Appendix Q

Revisions to 2014 Draft EIS/EIR and RDEIR/SDEIS

Appendix Q Revisions to 2014 Draft EIS/EIR and RDEIR/SDEIS

This Final EIS/EIR is a stand-alone document with revisions made in response to public comments received on the 2014 Draft Environmental Impact Statement/ Environmental Impact Report (EIS/EIR) and Revised Draft Environmental Impact Report/ Supplemental Draft Environmental Impact Statement (RDEIR/SDEIS). Text revisions need to be included in the Final EIR, as described in California Environmental Quality Act (CEQA) Guidelines Section 15132. As described in Section 15132(a):

> *The Final EIR shall consist of the draft EIR or a revision of the draft.*

Pursuant to Section 15132(a), this Appendix includes revisions of the 2014 Draft EIS/EIR and RDEIR/SDEIS in errata sheet format.

Document Structure

Only substantial text changes to the 2014 Draft EIS/EIR and the RDEIR/SDEIS are included in this appendix. Changes in text are signified by strikeouts where text is removed and by italics where text is added.

This Final EIS/EIR includes all appendices included in the 2014 Draft EIS/EIR, RDEIR/SDEIS, and additional appendices added in response to public comments. Appendices were renamed in this Final EIS/EIR as follows:

- Appendix B, Water Operations Assessment, of the 2014 Draft EIS/EIR was changed to Appendix C
- Appendix C, Delta Conditions Assessment, of the 2014 Draft EIS/EIR was changed to Appendix E
- Appendix E, Groundwater Existing Conditions of the RDEIR/SDEIS was changed to Appendix F
- Appendix F, Groundwater Modeling Results, of the RDEIR/SDEIS was changed to Appendix G
- Appendix F, Air Quality Emission Calculations, of the 2014 Draft EIS/EIR was changed to Appendix I
- Appendix G, Climate Change Analysis Emissions Calculations, of the 2014 Draft EIS/EIR was changed to Appendix J

- Appendix J, Climate Change Technical Appendix, of the RDEIR/SDEIS was changed to Appendix K
- Appendix D, Regulatory Setting, of the RDEIR/SDEIS was changed to Appendix L
- Appendix G, Natural Communities Descriptions, of the RDEIR/SDEIS was changed to Appendix M
- Appendix H, Special-Status Animals and Plants with Potential to Occur in the Area of Analysis, of the RDEIR/SDEIS was changed to Appendix N
- Appendix I, Tables Summarizing the Screening Evaluation and Average Monthly Flows using the Groundwater Model for Smaller Streams, of the RDEIR/SDEIS was changed to Appendix O

Renaming of Appendices is not discussed in this Appendix as they do not qualify as substantive text changes.

Executive Summary

Executive Summary of the 2014 Draft EIS/EIR was replaced in entirety with Executive Summary of the RDEIR/SDEIS.

Page ES-1

The following section, ES.1, on page ES-1 of the RDEIR/SDEIS is added:

ES.1 Introduction

Bureau of Reclamation (Reclamation) and the San Luis & Delta-Mendota Water Authority (SLDMWA) previously completed a joint Environmental Impact Statement/Environmental Impact Report (EIS/EIR) for the Proposed Action pursuant to the National Environmental Policy Act (NEPA) and California Environmental Quality Act (CEQA). The Draft Long-Term Water Transfers EIS/EIR (2014 Draft EIS/EIR) was completed in September 2014. Reclamation and SLDMWA held public meetings after release of the 2014 Draft EIS/EIR to solicit public comments. Meetings were held in Sacramento, Los Banos, and Chico, California in October 2014. Reclamation and SLDMWA also provided a 60-day comment period for the public and agencies to submit written comments on the 2014 Draft EIS/EIR. The Final Long-Term Water Transfers EIS/EIR (2015 Final EIS/EIR) was completed in March 2015. The 2015 Final EIS/EIR was challenged in United States District Court for the Eastern District of California in the case AquAlliance, et al., v. U.S. Bureau of Reclamation, et al. On July 5, 2018, the District Court entered judgment, vacating SLDMWA's decisions to approve the Final Long-Term Water Transfers EIS/EIR and approve the Proposed Action, vacating the 2015 Final EIS/EIR, and vacating the U.S. Fish and Wildlife Service's biological opinion. As a result, Reclamation and SLDMWA released the Long-Term Water Transfers Revised Draft EIR/Supplemental Draft EIS (RDEIR/SDEIS) in February 2019 to address the specific issues identified in the ruling. The RDEIR/SDEIS was released for *a 45-day comment period for the public and agencies to submit written comments on the RDEIR/SDEIS.*

The 2014 Draft EIS/EIR included the main document and nine appendices. The RDEIR/SDEIS included the main document and eleven appendices. The RDEIR/SDEIS replaced the following sections of the 2014 Draft EIS/EIR:

- *Project Description: updated to reflect new seller information and overall quantity of transfers. Removed environmental commitments related to protection of biological species from the project description and moved them to mitigation measures in the Vegetation and Wildlife chapter.*
- *Groundwater: revised affected environment to describe changes that have occurred since completion of the 2014 Draft EIS/EIR and revised Mitigation Measure GW-1.*
- *Vegetation and Wildlife: updated analysis to reflect project description without environmental commitments and include appropriate mitigation measures.*
- *Water Quality: updated cumulative analysis to provide more detail on water quality effects associated with changes in Delta outflow.*
- *Fisheries Resources: revised cumulative analysis to provide more detail on effects to fisheries associated with changes in Delta outflow.*
- *Climate Change: added impact analysis to describe potential impacts of climate change on the project.*
- *Appendices E, H and I of the 2014 Draft EIS/EIR were replaced with Appendices D, F and H of the RDEIR/SDEIS*

The 2014 Draft EIS/EIR and the RDEIR/SDEIS are available here: https://www.usbr.gov/mp/nepa/nepa_project_details.php?Project_ID=18361. This Final EIS/EIR presents the entire document with revisions to the 2014 Draft EIS/EIR and the RDEIR/SDEIS in response to the public comments.

Page ES-3

The last sentence on page ES-3 of the RDEIR/SDEIS is revised as follows:

> The Study Area for potential transfers encompasses the potential buyers and sellers that could participate, which are *listed*~~shown~~ in Figure ES-1 *and Tables ES-1 and ES-2*.

Page ES-4

The first sentence on page ES-4 of the RDEIR/SDEIS is revised as follows:

> A number of CVP contractors have identified interest in purchasing transfer water to reduce potential water shortages and have requested to be included in this Final EIS/EIR; these agencies are ~~shown~~*listed* in Table ES-1.

Page ES-9

The third paragraph on page ES-9 of the RDEIR/SDEIS is revised as follows:

> A summary of the environmental impacts identified for the action alternative*s* (including beneficial effects pursuant to NEPA) ~~is presented in Appendix C, Impacts Summary of the RDEIR/SDEIS~~ *is presented in Tables ES-4 and ES-5 below*. The No Action/No Project Alternative considers the potential for changed conditions during the 2019-2024 period when transfers could occur. The potential for changed conditions for this period was found to be insubstantial and the analysis did not identify changes from existing conditions. Alternative 1 is therefore not included in the tables.

Page ES-10

Table ES-4 and ES-5 are added to Page ES-10 of the RDEIR/SDEIS.

Table ES-4. Potential Impacts Summary

Potential Impact	**Alternative**	***Significance to CEQA***	***Proposed Mitigation***	**Significance *After Mitigation Pursuant* to CEQA**	***Revised Significance to CEQA***	***Revised* Proposed Mitigation**	***Revised* Significance After Mitigation Pursuant to CEQA**
~~3.1~~ Water Supply							
Groundwater substitution transfers could decrease flows in surface water bodies following a transfer while groundwater basins recharge, which could decrease pumping at Jones and Banks Pumping Plants and/or require additional water releases from upstream CVP reservoirs.	2, 3	S	WS-1: Streamflow Depletion Factor	LTS	*S*	*WS-1: Streamflow Depletion Factor*	*LTS*
Water supplies on the rivers downstream of reservoirs could decrease following stored reservoir water transfers, but would be limited by the refill agreements	2, 3, 4	LTS	None	LTS	*LTS*	*None*	*LTS*
Changes in Delta diversions could affect Delta water levels	*2, 3, 4*	*LTS*	*None*	*LTS*	*LTS*	*None*	*LTS*
Transfers would increase water supplies in the Buyers Service Area	2, 3, 4	B	None	B	*B*	*None*	*B*

Potential Impact	**Alternative**	***Significance to CEQA***	***Proposed Mitigation***	**Significance *After Mitigation Pursuant* to CEQA**	***Revised Significance to CEQA***	***Revised* Proposed Mitigation**	***Revised* Significance After Mitigation Pursuant to CEQA**
~~3.2~~ Water Quality							
Cropland idling transfers could result in increased deposition of sediment on water bodies.	2, 4	LTS	None	LTS	*LTS*	*None*	*LTS*
Cropland idling/shifting transfers could change the water quality constituents associated with leaching and runoff.	2, 4	LTS	None	LTS	*LTS*	*None*	*LTS*
Cropland idling/shifting transfers could change the quantity of organic carbon in waterways.	2, 4	LTS	None	LTS	*LTS*	*None*	*LTS*
Groundwater substitution transfers could introduce contaminants that could enter surface waters from irrigation return flows.	2, 3	LTS	None	LTS	*LTS*	*None*	*LTS*
Water transfers could change reservoir storage in CVP and SWP reservoirs and could result in water quality impacts.	2, 3, 4	LTS	None	LTS	*LTS*	*None*	*LTS*

Potential Impact	**Alternative**	***Significance to CEQA***	***Proposed Mitigation***	**Significance *After Mitigation Pursuant* to CEQA**	***Revised Significance to CEQA***	***Revised* Proposed Mitigation**	***Revised* Significance After Mitigation Pursuant to CEQA**
Water transfers could change reservoir storage non-Project reservoirs participating in reservoir release transfers, which could result in water quality impacts.	2, 3, 4	LTS	None	LTS	*LTS*	*None*	*LTS*
Water transfers could change river flow rates in the Seller Service Area and could affect water quality.	2, 3, 4	LTS	None	LTS	*LTS*	*None*	*LTS*
Water transfers could change Delta inflows and could result in water quality impacts.	*2, 3, 4*	*LTS*	*None*	*LTS*	*LTS*	*None*	*LTS*
Water transfers could change Delta outflows and could result in water quality impacts.	2, 3, 4	LTS	None	LTS	*LTS*	*None*	*LTS*
Water transfers could change Delta salinity and could result in water quality impacts.	2, 3, 4	LTS	None	LTS	*LTS*	*None*	*LTS*
Diversion of transfer water at Banta Carbona ID, West Stanislaus ID, and Patterson ID could affect water quality in the Delta-Mendota Canal.	2, 3, 4	LTS	None	LTS	*LTS*	*None*	*LTS*

Potential Impact	Alternative	*Significance to CEQA*	*Proposed Mitigation*	Significance *After Mitigation Pursuant* to CEQA	*Revised Significance to CEQA*	*Revised* Proposed Mitigation	*Revised* Significance After Mitigation Pursuant to CEQA
Use of transfer water in the Buyer Service Area could result in increased irrigation on drainage impaired lands in the Buyer Service Area which could affect water quality.	2, 3, 4	LTS	None	LTS	*LTS*	*None*	*LTS*
Water transfers could change reservoir storage in San Luis Reservoir and could result in water quality impacts.	2, 3, 4	LTS	None	LTS	*LTS*	*None*	*LTS*
~~3.3~~ **Groundwater Resources**							
Groundwater substitution transfers could cause a reduction in groundwater levels in the Seller Service Area.	2, 3	S	GW-1: Mitigation and Monitoring Plans	LTS	*S*	*GW-1: Mitigation and Monitoring Plans*	*LTS*
Groundwater substitution transfers could cause subsidence in the Seller Service Area.	2, 3	S	GW-1: Mitigation and Monitoring Plans	LTS	*S*	*GW-1: Mitigation and Monitoring Plans*	*LTS*
Groundwater substitution transfers could cause changes to groundwater quality in the Seller Service Area.	2, 3	LTS	None	LTS	*LTS*	*None*	*LTS*

Potential Impact	**Alternative**	***Significance to CEQA***	***Proposed Mitigation***	**Significance *After Mitigation Pursuant* to CEQA**	***Revised Significance to CEQA***	***Revised* Proposed Mitigation**	***Revised* Significance After Mitigation Pursuant to CEQA**
Cropland idling transfers could cause reduction in groundwater levels in the Seller Service Area due to decreased applied water recharge.	2, 4	LTS	None	LTS	*LTS*	*None*	*LTS*
Water transfers via cropland idling could cause groundwater level declines in the Seller Service Area that lead to permanent land subsidence or changes in groundwater quality.	*2, 4*	*LTS*	*None*	*LTS*	*LTS*	*None*	*LTS*
Water transfers could reduce groundwater pumping during shortages in the Buyer Service Area, which could increase groundwater levels, decrease subsidence, and improve groundwater quality.	2, 3, 4	B	None	B	*B*	*None*	*B*
~~3.~~4 Geology and Soils							
Cropland idling transfers in the Seller Service Area that temporarily convert cropland to bare fields could increase soil erosion.	2, 4	LTS	None	LTS	*LTS*	*None*	*LTS*

Potential Impact	**Alternative**	***Significance to CEQA***	***Proposed Mitigation***	**Significance *After Mitigation Pursuant* to CEQA**	***Revised Significance to CEQA***	***Revised* Proposed Mitigation**	***Revised* Significance After Mitigation Pursuant to CEQA**
Cropland idling water transfers could cause expansive soils in the Seller Service Area to shrink due to the reduction in applied irrigation water.	2, 4	LTS	None	LTS	*LTS*	*None*	*LTS*
Use of transfer water on agricultural fields in the Buyer Service Area could increase soil erosion.	2, 3, 4	LTS	None	LTS	*LTS*	*None*	*LTS*
Use of transfer water on agricultural fields in the Buyer Service Area could increase soil movement.	2, 3, 4	LTS	None	LTS	*LTS*	*None*	*LTS*
Changes in streamflows in the Sacramento and San Joaquin Rivers and their tributaries as a result of water transfers could result in increased soil erosion.	*2, 3, 4*	*LTS*	*None*	*LTS*	*LTS*	*None*	*LTS*
~~3.5~~ Air Quality							
Increased groundwater pumping for groundwater substitution transfers would increase emissions of air pollutants in the Sellers Service Area.	2, 3	S	AQ-1: Reducing pumping to reduce emissions, AQ-2: Operate electric engines	LTS	*S*	*AQ-1: Reducing pumping to reduce emissions, AQ-2: Operate electric engines*	*LTS*

Potential Impact	Alternative	*Significance to CEQA*	*Proposed Mitigation*	Significance *After Mitigation Pursuant* to CEQA	*Revised Significance to CEQA*	*Revised* Proposed Mitigation	*Revised* Significance After Mitigation Pursuant to CEQA
Water transfers via cropland idling could reduce vehicle exhaust emissions from reduced operations in the Sellers Service Area.	2, 4	B	None	B	*B*	*None*	*B*
Water transfers via cropland idling would increase fugitive dust emissions from wind erosion of bare fields and decrease fugitive dust emissions associated with land preparation and harvesting in the Sellers Service Area.	2, 4	B	None	B	*B*	*None*	*B*
Use of water from transfers on agricultural fields in the Buyer Service Area could reduce windblown dust.	2, 3, 4	B	None	B	*B*	*None*	*B*
Water transfers via groundwater substitution and cropland idling could exceed the general conformity de minimis thresholds.	2, 3, 4	LTS	None	LTS	*LTS*	*None*	*LTS*

Potential Impact	Alternative	*Significance to CEQA*	*Proposed Mitigation*	Significance *After Mitigation Pursuant* to CEQA	*Revised Significance to CEQA*	*Revised* Proposed Mitigation	*Revised* Significance After Mitigation Pursuant to CEQA
~~3.6~~ **Climate Change**							
Increased groundwater pumping for groundwater substitution transfers could increase emissions of greenhouse gases.	2, 3	LTS	None	LTS	*LTS*	*None*	*LTS*
Water transfers via cropland idling could reduce vehicle exhaust emissions from reduced operations in the study area.	2, 4	LTS	None	LTS	*LTS*	*None*	*LTS*
Changes to the environment from climate change could affect the ~~action alternatives~~ *Proposed Action by altering transfer supply or demand.*	2, 3, 4	LTS	None	LTS	*LTS*	*None*	*LTS*
Use of water from transfers on agricultural fields in the Buyer Service Area could affect emissions.	2, 3, 4	LTS	None	LTS	*LTS*	*None*	*LTS*

Potential Impact	Alternative	*Significance to CEQA*	*Proposed Mitigation*	Significance *After Mitigation Pursuant* to CEQA	*Revised Significance to CEQA*	*Revised* Proposed Mitigation	*Revised* Significance After Mitigation Pursuant to CEQA
~~3.7 Aquatic Resources~~ ***Fisheries***							
Transfer actions could affect reservoir storage and reservoir surface area in reservoirs supporting fisheries resources	2, 3, 4	LTS	None	LTS	*LTS*	*None*	*LTS*
Groundwater substitution could reduce stream flows supporting fisheries resources in small streams	*2, 3*	*LTS*	*None*	*LTS*	*LTS*	*None*	*LTS*
Transfer actions could ~~decrease~~ *alter* flows of rivers and creeks supporting fisheries resources in the Sacramento and San Joaquin river watersheds	2, 3, 4	LTS	None	LTS	*LTS*	*None*	*LTS*
Transfer actions could alter hydrologic conditions in the Delta, altering associated habitat availability and suitability	2, 3, 4	LTS	None	LTS	*LTS*	*None*	*LTS*
Transfer actions could affect the habitat of special-status species associated with mainstem rivers, tributaries, and the Delta.	*2, 3, 4*	*LTS*	*None*	*LTS*	*LTS*	*None*	*LTS*

Potential Impact	Alternative	*Significance to CEQA*	*Proposed Mitigation*	Significance *After Mitigation Pursuant* to CEQA	*Revised Significance to CEQA*	*Revised* Proposed Mitigation	*Revised* Significance After Mitigation Pursuant to CEQA
~~**3.8 Terrestrial Resources**~~ ***Vegetation and Wildlife***							
Groundwater substitution could reduce groundwater levels ~~supporting~~ *and available groundwater for* natural communities	2, 3	LTS	None	LTS	*LTS*	*None*	*LTS*
Transfers could impact reservoir storage and reservoir surface area and alter habitat availability and suitability associated with those reservoirs	*2, 3, 4*	*LTS*	*None*	*LTS*	*LTS*	*None*	*LTS*
Groundwater substitution could reduce stream flows supporting natural communities in small streams	2, 3	S	*GW-1*	*LTS*	*S*	GW-1, *VEG and WILD-1*	LTS
Cropland Idling/~~Shifting~~*shifting* could alter habitat availability and suitability *for upland species*	2, 4	LTS	None	LTS	*LTS*	*None*	*LTS*

Potential Impact	**Alternative**	***Significance to CEQA***	***Proposed Mitigation***	**Significance *After* Mitigation Pursuant to CEQA**	***Revised Significance to CEQA***	***Revised* Proposed Mitigation**	***Revised* Significance After Mitigation Pursuant to CEQA**
~~Transfer actions~~*Transfers* could ~~alter~~ reduce flows in large rivers *in the Sacramento and San Joaquin River watersheds,* altering habitat availability and suitability associated with these rivers	2, 3, 4	LTS	None	LTS	*LTS*	*None*	*LTS*
Transfer actions could alter hydrologic conditions in the Delta, altering associated habitat availability and suitability	2, 3, 4	LTS	None	LTS	*LTS*	*None*	*LTS*
Transfer actions could impact San Luis Reservoir storage and surface area.	2, 3, 4	LTS	None	LTS	*LTS*	*None*	*LTS*
Cropland idling/shifting under could alter the amount of suitable habitat for natural communities ~~and~~, special-status wildlife species, *and migratory birds* associated with seasonally flooded agriculture and associated irrigation waterways	2, 4	LTS	None	LTS	*S*	*VEG and WILD-1*	*LTS*

Potential Impact	Alternative	*Significance to CEQA*	*Proposed Mitigation*	**Significance *After Mitigation Pursuant* to CEQA**	***Revised Significance to CEQA***	***Revised* Proposed Mitigation**	***Revised* Significance After Mitigation Pursuant to CEQA**
Transfer actions could alter planting patterns and urban water use *in the Buyer Service Area*	2, 3, 4	LTS	None	LTS	*LTS*	*None*	*LTS*
Transfers could affect wetlands that provide habitat for special status plant species.	*2, 3, 4*	*LTS*	*None*	*LTS*	*S*	*GW-1, VEG and WILD- 1*	*LTS*
Transfers could affect giant garter snake and Pacific pond turtle by reducing aquatic habitat.	*2, 3, 4*	*LTS*	*None*	*LTS*	*S*	*GW-1, VEG and WILD-1*	*LTS*
Transfers could affect the San Joaquin kit fox by reducing available habitat.	*2, 3, 4*	*LTS*	*None*	*LTS*	*LTS*	*None*	*LTS*
Transfers could impact special status bird species and migratory birds.	*2, 3, 4*	*LTS*	*None*	*LTS*	*S*	*GW-1, VEG and WILD-1*	*LTS*

Potential Impact	Alternative	*Significance to CEQA*	*Proposed Mitigation*	Significance *After Mitigation Pursuant* to CEQA	*Revised Significance to CEQA*	*Revised* Proposed Mitigation	*Revised* Significance After Mitigation Pursuant to CEQA
~~3.9~~ Agricultural Land Use							
Cropland idling water transfers could ~~permanently or substantially~~ decrease the amount of lands categorized as Prime Farmland, Farmland of Statewide Importance, or Unique Farmland under the FMMP.	2	LTS	None	LTS	*LTS*	*None*	*LTS*
Cropland idling water transfers could decrease the amount of lands categorized as Prime Farmland, Farmland of Statewide Importance, or Unique Farmland under the FMMP.	*4*	*S*	*Mitigation Measure LU-1: Avoiding changes in FMMP land use classifications*	*LTS*	*S*	*Mitigation Measure LU-1: Avoiding changes in FMMP land use classifications*	*LTS*
Cropland idling water transfers could convert agricultural lands under the Williamson Act and other land resource programs to an incompatible use.	2, 4	LTS	None	LTS	*LTS*	*None*	*LTS*
Cropland idling water transfers could conflict with local land use policies.	2, 4	NI	None	NI	*NI*	*None*	*NI*

Potential Impact	Alternative	*Significance to CEQA*	*Proposed Mitigation*	Significance *After Mitigation Pursuant* to CEQA	*Revised Significance to CEQA*	*Revised* Proposed Mitigation	*Revised* Significance After Mitigation Pursuant to CEQA
Water transfers could provide water to irrigators in the Buyer Service Area to irrigate existing crop fields and maintain agricultural land uses.	2, 3, 4	B	B	B	*B*	*B*	*B*
~~3.13~~ Cultural Resources							
Transfers that draw down reservoir surface elevations beyond historically low levels could result in a potentially significant effect on cultural resources.	2, 3, 4	LTS	None	LTS	*LTS*	*None*	*LTS*
Stored reservoir release transfers that draw down reservoir surface elevations at local reservoirs beyond historically low levels could affect cultural resources.	2, 3, 4	LTS	None	LTS	*LTS*	*None*	*LTS*
~~3.14~~ *Visual Resources*							
Water transfers could degrade the existing landscape character or scenic attractiveness of Class A and B visual resources at CVP and SWP reservoirs	2, 3, 4	LTS	None	LTS	*LTS*	*None*	*LTS*

Potential Impact	Alternative	*Significance to CEQA*	*Proposed Mitigation*	**Significance *After Mitigation Pursuant* to CEQA**	***Revised Significance to CEQA***	***Revised* Proposed Mitigation**	***Revised* Significance After Mitigation Pursuant to CEQA**
Water transfers could degrade the existing landscape character or scenic quality of Class A and B visual resources along surface water bodies	2, 3, 4	LTS	None	LTS	*LTS*	*None*	*LTS*
Stored reservoir release transfers could substantially degrade the existing landscape character or scenic attractiveness of Class A and B visual resources participating reservoirs	2, 3, 4	LTS	None	LTS	*LTS*	*None*	*LTS*
Cropland idling transfers could substantially degrade the existing landscape character and scenic attractiveness of Class A and B visual resources	2, 4	LTS	None	LTS	*LTS*	*None*	*LTS*
Water transfers could substantially degrade the existing landscape character and quality in the Buyer's Service Area	2, 3, 4	LTS	None	LTS	*LTS*	*None*	*LTS*

Potential Impact	Alternative	*Significance to CEQA*	*Proposed Mitigation*	Significance *After Mitigation Pursuant* to CEQA	*Revised Significance to CEQA*	*Revised* Proposed Mitigation	*Revised* Significance After Mitigation Pursuant to CEQA
3.15 Recreation							
Changes in surface water elevation at Shasta, Folsom, Merle Collins, Oroville, Camp Far West, and Lake McClure reservoirs as a result of water transfers could affect reservoir-based recreation.	2, 3, 4	LTS	None	LTS	*LTS*	*None*	*LTS*
Changes in surface water elevations at Hell Hole and French Meadows Reservoirs as a result of water transfers could affect reservoir-based recreation.	2, 3, 4	LTS	None	LTS	*LTS*	*None*	*LTS*
Changes in river flows from water transfers could affect river-based recreation on the Sacramento, Yuba, Feather, American, San Joaquin, and Merced rivers.	2, 3, 4	LTS	None	LTS	*LTS*	*None*	*LTS*
Changes in average flow into the Delta from the San Joaquin River from water transfers could affect river-based recreation.	2, 3, 4	NI	None	NI	*NI*	*None*	*NI*

Potential Impact	Alternative	*Significance to CEQA*	*Proposed Mitigation*	Significance *After Mitigation Pursuant* to CEQA	*Revised Significance to CEQA*	*Revised* Proposed Mitigation	*Revised* Significance After Mitigation Pursuant to CEQA
Changes in surface water elevation at San Luis Reservoir as a result of water transfers could affect reservoir-based recreation	2, 3, 4	NI	None	NI	*NI*	*None*	*NI*
~~3.16~~ Power							
Acquisition of water via groundwater substitution or crop idling may cause changes in power generation from CVP and SWP reservoirs	2, 3, 4	LTS	None	LTS	*LTS*	*None*	*LTS*
Acquisition of water via stored reservoir water may cause changes in power generation from the facilities that ~~sell~~ *provide* water	2, 3, 4	LTS	None	LTS	*LTS*	*None*	*LTS*
~~3.17~~ Flood Control							
Water transfers would change storage levels in CVP and SWP reservoirs, potentially affecting flood control	2, 3, 4	LTS	None	LTS	*LTS*	*None*	*LTS*
Water transfers ~~could decrease~~ *would change* storage levels in non-Project reservoirs and potentially affecting flood control	2, 3, 4	B	None	B	*B*	*None*	*B*

Potential Impact	**Alternative**	***Significance to CEQA***	***Proposed Mitigation***	**Significance *After Mitigation Pursuant* to CEQA**	***Revised Significance to CEQA***	***Revised* Proposed Mitigation**	***Revised* Significance After Mitigation Pursuant to CEQA**
Water transfers could ~~change~~ *increase* river flows, potentially affecting flood capacity or levee stability	2, 3, 4	LTS	None	LTS	*LTS*	*None*	*LTS*
Water transfers would change storage at San Luis Reservoir, potentially affecting flood control	2, 3, 4	LTS	None	LTS	*LTS*	*None*	*LTS*

Key:
B = beneficial; LTS = less than significant; NI = no impact; None = no feasible mitigation identified and/or required; S = significant

Page ES-21

Table ES-5 on page ES-21 of the 2014 Draft EIS/EIR is revised as follows:

Table ES-5. Impacts for NEPA-Only Resources

Potential Impact	Alternative	Impact
~~**3.10 Regional Economics**~~ ***REGIONAL ECONOMICS***		
Seller Service Area		
Revenues from cropland idling water transfers could increase incomes for farmers or landowners selling water.	2, 4	Beneficial
Cropland idling transfers in Glenn, Colusa, and Yolo counties could reduce employment, labor income, and economic output for businesses and households linked to agricultural activities.	2, 4	Employment: -~~362~~*492* Labor Income: -$~~15.11~~*19.38* Million Output: -$~~45.46~~*90.43* Million
Cropland idling transfers in Sutter and Butte counties could reduce economic output, value added, and employment for businesses and households linked to agricultural activities.	2, 4	Employment: -~~118~~*163* Labor Income: -$~~4.16~~*5.50* Million Output: -$~~13.84~~*26.76* Million
Cropland idling transfers in Solano County could reduce economic output, labor income, and employment for businesses and households linked to agricultural activities.	2, 4	Employment: -~~19~~*32* Labor Income: -$~~0.84~~*1.13* Million Output: -$~~2.01~~*4.58* Million
Cropland idling transfers could have adverse local economic effects.	2, 4	Adverse
Water transfers from idling alfalfa could increase costs for dairy and other livestock feed.	2, 4	Adverse, but minimal
Cropland idling transfers could decrease net revenues to tenant farmers whose landowners choose to participate in transfers.	2, 4	Adverse
Crop shifting transfers could change economic output, value added, and employment for businesses and households linked to agricultural activities.	2, 4	Adverse, but minimal
Crop shifting transfers could change economic output, value added, and employment for businesses and households linked to agricultural activities.	2, 4	Adverse, but minimal
Economic effects associated with cropland idling could conflict with economic policies and objectives set forth in local plans.	2, 4	Adverse

Potential Impact	Alternative	Impact
Economic effects associated with cropland idling could conflict with economic policies and objectives set forth in local plans.	2, 4	Adverse
Reductions in local sales associated with cropland idling transfer effects could reduce tax revenues and increase costs to county governments.	2, 4	Adverse, but minimal
Groundwater substitution transfers could increase groundwater pumping costs for water users in areas where groundwater levels decline as a result of the transfer.	2, 3	Adverse
Revenues from groundwater substitution water transfers could increase incomes for farmers or landowners selling water.	2, 3	Beneficial
Groundwater substitution water transfers could increase management costs for local water districts.	2, 3	Adverse
Revenues received from stored reservoir and conservation transfers could increase operating incomes for sellers.	2, 3, 4	Beneficial, but minimal
Buyer Service Area		
Water transfers would provide water for agricultural uses that could support revenues, economic output, and employment.	2, 3, 4	Beneficial
Water transfers would provide water for M&I uses that could support revenues, economic output, and employment.	2, 3, 4	Beneficial
~~3.11 Environmental Justice~~ *ENVIRONMENTAL JUSTICE*		
Cropland idling transfers could adversely and disproportionately affect minority and low-income farm workers in the Seller Service Area.	2, 4	No disproportionately high or adverse effect
Crop shifting transfers could adversely and disproportionately affect minority and low-income farm workers in the Seller Service Area.	2, 3	No disproportionately high or adverse effect
Use of cropland modification transfers could adversely and disproportionately affect minority and low-income farm workers in the Buyer Service Area.	2, 3, 4	Beneficial
~~3.12 Indian Tribal Assets~~ *INDIAN TRUST ASSETS*		
Groundwater substitution transfers could adversely affect ITAs by decreasing groundwater levels, which would potentially interfere with the exercise of a federally-reserved water right use, occupancy, and or character	2, 3	No effect

Potential Impact	Alternative	Impact
Groundwater substitution transfers could adversely affect ITAs by reducing the health of tribal members by decreasing water supplies	2, 3	No effect
Groundwater substitution transfers could affect ITAs by affecting fish and wildlife where there is a federally-reserved hunting, gathering, or fishing right.	2, 3	No effect
Groundwater substitution transfers could adversely affect ITAs by causing changes in stream flow temperatures or stream depletion, which would potentially interfere with the exercise of a federally-reserved Indian right	2, 3	No effect
Use of groundwater substitution transfers could affect reservations or Rancherias in the Buyer Service Area to reduce CVP shortages.	2, 3, 4	Beneficial

Chapter 1, Introduction

Page 1-1

The third paragraph page 1-1 of the RDEIR/SDEIS is revised as follows:

> Transfers are allowed under California State law and under Federal law. Water users have been encouraged to seek alternative sources of water through willing buyers/willing seller agreements.
>
> *The purpose of the EIS/EIR is to address the effects of transfers between listed buyers and sellers (i.e., the Proposed Action) that will streamline the environmental review process and make transfers more implementable relative to NEPA and CEQA requirements, especially when hydrologic conditions and available pumping capacity are unknown until right before the transfer season.* ~~This Revised Draft Environmental Impact Report/Supplemental Draft Environmental Impact Statement (RDEIR/SDEIS) updates a Draft Environmental Impact Report/ Environmental Impact Statement (EIS/EIR) that was previously circulated in 2014 and has now been revised with new information and analysis presented herein. The purpose of the EIS/EIR is to address the effects of transfers between listed buyers and sellers (i.e., the Proposed Action) that will streamline the environmental review process and make transfers more implementable relative to National Environmental Policy Act (NEPA) and California Environmental Quality Act (CEQA) requirements, especially when hydrologic conditions and available pumping capacity are unknown until right before the transfer season.~~

The fourth paragraph on page 1-1 of the RDEIR/SDEIS is revised as follows:

> A water transfer involves an agreement between a willing seller and a willing buyer, and available infrastructure capacity to convey water between the two parties. To make water available for transfer, the willing seller must take an action to reduce the consumptive use of water (such as idle cropland or pump groundwater in lieu of using surface water) or release additional water from reservoir storage. This water would be conveyed to the buyers' service area for beneficial use. Water transfers would only be used to help meet existing demands and would not serve any new demands in the buyers' service areas. *The proposed water transfers would not directly or indirectly affect growth beyond what is already planned.*

The last paragraph on page 1-1 of the RDEIR/ SDEIS is revised as follows:

> ~~As further described below in Section 1.2, Reclamation and San Luis & Delta-Mendota Water Authority (SLDMWA) previously completed a joint EIS/EIR for the Proposed Action pursuant to NEPA and CEQA for water transfers through 2024, and revisions to the 2014 Draft EIS/EIR are presented herein. Reclamation serves as the Lead Agency under NEPA and SLDMWA is the Lead Agency under CEQA. Reclamation would facilitate transfers proposed by buyers and sellers. The SLDMWA, consisting of federal and exchange water service contractors in western San Joaquin Valley, San Benito, and Santa Clara counties, negotiates and purchases transfers in years when the member agencies could experience shortages.~~ *This Long-Term Water Transfers EIS/EIR evaluates water transfers conducted by CVP contractors located south of the Delta or in the San*

Francisco Bay Area. The water would be conveyed through the Delta using CVP or State Water Project (SWP) pumps, or facilities owned by other agencies in the San Francisco Bay Area. Reclamation serves as the Lead Agency under NEPA and SLDMWA is the Lead Agency under CEQA for this Final EIS/EIR. Reclamation would facilitate transfers proposed by buyers and sellers. The SLDMWA, consisting of federal and exchange water service contractors in western San Joaquin Valley, San Benito, and Santa Clara counties, helps negotiate transfers in years when the member agencies could experience shortages.

Page 1-2

The first paragraph on page 1-2 of the RDEIR/SDEIS is revised as follows:

> ~~The RDEIR/SDEIS evaluates water transfers to CVP contractors located south of the Delta or in the San Francisco Bay Area. The water would be conveyed through the legal Delta[1] using CVP or State Water Project (SWP) pumps, or facilities owned by other agencies in the San Francisco Bay Area. The RDEIR/SDEIS addresses the transfer of water to CVP contractors from CVP and non-CVP sources of supply that must be conveyed through the Delta using CVP, SWP, and local facilities. These transfers require approval from Reclamation and/or the Department of Water Resources (DWR), which necessitates compliance with NEPA and CEQA. Other transfers not included in this RDEIR/SDEIS could occur during the same time period, subject to their own environmental review (as necessary). Non-CVP transfers are analyzed in combination with the potential alternatives in the cumulative analysis.~~*The Final EIS/EIR addresses the transfer of water to CVP contractors from CVP and non-CVP sources of supply that must be conveyed through the Delta using CVP, SWP, and local facilities. These transfers require approval from Reclamation and/or the Department of Water Resources (DWR), which necessitates compliance with NEPA and CEQA. Other transfers not included in this Final EIS/EIR could occur during the same time period, subject to their own environmental review (as necessary). Non-CVP transfers are analyzed in combination with the Action Alternatives in the cumulative analysis.*

The footnote on Page 1-2 of the RDEIR/SDEIS is revised as follows:

> ~~The legal Delta is roughly defined as the waterways within the "triangular area" demarcated by Freeport on the Sacramento River on the north, to Vernalis on the San Joaquin River on the south, and Antioch at the confluence of the two rivers on the west.~~

Page 1-3

The last paragraph on Page 1-3 of the RDEIS/SDEIS is revised as follows:

> The 2015 Final EIS/EIR was challenged in United States District Court for the Eastern District of California in the case AquAlliance, et al., v. U.S. Bureau of Reclamation, et al. On July 5, 2018, the District Court entered judgment, vacating SLDMWA's decisions to approve the Final Long-Term Water Transfers EIS/EIR and approve the Proposed Action, vacating the 2015 Final EIS/EIR, and vacating the U.S. Fish and Wildlife

> Service's biological opinion. *Because the court vacated the 2015 Final EIS/EIR, the agencies could not simply supplement or revise the 2015 document. Instead, the agencies revised/supplemented the 2014 Draft EIS/EIR.*
>
> ~~As a result,~~ Reclamation and SLDMWA ~~are hereby revising~~revised the Long-Term Water Transfers EIS/EIR to address the specific issues identified in the ruling. *The additional information and associated analysis* ~~is being~~*was recirculated in the RDEIR/SDEIS,* ~~as described in CEQA Guidelines Section 15088.5. As described in Section 15088.5(c):~~
>
> ~~If the revision is limited to a few chapters or portions of the EIR, the lead agency need only recirculate the chapters or portions that have been modified~~*per CEQA and NEPA regulations.*

The following text from page 1-3 of the RDEIR/SDEIS is revised as follows:

> ~~Under NEPA~~ *In February 2019, Reclamation and SLDMWA completed the RDEIR/SDEIS to address specific issues identified in the ruling. The RDEIR/SDEIS* ~~this document represents a supplemental statement to~~ *supplemented* the *2014* Draft EIS, as defined in 40 Code of Federal Regulations (CFR) 1502.9 (c):
>
>> Agencies shall prepare supplements to either draft or final environmental impact statement if… there are significant new circumstances or information relevant to environmental concerns and bearing on the proposed action or its impacts.
>
> This RDEIR/SDEIS ~~includes revised sections to address the specific areas of the Final EIS/EIR requiring further discussion and clarification as determined by the court~~*included revised sections to address the specific issues resulting from the court ruling*. These sections include:

Page 1-4

The first two paragraphs on page 1-4 of the RDEIR/SDEIS are revised as follows:

> ~~The Project Description, Groundwater, and Vegetation and Wildlife sections represent complete sections within this RDEIR/SDEIS. The Water Quality, Fisheries Resources, and Climate Change sections add analysis to the 2014 Draft EIS/EIR. These sections do not include the entire text of these sections, but only include the new text that has been added as part of the RDEIR/SDEIS.~~ *The 2014 Draft EIS/EIR was completed in September 2014 and public meetings were held after the release to solicit public comments. Meetings were held in Sacramento, Los Banos, and Chico, California in October 2014. Reclamation and SLDMWA also provided a 60-day comment period for the public and agencies to submit written comments on the 2014 Draft EIS/EIR. The RDEIR/SDEIS completed in February 2019 was released for a 45-day comment period for the public and agencies to submit written comments on the RDEIR/SDEIS. This Final EIS/EIR presents the entire document with revisions to the 2014 Draft EIS/EIR and the RDEIR/SDEIS in response to the public comments.*

The remaining sections from the 2014 Draft EIS/EIR do not have changes resulting from the Court's ruling and are not included in this RDEIR/SDEIS; however, the 2014 Draft EIS/EIR is still available to the public for informational purposes, as described below in Section 1.6. After public review of this RDEIR/SDEIS, Reclamation and SLDMWA will consider public comments received, respond in writing to any significant environmental issues raised, and develop a Final Long-Term Water Transfers EIS/EIR that incorporates the 2014 Draft EIS/EIR (and responses to comments on that document) and the material in this RDEIR/SDEIS. Figure 1-1 illustrates the document structure of these documents and provides a document road map.

The first paragraph in Section 1.3 on page 1-4 of the RDEIR/SDEIS is revised as follows:

The 2014 Draft EIS/EIR evaluates out-of-basin water transfers from willing sellers upstream from the Delta to buyers south of the Delta and in the San Francisco Bay Area. Alternatives considered in the RDEIR/SDEIS *and this Final EIS/EIR* only analyze transfers to CVP contractors that require use of CVP or SWP facilities. SWP contractors located south of the Delta may also purchase water made available for transfer that originates north of the Delta. The cumulative analysis evaluates potential SWP transfers, but they are not part of the action alternatives for the RDEIR/SDEIS *and this Final EIS/EIR.*

Page 1-6

Section 1.6 on page 1-6 of the RDEIR/SDEIS is revised as follows:

1.6 RDEIR/SDEIS Availability and Processing

The RDEIR/SDEIS is available for public review on Reclamation's website: https://www.usbr.gov/mp/nepa/nepa_project_details.php?Project_ID=18361. Copies are also available in county libraries within the area of analysis and the offices of Reclamation and SLDMWA.

Only the new information and revised analysis prepared to address specific areas of the 2015 Final EIS/EIR requiring further discussion and clarification are being circulated for public review and comment, pursuant to the applicable requirements of NEPA and CEQA. The 2015 Final EIS/EIR is also available at the same weblink provided above. These sections of the analysis are provided for informational purposes only and are not being recirculated for public comment. Comments on the 2015 document will not be accepted by Reclamation or SLDMWA; only comments specific to the RDEIR/SDEIS will be accepted. Reclamation and SLDMWA will then prepare written responses to comments received on the RDEIR/SDEIS, which will be included in the Final Long-Term Water Transfers EIS/EIR.

Chapter 2, Proposed Action and Description of the Alternatives

Chapter 2 of the 2014 Draft EIS/EIR was replaced in entirety with Chapter 2 of the RDEIR/SDEIS.

Page 2-29

The title of Section 2.3 on page 2-29 of the RDEIR/SDEIS is revised as follows:

2.3 *CEQA* Environmentally Superior Alternative

The first paragraph on page 2-29 of the RDEIR/SDEIS is revised as follows:

> As ~~shown~~*presented* in the 2014 Draft EIS/EIR and confirmed in this Final EIS/EIR, the Proposed Action would not have any significant, unavoidable adverse impacts. Similarly, none of the alternatives have significant, unavoidable adverse impacts, although some of the alternatives could have less of an impact on some resources in comparison to *the* Proposed Action:

Section 3.1, Water Supply

Page 3.1-3

The last sentence on page 3.1-3 of the 2014 Draft EIS/EIR is revised as follows:

> For this Environmental Impact Statement/Environmental Impact Report (EIS/EIR), annual transfers would not exceed the above capacities and would be pumped through Banks or Jones Pumping Plants between July and September ~~unless it shifts based on consultation with USFWS and NOAA Fisheries~~.

Page 3.1-5

The last paragraph on page 3.1-5 of the 2014 Draft EIS/EIR is revised as follows:

> Several CVP sellers hold Sacramento River Settlement Contracts[1] (Settlement Contracts). Reclamation entered into settlement negotiations with water users on the Sacramento River beginning in 1944, and most contracts were completed by 1964. *These contracts expired on March 31, 2004 and were renewed as the 2005 Executed Sacramento River Settlement Contracts.*

Footnote 2 on page 3.1-5 of the 2014 Draft EIS/EIR is revised as follows:

> The Settlement Contracts are currently the subject of litigation. The court of appeals en banc panel remanded the matter to district court. The Sacramento River Settlement Contractors have petitioned the ~~supreme court~~ *Supreme Court* and that petition is pending.

Page 3.1-6

Footnote 3 on page 3.1-6 of the 2014 Draft EIS/EIR is revised as follows:

> ~~After January, 2016, the contract amount will decrease to 40,290 AF. Conway Preservation Group's water right was split, selling 10,000 AF to the Woodland Davis Clean Water Agency.~~ *Conway Preservation Group has assigned portions of its water rights and Sacramento River Settlement Contract to the Woodland Davis Clean Water Agency. Amendment No. 1 to the Conway Preservation Group's Settlement Contract,*

> *which identifies the assignment of 10,000 AF to the Woodland Davis Clean Water Agency, is effective upon the earlier of the Woodland Davis Clean Water Agency diverting water or January 15, 2016. After that time, Conway Preservation Group may receive surface water under the portion assigned to the Woodland Davis Clean Water Agency.*

Paragraph 6 on page 3.1-6 of the 2014 Draft EIS/EIR is revised as follows:

> Conaway Preservation Group, LLC, through either multiple year or single year agreements, could transfer a maximum of 35,000 AF annually through groundwater substitution~~,~~ ~~and/or~~ ~~9,239 AF per year~~ by cropland idling, or crop shifting.

Page 3.1-7

The first paragraph on page 3.1-7 of the 2014 Draft EIS/EIR is revised as follows:

> Cranmore Farms, LLC, through either multiple year or single year agreements, could transfer a maximum of 8,000 AF annually through groundwater substitution ~~, and/~~or *up to* 2,500 AF per year *through* by crop idling or crop shifting.

The sixth paragraph on page 3.1-7 of the 2014 Draft EIS/EIR is revised as follows:

> Glenn-Colusa ID, through either single or multi-year transfers, agreements, could transfer up to 66,000 AF per year through crop idling and shifting ~~and/~~or 25,000 AF per year through groundwater substitution.

Page 3.1-8

The first paragraph on page 3.1-8 of the 2014 Draft EIS/EIR is revised as follows:

> The Pelger MWC, through either multiple year or single year agreements, could transfer a maximum of 3,750 AF annually through groundwater substitution, ~~and/~~or ~~2,538 AF per year~~ by crop idling or crop shifting.

The third paragraph on page 3.1-8 of the 2014 Draft EIS/EIR is revised as follows:

> Pleasant Grove-Verona MWC, through either multiple year or single year agreements, could transfer a maximum of ~~10~~*18*,000 AF annually through groundwater substitution~~,~~ ~~and/~~or ~~10,000 AF per year~~ by crop idling or crop shifting.

The fifth paragraph on page 3.1-8 of the 2014 Draft EIS/EIR is revised as follows:

> RD 1004, through either single year or multiyear agreements, could transfer a maximum of 10,000 AF through crop idling or crop shifting, ~~and/~~or up to 7,175 AF through groundwater substitution.

The seventh paragraph on page 3.1-8 of the 2014 Draft EIS/EIR is revised as follows:

> RD 1004, through either single year or multiyear agreements, could transfer a maximum of 10,000 AF through crop idling or crop shifting, ~~and/~~or up to 7,175 AF through groundwater substitution.

The eighth paragraph on page 3.1-8 of the 2014 Draft EIS/EIR is revised as follows:

> River Garden Farms is on the west side of the Sacramento River. River Garden Farms has a Sacramento River Settlement Contract with Reclamation for 29,300 AF of Base Supply and 500 AF of Project Water. River Garden Farms supplements its surface water supply with ~~three~~ groundwater wells.

Page 3.1-9

The first paragraph on page 3.1-9 of the 2014 Draft EIS/EIR is revised as follows:

> Sycamore MWC, through either multiple year or single year agreements, could transfer up to ~~15~~*20*,000 AF through crop idling~~, or~~ crop shifting~~,~~ ~~and/~~or ~~up to 10,000 AF~~ through groundwater substitution.

The third paragraph on page 3.1-9 of the 2014 Draft EIS/EIR is revised as follows:

> Te Velde, through multiple year agreements, could transfer a maximum of 7,094 AF annually through groundwater substitution~~,~~ ~~and/~~or ~~7,094 AF per year~~ by crop idling or crop shifting.

The seventh paragraph on page 3.1-9 of the 2014 Draft EIS/EIR is revised as follows:

> The Butte WD, through either single or multiple year agreements, could transfer a maximum of 11,500 AF per year by crop idling or crop shifting, ~~and/~~or 5,500 AF per year from groundwater substitution. An agreement with DWR would be required for Butte WD to implement a transfer.

Page 3.1-10

The first paragraph on page 3.1-10 of the 2014 Draft EIS/EIR is revised as follows:

> Garden Highway MWC, through either multiple year or single year agreements, could transfer a maximum of ~~12,287~~*14,000* AF annually through groundwater substitution. An agreement with DWR would be required for Garden Highway to implement a transfer.

The fifth paragraph on page 3.1-10 of the 2014 Draft EIS/EIR is revised as follows:

> Goose Club Farms and Teichert Aggregates, through either multiple year or single year agreements, could transfer a maximum of 10,000 AF annually through groundwater substitution~~,~~ or ~~10,000 AF per year~~ by crop idling or crop shifting.

The last paragraph on page 3.1-10 of the 2014 Draft EIS/EIR is revised as follows:

> Tule Basin Farms is on the east side of the Sacramento River in the center of the Sacramento Valley (Figure 3.1-1). The Farm has a water right to 8,980 AF per year for agriculture and habitat needs out of the ~~Feather River.~~ *West Borrow Pit of the Sutter Bypass.*

Page 3.1-11

The third paragraph on page 3.1-11 of the 2014 Draft EIS/EIR is revised as follows:

> Browns Valley ID, through either multiple year or single year agreements, could transfer a maximum amount of 3,100 AF through conservation measures, ~~and/~~or 5,000 AF per year by stored reservoir release from Merle Collins Reservoir.

Page 3.1-13

The first paragraph on page 3.1-13 of the 2014 Draft EIS/EIR is revised as follows:

> RD 2068, through either multiple year or single year agreements, could transfer a maximum amount ~~of 4~~ *of 7*,500 AF through groundwater substitution or ~~7,500 AF~~ through crop-idling ~~and/~~or crop shifting.

The second paragraph on page 3.1-13 of the 2014 Draft EIS/EIR is revised as follows:

> Merced ID is on the Merced River upstream of the confluence with the San Joaquin River. Merced ID has water rights on the Merced River and stores water in McClure and McSwain lakes. Merced ID supplies water *primarily* for agriculture~~, and M&I~~ purposes.

The first sentences of the fifth and sixth paragraphs on page 3.1-13 of the 2014 Draft EIS/EIR is revised as follows:

> The SLDMWA is made up of ~~29~~*28* federal and exchange water service contractors that manage approximately 2,100,000 acres in western San Joaquin Valley, and San Benito and Santa Clara counties.

> Of the ~~29~~*28* members of the SLDMWA, there are ten that would receive water transfers through the program (see Table 2-6).

Page 3.1-14

A sentence in paragraph 4 on page 3.1-14 of the 2014 Draft EIS/EIR is revised as follows:

> Data for the post-processing tool was provided by the SACFEM 2013 model, which includes highly variable hydrology (from very wet periods to very dry periods) *that* was used as a basis for simulating groundwater substitution pumping.

Page 3.1-16

The last paragraph on page 3.1-16 of the 2014 Draft EIS/EIR is revised as follows:

> Decreased streamflows during dry periods could affect CVP and SWP supplies in the near term or longer term. *Under dry or critical water years, streamflows are expected to decrease during the months of October through June.* When faced with decreased streamflows, the CVP and SWP could choose to decrease Delta exports (affecting supplies to users south of the Delta) or increase releases from storage. Increased releases from storage would vacate storage that could be filled during wet periods, but would affect water supplies in subsequent years if the storage is not refilled.

Page 3.1-19

The following text is inserted after paragraph 1 on page 3.1-19 of the 2014 Draft EIS/EIR:

> *Changes in Delta diversions could affect Delta water levels. During July through September when transfer water can be pumped through the Delta, the Banks and Jones pumping plants would pump more water than they would under the No Action/No Project conditions. Increased pumping could affect water levels in the south Delta around the pumping facilities. Decreased Delta water levels could have the potential to affect water supplies in this area if local users' diversion pumps did not remain underwater.*
>
> *Reclamation and DWR operate a series of temporary barriers during this period to minimize potential water level impacts to south Delta water users. These barriers would help maintain water levels under Alternative 2. Table 3.1-1 shows water levels downstream of the barrier at Old River compared to the No Action/No Project Alternative. Water levels are generally the same under both alternatives, with only very minor changes to water levels. Appendix E contains water levels at other points, both upstream of barriers and in other waterways. These other areas show impacts to water levels that are similar or less than those shown in Table 3.1-1. Therefore, the impacts to south Delta water supplies would be less than significant.*
>
> *Table 3.1-1. Difference in Minimum Stage (ft) at Old River Downstream of Barrier for Alternative 2 minus the No Action/No Project Alternative*

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1971	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1972	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1973	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1974	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1975	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1976	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	-0.2	-0.1
1977	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.2	0.0	0.0
1978	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1979	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1980	0.0	0.0	0.0	0.0	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1981	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.2	0.0
1982	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1983	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1984	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1985	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1986	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1987	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	-0.2	-0.1
1988	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.2	-0.1	0.0
1989	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0
1990	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.2	-0.1	0.0
1991	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.2	-0.1	0.0
1992	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	-0.1	0.0
1993	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1994	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1
1995	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1996	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1997	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1998	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1999	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2001	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	-0.1	-0.1
2002	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2003	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	0.0
Average	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Critical	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	-0.1	0.0
Dry	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0
BN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Wet	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Page 3.1-20

The first complete sentence on page 3.1-20 of the 2014 Draft EIS/EIR is revised as follows:

> The effects in the Seller and Buyer Service Areas *and the Delta* would be the same as the Proposed Action.

The following sentence in the first paragraph on page 3.1-20 of the 2014 Draft EIS/EIR is revised as follows:

> Effects in the Buyer Service Area *and the Delta* would be the same as the Proposed Action.

The second paragraph on page 3.1-20 of the 2014 Draft EIS/EIR is revised as follows:

> Table 3.1-~~1~~*2* lists the effects of each of the action alternatives and compares them to the existing conditions and No Action/No Project Alternative.

Page 3.1-20

Table 3.1-1 on page 3.1-20 of the 2014 Draft EIS/EIR is revised as follows:

Table 3.1-~~1~~2. Comparative Analysis of Alternatives

Potential Impact	Alternatives	Significance	Proposed Mitigation	Significance after Mitigation
Surface water supplies would not change relative to existing conditions	1	NCFEC	None	NCFEC
Groundwater substitution transfers could decrease flows in surface water bodies following a transfer while groundwater basins recharge, which could decrease pumping at Jones and Banks Pumping Plants and/or require additional water releases from upstream CVP~~/SWP~~ reservoirs.	2, 3	S	WS-1: Streamflow Depletion Factor	LTS
Water supplies on the rivers downstream of reservoirs could decrease following reservoir release water transfers	2, 3, 4	LTS	None	LTS
Changes in Delta diversions could affect Delta water levels	*2, 3, 4*	*LTS*	*None*	*LTS*
Transfers would increase water supplies in the Buyers Service Area	2, 3, 4	B	None	B

Notes:
B = Beneficial
LTS = Less than significant
NCFEC = No change from existing conditions
S = Significant

Page 3.1-21

The following sentence is added to the fourth paragraph on page 3.1-21 of the 2014 Draft EIS/EIR:

> *The minimum streamflow depletion factor (based on modeling completed for this EIS/EIR) will be 13 percent. However, this factor may be adjusted based on additional information on local conditions if new information indicates a substantial difference in local conditions that warrants a change.*

The last paragraph on page 3.1-21 of the 2014 Draft EIS/EIR is revised as follows:

> Reclamation and DWR require the imposition of a streamflow depletion factor ~~because they will not~~ *to ensure* transfer*s do* water ~~if doing so will violate~~*not violate* the no injury rule *(Water Code § 1702, 1706, and 1725)*. This process to evaluate and determine the streamflow depletion factor will help verify that the factor reduces potential impacts to avoid legal injury to CVP or SWP water supplies and a substantial impact or injury.

Page 3.1-22

The first paragraph under Section 3.1.6, subtitled *Cumulative Effects*, on page 3.1-22 of the 2014 Draft EIS/EIR is revised as follows:

> The timeframe for the Long-Term Water Transfers cumulative analysis extends from 2015 through 2024, a ten year period. The cumulative effects analysis for water supply considers SWP water transfers, *the Lower Yuba River Accord (Yuba Accord),* CVP M&I Water Shortage Policy (WSP), ~~and~~ the San Joaquin River Restoration Program (SJRRP~~).~~*), and refuge transfers.* Chapter 4 further describes these projects and policies.

The following paragraph has been added after the second paragraph in Section 3.1.6.1.1, subtitled *Seller Service Area*, on page 3.1-22 of the 2014 Draft EIS/EIR:

> *The Proposed Action in combination with other cumulative projects could increase Delta diversions, which could decrease Delta water levels and affect in-Delta water users. SWP transfers, the Yuba Accord, and refuge transfers could affect Delta operations during the same period (July through September) as the Proposed Action. These efforts could increase Delta diversions during dry years. Reclamation and DWR install temporary barriers each year during this time period to reduce effects to Delta water levels; therefore, the effects of the Proposed Action in combination with other cumulative actions would not result in a cumulative significant impact.*

The following sentence in the first paragraph of Section 3.1.6.1.2, entitled *Buyer Service Area,* on page 3.1-22 of the 2014 Draft EIS/EIR is revised as follows:

> In any given WY, the volume of water delivered is dependent on forecasted reservoir inflows and Central Valley hydrologic conditions, amounts of storage in CVP reservoirs, regulatory requirements, and management of Section 3406(b)(2) water resources and Sections 3406 (b)(3) and (d) concerning refuge water supplies *(including refuge transfers)* in accordance with implementation of the CVPIA.

Page 3.1-23

The last sentence in the second paragraph of Section 3.1.6.1.2, entitled *Buyer Service Area,* on page 3.1-23 of the 2014 Draft EIS/EIR is revised as follows:

> Other cumulative projects could also affect water supplies. The M&I WSP could change water supplies to CVP users. The SJRRP could affect supplies within the Buyer Service Area as a result of reduced flood flows from the San Joaquin River that could supplement water supply to buyers in wet years. SWP transfers and the ~~Lower~~ Yuba ~~River~~ Accord could also increase supplies to the Buyer Service Area.

Section 3.2, Water Quality

Pages 3.2-8 and 3.2-9

Table 3.2-2 on pages 3.2-8 and 3.2-9 of the 2014 Draft EIS/EIR is revised as follows:

Table 3.2-2. Beneficial Uses of Water Bodies in the Seller Service Area

Beneficial Use Designation	Shasta Reservoir	Sacramento River	Lake Oroville	Lower Feather River	Bear River	Camp Far West Reservoir	Lower Yuba River	Hell Hole and French Meadows Reservoirs	Middle Fork American River	Folsom Reservoir	Lower American River	Lake McClure	Merced River	San Joaquin River	Sacramento-San Joaquin Delta
Municipal and Domestic Supply	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓		✓	✓	✓
Agricultural Irrigation	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Stock Watering		✓			✓	✓	✓	✓	✓				✓	✓	✓
Industrial Process Supply													✓	✓	✓
Industrial Service Supply		✓									✓		✓		✓
Power Generation	✓	✓	✓		✓		✓	✓	✓	✓	✓	✓	✓	✓	
Water Contact Recreation	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Canoeing and ~~Rafting~~[1]*Rafting*		✓		✓	✓		✓		✓		✓		✓	✓	
Non-contact Water Recreation	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Warm Freshwater ~~Habitat~~[2]*Habitat*	✓	✓	✓	✓	✓	✓	✓			✓	✓	✓	✓	✓	✓
Cold Freshwater ~~Habitat~~[2]*Habitat*	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
~~Warm~~[3]*Warm* and ~~Cold~~[4]*Cold* Water Migration Areas		✓		✓			✓						✓	✓	✓

Beneficial Use Designation	**Shasta Reservoir**	**Sacramento River**	**Lake Oroville**	**Lower Feather River**	**Bear River**	**Camp Far West Reservoir**	**Lower Yuba River**	**Hell Hole and French Meadows Reservoirs**	**Middle Fork American River**	**Folsom Reservoir**	**Lower American River**	**Lake McClure**	**Merced River**	**San Joaquin River**	**Sacramento-San Joaquin Delta**
Warm Water Spawning ~~Habitat~~[3] *Habitat*	✓	✓	✓	✓			✓			✓			✓	✓	✓
Cold Water Spawning ~~Habitat~~[4] *Habitat*	✓	✓	✓	✓			✓	✓	✓		✓		✓		
Navigation		✓													✓
Wildlife Habitat	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

Source: RWQCBCV 2011

Page 3.2-10

The following paragraph is added below the second paragraph on page 3.2-10 of the 2014 Draft EIS/EIR:

Reclamation Non-Project Water Acceptance Criteria

Reclamation ~~has~~ developed water quality criteria that must be met to add non-CVP water into the Delta-Mendota Canal (Reclamation 2014). Reclamation ~~has~~ developed these criteria to measure constituents of concern that would affect downstream users. The concentration for selenium must not exceed 2 µg/L, the limit for the Grasslands wetlands water supply channels specified in the 1988 Basin Plan. The salinity of any source shall not exceed 1,500 mg/L TDS. The other constituents are mainly agricultural chemicals listed in the California Drinking Water Standards.

The last paragraph on page 3.2-10 of the 2014 Draft EIS/EIR is revised as follows:

DWR Non-Project Water Acceptance Criteria

DWR ~~has~~ developed acceptance criteria to govern the water quality of non-Project water that may be conveyed through the California Aqueduct. These criteria dictate that a pump-in entity of any non-project water program must demonstrate that the water is of consistent, predictable, and acceptable quality prior to pumping the local groundwater into the SWP. Since there cannot be any adverse impacts to SWP water deliveries, operations or facilities, the water quality criteria cannot constrain DWR's ability to operate the SWP for its intended purposes or to protect its integrity during emergencies (DWR 2014).

The following paragraph is added below the last paragraph on page 3.2-10 of the 2014 Draft EIS/EIR:

The Sustainable Groundwater Management Act (SGMA)

The Sustainable Groundwater Management Act~~s~~ (SGMA) [California State Assembly Bill 1739 and Senate Bills 1168 and Senate Bill 1319] ~~were~~was signed into law in September, 2014. See section 3.3.1.2 for the effect of SGMA on proposed buyer and seller regions in regard to their groundwater management, land use, water demands, and water availability ~~due to the implementation of the SGMA~~.

Page 3.2-11, Table 3.2-4

The following revisions are made to Table 3.2-4 on page 3.2-11 of the 2014 Draft EIS/EIR:

Table 3.2-4. Water Quality in Shasta Reservoir

Water Quality Parameter	Minimum	Maximum	Average
pH[1] (standard units)	7.~~2~~*3*	8.~~1~~*3*	7.~~5~~*8*
Turbidity[2] (NTU)	0.1	6553	27.5
Dissolved Oxygen[2] (mg/L)	0.1	24.2	10.7
Total Nitrogen[1](mg/L)	0.~~01~~*2*	0.~~54~~*2*	0.~~09~~*2*
Total Phosphorus[1](mg/L)	0.~~0~~*01*	0.~~13~~*03*	0.~~03~~*02*
Electrical Conductivity[1] (µS/cm)	~~105~~*68*.0	~~131~~*109*	~~117~~*95.3*

Sources: [1-]~~*USGS 1980*~~*Storet 1975*; [2-]California DWR 2013. Water quality data from the California Data Exchange Center is from continuously hourly data from 2006 through 2011.

Key: NTU = Nephelometric Turbidity Units , mg/L = milligrams per liter; µS/cm = micro siemens per centimeter

Page 3.2-16, Table 3.2-10

The following revisions are made to Table 3.2-10 on page 3.2-16 of the 2014 Draft EIS/EIR:

Table 3.2-10. Water Quality Parameters ~~Sampled[1]~~*Sampled* at French Meadows Reservoir

Water Quality Parameter	Value
pH (standard units)	7.3
Turbidity (NTU)	0.4
~~Dissolved Oxygen (mg/L)[1]~~	~~9.6~~
Total Organic Carbon (mg/L)	1.2
~~Total Nitrogen (mg/L) [1]~~	~~0.012~~
Total Phosphorus (mg/L)	1.1
Electrical Conductivity (µS/cm)	26

~~Sources~~Source: Storet 1985~~; [1] Storet 1981~~
~~[1] Two samples, collected in 1981 and 1985.~~

Page 3.2-17, Table 3.2-11

The following revisions are made to Table 3.2-11 on page 3.2-17 of the 2014 Draft EIS/EIR:

Table 3.2-11. Water Quality Parameters ~~Sampled[1]~~*Sampled* at Hell Hole Reservoir

Water Quality Parameter	Value
pH (standard units) ~~[1]~~	7.1
~~Dissolved Oxygen (mg/L)~~	~~9.6~~
~~Total Nitrogen (mg/L)~~	~~0.11~~
~~Total Phosphorus (mg/L)~~	~~0.01~~
Electrical Conductivity (µS/cm) a	26

~~Sources~~Source: Storet ~~1985; [1]Storet~~ 1969
~~[1] Two samples, collected in 1969 and 1985.~~

Page 3.2-18

The title of Table 3.3-13 on page 3.2-18 of the 2014 Draft EIS/EIR is revised to the following:

Table 3.~~3~~*2*-13. Water Quality Parameters Sampled at Folsom Reservoir

The first paragraph on page 3.2-18 of the 2014 Draft EIS/EIR is revised as follows:

Gold mining has occurred within the American River basin since the Gold Rush in 1848. The lower American River is listed as an impaired water body because of mercury lost during gold recovery. The urbanized portions of the lower American River are also listed for unknown toxicity. This is believed to be a result of use of herbicides and pesticides on landscaped residential and commercial areas. Table 3.2-14 presents general water quality data for the American River at *the City of Sacramento's E.A. Fairbairn* Water Treatment Plant.

The title of Table 3.2-14 on page 3.2-18 of the 2014 Draft EIS/EIR is revised to the following:

Table 3.2-14. Water Quality Parameters Sampled[1] on the Lower ~~Fork~~ American River (American River at *E.A. Fairbairn* Water Treatment Plant)

Page 3.2-22

The following text from the second paragraph on page 3.2-22 of the 2014 Draft EIS/EIR is revised as follows:

> Salinity is a concern in the Delta because it can adversely affect municipal, industrial, agricultural, and recreational uses. Table 3.2-22 illustrates that within the Delta, mean TDS concentrations are highest in the west Delta and the south Delta channels that are affected by the San Joaquin River (CALFED ~~2000~~*2007*). Salinity issues in the Sacramento and San Joaquin rivers result from natural sources, urban discharges, and agricultural discharges. As the water from the rivers flows through the Delta, salinity intrusion from the Pacific Ocean contributes to these issues ~~(DWR 2012)~~.The extent of seawater intrusion into the Delta is a function of daily tidal fluctuations, the freshwater inflow to the Delta from the Sacramento and San Joaquin rivers, the rate of export at the SWP and CVP intake pumps, and the operation of various control structures, such as the Delta Cross-Channel Gates and Suisun Marsh Salinity Control System (DWR 2001). In the southern Delta, salinity is largely associated with the high concentrations of salts carried by the San Joaquin River into the Delta (SWRCB ~~1997~~*1999*). The high mean concentration of TDS in the San Joaquin River at Vernalis reflects the accumulation of salts in agricultural soils and the effects of recirculation of salts via the Delta Mendota Canal (CALFED ~~2000~~*2007*).

Page 3.2-23

The last paragraph on page 3.2-23 of the 2014 Draft EIS/EIR is revised as follows:

> Figure 3.2-2 presents monthly median chloride concentrations at Banks Pumping Plant, Sacramento River at Hood, and the San Joaquin River near Vernalis. As Figure 3.3-2 shows, the lowest median concentrations of chloride typically occur in spring and early summer (April through July). The monthly median concentrations of chloride for the period of record (January 2006-December 2012) do not exceed the secondary MCL for chloride of 250 mg/L. *D-1641 standards also require that export locations maintain mean monthly chloride concentration less than 250mg/L.*

Page 3.2-24

Text on page 3.2-24 of the 2014 Draft EIS/EIR is revised as follows:

> Salinity patterns in the Delta also vary with water year type. As shown in Figure 3.2-3 through 3.2-5, salinity, as measured by EC, is higher in dry years than in wet years ~~(DWR 2013)~~. In addition, ~~a DWR project report (DWR 2013) found that~~ EC levels generally rise during the late summer and fall months when river flows are low *and saltwater from the San Francisco Bay flows into the Delta.*

The note text under Figure 3.2-3 on page 3.2-24 of the 2014 Draft EIS/EIR is revised as follows:

> Source: DWR ~~2012~~*2013*

Page 3.2-25, Figures 3.2-4 and 3.2-5

The note text under Figure 3.2-4 and 3.2-5 on page 3.2-25 of the 2014 Draft EIS/EIR is revised as follows:

> Source: DWR ~~2012~~*2013*

Page 3.2-26

The third paragraph on page 3.2-26 of the 2014 Draft EIS/EIR is revised as follows:

> During the summer months, when water levels are lowest, water quality in San Luis Reservoir can decline due to a combination of warmer temperatures, wind-induced nutrient mixing, and algal blooms near the reservoir surface. When San Luis Reservoir approaches its late summer/early fall low point, algae concentrations in water drawn into the reservoir's pumping plants may be high enough that the water becomes difficult to treat. *A low point issue occurs when the water levels continue to decline and the algae blooms reach the Lower San Felipe Intake. Typically, this point occurs when water levels reach an elevation of 369 feet above mean sea level or 300 thousand acre-feet (TAF) of storage in San Luis Reservoir.* ~~If water levels fall below 369 feet (300 TAF), Santa Clara Valley Water District cannot withdraw water for M&I purposes from San Luis Reservoir because their existing water treatment plants cannot treat the algae-laden water to meet their existing water quality standards.~~

Page 3.2-27

The first paragraph of Section 3.2.2.1.1, entitled *Reservoirs and Waterways within the Seller and Buyer Service Areas,* on page 3.2-27 of the 2014 Draft EIS/EIR is revised as follows:

> The analysis for reservoirs and waterways uses both quantitative and qualitative methods to assess changes in water quality. The quantitative analysis relies on hydrologic modeling results that estimate changes in river flow rates and reservoir storage for the CVP and SWP reservoirs and the rivers that they influence. ~~If the change in storage is equal to or less than 1,000 AF, or if the change in flow is less than ten cubic feet per second (cfs), it is assumed that there would be no water quality impacts as this is within the error margins of the model.~~ If the changes are small and within the normal range of fluctuations (similar to the No Action/No Project Alternative) for that time period, it is generally assumed that any water quality impacts would be less than significant. *Appendix C* describes the modeling efforts to quantify changes in reservoir surface water storage and river flow rates.

Page 3.2-28

The following text is added above the first paragraph in Section 3.2.2.3.2, entitled *Buyer Service Area*, on page 3.2-28 of the 2014 Draft EIS/EIR:

> *The No Action/No Project Alternative could result in crop idling, which could increase sediment deposition into waterways and could degrade water quality in the Buyer Service Area. Under the No Action/No Project Alternative, significant water shortages are anticipated in the Buyer Service Area. These water shortages have the potential to lead to a decrease in agricultural water supply, therefore forcing farmers to resort to crop idling due to lack of irrigation water. Leaving fields bare would increase the potential for sediment transport via wind erosion and deposition of transported sediment onto surface water, which could affect water quality. However, users in the buyers' area have faced shortages under the existing conditions, and have had to make these types of planting decisions for many years. Overall, crop idling is not expected to increase significantly from existing conditions in the Buyer Service Area, therefore potential crop idling would cause no change from existing conditions. There would be no changes to water quality in the Buyer Service Area compared to existing conditions.*

Page 3.2-31, Table 3.2-23

The following revisions are made to Table 3.2-23 on page 3.2-31 of the 2014 Draft EIS/EIS.

Table 3.2-23. Changes in CVP and SWP Reservoir Storage between the No Action/No Project Alternative and the Proposed Action (in 1,000 AF)

Year Type	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Shasta Reservoir												
W	-0.6	-0.6	-0.4	-0.1	0.0	0.0	-0.01	-0.2	-0.3	-0.4	-0.56	-0.67
AN	-4.16	-4.16	-3.04	-2.48	-2.03	-2.03	-2.03	-0.1	-0.34	-0.5	-0.67	-0.8
BN	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.23	-1.45	-1.45	-1.67	-1.67
D	-1.92.3	-2.1.7	-2.1.7	-1.62.0	-1.62.0	-1.62.0	4.94	14.116.2	3743.3	23.229.0	-2.93.5	-3.16
C	-4.15.0	-4.35.2	-4.35.2	-4.35.2	-4.65.7	-4.65.7	-2.03.1	21.225.6	70.558.2	6.5 10.8	-6.27.3	-6.27.3
Lake Oroville												
W	-34.1	-3.08	-2.28	-1.82.3	0.0	0.0	0.0	0.0	-0.23	-0.46	-1.05	-1.52.2
AN	-10.913.0	-10.913.0	-11.013.1	-11.013.1	-10.9.2	-0.79	-0.79	-0.79	-0.23	- 5.96.3	-3.84.4	-2.3.1
BN	-3.2.5	-3.08	-4.09	-4.09	-4.09	-4.09	-4.09	-4.09	-45.2	-45.5	-5.16.4	-5.56.8
D	-3.85.1	-3.85.2	-4.05.5.	-4.05.5	-4.05.5	-4.05.5	-3.75.2	3.31.9	3.4.8	1.0.7	-8.29.6	-4.05.5
C	-10.012.8	-10.613.5	-1114.6	-1114.6	-11.815.0	-12.015.2	-12.115.5	-10.814.4	-7.010.9	-4.65.7	-1620.1	-1620.1
Folsom Reservoir												
W	1.50.9	-0.81.5	-0.61.1	0.0	0.0	0.0	0.0	0.0	-0.01	-0.34	-0.34	-0.78
AN	-1.82.2	-2.49	-2.53.1	-0.9	0.0	0.0	0.0	0.0	-0.12	-1.04	-2.08	-3.34.5
BN	-1.82.5	-2.3.1	-3.54.4	-3.54.4	0.0	0.0	0.0	0.0	-0.58	-1.26	-1.26	-2.1.6
D	2.72	2.1.7	-0.81.1	-0.81.1	-1.72.0	-1.0.7	-1.0.7	7.75	12.20	10.52	11.210.9	12.96
C	6.71	4.70	3.2.5	2.1.4	1.10.4	-0.61.3	0.80	5.14.4	12.91	7.8.6	6.7.4	9.68.8

Page 3.2-33

The first incomplete paragraph on page 3.2-33 of the 2014 Draft EIS/EIR is revised as follows:

> CVP and SWP reservoirs within the Seller Service Area would experience only small changes in storage, which would not be of sufficient magnitude and frequency to result in substantive changes to water quality. *These changes would not be large enough to affect dilution of other runoff into the reservoir, or* ~~the~~ *water quality within the reservoir.* Any small changes to water quality would not adversely affect designated beneficial uses, violate existing water quality standards, or substantially degrade water quality. Consequently, potential effects on reservoir water quality would be less than significant.

Table 3.2-24 on page 3.2-33 of the 2014 Draft EIS/EIR is revised as follows:

Table 3.2-24. Changes in Non-Project Reservoir Storage between the No Action/No Project Alternative and the Proposed Action (in 1,000 AF)

Year Type	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Camp Far West Reservoir												
W	-0.4	-0.4	-0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AN	-2.5	-2.5	-2.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
BN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
D	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.~~2~~*1*	-~~2.3~~*1.8*	-2.5
C	-3.6	-3.6	-3.6	-3.6	-1.1	-0.7	-0.7	-0.7	-0.7	-4.3	-4.3	-4.3
Collins Lake												
W	-0.4	-0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
BN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
D	-0.8	-0.8	-0.8	-0.8	-0.2	0.0	0.0	0.0	0.0	-1.1	-1.7	-1.7
C	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Hell Hole and French Meadows Reservoirs												
W	-6.1	-6.1	-4.1	-1.8	-0.7	-0.6	-0.6	-1.2	-0.4	-0.4	-0.3	-0.1
AN	-22.3	-22.3	-22.3	-13.9	-1.8	0.2	0.2	0.2	0.2	0.2	0.1	0.1
BN	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
D	-16.6	-16.7	-16.7	-13.4	-11.4	-7.9	-1.1	-4.9	-8.5	-12.5	-16.8	-20.4
C	-28.2	-28.5	-29.0	-29.0	-29.0	-29.0	-28.9	-34.5	-39.5	-44.5	-49.8	-55.2
Lake McClure												
W	-2.3	-2.3	-2.3	-2.3	0.0	0.0	-3.3	-4.8	-3.5	-2.0	-0.8	-0.2
AN	-15.0	-15.0	-15.0	-15.0	-15.0	-10.0	-17.7	-20.9	-12.8	-9.3	-6.4	-5.0
BN	0.0	0.0	0.0	0.0	0.0	0.0	-9.1	-15.0	-15.0	-15.0	-15.0	-15.0
D	-5.0	-5.0	-5.0	-5.0	-5.0	-5.0	-15.7	-21.9	-19.9	-17.8	-16.1	-15.2
C	0.0	0.0	0.0	0.0	0.0	0.0	-6.7	-10.3	-8.6	-6.6	-5.1	-4.5

Note: Negative numbers indicate that the Proposed Action would decrease reservoir storage compared to the No Action/No Project Alternative; positive numbers indicate that the Proposed Action would increase reservoir storage.
Key: Year Type = Sacramento watershed year type, W = wet, AN = above normal, BN = below normal, D = dry, C = critical

Page 3.2-36

The first complete paragraph on page 3.2-36 of the 2014 Draft EIS/EIR is revised as follows:

> Under the Proposed Action, flows in the Merced River at the confluence with the San Joaquin River would increase in April and May by 105 cfs (20.4 percent) and 59 cfs (7.2 percent), respectively, when water is released from stored reservoir release transfers. During winter months, as the reservoir refills, the river flows would decrease during winter months up to 1.3 percent. The decreases in flow would be small compared to overall river flows. The increased flow from the Merced River would carry high quality water into the San Joaquin River, which could dilute the constituents of ~~concern in the San Joaquin River.~~ *concern in the San Joaquin River. The modeling effort analyzed the potential impacts of diverting these transfers at Banks or Jones pumping plants, but they could also be diverted upstream at Banta-Carbona ID, West Stanislaus ID, or Patterson ID pumping plants. If the transferred water was diverted upstream, the transfers would still contribute to water increased quality in the San Joaquin River* ~~water~~*, but the flows entering the Delta in April and May would be the same as under the No Action/No Project Alternative.*

Pages 3.2-37 and 3.2-38, Table 3.2-25

The following revisions are made to Table 3.2-25 on pages 3.2-37 and 3.2-3 of the 2014 Draft EIS/EIS.

1 **Table 3.2-25. Changes in River Flows between the No Action/No Project Alternative and the Proposed Action (in cfs)**

Year Type	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Sacramento River at Freeport												
W	-18.822.0	-12.520.6	-99.8122.3	-123.8148.0	-94.9121.4	-41.562.3	-30.649.2	-17.232.5	-31.942.2	-11.817.9	-9.013.1	-5.07.2
AN	-12.06	-40.943.8	-99.2106.3	-401.2421.5	-358.1385.3	-259.7306.3	-61.483.0	-131.4147.6	-47.962.6	133.6 130.4	9.2	7.8
BN	0.0	0.0	0.0	-3742.5	-94.3119.6	-2638.3	-21.633.2	-1524.7	0.0	0.0	0.0	0.0
D	-36.442.0	-53.163.0	-42.756.8	-124.3140.5	-66.094.8	-194.4214.9	-156.9176.4	-44.565.7	-57.973.2	832.78 85.3	1,072.2 243.6	208.4 248.8
C	-72.781.0	-61.769.6	-78.870.5	-98.7112.0	-178.5187.1	-146.6162.3	-55.671.7	-52.263.1	-53.959.1	1,920.0 2,136.6	1,3315 97.5	540.4 622.5
Sacramento River at Wilkins Slough												
W	-8.69	-5.01	-68.0	-9.510.7	-4.6.3	-35.3	-3.5.0	-3.2.3	-1.49	-2.34	-1.34	-1.73
AN	-8.3	-8.12	-24.827.2	-18.719.6	-15.918.2	-6.47.9	-7.08.2	-38.244.3	-2.56	7.42	7.32	7.48
BN	-4.5	-3.67	-3.45	-3.45	-3.35	-3.13	-4.13	0.0	0.0	-3.3	0.0	-3.0
D	-10.911.0	-13.514.1	-9.610.1	-9.811.0	-7.19	-67.6	-52.953.1	-33.45	-252.56	394.94 65.6	587.87 58.9	118.3 162.0
C	-21.45	-15.68	-14.715.2	-13.614.1	-8.65.2	-14.715.1	-0.12	-114.45	-274.34	1244.5 1,517.7	609.28 38.4	264.6 356.1
Feather River below Thermalito Afterbay												
W	6.68.3	-2.85.4	-12.116.4	-6.69.0	-32.740.8	0.0	0.0	0.0	3.04.6	46.0	9.413.3	9.012.2
AN	27.629.4	0.91.1	1.52.0	0.0	-31.739.5	-138162.9	0.0	0.0	-8.09.3	9296.9	-34.429.8	-25.122.5

Year Type	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
BN	~~8~~10.2	~~8.1~~10.0	~~16.2~~17.9	0.0	0.0	0.0	0.0	0.0	~~3.8~~5.4	~~3~~4.7	14.1~~11.0~~	~~5.8~~7.0
D	~~8~~10.7	1.47	3.27	0.0	0.0	0.0	0.0	-105.1	-12.1	~~62.4~~43.5	~~149~~168.1	-70.0
C	~~9.2~~10.7	~~10.2~~11.1	~~15.0~~17.5	0.0	~~4.6~~7.7	~~1.9~~3.8	~~9.4~~11.6	~~-4.7~~1.8	-~~42.1~~36.5	-~~38.5~~84.9	~~186.9~~233.4	0.8
Lower Feather River												
W	0.~~1~~2	~~-9.7~~13.8	-~~19.5~~32.1	-~~20.3~~25.8	-~~40.2~~52.4	-~~11~~16.4	-~~5.6~~10.4	~~-5.2~~9.1	~~-1.9~~3.5	~~-0.7~~1.1	~~5~~7.1	6.~~4.8~~
AN	~~15~~16.3	-11.~~1~~7	-9.~~1~~9	~~-52~~55.2	-~~43.0~~55.8	-~~166.6~~196.8	-~~9.0~~15.5	-~~61.4~~58.8	-~~15.8~~22.0	~~85.8~~86.1	-~~41.1~~39.3	-31.~~6~~2
BN	~~4.4~~5.3	45.4	~~12.7~~13.4	~~-2.9~~5.0	-~~3.0~~7.5	~~-3.5~~9.6	~~-3.6~~9.2	~~-3.0~~7.2	~~1.2~~0.0	~~1.2~~0.7	~~8.6~~10.7	~~3.5~~4.0
D	-1.~~8~~9	~~-8.4~~10.0	-~~5.6~~8.2	-~~8.1~~13.3	-~~7.8~~25.2	-~~26.4~~35.2	~~-1.~~7.9	-~~103.6~~109.4	-~~11.8~~16.0	~~127.4~~120.1	~~230.0~~240.8	-~~41~~35.7
C	-~~9.9~~11.0	~~-7.0~~8.5	-0.~~1~~3	~~-14~~18.5	-~~54.1~~56.0	-~~17.7~~21.1	~~-1.2~~0.6	~~-1.~~0.5	-~~35.1~~31.3	~~161.8~~113.9	~~273.4~~318.3	~~50.8~~49.2
Lower Yuba River												
W	-0.4	-0.9	-~~1.5~~7.7	-0.9	-2.0	-6.3	-0.8	-0.7	-0.7	-0.6	-0.6	-0.6
AN	0.0	-1.0	-1.1	-1.2	-1.1	-19.1	-1.0	-~~54.0~~45.6	-0.9	-0.9	-0.9	-0.9
BN	-0.4	-0.4	-0.4	-0.4	-0.4	-0.4	-0.4	-0.4	-0.3	-0.3	-0.3	-0.3
D	-0.3	-0.8	-0.7	-0.7	-~~0~~12.7	-~~19.5~~22.2	-0.5	0.0	0.0	~~18.9~~34.8	~~6.0~~8.9	-0.2
C	-0.6	-1.5	-1.5	-1.5	-1.5	-1.5	-0.1	-0.1	-0.1	50.4	0.0	0.0
Bear River at the Feather River												
W	0.0	0.0	0.0	-6.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AN	0.0	0.0	0.0	-40.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
BN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Year Type	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
D	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.~~9~~1	26.6~~34.4~~	12.3~~.4~~
C	0.0	0.0	0.0	0.0	-44.6	-5.8	0.0	0.0	0.0	58.1	0.0	0.0
All	0.0	0.0	0.0	-9.6~~.3~~	-~~0.0~~9.2	~~-0.0~~1.2	0.0	0.0	0.0	~~0.0~~12.3	~~0.0~~4.7	~~0.0~~2.2
American River at H Street												
W	~~14.6~~16.4	38.~~0~~7	-36.~~9~~7	-~~47.8~~56.2	-22.~~3~~4	-2.~~6~~7	-1.3	8.43	-13.7~~14.1~~	~~2.~~4.1	-1.6	~~2~~3.5
AN	~~18.9~~21.2	~~10.5~~12.1	0.9	-~~164.1~~173.0	-235.7	-34.9	-1.~~2~~3	-1.3	~~0.7~~1.8	~~26~~32.7	~~30~~36.5	~~35.2~~41.0
BN	~~9.6~~12.1	11.9~~.5~~	~~19~~21.5	-0.4	-~~63.3~~79.4	-0.5	-0.4	-0.5	~~7.6~~12.3	~~10~~13.6	-0.3	~~6.~~8.2
D	~~24.2~~25.4	~~9~~8.9	~~47.1~~43.7	-53.~~0~~1	-~~21.9~~22.0	-73.~~7~~9	-114.5	-63.7	-0.9	130.~~6~~5	80.0	56.1
C	~~50.1~~51.5	~~38.4~~40.0	30.3	16.9	17.0	25.8	-23.3	19.4	-45.9	195.1	141.3	82.4
Merced River at San Joaquin River												
W	0.0	0.0	0.0	0.0	-41.6	0.0	~~58.8~~0.0	32.9	0.0	0.0	0.0	0.0
AN	0.0	0.0	0.0	0.0	0.0	-81.3	~~127.5~~0.0	~~71.4~~0.0	-84.0	0.0	0.0	0.0
BN	0.0	0.0	0.0	0.0	0.0	0.0	127.5	71.4	0.0	0.0	0.0	0.0
D	0.0	0.0	0.0	0.0	0.0	0.0	~~170~~85.0	~~95.2~~47.6	0.0	0.0	0.0	0.0
C	0.0	0.0	0.0	0.0	0.0	0.0	~~109.3~~36.4	~~61.2~~20.4	0.0	0.0	0.0	0.0
San Joaquin River at Vernalis												
W	0.0	0.0	0.0	0.0	-41.6	0.0	~~15~~0.0	0.0	0.0	0.0	0.0	0.0
AN	0.0	0.0	0.0	0.0	0.0	-81.3	~~32.5~~0.0	0.0	-84.0	0.0	0.0	0.0
BN	0.0	0.0	0.0	0.0	0.0	0.0	32.5	0.0	0.0	0.0	0.0	0.0
D	0.0	0.0	0.0	0.0	0.0	0.0	~~43.3~~21.7	0.0	0.0	0.0	0.0	0.0
C	0.0	0.0	0.0	0.0	0.0	0.0	~~27.~~9.3	0.0	0.0	0.0	0.0	0.0

Page 3.2-39

Text on page 3.2-39 of the 2014 Draft EIS/EIR is revised as follows:

> Water transfers could change Delta inflows and could result in water quality impacts. Under the Proposed Action, Delta inflows would be similar to the No Action/No Project Alternative. Inflows will generally increase *by as much as 15.8 percent* during July through September of Dry and Critical water years. Delta inflows slightly decrease *by less than 2 percent* most other months of the year. The timing of these changes is due to the timing of the release of transfer water from storage in upstream ~~dams~~*reservoirs*. ~~Percent decreases in Sacramento River inflow are less than 2 percent under the Proposed Action. Average increases in Sacramento River inflow may be as high as 15.8 percent during summer months of Critical water years.~~ These changes would have a less than significant effect on water quality.
>
> Water transfers could change Delta outflows and could result in water quality impacts. Under the Proposed Action, long-term Delta outflows would be similar to the No Action/No Project Alternative. Outflows would generally increase during the transfer period because carriage water would become additional Delta outflow. The most substantial change in flow would occur in August when Delta outflows would increase by an average of *2.*1.~~8~~ percent *across all water years. During July of Critical water years. Outflows may increase by approximately 12 percent*. Delta outflows would decrease slightly (by less than 0.~~3~~*4* percent) during the winter and spring compared to the No Action/No Project Alternative as reservoir storage and groundwater storage refill. These slight changes in flow would not affect water quality in the Delta.
>
> *Net Delta Outflow (NDO) is the sum of all inflows and outflows. NDO percent changes calculated in DSM2 modeling reflect the changes in Sacramento inflow. During non-transfer periods, the NDO decreases by a small amount (less than 1 percent), which reflects the streamflow depletion changes in Delta inflow. The largest percent changes occur during July through September of Critical and Dry water years when transfers are moving through the Delta. The NDO increases during transfers by up to 12.3 percent during a critical year in July. Increased NDO could help Delta water quality, and the decreases could have an adverse effect. The decreases, however, represent an insubstantial change in NDO. More detailed information is provided in Appendix C and Appendix E. These changes would have a less than significant effect on water quality.*
>
> Water transfers could change Delta salinity concentrations, resulting in water quality impacts. Changes in EC in the Delta are largely influenced by 1) increases in Sacramento River inflows which cause decreased EC and 2) increased SWP and CVP exports, which tend to increase EC. Based on water quality modeling results, minor changes in average monthly EC in the Delta occur between the No Action/No Project Alternative and the Proposed Action. Table 3.2-26 shows average monthly EC percent change from the No Action/No Project Alternative for the Proposed Action at *several locations, with the largest variation in percent change at SWP and CVP locations occurring at* the SWP intake to Clifton Court Forebay. Trends at CVP intakes were similar but with smaller magnitudes. Increases in EC are greatest (up to 4.2 percent) in July and August of critical

and dry water years. Delta SWP and CVP exports are highest during the summer months of critical and dry water years, which increases EC near the diversion facilities. Decreases are greatest (4.3 percent) during September of critical water years because of Sacramento River flow increases compared to the No Action/No Project Alternative. Additional intake locations show similar trends in average monthly percent change in EC.

Table 3.2-26 on page 3.2-39 of the 2014 Draft EIS/EIR is revised.

Table 3.2-26. Average Monthly Percent Change in EC from the No Action/No Project Alternative to the Proposed Action at ~~SWP intake to Clifton Court Forebay~~

Year Type	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
SWP intake to Clifton Court Forebay												
W	-0.3	-0.2	-0.1	0.0	-0.2	-0.1	0.0	0.0	0.0	0.0	0.0	0.0
AN	-1.8	-1.0	-0.3	0.1	0.0	-0.5	0.0	0.0	-0.6	0.0	0.1	-0.2
BN	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0
D	-1.9	-0.9	-0.2	0.1	0.2	0.1	0.2	0.6	0.6	1.2	1.9	-1.6
C	-3.8	-2.2	-1.1	-0.7	-0.1	0.4	0.3	0.6	0.6	4.2	1.0	-4.3
CVP intake at Delta Mendota Canal												
W	*-0.3*	*-0.2*	*-0.1*	*0.0*	*-0.2*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*
AN	*-1.6*	*-0.8*	*-0.2*	*0.0*	*-0.1*	*-0.7*	*-0.1*	*0.0*	*-0.6*	*0.1*	*0.1*	*-0.1*
BN	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.1*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*
D	*-1.6*	*-0.8*	*-0.2*	*0.1*	*0.2*	*0.0*	*0.2*	*0.6*	*0.5*	*1.0*	*0.7*	*-1.4*
C	*-3.2*	*-1.8*	*-0.8*	*-0.5*	*0.0*	*0.4*	*0.2*	*0.7*	*0.6*	*3.3*	*0.8*	*-3.9*
CCWD Victoria Canal location												
W	*-0.2*	*-0.1*	*-0.1*	*0.0*	*-0.1*	*-0.1*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*
AN	*-1.8*	*-0.7*	*-0.3*	*0.0*	*1.1*	*-0.3*	*-0.1*	*0.1*	*-0.6*	*-0.3*	*0.1*	*-0.1*
BN	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.1*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*
D	*-1.5*	*-0.6*	*-0.2*	*0.1*	*0.2*	*0.1*	*0.2*	*0.3*	*0.5*	*-0.3*	*0.0*	*-1.8*
C	*-3.1*	*-1.3*	*-0.9*	*-0.6*	*-0.2*	*0.2*	*0.3*	*0.4*	*0.4*	*0.5*	*-1.9*	*-5.9*
CCWD Old River location												
W	*-0.3*	*-0.2*	*-0.1*	*0.0*	*-0.2*	*-0.1*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*
AN	*-1.9*	*-1.1*	*-0.4*	*0.1*	*0.5*	*-0.4*	*-0.1*	*0.0*	*-0.4*	*0.2*	*0.1*	*-0.2*
BN	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.1*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*
D	*-2.0*	*-1.0*	*-0.2*	*0.2*	*0.2*	*0.2*	*0.2*	*0.5*	*0.5*	*1.7*	*2.4*	*-1.5*
C	*-4.0*	*-2.3*	*-1.5*	*-0.9*	*-0.3*	*0.3*	*0.3*	*0.6*	*0.6*	*4.9*	*0.5*	*-4.4*
CCWD Rock Slough location												
W	*-0.4*	*-0.3*	*-0.2*	*0.0*	*-0.1*	*-0.1*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*
AN	*-1.8*	*-1.4*	*-0.6*	*0.2*	*0.3*	*0.3*	*-0.3*	*0.0*	*-0.3*	*0.3*	*0.2*	*-0.2*
BN	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*
D	*-2.0*	*-1.4*	*-0.5*	*0.1*	*0.2*	*0.2*	*0.2*	*0.4*	*0.4*	*2.6*	*2.9*	*-0.6*
C	*-4.1*	*-2.9*	*-1.8*	*-1.1*	*-0.4*	*0.2*	*0.3*	*0.4*	*0.6*	*7.3*	*2.3*	*-3.3*
RSAC081 Collinsville												
W	*-0.1*	*-0.1*	*0.2*	*0.2*	*0.0*	*0.0*	*0.1*	*0.1*	*0.2*	*0.1*	*0.2*	*0.2*
AN	*-0.9*	*-0.3*	*0.5*	*0.9*	*0.1*	*0.2*	*0.0*	*0.2*	*1.3*	*0.3*	*-0.1*	*-0.2*
BN	*0.0*	*0.0*	*0.0*	*0.3*	*0.2*	*0.1*	*0.3*	*0.3*	*0.1*	*0.0*	*0.0*	*0.0*

Year Type	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
D	*-1.0*	*-0.1*	*0.5*	*0.5*	*0.9*	*0.9*	*1.5*	*1.1*	*0.6*	*-3.1*	*-5.6*	*-3.7*
C	*-1.9*	*-0.8*	*-0.2*	*0.5*	*1.4*	*1.7*	*1.5*	*1.0*	*1.1*	*-6.9*	*-9.2*	*-6.1*
RSAN007 near Antioch												
W	*-0.3*	*-0.2*	*0.2*	*0.2*	*0.0*	*0.0*	*0.0*	*0.1*	*0.1*	*0.1*	*0.2*	*0.1*
AN	*-1.2*	*-0.5*	*0.4*	*0.7*	*0.0*	*0.0*	*-0.2*	*0.0*	*0.7*	*0.5*	*-0.2*	*-0.2*
BN	*0.0*	*0.0*	*0.0*	*0.1*	*0.1*	*0.1*	*0.1*	*0.1*	*0.1*	*0.0*	*0.0*	*0.0*
D	*-1.3*	*-0.3*	*0.5*	*0.5*	*0.5*	*0.5*	*0.6*	*0.9*	*0.5*	*-2.6*	*-5.0*	*-4.2*
C	*-2.5*	*-1.1*	*-0.5*	*0.1*	*0.9*	*1.4*	*1.4*	*1.1*	*1.3*	*-5.8*	*-8.8*	*-6.5*
RSAN018 Jersey Point												
W	*-0.5*	*-0.3*	*0.0*	*0.1*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.1*	*0.1*
AN	*-1.7*	*-1.0*	*0.0*	*0.4*	*0.1*	*0.0*	*-0.2*	*0.0*	*0.1*	*1.0*	*-0.1*	*-0.2*
BN	*0.0*	*0.0*	*0.0*	*0.1*	*0.1*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*
D	*-1.9*	*-0.8*	*0.3*	*0.3*	*0.0*	*0.1*	*0.1*	*0.1*	*0.0*	*2.2*	*1.1*	*-3.2*
C	*-3.8*	*-2.2*	*-1.3*	*-0.9*	*0.0*	*0.5*	*0.5*	*0.6*	*1.4*	*3.5*	*-2.4*	*-5.0*

The last paragraph on page 3.2-39 of the 2014 Draft EIS/EIR is revised as follows:

> *Changes in EC regime were calculated at all D-1641 locations. It was found that results at many locations were either small, with average monthly percent difference of around +/- 1 percent or less, or were characteristic of a region (e.g., Suisun Marsh). It was found that at locations RSAN018, Jersey Point, and RSAC092, Emmaton, there are potential violations of D-1641 EC criteria in June and July of Critical water years; however, these exceedances would occur only a few days sooner than under the No Action/No Project Alternative, and this could be changed with a minor variation in export timing. The CVP and SWP regularly make this type of* ~~variation~~ *adjustment in real-time operations when responding to actual conditions; therefore, this change is a modeling artifact that does not reflect real Delta operations.*
>
> *Modeling results also indicate that San Joaquin River inflow EC for the Proposed Action makes little difference to inflow EC, as changes in San Joaquin River EC were found to be infrequent and small in magnitude.*
>
> Chloride calculations were completed to convert values from EC. Bay-Delta *D-1641* standards dictate maximum mean daily chloride levels of 250 mg/L for all intake locations. Modeling results indicate that chloride concentrations are below the 250 mg/L threshold at all export locations.

Page 3.2-40

The second paragraph on page 3.2-40 of the 2014 Draft EIS/EIR is revised as follows:

> Overall, the Proposed Action would not cause ~~any~~*significant changes to Delta water quality. Any* violation of Delta water quality standards *could be changed with minor variations in export timing*; therefore, the impacts to water quality would be less than significant.

Page 3.2-41

The last paragraph on Page 3.2-41 of the 2014 Draft EIS/EIR is revised as follows:

> Water transfers could change reservoir storage in San Luis Reservoir and could result in water quality impacts. Table 3.2-27 presents average end-of-month differences in combined SWP and CVP storage at San Luis Reservoir under the Proposed Action compared to the No Action/No Project Alternative. Storage under the Proposed Action would be less than the No Action/No Project Alternative for all months of the year because of decreased CVP and SWP exports associated with streamflow depletion from groundwater substitution transfers. San Luis Reservoir storage could decrease by as much as six percent (of water in storage in the No Action/No Project Alternative) during August of critical water years. Monthly storage changes during most year types would be less than three percent.
>
> *As discussed in Section 3.2.1.3, Existing Conditions, a low point water quality issue exists when reservoir volumes fall below approximately 300 TAF. Based on historical monthly data from 1970-2003 used for CalSim modeling purposes, average monthly storage for San Luis Reservoir fell below the 300 TAF threshold a total of 30* ~~times~~*months under the No Action/No Project Alternative. Under the Proposed Action, modeling indicates storage levels below 300 TAF over three additional months (total of 33* ~~times~~*months) during this time period, with storage declining from 324, 338, and 306 TAF to 291, 299, and 275 TAF, respectively. Under the Proposed Action, during these 33* ~~times~~*months storage levels fall below 300 TAF, overall average storage falls 9 TAF below the No Action/No Project Alternative, with a maximum decline of 42 TAF (during a period where levels are below 300 TAF under the No Action/No Project Alternative) and a maximum increase in storage of 28 TAF. Reclamation and Santa Clara Valley Water District are evaluating alternatives that would address the water quality and water supply issues associated with the reservoir low point.*
>
> *Additionally, in some cases water levels are expected to increase in San Luis Reservoir under the Proposed Action due to additional water storage opportunities based on regulation of the delivery schedule of transfer water. San Luis Reservoir may be used for short term water storage prior to delivery based on contractors' desired delivery schedules. These short term increases in storage were not included in the CalSim modeling analysis, and they would reduce the potential effects on the frequency of the San Luis Low Point issue. Based on modeling results, the Proposed Action would not substantially affect the low point issue beyond the complications experienced under the No Action/No Project Alternative.*
>
> These small changes in storage are not sufficient to adversely affect designated beneficial uses, violate existing water quality standards, or substantially degrade water quality. Consequently, potential storage-related effects on water quality would be less than significant for San Luis Reservoir.

Page 3.2-42, Table 3.2-27

The following revisions are made to Table 3.2-27 on page 3.2-42 of the 2014 Draft EIS/EIR:

Table 3.2-27. Changes in San Luis Reservoir Storage between the No Action/No Project Alternative and the Proposed Action (in 1,000 AF)

Sac Yr Type	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
W	-0.~~4~~*5*	-1.~~0~~*2*	-1.~~0~~*2*	-1.~~0~~*2*	-1.~~0~~*2*	-1.~~0~~*2*	-1.~~0~~*2*	-0.~~7~~*8*	-0.4	-0.2	0.~~2~~*1*	0.0
AN	-~~14.3~~*16.5*	-~~16.4~~*18.5*	-~~16.6~~*18.8*	-~~16.6~~*18.8*	-~~10.2~~*11.8*	-~~10.2~~*11.8*	-~~10.2~~*11.8*	-~~10.1~~*11.7*	-~~10.1~~*11.6*	-~~10.4~~*12.1*	-~~10.3~~*12.0*	-~~10.3~~*12.0*
BN	-~~18.7~~*20.8*	-~~18.7~~*20.8*	-~~18.7~~*20.8*	-~~18.7~~*20.8*	-~~18.7~~*20.8*	-~~18.7~~*20.8*	-~~18.7~~*20.8*	-~~18.7~~*20.8*	-~~18.7~~*20.8*	-~~18.7~~*20.8*	-~~18.7~~*20.8*	-~~18.7~~*20.8*
D	-~~4~~*5*.6	-~~6.1~~*7.2*	-6.~~3~~*5*	-8.8	-~~8.4~~*9.9*	-~~8.5~~*10.1*	-~~8.8~~*10.5*	-~~7.1~~*8.8*	-~~7.1~~*9.0*	-~~7.7~~*9.8*	-~~9.2~~*11.5*	-~~13~~*16.*6
C	-~~27.3~~*29.4*	-~~31.0~~*33.6*	-~~33.9~~*36.8*	-~~36.2~~*39.3*	-~~36.6~~*39.8*	-~~37.6~~*41.2*	-~~37.9~~*41.5*	-~~28.1~~*30.6*	-~~18.9~~*20.4*	-~~14.5~~*15.4*	-11.~~2~~*4*	-19.~~1~~*8*
All	-~~10.2~~*11.4*	-~~11.8~~*13.2*	-~~12.5~~*13.9*	-~~13.2~~*14.6*	-~~12.3~~*13.7*	-~~12.5~~*14.0*	-~~12.7~~*14.2*	-~~10.2~~*11.5*	-~~8~~*9*.2	-7.~~4~~*6*	-7.6~~.8~~	-~~9.2~~*10.3*

Page 3.2-43, Table 3.2-28

The following revisions are made to Table 3.2-28 on page 3.2-43 of the 2014 Draft EIS/EIR:

Table 3.2-28. Changes in CVP and SWP Reservoir Storage between the No Action/No Project Alternative and the Alternative 3 (in 1,000 AF)

Year Type	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Shasta Reservoir												
W	-0.6	-0.6	-0.4	-0.1	0.0	0.0	-0.1	-0.2	-0.3	-0.4	-0.56	-0.67
AN	-4.16	-4.16	-3.04	-2.48	-2.03	-2.03	-2.03	-0.1	-0.34	-0.5	-0.67	-0.8
BN	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.23	-1.45	-1.45	-1.67	-1.67
D	-1.92.3	-2.1.7	-2.1.7	-1.62.0	-1.62.0	-1.62.0	4.94	11.51	30.94	18.73	-2.93.5	-3.16
C	-4.15.0	-4.35.2	-4.35.2	-4.35.2	-4.65.7	-4.65.7	-2.03.1	11.910.7	34.633.5	-0.01.1	-6.27.3	-6.27.3
Lake Oroville												
W	-34.1	-3.08	-2.28	-1.82.3	0.0	0.0	0.0	0.0	-0.23	-0.46	-1.05	-1.52.2
AN	-10.913.0	-10.913.0	-11.013.1	-11.013.1	-10.9.2	-0.79	-0.79	-0.79	-0.23	-5.96.3	-3.84.4	-2.3.1
BN	-3.2.5	-3.08	-4.09	-4.09	-4.09	-4.09	-4.09	-4.09	-45.2	-45.5	-5.16.4	-5.56.8
D	-3.85.1	-3.85.2	-4.05.5	-4.05.5	-4.05.5	-4.05.5	-3.75.2	2.91.4	3.92.5	1.0.4	-8.29.6	-4.05.5
C	-10.012.8	-10.613.5	-1114.6	-1114.6	-11.815.0	-12.015.2	-12.115.5	-11.314.9	-8.412.3	-10.413.3	-1620.1	-1620.1
Folsom Reservoir												
W	1.50.9	-0.81.5	-0.61.1	0.0	0.0	0.0	0.0	0.0	-0.01	-0.34	-0.34	-0.78
AN	-1.82.2	-2.49	-2.53.1	-0.9	0.0	0.0	0.0	0.0	-0.12	-1.04	-2.08	-3.34.5
BN	-1.82.5	-2.3.1	-3.54.4	-3.54.4	0.0	0.0	0.0	0.0	-0.58	-1.26	-1.26	-2.16
D	2.72	2.1.7	-0.81.1	-0.81.1	-1.72.0	-1.0.7	-1.0.7	7.75	12.20	10.52	11.210.9	12.96
C	6.71	4.70	3.2.5	2.1.14	1.10.4	-0.61.3	0.80	5.14.3	12.70	8.7.9	6.7.4	9.68.8

Pages 3.2-45 and 3.2-46

The following revisions are made to Table 3.2-29 on pages 3.2-45 and 3.2-46 of the 2014 Draft EIS/EIR:

Table 3.2-29. Changes in River Flows between the No Action/No Project Alternative and Alternative 3 (in cfs)

Year Type	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Sacramento River at Freeport												
W	-~~18.8~~*22.0*	-~~12.5~~*20.6*	-~~99.8~~*122.3*	-~~123.8~~*148.0*	-~~94.9~~*121.4*	-~~41.5~~*62.3*	-~~30.6~~*49.2*	-~~17.2~~*32.5*	-~~31.9~~*42.2*	-~~11.8~~*17.9*	-~~9.0~~*13.1*	-~~5.0~~*7.2*
AN	-12.~~0~~*6*	-~~40.9~~*43.8*	-~~99.2~~*106.3*	-~~401.2~~*421.5*	-~~358.1~~*385.3*	-~~259.7~~*306.3*	-~~61.4~~*83.0*	-~~131.4~~*147.6*	-~~47.9~~*62.6*	~~133.6~~*130.4*	9.2	7.8
BN	0.0	0.0	0.0	-~~37~~*42*.5	-~~94.3~~*119.6*	-~~26~~*38*.3	-~~21.6~~*33.2*	-~~15~~*24*.7	0.0	0.0	0.0	0.0
D	-~~36.4~~*42.0*	-~~53.1~~*63.0*	-~~42.7~~*56.8*	-~~124.3~~*140.5*	-~~66.0~~*94.8*	-~~194.4~~*214.9*	-~~156.9~~*176.4*	-~~42.1~~*63.3*	-~~54.3~~*69.5*	~~711.8~~*696.7*	~~925.9~~*924.7*	~~160.8~~*157.4*
C	-~~72.7~~*81.0*	-~~61.7~~*69.6*	-~~70.5~~*78.8*	-~~98.7~~*112.0*	-~~178.5~~*187.1*	-~~146.6~~*162.3*	-~~55.6~~*71.7*	-~~50.5~~*61.3*	-~~44~~*49*.6	1,~~436.7~~*410.3*	~~886.8~~*893.5*	~~375.5~~*366.1*
Sacramento River at Wilkins Slough												
W	-8.~~6~~*9*	-5.~~0~~*1*	-~~6.~~*8.0*	-~~9.5~~*10.7*	-~~4~~*6*.3	-~~3~~*5*.3	-~~3~~*5*.0	-3.2~~.3~~	-1.~~4~~*9*	-2.~~3~~*4*	-1.~~3~~*4*	-1.~~7~~*3*
AN	-8.3	-8.~~1~~*2*	-~~24.8~~*27.2*	-~~18.7~~*19.6*	-~~15.9~~*18.2*	-~~6.4~~*7.9*	-~~7.0~~*8.2*	-~~38.2~~*44.3*	-2.~~5~~*6*	7.~~4~~*2*	7.~~3~~*2*	7.~~4~~*8*
BN	-4.5	-3.~~6~~*7*	-3.~~4~~*5*	-3.~~4~~*5*	-3.~~3~~*5*	-3.~~1~~*3*	-4.~~1~~*3*	0.0	0.0	-3.3	0.0	-3.0
D	-~~10.9~~*11.0*	-~~13.5~~*14.1*	-~~9.6~~*10.1*	-~~9.8~~*11.0*	-7.~~1~~*9*	-~~6~~*7*.6	-~~52.9~~*53.1*	-33.~~4~~*5*	-248.~~8~~*9*	~~296.3~~*294.9*	~~449.4~~*452.1*	75.~~7~~*6*
C	-21.~~4~~*5*	-15.~~6~~*8*	-~~14.7~~*15.2*	-~~13.6~~*14.1*	-~~8.6~~*5.2*	-~~14.7~~*15.1*	-0.~~1~~*2*	-119.~~2~~*3*	-273.~~6~~*7*	715.~~6~~*3*	251.9	102.~~3~~*1*
Feather River below Thermalito Afterbay												

Year Type	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
W	~~6.6~~8.3	~~-2.8~~5.4	-~~12.1~~16.4	~~-6.6~~9.0	-~~32.7~~40.8	0.0	0.0	0.0	~~3.0~~4.6	46.0	~~9.4~~13.3	~~9.0~~12.2
AN	~~27.6~~29.4	~~0.9~~1.1	~~1.5~~2.0	0.0	-~~31.7~~39.5	-~~138~~162.9	0.0	0.0	~~-8.0~~9.3	~~92~~96.9	-~~34.4~~29.8	-~~25.1~~22.5
BN	~~8~~10.2	~~8.1~~10.0	~~16.2~~17.9	0.0	0.0	0.0	0.0	0.0	~~3.8~~5.4	~~3~~4.7	~~11.0~~14.1	~~5.8~~7.0
D	~~8~~10.7	1.~~4~~7	3.~~2~~7	0.0	0.0	0.0	0.0	-102.6	-12.1	34.4~~48.0~~	~~149.1~~162.6	-70.0
C	~~9.2~~10.7	~~10.2~~11.1	~~15.0~~17.5	0.0	~~4.6~~7.7	~~1.9~~3.8	~~9.4~~11.6	~~-4.7~~1.8	-~~40.3~~34.7	~~32.3~~15.8	~~93.8~~110.3	0.8
Lower Feather River												
W	0.~~1~~2	~~-9.7~~13.8	-~~19.5~~32.1	~~-20.3~~25.8	-~~40.2~~52.4	-~~11~~16.4	-~~5.6~~10.4	~~-5.2~~9.1	~~-1.9~~3.5	~~-0.7~~1.1	~~5~~7.1	6.4~~.8~~
AN	~~15~~16.3	-11.~~4~~7	-9.~~1~~9	~~-52~~55.2	-~~43.0~~55.8	-~~166.6~~196.8	-~~9.0~~15.5	-~~61.4~~58.8	-~~15.8~~22.0	~~85.8~~86.1	-~~41.1~~39.3	-31.~~6~~2
BN	~~4.4~~5.3	45.4	~~12.7~~13.4	~~-2.9~~5.0	-~~3.0~~7.5	~~-3.5~~9.6	~~-3.6~~9.2	~~-3.0~~7.2	~~1.2~~0.0	~~1.2~~0.7	~~8.6~~10.7	~~3.5~~4.0
D	-1.~~8~~9	~~-8.4~~10.0	~~-5.6~~8.2	~~-8.1~~13.3	-~~7.8~~25.2	-~~26.4~~35.2	-~~1.~~7.9	-~~101.2~~106.9	-~~11.8~~16.0	~~105~~102.1	~~222.2~~228.7	~~-46~~40.7
C	~~-9.9~~11.0	~~-7.0~~8.5	-0.~~1~~3	~~-14~~18.5	-~~54.1~~56.0	-~~17.7~~21.1	~~-1.2~~0.6	~~-1.~~0.5	-~~33.3~~29.5	~~203.3~~185.5	~~182.9~~197.5	~~42.1~~40.6
Lower Yuba River												
W	-0.4	-0.9	~~-1.5~~7.7	-0.9	-2.0	-6.3	-0.8	-0.7	-0.7	-0.6	-0.6	-0.6
AN	0.0	-1.0	-1.1	-1.2	-1.1	-19.1	-1.0	-~~54.0~~45.6	-0.9	-0.9	-0.9	-0.9
BN	-0.4	-0.4	-0.4	-0.4	-0.4	-0.4	-0.4	-0.4	-0.3	-0.3	-0.3	-0.3
D	-0.3	-0.8	-0.7	-0.7	~~-0~~12.7	-~~19.5~~22.2	-0.5	0.0	0.0	~~18.9~~33.7	~~6~~10.0	-0.2
C	-0.6	-1.5	-1.5	-1.5	-1.5	-1.5	-0.1	-0.1	-0.1	43.7	6.7	0.0

Year Type	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Bear River at the Feather River												
W	0.0	0.0	0.0	-6.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AN	0.0	0.0	0.0	-40.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
BN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
D	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.9	~~34.4~~*26.6*	*12.3*~~.4~~
C	0.0	0.0	0.0	0.0	-44.6	-5.8	0.0	0.0	0.0	~~48.8~~*49.0*	9.~~2~~*0*	0.0
American River at H Street												
W	~~14.6~~*16.4*	38.~~0~~*7*	-36.~~9~~*7*	~~-47.8~~*56.2*	-22.~~3~~*4*	-2.~~6~~*7*	-1.3	8.4	-~~14.1~~*13.7*	~~2.4~~*.1*	-1.6	~~2~~*3*.5
AN	~~18.9~~*21.2*	~~10.5~~*12.1*	0.9	-~~164.1~~*173.0*	-235.7	-34.9	-1.~~2~~*3*	-1.3	~~0.7~~*1.8*	~~26~~*32*.7	~~30~~*36*.5	~~35.2~~*41.0*
BN	~~9.6~~*12.1*	*11.9*~~.5~~	~~19~~*21*.5	-0.4	-~~63.3~~*79.4*	-0.5	-0.4	-0.5	~~7.6~~*12.3*	~~10~~*13*.6	-0.3	~~6.~~*8.2*
D	~~24.2~~*25.4*	~~9~~8.9	~~47.1~~*43.7*	-53.~~0~~*1*	-~~21.9~~*22.0*	-73.~~7~~*9*	-114.5	-63.7	-0.9	130.~~6~~*5*	80.0	56.~~1~~*9*
C	~~50.1~~*51.5*	~~38.4~~*40.0*	30.3	16.9	17.0	25.8	-23.3	20.5	-44.3	191.3	142.5	82.4
Merced River at San Joaquin River												
W	0.0	0.0	0.0	0.0	-41.6	0.0	58.8	32.9	0.0	0.0	0.0	0.0
AN	0.0	0.0	0.0	0.0	0.0	-81.3	127.5	71.4	-84.0	0.0	0.0	0.0
BN	0.0	0.0	0.0	0.0	0.0	0.0	~~127.5~~*85.0*	~~71.4~~*47.6*	0.0	0.0	0.0	0.0
D	0.0	0.0	0.0	0.0	0.0	0.0	~~170~~*85.0*	~~95.2~~*47.6*	0.0	0.0	0.0	0.0
C	0.0	0.0	0.0	0.0	0.0	0.0	~~109.3~~*36.4*	~~61.2~~*20.4*	0.0	0.0	0.0	0.0
San Joaquin River at Vernalis												
W	0.0	0.0	0.0	0.0	-41.6	0.0	~~15~~*0*.0	0.0	0.0	0.0	0.0	0.0
AN	0.0	0.0	0.0	0.0	0.0	-81.3	~~32.5~~*0.0*	0.0	-84.0	0.0	0.0	0.0
BN	0.0	0.0	0.0	0.0	0.0	0.0	32.5	0.0	0.0	0.0	0.0	0.0

Year Type	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
D	0.0	0.0	0.0	0.0	0.0	0.0	~~43.3~~*21.7*	0.0	0.0	0.0	0.0	0.0
C	0.0	0.0	0.0	0.0	0.0	0.0	~~27.~~*9.3*	0.0	0.0	0.0	0.0	0.0

Page 3.2-47

The second and third paragraphs on page 3.2-47 of the 2014 Draft EIS/EIR is revised as follows:

> ~~*Water transfers could change flow*~~ *Water transfers could change Delta inflows and could result in water quality impacts. Under Alternative 3, Delta inflows would be similar to the No Action/No Project Alternative. Inflows will generally increase by as much as 9.9 percent during July through September of Dry and Critical water years, but these increases would be less than those under the Proposed Action. Delta inflows* ~~slightly~~ *decrease by less than 2 percent most other months of the year. The timing of these changes is due to the timing of the release of transfer water from storage in upstream* ~~dams~~*reservoirs.* ~~Percent decreases in Sacramento River inflow are less than 2 percent under Alternative 3. Average increases in Sacramento River inflow may be as high as 9.9 percent during summer months of Critical water years.~~

> *Water transfers could change outflow* rates in the Delta and could result in water quality impacts. Under Alternative 3, long-term Delta outflows would be similar to the No Action/No Project Alternative. The most substantial change would occur in August when Delta outflows would increase by an average of 1.4 percent. Outflows would decrease slightly by approximately 0.1-0.3 percent during the winter and spring when water demands are lower in the region. This slight change in Delta region outflows would have a less than significant effect on water quality.

> *Under Alternative 3, NDOs would be similar to the No Action/No Project Alternative. Small decreases would occur during non-transfer periods (less than 1 percent) because streamflow depletion decreases Delta inflow. The largest percent changes occur during July through September of Critical and Dry water years when transfers are moving through the Delta. The NDO increases during transfers by up to 7.9 percent during a critical year in July. More detailed information is provided in Appendix E. These changes would have a less than significant effect on water quality.*

> Water transfers could change Delta salinity and could result in water quality impacts. *EC modeling results are shown at several Delta locations in Table 3.2-30.* Modeled impacts to EC, chloride concentrations, and X2 indicate that under Alternative 3, water quality impacts in the Delta would be less than those under the Proposed Action. As a result, impacts to water quality in the Delta region under Alternative 3 are less than significant.

Page 3.2-47

The following table is inserted after the third paragraph on page 3.2-47 of the 2014 Draft EIS/EIR:

Table 3.2-30. Average Monthly Percent Change in EC from the No Action/No Project Alternative to Alternative 3

Year Type	*Oct*	*Nov*	*Dec*	*Jan*	*Feb*	*Mar*	*Apr*	*May*	*Jun*	*Jul*	*Aug*	*Sep*
SWP intake to Clifton Court Forebay												
W	*-0.3*	*-0.2*	*-0.1*	*0.0*	*-0.2*	*-0.1*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*
AN	*-1.4*	*-0.7*	*-0.2*	*0.1*	*0.0*	*-0.5*	*0.0*	*0.0*	*-0.6*	*0.0*	*0.1*	*-0.2*

Year Type	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
BN	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0
D	-1.4	-0.7	-0.1	0.2	0.2	0.1	0.2	0.6	0.6	0.8	1.5	-1.3
C	-3.0	-1.7	-0.9	-0.6	-0.1	0.4	0.3	0.6	0.5	2.7	0.6	-3.6
CVP intake at Delta Mendota Canal												
W	-0.3	-0.1	-0.1	0.0	-0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AN	-1.2	-0.6	-0.1	0.0	-0.1	-0.7	-0.1	0.0	-0.6	0.1	0.1	-0.1
BN	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0
D	-1.2	-0.5	-0.1	0.1	0.2	0.0	0.2	0.6	0.5	0.6	0.6	-1.1
C	-2.5	-1.4	-0.6	-0.4	0.0	0.4	0.2	0.7	0.6	2.1	0.5	-3.2
CCWD Victoria Canal location												
W	-0.2	-0.1	-0.1	0.0	-0.1	-0.1	0.0	0.0	0.0	0.0	0.0	0.0
AN	-1.3	-0.5	-0.1	0.1	1.1	-0.3	-0.1	0.1	-0.6	-0.3	0.1	-0.1
BN	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0
D	-1.1	-0.4	-0.1	0.2	0.2	0.1	0.2	0.3	0.5	-0.3	0.1	-1.2
C	-2.3	-0.9	-0.7	-0.4	-0.1	0.2	0.3	0.4	0.4	0.3	-1.1	-4.3
CCWD Old River location												
W	-0.3	-0.2	-0.1	0.0	-0.2	-0.1	0.0	0.0	0.0	0.0	0.0	0.0
AN	-1.4	-0.8	-0.2	0.2	0.5	-0.4	-0.1	0.0	-0.4	0.2	0.1	-0.2
BN	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0
D	-1.5	-0.7	-0.1	0.2	0.3	0.2	0.2	0.5	0.5	1.1	1.8	-1.4
C	-3.1	-1.8	-1.2	-0.8	-0.2	0.3	0.3	0.6	0.5	3.2	0.1	-3.8
CCWD Rock Slough location												
W	-0.4	-0.3	-0.1	0.0	-0.1	-0.1	0.0	0.0	0.0	0.0	0.0	0.0
AN	-1.3	-1.0	-0.4	0.2	0.3	0.3	-0.3	0.0	-0.3	0.3	0.2	-0.2
BN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
D	-1.5	-1.1	-0.4	0.2	0.2	0.2	0.2	0.4	0.4	1.9	2.1	-0.6
C	-3.3	-2.3	-1.4	-0.9	-0.3	0.3	0.3	0.4	0.5	5.2	1.6	-2.8
RSAC081 Collinsville												
W	-0.1	-0.1	0.3	0.2	0.0	0.0	0.1	0.1	0.2	0.1	0.2	0.2
AN	-0.6	-0.2	0.6	0.9	0.1	0.2	0.0	0.2	1.3	0.3	-0.1	-0.2
BN	0.0	0.0	0.0	0.3	0.2	0.1	0.3	0.3	0.1	0.0	0.0	0.0
D	-0.7	-0.1	0.6	0.5	1.0	0.9	1.5	1.1	0.5	-2.5	-4.4	-2.8
C	-1.3	-0.5	0.0	0.6	1.5	1.8	1.5	1.0	0.8	-4.6	-5.9	-3.9
RSAN007 near Antioch												
W	-0.2	-0.1	0.2	0.2	0.0	0.0	0.0	0.1	0.1	0.1	0.2	0.1
AN	-0.8	-0.3	0.5	0.7	0.0	0.0	-0.2	0.0	0.7	0.5	-0.2	-0.2
BN	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0
D	-1.0	-0.1	0.6	0.5	0.5	0.5	0.6	0.8	0.4	-2.1	-4.0	-3.3
C	-1.9	-0.8	-0.3	0.2	1.0	1.4	1.4	1.1	1.0	-3.8	-5.8	-4.3
RSAN018 Jersey Point												
W	-0.4	-0.3	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1
AN	-1.3	-0.8	0.2	0.5	0.1	0.0	-0.2	0.0	0.1	1.0	-0.1	-0.2
BN	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
D	-1.5	-0.6	0.4	0.3	0.0	0.1	0.1	0.1	-0.1	1.5	0.4	-2.9

Year Type	*Oct*	*Nov*	*Dec*	*Jan*	*Feb*	*Mar*	*Apr*	*May*	*Jun*	*Jul*	*Aug*	*Sep*
C	*-3.0*	*-1.8*	*-1.1*	*-0.7*	*0.0*	*0.5*	*0.5*	*0.6*	*1.0*	*2.3*	*-2.4*	*-4.0*

Key: Year Type = Sacramento watershed year type, W = wet, AN = above normal, BN = below normal, D = dry, C = critical

Page 3.2-48

The first paragraph of page 3.2-48 of the 2014 Draft EIS/EIR is revised as follows:

> Water transfers could change reservoir storage in San Luis Reservoir and could result in water quality impacts. Under Alternative 3, storage would be the same as that under the Proposed Action. These small changes in storage are not sufficient enough to adversely affect designated beneficial uses, violate existing water quality standards, or substantially degrade water quality. *Modeling indicates that San Luis Reservoir would fall below 300,000 acre-feet in 33* ~~years~~*months rather than 30* ~~years~~*months (under the No Action/No Project Alternative), but the modeling does not incorporate seasonal storage that would increase water levels during this period.* Consequently, potential storage-related effects on water quality would be less than significant for San Luis Reservoir.

The following sentence in the fifth paragraph on page 3.2-48 of the 2014 Draft EIS/EIR is revised as follows:

> Based on modeling efforts, changes in CVP and SWP reservoir storage Alternative 4 and the No Action/No Project Alternative are shown in Table 3.2-~~30~~*31*.

Page 3.2-49

The following revisions are made to Table 3.2-30 on page 3.2-49 of the 2014 Draft EIS/EIR:

Table 3.2-~~30~~*31*. Changes in CVP and SWP Reservoir Storage between the No Action/No Project Alternative and the Alternative 4 (in 1,000 AF)

Sac Yr Type	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Shasta Reservoir												
W	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
BN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
D	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.3	17.~~6~~*5*	8.~~8~~*7*	0.0	0.0
C	0.0	0.0	0.0	0.0	0.0	0.0	0.0	17.2	46.~~1~~*0*	7.4	0.0	0.0
Lake Oroville												
W	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-3.3	-0.8	0.0
BN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
D	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.1	2.9	9.0	-4.5	0.0
C	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.7	2.6	6.~~4~~*6*	0.0	0.0
Folsom Reservoir												
W	3.5	1.4	1.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.2
AN	-0.3	-0.5	-0.7	-0.9	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1
BN	0.2	0.3	0.4	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
D	4.2	3.5	-0.1	-0.1	-1.0	0.0	0.0	5.~~3~~2	8.9	9.5	11.7	13.5
C	8.5	7.2	5.7	4.6	3.6	1.9	0.3	3.6	9.1	8.2	10.0	12.1

The last sentence on page 3.2-49 of the 2014 Draft EIS/EIR is revised as follows:

> Changes in river flow rates between Alternative 4 and the No Action/No Project Alternative are shown in Table 3.2-~~31~~*32*.

Pages 3.2-50 and 3.2-51, Table 3.2-31

The following revisions are made to Table 3.2-31 on pages 3.2-50 and 3.2-51 of the 2014 Draft EIS/EIR:

Table 3.2-~~31~~*32*. Changes in River Flows between the No Action/No Project Alternative and Alternative 4 (in cfs)

Sac Yr Type	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Sacramento River at Freeport												
W	0.0	31.4	-~~33.5~~*39.7*	-24.9	-20.7	-5.0	0.0	9.6	-13.5	-0.5	-0.8	0.0
AN	0.0	0.0	0.0	-172.8	-233.9	-50.0	0.3	-33.5	0.0	54.2	-40.7	-14.0
BN	0.0	0.0	0.0	0.0	6.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0
D	0.0	0.0	47.2	-52.2	-~~21~~*33*.2	-~~89.0~~*91.7*	-113.6	-6.1	-9.2	~~346.4~~*37.2*	~~587.6~~*585.3*	~~68~~*67*.1
C	0.0	0.0	0.0	0.0	-44.6	-5.8	0.0	~~66.2~~*65.4*	-16.6	1,~~293~~*28*6.2	~~804.6~~*805.4*	~~369.5~~*368.2*
Sacramento River at Wilkins Slough												
W	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
BN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
D	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-~~75.3~~73.8	~~280.6~~*279.9*	~~280.6~~*279.9*	89.1
C	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-~~32.1~~*31.7*	-~~109.6~~*108.3*	1,~~025~~*024*.0	516.~~7~~*0*	255.9
Feather River below Thermalito Afterbay												
W	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	54.2	-40.7	-14.0
BN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
D	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-24.~~8~~*3*	0.0	-~~98.5~~*99.0*	219.6	-75.6

Sac Yr Type	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
C	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-13.2	-~~62.2~~*65.5*	~~104.6~~*107.9*	0.0
Lower Feather River												
W	0.0	0.0	-~~0.0~~*6.3*	-6.3	0.0	-3.9	0.0	0.0	0.0	0.0	0.0	0.0
AN	0.0	0.0	0.0	-40.7	0.0	-16.8	0.0	-33.6	0.0	54.2	-40.7	-14.0
BN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
D	0.0	0.0	0.0	0.0	-~~0~~*12*.0	-~~16.8~~*19.5*	0.0	-24.~~8~~*3*	0.0	-~~28.8~~*2.1*	237.2	-66.0
C	0.0	0.0	0.0	0.0	-44.6	-5.8	0.0	0.0	-13.2	65.~~6~~*2*	~~123.8~~*127.2*	12.4
Lower Yuba River												
W	0.0	0.0	-~~0.0~~*6.3*	0.0	0.0	-3.9	0.0	0.0	0.0	0.0	0.0	0.0
AN	0.0	0.0	0.0	0.0	0.0	-16.8	0.0	-33.6	0.0	0.0	0.0	0.0
BN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
D	0.0	0.0	0.0	0.0	-~~0~~*12*.0	-~~16.8~~*19.5*	0.0	0.0	0.0	~~16.8~~*43.9*	0.0	0.0
C	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	50.4	0.0	0.0
All	0.0	0.0	-~~0.0~~*2.4*	0.0	-~~0.0~~*2.1*	-7.4*9*	0.0	-5.9	0.0	~~13.3~~*18.1*	0.0	0.0
Bear River at the Feather River												
W	0.0	0.0	0.0	-6.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AN	0.0	0.0	0.0	-40.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
BN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
D	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	37.9	2.7	0.0
C	0.0	0.0	0.0	0.0	-44.6	-5.8	0.0	0.0	0.0	58.1	0.0	0.0
American River at H Street												
W	9.7	36.2	-28.6	-18.6	-20.7	-1.1	0.0	9.6	-13.5	-0.5	-0.8	0.0
AN	10.4	4.4	1.7	-132.1	-233.9	-33.2	0.3	0.1	0.0	0.0	0.0	0.0
BN	0.0	0.0	0.0	0.0	6.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0
D	20.8	11.7	57.6	-52.2	-21.2	-72.2	-113.6	-24.~~8~~*3*	0.0	~~56.1~~*55.6*	33.9	32.2
C	36.5	28.6	31.5	18.2	18.3	26.8	26.8	38.6	-~~7.4~~*6.8*	~~98.0~~*97.4*	59.6	55.8

Sac Yr Type	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Merced River at San Joaquin River												
W	0.0	0.0	0.0	0.0	-41.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-84.0	0.0	0.0	0.0
BN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
D	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	162.6	0.0	0.0
C	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	69.7	0.0	0.0
San Joaquin River at Vernalis												
W	0.0	0.0	0.0	0.0	-41.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-84.0	0.0	0.0	0.0
BN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
D	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	162.6	0.0	0.0
C	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	69.7	0.0	0.0

Page 3.2-52

The last two paragraphs on page 3.2-52 of the 2014 Draft EIS/EIR is revised as follows:

> Water transfers could change ~~flows to the~~ Delta *inflows* and could result in water quality impacts. Under Alternative 4, ~~the~~ *Delta inflows would be similar to the No Action/No Project Alternative. Inflows will generally increase by as much as 9.2 percent during July through September of Dry and Critical water years, but these increases would be less than those under the Preferred Action. Delta inflows* ~~slightly~~*could decrease by less than 2 percent most other months of the year. The timing of these changes is due to the timing of the release of transfer water from storage in upstream dams.* ~~Percent decreases in Sacramento River inflow are less than 2 percent under Alternative 4. Average increases in Sacramento River inflow may be as high as 9.2 percent during summer months of Critical water years.~~
>
> *Water transfers could change outflows to the Delta and could result in water quality impacts. Under Alternative 4, the average* maximum changes in long-term Delta outflows *across all water years* are less than one percent and this would occur during the summer months (July through August) when transfers are moving through the Delta. Outflows would decrease slightly by approximately 0.1 percent during the winter and spring when water demands are lower in the region. *The maximum change in an individual water year type would occur during July of critical water years when outflows could increase by 7 percent.* This slight change in Delta region outflows would have a less than significant effect on water quality.
>
> *Under Alternative 3, NDOs would be similar to the No Action/No Project Alternative. Small decreases would occur during January through April (less than 0.6 percent), likely because of decreased river flows during reservoir refill associated with reservoir release transfers. The largest percent changes occur during July through September of Critical and Dry water years when transfers are moving through the Delta. The NDO increases during transfers by up to 7.1 percent during a critical year in July. More detailed information is provided in Appendix E. These changes would have a less than significant effect on water quality.*
>
> *Water transfers could change Delta salinity and could result in water quality impacts.* Modeled impacts to EC, chloride concentrations, and X2 indicate that under Alternative 4, water quality impacts in the Delta would be less than those under the Proposed Action. *Percent changes in EC at locations within the Delta are shown in Table 3.2-33.* As a result, impacts to water quality in the Delta region under Alternative 4 are less than significant.

Page 3.2-52

The following table was inserted after the last paragraph on page 3.2-52 of the 2014 Draft EIS/EIR:

Table 3.2-33. Average Monthly Percent Change in EC from the No Action/No Project Alternative to Alternative 4

Year Type	*Oct*	*Nov*	*Dec*	*Jan*	*Feb*	*Mar*	*Apr*	*May*	*Jun*	*Jul*	*Aug*	*Sep*
SWP intake to Clifton Court Forebay												
W	*-0.1*	*-0.1*	*-0.1*	*0.0*	*-0.2*	*-0.1*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*
AN	*-0.7*	*-0.4*	*-0.2*	*0.0*	*0.0*	*0.0*	*0.1*	*0.0*	*-0.6*	*-0.2*	*0.0*	*-0.2*
BN	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.1*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*
D	*-0.7*	*-0.4*	*-0.2*	*-0.1*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.3*	*1.0*	*-0.2*
C	*-1.5*	*-0.8*	*-0.4*	*-0.2*	*-0.1*	*0.0*	*0.0*	*0.0*	*-0.2*	*2.2*	*1.1*	*-1.6*
CVP intake at Delta Mendota Canal												
W	*-0.1*	*-0.1*	*0.0*	*0.0*	*-0.2*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*
AN	*-0.6*	*-0.4*	*-0.2*	*0.0*	*0.0*	*0.0*	*0.1*	*0.0*	*-0.6*	*-0.1*	*0.0*	*-0.1*
BN	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.1*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*
D	*-0.6*	*-0.3*	*-0.1*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*1.1*	*0.3*	*-0.2*
C	*-1.3*	*-0.7*	*-0.3*	*-0.1*	*0.0*	*0.0*	*0.0*	*0.0*	*-0.1*	*0.6*	*0.2*	*-0.4*
CCWD Victoria Canal location												
W	*-0.1*	*-0.1*	*-0.1*	*0.0*	*-0.2*	*-0.1*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*
AN	*-0.8*	*-0.4*	*-0.2*	*0.0*	*0.0*	*0.0*	*0.0*	*0.1*	*-0.6*	*-0.3*	*0.0*	*-0.1*
BN	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.1*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*
D	*-0.6*	*-0.3*	*-0.1*	*-0.1*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.2*	*0.2*	*-0.4*
C	*-1.4*	*-0.6*	*-0.4*	*-0.2*	*-0.1*	*0.0*	*0.0*	*0.0*	*-0.2*	*-0.1*	*-0.7*	*-2.8*
CCWD Old River location												
W	*-0.1*	*-0.1*	*-0.1*	*0.0*	*-0.2*	*-0.1*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*
AN	*-0.8*	*-0.5*	*-0.2*	*-0.1*	*0.0*	*0.0*	*0.0*	*0.1*	*-0.4*	*-0.1*	*-0.1*	*-0.2*
BN	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.1*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*
D	*-0.7*	*-0.4*	*-0.2*	*-0.1*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.4*	*1.2*	*-0.1*
C	*-1.5*	*-0.9*	*-0.5*	*-0.3*	*-0.1*	*0.0*	*0.0*	*0.0*	*-0.3*	*2.7*	*0.8*	*-1.7*
CCWD Rock Slough location												
W	*-0.1*	*-0.1*	*-0.1*	*0.0*	*-0.1*	*-0.1*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*
AN	*-0.6*	*-0.6*	*-0.3*	*-0.1*	*0.0*	*0.0*	*0.0*	*0.0*	*-0.3*	*0.0*	*0.0*	*-0.2*
BN	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*
D	*-0.6*	*-0.5*	*-0.2*	*-0.1*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.5*	*1.0*	*0.7*
C	*-1.5*	*-1.1*	*-0.6*	*-0.3*	*-0.1*	*0.0*	*0.0*	*0.0*	*-0.4*	*4.7*	*2.1*	*-0.7*
RSAC081 Collinsville												
W	*-0.1*	*-0.2*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*
AN	*-0.5*	*-0.2*	*-0.2*	*0.1*	*0.1*	*0.0*	*0.0*	*0.0*	*0.5*	*0.2*	*0.1*	*0.1*
BN	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*
D	*-0.5*	*-0.2*	*-0.3*	*-0.1*	*0.3*	*0.3*	*0.9*	*0.5*	*0.3*	*-1.5*	*-2.4*	*-1.2*
C	*-0.9*	*-0.4*	*-0.2*	*-0.2*	*0.4*	*0.3*	*0.1*	*-0.9*	*-0.2*	*-4.2*	*-4.9*	*-3.0*
RSAN007 near Antioch												
W	*-0.1*	*-0.1*	*-0.1*	*0.0*	*-0.1*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*
AN	*-0.6*	*-0.2*	*-0.2*	*0.0*	*0.1*	*0.0*	*0.0*	*0.0*	*0.1*	*0.2*	*0.1*	*0.0*
BN	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*
D	*-0.6*	*-0.2*	*-0.2*	*-0.1*	*0.1*	*0.2*	*0.3*	*0.4*	*0.4*	*-1.2*	*-2.0*	*-1.3*
C	*-1.1*	*-0.5*	*-0.3*	*-0.2*	*0.3*	*0.3*	*0.1*	*-1.1*	*-0.2*	*-3.5*	*-4.6*	*-3.0*
RSAN018 Jersey Point												

Year Type	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
W	-0.1	-0.1	-0.1	0.0	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AN	-0.7	-0.3	-0.2	0.0	0.1	0.0	0.0	0.0	-0.1	0.4	-0.1	-0.2
BN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
D	-0.6	-0.3	-0.3	-0.1	0.0	0.0	0.0	0.1	0.3	0.9	1.1	-0.8
C	-1.3	-0.7	-0.4	-0.2	0.0	0.2	0.1	-0.9	-0.3	2.3	-0.9	-1.6

Key: Year Type = Sacramento watershed year type, W = wet, AN = above normal, BN = below normal, D = dry, C = critical

Page 3.2-53

The second paragraph in Section 3.2.2.6.2, entitled *Buyer Service Area,* on page 3.2-53 of the 2014 Draft EIS/EIR is revised as follows:

> Water transfers could change reservoir storage in San Luis Reservoir and could result in water quality impacts. Under Alternative 4, storage *changes* would be ~~the same as that~~ *smaller than those* under the Proposed Action *because the small decreases associated with streamflow depletion would not occur*. These small changes in storage are not sufficient enough to adversely affect designated beneficial uses, violate existing water quality standards, or substantially degrade water quality. *Modeling indicates that San Luis Reservoir would not fall below 300,000 acre-feet in more months than under the No Action/No Project Alternative.* Consequently, potential storage-related effects on water quality would be less than significant for San Luis Reservoir.

Section 3.2.3, entitled *Comparative Analysis of Alternatives*, on page 3.2-53 of the 2014 Draft EIS/EIR is revised as follows:

3.2.3 Comparative Analysis of Alternatives

> ~~Table 3.2-32 summarizes the potential water quality effects of each of the action alternatives and the No Action/ No Project Alternative. The following text supplements the table by comparing the effects of the action alternatives and No Action/ No Project Alternative.~~

Page 3.2-53

Table 3.2-32 on page 3.2-53 of the 2014 Draft EIS/EIR was renamed to Table 3.2-34.

The following text is inserted after Table 3.2-32 on page 3.2-53 of the 2014 Draft EIS/EIR:

> *Water transfers could change reservoir storage in San Luis Reservoir and could result in water quality impacts. Under Alternative 4, storage changes would be smaller than those under the Proposed Action because the small decreases associated with streamflow depletion would not occur. The small changes in storage are insubstantial and are not sufficient enough to adversely affect designated beneficial uses, violate existing water quality standards, or substantially degrade water quality. Modeling indicates that San Luis Reservoir would not fall below 300,000 acre-feet in more years than under the No Action/No Project Alternative. Consequently, potential storage-related effects on water quality would be less than significant for San Luis Reservoir.*

3.2.3 Comparative Analysis of Alternatives

Table 3.2-34 summarizes the potential water quality effects of each of the action alternatives and the No Action/No Project Alternative. The following text supplements the table by comparing the effects of the action alternatives and No Action/No Project Alternative.

Section 3.2.4, Water Quality- Cumulative Effects

Section 3.2.4 Cumulative Effects of the 2014 Draft EIS/EIR was replaced in entirety with Section 3.2.4 of the RDEIR/SDEIS.

Page 3.2-1

The second paragraph on page 3.2-1 of the RDEIS/SDEIS is revised as follows:

> In addition to these cumulative projects, the Central Valley Salinity Alternatives for Long-Term Sustainability initiative (CV-SALTS) could affect water quality in the Central Valley. CV-SALTS is a stakeholder-driven effort to manage salinity and nitrates in the Central Valley, and it includes efforts to implement the total maximum daily load (TMDL) for salinity. This effort ~~not yet reached decision points~~ has *been adopted by the State Water Resources Control Board and the implementation of this project* ~~about projects to implement that~~ would affect water quality. The State Water Resources Control Board is considering new water quality standards throughout the Central Valley, but these standards have not yet met the criteria to be considered reasonably foreseeable and included in the cumulative analysis because a decision has not yet been made on whether to implement the revised standards.

Section 3.3, Groundwater Resources

Section 3.3 of the 2014 Draft EIS/EIR was replaced in entirety with Section 3.3 of the RDEIR/SDEIS.

Page 3.3-1

The following text on page 3.3-1 of the RDEIR/SDEIS is revised as follows:

- Sacramento Valley Groundwater Basin: Colusa subbasin, ~~West Butte subbasin~~, Sutter subbasin, Yolo subbasin, Solano subbasin, North and South American subbasins

Page 3.3-3

The second paragraph on page 3.3-3 of the RDEIR/SDEIS is revised as follows:

> Historically, groundwater levels have remained stable within the Redding Area Groundwater Basin. Seasonal fluctuations in groundwater levels are generally less than five feet and can be up to 16 feet during drought years (Anderson-Cottonwood ID 2011). During the recent drought from 2011 to ~~2015~~ *2016*, water levels in the Redding Area Groundwater Basin, and in particular the Anderson subbasin, decreased up to 18 feet. Groundwater levels have shown some recovery during recent wet conditions in water year (WY) 2017 in the Anderson subbasin (*see Figures F-2 through F-9 in Appendix F*). Groundwater levels in the Anderson subbasin have recovered to spring 2016 levels but not to pre-drought levels, (i.e., spring 2011 levels). It should be noted that groundwater level declines discussed above were due to five consecutive drought years and only partial recovery from one wet year is consistent with historic patterns of drawdown and recovery.

The fifth paragraph on page 3.3-3 of the RDEIR/SDEIS is revised as follows:

> ~~Land subsidence has not been monitored in the Redding Area Groundwater Basin. However, there would be potential for subsidence in some areas of the basin if groundwater levels decline below historic low levels. The groundwater basin west of the Sacramento River is composed of the Tehama Formation. This formation has exhibited subsidence in Yolo County and the similar hydrogeologic characteristics in the Redding Area Groundwater Basin could be conducive to land subsidence.~~ *In the Redding Area Groundwater Basin, DWR has measured less than 0.2 feet of subsidence between 2008 and 2017 (DWR 2019).*

Page 3.3-6

The last paragraph on page 3.3-6 of the RDEIR/SDEIS is revised as follows:

> Historically, *greater than 1 feet of* land subsidence *has* occurred in the eastern portion of Yolo County and the southern portion of Colusa County, owing to groundwater extraction and geology. Due to groundwater withdrawal over several decades, ~~as much as four feet of~~ *between 0.3 to 1.1 feet of* land subsidence has ~~occurred~~ *been recorded* east of the town of Zamora *between 2008 and 2019 (DWR 2019)*. In Yolo County within Conaway Ranch, DWR observed land subsidence estimated at approximately 0.2 foot from 2012 to 2013 and an additional 0.6 foot from 2013 to 2014 (DWR 2017b). In comparison, slightly less than 0.1 foot of subsidence occurred over the previous 22 years (1991-2012). Ground surface elevations have reverted to pre-2012 trends at this station since 2014 and approximately 0.03 feet of subsidence has been recorded since 2015 (DWR 2017b). The area between Zamora, Knights Landing, and Woodland has been most affected (Yolo County 2012). *In Colusa County, the Arbuckle area has measured approximately 2.14 feet of subsidence between 2008 and 2017 (DWR 2019). In Glenn and Sutter counties, between 0.4 to 0.6 feet and 0.2 to 0.4 feet was measured from 2008 through 2017 respectively.* Subsidence in ~~this~~ *these* regions ~~is~~ *are* generally related to groundwater pumping and subsequent consolidation of loose aquifer sediments.

Page 3.3-15

The first paragraph on page 3.3-15 of the RDEIR/SDEIS is revised as follows:

Groundwater level drawdown and subsequent recovery can also be viewed at a specific location through the entire 33-year simulation period. Representative hydrographs were extracted from the model results at the 34 locations shown with pink triangles in drawdown figures in Appendix G. ~~Appendix F~~ Appendix G also includes hydrographs for all 34 locations and seven simulated model layers (varying depths throughout the model).

Page 3.3-20

Table 3.3-4 on page 3.3-20 of the RDEIR/SDEIS is revised as follows:

Table 3.3-4.
Well Depths in the Sacramento Valley Groundwater Basin

Groundwater Subbasin	Domestic Wells Depth Range (ft bgs)	Domestic Wells Average Depth (ft bgs)	Municipal/ Irrigation Wells Depth Range (ft bgs)	Municipal/ Irrigation Wells Average Depth (ft bgs)
Colusa	~~11 – 870~~ *16-500*	~~155~~ *148*	~~20 – 1,340~~ *16-1,360*	~~368~~ *315*
East Butte	~~25 – 639~~ 30-*513*	~~101~~ *133*	~~35 – 983~~ 57-*900*	~~285~~ *337*
North American	~~50 – 1,750~~ *76-438*	~~190~~ *190*	~~77 – 1,025~~ *80-952*	~~396~~ *223*
Solano	~~38 – 1,070~~ *20-320*	~~239~~ *150*	~~62 – 2,275~~ *53-1,464*	~~510~~ *523*
South American	~~87 – 575~~ *85-405*	~~247~~ *186*	~~41 – 1,000~~ *122-780*	~~372~~ *374*
Sutter	~~35 – 320~~ *55-302*	~~121~~ *138*	~~60 – 672~~ *42-820*	~~205~~ *184*
~~West Butte~~	~~15 – 680~~	~~136~~	~~40 – 920~~	~~321~~
Yolo	~~40 – 600~~ *30-317*	~~230~~ *147*	~~50 – 1,500~~ *20-767*	~~400~~ *309*

Source- ~~DWR 2003~~ Water Data Library 2019
Key:
bgs = below ground surface
ft = feet

The following text in the last paragraph on page 3.3-20 of the RDEIR/SDEIS is revised as follows:

Additionally, the change in groundwater level at Conaway Ranch would be between the Proposed Action and the No Action Alternative ranges of 2.5-12 feet (~~Appendix F~~ *Appendix G*, Location 30 hydrograph).

Page 3.3-29

The Shallow Groundwater Level Monitoring for Deep Rooted Vegetation section in page 3.3-27 of the RDEIR/SDEIS is revised as follows:

Shallow Groundwater Level Monitoring for Deep Rooted Vegetation

To avoid significant effects to vegetation and allow sellers to modify actions before significant effects occur, sellers will monitor groundwater level data to verify that significant adverse effects to deep-rooted vegetation are avoided. This monitoring is only required in areas with deep-rooted vegetation (i.e. oak trees and riparian trees that would have tap roots greater than 10 feet deep) within a one-half mile radius of the participating pumping well and areas where groundwater levels are between 10 to 25 feet below ground surface prior to starting the transfer of surface water made available from groundwater substitution actions. This monitoring is not required in areas with no deep-rooted vegetation (i.e., *areas without* oak trees and riparian trees that would have tap roots greater than 10 feet deep) within one-half mile of the participating wells or in areas where vegetation is located along waterways or irrigated fields that will continue to have water during the period of transfer.

The seller would be required to identify if monitoring for deep rooted vegetation is required in their transfer proposal to Reclamation and DWR. Existing resources such as DWR's groundwater dependent ecosystem maps (https://gis.water.ca.gov/app/NCDatasetViewer/) or any existing biological survey data in the area could be used to identify deep rooted vegetation near the participating pumping well.

If deep rooted vegetation is identified near the participating pumping well, a groundwater level monitoring well with the following requirements would need to be identified and monitored: (1) monitoring well is within a one-half mile radius of the deep-rooted vegetation; (2) monitoring well would measure shallow groundwater level changes (within the interval between 10 to 25 feet below ground surface). The participating production well can function as the monitoring well if previously mentioned requirements are met. If monitoring data at the well indicate that groundwater levels have dropped below root zones (i.e., more than 10 feet, where groundwater was 10 to 25 feet below ground surface prior to starting the transfer of surface water made available from groundwater substitution actions), the seller must implement actions set forth in the mitigation plan. If historic data show that groundwater levels in the area where actions are being taken to make water available for transfer have typically varied by more than this amount annually during the proposed transfer period, then the transfer may be allowed to proceed. *The seller must submit historic data showing groundwater variances to Reclamation prior to transfer pumping.*

If no monitoring wells with the requirements discussed in the previous paragraph exist, monitoring would be based on visual observations by a qualified ~~biologist~~ *plant ecologist/certified arborist* of the health of these areas of deep-rooted vegetation until it is feasible to obtain or install shallow groundwater monitoring. ~~If significant adverse impacts to deep-rooted vegetation (that is, loss of a substantial percentage of the deep-rooted vegetation as determined by Reclamation based on site-specific circumstances in consultation with a qualified biologist) occur as a result of the transfer despite the monitoring efforts and implementation of the mitigation plan, the seller will prepare a report documenting the result of the restoration activity to plant, maintain, and monitor restoration of vegetation for 5 years to replace the losses.~~ *Monitoring of these areas would include a pre-pumping vegetation assessment within a half-mile radius of the pumping well followed by an assessment near the end of the pumping season but prior to fall/autumn leaf-drop. The assessment of post-pumping impacts on deep-rooted vegetation will be conducted by a qualified plant ecologist/arborist and will take into account the existing health conditions of the vegetation prior to pumping, species present, size-class of trees, and rainfall data from the previous water years. If the qualified plant* *ecologist/certified arborist determines, based on site-specific circumstances, that groundwater pumping has caused significant adverse impacts to deep-rooted vegetation (that is, any loss of the deep-rooted vegetation), the seller must implement restoration actions set forth in the mitigation plan. Findings from the pre-pumping and post pumping assessment will be reported to Reclamation.*

Section 3.3.4.3 on page 3.3-29 of the RDEIR/SDEIS is revised as follows:

Potential sellers must complete and implement a mitigation plan to avoid potentially significant groundwater impacts and ensure prompt corrective action in the event unanticipated effects occur. *This plan must document the planned actions if there are unanticipated impacts to groundwater resources or groundwater-dependent vegetation. This plan must be submitted to Reclamation as part of the transfer approval process.*

Groundwater Resource Mitigation

If groundwater level triggers are reached at the participating pumping well(s) or the suitable monitoring well (s) (either BMO triggers or historic low groundwater levels), transfer-related pumping would stop from the participating pumping well that reached the trigger. Transfer related pumping would be stopped when the trigger is first reached at either the participating pumping well(s) or the suitable monitoring well(s). Transfer-related pumping could not continue from this well (in the same year or a future year) until groundwater levels recovered to above the groundwater level trigger. Implementation of the mitigation plan thus avoids any potentially significant groundwater impacts. Other corrective actions could include:

- Lowering of pumping bowls in non-transferring wells affected by substitution pumping.
- Reimbursement to non-transferring third parties for significant increases in their groundwater pumping costs due to the groundwater substitution pumping action, as compared with their costs absent the transfer.
- Reimbursement to non-transferring third parties for modifications to infrastructure that may be affected.
- Other appropriate actions based on local conditions.

Groundwater-Dependent Vegetation Mitigation

If shallow groundwater levels monitoring suggests that groundwater levels have dropped below root zones, the seller must stop transfer-related pumping at the participating pumping well. Transfer-related pumping from the participating pumping well would be stopped until groundwater levels have recovered to levels above the root zones. If historic data at the location indicates shallow groundwater levels typically dropped below the root zones (i.e., more than 10 feet, where groundwater was 10 to 25 feet below ground surface prior to starting the transfer of surface water made available from groundwater substitution actions) during the proposed transfer period, then the transfer may be allowed to proceed.

In areas where visual monitoring is conducted to monitor health of deep-rooted vegetation, the seller must stop transfer-related pumping at the participating well if the qualified plant ecologist/arborist, determines a loss or substantial risk of loss of vegetation.

If adverse impacts to deep-rooted vegetation occur, the seller will perform restoration activities by replanting similar vegetation at a 1:1 ratio (for every 1 inch diameter at breast height (dbh) lost, 1 inch in dbh will be planted. For example if 12-inch dbh of oak is lost then the seller would have to plant 12 gallon oak sapling at around 1-inch dbh. Therefore, the seller would plant more trees than lost.). The seller will plant, irrigate, maintain, and monitor restoration of vegetation for 3 years to replace the losses. All plantings will be fitted with exclusion cages or other suitable protection from herbivores. Plantings will be irrigated for 3 years or until the survival criterion is met. If 75% of the plants survive at the end of the 3-year monitoring period, the revegetation will be considered successful. If the survival criterion is not met at the end of the monitoring period, planting and monitoring will be repeated after mortality causes have been identified and corrected. Annual monitoring reports, prepared by a qualified plant ecologist/arborist, will document the status of the plantings and recommendations for remediation as necessary. The monitoring reports will be provided to the seller and Reclamation by August 31 following each year of monitoring (generally July 1 through June 30) to allow time for additional planting activities, if necessary.

Transfer-related pumping could not continue at the subject well while vegetation restoration activities consistent with the requirements above are ongoing (i.e. 3 years or until the survival criterion is met). Transfer-related pumping at the subject well could not resume after restoration unless the seller provides evidence that resuming pumping will not affect deep-rooted vegetation (such as data from the installation of a new shallow groundwater level monitoring well within a one-half mile radius of the deep-rooted vegetation that indicates stable shallow groundwater levels at less than 10 feet).

Section 3.4, Geology and Soils

Page 3.4-8

Figure 3.4-3 on page 3.4-8 of the 2014 Draft EIS/EIR is replaced with the below figures and revised as follows:

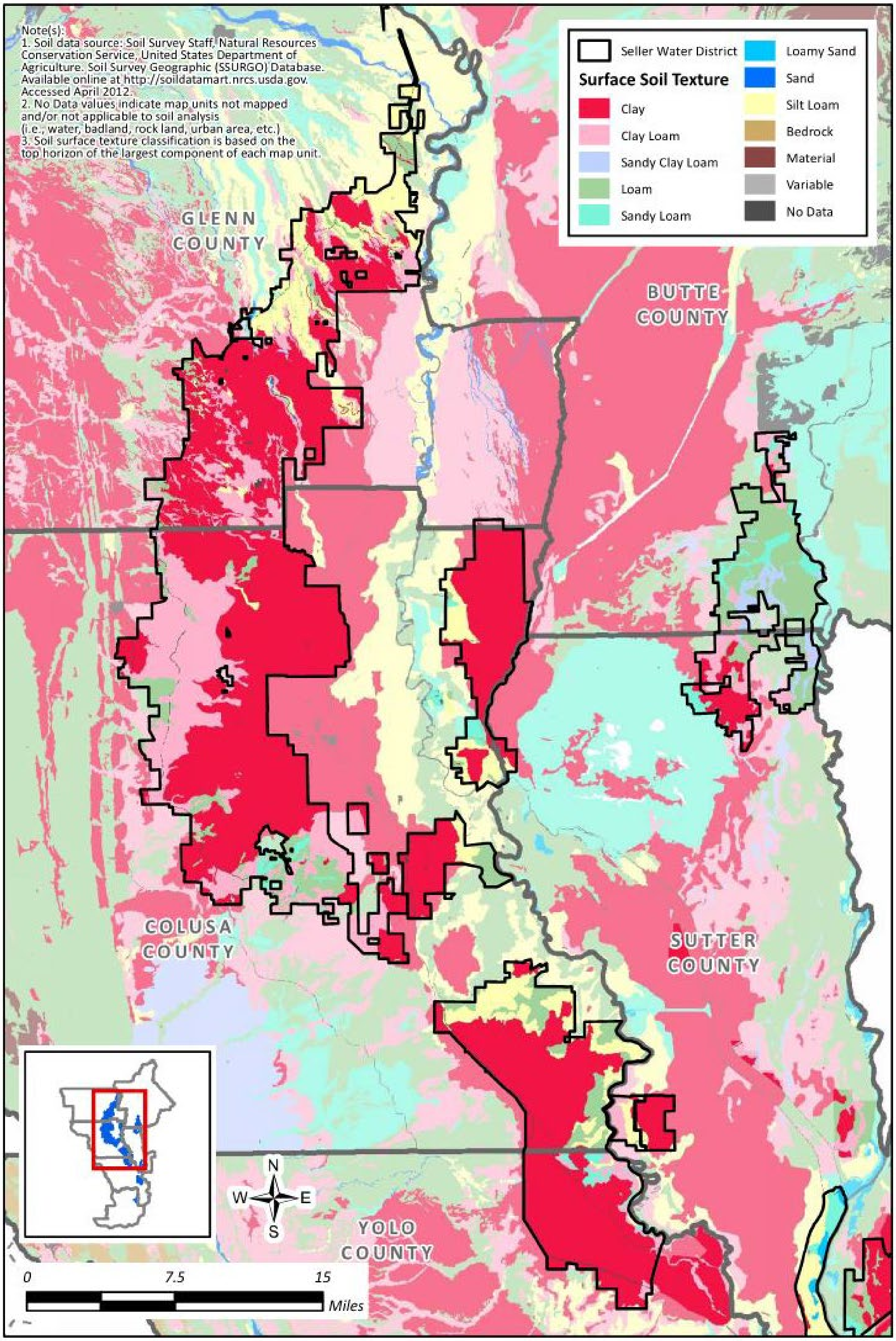


Figure 3.4-~~3~~*3a*. Surface Soil Texture – Seller Service Area

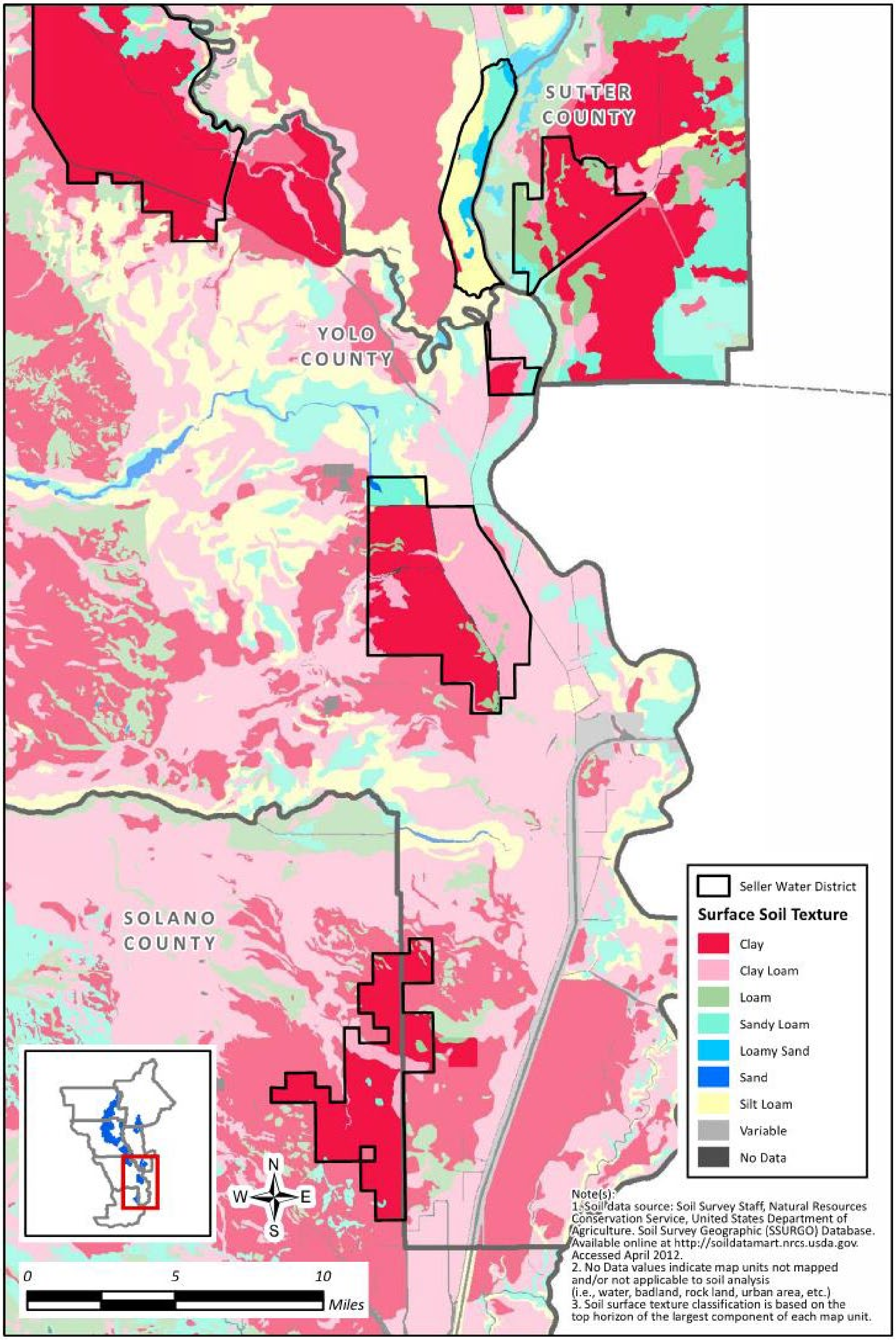


Figure 3.4-3b. Surface Soil Texture – Seller Service Area

Page 3.4-17

The third and fourth paragraphs on page 3.4-17 of the 2014 Draft EIS/EIR are revised as follows:

> As shown in ~~Figure~~*Figures* 3.4-*3a and* 3*.4-3b*, the soils in ~~Central Valley agricultural~~*the Seller water district* areas in Glenn, Colusa, Butte, Sutter, Solano, and Yolo counties are primarily clay and clay loam with ~~minor~~*smaller* portions of silt loam, loam, sandy loam, and ~~sandy~~ clay loam. In general, soils that contain some percentage of clay content, such as the predominant soils in counties in the Sellers Service Area, are less susceptible to erosion.

> In the Sacramento River Region (Glenn, Colusa, and Yolo counties), there could be a combined maximum of 2,200 acres of alfalfa, corn, or tomato cropland idled. The sellers that expressed interest in participating in cropland idling transfers in these counties are located mainly on clay and clay loam soils that have low erodibility. ~~*The northeastern part of Glenn County has silt loam, loam,*~~*(Figures 3.4-3a* and ~~sandy loam soils (Figure 3.4-3). Areas of loam and silt loam also exist along the eastern edge of Colusa County. The majority of the southeastern corner of Colusa County and the northeastern corner of Yolo County are composed of clay with small patches of loam, silt loam, and sand soils (Figure~~ 3.4-~~3~~*3b*). It is possible that some idling could occur on the more erodible soil textures *such as loam and silt loam.* While these soils are more susceptible to wind erosion, the amount of potential acres idled is small, with a maximum of 2,200 acres of alfalfa, corn, and tomatoes in the three counties. Idling of this amount of crop acreage on sandy soils would not likely result in substantial soil erosion.

Page 3.4-18

The following sentence in first complete paragraph on page 3.4-18 of the 2014 Draft EIS/EIR is revised as follows:

> In the Feather River Region (Butte and Sutter counties), there is also potential for idling to occur on some of the loam or loamy sand soils located in south-central areas (~~Figure~~*Figures* 3.4-*3a and* 3*.4-3b*).

Page 3.4-19

The following text is inserted after the first incomplete paragraph on page 3.4-19 of the 2014 Draft EIS/EIR:

> *Changes in streamflows in the Sacramento and San Joaquin Rivers and their tributaries as a result of water transfers could result in increased soil erosion. As described in Section 3.17, Flood Control, water transfers in the Proposed Action could increase flows in rivers and in the Delta during the period when water transfers are conveyed from the sellers to the buyers (April through October for East Bay MUD, July through September for transfers conveyed through the Delta). Table 3.17-2 in Section 3.17, Flood Control, shows changes in river flows on the major waterways in the Seller Service Area (Sacramento, Feather, American and Merced rivers). While there would be flow increases compared to the No Action/No Project Alternative, these increases would only be during the dry season of dry and critical years. Flows during these years are below normal and the increase resulting from water transfers would not increase streamflow to*

a level that would result in soil erosion impacts to stream and river banks. The impact would be less than significant.

The last paragraph on page 3.4-19 of the 2014 Draft EIS/EIR is revised as follows:

Effects in the Buyer Service Area would be the same as the Proposed Action. There would be no cropland idling under Alternative 3; therefore, there would be no impacts in the Seller Service Area. ~~Effects in the Buyer Service Area would be the same as the Proposed Action.~~ *from cropland idling.*

Changes in streamflows in the Sacramento and San Joaquin Rivers and their tributaries as a result of water transfers could result in increased soil erosion. As described in Section 3.17, Flood Control, water transfers in Alternative 3 could increase flows in rivers and in the Delta during the period when water transfers are conveyed from the sellers to the buyers (April through October for East Bay MUD, July through September for transfers conveyed through the Delta). Table 3.17-4 in Section 3.17, Flood Control, shows changes in river flows on the major waterways in the Seller Service Area (Sacramento, Feather, American and Merced rivers). While there would be flow increases compared to the No Action/No Project Alternative, these increases would only be during the dry season of dry and critical years. Flows during these years are below normal and the increase resulting from water transfers would not increase streamflow to a level that would result in soil erosion impacts to stream and river banks. The impact would be less than significant.

Page 3.4-20

The following text is inserted below the last paragraph in Section 3.4.2.6, entitled *Alternative 4: No Groundwater Substitution*, on page 3.4-20 of the 2014 Draft EIS/EIR:

Changes in streamflows in the Sacramento and San Joaquin Rivers and their tributaries as a result of water transfers could result in increased soil erosion. As described in Section 3.17, Flood Control, water transfers in Alternative 3 could increase flows in rivers and in the Delta during the period when water transfers are conveyed from the sellers to the buyers (April through October for East Bay MUD, July through September for transfers conveyed through the Delta). Table 3.17-6 in Section 3.17, Flood Control, shows changes in river flows on the major waterways in the Seller Service Area (Sacramento, Feather, American and Merced rivers). While there would be flow increases compared to the No Action/No Project Alternative, these increases would only be during the dry season of dry and critical years. Flows during these years are below normal and the increase resulting from water transfers would not increase streamflow to a level that would result in soil erosion impacts to stream and river banks. The impact would be less than significant.

Page 3.4-21, Table 3.4-4

Table 3.4-4 on page 3.4-21 of the 2014 Draft EIS/EIR is revised as follows:

Table 3.4-4. Comparative Analysis of Alternatives

Potential Impact	Alternatives	Significance	Proposed Mitigation	Significance after Mitigation
~~Cropland idling transfers in the Seller Service Area that temporarily convert cropland to bare fields could increase soil erosion.~~	~~2, 4~~	~~LTS~~	~~None~~	~~LTS~~
Land idling that temporarily converts cropland to bare fields in response to CVP shortages in the Buyer Service Area could increase soil loss from wind erosion.	1	LTS	None	LTS
Cropland idling ~~water~~ transfers ~~could cause expansive soils~~ in the Seller Service Area *that temporarily convert cropland* to ~~shrink due to the reduction in applied irrigation water~~*bare fields could increase soil erosion.*	2, 4	LTS	None	LTS
Land idling in response to CVP shortages in the Buyer Service Area could cause expansive soils to shrink due to the reduction of applied irrigation water.	1	LTS	None	LTS
Cropland idling water transfers could cause expansive soils in the Seller Service Area to shrink due to the reduction in applied irrigation water.	*2, 4*	*LTS*	*None*	*LTS*
Use of transfer water on agricultural fields in the Buyer Service Area could increase soil erosion.	2, 3, 4	LTS	None	LTS
Use of transfer water on agricultural fields in the Buyer Service Area could increase soil movement.	2, 3, 4	LTS	None	LTS
Changes in streamflows in the Sacramento and San Joaquin Rivers and their tributaries as a result of water transfers could result in increased soil erosion.	*2, 3, 4*	*LTS*	*None*	*LTS*

Page 3.4-23

The second paragraph in Section 3.4.6, entitled *Cumulative Effects*, on page 3.4-23 of the 2014 Draft EIS/EIR is revised as follows:

> The projects considered for the cumulative condition are the State Water Project (SWP) water transfers ~~and~~, CVP Municipal and Industrial Water Shortage Policy (WSP), *and refuge transfers*, which are described in more detail in Chapter 4. SWP transfers could utilize cropland idling in the area of analysis and could therefore affect soils on agricultural fields. The WSP could reduce agricultural water deliveries and increase land idling in the Buyer Service Area. Effects of the WSP in the Seller Service Area would be minor as agricultural water supplies would not substantially change relative to existing conditions. *A portion of refuge transfers could come from cropland idling transfers in the San Joaquin Valley near the Buyers Service Area. Idling fields for these transfers could affect soils on agricultural fields, but these changes would be very small and not directly within the Buyers Service Area.*

Page 3.4-24

The second paragraph on page 3.4-24 of the 2014 Draft EIS/EIR is revised as follows:

> Use of water from transfers on agricultural fields in the Buyer Service Area could reduce soil erosion. SWP transfers would increase water supply in the Buyer Service Area and reduce soil erosion. The WSP could reduce agricultural water supplies in dry and critical years, which could increase cropland idling and soil erosion. *Similarly, refuge transfers could increase cropland idling in areas near the Buyers Service Area.* However, CVP water transfers would offset some of these effects. The Proposed Action in combination with other cumulative actions would not result in a cumulative significant impact related to soil erosion in the Buyer Service Area.

The header to Section 3.4.6.3, entitled *Alternative 3: No Cropland Modification,* on page 3.4-24 of the 2014 Draft EIS/EIR is revised as follows:

> 3.4.6.~~3~~*2* Alternative 3: No Cropland Modification

The header to Section 3.2.4.3.3, entitled *Seller Service Area,* on page 3.4-24 of the 2014 Draft EIS/EIR is revised as follows:

> 3.4.6.~~4~~*3* Alternative 4: No Groundwater Substitution

Section 3.5, Air Quality

Page 3.5-23

The last paragraph on page 3.5-23 of the 2014 Draft EIS/EIR is revised as follows:

> *All engines operated by the water agencies would operate in compliance with the ATCM, including any necessary retrofits or repowering. The emission standards applicable to a given engine's size and model year were used in this analysis. If the model year of an engine was not known, then the engine was assumed to be "noncertified" as defined by the ATCM. Appendix I details the assumptions (e.g., size, emissions tier, pump rate, and emission factors) used for each engine.*

> To estimate reduction in vehicle exhaust as a result of cropland idling transfers, this analysis uses available information in "Comparison of Summertime Emission Credits from Land Fallowing Versus Groundwater Pumping" (Byron Buck & Associates 2009). The study compared the relative reduction in emissions due to cropland idling activities versus groundwater substitution. Byron Buck & Associates (2009) estimated the gallons of fuel consumed by farm equipment that would be reduced per acre idled and the average quantity of fuel consumed by groundwater pumping. It was assumed that an agency would need 4.25 acre-feet (AF) of water produced by idling to offset the equivalent emissions of one AF of groundwater pumped (Byron Buck & Associates 2009). Using this ratio, the expected reductions in vehicular exhaust emissions from cropland idling were estimated. *This ratio reflects the best information available to estimate emission reductions from cropland idling.*

Appendix I presents the detailed calculations that were used to estimate the reduced vehicular exhaust emissions from cropland idling (see Table F-69). Specifically, ratios between emissions from individual water agencies and Pelger MWC were calculated to estimate the overall emissions reductions. Pumping emissions from Pelger MWC were selected because the engines used by the water agency are most reflective of those discussed in Byron Buck & Associates 2009.

Page 3.5-29

The heading for Section 3.5.2.2.7, entitled *San Joaquin Valley APCD*, on page 3.5-29 of the 2014 Draft EIS/EIR is revised as follows:

3.5.2.2.~~7~~*6* San Joaquin Valley APCD

The heading for Section 3.5.2.2.8, entitled *Shasta County AQMD*, on page 3.5-29 of the 2014 Draft EIS/EIR is revised as follows:

3.5.2.2.~~8~~*7* Shasta County AQMD

The heading for Section 3.5.2.2.9, entitled *Tehama County APCD*, on page 3.5-29 of the 2014 Draft EIS/EIR is revised as follows:

3.5.2.2.~~9~~*8* Tehama County APCD

Page 3.5-30

The heading for Section 3.5.2.2.10, entitled *Yolo-Solano AQMD*, on page 3.5-30 of the 2014 Draft EIS/EIR is revised as follows:

3.5.2.2.~~10~~*9* Yolo-Solano AQMD

Page 3.5-43

The following table and text are inserted after the first paragraph on page 3.5-43 of the 2014 Draft EIS/EIR:

Table 3.5-20. Mitigated Peak Daily Emissions from Groundwater Pumping (lbs/day)

Air District	*VOC*	*NOx*	*CO*	*SOx*	*PM_{10}*	*$PM_{2.5}$*
Feather River AQMD						
Gilsizer Slough Ranch	*1*	*24*	*31*	*8*	*2*	*2*
Pleasant Grove-Verona MWC	*2*	*23*	*48*	*14*	*1*	*1*
Tule Basin Farms	*4*	*19*	*10*	*<1*	*<1*	*<1*
Significance Threshold	*25*	*25*	*n/a*	*n/a*	*80*	*n/a*
Significant?	*No*	*No*	*n/a*	*n/a*	*No*	*n/a*
Sacramento Metropolitan AQMD						
Sacramento Suburban WD	*2*	*54*	*4*	*<1*	*<1*	*<1*
Significance Threshold	*65*	*65*	*n/a*	*n/a*	*n/a*	*n/a*
Significant?	*No*	*No*	*n/a*	*n/a*	*n/a*	*n/a*

Notes:
[1] *Emission reductions (beneficial impacts) are shown in parentheses.*
Key:

CO = carbon monoxide; lbs/day = pounds per day; NOx = nitrogen oxides; PM_{10} = inhalable particulate matter; $PM_{2.5}$ = fine particulate matter; SOx = sulfur oxides; VOC = volatile organic compounds

Following mitigation, VOC and NOx emissions would be reduced to less than significant under CEQA.

The following text is added after the second paragraph on page 3.5-43 of the 2014 Draft EIS/EIR:

> *Any selling agencies with potentially significant emissions, as determined by this EIS/EIR, will be required to maintain recordkeeping logs that document the specific engine to be used for groundwater substitution transfers, the power rating (hp), and applicable emission factors. Emission calculations for daily emissions will be completed for comparison to the significance thresholds determined for each selling agency. The recordkeeping logs will be sent to Reclamation monthly for verification that emissions are within the allowable limits.*
>
> *Reclamation will also work with the water agencies to inform individual growers of incentive funding available through the Natural Resources Conservation Service's Environmental Quality Incentives Program. Funded conservation practices including the replacement of internal combustion engines in irrigation pumps; therefore, the program may be used by growers to further reduce criteria pollutant emissions.*

Section 3.5.4.2, entitled Mitigation Measure AQ-2: Operate Dual-Fired Wells as Electric Engines, *on page 3.5-43 of the 2014 Draft EIS/EIR is revised as follows:*

> Any engines operating in the area of analysis that are capable of operating as either electric or natural gas engines would only operate with electricity during any groundwater transfers. *Any selling agencies with these dual engines will be required to maintain recordkeeping logs that document that only electricity is used for groundwater substitution transfers. The recordkeeping logs will be sent to Reclamation monthly for verification that the engines are operating in compliance with the mitigation measure.*

Table 3.5-20 in Section 3.5.4.2, entitled *Mitigation Measure AQ-2: Operate Dual-Fired Wells as Electric Engines*, on page 3.5-43 of the 2014 Draft EIS/EIR is revised as follows:

~~Table 3.5-20. Mitigated Peak Daily Emissions from Groundwater Pumping (lbs/day)~~

~~Air District~~	~~VOC~~	~~NOx~~	~~CO~~	~~SOx~~	~~PM_{10}~~	~~$PM_{2.5}$~~
~~Feather River AQMD~~						
~~Gilsizer Slough Ranch~~	~~1~~	~~24~~	~~31~~	~~8~~	~~2~~	~~2~~
~~Pleasant Grove-Verona MWC~~	~~2~~	~~23~~	~~48~~	~~14~~	~~1~~	~~1~~
~~Tule Basin Farms~~	~~4~~	~~19~~	~~10~~	~~<1~~	~~<1~~	~~<1~~
~~Significance Threshold~~	~~25~~	~~25~~	~~n/a~~	~~n/a~~	~~80~~	~~n/a~~
~~Significant?~~	~~No~~	~~No~~	~~n/a~~	~~n/a~~	~~No~~	~~n/a~~
~~Sacramento Metropolitan AQMD~~						
~~Sacramento Suburban WD~~	~~2~~	~~54~~	~~4~~	~~<1~~	~~<1~~	~~<1~~
~~Significance Threshold~~	~~65~~	~~65~~	~~n/a~~	~~n/a~~	~~n/a~~	~~n/a~~
~~Significant?~~	~~No~~	~~No~~	~~n/a~~	~~n/a~~	~~n/a~~	~~n/a~~

~~*Notes:*~~
~~*[1] Emission reductions (beneficial impacts) are shown in parentheses.*~~
~~*Key:*~~
~~*CO = carbon monoxide; lbs/day = pounds per day; NOx = nitrogen oxides; PM_{10} = inhalable particulate matter; $PM_{2.5}$ = fine particulate matter; SOx = sulfur oxides; VOC = volatile organic compounds*~~

Page 3.5-44

The first sentence on Page 3.5-44 of the 2014 Draft EIS/EIR is revised as follows:

> ~~Following mitigation, VOC and NOx emissions would be reduced to less than significant under CEQA.~~

Section 3.6, Climate Change

Section 3.6 from the 2014 Draft EIS/EIR was supplemented with additional information in Section 3.6.2 in the RDEIR/SDEIS.

Page 3.6-2

The following text on page 3.6-2 of the RDEIR/SDEIS is revised as follows:

1. ~~Pertubed (i.e. adjusted for climate change)~~*Adjusted* Lake McClure storage, inflows to Bullards Bar Reservoir, and inflows to Folsom Lake from CalLite-CV model were used to analyze stored reservoir releases from Merced ID, Browns Valley ID, South Sutter WD, Nevada ID, and Placer County WA under the three climate change scenarios.

Section 3.7, Fisheries

Page 3.7-1

The following sentence in the first paragraph on page 3.7-1 of the 2014 Draft EIS/EIR is revised as follows:

> It includes a comparison of the impacts of the alternatives; ~~a description of environmental commitments and mitigation measures that will be implemented to avoid, minimize and mitigate any impacts identified; a description of any remaining potentially significant, unavoidable impacts;~~ and an evaluation of the cumulative effects of the project considering other existing and reasonably foreseeable actions within the area of analysis.

Page 3.7-6

The following text in the second paragraph on page 3.7-6 of the 2014 Draft EIS/EIR is revised as follows:

> Consequently, *in many, but not all, locations in the Area of Analysis*, dominant fishes currently occurring in these habitat types are now introduced species, including largemouth bass (Micropterus salmoides), white and black crappie (Pomoxis annularis and P. nigromaculatus), bluegill (Lepomis macrochirus), threadfin shad (Dorosoma petenense), striped bass (Morone saxatilis), bigscale logperch (Percina macrolepida), red shiner (Cyprinella lutrensis), inland silverside (Menidia beryllina), white catfish (Ameiurus catus), black and brown bullhead (A. melas and A. nebulosus), and common carp (Cyprinus carpio) (Moyle 2002). This area serves as a migration corridor for *native* anadromous ~~fish~~*salmonids* moving between the ocean and their freshwater spawning and

> rearing habitats. *Dominance by native versus non-native fish species in this assemblage is mediated by many factors, including flow regime, water temperature, and time of year (Brown and Bauer 2009, Kiernan et al. 2012, Sommer et al. 2014). For example, native fishes predominate early in the season on the Cosumnes River floodplain and Yolo Bypass when flooded, but is dominated by non-native species later in the season as water temperatures warm (Moyle et al. 2007, Sommer et al. 2014).*

Page 3.7-8

The following text is added after the first paragraph in Section 3.7.1.3.2, entitled *Fish Species of Management Concern*, on page 3.7-8 of the 2014 Draft EIS/EIR:

> *For native species described above that may be present in the affected area, but are not considered fish species of management concern, any impacts to the species would be less than significant under CEQA because they are not listed under California or federal Endangered Species Acts nor do they have recreational or commercial importance.*

Page 3.7-9

The last paragraph on page 3.7-9 of the 2014 Draft EIS/EIR is revised as follows:

> A review of field sampling data and reports in the following waterways indicates that there is no evidence of the presence of special-status fish species in the following waterways: ~~Seven Mile Creek, Walker Creek, North Fork Walker Creek, Wilson~~ *Walker* Creek, French Creek, Willow Creek, South Fork Willow Creek, Funks Creek, Stone Corral Creek, Lurline Creek, ~~Spring Valley Creek,~~ Cortina Creek, Sand Creek, Sycamore Slough (Colusa County), Wilkins Slough Canal, Honcut Creek, North Honcut Creek, South Honcut Creek, and Dry Creek (tributary of Bear River). As a result, no further biological analysis was conducted in these waterways.

Pages 3.7-10 and 3.7-11

Table 3.7-2 on pages 3.7-10 and 3.7-11 of the 2014 Draft EIS/EIR is revised to add to a row between the Putah Creek row and the Little Chico Creek row.

Table 3.7-2. Habitat Use by Fish Species of Management Concern within the Area of Analysis

Water Body	Listed Species						Other Evaluation Species					
	Winter-run Chinook Salmon	Spring-run Chinook Salmon	Central Valley Steelhead	Green Sturgeon	Delta Smelt	Longfin Smelt[1]	Fall/late-fall –run Chinook Salmon	Striped bass	American shad	Hardhead	Splittail	White sturgeon
Reservoirs												
Shasta Reservoir										S,R		R
Keswick Reservoir										S,R		
Lake Oroville										R,M		R
French Meadows Reservoir[2]												
Hell Hole Reservoir[2]												
Folsom Reservoir										R,M		
Lake Natoma[2]												
New Bullards Bar Reservoir										R,M		
Camp Far West Reservoir										R,M		
Lake McClure										R,M		
Rivers and Creeks												
Sacramento River Watershed												
Sacramento River from Keswick to Red Bluff	S,R,M	S,R,M	S,R,M	S,R,M			S,R,M	R	S,M	S,R		

Water Body	Listed Species						Other Evaluation Species					
	Winter-run Chinook Salmon	**Spring-run Chinook Salmon**	**Central Valley Steelhead**	**Green Sturgeon**	**Delta Smelt**	**Longfin Smelt[1]**	**Fall/late-fall –run Chinook Salmon**	**Striped bass**	**American shad**	**Hardhead**	**Splittail**	**White sturgeon**
Sacramento River from Red Bluff to the Delta	M	M	M	S,R,M	S,R,M	S,R,M	S,R,M	S,R,M	S,R,M	S,R	S,R	S,R,M
Deer Creek (Tehama County)		S,R,M	S,R,M				S,R,M			S,R		
Antelope Creek		S,R,M	S,R,M							S,R	S,R	
Paynes Creek										S,R	S,R	
Elder Creek[3]												
Mill Creek (Tehama County)		S,R,M	S,R,M				S,R,M			S,R	S,R	
Thomes Creek			S,R,M				R			S,R	S,R	
Mill Creek (tributary to Thomes Creek)										S,R		
Stony Creek		S,R,M	S,R,M				S,R,M			S,R		
Butte Creek		S,R,M	S,R,M				S,R,M			S,R		
Cache Creek							S,R,M			S,R		
Eastside/Cross Canal			R,M				R,M					
Auburn Ravine			S,R,M				S,R,M			S,R		
Coon Creek			S,R,M				S,R,M					
Colusa Basin Drain		R,M	R,M				R,M				S,R,M	
Freshwater Creek			S,R,M									
Putah Creek							S,R,M					
Big Chico Creek		*S,R,M*	*S,R,M*				*S,R,M*	*S,R,M*		*S,R*	*S,R*	
Little Chico Creek		S,R,M	S,R,M				R			S,R		
Salt Creek			S,R,M							S,R		
Feather River d/s of Lake Oroville		S,R,M	S,R,M	S,R,M			S,R,M	S,R,M	S,R,M	S,R		S,R,M
Yuba River		S,R,M	S,R,M				S,R,M	S,R,M	S,R,M	S,R		S,R,M
Bear River				S,R,M			S,R,M			S,R		S,R,M
American River d/s of Nimbus Dam	R	R	S,R,M	R			S,R,M	S,R,M	S,R,M		R,M	S,R,M
San Joaquin River Watershed												
Merced River			S,R,M				S,R,M	S,R,M		S,R		

Water Body	Listed Species						Other Evaluation Species					
	Winter-run Chinook Salmon	Spring-run Chinook Salmon	Central Valley Steelhead	Green Sturgeon	Delta Smelt	Longfin Smelt[1]	Fall/late-fall –run Chinook Salmon	Striped bass	American shad	Hardhead	Splittail	White sturgeon
San Joaquin River d/s of Merced River		M	S,R,M		S,R,M	S,R,M	R,M	S,R,M	S,R,M		S,R	S,R,M
Delta and Bays												
Delta	R,M	R,M	R,M	R,M	S,R,M	S,R,M	R,M	R,M	R,M		S,R	R,M
Suisun Bay	R,M	R,M	R,M	R,M	R	R,M	R,M	R,M	R,M		S,R	R,M
Suisun Marsh	R,M	R,M	R,M	R,M	S,R ,M	S,R,M	R,M	R,M	R,M		S,R	R,M

S = Spawning habitat; R = Rearing habitat; M = Migration corridor
[1] Longfin smelt is a federal candidate species and a state threatened species.
[2] There is no evidence that special-status fish species are found in this waterway.
[3] There is no information on the presence of special-status fish species in this stream, but critical habitat has been designated for Central Valley steelhead. Therefore, the stream was included for further analysis.

Page 3.7-12

The following sentence in the fourth paragraph on page 3.7-12 of the 2014 Draft EIS/EIR is revised as follows:

> Due in part to elevated water temperatures in these downstream areas during this period, ~~emigration~~ *spawning and egg incubation* would be complete before water transfers commence in July.

Page 3.7-15

The following text on page 3.7-15 of the 2014 Draft EIS/EIR is revised as follows:

> Summer rearing of CV steelhead would overlap with water transfers occurring in the Seller Service Area (~~July~~*April*-September), both in the Sacramento and San Joaquin River and their tributaries (see specific tributaries listed above). Thus water transfers have the potential to affect steelhead. The majority of rearing, however, would occur in the cooler sections of rivers and creeks ~~above the influence for the water transfers.~~*(McEwan 2001).*

Page 3.7-17

The last sentence on page 3.7-17 of the 2014 Draft EIS/EIR is revised as follows:

> Development of the impact analysis involved literature review, review of known occurrences of special-status species based on the California Natural Diversity Database (CNDDB), USFWS regional species lists, information from NOAA Fisheries website, *stream flow and biological monitoring data from previous years,* and results of hydrologic modeling, as detailed below.

Page 3.7-25

The last sentence on page 3.7-25 of the 2014 Draft EIS/EIR is revised as follows:

> The evaluation concluded that impacts in the following waterways are less than significant: Deer Creek (in Tehama County), Antelope Creek, Paynes Creek, Elder Creek, Mill Creek (in Tehama County), Thomes Creek, Mill Creek (Thomes Creek tributary), Butte Creek, Auburn Ravine, Freshwater Creek, Colusa Basin Drain, Putah Creek, and ~~Wilson~~*Big Chico* Creek (Table 3.7 3).

Page 3.7-26

Table 3.7-3 on page 3.7-26 of the 2014 Draft EIS/EIR is revised as follows:

> **Table 3.7-3. Screening Evaluation Results for Smaller Streams in the Sacramento River Watershed for Detailed Fisheries Impact Analysis for the Proposed Action.**

Waterway	>1 cfs reduction?	>10% reduction?	*Data Source*
Deer Creek (Tehama County)	N	-	*N/A*
Antelope Creek	N	-	*N/A*
Paynes Creek	N	-	*N/A*
Elder Creek	N	-	*N/A*
Mill Creek (Tehama County)	N	-	*N/A*
Thomes Creek	N	-	*N/A*
Mill Creek (tributary to Thomes Creek)	N	-	*N/A*
Stony Creek	Y	Y	*USGS Gage 11388000; Water Years 1976-2003*
Butte Creek	Y	N	*USGS Gage # 11390000; Water Years 1976-2003*
Cache Creek	Y	Y	*USGS Gage # 11452500; Water Years 1975-2013*
Eastside/Cross Canal	Y	U	*N/A*
Auburn Ravine	N	-	*N/A*
Coon Creek	Y	Y	*Bergfeld personal communication 2014*
Colusa Basin Drain	Y	N	*DWR Gage # WDL A02976; Water Years 1976-2003*
Freshwater Creek	N	-	*N/A*
Putah Creek	Y	N	*USGS Gage # 11454000; Water Years 1976-2003*
Big Chico Creek	*N*	-	*N/A*
Little Chico Creek	Y	Y	*DWR Gage # WDL A04280; Water Years 1976-1996*
Salt Creek	Y	U	*N/A*

Y = Yes; N = No; U = Unknown; *N/A = Not applicable*
Note: Darkened rows indicate that a detailed analysis was not conducted because both criteria were not met.

The last paragraph on page 3.7-26 of the 2014 Draft EIS/EIR is revised as follows:

Historical flow data was limited or not available for Eastside/Cross Canal, and Salt Creek. These streams have the potential for impacts on special-status fish species due to flow reductions under the Proposed Action although no data were available to determine the proportional reduction of base flows. Generally, these waterways are not immediately adjacent to groundwater substitution transfers, and other nearby small waterways are not experiencing flow decreases that are causing significant impacts to aquatic resources. ~~In addition, flow reductions as the result of groundwater declines would be observed at monitoring wells in the region and adverse effects on riparian vegetation would be mitigated by implementation of Mitigation Measure GW-1 (See Section 3.3, Groundwater Resources), because it requires monitoring of wells and~~

> ~~implementing a mitigation plan if the seller's monitoring efforts indicate that the operation of the wells for groundwater substitution pumping are causing substantial adverse impacts. The mitigation plan would include curtailment of pumping until natural recharge corrects the environmental impact.~~ Therefore, the impacts to fisheries resources would be less than significant in these streams.

Page 3.7-27

The first sentence on page 3.7-27 of the 2014 Draft EIS/EIR is revised as follows:

> Long-term water transfer actions under the Proposed Action would have a less than significant impact on fisheries resources in the following rivers and creeks within the Sacramento River Watershed: Sacramento River, Feather River, Yuba River, American River, ~~Butte Creek, Putah Creek, Colusa Basin Drain,~~ Deer Creek (in Tehama County), Antelope Creek, Paynes Creek, Elder Creek, Mill Creek (in Tehama County), Thomes Creek, Mill Creek (Thomes Creek tributary), Butte Creek, Auburn Ravine, Freshwater Creek, Colusa Basin Drain, Putah Creek, *Big Chico Creek*, Eastside/Cross Canal, and Salt Creek.

The first sentence in the second paragraph on page 3.7-27 of the 2014 Draft EIS/EIR is revised as follows:

> Long-term water transfer actions under the Proposed Action would have a less than significant impact on special-status fish species in the following waterways within the Sacramento River Watershed: Sacramento River, Feather River, Yuba River, American River, ~~Butte Creek, Putah Creek, Colusa Basin Drain,~~ Deer Creek (in Tehama County), Antelope Creek, Paynes Creek, Elder Creek, Mill Creek (in Tehama County), Thomes Creek, Mill Creek (Thomes Creek tributary), Butte Creek, Auburn Ravine, Freshwater Creek, Colusa Basin Drain, Putah Creek, *Big Chico Creek,* Eastside/Cross Canal, and Salt Creek.

Page 3.7-28

The following paragraph in the section entitled *Stony Creek* on page 3.7-28 of the 2014 Draft EIS/EIR is revised as follows:

> Groundwater substitution under the Proposed Action could cause Stony Creek flows to be lower than under the No Action/No Project Alternative. Modeling results indicate that there would be one water year in one month (critical water years during October) in which flows would be reduced by 10.0 percent (3.3 cfs) under the Proposed Action. Spring-run and fall-/late fall-run Chinook salmon, steelhead, and hardhead reside in Stony Creek. Because spring-run and fall-/late fall-run Chinook salmon are not present in the creek during October, there would be no effects to these races. ~~*Juvenile*~~*Stony Creek is used opportunistically by* steelhead ~~and hardhead~~*for spawning; spawning is possible only in years in which attraction flows are present, which are the wettest water years (H.T. Harvey & Associates et al. 2007). Because the 10.0 percent reduction occurs only in critical water years, steelhead would not likely be in Stony Creek.*

> *Hardhead* could be present in the river and experience this reduction in flows. ~~However, because this reduction occurs in only one month and~~ *It is unknown exactly what the biological effect of a flow reduction of 10 percent on hardhead could be, but mortality of all or a substantial proportion of fish during this* one water year type ~~in one month, it is not expected to~~ *and month is very unlikely. Two potential impact mechanisms involve habitat availability and water temperatures.*
>
> *There* have ~~a substantial effect on the two species present in the creek.~~*been no studies to develop habitat-flow relationships for hardhead in Stony Creek. We assumed in this analysis that a reduction in flow would degrade conditions for these fish, although it is common to find that increased flow actually reduces usable salmonid habitat in Central Valley rivers along at least part of the flow range (e.g., USFWS 1997, Payne and Allen 2004, 2005, Gard 2009).* Therefore, ~~it is concluded that~~ *there is uncertainty in whether the 10.0 percent reduction would have adverse* effects to ~~steelhead and hardhead~~ *habitat availability, as it is even possible that effects could be beneficial. In addition, hardhead are typically in the lower half of the water column and prefer slow moving pools (Moyle 2002). A reduction in flows would maintain the lower half of the water column and the number of slow moving pools in the river during February is not expected to decrease. Further, the frequency of the reduction would be low. Critical years would occur approximately once every five years within the period of analysis (1970-2003).*
>
> *Although water temperature is a concern in Stony Creek, this concern appears to be primarily for salmonids, which are more intolerant of higher water temperatures than hardhead. Reclamation (1998), as cited in H.T Harvey and Associates et al. (2007), reported that mean water temperatures in Stony Creek below Black Butte Dam between 1975 and 1994 were 46 to 71 F. These temperatures are 7.8 F lower than the upper range of hardhead tolerance of 26 C (78.8 F) (Thompson et al. 2012). It is not likely that temperatures will rise 7.8 F due to a 10 percent reduction in flow during October of critical water years to a level that would be a concern to hardhead.*
>
> *This impact* would be less than significant *for all fish species.*

Page 3.7-29

The following paragraph in the section, entitled *Little Chico Creek,* on page 3.7-29 of the 2014 Draft EIS/EIR is revised as follows:

> Groundwater substitution under the Proposed Action could cause Little Chico Creek flows to be lower than under the No Action/No Project Alternative. As modeled, flows in Little Chico Creek would be reduced by more than ten percent in multiple water year types during July through October (up to 100 percent of instream flows). It is not uncommon for Little Chico Creek flows to be very low during these months. A review of existing stream gage data from *Water Years* 1976 to ~~1995~~*1996* reveals that flows would be less than 0.5 cfs during at least one month in 20 of 21 years and would be 0 cfs in 14 of 21 years. *With the Proposed Action, there would be the same number of years with no flow or flows less than 0.5 cfs in at least month. In fact, flows would be less than 0.5 cfs under both the No Action/No Project Alternative and Proposed Action in the exact same*

> *months of the evaluated period except one (less than 0.5 cfs under the Proposed Action in August 1993) and there would be no flow in the exact same 27 months between the No Action/No Project Alternative and Proposed Action. Therefore, the Proposed Action would not increase the frequency of these low flow events relative to the No Action/No Project Alternative.* Low flows during these months would cause increases in water temperatures and reduced dissolved oxygen levels to levels intolerable for over-summering adult spring-run Chinook salmon. Therefore, spring-run Chinook salmon would not be present in the creek during ~~this time of year.~~*these months*. In addition, any juvenile steelhead and hardhead in the river would experience reductions in flows under the Proposed Action that would cause flows to be within the range of flows during the July through October period (generally less than 0.5 cfs). The flow reduction of greater than ten percent*, although large on a relative scale,* would not have a substantial effect on fisheries resources in Little Chico Creek.

The first paragraph in the section, entitled *Bear River,* on page 3.7-29 of the 2014 Draft EIS/EIR is revised as follows:

> The Proposed Action could cause Bear River flows to be lower than under the No Action/No Project Alternative. Under the Proposed Action, the only flow reduction greater than ten percent would occur in critical water years during February (approximately 18 percent, or 45 cfs lower). Fish species of management concern that could be present in the Bear River during February would include *fall-run Chinook salmon*, green and white sturgeon, and hardhead.

An 18 percent reduction in flows in critical water years during February would not affect fall-run Chinook salmon. This reduction is limited to critical water years in one month of the year and is, therefore, infrequent (approximately 20 percent of years). More importantly, the timing of the reduction would be during a period that would least likely affect fall-run Chinook salmon. Water temperatures during February are typically well below critical temperature thresholds such that a reduction in flows would not likely increase water temperatures to a level that is stressful to fall-run Chinook salmon. ***Page 3.7-30***

The following sentence on page 3.7-30 of the 2014 Draft EIS/EIR is revised as follows:

> ~~Based on the lack of evidence of effects on hardhead, t~~*T*his impact would be less than significant for all fish species.

The following sentence in the first complete paragraph on page 3.7-30 *of the 2014 Draft EIS/EIR* is revised as follows:

> ~~Third~~*Third, due to a lack of flow-habitat relationships for hardhead in the Bear River and because it is common for flow reductions to increase habitat availability for at least part of the flow range (e.g., USFWS 1997, Payne and Allen 2004, 2005, Gard 2009), there is uncertainty in whether a flow reduction would have adverse effects to habitat availability, as it is even possible that effects could be beneficial. Fourth,* the timing of the reduction would be during a period that would least likely affect hardhead.

Page 3.7-37

The first sentence of the second paragraph on page 3.7-37 of the 2014 Draft EIS/EIR is revised as follows:

> ~~Environmental Commitments would require that facilities affected by long-term water transfer actions continue to provide the existing protections for fish dependent on the mainstem~~ *Each of the special-status fish species use mainstem* rivers, including the Sacramento, Feather, American, Yuba, Bear, Merced, and San Joaquin rivers. ~~Each of the special-status fish species use mainstem habitats~~, *as habitat* for some portion of their life history, with the exception of delta and longfin smelt, which use only those portions of the mainstream rivers in the Delta.

Page 3.7-39

The following sentence in the second complete paragraph on page 3.7-39 of the 2014 Draft EIS/EIR is revised as follows:

> Long-term water transfer actions under the No Cropland Modifications Alternative would have a less than significant impact on fisheries resources in the following rivers and creeks within the Sacramento River Watershed: Sacramento River, Feather River, Yuba River, American River, ~~Butte Creek, Putah Creek, Colusa Basin Drain,~~ Deer Creek (in Tehama County), Antelope Creek, Paynes Creek, Elder Creek, Mill Creek (in Tehama County), Thomes Creek, Mill Creek (Thomes Creek tributary), Butte Creek, Cache Creek, Auburn Ravine, Freshwater Creek, Colusa Basin Drain, Putah Creek, Stony Creek, Eastside/Cross Canal, Coon Creek, *Big Chico Creek*, Little Chico Creek, Salt Creek, and Willow Creek including the south fork.

The following sentence in the third complete paragraph on page 3.7-39 of the 2014 Draft EIS/EIR is revised as follows:

> Long-term water transfer actions under the No Cropland Modifications Alternative would have a less than significant impact on special-status fish species in the following waterways within the Sacramento River Watershed: Sacramento River, Feather River, Yuba River, American River, ~~Butte Creek, Putah Creek, Colusa Basin Drain,~~ Deer Creek (in Tehama County), Antelope Creek, Paynes Creek, Elder Creek, Mill Creek (in Tehama County), Thomes Creek, Mill Creek (Thomes Creek tributary), Butte Creek, Cache Creek, Auburn Ravine, Freshwater Creek, Colusa Basin Drain, Putah Creek, Stony Creek, Eastside/Cross Canal, Coon Creek, Little Chico Creek, *Big Chico Creek,* Salt Creek, and Willow Creek including the south fork.

Page 3.7-40

The first incomplete paragraph on page 3.7-40 of the 2014 Draft EIS/EIR is revised as follows:

> *The No Cropland Modifications Alternative could cause Bear River flows to be lower than under the No Action/No Project Alternative.* Under the No Cropland Modifications Alternative, the only flow reduction greater than ten percent would occur in critical water years during February (approximately 18 percent, or 45 cfs lower). These flow reductions would occur only in one month during critical water years. Fish species of

management concern that could be present in the Bear River during February would include *fall-run Chinook salmon*, green and white sturgeon, and hardhead.

An 18 percent reduction in flows in critical water years during February would not affect fall-run Chinook salmon. This reduction is limited to critical water years in one month of the year and is, therefore, infrequent (approximately 20 percent of years). More importantly, the timing of the reduction would be during a period that would least likely affect fall-run Chinook salmon. Water temperatures during February are typically well below critical temperature thresholds such that a reduction in flows would not likely increase water temperatures to a level that is stressful to fall-run Chinook salmon.

Page 3.7-45

The first sentence of the second paragraph on page 3.7-45 of the 2014 Draft EIS/EIR is revised as follows:

~~Environmental Commitments would require that facilities affected by long-term water transfer actions continue to provide the existing protections for fish dependent on the mainstem~~ *Each of the special-status fish species use mainstem* rivers, including the Sacramento, Feather, American, Yuba, Bear, Merced and San Joaquin rivers~~. Each of the special-status fish species use mainstem habitats~~*, as habitat* for some portion of their life history, with the exception of delta and longfin smelt, which use only those portions of the mainstream rivers in the Delta.

Page 3.7-52

The first sentence of the third paragraph in Section 3.7.2.6.2, entitled *Special-Status Species Habitat*, on page 3.7-52 of the 2014 Draft EIS/EIR is revised as follows:

~~Environmental Commitments would require that facilities affected by long-term water transfer actions continue to provide the existing protections for fish dependent on the mainstem~~ *Each of the special-status fish species use mainstem* rivers, including the Sacramento, Feather, American, Yuba, Bear, Merced and San Joaquin rivers. ~~Each of the special-status fish species use mainstem habitats~~*, as habitat* for some portion of their life history, with the exception of delta and longfin smelt, which use only those portions of the mainstream rivers in the Delta.

Page 3.7-53

The following sentence in Section 3.7.3, entitled *Comparative Analysis of Alternatives*, on page 3.7-53 of the 2014 Draft EIS/EIR is revised as follows:

The following text supplements the table by describing the magnitude of the effects under the action alternatives ~~and~~*relative to the* No Action/No Project Alternative.

Page 3.7-53

Table 3.7-4, entitled *Comparative Analysis of Alternatives,* on page 3.7-53 of the 2014 Draft EIS/EIR is revised as follows:

Table 3.7-4. Comparative Analysis of Alternatives

Potential Impact	Alternatives	Significance[1]		Proposed Mitigation	Significance After Mitigation
		~~Natural Communities~~ *Fisheries Resources*	Special-Status *Fish* Species		
Groundwater substitution could reduce stream flows supporting fisheries resources in small streams	2, 3	LTS	LTS	None	LTS
Transfer actions could alter flows in ~~large~~ rivers~~,~~ ~~altering habitat availability~~ and ~~suitability associated with these~~ ~~*rivers*~~*creeks supporting fisheries resources in the Sacramento and San Joaquin river watersheds*.	2, 3, 4	LTS	LTS	None	LTS
Transfer actions could affect reservoir storage and reservoir surface area in reservoirs supporting fisheries resources	*2, 3, 4*	*LTS*	*LTS*	*None*	*LTS*
Transfer actions could alter hydrologic conditions in the Delta, altering associated habitat availability and suitability	2, 3, 4	LTS	LTS	None	LTS
Transfer actions could affect the habitat of special-status species associated with mainstem rivers, tributaries, and the Delta.	*2, 3, 4*	*Not applicable*	*LTS*	*None*	*LTS*

Page 3.7-54

The first two sentences of the paragraph in Section 3.7.3.2, entitled *Alternative 2: Proposed Action*, on page 3.7-54 of the 2014 Draft EIS/EIR are revised as follows:

> ~~Groundwater~~*The Propose Action would include groundwater* substitution and stored reservoir release transfers ~~could affect the availability of~~ *as mechanisms for transferring* water ~~in the Seller Service Area and the availability and suitability of habitat. This could affect conditions for~~ . *The analysis of this alternative indicates that there would be less than significant impacts to both* fisheries resources and special-status ~~fish~~ species ~~relative to the No Action/No Project Alternative, but the effects with the implementation of the Environmental Commitments would be less than significant.~~ .

The following sentence of the paragraph in Section 3.7.3.3, entitled *Alternative 3: No Cropland Modifications Alternative*, on page 3.7-54 of the 2014 Draft EIS/EIR is revised as follows:

> Effects would continue to occur from groundwater substitution and stored reservoir release transfers at the same levels described for the Proposed Action. ~~The effects of~~, *although* this ~~alternative with the implementation of the Environmental Commitments~~

would ~~be~~*result in* less than significant *impacts* to both fisheries resources and special-status fish species.

The following two sentence in the paragraph in Section 3.7.3.4, entitled *Alternative 4: No Groundwater Substitution Alternative,* on page 3.7-54 of the 2014 Draft EIS/EIR is revised as follows:

> Effects would continue to occur from reservoir storage transfers at the same levels considered for the Proposed Action~~. The effects of~~, *although* this ~~alternative with the implementation of the Environmental Commitments~~ would ~~be~~*result in* less than significant *impacts* to both fisheries resources and special status fish species.

Page 3.7-55

The first two sentences on page 3.7-55 of the 2014 Draft EIS/EIR are revised as follows:

> ~~The environmental commitments described in Section 2.3.2.4 incorporated into the project will reduce or eliminate significant~~ *Because* impacts to fisheries resources and ~~fish~~*special-status* species ~~of management concern. No additional~~ *were found to be less than significant for all alternatives, no environmental commitments or* mitigation ~~is required~~*measures are necessary.*

The second paragraph in Section 3.7.6, entitled Cumulative Impacts, on page 3.7-55 of the 2014 Draft EIS/EIR is revised as follows:

> The projects considered for the fisheries cumulative condition are the SWP water transfers, CVP Municipal and Industrial (M&I) Water Shortage Policy (WSP), Lower Yuba River Accord, SJRRP, *refuge transfers*, and Exchange Contractors 25-Year Water Transfers.

Page 3.7-56

The second and third complete paragraphs on page 3.7-56 of the 2014 Draft EIS/EIR are revised as follows:

> As modeled, Cache Creek, Stony Creek, Coon Creek, Little Chico Creek, and the Bear River may experience a greater than ten percent change in mean monthly flows in at least one water year type and month of the year. Fish species of management concern and special status fish species would not likely be present in these streams when flows would be reduced. In addition, historical flow data was limited or not available for Eastside/Cross Canal, and Salt Creek. Generally, these waterways are not immediately adjacent to groundwater substitution transfers, and other nearby small waterways are not experiencing flow decreases that are causing significant impacts to aquatic resources. ~~In addition, flow reductions as the result of groundwater declines would be observed at monitoring wells in the region and adverse effects on riparian vegetation would be mitigated by implementation of Mitigation Measure GW-1 (See Section 3.3, Groundwater Resources), because it requires monitoring of wells and implementing a mitigation plan if the seller's monitoring efforts indicate that the operation of the wells for groundwater substitution pumping are causing substantial adverse impacts. The~~

~~mitigation plan would include curtailment of pumping until natural recharge corrects the environmental impact. Therefore, the impacts to fisheries resources would be less than significant in these streams.~~*Therefore, the impacts to fisheries resources would be less than significant in these streams.*

~~With implementation of Mitigation Measure GW-1, the~~*The* Proposed Action in combination with other cumulative actions would not result in a cumulative significant impact related to groundwater quality.

Page 3.7-57

The following text is added after the first incomplete sentence on page 3.7-57 of the 2014 Draft EIS/EIR:

Refuge transfers, similarly, could have a beneficial effect on flows if transfers from Merced ID are conveyed to refuges by flowing down the San Joaquin River to the Delta.

The first sentence in Section 3.7.6.1.2, entitled Special-Status Species Habitat, on page 3.7-57 of the 2014 Draft EIS/EIR is revised as follows:

All water operations related to SWP transfers, WSP, Yuba Accord, the SJRRP, *refuge transfers,* and the Exchange Contractors 25-Year Water Transfers would be carried out such that all facilities would be operated consistent with their existing or future regulatory requirements.

Section 3.7.4, Fisheries - Cumulative Effects

Section 3.7.4 Cumulative Effects of the 2014 Draft EIS/EIR was replaced in entirety with Section 3.7.4 of the RDEIR/SDEIS. There are no errata from Section 3.7.4 of the RDEIR/SDEIS.

Section 3.8, Vegetation and Wildlife

Section 3.8 of the 2014 Draft EIS/EIR was replaced in entirety with Section 3.8 of the RDEIR/SDEIS.

Page 3.8-4

The first paragraph on page 3.8-4 of the RDEIR/SDEIS is revised as follows:

Development of the Proposed Action impact analysis involved literature review, review of known occurrences of special-status species based on CNDDB, California Native Plant Society Inventory records, USFWS regional species list, California Wildlife Habitat Relationships, review of information obtained from Reclamation and species experts, and results of hydrologic modeling, as detailed below and in ~~Appendix H of the RDEIR/SDEIS~~ *Appendix O*.

Page 3.8-5

The first paragraph on page 3.8-5 of the RDEIR/SDEIS is revised as follows:

A detailed discussion of the methods for assessing impacts on natural communities and special-status plants and wildlife is contained in ~~Appendix H of the RDEIR/SDEIS~~

> *Appendix P*. ~~Appendix H of the RDEIR/SDEIS~~ *Appendix P* also contains a description of impact mechanisms specific to each transfer type.

Page 3.8-7

Text in the last paragraph on page 3.8-7 of the RDEIR/SDEIS is revised as follows:

> As discussed in the Assessment Methods (~~Appendix H of the RDEIR/SDEIS~~ *Appendix P*), if groundwater levels are more than 15 feet below ground surface, a change in groundwater levels would not likely affect overlying terrestrial resources. In a few locations in the North Delta associated with wetlands, groundwater elevations under existing conditions are less than 15 feet below ground surface and natural communities reliant on groundwater are more likely to be impacted.

Page 3.8-8

Text in the last paragraph on page 3.8-8 of the RDEIR/SDEIS is revised as follows:

> As discussed in the Assessment Methods (~~Appendix H of the RDEIR/SDEIS~~ *Appendix P*), all reservoirs would continue to function under their existing operating requirements, including reservoir drawdown to targeted storage levels, and in meeting downstream flow, temperature, and other water quality requirements.

Page 3.8-10

The first paragraph on 3.8-10 of the RDEIR/SDEIS is revised as follows:

> As discussed in the Assessment Methods (~~Appendix H of the RDEIR/SDEIS~~ *Appendix P*), the results of the SACFEM2013 groundwater model analysis estimated streamflow depletion from groundwater substitution throughout the Sacramento Valley.

Page 3.8-18

Text in the second paragraph on page 3.8-18 of the RDEIR/SDEIS is revised as follows:

> An in-depth discussion of giant garter snake use of rice lands is provided in ~~Appendix H of the RDEIR/SDEIS~~ *Appendix N*.

Section 3.9, Agricultural Land Use

Page 3.9-3

The first sentence of the first paragraph on page 3.9-3 of the 2014 Draft EIS/EIR is revised as follows:

> The Williamson Act established a definition of Prime agricultural lands based on the actual or potential agricultural productivity of the land being restricted (California Department of Conservation [DOC] ~~2010~~*2010a*; California DOC 2007a).

Pages 3.9-26 and 3.9-27, Table 3.9-16

Text in the first column, third row cell of Table 3.9-16 on pages 3.9-26 and 3.9-27 of the 2014 Draft EIS/EIR is revised as follows:

> Cropland idling water transfers could ~~permanently or substantially~~ decrease the amount of lands categorized as Prime Farmland, Farmland of Statewide Importance, or Unique Farmland under the FMMP.

Page 3.9-41

The following sentence in the second paragraph on page 3.9-41 of the 2014 Draft EIS/EIR is revised as follows:

> There are nine incorporated cities in the county: Ceres, Hughson, Modesto, Newman, Oakdale, Patterson, Riverbank, Turlock, and Waterford (Stanislaus County ~~2013~~*2012*).

The last sentence on page 3.9-41 of the 2014 Draft EIS/EIR is revised as follows:

> Additional urban development took place on non-irrigated land uses (defined as grazing areas, dryland crop farming, and formerly irrigated land that has been left idle for three or more FMMP update cycles) (California DOC ~~2011k~~*2012*).

Page 3.9-42

The following text in the first paragraph on page 3.9-42 of the 2014 Draft EIS/EIR is revised as follows:

> Residential uses make up approximately ~~4.8~~*3* percent of the existing land use in the county (San Joaquin County ~~2005~~*2014a*). There are ~~eleven~~*seven* incorporated cities in the county: ~~Delta~~, Escalon, Lathrop, ~~Linden, Lockeford,~~ Lodi, Manteca, Ripon, Stockton, ~~Thornton,~~ and Tracy (San Joaquin County ~~2011~~*2014b*).

The following text in the second paragraph on page 3.9-42 of the 2014 Draft EIS/EIR is revised as follows:

> While urban development is responsible for some of the conversions of irrigated farmland, land fallowing (for three or more update cycles), contributed to a large portion of land conversions from irrigated agricultural uses (California DOC ~~2011j~~*2010b*).

Page 3.9-44

The following text in the third paragraph on page 3.9-44 of the 2014 Draft EIS/EIR is revised as follows:

> These occurred in the Cities of Hollister and San Juan Bautista (California DOC ~~2011f~~*2011h*). The majority of conversions from irrigated farmland to non-irrigated uses were related to land fallowing for three or more FMMP update cycles (California DOC ~~2011f~~*2011h*).

Page 3.9-45

The last paragraph on page 3.9-45 of the 2014 Draft EIS/EIR is revised as follows:

> Kings County's land use policies identify priority agricultural areas for conservation and guide development away from these areas; however, the California DOC reports land use changes from irrigated farmland to urban land in the county between 2008 and 2010 (California DOC ~~2011g~~*2011i*). The majority of these changes took place within the incorporated cities in the county. Additionally, as with other counties in the area of analysis, changes from irrigated farmland to non-irrigated land uses were largely the result of land being fallow for three or more FMMP update cycles (California DOC ~~2011g~~*2011i*).

Page 3.9-47

The following text in the first paragraph of Section 3.9.6.3.2, entitled *Buyer Service Area*, of the 2014 Draft EIS/EIR is revised as follows:

> Water management activities that could result in cumulative effects with long-term water transfers include the CVP M&I WSP, *refuge transfers,* and SWP water transfers. The CVP M&I WSP could limit water supplies to agricultural users and result in increased agricultural land idling in the Buyer Service Area. These changes, however, would likely be minor because the changes in water deliveries would likely represent a small amount of the overall water supply within the Buyer Service Area. *Refuge transfers could purchase water from sellers in the San Joaquin Valley that make water available through cropland idling, but this would also represent a very small change in land use within the area.*

Page 3.9-48

The following text in the second paragraph of Section 3.9.6.4, entitled *Alternative 3: No Cropland Modifications* of the 2014 Draft EIS/EIR, is revised as follows:

> Water management activities that could result in cumulative effects with Alternative 3 include the CVP M&I WSP ~~and SWP water~~, *refuge* transfers~~.~~, *and SWP water transfers*. The CVP M&I WSP could limit water supplies to agricultural users and result in increased agricultural land idling in the Buyer Service Area. These changes, however, would likely be minor because the changes in water deliveries would likely represent a small amount of the overall water supply within the Buyer Service Area. *Refuge transfers could purchase water from sellers in the San Joaquin Valley that make water available through cropland idling, but this would also represent an insubstantial amount of the water supply within the area.*

Page 3.9-49

The following text from the last paragraph on page 3.9-49 of the 2014 Draft EIS/EIR is revised as follows:

> Water management activities that could result in cumulative effects with Alternative 4 include the CVP M&I WSP, *refuge transfers,* and SWP water transfers. The CVP M&I

WSP could limit water supplies to agricultural users and result in increased agricultural land idling in the Buyer Service Area. These changes, however, would likely be minor because the changes in water deliveries would likely represent a small amount of the overall water supply within the Buyer Service Area. *Refuge transfers could purchase water from sellers in the San Joaquin Valley that make water available through cropland idling, but this would also represent an insubstantial amount of the water supply within the area.*

Section 3.10, Regional Economics

Page 3.10-4

Table 3.10-2 on page 3.10-4 of the 2014 Draft EIS/EIR is revised as follows:

Table 3.10-2. 2001-~~2010~~*2012* Crop Acreage Summary for Potential Cropland Idling Transfers in Glenn County

Year	Alfalfa	Beans, Dry	Corn, Grain	Rice	Safflower	Sunflowers	Vine Seed	Wheat
2001	15,964	864	22,992	87,239	930	3,612	1,033	15,726
2002	19,184	2,618	21,813	92,382	2,839	4,772	1,058	14,006
2003	19,280	608	15,653	87,793	287	4,427	1,948	16,000
2004	15,247	374	12,529	86,017	146	4,555	2,916	8,184
2005	10,506	2,267	12,620	88,876	205	6,915	n/a[1]	5,019
2006	16,345	2,153	8,413	82,436	306	4,120	1,448	6,389
2007	16,008	3,033	15,101	82,668	221	3,456	1,251	10,019
2008	16,068	1,713	10,807	77,770	1,030	2,790	641	14,902
2009	17,736	2,394	13,617	89,483	n/a	4,275	3,742	13,125
2010	15,100	1,550	15,750	88,209	n/a	4,380	3,610	10,500
2011	*11,000*	*1,104*	*16,200*	*84,900*	*n/a*	*6,240*	*2,580*	*13,500*
2012	*12,800*	*1,790*	*n/a*	*84,800*	*n/a*	*5,320*	*4,510*	*10,800*
Average (2001-~~10~~*12*)	~~16,144~~ *15,437*	1,~~757~~*706*	~~14,930~~*15,045*	86,~~287~~*048*	746	4,~~330~~*572*	~~1,961~~ *2,249*	11,~~387~~*514*
Average (~~2006~~*2008*-12)	~~16,251~~ *14,541*	~~2,169~~*1,710*	~~12,738~~*14,094*	~~84,113~~*85,032*	~~519~~*1,030*	~~3,804~~*4,601*	~~2,138~~ *3,017*	~~10,987~~*12,565*

Source: National Agricultural Statistics Service (NASS) 2001-~~2011~~*2013*
n/a – no acreage present or data is not reported individually for Glenn County. Averages do not include these years

Page 3.10-6

Table 3.10-4 on page 3.10-6 of the 2014 Draft EIS/EIR is revised as follows:

Table 3.10-4. 2001-~~2010~~*2012* Crop Acreage Summary for Potential Cropland Idling Transfers in Colusa County

Year	Alfalfa	Beans, Dry	Corn, Grain	Rice	Safflower	Sunflowers	Tomatoes, Processing	Vine Seed	Wheat
2001	6,650	8,250	1,690	111,250	10,750	475	20,250	8,010	22,600
2002	6,700	7,520	1,700	134,300	12,400	390	18,900	6,977	21,400
2003	6,750	7,050	1,240	127,350	9,350	790	16,900	10,525	21,500
2004	6,550	4,370	1,410	150,130	4,950	810	20,500	14,255	24,200

Year	Alfalfa	Beans, Dry	Corn, Grain	Rice	Safflower	Sunflowers	Tomatoes, Processing	Vine Seed	Wheat
2005	7,150	6,050	720	136,400	4,200	1,760	23,650	11,715	13,500
2006	8,000	6,400	410	142,600	3,840	2,180	18,400	9,837	14,700
2007	10,050	6,100	6,420	148,550	7,650	1,790	16,500	7,570	22,900
2008	11,800	4,390	2,750	150,200	7,750	1,780	13,940	9,090	27,400
2009	12,300	4,620	650	152,400	3,630	3,850	18,440	8,000	20,450
2010	12,700	4,040	4,310	154,000	2,050	2,220	11,800	14,200	18,600
2011	*10,900*	*4,260*	*4,560*	*149,000*	*1,060*	*5,570*	*12,700*	*16,600*	*16,600*
2012	*11,800*	*5,290*	*5,660*	*150,000*	*1,610*	*6,560*	*13,500*	*11,700*	*16,100*
Average (2001-~~10~~*12*)	~~8,865~~*9,279*	5,~~879~~*695*	2,~~130~~*627*	~~140,718~~ *142,182*	~~6,657~~*5,770*	~~1,605~~*2,348*	17,~~928~~*123*	10,~~018~~*707*	~~20,725~~*19,996*
Average (2008-12)	~~10,970~~ *11,900*	~~5,110~~*4,520*	~~2,908~~ *3,586*	~~149,550~~ *151,120*	~~4,984~~*3,220*	~~2,364~~*3,996*	~~15,816~~*14,076*	~~9,739~~*11,918*	~~20,810~~*19,830*

Source: NASS 2001-~~2011~~*2013*

Page 3.10-7

Table 3.10-6 on page 3.10-7 of the 2014 Draft EIS/EIR is revised as follows:

Table 3.10-6. 2001-~~2010~~*2012* Crop Acreage Summary for Potential Cropland Idling Transfers in Butte County

Year	Alfalfa	Beans, Dry	Rice	Safflower	Wheat
2001	3,000	500	86,000	900	3,500
2002	3,171	500	94,700	891	4,000
2003	2,900	500	92,500	700	4,440
2004	2,400	600	105,000	267	2,147
2005	1,885	756	96,400	210	1,600
2006	1,944	600	105,673	150	2,700
2007	1,602	610	101,634	380	3,200
2008	1,716	930	105,301	222	4,271
2009	1,508	1,672	103,416	120	3,704
2010	1,080	950	93,800	375	3,960
2011	*987*	*619*	*95,000*	*348*	*5,750*
2012	*1,080*	*794*	*94,500*	*288*	*8,970*
Average (2001-~~10~~*12*)	~~2,121~~*1,939*	~~762~~*753*	~~98,442~~*97,827*	~~422~~*404*	~~3,352~~*4,020*
Average (~~2006~~*2008-12*)	1,~~570~~*274*	~~952~~*993*	~~101,965~~*98,403*	~~249~~*271*	~~3,567~~*5,331*

Source: NASS 2001-~~2011~~*2013*

Pages 3.10-8 and 3.10-11

Table 3.10-8 on pages 3.10-8 and 3.10-11 of the 2014 Draft EIS/EIR is revised as follows:

Table 3.10-8. 2001-~~2010~~*2012* Crop Acreage Summary for Potential Cropland Idling Transfers in Sutter County

Year	Alfalfa	Beans, Dry	Corn, Grain	Rice	Safflower	Sunflowers	Tomatoes, Processing	Vine Seed	Wheat	Wild Rice
2001	6,740	4,482	5,931	81,857	15,596	2,008	9,500	1,684	11,594	4,185
2002	7,054	6,605	4,780	96,224	13,556	2,103	9,100	1,725	10,331	3,245
2003	7,247	5,429	2,928	93,654	14,991	3,685	8,000	2,910	14,246	2,261
2004	6,935	4,268	6,491	121,131	4,960	3,310	6,300	2,905	12,950	1,720
2005	7,004	4,084	3,210	97,801	10,641	4,069	5,200	1,704	11,580	1,707
2006	8,960	4,869	1,644	92,984	6,984	4,383	6,900	2,000	2,415	2,670
2007	7,772	2,320	7,800	108,241	5,213	4,435	7,900	745	20,721	2,871
2008	8,444	3,067	7,720	92,344	6,517	7,103	8,000	2,124	15,669	4,455
2009	7,250	2,183	3,477	109,766	1,965	9,041	9,000	2,266	14,045	1,371
2010	5,760	1,960	4,320	115,000	1,940	7,740	7,330	3,630	12,500	550
2011	*5,960*	*4,770*	*7,700*	*112,000*	*1,940*	*6,520*	*7,740*	*3,760*	*12,900*	*871*
2012	*6,570*		*9,810*	*116,000*	*1,940*	*9,680*	*7,830*	*2,580*	*11,500*	*1,100*
Average (2001-~~10~~*12*)	7,~~317~~*141*	~~3,927~~*4,003*	~~4,830~~*5,484*	~~100,900~~ *103,084*	~~8,236~~*7,187*	~~4,788~~*5,340*	7,~~723~~*733*	2,~~169~~*336*	12,~~605~~*538*	2,~~504~~*251*
Average (~~2006-10~~*2008-12*)	~~7,637~~*6,797*	2,~~880~~995	~~4,992~~*6,605*	~~103,667~~ *109,022*	~~4,524~~*2,860*	~~6,540~~*8,017*	7,~~826~~*980*	2,~~153~~*872*	13,~~070~~*323*	2,383

Source: NASS ~~2001~~-*2013*

Page 3.10-10

Table 3.10-10 on page 3.10-10 of the 2014 Draft EIS/EIR is revised as follows:

Table 3.10-10. 2001-~~2010~~*2012* Crop Acreage Summary for Potential Cropland Idling Transfers in Yolo County

Year	Alfalfa [1]	Corn, Grain	Rice	Safflower	Sunflowers	Tomatoes, Processing	Vine Seed	Wheat
2001	45,885	18,308	28,717	27,650	4,540	40,374	1,100	43,774
2002	53,231	9,195	32,446	20,765	3,372	42,812	1,179	33,076
2003	55,914	6,495	37,303	20,674	9,294	38,274	1,703	56,227
2004	52,904	9,523	45,655	9,991	13,403	45,129	3,591	44,098
2005	45,776	4,238	34,670	12,955	13,615	42,232	2,942	34,647
2006	59,269	2,452	29,997	10,176	35,500	37,026	2,756	20,976
2007	53,959	11,596	32,660	9,030	28,136	42,149	684	35,613
2008	56,710	8,118	30,057	13,514	13,808	37,571	1,663	42,398
2009	49,450	6,502	36,593	8,563	15,574	37,881	2,698	28,062
2010	42,900	16,300	41,400	9,530	12,700	33,000	1,030	33,900
2011	*41,000*	*20,200*	*42,500*	*8,780*	*19,000*	*40,100*	*2,630*	*42,900*
2012	*42,600*	*23,500*	*40,500*	*9,790*	*21,900*	*36,800*	*3,170*	*35,800*
Average (2001-~~10~~*12*)	~~51,600~~ *49,967*	~~9,273~~*11,369*	~~34,950~~*36,042*	~~14,285~~*13,452*	~~14,994~~*15,904*	39,~~645~~*446*	~~1,935~~*2,096*	37,~~277~~*623*
Average (2008-12)	46,532	14,924	38,210	10,035	16,596	37,070	2,238	36,612

Source: NASS 2001-~~2011~~*2013*

[1] Alfalfa cannot be idled within the legal boundaries of the Delta

Pages 3.10-11 and 3.10-12

Table 3.10-12 on pages 3.10-11 and 3.10-12 of the 2014 Draft EIS/EIR is revised as follows:

Table 3.10-12. 2001-~~2010~~*2012* Crop Acreage Summary for Potential Cropland Idling Transfers in Solano County

Year	Alfalfa [1]	Beans, Dry	Corn, Grain	Safflower	Sudan Grass	Sunflowers	Tomatoes, Processing	Vine Seed	Wheat
2001	31,969	2,911	13,677	6,018	3,233	1,191	13,801	519	39,350
2002	36,492	3,927	10,900	6,017	3,853	1,246	14,626	634	34,516
2003	34,602	1,859	7,406	8,246	6,242	2,474	11,952	1,221	32,956
2004	33,782	1,713	10,457	5,771	6,504	4,263	10,344	1,476	27,997
2005	34,605	2,789	6,445	6,276	7,938	6,526	10,300	1,307	25,227
2006	36,304	2,894	2,836	5,764	8,360	6,615	10,000	887	21,494
2007	29,483	n/a	8,282	4,200	6,863	6,070	9,700	832	26,575
2008	30,599	2,968	7,504	3,235	8,370	7,535	10,000	222	25,669
2009	31,438	1,642	7,104	1,680	5,024	9,439	12,000	221	25,141
2010	27,100	1,060	11,200	3,220	10,100	6,010	11,000	496	25,700
2011	*26,100*	*545*	*11,200*	*3,710*	*8,820*	*7,670*	*9,000*	*1,250*	*30,400*
2012	*28,200*	*1,590*	*10,700*	*2,920*	*9,020*	*8,640*	*10,000*	*1,020*	*20,000*
Average (2001-~~10~~*12*)	~~32,637~~ *31,723*	2,~~418~~*173*	8,~~581~~*976*	~~5,043~~*4,755*	~~6,649~~*7,027*	5,~~137~~*640*	11,~~372~~*060*	~~782~~*840*	~~28,463~~*27,919*
Average (~~2006-10~~*2008-12*)	~~30,985~~ *28,687*	~~2,141~~*1,561*	~~7,385~~*9,542*	~~3,620~~*2,953*	~~7,743~~*8,267*	7,~~134~~*859*	10,~~540~~*400*	~~532~~*642*	~~24,916~~*25,382*

Source: NASS 2001-~~2011~~*2013*
n/a – no acreage present or data is not reported individually for Solano County.
[1] Alfalfa cannot be idled within the legal boundaries of the Delta

Page 3.10-12

The following text and tables are inserted after Table 3.10-13 on page 3.10-12 of the 2014 Draft EIS/EIR:

Shasta County

In 2011, services provided the most jobs in Shasta County, followed by trade, and government. Services had the highest output in the county, followed by trade, and government. Incorporated cities are Anderson, Redding, and Shasta Lake. Table 3.10-14 summarizes the regional economy in Shasta County, in terms of employment, output, labor income, and total value added. No cropland idling transfers are proposed in Shasta County; therefore, data on agricultural economies are not presented. Shasta County is include because it overlies the Redding Groundwater Basin where economic effects from groundwater substation could occur.

Table 3.10-14. Summary of 2011 Regional Economy in Shasta County

Industry	Employment (Jobs)	Output (Million $)	Labor Income (Million $)	Total Value Added (Million $)
Agriculture	*2,465*	*$218.3*	*$76.1*	*$86.1*
Mining	*753*	*$133.9*	*$16.0*	*$58.0*
Construction	*5,306*	*$597.2*	*$272.3*	*$321.4*
Manufacturing	*2,524*	*$733.0*	*$143.8*	*$202.8*
TIPU	*3,786*	*$925.0*	*$236.4*	*$405.7*
Trade	*12,810*	*$1,129.9*	*$458.9*	*$824.8*
Service	*44,448*	*$5,074.1*	*$1,598.3*	*$3,170.5*
Government	*12,225*	*$1,033.3*	*$827.4*	*$966.4*
Total	*84,317*	*$9,844.7*	*$3,629.2*	*$6,035.7*

Source: MIG Inc. 2011
[1] Employment is measured in number of jobs.
[2] Income is the dollar value of total payroll for each industry plus income received by self-employed individuals.
[3] Output represents the dollar value of industry production.

Tehama County

In 2011, services provided the most jobs in Tehama County, followed by government, and agriculture. Services had the highest output in the county, followed by manufacturing, and agriculture. Corning, Red Bluff, and Tehama are the only incorporated cities in the county Table 3.10-15 summarizes the regional economy in Tehama County, in terms of employment, output, labor income, and total value added. No cropland idling transfers are proposed in Tehama County; therefore, data on agricultural economies are not presented. Tehama County is include because it overlies the Redding Groundwater Basin where economic effects from groundwater substation could occur.

Table 3.10-15. Summary of 2011 Regional Economy in Tehama County

Industry	Employment (Jobs)	Output (Million $)	Labor Income (Million $)	Total Value Added (Million $)
Agriculture	*3,290*	*$367.1*	*$106.0*	*$164.7*
Mining	*169*	*$55.3*	*$3.2*	*$14.5*
Construction	*1,284*	*$128.2*	*$49.6*	*$61.5*
Manufacturing	*1,430*	*$495.0*	*$86.7*	*$117.7*
TIPU	*1,569*	*$280.3*	*$80.1*	*$126.0*
Trade	*2,573*	*$239.7*	*$92.0*	*$173.4*
Service	*8,946*	*$1,056.5*	*$272.6*	*$637.0*
Government	*3,853*	*$303.2*	*$228.1*	*$273.2*
Total	*23,114*	*$2,925.3*	*$918.3*	*$1,568.0*

Source: MIG Inc. 2011
[1] Employment is measured in number of jobs.
[2] Income is the dollar value of total payroll for each industry plus income received by self-employed individuals.
[3] Output represents the dollar value of industry production.

Sacramento County

In 2011, services provided the most jobs in Sacramento County, followed by government, and trade. Services had the highest output in the county, followed by government, and manufacturing. Table 3.10-16 summarizes the regional economy in Sacramento County in 2011, in terms of employment, output, and labor income. No cropland idling transfers are proposed in Sacramento County; therefore, data on agricultural economies are not presented. Sacramento County is include because it overlies the Sacramento Valley Groundwater Basin where economic effects from groundwater substation could occur.

Table 3.10-16. Summary of 2011 Regional Economy in Sacramento County

Industry	Employment[1]	Labor Income (million $)[2]	Output (million $)[3]
Agriculture	3,468	$831.7	$248.3
Mining	325	$138.7	$12.9
Construction	35,107	$4,410.2	$2,260.8
Manufacturing	20,291	$11,641.3	$1,768.8
TIPU	14,149	$3,164.5	$1,077.0
Trade	86,564	$8,204.4	$3,615.0
Service	391,826	$55,621.6	$19,928.2
Government	188,723	$18,740.2	$15,949.1
Total	740,453	$102,752.6	$44,860.1

Source: MIG Inc. 2011
[1] Employment is measured in number of jobs.
[2] Income is the dollar value of total payroll for each industry plus income received by self-employed individuals.
[3] Output represents the dollar value of industry production.

The following sentence in the last paragraph on page 3.10-12 of the 2014 Draft EIS/EIR is revised as follows:

Table 3.10-~~14~~*17* presents employment, labor income, and output by industry for Placer County in 2011.

Page 3.10-13

The title for Table 3.10-14 on page 3.10-13 of the 2014 Draft EIS/EIR is revised as follows:

Table 3.10-~~14~~*17*. Summary of 2011 Regional Economy in Placer County

The following text on page 3.10-13 of the 2014 Draft EIS/EIR is revised as follows:

Table 3.10-~~15~~*18* presents employment, labor income, and output by industry for Merced County in 2010.

The title for Table 3.10-15 on page 3.10-13 of the 2014 Draft EIS/EIR is revised as follows:

Table 3.10-~~15~~*18*. Summary of 2010 Regional Economy in Merced County

Page 3.10-14

The first sentence of the third paragraph on page 3.10-14 of the 2014 Draft EIS/EIR is revised as follows:

Table 3.10-~~16~~*19* presents employment, labor income, and output in these three counties in 2011.

The title of Table 3.10-16 on page 3.10-14 of the 2014 Draft EIS/EIR is revised as follows:

> Table 3.10-~~16~~*19*. Summary of 2011 Regional Economy in Alameda, Contra Costa and Santa Clara Counties

Page 3.10-16

The following sentence in the last paragraph on page 3.10-16 of the 2014 Draft EIS/EIR is revised as follows:

> Contra Costa WD's residential water rates are made up of a service and demand charge, a quantity charge based on the volume of water used, an energy surcharge and a fire protection surcharge (Contra Costa WD ~~2012~~*2015*).

Page 3.10-17

The first sentence of the second paragraph in the section entitled *Agricultural Contractors* on page 3.10-17 of the 2014 Draft EIS/EIR is revised as follows:

> Table 3.10-~~17~~*20* presents employment, labor income, and output in the six counties combined in 2011.

The third paragraph in the section entitled *Agricultural Contractors* on page 3.10-17 of the 2014 Draft EIS/EIR is revised as follows:

> Table 3.10-~~18~~*21* summarizes some farm, owner, and operator characteristics in the six counties in 2007.

The title of Table 3.10-17 on page 3.10-17 of the 2014 Draft EIS/EIR is revised as follows:

> Table 3.10-~~17~~*20*. Summary of 2011 Regional Economy in Merced, Fresno, Kings, San Joaquin, Stanislaus and San Benito Counties

The title of Table 3.10-18 on page 3.10-17 of the 2014 Draft EIS/EIR is revised as follows:

> Table 3.10-~~18~~*21*. 2007 Farm and Farm Tenure Characteristics in Merced, San Benito, San Joaquin, Stanislaus, Fresno, and Kings Counties

Page 3.10-18

The last sentence on page 3.10-18 of the 2014 Draft EIS/EIR is revised as follows:

> Table 3.10-~~19~~*22* shows the top five commodities in terms of value of production in the six counties.

Page 3.10-19

The title of Table 3.10-19 of the 2014 Draft EIS/EIR is revised as follows:

> Table 3.10-~~19~~*22*. 2010 Top Five Commodities in Gross Value of Agricultural Production in Merced, San Benito, Fresno , Kings, Stanislaus and San Joaquin Counties

Section 3.10.1.3.3, entitled *Groundwater Pumping Costs,* on page 3.10-19 of the 2014 Draft EIS/EIR is revised as follows:

3.10.1.3.3 *Crop Prices*

Growers voluntarily participate in water transfers. There are likely many factors that affect a grower's decision to idle fields and sell water via cropland idling transfers, including crop prices. Table 3.10-23 presents past crop prices for most crops eligible for idling. Growers would presumably participate in idling transfers if water transfer revenues are greater than the net revenues received from growing the crop. Rice prices peaked in 2008 and have been steadily decreasing, but are still higher than prices from 2003 through 2007. Reclamation has set maximum annual acreages for cropland idling transfers; therefore, even if crop prices are beneficial for a grower to participate, the level of idling would be limited by the maximum acreages.

Table 3.10-23 Past Crop Prices for Crops Eligible for Idling

	Alfalfa	*Beans, Dry*	*Corn, Grain*	*Rice*	*Safflower*	*Sunflower*	*Tomatoes, Processing*	*Wheat*
	$/Ton	*$/Cwt.*	*$/Ton*	*$/Cwt.*	*$/Cwt.*	*$/Cwt.*	*$/Ton*	*$/Ton*
2003	*$93.00*	*$35.30*	*$103.57*	*$10.40*	*---*	*---*	*$57.20*	*$118.00*
2004	*$118.00*	*$36.90*	*$94.64*	*$7.34*	*---*	*---*	*$57.40*	*$126.67*
2005	*$136.00*	*$41.00*	*$96.43*	*$10.10*	*$11.30*	*---*	*$59.60*	*$124.67*
2006	*$116.00*	*$46.60*	*$119.64*	*$13.00*	*$13.70*	*---*	*$65.40*	*$138.00*
2007	*$165.00*	*$48.90*	*$152.86*	*$16.20*	*$19.10*	*---*	*$70.30*	*$180.33*
2008	*$204.00*	*$61.40*	*$170.36*	*$27.50*	*$23.90*	*---*	*$78.60*	*$236.00*
2009	*$107.00*	*$50.80*	*$152.86*	*$19.60*	*$16.40*	*$18.60*	*$86.10*	*$187.67*
2010	*$133.00*	*$47.00*	*$181.43*	*$21.00*	*$17.00*	*$20.90*	*$71.40*	*$173.65*
2011	*$239.00*	*$55.10*	*$228.93*	*$18.60*	*$23.50*	*$26.40*	*$74.30*	*$225.98*
2012	*$211.00*	*$54.60*	*$251.79*	*$17.10*	*$25.30*	*$26.30*	*$75.00*	*$271.64*

Source: CDFA 2013

***3.10.1.3.4* Groundwater ~~Pumping~~ Costs**

Section 3.3, Groundwater Resources, describes existing groundwater conditions in the area of analysis. *The area of analysis for the groundwater costs analysis includes the counties overlying the Sacramento Valley Groundwater Basin and the Redding Groundwater Basin.* Groundwater pumping costs are related to depth to groundwater, pump efficiencies, and power costs. Pumping costs tend to increase during drought as more water is pumped and average depth to water increases. *Groundwater costs also include costs to deepen wells or drill new wells. The costs for deepening or drilling a well can vary widely depending on many factors, such as depth, diameter, well use (potable vs. irrigation), and construction materials. There are also permitting costs.*

The heading for Section 3.10.1.3.4, entitled *Local Government Revenues*, on page 3.10-19 of the 2014 Draft EIS/EIR is revised as follows:

3.10.1.3.45 Local Government Revenues

Page 3.10-21

The last sentence of the first incomplete paragraph on page 3.10-21 of the 2014 Draft EIS/EIR is revised as follows:

> Table 3.10-~~20~~*24* shows the potential sellers and the counties they are in.

The title for Table 3.10-20 on page 3.10-21 of the 2014 Draft EIS/EIR is revised as follows:

> Table 3.10-~~20~~*24*. Sellers Potentially Participating in Cropland Idling Transfers and County Locations

The following paragraph is inserted after the second complete paragraph on page 3.10-21 of the 2014 Draft EIS/EIR:

> *IMPLAN is designed to look at backward linkages of the supply chain in the economy. Forward linkages are typically examined outside the model. Forward linkages describe the process of how a company in a given sector sells its goods, products, or supplies to a company in a different sector. For example, after rice is harvested, it must be transported and milled. IMPLAN does not account for these changes, depending on the sector where the change in final demand was measured. For this analysis, forward linkages for transportation, rice milling, and tomato processing were added to the direct effect, which was then run through IMPLAN to calculate indirect and induced effects.*

The following paragraphs are inserted after the third complete paragraph on page 3.10-21 of the 2014 Draft EIS/EIR:

> *IMPLAN calculates annual effects based on the long-run average cost structure of each industry. In the case of single year transfers, land idling may not reduce all long run costs. For example, the grower might retain most of their equipment and other fixed assets, and this would reduce the direct effect of the transfer relative to that estimated by IMPLAN. For this reason, IMPLAN tends to provide a larger direct impact per acre for temporary transfers than might be warranted. If the grower expected to transfer water every year, then the economic impacts provided by IMPLAN are more representative. However, as discussed previously and in Chapter 2, cropland idling would not likely be implemented each year and the grower would not have the option to idle fields. If the grower has the option to transfer in consecutive years, the economic effects presented in this analysis could occur each year.*
>
> *IMPLAN calculates annual effects based on a single year economy. The 2011 county data packages were used for this analysis, which were the most recent available data packages at the time the analysis was completed.*

Page 3.10-22

The following sentence in the first paragraph in the *Use of Representative Crops* section on page 3.10-22 of the 2014 Draft EIS/EIR is revised as follows:

> Table 3.10-~~21~~*25* identifies the representative crops and crop groups and provides the technical basis for developing crop groups and assigning representative crops.

Table 3.10-21 on page 3.10-22 of the 2014 Draft EIS/EIR is revised as follows:

Table 3.10-~~21~~*25*. Representative Crops, Eligible Crops, and Crop Characteristics

Representative Crop	Eligible Crops	Regional Acreage[1]	ETAW (AF/ Acre)	Direct Labor Hours/Acre [2]	Gross Revenue per acre[2]	Operating Costs per acre[2]	Production Practices[2]
	Rice	~~373,042~~ *383,384*	3.3	4.99	$1,547	$1,111	May be rotated depending on soils
Rice	Wild Rice	~~2,383~~ *1,669*	2	Data not available in recent cost and return studies	Data not available in recent cost and return studies	Data not available in recent cost and return studies	May be rotated depending on soils
	Tomatoes, Processing	~~71,707~~ *69,526*	1.9	27.42	$2,450	$2,017	Rotation crop, contracts with processors
Tomatoes, Processing[3]	Vine Crops	~~16,329~~ *20,687*	1.1	Data not available in recent cost and return studies	Data not available in recent cost and return studies	Data not available in recent cost and return studies	Rotation crop
	Corn Grain	~~37,017~~ *48,751*	1.9	11.03	$1,020	$673	Rotation crop
	Beans	~~13,251~~ *10,786*	1.5	11.88	$975	$731	Rotation crop
	Sunflower	~~40,986~~ *41,069*	1.4	4.86	$1,360	$447	Rotation crop
	Safflower	~~24,058~~ *20,099*	1	4.99	$363	$261	Rotation crop, some acreage is not irrigated
Corn[4]	Wheat	~~105,540~~ *107,712*	1	3.17	$450	$351	Rotation crop, some acreage is not irrigated
	Alfalfa	~~119,871~~ *108,457*	1.7	1.91	$1,450	$582	Rotation crop, contracts with dairies
Alfalfa[5]	Sudan Grass	~~7,743~~ *8,267*	3	1.52	$550	$756	Rotation crop

Source:
[1] NASS ~~2007-2011~~ *2009-2013*, Region includes Glenn, Colusa, Butte, Sutter, Yolo, and Solano counties. ~~2006-2010~~ *2008-2012* averages
[2] UCCE Crop Budgets. Does not include labor provided by custom operators
[3] Other crops included in this group that could be idled: Sugar Beets, Melons, Onions
[4] Other crops included in this group that could be idled: Sorghum Grain, Cotton
[5] In Sacramento Valley north of the American River. *Alfalfa cannot be idled in the Delta Region.*
Key:
ETAW = evapotranspiration of applied water

Page 3.10-23

The following text is inserted below the third paragraph on page 3.10-23 of the 2014 Draft EIS/EIR:

> *Table 3.10-26 shows the maximum acreages for idling annually for each of the crop groups by economic region. Table 3.10-25 lists the crops within each representative crop category.*

Table 3.10-26. Maximum Acreages for Cropland Idling

Region	*Rice*	*Tomatoes, Processing*	*Corn*	*Alfalfa*	*Total*
Colusa, Glenn, Yolo	*40,704*	*400*	*400*	*1,400*	*42,904*
Sutter, Butte	*10,769*	*400*	*800*	*600*	*12,569*
Solano	*-*	*-*	*1,500*	*3,000[1]*	*4,500*
Total	*51,473*	*800*	*2,700*	*5,000*	*59,973*

[1] Alfalfa cannot be idled within the legal boundaries of the Delta

The fourth paragraph on page 3.10-23 of the 2014 Draft EIS/EIR is revised as follows:

> Cropland idling transfers are the lowest priority for buyers because buyers would need to pay for the ETAW for an entire irrigation season, but they may only receive the ETAW amount from July through September if the water could not be stored April through June. Therefore, in the Proposed Action, idling transfers would be limited in quantity and do not occur every year that transfers are implemented. For the No Groundwater Substitution Alternative, cropland idling transfers continue to be the lowest priority for buyers; however, because less water is available from other transfer methods, crops may be idled more frequently to meet transfer needs. *Though, the acreages shown in Table 3.10-26 are the maximum acreages for all alternatives that include cropland idling transfers.*

Page 3.10-24

The third paragraph on page 3.10-24 of the 2014 Draft EIS/EIR is revised as follows:

> Groundwater substitution transfers could reduce groundwater levels, which would result in increased pumping costs for growers selling water and growers using nearby wells. This analysis uses results of changes in groundwater levels from the groundwater simulation described in Section 3.3, Groundwater Resources, to evaluate potential changes in pumping costs. *Section 3.3 also describes the existing groundwater levels in the Sacramento Valley Basin.* In the Sacramento Valley Groundwater Basin, production wells are typically located no closer than 0.25 mile from each other (Niblack 2012). For nearby wells, this analysis estimates changes in groundwater pumping costs in areas 0.25 miles away from regions of maximum drawdown as a result of transfers.

Page 3.10-26

The following text in the first paragraph of Section 3.10.2.3.1, entitled *Seller Service Area,* on page 3.10-26 of the 2014 Draft EIS/EIR:

> Table 3.10-~~22~~*27* summarizes the maximum acreages of each crop that would be idled under the Proposed Action.

The title for Table 3.10-22 on page 3.10-26 of the 2014 Draft EIS/EIR:

> Table 3.10-~~22~~*27*. Maximum Acreages for Cropland Idling under the Proposed Action

Page 3.10-27

The following sentence is added after the first incomplete sentence on page 3.10-27 of the 2014 Draft EIS/EIR:

> *This would increase returns to farmers and be an economic benefit.*

The first complete paragraph on page 3.10-27 of the 2014 Draft EIS/EIR is revised as follows:

> The economics of participation for a typical farmer can be shown using ~~2006-2010~~*2008-2012* agricultural prices and crop yields and farm production costs from UCCE crop budgets. Table 3.10-23 compares the net revenues gained by the water transfer to the net revenue lost from discontinued crop production based on ~~2006-2010~~*2008-2012* conditions. The analysis assumes a transfer price of $~~225~~*350* for each acre-foot for water made available by idling crop land. This water transfer price is a representative price. *It was calculated based on the weighted average of SLDMWA transfers in 2013 and 2014. Prices were $190 per acre-foot in 2013 and $500 per acre-foot in 2014.* The actual price would be negotiated among buyers and sellers and would likely vary according to hydrologic conditions, prices in agricultural markets, and other factors.

The first sentence of the second complete paragraph on page 3.10-27 of the 2014 Draft EIS/EIR is revised as follows:

> Table 3.10-~~24~~*28* suggests whether or not it would be economical for a typical farmer to participate in a crop idling transfer based on the assumed water transfer prices and representative crop production costs and returns.

Table 3.10-23 on page 3.10-27 of the 2014 Draft EIS/EIR is revised as follows:

Table 3.10-~~23~~*28*. Net Revenue From Water Transfer, Lost Revenue, Variable Costs Avoided and Lost Return Over Variable Costs ($ per Acre)

	(1)	(2)	(3)	(4)	(5)
Crop	Net Revenue from Water Transfer	Revenue from Crop Production (lost)	Variable Costs Avoided by the Transfer	Net Revenue from Crop Production (lost) (2) – (3)	Net Revenue Gained from Water Transfer (1) – (4)
Rice	~~743~~*1,155*	~~1,580~~*1,719*	1,111	~~469~~*608*	~~274~~*547*
Tomatoes, Processing	~~405~~*665*	~~2,768~~*3,513*	~~2,018~~*2,017*	~~750~~*1,496*	-~~345~~*831*
Corn	~~405~~*665*	~~867~~*1,041*	~~678~~*673*	~~189~~*368*	~~216~~*297*
Alfalfa	~~383~~*595*	~~985~~*1,237*	~~583~~*582*	~~302~~*655*	~~81~~*-60*

Source: UCCE 2012, 2008a, 2008b, 2008c, ~~NASS 2007-2011~~ *CDFA 2013*

The last paragraph on page 3.10-27 of the 2014 Draft EIS/EIR is revised as follows:

> Table 3.10-~~23~~*28* shows that tomato *and alfalfa* crops may not be economical to idle based on the assumed water transfer price and net revenues. It is important to note that each farmer's situation is unique and growers might choose to participate for reasons

other than net revenues. Also, some growers with less productive fields or higher costs would likely expect more net revenue improvement from participating in the water transfer than the representative farm. It is expected that growers would first idle marginal fields. For these fields, the economic benefits of water transfers would be better than average. *If water transfer prices remain at 2014 levels, which was $500 per acre-foot, alfalfa would become economical to idle. The farmer would receive $850 per acre for the transfer water and the price differential between the water transfer revenue and the net revenue lost from crop production would be $195 per acre. At this water transfer price, tomato crops would still not be economical to transfer at the assumed price and yield. The farmer would receive $950 per acre for the transfer water and the price differential between the water transfer revenue and the net revenue lost from crop production would be -$545 per acre.*

Page 3.10-28

The following text in first complete paragraph on page 3.10-28 of the 2014 Draft EIS/EIR is revised as follows:

> *In general, the higher the water transfer price, the more money would likely be spent in the regional economy and it would offset a larger portion of the adverse regional economic effects.* It is difficult to quantify how much of the farmer income would result in induced effects because it is unknown how much of the water transfer revenue would go to debt retirement, savings, vacations, or outside investments, which would not have any regional economic effects. *However, a higher transfer price would be a benefit to the Seller Service Area.*

The third complete paragraph on page 3.10-28 of the 2014 Draft EIS/EIR is revised as follows:

> Table 3.10-~~24~~*29* shows maximum *annual* cropland idling acreages, crop ETAW values, and water made available for transfer in Glenn, Colusa, and Yolo counties. It is not likely that all the acreage would be idled in a single year. Since the maximum crop acreage would not be idled in most years, the average annual effect would be even less. *Cropland idling transfers would also not occur each year over the 10-year long-term water transfers period. As discussed in Chapter 2, cropland idling transfers are the lowest priority transfer for buyers.*

The title of Table 3.10-24 on page 3.10-28 of the 2014 Draft EIS/EIR is revised as follows:

> Table 3.10-~~24~~*29*. Maximum *Annual* Cropland Idling Acreages in Glenn, Colusa, and Yolo Counties under the Proposed Action

The following text in the last paragraph on page 3.10-28 of the 2014 Draft EIS/EIR is revised as follows:

> Table 3.10-~~25~~*30* shows economic data for the combined three-county region.

Page 3.10-29

The title of Table 3.10-25 on page 3.10-29 of the 2014 Draft EIS/EIR is revised as follows:

> Table 3.10-~~25~~*30*. Summary of 2011 Regional Economy in Glenn, Colusa, and Yolo Counties

The first sentence of the first complete paragraph on page 3.10-29 of the 2014 Draft EIS/EIR is revised as follows:

> Table 3.10-~~26~~*31* shows the potential *annual* economic effects of idling the proposed maximum acreages of rice in Glenn, Colusa, and Yolo counties in a single year.

The following text from the last paragraph on page 3.10-29 of the 2014 Draft EIS/EIR is revised as follows:

> Table 3.10-~~26~~*31* also shows *annual* economic effects of idling the maximum acreage of other crop types, which are represented by tomatoes, corn, and alfalfa in this analysis. Idling the proposed acreages of non-rice crops would result in minimal effects *(0.0 to 0.01 percent of the baseline economy)* to the employment, labor income and output in the three-county region.

Page 3.10-30

The following text is inserted before Table 3.10-26 on page 3.10-30 of the 2014 Draft EIS/EIR:

> ~~Table 3.10-26.~~ *Cropland idling transfers could occur in consecutive years, meaning that these effects would occur each year. If the maximum cropland idling transfers occurred in consecutive year, 495 jobs would be lost in the regional economy each year the transfer occurs. Output and labor income would also reduce each year the same amounts as shown in Table 3.10-31. During consecutive year cropland idling transfers, the economic effects would become less temporary and the adverse economic effects may be felt more in the local agricultural economy than a single year cropland idling transfer. Local economic effects are described below. On a regional level, the adverse economic effects are relatively small each year and would not substantially affect regional economic activities in the three county region. Cropland idling transfers are the lowest priority for buyers and would not likely occur each year during the 10-year period, or even in all years that transfers occur. Chapter 2 describes the frequency of transfers.*

Table 3.10-26 on page 3.10-30 of the 2014 Draft EIS/EIR is revised as follows:

Table 3.10-31. **Regional Economic Effects in Glenn, Colusa, Yolo Counties from Maximum Cropland Idling Transfer under the Proposed Action (2012 dollars)**

Crop	Maximum Acreage Idled	Employment (Jobs)	% change from Total Employment	Labor Income (Million $)	% change from Total Labor Income	Output (Million $)	% change from Total Output
Rice	40,704	-~~342~~*464*	-0.~~24~~*33*%	-$~~14.27~~*18.31*	-0.~~19~~*24*%	-$~~43.26~~*86.52*	-0.~~22~~*44*%
Tomatoes, Processing	400	-~~8~~*14*	-0.01%	-$0.~~35~~*50*	-0.~~00~~*01*%	-$1.~~21~~*90*	-0.01%
Corn	400	-~~1~~*3*	-0.00%	-$0.~~05~~*11*	-0.00%	-$0.~~15~~*37*	-0.00%
Alfalfa	1,400	-~~12~~*13*	-0.01%	-$0.~~44~~*47*	-0.01%	-~~$0.84~~*1.64*	-0.~~00~~*01*%
Total	42,904	-~~362~~*495*	-0.~~25~~*35*%	-$~~15.11~~*19.38*	-0.~~20~~*26*%	-$~~45.46~~*90.43*	-0.~~23~~*46*%

The following sentence of the first paragraph on page 3.10-30 of the 2014 Draft EIS/EIR is revised as follows:

> Table 3.10-~~27~~*32* shows maximum cropland idling acreages, ETAW values, and water made available for transfers in Sutter and Butte counties.

The title for Table 3.10-27 on page 3.10-30 of the 2014 Draft EIS/EIR is revised as follows:

> Table 3.10-~~27~~*32*. Maximum Cropland Idling Acreages in Sutter and Butte Counties under the Proposed Action

The following sentence in the second paragraph on page 3.10-30 of the 2014 Draft EIS/EIR is revised as follows:

> Table 3.10-~~28~~*33* shows economic data for the combined two-county region.

The title for Table 3.10-28 on page 3.10-30 of the 2014 Draft EIS/EIR is revised as follows:

> Table 3.10-~~28~~*33*. Summary of 2011 Regional Economy in Sutter and Butte Counties

Page 3.10-31

The first sentence on page 3.10-31 of the 2014 Draft EIS/EIR is revised as follows:

> Table 3.10-~~29~~*34* shows the potential economic effects of idling the proposed maximum acreages of rice in a single year.

The first sentence of the second paragraph on page 3.10-31 of the 2014 Draft EIS/EIR is revised as follows:

> Table 3.10-~~29~~*34* also shows economic effects of idling the maximum assumed acreage of other crop types in Sutter and Butte counties, which are represented by tomatoes, corn, and alfalfa in this analysis.

Table 3.10-29 on page 3.10-31 of the 2014 Draft EIS/EIR is revised as follows:

Table 3.10-~~29~~*34*. Regional Economic Effects in Sutter and Butte Counties from Maximum Cropland Idling Transfer under the Proposed Action (2012 dollars)

Crop	Maximum Acreage Idled	Employment (Jobs)	% change from Total Employment	Labor Income (Million $)	% change from Total Labor Income	Output (Million $)	% change from Total Output
Rice	10,769	-~~100~~*132*	-0.~~07~~*09*%	-$~~3.49~~*4.56*	-0.~~06~~*08*%	-$~~11.77~~*23.21*	-~~0.07~~*0.13*%
Tomatoes, Processing	400	-~~9~~*16*	-0.01%	-$0.~~36~~*50*	-0.01%	-$~~1.03~~*2.00*	-0.01%
Corn	800	-~~3~~*8*	-0.~~00~~*01*%	-$0.~~11~~*22*	-0.00%	-$0.~~36~~*81*	-0.00%
Alfalfa	600	-~~6~~*7*	-0.00%	-$0.~~20~~*21*	-0.00%	-$0.~~41~~*75*	-0.00%
Total	12,569	-~~118~~*163*	-0.~~08~~*11*%	-$~~4.16~~*5.50*	-0.~~07~~*10*%	-$~~13.84~~*26.76*	-0.~~08~~*15*%

The following text is inserted after Table 3.10-29 on page 3.10-31 of the 2014 Draft EIS/EIR:

> *Cropland idling transfers could occur in consecutive years, meaning that these effects would occur each year. If the maximum cropland idling transfers occurred in consecutive year, 163 jobs would be lost in the regional economy each year the transfer occurs. Output and labor income would also reduce each year the same amounts as shown in Table 3.10-34. During consecutive year cropland idling transfers, the economic effects would become less temporary and the adverse economic effects may be felt more in the local agricultural economy than a single year cropland idling transfer. Local economic effects are described below. On a regional level, the adverse economic effects are relatively small each year and would not substantially affect regional economic activities in the region. Cropland idling transfers are the lowest priority for buyers and would not likely occur each year during the 10-year period, or even in all years that transfers occur. Chapter 2 describes the frequency of transfers.*

Page 3.10-32

The title for table 3.10-30 on page 3.10-32 of the 2014 Draft EIS/EIR is revised as follows:

> Table 3.10-~~30~~*35*. Maximum Cropland Idling Acreages in Solano County under the Proposed Action

The first complete paragraph on page 3.10-32 of the 2014 Draft EIS/EIR is revised as follows:

> Table 3.10-~~31~~*36* shows economic effects of idling the maximum assumed acreage of other crop types in Solano County, which are represented by corn and alfalfa in this analysis. Idling effects are compared to the regional economy of Solano County, shown in Table 3.10-11. Idling the proposed acreages would result in minimal effects to the employment, labor income and output in the county. Since the maximum *acreage* would not be idled in most years, the average annual effect would be even less.

Table 3.10-31 on page 3.10-32 of the 2014 Draft EIS/EIR is revised as follows:

Table 3.10-~~31~~*36*. Regional Economic Effects in Solano County from Maximum Non-Rice Idling Transfer (2012 dollars)

Crop	Maximum Acreage Idled	Employment (Jobs)	% change from Total Employment	Labor Income (Million $)	% change from Total Labor Income	Output (Million $)	% change from Total Output
Corn	1,500	*-414*	-0.~~00~~*01*%	-$0.~~21~~*43*	-0.00%	-$~~0.61~~*1.45*	-0.~~002~~*00*%
Alfalfa	3,000	-~~15~~*18*	-0.01%	-$0.~~63~~*70*	-0.01%	-$~~1.40~~*3.12*	-0.~~005~~*01*%
Total	4,500	-~~19~~*32*	-0.~~01~~*02*%	-$~~0.84~~*1.13*	-0.01%	-$~~2.01~~*4.58*	-0.~~007~~*01*%

The following text is inserted after Table 3.10-31 on page 3.10-32 of the 2014 Draft EIS/EIR:

> *Cropland idling transfers could occur in consecutive years, meaning that these effects would occur each year. If the maximum cropland idling transfers occurred in consecutive year, 32 jobs would be lost in the regional economy each year the transfer occurs. Output and labor income would also reduce each year the same amounts as shown in Table 3.10-36. During consecutive year cropland idling transfers, the economic effects would become less temporary and the adverse economic effects may be felt more in the local agricultural economy than a single year cropland idling transfer. Local economic effects are described below. On a regional level, the adverse economic effects are relatively small each year and would not substantially affect regional economic activities in the region. Cropland idling transfers are the lowest priority for buyers and would not likely occur each year during the 10-year period, or even in all years that transfers occur. Chapter 2 describes the frequency of transfers.*

Page 3.10-33

The second complete paragraph on page 3.10-33 of the 2014 Draft EIS/EIR is revised as follows:

> Local *economic* effects would be more adverse if cropland idling transfers occurred in consecutive years. Business owners would likely be able to recover from reduced sales in a single year, but it would be more difficult if sales remained low for multiple years. *Workers may also have more trouble finding long-term jobs if cropland idling occurred in consecutive years.*

Page 3.10-35

The following text and table are inserted after the last paragraph on page 3.10-35 of the 2014 Draft EIS/EIR is revised as follows:

> *Table 3.10-37 shows tax impacts of cropland idling transfers, as estimated by IMPLAN. IMPLAN calculates tax impacts based on tax receipts, not actual tax rates. IMPLAN does not have the underlying data to separate state and local taxes; therefore, they are lumped together. It is not possible to identify the tax impact on local county and city jurisdictions. These impacts to tax revenues would be an adverse effect on the federal, state, and local economies.*

Table 3.10-37. Federal, State, and Local Tax Impacts of Cropland Idling Transfers

	Colusa, Glenn, Yolo	*Sutter, Butte*	*Solano*
State/Local	*-$2,307,000*	*-$707,000*	*-$108,000*
Federal	*-$2,851,000*	*-$930,000*	*-$167,000*

Source: MIG Inc. 2011

Page 3.10-36

The first sentence of the last paragraph on page 3.10-36 of the 2014 Draft EIS/EIR is revised as follows:

> Groundwater substitution transfers could increase ~~costs to water users for~~ groundwater pumping ~~costs for water users~~, *deepening existing wells, or drilling new wells* in areas where groundwater levels decline as a result of the transfer.

The following text in the last paragraph on page 3.10-36 of the 2014 Draft EIS/EIR is revised as follows:

> Figures 3.10-5 and 3.10.6 show potential changes in groundwater pumping costs after a one-year transfer and after multi-year transfers, respectively. *As described in Section 3.3.2.4.2, the groundwater level figures show the simulated drawdown of groundwater elevations under September 1976 hydrologic conditions (WY 1976 was historically a critical dry year) and simulated drawdown of groundwater elevations under September 1990 hydrologic conditions, which shows the cumulative effects of multi-year transfers as groundwater substitution pumping was simulated in 1987, 1988, 1989, and 1990.* Table 3.10-~~32~~*38* shows potential changes in pumping costs corresponding to decline in groundwater levels.

Page 3.10-37

The title for Table 3.10-32 on page 3.10-37 of the 2014 Draft EIS/EIR is revised as follows:

> Table 3.10-~~32~~*38*. Potential Increases in Energy Costs Associated With Groundwater Level Declines

The first paragraph on page 3.10-37 of the 2014 Draft EIS/EIR is revised as follows:

> *Reduction in groundwater levels could also result in existing wells that may not be participating in the water transfers to dry out. This would require either deepening existing wells or drilling new wells to continue to pump groundwater. Deepening or drilling new wells would result in excessive costs to third parties and would be a substantial adverse economic effect.*
>
> Mitigation measure GW-1 (see Section 3.3, Groundwater Resources) establishes monitoring programs for groundwater substitution transfers. The programs would monitor groundwater level fluctuations within the local pumping area and if effects were reported or occurred, the participating selling agencies would implement appropriate mitigation, also described in mitigation measure GW-1. Mitigation measure GW-1 would reduce the effects of increased groundwater pumping costs for well owners in areas where groundwater levels decline as a result of transfers. This would reduce adverse economic effects of increased pumping costs. *Mitigation measure GW-1 also includes monitoring and mitigation actions to prevent wells from going dry or to mitigate the third party in the event that a well does go dry. Section 3.3.4.1.2 describes the monitoring plan that sellers must complete for groundwater substitution transfers and to address third party concerns. Section 3.3.4.1.3 details the mitigation plan for third party effects.*

Page 3.10-44

The last sentence on page 3.10-44 of the 2014 Draft EIS/EIR is revised as follows:

> Table 3.10-~~33~~*39* summarizes the potential economic effects of each of the action alternatives and the No Action/No Project Alternative.

Page 3.10-45

Table 3.10-33 on page 3.10-45 of the 2014 Draft EIS/EIR is revised as follows:

Table 3.10-~~33~~*39*. Comparative Analysis of the Alternatives

Potential Effect	No Action/No Project	Proposed Action	Alternative 3: No Cropland Modifications	Alternative 4: No Groundwater Substitution
Seller Service Area				
Revenues from cropland idling water transfers could increase incomes for growers or landowners selling water.	Same as existing conditions	Beneficial	No Effect	Same as the Proposed Action
Cropland idling transfers in Glenn, Colusa, and Yolo counties could reduce employment, labor income, and economic output for businesses and households linked to agricultural activities.	Same as existing conditions	Employment: - ~~362~~*495* Labor Income: - $~~15.11~~*19.38* Million Output: - $~~45.46~~*90.43* Million	No Effect	Same as the Proposed Action

Potential Effect	No Action/No Project	Proposed Action	Alternative 3: No Cropland Modifications	Alternative 4: No Groundwater Substitution
Cropland idling transfers in Sutter and Butte counties could reduce economic output, value added, and employment for businesses and households linked to agricultural activities.	Same as existing conditions	Employment: - ~~118~~*163* Labor Income: - $~~4.16~~*5.50* Million Output: - $~~13.84~~*26.76* Million	No Effect	Same as the Proposed Action
Cropland idling transfers in Solano County could reduce economic output, labor income, and employment for businesses and households linked to agricultural activities.	Same as existing conditions	Employment: - ~~19~~*32* Labor Income: - $~~0.84~~*1.13* Million Output: - $~~2.01~~*4.58* Million	No Effect	Same as the Proposed Action
Cropland idling transfers could have adverse local economic effects.	Same as existing conditions	Adverse	No Effect	Adverse
Water transfers from idling alfalfa could increase costs for dairy and other livestock feed.	Same as existing conditions	Adverse, but minimal	No Effect	Adverse, but minimal
Cropland idling transfers could decrease net revenues to tenant farmers whose landowners choose to participate in transfers.	Same as existing conditions	Adverse	No Effect	Adverse
Crop shifting transfers could change economic output, value added, and employment for businesses and households linked to agricultural activities.	Same as existing conditions	Adverse, but minimal	No Effect	Adverse, but minimal
Reductions in local sales associated with cropland idling transfer effects could reduce tax revenues and increase costs to county governments.	Same as existing conditions	Adverse, but minimal	No Effect	Adverse, but minimal
Economic effects associated with cropland idling could conflict with economic policies and objectives set forth in local plans.	Same as existing conditions	Adverse	No Effect	Adverse
Groundwater substitution transfers could increase groundwater pumping costs for water users in areas where groundwater levels decline as a result of the transfer.	Same as existing conditions	Adverse	Same as the Proposed Action	No Effect
Revenues from groundwater substitution water transfers could increase incomes for growers or landowners selling water.	Same as existing conditions	Beneficial	Same as the Proposed Action	No Effect
Revenues received from stored reservoir and conservation transfers could increase operating incomes for sellers.	Same as existing conditions	Beneficial, but minimal	Same as the Proposed Action	Same as the Proposed Action

Potential Effect	No Action/No Project	Proposed Action	Alternative 3: No Cropland Modifications	Alternative 4: No Groundwater Substitution
Buyer Service Area				
Water transfers would provide water for agricultural uses that could support revenues, economic output, and employment.	Same as existing conditions	Beneficial	Same as the Proposed Action	Same as the Proposed Action
Water transfers would provide water for M&I uses that could support revenues, economic output, and employment.	Same as existing conditions	Beneficial	Same as the Proposed Action	Same as the Proposed Action

Page 3.10-49

The second sentence on page 3.10-49 of the 2014 Draft EIS/EIR is revised as follows:

> Table 3.10-~~34~~*40* summarizes cumulative economic effects to employment, labor income, and output in Butte and Sutter counties of idling of 10,769 acres of rice under the Proposed Action and up to 26,342 acres of rice for SWP transfers.

Table 3.10-34 on page 3.10-49 of the 2014 Draft EIS/EIR is revised as follows:

Table 3.10-~~34~~*40*. *Cumulative* Regional Economic Effects in Butte and Sutter County from Rice Idling Transfer (2012 dollars)

Cumulative Acreage Idled	Employment (Jobs/1000 acres)	% change from Total Employment	Labor Income (Million $)	% change from Total Labor Income	Output (Million $)	% change from Total Output
37,111	~~345~~*456*	0.~~24~~*31*%	$~~12.02~~*15.71*	0.~~21~~*28*%	$~~40.55~~*79.98*	0.~~23~~*46*%

Page 3.10-50

The following sentence in the first paragraph on page 3.10-50 of the 2014 Draft EIS/EIR is revised as follows:

> Table 3.10-~~35~~*41* shows projected population growth in Glenn, Colusa, Yolo, Sutter, Solano, and Butte counties.

The title of Table 3.10-35 on page 3.10-50 of the 2014 Draft EIS/EIR is revised as follows:

> Table 3.10-~~35~~*41*. Population Projections in the Seller Service Area *Cropland Idling Counties*

Page 3.10-53

The first sentence on page 3.10-53 of the 2014 Draft EIS/EIR is revised as follows:

> Table 3.10-~~36~~*42* shows projected population growth in Merced, San Benito, San Joaquin, Stanislaus, Fresno, and Kings counties.

The title of Table 3.10-36 on page 3.10-53 of the 2014 Draft EIS/EIR is revised as follows:

Table 3.10-~~36~~*42*. Population Projections in the Merced, San Benito, San Joaquin, Stanislaus, Fresno and Kings Counties

The following text is inserted after the second paragraph on page 3.10-53 of the 2014 Draft EIS/EIR is revised as follows:

Refuge transfers could occur from sellers in the San Joaquin Valley near the Buyer Service Area. The single main seller of water supplies for refuge transfers is the San Joaquin River Exchange Contractors Water Authority. Water would be made available for refuges through cropland idling. Cropland idling in the sellers' areas would reduce agricultural employment and production. Refuge transfers would not affect agricultural employment or production in the Seller Service Area in the Sacramento Valley; therefore, refuge transfers in combination with the Proposed Action would not result in cumulative effects to regional economies in the Seller Service Area.

Page 3.10-54

The first complete paragraph on page 3.10-54 of the 2014 Draft EIS/EIR is revised as follows:

Table 3.10-~~37~~*43* shows population projections in the three counties.

The title of Table 3.10-37 on page 3.10-54 of the 2014 Draft EIS/EIR:

Table 3.10-~~37~~*43*. Population Projections in the Alameda, Contra Costa, and Santa Clara Counties

Section 3.11, Environmental Justice

Page 3.11-21

Table 3.11-11 on page 3.11-21 of the 2014 Draft EIS/EIR is revised as follows:

Table 3.11-11. Full-Time Labor Equivalents

Representative Crop	Number of Full Time Workers/1,000 acres
Alfalfa	1.0
Corn	5.5
Rice	2.6~~5~~
Tomatoes	13.7

Source: UCCE ~~2007~~2012, 2008a, 2008b, and 2008c.

Page 3.11-23

The table header for Table 3.11-12 on page 3.11-23 of the 2014 Draft EIS/EIR is revised as follows:

Table 3.11-12. Maximum Proposed Acreage for Cropland Idling under the Proposed Action

Region	Rice	Alfalfa	Corn	Tomatoes	Total Acres Idled ~~(Acre Feet)~~
Colusa, Glenn, and Yolo counties	40,704	1,400	400	400	42,904
Solano County	0	3,000	1,500	0	4,500
Sutter, Butte counties	10,769	600	800	400	12,569
				Total	**59,973**

Table 3.11-13 on page 3.11-23 of the 2014 Draft EIS/EIR is revised as follows:

Table 3.11-13. Farm Worker Effects from Proposed Cropland Idling in the Seller Service Area under the Proposed Action

Region/ County	Total County Farmworkers[1]	Farm Worker Jobs Affected by Proposed Action	Percent of Total Farm Worker Employment Affected	Maximum Annual Percent Change in Farm Worker Employment from 2003 to 2013[1]
Glenn/ Colusa/Yolo	9,940	-~~160~~161	0.02%	15% (occurred 2001-2002)
Solano	1,600	-~~13~~15	0.01%	15% (occurred 2006-2007)
Sutter/Butte	6,600	-~~57~~54	0.01%	9% (occurred 2003-2004)
Total	**18,140**	**-230**	**0.01%**	**5% (occurred 2007-2008)**

Page 3.11-27

The third and fourth paragraph in Section 3.11.4.1, entitled *Alternative 2: Full Range of Transfers (Proposed Action),* on page 3.11-27 of the 2014 Draft EIS/EIR is revised as follows:

Cropland idling transfers within Butte and Sutter counties could result in additional crops to be taken out of production, further decreasing available employment for farm workers in the area. Under the Proposed Action, Butte and Sutter counties crop idling transfers could result in the idling of a maximum 12,569 ~~acre-feet (AF),~~*acres*, including a maximum of 10,769 ~~AF~~*acres* of rice lands. This would decrease ~~57~~54 farm worker jobs during the transfer year, and approximately 0.01 percent of total farm employment in the region. *Cumulative effects could add an additional 37,111 acres of rice to be idled, which could reduce employment by an additional 133 jobs. The total cumulative effects would be minor relative to the regional baseline.* Employment effects would be temporary, and because of the temporary nature of effects and the relatively low percentage of farm worker losses relative to total agricultural employment, crop idling would not cause a cumulative adverse and disproportionately high effect to minority and low-income farm workers.

Repeated SWP crop idling transfers within a small geographic area could result in adverse and disproportionately high cumulative effects to low-income and minority populations. During these years, the buyers would focus CVP crop idling transfers in locations outside of Sutter *and Butte* County.

Page 3.11-28

The following text has been added to the end of the third complete paragraph on page 3.11-28 of the 2014 Draft EIS/EIR.

> *Refuge transfers could purchase water from sellers in the San Joaquin Valley near the Buyers Service Area that make water available through cropland idling, but this would represent a very small change in land use.*

Section 3.12, Indian Trust Assets

Page 3.12-7

The first sentence of the last paragraph on page 3.12-7 of the 2014 Draft EIS/EIR is revised as follows:

> Chico Rancheria lies near Butte Creek along the ~~boarder~~*border* of the Sacramento Valley Groundwater Basin; thus, effects from groundwater substitution, including changes in steam flow temperatures would be less than if the ITAs were located more centrally in the basin.

Page 3.12-12

The second sentence of the second paragraph on page 3.12-12 of the 2014 Draft EIS/EIR is revised as follows:

> Section 3.3.6.1.1 in the Groundwater Resources analysis describes other existing and ~~forseeable~~*foreseeable* projects that could affect groundwater resources in the Seller Service Area.

Section 3.13, Cultural Resources

Page 3.13-10

The last sentence of the first paragraph on page 3.13-10 of the 2014 Draft EIS/EIR is revised as follows:

> ~~Lumber extraction, first practiced in conjunction with mining, replaced mining as the leading local industry in areas above 3,000 feet (Department of Water Resources [DWR] 1964:9-10)~~

Page 3.13-15

The second sentence of the first paragraph on page 3.13-15 of the 2014 Draft EIS/EIR is revised as follows:

> The Proposed Action would *slightly* affect reservoir elevation in CVP and SWP reservoirs and reservoirs participating in stored reservoir water transfers.

Table 3.13-1 on page 3.13-15 of the 2014 Draft EIS/EIR is revised as follows:

Table 3.13-1. Changes in CVP and SWP Reservoir Elevations between the No Action/No Project Alternative and the Proposed Action (in feet)

Sac Yr Type	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Shasta Reservoir												
W	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AN	-0.34	-0.4	-0.3	-0.2	-0.1	-0.1	-0.1	0.0	0.0	0.0	0.0	0.0
BN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	-0.1	-0.1	-0.1
D	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	0.2	0.56	1.68	1.14	-0.12	-0.12
C	-0.2	-0.3	-0.3	-0.3	-0.23	-0.23	-0.12	1.02	3.17	0.24	-0.5	-0.5
Lake Oroville												
W	-0.45	-0.45	-0.23	-0.2	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	-0.12
AN	-1.92.2	-1.92.2	-2.18	-1.24	-1.0.91	0.01	0.0	0.0	0.0	-0.4	-0.3	-0.23
BN	-0.3	-0.34	-0.56	-0.45	-0.45	-0.3	-0.3	-0.3	-0.34	-0.56	-0.57	-0.78
D	-0.57	-0.57	-0.56	-0.56	-0.46	-0.34	-0.34	0.65	0.76	0.10	-1.02	-0.57
C	-1.37	-1.72.2	-1.82.3	-1.82.3	-2.16	-1.48	-1.59	-1.37	-0.911.4	-0.79	-2.39	-2.43.0
Folsom Reservoir												
W	0.32	-0.12	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1
AN	-0.45	-0.6	-0.5	-0.1	0.0	0.0	0.0	0.0	0.0	-0.1	-0.23	-0.45
BN	-0.23	-0.34	-0.56	-0.45	0.0	0.0	0.0	0.0	-0.01	-0.12	-0.12	-0.2
D	0.3	0.32	-0.1	-0.12	-0.23	-0.1	-0.1	0.8	1.4	1.4	1.76	1.98
C	1.21	0.98	0.76	0.75	0.76	-0.01	0.10	0.65	1.65	1.65	1.10	1.54

Page 3.13-17

Table 3.13-2 on page 3.13-17 of the 2014 Draft EIS/EIR is revised as follows:

Table 3.13-2. Changes in CVP and SWP Reservoir Elevations between the No Action/No Project Alternative and Alternative 3 (in feet)

Sac Yr Type	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Shasta Reservoir												
W	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AN	-0.34	-0.4	-0.3	-0.2	-0.1	-0.1	-0.1	0.0	0.0	0.0	0.0	0.0
BN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	-0.1	-0.1	-0.1
D	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	0.2	0.4	1.3	0.9	-0.12	-0.12
C	-0.23	-0.3	-0.3	-0.3	-0.23	-0.23	-0.12	0.5	1.8	-0.12	-0.5	-0.5

Sac Yr Type	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Lake Oroville												
W	-0.45	-0.45	-0.23	-0.2	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	-0.12
AN	-1.92.2	-1.92.2	-2.1.8	-1.24	-0.91.1	-0.01	-0.01	-0.01	0.0	-0.4	-0.3	-0.23
BN	-0.3	-0.34	-0.56	-0.5	-0.5	-0.3	-0.3	-0.3	-0.34	-0.56	-0.57	-0.78
D	-0.57	-0.57	-0.56	-0.56	-0.46	-0.34	-0.34	-0.54	0.65	0.10	-1.02	-0.57
C	-1.37	-1.72.2	-1.82.3	-1.82.3	-2.16	-1.48	-1.59	-1.38	-1.15	-1.48	-2.39	-2.43.0
Folsom Reservoir												
W	0.32	-0.12	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1
AN	-0.45	-0.6	-0.5	-0.1	0.0	0.0	0.0	0.0	0.0	-0.1	-0.23	-0.45
BN	-0.23	-0.34	-0.56	-0.45	0.0	0.0	0.0	0.0	-0.01	-0.12	-0.12	-0.2
D	0.43	0.32	-0.1	-0.12	-0.23	-0.1	-0.1	0.8	1.4	1.4	1.76	1.98
C	1.21	0.98	0.76	0.75	0.76	-0.01	0.10	0.65	1.5	1.65	1.10	1.54

Section 3.14, Visual Resources

Page 3.14-1

The following text in the third paragraph on page 3.14-1 of the 2014 Draft EIS/EIR is revised as follows:

> In addition to the counties, the area of analysis in the Seller Service Area includes: Sacramento, Feather, Bear, Yuba, American, Merced, and San Joaquin rivers, and Shasta, Oroville, Natoma, McClure, Camp Far West, *Collins Lake,* French ~~Meadow~~Meadows, Hell Hole, Folsom, and New Bullards Bar reservoirs.

Page 3.14-6

The first paragraph on page 3.14-6 of the 2014 Draft EIS/EIR is revised as follows:

> The Yuba River flows into the Feather River near Marysville. In this area agricultural lands are a dominant feature as well as grasslands and barren land, Class C visual resources. *Collins Lake is in Yuba County in the foothills between Marysville and Grass Valley. The reservoir has 12 miles of shoreline with many varieties of trees and shrubs, as well as wildflowers. The reservoir and surrounding area are considered Class A and B visual resources.*

Page 3.14-14

Table 3.14-1 on page 3.14-14 of the 2014 Draft EIS/EIR is revised as follows:

Table 3.14-1. Changes in CVP and SWP Reservoir Elevations between the No Action/No Project Alternative and the Proposed Action (in feet)

Sac Yr Type	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Shasta Reservoir												

Sac Yr Type	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
W	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AN	-0.4	-0.4	-0.3	-0.2	-0.1	-0.1	-0.1	0.0	0.0	0.0	0.0	0.0
BN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	-0.1	-0.1	-0.1
D	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	0.2	0.6	1.8	1.4	-0.2	-0.2
C	-0.~~3~~*2*	-0.3	-0.3	-0.3	-0.3	-0.3	-0.2	1.2	3.7	0.4	-0.5	-0.5
Lake Oroville												
W	-0.5	-0.5	-0.3	-0.2	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	-0.2
AN	-2.2	-2.2	-2.1	-1.4	-1.1	0.1	0.~~1~~*0*	0.~~1~~*0*	0.0	-0.4	-0.3	-0.3
BN	-0.3	-0.4	-0.6	-0.5	-0.5	-0.3	-0.3	-0.3	-0.4	-0.6	-0.7	-0.8
D	-0.7	-0.7	-0.6	-0.6	-0.6	-0.4	-0.4	0.5	0.6	0.0	-1.2	-0.7
C	-1.7	-2.2	-2.3	-2.3	-2.1	-1.8	-1.9	-1.7	-1.4	-0.9	-2.9	-3.0
Folsom Reservoir												
W	0.2	-0.2	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1
AN	-0.5	-0.6	-0.5	-0.1	0.0	0.0	0.0	0.0	0.0	-0.1	-0.3	-0.5
BN	-0.3	-0.4	-0.6	-0.5	0.0	0.0	0.0	0.0	-0.1	-0.2	-0.2	-0.2
D	0.3	0.2	-0.1	-0.2	-0.3	-0.1	-0.1	0.8	1.4	1.4	1.6	1.8
C	1.1	0.8	0.6	0.5	0.6	-0.1	0.0	0.5	1.5	1.5	1.0	1.4

Page 3.14-15

The first paragraph on page 3.14-15 of the 2014 Draft EIS/EIR is revised as follows:

> Stored reservoir release transfers could substantially degrade the existing landscape character or scenic attractiveness of Class A and B visual resources *at* participating reservoirs.

Section 3.15, Recreation

Page 3.15-8

The following text in the last paragraph on page 3.15-8 of the 2014 Draft EIS/EIR is revised as follows:

> The San Joaquin River National Wildlife Refuge (NWR) encompasses a section of the San Joaquin River between the Tuolumne and Stanislaus Rivers and is over 7,000 acres.

Page 3.15-12

The last paragraph in Section 3.15.2.1, entitled *Assessment Methods,* on page 3.15-12 of the 2014 Draft EIS/EIR is revised as follows:

> Recreation at NWRs would not be affected by the any of the proposed alternatives because water supply to these areas would not change. ~~There would be no impacts to wildlife populations or access to NWRs.~~ Impacts to *vegetation and wildlife resources and* NWRs are discussed ~~further.~~*in Section 3.7.*

Page 3.15-19

The header of Section 3.15.2.5.1, entitled *Seller Service Area*, on page 3.15-19 of the 2014 Draft EIS/EIR is revised as follows:

> 3.15.2.~~5~~*6*.1 Seller Service Area

Page 3.15-21

The title of Section 3.15.2.5.2, entitled *Buyer Service Area*, on page 3.15-21 of the 2014 Draft EIS/EIR is revised as follows:

> 3.15.2.~~5~~*6*.2 Buyer Service Area

Section 3.16, Power

Page 3.16-1

The first sentence on page 3.16-1 of the 2014 Draft EIS/EIR is revised as follows:

> This ~~chapter~~*section* presents the existing hydroelectric generation facilities within the area of analysis and discusses potential effects on hydroelectric generation from the proposed alternatives.

Section 3.17, Flood Control

Page 3.17-6

The last sentence on the third paragraph on page 3.17-6 of the 2014 Draft EIS/EIR is revised as follows:

> Englebright reservoir does not have any dedicated flood storage space and is not used for flood control purposes (Reclamation *et al*. 2007).

Page 3.17-20

Table 3.17-7 on page 3.17-20 of the 2014 Draft EIS/EIR is revised as follows:

Table 3.17-7. Comparative Analysis of Alternatives

Potential Impacts	Alternative(s)	Significance	Proposed Mitigation	Significance after Mitigation
Reservoirs operations would remain the same as existing conditions with regards to flood control, including flood storage capacity and timing of releases	1	~~NCFEC~~*No change from existing conditions (NCFEC)*	None	NCFEC
There would be no changes in river flows that could potentially compromise levee stability	1	NCFEC	None	NCFEC
There would be no changes to storage at San Luis Reservoir that could affect flood control	1	NCFEC	None	NCFEC
Water transfers would change storage levels in CVP and SWP reservoirs, potentially affecting flood control.	2, 3, 4	LTS	None	LTS
Water transfers ~~could decrease~~ *would change* storage levels in non-Project reservoirs, potentially affecting flood control.	2, 3, 4	~~LTS~~*B*	None	~~LTS~~*B*

Potential Impacts	Alternative(s)	Significance	Proposed Mitigation	Significance after Mitigation
Water transfers could ~~change~~ *increase* river flows, potentially affecting flood capacity or levee stability.	2, 3, 4	B	None	B
Water transfers would change storage at San Luis Reservoir, potentially affecting flood control.	2, 3, 4	LTS	None	LTS

Page 3.17-22

The first sentence in Section 3.17.6.1.1, entitled *Seller Service Area*, on page 3.17-22 of the 2014 Draft EIS/EIR is revised as follows:

> Water transfers would change storage levels in reservoirs and potentially affect flood control. In addition to the cumulative projects listed above, the projects in Chapter 4 (including SWP transfers, the CVP Municipal and Industrial Water Shortage Policy, the Lower Yuba River Accord, *refuge transfers,* and the San Joaquin River Restoration Program) have the potential to affect storage.

Chapter 4, Cumulative Effects Methodology

Page 4-7

The last two sentences on page 4-7 of the 2014 Draft EIS/EIR are revised as follows:

> Reclamation is in the process of updating the M&I WSP and is currently preparing the ~~draft~~ EIS for alternatives to the current M&I WSP~~. It is anticipated that the~~*The* draft EIS ~~will be available~~*was released for public review* in late 2014.

Page 4-10

The following text is inserted after the last paragraph on page 4-10 of the 2014 Draft EIS/EIR:

> ***4.3.5 Refuge Water Supplies***
>
> *A Report on Refuge Water Supply Investigations (Reclamation 1989) describes water needs and delivery requirements for National Wildlife Refuges (NWR), State Wildlife Management Areas, and the Grassland Resource Conservation District in the Central Valley of California. In this report, the average annual historical water supplies were termed "Level 2" (L2), and the supplies needed for optimum habitat management were termed "Level 4". Section 3406(d)(1) of the CVPIA requires the Secretary of the Interior to provide firm delivery of L2 water supplies to certain wildlife refuges in the Central Valley of California. Section 3406(d)(2) of the CVPIA further directs the Secretary to provide additional water supplies to meet Incremental Level 4 needs through the acquisition of water from willing sellers.*
>
> *For refuge water transfers, Reclamation (as a "willing buyer"), in cooperation with willing sellers, negotiates and develops agreements to purchase water for transfer to CVPIA refuges and prepares the associated National Environmental Policy Act/Endangered Species Act environmental compliance documents, as applicable.*

Before Reclamation can facilitate water transfers, it must first provide CVP water to meet all regulatory requirements mandated by the State Water Resources Control Board (Delta flow and water quality standards), CVPIA (specifically the "(b)(2) water" and refuge L2 water), and the Reasonable and Prudent Alternative actions listed in the USFWS's (2008) and National Oceanic and Atmospheric Administration (NOAA) Fisheries' (2009) respective Biological Opinions on the Coordinated Operations of the CVP and SWP. Reclamation must then meet its contractual obligations to CVP agricultural and municipal and industrial (M&I) water service contractors. If all these requirements are satisfied and excess pumping capacity is available, only then will Reclamation facilitate potential north-to-south water transfers. Water transfers under this EIS/EIR cannot affect Reclamation's ability to deliver allocated CVP L2 water to refuges.

Table 4-4 shows Reclamation's refuge related water transfers ("re-allocation" regarding L2 supplies) from 2009 through 2013. Most of these transfers do not need to be moved through the Delta. Merced Irrigation District (ID) is one exception, but Merced ID has multiple means of delivering transferred water and it does not need to be conveyed through the Delta (see Section 2.3.2.3). Additionally, Reclamation has permanently purchased water from Corning, Thames, and Proberta Water Districts (WDs) that is moved through the Delta in some years; however, this water is more frequently used for refuges in the Sacramento Valley and is not conveyed through the Delta. Because the Level 4 refuge transfers typically do not rely on through-Delta conveyance, the action alternatives are not expected to affect the potential for refuges to receive these supplies.

Table 4-4. Refuge Transferred Water Supplies, 2009-2013

Seller	*Water Transferred (AF)*[1]	*Notes*
WY 2013		
Corning, Thames, and Proberta WDs	*3,308*	*Permanently purchased NOD IL4 water transferred to the Kern NWR SOD*
SJRECWA	*19,500*	*Purchased IL4*
Merced ID	*7,256*	*Purchased for the East Bear Creek Unit of the San Luis NWR Complex as L2, then exchanged to meet SOD IL4 demands*
WY 2012		
SJRECWA	*25,000*	*Purchased IL4*
Santa Clara Valley WD	*10,000*	*Purchased IL4*
Merced ID	*3,480*	*Purchased for the East Bear Creek Unit of the San Luis NWR Complex as L2, then exchanged to meet SOD IL4 demands*
WY 2011		
SJRECWA	*50,333*	*Purchased IL4*
Panoche WD	*4,250*	*Purchased IL4*
San Luis WD	*5,000*	*Purchased IL4*
Santa Clara Valley WD	*10,000*	*Purchased IL4*

Seller	***Water Transferred (AF)[1]***	***Notes***
Merced ID	*1,627*	*Purchased for the East Bear Creek Unit of the San Luis NWR Complex as L2, then exchanged to meet SOD IL4 demands*
East Side Canal and Irrigation Company	*3,291*	*Purchased as L2, then exchanged to meet IL4 demands*
WY 2010		
Corning, Thames, and Proberta WDs and Sacramento Valley NWR Complex	*4,506*	*Permanently purchased NOD IL4 water and reallocated NOD conserved L2 water delivered to Kern NWR and GRCD*
SJRECWA	*35,714*	*Purchased IL4*
Kern-Tulare WD	*7,000*	*Purchased IL4*
Panoche WD	*10,000*	*Purchased IL4*
Merced ID	*500*	*Purchased for the East Bear Creek Unit of the San Luis NWR Complex as L2, then exchanged to meet SOD IL4 demands*
Stevinson WD	*4,080*	*Purchased for the East Bear Creek Unit of the San Luis NWR Complex as L2, then exchanged to meet SOD IL4 demands*
WY 2009		
Sacramento Valley NWR Complex	*5,342*	*NOD Conserved L2 water delivered to Kern NWR and the GCRD*
SJRECWA	*18,687*	*Purchased IL4*
Stevinson WD	*4,280*	*Purchased as L2, then exchanged to meet IL4 demands*

Key:
AF – Acre-feet, GRCD – Grasslands Resource Conservation District, ID – Irrigation District, IL4 – Incremental Level 4, L2 – Level 2, NOD – North of Delta, NWR – National Wildlife Refuge, SJRECWA – San Joaquin River Exchange Contractors Water Authority, SOD – South of Delta, WD – Water District, WY – Water Year
Note 1: Gross amount of transferred water (IL4) and re-allocated L2. Conveyance losses from source to destination were incurred and are not represented here; therefore, the amount total does not reflect the amount delivered to the refuges.

Chapter 5, Other Required Disclosures

Page 5-1

The first paragraph on page 5-1 of the 2014 Draft EIS/EIR is revised as follows:

> Other required disclosures of environmental documents include irreversible and irretrievable commitment of resources; the relationship between short-term uses and long-term productivity; growth inducing impacts; *significant and unavoidable impacts; and issues raised by the public. The* summary of environmental impacts by alternative; ~~significant and unavoidable impacts; and~~ *and* the environmentally superior alternative *are included in Chapter 2.*

Page 5-3

The last paragraph in Section 5.3, entitled *Growth Inducing Impacts*, on page 5-3 is revised as follows:

> Water proposed for transfer would be transferred from willing sellers to buyers to meet existing demands when there are shortages in Central Valley Project supplies. The

> proposed water transfers would not directly or indirectly affect growth beyond what is already planned. ~~Therefore, the proposed *action*~~*The term proposed for the transfers under the Proposed Action is 10 years beginning in 2015. The Proposed Action would not induce development growth or remove a barrier for growth because it is not a reliable source of water that could be used to approve development projects by local agencies. Therefore, the Proposed Action* would have no growth inducing impacts.

Chapter 6, Consultation and Coordination

Page 6-1

The following text in Section 6.1.2, entitled *Public Meetings*, on page 6-1 of the 2014 Draft EIS/EIR is revised as follows:

> Reclamation and SLDMWA ~~will hold~~*held* public meetings after release of the Public Draft EIS/EIR to solicit public comments. *Meetings were held in Sacramento, Los Banos, and Chico, California in October 2014. Reclamation and SLDMWA also provided a 60-day comment period for the public and agencies to submit written comments on the Public Draft EIS/EIR. Appendix R includes comment responses to all comments received at the public hearings and during the comment period for the 2014 Draft EIS/EIR.*

Appendix A, Alternatives Development Report of the 2014 Draft EIS/EIR

Title Page

The following text on the title page of the 2014 Draft EIS/EIR is revised as follows:

> **Alternatives Development Report**
> **~~Public~~ *Final* Draft**

The following text on the title page of the 2014 Draft EIS/EIR is revised as follows:

> ~~September 2014~~*September 2019*

Appendix B, Water Operations Assessment of the 2014 Draft EIS/EIR

As previously stated, Appendix B, Water Operations Assessment, of the 2014 Draft EIS/EIR is re-lettered to Appendix C in this Final EIS/EIR.

Page B-9

The header for Section B.4.3.1.2, entitled *Groundwater Substitution Transfers*, on page B-9 of the 2014 Draft EIS/EIR is revised as follows:

> ***C*~~B~~.4.3.1.~~2~~*3* Groundwater Substitution Transfers**

The following text and figure are inserted after Figure B-4, entitled *Annual Groundwater Substitution Transfer Supply* on page B-9 of the 2014 Draft EIS/EIR:

Groundwater substitution transfers included in the analysis were developed based on input from sellers, buyer demand, capacity to convey the water, and an analysis of the ability to potentially store water pumped from April through June in upstream CVP/SWP reservoirs. The ability to store water pumped April through June is described in greater detail in a subsequent section. The result of this analysis is a time-series of pumping that varies by month and year and is significantly less than the volumes illustrated in Figure C-4. Figure C-5 illustrates the range of monthly pumping simulated, and the average monthly pumping for the 12 years when groundwater substitution transfers are simulated. Additional detail on the monthly volume of groundwater substitution transfer simulated for each seller is provided in Attachment 2.

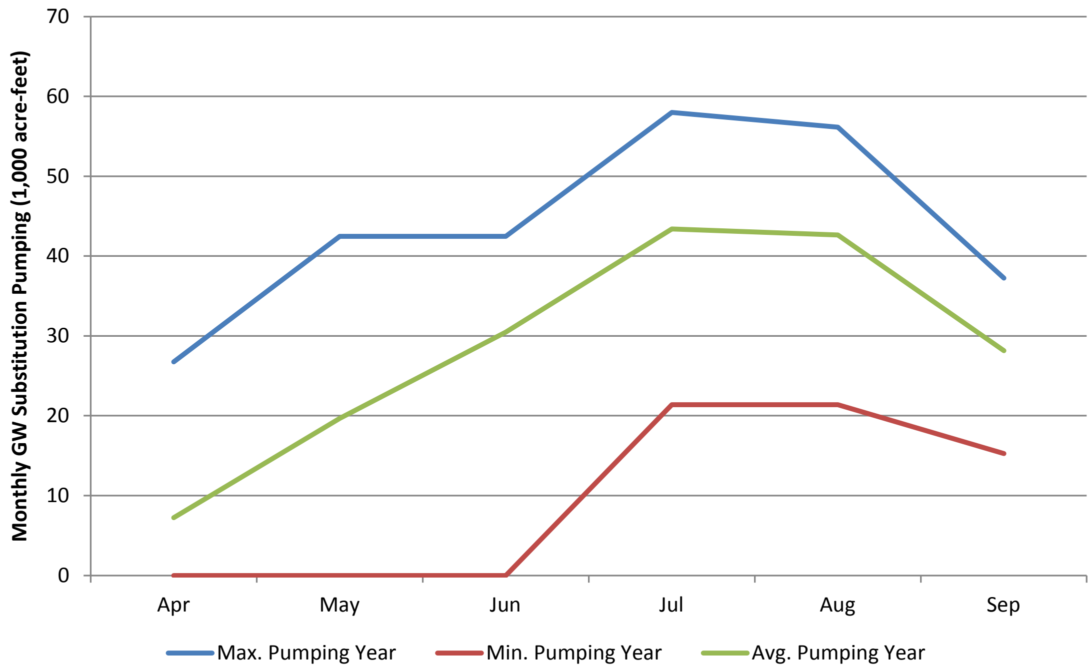


Figure C~~B~~-5. Range of Monthly Groundwater Substitution Transfers Analyzed

The last sentence on page B-9 of the 2014 Draft EIS/EIR is revised as follows:

Change in stream-aquifer interaction illustrated in Figure *C*~~B-5~~*6* is a reduction in Delta inflow.

Page B-10

The title for Figure B-5 on page B-10 of the 2014 Draft EIS/EIR is revised as follows:

Figure *C*~~B-5~~*6*. Total Change in Stream-Aquifer Interaction due to Groundwater Substitution Transfers

Page B-11

The following sentence in the first paragraph on page B-11 of the 2014 Draft EIS/EIR is revised as follows:

> Figure *C*~~B-6~~*7* illustrates changes in stream-aquifer interaction that occur during Delta balanced and surplus conditions.

The title for Figure B-6 on page B-11 of the 2014 Draft EIS/EIR is revised as follows:

> **Figure *C*~~B-6~~*7*. Change in Stream-Aquifer Interaction during Delta Balanced and Surplus Conditions**

Page B-12

The first incomplete sentence on page B-12 of the 2014 Draft EIS/EIR is revised as follows:

> The obligation of each project to respond to reductions in Delta inflow is generally governed by the accounting split illustrated below in Figure *C*~~B-7~~*8*.

The title for Figure B-7 on page B-12 of the 2014 Draft EIS/EIR is revised as follows:

> **Figure *C*~~B-7~~*8*. COA Accounting**

The header for Section B.4.3.1.3, entitled *Reservoir Release*, on page B-12 of the 2014 Draft EIS/EIR is revised as follows:

> ***C*~~B~~.4.3.1.~~3~~*4* Reservoir Release**

The last sentence on page B-12 of the 2014 Draft EIS/EIR is revised as follows:

> Figure *C*~~B-8~~*9* illustrates the annual volume of reservoir release water available from each seller in years with available export capacity/transfer demand.

Page B-13

The title for Figure B-8 on page B-13 of the 2014 Draft EIS/EIR is revised as follows:

> **Figure *C*~~B-8~~*9*. Annual Reservoir Release Transfer Supply**

Page B-14

The heading for Section B.4.3.1.4, entitled *Conserved Water*, on page B-14 of the 2014 Draft EIS/EIR is revised as follows:

> ***C*~~B~~.4.3.1.~~4~~*5* Conserved Water**

Page B-15

The heading for Section B.4.3.1.5, entitled *Crop Idling*, on page B-15 of the 2014 Draft EIS/EIR is revised as follows:

_C_~~B~~.4.3.1.~~5~~_6_ Crop Idling

The following text in the second paragraph of Section B.4.3.1.5, entitled Crop Idling, on page B-15 of the 2014 Draft EIS/EIR is revised as follows:

> Figure *C*~~B-9~~*10* illustrates the maximum annual volumes identified by sellers in the Sacramento Valley for years with available export capacity/transfer demand.

The title for Figure B-9 on page B-15 of the 2014 Draft EIS/EIR is revised as follows:

Figure _C_~~B-9~~_10_. Maximum Annual Crop Idling Transfer Supply

The following text in the last paragraph on page B-15 of the 2014 Draft EIS/EIR is revised as follows:

> Figure *C*~~B-10~~*11* illustrates the monthly ETAW pattern for rice.

Page B-16

The title for Figure B-10 on page B-16 of the 2014 Draft EIS/EIR is revised as follows:

Figure _C_~~B-10~~_11_. Monthly ETAW Pattern for Rice

The following sentence in the first paragraph on page B-16 of the 2014 Draft EIS/EIR is revised as follows:

> Crop idling transfers make water available on the fixed schedule illustrated in Figure *C*~~B-10~~*11*.

The heading for Section B.4.3.1.6, entitled *Storing Transfer in CVP/SWP Reservoirs Upstream of the Delta*, on page B-16 of the 2014 Draft EIS/EIR is revised as follows:

_C_~~B~~.4.3.1.~~6~~_7_ Storing Transfer Water in CVP/SWP Reservoirs Upstream of the Delta

Page B-17

The heading for Section B.4.3.1.7, entitled *Shift in CVP/SWP Exports to Facilitate Transfers*, on page B-17 of the 2014 Draft EIS/EIR is revised as follows:

_C_~~B~~.4.3.1.~~7~~_8_ Shift in CVP/SWP Exports to Facilitate Transfers

The heading for Section B.4.3.1.8, entitled *Diversion of Transfer Water by Sellers*, on page B-17 of the 2014 Draft EIS/EIR is revised as follows:

***C*~~B~~.4.3.1.~~8~~*9* Diversion of Transfer Water by Sellers**

The heading for Section B.4.3.1.8.1, entitled *East Bay MUD*, on page B-17 of the 2014 Draft EIS/EIR is revised as follows:

> *C*~~B~~.4.3.1.~~8~~*9*.1 East Bay MUD

Page B-18

The heading for Section B.4.3.1.8.2, entitled *Contra Costa WD*, on page B-18 of the 2014 Draft EIS/EIR is revised as follows:

> *C*~~B~~.4.3.1.~~8~~*9*.2 Contra Costa WD

The heading for Section B.4.3.1.8.2, entitled *SLDMWA*, on page B-18 of the 2014 Draft EIS/EIR is revised as follows:

> *C*~~B~~.4.3.1.~~8~~*9*.2 SLDMWA

Page B-20

The following text from the fourth paragraph on page B-20 of the 2014 Draft EIS/EIR is revised as follows:

> Alternative 2 includes transfers under all potential transfer measures: groundwater substitution, reservoir release, conserved water, and crop idling*/crop shifting*.

The first sentence from the fifth paragraph on page B-20 of the 2014 Draft EIS/EIR is revised as follows:

> Figure *C*~~B-11~~*12* is a summary of the quantity of transfer water made available (Transfer Supply) under Alternative 2 on an annual basis and illustrates where the water is diverted or used (Transfer Use).

Page B-21

The title for Figure B-11 on page B-21 of the 2014 Draft EIS/EIR is revised as follows:

> **Figure *C*~~B-11~~*12*. Annual Transfer Summary for Alternative 2**

The first sentence in the first paragraph in Section B.6.2.1, entitled Storage, on page B-21 of the 2014 Draft EIS/EIR is revised as follows:

> Figure *C*~~B-12~~*13* illustrates the change in operations at Shasta with the Project.

Page B-22

The title for Figure B-12 on page B-22 of the 2014 Draft EIS/EIR is revised as follows:

> **Figure *C*~~B-12~~*13*. Shasta Operations with and without Alternative 2 Transfers**

The first sentence on page B-22 of the 2014 Draft EIS/EIR is revised as follows:

> Operations at Folsom are illustrated below in Figure *C*~~B-13~~*14*.

The title for Figure B-13 on page B-22 of the 2014 Draft EIS/EIR is revised as follows:

> **Figure *C*~~B-13~~*14*. Folsom Operations with and without Alternative 2 Transfers**

The following text from the second paragraph on page B-22 of the 2014 Draft EIS/EIR is revised as follows:

> **Figure *C*~~B-14~~15 illustrates changes in Oroville storage with and without the Project.**

Page B-23

The title for Figure B-14 on page B-23 of the 2014 Draft EIS/EIR is revised as follows:

> **Figure *C*~~B-14~~*15*. Oroville Operations with and without Project**

The second sentence on page B-23 of the 2014 Draft EIS/EIR is revised as follows:

> Figure *C*~~B-15~~*16* illustrates the only change in reservoir storage from baseline conditions as the quantity released for transfer, a volume of five or 15 thousand acre-feet (TAF).

The title for Figure B-14 on page B-23 of the 2014 Draft EIS/EIR is revised as follows:

> **Figure *C*~~B-15~~*16*. Camp Far West Operations with and without Alternative 2 Transfers**

The last sentence on page B-23 of the 2014 Draft EIS/EIR is revised as follows:

> Figure *C*~~B-16~~*17* illustrates the only change in reservoir storage from baseline conditions as the quantity released for transfer, up to five TAF in any year.

Page B-24

The title for Figure B-16 on page B-24 of the 2014 Draft EIS/EIR is revised as follows:

> **Figure *C*~~B-16~~*17*. Merle Collins Reservoir Operations with and without Alternative 2 Transfers**

The second sentence on page B-24 of the 2014 Draft EIS/EIR is revised as follows:

> Figure *C*~~B-17~~*18* illustrates the combined storage in these two reservoirs under both baseline and with Project operations.

The title for Figure B-17 on page B-24 of the 2014 Draft EIS/EIR is revised as follows:

Figure *C*~~B-17~~*18*. MFP Operations with and without Alternative 2 Transfers

The first sentence of the second paragraph on page B-24 of the 2014 Draft EIS/EIR is revised as follows:

> Figure *C*~~B-18~~*19* illustrates Merced ID operations of Lake McClure with and without reservoir release transfers.

Page B-25

The title for Figure B-18 on page B-25 of the 2014 Draft EIS/EIR is revised as follows:

Figure *C*~~B-18~~*19*. Lake McClure Operations with and without Alternative 2 Transfers

The second sentence on page B-25 of the 2014 Draft EIS/EIR is revised as follows:

> The effect of these releases is illustrated below in Figure *C*~~B-19~~*20*.

The title for Figure B-19 on page B-25 of the 2014 Draft EIS/EIR is revised as follows:

Figure *C*~~B-19~~*20*. New Bullards Bar Operations with and without Alternative 2 Transfers

The first sentence in Section B.6.2.2, entitled *Stream Flow*, on page B-25 of the 2014 Draft EIS/EIR is revised as follows:

> Releases from Keswick Dam, as illustrated below in Figure *C*~~B-20~~*21*, reflect the changes in Shasta storage seen in Figure B~~-12~~*13*.

Page B-26

The title for Figure B-20 on page B-26 of the 2014 Draft EIS/EIR is revised as follows:

Figure *C*~~B-20~~*21*. Keswick Dam Release with and without Alternative 2 Transfers

The first sentence on page B-26 of the 2014 Draft EIS/EIR is revised as follows:

> Figure *C*~~B-21~~*22* illustrates the effect of Alternative 2 transfers to the Sacramento River at Wilkins Slough.

The title for Figure B-21 on page B-26 of the 2014 Draft EIS/EIR is revised as follows:

Figure *C*~~B-21~~*22*. Sacramento River at Wilkins Slough with and without Alternative 2 Transfers

The first sentence in the second paragraph on page B-26 of the 2014 Draft EIS/EIR is revised as follows:

> Figure *C*~~B-22~~*23* illustrates Nimbus Dam releases.

Page B-27

The title for Figure B-22 on page B-27 of the 2014 Draft EIS/EIR is revised as follows:

> **Figure *C*~~B-22~~*23*. Nimbus Dam Release with and without Alternative 2 Transfers**

The second sentence on page B-27 of the 2014 Draft EIS/EIR is revised as follows:

> Flows on the American River at H Street, illustrated in Figure *C*~~B-23~~*24*, show similar changes as flows at Nimbus.

The title for Figure B-23 on page B-27 of the 2014 Draft EIS/EIR is revised as follows:

> **Figure *C*~~B-23~~*24*. American River at H Street with and without Alternative 2 Transfers**

The first sentence in the last paragraph on page B-27 of the 2014 Draft EIS/EIR is revised as follows:

> Figure *C*~~B-24~~*25* illustrates change in Feather River flow below Thermalito.

Page B-28

The title for Figure B-24 on page B-28 of the 2014 Draft EIS/EIR is revised as follows:

> **Figure *C*~~B-24~~*25*. Feather River below Thermalito with and without Alternative 2 Transfers**

The first sentence on the second paragraph on page B-28 of the 2014 Draft EIS/EIR is revised as follows:

> Figure *C*~~B-25~~*26* illustrates changes in flow on the Yuba River at Marysville as a result of Browns Valley ID's transfers of conserved water from New Bullards Bar Reservoir and reservoir release from Merle Collins Reservoir.

The title for Figure B-25 on page B-28 of the 2014 Draft EIS/EIR is revised as follows:

> **Figure *C*~~B-25~~*26*. Yuba River at Marysville with and without Alternative 2 Transfers**

The last sentence on page B-28 of the 2014 Draft EIS/EIR is revised as follows:

> Figure *C*~~B-26~~*27* illustrates the response of Bear River flows into the Feather River as a result of South Sutter WD reservoir release transfers from Camp Far West Reservoir.

Page B-29

The title for Figure B-26 on page B-29 of the 2014 Draft EIS/EIR is revised as follows:

> **Figure *C*~~B-26~~*27*. Bear River to the Feather River with and without Alternative 2 Transfers**

The last sentence in the second paragraph on page B-29 of the 2014 Draft EIS/EIR is revised as follows:

> Figure *C*~~B-27~~*28* illustrates the effect to the Feather River.

The title for Figure B-27 on page B-29 of the 2014 Draft EIS/EIR is revised as follows:

> **Figure *C*~~B-27~~*28*. Lower Feather River with and without Alternative 2 Transfers**

The first sentence of the last paragraph on page B-29 of the 2014 Draft EIS/EIR is revised as follows:

> Figure *C*~~B-28~~*29* illustrates the flow of the Sacramento River at Freeport.

Page B-30

The second complete paragraph on page B-30 of the 2014 Draft EIS/EIR is revised as follows:

> These changes are also illustrated above in Figure *C*~~B-6~~*7*.

The title for Figure B-28 on page B-30 of the 2014 Draft EIS/EIR is revised as follows:

> **Figure *C*~~B-28~~*29*. Sacramento River at Freeport with and without Alternative 2 Transfers**

The first sentence in the second paragraph on page B-30 of the 2014 Draft EIS/EIR is revised as follows:

> Figure *C*~~B-29~~*30* illustrates the changes on the Merced River at the confluence with the San Joaquin River.

The title for Figure B-29 on page B-30 of the 2014 Draft EIS/EIR is revised as follows:

> **Figure *C*~~B-29~~*30*. Merced River at the San Joaquin River with and without Alternative 2 Transfers**

The last complete sentence on page B-30 of the 2014 Draft EIS/EIR is revised as follows:

> Figure *C*~~B-30~~*31* illustrates San Joaquin River flows at Vernalis.

Page B-31

The title for Figure B-30 on page B-31 of the 2014 Draft EIS/EIR is revised as follows:

> **Figure *C*~~B-30~~*31*. San Joaquin River at Vernalis with and without Alternative 2 Transfers**

The second complete sentence on page B-31 of the 2014 Draft EIS/EIR is revised as follows:

> Changes to Delta outflow are illustrated below in Figure *C*~~B-31~~*32*.

The title for Figure B-31 on page B-31 of the 2014 Draft EIS/EIR is revised as follows:

> **Figure *C*~~B-31~~*32*. Delta Outflow with and without Alternative 2 Transfers**

Page B-32

The first sentence in Section B.6.2.3, entitled *Exports and Diversion*, on page B-32 of the 2014 Draft EIS/EIR is revised as follows:

> Figure *C*~~B-32~~*33* illustrates the change in exports at Jones Pumping Plant.

The title for Figure B-32 on page B-32 of the 2014 Draft EIS/EIR is revised as follows:

> **Figure *C*~~B-32~~*33*. Exports at Jones Pumping Plant with and without Alternative 2 Transfers**

Page B-33

The third sentence on page B-33 of the 2014 Draft EIS/EIR is revised as follows:

> This is illustrated below in Figure *C*~~B-33~~*34*.

The title for Figure B-33 on page B-33 of the 2014 Draft EIS/EIR is revised as follows:

> **Figure *C*~~B-33~~*34*. Exports at Banks Pumping Plant with and without Alternative 2 Transfers**

The last sentence on page B-33 of the 2014 Draft EIS/EIR is revised as follows:

> Total CVP/SWP exports, the sum of exports at Jones and Banks Pumping Plants, are illustrated in Figure *C*~~B-34~~*35*.

Page B-34

The title for Figure B-34 on page B-34 of the 2014 Draft EIS/EIR is revised as follows:

> **Figure *C*~~B-34~~*36*. Total CVP/SWP Exports from the Delta with and without Alternative 2 Transfers**

The following text on page B-34 of the 2014 Draft EIS/EIR is revised as follows:

> Figure *C*~~B-35~~*36* illustrates changes in diversions by East Bay MUD at Freeport.

Page B-35

The title for Figure B-35 on page B-35 of the 2014 Draft EIS/EIR is revised as follows:

> **Figure *C*~~B-35~~*36*. East Bay MUD Diversions with and without Alternative 2 Transfers**

The first sentence on page B-35 of the 2014 Draft EIS/EIR is revised as follows:

> Contra Costa WD diversions increase to take delivery of transfer water as illustrated below in Figure *C*~~B-36~~*37*.

The title for Figure B-36 on page B-35 of the 2014 Draft EIS/EIR is revised as follows:

> **Figure *C*~~B-36~~*37*. Contra Costa WD Diversions with and without Alternative 2 Transfers**

Page B-36

The first sentence on page B-36 of the 2014 Draft EIS/EIR is revised as follows:

> Figure *C*~~B-37~~*38* summarizes the quantity of transfer water made available (Transfer Supply) under Alternative 3 on an annual basis, and illustrates where the water is diverted (Transfer Use).

The title for Figure B-37 on page B-36 of the 2014 Draft EIS/EIR is revised as follows:

> **Figure *C*~~B-37~~*38*. Annual Transfer Summary for Alternative 3**

The first sentence in Section B.6.3.1, entitled *Storage*, on page B-36 of the 2014 Draft EIS/EIR is revised as follows:

> Changes in the operation of Shasta under Alternative 3 are similar to changes under Alternative 2 (see Figure *C*~~B-38~~*39*).

Page B-37

The title for Figure B-38 on page B-37 of the 2014 Draft EIS/EIR is revised as follows:

> **Figure *C*~~B-38~~*39*. Shasta Operations with and without Alternative 3 Transfers**

The second sentence on page B-37 of the 2014 Draft EIS/EIR is revised as follows:

> This operation can result in temporary changes in storage, as illustrated in Figure *C*~~B-39~~*40*.

The title for Figure B-39 on page B-37 of the 2014 Draft EIS/EIR is revised as follows:

> **Figure *C*~~B-39~~*40*. Folsom Operations with and without Alternative 3 Transfers**

The first sentence of the second paragraph on page B-37 of the 2014 Draft EIS/EIR is revised as follows:

> Figure *C*~~B-40~~*41* illustrates the change in operations at Oroville.

The title for Figure B-40 on page B-37 of the 2014 Draft EIS/EIR is revised as follows:

> **Figure *C*~~B-40~~*41*. Oroville Operations with and without Alternative 3 Transfers**

Page B-38

The second sentence on page B-38 of the 2014 Draft EIS/EIR is revised as follows:

> Figure *C*~~B-41~~*42* illustrates the only change in reservoir storage from baseline conditions as the quantity released for transfer.

The title for Figure B-41 on page B-38 of the 2014 Draft EIS/EIR is revised as follows:

> **Figure *C*~~B-41~~*42*. Camp Far West Operations with and without Alternative 3 Transfers**

The second sentence of the second paragraph on page B-38 of the 2014 Draft EIS/EIR is revised as follows:

> Figure *C*~~B-42~~*43* illustrates the only change in reservoir storage from baseline conditions as the quantity released for transfer, up to five TAF in any year.

The title for Figure B-42 on page B-38 of the 2014 Draft EIS/EIR is revised as follows:

> **Figure *C*~~B-42~~*43*. Merle Collins Operations with and without Alternative 3 Transfers**

Page B-39

The first incomplete sentence on page B-39 of the 2014 Draft EIS/EIR is revised as follows:

> Figure *C*~~B-43~~*44* illustrates the combined storage in these two reservoirs under both baseline and with Project operations.

The title for Figure B-43 on page B-39 of the 2014 Draft EIS/EIR is revised as follows:

> **Figure *C*~~B-43~~*44*. MFP Operations with and without Alternative 3 Transfers**

The following sentence on page B-39 of the 2014 Draft EIS/EIR is revised as follows:

> Figure *C*~~B-44~~*45* illustrates change in storage of Lake McClure due to reservoir release transfers.

The title for Figure B-44 on page B-39 of the 2014 Draft EIS/EIR is revised as follows:

> **Figure *C*~~B-44~~*45*. Lake McClure Operations with and without Alternative 3 Transfers**

The last sentence on page B-39 of the 2014 Draft EIS/EIR is revised as follows:

> These releases of stored water are the primary effect to New Bullards Bar Reservoir as illustrated below in Figure *C*~~B-45~~*46*.

Page B-40

The title for Figure B-45 on page B-40 of the 2014 Draft EIS/EIR is revised as follows:

> **Figure *C*~~B-45~~*46*. New Bullards Bar Operations with and without Alternative 3 Transfers**

The first sentence on page B-40 of the 2014 Draft EIS/EIR is revised as follows:

> Releases from Keswick Dam, as illustrated below in Figure *C*~~B-46~~*47*, reflect changes in Shasta storage seen in Figure *C*~~B-38~~*39*.

The title for Figure B-46 on page B-40 of the 2014 Draft EIS/EIR is revised as follows:

> **Figure *C*~~B-46~~*47*. Keswick Dam Release with and without Alternative 3 Transfers**

The first sentence of the second paragraph on page B-40 of the 2014 Draft EIS/EIR is revised as follows:

> Figure *C*~~B-47~~*48* illustrates the effect to flows on the Sacramento River at Wilkins Slough.

Page B-41

The title for Figure B-47 on page B-41 of the 2014 Draft EIS/EIR is revised as follows:

> **Figure *C*~~B-47~~*48*. Sacramento River at Wilkins Slough with and without Alternative 3 Transfers**

The first complete sentence on page B-41 of the 2014 Draft EIS/EIR is revised as follows:

> Figure *C*~~B-48~~*49* illustrates Nimbus Dam releases under baseline and with Alternate 3 transfers.

The title for Figure B-48 on page B-41 of the 2014 Draft EIS/EIR is revised as follows:

> **Figure *C*~~B-48~~*49*. Nimbus Dam Release with and without Alternative 3 Transfers**

Page B-42

The last sentence of the first paragraph on page B-42 of the 2014 Draft EIS/EIR is revised as follows:

> Figure *C*~~B-49~~*50* is a comparison of flows under baseline and Alternative 3.

The title for Figure B-49 on page B-42 of the 2014 Draft EIS/EIR is revised as follows:

> **Figure *C*~~B-49~~*50*. American River at H Street with and without Alternative 3 Transfers**

The first sentence of the second paragraph on page B-42 of the 2014 Draft EIS/EIR is revised as follows:

> Figure *C*~~B-50~~*51* illustrates changes in Feather River flow downstream from Thermalito.

Page B-43

The title for Figure B-50 on page B-43 of the 2014 Draft EIS/EIR is revised as follows:

> **Figure *C*~~B-50~~*51*. Feather River below Thermalito with and without Alternative 3 Transfers**

The first sentence of the last paragraph on page B-43 of the 2014 Draft EIS/EIR is revised as follows:

> Figure *C*~~B-52~~*53* illustrates the monthly flow of the Bear River at the confluence with the Feather River.

Page B-44

The title for Figure B-52 on page B-44 of the 2014 Draft EIS/EIR is revised as follows:

> **Figure *C*~~B-52~~*53*. Bear River to the Feather River with and without Alternative 3 Transfers**

The following sentence on page B-44 of the 2014 Draft EIS/EIR is revised as follows:

> Figure C~~B-53~~*54* illustrates flows and changes in flows for the baseline and Alternative 3.

The title for Figure B-53 on page B-44 of the 2014 Draft EIS/EIR is revised as follows:

> **Figure *C*~~B-53~~*54*. Lower Feather River with and without Alternative 3 Transfers**

The first sentence of the last paragraph on page B-44 of the 2014 Draft EIS/EIR is revised as follows:

> Figure *C*~~B-54~~*55* illustrates Sacramento River at Freeport under baseline and Alternative 3 transfers.

Page B-45

The second complete sentence on page B-45 of the 2014 Draft EIS/EIR is revised as follows:

> These changes are also illustrated above in Figure *C*~~B-6~~*7*.

The title of Figure B-54 on page B-45 of the 2014 Draft EIS/EIR is revised as follows:

> **Figure *C*~~B-54~~*55*. Sacramento River at Freeport with and without Alternative 3 Transfers**

The following sentence on page B-45 of the 2014 Draft EIS/EIR is revised as follows:

> Figure *C*~~B-55~~*56* illustrates changes on the Merced River at the confluence with the San Joaquin River.

The title of Figure B-55 on page B-45 of the 2014 Draft EIS/EIR is revised as follows:

> **Figure *C*~~B-55~~*56*. Merced River at the San Joaquin River with and without Alternative 3 Transfers**

The following sentence on page B-45 of the 2014 Draft EIS/EIR is revised as follows:

> Figure *C*~~B-56~~*57* illustrates San Joaquin River flows at Vernalis.

Page B-46

The title of Figure B-56 on page B-46 of the 2014 Draft EIS/EIR is revised as follows:

> **Figure *C*~~B-56~~*57*. San Joaquin River at Vernalis with and without Alternative 3 Transfers**

The first complete sentence on page B-46 of the 2014 Draft EIS/EIR is revised as follows:

> Changes to Delta outflow are illustrated below in Figure *C*~~B-57~~*58*.

The title of Figure B-57 on page B-46 of the 2014 Draft EIS/EIR is revised as follows:

> **Figure *C*~~B-57~~*58*. Delta Outflow with and without Alternative 3 Transfers**

Page B-47

The first sentence on page B-47 of the 2014 Draft EIS/EIR is revised as follows:

> Figure *C*~~B-58~~*59* illustrates the change in exports at Jones Pumping Plant.

The title of Figure B-58 on page B-47 of the 2014 Draft EIS/EIR is revised as follows:

> **Figure *C*~~B-58~~*59*. Exports at Jones Pumping Plant with and without Alternative 3 Transfers**

The last sentence on page B-47 of the 2014 Draft EIS/EIR is revised as follows:

> This is illustrated below in Figure *C*~~B-59~~*60*.

Page B-48

The title of Figure B-59 on page B-48 of the 2014 Draft EIS/EIR is revised as follows:

> **Figure *C*~~B-59~~*60*. Exports at Banks Pumping Plant with and without Alternative 3 Transfers**

The last sentence on page B-48 of the 2014 Draft EIS/EIR is revised as follows:

> Total CVP/SWP exports, the sum of exports at Jones and Banks Pumping Plants, are illustrated in Figure *C*~~B-60~~*61*.

Page B-49

The title of Figure B-60 on page B-49 of the 2014 Draft EIS/EIR is revised as follows:

> **Figure *C*~~B-60~~*61*. Total CVP/SWP Exports from the Delta with and without Alternative 3 Transfers**

The following sentence on page B-49 of the 2014 Draft EIS/EIR is revised as follows:

> Figure *C*~~B-61~~*62* illustrates baseline, Alternative 3, and the change in East Bay MUD diversions at Freeport.

Page B-50

The title of Figure B-61 on page B-50 of the 2014 Draft EIS/EIR is revised as follows:

> **Figure *C*~~B-61~~*62*. East Bay MUD Diversions with and without Alternative 3 Transfers**

The first sentence on page B-50 of the 2014 Draft EIS/EIR is revised as follows:

> Contra Costa WD diversions increase to take delivery of transfer water as illustrated below in Figure *C*~~B-62~~*63*.

The title of Figure B-62 on page B-50 of the 2014 Draft EIS/EIR is revised as follows:

> **Figure *C*~~B-62~~*63*. Contra Costa WD Diversions with and without Alternative 3 Transfers**

Page B-51

The first sentence on page B-51 of the 2014 Draft EIS/EIR is revised as follows:

> Figure *C*~~B-63~~*64* summarizes the quantity of transfer water made available under Alternative 4 on an annual basis and illustrates where the water is diverted or used.

The title of Figure B-63 on page B-51 of the 2014 Draft EIS/EIR is revised as follows:

> **Figure *C*~~B-63~~*64*. Annual Transfers Summary for Alternative 4**

The following sentence on page B-51 of the 2014 Draft EIS/EIR is revised as follows:

> Figure *C*~~B-64~~*65* illustrates the change in operations at Shasta with the Project.

Page B-52

The title of Figure B-64 on page B-52 of the 2014 Draft EIS/EIR is revised as follows:

> **Figure *C*~~B-64~~*65*. Shasta Operations with and without Alternative 4 Transfers**

The first sentence on page B-52 of the 2014 Draft EIS/EIR is revised as follows:

> Operations at Folsom under Alternative 4 are illustrated below in Figure *C*~~B-65~~*66*.

The title of Figure B-65 on page B-52 of the 2014 Draft EIS/EIR is revised as follows:

> **Figure *C*~~B-65~~*66*. Folsom Operations with and without Alternative 4 Transfers**

The following sentence on page B-52 of the 2014 Draft EIS/EIR is revised as follows:

> Figure *C*~~B-66~~*67* illustrates the change in SWP operations at Oroville.

The title of Figure B-66 on page B-52 of the 2014 Draft EIS/EIR is revised as follows:

> **Figure *C*~~B-66~~*67*. Oroville Operations with and without Alternative 4 Transfers**

Page B-53

The second sentence on page B-53 of the 2014 Draft EIS/EIR is revised as follows:

> Figure *C*~~B-67~~*68* illustrates the only change in reservoir storage from baseline conditions as the quantity released for transfer.

The title of Figure B-67 on page B-53 of the 2014 Draft EIS/EIR is revised as follows:

> **Figure *C*~~B-67~~*68*. Camp Far West Operations with and without Alternative 4 Transfers**

The following sentence on page B-53 of the 2014 Draft EIS/EIR is revised as follows:

> Figure *C*~~B-68~~*69* illustrates Browns Valley ID operations of Merle Collins when making reservoir release transfers of up to five TAF.

The title of Figure B-68 on page B-53 of the 2014 Draft EIS/EIR is revised as follows:

Figure *C*~~B-68~~*69*. Merle Collins Operations with and without Alternative 4 Transfers

Page B-54

The first incomplete sentence on page B-54 of the 2014 Draft EIS/EIR is revised as follows:

> Changes in MFP storage are the same for Alternatives 2, 3, and 4 because all alternatives include reservoir release transfer measures (see Figure *C*~~B-69~~*70*).

The title of Figure B-69 on page B-54 of the 2014 Draft EIS/EIR is revised as follows:

Figure *C*~~B-69~~*70*. MFP Operations with and without Alternative 4 Transfers

The following text on page B-54 of the 2014 Draft EIS/EIR is revised as follows:

> Figure *C*~~B-70~~*71* illustrates Merced ID operations of Lake McClure when making reservoir release transfers of up to 30 TAF.

The title of Figure B-70 on page B-54 of the 2014 Draft EIS/EIR is revised as follows:

Figure *C*~~B-70~~*71*. Lake McClure Operations with and without Alternative 4 Transfers

The following text on page B-54 of the 2014 Draft EIS/EIR is revised as follows:

> These releases of conserved water are the only effect to New Bullards Bar Reservoir as illustrated below in Figure *C*~~B-71~~*72*.

Page B-55

The title of Figure B-71 on page B-55 of the 2014 Draft EIS/EIR is revised as follows:

Figure *C*~~B-71~~*72*. New Bullards Bar Operations with and without Alternative 4 Transfers

The first sentence on page B-55 of the 2014 Draft EIS/EIR is revised as follows:

> Releases from Keswick Dam correspond with Shasta operations as illustrated below in Figure *C*~~B-72~~*73*.

The title of Figure B-72 on page B-55 of the 2014 Draft EIS/EIR is revised as follows:

Figure *C*~~B-72~~*73*. Keswick Dam Release with and without Alternative 4 Transfers

The following text on page B-55 of the 2014 Draft EIS/EIR is revised as follows:

> Figure *C*~~B-73~~*74* illustrates the effect of Alternative 4 transfers to the Sacramento River at Wilkins Slough.

Page B-56

The title of Figure B-73 on page B-56 of the 2014 Draft EIS/EIR is revised as follows:

> **Figure *C*~~B-73~~*74*. Sacramento River at Wilkins Slough with and without Alternative 4 Transfers**

The first sentence on page B-56 of the 2014 Draft EIS/EIR is revised as follows:

> Figure *C*~~B-74~~*75* illustrates Nimbus Dam releases.

The title of Figure B-74 on page B-56 of the 2014 Draft EIS/EIR is revised as follows:

> **Figure *C*~~B-74~~*75*. Nimbus Dam Release with and without Alternative 4 Transfers**

The last sentence on page B-56 of the 2014 Draft EIS/EIR is revised as follows:

> Flows on the American River at H Street, illustrated below in Figure *C*~~B-75~~*76*, reflect the same changes in flow under Alternative 4 as illustrated above at Nimbus.

Page B-57

The title of Figure B-75 on page B-57 of the 2014 Draft EIS/EIR is revised as follows:

> **Figure *C*~~B-75~~*76*. American River at H Street with and without Alternative 4 Transfers**

The first sentence on page B-57 of the 2014 Draft EIS/EIR is revised as follows:

> Figure *C*~~B-76~~*77* illustrates change in Feather River flow below Thermalito. Feather River flows change due to changes in operations at Oroville.

The title of Figure B-76 on page B-57 of the 2014 Draft EIS/EIR is revised as follows:

> **Figure *C*~~B-76~~*77*. Feather River below Thermalito with and without Alternative 4 Transfers**

The last sentence on page B-57 of the 2014 Draft EIS/EIR is revised as follows:

> Figure *C*~~B-77~~*78* illustrates changes in flow on the Yuba River as a result of Browns Valley ID's reservoir release transfers from Merle Collins Reservoir and release of Browns Valley ID's conserved water from New Bullards Bar Reservoir. Decreases occur when these reservoirs refill.

Page B-58

The title of Figure B-77 on page B-58 of the 2014 Draft EIS/EIR is revised as follows:

> **Figure *C*~~B-77~~*78*. Yuba River at Marysville with and without Alternative 4 Transfers**

The first sentence on page B-58 of the 2014 Draft EIS/EIR is revised as follows:

> Figure *C*~~B-78~~*79* illustrates the response of Bear River flows into the Feather River as a result of South Sutter WD reservoir release transfers from Camp Far West Reservoir.

The title of Figure B-78 on page B-58 of the 2014 Draft EIS/EIR is revised as follows:

> **Figure *C*~~B-78~~*79*. Bear River to the Feather River with and without Alternative 4 Transfers**

The last sentence on page B-58 of the 2014 Draft EIS/EIR is revised as follows:

> Figure *C*~~B-79~~*80* represents the effect to the Feather River system.

Page B-59

The title of Figure B-79 on page B-59 of the 2014 Draft EIS/EIR is revised as follows:

> **Figure *C*~~B-79~~*80*. Lower Feather River with and without Alternative 4 Transfers**

The first sentence on page B-59 of the 2014 Draft EIS/EIR is revised as follows:

> Figure *C*~~B-80~~*81* illustrates the flow of the Sacramento River at Freeport.

The title of Figure B-80 on page B-59 of the 2014 Draft EIS/EIR is revised as follows:

> **Figure *C*~~B-80~~*81*. Sacramento River at Freeport with and without Alternative 4 Transfers**

The following sentence on page B-59 of the 2014 Draft EIS/EIR is revised as follows:

> Figure *C*~~B-81~~*82* illustrates changes on the Merced River at the confluence with the San Joaquin River.

Page B-60

The title of Figure B-81 on page B-60 of the 2014 Draft EIS/EIR is revised as follows:

> **Figure *C*~~B-81~~*82*. Merced River at the San Joaquin River with and without Alternative 4 Transfers**

The first sentence on page B-60 of the 2014 Draft EIS/EIR is revised as follows:

> Figure *C*~~B-82~~*83* illustrates San Joaquin River flows at Vernalis. Increases in flow result from Merced ID transfers.

The title of Figure B-82 on page B-60 of the 2014 Draft EIS/EIR is revised as follows:

> **Figure *C*~~B-82~~*83*. San Joaquin River at Vernalis with and without Alternative 4 Transfers**

The following sentence on page B-60 of the 2014 Draft EIS/EIR is revised as follows:

> Changes to Delta outflow are illustrated below in Figure *C*~~B-83~~*84*.

Page B-61

The title of Figure B-83 on page B-61 of the 2014 Draft EIS/EIR is revised as follows:

> **Figure B-~~83~~*84*. Delta Outflow with and without Alternative 4 Transfers**

The first sentence in Section B.6.4.3, entitled *Exports and Diversion*, on page B-61 of the 2014 Draft EIS/EIR is revised as follows:

> Figure *C*~~B-84~~*85* illustrates the change in exports at Jones Pumping Plant.

Page B-62

The title of Figure B-84 on page B-62 of the 2014 Draft EIS/EIR is revised as follows:

> **Figure *C*~~B-84~~*85*. Exports at Jones Pumping Plant with and without Alternative 4 Transfers**

The last sentence on page B-62 of the 2014 Draft EIS/EIR is revised as follows:

> These changes are illustrated below in Figure *C*~~B-85~~*86*.

Page B-63

The title of Figure B-85 on page B-63 of the 2014 Draft EIS/EIR is revised as follows:

> **Figure *C*~~B-85~~*86*. Exports at Banks Pumping Plant with and without Alternative 4 Transfers**

The second sentence on page B-63 of the 2014 Draft EIS/EIR is revised as follows:

> Total CVP/SWP exports, the sum of exports at Jones and Banks Pumping Plants, are illustrated in Figure *C*~~B-86~~*87*.

The title of Figure B-86 on page B-63 of the 2014 Draft EIS/EIR is revised as follows:

> **Figure *C*~~B-86~~*87*. Total CVP/SWP Exports from the Delta with and without Alternative 4 Transfers**

Page B-64

The following sentence on page B-64 of the 2014 Draft EIS/EIR is revised as follows:

> Figure *C*~~B-87~~*88* illustrates diversions made by East Bay MUD at Freeport under both the baseline and with Project scenarios.

The title of Figure B-87 on page B-64 of the 2014 Draft EIS/EIR is revised as follows:

> **Figure *C*~~B-87~~*88*. East Bay MUD Diversions with and without Alternative 4 Transfers**

The last sentence on page B-64 of the 2014 Draft EIS/EIR is revised as follows:

> Contra Costa WD diversions increase to take delivery of transfer water as is illustrated below in Figure *C*~~B-88~~*89*.

Page B-65

The title of Figure B-88 on page B-65 of the 2014 Draft EIS/EIR is revised as follows:

> **Figure *C*~~B-88~~*89*. Contra Costa WD Diversions with and without Alternative 4 Transfers**

Attachment 1: CalSim II Assumptions for Baseline Operations of the 2014 Draft EIS/EIR

Page B-71

Footnote 22 on page B-71 is revised as follows:

> Delta actions, under USFWS discretionary use of CVPIA 3406(b)(2) allocations, are no longer dynamically operated and accounted for in the CalSim II model. The Combined Old and Middle River Flow and Delta Export restrictions under the USFWS BO (Dec 15th 2008) and the NOAA Fisheries BO (June 4th 2009) severely limit any discretion that would have been otherwise assumed in selecting Delta ~~actionsunder~~ *actions under* the CVPIA 3406(b)(2) accounting criteria. Therefore, it is anticipated that CVPIA 3406(b)(2) account availability for upstream river flows below Whiskeytown, Keswick and Nimbus Dams would be very limited. It appears the integration of BO Reasonable and Prudent Alternative actions will likely exceed the 3406(b)(2) allocation in all water year types. Upstream flows on Clear Creek and the Sacramento River are pre-determined based on CVPIA 3406(b)(2) based operations from the Aug 2008 BA Study 7.0 and Study 8.0 for Existing Conditions baselines. The procedures for dynamic operation and accounting of CVPIA 3406(b)(2) are not included in CalSim II.

Attachment 2: Monthly Simulated Transfers by Seller for each Alternative

Appendix B of the 2014 Draft EIS/EIR is revised to include Monthly Simulated Transfers by Seller for each Alternative. The full attachment is included below.

> ***Monthly Simulated Transfers by Seller for each Alternative***
>
> The following tables show the volume of water simulated as transferred by each seller for each alternative. A separate table is included for each type of transfer: groundwater substitution, reservoir release, conserved water, and crop idling.

Table *C*~~D~~.2-1. Simulated Groundwater Substitution Transfers for Alternatives 2 & 3 (1,000 acre-feet)

WY	Apr	May	Jun	Jul	Aug	Sep	Total
Conaway Preservation Group							
1976	0.0	0.0	8.6	5.4	5.4	2.7	22.1

WY	Apr	May	Jun	Jul	Aug	Sep	Total
1977	0.0	0.0	10.0	4.0	4.0	2.0	20.1
1981	0.0	0.0	8.6	5.4	5.4	2.7	22.1
1987	4.3	8.6	8.6	5.4	5.4	2.7	35.0
1988	0.0	8.6	8.6	5.4	5.4	2.7	30.7
1989	0.0	8.6	8.6	5.4	5.4	2.7	30.7
1990	0.0	0.0	8.6	5.4	5.4	2.7	22.1
1991	0.0	0.0	10.0	4.0	4.0	2.0	20.1
1992	5.0	10.0	10.0	4.0	4.0	2.0	35.0
1994	0.0	0.0	0.5	4.0	4.0	2.0	10.6
2001	0.0	8.6	8.6	5.4	5.4	2.7	30.7
2003	0.0	0.0	0.0	5.4	5.4	2.7	13.5
Natomas Central Mutual Water Company							
1976	0.0	0.0	6.0	6.0	6.0	3.0	21.0
1977	0.0	0.0	6.0	6.0	6.0	3.0	21.0
1981	0.0	0.0	6.0	6.0	6.0	3.0	21.0
1987	3.0	6.0	6.0	6.0	6.0	3.0	30.0
1988	0.0	6.0	6.0	6.0	6.0	3.0	27.0
1989	0.0	6.0	6.0	6.0	6.0	3.0	27.0
1990	0.0	0.0	6.0	6.0	6.0	3.0	21.0
1991	0.0	0.0	6.0	6.0	6.0	3.0	21.0
1992	3.0	6.0	6.0	6.0	6.0	3.0	30.0
1994	0.0	0.0	0.0	6.0	6.0	3.0	15.0
2001	0.0	6.0	6.0	6.0	6.0	3.0	27.0
2003	0.0	0.0	0.0	6.0	6.0	3.0	15.0
Sacramento Suburban Water District*							
1976	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1977	0.0	0.0	0.0	0.0	1.8	0.0	1.8
1981	0.0	0.0	0.0	1.8	0.0	0.0	1.8
1987	0.0	0.0	0.0	1.8	0.0	0.0	1.8
1988	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1989	0.0	5.0	5.0	5.0	5.0	5.0	25.0
1990	0.0	0.0	0.0	1.8	0.0	0.0	1.8
1991	0.0	0.0	0.0	1.8	1.8	0.0	3.7
1992	0.0	0.0	0.0	1.8	0.0	0.0	1.8
1994	0.0	0.0	0.0	1.8	0.0	0.0	1.8
2001	0.0	0.0	0.0	1.8	0.0	0.0	1.8
2003	0.0	0.0	0.0	5.0	5.0	5.0	15.0

*Sacramento Suburban WD simulated to pump 3,800 acre-feet in October 1989 for transfer to EBMUD

Table C~~D~~.2-1. Simulated Groundwater Substitution Transfers for Alternatives 2 & 3 (1,000 acre-feet)

WY	Apr	May	Jun	Jul	Aug	Sep	Total
Glenn-Colusa Irrigation District							

WY	Apr	May	Jun	Jul	Aug	Sep	Total
1976	4.2	4.2	4.2	4.2	4.2	4.2	25.0
1977	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1981	4.2	4.2	4.2	4.2	4.2	4.2	25.0
1987	4.2	4.2	4.2	4.2	4.2	4.2	25.0
1988	4.2	4.2	4.2	4.2	4.2	4.2	25.0
1989	0.0	3.8	3.7	3.0	3.0	2.9	16.4
1990	0.0	4.2	4.2	4.2	4.2	4.2	20.8
1991	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1992	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1994	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2001	4.2	4.2	4.2	4.2	4.2	4.2	25.0
2003	0.0	0.0	0.0	4.2	4.2	4.2	12.5
Pleasant Grove-Verona Mutual Water Company							
1976	0.0	0.0	3.2	4.0	4.0	2.0	13.2
1977	0.0	0.0	3.2	2.8	2.8	1.4	10.2
1981	0.0	0.0	3.2	4.0	4.0	2.0	13.2
1987	1.6	3.2	3.2	4.0	4.0	2.0	18.0
1988	0.0	3.2	3.2	4.0	4.0	2.0	16.4
1989	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1990	0.0	0.0	3.2	4.0	4.0	2.0	13.2
1991	0.0	0.0	3.2	2.8	2.8	1.4	10.2
1992	1.6	3.2	3.2	2.8	2.8	1.4	15.0
1994	0.0	0.0	0.0	2.8	2.8	1.4	7.0
2001	0.0	3.2	3.2	4.0	4.0	2.0	16.4
2003	0.0	0.0	0.0	0.8	0.8	0.4	2.1
Reclamation District 108							
1976	2.5	2.5	2.5	2.5	2.5	2.5	15.0
1977	0.0	2.5	2.5	2.5	2.5	2.5	12.5
1981	1.5	1.5	1.5	2.5	2.5	2.5	12.1
1987	2.5	2.5	2.5	2.5	2.5	2.5	15.0
1988	2.5	2.5	2.5	2.5	2.5	2.5	15.0
1989	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1990	0.0	2.5	2.5	2.5	2.5	2.5	12.5
1991	0.0	2.5	2.5	2.5	2.5	2.5	12.5
1992	2.5	2.5	2.5	2.5	2.5	2.5	15.0
1994	2.5	2.5	2.5	2.5	2.5	2.5	15.0
2001	2.5	2.5	2.5	2.5	2.5	2.5	15.0
2003	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Appendix C, Delta Conditions Assessment of the 2014 Draft EIS/EIR

As previously stated, Appendix C, Delta Conditions Assessment, of the 2014 Draft EIS/EIR is re-lettered to Appendix E in this Final EIS/EIR

Page C-5

The first sentence on page C-5 of the 2014 Draft EIS/EIR is revised as follows:

The DICU model provides time series of values that are applied as boundary conditions on a monthly average basis[2,3] (DWR, ~~1995a~~*1995*; DWR 2002) in DSM2 at 257[4] locations throughout the Delta – these locations are subdivided into 142 regions.

Page C-11

The title of Table C-1 on page C-11 of the 2014 Draft EIS/EIR is revised as follows:

Table *E*~~C~~-1. Monthly Average Difference in Sacramento River Inflow (~~Cfs~~*cfs*) between the All Transfers and Base Alternatives, (All Transfers – Base). The Lower Table Computes Average Monthly Differences.

Page C-38

The following text on page C-38 of the 2014 Draft EIS/EIR is revised as follows:

1. the daily minimum stage was calculated for all the Base and three Alternative from the 15-minute model output
2. daily change from Base stage was calculated (Daily Alternative Min Stage – Daily Base Min Stage)
3. monthly average stage was calculated from the results at step 2.
4. *overall monthly averages and averages by Water Year type were calculated*

The following text is inserted after the second paragraph on page C-38 of the 2014 Draft EIS/EIR is revised as follows:

In addition, there is the potential for stage increases which would be considered a benefit during low flow conditions or during the summer particularly in dry or critical years. To this end, an additional calculation was made in which a conservative estimate of increase in stage was similarly made as:

1. *the daily maximum stage was calculated for all the Base and three Alternative from the 15-minute model output*
2. *daily change from Base stage was calculated (Daily Alternative Max Stage – Daily Base Max Stage)*
3. *monthly average stage was calculated from the results at step 2.*
4. *overall monthly maximum and monthly maximum by Water Year type were calculated.*

The first three sentences of the last paragraph on page C-38 of the 2014 Draft EIS/EIR is revised as follows:

A selection of results for ~~three~~*several* of these locations ~~are~~*is* shown in this section to illustrate the general results ~~the~~. *The* complete set of stage results is found in the Attachment. The largest differences *for stage decrease* from Base ~~stage~~ occurred for the All Transfers alternative, as this alternative had the greatest increases over Base exports for SWP and CVP in the south Delta.

Page C-39

The text was inserted after the incomplete paragraph on page C-39 of the 2014 Draft EIS/EIR is revised as follows:

> *The results for stage increases highlighted the "No Groundwater Substitution" alternative in both the minimum and maximum stage difference calculations. This Alternative was the only one in which either maximum or minimum stage increased. Table E~~C~~-28 shows increases maximum stage difference for the location in Middle River (RMID040) in July for several Dry (1981, 2001) and Critical (1992) Water Years. Table E~~C~~-29 shows an increase in the minimum stage difference for the location at Old River near Middle River (RMID040) in July of 1981, 2001. Note that stage increases for the No Groundwater substitution Alternative are among the smallest of the all the Alternatives, so it is not surprising that stage increases also occur at several locations.*

Page C-42

The title of Table C-27 on page C-42 of the 2014 Draft EIS/EIR is revised as follows:

> **Table *E*~~C~~-1. Difference in Minimum Stage (ft) at Old River near Middle River Location for All Transfers Minus Base ~~Alternatives~~*Alternative*.**

Page C-43

The following tables are inserted after Figure C-21 on page C-43 of the 2014 Draft EIS/EIR is revised as follows:

Table E~~C~~-2. Difference in Maximum Stage (ft) at the Middle River Location (RMID040) for the No Groundwater Substitution Alternative.

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1971	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1972	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1973	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1974	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1975	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1976	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	0.0
1977	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	0.0
1978	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1979	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1980	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1981	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**0.2**	0.0	0.0
1982	0.0	0.0	0.0	0.0	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1983	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1984	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1985	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1986	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1987	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0
1988	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	0.0
1989	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1990	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	0.0
1991	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	0.0
1992	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**0.1**	0.0	0.0
1993	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	0.0	0.0
1994	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0
1995	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1996	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1997	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1998	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1999	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2001	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**0.1**	0.0	0.0
2002	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2003	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Maximum	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**0.2**	0.0	0.0
Critical	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**0.1**	0.0	0.0
Dry	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**0.2**	0.0	0.0
BN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Wet	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table E~~C~~-3. Difference in Minimum Stage (ft) at the Middle River Location (RMID040) for the No Groundwater Substitution Alternative.

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1971	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1972	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1973	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1974	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1975	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1976	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1977	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1978	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1979	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1980	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1981	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0
1982	0.0	0.0	0.0	0.0	-0.2	-0.1	0.0	0.0	0.0	0.0	0.0	0.0
1983	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1984	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1985	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1986	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1987	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1988	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1989	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1990	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1991	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1992	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1993	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.2	0.0	0.0	0.0
1994	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0
1995	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1996	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1997	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1998	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1999	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2001	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2002	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2003	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Average	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Critical	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Dry	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
BN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Wet	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

The first sentence in Section C.10, entitled *Comparison OF X2 Results,* on page C-43 of the 2014 Draft EIS/EIR is revised as follows:

> Figure *E*~~C~~-22 and Table *E*~~C-28~~*30* illustrate the monthly average and average monthly, respectively, model results for the alternatives for the location of X2 in kilometers (km) from the Golden Gate.

Page C-44

The title of Table C-28 on page C-44 of the 2014 Draft EIS/EIR is revised as follows:

> **Table *E*~~C-28~~*4*. X2 Monthly Average Change from Base Location (km).**

Page C-45

The following sentence in the third paragraph on page C-45 of the 2014 Draft EIS/EIR is revised as follows:

> The December – June percent change from Base values (Table *E*~~C-29~~*31*) of OMR flow are similar for the All Transfers and No Crop Idle alternatives, with positive percent changes in April and June of Above Normal water years, while the No Groundwater Substitution alternative has a positive percent change in June of Above Normal water years.

Page C-46

The title of Table C-29 on page C-46 of the 2014 Draft EIS/EIR is revised as follows:

> **Table *E*~~C-29~~*5*. OMR Monthly Average Percent Change from Base Flow (cfs)**

Attachment 1: DSM2 Detailed Model Output and Boundary Conditions

Appendix C of the 2014 Draft EIS/EIR is revised to include Attachment 1: DSM2 Detailed Model Output and Boundary Conditions. The full attachment is included below.

> ***E.3.1.1 Salinity (EC) Model Output***
>
> Model output for EC at each location was calculated for water years 1970 – 200. It is presented here in two basic forms – as Tables and as Figures showing monthly average EC for the Base scenario and change from Base EC, (Scenario – Base). The Tables have several subtypes: monthly average results for water years 1970 – 2003, average monthly results for the average over all water year types and results split by water year type. For each location, the Tables show Base salinity as EC, change from Base EC and percent change from Base EC for each of the three alternative scenarios (i.e., seven tables per location).

Table E.3-1. Martinez Base salinity (EC).

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	15017.8	15341.5	5550.8	210.8	583.9	3326.3	10070.2	13841.5	17131.7	17836.8	19848.6	15539.9
1971	15069.8	14704.2	3807.2	2159.7	6928.3	4818.1	6810.6	6151.1	10434.5	16094.3	20489.2	15603.0
1972	15102.5	14743.8	17116.6	17362.1	13256.4	7918.8	11193.0	15234.0	18325.4	19152.2	20962.2	22417.0
1973	22847.2	20227.0	12717.5	1381.0	522.8	1246.7	6882.3	9675.1	14196.2	17722.4	20416.4	19007.8
1974	18806.4	5278.9	1551.7	248.1	2730.4	428.5	731.2	5969.6	11291.9	16170.3	19854.3	15211.2
1975	15125.4	14819.1	17454.7	19102.2	4911.5	541.0	4864.9	5592.2	8088.1	14693.0	20165.6	15196.6
1976	14981.4	14013.3	17058.6	19756.7	18839.4	16861.5	16713.6	19526.5	21934.1	22659.3	23189.2	23809.4
1977	24140.9	23811.9	23838.1	21451.7	19105.8	19163.4	19326.5	20901.0	22679.3	23675.9	23963.0	24237.1
1978	23909.0	23756.1	21476.5	3366.6	1783.4	976.2	2011.4	6017.0	11669.6	16545.6	20472.8	19063.6
1979	18577.8	18092.4	19363.9	14219.7	5516.1	5871.7	9372.5	9613.8	14571.0	18830.2	21263.5	22680.3
1980	22974.2	21624.1	19511.6	1861.2	234.7	971.7	6166.1	9483.8	13079.2	16891.8	20485.3	19233.6
1981	18590.3	18033.2	19223.7	14941.7	9315.7	9220.2	11522.4	15187.2	18331.4	20742.9	22300.8	23218.5
1982	23580.8	14475.7	1097.8	728.6	366.6	521.0	219.2	2072.6	7623.2	15067.1	20296.5	15496.8
1983	12854.9	5679.2	869.5	373.6	208.4	200.6	374.7	630.9	874.9	4438.0	10294.5	10414.1
1984	13701.5	1954.7	209.8	1143.9	3104.7	4068.1	8348.6	12412.3	16593.4	17651.6	19971.4	15620.2
1985	15281.8	12792.9	13096.5	15981.3	15142.4	14464.0	13668.3	14960.1	18381.9	20993.7	22625.8	23098.1
1986	23068.0	23262.7	20690.2	13779.2	340.3	215.5	4978.8	9030.3	14006.2	17829.2	20873.9	16173.1
1987	15438.8	15792.6	18630.2	19417.6	14375.8	8988.6	13200.6	17771.3	19479.0	20938.2	22498.3	23444.0
1988	23624.3	23370.4	19891.4	10401.8	11454.4	16723.6	17949.7	18770.2	20019.9	21696.8	22940.5	23803.4
1989	24174.3	23611.7	23238.2	21839.5	20110.8	5778.1	7331.7	13073.5	18135.1	21242.1	21951.2	22223.8
1990	22607.7	23003.3	23116.4	18919.4	15668.9	16480.7	17154.1	18556.6	20825.0	23014.9	23464.8	23752.7
1991	23929.0	24096.0	24164.9	22924.1	20850.8	8703.8	11369.4	17874.5	21192.3	22900.9	23386.2	23817.1
1992	24040.7	24015.1	23998.2	22958.8	9946.2	9186.8	14095.9	18310.5	20149.7	21797.5	23324.1	23842.8
1993	23514.0	23348.6	22440.7	4447.7	1524.1	3789.6	3382.9	4966.3	8355.8	14892.9	20086.5	18513.4
1994	18123.2	17960.9	19209.7	19618.0	12933.8	14156.6	15975.7	16726.0	19989.5	22395.6	23262.3	23700.5
1995	22913.5	22758.0	22412.3	2017.3	2464.1	224.0	820.3	495.9	2997.4	7687.9	14505.4	15109.1
1996	14498.9	14617.3	13411.3	4600.9	315.0	750.3	2000.2	2099.8	10630.2	17072.7	20478.2	14671.2
1997	14696.0	14704.1	1930.4	202.2	631.9	6065.4	9389.3	11556.5	16297.0	17314.7	19569.8	15595.9
1998	15352.3	14605.0	15412.1	5385.5	219.2	479.8	932.3	1242.4	820.3	5251.7	12308.8	12446.8
1999	14649.4	12204.3	7108.5	4099.7	507.6	1136.9	4278.5	8007.5	13094.0	17038.4	20462.0	15206.4
2000	15239.6	14518.6	17291.1	14037.6	905.4	999.7	5982.3	9591.7	15872.5	17978.4	19966.8	18795.7
2001	18606.3	18210.5	19306.4	17834.6	9685.6	7693.9	11392.5	15672.5	18500.6	20800.0	22312.8	23190.2
2002	23405.6	22909.1	12919.1	2989.0	9051.3	11378.4	11180.0	13260.5	18186.2	21302.7	22494.8	23456.6
2003	23382.3	23133.3	10292.3	1695.7	6007.8	9590.8	7074.8	3908.6	12954.5	17619.0	20032.7	19014.8
Average	19171.3	17513.8	14982.6	10042.9	7045.4	6263.0	8434.2	10828.9	14609.1	17880.5	20603.5	19311.9
Critical	21635.3	21467.3	21611.1	19432.9	15542.7	14468.1	16083.6	18666.5	20970.0	22591.5	23361.4	23851.9
Dry	19249.5	18558.3	17735.7	15500.6	12946.9	9587.2	11382.6	14987.5	18502.4	21003.2	22364.0	23105.2
BN	16840.2	16418.1	18240.2	15790.9	9386.3	6895.2	10282.7	12423.9	16448.2	18991.2	21112.9	22548.6
AN	21977.7	21101.3	17288.3	4465.0	1829.7	2929.1	5250.0	7273.8	12688.0	16941.7	20243.4	18938.2
Wet	16871.9	13415.8	8577.4	4157.8	1793.2	1752.0	4139.9	6084.8	9991.0	14165.1	18393.7	14791.1

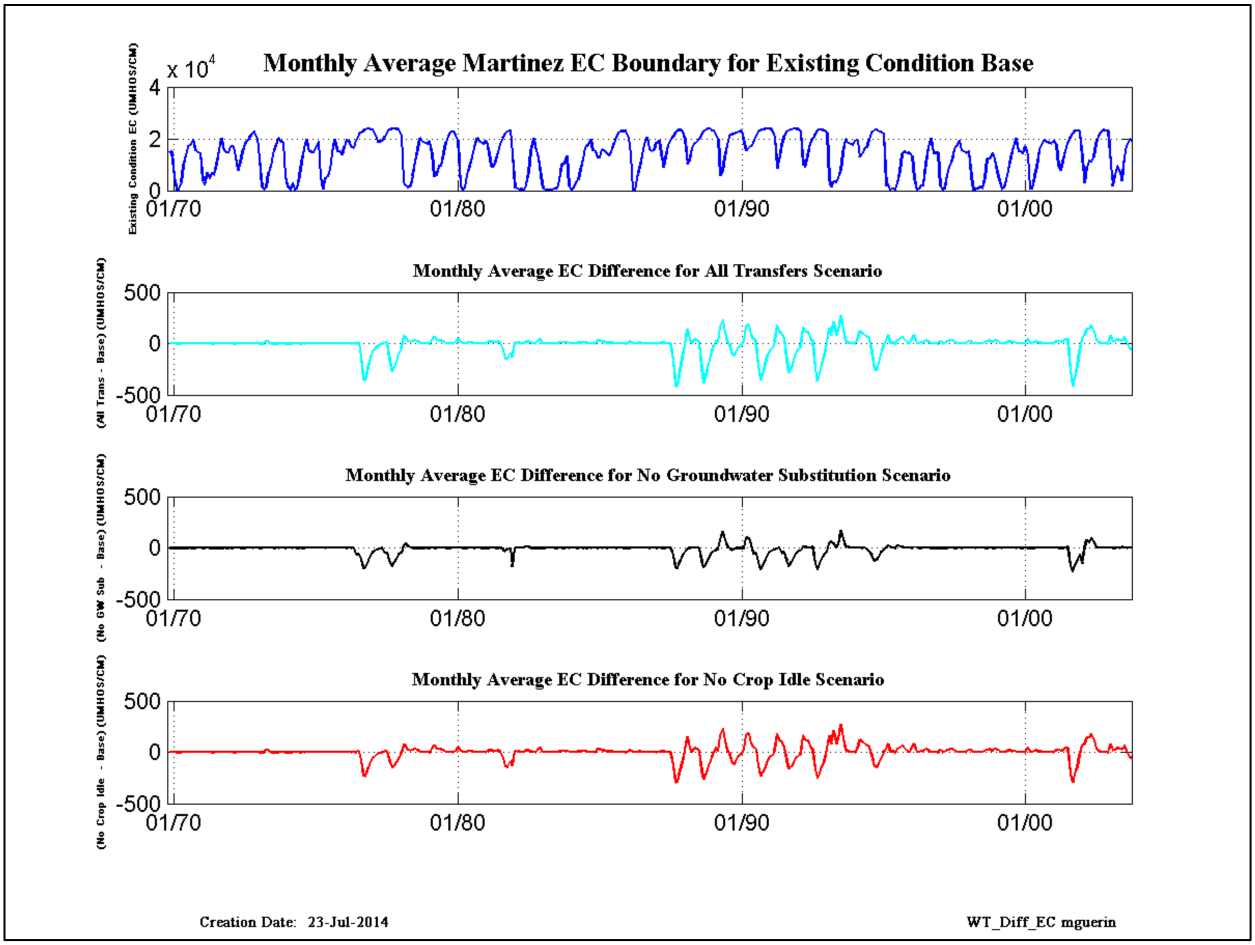


Figure E.3-1. Monthly Average Martinez EC for the Base condition and change from Base for the scenarios.

Table E.3-2. Martinez salinity (EC) difference All Transfers minus Base.

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1971	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1972	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1973	0.0	0.0	-0.1	0.0	-0.1	26.7	12.5	-0.8	0.0	0.0	0.0	0.0
1974	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1975	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1976	0.0	0.0	0.0	0.0	0.0	0.0	1.3	-3.4	12.2	-128.1	-349.8	-360.4
1977	-233.1	-138.6	-80.5	-53.2	-26.7	-9.5	-3.5	4.1	10.2	-151.3	-270.2	-234.8
1978	-174.5	-100.9	-42.2	68.2	65.1	23.1	14.2	27.5	35.7	17.1	3.3	1.3
1979	0.4	0.1	-0.6	35.1	62.0	31.6	30.6	29.0	10.7	1.8	0.5	0.2
1980	-0.1	11.8	43.5	13.6	1.3	2.0	9.6	14.8	6.0	0.7	0.2	0.1
1981	0.0	0.0	-0.3	19.7	19.2	14.4	14.6	15.4	10.0	-57.1	-147.2	-148.8
1982	-93.0	-128.2	13.2	3.6	5.1	2.0	0.1	18.9	20.2	6.9	1.0	-0.2
1983	35.5	44.8	3.8	0.4	0.0	0.0	0.5	1.1	1.5	6.1	12.4	14.6
1984	15.2	4.2	0.0	1.6	4.6	6.1	8.7	11.6	5.7	1.3	0.3	0.1
1985	-0.5	31.5	26.0	16.3	16.8	7.4	7.0	9.5	4.9	1.4	0.5	0.3
1986	0.1	0.0	9.5	16.0	0.4	0.0	3.9	6.0	2.3	0.3	0.1	0.0
1987	0.0	0.0	-0.1	3.9	8.8	8.8	3.2	0.7	5.0	-163.9	-416.0	-412.3
1988	-252.0	-141.0	-6.5	142.0	44.1	3.7	37.1	32.4	14.8	-244.9	-381.5	-299.7
1989	-196.2	-119.0	-21.9	28.1	5.5	171.2	228.8	111.1	14.7	-20.2	-107.4	-119.8
1990	-65.3	-31.5	-16.7	35.3	176.1	180.3	82.0	43.3	34.1	-213.0	-356.9	-300.2
1991	-204.9	-113.6	-66.0	-43.9	15.2	183.1	115.7	89.7	53.3	-157.5	-285.8	-239.3
1992	-163.0	-92.4	-54.8	-38.7	158.8	120.6	112.7	57.9	23.9	-240.0	-362.4	-290.3
1993	-199.1	-110.2	8.8	154.7	79.0	216.4	76.3	135.6	274.9	128.5	19.1	7.3
1994	2.4	0.7	-0.5	38.4	124.7	99.0	81.6	66.3	52.9	-75.9	-250.7	-260.3
1995	-188.6	-98.1	-18.8	27.5	84.8	1.5	6.0	-1.1	39.6	47.6	60.9	36.4
1996	5.8	0.1	53.8	83.3	2.3	3.2	10.0	10.4	31.1	19.0	4.0	1.5
1997	0.3	-3.1	21.4	0.0	1.9	20.3	29.8	31.5	14.6	3.4	0.7	0.3
1998	0.0	-0.3	21.0	24.8	0.1	1.2	2.9	3.8	2.0	11.0	22.5	27.9
1999	9.5	37.8	26.4	9.2	0.9	2.4	9.6	15.8	19.7	10.2	2.2	0.9
2000	0.1	0.0	-0.8	48.2	6.1	4.6	12.3	16.8	7.3	1.5	0.4	0.1
2001	0.0	0.0	-0.2	17.7	23.1	13.9	16.0	42.5	38.8	-262.7	-411.9	-334.5
2002	-217.8	-73.0	51.8	77.8	144.6	145.3	178.8	116.2	34.1	9.0	3.5	1.5
2003	0.8	-1.2	78.9	16.9	23.0	38.0	32.7	26.3	64.0	12.2	-43.4	-62.4
Average	-56.4	-30.0	1.4	22.0	30.8	38.7	33.4	27.4	24.8	-42.3	-95.6	-87.4
Critical	-130.8	-73.8	-32.1	11.4	70.3	82.5	61.0	41.5	28.8	-173.0	-322.5	-283.6
Dry	-69.1	-26.8	9.2	27.2	36.3	60.2	74.7	49.2	17.9	-82.3	-179.7	-168.9
BN	0.2	0.1	-0.3	17.5	31.0	15.8	15.3	14.5	5.4	0.9	0.3	0.1
AN	-62.1	-33.4	14.7	50.3	29.1	51.8	26.2	36.7	64.6	26.7	-3.4	-8.9
Wet	-16.5	-11.0	10.0	12.8	7.7	2.8	5.5	7.5	10.5	8.1	8.0	6.3

1 **Table E.3-3. Martinez salinity (EC) percent difference of All Transfers from Base.**

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1971	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1972	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1973	0.0	0.0	0.0	0.0	0.0	2.1	0.2	0.0	0.0	0.0	0.0	0.0
1974	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1975	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1976	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	-0.6	-1.5	-1.5
1977	-1.0	-0.6	-0.3	-0.2	-0.1	0.0	0.0	0.0	0.0	-0.6	-1.1	-1.0
1978	-0.7	-0.4	-0.2	2.0	3.7	2.4	0.7	0.5	0.3	0.1	0.0	0.0
1979	0.0	0.0	0.0	0.2	1.1	0.5	0.3	0.3	0.1	0.0	0.0	0.0
1980	0.0	0.1	0.2	0.7	0.6	0.2	0.2	0.2	0.0	0.0	0.0	0.0
1981	0.0	0.0	0.0	0.1	0.2	0.2	0.1	0.1	0.1	-0.3	-0.7	-0.6
1982	-0.4	-0.9	1.2	0.5	1.4	0.4	0.1	0.9	0.3	0.0	0.0	0.0
1983	0.3	0.8	0.4	0.1	0.0	0.0	0.1	0.2	0.2	0.1	0.1	0.1
1984	0.1	0.2	0.0	0.1	0.1	0.2	0.1	0.1	0.0	0.0	0.0	0.0
1985	0.0	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0
1986	0.0	0.0	0.0	0.1	0.1	0.0	0.1	0.1	0.0	0.0	0.0	0.0
1987	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.0	-0.8	-1.8	-1.8
1988	-1.1	-0.6	0.0	1.4	0.4	0.0	0.2	0.2	0.1	-1.1	-1.7	-1.3
1989	-0.8	-0.5	-0.1	0.1	0.0	3.0	3.1	0.8	0.1	-0.1	-0.5	-0.5
1990	-0.3	-0.1	-0.1	0.2	1.1	1.1	0.5	0.2	0.2	-0.9	-1.5	-1.3
1991	-0.9	-0.5	-0.3	-0.2	0.1	2.1	1.0	0.5	0.3	-0.7	-1.2	-1.0
1992	-0.7	-0.4	-0.2	-0.2	1.6	1.3	0.8	0.3	0.1	-1.1	-1.6	-1.2
1993	-0.8	-0.5	0.0	3.5	5.2	5.7	2.3	2.7	3.3	0.9	0.1	0.0
1994	0.0	0.0	0.0	0.2	1.0	0.7	0.5	0.4	0.3	-0.3	-1.1	-1.1
1995	-0.8	-0.4	-0.1	1.4	3.4	0.7	0.7	-0.2	1.3	0.6	0.4	0.2
1996	0.0	0.0	0.4	1.8	0.7	0.4	0.5	0.5	0.3	0.1	0.0	0.0
1997	0.0	0.0	1.1	0.0	0.3	0.3	0.3	0.3	0.1	0.0	0.0	0.0
1998	0.0	0.0	0.1	0.5	0.1	0.2	0.3	0.3	0.2	0.2	0.2	0.2
1999	0.1	0.3	0.4	0.2	0.2	0.2	0.2	0.2	0.2	0.1	0.0	0.0
2000	0.0	0.0	0.0	0.3	0.7	0.5	0.2	0.2	0.0	0.0	0.0	0.0
2001	0.0	0.0	0.0	0.1	0.2	0.2	0.1	0.3	0.2	-1.3	-1.8	-1.4
2002	-0.9	-0.3	0.4	2.6	1.6	1.3	1.6	0.9	0.2	0.0	0.0	0.0
2003	0.0	0.0	0.8	1.0	0.4	0.4	0.5	0.7	0.5	0.1	-0.2	-0.3
Average	-0.2	-0.1	0.1	0.5	0.7	0.7	0.4	0.3	0.2	-0.2	-0.4	-0.4
Critical	-0.5	-0.3	-0.1	0.2	0.6	0.7	0.4	0.2	0.1	-0.8	-1.4	-1.2
Dry	-0.3	-0.1	0.1	0.5	0.4	0.8	0.8	0.4	0.1	-0.4	-0.8	-0.7
BN	0.0	0.0	0.0	0.1	0.6	0.3	0.2	0.2	0.0	0.0	0.0	0.0
AN	-0.3	-0.1	0.1	1.3	1.7	1.9	0.7	0.7	0.7	0.2	0.0	0.0
Wet	-0.1	0.0	0.3	0.4	0.5	0.2	0.2	0.2	0.2	0.1	0.1	0.0

Table E.3-4. Martinez salinity (EC) difference No Groundwater Substitution minus Base.

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1971	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1972	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1973	0.0	0.0	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1974	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1975	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1976	0.0	0.0	0.0	0.0	0.0	0.0	1.2	-61.1	-60.9	-115.0	-200.9	-186.6
1977	-121.1	-72.8	-42.5	-28.5	-14.0	-5.1	-0.8	-47.7	-48.3	-118.2	-177.1	-146.5
1978	-107.8	-62.7	-45.8	23.0	47.7	10.5	0.7	-0.3	-0.1	0.0	0.0	0.0
1979	0.0	0.0	0.0	0.1	-2.8	-0.7	0.0	0.0	0.0	0.0	0.0	0.0
1980	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1981	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5	-23.3	-30.9	-12.2
1982	-2.5	-177.8	-2.8	0.8	4.2	0.5	0.0	13.5	5.7	-0.1	0.0	0.0
1983	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1984	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1985	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1986	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1987	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.7	3.6	-75.2	-196.0	-196.9
1988	-123.1	-69.0	-45.1	-13.4	-0.7	0.0	0.0	0.7	4.2	-129.2	-192.4	-146.6
1989	-97.8	-59.4	-35.0	-20.5	-13.9	81.1	159.7	81.8	10.6	-14.6	-20.9	-9.4
1990	-4.2	-2.1	-1.1	-2.6	96.1	92.8	33.7	-55.6	-54.6	-146.0	-211.5	-168.7
1991	-113.7	-63.6	-37.4	-24.7	-14.7	-4.9	0.6	-51.1	-44.8	-121.3	-177.6	-140.3
1992	-94.7	-54.2	-32.4	-21.2	15.7	6.8	0.2	0.6	6.0	-155.9	-210.3	-153.4
1993	-105.7	-58.7	-39.3	52.4	57.1	38.1	4.7	30.6	175.0	92.9	13.7	5.2
1994	1.6	0.5	0.1	0.0	0.0	0.0	0.3	-17.3	-35.4	-69.9	-127.2	-117.9
1995	-80.8	-41.9	-24.1	1.9	25.8	0.4	0.1	-3.7	21.5	10.3	5.7	3.8
1996	0.6	0.1	-0.5	9.9	0.3	0.0	0.0	0.3	0.2	0.0	0.0	0.0
1997	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1998	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1999	-0.3	-0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2001	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.6	6.0	-175.2	-233.3	-166.7
2002	-109.3	-59.8	-146.7	14.9	80.3	54.3	101.6	54.2	6.8	1.9	0.7	0.3
2003	0.2	0.1	0.1	-0.9	-0.3	0.0	-0.3	8.1	4.0	-1.4	0.7	0.5
Average	-28.2	-21.2	-13.3	-0.3	8.3	8.1	8.9	-1.3	0.0	-30.6	-51.7	-42.2
Critical	-65.0	-37.3	-22.6	-12.9	11.8	12.8	5.0	-33.1	-33.4	-122.2	-185.3	-151.4
Dry	-34.5	-19.9	-30.3	-0.9	11.1	22.6	43.5	22.9	4.6	-47.7	-80.1	-64.1
BN	0.0	0.0	0.0	0.1	-1.4	-0.4	0.0	0.0	0.0	0.0	0.0	0.0
AN	-35.6	-20.2	-14.2	12.4	17.4	8.1	0.8	6.4	29.8	15.3	2.4	0.9
Wet	-6.4	-16.9	-2.1	1.0	2.3	0.1	0.0	0.8	2.1	0.8	0.4	0.3

Table E.3-5. Martinez salinity (EC) difference of No Groundwater Substitution from Base.

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1971	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1972	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1973	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1974	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1975	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1976	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.3	-0.3	-0.5	-0.9	-0.8
1977	-0.5	-0.3	-0.2	-0.1	-0.1	0.0	0.0	-0.2	-0.2	-0.5	-0.7	-0.6
1978	-0.5	-0.3	-0.2	0.7	2.7	1.1	0.0	0.0	0.0	0.0	0.0	0.0
1979	0.0	0.0	0.0	0.0	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1980	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1981	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	-0.1	-0.1
1982	0.0	-1.2	-0.3	0.1	1.1	0.1	0.0	0.7	0.1	0.0	0.0	0.0
1983	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1984	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1985	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1986	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1987	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.4	-0.9	-0.8
1988	-0.5	-0.3	-0.2	-0.1	0.0	0.0	0.0	0.0	0.0	-0.6	-0.8	-0.6
1989	-0.4	-0.3	-0.2	-0.1	-0.1	1.4	2.2	0.6	0.1	-0.1	-0.1	0.0
1990	0.0	0.0	0.0	0.0	0.6	0.6	0.2	-0.3	-0.3	-0.6	-0.9	-0.7
1991	-0.5	-0.3	-0.2	-0.1	-0.1	-0.1	0.0	-0.3	-0.2	-0.5	-0.8	-0.6
1992	-0.4	-0.2	-0.1	-0.1	0.2	0.1	0.0	0.0	0.0	-0.7	-0.9	-0.6
1993	-0.4	-0.3	-0.2	1.2	3.7	1.0	0.1	0.6	2.1	0.6	0.1	0.0
1994	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	-0.2	-0.3	-0.5	-0.5
1995	-0.4	-0.2	-0.1	0.1	1.0	0.2	0.0	-0.7	0.7	0.1	0.0	0.0
1996	0.0	0.0	0.0	0.2	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1997	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1998	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1999	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2001	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.8	-1.0	-0.7
2002	-0.5	-0.3	-1.1	0.5	0.9	0.5	0.9	0.4	0.0	0.0	0.0	0.0
2003	0.0	0.0	0.0	-0.1	0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.0
Average	-0.1	-0.1	-0.1	0.1	0.3	0.1	0.1	0.0	0.1	-0.1	-0.2	-0.2
Critical	-0.3	-0.2	-0.1	-0.1	0.1	0.1	0.0	-0.2	-0.2	-0.5	-0.8	-0.6
Dry	-0.1	-0.1	-0.2	0.1	0.1	0.3	0.5	0.2	0.0	-0.2	-0.4	-0.3
BN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AN	-0.1	-0.1	-0.1	0.3	1.1	0.3	0.0	0.1	0.4	0.1	0.0	0.0
Wet	0.0	-0.1	0.0	0.0	0.2	0.0	0.0	0.0	0.1	0.0	0.0	0.0

Table E.3-6. Martinez salinity (EC) difference No Crop Idle minus Base.

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1971	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1972	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1973	0.0	0.0	-0.1	0.0	-0.1	26.7	12.5	-0.8	0.0	0.0	0.0	0.0
1974	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1975	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1976	0.0	0.0	0.0	0.0	0.0	0.0	1.2	-0.6	14.1	-85.8	-229.1	-235.3
1977	-155.3	-92.7	-54.0	-35.7	-18.0	-6.4	-2.4	7.6	11.2	-78.9	-148.5	-133.5
1978	-100.6	-58.5	-13.7	73.9	65.1	23.1	14.2	27.5	35.7	17.1	3.4	1.3
1979	0.4	0.1	-0.6	35.1	62.0	31.6	30.6	29.0	10.7	1.8	0.5	0.2
1980	-0.1	11.8	43.5	13.6	1.3	2.0	9.6	14.8	6.0	0.7	0.2	0.1
1981	0.0	0.1	-0.3	19.7	19.2	14.4	14.6	15.4	9.8	-50.2	-140.2	-145.5
1982	-90.7	-126.7	13.2	3.6	5.1	2.0	0.1	18.9	20.2	6.9	1.0	-0.2
1983	35.5	44.8	3.8	0.4	0.0	0.0	0.5	1.1	1.5	6.1	12.4	14.6
1984	15.2	4.2	0.0	1.6	4.6	6.1	8.7	11.6	5.7	1.3	0.3	0.1
1985	-0.5	31.5	26.0	16.3	16.8	7.4	7.0	9.5	4.9	1.4	0.5	0.3
1986	0.1	0.0	9.5	16.0	0.4	0.0	3.9	6.0	2.3	0.3	0.1	0.0
1987	0.0	0.0	-0.1	3.9	8.8	8.8	3.2	0.5	3.6	-126.9	-296.0	-285.4
1988	-175.6	-99.2	20.3	150.1	44.5	3.8	37.1	32.1	12.7	-179.7	-264.6	-198.9
1989	-131.9	-80.5	0.5	41.2	12.2	172.7	228.8	111.1	14.7	-20.2	-107.3	-119.8
1990	-65.3	-31.5	-16.7	35.3	176.1	180.3	82.0	46.3	34.7	-130.6	-229.8	-197.9
1991	-136.8	-76.3	-44.1	-29.6	23.6	186.0	115.7	93.1	54.4	-79.6	-161.5	-140.7
1992	-97.5	-55.4	-32.9	-24.8	165.8	120.9	112.7	57.7	21.2	-163.1	-250.8	-201.5
1993	-137.5	-76.7	28.3	160.1	79.0	216.4	76.3	135.6	274.9	128.5	19.1	7.3
1994	2.4	0.7	-0.5	38.4	124.7	99.0	81.6	66.6	52.6	-30.3	-139.0	-151.3
1995	-114.0	-60.2	1.2	30.2	84.8	1.5	6.0	-1.1	39.6	47.6	60.9	36.4
1996	5.8	0.1	53.8	83.3	2.3	3.2	10.0	10.4	31.1	19.0	4.0	1.5
1997	0.3	-3.1	21.4	0.0	1.9	20.3	29.8	31.5	14.6	3.4	0.7	0.3
1998	0.0	-0.3	21.0	24.8	0.1	1.2	2.9	3.8	2.0	11.0	22.5	27.9
1999	9.5	37.8	26.4	9.2	0.9	2.4	9.6	15.8	19.7	10.2	2.2	0.9
2000	0.1	0.0	-0.8	48.2	6.1	4.6	12.3	16.8	7.3	1.5	0.4	0.1
2001	0.0	0.0	-0.2	17.7	23.1	13.9	16.0	42.1	36.1	-208.9	-289.4	-216.2
2002	-144.5	-32.7	74.4	78.6	144.6	145.3	178.8	116.2	34.1	9.0	3.5	1.5
2003	0.8	-1.2	78.9	16.9	23.0	38.0	32.7	26.3	64.0	12.2	-43.4	-62.4
Average	-37.6	-19.5	7.6	24.4	31.7	39.0	33.4	27.8	24.7	-25.8	-63.8	-58.7
Critical	-89.7	-50.6	-18.3	19.1	73.8	83.4	61.1	43.3	28.7	-106.9	-203.3	-179.9
Dry	-46.1	-13.6	16.7	29.5	37.5	60.4	74.7	49.1	17.2	-66.0	-138.2	-127.5
BN	0.2	0.1	-0.3	17.5	31.0	15.8	15.3	14.5	5.4	0.9	0.3	0.1
AN	-39.5	-20.8	22.7	52.1	29.1	51.8	26.2	36.7	64.6	26.7	-3.4	-8.9
Wet	-10.6	-8.0	11.6	13.0	7.7	2.8	5.5	7.5	10.5	8.1	8.0	6.3

Table E.3-7. Martinez salinity (EC) percent difference of No Crop Idle from Base.

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1971	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1972	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1973	0.0	0.0	0.0	0.0	0.0	2.1	0.2	0.0	0.0	0.0	0.0	0.0
1974	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1975	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1976	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	-0.4	-1.0	-1.0
1977	-0.6	-0.4	-0.2	-0.2	-0.1	0.0	0.0	0.0	0.0	-0.3	-0.6	-0.6
1978	-0.4	-0.2	-0.1	2.2	3.7	2.4	0.7	0.5	0.3	0.1	0.0	0.0
1979	0.0	0.0	0.0	0.2	1.1	0.5	0.3	0.3	0.1	0.0	0.0	0.0
1980	0.0	0.1	0.2	0.7	0.6	0.2	0.2	0.2	0.0	0.0	0.0	0.0
1981	0.0	0.0	0.0	0.1	0.2	0.2	0.1	0.1	0.1	-0.2	-0.6	-0.6
1982	-0.4	-0.9	1.2	0.5	1.4	0.4	0.1	0.9	0.3	0.0	0.0	0.0
1983	0.3	0.8	0.4	0.1	0.0	0.0	0.1	0.2	0.2	0.1	0.1	0.1
1984	0.1	0.2	0.0	0.1	0.1	0.2	0.1	0.1	0.0	0.0	0.0	0.0
1985	0.0	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0
1986	0.0	0.0	0.0	0.1	0.1	0.0	0.1	0.1	0.0	0.0	0.0	0.0
1987	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.0	-0.6	-1.3	-1.2
1988	-0.7	-0.4	0.1	1.4	0.4	0.0	0.2	0.2	0.1	-0.8	-1.2	-0.8
1989	-0.5	-0.3	0.0	0.2	0.1	3.0	3.1	0.8	0.1	-0.1	-0.5	-0.5
1990	-0.3	-0.1	-0.1	0.2	1.1	1.1	0.5	0.2	0.2	-0.6	-1.0	-0.8
1991	-0.6	-0.3	-0.2	-0.1	0.1	2.1	1.0	0.5	0.3	-0.3	-0.7	-0.6
1992	-0.4	-0.2	-0.1	-0.1	1.7	1.3	0.8	0.3	0.1	-0.7	-1.1	-0.8
1993	-0.6	-0.3	0.1	3.6	5.2	5.7	2.3	2.7	3.3	0.9	0.1	0.0
1994	0.0	0.0	0.0	0.2	1.0	0.7	0.5	0.4	0.3	-0.1	-0.6	-0.6
1995	-0.5	-0.3	0.0	1.5	3.4	0.7	0.7	-0.2	1.3	0.6	0.4	0.2
1996	0.0	0.0	0.4	1.8	0.7	0.4	0.5	0.5	0.3	0.1	0.0	0.0
1997	0.0	0.0	1.1	0.0	0.3	0.3	0.3	0.3	0.1	0.0	0.0	0.0
1998	0.0	0.0	0.1	0.5	0.1	0.2	0.3	0.3	0.2	0.2	0.2	0.2
1999	0.1	0.3	0.4	0.2	0.2	0.2	0.2	0.2	0.2	0.1	0.0	0.0
2000	0.0	0.0	0.0	0.3	0.7	0.5	0.2	0.2	0.0	0.0	0.0	0.0
2001	0.0	0.0	0.0	0.1	0.2	0.2	0.1	0.3	0.2	-1.0	-1.3	-0.9
2002	-0.6	-0.1	0.6	2.6	1.6	1.3	1.6	0.9	0.2	0.0	0.0	0.0
2003	0.0	0.0	0.8	1.0	0.4	0.4	0.5	0.7	0.5	0.1	-0.2	-0.3
Average	-0.2	-0.1	0.1	0.5	0.7	0.7	0.4	0.3	0.2	-0.1	-0.3	-0.2
Critical	-0.4	-0.2	-0.1	0.2	0.6	0.7	0.4	0.2	0.1	-0.5	-0.9	-0.8
Dry	-0.2	0.0	0.1	0.5	0.4	0.8	0.8	0.4	0.1	-0.3	-0.6	-0.6
BN	0.0	0.0	0.0	0.1	0.6	0.3	0.2	0.2	0.0	0.0	0.0	0.0
AN	-0.2	-0.1	0.2	1.3	1.7	1.9	0.7	0.7	0.7	0.2	0.0	0.0
Wet	0.0	0.0	0.3	0.4	0.5	0.2	0.2	0.2	0.2	0.1	0.1	0.0

Table E.3-8. CCWD Contra Costa Canal Intake (CHCCC006) Base salinity (EC).

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	321.1	268.7	261.2	464.0	308.8	285.4	338.1	391.8	290.1	279.8	345.0	670.4
1971	338.9	302.6	299.6	276.4	264.4	290.8	355.6	399.1	267.5	244.3	387.7	717.8
1972	330.6	283.8	274.4	473.6	408.1	354.5	364.0	399.2	304.7	350.4	479.3	802.8
1973	893.9	1027.6	638.3	545.6	483.4	385.0	384.3	425.9	287.3	264.8	385.8	534.5
1974	294.6	322.2	285.5	308.7	288.9	285.9	323.3	393.5	289.4	249.0	325.2	524.1
1975	356.4	294.7	284.5	564.2	437.8	393.4	356.4	400.1	280.9	248.5	322.9	587.9
1976	363.8	271.2	260.7	528.9	547.1	458.6	386.5	401.6	460.6	637.5	934.1	741.4
1977	863.1	904.0	859.3	1158.2	701.6	473.9	421.5	393.9	492.5	605.3	739.5	979.8
1978	1061.2	827.3	888.6	642.9	468.3	440.1	403.4	333.7	285.7	257.9	378.7	511.9
1979	292.0	324.6	378.9	884.2	440.6	357.4	367.1	402.6	284.2	321.1	545.8	808.5
1980	939.1	787.7	710.4	547.2	697.2	518.2	334.5	399.3	314.0	259.2	340.9	498.9
1981	299.0	283.3	439.6	789.3	368.2	305.7	395.7	406.7	306.7	442.6	705.7	812.8
1982	987.0	917.1	325.6	487.5	329.0	414.3	328.0	242.7	245.0	256.9	292.9	375.8
1983	234.9	321.3	359.8	672.4	575.8	583.4	391.2	276.5	260.9	292.4	244.7	212.6
1984	223.6	283.5	348.7	360.3	307.5	274.9	348.2	412.2	286.0	280.3	338.8	603.3
1985	376.3	322.5	254.2	283.3	296.2	320.2	400.3	396.0	302.0	446.2	689.7	784.3
1986	879.6	736.6	996.4	583.9	666.0	722.6	395.7	327.4	291.9	271.1	391.0	393.4
1987	242.6	257.9	281.5	631.7	443.5	397.2	432.4	394.7	314.1	357.0	493.7	566.1
1988	745.3	717.1	772.2	461.4	423.4	461.2	403.5	395.0	352.6	366.7	591.0	650.7
1989	803.3	937.6	866.0	1104.9	732.4	511.4	399.7	326.0	263.2	506.1	808.6	778.9
1990	738.4	758.8	788.0	833.6	414.7	320.9	344.0	333.0	355.6	579.7	884.3	785.1
1991	929.2	939.1	1009.0	1012.1	680.4	525.6	445.5	374.3	365.7	642.0	902.1	757.5
1992	883.8	906.2	922.1	1014.5	775.5	442.9	379.7	356.6	324.2	388.6	660.7	784.0
1993	856.7	692.8	839.7	774.0	552.5	408.3	427.5	439.3	294.9	238.4	366.2	508.7
1994	282.3	353.8	431.4	875.0	558.2	385.1	358.0	341.2	334.0	620.0	1013.0	851.4
1995	944.8	614.5	760.9	802.7	362.1	489.2	431.6	245.3	234.5	293.1	233.3	216.8
1996	222.2	236.4	277.8	527.9	895.5	628.3	389.9	386.6	286.0	259.3	418.9	697.9
1997	340.7	272.0	398.1	536.3	328.0	296.3	331.6	411.1	298.2	278.2	324.5	596.9
1998	354.2	297.3	261.5	527.2	1368.3	844.8	313.3	265.2	248.0	299.1	245.7	216.4
1999	222.0	265.0	230.1	327.7	332.0	291.4	346.7	405.1	275.4	255.1	390.5	706.9
2000	358.0	274.0	273.1	578.1	661.9	440.8	350.3	417.7	293.7	282.1	341.1	534.2
2001	330.5	318.7	363.0	764.4	450.6	361.8	397.0	421.9	313.3	339.1	484.5	548.7
2002	724.9	713.5	873.2	394.9	299.0	296.9	362.6	450.7	327.1	501.7	745.2	752.5
2003	983.1	741.1	759.5	337.5	318.0	284.0	332.6	400.8	262.2	280.3	388.6	554.5
Average	559.3	522.8	528.6	619.8	505.4	419.1	374.7	375.5	305.6	358.6	504.1	619.6
Critical	686.6	692.9	720.4	840.5	585.8	438.3	391.3	370.8	383.6	548.5	817.8	792.8
Dry	462.8	472.3	512.9	661.4	431.6	365.5	398.0	399.3	304.4	432.1	654.6	707.2
BN	311.3	304.2	326.6	678.9	424.4	355.9	365.6	400.9	294.4	335.8	512.6	805.6
AN	848.6	725.1	684.9	570.9	530.2	412.7	372.1	402.8	289.6	263.8	366.9	523.8
Wet	440.0	394.8	391.5	495.3	497.2	446.2	357.7	350.5	273.4	269.8	327.8	501.6

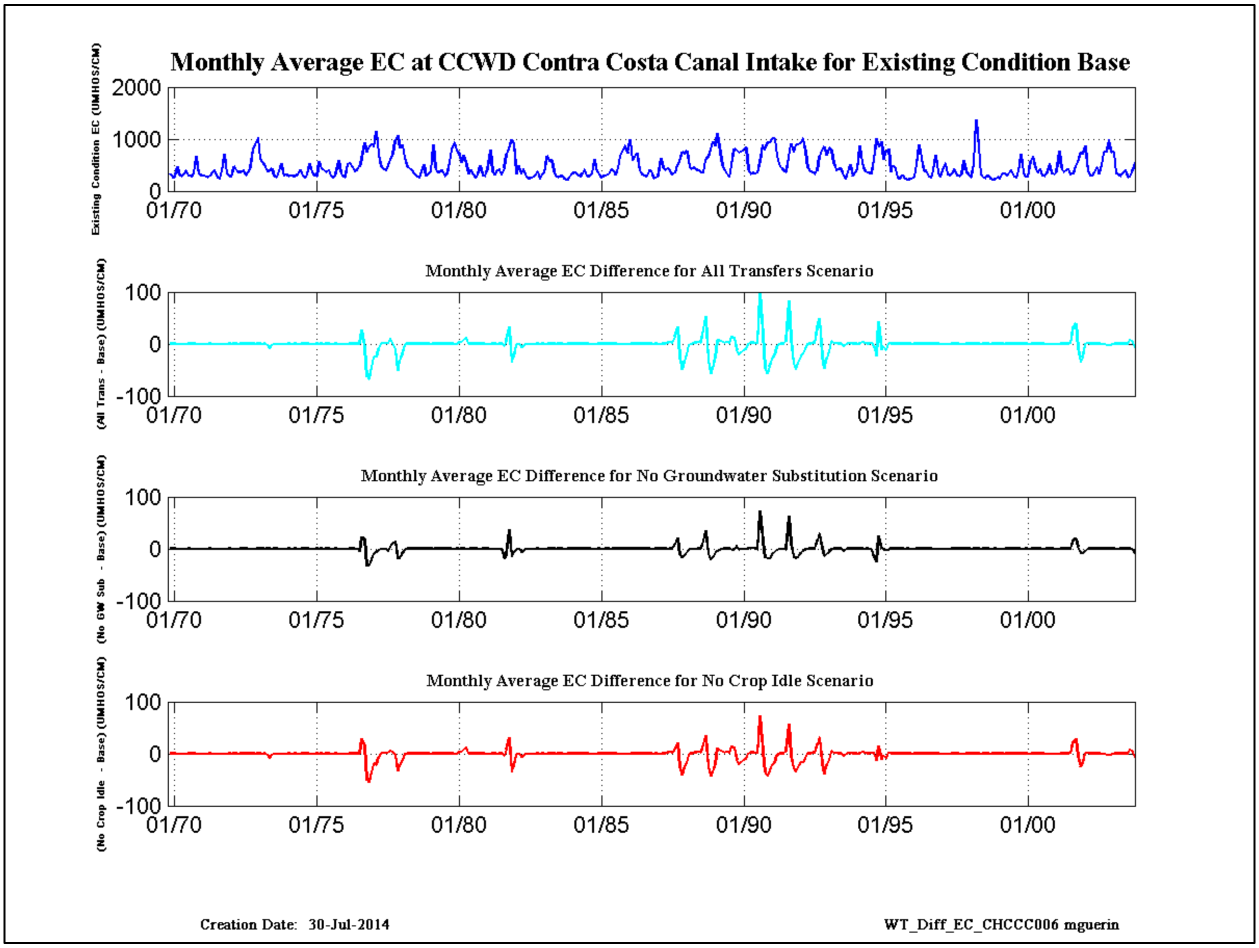


Figure E.3-2. Monthly Average CCWD Contra Costa Canal Intake EC for the Base condition and change from Base for the scenarios.

Table E.3-9. CVP-Jones Intake (CHDMC006) Base salinity (EC).

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	320.3	411.9	423.6	321.7	326.1	300.3	337.2	414.2	361.0	311.3	344.8	540.7
1971	373.1	392.7	503.3	506.4	509.4	413.6	333.8	371.4	331.6	270.0	372.8	558.2
1972	367.8	380.4	432.4	561.7	702.4	602.9	550.7	476.8	387.5	340.0	432.2	628.8
1973	659.8	797.2	636.4	735.5	621.8	375.9	361.3	374.5	358.9	304.8	372.0	418.3
1974	337.3	324.8	504.3	488.8	482.9	301.4	306.8	391.0	404.3	335.7	340.6	437.5
1975	343.3	339.4	432.8	604.6	436.0	286.8	338.5	388.8	368.7	332.4	342.9	470.8
1976	335.1	328.5	414.8	615.0	663.2	620.7	634.3	504.6	496.5	583.9	671.6	606.2
1977	661.6	698.5	765.0	911.9	884.3	865.4	681.0	625.9	511.2	542.4	613.5	749.9
1978	816.7	696.6	771.5	717.8	600.6	557.5	301.7	261.2	367.2	355.9	366.0	410.7
1979	332.1	362.6	492.9	684.0	433.9	308.9	346.3	329.4	324.4	323.0	460.2	622.7
1980	645.9	561.3	641.3	396.4	355.2	220.0	327.5	369.9	358.5	379.4	347.8	394.8
1981	345.6	341.3	506.4	686.9	594.2	520.2	464.5	448.7	384.9	401.6	558.6	647.2
1982	707.9	625.2	487.3	569.1	324.7	313.8	186.3	187.9	321.8	360.4	305.7	264.3
1983	201.3	210.1	275.8	337.1	316.0	272.1	190.9	207.7	212.7	227.9	194.3	220.6
1984	264.2	176.6	249.2	302.7	232.1	296.6	341.0	387.0	365.8	316.8	353.4	462.8
1985	336.4	322.6	410.0	500.3	545.9	500.3	417.3	455.4	385.8	408.9	550.5	629.2
1986	629.3	596.6	758.3	681.4	456.6	283.1	255.7	266.8	361.4	334.2	366.9	397.5
1987	348.0	335.4	420.4	631.0	625.6	628.8	617.4	491.3	382.1	344.4	451.0	511.2
1988	605.0	596.4	693.1	641.9	915.5	877.3	675.9	594.2	459.4	349.9	493.5	569.2
1989	669.2	719.7	759.1	886.5	840.5	801.8	602.8	554.3	311.2	439.9	625.2	591.1
1990	579.7	625.8	720.0	737.8	619.3	609.5	576.5	621.1	438.8	515.0	683.0	639.8
1991	729.9	747.6	830.8	873.3	891.3	750.1	615.0	595.3	384.5	548.0	700.0	627.2
1992	703.6	722.9	800.4	871.5	849.4	680.1	692.7	528.8	345.8	338.2	531.4	640.5
1993	684.7	612.9	745.5	759.9	673.6	572.9	493.2	492.6	503.9	378.8	370.4	418.6
1994	334.9	384.0	525.0	762.1	668.9	645.2	638.5	600.8	432.3	585.4	755.7	667.7
1995	708.6	535.7	710.1	786.7	583.8	394.5	228.1	165.1	290.3	262.3	264.3	276.8
1996	309.3	328.5	452.9	633.3	438.5	319.9	320.1	341.7	395.1	325.9	388.6	517.3
1997	363.5	325.7	316.3	272.0	178.6	213.8	331.6	349.9	368.2	312.7	346.5	489.8
1998	375.1	410.1	430.9	603.9	483.5	278.5	194.8	178.1	260.0	260.7	258.3	257.4
1999	272.5	308.5	424.0	480.6	268.1	321.6	352.6	370.9	347.2	293.3	384.8	533.2
2000	394.2	341.6	429.8	661.9	459.3	290.1	345.2	382.3	382.0	338.2	352.6	418.9
2001	340.7	362.6	491.2	705.3	655.8	569.0	432.3	455.3	377.8	335.2	432.3	508.8
2002	590.8	579.3	638.3	647.8	554.8	577.1	554.9	550.5	401.8	455.0	573.4	619.8
2003	717.6	604.9	678.8	614.0	514.5	509.1	490.8	462.9	304.9	281.8	365.5	446.5
Average	482.5	473.8	552.1	623.3	550.2	472.9	427.6	417.5	373.2	367.4	440.3	505.7
Critical	564.3	586.2	678.4	773.3	784.6	721.2	644.9	581.5	438.4	494.7	635.5	642.9
Dry	438.5	443.5	537.5	676.3	636.1	599.5	514.9	492.6	373.9	397.5	531.9	584.5
BN	350.0	371.5	462.7	622.8	568.2	455.9	448.5	403.1	355.9	331.5	446.2	625.7
AN	653.2	602.4	650.6	647.6	537.5	420.9	386.6	390.6	379.2	339.8	362.4	418.0
Wet	400.4	383.5	459.1	506.8	387.4	307.4	286.0	309.3	337.5	303.4	328.0	417.5

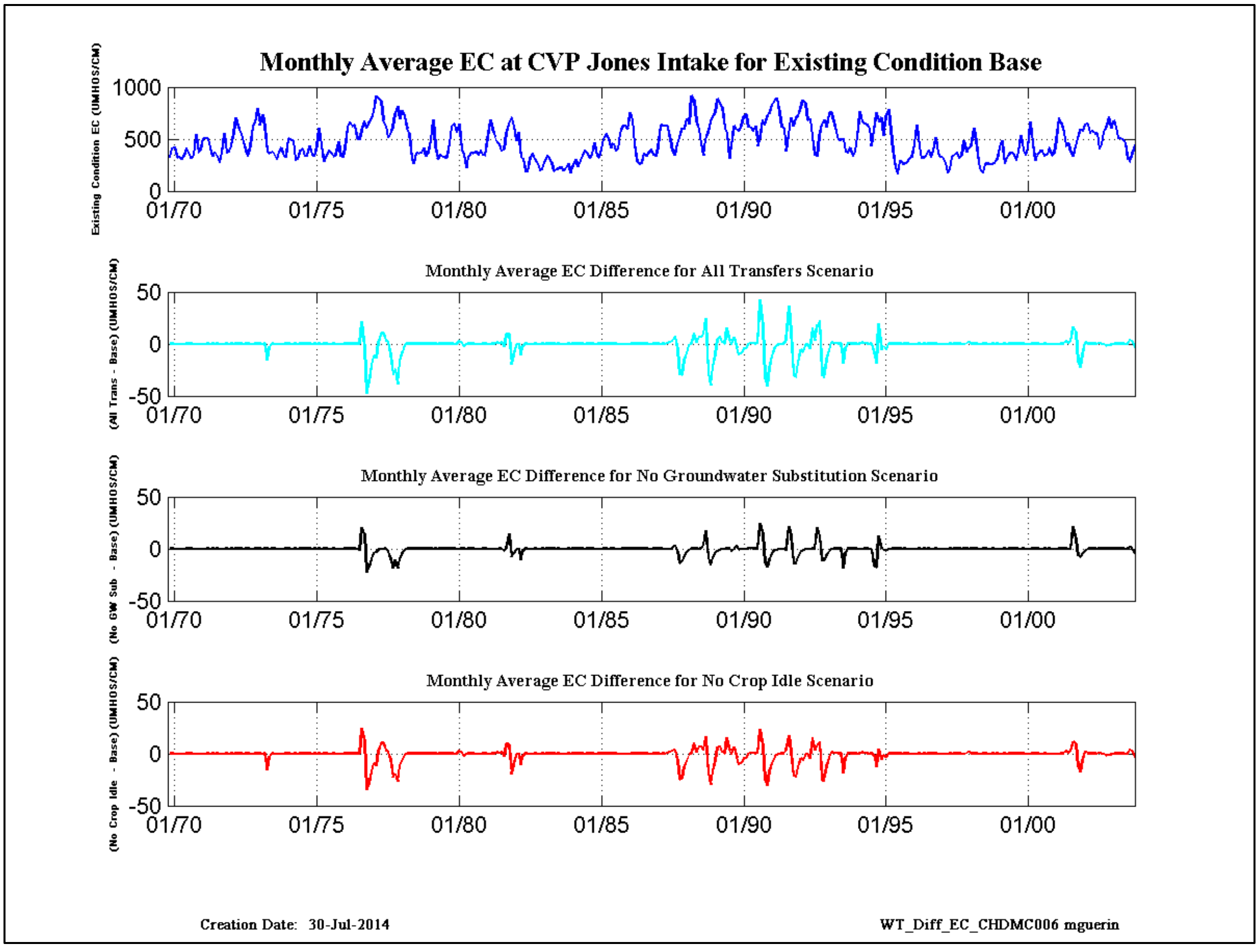


Figure E.3-3. Monthly Average CVP-Jones Intake EC for the Base condition and change from Base for the scenarios.

Table E.3-10. SWP-Clifton Court Intake (CHWST000) Base salinity (EC).

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	287.5	354.1	346.1	376.3	320.9	286.0	315.5	398.5	333.9	262.7	320.3	560.1
1971	337.1	313.5	385.7	413.8	405.2	361.9	314.4	359.7	295.7	233.3	356.6	580.4
1972	335.3	330.6	299.6	490.2	585.8	508.4	504.5	460.9	353.2	314.8	424.6	667.3
1973	715.8	880.1	590.5	623.3	526.9	365.4	344.5	354.7	319.4	259.8	350.9	401.4
1974	289.5	277.5	372.1	412.0	400.5	304.2	301.0	376.3	342.2	263.3	309.4	440.5
1975	313.1	304.8	305.8	545.8	442.1	309.2	329.7	374.6	326.5	261.6	313.7	484.0
1976	304.5	288.2	277.6	559.8	575.4	515.9	560.0	478.8	477.3	601.2	712.8	629.5
1977	719.9	734.1	775.1	951.2	784.7	669.6	556.0	541.0	485.4	548.7	642.5	793.7
1978	870.0	711.4	767.9	677.8	544.8	499.5	287.8	242.7	318.0	282.4	345.8	416.7
1979	298.8	327.7	396.8	679.2	444.9	329.3	337.6	307.0	298.6	294.0	471.2	679.6
1980	729.5	590.1	609.3	453.0	320.5	211.8	316.2	352.4	343.7	298.7	323.9	384.2
1981	297.4	303.2	416.1	653.5	483.9	456.3	445.5	439.6	350.3	390.0	575.0	689.5
1982	780.9	658.8	389.5	490.9	350.0	342.8	181.7	172.7	275.2	295.4	292.1	287.8
1983	210.3	225.8	291.0	278.2	290.3	241.7	179.2	199.4	201.3	219.1	217.7	205.9
1984	227.9	204.2	228.2	314.7	277.0	274.5	321.4	370.7	323.4	266.3	321.1	490.2
1985	314.0	277.2	273.9	397.2	440.9	443.3	400.4	443.2	348.4	394.5	564.8	676.6
1986	679.0	632.1	784.2	623.4	501.7	268.6	247.7	249.2	323.2	278.5	350.3	368.1
1987	299.1	293.7	326.8	596.7	537.3	555.6	582.7	463.2	353.2	328.6	431.8	508.2
1988	640.2	616.6	678.7	569.8	830.0	717.7	588.7	542.7	427.7	348.8	496.0	572.2
1989	706.4	760.3	773.7	915.5	790.5	719.2	549.4	473.4	285.2	449.4	652.7	621.6
1990	599.1	648.6	711.6	712.6	517.0	505.4	467.6	534.7	402.5	529.6	717.2	662.1
1991	780.2	795.3	853.5	886.9	822.4	702.3	584.6	521.5	367.5	566.9	733.0	642.8
1992	744.5	760.3	807.5	881.5	823.6	619.7	574.0	445.0	339.4	346.7	558.2	656.1
1993	707.8	617.3	740.5	726.2	596.7	494.8	472.3	486.9	386.8	271.8	337.0	413.5
1994	296.9	353.7	444.2	743.0	585.4	538.9	521.4	525.9	395.4	612.2	793.5	698.9
1995	744.4	520.8	704.2	742.3	502.6	416.6	217.9	154.5	254.3	278.4	238.6	226.0
1996	259.6	277.7	342.0	525.4	456.7	341.6	313.2	329.9	329.1	268.7	375.1	545.7
1997	336.6	286.6	333.7	245.6	193.9	234.2	308.3	325.8	326.8	267.2	306.0	507.0
1998	343.3	337.6	291.9	544.1	404.9	376.5	189.7	171.2	251.1	274.2	237.9	222.9
1999	237.0	268.2	314.5	412.4	326.5	291.1	340.8	357.5	308.5	246.8	365.8	556.5
2000	354.0	300.2	298.3	604.5	525.8	330.0	331.6	366.9	327.0	274.2	321.6	410.7
2001	304.5	332.0	385.7	675.5	562.2	494.9	422.1	450.2	353.3	315.2	419.3	500.5
2002	622.1	593.5	586.4	567.3	449.8	482.5	514.1	522.0	378.4	461.6	590.5	652.5
2003	771.8	621.6	650.1	515.3	410.1	392.9	461.6	450.2	288.7	258.8	339.7	428.3
Average	484.1	464.6	492.7	582.5	500.9	429.5	393.6	389.5	338.0	340.1	435.5	517.1
Critical	583.6	599.5	649.7	757.8	705.5	609.9	550.3	512.8	413.6	507.7	664.7	665.1
Dry	423.9	426.6	460.4	634.3	544.1	525.3	485.7	465.3	344.8	389.9	539.0	608.2
BN	317.1	329.2	348.2	584.7	515.4	418.8	421.0	383.9	325.9	304.4	447.9	673.4
AN	691.5	620.1	609.4	600.0	487.5	382.4	369.0	375.6	330.6	274.3	336.5	409.1
Wet	388.2	358.6	391.4	455.8	374.8	311.5	273.9	295.4	299.3	262.7	308.0	421.2

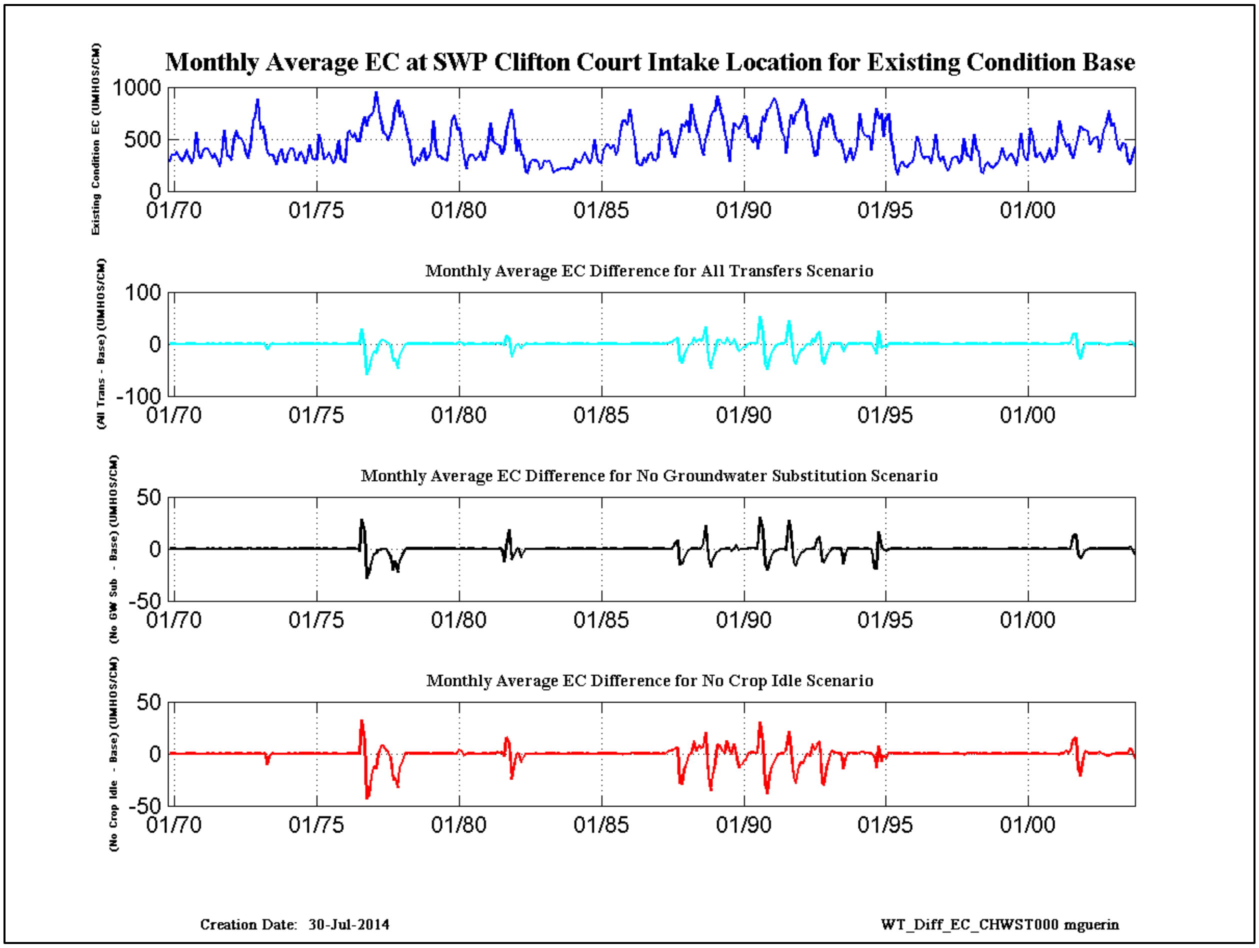


Figure E.3-4. Monthly Average SWP-Banks Intake to Clifton Court Forebay EC for the Base condition and change from Base for the scenarios.

Table E.3-11. Old River near Middle River location Base salinity (EC).

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	415.0	479.9	583.6	286.4	320.5	296.9	309.4	401.2	432.3	592.9	558.8	528.9
1971	486.7	564.4	786.6	673.6	736.4	449.5	303.3	358.9	459.6	569.3	555.8	541.0
1972	489.5	583.5	796.4	804.2	852.2	827.3	503.3	453.9	589.5	643.6	590.6	584.6
1973	526.1	577.4	784.9	807.3	648.4	350.8	339.9	349.0	481.2	591.8	477.6	490.3
1974	448.2	523.5	770.0	522.1	608.9	278.1	300.0	376.4	457.1	528.8	450.5	463.4
1975	430.1	470.9	728.2	757.0	389.6	261.5	328.9	369.3	374.8	511.3	438.9	478.5
1976	424.6	505.1	774.3	779.0	896.8	873.5	624.8	471.8	595.1	659.2	585.7	578.9
1977	535.1	656.8	824.3	824.5	1045.6	1224.0	781.0	683.2	676.9	695.7	685.1	666.6
1978	613.9	684.8	838.3	724.7	619.4	569.0	279.2	239.9	375.9	508.3	443.5	425.5
1979	513.9	494.8	746.7	667.0	387.4	285.7	336.3	302.5	443.3	605.0	476.6	511.2
1980	462.3	528.3	778.7	350.4	305.0	207.1	316.4	350.2	350.5	429.1	416.4	460.9
1981	453.3	501.3	771.9	768.3	852.4	581.7	433.7	426.7	594.8	626.2	591.1	572.6
1982	507.4	578.9	774.9	623.4	298.0	281.2	178.4	170.5	329.5	384.4	312.3	244.7
1983	190.7	195.1	268.1	266.0	282.9	227.4	177.1	198.9	200.4	217.8	171.0	224.5
1984	343.7	164.3	223.3	294.8	202.5	302.9	316.3	365.9	472.2	591.4	496.5	416.3
1985	381.9	470.3	789.4	767.9	769.7	561.5	381.4	443.6	581.9	667.7	574.1	538.9
1986	502.8	551.7	769.0	797.2	400.4	259.8	245.0	246.9	366.2	517.6	434.4	412.4
1987	395.0	424.7	721.9	743.1	869.0	722.2	583.3	461.5	602.2	653.6	613.6	590.5
1988	530.7	605.0	810.0	816.3	985.2	920.1	669.6	616.7	666.7	665.7	650.2	619.9
1989	584.8	638.5	818.0	826.9	963.2	840.2	580.4	684.1	648.0	634.2	621.2	555.7
1990	573.8	628.2	823.0	835.6	953.7	928.4	756.7	655.4	681.4	656.7	636.5	620.3
1991	583.5	626.9	828.7	848.7	1005.9	738.8	606.0	673.3	717.9	720.6	702.9	679.3
1992	593.1	639.6	838.5	852.9	837.4	798.2	801.7	731.8	742.4	746.2	772.5	732.9
1993	616.1	669.8	844.2	678.7	671.5	636.3	456.7	486.1	689.8	780.9	506.5	486.4
1994	500.8	555.6	814.1	842.6	906.3	927.5	697.4	631.1	692.9	709.1	664.8	641.4
1995	610.1	646.2	835.2	715.4	713.1	355.4	212.0	152.4	289.8	250.4	300.3	461.0
1996	453.0	510.7	772.6	742.5	337.3	284.6	310.2	328.3	456.2	565.7	472.0	476.1
1997	453.5	442.9	297.3	235.3	169.4	197.2	306.0	321.2	437.1	601.7	512.1	469.8
1998	471.8	567.4	784.7	569.4	349.2	253.7	186.6	169.5	253.1	249.6	275.9	303.9
1999	353.2	443.5	680.1	526.5	222.0	341.5	337.6	352.9	421.4	618.6	539.7	511.1
2000	485.7	555.8	809.1	751.0	361.4	256.4	330.1	364.1	569.2	631.5	556.1	477.0
2001	439.0	516.0	770.2	769.1	854.6	668.8	401.5	443.0	601.2	659.9	612.7	573.7
2002	533.7	591.7	785.4	759.7	806.9	774.2	514.1	517.9	561.0	652.2	608.4	586.3
2003	579.0	622.5	802.4	818.8	792.1	799.6	447.3	453.3	473.5	633.9	602.0	587.2
Average	484.8	535.8	736.6	677.8	629.8	537.7	422.1	419.2	508.4	581.5	526.7	515.1
Critical	534.5	602.4	816.1	828.5	947.3	915.8	705.3	637.6	681.9	693.3	671.1	648.5
Dry	464.6	523.8	776.1	772.5	852.6	691.4	482.4	496.1	598.2	648.9	603.5	569.6
BN	501.7	539.1	771.6	735.6	619.8	556.5	419.8	378.2	516.4	624.3	533.6	547.9
AN	547.2	606.4	809.6	688.5	566.3	469.9	361.6	373.8	490.0	595.9	500.3	487.9
Wet	435.9	472.3	636.4	539.2	386.9	291.5	270.1	293.2	380.8	476.9	424.5	425.5

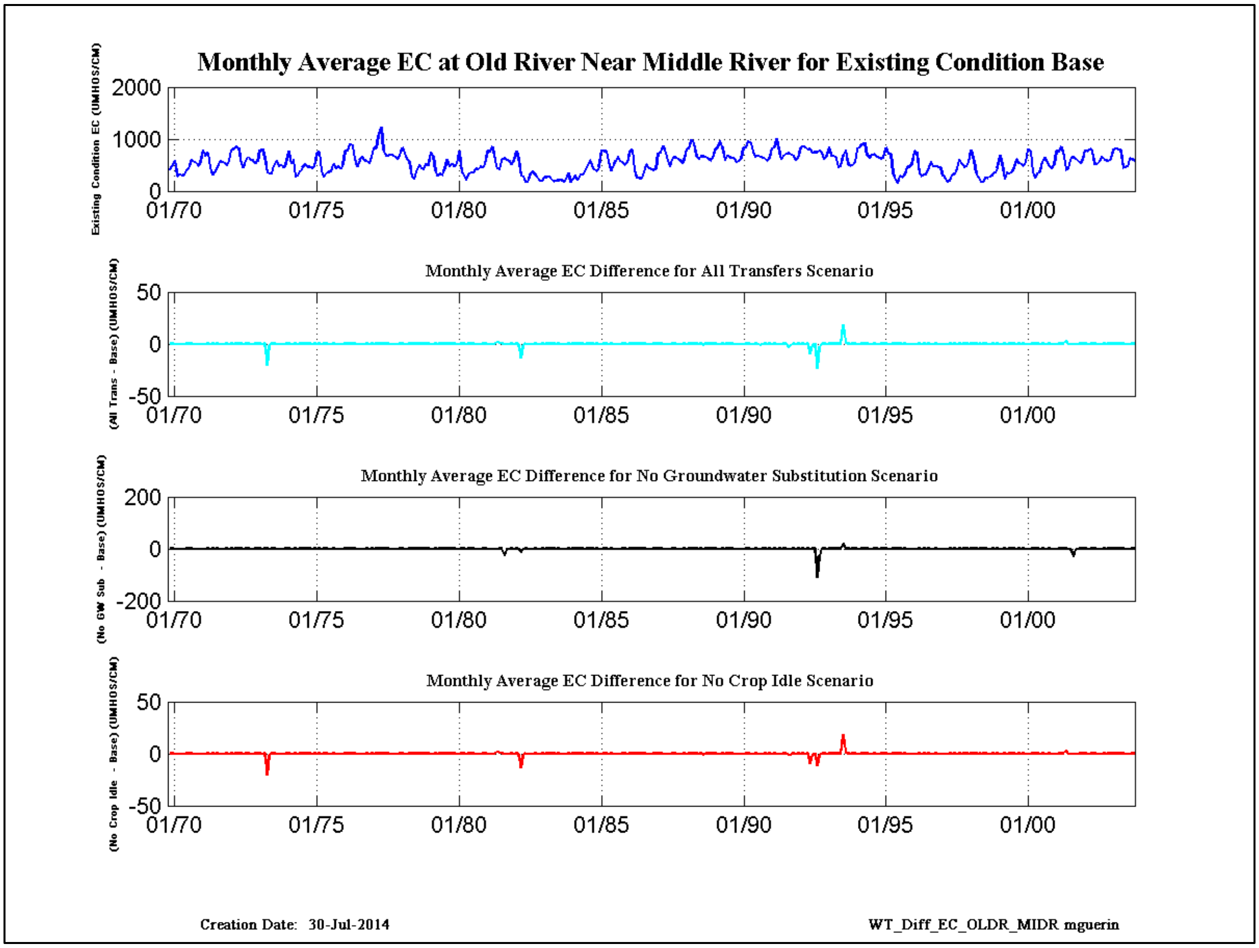


Figure E.3-5. Monthly Average Old River near Middle River EC for the Base condition and change from Base for the scenarios.

Table E.3-12. CCWD Old River Intake (ROLD034) Base salinity (EC).

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	274.1	291.1	271.4	401.3	304.2	267.4	328.7	392.4	308.2	261.6	335.4	593.0
1971	320.2	282.0	285.2	304.3	292.0	303.7	341.3	380.6	274.8	231.4	378.1	616.6
1972	319.3	301.1	284.8	436.0	399.9	355.0	422.1	440.8	326.9	325.2	454.7	727.9
1973	783.3	950.7	552.9	485.9	434.6	340.6	353.8	387.4	299.2	258.9	367.2	413.8
1974	278.6	267.4	278.0	345.9	316.5	293.0	306.7	384.4	307.6	250.6	316.6	462.0
1975	299.8	292.3	298.9	510.2	447.0	308.3	335.5	387.5	298.5	249.3	321.5	511.9
1976	293.4	273.0	272.7	538.2	514.5	414.8	427.0	439.7	462.5	650.7	781.3	668.5
1977	787.1	783.0	830.7	1009.2	676.0	529.0	462.5	426.3	484.4	562.4	691.4	871.9
1978	919.3	738.1	793.1	612.5	470.9	434.4	299.0	252.5	295.6	269.0	358.4	436.1
1979	291.8	324.9	416.0	689.5	428.2	330.6	345.6	325.5	286.3	302.8	503.9	743.9
1980	798.6	629.7	644.1	495.9	353.1	223.9	318.5	364.9	327.7	278.2	331.0	398.8
1981	283.7	291.3	433.3	640.3	377.2	347.1	445.7	455.8	327.6	412.0	621.5	756.4
1982	857.5	703.7	306.0	419.1	340.3	347.3	188.4	177.9	249.7	273.6	292.2	290.9
1983	206.4	228.7	336.8	322.0	296.2	245.1	186.5	202.7	208.2	232.4	219.0	199.9
1984	218.5	257.6	239.9	349.2	304.2	254.0	329.4	398.0	298.0	265.2	334.6	517.7
1985	301.1	266.2	251.0	296.8	325.1	351.4	431.1	435.1	322.1	416.2	609.4	738.7
1986	730.0	686.3	846.9	535.0	574.0	312.1	257.2	258.5	298.2	271.9	364.9	363.6
1987	262.2	268.9	299.5	576.5	438.2	407.2	512.6	425.4	331.9	337.9	447.4	535.7
1988	675.9	645.8	688.5	464.2	566.6	488.7	457.4	448.3	400.1	353.6	524.5	604.9
1989	752.3	814.4	829.9	978.4	706.8	577.8	464.5	373.0	271.7	480.7	706.5	670.9
1990	641.7	690.4	730.7	702.8	421.3	353.5	369.6	377.1	381.9	573.9	763.2	708.1
1991	833.1	848.3	919.1	923.9	726.4	602.5	525.4	412.2	362.8	621.5	775.1	679.6
1992	802.5	805.0	848.1	920.3	783.5	499.2	432.4	372.5	330.6	362.0	595.1	708.5
1993	743.9	632.1	775.5	717.7	513.8	401.7	481.0	496.4	331.3	255.6	349.5	432.7
1994	288.9	352.5	464.8	756.0	509.7	383.4	387.7	383.4	371.3	662.2	858.6	766.3
1995	795.3	525.5	755.1	711.9	404.2	459.6	234.6	158.9	235.2	306.5	231.8	218.9
1996	242.4	259.6	260.4	386.4	441.2	334.4	326.0	340.0	299.9	262.0	395.3	579.1
1997	321.0	270.8	374.5	250.1	273.4	240.3	325.1	354.0	307.1	263.5	316.7	535.8
1998	327.9	282.7	268.4	472.4	573.3	426.7	199.1	177.3	246.4	299.2	230.3	213.4
1999	226.2	260.4	244.7	339.8	324.1	263.1	345.0	382.9	286.7	244.8	387.3	590.6
2000	336.3	282.1	296.5	527.9	547.8	329.8	338.3	390.8	303.7	268.7	335.8	427.0
2001	292.2	325.0	393.3	674.5	444.2	367.3	449.1	467.0	333.8	322.6	435.9	527.4
2002	654.8	630.0	556.3	431.5	335.4	321.5	429.7	502.0	353.9	493.6	635.7	716.9
2003	826.5	661.7	638.2	368.5	293.6	275.4	420.4	429.5	271.3	262.5	359.8	448.1
Average	499.6	474.2	490.7	546.9	445.8	364.4	367.0	370.6	317.5	349.5	459.7	549.3
Critical	617.5	628.3	679.2	759.2	599.7	467.3	437.4	408.5	399.1	540.9	712.7	715.4
Dry	424.4	432.6	460.5	599.7	437.8	395.4	455.5	443.0	323.5	410.5	576.1	657.7
BN	305.5	313.0	350.4	562.8	414.0	342.8	383.9	383.1	306.6	314.0	479.3	735.9
AN	734.6	649.1	616.7	534.7	435.6	334.3	368.5	386.9	304.8	265.5	350.3	426.1
Wet	392.2	354.5	366.6	411.4	376.2	311.9	284.9	307.3	278.3	262.5	317.2	438.0

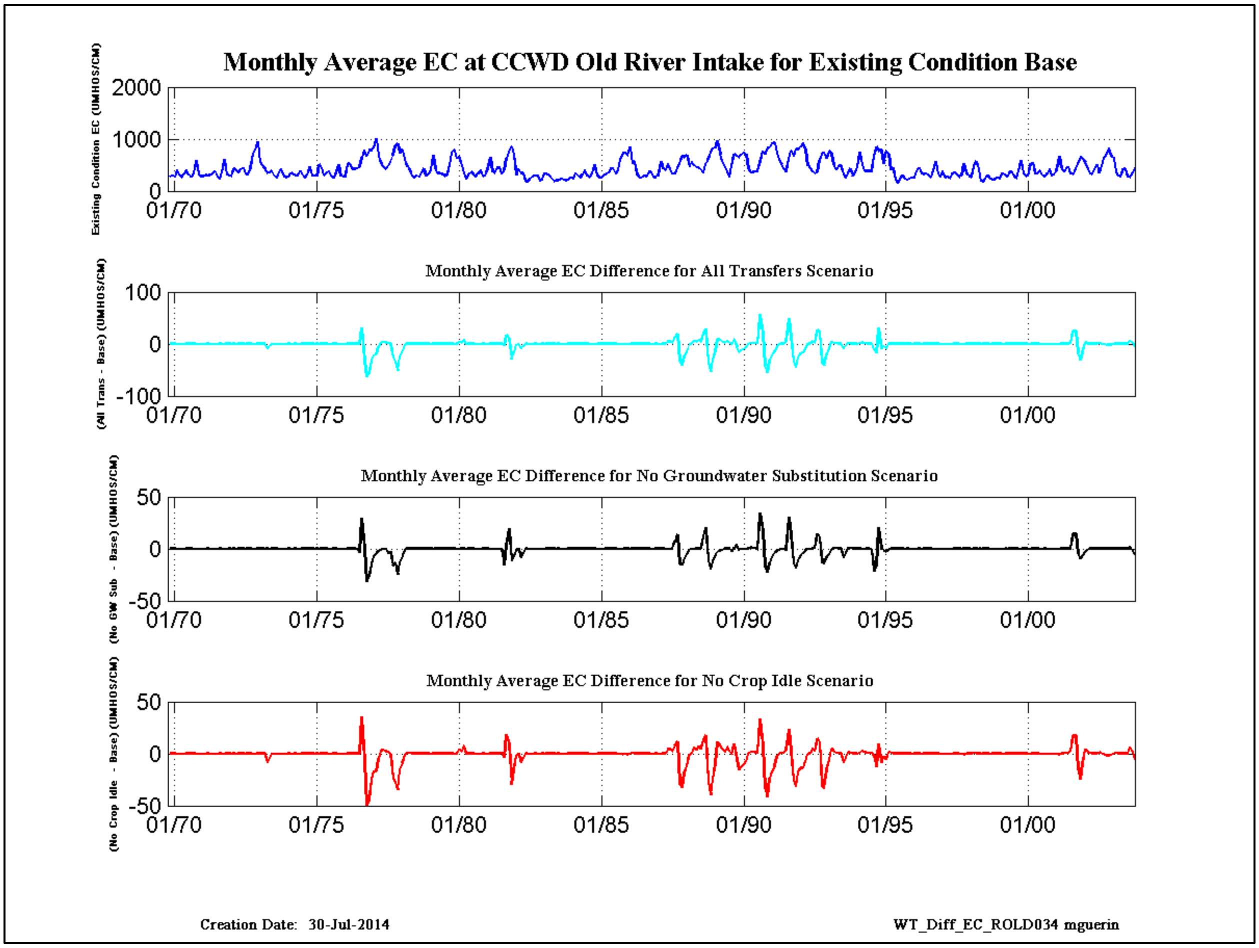


Figure E.3-6. Monthly Average CCWD Old River Intake EC for the Base condition and change from Base for the scenarios.

Table E.3-13. Old River location (ROLD059) Base salinity (EC).

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	417.0	477.0	582.7	310.4	339.1	308.0	321.0	409.4	458.2	589.1	581.6	549.3
1971	498.7	573.4	832.8	713.3	748.7	469.6	317.9	364.4	472.2	573.5	580.1	559.6
1972	502.2	565.3	780.4	826.4	861.6	841.6	534.3	469.2	581.2	648.9	618.3	598.3
1973	540.5	601.7	785.3	973.8	770.4	383.3	349.0	358.5	488.3	594.2	509.2	500.9
1974	458.6	524.7	768.8	559.8	627.3	294.1	304.5	382.3	463.1	533.6	474.8	472.8
1975	440.3	474.6	714.1	774.2	430.0	274.0	333.4	380.6	381.7	511.2	462.0	484.1
1976	434.8	501.8	757.2	796.8	899.3	885.9	649.6	493.6	572.5	660.8	690.0	636.9
1977	553.1	617.8	810.8	844.0	1029.4	1200.7	859.3	693.7	595.7	593.7	624.1	721.5
1978	753.7	696.8	831.4	777.8	648.7	593.0	290.4	247.2	378.3	510.8	466.4	437.7
1979	512.9	505.1	733.9	712.2	424.1	297.6	341.7	312.0	460.3	599.9	510.6	516.7
1980	473.4	524.7	766.1	380.7	328.4	216.6	321.9	356.7	355.0	432.6	431.7	466.9
1981	462.5	502.5	752.9	795.4	861.2	611.3	449.8	438.8	590.1	638.2	620.4	598.7
1982	522.0	579.1	769.4	689.3	317.1	299.7	180.6	175.1	331.4	388.6	327.5	249.7
1983	195.6	205.9	272.6	307.2	297.6	250.4	182.8	200.9	202.5	220.1	177.4	226.8
1984	342.0	170.0	231.5	305.3	219.0	309.8	325.0	375.3	480.1	591.4	523.1	431.3
1985	389.6	479.6	780.8	792.8	783.2	584.1	399.1	452.2	585.8	669.0	610.8	561.0
1986	514.8	554.1	757.8	822.4	438.2	267.3	253.0	253.8	369.1	518.4	455.0	423.1
1987	405.1	429.0	701.0	764.4	875.8	751.0	604.2	481.2	578.6	647.6	574.6	598.2
1988	549.2	594.0	796.8	841.8	976.9	938.1	698.4	628.8	599.7	577.8	539.3	611.1
1989	617.3	634.2	807.2	846.5	959.0	860.0	610.4	680.0	669.1	644.9	647.0	603.1
1990	577.3	623.2	804.9	852.7	954.1	941.3	793.4	669.2	569.6	621.2	688.6	680.2
1991	611.3	625.7	808.6	869.7	996.5	764.5	626.6	673.5	587.0	645.5	705.7	665.9
1992	637.4	633.9	816.1	875.1	868.9	809.5	810.6	749.1	518.6	454.5	552.7	649.8
1993	700.6	674.3	838.2	816.5	826.4	715.4	482.1	489.3	681.5	772.9	550.3	497.3
1994	505.8	556.2	799.6	862.8	912.3	934.9	733.4	640.2	570.9	696.0	742.6	690.9
1995	657.2	650.9	821.6	865.1	744.3	389.2	221.3	155.4	292.3	254.3	309.7	451.8
1996	463.3	510.0	759.7	840.2	459.1	319.3	317.2	333.2	461.0	567.7	498.3	485.7
1997	462.2	452.9	307.4	251.7	178.3	207.0	315.5	330.2	443.0	596.0	535.4	485.6
1998	479.0	565.9	776.5	690.5	443.6	268.3	191.2	172.5	255.3	253.1	284.7	309.1
1999	355.2	441.2	671.8	567.9	250.7	349.9	345.0	361.1	432.1	610.8	569.5	525.0
2000	497.6	554.2	793.2	793.4	444.4	273.9	335.9	371.1	565.5	636.7	579.6	498.9
2001	449.6	513.8	759.9	798.9	872.6	691.2	421.3	453.1	595.5	654.7	567.1	578.7
2002	549.9	590.5	796.0	807.1	826.9	786.3	545.2	548.6	586.8	647.4	644.2	603.3
2003	591.4	623.7	799.5	843.6	810.7	808.7	479.3	461.6	512.5	630.7	625.7	601.1
Average	503.6	536.1	729.0	722.6	659.5	555.7	439.5	428.3	490.7	564.3	537.6	528.6
Critical	552.7	593.2	799.2	849.0	948.2	925.0	738.8	649.7	573.4	607.1	649.0	665.2
Dry	479.0	524.9	766.3	800.9	863.1	714.0	505.0	509.0	601.0	650.3	610.7	590.5
BN	507.5	535.2	757.1	769.3	642.9	569.6	438.0	390.6	520.8	624.4	564.5	557.5
AN	592.9	612.6	802.3	764.3	638.1	498.5	376.4	380.7	496.9	596.3	527.1	500.5
Wet	446.6	475.4	635.9	592.1	422.5	308.2	277.6	299.6	387.8	477.5	444.6	434.9

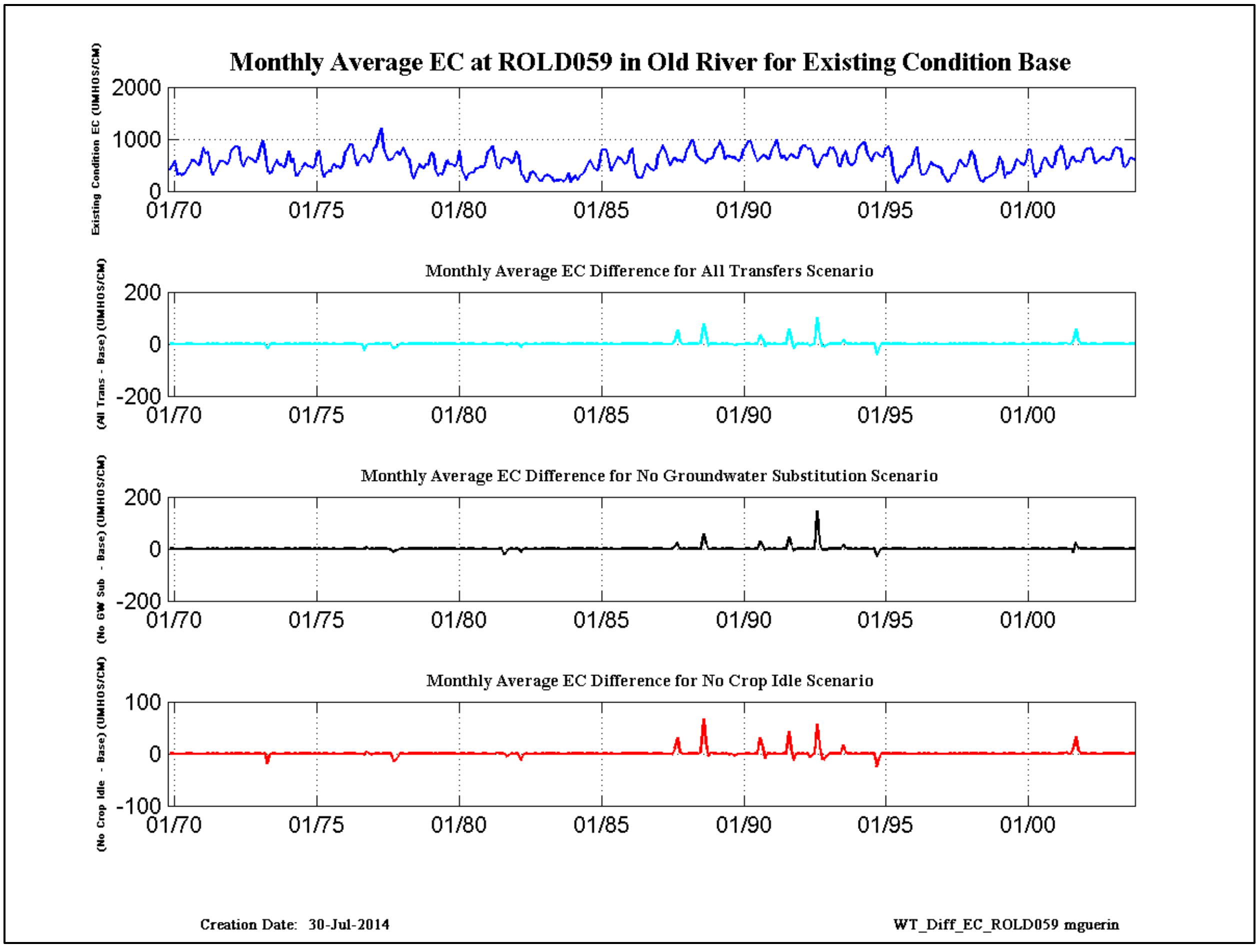


Figure E.3-7. Monthly Average Old River location (ROLD059) EC for the Base condition and change from Base for the scenarios.

Table E.3-14. CCWD Contra Costa Canal Intake (CHCCC006) salinity (EC) difference All Transfers minus Base.

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	0.0	0.0	0.0	0.0	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1971	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	0.0	0.0	0.0	0.0
1972	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0
1973	0.0	0.0	0.0	0.0	0.1	-2.6	-8.3	-1.9	-0.3	0.0	0.0	0.0
1974	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.2	0.0	0.0	0.0	0.0
1975	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0
1976	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.5	26.6	-7.1	-63.0
1977	-67.4	-46.0	-25.2	-24.8	-8.4	0.1	1.8	1.0	1.9	10.1	-1.9	-10.2
1978	-51.4	-34.0	-18.1	-1.7	0.8	0.5	0.2	0.1	0.2	0.2	0.3	0.2
1979	0.0	0.0	0.0	0.0	0.4	0.4	0.2	0.3	0.1	0.1	0.1	0.0
1980	-0.2	-0.3	2.9	3.2	7.0	11.6	0.6	0.3	0.1	0.0	0.0	0.0
1981	0.0	0.0	-0.4	-0.1	0.2	0.1	0.0	0.3	0.6	-4.0	7.6	32.4
1982	-35.5	-24.0	-2.6	0.2	-5.6	-5.9	-0.6	-0.1	-0.2	-0.1	0.0	0.0
1983	0.0	0.1	0.0	0.0	0.3	0.3	0.2	-0.1	0.1	0.1	-0.1	0.0
1984	0.0	0.2	0.1	0.1	0.0	0.0	0.1	0.1	0.0	-0.1	-0.1	0.0
1985	0.0	0.1	0.3	0.4	0.3	0.2	0.3	0.2	0.2	-0.3	-0.5	-0.8
1986	-0.7	-0.5	-0.8	0.7	0.1	0.1	0.2	0.1	0.1	0.0	0.0	0.0
1987	0.0	0.1	-0.1	-0.5	0.2	0.1	2.5	3.4	1.6	15.3	33.4	-24.6
1988	-48.8	-33.1	-20.6	-1.3	0.2	2.7	2.8	3.9	2.9	28.7	53.0	-31.7
1989	-58.0	-46.2	-24.9	7.6	5.0	3.4	1.3	4.0	1.4	13.5	10.6	-11.9
1990	-21.9	-16.7	-12.7	-10.4	0.0	2.3	2.3	1.3	2.2	99.6	17.4	-44.4
1991	-57.7	-43.7	-28.1	-21.3	-4.7	-0.4	0.6	0.8	5.0	83.8	11.8	-37.7
1992	-48.7	-36.0	-22.8	-20.0	-9.6	-0.1	0.4	2.9	1.8	31.9	48.3	-23.5
1993	-47.3	-27.2	-14.2	4.9	1.6	1.0	0.7	0.8	-4.8	-2.7	1.3	1.0
1994	0.1	0.1	0.0	0.3	3.2	1.5	0.9	0.6	1.1	-5.4	-22.6	43.2
1995	-10.9	-6.9	-11.4	1.0	0.9	0.5	0.2	0.1	0.1	0.1	0.1	0.5
1996	0.1	0.0	0.1	0.4	0.3	0.1	0.1	0.2	0.1	0.3	0.5	0.4
1997	0.1	0.0	0.0	-0.2	-0.3	-0.1	0.0	0.1	0.1	-0.1	-0.3	-0.7
1998	0.1	0.1	0.2	0.9	0.2	0.1	-0.1	0.2	0.2	0.0	0.0	0.0
1999	0.0	0.2	0.2	0.0	0.0	0.0	0.1	0.3	0.1	0.2	0.2	0.2
2000	0.0	0.0	-0.1	-0.5	0.1	0.1	0.2	0.2	0.0	-0.1	-0.2	0.0
2001	0.0	0.0	-0.2	-1.0	0.2	0.1	0.2	0.7	1.9	32.1	39.8	-6.0
2002	-34.0	-25.5	-0.9	1.0	0.5	0.4	0.2	0.2	1.0	-0.2	-0.7	-2.5
2003	-2.6	-1.1	-0.8	0.6	0.1	0.1	0.1	0.2	0.2	7.6	3.1	-7.6
Average	-14.3	-10.0	-5.3	-1.8	-0.2	0.5	0.2	0.6	0.5	9.9	5.7	-5.5
Critical	-34.9	-25.1	-15.6	-11.1	-2.8	0.9	1.3	1.5	2.2	39.3	14.1	-23.9
Dry	-15.3	-11.9	-4.4	1.2	1.1	0.7	0.7	1.5	1.1	9.4	15.0	-2.2
BN	0.0	0.0	0.0	0.0	0.2	0.2	0.1	0.2	0.1	0.0	0.0	0.0
AN	-16.9	-10.4	-5.1	1.1	1.6	1.8	-1.1	0.0	-0.8	0.8	0.7	-1.1
Wet	-3.6	-2.4	-1.1	0.2	-0.3	-0.4	0.0	0.0	0.0	0.0	0.0	0.0

Table E.3-15. CCWD Contra Costa Canal Intake (CHCCC006) salinity (EC) percent difference of All Transfers from Base.

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1971	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1972	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1973	0.0	0.0	0.0	0.0	0.0	-0.7	-2.2	-0.4	-0.1	0.0	0.0	0.0
1974	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1975	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1976	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	4.2	-0.8	-8.5
1977	-7.8	-5.1	-2.9	-2.1	-1.2	0.0	0.4	0.3	0.4	1.7	-0.3	-1.0
1978	-4.8	-4.1	-2.0	-0.3	0.2	0.1	0.0	0.0	0.1	0.1	0.1	0.0
1979	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.1	0.0	0.0	0.0	0.0
1980	0.0	0.0	0.4	0.6	1.0	2.2	0.2	0.1	0.0	0.0	0.0	0.0
1981	0.0	0.0	-0.1	0.0	0.1	0.0	0.0	0.1	0.2	-0.9	1.1	4.0
1982	-3.6	-2.6	-0.8	0.0	-1.7	-1.4	-0.2	-0.1	-0.1	0.0	0.0	0.0
1983	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0
1984	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1985	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.0	0.1	-0.1	-0.1	-0.1
1986	-0.1	-0.1	-0.1	0.1	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0
1987	0.0	0.0	0.0	-0.1	0.0	0.0	0.6	0.9	0.5	4.3	6.8	-4.3
1988	-6.6	-4.6	-2.7	-0.3	0.0	0.6	0.7	1.0	0.8	7.8	9.0	-4.9
1989	-7.2	-4.9	-2.9	0.7	0.7	0.7	0.3	1.2	0.5	2.7	1.3	-1.5
1990	-3.0	-2.2	-1.6	-1.2	0.0	0.7	0.7	0.4	0.6	17.2	2.0	-5.7
1991	-6.2	-4.7	-2.8	-2.1	-0.7	-0.1	0.1	0.2	1.4	13.1	1.3	-5.0
1992	-5.5	-4.0	-2.5	-2.0	-1.2	0.0	0.1	0.8	0.6	8.2	7.3	-3.0
1993	-5.5	-3.9	-1.7	0.6	0.3	0.3	0.2	0.2	-1.6	-1.1	0.3	0.2
1994	0.1	0.0	0.0	0.0	0.6	0.4	0.3	0.2	0.3	-0.9	-2.2	5.1
1995	-1.2	-1.1	-1.5	0.1	0.3	0.1	0.0	0.0	0.0	0.0	0.1	0.2
1996	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.1	0.0	0.1	0.1	0.1
1997	0.0	0.0	0.0	0.0	-0.1	0.0	0.0	0.0	0.0	0.0	-0.1	-0.1
1998	0.0	0.0	0.1	0.2	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.0
1999	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.1	0.0	0.1	0.1	0.0
2000	0.0	0.0	0.0	-0.1	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.0
2001	0.0	0.0	-0.1	-0.1	0.0	0.0	0.0	0.2	0.6	9.5	8.2	-1.1
2002	-4.7	-3.6	-0.1	0.3	0.2	0.1	0.1	0.0	0.3	0.0	-0.1	-0.3
2003	-0.3	-0.1	-0.1	0.2	0.0	0.0	0.0	0.0	0.1	2.7	0.8	-1.4
Average	-1.7	-1.2	-0.6	-0.2	0.0	0.1	0.1	0.2	0.2	2.0	1.0	-0.8
Critical	-4.1	-2.9	-1.8	-1.1	-0.4	0.2	0.3	0.4	0.6	7.3	2.3	-3.3
Dry	-2.0	-1.4	-0.5	0.1	0.2	0.2	0.2	0.4	0.4	2.6	2.9	-0.6
BN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AN	-1.8	-1.4	-0.6	0.2	0.3	0.3	-0.3	0.0	-0.3	0.3	0.2	-0.2
Wet	-0.4	-0.3	-0.2	0.0	-0.1	-0.1	0.0	0.0	0.0	0.0	0.0	0.0

Table E.3-16. CVP-Jones Intake (CHDMC006) salinity (EC) difference All Transfers minus Base.

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	0.1	0.1	0.0	-0.2	-0.2	0.0	0.0	0.1	0.1	0.1	0.0	0.0
1971	0.0	-0.1	0.0	0.0	0.1	-0.2	0.0	-0.1	0.0	0.0	0.0	0.0
1972	0.0	0.0	0.0	0.0	0.1	0.1	0.3	-0.2	0.0	0.0	0.0	-0.1
1973	0.0	0.0	0.1	-0.1	0.1	-15.3	-2.9	0.3	-0.2	-0.1	-0.1	-0.1
1974	-0.2	0.0	0.1	-0.1	0.0	0.2	-0.2	0.1	0.2	0.1	0.1	0.1
1975	0.0	0.0	0.0	0.1	0.0	0.1	0.1	-0.3	-0.1	0.1	0.0	0.0
1976	0.0	-0.1	0.0	0.0	0.1	0.1	0.0	0.1	0.1	21.3	-4.8	-47.9
1977	-36.9	-21.0	-11.4	-13.1	1.9	9.7	10.8	3.2	1.5	-9.4	-29.3	-24.1
1978	-38.7	-16.7	-7.7	-1.2	0.2	0.2	0.0	0.3	0.2	0.2	0.2	0.2
1979	0.1	0.1	0.0	0.0	0.4	0.0	0.3	0.2	0.1	0.1	0.1	0.0
1980	-0.1	0.1	2.3	0.4	-2.4	-0.5	0.3	0.2	0.1	-0.1	-0.1	0.0
1981	0.1	0.1	-0.2	0.0	0.0	-0.2	1.3	0.6	1.1	-2.5	9.3	9.0
1982	-19.1	-10.7	-1.1	0.2	-10.7	-1.7	0.4	-0.4	-0.3	-0.3	0.1	-0.2
1983	-0.3	0.0	-0.3	0.1	0.5	0.2	0.1	-0.3	0.3	-0.1	-0.4	0.0
1984	0.2	-0.2	0.1	0.0	0.1	0.1	0.2	-0.1	0.1	0.1	0.0	0.0
1985	0.0	0.0	0.1	0.3	0.2	0.2	0.4	0.0	0.2	-0.2	-0.4	-0.5
1986	-0.2	-0.3	-0.1	0.5	0.1	0.4	0.1	0.0	0.3	0.1	0.0	-0.1
1987	0.1	0.3	0.1	-0.1	0.1	-0.1	0.8	2.1	3.0	7.2	-5.5	-29.4
1988	-29.5	-15.8	-8.3	-1.0	0.3	10.6	1.5	7.0	6.8	9.3	24.1	-27.2
1989	-39.8	-21.7	-9.1	4.8	6.9	1.4	0.2	15.1	3.5	-0.7	6.8	-3.4
1990	-10.2	-8.6	-4.9	-4.2	-0.2	0.9	0.8	0.2	0.8	42.5	16.8	-32.1
1991	-40.5	-22.2	-11.4	-3.4	-1.7	-0.2	0.0	0.2	3.7	36.6	12.5	-29.7
1992	-31.7	-17.8	-5.7	-8.0	-1.7	-0.2	-4.3	15.4	3.7	18.3	22.4	-30.5
1993	-32.3	-14.9	-5.4	1.1	0.7	0.5	0.4	0.4	-18.7	-3.6	0.8	0.5
1994	0.1	0.0	-0.1	0.3	1.5	0.7	0.4	-0.1	0.3	-8.5	-18.3	19.5
1995	-6.0	-2.7	-5.1	0.0	0.2	0.3	0.2	0.1	0.3	-0.2	0.2	0.2
1996	-0.1	-0.1	0.0	-0.1	0.2	-0.3	0.3	0.0	0.1	0.2	0.2	0.2
1997	0.0	-0.1	-0.2	-0.4	-0.2	0.1	0.0	0.4	0.1	0.3	-0.2	-0.4
1998	0.5	1.7	0.2	0.4	0.3	-0.3	0.0	0.4	0.2	-0.2	-0.2	0.1
1999	-0.1	0.1	0.0	-0.2	0.0	0.0	0.4	0.3	0.3	0.1	0.1	0.1
2000	0.1	0.0	-0.1	-0.3	0.2	0.3	0.3	-0.3	0.0	0.2	-0.1	0.0
2001	0.0	-0.1	-0.3	-0.4	0.1	0.2	2.6	0.3	2.6	16.4	11.4	-17.4
2002	-22.9	-9.8	1.1	0.3	0.3	0.2	0.1	0.0	1.1	-0.1	-0.5	-1.6
2003	-1.4	-0.7	-0.3	0.4	0.2	0.2	0.3	0.0	0.1	3.7	1.8	-3.8
Average	-9.1	-4.7	-2.0	-0.7	-0.1	0.2	0.4	1.3	0.3	3.8	1.4	-6.4
Critical	-21.2	-12.2	-6.0	-4.2	0.0	3.1	1.3	3.7	2.4	15.7	3.3	-24.6
Dry	-10.4	-5.2	-1.4	0.8	1.2	0.3	0.9	3.0	1.9	3.3	3.5	-7.2
BN	0.1	0.0	0.0	0.0	0.2	0.0	0.3	0.0	0.1	0.1	0.0	0.0
AN	-12.1	-5.4	-1.9	0.1	-0.1	-2.4	-0.3	0.1	-3.1	0.0	0.4	-0.5
Wet	-2.0	-0.9	-0.5	0.0	-0.7	-0.1	0.1	0.0	0.1	0.0	0.0	0.0

Table E.3-17. CVP-Jones Intake (CHDMC006) salinity (EC) percent difference of All Transfers from Base.

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	0.0	0.0	0.0	-0.1	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1971	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1972	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1973	0.0	0.0	0.0	0.0	0.0	-4.1	-0.8	0.1	-0.1	0.0	0.0	0.0
1974	-0.1	0.0	0.0	0.0	0.0	0.1	-0.1	0.0	0.0	0.0	0.0	0.0
1975	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	0.0	0.0	0.0
1976	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.6	-0.7	-7.9
1977	-5.6	-3.0	-1.5	-1.4	0.2	1.1	1.6	0.5	0.3	-1.7	-4.8	-3.2
1978	-4.7	-2.4	-1.0	-0.2	0.0	0.0	0.0	0.1	0.1	0.0	0.1	0.0
1979	0.0	0.0	0.0	0.0	0.1	0.0	0.1	0.1	0.0	0.0	0.0	0.0
1980	0.0	0.0	0.4	0.1	-0.7	-0.2	0.1	0.1	0.0	0.0	0.0	0.0
1981	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.1	0.3	-0.6	1.7	1.4
1982	-2.7	-1.7	-0.2	0.0	-3.3	-0.5	0.2	-0.2	-0.1	-0.1	0.0	-0.1
1983	-0.2	0.0	-0.1	0.0	0.1	0.1	0.1	-0.2	0.1	-0.1	-0.2	0.0
1984	0.1	-0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1985	0.0	0.0	0.0	0.1	0.0	0.0	0.1	0.0	0.1	0.0	-0.1	-0.1
1986	0.0	0.0	0.0	0.1	0.0	0.1	0.0	0.0	0.1	0.0	0.0	0.0
1987	0.0	0.1	0.0	0.0	0.0	0.0	0.1	0.4	0.8	2.1	-1.2	-5.8
1988	-4.9	-2.6	-1.2	-0.2	0.0	1.2	0.2	1.2	1.5	2.6	4.9	-4.8
1989	-5.9	-3.0	-1.2	0.5	0.8	0.2	0.0	2.7	1.1	-0.2	1.1	-0.6
1990	-1.8	-1.4	-0.7	-0.6	0.0	0.1	0.1	0.0	0.2	8.3	2.5	-5.0
1991	-5.5	-3.0	-1.4	-0.4	-0.2	0.0	0.0	0.0	1.0	6.7	1.8	-4.7
1992	-4.5	-2.5	-0.7	-0.9	-0.2	0.0	-0.6	2.9	1.1	5.4	4.2	-4.8
1993	-4.7	-2.4	-0.7	0.1	0.1	0.1	0.1	0.1	-3.7	-1.0	0.2	0.1
1994	0.0	0.0	0.0	0.0	0.2	0.1	0.1	0.0	0.1	-1.5	-2.4	2.9
1995	-0.8	-0.5	-0.7	0.0	0.0	0.1	0.1	0.0	0.1	-0.1	0.1	0.1
1996	0.0	0.0	0.0	0.0	0.0	-0.1	0.1	0.0	0.0	0.1	0.1	0.0
1997	0.0	0.0	-0.1	-0.1	-0.1	0.0	0.0	0.1	0.0	0.1	-0.1	-0.1
1998	0.1	0.4	0.0	0.1	0.1	-0.1	0.0	0.2	0.1	-0.1	-0.1	0.0
1999	0.0	0.0	0.0	-0.1	0.0	0.0	0.1	0.1	0.1	0.0	0.0	0.0
2000	0.0	0.0	0.0	0.0	0.0	0.1	0.1	-0.1	0.0	0.1	0.0	0.0
2001	0.0	0.0	-0.1	-0.1	0.0	0.0	0.6	0.1	0.7	4.9	2.6	-3.4
2002	-3.9	-1.7	0.2	0.1	0.0	0.0	0.0	0.0	0.3	0.0	-0.1	-0.3
2003	-0.2	-0.1	0.0	0.1	0.0	0.0	0.1	0.0	0.0	1.3	0.5	-0.8
Average	-1.3	-0.7	-0.3	-0.1	-0.1	0.0	0.1	0.2	0.1	0.9	0.3	-1.1
Critical	-3.2	-1.8	-0.8	-0.5	0.0	0.4	0.2	0.7	0.6	3.3	0.8	-3.9
Dry	-1.6	-0.8	-0.2	0.1	0.2	0.0	0.2	0.6	0.5	1.0	0.7	-1.4
BN	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0
AN	-1.6	-0.8	-0.2	0.0	-0.1	-0.7	-0.1	0.0	-0.6	0.1	0.1	-0.1
Wet	-0.3	-0.2	-0.1	0.0	-0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table E.3-18. SWP-Clifton Court Intake (CHWST000) salinity (EC) difference All Transfers minus Base.

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	0.0	0.1	0.0	-0.1	-0.1	0.0	0.0	0.1	0.0	0.0	0.0	0.0
1971	0.0	0.0	0.0	0.0	0.1	-0.1	0.0	-0.1	0.0	0.0	0.0	0.0
1972	0.0	0.0	0.0	0.0	0.1	0.1	0.3	-0.2	0.0	0.0	0.0	0.0
1973	0.0	0.0	0.0	-0.1	0.2	-10.7	-2.2	0.3	-0.3	0.0	0.0	0.0
1974	-0.1	0.0	0.1	0.0	0.0	0.1	-0.2	0.1	0.1	0.0	0.0	0.0
1975	0.0	0.0	0.0	0.1	0.0	0.1	0.1	-0.3	-0.1	0.0	0.0	0.0
1976	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.1	0.3	29.0	-9.2	-58.3
1977	-50.0	-27.3	-15.8	-17.1	-1.7	6.3	7.7	3.2	1.6	-3.2	-32.5	-28.1
1978	-47.1	-21.1	-10.3	-1.5	0.5	0.4	0.0	0.3	0.2	0.2	0.2	0.2
1979	0.1	0.1	0.0	0.1	0.3	0.1	0.4	0.2	0.1	0.1	0.1	0.0
1980	-0.2	0.2	3.5	1.4	-1.6	-0.4	0.3	0.2	0.1	0.0	0.0	0.0
1981	0.0	0.0	-0.2	0.0	0.1	-0.1	1.2	0.6	1.2	-3.2	15.3	11.2
1982	-24.8	-13.6	-1.6	0.3	-8.2	-3.6	0.4	-0.4	-0.3	-0.1	0.0	0.0
1983	-0.1	0.0	-0.3	0.1	0.5	0.2	0.1	-0.3	0.3	-0.1	-0.2	-0.1
1984	0.1	-0.1	0.2	0.0	0.1	0.1	0.2	-0.1	0.0	0.0	-0.1	0.0
1985	0.0	0.1	0.2	0.3	0.2	0.4	0.4	0.1	0.3	-0.2	-0.4	-0.6
1986	-0.3	-0.4	-0.2	0.5	0.1	0.4	0.1	0.0	0.2	0.1	0.0	0.0
1987	0.0	0.2	0.1	-0.2	0.1	0.0	1.7	2.7	3.1	8.3	11.5	-32.8
1988	-36.1	-20.1	-10.9	-1.2	0.2	12.8	2.2	8.5	5.2	12.6	32.2	-30.0
1989	-47.6	-27.6	-11.7	6.4	7.1	2.5	0.8	12.0	2.9	-0.9	9.3	-4.5
1990	-13.4	-10.9	-6.8	-5.6	-0.2	1.2	1.3	0.6	1.0	52.9	20.2	-37.4
1991	-49.8	-28.3	-15.3	-7.6	-2.8	-0.5	0.1	0.4	3.9	45.3	14.4	-30.8
1992	-39.6	-22.5	-11.1	-11.4	-3.9	-0.2	-2.1	9.4	3.4	18.5	23.2	-33.3
1993	-38.3	-18.1	-6.9	2.0	1.1	0.8	0.5	0.4	-14.4	-4.6	1.0	0.7
1994	0.1	0.1	0.0	0.6	2.0	0.9	0.6	0.1	0.5	-9.9	-18.2	25.9
1995	-7.8	-3.8	-6.9	0.2	0.5	0.3	0.2	0.1	0.2	-0.1	0.1	0.3
1996	0.0	-0.1	0.0	0.0	0.2	-0.1	0.4	0.0	0.1	0.2	0.4	0.2
1997	0.0	-0.1	-0.1	-0.4	-0.2	0.0	-0.1	0.4	0.2	0.0	-0.2	-0.6
1998	0.3	0.9	0.2	0.5	0.3	-0.1	0.0	0.4	0.2	-0.1	-0.1	0.0
1999	0.0	0.1	0.1	-0.1	0.0	0.0	0.4	0.3	0.2	0.2	0.2	0.1
2000	0.0	0.0	0.0	-0.3	0.2	0.2	0.4	-0.3	0.0	0.1	-0.1	0.0
2001	0.0	0.0	-0.2	-0.6	0.1	0.1	2.4	0.3	2.8	19.1	20.9	-18.4
2002	-28.2	-12.7	1.5	0.6	0.4	0.3	0.2	0.0	1.5	-0.1	-0.6	-2.1
2003	-1.7	-0.9	-0.4	0.4	0.2	0.2	0.3	0.0	0.2	4.9	2.0	-5.0
Average	-11.3	-6.1	-2.7	-1.0	-0.1	0.3	0.5	1.2	0.4	5.0	2.6	-7.2
Critical	-27.0	-15.6	-8.6	-6.0	-0.9	2.9	1.4	3.2	2.3	20.8	4.3	-27.4
Dry	-12.6	-6.7	-1.7	1.1	1.3	0.5	1.1	2.6	2.0	3.8	9.3	-7.9
BN	0.0	0.0	0.0	0.0	0.2	0.1	0.3	0.0	0.1	0.0	0.0	0.0
AN	-14.5	-6.6	-2.3	0.3	0.1	-1.6	-0.1	0.2	-2.4	0.1	0.5	-0.7
Wet	-2.5	-1.3	-0.7	0.1	-0.5	-0.2	0.1	0.0	0.1	0.0	0.0	0.0

Table E.3-19. SWP-Clifton Court Intake (CHWST000) salinity (EC) percent difference of All Transfers from Base.

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1971	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1972	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1973	0.0	0.0	0.0	0.0	0.0	-2.9	-0.6	0.1	-0.1	0.0	0.0	0.0
1974	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	0.0	0.0	0.0	0.0
1975	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	0.0	0.0	0.0
1976	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	4.8	-1.3	-9.3
1977	-6.9	-3.7	-2.0	-1.8	-0.2	0.9	1.4	0.6	0.3	-0.6	-5.1	-3.5
1978	-5.4	-3.0	-1.3	-0.2	0.1	0.1	0.0	0.1	0.1	0.1	0.1	0.0
1979	0.0	0.0	0.0	0.0	0.1	0.0	0.1	0.1	0.0	0.0	0.0	0.0
1980	0.0	0.0	0.6	0.3	-0.5	-0.2	0.1	0.1	0.0	0.0	0.0	0.0
1981	0.0	0.0	-0.1	0.0	0.0	0.0	0.3	0.1	0.3	-0.8	2.7	1.6
1982	-3.2	-2.1	-0.4	0.1	-2.3	-1.0	0.2	-0.2	-0.1	0.0	0.0	0.0
1983	-0.1	0.0	-0.1	0.0	0.2	0.1	0.1	-0.2	0.1	-0.1	-0.1	0.0
1984	0.0	-0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1985	0.0	0.0	0.1	0.1	0.0	0.1	0.1	0.0	0.1	-0.1	-0.1	-0.1
1986	0.0	-0.1	0.0	0.1	0.0	0.1	0.0	0.0	0.1	0.0	0.0	0.0
1987	0.0	0.1	0.0	0.0	0.0	0.0	0.3	0.6	0.9	2.5	2.7	-6.4
1988	-5.6	-3.3	-1.6	-0.2	0.0	1.8	0.4	1.6	1.2	3.6	6.5	-5.2
1989	-6.7	-3.6	-1.5	0.7	0.9	0.4	0.1	2.5	1.0	-0.2	1.4	-0.7
1990	-2.2	-1.7	-1.0	-0.8	0.0	0.2	0.3	0.1	0.3	10.0	2.8	-5.7
1991	-6.4	-3.6	-1.8	-0.9	-0.3	-0.1	0.0	0.1	1.1	8.0	2.0	-4.8
1992	-5.3	-3.0	-1.4	-1.3	-0.5	0.0	-0.4	2.1	1.0	5.3	4.2	-5.1
1993	-5.4	-2.9	-0.9	0.3	0.2	0.2	0.1	0.1	-3.7	-1.7	0.3	0.2
1994	0.0	0.0	0.0	0.1	0.3	0.2	0.1	0.0	0.1	-1.6	-2.3	3.7
1995	-1.1	-0.7	-1.0	0.0	0.1	0.1	0.1	0.0	0.1	0.0	0.0	0.1
1996	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.1	0.1	0.0
1997	0.0	0.0	0.0	-0.1	-0.1	0.0	0.0	0.1	0.1	0.0	-0.1	-0.1
1998	0.1	0.3	0.1	0.1	0.1	0.0	0.0	0.2	0.1	0.0	0.0	0.0
1999	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.0	0.0
2000	0.0	0.0	0.0	-0.1	0.0	0.1	0.1	-0.1	0.0	0.0	0.0	0.0
2001	0.0	0.0	-0.1	-0.1	0.0	0.0	0.6	0.1	0.8	6.1	5.0	-3.7
2002	-4.5	-2.1	0.3	0.1	0.1	0.1	0.0	0.0	0.4	0.0	-0.1	-0.3
2003	-0.2	-0.1	-0.1	0.1	0.0	0.0	0.1	0.0	0.1	1.9	0.6	-1.2
Average	-1.6	-0.9	-0.4	-0.1	0.0	0.0	0.1	0.2	0.1	1.1	0.6	-1.2
Critical	-3.8	-2.2	-1.1	-0.7	-0.1	0.4	0.3	0.6	0.6	4.2	1.0	-4.3
Dry	-1.9	-0.9	-0.2	0.1	0.2	0.1	0.2	0.6	0.6	1.2	1.9	-1.6
BN	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0
AN	-1.8	-1.0	-0.3	0.1	0.0	-0.5	0.0	0.0	-0.6	0.0	0.1	-0.2
Wet	-0.3	-0.2	-0.1	0.0	-0.2	-0.1	0.0	0.0	0.0	0.0	0.0	0.0

Table E.3-20. Old River near Middle River location salinity (EC) difference All Transfers minus Base.

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	0.2	0.0	0.0	-0.2	-0.2	0.0	0.0	0.1	0.3	0.3	-0.3	-0.1
1971	-0.2	-0.2	0.0	0.0	0.3	-0.3	0.0	-0.1	0.2	-0.3	-0.2	-0.2
1972	0.2	-0.4	0.3	-0.2	0.2	0.2	0.3	-0.3	0.3	0.3	-0.3	-0.4
1973	0.3	0.1	0.2	-0.2	0.1	-20.9	-1.4	0.3	0.1	-0.4	-0.2	-0.4
1974	-0.5	0.4	0.1	-0.2	0.0	0.2	-0.2	0.1	0.3	0.2	0.3	0.4
1975	-0.2	0.2	-0.2	0.4	-0.1	0.2	0.1	-0.4	0.0	0.3	-0.1	0.0
1976	-0.1	-0.3	0.2	0.1	0.2	0.3	0.0	-0.2	0.0	-0.2	-0.3	0.1
1977	-0.1	0.1	-0.1	0.3	0.1	0.2	0.2	0.4	0.0	0.0	-0.4	-0.1
1978	-0.4	0.3	0.1	-0.4	0.0	0.1	0.0	0.3	0.3	0.2	0.3	0.4
1979	0.2	0.4	0.0	-0.1	0.4	-0.1	0.4	0.2	0.2	0.3	0.0	0.2
1980	0.2	-0.3	-0.2	0.1	0.2	-0.4	0.3	0.2	0.1	-0.3	-0.3	-0.1
1981	0.4	0.0	-0.1	-0.2	-0.1	-0.4	1.6	0.5	0.0	-0.2	-0.1	-0.2
1982	0.3	-0.3	0.3	0.0	-13.9	-1.1	0.4	-0.4	-0.3	-0.3	0.4	-0.3
1983	-0.4	0.0	-0.3	0.1	0.5	0.3	0.1	-0.3	0.3	-0.1	-0.5	0.0
1984	0.4	-0.3	0.2	0.0	0.1	0.1	0.2	-0.2	0.3	0.3	0.3	-0.1
1985	0.0	-0.2	-0.2	0.3	0.2	-0.2	0.4	0.0	-0.4	-0.4	-0.4	0.3
1986	0.5	0.0	0.4	0.5	0.1	0.4	0.1	0.0	0.4	0.0	0.0	-0.3
1987	0.3	0.3	0.1	0.1	0.0	-0.1	-0.2	-0.1	0.3	0.1	-0.4	-0.4
1988	-0.4	0.3	-0.1	0.0	0.4	0.1	0.4	-0.2	0.1	-0.6	0.1	0.2
1989	0.1	0.3	0.1	-0.4	-0.4	0.3	-0.4	0.2	0.1	0.2	-0.3	-0.2
1990	-0.2	-0.2	0.0	0.2	0.3	-0.2	-0.4	0.1	-0.3	-1.1	-0.3	0.1
1991	-0.1	0.3	-0.3	0.2	-0.3	0.0	-0.3	0.1	0.1	-3.5	-0.8	0.1
1992	-0.2	0.4	-0.1	0.3	-0.1	0.1	-9.1	-0.8	0.2	-23.1	-2.9	0.1
1993	0.1	-0.2	0.4	0.2	0.1	0.1	0.5	0.4	18.4	1.4	0.4	-0.1
1994	0.0	0.0	-0.4	-0.4	0.1	0.2	0.3	-0.4	-0.4	0.2	-0.1	-0.4
1995	0.1	0.2	0.3	-0.1	-0.4	0.3	0.2	0.1	0.3	-0.2	0.3	-0.4
1996	-0.4	-0.2	-0.2	-0.3	0.2	-0.3	0.4	-0.1	0.1	-0.1	-0.1	0.2
1997	-0.4	-0.1	-0.2	-0.4	-0.2	0.1	-0.1	0.4	0.0	0.1	-0.4	0.3
1998	0.2	-0.3	0.2	0.4	0.3	-0.3	0.0	0.4	0.1	-0.2	-0.4	0.2
1999	-0.4	0.0	-0.3	-0.4	0.1	0.0	0.4	0.3	0.5	-0.3	0.0	-0.1
2000	0.2	-0.3	-0.3	-0.2	0.3	0.3	0.4	-0.4	0.2	-0.1	-0.1	0.1
2001	-0.1	-0.2	-0.3	0.3	0.0	0.3	2.9	-0.2	-0.4	-0.4	-0.4	-0.3
2002	0.2	0.1	0.4	-0.1	-0.1	0.2	0.1	0.0	-0.3	-0.1	0.3	0.0
2003	0.1	0.0	0.0	0.3	0.5	0.5	0.3	-0.1	-0.2	-0.1	0.2	0.2
Average	0.0	0.0	0.0	0.0	-0.3	-0.6	-0.1	0.0	0.6	-0.8	-0.2	0.0
Critical	-0.2	0.1	-0.1	0.1	0.1	0.1	-1.3	-0.2	-0.1	-4.0	-0.7	0.0
Dry	0.1	0.0	0.0	0.0	-0.1	0.0	0.7	0.1	-0.1	-0.1	-0.2	-0.1
BN	0.2	0.0	0.1	-0.2	0.3	0.1	0.3	-0.1	0.3	0.3	-0.1	-0.1
AN	0.1	-0.1	0.0	0.0	0.2	-3.4	0.0	0.1	3.1	0.1	0.0	0.0
Wet	-0.1	0.0	0.0	0.0	-1.0	0.0	0.1	0.0	0.2	0.0	-0.1	0.0

Table E.3-21. Old River near Middle River location salinity (EC) percent difference of All Transfers from Base.

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	0.0	0.0	0.0	-0.1	-0.1	0.0	0.0	0.0	0.1	0.1	-0.1	0.0
1971	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	0.0	0.0	-0.1	0.0	0.0
1972	0.0	-0.1	0.0	0.0	0.0	0.0	0.1	-0.1	0.1	0.0	0.0	-0.1
1973	0.1	0.0	0.0	0.0	0.0	-6.0	-0.4	0.1	0.0	-0.1	0.0	-0.1
1974	-0.1	0.1	0.0	0.0	0.0	0.1	-0.1	0.0	0.1	0.0	0.1	0.1
1975	0.0	0.0	0.0	0.1	0.0	0.1	0.0	-0.1	0.0	0.1	0.0	0.0
1976	0.0	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0
1977	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	-0.1	0.0
1978	-0.1	0.0	0.0	-0.1	0.0	0.0	0.0	0.1	0.1	0.0	0.1	0.1
1979	0.0	0.1	0.0	0.0	0.1	0.0	0.1	0.1	0.1	0.0	0.0	0.0
1980	0.0	0.0	0.0	0.0	0.1	-0.2	0.1	0.1	0.0	-0.1	-0.1	0.0
1981	0.1	0.0	0.0	0.0	0.0	-0.1	0.4	0.1	0.0	0.0	0.0	0.0
1982	0.1	-0.1	0.0	0.0	-4.7	-0.4	0.2	-0.2	-0.1	-0.1	0.1	-0.1
1983	-0.2	0.0	-0.1	0.0	0.2	0.1	0.1	-0.2	0.2	-0.1	-0.3	0.0
1984	0.1	-0.2	0.1	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.1	0.0
1985	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	-0.1	-0.1	-0.1	0.1
1986	0.1	0.0	0.1	0.1	0.0	0.2	0.0	0.0	0.1	0.0	0.0	-0.1
1987	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	-0.1	-0.1
1988	-0.1	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	-0.1	0.0	0.0
1989	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	0.0	0.0	0.0	0.0
1990	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	0.0	-0.2	-0.1	0.0
1991	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.5	-0.1	0.0
1992	0.0	0.1	0.0	0.0	0.0	0.0	-1.1	-0.1	0.0	-3.1	-0.4	0.0
1993	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	2.7	0.2	0.1	0.0
1994	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	-0.1	0.0	0.0	-0.1
1995	0.0	0.0	0.0	0.0	-0.1	0.1	0.1	0.0	0.1	-0.1	0.1	-0.1
1996	-0.1	0.0	0.0	0.0	0.1	-0.1	0.1	0.0	0.0	0.0	0.0	0.0
1997	-0.1	0.0	-0.1	-0.2	-0.1	0.1	0.0	0.1	0.0	0.0	-0.1	0.1
1998	0.0	-0.1	0.0	0.1	0.1	-0.1	0.0	0.2	0.1	-0.1	-0.2	0.1
1999	-0.1	0.0	0.0	-0.1	0.0	0.0	0.1	0.1	0.1	0.0	0.0	0.0
2000	0.0	-0.1	0.0	0.0	0.1	0.1	0.1	-0.1	0.0	0.0	0.0	0.0
2001	0.0	0.0	0.0	0.0	0.0	0.0	0.7	0.0	-0.1	-0.1	-0.1	-0.1
2002	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	0.0	0.0
2003	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0
Average	0.0	0.0	0.0	0.0	-0.1	-0.2	0.0	0.0	0.1	-0.1	0.0	0.0
Critical	0.0	0.0	0.0	0.0	0.0	0.0	-0.2	0.0	0.0	-0.5	-0.1	0.0
Dry	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.0
BN	0.0	0.0	0.0	0.0	0.1	0.0	0.1	0.0	0.1	0.0	0.0	0.0
AN	0.0	0.0	0.0	0.0	0.0	-1.0	0.0	0.0	0.5	0.0	0.0	0.0
Wet	0.0	0.0	0.0	0.0	-0.3	0.0	0.1	0.0	0.1	0.0	0.0	0.0

Table E.3-22. CCWD Old River Intake (ROLD034) salinity (EC) difference All Transfers minus Base.

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	0.0	0.0	0.0	-0.1	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1971	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1972	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.0
1973	0.0	0.0	0.0	0.0	0.2	-8.7	-3.7	-0.2	-0.3	0.0	0.0	0.0
1974	-0.1	0.0	0.0	0.0	0.0	0.0	-0.2	0.0	0.0	0.0	0.0	0.0
1975	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0
1976	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.4	0.5	30.7	-32.4	-62.4
1977	-57.3	-31.3	-21.2	-19.6	-5.3	1.8	3.8	2.1	1.8	0.9	-27.4	-34.0
1978	-51.0	-23.6	-13.3	-1.9	0.7	0.5	0.0	0.3	0.2	0.2	0.2	0.2
1979	0.1	0.0	0.0	0.2	0.4	0.2	0.3	0.2	0.1	0.1	0.1	0.0
1980	-0.3	0.3	4.1	2.3	7.8	-0.3	0.3	0.3	0.1	0.0	0.0	0.0
1981	0.0	-0.1	-0.3	0.1	0.2	0.0	0.2	0.4	0.9	-3.8	17.3	10.0
1982	-29.2	-15.4	-1.8	0.2	-8.2	-4.4	0.4	-0.4	-0.2	-0.1	0.0	0.0
1983	-0.1	0.0	-0.1	0.1	0.5	0.3	0.1	-0.3	0.3	-0.1	-0.1	-0.1
1984	0.1	0.1	0.1	0.1	0.0	0.1	0.1	0.0	0.0	0.0	-0.1	0.0
1985	0.0	0.1	0.3	0.3	0.2	0.4	0.3	0.2	0.2	-0.3	-0.5	-0.7
1986	-0.4	-0.6	-0.3	0.6	0.1	0.4	0.1	0.0	0.1	0.1	0.0	0.0
1987	0.0	0.1	-0.1	-0.3	0.1	0.1	4.2	4.3	2.4	12.4	19.7	-32.4
1988	-40.3	-23.1	-14.1	-1.4	0.0	6.0	3.1	6.9	4.1	21.5	29.0	-34.7
1989	-52.1	-32.0	-13.6	9.2	7.5	3.9	1.5	6.5	2.2	-1.0	9.4	-5.7
1990	-15.5	-12.8	-10.4	-7.1	0.0	1.9	1.9	1.2	1.3	57.0	18.7	-41.7
1991	-54.3	-31.5	-22.0	-14.4	-4.2	-0.9	0.4	0.7	4.3	48.6	13.0	-33.7
1992	-44.7	-25.2	-18.4	-16.5	-8.4	-0.3	0.3	4.6	2.9	26.5	23.8	-36.7
1993	-41.5	-19.5	-8.1	3.9	1.6	1.0	0.6	0.6	-8.4	-3.7	1.1	0.7
1994	0.1	0.1	0.0	1.0	2.7	1.1	0.8	0.6	0.6	-11.3	-16.8	30.7
1995	-8.7	-4.9	-8.4	0.7	0.8	0.3	0.2	0.1	0.1	0.1	0.1	0.4
1996	0.0	-0.1	0.1	0.2	0.2	0.0	0.3	0.0	0.1	0.3	0.4	0.2
1997	0.0	-0.1	-0.1	-0.4	-0.3	-0.1	0.0	0.3	0.2	-0.1	-0.2	-0.7
1998	0.3	0.3	0.3	0.7	0.3	0.0	0.0	0.4	0.3	0.0	-0.1	0.0
1999	0.0	0.2	0.1	0.0	0.0	0.0	0.4	0.3	0.1	0.2	0.2	0.1
2000	0.0	0.0	-0.2	-0.4	0.1	0.2	0.3	-0.1	0.0	0.0	-0.1	0.0
2001	0.0	0.0	-0.5	-0.7	0.2	0.1	0.7	0.7	2.6	24.7	25.4	-17.4
2002	-31.3	-14.2	2.3	0.9	0.5	0.4	0.2	0.1	1.4	-0.2	-0.7	-2.3
2003	-1.9	-1.1	-0.5	0.5	0.1	0.1	0.2	0.2	0.2	6.4	2.0	-5.6
Average	-12.6	-6.9	-3.7	-1.2	-0.1	0.1	0.5	0.9	0.5	6.1	2.4	-7.8
Critical	-30.3	-17.7	-12.3	-8.3	-2.2	1.4	1.5	2.3	2.2	24.9	1.1	-30.4
Dry	-13.9	-7.7	-2.0	1.6	1.5	0.8	1.2	2.1	1.6	5.3	11.8	-8.1
BN	0.0	0.0	0.0	0.1	0.2	0.1	0.2	0.1	0.1	0.0	0.0	0.0
AN	-15.8	-7.3	-3.0	0.8	1.7	-1.2	-0.4	0.2	-1.4	0.5	0.5	-0.8
Wet	-2.9	-1.6	-0.8	0.2	-0.5	-0.3	0.1	0.0	0.1	0.0	0.0	0.0

Table E.3-23. CCWD Old River Intake (ROLD034) salinity (EC) percent difference of All Transfers from Base.

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1971	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1972	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1973	0.0	0.0	0.0	0.0	0.0	-2.6	-1.0	-0.1	-0.1	0.0	0.0	0.0
1974	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	0.0	0.0	0.0	0.0
1975	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1976	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	4.7	-4.1	-9.3
1977	-7.3	-4.0	-2.6	-1.9	-0.8	0.3	0.8	0.5	0.4	0.2	-4.0	-3.9
1978	-5.5	-3.2	-1.7	-0.3	0.2	0.1	0.0	0.1	0.1	0.1	0.1	0.0
1979	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0
1980	0.0	0.1	0.6	0.5	2.2	-0.1	0.1	0.1	0.0	0.0	0.0	0.0
1981	0.0	0.0	-0.1	0.0	0.1	0.0	0.0	0.1	0.3	-0.9	2.8	1.3
1982	-3.4	-2.2	-0.6	0.1	-2.4	-1.3	0.2	-0.2	-0.1	0.0	0.0	0.0
1983	0.0	0.0	0.0	0.0	0.2	0.1	0.1	-0.2	0.1	0.0	-0.1	0.0
1984	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1985	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.0	0.1	-0.1	-0.1	-0.1
1986	-0.1	-0.1	0.0	0.1	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0
1987	0.0	0.1	0.0	-0.1	0.0	0.0	0.8	1.0	0.7	3.7	4.4	-6.0
1988	-6.0	-3.6	-2.1	-0.3	0.0	1.2	0.7	1.5	1.0	6.1	5.5	-5.7
1989	-6.9	-3.9	-1.6	0.9	1.1	0.7	0.3	1.8	0.8	-0.2	1.3	-0.8
1990	-2.4	-1.9	-1.4	-1.0	0.0	0.5	0.5	0.3	0.3	9.9	2.4	-5.9
1991	-6.5	-3.7	-2.4	-1.6	-0.6	-0.2	0.1	0.2	1.2	7.8	1.7	-5.0
1992	-5.6	-3.1	-2.2	-1.8	-1.1	-0.1	0.1	1.2	0.9	7.3	4.0	-5.2
1993	-5.6	-3.1	-1.0	0.5	0.3	0.3	0.1	0.1	-2.5	-1.5	0.3	0.2
1994	0.0	0.0	0.0	0.1	0.5	0.3	0.2	0.1	0.2	-1.7	-2.0	4.0
1995	-1.1	-0.9	-1.1	0.1	0.2	0.1	0.1	0.0	0.1	0.0	0.1	0.2
1996	0.0	0.0	0.0	0.1	0.0	0.0	0.1	0.0	0.0	0.1	0.1	0.0
1997	0.0	0.0	0.0	-0.1	-0.1	0.0	0.0	0.1	0.1	0.0	-0.1	-0.1
1998	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.2	0.1	0.0	0.0	0.0
1999	0.0	0.1	0.1	0.0	0.0	0.0	0.1	0.1	0.0	0.1	0.1	0.0
2000	0.0	0.0	-0.1	-0.1	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.0
2001	0.0	0.0	-0.1	-0.1	0.0	0.0	0.1	0.2	0.8	7.7	5.8	-3.3
2002	-4.8	-2.3	0.4	0.2	0.1	0.1	0.0	0.0	0.4	0.0	-0.1	-0.3
2003	-0.2	-0.2	-0.1	0.1	0.0	0.0	0.0	0.0	0.1	2.4	0.5	-1.2
Average	-1.6	-0.9	-0.5	-0.1	0.0	0.0	0.1	0.2	0.1	1.3	0.5	-1.2
Critical	-4.0	-2.3	-1.5	-0.9	-0.3	0.3	0.3	0.6	0.6	4.9	0.5	-4.4
Dry	-2.0	-1.0	-0.2	0.2	0.2	0.2	0.2	0.5	0.5	1.7	2.4	-1.5
BN	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0
AN	-1.9	-1.1	-0.4	0.1	0.5	-0.4	-0.1	0.0	-0.4	0.2	0.1	-0.2
Wet	-0.3	-0.2	-0.1	0.0	-0.2	-0.1	0.0	0.0	0.0	0.0	0.0	0.0

Table E.3-24. Old River location (ROLD059) salinity (EC) difference All Transfers minus Base.

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	0.2	0.1	0.0	-0.2	-0.2	0.0	0.0	0.1	0.3	0.3	-0.2	-0.2
1971	-0.1	-0.2	0.0	0.0	0.3	-0.3	0.0	-0.1	0.2	-0.2	-0.2	-0.2
1972	0.1	-0.2	0.2	-0.2	0.1	0.2	0.3	-0.3	0.0	0.2	-0.1	-0.3
1973	0.2	0.1	0.2	-0.1	0.1	-18.2	-2.1	0.3	0.1	-0.3	-0.2	-0.3
1974	-0.4	0.3	0.1	-0.1	0.0	0.2	-0.2	0.1	0.3	0.2	0.3	0.4
1975	-0.1	0.1	-0.2	0.3	0.0	0.1	0.1	-0.3	-0.1	0.3	0.0	0.0
1976	-0.1	-0.3	0.1	0.1	0.2	0.3	0.0	-0.2	0.0	-0.2	-24.9	-4.7
1977	0.0	-1.1	-0.2	0.3	0.1	0.0	0.5	0.3	0.9	2.2	-17.0	-15.4
1978	-9.4	-0.2	0.1	-0.3	0.0	0.1	0.0	0.3	0.3	0.2	0.2	0.4
1979	0.2	0.3	0.0	-0.1	0.4	-0.1	0.4	0.2	0.2	0.2	0.1	0.1
1980	0.2	-0.2	-0.2	0.1	0.2	-0.4	0.3	0.2	0.1	-0.2	-0.3	-0.1
1981	0.3	0.1	-0.1	-0.1	-0.1	-0.3	1.4	0.6	0.1	-0.1	-5.7	-1.8
1982	0.3	-0.2	0.3	-0.1	-12.5	-1.4	0.4	-0.4	-0.3	-0.3	0.3	-0.3
1983	-0.4	0.0	-0.3	0.1	0.5	0.2	0.1	-0.3	0.3	-0.1	-0.5	0.0
1984	0.4	-0.3	0.2	0.0	0.1	0.1	0.2	-0.1	0.3	0.2	0.3	-0.1
1985	0.0	-0.2	-0.2	0.3	0.2	-0.2	0.4	0.0	-0.3	-0.3	-0.3	0.1
1986	0.4	0.1	0.4	0.4	0.1	0.4	0.1	0.0	0.4	0.0	0.0	-0.3
1987	0.2	0.3	0.1	0.1	0.0	-0.1	-0.2	0.0	-1.3	11.0	52.5	8.6
1988	-0.1	-0.1	0.0	0.0	0.4	0.2	0.4	-0.1	2.3	77.1	36.8	-6.6
1989	1.8	0.3	0.1	-0.2	-0.4	0.2	-0.3	0.1	-1.3	-0.5	-4.8	-2.2
1990	-0.2	-0.3	-0.2	0.2	0.3	-0.2	-0.4	0.0	0.5	34.3	19.4	-10.7
1991	0.4	0.1	-0.4	0.2	-0.2	0.0	-0.3	0.0	-0.5	57.0	21.1	-16.5
1992	-0.2	0.1	-0.2	0.3	-0.1	0.1	-7.7	-1.8	0.5	100.8	27.5	-8.9
1993	-10.5	-5.1	0.3	0.3	0.2	0.2	0.4	0.4	16.3	2.7	0.3	0.0
1994	0.0	0.0	-0.3	-0.3	0.0	0.2	0.3	-0.4	0.1	0.1	-41.7	-18.0
1995	0.2	0.5	0.3	0.0	-0.4	0.3	0.2	0.1	0.3	-0.2	0.3	-0.3
1996	-0.4	-0.2	-0.2	-0.2	0.2	-0.3	0.4	0.0	0.1	-0.1	-0.1	0.1
1997	-0.3	-0.1	-0.2	-0.4	-0.2	0.1	-0.1	0.4	0.0	0.1	-0.3	0.2
1998	0.2	-0.2	0.1	0.3	0.3	-0.3	0.0	0.4	0.2	-0.2	-0.4	0.1
1999	-0.3	0.0	-0.3	-0.4	0.0	0.0	0.4	0.3	0.4	-0.2	0.0	0.0
2000	0.1	-0.2	-0.3	-0.2	0.2	0.3	0.4	-0.3	0.1	0.0	-0.1	0.0
2001	-0.1	-0.2	-0.3	0.2	0.0	0.3	2.8	0.0	-0.7	9.5	57.5	13.8
2002	0.2	0.1	0.3	-0.1	-0.1	0.2	0.1	0.0	-0.4	-0.2	0.3	0.1
2003	0.0	0.1	0.0	0.2	0.4	0.5	0.3	0.0	-0.2	0.3	0.0	0.2
Average	-0.5	-0.2	0.0	0.0	-0.3	-0.5	0.0	0.0	0.6	8.6	3.5	-1.8
Critical	0.0	-0.2	-0.2	0.1	0.1	0.1	-1.0	-0.3	0.5	38.8	3.0	-11.5
Dry	0.4	0.1	0.0	0.0	-0.1	0.0	0.7	0.1	-0.7	3.2	16.6	3.1
BN	0.2	0.1	0.1	-0.1	0.3	0.1	0.3	0.0	0.1	0.2	0.0	-0.1
AN	-3.2	-0.9	0.0	0.0	0.2	-2.9	-0.1	0.1	2.8	0.4	0.0	0.0
Wet	0.0	0.0	0.0	0.0	-0.9	-0.1	0.1	0.0	0.2	0.0	0.0	0.0

Table E.3-25. Old River location (ROLD059) salinity (EC) percent difference of All Transfers from Base.

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	0.0	0.0	0.0	-0.1	-0.1	0.0	0.0	0.0	0.1	0.1	0.0	0.0
1971	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	0.0	0.0	0.0	0.0	0.0
1972	0.0	0.0	0.0	0.0	0.0	0.0	0.1	-0.1	0.0	0.0	0.0	-0.1
1973	0.0	0.0	0.0	0.0	0.0	-4.8	-0.6	0.1	0.0	-0.1	0.0	-0.1
1974	-0.1	0.0	0.0	0.0	0.0	0.1	-0.1	0.0	0.1	0.0	0.1	0.1
1975	0.0	0.0	0.0	0.0	0.0	0.1	0.0	-0.1	0.0	0.0	0.0	0.0
1976	0.0	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-3.6	-0.7
1977	0.0	-0.2	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.4	-2.7	-2.1
1978	-1.3	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.1	0.1
1979	0.0	0.1	0.0	0.0	0.1	0.0	0.1	0.1	0.0	0.0	0.0	0.0
1980	0.0	0.0	0.0	0.0	0.1	-0.2	0.1	0.1	0.0	-0.1	-0.1	0.0
1981	0.1	0.0	0.0	0.0	0.0	-0.1	0.3	0.1	0.0	0.0	-0.9	-0.3
1982	0.1	0.0	0.0	0.0	-3.9	-0.5	0.2	-0.2	-0.1	-0.1	0.1	-0.1
1983	-0.2	0.0	-0.1	0.0	0.2	0.1	0.1	-0.2	0.1	-0.1	-0.3	0.0
1984	0.1	-0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.1	0.0
1985	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	-0.1	0.0	0.0
1986	0.1	0.0	0.1	0.1	0.0	0.1	0.0	0.0	0.1	0.0	0.0	-0.1
1987	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	-0.2	1.7	9.1	1.4
1988	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.4	13.3	6.8	-1.1
1989	0.3	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	-0.2	-0.1	-0.7	-0.4
1990	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	5.5	2.8	-1.6
1991	0.1	0.0	-0.1	0.0	0.0	0.0	0.0	0.0	-0.1	8.8	3.0	-2.5
1992	0.0	0.0	0.0	0.0	0.0	0.0	-0.9	-0.2	0.1	22.2	5.0	-1.4
1993	-1.5	-0.8	0.0	0.0	0.0	0.0	0.1	0.1	2.4	0.4	0.1	0.0
1994	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	0.0	-5.6	-2.6
1995	0.0	0.1	0.0	0.0	-0.1	0.1	0.1	0.0	0.1	-0.1	0.1	-0.1
1996	-0.1	0.0	0.0	0.0	0.0	-0.1	0.1	0.0	0.0	0.0	0.0	0.0
1997	-0.1	0.0	-0.1	-0.1	-0.1	0.1	0.0	0.1	0.0	0.0	-0.1	0.0
1998	0.0	0.0	0.0	0.0	0.1	-0.1	0.0	0.2	0.1	-0.1	-0.1	0.0
1999	-0.1	0.0	0.0	-0.1	0.0	0.0	0.1	0.1	0.1	0.0	0.0	0.0
2000	0.0	0.0	0.0	0.0	0.1	0.1	0.1	-0.1	0.0	0.0	0.0	0.0
2001	0.0	0.0	0.0	0.0	0.0	0.0	0.7	0.0	-0.1	1.5	10.1	2.4
2002	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	0.1	0.0
2003	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0
Average	-0.1	0.0	0.0	0.0	-0.1	-0.1	0.0	0.0	0.1	1.6	0.7	-0.3
Critical	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	0.1	7.2	0.8	-1.7
Dry	0.1	0.0	0.0	0.0	0.0	0.0	0.2	0.0	-0.1	0.5	2.9	0.5
BN	0.0	0.0	0.0	0.0	0.1	0.0	0.1	0.0	0.0	0.0	0.0	0.0
AN	-0.4	-0.1	0.0	0.0	0.0	-0.8	0.0	0.0	0.4	0.1	0.0	0.0
Wet	0.0	0.0	0.0	0.0	-0.3	0.0	0.0	0.0	0.1	0.0	0.0	0.0

Table E.3-26. CCWD Contra Costa Canal Intake (CHCCC006) salinity (EC) difference No Groundwater Substitution minus Base.

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	0.0	0.0	0.0	0.0	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1971	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	0.0	0.0	0.0	0.0
1972	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0
1973	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0
1974	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.2	0.0	0.0	0.0	0.0
1975	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0
1976	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.5	-4.2	22.2	18.8	-32.4
1977	-31.9	-20.6	-9.7	-6.5	-2.1	-0.7	-0.3	-0.8	-5.0	4.2	9.6	14.6
1978	-18.4	-17.2	-8.4	-1.4	0.4	0.3	0.1	0.1	0.1	0.0	0.0	0.0
1979	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.2	0.1	0.0	0.0	0.0
1980	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.2	0.1	0.0	0.0	0.0
1981	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	-0.1	-0.1	-18.9	-13.6	36.7
1982	-15.8	-7.9	-2.3	0.2	-5.7	-5.9	-0.6	-0.1	-0.2	-0.1	0.0	0.0
1983	0.0	0.0	0.0	0.0	0.3	0.3	0.2	-0.1	0.1	0.1	-0.1	-0.1
1984	0.0	0.0	0.1	0.1	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.0
1985	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0
1986	0.0	0.0	0.0	0.0	0.0	0.1	0.2	0.1	0.1	0.0	0.0	0.0
1987	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.4	9.2	20.9	-10.5
1988	-17.9	-12.4	-7.0	-1.6	-0.4	-0.1	0.0	0.0	0.4	15.5	35.4	-9.0
1989	-20.5	-16.7	-7.4	-4.6	-1.7	-0.6	0.3	0.4	0.2	-2.5	-2.0	6.9
1990	-1.3	-0.7	-0.3	-0.3	0.3	1.4	1.1	0.4	-1.2	73.0	15.6	-16.4
1991	-19.0	-18.4	-10.5	-6.1	-2.3	-0.7	-0.2	-0.2	-1.9	63.3	11.4	-15.2
1992	-17.3	-15.1	-8.2	-5.1	-1.5	-0.1	0.0	0.0	0.9	17.1	29.7	1.3
1993	-13.7	-9.7	-5.5	-1.5	0.9	0.5	0.2	0.5	-5.1	-2.9	0.8	0.7
1994	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	-0.6	-16.7	-24.4	26.0
1995	2.0	-1.9	-2.9	-1.2	0.2	0.1	0.1	0.1	0.1	0.1	0.0	0.1
1996	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.2	0.0	0.0	0.0	0.0
1997	0.0	0.0	0.0	-0.2	-0.3	-0.1	0.0	0.0	0.1	0.0	0.0	0.0
1998	0.0	0.0	0.0	0.0	0.0	0.1	-0.1	0.2	0.2	0.0	-0.1	0.0
1999	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.3	0.1	0.0	0.0	0.0
2000	0.0	0.0	0.0	0.0	0.0	0.1	0.2	0.2	0.0	0.0	0.0	0.0
2001	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.3	16.6	19.4	4.5
2002	-7.7	-9.0	-3.7	-1.0	0.2	0.2	0.1	0.1	0.1	0.2	0.2	0.1
2003	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.0	2.5	-1.9	-8.7
Average	-4.7	-3.8	-1.9	-0.9	-0.3	-0.1	0.0	0.0	-0.4	5.4	3.5	0.0
Critical	-12.5	-9.6	-5.1	-2.8	-0.9	0.0	0.1	-0.1	-1.7	25.5	13.7	-4.4
Dry	-4.7	-4.3	-1.8	-0.9	-0.3	-0.1	0.0	0.1	0.1	0.8	4.2	6.3
BN	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.0
AN	-5.3	-4.5	-2.3	-0.5	0.2	0.2	0.1	0.2	-0.8	0.0	-0.2	-1.3
Wet	-1.1	-0.8	-0.4	-0.1	-0.4	-0.4	0.0	0.0	0.0	0.0	0.0	0.0

Table E.3-27. CCWD Contra Costa Canal Intake (CHCCC006) salinity (EC) percent difference of No Groundwater Substitution from Base.

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1971	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1972	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1973	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1974	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1975	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1976	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	-0.9	3.5	2.0	-4.4
1977	-3.7	-2.3	-1.1	-0.6	-0.3	-0.1	-0.1	-0.2	-1.0	0.7	1.3	1.5
1978	-1.7	-2.1	-0.9	-0.2	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0
1979	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0
1980	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0
1981	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-4.3	-1.9	4.5
1982	-1.6	-0.9	-0.7	0.0	-1.7	-1.4	-0.2	-0.1	-0.1	0.0	0.0	0.0
1983	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0
1984	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1985	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1986	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0
1987	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	2.6	4.2	-1.9
1988	-2.4	-1.7	-0.9	-0.3	-0.1	0.0	0.0	0.0	0.1	4.2	6.0	-1.4
1989	-2.6	-1.8	-0.9	-0.4	-0.2	-0.1	0.1	0.1	0.1	-0.5	-0.2	0.9
1990	-0.2	-0.1	0.0	0.0	0.1	0.4	0.3	0.1	-0.3	12.6	1.8	-2.1
1991	-2.0	-2.0	-1.0	-0.6	-0.3	-0.1	0.0	0.0	-0.5	9.9	1.3	-2.0
1992	-2.0	-1.7	-0.9	-0.5	-0.2	0.0	0.0	0.0	0.3	4.4	4.5	0.2
1993	-1.6	-1.4	-0.7	-0.2	0.2	0.1	0.0	0.1	-1.7	-1.2	0.2	0.1
1994	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.2	-2.7	-2.4	3.1
1995	0.2	-0.3	-0.4	-0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1996	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1997	0.0	0.0	0.0	0.0	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1998	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.0
1999	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0
2000	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.0
2001	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	4.9	4.0	0.8
2002	-1.1	-1.3	-0.4	-0.3	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0
2003	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.9	-0.5	-1.6
Average	-0.5	-0.5	-0.2	-0.1	-0.1	0.0	0.0	0.0	-0.1	1.0	0.6	-0.1
Critical	-1.5	-1.1	-0.6	-0.3	-0.1	0.0	0.0	0.0	-0.4	4.7	2.1	-0.7
Dry	-0.6	-0.5	-0.2	-0.1	0.0	0.0	0.0	0.0	0.0	0.5	1.0	0.7
BN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AN	-0.6	-0.6	-0.3	-0.1	0.0	0.0	0.0	0.0	-0.3	0.0	0.0	-0.2
Wet	-0.1	-0.1	-0.1	0.0	-0.1	-0.1	0.0	0.0	0.0	0.0	0.0	0.0

Table E.3-28. CVP-Jones Intake (CHDMC006) salinity (EC) difference No Groundwater Substitution minus Base.

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	0.1	0.1	0.0	-0.2	-0.2	0.0	0.0	0.1	0.1	0.1	0.0	0.0
1971	0.0	-0.1	0.0	0.0	0.1	-0.2	0.0	-0.1	0.0	0.0	0.0	0.0
1972	0.0	0.0	0.0	0.0	0.1	0.1	0.3	-0.2	0.0	0.0	0.0	-0.1
1973	0.0	0.0	0.1	-0.1	0.1	0.3	-0.1	0.3	0.1	0.0	0.0	-0.1
1974	-0.2	0.0	0.1	-0.1	0.0	0.2	-0.2	0.1	0.2	0.1	0.1	0.1
1975	0.0	0.0	0.0	0.1	0.0	0.1	0.1	-0.3	-0.1	0.1	0.0	0.0
1976	0.0	-0.1	0.0	0.0	0.1	0.1	0.0	-0.1	-1.5	20.5	14.2	-22.4
1977	-17.4	-9.8	-4.4	-3.4	-0.7	-0.3	-0.1	0.2	-2.1	-9.9	-18.9	-10.1
1978	-18.5	-9.1	-3.8	-0.9	0.1	0.1	0.0	0.3	0.2	0.1	0.1	0.1
1979	0.1	0.1	0.0	0.0	0.2	-0.1	0.3	0.2	0.1	0.0	0.0	0.0
1980	0.1	0.0	-0.1	0.1	0.2	-0.4	0.3	0.2	0.1	-0.1	-0.1	0.0
1981	0.1	0.1	0.0	-0.1	-0.1	-0.2	-0.3	0.3	-0.3	-2.2	0.2	14.7
1982	-7.6	-5.0	-1.0	0.2	-10.7	-1.7	0.4	-0.4	-0.3	-0.3	0.1	-0.2
1983	-0.3	0.0	-0.3	0.1	0.5	0.2	0.1	-0.3	0.3	-0.1	-0.4	0.0
1984	0.2	-0.2	0.1	0.0	0.1	0.1	0.2	-0.1	0.1	0.1	0.1	0.0
1985	0.0	0.0	-0.1	0.1	0.1	-0.1	0.3	0.0	0.0	0.0	-0.1	0.0
1986	0.1	0.1	0.1	0.2	0.1	0.4	0.1	0.0	0.3	0.1	0.0	-0.1
1987	0.1	0.1	0.1	0.0	0.0	-0.1	-0.2	-0.1	0.2	3.1	-2.7	-13.8
1988	-11.7	-6.3	-3.0	-0.8	0.3	0.1	0.3	-0.1	0.1	3.2	18.0	-8.4
1989	-15.3	-8.1	-3.3	-2.3	-0.9	0.0	-0.2	0.2	0.2	-2.1	0.4	2.6
1990	-0.8	-0.4	-0.2	-0.1	0.2	0.5	0.4	0.1	-0.3	24.1	14.7	-13.7
1991	-17.0	-9.6	-4.4	-1.0	-1.1	-0.2	-0.2	0.0	-1.2	21.4	12.1	-13.5
1992	-13.5	-8.0	-2.3	-2.2	-0.4	-0.1	-0.2	0.0	0.3	20.3	11.1	-11.4
1993	-11.2	-5.6	-2.9	-0.4	0.4	0.3	0.4	0.4	-18.8	-3.8	0.6	0.3
1994	0.1	0.0	-0.1	-0.1	0.0	0.1	0.2	-0.2	-0.2	-16.6	-17.9	12.8
1995	0.9	-1.1	-1.6	-0.4	-0.1	0.3	0.2	0.1	0.3	-0.2	0.1	0.0
1996	-0.2	-0.1	-0.1	-0.1	0.1	-0.3	0.3	0.0	0.1	0.0	0.0	0.0
1997	-0.1	-0.1	-0.2	-0.4	-0.2	0.1	0.0	0.4	0.1	0.0	-0.1	0.1
1998	0.1	-0.1	0.0	0.2	0.3	-0.3	0.0	0.4	0.2	-0.2	-0.2	0.0
1999	-0.1	0.0	-0.1	-0.3	0.0	0.0	0.4	0.3	0.2	0.0	0.0	0.0
2000	0.0	0.0	-0.1	-0.1	0.2	0.3	0.3	-0.3	0.0	0.0	0.0	0.0
2001	0.0	-0.1	-0.1	0.1	0.0	0.2	0.1	-0.3	-0.2	21.9	9.1	-6.3
2002	-7.7	-4.0	-1.7	-0.4	0.0	0.2	0.1	0.0	0.0	0.1	0.1	0.0
2003	0.0	0.0	0.0	0.1	0.2	0.2	0.3	0.0	0.0	1.6	-1.4	-4.0
Average	-3.5	-2.0	-0.9	-0.4	-0.3	0.0	0.1	0.0	-0.6	2.4	1.1	-2.2
Critical	-8.6	-4.9	-2.1	-1.1	-0.2	0.0	0.1	0.0	-0.7	9.0	4.8	-9.5
Dry	-3.8	-2.0	-0.9	-0.4	-0.1	0.0	0.0	0.0	0.0	3.5	1.2	-0.4
BN	0.1	0.0	0.0	0.0	0.2	0.0	0.3	0.0	0.1	0.0	0.0	0.0
AN	-4.9	-2.4	-1.1	-0.2	0.2	0.2	0.2	0.1	-3.1	-0.4	-0.1	-0.6
Wet	-0.5	-0.5	-0.2	0.0	-0.8	-0.1	0.1	0.0	0.1	0.0	0.0	0.0

Table E.3-29. CVP-Jones Intake (CHDMC006) salinity (EC) percent difference of No Groundwater Substitution from Base.

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	0.0	0.0	0.0	-0.1	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1971	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1972	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1973	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.1	0.0	0.0	0.0	0.0
1974	-0.1	0.0	0.0	0.0	0.0	0.1	-0.1	0.0	0.0	0.0	0.0	0.0
1975	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	0.0	0.0	0.0
1976	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.3	3.5	2.1	-3.7
1977	-2.6	-1.4	-0.6	-0.4	-0.1	0.0	0.0	0.0	-0.4	-1.8	-3.1	-1.3
1978	-2.3	-1.3	-0.5	-0.1	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.0
1979	0.0	0.0	0.0	0.0	0.1	0.0	0.1	0.1	0.0	0.0	0.0	0.0
1980	0.0	0.0	0.0	0.0	0.0	-0.2	0.1	0.1	0.0	0.0	0.0	0.0
1981	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.1	-0.1	-0.6	0.0	2.3
1982	-1.1	-0.8	-0.2	0.0	-3.3	-0.5	0.2	-0.2	-0.1	-0.1	0.0	-0.1
1983	-0.2	0.0	-0.1	0.0	0.1	0.1	0.1	-0.2	0.1	-0.1	-0.2	0.0
1984	0.1	-0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1985	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0
1986	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.1	0.0	0.0	0.0
1987	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.9	-0.6	-2.7
1988	-1.9	-1.1	-0.4	-0.1	0.0	0.0	0.0	0.0	0.0	0.9	3.6	-1.5
1989	-2.3	-1.1	-0.4	-0.3	-0.1	0.0	0.0	0.0	0.1	-0.5	0.1	0.4
1990	-0.1	-0.1	0.0	0.0	0.0	0.1	0.1	0.0	-0.1	4.7	2.1	-2.1
1991	-2.3	-1.3	-0.5	-0.1	-0.1	0.0	0.0	0.0	-0.3	3.9	1.7	-2.2
1992	-1.9	-1.1	-0.3	-0.3	0.0	0.0	0.0	0.0	0.1	6.0	2.1	-1.8
1993	-1.6	-0.9	-0.4	-0.1	0.1	0.1	0.1	0.1	-3.7	-1.0	0.2	0.1
1994	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-2.8	-2.4	1.9
1995	0.1	-0.2	-0.2	-0.1	0.0	0.1	0.1	0.0	0.1	-0.1	0.0	0.0
1996	-0.1	0.0	0.0	0.0	0.0	-0.1	0.1	0.0	0.0	0.0	0.0	0.0
1997	0.0	0.0	-0.1	-0.1	-0.1	0.0	0.0	0.1	0.0	0.0	0.0	0.0
1998	0.0	0.0	0.0	0.0	0.1	-0.1	0.0	0.2	0.1	-0.1	-0.1	0.0
1999	0.0	0.0	0.0	-0.1	0.0	0.0	0.1	0.1	0.1	0.0	0.0	0.0
2000	0.0	0.0	0.0	0.0	0.0	0.1	0.1	-0.1	0.0	0.0	0.0	0.0
2001	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	-0.1	6.5	2.1	-1.2
2002	-1.3	-0.7	-0.3	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2003	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.6	-0.4	-0.9
Average	-0.5	-0.3	-0.1	0.0	-0.1	0.0	0.0	0.0	-0.1	0.6	0.2	-0.4
Critical	-1.3	-0.7	-0.3	-0.1	0.0	0.0	0.0	0.0	-0.1	2.0	0.9	-1.5
Dry	-0.6	-0.3	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	1.1	0.3	-0.2
BN	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0
AN	-0.6	-0.4	-0.2	0.0	0.0	0.0	0.1	0.0	-0.6	-0.1	0.0	-0.1
Wet	-0.1	-0.1	0.0	0.0	-0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table E.3-30. SWP-Clifton Court Intake (CHWST000) salinity (EC) difference No Groundwater Substitution minus Base.

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	0.0	0.1	0.0	-0.1	-0.1	0.0	0.0	0.1	0.0	0.0	0.0	0.0
1971	0.0	0.0	0.0	0.0	0.1	-0.1	0.0	-0.1	0.0	0.0	0.0	0.0
1972	0.0	0.0	0.0	0.0	0.1	0.1	0.3	-0.2	0.0	0.0	0.0	0.0
1973	0.0	0.0	0.0	-0.1	0.0	0.2	-0.1	0.3	0.1	0.0	0.0	0.0
1974	-0.1	0.0	0.1	0.0	0.0	0.1	-0.2	0.1	0.1	0.0	0.0	0.0
1975	0.0	0.0	0.0	0.1	0.0	0.1	0.1	-0.3	-0.1	0.0	0.0	0.0
1976	0.0	0.0	0.0	0.0	0.0	0.1	0.0	-0.1	-2.3	28.1	16.4	-28.2
1977	-23.4	-12.5	-5.8	-4.3	-1.3	-0.6	-0.2	0.0	-3.0	-7.0	-20.6	-11.3
1978	-22.3	-11.3	-5.0	-1.1	0.2	0.2	0.0	0.3	0.2	0.1	0.0	0.0
1979	0.0	0.0	0.0	0.0	0.1	0.0	0.4	0.2	0.1	0.0	0.0	0.0
1980	0.0	0.0	0.0	0.0	0.2	-0.4	0.3	0.2	0.1	0.0	0.0	0.0
1981	0.0	0.1	0.0	0.0	0.0	-0.2	-0.3	0.2	-0.2	-12.1	3.0	18.0
1982	-10.0	-6.3	-1.4	0.2	-8.2	-3.6	0.4	-0.4	-0.3	-0.1	0.0	0.0
1983	-0.1	0.0	-0.3	0.1	0.5	0.2	0.1	-0.3	0.3	-0.1	-0.2	-0.1
1984	0.1	-0.1	0.2	0.0	0.0	0.1	0.2	-0.1	0.0	0.0	0.0	0.0
1985	0.0	0.0	0.0	0.1	0.1	-0.1	0.3	0.0	0.0	0.0	0.0	0.0
1986	0.1	0.0	0.0	0.1	0.1	0.4	0.1	0.0	0.2	0.1	0.0	-0.1
1987	0.0	0.1	0.0	0.0	0.0	-0.1	-0.2	-0.1	0.2	4.9	8.2	-15.3
1988	-14.0	-7.9	-4.0	-1.1	0.1	0.0	0.2	0.0	0.1	5.6	22.4	-8.6
1989	-17.8	-10.2	-4.4	-2.8	-1.2	-0.3	-0.1	0.3	0.2	-2.4	0.7	3.5
1990	-1.0	-0.4	-0.2	-0.2	0.2	0.8	0.7	0.3	-0.5	30.9	17.9	-15.7
1991	-20.5	-12.1	-5.8	-2.4	-1.7	-0.4	-0.2	-0.1	-1.3	27.1	14.1	-13.3
1992	-16.6	-9.9	-4.2	-3.0	-0.9	-0.1	-0.1	0.0	0.4	9.1	11.5	-12.0
1993	-13.2	-6.7	-3.9	-0.8	0.6	0.4	0.4	0.4	-14.6	-4.8	0.7	0.5
1994	0.1	0.0	0.0	0.0	0.0	0.1	0.1	-0.2	-0.2	-18.9	-19.2	16.8
1995	1.0	-1.4	-2.2	-0.6	0.0	0.2	0.2	0.1	0.2	-0.1	0.0	0.0
1996	-0.1	-0.1	-0.1	-0.1	0.1	-0.1	0.4	0.0	0.0	0.0	0.0	0.0
1997	0.0	-0.1	-0.1	-0.4	-0.2	0.0	-0.1	0.4	0.1	0.0	0.0	0.0
1998	0.0	0.0	0.0	0.2	0.3	-0.1	0.0	0.4	0.2	-0.1	-0.1	0.0
1999	0.0	0.0	0.0	-0.1	0.0	0.0	0.4	0.3	0.1	0.0	0.0	0.0
2000	0.0	0.0	0.0	-0.1	0.1	0.2	0.4	-0.3	-0.1	0.0	0.0	0.0
2001	0.0	0.0	0.0	0.0	0.0	0.1	0.1	-0.2	0.0	12.4	13.8	-6.0
2002	-9.3	-5.3	-2.5	-0.6	0.1	0.2	0.1	0.0	0.1	0.2	0.1	0.1
2003	0.0	0.0	0.0	0.1	0.1	0.1	0.3	0.0	0.0	1.5	-1.6	-5.2
Average	-4.3	-2.5	-1.2	-0.5	-0.3	-0.1	0.1	0.0	-0.6	2.2	2.0	-2.3
Critical	-10.8	-6.1	-2.9	-1.6	-0.5	0.0	0.1	0.0	-1.0	10.7	6.1	-10.3
Dry	-4.5	-2.6	-1.2	-0.6	-0.2	0.0	0.0	0.0	0.0	0.5	4.3	0.0
BN	0.0	0.0	0.0	0.0	0.1	0.0	0.3	0.0	0.0	0.0	0.0	0.0
AN	-5.9	-3.0	-1.5	-0.3	0.2	0.1	0.2	0.2	-2.4	-0.5	-0.2	-0.8
Wet	-0.7	-0.6	-0.3	0.0	-0.6	-0.2	0.1	0.0	0.1	0.0	0.0	0.0

Table E.3-31. SWP-Clifton Court Intake (CHWST000) salinity (EC) percent difference of No Groundwater Substitution from Base.

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1971	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1972	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1973	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.1	0.0	0.0	0.0	0.0
1974	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	0.0	0.0	0.0	0.0
1975	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	0.0	0.0	0.0
1976	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.5	4.7	2.3	-4.5
1977	-3.3	-1.7	-0.7	-0.5	-0.2	-0.1	0.0	0.0	-0.6	-1.3	-3.2	-1.4
1978	-2.6	-1.6	-0.7	-0.2	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.0
1979	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.0
1980	0.0	0.0	0.0	0.0	0.1	-0.2	0.1	0.1	0.0	0.0	0.0	0.0
1981	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.1	0.0	-3.1	0.5	2.6
1982	-1.3	-1.0	-0.4	0.0	-2.4	-1.1	0.2	-0.2	-0.1	0.0	0.0	0.0
1983	-0.1	0.0	-0.1	0.0	0.2	0.1	0.1	-0.2	0.1	-0.1	-0.1	0.0
1984	0.0	-0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1985	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0
1986	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.1	0.0	0.0	0.0
1987	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	1.5	1.9	-3.0
1988	-2.2	-1.3	-0.6	-0.2	0.0	0.0	0.0	0.0	0.0	1.6	4.5	-1.5
1989	-2.5	-1.3	-0.6	-0.3	-0.1	0.0	0.0	0.1	0.1	-0.5	0.1	0.6
1990	-0.2	-0.1	0.0	0.0	0.0	0.2	0.1	0.0	-0.1	5.8	2.5	-2.4
1991	-2.6	-1.5	-0.7	-0.3	-0.2	-0.1	0.0	0.0	-0.4	4.8	1.9	-2.1
1992	-2.2	-1.3	-0.5	-0.3	-0.1	0.0	0.0	0.0	0.1	2.6	2.1	-1.8
1993	-1.9	-1.1	-0.5	-0.1	0.1	0.1	0.1	0.1	-3.8	-1.7	0.2	0.1
1994	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-3.1	-2.4	2.4
1995	0.1	-0.3	-0.3	-0.1	0.0	0.0	0.1	0.0	0.1	0.0	0.0	0.0
1996	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0
1997	0.0	0.0	0.0	-0.1	-0.1	0.0	0.0	0.1	0.0	0.0	0.0	0.0
1998	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.2	0.1	0.0	0.0	0.0
1999	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.0
2000	0.0	0.0	0.0	0.0	0.0	0.1	0.1	-0.1	0.0	0.0	0.0	0.0
2001	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	3.9	3.3	-1.2
2002	-1.5	-0.9	-0.4	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2003	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.6	-0.5	-1.2
Average	-0.6	-0.4	-0.2	-0.1	-0.1	0.0	0.0	0.0	-0.1	0.5	0.4	-0.4
Critical	-1.5	-0.8	-0.4	-0.2	-0.1	0.0	0.0	0.0	-0.2	2.2	1.1	-1.6
Dry	-0.7	-0.4	-0.2	-0.1	0.0	0.0	0.0	0.0	0.0	0.3	1.0	-0.2
BN	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0
AN	-0.7	-0.4	-0.2	0.0	0.0	0.0	0.1	0.0	-0.6	-0.2	0.0	-0.2
Wet	-0.1	-0.1	-0.1	0.0	-0.2	-0.1	0.0	0.0	0.0	0.0	0.0	0.0

Table E.3-32. Old River near Middle River salinity (EC) difference No Groundwater Substitution minus Base.

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	0.2	0.0	0.0	-0.2	-0.2	0.0	0.0	0.1	0.3	0.3	-0.3	-0.1
1971	-0.2	-0.2	0.0	0.0	0.3	-0.3	0.0	-0.1	0.2	-0.3	-0.2	-0.2
1972	0.2	-0.4	0.3	-0.2	0.2	0.2	0.3	-0.3	0.3	0.3	-0.3	-0.4
1973	0.3	0.1	0.2	-0.2	0.2	0.4	-0.1	0.3	0.1	-0.4	-0.2	-0.4
1974	-0.5	0.4	0.1	-0.2	0.0	0.2	-0.2	0.1	0.3	0.2	0.3	0.4
1975	-0.2	0.2	-0.2	0.4	-0.1	0.2	0.1	-0.4	0.0	0.3	-0.1	0.0
1976	-0.1	-0.3	0.2	0.1	0.2	0.3	0.0	-0.2	0.0	-0.2	-0.2	0.1
1977	-0.1	0.1	-0.1	0.3	0.1	0.2	0.2	0.4	0.0	0.0	-0.4	0.0
1978	-0.4	0.3	0.1	-0.4	0.0	0.1	0.0	0.3	0.3	0.2	0.3	0.4
1979	0.2	0.4	0.0	-0.1	0.4	-0.1	0.4	0.2	0.2	0.3	0.0	0.2
1980	0.2	-0.3	-0.2	0.1	0.2	-0.4	0.3	0.2	0.1	-0.3	-0.3	-0.1
1981	0.4	0.0	-0.1	-0.2	-0.1	-0.4	-0.3	0.4	0.0	-24.6	-2.6	-0.2
1982	0.3	-0.3	0.3	0.0	-13.9	-1.1	0.4	-0.4	-0.3	-0.3	0.4	-0.3
1983	-0.4	0.0	-0.3	0.1	0.5	0.3	0.1	-0.3	0.3	-0.1	-0.5	0.0
1984	0.4	-0.3	0.2	0.0	0.1	0.1	0.2	-0.2	0.3	0.2	0.3	-0.1
1985	0.0	-0.2	-0.2	0.3	0.2	-0.2	0.4	0.0	-0.4	-0.4	-0.4	0.3
1986	0.5	0.0	0.4	0.5	0.1	0.4	0.1	0.0	0.4	0.0	0.0	-0.3
1987	0.3	0.3	0.1	0.1	0.0	-0.1	-0.2	-0.1	0.3	0.1	-0.3	-0.4
1988	-0.4	0.3	-0.1	0.0	0.4	0.1	0.4	-0.2	0.1	-0.5	0.2	0.2
1989	0.1	0.3	0.1	-0.4	-0.4	0.3	-0.4	0.2	0.1	0.2	-0.3	-0.2
1990	-0.2	-0.2	0.0	0.2	0.3	-0.2	-0.4	0.1	-0.3	-0.2	0.0	0.1
1991	-0.1	0.3	-0.3	0.2	-0.3	0.0	-0.3	0.1	0.1	-1.9	-0.6	0.1
1992	-0.2	0.4	-0.1	0.3	-0.1	0.1	-0.4	0.2	0.2	-110.4	-25.7	0.0
1993	0.1	-0.2	0.4	0.2	0.1	0.1	0.5	0.4	18.4	1.4	0.4	-0.1
1994	0.0	0.0	-0.4	-0.4	0.1	0.2	0.3	-0.4	-0.4	0.5	0.0	-0.4
1995	0.1	0.2	0.3	-0.1	-0.4	0.3	0.2	0.1	0.3	-0.2	0.3	-0.4
1996	-0.4	-0.2	-0.2	-0.3	0.2	-0.3	0.4	-0.1	0.1	-0.1	-0.1	0.2
1997	-0.4	-0.1	-0.2	-0.4	-0.2	0.1	-0.1	0.4	0.0	0.1	-0.4	0.3
1998	0.2	-0.3	0.2	0.4	0.3	-0.3	0.0	0.4	0.1	-0.2	-0.4	0.2
1999	-0.4	0.0	-0.3	-0.4	0.1	0.0	0.4	0.3	0.5	-0.3	0.0	-0.1
2000	0.2	-0.3	-0.3	-0.2	0.3	0.3	0.4	-0.4	0.2	-0.1	-0.1	0.1
2001	-0.1	-0.2	-0.3	0.3	0.0	0.3	0.1	-0.4	-0.4	-31.4	-3.9	-0.3
2002	0.2	0.1	0.4	-0.1	-0.1	0.2	0.1	0.0	-0.3	-0.1	0.2	0.0
2003	0.1	0.0	0.0	0.3	0.5	0.5	0.3	-0.1	-0.2	-0.1	0.2	0.2
Average	0.0	0.0	0.0	0.0	-0.3	0.0	0.1	0.0	0.6	-4.9	-1.0	0.0
Critical	-0.2	0.1	-0.1	0.1	0.1	0.1	0.0	0.0	-0.1	-16.1	-3.8	0.0
Dry	0.1	0.0	0.0	0.0	-0.1	0.0	0.0	0.0	-0.1	-9.4	-1.2	-0.1
BN	0.2	0.0	0.1	-0.2	0.3	0.1	0.3	-0.1	0.3	0.3	-0.1	-0.1
AN	0.1	-0.1	0.0	0.0	0.2	0.2	0.2	0.1	3.1	0.1	0.0	0.0
Wet	-0.1	0.0	0.0	0.0	-1.0	0.0	0.1	0.0	0.2	0.0	-0.1	0.0

Table E.3-33. Old River near Middle River salinity (EC) percent difference of No Groundwater Substitution from Base.

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	0.0	0.0	0.0	-0.1	-0.1	0.0	0.0	0.0	0.1	0.1	-0.1	0.0
1971	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	0.0	0.0	-0.1	0.0	0.0
1972	0.0	-0.1	0.0	0.0	0.0	0.0	0.1	-0.1	0.1	0.0	0.0	-0.1
1973	0.1	0.0	0.0	0.0	0.0	0.1	0.0	0.1	0.0	-0.1	0.0	-0.1
1974	-0.1	0.1	0.0	0.0	0.0	0.1	-0.1	0.0	0.1	0.0	0.1	0.1
1975	0.0	0.0	0.0	0.1	0.0	0.1	0.0	-0.1	0.0	0.1	0.0	0.0
1976	0.0	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1977	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	-0.1	0.0
1978	-0.1	0.0	0.0	-0.1	0.0	0.0	0.0	0.1	0.1	0.0	0.1	0.1
1979	0.0	0.1	0.0	0.0	0.1	0.0	0.1	0.1	0.1	0.0	0.0	0.0
1980	0.0	0.0	0.0	0.0	0.1	-0.2	0.1	0.1	0.0	-0.1	-0.1	0.0
1981	0.1	0.0	0.0	0.0	0.0	-0.1	-0.1	0.1	0.0	-3.9	-0.4	0.0
1982	0.1	-0.1	0.0	0.0	-4.7	-0.4	0.2	-0.2	-0.1	-0.1	0.1	-0.1
1983	-0.2	0.0	-0.1	0.0	0.2	0.1	0.1	-0.2	0.2	-0.1	-0.3	0.0
1984	0.1	-0.2	0.1	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.1	0.0
1985	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	-0.1	-0.1	-0.1	0.1
1986	0.1	0.0	0.1	0.1	0.0	0.2	0.0	0.0	0.1	0.0	0.0	-0.1
1987	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	-0.1
1988	-0.1	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	-0.1	0.0	0.0
1989	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	0.0	0.0	0.0	0.0
1990	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	0.0	0.0	0.0	0.0
1991	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.3	-0.1	0.0
1992	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-14.8	-3.3	0.0
1993	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	2.7	0.2	0.1	0.0
1994	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	-0.1	0.1	0.0	-0.1
1995	0.0	0.0	0.0	0.0	-0.1	0.1	0.1	0.0	0.1	-0.1	0.1	-0.1
1996	-0.1	0.0	0.0	0.0	0.1	-0.1	0.1	0.0	0.0	0.0	0.0	0.0
1997	-0.1	0.0	-0.1	-0.2	-0.1	0.1	0.0	0.1	0.0	0.0	-0.1	0.1
1998	0.0	-0.1	0.0	0.1	0.1	-0.1	0.0	0.2	0.1	-0.1	-0.2	0.1
1999	-0.1	0.0	0.0	-0.1	0.0	0.0	0.1	0.1	0.1	0.0	0.0	0.0
2000	0.0	-0.1	0.0	0.0	0.1	0.1	0.1	-0.1	0.0	0.0	0.0	0.0
2001	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	-0.1	-4.8	-0.6	-0.1
2002	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	0.0	0.0
2003	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0
Average	0.0	0.0	0.0	0.0	-0.1	0.0	0.0	0.0	0.1	-0.7	-0.1	0.0
Critical	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-2.2	-0.5	0.0
Dry	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-1.5	-0.2	0.0
BN	0.0	0.0	0.0	0.0	0.1	0.0	0.1	0.0	0.1	0.0	0.0	0.0
AN	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.5	0.0	0.0	0.0
Wet	0.0	0.0	0.0	0.0	-0.3	0.0	0.1	0.0	0.1	0.0	0.0	0.0

Table E.3-34. CCWD Old River Intake (ROLD034) salinity (EC) difference No Groundwater Substitution minus Base.

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	0.0	0.0	0.0	-0.1	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1971	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1972	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.0
1973	0.0	0.0	0.0	0.0	0.0	0.1	-0.1	0.2	0.1	0.0	0.0	0.0
1974	-0.1	0.0	0.0	0.0	0.0	0.0	-0.2	0.0	0.0	0.0	0.0	0.0
1975	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0
1976	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.2	-3.2	30.0	0.9	-31.8
1977	-26.7	-14.2	-7.4	-4.9	-1.9	-0.8	-0.3	-0.4	-3.7	-3.0	-16.1	-13.4
1978	-24.1	-12.4	-6.4	-1.4	0.4	0.3	0.0	0.3	0.2	0.0	0.0	0.0
1979	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.2	0.1	0.0	0.0	0.0
1980	0.0	0.0	0.0	0.0	0.2	-0.4	0.2	0.3	0.1	0.0	0.0	0.0
1981	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	-0.1	-0.1	-15.3	3.9	19.5
1982	-11.8	-7.1	-1.7	0.2	-8.3	-4.4	0.4	-0.4	-0.3	-0.1	0.0	0.0
1983	-0.1	-0.1	-0.1	0.1	0.5	0.3	0.1	-0.3	0.3	-0.1	-0.1	-0.1
1984	0.0	0.0	0.1	0.1	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0
1985	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0
1986	0.0	0.0	0.0	0.0	0.1	0.4	0.1	0.0	0.1	0.1	0.0	0.0
1987	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.3	7.5	13.8	-14.6
1988	-15.1	-8.7	-5.2	-1.5	-0.3	-0.1	0.0	0.0	0.2	11.3	20.9	-10.7
1989	-19.1	-11.4	-5.5	-3.5	-1.6	-0.6	0.2	0.4	0.2	-2.6	0.9	3.7
1990	-1.2	-0.4	-0.2	-0.2	0.3	1.2	1.0	0.5	-0.7	34.1	17.6	-16.9
1991	-22.1	-13.5	-7.9	-4.9	-2.4	-0.9	-0.2	-0.1	-1.5	30.0	13.8	-13.9
1992	-18.4	-10.9	-6.3	-4.0	-1.6	-0.1	0.0	0.0	0.6	14.3	11.4	-13.0
1993	-14.1	-7.0	-4.9	-1.4	0.8	0.5	0.3	0.4	-8.7	-3.9	0.7	0.5
1994	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.3	-21.0	-16.9	20.8
1995	0.7	-1.6	-2.8	-1.0	0.1	0.1	0.2	0.1	0.1	0.1	0.0	0.0
1996	-0.1	-0.1	0.0	0.0	0.0	0.0	0.3	0.0	0.0	0.0	0.0	0.0
1997	0.0	0.0	-0.1	-0.4	-0.3	-0.1	0.0	0.3	0.1	0.0	0.0	0.0
1998	0.0	0.0	0.0	0.0	0.2	0.0	0.0	0.4	0.3	0.0	-0.1	0.0
1999	0.0	0.0	0.0	-0.1	0.0	0.0	0.4	0.3	0.1	0.0	0.0	0.0
2000	0.0	0.0	0.0	0.0	0.0	0.1	0.3	-0.1	0.0	0.0	0.0	0.0
2001	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.1	14.6	14.8	-4.3
2002	-10.0	-6.1	-3.3	-0.9	0.2	0.2	0.1	0.1	0.1	0.2	0.1	0.1
2003	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.1	0.0	2.1	-2.0	-5.9
Average	-4.8	-2.7	-1.5	-0.7	-0.4	-0.1	0.1	0.1	-0.5	2.9	1.9	-2.4
Critical	-11.9	-6.8	-3.9	-2.2	-0.9	-0.1	0.1	0.0	-1.2	13.7	4.5	-11.3
Dry	-4.8	-2.9	-1.5	-0.7	-0.2	-0.1	0.0	0.1	0.1	0.7	5.6	0.7
BN	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.1	0.0	0.0	0.0	0.0
AN	-6.4	-3.2	-1.9	-0.5	0.2	0.1	0.2	0.2	-1.4	-0.3	-0.2	-0.9
Wet	-0.9	-0.7	-0.3	-0.1	-0.6	-0.3	0.1	0.0	0.1	0.0	0.0	0.0

Table E.3-35. CCWD Old River Intake (ROLD034) salinity (EC) percent difference of No Groundwater Substitution from Base.

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1971	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1972	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1973	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1974	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	0.0	0.0	0.0	0.0
1975	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1976	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	-0.7	4.6	0.1	-4.8
1977	-3.4	-1.8	-0.9	-0.5	-0.3	-0.1	-0.1	-0.1	-0.8	-0.5	-2.3	-1.5
1978	-2.6	-1.7	-0.8	-0.2	0.1	0.1	0.0	0.1	0.1	0.0	0.0	0.0
1979	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.0
1980	0.0	0.0	0.0	0.0	0.0	-0.2	0.1	0.1	0.0	0.0	0.0	0.0
1981	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-3.7	0.6	2.6
1982	-1.4	-1.0	-0.6	0.0	-2.4	-1.3	0.2	-0.2	-0.1	0.0	0.0	0.0
1983	0.0	0.0	0.0	0.0	0.2	0.1	0.1	-0.2	0.1	0.0	-0.1	0.0
1984	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1985	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1986	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0
1987	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	2.2	3.1	-2.7
1988	-2.2	-1.4	-0.7	-0.3	-0.1	0.0	0.0	0.0	0.1	3.2	4.0	-1.8
1989	-2.5	-1.4	-0.7	-0.4	-0.2	-0.1	0.0	0.1	0.1	-0.6	0.1	0.6
1990	-0.2	-0.1	0.0	0.0	0.1	0.3	0.3	0.1	-0.2	5.9	2.3	-2.4
1991	-2.7	-1.6	-0.9	-0.5	-0.3	-0.1	0.0	0.0	-0.4	4.8	1.8	-2.0
1992	-2.3	-1.4	-0.7	-0.4	-0.2	0.0	0.0	0.0	0.2	3.9	1.9	-1.8
1993	-1.9	-1.1	-0.6	-0.2	0.2	0.1	0.1	0.1	-2.6	-1.5	0.2	0.1
1994	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	-3.2	-2.0	2.7
1995	0.1	-0.3	-0.4	-0.1	0.0	0.0	0.1	0.0	0.1	0.0	0.0	0.0
1996	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0
1997	0.0	0.0	0.0	-0.1	-0.1	0.0	0.0	0.1	0.0	0.0	0.0	0.0
1998	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.1	0.0	0.0	0.0
1999	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.0
2000	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0
2001	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.5	3.4	-0.8
2002	-1.5	-1.0	-0.6	-0.2	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0
2003	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.8	-0.5	-1.3
Average	-0.6	-0.4	-0.2	-0.1	-0.1	0.0	0.0	0.0	-0.1	0.6	0.4	-0.4
Critical	-1.5	-0.9	-0.5	-0.3	-0.1	0.0	0.0	0.0	-0.3	2.7	0.8	-1.7
Dry	-0.7	-0.4	-0.2	-0.1	0.0	0.0	0.0	0.0	0.0	0.4	1.2	-0.1
BN	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0
AN	-0.8	-0.5	-0.2	-0.1	0.0	0.0	0.0	0.1	-0.4	-0.1	-0.1	-0.2
Wet	-0.1	-0.1	-0.1	0.0	-0.2	-0.1	0.0	0.0	0.0	0.0	0.0	0.0

Table E.3-36. Old River location (ROLD059) salinity (EC) difference No Groundwater Substitution minus Base.

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	0.2	0.1	0.0	-0.2	-0.2	0.0	0.0	0.1	0.3	0.3	-0.2	-0.2
1971	-0.1	-0.2	0.0	0.0	0.3	-0.3	0.0	-0.1	0.2	-0.2	-0.2	-0.2
1972	0.1	-0.2	0.2	-0.2	0.1	0.2	0.3	-0.3	0.0	0.2	-0.1	-0.3
1973	0.2	0.1	0.2	-0.1	0.1	0.4	-0.1	0.3	0.1	-0.3	-0.2	-0.3
1974	-0.4	0.3	0.1	-0.1	0.0	0.2	-0.2	0.1	0.3	0.2	0.3	0.4
1975	-0.1	0.1	-0.2	0.3	0.0	0.1	0.1	-0.3	-0.1	0.3	0.0	0.0
1976	-0.1	-0.3	0.1	0.1	0.2	0.3	0.0	-0.2	-0.6	-0.3	1.7	4.3
1977	-0.1	0.0	-0.1	0.2	0.2	0.2	0.2	0.3	-1.3	-2.0	-13.0	-6.8
1978	-4.1	-1.1	0.1	-0.3	0.0	0.1	0.0	0.3	0.3	0.2	0.2	0.4
1979	0.2	0.3	0.0	-0.1	0.4	-0.1	0.4	0.2	0.2	0.2	0.1	0.1
1980	0.2	-0.2	-0.2	0.1	0.2	-0.4	0.3	0.2	0.1	-0.2	-0.3	-0.1
1981	0.3	0.1	-0.1	-0.1	-0.1	-0.3	-0.3	0.3	0.0	-22.9	-10.3	-0.8
1982	0.3	-0.2	0.3	-0.1	-12.5	-1.4	0.4	-0.4	-0.3	-0.3	0.3	-0.3
1983	-0.4	0.0	-0.3	0.1	0.5	0.2	0.1	-0.3	0.3	-0.1	-0.5	0.0
1984	0.4	-0.3	0.2	0.0	0.1	0.1	0.2	-0.1	0.3	0.2	0.3	-0.1
1985	0.0	-0.2	-0.2	0.3	0.2	-0.2	0.4	0.0	-0.3	-0.4	-0.4	0.1
1986	0.4	0.1	0.4	0.4	0.1	0.4	0.1	0.0	0.4	0.0	0.0	-0.3
1987	0.2	0.3	0.1	0.1	0.0	-0.1	-0.2	-0.1	0.1	9.1	23.3	1.8
1988	-0.4	0.1	0.0	0.0	0.4	0.2	0.4	-0.2	0.0	57.3	21.8	-1.0
1989	-0.1	0.2	0.1	-0.3	-0.4	0.2	-0.3	0.1	0.1	0.2	-0.8	-0.5
1990	-0.2	-0.2	-0.1	0.2	0.3	-0.2	-0.4	0.0	-0.1	29.6	15.1	-4.7
1991	-0.2	0.1	-0.3	0.1	-0.2	0.0	-0.3	0.0	-0.4	47.2	16.7	-7.2
1992	-0.7	0.2	0.0	0.2	-0.1	0.1	-0.3	0.1	-0.5	147.4	20.9	-3.4
1993	-3.0	-2.2	0.3	0.2	0.1	0.1	0.4	0.4	16.3	2.7	0.3	0.0
1994	0.0	0.0	-0.3	-0.3	0.0	0.2	0.3	-0.4	-0.2	0.1	-28.2	-10.5
1995	-0.6	0.2	0.3	0.0	-0.4	0.3	0.2	0.1	0.3	-0.2	0.3	-0.3
1996	-0.4	-0.2	-0.2	-0.2	0.2	-0.3	0.4	0.0	0.1	-0.1	-0.1	0.1
1997	-0.3	-0.1	-0.2	-0.4	-0.2	0.1	-0.1	0.4	0.0	0.1	-0.3	0.2
1998	0.2	-0.2	0.1	0.3	0.3	-0.3	0.0	0.4	0.2	-0.2	-0.4	0.1
1999	-0.3	0.0	-0.3	-0.4	0.0	0.0	0.4	0.3	0.4	-0.2	0.0	0.0
2000	0.1	-0.2	-0.3	-0.2	0.2	0.3	0.4	-0.3	0.1	0.0	-0.1	0.0
2001	-0.1	-0.2	-0.3	0.2	0.0	0.3	0.1	-0.3	-0.5	-15.5	26.2	5.6
2002	0.1	0.1	0.3	-0.1	-0.1	0.2	0.1	0.0	-0.1	-0.1	0.1	0.1
2003	0.0	0.1	0.0	0.2	0.4	0.5	0.3	0.0	-0.1	0.1	0.1	0.2
Average	-0.3	-0.1	0.0	0.0	-0.3	0.0	0.1	0.0	0.5	7.4	2.1	-0.7
Critical	-0.2	0.0	-0.1	0.1	0.1	0.1	0.0	0.0	-0.5	39.9	5.0	-4.2
Dry	0.1	0.0	0.0	0.0	-0.1	0.0	0.0	0.0	-0.1	-4.9	6.3	1.0
BN	0.2	0.1	0.1	-0.1	0.3	0.1	0.3	0.0	0.1	0.2	0.0	-0.1
AN	-1.1	-0.6	0.0	0.0	0.2	0.2	0.2	0.1	2.8	0.4	0.0	0.0
Wet	-0.1	0.0	0.0	0.0	-0.9	-0.1	0.1	0.0	0.2	0.0	0.0	0.0

Table E.3-37. Old River location (ROLD059) salinity (EC) percent difference of No Groundwater Substitution from Base.

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	0.0	0.0	0.0	-0.1	-0.1	0.0	0.0	0.0	0.1	0.1	0.0	0.0
1971	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	0.0	0.0	0.0	0.0	0.0
1972	0.0	0.0	0.0	0.0	0.0	0.0	0.1	-0.1	0.0	0.0	0.0	-0.1
1973	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.1	0.0	-0.1	0.0	-0.1
1974	-0.1	0.0	0.0	0.0	0.0	0.1	-0.1	0.0	0.1	0.0	0.1	0.1
1975	0.0	0.0	0.0	0.0	0.0	0.1	0.0	-0.1	0.0	0.0	0.0	0.0
1976	0.0	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	0.2	0.7
1977	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.2	-0.3	-2.1	-0.9
1978	-0.5	-0.2	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.1	0.1
1979	0.0	0.1	0.0	0.0	0.1	0.0	0.1	0.1	0.0	0.0	0.0	0.0
1980	0.0	0.0	0.0	0.0	0.1	-0.2	0.1	0.1	0.0	-0.1	-0.1	0.0
1981	0.1	0.0	0.0	0.0	0.0	-0.1	-0.1	0.1	0.0	-3.6	-1.7	-0.1
1982	0.1	0.0	0.0	0.0	-3.9	-0.5	0.2	-0.2	-0.1	-0.1	0.1	-0.1
1983	-0.2	0.0	-0.1	0.0	0.2	0.1	0.1	-0.2	0.1	-0.1	-0.3	0.0
1984	0.1	-0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.1	0.0
1985	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	-0.1	-0.1	0.0
1986	0.1	0.0	0.1	0.1	0.0	0.1	0.0	0.0	0.1	0.0	0.0	-0.1
1987	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.4	4.0	0.3
1988	-0.1	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	9.9	4.0	-0.2
1989	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	0.0	0.0	-0.1	-0.1
1990	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.8	2.2	-0.7
1991	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	7.3	2.4	-1.1
1992	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	32.4	3.8	-0.5
1993	-0.4	-0.3	0.0	0.0	0.0	0.0	0.1	0.1	2.4	0.4	0.1	0.0
1994	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	0.0	-3.8	-1.5
1995	-0.1	0.0	0.0	0.0	-0.1	0.1	0.1	0.0	0.1	-0.1	0.1	-0.1
1996	-0.1	0.0	0.0	0.0	0.0	-0.1	0.1	0.0	0.0	0.0	0.0	0.0
1997	-0.1	0.0	-0.1	-0.1	-0.1	0.1	0.0	0.1	0.0	0.0	-0.1	0.0
1998	0.0	0.0	0.0	0.0	0.1	-0.1	0.0	0.2	0.1	-0.1	-0.1	0.0
1999	-0.1	0.0	0.0	-0.1	0.0	0.0	0.1	0.1	0.1	0.0	0.0	0.0
2000	0.0	0.0	0.0	0.0	0.1	0.1	0.1	-0.1	0.0	0.0	0.0	0.0
2001	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	-0.1	-2.4	4.6	1.0
2002	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2003	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0
Average	0.0	0.0	0.0	0.0	-0.1	0.0	0.0	0.0	0.1	1.5	0.4	-0.1
Critical	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	7.7	1.0	-0.6
Dry	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.8	1.1	0.2
BN	0.0	0.0	0.0	0.0	0.1	0.0	0.1	0.0	0.0	0.0	0.0	0.0
AN	-0.1	-0.1	0.0	0.0	0.0	0.0	0.1	0.0	0.4	0.0	0.0	0.0
Wet	0.0	0.0	0.0	0.0	-0.3	0.0	0.0	0.0	0.1	0.0	0.0	0.0

Table E.3-38. CCWD Contra Costa Canal Intake (CHCCC006) salinity (EC) difference No Crop Idle minus Base.

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	0.0	0.0	0.0	0.0	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1971	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	0.0	0.0	0.0	0.0
1972	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0
1973	0.0	0.0	0.0	0.0	0.1	-2.6	-8.3	-1.9	-0.3	0.0	0.0	0.0
1974	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.2	0.0	0.0	0.0	0.0
1975	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0
1976	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.4	28.7	14.1	-50.2
1977	-55.3	-35.8	-19.9	-21.0	-7.1	0.5	2.0	1.1	1.6	6.1	1.3	-2.3
1978	-33.3	-22.1	-12.3	-0.6	0.9	0.5	0.2	0.1	0.2	0.2	0.3	0.2
1979	0.0	0.0	0.0	0.0	0.4	0.4	0.2	0.3	0.1	0.1	0.1	0.0
1980	-0.2	-0.3	2.9	3.2	7.0	11.6	0.6	0.3	0.1	0.0	0.0	0.0
1981	0.0	0.0	-0.4	-0.1	0.2	0.1	0.0	0.3	0.6	-3.5	8.8	32.0
1982	-35.4	-23.7	-2.6	0.2	-5.6	-5.9	-0.6	-0.1	-0.2	-0.1	0.0	0.0
1983	0.0	0.1	0.0	0.0	0.3	0.3	0.2	-0.1	0.1	0.1	-0.1	0.0
1984	0.0	0.2	0.1	0.1	0.0	0.0	0.1	0.1	0.0	-0.1	-0.1	0.0
1985	0.0	0.1	0.3	0.4	0.3	0.2	0.3	0.2	0.2	-0.3	-0.5	-0.8
1986	-0.7	-0.5	-0.8	0.7	0.1	0.1	0.2	0.1	0.1	0.0	0.0	0.0
1987	0.0	0.1	-0.1	-0.5	0.2	0.1	2.5	3.3	1.4	9.8	21.1	-24.7
1988	-40.6	-26.2	-16.5	-0.4	0.4	2.8	2.8	3.9	2.7	18.1	34.4	-25.5
1989	-43.9	-34.9	-20.0	10.6	6.1	3.8	1.4	4.0	1.4	13.5	10.6	-11.9
1990	-21.9	-16.7	-12.7	-10.4	0.0	2.3	2.3	1.3	1.8	73.2	4.2	-34.6
1991	-43.1	-32.8	-21.7	-17.5	-3.2	0.1	0.7	0.8	4.3	57.2	-2.4	-28.5
1992	-34.4	-25.1	-17.0	-16.5	-8.4	0.1	0.5	2.9	1.5	18.1	31.9	-18.6
1993	-38.1	-21.2	-10.9	5.8	1.7	1.0	0.7	0.8	-4.8	-2.7	1.3	1.0
1994	0.1	0.1	0.0	0.3	3.2	1.5	0.9	0.6	1.1	0.7	-13.3	14.6
1995	-10.8	-4.7	-8.6	2.0	0.9	0.5	0.2	0.1	0.1	0.1	0.1	0.5
1996	0.1	0.0	0.1	0.4	0.3	0.1	0.1	0.2	0.1	0.3	0.5	0.4
1997	0.1	0.0	0.0	-0.2	-0.3	-0.1	0.0	0.1	0.1	-0.1	-0.3	-0.7
1998	0.1	0.1	0.2	0.9	0.2	0.1	-0.1	0.2	0.2	0.0	0.0	0.0
1999	0.0	0.2	0.2	0.0	0.0	0.0	0.1	0.3	0.1	0.2	0.2	0.2
2000	0.0	0.0	-0.1	-0.5	0.1	0.1	0.2	0.2	0.0	-0.1	-0.2	0.0
2001	0.0	0.0	-0.2	-1.0	0.2	0.1	0.2	0.7	1.8	23.2	28.2	-5.3
2002	-25.9	-19.0	1.6	1.3	0.5	0.4	0.2	0.2	1.0	-0.2	-0.7	-2.5
2003	-2.6	-1.1	-0.8	0.6	0.1	0.1	0.1	0.2	0.2	7.6	3.1	-7.6
Average	-11.3	-7.7	-4.1	-1.2	0.0	0.5	0.2	0.6	0.5	7.4	4.2	-4.8
Critical	-27.9	-19.5	-12.6	-9.4	-2.2	1.1	1.3	1.6	1.9	28.9	10.0	-20.7
Dry	-11.6	-9.0	-3.1	1.8	1.2	0.8	0.8	1.4	1.1	7.1	11.2	-2.2
BN	0.0	0.0	0.0	0.0	0.2	0.2	0.1	0.2	0.1	0.0	0.0	0.0
AN	-12.4	-7.4	-3.5	1.4	1.7	1.8	-1.1	0.0	-0.8	0.8	0.7	-1.1
Wet	-3.6	-2.2	-0.9	0.3	-0.3	-0.4	0.0	0.0	0.0	0.0	0.0	0.0

Table E.3-39. CCWD Contra Costa Canal Intake (CHCCC006) salinity (EC) percent difference of No Crop Idle from Base.

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1971	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1972	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1973	0.0	0.0	0.0	0.0	0.0	-0.7	-2.2	-0.4	-0.1	0.0	0.0	0.0
1974	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1975	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1976	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	4.5	1.5	-6.8
1977	-6.4	-4.0	-2.3	-1.8	-1.0	0.1	0.5	0.3	0.3	1.0	0.2	-0.2
1978	-3.1	-2.7	-1.4	-0.1	0.2	0.1	0.0	0.0	0.1	0.1	0.1	0.0
1979	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.1	0.0	0.0	0.0	0.0
1980	0.0	0.0	0.4	0.6	1.0	2.2	0.2	0.1	0.0	0.0	0.0	0.0
1981	0.0	0.0	-0.1	0.0	0.1	0.0	0.0	0.1	0.2	-0.8	1.2	3.9
1982	-3.6	-2.6	-0.8	0.0	-1.7	-1.4	-0.2	-0.1	-0.1	0.0	0.0	0.0
1983	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0
1984	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1985	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.0	0.1	-0.1	-0.1	-0.1
1986	-0.1	-0.1	-0.1	0.1	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0
1987	0.0	0.0	0.0	-0.1	0.0	0.0	0.6	0.8	0.4	2.7	4.3	-4.4
1988	-5.5	-3.7	-2.1	-0.1	0.1	0.6	0.7	1.0	0.8	4.9	5.8	-3.9
1989	-5.5	-3.7	-2.3	1.0	0.8	0.7	0.3	1.2	0.5	2.7	1.3	-1.5
1990	-3.0	-2.2	-1.6	-1.2	0.0	0.7	0.7	0.4	0.5	12.6	0.5	-4.4
1991	-4.6	-3.5	-2.2	-1.7	-0.5	0.0	0.2	0.2	1.2	8.9	-0.3	-3.8
1992	-3.9	-2.8	-1.8	-1.6	-1.1	0.0	0.1	0.8	0.5	4.7	4.8	-2.4
1993	-4.4	-3.1	-1.3	0.8	0.3	0.3	0.2	0.2	-1.6	-1.1	0.3	0.2
1994	0.1	0.0	0.0	0.0	0.6	0.4	0.3	0.2	0.3	0.1	-1.3	1.7
1995	-1.1	-0.8	-1.1	0.3	0.3	0.1	0.0	0.0	0.0	0.0	0.1	0.2
1996	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.1	0.0	0.1	0.1	0.1
1997	0.0	0.0	0.0	0.0	-0.1	0.0	0.0	0.0	0.0	0.0	-0.1	-0.1
1998	0.0	0.0	0.1	0.2	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.0
1999	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.1	0.0	0.1	0.1	0.0
2000	0.0	0.0	0.0	-0.1	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.0
2001	0.0	0.0	-0.1	-0.1	0.0	0.0	0.0	0.2	0.6	6.9	5.8	-1.0
2002	-3.6	-2.7	0.2	0.3	0.2	0.1	0.1	0.0	0.3	0.0	-0.1	-0.3
2003	-0.3	-0.1	-0.1	0.2	0.0	0.0	0.0	0.0	0.1	2.7	0.8	-1.4
Average	-1.3	-0.9	-0.5	-0.1	0.0	0.1	0.1	0.2	0.1	1.5	0.7	-0.7
Critical	-3.3	-2.3	-1.4	-0.9	-0.3	0.3	0.3	0.4	0.5	5.2	1.6	-2.8
Dry	-1.5	-1.1	-0.4	0.2	0.2	0.2	0.2	0.4	0.4	1.9	2.1	-0.6
BN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AN	-1.3	-1.0	-0.4	0.2	0.3	0.3	-0.3	0.0	-0.3	0.3	0.2	-0.2
Wet	-0.4	-0.2	-0.1	0.0	-0.1	-0.1	0.0	0.0	0.0	0.0	0.0	0.0

Table E.3-40. CVP-Jones Intake (CHDMC006) salinity (EC) difference No Crop Idle minus Base.

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	0.1	0.1	0.0	-0.2	-0.2	0.0	0.0	0.1	0.1	0.1	0.0	0.0
1971	0.0	-0.1	0.0	0.0	0.1	-0.2	0.0	-0.1	0.0	0.0	0.0	0.0
1972	0.0	0.0	0.0	0.0	0.1	0.1	0.3	-0.2	0.0	0.0	0.0	-0.1
1973	0.0	0.0	0.1	-0.1	0.1	-15.3	-2.9	0.3	-0.2	-0.1	-0.1	-0.1
1974	-0.2	0.0	0.1	-0.1	0.0	0.2	-0.2	0.1	0.2	0.1	0.1	0.1
1975	0.0	0.0	0.0	0.1	0.0	0.1	0.1	-0.3	-0.1	0.1	0.0	0.0
1976	0.0	-0.1	0.0	0.0	0.1	0.1	0.0	0.1	0.1	24.3	11.4	-34.3
1977	-29.5	-16.1	-9.0	-11.1	2.4	10.0	10.9	3.2	1.5	-5.6	-22.9	-19.6
1978	-26.7	-10.5	-5.1	-0.7	0.3	0.2	0.0	0.3	0.2	0.2	0.2	0.2
1979	0.1	0.1	0.0	0.0	0.4	0.0	0.3	0.2	0.1	0.1	0.1	0.0
1980	-0.1	0.1	2.3	0.4	-2.4	-0.5	0.3	0.2	0.1	-0.1	-0.1	0.0
1981	0.1	0.1	-0.2	0.0	0.0	-0.2	1.3	0.6	1.1	-2.2	9.9	8.8
1982	-19.0	-10.5	-1.1	0.2	-10.7	-1.7	0.4	-0.4	-0.3	-0.3	0.1	-0.2
1983	-0.3	0.0	-0.3	0.1	0.5	0.2	0.1	-0.3	0.3	-0.1	-0.4	0.0
1984	0.2	-0.2	0.1	0.0	0.1	0.1	0.2	-0.1	0.1	0.1	0.0	0.0
1985	0.0	0.0	0.1	0.3	0.2	0.2	0.4	0.0	0.2	-0.2	-0.4	-0.5
1986	-0.2	-0.3	-0.1	0.5	0.1	0.4	0.1	0.0	0.3	0.1	0.0	-0.1
1987	0.1	0.3	0.1	-0.1	0.1	-0.1	0.8	2.1	2.9	3.8	-6.5	-24.7
1988	-23.9	-12.3	-6.5	-0.5	0.3	10.6	1.5	7.0	6.8	3.6	16.5	-18.9
1989	-29.4	-16.1	-6.8	6.2	7.3	1.5	0.2	15.1	3.5	-0.7	6.8	-3.4
1990	-10.2	-8.6	-4.9	-4.2	-0.2	0.9	0.8	0.2	0.8	24.0	7.4	-24.3
1991	-30.8	-16.5	-8.8	-2.8	-1.1	-0.1	0.0	0.2	3.4	17.2	2.9	-21.1
1992	-22.4	-12.0	-4.1	-6.5	-1.5	-0.1	-4.3	15.4	3.5	9.0	11.2	-25.6
1993	-25.7	-11.3	-3.7	1.4	0.7	0.5	0.4	0.4	-18.7	-3.6	0.8	0.5
1994	0.1	0.0	-0.1	0.3	1.5	0.7	0.4	-0.1	0.3	-1.6	-12.5	4.7
1995	-6.0	-1.5	-3.6	0.3	0.2	0.3	0.2	0.1	0.3	-0.2	0.2	0.2
1996	-0.1	-0.1	0.0	-0.1	0.2	-0.3	0.3	0.0	0.1	0.2	0.2	0.2
1997	0.0	-0.1	-0.2	-0.4	-0.2	0.1	0.0	0.4	0.1	0.3	-0.2	-0.4
1998	0.5	1.7	0.2	0.4	0.3	-0.3	0.0	0.4	0.2	-0.2	-0.2	0.1
1999	-0.1	0.1	0.0	-0.2	0.0	0.0	0.4	0.3	0.3	0.1	0.1	0.1
2000	0.1	0.0	-0.1	-0.3	0.2	0.3	0.3	-0.3	0.0	0.2	-0.1	0.0
2001	0.0	-0.1	-0.3	-0.4	0.1	0.2	2.6	0.3	2.6	11.2	9.7	-12.8
2002	-17.5	-6.8	2.1	0.5	0.3	0.2	0.1	0.0	1.1	-0.1	-0.5	-1.6
2003	-1.4	-0.7	-0.3	0.4	0.2	0.2	0.3	0.0	0.1	3.7	1.8	-3.8
Average	-7.1	-3.6	-1.5	-0.5	0.0	0.3	0.5	1.3	0.3	2.4	1.0	-5.2
Critical	-16.7	-9.4	-4.8	-3.5	0.2	3.1	1.3	3.7	2.3	10.1	2.0	-19.9
Dry	-7.8	-3.8	-0.9	1.1	1.3	0.3	0.9	3.0	1.9	2.0	3.2	-5.7
BN	0.1	0.0	0.0	0.0	0.2	0.0	0.3	0.0	0.1	0.1	0.0	0.0
AN	-9.0	-3.7	-1.1	0.2	-0.1	-2.4	-0.3	0.1	-3.1	0.0	0.4	-0.5
Wet	-1.9	-0.8	-0.4	0.1	-0.7	-0.1	0.1	0.0	0.1	0.0	0.0	0.0

Table E.3-41. CVP-Jones Intake (CHDMC006) salinity (EC) percent difference of No Crop Idle from Base.

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	0.0	0.0	0.0	-0.1	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1971	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1972	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1973	0.0	0.0	0.0	0.0	0.0	-4.1	-0.8	0.1	-0.1	0.0	0.0	0.0
1974	-0.1	0.0	0.0	0.0	0.0	0.1	-0.1	0.0	0.0	0.0	0.0	0.0
1975	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	0.0	0.0	0.0
1976	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.2	1.7	-5.7
1977	-4.5	-2.3	-1.2	-1.2	0.3	1.2	1.6	0.5	0.3	-1.0	-3.7	-2.6
1978	-3.3	-1.5	-0.7	-0.1	0.0	0.0	0.0	0.1	0.1	0.0	0.1	0.0
1979	0.0	0.0	0.0	0.0	0.1	0.0	0.1	0.1	0.0	0.0	0.0	0.0
1980	0.0	0.0	0.4	0.1	-0.7	-0.2	0.1	0.1	0.0	0.0	0.0	0.0
1981	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.1	0.3	-0.6	1.8	1.4
1982	-2.7	-1.7	-0.2	0.0	-3.3	-0.5	0.2	-0.2	-0.1	-0.1	0.0	-0.1
1983	-0.2	0.0	-0.1	0.0	0.1	0.1	0.1	-0.2	0.1	-0.1	-0.2	0.0
1984	0.1	-0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1985	0.0	0.0	0.0	0.1	0.0	0.0	0.1	0.0	0.1	0.0	-0.1	-0.1
1986	0.0	0.0	0.0	0.1	0.0	0.1	0.0	0.0	0.1	0.0	0.0	0.0
1987	0.0	0.1	0.0	0.0	0.0	0.0	0.1	0.4	0.8	1.1	-1.4	-4.8
1988	-4.0	-2.1	-0.9	-0.1	0.0	1.2	0.2	1.2	1.5	1.0	3.3	-3.3
1989	-4.4	-2.2	-0.9	0.7	0.9	0.2	0.0	2.7	1.1	-0.2	1.1	-0.6
1990	-1.8	-1.4	-0.7	-0.6	0.0	0.1	0.1	0.0	0.2	4.7	1.1	-3.8
1991	-4.2	-2.2	-1.1	-0.3	-0.1	0.0	0.0	0.0	0.9	3.1	0.4	-3.4
1992	-3.2	-1.7	-0.5	-0.7	-0.2	0.0	-0.6	2.9	1.0	2.7	2.1	-4.0
1993	-3.8	-1.8	-0.5	0.2	0.1	0.1	0.1	0.1	-3.7	-1.0	0.2	0.1
1994	0.0	0.0	0.0	0.0	0.2	0.1	0.1	0.0	0.1	-0.3	-1.7	0.7
1995	-0.8	-0.3	-0.5	0.0	0.0	0.1	0.1	0.0	0.1	-0.1	0.1	0.1
1996	0.0	0.0	0.0	0.0	0.0	-0.1	0.1	0.0	0.0	0.1	0.1	0.0
1997	0.0	0.0	-0.1	-0.1	-0.1	0.0	0.0	0.1	0.0	0.1	-0.1	-0.1
1998	0.1	0.4	0.0	0.1	0.1	-0.1	0.0	0.2	0.1	-0.1	-0.1	0.0
1999	0.0	0.0	0.0	-0.1	0.0	0.0	0.1	0.1	0.1	0.0	0.0	0.0
2000	0.0	0.0	0.0	0.0	0.0	0.1	0.1	-0.1	0.0	0.1	0.0	0.0
2001	0.0	0.0	-0.1	-0.1	0.0	0.0	0.6	0.1	0.7	3.3	2.2	-2.5
2002	-3.0	-1.2	0.3	0.1	0.0	0.0	0.0	0.0	0.3	0.0	-0.1	-0.3
2003	-0.2	-0.1	0.0	0.1	0.0	0.0	0.1	0.0	0.0	1.3	0.5	-0.8
Average	-1.1	-0.5	-0.2	-0.1	-0.1	0.0	0.1	0.2	0.1	0.5	0.2	-0.9
Critical	-2.5	-1.4	-0.6	-0.4	0.0	0.4	0.2	0.7	0.6	2.1	0.5	-3.2
Dry	-1.2	-0.5	-0.1	0.1	0.2	0.0	0.2	0.6	0.5	0.6	0.6	-1.1
BN	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0
AN	-1.2	-0.6	-0.1	0.0	-0.1	-0.7	-0.1	0.0	-0.6	0.1	0.1	-0.1
Wet	-0.3	-0.1	-0.1	0.0	-0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0

1 **Table E.3-42. SWP-Clifton Court Intake (CHWST000) salinity (EC) difference No Crop Idle**
2 **minus Base.**

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	0.0	0.1	0.0	-0.1	-0.1	0.0	0.0	0.1	0.0	0.0	0.0	0.0
1971	0.0	0.0	0.0	0.0	0.1	-0.1	0.0	-0.1	0.0	0.0	0.0	0.0
1972	0.0	0.0	0.0	0.0	0.1	0.1	0.3	-0.2	0.0	0.0	0.0	0.0
1973	0.0	0.0	0.0	-0.1	0.2	-10.7	-2.2	0.3	-0.3	0.0	0.0	0.0
1974	-0.1	0.0	0.1	0.0	0.0	0.1	-0.2	0.1	0.1	0.0	0.0	0.0
1975	0.0	0.0	0.0	0.1	0.0	0.1	0.1	-0.3	-0.1	0.0	0.0	0.0
1976	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.1	0.3	32.7	11.8	-43.4
1977	-40.1	-21.0	-12.6	-14.5	-0.9	6.7	7.9	3.3	1.4	-3.7	-25.4	-23.7
1978	-32.4	-13.3	-6.9	-0.8	0.5	0.4	0.0	0.3	0.2	0.2	0.2	0.2
1979	0.1	0.1	0.0	0.1	0.3	0.1	0.4	0.2	0.1	0.1	0.1	0.0
1980	-0.2	0.2	3.5	1.4	-1.6	-0.4	0.3	0.2	0.1	0.0	0.0	0.0
1981	0.0	0.0	-0.2	0.0	0.1	-0.1	1.2	0.6	1.2	-2.8	16.0	10.9
1982	-24.7	-13.5	-1.6	0.3	-8.2	-3.6	0.4	-0.4	-0.3	-0.1	0.0	0.0
1983	-0.1	0.0	-0.3	0.1	0.5	0.2	0.1	-0.3	0.3	-0.1	-0.2	-0.1
1984	0.1	-0.1	0.2	0.0	0.1	0.1	0.2	-0.1	0.0	0.0	-0.1	0.0
1985	0.0	0.1	0.2	0.3	0.2	0.4	0.4	0.1	0.3	-0.2	-0.4	-0.6
1986	-0.3	-0.4	-0.2	0.5	0.1	0.4	0.1	0.0	0.2	0.1	0.0	0.0
1987	0.0	0.2	0.1	-0.2	0.1	0.0	1.7	2.7	3.0	4.9	5.9	-28.4
1988	-29.2	-15.7	-8.6	-0.6	0.3	12.8	2.2	8.5	5.1	6.6	20.4	-21.7
1989	-35.6	-20.7	-8.7	8.2	7.8	2.8	0.8	12.0	2.9	-0.9	9.3	-4.5
1990	-13.4	-10.9	-6.8	-5.6	-0.2	1.2	1.3	0.6	1.0	30.7	9.6	-29.0
1991	-38.1	-21.1	-11.8	-6.2	-1.7	-0.2	0.2	0.4	3.6	21.6	3.9	-22.7
1992	-28.2	-15.4	-8.1	-9.4	-3.4	-0.1	-2.1	9.4	3.2	9.1	11.8	-28.7
1993	-30.6	-13.9	-4.7	2.5	1.2	0.8	0.5	0.4	-14.4	-4.6	1.0	0.7
1994	0.1	0.1	0.0	0.6	2.0	0.9	0.6	0.1	0.5	-2.0	-13.8	7.3
1995	-7.7	-2.2	-4.9	0.7	0.6	0.3	0.2	0.1	0.2	-0.1	0.1	0.3
1996	0.0	-0.1	0.0	0.0	0.2	-0.1	0.4	0.0	0.1	0.2	0.4	0.2
1997	0.0	-0.1	-0.1	-0.4	-0.2	0.0	-0.1	0.4	0.2	0.0	-0.2	-0.6
1998	0.3	0.9	0.2	0.5	0.3	-0.1	0.0	0.4	0.2	-0.1	-0.1	0.0
1999	0.0	0.1	0.1	-0.1	0.0	0.0	0.4	0.3	0.2	0.2	0.2	0.1
2000	0.0	0.0	0.0	-0.3	0.2	0.2	0.4	-0.3	0.0	0.1	-0.1	0.0
2001	0.0	0.0	-0.2	-0.6	0.1	0.1	2.4	0.3	2.8	13.3	15.3	-14.3
2002	-21.6	-8.8	2.9	0.7	0.4	0.3	0.2	0.0	1.5	-0.1	-0.6	-2.1
2003	-1.7	-0.9	-0.4	0.4	0.2	0.2	0.3	0.0	0.2	4.9	2.0	-5.0
Average	-8.9	-4.6	-2.0	-0.7	0.0	0.4	0.5	1.2	0.4	3.2	2.0	-6.0
Critical	-21.3	-12.0	-6.8	-5.1	-0.5	3.0	1.4	3.2	2.2	13.6	2.6	-23.1
Dry	-9.5	-4.9	-1.0	1.4	1.5	0.6	1.1	2.6	1.9	2.4	7.6	-6.5
BN	0.0	0.0	0.0	0.0	0.2	0.1	0.3	0.0	0.1	0.0	0.0	0.0
AN	-10.8	-4.6	-1.4	0.5	0.1	-1.6	-0.1	0.2	-2.4	0.1	0.5	-0.7
Wet	-2.5	-1.2	-0.5	0.1	-0.5	-0.2	0.1	0.0	0.1	0.0	0.0	0.0

Table E.3-43. SWP-Clifton Court Intake (CHWST000) salinity (EC) percent difference of No Crop Idle from Base.

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1971	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1972	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1973	0.0	0.0	0.0	0.0	0.0	-2.9	-0.6	0.1	-0.1	0.0	0.0	0.0
1974	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	0.0	0.0	0.0	0.0
1975	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	0.0	0.0	0.0
1976	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	5.4	1.7	-6.9
1977	-5.6	-2.9	-1.6	-1.5	-0.1	1.0	1.4	0.6	0.3	-0.7	-3.9	-3.0
1978	-3.7	-1.9	-0.9	-0.1	0.1	0.1	0.0	0.1	0.1	0.1	0.1	0.0
1979	0.0	0.0	0.0	0.0	0.1	0.0	0.1	0.1	0.0	0.0	0.0	0.0
1980	0.0	0.0	0.6	0.3	-0.5	-0.2	0.1	0.1	0.0	0.0	0.0	0.0
1981	0.0	0.0	-0.1	0.0	0.0	0.0	0.3	0.1	0.3	-0.7	2.8	1.6
1982	-3.2	-2.0	-0.4	0.1	-2.3	-1.0	0.2	-0.2	-0.1	0.0	0.0	0.0
1983	-0.1	0.0	-0.1	0.0	0.2	0.1	0.1	-0.2	0.1	-0.1	-0.1	0.0
1984	0.0	-0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1985	0.0	0.0	0.1	0.1	0.0	0.1	0.1	0.0	0.1	-0.1	-0.1	-0.1
1986	0.0	-0.1	0.0	0.1	0.0	0.1	0.0	0.0	0.1	0.0	0.0	0.0
1987	0.0	0.1	0.0	0.0	0.0	0.0	0.3	0.6	0.9	1.5	1.4	-5.6
1988	-4.6	-2.5	-1.3	-0.1	0.0	1.8	0.4	1.6	1.2	1.9	4.1	-3.8
1989	-5.0	-2.7	-1.1	0.9	1.0	0.4	0.1	2.5	1.0	-0.2	1.4	-0.7
1990	-2.2	-1.7	-1.0	-0.8	0.0	0.2	0.3	0.1	0.2	5.8	1.3	-4.4
1991	-4.9	-2.6	-1.4	-0.7	-0.2	0.0	0.0	0.1	1.0	3.8	0.5	-3.5
1992	-3.8	-2.0	-1.0	-1.1	-0.4	0.0	-0.4	2.1	0.9	2.6	2.1	-4.4
1993	-4.3	-2.2	-0.6	0.3	0.2	0.2	0.1	0.1	-3.7	-1.7	0.3	0.2
1994	0.0	0.0	0.0	0.1	0.3	0.2	0.1	0.0	0.1	-0.3	-1.7	1.0
1995	-1.0	-0.4	-0.7	0.1	0.1	0.1	0.1	0.0	0.1	0.0	0.0	0.1
1996	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.1	0.1	0.0
1997	0.0	0.0	0.0	-0.1	-0.1	0.0	0.0	0.1	0.1	0.0	-0.1	-0.1
1998	0.1	0.3	0.1	0.1	0.1	0.0	0.0	0.2	0.1	0.0	0.0	0.0
1999	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.0	0.0
2000	0.0	0.0	0.0	-0.1	0.0	0.1	0.1	-0.1	0.0	0.0	0.0	0.0
2001	0.0	0.0	-0.1	-0.1	0.0	0.0	0.6	0.1	0.8	4.2	3.7	-2.9
2002	-3.5	-1.5	0.5	0.1	0.1	0.1	0.0	0.0	0.4	0.0	-0.1	-0.3
2003	-0.2	-0.1	-0.1	0.1	0.0	0.0	0.1	0.0	0.1	1.9	0.6	-1.2
Average	-1.2	-0.7	-0.3	-0.1	0.0	0.0	0.1	0.2	0.1	0.7	0.4	-1.0
Critical	-3.0	-1.7	-0.9	-0.6	-0.1	0.4	0.3	0.6	0.5	2.7	0.6	-3.6
Dry	-1.4	-0.7	-0.1	0.2	0.2	0.1	0.2	0.6	0.6	0.8	1.5	-1.3
BN	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0
AN	-1.4	-0.7	-0.2	0.1	0.0	-0.5	0.0	0.0	-0.6	0.0	0.1	-0.2
Wet	-0.3	-0.2	-0.1	0.0	-0.2	-0.1	0.0	0.0	0.0	0.0	0.0	0.0

Table E.3-44. Old River near Middle River location salinity (EC) difference No Crop Idle minus Base.

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	0.2	0.0	0.0	-0.2	-0.2	0.0	0.0	0.1	0.3	0.3	-0.3	-0.1
1971	-0.2	-0.2	0.0	0.0	0.3	-0.3	0.0	-0.1	0.2	-0.3	-0.2	-0.2
1972	0.2	-0.4	0.3	-0.2	0.2	0.2	0.3	-0.3	0.3	0.3	-0.3	-0.4
1973	0.3	0.1	0.2	-0.2	0.1	-20.9	-1.4	0.3	0.1	-0.4	-0.2	-0.4
1974	-0.5	0.4	0.1	-0.2	0.0	0.2	-0.2	0.1	0.3	0.2	0.3	0.4
1975	-0.2	0.2	-0.2	0.4	-0.1	0.2	0.1	-0.4	0.0	0.3	-0.1	0.0
1976	-0.1	-0.3	0.2	0.1	0.2	0.3	0.0	-0.2	0.0	-0.2	-0.2	0.1
1977	-0.1	0.1	-0.1	0.3	0.1	0.2	0.2	0.4	0.0	0.0	-0.4	0.0
1978	-0.4	0.3	0.1	-0.4	0.0	0.1	0.0	0.3	0.3	0.2	0.3	0.4
1979	0.2	0.4	0.0	-0.1	0.4	-0.1	0.4	0.2	0.2	0.3	0.0	0.2
1980	0.2	-0.3	-0.2	0.1	0.2	-0.4	0.3	0.2	0.1	-0.3	-0.3	-0.1
1981	0.4	0.0	-0.1	-0.2	-0.1	-0.4	1.6	0.5	0.0	-0.2	-0.1	-0.2
1982	0.3	-0.3	0.3	0.0	-13.9	-1.1	0.4	-0.4	-0.3	-0.3	0.4	-0.3
1983	-0.4	0.0	-0.3	0.1	0.5	0.3	0.1	-0.3	0.3	-0.1	-0.5	0.0
1984	0.4	-0.3	0.2	0.0	0.1	0.1	0.2	-0.2	0.3	0.3	0.3	-0.1
1985	0.0	-0.2	-0.2	0.3	0.2	-0.2	0.4	0.0	-0.4	-0.4	-0.4	0.3
1986	0.5	0.0	0.4	0.5	0.1	0.4	0.1	0.0	0.4	0.0	0.0	-0.3
1987	0.3	0.3	0.1	0.1	0.0	-0.1	-0.2	-0.1	0.3	0.1	-0.3	-0.4
1988	-0.4	0.3	-0.1	0.0	0.4	0.1	0.4	-0.2	0.1	-0.6	0.2	0.2
1989	0.1	0.3	0.1	-0.4	-0.4	0.3	-0.4	0.2	0.1	0.2	-0.3	-0.2
1990	-0.2	-0.2	0.0	0.2	0.3	-0.2	-0.4	0.1	-0.3	-0.3	0.0	0.1
1991	-0.1	0.3	-0.3	0.2	-0.3	0.0	-0.3	0.1	0.1	-1.5	-0.6	0.1
1992	-0.2	0.4	-0.1	0.3	-0.1	0.1	-9.1	-0.8	0.2	-11.9	-1.4	0.1
1993	0.1	-0.2	0.4	0.2	0.1	0.1	0.5	0.4	18.4	1.4	0.4	-0.1
1994	0.0	0.0	-0.4	-0.4	0.1	0.2	0.3	-0.4	-0.4	0.1	0.0	-0.4
1995	0.1	0.2	0.3	-0.1	-0.4	0.3	0.2	0.1	0.3	-0.2	0.3	-0.4
1996	-0.4	-0.2	-0.2	-0.3	0.2	-0.3	0.4	-0.1	0.1	-0.1	-0.1	0.2
1997	-0.4	-0.1	-0.2	-0.4	-0.2	0.1	-0.1	0.4	0.0	0.1	-0.4	0.3
1998	0.2	-0.3	0.2	0.4	0.3	-0.3	0.0	0.4	0.1	-0.2	-0.4	0.2
1999	-0.4	0.0	-0.3	-0.4	0.1	0.0	0.4	0.3	0.5	-0.3	0.0	-0.1
2000	0.2	-0.3	-0.3	-0.2	0.3	0.3	0.4	-0.4	0.2	-0.1	-0.1	0.1
2001	-0.1	-0.2	-0.3	0.3	0.0	0.3	2.9	-0.2	-0.4	-0.4	-0.3	-0.3
2002	0.2	0.1	0.4	-0.1	-0.1	0.2	0.1	0.0	-0.3	-0.1	0.3	0.0
2003	0.1	0.0	0.0	0.3	0.5	0.5	0.3	-0.1	-0.2	-0.1	0.2	0.2
Average	0.0	0.0	0.0	0.0	-0.3	-0.6	-0.1	0.0	0.6	-0.4	-0.1	0.0
Critical	-0.2	0.1	-0.1	0.1	0.1	0.1	-1.3	-0.2	-0.1	-2.0	-0.3	0.0
Dry	0.1	0.0	0.0	0.0	-0.1	0.0	0.7	0.1	-0.1	-0.1	-0.2	-0.1
BN	0.2	0.0	0.1	-0.2	0.3	0.1	0.3	-0.1	0.3	0.3	-0.1	-0.1
AN	0.1	-0.1	0.0	0.0	0.2	-3.4	0.0	0.1	3.1	0.1	0.0	0.0
Wet	-0.1	0.0	0.0	0.0	-1.0	0.0	0.1	0.0	0.2	0.0	-0.1	0.0

Table E.3-45. Old River near Middle River location salinity (EC) percent difference of No Crop Idle from Base.

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	0.0	0.0	0.0	-0.1	-0.1	0.0	0.0	0.0	0.1	0.1	-0.1	0.0
1971	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	0.0	0.0	-0.1	0.0	0.0
1972	0.0	-0.1	0.0	0.0	0.0	0.0	0.1	-0.1	0.1	0.0	0.0	-0.1
1973	0.1	0.0	0.0	0.0	0.0	-6.0	-0.4	0.1	0.0	-0.1	0.0	-0.1
1974	-0.1	0.1	0.0	0.0	0.0	0.1	-0.1	0.0	0.1	0.0	0.1	0.1
1975	0.0	0.0	0.0	0.1	0.0	0.1	0.0	-0.1	0.0	0.1	0.0	0.0
1976	0.0	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1977	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	-0.1	0.0
1978	-0.1	0.0	0.0	-0.1	0.0	0.0	0.0	0.1	0.1	0.0	0.1	0.1
1979	0.0	0.1	0.0	0.0	0.1	0.0	0.1	0.1	0.1	0.0	0.0	0.0
1980	0.0	0.0	0.0	0.0	0.1	-0.2	0.1	0.1	0.0	-0.1	-0.1	0.0
1981	0.1	0.0	0.0	0.0	0.0	-0.1	0.4	0.1	0.0	0.0	0.0	0.0
1982	0.1	-0.1	0.0	0.0	-4.7	-0.4	0.2	-0.2	-0.1	-0.1	0.1	-0.1
1983	-0.2	0.0	-0.1	0.0	0.2	0.1	0.1	-0.2	0.2	-0.1	-0.3	0.0
1984	0.1	-0.2	0.1	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.1	0.0
1985	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	-0.1	-0.1	-0.1	0.1
1986	0.1	0.0	0.1	0.1	0.0	0.2	0.0	0.0	0.1	0.0	0.0	-0.1
1987	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	-0.1	-0.1
1988	-0.1	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	-0.1	0.0	0.0
1989	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	0.0	0.0	0.0	0.0
1990	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	0.0	0.0	0.0	0.0
1991	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.2	-0.1	0.0
1992	0.0	0.1	0.0	0.0	0.0	0.0	-1.1	-0.1	0.0	-1.6	-0.2	0.0
1993	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	2.7	0.2	0.1	0.0
1994	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	-0.1	0.0	0.0	-0.1
1995	0.0	0.0	0.0	0.0	-0.1	0.1	0.1	0.0	0.1	-0.1	0.1	-0.1
1996	-0.1	0.0	0.0	0.0	0.1	-0.1	0.1	0.0	0.0	0.0	0.0	0.0
1997	-0.1	0.0	-0.1	-0.2	-0.1	0.1	0.0	0.1	0.0	0.0	-0.1	0.1
1998	0.0	-0.1	0.0	0.1	0.1	-0.1	0.0	0.2	0.1	-0.1	-0.2	0.1
1999	-0.1	0.0	0.0	-0.1	0.0	0.0	0.1	0.1	0.1	0.0	0.0	0.0
2000	0.0	-0.1	0.0	0.0	0.1	0.1	0.1	-0.1	0.0	0.0	0.0	0.0
2001	0.0	0.0	0.0	0.0	0.0	0.0	0.7	0.0	-0.1	-0.1	-0.1	-0.1
2002	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	0.0	0.0
2003	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0
Average	0.0	0.0	0.0	0.0	-0.1	-0.2	0.0	0.0	0.1	-0.1	0.0	0.0
Critical	0.0	0.0	0.0	0.0	0.0	0.0	-0.2	0.0	0.0	-0.3	0.0	0.0
Dry	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.0
BN	0.0	0.0	0.0	0.0	0.1	0.0	0.1	0.0	0.1	0.0	0.0	0.0
AN	0.0	0.0	0.0	0.0	0.0	-1.0	0.0	0.0	0.5	0.0	0.0	0.0
Wet	0.0	0.0	0.0	0.0	-0.3	0.0	0.1	0.0	0.1	0.0	0.0	0.0

Table E.3-46. CCWD Old River Intake (ROLD034) salinity (EC) difference No Crop Idle minus Base.

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	0.0	0.0	0.0	-0.1	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1971	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1972	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.0
1973	0.0	0.0	0.0	0.0	0.2	-8.7	-3.7	-0.2	-0.3	0.0	0.0	0.0
1974	-0.1	0.0	0.0	0.0	0.0	0.0	-0.2	0.0	0.0	0.0	0.0	0.0
1975	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0
1976	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.4	0.5	35.0	-7.2	-49.1
1977	-46.0	-24.0	-17.1	-16.7	-4.1	2.2	4.0	2.1	1.5	-0.6	-23.2	-27.8
1978	-34.9	-15.0	-9.0	-0.8	0.8	0.5	0.0	0.3	0.2	0.2	0.2	0.2
1979	0.1	0.0	0.0	0.2	0.4	0.2	0.3	0.2	0.1	0.1	0.1	0.0
1980	-0.3	0.3	4.1	2.3	7.8	-0.3	0.3	0.3	0.1	0.0	0.0	0.0
1981	0.0	-0.1	-0.3	0.1	0.2	0.0	0.2	0.4	0.9	-3.4	18.0	9.7
1982	-29.0	-15.2	-1.8	0.2	-8.2	-4.4	0.4	-0.4	-0.2	-0.1	0.0	0.0
1983	-0.1	0.0	-0.1	0.1	0.5	0.3	0.1	-0.3	0.3	-0.1	-0.1	-0.1
1984	0.1	0.1	0.1	0.1	0.0	0.1	0.1	0.0	0.0	0.0	-0.1	0.0
1985	0.0	0.1	0.3	0.3	0.2	0.4	0.3	0.2	0.2	-0.3	-0.5	-0.7
1986	-0.4	-0.6	-0.3	0.6	0.1	0.4	0.1	0.0	0.1	0.1	0.0	0.0
1987	0.0	0.1	-0.1	-0.3	0.1	0.1	4.2	4.3	2.3	7.9	11.6	-29.4
1988	-32.8	-18.2	-11.1	-0.5	0.3	6.0	3.1	6.9	4.0	13.1	17.6	-26.3
1989	-39.2	-24.2	-9.9	11.5	8.5	4.3	1.6	6.6	2.2	-1.0	9.4	-5.7
1990	-15.5	-12.8	-10.4	-7.1	0.0	1.9	1.9	1.2	1.2	33.6	7.7	-32.8
1991	-41.6	-23.5	-17.1	-11.4	-2.6	-0.3	0.6	0.7	3.8	23.8	2.3	-25.1
1992	-31.9	-17.3	-13.9	-13.8	-7.3	-0.1	0.4	4.6	2.7	14.7	11.4	-31.9
1993	-33.3	-15.0	-5.4	4.8	1.6	1.0	0.6	0.6	-8.4	-3.7	1.1	0.7
1994	0.1	0.1	0.0	1.0	2.7	1.1	0.8	0.6	0.6	-2.5	-12.0	9.6
1995	-8.2	-3.1	-5.9	1.6	0.8	0.3	0.2	0.1	0.1	0.1	0.1	0.4
1996	0.0	-0.1	0.1	0.2	0.2	0.0	0.3	0.0	0.1	0.3	0.4	0.2
1997	0.0	-0.1	-0.1	-0.4	-0.3	-0.1	0.0	0.3	0.2	-0.1	-0.2	-0.7
1998	0.3	0.3	0.3	0.7	0.3	0.0	0.0	0.4	0.3	0.0	-0.1	0.0
1999	0.0	0.2	0.1	0.0	0.0	0.0	0.4	0.3	0.1	0.2	0.2	0.1
2000	0.0	0.0	-0.2	-0.4	0.1	0.2	0.3	-0.1	0.0	0.0	-0.1	0.0
2001	0.0	0.0	-0.5	-0.7	0.2	0.1	0.7	0.7	2.5	17.7	17.6	-14.5
2002	-24.2	-9.7	4.1	1.1	0.5	0.4	0.2	0.1	1.4	-0.2	-0.7	-2.3
2003	-1.9	-1.1	-0.5	0.5	0.1	0.1	0.2	0.2	0.2	6.4	2.0	-5.6
Average	-10.0	-5.3	-2.8	-0.8	0.1	0.2	0.5	0.9	0.5	4.1	1.6	-6.8
Critical	-24.0	-13.7	-10.0	-6.9	-1.6	1.6	1.5	2.4	2.0	16.7	-0.5	-26.2
Dry	-10.6	-5.6	-1.1	2.0	1.6	0.9	1.2	2.1	1.6	3.5	9.3	-7.1
BN	0.0	0.0	0.0	0.1	0.2	0.1	0.2	0.1	0.1	0.0	0.0	0.0
AN	-11.7	-5.1	-1.8	1.1	1.8	-1.2	-0.4	0.2	-1.4	0.5	0.5	-0.8
Wet	-2.9	-1.4	-0.6	0.2	-0.5	-0.3	0.1	0.0	0.1	0.0	0.0	0.0

Table E.3-47. CCWD Old River Intake (ROLD034) salinity (EC) percent difference of No Crop Idle from Base.

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1971	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1972	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1973	0.0	0.0	0.0	0.0	0.0	-2.6	-1.0	-0.1	-0.1	0.0	0.0	0.0
1974	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	0.0	0.0	0.0	0.0
1975	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1976	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	5.4	-0.9	-7.3
1977	-5.8	-3.1	-2.1	-1.7	-0.6	0.4	0.9	0.5	0.3	-0.1	-3.4	-3.2
1978	-3.8	-2.0	-1.1	-0.1	0.2	0.1	0.0	0.1	0.1	0.1	0.1	0.0
1979	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0
1980	0.0	0.1	0.6	0.5	2.2	-0.1	0.1	0.1	0.0	0.0	0.0	0.0
1981	0.0	0.0	-0.1	0.0	0.1	0.0	0.0	0.1	0.3	-0.8	2.9	1.3
1982	-3.4	-2.2	-0.6	0.1	-2.4	-1.3	0.2	-0.2	-0.1	0.0	0.0	0.0
1983	0.0	0.0	0.0	0.0	0.2	0.1	0.1	-0.2	0.1	0.0	-0.1	0.0
1984	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1985	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.0	0.1	-0.1	-0.1	-0.1
1986	-0.1	-0.1	0.0	0.1	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0
1987	0.0	0.1	0.0	-0.1	0.0	0.0	0.8	1.0	0.7	2.3	2.6	-5.5
1988	-4.9	-2.8	-1.6	-0.1	0.0	1.2	0.7	1.5	1.0	3.7	3.4	-4.3
1989	-5.2	-3.0	-1.2	1.2	1.2	0.7	0.3	1.8	0.8	-0.2	1.3	-0.8
1990	-2.4	-1.9	-1.4	-1.0	0.0	0.5	0.5	0.3	0.3	5.9	1.0	-4.6
1991	-5.0	-2.8	-1.9	-1.2	-0.4	-0.1	0.1	0.2	1.0	3.8	0.3	-3.7
1992	-4.0	-2.1	-1.6	-1.5	-0.9	0.0	0.1	1.2	0.8	4.1	1.9	-4.5
1993	-4.5	-2.4	-0.7	0.7	0.3	0.3	0.1	0.1	-2.5	-1.5	0.3	0.2
1994	0.0	0.0	0.0	0.1	0.5	0.3	0.2	0.1	0.2	-0.4	-1.4	1.3
1995	-1.0	-0.6	-0.8	0.2	0.2	0.1	0.1	0.0	0.1	0.0	0.1	0.2
1996	0.0	0.0	0.0	0.1	0.0	0.0	0.1	0.0	0.0	0.1	0.1	0.0
1997	0.0	0.0	0.0	-0.1	-0.1	0.0	0.0	0.1	0.1	0.0	-0.1	-0.1
1998	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.2	0.1	0.0	0.0	0.0
1999	0.0	0.1	0.1	0.0	0.0	0.0	0.1	0.1	0.0	0.1	0.1	0.0
2000	0.0	0.0	-0.1	-0.1	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.0
2001	0.0	0.0	-0.1	-0.1	0.0	0.0	0.1	0.2	0.7	5.5	4.0	-2.7
2002	-3.7	-1.5	0.7	0.3	0.1	0.1	0.0	0.0	0.4	0.0	-0.1	-0.3
2003	-0.2	-0.2	-0.1	0.1	0.0	0.0	0.0	0.0	0.1	2.4	0.5	-1.2
Average	-1.3	-0.7	-0.3	-0.1	0.0	0.0	0.1	0.2	0.1	0.9	0.4	-1.0
Critical	-3.1	-1.8	-1.2	-0.8	-0.2	0.3	0.3	0.6	0.5	3.2	0.1	-3.8
Dry	-1.5	-0.7	-0.1	0.2	0.3	0.2	0.2	0.5	0.5	1.1	1.8	-1.4
BN	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0
AN	-1.4	-0.8	-0.2	0.2	0.5	-0.4	-0.1	0.0	-0.4	0.2	0.1	-0.2
Wet	-0.3	-0.2	-0.1	0.0	-0.2	-0.1	0.0	0.0	0.0	0.0	0.0	0.0

Table E.3-48. Old River location (ROLD059) salinity (EC) difference No Crop Idle minus Base.

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	0.2	0.1	0.0	-0.2	-0.2	0.0	0.0	0.1	0.3	0.3	-0.2	-0.2
1971	-0.1	-0.2	0.0	0.0	0.3	-0.3	0.0	-0.1	0.2	-0.2	-0.2	-0.2
1972	0.1	-0.2	0.2	-0.2	0.1	0.2	0.3	-0.3	0.0	0.2	-0.1	-0.3
1973	0.2	0.1	0.2	-0.1	0.1	-18.2	-2.1	0.3	0.1	-0.3	-0.2	-0.3
1974	-0.4	0.3	0.1	-0.1	0.0	0.2	-0.2	0.1	0.3	0.2	0.3	0.4
1975	-0.1	0.1	-0.2	0.3	0.0	0.1	0.1	-0.3	-0.1	0.3	0.0	0.0
1976	-0.1	-0.3	0.1	0.1	0.2	0.3	0.0	-0.2	0.0	-0.2	-1.6	3.7
1977	0.0	-1.1	-0.2	0.3	0.1	0.0	0.5	0.3	0.9	0.3	-13.9	-13.4
1978	-7.9	0.3	0.1	-0.3	0.0	0.1	0.0	0.3	0.3	0.2	0.2	0.4
1979	0.2	0.3	0.0	-0.1	0.4	-0.1	0.4	0.2	0.2	0.2	0.1	0.1
1980	0.2	-0.2	-0.2	0.1	0.2	-0.4	0.3	0.2	0.1	-0.2	-0.3	-0.1
1981	0.3	0.1	-0.1	-0.1	-0.1	-0.3	1.4	0.6	0.1	-0.1	-5.6	-1.8
1982	0.3	-0.2	0.3	-0.1	-12.5	-1.4	0.4	-0.4	-0.3	-0.3	0.3	-0.3
1983	-0.4	0.0	-0.3	0.1	0.5	0.2	0.1	-0.3	0.3	-0.1	-0.5	0.0
1984	0.4	-0.3	0.2	0.0	0.1	0.1	0.2	-0.1	0.3	0.2	0.3	-0.1
1985	0.0	-0.2	-0.2	0.3	0.2	-0.2	0.4	0.0	-0.3	-0.3	-0.3	0.1
1986	0.4	0.1	0.4	0.4	0.1	0.4	0.1	0.0	0.4	0.0	0.0	-0.3
1987	0.2	0.3	0.1	0.1	0.0	-0.1	-0.2	0.0	-1.3	10.4	31.0	2.7
1988	-0.1	-0.1	0.0	0.0	0.4	0.2	0.4	-0.1	2.3	67.9	24.0	-4.3
1989	2.0	0.3	0.1	-0.2	-0.4	0.2	-0.3	0.1	-1.3	-0.5	-4.8	-2.2
1990	-0.2	-0.3	-0.2	0.2	0.3	-0.2	-0.4	0.0	0.5	30.4	11.5	-8.6
1991	0.6	0.1	-0.4	0.2	-0.2	0.0	-0.3	0.0	-0.6	42.0	10.1	-13.2
1992	-0.4	0.1	-0.2	0.3	-0.1	0.1	-7.7	-1.8	0.5	56.2	14.2	-10.2
1993	-11.6	-4.3	0.3	0.2	0.2	0.2	0.4	0.4	16.3	2.7	0.3	0.0
1994	0.0	0.0	-0.3	-0.3	0.0	0.2	0.3	-0.4	0.1	0.1	-24.9	-10.3
1995	0.4	0.5	0.3	0.0	-0.4	0.3	0.2	0.1	0.3	-0.2	0.3	-0.3
1996	-0.4	-0.2	-0.2	-0.2	0.2	-0.3	0.4	0.0	0.1	-0.1	-0.1	0.1
1997	-0.3	-0.1	-0.2	-0.4	-0.2	0.1	-0.1	0.4	0.0	0.1	-0.3	0.2
1998	0.2	-0.2	0.1	0.3	0.3	-0.3	0.0	0.4	0.2	-0.2	-0.4	0.1
1999	-0.3	0.0	-0.3	-0.4	0.0	0.0	0.4	0.3	0.4	-0.2	0.0	0.0
2000	0.1	-0.2	-0.3	-0.2	0.2	0.3	0.4	-0.3	0.1	0.0	-0.1	0.0
2001	-0.1	-0.2	-0.3	0.2	0.0	0.3	2.8	0.0	-0.7	9.2	34.0	6.3
2002	0.2	0.1	0.3	-0.1	-0.1	0.2	0.1	0.0	-0.4	-0.2	0.3	0.1
2003	0.0	0.1	0.0	0.2	0.4	0.5	0.3	0.0	-0.2	0.3	0.0	0.2
Average	-0.5	-0.2	0.0	0.0	-0.3	-0.5	0.0	0.0	0.6	6.4	2.2	-1.5
Critical	0.0	-0.2	-0.2	0.1	0.1	0.1	-1.0	-0.3	0.5	28.1	2.8	-8.0
Dry	0.4	0.1	0.0	0.0	-0.1	0.0	0.7	0.1	-0.7	3.1	9.1	0.9
BN	0.2	0.1	0.1	-0.1	0.3	0.1	0.3	0.0	0.1	0.2	0.0	-0.1
AN	-3.2	-0.7	0.0	0.0	0.2	-2.9	-0.1	0.1	2.8	0.4	0.0	0.0
Wet	0.0	0.0	0.0	0.0	-0.9	-0.1	0.1	0.0	0.2	0.0	0.0	0.0

Table E.3-49. Old River location (ROLD059) salinity (EC) percent difference of No Crop Idle from Base.

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	0.0	0.0	0.0	-0.1	-0.1	0.0	0.0	0.0	0.1	0.1	0.0	0.0
1971	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	0.0	0.0	0.0	0.0	0.0
1972	0.0	0.0	0.0	0.0	0.0	0.0	0.1	-0.1	0.0	0.0	0.0	-0.1
1973	0.0	0.0	0.0	0.0	0.0	-4.8	-0.6	0.1	0.0	-0.1	0.0	-0.1
1974	-0.1	0.0	0.0	0.0	0.0	0.1	-0.1	0.0	0.1	0.0	0.1	0.1
1975	0.0	0.0	0.0	0.0	0.0	0.1	0.0	-0.1	0.0	0.0	0.0	0.0
1976	0.0	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.2	0.6
1977	0.0	-0.2	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.0	-2.2	-1.9
1978	-1.1	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.1	0.1
1979	0.0	0.1	0.0	0.0	0.1	0.0	0.1	0.1	0.0	0.0	0.0	0.0
1980	0.0	0.0	0.0	0.0	0.1	-0.2	0.1	0.1	0.0	-0.1	-0.1	0.0
1981	0.1	0.0	0.0	0.0	0.0	-0.1	0.3	0.1	0.0	0.0	-0.9	-0.3
1982	0.1	0.0	0.0	0.0	-3.9	-0.5	0.2	-0.2	-0.1	-0.1	0.1	-0.1
1983	-0.2	0.0	-0.1	0.0	0.2	0.1	0.1	-0.2	0.1	-0.1	-0.3	0.0
1984	0.1	-0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.1	0.0
1985	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	-0.1	0.0	0.0
1986	0.1	0.0	0.1	0.1	0.0	0.1	0.0	0.0	0.1	0.0	0.0	-0.1
1987	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	-0.2	1.6	5.4	0.4
1988	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.4	11.8	4.4	-0.7
1989	0.3	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	-0.2	-0.1	-0.7	-0.4
1990	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	4.9	1.7	-1.3
1991	0.1	0.0	-0.1	0.0	0.0	0.0	0.0	0.0	-0.1	6.5	1.4	-2.0
1992	-0.1	0.0	0.0	0.0	0.0	0.0	-0.9	-0.2	0.1	12.4	2.6	-1.6
1993	-1.7	-0.6	0.0	0.0	0.0	0.0	0.1	0.1	2.4	0.4	0.1	0.0
1994	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	0.0	-3.3	-1.5
1995	0.1	0.1	0.0	0.0	-0.1	0.1	0.1	0.0	0.1	-0.1	0.1	-0.1
1996	-0.1	0.0	0.0	0.0	0.0	-0.1	0.1	0.0	0.0	0.0	0.0	0.0
1997	-0.1	0.0	-0.1	-0.1	-0.1	0.1	0.0	0.1	0.0	0.0	-0.1	0.0
1998	0.0	0.0	0.0	0.0	0.1	-0.1	0.0	0.2	0.1	-0.1	-0.1	0.0
1999	-0.1	0.0	0.0	-0.1	0.0	0.0	0.1	0.1	0.1	0.0	0.0	0.0
2000	0.0	0.0	0.0	0.0	0.1	0.1	0.1	-0.1	0.0	0.0	0.0	0.0
2001	0.0	0.0	0.0	0.0	0.0	0.0	0.7	0.0	-0.1	1.4	6.0	1.1
2002	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	0.1	0.0
2003	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0
Average	-0.1	0.0	0.0	0.0	-0.1	-0.1	0.0	0.0	0.1	1.1	0.4	-0.2
Critical	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	0.1	5.1	0.6	-1.2
Dry	0.1	0.0	0.0	0.0	0.0	0.0	0.2	0.0	-0.1	0.5	1.6	0.2
BN	0.0	0.0	0.0	0.0	0.1	0.0	0.1	0.0	0.0	0.0	0.0	0.0
AN	-0.4	-0.1	0.0	0.0	0.0	-0.8	0.0	0.0	0.4	0.1	0.0	0.0
Wet	0.0	0.0	0.0	0.0	-0.3	0.0	0.0	0.0	0.1	0.0	0.0	0.0

Table E.3-50. Sacramento River location RSAC081 Base Salinity (EC)

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	1646.4	1324.8	199.8	182.1	185.8	187.4	441.6	948.7	2200.1	1905.2	3907.6	1127.7
1971	1427.2	1129.0	216.5	187.1	212.6	191.7	231.4	211.3	430.5	1534.8	4318.5	1207.5
1972	1464.0	1228.0	2455.0	2096.7	654.8	229.6	534.9	1437.5	3087.7	2715.8	4701.5	6474.6
1973	8653.2	3954.5	694.9	208.2	200.0	192.0	249.8	356.2	1153.6	2093.6	4438.5	2596.9
1974	3457.1	318.8	185.0	181.8	187.7	183.4	186.1	230.4	488.8	1667.2	3846.7	1086.7
1975	1514.7	1139.7	2635.4	3364.5	364.6	188.6	213.1	207.1	253.7	1352.0	4193.7	1195.0
1976	1442.6	1034.2	2571.0	4388.8	3139.6	1663.8	1870.6	4496.7	6944.6	6633.5	7753.6	9572.2
1977	11066.8	10382.5	10091.9	4846.6	3205.9	3126.5	3398.9	5570.2	7931.9	8756.1	9447.2	10645.0
1978	10568.5	10478.2	5162.3	283.2	208.2	202.1	215.8	234.0	580.6	1853.3	4413.1	2728.0
1979	3428.8	2768.1	4119.6	1341.7	248.8	228.7	308.0	350.7	1316.4	3061.7	5134.7	7182.8
1980	8599.8	6067.0	3213.8	254.5	198.4	199.7	232.4	341.4	785.7	1976.0	4548.3	2820.4
1981	3317.7	2638.2	3832.6	1360.2	296.0	279.6	531.2	1464.3	2885.3	4401.2	6146.3	7884.3
1982	9685.4	1332.0	190.7	200.7	187.4	198.4	181.8	181.9	259.3	1412.5	4559.1	1433.0
1983	667.2	236.4	188.6	209.8	194.2	184.5	186.8	181.7	184.7	201.4	374.5	341.0
1984	853.5	207.0	182.0	193.0	193.3	187.5	290.9	686.1	2007.4	2027.4	4193.7	1282.1
1985	1584.0	700.7	786.6	1544.8	1051.2	883.5	804.3	1272.9	3082.6	4500.6	6505.3	7290.0
1986	8442.9	8743.4	4072.9	720.2	186.8	189.8	232.1	331.1	1130.5	2264.3	4660.0	1523.2
1987	1647.5	1538.3	3601.9	3538.7	932.3	288.6	1057.6	2658.1	3527.0	4984.3	7090.0	8585.7
1988	9806.0	9565.3	3663.9	434.9	579.0	2175.5	2566.8	3074.8	3773.3	6078.9	7993.9	9304.3
1989	11353.2	9275.8	8335.7	5354.0	4001.3	372.2	259.2	828.2	3030.5	4824.6	5543.1	5916.1
1990	7681.6	8791.1	9005.4	2761.9	1213.6	1710.8	2111.2	3159.0	5730.9	7422.4	8259.4	9521.1
1991	10897.9	11245.0	10662.5	7448.6	4601.1	571.6	746.4	2999.1	6006.4	7479.8	8079.1	9579.2
1992	10967.8	10816.0	10717.3	7410.9	770.3	392.7	1057.6	3238.9	4028.4	6142.8	8445.7	9382.3
1993	9789.9	9650.1	6832.6	399.5	218.7	203.8	196.4	204.9	257.6	1320.7	4299.0	2377.9
1994	3103.9	2688.5	3936.8	3894.7	837.5	1190.4	1530.8	2053.9	4787.5	6217.2	7303.6	8641.2
1995	8028.6	8430.3	6408.8	317.4	198.4	181.1	193.7	178.2	182.1	255.5	1165.5	1052.0
1996	1017.6	1103.8	818.4	212.3	191.2	188.2	193.2	194.0	587.4	2024.9	4609.6	1095.6
1997	1582.3	1086.1	201.3	184.9	190.3	215.8	307.5	581.3	2035.6	1869.9	3991.4	1210.5
1998	1833.7	1329.5	1518.6	333.0	189.8	194.1	186.5	181.1	181.2	212.3	649.6	528.3
1999	1251.1	625.0	218.9	192.5	188.6	183.9	202.5	280.4	886.5	1907.2	4497.4	1197.5
2000	1688.7	1097.6	2911.9	1101.0	201.9	189.9	220.6	348.4	2057.3	2174.1	4089.8	2580.9
2001	3522.7	2665.4	3939.7	2498.4	360.1	239.2	541.2	1836.9	2968.6	4830.1	6722.2	8521.5
2002	9490.2	8327.7	1127.9	202.9	360.7	442.1	439.5	829.3	3219.4	4875.7	6143.2	8167.2
2003	9135.9	9095.5	994.0	191.8	212.7	281.8	225.1	194.3	1240.9	1959.0	4008.1	2590.8
Average	5312.3	4441.6	3402.8	1707.1	769.5	515.8	651.3	1216.0	2330.1	3321.7	5177.4	4607.1
Critical	7852.4	7789.0	7235.5	4455.2	2049.6	1547.3	1897.5	3513.2	5600.4	6961.5	8183.2	9520.8
Dry	5152.5	4191.0	3604.1	2416.5	1166.9	417.5	605.5	1481.6	3118.9	4736.1	6358.4	7727.5
BN	2446.4	1998.0	3287.3	1719.2	451.8	229.2	421.5	894.1	2202.1	2888.8	4918.1	6828.7
AN	8072.7	6723.8	3301.6	406.4	206.7	211.5	223.3	279.8	1012.6	1896.1	4299.5	2615.8
Wet	3185.2	2077.4	1310.5	498.4	205.4	190.3	234.4	337.9	832.9	1433.4	3459.0	1098.5

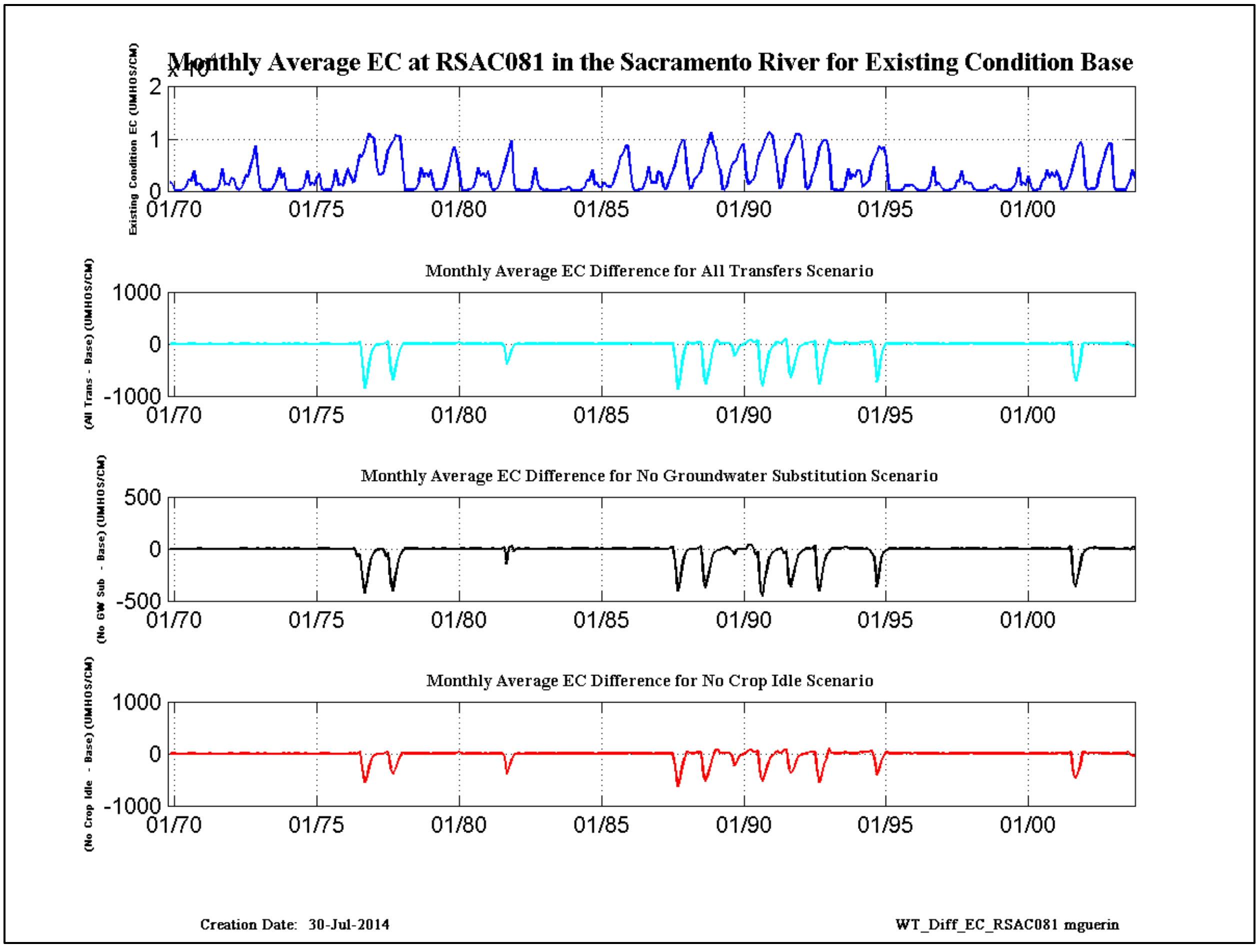


Figure E.3-8. Sacramento River location RSAC081 EC for the Base condition and change from Base for the scenarios.

Table E.3-51. Sacramento River location RSAC092 Base Salinity (EC).

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	325.3	262.6	181.4	180.4	181.0	182.0	205.6	234.8	395.3	314.1	714.3	306.3
1971	280.8	239.8	186.7	182.6	185.6	181.6	191.1	185.6	191.9	269.6	794.0	324.4
1972	286.0	252.3	390.7	380.6	216.3	186.1	208.0	291.7	584.1	437.0	910.7	1537.5
1973	2423.2	702.4	249.3	196.4	190.0	183.7	199.7	203.3	253.4	339.4	866.3	469.5
1974	593.9	186.3	181.9	179.3	182.7	180.3	179.8	189.9	198.7	292.1	689.0	289.6
1975	285.1	243.8	420.3	572.1	200.9	182.5	191.2	185.6	187.2	262.4	790.0	312.6
1976	277.3	239.1	405.9	810.0	520.9	311.7	346.2	1081.9	2045.6	1434.9	2455.9	3347.2
1977	3955.2	3218.6	2950.3	960.3	597.5	574.0	612.4	1388.8	2491.8	2786.2	2938.4	4120.7
1978	3712.3	3413.9	916.4	207.5	194.3	190.9	193.5	196.6	211.1	314.0	845.9	509.3
1979	573.2	451.6	689.1	351.6	214.1	197.9	204.8	208.2	278.9	495.9	1049.1	1807.0
1980	2275.5	1263.0	509.8	192.0	187.7	184.4	192.2	204.2	232.1	342.3	884.8	510.0
1981	597.7	388.8	612.9	333.6	198.0	191.6	213.3	305.0	510.4	785.5	1428.8	2135.1
1982	2813.3	341.7	181.1	192.8	180.7	190.6	178.6	179.1	186.2	290.4	932.8	314.1
1983	194.3	184.9	181.5	192.5	184.6	180.9	181.1	177.8	179.0	187.6	188.9	182.0
1984	205.5	178.4	179.3	183.9	184.1	181.5	198.9	222.7	365.3	336.1	817.3	323.9
1985	317.6	209.4	209.4	285.2	232.7	230.2	232.3	269.6	571.1	805.7	1614.9	1761.2
1986	2392.5	2126.4	783.3	247.9	182.8	182.3	201.0	205.5	268.5	360.6	916.2	342.0
1987	311.4	276.1	611.0	634.8	247.0	196.0	273.8	490.1	648.8	1035.8	2051.2	2649.8
1988	3059.2	2812.8	692.9	217.8	222.3	447.7	452.5	563.5	744.5	1432.0	2514.7	3208.5
1989	4188.3	2468.3	2037.2	1038.5	755.8	196.3	192.1	219.2	547.1	902.2	1174.0	1321.4
1990	1919.4	2472.4	2567.5	503.4	267.5	316.7	366.8	606.7	1535.9	1840.2	2539.2	3276.6
1991	3927.6	3974.9	3457.8	1856.7	810.5	226.8	241.9	616.6	1537.6	1896.9	2442.6	3350.8
1992	3911.7	3633.5	3508.1	1680.2	257.4	216.3	256.5	622.9	789.0	1476.9	2643.3	3117.5
1993	3185.4	3010.1	1410.8	227.4	201.6	189.6	185.1	186.4	184.9	257.6	829.5	448.9
1994	518.5	450.6	666.2	719.0	254.0	276.0	286.5	368.1	1204.6	1269.8	1975.0	2480.5
1995	2327.6	2205.0	1360.9	204.7	186.5	179.1	182.2	176.2	179.1	196.9	244.5	223.7
1996	218.2	225.7	209.4	188.8	184.6	181.1	183.9	182.6	210.3	331.9	897.8	314.9
1997	322.7	228.8	185.9	181.0	182.7	185.1	192.8	215.9	387.7	313.8	769.3	314.2
1998	360.1	255.8	268.1	206.1	184.8	182.6	179.9	177.6	177.8	190.1	201.6	189.4
1999	235.0	205.5	180.3	185.1	182.5	180.0	188.6	194.5	225.7	314.7	855.3	321.7
2000	344.3	230.5	471.5	290.1	188.3	181.4	190.9	201.4	405.4	365.7	760.8	467.0
2001	647.5	407.5	651.7	479.9	212.3	193.8	219.0	371.1	536.3	974.7	1822.6	2643.4
2002	2825.1	2062.6	315.7	190.0	197.1	195.1	198.0	235.1	689.0	896.0	1464.0	2225.5
2003	2771.6	2431.9	292.4	183.7	185.7	186.1	188.0	182.8	278.6	323.4	730.5	489.3
Average	1546.5	1213.4	827.0	430.5	257.5	218.9	232.6	333.6	571.6	708.0	1257.4	1342.2
Critical	2509.8	2400.3	2035.5	963.9	418.6	338.5	366.1	749.8	1478.4	1733.9	2501.3	3271.7
Dry	1481.3	968.8	739.7	493.7	307.2	200.5	221.4	315.0	583.8	900.0	1592.6	2122.7
BN	429.6	352.0	539.9	366.1	215.2	192.0	206.4	249.9	431.5	466.4	979.9	1672.3
AN	2452.1	1842.0	641.7	216.2	191.3	186.0	191.6	195.8	260.9	323.7	819.6	482.4
Wet	811.9	529.6	346.2	222.9	184.9	182.3	188.8	194.4	242.5	281.5	677.8	289.1

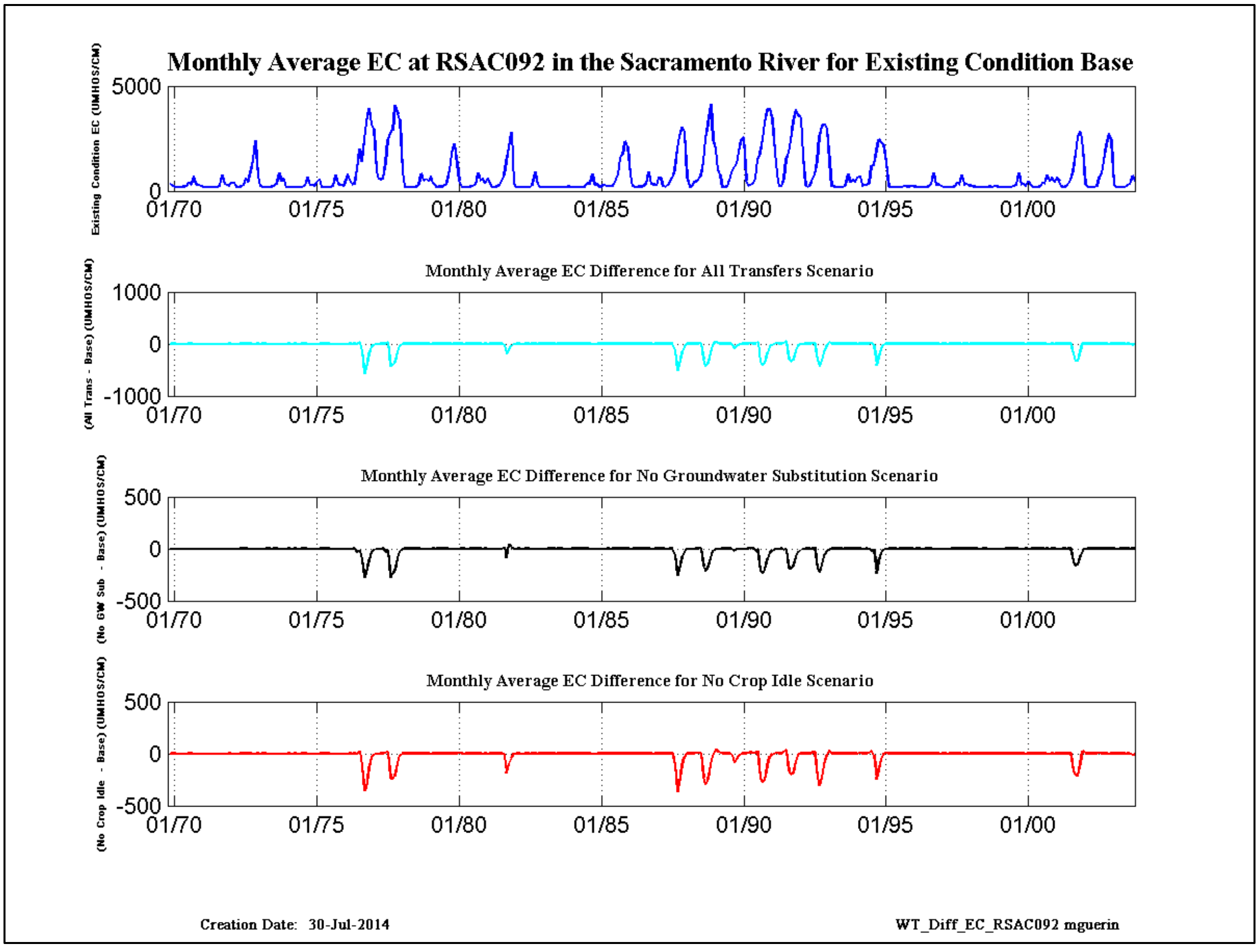


Figure E.3-9. Sacramento River location Sacramento River location RSAC092 EC for the Base condition and change from Base for the scenarios.

Table E.3-52. Sacramento River location RSA101 Base salinity (EC).

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	187.5	183.7	178.6	180.0	179.5	179.3	188.5	187.3	192.3	186.8	221.8	185.3
1971	187.7	185.8	183.9	180.6	182.4	178.5	182.0	178.7	180.1	183.0	227.6	187.8
1972	188.6	183.4	195.7	204.6	187.0	180.4	186.1	190.2	201.1	198.0	245.3	317.1
1973	400.5	242.1	190.1	192.6	187.3	180.8	187.3	185.3	186.1	189.1	235.2	200.2
1974	198.5	177.8	181.0	178.6	180.3	179.0	177.3	181.3	182.1	183.9	214.2	185.5
1975	186.9	183.3	199.0	218.8	186.1	180.4	183.2	179.0	180.2	182.3	219.0	187.3
1976	186.5	182.0	194.7	239.8	211.3	194.3	193.4	247.7	351.3	293.8	423.6	502.0
1977	572.4	456.8	449.1	259.6	224.5	209.6	206.6	266.2	408.3	443.6	441.4	643.8
1978	539.2	499.2	246.5	196.8	188.5	186.8	182.4	183.5	185.3	185.8	229.7	207.7
1979	200.7	197.2	223.9	217.5	203.4	189.4	189.4	186.4	186.5	201.4	255.2	340.6
1980	378.3	271.5	217.8	183.4	184.4	180.3	184.3	185.7	188.4	186.5	229.0	203.6
1981	198.9	189.8	216.9	202.2	185.4	184.1	189.0	192.7	196.5	230.4	297.9	370.8
1982	431.6	188.4	178.4	190.0	179.0	188.3	177.9	178.9	180.8	185.5	223.8	186.8
1983	178.6	182.3	178.7	186.6	182.0	180.1	180.1	177.0	176.7	180.1	179.8	178.2
1984	179.7	176.8	178.5	179.6	180.0	179.1	185.8	187.8	190.3	188.3	229.0	185.4
1985	188.5	184.2	185.0	195.0	188.9	193.8	192.3	190.1	200.7	233.3	319.0	329.8
1986	398.4	364.2	251.4	200.8	182.1	180.1	188.1	187.4	191.2	189.1	236.3	192.4
1987	185.5	183.0	210.7	229.6	191.0	185.0	195.4	200.5	205.9	239.9	353.0	408.5
1988	462.6	428.0	227.1	194.3	196.3	208.2	199.2	204.1	215.2	280.0	416.6	505.4
1989	671.4	388.3	373.9	276.1	242.4	180.5	183.5	184.0	197.7	245.7	279.8	289.6
1990	335.9	417.8	435.1	217.2	201.7	197.3	193.5	204.8	301.2	327.8	432.0	508.3
1991	620.6	639.3	574.3	350.6	231.2	190.0	195.5	209.2	287.2	341.5	415.3	524.3
1992	600.3	558.8	553.7	320.6	195.0	199.5	196.0	206.0	214.4	283.8	422.8	473.6
1993	471.8	454.6	286.8	205.0	196.0	184.1	179.0	179.2	178.8	182.6	229.8	200.8
1994	199.2	198.7	225.4	242.7	197.1	196.9	189.5	190.1	261.1	277.4	367.0	395.7
1995	393.7	338.7	299.3	192.7	182.7	179.0	179.5	176.2	177.1	183.1	181.9	180.0
1996	180.5	181.2	185.0	185.1	182.8	179.2	178.6	177.0	183.9	188.0	239.5	184.7
1997	189.7	181.8	181.0	180.2	181.7	182.7	184.7	187.5	192.8	186.2	221.7	188.3
1998	191.4	183.2	186.8	190.0	184.0	180.2	177.7	176.9	176.1	180.7	180.0	178.4
1999	181.2	180.2	177.4	182.1	180.3	178.6	181.0	182.0	183.2	186.6	235.3	186.3
2000	192.7	181.3	200.9	196.8	184.2	178.8	183.4	184.6	193.4	189.4	226.1	202.3
2001	202.3	193.6	220.6	218.5	195.9	186.2	191.6	197.8	198.4	232.5	316.6	393.3
2002	408.5	334.1	198.3	186.1	188.6	184.7	184.6	191.9	216.2	243.4	303.1	378.8
2003	450.0	379.4	188.5	181.3	183.0	182.5	181.8	177.4	185.4	188.9	226.0	205.4
Average	315.9	278.5	246.3	210.4	191.9	185.8	186.7	191.6	210.2	223.5	278.6	294.3
Critical	425.4	411.6	379.9	260.7	208.2	199.4	196.2	218.3	291.3	321.1	416.9	507.6
Dry	309.2	245.5	234.2	217.9	198.7	185.7	189.4	192.8	202.6	237.5	311.6	361.8
BN	194.6	190.3	209.8	211.0	195.2	184.9	187.8	188.3	193.8	199.7	250.2	328.9
AN	405.4	338.0	221.8	192.6	187.2	182.2	183.0	182.6	186.2	187.0	229.3	203.3
Wet	237.3	208.2	196.9	188.1	181.8	180.4	181.9	181.3	183.6	184.9	216.1	185.1

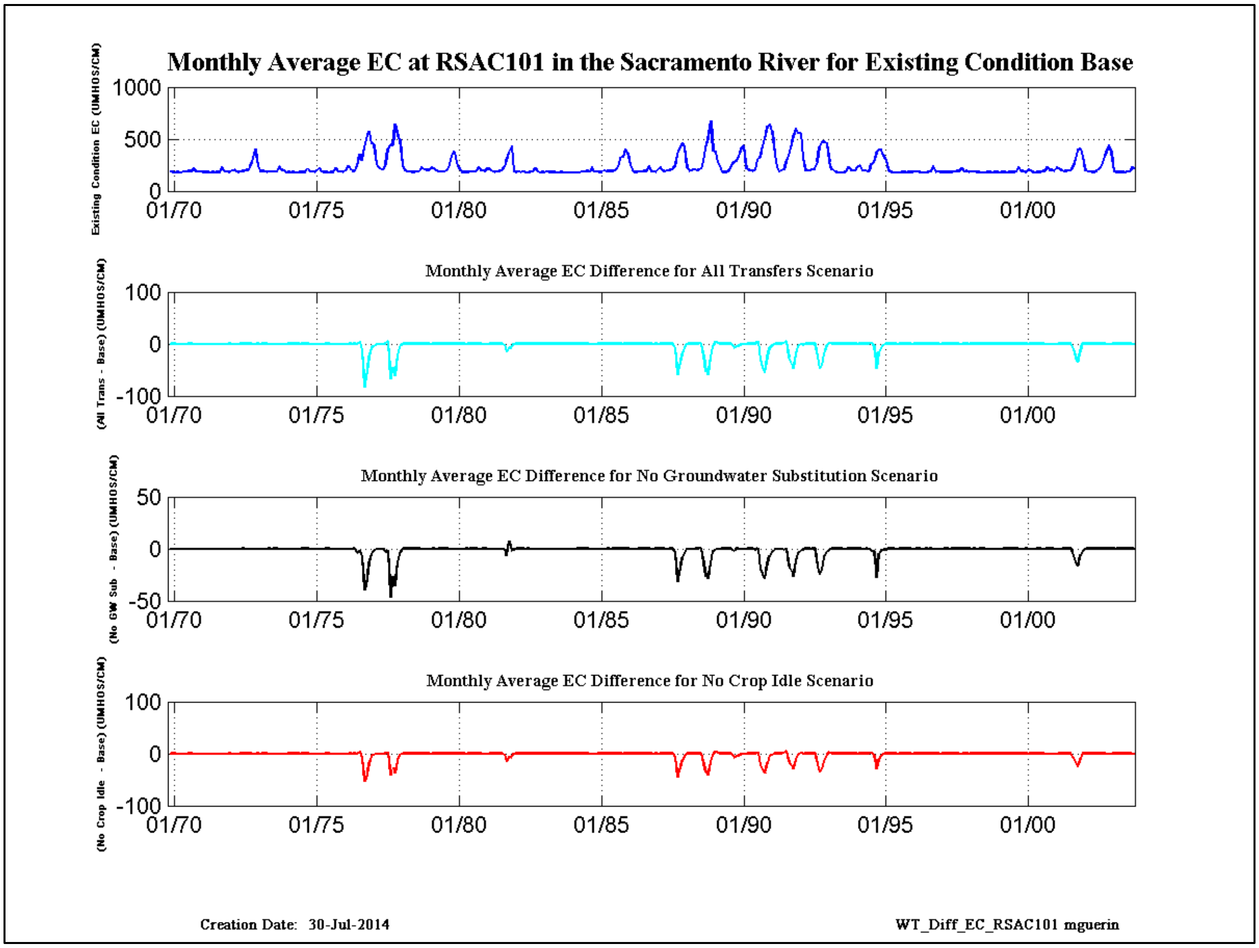


Figure E.3-10. Sacramento River location Sacramento River location RSAC101 EC for the Base condition and change from Base for the scenarios.

Table E.3-53. San Joaquin River location RSAN007 Base salinity (EC).

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	835.0	616.6	204.5	231.8	211.2	200.5	261.7	434.7	1017.8	1084.5	2458.5	1056.3
1971	738.0	652.6	227.0	203.8	203.1	201.5	219.9	217.4	260.3	848.2	2834.4	1054.8
1972	764.4	621.0	1408.2	1282.9	420.4	221.3	291.7	658.5	1571.2	1697.8	3095.7	4599.2
1973	6050.8	2913.3	589.5	263.4	252.2	223.4	231.1	261.3	548.3	1172.2	2836.8	1850.3
1974	1879.0	486.4	199.5	212.1	206.8	208.9	209.8	221.1	276.9	877.3	2412.9	990.3
1975	833.9	670.4	1549.0	2046.9	419.7	221.7	218.7	220.7	214.4	726.3	2731.4	1067.3
1976	758.7	584.0	1496.8	2755.6	2011.8	1019.0	892.7	2462.5	4091.1	4725.5	5071.2	6557.3
1977	7536.2	6978.8	7160.7	3604.9	1761.6	1664.6	1774.1	3145.6	4872.7	5648.8	6765.6	7578.7
1978	6831.1	6908.7	3632.1	430.7	260.3	256.7	262.8	236.5	305.4	997.3	2876.6	1966.2
1979	1932.3	1657.3	2624.6	1178.2	298.5	244.9	243.6	264.4	637.3	1895.6	3512.6	5222.0
1980	6058.2	4122.0	2122.2	354.4	272.5	241.9	217.0	253.1	367.8	964.3	2906.2	1986.2
1981	1686.4	1492.8	2452.1	1133.1	277.8	229.5	300.8	655.9	1425.5	2874.6	4187.3	5709.9
1982	6912.7	1502.4	243.2	241.2	222.2	232.5	201.4	184.9	205.4	666.3	2817.0	993.4
1983	361.0	216.2	210.9	273.3	278.6	247.0	206.4	190.6	197.7	207.3	236.0	216.0
1984	455.3	214.8	207.5	221.5	213.8	197.7	232.2	347.1	957.5	1171.6	2634.8	1171.9
1985	778.0	480.1	451.6	804.3	565.8	438.6	388.4	574.1	1557.3	2913.7	4350.9	5280.5
1986	5609.3	6116.8	2816.9	541.5	268.6	254.2	241.8	247.7	494.9	1249.9	2971.3	1078.9
1987	695.1	700.3	2139.3	2197.7	658.7	255.5	510.4	1360.4	1837.8	3073.3	4439.0	5795.2
1988	6465.7	6302.4	2603.8	386.3	325.7	1041.8	1289.5	1518.7	1837.2	3814.6	5122.1	6202.2
1989	7766.1	6291.9	5774.5	3671.6	2219.3	374.0	228.6	407.8	1600.4	3233.3	3837.9	4111.3
1990	5162.9	5873.8	6042.1	1969.3	677.7	869.3	1039.5	1551.2	3228.9	5192.0	5633.9	6601.3
1991	7330.7	7700.6	7336.2	4508.5	2566.9	511.7	408.6	1526.6	3661.1	5278.1	5501.4	6573.2
1992	7412.5	7246.5	7299.7	5034.2	805.9	301.0	506.6	1708.7	2199.6	3951.1	5760.5	6589.7
1993	6262.0	6199.7	4784.8	603.3	283.2	235.6	223.5	219.6	216.4	707.3	2776.2	1836.9
1994	1773.2	1615.5	2546.1	2543.5	693.2	609.5	747.6	957.7	2574.1	4477.8	5109.1	6279.9
1995	4808.9	5412.4	4530.9	502.7	245.5	240.6	227.6	183.3	188.1	223.5	594.4	583.0
1996	465.9	519.7	452.2	234.3	249.6	220.3	220.6	222.3	314.5	1131.3	3028.3	1191.8
1997	817.8	624.8	234.0	251.7	212.1	200.0	225.1	306.8	968.6	1098.6	2537.4	1139.8
1998	932.5	716.9	863.6	360.3	323.2	246.1	203.8	187.6	193.5	214.3	351.9	294.6
1999	669.9	431.8	202.9	206.0	224.5	200.8	218.2	238.7	426.4	1063.1	2943.9	1169.7
2000	818.4	656.0	1750.7	931.7	276.4	225.7	214.0	255.0	1032.2	1254.6	2572.1	1854.1
2001	1870.7	1567.0	2443.2	1708.4	343.1	233.0	303.3	845.3	1481.5	2978.7	4214.5	5764.0
2002	6314.0	5548.3	1073.7	237.0	252.5	274.2	267.3	401.5	1701.3	3306.7	4146.0	5891.4
2003	5996.6	6213.6	1205.5	222.0	202.8	216.9	215.4	216.2	632.4	1131.0	2536.2	1841.0
Average	3399.5	2936.9	2320.0	1216.1	550.2	369.4	395.4	667.2	1267.5	2113.3	3406.0	3297.0
Critical	5205.7	5186.0	4926.5	2971.8	1263.3	859.6	951.2	1838.7	3209.3	4726.9	5566.3	6626.1
Dry	3185.1	2680.1	2389.1	1625.4	719.5	300.8	333.2	707.5	1600.6	3063.4	4195.9	5425.4
BN	1348.4	1139.1	2016.4	1230.5	359.5	233.1	267.6	461.5	1104.2	1796.7	3304.2	4910.6
AN	5336.2	4502.2	2347.5	467.6	257.9	233.4	227.3	240.3	517.1	1037.8	2750.7	1889.1
Wet	1947.6	1398.6	918.6	425.2	252.2	220.9	222.1	246.4	439.7	812.5	2196.3	923.7

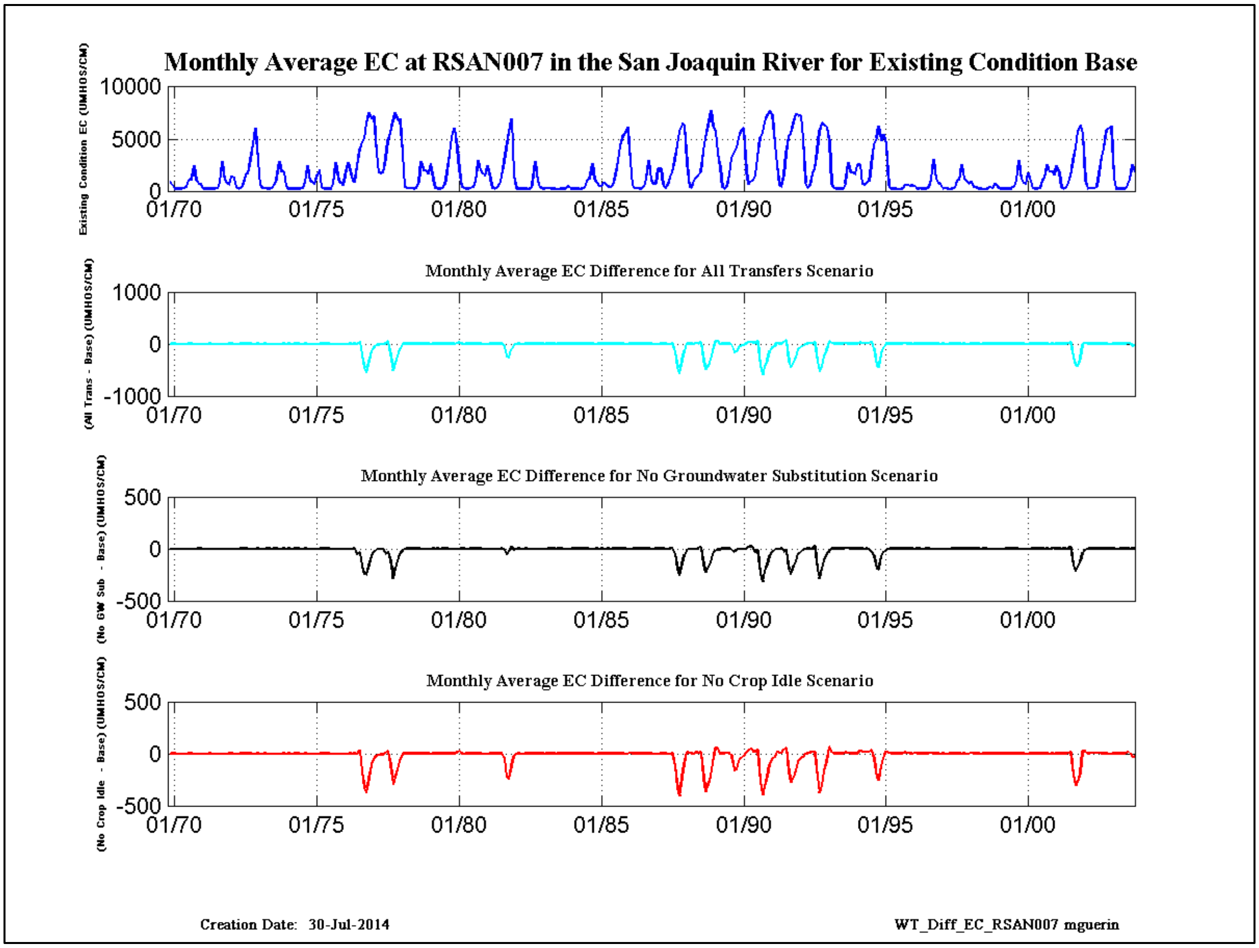


Figure E.3-11. San Joaquin River location RSAN007 EC for the Base condition and change from Base for the scenarios.

Table E.3-54. San Joaquin River location RSAN018 Base salinity (EC).

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	316.8	247.5	206.4	232.0	212.4	205.6	225.3	242.2	279.1	460.9	1027.0	1011.5
1971	336.6	343.8	220.1	208.8	207.8	208.0	229.4	224.9	208.7	359.4	1254.2	1018.0
1972	348.0	271.7	570.6	638.6	285.8	223.1	230.6	268.3	383.0	791.7	1389.2	2233.7
1973	2365.0	1988.4	541.1	268.4	252.8	227.1	239.8	251.3	246.5	475.0	1138.2	872.6
1974	532.4	317.2	202.0	215.6	212.7	211.2	214.0	226.5	218.4	320.8	931.2	869.0
1975	378.0	359.4	651.4	867.3	312.4	222.4	227.5	225.9	210.7	291.5	1041.7	974.2
1976	342.3	286.9	606.2	1116.1	869.5	494.1	317.2	573.3	976.2	2202.6	1702.1	2091.3
1977	2378.0	2138.4	2655.6	1819.4	652.3	480.9	461.6	727.4	1252.5	1619.8	2490.7	2716.9
1978	2029.0	2031.6	1647.0	363.3	270.8	264.6	272.4	240.0	226.0	359.2	1169.9	1013.7
1979	607.7	670.2	1211.6	773.6	304.1	247.2	242.0	255.7	254.6	804.2	1590.1	2463.4
1980	2513.9	1670.6	1263.7	309.1	269.8	236.4	220.8	246.0	239.8	293.3	1076.7	934.1
1981	424.8	532.1	1156.6	842.8	276.7	226.9	252.2	271.7	350.5	1296.1	1804.4	2526.2
1982	2789.2	1438.8	237.3	244.8	219.9	234.3	197.6	183.4	200.2	242.2	888.8	424.1
1983	215.0	202.4	214.3	274.9	274.1	241.5	202.2	189.7	198.3	208.5	198.5	185.6
1984	244.5	195.1	208.4	227.5	216.2	201.3	232.3	247.6	286.4	497.6	1013.7	1015.3
1985	316.4	317.2	272.5	328.5	295.0	250.5	261.6	263.8	376.5	1288.8	1733.2	2479.8
1986	2000.4	2506.0	1533.1	413.7	266.9	249.3	247.3	235.8	235.9	455.7	1170.9	522.2
1987	220.4	236.0	816.8	966.7	426.9	251.4	269.1	388.6	457.2	987.4	1257.7	1868.6
1988	2007.9	1919.6	1322.3	342.5	254.6	318.8	369.0	381.1	400.3	1166.7	1510.5	1897.4
1989	2531.0	2182.3	2366.9	1781.4	798.7	293.4	233.5	232.0	417.0	1518.9	1898.5	1942.7
1990	1953.0	2035.2	2062.3	1044.8	392.1	333.3	321.0	362.2	730.2	2054.7	2077.3	2267.3
1991	2350.0	2492.1	2539.2	1403.3	756.2	336.4	274.7	386.7	988.1	2198.8	1982.9	2173.9
1992	2346.8	2255.3	2383.3	1905.9	512.2	281.3	255.0	424.6	543.5	1276.6	1939.2	2296.5
1993	1788.1	1735.9	1981.3	460.4	289.4	240.7	234.3	230.5	216.4	297.4	1125.3	1007.2
1994	602.8	668.8	1235.2	1222.9	481.7	293.1	279.5	280.8	550.8	2228.3	2173.4	2627.8
1995	1505.1	1555.3	2062.3	418.4	245.6	239.5	224.5	179.7	193.3	222.4	252.3	269.1
1996	212.7	225.6	254.3	232.4	244.6	217.7	229.5	228.5	219.4	451.1	1285.2	1131.8
1997	337.5	295.2	235.7	248.0	207.3	198.4	215.6	244.4	286.5	462.1	970.8	1034.8
1998	336.8	296.1	421.2	316.5	313.5	237.0	203.0	186.2	196.6	216.3	212.7	197.6
1999	298.6	318.9	201.0	215.4	224.2	202.0	230.2	237.6	223.4	433.2	1263.1	1104.5
2000	320.9	314.6	728.2	570.2	276.5	224.5	222.3	245.6	309.4	493.5	1034.3	973.6
2001	500.3	613.6	1090.9	963.3	313.6	240.0	257.8	293.7	360.7	947.8	1236.8	1827.8
2002	1954.9	1872.4	704.4	242.0	228.0	219.0	229.1	257.1	438.0	1539.9	1694.4	2589.1
2003	2054.2	2204.6	866.7	222.5	207.9	205.4	224.9	225.6	250.7	512.3	1102.1	991.7
Average	1160.6	1080.6	1019.7	638.3	340.4	257.5	251.4	284.1	380.1	852.2	1312.9	1457.4
Critical	1711.6	1685.2	1829.1	1265.0	559.8	362.5	325.4	448.0	777.4	1821.1	1982.3	2295.9
Dry	991.3	958.9	1068.0	854.1	389.8	246.9	250.5	284.5	400.0	1263.2	1604.2	2205.7
BN	477.8	470.9	891.1	706.1	295.0	235.2	236.3	262.0	318.8	797.9	1489.6	2348.6
AN	1845.2	1657.6	1171.3	365.6	261.2	233.1	235.7	239.8	248.2	405.1	1107.7	965.5
Wet	731.0	638.6	511.4	316.6	242.9	220.6	221.4	219.4	227.4	355.5	885.4	750.6

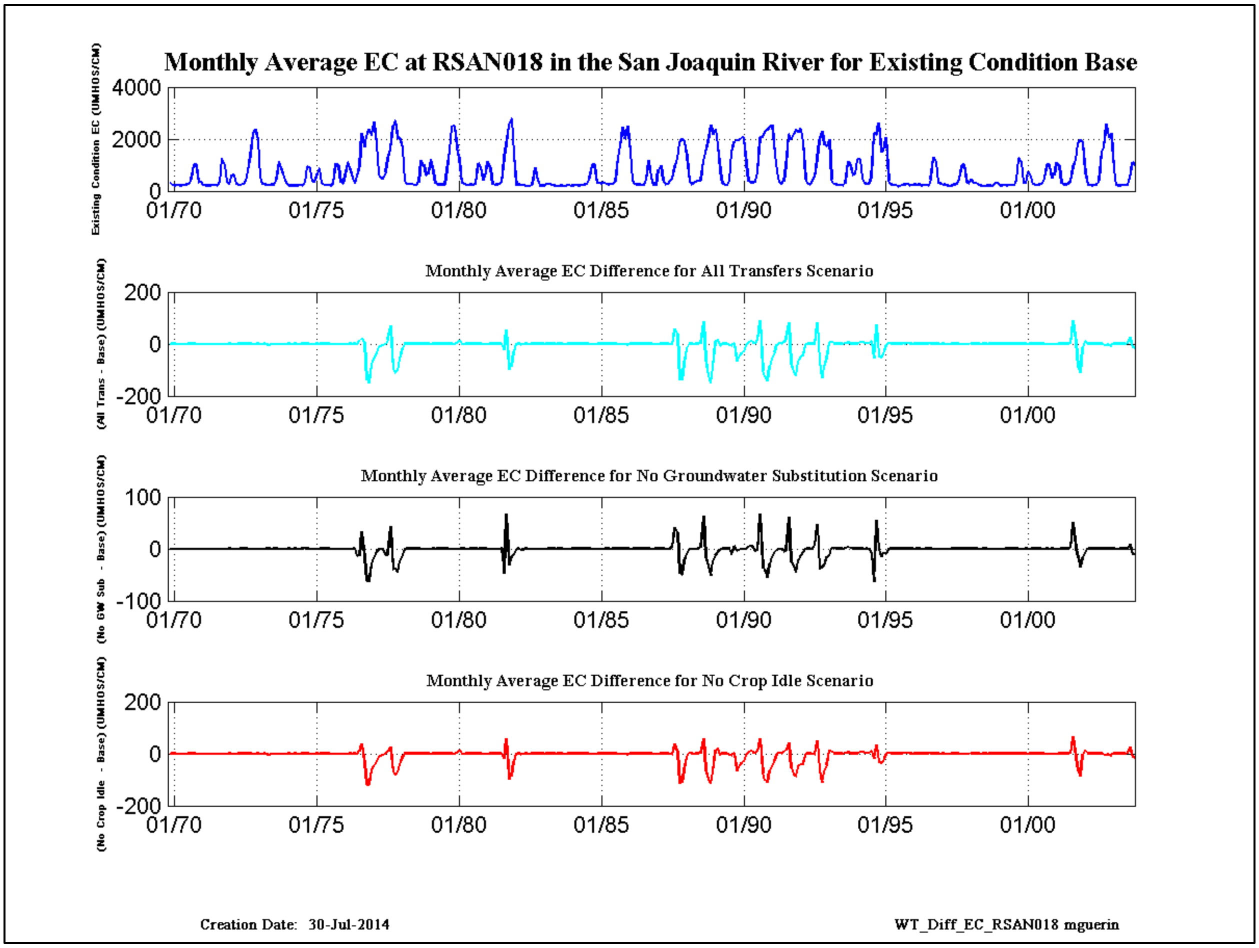


Figure E.3-12. San Joaquin River location RSAN018 EC for the Base condition and change from Base for the scenarios.

Table E.3-55. San Joaquin River location San Joaquin River location RSAN032 Base salinity (EC).

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	205.0	212.4	196.9	196.4	192.5	196.8	225.4	228.5	207.1	204.9	276.4	441.8
1971	222.1	217.0	202.3	196.1	200.1	199.9	223.7	207.4	188.4	194.7	305.8	446.2
1972	223.7	213.1	248.3	321.4	236.7	207.3	237.3	246.7	216.1	244.8	355.2	503.0
1973	559.6	747.2	331.5	228.8	215.2	206.0	232.9	233.9	201.0	207.2	291.1	253.0
1974	213.8	194.7	190.7	196.1	199.7	195.0	194.1	211.2	197.9	192.9	248.1	348.6
1975	224.3	224.9	274.8	375.2	233.8	200.8	218.7	201.3	195.7	191.7	256.2	377.0
1976	213.2	204.2	249.8	433.5	355.6	272.5	253.9	294.4	333.2	463.7	533.5	533.0
1977	623.4	559.5	716.3	687.2	379.9	294.2	268.9	306.7	377.4	431.0	520.1	746.4
1978	634.0	567.9	565.4	259.8	241.6	234.5	234.8	219.3	210.6	200.9	283.2	270.5
1979	223.2	244.1	397.7	404.3	265.4	222.5	232.9	232.7	200.6	240.7	367.6	517.4
1980	524.7	433.4	514.1	210.0	211.5	199.1	214.2	230.6	217.3	200.2	262.3	251.4
1981	208.3	228.6	394.3	412.8	229.1	225.0	257.2	255.2	215.3	319.0	430.4	535.5
1982	588.5	453.4	194.2	213.7	187.9	204.0	173.7	174.2	194.7	200.7	234.6	199.3
1983	186.7	191.9	193.8	222.9	205.4	183.2	182.2	174.7	181.6	191.3	182.8	178.7
1984	190.1	178.6	188.1	204.6	195.9	194.1	229.6	233.4	204.8	206.8	271.5	384.7
1985	212.6	210.9	209.8	229.5	223.5	238.6	259.1	246.0	217.1	322.2	428.2	508.0
1986	492.8	551.9	548.5	287.6	193.7	193.7	224.6	216.8	216.2	207.3	286.0	217.1
1987	198.1	201.5	284.9	429.3	272.0	240.3	269.4	262.4	223.4	264.2	356.3	425.7
1988	496.5	492.0	490.5	264.5	251.5	267.5	262.1	260.1	232.2	285.3	418.7	499.2
1989	650.3	570.5	667.8	708.4	423.7	227.0	222.3	216.3	206.5	368.3	462.2	448.0
1990	452.7	525.2	594.4	456.6	274.2	236.3	229.4	237.6	270.8	431.6	541.9	564.9
1991	661.0	691.5	748.4	636.1	398.2	267.7	259.6	246.2	282.2	464.2	525.7	547.1
1992	635.2	627.6	707.5	675.6	317.1	253.8	235.2	241.2	227.8	300.4	464.8	543.5
1993	513.2	490.6	590.2	292.8	239.8	215.6	214.0	213.6	205.4	192.4	280.5	263.2
1994	228.1	263.2	435.5	534.9	297.4	242.4	229.5	231.2	247.1	473.5	555.2	545.5
1995	469.3	390.3	574.1	264.1	208.2	197.3	188.8	169.1	190.3	203.9	188.1	182.6
1996	189.8	202.7	205.5	218.3	205.2	195.8	212.7	201.0	197.9	204.0	310.3	411.6
1997	218.4	207.5	205.2	183.0	184.0	192.0	212.3	240.1	212.5	202.9	259.3	407.5
1998	219.8	206.1	228.5	270.5	230.6	196.8	184.5	175.3	186.5	198.0	186.0	180.3
1999	194.4	210.9	189.8	211.1	194.9	189.6	221.6	218.6	194.5	200.5	306.2	419.5
2000	221.6	210.9	277.8	308.7	230.9	198.8	219.4	232.8	208.4	206.0	274.2	262.6
2001	219.9	250.4	357.7	446.9	258.6	229.0	267.1	258.9	216.1	256.3	331.0	419.0
2002	487.1	472.5	319.9	214.5	215.6	210.5	229.3	248.6	229.0	360.7	430.2	530.4
2003	545.4	506.2	352.6	196.2	199.5	198.8	226.4	204.1	194.3	211.7	292.9	275.7
Average	363.1	357.5	377.8	335.0	246.1	218.4	227.9	228.5	220.6	266.0	344.6	401.1
Critical	472.9	480.5	563.2	526.9	324.8	262.1	248.4	259.6	281.5	407.1	508.6	568.5
Dry	329.4	322.4	372.4	406.9	270.4	228.4	250.7	247.9	217.9	315.1	406.4	477.7
BN	223.4	228.6	323.0	362.8	251.0	214.9	235.1	239.7	208.3	242.8	361.4	510.2
AN	499.8	492.7	438.6	249.4	223.1	208.8	223.6	222.4	206.2	203.1	280.7	262.7
Wet	278.1	264.8	260.9	233.8	202.5	195.3	207.1	204.0	197.5	200.0	254.7	322.7

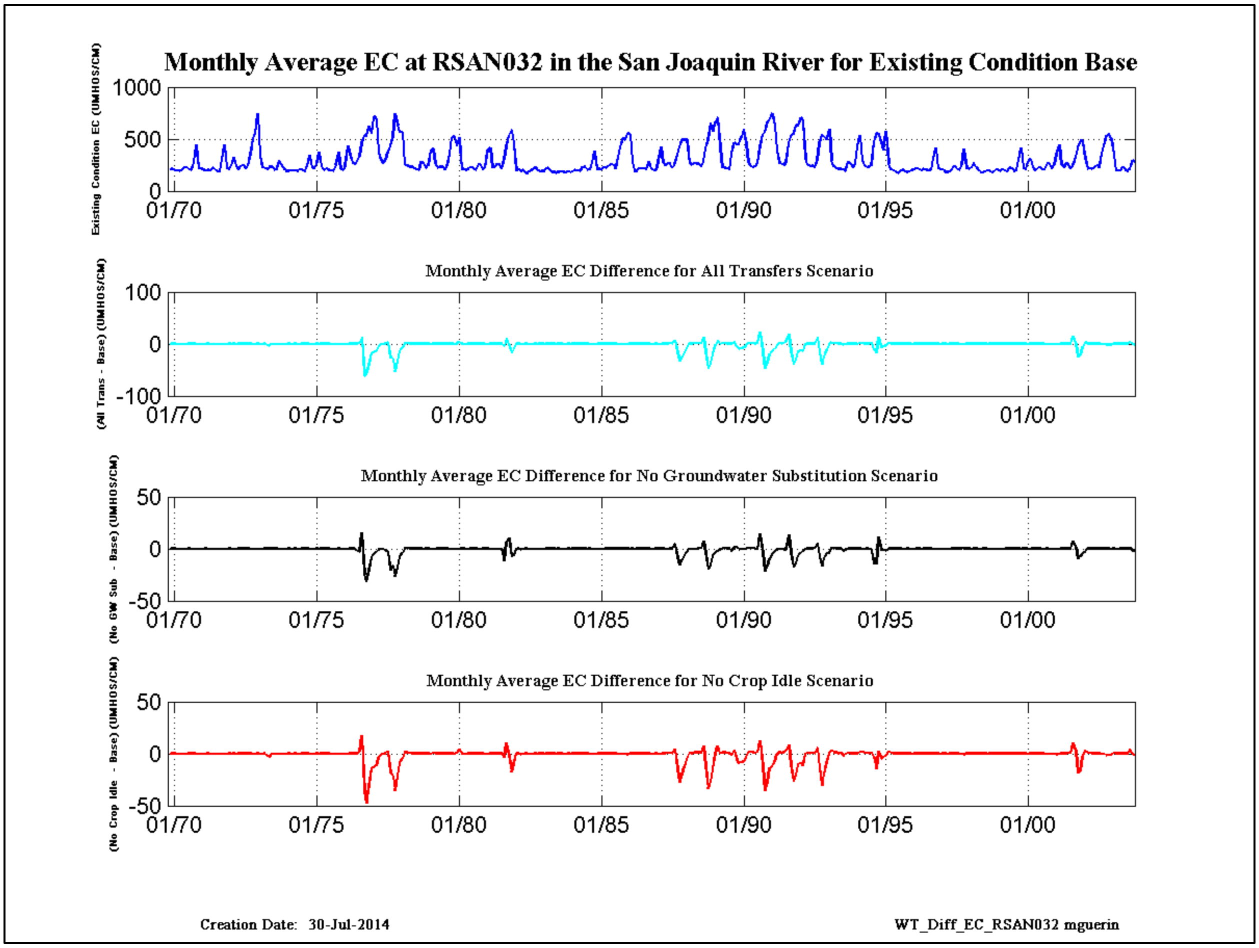


Figure E.3-13. San Joaquin River location San Joaquin River location RSAN032 EC for the Base condition and change from Base for the scenarios.

Table E.3-56. Sacramento River location RSAC081 salinity (EC) difference All Transfers minus Base.

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	-0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1971	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1972	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1973	0.0	0.0	0.0	0.0	0.0	-0.6	-2.1	-0.8	-0.2	0.0	0.0	0.0
1974	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.2	-0.1
1975	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1976	0.0	0.0	0.0	0.0	0.0	0.0	0.7	-1.9	48.6	-322.8	-853.9	-759.1
1977	-371.1	-144.9	-71.7	-19.4	-13.1	-4.2	-1.5	13.6	50.6	-507.1	-685.3	-496.2
1978	-279.5	-108.8	-3.1	2.0	0.5	0.2	0.2	0.6	4.6	5.6	2.1	0.5
1979	0.2	0.1	-0.7	7.3	0.8	0.5	1.6	1.9	2.1	0.8	0.4	0.0
1980	1.5	18.9	35.0	1.5	-0.3	0.1	0.3	0.9	0.8	0.2	0.1	0.0
1981	-0.1	0.5	-0.8	5.1	0.9	0.6	1.9	6.3	7.1	-64.7	-391.8	-284.8
1982	-111.0	-22.4	-0.1	0.1	-0.3	-0.3	0.0	0.0	0.6	1.3	0.7	-0.1
1983	8.9	1.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	1.3	0.8
1984	4.1	0.2	0.0	0.0	0.0	0.0	0.4	2.4	2.1	0.5	0.1	0.0
1985	-0.3	5.3	4.3	7.2	5.3	1.5	1.5	3.5	3.1	1.6	1.7	1.6
1986	1.2	1.0	10.7	2.6	0.0	0.0	0.2	0.4	0.4	0.1	0.1	0.0
1987	0.0	0.0	0.3	3.7	1.8	0.4	0.8	3.9	20.8	-308.9	-871.8	-773.7
1988	-354.8	-143.3	26.1	11.3	2.7	3.0	27.8	22.9	36.6	-591.8	-766.7	-585.0
1989	-320.1	-110.7	57.0	66.3	8.7	4.7	10.0	17.5	10.2	-32.3	-239.6	-169.8
1990	-64.2	-25.7	-10.9	21.6	63.3	82.3	36.1	35.8	68.5	-677.3	-802.9	-591.6
1991	-336.2	-136.6	-65.3	-23.8	39.9	14.0	20.0	67.3	96.6	-537.6	-640.9	-471.7
1992	-263.6	-102.8	-49.7	-22.7	8.9	9.0	33.5	39.8	46.9	-603.1	-766.2	-553.6
1993	-292.1	-107.8	86.7	11.8	0.9	1.4	0.3	1.6	10.8	25.9	11.0	2.7
1994	1.2	0.7	-0.7	45.1	23.2	30.8	32.4	34.2	58.2	-125.8	-721.0	-579.0
1995	-235.0	-87.2	18.4	3.8	0.4	0.0	0.1	0.0	0.1	1.3	19.6	9.9
1996	1.8	0.0	13.7	1.1	0.0	0.0	0.0	0.1	5.4	7.8	2.7	0.3
1997	0.0	-1.3	0.1	0.0	0.0	0.5	1.7	4.9	5.3	1.9	0.1	0.6
1998	0.4	0.1	9.9	1.6	0.0	0.0	0.0	0.0	0.0	0.1	4.3	3.8
1999	2.7	4.7	0.7	0.0	0.0	0.0	0.1	0.7	4.9	3.7	1.3	0.2
2000	0.0	0.0	-0.1	9.5	0.1	0.0	0.3	1.1	2.4	1.1	0.2	0.0
2001	0.0	-0.1	1.6	10.4	1.7	0.4	2.3	25.2	47.5	-507.6	-708.3	-599.8
2002	-311.9	1.8	18.8	0.7	14.2	15.4	18.6	19.7	18.1	6.9	6.2	5.7
2003	1.1	-1.0	6.9	0.1	0.5	2.2	0.7	0.1	29.3	-14.5	-44.6	-34.1
Average	-85.8	-28.2	2.6	4.3	4.7	4.8	5.5	8.9	17.1	-124.5	-218.9	-172.7
Critical	-198.4	-79.0	-24.6	1.7	17.8	19.3	21.3	30.3	58.0	-480.8	-748.1	-576.6
Dry	-105.4	-17.2	13.5	15.6	5.4	3.8	5.9	12.7	17.8	-150.8	-367.3	-303.5
BN	0.1	0.0	-0.4	3.6	0.4	0.2	0.8	1.0	1.1	0.4	0.2	0.0
AN	-94.8	-33.1	20.9	4.1	0.3	0.6	-0.1	0.6	8.0	3.1	-5.2	-5.1
Wet	-25.2	-8.0	4.1	0.7	0.0	0.0	0.2	0.7	1.4	1.3	2.3	1.2

Table E.3-57. Sacramento River location RSAC081 salinity (EC) percent difference of All Transfers from Base.

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1971	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1972	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1973	0.0	0.0	0.0	0.0	0.0	-0.3	-0.8	-0.2	0.0	0.0	0.0	0.0
1974	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1975	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1976	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.7	-4.9	-11.0	-7.9
1977	-3.4	-1.4	-0.7	-0.4	-0.4	-0.1	0.0	0.2	0.6	-5.8	-7.3	-4.7
1978	-2.6	-1.0	-0.1	0.7	0.2	0.1	0.1	0.3	0.8	0.3	0.0	0.0
1979	0.0	0.0	0.0	0.5	0.3	0.2	0.5	0.5	0.2	0.0	0.0	0.0
1980	0.0	0.3	1.1	0.6	-0.2	0.0	0.1	0.3	0.1	0.0	0.0	0.0
1981	0.0	0.0	0.0	0.4	0.3	0.2	0.4	0.4	0.2	-1.5	-6.4	-3.6
1982	-1.1	-1.7	-0.1	0.0	-0.2	-0.1	0.0	0.0	0.2	0.1	0.0	0.0
1983	1.3	0.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.2
1984	0.5	0.1	0.0	0.0	0.0	0.0	0.2	0.4	0.1	0.0	0.0	0.0
1985	0.0	0.8	0.6	0.5	0.5	0.2	0.2	0.3	0.1	0.0	0.0	0.0
1986	0.0	0.0	0.3	0.4	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.0
1987	0.0	0.0	0.0	0.1	0.2	0.1	0.1	0.1	0.6	-6.2	-12.3	-9.0
1988	-3.6	-1.5	0.7	2.6	0.5	0.1	1.1	0.7	1.0	-9.7	-9.6	-6.3
1989	-2.8	-1.2	0.7	1.2	0.2	1.3	3.9	2.1	0.3	-0.7	-4.3	-2.9
1990	-0.8	-0.3	-0.1	0.8	5.2	4.8	1.7	1.1	1.2	-9.1	-9.7	-6.2
1991	-3.1	-1.2	-0.6	-0.3	0.9	2.5	2.7	2.2	1.6	-7.2	-7.9	-4.9
1992	-2.4	-1.0	-0.5	-0.3	1.2	2.3	3.2	1.2	1.2	-9.8	-9.1	-5.9
1993	-3.0	-1.1	1.3	2.9	0.4	0.7	0.2	0.8	4.2	2.0	0.3	0.1
1994	0.0	0.0	0.0	1.2	2.8	2.6	2.1	1.7	1.2	-2.0	-9.9	-6.7
1995	-2.9	-1.0	0.3	1.2	0.2	0.0	0.0	0.0	0.1	0.5	1.7	0.9
1996	0.2	0.0	1.7	0.5	0.0	0.0	0.0	0.0	0.9	0.4	0.1	0.0
1997	0.0	-0.1	0.1	0.0	0.0	0.2	0.6	0.8	0.3	0.1	0.0	0.1
1998	0.0	0.0	0.6	0.5	0.0	0.0	0.0	0.0	0.0	0.1	0.7	0.7
1999	0.2	0.7	0.3	0.0	0.0	0.0	0.0	0.3	0.6	0.2	0.0	0.0
2000	0.0	0.0	0.0	0.9	0.0	0.0	0.1	0.3	0.1	0.0	0.0	0.0
2001	0.0	0.0	0.0	0.4	0.5	0.1	0.4	1.4	1.6	-10.5	-10.5	-7.0
2002	-3.3	0.0	1.7	0.3	3.9	3.5	4.2	2.4	0.6	0.1	0.1	0.1
2003	0.0	0.0	0.7	0.1	0.2	0.8	0.3	0.1	2.4	-0.7	-1.1	-1.3
Average	-0.8	-0.3	0.2	0.4	0.5	0.6	0.6	0.5	0.6	-1.9	-2.8	-1.9
Critical	-1.9	-0.8	-0.2	0.5	1.4	1.7	1.5	1.0	1.1	-6.9	-9.2	-6.1
Dry	-1.0	-0.1	0.5	0.5	0.9	0.9	1.5	1.1	0.6	-3.1	-5.6	-3.7
BN	0.0	0.0	0.0	0.3	0.2	0.1	0.3	0.3	0.1	0.0	0.0	0.0
AN	-0.9	-0.3	0.5	0.9	0.1	0.2	0.0	0.2	1.3	0.3	-0.1	-0.2
Wet	-0.1	-0.1	0.2	0.2	0.0	0.0	0.1	0.1	0.2	0.1	0.2	0.2

Table E.3-58. Sacramento River location RSAC092 export difference All Transfers minus Base.

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1971	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1972	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1973	0.0	0.0	0.0	0.0	0.0	-0.2	-1.3	-0.3	-0.1	0.0	0.0	0.0
1974	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1975	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1976	0.0	0.0	0.0	0.0	0.0	0.0	0.1	-0.4	28.2	-129.4	-576.4	-479.0
1977	-190.7	-53.6	-20.7	-5.5	-2.4	0.1	0.5	7.6	30.5	-423.5	-403.7	-359.7
1978	-149.0	-38.5	-1.1	0.5	0.3	0.1	0.1	0.1	0.4	0.6	0.5	0.1
1979	0.0	0.0	-0.2	0.9	0.3	0.1	0.2	0.2	0.2	0.1	0.1	0.0
1980	1.5	4.7	5.5	0.2	-0.1	0.0	0.0	0.1	0.1	0.0	0.0	0.0
1981	0.0	0.1	-0.2	0.5	0.1	0.0	0.1	1.0	2.0	-17.2	-186.3	-100.7
1982	-44.2	-4.3	0.0	0.0	-0.1	-0.1	0.0	0.0	0.0	0.1	0.1	0.0
1983	0.4	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1984	0.3	0.0	0.0	0.0	0.0	0.0	0.1	0.2	0.3	0.1	0.0	0.0
1985	0.0	0.3	0.3	0.8	0.4	0.2	0.2	0.4	0.8	0.5	1.0	0.8
1986	1.0	0.8	1.5	0.3	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0
1987	0.0	0.0	0.2	0.7	0.2	0.0	0.5	2.1	7.1	-126.9	-505.1	-404.0
1988	-151.5	-48.5	2.4	0.9	0.2	2.3	5.8	6.2	11.7	-295.9	-430.9	-367.3
1989	-161.3	-28.8	32.1	22.1	4.7	0.7	0.8	1.5	3.4	-10.9	-89.9	-50.9
1990	-18.6	-4.6	1.3	2.0	5.7	11.1	5.7	9.5	31.7	-352.1	-412.0	-368.1
1991	-174.7	-51.3	-18.4	-1.2	10.4	1.8	2.4	18.5	46.7	-296.4	-331.9	-304.6
1992	-131.5	-36.2	-6.9	-2.1	1.1	0.8	3.9	11.1	16.0	-304.8	-425.2	-317.8
1993	-142.2	-32.0	29.8	1.9	0.6	0.6	0.1	0.3	0.0	1.8	2.5	0.6
1994	0.2	0.1	-0.1	9.6	2.5	4.0	4.1	5.8	22.4	-38.4	-419.9	-254.1
1995	-87.6	-19.5	4.6	0.5	0.2	0.0	0.0	0.0	0.0	0.2	2.2	1.0
1996	0.1	0.0	0.8	0.2	0.0	0.0	0.0	0.0	0.4	1.0	0.7	0.1
1997	0.0	-0.1	0.1	0.0	0.0	0.0	0.1	0.4	0.8	0.2	-0.1	0.1
1998	0.4	0.0	1.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.2
1999	0.2	0.3	0.0	0.0	0.0	0.0	0.0	0.1	0.5	0.4	0.3	0.0
2000	0.0	0.0	0.1	0.9	0.0	0.0	0.1	0.1	0.3	0.1	0.0	0.0
2001	0.0	0.0	0.6	1.5	0.1	0.0	0.2	4.9	12.2	-192.2	-329.4	-327.7
2002	-130.5	12.1	3.8	0.2	0.8	0.8	1.0	1.6	5.2	1.5	4.2	2.0
2003	-0.1	0.9	1.1	0.1	0.0	0.1	0.1	0.0	4.7	-1.3	-10.3	-6.9
Average	-40.5	-8.8	1.1	1.0	0.7	0.7	0.7	2.1	6.6	-64.2	-120.9	-98.1
Critical	-95.3	-27.7	-6.1	0.5	2.5	2.9	3.2	8.3	26.8	-262.9	-428.6	-350.1
Dry	-48.7	-2.7	6.1	4.3	1.1	0.3	0.5	1.9	5.1	-57.5	-184.2	-146.7
BN	0.0	0.0	-0.1	0.5	0.2	0.1	0.1	0.1	0.1	0.1	0.0	0.0
AN	-48.3	-10.8	5.9	0.6	0.2	0.1	-0.2	0.1	0.9	0.2	-1.2	-1.0
Wet	-10.0	-1.7	0.6	0.1	0.0	0.0	0.0	0.1	0.2	0.2	0.3	0.1

Table E.3-59. Sacramento River location RSAC092 (EC) percent difference of All Transfers from Base.

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1971	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1972	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1973	0.0	0.0	0.0	0.0	0.0	-0.1	-0.7	-0.2	0.0	0.0	0.0	0.0
1974	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1975	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1976	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.4	-9.0	-23.5	-14.3
1977	-4.8	-1.7	-0.7	-0.6	-0.4	0.0	0.1	0.5	1.2	-15.2	-13.7	-8.7
1978	-4.0	-1.1	-0.1	0.2	0.2	0.1	0.1	0.1	0.2	0.2	0.1	0.0
1979	0.0	0.0	0.0	0.3	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0
1980	0.1	0.4	1.1	0.1	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0
1981	0.0	0.0	0.0	0.2	0.0	0.0	0.1	0.3	0.4	-2.2	-13.0	-4.7
1982	-1.6	-1.3	0.0	0.0	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1983	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1984	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.0
1985	0.0	0.1	0.1	0.3	0.2	0.1	0.1	0.2	0.1	0.1	0.1	0.0
1986	0.0	0.0	0.2	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1987	0.0	0.0	0.0	0.1	0.1	0.0	0.2	0.4	1.1	-12.3	-24.6	-15.2
1988	-5.0	-1.7	0.3	0.4	0.1	0.5	1.3	1.1	1.6	-20.7	-17.1	-11.4
1989	-3.9	-1.2	1.6	2.1	0.6	0.4	0.4	0.7	0.6	-1.2	-7.7	-3.9
1990	-1.0	-0.2	0.1	0.4	2.1	3.5	1.5	1.6	2.1	-19.1	-16.2	-11.2
1991	-4.4	-1.3	-0.5	-0.1	1.3	0.8	1.0	3.0	3.0	-15.6	-13.6	-9.1
1992	-3.4	-1.0	-0.2	-0.1	0.4	0.4	1.5	1.8	2.0	-20.6	-16.1	-10.2
1993	-4.5	-1.1	2.1	0.8	0.3	0.3	0.1	0.2	0.0	0.7	0.3	0.1
1994	0.0	0.0	0.0	1.3	1.0	1.5	1.4	1.6	1.9	-3.0	-21.3	-10.2
1995	-3.8	-0.9	0.3	0.3	0.1	0.0	0.0	0.0	0.0	0.1	0.9	0.4
1996	0.1	0.0	0.4	0.1	0.0	0.0	0.0	0.0	0.2	0.3	0.1	0.0
1997	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.2	0.1	0.0	0.0
1998	0.1	0.0	0.4	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1
1999	0.1	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.1	0.0	0.0
2000	0.0	0.0	0.0	0.3	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.0
2001	0.0	0.0	0.1	0.3	0.1	0.0	0.1	1.3	2.3	-19.7	-18.1	-12.4
2002	-4.6	0.6	1.2	0.1	0.4	0.4	0.5	0.7	0.8	0.2	0.3	0.1
2003	0.0	0.0	0.4	0.0	0.0	0.0	0.0	0.0	1.7	-0.4	-1.4	-1.4
Average	-1.2	-0.3	0.2	0.2	0.2	0.2	0.2	0.4	0.6	-4.0	-5.4	-3.3
Critical	-2.6	-0.8	-0.2	0.2	0.6	1.0	1.0	1.4	1.9	-14.8	-17.4	-10.8
Dry	-1.4	-0.1	0.5	0.5	0.2	0.1	0.2	0.6	0.9	-5.9	-10.5	-6.0
BN	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.1	0.0	0.0	0.0	0.0
AN	-1.4	-0.3	0.6	0.2	0.1	0.1	-0.1	0.0	0.3	0.1	-0.2	-0.2
Wet	-0.4	-0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.0

Table E.3-60. Sacramento River location RSAC101 (EC) difference All Transfers minus Base.

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1971	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1972	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1973	0.0	0.0	0.0	0.0	0.0	0.0	-0.3	-0.1	0.0	0.0	0.0	0.0
1974	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1975	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1976	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.2	-10.2	-82.7	-65.0
1977	-25.6	-7.3	-3.6	-1.2	-0.5	-0.1	0.0	0.9	4.7	-67.8	-44.1	-61.5
1978	-21.2	-5.4	-0.6	0.3	0.2	0.1	0.0	0.1	0.1	0.0	0.1	0.0
1979	0.0	0.0	0.0	0.2	0.2	0.1	0.1	0.1	0.0	0.0	0.0	0.0
1980	0.1	0.4	0.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1981	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.1	0.1	-1.7	-15.1	-7.2
1982	-7.3	-0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1983	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1984	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1985	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0
1986	0.1	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1987	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.3	0.5	-7.3	-58.6	-44.8
1988	-18.1	-6.8	-0.2	0.2	0.0	0.5	0.4	0.6	1.0	-23.1	-53.6	-58.5
1989	-24.5	-4.8	3.1	2.5	0.6	0.2	0.3	0.2	0.2	-1.0	-7.7	-4.4
1990	-3.0	-1.8	-0.8	0.0	0.6	0.8	0.4	0.8	4.4	-30.6	-44.5	-54.1
1991	-25.2	-7.4	-3.4	-0.4	0.6	0.3	0.4	1.5	5.7	-25.8	-36.4	-47.2
1992	-18.6	-5.1	-0.5	-1.2	0.4	0.3	0.4	0.8	1.1	-24.2	-47.6	-40.3
1993	-18.3	-3.2	2.3	0.6	0.4	0.3	0.0	0.1	0.0	0.0	0.3	0.1
1994	0.0	0.0	0.0	0.8	0.3	0.4	0.2	0.3	2.5	-4.3	-47.7	-15.1
1995	-7.0	-1.6	0.0	0.2	0.1	0.0	0.0	0.0	0.0	0.1	0.1	0.1
1996	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.0
1997	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0
1998	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1999	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2000	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2001	0.0	0.0	0.0	0.2	0.0	0.0	0.1	0.4	0.8	-10.0	-27.4	-34.8
2002	-13.3	0.2	0.3	0.1	0.3	0.1	0.2	0.2	0.5	0.1	0.4	-0.1
2003	-0.3	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.2	0.3	-0.8	-0.7
Average	-5.4	-1.3	-0.1	0.1	0.1	0.1	0.1	0.2	0.8	-6.0	-13.7	-12.7
Critical	-12.9	-4.1	-1.2	-0.3	0.2	0.3	0.2	0.7	3.4	-26.6	-50.9	-48.8
Dry	-6.3	-0.7	0.6	0.5	0.2	0.1	0.1	0.2	0.4	-3.3	-18.1	-15.2
BN	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AN	-6.6	-1.4	0.4	0.2	0.1	0.1	0.0	0.0	0.1	0.1	-0.1	-0.1
Wet	-1.1	-0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table E.3-61. Sacramento River location RSAC101 (EC) percent difference of All Transfers from Base.

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1971	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1972	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1973	0.0	0.0	0.0	0.0	0.0	0.0	-0.2	0.0	0.0	0.0	0.0	0.0
1974	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1975	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1976	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.2	-3.5	-19.5	-12.9
1977	-4.5	-1.6	-0.8	-0.5	-0.2	0.0	0.0	0.3	1.2	-15.3	-10.0	-9.5
1978	-3.9	-1.1	-0.3	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1979	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1980	0.0	0.2	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1981	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.1	-0.8	-5.1	-1.9
1982	-1.7	-0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1983	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1984	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1985	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1986	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1987	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.3	-3.0	-16.6	-11.0
1988	-3.9	-1.6	-0.1	0.1	0.0	0.2	0.2	0.3	0.5	-8.2	-12.9	-11.6
1989	-3.7	-1.2	0.8	0.9	0.2	0.1	0.2	0.1	0.1	-0.4	-2.7	-1.5
1990	-0.9	-0.4	-0.2	0.0	0.3	0.4	0.2	0.4	1.5	-9.3	-10.3	-10.6
1991	-4.1	-1.2	-0.6	-0.1	0.3	0.2	0.2	0.7	2.0	-7.5	-8.8	-9.0
1992	-3.1	-0.9	-0.1	-0.4	0.2	0.2	0.2	0.4	0.5	-8.5	-11.3	-8.5
1993	-3.9	-0.7	0.8	0.3	0.2	0.2	0.0	0.1	0.0	0.0	0.1	0.0
1994	0.0	0.0	0.0	0.3	0.2	0.2	0.1	0.2	1.0	-1.6	-13.0	-3.8
1995	-1.8	-0.5	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.1	0.0
1996	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1997	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1998	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1999	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2000	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2001	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.2	0.4	-4.3	-8.7	-8.8
2002	-3.3	0.1	0.2	0.1	0.1	0.1	0.1	0.1	0.2	0.0	0.1	0.0
2003	-0.1	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.1	0.2	-0.4	-0.3
Average	-1.0	-0.3	0.0	0.0	0.1	0.0	0.0	0.1	0.3	-1.8	-3.5	-2.6
Critical	-2.3	-0.8	-0.3	-0.1	0.1	0.2	0.1	0.3	1.1	-7.7	-12.2	-9.4
Dry	-1.2	-0.2	0.2	0.2	0.1	0.0	0.1	0.1	0.2	-1.4	-5.5	-3.9
BN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AN	-1.3	-0.3	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	-0.1
Wet	-0.3	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table E.3-62. San Joaquin River location RSAN007 (EC) difference All Transfers minus Base.

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	-0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1971	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1972	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1973	0.0	0.0	0.0	0.0	0.0	-1.9	-3.6	-1.1	-0.2	0.0	0.0	0.0
1974	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	-0.1
1975	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1976	0.0	0.0	0.0	0.0	0.0	0.0	0.3	-1.9	40.4	-214.5	-453.2	-542.8
1977	-326.9	-139.2	-73.6	-27.6	-15.6	-10.0	-6.0	6.7	44.9	-191.6	-505.3	-364.4
1978	-233.7	-102.8	-12.7	1.6	0.6	0.4	0.2	0.2	1.6	3.3	1.6	0.5
1979	0.1	0.0	-0.6	3.2	0.5	0.3	0.3	0.5	0.9	0.5	0.3	0.0
1980	0.2	13.3	24.7	2.4	-1.8	0.3	0.1	0.2	0.3	0.1	0.1	0.0
1981	-0.1	-0.3	-0.7	2.0	0.4	0.2	0.5	2.8	2.7	-48.3	-232.8	-253.0
1982	-113.4	-21.8	-1.1	0.1	-1.7	-1.2	0.1	0.0	0.0	0.5	0.5	0.0
1983	3.8	0.7	0.0	0.0	0.2	0.2	0.1	-0.1	0.0	0.1	0.3	0.2
1984	2.0	0.2	0.0	0.0	0.0	0.0	0.1	0.8	1.0	0.1	0.0	0.0
1985	-0.2	2.3	2.3	3.8	2.8	0.6	0.5	1.4	1.3	0.8	0.4	0.8
1986	-0.1	-0.2	6.3	1.7	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0
1987	0.0	-0.2	-0.1	2.2	1.2	0.2	0.0	-0.9	8.8	-145.1	-454.7	-572.0
1988	-310.7	-132.5	2.9	5.5	0.9	-1.6	13.7	9.7	21.7	-308.1	-491.1	-420.0
1989	-295.9	-121.5	44.5	50.2	-4.7	1.2	2.7	5.9	1.9	-22.5	-156.7	-145.9
1990	-66.3	-36.3	-24.7	6.6	30.3	45.9	22.4	20.9	53.8	-415.1	-583.8	-443.0
1991	-304.9	-139.4	-74.0	-42.2	17.6	8.6	8.1	40.5	70.7	-326.2	-451.9	-351.4
1992	-244.6	-107.5	-65.8	-40.4	-3.5	3.0	14.1	17.7	22.3	-328.0	-526.6	-422.9
1993	-233.5	-102.4	55.8	15.3	1.2	0.9	0.4	0.5	2.1	13.5	8.3	2.7
1994	0.8	0.5	-0.6	28.4	15.4	15.2	17.1	17.6	39.9	-98.6	-414.0	-445.1
1995	-181.6	-76.9	8.6	5.0	0.6	0.2	0.1	0.0	0.0	0.3	10.6	7.0
1996	0.8	0.0	6.2	0.8	0.1	0.0	0.0	0.1	1.9	5.3	2.1	0.4
1997	0.1	-0.5	0.1	-0.2	-0.1	0.1	0.4	1.4	2.6	0.4	-0.2	0.9
1998	-0.3	-1.2	5.9	1.7	0.3	0.1	0.0	0.1	0.1	0.0	1.8	1.6
1999	1.3	2.2	0.3	0.0	0.0	0.0	0.0	0.2	2.0	2.4	1.0	0.2
2000	0.0	0.0	-0.4	3.3	0.1	0.1	0.1	0.2	1.2	0.1	0.1	0.0
2001	0.0	-0.1	0.4	4.7	0.8	0.1	0.7	12.3	25.8	-251.2	-419.0	-424.7
2002	-268.7	-4.0	18.2	0.7	4.7	5.9	5.2	6.8	8.3	4.5	1.4	2.2
2003	-0.4	-4.5	3.1	0.3	0.1	0.6	0.2	0.1	16.2	4.9	-33.3	-27.4
Average	-75.7	-28.6	-2.2	0.9	1.5	2.0	2.3	4.2	11.0	-68.0	-138.1	-129.3
Critical	-178.9	-79.2	-33.7	-10.0	6.5	8.7	9.9	15.9	42.0	-268.9	-489.4	-427.1
Dry	-94.1	-20.6	10.8	10.6	0.9	1.4	1.6	4.7	8.1	-77.0	-210.2	-232.1
BN	0.1	0.0	-0.3	1.6	0.2	0.1	0.2	0.3	0.5	0.3	0.1	0.0
AN	-77.9	-32.7	11.7	3.8	0.0	0.1	-0.4	0.0	3.5	3.7	-3.9	-4.0
Wet	-22.1	-7.5	2.0	0.7	0.0	0.0	0.1	0.2	0.6	0.7	1.2	0.8

Table E.3-63. San Joaquin River location RSAN007 (EC) percent difference of All Transfers from Base.

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1971	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1972	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1973	0.0	0.0	0.0	0.0	0.0	-0.8	-1.6	-0.4	0.0	0.0	0.0	0.0
1974	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1975	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1976	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	1.0	-4.5	-8.9	-8.3
1977	-4.3	-2.0	-1.0	-0.8	-0.9	-0.6	-0.3	0.2	0.9	-3.4	-7.5	-4.8
1978	-3.4	-1.5	-0.4	0.4	0.2	0.1	0.1	0.1	0.5	0.3	0.1	0.0
1979	0.0	0.0	0.0	0.3	0.2	0.1	0.1	0.2	0.1	0.0	0.0	0.0
1980	0.0	0.3	1.2	0.7	-0.7	0.1	0.0	0.1	0.1	0.0	0.0	0.0
1981	0.0	0.0	0.0	0.2	0.1	0.1	0.2	0.4	0.2	-1.7	-5.6	-4.4
1982	-1.6	-1.5	-0.5	0.0	-0.8	-0.5	0.0	0.0	0.0	0.1	0.0	0.0
1983	1.1	0.3	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.1	0.1
1984	0.4	0.1	0.0	0.0	0.0	0.0	0.0	0.2	0.1	0.0	0.0	0.0
1985	0.0	0.5	0.5	0.5	0.5	0.1	0.1	0.2	0.1	0.0	0.0	0.0
1986	0.0	0.0	0.2	0.3	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0
1987	0.0	0.0	0.0	0.1	0.2	0.1	0.0	-0.1	0.5	-4.7	-10.2	-9.9
1988	-4.8	-2.1	0.1	1.4	0.3	-0.2	1.1	0.6	1.2	-8.1	-9.6	-6.8
1989	-3.8	-1.9	0.8	1.4	-0.2	0.3	1.2	1.5	0.1	-0.7	-4.1	-3.5
1990	-1.3	-0.6	-0.4	0.3	4.5	5.3	2.2	1.3	1.7	-8.0	-10.4	-6.7
1991	-4.2	-1.8	-1.0	-0.9	0.7	1.7	2.0	2.7	1.9	-6.2	-8.2	-5.3
1992	-3.3	-1.5	-0.9	-0.8	-0.4	1.0	2.8	1.0	1.0	-8.3	-9.1	-6.4
1993	-3.7	-1.7	1.2	2.5	0.4	0.4	0.2	0.2	1.0	1.9	0.3	0.1
1994	0.0	0.0	0.0	1.1	2.2	2.5	2.3	1.8	1.5	-2.2	-8.1	-7.1
1995	-3.8	-1.4	0.2	1.0	0.3	0.1	0.1	0.0	0.0	0.1	1.8	1.2
1996	0.2	0.0	1.4	0.4	0.0	0.0	0.0	0.0	0.6	0.5	0.1	0.0
1997	0.0	-0.1	0.0	-0.1	0.0	0.0	0.2	0.5	0.3	0.0	0.0	0.1
1998	0.0	-0.2	0.7	0.5	0.1	0.0	0.0	0.1	0.0	0.0	0.5	0.5
1999	0.2	0.5	0.2	0.0	0.0	0.0	0.0	0.1	0.5	0.2	0.0	0.0
2000	0.0	0.0	0.0	0.4	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.0
2001	0.0	0.0	0.0	0.3	0.2	0.0	0.2	1.5	1.7	-8.4	-9.9	-7.4
2002	-4.3	-0.1	1.7	0.3	1.9	2.2	2.0	1.7	0.5	0.1	0.0	0.0
2003	0.0	-0.1	0.3	0.2	0.1	0.3	0.1	0.0	2.6	0.4	-1.3	-1.5
Average	-1.1	-0.4	0.1	0.3	0.3	0.4	0.4	0.4	0.5	-1.5	-2.6	-2.1
Critical	-2.5	-1.1	-0.5	0.1	0.9	1.4	1.4	1.1	1.3	-5.8	-8.8	-6.5
Dry	-1.3	-0.3	0.5	0.5	0.5	0.5	0.6	0.9	0.5	-2.6	-5.0	-4.2
BN	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0
AN	-1.2	-0.5	0.4	0.7	0.0	0.0	-0.2	0.0	0.7	0.5	-0.2	-0.2
Wet	-0.3	-0.2	0.2	0.2	0.0	0.0	0.0	0.1	0.1	0.1	0.2	0.1

Table E.3-64. San Joaquin River location RSAN018 (EC) difference All Transfers minus Base.

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1971	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1972	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1973	0.0	0.0	0.0	0.0	0.1	-2.6	-4.3	-1.0	-0.2	0.0	0.0	0.0
1974	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1
1975	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1976	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.7	13.8	18.9	4.5	-136.5
1977	-151.4	-78.0	-56.6	-34.5	-11.4	-6.5	-4.3	0.1	17.2	70.3	-97.7	-111.4
1978	-102.5	-56.0	-19.3	0.7	0.9	0.5	0.2	0.1	0.2	0.9	0.9	0.3
1979	0.1	0.0	-0.3	1.0	0.4	0.2	0.1	0.2	0.1	0.3	0.2	0.0
1980	-2.0	4.2	12.8	1.4	-1.8	0.3	0.0	0.1	0.1	0.0	0.0	0.0
1981	0.0	-0.9	-0.6	0.6	0.2	0.1	0.0	0.3	-0.1	-22.0	55.4	-98.6
1982	-87.1	-28.6	-0.9	0.1	-2.1	-1.1	0.1	0.0	-0.1	0.0	0.2	0.0
1983	0.6	0.2	0.0	0.0	0.2	0.2	0.1	-0.1	0.0	0.0	0.0	0.0
1984	0.5	0.1	0.0	0.0	0.0	0.0	0.1	0.1	0.1	-0.4	-0.1	0.0
1985	0.0	0.7	0.9	1.0	0.8	0.2	0.1	0.2	0.1	-0.5	-1.2	-1.5
1986	-1.5	-2.1	1.7	0.8	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0
1987	0.0	-0.1	-0.5	0.3	0.5	0.1	0.3	-1.3	-0.6	57.2	38.3	-137.5
1988	-136.7	-73.7	-16.5	1.4	0.3	-0.6	1.8	0.9	3.7	87.5	-59.3	-123.6
1989	-150.6	-86.8	6.0	15.8	-6.6	0.7	0.9	0.8	-2.4	-6.2	1.6	-64.6
1990	-50.5	-36.7	-29.8	-5.9	5.6	10.2	5.8	3.9	16.9	91.3	-102.2	-127.2
1991	-142.3	-84.7	-56.1	-30.9	-2.7	2.0	1.1	7.6	20.9	81.6	-75.1	-105.7
1992	-120.3	-66.1	-50.6	-44.5	-5.4	0.6	1.3	0.2	-0.2	81.2	-71.0	-130.0
1993	-90.6	-53.7	6.7	7.4	1.7	1.2	0.4	0.5	-0.7	2.6	4.3	1.9
1994	0.3	0.2	-0.3	7.8	6.7	2.8	2.8	2.3	9.8	-53.1	75.2	-47.4
1995	-52.6	-37.3	-6.7	3.0	0.9	0.2	0.1	0.0	0.1	0.1	2.0	2.4
1996	0.2	0.0	1.1	0.4	0.1	0.0	0.0	0.1	0.1	2.0	1.2	0.5
1997	0.0	-0.1	0.1	-0.2	-0.1	0.0	0.1	0.1	0.3	-0.9	-0.3	-0.5
1998	-0.3	-1.2	2.0	0.9	0.3	0.0	0.0	0.1	0.1	0.0	0.1	0.2
1999	0.4	0.8	0.2	0.0	0.0	0.0	0.1	0.1	0.2	0.9	0.6	0.2
2000	0.0	0.0	-0.9	0.4	0.1	0.1	0.1	0.1	0.2	-0.6	-0.1	0.0
2001	0.0	0.0	-1.3	0.6	0.3	0.1	0.1	1.4	3.2	89.6	6.1	-84.5
2002	-110.6	-15.8	9.8	0.8	0.7	0.7	0.3	0.5	0.5	0.0	-4.2	-5.5
2003	-2.6	-6.4	1.9	0.4	0.1	0.1	0.1	0.1	2.6	24.5	-12.4	-16.5
Average	-35.3	-18.3	-5.8	-2.1	-0.3	0.3	0.2	0.5	2.5	15.5	-6.9	-34.9
Critical	-85.8	-48.4	-30.0	-15.2	-1.0	1.2	1.2	2.0	11.7	54.0	-46.5	-111.7
Dry	-43.5	-17.1	2.4	3.2	-0.7	0.3	0.3	0.3	0.1	19.7	16.0	-65.4
BN	0.0	0.0	-0.2	0.5	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.0
AN	-32.9	-18.7	0.2	1.7	0.2	-0.1	-0.6	0.0	0.4	4.6	-1.2	-2.4
Wet	-10.8	-5.2	-0.2	0.4	0.0	0.0	0.1	0.0	0.1	0.1	0.3	0.2

Table E.3-65. San Joaquin River location RSAN018 (EC) percent difference of All Transfers from Base.

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1971	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1972	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1973	0.0	0.0	0.0	0.0	0.0	-1.1	-1.8	-0.4	-0.1	0.0	0.0	0.0
1974	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1975	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1976	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	1.4	0.9	0.3	-6.5
1977	-6.4	-3.6	-2.1	-1.9	-1.7	-1.4	-0.9	0.0	1.4	4.3	-3.9	-4.1
1978	-5.1	-2.8	-1.2	0.2	0.3	0.2	0.1	0.1	0.1	0.3	0.1	0.0
1979	0.0	0.0	0.0	0.1	0.1	0.1	0.0	0.1	0.1	0.0	0.0	0.0
1980	-0.1	0.3	1.0	0.5	-0.7	0.1	0.0	0.0	0.0	0.0	0.0	0.0
1981	0.0	-0.2	0.0	0.1	0.1	0.0	0.0	0.1	0.0	-1.7	3.1	-3.9
1982	-3.1	-2.0	-0.4	0.1	-0.9	-0.5	0.1	0.0	0.0	0.0	0.0	0.0
1983	0.3	0.1	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0
1984	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	0.0
1985	0.0	0.2	0.3	0.3	0.3	0.1	0.1	0.1	0.0	0.0	-0.1	-0.1
1986	-0.1	-0.1	0.1	0.2	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0
1987	0.0	0.0	-0.1	0.0	0.1	0.0	0.1	-0.3	-0.1	5.8	3.0	-7.4
1988	-6.8	-3.8	-1.3	0.4	0.1	-0.2	0.5	0.2	0.9	7.5	-3.9	-6.5
1989	-5.9	-4.0	0.3	0.9	-0.8	0.2	0.4	0.4	-0.6	-0.4	0.1	-3.3
1990	-2.6	-1.8	-1.4	-0.6	1.4	3.1	1.8	1.1	2.3	4.4	-4.9	-5.6
1991	-6.1	-3.4	-2.2	-2.2	-0.4	0.6	0.4	2.0	2.1	3.7	-3.8	-4.9
1992	-5.1	-2.9	-2.1	-2.3	-1.1	0.2	0.5	0.0	0.0	6.4	-3.7	-5.7
1993	-5.1	-3.1	0.3	1.6	0.6	0.5	0.2	0.2	-0.3	0.9	0.4	0.2
1994	0.1	0.0	0.0	0.6	1.4	0.9	1.0	0.8	1.8	-2.4	3.5	-1.8
1995	-3.5	-2.4	-0.3	0.7	0.4	0.1	0.1	0.0	0.0	0.1	0.8	0.9
1996	0.1	0.0	0.4	0.2	0.1	0.0	0.0	0.1	0.1	0.4	0.1	0.0
1997	0.0	0.0	0.0	-0.1	0.0	0.0	0.0	0.0	0.1	-0.2	0.0	0.0
1998	-0.1	-0.4	0.5	0.3	0.1	0.0	0.0	0.1	0.0	0.0	0.1	0.1
1999	0.1	0.3	0.1	0.0	0.0	0.0	0.0	0.1	0.1	0.2	0.0	0.0
2000	0.0	0.0	-0.1	0.1	0.0	0.0	0.0	0.0	0.1	-0.1	0.0	0.0
2001	0.0	0.0	-0.1	0.1	0.1	0.0	0.1	0.5	0.9	9.5	0.5	-4.6
2002	-5.7	-0.8	1.4	0.3	0.3	0.3	0.2	0.2	0.1	0.0	-0.2	-0.2
2003	-0.1	-0.3	0.2	0.2	0.0	0.0	0.0	0.1	1.0	4.8	-1.1	-1.7
Average	-1.6	-0.9	-0.2	0.0	0.0	0.1	0.1	0.2	0.3	1.3	-0.3	-1.6
Critical	-3.8	-2.2	-1.3	-0.9	0.0	0.5	0.5	0.6	1.4	3.5	-2.4	-5.0
Dry	-1.9	-0.8	0.3	0.3	0.0	0.1	0.1	0.1	0.0	2.2	1.1	-3.2
BN	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AN	-1.7	-1.0	0.0	0.4	0.1	0.0	-0.2	0.0	0.1	1.0	-0.1	-0.2
Wet	-0.5	-0.3	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1

Table E.3-66. San Joaquin River location RSAN032 (EC) difference All Transfers minus Base.

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1971	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1972	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1973	0.0	0.0	0.0	0.0	0.0	-2.2	-3.1	-0.4	0.0	0.0	0.0	0.0
1974	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1975	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1976	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.6	13.0	-61.8	-58.1
1977	-39.2	-17.3	-16.1	-13.2	-4.0	-0.8	-0.1	0.4	3.7	-27.0	-28.9	-53.8
1978	-33.3	-13.4	-7.5	1.1	1.0	0.5	0.2	0.2	0.1	0.1	0.1	0.1
1979	0.0	0.0	-0.1	0.5	0.5	0.1	0.1	0.2	0.0	0.0	0.0	0.0
1980	-0.2	0.7	3.8	0.3	-0.3	0.0	0.0	0.1	0.0	0.0	0.0	0.0
1981	0.0	-0.1	-0.2	0.3	0.1	0.0	0.1	0.3	0.2	-3.7	10.2	-1.4
1982	-17.8	-9.2	0.0	0.1	-0.9	-0.3	0.0	-0.1	0.0	0.0	0.0	0.0
1983	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0
1984	0.1	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.0
1985	0.0	0.2	0.2	0.2	0.1	0.2	0.1	0.1	0.1	-0.1	-0.2	-0.5
1986	-0.2	-0.5	0.2	0.3	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0
1987	0.0	0.0	-0.2	-0.1	0.1	0.0	0.7	1.0	0.6	7.0	-15.7	-32.3
1988	-25.2	-15.3	-7.4	0.5	0.2	1.2	1.2	1.3	1.1	12.7	-14.7	-46.2
1989	-37.0	-19.1	-2.0	6.2	0.0	1.3	1.0	0.9	0.2	-1.0	3.2	-5.6
1990	-9.4	-8.4	-7.8	-3.3	1.1	1.7	1.3	0.8	2.7	23.7	-14.5	-47.8
1991	-37.0	-19.5	-15.1	-9.6	-1.2	1.1	0.8	1.2	4.3	19.2	-12.7	-38.6
1992	-29.8	-15.2	-12.0	-13.4	-0.4	0.7	0.5	0.9	0.7	12.3	-14.2	-39.0
1993	-24.9	-10.8	-0.9	2.9	1.4	1.1	0.3	0.6	-2.1	-0.5	0.7	0.2
1994	0.1	0.0	-0.1	1.8	1.9	0.8	0.6	0.5	1.4	-10.9	-17.8	12.2
1995	-6.3	-4.5	-3.7	1.6	0.7	0.2	0.1	0.0	0.1	0.1	0.1	0.1
1996	0.0	0.0	0.2	0.3	0.1	0.0	0.1	0.1	0.1	0.2	0.2	0.1
1997	0.0	0.0	0.2	0.0	0.0	0.0	0.1	0.1	0.1	-0.1	-0.1	-0.5
1998	0.1	0.0	0.3	0.3	0.3	0.0	0.0	0.1	0.0	0.0	0.0	0.0
1999	0.0	0.2	0.1	0.0	0.0	0.0	0.1	0.1	0.0	0.1	0.1	0.1
2000	0.0	0.0	-0.2	0.2	0.1	0.1	0.1	0.1	0.0	-0.1	-0.1	0.0
2001	0.0	0.0	-0.6	-0.1	0.1	0.1	0.3	0.8	0.8	15.2	1.9	-24.5
2002	-21.4	-5.3	2.1	0.6	0.5	0.3	0.4	0.4	0.4	-0.2	-0.4	-1.5
2003	-1.0	-1.1	0.6	0.1	0.1	0.1	0.1	0.1	0.3	3.7	-0.4	-2.5
Average	-8.3	-4.1	-1.9	-0.7	0.0	0.2	0.2	0.3	0.5	1.9	-4.9	-10.0
Critical	-20.1	-10.8	-8.4	-5.3	-0.3	0.7	0.6	0.7	2.4	6.1	-23.5	-38.8
Dry	-9.7	-4.1	-0.1	1.2	0.2	0.3	0.4	0.6	0.4	2.9	-0.2	-11.0
BN	0.0	0.0	0.0	0.3	0.2	0.1	0.1	0.1	0.0	0.0	0.0	0.0
AN	-9.9	-4.1	-0.7	0.8	0.4	-0.1	-0.4	0.1	-0.3	0.5	0.1	-0.4
Wet	-1.9	-1.1	-0.2	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table E.3-67. San Joaquin River location RSAN032 (EC) percent difference of All Transfers from Base.

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1971	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1972	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1973	0.0	0.0	0.0	0.0	0.0	-1.1	-1.3	-0.2	0.0	0.0	0.0	0.0
1974	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1975	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1976	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.8	2.8	-11.6	-10.9
1977	-6.3	-3.1	-2.3	-1.9	-1.0	-0.3	0.0	0.1	1.0	-6.3	-5.6	-7.2
1978	-5.3	-2.4	-1.3	0.4	0.4	0.2	0.1	0.1	0.1	0.0	0.0	0.0
1979	0.0	0.0	0.0	0.1	0.2	0.1	0.1	0.1	0.0	0.0	0.0	0.0
1980	0.0	0.2	0.7	0.2	-0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1981	0.0	-0.1	-0.1	0.1	0.1	0.0	0.0	0.1	0.1	-1.1	2.4	-0.3
1982	-3.0	-2.0	0.0	0.1	-0.5	-0.2	0.0	0.0	0.0	0.0	0.0	0.0
1983	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1984	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1985	0.0	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	-0.1
1986	0.0	-0.1	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1987	0.0	0.0	-0.1	0.0	0.0	0.0	0.3	0.4	0.3	2.6	-4.4	-7.6
1988	-5.1	-3.1	-1.5	0.2	0.1	0.5	0.5	0.5	0.5	4.5	-3.5	-9.3
1989	-5.7	-3.4	-0.3	0.9	0.0	0.6	0.5	0.4	0.1	-0.3	0.7	-1.2
1990	-2.1	-1.6	-1.3	-0.7	0.4	0.7	0.5	0.3	1.0	5.5	-2.7	-8.5
1991	-5.6	-2.8	-2.0	-1.5	-0.3	0.4	0.3	0.5	1.5	4.1	-2.4	-7.1
1992	-4.7	-2.4	-1.7	-2.0	-0.1	0.3	0.2	0.4	0.3	4.1	-3.1	-7.2
1993	-4.9	-2.2	-0.2	1.0	0.6	0.5	0.2	0.3	-1.0	-0.3	0.2	0.1
1994	0.0	0.0	0.0	0.3	0.6	0.3	0.3	0.2	0.6	-2.3	-3.2	2.2
1995	-1.3	-1.2	-0.6	0.6	0.3	0.1	0.0	0.0	0.1	0.1	0.1	0.1
1996	0.0	0.0	0.1	0.1	0.0	0.0	0.1	0.0	0.0	0.1	0.1	0.0
1997	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	-0.1
1998	0.0	0.0	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1999	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0
2000	0.0	0.0	-0.1	0.1	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0
2001	0.0	0.0	-0.2	0.0	0.0	0.0	0.1	0.3	0.4	5.9	0.6	-5.8
2002	-4.4	-1.1	0.7	0.3	0.2	0.1	0.2	0.1	0.2	-0.1	-0.1	-0.3
2003	-0.2	-0.2	0.2	0.1	0.0	0.0	0.0	0.1	0.1	1.7	-0.1	-0.9
Average	-1.4	-0.7	-0.3	0.0	0.0	0.1	0.1	0.1	0.2	0.6	-1.0	-1.9
Critical	-3.4	-1.9	-1.3	-0.8	-0.1	0.3	0.3	0.3	0.8	1.8	-4.6	-6.8
Dry	-1.7	-0.7	0.0	0.2	0.1	0.1	0.2	0.2	0.2	1.2	-0.2	-2.6
BN	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AN	-1.7	-0.8	-0.1	0.3	0.2	-0.1	-0.2	0.1	-0.1	0.2	0.0	-0.1
Wet	-0.3	-0.2	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table E.3-68. Sacramento River location RSAC081 (EC) difference No Groundwater Substitution minus Base.

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	-0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1971	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1972	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1973	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1974	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.2	-0.1
1975	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1976	0.0	0.0	0.0	0.0	0.0	0.0	0.6	-79.3	-52.1	-258.5	-423.9	-357.4
1977	-186.1	-77.2	-41.7	-13.5	-8.2	-2.9	0.0	-70.1	-38.1	-323.9	-407.7	-278.6
1978	-155.8	-67.6	-27.5	0.3	0.3	0.1	0.0	0.0	0.0	0.0	0.0	0.0
1979	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0
1980	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	0.0	0.0	0.0	0.0
1981	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.2	18.2	-141.2	6.3
1982	26.5	-29.4	-0.1	0.0	-0.4	-0.3	0.0	0.0	0.0	-0.1	0.0	0.0
1983	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1984	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1985	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1
1986	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0
1987	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.3	20.1	-129.8	-404.6	-363.5
1988	-172.8	-70.2	-18.9	-1.2	-0.1	0.0	0.0	7.0	29.2	-303.5	-372.1	-265.1
1989	-153.9	-59.7	-28.6	-11.9	-10.7	2.0	7.0	12.0	4.6	-18.5	-50.9	-12.1
1990	-1.4	-1.8	-1.6	-1.8	38.9	38.6	14.8	-54.0	-26.8	-402.9	-454.0	-307.3
1991	-175.4	-76.9	-39.9	-18.2	-7.0	-0.5	0.1	-45.4	-21.8	-336.5	-369.3	-251.1
1992	-143.6	-60.8	-36.0	-18.6	0.6	0.2	0.2	6.7	34.5	-365.1	-409.6	-263.6
1993	-139.0	-57.8	-33.8	1.6	0.6	0.3	0.0	0.4	6.9	18.4	7.7	1.9
1994	0.6	0.2	0.1	0.0	0.0	0.0	0.1	-11.9	-44.8	-71.3	-366.8	-263.3
1995	-93.6	-36.7	-19.4	0.2	0.1	0.0	0.0	0.0	0.1	0.2	2.1	1.1
1996	0.8	0.1	-0.3	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1997	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1998	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1999	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2001	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.3	27.8	-315.8	-364.0	-265.2
2002	-149.1	-47.4	-16.4	-0.2	7.8	5.8	10.8	7.0	2.9	1.4	0.6	0.3
2003	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.1	-8.7	16.9	7.3
Average	-39.5	-17.2	-7.8	-1.9	0.6	1.3	1.0	-6.4	-1.7	-73.4	-109.9	-76.8
Critical	-97.0	-41.0	-19.7	-7.6	3.5	5.0	2.3	-35.3	-17.1	-294.5	-400.5	-283.8
Dry	-50.5	-17.9	-7.5	-2.0	-0.5	1.3	3.0	4.8	9.2	-74.1	-160.0	-105.7
BN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AN	-49.1	-20.9	-10.2	0.3	0.2	0.1	0.0	0.1	1.3	1.6	4.1	1.5
Wet	-5.1	-5.1	-1.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1

Table E.3-69. Sacramento River location RSAC081 (EC) percent difference of No Groundwater Substitution from Base.

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1971	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1972	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1973	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1974	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1975	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1976	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-1.8	-0.7	-3.9	-5.5	-3.7
1977	-1.7	-0.7	-0.4	-0.3	-0.3	-0.1	0.0	-1.3	-0.5	-3.7	-4.3	-2.6
1978	-1.5	-0.6	-0.5	0.1	0.2	0.1	0.0	0.0	0.0	0.0	0.0	0.0
1979	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1980	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1981	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.4	-2.3	0.1
1982	0.3	-2.2	-0.1	0.0	-0.2	-0.2	0.0	0.0	0.0	0.0	0.0	0.0
1983	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1984	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1985	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1986	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1987	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.6	-2.6	-5.7	-4.2
1988	-1.8	-0.7	-0.5	-0.3	0.0	0.0	0.0	0.2	0.8	-5.0	-4.7	-2.8
1989	-1.4	-0.6	-0.3	-0.2	-0.3	0.5	2.7	1.4	0.2	-0.4	-0.9	-0.2
1990	0.0	0.0	0.0	-0.1	3.2	2.3	0.7	-1.7	-0.5	-5.4	-5.5	-3.2
1991	-1.6	-0.7	-0.4	-0.2	-0.2	-0.1	0.0	-1.5	-0.4	-4.5	-4.6	-2.6
1992	-1.3	-0.6	-0.3	-0.3	0.1	0.1	0.0	0.2	0.9	-5.9	-4.9	-2.8
1993	-1.4	-0.6	-0.5	0.4	0.3	0.1	0.0	0.2	2.7	1.4	0.2	0.1
1994	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.6	-0.9	-1.1	-5.0	-3.0
1995	-1.2	-0.4	-0.3	0.0	0.1	0.0	0.0	0.0	0.0	0.1	0.2	0.1
1996	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1997	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1998	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1999	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2001	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.9	-6.5	-5.4	-3.1
2002	-1.6	-0.6	-1.5	-0.1	2.2	1.3	2.5	0.8	0.1	0.0	0.0	0.0
2003	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	-0.4	0.4	0.3
Average	-0.4	-0.2	-0.1	0.0	0.1	0.1	0.2	-0.1	0.1	-1.1	-1.4	-0.8
Critical	-0.9	-0.4	-0.2	-0.2	0.4	0.3	0.1	-0.9	-0.2	-4.2	-4.9	-3.0
Dry	-0.5	-0.2	-0.3	-0.1	0.3	0.3	0.9	0.5	0.3	-1.5	-2.4	-1.2
BN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AN	-0.5	-0.2	-0.2	0.1	0.1	0.0	0.0	0.0	0.5	0.2	0.1	0.1
Wet	-0.1	-0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table E.3-70. Sacramento River location RSAC092 (EC) difference No Groundwater Substitution minus Base.

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1971	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1972	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1973	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1974	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1975	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1976	0.0	0.0	0.0	0.0	0.0	0.0	0.1	-34.2	-19.3	-106.9	-273.6	-237.9
1977	-100.3	-33.0	-15.5	-3.0	-1.4	-0.6	0.0	-32.8	-14.5	-277.5	-242.4	-205.6
1978	-85.2	-29.7	-5.8	0.2	0.2	0.1	0.0	0.0	0.0	0.0	0.0	0.0
1979	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1980	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1981	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	12.5	-88.3	44.5
1982	10.4	-4.0	0.0	0.0	-0.1	-0.1	0.0	0.0	0.0	0.0	0.0	0.0
1983	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1984	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1985	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1986	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1987	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.4	5.9	-57.6	-252.5	-201.0
1988	-76.9	-27.5	-3.7	-0.2	0.0	0.0	0.0	1.9	9.4	-164.8	-213.5	-175.1
1989	-84.8	-21.3	-8.9	-2.6	-2.3	0.3	0.5	0.8	0.8	-4.5	-22.0	-0.8
1990	-0.8	-0.7	-0.7	-0.7	3.6	5.0	2.3	-15.6	-4.5	-216.0	-235.9	-195.3
1991	-95.3	-37.3	-17.4	-5.9	-1.4	-0.1	0.0	-13.8	-2.7	-189.3	-192.0	-166.7
1992	-76.5	-27.6	-15.4	-3.9	0.1	0.0	0.0	2.2	10.8	-192.1	-223.8	-157.6
1993	-63.5	-22.6	-9.1	0.5	0.4	0.1	0.0	0.1	-0.1	1.2	1.7	0.4
1994	0.1	0.0	0.0	0.0	0.0	0.0	0.0	-2.3	-19.1	-17.4	-235.7	-114.0
1995	-35.4	-11.1	-5.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.2	0.1
1996	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1997	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1998	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1999	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2001	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.9	7.0	-125.3	-162.8	-153.7
2002	-64.2	-14.7	-2.7	0.0	0.5	0.3	0.6	0.4	0.6	0.3	0.2	0.1
2003	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	-1.3	8.7	0.5
Average	-19.8	-6.7	-2.5	-0.5	0.0	0.1	0.1	-2.7	-0.7	-39.4	-62.7	-45.9
Critical	-49.9	-18.0	-7.5	-2.0	0.1	0.6	0.4	-13.5	-5.7	-166.3	-231.0	-178.9
Dry	-24.8	-6.0	-1.9	-0.4	-0.3	0.1	0.2	0.6	2.4	-29.1	-87.6	-51.8
BN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AN	-24.8	-8.7	-2.5	0.1	0.1	0.0	0.0	0.0	0.0	0.0	1.7	0.1
Wet	-1.9	-1.2	-0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table E.3-71. Sacramento River location RSAC092 (EC) percent difference of No Groundwater Substitution from Base.

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1971	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1972	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1973	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1974	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1975	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1976	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-3.2	-0.9	-7.4	-11.1	-7.1
1977	-2.5	-1.0	-0.5	-0.3	-0.2	-0.1	0.0	-2.4	-0.6	-10.0	-8.2	-5.0
1978	-2.3	-0.9	-0.6	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1979	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1980	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1981	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.6	-6.2	2.1
1982	0.4	-1.2	0.0	0.0	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1983	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1984	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1985	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1986	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1987	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.9	-5.6	-12.3	-7.6
1988	-2.5	-1.0	-0.5	-0.1	0.0	0.0	0.0	0.3	1.3	-11.5	-8.5	-5.5
1989	-2.0	-0.9	-0.4	-0.2	-0.3	0.1	0.3	0.4	0.1	-0.5	-1.9	-0.1
1990	0.0	0.0	0.0	-0.1	1.3	1.6	0.6	-2.6	-0.3	-11.7	-9.3	-6.0
1991	-2.4	-0.9	-0.5	-0.3	-0.2	0.0	0.0	-2.2	-0.2	-10.0	-7.9	-5.0
1992	-2.0	-0.8	-0.4	-0.2	0.0	0.0	0.0	0.4	1.4	-13.0	-8.5	-5.1
1993	-2.0	-0.8	-0.6	0.2	0.2	0.1	0.0	0.1	-0.1	0.5	0.2	0.1
1994	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.6	-1.6	-1.4	-11.9	-4.6
1995	-1.5	-0.5	-0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0
1996	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1997	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1998	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1999	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2001	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	1.3	-12.9	-8.9	-5.8
2002	-2.3	-0.7	-0.9	0.0	0.2	0.1	0.3	0.2	0.1	0.0	0.0	0.0
2003	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	-0.4	1.2	0.1
Average	-0.6	-0.3	-0.1	0.0	0.0	0.1	0.0	-0.3	0.0	-2.4	-2.7	-1.4
Critical	-1.3	-0.5	-0.3	-0.2	0.1	0.2	0.1	-1.5	-0.1	-9.3	-9.3	-5.4
Dry	-0.7	-0.3	-0.2	0.0	0.0	0.0	0.1	0.2	0.4	-2.9	-4.9	-1.9
BN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AN	-0.7	-0.3	-0.2	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.2	0.0
Wet	-0.1	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table E.3-72. Sacramento River location RSAC101 (EC) difference No Groundwater Substitution minus Base.

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1971	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1972	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1973	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1974	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1975	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1976	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-3.7	-2.1	-7.8	-39.6	-35.1
1977	-13.8	-4.5	-2.1	-0.4	-0.1	-0.1	0.0	-3.6	-2.0	-46.6	-26.3	-35.0
1978	-12.2	-4.5	-0.6	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1979	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1980	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1981	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.5	-7.0	7.1
1982	-1.6	-0.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1983	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1984	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1985	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1986	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1987	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.4	-3.0	-32.0	-23.1
1988	-8.9	-3.7	-0.4	0.0	0.0	0.0	0.0	0.1	0.7	-13.0	-26.3	-28.9
1989	-13.4	-2.8	-1.3	-0.3	-0.3	0.1	0.2	0.0	0.0	-0.6	-1.8	0.3
1990	-0.3	-0.1	-0.1	0.0	0.4	0.4	0.2	-1.1	0.2	-19.0	-24.4	-28.5
1991	-14.0	-6.5	-3.0	-0.8	-0.2	0.0	0.0	-1.1	0.0	-16.2	-20.4	-26.1
1992	-11.1	-4.5	-2.4	-0.5	0.0	0.0	0.0	0.2	0.8	-16.0	-24.8	-19.8
1993	-7.2	-3.0	-0.9	0.3	0.3	0.1	0.0	0.0	0.0	0.0	0.2	0.0
1994	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	-2.3	-2.7	-27.9	-4.9
1995	-2.6	-0.9	-0.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1996	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1997	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1998	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1999	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2001	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.4	-6.7	-12.8	-16.4
2002	-5.8	-1.7	-0.4	0.1	0.1	0.0	0.1	0.0	0.0	0.0	0.0	0.0
2003	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.4	-0.3
Average	-2.7	-1.0	-0.3	0.0	0.0	0.0	0.0	-0.3	-0.1	-3.9	-7.1	-6.2
Critical	-6.9	-2.7	-1.1	-0.3	0.0	0.0	0.0	-1.3	-0.7	-17.3	-27.1	-25.5
Dry	-3.2	-0.8	-0.3	0.0	0.0	0.0	0.1	0.0	0.2	-1.8	-8.9	-5.3
BN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AN	-3.2	-1.2	-0.3	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.1	0.0
Wet	-0.3	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table E.3-73. Sacramento River location RSAC101 (EC) percent difference of No Groundwater Substitution from Base.

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1971	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1972	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1973	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1974	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1975	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1976	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-1.5	-0.6	-2.6	-9.3	-7.0
1977	-2.4	-1.0	-0.5	-0.1	-0.1	0.0	0.0	-1.3	-0.5	-10.5	-6.0	-5.4
1978	-2.3	-0.9	-0.2	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1979	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1980	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1981	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.2	-2.3	1.9
1982	-0.4	-0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1983	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1984	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1985	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1986	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1987	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	-1.3	-9.1	-5.6
1988	-1.9	-0.9	-0.2	0.0	0.0	0.0	0.0	0.1	0.3	-4.7	-6.3	-5.7
1989	-2.0	-0.7	-0.3	-0.1	-0.1	0.0	0.1	0.0	0.0	-0.2	-0.7	0.1
1990	-0.1	0.0	0.0	0.0	0.2	0.2	0.1	-0.6	0.1	-5.8	-5.6	-5.6
1991	-2.2	-1.0	-0.5	-0.2	-0.1	0.0	0.0	-0.5	0.0	-4.8	-4.9	-5.0
1992	-1.9	-0.8	-0.4	-0.2	0.0	0.0	0.0	0.1	0.4	-5.6	-5.9	-4.2
1993	-1.5	-0.7	-0.3	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.1	0.0
1994	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	-0.9	-1.0	-7.6	-1.2
1995	-0.7	-0.3	-0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1996	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1997	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1998	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1999	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2001	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	-2.9	-4.0	-4.2
2002	-1.4	-0.5	-0.2	0.0	0.1	0.0	0.1	0.0	0.0	0.0	0.0	0.0
2003	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	-0.1
Average	-0.5	-0.2	-0.1	0.0	0.0	0.0	0.0	-0.1	0.0	-1.2	-1.8	-1.2
Critical	-1.2	-0.5	-0.2	-0.1	0.0	0.0	0.0	-0.6	-0.2	-5.0	-6.5	-4.9
Dry	-0.6	-0.2	-0.1	0.0	0.0	0.0	0.0	0.0	0.1	-0.8	-2.7	-1.3
BN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AN	-0.6	-0.3	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Wet	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table E.3-74. San Joaquin River location RSAN007 (EC) difference No Groundwater Substitution minus Base.

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	-0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1971	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1972	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1973	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1974	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	-0.1
1975	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1976	0.0	0.0	0.0	0.0	0.0	0.0	0.3	-53.9	-37.5	-168.8	-242.4	-246.4
1977	-151.8	-63.3	-34.1	-11.5	-4.9	-2.0	-0.1	-48.6	-28.5	-116.3	-288.1	-187.2
1978	-117.6	-53.3	-22.0	-0.5	0.3	0.2	0.0	0.0	0.1	0.0	0.0	0.0
1979	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0
1980	0.0	0.0	0.0	0.0	0.0	-0.1	-0.1	0.0	0.0	0.0	0.0	0.0
1981	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	-5.2	-59.9	-21.4
1982	18.4	-12.3	-0.8	0.1	-1.8	-1.2	0.1	0.0	-0.1	0.0	0.0	0.0
1983	0.0	0.0	0.0	0.0	0.2	0.2	0.1	-0.1	0.0	0.0	0.0	0.0
1984	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1985	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1986	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.0
1987	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.2	13.8	-49.2	-191.8	-254.7
1988	-138.1	-55.2	-15.2	-1.3	-0.1	0.0	0.0	4.1	19.6	-143.5	-228.3	-170.0
1989	-126.3	-48.5	-22.9	-9.1	-6.7	0.7	1.7	4.8	2.6	-15.7	-32.2	-11.9
1990	-1.4	-1.5	-1.3	-1.3	18.2	22.4	9.1	-31.2	-14.4	-237.5	-318.8	-213.4
1991	-142.7	-63.6	-32.3	-13.1	-4.6	-0.6	0.0	-27.7	-14.2	-197.7	-248.8	-169.3
1992	-116.1	-49.2	-29.0	-14.4	-0.6	0.1	0.1	4.4	25.2	-195.8	-283.0	-182.4
1993	-103.4	-43.0	-27.3	0.2	0.7	0.4	0.1	0.2	1.0	9.4	5.8	1.9
1994	0.5	0.2	0.1	0.0	0.0	0.0	0.1	-6.1	-32.0	-67.7	-190.3	-195.8
1995	-66.5	-26.2	-15.8	-0.4	0.2	0.1	0.1	0.0	0.0	0.1	1.1	0.8
1996	0.3	0.1	-0.1	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0
1997	0.0	0.0	0.0	-0.2	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1998	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.1	0.1	0.0	0.0	0.0
1999	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0
2000	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.0
2001	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.2	18.7	-155.8	-219.4	-169.7
2002	-114.8	-37.4	-10.9	-0.5	2.6	2.5	2.9	2.3	1.6	1.1	0.5	0.3
2003	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.7	-0.9	6.6	1.6
Average	-31.2	-13.3	-6.2	-1.5	0.1	0.7	0.4	-4.3	-1.3	-39.5	-67.3	-53.5
Critical	-78.5	-33.2	-16.0	-5.9	1.1	2.8	1.3	-22.7	-11.7	-161.1	-257.1	-194.9
Dry	-40.2	-14.3	-5.6	-1.6	-0.7	0.5	0.8	2.1	6.1	-37.5	-83.8	-76.2
BN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AN	-36.8	-16.0	-8.2	-0.1	0.2	0.1	0.0	0.1	0.3	1.4	2.1	0.6
Wet	-3.7	-3.0	-1.3	0.0	-0.1	-0.1	0.0	0.0	0.0	0.0	0.1	0.0

Table E.3-75. San Joaquin River location RSAN007 (EC) percent difference of No Groundwater Substitution from Base.

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1971	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1972	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1973	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1974	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1975	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1976	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-2.2	-0.9	-3.6	-4.8	-3.8
1977	-2.0	-0.9	-0.5	-0.3	-0.3	-0.1	0.0	-1.5	-0.6	-2.1	-4.3	-2.5
1978	-1.7	-0.8	-0.6	-0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0
1979	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1980	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1981	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.2	-1.4	-0.4
1982	0.3	-0.8	-0.3	0.0	-0.8	-0.5	0.0	0.0	0.0	0.0	0.0	0.0
1983	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0
1984	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1985	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1986	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1987	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.7	-1.6	-4.3	-4.4
1988	-2.1	-0.9	-0.6	-0.3	0.0	0.0	0.0	0.3	1.1	-3.8	-4.5	-2.7
1989	-1.6	-0.8	-0.4	-0.2	-0.3	0.2	0.8	1.2	0.2	-0.5	-0.8	-0.3
1990	0.0	0.0	0.0	-0.1	2.7	2.6	0.9	-2.0	-0.4	-4.6	-5.7	-3.2
1991	-1.9	-0.8	-0.4	-0.3	-0.2	-0.1	0.0	-1.8	-0.4	-3.7	-4.5	-2.6
1992	-1.6	-0.7	-0.4	-0.3	-0.1	0.0	0.0	0.3	1.1	-5.0	-4.9	-2.8
1993	-1.7	-0.7	-0.6	0.0	0.3	0.2	0.0	0.1	0.5	1.3	0.2	0.1
1994	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.6	-1.2	-1.5	-3.7	-3.1
1995	-1.4	-0.5	-0.3	-0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.2	0.1
1996	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1997	0.0	0.0	0.0	-0.1	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1998	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1999	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2001	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	1.3	-5.2	-5.2	-2.9
2002	-1.8	-0.7	-1.0	-0.2	1.0	0.9	1.1	0.6	0.1	0.0	0.0	0.0
2003	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	-0.1	0.3	0.1
Average	-0.5	-0.2	-0.2	-0.1	0.1	0.1	0.1	-0.2	0.0	-0.9	-1.3	-0.8
Critical	-1.1	-0.5	-0.3	-0.2	0.3	0.3	0.1	-1.1	-0.2	-3.5	-4.6	-3.0
Dry	-0.6	-0.2	-0.2	-0.1	0.1	0.2	0.3	0.4	0.4	-1.2	-2.0	-1.3
BN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AN	-0.6	-0.2	-0.2	0.0	0.1	0.0	0.0	0.0	0.1	0.2	0.1	0.0
Wet	-0.1	-0.1	-0.1	0.0	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table E.3-76. San Joaquin River location RSAN018 (EC) difference No Groundwater Substitution minus Base.

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1971	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1972	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1973	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0
1974	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1
1975	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1976	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-13.0	-12.4	33.3	-16.0	-61.1
1977	-62.6	-29.2	-17.0	-7.2	-1.8	-0.7	-0.2	-12.7	-11.9	43.3	-39.6	-38.7
1978	-44.9	-23.3	-11.6	-0.2	0.5	0.2	0.0	0.1	0.1	0.0	0.0	0.0
1979	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0
1980	0.0	0.0	0.0	0.0	0.0	-0.1	-0.1	0.1	0.0	0.0	0.0	0.0
1981	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	-47.0	67.7	-30.5
1982	-14.8	-11.9	-0.8	0.1	-2.1	-1.1	0.1	0.0	-0.1	0.0	0.0	0.0
1983	0.0	0.0	-0.1	0.0	0.2	0.2	0.1	-0.1	0.0	0.0	0.0	0.0
1984	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1985	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1986	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.0
1987	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.6	3.6	40.7	31.0	-46.0
1988	-49.2	-23.5	-9.1	-1.1	-0.1	0.0	0.0	0.7	3.7	62.7	-15.5	-32.3
1989	-51.1	-23.4	-12.2	-5.3	-2.1	0.3	0.5	0.6	0.6	-10.2	5.9	-3.6
1990	-2.3	-0.8	-0.6	-0.6	3.1	5.5	2.4	-4.7	-2.1	68.0	-36.7	-40.8
1991	-54.9	-30.0	-15.8	-5.8	-1.9	-0.3	0.0	-5.1	-3.7	61.1	-25.1	-32.5
1992	-45.3	-22.6	-13.2	-6.4	-0.5	0.0	0.0	0.9	6.7	46.2	-38.7	-35.6
1993	-32.4	-15.9	-13.0	0.2	1.1	0.4	0.1	0.2	-0.9	1.4	3.0	1.3
1994	0.2	0.1	0.0	0.0	0.0	0.0	0.0	-0.7	-8.2	-63.4	55.2	-0.3
1995	-15.3	-8.3	-8.3	-0.2	0.2	0.1	0.1	0.0	0.1	0.0	0.2	0.3
1996	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0
1997	0.0	0.0	0.0	-0.2	-0.1	0.0	0.0	0.0	0.1	0.0	0.0	0.0
1998	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.1	0.1	0.0	0.0	0.0
1999	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0
2000	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.0
2001	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	3.7	51.5	0.0	-15.0
2002	-34.2	-17.0	-7.3	-0.4	0.3	0.3	0.2	0.2	0.3	0.6	0.3	0.2
2003	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	8.5	-10.0	-10.6
Average	-12.0	-6.0	-3.2	-0.8	-0.1	0.1	0.1	-0.9	-0.6	8.7	-0.6	-10.2
Critical	-30.6	-15.1	-8.0	-3.0	-0.2	0.6	0.3	-5.0	-4.0	35.9	-16.6	-34.5
Dry	-14.2	-6.7	-3.3	-1.0	-0.3	0.1	0.1	0.3	1.4	5.9	17.5	-15.8
BN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0
AN	-12.9	-6.5	-4.1	0.0	0.3	0.1	0.0	0.1	-0.1	1.7	-1.2	-1.5
Wet	-2.3	-1.6	-0.7	0.0	-0.1	-0.1	0.0	0.0	0.0	0.0	0.0	0.0

Table E.3-77. San Joaquin River location RSAN018 (EC) percent difference of No Groundwater Substitution from Base.

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1971	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1972	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1973	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1974	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1975	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1976	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-2.3	-1.3	1.5	-0.9	-2.9
1977	-2.6	-1.4	-0.6	-0.4	-0.3	-0.2	0.0	-1.7	-0.9	2.7	-1.6	-1.4
1978	-2.2	-1.1	-0.7	-0.1	0.2	0.1	0.0	0.0	0.0	0.0	0.0	0.0
1979	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1980	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1981	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-3.6	3.8	-1.2
1982	-0.5	-0.8	-0.3	0.0	-1.0	-0.5	0.0	0.0	-0.1	0.0	0.0	0.0
1983	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0
1984	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1985	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1986	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1987	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.8	4.1	2.5	-2.5
1988	-2.4	-1.2	-0.7	-0.3	0.0	0.0	0.0	0.2	0.9	5.4	-1.0	-1.7
1989	-2.0	-1.1	-0.5	-0.3	-0.3	0.1	0.2	0.3	0.1	-0.7	0.3	-0.2
1990	-0.1	0.0	0.0	-0.1	0.8	1.6	0.7	-1.3	-0.3	3.3	-1.8	-1.8
1991	-2.3	-1.2	-0.6	-0.4	-0.2	-0.1	0.0	-1.3	-0.4	2.8	-1.3	-1.5
1992	-1.9	-1.0	-0.6	-0.3	-0.1	0.0	0.0	0.2	1.2	3.6	-2.0	-1.6
1993	-1.8	-0.9	-0.7	0.1	0.4	0.2	0.0	0.1	-0.4	0.5	0.3	0.1
1994	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.2	-1.5	-2.8	2.5	0.0
1995	-1.0	-0.5	-0.4	-0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.1	0.1
1996	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1997	0.0	0.0	0.0	-0.1	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1998	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0
1999	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2001	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	1.0	5.4	0.0	-0.8
2002	-1.8	-0.9	-1.0	-0.2	0.1	0.2	0.1	0.1	0.1	0.0	0.0	0.0
2003	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	1.7	-0.9	-1.1
Average	-0.6	-0.3	-0.2	-0.1	0.0	0.0	0.0	-0.2	0.0	0.7	0.0	-0.5
Critical	-1.3	-0.7	-0.4	-0.2	0.0	0.2	0.1	-0.9	-0.3	2.3	-0.9	-1.6
Dry	-0.6	-0.3	-0.3	-0.1	0.0	0.0	0.0	0.1	0.3	0.9	1.1	-0.8
BN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AN	-0.7	-0.3	-0.2	0.0	0.1	0.0	0.0	0.0	-0.1	0.4	-0.1	-0.2
Wet	-0.1	-0.1	-0.1	0.0	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table E.3-78. San Joaquin River location RSAN032 (EC) difference No Groundwater Substitution minus Base.

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1971	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1972	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1973	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1974	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1975	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1976	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-2.1	-2.7	15.8	-24.8	-31.1
1977	-19.1	-8.0	-5.3	-2.8	-0.8	-0.3	-0.1	-2.4	-2.9	-20.4	-16.1	-26.5
1978	-17.1	-7.2	-3.9	0.4	0.7	0.2	0.0	0.1	0.0	0.0	0.0	0.0
1979	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0
1980	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	0.1	0.0	0.0	0.0	0.0
1981	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-11.9	6.7	10.0
1982	-7.1	-6.1	0.0	0.0	-0.9	-0.3	0.0	-0.1	-0.1	0.0	0.0	0.0
1983	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1984	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1985	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1986	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0
1987	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.4	4.6	-7.6	-15.2
1988	-10.0	-5.7	-3.1	-0.4	-0.1	0.0	0.0	0.1	0.5	7.4	-4.0	-19.7
1989	-15.4	-6.3	-3.7	-2.2	-0.8	0.4	0.6	0.2	0.1	-2.2	1.1	1.6
1990	-0.8	-0.3	-0.2	-0.2	0.7	0.9	0.6	-0.4	-0.4	14.7	-3.5	-21.5
1991	-16.7	-9.2	-5.4	-2.7	-0.9	-0.1	0.0	-0.7	-0.6	13.2	-3.2	-17.9
1992	-13.7	-6.9	-4.5	-2.5	0.0	0.0	0.0	0.1	0.7	5.2	-7.6	-16.3
1993	-8.6	-4.2	-3.5	0.9	1.0	0.2	0.0	0.2	-2.4	-0.6	0.4	0.2
1994	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	-1.1	-14.5	-14.3	11.3
1995	-1.2	-1.3	-2.0	0.2	0.2	0.0	0.0	0.0	0.1	0.0	0.0	0.0
1996	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1997	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1998	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0
1999	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0
2000	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0
2001	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.3	7.5	1.8	-9.3
2002	-7.2	-3.8	-2.6	0.1	0.3	0.1	0.2	0.1	0.0	0.1	0.1	0.0
2003	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.3	-2.0	-2.4
Average	-3.4	-1.7	-1.0	-0.3	0.0	0.0	0.1	-0.1	-0.2	0.6	-2.1	-4.0
Critical	-8.6	-4.3	-2.6	-1.2	-0.1	0.1	0.1	-0.8	-0.9	3.1	-10.5	-17.4
Dry	-3.8	-1.7	-1.0	-0.4	-0.1	0.1	0.1	0.1	0.1	-0.3	0.3	-2.1
BN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0
AN	-4.3	-1.9	-1.2	0.2	0.3	0.1	0.0	0.1	-0.4	0.1	-0.3	-0.4
Wet	-0.6	-0.6	-0.2	0.0	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table E.3-79. San Joaquin River location RSAN032 (EC) percent difference of No Groundwater Substitution from Base.

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1971	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1972	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1973	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1974	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1975	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1976	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.7	-0.8	3.4	-4.7	-5.8
1977	-3.1	-1.4	-0.7	-0.4	-0.2	-0.1	0.0	-0.8	-0.8	-4.7	-3.1	-3.5
1978	-2.7	-1.3	-0.7	0.2	0.3	0.1	0.0	0.0	0.0	0.0	0.0	0.0
1979	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1980	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1981	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-3.7	1.6	1.9
1982	-1.2	-1.4	0.0	0.0	-0.5	-0.2	0.0	0.0	0.0	0.0	0.0	0.0
1983	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1984	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1985	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1986	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1987	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	1.7	-2.1	-3.6
1988	-2.0	-1.2	-0.6	-0.2	0.0	0.0	0.0	0.0	0.2	2.6	-0.9	-3.9
1989	-2.4	-1.1	-0.5	-0.3	-0.2	0.2	0.3	0.1	0.0	-0.6	0.2	0.4
1990	-0.2	0.0	0.0	0.0	0.3	0.4	0.2	-0.2	-0.1	3.4	-0.6	-3.8
1991	-2.5	-1.3	-0.7	-0.4	-0.2	0.0	0.0	-0.3	-0.2	2.8	-0.6	-3.3
1992	-2.2	-1.1	-0.6	-0.4	0.0	0.0	0.0	0.0	0.3	1.7	-1.6	-3.0
1993	-1.7	-0.9	-0.6	0.3	0.4	0.1	0.0	0.1	-1.1	-0.3	0.2	0.1
1994	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.5	-3.1	-2.6	2.1
1995	-0.3	-0.3	-0.4	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1996	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1997	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1998	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1999	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2001	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	2.9	0.5	-2.2
2002	-1.5	-0.8	-0.8	0.0	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0
2003	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.6	-0.7	-0.9
Average	-0.6	-0.3	-0.2	0.0	0.0	0.0	0.0	0.0	-0.1	0.2	-0.4	-0.8
Critical	-1.4	-0.7	-0.4	-0.2	0.0	0.0	0.0	-0.3	-0.3	0.9	-2.0	-3.0
Dry	-0.6	-0.3	-0.2	0.0	0.0	0.0	0.1	0.0	0.1	0.1	0.0	-0.6
BN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AN	-0.7	-0.4	-0.2	0.1	0.1	0.0	0.0	0.0	-0.2	0.1	-0.1	-0.1
Wet	-0.1	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table E.3-80. Sacramento River location RSAC081 (EC) difference No Crop Idle minus Base.

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	-0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1971	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1972	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1973	0.0	0.0	0.0	0.0	0.0	-0.6	-2.1	-0.8	-0.2	0.0	0.0	0.0
1974	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.2	-0.1
1975	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1976	0.0	0.0	0.0	0.0	0.0	0.0	0.7	-1.2	41.2	-270.2	-549.6	-503.1
1977	-258.7	-97.6	-45.3	-10.5	-9.7	-2.8	-0.9	15.4	30.9	-272.4	-394.9	-297.8
1978	-168.5	-63.0	12.1	2.3	0.5	0.2	0.2	0.6	4.6	5.6	2.1	0.5
1979	0.2	0.1	-0.7	7.3	0.8	0.5	1.6	1.9	2.1	0.8	0.4	0.0
1980	1.5	18.9	35.0	1.5	-0.3	0.1	0.3	0.9	0.8	0.2	0.1	0.0
1981	-0.1	0.5	-0.8	5.1	0.9	0.6	1.9	6.3	6.9	-55.8	-381.4	-278.8
1982	-107.3	-22.2	-0.1	0.1	-0.3	-0.3	0.0	0.0	0.6	1.3	0.7	-0.1
1983	8.9	1.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	1.3	0.8
1984	4.1	0.2	0.0	0.0	0.0	0.0	0.4	2.4	2.1	0.5	0.1	0.0
1985	-0.3	5.3	4.3	7.2	5.3	1.5	1.5	3.5	3.1	1.6	1.7	1.6
1986	1.2	1.0	10.7	2.6	0.0	0.0	0.2	0.4	0.4	0.1	0.1	0.0
1987	0.0	0.0	0.3	3.7	1.8	0.4	0.8	1.6	11.7	-245.0	-621.5	-542.1
1988	-249.9	-99.9	38.0	12.0	2.8	3.0	27.9	20.2	23.4	-441.2	-534.6	-390.8
1989	-217.2	-71.7	75.4	74.0	12.8	4.8	10.0	17.5	10.3	-32.3	-239.6	-169.7
1990	-64.2	-25.7	-10.9	21.6	63.3	82.3	36.1	36.5	52.1	-434.1	-534.6	-403.0
1991	-227.6	-89.6	-38.7	-11.2	44.7	14.4	20.0	68.5	80.5	-294.3	-379.8	-290.7
1992	-160.1	-59.8	-25.3	-12.1	9.8	9.0	33.4	38.3	31.3	-419.7	-541.1	-389.4
1993	-205.3	-72.5	101.8	12.2	0.9	1.4	0.3	1.6	10.8	26.0	11.0	2.7
1994	1.2	0.7	-0.7	45.1	23.2	30.8	32.4	34.3	58.0	-63.1	-405.7	-338.4
1995	-143.9	-50.2	33.4	4.1	0.4	0.0	0.1	0.0	0.1	1.3	19.6	9.9
1996	1.8	0.0	13.7	1.1	0.0	0.0	0.0	0.1	5.4	7.8	2.7	0.3
1997	0.0	-1.3	0.1	0.0	0.0	0.5	1.7	4.9	5.3	1.9	0.1	0.6
1998	0.4	0.1	9.9	1.6	0.0	0.0	0.0	0.0	0.0	0.1	4.3	3.8
1999	2.7	4.7	0.7	0.0	0.0	0.0	0.1	0.7	4.9	3.7	1.3	0.2
2000	0.0	0.0	-0.1	9.5	0.1	0.0	0.3	1.1	2.4	1.1	0.2	0.0
2001	0.0	-0.1	1.6	10.4	1.7	0.4	2.3	23.4	38.6	-415.8	-479.6	-379.4
2002	-210.7	37.4	22.3	0.7	14.2	15.4	18.6	19.8	18.1	7.0	6.2	5.7
2003	1.1	-1.0	6.9	0.1	0.5	2.2	0.7	0.1	29.3	-14.5	-44.6	-34.1
Average	-58.6	-17.2	7.2	5.5	5.1	4.8	5.5	8.8	14.0	-85.3	-148.7	-117.4
Critical	-137.0	-53.2	-11.8	6.4	19.2	19.5	21.4	30.3	45.4	-313.6	-477.2	-373.3
Dry	-71.4	-4.8	17.2	16.9	6.1	3.8	5.9	12.0	14.8	-123.4	-285.7	-227.1
BN	0.1	0.0	-0.3	3.6	0.4	0.2	0.8	1.0	1.1	0.4	0.2	0.0
AN	-61.9	-19.6	26.0	4.3	0.3	0.6	-0.1	0.6	8.0	3.1	-5.2	-5.1
Wet	-17.9	-5.1	5.3	0.7	0.0	0.0	0.2	0.7	1.4	1.3	2.3	1.2

Table E.3-81. Sacramento River location RSAC081 (EC) percent difference of No Crop Idle from Base.

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1971	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1972	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1973	0.0	0.0	0.0	0.0	0.0	-0.3	-0.8	-0.2	0.0	0.0	0.0	0.0
1974	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1975	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1976	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.6	-4.1	-7.1	-5.3
1977	-2.3	-0.9	-0.4	-0.2	-0.3	-0.1	0.0	0.3	0.4	-3.1	-4.2	-2.8
1978	-1.6	-0.6	0.2	0.8	0.2	0.1	0.1	0.3	0.8	0.3	0.0	0.0
1979	0.0	0.0	0.0	0.5	0.3	0.2	0.5	0.5	0.2	0.0	0.0	0.0
1980	0.0	0.3	1.1	0.6	-0.2	0.0	0.1	0.3	0.1	0.0	0.0	0.0
1981	0.0	0.0	0.0	0.4	0.3	0.2	0.4	0.4	0.2	-1.3	-6.2	-3.5
1982	-1.1	-1.7	-0.1	0.0	-0.2	-0.1	0.0	0.0	0.2	0.1	0.0	0.0
1983	1.3	0.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.2
1984	0.5	0.1	0.0	0.0	0.0	0.0	0.2	0.4	0.1	0.0	0.0	0.0
1985	0.0	0.8	0.6	0.5	0.5	0.2	0.2	0.3	0.1	0.0	0.0	0.0
1986	0.0	0.0	0.3	0.4	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.0
1987	0.0	0.0	0.0	0.1	0.2	0.1	0.1	0.1	0.3	-4.9	-8.8	-6.3
1988	-2.5	-1.0	1.0	2.8	0.5	0.1	1.1	0.7	0.6	-7.3	-6.7	-4.2
1989	-1.9	-0.8	0.9	1.4	0.3	1.3	3.9	2.1	0.3	-0.7	-4.3	-2.9
1990	-0.8	-0.3	-0.1	0.8	5.2	4.8	1.7	1.2	0.9	-5.8	-6.5	-4.2
1991	-2.1	-0.8	-0.4	-0.2	1.0	2.5	2.7	2.3	1.3	-3.9	-4.7	-3.0
1992	-1.5	-0.6	-0.2	-0.2	1.3	2.3	3.2	1.2	0.8	-6.8	-6.4	-4.2
1993	-2.1	-0.8	1.5	3.1	0.4	0.7	0.2	0.8	4.2	2.0	0.3	0.1
1994	0.0	0.0	0.0	1.2	2.8	2.6	2.1	1.7	1.2	-1.0	-5.6	-3.9
1995	-1.8	-0.6	0.5	1.3	0.2	0.0	0.0	0.0	0.1	0.5	1.7	0.9
1996	0.2	0.0	1.7	0.5	0.0	0.0	0.0	0.0	0.9	0.4	0.1	0.0
1997	0.0	-0.1	0.1	0.0	0.0	0.2	0.6	0.8	0.3	0.1	0.0	0.1
1998	0.0	0.0	0.6	0.5	0.0	0.0	0.0	0.0	0.0	0.1	0.7	0.7
1999	0.2	0.7	0.3	0.0	0.0	0.0	0.0	0.3	0.6	0.2	0.0	0.0
2000	0.0	0.0	0.0	0.9	0.0	0.0	0.1	0.3	0.1	0.0	0.0	0.0
2001	0.0	0.0	0.0	0.4	0.5	0.1	0.4	1.3	1.3	-8.6	-7.1	-4.5
2002	-2.2	0.4	2.0	0.3	3.9	3.5	4.2	2.4	0.6	0.1	0.1	0.1
2003	0.0	0.0	0.7	0.1	0.2	0.8	0.3	0.1	2.4	-0.7	-1.1	-1.3
Average	-0.5	-0.2	0.3	0.5	0.5	0.6	0.6	0.5	0.5	-1.3	-1.9	-1.3
Critical	-1.3	-0.5	0.0	0.6	1.5	1.8	1.5	1.0	0.8	-4.6	-5.9	-3.9
Dry	-0.7	0.1	0.6	0.5	1.0	0.9	1.5	1.1	0.5	-2.5	-4.4	-2.8
BN	0.0	0.0	0.0	0.3	0.2	0.1	0.3	0.3	0.1	0.0	0.0	0.0
AN	-0.6	-0.2	0.6	0.9	0.1	0.2	0.0	0.2	1.3	0.3	-0.1	-0.2
Wet	-0.1	-0.1	0.3	0.2	0.0	0.0	0.1	0.1	0.2	0.1	0.2	0.2

Table E.3-82. Sacramento River location RSAC092 (EC) difference No Crop Idle minus Base.

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1971	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1972	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1973	0.0	0.0	0.0	0.0	0.0	-0.2	-1.3	-0.3	-0.1	0.0	0.0	0.0
1974	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1975	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1976	0.0	0.0	0.0	0.0	0.0	0.0	0.1	-0.3	23.4	-113.4	-357.1	-331.2
1977	-133.3	-34.0	-10.8	-3.5	-1.7	0.4	0.6	8.3	17.7	-238.7	-237.9	-216.1
1978	-88.7	-18.1	2.1	0.5	0.3	0.1	0.1	0.1	0.4	0.6	0.5	0.1
1979	0.0	0.0	-0.2	0.9	0.3	0.1	0.2	0.2	0.2	0.1	0.1	0.0
1980	1.5	4.7	5.5	0.2	-0.1	0.0	0.0	0.1	0.1	0.0	0.0	0.0
1981	0.0	0.1	-0.2	0.5	0.1	0.0	0.1	1.0	2.0	-14.8	-182.2	-97.8
1982	-42.8	-4.2	0.0	0.0	-0.1	-0.1	0.0	0.0	0.0	0.1	0.1	0.0
1983	0.4	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1984	0.3	0.0	0.0	0.0	0.0	0.0	0.1	0.2	0.3	0.1	0.0	0.0
1985	0.0	0.3	0.3	0.8	0.4	0.2	0.2	0.4	0.8	0.5	1.0	0.8
1986	1.0	0.8	1.5	0.3	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0
1987	0.0	0.0	0.2	0.7	0.2	0.0	0.5	1.4	4.5	-102.4	-364.1	-289.0
1988	-105.2	-31.8	4.8	1.0	0.2	2.3	5.9	5.4	7.5	-227.3	-292.9	-245.0
1989	-104.3	-14.4	38.0	23.8	5.6	0.7	0.8	1.5	3.4	-10.9	-89.9	-50.9
1990	-18.6	-4.6	1.3	2.0	5.7	11.1	5.7	9.6	22.5	-234.0	-278.2	-250.7
1991	-116.1	-28.3	-6.9	2.8	11.5	1.9	2.4	18.8	38.1	-169.9	-200.9	-186.8
1992	-75.7	-16.1	3.8	0.9	1.3	0.8	3.9	10.6	11.5	-220.8	-307.2	-220.8
1993	-102.1	-17.8	33.6	1.9	0.6	0.6	0.1	0.3	0.0	1.8	2.5	0.6
1994	0.2	0.1	-0.1	9.6	2.5	4.0	4.1	5.8	22.3	-19.7	-246.9	-156.4
1995	-53.1	-7.6	8.4	0.6	0.2	0.0	0.0	0.0	0.0	0.2	2.2	1.0
1996	0.1	0.0	0.8	0.2	0.0	0.0	0.0	0.0	0.4	1.0	0.7	0.1
1997	0.0	-0.1	0.1	0.0	0.0	0.0	0.1	0.4	0.8	0.2	-0.1	0.1
1998	0.4	0.0	1.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.2
1999	0.2	0.3	0.0	0.0	0.0	0.0	0.0	0.1	0.5	0.4	0.3	0.0
2000	0.0	0.0	0.1	0.9	0.0	0.0	0.1	0.1	0.3	0.1	0.0	0.0
2001	0.0	0.0	0.6	1.5	0.1	0.0	0.2	4.6	9.9	-160.9	-207.7	-213.6
2002	-87.2	24.1	4.4	0.3	0.8	0.8	1.0	1.6	5.2	1.5	4.2	2.0
2003	-0.1	0.9	1.1	0.1	0.0	0.1	0.1	0.0	4.7	-1.3	-10.3	-6.9
Average	-27.2	-4.3	2.6	1.4	0.8	0.7	0.7	2.1	5.2	-44.3	-81.3	-66.5
Critical	-64.1	-16.4	-1.1	1.8	2.8	2.9	3.2	8.3	20.4	-174.8	-274.4	-229.6
Dry	-31.9	1.7	7.2	4.6	1.2	0.3	0.5	1.8	4.3	-47.8	-139.8	-108.1
BN	0.0	0.0	-0.1	0.5	0.2	0.1	0.1	0.1	0.1	0.1	0.0	0.0
AN	-31.6	-5.1	7.1	0.6	0.2	0.1	-0.2	0.1	0.9	0.2	-1.2	-1.0
Wet	-7.2	-0.8	0.9	0.1	0.0	0.0	0.0	0.1	0.2	0.2	0.3	0.1

Table E.3-83. Sacramento River location RSAC092 (EC) percent difference of No Crop Idle from Base.

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1971	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1972	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1973	0.0	0.0	0.0	0.0	0.0	-0.1	-0.7	-0.2	0.0	0.0	0.0	0.0
1974	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1975	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1976	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.1	-7.9	-14.5	-9.9
1977	-3.4	-1.1	-0.4	-0.4	-0.3	0.1	0.1	0.6	0.7	-8.6	-8.1	-5.2
1978	-2.4	-0.5	0.2	0.3	0.2	0.1	0.1	0.1	0.2	0.2	0.1	0.0
1979	0.0	0.0	0.0	0.3	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0
1980	0.1	0.4	1.1	0.1	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0
1981	0.0	0.0	0.0	0.2	0.0	0.0	0.1	0.3	0.4	-1.9	-12.8	-4.6
1982	-1.5	-1.2	0.0	0.0	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1983	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1984	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.0
1985	0.0	0.1	0.1	0.3	0.2	0.1	0.1	0.2	0.1	0.1	0.1	0.0
1986	0.0	0.0	0.2	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1987	0.0	0.0	0.0	0.1	0.1	0.0	0.2	0.3	0.7	-9.9	-17.8	-10.9
1988	-3.4	-1.1	0.7	0.4	0.1	0.5	1.3	1.0	1.0	-15.9	-11.6	-7.6
1989	-2.5	-0.6	1.9	2.3	0.7	0.4	0.4	0.7	0.6	-1.2	-7.7	-3.9
1990	-1.0	-0.2	0.1	0.4	2.1	3.5	1.5	1.6	1.5	-12.7	-11.0	-7.7
1991	-3.0	-0.7	-0.2	0.2	1.4	0.8	1.0	3.1	2.5	-9.0	-8.2	-5.6
1992	-1.9	-0.4	0.1	0.1	0.5	0.4	1.5	1.7	1.5	-14.9	-11.6	-7.1
1993	-3.2	-0.6	2.4	0.8	0.3	0.3	0.1	0.2	0.0	0.7	0.3	0.1
1994	0.0	0.0	0.0	1.3	1.0	1.5	1.4	1.6	1.9	-1.6	-12.5	-6.3
1995	-2.3	-0.3	0.6	0.3	0.1	0.0	0.0	0.0	0.0	0.1	0.9	0.4
1996	0.1	0.0	0.4	0.1	0.0	0.0	0.0	0.0	0.2	0.3	0.1	0.0
1997	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.2	0.1	0.0	0.0
1998	0.1	0.0	0.4	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1
1999	0.1	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.1	0.0	0.0
2000	0.0	0.0	0.0	0.3	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.0
2001	0.0	0.0	0.1	0.3	0.1	0.0	0.1	1.2	1.9	-16.5	-11.4	-8.1
2002	-3.1	1.2	1.4	0.1	0.4	0.4	0.5	0.7	0.8	0.2	0.3	0.1
2003	0.0	0.0	0.4	0.0	0.0	0.0	0.0	0.0	1.7	-0.4	-1.4	-1.4
Average	-0.8	-0.1	0.3	0.2	0.2	0.2	0.2	0.4	0.5	-2.9	-3.7	-2.3
Critical	-1.8	-0.5	0.0	0.3	0.7	1.0	1.0	1.4	1.4	-10.1	-11.1	-7.1
Dry	-0.9	0.1	0.6	0.5	0.3	0.1	0.2	0.6	0.7	-4.9	-8.2	-4.5
BN	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.1	0.0	0.0	0.0	0.0
AN	-0.9	-0.1	0.7	0.3	0.1	0.1	-0.1	0.0	0.3	0.1	-0.2	-0.2
Wet	-0.2	-0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.0

Table E.3-84. Sacramento River location RSAC101 (EC) difference No Crop Idle minus Base.

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1971	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1972	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1973	0.0	0.0	0.0	0.0	0.0	0.0	-0.3	-0.1	0.0	0.0	0.0	0.0
1974	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1975	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1976	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.5	-8.3	-52.2	-49.0
1977	-18.5	-4.8	-2.3	-1.0	-0.4	-0.1	0.0	1.0	2.7	-40.5	-27.7	-37.9
1978	-12.7	-2.3	-0.3	0.3	0.2	0.1	0.0	0.1	0.1	0.0	0.1	0.0
1979	0.0	0.0	0.0	0.2	0.2	0.1	0.1	0.1	0.0	0.0	0.0	0.0
1980	0.1	0.4	0.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1981	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.1	0.1	-1.5	-14.7	-6.9
1982	-7.2	-0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1983	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1984	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1985	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0
1986	0.1	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1987	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.2	0.3	-6.2	-44.5	-33.9
1988	-13.0	-4.6	0.1	0.2	0.0	0.5	0.4	0.5	0.7	-18.4	-36.0	-40.3
1989	-15.4	-2.8	3.9	2.7	0.7	0.2	0.3	0.2	0.2	-1.0	-7.7	-4.4
1990	-3.0	-1.8	-0.8	0.0	0.6	0.8	0.4	0.8	3.0	-21.0	-30.7	-38.0
1991	-16.8	-3.4	-1.6	0.1	0.7	0.3	0.4	1.5	4.6	-15.4	-23.0	-30.0
1992	-10.5	-1.8	1.2	-0.9	0.4	0.3	0.4	0.7	0.8	-18.4	-35.7	-28.6
1993	-13.9	-1.3	2.7	0.6	0.4	0.3	0.0	0.1	0.0	0.0	0.3	0.1
1994	0.0	0.0	0.0	0.8	0.3	0.4	0.2	0.3	2.5	-2.1	-28.6	-10.5
1995	-4.4	-0.6	0.5	0.2	0.1	0.0	0.0	0.0	0.0	0.1	0.1	0.1
1996	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.0
1997	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0
1998	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1999	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2000	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2001	0.0	0.0	0.0	0.2	0.0	0.0	0.1	0.4	0.7	-8.6	-16.0	-24.2
2002	-9.3	1.6	0.4	0.1	0.3	0.1	0.2	0.2	0.5	0.1	0.4	-0.1
2003	-0.3	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.2	0.3	-0.8	-0.7
Average	-3.7	-0.6	0.1	0.1	0.1	0.1	0.1	0.2	0.6	-4.1	-9.3	-9.0
Critical	-8.8	-2.3	-0.5	-0.1	0.3	0.3	0.3	0.7	2.5	-17.7	-33.4	-33.5
Dry	-4.1	-0.2	0.7	0.5	0.2	0.1	0.1	0.2	0.3	-2.9	-13.7	-11.6
BN	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AN	-4.5	-0.5	0.5	0.2	0.1	0.1	0.0	0.0	0.1	0.1	-0.1	-0.1
Wet	-0.9	-0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table E.3-85. Sacramento River location RSAC101 (EC) percent difference of No Crop Idle from Base.

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1971	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1972	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1973	0.0	0.0	0.0	0.0	0.0	0.0	-0.2	0.0	0.0	0.0	0.0	0.0
1974	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1975	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1976	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	-2.8	-12.3	-9.8
1977	-3.2	-1.0	-0.5	-0.4	-0.2	0.0	0.0	0.4	0.7	-9.1	-6.3	-5.9
1978	-2.3	-0.5	-0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1979	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1980	0.0	0.2	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1981	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.1	-0.7	-4.9	-1.9
1982	-1.7	-0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1983	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1984	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1985	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1986	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1987	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.2	-2.6	-12.6	-8.3
1988	-2.8	-1.1	0.0	0.1	0.0	0.2	0.2	0.3	0.3	-6.6	-8.6	-8.0
1989	-2.3	-0.7	1.0	1.0	0.3	0.1	0.2	0.1	0.1	-0.4	-2.7	-1.5
1990	-0.9	-0.4	-0.2	0.0	0.3	0.4	0.2	0.4	1.0	-6.4	-7.1	-7.5
1991	-2.7	-0.5	-0.3	0.0	0.3	0.2	0.2	0.7	1.6	-4.5	-5.5	-5.7
1992	-1.7	-0.3	0.2	-0.3	0.2	0.2	0.2	0.3	0.3	-6.5	-8.4	-6.0
1993	-2.9	-0.3	0.9	0.3	0.2	0.2	0.0	0.1	0.0	0.0	0.1	0.0
1994	0.0	0.0	0.0	0.3	0.2	0.2	0.1	0.2	1.0	-0.8	-7.8	-2.7
1995	-1.1	-0.2	0.2	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.1	0.0
1996	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1997	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1998	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1999	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2000	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2001	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.2	0.3	-3.7	-5.0	-6.2
2002	-2.3	0.5	0.2	0.1	0.1	0.1	0.1	0.1	0.2	0.0	0.1	0.0
2003	-0.1	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.1	0.2	-0.4	-0.3
Average	-0.7	-0.1	0.1	0.1	0.1	0.0	0.0	0.1	0.2	-1.3	-2.4	-1.9
Critical	-1.6	-0.5	-0.1	0.0	0.1	0.2	0.1	0.3	0.8	-5.2	-8.0	-6.5
Dry	-0.8	0.0	0.2	0.2	0.1	0.0	0.1	0.1	0.2	-1.2	-4.2	-3.0
BN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AN	-0.9	-0.1	0.2	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	-0.1
Wet	-0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table E.3-86. San Joaquin River location RSAN007 (EC) difference No Crop Idle minus Base.

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	-0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1971	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1972	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1973	0.0	0.0	0.0	0.0	0.0	-1.9	-3.6	-1.1	-0.2	0.0	0.0	0.0
1974	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	-0.1
1975	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1976	0.0	0.0	0.0	0.0	0.0	0.0	0.3	-1.6	33.9	-174.5	-324.3	-374.0
1977	-237.7	-101.4	-52.2	-20.1	-13.4	-9.1	-5.7	7.9	26.7	-108.7	-296.1	-229.1
1978	-149.9	-66.6	-0.3	2.4	0.6	0.4	0.2	0.2	1.6	3.3	1.6	0.5
1979	0.1	0.0	-0.6	3.2	0.5	0.3	0.3	0.5	0.9	0.5	0.3	0.0
1980	0.2	13.3	24.7	2.4	-1.8	0.3	0.1	0.2	0.3	0.1	0.1	0.0
1981	-0.1	-0.3	-0.7	2.0	0.4	0.2	0.5	2.8	2.6	-41.6	-225.1	-248.5
1982	-110.4	-21.5	-1.1	0.1	-1.7	-1.2	0.1	0.0	0.0	0.5	0.5	0.0
1983	3.8	0.7	0.0	0.0	0.2	0.2	0.1	-0.1	0.0	0.1	0.3	0.2
1984	2.0	0.2	0.0	0.0	0.0	0.0	0.1	0.8	1.0	0.1	0.0	0.0
1985	-0.2	2.3	2.3	3.8	2.8	0.6	0.5	1.4	1.3	0.8	0.4	0.8
1986	-0.1	-0.2	6.3	1.7	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0
1987	0.0	-0.2	-0.1	2.2	1.2	0.2	0.0	-2.3	2.5	-119.1	-334.5	-409.9
1988	-227.3	-98.8	12.6	6.3	1.0	-1.6	13.7	8.0	13.1	-230.3	-363.6	-291.7
1989	-211.1	-89.6	59.2	56.1	-1.9	1.4	2.7	5.9	1.9	-22.5	-156.7	-145.9
1990	-66.2	-36.3	-24.6	6.6	30.3	45.9	22.4	21.2	39.5	-264.1	-392.9	-311.1
1991	-216.9	-100.6	-52.5	-33.3	20.9	9.0	8.1	41.2	56.2	-177.4	-271.2	-226.6
1992	-160.4	-72.7	-46.3	-32.2	-2.4	3.1	14.1	17.1	11.3	-229.0	-378.0	-309.6
1993	-168.6	-76.0	68.0	16.2	1.2	0.9	0.4	0.5	2.1	13.5	8.3	2.7
1994	0.8	0.5	-0.5	28.4	15.4	15.2	17.1	17.7	39.7	-46.6	-230.3	-259.4
1995	-117.0	-49.8	20.8	5.7	0.6	0.2	0.1	0.0	0.0	0.3	10.6	7.0
1996	0.8	0.0	6.2	0.8	0.1	0.0	0.0	0.1	1.9	5.3	2.1	0.4
1997	0.1	-0.5	0.1	-0.2	-0.1	0.1	0.4	1.4	2.6	0.4	-0.2	0.9
1998	-0.3	-1.2	5.9	1.7	0.3	0.1	0.0	0.1	0.1	0.0	1.8	1.6
1999	1.3	2.2	0.3	0.0	0.0	0.0	0.0	0.2	2.0	2.4	1.0	0.2
2000	0.0	0.0	-0.4	3.3	0.1	0.1	0.1	0.2	1.2	0.1	0.1	0.0
2001	0.0	-0.1	0.4	4.7	0.8	0.1	0.7	11.4	20.0	-208.0	-304.9	-273.7
2002	-189.8	24.8	22.0	0.9	4.8	5.9	5.2	6.8	8.3	4.6	1.4	2.2
2003	-0.4	-4.5	3.1	0.3	0.1	0.6	0.2	0.1	16.2	4.9	-33.3	-27.4
Average	-54.3	-19.9	1.5	1.9	1.8	2.1	2.3	4.1	8.4	-46.6	-96.5	-90.9
Critical	-129.7	-58.5	-23.4	-6.3	7.4	8.9	10.0	15.9	31.5	-175.8	-322.3	-285.9
Dry	-66.9	-10.5	13.9	11.6	1.3	1.4	1.6	4.3	6.1	-64.3	-169.9	-179.2
BN	0.1	0.0	-0.3	1.6	0.2	0.1	0.2	0.3	0.5	0.3	0.1	0.0
AN	-53.1	-22.3	15.8	4.1	0.1	0.1	-0.4	0.0	3.5	3.7	-3.9	-4.0
Wet	-16.9	-5.4	3.0	0.8	0.0	0.0	0.1	0.2	0.6	0.7	1.2	0.8

Table E.3-87. San Joaquin River location RSAN007 (EC) percent difference of No Crop Idle from Base.

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1971	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1972	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1973	0.0	0.0	0.0	0.0	0.0	-0.8	-1.6	-0.4	0.0	0.0	0.0	0.0
1974	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1975	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1976	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.8	-3.7	-6.4	-5.7
1977	-3.2	-1.5	-0.7	-0.6	-0.8	-0.5	-0.3	0.3	0.5	-1.9	-4.4	-3.0
1978	-2.2	-1.0	0.0	0.6	0.2	0.1	0.1	0.1	0.5	0.3	0.1	0.0
1979	0.0	0.0	0.0	0.3	0.2	0.1	0.1	0.2	0.1	0.0	0.0	0.0
1980	0.0	0.3	1.2	0.7	-0.7	0.1	0.0	0.1	0.1	0.0	0.0	0.0
1981	0.0	0.0	0.0	0.2	0.1	0.1	0.2	0.4	0.2	-1.4	-5.4	-4.4
1982	-1.6	-1.4	-0.4	0.0	-0.8	-0.5	0.0	0.0	0.0	0.1	0.0	0.0
1983	1.1	0.3	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.1	0.1
1984	0.4	0.1	0.0	0.0	0.0	0.0	0.0	0.2	0.1	0.0	0.0	0.0
1985	0.0	0.5	0.5	0.5	0.5	0.1	0.1	0.2	0.1	0.0	0.0	0.0
1986	0.0	0.0	0.2	0.3	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0
1987	0.0	0.0	0.0	0.1	0.2	0.1	0.0	-0.2	0.1	-3.9	-7.5	-7.1
1988	-3.5	-1.6	0.5	1.6	0.3	-0.2	1.1	0.5	0.7	-6.0	-7.1	-4.7
1989	-2.7	-1.4	1.0	1.5	-0.1	0.4	1.2	1.5	0.1	-0.7	-4.1	-3.5
1990	-1.3	-0.6	-0.4	0.3	4.5	5.3	2.2	1.4	1.2	-5.1	-7.0	-4.7
1991	-3.0	-1.3	-0.7	-0.7	0.8	1.8	2.0	2.7	1.5	-3.4	-4.9	-3.4
1992	-2.2	-1.0	-0.6	-0.6	-0.3	1.0	2.8	1.0	0.5	-5.8	-6.6	-4.7
1993	-2.7	-1.2	1.4	2.7	0.4	0.4	0.2	0.2	1.0	1.9	0.3	0.1
1994	0.0	0.0	0.0	1.1	2.2	2.5	2.3	1.8	1.5	-1.0	-4.5	-4.1
1995	-2.4	-0.9	0.5	1.1	0.3	0.1	0.1	0.0	0.0	0.1	1.8	1.2
1996	0.2	0.0	1.4	0.4	0.0	0.0	0.0	0.0	0.6	0.5	0.1	0.0
1997	0.0	-0.1	0.0	-0.1	0.0	0.0	0.2	0.5	0.3	0.0	0.0	0.1
1998	0.0	-0.2	0.7	0.5	0.1	0.0	0.0	0.1	0.0	0.0	0.5	0.5
1999	0.2	0.5	0.2	0.0	0.0	0.0	0.0	0.1	0.5	0.2	0.0	0.0
2000	0.0	0.0	0.0	0.4	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.0
2001	0.0	0.0	0.0	0.3	0.2	0.0	0.2	1.3	1.3	-7.0	-7.2	-4.7
2002	-3.0	0.4	2.1	0.4	1.9	2.2	2.0	1.7	0.5	0.1	0.0	0.0
2003	0.0	-0.1	0.3	0.2	0.1	0.3	0.1	0.0	2.6	0.4	-1.3	-1.5
Average	-0.8	-0.3	0.2	0.3	0.3	0.4	0.4	0.4	0.4	-1.1	-1.9	-1.5
Critical	-1.9	-0.8	-0.3	0.2	1.0	1.4	1.4	1.1	1.0	-3.8	-5.8	-4.3
Dry	-1.0	-0.1	0.6	0.5	0.5	0.5	0.6	0.8	0.4	-2.1	-4.0	-3.3
BN	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0
AN	-0.8	-0.3	0.5	0.7	0.0	0.0	-0.2	0.0	0.7	0.5	-0.2	-0.2
Wet	-0.2	-0.1	0.2	0.2	0.0	0.0	0.0	0.1	0.1	0.1	0.2	0.1

Table E.3-88. San Joaquin River location RSAN018 (EC) difference No Crop Idle minus Base.

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1971	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1972	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1973	0.0	0.0	0.0	0.0	0.1	-2.6	-4.3	-1.0	-0.2	0.0	0.0	0.0
1974	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1
1975	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1976	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.7	11.4	39.4	-34.8	-119.6
1977	-118.7	-61.8	-46.5	-30.1	-10.4	-6.2	-4.1	0.4	10.1	24.7	-70.5	-81.8
1978	-70.7	-40.1	-12.1	1.2	0.9	0.5	0.2	0.1	0.2	0.9	0.9	0.3
1979	0.1	0.0	-0.3	1.0	0.4	0.2	0.1	0.2	0.1	0.3	0.2	0.0
1980	-2.0	4.2	12.8	1.4	-1.8	0.3	0.0	0.1	0.1	0.0	0.0	0.0
1981	0.0	-0.9	-0.6	0.6	0.2	0.1	0.0	0.3	-0.1	-19.2	57.3	-98.1
1982	-85.9	-28.2	-0.9	0.1	-2.1	-1.1	0.1	0.0	-0.1	0.0	0.2	0.0
1983	0.6	0.2	0.0	0.0	0.2	0.2	0.1	-0.1	0.0	0.0	0.0	0.0
1984	0.5	0.1	0.0	0.0	0.0	0.0	0.1	0.1	0.1	-0.4	-0.1	0.0
1985	0.0	0.7	0.9	1.0	0.8	0.2	0.1	0.2	0.1	-0.5	-1.2	-1.5
1986	-1.5	-2.1	1.7	0.8	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0
1987	0.0	-0.1	-0.5	0.3	0.5	0.1	0.3	-1.6	-2.2	38.2	7.5	-113.7
1988	-108.0	-60.1	-10.9	2.0	0.4	-0.5	1.8	0.6	2.1	59.9	-63.8	-97.2
1989	-115.8	-71.2	13.9	19.2	-5.5	0.9	0.9	0.8	-2.4	-6.2	1.6	-64.6
1990	-50.5	-36.7	-29.8	-5.9	5.6	10.2	5.8	4.0	12.0	58.1	-75.3	-101.5
1991	-109.3	-66.5	-46.1	-27.1	-1.4	2.2	1.1	7.7	14.9	42.4	-52.3	-79.9
1992	-87.3	-50.1	-41.7	-40.4	-4.8	0.7	1.3	0.0	-2.7	48.7	-61.6	-109.7
1993	-70.5	-43.8	12.9	7.9	1.7	1.2	0.4	0.5	-0.7	2.6	4.3	1.9
1994	0.3	0.2	-0.3	7.8	6.7	2.8	2.8	2.3	9.8	-19.6	33.2	-33.4
1995	-37.3	-28.7	-0.2	3.5	0.9	0.2	0.1	0.0	0.1	0.1	2.0	2.4
1996	0.2	0.0	1.1	0.4	0.1	0.0	0.0	0.1	0.1	2.0	1.2	0.5
1997	0.0	-0.1	0.1	-0.2	-0.1	0.0	0.1	0.1	0.3	-0.9	-0.3	-0.5
1998	-0.3	-1.2	2.0	0.9	0.3	0.0	0.0	0.1	0.1	0.0	0.1	0.2
1999	0.4	0.8	0.2	0.0	0.0	0.0	0.1	0.1	0.2	0.9	0.6	0.2
2000	0.0	0.0	-0.9	0.4	0.1	0.1	0.1	0.1	0.2	-0.6	-0.1	0.0
2001	0.0	0.0	-1.3	0.6	0.3	0.1	0.1	1.4	2.1	67.0	-15.9	-66.4
2002	-85.6	-2.7	12.5	0.9	0.7	0.8	0.3	0.5	0.5	0.0	-4.2	-5.5
2003	-2.5	-6.4	1.9	0.4	0.1	0.1	0.1	0.1	2.6	24.5	-12.4	-16.5
Average	-27.8	-14.5	-3.9	-1.6	-0.2	0.3	0.2	0.5	1.7	10.7	-8.3	-29.0
Critical	-67.6	-39.3	-25.1	-13.4	-0.6	1.3	1.2	2.0	8.2	36.2	-46.4	-89.0
Dry	-33.6	-12.3	4.1	3.8	-0.5	0.3	0.3	0.3	-0.3	13.2	7.5	-58.3
BN	0.0	0.0	-0.1	0.5	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.0
AN	-24.3	-14.4	2.4	1.9	0.2	-0.1	-0.6	0.0	0.4	4.6	-1.2	-2.4
Wet	-9.5	-4.6	0.3	0.4	0.0	0.0	0.1	0.0	0.1	0.1	0.3	0.2

Table E.3-89. San Joaquin River location RSAN018 (EC) percent difference of No Crop Idle from Base.

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1971	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1972	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1973	0.0	0.0	0.0	0.0	0.0	-1.1	-1.8	-0.4	-0.1	0.0	0.0	0.0
1974	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1975	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1976	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	1.2	1.8	-2.0	-5.7
1977	-5.0	-2.9	-1.8	-1.7	-1.6	-1.3	-0.9	0.1	0.8	1.5	-2.8	-3.0
1978	-3.5	-2.0	-0.7	0.3	0.3	0.2	0.1	0.1	0.1	0.3	0.1	0.0
1979	0.0	0.0	0.0	0.1	0.1	0.1	0.0	0.1	0.1	0.0	0.0	0.0
1980	-0.1	0.3	1.0	0.5	-0.7	0.1	0.0	0.0	0.0	0.0	0.0	0.0
1981	0.0	-0.2	0.0	0.1	0.1	0.0	0.0	0.1	0.0	-1.5	3.2	-3.9
1982	-3.1	-2.0	-0.4	0.1	-0.9	-0.5	0.1	0.0	0.0	0.0	0.0	0.0
1983	0.3	0.1	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0
1984	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	0.0
1985	0.0	0.2	0.3	0.3	0.3	0.1	0.1	0.1	0.0	0.0	-0.1	-0.1
1986	-0.1	-0.1	0.1	0.2	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0
1987	0.0	0.0	-0.1	0.0	0.1	0.0	0.1	-0.4	-0.5	3.9	0.6	-6.1
1988	-5.4	-3.1	-0.8	0.6	0.1	-0.2	0.5	0.2	0.5	5.1	-4.2	-5.1
1989	-4.6	-3.3	0.6	1.1	-0.7	0.3	0.4	0.4	-0.6	-0.4	0.1	-3.3
1990	-2.6	-1.8	-1.4	-0.6	1.4	3.1	1.8	1.1	1.6	2.8	-3.6	-4.5
1991	-4.7	-2.7	-1.8	-1.9	-0.2	0.7	0.4	2.0	1.5	1.9	-2.6	-3.7
1992	-3.7	-2.2	-1.8	-2.1	-0.9	0.2	0.5	0.0	-0.5	3.8	-3.2	-4.8
1993	-3.9	-2.5	0.6	1.7	0.6	0.5	0.2	0.2	-0.3	0.9	0.4	0.2
1994	0.1	0.0	0.0	0.6	1.4	0.9	1.0	0.8	1.8	-0.9	1.5	-1.3
1995	-2.5	-1.8	0.0	0.8	0.4	0.1	0.1	0.0	0.0	0.1	0.8	0.9
1996	0.1	0.0	0.4	0.2	0.1	0.0	0.0	0.1	0.1	0.4	0.1	0.0
1997	0.0	0.0	0.0	-0.1	0.0	0.0	0.0	0.0	0.1	-0.2	0.0	0.0
1998	-0.1	-0.4	0.5	0.3	0.1	0.0	0.0	0.1	0.0	0.0	0.1	0.1
1999	0.1	0.3	0.1	0.0	0.0	0.0	0.0	0.1	0.1	0.2	0.0	0.0
2000	0.0	0.0	-0.1	0.1	0.0	0.0	0.0	0.0	0.1	-0.1	0.0	0.0
2001	0.0	0.0	-0.1	0.1	0.1	0.0	0.1	0.5	0.6	7.1	-1.3	-3.6
2002	-4.4	-0.1	1.8	0.4	0.3	0.3	0.2	0.2	0.1	0.0	-0.2	-0.2
2003	-0.1	-0.3	0.2	0.2	0.0	0.0	0.0	0.1	1.0	4.8	-1.1	-1.7
Average	-1.3	-0.7	-0.1	0.0	0.0	0.1	0.1	0.2	0.2	0.9	-0.4	-1.3
Critical	-3.0	-1.8	-1.1	-0.7	0.0	0.5	0.5	0.6	1.0	2.3	-2.4	-4.0
Dry	-1.5	-0.6	0.4	0.3	0.0	0.1	0.1	0.1	-0.1	1.5	0.4	-2.9
BN	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AN	-1.3	-0.8	0.2	0.5	0.1	0.0	-0.2	0.0	0.1	1.0	-0.1	-0.2
Wet	-0.4	-0.3	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1

Table E.3-90. San Joaquin River location RSAN032 (EC) difference No Crop Idle minus Base.

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1971	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1972	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1973	0.0	0.0	0.0	0.0	0.0	-2.2	-3.1	-0.4	0.0	0.0	0.0	0.0
1974	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1975	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1976	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.2	17.3	-36.6	-47.2
1977	-30.6	-13.1	-13.2	-11.5	-3.5	-0.7	0.0	0.4	2.2	-18.1	-21.7	-36.0
1978	-21.5	-8.4	-5.0	1.2	1.0	0.5	0.2	0.2	0.1	0.1	0.1	0.1
1979	0.0	0.0	-0.1	0.5	0.5	0.1	0.1	0.2	0.0	0.0	0.0	0.0
1980	-0.2	0.7	3.8	0.3	-0.3	0.0	0.0	0.1	0.0	0.0	0.0	0.0
1981	0.0	-0.1	-0.2	0.3	0.1	0.0	0.1	0.3	0.2	-3.2	10.5	-1.4
1982	-17.7	-9.1	0.0	0.1	-0.9	-0.3	0.0	-0.1	0.0	0.0	0.0	0.0
1983	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0
1984	0.1	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.0
1985	0.0	0.2	0.2	0.2	0.1	0.2	0.1	0.1	0.1	-0.1	-0.2	-0.5
1986	-0.2	-0.5	0.2	0.3	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0
1987	0.0	0.0	-0.2	-0.1	0.1	0.0	0.7	1.0	0.4	4.1	-14.1	-27.5
1988	-19.9	-12.0	-5.5	0.7	0.3	1.3	1.2	1.2	0.9	7.3	-11.0	-33.8
1989	-26.6	-14.9	0.5	7.6	0.5	1.3	1.0	0.9	0.2	-1.0	3.2	-5.6
1990	-9.4	-8.4	-7.8	-3.3	1.1	1.7	1.3	0.8	1.9	12.8	-12.6	-35.3
1991	-27.2	-14.0	-11.7	-7.9	-0.6	1.2	0.8	1.2	3.3	8.4	-10.5	-26.5
1992	-20.1	-10.2	-8.9	-11.8	-0.2	0.7	0.5	0.9	0.4	5.6	-13.6	-30.3
1993	-19.7	-8.1	0.9	3.0	1.4	1.1	0.3	0.6	-2.1	-0.5	0.7	0.3
1994	0.1	0.0	-0.1	1.8	1.9	0.8	0.6	0.5	1.4	-3.8	-14.2	2.3
1995	-4.8	-3.1	-2.0	1.7	0.7	0.2	0.1	0.0	0.1	0.1	0.1	0.1
1996	0.0	0.0	0.2	0.3	0.1	0.0	0.1	0.1	0.1	0.2	0.2	0.1
1997	0.0	0.0	0.2	0.0	0.0	0.0	0.1	0.1	0.1	-0.1	-0.1	-0.5
1998	0.1	0.0	0.3	0.3	0.3	0.0	0.0	0.1	0.0	0.0	0.0	0.0
1999	0.0	0.2	0.1	0.0	0.0	0.0	0.1	0.1	0.0	0.1	0.1	0.1
2000	0.0	0.0	-0.2	0.2	0.1	0.1	0.1	0.1	0.0	-0.1	-0.1	0.0
2001	0.0	0.0	-0.6	-0.1	0.1	0.1	0.3	0.7	0.7	11.0	2.5	-18.8
2002	-16.3	-2.3	3.0	0.7	0.5	0.3	0.4	0.4	0.4	-0.2	-0.4	-1.5
2003	-1.0	-1.1	0.6	0.1	0.1	0.1	0.1	0.1	0.3	3.7	-0.4	-2.5
Average	-6.3	-3.1	-1.3	-0.4	0.1	0.2	0.2	0.3	0.4	1.3	-3.5	-7.8
Critical	-15.3	-8.2	-6.7	-4.6	-0.2	0.7	0.6	0.7	1.8	4.2	-17.2	-29.6
Dry	-7.2	-2.9	0.4	1.4	0.3	0.3	0.4	0.6	0.3	1.7	0.2	-9.2
BN	0.0	0.0	0.0	0.3	0.2	0.1	0.1	0.1	0.0	0.0	0.0	0.0
AN	-7.1	-2.8	0.0	0.8	0.4	-0.1	-0.4	0.1	-0.3	0.5	0.1	-0.4
Wet	-1.7	-1.0	-0.1	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table E.3-91. San Joaquin River location RSAN032 (EC) percent difference of No Crop Idle from Base.

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1971	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1972	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1973	0.0	0.0	0.0	0.0	0.0	-1.1	-1.3	-0.2	0.0	0.0	0.0	0.0
1974	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1975	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1976	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.6	3.7	-6.9	-8.9
1977	-4.9	-2.3	-1.8	-1.7	-0.9	-0.2	0.0	0.1	0.6	-4.2	-4.2	-4.8
1978	-3.4	-1.5	-0.9	0.5	0.4	0.2	0.1	0.1	0.1	0.0	0.0	0.0
1979	0.0	0.0	0.0	0.1	0.2	0.1	0.1	0.1	0.0	0.0	0.0	0.0
1980	0.0	0.2	0.7	0.2	-0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1981	0.0	-0.1	-0.1	0.1	0.1	0.0	0.0	0.1	0.1	-1.0	2.4	-0.3
1982	-3.0	-2.0	0.0	0.1	-0.5	-0.2	0.0	0.0	0.0	0.0	0.0	0.0
1983	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1984	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1985	0.0	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	-0.1
1986	0.0	-0.1	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1987	0.0	0.0	-0.1	0.0	0.0	0.0	0.3	0.4	0.2	1.6	-4.0	-6.5
1988	-4.0	-2.4	-1.1	0.3	0.1	0.5	0.5	0.5	0.4	2.5	-2.6	-6.8
1989	-4.1	-2.6	0.1	1.1	0.1	0.6	0.5	0.4	0.1	-0.3	0.7	-1.2
1990	-2.1	-1.6	-1.3	-0.7	0.4	0.7	0.5	0.3	0.7	3.0	-2.3	-6.3
1991	-4.1	-2.0	-1.6	-1.2	-0.2	0.5	0.3	0.5	1.2	1.8	-2.0	-4.9
1992	-3.2	-1.6	-1.3	-1.7	-0.1	0.3	0.2	0.4	0.2	1.9	-2.9	-5.6
1993	-3.8	-1.7	0.2	1.0	0.6	0.5	0.2	0.3	-1.0	-0.3	0.2	0.1
1994	0.0	0.0	0.0	0.3	0.6	0.3	0.3	0.2	0.6	-0.8	-2.6	0.4
1995	-1.0	-0.8	-0.3	0.7	0.3	0.1	0.0	0.0	0.1	0.1	0.1	0.1
1996	0.0	0.0	0.1	0.1	0.0	0.0	0.1	0.0	0.0	0.1	0.1	0.0
1997	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	-0.1
1998	0.0	0.0	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1999	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0
2000	0.0	0.0	-0.1	0.1	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0
2001	0.0	0.0	-0.2	0.0	0.0	0.0	0.1	0.3	0.3	4.3	0.7	-4.5
2002	-3.4	-0.5	0.9	0.3	0.2	0.1	0.2	0.1	0.2	-0.1	-0.1	-0.3
2003	-0.2	-0.2	0.2	0.1	0.0	0.0	0.0	0.1	0.1	1.7	-0.1	-0.9
Average	-1.1	-0.6	-0.2	0.0	0.1	0.1	0.1	0.1	0.1	0.4	-0.7	-1.5
Critical	-2.6	-1.4	-1.0	-0.7	0.0	0.3	0.3	0.3	0.6	1.1	-3.4	-5.2
Dry	-1.2	-0.5	0.1	0.3	0.1	0.1	0.2	0.2	0.2	0.7	0.0	-2.1
BN	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AN	-1.2	-0.5	0.0	0.3	0.2	-0.1	-0.2	0.1	-0.1	0.2	0.0	-0.1
Wet	-0.3	-0.2	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table E.3-92. San Joaquin River location RSAN037 Base salinity (EC).

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	230.6	266.4	234.5	292.1	251.3	246.9	268.4	268.9	233.4	216.3	283.6	468.2
1971	250.4	238.6	245.0	247.4	236.1	275.8	290.2	260.2	211.4	201.4	317.2	476.2
1972	249.5	254.2	251.0	335.0	287.4	255.6	319.4	297.9	238.5	261.5	371.0	528.9
1973	533.8	749.2	373.6	331.9	340.0	296.7	300.1	296.3	226.6	216.8	295.4	279.7
1974	230.6	217.4	240.1	315.1	262.6	261.7	259.0	274.0	252.6	206.7	253.9	357.8
1975	246.5	252.8	269.8	390.7	342.0	254.6	276.3	257.1	260.3	209.2	259.2	390.9
1976	236.4	236.4	247.0	432.1	377.0	302.9	317.6	331.7	346.5	496.7	524.1	490.9
1977	565.1	530.5	662.5	715.7	424.4	336.2	301.3	321.3	377.9	426.5	513.0	663.0
1978	610.9	527.6	575.6	382.2	388.9	389.6	327.5	257.0	280.3	222.0	286.9	294.7
1979	232.4	261.6	380.1	476.5	367.2	283.7	296.0	295.4	222.4	250.8	383.3	530.4
1980	516.5	420.2	530.8	324.9	313.1	238.0	261.4	297.9	292.0	243.8	266.2	272.8
1981	236.0	244.2	384.8	452.1	268.8	316.3	345.8	307.6	240.9	337.4	453.4	540.1
1982	565.9	478.4	228.2	314.7	272.9	282.1	204.1	182.1	248.9	250.4	241.5	220.8
1983	194.3	206.4	250.2	292.8	304.6	252.9	202.1	201.0	209.3	222.5	193.6	190.4
1984	201.9	187.8	227.6	274.1	229.9	235.8	285.1	281.5	231.0	217.6	274.3	391.7
1985	246.5	228.4	219.4	247.3	262.6	317.5	338.6	292.5	240.1	342.3	443.3	524.9
1986	479.5	513.8	584.4	341.1	350.7	278.4	261.9	251.1	275.6	223.7	290.6	249.9
1987	242.6	242.8	274.8	442.4	312.2	329.4	350.4	303.5	244.7	270.2	344.9	402.3
1988	471.7	463.4	504.1	315.2	318.0	329.8	320.1	301.6	265.5	286.0	402.2	462.6
1989	580.4	555.4	645.4	731.9	469.2	339.5	285.6	244.8	216.3	398.4	513.0	474.1
1990	443.5	496.9	563.1	490.0	305.4	265.4	257.5	268.7	283.5	445.3	539.9	522.0
1991	600.6	620.7	703.5	658.1	457.6	405.9	335.0	276.7	282.4	479.5	532.4	505.1
1992	580.2	577.2	662.6	678.9	452.8	323.0	277.9	260.6	243.7	298.9	451.3	516.9
1993	497.9	463.8	589.1	462.3	357.9	311.2	315.3	288.4	257.4	205.5	284.6	290.6
1994	234.8	276.9	423.8	564.8	351.5	282.0	269.1	270.8	267.1	519.3	594.3	546.1
1995	487.4	378.6	572.9	419.4	277.7	325.3	240.8	173.6	241.8	254.0	202.8	190.1
1996	221.0	246.1	222.8	300.8	326.8	265.0	283.3	276.3	247.9	215.9	315.6	429.4
1997	253.1	245.3	288.8	267.5	197.7	203.3	246.8	289.6	245.1	215.1	261.2	417.3
1998	254.9	236.1	231.8	384.2	372.0	263.9	210.8	186.1	232.1	248.3	203.6	197.2
1999	211.3	231.8	209.5	299.9	260.2	238.9	295.6	278.0	224.0	208.7	314.3	440.7
2000	260.6	245.5	272.5	368.6	377.2	258.6	274.3	293.6	232.1	217.2	279.1	289.7
2001	243.3	267.2	345.8	484.0	338.9	309.4	358.9	305.2	241.6	261.2	327.7	394.6
2002	459.9	448.3	355.5	294.2	249.7	259.8	302.6	309.4	254.6	390.4	455.3	528.1
2003	534.2	473.7	397.1	237.5	222.0	224.1	320.7	265.6	207.7	222.7	301.9	307.0
Average	364.8	361.3	387.3	399.0	321.4	287.0	288.2	272.5	252.2	284.8	352.2	405.4
Critical	447.5	457.4	538.1	550.7	383.8	320.8	296.9	290.2	295.2	421.7	508.2	529.5
Dry	334.8	331.1	370.9	442.0	316.9	312.0	330.3	293.8	239.7	333.3	422.9	477.3
BN	240.9	257.9	315.6	405.7	327.3	269.7	307.7	296.6	230.5	256.1	377.1	529.7
AN	492.3	480.0	456.4	351.2	333.2	286.4	299.9	283.1	249.3	221.3	285.7	289.1
Wet	294.4	284.6	292.7	318.5	283.4	260.4	255.7	244.6	239.5	222.3	262.4	340.1

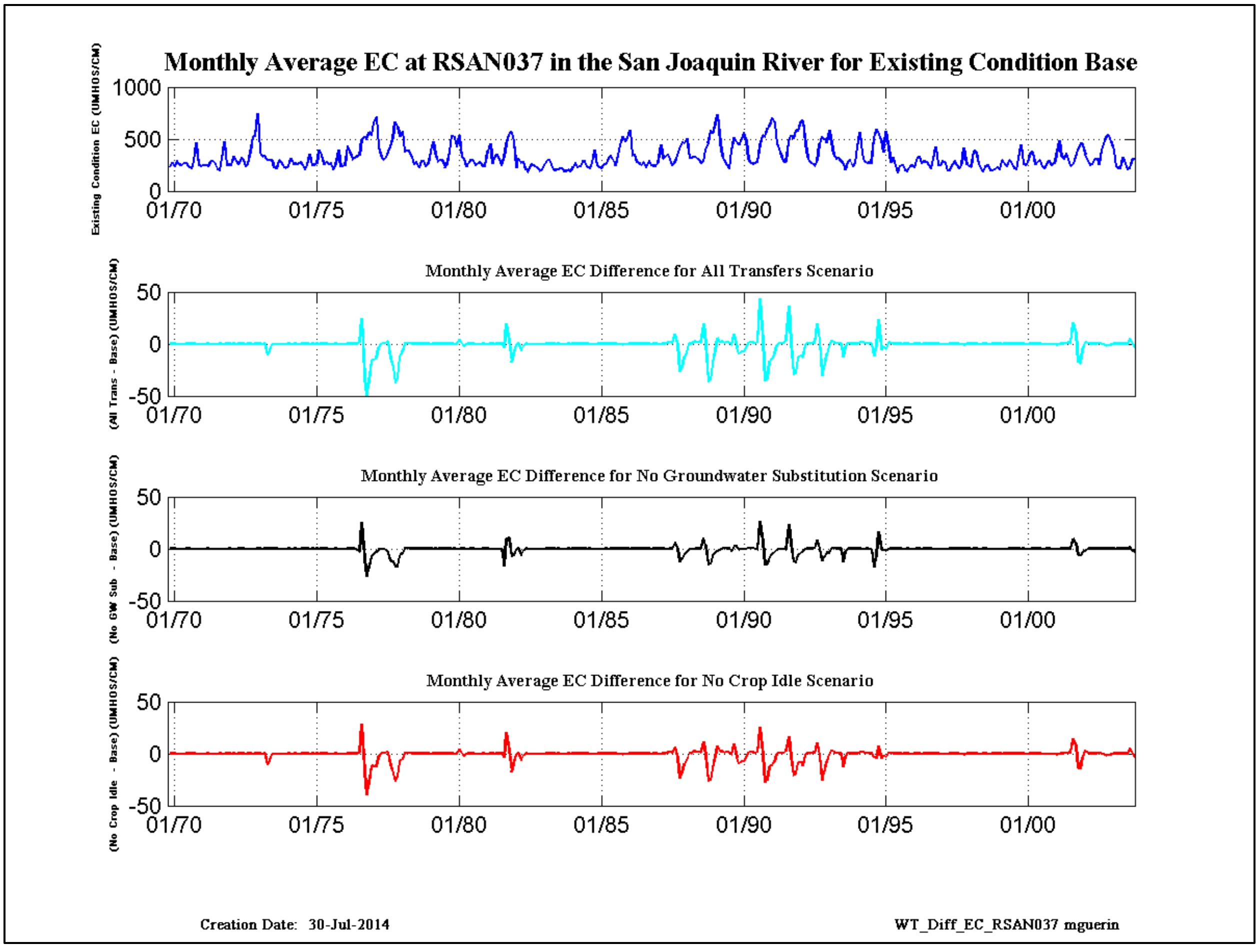


Figure E.3-14. San Joaquin River location San Joaquin River location RSAN037 EC for the Base condition and change from Base for the scenarios.

Table E.3-93. RSAN072 Base salinity (EC).

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	413.6	478.1	582.3	286.3	319.2	296.1	308.7	400.2	430.5	590.4	560.4	528.3
1971	484.6	563.5	783.3	673.3	734.0	449.2	302.9	358.0	457.7	567.5	557.3	540.1
1972	487.5	581.9	787.5	805.3	850.3	827.4	505.6	454.2	587.3	642.6	595.4	584.0
1973	524.4	576.1	776.6	811.6	649.1	351.1	339.1	348.3	478.3	590.5	478.1	489.1
1974	446.5	521.3	768.7	521.3	607.4	277.9	299.4	375.5	456.0	527.4	450.9	462.0
1975	428.3	469.2	721.0	755.4	389.2	260.8	328.3	368.6	374.0	510.1	439.1	476.9
1976	423.0	503.7	762.1	778.7	893.2	874.1	628.2	473.2	593.5	655.2	586.5	577.9
1977	532.8	655.2	816.4	825.7	1037.2	1212.6	808.2	684.9	673.5	694.9	685.7	665.5
1978	611.0	683.0	833.1	725.8	618.6	567.9	279.4	239.6	375.1	507.3	443.8	424.4
1979	512.2	493.0	741.1	666.0	386.7	284.9	335.7	302.1	440.5	603.6	476.7	509.9
1980	460.8	526.5	767.6	350.6	304.2	206.8	315.6	349.6	350.0	428.5	416.0	459.4
1981	451.3	499.6	758.2	768.7	849.3	581.5	433.3	426.4	592.6	627.3	592.3	571.9
1982	505.4	577.9	771.1	622.6	298.0	280.0	178.2	170.2	328.8	383.7	311.8	244.4
1983	190.3	194.9	267.7	265.2	282.2	227.2	176.8	198.7	200.0	217.5	170.5	223.8
1984	342.2	164.4	223.0	293.9	201.8	301.6	315.7	364.9	469.7	589.4	497.1	415.8
1985	380.6	467.8	777.0	768.2	768.7	560.5	381.1	442.6	580.2	665.1	575.2	538.3
1986	500.7	550.5	764.4	797.2	400.2	259.4	244.6	246.5	365.3	515.7	434.9	411.5
1987	393.1	423.1	710.5	741.6	865.2	723.3	585.1	463.0	600.3	652.3	614.1	589.6
1988	528.1	603.1	798.3	817.0	980.7	921.9	675.3	617.4	664.2	668.6	649.3	618.9
1989	581.8	636.8	811.6	827.2	958.1	842.3	586.0	679.0	651.2	621.0	615.8	556.2
1990	572.1	626.2	815.2	837.5	948.7	929.9	766.4	657.3	679.2	665.0	634.7	619.3
1991	581.0	624.9	820.8	847.2	1000.9	741.9	607.9	672.2	716.5	693.9	700.5	678.4
1992	591.0	637.7	829.6	855.7	837.0	799.0	802.6	738.5	740.5	691.2	757.9	733.3
1993	613.2	668.2	833.0	678.2	673.5	636.1	456.7	485.2	687.9	780.0	510.6	485.2
1994	499.1	554.2	800.1	843.9	904.1	927.1	705.1	631.8	690.7	648.5	657.0	641.0
1995	607.6	644.2	820.5	716.2	711.7	355.2	211.7	152.2	289.3	250.1	299.4	458.7
1996	450.9	508.7	766.5	744.5	337.8	284.0	309.4	327.8	454.9	563.9	472.6	474.9
1997	451.7	441.0	297.2	234.8	168.9	196.4	304.9	320.5	435.1	599.7	513.2	468.9
1998	469.9	566.1	770.8	569.4	348.7	253.3	186.3	169.3	252.7	249.3	275.0	302.6
1999	351.8	442.1	676.4	525.8	221.6	340.0	337.1	352.2	419.6	615.0	540.9	510.0
2000	483.5	554.1	796.6	751.8	360.1	255.8	329.2	363.3	566.0	630.9	557.8	475.9
2001	437.4	514.2	765.0	769.3	851.8	669.2	401.2	442.1	598.4	657.8	613.1	572.7
2002	531.1	590.1	782.7	758.4	805.1	773.8	517.8	517.3	559.4	629.0	610.5	585.6
2003	576.7	620.6	797.8	818.5	792.7	798.7	448.2	452.8	473.8	623.8	604.2	586.5
Average	482.8	534.2	729.2	678.0	628.1	537.3	423.9	419.0	506.8	575.2	526.4	514.1
Critical	532.4	600.7	806.1	829.4	943.1	915.2	713.4	639.3	679.7	673.9	667.4	647.8
Dry	462.5	521.9	767.5	772.3	849.7	691.8	484.1	495.1	597.0	642.1	603.5	569.0
BN	499.8	537.4	764.3	735.6	618.5	556.1	420.7	378.1	513.9	623.1	536.0	546.9
AN	544.9	604.8	800.8	689.4	566.4	469.4	361.4	373.2	488.5	593.5	501.8	486.8
Wet	434.1	470.9	631.8	538.9	386.2	290.9	269.5	292.7	379.5	475.4	424.8	424.4

Table E.3-94. San Joaquin River location RSAN112 Base salinity (EC).

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	414.5	479.7	584.5	277.7	319.3	293.9	301.7	392.8	415.0	593.5	546.3	520.9
1971	481.5	562.3	782.4	664.3	736.7	439.7	293.7	353.8	446.5	563.4	545.0	533.6
1972	483.5	586.7	804.2	797.8	851.8	817.0	482.5	439.5	583.4	638.0	578.5	580.3
1973	520.7	573.0	790.3	769.3	628.2	342.1	335.1	341.4	472.3	588.6	463.6	485.5
1974	443.9	522.7	775.3	510.5	609.9	268.5	298.8	371.4	451.9	524.4	438.7	457.8
1975	425.4	470.2	737.0	753.3	374.6	257.3	327.4	359.4	368.7	508.9	429.0	474.3
1976	420.0	506.2	784.2	772.7	898.1	861.2	606.0	451.2	587.9	655.0	573.9	574.8
1977	528.8	662.0	831.5	817.4	1058.5	1236.8	720.8	675.5	651.9	691.5	677.9	659.6
1978	604.4	687.6	842.6	709.2	612.5	559.6	272.0	235.6	373.9	505.5	432.4	419.9
1979	513.6	490.5	755.8	655.8	376.0	281.0	334.6	296.2	427.0	605.7	462.2	507.0
1980	457.6	528.7	787.3	338.4	300.6	204.6	314.7	345.8	346.0	426.5	408.1	457.3
1981	448.9	501.1	781.5	761.2	853.5	570.2	422.2	415.6	590.7	617.5	580.3	565.7
1982	501.8	579.5	779.8	604.3	289.6	274.5	176.0	167.6	328.6	380.8	303.3	241.5
1983	188.2	191.7	267.8	257.3	279.7	221.7	175.4	197.6	197.7	215.6	165.2	222.9
1984	344.4	159.9	221.5	294.6	198.5	302.2	310.7	357.6	463.9	588.6	483.5	407.7
1985	378.8	468.0	798.9	762.3	767.6	551.7	367.8	434.6	575.5	667.4	560.2	532.5
1986	497.7	551.1	776.8	789.4	386.2	254.5	243.2	243.0	363.3	514.0	422.4	407.7
1987	390.3	422.6	733.1	737.2	870.9	707.9	564.1	442.1	596.9	647.3	601.9	583.0
1988	523.5	606.6	817.9	807.6	992.6	909.0	645.9	604.4	656.9	648.8	640.8	610.8
1989	576.1	639.4	824.6	820.8	968.7	830.6	554.2	681.0	623.2	616.9	612.5	549.5
1990	572.3	628.2	832.0	830.0	957.8	918.8	724.4	646.4	667.6	634.0	625.9	612.4
1991	575.4	625.8	839.0	842.9	1013.7	724.1	587.9	668.9	713.4	717.4	698.2	670.8
1992	584.2	640.4	848.9	845.0	829.7	791.2	794.3	716.5	737.9	752.0	790.3	723.5
1993	603.0	671.6	849.4	651.8	648.8	624.7	445.8	483.1	694.0	786.0	485.1	480.9
1994	498.4	555.9	824.2	836.3	905.3	924.2	667.9	623.7	686.2	711.8	651.9	634.0
1995	603.9	645.2	845.7	683.0	711.2	344.2	208.2	149.8	288.7	246.8	294.0	461.6
1996	448.1	510.9	779.0	720.7	315.4	280.1	308.5	325.5	452.4	561.5	458.8	471.2
1997	450.2	439.4	292.2	230.3	167.5	194.9	299.4	314.2	430.9	602.0	500.2	462.8
1998	468.6	568.8	792.2	542.4	329.4	250.8	184.2	168.0	251.9	246.5	269.6	300.7
1999	352.7	443.8	687.1	516.6	212.2	342.3	334.0	346.3	411.2	622.1	527.5	504.8
2000	480.6	556.6	819.3	739.3	341.1	253.2	327.0	358.4	567.4	627.3	544.1	469.5
2001	435.2	516.3	779.3	760.7	852.4	660.4	389.3	432.6	596.6	656.6	601.3	566.5
2002	527.1	591.6	785.9	749.6	805.9	769.2	491.8	492.7	541.6	651.3	596.7	579.6
2003	574.1	621.3	805.6	813.7	786.6	797.1	430.7	445.2	439.5	637.1	592.6	581.1
Average	479.9	535.5	742.8	666.6	625.0	531.2	410.0	411.1	500.0	578.0	516.5	509.2
Critical	528.9	603.6	825.4	821.7	950.8	909.3	678.2	626.7	671.7	687.2	665.6	640.8
Dry	459.4	523.2	783.9	765.3	853.2	681.7	464.9	483.1	587.4	642.8	592.1	562.8
BN	498.5	538.6	780.0	726.8	613.9	549.0	408.6	367.8	505.2	621.8	520.3	543.6
AN	540.1	606.5	815.7	670.3	552.9	463.6	354.2	368.3	482.2	595.2	487.6	482.4
Wet	432.4	471.2	640.1	526.5	379.2	286.5	266.2	288.2	374.7	474.5	414.1	420.6

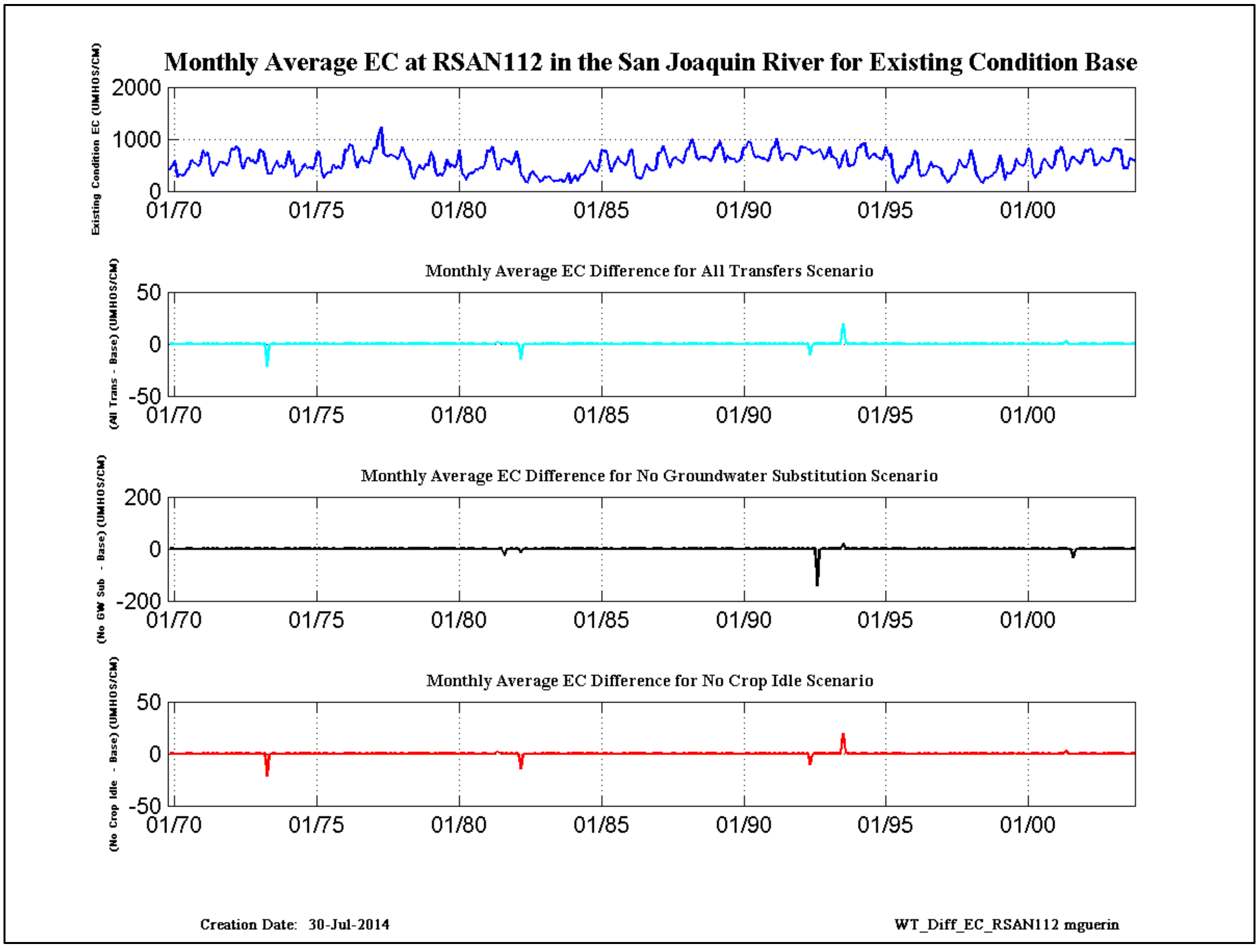


Figure E.3-15. San Joaquin River location San Joaquin River location RSAN112 EC for the Base condition and change from Base for the scenarios.

Table E.3-95. Mokelumne River location RSMKL008 Base salinity (EC).

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	182.4	187.3	186.3	203.2	185.5	181.4	196.9	191.5	187.6	183.6	182.7	182.8
1971	185.6	189.2	205.5	194.0	195.0	184.3	185.6	176.8	179.1	183.1	181.6	182.3
1972	185.4	187.6	186.6	216.1	208.3	192.4	194.9	198.0	189.8	183.6	182.4	181.9
1973	183.7	199.5	205.4	233.6	207.2	189.7	189.5	183.2	184.9	183.0	182.2	179.5
1974	182.8	179.8	190.9	192.0	191.7	193.7	177.1	174.2	179.2	181.2	180.4	181.5
1975	184.8	189.8	189.4	219.1	211.4	200.0	185.5	173.1	179.2	181.3	179.8	180.3
1976	181.7	184.7	186.3	215.6	217.2	208.9	208.8	230.4	205.4	185.3	185.7	188.7
1977	193.4	192.9	201.0	222.3	237.3	223.4	213.8	217.5	203.5	194.3	185.6	189.1
1978	193.5	195.2	208.3	246.8	222.9	223.2	194.7	184.0	185.7	184.6	183.0	180.2
1979	184.2	184.4	187.0	237.1	255.6	203.8	189.6	177.2	184.7	183.5	181.9	182.4
1980	182.9	186.5	194.5	195.1	201.4	182.9	187.2	176.4	180.1	182.7	180.4	177.8
1981	184.6	186.8	189.8	210.4	209.2	207.9	202.8	201.9	191.2	184.7	184.0	183.3
1982	183.8	185.6	192.9	215.5	179.8	201.6	167.8	168.1	176.6	182.9	180.2	175.1
1983	183.2	194.3	182.8	222.3	201.0	189.9	179.7	165.7	171.2	177.4	175.0	173.2
1984	184.8	174.7	192.2	185.1	184.9	182.8	189.6	187.0	185.3	182.5	181.7	183.1
1985	182.4	195.9	210.0	225.2	212.5	225.0	205.1	200.6	191.4	184.7	184.3	181.6
1986	186.0	187.5	189.5	237.3	209.5	190.9	198.0	179.3	184.3	182.7	181.9	177.5
1987	185.2	186.2	188.2	226.0	227.8	231.7	220.9	209.4	191.3	186.5	188.2	187.3
1988	188.8	191.6	208.4	249.7	237.9	234.4	214.7	210.9	193.6	189.2	190.1	191.4
1989	194.2	191.2	196.9	222.7	237.7	199.6	195.4	192.4	187.9	184.1	182.1	181.1
1990	184.8	190.6	201.1	217.1	242.3	223.6	205.7	204.4	196.9	187.3	186.8	189.0
1991	192.9	196.8	204.4	248.9	241.9	229.9	212.9	202.4	189.1	186.7	186.0	189.8
1992	190.8	196.7	208.6	236.7	250.8	236.3	212.6	203.0	189.0	187.4	187.0	187.4
1993	190.4	196.7	204.6	263.6	230.7	202.5	182.2	177.0	180.6	182.4	181.8	179.4
1994	184.9	186.4	190.0	228.2	260.3	231.6	206.1	201.8	197.7	184.6	185.0	184.6
1995	188.7	190.5	192.0	245.9	197.8	196.0	173.9	165.4	172.4	179.4	176.9	175.4
1996	183.7	189.7	198.1	225.8	200.3	189.3	185.6	171.5	179.1	182.7	182.1	181.7
1997	184.5	184.9	192.9	192.0	182.2	195.3	198.6	198.6	188.9	183.4	182.4	182.8
1998	185.3	186.0	192.1	251.4	238.6	186.5	175.2	170.3	172.6	179.3	177.4	175.7
1999	185.3	188.3	187.3	209.2	194.6	183.6	182.9	176.6	180.3	181.5	180.2	181.0
2000	185.2	188.5	188.6	214.5	225.4	185.7	190.3	183.9	184.3	183.3	182.3	180.3
2001	184.3	190.4	191.6	241.0	242.7	206.9	208.9	205.1	190.1	186.6	187.3	187.1
2002	191.0	192.1	199.4	208.7	212.5	199.4	196.5	211.3	191.3	184.6	184.1	184.2
2003	188.3	188.3	188.8	195.8	205.3	201.7	192.6	178.2	184.6	184.0	181.2	180.9
Average	186.3	189.3	195.0	222.0	216.4	203.4	194.8	189.6	186.1	183.9	182.8	182.3
Critical	188.2	191.4	200.0	231.2	241.1	226.9	210.7	210.1	196.5	187.8	186.6	188.6
Dry	186.9	190.4	196.0	222.3	223.7	211.7	205.0	203.4	190.5	185.2	185.0	184.1
BN	184.8	186.0	186.8	226.6	231.9	198.1	192.2	187.6	187.2	183.6	182.1	182.1
AN	187.3	192.4	198.4	224.9	215.5	197.6	189.4	180.5	183.4	183.3	181.8	179.7
Wet	184.7	186.7	191.7	214.8	197.9	190.4	184.3	176.8	179.7	181.6	180.2	179.4

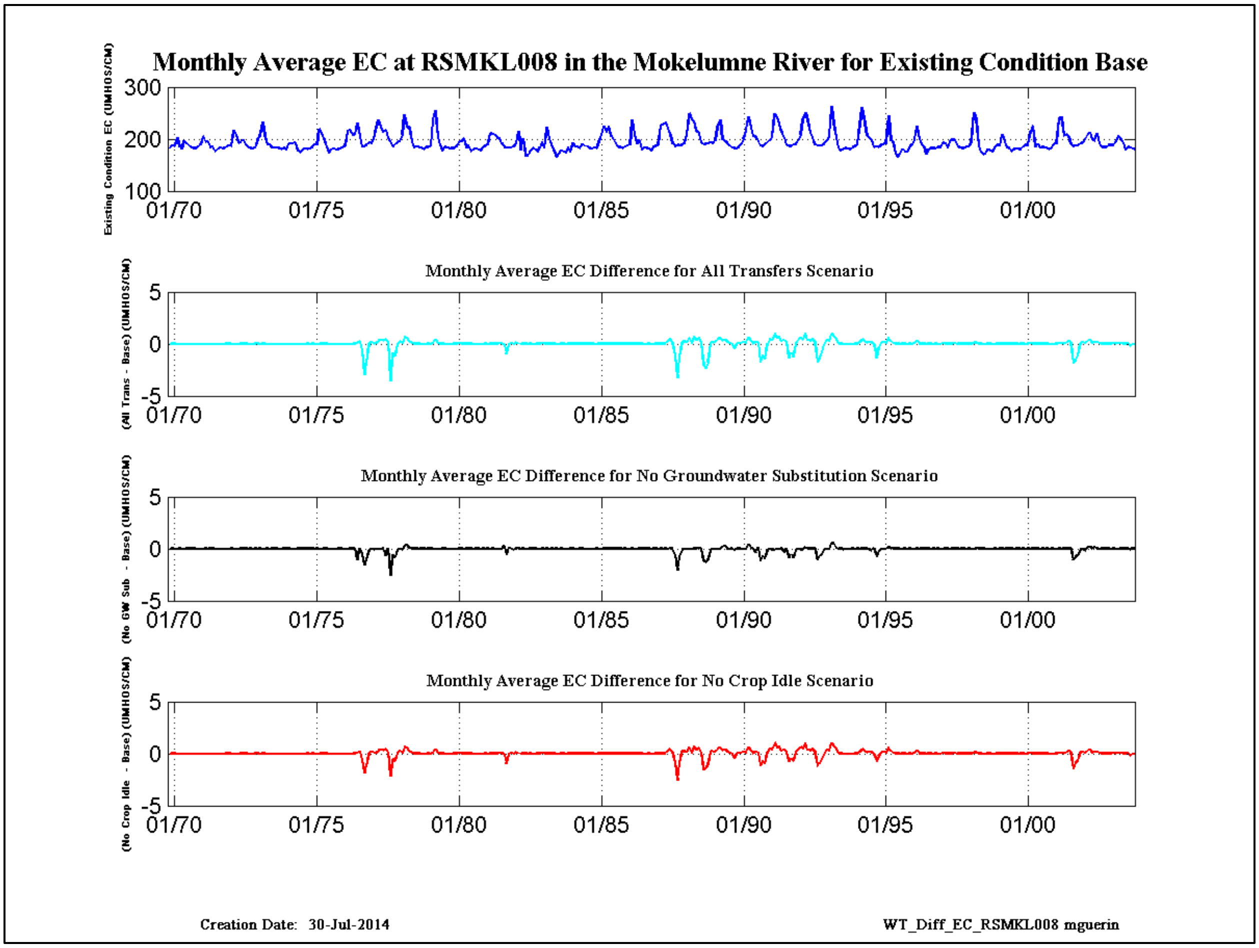


Figure E.3-16. Mokelumne River location San Joaquin River location RSMKL008 EC for the Base condition and change from Base for the scenarios.

Table E.3-96. Barker Slough location SLBAR002 Base salinity (EC).

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	186.1	186.4	193.8	220.8	220.1	199.7	201.4	196.4	191.9	189.4	189.1	189.4
1971	189.3	198.3	208.5	204.7	200.6	200.9	197.7	190.3	188.1	188.9	189.4	189.4
1972	190.1	192.0	195.9	201.2	204.8	206.4	206.4	198.5	192.7	189.4	187.5	187.7
1973	186.6	199.8	205.0	230.3	245.7	211.4	203.1	197.2	193.2	189.4	188.9	189.8
1974	188.1	195.8	198.4	203.6	201.0	197.7	193.2	191.0	190.1	188.7	187.7	188.7
1975	188.7	189.3	189.4	197.5	218.2	212.1	198.1	192.6	189.1	188.7	189.6	189.2
1976	183.8	187.2	188.0	195.9	204.2	204.9	206.4	204.6	200.5	194.6	189.2	193.6
1977	197.9	196.1	190.9	196.7	210.0	216.5	223.8	221.2	204.1	203.9	196.6	193.9
1978	202.5	203.5	211.5	244.7	255.0	222.3	206.9	195.5	192.6	190.3	189.8	189.5
1979	191.1	190.9	187.7	233.9	277.2	246.4	209.4	197.2	193.3	190.7	187.7	189.8
1980	187.5	185.6	197.0	219.7	227.2	212.5	200.1	195.2	191.6	188.9	188.2	189.0
1981	189.5	191.5	187.7	205.1	221.1	204.4	206.5	201.0	195.1	191.6	187.9	188.8
1982	187.8	193.2	195.7	223.8	223.5	212.2	210.3	193.1	190.7	188.9	189.3	188.2
1983	186.4	198.2	195.2	210.8	228.5	233.7	218.3	191.3	188.1	185.9	187.1	188.0
1984	188.2	187.7	193.8	197.6	194.7	199.6	199.0	194.6	192.9	189.4	188.9	190.1
1985	188.3	203.4	201.7	203.0	209.5	204.5	210.0	199.0	194.5	191.2	189.5	189.0
1986	190.1	193.0	193.5	208.8	249.5	233.5	204.9	199.6	193.6	190.6	189.2	188.9
1987	189.4	191.4	186.9	198.1	212.5	212.7	214.1	220.3	205.2	199.5	195.7	198.4
1988	202.4	202.4	199.9	211.5	227.4	233.5	228.7	211.1	205.0	198.4	195.5	198.5
1989	204.1	201.2	191.7	197.1	203.5	209.0	206.9	207.0	195.7	189.9	186.9	185.6
1990	187.2	190.1	194.1	204.6	213.7	221.8	220.0	206.8	197.9	203.9	197.7	198.1
1991	200.4	202.4	203.1	204.2	211.3	209.0	218.5	205.5	195.8	195.5	195.0	197.4
1992	198.3	197.8	197.0	202.6	216.5	225.1	226.5	220.6	210.7	198.5	195.0	197.3
1993	194.7	195.0	213.2	257.2	276.0	226.4	200.4	192.0	188.1	188.3	189.4	190.4
1994	190.9	190.9	189.5	203.7	223.7	228.5	216.5	200.2	195.1	196.1	191.0	193.3
1995	194.6	198.6	204.4	247.3	249.2	214.7	211.5	188.7	186.4	186.3	187.6	188.7
1996	189.2	190.4	202.0	209.8	215.8	206.7	194.9	189.0	189.9	190.6	190.3	189.3
1997	187.4	190.2	199.9	226.8	232.2	206.6	204.8	195.8	191.8	189.1	188.5	189.0
1998	188.6	192.6	191.3	211.2	252.2	242.4	193.3	186.5	185.8	185.5	187.4	187.4
1999	187.1	186.6	184.2	195.4	209.0	200.9	196.0	192.0	190.0	189.4	189.6	189.6
2000	190.3	191.6	188.5	201.8	217.7	208.7	197.7	194.1	193.7	190.0	189.4	189.5
2001	186.4	188.3	188.6	197.2	216.6	227.2	208.9	207.9	204.6	196.9	193.6	196.4
2002	199.9	195.2	210.7	226.5	215.9	210.0	207.7	208.9	201.3	190.7	187.9	190.3
2003	192.7	194.6	207.3	213.6	205.7	204.1	200.8	193.5	190.0	189.0	187.0	189.1
Average	191.3	193.9	196.6	212.0	223.2	214.9	207.1	199.4	194.4	191.7	190.1	190.9
Critical	194.4	195.3	194.6	202.7	215.3	219.9	220.1	210.0	201.3	198.7	194.3	196.0
Dry	192.9	195.2	194.5	204.5	213.2	211.3	209.0	207.3	199.4	193.3	190.2	191.4
BN	190.6	191.5	191.8	217.5	241.0	226.4	207.9	197.8	193.0	190.1	187.6	188.7
AN	192.4	195.0	203.7	227.9	237.9	214.2	201.5	194.6	191.6	189.3	188.8	189.5
Wet	188.6	192.3	196.2	212.2	222.7	212.4	201.8	192.4	189.9	188.6	188.7	188.9

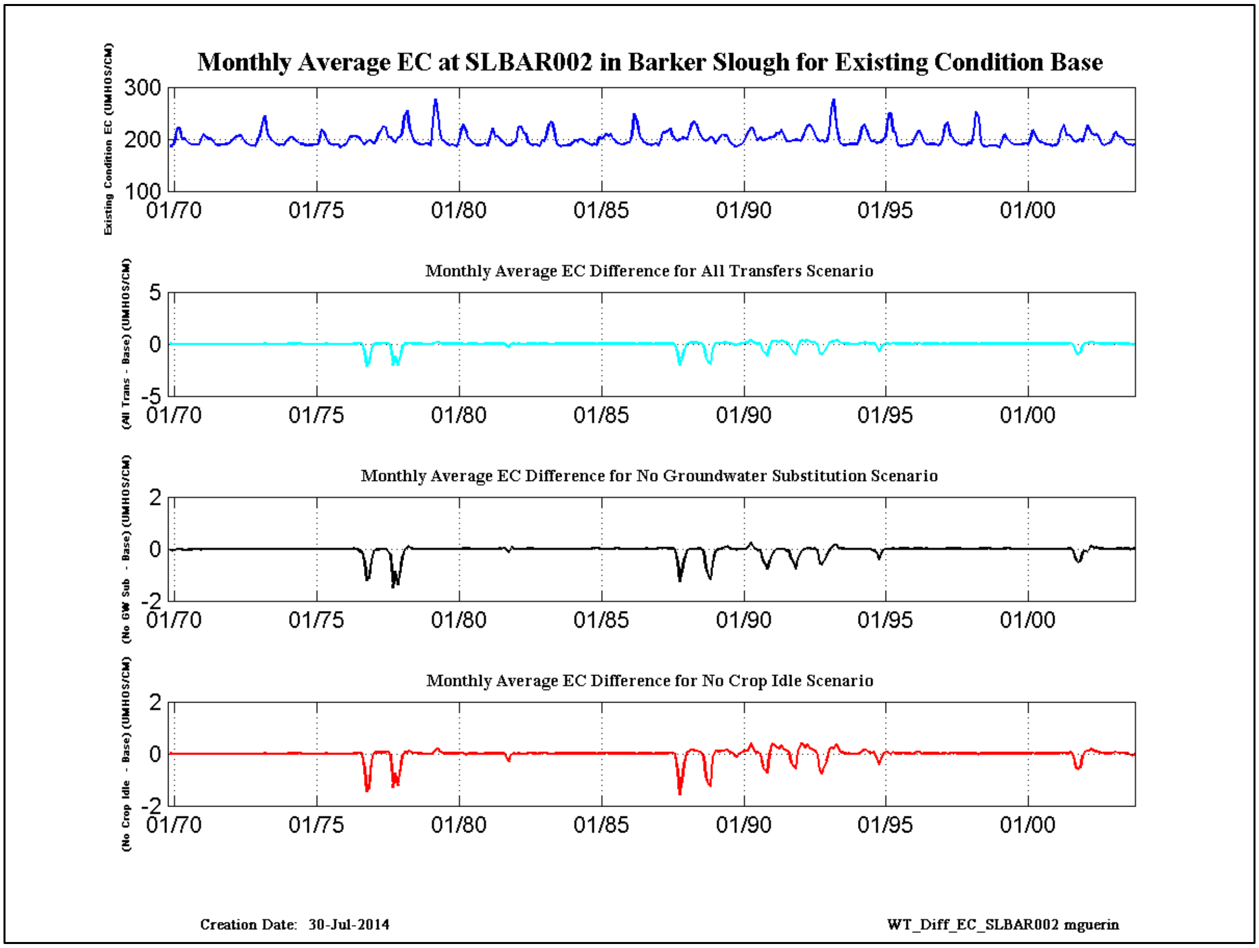


Figure E.3-17. Barker Slough location SLBAR002 EC for the Base condition and change from Base for the scenarios.

Table E.3-97. Suisun Marsh location SLCBN002 Base salinity (EC).

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	5164.7	5471.1	2604.9	1186.2	1026.0	980.1	2124.4	4396.3	6318.3	7702.3	8852.0	8158.9
1971	5559.2	5438.9	2726.5	1632.7	1749.0	1569.3	1460.2	1515.8	2331.3	4922.9	8645.7	8254.4
1972	5448.9	5516.6	5840.5	6460.9	4748.5	3010.1	3218.1	5456.9	7813.4	9169.2	10397.8	12605.9
1973	11957.5	9649.8	5994.5	2594.0	1493.8	1868.5	2118.3	2729.3	4217.8	7107.7	9531.3	10048.1
1974	7939.1	4016.2	1760.9	1246.5	1340.3	894.5	947.4	1320.3	2635.4	5166.1	8581.6	7946.6
1975	5529.2	5440.0	5773.9	7181.5	4271.9	1602.3	1530.3	1606.1	1755.0	4225.2	8300.0	8169.8
1976	5347.7	5344.0	5622.7	7633.6	7456.7	7327.7	7709.0	9573.8	12422.4	13948.0	14373.6	15455.4
1977	14250.0	13441.7	13000.9	11013.6	8488.3	9908.9	10827.8	12054.2	14260.8	15539.0	16383.7	17056.3
1978	14922.9	13701.1	11544.7	4713.3	2513.9	2492.8	2177.6	2403.4	3742.1	6414.9	9709.6	10724.6
1979	8221.9	7808.8	7928.5	6928.1	3486.9	2531.8	2924.2	3241.6	4773.7	8332.0	10900.9	13314.6
1980	12155.2	10830.5	8647.9	3850.7	2019.1	2054.8	2280.5	2808.9	4026.0	6382.9	9579.6	10399.5
1981	8022.4	7450.6	7570.5	6442.8	3958.1	3198.4	3849.6	5543.4	7990.6	10485.6	12319.0	13973.0
1982	12997.2	7981.9	3123.9	2002.3	1602.3	1244.8	1198.2	1144.3	1679.9	4214.4	8708.6	8418.9
1983	5123.5	2914.0	1504.6	1021.4	962.8	856.5	1007.2	827.7	698.3	848.9	1953.7	2718.8
1984	3238.8	1932.1	853.4	776.3	781.6	807.6	1510.9	3213.2	5652.5	7536.9	8817.3	8293.3
1985	5620.4	4882.8	4180.6	5098.6	4975.3	5054.7	5234.6	5586.5	7869.1	10298.4	12257.7	13929.9
1986	12086.7	11711.6	10005.9	5996.4	2121.9	1860.2	1953.3	2517.2	4296.2	7114.4	9688.7	8892.8
1987	5961.6	6154.2	6802.0	7919.9	5968.5	3802.1	4590.3	7638.4	9353.8	11104.6	12947.0	14324.0
1988	13270.5	12622.1	10462.4	5498.5	4064.4	6556.5	8960.0	9379.9	10470.8	12170.0	14050.1	15400.9
1989	14365.3	13408.1	12512.0	11128.9	9314.7	4878.1	3116.4	4606.4	7782.0	10892.9	12686.4	13316.9
1990	11874.9	11915.8	12307.5	9583.8	6810.7	7439.8	8519.0	9411.1	11563.5	13937.5	15051.1	15853.3
1991	14447.5	14087.2	14072.1	12633.1	10244.5	6543.8	5597.8	8311.5	11767.1	14106.6	15130.5	16043.7
1992	14739.3	14081.0	14027.1	12784.4	7166.1	4496.8	6075.0	8784.3	10865.7	12460.5	14689.9	15819.8
1993	14067.8	13095.0	12193.9	5234.5	2779.7	2693.3	2522.8	1964.4	2408.6	4613.3	8946.0	10008.3
1994	7828.4	7585.2	7809.9	8375.5	6134.9	5597.6	7282.9	7799.1	10052.5	12860.7	14112.7	15260.2
1995	13143.3	11658.3	11552.0	4366.9	3016.8	1717.9	2284.1	1538.3	1453.1	1868.6	4264.9	6077.1
1996	5202.7	5096.3	4783.9	2722.3	1171.3	1250.4	1274.2	978.6	2193.4	6076.1	9273.5	8190.9
1997	5513.3	5449.9	2118.3	1032.1	1306.7	1547.9	2340.0	3381.4	5542.8	7479.5	8783.2	8126.3
1998	5826.0	5705.8	5293.4	3405.6	1291.8	1401.4	1203.4	891.8	745.7	1065.6	2693.2	3988.7
1999	4090.6	4064.2	2425.0	1296.8	873.6	705.4	926.9	1580.7	3393.4	6049.9	8965.4	8293.7
2000	5352.4	5291.7	5851.0	5416.3	1826.4	1381.5	1501.2	2355.9	4996.8	7569.0	8961.1	9863.2
2001	7734.4	7186.9	7316.9	7525.3	4109.7	2666.2	3425.4	5925.1	8138.7	10429.3	12337.5	14113.0
2002	12795.0	11869.3	7306.8	2939.7	2894.3	3896.9	3898.4	4598.7	7419.6	10996.6	12510.6	14264.8
2003	12796.0	12175.8	6864.3	3103.8	2388.4	3218.9	2702.8	1805.0	3379.6	7003.7	9046.5	9991.9
Average	9193.9	8381.7	7128.9	5316.1	3657.6	3148.7	3479.2	4320.3	6000.3	8238.0	10395.6	11097.0
Critical	11679.8	11296.7	11043.2	9646.1	7195.1	6838.7	7853.1	9330.6	11629.0	13574.6	14827.4	15841.4
Dry	9083.2	8492.0	7614.8	6842.5	5203.4	3916.0	4019.1	5649.8	8092.3	10701.2	12509.7	13986.9
BN	6835.4	6662.7	6884.5	6694.5	4117.7	2771.0	3071.1	4349.3	6293.5	8750.6	10649.3	12960.3
AN	11875.3	10790.6	8516.1	4152.1	2170.2	2285.0	2217.2	2344.5	3795.2	6515.3	9295.7	10172.6
Wet	7031.9	5913.9	4194.4	2605.1	1655.1	1264.5	1520.0	1916.3	2976.6	4943.9	7502.1	7348.5

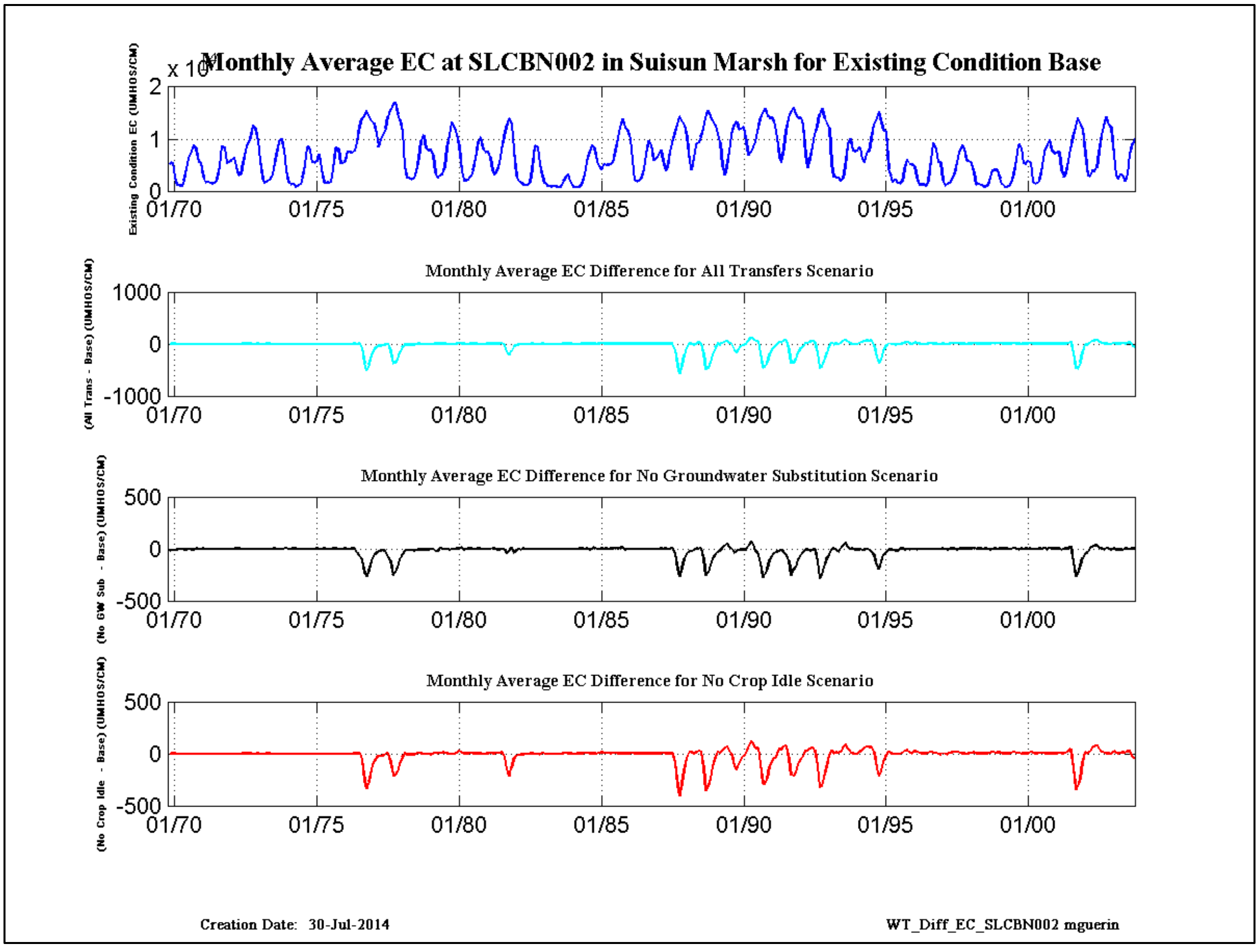


Figure E.3-18. Suisun Marsh location SLCBN002 EC for the Base condition and change from Base for the scenarios.

Table E.3-98. San Joaquin River location RSAN037 salinity (EC, UMHOS/CM) difference All Transfers minus Base.

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	0.0	0.0	0.0	-0.1	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1971	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	0.0	0.0	0.0	0.0
1972	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.0
1973	0.0	0.0	0.0	0.0	0.2	-10.2	-6.2	-0.6	0.0	0.0	0.0	0.0
1974	0.0	0.0	0.0	0.0	0.0	0.1	-0.1	0.0	0.0	0.0	0.0	0.0
1975	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0
1976	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	1.7	24.1	-32.5	-49.2
1977	-35.3	-15.6	-15.2	-13.9	-3.7	0.0	0.7	0.7	2.9	-13.7	-22.4	-37.0
1978	-32.4	-11.8	-8.0	0.5	0.9	0.5	0.1	0.2	0.2	0.1	0.1	0.1
1979	0.0	0.0	-0.1	0.3	0.4	0.1	0.2	0.2	0.1	0.0	0.0	0.0
1980	-0.2	0.5	3.7	0.4	-2.0	-0.1	0.0	0.2	0.1	0.0	0.0	0.0
1981	0.0	0.0	-0.2	0.2	0.1	0.0	0.2	0.5	0.4	-3.6	19.9	3.9
1982	-17.5	-9.8	-0.4	0.3	-6.9	-1.8	0.2	-0.2	-0.2	-0.1	0.0	0.0
1983	-0.1	0.0	-0.2	0.0	0.4	0.2	0.1	-0.2	0.2	0.0	-0.1	0.0
1984	0.1	-0.1	0.1	0.0	0.0	0.1	0.1	0.1	0.0	0.0	0.0	0.0
1985	0.0	0.1	0.2	0.2	0.1	0.3	0.2	0.1	0.1	-0.2	-0.3	-0.5
1986	-0.2	-0.5	0.1	0.3	0.1	0.3	0.1	0.1	0.1	0.0	0.0	0.0
1987	0.0	0.1	-0.1	-0.2	0.1	0.0	1.1	1.7	1.0	9.9	-0.1	-26.4
1988	-22.8	-12.4	-8.1	0.2	0.3	2.2	1.8	1.9	1.5	19.1	0.5	-36.1
1989	-34.4	-18.1	-5.3	5.9	1.6	2.2	1.0	1.8	0.6	-0.7	9.9	-3.7
1990	-9.6	-7.8	-7.3	-4.0	0.7	1.5	1.3	0.8	2.0	43.6	2.9	-35.6
1991	-33.7	-16.7	-14.1	-8.9	-1.1	0.8	0.9	1.0	3.6	36.3	1.4	-29.1
1992	-27.7	-13.0	-11.3	-12.7	-1.5	0.8	0.5	1.4	1.1	19.9	2.2	-30.5
1993	-23.9	-9.5	-2.7	2.8	1.5	1.0	0.6	0.8	-12.2	-2.1	0.7	0.3
1994	0.1	0.0	-0.1	1.3	1.8	0.8	0.6	0.4	1.0	-11.5	-1.6	23.1
1995	-5.5	-3.2	-4.6	1.2	0.7	0.3	0.2	0.1	0.2	-0.1	0.1	0.1
1996	0.0	-0.1	0.1	0.3	0.2	-0.1	0.1	0.1	0.1	0.2	0.3	0.2
1997	0.0	0.0	0.0	-0.3	-0.2	0.0	0.0	0.2	0.1	-0.1	-0.1	-0.7
1998	0.2	0.3	0.3	0.3	0.3	-0.1	0.0	0.3	0.2	-0.1	0.0	0.0
1999	0.0	0.1	0.1	0.0	0.0	0.0	0.2	0.2	0.1	0.1	0.1	0.1
2000	0.0	0.0	-0.3	0.0	0.2	0.2	0.2	0.1	0.0	0.0	-0.1	0.0
2001	0.0	0.0	-0.6	-0.3	0.1	0.1	0.7	1.0	1.2	20.2	10.7	-17.2
2002	-18.8	-5.8	1.9	0.6	0.5	0.3	0.2	0.4	0.6	-0.3	-0.7	-1.8
2003	-1.0	-0.9	0.4	0.2	0.1	0.1	0.2	0.2	0.2	4.8	0.5	-3.1
Average	-7.7	-3.7	-2.1	-0.7	-0.2	0.0	0.2	0.4	0.2	4.3	-0.3	-7.2
Critical	-18.5	-9.4	-8.0	-5.4	-0.5	0.9	0.8	0.9	2.0	16.8	-7.1	-27.8
Dry	-8.9	-4.0	-0.7	1.1	0.4	0.5	0.6	0.9	0.6	4.2	6.6	-7.6
BN	0.0	0.0	0.0	0.1	0.2	0.1	0.1	0.1	0.0	0.0	0.0	0.0
AN	-9.6	-3.6	-1.1	0.7	0.1	-1.4	-0.8	0.1	-2.0	0.5	0.2	-0.5
Wet	-1.8	-1.0	-0.4	0.2	-0.4	-0.1	0.1	0.0	0.1	0.0	0.0	0.0

Table E.3-99. San Joaquin River location RSAN037 salinity (EC, UMHOS/CM) percent difference of All Transfers from Base.

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1971	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1972	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1973	0.0	0.0	0.0	0.0	0.1	-3.4	-2.1	-0.2	0.0	0.0	0.0	0.0
1974	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1975	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1976	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5	4.8	-6.2	-10.0
1977	-6.3	-2.9	-2.3	-1.9	-0.9	0.0	0.2	0.2	0.8	-3.2	-4.4	-5.6
1978	-5.3	-2.2	-1.4	0.1	0.2	0.1	0.0	0.1	0.1	0.0	0.1	0.0
1979	0.0	0.0	0.0	0.1	0.1	0.0	0.1	0.1	0.0	0.0	0.0	0.0
1980	0.0	0.1	0.7	0.1	-0.6	-0.1	0.0	0.1	0.0	0.0	0.0	0.0
1981	0.0	0.0	-0.1	0.0	0.0	0.0	0.1	0.2	0.1	-1.1	4.4	0.7
1982	-3.1	-2.1	-0.2	0.1	-2.5	-0.6	0.1	-0.1	-0.1	0.0	0.0	0.0
1983	0.0	0.0	-0.1	0.0	0.1	0.1	0.1	-0.1	0.1	0.0	-0.1	0.0
1984	0.0	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1985	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.0	-0.1	-0.1	-0.1
1986	0.0	-0.1	0.0	0.1	0.0	0.1	0.1	0.0	0.1	0.0	0.0	0.0
1987	0.0	0.1	-0.1	0.0	0.0	0.0	0.3	0.5	0.4	3.7	0.0	-6.6
1988	-4.8	-2.7	-1.6	0.1	0.1	0.7	0.6	0.6	0.6	6.7	0.1	-7.8
1989	-5.9	-3.3	-0.8	0.8	0.3	0.6	0.4	0.7	0.3	-0.2	1.9	-0.8
1990	-2.2	-1.6	-1.3	-0.8	0.2	0.6	0.5	0.3	0.7	9.8	0.5	-6.8
1991	-5.6	-2.7	-2.0	-1.4	-0.2	0.2	0.3	0.3	1.3	7.6	0.3	-5.8
1992	-4.8	-2.3	-1.7	-1.9	-0.3	0.2	0.2	0.5	0.4	6.7	0.5	-5.9
1993	-4.8	-2.0	-0.5	0.6	0.4	0.3	0.2	0.3	-4.7	-1.0	0.3	0.1
1994	0.0	0.0	0.0	0.2	0.5	0.3	0.2	0.2	0.4	-2.2	-0.3	4.2
1995	-1.1	-0.8	-0.8	0.3	0.3	0.1	0.1	0.0	0.1	0.0	0.0	0.1
1996	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.1	0.1	0.0
1997	0.0	0.0	0.0	-0.1	-0.1	0.0	0.0	0.1	0.0	0.0	0.0	-0.2
1998	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.2	0.1	0.0	0.0	0.0
1999	0.0	0.1	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.0
2000	0.0	0.0	-0.1	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.0
2001	0.0	0.0	-0.2	-0.1	0.0	0.0	0.2	0.3	0.5	7.7	3.3	-4.4
2002	-4.1	-1.3	0.5	0.2	0.2	0.1	0.1	0.1	0.2	-0.1	-0.2	-0.3
2003	-0.2	-0.2	0.1	0.1	0.0	0.0	0.1	0.1	0.1	2.2	0.2	-1.0
Average	-1.4	-0.7	-0.3	-0.1	-0.1	0.0	0.1	0.1	0.1	1.2	0.0	-1.5
Critical	-3.4	-1.7	-1.3	-0.8	-0.1	0.3	0.3	0.3	0.7	4.3	-1.4	-5.4
Dry	-1.7	-0.7	-0.1	0.2	0.1	0.1	0.2	0.3	0.3	1.7	1.6	-1.9
BN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AN	-1.7	-0.7	-0.2	0.2	0.0	-0.5	-0.3	0.1	-0.8	0.2	0.1	-0.1
Wet	-0.3	-0.2	-0.1	0.0	-0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0

1 **Table E.3-100. RSAN072 salinity (EC) difference All Transfers minus Base.**

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	0.2	0.0	0.0	-0.2	-0.2	0.0	0.0	0.1	0.3	0.3	-0.3	-0.1
1971	-0.2	-0.2	0.0	0.0	0.3	-0.3	0.0	-0.1	0.2	-0.3	-0.2	-0.2
1972	0.2	-0.4	0.3	-0.2	0.2	0.2	0.3	-0.3	0.3	0.3	-0.2	-0.4
1973	0.3	0.1	0.2	-0.2	0.1	-20.9	-1.5	0.3	0.1	-0.4	-0.2	-0.4
1974	-0.5	0.4	0.1	-0.2	0.0	0.2	-0.2	0.1	0.3	0.3	0.3	0.4
1975	-0.2	0.2	-0.2	0.4	-0.1	0.2	0.1	-0.4	0.0	0.3	-0.1	0.0
1976	-0.1	-0.3	0.2	0.1	0.2	0.3	0.0	-0.2	0.0	-3.2	0.3	0.1
1977	-0.2	0.1	-0.1	0.2	0.2	0.4	0.0	0.4	0.0	-0.2	0.2	0.0
1978	-0.4	0.3	0.1	-0.4	0.0	0.1	0.0	0.3	0.3	0.2	0.3	0.4
1979	0.2	0.4	0.0	-0.1	0.4	-0.1	0.4	0.2	0.2	0.3	0.0	0.2
1980	0.2	-0.3	-0.2	0.1	0.2	-0.4	0.3	0.2	0.1	-0.3	-0.3	-0.1
1981	0.4	0.0	-0.1	-0.2	-0.1	-0.4	1.6	0.5	0.0	-0.2	0.3	-0.2
1982	0.3	-0.3	0.3	0.0	-13.9	-1.1	0.4	-0.4	-0.3	-0.3	0.4	-0.3
1983	-0.4	0.0	-0.3	0.1	0.5	0.3	0.1	-0.3	0.3	-0.1	-0.5	0.0
1984	0.4	-0.3	0.2	0.0	0.1	0.1	0.2	-0.2	0.3	0.3	0.3	-0.1
1985	0.0	-0.2	-0.2	0.3	0.2	-0.2	0.4	0.0	-0.4	-0.4	-0.4	0.3
1986	0.5	0.0	0.4	0.5	0.1	0.4	0.1	0.0	0.4	0.0	0.0	-0.3
1987	0.3	0.3	0.1	0.1	0.0	-0.1	-0.2	-0.1	0.3	-0.4	0.5	-0.3
1988	-0.4	0.3	0.0	0.0	0.4	0.1	0.4	-0.2	0.1	-0.5	0.1	0.3
1989	0.1	0.3	0.1	-0.4	-0.4	0.3	-0.4	0.3	0.0	0.5	-0.6	-0.2
1990	-0.2	-0.2	0.0	0.2	0.3	-0.2	-0.4	0.0	-0.3	-22.6	-5.0	0.1
1991	-0.1	0.3	-0.3	0.1	-0.3	0.0	-0.3	0.1	0.1	-31.4	-6.4	0.1
1992	-0.2	0.4	0.1	0.1	-0.1	0.1	-8.7	-1.6	0.2	-84.0	-34.3	0.1
1993	0.1	-0.2	0.3	0.2	0.1	0.1	0.5	0.4	17.7	1.7	0.4	-0.1
1994	0.0	0.0	-0.3	-0.4	0.0	0.2	0.3	-0.4	-0.4	0.3	-1.9	-0.3
1995	0.1	0.2	0.3	-0.1	-0.4	0.3	0.2	0.1	0.3	-0.2	0.3	-0.4
1996	-0.4	-0.2	-0.2	-0.3	0.2	-0.3	0.4	-0.1	0.1	-0.1	-0.1	0.2
1997	-0.4	-0.1	-0.2	-0.4	-0.2	0.1	-0.1	0.4	0.0	0.1	-0.4	0.3
1998	0.2	-0.3	0.1	0.4	0.3	-0.3	0.0	0.4	0.1	-0.2	-0.4	0.2
1999	-0.4	0.0	-0.3	-0.4	0.1	0.0	0.4	0.3	0.5	-0.3	0.0	-0.1
2000	0.2	-0.3	-0.3	-0.2	0.3	0.3	0.4	-0.4	0.2	-0.1	-0.1	0.1
2001	-0.1	-0.2	-0.3	0.2	0.0	0.3	2.9	-0.2	-0.4	-0.8	0.0	-0.3
2002	0.2	0.1	0.4	-0.1	-0.1	0.2	0.1	0.0	-0.4	0.0	0.2	0.0
2003	0.1	0.0	0.0	0.3	0.5	0.5	0.3	-0.1	-0.2	-1.4	0.2	0.2
Average	0.0	0.0	0.0	0.0	-0.3	-0.6	-0.1	0.0	0.6	-4.2	-1.4	0.0
Critical	-0.2	0.1	-0.1	0.1	0.1	0.1	-1.2	-0.3	0.0	-20.2	-6.7	0.1
Dry	0.1	0.0	0.0	0.0	-0.1	0.0	0.7	0.1	-0.1	-0.2	0.0	-0.1
BN	0.2	0.0	0.1	-0.1	0.3	0.1	0.3	-0.1	0.3	0.3	-0.1	-0.1
AN	0.1	-0.1	0.0	0.0	0.2	-3.4	0.0	0.1	3.0	0.0	0.0	0.0
Wet	-0.1	0.0	0.0	0.0	-1.0	0.0	0.1	0.0	0.2	0.0	-0.1	0.0

Table E.3-101. RSAN072 salinity (EC) percent difference of All Transfers from Base.

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	0.0	0.0	0.0	-0.1	-0.1	0.0	0.0	0.0	0.1	0.1	-0.1	0.0
1971	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	0.0	0.0	0.0	0.0	0.0
1972	0.0	-0.1	0.0	0.0	0.0	0.0	0.1	-0.1	0.1	0.0	0.0	-0.1
1973	0.1	0.0	0.0	0.0	0.0	-5.9	-0.4	0.1	0.0	-0.1	0.0	-0.1
1974	-0.1	0.1	0.0	0.0	0.0	0.1	-0.1	0.0	0.1	0.0	0.1	0.1
1975	0.0	0.0	0.0	0.0	0.0	0.1	0.0	-0.1	0.0	0.1	0.0	0.0
1976	0.0	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.5	0.1	0.0
1977	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0
1978	-0.1	0.0	0.0	-0.1	0.0	0.0	0.0	0.1	0.1	0.0	0.1	0.1
1979	0.0	0.1	0.0	0.0	0.1	0.0	0.1	0.1	0.1	0.0	0.0	0.0
1980	0.0	0.0	0.0	0.0	0.1	-0.2	0.1	0.1	0.0	-0.1	-0.1	0.0
1981	0.1	0.0	0.0	0.0	0.0	-0.1	0.4	0.1	0.0	0.0	0.0	0.0
1982	0.1	-0.1	0.0	0.0	-4.7	-0.4	0.2	-0.2	-0.1	-0.1	0.1	-0.1
1983	-0.2	0.0	-0.1	0.0	0.2	0.1	0.1	-0.2	0.2	-0.1	-0.3	0.0
1984	0.1	-0.2	0.1	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.1	0.0
1985	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	-0.1	-0.1	-0.1	0.1
1986	0.1	0.0	0.1	0.1	0.0	0.2	0.0	0.0	0.1	0.0	0.0	-0.1
1987	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.1	-0.1	0.1	-0.1
1988	-0.1	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	-0.1	0.0	0.0
1989	0.0	0.0	0.0	-0.1	0.0	0.0	-0.1	0.0	0.0	0.1	-0.1	0.0
1990	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	0.0	-3.4	-0.8	0.0
1991	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-4.5	-0.9	0.0
1992	0.0	0.1	0.0	0.0	0.0	0.0	-1.1	-0.2	0.0	-12.2	-4.5	0.0
1993	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	2.6	0.2	0.1	0.0
1994	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	-0.1	0.0	-0.3	0.0
1995	0.0	0.0	0.0	0.0	-0.1	0.1	0.1	0.0	0.1	-0.1	0.1	-0.1
1996	-0.1	0.0	0.0	0.0	0.1	-0.1	0.1	0.0	0.0	0.0	0.0	0.0
1997	-0.1	0.0	-0.1	-0.2	-0.1	0.1	0.0	0.1	0.0	0.0	-0.1	0.1
1998	0.0	-0.1	0.0	0.1	0.1	-0.1	0.0	0.2	0.1	-0.1	-0.2	0.1
1999	-0.1	0.0	0.0	-0.1	0.0	0.0	0.1	0.1	0.1	0.0	0.0	0.0
2000	0.0	-0.1	0.0	0.0	0.1	0.1	0.1	-0.1	0.0	0.0	0.0	0.0
2001	0.0	0.0	0.0	0.0	0.0	0.0	0.7	0.0	-0.1	-0.1	0.0	0.0
2002	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	0.0	0.0
2003	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.0	0.0	-0.2	0.0	0.0
Average	0.0	0.0	0.0	0.0	-0.1	-0.2	0.0	0.0	0.1	-0.6	-0.2	0.0
Critical	0.0	0.0	0.0	0.0	0.0	0.0	-0.2	0.0	0.0	-2.9	-0.9	0.0
Dry	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.0
BN	0.0	0.0	0.0	0.0	0.1	0.0	0.1	0.0	0.1	0.0	0.0	0.0
AN	0.0	0.0	0.0	0.0	0.0	-1.0	0.0	0.0	0.4	0.0	0.0	0.0
Wet	0.0	0.0	0.0	0.0	-0.3	0.0	0.1	0.0	0.1	0.0	0.0	0.0

Table E.3-102. San Joaquin River location RSAN112 salinity (EC) difference All Transfers minus Base.

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	0.2	0.0	0.0	-0.2	-0.2	0.0	0.0	0.1	0.3	0.4	-0.4	-0.1
1971	-0.2	-0.2	0.0	0.0	0.3	-0.4	0.1	-0.1	0.2	-0.3	-0.2	-0.2
1972	0.2	-0.4	0.3	-0.3	0.2	0.2	0.3	-0.4	0.4	0.3	-0.3	-0.4
1973	0.4	0.0	0.2	-0.3	0.2	-21.8	-0.9	0.4	0.1	-0.4	-0.2	-0.4
1974	-0.5	0.4	0.1	-0.2	0.0	0.3	-0.3	0.1	0.3	0.3	0.4	0.4
1975	-0.2	0.2	-0.2	0.4	-0.1	0.2	0.1	-0.4	0.0	0.3	-0.1	0.0
1976	-0.1	-0.3	0.2	0.0	0.2	0.3	0.0	-0.2	0.0	-0.2	-0.1	0.1
1977	-0.2	0.1	-0.2	0.3	0.1	0.3	0.2	0.4	-0.1	0.0	-0.4	0.0
1978	-0.4	0.3	0.1	-0.4	0.0	0.1	0.0	0.3	0.3	0.2	0.3	0.4
1979	0.2	0.4	0.0	-0.1	0.4	-0.1	0.4	0.2	0.3	0.3	0.0	0.2
1980	0.2	-0.3	-0.2	0.1	0.2	-0.4	0.3	0.2	0.1	-0.3	-0.3	-0.1
1981	0.4	0.0	-0.1	-0.2	-0.1	-0.4	1.6	0.5	0.0	-0.2	0.0	-0.2
1982	0.4	-0.4	0.4	0.0	-14.5	-0.9	0.4	-0.4	-0.3	-0.3	0.4	-0.4
1983	-0.4	0.1	-0.3	0.1	0.5	0.2	0.1	-0.4	0.3	-0.1	-0.5	0.0
1984	0.4	-0.3	0.2	0.0	0.1	0.1	0.2	-0.2	0.4	0.3	0.3	-0.2
1985	0.0	-0.2	-0.2	0.4	0.2	-0.2	0.4	0.0	-0.5	-0.4	-0.4	0.4
1986	0.5	0.0	0.5	0.5	0.1	0.4	0.1	0.0	0.4	0.0	0.0	-0.3
1987	0.3	0.3	0.1	0.1	0.0	-0.1	-0.2	-0.1	0.4	0.1	-0.2	-0.4
1988	-0.4	0.3	-0.1	0.0	0.4	0.1	0.4	-0.3	0.1	-0.5	0.4	0.3
1989	0.1	0.3	0.0	-0.4	-0.4	0.3	-0.4	0.3	0.1	0.3	-0.3	-0.2
1990	-0.2	-0.2	0.0	0.3	0.3	-0.2	-0.4	0.1	-0.4	0.2	0.4	0.1
1991	-0.2	0.3	-0.4	0.2	-0.3	0.0	-0.3	0.1	0.1	-0.4	-0.5	0.2
1992	-0.2	0.5	-0.1	0.4	-0.2	0.1	-10.1	-0.1	0.2	0.5	0.3	0.1
1993	0.1	-0.2	0.4	0.2	0.1	0.1	0.5	0.4	19.8	0.7	0.4	-0.1
1994	0.0	0.0	-0.4	-0.4	0.1	0.2	0.3	-0.5	-0.5	0.3	0.3	-0.4
1995	0.1	0.2	0.3	-0.1	-0.5	0.3	0.1	0.1	0.3	-0.2	0.3	-0.5
1996	-0.4	-0.2	-0.2	-0.3	0.2	-0.4	0.4	-0.1	0.2	-0.1	-0.1	0.2
1997	-0.4	-0.1	-0.2	-0.4	-0.2	0.1	-0.1	0.5	-0.1	0.1	-0.5	0.4
1998	0.2	-0.3	0.2	0.4	0.3	-0.3	0.0	0.4	0.1	-0.2	-0.4	0.2
1999	-0.4	0.0	-0.3	-0.4	0.1	-0.1	0.5	0.3	0.5	-0.3	0.1	-0.1
2000	0.2	-0.4	-0.3	-0.2	0.3	0.3	0.4	-0.4	0.2	-0.1	-0.1	0.1
2001	-0.1	-0.2	-0.3	0.3	0.0	0.3	3.0	-0.3	-0.4	-0.5	-0.3	-0.3
2002	0.2	0.1	0.4	-0.1	-0.1	0.2	0.1	-0.1	-0.4	-0.1	0.3	-0.1
2003	0.1	0.0	0.0	0.3	0.5	0.5	0.3	-0.1	-0.2	-0.1	0.2	0.2
Average	0.0	0.0	0.0	0.0	-0.4	-0.6	-0.1	0.0	0.7	0.0	0.0	0.0
Critical	-0.2	0.1	-0.1	0.1	0.1	0.1	-1.4	-0.1	-0.1	0.0	0.1	0.0
Dry	0.1	0.0	0.0	0.0	-0.1	0.0	0.8	0.0	-0.1	-0.1	-0.1	-0.1
BN	0.2	0.0	0.2	-0.2	0.3	0.1	0.4	-0.1	0.3	0.3	-0.2	-0.1
AN	0.1	-0.1	0.0	-0.1	0.2	-3.5	0.1	0.1	3.4	0.0	0.0	0.0
Wet	-0.1	0.0	0.0	0.0	-1.1	0.0	0.1	0.0	0.2	0.0	-0.1	0.0

Table E.3-103. San Joaquin River location RSAN112 salinity (EC) percent difference of All Transfers from Base.

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	0.0	0.0	0.0	-0.1	-0.1	0.0	0.0	0.0	0.1	0.1	-0.1	0.0
1971	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	0.0	0.1	-0.1	0.0	0.0
1972	0.0	-0.1	0.0	0.0	0.0	0.0	0.1	-0.1	0.1	0.0	-0.1	-0.1
1973	0.1	0.0	0.0	0.0	0.0	-6.4	-0.3	0.1	0.0	-0.1	0.0	-0.1
1974	-0.1	0.1	0.0	0.0	0.0	0.1	-0.1	0.0	0.1	0.0	0.1	0.1
1975	0.0	0.0	0.0	0.1	0.0	0.1	0.0	-0.1	0.0	0.1	0.0	0.0
1976	0.0	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1977	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	-0.1	0.0
1978	-0.1	0.0	0.0	-0.1	0.0	0.0	0.0	0.1	0.1	0.0	0.1	0.1
1979	0.0	0.1	0.0	0.0	0.1	-0.1	0.1	0.1	0.1	0.0	0.0	0.0
1980	0.0	-0.1	0.0	0.0	0.1	-0.2	0.1	0.1	0.0	-0.1	-0.1	0.0
1981	0.1	0.0	0.0	0.0	0.0	-0.1	0.4	0.1	0.0	0.0	0.0	0.0
1982	0.1	-0.1	0.0	0.0	-5.0	-0.3	0.2	-0.3	-0.1	-0.1	0.1	-0.1
1983	-0.2	0.0	-0.1	0.0	0.2	0.1	0.1	-0.2	0.2	-0.1	-0.3	0.0
1984	0.1	-0.2	0.1	0.0	0.0	0.0	0.1	0.0	0.1	0.0	0.1	0.0
1985	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	-0.1	-0.1	-0.1	0.1
1986	0.1	0.0	0.1	0.1	0.0	0.2	0.0	0.0	0.1	0.0	0.0	-0.1
1987	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	-0.1
1988	-0.1	0.1	0.0	0.0	0.0	0.0	0.1	0.0	0.0	-0.1	0.1	0.0
1989	0.0	0.0	0.0	-0.1	0.0	0.0	-0.1	0.0	0.0	0.0	-0.1	0.0
1990	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	-0.1	0.0	0.1	0.0
1991	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	0.0	-0.1	-0.1	0.0
1992	0.0	0.1	0.0	0.0	0.0	0.0	-1.3	0.0	0.0	0.1	0.0	0.0
1993	0.0	0.0	0.1	0.0	0.0	0.0	0.1	0.1	2.9	0.1	0.1	0.0
1994	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	-0.1	0.0	0.0	-0.1
1995	0.0	0.0	0.0	0.0	-0.1	0.1	0.1	0.0	0.1	-0.1	0.1	-0.1
1996	-0.1	0.0	0.0	0.0	0.1	-0.1	0.1	0.0	0.0	0.0	0.0	0.0
1997	-0.1	0.0	-0.1	-0.2	-0.1	0.1	0.0	0.1	0.0	0.0	-0.1	0.1
1998	0.0	-0.1	0.0	0.1	0.1	-0.1	0.0	0.3	0.1	-0.1	-0.2	0.1
1999	-0.1	0.0	0.0	-0.1	0.0	0.0	0.1	0.1	0.1	-0.1	0.0	0.0
2000	0.0	-0.1	0.0	0.0	0.1	0.1	0.1	-0.1	0.0	0.0	0.0	0.0
2001	0.0	0.0	0.0	0.0	0.0	0.0	0.8	-0.1	-0.1	-0.1	0.0	-0.1
2002	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	0.0	0.0
2003	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0
Average	0.0	0.0	0.0	0.0	-0.1	-0.2	0.0	0.0	0.1	0.0	0.0	0.0
Critical	0.0	0.0	0.0	0.0	0.0	0.0	-0.2	0.0	0.0	0.0	0.0	0.0
Dry	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.0
BN	0.0	0.0	0.0	0.0	0.1	0.0	0.1	0.0	0.1	0.0	0.0	0.0
AN	0.0	0.0	0.0	0.0	0.0	-1.1	0.0	0.0	0.5	0.0	0.0	0.0
Wet	0.0	0.0	0.0	0.0	-0.4	0.0	0.1	0.0	0.1	0.0	0.0	0.0

Table E.3-104. Mokelumne River location RSMKL008 salinity (EC) difference All Transfers minus Base.

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1971	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1972	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1973	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1974	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1975	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1976	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.3	-0.6	-2.9	-1.8
1977	0.0	0.2	0.0	0.1	0.3	0.4	0.3	0.4	0.2	-3.6	-0.9	-1.2
1978	0.0	0.2	0.1	0.6	0.6	0.2	0.1	0.0	0.0	0.0	0.0	0.0
1979	0.0	0.0	0.0	0.1	0.4	0.1	0.0	0.0	0.0	0.0	0.0	0.0
1980	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1981	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	-0.9	0.0
1982	0.1	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1983	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1984	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1985	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1986	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1987	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.5	0.1	-1.1	-3.3	-1.2
1988	0.2	0.2	0.2	0.6	0.1	0.7	0.3	0.6	0.2	-2.1	-2.4	-1.8
1989	0.2	0.1	0.2	0.4	0.6	0.3	0.4	0.2	0.1	0.0	-0.4	0.0
1990	0.1	0.1	0.2	0.1	0.6	0.3	0.0	0.2	0.2	-1.8	-1.1	-1.4
1991	0.0	0.4	0.4	1.0	0.6	0.7	0.3	0.3	0.2	-1.4	-0.9	-1.3
1992	0.1	0.3	0.6	0.4	1.0	0.4	0.3	0.5	0.2	-1.7	-1.3	-0.8
1993	-0.1	0.4	0.3	1.0	0.7	0.5	0.0	0.0	0.0	0.0	0.0	0.0
1994	0.0	0.0	0.0	0.2	0.4	0.2	0.1	0.2	0.1	-0.1	-1.4	-0.4
1995	0.1	0.2	0.1	0.6	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1996	0.0	0.0	0.1	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1997	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0
1998	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1999	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2000	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2001	0.0	0.0	0.0	0.1	0.1	0.0	0.1	0.3	0.1	-1.8	-1.6	-1.1
2002	0.1	0.2	0.1	0.3	0.4	0.1	0.2	0.2	0.1	0.0	0.0	0.0
2003	0.0	0.0	0.1	0.0	0.1	0.1	0.0	0.0	0.1	-0.2	0.0	0.0
Average	0.0	0.1	0.1	0.2	0.2	0.1	0.1	0.1	0.1	-0.4	-0.5	-0.3
Critical	0.1	0.2	0.2	0.3	0.4	0.4	0.2	0.3	0.2	-1.6	-1.6	-1.2
Dry	0.0	0.1	0.1	0.1	0.2	0.1	0.2	0.2	0.1	-0.5	-1.0	-0.4
BN	0.0	0.0	0.0	0.1	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AN	0.0	0.1	0.1	0.3	0.2	0.1	0.0	0.0	0.0	0.0	0.0	0.0
Wet	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table E.3-105. Mokelumne River location RSMKL008 salinity (EC) percent difference of All Transfers from Base.

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1971	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1972	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1973	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1974	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1975	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1976	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	-0.3	-1.6	-1.0
1977	0.0	0.1	0.0	0.0	0.1	0.2	0.1	0.2	0.1	-1.9	-0.5	-0.6
1978	0.0	0.1	0.0	0.3	0.3	0.1	0.0	0.0	0.0	0.0	0.0	0.0
1979	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1980	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1981	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.5	0.0
1982	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1983	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1984	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1985	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1986	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1987	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.2	0.1	-0.6	-1.7	-0.6
1988	0.1	0.1	0.1	0.2	0.0	0.3	0.2	0.3	0.1	-1.1	-1.3	-0.9
1989	0.1	0.1	0.1	0.2	0.3	0.2	0.2	0.1	0.0	0.0	-0.2	0.0
1990	0.0	0.1	0.1	0.1	0.3	0.1	0.0	0.1	0.1	-1.0	-0.6	-0.7
1991	0.0	0.2	0.2	0.4	0.2	0.3	0.1	0.2	0.1	-0.7	-0.5	-0.7
1992	0.0	0.2	0.3	0.2	0.4	0.2	0.1	0.3	0.1	-0.9	-0.7	-0.4
1993	-0.1	0.2	0.1	0.4	0.3	0.2	0.0	0.0	0.0	0.0	0.0	0.0
1994	0.0	0.0	0.0	0.1	0.2	0.1	0.1	0.1	0.1	0.0	-0.8	-0.2
1995	0.1	0.1	0.0	0.3	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1996	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1997	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1998	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1999	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2001	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	-1.0	-0.9	-0.6
2002	0.0	0.1	0.0	0.1	0.2	0.1	0.1	0.1	0.0	0.0	0.0	0.0
2003	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	0.0
Average	0.0	0.0	0.0	0.1	0.1	0.1	0.0	0.1	0.0	-0.2	-0.3	-0.2
Critical	0.0	0.1	0.1	0.1	0.2	0.2	0.1	0.2	0.1	-0.8	-0.8	-0.6
Dry	0.0	0.0	0.0	0.1	0.1	0.0	0.1	0.1	0.0	-0.3	-0.6	-0.2
BN	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AN	0.0	0.1	0.0	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0
Wet	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table E.3-106. Barker Slough location SLBAR002 salinity (EC) difference All Transfers minus Base.

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1971	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1972	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1973	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1974	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1975	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1976	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	-0.8	-2.1
1977	-1.8	-0.5	0.0	0.0	0.0	0.0	0.1	0.0	0.1	-0.1	-2.0	-1.2
1978	-2.0	-1.4	-0.2	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0
1979	0.0	0.0	0.0	0.0	0.1	0.2	0.1	0.0	0.0	0.0	0.0	0.0
1980	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1981	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.2	-0.3
1982	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1983	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1984	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1985	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1986	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1987	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.9	-2.1
1988	-1.4	-0.6	0.0	0.1	0.1	0.1	0.1	0.1	0.1	-0.1	-1.1	-1.8
1989	-1.9	-0.4	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0	-0.1	-0.1
1990	0.0	0.0	0.1	0.1	0.1	0.4	0.2	0.0	0.0	0.0	-0.7	-0.9
1991	-1.1	-0.3	0.3	0.3	0.2	0.2	0.3	0.1	0.1	0.0	-0.6	-0.8
1992	-1.1	-0.1	0.3	0.3	0.2	0.4	0.2	0.2	0.1	-0.1	-0.9	-1.0
1993	-0.8	-0.4	0.1	0.2	0.2	0.4	0.2	0.1	0.1	0.0	0.0	0.0
1994	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.0	0.0	0.1	-0.3	-0.7
1995	-0.3	-0.1	0.1	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0
1996	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1997	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1998	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1999	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2001	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	-0.1	-0.7	-1.0
2002	-0.8	-0.1	0.0	0.1	0.1	0.2	0.1	0.1	0.0	0.0	0.0	0.0
2003	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0
Average	-0.3	-0.1	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	-0.2	-0.4
Critical	-0.8	-0.2	0.1	0.1	0.1	0.2	0.1	0.1	0.1	0.0	-0.9	-1.2
Dry	-0.5	-0.1	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	-0.3	-0.6
BN	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0
AN	-0.5	-0.3	0.0	0.1	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0
Wet	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table E.3-107. Barker Slough location SLBAR002 salinity (EC) percent difference of All Transfers from Base.

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1971	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1972	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1973	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1974	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1975	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1976	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.4	-1.1
1977	-0.9	-0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	-1.0	-0.6
1978	-1.0	-0.7	-0.1	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0
1979	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0
1980	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1981	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	-0.2
1982	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1983	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1984	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1985	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1986	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1987	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.4	-1.0
1988	-0.7	-0.3	0.0	0.0	0.1	0.1	0.0	0.0	0.0	-0.1	-0.6	-0.9
1989	-0.9	-0.2	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.0	-0.1
1990	0.0	0.0	0.0	0.1	0.1	0.2	0.1	0.0	0.0	0.0	-0.3	-0.5
1991	-0.6	-0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0	-0.3	-0.4
1992	-0.5	-0.1	0.1	0.2	0.1	0.2	0.1	0.1	0.1	0.0	-0.5	-0.5
1993	-0.4	-0.2	0.1	0.1	0.1	0.2	0.1	0.0	0.0	0.0	0.0	0.0
1994	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	-0.1	-0.4
1995	-0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1996	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1997	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1998	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1999	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2001	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	-0.4	-0.5
2002	-0.4	-0.1	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0
2003	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Average	-0.2	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	-0.2
Critical	-0.4	-0.1	0.0	0.1	0.1	0.1	0.1	0.0	0.0	0.0	-0.5	-0.6
Dry	-0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.2	-0.3
BN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AN	-0.2	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Wet	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table E.3-108. Suisun Marsh location SLCBN002 salinity (EC) difference All Transfers minus Base.

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1971	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1972	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1973	0.0	0.0	0.0	0.0	0.0	1.5	1.0	-1.1	-0.4	-0.2	-0.1	-0.1
1974	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.2
1975	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1976	0.0	0.0	0.0	0.0	0.0	0.0	0.6	-0.9	4.4	-79.7	-377.5	-509.9
1977	-392.4	-213.5	-122.2	-69.8	-37.2	-35.0	-23.6	-11.7	7.8	-134.3	-378.0	-363.8
1978	-296.1	-166.4	-68.8	-14.7	-14.9	-19.5	-16.9	-14.5	-4.5	5.2	-4.7	-8.6
1979	-9.2	-8.9	-9.7	-0.6	3.0	1.3	3.4	7.2	5.0	-1.3	-2.9	-3.4
1980	-2.9	5.2	23.0	7.3	1.3	-1.4	-0.2	4.0	3.5	0.4	-0.5	-0.9
1981	-1.1	-1.0	0.4	5.0	3.3	2.9	6.6	9.4	12.0	-30.2	-152.5	-216.8
1982	-140.5	-55.6	-22.4	-15.5	-6.1	-5.5	-5.3	-4.9	-0.3	0.6	-2.3	-2.6
1983	-6.5	5.9	-0.5	-1.8	-1.5	-1.6	-2.6	-1.5	-1.3	-0.6	2.4	6.1
1984	3.7	2.1	-0.2	-0.5	-0.1	0.0	1.4	5.4	6.1	2.3	0.8	0.2
1985	-0.3	7.8	13.5	9.4	7.2	6.5	4.8	7.0	6.8	2.5	2.4	1.6
1986	1.4	1.1	3.4	9.3	1.6	1.3	1.4	2.6	2.4	1.1	0.7	0.5
1987	0.4	0.4	0.5	2.6	6.4	4.4	3.0	2.4	11.6	-107.8	-418.3	-575.1
1988	-402.1	-211.1	-73.2	0.9	4.3	-11.8	9.5	22.3	18.5	-185.4	-485.6	-462.8
1989	-344.2	-191.4	-68.4	2.3	-11.1	22.8	39.6	65.3	17.5	-9.9	-115.7	-160.4
1990	-98.4	-47.8	-25.6	0.5	54.4	117.7	96.3	50.5	53.5	-164.1	-455.5	-438.2
1991	-352.1	-185.3	-108.9	-63.8	-17.5	38.4	29.6	62.0	74.8	-110.8	-369.4	-362.1
1992	-287.4	-161.7	-88.9	-52.7	16.2	16.1	41.0	52.9	34.0	-178.5	-455.3	-436.5
1993	-320.0	-177.0	-43.5	16.3	-11.1	2.5	-2.3	10.7	57.8	82.6	36.4	5.8
1994	-4.1	-5.9	-6.2	13.0	35.2	51.0	64.0	59.8	61.7	-20.1	-257.4	-376.9
1995	-283.3	-121.4	-46.5	9.8	-7.0	-7.5	-10.5	-9.8	-5.0	4.2	25.4	30.7
1996	3.6	-1.3	21.1	15.2	3.4	-0.1	-1.9	-0.6	7.3	19.8	8.3	4.2
1997	-2.0	-6.9	3.6	-5.4	-6.7	7.5	11.3	16.7	16.5	8.1	3.5	2.9
1998	-0.7	0.1	7.0	12.4	1.6	2.2	1.2	0.8	0.7	2.0	8.8	17.2
1999	5.6	14.0	12.9	4.4	2.1	1.3	2.2	5.3	15.8	8.1	6.9	-1.4
2000	2.2	1.3	0.7	17.3	9.4	3.4	4.0	7.8	7.6	4.8	1.7	1.2
2001	1.0	0.9	0.9	5.6	2.2	4.5	7.3	28.2	47.6	-172.1	-466.3	-475.3
2002	-352.1	-141.6	-12.4	-13.3	14.7	58.8	68.0	73.2	41.2	15.8	4.3	1.3
2003	-1.1	-3.7	21.5	3.8	1.3	7.5	10.5	4.3	23.5	27.3	-32.6	-51.3
Average	-96.4	-48.9	-17.3	-3.0	1.6	7.9	10.1	13.3	15.5	-29.7	-113.9	-128.7
Critical	-219.5	-117.9	-60.7	-24.5	7.9	25.2	31.1	33.6	36.4	-124.7	-397.0	-421.4
Dry	-116.0	-54.1	-10.9	1.9	3.8	16.6	21.5	30.9	22.8	-50.3	-191.0	-237.5
BN	-4.6	-4.5	-4.9	-0.3	1.5	0.6	1.7	3.6	2.5	-0.6	-1.4	-1.7
AN	-103.0	-56.8	-11.2	5.0	-2.3	-1.0	-0.6	1.9	14.6	20.0	0.0	-9.0
Wet	-32.2	-12.5	-1.7	2.1	-1.0	-0.2	-0.2	1.1	3.2	3.5	4.2	4.4

Table E.3-109. Suisun Marsh location SLCBN002 salinity (EC) percent difference of All Transfers from Base.

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1971	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1972	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1973	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0
1974	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1975	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1976	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.6	-2.6	-3.3
1977	-2.8	-1.6	-0.9	-0.6	-0.4	-0.4	-0.2	-0.1	0.1	-0.9	-2.3	-2.1
1978	-2.0	-1.2	-0.6	-0.3	-0.6	-0.8	-0.8	-0.6	-0.1	0.1	0.0	-0.1
1979	-0.1	-0.1	-0.1	0.0	0.1	0.1	0.1	0.2	0.1	0.0	0.0	0.0
1980	0.0	0.0	0.3	0.2	0.1	-0.1	0.0	0.1	0.1	0.0	0.0	0.0
1981	0.0	0.0	0.0	0.1	0.1	0.1	0.2	0.2	0.1	-0.3	-1.2	-1.6
1982	-1.1	-0.7	-0.7	-0.8	-0.4	-0.4	-0.4	-0.4	0.0	0.0	0.0	0.0
1983	-0.1	0.2	0.0	-0.2	-0.2	-0.2	-0.3	-0.2	-0.2	-0.1	0.1	0.2
1984	0.1	0.1	0.0	-0.1	0.0	0.0	0.1	0.2	0.1	0.0	0.0	0.0
1985	0.0	0.2	0.3	0.2	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0
1986	0.0	0.0	0.0	0.2	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0
1987	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.0	0.1	-1.0	-3.2	-4.0
1988	-3.0	-1.7	-0.7	0.0	0.1	-0.2	0.1	0.2	0.2	-1.5	-3.5	-3.0
1989	-2.4	-1.4	-0.5	0.0	-0.1	0.5	1.3	1.4	0.2	-0.1	-0.9	-1.2
1990	-0.8	-0.4	-0.2	0.0	0.8	1.6	1.1	0.5	0.5	-1.2	-3.0	-2.8
1991	-2.4	-1.3	-0.8	-0.5	-0.2	0.6	0.5	0.7	0.6	-0.8	-2.4	-2.3
1992	-1.9	-1.1	-0.6	-0.4	0.2	0.4	0.7	0.6	0.3	-1.4	-3.1	-2.8
1993	-2.3	-1.4	-0.4	0.3	-0.4	0.1	-0.1	0.5	2.4	1.8	0.4	0.1
1994	-0.1	-0.1	-0.1	0.2	0.6	0.9	0.9	0.8	0.6	-0.2	-1.8	-2.5
1995	-2.2	-1.0	-0.4	0.2	-0.2	-0.4	-0.5	-0.6	-0.3	0.2	0.6	0.5
1996	0.1	0.0	0.4	0.6	0.3	0.0	-0.1	-0.1	0.3	0.3	0.1	0.1
1997	0.0	-0.1	0.2	-0.5	-0.5	0.5	0.5	0.5	0.3	0.1	0.0	0.0
1998	0.0	0.0	0.1	0.4	0.1	0.2	0.1	0.1	0.1	0.2	0.3	0.4
1999	0.1	0.3	0.5	0.3	0.2	0.2	0.2	0.3	0.5	0.1	0.1	0.0
2000	0.0	0.0	0.0	0.3	0.5	0.2	0.3	0.3	0.2	0.1	0.0	0.0
2001	0.0	0.0	0.0	0.1	0.1	0.2	0.2	0.5	0.6	-1.7	-3.8	-3.4
2002	-2.8	-1.2	-0.2	-0.5	0.5	1.5	1.7	1.6	0.6	0.1	0.0	0.0
2003	0.0	0.0	0.3	0.1	0.1	0.2	0.4	0.2	0.7	0.4	-0.4	-0.5
Average	-0.7	-0.4	-0.1	0.0	0.0	0.1	0.2	0.2	0.2	-0.2	-0.8	-0.8
Critical	-1.6	-0.9	-0.5	-0.2	0.2	0.4	0.4	0.4	0.3	-0.9	-2.7	-2.7
Dry	-0.9	-0.4	-0.1	0.0	0.1	0.4	0.6	0.6	0.3	-0.5	-1.5	-1.7
BN	-0.1	-0.1	-0.1	0.0	0.0	0.0	0.1	0.1	0.1	0.0	0.0	0.0
AN	-0.7	-0.4	-0.1	0.1	-0.1	0.0	0.0	0.1	0.5	0.4	0.0	-0.1
Wet	-0.2	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1

Table E.3-110. San Joaquin River location RSAN037 salinity (EC) difference No Groundwater Substitution minus Base.

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	0.0	0.0	0.0	-0.1	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1971	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	0.0	0.0	0.0	0.0
1972	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.0
1973	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0
1974	0.0	0.0	0.0	0.0	0.0	0.1	-0.1	0.0	0.0	0.0	0.0	0.0
1975	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0
1976	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-1.2	-2.8	25.4	-9.8	-26.2
1977	-17.1	-7.3	-5.0	-3.1	-0.9	-0.3	-0.1	-1.4	-3.1	-11.8	-12.2	-16.8
1978	-16.7	-6.5	-4.0	0.1	0.6	0.3	0.0	0.2	0.1	0.0	0.0	0.0
1979	0.0	0.0	0.0	0.0	0.1	0.0	0.1	0.2	0.0	0.0	0.0	0.0
1980	0.0	0.0	0.0	0.0	0.1	-0.2	0.0	0.2	0.1	0.0	0.0	0.0
1981	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	-0.1	-0.1	-16.0	9.5	10.2
1982	-7.2	-6.0	-0.5	0.3	-7.0	-1.8	0.2	-0.2	-0.2	-0.1	0.0	0.0
1983	-0.1	0.0	-0.2	0.0	0.4	0.2	0.1	-0.2	0.2	-0.1	-0.1	0.0
1984	0.0	-0.1	0.1	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.0
1985	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0
1986	0.0	0.0	0.0	0.0	0.0	0.3	0.1	0.0	0.1	0.0	0.0	0.0
1987	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.3	6.0	0.6	-12.5
1988	-9.1	-4.8	-3.3	-0.6	-0.1	0.0	0.0	0.1	0.4	10.3	3.4	-14.6
1989	-14.0	-6.2	-3.7	-2.4	-0.9	0.3	0.5	0.3	0.1	-2.5	2.6	2.3
1990	-0.8	-0.2	-0.2	-0.2	0.5	0.9	0.6	-0.2	-0.5	26.3	6.8	-15.1
1991	-14.9	-7.8	-5.1	-2.9	-1.0	-0.2	0.0	-0.4	-0.8	23.0	5.4	-12.4
1992	-12.5	-6.0	-4.1	-2.6	-0.3	0.1	0.0	0.1	0.6	8.8	0.1	-11.6
1993	-8.4	-3.7	-3.5	0.5	1.0	0.3	0.1	0.5	-12.4	-2.2	0.5	0.2
1994	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.7	-17.6	-5.8	16.1
1995	-0.9	-1.0	-2.0	0.0	0.2	0.2	0.1	0.1	0.2	-0.1	0.0	0.0
1996	0.0	-0.1	0.0	0.0	0.1	-0.1	0.1	0.1	0.0	0.0	0.0	0.0
1997	0.0	0.0	-0.1	-0.3	-0.2	0.0	0.0	0.1	0.1	0.0	0.0	0.0
1998	0.0	0.0	0.0	0.1	0.2	-0.1	0.0	0.3	0.2	-0.1	-0.1	0.0
1999	0.0	0.0	0.0	-0.1	0.0	0.0	0.1	0.2	0.0	0.0	0.0	0.0
2000	0.0	0.0	0.0	0.0	0.1	0.1	0.2	0.0	0.0	0.0	0.0	0.0
2001	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.2	9.5	5.7	-5.8
2002	-6.5	-3.2	-2.4	-0.2	0.2	0.1	0.1	0.2	0.0	0.1	0.1	0.0
2003	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.0	1.7	-2.5	-3.5
Average	-3.2	-1.6	-1.0	-0.3	-0.2	0.0	0.1	0.0	-0.5	1.8	0.1	-2.6
Critical	-7.8	-3.7	-2.5	-1.3	-0.3	0.1	0.1	-0.5	-1.0	9.2	-1.7	-11.5
Dry	-3.4	-1.6	-1.0	-0.4	-0.1	0.1	0.1	0.1	0.1	-0.5	3.1	-1.0
BN	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.0
AN	-4.2	-1.7	-1.3	0.1	0.3	0.1	0.1	0.2	-2.0	-0.1	-0.3	-0.5
Wet	-0.6	-0.6	-0.2	0.0	-0.5	-0.1	0.1	0.0	0.0	0.0	0.0	0.0

Table E.3-111. San Joaquin River location RSAN037 salinity (EC) percent difference of No Groundwater Substitution from Base.

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1971	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1972	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1973	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1974	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1975	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1976	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.4	-0.8	5.1	-1.9	-5.3
1977	-3.0	-1.4	-0.8	-0.4	-0.2	-0.1	0.0	-0.4	-0.8	-2.8	-2.4	-2.5
1978	-2.7	-1.2	-0.7	0.0	0.1	0.1	0.0	0.1	0.1	0.0	0.0	0.0
1979	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0
1980	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	0.1	0.0	0.0	0.0	0.0
1981	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-4.8	2.1	1.9
1982	-1.3	-1.3	-0.2	0.1	-2.5	-0.6	0.1	-0.1	-0.1	0.0	0.0	0.0
1983	0.0	0.0	-0.1	0.0	0.1	0.1	0.1	-0.1	0.1	0.0	-0.1	0.0
1984	0.0	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1985	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1986	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.1	0.0	0.0	0.0
1987	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	2.2	0.2	-3.1
1988	-1.9	-1.0	-0.6	-0.2	0.0	0.0	0.0	0.0	0.1	3.6	0.9	-3.2
1989	-2.4	-1.1	-0.6	-0.3	-0.2	0.1	0.2	0.1	0.0	-0.6	0.5	0.5
1990	-0.2	0.0	0.0	0.0	0.2	0.3	0.2	-0.1	-0.2	5.9	1.3	-2.9
1991	-2.5	-1.3	-0.7	-0.4	-0.2	-0.1	0.0	-0.2	-0.3	4.8	1.0	-2.5
1992	-2.2	-1.0	-0.6	-0.4	-0.1	0.0	0.0	0.0	0.2	2.9	0.0	-2.2
1993	-1.7	-0.8	-0.6	0.1	0.3	0.1	0.0	0.2	-4.8	-1.1	0.2	0.1
1994	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.3	-3.4	-1.0	2.9
1995	-0.2	-0.3	-0.3	0.0	0.1	0.1	0.1	0.0	0.1	0.0	0.0	0.0
1996	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1997	0.0	0.0	0.0	-0.1	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1998	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.1	0.1	-0.1	0.0	0.0
1999	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0
2000	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.0
2001	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	3.6	1.7	-1.5
2002	-1.4	-0.7	-0.7	-0.1	0.1	0.1	0.0	0.1	0.0	0.0	0.0	0.0
2003	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.8	-0.8	-1.1
Average	-0.6	-0.3	-0.2	-0.1	-0.1	0.0	0.0	0.0	-0.2	0.5	0.0	-0.6
Critical	-1.4	-0.7	-0.4	-0.2	-0.1	0.0	0.0	-0.1	-0.3	2.3	-0.3	-2.2
Dry	-0.6	-0.3	-0.2	-0.1	0.0	0.0	0.0	0.0	0.0	0.1	0.8	-0.4
BN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AN	-0.7	-0.3	-0.2	0.0	0.1	0.0	0.0	0.1	-0.8	-0.1	-0.1	-0.2
Wet	-0.1	-0.1	0.0	0.0	-0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table E.3-112. RSAN072 salinity (EC) difference No Groundwater Substitution minus Base.

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	0.2	0.0	0.0	-0.2	-0.2	0.0	0.0	0.1	0.3	0.3	-0.3	-0.1
1971	-0.2	-0.2	0.0	0.0	0.3	-0.3	0.0	-0.1	0.2	-0.3	-0.2	-0.2
1972	0.2	-0.4	0.3	-0.2	0.2	0.2	0.3	-0.3	0.3	0.3	-0.2	-0.4
1973	0.3	0.1	0.2	-0.2	0.2	0.4	-0.1	0.3	0.1	-0.4	-0.2	-0.4
1974	-0.5	0.4	0.1	-0.2	0.0	0.2	-0.2	0.1	0.3	0.3	0.3	0.4
1975	-0.2	0.2	-0.2	0.4	-0.1	0.2	0.1	-0.4	0.0	0.3	-0.1	0.0
1976	-0.1	-0.3	0.2	0.1	0.2	0.3	0.0	-0.2	0.0	-2.9	0.0	0.1
1977	-0.2	0.1	-0.1	0.3	0.1	0.2	0.2	0.4	0.0	-0.1	0.0	0.0
1978	-0.4	0.3	0.1	-0.4	0.0	0.1	0.0	0.3	0.3	0.2	0.3	0.4
1979	0.2	0.4	0.0	-0.1	0.4	-0.1	0.4	0.2	0.2	0.3	0.0	0.2
1980	0.2	-0.3	-0.2	0.1	0.2	-0.4	0.3	0.2	0.1	-0.3	-0.3	-0.1
1981	0.4	0.0	-0.1	-0.2	-0.1	-0.4	-0.3	0.4	0.0	-25.2	-3.1	-0.2
1982	0.3	-0.3	0.3	0.0	-13.9	-1.1	0.4	-0.4	-0.3	-0.3	0.4	-0.3
1983	-0.4	0.0	-0.3	0.1	0.5	0.3	0.1	-0.3	0.3	-0.1	-0.5	0.0
1984	0.4	-0.3	0.2	0.0	0.1	0.1	0.2	-0.2	0.3	0.3	0.3	-0.1
1985	0.0	-0.2	-0.2	0.3	0.2	-0.2	0.4	0.0	-0.4	-0.4	-0.4	0.3
1986	0.5	0.0	0.4	0.5	0.1	0.4	0.1	0.0	0.4	0.0	0.0	-0.3
1987	0.3	0.3	0.1	0.1	0.0	-0.1	-0.2	-0.1	0.3	-0.1	0.1	-0.4
1988	-0.4	0.3	0.0	0.0	0.4	0.1	0.4	-0.2	0.1	0.8	0.4	0.3
1989	0.1	0.3	0.1	-0.4	-0.4	0.3	-0.4	0.2	0.1	0.4	-0.2	-0.2
1990	-0.2	-0.2	0.0	0.2	0.3	-0.2	-0.4	0.0	-0.3	-12.4	-2.7	0.1
1991	-0.1	0.3	-0.3	0.2	-0.3	0.0	-0.3	0.1	0.1	-19.7	-3.9	0.1
1992	-0.2	0.4	0.0	0.3	-0.1	0.1	-0.4	0.1	0.1	-43.0	-29.1	0.1
1993	0.1	-0.2	0.3	0.2	0.1	0.1	0.5	0.4	17.7	1.7	0.4	-0.1
1994	0.0	0.0	-0.3	-0.4	0.0	0.2	0.3	-0.4	-0.4	1.9	-0.1	-0.3
1995	0.1	0.2	0.3	-0.1	-0.4	0.3	0.2	0.1	0.3	-0.2	0.3	-0.4
1996	-0.4	-0.2	-0.2	-0.3	0.2	-0.3	0.4	-0.1	0.1	-0.1	-0.1	0.2
1997	-0.4	-0.1	-0.2	-0.4	-0.2	0.1	-0.1	0.4	0.0	0.1	-0.4	0.3
1998	0.2	-0.3	0.1	0.4	0.3	-0.3	0.0	0.4	0.1	-0.2	-0.4	0.2
1999	-0.4	0.0	-0.3	-0.4	0.1	0.0	0.4	0.3	0.5	-0.3	0.0	-0.1
2000	0.2	-0.3	-0.3	-0.2	0.3	0.3	0.4	-0.4	0.2	-0.1	-0.1	0.1
2001	-0.1	-0.2	-0.3	0.2	0.0	0.3	0.1	-0.4	-0.4	-29.7	-4.5	-0.3
2002	0.2	0.1	0.4	-0.1	-0.1	0.2	0.1	0.0	-0.3	-0.2	0.2	0.0
2003	0.1	0.0	0.0	0.3	0.5	0.5	0.3	-0.1	-0.2	-0.6	0.1	0.2
Average	0.0	0.0	0.0	0.0	-0.3	0.0	0.1	0.0	0.6	-3.8	-1.3	0.0
Critical	-0.2	0.1	-0.1	0.1	0.1	0.1	0.0	0.0	-0.1	-10.8	-5.1	0.1
Dry	0.1	0.0	0.0	0.0	-0.1	0.0	0.0	0.0	-0.1	-9.2	-1.3	-0.1
BN	0.2	0.0	0.1	-0.1	0.3	0.1	0.3	-0.1	0.3	0.3	-0.1	-0.1
AN	0.1	-0.1	0.0	0.0	0.2	0.2	0.2	0.1	3.0	0.1	0.0	0.0
Wet	-0.1	0.0	0.0	0.0	-1.0	0.0	0.1	0.0	0.2	0.0	-0.1	0.0

Table E.3-113. RSAN072 salinity (EC) percent difference of No Groundwater Substitution from Base.

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	0.0	0.0	0.0	-0.1	-0.1	0.0	0.0	0.0	0.1	0.1	-0.1	0.0
1971	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	0.0	0.0	0.0	0.0	0.0
1972	0.0	-0.1	0.0	0.0	0.0	0.0	0.1	-0.1	0.1	0.0	0.0	-0.1
1973	0.1	0.0	0.0	0.0	0.0	0.1	0.0	0.1	0.0	-0.1	0.0	-0.1
1974	-0.1	0.1	0.0	0.0	0.0	0.1	-0.1	0.0	0.1	0.0	0.1	0.1
1975	0.0	0.0	0.0	0.0	0.0	0.1	0.0	-0.1	0.0	0.1	0.0	0.0
1976	0.0	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.4	0.0	0.0
1977	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0
1978	-0.1	0.0	0.0	-0.1	0.0	0.0	0.0	0.1	0.1	0.0	0.1	0.1
1979	0.0	0.1	0.0	0.0	0.1	0.0	0.1	0.1	0.1	0.0	0.0	0.0
1980	0.0	0.0	0.0	0.0	0.1	-0.2	0.1	0.1	0.0	-0.1	-0.1	0.0
1981	0.1	0.0	0.0	0.0	0.0	-0.1	-0.1	0.1	0.0	-4.0	-0.5	0.0
1982	0.1	-0.1	0.0	0.0	-4.7	-0.4	0.2	-0.2	-0.1	-0.1	0.1	-0.1
1983	-0.2	0.0	-0.1	0.0	0.2	0.1	0.1	-0.2	0.2	-0.1	-0.3	0.0
1984	0.1	-0.2	0.1	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.1	0.0
1985	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	-0.1	-0.1	-0.1	0.1
1986	0.1	0.0	0.1	0.1	0.0	0.2	0.0	0.0	0.1	0.0	0.0	-0.1
1987	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	-0.1
1988	-0.1	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.1	0.1	0.0
1989	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	0.0	0.1	0.0	0.0
1990	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	0.0	-1.9	-0.4	0.0
1991	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-2.8	-0.6	0.0
1992	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-6.2	-3.8	0.0
1993	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	2.6	0.2	0.1	0.0
1994	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	-0.1	0.3	0.0	0.0
1995	0.0	0.0	0.0	0.0	-0.1	0.1	0.1	0.0	0.1	-0.1	0.1	-0.1
1996	-0.1	0.0	0.0	0.0	0.1	-0.1	0.1	0.0	0.0	0.0	0.0	0.0
1997	-0.1	0.0	-0.1	-0.2	-0.1	0.1	0.0	0.1	0.0	0.0	-0.1	0.1
1998	0.0	-0.1	0.0	0.1	0.1	-0.1	0.0	0.2	0.1	-0.1	-0.2	0.1
1999	-0.1	0.0	0.0	-0.1	0.0	0.0	0.1	0.1	0.1	0.0	0.0	0.0
2000	0.0	-0.1	0.0	0.0	0.1	0.1	0.1	-0.1	0.0	0.0	0.0	0.0
2001	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	-0.1	-4.5	-0.7	0.0
2002	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	0.0	0.0
2003	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.0	0.0	-0.1	0.0	0.0
Average	0.0	0.0	0.0	0.0	-0.1	0.0	0.0	0.0	0.1	-0.6	-0.2	0.0
Critical	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-1.6	-0.7	0.0
Dry	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-1.4	-0.2	0.0
BN	0.0	0.0	0.0	0.0	0.1	0.0	0.1	0.0	0.1	0.0	0.0	0.0
AN	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.4	0.0	0.0	0.0
Wet	0.0	0.0	0.0	0.0	-0.3	0.0	0.1	0.0	0.1	0.0	0.0	0.0

Table E.3-114. San Joaquin River location RSAN112 salinity (EC) difference No Groundwater Substitution minus Base.

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	0.2	0.0	0.0	-0.2	-0.2	0.0	0.0	0.1	0.3	0.4	-0.4	-0.1
1971	-0.2	-0.2	0.0	0.0	0.3	-0.4	0.1	-0.1	0.2	-0.3	-0.2	-0.2
1972	0.2	-0.4	0.3	-0.3	0.2	0.2	0.3	-0.4	0.4	0.3	-0.3	-0.4
1973	0.4	0.0	0.2	-0.3	0.2	0.4	-0.2	0.4	0.1	-0.4	-0.2	-0.4
1974	-0.5	0.4	0.1	-0.2	0.0	0.3	-0.3	0.1	0.3	0.3	0.4	0.4
1975	-0.2	0.2	-0.2	0.4	-0.1	0.2	0.1	-0.4	0.0	0.3	-0.1	0.0
1976	-0.1	-0.3	0.2	0.0	0.2	0.3	0.0	-0.2	0.0	-0.2	-0.1	0.1
1977	-0.2	0.1	-0.2	0.3	0.1	0.3	0.2	0.4	-0.1	0.0	-0.4	0.0
1978	-0.4	0.3	0.1	-0.4	0.0	0.1	0.0	0.3	0.3	0.2	0.3	0.4
1979	0.2	0.4	0.0	-0.1	0.4	-0.1	0.4	0.2	0.3	0.3	0.0	0.2
1980	0.2	-0.3	-0.2	0.1	0.2	-0.4	0.3	0.2	0.1	-0.3	-0.3	-0.1
1981	0.4	0.0	-0.1	-0.2	-0.1	-0.4	-0.3	0.4	0.0	-25.3	-0.9	-0.2
1982	0.4	-0.4	0.4	0.0	-14.5	-0.9	0.4	-0.4	-0.3	-0.3	0.4	-0.4
1983	-0.4	0.1	-0.3	0.1	0.5	0.2	0.1	-0.4	0.3	-0.1	-0.5	0.0
1984	0.4	-0.3	0.2	0.0	0.1	0.1	0.2	-0.2	0.4	0.3	0.3	-0.2
1985	0.0	-0.2	-0.2	0.4	0.2	-0.2	0.4	0.0	-0.5	-0.4	-0.4	0.4
1986	0.5	0.0	0.5	0.5	0.1	0.4	0.1	0.0	0.4	0.0	0.0	-0.3
1987	0.3	0.3	0.1	0.1	0.0	-0.1	-0.2	-0.1	0.4	0.1	-0.2	-0.4
1988	-0.4	0.3	-0.1	0.0	0.4	0.1	0.4	-0.3	0.1	-0.5	0.4	0.3
1989	0.1	0.3	0.0	-0.4	-0.4	0.3	-0.4	0.3	0.1	0.3	-0.3	-0.2
1990	-0.2	-0.2	0.0	0.3	0.3	-0.2	-0.4	0.1	-0.4	0.2	0.4	0.1
1991	-0.2	0.3	-0.4	0.2	-0.3	0.0	-0.3	0.1	0.1	-0.4	-0.5	0.2
1992	-0.2	0.5	-0.1	0.4	-0.2	0.1	-0.4	0.2	0.2	-143.5	-4.8	0.1
1993	0.1	-0.2	0.4	0.2	0.1	0.1	0.5	0.4	19.8	0.7	0.4	-0.1
1994	0.0	0.0	-0.4	-0.4	0.1	0.2	0.3	-0.5	-0.5	0.3	0.3	-0.4
1995	0.1	0.2	0.3	-0.1	-0.5	0.3	0.1	0.1	0.3	-0.2	0.3	-0.5
1996	-0.4	-0.2	-0.2	-0.3	0.2	-0.4	0.4	-0.1	0.2	-0.1	-0.1	0.2
1997	-0.4	-0.1	-0.2	-0.4	-0.2	0.1	-0.1	0.5	-0.1	0.1	-0.5	0.4
1998	0.2	-0.3	0.2	0.4	0.3	-0.3	0.0	0.4	0.1	-0.2	-0.4	0.2
1999	-0.4	0.0	-0.3	-0.4	0.1	-0.1	0.5	0.3	0.5	-0.3	0.1	-0.1
2000	0.2	-0.4	-0.3	-0.2	0.3	0.3	0.4	-0.4	0.2	-0.1	-0.1	0.1
2001	-0.1	-0.2	-0.3	0.3	0.0	0.3	0.1	-0.4	-0.4	-34.3	-1.4	-0.3
2002	0.2	0.1	0.4	-0.1	-0.1	0.2	0.1	-0.1	-0.4	-0.1	0.3	-0.1
2003	0.1	0.0	0.0	0.3	0.5	0.5	0.3	-0.1	-0.2	-0.1	0.2	0.2
Average	0.0	0.0	0.0	0.0	-0.4	0.0	0.1	0.0	0.7	-6.0	-0.2	0.0
Critical	-0.2	0.1	-0.1	0.1	0.1	0.1	0.0	0.0	-0.1	-20.6	-0.7	0.0
Dry	0.1	0.0	0.0	0.0	-0.1	0.0	0.0	0.0	-0.1	-10.0	-0.5	-0.1
BN	0.2	0.0	0.2	-0.2	0.3	0.1	0.4	-0.1	0.3	0.3	-0.2	-0.1
AN	0.1	-0.1	0.0	-0.1	0.2	0.2	0.2	0.1	3.4	0.0	0.0	0.0
Wet	-0.1	0.0	0.0	0.0	-1.1	0.0	0.1	0.0	0.2	0.0	-0.1	0.0

Table E.3-115. San Joaquin River location RSAN112 salinity (EC) percent difference of No Groundwater Substitution from Base.

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	0.0	0.0	0.0	-0.1	-0.1	0.0	0.0	0.0	0.1	0.1	-0.1	0.0
1971	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	0.0	0.1	-0.1	0.0	0.0
1972	0.0	-0.1	0.0	0.0	0.0	0.0	0.1	-0.1	0.1	0.0	-0.1	-0.1
1973	0.1	0.0	0.0	0.0	0.0	0.1	0.0	0.1	0.0	-0.1	0.0	-0.1
1974	-0.1	0.1	0.0	0.0	0.0	0.1	-0.1	0.0	0.1	0.0	0.1	0.1
1975	0.0	0.0	0.0	0.1	0.0	0.1	0.0	-0.1	0.0	0.1	0.0	0.0
1976	0.0	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1977	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	-0.1	0.0
1978	-0.1	0.0	0.0	-0.1	0.0	0.0	0.0	0.1	0.1	0.0	0.1	0.1
1979	0.0	0.1	0.0	0.0	0.1	-0.1	0.1	0.1	0.1	0.0	0.0	0.0
1980	0.0	-0.1	0.0	0.0	0.1	-0.2	0.1	0.1	0.0	-0.1	-0.1	0.0
1981	0.1	0.0	0.0	0.0	0.0	-0.1	-0.1	0.1	0.0	-4.1	-0.1	0.0
1982	0.1	-0.1	0.0	0.0	-5.0	-0.3	0.2	-0.3	-0.1	-0.1	0.1	-0.1
1983	-0.2	0.0	-0.1	0.0	0.2	0.1	0.1	-0.2	0.2	-0.1	-0.3	0.0
1984	0.1	-0.2	0.1	0.0	0.0	0.0	0.1	0.0	0.1	0.0	0.1	0.0
1985	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	-0.1	-0.1	-0.1	0.1
1986	0.1	0.0	0.1	0.1	0.0	0.2	0.0	0.0	0.1	0.0	0.0	-0.1
1987	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	-0.1
1988	-0.1	0.1	0.0	0.0	0.0	0.0	0.1	0.0	0.0	-0.1	0.1	0.0
1989	0.0	0.0	0.0	-0.1	0.0	0.0	-0.1	0.0	0.0	0.0	-0.1	0.0
1990	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	-0.1	0.0	0.1	0.0
1991	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	0.0	-0.1	-0.1	0.0
1992	0.0	0.1	0.0	0.0	0.0	0.0	-0.1	0.0	0.0	-19.1	-0.6	0.0
1993	0.0	0.0	0.1	0.0	0.0	0.0	0.1	0.1	2.9	0.1	0.1	0.0
1994	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	-0.1	0.0	0.0	-0.1
1995	0.0	0.0	0.0	0.0	-0.1	0.1	0.1	0.0	0.1	-0.1	0.1	-0.1
1996	-0.1	0.0	0.0	0.0	0.1	-0.1	0.1	0.0	0.0	0.0	0.0	0.0
1997	-0.1	0.0	-0.1	-0.2	-0.1	0.1	0.0	0.1	0.0	0.0	-0.1	0.1
1998	0.0	-0.1	0.0	0.1	0.1	-0.1	0.0	0.3	0.1	-0.1	-0.2	0.1
1999	-0.1	0.0	0.0	-0.1	0.0	0.0	0.1	0.1	0.1	-0.1	0.0	0.0
2000	0.0	-0.1	0.0	0.0	0.1	0.1	0.1	-0.1	0.0	0.0	0.0	0.0
2001	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	-0.1	-5.2	-0.2	-0.1
2002	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	0.0	0.0
2003	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0
Average	0.0	0.0	0.0	0.0	-0.1	0.0	0.0	0.0	0.1	-0.8	0.0	0.0
Critical	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-2.7	-0.1	0.0
Dry	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-1.6	-0.1	0.0
BN	0.0	0.0	0.0	0.0	0.1	0.0	0.1	0.0	0.1	0.0	0.0	0.0
AN	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.5	0.0	0.0	0.0
Wet	0.0	0.0	0.0	0.0	-0.4	0.0	0.1	0.0	0.1	0.0	0.0	0.0

Table E.3-116. Mokelumne River location RSMKL008 salinity (EC) difference No Groundwater Substitution minus Base.

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1971	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1972	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1973	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1974	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1975	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1976	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-1.1	0.0	-0.5	-1.5	-1.0
1977	-0.1	0.0	-0.1	0.0	0.0	0.0	0.0	-0.7	0.1	-2.5	-0.6	-0.8
1978	-0.1	0.0	-0.1	0.3	0.4	0.1	0.0	0.0	0.0	0.0	0.0	0.0
1979	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1980	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1981	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	-0.5	0.1
1982	0.0	-0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1983	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1984	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1985	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1986	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1987	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.6	-2.1	-0.7
1988	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	-1.2	-1.3	-1.1
1989	-0.1	0.0	0.0	0.0	0.0	0.2	0.3	0.0	0.0	0.0	-0.1	0.0
1990	0.0	0.0	0.0	0.0	0.4	0.1	0.0	-0.4	0.1	-1.1	-0.7	-0.9
1991	-0.2	0.0	-0.1	-0.1	0.0	0.0	0.0	-0.3	0.0	-0.9	-0.6	-0.8
1992	-0.1	0.0	-0.1	-0.1	0.1	0.0	0.0	0.0	0.0	-1.0	-0.7	-0.5
1993	-0.1	0.0	0.0	0.5	0.5	0.1	0.0	0.0	-0.1	0.0	0.0	0.0
1994	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	-0.2	0.0	-0.8	-0.2
1995	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1996	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1997	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1998	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1999	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2001	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-1.1	-0.8	-0.6
2002	-0.1	0.0	-0.2	0.1	0.2	0.0	0.2	0.0	0.0	0.0	0.0	0.0
2003	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.1	0.0
Average	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	-0.3	-0.3	-0.2
Critical	-0.1	0.0	0.0	0.0	0.1	0.0	0.0	-0.3	0.0	-1.0	-0.9	-0.8
Dry	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	-0.2	-0.6	-0.2
BN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AN	0.0	0.0	0.0	0.1	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Wet	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table E.3-117. Mokelumne River location RSMKL008 salinity (EC) percent difference of No Groundwater Substitution from Base.

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1971	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1972	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1973	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1974	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1975	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1976	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.5	0.0	-0.3	-0.8	-0.5
1977	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	-0.3	0.0	-1.3	-0.3	-0.4
1978	-0.1	0.0	0.0	0.1	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1979	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1980	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1981	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	-0.3	0.1
1982	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1983	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1984	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1985	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1986	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1987	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.3	-1.1	-0.4
1988	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.6	-0.7	-0.6
1989	-0.1	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.0	-0.1	0.0
1990	0.0	0.0	0.0	0.0	0.2	0.0	0.0	-0.2	0.1	-0.6	-0.4	-0.5
1991	-0.1	0.0	0.0	-0.1	0.0	0.0	0.0	-0.1	0.0	-0.5	-0.3	-0.4
1992	-0.1	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	-0.5	-0.4	-0.3
1993	0.0	0.0	0.0	0.2	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1994	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	-0.4	-0.1
1995	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1996	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1997	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1998	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1999	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2001	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.6	-0.4	-0.3
2002	0.0	0.0	-0.1	0.1	0.1	0.0	0.1	0.0	0.0	0.0	0.0	0.0
2003	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Average	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	-0.1	-0.1
Critical	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.2	0.0	-0.5	-0.5	-0.4
Dry	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	-0.3	-0.1
BN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AN	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Wet	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table E.3-118. Barker Slough location SLBAR002 salinity (EC) difference No Groundwater Substitution minus Base.

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	-0.1	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1971	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1972	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1973	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1974	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1975	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1976	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	-0.1	-0.5	-1.2
1977	-1.1	-0.4	-0.1	0.0	0.0	0.0	0.0	0.0	-0.1	-0.2	-1.5	-0.8
1978	-1.4	-1.0	-0.3	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0
1979	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1980	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1981	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1
1982	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1983	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1984	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1985	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1986	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1987	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.5	-1.3
1988	-0.9	-0.4	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	-0.7	-1.0
1989	-1.2	-0.5	-0.1	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.0
1990	0.0	0.0	0.0	0.0	0.1	0.3	0.1	0.0	-0.1	0.0	-0.4	-0.6
1991	-0.8	-0.5	-0.2	-0.1	0.0	0.0	0.0	0.0	-0.1	-0.1	-0.4	-0.5
1992	-0.8	-0.3	-0.1	-0.1	0.0	0.0	0.0	0.0	0.0	-0.1	-0.6	-0.6
1993	-0.5	-0.2	-0.1	0.0	0.1	0.2	0.0	0.0	0.0	0.0	0.0	0.0
1994	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	-0.2	-0.4
1995	-0.2	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1996	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1997	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1998	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1999	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2001	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	-0.4	-0.5
2002	-0.5	-0.1	-0.1	-0.1	0.1	0.1	0.0	0.1	0.0	0.0	0.0	0.0
2003	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Average	-0.2	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.2	-0.2
Critical	-0.5	-0.2	-0.1	0.0	0.0	0.0	0.0	0.0	-0.1	-0.1	-0.6	-0.7
Dry	-0.3	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.2	-0.3
BN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AN	-0.3	-0.2	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Wet	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table E.3-119. Barker Slough location SLBAR002 salinity (EC) percent difference of No Groundwater Substitution from Base.

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1971	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1972	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1973	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1974	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1975	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1976	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	-0.3	-0.6
1977	-0.6	-0.2	-0.1	0.0	0.0	0.0	0.0	0.0	-0.1	-0.1	-0.8	-0.4
1978	-0.7	-0.5	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1979	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1980	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1981	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1
1982	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1983	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1984	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1985	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1986	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1987	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.3	-0.6
1988	-0.4	-0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.4	-0.5
1989	-0.6	-0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1990	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	-0.2	-0.3
1991	-0.4	-0.2	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.2	-0.3
1992	-0.4	-0.2	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.3	-0.3
1993	-0.2	-0.1	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0
1994	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	-0.2
1995	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1996	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1997	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1998	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1999	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2001	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.2	-0.3
2002	-0.2	-0.1	0.0	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2003	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Average	-0.1	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	-0.1
Critical	-0.3	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.3	-0.4
Dry	-0.1	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	-0.2
BN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AN	-0.2	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Wet	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table E.3-120. Suisun Marsh location SLCBN002 salinity (EC) difference No Groundwater Substitution minus Base.

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	-18.8	-10.9	-11.2	-7.7	-0.8	-1.8	-5.4	-5.1	-3.6	-6.8	-5.7	0.2
1971	-1.5	-2.8	0.1	-4.2	-4.4	-2.1	-1.3	-4.7	-1.3	-1.2	-1.3	-1.7
1972	-1.5	-1.5	-3.5	-1.7	2.3	2.3	-3.4	-1.7	-1.6	-1.3	-1.2	-1.1
1973	-0.8	-0.6	-0.5	-0.5	-0.5	-0.9	-0.8	-1.5	0.2	-0.5	-0.3	-0.6
1974	-0.3	5.4	-1.3	-1.3	1.3	2.5	-0.1	-1.1	-0.3	-0.3	-0.4	-0.4
1975	-0.2	-0.2	0.2	-0.2	-0.5	0.2	-0.2	-0.2	0.0	0.1	0.0	-0.4
1976	-0.1	-0.2	0.4	-0.9	-1.8	2.1	3.2	-38.2	-75.7	-101.2	-236.3	-265.8
1977	-203.4	-114.1	-68.1	-42.3	-20.7	-19.0	-14.8	-39.5	-77.9	-117.0	-251.7	-224.2
1978	-172.5	-99.1	-56.6	-19.6	-11.8	-13.8	-11.6	-15.1	-11.1	-7.3	-7.8	-8.4
1979	-7.2	-6.8	-3.1	-1.1	-21.7	-23.8	10.8	-0.2	-3.0	-2.6	-11.8	-1.9
1980	-3.4	1.2	-1.8	11.7	-8.1	-3.5	0.7	0.3	-2.8	-0.8	3.0	4.2
1981	-4.6	-1.8	-2.0	-2.4	4.8	2.8	-5.5	-5.3	-2.8	-8.6	-41.8	-23.0
1982	6.2	-38.6	-16.4	-3.6	-13.4	0.6	-4.5	-1.7	-0.2	-1.2	-1.8	-1.6
1983	-1.2	-0.9	-0.8	-0.7	-0.7	-0.7	-1.4	-0.5	-0.7	-0.5	-0.5	-0.4
1984	-0.4	-0.6	-0.4	-0.4	-1.0	0.3	0.1	-0.3	1.1	-7.1	-1.6	11.8
1985	-4.4	-0.9	1.4	-1.2	0.9	-2.0	0.6	0.7	8.2	4.6	14.4	12.1
1986	-12.1	-2.1	-3.0	-1.8	-0.8	-1.1	-1.3	-0.9	-0.5	-0.7	-0.6	-1.0
1987	-0.5	-0.7	-0.2	0.5	-1.0	2.5	-0.3	-0.4	11.2	-42.1	-190.3	-265.6
1988	-187.3	-98.5	-49.4	-25.8	-20.1	-13.0	0.2	-4.5	5.4	-96.4	-255.4	-228.3
1989	-159.9	-91.6	-56.9	-28.8	-16.4	3.2	28.7	49.8	13.6	-5.1	-39.4	-18.2
1990	-12.0	-9.9	-6.2	-7.1	24.5	66.4	41.3	-21.1	-54.7	-133.6	-273.2	-247.0
1991	-194.5	-104.8	-67.4	-41.9	-25.9	-16.7	-6.0	-41.5	-63.5	-117.1	-250.8	-201.6
1992	-175.0	-100.6	-58.2	-37.3	-9.2	-6.8	-15.7	-11.2	-0.3	-116.4	-284.6	-242.9
1993	-173.0	-93.0	-57.9	-6.5	5.0	-9.6	-29.5	0.7	28.7	57.2	13.3	-0.6
1994	3.0	-5.4	-6.2	-5.1	-11.5	-9.3	-3.4	-14.8	-27.1	-60.7	-162.9	-195.2
1995	-122.1	-59.8	-39.5	-6.2	-10.0	-10.9	-18.0	-19.7	0.4	1.8	-5.7	2.5
1996	-5.7	-3.1	-1.2	-6.8	-0.9	-2.2	-3.8	-2.5	-1.5	-1.5	-1.6	-2.2
1997	-1.7	-1.3	0.1	-4.4	-6.9	3.4	0.8	0.4	-8.1	1.6	1.2	2.9
1998	1.0	0.9	0.5	6.7	-3.2	1.9	3.2	-2.1	0.7	-0.7	-5.4	-0.3
1999	2.5	-0.4	1.7	0.9	2.7	1.4	-2.9	-1.2	8.3	-4.8	-8.1	3.9
2000	-2.3	0.4	-2.7	4.2	-3.1	-4.1	-2.7	3.9	-3.0	7.8	-7.5	6.6
2001	4.4	1.8	1.9	1.7	-13.3	-0.9	3.1	4.4	20.1	-121.7	-260.3	-243.9
2002	-158.2	-89.9	-46.2	-39.4	3.6	19.6	32.3	33.1	8.8	2.8	-8.1	11.1
2003	-1.5	-7.6	1.2	-5.9	-7.1	-5.5	-11.1	8.0	-0.6	-1.3	4.6	4.2
Average	-47.3	-27.6	-16.3	-8.2	-5.0	-1.1	-0.6	-3.9	-6.9	-26.0	-67.0	-62.3
Critical	-109.9	-61.9	-36.4	-22.9	-9.3	0.5	0.7	-24.4	-42.0	-106.1	-245.0	-229.3
Dry	-53.9	-30.5	-17.0	-11.6	-3.5	4.2	9.8	13.7	9.9	-28.4	-87.6	-87.9
BN	-4.4	-4.2	-3.3	-1.4	-9.7	-10.7	3.7	-1.0	-2.3	-1.9	-6.5	-1.5
AN	-58.9	-33.1	-19.7	-2.8	-4.3	-6.2	-9.1	-0.6	1.9	9.2	0.9	0.9
Wet	-11.9	-8.8	-5.5	-2.3	-3.0	-0.7	-2.7	-3.0	-0.4	-1.6	-2.4	1.0

Table E.3-121. Suisun Marsh location SLCBN002 salinity (EC) percent difference of No Groundwater Substitution from Base.

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	-0.4	-0.2	-0.4	-0.6	-0.1	-0.2	-0.3	-0.1	-0.1	-0.1	-0.1	0.0
1971	0.0	-0.1	0.0	-0.3	-0.2	-0.1	-0.1	-0.3	-0.1	0.0	0.0	0.0
1972	0.0	0.0	-0.1	0.0	0.0	0.1	-0.1	0.0	0.0	0.0	0.0	0.0
1973	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	0.0	0.0	0.0
1974	0.0	0.1	-0.1	-0.1	0.1	0.3	0.0	-0.1	0.0	0.0	0.0	0.0
1975	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1976	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.4	-0.6	-0.7	-1.6	-1.7
1977	-1.4	-0.8	-0.5	-0.4	-0.2	-0.2	-0.1	-0.3	-0.5	-0.8	-1.5	-1.3
1978	-1.2	-0.7	-0.5	-0.4	-0.5	-0.6	-0.5	-0.6	-0.3	-0.1	-0.1	-0.1
1979	-0.1	-0.1	0.0	0.0	-0.6	-0.9	0.4	0.0	-0.1	0.0	-0.1	0.0
1980	0.0	0.0	0.0	0.3	-0.4	-0.2	0.0	0.0	-0.1	0.0	0.0	0.0
1981	-0.1	0.0	0.0	0.0	0.1	0.1	-0.1	-0.1	0.0	-0.1	-0.3	-0.2
1982	0.0	-0.5	-0.5	-0.2	-0.8	0.0	-0.4	-0.1	0.0	0.0	0.0	0.0
1983	0.0	0.0	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	0.0	0.0
1984	0.0	0.0	0.0	0.0	-0.1	0.0	0.0	0.0	0.0	-0.1	0.0	0.1
1985	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.1	0.1
1986	-0.1	0.0	0.0	0.0	0.0	-0.1	-0.1	0.0	0.0	0.0	0.0	0.0
1987	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.1	-0.4	-1.5	-1.9
1988	-1.4	-0.8	-0.5	-0.5	-0.5	-0.2	0.0	0.0	0.1	-0.8	-1.8	-1.5
1989	-1.1	-0.7	-0.5	-0.3	-0.2	0.1	0.9	1.1	0.2	0.0	-0.3	-0.1
1990	-0.1	-0.1	-0.1	-0.1	0.4	0.9	0.5	-0.2	-0.5	-1.0	-1.8	-1.6
1991	-1.3	-0.7	-0.5	-0.3	-0.3	-0.3	-0.1	-0.5	-0.5	-0.8	-1.7	-1.3
1992	-1.2	-0.7	-0.4	-0.3	-0.1	-0.2	-0.3	-0.1	0.0	-0.9	-1.9	-1.5
1993	-1.2	-0.7	-0.5	-0.1	0.2	-0.4	-1.2	0.0	1.2	1.2	0.1	0.0
1994	0.0	-0.1	-0.1	-0.1	-0.2	-0.2	0.0	-0.2	-0.3	-0.5	-1.2	-1.3
1995	-0.9	-0.5	-0.3	-0.1	-0.3	-0.6	-0.8	-1.3	0.0	0.1	-0.1	0.0
1996	-0.1	-0.1	0.0	-0.2	-0.1	-0.2	-0.3	-0.3	-0.1	0.0	0.0	0.0
1997	0.0	0.0	0.0	-0.4	-0.5	0.2	0.0	0.0	-0.1	0.0	0.0	0.0
1998	0.0	0.0	0.0	0.2	-0.3	0.1	0.3	-0.2	0.1	-0.1	-0.2	0.0
1999	0.1	0.0	0.1	0.1	0.3	0.2	-0.3	-0.1	0.2	-0.1	-0.1	0.0
2000	0.0	0.0	0.0	0.1	-0.2	-0.3	-0.2	0.2	-0.1	0.1	-0.1	0.1
2001	0.1	0.0	0.0	0.0	-0.3	0.0	0.1	0.1	0.2	-1.2	-2.1	-1.7
2002	-1.2	-0.8	-0.6	-1.3	0.1	0.5	0.8	0.7	0.1	0.0	-0.1	0.1
2003	0.0	-0.1	0.0	-0.2	-0.3	-0.2	-0.4	0.4	0.0	0.0	0.1	0.0
Average	-0.4	-0.2	-0.2	-0.2	-0.2	-0.1	-0.1	-0.1	0.0	-0.2	-0.5	-0.4
Critical	-0.8	-0.5	-0.3	-0.2	-0.1	0.0	0.0	-0.3	-0.3	-0.8	-1.7	-1.4
Dry	-0.4	-0.2	-0.2	-0.3	0.0	0.1	0.3	0.3	0.1	-0.3	-0.7	-0.6
BN	-0.1	-0.1	0.0	0.0	-0.3	-0.4	0.1	0.0	0.0	0.0	-0.1	0.0
AN	-0.4	-0.2	-0.2	-0.1	-0.2	-0.3	-0.4	0.0	0.1	0.2	0.0	0.0
Wet	-0.1	-0.1	-0.1	-0.1	-0.2	0.0	-0.2	-0.2	0.0	0.0	0.0	0.0

Table E.3-122. San Joaquin River location RSAN037 salinity (EC) difference No Crop Idle minus Base.

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	0.0	0.0	0.0	-0.1	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1971	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	0.0	0.0	0.0	0.0
1972	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.0
1973	0.0	0.0	0.0	0.0	0.2	-10.2	-6.2	-0.6	0.0	0.0	0.0	0.0
1974	0.0	0.0	0.0	0.0	0.0	0.1	-0.1	0.0	0.0	0.0	0.0	0.0
1975	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0
1976	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	1.4	28.3	-17.7	-39.6
1977	-27.8	-11.9	-12.4	-12.1	-3.2	0.2	0.8	0.7	1.9	-10.1	-18.2	-26.5
1978	-21.1	-7.3	-5.3	0.8	0.9	0.5	0.1	0.2	0.2	0.1	0.2	0.1
1979	0.0	0.0	-0.1	0.3	0.4	0.1	0.2	0.2	0.1	0.0	0.0	0.0
1980	-0.2	0.5	3.7	0.4	-2.0	-0.1	0.0	0.2	0.1	0.0	0.0	0.0
1981	0.0	0.0	-0.2	0.2	0.1	0.0	0.2	0.5	0.4	-3.2	20.1	3.6
1982	-17.3	-9.7	-0.3	0.3	-6.9	-1.8	0.2	-0.2	-0.2	-0.1	0.0	0.0
1983	-0.1	0.0	-0.2	0.0	0.4	0.2	0.1	-0.2	0.2	0.0	-0.1	0.0
1984	0.1	-0.1	0.1	0.0	0.0	0.1	0.1	0.1	0.0	0.0	0.0	0.0
1985	0.0	0.1	0.2	0.2	0.1	0.3	0.2	0.1	0.1	-0.2	-0.3	-0.5
1986	-0.2	-0.5	0.1	0.3	0.1	0.3	0.1	0.1	0.1	0.0	0.0	0.0
1987	0.0	0.1	-0.1	-0.2	0.1	0.0	1.1	1.6	0.8	6.3	-3.0	-23.3
1988	-18.2	-9.7	-6.2	0.5	0.4	2.2	1.8	1.9	1.3	11.5	-1.6	-26.6
1989	-25.1	-13.9	-2.9	7.5	2.1	2.2	1.0	1.8	0.6	-0.7	9.9	-3.7
1990	-9.6	-7.8	-7.3	-4.0	0.7	1.5	1.3	0.8	1.5	25.0	-1.5	-27.2
1991	-25.1	-12.1	-11.0	-7.1	-0.5	0.9	0.9	1.0	3.0	17.0	-2.6	-20.8
1992	-18.9	-8.7	-8.5	-11.0	-1.2	0.8	0.5	1.4	0.8	10.6	-2.4	-25.1
1993	-18.8	-7.1	-0.8	3.0	1.5	1.0	0.6	0.8	-12.2	-2.1	0.7	0.3
1994	0.1	0.0	-0.1	1.3	1.8	0.8	0.6	0.4	1.0	-3.5	-4.5	7.8
1995	-4.3	-2.1	-2.9	1.4	0.7	0.3	0.2	0.1	0.2	-0.1	0.1	0.1
1996	0.0	-0.1	0.1	0.3	0.2	-0.1	0.1	0.1	0.1	0.2	0.3	0.2
1997	0.0	0.0	0.0	-0.3	-0.2	0.0	0.0	0.2	0.1	-0.1	-0.1	-0.7
1998	0.2	0.3	0.3	0.3	0.3	-0.1	0.0	0.3	0.2	-0.1	0.0	0.0
1999	0.0	0.1	0.1	0.0	0.0	0.0	0.2	0.2	0.1	0.1	0.1	0.1
2000	0.0	0.0	-0.3	0.0	0.2	0.2	0.2	0.1	0.0	0.0	-0.1	0.0
2001	0.0	0.0	-0.6	-0.3	0.1	0.1	0.7	1.0	1.1	14.4	7.4	-13.6
2002	-14.3	-3.3	2.8	0.6	0.5	0.3	0.2	0.4	0.6	-0.3	-0.7	-1.8
2003	-1.0	-0.9	0.4	0.2	0.1	0.1	0.2	0.2	0.2	4.8	0.5	-3.1
Average	-5.9	-2.8	-1.5	-0.5	-0.1	0.0	0.2	0.4	0.1	2.9	-0.4	-5.9
Critical	-14.2	-7.2	-6.5	-4.6	-0.3	0.9	0.8	0.9	1.5	11.3	-6.9	-22.6
Dry	-6.6	-2.8	-0.1	1.3	0.5	0.5	0.6	0.9	0.6	2.7	5.5	-6.5
BN	0.0	0.0	0.0	0.1	0.2	0.1	0.1	0.1	0.0	0.0	0.0	0.0
AN	-6.9	-2.5	-0.4	0.7	0.1	-1.4	-0.8	0.1	-2.0	0.5	0.2	-0.5
Wet	-1.7	-0.9	-0.2	0.2	-0.4	-0.1	0.1	0.0	0.1	0.0	0.0	0.0

Table E.3-123. San Joaquin River location RSAN037 salinity (EC) percent difference of No Crop Idle from Base.

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1971	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1972	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1973	0.0	0.0	0.0	0.0	0.1	-3.4	-2.1	-0.2	0.0	0.0	0.0	0.0
1974	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1975	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1976	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.4	5.7	-3.4	-8.1
1977	-4.9	-2.2	-1.9	-1.7	-0.7	0.1	0.3	0.2	0.5	-2.4	-3.5	-4.0
1978	-3.4	-1.4	-0.9	0.2	0.2	0.1	0.0	0.1	0.1	0.0	0.1	0.0
1979	0.0	0.0	0.0	0.1	0.1	0.0	0.1	0.1	0.0	0.0	0.0	0.0
1980	0.0	0.1	0.7	0.1	-0.6	-0.1	0.0	0.1	0.0	0.0	0.0	0.0
1981	0.0	0.0	-0.1	0.0	0.0	0.0	0.1	0.2	0.1	-0.9	4.4	0.7
1982	-3.1	-2.0	-0.2	0.1	-2.5	-0.6	0.1	-0.1	-0.1	0.0	0.0	0.0
1983	0.0	0.0	-0.1	0.0	0.1	0.1	0.1	-0.1	0.1	0.0	-0.1	0.0
1984	0.0	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1985	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.0	-0.1	-0.1	-0.1
1986	0.0	-0.1	0.0	0.1	0.0	0.1	0.1	0.0	0.1	0.0	0.0	0.0
1987	0.0	0.1	-0.1	0.0	0.0	0.0	0.3	0.5	0.3	2.3	-0.9	-5.8
1988	-3.9	-2.1	-1.2	0.2	0.1	0.7	0.6	0.6	0.5	4.0	-0.4	-5.7
1989	-4.3	-2.5	-0.4	1.0	0.5	0.7	0.4	0.7	0.3	-0.2	1.9	-0.8
1990	-2.2	-1.6	-1.3	-0.8	0.2	0.6	0.5	0.3	0.5	5.6	-0.3	-5.2
1991	-4.2	-1.9	-1.6	-1.1	-0.1	0.2	0.3	0.4	1.0	3.5	-0.5	-4.1
1992	-3.3	-1.5	-1.3	-1.6	-0.3	0.2	0.2	0.5	0.3	3.5	-0.5	-4.9
1993	-3.8	-1.5	-0.1	0.7	0.4	0.3	0.2	0.3	-4.7	-1.0	0.3	0.1
1994	0.0	0.0	0.0	0.2	0.5	0.3	0.2	0.2	0.4	-0.7	-0.8	1.4
1995	-0.9	-0.5	-0.5	0.3	0.3	0.1	0.1	0.0	0.1	0.0	0.0	0.1
1996	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.1	0.1	0.0
1997	0.0	0.0	0.0	-0.1	-0.1	0.0	0.0	0.1	0.0	0.0	0.0	-0.2
1998	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.2	0.1	0.0	0.0	0.0
1999	0.0	0.1	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.0
2000	0.0	0.0	-0.1	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.0
2001	0.0	0.0	-0.2	-0.1	0.0	0.0	0.2	0.3	0.4	5.5	2.2	-3.5
2002	-3.1	-0.7	0.8	0.2	0.2	0.1	0.1	0.1	0.2	-0.1	-0.2	-0.3
2003	-0.2	-0.2	0.1	0.1	0.0	0.0	0.1	0.1	0.1	2.2	0.2	-1.0
Average	-1.1	-0.5	-0.2	-0.1	0.0	0.0	0.1	0.1	0.0	0.8	0.0	-1.2
Critical	-2.6	-1.3	-1.0	-0.7	0.0	0.3	0.3	0.3	0.5	2.8	-1.3	-4.4
Dry	-1.2	-0.5	0.0	0.2	0.1	0.2	0.2	0.3	0.2	1.1	1.2	-1.6
BN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AN	-1.2	-0.5	-0.1	0.2	0.0	-0.5	-0.3	0.1	-0.8	0.2	0.1	-0.1
Wet	-0.3	-0.2	0.0	0.0	-0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table E.3-124. RSAN072 salinity (EC) difference No Crop Idle minus Base.

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	0.2	0.0	0.0	-0.2	-0.2	0.0	0.0	0.1	0.3	0.3	-0.3	-0.1
1971	-0.2	-0.2	0.0	0.0	0.3	-0.3	0.0	-0.1	0.2	-0.3	-0.2	-0.2
1972	0.2	-0.4	0.3	-0.2	0.2	0.2	0.3	-0.3	0.3	0.3	-0.2	-0.4
1973	0.3	0.1	0.2	-0.2	0.1	-20.9	-1.5	0.3	0.1	-0.4	-0.2	-0.4
1974	-0.5	0.4	0.1	-0.2	0.0	0.2	-0.2	0.1	0.3	0.3	0.3	0.4
1975	-0.2	0.2	-0.2	0.4	-0.1	0.2	0.1	-0.4	0.0	0.3	-0.1	0.0
1976	-0.1	-0.3	0.2	0.1	0.2	0.3	0.0	-0.2	0.0	-3.2	0.0	0.1
1977	-0.2	0.1	-0.1	0.2	0.2	0.4	0.0	0.4	0.0	0.0	-0.1	0.0
1978	-0.4	0.3	0.1	-0.4	0.0	0.1	0.0	0.3	0.3	0.2	0.3	0.4
1979	0.2	0.4	0.0	-0.1	0.4	-0.1	0.4	0.2	0.2	0.3	0.0	0.2
1980	0.2	-0.3	-0.2	0.1	0.2	-0.4	0.3	0.2	0.1	-0.3	-0.3	-0.1
1981	0.4	0.0	-0.1	-0.2	-0.1	-0.4	1.6	0.5	0.0	-0.2	0.3	-0.2
1982	0.3	-0.3	0.3	0.0	-13.9	-1.1	0.4	-0.4	-0.3	-0.3	0.4	-0.3
1983	-0.4	0.0	-0.3	0.1	0.5	0.3	0.1	-0.3	0.3	-0.1	-0.5	0.0
1984	0.4	-0.3	0.2	0.0	0.1	0.1	0.2	-0.2	0.3	0.3	0.3	-0.1
1985	0.0	-0.2	-0.2	0.3	0.2	-0.2	0.4	0.0	-0.4	-0.4	-0.4	0.3
1986	0.5	0.0	0.4	0.5	0.1	0.4	0.1	0.0	0.4	0.0	0.0	-0.3
1987	0.3	0.3	0.1	0.1	0.0	-0.1	-0.2	-0.1	0.3	-0.2	0.2	-0.4
1988	-0.4	0.3	0.0	0.0	0.4	0.1	0.4	-0.2	0.1	0.8	0.3	0.3
1989	0.1	0.3	0.1	-0.4	-0.4	0.3	-0.4	0.3	0.0	0.5	-0.6	-0.2
1990	-0.2	-0.2	0.0	0.2	0.3	-0.2	-0.4	0.0	-0.3	-12.6	-2.8	0.1
1991	-0.1	0.3	-0.3	0.1	-0.3	0.0	-0.3	0.1	0.1	-15.4	-3.1	0.1
1992	-0.2	0.4	0.1	0.1	-0.1	0.1	-8.7	-1.6	0.2	-58.0	-20.7	0.1
1993	0.1	-0.2	0.3	0.2	0.1	0.1	0.5	0.4	17.7	1.7	0.4	-0.1
1994	0.0	0.0	-0.3	-0.4	0.0	0.2	0.3	-0.4	-0.4	-0.3	-0.5	-0.3
1995	0.1	0.2	0.3	-0.1	-0.4	0.3	0.2	0.1	0.3	-0.2	0.3	-0.4
1996	-0.4	-0.2	-0.2	-0.3	0.2	-0.3	0.4	-0.1	0.1	-0.1	-0.1	0.2
1997	-0.4	-0.1	-0.2	-0.4	-0.2	0.1	-0.1	0.4	0.0	0.1	-0.4	0.3
1998	0.2	-0.3	0.1	0.4	0.3	-0.3	0.0	0.4	0.1	-0.2	-0.4	0.2
1999	-0.4	0.0	-0.3	-0.4	0.1	0.0	0.4	0.3	0.5	-0.3	0.0	-0.1
2000	0.2	-0.3	-0.3	-0.2	0.3	0.3	0.4	-0.4	0.2	-0.1	-0.1	0.1
2001	-0.1	-0.2	-0.3	0.2	0.0	0.3	2.9	-0.2	-0.4	-0.7	-0.1	-0.3
2002	0.2	0.1	0.4	-0.1	-0.1	0.2	0.1	0.0	-0.4	0.0	0.2	0.0
2003	0.1	0.0	0.0	0.3	0.5	0.5	0.3	-0.1	-0.2	-1.4	0.2	0.2
Average	0.0	0.0	0.0	0.0	-0.3	-0.6	-0.1	0.0	0.6	-2.6	-0.8	0.0
Critical	-0.2	0.1	-0.1	0.1	0.1	0.1	-1.2	-0.3	0.0	-12.7	-3.8	0.1
Dry	0.1	0.0	0.0	0.0	-0.1	0.0	0.7	0.1	-0.1	-0.2	-0.1	-0.1
BN	0.2	0.0	0.1	-0.1	0.3	0.1	0.3	-0.1	0.3	0.3	-0.1	-0.1
AN	0.1	-0.1	0.0	0.0	0.2	-3.4	0.0	0.1	3.0	0.0	0.0	0.0
Wet	-0.1	0.0	0.0	0.0	-1.0	0.0	0.1	0.0	0.2	0.0	-0.1	0.0

Table E.3-125. RSAN072 salinity (EC) percent difference of No Crop Idle from Base.

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	0.0	0.0	0.0	-0.1	-0.1	0.0	0.0	0.0	0.1	0.1	-0.1	0.0
1971	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	0.0	0.0	0.0	0.0	0.0
1972	0.0	-0.1	0.0	0.0	0.0	0.0	0.1	-0.1	0.1	0.0	0.0	-0.1
1973	0.1	0.0	0.0	0.0	0.0	-5.9	-0.4	0.1	0.0	-0.1	0.0	-0.1
1974	-0.1	0.1	0.0	0.0	0.0	0.1	-0.1	0.0	0.1	0.0	0.1	0.1
1975	0.0	0.0	0.0	0.0	0.0	0.1	0.0	-0.1	0.0	0.1	0.0	0.0
1976	0.0	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.5	0.0	0.0
1977	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0
1978	-0.1	0.0	0.0	-0.1	0.0	0.0	0.0	0.1	0.1	0.0	0.1	0.1
1979	0.0	0.1	0.0	0.0	0.1	0.0	0.1	0.1	0.1	0.0	0.0	0.0
1980	0.0	0.0	0.0	0.0	0.1	-0.2	0.1	0.1	0.0	-0.1	-0.1	0.0
1981	0.1	0.0	0.0	0.0	0.0	-0.1	0.4	0.1	0.0	0.0	0.0	0.0
1982	0.1	-0.1	0.0	0.0	-4.7	-0.4	0.2	-0.2	-0.1	-0.1	0.1	-0.1
1983	-0.2	0.0	-0.1	0.0	0.2	0.1	0.1	-0.2	0.2	-0.1	-0.3	0.0
1984	0.1	-0.2	0.1	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.1	0.0
1985	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	-0.1	-0.1	-0.1	0.1
1986	0.1	0.0	0.1	0.1	0.0	0.2	0.0	0.0	0.1	0.0	0.0	-0.1
1987	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	-0.1
1988	-0.1	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.1	0.0	0.0
1989	0.0	0.0	0.0	-0.1	0.0	0.0	-0.1	0.0	0.0	0.1	-0.1	0.0
1990	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	0.0	-1.9	-0.4	0.0
1991	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-2.2	-0.4	0.0
1992	0.0	0.1	0.0	0.0	0.0	0.0	-1.1	-0.2	0.0	-8.4	-2.7	0.0
1993	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	2.6	0.2	0.1	0.0
1994	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	-0.1	0.0	-0.1	0.0
1995	0.0	0.0	0.0	0.0	-0.1	0.1	0.1	0.0	0.1	-0.1	0.1	-0.1
1996	-0.1	0.0	0.0	0.0	0.1	-0.1	0.1	0.0	0.0	0.0	0.0	0.0
1997	-0.1	0.0	-0.1	-0.2	-0.1	0.1	0.0	0.1	0.0	0.0	-0.1	0.1
1998	0.0	-0.1	0.0	0.1	0.1	-0.1	0.0	0.2	0.1	-0.1	-0.2	0.1
1999	-0.1	0.0	0.0	-0.1	0.0	0.0	0.1	0.1	0.1	0.0	0.0	0.0
2000	0.0	-0.1	0.0	0.0	0.1	0.1	0.1	-0.1	0.0	0.0	0.0	0.0
2001	0.0	0.0	0.0	0.0	0.0	0.0	0.7	0.0	-0.1	-0.1	0.0	0.0
2002	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	0.0	0.0
2003	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.0	0.0	-0.2	0.0	0.0
Average	0.0	0.0	0.0	0.0	-0.1	-0.2	0.0	0.0	0.1	-0.4	-0.1	0.0
Critical	0.0	0.0	0.0	0.0	0.0	0.0	-0.2	0.0	0.0	-1.8	-0.5	0.0
Dry	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.0
BN	0.0	0.0	0.0	0.0	0.1	0.0	0.1	0.0	0.1	0.0	0.0	0.0
AN	0.0	0.0	0.0	0.0	0.0	-1.0	0.0	0.0	0.4	0.0	0.0	0.0
Wet	0.0	0.0	0.0	0.0	-0.3	0.0	0.1	0.0	0.1	0.0	0.0	0.0

Table E.3-126. San Joaquin River location RSAN112 salinity (EC) difference No Crop Idle minus Base.

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	0.2	0.0	0.0	-0.2	-0.2	0.0	0.0	0.1	0.3	0.4	-0.4	-0.1
1971	-0.2	-0.2	0.0	0.0	0.3	-0.4	0.1	-0.1	0.2	-0.3	-0.2	-0.2
1972	0.2	-0.4	0.3	-0.3	0.2	0.2	0.3	-0.4	0.4	0.3	-0.3	-0.4
1973	0.4	0.0	0.2	-0.3	0.2	-21.8	-0.9	0.4	0.1	-0.4	-0.2	-0.4
1974	-0.5	0.4	0.1	-0.2	0.0	0.3	-0.3	0.1	0.3	0.3	0.4	0.4
1975	-0.2	0.2	-0.2	0.4	-0.1	0.2	0.1	-0.4	0.0	0.3	-0.1	0.0
1976	-0.1	-0.3	0.2	0.0	0.2	0.3	0.0	-0.2	0.0	-0.2	-0.1	0.1
1977	-0.2	0.1	-0.2	0.3	0.1	0.3	0.2	0.4	-0.1	0.0	-0.4	0.0
1978	-0.4	0.3	0.1	-0.4	0.0	0.1	0.0	0.3	0.3	0.2	0.3	0.4
1979	0.2	0.4	0.0	-0.1	0.4	-0.1	0.4	0.2	0.3	0.3	0.0	0.2
1980	0.2	-0.3	-0.2	0.1	0.2	-0.4	0.3	0.2	0.1	-0.3	-0.3	-0.1
1981	0.4	0.0	-0.1	-0.2	-0.1	-0.4	1.6	0.5	0.0	-0.2	0.0	-0.2
1982	0.4	-0.4	0.4	0.0	-14.5	-0.9	0.4	-0.4	-0.3	-0.3	0.4	-0.4
1983	-0.4	0.1	-0.3	0.1	0.5	0.2	0.1	-0.4	0.3	-0.1	-0.5	0.0
1984	0.4	-0.3	0.2	0.0	0.1	0.1	0.2	-0.2	0.4	0.3	0.3	-0.2
1985	0.0	-0.2	-0.2	0.4	0.2	-0.2	0.4	0.0	-0.5	-0.4	-0.4	0.4
1986	0.5	0.0	0.5	0.5	0.1	0.4	0.1	0.0	0.4	0.0	0.0	-0.3
1987	0.3	0.3	0.1	0.1	0.0	-0.1	-0.2	-0.1	0.4	0.1	-0.2	-0.4
1988	-0.4	0.3	-0.1	0.0	0.4	0.1	0.4	-0.3	0.1	-0.5	0.4	0.3
1989	0.1	0.3	0.0	-0.4	-0.4	0.3	-0.4	0.3	0.1	0.3	-0.3	-0.2
1990	-0.2	-0.2	0.0	0.3	0.3	-0.2	-0.4	0.1	-0.4	0.2	0.4	0.1
1991	-0.2	0.3	-0.4	0.2	-0.3	0.0	-0.3	0.1	0.1	-0.4	-0.5	0.2
1992	-0.2	0.5	-0.1	0.4	-0.2	0.1	-10.1	-0.1	0.2	0.5	0.3	0.1
1993	0.1	-0.2	0.4	0.2	0.1	0.1	0.5	0.4	19.8	0.7	0.4	-0.1
1994	0.0	0.0	-0.4	-0.4	0.1	0.2	0.3	-0.5	-0.5	0.3	0.3	-0.4
1995	0.1	0.2	0.3	-0.1	-0.5	0.3	0.1	0.1	0.3	-0.2	0.3	-0.5
1996	-0.4	-0.2	-0.2	-0.3	0.2	-0.4	0.4	-0.1	0.2	-0.1	-0.1	0.2
1997	-0.4	-0.1	-0.2	-0.4	-0.2	0.1	-0.1	0.5	-0.1	0.1	-0.5	0.4
1998	0.2	-0.3	0.2	0.4	0.3	-0.3	0.0	0.4	0.1	-0.2	-0.4	0.2
1999	-0.4	0.0	-0.3	-0.4	0.1	-0.1	0.5	0.3	0.5	-0.3	0.1	-0.1
2000	0.2	-0.4	-0.3	-0.2	0.3	0.3	0.4	-0.4	0.2	-0.1	-0.1	0.1
2001	-0.1	-0.2	-0.3	0.3	0.0	0.3	3.0	-0.3	-0.4	-0.5	-0.3	-0.3
2002	0.2	0.1	0.4	-0.1	-0.1	0.2	0.1	-0.1	-0.4	-0.1	0.3	-0.1
2003	0.1	0.0	0.0	0.3	0.5	0.5	0.3	-0.1	-0.2	-0.1	0.2	0.2
Average	0.0	0.0	0.0	0.0	-0.4	-0.6	-0.1	0.0	0.7	0.0	0.0	0.0
Critical	-0.2	0.1	-0.1	0.1	0.1	0.1	-1.4	-0.1	-0.1	0.0	0.1	0.0
Dry	0.1	0.0	0.0	0.0	-0.1	0.0	0.8	0.0	-0.1	-0.1	-0.1	-0.1
BN	0.2	0.0	0.2	-0.2	0.3	0.1	0.4	-0.1	0.3	0.3	-0.2	-0.1
AN	0.1	-0.1	0.0	-0.1	0.2	-3.5	0.1	0.1	3.4	0.0	0.0	0.0
Wet	-0.1	0.0	0.0	0.0	-1.1	0.0	0.1	0.0	0.2	0.0	-0.1	0.0

Table E.3-127. San Joaquin River location RSAN112 salinity (EC) percent difference of No Crop Idle from Base.

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	0.0	0.0	0.0	-0.1	-0.1	0.0	0.0	0.0	0.1	0.1	-0.1	0.0
1971	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	0.0	0.1	-0.1	0.0	0.0
1972	0.0	-0.1	0.0	0.0	0.0	0.0	0.1	-0.1	0.1	0.0	-0.1	-0.1
1973	0.1	0.0	0.0	0.0	0.0	-6.4	-0.3	0.1	0.0	-0.1	0.0	-0.1
1974	-0.1	0.1	0.0	0.0	0.0	0.1	-0.1	0.0	0.1	0.0	0.1	0.1
1975	0.0	0.0	0.0	0.1	0.0	0.1	0.0	-0.1	0.0	0.1	0.0	0.0
1976	0.0	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1977	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	-0.1	0.0
1978	-0.1	0.0	0.0	-0.1	0.0	0.0	0.0	0.1	0.1	0.0	0.1	0.1
1979	0.0	0.1	0.0	0.0	0.1	-0.1	0.1	0.1	0.1	0.0	0.0	0.0
1980	0.0	-0.1	0.0	0.0	0.1	-0.2	0.1	0.1	0.0	-0.1	-0.1	0.0
1981	0.1	0.0	0.0	0.0	0.0	-0.1	0.4	0.1	0.0	0.0	0.0	0.0
1982	0.1	-0.1	0.0	0.0	-5.0	-0.3	0.2	-0.3	-0.1	-0.1	0.1	-0.1
1983	-0.2	0.0	-0.1	0.0	0.2	0.1	0.1	-0.2	0.2	-0.1	-0.3	0.0
1984	0.1	-0.2	0.1	0.0	0.0	0.0	0.1	0.0	0.1	0.0	0.1	0.0
1985	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	-0.1	-0.1	-0.1	0.1
1986	0.1	0.0	0.1	0.1	0.0	0.2	0.0	0.0	0.1	0.0	0.0	-0.1
1987	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	-0.1
1988	-0.1	0.1	0.0	0.0	0.0	0.0	0.1	0.0	0.0	-0.1	0.1	0.0
1989	0.0	0.0	0.0	-0.1	0.0	0.0	-0.1	0.0	0.0	0.0	-0.1	0.0
1990	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	-0.1	0.0	0.1	0.0
1991	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	0.0	-0.1	-0.1	0.0
1992	0.0	0.1	0.0	0.0	0.0	0.0	-1.3	0.0	0.0	0.1	0.0	0.0
1993	0.0	0.0	0.1	0.0	0.0	0.0	0.1	0.1	2.9	0.1	0.1	0.0
1994	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	-0.1	0.0	0.0	-0.1
1995	0.0	0.0	0.0	0.0	-0.1	0.1	0.1	0.0	0.1	-0.1	0.1	-0.1
1996	-0.1	0.0	0.0	0.0	0.1	-0.1	0.1	0.0	0.0	0.0	0.0	0.0
1997	-0.1	0.0	-0.1	-0.2	-0.1	0.1	0.0	0.1	0.0	0.0	-0.1	0.1
1998	0.0	-0.1	0.0	0.1	0.1	-0.1	0.0	0.3	0.1	-0.1	-0.2	0.1
1999	-0.1	0.0	0.0	-0.1	0.0	0.0	0.1	0.1	0.1	-0.1	0.0	0.0
2000	0.0	-0.1	0.0	0.0	0.1	0.1	0.1	-0.1	0.0	0.0	0.0	0.0
2001	0.0	0.0	0.0	0.0	0.0	0.0	0.8	-0.1	-0.1	-0.1	0.0	-0.1
2002	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	0.0	0.0
2003	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0
Average	0.0	0.0	0.0	0.0	-0.1	-0.2	0.0	0.0	0.1	0.0	0.0	0.0
Critical	0.0	0.0	0.0	0.0	0.0	0.0	-0.2	0.0	0.0	0.0	0.0	0.0
Dry	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.0
BN	0.0	0.0	0.0	0.0	0.1	0.0	0.1	0.0	0.1	0.0	0.0	0.0
AN	0.0	0.0	0.0	0.0	0.0	-1.1	0.0	0.0	0.5	0.0	0.0	0.0
Wet	0.0	0.0	0.0	0.0	-0.4	0.0	0.1	0.0	0.1	0.0	0.0	0.0

Table E.3-128. Mokelumne River location RSMKL008 salinity (EC) difference No Crop Idle minus Base.

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1971	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1972	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1973	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1974	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1975	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1976	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.2	-0.6	-1.9	-1.2
1977	0.1	0.2	0.1	0.1	0.3	0.4	0.3	0.4	0.1	-2.2	-0.5	-0.7
1978	0.1	0.2	0.1	0.6	0.6	0.2	0.1	0.0	0.0	0.0	0.0	0.0
1979	0.0	0.0	0.0	0.1	0.4	0.1	0.0	0.0	0.0	0.0	0.0	0.0
1980	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1981	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	-0.9	0.0
1982	0.1	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1983	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1984	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1985	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1986	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1987	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.4	0.1	-0.9	-2.5	-0.8
1988	0.2	0.2	0.2	0.6	0.1	0.7	0.3	0.5	0.1	-1.5	-1.4	-1.1
1989	0.3	0.2	0.2	0.4	0.6	0.3	0.4	0.2	0.1	0.0	-0.4	0.0
1990	0.1	0.1	0.2	0.1	0.6	0.3	0.0	0.2	0.1	-1.2	-0.7	-0.9
1991	0.1	0.5	0.4	1.1	0.6	0.7	0.3	0.4	0.2	-0.7	-0.5	-0.7
1992	0.2	0.3	0.6	0.4	1.0	0.4	0.3	0.5	0.2	-1.2	-1.0	-0.5
1993	-0.1	0.4	0.3	1.0	0.7	0.5	0.0	0.0	0.0	0.0	0.0	0.0
1994	0.0	0.0	0.0	0.2	0.4	0.2	0.1	0.2	0.1	0.0	-0.7	-0.2
1995	0.1	0.2	0.1	0.6	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1996	0.0	0.0	0.1	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1997	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0
1998	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1999	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2000	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2001	0.0	0.0	0.0	0.1	0.1	0.0	0.1	0.3	0.1	-1.5	-0.9	-0.7
2002	0.1	0.2	0.1	0.3	0.4	0.1	0.2	0.2	0.1	0.0	0.0	0.0
2003	0.0	0.0	0.1	0.0	0.1	0.1	0.0	0.0	0.1	-0.2	0.0	0.0
Average	0.0	0.1	0.1	0.2	0.2	0.1	0.1	0.1	0.0	-0.3	-0.3	-0.2
Critical	0.1	0.2	0.2	0.3	0.4	0.4	0.2	0.3	0.2	-1.1	-1.0	-0.7
Dry	0.1	0.1	0.1	0.1	0.2	0.1	0.2	0.2	0.1	-0.4	-0.8	-0.3
BN	0.0	0.0	0.0	0.1	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AN	0.0	0.1	0.1	0.3	0.2	0.1	0.0	0.0	0.0	0.0	0.0	0.0
Wet	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table E.3-129. Mokelumne River location RSMKL008 salinity (EC) percent difference of No Crop Idle from Base.

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1971	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1972	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1973	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1974	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1975	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1976	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	-0.3	-1.0	-0.6
1977	0.0	0.1	0.0	0.0	0.1	0.2	0.1	0.2	0.1	-1.1	-0.3	-0.3
1978	0.0	0.1	0.0	0.3	0.3	0.1	0.0	0.0	0.0	0.0	0.0	0.0
1979	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1980	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1981	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.5	0.0
1982	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1983	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1984	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1985	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1986	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1987	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.2	0.1	-0.5	-1.3	-0.4
1988	0.1	0.1	0.1	0.2	0.0	0.3	0.2	0.3	0.1	-0.8	-0.8	-0.6
1989	0.1	0.1	0.1	0.2	0.3	0.2	0.2	0.1	0.0	0.0	-0.2	0.0
1990	0.0	0.1	0.1	0.1	0.3	0.1	0.0	0.1	0.1	-0.6	-0.4	-0.5
1991	0.1	0.2	0.2	0.4	0.2	0.3	0.1	0.2	0.1	-0.4	-0.3	-0.4
1992	0.1	0.2	0.3	0.2	0.4	0.2	0.1	0.3	0.1	-0.6	-0.5	-0.3
1993	0.0	0.2	0.1	0.4	0.3	0.2	0.0	0.0	0.0	0.0	0.0	0.0
1994	0.0	0.0	0.0	0.1	0.2	0.1	0.1	0.1	0.1	0.0	-0.4	-0.1
1995	0.1	0.1	0.0	0.3	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1996	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1997	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1998	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1999	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2001	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	-0.8	-0.5	-0.4
2002	0.1	0.1	0.1	0.1	0.2	0.1	0.1	0.1	0.0	0.0	0.0	0.0
2003	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	0.0
Average	0.0	0.0	0.0	0.1	0.1	0.1	0.0	0.1	0.0	-0.2	-0.2	-0.1
Critical	0.1	0.1	0.1	0.1	0.2	0.2	0.1	0.2	0.1	-0.6	-0.5	-0.4
Dry	0.0	0.0	0.0	0.1	0.1	0.0	0.1	0.1	0.0	-0.2	-0.4	-0.1
BN	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AN	0.0	0.1	0.0	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0
Wet	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table E.3-130. Barker Slough location SLBAR002 salinity (EC) difference No Crop Idle minus Base.

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1971	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1972	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1973	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1974	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1975	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1976	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.6	-1.5
1977	-1.3	-0.3	0.0	0.1	0.1	0.1	0.1	0.1	0.1	-0.1	-1.3	-0.8
1978	-1.2	-0.8	-0.1	0.1	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0
1979	0.0	0.0	0.0	0.0	0.1	0.2	0.1	0.0	0.0	0.0	0.0	0.0
1980	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1981	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.2	-0.3
1982	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1983	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1984	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1985	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1986	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1987	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.7	-1.6
1988	-1.0	-0.4	0.0	0.1	0.2	0.1	0.1	0.1	0.1	-0.1	-0.9	-1.2
1989	-1.3	-0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0	-0.1	-0.1
1990	0.0	0.0	0.1	0.1	0.1	0.4	0.2	0.0	0.0	0.0	-0.5	-0.6
1991	-0.7	0.0	0.4	0.3	0.2	0.2	0.3	0.2	0.1	0.1	-0.3	-0.5
1992	-0.6	0.1	0.4	0.4	0.2	0.4	0.2	0.2	0.1	0.0	-0.7	-0.8
1993	-0.5	-0.3	0.2	0.2	0.2	0.4	0.2	0.1	0.1	0.0	0.0	0.0
1994	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.0	0.0	0.1	-0.2	-0.4
1995	-0.2	0.0	0.1	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0
1996	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1997	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1998	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1999	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2001	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	-0.5	-0.6
2002	-0.5	-0.1	0.1	0.1	0.1	0.2	0.1	0.1	0.0	0.0	0.0	0.0
2003	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0
Average	-0.2	-0.1	0.0	0.1	0.0	0.1	0.0	0.0	0.0	0.0	-0.2	-0.2
Critical	-0.5	-0.1	0.1	0.1	0.1	0.2	0.1	0.1	0.1	0.0	-0.6	-0.8
Dry	-0.3	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	-0.2	-0.4
BN	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0
AN	-0.3	-0.2	0.0	0.1	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0
Wet	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table E.3-131. Barker Slough location SLBAR002 salinity (EC) percent difference of No Crop Idle from Base.

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1971	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1972	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1973	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1974	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1975	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1976	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.3	-0.8
1977	-0.7	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.7	-0.4
1978	-0.6	-0.4	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0
1979	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0
1980	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1981	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	-0.2
1982	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1983	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1984	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1985	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1986	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1987	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.3	-0.8
1988	-0.5	-0.2	0.0	0.0	0.1	0.1	0.0	0.0	0.0	-0.1	-0.4	-0.6
1989	-0.6	0.0	0.1	0.1	0.0	0.0	0.1	0.1	0.0	0.0	0.0	-0.1
1990	0.0	0.0	0.0	0.1	0.1	0.2	0.1	0.0	0.0	0.0	-0.2	-0.3
1991	-0.4	0.0	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.0	-0.2	-0.3
1992	-0.3	0.1	0.2	0.2	0.1	0.2	0.1	0.1	0.1	0.0	-0.3	-0.4
1993	-0.3	-0.1	0.1	0.1	0.1	0.2	0.1	0.0	0.0	0.0	0.0	0.0
1994	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	-0.1	-0.2
1995	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1996	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1997	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1998	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1999	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2001	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.3	-0.3
2002	-0.3	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0
2003	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Average	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	-0.1
Critical	-0.3	0.0	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	-0.3	-0.4
Dry	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	-0.2
BN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AN	-0.1	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Wet	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table E.3-132. Suisun Marsh location SLCBN002 salinity (EC) difference No Crop Idle minus Base.

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1971	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1972	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1973	0.0	0.0	0.0	0.0	0.0	1.5	1.0	-1.1	-0.4	-0.2	-0.1	-0.1
1974	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.2
1975	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1976	0.0	0.0	0.0	0.0	0.0	0.0	0.6	0.1	4.5	-55.3	-258.6	-335.2
1977	-266.5	-144.6	-82.1	-46.1	-21.7	-22.7	-15.7	-5.2	9.6	-72.0	-208.6	-207.5
1978	-173.6	-96.6	-31.4	1.2	-5.3	-9.6	-8.3	-6.5	2.9	10.2	0.5	-3.4
1979	-4.6	-4.7	-5.5	2.4	6.4	4.6	6.8	10.1	7.5	1.1	-0.6	-1.3
1980	-1.0	7.0	24.5	8.5	2.5	0.3	1.4	5.2	4.5	1.3	0.4	0.0
1981	-0.2	-0.1	1.1	5.6	4.0	3.5	7.2	9.9	12.4	-25.2	-142.9	-210.5
1982	-135.9	-53.4	-21.3	-14.7	-5.4	-5.0	-4.9	-4.5	0.1	1.0	-2.0	-2.3
1983	-6.2	6.1	-0.3	-1.6	-1.3	-1.4	-2.3	-1.3	-1.2	-0.5	2.6	6.2
1984	3.9	2.2	-0.1	-0.4	0.0	0.1	1.5	5.5	6.2	2.4	0.9	0.3
1985	-0.2	7.9	13.6	9.4	7.2	6.6	4.9	7.0	6.8	2.5	2.4	1.6
1986	1.5	1.1	3.4	9.3	1.7	1.3	1.5	2.6	2.4	1.1	0.7	0.5
1987	0.5	0.4	0.5	2.6	6.4	4.4	3.0	1.4	7.0	-86.6	-308.3	-403.9
1988	-281.4	-150.7	-43.5	16.0	12.7	-5.2	14.5	25.7	16.8	-137.9	-350.0	-313.2
1989	-234.2	-128.6	-30.6	24.8	0.0	31.0	46.1	71.1	22.0	-5.6	-111.7	-156.4
1990	-94.1	-44.2	-22.5	3.6	57.5	120.8	98.5	53.6	52.3	-95.5	-289.0	-287.7
1991	-235.1	-121.0	-72.9	-42.0	-2.8	48.3	39.0	69.7	76.6	-45.2	-202.8	-213.1
1992	-172.8	-95.3	-50.3	-27.8	29.0	25.5	51.2	59.2	34.2	-117.7	-324.8	-309.6
1993	-226.4	-123.5	-12.8	29.9	-1.5	12.1	6.9	16.8	63.5	87.7	41.6	10.9
1994	0.4	-1.5	-2.1	16.6	38.4	54.6	67.3	62.5	63.9	11.0	-136.7	-215.8
1995	-166.5	-73.2	-18.1	20.0	2.6	-1.9	-2.4	-4.5	-0.3	8.2	29.2	34.5
1996	7.5	2.3	23.9	18.1	5.4	2.5	0.9	1.4	9.2	21.4	9.9	5.7
1997	-0.4	-5.4	4.7	-4.6	-5.3	8.7	12.4	17.5	17.2	8.8	4.1	3.6
1998	-0.1	0.6	7.5	12.8	2.0	2.8	1.7	1.2	1.0	2.3	9.1	17.5
1999	5.9	14.3	13.2	4.6	2.3	1.5	2.4	5.5	15.9	8.2	7.1	-1.3
2000	2.4	1.4	0.8	17.4	9.5	3.4	4.1	7.9	7.6	4.8	1.7	1.2
2001	1.1	1.0	1.0	5.6	2.3	4.5	7.3	27.0	43.1	-138.0	-344.7	-312.9
2002	-236.8	-80.6	12.5	-1.7	22.9	64.8	72.9	77.2	44.4	18.7	7.3	4.0
2003	1.6	-1.3	23.3	6.0	3.3	9.9	12.3	5.9	24.9	28.6	-31.4	-50.0
Average	-65.0	-31.8	-7.8	2.2	5.1	10.8	12.7	15.3	16.3	-16.5	-76.3	-86.4
Critical	-149.9	-79.6	-39.1	-11.4	16.2	31.6	36.5	37.9	36.9	-73.3	-252.9	-268.9
Dry	-78.3	-33.3	-0.3	7.7	7.1	19.2	23.6	32.3	22.6	-39.0	-149.7	-179.7
BN	-2.3	-2.3	-2.7	1.2	3.2	2.3	3.4	5.0	3.8	0.5	-0.3	-0.7
AN	-66.2	-35.5	0.7	10.5	1.4	2.9	2.9	4.7	17.2	22.1	2.1	-6.9
Wet	-22.3	-8.1	1.0	3.3	0.1	0.7	0.8	1.8	3.9	4.1	4.7	5.0

Table E.3-133. Suisun Marsh location SLCBN002 salinity (EC) percent difference of No Crop Idle from Base.

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1971	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1972	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1973	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0
1974	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1975	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1976	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.4	-1.8	-2.2
1977	-1.9	-1.1	-0.6	-0.4	-0.3	-0.2	-0.1	0.0	0.1	-0.5	-1.3	-1.2
1978	-1.2	-0.7	-0.3	0.0	-0.2	-0.4	-0.4	-0.3	0.1	0.2	0.0	0.0
1979	-0.1	-0.1	-0.1	0.0	0.2	0.2	0.2	0.3	0.2	0.0	0.0	0.0
1980	0.0	0.1	0.3	0.2	0.1	0.0	0.1	0.2	0.1	0.0	0.0	0.0
1981	0.0	0.0	0.0	0.1	0.1	0.1	0.2	0.2	0.2	-0.2	-1.2	-1.5
1982	-1.0	-0.7	-0.7	-0.7	-0.3	-0.4	-0.4	-0.4	0.0	0.0	0.0	0.0
1983	-0.1	0.2	0.0	-0.2	-0.1	-0.2	-0.2	-0.2	-0.2	-0.1	0.1	0.2
1984	0.1	0.1	0.0	0.0	0.0	0.0	0.1	0.2	0.1	0.0	0.0	0.0
1985	0.0	0.2	0.3	0.2	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0
1986	0.0	0.0	0.0	0.2	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0
1987	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.0	0.1	-0.8	-2.4	-2.8
1988	-2.1	-1.2	-0.4	0.3	0.3	-0.1	0.2	0.3	0.2	-1.1	-2.5	-2.0
1989	-1.6	-1.0	-0.2	0.2	0.0	0.6	1.5	1.5	0.3	-0.1	-0.9	-1.2
1990	-0.8	-0.4	-0.2	0.0	0.8	1.6	1.2	0.6	0.5	-0.7	-1.9	-1.8
1991	-1.6	-0.9	-0.5	-0.3	0.0	0.7	0.7	0.8	0.7	-0.3	-1.3	-1.3
1992	-1.2	-0.7	-0.4	-0.2	0.4	0.6	0.8	0.7	0.3	-0.9	-2.2	-2.0
1993	-1.6	-0.9	-0.1	0.6	-0.1	0.4	0.3	0.9	2.6	1.9	0.5	0.1
1994	0.0	0.0	0.0	0.2	0.6	1.0	0.9	0.8	0.6	0.1	-1.0	-1.4
1995	-1.3	-0.6	-0.2	0.5	0.1	-0.1	-0.1	-0.3	0.0	0.4	0.7	0.6
1996	0.1	0.0	0.5	0.7	0.5	0.2	0.1	0.1	0.4	0.4	0.1	0.1
1997	0.0	-0.1	0.2	-0.4	-0.4	0.6	0.5	0.5	0.3	0.1	0.0	0.0
1998	0.0	0.0	0.1	0.4	0.2	0.2	0.1	0.1	0.1	0.2	0.3	0.4
1999	0.1	0.4	0.5	0.4	0.3	0.2	0.3	0.3	0.5	0.1	0.1	0.0
2000	0.0	0.0	0.0	0.3	0.5	0.2	0.3	0.3	0.2	0.1	0.0	0.0
2001	0.0	0.0	0.0	0.1	0.1	0.2	0.2	0.5	0.5	-1.3	-2.8	-2.2
2002	-1.9	-0.7	0.2	-0.1	0.8	1.7	1.9	1.7	0.6	0.2	0.1	0.0
2003	0.0	0.0	0.3	0.2	0.1	0.3	0.5	0.3	0.7	0.4	-0.3	-0.5
Average	-0.5	-0.2	0.0	0.1	0.1	0.2	0.3	0.3	0.3	-0.1	-0.5	-0.6
Critical	-1.1	-0.6	-0.3	-0.1	0.3	0.5	0.5	0.4	0.3	-0.6	-1.7	-1.7
Dry	-0.6	-0.2	0.0	0.1	0.2	0.5	0.7	0.7	0.3	-0.4	-1.2	-1.3
BN	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.2	0.1	0.0	0.0	0.0
AN	-0.5	-0.3	0.0	0.2	0.1	0.1	0.1	0.2	0.6	0.4	0.0	-0.1
Wet	-0.2	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1

Table E.3-134. Upper Cache Slough location SLCCH016 Base salinity (EC).

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	188.1	188.5	244.3	763.2	711.4	419.3	242.3	202.5	194.1	191.5	188.9	188.5
1971	188.4	190.9	428.5	390.7	289.1	234.3	204.4	193.7	188.8	188.9	188.6	188.3
1972	188.3	189.7	189.9	195.9	205.9	205.1	199.9	194.8	192.0	190.7	188.4	188.0
1973	187.7	204.2	214.5	759.9	806.3	623.4	309.0	210.0	194.7	191.5	189.2	189.2
1974	189.0	190.8	326.2	472.8	397.9	290.2	249.1	205.2	192.7	190.1	189.1	189.0
1975	188.5	189.1	189.7	195.5	410.2	376.5	273.7	207.4	191.5	189.8	188.9	188.9
1976	187.5	187.1	188.5	193.6	202.8	204.6	202.0	197.1	197.1	194.5	189.0	190.3
1977	194.3	197.5	196.1	198.6	207.9	210.2	204.1	197.2	194.7	195.4	193.5	191.4
1978	195.9	198.8	224.7	754.5	762.7	718.2	499.2	246.7	198.3	192.0	189.8	189.4
1979	189.9	191.3	190.2	563.3	762.9	573.3	297.3	212.7	194.6	191.6	189.3	189.6
1980	190.3	189.9	222.9	577.6	782.5	635.5	314.1	214.0	195.9	191.8	189.8	189.4
1981	190.0	191.9	191.2	222.0	227.3	217.1	207.5	198.4	193.7	191.9	189.5	189.3
1982	189.5	190.3	278.0	745.6	675.3	700.4	572.8	288.1	201.5	191.9	190.7	189.7
1983	188.2	190.5	200.7	685.0	807.8	790.2	661.3	310.4	201.8	189.5	188.9	188.7
1984	188.8	189.6	324.6	305.3	253.5	225.4	206.0	197.2	192.8	191.1	188.9	188.9
1985	188.2	191.5	202.7	211.3	218.1	217.1	216.8	200.3	193.2	191.7	189.2	189.1
1986	189.5	191.9	193.4	299.3	783.9	767.2	455.2	230.1	198.1	192.8	189.9	189.6
1987	189.6	191.5	190.6	195.6	209.1	214.6	209.0	198.2	192.6	190.6	190.0	192.1
1988	193.3	194.5	195.0	383.6	351.5	258.6	218.5	200.6	193.4	192.0	191.5	193.9
1989	197.0	200.3	197.3	198.9	206.7	208.1	203.3	195.6	191.4	190.0	188.2	187.3
1990	187.2	189.6	192.7	198.9	210.8	223.4	212.6	199.3	193.9	194.6	190.6	191.9
1991	195.2	199.7	202.4	204.7	212.3	213.7	218.7	205.3	192.3	189.6	189.8	191.9
1992	195.0	197.4	198.7	202.9	270.2	272.3	251.3	210.5	195.5	191.3	190.7	192.1
1993	193.3	195.0	270.4	786.5	812.0	561.7	262.9	203.7	190.9	188.8	189.1	189.4
1994	189.7	190.3	190.2	219.9	372.1	306.3	220.0	197.6	192.8	193.2	189.5	190.3
1995	191.6	193.9	197.5	784.5	701.3	732.7	550.8	251.6	198.1	189.6	189.4	189.2
1996	189.8	191.1	245.8	397.9	682.9	520.0	261.8	204.9	192.6	191.4	189.8	189.1
1997	188.1	189.4	298.4	769.9	699.9	368.8	227.0	201.2	193.8	191.9	189.0	188.7
1998	188.5	190.0	190.7	503.3	811.0	676.9	326.1	220.0	195.3	188.5	189.0	188.6
1999	188.6	189.4	189.4	231.2	408.3	342.1	236.4	199.0	191.2	190.0	188.7	188.3
2000	188.7	190.6	190.1	196.4	370.2	336.8	238.0	204.6	194.6	192.1	189.3	189.1
2001	188.4	189.3	190.9	195.5	301.0	283.2	225.3	201.7	194.8	191.9	190.4	191.9
2002	193.7	195.0	330.4	332.3	289.2	246.0	213.8	205.0	201.9	193.0	189.6	190.1
2003	191.7	193.8	367.1	376.0	304.6	249.0	220.0	200.9	190.7	190.8	188.6	188.5
Average	190.3	192.5	230.7	403.3	462.3	394.8	282.6	211.9	194.4	191.4	189.6	189.7
Critical	191.7	193.7	194.8	228.9	261.1	241.3	218.2	201.1	194.2	192.9	190.7	191.7
Dry	191.2	193.2	217.2	225.9	241.9	231.0	212.6	199.9	194.6	191.5	189.5	190.0
BN	189.1	190.5	190.1	379.6	484.4	389.2	248.6	203.8	193.3	191.2	188.8	188.8
AN	191.2	195.4	248.3	575.1	639.7	520.8	307.2	213.3	194.2	191.2	189.3	189.2
Wet	189.0	190.4	254.4	503.4	587.1	495.7	343.6	223.9	194.8	190.5	189.2	188.9

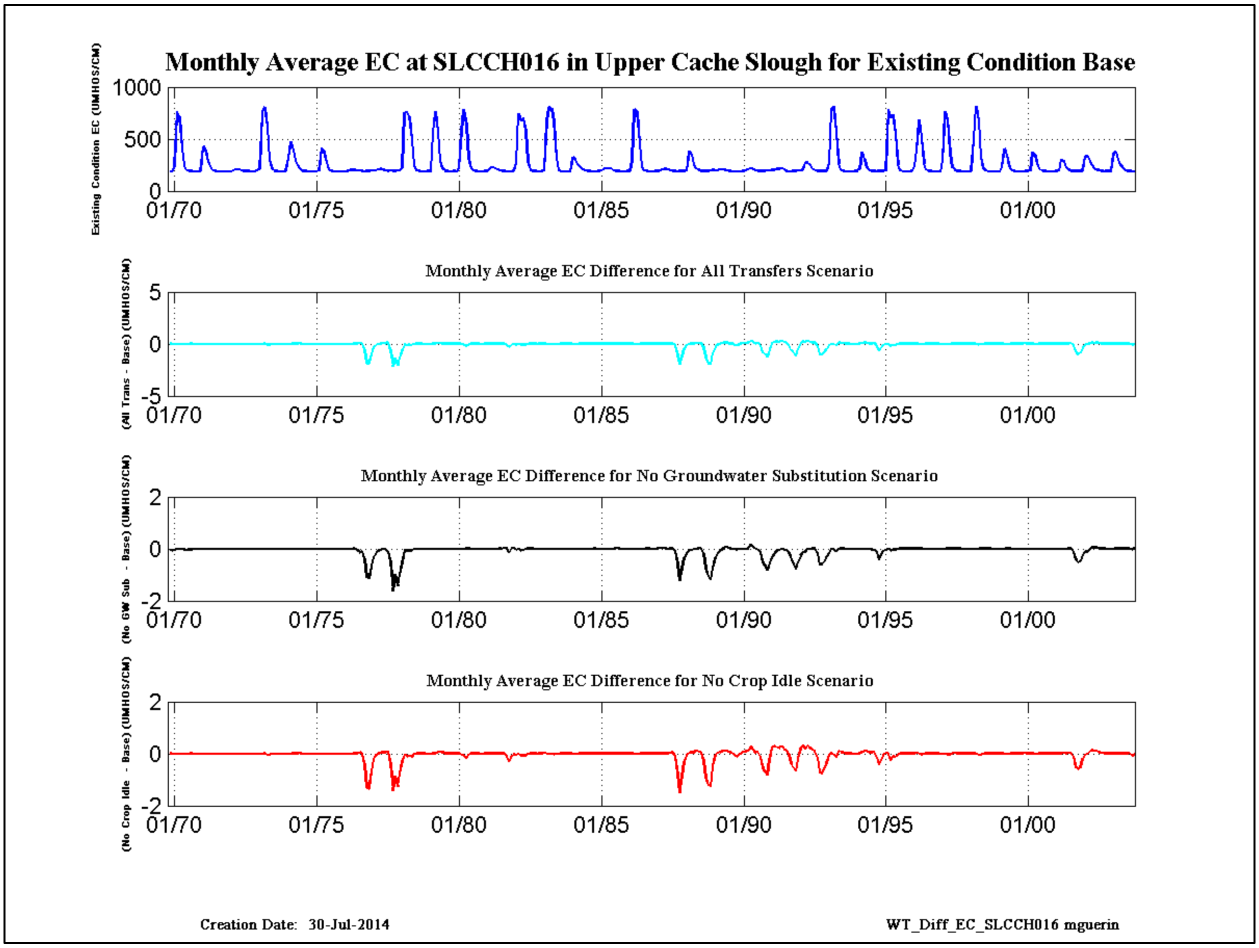


Figure E.3-19. Cache Slough location SLCCH016 EC for the Base condition and change from Base for the scenarios.

Table E.3-135. Montezuma Slough location SLMZU011 Base salinity (EC).

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	2620.5	2489.3	849.7	192.4	200.7	254.1	1205.4	3358.9	5314.3	6641.3	7975.5	7087.5
1971	2564.7	2273.7	755.8	268.2	473.2	539.7	595.0	714.8	1373.3	3939.2	8056.0	7221.5
1972	2477.3	2362.0	2682.4	2851.0	1759.8	1197.5	1852.1	4196.4	6780.4	8260.3	9521.5	12164.0
1973	8639.2	4659.2	1924.0	459.0	227.8	234.5	682.2	1455.4	2939.2	5948.6	8831.1	9512.2
1974	4048.4	1611.1	266.2	189.6	247.5	197.3	197.5	477.3	1648.7	4141.7	8073.2	6936.9
1975	2610.6	2239.7	2683.9	3555.8	1431.4	241.6	395.3	587.1	831.3	3019.6	7955.0	7041.7
1976	2367.7	2290.7	2606.4	4299.8	3551.7	5340.8	6252.7	8537.8	11890.2	13237.7	13857.8	15356.8
1977	10863.7	9951.1	9330.3	5365.7	3224.1	7286.5	9259.0	10783.5	13336.1	14958.6	15780.2	16567.5
1978	10564.9	9757.1	5732.4	984.4	307.4	252.4	290.4	550.0	1815.8	4793.5	8794.0	9712.1
1979	4012.1	3365.1	3783.1	2816.5	954.1	652.0	1177.0	1653.3	3281.9	7115.3	10244.5	13053.9
1980	8471.9	6163.9	3523.5	686.5	212.6	241.1	610.3	1418.6	2631.7	4963.8	8738.6	9607.4
1981	3866.0	3222.1	3765.1	2555.6	1369.3	1368.1	2202.0	4201.2	6826.6	9468.6	11784.8	13888.1
1982	9495.1	3135.4	417.0	230.2	207.2	209.5	190.0	222.5	668.5	3114.0	7804.3	7219.5
1983	2309.3	969.1	249.0	219.2	204.4	194.0	198.1	192.1	194.7	312.5	1232.3	1842.7
1984	1610.5	626.1	187.9	206.1	248.1	310.2	866.9	2353.5	4759.0	6503.1	7974.1	7337.1
1985	2595.1	2219.7	1783.3	2227.5	1926.2	3385.5	3912.8	4244.2	6683.6	9434.7	11806.3	13778.4
1986	8306.1	8117.1	4768.3	1816.1	257.0	200.0	412.8	1149.1	2915.5	5934.6	9013.9	7683.4
1987	2595.2	2489.8	3507.4	3947.5	2179.3	1519.8	2709.2	6274.7	8331.4	10174.3	12531.6	14283.7
1988	9715.9	9067.0	4666.6	1484.0	1340.6	4620.6	7699.1	7988.1	9122.5	10925.3	13509.2	15165.7
1989	11041.8	9205.3	7799.7	5421.5	4021.1	1746.4	873.8	2622.7	6081.1	9735.4	11715.5	12045.2
1990	7594.2	8175.6	8533.8	3817.7	1885.0	4613.4	6586.0	7692.9	10270.6	13106.5	14459.2	15222.0
1991	10753.4	10599.3	10047.0	7330.2	4576.4	2804.0	2100.0	6154.9	10433.0	13285.0	14507.5	15441.0
1992	10876.1	10230.3	10040.2	7371.0	2362.3	1535.1	3427.3	6853.8	9385.5	11107.6	14052.9	15444.4
1993	9739.2	9098.3	6915.8	1432.6	337.8	413.4	374.2	459.5	872.2	3006.8	7863.3	8947.9
1994	3783.3	3325.5	3793.7	4157.5	2172.0	3206.8	5613.8	6174.5	8841.2	12227.8	13638.4	14811.2
1995	8321.5	7568.4	6351.5	848.5	323.5	195.4	232.2	198.8	260.8	718.1	3017.3	4849.1
1996	2157.6	1944.6	1858.6	787.3	209.8	206.6	237.1	240.0	1317.6	5112.3	8846.6	7167.0
1997	2637.0	2249.3	511.5	195.8	209.6	559.7	1334.0	2311.5	4576.0	6550.7	7868.5	7181.7
1998	2908.6	2519.8	2236.7	1197.0	213.0	215.1	209.2	205.3	192.5	390.2	1867.3	2979.4
1999	1948.2	1788.2	933.9	411.5	211.5	197.9	335.2	891.9	2528.0	5225.7	8601.8	7149.8
2000	2388.6	2217.1	2884.0	2367.7	401.4	220.7	527.6	1350.1	3980.1	6805.0	8216.0	9205.6
2001	3981.3	3314.7	3704.7	3415.6	1465.9	1020.9	1921.4	4579.0	7135.6	9561.1	12046.2	14069.3
2002	9409.9	7976.9	2638.1	505.2	843.2	2024.7	2263.7	3016.9	6045.5	10184.6	12019.8	13958.0
2003	9044.5	8603.6	2576.3	389.3	507.5	1229.8	1157.6	457.3	2089.0	5655.8	7891.0	8985.0
Average	5774.1	4877.2	3656.1	2176.6	1178.3	1424.6	1997.1	3046.1	4863.3	7222.3	9708.7	10379.9
Critical	7993.5	7662.8	7002.6	4832.3	2730.3	4201.0	5848.3	7740.8	10468.4	12692.6	14257.9	15429.8
Dry	5581.6	4738.1	3866.4	3012.2	1967.5	1844.3	2313.8	4156.4	6850.6	9759.8	11984.0	13670.4
BN	3244.7	2863.5	3232.8	2833.7	1357.0	924.7	1514.6	2924.8	5031.1	7687.8	9883.0	12609.0
AN	8141.4	6749.9	3926.0	1053.2	332.4	432.0	607.0	948.5	2388.0	5195.6	8389.0	9328.3
Wet	3964.5	2887.1	1697.7	778.3	341.3	270.9	493.0	992.5	2044.6	3969.5	6791.2	6284.4

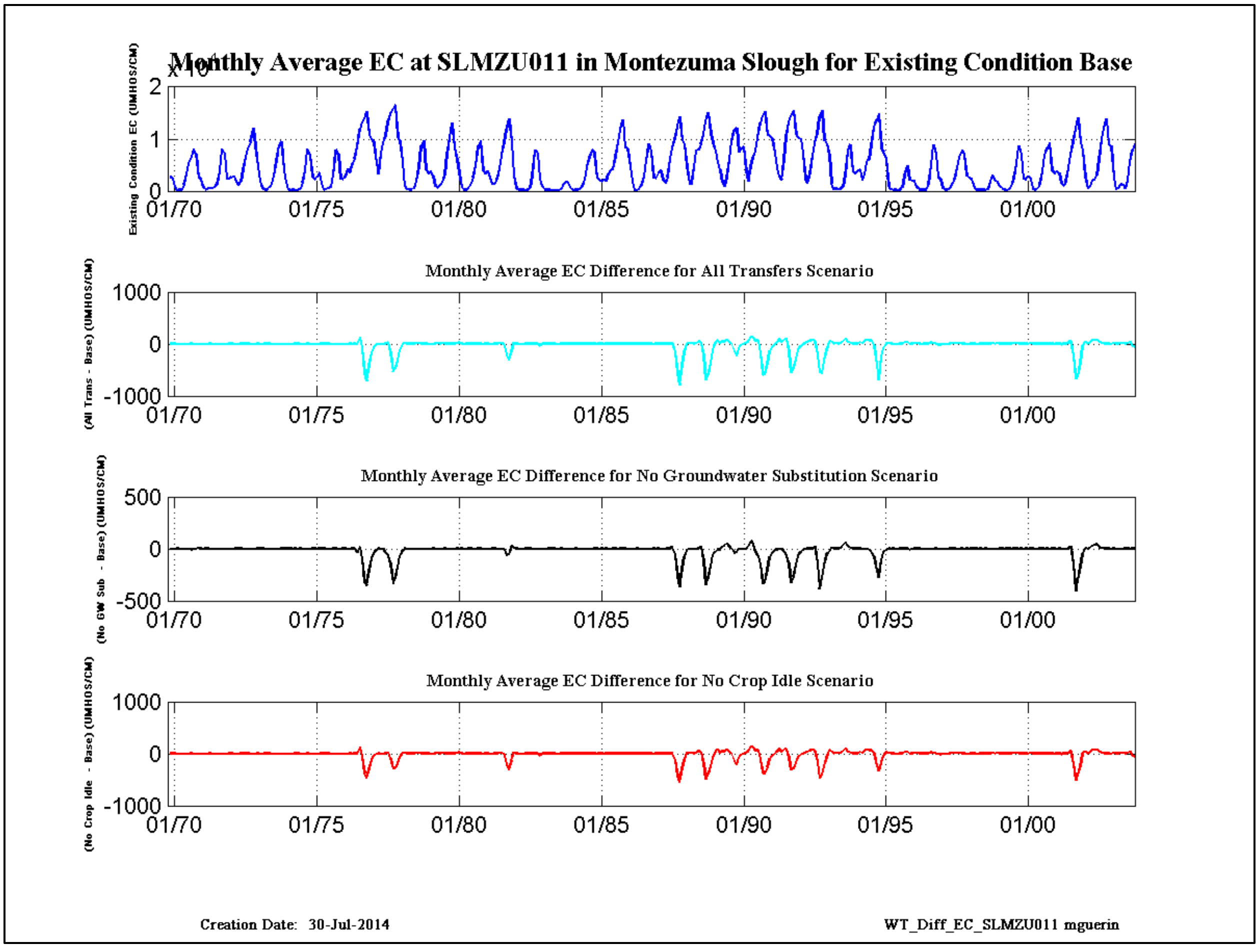


Figure E.3-20. Montezuma Slough location SLMZU011 EC for the Base condition and change from Base for the scenarios.

Table E.3-136. Montezuma Slough location SLMZU025 Base salinity (EC).

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	1718.1	1507.9	262.7	186.4	186.2	189.8	516.8	1477.7	3032.9	3334.2	5153.3	2807.3
1971	1478.4	1272.2	271.1	189.7	221.1	216.5	260.0	266.5	563.6	2028.1	5386.2	2928.2
1972	1492.1	1296.6	2329.3	2101.7	735.9	337.9	765.8	2116.3	4192.1	4551.9	6304.9	8670.5
1973	8123.4	3795.7	814.0	218.8	201.0	193.3	285.6	511.6	1472.9	3223.1	5832.5	4992.7
1974	3242.5	509.4	186.4	182.7	189.9	183.9	186.4	243.1	662.7	2227.2	5180.9	2740.5
1975	1537.5	1200.5	2495.9	3086.5	512.5	189.9	220.7	243.5	317.1	1617.3	5251.2	2793.6
1976	1417.9	1098.0	2321.3	4076.0	2936.6	2608.7	3217.9	5673.6	8756.2	9253.6	10078.5	11872.0
1977	10330.1	9664.6	9358.6	4558.0	2908.8	4124.5	5286.3	7315.9	9956.1	11347.6	12009.4	13015.5
1978	9835.3	9692.8	4860.4	352.6	211.6	203.3	219.1	258.5	753.2	2554.4	5800.4	5072.3
1979	3183.2	2669.9	3746.9	1468.5	316.8	272.0	415.0	554.8	1668.8	4225.0	6832.9	9399.6
1980	7853.6	5567.2	2988.9	304.0	201.0	202.3	266.4	500.7	1127.8	2676.5	5806.3	5080.8
1981	3056.4	2501.9	3534.2	1453.7	375.3	428.1	821.8	2088.1	4069.2	6160.0	8190.2	10187.3
1982	8947.6	1555.0	197.1	200.4	188.6	198.4	183.6	182.8	296.8	1716.8	5489.7	3027.3
1983	787.2	291.2	189.9	210.8	201.5	193.4	188.3	182.0	185.0	207.4	498.9	616.6
1984	873.5	246.8	183.5	193.3	196.1	195.0	355.8	1000.5	2680.0	3350.8	5295.4	3064.8
1985	1574.9	874.7	884.8	1551.5	1041.2	1398.0	1544.2	1990.6	4134.1	6213.7	8445.6	9935.0
1986	7806.3	8101.7	3924.9	792.0	198.0	193.5	239.6	439.3	1481.1	3329.2	6079.3	3300.1
1987	1700.0	1580.8	3457.6	3437.2	1033.7	453.4	1315.6	3737.7	5138.7	6874.7	9191.9	10907.1
1988	9219.9	8944.4	3636.9	518.5	614.7	2634.3	4257.3	4681.6	5588.5	7777.1	10125.1	11726.8
1989	10671.5	8694.3	7682.3	4983.0	3686.8	599.0	331.9	1169.5	3817.9	6552.3	7892.7	8358.1
1990	7092.3	8201.2	8501.1	2720.1	1182.8	2290.7	3450.2	4612.1	7329.2	9696.6	10810.4	11894.4
1991	10242.6	10524.2	10013.7	6885.2	4206.4	985.2	945.4	3764.4	7523.4	9816.7	10747.1	11962.5
1992	10317.5	10102.8	10059.4	6904.7	945.1	578.0	1576.5	4250.4	5916.3	7930.0	10699.7	11937.8
1993	9143.8	8977.4	6425.3	531.5	223.4	218.0	205.3	223.0	322.3	1595.4	5263.4	4542.5
1994	2942.5	2655.8	3655.6	3675.1	949.6	1480.6	2626.4	3230.4	6036.0	8581.0	9685.1	11032.5
1995	7387.6	7621.6	5837.0	374.4	203.9	185.9	195.1	178.9	184.5	300.2	1477.0	2013.7
1996	1024.0	1085.9	862.5	250.8	192.9	189.1	194.2	196.1	635.3	2776.1	5887.5	2748.5
1997	1591.5	1180.6	220.6	195.2	191.6	245.0	446.9	894.4	2615.7	3240.3	5136.3	2873.6
1998	1850.9	1440.4	1511.9	449.4	202.7	195.9	187.3	181.9	181.3	222.1	816.5	1029.0
1999	1208.5	674.5	281.2	203.2	189.7	184.4	209.7	353.6	1176.1	2782.1	5655.6	2780.1
2000	1576.9	1152.4	2628.5	1196.0	211.0	191.3	240.9	486.6	2374.4	3596.4	5311.1	4777.7
2001	3268.4	2595.0	3602.5	2501.6	451.6	336.4	732.8	2460.7	4223.3	6408.5	8626.9	10631.5
2002	8786.6	7723.3	1243.9	217.0	363.4	687.1	776.4	1270.1	3875.7	6808.0	8267.9	10385.6
2003	8485.3	8456.2	1125.7	199.3	231.4	400.4	337.8	213.3	1249.4	2948.1	5096.4	4652.3
Average	4993.2	4219.3	3214.6	1657.9	761.8	681.9	970.7	1675.0	3045.2	4585.9	6715.5	6581.1
Critical	7366.1	7313.0	6792.4	4191.1	1963.4	2100.3	3051.5	4789.8	7300.8	9200.4	10593.6	11920.2
Dry	4843.0	3995.0	3400.9	2357.3	1158.7	650.3	920.5	2119.5	4209.8	6502.8	8435.9	10067.4
BN	2337.6	1983.2	3038.1	1785.1	526.3	305.0	590.4	1335.6	2930.4	4388.5	6568.9	9035.1
AN	7503.0	6273.6	3140.4	467.0	213.2	234.7	259.2	365.6	1216.7	2765.7	5518.3	4853.0
Wet	3034.9	2052.9	1263.4	501.1	221.1	197.0	260.4	449.3	1077.9	2087.1	4408.3	2517.2

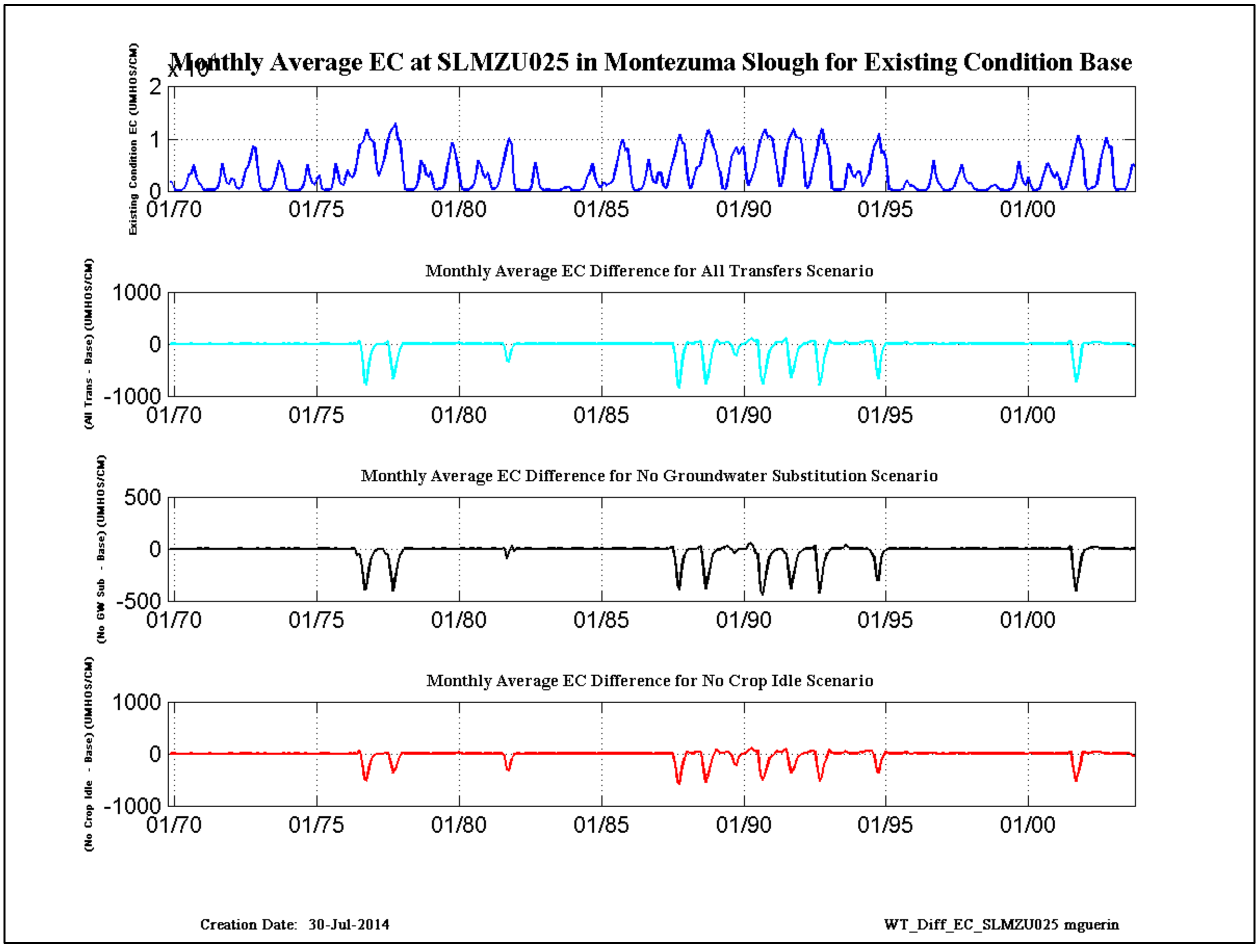


Figure E.3-21. Montezuma Slough location SLMZU025 EC for the Base condition and change from Base for the scenarios.

Table E.3-137. Suisun Slough location SLSUS012 Base salinity (EC).

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	4798.7	5011.1	2301.3	727.3	535.3	545.8	1721.0	4292.2	6359.5	7971.0	9145.3	8814.9
1971	5195.7	4868.6	2281.5	938.6	1053.6	1105.5	1040.0	1227.4	1985.6	4847.5	8999.3	8880.6
1972	5119.4	4978.1	5062.5	5829.3	4255.9	2535.1	2732.1	5222.7	7834.4	9547.6	10724.2	13295.6
1973	11794.0	8980.5	5107.1	1892.7	862.6	821.2	1281.3	2249.4	3867.0	7085.9	9873.5	10856.5
1974	7593.3	3703.8	1063.6	613.5	629.0	484.0	454.2	829.7	2315.3	5064.2	8970.1	8565.3
1975	5160.0	4890.0	5053.5	6541.0	3755.2	1023.4	888.5	1106.0	1373.6	3960.4	8766.7	8739.5
1976	4998.5	4814.5	4909.9	6971.2	6837.0	7266.1	7808.4	9732.3	12954.2	14429.7	15042.4	16241.4
1977	14201.4	12946.8	12262.5	9916.4	6983.1	9340.6	10790.7	12121.2	14486.2	15962.1	16884.2	17609.2
1978	14647.2	12752.8	10384.3	3718.9	1381.7	1145.4	995.4	1264.3	2770.5	5925.8	9792.3	11184.9
1979	7647.4	6827.2	6685.5	6086.4	2592.7	1573.1	2026.9	2609.7	4296.5	8282.4	11345.0	14016.7
1980	11996.8	10053.3	7459.5	3066.5	1093.7	898.4	1271.8	2207.7	3583.3	6154.4	9789.9	11052.0
1981	7544.6	6650.2	6630.6	5722.2	3160.6	2529.2	3266.5	5263.2	8026.4	10657.7	12910.1	14863.1
1982	13057.9	7468.2	2120.8	985.3	744.0	591.3	541.0	547.5	1130.7	3864.1	8914.0	8999.3
1983	4786.9	2561.0	935.7	578.7	494.9	420.1	504.6	439.8	394.5	549.8	1702.9	2637.6
1984	3036.4	1794.6	554.6	438.0	460.3	547.9	1288.1	3126.9	5673.2	7765.2	9115.5	8983.3
1985	5215.8	4527.3	3634.0	4506.2	4481.8	4886.9	5193.8	5486.8	7831.2	10589.3	12948.8	14760.7
1986	12112.2	11124.5	9009.8	5031.8	1532.7	876.0	998.2	1856.5	3812.4	7028.3	9998.2	9439.5
1987	5418.2	5319.0	5861.1	7082.0	5295.3	3095.2	3820.4	7383.1	9511.7	11360.7	13465.1	15105.1
1988	13127.5	11969.5	9296.0	4371.9	2992.4	5938.3	8944.4	9360.4	10555.0	12246.5	14534.1	16065.5
1989	14251.2	12733.8	11359.5	9814.9	7906.8	4014.2	1976.4	3725.3	7253.2	10892.7	12992.8	13751.2
1990	11446.8	11008.6	11355.0	8440.4	5334.6	6529.4	8142.5	9125.9	11489.5	14161.3	15532.0	16389.6
1991	14165.6	13367.1	13159.7	11414.7	8789.7	5526.6	3741.9	7476.6	11581.2	14339.5	15627.0	16485.9
1992	14304.0	13195.0	13036.3	11508.5	6151.3	3238.3	4878.0	8175.4	10714.9	12420.2	15014.6	16414.8
1993	13682.0	12052.6	10954.3	4331.0	1574.4	1364.1	1190.8	1092.5	1612.0	3985.7	8881.8	10517.0
1994	7242.3	6602.5	6669.6	7397.4	5275.9	4775.8	7029.3	7583.4	10018.3	13249.3	14806.3	16010.4
1995	12748.7	10635.6	10369.8	3681.6	1601.5	846.5	934.6	676.4	693.7	1243.7	3824.4	6105.8
1996	4753.2	4424.7	4155.8	2126.9	699.9	588.4	593.2	517.3	1799.2	6021.4	9739.5	8935.7
1997	5047.0	4919.3	1818.9	573.3	584.3	994.9	2005.0	3167.8	5506.2	7800.2	9016.3	8854.7
1998	5443.3	5161.9	4642.9	2950.5	834.2	702.4	577.7	476.0	401.2	689.5	2480.3	4010.7
1999	3899.1	3832.9	2040.6	962.4	511.0	383.5	573.8	1325.7	3247.2	6227.1	9577.9	9022.3
2000	5002.2	4840.1	5167.6	5097.5	1535.0	714.6	991.9	2042.3	4785.6	7929.8	9370.8	10622.4
2001	7423.5	6603.7	6509.2	6760.9	3647.7	2058.1	2862.3	5642.8	8296.8	10736.2	13048.4	14957.3
2002	12963.4	11286.5	6404.1	1949.8	1822.1	3248.5	3400.3	4138.8	7153.6	11273.1	13145.9	14947.0
2003	12648.7	11495.8	6244.7	1883.3	1362.5	2209.6	2112.0	1124.3	2778.0	6905.4	9144.1	10529.7
Average	8896.3	7747.1	6308.9	4526.8	2846.3	2435.8	2840.5	3900.5	5767.4	8269.6	10738.9	11696.0
Critical	11355.2	10557.7	10098.4	8574.4	6052.0	6087.8	7333.6	9082.2	11685.6	13829.8	15348.7	16459.5
Dry	8802.8	7853.4	6733.1	5972.7	4385.7	3305.4	3419.9	5273.3	8012.2	10918.3	13085.2	14730.7
BN	6383.4	5902.6	5874.0	5957.9	3424.3	2054.1	2379.5	3916.2	6065.5	8915.0	11034.6	13656.1
AN	11628.5	10029.2	7552.9	3331.7	1301.7	1192.2	1307.2	1663.4	3232.7	6331.2	9475.4	10793.8
Wet	6741.0	5415.1	3565.3	2011.5	1033.5	700.7	932.3	1506.9	2668.6	4848.6	7711.6	7845.3

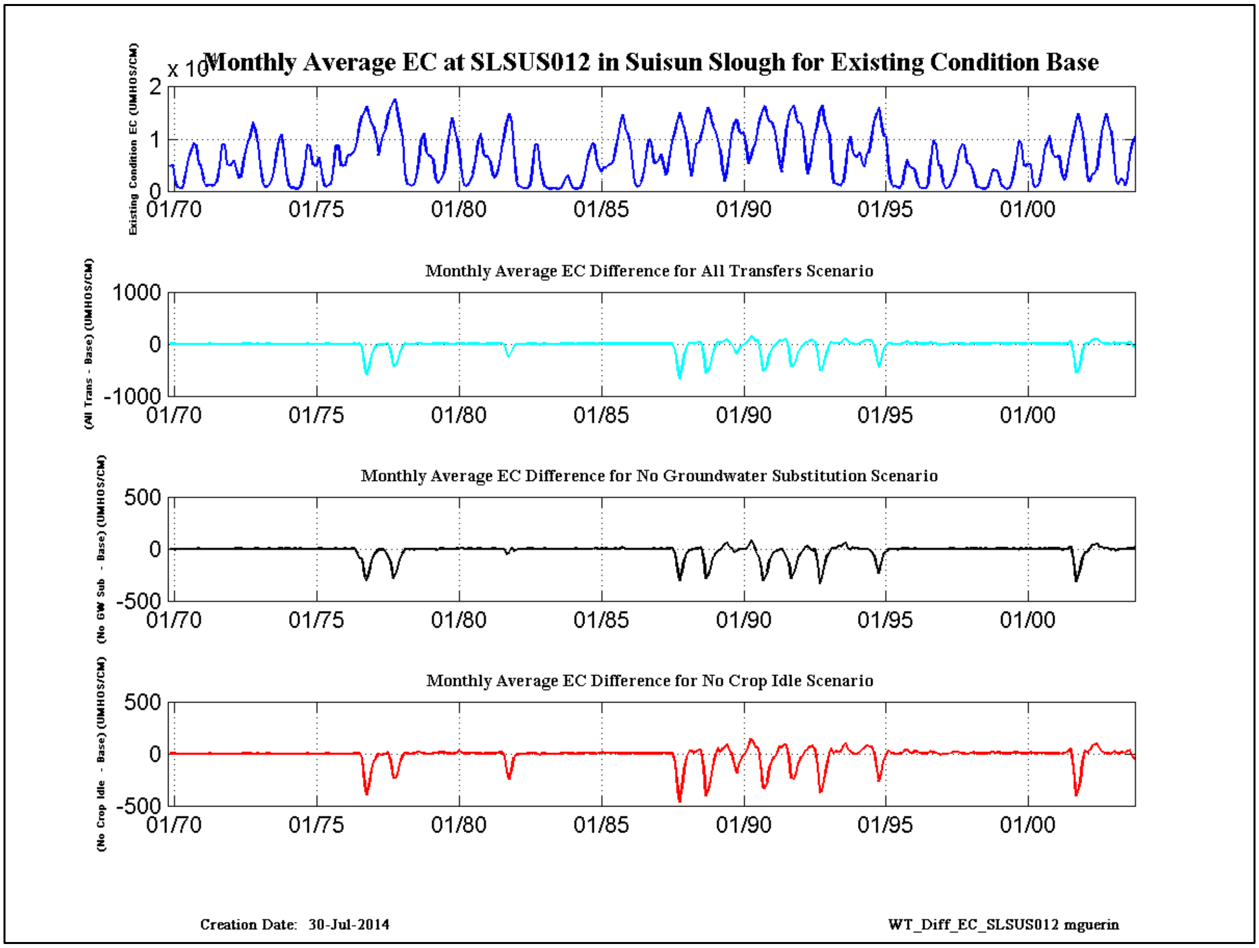
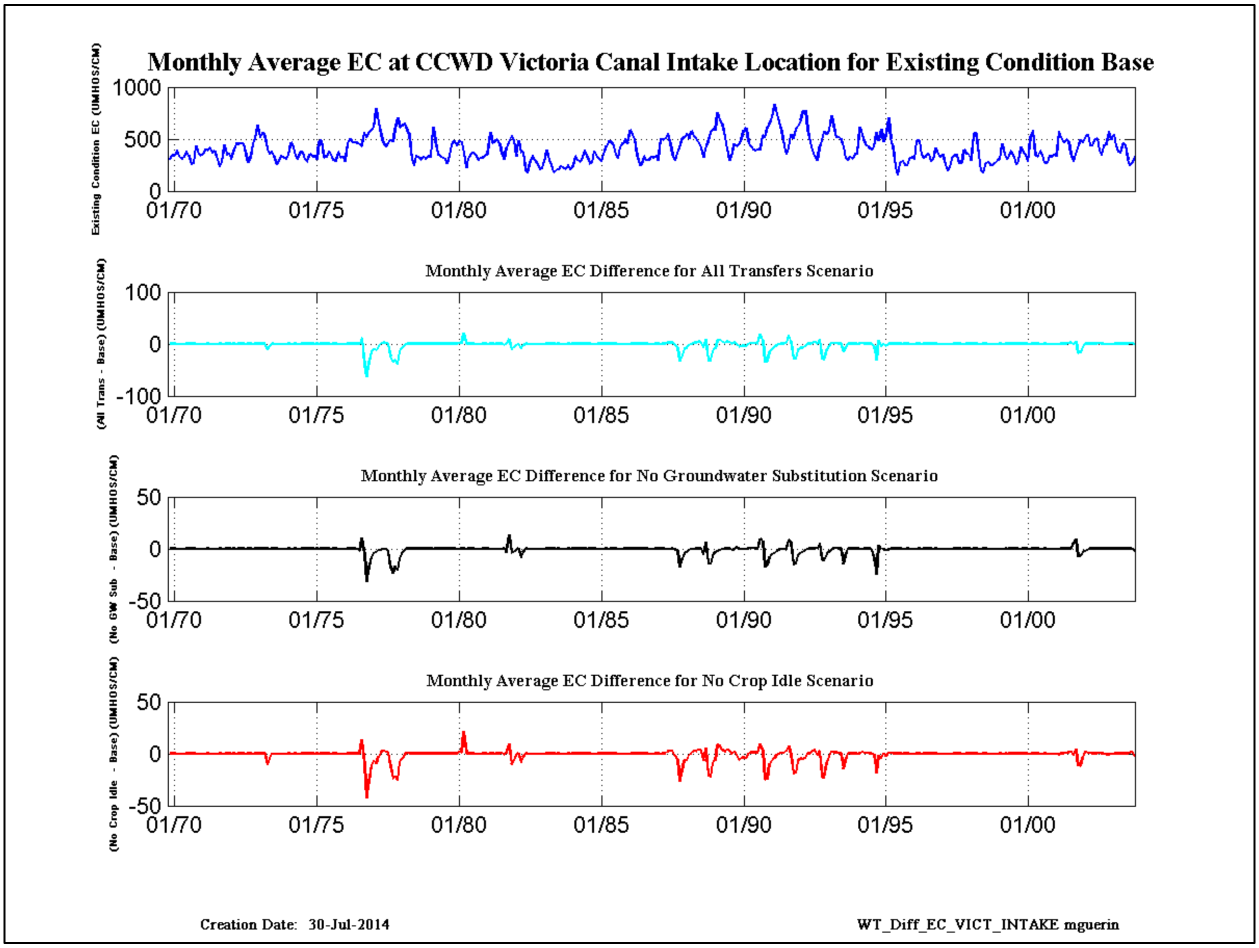


Figure E.3-22. Suisun Slough location SLMZU012EC for the Base condition and change from Base for the scenarios.

Table E.3-138. CCWD Intake location in Victoria Canal Base salinity (EC).

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	310.0	341.7	340.9	387.2	334.2	307.6	329.5	382.1	340.3	259.8	268.5	431.3
1971	356.2	337.5	354.3	399.1	392.9	414.5	366.3	381.8	309.3	238.1	280.2	443.7
1972	352.3	359.9	305.4	399.5	455.7	451.8	458.6	451.2	358.4	273.3	316.2	452.8
1973	506.7	630.9	516.9	562.1	531.6	401.7	351.5	378.3	337.2	259.4	294.7	335.2
1974	315.0	305.9	352.6	467.9	421.4	346.0	302.0	379.7	367.2	300.0	283.4	356.4
1975	333.1	334.9	300.3	471.9	486.3	322.4	327.9	383.6	352.0	298.1	286.6	377.6
1976	324.1	328.3	282.4	456.2	503.1	466.5	467.3	462.1	449.9	431.3	564.2	517.9
1977	570.4	587.8	611.3	791.3	650.8	541.2	466.5	428.2	460.1	485.1	475.4	593.2
1978	709.7	611.8	626.5	653.4	585.1	548.4	308.2	247.9	343.5	320.0	302.4	334.5
1979	308.9	332.8	331.9	610.3	487.9	353.5	339.7	317.9	310.0	261.5	350.0	449.1
1980	483.2	436.8	479.5	465.0	363.0	225.0	311.0	357.9	366.7	347.9	299.6	317.4
1981	321.2	336.0	351.7	562.5	462.1	473.5	494.8	459.5	359.8	309.1	413.3	467.2
1982	526.6	481.1	335.7	483.2	371.2	376.7	192.1	175.3	288.9	338.7	290.4	259.0
1983	214.4	224.5	287.3	397.6	297.3	248.0	181.6	200.1	207.4	236.9	215.4	210.6
1984	254.5	203.8	233.2	338.6	295.6	282.4	327.2	391.9	336.9	264.2	277.9	384.6
1985	330.1	309.6	280.6	354.5	431.5	472.9	474.4	436.5	355.6	314.6	420.1	456.1
1986	497.1	460.0	586.7	541.7	500.8	347.9	252.4	253.1	337.8	295.6	299.9	327.4
1987	321.3	335.3	293.4	501.7	491.4	509.5	550.7	456.0	357.7	295.9	360.8	419.9
1988	504.5	511.1	551.1	507.5	576.7	521.2	503.6	462.6	416.0	321.9	404.4	478.6
1989	567.4	591.1	585.5	759.4	680.9	644.8	528.2	403.9	296.6	333.2	452.4	432.5
1990	444.9	508.4	580.7	607.1	470.5	425.1	400.9	388.9	397.0	399.8	531.9	515.6
1991	610.7	640.2	717.0	836.2	735.0	667.9	577.2	437.5	356.6	412.3	540.4	506.6
1992	596.4	620.4	685.1	765.7	774.5	594.0	465.4	391.9	335.7	294.7	416.2	487.7
1993	573.9	544.9	580.7	720.2	621.1	519.1	516.2	503.7	420.6	319.5	296.5	331.0
1994	311.6	357.2	362.8	618.8	547.6	467.5	434.0	413.0	396.3	424.7	565.3	484.1
1995	594.7	476.2	523.0	709.5	501.0	437.6	231.2	157.7	267.3	286.9	251.9	245.4
1996	304.6	323.1	307.4	483.3	480.3	346.6	318.0	333.3	357.6	286.8	304.6	411.8
1997	353.1	324.3	352.9	256.0	199.9	232.6	315.3	343.2	343.0	269.6	270.6	395.4
1998	359.0	344.5	299.4	549.4	558.5	349.3	196.9	174.1	257.8	279.9	251.4	246.3
1999	269.7	292.0	306.3	453.3	354.9	303.0	344.4	385.7	329.4	250.5	291.8	422.2
2000	367.5	345.2	285.7	520.8	588.3	343.1	331.0	385.5	342.2	274.9	273.6	337.1
2001	326.9	351.3	340.0	574.4	513.2	466.2	494.7	476.2	362.9	288.3	350.9	410.7
2002	494.5	469.6	511.3	541.7	442.9	435.6	489.9	507.4	391.5	343.1	432.6	447.4
2003	572.2	493.4	541.8	438.0	376.8	367.1	458.0	441.2	305.1	241.0	270.1	339.6
Average	420.2	416.2	423.6	534.9	484.8	417.9	385.5	375.0	347.5	310.5	350.1	400.8
Critical	480.4	507.6	541.5	654.7	608.3	526.2	473.6	426.3	401.7	395.7	499.7	512.0
Dry	393.6	398.8	393.8	549.0	503.7	500.4	505.5	456.6	354.0	314.0	405.0	439.0
BN	330.6	346.3	318.7	504.9	471.8	402.6	399.2	384.5	334.2	267.4	333.1	450.9
AN	535.5	510.5	505.2	559.9	511.0	400.7	379.3	385.7	352.6	293.8	289.5	332.4
Wet	360.6	342.3	352.3	456.8	399.6	331.9	283.5	303.2	315.0	277.3	274.8	347.1



1
2 **Figure E.3-23. CCWD Intake location in Victoria Canal EC for the Base condition and**
3 **change from Base for the scenarios.**

Table E.3-139. Upper Cache Slough location SLCCH016 salinity (EC) difference All Transfers minus Base.

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1971	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1972	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1973	0.0	0.0	0.0	0.0	0.0	-0.1	-0.1	0.0	0.0	0.0	0.0	0.0
1974	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1975	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1976	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	-0.5	-1.9
1977	-1.9	-1.0	-0.3	-0.1	0.0	0.0	0.1	0.0	0.1	-0.6	-2.2	-1.4
1978	-2.1	-1.3	-0.5	0.0	-0.1	-0.1	-0.1	0.0	0.0	0.0	0.0	0.0
1979	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.0
1980	0.0	0.0	0.0	0.0	-0.1	-0.2	-0.1	0.0	0.0	0.0	0.0	0.0
1981	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	-0.3
1982	-0.1	0.0	-0.1	0.0	-0.1	-0.1	-0.1	0.0	0.0	0.0	0.0	0.0
1983	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1984	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1985	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1986	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1987	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	-1.0	-2.0
1988	-1.2	-0.4	-0.1	0.0	0.0	0.0	0.1	0.1	0.1	-0.3	-1.2	-1.9
1989	-1.9	-0.9	-0.2	-0.1	0.0	0.1	0.1	0.1	0.0	0.0	-0.1	-0.1
1990	-0.1	0.0	0.1	0.1	0.1	0.3	0.2	0.0	0.1	-0.2	-0.8	-1.0
1991	-1.2	-0.5	0.0	0.2	0.2	0.2	0.3	0.2	0.1	-0.1	-0.6	-0.9
1992	-1.1	-0.5	0.0	0.2	0.2	0.3	0.2	0.1	0.1	-0.2	-1.0	-1.0
1993	-0.8	-0.5	-0.1	0.0	0.0	-0.2	0.1	0.1	0.1	0.0	0.0	0.0
1994	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.0	0.0	0.1	-0.2	-0.7
1995	-0.4	-0.1	0.0	0.0	-0.3	-0.1	-0.1	0.0	0.0	0.0	0.0	0.0
1996	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1997	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1998	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	0.0	0.0	0.0	0.0	0.0
1999	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2001	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	-0.1	-0.7	-1.0
2002	-0.8	-0.3	-0.1	0.0	0.0	0.1	0.1	0.1	0.1	0.0	0.0	0.0
2003	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0
Average	-0.3	-0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.3	-0.4
Critical	-0.8	-0.3	0.0	0.1	0.1	0.1	0.1	0.1	0.1	-0.2	-0.9	-1.2
Dry	-0.5	-0.2	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.3	-0.6
BN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AN	-0.5	-0.3	-0.1	0.0	0.0	-0.1	0.0	0.0	0.0	0.0	0.0	0.0
Wet	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table E.3-140. Upper Cache Slough location SLCCH016 salinity (EC) percent difference of All Transfers from Base.

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1971	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1972	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1973	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1974	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1975	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1976	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.3	-1.0
1977	-1.0	-0.5	-0.2	-0.1	0.0	0.0	0.0	0.0	0.1	-0.3	-1.1	-0.7
1978	-1.1	-0.7	-0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1979	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1980	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1981	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	-0.2
1982	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1983	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1984	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1985	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1986	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1987	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	-0.5	-1.0
1988	-0.6	-0.2	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	-0.2	-0.6	-1.0
1989	-1.0	-0.4	-0.1	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.0	-0.1
1990	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.0	-0.1	-0.4	-0.5
1991	-0.6	-0.3	0.0	0.1	0.1	0.1	0.1	0.1	0.1	-0.1	-0.3	-0.5
1992	-0.6	-0.2	0.0	0.1	0.1	0.1	0.1	0.1	0.1	-0.1	-0.5	-0.5
1993	-0.4	-0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1994	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	-0.4
1995	-0.2	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1996	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1997	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1998	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1999	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2001	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	-0.4	-0.5
2002	-0.4	-0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2003	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Average	-0.2	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	-0.2
Critical	-0.4	-0.2	0.0	0.0	0.0	0.1	0.1	0.0	0.0	-0.1	-0.5	-0.7
Dry	-0.2	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.2	-0.3
BN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AN	-0.2	-0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Wet	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table E.3-141. Montezuma Slough location SLMZU011 salinity (EC) difference All Transfers minus Base.

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1971	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1972	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1973	0.0	0.0	0.0	0.0	0.0	0.3	0.9	-1.3	-0.3	-0.1	0.0	0.0
1974	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.2
1975	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1976	0.0	0.0	0.0	0.0	0.0	0.0	0.7	-0.8	122.0	-78.7	-548.8	-710.7
1977	-414.0	-156.6	-69.9	-15.5	-3.1	-7.5	-6.3	2.9	39.6	-172.3	-530.7	-474.6
1978	-307.4	-113.8	-5.6	11.5	0.9	0.5	0.1	2.4	11.6	15.9	5.7	1.5
1979	0.2	0.0	-0.8	-6.4	6.3	10.2	8.9	11.7	8.5	2.9	0.8	0.1
1980	1.3	16.1	22.0	0.4	-0.2	0.0	1.4	4.9	4.4	1.2	0.3	0.1
1981	-0.1	0.3	2.1	-0.4	-6.2	2.2	6.4	11.1	13.1	-36.1	-219.5	-312.2
1982	-127.2	20.8	4.0	-0.1	-0.1	-0.4	0.0	0.5	3.0	4.7	1.8	0.0
1983	-32.6	1.1	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.4	3.3	6.9
1984	1.2	1.9	0.0	0.0	0.2	0.4	1.8	8.6	6.8	2.3	0.7	0.1
1985	-0.3	1.0	9.7	-0.1	1.6	6.3	4.6	7.2	7.2	2.9	1.6	1.1
1986	1.2	1.0	2.3	6.2	0.3	0.0	0.4	1.7	1.8	0.6	0.2	0.1
1987	0.0	0.1	0.5	3.2	5.3	3.0	2.5	2.7	16.5	-141.1	-577.4	-792.1
1988	-392.5	-145.2	9.6	17.1	16.4	3.8	26.8	43.1	39.8	-239.9	-685.8	-591.5
1989	-347.2	-116.5	37.3	66.1	10.4	46.9	46.9	75.5	26.8	-8.9	-136.7	-220.3
1990	-71.9	-21.9	-6.2	17.1	47.5	140.4	112.0	56.3	68.8	-174.0	-592.0	-580.5
1991	-370.3	-138.3	-62.0	-20.4	26.6	97.1	32.0	71.9	100.2	-152.8	-541.5	-473.7
1992	-290.4	-109.7	-47.6	-15.6	16.1	40.3	66.4	75.5	54.8	-208.1	-539.8	-565.0
1993	-317.5	-109.0	60.0	33.4	5.2	12.4	9.8	16.6	57.3	91.2	35.6	12.8
1994	0.2	0.5	-0.7	29.5	9.9	51.0	77.5	67.1	69.3	-30.4	-410.6	-685.7
1995	-255.5	-76.4	9.5	17.7	1.8	0.0	-0.7	-0.2	1.6	7.9	32.1	39.8
1996	-2.8	0.2	19.7	14.9	0.4	0.0	0.3	0.4	8.8	28.0	17.1	7.4
1997	-10.2	-19.4	-0.2	-0.1	-0.2	3.3	11.3	16.9	19.1	12.9	3.5	5.0
1998	-6.7	-0.5	5.5	8.6	-0.4	-0.4	0.0	0.1	0.1	1.1	9.7	20.2
1999	-1.9	10.8	5.4	1.3	0.1	0.1	0.8	3.7	10.1	11.8	4.3	1.4
2000	0.1	0.0	-0.2	9.9	3.1	0.2	1.8	5.6	6.5	2.9	1.1	0.3
2001	0.0	-0.1	1.3	2.7	-10.7	3.0	6.4	28.7	54.7	-227.8	-676.0	-630.5
2002	-344.9	-21.0	36.5	4.3	20.5	73.4	75.6	70.5	45.6	18.8	6.7	4.5
2003	1.5	-1.3	13.9	3.2	2.5	11.5	11.6	3.7	19.9	32.0	-43.0	-63.8
Average	-96.7	-28.7	1.4	5.5	4.5	14.6	14.7	17.3	24.0	-36.2	-158.2	-176.5
Critical	-219.8	-81.6	-25.3	1.7	16.2	46.4	44.2	45.2	70.6	-150.9	-549.9	-583.1
Dry	-115.4	-22.7	14.6	12.6	3.5	22.4	23.7	32.6	27.3	-65.4	-266.9	-324.9
BN	0.1	0.0	-0.4	-3.2	3.2	5.1	4.4	5.9	4.3	1.5	0.4	0.0
AN	-103.7	-34.7	15.0	9.7	1.9	4.2	4.3	5.3	16.6	23.9	0.0	-8.2
Wet	-33.4	-4.7	3.6	3.7	0.2	0.2	1.1	2.4	3.9	5.4	5.6	6.2

Table E.3-142. Montezuma Slough location SLMZU011 salinity (EC) percent difference of All Transfers from Base.

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1971	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1972	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1973	0.0	0.0	0.0	0.0	0.0	0.1	0.1	-0.1	0.0	0.0	0.0	0.0
1974	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1975	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1976	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	-0.6	-4.0	-4.6
1977	-3.8	-1.6	-0.7	-0.3	-0.1	-0.1	-0.1	0.0	0.3	-1.2	-3.4	-2.9
1978	-2.9	-1.2	-0.1	1.2	0.3	0.2	0.0	0.4	0.6	0.3	0.1	0.0
1979	0.0	0.0	0.0	-0.2	0.7	1.6	0.8	0.7	0.3	0.0	0.0	0.0
1980	0.0	0.3	0.6	0.1	-0.1	0.0	0.2	0.3	0.2	0.0	0.0	0.0
1981	0.0	0.0	0.1	0.0	-0.5	0.2	0.3	0.3	0.2	-0.4	-1.9	-2.2
1982	-1.3	0.7	1.0	0.0	0.0	-0.2	0.0	0.2	0.4	0.2	0.0	0.0
1983	-1.4	0.1	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.3	0.4
1984	0.1	0.3	0.0	0.0	0.1	0.1	0.2	0.4	0.1	0.0	0.0	0.0
1985	0.0	0.0	0.5	0.0	0.1	0.2	0.1	0.2	0.1	0.0	0.0	0.0
1986	0.0	0.0	0.0	0.3	0.1	0.0	0.1	0.2	0.1	0.0	0.0	0.0
1987	0.0	0.0	0.0	0.1	0.2	0.2	0.1	0.0	0.2	-1.4	-4.6	-5.5
1988	-4.0	-1.6	0.2	1.2	1.2	0.1	0.3	0.5	0.4	-2.2	-5.1	-3.9
1989	-3.1	-1.3	0.5	1.2	0.3	2.7	5.4	2.9	0.4	-0.1	-1.2	-1.8
1990	-0.9	-0.3	-0.1	0.4	2.5	3.0	1.7	0.7	0.7	-1.3	-4.1	-3.8
1991	-3.4	-1.3	-0.6	-0.3	0.6	3.5	1.5	1.2	1.0	-1.2	-3.7	-3.1
1992	-2.7	-1.1	-0.5	-0.2	0.7	2.6	1.9	1.1	0.6	-1.9	-3.8	-3.7
1993	-3.3	-1.2	0.9	2.3	1.5	3.0	2.6	3.6	6.6	3.0	0.5	0.1
1994	0.0	0.0	0.0	0.7	0.5	1.6	1.4	1.1	0.8	-0.2	-3.0	-4.6
1995	-3.1	-1.0	0.1	2.1	0.5	0.0	-0.3	-0.1	0.6	1.1	1.1	0.8
1996	-0.1	0.0	1.1	1.9	0.2	0.0	0.1	0.2	0.7	0.5	0.2	0.1
1997	-0.4	-0.9	0.0	-0.1	-0.1	0.6	0.8	0.7	0.4	0.2	0.0	0.1
1998	-0.2	0.0	0.2	0.7	-0.2	-0.2	0.0	0.1	0.0	0.3	0.5	0.7
1999	-0.1	0.6	0.6	0.3	0.1	0.0	0.2	0.4	0.4	0.2	0.1	0.0
2000	0.0	0.0	0.0	0.4	0.8	0.1	0.3	0.4	0.2	0.0	0.0	0.0
2001	0.0	0.0	0.0	0.1	-0.7	0.3	0.3	0.6	0.8	-2.4	-5.6	-4.5
2002	-3.7	-0.3	1.4	0.8	2.4	3.6	3.3	2.3	0.8	0.2	0.1	0.0
2003	0.0	0.0	0.5	0.8	0.5	0.9	1.0	0.8	1.0	0.6	-0.5	-0.7
Average	-1.0	-0.3	0.2	0.4	0.3	0.7	0.7	0.6	0.6	-0.2	-1.1	-1.2
Critical	-2.1	-0.8	-0.2	0.2	0.8	1.5	1.0	0.7	0.7	-1.2	-3.9	-3.8
Dry	-1.1	-0.2	0.4	0.4	0.3	1.2	1.6	1.1	0.4	-0.7	-2.2	-2.3
BN	0.0	0.0	0.0	-0.1	0.3	0.8	0.4	0.4	0.1	0.0	0.0	0.0
AN	-1.0	-0.4	0.3	0.8	0.5	0.7	0.7	0.9	1.4	0.7	0.0	-0.1
Wet	-0.5	0.0	0.2	0.4	0.1	0.0	0.1	0.2	0.2	0.2	0.2	0.2

Table E.3-143. Montezuma Slough location SLMZU025 salinity (EC) difference All Transfers minus Base.

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	-0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1971	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1972	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1973	0.0	0.0	0.0	0.0	0.0	-0.5	-1.5	-1.1	-0.2	-0.1	0.0	0.0
1974	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	-0.2
1975	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1976	0.0	0.0	0.0	0.0	0.0	0.0	0.7	-1.2	56.2	-216.8	-744.1	-788.5
1977	-375.3	-142.8	-64.7	-14.7	-10.0	-5.1	-3.3	9.5	46.4	-339.5	-666.4	-517.3
1978	-282.7	-104.4	0.6	3.7	0.6	0.3	0.2	0.8	6.2	9.6	4.1	1.1
1979	0.2	0.1	-0.7	5.8	2.1	1.4	3.0	4.2	4.3	1.8	0.6	0.1
1980	1.5	17.9	27.1	1.8	-0.5	0.1	0.4	1.7	1.9	0.6	0.2	0.1
1981	-0.1	0.5	2.0	2.9	-1.2	0.9	3.1	8.0	10.1	-53.0	-319.0	-335.7
1982	-110.2	-14.8	0.0	0.1	-0.4	-0.3	0.0	0.1	0.9	2.5	1.3	0.0
1983	2.8	1.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	1.6	1.8
1984	4.2	0.5	0.0	0.0	0.0	0.1	0.7	4.0	4.0	1.3	0.4	0.0
1985	-0.3	5.1	4.9	4.8	4.5	3.0	2.5	4.7	5.1	2.3	1.6	1.5
1986	1.2	1.1	7.4	3.1	0.0	0.0	0.2	0.6	0.9	0.3	0.1	0.0
1987	0.0	0.7	0.3	3.6	2.5	0.9	1.3	3.7	21.6	-235.6	-762.9	-842.9
1988	-349.7	-135.3	26.3	12.6	4.9	3.1	30.1	33.4	41.9	-426.6	-775.2	-625.0
1989	-320.0	-102.3	55.0	62.5	9.1	15.0	16.6	35.1	17.9	-21.4	-204.9	-215.4
1990	-59.8	-16.3	-6.7	21.2	58.8	104.4	69.3	46.7	73.5	-583.5	-768.8	-620.8
1991	-339.5	-123.9	-58.8	-19.8	36.5	30.1	24.9	67.0	104.8	-353.4	-652.2	-503.1
1992	-267.1	-100.2	-44.1	-15.5	9.7	16.2	44.3	56.4	55.6	-444.9	-785.1	-600.9
1993	-282.4	-100.4	78.3	16.0	1.3	3.1	1.2	3.1	18.4	46.6	22.8	6.8
1994	0.6	0.7	-0.7	41.4	12.0	34.8	52.0	48.8	64.2	-83.4	-590.2	-672.2
1995	-221.9	-74.8	18.4	5.5	0.5	0.0	0.1	0.0	0.2	2.2	22.1	20.9
1996	-0.5	0.0	14.4	2.2	0.0	0.0	0.0	0.1	5.4	16.3	10.7	2.8
1997	-1.7	-0.6	0.2	0.0	0.0	0.9	3.7	8.4	11.1	6.6	1.8	2.0
1998	-0.1	0.1	9.9	3.1	0.0	0.0	0.0	0.0	0.0	0.2	5.4	9.0
1999	2.9	5.4	1.2	0.1	0.0	0.0	0.1	1.3	6.2	7.0	2.7	0.5
2000	0.1	0.0	-0.1	9.8	0.3	0.0	0.4	2.0	3.8	1.8	0.6	0.1
2001	0.0	-0.1	1.7	7.2	2.0	0.8	3.1	25.7	52.9	-390.6	-729.9	-654.2
2002	-308.2	-1.0	21.3	1.1	11.9	29.0	34.7	37.4	30.4	13.1	6.6	5.3
2003	1.1	-1.1	7.0	0.3	0.5	3.7	2.7	0.5	21.3	1.6	-45.6	-49.5
Average	-85.4	-26.0	2.9	4.7	4.3	7.1	8.5	11.8	19.6	-89.3	-204.8	-187.5
Critical	-198.7	-74.0	-21.2	3.6	16.0	26.2	31.1	37.2	63.2	-349.7	-711.7	-618.3
Dry	-104.8	-16.2	14.2	13.7	4.8	8.3	10.2	19.1	23.0	-114.2	-334.8	-340.2
BN	0.1	0.0	-0.4	2.9	1.0	0.7	1.5	2.1	2.1	0.9	0.3	0.0
AN	-93.7	-31.3	18.8	5.3	0.4	1.1	0.6	1.2	8.6	10.0	-3.0	-6.9
Wet	-24.9	-6.3	4.0	1.1	0.0	0.1	0.4	1.1	2.2	2.8	3.5	2.8

Table E.3-144. Montezuma Slough location SLMZU025 salinity (EC) percent difference of All Transfers from Base.

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1971	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1972	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1973	0.0	0.0	0.0	0.0	0.0	-0.3	-0.5	-0.2	0.0	0.0	0.0	0.0
1974	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1975	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1976	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.6	-2.3	-7.4	-6.6
1977	-3.6	-1.5	-0.7	-0.3	-0.3	-0.1	-0.1	0.1	0.5	-3.0	-5.5	-4.0
1978	-2.9	-1.1	0.0	1.0	0.3	0.1	0.1	0.3	0.8	0.4	0.1	0.0
1979	0.0	0.0	0.0	0.4	0.7	0.5	0.7	0.8	0.3	0.0	0.0	0.0
1980	0.0	0.3	0.9	0.6	-0.2	0.0	0.2	0.3	0.2	0.0	0.0	0.0
1981	0.0	0.0	0.1	0.2	-0.3	0.2	0.4	0.4	0.2	-0.9	-3.9	-3.3
1982	-1.2	-1.0	0.0	0.0	-0.2	-0.2	0.0	0.0	0.3	0.1	0.0	0.0
1983	0.4	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.3	0.3
1984	0.5	0.2	0.0	0.0	0.0	0.0	0.2	0.4	0.1	0.0	0.0	0.0
1985	0.0	0.6	0.6	0.3	0.4	0.2	0.2	0.2	0.1	0.0	0.0	0.0
1986	0.0	0.0	0.2	0.4	0.0	0.0	0.1	0.1	0.1	0.0	0.0	0.0
1987	0.0	0.0	0.0	0.1	0.2	0.2	0.1	0.1	0.4	-3.4	-8.3	-7.7
1988	-3.8	-1.5	0.7	2.4	0.8	0.1	0.7	0.7	0.8	-5.5	-7.7	-5.3
1989	-3.0	-1.2	0.7	1.3	0.2	2.5	5.0	3.0	0.5	-0.3	-2.6	-2.6
1990	-0.8	-0.2	-0.1	0.8	5.0	4.6	2.0	1.0	1.0	-6.0	-7.1	-5.2
1991	-3.3	-1.2	-0.6	-0.3	0.9	3.1	2.6	1.8	1.4	-3.6	-6.1	-4.2
1992	-2.6	-1.0	-0.4	-0.2	1.0	2.8	2.8	1.3	0.9	-5.6	-7.3	-5.0
1993	-3.1	-1.1	1.2	3.0	0.6	1.4	0.6	1.4	5.7	2.9	0.4	0.1
1994	0.0	0.0	0.0	1.1	1.3	2.4	2.0	1.5	1.1	-1.0	-6.1	-6.1
1995	-3.0	-1.0	0.3	1.5	0.2	0.0	0.0	0.0	0.1	0.7	1.5	1.0
1996	0.0	0.0	1.7	0.9	0.0	0.0	0.0	0.0	0.9	0.6	0.2	0.1
1997	-0.1	0.0	0.1	0.0	0.0	0.4	0.8	0.9	0.4	0.2	0.0	0.1
1998	0.0	0.0	0.7	0.7	0.0	0.0	0.0	0.0	0.0	0.1	0.7	0.9
1999	0.2	0.8	0.4	0.1	0.0	0.0	0.1	0.4	0.5	0.3	0.0	0.0
2000	0.0	0.0	0.0	0.8	0.1	0.0	0.2	0.4	0.2	0.1	0.0	0.0
2001	0.0	0.0	0.0	0.3	0.5	0.2	0.4	1.0	1.3	-6.1	-8.5	-6.2
2002	-3.5	0.0	1.7	0.5	3.3	4.2	4.5	2.9	0.8	0.2	0.1	0.1
2003	0.0	0.0	0.6	0.2	0.2	0.9	0.8	0.2	1.7	0.1	-0.9	-1.1
Average	-0.9	-0.2	0.2	0.5	0.4	0.7	0.7	0.6	0.6	-0.9	-2.0	-1.6
Critical	-2.0	-0.8	-0.2	0.5	1.2	1.8	1.4	0.9	0.9	-3.9	-6.7	-5.2
Dry	-1.1	-0.1	0.5	0.4	0.7	1.3	1.8	1.3	0.5	-1.7	-3.9	-3.3
BN	0.0	0.0	0.0	0.2	0.3	0.2	0.4	0.4	0.1	0.0	0.0	0.0
AN	-1.0	-0.3	0.5	0.9	0.2	0.4	0.2	0.4	1.4	0.6	-0.1	-0.1
Wet	-0.3	0.0	0.3	0.3	0.0	0.0	0.1	0.1	0.2	0.2	0.2	0.2

Table E.3-145. Suisun Slough location SLSUS012 salinity (EC) difference All Transfers minus Base.

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1971	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1972	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1973	0.0	0.0	0.0	0.0	0.0	1.6	2.3	-0.9	-0.3	-0.1	0.0	0.0
1974	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.2
1975	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1976	0.0	0.0	0.0	0.0	0.0	0.0	0.7	-0.7	2.7	-68.5	-424.4	-595.7
1977	-449.7	-219.4	-109.7	-49.2	-12.6	-16.9	-11.5	-2.3	17.6	-130.8	-422.7	-411.4
1978	-328.3	-162.2	-50.8	2.4	-2.7	-6.4	-5.9	-2.2	8.4	14.0	3.5	-1.2
1979	-2.6	-2.5	-3.3	0.1	8.6	7.4	9.3	12.8	9.4	2.4	0.0	-0.9
1980	-0.3	9.2	25.0	5.5	1.4	-0.1	1.2	5.4	5.0	1.3	0.2	-0.2
1981	-0.4	-0.2	1.6	3.8	1.9	3.2	7.2	11.4	12.9	-29.6	-170.9	-256.9
1982	-158.5	-38.0	-9.5	-7.0	-3.1	-2.2	-1.7	1.3	2.7	5.1	0.8	-0.7
1983	-12.5	3.1	0.8	-0.7	-0.5	-0.5	-1.2	-0.6	-0.5	0.1	3.3	7.2
1984	4.2	2.7	0.2	-0.1	0.1	0.5	2.1	6.3	7.0	2.8	1.0	0.3
1985	-0.2	5.7	14.6	8.0	5.5	6.4	5.0	7.4	7.3	2.8	1.8	1.2
1986	1.1	0.9	1.6	9.4	2.5	0.7	0.9	2.3	2.3	0.9	0.5	0.3
1987	0.2	0.1	0.3	2.5	6.7	4.5	3.1	2.3	12.1	-109.8	-464.8	-667.9
1988	-453.1	-212.6	-51.1	19.0	19.3	1.5	19.5	37.3	30.3	-181.2	-554.0	-525.9
1989	-382.7	-182.0	-37.0	41.3	8.3	39.4	54.7	85.4	29.0	-4.7	-111.1	-187.5
1990	-102.3	-34.9	-17.4	10.9	59.3	143.8	115.9	58.5	61.1	-161.8	-511.6	-503.3
1991	-396.3	-185.6	-94.7	-43.4	0.4	63.8	53.1	79.2	90.2	-104.1	-423.6	-412.7
1992	-317.1	-157.0	-74.8	-35.2	23.1	35.6	61.8	71.3	47.3	-177.6	-506.2	-500.3
1993	-352.2	-165.6	-14.6	43.4	4.1	17.5	13.1	18.0	68.3	102.9	40.5	14.7
1994	1.7	-2.0	-1.9	16.5	36.6	59.1	77.4	68.7	69.2	-16.7	-292.7	-447.1
1995	-316.7	-110.1	-31.8	19.5	2.3	-0.6	-2.8	-3.2	-0.5	8.6	31.5	40.9
1996	6.4	0.6	22.3	21.1	4.4	0.6	0.1	0.4	8.6	23.3	10.9	5.7
1997	-2.8	-10.4	-1.9	-2.3	-3.7	4.4	12.6	17.8	18.2	9.3	3.4	2.9
1998	-2.0	-0.4	5.8	13.0	1.5	0.6	0.5	0.4	0.4	1.6	9.2	19.0
1999	4.0	13.6	13.2	4.0	1.3	0.6	1.5	5.0	13.3	11.8	6.9	1.2
2000	0.7	0.5	0.0	14.8	10.0	2.2	2.8	7.3	7.7	4.1	1.6	0.7
2001	0.4	0.2	0.5	4.7	-2.7	4.0	7.5	28.3	53.3	-173.3	-542.8	-550.0
2002	-397.8	-134.2	15.9	2.2	27.1	76.9	84.8	90.1	50.3	20.3	6.9	3.6
2003	1.3	-1.6	21.7	7.8	3.1	11.4	14.2	6.2	24.4	34.7	-34.1	-58.9
Average	-107.5	-46.5	-11.0	3.3	5.9	13.5	15.5	18.0	19.3	-26.8	-127.6	-147.7
Critical	-245.3	-115.9	-49.9	-11.6	18.0	41.0	45.2	44.5	45.5	-120.1	-447.9	-485.2
Dry	-130.1	-51.7	-0.7	10.4	7.8	22.4	27.0	37.5	27.5	-49.1	-213.5	-276.2
BN	-1.3	-1.3	-1.7	0.1	4.3	3.7	4.6	6.4	4.7	1.2	0.0	-0.5
AN	-113.1	-53.3	-3.1	12.3	2.7	4.4	4.6	5.6	18.9	26.1	1.9	-7.5
Wet	-36.7	-10.6	0.0	4.4	0.4	0.3	0.9	2.3	4.0	4.9	5.2	5.9

Table E.3-146. Suisun Slough location SLSUS012 salinity (EC) percent difference of All Transfers from Base.

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1971	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1972	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1973	0.0	0.0	0.0	0.0	0.0	0.2	0.2	0.0	0.0	0.0	0.0	0.0
1974	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1975	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1976	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.5	-2.8	-3.7
1977	-3.2	-1.7	-0.9	-0.5	-0.2	-0.2	-0.1	0.0	0.1	-0.8	-2.5	-2.3
1978	-2.2	-1.3	-0.5	0.1	-0.2	-0.6	-0.6	-0.2	0.3	0.2	0.0	0.0
1979	0.0	0.0	0.0	0.0	0.3	0.5	0.5	0.5	0.2	0.0	0.0	0.0
1980	0.0	0.1	0.3	0.2	0.1	0.0	0.1	0.2	0.1	0.0	0.0	0.0
1981	0.0	0.0	0.0	0.1	0.1	0.1	0.2	0.2	0.2	-0.3	-1.3	-1.7
1982	-1.2	-0.5	-0.4	-0.7	-0.4	-0.4	-0.3	0.2	0.2	0.1	0.0	0.0
1983	-0.3	0.1	0.1	-0.1	-0.1	-0.1	-0.2	-0.1	-0.1	0.0	0.2	0.3
1984	0.1	0.2	0.0	0.0	0.0	0.1	0.2	0.2	0.1	0.0	0.0	0.0
1985	0.0	0.1	0.4	0.2	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0
1986	0.0	0.0	0.0	0.2	0.2	0.1	0.1	0.1	0.1	0.0	0.0	0.0
1987	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.0	0.1	-1.0	-3.5	-4.4
1988	-3.5	-1.8	-0.5	0.4	0.6	0.0	0.2	0.4	0.3	-1.5	-3.8	-3.3
1989	-2.7	-1.4	-0.3	0.4	0.1	1.0	2.8	2.3	0.4	0.0	-0.9	-1.4
1990	-0.9	-0.3	-0.2	0.1	1.1	2.2	1.4	0.6	0.5	-1.1	-3.3	-3.1
1991	-2.8	-1.4	-0.7	-0.4	0.0	1.2	1.4	1.1	0.8	-0.7	-2.7	-2.5
1992	-2.2	-1.2	-0.6	-0.3	0.4	1.1	1.3	0.9	0.4	-1.4	-3.4	-3.0
1993	-2.6	-1.4	-0.1	1.0	0.3	1.3	1.1	1.7	4.2	2.6	0.5	0.1
1994	0.0	0.0	0.0	0.2	0.7	1.2	1.1	0.9	0.7	-0.1	-2.0	-2.8
1995	-2.5	-1.0	-0.3	0.5	0.1	-0.1	-0.3	-0.5	-0.1	0.7	0.8	0.7
1996	0.1	0.0	0.5	1.0	0.6	0.1	0.0	0.1	0.5	0.4	0.1	0.1
1997	-0.1	-0.2	-0.1	-0.4	-0.6	0.4	0.6	0.6	0.3	0.1	0.0	0.0
1998	0.0	0.0	0.1	0.4	0.2	0.1	0.1	0.1	0.1	0.2	0.4	0.5
1999	0.1	0.4	0.6	0.4	0.2	0.2	0.3	0.4	0.4	0.2	0.1	0.0
2000	0.0	0.0	0.0	0.3	0.7	0.3	0.3	0.4	0.2	0.1	0.0	0.0
2001	0.0	0.0	0.0	0.1	-0.1	0.2	0.3	0.5	0.6	-1.6	-4.2	-3.7
2002	-3.1	-1.2	0.2	0.1	1.5	2.4	2.5	2.2	0.7	0.2	0.1	0.0
2003	0.0	0.0	0.3	0.4	0.2	0.5	0.7	0.5	0.9	0.5	-0.4	-0.6
Average	-0.8	-0.4	-0.1	0.1	0.2	0.4	0.4	0.4	0.4	-0.1	-0.8	-0.9
Critical	-1.8	-0.9	-0.4	-0.1	0.4	0.8	0.8	0.5	0.4	-0.9	-2.9	-3.0
Dry	-1.0	-0.4	0.1	0.1	0.3	0.7	1.0	0.9	0.4	-0.4	-1.6	-1.9
BN	0.0	0.0	0.0	0.0	0.2	0.2	0.2	0.2	0.1	0.0	0.0	0.0
AN	-0.8	-0.4	0.0	0.3	0.2	0.3	0.3	0.4	1.0	0.6	0.0	-0.1
Wet	-0.3	-0.1	0.0	0.1	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.1

Table E.3-147. CCWD Intake location in Victoria Canal salinity (EC) difference All Transfers minus Base.

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	0.1	0.1	0.0	-0.1	-0.1	-0.1	0.0	0.0	0.0	0.0	0.0	0.0
1971	0.0	-0.1	0.0	0.0	0.0	-0.1	-0.1	0.0	0.0	0.0	0.0	0.0
1972	0.0	0.0	-0.1	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.0
1973	0.0	0.1	0.0	0.0	0.2	-10.6	-4.4	0.0	-0.4	0.0	0.0	-0.1
1974	-0.2	0.0	0.1	0.0	-0.1	0.1	-0.2	0.0	0.1	0.1	0.0	0.1
1975	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.0	-0.1	0.0	0.0	0.0
1976	0.0	-0.1	-0.1	0.0	0.0	0.0	0.0	0.2	0.2	11.9	-40.5	-63.2
1977	-34.5	-14.5	-9.7	-11.5	-3.7	1.0	2.8	1.7	1.2	-23.6	-35.1	-31.4
1978	-38.5	-13.8	-7.4	-1.6	0.7	0.4	0.0	0.3	0.2	0.1	0.1	0.1
1979	0.1	0.1	0.0	0.1	0.3	0.1	0.3	0.2	0.1	0.0	0.0	0.0
1980	0.0	0.1	2.0	1.0	21.8	0.4	0.2	0.3	0.1	-0.1	-0.1	0.0
1981	0.1	0.2	-0.1	0.0	0.1	0.0	0.2	0.5	0.9	-1.3	0.4	9.6
1982	-10.1	-6.7	-1.2	0.4	-8.0	-3.4	0.4	-0.4	-0.3	-0.2	0.0	-0.1
1983	-0.2	-0.1	-0.3	0.0	0.5	0.3	0.1	-0.3	0.2	-0.1	-0.2	-0.1
1984	0.1	-0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.1	0.0	0.0
1985	0.0	0.0	0.1	0.2	0.2	0.2	0.2	0.2	0.2	-0.1	-0.2	-0.3
1986	0.0	0.0	-0.2	0.4	0.1	0.3	0.1	0.0	0.2	0.1	0.0	-0.1
1987	0.0	0.2	0.1	-0.2	0.1	0.0	2.5	2.9	2.5	-2.2	-6.7	-32.9
1988	-21.0	-8.7	-7.8	-1.3	0.2	2.6	2.4	4.1	3.0	-7.5	8.9	-31.2
1989	-31.5	-13.0	-8.2	6.4	7.2	3.5	1.5	4.2	3.0	-0.4	2.5	-0.9
1990	-5.9	-4.5	-3.9	-4.2	-0.3	1.2	1.4	1.1	0.8	18.6	7.2	-34.1
1991	-33.3	-14.4	-9.9	-6.5	-2.3	-0.5	0.6	0.6	2.9	16.1	5.1	-28.9
1992	-27.5	-11.3	-7.7	-7.1	-4.7	0.1	0.5	2.9	3.3	0.6	8.5	-28.7
1993	-30.3	-11.1	-4.4	1.6	1.3	1.0	0.7	0.7	-14.5	-6.9	0.6	0.3
1994	0.0	0.0	0.0	0.4	1.5	0.8	0.6	0.5	0.4	-4.8	-30.5	6.0
1995	-4.9	-0.4	-4.1	0.0	0.7	0.3	0.2	0.1	0.2	-0.1	0.0	0.1
1996	-0.1	-0.1	0.0	0.1	0.2	-0.1	0.3	0.0	0.1	0.1	0.2	0.1
1997	0.0	-0.1	-0.1	-0.4	-0.2	0.0	0.0	0.3	0.2	0.1	-0.1	-0.3
1998	0.3	0.4	0.2	0.4	0.3	-0.1	0.0	0.4	0.2	-0.1	-0.2	0.0
1999	-0.1	0.0	0.1	-0.1	0.0	0.0	0.4	0.3	0.2	0.1	0.1	0.1
2000	0.0	0.0	-0.1	-0.3	0.1	0.3	0.3	-0.1	-0.1	0.1	0.0	0.0
2001	0.0	-0.1	-0.1	-0.6	0.1	0.1	0.9	1.0	2.1	-0.9	4.3	-17.7
2002	-16.5	-5.8	0.8	0.7	0.6	0.3	0.2	0.1	1.2	0.1	-0.1	-0.8
2003	-0.9	-0.1	-0.1	0.5	0.1	0.1	0.2	0.2	0.1	1.1	1.5	-2.6
Average	-7.5	-3.1	-1.8	-0.6	0.5	0.0	0.4	0.7	0.3	0.0	-2.2	-7.6
Critical	-17.5	-7.6	-5.6	-4.3	-1.3	0.7	1.2	1.6	1.7	1.6	-10.9	-30.2
Dry	-8.0	-3.1	-1.2	1.1	1.4	0.7	0.9	1.5	1.7	-0.8	0.0	-7.2
BN	0.1	0.1	0.0	0.0	0.1	0.1	0.2	0.2	0.0	0.0	0.0	0.0
AN	-11.6	-4.2	-1.7	0.2	4.0	-1.4	-0.5	0.2	-2.4	-0.9	0.3	-0.4
Wet	-1.2	-0.6	-0.4	0.1	-0.5	-0.2	0.1	0.0	0.1	0.0	0.0	0.0

Table E.3-148. CCWD Intake location in Victoria Canal salinity (EC) percent difference of All Transfers from Base.

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1971	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1972	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1973	0.0	0.0	0.0	0.0	0.0	-2.6	-1.3	0.0	-0.1	0.0	0.0	0.0
1974	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	0.0	0.0	0.0	0.0
1975	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1976	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.8	-7.2	-12.2
1977	-6.0	-2.5	-1.6	-1.5	-0.6	0.2	0.6	0.4	0.3	-4.9	-7.4	-5.3
1978	-5.4	-2.3	-1.2	-0.2	0.1	0.1	0.0	0.1	0.1	0.0	0.0	0.0
1979	0.0	0.0	0.0	0.0	0.1	0.0	0.1	0.1	0.0	0.0	0.0	0.0
1980	0.0	0.0	0.4	0.2	6.0	0.2	0.1	0.1	0.0	0.0	0.0	0.0
1981	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.2	-0.4	0.1	2.1
1982	-1.9	-1.4	-0.4	0.1	-2.2	-0.9	0.2	-0.2	-0.1	-0.1	0.0	0.0
1983	-0.1	0.0	-0.1	0.0	0.2	0.1	0.1	-0.2	0.1	0.0	-0.1	-0.1
1984	0.1	-0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1985	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	-0.1
1986	0.0	0.0	0.0	0.1	0.0	0.1	0.0	0.0	0.1	0.0	0.0	0.0
1987	0.0	0.1	0.0	0.0	0.0	0.0	0.5	0.6	0.7	-0.7	-1.8	-7.8
1988	-4.2	-1.7	-1.4	-0.3	0.0	0.5	0.5	0.9	0.7	-2.3	2.2	-6.5
1989	-5.6	-2.2	-1.4	0.8	1.1	0.5	0.3	1.0	1.0	-0.1	0.6	-0.2
1990	-1.3	-0.9	-0.7	-0.7	-0.1	0.3	0.3	0.3	0.2	4.6	1.3	-6.6
1991	-5.4	-2.2	-1.4	-0.8	-0.3	-0.1	0.1	0.1	0.8	3.9	0.9	-5.7
1992	-4.6	-1.8	-1.1	-0.9	-0.6	0.0	0.1	0.7	1.0	0.2	2.0	-5.9
1993	-5.3	-2.0	-0.7	0.2	0.2	0.2	0.1	0.1	-3.4	-2.2	0.2	0.1
1994	0.0	0.0	0.0	0.1	0.3	0.2	0.1	0.1	0.1	-1.1	-5.4	1.2
1995	-0.8	-0.1	-0.8	0.0	0.1	0.1	0.1	0.0	0.1	0.0	0.0	0.0
1996	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.1	0.0
1997	0.0	0.0	0.0	-0.1	-0.1	0.0	0.0	0.1	0.1	0.1	0.0	-0.1
1998	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.2	0.1	0.0	-0.1	0.0
1999	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.0	0.0	0.0
2000	0.0	0.0	0.0	-0.1	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.0
2001	0.0	0.0	0.0	-0.1	0.0	0.0	0.2	0.2	0.6	-0.3	1.2	-4.3
2002	-3.3	-1.2	0.2	0.1	0.1	0.1	0.0	0.0	0.3	0.0	0.0	-0.2
2003	-0.2	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.4	0.6	-0.8
Average	-1.3	-0.5	-0.3	-0.1	0.1	0.0	0.1	0.2	0.1	0.0	-0.4	-1.5
Critical	-3.1	-1.3	-0.9	-0.6	-0.2	0.2	0.3	0.4	0.4	0.5	-1.9	-5.9
Dry	-1.5	-0.6	-0.2	0.1	0.2	0.1	0.2	0.3	0.5	-0.3	0.0	-1.8
BN	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0
AN	-1.8	-0.7	-0.3	0.0	1.1	-0.3	-0.1	0.1	-0.6	-0.3	0.1	-0.1
Wet	-0.2	-0.1	-0.1	0.0	-0.1	-0.1	0.0	0.0	0.0	0.0	0.0	0.0

Table E.3-149. Upper Cache Slough location SLCCH016 salinity (EC) difference No Groundwater Substitution minus Base.

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	0.0	-0.1	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1971	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1972	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1973	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1974	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1975	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1976	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	-0.1	-0.4	-1.1
1977	-1.1	-0.7	-0.3	-0.1	-0.1	0.0	0.0	0.0	-0.1	-0.5	-1.6	-1.0
1978	-1.4	-1.0	-0.5	0.0	-0.1	-0.1	-0.1	0.0	0.0	0.0	0.0	0.0
1979	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1980	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1981	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1
1982	0.0	0.0	0.0	0.0	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1983	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1984	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1985	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1986	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1987	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	-0.6	-1.2
1988	-0.7	-0.3	-0.2	-0.1	0.0	0.0	0.0	0.0	0.0	-0.2	-0.7	-1.1
1989	-1.2	-0.7	-0.3	-0.2	-0.1	0.0	0.1	0.1	0.0	0.0	0.0	0.0
1990	0.0	0.0	0.0	0.0	0.0	0.2	0.1	0.0	0.0	-0.1	-0.5	-0.7
1991	-0.8	-0.6	-0.3	-0.2	-0.1	0.0	0.0	0.0	-0.1	-0.1	-0.4	-0.6
1992	-0.8	-0.5	-0.3	-0.1	-0.1	0.0	0.0	0.0	0.0	-0.2	-0.6	-0.6
1993	-0.5	-0.3	-0.1	0.0	0.0	-0.1	0.0	0.0	0.0	0.0	0.0	0.0
1994	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	-0.1	-0.4
1995	-0.2	-0.1	0.0	0.0	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1996	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1997	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1998	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1999	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2001	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	-0.4	-0.5
2002	-0.5	-0.2	-0.1	-0.1	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0
2003	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Average	-0.2	-0.1	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.2	-0.2
Critical	-0.5	-0.3	-0.2	-0.1	0.0	0.0	0.0	0.0	0.0	-0.2	-0.6	-0.8
Dry	-0.3	-0.2	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.2	-0.3
BN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AN	-0.3	-0.2	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Wet	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table E.3-150. Upper Cache Slough location SLCCH016 salinity (EC) percent difference of No Groundwater Substitution from Base.

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1971	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1972	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1973	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1974	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1975	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1976	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	-0.2	-0.6
1977	-0.6	-0.3	-0.2	-0.1	0.0	0.0	0.0	0.0	-0.1	-0.2	-0.8	-0.5
1978	-0.7	-0.5	-0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1979	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1980	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1981	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1
1982	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1983	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1984	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1985	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1986	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1987	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.3	-0.6
1988	-0.4	-0.2	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	-0.4	-0.6
1989	-0.6	-0.4	-0.2	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1990	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	-0.1	-0.3	-0.3
1991	-0.4	-0.3	-0.2	-0.1	0.0	0.0	0.0	0.0	0.0	-0.1	-0.2	-0.3
1992	-0.4	-0.3	-0.1	-0.1	0.0	0.0	0.0	0.0	0.0	-0.1	-0.3	-0.3
1993	-0.3	-0.2	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1994	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	-0.2
1995	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1996	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1997	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1998	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1999	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2001	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	-0.2	-0.3
2002	-0.2	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2003	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Average	-0.1	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	-0.1
Critical	-0.3	-0.2	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	-0.3	-0.4
Dry	-0.1	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	-0.2
BN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AN	-0.2	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Wet	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table E.3-151. Montezuma Slough location SLMZU011 salinity (EC) difference No Groundwater Substitution minus Base.

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	-0.6	0.0	-0.5	0.0	-0.1	-0.1	-0.3	-4.1	-4.9	-5.3	-2.5	-3.2
1971	7.9	0.2	-0.1	0.3	4.1	-1.0	0.0	-0.2	-0.2	-0.1	-0.1	-0.1
1972	0.0	0.0	-0.1	0.0	0.1	0.2	0.1	-0.2	-0.2	-0.2	-0.1	-0.2
1973	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	-0.1	0.0	0.0
1974	0.0	0.0	0.0	0.0	-0.2	0.0	0.0	0.0	-0.1	-0.1	-0.1	-0.2
1975	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	0.0	0.0	0.0	0.0
1976	0.0	0.0	0.0	0.0	0.0	0.1	0.8	-35.5	18.6	-98.6	-324.2	-351.6
1977	-206.0	-82.4	-40.3	-12.7	1.3	-2.7	-2.9	-40.6	-60.9	-145.4	-337.7	-281.6
1978	-170.8	-67.9	-21.8	2.5	-0.1	0.0	-0.3	-0.7	-1.0	-0.7	-0.7	-0.7
1979	-0.1	-0.1	-0.4	0.4	-1.1	-1.9	-0.1	0.0	0.1	-0.4	-1.0	-0.9
1980	-0.1	0.0	0.0	0.2	0.0	-0.2	0.1	0.0	-0.1	-0.1	0.2	0.5
1981	0.0	0.0	0.0	-0.1	0.6	0.2	-0.4	-0.2	-0.6	-5.2	-64.0	-52.1
1982	27.8	10.1	2.8	0.0	-0.1	-0.5	0.0	0.4	0.7	0.0	-0.1	-0.1
1983	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	0.0	0.0
1984	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	-0.2	-0.2	-0.3	-0.3	0.4
1985	0.1	-0.1	0.1	0.0	0.0	-0.1	-0.1	0.0	0.1	-0.2	0.7	2.7
1986	0.1	0.0	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	-0.2
1987	0.0	0.0	0.0	0.0	0.0	-0.3	0.4	3.4	16.5	-51.7	-260.1	-369.1
1988	-182.8	-71.0	-14.2	-4.0	-1.1	-1.1	-0.1	3.4	21.1	-116.8	-346.3	-278.9
1989	-169.7	-58.9	-28.1	-8.8	-7.5	22.6	31.7	54.9	17.7	-7.2	-37.4	-28.3
1990	-2.3	-2.0	-1.7	-2.1	20.1	75.7	47.6	-32.8	-71.4	-145.7	-330.0	-316.6
1991	-194.2	-78.9	-41.4	-17.8	-5.5	-3.2	-0.8	-33.2	-61.4	-142.7	-329.9	-269.1
1992	-158.7	-64.1	-33.2	-12.6	0.0	4.0	0.6	0.9	20.4	-139.8	-387.5	-274.8
1993	-153.2	-54.7	-27.3	10.4	3.4	3.1	1.8	5.2	32.4	63.8	22.4	5.7
1994	0.9	0.4	0.0	0.0	0.0	-0.5	-0.2	-11.2	-39.1	-76.9	-213.0	-279.5
1995	-107.2	-34.1	-15.6	0.2	-1.7	0.0	0.0	-0.2	0.7	2.1	3.1	4.1
1996	-7.5	0.0	3.1	0.8	0.1	0.0	-0.1	-0.1	-0.1	-0.2	-0.2	0.0
1997	-0.1	0.0	-0.1	0.0	-0.2	0.1	0.1	0.0	-0.4	-0.8	0.2	-0.4
1998	0.0	0.0	0.0	0.2	0.0	-0.1	0.1	0.0	0.1	-0.1	-0.5	-0.4
1999	-0.1	0.0	0.0	0.1	0.0	0.0	0.0	-0.1	0.3	0.2	-1.1	0.1
2000	-0.2	0.0	0.0	0.1	0.0	0.0	-0.5	0.2	0.2	-0.3	0.0	-0.1
2001	0.1	0.0	0.0	0.4	-0.9	-0.9	-0.4	3.4	21.1	-143.5	-403.8	-307.4
2002	-163.1	-42.3	5.6	-3.2	11.1	29.9	36.4	42.7	12.7	5.7	2.0	1.0
2003	0.4	0.0	0.0	-0.8	-0.7	-0.4	-0.2	0.2	1.9	-2.6	2.6	9.1
Average	-43.5	-16.1	-6.3	-1.4	0.6	3.6	3.3	-1.3	-2.2	-29.8	-88.5	-82.1
Critical	-106.2	-42.6	-18.7	-7.0	2.1	10.3	6.4	-21.3	-24.7	-123.7	-324.1	-293.2
Dry	-55.4	-16.9	-3.7	-2.0	0.5	8.6	11.3	17.4	11.3	-33.7	-127.1	-125.5
BN	-0.1	-0.1	-0.3	0.2	-0.5	-0.8	0.0	-0.1	0.0	-0.3	-0.6	-0.5
AN	-54.0	-20.4	-8.2	2.1	0.4	0.4	0.1	0.8	5.5	10.0	4.1	2.4
Wet	-6.1	-1.8	-0.8	0.1	0.2	-0.1	0.0	-0.4	-0.3	-0.4	-0.1	0.0

Table E.3-152. Montezuma Slough location SLMZU011 salinity (EC) percent difference of No Groundwater Substitution from Base.

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	0.0	0.0	-0.1	0.0	0.0	0.0	0.0	-0.1	-0.1	-0.1	0.0	0.0
1971	0.3	0.0	0.0	0.1	0.9	-0.2	0.0	0.0	0.0	0.0	0.0	0.0
1972	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1973	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1974	0.0	0.0	0.0	0.0	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1975	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1976	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.4	0.2	-0.7	-2.3	-2.3
1977	-1.9	-0.8	-0.4	-0.2	0.0	0.0	0.0	-0.4	-0.5	-1.0	-2.1	-1.7
1978	-1.6	-0.7	-0.4	0.3	0.0	0.0	-0.1	-0.1	-0.1	0.0	0.0	0.0
1979	0.0	0.0	0.0	0.0	-0.1	-0.3	0.0	0.0	0.0	0.0	0.0	0.0
1980	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	0.0	0.0	0.0	0.0	0.0
1981	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	-0.5	-0.4
1982	0.3	0.3	0.7	0.0	0.0	-0.2	0.0	0.2	0.1	0.0	0.0	0.0
1983	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1984	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1985	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1986	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1987	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.2	-0.5	-2.1	-2.6
1988	-1.9	-0.8	-0.3	-0.3	-0.1	0.0	0.0	0.0	0.2	-1.1	-2.6	-1.8
1989	-1.5	-0.6	-0.4	-0.2	-0.2	1.3	3.6	2.1	0.3	-0.1	-0.3	-0.2
1990	0.0	0.0	0.0	-0.1	1.1	1.6	0.7	-0.4	-0.7	-1.1	-2.3	-2.1
1991	-1.8	-0.7	-0.4	-0.2	-0.1	-0.1	0.0	-0.5	-0.6	-1.1	-2.3	-1.7
1992	-1.5	-0.6	-0.3	-0.2	0.0	0.3	0.0	0.0	0.2	-1.3	-2.8	-1.8
1993	-1.6	-0.6	-0.4	0.7	1.0	0.7	0.5	1.1	3.7	2.1	0.3	0.1
1994	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.2	-0.4	-0.6	-1.6	-1.9
1995	-1.3	-0.5	-0.2	0.0	-0.5	0.0	0.0	-0.1	0.3	0.3	0.1	0.1
1996	-0.3	0.0	0.2	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1997	0.0	0.0	0.0	0.0	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1998	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1999	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2000	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	0.0	0.0	0.0	0.0
2001	0.0	0.0	0.0	0.0	-0.1	-0.1	0.0	0.1	0.3	-1.5	-3.4	-2.2
2002	-1.7	-0.5	0.2	-0.6	1.3	1.5	1.6	1.4	0.2	0.1	0.0	0.0
2003	0.0	0.0	0.0	-0.2	-0.1	0.0	0.0	0.0	0.1	0.0	0.0	0.1
Average	-0.4	-0.2	-0.1	0.0	0.1	0.1	0.2	0.1	0.1	-0.2	-0.6	-0.5
Critical	-1.0	-0.4	-0.2	-0.1	0.1	0.2	0.1	-0.3	-0.2	-1.0	-2.3	-1.9
Dry	-0.5	-0.2	0.0	-0.1	0.2	0.4	0.9	0.6	0.2	-0.3	-1.0	-0.9
BN	0.0	0.0	0.0	0.0	-0.1	-0.1	0.0	0.0	0.0	0.0	0.0	0.0
AN	-0.5	-0.2	-0.1	0.1	0.1	0.1	0.0	0.2	0.6	0.3	0.1	0.0
Wet	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table E.3-153. Montezuma Slough location SLMZU025 salinity (EC) difference No Groundwater Substitution minus Base.

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	-0.6	0.0	0.0	0.0	0.0	0.0	-0.1	-1.6	-2.2	-2.2	-1.3	-1.1
1971	0.6	0.0	0.0	0.0	1.0	-0.1	0.0	0.0	0.0	0.0	0.0	0.0
1972	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	0.0	-0.1
1973	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1974	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.2	-0.2
1975	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1976	0.0	0.0	0.0	0.0	0.0	0.0	0.7	-60.5	-51.5	-188.5	-395.9	-376.4
1977	-187.3	-75.8	-38.2	-11.4	-4.2	-2.6	-1.1	-54.8	-53.8	-234.8	-405.4	-297.4
1978	-155.7	-63.2	-20.6	0.2	0.4	0.1	0.0	-0.1	-0.2	-0.2	-0.2	-0.2
1979	0.0	0.0	0.0	0.0	-0.1	-0.2	-0.1	0.0	0.1	-0.1	-0.2	-0.3
1980	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2
1981	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	-0.1	-0.4	8.0	-99.7	-38.5
1982	28.8	-25.0	0.1	0.0	-0.4	-0.4	0.0	0.0	0.1	0.0	0.0	0.0
1983	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1984	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	-0.1	0.0
1985	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	1.0
1986	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	-0.1
1987	0.0	0.0	0.0	0.0	0.0	0.0	0.1	5.0	21.2	-92.9	-348.2	-391.8
1988	-165.2	-66.4	-17.6	-1.6	-0.2	-0.3	-0.1	6.1	29.9	-213.3	-383.3	-286.8
1989	-155.3	-52.6	-27.6	-8.1	-9.2	7.3	11.3	24.9	10.5	-13.6	-46.0	-22.3
1990	-1.2	-1.8	-1.5	-1.9	35.1	52.9	29.3	-44.0	-49.9	-398.8	-444.4	-328.2
1991	-177.5	-70.8	-39.1	-16.7	-6.2	-1.1	-0.1	-37.3	-43.1	-241.0	-387.3	-274.8
1992	-144.5	-59.6	-32.0	-12.4	0.1	0.9	0.6	5.0	32.8	-265.9	-423.4	-289.9
1993	-134.7	-53.2	-26.0	2.8	0.9	0.8	0.1	0.9	10.9	32.8	15.4	3.9
1994	0.7	0.2	0.1	0.0	0.0	-0.1	0.0	-12.1	-42.9	-80.2	-302.4	-300.1
1995	-90.9	-32.5	-15.5	0.1	0.1	0.0	0.0	0.0	0.1	0.5	2.2	2.2
1996	-1.7	0.1	0.1	0.2	0.0	0.0	0.0	0.0	0.0	-0.1	-0.1	0.0
1997	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	-0.2	0.1	-0.1
1998	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	-0.1
1999	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	-0.3	0.0
2000	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.1	0.1	-0.1	0.1	0.0
2001	0.0	0.0	0.0	0.0	-0.1	-0.1	-0.1	4.0	28.1	-240.5	-401.9	-301.8
2002	-147.0	-40.9	-15.0	-0.3	6.9	12.0	17.7	18.5	7.3	3.2	1.3	0.5
2003	0.2	0.0	0.0	0.0	-0.1	-0.1	0.0	0.1	1.3	-7.5	9.8	9.2
Average	-39.2	-15.9	-6.8	-1.4	0.7	2.0	1.7	-4.3	-3.0	-56.9	-106.2	-85.1
Critical	-96.4	-39.2	-18.3	-6.3	3.5	7.1	4.2	-28.2	-25.5	-231.8	-391.7	-307.6
Dry	-50.4	-15.6	-7.1	-1.4	-0.4	3.2	4.8	8.7	11.1	-56.0	-149.1	-125.5
BN	0.0	0.0	0.0	0.0	-0.1	-0.1	0.0	0.0	0.0	-0.1	-0.1	-0.2
AN	-48.4	-19.4	-7.8	0.5	0.2	0.1	0.0	0.2	2.0	4.2	4.2	2.2
Wet	-4.9	-4.4	-1.2	0.0	0.1	0.0	0.0	-0.1	-0.2	-0.2	0.0	0.0

Table E.3-154. Montezuma Slough location SLMZU025 salinity (EC) percent difference of No Groundwater Substitution from Base.

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	-0.1	-0.1	0.0	0.0
1971	0.0	0.0	0.0	0.0	0.5	-0.1	0.0	0.0	0.0	0.0	0.0	0.0
1972	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1973	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1974	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1975	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1976	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-1.1	-0.6	-2.0	-3.9	-3.2
1977	-1.8	-0.8	-0.4	-0.3	-0.1	-0.1	0.0	-0.7	-0.5	-2.1	-3.4	-2.3
1978	-1.6	-0.7	-0.4	0.1	0.2	0.1	0.0	0.0	0.0	0.0	0.0	0.0
1979	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	0.0	0.0	0.0	0.0	0.0
1980	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1981	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	-1.2	-0.4
1982	0.3	-1.6	0.0	0.0	-0.2	-0.2	0.0	0.0	0.0	0.0	0.0	0.0
1983	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1984	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1985	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1986	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1987	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.4	-1.4	-3.8	-3.6
1988	-1.8	-0.7	-0.5	-0.3	0.0	0.0	0.0	0.1	0.5	-2.7	-3.8	-2.4
1989	-1.5	-0.6	-0.4	-0.2	-0.2	1.2	3.4	2.1	0.3	-0.2	-0.6	-0.3
1990	0.0	0.0	0.0	-0.1	3.0	2.3	0.8	-1.0	-0.7	-4.1	-4.1	-2.8
1991	-1.7	-0.7	-0.4	-0.2	-0.1	-0.1	0.0	-1.0	-0.6	-2.5	-3.6	-2.3
1992	-1.4	-0.6	-0.3	-0.2	0.0	0.2	0.0	0.1	0.6	-3.4	-4.0	-2.4
1993	-1.5	-0.6	-0.4	0.5	0.4	0.4	0.1	0.4	3.4	2.1	0.3	0.1
1994	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.4	-0.7	-0.9	-3.1	-2.7
1995	-1.2	-0.4	-0.3	0.0	0.1	0.0	0.0	0.0	0.1	0.2	0.1	0.1
1996	-0.2	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1997	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1998	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1999	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2001	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.7	-3.8	-4.7	-2.8
2002	-1.7	-0.5	-1.2	-0.1	1.9	1.7	2.3	1.5	0.2	0.0	0.0	0.0
2003	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	-0.3	0.2	0.2
Average	-0.4	-0.2	-0.1	0.0	0.2	0.2	0.2	0.0	0.1	-0.6	-1.0	-0.7
Critical	-1.0	-0.4	-0.2	-0.1	0.4	0.3	0.1	-0.6	-0.3	-2.5	-3.7	-2.6
Dry	-0.5	-0.2	-0.3	0.0	0.3	0.5	0.9	0.6	0.3	-0.9	-1.7	-1.2
BN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AN	-0.5	-0.2	-0.1	0.1	0.1	0.1	0.0	0.1	0.6	0.3	0.1	0.0
Wet	-0.1	-0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table E.3-155. Suisun Slough location SLSUS01 salinity (EC) difference No Groundwater Substitution minus Base.

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	-2.6	-3.0	-5.1	-3.6	-2.3	-1.5	-1.4	-2.6	-4.0	-3.0	-2.1	-3.4
1971	2.6	-0.4	-0.9	-1.7	-1.1	-0.5	0.0	-1.4	-0.9	-0.6	-0.5	-0.4
1972	-0.4	-0.6	-1.3	-0.9	1.6	1.6	0.7	-0.8	-0.8	-0.5	-0.5	-0.6
1973	0.1	0.1	0.0	-0.1	-0.4	-0.6	0.2	-0.4	-0.3	-0.3	0.5	0.1
1974	-0.3	0.2	1.1	-0.4	-2.6	0.8	-1.3	0.2	-0.2	-0.3	-0.4	-0.1
1975	0.0	-0.1	-0.1	0.0	1.2	0.0	-1.1	-0.3	0.0	0.0	0.0	-0.1
1976	-0.1	0.0	0.2	-0.2	-0.5	0.7	1.6	-37.5	-93.8	-98.9	-265.7	-305.8
1977	-227.8	-114.4	-60.3	-30.2	-5.5	-8.8	-7.2	-39.1	-73.9	-122.7	-280.7	-249.4
1978	-189.1	-95.0	-44.0	-8.5	-4.3	-5.4	-4.7	-5.5	-4.9	-3.0	-2.9	-2.9
1979	-2.2	-2.3	-1.6	-0.5	-7.0	-14.3	1.2	0.0	-0.2	-1.2	-4.2	-2.8
1980	-0.1	0.7	-0.5	8.7	-4.0	-3.8	2.1	0.2	-0.7	-0.2	0.5	2.4
1981	-0.8	-1.3	-1.5	-1.5	4.2	1.7	-2.3	-0.9	-2.1	-7.3	-47.1	-36.8
1982	11.8	-18.4	-12.2	-1.7	-3.5	-3.1	-0.3	0.7	0.8	0.4	-0.7	0.0
1983	-0.2	-0.5	0.5	-0.1	-0.2	-0.2	-0.8	-0.5	-1.1	-0.3	-0.2	-0.2
1984	-0.2	-0.2	-0.4	0.1	-0.5	-0.4	-0.2	-0.9	-1.1	-2.3	-3.7	4.9
1985	0.1	-0.7	0.7	-1.2	0.1	-0.8	-0.1	-0.2	1.6	-2.5	4.6	12.0
1986	-1.3	-1.7	-1.1	-0.5	0.0	-0.7	-0.7	-0.4	-0.4	-0.4	-0.2	-0.1
1987	0.1	-0.4	-0.2	0.1	-0.5	-2.7	2.1	1.8	13.0	-41.5	-209.5	-307.5
1988	-210.1	-101.4	-37.6	-16.6	-7.1	-4.6	2.3	0.4	15.1	-91.6	-281.7	-258.3
1989	-188.1	-87.8	-45.1	-20.4	-9.1	11.9	35.5	62.4	20.4	-3.3	-35.1	-24.5
1990	-8.0	-4.7	-4.4	-3.9	23.0	78.7	50.2	-19.5	-65.6	-138.7	-303.8	-281.0
1991	-214.7	-103.8	-59.7	-31.5	-17.1	-5.8	-4.5	-35.6	-78.8	-134.2	-281.9	-239.2
1992	-174.7	-84.3	-45.6	-18.1	16.3	21.7	-4.4	-17.1	-4.0	-124.6	-334.2	-276.2
1993	-177.6	-73.1	-41.1	3.5	7.7	3.7	31.4	22.2	36.8	63.9	2.6	-9.4
1994	12.8	5.0	0.8	-1.6	-0.4	-1.4	-1.0	-11.0	-33.4	-67.1	-171.4	-233.8
1995	-139.6	-53.2	-28.0	-7.3	-3.3	-4.3	-2.7	-5.2	-2.3	4.4	3.4	3.4
1996	-4.4	-1.2	1.7	-2.7	-0.1	-0.7	-1.2	-1.1	-0.5	-0.6	-0.6	-0.7
1997	-0.6	-0.7	-1.2	-1.9	-3.7	0.9	0.3	0.0	-4.5	-2.4	-1.1	-1.7
1998	0.0	0.0	0.1	2.5	0.7	-0.8	1.5	-0.7	1.3	-0.4	-3.4	-1.6
1999	-0.3	0.4	0.7	0.2	0.4	0.7	-0.2	-1.2	2.9	-1.1	-5.7	0.7
2000	-1.6	0.1	-0.7	1.0	-1.0	-1.1	-3.8	1.4	-0.2	0.2	-0.7	0.2
2001	0.9	1.2	2.0	3.1	-8.0	-7.2	-1.5	4.7	20.9	-108.2	-314.0	-273.9
2002	-181.8	-83.7	-33.0	-31.1	4.9	35.1	40.0	48.5	19.8	15.5	3.5	5.3
2003	1.4	-7.2	-4.6	-18.6	-6.9	-1.3	-2.5	-3.1	1.7	6.3	6.1	10.7
Average	-49.9	-24.5	-12.4	-5.5	-0.9	2.6	3.7	-1.3	-7.0	-25.5	-74.4	-72.7
Critical	-117.5	-57.6	-29.5	-14.6	1.2	11.5	5.3	-22.8	-47.8	-111.1	-274.2	-263.4
Dry	-61.6	-28.8	-12.8	-8.5	-1.4	6.3	12.3	19.4	12.3	-24.5	-99.6	-104.2
BN	-1.3	-1.4	-1.4	-0.7	-2.7	-6.4	1.0	-0.4	-0.5	-0.9	-2.3	-1.7
AN	-61.2	-29.1	-15.2	-2.3	-1.5	-1.4	3.8	2.5	5.4	11.1	1.0	0.2
Wet	-10.4	-6.1	-3.5	-1.3	-1.2	-0.8	-0.6	-1.0	-0.8	-0.5	-1.2	0.0

Table E.3-156. Suisun Slough location SLSUS012 salinity (EC) percent difference of No Groundwater Substitution from Base.

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	-0.1	-0.1	-0.2	-0.5	-0.4	-0.3	-0.1	-0.1	-0.1	0.0	0.0	0.0
1971	0.1	0.0	0.0	-0.2	-0.1	0.0	0.0	-0.1	0.0	0.0	0.0	0.0
1972	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0
1973	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	0.0	0.0	0.0	0.0	0.0
1974	0.0	0.0	0.1	-0.1	-0.4	0.2	-0.3	0.0	0.0	0.0	0.0	0.0
1975	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	0.0	0.0	0.0	0.0
1976	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.4	-0.7	-0.7	-1.8	-1.9
1977	-1.6	-0.9	-0.5	-0.3	-0.1	-0.1	-0.1	-0.3	-0.5	-0.8	-1.7	-1.4
1978	-1.3	-0.7	-0.4	-0.2	-0.3	-0.5	-0.5	-0.4	-0.2	-0.1	0.0	0.0
1979	0.0	0.0	0.0	0.0	-0.3	-0.9	0.1	0.0	0.0	0.0	0.0	0.0
1980	0.0	0.0	0.0	0.3	-0.4	-0.4	0.2	0.0	0.0	0.0	0.0	0.0
1981	0.0	0.0	0.0	0.0	0.1	0.1	-0.1	0.0	0.0	-0.1	-0.4	-0.2
1982	0.1	-0.2	-0.6	-0.2	-0.5	-0.5	0.0	0.1	0.1	0.0	0.0	0.0
1983	0.0	0.0	0.1	0.0	0.0	0.0	-0.1	-0.1	-0.3	-0.1	0.0	0.0
1984	0.0	0.0	-0.1	0.0	-0.1	-0.1	0.0	0.0	0.0	0.0	0.0	0.1
1985	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1
1986	0.0	0.0	0.0	0.0	0.0	-0.1	-0.1	0.0	0.0	0.0	0.0	0.0
1987	0.0	0.0	0.0	0.0	0.0	-0.1	0.1	0.0	0.1	-0.4	-1.6	-2.0
1988	-1.6	-0.8	-0.4	-0.4	-0.2	-0.1	0.0	0.0	0.1	-0.7	-1.9	-1.6
1989	-1.3	-0.7	-0.4	-0.2	-0.1	0.3	1.8	1.7	0.3	0.0	-0.3	-0.2
1990	-0.1	0.0	0.0	0.0	0.4	1.2	0.6	-0.2	-0.6	-1.0	-2.0	-1.7
1991	-1.5	-0.8	-0.5	-0.3	-0.2	-0.1	-0.1	-0.5	-0.7	-0.9	-1.8	-1.5
1992	-1.2	-0.6	-0.3	-0.2	0.3	0.7	-0.1	-0.2	0.0	-1.0	-2.2	-1.7
1993	-1.3	-0.6	-0.4	0.1	0.5	0.3	2.6	2.0	2.3	1.6	0.0	-0.1
1994	0.2	0.1	0.0	0.0	0.0	0.0	0.0	-0.1	-0.3	-0.5	-1.2	-1.5
1995	-1.1	-0.5	-0.3	-0.2	-0.2	-0.5	-0.3	-0.8	-0.3	0.4	0.1	0.1
1996	-0.1	0.0	0.0	-0.1	0.0	-0.1	-0.2	-0.2	0.0	0.0	0.0	0.0
1997	0.0	0.0	-0.1	-0.3	-0.6	0.1	0.0	0.0	-0.1	0.0	0.0	0.0
1998	0.0	0.0	0.0	0.1	0.1	-0.1	0.3	-0.1	0.3	-0.1	-0.1	0.0
1999	0.0	0.0	0.0	0.0	0.1	0.2	0.0	-0.1	0.1	0.0	-0.1	0.0
2000	0.0	0.0	0.0	0.0	-0.1	-0.2	-0.4	0.1	0.0	0.0	0.0	0.0
2001	0.0	0.0	0.0	0.0	-0.2	-0.3	-0.1	0.1	0.3	-1.0	-2.4	-1.8
2002	-1.4	-0.7	-0.5	-1.6	0.3	1.1	1.2	1.2	0.3	0.1	0.0	0.0
2003	0.0	-0.1	-0.1	-1.0	-0.5	-0.1	-0.1	-0.3	0.1	0.1	0.1	0.1
Average	-0.4	-0.2	-0.1	-0.2	-0.1	0.0	0.1	0.0	0.0	-0.2	-0.5	-0.5
Critical	-0.8	-0.4	-0.2	-0.2	0.0	0.2	0.1	-0.2	-0.4	-0.8	-1.8	-1.6
Dry	-0.5	-0.2	-0.1	-0.3	0.0	0.2	0.5	0.5	0.2	-0.2	-0.8	-0.7
BN	0.0	0.0	0.0	0.0	-0.1	-0.4	0.0	0.0	0.0	0.0	0.0	0.0
AN	-0.4	-0.2	-0.1	-0.1	-0.1	-0.2	0.3	0.2	0.4	0.3	0.0	0.0
Wet	-0.1	-0.1	-0.1	-0.1	-0.2	-0.1	-0.1	-0.1	0.0	0.0	0.0	0.0

Table E.3-157. CCWD Intake location in Victoria Canal salinity (EC) difference No Groundwater Substitution minus Base.

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	0.1	0.1	0.0	-0.1	-0.1	-0.1	0.0	0.0	0.0	0.0	0.0	0.0
1971	0.0	-0.1	0.0	0.0	0.0	-0.1	-0.1	0.0	0.0	0.0	0.0	0.0
1972	0.0	0.0	-0.1	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.0
1973	0.0	0.1	0.0	0.0	0.0	0.2	-0.1	0.2	0.1	0.0	0.0	-0.1
1974	-0.2	0.0	0.1	0.0	-0.1	0.1	-0.2	0.0	0.1	0.1	0.0	0.1
1975	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.0	-0.1	0.0	0.0	0.0
1976	0.0	-0.1	-0.1	0.0	0.0	0.0	0.0	0.0	-1.9	10.9	-5.1	-31.3
1977	-18.0	-7.8	-4.3	-3.4	-1.5	-0.6	-0.3	-0.2	-2.4	-18.7	-23.9	-16.6
1978	-20.6	-8.5	-4.0	-1.1	0.3	0.3	0.0	0.3	0.2	0.1	0.0	0.1
1979	0.1	0.1	0.1	0.0	0.1	0.0	0.3	0.2	0.1	0.0	0.0	0.0
1980	0.0	0.0	0.0	0.0	0.2	-0.3	0.2	0.3	0.1	-0.1	-0.1	0.0
1981	0.1	0.1	0.0	0.0	0.0	-0.1	-0.2	-0.1	-0.2	0.4	-3.6	13.8
1982	-3.7	-3.5	-1.2	0.3	-8.1	-3.4	0.4	-0.4	-0.3	-0.2	0.0	-0.1
1983	-0.2	-0.1	-0.3	0.0	0.5	0.2	0.2	-0.3	0.2	-0.1	-0.2	-0.1
1984	0.1	-0.2	0.1	0.1	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.0
1985	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.1	0.0	0.0	0.0	0.0
1986	0.1	0.1	0.0	0.1	0.1	0.3	0.1	0.0	0.2	0.1	0.0	-0.1
1987	0.0	0.2	0.1	0.0	0.0	0.0	0.0	-0.1	0.1	-0.9	-1.6	-17.7
1988	-9.7	-4.3	-3.0	-1.1	-0.2	-0.1	0.0	0.0	0.1	-5.4	6.9	-13.6
1989	-14.3	-6.3	-3.1	-2.4	-1.2	-0.5	0.3	0.4	0.2	-1.2	-0.8	2.3
1990	-0.5	-0.3	-0.2	-0.2	0.1	0.7	0.7	0.5	-0.4	9.5	7.1	-17.2
1991	-15.9	-7.7	-5.0	-3.8	-2.1	-0.6	-0.2	-0.1	-0.8	8.5	5.6	-15.1
1992	-13.8	-6.5	-4.1	-2.9	-1.2	-0.1	0.0	0.0	0.1	0.9	5.3	-10.9
1993	-11.1	-4.4	-2.8	-0.9	0.7	0.5	0.3	0.4	-14.7	-7.0	0.4	0.2
1994	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	-9.8	-24.1	3.5
1995	0.5	-0.8	-1.4	-0.7	0.1	0.2	0.2	0.1	0.2	-0.1	0.0	0.0
1996	-0.1	-0.1	0.0	0.0	0.1	-0.1	0.3	0.0	0.0	0.0	0.0	0.0
1997	-0.1	-0.1	-0.1	-0.4	-0.2	0.0	0.0	0.3	0.2	0.0	0.0	0.0
1998	0.1	0.0	0.0	0.1	0.3	-0.1	0.0	0.4	0.2	-0.1	-0.2	0.0
1999	-0.1	-0.1	0.0	-0.1	0.0	0.0	0.4	0.3	0.2	0.1	0.0	0.0
2000	0.0	0.0	0.0	0.0	0.1	0.2	0.3	-0.1	-0.1	0.0	0.0	0.0
2001	0.0	-0.1	0.0	0.0	0.0	0.0	0.1	0.1	-0.1	5.5	9.3	-7.5
2002	-6.8	-2.5	-1.6	-0.6	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.0
2003	0.0	0.0	0.0	0.0	0.0	0.1	0.2	0.2	0.0	0.2	-0.1	-2.7
Average	-3.4	-1.6	-0.9	-0.5	-0.3	-0.1	0.1	0.1	-0.5	-0.2	-0.7	-3.3
Critical	-8.3	-3.8	-2.4	-1.6	-0.7	-0.1	0.1	0.0	-0.8	-0.6	-4.0	-14.4
Dry	-3.5	-1.4	-0.8	-0.5	-0.2	-0.1	0.0	0.1	0.0	0.6	0.6	-1.5
BN	0.0	0.1	0.0	0.0	0.0	0.0	0.2	0.2	0.0	0.0	0.0	0.0
AN	-5.3	-2.1	-1.1	-0.3	0.2	0.2	0.2	0.2	-2.4	-1.1	0.0	-0.4
Wet	-0.3	-0.4	-0.2	-0.1	-0.6	-0.2	0.1	0.0	0.1	0.0	0.0	0.0

Table E.3-158. CCWD Intake location in Victoria Canal salinity (EC) percent difference of No Groundwater Substitution from Base.

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1971	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1972	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1973	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0
1974	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	0.0	0.0	0.0	0.0
1975	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1976	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.4	2.5	-0.9	-6.0
1977	-3.1	-1.3	-0.7	-0.4	-0.2	-0.1	-0.1	0.0	-0.5	-3.9	-5.0	-2.8
1978	-2.9	-1.4	-0.6	-0.2	0.1	0.1	0.0	0.1	0.1	0.0	0.0	0.0
1979	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.0
1980	0.0	0.0	0.0	0.0	0.0	-0.1	0.1	0.1	0.0	0.0	0.0	0.0
1981	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	-0.9	3.0
1982	-0.7	-0.7	-0.4	0.1	-2.2	-0.9	0.2	-0.2	-0.1	-0.1	0.0	0.0
1983	-0.1	0.0	-0.1	0.0	0.2	0.1	0.1	-0.2	0.1	0.0	-0.1	-0.1
1984	0.1	-0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1985	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1986	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.1	0.0	0.0	0.0
1987	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.3	-0.4	-4.2
1988	-1.9	-0.8	-0.5	-0.2	0.0	0.0	0.0	0.0	0.0	-1.7	1.7	-2.8
1989	-2.5	-1.1	-0.5	-0.3	-0.2	-0.1	0.1	0.1	0.1	-0.4	-0.2	0.5
1990	-0.1	-0.1	0.0	0.0	0.0	0.2	0.2	0.1	-0.1	2.4	1.3	-3.3
1991	-2.6	-1.2	-0.7	-0.5	-0.3	-0.1	0.0	0.0	-0.2	2.1	1.0	-3.0
1992	-2.3	-1.0	-0.6	-0.4	-0.2	0.0	0.0	0.0	0.0	0.3	1.3	-2.2
1993	-1.9	-0.8	-0.5	-0.1	0.1	0.1	0.0	0.1	-3.5	-2.2	0.2	0.1
1994	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-2.3	-4.3	0.7
1995	0.1	-0.2	-0.3	-0.1	0.0	0.0	0.1	0.0	0.1	0.0	0.0	0.0
1996	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0
1997	0.0	0.0	0.0	-0.1	-0.1	0.0	0.0	0.1	0.0	0.0	0.0	0.0
1998	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.1	0.0	-0.1	0.0
1999	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.0	0.0	0.0
2000	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.0
2001	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.9	2.7	-1.8
2002	-1.4	-0.5	-0.3	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2003	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	-0.8
Average	-0.6	-0.3	-0.2	-0.1	-0.1	0.0	0.0	0.0	-0.1	0.0	-0.1	-0.7
Critical	-1.4	-0.6	-0.4	-0.2	-0.1	0.0	0.0	0.0	-0.2	-0.1	-0.7	-2.8
Dry	-0.6	-0.3	-0.1	-0.1	0.0	0.0	0.0	0.0	0.0	0.2	0.2	-0.4
BN	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0
AN	-0.8	-0.4	-0.2	0.0	0.0	0.0	0.0	0.1	-0.6	-0.3	0.0	-0.1
Wet	-0.1	-0.1	-0.1	0.0	-0.2	-0.1	0.0	0.0	0.0	0.0	0.0	0.0

Table E.3-159. Upper Cache Slough location SLCCH016 salinity (EC) difference No Crop Idle minus Base.

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1971	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1972	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1973	0.0	0.0	0.0	0.0	0.0	-0.1	-0.1	0.0	0.0	0.0	0.0	0.0
1974	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1975	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1976	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.4	-1.3
1977	-1.3	-0.6	-0.2	0.0	0.0	0.0	0.1	0.0	0.1	-0.4	-1.4	-0.9
1978	-1.3	-0.7	-0.2	0.0	-0.1	-0.1	-0.1	0.0	0.0	0.0	0.0	0.0
1979	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.0
1980	0.0	0.0	0.0	0.0	-0.1	-0.2	-0.1	0.0	0.0	0.0	0.0	0.0
1981	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	-0.3
1982	-0.1	0.0	-0.1	0.0	-0.1	-0.1	-0.1	0.0	0.0	0.0	0.0	0.0
1983	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1984	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1985	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1986	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1987	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	-0.8	-1.5
1988	-0.9	-0.3	-0.1	0.0	0.1	0.0	0.1	0.1	0.1	-0.2	-0.9	-1.2
1989	-1.3	-0.4	0.0	0.0	0.1	0.1	0.1	0.1	0.0	0.0	-0.1	-0.1
1990	-0.1	0.0	0.1	0.1	0.1	0.3	0.2	0.0	0.1	-0.1	-0.6	-0.7
1991	-0.8	-0.2	0.2	0.3	0.3	0.2	0.3	0.2	0.1	0.0	-0.4	-0.5
1992	-0.7	-0.2	0.2	0.3	0.2	0.3	0.2	0.1	0.1	-0.1	-0.7	-0.8
1993	-0.6	-0.3	0.0	0.0	0.0	-0.2	0.1	0.1	0.1	0.0	0.0	0.0
1994	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.0	0.0	0.1	-0.1	-0.4
1995	-0.2	-0.1	0.0	0.0	-0.3	-0.1	-0.1	0.0	0.0	0.0	0.0	0.0
1996	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1997	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1998	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	0.0	0.0	0.0	0.0	0.0
1999	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2001	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	-0.1	-0.5	-0.6
2002	-0.5	-0.2	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0
2003	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0
Average	-0.2	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.2	-0.2
Critical	-0.5	-0.2	0.0	0.1	0.1	0.1	0.1	0.1	0.1	-0.1	-0.6	-0.8
Dry	-0.3	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.2	-0.4
BN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AN	-0.3	-0.2	0.0	0.0	0.0	-0.1	0.0	0.0	0.0	0.0	0.0	0.0
Wet	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table E.3-160. Upper Cache Slough location SLCCH016 salinity (EC) percent difference of No Crop Idle from Base.

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1971	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1972	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1973	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1974	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1975	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1976	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.2	-0.7
1977	-0.7	-0.3	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	-0.2	-0.7	-0.4
1978	-0.6	-0.4	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1979	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1980	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1981	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	-0.2
1982	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1983	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1984	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1985	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1986	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1987	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.4	-0.8
1988	-0.4	-0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	-0.5	-0.6
1989	-0.6	-0.2	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.0	-0.1
1990	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.0	-0.1	-0.3	-0.4
1991	-0.4	-0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0	-0.2	-0.3
1992	-0.3	-0.1	0.1	0.2	0.1	0.1	0.1	0.1	0.1	-0.1	-0.4	-0.4
1993	-0.3	-0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1994	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	-0.2
1995	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1996	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1997	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1998	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1999	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2001	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	-0.3	-0.3
2002	-0.3	-0.1	0.0	0.0	0.0	0.1	0.0	0.1	0.0	0.0	0.0	0.0
2003	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Average	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	-0.1
Critical	-0.3	-0.1	0.0	0.0	0.0	0.1	0.1	0.0	0.0	-0.1	-0.3	-0.4
Dry	-0.2	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	-0.2
BN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AN	-0.2	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Wet	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table E.3-161. Montezuma Slough location SLMZU011 salinity (EC) difference No Crop Idle minus Base.

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1971	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1972	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1973	0.0	0.0	0.0	0.0	0.0	0.3	0.9	-1.3	-0.3	-0.1	0.0	0.0
1974	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.2
1975	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1976	0.0	0.0	0.0	0.0	0.0	0.0	0.7	0.1	121.3	-51.1	-376.0	-463.0
1977	-287.7	-106.3	-45.1	-9.7	0.4	-3.8	-4.1	5.3	22.3	-89.9	-290.5	-273.1
1978	-185.4	-65.8	8.6	13.7	1.3	0.7	0.4	2.9	12.1	16.4	6.2	1.9
1979	0.3	0.0	-0.7	-6.4	6.5	10.3	9.1	11.9	8.7	3.2	1.0	0.2
1980	1.3	16.1	22.1	0.4	-0.2	0.0	1.5	5.0	4.5	1.3	0.4	0.1
1981	-0.1	0.3	2.1	-0.4	-6.2	2.3	6.4	11.2	13.0	-30.5	-207.3	-304.8
1982	-123.2	21.5	4.1	-0.1	-0.1	-0.4	0.0	0.5	3.0	4.7	1.8	0.1
1983	-32.6	1.1	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.4	3.4	7.0
1984	1.2	1.9	0.0	0.0	0.2	0.4	1.8	8.6	6.8	2.3	0.7	0.2
1985	-0.3	1.0	9.7	-0.1	1.6	6.3	4.6	7.2	7.3	2.9	1.6	1.1
1986	1.2	1.0	2.3	6.2	0.3	0.0	0.4	1.7	1.8	0.6	0.2	0.1
1987	0.0	0.1	0.5	3.2	5.3	3.0	2.5	1.3	9.6	-114.2	-424.6	-555.8
1988	-273.9	-103.2	18.1	19.6	17.3	4.4	27.3	42.0	29.0	-181.3	-496.9	-398.4
1989	-235.9	-75.2	56.3	70.3	13.4	48.0	47.3	76.0	27.2	-8.5	-136.3	-220.0
1990	-71.9	-21.9	-6.2	17.1	47.5	140.6	112.2	57.3	63.0	-111.5	-370.5	-385.1
1991	-252.2	-91.9	-40.2	-11.2	30.6	99.2	32.9	73.7	95.7	-67.6	-304.1	-284.9
1992	-179.4	-65.2	-24.1	-5.3	19.1	41.4	67.2	75.2	45.6	-154.8	-470.0	-410.7
1993	-225.5	-74.6	71.9	35.5	5.6	12.8	10.2	16.9	57.6	91.6	36.1	13.3
1994	0.3	0.6	-0.6	29.6	9.9	51.2	77.8	67.3	69.5	6.8	-224.0	-328.3
1995	-160.7	-44.6	21.2	19.0	2.1	0.0	-0.5	-0.2	1.7	8.2	32.4	40.1
1996	-2.6	0.3	19.8	15.0	0.4	0.0	0.3	0.5	8.9	28.2	17.2	7.5
1997	-10.1	-19.4	-0.1	-0.1	-0.2	3.3	11.3	17.0	19.1	13.0	3.6	5.1
1998	-6.7	-0.5	5.5	8.6	-0.4	-0.4	0.0	0.1	0.1	1.2	9.7	20.2
1999	-1.9	10.8	5.5	1.3	0.1	0.1	0.8	3.7	10.1	11.8	4.3	1.4
2000	0.1	0.0	-0.2	9.9	3.1	0.2	1.8	5.6	6.5	2.9	1.1	0.3
2001	0.0	-0.1	1.3	2.7	-10.7	3.0	6.4	27.3	52.6	-183.4	-508.8	-412.0
2002	-234.4	9.1	39.7	5.0	21.0	73.7	75.9	70.8	45.8	19.0	7.0	4.7
2003	1.5	-1.3	13.9	3.2	2.6	11.7	11.7	3.8	20.0	32.1	-42.9	-63.7
Average	-67.0	-17.8	5.5	6.7	5.0	15.0	14.9	17.4	22.4	-21.9	-109.6	-117.6
Critical	-152.1	-55.4	-14.0	5.7	17.8	47.6	44.8	45.8	63.8	-92.8	-361.7	-363.4
Dry	-78.4	-10.8	18.3	13.5	4.1	22.7	23.9	32.3	25.9	-52.5	-211.4	-247.8
BN	0.1	0.0	-0.3	-3.2	3.2	5.2	4.5	6.0	4.3	1.6	0.5	0.1
AN	-68.0	-20.9	19.4	10.5	2.1	4.3	4.4	5.5	16.7	24.0	0.1	-8.0
Wet	-25.8	-2.2	4.5	3.8	0.2	0.2	1.1	2.5	4.0	5.4	5.6	6.3

Table E.3-162. Montezuma Slough location SLMZU011 salinity (EC) percent difference of No Crop Idle from Base.

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1971	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1972	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1973	0.0	0.0	0.0	0.0	0.0	0.1	0.1	-0.1	0.0	0.0	0.0	0.0
1974	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1975	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1976	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	-0.4	-2.7	-3.0
1977	-2.6	-1.1	-0.5	-0.2	0.0	-0.1	0.0	0.0	0.2	-0.6	-1.8	-1.6
1978	-1.8	-0.7	0.2	1.4	0.4	0.3	0.1	0.5	0.7	0.3	0.1	0.0
1979	0.0	0.0	0.0	-0.2	0.7	1.6	0.8	0.7	0.3	0.0	0.0	0.0
1980	0.0	0.3	0.6	0.1	-0.1	0.0	0.2	0.4	0.2	0.0	0.0	0.0
1981	0.0	0.0	0.1	0.0	-0.5	0.2	0.3	0.3	0.2	-0.3	-1.8	-2.2
1982	-1.3	0.7	1.0	0.0	0.0	-0.2	0.0	0.2	0.5	0.2	0.0	0.0
1983	-1.4	0.1	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.3	0.4
1984	0.1	0.3	0.0	0.0	0.1	0.1	0.2	0.4	0.1	0.0	0.0	0.0
1985	0.0	0.0	0.5	0.0	0.1	0.2	0.1	0.2	0.1	0.0	0.0	0.0
1986	0.0	0.0	0.0	0.3	0.1	0.0	0.1	0.2	0.1	0.0	0.0	0.0
1987	0.0	0.0	0.0	0.1	0.2	0.2	0.1	0.0	0.1	-1.1	-3.4	-3.9
1988	-2.8	-1.1	0.4	1.3	1.3	0.1	0.4	0.5	0.3	-1.7	-3.7	-2.6
1989	-2.1	-0.8	0.7	1.3	0.3	2.8	5.4	2.9	0.4	-0.1	-1.2	-1.8
1990	-0.9	-0.3	-0.1	0.4	2.5	3.0	1.7	0.7	0.6	-0.9	-2.6	-2.5
1991	-2.3	-0.9	-0.4	-0.2	0.7	3.5	1.6	1.2	0.9	-0.5	-2.1	-1.8
1992	-1.6	-0.6	-0.2	-0.1	0.8	2.7	2.0	1.1	0.5	-1.4	-3.3	-2.7
1993	-2.3	-0.8	1.0	2.5	1.6	3.1	2.7	3.7	6.6	3.0	0.5	0.1
1994	0.0	0.0	0.0	0.7	0.5	1.6	1.4	1.1	0.8	0.1	-1.6	-2.2
1995	-1.9	-0.6	0.3	2.2	0.6	0.0	-0.2	-0.1	0.7	1.1	1.1	0.8
1996	-0.1	0.0	1.1	1.9	0.2	0.0	0.1	0.2	0.7	0.6	0.2	0.1
1997	-0.4	-0.9	0.0	-0.1	-0.1	0.6	0.8	0.7	0.4	0.2	0.0	0.1
1998	-0.2	0.0	0.2	0.7	-0.2	-0.2	0.0	0.1	0.0	0.3	0.5	0.7
1999	-0.1	0.6	0.6	0.3	0.1	0.0	0.2	0.4	0.4	0.2	0.1	0.0
2000	0.0	0.0	0.0	0.4	0.8	0.1	0.3	0.4	0.2	0.0	0.0	0.0
2001	0.0	0.0	0.0	0.1	-0.7	0.3	0.3	0.6	0.7	-1.9	-4.2	-2.9
2002	-2.5	0.1	1.5	1.0	2.5	3.6	3.4	2.3	0.8	0.2	0.1	0.0
2003	0.0	0.0	0.5	0.8	0.5	0.9	1.0	0.8	1.0	0.6	-0.5	-0.7
Average	-0.7	-0.2	0.2	0.4	0.4	0.7	0.7	0.6	0.5	-0.1	-0.8	-0.8
Critical	-1.5	-0.6	-0.1	0.3	0.8	1.6	1.0	0.7	0.6	-0.8	-2.6	-2.4
Dry	-0.8	-0.1	0.5	0.4	0.3	1.2	1.6	1.0	0.4	-0.5	-1.7	-1.8
BN	0.0	0.0	0.0	-0.1	0.3	0.8	0.4	0.4	0.1	0.0	0.0	0.0
AN	-0.7	-0.2	0.4	0.9	0.5	0.8	0.8	1.0	1.4	0.7	0.0	-0.1
Wet	-0.4	0.0	0.3	0.4	0.1	0.0	0.1	0.2	0.2	0.2	0.2	0.2

Table E.3-163. Montezuma Slough location SLMZU025 salinity (EC) difference No Crop Idle minus Base.

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	-0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1971	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1972	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1973	0.0	0.0	0.0	0.0	0.0	-0.5	-1.5	-1.1	-0.2	-0.1	0.0	0.0
1974	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	-0.2
1975	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1976	0.0	0.0	0.0	0.0	0.0	0.0	0.7	-0.6	51.5	-173.3	-492.8	-516.3
1977	-262.4	-96.6	-41.7	-8.5	-6.7	-2.9	-2.1	11.4	29.1	-179.3	-373.8	-305.6
1978	-171.7	-59.6	14.3	4.1	0.6	0.3	0.2	0.9	6.3	9.7	4.3	1.2
1979	0.2	0.1	-0.7	5.8	2.1	1.4	3.0	4.3	4.3	1.8	0.7	0.2
1980	1.5	17.9	27.1	1.8	-0.5	0.1	0.4	1.7	1.9	0.6	0.3	0.1
1981	-0.1	0.5	2.0	2.9	-1.2	0.9	3.1	8.0	9.9	-45.3	-307.1	-328.6
1982	-106.6	-14.5	0.0	0.1	-0.4	-0.3	0.0	0.1	0.9	2.5	1.3	0.0
1983	2.8	1.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	1.6	1.8
1984	4.2	0.5	0.0	0.0	0.0	0.1	0.7	4.0	4.0	1.3	0.4	0.0
1985	-0.3	5.1	4.9	4.8	4.5	3.0	2.5	4.7	5.1	2.3	1.6	1.5
1986	1.2	1.1	7.4	3.1	0.0	0.0	0.2	0.6	0.9	0.3	0.1	0.0
1987	0.0	0.7	0.3	3.6	2.5	0.9	1.4	1.6	12.4	-188.8	-552.8	-589.9
1988	-245.1	-95.9	36.4	13.5	5.1	3.3	30.3	31.1	28.8	-320.3	-552.6	-419.0
1989	-217.1	-65.3	72.7	67.9	13.2	15.3	16.7	35.2	18.0	-21.3	-204.8	-215.3
1990	-59.8	-16.3	-6.7	21.2	58.8	104.4	69.3	47.4	60.8	-401.4	-513.2	-417.6
1991	-231.1	-79.9	-37.1	-10.5	40.8	30.8	25.1	68.3	93.1	-182.9	-379.6	-306.7
1992	-163.7	-59.4	-21.8	-6.1	10.8	16.4	44.4	55.8	41.0	-303.9	-529.8	-433.6
1993	-201.7	-67.1	89.2	16.7	1.3	3.1	1.2	3.1	18.5	46.7	23.0	6.9
1994	0.6	0.7	-0.7	41.4	12.0	34.9	52.1	48.9	64.2	-30.3	-332.8	-366.5
1995	-141.2	-42.3	30.9	5.9	0.5	0.0	0.1	0.0	0.2	2.2	22.1	21.0
1996	-0.5	0.0	14.4	2.2	0.0	0.0	0.0	0.1	5.5	16.3	10.7	2.8
1997	-1.7	-0.6	0.2	0.0	0.0	0.9	3.7	8.5	11.2	6.6	1.9	2.0
1998	-0.1	0.1	9.9	3.1	0.0	0.0	0.0	0.0	0.0	0.2	5.4	9.0
1999	2.9	5.4	1.2	0.1	0.0	0.0	0.1	1.3	6.2	7.0	2.7	0.5
2000	0.1	0.0	-0.1	9.8	0.3	0.0	0.4	2.0	3.9	1.8	0.6	0.1
2001	0.0	-0.1	1.7	7.2	2.0	0.8	3.1	24.1	47.7	-318.2	-522.2	-419.6
2002	-210.5	31.2	22.3	1.2	12.0	29.1	34.7	37.5	30.5	13.2	6.6	5.4
2003	1.1	-1.1	7.0	0.3	0.5	3.7	2.7	0.5	21.3	1.6	-45.6	-49.5
Average	-58.8	-15.7	6.9	5.6	4.7	7.2	8.6	11.7	17.0	-60.3	-138.9	-126.9
Critical	-137.4	-49.6	-10.2	7.3	17.3	26.7	31.4	37.5	52.6	-227.3	-453.5	-395.1
Dry	-71.3	-4.7	17.3	14.6	5.5	8.3	10.2	18.5	20.6	-93.0	-263.1	-257.7
BN	0.1	0.0	-0.4	2.9	1.0	0.7	1.5	2.1	2.2	0.9	0.3	0.1
AN	-61.8	-18.3	22.9	5.5	0.4	1.1	0.6	1.2	8.6	10.1	-2.9	-6.9
Wet	-18.4	-3.7	4.9	1.1	0.0	0.1	0.4	1.1	2.2	2.8	3.6	2.8

Table E.3-164. Montezuma Slough location SLMZU025 salinity (EC) percent difference of No Crop Idle from Base.

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1971	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1972	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1973	0.0	0.0	0.0	0.0	0.0	-0.3	-0.5	-0.2	0.0	0.0	0.0	0.0
1974	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1975	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1976	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.6	-1.9	-4.9	-4.3
1977	-2.5	-1.0	-0.4	-0.2	-0.2	-0.1	0.0	0.2	0.3	-1.6	-3.1	-2.3
1978	-1.7	-0.6	0.3	1.2	0.3	0.1	0.1	0.3	0.8	0.4	0.1	0.0
1979	0.0	0.0	0.0	0.4	0.7	0.5	0.7	0.8	0.3	0.0	0.0	0.0
1980	0.0	0.3	0.9	0.6	-0.2	0.0	0.2	0.3	0.2	0.0	0.0	0.0
1981	0.0	0.0	0.1	0.2	-0.3	0.2	0.4	0.4	0.2	-0.7	-3.7	-3.2
1982	-1.2	-0.9	0.0	0.0	-0.2	-0.2	0.0	0.0	0.3	0.1	0.0	0.0
1983	0.4	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.3	0.3
1984	0.5	0.2	0.0	0.0	0.0	0.0	0.2	0.4	0.1	0.0	0.0	0.0
1985	0.0	0.6	0.6	0.3	0.4	0.2	0.2	0.2	0.1	0.0	0.0	0.0
1986	0.0	0.0	0.2	0.4	0.0	0.0	0.1	0.1	0.1	0.0	0.0	0.0
1987	0.0	0.0	0.0	0.1	0.2	0.2	0.1	0.0	0.2	-2.7	-6.0	-5.4
1988	-2.7	-1.1	1.0	2.6	0.8	0.1	0.7	0.7	0.5	-4.1	-5.5	-3.6
1989	-2.0	-0.8	0.9	1.4	0.4	2.6	5.0	3.0	0.5	-0.3	-2.6	-2.6
1990	-0.8	-0.2	-0.1	0.8	5.0	4.6	2.0	1.0	0.8	-4.1	-4.7	-3.5
1991	-2.3	-0.8	-0.4	-0.2	1.0	3.1	2.7	1.8	1.2	-1.9	-3.5	-2.6
1992	-1.6	-0.6	-0.2	-0.1	1.1	2.8	2.8	1.3	0.7	-3.8	-5.0	-3.6
1993	-2.2	-0.7	1.4	3.1	0.6	1.4	0.6	1.4	5.7	2.9	0.4	0.2
1994	0.0	0.0	0.0	1.1	1.3	2.4	2.0	1.5	1.1	-0.4	-3.4	-3.3
1995	-1.9	-0.6	0.5	1.6	0.2	0.0	0.0	0.0	0.1	0.7	1.5	1.0
1996	0.0	0.0	1.7	0.9	0.0	0.0	0.0	0.0	0.9	0.6	0.2	0.1
1997	-0.1	0.0	0.1	0.0	0.0	0.4	0.8	0.9	0.4	0.2	0.0	0.1
1998	0.0	0.0	0.7	0.7	0.0	0.0	0.0	0.0	0.0	0.1	0.7	0.9
1999	0.2	0.8	0.4	0.1	0.0	0.0	0.1	0.4	0.5	0.3	0.0	0.0
2000	0.0	0.0	0.0	0.8	0.1	0.0	0.2	0.4	0.2	0.1	0.0	0.0
2001	0.0	0.0	0.0	0.3	0.5	0.2	0.4	1.0	1.1	-5.0	-6.1	-3.9
2002	-2.4	0.4	1.8	0.5	3.3	4.2	4.5	2.9	0.8	0.2	0.1	0.1
2003	0.0	0.0	0.6	0.2	0.2	0.9	0.8	0.2	1.7	0.1	-0.9	-1.1
Average	-0.6	-0.1	0.3	0.5	0.4	0.7	0.7	0.6	0.6	-0.6	-1.4	-1.1
Critical	-1.4	-0.5	0.0	0.6	1.3	1.8	1.5	0.9	0.7	-2.5	-4.3	-3.3
Dry	-0.7	0.0	0.6	0.5	0.7	1.3	1.8	1.3	0.5	-1.4	-3.1	-2.5
BN	0.0	0.0	0.0	0.2	0.3	0.3	0.4	0.4	0.1	0.0	0.0	0.0
AN	-0.7	-0.2	0.5	1.0	0.2	0.4	0.2	0.4	1.4	0.6	-0.1	-0.1
Wet	-0.2	0.0	0.3	0.3	0.0	0.0	0.1	0.1	0.2	0.2	0.2	0.2

Table E.3-165. Suisun Slough location SLSUS012 salinity (EC) difference No Crop Idle minus Base.

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1971	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1972	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1973	0.0	0.0	0.0	0.0	0.0	1.6	2.3	-0.9	-0.3	-0.1	0.0	0.0
1974	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.2
1975	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1976	0.0	0.0	0.0	0.0	0.0	0.0	0.6	0.2	3.1	-45.5	-293.0	-390.6
1977	-306.2	-149.1	-73.6	-32.3	-4.2	-10.2	-7.6	1.2	16.3	-68.2	-232.1	-234.5
1978	-192.9	-94.5	-20.6	12.6	1.7	-2.5	-2.6	0.7	11.1	16.0	5.4	0.7
1979	-1.0	-1.2	-2.0	1.1	9.8	8.6	10.4	13.9	10.3	3.3	0.8	-0.1
1980	0.3	9.8	25.5	5.9	1.9	0.5	1.8	5.9	5.4	1.7	0.5	0.1
1981	-0.1	0.1	1.8	4.0	2.1	3.4	7.4	11.6	13.0	-24.8	-160.0	-249.9
1982	-153.8	-36.2	-8.9	-6.7	-2.9	-2.0	-1.5	1.4	2.8	5.2	1.0	-0.6
1983	-12.3	3.1	0.9	-0.7	-0.4	-0.4	-1.1	-0.5	-0.4	0.2	3.4	7.3
1984	4.2	2.8	0.2	-0.1	0.1	0.6	2.1	6.4	7.1	2.8	1.0	0.3
1985	-0.2	5.8	14.6	8.0	5.5	6.5	5.0	7.4	7.3	2.8	1.8	1.2
1986	1.2	0.9	1.6	9.4	2.5	0.7	0.9	2.3	2.3	0.9	0.5	0.3
1987	0.2	0.1	0.3	2.5	6.7	4.5	3.1	1.3	7.0	-88.7	-343.2	-468.8
1988	-316.2	-150.7	-28.1	27.9	23.8	4.2	21.4	37.7	25.3	-134.9	-401.0	-356.3
1989	-259.6	-120.9	-5.6	56.2	13.4	43.5	57.2	87.4	30.8	-3.1	-109.6	-186.0
1990	-100.9	-33.8	-16.4	11.9	60.3	144.8	116.7	60.1	58.8	-94.5	-325.2	-331.6
1991	-267.0	-122.7	-64.2	-29.0	9.0	69.2	56.6	82.7	89.3	-40.3	-233.0	-244.3
1992	-193.3	-93.9	-42.1	-17.0	30.9	40.2	65.6	73.2	42.5	-119.4	-368.7	-359.2
1993	-251.1	-117.4	8.8	50.9	8.4	21.4	16.4	20.4	70.5	104.8	42.6	16.7
1994	3.4	-0.6	-0.5	17.6	37.6	60.3	78.5	69.6	69.9	14.3	-159.4	-260.3
1995	-188.5	-68.8	-9.8	25.9	6.3	1.6	0.0	-1.3	1.3	10.1	32.9	42.3
1996	7.7	1.7	23.2	22.1	5.1	1.5	1.0	1.1	9.3	23.9	11.5	6.3
1997	-2.2	-9.9	-1.5	-2.0	-3.2	4.8	13.0	18.1	18.4	9.5	3.6	3.2
1998	-1.8	-0.2	6.0	13.2	1.6	0.8	0.7	0.6	0.5	1.8	9.3	19.1
1999	4.1	13.7	13.3	4.1	1.3	0.7	1.6	5.1	13.4	11.8	6.9	1.3
2000	0.8	0.6	0.0	14.8	10.0	2.2	2.9	7.3	7.7	4.1	1.6	0.7
2001	0.4	0.3	0.5	4.8	-2.7	4.0	7.6	27.2	48.6	-138.9	-405.9	-362.2
2002	-267.2	-73.9	34.6	8.2	30.4	79.2	86.5	91.6	51.4	21.3	8.0	4.6
2003	2.2	-0.9	22.3	8.6	3.8	12.2	14.8	6.7	24.8	35.2	-33.6	-58.4
Average	-73.2	-30.5	-3.5	6.5	7.6	14.8	16.5	18.8	19.0	-14.4	-86.3	-100.0
Critical	-168.6	-78.7	-32.1	-3.0	22.5	44.1	47.4	46.4	43.6	-69.8	-287.5	-311.0
Dry	-87.7	-31.4	7.7	14.0	9.2	23.5	27.8	37.7	26.4	-38.6	-168.2	-210.2
BN	-0.5	-0.6	-1.0	0.6	4.9	4.3	5.2	6.9	5.2	1.6	0.4	-0.1
AN	-73.5	-33.7	6.0	15.5	4.3	5.9	5.9	6.7	19.9	26.9	2.7	-6.7
Wet	-26.3	-7.1	1.9	5.0	0.8	0.6	1.3	2.5	4.2	5.1	5.4	6.1

Table E.3-166. Suisun Slough location SLSUS012 salinity (EC) percent difference of No Crop Idle from Base.

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1971	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1972	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1973	0.0	0.0	0.0	0.0	0.0	0.2	0.2	0.0	0.0	0.0	0.0	0.0
1974	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1975	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1976	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.3	-1.9	-2.4
1977	-2.2	-1.2	-0.6	-0.3	-0.1	-0.1	-0.1	0.0	0.1	-0.4	-1.4	-1.3
1978	-1.3	-0.7	-0.2	0.3	0.1	-0.2	-0.3	0.1	0.4	0.3	0.1	0.0
1979	0.0	0.0	0.0	0.0	0.4	0.5	0.5	0.5	0.2	0.0	0.0	0.0
1980	0.0	0.1	0.3	0.2	0.2	0.1	0.1	0.3	0.2	0.0	0.0	0.0
1981	0.0	0.0	0.0	0.1	0.1	0.1	0.2	0.2	0.2	-0.2	-1.2	-1.7
1982	-1.2	-0.5	-0.4	-0.7	-0.4	-0.3	-0.3	0.3	0.2	0.1	0.0	0.0
1983	-0.3	0.1	0.1	-0.1	-0.1	-0.1	-0.2	-0.1	-0.1	0.0	0.2	0.3
1984	0.1	0.2	0.0	0.0	0.0	0.1	0.2	0.2	0.1	0.0	0.0	0.0
1985	0.0	0.1	0.4	0.2	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0
1986	0.0	0.0	0.0	0.2	0.2	0.1	0.1	0.1	0.1	0.0	0.0	0.0
1987	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.0	0.1	-0.8	-2.5	-3.1
1988	-2.4	-1.3	-0.3	0.6	0.8	0.1	0.2	0.4	0.2	-1.1	-2.8	-2.2
1989	-1.8	-0.9	0.0	0.6	0.2	1.1	2.9	2.3	0.4	0.0	-0.8	-1.4
1990	-0.9	-0.3	-0.1	0.1	1.1	2.2	1.4	0.7	0.5	-0.7	-2.1	-2.0
1991	-1.9	-0.9	-0.5	-0.3	0.1	1.3	1.5	1.1	0.8	-0.3	-1.5	-1.5
1992	-1.4	-0.7	-0.3	-0.1	0.5	1.2	1.3	0.9	0.4	-1.0	-2.5	-2.2
1993	-1.8	-1.0	0.1	1.2	0.5	1.6	1.4	1.9	4.4	2.6	0.5	0.2
1994	0.0	0.0	0.0	0.2	0.7	1.3	1.1	0.9	0.7	0.1	-1.1	-1.6
1995	-1.5	-0.6	-0.1	0.7	0.4	0.2	0.0	-0.2	0.2	0.8	0.9	0.7
1996	0.2	0.0	0.6	1.0	0.7	0.3	0.2	0.2	0.5	0.4	0.1	0.1
1997	0.0	-0.2	-0.1	-0.4	-0.6	0.5	0.6	0.6	0.3	0.1	0.0	0.0
1998	0.0	0.0	0.1	0.4	0.2	0.1	0.1	0.1	0.1	0.3	0.4	0.5
1999	0.1	0.4	0.7	0.4	0.3	0.2	0.3	0.4	0.4	0.2	0.1	0.0
2000	0.0	0.0	0.0	0.3	0.7	0.3	0.3	0.4	0.2	0.1	0.0	0.0
2001	0.0	0.0	0.0	0.1	-0.1	0.2	0.3	0.5	0.6	-1.3	-3.1	-2.4
2002	-2.1	-0.7	0.5	0.4	1.7	2.4	2.5	2.2	0.7	0.2	0.1	0.0
2003	0.0	0.0	0.4	0.5	0.3	0.6	0.7	0.6	0.9	0.5	-0.4	-0.6
Average	-0.5	-0.2	0.0	0.2	0.2	0.4	0.5	0.4	0.4	0.0	-0.6	-0.6
Critical	-1.2	-0.6	-0.3	0.0	0.5	0.8	0.8	0.6	0.4	-0.5	-1.9	-1.9
Dry	-0.6	-0.2	0.2	0.2	0.3	0.7	1.0	0.9	0.3	-0.4	-1.3	-1.4
BN	0.0	0.0	0.0	0.0	0.2	0.3	0.3	0.3	0.1	0.0	0.0	0.0
AN	-0.5	-0.3	0.1	0.4	0.3	0.4	0.4	0.5	1.0	0.6	0.0	-0.1
Wet	-0.2	-0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.1	0.1

Table E.3-167. CCWD Intake location in Victoria Canal salinity (EC) difference No Crop Idle minus Base.

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	0.1	0.1	0.0	-0.1	-0.1	-0.1	0.0	0.0	0.0	0.0	0.0	0.0
1971	0.0	-0.1	0.0	0.0	0.0	-0.1	-0.1	0.0	0.0	0.0	0.0	0.0
1972	0.0	0.0	-0.1	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.0
1973	0.0	0.1	0.0	0.0	0.2	-10.6	-4.4	0.0	-0.4	0.0	0.0	-0.1
1974	-0.2	0.0	0.1	0.0	-0.1	0.1	-0.2	0.0	0.1	0.1	0.0	0.1
1975	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.0	-0.1	0.0	0.0	0.0
1976	0.0	-0.1	-0.1	0.0	0.0	0.0	0.0	0.2	0.2	13.6	-11.8	-42.5
1977	-26.6	-10.6	-7.3	-9.5	-2.8	1.4	3.0	1.8	1.1	-12.6	-23.9	-22.4
1978	-25.0	-7.9	-4.7	-0.8	0.7	0.4	0.0	0.3	0.2	0.1	0.1	0.1
1979	0.1	0.1	0.0	0.1	0.3	0.1	0.3	0.2	0.1	0.0	0.0	0.0
1980	0.0	0.1	2.0	1.0	21.8	0.4	0.2	0.3	0.1	-0.1	-0.1	0.0
1981	0.1	0.2	-0.1	0.0	0.1	0.0	0.2	0.5	0.9	-1.2	0.9	9.5
1982	-10.1	-6.6	-1.2	0.4	-8.0	-3.4	0.4	-0.4	-0.3	-0.2	0.0	-0.1
1983	-0.2	-0.1	-0.3	0.0	0.5	0.3	0.1	-0.3	0.2	-0.1	-0.2	-0.1
1984	0.1	-0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.1	0.0	0.0
1985	0.0	0.0	0.1	0.2	0.2	0.2	0.2	0.2	0.2	-0.1	-0.2	-0.3
1986	0.0	0.0	-0.2	0.4	0.1	0.3	0.1	0.0	0.2	0.1	0.0	-0.1
1987	0.0	0.2	0.1	-0.2	0.1	0.0	2.5	2.9	2.4	-2.2	-5.2	-26.0
1988	-16.4	-6.3	-6.0	-0.6	0.4	2.6	2.4	4.1	3.0	-6.7	5.9	-20.9
1989	-22.1	-8.7	-6.1	8.0	8.0	3.8	1.6	4.2	3.0	-0.4	2.5	-0.9
1990	-5.9	-4.5	-3.9	-4.2	-0.3	1.2	1.4	1.1	0.8	9.7	2.2	-24.6
1991	-24.2	-9.8	-6.7	-4.1	-0.9	-0.1	0.7	0.6	2.7	7.2	-0.4	-19.0
1992	-18.1	-6.6	-4.7	-5.1	-3.9	0.2	0.5	2.9	3.2	-1.1	2.5	-22.6
1993	-23.2	-8.1	-2.7	2.2	1.3	1.0	0.7	0.7	-14.5	-6.9	0.6	0.3
1994	0.0	0.0	0.0	0.4	1.5	0.8	0.6	0.5	0.4	-0.8	-18.7	-1.7
1995	-4.6	0.5	-2.8	0.6	0.7	0.3	0.2	0.1	0.2	-0.1	0.0	0.1
1996	-0.1	-0.1	0.0	0.1	0.2	-0.1	0.3	0.0	0.1	0.1	0.2	0.1
1997	0.0	-0.1	-0.1	-0.4	-0.2	0.0	0.0	0.3	0.2	0.1	-0.1	-0.3
1998	0.3	0.4	0.2	0.4	0.3	-0.1	0.0	0.4	0.2	-0.1	-0.2	0.0
1999	-0.1	0.0	0.1	-0.1	0.0	0.0	0.4	0.3	0.2	0.1	0.1	0.1
2000	0.0	0.0	-0.1	-0.3	0.1	0.3	0.3	-0.1	-0.1	0.1	0.0	0.0
2001	0.0	-0.1	-0.1	-0.6	0.1	0.1	0.9	1.0	2.1	-1.8	4.5	-11.5
2002	-12.0	-4.0	1.7	0.8	0.6	0.3	0.2	0.1	1.2	0.1	-0.1	-0.8
2003	-0.9	-0.1	-0.1	0.5	0.1	0.1	0.2	0.2	0.1	1.1	1.5	-2.6
Average	-5.6	-2.1	-1.3	-0.3	0.6	0.0	0.4	0.7	0.2	0.0	-1.2	-5.5
Critical	-13.0	-5.4	-4.1	-3.3	-0.9	0.9	1.2	1.6	1.6	1.3	-6.3	-22.0
Dry	-5.7	-2.1	-0.7	1.4	1.5	0.7	0.9	1.5	1.6	-0.9	0.4	-5.0
BN	0.1	0.1	0.0	0.0	0.1	0.1	0.2	0.2	0.0	0.0	0.0	0.0
AN	-8.2	-2.7	-0.9	0.4	4.0	-1.4	-0.5	0.2	-2.4	-0.9	0.3	-0.4
Wet	-1.1	-0.5	-0.3	0.1	-0.5	-0.2	0.1	0.0	0.1	0.0	0.0	0.0

Table E.3-168. CCWD Intake location in Victoria Canal salinity (EC) percent difference of No Crop Idle from Base.

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1971	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1972	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1973	0.0	0.0	0.0	0.0	0.0	-2.6	-1.3	0.0	-0.1	0.0	0.0	0.0
1974	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	0.0	0.0	0.0	0.0
1975	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1976	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.2	-2.1	-8.2
1977	-4.7	-1.8	-1.2	-1.2	-0.4	0.3	0.6	0.4	0.2	-2.6	-5.0	-3.8
1978	-3.5	-1.3	-0.7	-0.1	0.1	0.1	0.0	0.1	0.1	0.0	0.0	0.0
1979	0.0	0.0	0.0	0.0	0.1	0.0	0.1	0.1	0.0	0.0	0.0	0.0
1980	0.0	0.0	0.4	0.2	6.0	0.2	0.1	0.1	0.0	0.0	0.0	0.0
1981	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.2	-0.4	0.2	2.0
1982	-1.9	-1.4	-0.4	0.1	-2.2	-0.9	0.2	-0.2	-0.1	-0.1	0.0	0.0
1983	-0.1	0.0	-0.1	0.0	0.2	0.1	0.1	-0.2	0.1	0.0	-0.1	-0.1
1984	0.1	-0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1985	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	-0.1
1986	0.0	0.0	0.0	0.1	0.0	0.1	0.0	0.0	0.1	0.0	0.0	0.0
1987	0.0	0.1	0.0	0.0	0.0	0.0	0.5	0.6	0.7	-0.7	-1.4	-6.2
1988	-3.3	-1.2	-1.1	-0.1	0.1	0.5	0.5	0.9	0.7	-2.1	1.5	-4.4
1989	-3.9	-1.5	-1.0	1.1	1.2	0.6	0.3	1.0	1.0	-0.1	0.6	-0.2
1990	-1.3	-0.9	-0.7	-0.7	-0.1	0.3	0.3	0.3	0.2	2.4	0.4	-4.8
1991	-4.0	-1.5	-0.9	-0.5	-0.1	0.0	0.1	0.1	0.8	1.8	-0.1	-3.8
1992	-3.0	-1.1	-0.7	-0.7	-0.5	0.0	0.1	0.7	1.0	-0.4	0.6	-4.6
1993	-4.0	-1.5	-0.5	0.3	0.2	0.2	0.1	0.1	-3.4	-2.2	0.2	0.1
1994	0.0	0.0	0.0	0.1	0.3	0.2	0.1	0.1	0.1	-0.2	-3.3	-0.4
1995	-0.8	0.1	-0.5	0.1	0.1	0.1	0.1	0.0	0.1	0.0	0.0	0.0
1996	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.1	0.0
1997	0.0	0.0	0.0	-0.1	-0.1	0.0	0.0	0.1	0.1	0.1	0.0	-0.1
1998	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.2	0.1	0.0	-0.1	0.0
1999	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.0	0.0	0.0
2000	0.0	0.0	0.0	-0.1	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.0
2001	0.0	0.0	0.0	-0.1	0.0	0.0	0.2	0.2	0.6	-0.6	1.3	-2.8
2002	-2.4	-0.8	0.3	0.1	0.1	0.1	0.0	0.0	0.3	0.0	0.0	-0.2
2003	-0.2	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.4	0.6	-0.8
Average	-1.0	-0.4	-0.2	0.0	0.2	0.0	0.1	0.2	0.1	0.0	-0.2	-1.1
Critical	-2.3	-0.9	-0.7	-0.4	-0.1	0.2	0.3	0.4	0.4	0.3	-1.1	-4.3
Dry	-1.1	-0.4	-0.1	0.2	0.2	0.1	0.2	0.3	0.5	-0.3	0.1	-1.2
BN	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0
AN	-1.3	-0.5	-0.1	0.1	1.1	-0.3	-0.1	0.1	-0.6	-0.3	0.1	-0.1
Wet	-0.2	-0.1	-0.1	0.0	-0.1	-0.1	0.0	0.0	0.0	0.0	0.0	0.0

E.3.1.2 Stage Model Output

Model output for each location is presented here in two basic forms – as Tables and as Figures showing monthly average of daily minimum stage for the Base scenario and change from Base for monthly average of daily minimum stage, (Scenario – Base). The Tables have several subtypes, although all of them show results for water years 1970 – 2003, including average monthly results for the average over all water year types and results split by water year type. For each location, the Tables show Base monthly average of daily minimum stage, change from Base of Monthly Average of daily minimum stage and percent change from Base of monthly average of daily minimum stage for each of the three alternative scenarios (i.e., seven tables per location).

Results were calculated upstream and downstream of agricultural barrier locations in Old River, Middle River and Grant Line Canal, as well as at three additional locations: Old River near Middle River, Old River near Tracy, and RMID040 in Middle River.

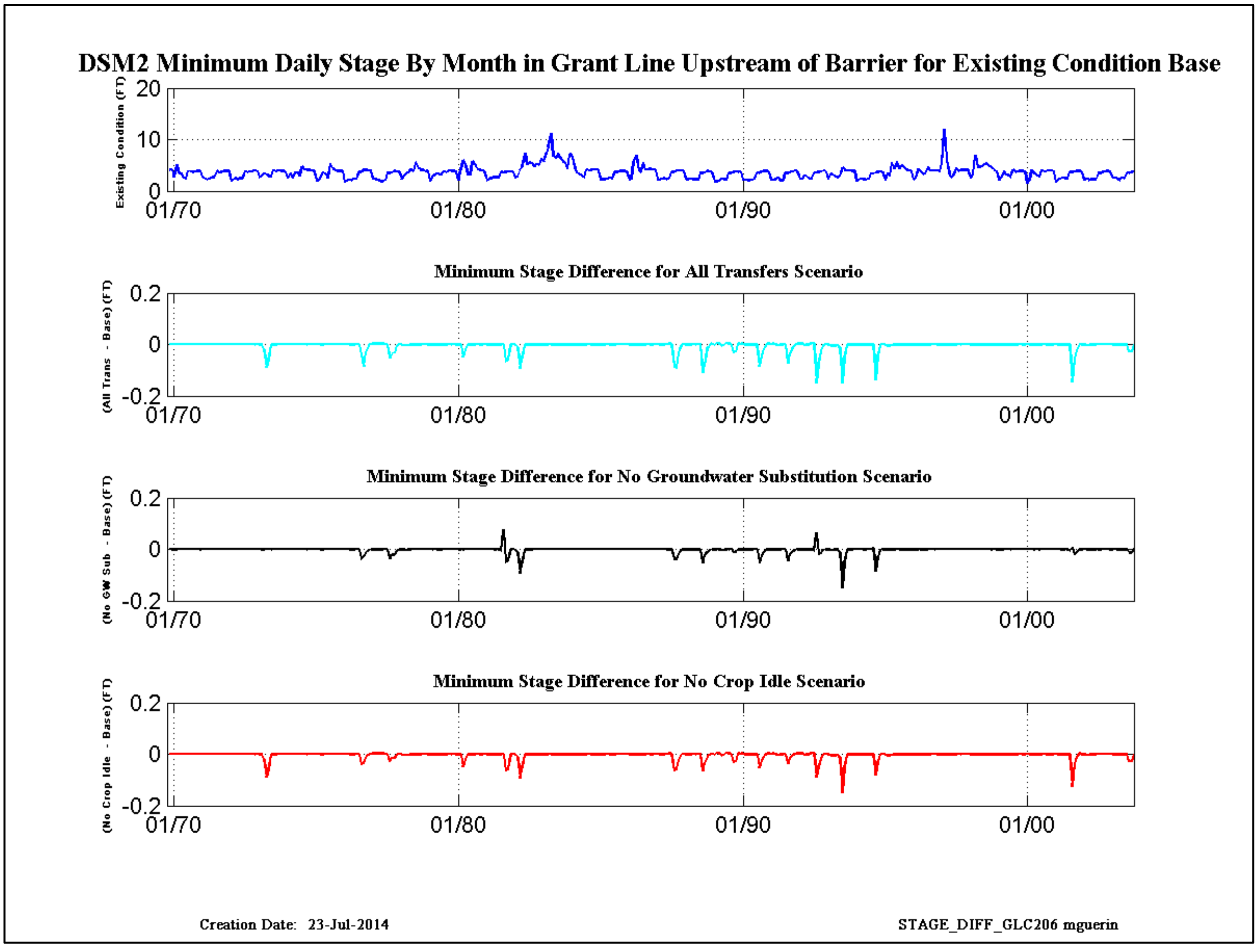


Figure E.3-23. Minimum stage at Grant Line barrier and minimum stage differences Scenario – Base.

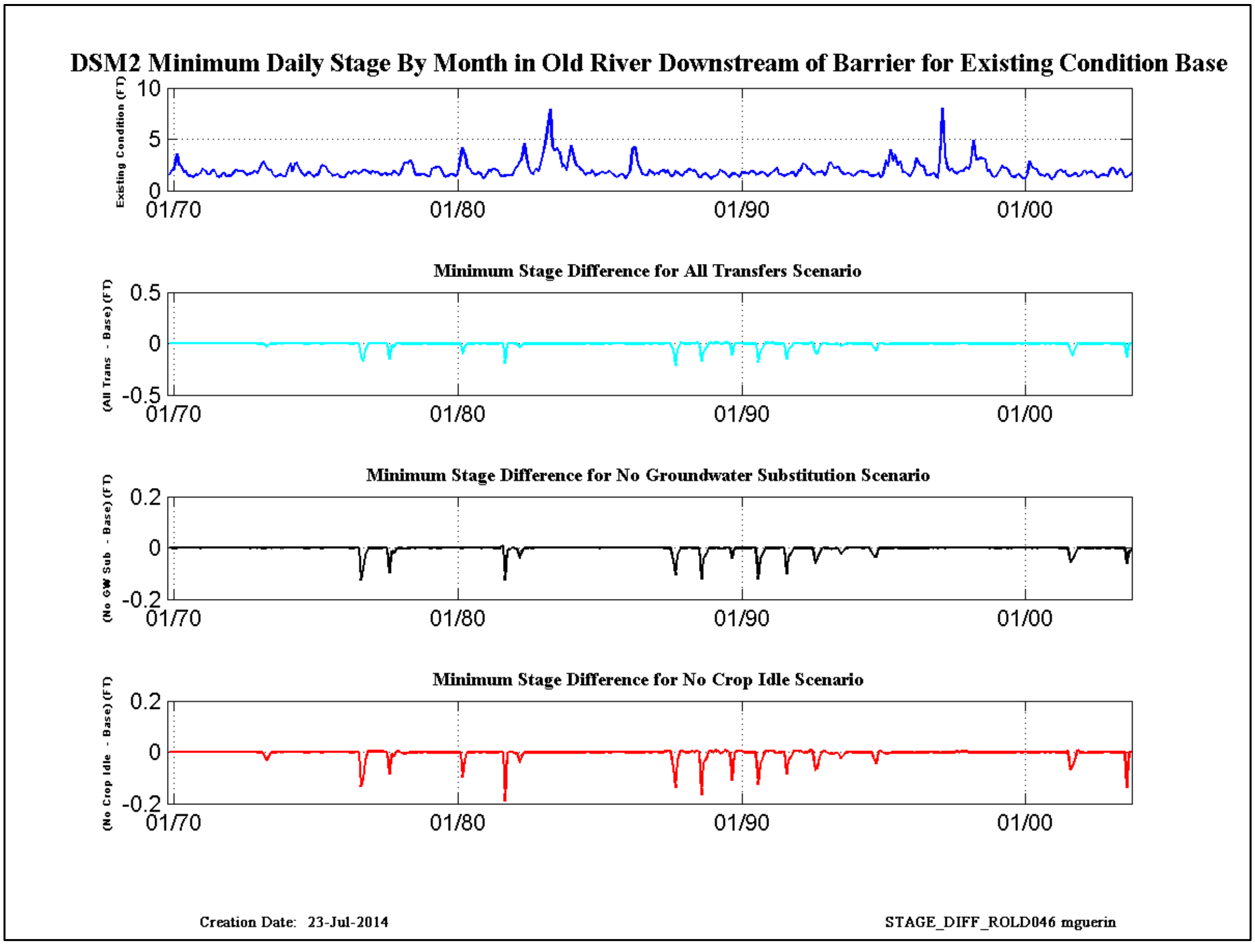


Figure E.3-24. Minimum stage at Old River Downstream barrier and minimum stage differences Scenario – Base.

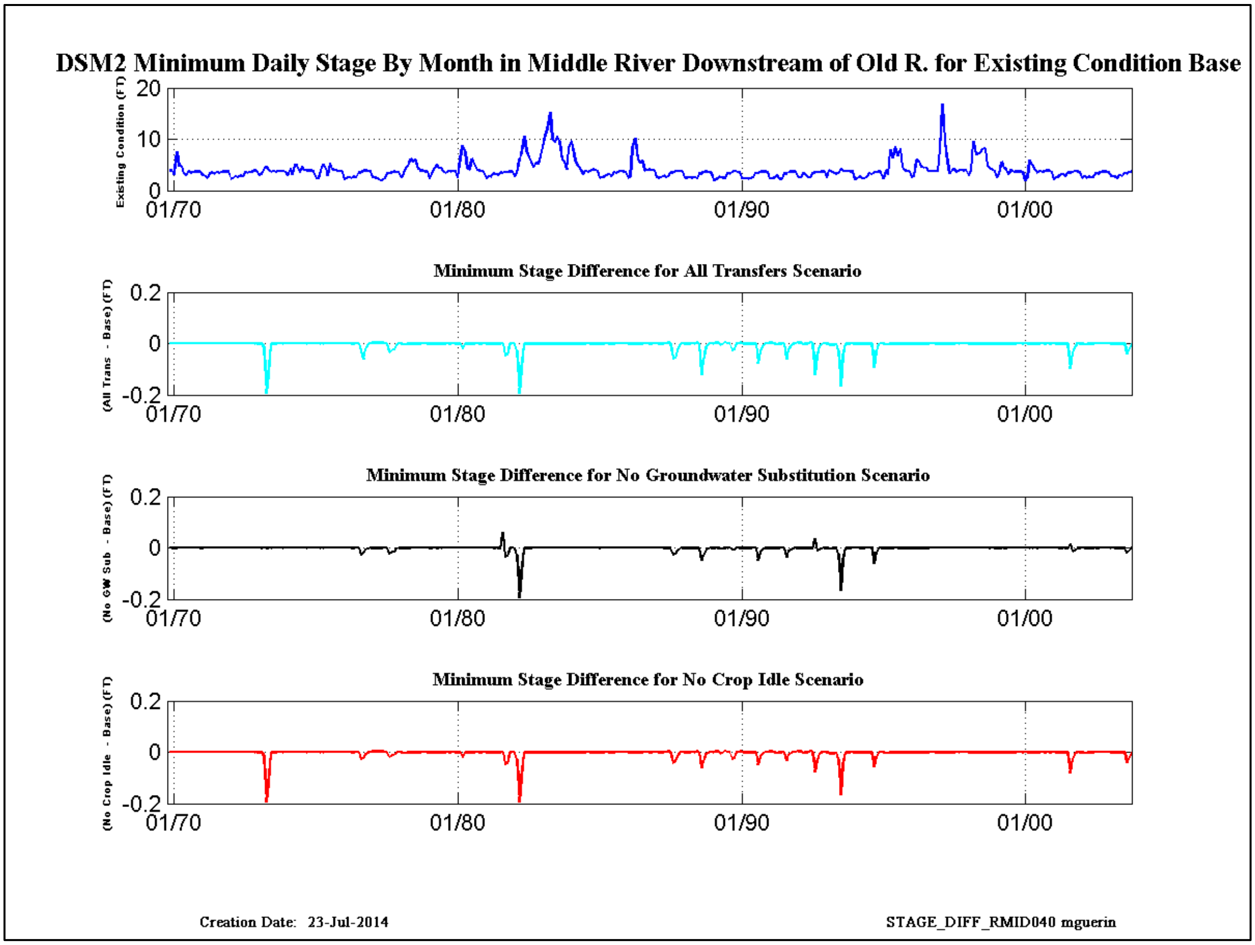


Figure E.3-25. Minimum stage at Middle River Downstream of Old R. barrier and minimum stage differences Scenario – Base.

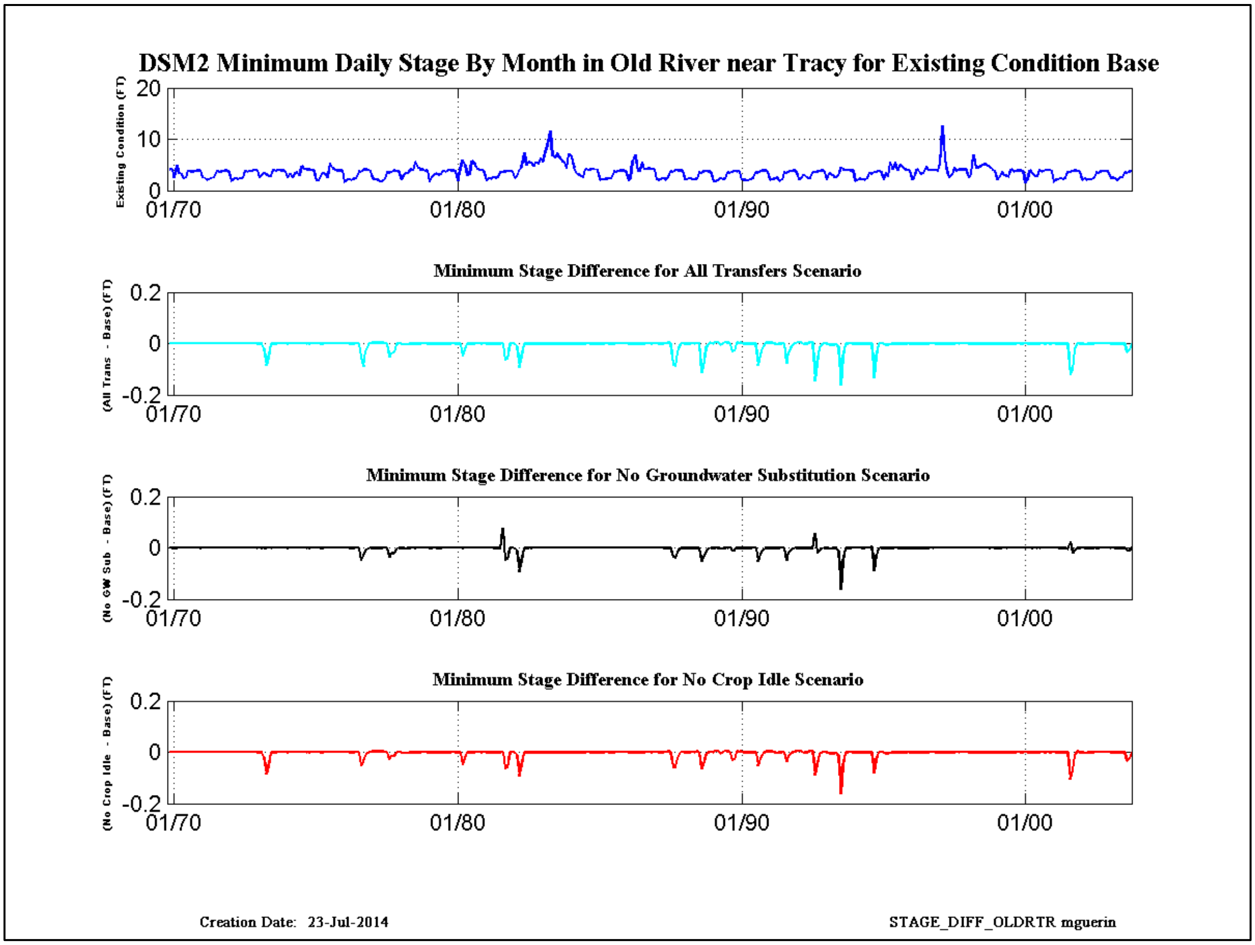
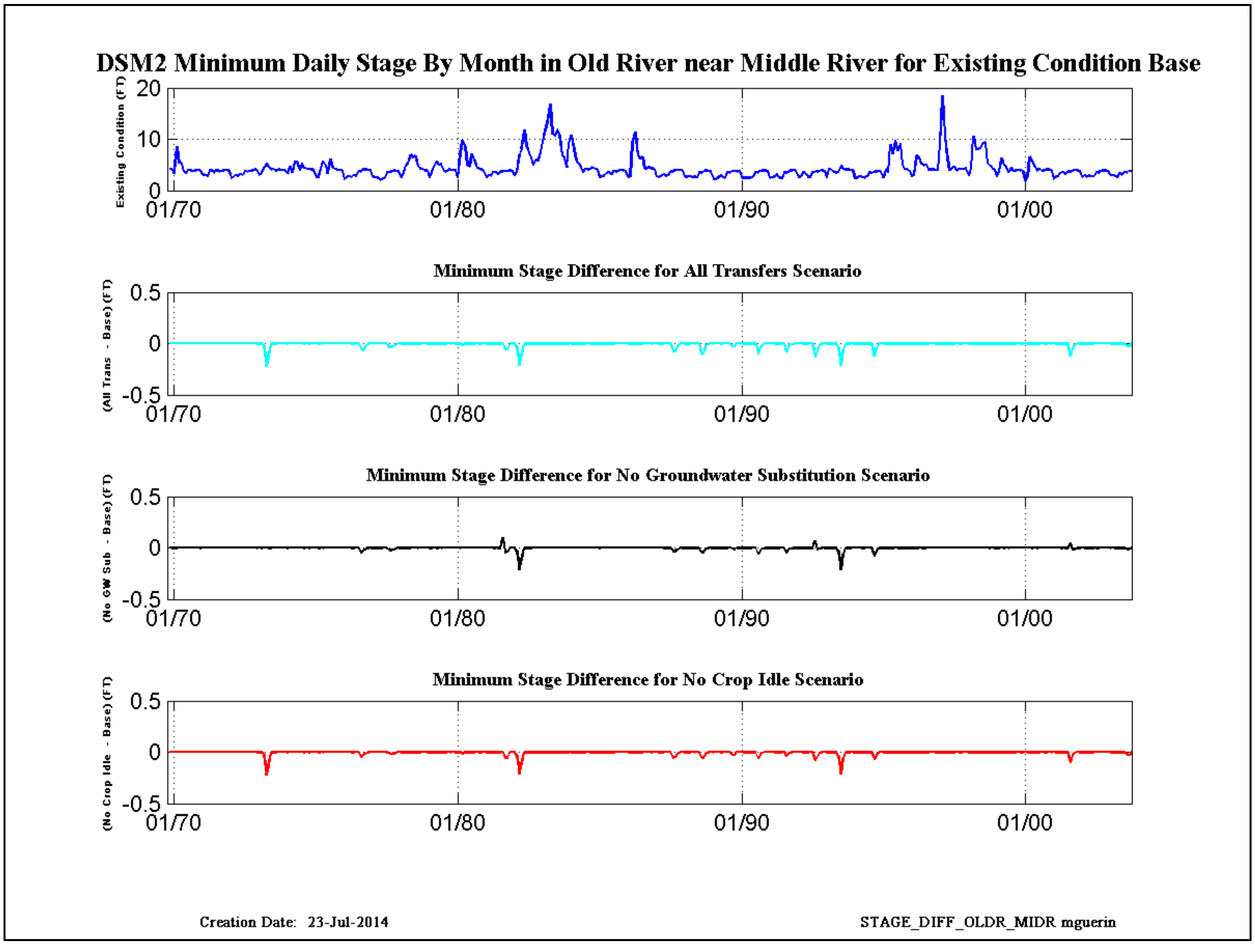


Figure E.3-26. Minimum stage at Old River near Tracy barrier and minimum stage differences Scenario – Base.

1


2 **Figure E.3-27. Minimum stage at Old River near Middle River barrier and minimum stage**
3 **differences Scenario – Base.**

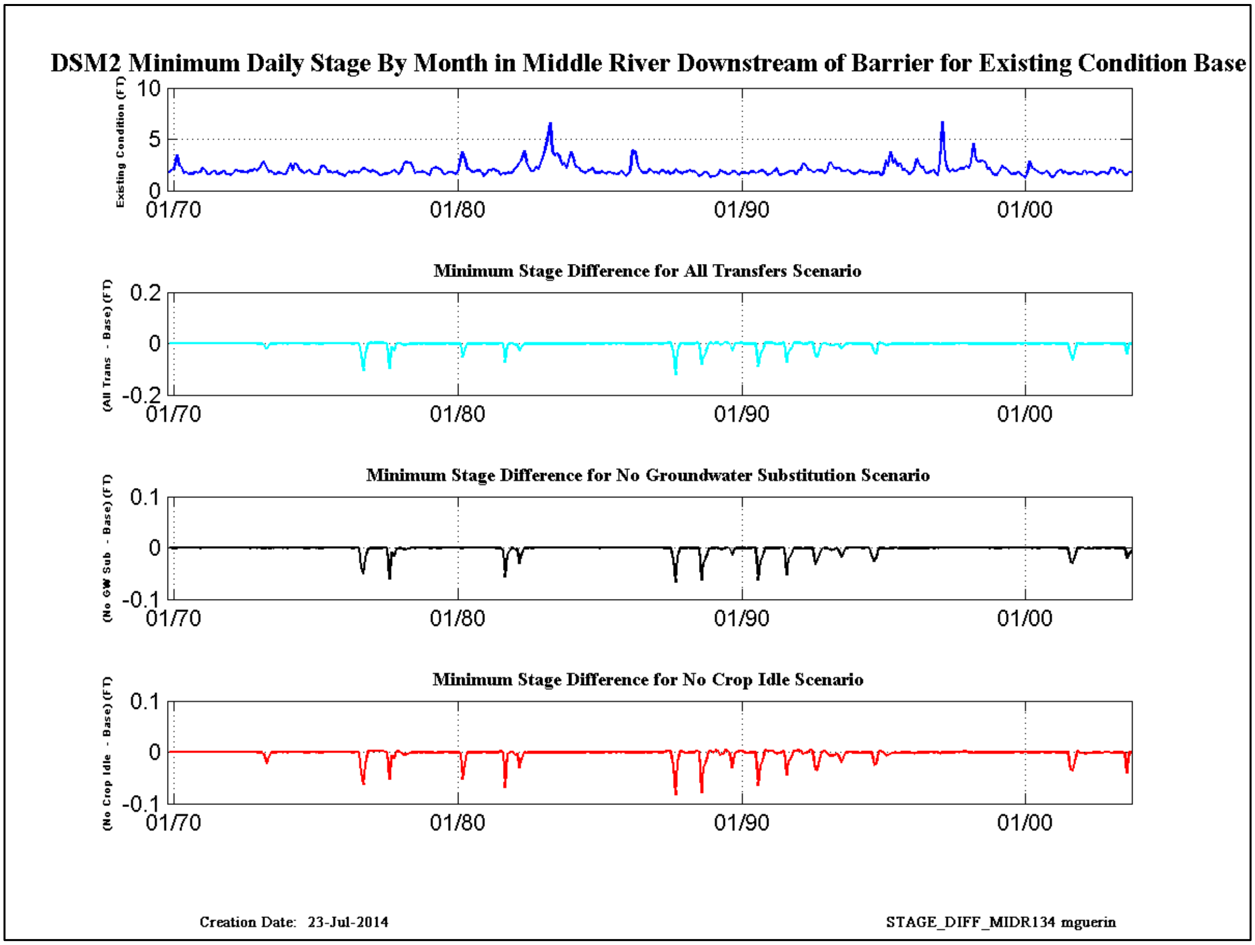


Figure E.3-28. Minimum stage at Middle River barrier and minimum stage differences Scenario – Base.

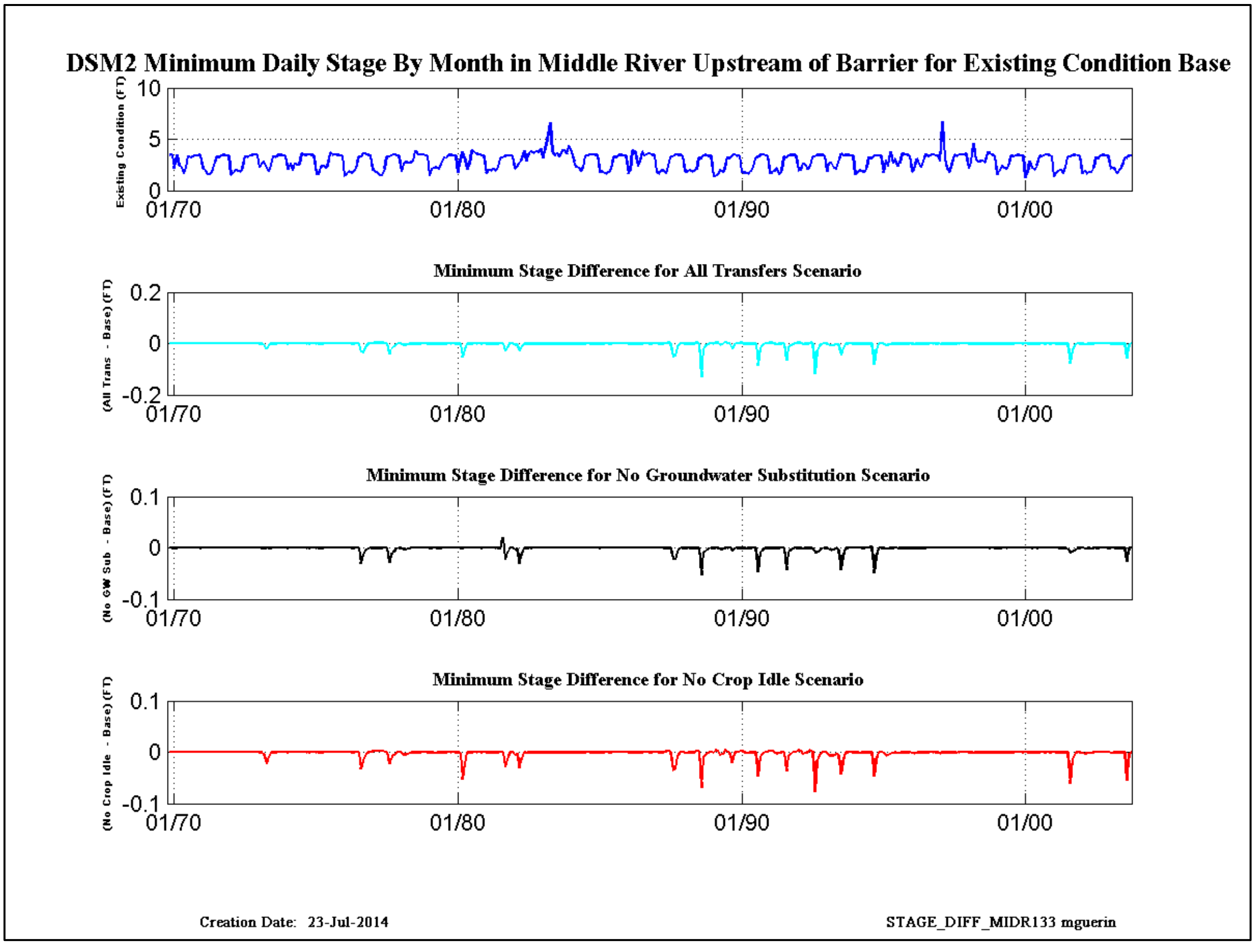


Figure E.3-29. Minimum stage at Middle River Upstream barrier and minimum stage differences Scenario – Base.

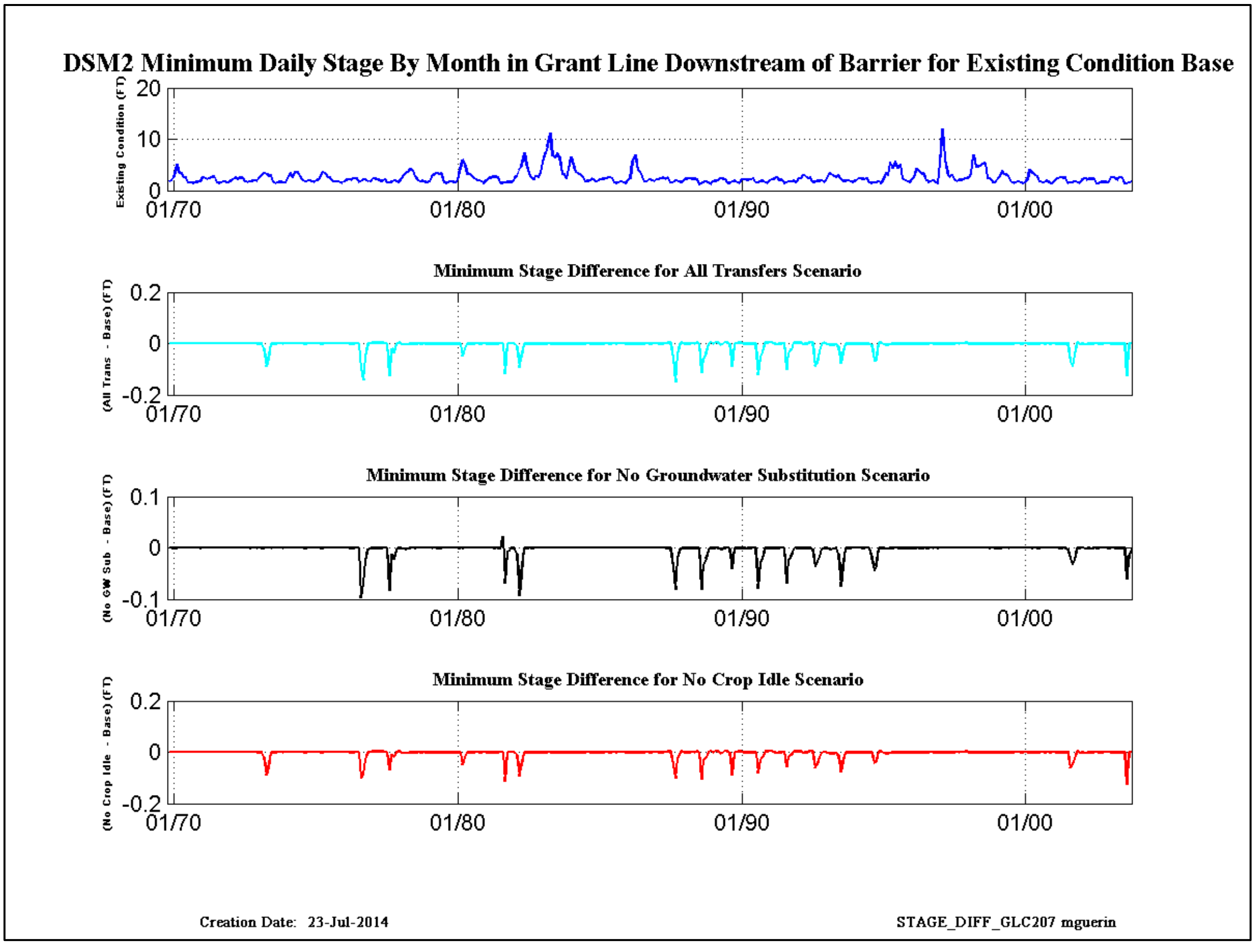


Figure E.3-30. Minimum stage downstream of Grant Line barrier and minimum stage differences Scenario – Base.

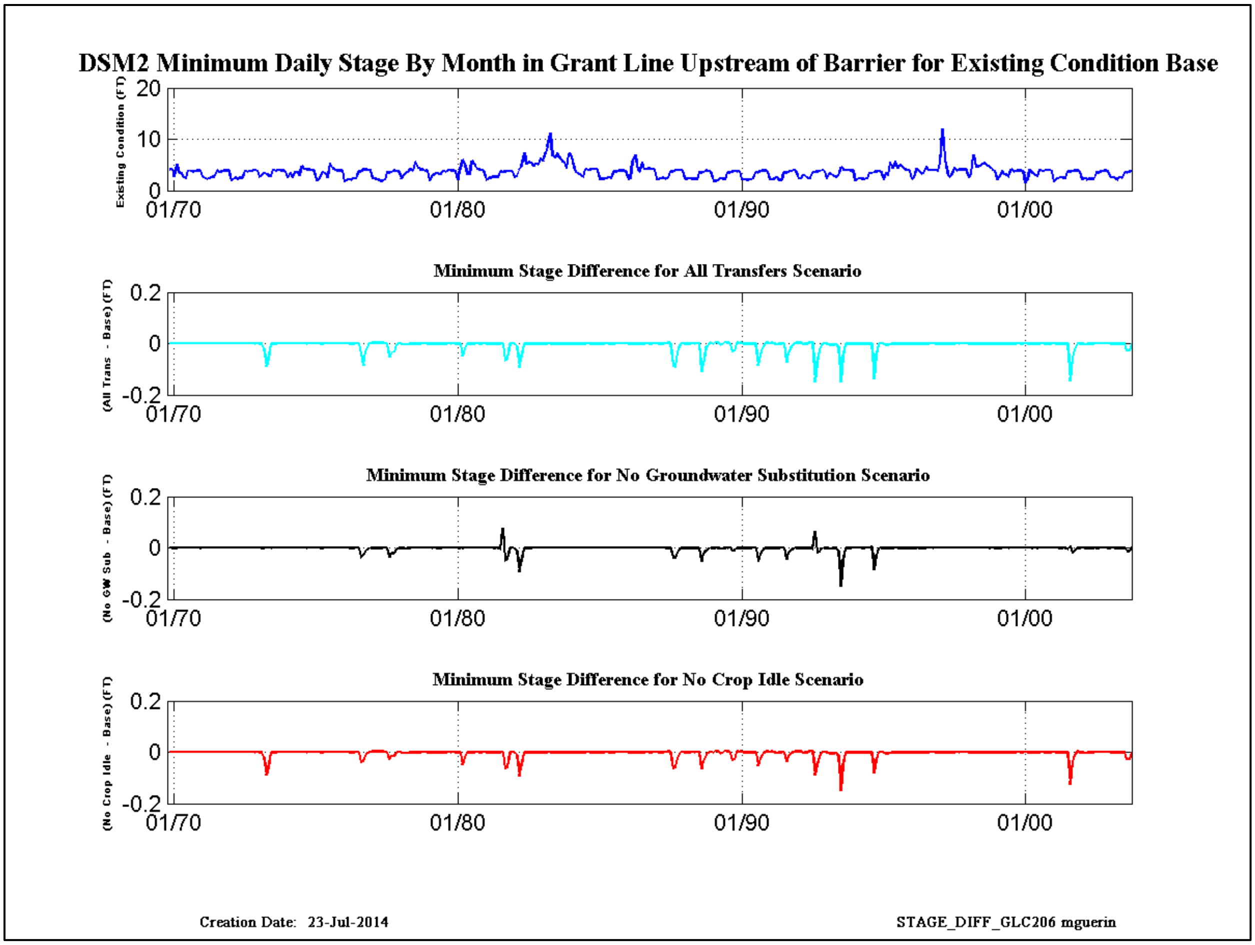


Figure E.3-31. Minimum stage at Grant Line Upstream barrier and minimum stage differences Scenario – Base.

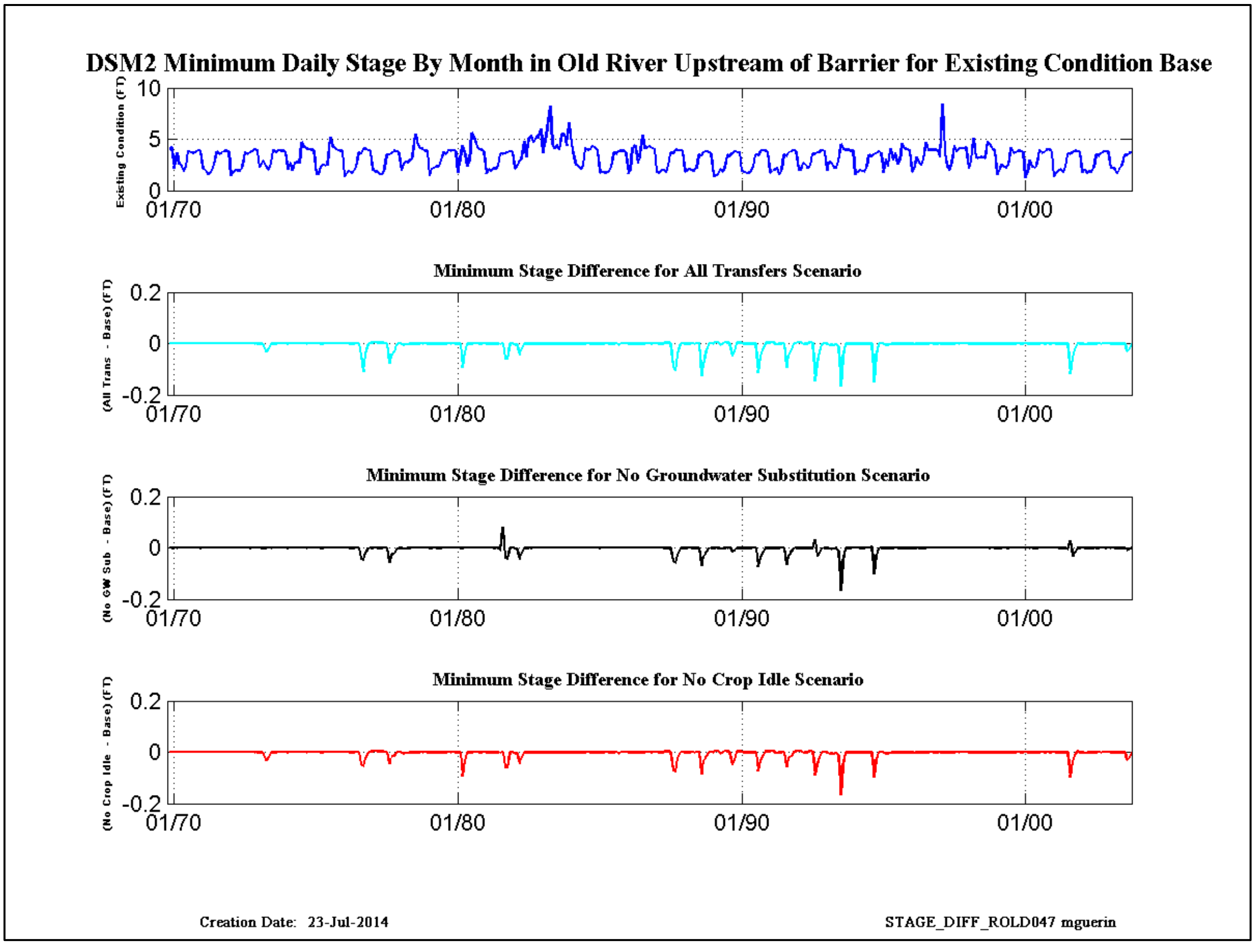


Figure E.3-32. Minimum stage at Old River Upstream barrier and minimum stage differences Scenario – Base.

Table E.3-169. Grant Line upstream of barrier Base stage (ft).

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	4.1	4.2	2.7	5.1	3.5	3.3	2.6	2.5	3.9	3.8	3.7	3.8
1971	3.9	3.9	2.6	2.4	2.1	2.5	2.7	2.7	3.9	3.6	3.7	3.8
1972	3.9	3.9	2.0	2.1	2.5	2.3	2.5	2.5	3.8	3.6	3.8	3.8
1973	4.0	3.9	2.6	3.0	3.4	3.2	2.9	2.9	4.0	3.8	4.0	3.9
1974	3.9	3.8	2.5	3.4	2.5	3.6	3.6	2.9	4.8	4.2	4.1	4.1
1975	4.0	3.9	2.1	2.1	3.0	3.6	3.2	2.6	5.3	4.3	4.1	3.9
1976	3.9	3.9	1.8	2.1	2.3	2.1	2.4	2.4	3.7	3.7	4.1	4.1
1977	4.0	3.9	2.4	2.2	2.2	1.9	1.9	2.2	3.5	3.5	3.6	3.9
1978	3.8	3.7	2.3	3.0	3.5	3.6	4.2	3.8	5.6	4.5	4.1	4.1
1979	3.8	3.9	1.9	2.7	3.1	3.5	3.2	3.2	3.8	3.6	4.0	3.9
1980	3.9	3.8	2.1	4.3	6.0	5.0	3.2	3.1	5.8	5.1	4.3	4.1
1981	4.0	3.8	2.1	2.5	2.3	2.7	2.6	2.6	3.7	3.6	3.7	3.8
1982	3.8	3.8	2.5	2.9	4.1	4.7	7.3	5.1	5.5	5.4	4.6	5.3
1983	5.1	6.2	5.7	7.4	8.6	11.2	6.8	6.3	7.2	6.5	5.7	5.6
1984	4.4	7.2	6.6	4.6	3.6	3.2	2.9	2.6	4.2	4.0	4.1	4.3
1985	4.1	4.0	2.2	2.3	2.3	2.4	2.6	2.4	3.8	3.6	3.9	3.9
1986	3.9	3.7	2.1	2.4	5.8	6.9	4.0	3.7	5.5	4.2	4.2	4.3
1987	4.2	4.1	2.3	2.1	2.4	2.5	2.2	2.5	3.7	3.7	4.0	3.9
1988	4.0	3.9	2.3	2.3	2.5	2.3	2.3	2.2	3.5	3.4	3.7	3.9
1989	3.8	3.6	1.9	1.8	2.1	2.4	2.2	2.2	3.5	3.4	3.7	3.9
1990	3.7	3.8	2.3	2.2	2.1	2.1	2.2	2.4	3.5	3.5	3.8	3.9
1991	3.9	3.8	2.1	2.2	2.3	2.7	2.0	2.0	3.5	3.4	3.7	3.8
1992	3.9	3.8	2.4	2.3	3.1	2.8	2.4	2.4	3.6	3.6	3.7	3.8
1993	3.9	3.8	2.3	3.3	3.2	2.8	2.7	2.9	4.6	4.1	4.0	4.0
1994	3.9	3.9	2.0	2.1	2.4	2.2	2.2	2.3	3.5	3.3	3.6	3.6
1995	3.9	3.7	2.1	3.5	2.8	5.5	4.3	5.7	4.3	5.1	4.6	4.1
1996	4.0	3.9	2.3	2.5	4.3	3.9	3.3	3.4	4.7	4.0	4.0	4.0
1997	4.0	3.9	5.3	12.1	6.2	3.6	2.7	3.1	4.5	3.8	4.1	4.1
1998	4.1	4.2	2.5	3.4	6.9	4.7	4.7	4.8	5.2	5.3	4.8	4.6
1999	4.1	3.9	2.1	2.6	3.8	3.2	3.0	2.7	4.2	3.7	3.8	3.9
2000	3.9	3.8	1.6	2.2	4.1	3.4	3.0	2.8	4.0	3.7	3.8	4.0
2001	4.0	3.8	1.8	2.2	2.3	2.6	2.5	2.5	3.7	3.6	3.8	3.9
2002	3.8	3.8	2.2	2.4	2.1	2.3	2.3	2.3	3.6	3.4	3.7	3.8
2003	3.8	3.8	2.6	2.6	2.4	2.1	2.6	2.5	3.5	3.5	3.7	3.8
Average	4.0	4.0	2.5	3.1	3.4	3.4	3.1	3.0	4.3	4.0	4.0	4.0
Critical	3.9	3.8	2.2	2.2	2.4	2.3	2.2	2.3	3.5	3.5	3.7	3.9
Dry	4.0	3.8	2.0	2.2	2.2	2.5	2.4	2.4	3.7	3.6	3.8	3.9
BN	3.9	3.9	1.9	2.4	2.8	2.9	2.8	2.9	3.8	3.6	3.9	3.9
AN	3.9	3.8	2.2	3.1	3.8	3.4	3.1	3.0	4.6	4.1	4.0	4.0
Wet	4.1	4.3	3.2	4.2	4.4	4.6	3.9	3.7	4.9	4.5	4.3	4.3

Table E.3-170. Grant Line downstream of barrier Base stage (ft).

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	1.8	2.0	2.6	5.1	3.5	3.3	2.6	2.5	1.6	1.6	1.5	1.7
1971	1.7	1.8	2.6	2.4	2.1	2.5	2.7	2.7	1.6	1.4	1.6	1.8
1972	1.6	1.5	1.9	2.1	2.5	2.3	2.5	2.5	1.7	1.6	1.8	1.8
1973	2.1	1.9	2.6	3.0	3.4	3.2	2.9	2.9	1.7	1.5	1.7	1.7
1974	1.6	1.5	2.5	3.4	2.5	3.6	3.6	2.9	2.2	1.8	1.8	2.0
1975	1.8	1.6	2.0	2.1	3.0	3.6	3.2	2.6	2.5	1.8	1.8	1.8
1976	1.5	1.5	1.7	2.1	2.3	2.1	2.4	2.4	1.6	1.8	2.1	2.1
1977	1.9	1.7	2.3	2.2	2.2	1.9	1.9	2.2	1.5	1.6	1.6	2.0
1978	1.7	1.5	2.2	3.0	3.5	3.6	4.2	3.8	2.6	2.0	1.8	1.9
1979	1.7	1.6	1.8	2.7	3.1	3.5	3.2	3.2	1.5	1.4	1.7	1.7
1980	1.7	1.6	2.1	4.3	6.0	5.0	3.2	3.1	2.9	2.3	2.0	2.0
1981	1.7	1.3	2.0	2.5	2.3	2.7	2.6	2.6	1.5	1.5	1.5	1.6
1982	1.6	1.7	2.5	2.9	4.1	4.7	7.3	5.1	3.4	2.6	2.1	2.8
1983	2.6	3.6	5.6	7.4	8.6	11.2	6.8	6.3	7.2	6.5	3.2	3.2
1984	2.3	4.4	6.6	4.6	3.6	3.2	2.9	2.6	1.8	1.9	1.9	2.3
1985	1.7	1.7	2.1	2.3	2.3	2.4	2.6	2.4	1.6	1.4	1.6	1.8
1986	1.6	1.4	2.1	2.4	5.8	6.9	4.0	3.7	2.6	1.8	1.8	2.2
1987	2.0	1.7	2.2	2.1	2.4	2.5	2.2	2.5	1.5	1.6	2.0	1.8
1988	1.7	1.6	2.2	2.3	2.5	2.3	2.3	2.2	1.3	1.4	1.6	1.7
1989	1.5	1.2	1.8	1.8	2.1	2.4	2.2	2.2	1.5	1.4	1.7	1.8
1990	1.6	1.5	2.2	2.2	2.1	2.1	2.2	2.4	1.6	1.6	1.8	1.9
1991	1.7	1.5	2.1	2.2	2.3	2.7	2.0	2.0	1.5	1.5	1.7	1.8
1992	1.9	1.5	2.3	2.3	3.1	2.8	2.4	2.4	1.7	1.7	1.9	1.8
1993	1.9	1.6	2.2	3.3	3.2	2.8	2.7	2.9	2.1	1.9	1.8	1.9
1994	1.8	1.6	1.9	2.1	2.4	2.2	2.2	2.3	1.6	1.5	1.5	1.6
1995	1.8	1.4	2.1	3.5	2.8	5.5	4.3	5.7	4.3	5.1	2.3	2.0
1996	1.8	1.5	2.2	2.5	4.3	3.9	3.3	3.4	2.0	1.7	1.8	1.9
1997	1.6	1.5	5.3	12.1	6.2	3.6	2.7	3.1	2.1	1.8	2.0	2.1
1998	2.1	2.4	2.5	3.4	6.9	4.7	4.7	4.8	5.2	5.3	2.4	2.3
1999	1.7	1.5	2.1	2.6	3.8	3.2	3.0	2.7	1.7	1.5	1.5	1.8
2000	1.6	1.3	1.6	2.2	4.1	3.4	3.0	2.8	1.7	1.6	1.6	1.8
2001	1.7	1.2	1.7	2.2	2.3	2.6	2.5	2.5	1.5	1.5	1.6	1.8
2002	1.6	1.5	2.1	2.4	2.1	2.3	2.3	2.3	1.4	1.4	1.6	1.7
2003	1.6	1.5	2.5	2.6	2.4	2.1	2.6	2.5	1.4	1.4	1.6	1.8
Average	1.8	1.7	2.5	3.1	3.4	3.4	3.1	3.0	2.2	2.0	1.8	1.9
Critical	1.7	1.6	2.1	2.2	2.4	2.3	2.2	2.3	1.5	1.6	1.8	1.8
Dry	1.7	1.5	2.0	2.2	2.2	2.5	2.4	2.4	1.5	1.5	1.7	1.8
BN	1.6	1.6	1.9	2.4	2.8	2.9	2.8	2.9	1.6	1.5	1.7	1.8
AN	1.8	1.6	2.2	3.1	3.8	3.4	3.1	3.0	2.1	1.8	1.8	1.8
Wet	1.8	2.0	3.1	4.2	4.4	4.6	3.9	3.7	2.9	2.7	2.0	2.2

Table E.3-171. Middle River upstream of barrier Base stage (ft).

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	3.5	3.5	2.1	3.5	2.5	2.2	1.7	2.3	3.4	3.3	3.4	3.4
1971	3.4	3.4	2.2	1.9	1.6	1.6	1.8	2.4	3.3	3.2	3.4	3.5
1972	3.4	3.4	1.5	1.7	2.0	1.9	1.8	2.3	3.3	3.2	3.4	3.5
1973	3.5	3.5	2.2	2.6	2.9	2.2	1.8	2.5	3.4	3.3	3.5	3.4
1974	3.4	3.4	2.0	2.7	1.9	2.6	2.5	2.5	3.6	3.4	3.5	3.5
1975	3.4	3.4	1.6	1.6	2.3	2.4	2.2	2.4	3.7	3.4	3.5	3.5
1976	3.4	3.4	1.4	1.6	1.9	1.7	1.8	2.2	3.3	3.3	3.6	3.6
1977	3.5	3.4	2.0	1.8	1.8	1.5	1.5	2.1	3.3	3.3	3.4	3.5
1978	3.4	3.4	1.9	2.6	2.8	2.7	2.7	2.9	3.8	3.5	3.5	3.5
1979	3.4	3.4	1.5	2.1	2.2	2.2	2.1	2.6	3.3	3.2	3.5	3.4
1980	3.4	3.4	1.8	2.9	3.8	3.0	2.1	2.7	3.9	3.7	3.5	3.5
1981	3.4	3.4	1.7	2.0	1.9	2.1	2.0	2.4	3.2	3.2	3.4	3.4
1982	3.4	3.4	2.1	2.3	2.7	3.0	3.9	2.8	3.6	3.8	3.6	3.9
1983	3.7	4.1	3.2	4.1	5.0	6.6	3.8	3.4	3.6	3.3	3.9	3.9
1984	3.6	4.4	3.8	2.9	2.3	2.2	1.9	2.3	3.4	3.4	3.5	3.6
1985	3.5	3.4	1.8	1.8	1.7	1.7	1.8	2.2	3.3	3.2	3.4	3.5
1986	3.4	3.4	1.6	1.9	3.9	3.8	2.3	2.8	3.8	3.4	3.5	3.6
1987	3.5	3.5	1.8	1.7	1.9	1.9	1.7	2.4	3.3	3.3	3.5	3.5
1988	3.4	3.4	1.8	1.8	2.0	1.8	1.9	2.1	3.2	3.2	3.4	3.5
1989	3.4	3.3	1.4	1.4	1.6	2.0	1.8	2.2	3.2	3.1	3.4	3.5
1990	3.4	3.4	1.8	1.8	1.7	1.7	1.9	2.4	3.2	3.2	3.5	3.5
1991	3.4	3.4	1.7	1.8	1.9	2.2	1.5	2.0	3.2	3.2	3.4	3.5
1992	3.5	3.4	2.0	2.0	2.6	2.5	2.1	2.4	3.3	3.3	3.5	3.5
1993	3.5	3.4	1.9	2.7	2.7	2.3	2.1	2.7	3.6	3.4	3.5	3.5
1994	3.4	3.4	1.6	1.8	2.0	1.8	1.8	2.3	3.2	3.1	3.4	3.4
1995	3.4	3.4	1.7	3.0	2.4	3.8	2.7	3.1	2.4	2.6	3.6	3.5
1996	3.4	3.4	1.8	2.0	3.1	2.6	2.2	2.8	3.6	3.3	3.5	3.5
1997	3.4	3.4	2.9	6.7	3.1	2.1	1.8	2.6	3.5	3.4	3.5	3.5
1998	3.5	3.6	2.2	2.8	4.5	3.0	2.8	2.9	2.9	2.7	3.7	3.6
1999	3.4	3.4	1.6	1.8	2.4	2.2	2.1	2.4	3.4	3.3	3.4	3.4
2000	3.4	3.4	1.3	1.7	2.8	2.2	2.0	2.5	3.4	3.3	3.4	3.5
2001	3.4	3.4	1.4	1.7	1.9	2.0	1.7	2.3	3.3	3.3	3.4	3.5
2002	3.4	3.4	1.7	1.9	1.7	1.8	1.8	2.2	3.2	3.1	3.4	3.4
2003	3.4	3.4	2.2	2.2	2.0	1.6	2.0	2.4	3.2	3.1	3.4	3.4
Average	3.4	3.5	1.9	2.3	2.5	2.4	2.1	2.5	3.4	3.3	3.5	3.5
Critical	3.4	3.4	1.8	1.8	2.0	1.9	1.8	2.2	3.3	3.2	3.4	3.5
Dry	3.4	3.4	1.6	1.8	1.8	1.9	1.8	2.3	3.3	3.2	3.4	3.5
BN	3.4	3.4	1.5	1.9	2.1	2.1	2.0	2.5	3.3	3.2	3.4	3.5
AN	3.4	3.4	1.9	2.5	2.8	2.3	2.1	2.6	3.5	3.4	3.5	3.5
Wet	3.5	3.5	2.2	2.9	2.9	2.9	2.4	2.7	3.4	3.3	3.5	3.6

Table E.3-172. Middle River downstream of barrier Base stage (ft).

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	1.8	2.0	2.1	3.5	2.5	2.2	1.7	1.8	1.6	1.7	1.6	1.8
1971	1.7	1.8	2.2	1.9	1.6	1.6	1.8	1.9	1.6	1.6	1.8	1.9
1972	1.6	1.6	1.5	1.7	2.0	1.9	1.8	1.8	1.8	1.8	1.9	1.9
1973	2.1	1.9	2.2	2.6	2.9	2.2	1.8	1.9	1.6	1.6	1.8	1.7
1974	1.6	1.6	2.0	2.7	1.9	2.6	2.5	2.0	1.8	1.7	1.8	2.0
1975	1.7	1.6	1.6	1.6	2.3	2.4	2.2	1.8	1.8	1.7	1.8	1.8
1976	1.6	1.5	1.4	1.6	1.9	1.7	1.8	1.8	1.7	2.0	2.2	2.1
1977	1.9	1.8	1.9	1.8	1.8	1.5	1.5	1.7	1.6	1.7	1.8	2.0
1978	1.8	1.6	1.9	2.6	2.8	2.7	2.7	2.2	1.7	1.8	1.8	1.9
1979	1.8	1.6	1.5	2.1	2.2	2.2	2.1	2.0	1.6	1.6	1.8	1.8
1980	1.7	1.6	1.8	2.9	3.8	3.0	2.1	2.0	1.8	1.8	1.9	2.0
1981	1.7	1.4	1.7	2.0	1.9	2.1	2.0	1.9	1.6	1.7	1.7	1.7
1982	1.7	1.7	2.1	2.3	2.7	3.0	3.9	2.8	2.2	1.9	1.9	2.3
1983	2.1	2.7	3.2	4.1	5.0	6.6	3.8	3.4	3.6	3.3	2.5	2.6
1984	2.1	3.0	3.8	2.9	2.3	2.2	1.9	1.8	1.7	1.9	2.0	2.2
1985	1.7	1.8	1.8	1.8	1.7	1.7	1.8	1.7	1.7	1.6	1.6	1.9
1986	1.7	1.4	1.6	1.9	3.9	3.8	2.3	2.1	1.7	1.7	1.8	2.1
1987	1.9	1.7	1.8	1.7	1.9	1.9	1.7	1.9	1.6	1.7	2.0	1.9
1988	1.7	1.7	1.8	1.8	2.0	1.8	1.9	1.6	1.4	1.5	1.7	1.8
1989	1.6	1.3	1.4	1.4	1.6	2.0	1.8	1.7	1.6	1.6	1.9	1.9
1990	1.7	1.5	1.8	1.8	1.7	1.7	1.9	1.8	1.7	1.8	1.9	1.9
1991	1.7	1.5	1.6	1.8	1.9	2.2	1.5	1.5	1.6	1.7	1.8	1.9
1992	1.9	1.5	1.9	2.0	2.6	2.5	2.1	2.0	1.8	1.8	2.0	1.9
1993	2.0	1.7	1.9	2.7	2.7	2.3	2.1	2.3	2.0	1.9	1.9	2.0
1994	1.8	1.6	1.6	1.8	2.0	1.8	1.8	1.8	1.7	1.7	1.7	1.7
1995	1.8	1.4	1.7	3.0	2.4	3.8	2.7	3.1	2.4	2.6	2.1	2.1
1996	1.8	1.5	1.8	2.0	3.1	2.6	2.2	2.3	1.7	1.8	1.8	2.0
1997	1.7	1.5	2.8	6.7	3.1	2.1	1.8	2.0	1.9	1.9	2.1	2.1
1998	2.1	2.4	2.2	2.8	4.5	3.0	2.8	2.9	2.9	2.7	2.1	2.1
1999	1.6	1.6	1.6	1.8	2.4	2.2	2.1	1.8	1.6	1.6	1.7	1.8
2000	1.6	1.4	1.2	1.7	2.8	2.2	2.0	1.9	1.7	1.7	1.7	1.9
2001	1.7	1.3	1.3	1.7	1.9	2.0	1.7	1.8	1.6	1.6	1.7	1.8
2002	1.6	1.6	1.7	1.9	1.7	1.8	1.8	1.7	1.5	1.6	1.7	1.8
2003	1.7	1.6	2.1	2.2	2.0	1.6	2.0	1.9	1.5	1.5	1.8	1.8
Average	1.8	1.7	1.9	2.3	2.5	2.4	2.1	2.0	1.8	1.8	1.9	1.9
Critical	1.8	1.6	1.7	1.8	2.0	1.9	1.8	1.7	1.6	1.7	1.9	1.9
Dry	1.7	1.5	1.6	1.8	1.8	1.9	1.8	1.8	1.6	1.6	1.8	1.8
BN	1.7	1.6	1.5	1.9	2.1	2.1	2.0	1.9	1.7	1.7	1.9	1.9
AN	1.8	1.6	1.8	2.5	2.8	2.3	2.1	2.0	1.7	1.7	1.8	1.9
Wet	1.8	1.9	2.2	2.9	2.9	2.9	2.4	2.3	2.0	2.0	1.9	2.1

Table E.3-173. Old River upstream of barrier Base stage (ft).

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	4.1	4.1	2.1	3.7	2.6	2.4	1.9	2.4	3.9	3.7	3.6	3.8
1971	3.9	3.8	2.2	2.0	1.6	1.6	2.0	2.6	3.8	3.6	3.7	3.8
1972	3.9	3.8	1.5	1.7	2.1	1.9	2.0	2.4	3.8	3.5	3.7	3.8
1973	4.0	3.9	2.2	2.6	2.9	2.3	2.0	2.6	4.0	3.7	4.0	3.9
1974	3.9	3.7	2.0	2.7	2.0	2.7	2.7	2.7	4.7	4.2	4.1	4.0
1975	4.0	3.9	1.6	1.6	2.3	2.5	2.4	2.5	5.2	4.3	4.1	3.9
1976	3.9	3.9	1.4	1.6	1.9	1.7	1.9	2.3	3.7	3.6	4.1	4.0
1977	4.0	3.8	2.0	1.8	1.8	1.6	1.6	2.2	3.5	3.5	3.6	3.9
1978	3.8	3.7	1.9	2.6	2.8	2.7	3.0	3.4	5.5	4.4	4.1	4.1
1979	3.8	3.8	1.5	2.2	2.3	2.3	2.3	2.9	3.7	3.6	4.0	3.9
1980	3.9	3.8	1.7	3.1	4.4	3.5	2.3	2.9	5.6	5.1	4.2	4.0
1981	4.0	3.8	1.7	2.0	1.9	2.1	2.1	2.5	3.6	3.5	3.6	3.7
1982	3.8	3.7	2.1	2.4	2.8	3.1	4.8	3.3	5.0	5.4	4.7	5.3
1983	5.1	6.0	3.7	4.9	6.1	8.3	4.5	4.1	4.4	4.0	5.5	5.5
1984	4.4	6.6	4.6	3.2	2.5	2.3	2.1	2.5	4.1	3.9	4.0	4.3
1985	4.1	3.9	1.8	1.8	1.7	1.7	1.9	2.3	3.7	3.6	3.8	3.9
1986	3.9	3.7	1.6	2.0	4.2	4.4	2.7	3.3	5.4	4.1	4.2	4.3
1987	4.2	4.1	1.8	1.7	2.0	2.0	1.8	2.5	3.6	3.6	3.9	3.9
1988	3.9	3.9	1.9	1.9	2.1	1.9	2.0	2.2	3.5	3.4	3.7	3.8
1989	3.7	3.6	1.4	1.4	1.6	2.1	1.9	2.2	3.5	3.3	3.6	3.8
1990	3.7	3.8	1.9	1.8	1.7	1.7	1.9	2.4	3.5	3.4	3.8	3.9
1991	3.8	3.8	1.8	1.9	2.0	2.3	1.6	2.1	3.5	3.4	3.7	3.8
1992	3.9	3.8	2.0	2.0	2.7	2.5	2.1	2.4	3.6	3.5	3.7	3.8
1993	3.9	3.8	1.9	2.8	2.7	2.3	2.3	2.9	4.5	4.0	4.0	3.9
1994	3.9	3.8	1.6	1.8	2.0	1.9	1.8	2.3	3.5	3.3	3.5	3.6
1995	3.8	3.7	1.7	3.0	2.4	4.1	3.0	3.7	2.6	3.0	4.6	4.0
1996	4.0	3.9	1.9	2.1	3.2	2.7	2.4	3.1	4.7	3.9	4.0	4.0
1997	3.9	3.9	3.3	8.4	3.7	2.3	2.0	2.8	4.4	3.8	4.1	4.1
1998	4.1	4.2	2.2	2.8	5.1	3.2	3.2	3.3	3.2	3.1	4.8	4.5
1999	4.1	3.9	1.6	1.9	2.5	2.3	2.3	2.5	4.2	3.7	3.8	3.8
2000	3.9	3.8	1.2	1.8	3.0	2.3	2.2	2.6	4.0	3.7	3.8	4.0
2001	4.0	3.7	1.3	1.7	1.9	2.0	1.8	2.4	3.6	3.6	3.8	3.9
2002	3.8	3.8	1.7	2.0	1.7	1.8	1.9	2.3	3.5	3.4	3.7	3.8
2003	3.8	3.8	2.2	2.2	2.1	1.6	2.1	2.4	3.5	3.4	3.7	3.7
Average	4.0	4.0	2.0	2.4	2.6	2.5	2.3	2.7	4.0	3.7	4.0	4.0
Critical	3.9	3.8	1.8	1.8	2.0	1.9	1.9	2.3	3.5	3.4	3.7	3.8
Dry	4.0	3.8	1.6	1.8	1.8	2.0	1.9	2.4	3.6	3.5	3.7	3.8
BN	3.8	3.8	1.5	2.0	2.2	2.1	2.2	2.7	3.8	3.5	3.8	3.8
AN	3.9	3.8	1.9	2.5	3.0	2.4	2.3	2.8	4.5	4.1	4.0	3.9
Wet	4.1	4.2	2.4	3.1	3.2	3.2	2.8	3.0	4.3	3.9	4.2	4.3

Table E.3-174. Old River downstream of barrier Base stage (ft).

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	1.5	1.9	2.1	3.6	2.5	2.3	1.8	1.8	1.5	1.4	1.3	1.5
1971	1.5	1.7	2.1	1.9	1.6	1.6	1.9	1.9	1.4	1.3	1.4	1.7
1972	1.4	1.4	1.4	1.7	2.0	1.9	1.9	1.9	1.6	1.5	1.6	1.7
1973	1.9	1.7	2.2	2.6	2.8	2.2	2.0	2.0	1.5	1.3	1.5	1.5
1974	1.4	1.4	2.0	2.6	1.9	2.6	2.7	2.1	1.7	1.4	1.5	1.8
1975	1.5	1.4	1.5	1.6	2.3	2.5	2.4	1.9	1.7	1.4	1.5	1.6
1976	1.3	1.3	1.3	1.6	1.8	1.6	1.9	1.8	1.6	1.8	2.0	1.9
1977	1.8	1.6	1.9	1.7	1.8	1.5	1.5	1.7	1.5	1.6	1.5	1.9
1978	1.7	1.5	1.8	2.6	2.7	2.6	2.9	2.4	1.5	1.5	1.5	1.6
1979	1.5	1.4	1.4	2.1	2.2	2.3	2.3	2.1	1.4	1.3	1.5	1.6
1980	1.5	1.4	1.7	3.0	4.2	3.3	2.3	2.1	1.7	1.6	1.7	1.7
1981	1.6	1.1	1.6	2.0	1.9	2.1	2.0	1.9	1.4	1.4	1.4	1.5
1982	1.5	1.5	2.1	2.3	2.7	3.0	4.6	3.2	2.1	1.7	1.6	2.1
1983	1.9	2.5	3.5	4.6	5.9	8.0	4.3	3.9	4.2	3.8	2.3	2.5
1984	1.9	3.1	4.4	3.1	2.4	2.3	2.1	1.9	1.5	1.7	1.7	2.0
1985	1.5	1.5	1.7	1.8	1.7	1.7	1.9	1.7	1.5	1.3	1.4	1.6
1986	1.5	1.2	1.5	1.9	4.1	4.2	2.6	2.2	1.6	1.5	1.5	2.0
1987	1.8	1.5	1.7	1.6	1.9	2.0	1.8	2.0	1.4	1.5	1.9	1.7
1988	1.5	1.5	1.8	1.8	2.1	1.9	1.9	1.7	1.3	1.3	1.6	1.6
1989	1.4	1.1	1.3	1.4	1.6	2.0	1.8	1.7	1.4	1.3	1.7	1.7
1990	1.5	1.3	1.8	1.7	1.7	1.7	1.9	1.9	1.6	1.6	1.7	1.8
1991	1.6	1.3	1.6	1.8	1.9	2.2	1.6	1.5	1.4	1.5	1.6	1.7
1992	1.7	1.4	2.0	2.0	2.7	2.4	2.1	2.0	1.6	1.6	1.8	1.8
1993	1.8	1.5	1.8	2.7	2.6	2.2	2.2	2.3	1.8	1.6	1.6	1.7
1994	1.6	1.4	1.5	1.7	2.0	1.8	1.8	1.8	1.6	1.4	1.4	1.5
1995	1.7	1.3	1.6	3.0	2.4	4.0	2.9	3.5	2.5	2.9	1.8	1.8
1996	1.6	1.3	1.8	2.0	3.2	2.6	2.4	2.4	1.5	1.5	1.5	1.7
1997	1.4	1.2	3.1	8.0	3.5	2.2	1.9	2.1	1.7	1.7	1.8	1.9
1998	1.9	2.3	2.1	2.8	4.9	3.1	3.1	3.2	3.1	3.0	1.9	1.9
1999	1.4	1.3	1.5	1.8	2.5	2.2	2.2	1.9	1.4	1.3	1.4	1.6
2000	1.5	1.2	1.2	1.7	2.9	2.2	2.1	2.0	1.5	1.5	1.4	1.6
2001	1.5	1.0	1.3	1.7	1.9	2.0	1.8	1.9	1.4	1.4	1.5	1.7
2002	1.4	1.4	1.6	1.9	1.6	1.8	1.8	1.7	1.3	1.3	1.5	1.5
2003	1.5	1.4	2.1	2.2	2.0	1.6	2.1	1.9	1.3	1.3	1.5	1.7
Average	1.6	1.5	1.9	2.4	2.5	2.5	2.2	2.1	1.7	1.6	1.6	1.7
Critical	1.6	1.4	1.7	1.8	2.0	1.9	1.8	1.8	1.5	1.5	1.7	1.8
Dry	1.5	1.3	1.5	1.7	1.8	1.9	1.8	1.8	1.4	1.4	1.6	1.6
BN	1.5	1.4	1.4	1.9	2.1	2.1	2.1	2.0	1.5	1.4	1.5	1.6
AN	1.6	1.4	1.8	2.5	2.9	2.4	2.3	2.1	1.6	1.5	1.5	1.6
Wet	1.6	1.7	2.3	3.0	3.1	3.1	2.7	2.5	2.0	1.9	1.6	1.9

Table E.3-175. Grant Line upstream of barrier stage (ft) difference All Transfers minus Base.

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1971	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1972	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1973	0.0	0.0	0.0	0.0	0.0	-0.1	-0.1	0.0	0.0	0.0	0.0	0.0
1974	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1975	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1976	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0
1977	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	0.0
1978	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1979	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1980	0.0	0.0	0.0	0.0	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1981	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	-0.1
1982	0.0	0.0	0.0	0.0	-0.1	-0.1	0.0	0.0	0.0	0.0	0.0	0.0
1983	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1984	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1985	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1986	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1987	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	-0.1	0.0
1988	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	-0.1	0.0
1989	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1990	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	0.0
1991	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	0.0
1992	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	-0.1	0.0
1993	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	0.0	0.0
1994	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0
1995	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1996	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1997	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1998	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1999	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2001	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	-0.1	0.0
2002	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2003	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Average	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Critical	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	-0.1	0.0
Dry	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
BN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Wet	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table E.3-176. Grant Line upstream of barrier stage percent difference of All Transfers from Base.

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1971	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1972	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1973	0.0	0.0	0.0	0.0	-0.6	-2.8	-2.0	0.0	0.0	0.0	0.0	0.0
1974	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1975	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1976	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-1.1	-2.1	-0.7
1977	-0.1	0.0	0.1	0.1	0.1	0.1	0.1	0.0	0.0	-1.5	-1.0	-0.8
1978	-0.1	0.0	0.0	-0.1	-0.1	-0.1	0.0	0.0	0.0	0.0	0.0	0.0
1979	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1980	0.0	0.0	0.0	0.0	-0.8	-0.4	0.0	0.0	0.0	0.0	0.0	0.0
1981	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-1.8	-1.6
1982	0.0	0.0	-0.1	-0.4	-2.3	-1.1	0.0	0.0	0.0	0.0	0.0	0.0
1983	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1984	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1985	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1986	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1987	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.0	-2.4	-2.3	-0.8
1988	-0.1	0.1	0.0	-0.1	0.0	0.1	0.0	0.2	0.0	-3.2	-2.2	-0.4
1989	-0.1	0.1	-0.1	0.2	0.2	-0.2	-0.1	0.3	0.1	0.0	-0.9	-0.7
1990	0.1	0.0	0.1	0.0	-0.1	-0.1	0.0	0.0	0.0	-2.5	-1.1	-0.5
1991	0.0	0.1	0.1	0.2	0.0	-0.1	-0.1	0.0	0.0	-2.1	-0.9	-0.3
1992	0.0	0.1	0.1	0.1	-0.1	-0.1	0.0	0.2	0.1	-4.2	-2.0	-0.6
1993	-0.1	0.0	-0.1	-0.2	-0.2	-0.2	-0.1	-0.5	-3.3	-1.2	0.0	0.0
1994	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-3.9	-1.2
1995	-0.1	0.0	0.0	-0.1	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1996	0.0	0.0	0.0	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1997	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1998	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1999	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2001	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-4.0	-1.5	-0.5
2002	0.0	0.0	0.0	-0.1	-0.1	-0.1	-0.1	0.0	0.0	0.0	0.0	0.0
2003	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.8	-0.7	0.0
Average	0.0	0.0	0.0	0.0	-0.1	-0.1	-0.1	0.0	-0.1	-0.7	-0.6	-0.2
Critical	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.1	0.0	-2.1	-1.9	-0.7
Dry	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	-1.1	-1.1	-0.6
BN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AN	0.0	0.0	0.0	-0.1	-0.3	-0.6	-0.4	-0.1	-0.6	-0.3	-0.1	0.0
Wet	0.0	0.0	0.0	-0.1	-0.2	-0.1	0.0	0.0	0.0	0.0	0.0	0.0

Table E.3-180. Grant Line downstream of barrier stage (ft) difference All Transfers minus Base.

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1971	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1972	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1973	0.0	0.0	0.0	0.0	0.0	-0.1	-0.1	0.0	0.0	0.0	0.0	0.0
1974	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1975	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1976	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	-0.1	-0.1
1977	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	0.0
1978	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1979	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1980	0.0	0.0	0.0	0.0	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1981	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0
1982	0.0	0.0	0.0	0.0	-0.1	-0.1	0.0	0.0	0.0	0.0	0.0	0.0
1983	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1984	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1985	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1986	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1987	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	-0.1	0.0
1988	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	-0.1	0.0
1989	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0
1990	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	-0.1	0.0
1991	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	0.0
1992	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	-0.1	0.0
1993	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	0.0	0.0
1994	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	-0.1
1995	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1996	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1997	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1998	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1999	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2001	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	-0.1	0.0
2002	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2003	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	0.0
Average	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Critical	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	-0.1	0.0
Dry	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0
BN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Wet	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table E.3-181. Grant Line downstream of barrier stage percent difference of All Transfers from Base.

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1971	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1972	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1973	0.0	0.0	0.0	0.0	-0.6	-2.8	-2.0	0.0	0.0	0.0	0.0	0.0
1974	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1975	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1976	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-5.3	-6.6	-2.6
1977	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0	-7.9	-1.2	-1.8
1978	-0.1	0.2	0.0	-0.1	-0.1	-0.1	0.0	0.0	0.0	0.0	0.0	0.0
1979	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1980	0.0	0.0	0.0	0.0	-0.8	-0.4	0.0	0.0	0.0	0.0	0.0	0.0
1981	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	-7.6	-0.1
1982	0.0	0.0	-0.1	-0.4	-2.3	-1.1	0.0	0.0	0.0	0.0	0.0	0.0
1983	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1984	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1985	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1986	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1987	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.2	-3.5	-7.4	-2.2
1988	0.0	0.2	0.0	-0.1	0.0	0.1	0.0	0.2	0.1	-8.3	-3.8	-2.0
1989	0.0	0.3	-0.1	0.2	0.2	-0.2	-0.1	0.3	0.3	-0.1	-5.1	-0.2
1990	0.1	0.2	0.1	0.0	-0.1	-0.1	0.0	0.0	0.0	-7.5	-2.9	-1.8
1991	0.2	0.2	0.2	0.2	0.0	-0.1	-0.1	0.0	0.2	-6.6	-2.2	-1.3
1992	0.1	0.2	0.1	0.1	-0.1	-0.1	0.0	0.2	0.2	-5.3	-4.2	-1.5
1993	-0.2	0.2	-0.1	-0.2	-0.2	-0.2	-0.1	-0.5	-3.5	-2.0	0.0	0.0
1994	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.3	-4.3	-4.1
1995	0.1	0.2	0.0	-0.1	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1996	0.0	0.0	0.0	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1997	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.1
1998	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1999	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2001	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	-4.6	-5.5	-2.2
2002	0.3	-0.2	-0.1	-0.1	-0.1	-0.1	-0.1	0.0	0.0	-0.1	-0.1	0.0
2003	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	-9.2	0.0	0.0
Average	0.0	0.1	0.0	0.0	-0.1	-0.1	-0.1	0.0	-0.1	-1.8	-1.5	-0.6
Critical	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.1	0.0	-5.9	-3.6	-2.2
Dry	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	-1.4	-4.3	-0.8
BN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AN	-0.1	0.1	0.0	-0.1	-0.3	-0.6	-0.4	-0.1	-0.6	-1.9	0.0	0.0
Wet	0.0	0.0	0.0	-0.1	-0.2	-0.1	0.0	0.0	0.0	0.0	0.0	0.0

Table E.3-182. Middle River upstream of barrier stage (ft) difference All Transfers minus Base.

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1971	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1972	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1973	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1974	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1975	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1976	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1977	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1978	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1979	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1980	0.0	0.0	0.0	0.0	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1981	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1982	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1983	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1984	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1985	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1986	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1987	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1988	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	0.0
1989	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1990	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	0.0
1991	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	0.0
1992	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	0.0
1993	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1994	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0
1995	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1996	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1997	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1998	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1999	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2001	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	0.0
2002	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2003	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	0.0
Average	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Critical	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	0.0
Dry	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
BN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Wet	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table E.3-183. Middle River upstream of barrier stage percent difference of All Transfers from Base.

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1971	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1972	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1973	0.0	0.0	0.0	0.0	-0.2	-1.0	-0.5	0.0	0.0	0.0	0.0	0.0
1974	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1975	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1976	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.9	-1.0	-0.4
1977	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.0	0.0	-1.3	-0.5	-0.4
1978	-0.1	0.0	0.0	-0.2	-0.2	-0.1	0.0	0.0	0.0	0.0	0.0	0.0
1979	0.0	0.0	0.0	0.0	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1980	0.0	0.0	0.0	0.0	-1.4	-0.8	0.0	0.0	0.0	0.0	0.0	0.0
1981	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.9	-0.5
1982	0.0	0.0	-0.2	-0.1	-1.1	-0.4	0.0	0.0	0.0	0.0	0.0	0.0
1983	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1984	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1985	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1986	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1987	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.0	-1.5	-1.3	-0.3
1988	0.0	0.0	-0.1	-0.1	0.0	0.0	0.0	0.1	0.0	-4.1	-0.6	-0.2
1989	-0.1	0.0	-0.1	0.3	0.2	-0.3	-0.2	0.2	0.0	-0.1	-0.6	-0.1
1990	0.0	0.0	0.1	0.0	-0.1	-0.1	0.0	0.0	0.0	-2.6	-0.5	-0.2
1991	0.0	0.0	0.2	0.2	0.0	-0.1	-0.1	0.0	0.0	-2.0	-0.4	-0.2
1992	0.0	0.0	0.2	0.1	-0.1	-0.1	0.0	0.2	0.0	-3.6	-0.9	-0.3
1993	-0.1	0.0	-0.1	-0.2	-0.2	-0.3	-0.1	-0.2	-1.2	-0.5	0.0	0.0
1994	0.0	0.0	0.0	0.0	-0.1	-0.1	0.0	0.0	0.0	0.0	-2.4	-0.7
1995	0.0	0.0	-0.1	-0.2	-0.2	-0.1	0.0	0.0	-0.1	-0.1	0.0	0.0
1996	0.0	0.0	-0.1	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1997	0.0	0.0	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1998	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1999	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2001	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-2.3	-0.7	-0.2
2002	0.0	0.0	-0.1	-0.2	-0.2	-0.1	-0.1	0.0	0.0	0.0	0.0	0.0
2003	0.0	0.0	-0.1	-0.1	0.0	0.0	0.0	0.0	0.0	-1.8	-0.1	0.0
Average	0.0	0.0	0.0	0.0	-0.1	-0.1	0.0	0.0	0.0	-0.6	-0.3	-0.1
Critical	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	-2.1	-0.9	-0.3
Dry	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	0.0	0.0	-0.6	-0.6	-0.2
BN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AN	0.0	0.0	0.0	-0.1	-0.3	-0.4	-0.1	0.0	-0.2	-0.4	0.0	0.0
Wet	0.0	0.0	0.0	0.0	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table E.3-184. Middle River downstream of barrier stage (ft) difference All Transfers minus Base.

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1971	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1972	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1973	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1974	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1975	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1976	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0
1977	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	0.0
1978	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1979	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1980	0.0	0.0	0.0	0.0	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1981	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0
1982	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1983	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1984	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1985	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1986	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1987	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0
1988	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	-0.1	0.0
1989	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1990	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	0.0
1991	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	0.0
1992	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0
1993	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1994	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1995	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1996	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1997	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1998	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1999	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2001	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0
2002	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2003	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Average	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Critical	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	0.0
Dry	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
BN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Wet	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table E.3-185. Middle River downstream of barrier stage percent difference of All Transfers from Base.

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1971	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1972	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1973	0.0	0.0	0.0	0.0	-0.2	-1.0	-0.5	0.0	0.0	0.0	0.0	0.0
1974	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1975	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1976	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-2.1	-4.9	-1.9
1977	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0	-5.6	-0.7	-1.3
1978	0.0	0.1	0.0	-0.2	-0.2	-0.1	0.0	0.0	0.0	0.0	0.0	0.0
1979	0.0	0.0	0.0	0.0	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1980	0.0	0.0	0.0	0.0	-1.4	-0.8	0.0	0.0	0.0	0.0	0.0	0.0
1981	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	-4.3	-0.2
1982	0.0	0.0	-0.2	-0.1	-1.1	-0.4	0.0	0.0	0.0	0.0	0.0	0.0
1983	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1984	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1985	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1986	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1987	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.2	0.1	-1.8	-6.0	-1.6
1988	0.1	0.1	-0.1	-0.1	0.0	0.0	0.0	0.2	0.1	-5.3	-3.1	-1.6
1989	0.1	0.2	-0.1	0.3	0.2	-0.3	-0.2	0.3	0.2	-0.1	-1.6	-0.2
1990	0.0	0.1	0.1	0.0	-0.1	-0.1	0.0	0.0	0.0	-5.0	-2.1	-1.4
1991	0.2	0.2	0.2	0.2	0.0	-0.1	-0.1	0.0	0.1	-4.3	-1.9	-1.1
1992	0.1	0.2	0.2	0.1	-0.1	-0.1	0.0	0.2	0.1	-2.5	-2.6	-1.2
1993	-0.1	0.1	-0.1	-0.2	-0.2	-0.3	-0.1	-0.2	-1.0	-0.5	0.0	0.0
1994	0.0	0.0	0.0	0.0	-0.1	-0.1	0.0	0.0	0.0	-0.2	-2.0	-2.3
1995	0.2	0.1	-0.1	-0.2	-0.2	-0.1	0.0	0.0	-0.1	-0.1	0.0	0.0
1996	0.0	0.0	-0.1	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1997	0.0	0.0	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1998	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1999	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2001	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	-2.4	-3.8	-1.7
2002	0.2	-0.1	-0.1	-0.2	-0.2	-0.1	-0.1	-0.1	0.0	0.0	-0.1	-0.1
2003	0.0	0.0	-0.1	-0.1	0.0	0.0	0.0	0.0	-0.1	-2.6	0.0	0.0
Average	0.0	0.0	0.0	0.0	-0.1	-0.1	0.0	0.0	0.0	-1.0	-1.0	-0.4
Critical	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.1	0.0	-3.6	-2.5	-1.5
Dry	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	0.1	0.1	-0.7	-2.6	-0.6
BN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AN	0.0	0.0	0.0	-0.1	-0.3	-0.4	-0.1	-0.1	-0.2	-0.5	0.0	0.0
Wet	0.0	0.0	0.0	0.0	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table E.3-186. Old River upstream of barrier stage (ft) difference All Transfers minus Base.

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1971	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1972	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1973	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1974	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1975	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1976	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0
1977	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	0.0
1978	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1979	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1980	0.0	0.0	0.0	0.0	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1981	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	-0.1
1982	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1983	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1984	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1985	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1986	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1987	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	-0.1	0.0
1988	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	-0.1	0.0
1989	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1990	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	0.0
1991	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	0.0
1992	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	-0.1	0.0
1993	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.2	-0.1	0.0	0.0
1994	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0
1995	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1996	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1997	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1998	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1999	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2001	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	-0.1	0.0
2002	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2003	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Average	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Critical	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	-0.1	0.0
Dry	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
BN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Wet	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table E.3-187. Old River upstream of barrier stage percent difference of All Transfers from Base.

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1971	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1972	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1973	0.0	0.0	0.0	0.0	-0.3	-1.5	-0.9	0.0	0.0	0.0	0.0	0.0
1974	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1975	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1976	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-1.3	-2.7	-1.0
1977	-0.1	0.1	0.2	0.2	0.2	0.2	0.2	0.0	0.0	-2.1	-1.2	-0.9
1978	-0.1	0.0	0.0	-0.2	-0.1	-0.1	0.0	0.0	0.0	0.0	0.0	0.0
1979	0.0	0.0	0.0	0.0	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1980	0.0	0.0	0.0	0.0	-2.1	-0.9	0.0	0.0	0.0	0.0	0.0	0.0
1981	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	-1.6	-1.6
1982	0.0	0.0	-0.2	-0.2	-1.5	-0.5	0.0	0.0	0.0	0.0	0.0	0.0
1983	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1984	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1985	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.2	0.0
1986	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1987	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.1	0.0	-2.5	-2.6	-1.1
1988	-0.1	0.1	-0.1	-0.1	0.0	0.1	0.0	0.2	0.0	-3.7	-2.3	-0.7
1989	-0.1	0.1	-0.1	0.4	0.3	-0.3	-0.2	0.3	0.1	0.0	-1.3	-0.7
1990	0.1	0.1	0.2	0.0	-0.1	-0.1	0.0	0.0	0.0	-3.3	-1.3	-0.6
1991	0.0	0.1	0.2	0.3	0.0	-0.1	-0.1	0.0	0.1	-2.8	-1.2	-0.7
1992	0.0	0.1	0.2	0.2	-0.1	-0.1	0.0	0.2	0.1	-4.1	-2.1	-0.8
1993	-0.1	0.0	-0.1	-0.2	-0.2	-0.3	-0.1	-0.5	-3.7	-1.3	0.0	0.0
1994	0.0	0.0	0.0	0.0	-0.1	0.0	0.0	0.0	0.0	0.0	-4.2	-1.3
1995	-0.1	0.0	-0.1	-0.2	-0.2	-0.1	0.0	0.0	-0.1	0.0	0.0	0.0
1996	0.0	0.0	-0.1	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1997	0.0	0.0	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1998	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1999	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2000	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2001	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	-3.3	-1.5	-0.6
2002	0.0	0.0	-0.1	-0.2	-0.2	-0.1	-0.1	0.0	0.0	0.0	-0.1	0.0
2003	0.0	0.0	-0.1	-0.1	0.0	0.0	0.0	0.0	0.0	-0.9	-0.6	0.0
Average	0.0	0.0	0.0	0.0	-0.1	-0.1	0.0	0.0	-0.1	-0.7	-0.7	-0.3
Critical	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.1	0.0	-2.5	-2.1	-0.9
Dry	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	0.1	0.0	-1.0	-1.2	-0.7
BN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AN	0.0	0.0	0.0	-0.1	-0.5	-0.5	-0.2	-0.1	-0.6	-0.4	-0.1	0.0
Wet	0.0	0.0	0.0	0.0	-0.1	-0.1	0.0	0.0	0.0	0.0	0.0	0.0

Table E.3-188. Old River downstream of barrier stage (ft) difference All Transfers minus Base.

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1971	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1972	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1973	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1974	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1975	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1976	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	-0.2	-0.1
1977	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.2	0.0	0.0
1978	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1979	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1980	0.0	0.0	0.0	0.0	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1981	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.2	0.0
1982	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1983	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1984	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1985	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1986	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1987	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	-0.2	-0.1
1988	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.2	-0.1	0.0
1989	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0
1990	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.2	-0.1	0.0
1991	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.2	-0.1	0.0
1992	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	-0.1	0.0
1993	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1994	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1
1995	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1996	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1997	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1998	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1999	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2001	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	-0.1	-0.1
2002	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2003	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	0.0
Average	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Critical	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	-0.1	0.0
Dry	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0
BN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Wet	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table E.3-189. Old River downstream of barrier stage percent difference of All Transfers from Base.

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1971	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1972	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1973	0.0	0.0	0.0	0.0	-0.2	-1.4	-0.8	0.0	0.0	0.0	0.0	0.0
1974	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1975	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1976	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-7.3	-8.4	-3.0
1977	0.1	0.2	0.2	0.2	0.2	0.2	0.2	0.1	0.0	-9.7	-1.0	-1.7
1978	0.0	0.2	0.0	-0.2	-0.2	-0.1	0.0	0.0	0.0	0.0	0.0	0.0
1979	0.0	0.0	0.0	0.0	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1980	0.0	0.0	0.0	0.0	-2.3	-0.8	0.0	0.0	0.0	0.0	0.0	0.0
1981	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	-13.7	-0.1
1982	0.1	0.0	-0.2	-0.2	-1.5	-0.5	0.0	0.0	0.0	0.0	0.0	0.0
1983	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1984	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0
1985	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0
1986	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1987	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.2	0.3	-4.5	-11.2	-3.1
1988	0.4	0.3	-0.1	-0.1	0.0	0.2	0.0	0.3	0.1	-12.6	-5.1	-2.7
1989	0.3	0.5	-0.1	0.5	0.3	-0.3	-0.2	0.5	0.4	-0.1	-6.6	-0.2
1990	0.2	0.3	0.2	0.0	-0.1	-0.1	0.0	0.0	0.0	-11.2	-4.2	-2.4
1991	0.3	0.4	0.3	0.3	0.0	-0.1	-0.1	0.0	0.3	-10.3	-3.7	-2.0
1992	0.3	0.3	0.2	0.2	-0.1	-0.1	0.0	0.4	0.3	-5.6	-5.6	-1.8
1993	-0.1	0.3	-0.1	-0.2	-0.2	-0.3	-0.1	-0.3	-1.4	-0.8	0.0	0.0
1994	0.0	0.0	0.0	0.0	-0.1	0.0	0.0	0.0	0.0	-0.3	-3.3	-5.0
1995	0.3	0.3	-0.1	-0.2	-0.2	-0.1	0.0	0.0	-0.1	0.0	0.0	0.0
1996	0.0	0.0	-0.1	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1997	0.0	0.0	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.1
1998	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1999	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2000	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0
2001	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.3	-5.3	-7.9	-3.0
2002	0.6	-0.1	-0.1	-0.2	-0.2	-0.1	-0.1	-0.1	0.0	-0.1	-0.1	-0.1
2003	0.0	0.0	-0.1	-0.1	0.0	0.0	0.0	0.0	-0.1	-10.8	0.0	0.0
Average	0.1	0.1	0.0	0.0	-0.1	-0.1	0.0	0.0	0.0	-2.3	-2.1	-0.7
Critical	0.2	0.2	0.1	0.1	0.0	0.0	0.0	0.1	0.1	-8.1	-4.5	-2.7
Dry	0.1	0.1	0.0	0.0	0.0	-0.1	0.0	0.1	0.2	-1.6	-6.6	-1.1
BN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AN	0.0	0.1	0.0	-0.1	-0.5	-0.5	-0.2	-0.1	-0.3	-1.9	0.0	0.0
Wet	0.0	0.0	0.0	0.0	-0.1	-0.1	0.0	0.0	0.0	0.0	0.0	0.0

Table E.3-190. Grant Line upstream of barrier stage (ft) difference No Groundwater Substitution minus Base.

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1971	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1972	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1973	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1974	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1975	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1976	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1977	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1978	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1979	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1980	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1981	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0
1982	0.0	0.0	0.0	0.0	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1983	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1984	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1985	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1986	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1987	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1988	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	0.0
1989	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1990	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	0.0
1991	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1992	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0
1993	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	0.0	0.0
1994	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0
1995	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1996	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1997	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1998	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1999	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2001	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2002	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2003	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Average	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Critical	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Dry	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
BN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Wet	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table E.3-191. Grant Line upstream of barrier stage percent difference of No Groundwater Substitution from Base.

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1971	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1972	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1973	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1974	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1975	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1976	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-1.0	-0.7	-0.3
1977	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-1.0	-0.6	-0.5
1978	-0.1	0.0	0.0	-0.1	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1979	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1980	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1981	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	2.2	-1.3	-1.1
1982	0.0	0.0	-0.1	-0.4	-2.3	-1.1	0.0	0.0	0.0	0.0	0.0	0.0
1983	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1984	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1985	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1986	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1987	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-1.0	-1.0	-0.4
1988	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-1.5	-0.6	-0.3
1989	-0.1	0.0	0.0	0.0	0.0	-0.1	-0.1	0.0	0.0	0.0	-0.3	-0.3
1990	0.0	0.0	0.0	0.0	-0.1	0.0	0.0	0.0	0.0	-1.5	-0.6	-0.3
1991	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-1.3	-0.5	-0.2
1992	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	1.8	-0.5	-0.4
1993	-0.1	0.0	0.0	-0.1	-0.1	-0.1	0.0	-0.4	-3.3	-1.2	0.0	0.0
1994	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	-2.4	-0.8
1995	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1996	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1997	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1998	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1999	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2001	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.1	-0.5	-0.3
2002	0.0	0.0	0.0	-0.1	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2003	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.4	-0.3	0.0
Average	0.0	0.0	0.0	0.0	-0.1	0.0	0.0	0.0	-0.1	-0.1	-0.3	-0.1
Critical	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.6	-0.8	-0.4
Dry	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	-0.5	-0.3
BN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	-0.5	-0.3	-0.1	0.0
Wet	0.0	0.0	0.0	0.0	-0.2	-0.1	0.0	0.0	0.0	0.0	0.0	0.0

Table E.3-192. Grant Line downstream of barrier stage (ft) difference No Groundwater Substitution minus Base.

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1971	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1972	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1973	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1974	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1975	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1976	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	-0.1	0.0
1977	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	0.0
1978	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1979	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1980	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1981	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0
1982	0.0	0.0	0.0	0.0	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1983	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1984	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1985	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1986	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1987	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0
1988	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	0.0
1989	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1990	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	0.0
1991	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	0.0
1992	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1993	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	0.0	0.0
1994	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1995	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1996	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1997	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1998	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1999	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2001	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2002	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2003	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	0.0
Average	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Critical	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	0.0
Dry	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
BN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Wet	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table E.3-193. Grant Line downstream of barrier stage percent difference of No Groundwater Substitution from Base.

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1971	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1972	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1973	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1974	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1975	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1976	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-5.3	-3.2	-1.1
1977	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-5.3	-0.8	-1.2
1978	-0.2	0.0	0.0	-0.1	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1979	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1980	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1981	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	1.4	-4.5	-0.5
1982	-0.3	0.0	-0.1	-0.4	-2.3	-1.1	0.0	0.0	0.0	0.0	0.0	0.0
1983	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1984	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1985	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1986	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1987	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-2.3	-4.0	-1.1
1988	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-5.9	-2.0	-1.2
1989	-0.2	0.0	0.0	0.0	0.0	-0.1	-0.1	0.0	0.0	-0.1	-2.3	-0.1
1990	0.0	0.0	0.0	0.0	-0.1	0.0	0.0	0.0	0.0	-4.9	-1.6	-1.1
1991	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-4.4	-1.4	-0.9
1992	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	-2.2	-1.5	-0.9
1993	-0.2	0.0	0.0	-0.1	-0.1	-0.1	0.0	-0.4	-3.5	-2.0	0.0	0.0
1994	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-1.2	-2.9	-2.1
1995	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1996	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1997	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1998	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1999	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2001	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	-1.3	-2.0	-1.3
2002	0.0	0.0	0.0	-0.1	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2003	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-4.5	-0.8	-0.2
Average	0.0	0.0	0.0	0.0	-0.1	0.0	0.0	0.0	-0.1	-1.1	-0.8	-0.3
Critical	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-4.2	-1.9	-1.2
Dry	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.4	-2.1	-0.5
BN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AN	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	-0.6	-1.1	-0.1	0.0
Wet	0.0	0.0	0.0	0.0	-0.2	-0.1	0.0	0.0	0.0	0.0	0.0	0.0

Table E.3-194. Middle River upstream of barrier stage (ft) difference No Groundwater Substitution minus Base.

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1971	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1972	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1973	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1974	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1975	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1976	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1977	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1978	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1979	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1980	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1981	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1982	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1983	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1984	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1985	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1986	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1987	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1988	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	0.0
1989	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1990	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1991	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1992	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1993	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1994	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1995	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1996	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1997	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1998	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1999	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2001	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2002	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2003	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Average	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Critical	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Dry	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
BN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Wet	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table E.3-195. Middle River upstream of barrier stage percent difference of No Groundwater Substitution from Base.

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1971	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1972	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1973	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1974	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1975	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1976	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.9	-0.3	-0.2
1977	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.8	-0.3	-0.2
1978	-0.1	0.0	0.0	-0.1	-0.1	-0.1	0.0	0.0	0.0	0.0	0.0	0.0
1979	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1980	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1981	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.6	-0.7	-0.2
1982	0.0	0.0	-0.2	-0.1	-1.1	-0.4	0.0	0.0	0.0	0.0	0.0	0.0
1983	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1984	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1985	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1986	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1987	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.6	-0.6	-0.2
1988	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-1.6	-0.3	-0.1
1989	0.0	0.0	0.0	0.0	0.0	-0.1	-0.1	0.0	0.0	0.0	-0.2	0.0
1990	0.0	0.0	0.0	0.0	-0.1	0.0	0.0	0.0	0.0	-1.4	-0.3	-0.1
1991	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-1.3	-0.3	-0.1
1992	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.3	-0.3	-0.1
1993	0.0	0.0	0.0	-0.1	-0.2	-0.1	0.0	-0.2	-1.2	-0.5	0.0	0.0
1994	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	-1.4	-0.5
1995	0.0	0.0	0.0	0.0	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1996	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1997	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1998	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1999	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2001	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	-0.3	-0.2	-0.1
2002	0.0	0.0	0.0	-0.1	-0.1	0.0	-0.1	0.0	0.0	0.0	0.0	0.0
2003	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.8	0.0	0.0
Average	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.2	-0.1	-0.1
Critical	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.9	-0.4	-0.2
Dry	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.3	-0.1
BN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.2	-0.2	0.0	0.0
Wet	0.0	0.0	0.0	0.0	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table E.3-196. Middle River downstream of barrier stage (ft) difference No Groundwater Substitution minus Base.

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1971	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1972	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1973	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1974	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1975	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1976	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1977	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	0.0
1978	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1979	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1980	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1981	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0
1982	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1983	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1984	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1985	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1986	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1987	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0
1988	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	0.0
1989	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1990	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	0.0
1991	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	0.0
1992	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1993	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1994	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1995	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1996	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1997	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1998	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1999	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2001	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2002	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2003	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Average	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Critical	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Dry	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
BN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Wet	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table E.3-197. Middle River downstream of barrier stage percent difference of No Groundwater Substitution from Base.

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1971	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1972	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1973	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1974	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1975	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1976	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-1.9	-2.3	-0.9
1977	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-3.6	-0.5	-0.8
1978	-0.1	0.0	0.0	-0.1	-0.1	-0.1	0.0	0.0	0.0	0.0	0.0	0.0
1979	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1980	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1981	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.3	-3.4	-0.7
1982	-0.4	0.0	-0.2	-0.1	-1.1	-0.4	0.0	0.0	0.0	0.0	0.0	0.0
1983	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1984	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1985	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1986	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1987	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-1.3	-3.2	-0.9
1988	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-4.1	-1.7	-1.0
1989	-0.1	0.0	0.0	0.0	0.0	-0.1	-0.1	0.0	0.0	-0.1	-0.7	-0.1
1990	0.0	0.0	0.0	0.0	-0.1	0.0	0.0	0.0	0.0	-3.5	-1.3	-0.8
1991	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-3.1	-1.2	-0.7
1992	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	-1.8	-1.1	-0.7
1993	-0.1	0.0	0.0	-0.1	-0.2	-0.1	0.0	-0.1	-1.0	-0.5	0.0	0.0
1994	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.8	-1.6	-1.2
1995	0.0	0.0	0.0	0.0	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1996	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1997	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1998	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1999	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2001	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	-1.6	-1.7	-1.0
2002	0.0	0.0	0.0	-0.1	-0.1	0.0	-0.1	0.0	0.0	0.0	0.0	0.0
2003	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-1.4	-0.6	-0.2
Average	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.7	-0.6	-0.3
Critical	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-2.7	-1.4	-0.9
Dry	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.6	-1.5	-0.4
BN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.2	-0.3	-0.1	0.0
Wet	0.0	0.0	0.0	0.0	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table E.3-198. Old River upstream of barrier stage (ft) difference No Groundwater Substitution minus Base.

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1971	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1972	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1973	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1974	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1975	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1976	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1977	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	0.0
1978	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1979	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1980	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1981	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0
1982	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1983	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1984	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1985	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1986	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1987	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0
1988	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	0.0
1989	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1990	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	0.0
1991	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	0.0
1992	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1993	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.2	-0.1	0.0	0.0
1994	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0
1995	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1996	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1997	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1998	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1999	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2001	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2002	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2003	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Average	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Critical	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Dry	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
BN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Wet	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table E.3-199. Old River upstream of barrier stage percent difference of No Groundwater Substitution from Base.

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1971	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1972	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1973	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1974	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1975	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1976	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-1.1	-1.1	-0.5
1977	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-1.6	-0.7	-0.5
1978	-0.1	0.0	0.0	-0.1	-0.1	-0.1	0.0	0.0	0.0	0.0	0.0	0.0
1979	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1980	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1981	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.3	2.3	-1.1	-1.1
1982	0.0	0.0	-0.1	-0.2	-1.5	-0.5	0.0	0.0	0.0	0.0	0.0	0.0
1983	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1984	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1985	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1986	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1987	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-1.4	-1.5	-0.7
1988	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-2.0	-0.9	-0.5
1989	-0.1	0.0	0.0	0.0	0.0	-0.1	-0.1	0.0	0.0	0.0	-0.4	-0.3
1990	0.0	0.0	0.0	0.0	-0.1	0.0	0.0	0.0	0.0	-2.1	-0.9	-0.5
1991	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-2.0	-0.9	-0.4
1992	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.9	-0.8	-0.5
1993	-0.1	0.0	0.0	-0.1	-0.2	-0.1	0.0	-0.4	-3.7	-1.3	0.0	0.0
1994	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	-2.9	-0.8
1995	-0.1	0.0	0.0	0.0	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1996	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1997	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1998	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1999	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2001	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.8	-0.8	-0.5
2002	0.0	0.0	0.0	-0.1	-0.1	0.0	-0.1	0.0	0.0	0.0	0.0	0.0
2003	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.3	-0.2	0.0
Average	0.0	0.0	0.0	0.0	-0.1	0.0	0.0	0.0	-0.1	-0.2	-0.4	-0.2
Critical	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-1.1	-1.2	-0.5
Dry	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.3	-0.6	-0.4
BN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	-0.6	-0.3	0.0	0.0
Wet	0.0	0.0	0.0	0.0	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table E.3-200. Old River downstream of barrier stage (ft) difference No Groundwater Substitution from Base.

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1971	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1972	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1973	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1974	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1975	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1976	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	-0.1	0.0
1977	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	0.0
1978	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1979	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1980	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1981	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0
1982	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1983	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1984	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1985	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1986	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1987	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	-0.1	0.0
1988	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	0.0
1989	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1990	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	0.0
1991	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	0.0
1992	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	0.0
1993	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1994	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1995	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1996	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1997	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1998	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1999	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2001	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	0.0
2002	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2003	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	0.0
Average	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Critical	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	0.0
Dry	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0
BN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Wet	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table E.3-201. Old River downstream of barriers stage (ft) of barrier stage percent difference of No Groundwater Substitution from Base.

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1971	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1972	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1973	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1974	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1975	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1976	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-7.2	-4.0	-1.4
1977	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-6.1	-0.7	-1.1
1978	-0.2	0.0	0.0	-0.1	-0.1	-0.1	0.0	0.0	0.0	0.0	0.0	0.0
1979	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1980	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1981	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5	-8.8	-0.6
1982	-0.5	0.0	-0.2	-0.2	-1.4	-0.5	0.0	0.0	0.0	0.0	0.0	0.0
1983	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1984	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1985	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1986	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1987	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-3.4	-5.5	-1.7
1988	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-9.2	-2.5	-1.6
1989	-0.1	0.0	0.0	0.0	0.0	-0.1	-0.1	0.0	0.0	-0.1	-2.5	-0.1
1990	0.0	0.0	0.0	0.0	-0.1	0.0	0.0	0.0	0.0	-7.6	-2.4	-1.3
1991	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-6.7	-2.2	-1.2
1992	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	-3.8	-2.2	-1.1
1993	-0.1	0.0	0.0	-0.1	-0.2	-0.1	0.0	-0.2	-1.3	-0.8	0.0	0.0
1994	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-1.2	-2.4	-2.3
1995	0.0	0.0	0.0	0.0	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1996	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1997	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1998	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1999	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2001	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	-3.9	-3.0	-1.6
2002	0.0	0.0	0.0	-0.1	-0.1	0.0	-0.1	0.0	0.0	0.0	0.0	0.0
2003	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-4.9	-1.1	-0.3
Average	0.0	0.0	0.0	0.0	-0.1	0.0	0.0	0.0	-0.1	-1.6	-1.1	-0.4
Critical	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-5.9	-2.3	-1.4
Dry	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-1.2	-3.3	-0.7
BN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.2	-0.9	-0.2	0.0
Wet	0.0	0.0	0.0	0.0	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table E.3-202. Grant Line upstream of barrier stage (ft) difference No Crop Idle minus Base.

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1971	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1972	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1973	0.0	0.0	0.0	0.0	0.0	-0.1	-0.1	0.0	0.0	0.0	0.0	0.0
1974	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1975	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1976	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1977	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1978	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1979	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1980	0.0	0.0	0.0	0.0	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1981	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	-0.1
1982	0.0	0.0	0.0	0.0	-0.1	-0.1	0.0	0.0	0.0	0.0	0.0	0.0
1983	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1984	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1985	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1986	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1987	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	-0.1	0.0
1988	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	0.0
1989	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1990	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	0.0
1991	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1992	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	0.0
1993	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	0.0	0.0
1994	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0
1995	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1996	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1997	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1998	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1999	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2001	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	0.0
2002	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2003	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Average	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Critical	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Dry	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
BN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Wet	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table E.3-203. Grant Line upstream of barrier stage percent difference of No Crop Idle from Base.

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1971	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1972	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1973	0.0	0.0	0.0	0.0	-0.6	-2.8	-2.0	0.0	0.0	0.0	0.0	0.0
1974	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1975	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1976	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-1.1	-0.9	-0.3
1977	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.0	0.0	-0.8	-0.4	-0.4
1978	0.0	0.0	0.0	-0.1	-0.1	-0.1	0.0	0.0	0.0	0.0	0.0	0.0
1979	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1980	0.0	0.0	0.0	0.0	-0.8	-0.4	0.0	0.0	0.0	0.0	0.0	0.0
1981	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-1.8	-1.5
1982	0.0	0.0	-0.1	-0.4	-2.3	-1.1	0.0	0.0	0.0	0.0	0.0	0.0
1983	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1984	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1985	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1986	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1987	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.0	-1.7	-1.5	-0.5
1988	0.0	0.1	0.0	-0.1	0.0	0.1	0.0	0.2	0.0	-1.9	-0.9	-0.2
1989	0.0	0.1	-0.1	0.2	0.2	-0.2	-0.1	0.3	0.1	0.0	-0.9	-0.7
1990	0.1	0.0	0.1	0.0	-0.1	-0.1	0.0	0.0	0.0	-1.5	-0.6	-0.2
1991	0.0	0.1	0.1	0.2	0.0	-0.1	-0.1	0.0	0.0	-1.0	-0.4	-0.1
1992	0.0	0.1	0.1	0.1	-0.1	-0.1	0.0	0.2	0.1	-2.5	-1.3	-0.4
1993	0.0	0.0	-0.1	-0.2	-0.2	-0.2	-0.1	-0.5	-3.3	-1.2	0.0	0.0
1994	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-2.2	-0.8
1995	0.0	0.0	0.0	-0.1	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1996	0.0	0.0	0.0	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1997	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1998	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1999	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2001	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-3.4	-1.0	-0.3
2002	0.1	0.0	0.0	-0.1	-0.1	-0.1	-0.1	0.0	0.0	0.0	0.0	0.0
2003	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.8	-0.7	0.0
Average	0.0	0.0	0.0	0.0	-0.1	-0.1	-0.1	0.0	-0.1	-0.5	-0.4	-0.2
Critical	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.1	0.0	-1.3	-1.0	-0.3
Dry	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	-0.9	-0.8	-0.5
BN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AN	0.0	0.0	0.0	-0.1	-0.3	-0.6	-0.4	-0.1	-0.6	-0.3	-0.1	0.0
Wet	0.0	0.0	0.0	-0.1	-0.2	-0.1	0.0	0.0	0.0	0.0	0.0	0.0

Table E.3-204. Grant Line downstream of barrier stage (ft) difference No Crop Idle minus Base.

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1971	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1972	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1973	0.0	0.0	0.0	0.0	0.0	-0.1	-0.1	0.0	0.0	0.0	0.0	0.0
1974	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1975	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1976	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	-0.1	0.0
1977	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	0.0
1978	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1979	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1980	0.0	0.0	0.0	0.0	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1981	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0
1982	0.0	0.0	0.0	0.0	-0.1	-0.1	0.0	0.0	0.0	0.0	0.0	0.0
1983	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1984	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1985	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1986	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1987	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0
1988	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	0.0
1989	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0
1990	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	0.0
1991	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	0.0
1992	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	0.0
1993	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	0.0	0.0
1994	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1995	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1996	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1997	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1998	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1999	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2001	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	0.0
2002	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2003	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	0.0
Average	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Critical	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	0.0
Dry	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0
BN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Wet	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table E.3-205. Grant Line downstream of barrier stage percent difference of No Crop Idle from Base.

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1971	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1972	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1973	0.0	0.0	0.0	0.0	-0.6	-2.8	-2.0	0.0	0.0	0.0	0.0	0.0
1974	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1975	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1976	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-5.5	-4.0	-1.4
1977	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0	-4.5	-0.6	-0.9
1978	0.1	0.2	0.0	-0.1	-0.1	-0.1	0.0	0.0	0.0	0.0	0.0	0.0
1979	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1980	0.0	0.0	0.0	0.0	-0.8	-0.4	0.0	0.0	0.0	0.0	0.0	0.0
1981	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	-7.3	-0.1
1982	0.0	0.0	-0.1	-0.4	-2.3	-1.1	0.0	0.0	0.0	0.0	0.0	0.0
1983	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1984	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1985	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1986	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1987	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.2	-3.0	-5.1	-1.4
1988	0.1	0.2	0.0	-0.1	0.0	0.1	0.0	0.2	0.1	-7.7	-2.0	-1.2
1989	0.1	0.3	-0.1	0.2	0.2	-0.2	-0.1	0.3	0.3	-0.1	-5.1	-0.2
1990	0.1	0.2	0.1	0.0	-0.1	-0.1	0.0	0.0	0.0	-5.1	-1.6	-1.0
1991	0.2	0.2	0.2	0.2	0.0	-0.1	-0.1	0.0	0.2	-3.7	-1.1	-0.6
1992	0.2	0.2	0.1	0.1	-0.1	-0.1	0.0	0.2	0.2	-3.8	-2.6	-0.9
1993	-0.1	0.2	-0.1	-0.2	-0.2	-0.2	-0.1	-0.5	-3.5	-2.0	0.0	0.0
1994	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-2.7	-2.4
1995	0.2	0.2	0.0	-0.1	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1996	0.0	0.0	0.0	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1997	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.1
1998	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1999	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2001	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	-4.1	-3.0	-1.4
2002	0.3	-0.2	-0.1	-0.1	-0.1	-0.1	-0.1	0.0	0.0	-0.1	-0.1	0.0
2003	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	-9.2	0.0	0.0
Average	0.0	0.1	0.0	0.0	-0.1	-0.1	-0.1	0.0	-0.1	-1.4	-1.0	-0.3
Critical	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.1	0.1	-4.3	-2.1	-1.2
Dry	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	-1.2	-3.4	-0.5
BN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AN	0.0	0.1	0.0	-0.1	-0.3	-0.6	-0.4	-0.1	-0.6	-1.9	0.0	0.0
Wet	0.0	0.0	0.0	-0.1	-0.2	-0.1	0.0	0.0	0.0	0.0	0.0	0.0

Table E.3-206. Middle River upstream of barrier stage (ft) difference No Crop Idle minus Base.

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1971	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1972	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1973	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1974	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1975	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1976	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1977	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1978	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1979	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1980	0.0	0.0	0.0	0.0	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1981	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1982	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1983	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1984	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1985	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1986	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1987	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1988	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	0.0
1989	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1990	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1991	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1992	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	0.0
1993	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1994	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1995	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1996	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1997	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1998	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1999	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2001	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	0.0
2002	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2003	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	0.0
Average	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Critical	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Dry	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
BN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Wet	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table E.3-207. Middle River upstream of barrier stage percent difference of No Crop Idle from Base.

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1971	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1972	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1973	0.0	0.0	0.0	0.0	-0.2	-1.0	-0.5	0.0	0.0	0.0	0.0	0.0
1974	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1975	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1976	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-1.0	-0.4	-0.2
1977	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.0	0.0	-0.7	-0.2	-0.2
1978	0.0	0.0	0.0	-0.2	-0.2	-0.1	0.0	0.0	0.0	0.0	0.0	0.0
1979	0.0	0.0	0.0	0.0	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1980	0.0	0.0	0.0	0.0	-1.4	-0.8	0.0	0.0	0.0	0.0	0.0	0.0
1981	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.8	-0.4
1982	0.0	0.0	-0.2	-0.1	-1.1	-0.4	0.0	0.0	0.0	0.0	0.0	0.0
1983	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1984	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1985	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1986	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1987	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.0	-1.1	-0.9	-0.2
1988	0.0	0.0	-0.1	-0.1	0.0	0.0	0.0	0.1	0.0	-2.1	-0.3	-0.1
1989	0.0	0.0	-0.1	0.3	0.2	-0.3	-0.2	0.2	0.0	-0.1	-0.6	-0.1
1990	0.0	0.0	0.1	0.0	-0.1	-0.1	0.0	0.0	0.0	-1.4	-0.3	-0.1
1991	0.0	0.0	0.2	0.2	0.0	-0.1	-0.1	0.0	0.0	-1.1	-0.2	-0.1
1992	0.0	0.0	0.2	0.1	-0.1	-0.1	0.0	0.2	0.0	-2.3	-0.5	-0.2
1993	0.0	0.0	-0.1	-0.2	-0.2	-0.3	-0.1	-0.2	-1.2	-0.5	0.0	0.0
1994	0.0	0.0	0.0	0.0	-0.1	-0.1	0.0	0.0	0.0	0.0	-1.4	-0.4
1995	0.0	0.0	-0.1	-0.2	-0.2	-0.1	0.0	0.0	-0.1	-0.1	0.0	0.0
1996	0.0	0.0	-0.1	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1997	0.0	0.0	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1998	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1999	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2001	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-1.9	-0.4	-0.1
2002	0.0	0.0	-0.1	-0.2	-0.2	-0.1	-0.1	0.0	0.0	0.0	0.0	0.0
2003	0.0	0.0	-0.1	-0.1	0.0	0.0	0.0	0.0	0.0	-1.8	-0.1	0.0
Average	0.0	0.0	0.0	0.0	-0.1	-0.1	0.0	0.0	0.0	-0.4	-0.2	-0.1
Critical	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	-1.2	-0.5	-0.2
Dry	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	0.0	0.0	-0.5	-0.4	-0.1
BN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AN	0.0	0.0	0.0	-0.1	-0.3	-0.4	-0.1	0.0	-0.2	-0.4	0.0	0.0
Wet	0.0	0.0	0.0	0.0	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table E.3-208. Middle River downstream of barrier stage (ft) difference No Crop Idle minus Base.

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1971	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1972	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1973	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1974	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1975	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1976	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0
1977	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	0.0
1978	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1979	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1980	0.0	0.0	0.0	0.0	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1981	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0
1982	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1983	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1984	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1985	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1986	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1987	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0
1988	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	0.0
1989	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1990	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	0.0
1991	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1992	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1993	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1994	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1995	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1996	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1997	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1998	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1999	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2001	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2002	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2003	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Average	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Critical	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Dry	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
BN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Wet	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table E.3-209. Middle River downstream of barrier stage percent difference of No Crop Idle from Base.

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1971	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1972	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1973	0.0	0.0	0.0	0.0	-0.2	-1.0	-0.5	0.0	0.0	0.0	0.0	0.0
1974	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1975	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1976	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-2.1	-2.9	-1.0
1977	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0	-3.0	-0.3	-0.6
1978	0.1	0.1	0.0	-0.2	-0.2	-0.1	0.0	0.0	0.0	0.0	0.0	0.0
1979	0.0	0.0	0.0	0.0	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1980	0.0	0.0	0.0	0.0	-1.4	-0.8	0.0	0.0	0.0	0.0	0.0	0.0
1981	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	-4.2	-0.2
1982	0.0	0.0	-0.2	-0.1	-1.1	-0.4	0.0	0.0	0.0	0.0	0.0	0.0
1983	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1984	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1985	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1986	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1987	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.2	0.1	-1.5	-4.1	-1.0
1988	0.1	0.1	-0.1	-0.1	0.0	0.0	0.0	0.2	0.1	-5.1	-1.7	-1.0
1989	0.1	0.2	-0.1	0.3	0.2	-0.3	-0.2	0.3	0.2	-0.1	-1.6	-0.2
1990	0.0	0.1	0.1	0.0	-0.1	-0.1	0.0	0.0	0.0	-3.7	-1.3	-0.9
1991	0.2	0.2	0.2	0.2	0.0	-0.1	-0.1	0.0	0.2	-2.6	-1.0	-0.5
1992	0.1	0.2	0.2	0.1	-0.1	-0.1	0.0	0.2	0.1	-1.9	-1.8	-0.7
1993	0.0	0.1	-0.1	-0.2	-0.2	-0.3	-0.1	-0.2	-1.0	-0.5	0.0	0.0
1994	0.0	0.0	0.0	0.0	-0.1	-0.1	0.0	0.0	0.0	0.0	-1.5	-1.3
1995	0.2	0.1	-0.1	-0.2	-0.2	-0.1	0.0	0.0	-0.1	-0.1	0.0	0.0
1996	0.0	0.0	-0.1	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1997	0.0	0.0	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1998	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1999	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2001	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	-2.1	-2.1	-1.0
2002	0.2	-0.1	-0.1	-0.2	-0.2	-0.1	-0.1	-0.1	0.0	0.0	-0.1	-0.1
2003	0.0	0.0	-0.1	-0.1	0.0	0.0	0.0	0.0	-0.1	-2.6	0.0	0.0
Average	0.0	0.0	0.0	0.0	-0.1	-0.1	0.0	0.0	0.0	-0.7	-0.7	-0.3
Critical	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.1	0.0	-2.6	-1.5	-0.9
Dry	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	0.1	0.1	-0.6	-2.0	-0.4
BN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AN	0.0	0.0	0.0	-0.1	-0.3	-0.4	-0.1	-0.1	-0.2	-0.5	0.0	0.0
Wet	0.0	0.0	0.0	0.0	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table E.3-210. Old River upstream of barrier stage (ft) difference No Crop Idle minus Base.

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1971	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1972	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1973	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1974	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1975	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1976	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0
1977	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1978	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1979	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1980	0.0	0.0	0.0	0.0	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1981	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	-0.1
1982	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1983	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1984	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1985	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1986	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1987	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	-0.1	0.0
1988	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	0.0
1989	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1990	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	0.0
1991	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	0.0
1992	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	0.0
1993	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.2	-0.1	0.0	0.0
1994	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0
1995	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1996	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1997	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1998	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1999	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2001	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	0.0
2002	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2003	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Average	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Critical	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	0.0
Dry	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
BN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Wet	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table E.3-211. Old River upstream of barrier stage percent difference of No Crop Idle from Base.

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1971	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1972	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1973	0.0	0.0	0.0	0.0	-0.3	-1.5	-0.9	0.0	0.0	0.0	0.0	0.0
1974	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1975	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1976	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-1.3	-1.3	-0.5
1977	0.0	0.1	0.2	0.2	0.2	0.2	0.2	0.0	0.0	-1.3	-0.5	-0.4
1978	0.0	0.0	0.0	-0.2	-0.1	-0.1	0.0	0.0	0.0	0.0	0.0	0.0
1979	0.0	0.0	0.0	0.0	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1980	0.0	0.0	0.0	0.0	-2.1	-0.9	0.0	0.0	0.0	0.0	0.0	0.0
1981	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	-1.6	-1.6
1982	0.0	0.0	-0.2	-0.2	-1.5	-0.5	0.0	0.0	0.0	0.0	0.0	0.0
1983	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1984	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1985	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.2	0.0
1986	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1987	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.2	0.0	-1.9	-1.9	-0.6
1988	0.0	0.1	-0.1	-0.1	0.0	0.1	0.0	0.2	0.0	-2.4	-0.9	-0.5
1989	0.0	0.1	-0.1	0.4	0.3	-0.3	-0.2	0.3	0.1	0.0	-1.3	-0.7
1990	0.1	0.1	0.2	0.0	-0.1	-0.1	0.0	0.0	0.0	-2.2	-0.8	-0.4
1991	0.1	0.1	0.2	0.3	0.0	-0.1	-0.1	0.0	0.1	-1.7	-0.6	-0.4
1992	0.0	0.1	0.2	0.2	-0.1	-0.1	0.0	0.2	0.1	-2.5	-1.3	-0.5
1993	0.0	0.0	-0.1	-0.2	-0.2	-0.3	-0.1	-0.5	-3.7	-1.3	0.0	0.0
1994	0.0	0.0	0.0	0.0	-0.1	0.0	0.0	0.0	0.0	0.0	-2.8	-0.8
1995	0.0	0.0	-0.1	-0.2	-0.2	-0.1	0.0	0.0	-0.1	0.0	0.0	0.0
1996	0.0	0.0	-0.1	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1997	0.0	0.0	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1998	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1999	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2000	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2001	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	-2.7	-1.0	-0.3
2002	0.1	0.0	-0.1	-0.2	-0.2	-0.1	-0.1	0.0	0.0	0.0	-0.1	0.0
2003	0.0	0.0	-0.1	-0.1	0.0	0.0	0.0	0.0	0.0	-0.9	-0.6	0.0
Average	0.0	0.0	0.0	0.0	-0.1	-0.1	0.0	0.0	-0.1	-0.5	-0.4	-0.2
Critical	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.1	0.0	-1.6	-1.2	-0.5
Dry	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	0.1	0.0	-0.8	-1.0	-0.5
BN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AN	0.0	0.0	0.0	-0.1	-0.5	-0.5	-0.2	-0.1	-0.6	-0.4	-0.1	0.0
Wet	0.0	0.0	0.0	0.0	-0.1	-0.1	0.0	0.0	0.0	0.0	0.0	0.0

Table E.3-212. Old River downstream of barrier stage (ft) difference No Crop Idle minus Base.

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1971	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1972	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1973	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1974	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1975	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1976	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	-0.1	0.0
1977	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	0.0
1978	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1979	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1980	0.0	0.0	0.0	0.0	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1981	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.2	0.0
1982	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1983	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1984	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1985	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1986	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1987	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	-0.1	0.0
1988	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.2	0.0	0.0
1989	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0
1990	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	0.0
1991	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	0.0
1992	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	-0.1	0.0
1993	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1994	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1995	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1996	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1997	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1998	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1999	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2001	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	-0.1	0.0
2002	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2003	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	0.0
Average	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Critical	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	0.0
Dry	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0
BN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Wet	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table E.3-213. Old River downstream of barrier stage percent difference of No Crop Idle from Base.

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1971	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1972	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1973	0.0	0.0	0.0	0.0	-0.2	-1.4	-0.8	0.0	0.0	0.0	0.0	0.0
1974	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1975	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1976	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-7.6	-5.1	-1.7
1977	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.1	0.0	-5.3	-0.5	-0.8
1978	0.2	0.2	0.0	-0.2	-0.2	-0.1	0.0	0.0	0.0	0.0	0.0	0.0
1979	0.0	0.0	0.0	0.0	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1980	0.0	0.0	0.0	0.0	-2.3	-0.8	0.0	0.0	0.0	0.0	0.0	0.0
1981	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	-13.4	-0.1
1982	0.1	0.0	-0.2	-0.2	-1.5	-0.5	0.0	0.0	0.0	0.0	0.0	0.0
1983	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1984	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0
1985	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0
1986	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1987	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.2	0.3	-4.0	-7.2	-1.9
1988	0.4	0.3	-0.1	-0.1	0.0	0.2	0.0	0.3	0.1	-12.5	-2.6	-1.6
1989	0.4	0.5	-0.1	0.5	0.3	-0.3	-0.2	0.5	0.4	-0.1	-6.6	-0.2
1990	0.2	0.3	0.2	0.0	-0.1	-0.1	0.0	0.0	0.0	-7.9	-2.4	-1.4
1991	0.3	0.4	0.3	0.3	0.0	-0.1	-0.1	0.0	0.3	-5.6	-1.9	-0.9
1992	0.3	0.3	0.2	0.2	-0.1	-0.1	0.0	0.4	0.3	-4.4	-3.6	-0.9
1993	0.0	0.3	-0.1	-0.2	-0.2	-0.3	-0.1	-0.3	-1.4	-0.8	0.0	0.0
1994	0.0	0.0	0.0	0.0	-0.1	0.0	0.0	0.0	0.0	0.0	-2.2	-2.9
1995	0.3	0.3	-0.1	-0.2	-0.2	-0.1	0.0	0.0	-0.1	0.0	0.0	0.0
1996	0.0	0.0	-0.1	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1997	0.0	0.0	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.1
1998	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1999	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2000	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0
2001	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.3	-4.8	-3.7	-1.9
2002	0.6	-0.1	-0.1	-0.2	-0.2	-0.1	-0.1	-0.1	0.0	-0.1	-0.1	-0.1
2003	0.0	0.0	-0.1	-0.1	0.0	0.0	0.0	0.0	-0.1	-10.8	0.0	0.0
Average	0.1	0.1	0.0	0.0	-0.1	-0.1	0.0	0.0	0.0	-1.9	-1.4	-0.4
Critical	0.2	0.2	0.1	0.1	0.0	0.0	0.0	0.1	0.1	-6.2	-2.6	-1.5
Dry	0.2	0.1	0.0	0.0	0.0	-0.1	0.0	0.1	0.2	-1.5	-5.2	-0.7
BN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AN	0.0	0.1	0.0	-0.1	-0.5	-0.5	-0.2	-0.1	-0.3	-1.9	0.0	0.0
Wet	0.0	0.0	0.0	0.0	-0.1	-0.1	0.0	0.0	0.0	0.0	0.0	0.0

Table E.3-214. Old River near Middle River location Base stage (ft).

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	4.2	4.2	3.4	8.5	5.4	5.4	3.8	3.3	4.0	3.8	3.8	3.9
1971	4.0	3.9	3.1	3.0	2.8	3.9	3.9	3.5	4.0	3.7	3.8	3.9
1972	4.0	3.9	2.4	2.5	2.9	2.8	3.2	3.1	3.9	3.7	3.8	3.9
1973	4.1	3.9	3.1	3.4	4.4	5.2	4.6	4.1	4.2	3.9	4.1	4.0
1974	4.0	3.8	3.3	4.7	3.5	5.6	5.5	4.0	5.2	4.4	4.2	4.2
1975	4.1	4.0	2.6	2.6	4.3	5.8	4.9	3.3	6.1	4.5	4.3	4.0
1976	4.0	4.0	2.3	2.6	2.8	2.6	3.0	2.9	3.8	3.7	4.1	4.1
1977	4.0	3.9	2.7	2.6	2.5	2.1	2.1	2.5	3.5	3.6	3.7	3.9
1978	3.8	3.7	2.6	3.6	4.9	5.3	7.0	6.4	6.8	4.7	4.3	4.2
1979	3.9	3.9	2.4	3.6	4.7	5.7	5.0	5.1	3.9	3.7	4.1	3.9
1980	4.0	3.9	2.6	7.1	9.7	8.6	4.9	4.7	7.1	5.9	4.4	4.2
1981	4.1	3.9	2.5	2.9	2.9	3.6	3.6	3.2	3.7	3.7	3.8	3.8
1982	3.9	3.8	3.0	3.6	6.9	8.1	11.8	8.9	7.4	6.4	5.0	6.0
1983	5.8	7.5	9.7	11.9	13.3	16.8	11.0	10.6	11.8	10.8	6.8	6.4
1984	4.6	9.2	10.7	7.9	6.0	5.2	4.6	3.6	4.3	4.1	4.2	4.5
1985	4.3	4.0	2.6	2.8	2.9	3.3	3.6	3.1	3.8	3.7	3.9	4.0
1986	3.9	3.8	2.6	2.8	9.4	11.4	6.8	6.2	6.6	4.3	4.3	4.5
1987	4.3	4.2	2.7	2.6	2.9	3.1	2.8	3.0	3.7	3.7	4.0	4.0
1988	4.0	3.9	2.7	2.6	2.8	2.6	2.7	2.6	3.5	3.5	3.7	3.9
1989	3.8	3.7	2.2	2.2	2.5	2.9	2.7	2.5	3.6	3.4	3.7	3.9
1990	3.7	3.8	2.6	2.5	2.5	2.4	2.5	2.7	3.6	3.5	3.8	3.9
1991	3.9	3.8	2.5	2.5	2.7	3.2	2.5	2.4	3.5	3.5	3.7	3.8
1992	3.9	3.8	2.7	2.7	3.6	3.3	2.7	2.7	3.6	3.6	3.7	3.8
1993	3.9	3.8	2.6	4.2	4.0	3.6	3.4	3.6	4.8	4.2	4.1	4.1
1994	4.0	3.9	2.4	2.5	2.8	2.6	2.5	2.7	3.6	3.4	3.6	3.7
1995	3.9	3.7	2.5	4.2	3.4	9.0	7.3	9.7	7.8	9.2	5.1	4.2
1996	4.1	3.9	2.8	3.1	6.8	6.4	5.2	4.9	5.2	4.1	4.1	4.1
1997	4.0	4.0	9.3	18.5	10.6	6.2	3.9	4.4	4.7	3.9	4.2	4.2
1998	4.2	4.2	3.0	4.3	10.7	8.0	8.1	8.3	9.1	9.4	5.3	4.9
1999	4.3	4.0	2.8	3.8	6.4	4.9	4.6	3.6	4.4	3.8	3.9	4.0
2000	3.9	3.8	2.0	2.7	6.6	5.7	4.6	3.9	4.1	3.8	3.9	4.1
2001	4.1	3.8	2.3	2.7	2.9	3.4	3.5	3.1	3.7	3.7	3.8	4.0
2002	3.9	3.8	2.6	3.0	2.5	2.8	2.8	2.8	3.6	3.5	3.8	3.9
2003	3.9	3.8	3.0	2.9	2.8	2.6	3.4	3.0	3.6	3.5	3.8	3.8
Average	4.1	4.2	3.3	4.2	4.9	5.1	4.5	4.2	4.9	4.5	4.1	4.2
Critical	3.9	3.9	2.5	2.6	2.8	2.7	2.6	2.6	3.6	3.5	3.8	3.9
Dry	4.1	3.9	2.5	2.7	2.8	3.2	3.2	2.9	3.7	3.6	3.8	3.9
BN	3.9	3.9	2.4	3.1	3.8	4.3	4.1	4.1	3.9	3.7	4.0	3.9
AN	3.9	3.8	2.6	4.0	5.4	5.2	4.6	4.3	5.1	4.3	4.1	4.1
Wet	4.2	4.6	4.5	6.1	6.9	7.4	6.3	5.7	6.2	5.6	4.5	4.5

Table E.3-215. Old River near Tracy location Base stage (ft).

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	4.1	4.2	2.6	5.0	3.4	3.2	2.4	2.5	3.9	3.7	3.7	3.8
1971	3.9	3.8	2.6	2.3	2.0	2.3	2.5	2.7	3.8	3.6	3.7	3.8
1972	3.9	3.8	1.8	2.1	2.4	2.2	2.3	2.5	3.8	3.6	3.7	3.8
1973	4.0	3.9	2.5	2.9	3.4	3.1	2.7	2.9	4.0	3.7	4.0	3.9
1974	3.9	3.7	2.4	3.3	2.4	3.4	3.5	2.9	4.8	4.2	4.1	4.0
1975	4.0	3.9	1.9	2.0	2.9	3.4	3.1	2.6	5.3	4.3	4.1	3.9
1976	3.9	3.9	1.7	2.0	2.2	2.0	2.3	2.4	3.7	3.6	4.1	4.1
1977	4.0	3.8	2.3	2.1	2.1	1.8	1.8	2.2	3.5	3.5	3.6	3.9
1978	3.8	3.7	2.2	3.0	3.4	3.4	4.1	4.0	5.6	4.5	4.1	4.1
1979	3.8	3.9	1.8	2.6	3.0	3.3	3.1	3.3	3.8	3.6	4.0	3.9
1980	3.9	3.8	2.0	4.2	6.0	4.9	3.0	3.2	5.8	5.2	4.3	4.0
1981	4.0	3.8	1.9	2.4	2.3	2.6	2.5	2.6	3.6	3.6	3.7	3.7
1982	3.8	3.7	2.4	2.8	3.9	4.5	7.4	4.9	5.5	5.4	4.7	5.4
1983	5.2	6.2	5.6	7.5	8.8	11.6	6.8	6.3	7.2	6.4	5.7	5.6
1984	4.4	7.1	6.6	4.5	3.5	3.1	2.8	2.7	4.2	3.9	4.1	4.3
1985	4.1	3.9	2.0	2.2	2.1	2.2	2.4	2.4	3.7	3.6	3.8	3.9
1986	3.9	3.7	2.0	2.3	5.8	6.9	3.8	3.8	5.5	4.2	4.2	4.3
1987	4.2	4.1	2.2	2.0	2.3	2.4	2.1	2.6	3.7	3.6	4.0	3.9
1988	3.9	3.9	2.2	2.2	2.4	2.2	2.2	2.2	3.4	3.4	3.7	3.8
1989	3.7	3.6	1.8	1.7	2.0	2.3	2.1	2.3	3.5	3.3	3.7	3.9
1990	3.7	3.8	2.2	2.1	2.0	2.0	2.1	2.5	3.5	3.5	3.8	3.9
1991	3.8	3.8	2.1	2.2	2.2	2.6	1.9	2.1	3.5	3.4	3.7	3.8
1992	3.9	3.8	2.3	2.3	3.0	2.7	2.3	2.5	3.5	3.5	3.7	3.8
1993	3.9	3.8	2.2	3.2	3.1	2.7	2.6	3.0	4.5	4.1	4.0	4.0
1994	3.9	3.8	1.8	2.1	2.2	2.1	2.1	2.4	3.5	3.3	3.5	3.6
1995	3.8	3.7	2.1	3.4	2.8	5.5	4.1	5.6	4.0	5.0	4.7	4.1
1996	4.0	3.9	2.2	2.5	4.2	3.7	3.2	3.4	4.7	4.0	4.0	4.0
1997	4.0	3.9	5.2	12.6	6.2	3.3	2.5	3.1	4.4	3.8	4.1	4.1
1998	4.1	4.2	2.4	3.3	7.0	4.5	4.5	4.7	5.0	5.1	4.8	4.6
1999	4.1	3.9	2.0	2.5	3.6	3.0	2.9	2.7	4.2	3.7	3.8	3.9
2000	3.9	3.8	1.5	2.1	4.0	3.2	2.8	2.8	4.0	3.7	3.8	4.0
2001	4.0	3.7	1.6	2.1	2.3	2.5	2.3	2.5	3.6	3.6	3.8	3.9
2002	3.8	3.8	2.1	2.3	2.0	2.2	2.2	2.4	3.5	3.4	3.7	3.8
2003	3.8	3.8	2.5	2.5	2.4	2.0	2.5	2.5	3.5	3.4	3.7	3.7
Average	4.0	4.0	2.4	3.1	3.3	3.3	3.0	3.0	4.2	4.0	4.0	4.0
Critical	3.9	3.8	2.1	2.1	2.3	2.2	2.1	2.3	3.5	3.5	3.7	3.8
Dry	4.0	3.8	1.9	2.1	2.2	2.4	2.3	2.5	3.6	3.5	3.8	3.8
BN	3.8	3.8	1.8	2.4	2.7	2.7	2.7	2.9	3.8	3.6	3.9	3.8
AN	3.9	3.8	2.2	3.0	3.7	3.2	3.0	3.1	4.6	4.1	4.0	4.0
Wet	4.1	4.3	3.1	4.2	4.3	4.5	3.8	3.7	4.8	4.4	4.3	4.3

Table ES.3-216. Middle River downstream of Old River location Base stage (ft).

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	3.9	3.9	3.1	7.6	4.8	4.7	3.3	2.9	3.7	3.5	3.6	3.7
1971	3.7	3.7	2.9	2.8	2.5	3.4	3.5	3.2	3.6	3.4	3.6	3.7
1972	3.7	3.7	2.3	2.4	2.7	2.5	2.9	2.8	3.6	3.4	3.6	3.7
1973	3.8	3.7	2.9	3.3	4.1	4.6	4.0	3.6	3.8	3.6	3.8	3.7
1974	3.8	3.6	3.0	4.3	3.1	4.9	4.9	3.5	4.6	4.0	3.9	3.9
1975	3.8	3.8	2.4	2.4	3.8	5.1	4.3	3.0	5.3	4.0	3.9	3.8
1976	3.8	3.7	2.1	2.4	2.6	2.3	2.7	2.6	3.5	3.5	3.9	3.9
1977	3.8	3.7	2.6	2.5	2.3	2.0	2.0	2.4	3.3	3.4	3.5	3.7
1978	3.6	3.6	2.5	3.4	4.4	4.8	6.2	5.6	6.0	4.2	3.9	3.9
1979	3.7	3.7	2.3	3.3	4.2	5.0	4.4	4.4	3.6	3.4	3.8	3.7
1980	3.8	3.7	2.4	6.3	8.7	7.7	4.3	4.1	6.3	5.2	4.1	3.9
1981	3.8	3.6	2.4	2.8	2.7	3.3	3.2	2.9	3.4	3.4	3.6	3.6
1982	3.7	3.6	2.8	3.4	6.1	7.2	10.7	7.8	6.5	5.6	4.5	5.4
1983	5.2	6.7	8.6	10.7	12.1	15.3	9.9	9.5	10.6	9.7	6.0	5.7
1984	4.2	8.3	9.6	7.0	5.3	4.6	4.0	3.2	3.9	3.7	3.9	4.1
1985	4.0	3.8	2.4	2.6	2.7	3.0	3.2	2.7	3.5	3.4	3.7	3.7
1986	3.7	3.6	2.4	2.6	8.4	10.2	6.0	5.4	5.8	3.9	4.0	4.1
1987	4.0	3.9	2.6	2.4	2.7	2.9	2.5	2.8	3.5	3.5	3.8	3.7
1988	3.7	3.7	2.5	2.5	2.7	2.4	2.5	2.4	3.3	3.3	3.6	3.7
1989	3.6	3.5	2.1	2.1	2.3	2.7	2.5	2.4	3.4	3.2	3.6	3.7
1990	3.6	3.6	2.5	2.4	2.3	2.2	2.4	2.6	3.4	3.3	3.6	3.7
1991	3.7	3.6	2.3	2.4	2.5	3.0	2.2	2.2	3.4	3.3	3.6	3.7
1992	3.7	3.6	2.5	2.5	3.4	3.1	2.6	2.6	3.4	3.4	3.6	3.6
1993	3.7	3.6	2.5	3.9	3.7	3.4	3.1	3.4	4.3	3.8	3.8	3.8
1994	3.7	3.7	2.2	2.4	2.7	2.4	2.3	2.6	3.4	3.2	3.5	3.5
1995	3.7	3.5	2.3	4.0	3.2	8.1	6.4	8.7	6.8	8.1	4.6	3.9
1996	3.8	3.7	2.6	2.9	6.1	5.7	4.6	4.4	4.5	3.7	3.8	3.8
1997	3.8	3.8	8.3	16.8	9.5	5.5	3.4	3.9	4.2	3.6	3.9	3.9
1998	3.9	4.0	2.8	4.0	9.7	7.2	7.2	7.4	8.0	8.3	4.8	4.4
1999	3.9	3.7	2.5	3.4	5.7	4.4	4.1	3.2	3.9	3.5	3.7	3.7
2000	3.7	3.6	1.9	2.5	5.9	5.0	4.0	3.5	3.8	3.5	3.7	3.9
2001	3.8	3.6	2.1	2.5	2.7	3.1	3.2	2.8	3.4	3.5	3.6	3.7
2002	3.6	3.6	2.5	2.8	2.4	2.6	2.5	2.6	3.4	3.3	3.6	3.7
2003	3.6	3.6	2.8	2.8	2.7	2.4	3.1	2.8	3.4	3.3	3.6	3.6
Average	3.8	3.9	3.1	3.9	4.4	4.6	4.1	3.8	4.4	4.1	3.9	3.9
Critical	3.7	3.7	2.4	2.4	2.7	2.5	2.4	2.5	3.4	3.4	3.6	3.7
Dry	3.8	3.7	2.3	2.5	2.6	2.9	2.9	2.7	3.4	3.4	3.6	3.7
BN	3.7	3.7	2.3	2.8	3.5	3.8	3.6	3.6	3.6	3.4	3.7	3.7
AN	3.7	3.6	2.5	3.7	4.9	4.7	4.1	3.8	4.6	3.9	3.8	3.8
Wet	3.9	4.3	4.1	5.5	6.2	6.6	5.6	5.1	5.5	5.0	4.2	4.2

Table ES.3-217. Old River near Middle River location stage (ft) difference All Transfers minus Base.

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1971	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1972	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1973	0.0	0.0	0.0	0.0	0.0	-0.2	-0.1	0.0	0.0	0.0	0.0	0.0
1974	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1975	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1976	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0
1977	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1978	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1979	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1980	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1981	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	-0.1
1982	0.0	0.0	0.0	0.0	-0.2	-0.1	0.0	0.0	0.0	0.0	0.0	0.0
1983	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1984	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1985	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1986	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1987	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	-0.1	0.0
1988	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	-0.1	0.0
1989	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1990	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	0.0
1991	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	0.0
1992	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	-0.1	0.0
1993	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.2	-0.1	0.0	0.0
1994	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0
1995	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1996	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1997	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1998	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1999	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2001	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	0.0
2002	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2003	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Average	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Critical	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	-0.1	0.0
Dry	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
BN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Wet	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table E.3-218. Old River near Middle River location stage percent difference of All Transfers from Base.

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1971	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1972	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1973	0.0	0.0	0.0	0.0	-0.4	-4.2	-3.0	0.0	0.0	0.0	0.0	0.0
1974	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1975	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1976	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-1.3	-1.7	-0.7
1977	-0.1	0.0	0.1	0.1	0.1	0.1	0.1	0.0	0.0	-1.1	-1.0	-0.7
1978	-0.1	0.0	0.0	-0.1	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1979	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1980	0.0	0.0	0.0	0.0	-0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1981	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-1.5	-1.5
1982	0.0	0.0	-0.1	-1.1	-3.1	-1.4	0.0	0.0	0.0	0.0	0.0	0.0
1983	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1984	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1985	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1986	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1987	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.0	-2.0	-1.9	-0.8
1988	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	-3.0	-2.6	-0.3
1989	-0.1	0.1	0.0	0.1	0.1	-0.1	-0.1	0.2	0.1	0.0	-0.8	-0.7
1990	0.1	0.0	0.1	0.0	-0.1	0.0	0.0	0.0	0.0	-2.9	-1.0	-0.4
1991	0.0	0.1	0.1	0.1	0.0	-0.1	-0.1	0.0	0.0	-2.3	-0.8	-0.3
1992	0.0	0.1	0.1	0.1	-0.1	0.0	0.0	0.2	0.1	-3.7	-1.9	-0.3
1993	-0.1	0.0	0.0	-0.1	-0.1	-0.1	-0.1	-1.1	-4.4	-1.4	0.0	0.0
1994	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-3.3	-1.2
1995	-0.1	0.0	0.0	-0.1	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1996	0.0	0.0	0.0	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1997	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1998	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1999	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2001	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-3.3	-1.2	-0.5
2002	0.0	0.0	0.0	-0.1	-0.1	0.0	-0.1	0.0	0.0	0.0	0.0	0.0
2003	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.6	-0.7	0.0
Average	0.0	0.0	0.0	0.0	-0.1	-0.2	-0.1	0.0	-0.1	-0.6	-0.5	-0.2
Critical	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	-2.0	-1.7	-0.6
Dry	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.9	-0.9	-0.6
BN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AN	0.0	0.0	0.0	0.0	-0.1	-0.7	-0.5	-0.2	-0.7	-0.3	-0.1	0.0
Wet	0.0	0.0	0.0	-0.1	-0.2	-0.1	0.0	0.0	0.0	0.0	0.0	0.0

Table E.3-219. Old River near Tracy location stage (ft) difference All Transfers minus Base.

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1971	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1972	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1973	0.0	0.0	0.0	0.0	0.0	-0.1	-0.1	0.0	0.0	0.0	0.0	0.0
1974	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1975	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1976	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	-0.1	0.0
1977	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	0.0
1978	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1979	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1980	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1981	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	-0.1
1982	0.0	0.0	0.0	0.0	-0.1	-0.1	0.0	0.0	0.0	0.0	0.0	0.0
1983	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1984	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1985	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1986	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1987	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	-0.1	0.0
1988	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	-0.1	0.0
1989	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1990	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	0.0
1991	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	0.0
1992	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	-0.1	0.0
1993	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.2	-0.1	0.0	0.0
1994	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0
1995	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1996	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1997	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1998	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1999	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2001	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	-0.1	0.0
2002	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2003	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Average	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Critical	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	-0.1	0.0
Dry	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
BN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Wet	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table E.3-220. Old River near Tracy location stage percent difference of All Transfers from Base.

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1971	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1972	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1973	0.0	0.0	0.0	0.0	-0.6	-2.8	-2.1	0.0	0.0	0.0	0.0	0.0
1974	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1975	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1976	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-1.4	-2.1	-0.7
1977	-0.1	0.0	0.1	0.2	0.1	0.1	0.2	0.0	0.0	-1.5	-1.0	-0.8
1978	-0.1	0.0	0.0	-0.1	-0.1	-0.1	0.0	0.0	0.0	0.0	0.0	0.0
1979	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1980	0.0	0.0	0.0	0.0	-0.8	-0.5	0.0	0.0	0.0	0.0	0.0	0.0
1981	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-1.7	-1.6
1982	0.0	0.0	-0.1	-0.4	-2.4	-1.2	0.0	0.0	0.0	0.0	0.0	0.0
1983	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1984	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1985	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1986	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1987	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.0	-2.3	-2.2	-0.8
1988	-0.1	0.1	0.0	-0.1	0.0	0.1	0.0	0.1	0.0	-3.3	-2.6	-0.4
1989	-0.1	0.1	-0.1	0.3	0.2	-0.2	-0.2	0.3	0.1	0.0	-0.9	-0.7
1990	0.1	0.1	0.1	0.0	-0.1	-0.1	0.0	0.0	0.0	-2.5	-1.1	-0.4
1991	0.0	0.1	0.2	0.2	0.0	-0.1	-0.1	0.0	0.0	-2.2	-0.9	-0.3
1992	0.0	0.1	0.2	0.2	-0.1	-0.1	0.0	0.2	0.1	-4.1	-2.1	-0.4
1993	-0.1	0.0	-0.1	-0.2	-0.2	-0.2	-0.1	-0.5	-3.6	-1.3	0.0	0.0
1994	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-3.8	-1.3
1995	-0.1	0.0	0.0	-0.1	-0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1996	0.0	0.0	0.0	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1997	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1998	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1999	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2000	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2001	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-3.4	-2.7	-0.5
2002	0.0	0.0	-0.1	-0.1	-0.1	-0.1	-0.1	0.0	0.0	0.0	0.0	0.0
2003	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-1.0	-0.7	0.0
Average	0.0	0.0	0.0	0.0	-0.1	-0.2	-0.1	0.0	-0.1	-0.7	-0.6	-0.2
Critical	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.1	0.0	-2.1	-1.9	-0.6
Dry	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	-0.9	-1.2	-0.6
BN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AN	0.0	0.0	0.0	-0.1	-0.3	-0.6	-0.4	-0.1	-0.6	-0.4	-0.1	0.0
Wet	0.0	0.0	0.0	-0.1	-0.2	-0.1	0.0	0.0	0.0	0.0	0.0	0.0

Table E.3-221. Middle River downstream of Old River location stage (ft) difference All Transfers minus Base.

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1971	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1972	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1973	0.0	0.0	0.0	0.0	0.0	-0.2	-0.1	0.0	0.0	0.0	0.0	0.0
1974	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1975	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1976	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0
1977	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1978	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1979	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1980	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1981	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1982	0.0	0.0	0.0	0.0	-0.2	-0.1	0.0	0.0	0.0	0.0	0.0	0.0
1983	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1984	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1985	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1986	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1987	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	-0.1	0.0
1988	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	-0.1	0.0
1989	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1990	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	0.0
1991	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	0.0
1992	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	0.0
1993	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.2	0.0	0.0	0.0
1994	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0
1995	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1996	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1997	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1998	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1999	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2001	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	0.0
2002	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2003	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Average	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Critical	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	-0.1	0.0
Dry	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
BN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Wet	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table E.3-222. Middle River downstream of Old River location stage percent difference of All Transfers from Base.

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1971	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1972	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1973	0.0	0.0	0.0	0.0	-0.3	-4.2	-3.0	0.0	0.0	0.0	0.0	0.0
1974	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1975	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1976	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.8	-1.5	-0.6
1977	-0.1	0.0	0.1	0.1	0.1	0.1	0.1	0.0	0.0	-1.0	-0.8	-0.6
1978	-0.1	0.0	0.0	-0.1	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1979	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1980	0.0	0.0	0.0	0.0	-0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1981	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-1.3	-1.2
1982	0.0	0.0	-0.1	-0.9	-3.1	-1.4	0.0	0.0	0.0	0.0	0.0	0.0
1983	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1984	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1985	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1986	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1987	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.0	-1.7	-1.5	-0.6
1988	-0.1	0.0	0.0	-0.1	0.0	0.0	0.0	0.1	0.0	-3.6	-2.0	-0.3
1989	-0.1	0.0	0.0	0.1	0.2	-0.2	-0.1	0.2	0.1	0.0	-0.7	-0.6
1990	0.0	0.0	0.1	0.0	-0.1	0.0	0.0	0.0	0.0	-2.3	-0.8	-0.3
1991	0.0	0.0	0.1	0.1	0.0	-0.1	-0.1	0.0	0.0	-1.8	-0.6	-0.2
1992	0.0	0.0	0.2	0.1	-0.1	-0.1	0.0	0.2	0.0	-3.5	-1.4	-0.2
1993	-0.1	0.0	-0.1	-0.1	-0.1	-0.1	-0.1	-0.8	-3.8	-1.2	0.0	0.0
1994	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-2.7	-0.8
1995	-0.1	0.0	0.0	-0.1	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1996	0.0	0.0	0.0	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1997	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1998	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1999	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2001	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-2.8	-1.0	-0.4
2002	0.0	0.0	0.0	-0.1	-0.1	-0.1	-0.1	0.0	0.0	0.0	0.0	0.0
2003	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-1.2	-0.6	0.0
Average	0.0	0.0	0.0	0.0	-0.1	-0.2	-0.1	0.0	-0.1	-0.6	-0.4	-0.2
Critical	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	-1.9	-1.4	-0.4
Dry	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.7	-0.7	-0.5
BN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AN	0.0	0.0	0.0	0.0	-0.1	-0.7	-0.5	-0.1	-0.6	-0.4	-0.1	0.0
Wet	0.0	0.0	0.0	-0.1	-0.3	-0.1	0.0	0.0	0.0	0.0	0.0	0.0

Table E.3-223. Old River near Middle River location stage (ft) difference No Groundwater Substitution minus Base.

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1971	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1972	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1973	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1974	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1975	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1976	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1977	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1978	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1979	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1980	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1981	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0
1982	0.0	0.0	0.0	0.0	-0.2	-0.1	0.0	0.0	0.0	0.0	0.0	0.0
1983	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1984	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1985	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1986	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1987	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1988	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1989	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1990	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	0.0
1991	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1992	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0
1993	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.2	-0.1	0.0	0.0
1994	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0
1995	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1996	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1997	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1998	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1999	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2001	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2002	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2003	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Average	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Critical	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Dry	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
BN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Wet	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table E.3-224. Old River near Middle River location stage percent difference of No Groundwater Substitution from Base.

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1971	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1972	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1973	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1974	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1975	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1976	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-1.2	-0.6	-0.3
1977	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.7	-0.6	-0.5
1978	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1979	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1980	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1981	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	2.7	-1.2	-1.1
1982	0.0	0.0	-0.1	-1.1	-3.1	-1.4	0.0	0.0	0.0	0.0	0.0	0.0
1983	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1984	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1985	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1986	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1987	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.9	-0.8	-0.4
1988	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-1.2	-1.1	-0.2
1989	-0.1	0.0	0.0	0.0	0.0	-0.1	-0.1	0.0	0.0	0.0	-0.3	-0.3
1990	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-1.7	-0.5	-0.2
1991	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-1.4	-0.5	-0.2
1992	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	2.0	-0.4	-0.2
1993	-0.1	0.0	0.0	0.0	-0.1	0.0	0.0	-1.1	-4.4	-1.4	0.0	0.0
1994	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	-2.2	-0.7
1995	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1996	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1997	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1998	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1999	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2001	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	1.2	-0.4	-0.3
2002	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2003	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.3	-0.3	0.0
Average	0.0	0.0	0.0	0.0	-0.1	0.0	0.0	0.0	-0.1	-0.1	-0.3	-0.1
Critical	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.6	-0.8	-0.3
Dry	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5	-0.4	-0.3
BN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.2	-0.7	-0.3	-0.1	0.0
Wet	0.0	0.0	0.0	-0.1	-0.2	-0.1	0.0	0.0	0.0	0.0	0.0	0.0

Table E.3-225. Old River near Tracy location stage (ft) difference No Groundwater Substitution minus Base.

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1971	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1972	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1973	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1974	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1975	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1976	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	0.0
1977	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1978	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1979	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1980	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1981	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0
1982	0.0	0.0	0.0	0.0	-0.1	-0.1	0.0	0.0	0.0	0.0	0.0	0.0
1983	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1984	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1985	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1986	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1987	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1988	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	0.0
1989	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1990	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	0.0
1991	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1992	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0
1993	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.2	-0.1	0.0	0.0
1994	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0
1995	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1996	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1997	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1998	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1999	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2001	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2002	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2003	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Average	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Critical	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Dry	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
BN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Wet	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table E.3-226. Old River near Tracy location stage percent difference of No Groundwater Substitution from Base.

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1971	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1972	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1973	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1974	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1975	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1976	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-1.4	-0.7	-0.3
1977	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-1.0	-0.6	-0.5
1978	-0.1	0.0	0.0	-0.1	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1979	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1980	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1981	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	2.2	-1.3	-1.1
1982	0.0	0.0	-0.1	-0.4	-2.4	-1.1	0.0	0.0	0.0	0.0	0.0	0.0
1983	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1984	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1985	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1986	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1987	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-1.0	-1.0	-0.4
1988	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-1.5	-0.9	-0.3
1989	-0.1	0.0	0.0	0.0	0.0	-0.1	-0.1	0.0	0.0	0.0	-0.3	-0.2
1990	0.0	0.0	0.0	0.0	-0.1	0.0	0.0	0.0	0.0	-1.5	-0.6	-0.3
1991	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-1.4	-0.5	-0.2
1992	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	1.7	-0.5	-0.3
1993	-0.1	0.0	0.0	-0.1	-0.1	-0.1	0.0	-0.4	-3.6	-1.3	0.0	0.0
1994	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	-2.5	-0.8
1995	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1996	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1997	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1998	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1999	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2001	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.6	-0.5	-0.3
2002	0.0	0.0	0.0	-0.1	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2003	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.3	-0.3	0.0
Average	0.0	0.0	0.0	0.0	-0.1	0.0	0.0	0.0	-0.1	-0.1	-0.3	-0.1
Critical	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.7	-0.9	-0.4
Dry	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	-0.5	-0.3
BN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	-0.6	-0.3	-0.1	0.0
Wet	0.0	0.0	0.0	0.0	-0.2	-0.1	0.0	0.0	0.0	0.0	0.0	0.0

Table E.3-227. Middle River downstream of Old River location stage (ft) difference No Groundwater Substitution minus Base.

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1971	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1972	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1973	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1974	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1975	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1976	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1977	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1978	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1979	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1980	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1981	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0
1982	0.0	0.0	0.0	0.0	-0.2	-0.1	0.0	0.0	0.0	0.0	0.0	0.0
1983	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1984	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1985	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1986	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1987	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1988	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1989	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1990	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1991	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1992	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1993	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.2	0.0	0.0	0.0
1994	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0
1995	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1996	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1997	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1998	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1999	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2001	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2002	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2003	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Average	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Critical	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Dry	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
BN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Wet	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table E.3-228. Middle River downstream of Old River location stage percent difference of No Groundwater Substitution from Base.

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1971	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1972	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1973	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1974	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1975	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1976	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.7	-0.5	-0.2
1977	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.7	-0.5	-0.4
1978	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1979	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1980	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1981	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	1.7	-1.0	-0.9
1982	0.0	0.0	-0.1	-0.9	-3.1	-1.4	0.0	0.0	0.0	0.0	0.0	0.0
1983	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1984	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1985	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1986	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1987	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.7	-0.6	-0.3
1988	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-1.5	-0.8	-0.2
1989	-0.1	0.0	0.0	0.0	0.0	-0.1	-0.1	0.0	0.0	0.0	-0.2	-0.2
1990	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-1.4	-0.4	-0.2
1991	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-1.1	-0.4	-0.2
1992	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	1.1	-0.3	-0.2
1993	-0.1	0.0	0.0	-0.1	-0.1	0.0	0.0	-0.8	-3.8	-1.2	0.0	0.0
1994	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	-1.7	-0.5
1995	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1996	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1997	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1998	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1999	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2001	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.4	-0.4	-0.3
2002	0.0	0.0	0.0	0.0	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2003	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.6	-0.3	0.0
Average	0.0	0.0	0.0	0.0	-0.1	0.0	0.0	0.0	-0.1	-0.1	-0.2	-0.1
Critical	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.6	-0.7	-0.3
Dry	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	-0.4	-0.3
BN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	-0.6	-0.3	0.0	0.0
Wet	0.0	0.0	0.0	-0.1	-0.2	-0.1	0.0	0.0	0.0	0.0	0.0	0.0

Table E.3-229. Old River near Middle River location stage (ft) difference No Crop Idle minus Base.

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1971	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1972	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1973	0.0	0.0	0.0	0.0	0.0	-0.2	-0.1	0.0	0.0	0.0	0.0	0.0
1974	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1975	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1976	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1977	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1978	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1979	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1980	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1981	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	-0.1
1982	0.0	0.0	0.0	0.0	-0.2	-0.1	0.0	0.0	0.0	0.0	0.0	0.0
1983	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1984	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1985	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1986	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1987	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	0.0
1988	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	-0.1	0.0
1989	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1990	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	0.0
1991	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1992	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	0.0
1993	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.2	-0.1	0.0	0.0
1994	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0
1995	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1996	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1997	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1998	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1999	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2001	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	0.0
2002	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2003	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Average	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Critical	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Dry	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
BN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Wet	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table E.3-230. Old River near Middle River location stage percent difference of No Crop Idle from Base.

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1971	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1972	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1973	0.0	0.0	0.0	0.0	-0.4	-4.2	-3.0	0.0	0.0	0.0	0.0	0.0
1974	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1975	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1976	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-1.3	-0.7	-0.3
1977	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.0	0.0	-0.5	-0.4	-0.3
1978	0.0	0.0	0.0	-0.1	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1979	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1980	0.0	0.0	0.0	0.0	-0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1981	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-1.5	-1.5
1982	0.0	0.0	-0.1	-1.1	-3.1	-1.4	0.0	0.0	0.0	0.0	0.0	0.0
1983	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1984	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1985	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1986	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1987	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.0	-1.4	-1.2	-0.5
1988	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	-1.6	-1.4	-0.2
1989	0.0	0.1	0.0	0.1	0.1	-0.1	-0.1	0.2	0.1	0.0	-0.8	-0.7
1990	0.1	0.0	0.1	0.0	-0.1	0.0	0.0	0.0	0.0	-1.8	-0.5	-0.2
1991	0.0	0.1	0.1	0.1	0.0	-0.1	-0.1	0.0	0.0	-1.1	-0.4	-0.1
1992	0.0	0.1	0.1	0.1	-0.1	0.0	0.0	0.2	0.1	-2.2	-1.2	-0.1
1993	0.0	0.0	0.0	-0.1	-0.1	-0.1	-0.1	-1.1	-4.4	-1.4	0.0	0.0
1994	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-2.1	-0.7
1995	0.0	0.0	0.0	-0.1	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1996	0.0	0.0	0.0	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1997	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1998	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1999	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2001	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-2.7	-0.8	-0.3
2002	0.1	0.0	0.0	-0.1	-0.1	0.0	-0.1	0.0	0.0	0.0	0.0	0.0
2003	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.6	-0.7	0.0
Average	0.0	0.0	0.0	0.0	-0.1	-0.2	-0.1	0.0	-0.1	-0.4	-0.3	-0.1
Critical	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	-1.2	-1.0	-0.3
Dry	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.7	-0.7	-0.5
BN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AN	0.0	0.0	0.0	0.0	-0.1	-0.7	-0.5	-0.2	-0.7	-0.3	-0.1	0.0
Wet	0.0	0.0	0.0	-0.1	-0.2	-0.1	0.0	0.0	0.0	0.0	0.0	0.0

Table E.3-231. Old River near Tracy location stage (ft) difference No Crop Idle minus Base.

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1971	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1972	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1973	0.0	0.0	0.0	0.0	0.0	-0.1	-0.1	0.0	0.0	0.0	0.0	0.0
1974	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1975	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1976	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	0.0
1977	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1978	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1979	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1980	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1981	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	-0.1
1982	0.0	0.0	0.0	0.0	-0.1	-0.1	0.0	0.0	0.0	0.0	0.0	0.0
1983	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1984	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1985	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1986	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1987	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	-0.1	0.0
1988	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	0.0
1989	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1990	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	0.0
1991	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1992	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	0.0
1993	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.2	-0.1	0.0	0.0
1994	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0
1995	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1996	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1997	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1998	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1999	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2001	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	-0.1	0.0
2002	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2003	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Average	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Critical	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Dry	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
BN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Wet	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table E.3-232. Old River near Tracy location stage percent difference of No Crop Idle from Base.

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1971	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1972	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1973	0.0	0.0	0.0	0.0	-0.6	-2.8	-2.1	0.0	0.0	0.0	0.0	0.0
1974	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1975	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1976	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-1.5	-0.9	-0.3
1977	0.0	0.0	0.1	0.2	0.1	0.1	0.2	0.0	0.0	-0.8	-0.4	-0.4
1978	0.0	0.0	0.0	-0.1	-0.1	-0.1	0.0	0.0	0.0	0.0	0.0	0.0
1979	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1980	0.0	0.0	0.0	0.0	-0.8	-0.5	0.0	0.0	0.0	0.0	0.0	0.0
1981	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-1.7	-1.6
1982	0.0	0.0	-0.1	-0.4	-2.4	-1.2	0.0	0.0	0.0	0.0	0.0	0.0
1983	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1984	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1985	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1986	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1987	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.0	-1.6	-1.5	-0.5
1988	0.0	0.1	0.0	-0.1	0.0	0.1	0.0	0.2	0.0	-1.9	-1.3	-0.2
1989	0.0	0.1	-0.1	0.3	0.2	-0.2	-0.2	0.3	0.1	0.0	-0.9	-0.7
1990	0.1	0.1	0.1	0.0	-0.1	-0.1	0.0	0.0	0.0	-1.6	-0.6	-0.2
1991	0.0	0.1	0.2	0.2	0.0	-0.1	-0.1	0.0	0.0	-1.1	-0.4	-0.1
1992	0.0	0.1	0.2	0.2	-0.1	-0.1	0.0	0.2	0.1	-2.5	-1.3	-0.2
1993	0.0	0.0	-0.1	-0.2	-0.2	-0.2	-0.1	-0.5	-3.6	-1.3	0.0	0.0
1994	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-2.3	-0.8
1995	0.0	0.0	0.0	-0.1	-0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1996	0.0	0.0	0.0	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1997	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1998	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1999	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2000	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2001	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-3.0	-1.8	-0.3
2002	0.1	0.0	-0.1	-0.1	-0.1	-0.1	-0.1	0.0	0.0	0.0	0.0	0.0
2003	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-1.0	-0.7	0.0
Average	0.0	0.0	0.0	0.0	-0.1	-0.2	-0.1	0.0	-0.1	-0.5	-0.4	-0.2
Critical	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.1	0.0	-1.3	-1.0	-0.3
Dry	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	-0.8	-1.0	-0.5
BN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AN	0.0	0.0	0.0	-0.1	-0.3	-0.6	-0.4	-0.1	-0.6	-0.4	-0.1	0.0
Wet	0.0	0.0	0.0	-0.1	-0.2	-0.1	0.0	0.0	0.0	0.0	0.0	0.0

Table E.3-233. Middle River downstream of Old River location stage (ft) difference No Crop Idle minus Base.

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1971	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1972	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1973	0.0	0.0	0.0	0.0	0.0	-0.2	-0.1	0.0	0.0	0.0	0.0	0.0
1974	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1975	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1976	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1977	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1978	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1979	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1980	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1981	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1982	0.0	0.0	0.0	0.0	-0.2	-0.1	0.0	0.0	0.0	0.0	0.0	0.0
1983	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1984	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1985	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1986	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1987	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1988	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	0.0
1989	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1990	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1991	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1992	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	0.0
1993	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.2	0.0	0.0	0.0
1994	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0
1995	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1996	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1997	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1998	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1999	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2001	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	0.0
2002	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2003	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Average	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Critical	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Dry	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
BN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Wet	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table E.3-234. Middle River downstream of Old River location stage percent difference of No Crop Idle from Base.

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1971	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1972	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1973	0.0	0.0	0.0	0.0	-0.3	-4.2	-3.0	0.0	0.0	0.0	0.0	0.0
1974	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1975	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1976	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.8	-0.6	-0.2
1977	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.0	0.0	-0.5	-0.4	-0.3
1978	0.0	0.0	0.0	-0.1	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1979	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1980	0.0	0.0	0.0	0.0	-0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1981	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-1.3	-1.2
1982	0.0	0.0	-0.1	-0.9	-3.1	-1.4	0.0	0.0	0.0	0.0	0.0	0.0
1983	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1984	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1985	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1986	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1987	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.0	-1.2	-0.9	-0.4
1988	0.0	0.0	0.0	-0.1	0.0	0.0	0.0	0.1	0.0	-1.9	-1.1	-0.2
1989	0.0	0.0	0.0	0.1	0.2	-0.2	-0.1	0.2	0.1	0.0	-0.7	-0.6
1990	0.0	0.0	0.1	0.0	-0.1	0.0	0.0	0.0	0.0	-1.5	-0.4	-0.2
1991	0.0	0.0	0.1	0.1	0.0	-0.1	-0.1	0.0	0.0	-0.9	-0.3	-0.1
1992	0.0	0.0	0.2	0.1	-0.1	-0.1	0.0	0.2	0.0	-2.2	-0.9	-0.1
1993	0.0	0.0	-0.1	-0.1	-0.1	-0.1	-0.1	-0.8	-3.8	-1.2	0.0	0.0
1994	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-1.6	-0.5
1995	0.0	0.0	0.0	-0.1	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1996	0.0	0.0	0.0	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1997	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1998	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1999	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2001	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-2.3	-0.7	-0.2
2002	0.0	0.0	0.0	-0.1	-0.1	-0.1	-0.1	0.0	0.0	0.0	0.0	0.0
2003	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-1.2	-0.6	0.0
Average	0.0	0.0	0.0	0.0	-0.1	-0.2	-0.1	0.0	-0.1	-0.4	-0.3	-0.1
Critical	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	-1.1	-0.7	-0.2
Dry	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.6	-0.6	-0.4
BN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AN	0.0	0.0	0.0	0.0	-0.1	-0.7	-0.5	-0.1	-0.6	-0.4	-0.1	0.0
Wet	0.0	0.0	0.0	-0.1	-0.3	-0.1	0.0	0.0	0.0	0.0	0.0	0.0

Table E.3-235. Middle River downstream of Old River location maximum stage (ft) difference No Groundwater Substitution minus Base.

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1971	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1972	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1973	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1974	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1975	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1976	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	0.0
1977	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	0.0
1978	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1979	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1980	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1981	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**0.2**	0.0	0.0
1982	0.0	0.0	0.0	0.0	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1983	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1984	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1985	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1986	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1987	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0
1988	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	0.0
1989	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1990	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	0.0
1991	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	0.0
1992	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**0.1**	0.0	0.0
1993	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	0.0	0.0
1994	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0
1995	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1996	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1997	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1998	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1999	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2001	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**0.1**	0.0	0.0
2002	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2003	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Maximum	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**0.2**	0.0	0.0
Critical	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**0.1**	0.0	0.0
Dry	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**0.2**	0.0	0.0
BN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Wet	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table E.3-236. Old River near Tracy location maximum stage (ft) difference No Groundwater Substitution minus Base.

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1971	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1972	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1973	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1974	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1975	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1976	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	-0.1	0.0
1977	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	-0.1	0.0
1978	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1979	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1980	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1981	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**0.2**	0.0	0.0
1982	0.0	0.0	0.0	0.0	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1983	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1984	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1985	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1986	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1987	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	-0.1	0.0
1988	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	0.0
1989	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1990	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	0.0
1991	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	0.0
1992	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	0.0
1993	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	0.0	0.0
1994	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0
1995	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1996	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1997	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1998	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1999	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2001	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2002	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2003	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Maximum	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**0.2**	0.0	0.0
Critical	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Dry	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**0.2**	0.0	0.0
BN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Wet	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table E.3-237. Old River near Middle River location maximum stage (ft) difference No Groundwater Substitution minus Base.

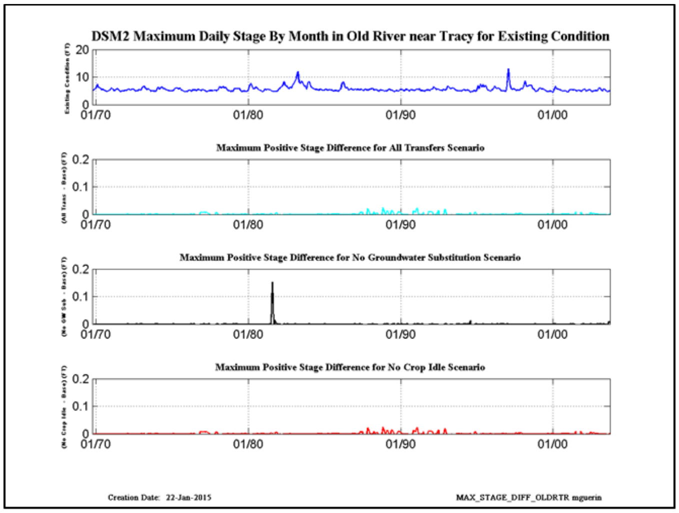
WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1971	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1972	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1973	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1974	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1975	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1976	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	-0.1	0.0
1977	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	0.0
1978	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1979	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1980	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1981	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**0.2**	0.0	0.0
1982	0.0	0.0	0.0	0.0	-0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1983	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1984	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1985	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1986	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1987	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0
1988	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	0.0
1989	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1990	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	0.0
1991	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	0.0
1992	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**0.1**	0.0	0.0
1993	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	0.0	0.0
1994	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0
1995	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1996	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1997	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1998	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1999	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2001	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**0.1**	0.0	0.0
2002	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2003	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Maximum	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**0.2**	0.0	0.0
Critical	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**0.1**	0.0	0.0
Dry	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**0.2**	0.0	0.0
BN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Wet	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

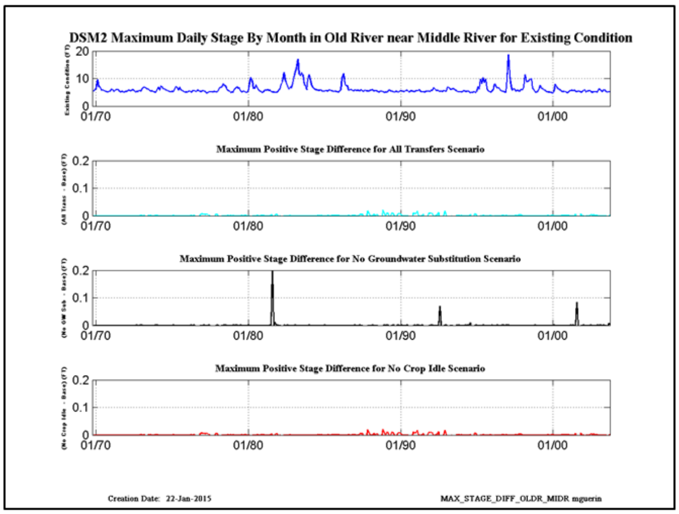
Table E.3-238. Grant Line Canal upstream of barrier location maximum stage (ft) difference No Groundwater Substitution minus Base.

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1971	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1972	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1973	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1974	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1975	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1976	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	-0.1	0.0
1977	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	-0.1	0.0
1978	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1979	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1980	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1981	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**0.2**	0.0	0.0
1982	0.0	0.0	0.0	0.0	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1983	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1984	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1985	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1986	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1987	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	-0.1	0.0
1988	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	0.0
1989	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1990	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	0.0
1991	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	0.0
1992	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1993	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	0.0	0.0
1994	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0
1995	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1996	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1997	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1998	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1999	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2001	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2002	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2003	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Maximum	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**0.2**	0.0	0.0
Critical	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Dry	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**0.2**	0.0	0.0
BN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Wet	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table E.3-239. Old River upstream of barrier location maximum stage (ft) difference No Groundwater Substitution minus Base.

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1971	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1972	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1973	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1974	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1975	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1976	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	-0.1	0.0
1977	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	0.0
1978	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1979	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1980	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1981	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**0.1**	0.0	0.0
1982	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1983	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1984	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1985	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1986	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1987	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	-0.1	0.0
1988	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	0.0
1989	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1990	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	0.0
1991	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	0.0
1992	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1993	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	0.0	0.0
1994	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0
1995	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1996	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1997	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1998	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1999	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2001	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2002	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2003	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Maximum	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**0.1**	0.0	0.0
Critical	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Dry	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**0.1**	0.0	0.0
BN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Wet	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0





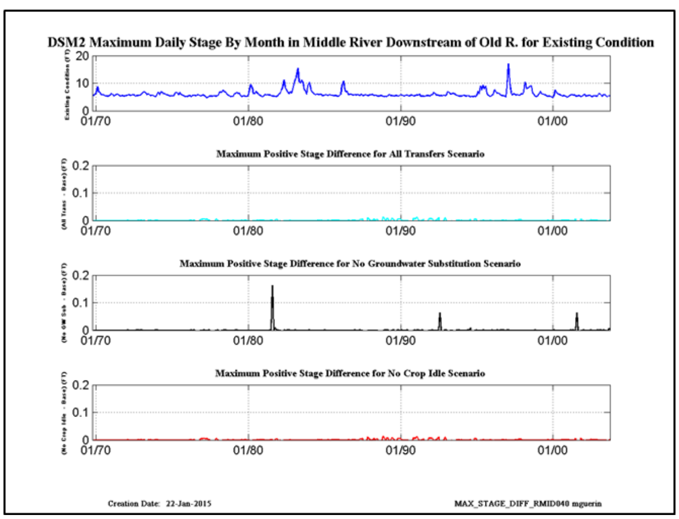
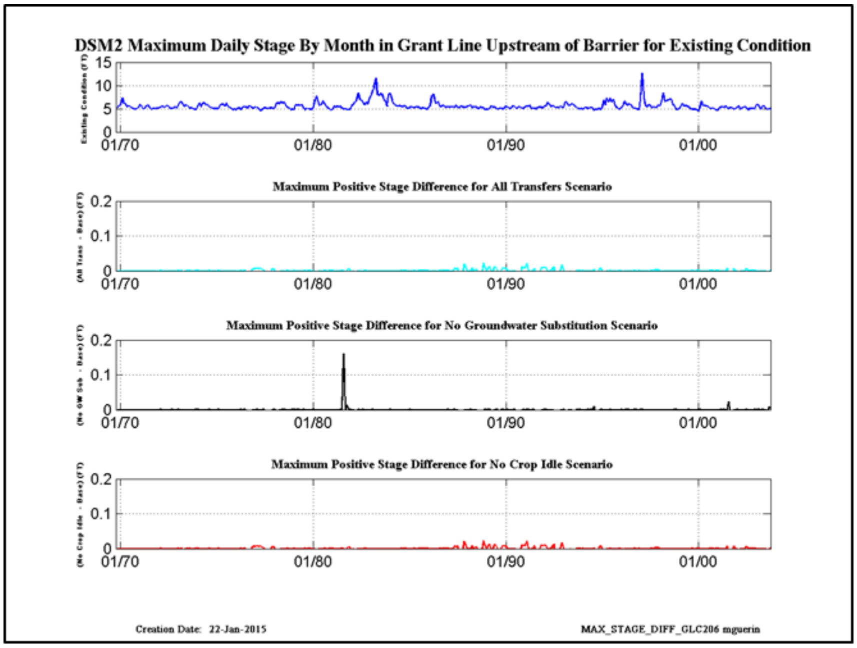


Figure E.3-33. Figures show the maximum positive stage difference at three locations.



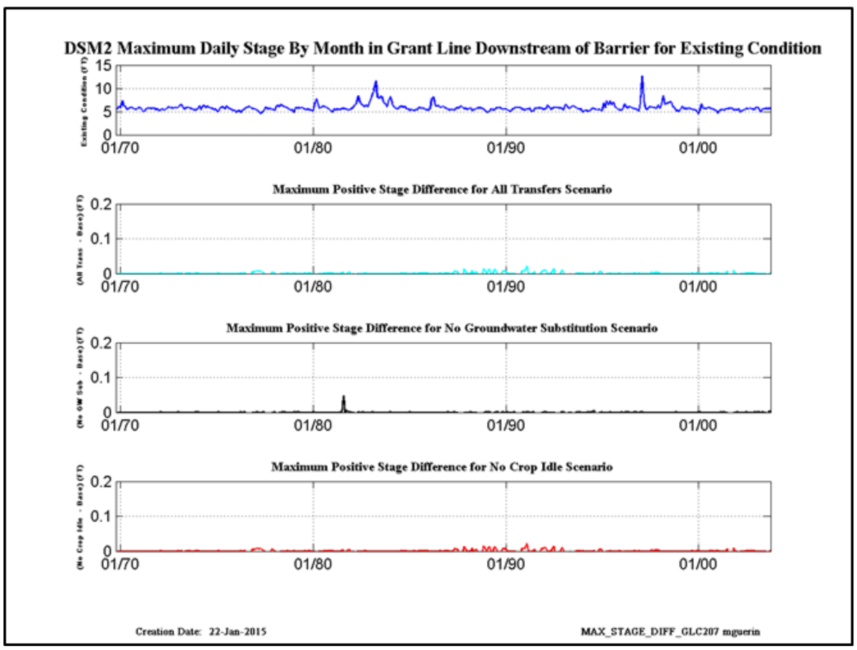


Figure E.3-34. Figures show the maximum positive stage difference upstream and downstream of the barrier in Grant Line Canal.

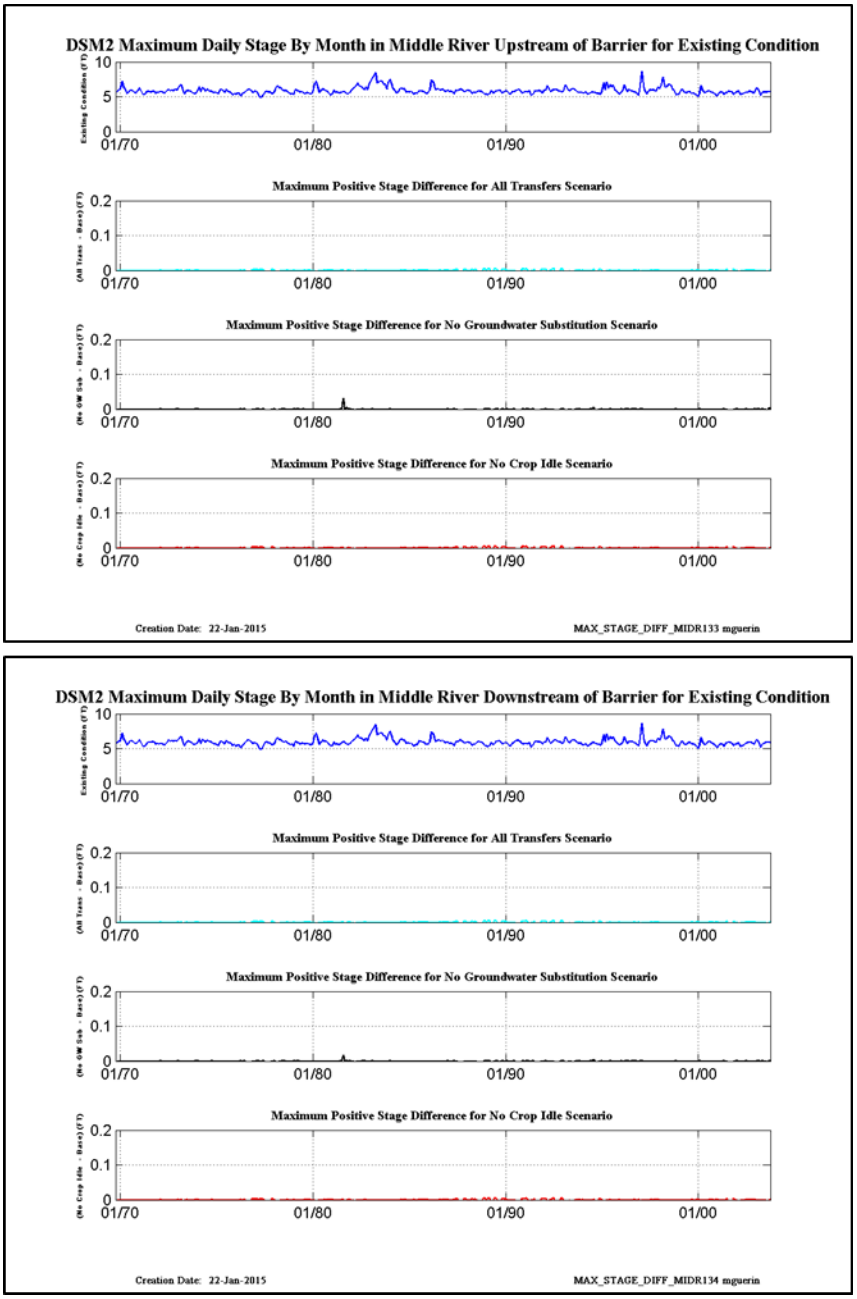
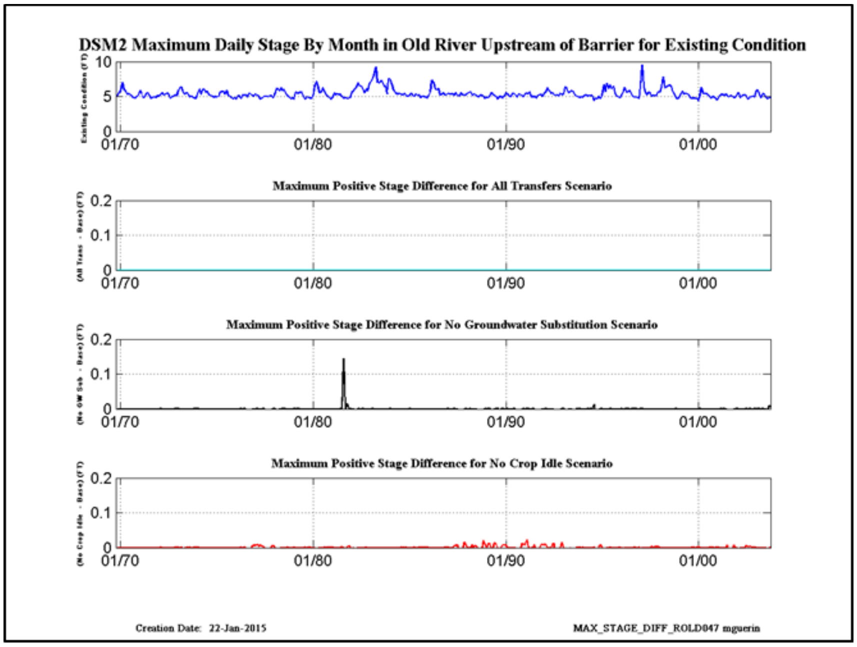


Figure E.3-35. Figures show the maximum positive stage difference upstream and downstream of the barrier in Middle River.



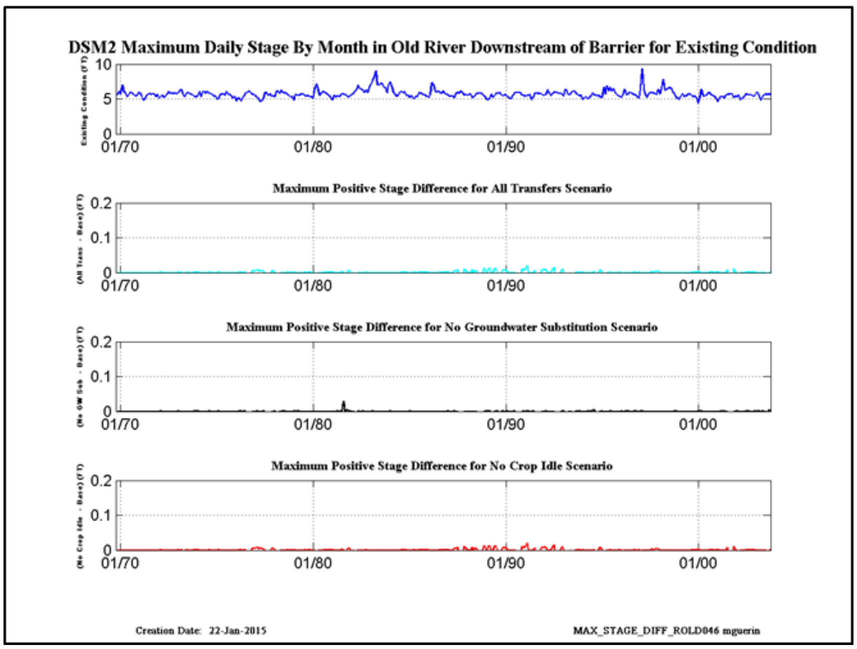


Figure E.3-36. Figures show the maximum positive stage difference upstream and downstream of the barrier in Old River.

E.3.1.3 X2 Model Output

X2 is defined as the distance in km from Golden Gate to the position of 2.0 ppt (parts per thousand) bottom salinity. Using EC data analysis at stations throughout the Delta, regression relationships were developed relating Net Delta Outflow (NDO) to EC measurements (Jassby *et.al.*, 1995). Using these data, it was also found that 2.0 ppt corresponds to 2640 µS cm^{-1} surface EC and to 3000 µS cm^{-1} bottom EC.

The position of X2 is regulated from February to June each year by the 1995 Bay/Delta Plan (SWRCB, 1995). The compliance standard for the position of X2 can be met either with flow objectives specified by the Net Delta Outflow Index (NDOI) or as an equivalent EC standard, each of which vary with the Sacramento Water Year Type[2]. Compliance is met by a 3-day NDOI for an X2 location at Collinsville (81 km, NDOI=7100 cfs), Chipps (75 km, NDOI=11,400 cfs) or at Port Chicago (64 km, NDOI=29,200 cfs). Equivalently, compliance can also be met at these locations using surface EC of 2640 µmhos cm^{-1}on a daily basis or on a 14-day running average basis.

DSM2 is depth-averaged EC, so as a proxy for X2, the methodology developed to use DSM2 EC output for the calculation of X2 assumed that the average of the top and bottom EC values for X2, 2820 µmhos cm^{-1} was the *de facto* location of X2. Using this estimate, the monthly average DSM2 EC output at six RKI[3] locations in the western Delta – RSAC054, RSAC064, RSAC075, RSAC077, RSAC081, RSAC084, RSAC092 and RSAC101 – were used to calculate X2 (see **Error! Reference source not found.**). Eastward movement of X2 is less desirable from a fish habitat standpoint.

Linear interpolation was used to estimate the location of X2 between successive points. Two exceptions occurred: if EC at RSAC054 (Martinez boundary) EC was less than 2820 µmhos cm^{-1}, X2 was set to be 54 km, or if EC at RSAC101was greater than 2820 µmhos cm^{-1}, X2 was set to be101 km – the latter case did not occur. When 2820 µmhos cm^{-1} occurred between two adjacent RKI locations, RKI_1 and RKI_2 (in km), the average change in EC per km between the points, delta_X2, was used to calculate the position of X2 as follows, where EC(RKI_1) is the EC at RKI_1:

$$X2 = RKI_1 + (2820 - EC\ (RKI_1))/delta\_X2$$

For each scenario, the position of X2 was calculated using the linear interpolation method. Plots of monthly average of X2 position are presented below, with Figure 3-3 also showing the change in X2, (Scenario minus Base), for all three alternative scenarios.

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[2]Sacramento R. Water Year Index = 0.4 * Current Apr-Jul Runoff Forecast (MAF) + 0.3 * Current Oct-Mar Runoff (MAF) + 0.3 * Previous Water Year's Index (if it exceeds 10.0, then 10.0 is used)

[3]RKI is River Kilometer Index, the distance from the Golden Gate in km.

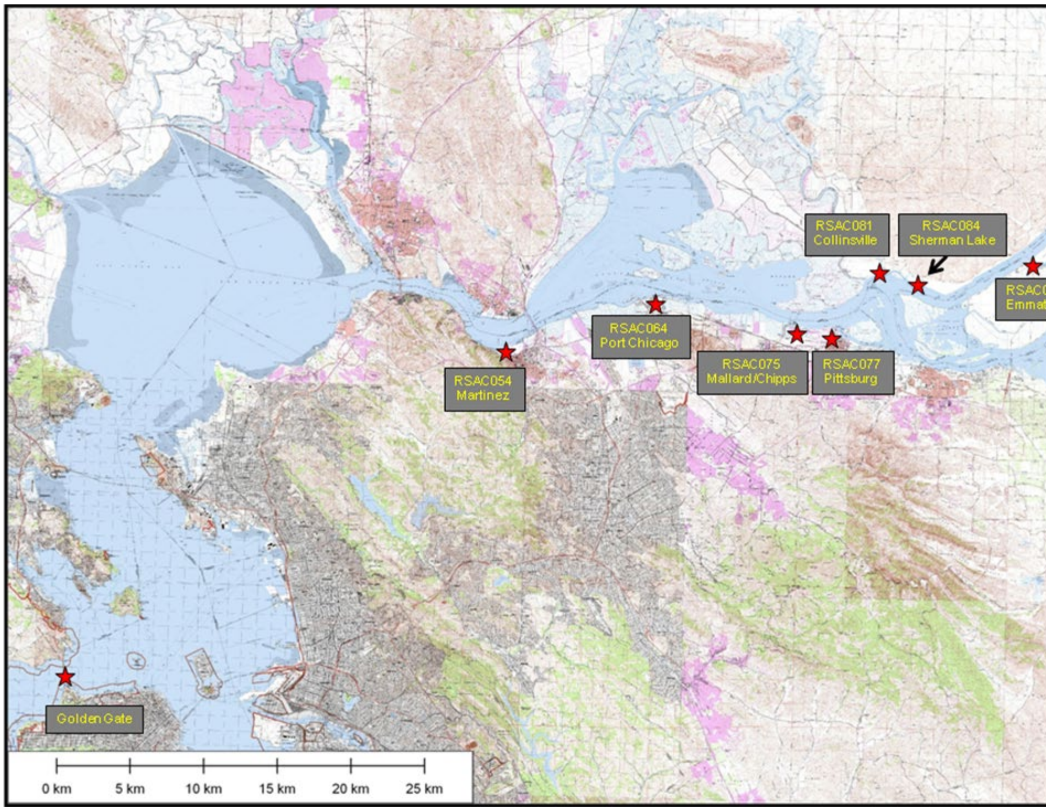

Figure E.3-37. DSM2 Output locations used in the calculation of X2 are on the Sacramento River from Rio Vista (upstream of Emmaton) to Martinez

E.3.1.4 Reference

Jassby, A.D., W.J. Kimmerer, S.G. Monosmith, C. Armour, J.E. Cloern, T.M. Powell, J.R. Schubel, T.J. Vendlinski. 1995. "Isohaline Position as a Habitat Indicator", Ecological Applications 5:1, pp 272 – 289.

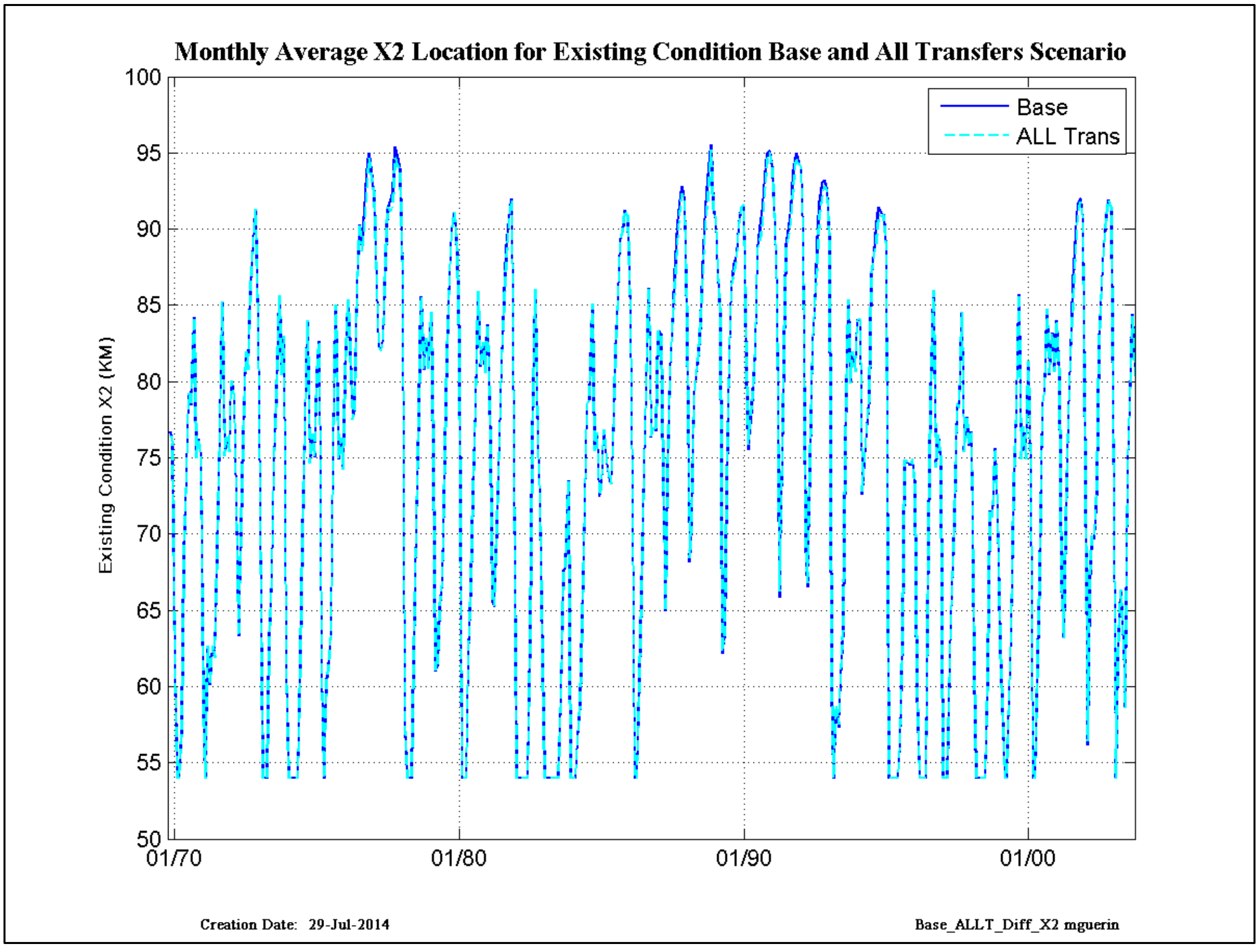

Figure E.3-38. Monthly Average X2 Location for Existing Condition Base and All Transfers Scenario.

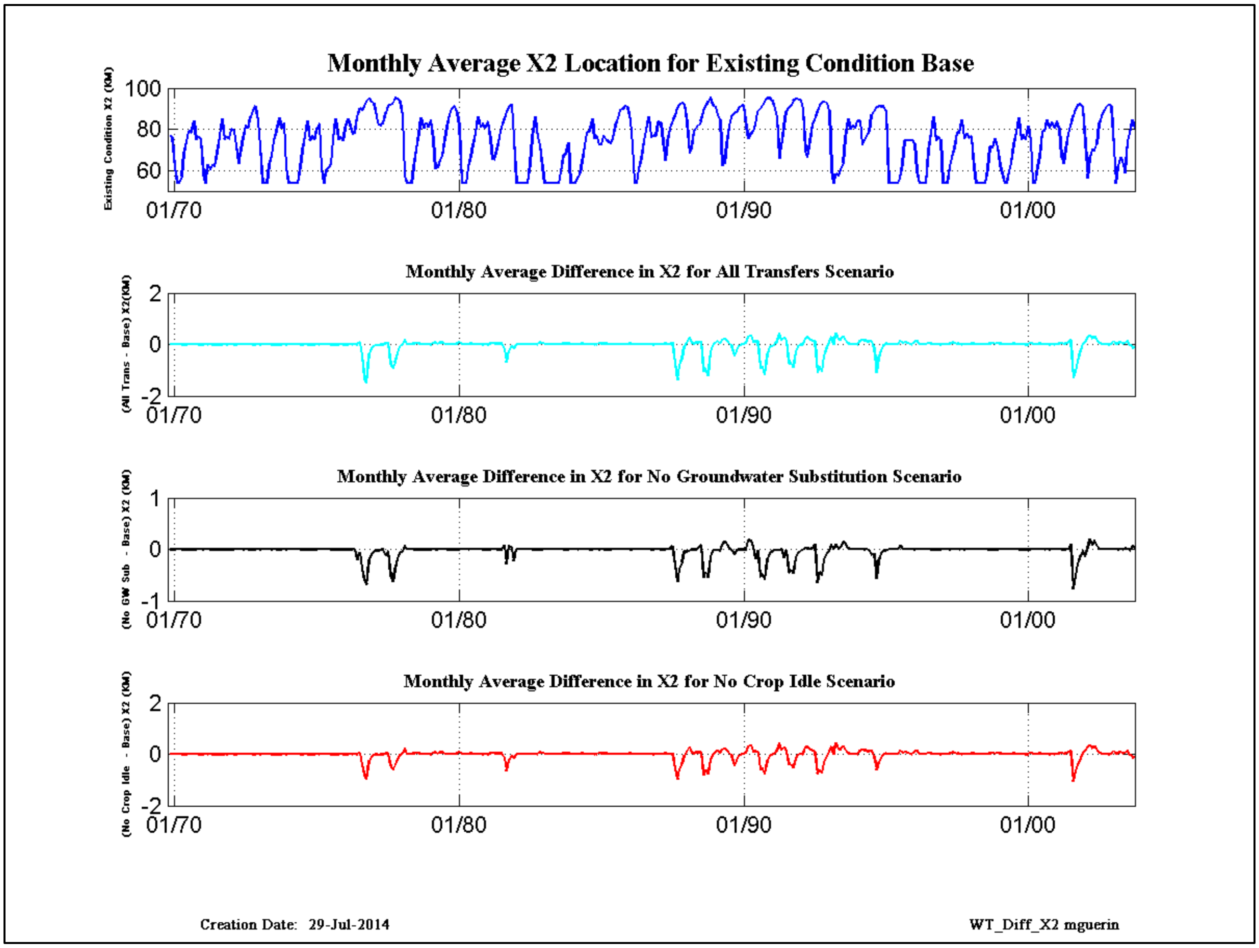

Figure E.3-39. Monthly Average X2 Location for Existing Condition Base and the differences Scenario – Base.

Table E.3-240. X2 (km) Base.

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	76.7	75.9	61.1	54.0	54.0	57.2	68.7	73.9	79.2	78.5	84.2	75.0
1971	76.2	75.1	58.5	54.0	62.7	60.1	62.6	61.9	68.8	76.7	85.3	75.1
1972	76.4	75.4	80.1	79.0	72.1	63.3	70.3	76.2	82.0	80.8	86.1	89.1
1973	91.3	83.9	71.8	54.0	54.0	54.0	62.9	67.2	74.7	79.0	85.6	80.5
1974	83.0	61.3	54.0	54.0	54.0	54.0	54.0	61.9	69.8	77.2	84.0	74.7
1975	76.6	75.1	80.6	82.6	60.8	54.0	60.4	61.2	63.6	75.6	85.1	74.9
1976	76.3	74.3	80.4	85.3	82.0	77.5	78.2	86.2	90.3	89.0	91.3	93.7
1977	95.0	93.3	92.5	86.3	82.3	82.0	82.8	88.2	91.4	91.9	92.4	95.4
1978	94.5	93.8	86.7	57.6	54.0	54.0	54.0	61.8	70.7	78.0	85.6	80.8
1979	82.8	80.9	84.6	75.1	61.0	61.4	65.2	66.8	75.4	81.8	87.0	89.9
1980	91.1	88.3	82.2	54.0	54.0	54.0	62.1	66.7	72.7	78.5	85.9	81.0
1981	82.6	80.6	83.7	75.8	65.5	65.2	70.6	76.3	81.2	85.4	88.7	90.7
1982	92.0	75.4	54.0	54.0	54.0	54.0	54.0	54.0	63.4	75.8	86.1	75.9
1983	72.3	61.6	54.0	54.0	54.0	54.0	54.0	54.0	54.0	59.5	67.6	67.8
1984	73.5	54.0	54.0	54.0	56.6	58.9	64.2	72.0	78.5	78.8	85.1	75.5
1985	76.6	72.5	72.9	76.8	74.8	73.9	73.3	75.6	82.0	85.6	89.3	89.9
1986	91.2	90.9	84.5	72.6	54.0	54.0	60.7	65.9	74.4	79.6	86.1	76.4
1987	77.0	76.8	83.4	83.1	73.9	65.0	73.9	80.6	83.3	86.9	90.3	91.7
1988	92.8	92.0	83.5	68.2	70.5	79.1	80.4	81.9	83.9	88.7	91.4	93.3
1989	95.5	91.4	90.6	87.1	84.3	62.2	63.3	73.1	81.8	86.3	87.7	88.3
1990	90.3	91.4	91.6	80.9	75.6	77.5	79.1	82.2	88.6	90.1	91.5	93.5
1991	95.0	95.1	94.0	90.1	85.7	65.8	71.4	81.7	88.9	90.2	91.3	93.7
1992	95.0	94.4	94.1	89.8	69.5	66.5	74.4	82.5	84.7	88.8	91.7	93.0
1993	93.2	92.7	89.1	60.3	54.0	58.3	57.4	60.5	63.8	75.6	85.3	79.9
1994	81.9	80.7	84.0	84.0	72.6	74.9	76.8	78.8	86.9	88.4	90.3	91.4
1995	91.1	90.9	88.7	54.0	54.0	54.0	54.0	54.0	56.2	63.2	74.7	74.7
1996	74.5	74.9	73.2	59.9	54.0	54.0	54.0	54.0	70.1	78.8	86.0	74.4
1997	76.5	74.9	54.0	54.0	54.0	61.9	66.4	70.9	78.5	78.3	84.5	75.4
1998	77.7	75.8	76.7	61.4	54.0	54.0	54.0	54.0	54.0	60.8	71.5	71.1
1999	75.6	71.6	62.7	59.0	54.0	54.0	59.4	63.7	73.2	78.4	85.7	74.9
2000	77.0	74.9	81.3	74.3	54.0	54.0	61.9	67.1	78.5	79.3	84.7	80.4
2001	83.2	80.7	84.0	80.2	66.8	63.2	70.6	77.8	81.5	86.5	89.8	91.7
2002	92.0	90.7	73.4	56.2	66.5	69.8	69.7	73.1	82.5	86.4	88.8	90.9
2003	91.9	91.4	71.2	54.0	61.8	66.3	62.8	58.6	74.4	78.7	84.4	80.5
Average	84.4	81.0	76.8	68.2	63.4	62.1	65.5	69.5	76.0	80.5	86.0	83.1
Critical	89.5	88.7	88.6	83.5	76.9	74.8	77.6	83.1	87.8	89.6	91.4	93.4
Dry	84.5	82.1	81.3	76.5	72.0	66.5	70.2	76.1	82.0	86.2	89.1	90.5
BN	79.6	78.1	82.3	77.1	66.6	62.4	67.8	71.5	78.7	81.3	86.6	89.5
AN	89.8	87.5	80.4	59.0	55.3	56.8	60.2	63.6	72.5	78.2	85.3	80.5
Wet	79.8	73.6	65.8	59.0	55.4	55.7	59.0	61.7	68.0	73.9	82.0	74.3

Table E.3-241. X2 (km) difference All Transfers minus Base.

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1971	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1972	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1973	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1974	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1975	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1976	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	-0.4	-1.3	-1.5
1977	-0.4	-0.2	-0.1	0.0	0.0	0.0	0.0	0.0	0.1	-0.8	-0.9	-0.7
1978	-0.3	-0.1	0.0	0.2	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0
1979	0.0	0.0	0.0	0.0	0.1	0.0	0.1	0.1	0.0	0.0	0.0	0.0
1980	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1981	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.2	-0.7	-0.2
1982	-0.1	-0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1983	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1984	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1985	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1986	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1987	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	-0.7	-1.4	-0.8
1988	-0.5	-0.1	0.1	0.2	0.1	0.0	0.1	0.1	0.1	-1.1	-1.0	-1.2
1989	-0.3	-0.1	0.1	0.1	0.0	0.2	0.2	0.1	0.0	-0.1	-0.4	-0.2
1990	-0.1	0.0	0.0	0.0	0.3	0.3	0.1	0.1	0.1	-0.9	-0.9	-1.2
1991	-0.4	-0.1	0.0	0.0	0.1	0.4	0.2	0.2	0.2	-0.7	-0.7	-0.9
1992	-0.3	-0.1	0.0	0.0	0.3	0.3	0.2	0.1	0.1	-1.1	-0.9	-1.0
1993	-0.4	-0.1	0.1	0.3	0.0	0.4	0.2	0.2	0.3	0.2	0.0	0.0
1994	0.0	0.0	0.0	0.1	0.2	0.1	0.1	0.1	0.1	-0.2	-1.1	-0.5
1995	-0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.1	0.0
1996	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0
1997	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.0
1998	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1999	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2000	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2001	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.1	0.2	-1.3	-1.0	-0.6
2002	-0.2	0.0	0.1	0.3	0.4	0.2	0.3	0.1	0.1	0.0	0.0	0.0
2003	0.0	0.0	0.1	0.0	0.0	0.1	0.0	0.1	0.1	0.0	-0.1	-0.1
Average	-0.1	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.1	-0.2	-0.3	-0.3
Critical	-0.2	-0.1	0.0	0.1	0.1	0.2	0.1	0.1	0.1	-0.7	-1.0	-1.0
Dry	-0.1	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.1	-0.4	-0.6	-0.3
BN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AN	-0.1	0.0	0.0	0.1	0.0	0.1	0.0	0.1	0.1	0.0	0.0	0.0
Wet	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table E.3-242. X2 percent difference of All Transfers from Base.

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1971	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1972	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1973	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1974	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1975	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1976	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	-0.5	-1.4	-1.6
1977	-0.4	-0.2	-0.1	0.0	0.0	0.0	0.0	0.0	0.1	-0.8	-1.0	-0.7
1978	-0.4	-0.1	0.0	0.4	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0
1979	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0
1980	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1981	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.0	-0.2	-0.8	-0.3
1982	-0.1	-0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1983	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1984	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1985	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1986	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1987	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	-0.8	-1.5	-0.9
1988	-0.5	-0.1	0.1	0.4	0.1	0.0	0.1	0.1	0.1	-1.2	-1.0	-1.3
1989	-0.3	-0.1	0.1	0.1	0.0	0.3	0.4	0.2	0.0	-0.1	-0.5	-0.3
1990	-0.1	0.0	0.0	0.1	0.4	0.4	0.2	0.1	0.1	-1.0	-1.0	-1.2
1991	-0.4	-0.1	-0.1	0.0	0.1	0.7	0.3	0.3	0.2	-0.8	-0.8	-1.0
1992	-0.3	-0.1	0.0	0.0	0.4	0.4	0.2	0.2	0.2	-1.2	-0.9	-1.1
1993	-0.5	-0.1	0.1	0.5	0.0	0.8	0.3	0.3	0.5	0.2	0.0	0.0
1994	0.0	0.0	0.0	0.1	0.2	0.2	0.2	0.1	0.1	-0.2	-1.2	-0.6
1995	-0.2	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.1	0.1	0.1
1996	0.0	0.0	0.1	0.2	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0
1997	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.0
1998	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1
1999	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2000	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0
2001	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.1	0.2	-1.5	-1.2	-0.7
2002	-0.2	0.0	0.1	0.5	0.5	0.3	0.4	0.2	0.1	0.0	0.0	0.0
2003	0.0	0.0	0.1	0.0	0.0	0.1	0.0	0.1	0.2	0.0	-0.2	-0.1
Average	-0.1	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.1	-0.2	-0.3	-0.3
Critical	-0.2	-0.1	0.0	0.1	0.2	0.2	0.1	0.1	0.1	-0.8	-1.1	-1.1
Dry	-0.1	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.1	-0.4	-0.7	-0.4
BN	0.0	0.0	0.0	0.0	0.1	0.0	0.1	0.0	0.0	0.0	0.0	0.0
AN	-0.1	0.0	0.1	0.2	0.0	0.1	0.1	0.1	0.1	0.0	0.0	0.0
Wet	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table E.3-243. X2 (km) difference No Groundwater Substitution minus Base.

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1971	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1972	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1973	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1974	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1975	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1976	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.2	-0.1	-0.4	-0.6	-0.7
1977	-0.2	-0.1	-0.1	0.0	0.0	0.0	0.0	-0.1	0.0	-0.5	-0.6	-0.4
1978	-0.2	-0.1	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1979	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1980	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1981	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	-0.3	0.1
1982	0.0	-0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1983	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1984	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1985	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1986	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1987	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	-0.3	-0.6	-0.4
1988	-0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	-0.5	-0.5	-0.5
1989	-0.1	0.0	0.0	0.0	0.0	0.1	0.2	0.1	0.0	0.0	-0.1	0.0
1990	0.0	0.0	0.0	0.0	0.2	0.2	0.0	-0.2	0.0	-0.5	-0.5	-0.6
1991	-0.2	-0.1	0.0	0.0	0.0	0.0	0.0	-0.2	0.0	-0.5	-0.4	-0.5
1992	-0.2	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.1	-0.6	-0.4	-0.5
1993	-0.2	-0.1	0.0	0.1	0.0	0.1	0.0	0.0	0.1	0.1	0.0	0.0
1994	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	-0.1	-0.6	-0.2
1995	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0
1996	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1997	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1998	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1999	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2001	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	-0.8	-0.5	-0.3
2002	-0.1	0.0	-0.1	0.0	0.2	0.1	0.2	0.1	0.0	0.0	0.0	0.0
2003	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0
Average	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	-0.1	-0.1
Critical	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	-0.4	-0.5	-0.5
Dry	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	-0.2	-0.2	-0.1
BN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AN	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Wet	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table E.3-244. X2 percent difference of No Groundwater Substitution from Base.

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1971	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1972	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1973	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1974	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1975	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1976	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.2	-0.1	-0.4	-0.7	-0.7
1977	-0.2	-0.1	-0.1	0.0	0.0	0.0	0.0	-0.1	0.0	-0.5	-0.7	-0.4
1978	-0.2	-0.1	-0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1979	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1980	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1981	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	-0.3	0.1
1982	0.0	-0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1983	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1984	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1985	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1986	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1987	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	-0.3	-0.7	-0.4
1988	-0.3	0.0	-0.1	0.0	0.0	0.0	0.0	0.0	0.1	-0.6	-0.5	-0.6
1989	-0.2	0.0	0.0	0.0	0.0	0.1	0.3	0.1	0.0	0.0	-0.1	0.0
1990	0.0	0.0	0.0	0.0	0.2	0.2	0.1	-0.2	0.0	-0.6	-0.5	-0.6
1991	-0.2	-0.1	0.0	0.0	0.0	0.0	0.0	-0.2	0.0	-0.5	-0.4	-0.5
1992	-0.2	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.1	-0.7	-0.5	-0.5
1993	-0.2	-0.1	0.0	0.2	0.0	0.1	0.0	0.1	0.2	0.1	0.0	0.0
1994	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	-0.1	-0.1	-0.6	-0.2
1995	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0
1996	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1997	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1998	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1999	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2001	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	-0.9	-0.6	-0.3
2002	-0.1	0.0	-0.2	0.1	0.3	0.1	0.2	0.1	0.0	0.0	0.0	0.0
2003	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0
Average	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	-0.2	-0.1
Critical	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	-0.5	-0.6	-0.5
Dry	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	-0.2	-0.3	-0.1
BN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AN	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Wet	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table E.3-245. X2 (km) difference No Crop Idle minus Base.

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1971	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1972	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1973	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1974	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1975	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1976	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	-0.4	-0.8	-1.0
1977	-0.3	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.4	-0.6	-0.4
1978	-0.2	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0
1979	0.0	0.0	0.0	0.0	0.1	0.0	0.1	0.1	0.0	0.0	0.0	0.0
1980	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1981	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	-0.7	-0.2
1982	-0.1	-0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1983	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1984	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1985	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1986	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1987	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.6	-1.0	-0.6
1988	-0.3	-0.1	0.1	0.3	0.1	0.0	0.1	0.1	0.1	-0.8	-0.6	-0.8
1989	-0.2	0.0	0.1	0.1	0.0	0.2	0.2	0.1	0.0	-0.1	-0.4	-0.2
1990	-0.1	0.0	0.0	0.0	0.3	0.3	0.1	0.1	0.1	-0.6	-0.6	-0.8
1991	-0.2	-0.1	0.0	0.0	0.1	0.4	0.2	0.3	0.1	-0.4	-0.4	-0.5
1992	-0.2	0.0	0.0	0.0	0.3	0.3	0.2	0.1	0.1	-0.7	-0.6	-0.7
1993	-0.3	-0.1	0.1	0.3	0.0	0.4	0.2	0.2	0.3	0.2	0.0	0.0
1994	0.0	0.0	0.0	0.1	0.2	0.1	0.1	0.1	0.1	-0.1	-0.6	-0.3
1995	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.1	0.0
1996	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0
1997	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.0
1998	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1999	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2000	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2001	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.1	0.1	-1.0	-0.7	-0.4
2002	-0.2	0.0	0.1	0.3	0.4	0.2	0.3	0.1	0.1	0.0	0.0	0.0
2003	0.0	0.0	0.1	0.0	0.0	0.1	0.0	0.1	0.1	0.0	-0.1	-0.1
Average	-0.1	0.0	0.0	0.1	0.0	0.1	0.0	0.0	0.0	-0.1	-0.2	-0.2
Critical	-0.1	0.0	0.0	0.1	0.1	0.2	0.1	0.1	0.1	-0.5	-0.6	-0.6
Dry	-0.1	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.1	-0.3	-0.4	-0.2
BN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AN	-0.1	0.0	0.1	0.1	0.0	0.1	0.0	0.1	0.1	0.0	0.0	0.0
Wet	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table E.3-246. X2 percent difference No Crop Idle minus Base.

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1971	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1972	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1973	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1974	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1975	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1976	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	-0.4	-0.9	-1.0
1977	-0.3	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.5	-0.7	-0.4
1978	-0.2	0.0	0.0	0.4	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0
1979	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0
1980	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1981	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.0	-0.2	-0.7	-0.3
1982	-0.1	-0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1983	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1984	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1985	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1986	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1987	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.6	-1.1	-0.6
1988	-0.4	-0.1	0.1	0.4	0.1	0.0	0.1	0.1	0.1	-0.9	-0.7	-0.8
1989	-0.2	0.0	0.1	0.2	0.1	0.3	0.4	0.2	0.0	-0.1	-0.5	-0.3
1990	-0.1	0.0	0.0	0.1	0.4	0.4	0.2	0.1	0.1	-0.6	-0.6	-0.8
1991	-0.2	-0.1	0.0	0.0	0.1	0.7	0.3	0.3	0.1	-0.4	-0.5	-0.6
1992	-0.2	0.0	0.0	0.0	0.4	0.4	0.2	0.1	0.1	-0.8	-0.7	-0.8
1993	-0.3	-0.1	0.1	0.5	0.0	0.8	0.3	0.3	0.5	0.2	0.0	0.0
1994	0.0	0.0	0.0	0.1	0.2	0.2	0.2	0.1	0.1	-0.1	-0.7	-0.3
1995	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.1	0.1	0.1
1996	0.0	0.0	0.1	0.2	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0
1997	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.0
1998	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1
1999	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2000	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0
2001	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.1	0.2	-1.2	-0.7	-0.4
2002	-0.2	0.1	0.2	0.5	0.5	0.3	0.4	0.2	0.1	0.0	0.0	0.0
2003	0.0	0.0	0.1	0.0	0.0	0.1	0.0	0.1	0.2	0.0	-0.2	-0.1
Average	-0.1	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.1	-0.2	-0.2	-0.2
Critical	-0.2	0.0	0.0	0.1	0.2	0.2	0.1	0.1	0.1	-0.5	-0.7	-0.7
Dry	-0.1	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	-0.3	-0.5	-0.3
BN	0.0	0.0	0.0	0.0	0.1	0.0	0.1	0.0	0.0	0.0	0.0	0.0
AN	-0.1	0.0	0.1	0.2	0.0	0.1	0.1	0.1	0.1	0.0	0.0	0.0
Wet	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

E.3.1.5 OMR Model Output

See the text in Appendix *E* for details on OMR calculation.

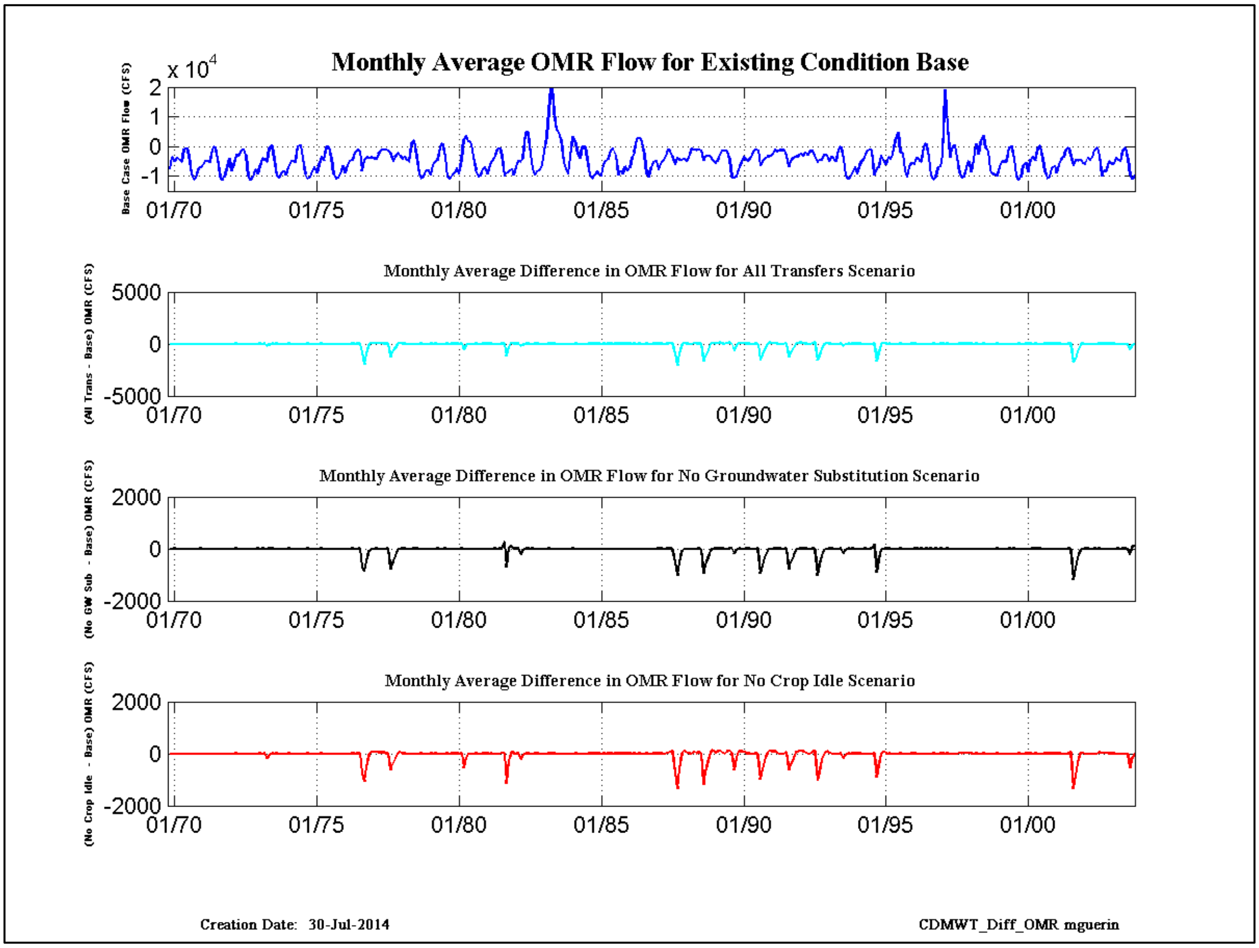

Figure E.3-40. Monthly average OMR flow (cfs) and flow differences Scenario – Base.

Table E.3-247. OMR Base flow (cfs).

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	-7495.0	-3464.3	-5193.7	-3968.9	-4657.4	-5144.2	-838.1	-480.5	-2947.5	-9091.5	-11098.4	-10579.6
1971	-7441.6	-7054.6	-6102.2	-4882.6	-4896.7	-5212.6	-927.1	-100.0	-3997.9	-10023.2	-11375.0	-10397.2
1972	-7721.4	-3896.0	-8206.4	-5960.7	-2821.5	-3174.6	-1248.8	-875.7	-3019.9	-9758.7	-11402.4	-10155.1
1973	-7693.4	-9240.3	-6633.4	-3803.1	-4672.4	-5087.2	-383.8	334.0	-3915.0	-9755.5	-10777.0	-9170.6
1974	-8189.7	-9657.4	-6835.6	-5095.0	-5015.9	-5284.6	130.3	471.4	-3935.7	-9371.3	-10793.8	-10352.2
1975	-8287.1	-6848.7	-8896.9	-6043.2	-3407.3	-4676.9	-173.2	-164.6	-3941.6	-9273.8	-10672.7	-10398.1
1976	-9165.6	-6304.9	-8885.8	-6076.9	-4928.8	-4609.9	-2019.8	-1272.1	-1366.5	-8305.5	-4666.6	-3688.0
1977	-3841.7	-3701.7	-4128.9	-4221.0	-2532.0	-1464.9	-1161.6	-1099.5	-1380.2	-2147.1	-5029.6	-3591.8
1978	-2282.9	-3035.3	-4315.3	-3571.5	-4666.0	-5157.2	963.5	2011.5	-3331.0	-9152.8	-10701.3	-10188.8
1979	-8335.5	-8103.3	-9588.6	-6164.2	-5169.1	-4567.5	3.3	992.9	-3715.2	-10117.0	-11025.9	-9982.4
1980	-8926.1	-7421.1	-9201.7	-4487.3	2201.7	3445.4	1629.1	797.4	-3300.4	-7879.0	-10231.8	-9888.0
1981	-7345.2	-7238.1	-9173.4	-6025.5	-4897.6	-3968.4	-1173.4	-628.2	-3002.5	-9792.5	-9065.7	-8366.6
1982	-7616.2	-9498.3	-6769.9	-4924.4	-5085.0	-3919.8	4723.9	4629.6	-2739.6	-7452.2	-9635.2	-8335.7
1983	-7887.2	-6060.2	-1619.0	3478.7	12068.5	22937.7	11740.8	5554.3	4635.3	2460.0	-5381.7	-7570.2
1984	-9116.2	-3255.4	3513.1	788.0	-2703.0	-4136.0	-205.9	-19.1	-4008.7	-9476.8	-10683.4	-9929.9
1985	-8377.7	-9464.1	-9686.2	-5972.5	-4989.6	-4205.3	-1330.3	-808.8	-3046.3	-9724.0	-8271.4	-9376.6
1986	-6759.7	-8123.8	-7197.5	-3756.8	-1924.2	2574.2	2707.7	1795.4	-2816.4	-9379.3	-10428.5	-7160.8
1987	-5256.9	-4840.2	-7859.5	-5785.9	-4923.6	-3276.5	-1047.7	-1626.2	-3279.9	-5994.3	-3822.1	-4631.3
1988	-4667.8	-4293.7	-5000.6	-3744.7	-950.8	-1171.6	-1293.8	-932.8	-1245.7	-4640.9	-3277.4	-3180.8
1989	-3462.4	-4802.4	-5735.5	-4941.5	-2721.6	-1485.7	-1475.9	-1615.2	-4393.4	-10291.5	-10455.9	-10015.5
1990	-7697.6	-5239.2	-3583.1	-4555.1	-4935.9	-3642.6	-1762.9	-1045.8	-1320.2	-6402.1	-4903.5	-4140.8
1991	-3394.2	-3376.1	-2922.7	-1120.6	-1640.3	-1340.9	-1199.8	-1339.0	-3168.9	-6723.6	-4869.1	-3758.5
1992	-3431.2	-3332.9	-2520.4	-3192.8	-1912.9	-2954.1	-1653.8	-1473.7	-3008.9	-5423.9	-4623.0	-4489.3
1993	-2888.3	-3001.0	-5118.0	-3503.7	-4459.8	-5009.1	-1053.6	-37.2	-3919.9	-9626.0	-11007.5	-10417.2
1994	-8233.8	-6768.7	-9149.4	-6052.3	-4987.0	-3755.6	-1748.8	-1167.3	-1319.9	-9417.4	-7405.2	-6979.4
1995	-3043.8	-4579.5	-6172.3	-3612.7	-4421.7	-2545.9	1807.5	4740.2	-2032.9	-2203.2	-8142.2	-10113.1
1996	-6769.5	-5665.9	-5765.6	-3894.9	-4786.3	-5034.9	-9.3	1071.4	-3710.7	-9756.7	-11023.6	-10373.6
1997	-7064.9	-6780.9	-2630.0	19251.5	6608.5	-3695.7	-820.4	422.5	-3765.7	-8790.4	-10532.1	-10271.5
1998	-7018.0	-4866.5	-8412.3	-4477.2	937.1	-2501.6	1799.7	3763.3	-563.1	-1587.4	-7883.0	-9353.9
1999	-9407.2	-9806.0	-6755.9	-5150.8	-5094.7	-5158.1	-195.8	196.5	-3994.2	-9899.2	-11214.5	-10337.4
2000	-6307.7	-5443.4	-8668.6	-4384.4	-3438.1	-4725.0	-358.8	328.0	-3933.9	-8212.6	-10685.9	-10399.5
2001	-7263.3	-6505.1	-8861.1	-5976.0	-4378.2	-3651.1	-1071.9	-500.9	-2933.1	-6256.1	-4622.6	-4749.9
2002	-4592.8	-5490.1	-5767.8	-3790.1	-4542.9	-3777.2	-1302.6	-497.6	-2932.2	-9917.0	-8226.5	-8311.4
2003	-5083.1	-5769.4	-5859.2	-3768.6	-4493.8	-4879.6	-1158.5	-534.5	-4162.4	-9521.3	-11054.5	-9888.6
Average	-6531.3	-5968.5	-6167.7	-3511.4	-2889.4	-2654.6	-3.2	320.3	-2809.2	-7732.5	-8676.1	-8251.3
Critical	-5776.0	-4716.7	-5170.1	-4137.6	-3126.8	-2705.7	-1548.7	-1190.1	-1830.0	-6151.5	-4967.8	-4261.2
Dry	-6049.7	-6390.0	-7847.2	-5415.3	-4408.9	-3394.0	-1233.6	-946.1	-3264.6	-8662.6	-7410.7	-7575.2
BN	-8028.5	-5999.6	-8897.5	-6062.4	-3995.3	-3871.1	-622.8	58.6	-3367.6	-9937.8	-11214.1	-10068.7
AN	-5530.2	-5651.8	-6632.7	-3919.8	-3254.7	-3568.8	-60.3	483.2	-3760.4	-9024.5	-10743.0	-9992.1
Wet	-7392.0	-6589.3	-5295.2	-1714.5	-1721.4	-1676.8	1518.5	1683.1	-2601.5	-7218.8	-9912.6	-9628.7

Table E.3-248. OMR flow (cfs) difference All Transfers minus Base.

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1971	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1972	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1973	0.0	0.0	0.0	-0.1	2.6	-186.2	-56.5	1.2	0.0	0.0	0.0	0.0
1974	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1975	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1976	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.6	1.6	-716.9	-1916.3	-931.5
1977	-52.1	78.3	66.0	63.8	58.7	55.1	42.4	18.6	2.9	-1213.9	-768.0	-406.7
1978	-28.2	66.1	15.5	0.0	-0.3	-0.2	-0.1	0.0	0.0	0.0	0.0	0.0
1979	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	0.0	0.0	0.0	0.0	0.0
1980	8.9	2.7	0.0	0.0	-529.0	-148.0	0.0	0.0	0.0	0.0	0.0	0.0
1981	0.0	10.2	2.8	0.0	0.0	0.0	0.0	0.0	27.1	7.7	-1176.1	-275.5
1982	70.5	14.5	0.2	2.9	-205.4	-61.8	1.7	0.0	-0.1	0.0	0.0	0.0
1983	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1984	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	9.7	2.7	0.0
1985	0.0	0.0	0.0	0.0	0.0	11.9	3.5	0.0	7.4	11.0	11.1	9.2
1986	8.3	8.4	1.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1987	0.0	6.6	8.3	1.8	0.0	0.0	31.7	60.0	82.1	-992.9	-2030.9	-903.9
1988	-19.9	98.2	20.6	0.0	-0.1	61.7	18.1	47.2	34.6	-1649.7	-1187.6	-559.1
1989	9.6	137.8	29.7	91.2	110.0	24.5	-0.4	88.2	104.8	22.2	-614.6	-138.3
1990	85.9	88.9	78.4	17.0	0.0	-0.1	-0.1	0.0	-0.1	-1589.4	-1018.3	-500.2
1991	-8.1	106.5	88.5	94.5	25.9	0.0	-0.3	0.0	71.8	-1219.4	-814.6	-385.8
1992	19.8	98.2	101.0	99.2	23.5	-0.3	0.0	75.2	118.3	-1556.8	-1158.0	-433.5
1993	-65.9	93.7	28.7	-0.1	-0.5	-0.6	-0.7	2.9	-160.9	-47.5	1.1	0.0
1994	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	0.0	0.0	46.3	-1686.1	-846.6
1995	-33.5	81.0	19.0	0.1	-0.4	-0.3	0.0	-0.1	0.1	-0.1	-0.1	-0.1
1996	0.0	0.0	0.0	0.0	-0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1997	0.0	0.0	0.1	-0.1	0.0	0.0	0.0	0.0	0.0	24.4	6.7	21.9
1998	27.8	33.9	7.7	0.0	0.0	-0.1	0.0	0.0	0.0	0.0	0.0	0.0
1999	0.0	0.0	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2000	0.0	0.0	10.6	3.0	0.0	0.0	0.0	0.0	0.0	13.5	3.7	0.0
2001	0.0	0.0	16.1	4.6	0.0	0.0	0.0	0.0	72.2	-1707.1	-1417.7	-656.9
2002	-35.7	20.9	-0.1	0.0	-0.3	-0.2	-0.1	-0.2	41.7	24.5	38.2	28.9
2003	7.3	17.8	5.2	-0.1	-0.1	0.0	0.0	0.0	-0.1	-528.5	-142.5	6.7
Average	-0.2	28.3	14.7	11.1	-15.2	-7.2	1.2	8.8	11.9	-325.4	-407.9	-175.6
Critical	3.7	67.2	50.6	39.2	15.4	16.6	8.6	20.9	32.7	-1128.5	-1221.3	-580.5
Dry	-4.4	29.3	9.5	16.3	18.3	6.0	5.8	24.7	55.9	-439.1	-865.0	-322.8
BN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AN	-13.0	30.0	10.0	0.5	-87.9	-55.8	-9.6	0.7	-26.8	-93.7	-22.9	1.1
Wet	5.6	10.6	2.2	0.2	-15.8	-4.8	0.1	0.0	0.0	2.6	0.7	1.7

Table E.3-249. OMR flow (cfs) percent difference of All Transfers from Base.

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1971	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1972	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1973	0.0	0.0	0.0	0.0	-0.1	3.7	14.7	0.4	0.0	0.0	0.0	0.0
1974	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1975	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1976	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.4	-0.1	8.6	41.1	25.3
1977	1.4	-2.1	-1.6	-1.5	-2.3	-3.8	-3.7	-1.7	-0.2	56.5	15.3	11.3
1978	1.2	-2.2	-0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1979	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	0.0	0.0	0.0	0.0
1980	-0.1	0.0	0.0	0.0	-24.0	-4.3	0.0	0.0	0.0	0.0	0.0	0.0
1981	0.0	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	-0.9	-0.1	13.0	3.3
1982	-0.9	-0.2	0.0	-0.1	4.0	1.6	0.0	0.0	0.0	0.0	0.0	0.0
1983	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1984	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	0.0
1985	0.0	0.0	0.0	0.0	0.0	-0.3	-0.3	0.0	-0.2	-0.1	-0.1	-0.1
1986	-0.1	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1987	0.0	-0.1	-0.1	0.0	0.0	0.0	-3.0	-3.7	-2.5	16.6	53.1	19.5
1988	0.4	-2.3	-0.4	0.0	0.0	-5.3	-1.4	-5.1	-2.8	35.5	36.2	17.6
1989	-0.3	-2.9	-0.5	-1.8	-4.0	-1.6	0.0	-5.5	-2.4	-0.2	5.9	1.4
1990	-1.1	-1.7	-2.2	-0.4	0.0	0.0	0.0	0.0	0.0	24.8	20.8	12.1
1991	0.2	-3.2	-3.0	-8.4	-1.6	0.0	0.0	0.0	-2.3	18.1	16.7	10.3
1992	-0.6	-2.9	-4.0	-3.1	-1.2	0.0	0.0	-5.1	-3.9	28.7	25.0	9.7
1993	2.3	-3.1	-0.6	0.0	0.0	0.0	0.1	-7.7	4.1	0.5	0.0	0.0
1994	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.5	22.8	12.1
1995	1.1	-1.8	-0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1996	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1997	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.3	-0.1	-0.2
1998	-0.4	-0.7	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1999	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2000	0.0	0.0	-0.1	-0.1	0.0	0.0	0.0	0.0	0.0	-0.2	0.0	0.0
2001	0.0	0.0	-0.2	-0.1	0.0	0.0	0.0	0.0	-2.5	27.3	30.7	13.8
2002	0.8	-0.4	0.0	0.0	0.0	0.0	0.0	0.0	-1.4	-0.2	-0.5	-0.3
2003	-0.1	-0.3	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	5.6	1.3	-0.1
Average	0.1	-0.7	-0.4	-0.5	-0.9	-0.3	0.2	-0.8	-0.4	6.5	8.3	4.0
Critical	0.0	-1.7	-1.6	-1.9	-0.7	-1.3	-0.7	-1.8	-1.3	24.6	25.4	14.0
Dry	0.1	-0.6	-0.1	-0.3	-0.7	-0.3	-0.5	-1.5	-1.7	7.2	17.0	6.3
BN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AN	0.5	-0.9	-0.2	0.0	-4.0	-0.1	2.5	-1.2	0.7	1.0	0.2	0.0
Wet	0.0	-0.2	0.0	0.0	0.3	0.1	0.0	0.0	0.0	0.0	0.0	0.0

Table E.3-250. OMR flow (cfs) difference No Groundwater Substitution minus Base.

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1971	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1972	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1973	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1974	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1975	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1976	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-692.0	-863.7	-447.6
1977	-71.4	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.1	-775.1	-484.4	-262.0
1978	-48.4	0.0	0.0	0.0	-0.1	-0.2	-0.1	0.0	0.0	0.0	0.0	0.0
1979	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1980	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1981	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	-3.1	268.6	-687.0	73.1
1982	89.1	0.0	0.3	2.9	-205.4	-61.8	1.7	0.0	-0.1	0.0	0.0	0.0
1983	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1984	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1985	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1986	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1987	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-489.9	-1028.8	-509.1
1988	-71.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-920.2	-627.3	-346.6
1989	-66.9	0.0	0.0	0.0	0.0	0.1	-0.2	-0.2	0.0	32.7	-187.2	-35.9
1990	7.2	0.0	0.0	0.0	0.1	-0.1	0.0	-0.1	0.1	-948.7	-602.3	-307.9
1991	-58.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-774.1	-497.1	-255.0
1992	-48.4	0.0	0.0	0.0	0.0	-0.1	0.0	0.1	-3.7	-1039.1	-632.8	-259.3
1993	-46.3	0.0	0.0	0.0	-0.3	-0.4	-0.1	3.0	-160.6	-47.3	1.1	0.0
1994	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	165.4	-891.5	-435.4
1995	-39.8	0.0	0.0	0.0	-0.1	-0.1	0.0	-0.1	0.2	-0.1	0.0	0.0
1996	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1997	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1998	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1999	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2001	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	-3.2	-1160.0	-734.4	-359.3
2002	-67.9	0.0	0.0	0.2	-0.1	-0.1	0.0	-0.1	0.0	0.0	0.0	0.0
2003	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-234.6	107.2	114.9
Average	-12.4	0.0	0.0	0.1	-6.1	-1.8	0.0	0.1	-5.0	-194.5	-209.7	-89.1
Critical	-34.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.5	-711.9	-657.0	-330.5
Dry	-22.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-1.1	-224.8	-439.6	-138.5
BN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AN	-15.8	0.0	0.0	0.0	-0.1	-0.1	0.0	0.5	-26.8	-47.0	18.0	19.1
Wet	3.8	0.0	0.0	0.2	-15.8	-4.8	0.1	0.0	0.0	0.0	0.0	0.0

Table E.3-251. OMR flow (cfs) percent difference of No Groundwater Substitution from Base.

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1971	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1972	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1973	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1974	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1975	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1976	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	8.3	18.5	12.1
1977	1.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	36.1	9.6	7.3
1978	2.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1979	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1980	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1981	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	-2.7	7.6	-0.9
1982	-1.2	0.0	0.0	-0.1	4.0	1.6	0.0	0.0	0.0	0.0	0.0	0.0
1983	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1984	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1985	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1986	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1987	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	8.2	26.9	11.0
1988	1.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	19.8	19.1	10.9
1989	1.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.3	1.8	0.4
1990	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	14.8	12.3	7.4
1991	1.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	11.5	10.2	6.8
1992	1.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	19.2	13.7	5.8
1993	1.6	0.0	0.0	0.0	0.0	0.0	0.0	-7.9	4.1	0.5	0.0	0.0
1994	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-1.8	12.0	6.2
1995	1.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1996	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1997	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1998	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1999	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2001	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	18.5	15.9	7.6
2002	1.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2003	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.5	-1.0	-1.2
Average	0.4	0.0	0.0	0.0	0.1	0.0	0.0	-0.2	0.1	4.0	4.3	2.2
Critical	0.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	15.4	13.6	8.1
Dry	0.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.9	8.7	3.0
BN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AN	0.6	0.0	0.0	0.0	0.0	0.0	0.0	-1.3	0.7	0.5	-0.2	-0.2
Wet	0.0	0.0	0.0	0.0	0.3	0.1	0.0	0.0	0.0	0.0	0.0	0.0

Table E.3-252. OMR flow (cfs) difference No Crop Idle minus Base.

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1971	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1972	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1973	0.0	0.0	0.0	-0.1	2.6	-186.2	-56.5	1.2	0.0	0.0	0.0	0.0
1974	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1975	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1976	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.6	1.6	-729.0	-1045.4	-515.7
1977	-7.9	78.3	66.0	63.8	58.7	55.1	42.4	18.6	2.9	-606.4	-372.8	-178.8
1978	14.7	66.1	15.5	0.0	-0.3	-0.2	-0.1	0.0	0.0	0.0	0.0	0.0
1979	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	0.0	0.0	0.0	0.0	0.0
1980	8.9	2.7	0.0	0.0	-529.0	-148.0	0.0	0.0	0.0	0.0	0.0	0.0
1981	0.0	10.2	2.8	0.0	0.0	0.0	0.0	0.0	27.1	10.6	-1153.1	-263.5
1982	72.0	14.5	0.2	2.9	-205.4	-61.8	1.7	0.0	-0.1	0.0	0.0	0.0
1983	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1984	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	9.7	2.7	0.0
1985	0.0	0.0	0.0	0.0	0.0	11.9	3.5	0.0	7.4	11.0	11.1	9.2
1986	8.3	8.4	1.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1987	0.0	6.6	8.3	1.8	0.0	0.0	31.7	60.0	82.1	-725.7	-1349.3	-573.9
1988	24.4	98.2	20.6	0.0	-0.1	61.7	18.1	47.2	34.6	-1187.9	-697.5	-309.5
1989	51.5	137.8	29.7	91.2	110.0	24.5	-0.4	88.2	104.8	22.2	-614.6	-138.3
1990	85.9	88.9	78.4	17.0	0.0	-0.1	-0.1	0.0	-0.1	-967.7	-595.1	-271.1
1991	36.1	106.5	88.5	94.5	25.9	0.0	-0.3	0.0	71.8	-613.9	-406.1	-163.2
1992	62.7	98.2	101.0	99.2	23.5	-0.3	0.0	75.2	118.3	-1015.7	-754.9	-229.1
1993	-28.0	93.7	28.7	-0.1	-0.5	-0.6	-0.7	2.9	-160.9	-47.5	1.1	0.0
1994	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	0.0	0.0	0.5	-884.1	-454.8
1995	6.3	80.9	19.0	0.1	-0.4	-0.3	0.0	-0.1	0.1	-0.1	-0.1	-0.1
1996	0.0	0.0	0.0	0.0	-0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1997	0.0	0.0	0.1	-0.1	0.0	0.0	0.0	0.0	0.0	24.4	6.7	21.9
1998	27.8	33.9	7.7	0.0	0.0	-0.1	0.0	0.0	0.0	0.0	0.0	0.0
1999	0.0	0.0	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2000	0.0	0.0	10.6	3.0	0.0	0.0	0.0	0.0	0.0	13.5	3.7	0.0
2001	0.0	0.0	16.1	4.6	0.0	0.0	0.0	0.0	72.2	-1325.9	-810.5	-356.7
2002	8.7	20.9	-0.1	0.0	-0.3	-0.2	-0.1	-0.2	41.7	24.5	38.2	28.9
2003	7.3	17.8	5.2	-0.1	-0.1	0.0	0.0	0.0	-0.1	-528.5	-142.5	6.7
Average	11.1	28.3	14.7	11.1	-15.2	-7.2	1.2	8.8	11.9	-224.5	-257.7	-99.7
Critical	28.8	67.2	50.6	39.2	15.4	16.6	8.6	20.9	32.7	-731.5	-679.4	-303.2
Dry	10.0	29.3	9.5	16.3	18.3	6.0	5.8	24.7	55.9	-330.6	-646.4	-215.7
BN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AN	0.5	30.0	10.0	0.5	-87.9	-55.8	-9.6	0.7	-26.8	-93.7	-22.9	1.1
Wet	8.8	10.6	2.2	0.2	-15.8	-4.8	0.1	0.0	0.0	2.6	0.7	1.7

Table E.3-253. OMR flow (cfs) percent difference of No Crop Idle from Base.

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1971	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1972	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1973	0.0	0.0	0.0	0.0	-0.1	3.7	14.7	0.4	0.0	0.0	0.0	0.0
1974	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1975	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1976	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.4	-0.1	8.8	22.4	14.0
1977	0.2	-2.1	-1.6	-1.5	-2.3	-3.8	-3.7	-1.7	-0.2	28.2	7.4	5.0
1978	-0.6	-2.2	-0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1979	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	0.0	0.0	0.0	0.0
1980	-0.1	0.0	0.0	0.0	-24.0	-4.3	0.0	0.0	0.0	0.0	0.0	0.0
1981	0.0	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	-0.9	-0.1	12.7	3.1
1982	-0.9	-0.2	0.0	-0.1	4.0	1.6	0.0	0.0	0.0	0.0	0.0	0.0
1983	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1984	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	0.0
1985	0.0	0.0	0.0	0.0	0.0	-0.3	-0.3	0.0	-0.2	-0.1	-0.1	-0.1
1986	-0.1	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1987	0.0	-0.1	-0.1	0.0	0.0	0.0	-3.0	-3.7	-2.5	12.1	35.3	12.4
1988	-0.5	-2.3	-0.4	0.0	0.0	-5.3	-1.4	-5.1	-2.8	25.6	21.3	9.7
1989	-1.5	-2.9	-0.5	-1.8	-4.0	-1.6	0.0	-5.5	-2.4	-0.2	5.9	1.4
1990	-1.1	-1.7	-2.2	-0.4	0.0	0.0	0.0	0.0	0.0	15.1	12.1	6.5
1991	-1.1	-3.2	-3.0	-8.4	-1.6	0.0	0.0	0.0	-2.3	9.1	8.3	4.3
1992	-1.8	-2.9	-4.0	-3.1	-1.2	0.0	0.0	-5.1	-3.9	18.7	16.3	5.1
1993	1.0	-3.1	-0.6	0.0	0.0	0.0	0.1	-7.7	4.1	0.5	0.0	0.0
1994	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	11.9	6.5
1995	-0.2	-1.8	-0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1996	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1997	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.3	-0.1	-0.2
1998	-0.4	-0.7	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1999	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2000	0.0	0.0	-0.1	-0.1	0.0	0.0	0.0	0.0	0.0	-0.2	0.0	0.0
2001	0.0	0.0	-0.2	-0.1	0.0	0.0	0.0	0.0	-2.5	21.2	17.5	7.5
2002	-0.2	-0.4	0.0	0.0	0.0	0.0	0.0	0.0	-1.4	-0.2	-0.5	-0.3
2003	-0.1	-0.3	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	5.6	1.3	-0.1
Average	-0.2	-0.7	-0.4	-0.5	-0.9	-0.3	0.2	-0.8	-0.4	4.2	5.1	2.2
Critical	-0.6	-1.7	-1.6	-1.9	-0.7	-1.3	-0.7	-1.8	-1.3	15.1	14.3	7.3
Dry	-0.3	-0.6	-0.1	-0.3	-0.7	-0.3	-0.5	-1.5	-1.7	5.4	11.8	4.0
BN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AN	0.0	-0.9	-0.2	0.0	-4.0	-0.1	2.5	-1.2	0.7	1.0	0.2	0.0
Wet	-0.1	-0.2	0.0	0.0	0.3	0.1	0.0	0.0	0.0	0.0	0.0	0.0

E.3.1.6 Boundary Conditions: Sacramento and San Joaquin River Inflows, Net Delta Outflow (NDO) and San Joaquin River Salinity (EC)

See the text in Appendix *E* for details on the boundary conditions for the Base and the Alternatives 2- 4.

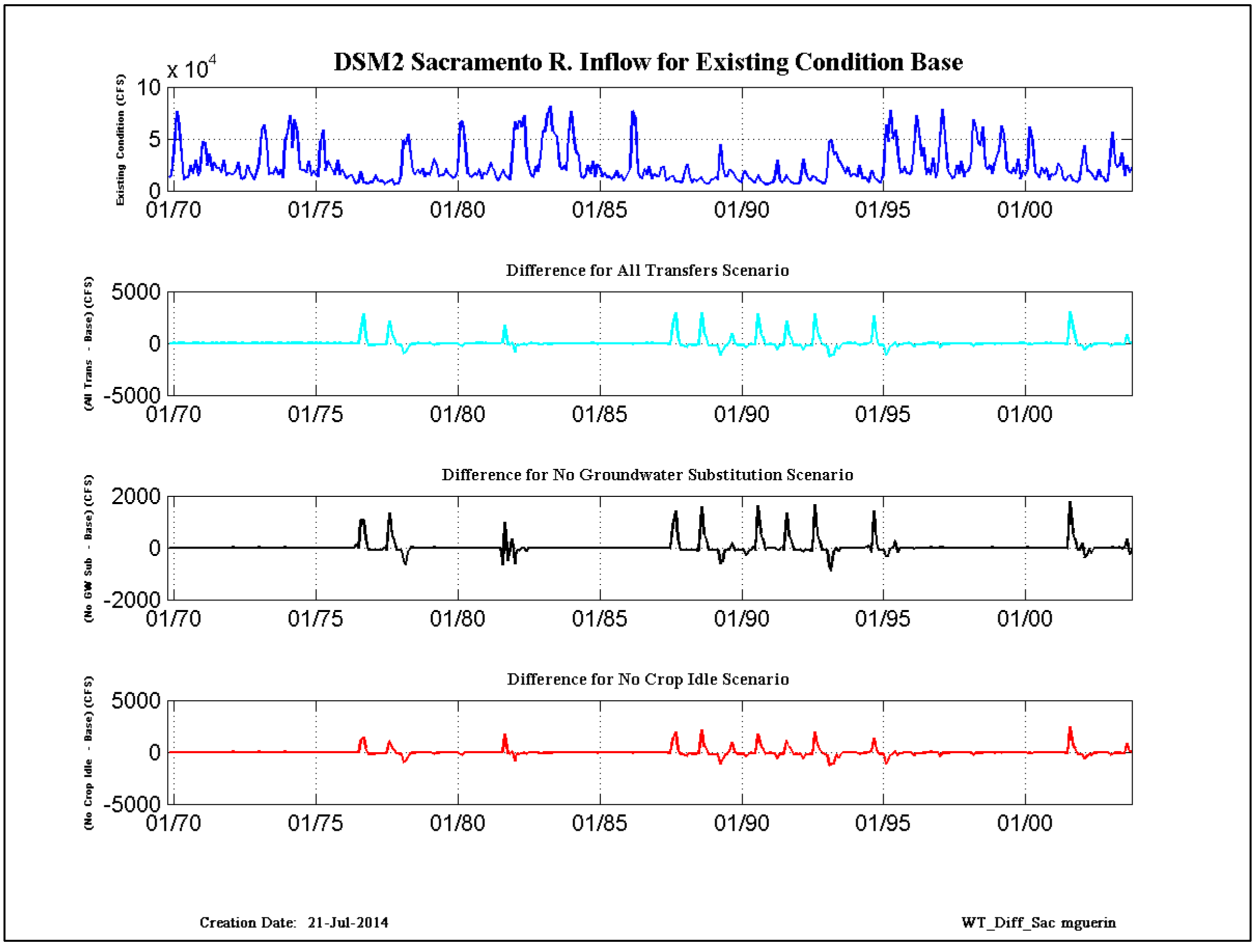

Figure E.3-41. Sacramento R. Inflow for the Base condition and change from Base for the scenarios.

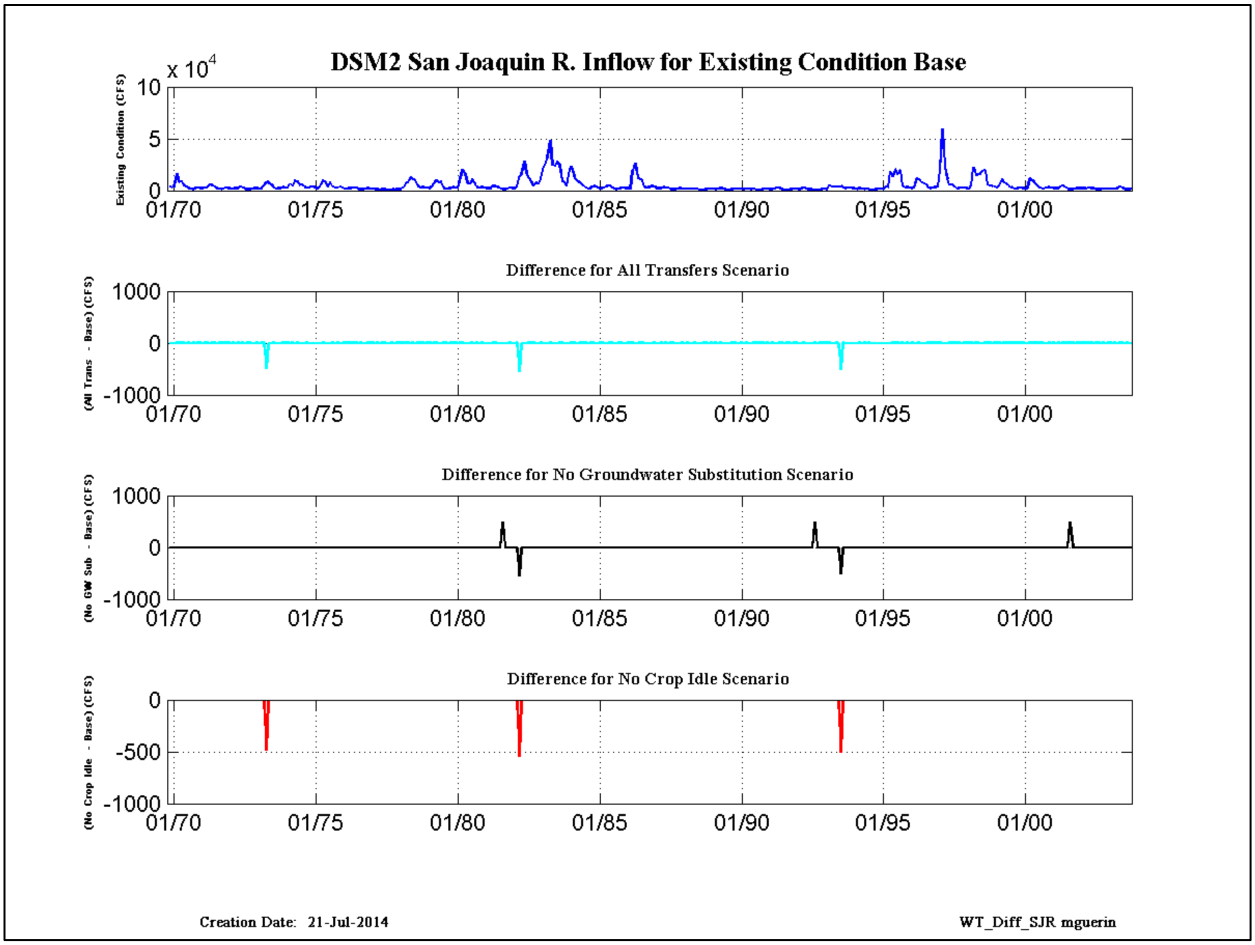

Figure ES.3-42. San Joaquin R. Inflow for Existing Base condition and change from Base for the scenarios.

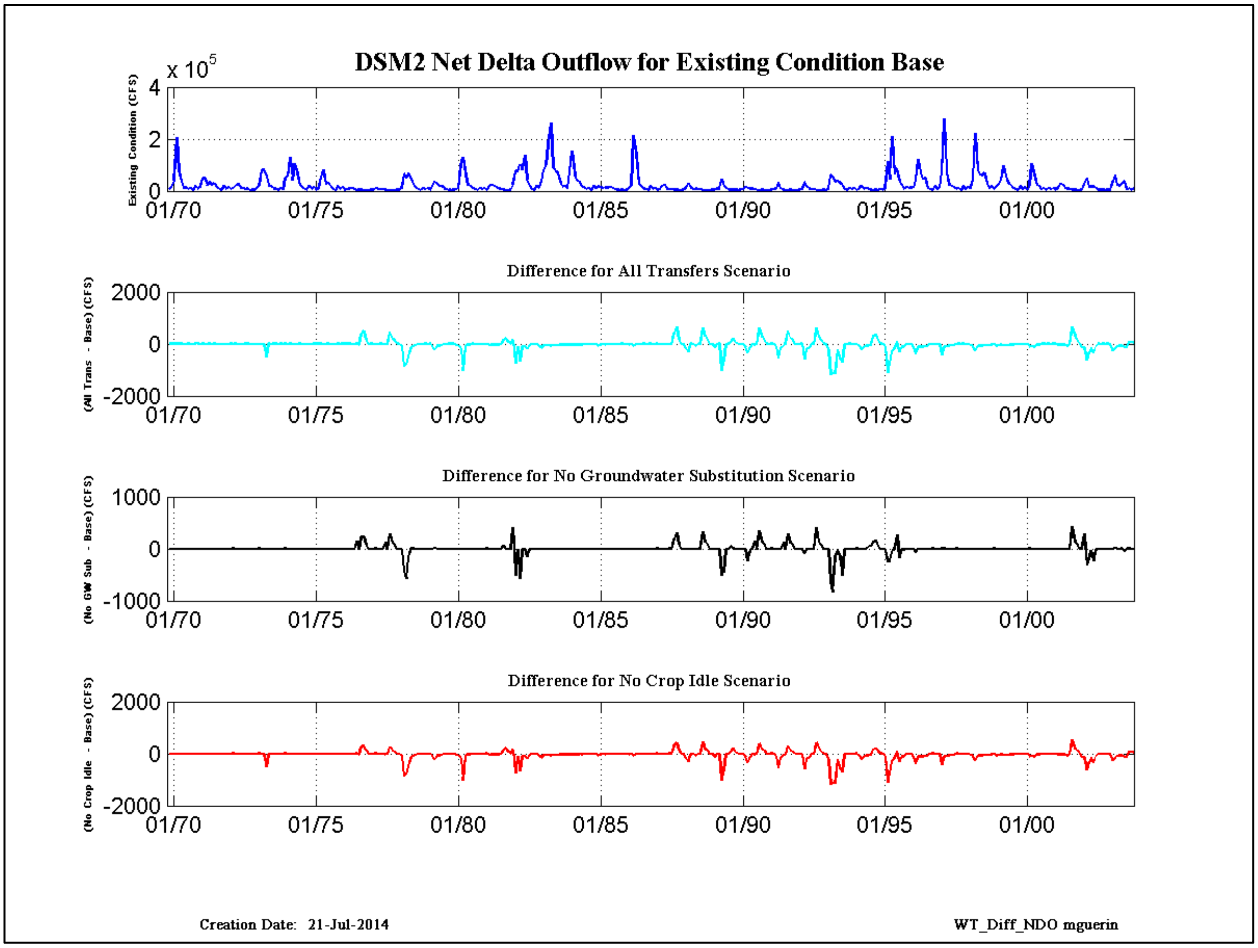

Figure E.3-43. Net Delta Outflow for the Base condition and change from Base for the scenarios.

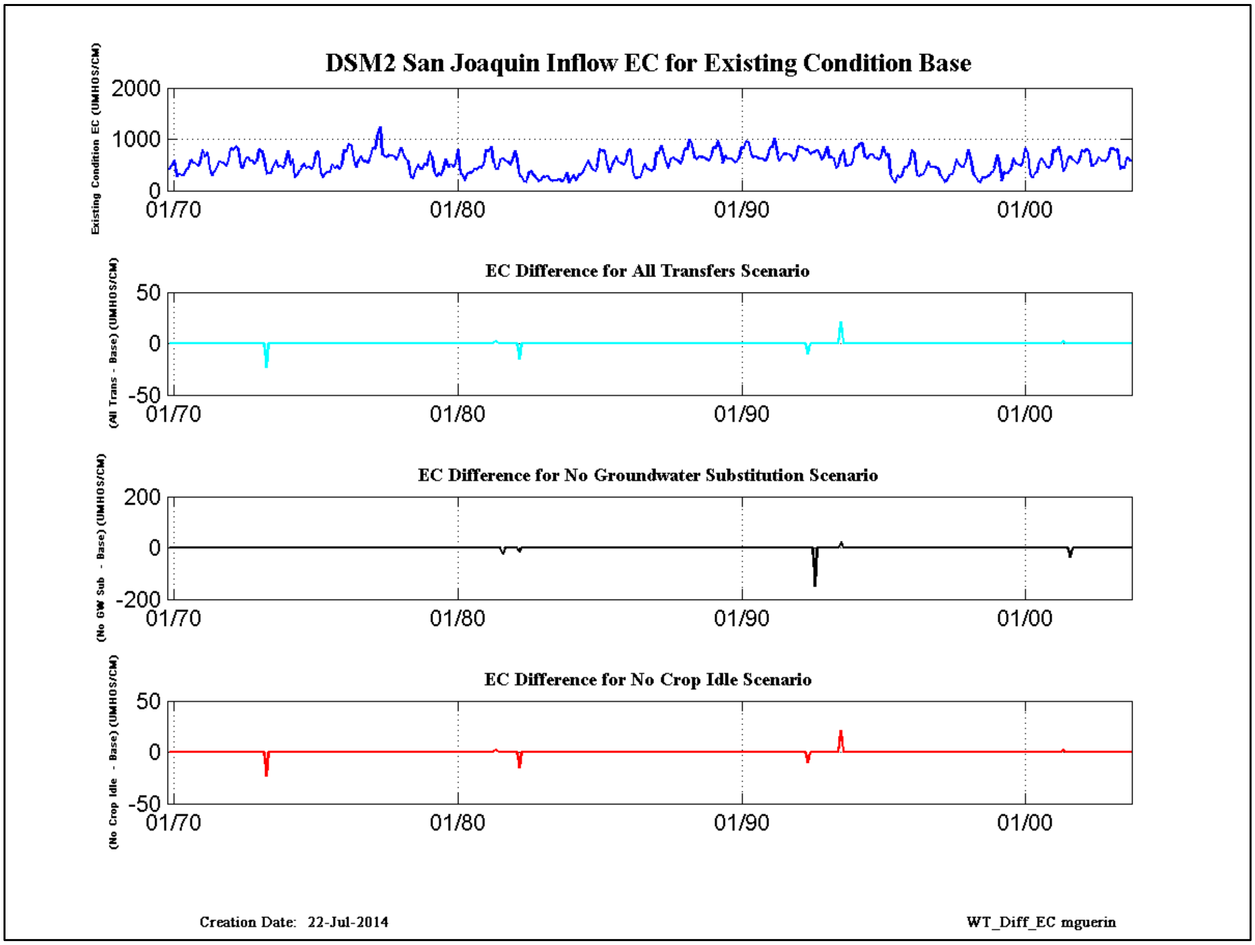

Figure ES.3-44. San Joaquin Inflow EC for Existing Base condition and change from Base for the scenarios.

Table E.3-255. Sacramento River Base inflow (cfs).

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	13169.5	15030.2	38985.0	76879.2	62925.7	33571.0	10845.8	12666.5	12895.4	24931.4	16762.8	29447.9
1971	14275.5	19579.5	47365.8	46356.4	24724.1	35936.3	19847.8	27399.0	21674.7	22450.3	17237.0	29804.6
1972	14594.1	16600.6	15651.7	16005.6	18971.6	27881.1	12105.4	11262.7	12598.4	24038.4	17049.0	14766.6
1973	10333.5	19133.7	26101.3	57692.8	63491.4	46989.9	15637.7	17111.0	16064.0	22844.1	15510.7	20364.8
1974	12939.5	48514.3	56875.6	72508.5	41804.7	68080.6	56314.9	20618.7	19493.6	19869.4	17033.3	28981.7
1975	14553.8	19396.1	14925.0	13471.1	47130.9	58710.3	19978.5	28823.8	24536.4	19542.2	15205.9	29588.1
1976	15513.8	20084.5	15568.1	11434.5	14117.3	15159.8	10294.9	6564.6	8290.0	18343.1	7883.3	7168.6
1977	6745.2	8287.5	8493.3	14841.8	9657.7	9027.2	9289.1	6067.2	8007.1	9026.5	10821.0	6283.0
1978	6502.4	6568.4	15571.1	48628.7	44316.3	54508.5	33667.7	18061.9	15802.4	20196.7	16452.4	21580.3
1979	13542.1	16845.2	15341.0	21552.7	30939.3	24900.8	13885.9	14651.4	15343.1	20830.1	16020.5	13708.0
1980	11735.6	13714.7	19535.9	65995.4	66815.8	43319.9	16875.5	14379.9	13196.2	16050.3	15327.8	20849.9
1981	11976.7	16798.8	15584.5	20930.6	26922.2	20299.5	13243.5	9847.9	13671.8	20224.2	14425.6	12327.3
1982	10918.3	32589.5	66283.2	59017.8	67544.7	61335.8	72176.4	31567.9	21052.5	14691.5	13190.1	23819.1
1983	18851.4	33898.4	57243.7	57365.0	74553.6	81218.2	57054.8	54471.4	51762.9	23527.8	20390.6	23971.6
1984	19106.7	54919.0	76014.2	47229.0	36617.4	33804.6	13671.3	12395.7	13962.0	24194.7	16007.0	28412.7
1985	13116.1	25317.3	21459.9	13844.3	17498.8	13270.5	13046.1	11392.1	12783.6	19935.3	12823.7	14777.7
1986	9142.0	12206.1	17131.2	22628.1	76672.5	70719.9	17937.1	12683.2	11561.2	20934.2	15431.6	23829.3
1987	11474.7	15878.4	14044.9	13795.9	21956.0	23028.4	9759.0	10535.8	13465.5	14450.3	8665.8	8871.2
1988	8066.7	8118.1	18384.8	25699.3	13287.3	7598.0	11017.1	8974.5	10928.5	12744.7	8109.0	7024.3
1989	6495.4	10332.1	10684.9	12811.6	10178.0	44407.4	21194.7	14106.6	13945.1	20458.9	17722.5	15124.2
1990	11069.6	8833.8	8332.8	18898.9	16052.6	12340.7	11295.6	8140.3	8134.6	15096.8	9890.9	7734.0
1991	6308.1	6374.6	7342.9	7575.1	10520.4	29303.4	11868.6	7820.9	9823.1	14728.1	10043.5	7531.9
1992	6656.3	6784.1	6929.7	10692.7	30330.1	18736.3	11534.3	9091.9	13553.7	12968.0	9805.5	8789.4
1993	7318.7	6683.3	13435.0	46916.1	48160.4	34709.9	37159.0	28605.1	25741.2	21467.4	16654.5	22924.9
1994	13623.7	16004.0	15481.7	13085.1	24379.4	11849.4	12836.6	10303.5	8336.6	19528.4	12459.7	11452.6
1995	8049.6	8315.8	15311.7	63795.5	47429.8	77273.3	50128.1	58571.8	37893.7	17181.4	17824.0	23602.4
1996	16878.4	15916.5	19772.0	40451.0	72313.1	57238.6	33302.4	41069.9	15240.3	21657.7	15847.5	31452.8
1997	12850.3	19289.7	49630.3	78330.0	52800.7	22177.8	16219.0	12429.2	12867.7	24525.7	16157.0	28814.4
1998	13079.6	18351.9	19346.2	26948.0	68021.1	60584.4	45597.2	43198.1	61417.2	23080.1	20056.5	24560.6
1999	16002.5	26617.5	33436.6	38835.1	62496.5	53344.8	22898.0	18412.5	16896.0	21883.1	16097.1	30087.1
2000	11909.9	19359.6	15029.2	21584.9	61207.3	47814.4	18229.8	15990.3	12961.1	22452.3	16925.5	21912.9
2001	10622.2	15674.7	14871.5	16534.5	26400.9	22373.9	11647.8	9239.3	13459.7	14659.4	9709.4	8549.0
2002	8122.6	10127.9	28744.8	43310.3	19020.7	19285.1	16565.0	12021.7	10818.3	20639.9	13591.0	12587.5
2003	8581.7	10299.0	36296.7	56676.5	27324.9	22303.7	24558.4	36943.2	14407.2	24534.2	17315.0	22225.8
Average	11591.9	17719.0	25153.1	35362.4	39311.3	37150.1	22696.6	19277.0	17429.0	19520.2	14542.5	18909.6
Critical	9711.9	10640.9	11504.8	14603.9	16906.4	14859.3	11162.3	8137.5	9581.9	14633.7	9859.0	7997.7
Dry	10301.3	15688.2	17565.1	20204.5	20329.4	23777.5	14242.7	11190.6	13024.0	18394.7	12823.0	12039.5
BN	14068.1	16722.9	15496.3	18779.1	24955.4	26391.0	12995.6	12957.0	13970.7	22434.3	16534.8	14237.3
AN	9397.0	12626.5	20994.8	49582.4	51886.0	41607.7	24354.7	21848.6	16362.0	21257.5	16364.3	21643.1
Wet	13832.1	24971.1	39409.3	49524.2	56541.1	54922.7	33536.3	28792.9	24711.8	21420.7	16710.8	27413.3

Table E.3-256. San Joaquin River Base inflow (cfs).

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	3768.2	2936.4	3586.4	16926.6	8289.8	8768.7	5357.9	3585.1	2204.6	1761.4	1456.6	2037.4
1971	2847.6	2207.8	2077.1	2733.9	2821.6	5836.3	5489.7	4008.9	2341.4	1544.6	1417.8	1861.5
1972	2924.9	2058.9	1938.2	1573.8	2230.1	2234.7	3769.2	2932.7	1486.4	1199.0	1320.9	1604.4
1973	2286.3	2195.7	1935.2	2176.9	4981.5	8475.8	7146.1	5654.0	2685.7	1879.3	2418.0	2497.5
1974	3284.7	2581.8	3403.9	6480.1	4095.8	9057.5	8575.9	5164.3	5551.4	3388.1	2713.8	2788.4
1975	3602.3	3053.1	2450.1	2291.2	5840.3	9579.7	7376.5	3711.5	8129.2	3713.7	2792.5	2578.6
1976	3484.5	2781.3	1995.0	1990.9	2230.6	2355.0	2899.8	2589.0	1290.4	1124.0	1455.5	1619.1
1977	2084.7	1607.9	1500.6	1468.1	1412.9	872.2	1154.7	1419.7	698.1	618.4	695.6	1013.3
1978	1434.9	1460.6	1475.5	3053.5	6647.6	8137.9	12698.4	11108.7	10231.5	4243.7	2783.6	3275.7
1979	2552.3	2952.7	2326.6	3982.2	6950.8	9748.7	7763.4	8020.5	2028.8	1608.8	2452.4	2282.7
1980	3151.8	2543.7	2110.2	12875.6	20072.9	16873.3	7388.5	6912.1	10906.7	7286.5	3055.8	2746.1
1981	3335.6	2850.4	2017.1	2182.5	2411.4	4248.0	4429.0	3239.3	1581.1	1349.2	1320.3	1737.1
1982	2585.7	2139.5	2098.1	3749.6	12819.4	15750.1	28065.2	17966.2	11977.8	8608.9	4699.5	7232.5
1983	6774.0	11265.6	20556.0	27494.0	32934.1	48804.6	24500.0	23551.5	28265.1	24539.8	9180.6	7749.3
1984	4939.3	16633.1	23670.7	14694.0	10099.5	8292.2	6991.7	4493.9	3000.9	1962.5	2287.8	3605.6
1985	4267.1	3050.4	1903.6	2214.9	2981.0	4255.5	4819.7	3328.5	1628.2	1357.5	1616.8	2060.8
1986	2665.3	2419.3	2079.8	1845.6	19484.7	26225.5	12084.3	10712.5	9568.0	3063.4	2887.0	3434.2
1987	4034.1	3487.6	2142.4	2017.2	2162.6	3202.4	2802.8	2523.1	1310.0	1028.5	1243.1	1691.5
1988	2241.1	1938.8	1634.5	1627.8	1676.4	1758.2	1941.6	1694.1	986.3	724.1	932.6	1411.8
1989	1517.4	1744.8	1558.4	1446.6	1802.0	2121.7	2267.2	1399.5	941.0	832.4	1069.8	1808.7
1990	1852.0	1802.4	1508.7	1404.4	1839.9	1685.1	1212.3	1604.7	861.6	701.9	888.7	1376.7
1991	1800.3	1858.9	1396.4	1241.9	1552.3	3094.3	2053.6	1470.9	840.4	669.8	774.7	1066.4
1992	1638.7	1692.9	1288.3	1196.3	2610.9	2260.2	1256.1	1128.0	537.2	465.8	528.5	929.8
1993	1389.8	1500.6	1369.7	4671.8	3769.2	3840.3	3650.7	3617.4	4375.1	2587.8	2233.3	2568.3
1994	2674.2	2309.4	1637.5	1437.5	2120.8	1864.0	1438.9	1842.1	931.6	738.0	831.2	1214.1
1995	1580.5	1666.1	1335.4	3669.2	3160.3	18105.3	13322.5	20874.7	15410.6	19518.4	4737.5	2784.0
1996	3188.6	2690.5	2087.7	2699.3	11657.4	11004.8	8245.0	7120.1	5628.2	2572.5	2475.6	2671.8
1997	3140.8	3506.0	20158.9	59665.2	23357.5	11036.3	5500.8	6373.0	3890.7	1721.8	2302.6	2872.0
1998	2999.0	2154.6	1986.5	4970.9	22897.5	15256.5	15489.5	16158.1	18923.2	19964.7	5513.6	4981.8
1999	4466.2	3499.9	2871.8	5106.5	11331.2	7556.8	6982.8	4317.9	3421.8	1702.9	1887.6	2360.9
2000	2816.7	2278.9	1662.4	2257.2	11533.0	9676.8	6917.6	5094.9	2731.7	1566.5	1820.2	2871.0
2001	3380.6	2625.3	2119.9	2258.2	2392.7	3841.0	4839.5	2973.6	1478.6	1095.8	1311.7	1806.0
2002	2238.8	2042.6	2024.5	2414.6	1915.9	2592.7	2467.8	2213.1	1165.7	1016.7	1241.5	1663.7
2003	1824.1	1823.5	1825.7	1664.0	1812.6	2363.5	3737.7	2741.8	1226.5	1148.7	1359.2	1692.7
Average	2905.1	3040.0	3698.0	6102.4	7467.5	8552.2	6901.1	5927.8	4948.1	3744.3	2226.6	2526.3
Critical	2253.7	1998.8	1565.8	1481.0	1920.5	1984.2	1708.1	1678.4	877.9	720.3	872.4	1233.0
Dry	3128.9	2633.5	1961.0	2089.0	2277.6	3376.9	3604.3	2612.8	1350.8	1113.3	1300.5	1794.6
BN	2738.6	2505.8	2132.4	2778.0	4590.4	5991.7	5766.3	5476.6	1757.6	1403.9	1886.7	1943.6
AN	2150.6	1967.2	1729.8	4449.8	8136.1	8227.9	6923.2	5854.8	5359.5	3118.7	2278.3	2608.5
Wet	3526.3	4365.7	6797.1	11717.4	12983.8	15021.1	11383.2	9849.1	9101.0	7235.6	3411.7	3612.2

Table E.3-257. Net Delta Outflow (cfs) Base.

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	7187.5	14640.8	42013.9	207621.7	77822.7	36548.8	13527.3	12532.2	7627.6	11076.4	4000.0	18437.5
1971	8437.5	15312.5	49917.8	48106.2	21508.4	37066.9	23384.3	29218.7	15234.4	8000.0	4000.0	19062.5
1972	8281.3	14591.1	6675.5	11909.4	18112.6	26002.5	12957.0	10053.1	6447.5	8880.9	4000.0	4192.2
1973	4000.0	11709.2	22091.2	80437.1	83604.2	56514.9	20261.8	19386.2	9382.9	8805.8	4000.0	11718.8
1974	6250.0	51476.8	58150.2	131491.9	40998.5	107783.3	69890.1	23550.8	15124.5	8000.0	5228.1	18906.3
1975	8125.0	14572.7	5352.6	9527.8	53868.6	83609.1	26862.2	30682.7	21480.5	8000.0	4000.0	19687.5
1976	8125.0	15937.5	5031.6	7008.7	9542.0	10771.1	9298.9	4000.0	4576.3	4755.4	3884.8	3000.0
1977	3000.0	4674.6	3500.0	10872.0	7521.4	7238.7	7100.0	4024.8	4000.0	4000.0	3368.9	3000.0
1978	4371.6	3500.0	11387.3	67380.2	51430.8	67829.5	46888.4	24774.3	13190.1	8000.0	4000.0	11562.5
1979	5937.5	10625.0	5056.7	21612.8	35577.7	27540.7	19555.2	19587.7	8150.0	6500.0	4086.6	3619.6
1980	4136.9	8004.0	10839.4	100182.6	130651.5	62796.1	21972.3	18834.8	12363.5	8000.0	4000.0	11562.5
1981	6250.0	10312.5	5145.4	19334.2	22884.2	19634.9	14190.8	8977.1	7100.0	5000.0	3996.8	3076.6
1982	4154.8	26104.0	79982.5	75273.3	101687.0	82095.6	139773.6	46361.5	20981.8	8000.0	4000.0	19375.0
1983	13461.7	39419.4	80646.5	102986.7	182104.6	260276.2	90337.6	76100.2	69560.8	34113.1	16717.0	20243.9
1984	11361.2	79829.7	154668.9	63210.5	40204.1	34662.4	18090.3	13461.4	7700.0	10698.3	4000.0	19062.5
1985	8281.3	19246.4	12118.9	10008.1	13889.1	12240.8	14203.4	10270.1	6406.3	5000.0	3791.0	4262.8
1986	4000.0	4617.0	11288.5	22623.1	214875.9	140086.7	26443.4	19792.2	9916.6	8000.0	4000.0	18437.5
1987	8125.0	12707.2	4619.9	9635.3	18313.5	23224.7	9227.1	7459.4	7100.0	5000.0	4147.4	3000.0
1988	4000.0	4500.0	13160.4	26671.0	13525.9	6088.3	9496.1	7100.0	7100.0	4000.0	3889.0	3000.0
1989	3000.0	5311.3	4411.1	8412.2	8635.7	47267.9	19653.7	11116.1	5937.5	5051.9	5359.5	4593.1
1990	4000.0	4500.0	4500.0	14585.4	11869.4	8990.5	9426.7	6832.7	4000.0	4000.0	4254.5	3000.0
1991	3438.6	3500.0	4140.6	7358.0	8748.0	33920.7	10515.9	5636.1	4000.0	4000.0	4409.0	3000.0
1992	3327.2	3618.3	4232.1	7538.7	35067.8	16743.3	9787.2	5997.6	7100.0	4000.0	3704.3	3000.0
1993	4857.6	3500.0	8379.2	63439.0	55587.7	35078.6	39776.0	30179.3	20923.0	8000.0	4000.0	12343.8
1994	6406.3	10312.5	5088.2	8972.5	21936.0	8465.7	11151.5	8677.6	4099.7	4000.0	4044.5	3000.0
1995	6342.1	3500.0	8995.3	112539.3	45657.8	208959.4	67780.3	87602.4	40848.3	22236.6	9017.5	14062.5
1996	11875.0	12570.3	15759.3	44785.6	123345.4	68296.1	46336.4	48365.0	10900.3	8000.0	4000.0	21250.0
1997	7812.5	15625.0	73827.6	276450.7	74642.5	22507.6	18591.8	14870.0	6843.4	11631.7	4000.0	18437.5
1998	7812.5	15312.5	9889.7	47972.5	220892.1	82137.0	64070.5	59459.6	71969.3	28161.0	11827.5	17524.4
1999	8906.3	19896.1	28686.9	40175.6	96127.9	58523.1	30458.2	20578.8	11277.5	8151.2	4000.0	20000.0
2000	7500.0	15398.1	4778.1	21731.5	104608.7	61479.6	22597.5	18264.0	6218.8	10481.6	4000.0	11718.8
2001	5781.3	10468.8	4853.0	13157.7	26754.6	22964.2	13236.0	8390.1	7100.0	5000.0	4185.0	3000.0
2002	4000.0	5791.9	27774.6	48417.2	14571.5	17226.7	16612.9	12736.2	4849.0	5312.3	4327.7	3000.0
2003	4614.9	4500.0	36796.8	61445.9	23945.5	18232.7	27994.6	38807.6	6689.2	9956.5	4000.0	11562.5
Average	6387.1	14576.0	24228.2	53025.7	59132.7	53317.8	29454.4	22461.2	13711.7	8876.8	4830.6	10726.5
Critical	4613.9	6720.4	5664.7	11858.1	15458.6	13174.1	9539.5	6038.4	4982.3	4107.9	3936.4	3000.0
Dry	5906.3	10639.7	9820.5	18160.8	17508.1	23759.9	14520.7	9824.8	6415.5	5060.7	4301.2	3488.8
BN	7109.4	12608.1	5866.1	16761.1	26845.1	26771.6	16256.1	14820.4	7298.8	7690.5	4043.3	3905.9
AN	4913.5	7768.5	15712.0	65769.4	74971.4	50321.9	29915.1	25041.0	11461.3	8874.0	4000.0	11744.8
Wet	8132.8	24067.5	47629.2	90981.9	99518.1	94042.5	48888.2	37121.2	23805.0	13389.9	6060.8	18806.7

Table E.3-258. San Joaquin River inflow salinity (EC, UMHOS/CM)

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	417.0	482.0	588.0	267.0	321.0	293.0	302.0	396.0	416.0	600.0	544.0	520.0
1971	480.0	565.0	790.0	660.0	740.0	429.0	289.0	356.0	450.0	567.0	544.0	533.0
1972	482.0	590.0	812.0	797.0	854.0	816.0	471.0	438.0	589.0	640.0	576.0	580.0
1973	519.0	575.0	798.0	768.0	623.0	333.0	335.0	342.0	477.0	592.0	459.0	486.0
1974	442.0	526.0	784.0	501.0	614.0	257.0	300.0	374.0	455.0	527.0	436.0	459.0
1975	424.0	472.0	746.0	754.0	360.0	254.0	330.0	360.0	369.0	514.0	426.0	476.0
1976	418.0	509.0	794.0	772.0	903.0	860.0	597.0	446.0	593.0	657.0	571.0	575.0
1977	527.0	667.0	837.0	817.0	1068.0	1243.0	702.0	675.0	651.0	693.0	677.0	659.0
1978	602.0	691.0	848.0	704.0	609.0	558.0	262.0	235.0	379.0	510.0	430.0	420.0
1979	517.0	490.0	765.0	652.0	366.0	278.0	337.0	295.0	432.0	612.0	457.0	509.0
1980	456.0	531.0	796.0	323.0	300.0	201.0	319.0	347.0	346.0	429.0	407.0	459.0
1981	449.0	503.0	791.0	760.0	857.0	560.0	417.0	416.0	597.0	618.0	579.0	565.0
1982	500.0	582.0	787.0	598.0	278.0	274.0	173.0	167.0	334.0	382.0	301.0	239.0
1983	186.0	192.0	270.0	257.0	281.0	220.0	174.0	198.0	198.0	216.0	163.0	225.0
1984	349.0	153.0	224.0	297.0	195.0	306.0	311.0	359.0	468.0	593.0	480.0	405.0
1985	378.0	471.0	810.0	761.0	768.0	544.0	362.0	437.0	580.0	670.0	556.0	532.0
1986	497.0	553.0	785.0	790.0	371.0	251.0	243.0	243.0	368.0	519.0	419.0	407.0
1987	390.0	424.0	744.0	737.0	876.0	702.0	559.0	438.0	603.0	649.0	600.0	582.0
1988	521.0	610.0	825.0	807.0	1000.0	906.0	637.0	603.0	659.0	648.0	641.0	610.0
1989	575.0	642.0	831.0	820.0	974.0	826.0	544.0	686.0	621.0	617.0	612.0	547.0
1990	573.0	630.0	839.0	830.0	963.0	917.0	717.0	644.0	668.0	633.0	626.0	612.0
1991	574.0	628.0	846.0	843.0	1020.0	714.0	583.0	672.0	715.0	717.0	697.0	670.0
1992	581.0	643.0	856.0	845.0	829.0	790.0	794.0	714.0	739.0	753.0	792.0	721.0
1993	599.0	674.0	856.0	645.0	649.0	624.0	440.0	485.0	701.0	789.0	475.0	481.0
1994	499.0	558.0	833.0	836.0	908.0	925.0	659.0	622.0	688.0	713.0	650.0	633.0
1995	603.0	647.0	853.0	677.0	712.0	332.0	204.0	148.0	294.0	245.0	296.0	467.0
1996	447.0	513.0	788.0	718.0	301.0	279.0	310.0	326.0	457.0	565.0	455.0	472.0
1997	449.0	439.0	287.0	228.0	165.0	196.0	303.0	315.0	435.0	608.0	496.0	462.0
1998	469.0	572.0	800.0	534.0	322.0	248.0	182.0	168.0	255.0	246.0	270.0	302.0
1999	354.0	447.0	695.0	510.0	201.0	347.0	334.0	347.0	414.0	629.0	524.0	504.0
2000	480.0	559.0	828.0	736.0	327.0	251.0	330.0	359.0	575.0	629.0	541.0	467.0
2001	434.0	519.0	788.0	760.0	856.0	654.0	380.0	434.0	602.0	658.0	599.0	565.0
2002	526.0	594.0	793.0	748.0	808.0	768.0	482.0	493.0	543.0	655.0	595.0	579.0
2003	574.0	623.0	812.0	814.0	786.0	798.0	418.0	446.0	439.0	644.0	591.0	581.0
Average	479.1	537.5	750.0	663.7	623.7	528.1	405.9	411.3	503.2	580.5	514.3	508.9
Critical	527.6	606.4	832.9	821.4	955.9	907.9	669.9	625.1	673.3	687.7	664.9	640.0
Dry	458.7	525.5	792.8	764.3	856.5	675.7	457.3	484.0	591.0	644.5	590.2	561.7
BN	499.5	540.0	788.5	724.5	610.0	547.0	404.0	366.5	510.5	626.0	516.5	544.5
AN	538.3	608.8	823.0	665.0	549.0	460.8	350.7	369.0	486.2	598.8	483.8	482.3
Wet	432.1	472.5	645.9	522.4	373.9	283.5	265.8	289.0	377.9	477.8	411.8	420.8

Table E.3-259. Sacramento River inflow (cfs) difference All Transfers minus Base.

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	-0.5	-0.2	0.0	-0.2	0.3	0.0	0.2	-0.5	-0.4	-0.4	0.2	0.1
1971	0.5	-0.5	0.2	-0.4	-0.1	-0.3	0.2	0.0	0.3	-0.3	0.0	0.4
1972	-0.1	0.4	0.3	0.4	0.4	-0.1	-0.4	0.3	-0.4	-0.4	0.0	0.4
1973	0.5	0.3	-0.3	0.2	-0.4	0.1	0.3	0.0	0.0	-0.1	0.3	0.2
1974	-0.5	-0.3	0.4	-0.5	0.3	0.4	0.1	0.3	0.4	-0.4	-0.3	0.3
1975	0.2	-0.1	0.0	-0.1	0.1	-0.3	-0.5	0.2	-0.4	-0.2	0.1	-0.1
1976	0.3	-0.5	-0.1	-0.5	-0.3	0.2	-2.9	-4.6	-45.0	1279.9	2802.7	693.4
1977	-180.2	-167.5	-155.3	-155.8	-148.7	-146.2	-127.1	-120.2	-97.1	2118.5	826.0	471.0
1978	-146.4	-160.4	-162.1	-961.7	-849.3	-464.5	-123.7	-92.9	-58.4	0.3	-0.4	-0.3
1979	-0.1	-0.2	0.0	-84.7	-239.3	-76.8	-65.9	-49.4	-0.1	-0.1	-0.5	0.0
1980	-12.6	-30.7	-69.9	-196.4	-291.8	-48.9	-34.5	-27.9	-0.2	-0.3	0.2	0.1
1981	0.3	-13.8	0.5	-43.6	-29.2	-28.5	-22.5	-19.9	-37.8	66.8	1740.4	-102.3
1982	-153.3	62.5	-817.2	-198.8	-218.7	-100.8	-84.4	-199.9	-40.5	0.5	-0.1	-0.1
1983	-84.4	-150.4	-64.7	-50.0	-56.6	-63.2	-56.8	-49.4	-40.9	-30.8	-27.6	-25.6
1984	-23.7	-37.0	-37.2	-35.0	-31.4	-29.6	-20.3	-17.7	0.0	-13.7	0.0	0.3
1985	-0.1	-76.3	-20.9	-16.3	-20.8	-16.5	-13.1	-12.1	-10.6	-12.3	-11.7	-9.7
1986	-9.0	-9.1	-22.2	-16.1	-77.5	-19.9	-18.1	-11.2	-0.2	-0.2	0.4	-0.3
1987	0.3	-9.4	-8.9	-8.9	-12.0	-17.4	-46.0	-77.8	-106.5	1818.7	2956.2	659.8
1988	-216.7	-182.1	-276.8	-384.3	-82.3	-173.0	-165.1	-158.5	-126.5	2939.3	1189.0	567.7
1989	-237.4	-229.1	-222.9	-213.6	-204.0	-1104.4	-698.7	-210.6	-196.1	59.1	959.5	-30.2
1990	-186.6	-179.8	-168.8	-189.9	-409.6	-227.7	-85.6	-144.3	-96.6	2801.2	1042.1	616.0
1991	-197.1	-113.6	-91.9	-111.1	-114.4	-620.4	-240.6	-177.9	-198.1	2186.9	856.5	463.1
1992	-209.3	-186.1	-200.7	-193.7	-674.1	-286.3	-234.3	-198.9	-235.7	2889.0	1185.5	443.6
1993	-85.7	-218.3	-298.0	-1265.1	-1190.4	-1136.9	-226.0	-595.1	-184.2	-0.4	-0.5	0.1
1994	0.3	0.0	0.3	-90.1	-216.4	-110.4	-73.6	-64.5	-43.6	142.6	2682.3	503.4
1995	-157.6	-176.8	-189.7	-1176.5	-837.8	-282.3	-183.1	109.2	-311.7	-108.4	-100.0	-0.4
1996	-0.4	0.5	-129.0	-397.0	-117.1	-109.6	-102.4	-97.9	-66.3	0.3	0.5	0.2
1997	-0.3	0.3	-406.3	-92.0	-83.7	-75.8	-54.0	-49.2	0.3	-33.7	0.0	-30.4
1998	-29.6	-37.9	-48.2	-90.0	-272.1	-81.4	-74.2	-67.1	-59.2	-46.1	-41.5	-38.6
1999	0.5	-89.5	-46.6	-39.1	-53.5	-47.8	-46.0	-38.5	-30.0	-0.1	-0.1	-0.1
2000	0.1	0.4	-14.2	-110.9	-69.3	-109.4	-39.8	-31.3	-0.1	-18.3	-0.5	0.1
2001	-0.2	0.3	-22.5	-38.5	-33.9	-31.9	-28.8	-82.3	-112.7	3053.6	1524.6	657.0
2002	-185.6	-220.9	-236.8	-692.3	-440.7	-176.1	-335.0	-76.7	-61.3	-15.9	-49.0	-25.5
2003	-2.7	-24.0	-264.7	-165.5	-81.9	-77.7	-75.4	-137.2	-133.2	800.8	55.0	46.6
Average	-62.3	-66.2	-116.9	-206.4	-201.7	-166.6	-96.4	-79.5	-67.4	584.6	517.3	142.9
Critical	-141.3	-118.5	-127.6	-160.8	-235.1	-223.4	-132.8	-124.1	-120.4	2051.0	1512.0	536.9
Dry	-70.4	-91.6	-85.3	-168.9	-123.4	-229.1	-190.7	-79.9	-87.5	828.3	1186.7	191.5
BN	-0.1	0.1	0.2	-42.1	-119.4	-38.5	-33.1	-24.5	-0.2	-0.3	-0.3	0.2
AN	-41.1	-72.1	-134.8	-449.9	-413.8	-306.2	-83.2	-147.4	-62.7	130.3	9.0	7.8
Wet	-35.2	-33.7	-135.4	-161.2	-134.4	-62.4	-49.2	-32.4	-42.2	-18.0	-12.9	-7.3

Table E.3-260. Sacramento River inflow percent difference of All Transfers from Base.

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1971	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1972	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1973	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1974	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1975	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1976	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	-0.5	7.0	35.6	9.7
1977	-2.7	-2.0	-1.8	-1.0	-1.5	-1.6	-1.4	-2.0	-1.2	23.5	7.6	7.5
1978	-2.3	-2.4	-1.0	-2.0	-1.9	-0.9	-0.4	-0.5	-0.4	0.0	0.0	0.0
1979	0.0	0.0	0.0	-0.4	-0.8	-0.3	-0.5	-0.3	0.0	0.0	0.0	0.0
1980	-0.1	-0.2	-0.4	-0.3	-0.4	-0.1	-0.2	-0.2	0.0	0.0	0.0	0.0
1981	0.0	-0.1	0.0	-0.2	-0.1	-0.1	-0.2	-0.2	-0.3	0.3	12.1	-0.8
1982	-1.4	0.2	-1.2	-0.3	-0.3	-0.2	-0.1	-0.6	-0.2	0.0	0.0	0.0
1983	-0.4	-0.4	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1
1984	-0.1	-0.1	0.0	-0.1	-0.1	-0.1	-0.1	-0.1	0.0	-0.1	0.0	0.0
1985	0.0	-0.3	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1
1986	-0.1	-0.1	-0.1	-0.1	-0.1	0.0	-0.1	-0.1	0.0	0.0	0.0	0.0
1987	0.0	-0.1	-0.1	-0.1	-0.1	-0.1	-0.5	-0.7	-0.8	12.6	34.1	7.4
1988	-2.7	-2.2	-1.5	-1.5	-0.6	-2.3	-1.5	-1.8	-1.2	23.1	14.7	8.1
1989	-3.7	-2.2	-2.1	-1.7	-2.0	-2.5	-3.3	-1.5	-1.4	0.3	5.4	-0.2
1990	-1.7	-2.0	-2.0	-1.0	-2.6	-1.8	-0.8	-1.8	-1.2	18.6	10.5	8.0
1991	-3.1	-1.8	-1.3	-1.5	-1.1	-2.1	-2.0	-2.3	-2.0	14.8	8.5	6.1
1992	-3.1	-2.7	-2.9	-1.8	-2.2	-1.5	-2.0	-2.2	-1.7	22.3	12.1	5.0
1993	-1.2	-3.3	-2.2	-2.7	-2.5	-3.3	-0.6	-2.1	-0.7	0.0	0.0	0.0
1994	0.0	0.0	0.0	-0.7	-0.9	-0.9	-0.6	-0.6	-0.5	0.7	21.5	4.4
1995	-2.0	-2.1	-1.2	-1.8	-1.8	-0.4	-0.4	0.2	-0.8	-0.6	-0.6	0.0
1996	0.0	0.0	-0.7	-1.0	-0.2	-0.2	-0.3	-0.2	-0.4	0.0	0.0	0.0
1997	0.0	0.0	-0.8	-0.1	-0.2	-0.3	-0.3	-0.4	0.0	-0.1	0.0	-0.1
1998	-0.2	-0.2	-0.2	-0.3	-0.4	-0.1	-0.2	-0.2	-0.1	-0.2	-0.2	-0.2
1999	0.0	-0.3	-0.1	-0.1	-0.1	-0.1	-0.2	-0.2	-0.2	0.0	0.0	0.0
2000	0.0	0.0	-0.1	-0.5	-0.1	-0.2	-0.2	-0.2	0.0	-0.1	0.0	0.0
2001	0.0	0.0	-0.2	-0.2	-0.1	-0.1	-0.2	-0.9	-0.8	20.8	15.7	7.7
2002	-2.3	-2.2	-0.8	-1.6	-2.3	-0.9	-2.0	-0.6	-0.6	-0.1	-0.4	-0.2
2003	0.0	-0.2	-0.7	-0.3	-0.3	-0.3	-0.3	-0.4	-0.9	3.3	0.3	0.2
Average	-0.8	-0.7	-0.6	-0.6	-0.7	-0.6	-0.5	-0.6	-0.5	4.3	5.2	1.8
Critical	-1.9	-1.5	-1.4	-1.1	-1.3	-1.5	-1.2	-1.5	-1.2	15.7	15.8	7.0
Dry	-1.0	-0.8	-0.5	-0.6	-0.8	-0.6	-1.1	-0.7	-0.7	5.6	11.1	2.3
BN	0.0	0.0	0.0	-0.2	-0.4	-0.2	-0.2	-0.2	0.0	0.0	0.0	0.0
AN	-0.6	-1.0	-0.7	-1.0	-0.9	-0.8	-0.3	-0.6	-0.3	0.5	0.1	0.0
Wet	-0.3	-0.2	-0.4	-0.3	-0.2	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	0.0

Table E.3-261. San Joaquin River inflow (cfs) difference All Transfers minus Base.

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	-0.2	-0.4	-0.4	0.4	0.2	0.3	0.1	-0.1	0.4	-0.4	0.4	-0.4
1971	0.4	0.2	-0.1	0.1	0.4	-0.3	0.3	0.1	-0.4	0.4	0.2	0.5
1972	0.1	0.1	-0.2	0.2	-0.1	0.3	-0.2	0.3	-0.4	0.0	0.1	-0.4
1973	-0.3	0.3	-0.2	0.1	0.5	-487.8	-0.1	0.0	0.3	-0.3	0.0	-0.5
1974	0.3	0.2	0.1	-0.1	0.2	-0.5	0.1	-0.3	-0.4	-0.1	0.2	-0.4
1975	-0.3	-0.1	-0.1	-0.2	-0.3	0.3	-0.5	-0.5	-0.2	0.3	-0.5	0.4
1976	-0.5	-0.3	0.0	0.1	0.4	0.0	0.2	0.0	-0.4	0.0	-0.5	-0.1
1977	0.3	0.1	0.4	-0.1	0.1	-0.2	0.3	0.3	-0.1	-0.4	0.4	-0.3
1978	0.1	0.4	0.5	0.5	0.4	0.1	-0.4	0.3	-0.5	0.3	0.4	0.3
1979	-0.3	0.3	0.4	-0.2	0.2	0.3	-0.4	-0.5	0.2	0.2	-0.4	0.3
1980	0.2	0.3	-0.2	0.4	0.1	-0.3	-0.5	-0.1	0.3	-0.5	0.2	-0.1
1981	0.4	-0.4	-0.1	-0.5	-0.4	0.0	0.0	-0.3	-0.1	-0.2	-0.3	-0.1
1982	0.3	-0.5	-0.1	0.4	-540.4	-0.1	-0.2	-0.2	0.2	0.1	0.5	-0.5
1983	0.0	0.4	0.0	0.0	-0.1	0.4	0.0	-0.5	-0.1	0.2	0.4	-0.3
1984	-0.3	-0.1	0.3	0.0	-0.5	-0.2	0.3	0.1	0.1	-0.5	0.2	0.4
1985	-0.1	-0.4	0.4	0.1	0.0	-0.5	0.3	0.5	-0.2	-0.5	0.2	0.2
1986	-0.3	-0.3	0.2	0.4	0.3	-0.5	-0.3	0.5	0.0	-0.4	0.0	-0.2
1987	-0.1	0.4	-0.4	-0.2	0.4	-0.4	0.2	-0.1	0.0	0.5	-0.1	-0.5
1988	-0.1	0.2	-0.5	0.2	-0.4	-0.2	0.4	-0.1	-0.3	-0.1	0.4	0.2
1989	-0.4	0.2	-0.4	0.4	0.0	0.3	-0.2	-0.5	0.0	-0.4	0.2	0.3
1990	0.0	-0.4	0.3	-0.4	0.1	-0.1	-0.3	0.3	0.4	0.1	0.3	0.3
1991	-0.3	0.1	-0.4	0.1	-0.3	-0.3	0.4	0.1	-0.4	0.2	0.3	-0.4
1992	0.3	0.1	-0.3	-0.3	0.1	-0.2	-0.1	0.0	-0.2	0.2	-0.5	0.2
1993	0.2	0.4	0.3	0.2	-0.2	-0.3	0.3	-0.4	-504.1	0.2	-0.3	-0.3
1994	-0.2	-0.4	-0.5	-0.5	0.2	0.0	0.1	-0.1	0.4	0.0	-0.2	-0.1
1995	-0.5	-0.1	-0.4	-0.2	-0.3	-0.3	0.5	0.3	0.4	-0.4	0.5	0.0
1996	0.4	-0.5	0.3	-0.3	-0.4	0.2	0.0	-0.1	-0.2	0.5	0.4	0.2
1997	0.2	0.0	0.1	-0.2	-0.5	-0.3	0.2	0.0	0.3	0.2	0.4	0.0
1998	0.0	0.4	0.5	0.1	-0.5	0.5	0.5	-0.1	-0.2	0.3	0.4	0.2
1999	-0.2	0.1	0.2	0.5	-0.2	0.2	0.2	0.1	0.2	0.1	0.4	0.1
2000	0.3	0.1	-0.4	-0.2	0.0	0.2	0.4	0.1	0.3	0.5	-0.2	0.0
2001	0.4	-0.3	0.1	-0.2	0.3	0.0	0.5	0.4	0.4	0.2	0.3	0.0
2002	0.2	0.4	0.5	0.4	0.1	0.3	0.2	-0.1	0.3	0.3	-0.5	0.3
2003	-0.1	0.5	0.3	0.0	0.4	-0.5	0.3	0.2	-0.5	0.3	-0.2	0.0
Average	0.0	0.0	0.0	0.0	-15.9	-14.4	0.1	0.0	-14.8	0.0	0.1	0.0
Critical	-0.1	-0.1	-0.1	-0.1	0.0	-0.2	0.1	0.1	-0.1	0.0	0.0	0.0
Dry	0.1	0.0	0.0	0.0	0.1	-0.1	0.2	0.0	0.1	0.0	0.0	0.0
BN	-0.1	0.2	0.1	0.0	0.1	0.3	-0.3	-0.1	-0.1	0.1	-0.2	-0.1
AN	0.1	0.3	0.1	0.2	0.2	-81.4	0.0	0.0	-84.0	0.1	0.0	-0.1
Wet	0.0	0.0	0.0	0.1	-41.7	0.0	0.1	-0.1	0.0	0.0	0.3	0.0

1 **Table E.3-262. San Joaquin River inflow percent difference of All Transfers from Base.**

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1971	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1972	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1973	0.0	0.0	0.0	0.0	0.0	-5.8	0.0	0.0	0.0	0.0	0.0	0.0
1974	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1975	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1976	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1977	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.1	0.0
1978	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1979	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1980	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1981	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1982	0.0	0.0	0.0	0.0	-4.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1983	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1984	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1985	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1986	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1987	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1988	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1989	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1990	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1991	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1992	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	-0.1	0.0
1993	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-11.5	0.0	0.0	0.0
1994	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1995	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1996	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1997	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1998	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1999	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2001	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2002	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2003	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Average	0.0	0.0	0.0	0.0	-0.1	-0.2	0.0	0.0	-0.3	0.0	0.0	0.0
Critical	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Dry	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
BN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AN	0.0	0.0	0.0	0.0	0.0	-1.0	0.0	0.0	-1.9	0.0	0.0	0.0
Wet	0.0	0.0	0.0	0.0	-0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0

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Table E.3-263. NDO (cfs) difference All Transfers minus Base.

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	0.5	0.2	0.1	0.3	0.3	0.2	-0.3	-0.2	0.4	-0.4	0.0	0.5
1971	0.5	-0.5	0.2	-0.2	-0.4	0.1	-0.3	0.3	-0.4	0.0	0.0	-0.5
1972	-0.3	-0.1	0.5	-0.4	0.4	-0.5	0.0	-0.1	0.5	0.1	0.0	-0.2
1973	0.0	-0.2	-0.2	-0.1	-0.2	-487.9	0.2	-0.2	0.1	0.2	0.0	0.3
1974	0.0	0.2	-0.2	0.1	-0.5	-0.3	-0.1	0.2	-0.5	0.0	-0.1	-0.3
1975	0.0	0.3	0.4	0.2	0.4	-0.1	-0.2	0.3	-0.5	0.0	0.0	0.5
1976	0.0	0.5	0.4	0.3	0.0	-0.1	-2.9	10.0	-34.3	389.6	504.2	181.0
1977	0.0	0.4	0.0	0.0	-0.4	0.3	0.0	-12.8	0.0	460.0	205.1	133.0
1978	0.4	0.0	-76.3	-876.2	-763.8	-464.5	-123.4	-93.3	-58.1	0.0	0.0	-0.5
1979	0.5	0.0	0.3	-84.8	-238.7	-76.7	-66.2	-49.7	0.0	0.0	0.4	0.4
1980	0.1	-30.0	-69.4	-196.6	-1026.5	-49.1	-34.3	-27.8	0.5	0.0	0.0	-0.5
1981	0.0	-0.5	-0.4	-44.2	-29.2	-27.9	-22.8	-20.1	0.0	152.0	210.2	79.4
1982	0.2	148.0	-731.5	-113.3	-673.0	-100.6	-84.6	-199.5	-40.8	0.0	0.0	0.0
1983	-83.7	-150.4	-64.5	-50.7	-56.6	-63.2	-56.6	-50.2	-40.8	-31.1	-28.0	-25.9
1984	-24.2	-37.7	-36.9	-34.5	-32.1	-29.4	-20.3	-18.4	0.0	-0.3	0.0	-0.5
1985	-0.3	-76.4	-20.9	-17.1	-21.1	0.2	-13.4	-12.1	-0.3	0.0	0.0	0.2
1986	0.0	0.0	-22.5	-16.1	-76.9	-19.7	-18.4	-11.2	0.4	0.0	0.0	0.5
1987	0.0	-0.2	0.1	-9.3	-11.5	-17.7	-0.1	-0.4	0.0	408.0	640.6	181.0
1988	0.0	0.0	-191.4	-299.0	0.1	-0.3	-80.1	0.0	0.0	637.0	290.0	165.0
1989	0.0	-0.3	-137.1	-0.2	0.3	-1018.9	-613.7	-0.1	0.5	66.1	197.5	47.9
1990	0.0	0.0	0.0	-104.4	-323.4	-142.5	0.3	-51.7	0.0	609.0	261.5	176.0
1991	0.4	0.0	0.4	0.0	-115.0	-534.7	-154.9	-85.1	0.0	485.0	221.0	141.0
1992	-0.2	-0.3	-0.1	0.3	-591.8	-200.3	-148.2	0.4	0.0	628.0	288.7	141.0
1993	0.4	0.0	-212.2	-1180.0	-1104.7	-1136.6	-226.0	-595.3	-689.0	0.0	0.0	0.3
1994	-0.3	-0.5	-0.2	-90.5	-217.0	-110.7	-73.5	-64.6	-42.7	293.0	349.5	143.0
1995	3.9	0.0	-104.3	-1091.3	-752.8	-282.4	-183.3	109.6	-311.3	-108.6	-100.5	-0.5
1996	0.0	-0.3	-129.3	-397.6	-117.4	-110.1	-102.4	-98.0	-66.3	0.0	0.0	0.0
1997	-0.5	0.0	-406.6	-91.7	-83.5	-76.6	-53.8	-50.0	-0.4	0.3	0.0	0.5
1998	-0.5	-0.5	-48.7	-89.5	-272.1	-81.0	-73.5	-66.6	-59.3	-47.0	-41.5	-38.4
1999	0.8	-89.1	-45.9	-39.6	-52.9	-48.1	-46.2	-37.8	-30.5	-0.2	0.0	0.0
2000	0.0	-0.1	-0.1	-110.5	-69.7	-109.6	-39.5	-32.0	0.3	0.4	0.0	0.3
2001	-0.3	0.3	0.0	-38.7	-33.6	-32.2	-28.0	-75.1	0.0	655.0	355.0	181.0
2002	1.0	-134.9	-151.6	-607.2	-354.5	-175.7	-334.9	-76.2	0.0	-0.3	0.3	0.0
2003	0.1	0.0	-263.8	-165.9	-81.5	-77.7	-74.6	-136.6	-133.2	69.5	70.0	51.3
Average	-3.0	-10.9	-79.8	-169.1	-208.8	-161.0	-78.7	-51.3	-44.3	137.2	100.7	45.8
Critical	0.0	0.0	-27.3	-70.5	-178.2	-141.2	-65.6	-29.1	-11.0	500.2	302.9	154.3
Dry	0.1	-35.3	-51.7	-119.4	-74.9	-212.0	-168.8	-30.7	0.0	213.5	233.9	81.6
BN	0.1	-0.1	0.4	-42.6	-119.1	-38.6	-33.1	-24.9	0.3	0.0	0.2	0.1
AN	0.2	-5.0	-103.7	-421.5	-507.8	-387.6	-82.9	-147.5	-146.6	11.7	11.7	8.5
Wet	-7.9	-10.0	-122.3	-148.0	-162.9	-62.4	-49.2	-32.4	-42.3	-14.4	-13.1	-4.9

Table E.3-264. NDO percent difference All Transfers minus Base.

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1971	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1972	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1973	0.0	0.0	0.0	0.0	0.0	-0.9	0.0	0.0	0.0	0.0	0.0	0.0
1974	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1975	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1976	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	-0.8	8.2	13.0	6.0
1977	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.3	0.0	11.5	6.1	4.4
1978	0.0	0.0	-0.7	-1.3	-1.5	-0.7	-0.3	-0.4	-0.4	0.0	0.0	0.0
1979	0.0	0.0	0.0	-0.4	-0.7	-0.3	-0.3	-0.3	0.0	0.0	0.0	0.0
1980	0.0	-0.4	-0.6	-0.2	-0.8	-0.1	-0.2	-0.1	0.0	0.0	0.0	0.0
1981	0.0	0.0	0.0	-0.2	-0.1	-0.1	-0.2	-0.2	0.0	3.0	5.3	2.6
1982	0.0	0.6	-0.9	-0.2	-0.7	-0.1	-0.1	-0.4	-0.2	0.0	0.0	0.0
1983	-0.6	-0.4	-0.1	0.0	0.0	0.0	-0.1	-0.1	-0.1	-0.1	-0.2	-0.1
1984	-0.2	0.0	0.0	-0.1	-0.1	-0.1	-0.1	-0.1	0.0	0.0	0.0	0.0
1985	0.0	-0.4	-0.2	-0.2	-0.2	0.0	-0.1	-0.1	0.0	0.0	0.0	0.0
1986	0.0	0.0	-0.2	-0.1	0.0	0.0	-0.1	-0.1	0.0	0.0	0.0	0.0
1987	0.0	0.0	0.0	-0.1	-0.1	-0.1	0.0	0.0	0.0	8.2	15.4	6.0
1988	0.0	0.0	-1.5	-1.1	0.0	0.0	-0.8	0.0	0.0	15.9	7.5	5.5
1989	0.0	0.0	-3.1	0.0	0.0	-2.2	-3.1	0.0	0.0	1.3	3.7	1.0
1990	0.0	0.0	0.0	-0.7	-2.7	-1.6	0.0	-0.8	0.0	15.2	6.1	5.9
1991	0.0	0.0	0.0	0.0	-1.3	-1.6	-1.5	-1.5	0.0	12.1	5.0	4.7
1992	0.0	0.0	0.0	0.0	-1.7	-1.2	-1.5	0.0	0.0	15.7	7.8	4.7
1993	0.0	0.0	-2.5	-1.9	-2.0	-3.2	-0.6	-2.0	-3.3	0.0	0.0	0.0
1994	0.0	0.0	0.0	-1.0	-1.0	-1.3	-0.7	-0.7	-1.0	7.3	8.6	4.8
1995	0.1	0.0	-1.2	-1.0	-1.6	-0.1	-0.3	0.1	-0.8	-0.5	-1.1	0.0
1996	0.0	0.0	-0.8	-0.9	-0.1	-0.2	-0.2	-0.2	-0.6	0.0	0.0	0.0
1997	0.0	0.0	-0.6	0.0	-0.1	-0.3	-0.3	-0.3	0.0	0.0	0.0	0.0
1998	0.0	0.0	-0.5	-0.2	-0.1	-0.1	-0.1	-0.1	-0.1	-0.2	-0.4	-0.2
1999	0.0	-0.4	-0.2	-0.1	-0.1	-0.1	-0.2	-0.2	-0.3	0.0	0.0	0.0
2000	0.0	0.0	0.0	-0.5	-0.1	-0.2	-0.2	-0.2	0.0	0.0	0.0	0.0
2001	0.0	0.0	0.0	-0.3	-0.1	-0.1	-0.2	-0.9	0.0	13.1	8.5	6.0
2002	0.0	-2.3	-0.5	-1.3	-2.4	-1.0	-2.0	-0.6	0.0	0.0	0.0	0.0
2003	0.0	0.0	-0.7	-0.3	-0.3	-0.4	-0.3	-0.4	-2.0	0.7	1.8	0.4
Average	0.0	-0.1	-0.4	-0.4	-0.5	-0.5	-0.4	-0.3	-0.3	3.3	2.6	1.5
Critical	0.0	0.0	-0.2	-0.4	-1.0	-0.8	-0.6	-0.4	-0.3	12.3	7.7	5.1
Dry	0.0	-0.5	-0.6	-0.3	-0.5	-0.6	-0.9	-0.3	0.0	4.3	5.5	2.6
BN	0.0	0.0	0.0	-0.2	-0.3	-0.1	-0.2	-0.1	0.0	0.0	0.0	0.0
AN	0.0	-0.1	-0.8	-0.7	-0.8	-0.9	-0.2	-0.5	-1.0	0.1	0.3	0.1
Wet	-0.1	0.0	-0.3	-0.2	-0.2	-0.1	-0.1	-0.1	-0.2	-0.1	-0.1	0.0

Table E.3-265. San Joaquin River inflow salinity (EC) difference All Transfers minus Base.

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1971	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1972	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1973	0.0	0.0	0.0	0.0	0.0	-23.0	0.0	0.0	0.0	0.0	0.0	0.0
1974	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1975	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1976	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1977	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1978	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1979	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1980	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1981	0.0	0.0	0.0	0.0	0.0	0.0	2.0	0.0	0.0	0.0	0.0	0.0
1982	0.0	0.0	0.0	0.0	-15.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1983	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1984	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1985	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1986	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1987	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1988	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1989	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1990	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1991	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1992	0.0	0.0	0.0	0.0	0.0	0.0	-10.0	0.0	0.0	0.0	0.0	0.0
1993	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	21.0	0.0	0.0	0.0
1994	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1995	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1996	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1997	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1998	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1999	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2001	0.0	0.0	0.0	0.0	0.0	0.0	3.0	0.0	0.0	0.0	0.0	0.0
2002	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2003	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Average	0.0	0.0	0.0	0.0	-0.4	-0.7	-0.1	0.0	0.6	0.0	0.0	0.0
Critical	0.0	0.0	0.0	0.0	0.0	0.0	-1.4	0.0	0.0	0.0	0.0	0.0
Dry	0.0	0.0	0.0	0.0	0.0	0.0	0.8	0.0	0.0	0.0	0.0	0.0
BN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AN	0.0	0.0	0.0	0.0	0.0	-3.8	0.0	0.0	3.5	0.0	0.0	0.0
Wet	0.0	0.0	0.0	0.0	-1.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table E.3-267. San Joaquin River inflow salinity (EC) percent difference All Transfers minus Base.

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1971	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1972	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1973	0.0	0.0	0.0	0.0	0.0	-6.9	0.0	0.0	0.0	0.0	0.0	0.0
1974	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1975	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1976	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1977	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1978	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1979	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1980	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1981	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.0	0.0	0.0	0.0	0.0
1982	0.0	0.0	0.0	0.0	-5.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1983	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1984	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1985	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1986	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1987	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1988	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1989	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1990	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1991	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1992	0.0	0.0	0.0	0.0	0.0	0.0	-1.3	0.0	0.0	0.0	0.0	0.0
1993	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.0	0.0	0.0	0.0
1994	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1995	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1996	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1997	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1998	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1999	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2001	0.0	0.0	0.0	0.0	0.0	0.0	0.8	0.0	0.0	0.0	0.0	0.0
2002	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2003	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Average	0.0	0.0	0.0	0.0	-0.2	-0.2	0.0	0.0	0.1	0.0	0.0	0.0
Critical	0.0	0.0	0.0	0.0	0.0	0.0	-0.2	0.0	0.0	0.0	0.0	0.0
Dry	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.0
BN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AN	0.0	0.0	0.0	0.0	0.0	-1.2	0.0	0.0	0.5	0.0	0.0	0.0
Wet	0.0	0.0	0.0	0.0	-0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table E.3-268. Sacramento River inflow (cfs) difference No Groundwater Substitution minus Base.

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1971	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1972	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1973	0.0	0.0	0.2	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1974	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1975	0.0	0.0	0.0	0.0	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1976	0.0	0.0	0.0	0.0	0.0	0.0	0.0	127.7	-27.7	1077.3	1049.4	342.7
1977	-85.5	-85.5	-85.5	-85.5	-85.5	-85.5	-85.5	14.4	-113.2	1325.0	478.4	278.7
1978	-85.5	-85.5	-85.5	-510.8	-663.6	-156.0	1.4	0.5	0.0	0.0	0.0	0.0
1979	0.0	0.0	0.0	0.0	13.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1980	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1981	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-654.7	971.6	-505.6
1982	-85.5	322.3	-601.4	-97.5	-123.4	-14.7	0.0	-142.9	0.0	0.0	0.0	0.0
1983	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1984	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1985	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1986	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1987	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-18.3	-27.7	843.2	1429.5	342.7
1988	-85.5	-85.5	-85.5	-85.5	-82.7	-85.5	-85.5	-103.8	-113.2	1581.1	532.6	313.7
1989	-85.5	-85.5	-85.5	-85.5	-85.4	-601.6	-539.4	-85.5	-85.5	-85.5	191.0	-119.1
1990	-85.5	-85.5	-85.5	-85.5	-310.6	-126.0	-85.5	42.2	-113.2	1630.5	577.5	342.7
1991	-80.1	0.0	0.0	0.0	0.0	-85.5	-85.5	14.4	-113.2	1325.0	478.4	278.7
1992	-85.5	-85.5	-85.5	-85.5	-169.3	-85.5	-85.5	-103.8	-113.2	1655.2	503.2	260.7
1993	-85.5	-85.5	-85.5	-712.7	-910.6	-143.8	0.0	-151.3	0.0	0.0	0.0	0.0
1994	0.0	0.0	0.0	0.0	0.0	0.0	0.0	39.1	50.4	-189.3	1419.6	162.0
1995	-85.5	-85.5	-85.5	-335.0	-317.2	-50.4	0.0	270.6	-175.7	-6.0	-11.0	0.0
1996	0.0	0.0	0.0	-62.2	0.0	0.0	0.0	-3.2	0.0	0.0	0.1	0.0
1997	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1998	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1999	0.6	-0.2	-0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2001	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-18.3	-27.7	1776.5	577.5	342.7
2002	-85.5	-85.5	197.7	-398.7	-284.6	-34.1	-227.6	0.0	0.0	0.0	0.0	0.0
2003	0.0	0.0	0.0	15.9	0.0	0.0	0.3	-50.4	0.0	325.3	-244.0	-84.0
Average	-27.5	-13.2	-32.0	-74.4	-88.8	-43.2	-35.1	-5.0	-25.3	311.9	233.9	57.5
Critical	-60.3	-48.9	-48.9	-48.9	-92.6	-66.9	-61.1	4.3	-77.6	1200.7	719.9	282.7
Dry	-28.5	-28.5	18.7	-80.7	-61.7	-106.0	-127.8	-20.3	-23.5	313.2	528.3	10.1
BN	0.0	0.0	0.0	0.0	6.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AN	-28.5	-28.5	-28.5	-201.3	-262.4	-50.0	0.3	-33.5	0.0	54.2	-40.7	-14.0
Wet	-13.1	18.2	-52.9	-38.0	-33.9	-5.0	0.0	9.6	-13.5	-0.5	-0.8	0.0

Table E.3-269. Sacramento River inflow (cfs) percent difference of No Groundwater Substitution from Base.

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1971	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1972	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1973	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1974	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1975	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1976	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.9	-0.3	5.9	13.3	4.8
1977	-1.3	-1.0	-1.0	-0.6	-0.9	-0.9	-0.9	0.2	-1.4	14.7	4.4	4.4
1978	-1.3	-1.3	-0.5	-1.1	-1.5	-0.3	0.0	0.0	0.0	0.0	0.0	0.0
1979	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1980	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1981	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-3.2	6.7	-4.1
1982	-0.8	1.0	-0.9	-0.2	-0.2	0.0	0.0	-0.5	0.0	0.0	0.0	0.0
1983	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1984	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1985	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1986	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1987	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.2	-0.2	5.8	16.5	3.9
1988	-1.1	-1.1	-0.5	-0.3	-0.6	-1.1	-0.8	-1.2	-1.0	12.4	6.6	4.5
1989	-1.3	-0.8	-0.8	-0.7	-0.8	-1.4	-2.5	-0.6	-0.6	-0.4	1.1	-0.8
1990	-0.8	-1.0	-1.0	-0.5	-1.9	-1.0	-0.8	0.5	-1.4	10.8	5.8	4.4
1991	-1.3	0.0	0.0	0.0	0.0	-0.3	-0.7	0.2	-1.2	9.0	4.8	3.7
1992	-1.3	-1.3	-1.2	-0.8	-0.6	-0.5	-0.7	-1.1	-0.8	12.8	5.1	3.0
1993	-1.2	-1.3	-0.6	-1.5	-1.9	-0.4	0.0	-0.5	0.0	0.0	0.0	0.0
1994	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.4	0.6	-1.0	11.4	1.4
1995	-1.1	-1.0	-0.6	-0.5	-0.7	-0.1	0.0	0.5	-0.5	0.0	-0.1	0.0
1996	0.0	0.0	0.0	-0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1997	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1998	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1999	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2001	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.2	-0.2	12.1	5.9	4.0
2002	-1.1	-0.8	0.7	-0.9	-1.5	-0.2	-1.4	0.0	0.0	0.0	0.0	0.0
2003	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	1.3	-1.4	-0.4
Average	-0.4	-0.3	-0.2	-0.2	-0.3	-0.2	-0.2	0.0	-0.2	2.4	2.4	0.8
Critical	-0.8	-0.6	-0.5	-0.3	-0.6	-0.5	-0.6	0.1	-0.8	9.2	7.3	3.7
Dry	-0.4	-0.3	0.0	-0.3	-0.4	-0.3	-0.7	-0.2	-0.2	2.4	5.0	0.5
BN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AN	-0.4	-0.4	-0.2	-0.4	-0.6	-0.1	0.0	-0.1	0.0	0.2	-0.2	-0.1
Wet	-0.1	0.0	-0.1	-0.1	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table E.3-270. San Joaquin River inflow (cfs) difference No Groundwater Substitution minus Base.

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1971	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1972	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1973	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1974	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1975	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1976	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1977	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1978	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1979	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1980	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1981	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	487.9	0.0	0.0
1982	0.0	0.0	0.0	0.0	-540.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1983	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1984	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1985	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1986	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1987	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1988	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1989	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1990	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1991	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1992	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	487.9	0.0	0.0
1993	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-504.2	0.0	0.0	0.0
1994	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1995	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1996	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1997	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1998	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1999	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2001	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	487.9	0.0	0.0
2002	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2003	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Average	0.0	0.0	0.0	0.0	-15.9	0.0	0.0	0.0	-14.8	43.1	0.0	0.0
Critical	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	69.7	0.0	0.0
Dry	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	162.6	0.0	0.0
BN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-84.0	0.0	0.0	0.0
Wet	0.0	0.0	0.0	0.0	-41.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table E.3-271. San Joaquin River inflow (cfs) percent difference of No Groundwater Substitution from Base.

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1971	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1972	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1973	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1974	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1975	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1976	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1977	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1978	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1979	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1980	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1981	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	36.2	0.0	0.0
1982	0.0	0.0	0.0	0.0	-4.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1983	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1984	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1985	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1986	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1987	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1988	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1989	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1990	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1991	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1992	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	104.8	0.0	0.0
1993	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-11.5	0.0	0.0	0.0
1994	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1995	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1996	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1997	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1998	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1999	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2001	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	44.5	0.0	0.0
2002	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2003	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Average	0.0	0.0	0.0	0.0	-0.1	0.0	0.0	0.0	-0.3	5.5	0.0	0.0
Critical	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	15.0	0.0	0.0
Dry	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	13.4	0.0	0.0
BN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-1.9	0.0	0.0	0.0
Wet	0.0	0.0	0.0	0.0	-0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table E.3-272. NDO (cfs) difference No Groundwater Substitution minus Base.

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1971	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1972	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1973	0.0	0.0	0.2	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1974	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1975	0.0	0.0	0.0	0.0	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1976	0.0	0.0	0.0	0.0	0.0	0.0	0.0	146.0	0.0	238.4	232.8	89.4
1977	0.0	0.0	0.0	0.0	0.0	0.0	0.0	118.2	0.0	288.0	118.6	76.6
1978	0.0	0.0	0.0	-425.3	-578.2	-156.0	1.4	0.5	0.0	0.0	0.0	0.0
1979	0.0	0.0	0.0	0.0	13.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1980	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1981	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	65.1	0.0	0.0
1982	0.0	407.8	-515.9	-12.0	-578.1	-14.6	0.0	-142.9	0.0	0.0	0.0	0.0
1983	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1984	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1985	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1986	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1987	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	191.6	308.9	89.4
1988	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	339.2	129.5	83.6
1989	0.0	0.0	0.0	0.0	0.0	-516.1	-453.9	0.0	0.0	45.5	3.3	0.0
1990	0.0	0.0	0.0	0.0	-225.3	-40.5	0.0	146.0	0.0	349.1	138.5	89.4
1991	0.0	0.0	0.0	0.0	0.0	0.0	0.0	118.2	0.0	288.0	118.6	76.6
1992	0.0	0.0	0.0	0.0	-86.9	0.0	0.0	0.0	0.0	402.8	123.6	73.0
1993	0.0	0.0	0.0	-627.2	-825.2	-143.8	0.0	-151.3	-504.2	0.0	0.0	0.0
1994	0.0	0.0	0.0	0.0	0.0	0.0	0.0	39.1	50.4	125.6	154.7	49.5
1995	0.0	0.0	0.0	-249.5	-231.7	-50.4	0.0	270.6	-175.7	-6.0	-11.0	0.0
1996	0.0	0.0	0.0	-62.2	0.0	0.0	0.0	-3.2	0.0	0.0	0.1	0.0
1997	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1998	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1999	0.6	-0.2	-0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2001	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	427.0	138.5	89.4
2002	0.0	0.0	283.2	-313.2	-199.1	-34.1	-227.6	0.0	0.0	0.0	0.0	0.0
2003	0.0	0.0	0.0	15.9	0.0	0.0	0.3	-50.4	0.0	0.0	0.0	0.0
Average	0.0	12.0	-6.8	-49.2	-79.7	-28.1	-20.0	14.4	-18.5	81.0	42.8	21.1
Critical	0.0	0.0	0.0	0.0	-44.6	-5.8	0.0	81.1	7.2	290.1	145.2	76.9
Dry	0.0	0.0	47.2	-52.2	-33.2	-91.7	-113.6	0.0	0.0	121.5	75.1	29.8
BN	0.0	0.0	0.0	0.0	6.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AN	0.0	0.0	0.0	-172.8	-233.9	-50.0	0.3	-33.5	-84.0	0.0	0.0	0.0
Wet	0.0	31.4	-39.7	-24.9	-62.3	-5.0	0.0	9.6	-13.5	-0.5	-0.8	0.0

Table E.3-273. NDO percent difference No Groundwater Substitution minus Base.

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1971	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1972	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1973	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1974	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1975	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1976	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.7	0.0	5.0	6.0	3.0
1977	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.9	0.0	7.2	3.5	2.6
1978	0.0	0.0	0.0	-0.6	-1.1	-0.2	0.0	0.0	0.0	0.0	0.0	0.0
1979	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1980	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1981	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.3	0.0	0.0
1982	0.0	1.6	-0.6	0.0	-0.6	0.0	0.0	-0.3	0.0	0.0	0.0	0.0
1983	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1984	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1985	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1986	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1987	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.8	7.4	3.0
1988	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	8.5	3.3	2.8
1989	0.0	0.0	0.0	0.0	0.0	-1.1	-2.3	0.0	0.0	0.9	0.1	0.0
1990	0.0	0.0	0.0	0.0	-1.9	-0.5	0.0	2.1	0.0	8.7	3.3	3.0
1991	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.1	0.0	7.2	2.7	2.6
1992	0.0	0.0	0.0	0.0	-0.2	0.0	0.0	0.0	0.0	10.1	3.3	2.4
1993	0.0	0.0	0.0	-1.0	-1.5	-0.4	0.0	-0.5	-2.4	0.0	0.0	0.0
1994	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5	1.2	3.1	3.8	1.7
1995	0.0	0.0	0.0	-0.2	-0.5	0.0	0.0	0.3	-0.4	0.0	-0.1	0.0
1996	0.0	0.0	0.0	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1997	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1998	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1999	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2001	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	8.5	3.3	3.0
2002	0.0	0.0	1.0	-0.6	-1.4	-0.2	-1.4	0.0	0.0	0.0	0.0	0.0
2003	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	0.0	0.0	0.0
Average	0.0	0.0	0.0	-0.1	-0.2	-0.1	-0.1	0.3	0.0	1.9	1.1	0.7
Critical	0.0	0.0	0.0	0.0	-0.3	-0.1	0.0	1.6	0.2	7.1	3.7	2.6
Dry	0.0	0.0	0.2	-0.1	-0.2	-0.2	-0.6	0.0	0.0	2.4	1.8	1.0
BN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AN	0.0	0.0	0.0	-0.3	-0.4	-0.1	0.0	-0.1	-0.4	0.0	0.0	0.0
Wet	0.0	0.1	0.0	0.0	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table E.3-274. San Joaquin River inflow salinity (EC) difference No Groundwater Substitution minus Base.

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1971	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1972	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1973	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1974	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1975	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1976	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1977	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1978	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1979	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1980	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1981	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-26.0	0.0	0.0
1982	0.0	0.0	0.0	0.0	-15.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1983	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1984	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1985	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1986	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1987	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1988	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1989	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1990	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1991	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1992	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-149.0	0.0	0.0
1993	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	21.0	0.0	0.0	0.0
1994	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1995	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1996	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1997	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1998	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1999	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2001	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-35.0	0.0	0.0
2002	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2003	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Average	0.0	0.0	0.0	0.0	-0.4	0.0	0.0	0.0	0.6	-6.2	0.0	0.0
Critical	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-21.3	0.0	0.0
Dry	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-10.2	0.0	0.0
BN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.5	0.0	0.0	0.0
Wet	0.0	0.0	0.0	0.0	-1.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table E.3-275. San Joaquin River inflow salinity (EC) percent difference No Groundwater Substitution minus Base.

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1971	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1972	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1973	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1974	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1975	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1976	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1977	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1978	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1979	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1980	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1981	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-4.2	0.0	0.0
1982	0.0	0.0	0.0	0.0	-5.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1983	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1984	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1985	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1986	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1987	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1988	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1989	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1990	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1991	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1992	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-19.8	0.0	0.0
1993	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.0	0.0	0.0	0.0
1994	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1995	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1996	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1997	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1998	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1999	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2001	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-5.3	0.0	0.0
2002	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2003	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Average	0.0	0.0	0.0	0.0	-0.2	0.0	0.0	0.0	0.1	-0.9	0.0	0.0
Critical	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-2.8	0.0	0.0
Dry	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-1.6	0.0	0.0
BN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.0	0.0	0.0
Wet	0.0	0.0	0.0	0.0	-0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table E.3-276. Sacramento River inflow (cfs) difference No Crop Idle minus Base.

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1971	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1972	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1973	0.0	0.0	0.2	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1974	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1975	0.0	0.0	0.0	0.0	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1976	0.0	0.0	0.0	0.0	0.0	0.0	-2.6	-4.9	-34.2	1191.1	1402.3	423.3
1977	-179.8	-167.3	-155.1	-155.7	-148.5	-146.0	-127.5	-120.9	-85.5	1077.7	420.6	209.5
1978	-146.4	-160.6	-162.1	-962.1	-849.3	-464.9	-123.6	-93.2	-58.0	0.0	0.0	0.0
1979	0.0	0.0	0.0	-85.0	-239.2	-76.5	-66.3	-49.4	0.0	0.0	0.0	0.0
1980	-12.1	-30.5	-69.7	-196.6	-291.3	-48.6	-34.4	-28.3	0.0	0.0	0.0	0.0
1981	0.0	-14.0	0.0	-43.8	-28.8	-28.1	-22.5	-20.1	-38.2	45.7	1710.6	-111.3
1982	-153.7	62.6	-817.0	-198.4	-218.8	-100.4	-84.3	-199.7	-40.9	0.0	0.0	0.0
1983	-83.9	-150.7	-64.4	-50.3	-56.8	-63.1	-57.1	-49.8	-40.9	-30.9	-27.7	-25.4
1984	-23.8	-37.4	-36.9	-34.8	-31.8	-29.2	-20.0	-18.1	0.0	-13.4	0.0	0.0
1985	0.0	-76.1	-21.2	-16.6	-20.6	-16.5	-13.6	-11.9	-10.4	-12.3	-11.9	-9.2
1986	-8.8	-9.0	-22.5	-16.6	-77.2	-20.0	-18.0	-11.5	0.0	0.0	0.0	0.0
1987	0.0	-9.1	-9.0	-9.0	-11.8	-17.7	-45.7	-71.0	-95.2	1357.7	1920.3	390.2
1988	-217.0	-182.3	-277.2	-384.8	-82.7	-172.7	-165.3	-151.4	-115.1	2121.9	591.5	313.2
1989	-237.4	-228.8	-222.4	-213.2	-204.1	-1104.4	-698.7	-211.0	-196.1	59.1	959.7	-29.9
1990	-186.4	-180.2	-169.0	-190.1	-409.2	-227.7	-85.5	-144.2	-85.5	1728.8	624.4	346.3
1991	-197.4	-113.6	-92.1	-110.7	-114.8	-620.5	-240.9	-179.1	-187.3	1146.4	450.8	201.1
1992	-208.9	-185.8	-200.3	-193.9	-674.0	-286.2	-234.2	-191.4	-224.2	1927.2	776.9	214.0
1993	-85.5	-218.2	-298.0	-1265.4	-1190.5	-1136.7	-225.7	-595.3	-184.4	0.0	0.0	0.0
1994	0.0	0.0	0.0	-90.5	-216.8	-110.4	-73.5	-64.9	-43.2	80.1	1389.8	256.6
1995	-157.7	-176.8	-189.5	-1176.3	-838.3	-282.3	-183.2	109.5	-311.3	-108.1	-100.3	0.0
1996	0.0	0.0	-129.2	-397.4	-117.1	-109.7	-102.8	-98.1	-66.4	0.0	0.1	0.0
1997	0.0	0.0	-406.3	-92.0	-83.9	-76.2	-54.1	-49.6	0.0	-33.6	0.0	-30.0
1998	-29.6	-38.4	-48.5	-89.7	-272.2	-81.1	-73.8	-66.7	-59.1	-46.6	-41.9	-38.6
1999	0.6	-89.3	-46.3	-39.2	-53.0	-48.1	-45.8	-38.0	-30.5	0.0	0.0	0.0
2000	0.0	0.0	-14.7	-110.5	-69.7	-109.4	-39.3	-31.8	0.0	-18.5	0.0	0.0
2001	0.0	0.0	-22.4	-38.4	-33.8	-32.1	-28.4	-74.6	-101.7	2404.1	676.8	387.6
2002	-185.8	-220.9	-236.9	-692.7	-440.3	-176.1	-335.0	-76.4	-61.0	-16.3	-49.2	-25.3
2003	-2.9	-24.3	-264.3	-165.4	-81.8	-77.9	-75.0	-137.0	-133.4	801.1	55.0	46.6
Average	-62.2	-66.2	-116.9	-206.4	-201.7	-166.5	-96.4	-78.8	-64.8	401.8	316.1	74.1
Critical	-141.4	-118.5	-127.7	-160.8	-235.1	-223.3	-132.8	-122.4	-110.7	1324.8	808.0	280.6
Dry	-70.5	-91.5	-85.3	-169.0	-123.2	-229.1	-190.7	-77.5	-83.8	639.7	867.7	100.4
BN	0.0	0.0	0.0	-42.5	-119.6	-38.3	-33.2	-24.7	0.0	0.0	0.0	0.0
AN	-41.1	-72.3	-134.8	-450.0	-413.8	-306.3	-83.0	-147.6	-62.6	130.4	9.2	7.8
Wet	-35.1	-33.8	-135.4	-161.1	-134.6	-62.3	-49.2	-32.5	-42.2	-17.9	-13.1	-7.2

Table E.3-277. Sacramento River inflow (cfs) percent difference of No Crop Idle from Base.

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1971	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1972	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1973	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1974	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1975	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1976	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	-0.4	6.5	17.8	5.9
1977	-2.7	-2.0	-1.8	-1.0	-1.5	-1.6	-1.4	-2.0	-1.1	11.9	3.9	3.3
1978	-2.3	-2.4	-1.0	-2.0	-1.9	-0.9	-0.4	-0.5	-0.4	0.0	0.0	0.0
1979	0.0	0.0	0.0	-0.4	-0.8	-0.3	-0.5	-0.3	0.0	0.0	0.0	0.0
1980	-0.1	-0.2	-0.4	-0.3	-0.4	-0.1	-0.2	-0.2	0.0	0.0	0.0	0.0
1981	0.0	-0.1	0.0	-0.2	-0.1	-0.1	-0.2	-0.2	-0.3	0.2	11.9	-0.9
1982	-1.4	0.2	-1.2	-0.3	-0.3	-0.2	-0.1	-0.6	-0.2	0.0	0.0	0.0
1983	-0.4	-0.4	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1
1984	-0.1	-0.1	0.0	-0.1	-0.1	-0.1	-0.1	-0.1	0.0	-0.1	0.0	0.0
1985	0.0	-0.3	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1
1986	-0.1	-0.1	-0.1	-0.1	-0.1	0.0	-0.1	-0.1	0.0	0.0	0.0	0.0
1987	0.0	-0.1	-0.1	-0.1	-0.1	-0.1	-0.5	-0.7	-0.7	9.4	22.2	4.4
1988	-2.7	-2.2	-1.5	-1.5	-0.6	-2.3	-1.5	-1.7	-1.1	16.6	7.3	4.5
1989	-3.7	-2.2	-2.1	-1.7	-2.0	-2.5	-3.3	-1.5	-1.4	0.3	5.4	-0.2
1990	-1.7	-2.0	-2.0	-1.0	-2.5	-1.8	-0.8	-1.8	-1.1	11.5	6.3	4.5
1991	-3.1	-1.8	-1.3	-1.5	-1.1	-2.1	-2.0	-2.3	-1.9	7.8	4.5	2.7
1992	-3.1	-2.7	-2.9	-1.8	-2.2	-1.5	-2.0	-2.1	-1.7	14.9	7.9	2.4
1993	-1.2	-3.3	-2.2	-2.7	-2.5	-3.3	-0.6	-2.1	-0.7	0.0	0.0	0.0
1994	0.0	0.0	0.0	-0.7	-0.9	-0.9	-0.6	-0.6	-0.5	0.4	11.2	2.2
1995	-2.0	-2.1	-1.2	-1.8	-1.8	-0.4	-0.4	0.2	-0.8	-0.6	-0.6	0.0
1996	0.0	0.0	-0.7	-1.0	-0.2	-0.2	-0.3	-0.2	-0.4	0.0	0.0	0.0
1997	0.0	0.0	-0.8	-0.1	-0.2	-0.3	-0.3	-0.4	0.0	-0.1	0.0	-0.1
1998	-0.2	-0.2	-0.3	-0.3	-0.4	-0.1	-0.2	-0.2	-0.1	-0.2	-0.2	-0.2
1999	0.0	-0.3	-0.1	-0.1	-0.1	-0.1	-0.2	-0.2	-0.2	0.0	0.0	0.0
2000	0.0	0.0	-0.1	-0.5	-0.1	-0.2	-0.2	-0.2	0.0	-0.1	0.0	0.0
2001	0.0	0.0	-0.2	-0.2	-0.1	-0.1	-0.2	-0.8	-0.8	16.4	7.0	4.5
2002	-2.3	-2.2	-0.8	-1.6	-2.3	-0.9	-2.0	-0.6	-0.6	-0.1	-0.4	-0.2
2003	0.0	-0.2	-0.7	-0.3	-0.3	-0.3	-0.3	-0.4	-0.9	3.3	0.3	0.2
Average	-0.8	-0.7	-0.6	-0.6	-0.7	-0.6	-0.5	-0.6	-0.4	2.9	3.1	1.0
Critical	-1.9	-1.5	-1.4	-1.1	-1.3	-1.5	-1.2	-1.5	-1.1	9.9	8.4	3.6
Dry	-1.0	-0.8	-0.5	-0.6	-0.8	-0.6	-1.1	-0.7	-0.6	4.4	7.7	1.3
BN	0.0	0.0	0.0	-0.2	-0.4	-0.2	-0.2	-0.2	0.0	0.0	0.0	0.0
AN	-0.6	-1.0	-0.7	-1.0	-0.9	-0.8	-0.3	-0.6	-0.3	0.5	0.1	0.0
Wet	-0.3	-0.2	-0.4	-0.3	-0.2	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	0.0

Table E.3-278. San Joaquin River inflow (cfs) difference No Crop Idle minus Base.

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1971	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1972	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1973	0.0	0.0	0.0	0.0	0.0	-487.9	0.0	0.0	0.0	0.0	0.0	0.0
1974	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1975	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1976	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1977	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1978	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1979	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1980	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1981	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1982	0.0	0.0	0.0	0.0	-540.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1983	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1984	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1985	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1986	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1987	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1988	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1989	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1990	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1991	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1992	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1993	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-504.2	0.0	0.0	0.0
1994	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1995	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1996	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1997	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1998	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1999	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2001	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2002	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2003	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Average	0.0	0.0	0.0	0.0	-15.9	-14.4	0.0	0.0	-14.8	0.0	0.0	0.0
Critical	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Dry	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
BN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AN	0.0	0.0	0.0	0.0	0.0	-81.3	0.0	0.0	-84.0	0.0	0.0	0.0
Wet	0.0	0.0	0.0	0.0	-41.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table E.3-279. San Joaquin River inflow (cfs) percent difference of No Crop Idle from Base.

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1971	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1972	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1973	0.0	0.0	0.0	0.0	0.0	-5.8	0.0	0.0	0.0	0.0	0.0	0.0
1974	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1975	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1976	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1977	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1978	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1979	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1980	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1981	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1982	0.0	0.0	0.0	0.0	-4.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1983	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1984	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1985	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1986	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1987	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1988	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1989	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1990	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1991	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1992	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1993	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-11.5	0.0	0.0	0.0
1994	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1995	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1996	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1997	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1998	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1999	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2001	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2002	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2003	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Average	0.0	0.0	0.0	0.0	-0.1	-0.2	0.0	0.0	-0.3	0.0	0.0	0.0
Critical	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Dry	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
BN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AN	0.0	0.0	0.0	0.0	0.0	-1.0	0.0	0.0	-1.9	0.0	0.0	0.0
Wet	0.0	0.0	0.0	0.0	-0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table E.3-280. NDO (cfs) difference No Crop Idle minus Base.

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1971	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1972	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1973	0.0	0.0	0.2	-0.1	0.0	-487.9	0.0	0.0	0.0	0.0	0.0	0.0
1974	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1975	0.0	0.0	0.0	0.0	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1976	0.0	0.0	0.0	0.0	0.0	0.0	-2.6	2.9	-34.2	271.8	319.4	125.1
1977	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-20.9	0.0	249.9	121.5	78.6
1978	0.0	0.0	-76.6	-876.6	-764.0	-464.9	-123.6	-93.2	-58.0	0.0	0.0	0.0
1979	0.0	0.0	0.0	-85.0	-239.2	-76.5	-66.3	-49.4	0.0	0.0	0.0	0.0
1980	0.0	-30.5	-69.7	-196.6	-1026.4	-48.6	-34.4	-28.3	0.0	0.0	0.0	0.0
1981	0.0	0.0	0.0	-43.8	-28.8	-28.1	-22.5	-20.1	0.0	135.2	211.0	77.8
1982	0.0	148.1	-731.5	-112.9	-673.4	-100.4	-84.3	-199.7	-40.9	0.0	0.0	0.0
1983	-83.9	-150.7	-64.4	-50.3	-56.8	-63.1	-57.1	-49.8	-40.9	-30.9	-27.7	-25.4
1984	-23.8	-37.4	-36.9	-34.8	-31.8	-29.2	-20.0	-18.1	0.0	0.0	0.0	0.0
1985	0.0	-76.1	-21.2	-16.6	-20.6	0.0	-13.6	-11.9	0.0	0.0	0.0	0.0
1986	0.0	0.0	-22.5	-16.6	-77.2	-20.0	-18.0	-11.5	0.0	0.0	0.0	0.0
1987	0.0	0.0	0.0	-9.0	-11.8	-17.7	0.0	0.0	0.0	313.9	430.7	125.1
1988	0.0	0.0	-191.7	-299.3	0.0	0.0	-79.8	0.0	0.0	471.4	168.7	113.1
1989	0.0	0.0	-136.9	0.0	0.0	-1018.9	-613.2	0.0	0.0	65.9	197.2	47.9
1990	0.0	0.0	0.0	-104.6	-323.8	-142.2	0.0	-58.7	0.0	391.9	175.5	120.1
1991	0.0	0.0	0.0	0.0	-114.8	-535.0	-155.4	-93.6	0.0	274.3	137.2	86.7
1992	0.0	0.0	0.0	0.0	-591.6	-200.7	-148.7	0.0	0.0	432.7	204.5	93.7
1993	0.0	0.0	-212.5	-1179.9	-1105.1	-1136.7	-225.7	-595.3	-688.6	0.0	0.0	0.0
1994	0.0	0.0	0.0	-90.5	-216.8	-110.4	-73.5	-64.9	-43.2	166.3	204.9	93.7
1995	3.9	0.0	-104.0	-1090.8	-752.8	-282.3	-183.2	109.5	-311.3	-108.1	-100.3	0.0
1996	0.0	0.0	-129.2	-397.4	-117.1	-109.7	-102.8	-98.1	-66.4	0.0	0.1	0.0
1997	0.0	0.0	-406.3	-92.0	-83.9	-76.2	-54.1	-49.6	0.0	0.0	0.0	0.0
1998	0.0	0.0	-48.5	-89.7	-272.2	-81.1	-73.8	-66.7	-59.1	-46.6	-41.9	-38.6
1999	0.6	-89.3	-46.3	-39.2	-53.0	-48.1	-45.8	-38.0	-30.5	0.0	0.0	0.0
2000	0.0	0.0	0.0	-110.5	-69.7	-109.4	-39.3	-31.8	0.0	0.0	0.0	0.0
2001	0.0	0.0	0.0	-38.4	-33.8	-32.1	-28.4	-74.6	0.0	523.0	182.6	125.1
2002	0.6	-135.4	-151.4	-607.2	-354.8	-176.1	-335.0	-76.4	0.0	0.0	0.0	0.0
2003	0.0	0.0	-264.3	-165.4	-81.8	-77.9	-75.0	-137.0	-133.4	69.5	69.5	51.3
Average	-3.0	-10.9	-79.8	-169.0	-208.9	-161.0	-78.7	-52.2	-44.3	93.5	66.3	31.6
Critical	0.0	0.0	-27.4	-70.6	-178.1	-141.2	-65.7	-33.6	-11.1	322.6	190.2	101.6
Dry	0.1	-35.3	-51.6	-119.2	-75.0	-212.1	-168.8	-30.5	0.0	173.0	170.3	62.6
BN	0.0	0.0	0.0	-42.5	-119.6	-38.3	-33.2	-24.7	0.0	0.0	0.0	0.0
AN	0.0	-5.1	-103.8	-421.5	-507.8	-387.6	-83.0	-147.6	-146.7	11.6	11.6	8.6
Wet	-7.9	-9.9	-122.3	-148.0	-163.0	-62.3	-49.2	-32.5	-42.2	-14.3	-13.1	-4.9

Table E.3-281. NDO (cfs) percent difference No Crop Idle minus Base.

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1971	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1972	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1973	0.0	0.0	0.0	0.0	0.0	-0.9	0.0	0.0	0.0	0.0	0.0	0.0
1974	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1975	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1976	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	-0.7	5.7	8.2	4.2
1977	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.5	0.0	6.2	3.6	2.6
1978	0.0	0.0	-0.7	-1.3	-1.5	-0.7	-0.3	-0.4	-0.4	0.0	0.0	0.0
1979	0.0	0.0	0.0	-0.4	-0.7	-0.3	-0.3	-0.3	0.0	0.0	0.0	0.0
1980	0.0	-0.4	-0.6	-0.2	-0.8	-0.1	-0.2	-0.2	0.0	0.0	0.0	0.0
1981	0.0	0.0	0.0	-0.2	-0.1	-0.1	-0.2	-0.2	0.0	2.7	5.3	2.5
1982	0.0	0.6	-0.9	-0.1	-0.7	-0.1	-0.1	-0.4	-0.2	0.0	0.0	0.0
1983	-0.6	-0.4	-0.1	0.0	0.0	0.0	-0.1	-0.1	-0.1	-0.1	-0.2	-0.1
1984	-0.2	0.0	0.0	-0.1	-0.1	-0.1	-0.1	-0.1	0.0	0.0	0.0	0.0
1985	0.0	-0.4	-0.2	-0.2	-0.1	0.0	-0.1	-0.1	0.0	0.0	0.0	0.0
1986	0.0	0.0	-0.2	-0.1	0.0	0.0	-0.1	-0.1	0.0	0.0	0.0	0.0
1987	0.0	0.0	0.0	-0.1	-0.1	-0.1	0.0	0.0	0.0	6.3	10.4	4.2
1988	0.0	0.0	-1.5	-1.1	0.0	0.0	-0.8	0.0	0.0	11.8	4.3	3.8
1989	0.0	0.0	-3.1	0.0	0.0	-2.2	-3.1	0.0	0.0	1.3	3.7	1.0
1990	0.0	0.0	0.0	-0.7	-2.7	-1.6	0.0	-0.9	0.0	9.8	4.1	4.0
1991	0.0	0.0	0.0	0.0	-1.3	-1.6	-1.5	-1.7	0.0	6.9	3.1	2.9
1992	0.0	0.0	0.0	0.0	-1.7	-1.2	-1.5	0.0	0.0	10.8	5.5	3.1
1993	0.0	0.0	-2.5	-1.9	-2.0	-3.2	-0.6	-2.0	-3.3	0.0	0.0	0.0
1994	0.0	0.0	0.0	-1.0	-1.0	-1.3	-0.7	-0.7	-1.1	4.2	5.1	3.1
1995	0.1	0.0	-1.2	-1.0	-1.6	-0.1	-0.3	0.1	-0.8	-0.5	-1.1	0.0
1996	0.0	0.0	-0.8	-0.9	-0.1	-0.2	-0.2	-0.2	-0.6	0.0	0.0	0.0
1997	0.0	0.0	-0.6	0.0	-0.1	-0.3	-0.3	-0.3	0.0	0.0	0.0	0.0
1998	0.0	0.0	-0.5	-0.2	-0.1	-0.1	-0.1	-0.1	-0.1	-0.2	-0.4	-0.2
1999	0.0	-0.4	-0.2	-0.1	-0.1	-0.1	-0.2	-0.2	-0.3	0.0	0.0	0.0
2000	0.0	0.0	0.0	-0.5	-0.1	-0.2	-0.2	-0.2	0.0	0.0	0.0	0.0
2001	0.0	0.0	0.0	-0.3	-0.1	-0.1	-0.2	-0.9	0.0	10.5	4.4	4.2
2002	0.0	-2.3	-0.5	-1.3	-2.4	-1.0	-2.0	-0.6	0.0	0.0	0.0	0.0
2003	0.0	0.0	-0.7	-0.3	-0.3	-0.4	-0.3	-0.4	-2.0	0.7	1.7	0.4
Average	0.0	-0.1	-0.4	-0.4	-0.5	-0.5	-0.4	-0.3	-0.3	2.2	1.7	1.1
Critical	0.0	0.0	-0.2	-0.4	-1.0	-0.8	-0.6	-0.5	-0.3	7.9	4.9	3.4
Dry	0.0	-0.5	-0.6	-0.3	-0.5	-0.6	-0.9	-0.3	0.0	3.5	4.0	2.0
BN	0.0	0.0	0.0	-0.2	-0.3	-0.1	-0.2	-0.1	0.0	0.0	0.0	0.0
AN	0.0	-0.1	-0.8	-0.7	-0.8	-0.9	-0.2	-0.5	-1.0	0.1	0.3	0.1
Wet	-0.1	0.0	-0.3	-0.2	-0.2	-0.1	-0.1	-0.1	-0.2	-0.1	-0.1	0.0

Table E.3-282. San Joaquin River salinity (EC) difference No Crop Idle minus Base.

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1971	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1972	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1973	0.0	0.0	0.0	0.0	0.0	-23.0	0.0	0.0	0.0	0.0	0.0	0.0
1974	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1975	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1976	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1977	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1978	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1979	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1980	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1981	0.0	0.0	0.0	0.0	0.0	0.0	2.0	0.0	0.0	0.0	0.0	0.0
1982	0.0	0.0	0.0	0.0	-15.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1983	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1984	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1985	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1986	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1987	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1988	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1989	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1990	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1991	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1992	0.0	0.0	0.0	0.0	0.0	0.0	-10.0	0.0	0.0	0.0	0.0	0.0
1993	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	21.0	0.0	0.0	0.0
1994	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1995	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1996	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1997	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1998	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1999	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2001	0.0	0.0	0.0	0.0	0.0	0.0	3.0	0.0	0.0	0.0	0.0	0.0
2002	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2003	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Average	0.0	0.0	0.0	0.0	-0.4	-0.7	-0.1	0.0	0.6	0.0	0.0	0.0
Critical	0.0	0.0	0.0	0.0	0.0	0.0	-1.4	0.0	0.0	0.0	0.0	0.0
Dry	0.0	0.0	0.0	0.0	0.0	0.0	0.8	0.0	0.0	0.0	0.0	0.0
BN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AN	0.0	0.0	0.0	0.0	0.0	-3.8	0.0	0.0	3.5	0.0	0.0	0.0
Wet	0.0	0.0	0.0	0.0	-1.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table E.3-283. San Joaquin River salinity (EC) percent difference No Crop Idle minus Base.

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1971	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1972	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1973	0.0	0.0	0.0	0.0	0.0	-6.9	0.0	0.0	0.0	0.0	0.0	0.0
1974	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1975	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1976	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1977	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1978	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1979	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1980	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1981	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.0	0.0	0.0	0.0	0.0
1982	0.0	0.0	0.0	0.0	-5.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1983	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1984	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1985	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1986	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1987	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1988	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1989	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1990	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1991	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1992	0.0	0.0	0.0	0.0	0.0	0.0	-1.3	0.0	0.0	0.0	0.0	0.0
1993	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.0	0.0	0.0	0.0
1994	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1995	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1996	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1997	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1998	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1999	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2001	0.0	0.0	0.0	0.0	0.0	0.0	0.8	0.0	0.0	0.0	0.0	0.0
2002	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2003	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Average	0.0	0.0	0.0	0.0	-0.2	-0.2	0.0	0.0	0.1	0.0	0.0	0.0
Critical	0.0	0.0	0.0	0.0	0.0	0.0	-0.2	0.0	0.0	0.0	0.0	0.0
Dry	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.0
BN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AN	0.0	0.0	0.0	0.0	0.0	-1.2	0.0	0.0	0.5	0.0	0.0	0.0
Wet	0.0	0.0	0.0	0.0	-0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0

E.3.1.7 Export Boundary Conditions

See the text in Appendix *E* for details on the export boundary conditions.

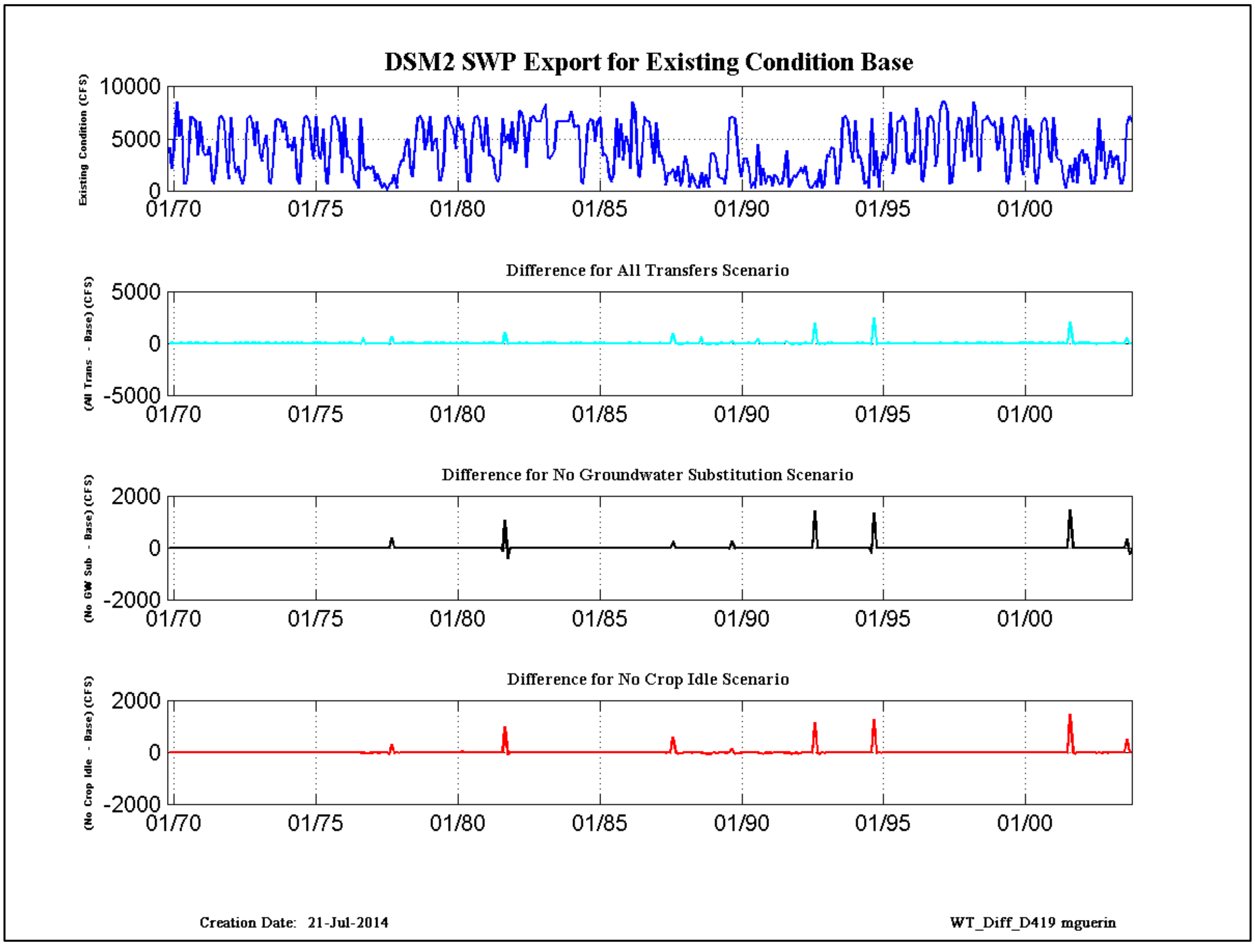

Figure E.3-44. SWP Export for the Base condition and change from Base for the scenarios.

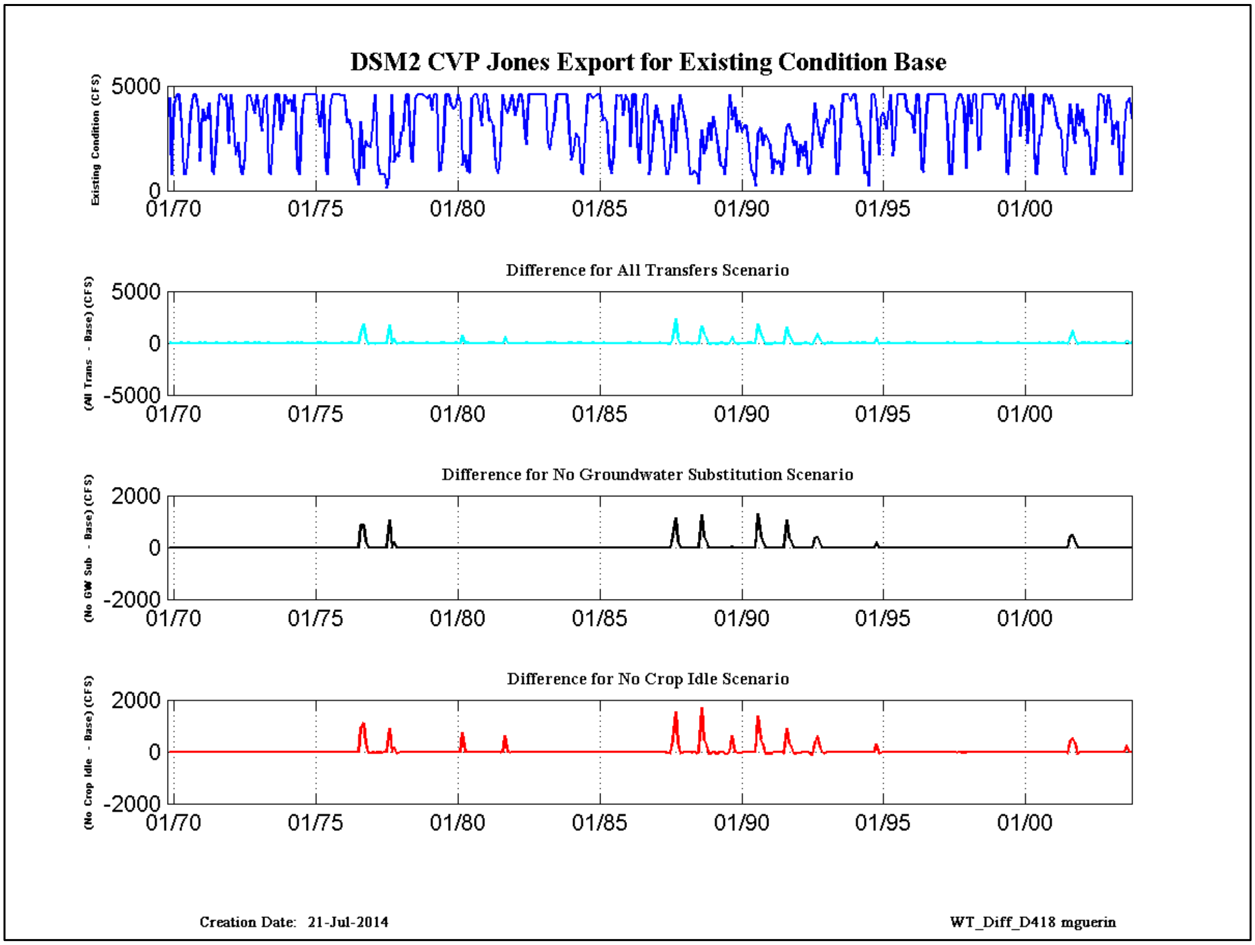

Figure E.3-45. CVP Jones Export for the Base condition and change from Base for the scenarios.

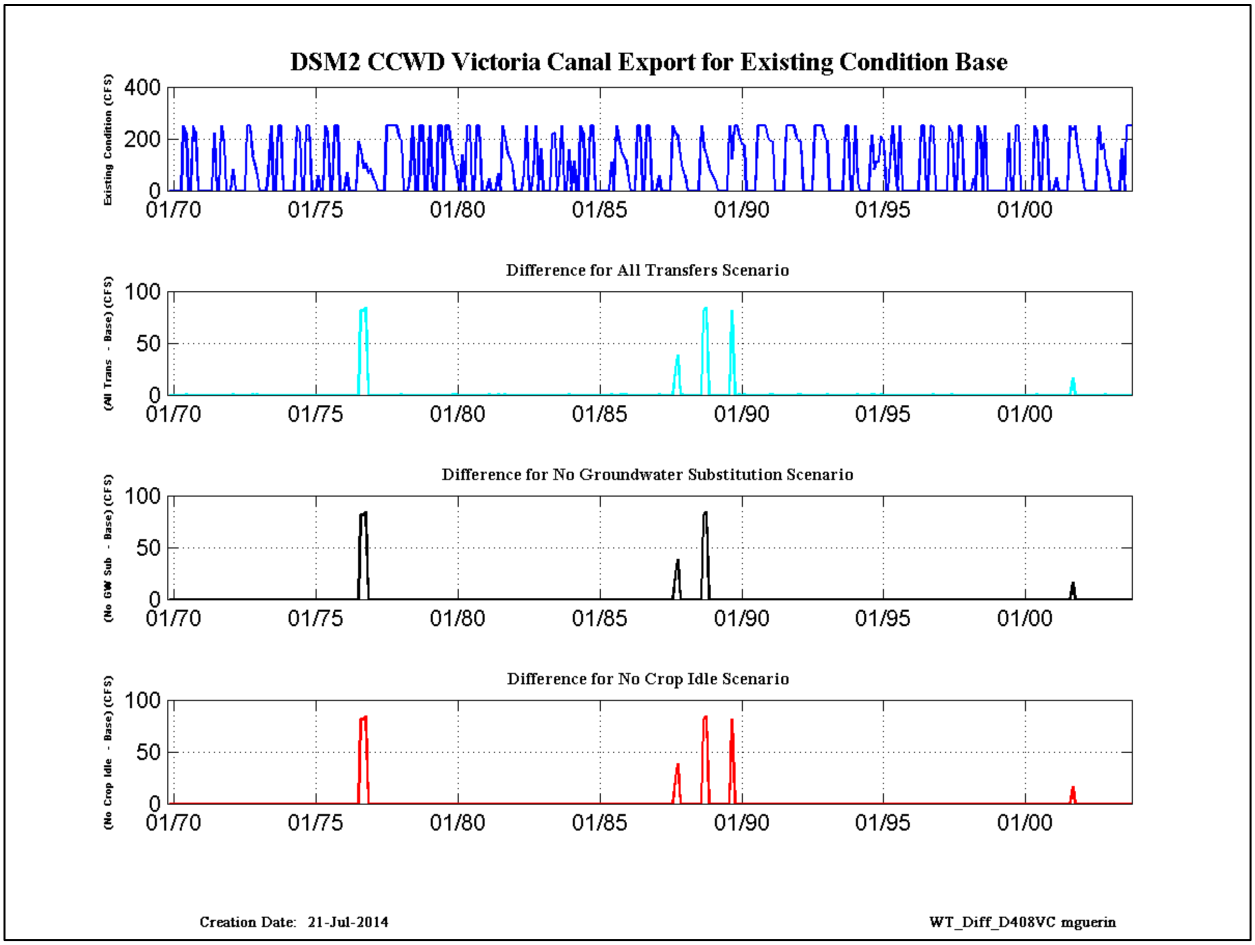

Figure E.3-46. CCWD Victoria Canal Export for the Base condition and change from Base for the scenarios.

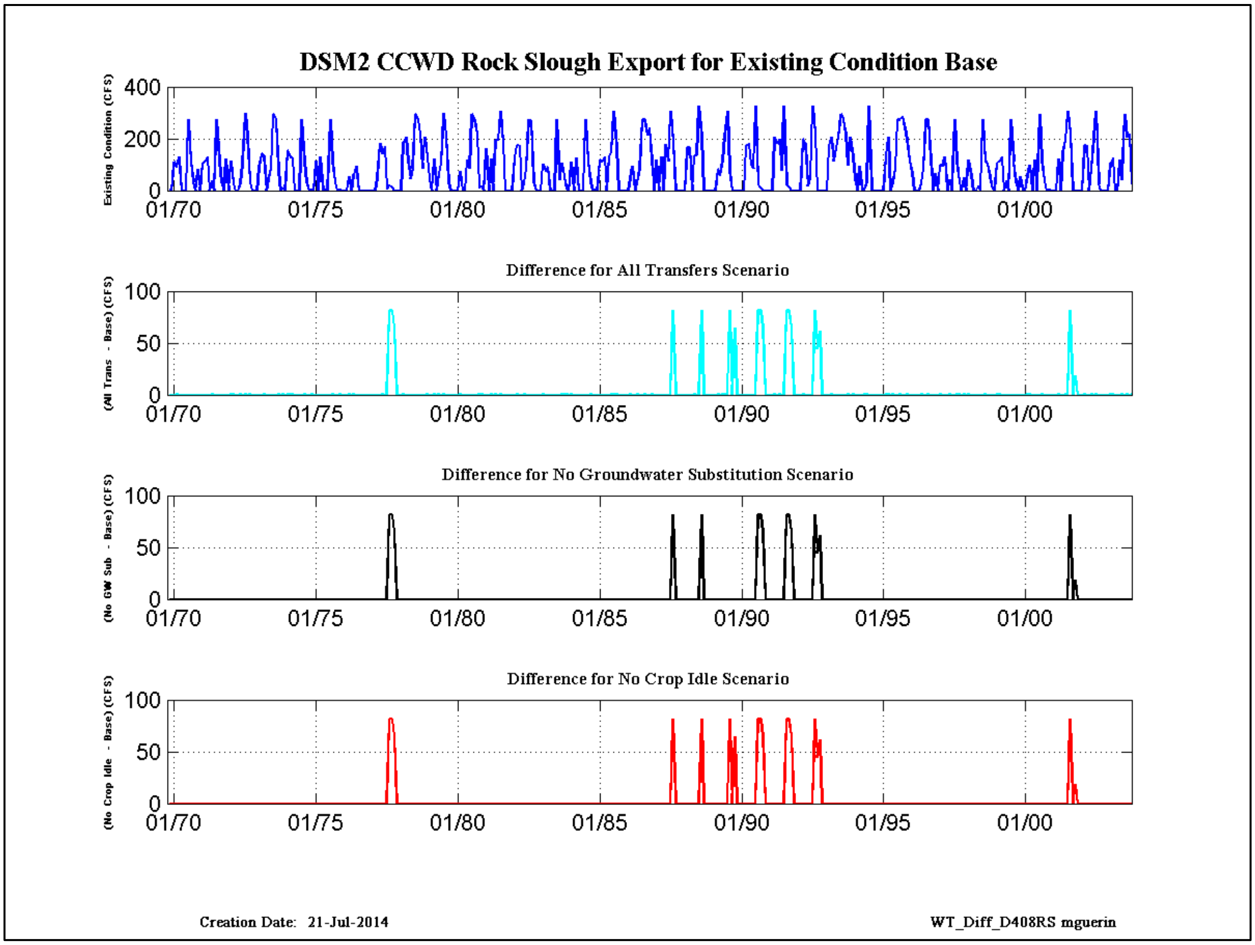

Figure E.3-47. CCWD Rock Slough Export for the Base condition and change from Base for the scenarios.

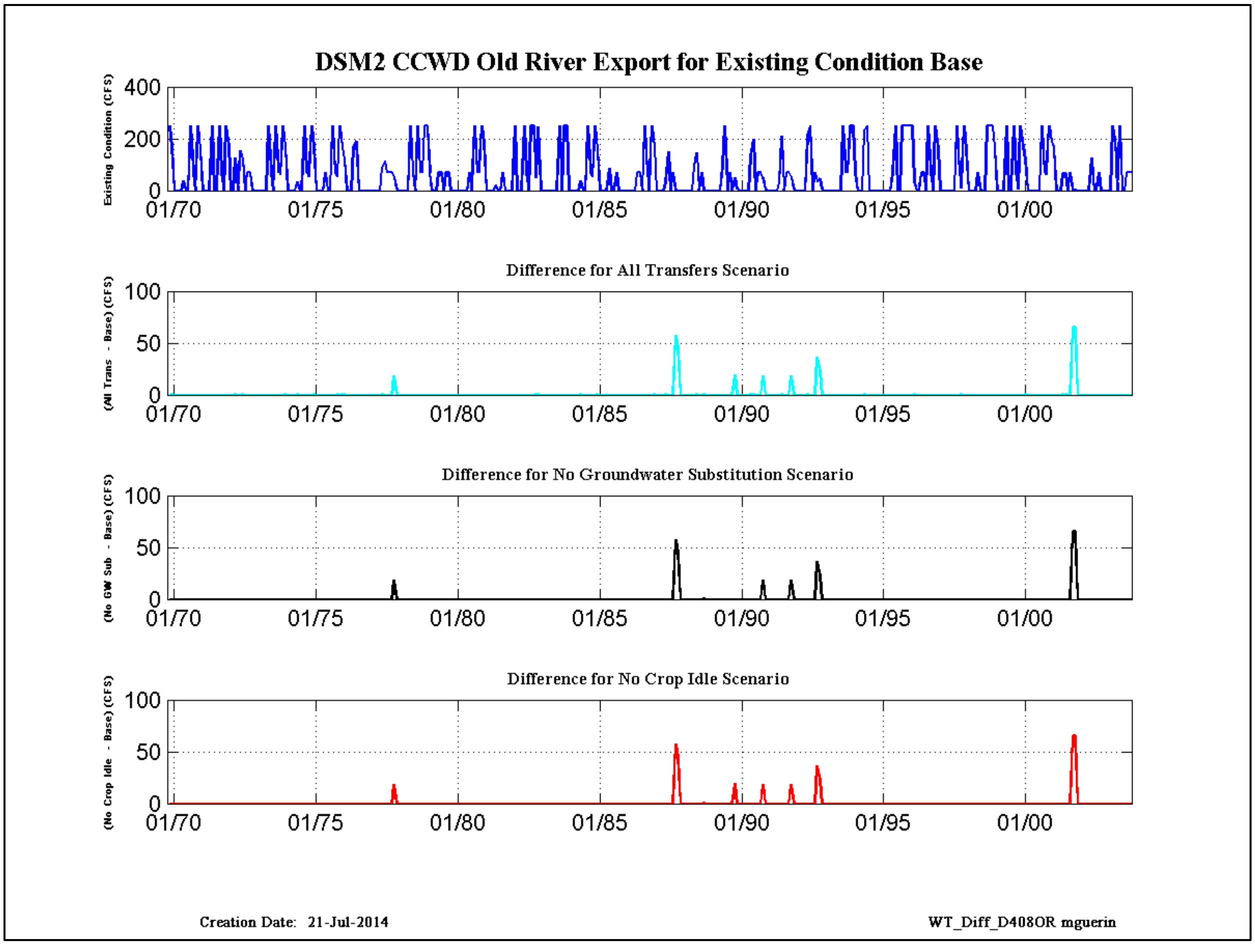

Figure E.3-48. CCWD Old River Export for the Base condition and change from Base for the scenarios.

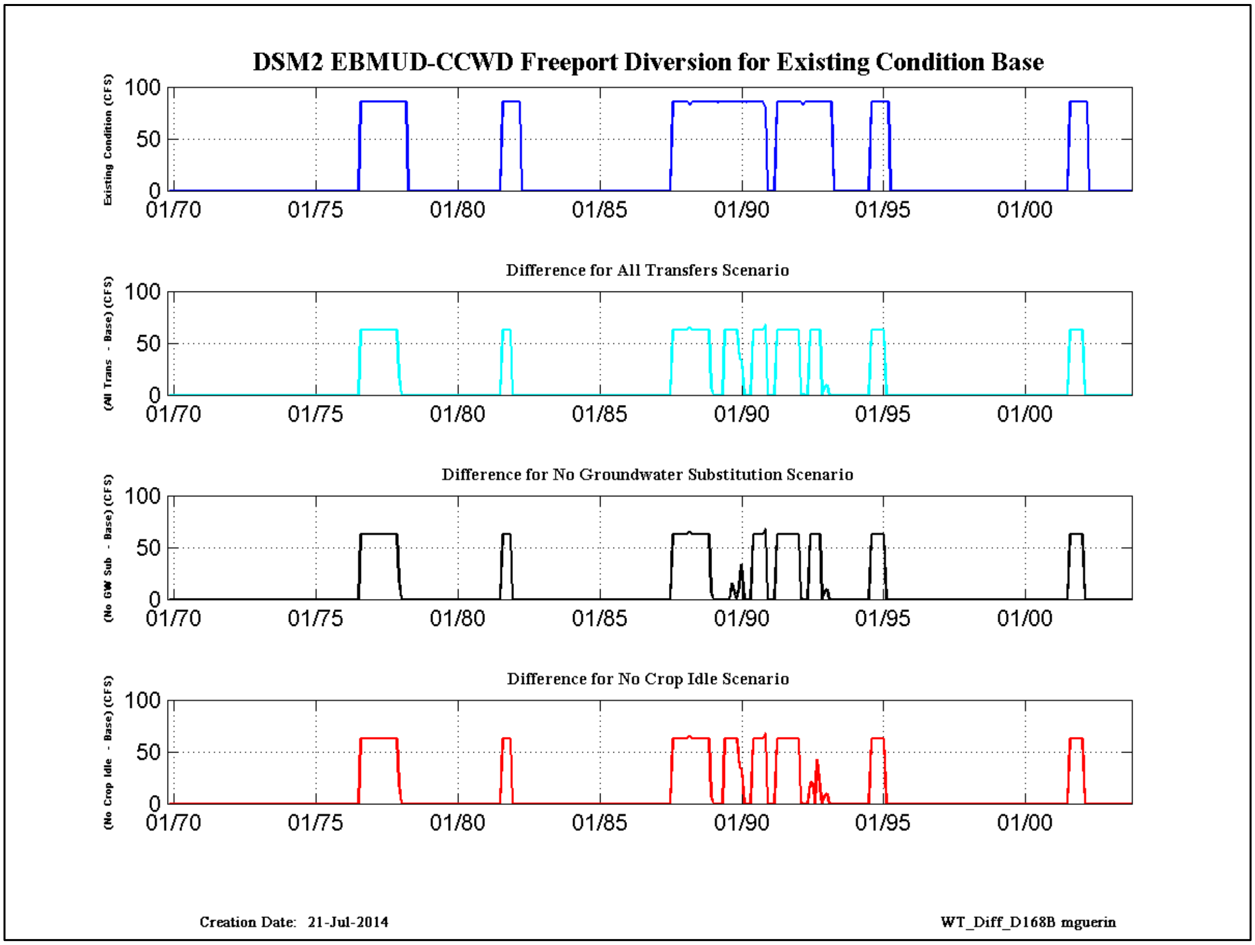

Figure E.3-49. EBMUD Freeport Diversion for the Base condition and change from Base for the scenarios.

Table E.3-283. EBMUD at Freeport Base exports (cfs).

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1971	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1972	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1973	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1974	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1975	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1976	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	85.5	85.5	85.5
1977	85.5	85.5	85.5	85.5	85.5	85.5	85.5	85.5	85.5	85.5	85.5	85.5
1978	85.5	85.5	85.5	85.5	85.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1979	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1980	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1981	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	85.5	85.5	85.5
1982	85.5	85.5	85.5	85.5	85.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1983	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1984	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1985	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1986	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1987	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	85.5	85.5	85.5
1988	85.5	85.5	85.5	85.5	82.7	85.5	85.5	85.5	85.5	85.5	85.5	85.5
1989	85.5	85.5	85.5	85.5	85.4	85.5	85.5	85.5	85.5	85.5	85.5	85.5
1990	85.5	85.5	85.5	85.5	85.4	85.5	85.5	85.5	85.5	85.5	85.5	85.5
1991	80.1	0.0	0.0	0.0	0.0	85.5	85.5	85.5	85.5	85.5	85.5	85.5
1992	85.5	85.5	85.5	85.5	82.4	85.5	85.5	85.5	85.5	85.5	85.5	85.5
1993	85.5	85.5	85.5	85.5	85.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1994	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	85.5	85.5	85.5
1995	85.5	85.5	85.5	85.5	85.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1996	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1997	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1998	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1999	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2001	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	85.5	85.5	85.5
2002	85.5	85.5	85.5	85.5	85.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2003	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Average	27.5	25.1	25.1	25.1	25.0	15.1	15.1	15.1	15.1	27.7	27.7	27.7
Critical	60.3	48.9	48.9	48.9	48.0	61.1	61.1	61.1	61.1	85.5	85.5	85.5
Dry	28.5	28.5	28.5	28.5	28.5	14.3	14.3	14.3	14.3	57.0	57.0	57.0
BN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AN	28.5	28.5	28.5	28.5	28.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Wet	13.2	13.2	13.2	13.2	13.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table E.3-284. CVP-Jones Base exports (cfs).

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	4480.8	800.0	4128.0	4600.0	4600.0	3102.3	800.0	800.0	1834.1	3728.1	4600.0	4600.0
1971	3903.3	1444.7	3942.9	3379.3	3474.6	4233.7	914.9	800.0	2639.9	4600.0	4600.0	4356.3
1972	4600.0	2272.1	4600.0	3161.6	1736.9	2331.3	887.5	800.0	1636.9	4583.7	4600.0	4228.6
1973	3721.4	4600.0	3775.4	2881.5	4366.0	4600.0	893.3	800.0	2706.7	4600.0	4600.0	2921.4
1974	3384.7	4600.0	4162.3	4387.9	3806.6	4600.0	1072.0	800.0	3390.2	4600.0	4600.0	4600.0
1975	4600.0	4600.0	4600.0	3344.8	3071.3	4600.0	922.1	800.0	3960.4	4600.0	4600.0	4600.0
1976	4600.0	4598.6	4600.0	3254.0	3425.9	2938.3	1112.2	800.0	284.3	3340.8	1080.2	2382.8
1977	2140.4	2115.7	3081.7	4600.0	1334.3	800.0	800.0	800.0	113.4	675.9	4600.0	1386.5
1978	1778.2	1648.5	2813.8	2873.0	4600.0	4600.0	1587.3	1388.6	4440.5	4600.0	4600.0	4600.0
1979	4525.2	4448.5	4600.0	3879.5	4600.0	4600.0	970.4	1002.6	2566.1	4600.0	4600.0	4125.5
1980	3949.5	4028.1	4600.0	4229.0	1222.7	1728.3	923.6	864.0	4466.8	4600.0	4600.0	4019.0
1981	3111.1	4600.0	4600.0	3355.2	3380.3	3122.1	1107.2	809.8	1642.4	4600.0	3988.5	3732.0
1982	4199.1	4600.0	3634.1	3878.2	4600.0	4600.0	3218.9	2245.8	4600.0	4600.0	4600.0	4600.0
1983	4600.0	4600.0	4600.0	4600.0	2308.6	1991.0	2721.7	3487.1	4600.0	4600.0	4600.0	4600.0
1984	4600.0	2978.3	1461.8	1972.7	2764.8	2529.0	874.0	800.0	2832.0	4600.0	4600.0	4456.4
1985	4559.4	4600.0	4600.0	3381.7	3523.1	3257.4	1204.9	832.1	1668.5	4600.0	4550.0	4600.0
1986	3630.3	4600.0	4272.0	2121.1	4600.0	4600.0	1510.5	1339.1	3908.8	4600.0	4600.0	800.0
1987	1565.4	3157.2	4101.9	3269.7	3352.4	2342.5	800.0	800.0	1638.9	4139.7	1812.7	3183.2
1988	4600.0	3975.4	3317.4	2347.8	800.0	800.0	929.0	800.0	329.6	2917.2	1799.6	2077.9
1989	3272.2	2445.9	3584.9	2856.7	2019.0	1204.1	1133.6	800.0	2364.1	4600.0	3422.9	4014.0
1990	2806.8	3355.7	2819.0	3060.3	3132.8	2125.8	1031.7	800.0	229.5	2787.1	3045.7	2160.1
1991	2686.6	2504.7	2216.2	804.6	1517.8	1290.8	1433.6	800.0	1561.0	3048.2	3221.5	2732.6
1992	2170.0	2379.3	1177.1	2223.9	1690.0	2384.8	800.0	856.7	2308.1	4230.8	3221.9	2474.0
1993	2089.8	2979.7	3459.1	3201.5	4120.7	3944.0	800.0	800.0	3132.0	4600.0	4600.0	4600.0
1994	4310.4	4600.0	4600.0	3168.1	3338.1	2298.4	836.6	866.3	225.1	4600.0	4600.0	3869.4
1995	1714.6	3565.8	3743.9	2985.9	3563.0	4600.0	1665.3	2609.3	4600.0	4600.0	4600.0	4600.0
1996	3808.5	3773.6	3649.3	2798.5	4600.0	4600.0	1030.6	890.0	3364.5	4600.0	4600.0	4600.0
1997	4600.0	4600.0	4600.0	4600.0	4600.0	2980.5	800.0	800.0	3120.9	4229.9	4600.0	4600.0
1998	3984.1	1085.1	4600.0	3205.9	4600.0	4600.0	1936.2	2019.8	4600.0	4600.0	4600.0	4600.0
1999	4600.0	4600.0	3925.6	4072.3	4600.0	4600.0	872.8	800.0	2921.8	4600.0	4600.0	4421.6
2000	2622.6	4600.0	4188.0	2250.7	4600.0	4600.0	864.7	800.0	2680.5	2666.0	4600.0	4600.0
2001	4173.5	4600.0	4246.4	3425.9	3035.8	2905.9	1209.9	800.0	2287.8	4188.4	2863.7	2268.6
2002	4171.7	3148.9	3903.0	2636.0	2944.8	2593.6	800.0	800.0	1610.6	4600.0	4600.0	4519.8
2003	3283.2	4600.0	3829.3	2243.4	3154.2	3345.1	800.0	800.0	3057.7	4245.8	4458.4	3473.5
Average	3613.0	3561.9	3824.5	3207.4	3326.0	3219.1	1154.8	1059.2	2568.3	4158.3	4096.0	3747.2
Critical	3330.6	3361.3	3115.9	2779.8	2177.0	1805.4	991.9	817.6	721.6	3085.7	3081.3	2440.5
Dry	3475.5	3758.7	4172.7	3154.2	3042.6	2570.9	1042.6	807.0	1868.7	4454.7	3539.6	3719.6
BN	4562.6	3360.3	4600.0	3520.6	3168.4	3465.7	929.0	901.3	2101.5	4591.8	4600.0	4177.1
AN	2907.4	3742.7	3777.6	2946.5	3677.3	3802.9	978.1	908.8	3414.1	4218.6	4576.4	4035.7
Wet	4008.1	3526.7	3947.7	3534.4	3937.6	3972.0	1410.7	1399.3	3567.1	4504.5	4600.0	4264.2

Table E.3-285. SWP-Banks Base exports (cfs).

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	4178.7	2198.2	4128.0	8500.0	5205.9	6828.3	700.0	700.0	1834.1	7114.9	7029.9	6675.3
1971	3459.6	6680.0	3942.9	3379.3	3474.6	4233.7	914.9	700.0	2639.9	7004.9	7180.0	6680.0
1972	3210.1	1138.4	7034.3	3161.6	1736.9	2331.3	997.1	700.0	1636.9	6915.0	7180.0	6530.6
1973	4303.6	6680.0	3775.4	2881.5	4366.0	5383.7	893.3	700.0	2706.7	6781.0	6905.7	6680.0
1974	5649.7	6680.0	4162.3	4387.9	3806.6	5169.9	1072.0	700.0	3390.2	7004.9	7180.0	6680.0
1975	4169.5	3019.6	7127.9	3344.8	3071.3	5940.6	922.1	700.0	3960.4	7004.9	7180.0	6680.0
1976	5344.3	1767.3	7044.7	3254.0	3200.6	2938.3	1112.2	895.0	284.3	6976.9	2325.3	1995.7
1977	2302.7	2014.0	2366.9	911.3	1684.8	789.4	300.0	700.0	16.2	554.7	735.9	1543.0
1978	300.0	2007.6	2813.8	2873.0	4676.4	4994.0	1587.3	1388.6	4440.5	7004.9	7180.0	6680.0
1979	3938.2	4789.9	7105.3	3879.5	4680.3	5000.1	970.4	1002.6	2566.1	7004.9	7180.0	6528.9
1980	5864.1	4028.1	7065.7	5838.8	6424.1	3839.7	923.6	864.0	4466.8	7004.9	7180.0	6680.0
1981	4414.0	3748.7	7048.7	3355.2	3380.3	3122.1	1107.2	809.8	1642.4	6928.9	4653.0	5413.9
1982	4065.5	6680.0	3634.1	3878.2	7627.6	7560.6	6125.3	2245.8	5267.0	7004.9	7180.0	6680.0
1983	6680.0	6680.0	7678.1	8342.5	3195.0	3109.4	3357.5	4038.7	6680.0	6680.0	6680.0	6680.0
1984	6680.0	6680.0	7678.1	6131.6	6180.4	6237.3	874.0	700.0	2832.0	6492.0	6933.9	6680.0
1985	4774.8	6680.0	7028.0	3381.7	3523.1	3204.9	1204.9	832.1	1668.5	6915.0	3221.1	6419.4
1986	2997.1	5267.4	4272.0	2121.1	8500.0	7560.6	1510.5	1339.1	3894.4	7114.9	6690.9	6680.0
1987	4335.7	2662.5	6587.7	3269.7	3352.4	2342.5	562.2	1723.1	1638.9	2097.1	985.0	2347.9
1988	438.4	904.4	3317.4	2347.8	304.6	1672.1	929.0	300.0	300.0	1724.8	350.0	1507.0
1989	387.1	3518.2	3584.9	3149.1	1322.9	1204.1	1133.6	700.0	2364.1	6914.9	7058.5	6991.9
1990	4781.7	1814.9	1379.0	3060.3	3132.8	2125.8	300.0	804.7	229.5	4458.0	549.9	2163.2
1991	672.7	1320.5	1352.0	414.3	1517.8	1290.8	620.0	700.0	1561.0	3862.4	380.3	757.5
1992	1496.2	1280.2	1774.0	2182.6	1690.0	2384.8	700.0	300.0	330.1	891.5	350.0	2088.6
1993	300.0	543.2	3459.1	3201.5	4120.7	3944.0	700.0	700.0	3132.0	7004.9	7180.0	6680.0
1994	4085.8	2718.4	6774.6	3168.1	3338.1	2298.4	663.4	866.3	225.1	6976.9	1423.5	3834.3
1995	334.2	2393.5	3743.9	2985.9	3563.0	7560.6	1665.3	2609.3	6680.0	6680.0	7180.0	6680.0
1996	2709.2	2590.6	3649.3	2798.5	7909.4	6853.0	1030.6	890.0	3364.5	7004.9	7180.0	6680.0
1997	2391.4	3493.7	7678.1	8500.0	8500.0	7560.6	700.0	793.2	2955.1	5761.8	7029.9	6680.0
1998	2889.9	4239.9	7043.1	3205.9	8500.0	7560.6	1936.2	2019.8	6680.0	6843.0	7180.0	6680.0
1999	6234.0	6680.0	3925.6	4072.3	7020.4	4748.7	872.8	700.0	2921.8	7004.9	7180.0	6680.0
2000	3159.1	1593.2	6983.9	2250.7	6246.4	5828.3	864.7	700.0	2680.5	6549.6	7029.9	6680.0
2001	3279.3	2798.2	7067.5	3425.9	3035.8	2905.9	1209.9	300.0	928.0	2457.4	897.7	3181.8
2002	719.2	3447.9	3903.0	2636.0	3541.8	2593.6	700.0	700.0	1610.6	6929.0	2852.7	4777.7
2003	1176.8	2477.5	3829.3	2243.4	3154.2	3345.1	700.0	700.0	1600.6	6279.1	7180.0	6680.0
Average	3286.0	3565.2	4998.8	3603.9	4264.2	4248.9	1172.4	1015.4	2621.4	5910.2	5135.4	5382.3
Critical	2731.7	1688.5	3429.8	2191.2	2124.1	1928.5	660.7	652.3	420.9	3635.0	873.6	1984.2
Dry	2985.0	3809.3	5870.0	3202.9	3026.0	2562.2	986.3	844.2	1642.1	5373.7	3278.0	4855.4
BN	3574.1	2964.1	7069.8	3520.6	3208.6	3665.7	983.7	851.3	2101.5	6959.9	7180.0	6529.7
AN	2517.3	2888.2	4654.5	3214.8	4831.3	4555.8	944.8	842.1	3171.2	6770.7	7109.3	6680.0
Wet	4033.8	4867.9	5281.8	4742.2	5888.8	6224.9	1667.8	1395.1	4084.6	6824.3	7061.9	6679.6

Table E.3-286. CCDW Old River Base exports (cfs).

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	250.0	168.1	0.0	0.0	0.0	0.0	37.8	0.0	0.0	250.0	70.0	0.0
1971	250.0	157.0	0.0	0.0	0.0	0.0	250.0	0.0	0.0	250.0	70.0	0.0
1972	250.0	168.3	0.0	0.0	127.7	0.0	153.0	122.3	0.0	70.0	70.0	0.0
1973	0.0	0.0	0.0	0.0	0.0	0.0	250.0	70.0	0.0	250.0	70.0	62.5
1974	250.0	171.3	0.0	0.0	0.0	0.0	32.1	0.0	0.0	250.0	70.0	55.6
1975	250.0	168.9	0.0	0.0	0.0	0.0	70.0	0.0	0.0	250.0	70.0	53.2
1976	250.0	169.6	120.2	0.0	0.0	0.0	171.0	190.9	0.0	0.0	0.0	0.0
1977	0.0	0.0	0.0	0.0	0.0	0.0	89.9	114.0	70.0	70.0	70.0	51.5
1978	4.7	0.0	0.0	0.0	0.0	0.0	250.0	70.0	0.0	250.0	70.0	70.0
1979	250.0	250.0	70.0	0.0	0.0	0.0	70.0	70.0	0.0	70.0	70.0	0.0
1980	0.0	0.0	0.0	0.0	0.0	0.0	0.0	70.0	0.0	250.0	70.0	70.0
1981	250.0	184.6	0.0	0.0	0.0	0.0	22.3	0.0	0.0	70.0	0.0	0.0
1982	0.0	0.0	250.0	0.0	0.0	0.0	250.0	70.0	0.0	250.0	250.0	51.5
1983	247.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	250.0	0.0	250.0
1984	250.0	0.0	0.0	0.0	0.0	0.0	37.9	0.0	0.0	250.0	70.0	53.8
1985	250.0	157.8	0.0	0.0	0.0	0.0	86.4	0.0	0.0	70.0	0.0	0.0
1986	0.0	0.0	0.0	0.0	0.0	0.0	70.0	70.0	0.0	250.0	70.0	0.0
1987	250.0	170.0	0.0	0.0	0.0	0.0	35.2	148.7	0.0	70.0	0.0	0.0
1988	0.0	0.0	0.0	0.0	0.0	0.0	99.0	147.9	0.0	70.0	0.0	0.0
1989	0.0	0.0	0.0	0.0	0.0	0.0	98.0	250.0	0.0	70.0	0.0	50.6
1990	6.2	0.0	0.0	0.0	0.0	0.0	135.6	198.6	0.0	70.0	70.0	51.5
1991	4.7	0.0	0.0	0.0	0.0	0.0	35.5	208.1	0.0	70.0	70.0	51.5
1992	4.7	0.0	0.0	0.0	0.0	0.0	215.6	250.0	0.0	70.0	33.3	48.0
1993	4.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	250.0	70.0	70.0
1994	250.0	250.0	70.0	0.0	0.0	0.0	232.5	250.0	0.0	0.0	0.0	0.0
1995	0.0	0.0	0.0	0.0	0.0	0.0	70.0	250.0	0.0	0.0	250.0	250.0
1996	250.0	250.0	250.0	34.8	0.0	0.0	70.0	70.0	0.0	250.0	70.0	0.0
1997	250.0	162.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	250.0	70.0	8.1
1998	250.0	159.6	0.0	0.0	0.0	0.0	70.0	0.0	0.0	0.0	250.0	250.0
1999	250.0	165.7	0.0	0.0	0.0	0.0	250.0	0.0	0.0	250.0	70.0	6.3
2000	250.0	165.8	122.3	0.0	0.0	0.0	0.0	0.0	0.0	250.0	70.0	62.6
2001	250.0	189.4	167.0	0.0	0.0	0.0	64.9	66.9	0.0	70.0	0.0	4.7
2002	0.0	0.0	0.0	0.0	0.0	0.0	127.2	0.0	0.0	70.0	0.0	0.0
2003	0.0	0.0	0.0	250.0	201.3	0.0	250.0	0.0	0.0	70.0	70.0	70.0
Average	140.4	91.4	30.9	8.4	9.7	0.0	105.7	79.0	2.1	146.5	64.2	48.3
Critical	73.7	59.9	27.2	0.0	0.0	0.0	139.9	194.2	10.0	50.0	34.8	28.9
Dry	166.7	117.0	27.8	0.0	0.0	0.0	72.3	77.6	0.0	70.0	0.0	9.2
BN	250.0	209.2	35.0	0.0	63.8	0.0	111.5	96.1	0.0	70.0	70.0	0.0
AN	43.2	27.6	20.4	41.7	33.6	0.0	125.0	35.0	0.0	220.0	70.0	67.5
Wet	192.1	107.9	38.5	2.7	0.0	0.0	92.9	35.4	0.0	211.5	106.2	75.3

Table E.3-287. CCDW Rock Slough Base exports (cfs).

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	3.3	0.0	111.7	88.8	128.8	0.0	0.0	0.0	273.4	113.0	34.2	0.0
1971	81.3	0.0	104.7	112.0	128.8	0.0	38.9	0.0	273.4	113.5	34.2	0.0
1972	123.9	0.0	112.0	28.9	0.0	0.0	31.2	102.9	296.4	210.7	34.9	0.0
1973	0.0	0.0	95.3	143.2	135.7	0.0	47.1	84.2	295.6	275.7	78.3	0.0
1974	9.9	0.0	155.1	128.2	122.0	0.0	0.0	0.0	273.4	111.7	34.2	0.0
1975	3.9	0.0	115.2	0.0	128.8	0.0	4.8	0.0	273.4	113.0	33.4	0.0
1976	3.3	0.0	0.0	0.0	56.0	0.0	61.7	93.5	0.0	0.0	0.0	0.0
1977	0.0	0.0	0.0	0.0	50.2	180.9	142.8	170.4	6.5	20.5	10.8	0.0
1978	0.0	0.0	0.0	187.0	206.0	114.9	47.1	84.2	295.6	275.7	217.1	88.0
1979	205.1	130.5	44.7	0.0	122.0	0.0	64.2	105.2	296.4	210.7	34.3	0.0
1980	0.0	0.0	0.0	73.7	0.0	0.0	117.1	84.2	295.6	275.7	217.1	13.1
1981	14.1	0.0	162.6	0.0	122.0	0.0	192.6	195.0	305.5	184.8	0.0	0.0
1982	0.0	0.0	131.6	175.9	172.8	0.0	31.5	85.9	273.4	268.8	34.2	0.0
1983	0.0	0.0	102.8	72.1	91.0	0.0	0.0	0.0	273.4	43.4	104.0	53.8
1984	5.1	0.0	108.4	0.0	124.3	0.0	0.0	0.0	273.4	113.4	34.1	0.0
1985	4.1	0.0	117.5	112.0	128.8	0.0	128.5	150.0	305.5	166.5	0.0	0.0
1986	0.0	0.0	0.0	48.6	94.1	0.0	31.5	85.9	273.4	272.1	214.5	240.6
1987	118.1	0.0	118.7	0.0	128.8	0.0	179.7	112.2	305.5	190.2	0.0	0.0
1988	0.0	0.0	0.0	164.9	166.8	0.0	133.8	136.5	326.5	210.4	0.0	0.0
1989	0.0	0.0	0.0	0.0	84.0	58.4	116.9	210.9	305.5	79.4	0.0	0.0
1990	0.0	0.0	0.0	0.0	172.8	180.9	97.2	85.8	326.5	20.5	10.8	0.0
1991	0.0	0.0	0.0	0.0	206.0	180.9	197.2	76.3	326.5	20.5	10.8	0.0
1992	0.0	0.0	0.0	0.0	198.9	180.9	17.2	47.3	326.5	220.5	0.0	0.0
1993	0.0	0.0	0.0	172.0	206.0	114.9	167.1	204.2	295.6	275.7	217.1	99.4
1994	205.1	130.5	44.7	0.0	93.4	0.0	0.3	34.4	326.5	0.0	0.0	0.0
1995	0.0	0.0	0.0	134.8	206.0	0.0	31.5	85.9	273.4	272.1	284.5	240.6
1996	197.0	115.8	68.7	0.0	0.0	0.0	31.5	85.9	273.4	272.1	116.8	0.0
1997	64.6	0.0	97.7	94.7	128.8	0.0	42.7	0.0	273.4	112.7	33.3	0.0
1998	50.0	0.0	116.1	56.4	0.0	0.0	16.8	0.0	273.4	113.3	104.2	55.2
1999	6.1	0.0	107.6	110.1	128.8	0.0	38.3	0.0	273.4	112.5	34.0	0.0
2000	53.4	0.0	0.0	56.3	96.4	0.0	117.1	0.0	295.6	116.6	36.5	0.0
2001	5.1	0.0	0.0	0.0	122.0	0.0	150.0	194.1	305.5	221.1	0.0	0.0
2002	0.0	0.0	0.0	175.9	172.8	0.0	87.7	206.7	305.5	24.4	0.0	0.0
2003	0.0	0.0	106.7	125.9	0.0	0.0	117.1	40.6	295.6	205.7	217.1	25.6
Average	33.9	11.1	59.5	66.5	115.4	29.8	73.0	81.2	276.3	154.0	64.1	24.0
Critical	29.8	18.6	6.4	23.6	134.9	103.3	92.9	92.0	234.1	70.4	4.6	0.0
Dry	23.6	0.0	66.5	48.0	126.4	9.7	142.6	178.2	305.5	144.4	0.0	0.0
BN	164.5	65.3	78.4	14.4	61.0	0.0	47.7	104.1	296.4	210.7	34.6	0.0
AN	8.9	0.0	33.7	126.3	107.3	38.3	102.1	82.9	295.6	237.6	163.8	37.7
Wet	32.4	8.9	93.8	78.6	111.9	0.0	20.6	26.4	273.4	156.3	84.3	45.4

Table E.3-288. CCDW Victoria Canal Base exports (cfs).

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	0.0	0.0	0.0	0.0	0.0	0.0	250.0	222.8	0.0	0.0	250.0	226.4
1971	0.0	0.0	0.0	0.0	0.0	0.0	0.0	220.4	0.0	0.0	250.0	183.1
1972	0.0	0.0	0.0	83.1	0.0	0.0	0.0	0.0	0.0	250.0	250.0	136.7
1973	101.0	57.9	0.0	0.0	0.0	0.0	70.0	250.0	0.0	0.0	250.0	250.0
1974	0.0	0.0	0.0	0.0	0.0	0.0	250.0	222.8	0.0	0.0	250.0	250.0
1975	0.0	0.0	0.0	58.6	0.0	0.0	250.0	222.8	0.0	0.0	250.0	250.0
1976	0.0	0.0	0.0	71.0	0.0	0.0	0.0	0.0	190.1	159.6	86.9	104.6
1977	66.7	84.9	48.1	32.5	0.0	0.0	0.0	0.0	250.0	250.0	250.0	250.0
1978	250.0	210.0	192.0	0.0	0.0	0.0	70.0	250.0	0.0	0.0	250.0	250.0
1979	0.0	0.0	250.0	43.4	0.0	0.0	250.0	250.0	0.0	250.0	250.0	187.2
1980	126.9	92.7	34.3	0.0	138.0	0.0	250.0	250.0	0.0	0.0	250.0	250.0
1981	0.0	0.0	0.0	46.0	0.0	0.0	0.0	65.9	0.0	250.0	203.3	143.5
1982	123.7	96.3	0.0	0.0	0.0	0.0	70.0	250.0	0.0	0.0	70.0	250.0
1983	0.0	161.5	0.0	0.0	0.0	0.0	215.2	222.1	0.0	70.0	250.0	0.0
1984	0.0	157.5	0.0	113.7	0.0	0.0	250.0	222.8	0.0	0.0	250.0	250.0
1985	0.0	0.0	0.0	0.0	0.0	0.0	0.0	110.9	0.0	250.0	201.4	150.9
1986	134.9	117.9	44.1	0.0	0.0	0.0	250.0	250.0	0.0	0.0	250.0	250.0
1987	0.0	0.0	0.0	57.9	0.0	0.0	0.0	0.0	0.0	250.0	225.8	211.1
1988	130.7	83.1	56.3	0.0	0.0	0.0	0.0	0.0	0.0	250.0	169.4	139.9
1989	94.9	71.3	50.6	35.9	0.0	0.0	0.0	0.0	0.0	250.0	122.9	250.0
1990	250.0	207.3	181.6	175.9	0.0	0.0	0.0	0.0	0.0	250.0	250.0	250.0
1991	250.0	210.0	192.0	187.0	0.0	0.0	0.0	0.0	0.0	250.0	250.0	250.0
1992	250.0	210.0	192.0	187.0	0.0	0.0	0.0	0.0	0.0	250.0	250.0	250.0
1993	250.0	210.0	192.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	250.0	250.0
1994	0.0	0.0	250.0	32.5	0.0	0.0	0.0	0.0	0.0	213.3	82.2	111.9
1995	110.0	208.2	190.6	0.0	0.0	113.8	250.0	70.0	0.0	250.0	0.0	0.0
1996	0.0	0.0	0.0	0.0	0.0	0.0	250.0	250.0	0.0	0.0	250.0	242.9
1997	0.0	0.0	0.0	0.0	0.0	0.0	250.0	222.3	0.0	0.0	250.0	250.0
1998	0.0	0.0	0.0	0.0	47.0	0.0	250.0	215.7	0.0	250.0	0.0	0.0
1999	0.0	0.0	0.0	0.0	0.0	0.0	0.0	221.8	0.0	0.0	250.0	250.0
2000	0.0	0.0	0.0	0.0	0.0	0.0	250.0	229.7	0.0	0.0	250.0	250.0
2001	0.0	0.0	0.0	50.9	0.0	0.0	0.0	0.0	0.0	250.0	233.8	250.0
2002	152.6	115.5	62.2	0.0	0.0	0.0	0.0	0.0	0.0	250.0	159.6	181.9
2003	102.5	69.3	0.0	0.0	0.0	0.0	0.0	163.6	0.0	250.0	250.0	250.0
Average	70.4	69.5	56.9	34.6	5.4	3.3	100.7	128.9	12.9	130.7	207.5	199.1
Critical	135.3	113.6	131.4	98.0	0.0	0.0	0.0	0.0	62.9	231.8	191.2	193.8
Dry	41.3	31.1	18.8	31.8	0.0	0.0	0.0	29.5	0.0	250.0	191.1	197.9
BN	0.0	0.0	125.0	63.3	0.0	0.0	125.0	125.0	0.0	250.0	250.0	162.0
AN	138.4	106.6	69.7	0.0	23.0	0.0	106.7	190.6	0.0	41.7	250.0	250.0
Wet	28.4	57.0	18.1	13.3	3.6	8.8	195.0	216.4	0.0	43.8	197.7	184.8

Table E.3-289. EBMUD at Freeport export difference (cfs) All Transfers minus Base.

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1971	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1972	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1973	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1974	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1975	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1976	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	62.5	62.5	62.5
1977	62.5	62.5	62.5	62.5	62.5	62.5	62.5	62.5	62.5	62.5	62.5	62.5
1978	62.5	19.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1979	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1980	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1981	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	62.5	62.5	62.5
1982	62.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1983	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1984	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1985	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1986	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1987	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	62.5	62.5	62.5
1988	62.5	62.5	62.5	62.5	65.3	62.5	62.5	62.5	62.5	62.5	62.5	62.5
1989	62.5	7.5	0.0	0.0	0.0	0.0	0.0	62.5	62.5	62.5	62.5	62.5
1990	62.5	34.5	33.0	0.9	0.0	0.0	0.0	62.5	62.5	62.5	62.5	62.5
1991	67.9	0.0	0.0	0.0	0.0	62.5	62.5	62.5	62.5	62.5	62.5	62.5
1992	62.5	62.5	62.5	1.2	0.0	0.0	0.0	62.5	62.5	62.5	62.5	62.5
1993	0.0	6.8	9.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1994	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	62.5	62.5	62.5
1995	62.5	62.5	62.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1996	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1997	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1998	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1999	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2001	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	62.5	62.5	62.5
2002	62.5	62.5	62.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2003	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Average	18.5	11.2	10.5	3.7	3.8	5.5	5.5	11.0	11.0	20.2	20.2	20.2
Critical	45.4	31.7	31.5	18.2	18.3	26.8	26.8	44.6	44.6	62.5	62.5	62.5
Dry	20.8	11.7	10.4	0.0	0.0	0.0	0.0	10.4	10.4	41.7	41.7	41.7
BN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AN	10.4	4.4	1.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Wet	9.6	4.8	4.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table E.3-290. EBMUD at Freeport export (cfs) percent difference of All Transfers from Base.

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1971	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1972	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1973	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1974	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1975	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1976	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	73.1	73.1	73.1
1977	73.1	73.1	73.1	73.1	73.1	73.1	73.1	73.1	73.1	73.1	73.1	73.1
1978	73.1	23.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1979	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1980	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1981	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	73.1	73.1	73.1
1982	73.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1983	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1984	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1985	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1986	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1987	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	73.1	73.1	73.1
1988	73.1	73.1	73.1	73.1	79.0	73.1	73.1	73.1	73.1	73.1	73.1	73.1
1989	73.1	8.8	0.0	0.0	0.0	0.0	0.0	73.1	73.1	73.1	73.1	73.1
1990	73.1	40.3	38.6	1.1	0.0	0.0	0.0	73.1	73.1	73.1	73.1	73.1
1991	84.7	0.0	0.0	0.0	0.0	73.1	73.1	73.1	73.1	73.1	73.1	73.1
1992	73.1	73.1	73.1	1.4	0.0	0.0	0.0	73.1	73.1	73.1	73.1	73.1
1993	0.0	7.9	11.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1994	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	73.1	73.1	73.1
1995	73.1	73.1	73.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1996	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1997	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1998	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1999	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2001	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	73.1	73.1	73.1
2002	73.1	73.1	73.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2003	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Average	21.8	13.1	12.2	4.4	4.5	6.4	6.4	12.9	12.9	23.6	23.6	23.6
Critical	53.9	37.1	36.8	21.2	21.7	31.3	31.3	52.2	52.2	73.1	73.1	73.1
Dry	24.4	13.6	12.2	0.0	0.0	0.0	0.0	12.2	12.2	48.7	48.7	48.7
BN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AN	12.2	5.2	1.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Wet	11.2	5.6	5.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table E.3-291. CVP-Jones export difference (cfs) All Transfers minus Base.

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1971	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1972	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1973	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1974	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1975	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1976	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-7.9	0.0	962.3	1853.9	574.1
1977	-51.9	-45.0	-38.3	-52.7	-34.6	-33.0	-42.0	-14.5	0.0	1760.0	0.0	389.1
1978	-60.9	-41.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1979	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1980	0.0	0.0	0.0	0.0	722.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1981	0.0	-14.0	0.0	0.0	0.0	0.0	0.0	0.0	-28.6	0.0	611.5	0.0
1982	-37.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1983	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1984	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-13.4	0.0	0.0
1985	0.0	0.0	0.0	0.0	0.0	-9.1	0.0	0.0	-7.2	-9.2	-8.9	-4.1
1986	-3.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1987	0.0	-6.8	-5.0	0.0	0.0	0.0	-25.1	-51.1	-71.4	460.3	2369.0	555.9
1988	-72.3	-44.5	0.0	0.0	0.0	-62.6	0.0	-65.9	-29.6	1682.8	955.6	486.3
1989	-83.6	-64.5	0.0	-70.3	-65.3	0.0	0.0	-94.1	-83.0	0.0	630.0	0.0
1990	-55.5	-52.1	-45.9	0.0	0.0	0.0	0.0	0.0	0.0	1812.9	838.5	525.3
1991	-82.2	-78.6	-64.9	-60.9	0.0	0.0	0.0	0.0	-69.9	1551.8	689.1	397.6
1992	-67.9	-69.5	-53.7	-52.5	0.0	0.0	0.0	-105.9	-108.5	369.2	953.1	387.8
1993	0.0	-73.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1994	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	503.3
1995	-76.2	-42.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1996	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1997	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-33.6	0.0	-30.0
1998	-29.6	-38.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1999	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2000	0.0	0.0	-14.7	0.0	0.0	0.0	0.0	0.0	0.0	-18.5	0.0	0.0
2001	0.0	0.0	-12.3	0.0	0.0	0.0	0.0	0.0	-76.4	411.6	1223.4	554.4
2002	-100.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2003	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	235.6	0.0	0.0
Average	-21.2	-16.8	-6.9	-7.0	18.3	-3.1	-2.0	-10.0	-14.0	269.8	297.5	127.6
Critical	-47.1	-41.4	-29.0	-23.7	-4.9	-13.6	-6.0	-27.8	-29.7	1162.7	755.7	466.2
Dry	-30.7	-14.2	-2.9	-11.7	-10.9	-1.5	-4.2	-24.2	-44.4	143.8	804.2	184.4
BN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AN	-10.1	-19.1	-2.4	0.0	120.4	0.0	0.0	0.0	0.0	36.2	0.0	0.0
Wet	-11.3	-6.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-3.6	0.0	-2.3

Table E.3-292. CVP-Jones export (cfs) percent difference of All Transfers from Base.

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1971	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1972	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1973	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1974	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1975	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1976	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-1.0	0.0	28.8	171.6	24.1
1977	-2.4	-2.1	-1.2	-1.1	-2.6	-4.1	-5.3	-1.8	0.0	260.4	0.0	28.1
1978	-3.4	-2.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1979	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1980	0.0	0.0	0.0	0.0	59.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1981	0.0	-0.3	0.0	0.0	0.0	0.0	0.0	0.0	-1.7	0.0	15.3	0.0
1982	-0.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1983	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1984	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.3	0.0	0.0
1985	0.0	0.0	0.0	0.0	0.0	-0.3	0.0	0.0	-0.4	-0.2	-0.2	-0.1
1986	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1987	0.0	-0.2	-0.1	0.0	0.0	0.0	-3.1	-6.4	-4.4	11.1	130.7	17.5
1988	-1.6	-1.1	0.0	0.0	0.0	-7.8	0.0	-8.2	-9.0	57.7	53.1	23.4
1989	-2.6	-2.6	0.0	-2.5	-3.2	0.0	0.0	-11.8	-3.5	0.0	18.4	0.0
1990	-2.0	-1.6	-1.6	0.0	0.0	0.0	0.0	0.0	0.0	65.0	27.5	24.3
1991	-3.1	-3.1	-2.9	-7.6	0.0	0.0	0.0	0.0	-4.5	50.9	21.4	14.5
1992	-3.1	-2.9	-4.6	-2.4	0.0	0.0	0.0	-12.4	-4.7	8.7	29.6	15.7
1993	0.0	-2.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1994	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	13.0
1995	-4.4	-1.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1996	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1997	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.8	0.0	-0.7
1998	-0.7	-3.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1999	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2000	0.0	0.0	-0.4	0.0	0.0	0.0	0.0	0.0	0.0	-0.7	0.0	0.0
2001	0.0	0.0	-0.3	0.0	0.0	0.0	0.0	0.0	-3.3	9.8	42.7	24.4
2002	-2.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2003	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.5	0.0	0.0
Average	-0.8	-0.7	-0.3	-0.4	1.6	-0.4	-0.2	-1.2	-0.9	14.6	15.0	5.4
Critical	-1.7	-1.6	-1.5	-1.6	-0.4	-1.7	-0.8	-3.3	-2.6	67.4	43.3	20.4
Dry	-0.8	-0.5	-0.1	-0.4	-0.5	0.0	-0.5	-3.0	-2.2	3.5	34.5	7.0
BN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AN	-0.6	-0.8	-0.1	0.0	9.8	0.0	0.0	0.0	0.0	0.8	0.0	0.0
Wet	-0.5	-0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	-0.1

Table E.3-293. SWP-Banks export difference (cfs) All Transfers minus Base.

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1971	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1972	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1973	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1974	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1975	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1976	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-55.5	460.6	-52.5
1977	-42.5	-36.8	-31.4	-17.6	-28.3	-27.4	0.0	0.0	0.0	-86.2	637.0	-41.3
1978	0.0	-33.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1979	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1980	-12.1	0.0	0.0	0.0	13.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1981	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-9.5	0.0	1004.0	-96.2
1982	-30.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1983	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1984	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1985	0.0	0.0	0.0	0.0	0.0	-7.5	0.0	0.0	-3.2	-3.1	-3.0	-5.2
1986	-5.0	-8.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1987	0.0	-2.3	-4.0	0.0	0.0	0.0	-20.5	-19.9	-23.8	965.9	-36.9	-67.4
1988	-59.1	-52.3	0.0	0.0	0.0	-24.6	0.0	0.0	0.0	635.1	-41.6	-74.9
1989	-68.3	-78.8	0.0	-57.5	-53.4	0.0	0.0	-31.4	-27.7	-2.5	136.7	-76.4
1990	-45.4	-42.6	-37.6	0.0	0.0	0.0	0.0	0.0	0.0	395.5	-41.8	-75.9
1991	-35.1	-35.0	-27.3	-49.8	0.0	0.0	0.0	0.0	-31.9	166.4	-37.3	-66.1
1992	-55.5	-30.8	-61.1	-55.9	0.0	0.0	0.0	0.0	-30.1	1908.6	-40.0	-76.0
1993	0.0	-59.7	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1994	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-64.2	2418.7	-56.9
1995	0.0	-48.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1996	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1997	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1998	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1999	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2001	0.0	0.0	-10.1	0.0	0.0	0.0	0.0	0.0	-25.5	2002.9	-37.7	-68.6
2002	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-61.0	-16.3	-49.2	-25.3
2003	-2.9	-24.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	496.0	-14.6	-4.7
Average	-10.5	-13.3	-5.0	-5.3	-2.0	-1.8	-0.6	-1.5	-6.3	186.5	128.1	-23.2
Critical	-33.9	-28.2	-22.5	-17.6	-4.1	-7.4	0.0	0.0	-8.9	414.2	479.4	-63.4
Dry	-11.4	-13.5	-2.3	-9.6	-8.9	-1.2	-3.4	-8.6	-25.1	491.1	169.0	-56.5
BN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AN	-2.5	-19.6	0.0	0.0	2.2	0.0	0.0	0.0	0.0	82.7	-2.4	-0.8
Wet	-2.8	-4.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table E.3-294. SWP-Banks export (cfs) percent difference of All Transfers from Base.

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1971	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1972	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1973	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1974	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1975	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1976	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.8	19.8	-2.6
1977	-1.8	-1.8	-1.3	-1.9	-1.7	-3.5	0.0	0.0	-0.1	-15.5	86.6	-2.7
1978	0.0	-1.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1979	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1980	-0.2	0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1981	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.6	0.0	21.6	-1.8
1982	-0.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1983	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1984	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1985	0.0	0.0	0.0	0.0	0.0	-0.2	0.0	0.0	-0.2	0.0	-0.1	-0.1
1986	-0.2	-0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1987	0.0	-0.1	-0.1	0.0	0.0	0.0	-3.7	-1.2	-1.5	46.1	-3.7	-2.9
1988	-13.5	-5.8	0.0	0.0	0.0	-1.5	0.0	0.0	0.0	36.8	-11.9	-5.0
1989	-17.6	-2.2	0.0	-1.8	-4.0	0.0	0.0	-4.5	-1.2	0.0	1.9	-1.1
1990	-0.9	-2.3	-2.7	0.0	0.0	0.0	0.0	0.0	0.0	8.9	-7.6	-3.5
1991	-5.2	-2.6	-2.0	-12.0	0.0	0.0	0.0	0.0	-2.0	4.3	-9.8	-8.7
1992	-3.7	-2.4	-3.4	-2.6	0.0	0.0	0.0	0.0	-9.1	214.1	-11.4	-3.6
1993	0.0	-11.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1994	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.9	169.9	-1.5
1995	0.0	-2.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1996	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1997	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1998	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1999	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2001	0.0	0.0	-0.1	0.0	0.0	0.0	0.0	0.0	-2.7	81.5	-4.2	-2.2
2002	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-3.8	-0.2	-1.7	-0.5
2003	-0.2	-1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	7.9	-0.2	-0.1
Average	-1.3	-1.0	-0.3	-0.5	-0.2	-0.2	-0.1	-0.2	-0.6	11.2	7.3	-1.1
Critical	-3.6	-2.1	-1.4	-2.4	-0.2	-0.7	0.0	0.0	-1.6	35.3	33.7	-3.9
Dry	-2.9	-0.4	0.0	-0.3	-0.7	0.0	-0.6	-0.9	-1.7	21.2	2.3	-1.4
BN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AN	-0.1	-2.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.3	0.0	0.0
Wet	-0.1	-0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table E.3-295. CCDW Old River export difference (cfs) All Transfers minus Base.

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1971	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1972	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1973	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1974	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1975	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1976	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1977	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	18.5
1978	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1979	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1980	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1981	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1982	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1983	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1984	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1985	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1986	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1987	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	57.1	45.1
1988	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.7	0.0
1989	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	19.4
1990	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	18.5
1991	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	18.5
1992	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	36.7	22.0
1993	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1994	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1995	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1996	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1997	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1998	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1999	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2001	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	65.1	65.3
2002	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2003	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Average	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.7	6.1
Critical	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.4	11.1
Dry	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	20.4	21.6
BN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Wet	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table E.3-296. CCDW Old River export (cfs) percent difference of All Transfers from Base.

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1971	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1972	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1973	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1974	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1975	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1976	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1977	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	35.9
1978	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1979	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1980	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1981	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1982	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1983	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1984	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1985	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1986	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1987	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
1988	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0
1989	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	38.2
1990	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	35.9
1991	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	35.9
1992	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	110.4	46.0
1993	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1994	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1995	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1996	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1997	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1998	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1999	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1
2000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2001	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		1378.0
2002	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2003	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Average	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.6	47.6
Critical	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	18.4	21.9
Dry	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	283.3
BN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Wet	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table E.3-297. CCDW Rock Slough export difference (cfs) All Transfers minus Base.

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1971	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1972	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1973	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1974	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1975	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1976	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1977	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	81.3	81.3	65.5
1978	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1979	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1980	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1981	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1982	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1983	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1984	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1985	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1986	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1987	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	81.3	0.0	0.0
1988	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	81.3	0.0	0.0
1989	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	81.3	0.0	64.7
1990	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	81.3	81.3	65.5
1991	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	81.3	81.3	65.5
1992	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	81.3	44.6	62.0
1993	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1994	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1995	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1996	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1997	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1998	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1999	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2001	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	81.3	0.0	18.8
2002	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2003	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Average	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	19.1	8.5	10.1
Critical	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	58.1	41.2	36.9
Dry	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	40.7	0.0	13.9
BN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Wet	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table E.3-298. CCDW Rock Slough export (cfs) percent difference of All Transfers from Base.

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1971	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1972	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1973	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1974	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1975	0.1	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	0.0	0.0	0.0	0.0
1976	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1977	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	396.4	755.1	
1978	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1979	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1980	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1981	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1982	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1983	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1984	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1985	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1986	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1987	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	42.7	0.0	0.0
1988	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	38.6	0.0	0.0
1989	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	102.5	0.0	
1990	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	396.4	755.1	
1991	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	396.4	755.1	
1992	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	36.9		
1993	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1994	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0
1995	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1996	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1997	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1998	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1999	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2001	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	36.8	0.0	
2002	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2003	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Average	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	42.5	68.6	0.0
Critical	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	180.7	377.5	0.0
Dry	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	30.3	0.0	0.0
BN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Wet	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table E.3-299. CCDW Victoria Canal export difference (cfs) All Transfers minus Base.

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1971	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1972	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1973	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1974	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1975	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1976	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	81.3	81.3	84.0
1977	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1978	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1979	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1980	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1981	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1982	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1983	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1984	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1985	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1986	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1987	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	24.2	38.9
1988	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	80.6	84.0
1989	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	81.3	0.0
1990	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1991	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1992	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1993	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1994	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1995	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1996	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1997	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1998	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1999	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2001	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	16.2	0.0
2002	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2003	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Average	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.4	8.3	6.1
Critical	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	11.6	23.1	24.0
Dry	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	20.3	6.5
BN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Wet	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table E.3-300. CCDW Victoria Canal export (cfs) percent difference of All Transfers from Base.

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1971	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1972	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1973	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1974	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1975	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1976	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	51.0	93.6	80.3
1977	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1978	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1979	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1980	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1981	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1982	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1983	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1984	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1985	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1986	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1987	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	10.7	18.4
1988	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	47.6	60.1
1989	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	66.1	0.0
1990	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1991	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1992	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1993	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1994	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1995	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1996	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1997	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1998	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1999	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2001	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	6.9	0.0
2002	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2003	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Average	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.5	6.6	4.7
Critical	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	7.3	20.2	20.1
Dry	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	14.0	3.1
BN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Wet	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table E.3-301. EBMUD at Freeport export difference (cfs) No Groundwater Substitution minus Base.

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1971	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1972	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1973	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1974	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1975	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1976	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	62.5	62.5	62.5
1977	62.5	62.5	62.5	62.5	62.5	62.5	62.5	62.5	62.5	62.5	62.5	62.5
1978	62.5	19.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1979	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1980	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1981	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	62.5	62.5	62.5
1982	62.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1983	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1984	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1985	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1986	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1987	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	62.5	62.5	62.5
1988	62.5	62.5	62.5	62.5	65.3	62.5	62.5	62.5	62.5	62.5	62.5	62.5
1989	62.5	7.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	15.7	5.6
1990	0.0	12.6	33.0	0.9	0.0	0.0	0.0	62.5	62.5	62.5	62.5	62.5
1991	67.9	0.0	0.0	0.0	0.0	62.5	62.5	62.5	62.5	62.5	62.5	62.5
1992	62.5	62.5	62.5	1.2	0.0	0.0	0.0	62.5	62.5	62.5	62.5	62.5
1993	0.0	6.8	9.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1994	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	62.5	62.5	62.5
1995	62.5	62.5	62.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1996	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1997	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1998	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1999	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2001	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	62.5	62.5	62.5
2002	62.5	62.5	62.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2003	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Average	16.7	10.6	10.5	3.7	3.8	5.5	5.5	9.2	9.2	18.4	18.8	18.5
Critical	36.5	28.6	31.5	18.2	18.3	26.8	26.8	44.6	44.6	62.5	62.5	62.5
Dry	20.8	11.7	10.4	0.0	0.0	0.0	0.0	0.0	0.0	31.3	33.9	32.2
BN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AN	10.4	4.4	1.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Wet	9.6	4.8	4.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table E.3-302. EBMUD at Freeport export (cfs) percent difference of No Groundwater Substitution from Base.

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1971	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1972	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1973	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1974	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1975	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1976	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	73.1	73.1	73.1
1977	73.1	73.1	73.1	73.1	73.1	73.1	73.1	73.1	73.1	73.1	73.1	73.1
1978	73.1	23.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1979	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1980	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1981	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	73.1	73.1	73.1
1982	73.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1983	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1984	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1985	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1986	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1987	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	73.1	73.1	73.1
1988	73.1	73.1	73.1	73.1	79.0	73.1	73.1	73.1	73.1	73.1	73.1	73.1
1989	73.1	8.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	18.4	6.5
1990	0.0	14.8	38.6	1.1	0.0	0.0	0.0	73.1	73.1	73.1	73.1	73.1
1991	84.7	0.0	0.0	0.0	0.0	73.1	73.1	73.1	73.1	73.1	73.1	73.1
1992	73.1	73.1	73.1	1.4	0.0	0.0	0.0	73.1	73.1	73.1	73.1	73.1
1993	0.0	7.9	11.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1994	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	73.1	73.1	73.1
1995	73.1	73.1	73.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1996	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1997	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1998	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1999	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2001	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	73.1	73.1	73.1
2002	73.1	73.1	73.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2003	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Average	19.7	12.4	12.2	4.4	4.5	6.4	6.4	10.7	10.7	21.5	22.0	21.7
Critical	43.4	33.4	36.8	21.2	21.7	31.3	31.3	52.2	52.2	73.1	73.1	73.1
Dry	24.4	13.6	12.2	0.0	0.0	0.0	0.0	0.0	0.0	36.5	39.6	37.6
BN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AN	12.2	5.2	1.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Wet	11.2	5.6	5.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table E.3-303. CVP-Jones export difference (cfs) No Groundwater Substitution minus Base.

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1971	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1972	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1973	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1974	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1975	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1976	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	872.4	850.0	273.7
1977	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1070.5	0.0	222.4
1978	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1979	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1980	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1981	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1982	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1983	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1984	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1985	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1986	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1987	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	460.3	1154.1	273.7
1988	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1275.4	436.6	250.5
1989	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	13.0	0.0
1990	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1314.9	472.5	273.7
1991	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1070.5	393.2	222.4
1992	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	369.2	413.0	208.0
1993	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1994	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	198.0
1995	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1996	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1997	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1998	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1999	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2001	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	411.6	472.5	273.7
2002	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2003	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Average	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	201.3	123.7	64.6
Critical	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	853.3	366.5	235.5
Dry	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	145.3	273.3	91.2
BN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Wet	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table E.3-304. CVP-Jones export (cfs) percent difference of No Groundwater Substitution from Base.

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1971	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1972	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1973	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1974	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1975	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1976	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	26.1	78.7	11.5
1977	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	158.4	0.0	16.0
1978	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1979	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1980	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1981	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1982	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1983	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1984	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1985	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1986	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1987	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	11.1	63.7	8.6
1988	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	43.7	24.3	12.1
1989	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.4	0.0
1990	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	47.2	15.5	12.7
1991	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	35.1	12.2	8.1
1992	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	8.7	12.8	8.4
1993	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1994	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.1
1995	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1996	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1997	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1998	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1999	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2001	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	9.8	16.5	12.1
2002	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2003	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Average	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	10.0	6.6	2.8
Critical	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	45.6	20.5	10.6
Dry	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.5	13.4	3.4
BN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Wet	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table E.3-305. SWP-Banks export difference (cfs) No Groundwater Substitution minus Base.

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1971	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1972	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1973	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1974	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1975	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1976	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1977	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	393.2	0.0
1978	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1979	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1980	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1981	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-146.4	1057.1	-420.1
1982	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1983	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1984	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1985	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1986	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1987	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	224.7	0.0	0.0
1988	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1989	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-45.5	260.2	-33.6
1990	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1991	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1992	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1404.6	0.0	0.0
1993	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1994	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-229.4	1350.5	0.0
1995	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1996	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1997	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1998	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1999	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2001	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1459.3	0.0	0.0
2002	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2003	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	325.3	-244.0	-84.0
Average	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	88.0	82.9	-15.8
Critical	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	167.9	249.1	0.0
Dry	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	248.7	219.6	-75.6
BN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	54.2	-40.7	-14.0
Wet	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table E.3-306. SWP-Banks export (cfs) percent difference of No Groundwater Substitution from Base.

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1971	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1972	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1973	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1974	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1975	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1976	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1977	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	53.4	0.0
1978	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1979	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1980	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1981	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-2.1	22.7	-7.8
1982	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1983	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1984	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1985	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1986	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1987	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	10.7	0.0	0.0
1988	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1989	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.7	3.7	-0.5
1990	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1991	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1992	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	157.6	0.0	0.0
1993	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1994	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-3.3	94.9	0.0
1995	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1996	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1997	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1998	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1999	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2001	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	59.4	0.0	0.0
2002	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2003	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.2	-3.4	-1.3
Average	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	6.7	5.0	-0.3
Critical	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	22.0	21.2	0.0
Dry	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	11.2	4.4	-1.4
BN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.9	-0.6	-0.2
Wet	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table E.3-307. CCDW Old River export difference (cfs) No Groundwater Substitution minus Base.

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1971	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1972	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1973	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1974	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1975	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1976	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1977	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	18.5
1978	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1979	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1980	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1981	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1982	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1983	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1984	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1985	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1986	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1987	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	57.1	45.1
1988	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.7	0.0
1989	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1990	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	18.5
1991	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	18.5
1992	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	36.7	22.0
1993	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1994	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1995	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1996	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1997	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1998	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1999	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2001	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	65.1	65.3
2002	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2003	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Average	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.7	5.5
Critical	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.4	11.1
Dry	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	20.4	18.4
BN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Wet	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table E.3-308. CCDW Old River export (cfs) percent difference of No Groundwater Substitution from Base.

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1971	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1972	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1973	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1974	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1975	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1976	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1977	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	35.9
1978	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1979	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1980	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1981	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1982	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1983	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1984	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1985	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1986	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1987	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
1988	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0
1989	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1990	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	35.9
1991	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	35.9
1992	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	110.4	46.0
1993	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1994	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1995	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1996	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1997	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1998	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1999	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2001	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		1378.0
2002	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2003	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Average	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.6	46.4
Critical	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	18.4	21.9
Dry	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	275.6
BN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Wet	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table E.3-309. CCDW Rock Slough export difference (cfs) No Groundwater Substitution minus Base.

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1971	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1972	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1973	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1974	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1975	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1976	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1977	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	81.3	81.3	65.5
1978	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1979	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1980	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1981	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1982	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1983	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1984	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1985	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1986	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1987	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	81.3	0.0	0.0
1988	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	81.3	0.0	0.0
1989	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1990	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	81.3	81.3	65.5
1991	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	81.3	81.3	65.5
1992	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	81.3	44.6	62.0
1993	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1994	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1995	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1996	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1997	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1998	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1999	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2001	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	81.3	0.0	18.8
2002	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2003	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Average	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	16.7	8.5	8.2
Critical	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	58.1	41.2	36.9
Dry	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	27.1	0.0	3.1
BN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Wet	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table E.3-310. CCDW Rock Slough export (cfs) percent difference of No Groundwater Substitution from Base.

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1971	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1972	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1973	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1974	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1975	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1976	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1977	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	396.4	755.0	
1978	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1979	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1980	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1981	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1982	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1983	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1984	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1985	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1986	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1987	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	42.7	0.0	0.0
1988	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	38.6	0.0	0.0
1989	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1990	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	396.4	755.0	
1991	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	396.4	755.0	
1992	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	36.9		
1993	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1994	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1995	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1996	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1997	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1998	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1999	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2001	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	36.8	0.0	
2002	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2003	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Average	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	39.5	68.6	0.0
Critical	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	180.7	377.5	0.0
Dry	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	13.3	0.0	0.0
BN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Wet	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table E.3-311. CCDW Victoria Canal export difference (cfs) No Groundwater Substitution minus Base.

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1971	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1972	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1973	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1974	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1975	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1976	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	81.3	81.3	84.0
1977	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1978	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1979	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1980	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1981	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1982	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1983	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1984	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1985	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1986	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1987	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	24.2	38.9
1988	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	80.6	84.0
1989	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1990	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1991	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1992	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1993	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1994	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1995	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1996	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1997	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1998	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1999	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2001	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	16.2	0.0
2002	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2003	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Average	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.4	6.0	6.1
Critical	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	11.6	23.1	24.0
Dry	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	6.7	6.5
BN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Wet	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table E.3-312. CCDW Victoria Canal export difference (cfs) of No Groundwater Substitution from Base.

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1971	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1972	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1973	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1974	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1975	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1976	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	51.0	93.6	80.3
1977	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1978	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1979	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1980	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1981	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1982	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1983	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1984	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1985	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1986	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1987	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	10.7	18.4
1988	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	47.6	60.1
1989	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1990	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1991	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1992	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1993	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1994	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1995	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1996	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1997	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1998	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1999	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2001	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	6.9	0.0
2002	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2003	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Average	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.5	4.7	4.7
Critical	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	7.3	20.2	20.1
Dry	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.9	3.1
BN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Wet	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table E.3-313. EBMUD at Freeport export difference (cfs) No Crop Idle minus Base.

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1971	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1972	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1973	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1974	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1975	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1976	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	62.5	62.5	62.5
1977	62.5	62.5	62.5	62.5	62.5	62.5	62.5	62.5	62.5	62.5	62.5	62.5
1978	62.5	19.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1979	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1980	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1981	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	62.5	62.5	62.5
1982	62.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1983	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1984	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1985	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1986	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1987	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	62.5	62.5	62.5
1988	62.5	62.5	62.5	62.5	65.3	62.5	62.5	62.5	62.5	62.5	62.5	62.5
1989	62.5	7.5	0.0	0.0	0.0	0.0	0.0	62.5	62.5	62.5	62.5	62.5
1990	62.5	34.5	33.0	0.9	0.0	0.0	0.0	62.5	62.5	62.5	62.5	62.5
1991	67.9	0.0	0.0	0.0	0.0	62.5	62.5	62.5	62.5	62.5	62.5	62.5
1992	62.5	62.5	62.5	1.2	0.0	0.0	0.0	20.3	19.7	0.0	42.4	15.5
1993	0.0	6.8	9.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1994	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	62.5	62.5	62.5
1995	62.5	62.5	62.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1996	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1997	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1998	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1999	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2001	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	62.5	62.5	62.5
2002	62.5	62.5	62.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2003	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Average	18.5	11.2	10.5	3.7	3.8	5.5	5.5	9.8	9.8	18.4	19.6	18.8
Critical	45.4	31.7	31.5	18.2	18.3	26.8	26.8	38.6	38.5	53.6	59.6	55.8
Dry	20.8	11.7	10.4	0.0	0.0	0.0	0.0	10.4	10.4	41.7	41.7	41.7
BN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AN	10.4	4.4	1.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Wet	9.6	4.8	4.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table E.3-314. EBMUD at Freeport export difference (cfs) No Crop Idle minus Base.

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1971	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1972	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1973	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1974	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1975	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1976	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	62.5	62.5	62.5
1977	62.5	62.5	62.5	62.5	62.5	62.5	62.5	62.5	62.5	62.5	62.5	62.5
1978	62.5	19.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1979	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1980	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1981	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	62.5	62.5	62.5
1982	62.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1983	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1984	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1985	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1986	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1987	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	62.5	62.5	62.5
1988	62.5	62.5	62.5	62.5	65.3	62.5	62.5	62.5	62.5	62.5	62.5	62.5
1989	62.5	7.5	0.0	0.0	0.0	0.0	0.0	62.5	62.5	62.5	62.5	62.5
1990	62.5	34.5	33.0	0.9	0.0	0.0	0.0	62.5	62.5	62.5	62.5	62.5
1991	67.9	0.0	0.0	0.0	0.0	62.5	62.5	62.5	62.5	62.5	62.5	62.5
1992	62.5	62.5	62.5	1.2	0.0	0.0	0.0	20.3	19.7	0.0	42.4	15.5
1993	0.0	6.8	9.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1994	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	62.5	62.5	62.5
1995	62.5	62.5	62.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1996	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1997	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1998	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1999	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2001	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	62.5	62.5	62.5
2002	62.5	62.5	62.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2003	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Average	18.5	11.2	10.5	3.7	3.8	5.5	5.5	9.8	9.8	18.4	19.6	18.8
Critical	45.4	31.7	31.5	18.2	18.3	26.8	26.8	38.6	38.5	53.6	59.6	55.8
Dry	20.8	11.7	10.4	0.0	0.0	0.0	0.0	10.4	10.4	41.7	41.7	41.7
BN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AN	10.4	4.4	1.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Wet	9.6	4.8	4.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table E.3-315 EBMUD at Freeport export (cfs) percent difference of No Crop Idle from Base.

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1971	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1972	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1973	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1974	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1975	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1976	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	73.1	73.1	73.1
1977	73.1	73.1	73.1	73.1	73.1	73.1	73.1	73.1	73.1	73.1	73.1	73.1
1978	73.1	23.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1979	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1980	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1981	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	73.1	73.1	73.1
1982	73.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1983	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1984	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1985	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1986	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1987	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	73.1	73.1	73.1
1988	73.1	73.1	73.1	73.1	79.0	73.1	73.1	73.1	73.1	73.1	73.1	73.1
1989	73.1	8.8	0.0	0.0	0.0	0.0	0.0	73.1	73.1	73.1	73.1	73.1
1990	73.1	40.3	38.6	1.1	0.0	0.0	0.0	73.1	73.1	73.1	73.1	73.1
1991	84.7	0.0	0.0	0.0	0.0	73.1	73.1	73.1	73.1	73.1	73.1	73.1
1992	73.1	73.1	73.1	1.4	0.0	0.0	0.0	23.7	23.1	0.0	49.6	18.1
1993	0.0	7.9	11.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1994	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	73.1	73.1	73.1
1995	73.1	73.1	73.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1996	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1997	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1998	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1999	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2001	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	73.1	73.1	73.1
2002	73.1	73.1	73.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2003	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Average	21.8	13.1	12.2	4.4	4.5	6.4	6.4	11.4	11.4	21.5	23.0	22.0
Critical	53.9	37.1	36.8	21.2	21.7	31.3	31.3	45.2	45.1	62.7	69.7	65.2
Dry	24.4	13.6	12.2	0.0	0.0	0.0	0.0	12.2	12.2	48.7	48.7	48.7
BN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AN	12.2	5.2	1.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Wet	11.2	5.6	5.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table E.3-316. CVP-Jones export difference (cfs) No Crop Idle minus Base.

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1971	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1972	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1973	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1974	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1975	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1976	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-7.9	0.0	944.1	1114.4	352.2
1977	-51.8	-45.0	-38.3	-52.7	-34.6	-33.0	-42.0	-14.5	0.0	918.2	0.0	173.6
1978	-60.9	-41.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1979	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1980	0.0	0.0	0.0	0.0	722.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1981	0.0	-14.0	0.0	0.0	0.0	0.0	0.0	0.0	-28.6	0.0	611.5	0.0
1982	-37.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1983	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1984	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-13.4	0.0	0.0
1985	0.0	0.0	0.0	0.0	0.0	-9.1	0.0	0.0	-7.2	-9.2	-8.9	-4.1
1986	-3.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1987	0.0	-6.8	-4.9	0.0	0.0	0.0	-25.1	-51.1	-71.4	460.3	1530.7	334.0
1988	-72.3	-44.5	0.0	0.0	0.0	-62.6	0.0	-65.9	-29.6	1682.8	468.6	276.6
1989	-83.5	-64.5	0.0	-70.2	-65.3	0.0	0.0	-94.1	-83.0	0.0	629.9	0.0
1990	-55.5	-52.1	-46.0	0.0	0.0	0.0	0.0	0.0	0.0	1377.4	494.9	303.5
1991	-82.2	-78.6	-64.9	-60.9	0.0	0.0	0.0	0.0	-69.9	911.2	355.2	182.0
1992	-67.9	-69.5	-53.7	-52.5	0.0	0.0	0.0	-105.9	-108.5	369.2	616.6	197.8
1993	0.0	-73.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1994	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	305.3
1995	-76.2	-43.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1996	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1997	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-33.6	0.0	-30.0
1998	-29.6	-38.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1999	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2000	0.0	0.0	-14.7	0.0	0.0	0.0	0.0	0.0	0.0	-18.5	0.0	0.0
2001	0.0	0.0	-12.3	0.0	0.0	0.0	0.0	0.0	-76.3	411.6	536.0	332.6
2002	-100.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2003	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	235.6	0.0	0.0
Average	-21.2	-16.8	-6.9	-6.9	18.3	-3.1	-2.0	-10.0	-14.0	212.8	186.7	71.3
Critical	-47.1	-41.4	-29.0	-23.7	-4.9	-13.7	-6.0	-27.7	-29.7	886.1	435.7	255.8
Dry	-30.7	-14.2	-2.9	-11.7	-10.9	-1.5	-4.2	-24.2	-44.4	143.8	549.9	110.4
BN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AN	-10.2	-19.0	-2.5	0.0	120.4	0.0	0.0	0.0	0.0	36.2	0.0	0.0
Wet	-11.3	-6.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-3.6	0.0	-2.3

Table E.3-317. CVP-Jones export (cfs) percent difference of No Crop Idle from Base.

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1971	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1972	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1973	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1974	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1975	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1976	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-1.0	0.0	28.3	103.2	14.8
1977	-2.4	-2.1	-1.2	-1.1	-2.6	-4.1	-5.2	-1.8	0.0	135.9	0.0	12.5
1978	-3.4	-2.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1979	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1980	0.0	0.0	0.0	0.0	59.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1981	0.0	-0.3	0.0	0.0	0.0	0.0	0.0	0.0	-1.7	0.0	15.3	0.0
1982	-0.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1983	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1984	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.3	0.0	0.0
1985	0.0	0.0	0.0	0.0	0.0	-0.3	0.0	0.0	-0.4	-0.2	-0.2	-0.1
1986	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1987	0.0	-0.2	-0.1	0.0	0.0	0.0	-3.1	-6.4	-4.4	11.1	84.4	10.5
1988	-1.6	-1.1	0.0	0.0	0.0	-7.8	0.0	-8.2	-9.0	57.7	26.0	13.3
1989	-2.6	-2.6	0.0	-2.5	-3.2	0.0	0.0	-11.8	-3.5	0.0	18.4	0.0
1990	-2.0	-1.6	-1.6	0.0	0.0	0.0	0.0	0.0	0.0	49.4	16.3	14.1
1991	-3.1	-3.1	-2.9	-7.6	0.0	0.0	0.0	0.0	-4.5	29.9	11.0	6.7
1992	-3.1	-2.9	-4.6	-2.4	0.0	0.0	0.0	-12.4	-4.7	8.7	19.1	8.0
1993	0.0	-2.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1994	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	7.9
1995	-4.4	-1.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1996	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1997	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.8	0.0	-0.7
1998	-0.7	-3.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1999	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2000	0.0	0.0	-0.4	0.0	0.0	0.0	0.0	0.0	0.0	-0.7	0.0	0.0
2001	0.0	0.0	-0.3	0.0	0.0	0.0	0.0	0.0	-3.3	9.8	18.7	14.7
2002	-2.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2003	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.5	0.0	0.0
Average	-0.8	-0.7	-0.3	-0.4	1.6	-0.4	-0.2	-1.2	-0.9	9.8	9.2	3.0
Critical	-1.7	-1.6	-1.5	-1.6	-0.4	-1.7	-0.7	-3.3	-2.6	44.3	25.1	11.0
Dry	-0.8	-0.5	-0.1	-0.4	-0.5	0.0	-0.5	-3.0	-2.2	3.5	22.8	4.2
BN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AN	-0.6	-0.8	-0.1	0.0	9.8	0.0	0.0	0.0	0.0	0.8	0.0	0.0
Wet	-0.5	-0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	-0.1

Table E.3-318. SWP-Banks export difference (cfs) No Crop Idle minus Base.

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1971	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1972	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1973	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1974	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1975	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1976	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-20.6	-27.3	-52.5
1977	-42.4	-36.8	-31.3	-17.6	-28.3	-27.4	0.0	0.0	0.0	-86.2	303.3	-41.2
1978	0.0	-33.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1979	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1980	-12.1	0.0	0.0	0.0	12.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1981	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-9.5	-4.0	973.6	-103.6
1982	-30.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1983	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1984	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1985	0.0	0.0	0.0	0.0	0.0	-7.4	0.0	0.0	-3.2	-3.1	-3.0	-5.1
1986	-4.9	-9.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1987	0.0	-2.3	-4.0	0.0	0.0	0.0	-20.6	-19.9	-23.8	587.6	-36.9	-67.4
1988	-59.2	-52.3	0.0	0.0	0.0	-24.6	0.0	0.0	0.0	-28.0	-41.6	-75.0
1989	-68.3	-78.8	0.0	-57.5	-53.5	0.0	0.0	-31.4	-27.7	-2.6	136.7	-76.3
1990	-45.4	-42.6	-37.6	0.0	0.0	0.0	0.0	0.0	0.0	-36.3	-41.9	-75.8
1991	-35.1	-34.9	-27.2	-49.8	0.0	0.0	0.0	0.0	-31.9	-34.8	-37.4	-66.1
1992	-55.5	-30.8	-61.1	-55.9	0.0	0.0	0.0	0.0	-30.1	1129.4	-40.0	-76.0
1993	0.0	-59.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1994	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.7	1270.4	-56.9
1995	0.0	-48.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1996	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1997	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1998	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1999	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2001	0.0	0.0	-10.1	0.0	0.0	0.0	0.0	0.0	-25.4	1473.7	-37.7	-68.6
2002	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-61.0	-16.3	-49.2	-25.3
2003	-2.9	-24.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	496.0	-14.6	-4.7
Average	-10.5	-13.3	-5.0	-5.3	-2.0	-1.7	-0.6	-1.5	-6.3	101.6	69.2	-23.4
Critical	-33.9	-28.2	-22.5	-17.6	-4.0	-7.4	0.0	0.0	-8.9	131.8	197.9	-63.4
Dry	-11.4	-13.5	-2.4	-9.6	-8.9	-1.2	-3.4	-8.5	-25.1	339.2	163.9	-57.7
BN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AN	-2.5	-19.6	0.0	0.0	2.2	0.0	0.0	0.0	0.0	82.7	-2.4	-0.8
Wet	-2.7	-4.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table E.3-319. SWP-Banks export (cfs) percent difference of No Crop Idle from Base.

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1971	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1972	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1973	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1974	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1975	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1976	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.3	-1.2	-2.6
1977	-1.8	-1.8	-1.3	-1.9	-1.7	-3.5	0.0	0.0	0.0	-15.5	41.2	-2.7
1978	0.0	-1.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1979	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1980	-0.2	0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1981	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.6	-0.1	20.9	-1.9
1982	-0.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1983	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1984	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1985	0.0	0.0	0.0	0.0	0.0	-0.2	0.0	0.0	-0.2	0.0	-0.1	-0.1
1986	-0.2	-0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1987	0.0	-0.1	-0.1	0.0	0.0	0.0	-3.7	-1.2	-1.5	28.0	-3.7	-2.9
1988	-13.5	-5.8	0.0	0.0	0.0	-1.5	0.0	0.0	0.0	-1.6	-11.9	-5.0
1989	-17.7	-2.2	0.0	-1.8	-4.0	0.0	0.0	-4.5	-1.2	0.0	1.9	-1.1
1990	-0.9	-2.3	-2.7	0.0	0.0	0.0	0.0	0.0	0.0	-0.8	-7.6	-3.5
1991	-5.2	-2.6	-2.0	-12.0	0.0	0.0	0.0	0.0	-2.0	-0.9	-9.8	-8.7
1992	-3.7	-2.4	-3.4	-2.6	0.0	0.0	0.0	0.0	-9.1	126.7	-11.4	-3.6
1993	0.0	-11.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1994	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	89.2	-1.5
1995	0.0	-2.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1996	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1997	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1998	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1999	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2001	0.0	0.0	-0.1	0.0	0.0	0.0	0.0	0.0	-2.7	60.0	-4.2	-2.2
2002	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-3.8	-0.2	-1.7	-0.5
2003	-0.2	-1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	7.9	-0.2	-0.1
Average	-1.3	-1.0	-0.3	-0.5	-0.2	-0.2	-0.1	-0.2	-0.6	6.0	3.0	-1.1
Critical	-3.6	-2.1	-1.4	-2.4	-0.2	-0.7	0.0	0.0	-1.6	15.4	12.6	-3.9
Dry	-2.9	-0.4	0.0	-0.3	-0.7	0.0	-0.6	-0.9	-1.7	14.6	2.2	-1.4
BN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AN	-0.1	-2.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.3	0.0	0.0
Wet	-0.1	-0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

1 **Table E.3-319 CCDW Old River export difference (cfs) No Crop Idle minus Base.**

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1971	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1972	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1973	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1974	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1975	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1976	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1977	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	18.5
1978	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1979	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1980	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1981	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1982	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1983	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1984	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1985	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1986	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1987	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	57.1	45.1
1988	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.7	0.0
1989	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	19.4
1990	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	18.5
1991	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	18.5
1992	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	36.7	22.0
1993	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1994	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1995	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1996	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1997	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1998	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1999	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2001	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	65.1	65.3
2002	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2003	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Average	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.7	6.1
Critical	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.4	11.1
Dry	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	20.4	21.6
BN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Wet	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

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Table E.3-320. CCDW Old River export (cfs) percent difference of No Crop Idle from Base.

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1971	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1972	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1973	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1974	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1975	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1976	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1977	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	35.9
1978	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1979	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1980	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1981	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1982	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1983	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1984	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1985	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1986	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1987	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
1988	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0
1989	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	38.2
1990	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	35.9
1991	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	35.9
1992	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	110.4	46.0
1993	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1994	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1995	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1996	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1997	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1998	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1999	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2001	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		1378.0
2002	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2003	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Average	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.6	47.6
Critical	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	18.4	21.9
Dry	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	283.3
BN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Wet	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table E.3-321. CCDW Rock Slough export difference (cfs) No Crop Idle minus Base.

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1971	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1972	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1973	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1974	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1975	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1976	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1977	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	81.3	81.3	65.5
1978	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1979	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1980	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1981	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1982	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1983	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1984	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1985	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1986	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1987	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	81.3	0.0	0.0
1988	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	81.3	0.0	0.0
1989	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	81.3	0.0	64.7
1990	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	81.3	81.3	65.5
1991	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	81.3	81.3	65.5
1992	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	81.3	44.6	62.0
1993	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1994	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1995	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1996	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1997	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1998	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1999	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2001	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	81.3	0.0	18.8
2002	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2003	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Average	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	19.1	8.5	10.1
Critical	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	58.1	41.2	36.9
Dry	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	40.7	0.0	13.9
BN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Wet	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table E.3-322. CCDW Rock Slough export (cfs) percent difference of No Crop Idle from Base.

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1971	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1972	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1973	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1974	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1975	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1976	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1977	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	396.4	755.0	
1978	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1979	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1980	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1981	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1982	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1983	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1984	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1985	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1986	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1987	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	42.7	0.0	0.0
1988	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	38.6	0.0	0.0
1989	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	102.5	0.0	
1990	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	396.4	755.0	
1991	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	396.4	755.0	
1992	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	36.9		
1993	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1994	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1995	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1996	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1997	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1998	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1999	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2001	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	36.8	0.0	
2002	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2003	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Average	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	42.5	68.6	0.0
Critical	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	180.7	377.5	0.0
Dry	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	30.3	0.0	0.0
BN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Wet	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table E.3-333. CCDW Victoria Canal export difference (cfs) No Crop Idle minus Base.

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1971	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1972	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1973	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1974	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1975	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1976	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	81.3	81.3	84.0
1977	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1978	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1979	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1980	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1981	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1982	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1983	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1984	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1985	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1986	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1987	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	24.2	38.9
1988	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	80.6	84.0
1989	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	81.3	0.0
1990	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1991	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1992	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1993	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1994	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1995	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1996	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1997	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1998	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1999	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2001	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	16.2	0.0
2002	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2003	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Average	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.4	8.3	6.1
Critical	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	11.6	23.1	24.0
Dry	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	20.3	6.5
BN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Wet	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table E.3-334. CCDW Victoria Canal export (cfs) percent difference of No Crop Idle from Base.

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1971	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1972	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1973	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1974	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1975	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1976	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	51.0	93.6	80.3
1977	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1978	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1979	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1980	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1981	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1982	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1983	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1984	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1985	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1986	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1987	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	10.7	18.4
1988	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	47.6	60.1
1989	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	66.1	0.0
1990	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1991	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1992	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1993	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1994	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1995	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1996	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1997	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1998	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1999	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2001	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	6.9	0.0
2002	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2003	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Average	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.5	6.6	4.7
Critical	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	7.3	20.2	20.1
Dry	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	14.0	3.1
BN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Wet	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Appendix D, Groundwater Model Documentation of the 2014 Draft EIS/EIR

Page D-1

The following text is inserted after the first paragraph on page D-1 of the 2014 Draft EIS/EIR is revised as follows:

> ~~D~~*In 2011, prior to selecting the SACFEM model for use in this EIS/EIR analysis, a model evaluation process was undertaken to select the best fitting tool for the groundwater analysis in the EIS/EIR. Each model evaluated, including the selected SACFEM model, has undergone changes and updates*

over the past few years since the model evaluation. Where appropriate, the text below includes notes as to the more recent model updates/additions.

D.1 Model Evaluation

D.1.1 Introduction

This EIS/EIR analyzes the environmental effects of a variety of types of transfers, including groundwater substitution transfers. For groundwater substitution transfers, a willing seller would pump additional groundwater for irrigation in lieu of a surface water supply. The surface water would then be transferred to the buyer. Additional groundwater pumping could affect the groundwater system through: (1) a decline in groundwater levels (resulting in potential water quality and subsidence concerns) and (2) a change in the groundwater/surface water interaction flows.

A quantitative model can help analyze these impacts by simulating groundwater conditions with the additional groundwater pumping. The distinction between the model code (the computational "engine" behind the simulation) and the model application (the use of the code to simulate conditions in a certain area) should be noted. The process evaluated several available groundwater models against criteria that were deemed relevant to the required EIS/EIR analysis.

D.1.2 Evaluation Criteria

The following criteria were used to evaluate the potential use of several available groundwater models.

Numerical Code. *The numerical modeling code must be available for use by others. The code should also have sufficient technical review and/or benchmarking tests to illustrate the model computationally performs in accordance with established solution techniques.*

Spatial Extent. *The model must encompass most of the Sacramento Valley where potential sellers are located.*

Grid. *The model's grid should be sufficiently refined such that accurate results (e.g., groundwater levels, changes to groundwater/surface water interaction flows) are simulated. Grid sizes that are too large will not provide accurate results at the scale needed for this study. If the grid is not acceptably discretized, the grid must be able to be refined relatively easily to accommodate the needs of this work.*

Transient Calibration. *The model application should have been calibrated over transient conditions. A steady-state calibration is, likely, not sufficient for this study because groundwater substitution transfers have the potential to occur over varying hydrologic year types. Therefore, the model should be calibrated over a transient period long enough to encompass multiple hydrologic conditions.*

Technical Review. *The model application has been thoroughly reviewed and deemed adequate for use in this type of modeling study.*

Availability. *The model application must be available for public use in the time frame of this study.*

D.1.3 Available Models

The majority of potential sellers that would be transferring water through groundwater substitution are in the Sacramento Valley. There are several groundwater models that encompass some or all of the Sacramento Valley. These models are briefly described below. The evaluation criteria from the previous section are included along with a brief discussion of the adequacy of the model to meet the criteria.

D.1.3.1 C2VSIM

The California Central Valley Groundwater-Surface Water Simulation Model (C2VSIM) was developed by the California Department of Water Resources (DWR) and uses the Integrated Water Flow Model (IWFM) numerical code. IWFM is a finite-element code that simulates groundwater flow and groundwater/surface water interaction. The model is capable of estimating the amount of historical and future groundwater pumping based on input data such as cropping, evapotranspiration, and surface water delivery patterns. At the time of the model selection, C2VSIM simulated conditions in the entire Central Valley over the period of Water Years[4] (WY) 1921 through 2003 on a monthly basis. The model grid was relatively coarse in both the horizontal and vertical directions (three layers, 1,393 nodes, and 1,392 elements). The model simulates 72 stream reaches, two lakes, and eight bypass canals. There are 97 surface water diversion points simulated in model. Water accounting is carried out over 21 subregions that use four land use types (agriculture, urban, native, and riparian).

Numerical Code. *The IWFM code used by C2VSIM is available for use. This code and many of its components have been tested by DWR.*

Spatial Extent. *C2VSIM covers the entire Central Valley.*

Grid. *C2VSIM's grid spacing varies throughout the model. In general, node spacing is on the order of miles. This node spacing is not adequate for simulation of potential impacts at the scale needed (see note below).*

Transient Calibration. *C2VSIM is calibrated for WY 1921 through 2003 (see note below).*

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[4] *A water year runs from October 1 of the previous calendar year through September 30 of the current calendar year (for example, water year 1970 includes the period of October 1, 1969 through September 30, 1970).*

Technical Review. *The code has been tested and used.*

Availability. *This model would be available for use.*

Note: Since the model selection was completed, C2VSIM has been updated to include simulation through WY 2009. A "fine grid" version of C2VSIM has recently been developed and would be available for use. However, this version was not available at the time this study began.

D.1.3.2 CVHM

The Central Valley Hydrologic Model (CVHM) was developed by the U.S. Geologic Survey (USGS) to aid in making water management decisions throughout the Central Valley (Faunt 2009). The model focuses on groundwater availability and changes in storage. CVHM uses the MODFLOW-2000 finite-difference numerical model code. MODFLOW, developed and maintained by the USGS, is commonly believed to be the most widely accepted numerical modeling code in use. To develop CVHM, the USGS conducted a "texture analysis" of 8,500 drillers' logs to describe the sediment characteristics of aquifer materials. These characteristics were used to assign hydraulic conductivities to the model. CVHM uses the Farm Management Process to estimate groundwater pumping based on land use patterns and applied surface water, similar to IWFM.

CVHM uses a uniform 1-mile square grid to simulate conditions from WY 1962 through WY 2003 over the entire Central Valley. Similar to IWFM, water budgets are developed over 21 regions that use urban, native, and crop land use categories. The model simulates 43 inflows to streams in the valley and 66 diversions from streams.

Numerical Code. *The MODFLOW-2000 code used by CVHM is available for use. MODFLOW is an industry standard modeling platform.*

Spatial Extent. *CVHM covers the entire Central Valley.*

Grid. *CVHM's grid has uniform 1-mile by 1-mile square cells. The 1-mile spacing is not adequate for simulation of potential impacts at the scale needed. Several post-processing routines exist that allow the subdivision of all model cells and the extraction of boundary conditions. For example, each 1-mile cell could be divided into four sections yielding 0.5-mile cell spacing. Further subdivision is also possible (e.g. 16 sections would yield 0.25-mile (1,320 ft) cell spacing). Model runtime will increase as the number of cells is increased.*

Transient Calibration. *CVHM is calibrated for WY 1962 through 2003.*

Technical Review. *CVHM has been peer reviewed and published by the USGS as Professional Paper 1766.*

Availability. *CVHM is available for public use.*

D.1.3.3 SACFEM

The SACFEM model was developed to simulate groundwater conditions in the Sacramento Valley using the MicroFEM© finite-element numerical code. This model is capable of simulating groundwater conditions and groundwater/surface water interactions in the valley. The model contains 88,992 nodes and 177,095 elements and covers the entire Sacramento Valley groundwater basin from the Cosumnes River in the south to just north of Red Bluff. The model does not include the Redding or San Joaquin Valley groundwater basins as C2VSIM and CVHM do. The node spacing varies from 500 ft to 5,800 ft depending on the location in the model. The areas of fine node discretization exist where detailed groundwater and groundwater/surface water results were required during the development of the model.

SACFEM uses input from the Integrated Demand Calculator (IDC) as guidance to assign deep percolation and groundwater pumping data. The IDC performs the water demand calculations (i.e., land use demand, surface water deliveries, and groundwater pumping) that IWFM and CVHM also conduct. The output from IDC is assigned as input to SACFEM.

- ***Numerical Code.*** *The MicroFEM code used by SACFEM is available for purchase. MicroFEM has been reviewed by the National Groundwater Association's (NGWA) Ground Water Journal (Diodato 2000).*

- ***Spatial Extent.*** *SACFEM covers the entire Sacramento Valley groundwater basin.*

- ***Grid.*** *SACFEM's grid spacing varies from 500 to 5,800 ft. The current version of the model has already been sufficiently refined in the areas near potential groundwater substitution sellers. However, additional grid refinement may be necessary depending on the locations of potential substitution sellers. Several pre- and post-processing tools can be used to facilitate this process (see note below).*

- ***Transient Calibration.*** *SACFEM is calibrated for years 1982 through 2003 (also see note below).*

- ***Technical Review.*** *The SACFEM model was peer reviewed in late 2010. The peer review identified several items that could be improved. The review listed seven items as Tier 1 (requires attention and revision/modification), three items as Tier 2 (strengthen model defensibility), and two items as Tier 3 (improve model features/capabilities) [see note below].*

- ***Availability.*** *The current version of SACFEM is available for use.*

Note: Several updates have been made to the SACFEM model since its initial selection for use in this analysis. The highest priority ("Tier 1") items identified during the peer review process were addressed to improve the technical *accuracy of the model. The model's calibration period was extended through WY 2010. The grid of the model was also refined to include smaller node spacing in the areas surrounding the potential sellers and in the areas of the flood bypasses in the valley. After updating the model and incorporating the technical feedback, the model was renamed from SACFEM to SACFEM2013. Further information on SACFEM2013 is provided in the sections below.*

D.1.3.4 HydroGeoSphere

The HydroGeoSphere (HGS) model code is being applied to the Sacramento Valley. HGS is likely the most computationally comprehensive of the models discussed here. The code simultaneously solves the groundwater and surface water flow equation and is capable of using sub-gridding (i.e., localized grid refinement) and sub-timing (i.e., varying time steps to improve accuracy) routines. The sub-gridding process would be valuable to improve the accuracy of simulated results near pumping centers, for example. At this time, little additional information regarding the Sacramento Valley application of HydroGeoSphere is known (e.g., number of nodes, elements, rivers, etc.). The construction and calibration of this model are understood to be on-going.

Numerical Code. *The HGS code is available for purchase. The extent of testing is unknown.*

Spatial Extent. *The Sacramento Valley application of HGS covers the entire groundwater basin.*

Grid. *Work on HGS is underway to allow for sub-gridding. The sub-gridding functionality may not be complete at this time.*

Transient Calibration. *The transient calibration in the Sacramento Valley application of HGS is not complete at this point.*

Technical Review. *The Sacramento Valley application of the HGS model is not complete and, therefore, has not had technical review.*

Availability. *The Sacramento Valley application of the HGS model is not complete.*

D.1.3.5 Local Models

In addition to the larger-scale models listed above which cover the Sacramento and/or Central Valleys, several smaller, local groundwater models also exist. These models include applications to the Butte County, Stony Creek Fan, Lower Colusa basin, North American River, Sacramento County, Yolo, and Yuba County areas. The combined extent of each of these models covers much of the Sacramento Valley. Many of the models have been developed in either IWFM or its predecessor, the Integrated Groundwater-Surface Water Model (IGSM). For the most part, each of these local models occupies a separate area and does not overlap extensively with another local model. Therefore, where adjoining models abut, separate boundary conditions have been established for each *model. It is possible that the boundary conditions do not fully agree with each other. Additionally, each model may have differing interpretations of hydraulic conductivity and layering. Each model was developed separately and each may not have the most up-to date data included.*

- ***Numerical Code.*** *The majority of the local models were developed in either IWFM or IGSM. These codes would be available for use.*

- ***Spatial Extent.*** *The combined extent of the local models covers most of the Sacramento Valley. The areas east and west of Red Bluff are not covered by one of the local models. Even though the models cover most of the Sacramento Valley, the simulation of potential impacts may be difficult if the impacts exceed each of the separate model's areas.*

- ***Grid.*** *The grid spacing in some of the local models is likely sufficient, but grid spacing for some models is unknown. Revisions to the grid(s) and input data may be required if the grid spacing is deemed too large.*

- ***Transient Calibration.*** *Several of the local models (Stony Creek Fan, Butte County, Yuba County, and Yolo County) have been calibrated over an approximate 30-year period. The Lower Colusa model is calibrated for a 19-year period. The calibration period for the other models is not known at this point.*

- ***Technical Review.*** *The status of technical reviews of these models is not known. Most of the models have, likely, not undergone significant technical or peer reviews.*

- ***Availability.*** *The availability of each of the models would need to be determined by the model's owner. Because most of the models were developed for public agencies they should be available. However, the exact availability for each of the local models is not known.*

D.1.4 Selection

Based on the evaluation criteria described above, the SACFEM model was selected for use in the analysis for this EIS/EIR. The model was updated to the SACFEM2013 version as part of this EIS/EIR to address the peer review comments. SACFEM2013 was used for this EIS/EIR.

D.2 SACFEM2013

This section provides a more detailed description of SACFEM2013. Appendix H is the SACFEM User's Manual.

The heading for Section D.1, entitled *Model Code Description*, on page D-1 of the 2014 Draft EIS/EIR is revised as follows:

D.2.1 Model Code Description

Page D-2

The heading for Section D.2, entitled Sacramento Valley Groundwater Basin, on page D-2 of the 2014 Draft EIS/EIR is revised as follows:

D.2.2 Sacramento Valley Groundwater Basin

The heading for Section D.2.1, entitled *Geologic Setting*, on page D-2 of the 2014 Draft EIS/EIR is revised as follows:

D.2.2.1 Geologic Setting

The heading for Section D.2.2, entitled *Hydrology*, on page D-2 of the 2014 Draft EIS/EIR is revised as follows:

D.2.2.2 Hydrology

Page D-3

The first sentence on page D-3 of the 2014 Draft EIS/EIR is revised as follows:

> Streamflow data for streams throughout the Sacramento Valley are collected at gaging stations operated by ~~the California Department of Water Resources~~[2] ~~(~~DWR~~)~~[3] and the ~~U.S. Geological Survey~~ [4] ~~(~~USGS~~)~~[5].

The heading for Section D.2.3, entitled *Model Construction*, on page D-3 of the 2014 Draft EIS/EIR is revised as follows:

D.2.3 Model Construction

The heading for Section D.2.3.1, entitled *Spatial Grid*, on page D-3 of the 2014 Draft EIS/EIR is revised as follows:

D.2.3.1 Spatial Grid

The heading for Section D.3.2, entitled *Vertical Layering*, on page D-3 of the 2014 Draft EIS/EIR is revised as follows:

D.2.3.2 Vertical Layering

The first sentence in Section D.3.2, entitled *Vertical Layering*, on page D-3 of the 2014 Draft EIS/EIR is revised as follows:

> The total model thickness is defined by the thickness of the freshwater aquifer (less than 3,000 micromhos), as defined by Berkstresser (1973) and subsequently refined in the northern portion of the valley by DWR (DWR ~~2002~~*2005*).

Footnotes 2-5 on page D-3 of the 2014 Draft EIS/EIR is revised as follows:

~~[2] http://cdec.water.ca.gov/~~
[3] http://cdec.water.ca.gov/
~~[4] http://waterdata.usgs.gov/nwis~~
[5] http://waterdata.usgs.gov/nwis

Page D-4

The header for Section D.3.2.1, entitled *Total Aquifer Thickness*, on page D-4 of the 2014 Draft EIS/EIR is revised as follows:

~~D.3.2.1~~ Total Aquifer Thickness

The header for Section D.3.2.2, entitled *Model Layer Thickness*, on page D-4 of the 2014 Draft EIS/EIR is revised as follows:

~~D.3.2.2~~ Model Layer Thickness

Page D-5

The header for Section D.3.3, entitled *Model Time Discretization*, on page D-5 of the 2014 Draft EIS/EIR is revised as follows:

D.2.3.3 Model Time Discretization

The header for Section D.3.4, entitled *Boundary Conditions*, on page D-5 of the 2014 Draft EIS/EIR is revised as follows:

D.2.3.4 Boundary Conditions

The header for Section D.3.4.1, entitled *Head-dependent Boundaries,* on page D-5 of the 2014 Draft EIS/EIR is revised as follows:

~~D.3.4.1~~ Head-dependent Boundaries

Footnote 3 on page D-5 of the 2014 Draft EIS/EIR is revised as follows:

~~[3] A water year runs from October 1 of the previous calendar year through September 30 of the current calendar year (for example, water year 1970 includes the period of October 1, 1970 includes the period of October 1, 1969 through September 30, 1970).~~

Page D-11

The header for Section D.3.4.2, entitled *No-flow Boundaries*, on page D-11 of the 2014 Draft EIS/EIR is revised as follows:

~~D.3.4.2~~ No-flow Boundaries

The header for Section D.3.5, entitled *Surface Water Budget*, on page D-11 of the 2014 Draft EIS/EIR is revised as follows:

D.2.3.5 Surface Water Budget

The header for Section D.3.5.1, entitled *Approach*, on page D-11 of the 2014 Draft EIS/EIR is revised as follows:

~~D.3.5.1~~ Approach

The header for Section D.3.5.2, entitled *Methodology*, on page D-11 of the 2014 Draft EIS/EIR is revised as follows:

~~D.3.5.2~~ Methodology

Page D-12

The header for Section D.3.6, entitled *Aquifer Properties*, on page D-12 of the 2014 Draft EIS/EIR is revised as follows:

D.2.3.6 Aquifer Properties

Page D-14

The following text is inserted after the last paragraph on page D-14 of the 2014 Draft EIS/EIR is revised as follows:

D.3 Sensitivity

To test the sensitivity of the SACFEM2013 model to various hydrologic parameters, several sensitivity simulations have been run to-date. Each of these sensitivity simulations varied specific sets of hydraulic parameters. The following parameters were varied in simulations performed to-date.

1. *<u>Basin Deposits</u>: The hydraulic conductivity of the Basin deposits (geologic terms Qb, Qm, and Qp) were decreased. Basin deposits are generally surficial deposits of fine grain nature. Decreasing the hydraulic conductivity of the basin deposits would have the tendency to slow the flow of water from the surface to the groundwater.*
2. *<u>Stream Deposits</u>: The hydraulic conductivity of the Stream deposits (geologic terms Qsc, Qa, and Qal) were increased. Stream deposits are located along the historic channel of the river and represent a coarser grained material. Increasing the hydraulic conductivity of these deposits can allow faster movement of water through this area.*
3. *<u>Basin and Stream Deposits</u>: The hydraulic conductivity of the Basin deposits (geologic terms Qb, Qm, and Qp) were decreased, and the hydraulic conductivity of the Stream deposits (Qsc, Qa, and Qal) were increased. This simulation combines the changes made in the previous two simulations.*

4. *Horizontal Hydraulic Conductivity: The horizontal hydraulic conductivity throughout the model was decreased by one order of magnitude (i.e., all values were multiplied by 0.1). A decrease in hydraulic conductivity slows the movement of water through the aquifer.*
5. *Anisotropy Ratio: The anisotropy ratio (the ratio of horizontal hydraulic conductivity to vertical hydraulic conductivity) was changed across the entire model from 500:1 to 1000:1. Increasing this ratio from 500:1 to 1000:1 increases the resistance to flow in the vertical direction by decreasing the vertical hydraulic conductivity of the aquifer.*
6. *Storage Coefficients: The values of the storage coefficients were increased. The specific yield was increased from 0.12 to 0.2. The storativity value was increased by a factor of 10 across the entire model. Changes to storage coefficients also result in a change in the velocity of groundwater movement within the aquifer.*
7. *Streambed Hydraulic Conductivity. The hydraulic conductivity of each streambed was decreased by a factor of 10. Decreasing the hydraulic conductivity of the streambeds would slow movement of water between the surface water and groundwater systems.*

The SACFEM2013 model has been calibrated (as previously described). It should be noted that model was not recalibrated for each of the parameters sets listed above. The purpose of the sensitivity simulations is to determine which parameters the model results may or may not be sensitive to.

The sensitivity simulations were run with approximately 153,000 acre-feet of water pumped in a single year. This volume of water is roughly equivalent to the average of all pumping in transfer years under the Proposed Action. Pumping was specified at the locations and depths of the wells used in the Proposed Action. The change in groundwater level (i.e., drawdown) between simulations with and without the 153,000 acre-feet of pumping was plotted at three locations. Locations 6, 21, and 30 were selected as they are spread across the area where drawdown due to the Proposed Action is simulated (Figures 3.3-28a through 3.3-33c). Simulated drawdown has been plotted at each location for the water table and at the depth of pumping in the area surrounding that location.

Figures D-5 and D-6 show the simulated drawdown at Location 6. Figure D-5 shows the drawdown at the water table (model layer 1). Figure D-6 shows the drawdown in model layer 7. At the water table (Figure D-5), each of the simulations show similar or less drawdown as compared to the calibrated model. Three of the sensitivity simulations (stream bed conductivity, anisotropy ratio, hydraulic conductivity) show recovery period that is longer than the calibrated model. In the pumping zone (Figure D-6), two simulations (hydraulic conductivity, anisotropy ratio) show more drawdown than the calibrated model. Three of the simulations show a longer recovery period following the pumping. The increase anisotropy simulation has a similar, but slower recovery, than the calibrated model.

The higher storage coefficient and lower streambed conductivity simulations take additional years for the groundwater levels to recover from the pumping.

Figures D-7 and D-8 show similar results at Location 21. Figure D-7 shows the simulated drawdown in model layer 1. Figure D-8 shows the results in model layer 6, where pumping occurs in this area. The results at the water table (Figure D-7) are very similar to those shown for Location 6 (Figure D-5). In the pumping zone (Figure D-8), two simulations show an increase in the total drawdown (hydraulic conductivity, anisotropy ratio). The hydraulic conductivity simulation also shows a longer period to recover from the pumping. The simulation with altered storage coefficients also requires a longer period to recover, although drawdown in this simulation is significantly lower.

Figures D-9 and D-10 show the simulated drawdown at Location 30 in Layers 1 and 3, respectively. Similar to the other locations, the drawdown and recovery period at the water table (Figure D-9) show similar trends to those described for Location 6 (Figure D-5) and Location 21 (Figure D-7). At the depth of pumping (Figure D-10), two simulations (anisotropy ratio, hydraulic conductivity) show an increase in the amount of drawdown that is simulated as compared to the calibrated model. Two of the simulations (storage coefficients, hydraulic conductivity) require a longer period for groundwater levels to recover than the calibrated model.

Appendix E, Groundwater Existing Conditions, of the RDEIR/SDEIS

As previously stated, Appendix E, Groundwater Existing Conditions, of the 2014 Draft EIS/EIR is re-lettered to Appendix F in this Final EIS/EIR.

The following figures have been added to Appendix E, Groundwater Existing Conditions of the RDEIR/SDEIS.:

<Insert Appendix E- Groundwater Existing Conditions

Appendix F, Groundwater Modeling Results, of the RDEIR/SDEIS

As previously stated, Appendix F, Groundwater Modeling Results, of the 2014 Draft EIS/EIR is re-lettered to Appendix G in this Final EIS/EIR.

The following figures have been added to Appendix F, Groundwater Modeling Results of the RDEIR/SDEIS:

<Insert Figures>

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Appendix R

Comments and Responses on the 2014 Draft EIS/EIR

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Appendix R
Comments and Responses on the 2014 Draft EIS/EIR

This appendix contains responses to comments received on the 2014 Draft Environmental Impact Statement/Environmental Impact Report (EIS/EIR), including all written comments received during the comment period and oral comments submitted at public meetings. The comment letters are included in Appendix T.

Table R-1 presents commenters and associated agencies or groups that submitted comments on the Draft EIS/EIR.

Table R-1.
List of Commenters

Commenter	Agency/Group	Date	Comment ID
Federal Agencies			
Kathleen Martyn Goforth	United States Environmental Protection Agency	12/15/2014	FA01
State Agencies			
Helen Birss	California Department of Fish and Wildlife	12/1/2014	SA01
Cindy Messer	Delta Stewardship Council	12/1/2014	SA02
Diane Riddle	State Water Resources Control Board	12/1/2014	SA03
Local Agencies			
Doug Teeter	Butte County Board of Supervisors	11/25/2014	LA01
Brendan Vieg	Chico, City of	12/1/2014	LA02
Jim Wallace	Colusa Drain Mutual Water Company	12/1/2014	LA03
Jennifer Buckman	Friant Water Authority	12/1/2014	LA04
Thaddeus Bettner	Glenn-Colusa Irrigation District	10/14/2014	LA05
Thaddeus Bettner	Glenn-Colusa Irrigation District	11/18/2014	LA06
Ricardo Ortega	Grassland Water District	12/1/2014	LA07
Osha Meserve	Local Agencies of the North Delta	12/1/2014	LA08
Lewis Bair	RD 108	12/1/2014	LA09
Karen Huss	Sacramento Metropolitan Air Quality Management District	11/25/2014	LA10
Garth Hall	Santa Clara Valley Water District	12/1/2014	LA11
John Herrick	South Delta Water Agency, Central Delta Water Agency	12/1/2014	LA12
Terry Erlewine	State Water Contractors	12/1/2014	LA13
Patrick Blacklock	Yolo County	12/1/2014	LA14
e-PUR	South Delta Water Agency, Central Delta Water Agency	12/1/2014	LA15

Commenter	Agency/Group	Date	Comment ID
Non-Governmental Organizations			
Kit Custis	AquAlliance, California Sportfishing Protection Alliance, Aqua Terra Aeris Law Group	11/25/2014	NG01
ECONorthwest	AquAlliance, California Sportfishing Protection Alliance, Aqua Terra Aeris Law Group	12/1/2014	NG02
Barbara Vlamis, Bill Jennings, Jason Flanders	AquAlliance, California Sportfishing Protection Alliance, Aqua Terra Aeris Law Group	12/1/2014	NG03
Kyran Mish	AquAlliance, California Sportfishing Protection Alliance, Aqua Terra Aeris Law Group	12/1/2014	NG04
Tom Cannon	AquAlliance, California Sportfishing Protection Alliance, Aqua Terra Aeris Law Group	12/1/2014	NG05
Robyn Difalco, Carol Perkins	Butte Environmental Council, Citizens Water Watch of Northern California, Butte-Sutter Basin Area Groundwater Users	12/1/2014	NG06
Jeffrey Volberg	California Waterfowl	12/1/2014	NG07
Chelsea Tu	Center for Biological Diversity	12/1/2014	NG08
Rachel Zwillinger	Defenders of Wildlife	10/23/2014	NG09
Rachel Zwillinger	Defenders of Wildlife	12/1/2014	NG10
Joni Stellar	Frack-Free Butte County	12/1/2014	NG11
Grace Marvin	Sierra Club, Yahi Group	12/1/2014	NG12
Jay Ziegler	The Nature Conservancy, California Chapter	12/1/2014	NG13
Individuals			
Bob Adams	n/a	10/21/2014	IN01
Geoffrey Baugher	n/a	10/22/2014	IN02
Linda Calbreath	n/a	11/25/2014	IN03
Lynne Elhardt	n/a	10/25/2014	IN04
Virginia Freeman	n/a	10/31/2014	IN05
Heather Gray	n/a	10/21/2014	IN06
Steven Hammond	n/a	11/30/2014	IN07
Scott Lape	n/a	10/21/2014	IN08
Linda Lohse	n/a	10/21/2014	IN09
John MacTavish	n/a	11/5/2014	IN10
H. Elena Middleton	n/a	10/21/2014	IN11
MBK Engineers	n/a	12/1/2014	IN12
Mary McCluskey	n/a	11/24/2014	IN13
Peter Ratner	n/a	10/21/2014	IN14
Edwin Roland McNutt	n/a	11/25/2014	IN15
Margaret Rader	n/a	10/24/2014	IN16
Sherri Scott	n/a	11/28/2014	IN17
Amalie Sorenson	n/a	10/27/2014	IN18
Tony St. Amant	n/a	10/24/2014	IN19
Tony St. Amant	n/a	11/3/2014	IN20
Karen Stinson	n/a	12/1/2014	IN21

Commenter	Agency/Group	Date	Comment ID
Paula Sunn	n/a	10/23/2014	IN22
Melinda Teves	n/a	10/21/2014	IN23
Sally Wallace	n/a	10/27/2014	IN24
Suzette Welch	n/a	11/27/2014	IN25
Seamus Yeo	n/a	12/1/2014	IN26
Julian Zener	n/a	11/24/2014	IN27
John Scott	n/a	12/3/2014	IN28

Key:
n/a = not applicable

Common Responses

Multiple comments were received on some issues. The Common Responses below provide responses to these groups of comments.

Common Response 1: CEQA Lead Agency

Commenters questioned whether San Luis & Delta-Mendota Water Authority (SLDMWA) is the appropriate California Environmental Quality Act (CEQA) lead agency, and several commenters opined the California Department of Water Resources (DWR) would be more appropriate. In Public Resources Code Section 21067, the CEQA statute defines a lead agency as “the public agency which has the principal responsibility for carrying out or approving a project which may have a significant effect upon the environment.” For the range of potential transfer activities analyzed in the EIS/EIR, SLDMWA is anticipated to be negotiating transfer agreements with potential sellers on behalf of the Participating Members, and as such, would be a key party in the range of potential transfers analyzed in the EIS/EIR. Each seller would be a key party to a transfer from their agency, but they would not be involved in any other transfer. Under the current regulatory framework, no single California public agency has regulatory responsibility for reviewing and approving all Central Valley Project (CVP) water transfers. As a potential facilitator, SLDWMA is a common party and has undertaken the responsibility to evaluate a range of potential transfers under CEQA in order to provide a more comprehensive and coordinated analysis as commenters have requested in the past.

Water transfers are voluntary actions proposed by willing buyers and sellers, and are not initiated by state agencies. DWR will not be a party involved in negotiating transfers, nor will the agency be a party to any of the transfer contracts. Some commenters suggest that DWR will approve transfers, but that is not accurate. Potential sellers identified in this EIS/EIR will submit transfer information to Reclamation for review and consideration for approval under federal and state law. DWR will have a coordination role in the process because it will coordinate with Reclamation on review of potential transfer information packages (to help ensure consistency between CVP-related transfers and non-CVP-related transfers). DWR may also help facilitate transfers through State Water Project (SWP) facilities in some years. This is not a role with “principal responsibility” such that DWR should be the CEQA lead agency. More information regarding management of water transfers in California and DWR’s role can be found on DWR’s website: http://wwwdwr.water.ca.gov/watertransfers/.

Common Response 2: Project Opposition

Commenters expressed opposition to transfers from the Sacramento Valley. The Lead Agencies (Reclamation and SLDMWA) recognize the range of potential transfer activities that are the subject of this EIS/EIR are of interest to many people, and opinions and viewpoints about water transfers vary; many are opposed to them. Reclamation and SLDMWA will consider all public input regarding the potential transfer activities analyzed in the EIS/EIR, as well as federal and state policies and regulations concerning water transfers, when evaluating transfer proposals and deciding how to proceed.

Common Response 3: Sacramento Valley Impacts

Commenters expressed concerns that potential effects of transfers on the Sacramento Valley must be considered, including effects on groundwater resources, terrestrial resources, fisheries, and local economies. The 2014 Draft EIS/EIR includes substantial analysis on these issues:

- Groundwater resources are analyzed in detail in Section 3.3. The impact analysis finds that Alternative 2 (Full Range of Transfers) and Alternative 3 (No Cropland Modifications) could result in potentially significant impacts related to groundwater levels and subsidence. Mitigation Measure GW-1, Mitigation and Monitoring Plans, includes monitoring and mitigation to avoid significant effects.

- Fisheries resources are analyzed in detail in Section 3.7. The analysis considers flow changes from transfer operations and streamflow depletion caused by groundwater basins refilling after groundwater substitution transfers. The flow changes in streams and rivers would be insubstantial, and they would not occur at times or in locations that would have significant adverse effects on sensitive fish species.

- Terrestrial resources are analyzed in detail in Section 3.8. Cropland idling transfers have the potential to affect giant garter snakes that use rice fields and irrigation ditches as habitat, but these potential effects are avoided by the environmental commitments included in the action alternatives. Streamflow depletion from groundwater substitution transfers would have the potential to affect riparian vegetation in four creeks, but Mitigation Measure GW-1 includes monitoring and mitigation to avoid significant effects.

- Economic resources are analyzed in detail in Section 3.10. The economics analysis estimates direct, indirect, and induced economic effects of cropland idling on regional economies in participating areas. The analysis also considers increased income associated with transfer payments to sellers.

Common Response 4: Groundwater Existing Conditions

Commenters expressed concerns that the Groundwater Affected Environment section does not adequately represent the current drought conditions.

Recent groundwater levels in the Sacramento Valley

Section 3.3.1.3.2 has been revised to include additional information clarifying recent groundwater level trends within the Sacramento Valley. The following figures and discussion have been included in the Groundwater Resources section:

1. Spring 2013 to Spring 2014 change in groundwater elevation in shallow (<200 feet below ground surface [bgs]), intermediate (200-600 feet bgs), and deep (>600 feet bgs) wells.

2. Spring 2004 to Spring 2014 change in groundwater elevation in shallow (<200 feet bgs), intermediate (200-600 feet bgs), and deep (>600 feet bgs) wells.

3. Spring 2010 to Spring 2014 change in groundwater levels in wells.

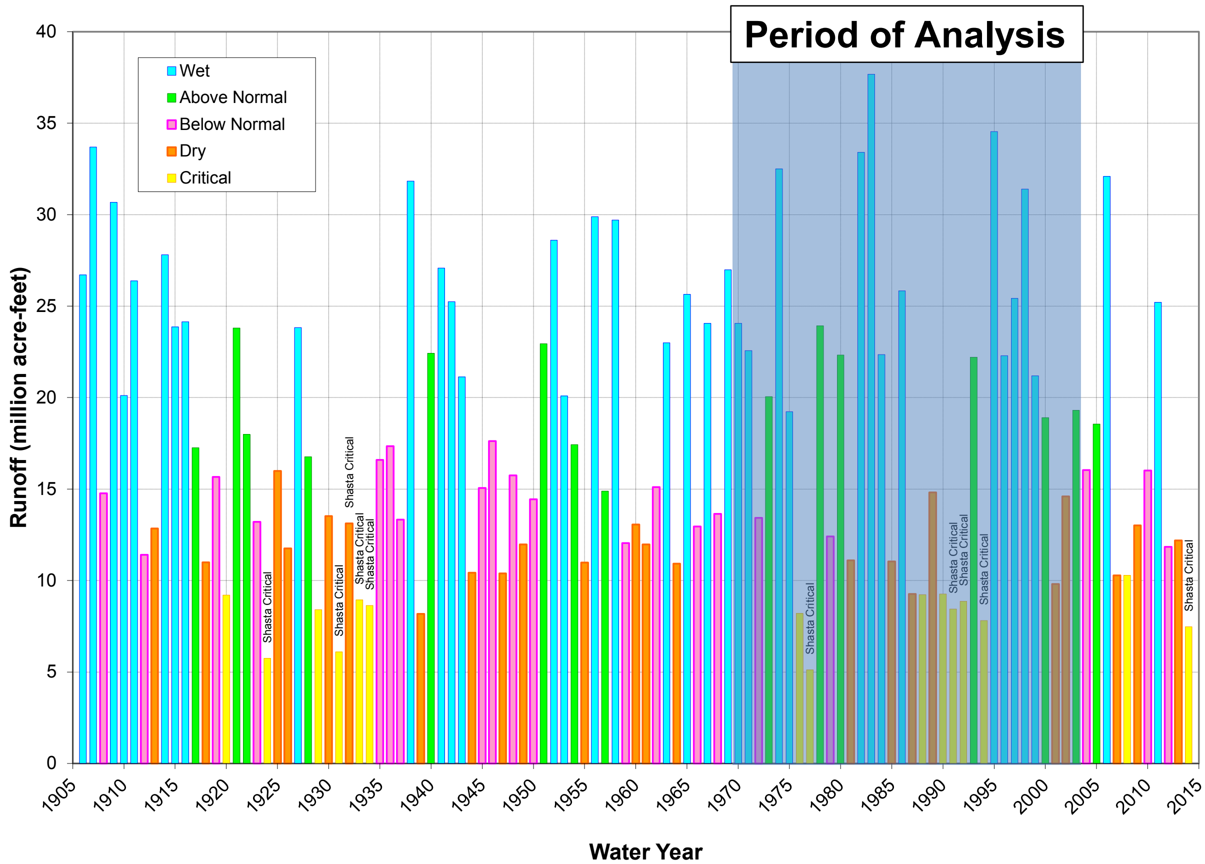
4. Spring 2010 to Spring 2011 change in groundwater elevation in shallow (<200 feet bgs), intermediate (200-600 feet bgs), and deep (>600 feet bgs) wells.

5. Fall 2010 to Fall 2011 change in groundwater elevation in shallow (<200 feet bgs), intermediate (200-600 feet bgs), and deep (>600 feet bgs) wells.

6. Hydrographs for shallow and deep wells in Colusa, Corning, East Butte, West Butte, Solano, North American, South American, and Yolo subbasins.

Change in groundwater elevation figures for (a) Spring 2013 to Spring 2014, (b) Spring 2004 to Spring 2014, and (c) Spring 2010 to Spring 2014 indicate groundwater levels have decreased within the Sacramento Valley. As shown in Figure R-1 below, water year (WY) 2014 was one of the driest years on record since 1977 and it was preceded by a dry and a critical year. Spring 2014 groundwater levels have changed between +5 and -20 feet within the Sacramento Valley in comparison to Spring 2013. Comparisons of spring groundwater levels in the last decade (Spring 2004 to Spring 2014) indicate groundwater levels have declined as much as 40 feet in parts of Glenn, Colusa and Tehama County within the Sacramento Valley.

Change in groundwater elevation figures between Spring 2010 and Spring 2011 indicate an increase of up to eight feet in groundwater levels within the Sacramento Valley. This increase occurred after four consecutive years of dry weather conditions in the Sacramento Valley (two dry years, one critical dry year and one below normal year). Though the Sacramento Valley and other parts of California are currently noticing declining groundwater level trends, past groundwater trends are indicative of groundwater levels declining moderately during extended droughts and recovering to pre-drought levels after subsequent wet periods. Implementation of monitoring and mitigation measures as set forth in GW-1 would avoid potential significant adverse environmental effects. Refer to Common Response 6 for a discussion of revisions to GW-1 in response to public comments.



Source: DWR 2015

Figure R-1.
Historical Sacramento Valley Water Year Runoff and 40-30-30 Index Year Types

Wells going dry within the Sacramento Valley

Comments were received about wells going dry in the Sacramento Valley region, particularly in Butte County. Information on this point has been added in the discussion of Groundwater Resources Affected Environment. As shown in Table R-2 below, the number of wells reported dry in Butte County is substantially higher than in other counties within the area of analysis. (The action alternatives do not include groundwater substitution transfers in Butte County.) As discussed in Section 3.3.4.1, Mitigation Measure GW-1 will monitor groundwater levels during transfers of water made available from groundwater substitution actions to avoid potentially significant effects to other legal users of water. Refer to Common Response 6 for a discussion of revisions to Mitigation Measure GW-1 in response to public comments.

**Table R-2.
Summary of Dry Wells Reported in 2014**

Counties	Number of wells reported dry in 2014	Information received as of
Shasta	3	9/16/2014
Tehama	34	10/2/2014
Glenn	26	10/23/2014
Butte	60	12/4/2014
Colusa	8	7/7/2014
Sutter	Data not available	Data not available
Yuba	Data not available	Data not available
Solano	1	11/12/2014
Yolo	2*	10/21/2014
Sacramento	1	10/16/2014

Source: Data collected by UC Davis
*Number of dry wells reported includes data only for October; data for prior months not reported

Concerns regarding pumping in the Tuscan Formation

Commenters expressed concerns that transfer-related pumping would be concentrated in the Tuscan Formation. As shown in Figure R-2, groundwater substitution pumping associated with the range of potential activities analyzed under the Proposed Action would occur primarily outside the Tuscan formation, either from the Tehama Formation or other formations not identified in Figure R-2. Some of the groundwater substitution pumping wells for Glenn-Colusa Irrigation District, Reclamation District 1004, and Butte Water District lie within (or near) the potentially disputed Tuscan and Tehama subsurface formations. Pumping from these wells will be closely monitored through the implementation of Mitigation Measure GW-1 to avoid potentially adverse effects. Refer to Common Response 6 for a discussion of revisions to Mitigation Measure GW-1 in response to public comments.

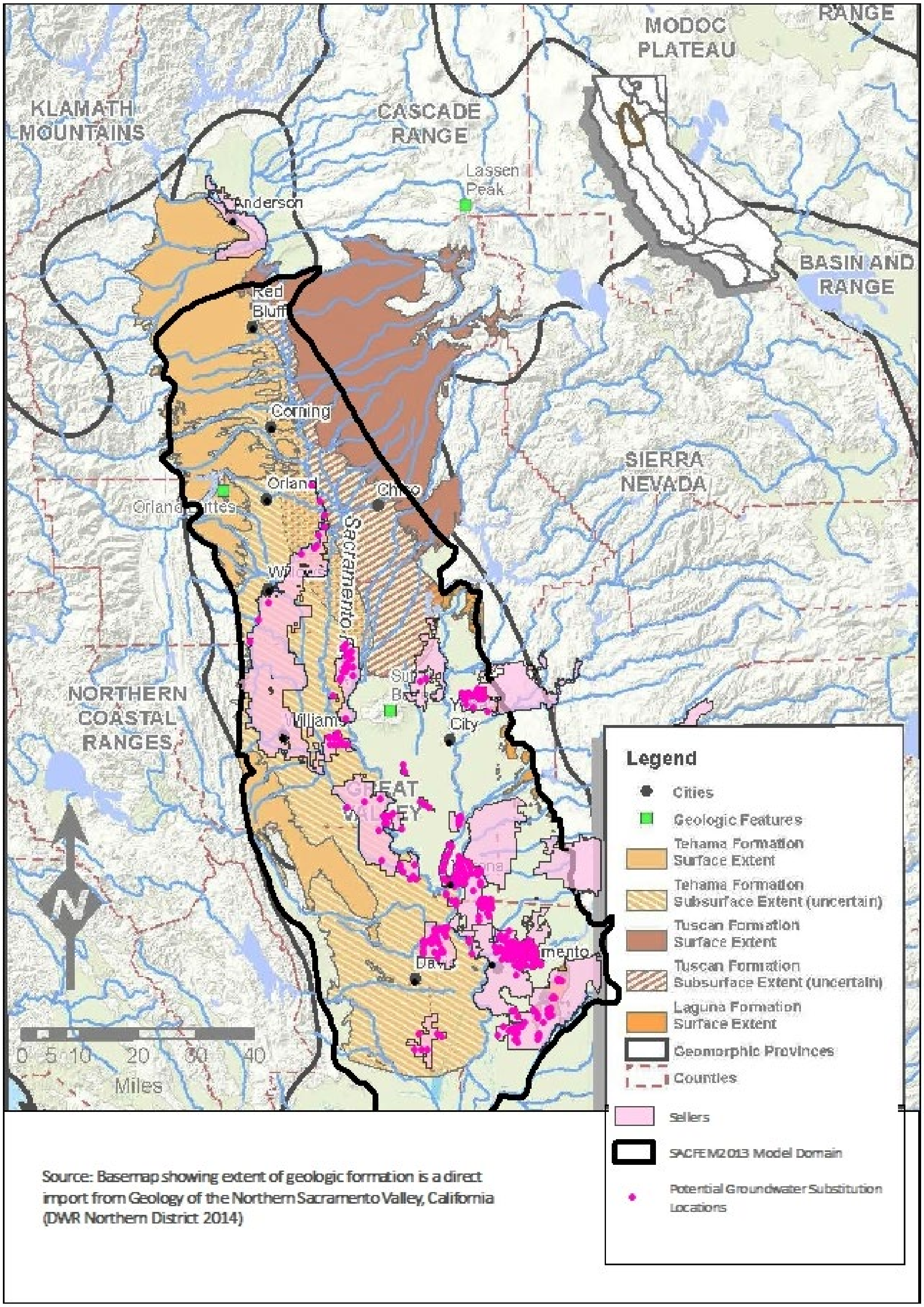


Figure R-2.
Extent of Tuscan and Tehama Formations with respect to groundwater substitution pumping under Proposed Action

Common Response 5: Model Timeframe

Comments were received on the period of analysis for the various models used to analyze the environmental effects of transfers. The period of analysis for the Sacramento Valley Finite Element Groundwater Model (SACFEM2013), CalSim II, and the Transfer Operations Model (TOM) was water years (WY) 1970 through 2003. This period was used because it is common to both SACFEM2013 and CalSim II. The full simulation period for SACFEM2013 is WY 1970 through 2010 while the full simulation period for CalSim II is WY 1922 through 2003. TOM was developed, and the analysis conducted, for the common 34-year period of WY 1970 through 2003.

Several commenters asserted that the period was inadequate because it ended in 2003 and did not include the most recent 11 years when (1) the hydrology in the Sacramento Valley was drier than average, (2) hydrological factors were potentially affected by climate change, and (3) there were frequent transfers. Other comments focused on the changes that have occurred in population, water demand, regulations, and CVP and SWP operations since 2003. Each of these concerns is addressed in the following paragraphs.

Recent hydrology was drier than average

Sacramento Valley hydrology has been drier than average since 2003. Figure R-1 shows the observed Sacramento Valley river runoff in millions of acre-feet (MAF) for the complete available record, as calculated by DWR. Runoff illustrated in this figure is the sum of the Sacramento River at Bend Bridge, the Feather River inflow to Lake Oroville, the Yuba River at Smartville, and the American River inflow to Folsom Lake. Runoff is used to calculate the Sacramento Valley Water Year Type Index (40-30-30 Index) to define the year type as either wet, above normal, below normal, dry, or critical. The water year runoff of these four rivers provides a good indicator of the range and variability of the hydrology of the Sacramento Valley.

Additional information illustrated in Figure R-1 includes years in the historical record that were classified as “Shasta Critical” per the definition contained in Sacramento River Settlement Contracts. These years are identified in the figure because in such years the availability of surface water for many areas in the Sacramento Valley is further limited, beyond that in other critical years. The period of analysis used to support the EIS/EIR is shaded.

The long-term average annual runoff from these four rivers is approximately 17.8 MAF. The average annual runoff for the period 2004 through 2014 is 15.7 MAF, while the average annual runoff for the period of analysis is 18.6 MAF. While it is true that the period from 2004 through 2014 has been drier than both the long-term average and the average for the period of analysis, this does not invalidate the analysis supporting the discussions in the environmental document. Hydrology in the period of analysis adequately represents the historical range and the variability that has occurred in the Sacramento Valley, and includes two multi-year droughts: 1976-77 and 1987-92. The drought of 1976-77 was more severe than any single year or 2-year period from 2004 through 2014, and the 1987-92 drought was more prolonged than any recent 6-year period.

Additionally, the EIS/EIR is intended to assess environmental conditions resulting from implementation of the range of potential transfer activities under the Proposed Action for a 10-year period. A key consideration, therefore, is whether there exists within the period of analysis any 10-year period that is representative of a reasonable worst-case condition for Sacramento

Valley hydrology. Within the period of analysis, there are several 10-year periods that are considerably drier than the 2004 through 2014 period. For example, the average annual runoff for the 10-year period 1985 through 1994 is 12.7 MAF. This is comparable to the minimum average annual runoff, 12.3 MAF in 1928 through 1937, for any 10-year period in the available record. The analysis includes a period similar to the driest 10 years on record, and drier than the period from 2004 through 2014.

Climate change

Some commenters suggested that not including the most recent 11-year period ignored the effects of climate change that have occurred since 2003, and will occur over the life of the project. Based on a review of the historical hydrology for the Sacramento Valley, any climate change effects that may have occurred since 2003 are difficult to discern within the historical variability. The most recent 11-year period is not outside the range of the historical record or the period analyzed in the EIS/EIR. While it is possible that the next 10 years may become the driest on record, potentially influenced to some unknown extent by climate change, it would be speculative to develop hydrology for the 2015 through 2024 period as a series of 10 consecutive critical years based on potential climate change or as a worst-case condition. Additionally, the mitigation measure to protect groundwater resources (Mitigation Measure GW-1) was developed to avoid or reduce impacts based on actual conditions at the time of transfer rather than predicted conditions from the modeling effort. If climate change does result in different conditions in the next ten years, Mitigation Measure GW-1 would continue to protect the resource (but may require reduced pumping or other actions to reduce effects more often).

Transfer frequency

Comments were received asserting the Lead Agencies did not analyze transfers occurring at the same frequency as they occurred in recent years. These comments compared the average frequency of transfers throughout the entire simulation period to shorter periods in the recent past. Commenters suggested that the frequency of transfers analyzed was approximately 36 percent of all years, or 12 out of 33 years analyzed. This frequency was compared to transfers in more recent years. However, because the EIS/EIR is intended to assess environmental conditions resulting from implementation of the range of potential transfer activities under the Proposed Action for a 10-year period, a more appropriate comparison is to look at the frequency of transfers analyzed over specific 10-year periods. For example, analysis for the period 1987 through 1994 included transfers in seven out of eight years, including transfers in six consecutive years, which is similar to what has occurred in recent years. The frequency and volume of transfers were determined based on assumptions for three primary factors that limit transfers: demand for transfer water, supply of transfer water, and capacity to convey transfer water from seller to buyer.

Changes in demands, regulations, and operations since 2003

Commenters also suggested that the period of analysis was inadequate because it does not represent existing demands, regulations, and CVP/SWP operations. On this issue there were differences in the understanding of model inputs and assumptions across the range of commenters. Some commenters suggested the models (SACFEM2013 and CalSim II) operated under “historical” assumptions rather than reflecting current conditions (e.g., the demands, regulations, and operations of the model in a particular year of simulation reflect what historically occurred). These included comments that modeling ignored the effects of biological opinions issued in 2008 and 2009 on the operation of the CVP/SWP. Other commenters suggested that the level of demand assumed in CalSim II and SACFEM2013 was not appropriate because demands have changed since model demands were developed.

Both CalSim II and SACFEM2013 simulate demands that are developed to approximate a fixed level of development. CalSim II demands approximate a 2005 level of development while demands in SACFEM2013 approximate a 2010 level of development. This means that population, land use, and agricultural demands used in the models are representative of demands that existed in those years. These demands are then used with historical hydrology inputs, primarily precipitation, reservoir inflows, and unregulated flows, in model simulations. Therefore, demands simulated for WY 1970 in the models are representative of approximately 2005 and 2010 levels of development, not 1970.

Actual demand for water within the Sacramento Valley changes every year based on numerous factors. Since 2005, demand on water supplies, and particularly demands on groundwater, have likely increased. The most significant demand changes in the Sacramento Valley since 2005 include development of additional irrigated lands, particularly in permanent crops, and increases in population. Both of these changes primarily affect groundwater resources as new irrigated lands and many municipalities meet their demands using groundwater. Therefore, it is more important that these changes be considered in SACFEM2013 than in CalSim II. Demands in SACFEM2013 are based on land use data and surveys taken as recently as 2010 (see Appendix H for more information). These land use surveys show an increase in permanent crops and a slight increase in the total irrigated acreage. Additionally, recently developed agricultural lands are in areas outside of existing water districts and away from surface water sources where groundwater is the only source of water. This information is incorporated in SACFEM2013 by combining recent land use surveys with the historical precipitation record to develop demands that vary in each year of the simulation, with higher demands for groundwater in drier years. While there have been changes in demand since 2010, the range of demands simulated in SACFEM2013 is representative of existing conditions in the Sacramento Valley.

Sacramento Valley agricultural demands in CalSim II approximate a 2005 level of development and vary in each year of the simulation. The focus of CalSim II is simulation of the surface water system and operations of the CVP and SWP. Demands for surface water within the Sacramento Valley have been relatively stable since 2005. This can be seen through review of Reclamation delivery data to Sacramento River Settlement Contractors, other water service contractors, and diversion data from other river systems. The majority of surface water demands and the associated water rights and contracts were developed many decades ago and have been stable over the most recent decade.

The regulatory constraints on CVP and SWP operations have changed significantly since 2005 and CalSim II modeling used in preparation of the EIS/EIR was modified to reflect these changes. The most notable change since 2005 was the incorporation of the reasonable and prudent alternatives contained in the U.S. Fish and Wildlife Service's 2008 biological opinion on Delta smelt and the National Marine Fisheries Service's 2009 biological opinion on Chinook salmon and other species. The regulatory constraints described in these biological opinions are included in the CalSim II simulation of existing CVP and SWP operations. CalSim II simulates the current regulatory conditions and a fixed level of development demand as the existing condition, and uses the historical hydrology for the period 1922 through 2003 to help understand CVP/SWP operations under a range of hydrologic conditions.

Common Response 6: Groundwater Mitigation

Commenters indicated they would like more specificity in the required groundwater monitoring and mitigation in Mitigation Measure GW-1. In particular, they wanted to understand the monitoring triggers that would cause mitigation actions in the Mitigation Plans to go into effect.

The primary triggers used to establish impacts to groundwater levels are the Basin Management Objectives (BMOs) set by Groundwater Management Plans (GMPs). In the Sacramento Valley, several counties have established GMPs to provide guidance in managing the resource. While the GMPs aid in establishing best practices, not all of the GMPs set quantitative groundwater elevation triggers for their BMOs. Table R-3 lists the counties in the Sacramento Valley with existing GMPs. The table also provides a description of the BMOs as described in each GMP. This list is provided for the entire Sacramento Valley; however, in addition to listing counties that contain potential groundwater substitution pumping sellers, the list also contains counties that do not (e.g., Butte).

Table R-3.
Groundwater Management Plans and BMOs in the Sacramento Valley

County	Basin Management Plan	Groundwater Basin Management Objective
Shasta (Anderson Cottonwood Irrigation District Groundwater Management Plan)	http://www.andersoncottonwoodirrigationdistrict.org/uploads/2/7/2/8/2728665/acid_gwmp.pdf	Pg. 3-2: No set elevation thresholds.
Shasta County (Shasta County Water Agency)	http://www.co.shasta.ca.us/index/pw_index/engineering/water_agency.aspx	No elevation thresholds.
Tehama County (Tehama County Flood Control and Water Conservation District)	http://www.tehamacountypublicworks.ca.gov/Flood/ Groundwater trigger levels for each sub-basin located here: http://www.tehamacountypublicworks.ca.gov/Flood/groundwater.htm	Trigger levels vary based on groundwater measurements in each monitoring well. Trigger levels generally follow a pattern of: • Historical low of spring measurements plus 20% of the range of spring measurements: notify and inform public. • Second consecutive year of groundwater levels at or below spring trigger level 1: monitor and investigate cause. • Historical low of spring measurements: consider management options. • Historical low of late groundwater measurements: notify public and begin investigations.

County	Basin Management Plan	Groundwater Basin Management Objective
Glenn County	http://www.glenncountywater.org/documents/GlennCoBMOdocument_000.pdf	There are 17 basin management sub-areas in the basin. BMOs for groundwater levels are established separately for each sub-area. No clear BMOs have yet been established. Objectives for the sub-areas are qualitative and relate to maintaining groundwater surface elevations at a level that will assure an adequate and affordable irrigation water supply; sustainable agricultural water supply; and adequate groundwater supply for all domestic users. Additionally, some BMOs state that the objective is to develop an understanding of groundwater levels in the sub-area. Elevation thresholds vary depending on the sub-area and monitoring well within each sub-area.
Butte County	http://www.buttecounty.net/Portals/26/GWMP/Section_3__1-7-05_2.pdf	Pg. 3-4: Groundwater level declines in many areas of the county have been observed. These range from 0.8 to 2.0 feet per year. Declining groundwater levels are used as a trigger for close observation of groundwater level trends.
Colusa County	http://colusagroundwater.ucdavis.edu/Technical%20Materials%20for%20Posting/ColusaCo_GMP_Volume-1_9-10-08.pdf	Pg. 34: From a review of the groundwater level hydrographs on Figure II.5, it can be seen that the extent to which the groundwater basin is utilized throughout the County varies significantly. Accordingly, the assessment of changes in groundwater levels in the respective areas must be performed with full consideration of the historic levels. It is premature to attempt to set groundwater level targets or thresholds in Colusa County. It is, however, very important to evaluate the groundwater level data in relation to historic data and report the results of that evaluation together with an assessment of overall hydrologic conditions, known changes in land use, etc.
Sutter County	http://www.co.sutter.ca.us/pdf/pw/wr/gmp/Sutter_County_Final_GMP_20120319.pdf	There are three BMOs for groundwater levels. One is related to low groundwater levels: • Avoid ongoing declines in groundwater levels during water year types identified by DWR to be “above normal” or “wet” for the Sacramento Valley. The BMO also states “groundwater levels are to be managed to ensure adequate water supplies while avoiding adverse impacts and mitigating them if and when they do occur. Adverse impacts related to groundwater levels can occur from excessively high or low groundwater levels. What constitutes an excessively high or low groundwater level may change over time, and will also vary by land use and hydrologic and climatic conditions.
Yuba County Water Agency	http://www.ycwa.com/documents/943	Pg. 3-12: No specific threshold. Qualitative objectives: • Avoid potential unreasonable impacts that may occur from changes in groundwater surface elevations because of external transfers. • Monitor any lowering of groundwater surface elevations that may occur as a result of groundwater extraction to meet local demands in drier years.

County	Basin Management Plan	Groundwater Basin Management Objective
Nevada County (Martis Valley Groundwater Management Plan)	http://www.pcwa.net/files/docs/enviro/MartisValleyGMPFinal07.22.2013.pdf	Very general BMO about protecting groundwater quantity. Plan includes details on the establishment of a groundwater elevation monitoring program.
Placer County Water Agency (Western Placer County Groundwater Management Plan)	http://www.pcwa.net/general-information/environmental-and-planning-documents.html and http://www.pcwa.net/files/docs/enviro/WPCGMP_Groundwater_Manaqerment_Plan_07.pdf	Pg. 3-8: discusses the need to create a uniform groundwater elevation monitoring program. No thresholds are set because, historically, data have not been collected consistently.
El Dorado County	No plan available.	
Sacramento Groundwater Authority	http://www.sgah2o.org/sga/files/2008-SGA-GMP-FINAL-20090206-print_ready.pdf	Pg. 29: "SGA members intend that overall groundwater elevations in the basin be improved over time, and that the groundwater basin be managed such that the impacts during drier years will be minimized when surface water supplies are curtailed and are replaced by increased groundwater supplies. This is accomplished, similar to what is done in the Central Sacramento Basin, by measuring groundwater levels in more than 30 wells throughout the SGA. A similar 5 square mile grid pattern is used to monitor groundwater levels over time throughout the basin. SGA monitors groundwater elevations twice a year.
Central Sacramento County	http://www.amwater.com/files/CSCGMP_final.pdf	Pg. 3-3: An operating range for groundwater elevations in the basin defines the upper and lower groundwater elevation thresholds. Upper and lower elevation limits are defined for 5 square mile polygons throughout the basin. Each polygon represents its own management unit with lower and upper elevation attributes. Groundwater elevation contour maps are found on pages 3-4 and 3-5 of the plan. Lower groundwater thresholds range from -90 feet msl in the southwestern part of the basin to 150 feet msl in the northeastern part of the basin. Upper groundwater thresholds range from -70 feet msl in the southwestern part of the basin to 200 feet msl in the northeastern part of the basin.
South Area Water Council	http://www.water.ca.gov/groundwater/docs/GWMP/SJ-20_SouthBasin_GWMP_2011.pdf	Similar to the Sacramento Groundwater Authority and Central Sacramento County, the South Area Water Council's groundwater management plan uses several wells throughout the basin to gather groundwater elevation data and high/low thresholds would be based on individual wells. The BMO, on p. 2-2, states generally: Maintain or enhance groundwater elevations to meet the long-term needs of groundwater users within the Groundwater Management Area.
Yolo County	http://www.water.ca.gov/groundwater/docs/GWMP/SR-35_YoloCountyFCWCD_GWMP_2006.pdf	p. 12: "when ¾ of monitoring wells reach within 25% of the lowest water level recorded for that well. Spring and fall measurements will be analyzed separately."

In areas where quantitative BMOs do not exist, Reclamation, SLDMWA, and the potential seller(s) will coordinate closely with potentially affected third parties to collect and monitor groundwater data. If warranted, additional groundwater level monitoring to address concerns from third parties will be incorporated in the monitoring and mitigation plans required by Mitigation Measure GW-1. The monitoring plan, which must be reviewed and approved by Reclamation, includes the seller's plan to monitor groundwater levels to avoid any potentially significant impacts that may result from the proposed transfer. If a third party has a concern that warrants the inclusion of additional monitoring, Reclamation and the seller will adjust the plan to address the concern.

Common Response 7: Subsidence

Commenters expressed concern that utilizing groundwater in lieu of the surface water made available for transfer from groundwater substitution actions could cause subsidence, and the mitigation measures should be clarified to be certain they would reduce or avoid this subsidence. While Section 3.3 of the EIS/EIR addresses the potential for subsidence to the degree reasonable and appropriate based on available data, the lead agencies recognize that in many areas of the Sacramento Valley the potential for subsidence remains unclear. While monitoring efforts may not have detected historic subsidence, the potential exists for future subsidence. This uncertainty has caused the lead agencies to develop a process to help clarify how mitigation to avoid significant subsidence impacts would be implemented. This process requires monitoring for subsidence and identifies a multi-stage process to help address the uncertainty in the potential effects.

Stage 1: Groundwater Levels

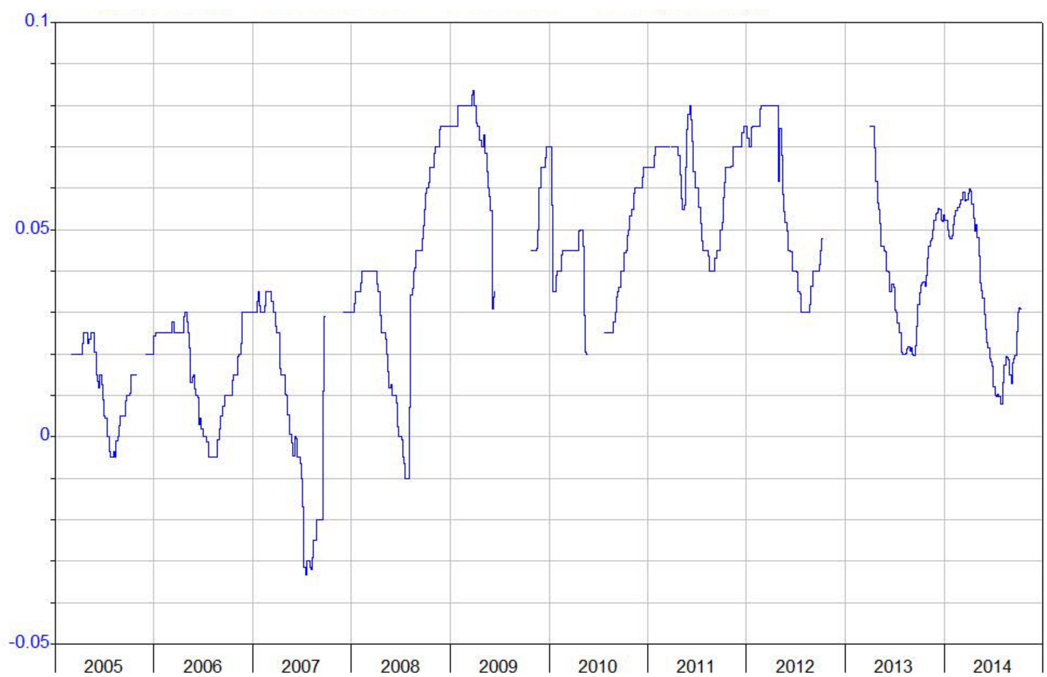
Irreversible subsidence would not occur if groundwater levels stay above historic low levels for the entire transfer period. As groundwater is pumped from an aquifer, the pore water pressure in the aquifer is reduced. This reduction in pore water pressure increases the effective stress on the structure of the aquifer itself. This increase in effective stress can cause the aquifer structure to deform, or compress, resulting in the subsidence of the ground surface elevation. Subsidence can be irreversible if the reduced effective stress is lower than the historically low effective stress. Typically this would be the result of groundwater levels reaching levels lower than the historical low level.

Before a transfer, each seller will examine local groundwater conditions and groundwater level changes based on past pumping events or groundwater substitution transfers. This existing information will be the basis to estimate if groundwater levels are likely to decline below historic low levels as a result of the proposed transfer. If the pre-transfer assessment indicates that groundwater levels will stay above historic low levels, and this finding is confirmed by monitoring during the transfer-related pumping period, then no additional actions for subsidence monitoring or mitigation are necessary. Sellers would need to proceed to stage 2 for land surface elevation monitoring if the pre-transfer estimates indicate that groundwater levels are anticipated to decline below historic low levels. If monitoring during the transfer-related pumping period (confirmed by two measurements within seven days) indicates that groundwater levels have fallen below historic low levels, sellers must immediately stop pumping from transfer wells in the area that is affected or proceed to stage 2.

Stage 2: Ground Surface Elevations

Stage 2 includes monthly ground surface monitoring during transfer-related pumping if pumping could cause groundwater levels to fall below historic low levels, as described in Stage 1. If ground surface elevations decrease between 0.1 and 0.2 foot, the seller will evaluate the accuracy of the information based on the current limitations of technology, professional engineering/surveying judgment, and any other data available in or near the transferring area. If the elevations decline more than 0.2 foot, this change could indicate inelastic subsidence, which would trigger a shift to Stage 3.

The threshold of 0.1 foot was chosen as this value is typical of the elastic (i.e., recoverable) portion of subsidence; the threshold of 0.2 foot was selected considering limitations of current land survey technology. This threshold is supported by a review of data from extensometers within the Sacramento Valley. Figure R-3 shows the subsidence data from extensometer 22N02W15C002M, in Glenn County. This extensometer has not been identified as having long-term declining trends, but exhibits a small amount of movement (up to about 0.1 foot).



Source: DWR Water Data Library 2014

Figure R-3.
Measured Ground Surface Displacement at Extensometer 22N02W15C002M in Glenn County

Stage 3: Local Investigation

If the threshold of 0.2 foot of ground surface elevation change is exceeded, the seller shall cease groundwater substitution pumping for the transfer until one of the following occurs: (1) groundwater levels recover above historic low groundwater levels; (2) seller completes a more detailed local investigation identifying hydrogeologic conditions that could potentially allow continued transfer-related pumping from a subset of wells (if the seller can provide evidence that this pumping is not expected to cause additional subsidence); or (3) seller completes an investigation of local infrastructure that could be affected by subsidence (such as water delivery infrastructure, water supply facilities, flood protection facilities, highways, etc.) indicating the local threshold of subsidence that could be experienced before these facilities would be adversely affected. Any option should also consider the effect of non-transfer pumping that may be causing subsidence.

Stage 4: Mitigation

If subsidence effects to local infrastructure occur despite monitoring efforts, then the sellers must work with the lead agencies to determine whether the measured subsidence may be caused by transfer-related pumping. Any significant adverse subsidence effects caused by transfer pumping activities must be addressed. A contingency plan must be developed in the event that a need for further corrective action is necessary. This contingency plan must be approved by Reclamation before transfer-related pumping could continue after Stage 3.

Stage 5: Continued Monitoring

The sellers will continue to monitor for subsidence while groundwater levels remain below historic low levels. If the seller has ceased transfer-related pumping but groundwater levels remain below historic lows, subsidence monitoring will need to continue until the spring following the transfer. The results of subsidence monitoring will be factored into monitoring and mitigation plans for future transfers.

Common Response 8: Streamflow Depletion Factor

Commenters had questions about the streamflow depletion factor described in Mitigation Measure WS-1. Some of the comments reflected confusion about the purpose of this mitigation measure. These commenters indicated that Mitigation Measure WS-1 should help with potential streamflow depletion impacts to small streams and their biological resources. This mitigation measure, however, is specific to CVP and SWP water supplies. Section 3.1, Water Supply, assessed the potential impacts from streamflow depletion to surface water supplies. The assessment found that Reclamation and DWR would take actions to continue to meet water quality and flow standards during and after water transfers, and these actions would result in decreased water supply deliveries to CVP and SWP contractors that receive Delta exports. Supply impacts to other users in the Sacramento Valley were not identified. Mitigation Measure WS-1 is focused on avoiding the supply effects to CVP and SWP contractors that receive Delta exports. Section 3.7 analyzed streamflow depletion impacts to fisheries, and determined that the changes in flows on small creeks and streams would be small and would not be at times or locations that would have significant effects on sensitive fish species. Section 3.8 assessed streamflow depletion impacts on riparian vegetation, and found the potential for significant impacts. These potential impacts would be reduced through the groundwater monitoring and mitigation requirements in Mitigation Measure GW-1.

Specific questions and comments are discussed below in more detail.

Process to develop the streamflow depletion factor

Several commenters wanted to better understand the process to develop and enforce the streamflow depletion factor. Reclamation and DWR will develop the streamflow depletion factor in cooperation with buyers and sellers, based on the best available technical information. The process will be generally similar to the process used in past years to develop the Draft Technical Information for Preparing Water Transfer Proposals (also known as the Water Transfer White Paper). As part of this process, Reclamation and DWR identify new information, consider monitoring information from past transfers, and edit the Water Transfer White Paper.

Reclamation and DWR have established regular meetings throughout the year to review transfer proposals and assess how ongoing transfers are working. Any changes or updates to streamflow depletion factors for future water transfers would work within this existing interagency structure. This group receives monitoring data from transfers and feedback from the CVP and SWP operators throughout the year, and can identify when new information is available and when updates to the streamflow depletion factor would be appropriate. They would raise this issue to management levels at both organizations.

At this point, Reclamation and DWR would work with the buyers and sellers to review the most recent monitoring or modeling information to identify potential refinements to the streamflow depletion factor. The resulting refinements would be published in an update to the technical information papers on DWR's water transfer website.

Monitoring and modeling

Commenters asked what type of monitoring and modeling would be used to update the streamflow depletion factor. Mitigation Measure GW-1 requires extensive groundwater monitoring for groundwater substitution transfers under the action alternatives. In addition to this transfer-specific monitoring, Reclamation, DWR, and other state and federal agencies monitor streamflows throughout the Sacramento Valley.

During development of this EIS/EIR, the lead agencies updated the SACFEM2013 groundwater model and applied this model to assess the action alternatives. This model could be used in the future to investigate whether monitoring information is consistent with the projected changes to the groundwater aquifer, or whether the modeling parameters should be modified based on monitoring. Additionally, the SACFEM2013 model includes some uncertainties about hydraulic properties that could be clarified through monitoring efforts. The lead agencies are planning to work with the sellers to solicit grant funds to obtain additional information about key hydraulic factors related to groundwater/surface water interaction. If this monitoring information becomes available, it would be used to update the groundwater model and may lead to modifications to the streamflow depletion factor.

Timing

The EIS/EIR explained in multiple places that groundwater utilized in lieu of the surface water made available from groundwater substitution actions could affect groundwater levels and recharge for multiple years after a transfer. Commenters wanted to understand how the streamflow depletion factor could mitigate for transfer-related streamflow effects in years following transfers. Additionally, commenters mentioned that if water is "backed up" into storage before it can be moved through the Delta, the groundwater pumped in lieu of diverting the surface water could cause streamflow effects before the transfer occurs, which should also be addressed through the streamflow depletion factor.

As discussed at the beginning of this common response, the streamflow depletion factor is focused on mitigating impacts to CVP and SWP water users. The impacts disclosed in Section 3.1 consider the impacts to supplies from when pumping begins until the groundwater aquifer recovers. The streamflow depletion factor equates to a percentage of the total groundwater substitution transfer that will not be available for transfer to the transferee, and is intended to offset the streamflow effects of the added groundwater pumping due to transfer. This percentage would account for supply impacts in transfer years and years following transfers. The CVP and SWP would be responsible for using this retained water to account for current and future supply impacts.

Size of the streamflow depletion factor

Several commenters wanted to know more about the specific percentage for the streamflow depletion factor. Specifically, several commenters asked if the percentage would stay the same, and what a minimum percentage would be. The streamflow depletion percentage could vary based on monitoring and modeling data.

The analysis for Mitigation Measure WS-1, to address potential streamflow depletion effects on CVP and SWP water supplies, identified several issues relevant to development of a streamflow depletion factor. Analysis indicates that the effect of groundwater substitution transfers on CVP/SWP water supplies varies depending on hydrology and system conditions after the transfer. For example, when the post-transfer hydrology is dry the effect on CVP/SWP water supply can be greater than when the post-transfer hydrology is wet. This difference in the effect can generally be explained by the fact that during drier conditions the Delta is more likely to be in balance; therefore, streamflow depletions are more likely to affect CVP/SWP water supplies. Additionally, sensitivity analyses were conducted to better understand how uncertainty in key model inputs, those inputs that are likely to have the largest effect on streamflow depletion, may affect the streamflow depletion factor. Results of these analyses indicate that the minimum streamflow depletion factor for the purpose of Mitigation Measure WS-1 is approximately 13 percent of the volume pumped as a groundwater substitution transfer. This minimum streamflow depletion percentage has been added to the text of Mitigation Measure WS-1 to help clarify the measure.

Public Involvement

Commenters asked if the public would have a chance to comment if the streamflow depletion factor changes in the future. Reclamation and DWR would consider public feedback when identifying if refinements to the streamflow depletion factor are necessary, including any potential third party concerns. The Water Transfer White Paper is reviewed annually and updated as needed; new versions are published in draft form on DWR’s water transfer website.

Common Response 9: Refuge Water Supplies

Some commenters questioned Reclamation’s ability to meet requirements to provide Level 4 (Level 2 [L2] and Incremental Level 4 [IL4]) water supplies as stipulated under the Central Valley Project Improvement Act (CVPIA) and were concerned about possible adverse effects on refuge habitat if Reclamation were unable to comply. Reclamation is committed to meeting their requirements to work with U.S. Fish and Wildlife Service (USFWS), California Department of Fish and Wildlife (CDFW), and the Grassland Water District/Grassland Resource Conservation District to attempt to provide Level 4 water when possible.

Inclusion of refuge transfers in action alternatives

Several commenters suggested that the action alternatives should include transfers to refuges. Reclamation, however, views refuge-related water purchases and transfers as a separate federal action having independent utility from all other potential voluntary water transfers. For such refuge water transfers, Reclamation (as a "willing buyer"), in cooperation with willing sellers, negotiates and develops agreements to purchase water for transfer to CVPIA refuges and prepares the associated National Environmental Policy Act/Endangered Species Act (NEPA/ESA) environmental compliance documents, as applicable.

For the range of potential water transfers evaluated under the Long-Term Water Transfers EIS/EIR, Reclamation's federal action would be to approve and facilitate transfers initiated by non-governmental buyers and sellers. This difference is not a sign of a difference in priority, but rather a difference in the type of federal action taken by Reclamation.

Pumping priority through the Delta

Commenters expressed concern that refuge north-to-south water transfers may have a lower priority for conveyance through the Delta than water transfers under the action alternatives, which could decrease the amount of water received. Before Reclamation can facilitate water transfers, it must first provide CVP water to meet all regulatory requirements mandated by the State Water Resources Control Board (Delta flow and water quality standards), CVPIA (specifically the "(b)(2) water" and refuge L2 water), and the Reasonable and Prudent Alternative actions listed in the USFWS's (2008) and National Oceanic and Atmospheric Administration (NOAA) Fisheries' (2009) respective Biological Opinions on the Coordinated Operations of the CVP and SWP. Reclamation must then meet its contractual obligations to CVP agricultural and municipal and industrial (M&I) water service contractors. If all these requirements are satisfied and excess pumping capacity is available, only then will Reclamation facilitate potential north-to-south water transfers. Water transfers under this EIS/EIR cannot affect Reclamation's ability to deliver allocated CVP L2 water to refuges.

Table R-4 shows Reclamation's refuge related water transfers ("re-allocation" regarding L2 supplies) from 2009 through 2013. Most of these transfers do not need to be moved through the Delta. Merced Irrigation District (ID) is one exception, but Merced ID has multiple means of delivering transferred water and it does not need to be conveyed through the Delta (see Section 2.3.2.3 of the EIS/EIR for more information). Additionally, Reclamation has permanently purchased water from Corning, Thames, and Proberta Water Districts (WDs) that is moved through the Delta in some years; however, this water is more frequently used for refuges in the Sacramento Valley and is not conveyed through the Delta. Because the Level 4 refuge transfers typically do not rely on through-Delta conveyance, the action alternatives are not expected to affect the potential for refuges to receive these supplies.

Table R-4.
Refuge Transferred Water Supplies, 2009-2013

Seller	Water Transferred (AF)[1]	Notes
WY 2013		
Corning, Thames, and Proberta WDs	3,308	Permanently purchased NOD IL4 water transferred to the Kern NWR SOD

Seller	Water Transferred (AF)[1]	Notes
SJRECWA	19,500	Purchased IL4
Merced ID	7,256	Purchased for the East Bear Creek Unit of the San Luis NWR Complex as L2, then exchanged to meet SOD IL4 demands
WY 2012		
SJRECWA	25,000	Purchased IL4
Santa Clara Valley WD	10,000	Purchased IL4
Merced ID	3,480	Purchased for the East Bear Creek Unit of the San Luis NWR Complex as L2, then exchanged to meet SOD IL4 demands
WY 2011		
SJRECWA	50,333	Purchased IL4
Panoche WD	4,250	Purchased IL4
San Luis WD	5,000	Purchased IL4
Santa Clara Valley WD	10,000	Purchased IL4
Merced ID	1,627	Purchased for the East Bear Creek Unit of the San Luis NWR Complex as L2, then exchanged to meet SOD IL4 demands
East Side Canal and Irrigation Company	3,291	Purchased as L2, then exchanged to meet IL4 demands
WY 2010		
Corning, Thames, and Proberta WDs and Sacramento Valley NWR Complex	4,506	Permanently purchased NOD IL4 water and reallocated NOD conserved L2 water delivered to Kern NWR and GRCD
SJRECWA	35,714	Purchased IL4
Kern-Tulare WD	7,000	Purchased IL4
Panoche WD	10,000	Purchased IL4
Merced ID	500	Purchased for the East Bear Creek Unit of the San Luis NWR Complex as L2, then exchanged to meet SOD IL4 demands
Stevinson WD	4,080	Purchased for the East Bear Creek Unit of the San Luis NWR Complex as L2, then exchanged to meet SOD IL4 demands
WY 2009		
Sacramento Valley NWR Complex	5,342	NOD Conserved L2 water delivered to Kern NWR and the GCRD
SJRECWA	18,687	Purchased IL4
Stevinson WD	4,280	Purchased as L2, then exchanged to meet IL4 demands

Key:
AF – Acre-feet, GRCD – Grasslands Resource Conservation District, ID – Irrigation District, IL4 – Incremental Level 4, L2 – Level 2, NOD – North of Delta, NWR – National Wildlife Refuge, SJRECWA – San Joaquin River Exchange Contractors Water Authority, SOD – South of Delta, WD – Water District, WY – Water Year
Note 1: Gross amount of transferred water (IL4) and re-allocated L2. Conveyance losses from source to destination were incurred and are not represented here; therefore, the amount total does not reflect the amount delivered to the refuges.

Ongoing shortages in Incremental Level 4 water supplies

Commenters expressed concern that IL4 water supplies have not been met in recent years. Reclamation is committed to providing refuge water supplies, and is working to meet that objective through efforts independent of the water transfer activities evaluated in this EIS/EIR. As discussed above, Reclamation purchases for refuge water supplies are wholly separate actions implemented by Reclamation and are not part of the purpose and need/project objectives for the range of potential water transfer activities evaluated in this EIS/EIR.

Potential to affect northern California refuges

Commenters mentioned the potential for water transfers to affect northern California refuges, either through decreased groundwater levels or by affecting forage areas for wildlife that lives in the refuge. These potential effects are analyzed in Section 3.8. The analysis finds that groundwater substitution transfers would not likely have significant effects on refuge areas, but Mitigation Measure GW-1 has been clarified (see Common Responses 6, 7, and 10) to further ensure that such potential effects are avoided.

Increased transfer costs

Several commenters discussed the action alternatives to cause increased demand for transfers, which could increase the price of transfers for the refuges. As shown in Table R-4, the sellers for Refuge IL4 supplies differ from those under the action alternatives. The exception is Merced ID, which is required to deliver water (L2 and IL4) to the Merced National Wildlife Refuge as a condition under its Federal Energy Regulatory Commission (FERC) permit. Merced ID must fulfill this FERC provision before it could sell water to other buyers.

The range of potential transfers evaluated in this EIS/EIR would not affect the prices for the main source of water for refuge transfers. The single main seller of water supplies for refuge transfers is the San Joaquin River Exchange Contractors Water Authority (SJRECWA). The SJRECWA and Reclamation have negotiated a five-year contract for refuge water supplies, which is expected to be fully executed in Spring 2015, which includes quantities and prices. These quantities and prices have been negotiated, and the prices are independent of the potential future transfers evaluated in this document. In the past, five-year contracts have been extended for additional years, so the contract terms (including price) may stay in effect for longer than five years.

Cumulative impacts

Commenters suggested that refuge transfers should be included as a cumulative project. Most of the transfers under this EIS/EIR are from sellers concentrated in the Sacramento Valley, while most refuge transfers would be from sellers in the San Joaquin Valley. Therefore, most of the refuge transfers would not produce cumulative impacts in conjunction with the range of potential transfer activities associated with the action alternatives. Refuge transfers have been added as a cumulative project in Chapter 4.

Mitigation measures needed to protect refuges

Commenters suggested that mitigation measures are necessary to reduce perceived impacts to refuges, and these measures should include a portion of the transfer supply being delivered to refuges. The EIS/EIR analyzed potential impacts but did not identify significant impacts to refuges or the species that depend on them; therefore, mitigation was not necessary.

Common Response 10: Environmental Commitments/Mitigation Measures

The following revisions to certain environmental commitments and mitigation measures have been proposed in response to comments.

GW-1 (revised)

In section 3.3.4.1.2 Monitoring Program, the following text changes are proposed: (New text is shown as underlined; deleted text is shown as ~~strikethrough~~.)

Vegetation Effects

Sellers will monitor groundwater depth data to verify that significant adverse effects to deep-rooted vegetation are avoided or allow sellers to modify actions before significant effects occur. If monitoring data indicate that water levels have dropped below root zones (i.e., more than 10 feet where groundwater was 10 to 25 feet below ground surface prior to starting the transfer of surface water made available from groundwater substitution actions), the seller must implement actions set forth in the mitigation plan. If historic data show that groundwater elevations in the area of transfer have typically varied by more than this amount annually during the proposed transfer period, then the transfer may be allowed to proceed. If there is no deep-rooted vegetation (i.e., oak trees and riparian trees that would have tap roots greater than 10 feet deep) within one-half mile of the transfer wells or the vegetation is located along waterways that will continue to have water during the transfer, the transfer may be allowed to proceed. If no existing monitoring points exist in the shallow aquifer, monitoring would be based on visual observations of the health of these areas of deep-rooted vegetation. If significant adverse impacts to deep-rooted vegetation (that is, loss of a substantial percentage of the deep-rooted vegetation as determined by Reclamation based on site-specific circumstances in consultation with a qualified biologist) occur as a result of the transfer despite the monitoring efforts and implementation of the mitigation plan, the seller will prepare a report documenting the result of the restoration activity to plant, maintain, and monitor restoration of vegetation for 5 years to replace the losses.

GGS Measures (revised)

- As part of the approval process for long-term water transfers, Reclamation will have access to the land to verify how the water transfer is being made available and to verify that actions to protect the giant garter snake are being implemented. At the end of each water transfer year, Reclamation will prepare a monitoring report that contains the following:
  - Maps of all cropland idling actions that occurred within the range of potential transfer activities analyzed in this EIS/EIR,
  - Results of any newly available scientific research and monitoring results pertinent to water transfer actions, and
  - A discussion of conservation measure effectiveness.

The report will be submitted to USFWS and shared with California Department of Fish and Wildlife (CDFW) in February, prior to the next year of potential transfers. Reclamation will coordinate with USFWS and CDFW on the contents and findings of the annual report prior to additional transfers.

- Reclamation will establish annual meetings with the Service to discuss the contents and findings of the annual report. These meetings will be scheduled following the distribution of the monitoring report and prior to the next transfer season.

- Reclamation will establish annual meetings with the Service to discuss the contents and findings of the annual report. These meetings will be scheduled following the distribution of the monitoring report and prior to the next transfer season.

- Reclamation will provide a map(s) to the USFWS in June of each year showing the parcels of riceland that are ~~idled~~ proposed for the purpose of transferring water for that year. These maps will be prepared to comport with Reclamation's geographic information system (GIS) standards.

- Movement corridors for aquatic species (including pond turtle and giant garter snake) include major irrigation and drainage canals. The water seller will keep adequate water in major irrigation and drainage canals. Canal water depths should be similar to years when transfers do not occur or, where information on existing water depths is limited, at least two feet of water will be considered sufficient.

- Districts proposing water transfers made available from idled rice fields will ensure that adequate water is available for giant garter snake priority habitat with a high likelihood of giant garter snake occurrence. The determination of priority habitat will be made through coordination with giant garter snake experts, GIS analysis of proximity to historic tule marsh, and GIS analysis of suitable habitat. The priority habitat areas are indicated on the priority habitat maps for participating water agencies and will be maintained by Reclamation. As new information becomes available, these maps will be updated in coordination with USFWS and CDFW. In addition to mapped priority habitat, fields abutting or immediately adjacent to federal wildlife refuges will be considered priority habitat.

- Maintaining water in smaller drains and conveyance infrastructure supports key habitat attributes such as emergent vegetation used by giant garter snakes for escape cover and foraging habitat. If crop idling/shifting occurs in priority habitat areas, Reclamation will work with contractors to document that adequate water remains in drains and canals in those priority areas. Documentation may include flow records, photo documentation, or other means of documentation agreed to by Reclamation and USFWS.

- ~~Areas with known priority giant garter snake populations~~ Mapped priority habitat known to be occupied by giant garter snake and priority habitats with a high likelihood for giant garter snake occurrence (60 percent or greater probability) will not be permitted to participate in cropland idling/shifting transfers. Water sellers can request a case-by-case evaluation of whether a specific field would be precluded from participating in long-term water transfers. These areas include lands adjacent to naturalized lands and refuges and corridors between these areas, including:

  - Fields abutting or immediately adjacent to Little Butte Creek between Llano Seco and Upper Butte Basin Wildlife Area, Butte Creek between Upper Butte Basin and Gray Lodge Wildlife areas, Colusa Basin drainage canal between Delevan and Colusa National Wildlife Refuges, Gilsizer Slough, Colusa Drainage Canal, the land side of the Toe Drain along the Sutter Bypass, Willow Slough and Willow Slough Bypass in Yolo County, Hunters and Logan Creeks between Sacramento and Delevan National Wildlife Refuges, and

- Lands in the Natomas Basin.

- Sellers will ~~continue to voluntarily~~ perform giant garter snake best management practices, including educating maintenance personnel to recognize and avoid contact with giant garter snake, ~~cleaning~~ <u>dredging</u> only one side of a conveyance channel per year, and implementing other measures to enhance habitat for giant garter snake. <u>Implementation of best management practices will be documented by the sellers and verified by Reclamation and</u> ~~information on the effectiveness of these measures, along with recommendations for additional measures~~ will be <u>included in the annual monitoring report.</u>

Birds (revised)

- In order to limit reduction in the amount of over-winter forage for migratory birds, including greater sandhill crane, cropland idling transfers will be minimized near known wintering areas <u>that support high concentrations of waterfowl and shorebirds, such as wildlife refuges and established wildlife areas</u>. ~~in the Butte Sink.~~

Common Response 11: Surface Water/Groundwater Interactions and Vegetation/Wildlife

Several commenters questioned the basis for the 1 cubic feet per second (cfs) and 10 percent thresholds used in this portion of the analysis, others questioned the validity of the analysis regarding surface water-groundwater interactions to support local vegetation communities, and some questioned the overall appropriateness of the modeled data. The following response includes information regarding these factors. Additional information can also be found in Section 3.3 Groundwater Resources.

Thresholds

The 10 percent screening threshold for instream flow in rivers and creeks is one of multiple criteria used to determine whether there could be potentially significant impacts on aquatic and terrestrial resources. Use of the 10 percent threshold is described in Section 3.7.2.1.3 of the EIS/EIR. As stated in the text, the use of the 10 percent value is to distinguish between effects that are a result of "model noise" and actual impacts of an alternative. Experts in the field often use this criterion to evaluate potential impacts to Central Valley fisheries.

The effects analysis in this EIS/EIR also evaluates whether an alternative changes instream flows more than 1 cfs. This threshold was more biological in nature and was applied to every month of modeling. If a change of greater than 1 cfs occurred in any single month during the entire modeled period (1976-2003), the waterway was examined further for potential biological effects. The combination of the1 cfs and 10 percent threshold criteria provides an extremely conservative screening process through which each river or stream was analyzed. If either criterion was not met for a river or stream, a further analysis was conducted to evaluate the biological significance of the flow change, such as those conducted for the Bear River, Cache Creek, Stony Creek, Coon Creek, and Little Chico Creek.

Flows in smaller waterways with less than 1 cfs are expected to be within the normal range of annual fluctuation; some of these waterways are ephemeral and are subject to a wide range of flow conditions dependent on annual hydrology. Other smaller waterways are part of a managed system (i.e., canals) that also results in variation in flows. These small waterways were not analyzed further as groundwater substitution impacts on surface waterways are expected to be within this annual variation.

Groundwater table effects on vegetation

The analysis acknowledges that there are groundwater and surface water interactions, and focuses the analysis primarily on surface water where terrestrial ecosystems are most likely to be affected. The flow regime (i.e., ephemeral, seasonal, perennial) within rivers and creeks would remain unchanged and groundwater replenishment would occur naturally; therefore, riparian vegetation would continue to have access to water and is not expected to be substantially affected by groundwater transfers. Farther from creeks and rivers, the groundwater levels are substantially below the surface in many areas (i.e., typically between 30-70 feet in depth, as discussed in Appendix G), as described in Section 3.8.2.1 Assessment/Evaluations Methods of the EIS/EIR. Therefore, groundwater table effects were considered and were not expected to result in substantial impacts on vegetation because groundwater depths are greater than the rooting depth of typical vegetation associated with upland communities, which is expected to be substantially less than 15 feet.

Changes in surface water flows

Creeks and rivers where modeling predicted more than a 10 percent reduction and more than a 1 cfs reduction in streamflows were analyzed in more detail to determine potential effects on vegetation and wildlife. Section 3.8.2.4 of the EIS/EIR acknowledges that there are potentially significant impacts to natural communities and wildlife associated with periodic reductions in creek flows of more than 10 percent. These impacts would be mitigated to a less-than-significant level through implementation of Mitigation Measure GW-1.

Vegetation effects in the North Delta area

Several commenters refer to text in Section 3.8.2.1.1 that analyzes the potential for shallow groundwater changes to affect vegetation. In this area of the North Delta, groundwater levels are high. The groundwater model estimated a maximum modeled reduction of 0.3 to 0.8 feet over the growing season, and plants are expected to adjust to this small reduction. It is true that plants may not be able to respond quickly to sudden large changes in depth to groundwater; however, large changes are only expected to occur in areas where the groundwater table is already too deep for tree roots. The modeling covered a wide range of groundwater levels, including relatively low levels associated with the 1976-77 drought. Although areas in the North Delta could experience maximum modeled reductions of groundwater levels between 0.3 to 0.8 feet, these reductions are expected to occur slowly and would not substantially alter the suitability of shallowly-flooded habitat for wildlife. Further, the modeled change showed that these areas recovered from year to year and, therefore, were not expected to be substantially changed. Sacramento Valley wetlands are generally supplied by surface water (e.g., rice fields, agricultural ditches, and duck clubs), and not by groundwater. Therefore, vegetation and wildlife that occur in these wetlands would not be affected by changes in groundwater levels. Mitigation Measure GW-1 has been reworded to better explain how potentially significant vegetation effects would be avoided. See Common Responses 6, 7, 8, and 10 for additional information.

Appropriateness of modeled data

The CalSim II simulation was based on historic hydrology for 1970 through 2003; additional information on the appropriateness of the modeled data is described in Common Response 5.

Common Response 12: Wildlife - Giant Garter Snake

Several commenters noted that environmental commitments contained in the 2014 Draft EIS/EIR are not identical to information in past Biological Opinions issued by USFWS for water transfer projects or in the *2013 Draft Technical Information for Preparing Water Transfer Proposals*. The commenters further question why the 2014 Draft EIS/EIR does not include previously approved commitments to ensure protection of giant garter snake (i.e., limiting parcel size for idling and prohibiting the same field from being idled more than two consecutive seasons). The commenters are correct that environmental commitments in the 2014 Draft EIS/EIR are modified from past water transfer documents, including the 2013 Draft Technical Information. However, commitments in the EIS/EIR are consistent with the recent 2014 Water Transfer Biological Opinion. Guidance for preparation of water transfer proposals will be revised annually (as necessary) to reflect how transfers would be implemented, and includes the prescribed measures in project-specific CEQA/NEPA and Section 7 documents that cover the area where transfers are proposed. Refinement of prior year's environmental commitments was based on best available scientific data that provides better information on where giant garter snake populations are likely to be found. Commitments that broadly restrict idling across the service area were refined to focus on cropland idling restrictions in areas where giant garter snake have a high likelihood of occurrence.

Giant garter snake priority habitat areas have been identified by Reclamation and maps have been developed (Halstead 2014) for each water district using the best available scientific information on habitat use, known populations, and historic tule marsh zones. The purpose of these maps is to identify areas with the highest probability of giant garter snake occurrence so that water transfer actions can be avoided within these areas. The range of transfer activities in the action alternatives could result in up to 10.5 percent of rice field idling throughout the sellers' service area; however, idling would be focused in areas where giant garter snake occurrence probability is low. These habitat restrictions, along with retaining water within conveyance structures that provide habitat movement corridor, avoid potentially significant impacts from cropland idling.

Commenters also expressed concern over the ability to enforce the environmental commitments, lack agency oversight, and opportunities for adaptive management of habitat over the 10-year term of analysis. The environmental commitments have been clarified and refined to address these concerns, including requirement of an annual monitoring report to the USFWS and CDFW that includes maps of idled fields in the previous year, results of current giant garter snake surveys, new scientific research, and recommendations for future protection measures. The monitoring report will be followed by coordination efforts between Reclamation and the wildlife agencies.

Common Response 13: Migratory Birds

Several commenters asserted that the 2014 Draft EIS/EIR lacks adequate discussion of cropland idling effects on migratory bird populations, particularly waterfowl.

Sections 3.8.2.1.2 and 3.8.2.4.3 of the 2014 Draft EIS/EIR identify and evaluate potential impacts of cropland idling/shifting on terrestrial wildlife species that use seasonally flooded agriculture for some portion of their lifecycle, including wintering waterfowl and shorebirds. To address commenters' concerns regarding impacts specific to migratory birds, additional information was added to the section to further describe these potential impacts.

The 2014 Draft EIS/EIR acknowledges the importance of agricultural lands within the project area for migratory birds, particularly those traveling on the Pacific Flyway. Section 3.8.2.4.1 (including Tables 3.8-8 and 3.8-9) describes and quantifies the maximum potential loss of residual feed for migratory birds, which in all cases was insubstantial and would amount to a maximum two percent reduction of upland cropland in Glenn, Colusa, and Yolo Counties and a maximum nine percent reduction of upland cropland in Sutter and Solano Counties. This section also identifies the maximum reductions in rice acreage, which again would be insubstantial in all cases and could amount to up to 10.5 percent across the sellers' service area. Although the project may reduce the availability of cropland, it would not affect post–harvest practices (i.e., flooding, burning, disking, or rolling). Specifically, the project would not include transfers of rice decomposition water and so would not reduce the availability of water for post-harvest flooding. The majority of forage available to migratory birds in the project area is in the form of decomposing waste grains during post-harvest flooding. Farmers in the Sacramento Valley only flood-up a fraction of the cropland planted; typically around 60 percent in normal water years (Miller et al 2010, Central Valley Joint Venture 2006) and as little as 15 percent in critically dry years (Buttner 2014). The decision on whether to flood is not based on what was produced for the year but instead is determined by the availability of fall and winter water. Therefore, the project would not result in a reduction of winter forage for migrating birds, specifically waterfowl and shorebirds, because it would not affect the availability of water for post-harvest flooding.

Several commenters alleged that the environmental commitment for migratory birds, including Sandhill Crane, is specific to the Butte Sink and neglects other important habitat outside the Butte Sink. To further ensure there are no significant adverse impacts on migratory birds, including greater sandhill crane, the environmental commitment pertaining to the Butte Sink has been refined to limit water transfer activities near all wildlife refuges and established wildlife areas within the seller's service area that support high concentrations of waterfowl and shorebirds.

Several commenters recommended using TRUEMET bioenergetics modeling to determine the impacts of the project on wintering waterfowl (i.e., reduction in carry capacity) based on changes in the availability of winter forage. However, this modeling approach is not applicable to the range of transfer actions in the alternatives because fallowing is expected to be within the annual variation experienced for forage and because water transfers are not expected to reduce the availability of forage for wintering waterfowl. Therefore, TRUMET bioenergetics modeling will not be used.

Common Response 14: Water Transfers Approval Process

As described in Chapters 1 and 2 of the 2014 Draft EIS/EIR, Reclamation and SLDMWA are preparing an EIS/EIR for a range of potential water transfer activities in an effort to streamline and facilitate the process for reviewing and approving yearly temporary transfers, and to accommodate transfers that may extend over multiple years. Water transfers are one of the critical elements integrated into the California Water Action Plan for dealing with or managing critically dry periods. Appropriate water transfers are promoted under federal and state water policies as an effective incentive for improved water management, as well as a way to promote water conservation, particularly in drought years, as long as transfers are consistent with state and federal law. The Governor's emergency drought proclamations and executive orders have recognized the importance of water transfers for effective water management by including provisions to streamline and expedite transfers.

The purpose of this EIS/EIR is to provide a streamlining tool by providing a comprehensive, long-range, project-level view of the potential environment impacts associated with a range of potential transfer activities over a ten-year period, to both expedite approval of water transfers and to reduce participant uncertainty. The Lead Agencies recognize, throughout the EIS/EIR, that each transfer is unique and must be considered on its individual factual merits, using all the information that is available at the time of transfer approval and execution of the conveyance or letter of agreement with the respective project agency in accordance with the applicable legal requirements. Annual approval of transfers is required by Reclamation, irrespective of the EIS/EIR term or the duration of a water transfer contract.

The Lead Agencies are not managing a bank or program. The participating potential willing buyers and sellers will continue to negotiate and propose individual water transfers, including the transfer quantity, method, and use. Individual transfers would be voluntary, independent transactions between willing buyers and sellers subject to review and approval by Reclamation, the selling entity, and the buying entity (or SLDMWA on the buyer's behalf). Each transfer has independent utility and is not dependent on, nor does it dictate the nature and scope of, the potential for long-term transfers that are analyzed in the EIS/EIR. Implementation of the range of potential water transfers analyzed in this EIS/EIR (annual and multiyear, if any) would be subject to Reclamation's annual review and approval.

Reclamation's Potential Action is to review and approve potential transfer activities, if appropriate, based on detailed review of the specific proposed transfer. Reclamation is not soliciting potential buyers or sellers for transfers. The potential buyers and sellers listed in this document could seek to transfer up to the maximum quantities analyzed in this EIS/EIR using this document for NEPA and CEQA compliance, or could propose other transfers outside of this range subject to appropriate environmental review and compliance with any other applicable requirements. Buyers and sellers must implement measures incorporated into the Proposed Action to avoid or reduce potential environmental impacts to obtain Reclamation approval of the transfer. Reclamation technical experts review all proposed transfers prior to approval of the transfer to ensure that impacts of the proposed transfer are within the scope of analysis in this EIS/EIR (or require the preparation of further environmental documentation in the event that new or substantially more severe adverse impacts are presented by the proposed transfer). Reclamation ensures that the identified mitigation measures are implemented through review of monthly reports, field visits, and necessary coordination with transfer participants. Reclamation and SLDMWA have developed a Mitigation, Monitoring, and Reporting Plan, which is included in Appendix V. The requirements of monitoring and mitigation as they apply to each individual transfer will be included in the transfer approval.

Reclamation will review each water transfer proposal with a view to the proposal's adequacy in addressing the technical information needed. To fully consider the proposal, site specific conditions may require additional information and considerations beyond that described in current guidance (such as including the Technical Information Document for Preparing Water Transfer Proposals, which is jointly prepared by DWR and Reclamation). This EIS/EIR does not predetermine those needs or those facts and does not foreclose the requirement and consideration of additional information (or further environmental review if necessary based on the potential for new or more severe environmental effects). The final quantity of water, if any, to be transferred is dependent on numerous factors, including future changes in hydrologic conditions, export capacity available for transfer water, negotiations between buyers and sellers, and Reclamation approval. Additional information regarding the process by which individual transfer proposals would be presented, evaluated, and potentially approved, can be found on Reclamation's website at http://www.usbr.gov/mp/watertransfer/ and DWR's website at http://www.water.ca.gov/watertransfers/proposals.cfm.

Detailed Comments and Responses

Individual responses to comments are presented in the following section.

Comment Letter FA01, Kathleen Martyn Goforth, United States Environmental Protection Agency

Comment FA01-1

Comment

The Environmental Protection Agency has reviewed the Draft Environmental Impact Statement (DEIS) for the above referenced document. Our review is pursuant to the National Environmental Policy Act, Council on Environmental Quality regulations (40 CFR Parts 1500-1508), and our NEPA review authority under Section 309 of the Clean Air Act.

The Long Term Water Transfer Project would implement a 10-year water transfer program to move water from willing sellers upstream of the Sacramento/San Joaquin Delta to willing buyers south of the Delta. Long-term water transfers have the potential to provide improved flexibility in the allocation, management, and use of water resources. When implemented in conjunction with a water management system that include efficiency improvement, conservation, and environmental protection, they can be an important tool for ensuring that California's scarce water supplies are put to their highest priority use.

While EPA supports the goal of improving water management flexibility, we also recognize that the Delta faces interrelated problems of inadequate water supplies, instream flow deficits, water quality impairments, and degraded aquatic habitats. Many of the groundwater aquifers that previously supported ecosystem processes across the estuary and provided water consumers with a hedge against drought have been overdrawn and depleted to historic levels. The extreme drought of the past 3 years has produced precipitous declines in groundwater elevations statewide, including level decreases of more than 10 feet for some monitored wells in the project area. Land subsidence associated with groundwater overdraft not only impacts infrastructure, water quality, and ecosystems, but also permanently reduces the State's capacity to store water underground. Water transfers would affect each of these conditions; therefore, they must be carefully designed and implemented, based upon the best available data, to ensure that adverse impacts are minimized and the interest of all affected parties and the environment are appropriately considered.

Response

The Lead Agencies agree that adverse impacts from groundwater subsidence must be minimized. For that reason, Section 3.2 includes an analysis of potential impacts to groundwater levels and subsidence. It also includes Mitigation Measure GW-1 to avoid potential effects to groundwater resources.

Comment FA01-2

Comment

In the DEIS, BOR concludes that, after mitigation, the proposed project would result in less than significant or beneficial environmental impacts for all resources. Based on our review, EPA finds that the DEIS does not contain sufficient information to support this conclusion for many resource areas, particularly groundwater, air quality, fisheries, and wildlife.

Response

The EPA's subsequent comments focus on lack of clarity for the mitigation measures in these resources. Based on comments from the EPA and other reviewers, the Lead Agencies have clarified and strengthened Mitigation Measures WS-1, GW-1, AQ-1, and AQ-2. These mitigation measures support the Lead Agencies' conclusions regarding the impacts.

Comment FA01-3

Comment

The DEIS identifies potentially significant impacts to groundwater levels and land subsidence associated with groundwater substitution water transfers. It states that proposed mitigation would reduce these impacts to less than significant for all groundwater basins in the seller's service area. However, the proposed mitigation is vague and defers the responsibility for developing detailed mitigation plans to the water transfer applicants. This precludes meaningful evaluation of the viability and effectiveness of BOR's proposed approach to mitigation.

Response

Refer to Common Responses 6 and 7.

Comment FA01-4

Comment

Furthermore, the modeling performed to assess groundwater-related impacts depends upon a data set spanning 1970 to 2003. The use of this truncated data set means that recent trends and current existing conditions are not appropriately taken into account in the impact analysis. Absent sufficient information regarding both mitigation and existing conditions, the DEIS does not demonstrate that the proposed project would not adversely affect groundwater levels.

Response

See Common Response 5.

Comment FA01-5

Comment

Similarly, while the DEIS concludes that mitigation measures would render potential impacts to air quality to less than significant levels, the two mitigation measures proposed for air impacts essentially amount to a guarantee from BOR that emissions will not be allowed to exceed applicable thresholds. Without information on how these measures would be implemented and enforced on a transfer by transfer basis, it is not clear that the mitigation would successfully prevent exceedance of de minimis value under EPA's General Conformity rule or local air quality thresholds.

Response

The mitigation measures in the EIS/EIR have been modified to clarify enforcement provisions that will ensure implementation of the action alternatives would not result in significant adverse impacts to air quality.

Comment FA01-6

Comment

Finally, the DEIS analysis with regard to fisheries and terrestrial wildlife understates a number of potentially significant adverse impacts upon these resources, thereby rendering unsupportable the conclusion that these impacts will be less than significant. For both fisheries and wildlife impacts, significance thresholds identified in the DEIS are focused around special status species, with insufficient regard for other native communities. It is not clear why the DEIS concludes that most potential impacts to non-special-status species are inherently less than significant.

Response

The DEIS does not conclude or assume that most potential impacts to non-special-status species are inherently less than significant. Sections 3.7.2.1.5 and 3.8.2.1.7 of the 2014 Draft EIS/EIR describe assessment methods for fish and terrestrial wildlife, respectively. Impacts on terrestrial wildlife were assessed based on how the range of potential transfer activities evaluated in this document may affect natural communities and aquatic habitats that are used by wildlife during all or part of their lifecycle. Where impacts to natural communities were determined to be less than significant, impacts to terrestrial species were also determined to be less than significant. The impacts analysis for fish looked at the full range of potential effects to all target species in all waterways that could potentially be affected by each alternative using the best available science and analytical tools possible. The approach is described in Sections 3.7.2.1 and 3.8.2.1, significance thresholds are listed in Sections 3.7.2.2 and 3.8.2.2, and the results for each alternative are provided in Sections 3.7.2.3 through 3.7.2.6 and 3.8.2.3 through 3.8.2.6. The methodology and supporting information behind the findings of less than significant for biological impacts are summarized in these sections.

Comment FA01-7

Comment

Even where special status species are concerned, the impact analysis frequently depends upon conjecture, without sufficient justification or citation for significance thresholds established and impact assessments made. For example, potential impacts to migratory bird species receive only a summary consideration. Wintering waterfowl in the Sacramento Valley gather as much as 50 percent of their nourishment from rice farms, yet the DEIS concludes that the 16% reduction in flooded rice field in some regions along the Sacramento River (11% when averaged across the entire sellers' service area) would be a less than significant project effect. The DEIS states that migrating species will simply choose appropriate habitat upon arrival. Neither this assumption, nor the conclusion that follows from it are well founded.

Response

The EIS/EIR analysis of biological resources covers a very large study area and incorporates data from a variety of sources. Conclusions regarding impacts were made by highly-qualified experts based on review and analyses of those data, taking into consideration the stated thresholds of significance. Notwithstanding, Section 3.8.2.4.3 for special-status bird impacts has been expanded to include all migratory bird use of flooded agricultural lands. To further ensure that any potentially substantial impacts on migratory birds are avoided, environmental commitments have been refined to minimize crop idling in known wintering areas that support high concentrations of waterfowl and shorebirds, such as refuges and established wildlife areas. The EIS/EIR acknowledges the importance of rice fields for wintering waterfowl; however, the project does not include transfers of rice decomposition water. Water transfers would not reduce the availability of water for post-harvest flooding; while different fields may be flooded, water transfers would not substantial reduce forage for wintering waterfowl. See Common Response 10 (Environmental Commitments/Mitigation Measures) and Common Response 13 (Migratory Birds) for additional discussion of migratory birds.

Comment FA01-8

Comment

Similar data gaps and unsupported conclusions are common throughout the DEIS and warrant substantial revision prior to the publication of the Final EIS. The level of detail missing from the DEIS, particularly with regard to the specific provisions of likely transfer actions and the expected requirements of future mitigation, results in an EIS document more appropriate to a programmatic analysis. Without further details regarding these aspects of the proposed project, EPA believes that the FEIS will not be sufficient to support project-level decision-making.

Response

The Lead Agencies have addressed EPA's requests as described in the comment responses to allow project-level decision-making. See Common Response 14.

Comment FA01-9

Comment

Based on EPA's review of the Draft EIS, we have rated the Proposed Action as Environmental Concerns - Insufficient Information (EC-2). This rating reflects the potentially significant adverse environmental impacts that the project, as proposed, may have upon the terrestrial and aquatic environments of the Delta and Sacramento Valley, the lack of consideration of appropriate mitigation for some project impacts, and the need for improved disclosure related to air quality, water quality, groundwater, fisheries, vegetation/wildlife, economics, project alternatives, and mitigation. Please see the enclosed Summary of EPA Rating Definitions for a description of the rating system. Further discussion of our concerns is provided in the enclosed Detailed Comments.

EPA appreciates the opportunity to provide comments for this project. When the Final EIS is released for public review, please send one hard copy and one CD to the address above (Mail Code: ENF 4-2). If you have any questions, please contact me at (415) 972-3873 or contact

Carter Jessop, the lead reviewer for this project. Carter can be reached at (415) 972-3815 or jessop.carter@epa.gov.

Response

The Final EIS/EIR includes responses to the EPA's comments, and edits to the EIS/EIR where appropriate to address concerns. See Common Response 14.

Comment FA01-10

Comment

The proposed project spans five air basins, including numerous attainment, nonattainment, and maintenance areas for a number of National Ambient Air Quality criteria pollutants. Groundwater substitution water transfers would necessitate the use of diesel, natural gas, or electrically powered pumps. According to the DEIS (p. 3.5-38), and as referenced in Appendix I (page I-1), the emissions from these pumps, in particular those powered by diesel fuel, have the potential to exceed the applicable de minimis value for nitrogen oxide (NOx) established under EPA's General Conformity Rule for the Sacramento Metro non-attainment area. Table I-1 indicates that unmitigated emissions would exceed the de minimis threshold nearly fourfold. In addition, groundwater substitution pumping has the potential to emit criteria pollutants at levels that exceed local air district significance thresholds for volatile organic compounds (VOCs) and NOx in the Feather River Air Quality Management District and for NOx for the Sacramento Metropolitan AQMD.

In order to address these potential impacts, the DEIS includes mitigation measure AQ-1: "Reduce pumping at diesel or natural gas wells to reduce pumping below significance levels." (p. 3.5-43). It indicates that, following application of this measure, all project emissions are modeled to fall below applicable thresholds. EPA is concerned that measure AQ-1 is very vague. The single paragraph description provided is insufficient to determine whether this measure is capable of achieving the described emission reductions. It is unclear how BOR would limit diesel or natural gas well pumping and manage individual transfer permit to ensure cumulative compliance. The mechanisms for both emissions accounting and enforcement are similarly unclear.

Response

The mitigation measures in the EIS/EIR have been modified to clarify recordkeeping requirements that will ensure implementation of the action alternatives would not result in significant or adverse impacts to air quality.

Comment FA01-11

Comment

Measure AQ-1 also stipulates that "if an agency is transferring water through cropland idling and groundwater substitution, the reduction in vehicle emissions can partially offset groundwater substitution pumping at a rate of 4.25 acre-feet for water produced by idling to one acre-foot of groundwater pumped." The DEIS provides no citation or explanation for how the 4.25 AF/1 AF ratio was determined. Given the range of potential emissions rates associated with pumps of various ages/tiers and fuel types, plus the differing water needs of various crops, it is unclear how a single ratio of groundwater pumping to cropland idling was derived and deemed universally applicable.

Response

The ratio of 4.25 acre-feet of water produced by idling to one acre-foot of groundwater pumped is not reflective of emissions from the groundwater pumps, but rather of emissions that would occur from farm equipment operating on the field. The reference for Byron Buck & Associates 2009 (as cited in Section 3.5, Air Quality) provides detailed information on how the ratio was calculated. The ratio represents the best available information to estimate emission reductions from cropland idling.

Comment FA01-12

Comment

EPA's guidance on the General Conformity applicability analysis states, "the Federal agency can take measures to reduce its emissions from the proposed action to in fact below de minimis levels and, thus, the rule would not apply. The change must be State or Federally enforceable to guarantee that emissions would be below de minimis in the future." While California Environmental Quality Act mitigation measures may be enforceable under state law, the vague language of AQ-1 falls short of guaranteeing the de minimis thresholds will not be exceeded. Without additional information regarding the mechanism and enforcement for mitigation measure AQ-1, the DEIS does not demonstrate that emissions of NOx in the Sacramento Metro non-attainment area would be limited to below the de minimus threshold.

Response

The mitigation measures in the EIS/EIR have been modified to clarify enforcement provisions that will ensure implementation of the action alternatives would not result in significant adverse impacts to air quality.

Comment FA01-13

Comment

Recommendation: Include in the FEIS a detailed description of the processes by which BOR would approve, disapprove or approve with conditions those transfer applications within the Sacramento Metro AQMD such that emissions are maintained below the applicable de minimis and local significance thresholds; similarly for the Feather River AQMD. In order to demonstrate compliance with the General Conformity Rule, the FEIS should clearly show how the proposed mitigation measure would be implemented and enforced. Describe the mechanism for compliance assurance and enforcement, and clearly demonstrate the calculation leading to the 4.25 AF of water produced by idling to one AF of groundwater pumped ratio. Explain why this value is appropriate for all pumping/idling scenarios.

Response

The mitigation measures in the EIS/EIR have been modified to clarify enforcement provisions that will ensure implementation of the action alternatives would not result in significant adverse impacts to air quality. Additionally, the discussion on the 4.25 AF of water produced by idling to one AF of groundwater pumped ratio was expanded.

Comment FA01-14

Comment

The Department of Agriculture's Natural Resource Conservation Service has a program to promote agricultural production and environmental quality as compatible goals, optimize environmental benefits and help farmers and ranchers meet Federal, State, Tribal, and local environmental regulations. Through the Environmental Quality Improvement Program (EQIP), NRCS provide incentive funding to agricultural producers specifically to reduce NOx, VOCs, PM10 and PM2.5. Currently, incentive funds are available throughout California. The funded conservation practices include the replacement of internal combustion engines in irrigation pumps. For more information, go to http://www.nrcs.usda.gov/wps/portal/nrc/detail/ca/programs/financial/eqip/?cid=stelprdb1247003. As the DEIS notes, a California Air Resources Board airborne toxic control measure contain a schedule for the replacement of older and dirtier diesel agricultural engines.

Recommendation: Work with irrigation districts to ensure that individual growers participating in the project are aware of NRCS incentive funding to reduce project related air quality impacts. The FEIS should describe this program and the benefits it might offer for reducing potentially significant air quality impacts with regard to General Conformity.

Response

The individual growers are operating in compliance with ATCM, including any necessary retrofitting and repowering to meet the emission reduction requirements. The EIS/EIR has been clarified to include a discussion of the incentive program described in this comment. The mitigation measures have been modified to include a requirement to notify individual growers about the incentive program.

Comment FA01-15

Comment

The proposed project has the potential to cause or exacerbate overdraft of groundwater in the sellers' service area if groundwater substitution transfers are not carefully managed, and if mitigation is not aggressively enforced. One of the primary mechanisms whereby water transfers would be made possible under the proposed action is by groundwater substitution. A seller would pump groundwater in lieu of drawing that same volume of surface water from canal or stream flow. That surface water allocation (less carriage water) would then be sold downstream to a willing buyer in the buyer service area. California's limited regulation of groundwater resources has allowed overdraft of groundwater in part of the State. When groundwater elevations fall below historic lows, aquifer of certain geologies are subject to collapse, resulting in land subsidence. Areas subject to land subsidence have experienced particularly severe financial and ecological repercussion from groundwater overdraft. These impacts stretch far beyond the individuals pumping the groundwater, impacting entire communities and ecosystems. Furthermore, in dry and critical years, a lack of available water lead a greater proportion of water users to pump groundwater to supplement diminished surface water supplies. These circumstances are likely to co-occur with periods of the greatest number of groundwater substitution transfers.

Response

The monitoring and mitigation plans that are required by Mitigation Measure GW-1 include aspects related to water levels and subsidence. Groundwater levels are required to be monitored before, during, and after a groundwater substitution pumping transfer. The location and type of testing will be dependent on the area of the potential transfer. In areas that may be prone to subsidence because groundwater levels could fall below historic low levels, additional monitoring to ensure compliance with performance criteria will be required (see Common Response 7 for additional information). The plans will also include mitigation for issues related to substantial declines in groundwater levels and for significant subsidence impacts related to the projects in this EIS/EIR. The plans include mitigation measures such as reducing transfer pumping if warranted based on monitoring data. Reclamation will review the available data prior to approving the monitoring and mitigation plans. These plans are required prior to initiating a groundwater substitution transfer.

Comment FA01-16

Comment

The analysis of groundwater impacts assumes that transfers would occur at a rate of 12 out of 33 years, or 36% of the time (p. 2-13), based upon the period of record from 1970 to 2003. This data set is truncated to this period due to the limitation of the CalSim II model used, not because this period was deemed to be the most appropriate to represent future conditions. In fact, according to the DEIS (p. 1-17), north-of-delta to south-of-delta water transfers have taken place in 9 of the past 15 water years -- a rate of 60%. This is nearly double the transfer frequency assumed by the modeling performed.

The proposed project would likely ease and expedite the water transfer process during its 10-year term by removing the need for independent environmental review for transfer approval. The available data suggest that drought frequency will increase and water supply reliability decrease in coming decades as the effects of global climate change take hold of the State (p. 3.6-12). For this reason, it seems reasonable to assume that the frequency of water transfers during the 10-year project term would be at least equivalent to the past 15 years, if not more frequent. This discrepancy could potentially have very substantial influence on the predicted environmental impact of the project. The conclusion reached in the DEIS regarding impact upon groundwater elevations, land subsidence, streamflow, water quality, fisheries, wildlife, and economics are predicated on the assumption that natural recharge in non-transfer years will replenish groundwater aquifers. If the modeling performed were based upon the past 15 years of record, the environmental outcomes predicted for each of these resource areas would likely differ from those described in the DEIS.

Response

See Common Response 5.

Comment FA01-17

Comment

Recommendations: Complete additional modeling that is more representative of current and future reasonably foreseeable conditions with regard to transfer frequency. These results should be incorporated into each major resource area so potential adverse effects can be properly characterized. If the framework of CalSim II does not accommodate such modeling, we recommend that BOR perform a sensitivity analysis to determine the effect of this discrepancy upon overall conclusions regarding project impacts. In addition, BOR should consider what additional tools might be available for more accurately predicting likely project impacts in the event that transfer frequency occurs closer to the rate observed in the past 15 years.

Response

See Common Response 5.

Comment FA01-18

Comment

The DEIS is internally inconsistent in defining and treating baseline/existing groundwater elevations. The characterization of existing groundwater conditions uses data sets that conclude at dates ranging from 1995 to 2013, and none include data from the 2013-2014 critical drought year. Where older, outdated data are used, it is possible that recent trends in groundwater elevation or land subsidence are not represented in the analysis. The current drought is perhaps the most severe the state has ever experienced and would be the relevant baseline for additional impact from the proposed action, slated to commence in 2015. According to the California Department of Water Resources' November 2014 Drought Update, over 50 percent of monitored wells in the Central and Sacramento Valleys have experienced groundwater level decreases of 2.5 feet or more from spring of 2013 to spring of 2014, with over 20% experiencing decreases of more than 10 feet. For the period from spring 2010 to spring 2014, nearly 30% of monitored wells have experienced declines in excess of 10 feet. While the most severe declines occur in the San Joaquin basin, precipitous declines are none-the-less prevalent across a majority of the sellers' service area. Due to these recent declines, some of the monitored wells in the sellers' service area may have reached historic low levels. Consequently, we are concerned that the extent of, or potential for, land subsidence may be greater than is reflected in the DEIS.

Response

See Common Response 4, Common Response 6, and Common Response 7.

Comment FA01-19

Comment

According to the DEIS, five of eleven extensometers placed in the Sacramento Valley Groundwater Basin to monitor land subsidence are showing some amount of subsidence on an annual basis. This suggests that groundwater elevations are likely falling below historic lows in some portions of the Sacramento Basin. Analysis of data from the National Aeronautics and Space Administration (NASA) Gravity Recovery and Climate Experiment (GRACE) satellite mission suggests that, in the Central Valley, including the Sacramento basin, substantial loss of groundwater storage has occurred across the period of 2003 to 2010.

Response

Section 3.3.1.3.2 has been revised to include monthly groundwater storage estimates for Sacramento and San Joaquin Valley from the NASA effort (Famiglietti et al. 2011).

Comment FA01-20

Comment

Recommendation: Ensure that the most current groundwater elevation and land subsidence data available are used in the characterization of existing conditions and the determination of likely project effects in the FEIS. The FEIS should examine all available data source regarding groundwater elevations in the seller's service area and include a more thorough consideration of alternate data sources, given data limitation at some monitoring points. We recommend that the FEIS include specific requirements that prohibit the pumping of groundwater below historic lows where the risk of subsidence is present.

Response

See Common Response 4 and Common Response 7.

Comment FA01-21

Comment

The DEIS outlines a monitoring and mitigation measure for ensuring that potentially significant impacts to groundwater are offset; however, this measure (GW-1, p. 3.3-88) largely defers the specific to a required monitoring and mitigation plan to be developed by the water seller for approval by DWR and BOR in an independent post-NEPA permitting process. While a general framework is offered in the DEIS for how mitigation would be constructed, greater detail is needed to sufficiently demonstrate that environmental harm would be offset. The DEIS states that measure GW-1 will mitigate all impacts from groundwater pumping, placing responsibility for mitigating any "significant adverse impacts" of groundwater pumping on the water seller. Beyond the statement that mitigation "could include… curtailment of pumping until water levels raise above historic lows if non-reversible subsidence is detected," no more specific mitigation threshold or trigger are provided. Inelastic subsidence is a permanent impact. Implementation of mitigation after it has been monitored to occur mean that an irreversible and irretrievable commitment of resources will have occurred. The measure also does not include monitoring or mitigation specifically related to minimizing harm to the aquatic environment. It is not clear what action could or would be taken if groundwater substitution pumping were found to be dewatering a stream or water body (see comment on stream flow and fisheries impacts).

Response

Groundwater Mitigation Measure GW-1 requires the development of an approved monitoring and mitigation plan to identify and deal with potential impacts from groundwater substitution pumping. In counties where BMOs currently exist, the BMOs will be used as monitoring criteria. In counties where BMOs do not exist, critical changes to groundwater levels will be established through coordination with and feedback from third parties. Potential groundwater substitution sellers are required to develop monitoring and mitigation plans as part of Mitigation Measure GW-1. These plans are subject to review and approval prior to commencing a transfer. The seller will be required to successfully implement GW-1 in order to transfer water. Common Responses 6 and 7 include additional information.

Comment FA01-22

Comment

Measure GW-1 includes language placing financial responsibility on the transferring party for any repercussions of their pumping on others, including the cost to neighbors if the neighbors' pumping expenses increase, and the costs of infrastructure repair or improvements that may be required due to lower groundwater elevations or non-reversible land subsidence. However, as presented in the DEIS, these provisions are unlikely to be enforceable. The DEIS does not include metrics by which claims would be judged and processed, and responsibility apportioned, nor timeframes in which decisions would be made. Also, the DEIS does not define how "assurances that adequate financial resources are available to cover reasonably anticipated mitigation needs" would be made. Where offsetting a neighbor's pumping expenses or replacing public infrastructure is concerned, the expense to the transferring party could easily exceed the financial benefit of the water transfer by many times over.

Response

Common Responses 6 and 7 discuss groundwater mitigation and subsidence, respectively. Sellers must indicate that they understand the financial commitments associated with potential mitigation and they can meet those commitments.

Comment FA01-23

Comment

Recommendation: Provide greater detail about monitoring and mitigation measure GW-1 in the FEIS. The FEIS should include clearly defined mitigation triggers for the foreseeable range of potential environmental impacts associated with groundwater substitution transfers, including potential impacts to groundwater elevations, land subsidence, streamflow, fisheries, vegetation, and wildlife. We recommend that Measure GW-1 be revised to improve its enforceability, including providing metrics by which claims would be judged and responsibility would be apportioned, and timeframes in which decisions and distribution of reimbursement would be made. The FEIS should also define what constitutes "adequate financial resources to cover reasonably anticipated mitigation needs" and how their availability would be ensured.

Response

Groundwater Mitigation Measure GW-1 requires the development of an approved monitoring and mitigation plan to identify and deal with potential impacts from groundwater substitution pumping. Common Response 6 provides additional information. In counties where BMOs currently exist, the BMOs will be used as monitoring criteria. In counties where BMOs do not exist, critical changes to groundwater levels will be established through coordination with and feedback from third parties. Potential groundwater substitution sellers are required to develop monitoring and mitigation plans as part of Mitigation Measure GW-1. These plans are subject to review and approval prior to commencing a transfer. The seller will be required to successfully implement GW-1 in order to transfer water. Common Response 7 also includes additional information related to subsidence monitoring and mitigation.

Comment FA01-24

Comment

Page 3.7-26 of the DEIS states that stream flow reductions as the result of groundwater declines would have a less than significant impact upon fisheries and riparian resources because they "would be observed at monitoring wells in the region and adverse effects on riparian vegetation would be mitigated by implementation of Mitigation Measure GW-1." The principle mitigation for this impact is the curtailment of pumping until natural recharge corrects the environmental impact. The DEIS overestimates the effectiveness of this measure in avoiding harm to fisheries and riparian resources. Following the curtailment of pumping, a lag time would exist between when the effects of groundwater on streamflows are detected and when the curtailment of pumping would result in the augmentation of stream flows. This lag time could be months to years depending on specific ground and surface water conditions. During this lag time, significant adverse impacts to fisheries could occur.

Response

All references to mitigation measures in Section 3.7, Fisheries, have been removed. Mitigation measures are unnecessary because the effects of the range of potential activities analyzed under the action alternatives would be less than significant without them.

Comment FA01-25

Comment

Recommendation: Define, in the FEIS, triggers that would be used to make the decision to continue pumping or to cease pumping. For example, define at what depth below historic lows groundwater pumping would be curtailed, and at what point land subsidence measures are considered to be too great to be elastic and pumping would cease. The FEIS should more accurately characterize the potential for harm to fisheries resources during the lag time between impact observation and mitigation benefit.

Response

See Common Responses 6 and 7. Section 3.7 determines there are no significant effects to fisheries.

Comment FA01-26

Comment

In September of this year, Governor Jerry Brown signed a suite of three bills -- AB 1739, SB 1168, and SB 1319 -- collectively called the Sustainable Groundwater Management Act, with the intended goal of moving toward the sustainable management of unadjudicated groundwater basins throughout the state. This legislation will be enacted across the term of the Long Term Water Transfers project and has the potential to affect the proposed project.

Recommendation: Discuss the Sustainable Groundwater Management Act in the FEIS. The stipulations of this legislation should be identified in the "Regulatory Framework" portion of section 3.3. The FEIS should also discuss the potential effects of this legislation on the actions proposed for this project.

Response
Section 3.3.1.2 has been revised to include summaries of the sustainable groundwater management acts (AB 1739, SB 1168, and SB 1319).

Comment FA01-27

Comment
Streamflow Impacts and Water Quality. The proposed project would affect the quantity and timing of streamflow throughout the sellers' service area and downstream into the Sacramento/San Joaquin Delta. In an aquatic ecosystem that has already been severely degraded by reduced instream flows related to freshwater diversion and groundwater overdraft, any action with the potential to further reduce flows has the potential to significantly impair water quality. The DEIS states that, due to the timing and magnitude of potential impacts to streamflow, the project will not cause violation of any Delta water quality standards (p. 3.2-40).

Response
Changes in the flow resulting from transfer alternatives were modeled to assist in the evaluation of potential impacts due to changes in flow in the seller's and buyer's service areas. Appendix E presents a DSM2 modeling analysis of Delta conditions for the alternatives. The modeling addresses regulated parameters to determine the magnitude of changes to these parameters that could occur if the system operations defined by any of the alternatives were implemented instead of base operations. The flow analysis included changes in south Delta stage heights. Based on water quality standards and objectives, it was determined that any changes in operations resulting from the action alternatives would not significantly affect the quantity and timing of streamflow such that water quality would be impacted.

Comment FA01-28

Comment
The release of transfer carriage water, defined as the "portion of the transfer that is not diverted in the Delta and becomes Delta outflow" (p. 2-29), has the potential to increase outflows by an average of 1.8% (p. 3.2-47) between October and June. The DEIS states that streamflow losses associated with reservoir refilling, groundwater recharge, and loss of irrigation return water are modeled to reduce Delta outflows by up to 0.3 percent during the spring and winter months (3.2-47). However, as discussed in our comments on groundwater resources, the DEIS analysis assumes that water transfers will take place in approximately 35% of water years, while in the past 15 years, transfers have occurred at almost double this frequency. In the event that transfers occur as often as, or perhaps more often than, observed in recent history, groundwater aquifers

may not fully recharge between transfers, resulting in greater impacts to streamflow. Furthermore, it is unclear how the increase in Delta outflow was calculated given that the percent of a given water transfer that will be required for carriage is variable – assumed for some transfers to be as much as 20% (Sacramento River) and for others to not apply at all (EBMUD diversions) (p. B-18). If the data presented in the DEIS are average values, it is necessary to understand the maximum possible streamflow loses in order to determine the range of possible project impacts.

Response

See Common Response 5 for a discussion of transfer frequency.

Comment FA01-29

Comment

Recommendations: Describe in the FEIS how an increase in transfer frequency might affect expected streamflow and water quality impacts. Clarify how the proportion of a transfer deemed "carriage water" is determined and how these values were used to calculate expected change in streamflow resulting from project actions.

Response

See Common Response 5 for a discussion of transfer frequency.

Comment FA01-30

Comment

The California State Water Resources Control Board (State Board) has proposed flow criteria for the lower San Joaquin River Basin [Footnote: State Water Resources Control Board, December 2012, Public Draft Substitute Environmental Document in Support of Potential Changes to the Water Quality Control Plan for the San Francisco Bay/ Sacramento-San Joaquin Delta Estuary: San Joaquin River Flows and Southern Delta Water Quality. http://www.waterboards.ca.gov/waterrights/water_isues/programs/bay_delta/bay_delta_plan/water_quality_control_planning/2012_sed/] and is in the process of preparing a comprehensive update of the Bay Delta Water Quality Control Plan (Bay Delta WQCP) that will include flow criteria for the Delta as a whole. [Footnote: http://www.waterboards.ca.gov/waterrights/water_issues/programs/bay_delta/bay_delta_plan/water_quality_control_planning/] The State Board's 2010 Flows Report [Footnote: http://www.waterboards.ca.gov/waterrights/water_issues/programs/bay_delta/deltaflow/docs/final_rpt080310.pdf] underscores the need to increase flows to and through the estuary to support ecosystem processes, safeguard aquatic life, and protect imperiled species. It is not clear whether or how the proposed project would comply with these new requirement at all times.

Response

The exact content of future flow and water quality requirements in the Delta is not known at this time. Requirements for increased flow and improved water quality could require Reclamation, DWR, and other water rights holders to make changes in operations and diversions to meet standards. Reclamation would need to consider these requirements and determine how best to meet them, but the requirements would not be met through independent water transfers (as described in this EIS/EIR). The purpose and need/project objectives for this effort addresses the need for water supplies during years with shortages under current conditions. The water transfers described in this EIS/EIR would not contribute to meeting any new flow standards, but they would be operated so that they did not reduce the ability of Reclamation, DWR, and other water rights holders to meet the standards.

Comment FA01-31

Comment

Any water transfer program will have to be designed for operational flexibility so it can comply with existing water quality standards (such as the X2 salinity standard within D-1641 [Footnote: http://www.waterboards.ca.gov/waterrights/water_isues/programs/bay_delta/decision_1641/index.shtml. X2 refers to the distance from the Golden Gate up the axis of the estuary to the point where daily average salinity is 2 parts per thousand at 1 meter off the bottom. X2 provides a surrogate measure for the low salinity zone favored by an assemblage of native fish where abundance and survival is statistically greater than in other parts of the estuary. http://online.sfsu.edu/modelds/Files/References/JassbyEtAl1995EcoApps.pdf]), and potentially more stringent standards once the comprehensive Bay Delta WQCP is completed. On the whole, these new requirements are anticipated to necessitate that less water be diverted for human consumption and more be left in the river for aquatic life. While Appendix B provides detailed analysis of the project's potential effects on the X2 salinity standard, the current text of the DEIS constitutes an insufficient summary of these data (p. 3.2-40). In addition, the modeling performed for assessing impacts to the position of X2 relies upon monthly averages of that position. Monthly averages are not the appropriate “time step” as they can mask violations and standards. Impacts to the position of X2 must be analyzed and evaluated in the units in which the standard is written in order to demonstrate compliance.

Response

Additional information regarding a summary of Delta conditions resulting from the transfer alternatives has been added to Section 3.2. Water transfers are a flexible tool (as required by the purpose and need and project objectives). Appendix E includes additional information on Delta conditions, including water quality.

Comment FA01-32

Comment

Recommendations: Recent proposals by the State Board to include specific flow requirements in future Water Quality Control Plans for the Sacramento/San Joaquin River Delta should be discussed in the FEIS. Explain how the proposed project would be designed and operated with the flexibility needed to achieve compliance with current water quality standards and future standards that might be significantly more stringent.

Response

See Response to Comment FA01-30.

Comment FA01-33

Comment

Streamflow modeling data should be analyzed to determine any change in the position of X2 on a daily basis through time in order to demonstrate that water transfers would not cause the X2 standard to be violated. Include in the FEIS a fuller summary of the data contained in Appendix B to properly support the assertion that the proposed project would not violate the existing X2 standard. If any violations of the X2 standard are found in the modeling to occur on a daily basis, the FEIS should identify this significant impact, indicate the frequency of modeled exceedance, and discuss mitigation that would prevent this impact.

Response

Additional information regarding a summary of Delta conditions resulting from the transfer alternatives has been added to Section 3.2. Appendix E includes more detail.

Comment FA01-34

Comment

The DEIS states that changes in streamflow of less than ten cubic feet per second (cfs) are assumed to have no impact upon water quality (p. 3.2-27). This assumption is not supported with appropriate citation or data. The explanation that changes of less than 10 cfs are outside the accuracy of the model employed is insufficient to demonstrate that this threshold is physically or chemically appropriate. Depending on water levels and flow conditions, a loss of 10 cfs could degrade water quality.

Response

This standard has been removed from the Assessment Methods section. The impact analysis previously presented changes in flows that were below this threshold.

Comment FA01-35

Comment

Recommendation: Explain, in the FEIS, the basis for the assumption that streamflow changes of less than 10 cfs would not affect water quality. If data supporting such an assumption are not available, we recommend that BOR reconsider its use of this assumption for its analysis. If a lower threshold for significance is deemed appropriate, but the available modeling tools lack the resolution to predict all impacts at this threshold, we recommend that the remaining uncertainty be clearly identified in the FEIS and a precautionary approach be taken with regard to permitting water transfer related actions.

Response

This standard has been removed from the Assessment Methods section. The impact analysis previously presented changes in flows that were below this threshold.

Comment FA01-36

Comment

The DEIS consider potential streamflow impacts to smaller tributaries in Section 3.7. It states that, for rivers and their major tributaries, groundwater and streamflow modeling was compared against historical flow data to assess impacts to surface water flows. For smaller streams and water bodies, where insufficient data were available to allow this approach, the analysis assumed that streamflow response was similar to that of larger adjacent modeled waterways. This approach is significantly flawed. Model resolution is not the appropriate basis for excluding smaller waterways from a more detailed examination. Smaller water bodies will respond differently to changes in groundwater contributions than will larger water bodies and are potentially much more sensitive to small changes in f1ow magnitude and frequency. Where a loss or reduction in groundwater contributions to a section of a large water way may result in a small reduction in flow, but no loss of ecological function, the same reduction in groundwater contributions to a smaller tributary stream could result in near or complete dewatering and a significant degradation of ecological function.

Response

The analysis uses the best available modeling and analysis tools. No such tools were available for these smaller streams, therefore a more quantitative analysis could not be conducted for them. A qualitative assessment based on best professional judgment, inferences predicated on facts, and the reasonable assumption that changes in flow in smaller streams were similar to those of adjacent larger streams were used to analyze these smaller streams. Overall, the analysis is very conservative. The assertion by the commenter that smaller water bodies respond differently from larger water bodies may be true under some site-specific circumstances, but the opposite may also be true under other site-specific circumstances. Due to the uncertainty of potential responses and based on available data, Reclamation and SLDMWA assume, for the purposes of this EIS/EIR, that the smaller streams respond similarly to larger streams. As specific transfers are proposed, and if warranted under site-specific conditions, additional quantitative analysis of smaller streams may be appropriate. See responses to Comments FA01-37 and NG10-28 for additional discussion of site-specific streamflow data. See Common Response 14 for additional discussion regarding consideration of specific transfer proposals.

Comment FA01-37

Comment

Recommendations: Additional site specific information, including streamflow data and the likely proportion of flow contributed by groundwater, is needed in order to determine the likely effect of groundwater substitution transfers on smaller streams and waterbodies in the seller's service area. The FEIS should explicitly identify where uncertainty exists due to model limitations, and describe the range of potential impacts contained within that uncertainty. In the absence of the necessary site specific data for a more comprehensive analysis, we recommend that BOR consider taking a precautious approach to minimize potential ecological risk.

Response

Site specific information was gathered for each stream. When limited or no information was available, the analysis considered the size of the stream, whether it was ephemeral, and the effects of groundwater substitution pumping on other neighboring waterways. Overall, the analysis is very conservative. See response to Comment NG10-28 for more information.

Comment FA01-38

Comment

The DEIS states that changes in stream flows on the San Joaquin River and in the Sacramento/San Joaquin Delta will be less than significant because total reductions in flow will be only a fraction of a percent. A two percent reduction in flow is identified as the threshold for significance for this impact. A more refined analysis of impacts to species would have to be conducted to determine whether this significance threshold is biologically appropriate. According to the State Board, [Footnote: State Water Resources Control Board, 3 Aug. 2010, Development of Flow Criteria for the Sacramento-San Joaquin Delta Ecosystem Prepared Pursuant to the Sacramento-San Joaquin Delta Reform Act of 2009, (2010 Flows Report), available at http://www.waterboards.ca.gov/waterrights/water_issues/programs/bay_delta/deltaflow/docs/final_rpt080310.pdf] U.S. Fish and Wildlife Service, [Footnote: "Interior remains concerned that the San Joaquin Basin salmonid populations continue to decline and believes that flow increases are needed to improve salmonid survival and habitat." USFWS May 23, 2011 Phase I Scoping Comments: http://www.waterboards.ca.gov/waterrights/water_issues/programs/ bay_delta/bay_delta_plan/water_quality_control_planning/cmmnts052311/amy_aufdemberge.pdf] NMFS, [Footnote: "Inadequate flow to support fish and their habitats is directly and indirectly linked to many stressors in the San Joaquin river basin and is a primary threat to steelhead and salmon." NMFS Feb. 4, 2011 Phase I Scoping Comments: https://www.waterboards.ca.gov/waterrights/water_issues/programs/bay_delta/bay_delta_plan/water_quality_control _planning/cmmnts020811/010411dpowell.pdf] and the California Department of Fish and Wildlife, [Footnote: "…current Delta water flows for environmental resources are not adequate to maintain, recover, or restore the functions and processes that support native Delta fish." Executive Summary of California Department of Fish and Game, November 23, 2010, Quantifiable Biological Objectives and Flow Criteria for Aquatic and Terrestrial Species of Concern Dependent on the Delta.] existing conditions in the San Joaquin River basin are not adequate to protect aquatic life. All three fisheries agencies identified salmon and steelhead populations as declining under current flow conditions. The DEIS does not provide sufficient support for the conclusion that this further reduction in flow would not adversely affect these species or other native aquatic species.

Response

The analysis compares conditions under each action alternative to existing conditions to determine the potential for significant adverse effects. The analysis found that the incremental effect of the range of potential transfer activities analyzed under the action alternatives would be less than significant. See Section 3.7.2.4 of the EIS/EIR for a detailed explanation of the bases of this conclusion.

The commenter would like the thresholds of significance under CEQA to be zero such that any change, no matter how small, would be significant. The preparers of the EIS/EIR who model hydrology have indicated the changes to the environment are barely perceptible. As such, they are within the range of normal operations of existing facilities and are less than significant under CEQA.

Comment FA01-39

Comment

The DEIS indicates that, under the proposed project, the many waterways in the project area are likely to experience higher flows during some portions of the year but lower flows during wetter periods. There are many benefits to maintaining flood flows in rivers in wet years as they inundate floodplains and initiate ecosystem processes that support aquatic life. Juvenile salmon will rear on seasonally inundated floodplains when available. This has been found to increase growth and survival in the Central Valley, specifically in the Yolo Bypass and the Cosumnes River floodplain. [Footnote: T.R. Sommer, M.L Nobriga, W.C. Harrell, W. Batham, and W.J. Kimmerer, 2001. Floodplain rearing of juvenile Chinook salmon: evidence of enhanced growth and survival. Can. J. Fish. Aquat. Sci. 58: 325-333.] [Footnote: C.A. Jeffres, J.J. Opperman, and P. Moyle. 2008. Ephemeral floodplain habitats provide best growth conditions for juvenile Chinook salmon in California river. Environmental Biology of Fishes, Published online June 6, 2008: www.waterboards.ca.gov/waterrights/water_issues/programs/bay_delta/deltaflow/docs/exhibits/usdoi/spprt_docs/doi_jeffres_2008.pdf] These benefits to the ecosystem would be lost if peak flows and flood pulses are suppressed, and contribute increased stress on fish populations that are already adversely affected by flow diversions (e .g., loss of spawning gravels, reduced foraging habitat, loss of cold water).

Response

Reclamation and SLDMWA do not disagree with this statement and do not see any conflict between the analysis and this statement. The ten percent screening threshold for instream flow in rivers and creeks is one of multiple criteria used to determine whether there were significant impacts on aquatic and terrestrial resources. Use of the ten percent threshold is described in Section 3.7.2.1.3. See response to Comment NG10-28 for additional information.

The analysis used two screening criteria to determine whether there were substantial flow reductions in waterways: a greater than 1 cfs reduction criterion and a greater that 10 percent reduction criterion. Flow reductions in the majority of waterways did not meet either of these criteria (see Table 3.7-3). Because there is high environmental heterogeneity in these Central Valley streams, a change of 1 cfs, either higher or lower, is not uncommon. This is why the 1 cfs criterion, in combination with the 10 percent criterion, were used and were considered highly conservative for detecting substantial flow changes. For those waterways with changes greater than the criteria, Section 3.7.2 includes a further biological analysis that considers the types of biological benefits discussed in the comment. Flow changes during wet periods represent a very small percent of flow during these periods (a barely perceptible change), and would not alter floodplain inundation. See response to Comment NG10-28 for additional information.

Comment FA01-40

Comment

Recommendation: More thoroughly analyze the project's potential impacts on native ecosystems, including sensitive and endangered species, from changes in streamflow. Clearly define, in the FEIS, the criteria used for defining harm to species. Where significant impacts are found to occur, the FEIS should discuss potential mitigation measures.

Response

See response to Comment FA01-39. Because streamflow changes associated with the range of potential transfer activities analyzed under the action alternatives are insubstantial, no significant impacts on native ecosystems from changes in streamflow are anticipated.

Comment FA01-41

Comment

The idling of cropland has the potential to result in increased sediment runoff to local waterbodies. The document contends that this impact is expected to be less than significant due to the crust-like surface formed on rice fields after they are drained and the assumption that farmers idling upland crops will employ soil retention measures (p. 3.2-29). The DEIS does not discuss the possible benefits of planting cover crops toward preventing sediment runoff, especially where landowners choose not to employ other erosion control techniques.

Response

The commenter is correct that runoff from idling of cropland was not found to have a significant impact on water quality. As a result, mitigation measures such as cover crops were not evaluated as part of this study. However, additional information was added to Section 2.3.2.1 to describe how non-irrigated vegetation left on idled fields may improve the existing condition and habitat value of these fields.

Comment FA01-42

Comment

Recommendations: Discuss, in the FEIS, the feasibility and benefit of planting or encouraging the growth of cover vegetation for reducing soil erosion and sediment runoff into waterways.

Response

The analysis of runoff from idled fields found this type of action was not necessary to reduce soil erosion, but it could improve existing conditions and habitat value. Text has been added in Section 2.3.2.1 to describe how non-irrigated vegetation left on idled fields may improve the habitat value of these fields.

Comment FA01-43

Comment

Fisheries. Chapter 3.7 of the DEIS assesses the project's potential impacts upon fisheries. EPA finds that the analysis performed lacks the resolution necessary to identify the full range of potentially significant adverse impacts the project may have upon fisheries, including potential impacts on special status species. The modeling performed for this analysis relied upon the flawed assumptions that a transfer action would have no adverse impact upon fisheries if modeled flow reduction were of less than one cubic foot per second (cfs) or less than a ten percent change in mean flow by water year type (p. 3.7-20). These assumptions inappropriately limit the scope of the impact analysis and undermine the accuracy of the conclusions reached.

Response

The EIS/EIR employs the best available tools. When tools were not available, the analysis required assumptions, inference, and best professional judgment. There were several steps to the analysis, including the screening analysis of 1 cfs and 10 percent, followed by a biological analysis. The 10 percent assumption used was based on previous legally certified documents (as discussed in Section 3.7.2.1.3) and is, therefore, appropriate for use. The 1 cfs assumption was an additional criterion needed for larger streams. Ultimately, the range of potential activities under the Proposed Action, throughout the many analyses conducted, was found to be less than significant in all waterways for fisheries resources.

Comment FA01-44

Comment

The DEIS contends that any change in flow of less than ten percent falls within the "noise of model outputs and beyond the ability to measure actual changes" (pg. 3.7-20). It is not logical nor acceptable for purposes of this analysis to conclude that biological impacts are limited to the range of flow changes capable of being represented by the model employed. Research has examined the effects of implementing freshwater flow prescriptions for rivers and estuaries that mimic the pattern of the natural hydrographs in order to protect aquatic species with life histories adapted to such flow patterns. [Footnote: "Major researchers involved in developing ecologically protective flow prescriptions concur that mimicking the unimpaired hydrographic conditions of a river is essential to protecting populations of native aquatic species and promoting natural ecological functions". (Sparks 1995; Walker et al. 1995; Richter et al. 1996: Poff et al. 1997: Tharme and King 1998: Bunn and Arthington 2002: Richter et al. 2003; Tharme 2003: Poff et al. 2006; Poff et al. 2007: Brown and Bauer 2009). SED. Appendix C. p. 116] For example, work performed by Richter, et. al. [Footnote: Richter, B.D., Davis, M., Apse, C., and Konrad, C. P. 2011. A presumptive standard for environmental flow protection. River Research and Applications. DOI: 10.1002/rra.1511. http://eflownet.org/downloads/documents/Richter&al2011.pdf] on riverine systems in Florida, Michigan, Maine, and the European Union found that the maximum cumulative depletion of flows allowable to ensure adequate protection of aquatic species ranged from 6- 20% year-round or in low-flow months and 20-35% in higher flow months. These scientists recommended the equivalent of no less than 90% of natural flow to achieve a high-level of ecological protection, and no less than 80% of natural flow to achieve a moderate level of ecological protection. Central Valley watersheds experience a much higher proportion of flow alteration than these scenarios. For example, during a median year in the San Joaquin River system, only 31% of the natural flow is allowed to remain in the river channel. [Footnote: EPA Comments on the Bay Delta Water Quality Control Plan, Phase I SED. March 28, 2013. Available at: http://www.epa.gov/sites/production/files/documents/sfdelta-epa-comments-swrcb-wqcp-phase1-

sed3-28-2013.pdf] In a system that is so severely impacted with regard to streamflow, additional reductions in flow of less than ten percent have the potential to cause significant adverse impacts.

Response

The ten percent screening threshold for instream flow in rivers and creeks is one of multiple criteria used to determine whether there were significant impacts on aquatic and terrestrial resources. Use of the ten percent threshold is described in Section 3.7.2.1.3. See response to Comment NG10-28 for additional information. While the hydrologic models used for the analysis are considered to be the best available, they are not perfect and a certain amount of "noise" is associated with them. It is not reasonable or appropriate to consider any model as having perfect predictive power.

Comment FA01-45

Comment

Similarly, because streams and stream flows vary greatly at the reach scale due to environmental heterogeneity, changes of less than 1 cfs can have significant adverse effects on fishes and amphibians, depending on the specific reach affected and the conditions in that reach at the time of impact. Fishes, especially special status species, rely on high quality reaches as refugia for population persistence. Any degradation of reach quality has the potential to affect population vitality.

Response

Reclamation and SLDMWA agree that there is high environmental heterogeneity in these Central Valley streams. As a result, a change in 1 cfs, either higher or lower, is not uncommon. This is why the 1 cfs criterion, in combination with the 10 percent criterion, were used and were considered highly conservative for detecting substantial flow changes. See responses to Comments FA01-39 and NG10-28 for additional information. The commenter would like the thresholds of significance under CEQA to be zero such that any change, no matter how small, would be significant. The preparers of the EIS/EIR have indicated the changes to the environment are barely perceptible. As such, they are within the range of normal operations of existing facilities and are less than significant under CEQA.

Comment FA01-46

Comment

According to the DEIS, the Central Valley Project Improvement Act of 1992 requires that a transfer "will not adversely affect water supplies for fish and wildlife purposes" (p. 1-11). Based upon the information provided in the DEIS, it is not clear that this provision would be met if the "Full Range of Transfer Measures" project alternative (the preferred alternative) is implemented as currently described.

Response

See response to Comment NG10-36.

Comment FA01-47

Comment

Recommendations: Perform additional modeling and analysis to more accurately assess potential impacts of the project upon fisheries. We recommend discarding the flawed assumptions that underpin the analysis performed for the DEIS. The FEIS should disclose when model resolution is too coarse to capture flow changes with the potential to adversely impact fisheries, and identify measures that would avoid or mitigate adverse impacts to fisheries and the aquatic environment in connection with actions authorized by the proposed project. Explain how and when the need for implementation of such measures would be determined.

Response

The EIS/EIR contains a complete analysis of fisheries resources impacts. See response to Comment NG10-36 for a more detailed description of the analysis.

Comment FA01-48

Comment

The bulk of the analysis presented in section 3.7 of the DEIS focuses primarily upon the proposed project's potential impacts upon a short list of “species of management concern”. It is unclear why the numerous other native fishes potentially affected by the proposed project are not more thoroughly examined. For example, page 3.7-9 provides a list of waterways that do not contain special-status fish species, followed by the statement, “as a result, no further biological analysis was conducted in these waterways". It is not clear why the DEIS concludes that potential impact to non-special-status species are inherently less than significant. Numerous native species may inhabit these waterways and may be exposed to adverse conditions as a consequence of this project. Furthermore, the DEIS does not demonstrate that potential impact to fish assemblages or communities were considered, only impacts upon individual species. While protection of individual special status species is important, the project's potential impacts upon fisheries at the ecosystem scale may be equally significant and worthy of consideration.

Response

A discussion of effects to native species and conclusion of no impacts have been added to the section.

Comment FA01-49

Comment

Recommendations: Discuss, in the FEIS, the proposed project's potential impact upon all native species, rather than focusing solely upon “species of management concern”; this should include analysis of potential impacts upon waterways previously eliminated from analysis for fisheries impacts. We recommend that the FEIS analyze potential impacts to multi-species communities, rather than focus solely on single-species impacts.

Response

A discussion of effects to native species and conclusion of no impacts have been added to the section.

Comment FA01-50

Comment

The DEIS explains that native fishes assemblages in the deep-bodied fishes zone have been replaced largely by non-native assemblages, citing "Moyle (2002)" (page 3.7-6). While this is generally true for the San Joaquin River, it is not an accurate characterization for the Sacramento River system. Many more recent studies of fishes in the Sacramento River system have been produced since 2002 that more accurately characterize the current condition of fisheries in that system.

Response

Reclamation contacted EPA and requested they provide the references offered in this comment. EPA suggested that Reclamation contact one or more of the four fisheries biologists whose names and employers were provided by EPA in their response. All four individuals were contacted and Reclamation received responses from Peter Moyle, Michael Marchetti, and Larry Brown with the information needed to address this comment. The text has been updated based on their responses.

Comment FA01-51

Comment

Recommendations: A review of available scientific literature related to the fish assemblages of the Sacramento River should be conducted and the most current reliable data should be employed for defining existing conditions and determining potential project impacts. Based on this review, clarify the potential for the proposed project to adversely affect native fish assemblages in the deep-bodied fishes zone. EPA would be willing to assist BOR in acquiring the relevant literature, if needed.

Response

See response to Comment FA01-50.

Comment FA01-52

Comment

The DEIS understates potentially significant impacts to anadromous fish species by focusing on peak habitation times and locations, without regard for the potentially substantial number of individuals who may occur in waterways outside of peak times. For instance, water transfers, which would occur from July through September, would coincide with the spawning period of winter-run Chinook salmon. The DEIS states that "spawning occurs upstream of the areas potentially affected by the transfers. Due in part to elevated water temperatures in these downstream areas during this period, emigration would be complete before water transfers commence in July." (pg. 3.7-12) While most winter-run emigration is completed between Sept-June, not all emigration is complete by the end of June, and this is important for such a diminished species because every individual counts. Depending on the water year and river conditions, some fish continue to emigrate beyond June. Therefore, the conclusion that no potential effect to winter-run Chinook salmon emigration would occur is not supported. Similarly, the DEIS indicates that impacts to spring-run Chinook salmon would be less than significant because "the bulk of upstream migration (March-September, peaking May-June) and emigration (November-June) would be complete before water transfers commence in July" (pg. 3.7-13 to 14).

Response

The section referred to by the commenter is an initial discussion of potential effects. Later in the document (Section 3.7.2.4 for the Proposed Action), there is a full analysis of potential impacts to flows in the Sacramento River for all months and water year types, including those that were suggested by the commenter. The analysis concludes that impacts would be less than significant because there are no substantial changes in flows in waterways that winter- and spring-run Chinook salmon inhabit except Little Chico Creek, which is discussed separately.

Comment FA01-53

Comment

While most migration may occur outside the proposed transfer period, the DEIS does not discuss in sufficient detail the potential adverse effects of the proposed project upon those migrating or emigrating fish that would be present in waterways affected by transfer actions. Furthermore, the DEIS contends that, while summer rearing of Central Valley steelhead would overlap with water transfers in the Seller Service Area, "the majority of rearing ... would occur in the cooler sections of rivers and creeks above the influence for the water transfers." (page 3.7-15). This statement requires a citation if it is to serve as the basis for concluding that potential adverse effects on Central Valley steelhead summer rearing is unlikely to occur. Again, while most of the rearing may occur outside the area to be adversely affected by water transfers, the DEIS suggests that this is not the case for all rearing, and this potential adverse effect is not quantified or analyzed in sufficient detail.

Response

The text has been changed and reference provided, although it is not the basis for conclusions drawn later. The lack of changes in flows in the rivers is the basis for these conclusions.

Comment FA01-54

Comment

Recommendation: The FEIS should accurately characterize the potential impact upon winter-run Chinook salmon and Central Valley steelhead. Where adverse impacts are likely to occur, potential mitigation measures should be proposed and analyzed.

Response

See response to Comment NG10-36 for a more detailed description of the analysis. No mitigation was necessary because the analysis shows no significant impacts are anticipated.

Comment FA01-55

Comment

The discussion of potential impacts to steelhead and hardhead understates potential impacts and ignores the potential consequence for these populations where consecutive dry or critically-dry water years occur. The DEIS states that, although juvenile steelhead and hardhead could be present in some rivers affected by reduction in flows, those reductions occur "only one month and one water year type in one month," and therefore this impact is not expected to have a substantial effect on these species (page 3.7-28), but the potential adverse effects on these species during this one month period are not clearly characterized. If mortality is possible due to adverse stream conditions, then the brief duration of this impact does not necessary ensure minimal harm. Furthermore, if a dry or critically-dry year follows one of the same, the adverse effects during this one month period could be compounded.

Response

The text has been clarified to address this comment. Reclamation and SLDMWA have provided further biological information to support the conclusion that there would be less than significant impacts to fisheries resources in Stony Creek.

Comment FA01-56

Comment

Recommendations: Clearly explain the criteria used to conclude that these potential effects on steelhead and hardhead would be less than significant. The cumulative effect analysis should encompass consecutive dry and critically-dry years.

Response

As described in Section 3.7.2.4, a reduction of 10.0 percent in one water year type and one month is infrequent and, therefore, not considered a "substantial" effect to the habitat of target species, which is the significance criterion used in the EIS/EIR.

Comment FA01-57

Comment

Migratory Birds. With the large-scale conversion of Central Valley riparian forests and wetlands to agriculture and suburban development, birds and other wildlife have become increasingly dependent on agricultural lands for food and cover. Ricelands serve as essential breeding and wintering habitat for nearly 187 species of birds, 27 species of mammals, and 15 species of reptiles (of which 30 are considered special-status species) [Footnote: "Wildlife Known to Use California Ricelands," 2011. Prepared for California Rice Commission http://calrice.org/pdf /wildlife/Species-Report.pdf]. The DEIS focuses almost exclusively on the proposed project's potential adverse effects upon special status species while potentially significant adverse effects upon migratory birds are either discounted or ignored altogether. Ricelands provide a high-value food source from the 75,000 tons of grain estimated to remain on the ground each year due to harvesting inefficiencies. As a result, wintering waterfowl are estimated to gather more than 50% of their nourishment from ricelands.

Response

See response to Comment FA01-7.

Comment FA01-58

Comment

The DEIS contends that a reduction in acres of flooded agricultural fields in the Delta resulting from the idling of cropland and the shifting of crops would not affect species migrating to the project area during spring because these species would simply select suitable habitat upon arrival (Section 3.8.2.4.1). But the proposed project could remove up to 51,473 acres (p. 3.8-64) of valuable farmed wetlands from the landscape and the DEIS' apparent conclusion that migratory bird population can quickly adapt to a radically altered mosaic of fallowed fields and farmed wetlands seems flawed and not supported by scientific documentation. Furthermore, the DEIS appears to incorrectly assume that all other factors will be held equal while cropland idling and water transfers take place. This is not the case. The critically-dry water years in which the maximum amount of water transfers are likely to take place are also the years when Delta farmers are most likely to fallow their lands, either voluntarily or due to water shortage, and these outcomes could greatly compound the adverse effects of the proposed project. For instance, the California Rice Commission reports that while farmers flood between 150,000 and 350,000 acres of ricelands annually in the Southern Sacramento Valley and Delta, farmers planted ~20% fewer acres during 2014 and may flood as little as 50,000 acres of ricelands in the 2014-2015 season due to the ongoing drought and water shortages. [Footnote: "Wintering Waterfowl Habitat Concerns Looms Large," California Rice Commission, September 16 2014, http://calrice.org/blog/?id=1410890340&author=California+Rice+Commission]

Response

See response to Comment FA01-7.

Comment FA01-59

Comment

Recommendations: The FEIS should thoroughly characterize the potential reduction in resting and forage habitat for migratory bird species resulting from cropland idling and crop shifting. The FEIS should consider these potential impacts in the context of current trends regarding habitat availability and anticipated future conditions resulting from climate change and changes in farming practices. The FEIS should discuss means for ensuring that sufficient wetted habitat (natural wetland or flooded field) is available for migrating bird species.

Response

Habitat variability due to changes in farming practices is common within the potential transfer areas and is reasonably certain to continue into the future. The range of potential transfer activities analyzed in this EIS/EIR will not significantly affect the degree of change within this highly variable landscape. Effects from climate change, although reasonably certain to occur, are not expected to result in substantial changes to existing habitat conditions during the 10-year term of analysis.

Comment FA01-60

Comment

Riparian Communities. The project has the potential to have significant adverse effects on riparian systems, but the DEIS discounts these potential effects, in part because "changes in stream flow attributable to the Proposed Action would fall within historical ranges" (page 3.8-52). It should be recognized, however, that water management practices administered by federal and State agencies and local irrigation districts have already caused great stress on riparian systems and their associated fish and wildlife species. Recent consumptive patterns involving surface water diversions and groundwater pumping have, in effect, simulated, for fish and wildlife, severe and prolonged drought conditions whether or not drought conditions are actually present. The shift in hydrological conditions has caused a shift in species composition as native fishes have been overwhelmed and replaced by introduced and invasive aquatic species. Additional stress on these aquatic ecosystems could reinforce these adverse effects and potentially cause permanent, unmitigable impacts. The DEIS identified impacts to Cache, Stony, Coon, and Little Chico creeks that would be significant, with Little Chico Creek going to zero flow under some project scenarios. By their nature, no-flow conditions can lead to long-term and irreplaceable losses of ecosystem function.

Response

See Common Response 11. As described and analyzed in Section 3.8 of the EIS/EIR, the range of potential transfer activities analyzed in this EIS/EIR would not result in significant losses in ecosystem functions.

Comment FA01-61

Comment

Recommendation: Revise the EIS to more accurately characterize potential impacts to riparian communities. Identify robust mitigation measures that would ensure that the proposed project would not diminish instream flows in waterbodies affected by the proposed project.

Response

See Common Response 10 and Common Response 11 related to effects to vegetation communities.

Comment FA01-62

Comment

The DEIS identifies GW-1 as a mitigation measure for off-setting the potential adverse effects on stream flows from groundwater substitution, but the proposed measure may not provide full compensation for the potential significant adverse effects on riparian systems. Based on the information provided in the DEIS, it appears that the proposed project does not contain provisions for preventing the complete dewatering of smaller streams near groundwater pumping zones. As mitigation measure GW-1 is designed to be reactionary, dewatered stream conditions might persist for extended periods before natural recharge to aquifers could restore base flows. This could result in serious indirect costs, such as the loss of mature riparian vegetation essential to the structure and function of riparian systems. Even if measures are taken to restore the riparian forests, the genetic losses could be permanent and full restoration may not be possible.

Response

The monitoring requirements of Mitigation Measure GW-1 have been clarified. See Common Response 10 for additional information.

Comment FA01-63

Comment

Recommendations: Revise measure GW-1 to address potentially irreversible adverse effects to riparian systems and related habitats from the implementation of the proposed project. Include, in the proposed monitoring plan, monitoring of any small tributary streams near the point of groundwater extraction. We recommend that specific mitigation triggers be established identifying the percent reduction in flow outside the natural range that would require a cessation of pumping.

Response

See response to Comment FA01-62.

Comment FA01-64

Comment

Range of Alternatives. In the development of project alternatives, BOR employed a screening criterion that all alternatives must be immediate, flexible, and provide new water to the buyers' service area. The requirement that all project alternatives provide water was used to screen out potential project components involving the conservation or transfer of water within the seller service area (Table 2-1). It is unclear why this screening criterion was deemed necessary and how it relates to the project "need" of immediately implementable and flexible water supplies to alleviate shortages (p. 1-2). The restriction imposed that the alternatives need to "provide water" screens out all alternatives that would promote reducing demand in the buyer area and having water rights holders operate within the limit of their existing legal water rights. Some of the alternatives screened out by this criterion might be found to be environmentally and economically preferable. For example, retirement of drainage impaired areas that leach selenium into the San Joaquin River has been documented to have environmental and economic benefits in a National Economic Development Analysis conducted as part of the San Luis Drainage Feature Re-evaluation FEIS. [Footnote: San Luis Drainage Feature Re-evaluation Final EIS (2007) available at: http://www.usbr.gov/mp/nepa/nepa_projdetails.cfm?Project_ID=61] It is unclear why within basin transfers in the buyers service area, considered in conjunction with demand reducing measures, such as conservation and land fallowing, would not meet the underlying project need to supply water to meet shortages.

Response

The Lead Agencies established the purpose and need and project objectives to best describe their underlying reasons for considering an action. The objective to "develop supplemental water supply for member agencies during times of CVP shortages to meet existing demands" reflects the water shortages felt by transfer recipients and their desire to receive additional water during these shortages.

Reclamation, as an agency, has multiple planning efforts ongoing to satisfy their directives. The San Luis Drainage Feature Re-Evaluation reflects different objectives, and is being carried forward as a different project to achieve those objectives. See responses to Comments NG03-125 and NG03-141 for additional information.

Comment FA01-65

Comment
It is also unclear why groundwater storage ("Build new facilities to recharge and extract groundwater for use in buyer service area") in the buyers service area was deemed as not providing new water supply. If aquifers are recharged in wet years, then that water is pumped and used in dry years, it seems this alternative would offer "new supply" in circumstances similar to those when pumping of groundwater from the seller's service area would enable groundwater substitution transfers.

Response
The detailed reasons for screening out the Groundwater Storage Alternative are explained in Appendix A in Section 4.1.13. Groundwater storage could provide water during dry or critical years, but that supply depends on having an available source of water to recharge. Agencies in the buyer service area face water shortages in most years and would not have additional water available for recharge. Without an adequate source of recharge water, this measure would not provide sufficient water to reduce CVP shortages.

Comment FA01-66

Comment
Recommendation: Explain how the screening criteria were developed and why the requirement that a project component provide new water was deemed appropriate and necessary. A number of the measures eliminated from further consideration in Table 2-1 warrant further consideration and discussion. The FEIS should explain why measures to limit demand and enable within basin exchange of water in the buyer service area, considered in conjunction with one another, would not meet the screening criteria identified.

Response
Appendix A includes additional detail on how the screening criteria were developed and why measures were eliminated from further consideration.

Comment Letter SA01, Helen Birss, California Department of Fish and Wildlife

Comment SA01-1

Comment
The California Department of Fish and Wildlife (CDFW) has reviewed the Bureau of Reclamation and San Luis & Delta-Mendota Water Authority (SLDMWA) Draft Environmental

Impact Statement/Environmental Impact Report (EIS/EIR) for the Long-Term Water Transfers Project (Project). Thank you for providing CDFW the opportunity to address its area of statutory responsibility in the EIS/EIR (Cal. Code Regs., tit. 14, §§15086 & 15088).

The goal of the Project is to reduce Central Valley Project (CVP) supply shortages caused by dry hydrologic years by transferring water from entities upstream from the Sacramento-San Joaquin Delta to SLDWMA Participating Members and other CVP water contractors south of the Delta. Water would be made available for transfer through groundwater substitution, cropland idling, crop shifting, reservoir release, and conservation. The EIS/EIR evaluates potential impacts of water transfers over a 10-year period, 2015 through 2024.

CEQA Role: CDFW is a Trustee Agency as defined in the Guidelines for the Implementation of the California Environmental Quality Act (Cal. Code Regs., tit. 14, § 15000 et seq.; hereafter CEQA Guidelines) with responsibility for commenting on projects that could affect fish and wildlife resources (CEQA Guidelines, § 15386). CDFW has jurisdiction over the conservation, protection, and management of fish, wildlife, native plants, and the habitat necessary for biologically sustainable populations of those species (i.e., biological resources). As a Trustee Agency, CDFW is responsible for providing, as available, biological expertise to review and comment upon environmental documents and impacts arising from project activities, as those terms are used under CEQA (Fish & G. Code, § 1802). CDFW anticipates that it may use the final EIS/EIR and act as a Responsible Agency as part of possible future consideration and issuance of discretionary approvals, described below.

Discretionary Approvals: State Threatened, Endangered, and Candidate Species: CDFW has discretionary authority over activities that could result in the "take" of any species listed as candidate, threatened, or endangered pursuant to the California Endangered Species Act (CESA; Fish & G. Code, § 2050 et seq.). DFW considers most adverse impacts on CESA listed species, for the purposes of CEQA, to be significant without mitigation. Take of any CESA-listed species is prohibited except as authorized by state law (Fish & G. Code, §§ 2080 & 2085). Consequently, if Project activities result in take of CESA-listed species, CDFW recommends that the Project proponent seek appropriate authorization prior to Project implementation. This may include an incidental take permit (ITP) or a consistency determination in certain circumstances (Fish & G. Code, §§ 2080.1 & 2081 subd. (b)).

Rivers, Lakes, and Streams: An entity may not: substantially divert or obstruct the natural flow of; substantially change or use any material from the bed, channel, or bank of; or dispose of any debris, waste, or other material into, any river, stream, or lake unless certain conditions are met. For such activities, the entity must provide written notification to CDFW. Based on the written notification and site specific conditions, CDFW will determine if the activity may substantially adversely affect an existing fish or wildlife resource and issue a Lake or Streambed Alteration (LSA) Agreement to the entity that includes reasonable measures necessary to protect the resource (Fish & G. Code, § 1600 et seq.).

Note that CDFW must comply with CEQA prior to issuance of an ITP or LSA Agreement for a project. As such, CDFW may consider the Lead Agency's CEQA documentation for the project. To minimize additional requirements by CDFW and/or under CEQA, the final EIR should fully disclose potential Project impacts on CESA-listed species and any river, lake, or stream, and provide adequate avoidance, minimization, mitigation, monitoring and reporting measures for issuance of an ITP or LSA agreement.

Response

The action alternatives do not include actions that would trigger the need for a Lake or Streambed Alteration Agreement with CDFW. The EIS/EIR addresses potential effects to both federal- and state-listed species in Sections 3.7, Fisheries and 3.8, Vegetation and Wildlife.

Comment SA01-2

Comment

Section ES.2.2, Page ES-6, Table ES-2:

The EIS/EIR states that Merced Irrigation District (ID) is a Potential Seller of 30,000 acft of water. However, Merced ID is seeking a new license from the Federal Energy Regulatory Commission (FERC) for continued operation of the Merced River Hydroelectric Project, and in July 2014, CDFW submitted to FERC recommended mitigation measures for the new license, including significant changes to in stream flow releases and reservoir operations. In September 2014, Merced ID responded to CDFW's recommendations in a document filed with FERC as part of the FERC Project No. 2179 administrative record titled, "Merced ID's Reply to Comments, Recommendations, Preliminary Terms and Conditions, and Preliminary Fishway Prescriptions." On pages 106-107 of this document, Merced ID predicted that compliance with CDFW flow recommendations "increases the average annual water supply shortage by more than 100,000 ac-ft and creates shortages in most year types. [CDFW's] recommendation reduces average annual carryover capacity storage by ... 73,000 ac-ft compared to the Merced ID's Proposed Project." Analogous recommendations by the U.S. Fish and Wildlife Service (USFWS) and other agencies to modify flow releases and reservoir operations received similar responses from Merced ID, all indicating significant water supply shortages and reduced carryover volumes if the recommended mitigation measures were implemented. There appears to be a substantive disconnect between these kinds of water supply evaluations in the FERC administrative record and the Project EIS/EIR which lists Merced ID as a willing seller of up to 30,000 ac-ft annually.

CDFW recommends that the EIS/EIR scope reference the ongoing FERC relicensing and incorporate the water supply and carryover volume analyses submitted by Merced ID to FERC. A Draft Environmental Impact Statement prepared by FERC for Merced ID's Hydroelectric Project is estimated to be issued in March 2015 and finalized in August 2015.

Response

Merced ID's FERC relicensing process is ongoing, and the license terms are not yet finalized. The FERC license requirements will have to be met before water could be transferred under the action alternatives. See Common Response 14.

Comment SA01-3

Comment

Section ES.3.2, Page ES-9, Table ES-3:

This section states, "[i]n the No Action/No Project Alternative the Buyer Service Area would experience shortages and could increase groundwater pumping, idle cropland, or retire land to address those shortages." However, this may not be an accurate description of this alternative because the Buyer Service Area currently utilizes short-term transfers to address their water needs. Further, due to existing transfers, the Central Valley Project Improvement Act Refuge Water Supply Program, which maintains and improves wetland habitat areas, is currently experiencing water transfer capacity issues concerning its already limited water supply, even without implementation of the Project. For example, this year at the Volta Wildlife Area, the last known population of giant garter snake (Thamnophis giga, GGS) in the western San Joaquin Valley was threatened with incidental take pursuant to CESA due to surface water supply limitations and likely operational constraints of conveyance systems needed to provide water needed for habitat. Cumulative impacts from short-term transfers and long term transfers proposed by the Project may have a significant impact on fish and wildlife that utilize refuges by resulting in a substantial adverse impact on sensitive species or interfering substantially with the movement of native migratory species.

CDFW recommends that that EIS/EIR describe the relationship between the existing short-term water transfers and long term transfers proposed by the Project, including an analysis of cumulative impacts from these activities, and any potentially significant impacts on fish and wildlife resources. Mitigation should be proposed if warranted.

Response

This EIS/EIR analyzes a range of potential transfer activities that may be proposed during the period 2015-2024. The transfers could be either short-term (single year) or long-term, as discussed in Section 2.3.2.7. The No Action/No Project Alternative assumes that theses short-term and long-term transfers would not move forward, which would mean that buyers included in this EIS/EIR would not purchase transfers that would need to be conveyed through the Delta.

Additional information about refuge-related issues is included in Common Response 9.

Comment SA01-4

Comment

Section 2.3.2.4, Page 2-30:

This section references, but does not clearly define, "protected aquatic habitats." Project activities could result in substantial adverse impacts on aquatic habitats that are not clearly designated as "protected aquatic habitats."

CDFW recommends that the EIS/EIR expand the definition of "protected aquatic habitats" to include public lands under conservation easement, State wildlife areas and ecological reserves, federal refuges, and private managed wetlands because management efforts to protect GGS occur on these lands. Also identify how and to whom the seller will demonstrate that any impacts to special-status species have been addressed, including through coordination with CDFW and USFWS.

Response

Protected aquatic habitats include those lands with aquatic habitat and natural resource protections such as those identified by the commenter. See Common Response 14 for water transfer process.

Comment SA01-5

Comment

Section 2.3.2.4, Page 2-30:

This section states that the determination of Priority GGS habitat will be made through coordination with GGS experts, Geographic Information System (GIS) analysis of habitat proximity to historic tule (*Schoenoplectus sp*.) marsh, and GIS analysis of suitable habitat. However, this may not be sufficient to ensure appropriate identification of GGS habitat or areas that should be "prioritized" for species conservation. This could result in a substantial adverse impact on the species should appropriate habitat be overlooked.

CDFW recommends that the EIS/EIR state that consultation with CDFW and USFWS is required to ensure appropriate identification of GGS habitat and to evaluate which fields to fallow, through review of the CDFW's California Natural Diversity Database (CNDDB), review of rice fields which will be in production, and fallowing away from canals in a patchwork fashion to maximize habitat connectivity.

Response

Existing priority habitat areas have been identified based on the best available information on habitat use, known populations, and historic marsh habitat. Reclamation has prepared a Biological Assessment for the USFWS on the program. The water agencies requesting transfers will need to consult with CDFW if there is the potential to take listed species as a result of their transfers. See Common Response 14 for water transfer process.

Comment SA01-6

Comment

Section 2.4, Page 2-41, Table 2.9:

This table states that use of transfer water in the Buyer Service Area may result in increased irrigation on drainage impaired lands in the Buyer Service Area which could affect water quality, but that this impact is less than significant. However, significant environmental damage to fish and wildlife resources has occurred in the past from discharge of drainage from impaired lands. Many federal, state, and private managed wetland areas in the Central Valley are located at the lower end of watershed drainage areas and receive irrigation return flows as part of their water supply.

CDFW recommends the EIS/EIR analyze potentially significant impacts from increased irrigation on drainage impaired lands on Central Valley managed wetland public trust fish and wildlife resources.

Response

Table 2-9 a summary of potential impacts, but Section 3.2 of the EIS/EIR includes a more detailed analysis of the potential effects of irrigation return flows on water quality. Though there is the potential for transfer water in the buyer service area to result in increased irrigation runoff in the buyer service area, the effects to water quality were determined to be less than significant. Effects on wildlife are therefore anticipated to be less than significant. While there are and have been contaminant issues in some portions of the buyer service area (e.g., selenium contamination), the action alternatives are not expected to exacerbate these existing conditions.

Comment SA01-7

Comment

Table 2.9 of this section states that cropland idling/shifting could alter the amount of suitable habitat for natural communities and special-status wildlife species associated with seasonally flooded agriculture and associated irrigation waterways. This impact is identified as less than significant. However, cropland idling/shifting could have a significant impact on habitat availability for shorebirds, resident and migratory waterfowl, and special-status species in the Central Valley, especially if shifting reduces the amount of seasonally flooded post-harvest rice and corn. Seasonal flooding of postharvest rice and corn provides a substantial percentage of habitat and food supplies for migratory waterfowl. The 2006 Central Valley Joint Venture Implementation Plan estimates that 170,000 acres of post-harvest rice is needed for wintering waterfowl and wintering shorebirds in order to meet bird conservation goals.

CDFW recommends that the EIS/EIR address potentially significant impacts of cropland/idling shifting on fish and wildlife resources. Impacts could be mitigated if buyers of transfer water created equivalent habitat or habitat values to those that would be lost.

Response

Cropland idling would not affect fish. Section 3.8.2.4.3 of the 2014 Draft EIS/EIR evaluates potential impacts of cropland idling/shifting on terrestrial wildlife species, including migratory birds. As stated in Section 2.7.2.4.1, cropland idling is not likely to affect fisheries resources because this action would not substantially affect flows within natural waterways. Mitigation is not proposed to compensate for the temporary loss of terrestrial wildlife habitat because the 2014 Draft EIS/EIR concludes that impacts to wildlife are less than significant. The commenter is concerned with the reduction of post-harvest forage for migratory waterfowl. The project does not include transfers of rice decomposition water and would not reduce the availability of water for post-harvest flooding. See response to Comment FA01-7 and Common Response 13 (Migratory Birds) for additional discussion of migratory bird impacts.

Comment SA01-8

Comment

Section 3.1.2.1, Page 3.1-14:

SACFEM2013 was used to model streamflow depletion from groundwater substitutions. Outputs from this model were used in a post-processing tool to simulate transfers and delta exports in order to analyze potential impacts to surface water supplies. However, it is unclear why monitoring data collected from 2007-2010 transfers were not used to support the models.

CDFW recommends that the EIS/EIR explain what type of data (i.e., surface flow depletions from groundwater substitution pumping) were collected by the Sellers from all years that transfers took place, and specifically from the recent four consecutive years of transfers (2007 - 2010). The document should discuss why these data were not used in the analysis of impacts to streamflow from groundwater substitution pumping.

Response
See Common Response 5.

Comment SA01-9

Comment
Section 3.3.4.1, Page 3.3-88 to 3.3-91:

Groundwater substitution transfers can create time delays between additional groundwater pumping and potential impacts on stream systems. These delays may have significant impacts on timing and availability of surface flow to resident and anadromous fish species, special status species, and other fish and wildlife resources. The Department of Water Resources has been studying stream flow depletions as they relate to Sacramento Valley groundwater substitution transfers for several years.

CDFW recommends that the EIS/EIR include the results of the Department of Water Resources studies and analyze potential impacts on fish and wildlife resources resulting from time delays.

Response
The regional groundwater model used, SACFEM2013, incorporates the latest information about how groundwater pumping can alter the timing and amount of stream flows (see Section 3.1.2.1 and Appendix D for more information on SACFEM). The effects of any changes to the timing and amount of stream flow on resident and anadromous fish were then analyzed in Section 3.7.2.4. Reclamation has coordinated with DWR throughout the process of developing the EIS/EIR, including model development.

Comment SA01-10

Comment
Section 3.7.1.3.2, Page 3.7-9:

This section lists the names of five creeks where no sampling information is available to indicate the presence of special-status fish species. Presence was assumed and further biological analyses were conducted in these waterways. However, this section inconsistently lists four of the five same creeks (along with 15 others) and states that a review of field sampling data and reports indicates that there is no evidence of the presence of special-status fish species in these waterways and, as a result, no further biological analysis was conducted.

CDFW recommends that the EIS/EIR clarify whether these five creeks may support special-status fish species.

Response

This section has been corrected. Biological analyses were conducted on the five creeks for which it was assumed special status species were present.

Comment SA01-11

Comment

Section 3.8, Page 3.8-20, Table 3.8-1:

The EIS/EIR includes western pond turtle (Actinemys marmorata, WPT) as a "listed" species. However, WPT is a Species of Special Concern (SSC), and is not CESA-listed or listed under the federal Endangered Species Act. Pacific pond turtle is used throughout the EIS/EIR in reference to WPT.

CDFW recommends that WPT be described as an SSC and moved to the following rows that describe SSC in Table 3.8-1. The species should be consistently referred to as "western pond turtle (WPT)" throughout the EIS/EIR.

Response

In the 2014 Draft EIS/EIR, the western pond turtle was inadvertently included under listed wildlife species and was also identified as a species of special concern, when in fact it is only the latter. The pond turtles' common name has changed many times and will be retained as pacific pond turtle. The document refers to the common name as pacific pond turtle and this will be reflected in Table 3.8-1 as only a species of special concern.

Comment SA01-12

Comment

Section 1.3.2.4, Page 1-14:

This section addresses impacts on fish and wildlife resources, and states that Water Code sections 1725 and 1736 require the State Water Resources Control Board to make a finding that proposed transfers would not result in unreasonable impacts on fish and wildlife or other instream beneficial uses prior to approving a change in post-1914 water rights.

CDFW recommends adding the following information is to Section 1.3.2.4 for regulatory consistency and clarity: California Code of Regulations Title 23 section 794 requires the petitioner to 1) provide information identifying any effects of the proposed changes on fish, wildlife, and other instream beneficial uses, and 2) request consultation with CDFW and the Regional Water Quality Control Board regarding potential effects of the proposed changes on water quality, fish, wildlife and other in stream beneficial uses. The petition for change will not be accepted by the State Water Resources Control Board unless it contains the required information and consultation request. Early communication with CDFW would streamline the consultation process through "up front" coordination regarding assessment of the potential impact to fish and wildlife resources. The State Water Resources Control Board will use this information in making their finding that proposed transfers do not result in unreasonable impacts on fish and wildlife or other instream beneficial uses.

Response

This text has been added.

Comment SA01-13

Comment

Section 2.3.2.1, Page 2-10:

CDFW recommends that the EIS/EIR clarify if water transferred via forbearance agreements were analyzed as part of the Project. If not, impacts from potential increases in groundwater pumping by seller agencies forbearing CVP water should be analyzed as a reasonably foreseeable future action/probable future project in the cumulative impacts analysis of each section.

Response

As described in Section 2.3.2.1, the transfers analyzed in the EIS/EIR could involve forbearance agreements of base supply or transfer agreements for CVP project water. Both transfer mechanisms would involve the same methods to make water available and move it; therefore, the environmental effects would not vary with the contract vehicle selected.

Comment SA01-14

Comment

Section 2.3.2.4, Page 2-29 to 2-30:

It is common for CDFW to review proposed water transfer CEQA documents, typically Negative Declarations, which do not address Environmental Commitments. Data may not be available to support the transfer request relative to potential impacts to fish and wildlife.

CDFW recommends that all proposed water transfers address Environmental Commitments and potential impacts on fish and wildlife. Include analysis of any previous transfers, monitoring, and mitigation efforts, and identification of how much water was actually transferred in previous years. Annual review of mapped acreage, diverted acre feet of water and monitoring and reporting results would provide a basis to develop baseline information on potential impacts of future proposed transfers.

This section states that Bureau of Reclamation would provide maps to USFWS in June of each year showing the parcels of riceland that are idled for the purpose of transferring water for that year.

CDFW recommends that the EIS/EIR state that these maps would also be provided to CDFW and the GGS interagency management team in order to provide coordination for conservation and management of Central Valley GGS populations.

Response

See Common Response 14 for water transfer process. All transfers that could occur under this environmental document would need to incorporate the environmental commitments as part of the way water transfers are identified and operated. Reclamation will share the maps with riceland idling with the CDFW and the giant garter snake (GGS) interagency management team.

Comment SA01-15

Comment

Section 3.7.1.3.3, Page 3.7-15:

Summer rearing of Central Valley steelhead would overlap with water transfers occurring in the Seller Service Area (July-September), both in the Sacramento and San Joaquin River and their tributaries. Thus, water transfers have the potential to impact steelhead. The majority of rearing, however, would occur in the cooler sections of rivers and creeks above the influence for the transfers. Earlier in the Draft EIS/EIR, it is stated that water made available from groundwater substitution transfers may start as early as April (Page 2-10).

CDFW recommends that the EIS/EIR clarify when groundwater substitution transfers could begin and, if necessary, analyze impacts on Central Valley steel head that may be impacted by groundwater transfers occurring in April, May and June.

Response

This section has been corrected to include the April-September period.

Comment SA01-16

Comment

Section 3.7.2.1.3, Page 3.7-20:

For smaller tributaries, the impact analysis compared modeled groundwater depletion flow rates to available data on mean flow rates for the historical period of record and identified changes to these monthly average flow rates that would result from water transfer actions. Significant impacts on fisheries resources due to stream flow depletions are more likely to occur during low-flow periods of any given month.

CDFW recommends that the EIS/EIR analyze the impacts from groundwater pumping on the low-flow period of each month, rather than the average stream flow for the entire month, in order to determine the significance of impacts on fisheries resources and special-status fish species during this sensitive period.

Response

While Reclamation and SLDMWA recognize the importance of low flow periods, limitations to the model's precision preclude such types of analysis. Mean monthly flows provide a reasonable and appropriate basis to characterize impacts for disclosure and decision-making purposes.

Comment SA01-17

Comment

This section states that development of the impact analysis involved literature review, review of known occurrences of special-status species based on the CNDDB, USFWS regional species lists, information from National Oceanic and Atmospheric Association fisheries website, and results of hydrologic modeling.

CDFW recommends that the EIS/EIR also include a discussion of how monitoring plans and monitoring data from previous years were used to show that transfers did not adversely affect fisheries resources.

Response

The analysis did use past monitoring data and a description was added to Section 3.7.2.1

Comment SA01-18

Comment

This section states that historical stream flow information for small streams were gathered where available and used as the measure of baseline flow. For locations for which historical flow data were limited or unavailable, a qualitative discussion of potential impacts is included for these locations.

CDFW recommends that the EIS/EIR include a table or an appendix to show which streams used available historic flow data, what this data included, and which streams lacked historic data and were subject to a qualitative analysis. This information will guide where additional stream flow efforts are needed relative to fisheries resource needs.

Response

This information has been added to Table 3.7-3 for streams for which it was used. For all other small streams, the use of historical data was not necessary.

Comment SA01-19

Comment

Section 3.7.2.4.1, Page 3.7-26 – 3.7-27:

Eastside/Cross Canal and Salt Creek have the potential for impacts on special-status fish species due to flow reductions, although no data were available to determine the proportional reduction in base flows (i.e., if a greater than 10 percent reduction would occur). This section states that these waterways are 1) "generally" not immediately adjacent to groundwater substitution transfers; 2) other "nearby" small waterways are not experiencing flow decreases that are causing significant impacts to aquatic resources; and 3) flow reductions would be observed at monitoring wells in the region and any adverse effects would be mitigated by implementation of Mitigation Measure GW-1. The mitigation plan would include curtailment of the pumping until natural recharge corrects the environmental impact. Therefore, the impacts on fisheries resources would be less than significant. However, it is unclear what the trigger for pumping curtailment would be and how cessation of pumping to allow natural recharge to "correct the environmental impact" mitigates this impact to a less than significant level if the impact has already occurred.

CDFW recommends that the EIS/EIR define "generally not immediately adjacent," explain how the determination was made that other "nearby" small waterways are not experiencing flow decreases that are impacting aquatic resources, and how these surrogate waterways relate to the potentially impacted streams. Additionally, the EIS/EIR should identify 1) how the placement and use of monitoring wells would be able to observe instream flow reductions, 2) how the trigger for curtailment of pumping that causes an adverse impact was derived, and 3) if the time from observation of streamflow reductions that result in adverse impacts to the cessation of groundwater pumping would be responsive enough to mitigate for impacts (Barlow and Leake 2012). This recommendation also applies to Section 3.7.6.1.1, which analyzes the cumulative impacts on fisheries resources and special-status fish species in Cache Creek, Stony Creek, Coon Creek, Little Chico Creek, Bear River, Eastside/Cross Canal and Salt Creek and Section 3.8.2.4.1, which analyzes the effects of substantially reduced stream flows as a result of groundwater substitution pumping on the riparian natural communities in Cache and Stony Creeks.

Response

No effects on fisheries were found and mitigation measures are unnecessary. All references to environmental commitments were removed from the fisheries section (Section 3.7) to avoid confusion, except in Section 3.7.4 which indicates that environmental commitments are unnecessary. Additional vegetation monitoring requirements have been added to GW-1 (see Common Response 10).

Comment SA01-20

Comment

This section lists 21 waterways where the Project would have a less than significant impact on fisheries resources and special-status fish species. The basis for this determination is that modeled flow changes would be small and no substantial effect on water quality would result from implementing the Proposed Action.

CDFW recommends that "water quality" in the previous sentence be replaced with "fisheries resources" and tables similar to Tables 3.8-5 and 3.8-7, which show the average monthly flow by water year type in Cache Creek and Stony Creek, respectively, under the No Action/No Project alternative (using historical data) and the Project (using the groundwater model's prediction of reduced flows from the Proposed Action), be included for all streams that have the potential to be impacted by the Proposed Action. As stated above, CDFW recommends that the analysis of potential impacts from groundwater pumping use data from the low-flow period of each month, rather than the average stream flow for the entire month, to determine the significance of impacts to fisheries resources and special-status fish species during this sensitive period.

Response

This text was changed as requested.

Regarding an examination of intra-monthly modeling outputs: While the lead agencies recognize the importance of low flow periods, limitations to the model's precision preclude such types of analysis. Mean monthly flows provide a reasonable and appropriate basis to characterize impacts for disclosure and decision-making purposes.

Comment SA01-21

Comment

Section 3.7.2.4.1, Pages 3.7-28 to 3.7-29:

This section states that due to incomplete baseline flow data, modeling results were compared to only three years (2003-2005) of existing stream gage data for Coon Creek, indicating that there would be one water year in one month in which flows could potentially be reduced by more than 10 percent. This modeled reduction to baseline flows is stated to be a "worst case scenario" because flows used in this calculation are at the low end (20 cfs) of existing flow data range (20-40 cfs). Modeling shows that flows in all other months and water year types would be reduced by less than 10 percent of baseline flows and, therefore, impacts on fisheries resources would be less than significant. Omitted from this analysis is that the Water Year types for 2003, 2004 and 2005 were categorized as above normal, below normal, and above normal, respectively. It is unclear how this analysis of reductions is considered a "worst case scenario" if the low end of the baseline flow data range (20 cfs) was observed in either an above normal or below normal water year. Regardless of available gage data, it is rational to expect lower flows in Coon Creek in a dry or critically dry year, which would result in the Project reducing baseline flows by more than 10 percent.

CDFW recommends that the EIS/EIR explain how stream gage data taken from only above normal and below normal water years, which is then used as baseline flows for comparing to model results, captures the full extent of the potential impacts to fisheries resources in Coon Creek that may occur in dry or critically dry years. This explanation should also be included for impacts on natural communities and wildlife species habitat (Page 3.8-59).

Response

Using 3 years of baseline data, the analysis looked at modeling results for each month for every water year type. The worst-case scenario assumes the low end of flow data observed during the 3-year period. Although water years 2003-2005 do not include a dry or critically dry water year, flows in Coon Creek are heavily regulated by Nevada Irrigation District for purposes of water delivery and are expected to be relatively consistent across different water year types. Therefore, a baseline flow of 20 cfs across all water year types was determined to be appropriate as a worst-case scenario. No changes to impact conclusions are warranted.

Comment SA01-22

Comment

This section states that pursuant to model results, Little Chico Creek flows would be reduced by more than 10 percent in multiple water year types from July to October. Although this reduction could be as much as 100 percent of instream flows, the Project would not have a substantial impact on fisheries resources. The reason being that it's not uncommon for natural flows to be very low during these months (0.5 cfs and below), which causes an increase in temperature and reduced dissolved oxygen levels intolerable for over-summering adult spring-run Chinook salmon, so the fish would not be present anyway. Also, depletions from groundwater pumping would cause levels to be within the flow range normally experienced by any juvenile steelhead and hardhead species have experienced low-to-no flows in the past, project impacts that reduce flows to this level would not harm them.

CDFW recommends that the EIS/EIR analysis focus on the impacts that low flow periods in Little Chico Creek have on special-status fish species and fisheries resources in general, what an increase to the frequency of these low flow events caused by the Project means to these species, and how do the periods were the Project completely dewaters the creek (i.e., reductions of "up to 100 percent of instream flows") affect stream connectivity, species movement, and the overall health of the species.

Response

Text was added to further explain the finding that low-flow periods would not increase in frequency.

Comment SA01-23

Comment

Section 3.8.2, Page 3.8-35:

This section states that the distribution of water year types within the action period is unknown. Additionally, the exact locations of cropland idling/shifting actions would not be known until the spring of each year, when water acquisition decisions are made. The contribution to instream flows from agricultural return flows would be reduced in areas where cropland idling occurs. However it is unclear how this reduction was accounted for in the analysis of impacts on fish and wildlife resources and instream flows if the locations are unknown at this time.

CDFW recommends that the EIS/EIR explain how reduced agricultural return flows due to cropland idling/shifting were factored into the impact analysis.

Response

As described in Section 2.3.2.1, water for transfers is made available by a seller who "must take an action to reduce consumptive use or use water in storage." In addition, "water transfers must be consistent with State and Federal law, as discussed in Chapter 1."

If sellers transfer water through cropland idling or crop shifting, they would decrease their diversions only by the amount of applied water that would have been consumed absent the transfer. Without transfers, some of the water applied on each field is consumptively used by the crop (the evapotranspiration of applied water), but some is not used by the crop and becomes percolation to the groundwater or surface runoff. For cropland idling or crop shifting, water that would have been applied to the field but not consumptively used by the crop would continue to be diverted by the seller and would enter the distribution system. Water that would run off fields into drain facilities would continue to flow into these drains; therefore, agricultural return flows would not be affected.

Comment SA01-24

Comment
Section 3.8.2.1.4 Page 3.8-38 to 3.8-40:

This section states that the magnitude and frequency of streamflow depletion in small streams were derived from a groundwater model (SACFEM2013) and then used to evaluate potential impacts to natural communities and special status vegetation and wildlife, since Central Valley Project and State Water Project operations could not be altered to offset any changes in small streams. However, the impacts of groundwater substitution on larger rivers and Central Valley Project/State Water Project reservoirs are carried from the groundwater model to the transfer operations model, which incorporates other changes in hydrology associated with cropland idling/shifting, reservoir releases and water conservations. This implies that changes in small stream hydrology associated with cropland idling/shifting were not included in the SACFEM2013 model.

CDFW recommends that the EIS/EIR explain how reduced agricultural return flows in small streams were accounted for in the SACFEM2013 groundwater model.

Response
Cropland idling and crop shifting would not result in changes to flows in small streams. Changes from these transfer mechanisms would occur on the water systems that supply water to the selling entity. As described in Chapter 2, these waterways include the Sacramento and Feather rivers. These waterways are not "small streams" and are analyzed using CalSim II and the Transfer Operations Model.

Comment SA01-25

Comment
Section 3.8.2.4.1, Page 3.8-47:

This section describes impacts on natural communities in shallow groundwater areas in the North Delta; however it does not address impacts on wildlife. Some sensitive wildlife species require shallowly flooded areas (e.g., GGS and WPT) and impacts on these areas may substantially adversely affect such species.

CDFW recommends that the impact analysis not be solely based on whether vegetation will change. In shallowly flooded areas, a reduction of groundwater that lowers surface water elevation of wetlands should also be described, and impacts on wildlife that rely on shallow water analyzed. Mitigation should be provided if warranted.

Response

Although areas in the North Delta could experience maximum modeled reductions of between 0.3 and 0.8 feet in subsurface drawdowns, these reductions are expected to occur slowly and would not substantially alter the suitability of shallowly-flooded habitat for wildlife, specifically giant garter snake and pond turtle. See Common Response 11 for more information.

Comment SA01-26

Comment

In this section, the Assessment/Evaluation Methods for groundwater substitution transfers states that potential impacts of groundwater substitution on natural communities in upland areas was considered potentially significant if it resulted in a consistent, sustained depletion of water levels that were accessible to overlying communities (groundwater depth under existing conditions was 15 feet or less). A sustained depletion would be considered to have occurred if the basin did not recharge from one year to the next (Page 3.8-33). In a few locations in the North Delta associated with wetlands, groundwater elevations under existing conditions are less than 15 feet below ground surface and natural communities reliant on groundwater are more likely to be impacted. In these areas, the maximum reductions would be 0.3 to 0.8 feet, with full recharge. The Project would have a less than significant effect on natural communities and special-status plants because increases in drawdown would be too small to cause a substantial effect on vegetation that relies on groundwater. However, the EIS/EIR doesn't identify where these "few locations in the North Delta" are located or the natural communities that occur in these areas. Also, the less than significant determination is based upon the assertion that full recharge of the groundwater basin would always occur, thus only reducing groundwater levels by a maximum of 0.3-0.8 feet.

CDFW recommends that the EIS/EIR identify and discuss the areas in the North Delta and the natural communities associated with those areas in greater detail. Since the less than significant determination is based upon the assertion that full recharge of the groundwater basin will always occur, thus resulting in a max reduction of 0.3-0.8 feet (too small to cause substantial effects), supporting historic groundwater elevation data should be provided.

Response

Figure 3.3-28c shows the changes in groundwater levels in the North Delta. The North Delta areas referenced in Section 3.8 include RD 2068, Pope Ranch, and Sacramento County Water Agency. See Common Response 11 for more information.

Comment SA01-27

Comment

Section 3.8.2.4.1, Page 3.8-60:

For Little Chico Creek, this section states, "[b]ecause flow reductions would be small and only during months when the creek is essentially dry, changes in stream flow would not substantially reduce natural communities or wildlife species habitat." However, taking water from a creek that is nearly dry could result in significant impacts on wildlife because some animals may not be able to tolerate prolonged episodes of dryness (e.g.,WPT).

CDFW recommends that the EIS/EIR include an analysis of how the reduction of water during already dry times does not substantially reduce the availability of habitat for, or movement ability of, sensitive species.

Response

Pond turtles are not expected to occur year-round in Little Chico Creek, an intermittent stream, and likely use adjacent human-made ponds and nearby canals and drainages when the creek dries down. Section 3.8.2.4.1 states that the maximum modeled change in flow within Little Chico Creek would be a decrease of 0.04 cfs. This amount of water loss would not substantially change existing conditions for pond turtles.

Comment SA01-28

Comment

Appendix I, Table 1-1:

The Project proposes to fallow alfalfa and other row crops which Swainson's hawks (*Buteo swainsoni*, "SWHA"), a State-listed species, utilize to forage. However, the EIS/EIR does not disclose which croplands within foraging distance of SWHA nest trees will be fallowed, or the composition of these areas. Long term fallowing of these fields may result in a change or loss of pray base, prompting SWHA to leave the nest tree for longer periods to forage in other areas, which could negatively affect the species' reproductive effort. Therefore, the long term loss of foraging habitat could result in significant impacts on nesting SWHA by substantially reducing the number of an endangered, rare, or threatened species, and/or substantially adversely affecting a special status species (CEQA Guidelines, §15065 & Appendix G).

CDFW recommends that the EIS/EIR disclose which croplands in foraging distance of SWHA nest trees would be fallowed and the composition of these areas, analyze whether resultant impacts on SWHA could be significant, and provide for mitigation if warranted.

Response

Page 3.8-35 of the 2014 Draft EIS/EIR states that the exact locations of cropland idling/shifting actions would not be known until the spring of each year, when water acquisition decisions are made. Table N-1 in Appendix N states that the project may alter the composition of foraging habitat for Swainson's hawk within the project area, but these areas would still provide suitable habitat as fallowed fields and therefore no net loss of foraging habitat would occur. Fallowing of croplands may reduce some sources of forage for small rodents, which provide prey for Swainson's hawks, but the project is not expected to substantially alter the prey population because fallowing would result in a small loss of residual feed (a maximum 2 percent reduction for Glenn, Colusa, and Yolo counties and a maximum 9 percent reduction within Solano and Sutter counties). See page 3.8-63 of 2014 Draft EIS/EIR.

Comment SA01-29

Comment

Bureau of Reclamation contracts for Central Valley Project Improvement Act (CVPIA) Refuge Water Supply (RWS) delivery to USFWS, CDFW, and Grassland Water District managed wetlands all contain language in Article 7 allowing Project Water to be transferred, reallocated or exchanged to other refuges. CVPIA section 3406 subdivision (b)(3) requires development and implementation of a program to identify how the Secretary intends to utilize improvements in or modifications of project operation, including transfers, to fulfill the Secretary's obligations to deliver RWS.

CDFW recommends that the EIS/EIR identify the total amount of RWS available from all sources north of Delta, and how these transfers are integrated into project operation. The program should address annual and long-term water transfer impacts that may adversely affect managed wetland water supply including endangered species recovery needs at managed wetlands; lack of sufficient dedicated water storage; timing of water delivery and use on shared conveyance systems; and potential increased groundwater use. CDFW is available to assist Bureau of Reclamation with any and all efforts to maximize use of water transfers in the furtherance of overall CVPIA RWS program objectives. These efforts should be coordinated with USFWS, Grassland Water District, and the Central Valley Joint Venture.

Response

See Common Response 9.

Comment SA01-30

Comment

Section 2.3.2.4, Pages 2-29 to 2-30:

Much of this section involves Environmental Commitments to protect GGS. These same commitments were largely used for 2014 transfers, and to a lesser degree, in previous years. Efforts to develop and refine the Environmental Commitments are ongoing, and studies to better understand GGS life history and distribution continue.

CDFW recommends incorporating any monitoring and analysis available from 2014 and previous transfer years where these and similar commitments were in place, and adaptively incorporating feedback as more information becomes available each year, including drought year impacts, as well as the following: incorporate results from ongoing studies on GGS population dynamics and distribution analysis; continue development of a long-term strategy and research framework; continue interagency coordinated efforts and investigate partnerships with water districts, non-governmental organizations, and academia; and include coordinated and collaborative development, including CDFW, to address GGS long-term conservation needs.

Response

See Common Response 10 (Environmental Commitments/Mitigation Measures).

Comment SA01-31

Comment

Section 3.1.4.1, Page 3.1-21:

This section states that a streamflow depletion factor (SDF) would be applied to mitigate potential water supply impacts from additional groundwater pumping due to groundwater substitution transfers. This is intended to offset the streamflow effects of the added groundwater pumping. The exact percentage of the SDF would be determined based on hydrologic conditions, groundwater and surface water modeling, monitoring information, and past transfer data. However, it is unclear what monitoring information and past transfer data has shown, and if previous percentages been adequate to mitigate for impacts.

CDFW recommends that the EIS/EIR include information on previous monitoring efforts; for example, what they entailed, past transfer data, the type of post-transfer analysis that was done, and what this analysis showed with respect to impacts on streamflow from increased groundwater pumping.

Response

See Common Response 8.

Comment SA01-32

Comment

Section 3.3.4, Pages 3.3-88 to 3.3-91:

It is unclear whether mitigation measure GW-1 "Monitoring Program and Mitigation Plans" would reduce impacts on wildlife to less than significant because it appears that only wells would be monitored (as opposed to streams, wetlands, or sensitive species), and that impacts to wildlife would be reported by an outside entity. Monitoring would be coordinated with well operators and "other decision makers." The section states that if the seller's monitoring efforts indicate that the operation of wells for groundwater substitution pumping are causing substantial adverse impacts, the seller will be responsible for mitigating any significant environmental impacts that occur. However, it is unclear how this determination would be made.

CDFW recommends that the EIS/EIR analyze the need for monitoring of other water features and resources and include discussion of the types of monitoring and mitigation efforts conducted for past transfers, what will be duplicated for the Proposed Project, and any new/revised activities to ensure impacts on fish and wildlife resources are reduced to less than significant. The EIS/EIR should clarify who the "other decision makers" are and include representatives from CDFW and USFWS. Mitigation should also state that CDFW and USFWS would have authority to deem a monitoring and mitigation plan adequate or not for the purposes of issuing a water transfer agreement. The EIS/EIR should identify an entity with appropriate expertise to determine if Project activities are resulting in substantially adverse impacts and an adequate level of mitigation.

Response

Groundwater monitoring and mitigation plans will be implemented to avoid any potentially significant adverse effects, as set forth in the EIS/EIR and clarified in response to comments. See Common Response 10 for additional information.

Comment SA01-33

Comment

There are several EIS/EIR sections that conclude impacts on wildlife would be reduced to less than significant levels based on implementation of mitigation measure GW-1, which is intended to take corrective actions once substantial adverse impacts have been identified. However, these impacts appear to be based almost exclusively on changes in vegetation, which are not necessarily appropriate proxies for wildlife populations. Animals may starve or be exposed to greater predation well before signs of substantial impacts on riparian and wetland vegetation become evident. In addition, because there is no requirement for monitoring of vegetation changes, those signs would apparently have to be identified by agencies and organizations outside of the water transfers; therefore, there are no assurances they would be identified. Further, increases in flows are not always beneficial. For example, if flows are over 200 percent of normal during summer months, WPT nests could be flooded out, significantly reducing recruitment.

CDFW recommends that the EIS/EIR include a more comprehensive approach to evaluating impacts on fish and wildlife based on the habitat components required by each affected species including, but not limited to, plant community requirements. Mitigation should be proposed if warranted.

Response

With respect to impacts on wildlife, vegetation composition and structure are important determinants of wildlife habitat suitability and provide an adequate assessment of impacts to terrestrial wildlife. Because changes in surface water flows in most streams and rivers that could be affected by groundwater transfers are anticipated to be insubstantial and limited in duration and location, impacts to wildlife would not be substantial and would not result in significant effects. Further discussion regarding groundwater monitoring and effects on vegetation is provided in Common Responses 10 and 11.

Comment SA01-34

Comment

This section states the objectives of the monitoring and mitigation plan. However, these objectives are not fully consistent with the Draft Technical Information for Preparing Water Transfer Proposals (Bureau of Reclamation and Department of Water Resources 2013) and Addendum (Bureau of Reclamation and Department of Water Resources 2014).

CDFW recommends that the above statement be consistent with the specific mitigation and monitoring requirements of the aforementioned Draft Technical Information for Preparing Water Transfer Proposals and Addendum.

Response

Transfers that may occur under the coverage of this document would need to conform to Mitigation Measure GW-1. The DWR documents referenced by the commenter were used as a reference in the development of Mitigation Measure GW-1, which has been clarified in response to comments. See Common Responses 6, 7, 8, 10, and 14 for additional information.

Comment SA01-35

Comment

This section states that water transfer proponents would provide a final summary report to Bureau of Reclamation evaluating the impacts of the water transfer. The final report would identify transfer-related impacts on groundwater and surface water during and after pumping. However, past water transfer activities could inform anticipated impacts on fish and wildlife resources.

CDFW recommends that the EIS/EIR include the impacts past reports have shown in order to inform analysis of future transfers regarding impacts on the environment, and to avoid or mitigate any significant effects of proposed transfers.

Response

Text has been added to the requirements of the summary report described in Section 3.3.4.1.2. Additionally, an end-of-transfer report regarding the implementation of conservation measures has been included in Section 2.3.2.4.

Comment SA01-36

Comment

Water Code section 1018 states that landowners "shall be encouraged" to cultivate or retain non irrigated cover crops or natural vegetation to benefit waterfowl, upland game bird, and other wildlife habitat. The Department of Water Resources is currently addressing guidance and implementation regarding this language. CDFW recommends incorporating this information into the EIS/EIR so those proposing transfers would be compliant with these provisions.

Response

Text has been added to Chapter 2 encouraging sellers to incorporate habitat features in cropland idling transfers.

Comment Letter SA02, Cindy Messer, Delta Stewardship Council

Comment SA02-1

Comment

The Delta Stewardship Council (Council) welcomes the opportunity to comment on the Long-Term Water Transfers Environmental Impact Statement/Environmental Impact Report (EIS/R) evaluating the potential impacts of alternatives to help address the Central Valley Project (CVP) water supply shortages (Project), being prepared jointly by the U.S. Bureau of Reclamation (Reclamation) and the San Luis & Delta-Mendota Water Authority (SLDMWA). The Council is an independent California state agency tasked with furthering California's coequal goals for the Delta through the implementation of the Delta Plan, a comprehensive, long-term Delta management plan. As defined in the California Water Code section 85054 [Footnote: "Coequal goals" means the two goals of providing a more reliable water supply for California and protecting, restoring, and enhancing the Delta ecosystem. The coequal goals shall be achieved in a manner that protects and enhances the unique cultural, recreational, natural resource, and agricultural values of the Delta as an evolving place." – Water Code §85054], the State's coequal goals include providing a more reliable water supply for California and protecting, restoring, and enhancing the Delta ecosystem. The Delta Plan highlights that north-to-south water transfers across the Delta can be an important tool for improving water supply reliability and includes several recommendations to identify and enhance opportunities for water transfers in furtherance of the coequal goals. The Plan also calls for improving water transfer procedures.

Even as the Council and Delta Plan support water transfers, they are only one important component for increasing water supply reliability and must be part of a larger suite of actions and projects. The Council has defined what the achievement of a more reliable water supply for California means:

(a) Better matching the state's demands for reasonable and beneficial uses of water to the available water supply. This will be done by promoting, improving, investing in, and implementing projects and programs that improve the resiliency of the state's water systems, increase water efficiency and conservation, increase water recycling and use of advanced water technologies, improve groundwater management, expand storage, and improve Delta conveyance and operations. The evaluation of progress toward improving reliability will take into account the inherent variability in water demands and supplies across California;

(b) Regions that use water from the Delta watershed will reduce their reliance on this water for reasonable and beneficial uses, and improve regional self-reliance, consistent with existing water rights and the State's area-of-origin statutes and Reasonable Use and Public Trust Doctrines. This will be done by improving, investing in, and implementing local and regional projects and programs that increase water conservation and efficiency, increase water recycling and use of advanced water technologies, expand storage, improve groundwater management, and enhance regional coordination of local and regional water supply development efforts;

(c) Water exported from the Delta will more closely match water supplies available to be exported, based on water year type and consistent with the coequal goal of protecting, restoring, and enhancing the Delta ecosystem. This will be done by improving conveyance in the Delta and expanding groundwater and surface storage both north and south of the Delta to optimize diversions in wet years when more water is available and conflicts with the ecosystem are less likely, and limit diversions in dry years when conflicts with the ecosystem are more likely. Delta water that is stored in wet years will be available for water users during dry years, when the limited amount of available water must remain in the Delta, making water deliveries more predictable and reliable. In addition, these improvements will decrease the vulnerability of Delta water supplies to disruption by natural disasters, such as, earthquakes, floods, and levee failures.

Response

The types of broad goals described in this comment are directed towards efforts that are materially different from the Proposed Action. See Common Response 14. Relative to the EIS/EIR for the proposed long-term water transfers, the Lead Agencies establish the purpose and need to best describe their underlying reasons for taking an action. Reclamation has multiple planning efforts to help meet the many demands on the CVP, including projects to help address the many pressures on the Delta. Water transfers are one of the potential actions related to these purposes, but Reclamation is moving forward with multiple other efforts to help meet these objectives:

(a) Reclamation requires all agricultural contractors to implement agricultural water use efficiency best management practices and is continuing to work with these contractors to improve the efficient use of water.

(b) Reclamation is participating in multiple studies on groundwater and surface water storage.

(c) Reclamation is studying conveyance options through its participation in the Bay-Delta Conservation Plan efforts. Also, Reclamation is working on developing new biological assessments on long-term operations of the CVP and SWP, which help clarify potential exports based on biological needs in the Delta.

Comment SA02-2

Comment

The 2009 legislation that created the Council also provided the Council with regulatory authority over certain types of activities undertaken by local or state agencies, called covered actions, and requires that covered actions be consistent with the Delta Plan as cited in Water Code section 85225 “A state or local public agency that proposed to undertake a covered action, prior to initiating the implementation of that covered action, shall prepare a written certification of consistency with detailed findings as to whether the covered action is consistent with the Delta Plan and shall submit that certification to the council.” The Council developed new regulations governing covered actions, which became effective on September 1, 2013, and included them in the Delta Plan. The water transfers that are identified in EIS/R may be considered covered actions. Typically the lead CEQA agency determines if a proposed activity is a covered action and would then file a certification of consistency with the Council. The Council strongly encourages all state and local agencies who propose to approve, fund, or carry out an action in the Delta, consult with the Council as early in the project's development as possible, to ensure the project is consistent with the Delta Plan.

Response

The lead agencies have prepared this EIS/EIR as a tool to evaluate potential CVP-related water transfer activities in a more comprehensive manner than has been conducted in the past. See Common Response 14. The 2014 Draft EIS/EIR provides a coordinated and detailed analysis of the environmental effects of a range of independent potential transfer activities that may or may not occur, depending on a variety of factors that vary from year to year. In preparing this environmental analysis, the lead agencies have not made, and cannot make, any commitment to a definite course of action (i.e., no plan, program, or project is being considered or approved as that term is understood pursuant to Public Resources Code section 21065). Rather, the lead agencies would review individual proposed transfers if and when they are presented. All transactions are voluntary among willing buyers and willing sellers, who may seek to rely on the analysis in this EIS/EIR or proceed independently. Covered actions are not presented, and certifications of consistency as described in the comment could not be made until the details of the proposed individual transfers are known. See Section 1.5 of the 2014 Draft EIS/EIR and response to Comment NG01-24.

Comment SA02-3

Comment

The Council submits the following comments on the EIS/R: The Council suggests that SLDMWA, on behalf of its participating member agencies as well as the Contra Costa Water District (CCWD) and East Bay Municipal Utility District (EBMUD), file a certification of consistency with the Council on the program of water transfers covered by this EIS/R and indicate in the EIS/R that these transfers are covered actions. Water Code section 85057.5(a) defines a covered action as: ... a plan, program, or project as defined pursuant to Section 21065 of the Public Resources Code that meets all of the following conditions: 1. Will occur, in whole or in part, within the boundaries of the Delta or Suisun Marsh; 2. Will be carried out, approved, or funded by the state or a local public agency; 3. Is covered by one or more provisions of the Delta Plan; 4. Will have a significant impact on the achievement of one or both of the coequal goals or the implementation of government-sponsored flood control programs to reduce risks to people, property, and state interests in the Delta.

It appears that water transfers identified in the EIS/R meet the definition of a covered action. The preparation of the EIS/R indicates the Project meets the definition of a plan, program, or project as defined pursuant to Section 21065 of the Public Resources Code, the water transfers will take place at least partially in the Delta, will be undertaken by the participating agencies, will have a significant beneficial impact on water supply reliability, and implicate the following two regulatory policies that cover proposed water transfers through the Delta:

WR P1 (23 CCR section 5003) - Reduce Reliance on the Delta through Improved Regional Water Self-Reliance. This policy covers a proposed action to export water from, transfer water through, or use water in the Delta.

WR P2 (23 CCR section 5004) - Transparency in Water Contracting. This policy covers:

1. With regard to water from the State Water Project, a proposed action to enter into or amend a water supply or water transfer contract subject to California Department of Water Resources Guidelines 03-09 and/or 03-10 (each dated July 3, 2003), which are attached as Appendix 2A; and

2. With regard to water from the Central Valley Project, a proposed action to enter into or amend a water supply or water transfer contract subject to section 226 of P.L. 97-293, as amended or section 3405(a)(2)(B) of the Central Valley Project Improvement Act, Title

XXXIV of Public Law 102-575, as amended, which are attached as Appendix 2B, and Rules and Regulations promulgated by the Secretary of the Interior to implement these laws.

Response

See response to Comment SA02-2.

Comment SA02-4

Comment

The EIS/R should acknowledge the Delta Plan and its regulatory policies. As previously discussed, the Council's regulations apply to covered actions where water suppliers export water from, transfer water through, or use water in the Delta; and covered actions that include entering into or amending water supply or water transfer contracts. Therefore, the Council, and its role with respect to covered actions, should be included in the appropriate sections of the EIS/R.

Response

See response to Comment SA02-2.

Comment SA02-5

Comment

The EIS/R "Purpose and Need/Project Objectives" section of the EIS/R should include a quantitative assessment of the need for water transfers to help identify other possible reasonable alternatives. CEQA requires the project objectives describe the underlying need for and purpose of the project. The EIS/R states the Project's objectives as:

1. Develop supplemental water supply for member agencies during times of CVP shortages to meet existing demands.

2. Meet the need of member agencies for a water supply that is immediately implementable and flexible and can respond to changes in hydrologic conditions and CVP allocations.

However the EIS/R does not state what the water supply demand is for the participating agencies, nor does it state if that demand is changing over time, rather it merely identifies a list of potential buyers without any indication of the demands of those buyers. The EIS/R does describe how the member agencies' water supply from the CVP is variable, even with the use of water transfers. Table 1-1 indicates that the average CVP water supply allocation for the 2000 to 2014 period was 54% of contracted amounts for irrigation use and 83% of contracted amounts for municipal and industrial uses. Irrigation allocation was a full 100% only once during this period. Table 1-3 indicates that water transfers to SLDMWA member agencies occurred in 60% of the years between 2000 and 2014 though the amounts varied from several thousand acre-feet to over 169,000 acre-feet in 2009.

Are the participating agencies' demands variable and able to adjust to a decrease in supply? Then potential alternatives to reduce demand in lieu of increasing supply should also be considered. Or are the participating agencies' water supply demands constrained only by their contracts and the ability of the federal and state projects to deliver water? Understanding the demand on the Delta as a water supply is important. It is California's policy to reduce reliance on the Delta in meeting California's future water supply needs through a statewide strategy of investing in improved regional supplies, conservation, and water use efficiency. Each region that depends on water from the Delta watershed shall improve its regional self-reliance for water through investment in water use efficiency, water recycling, advanced water technologies, local and regional water supply projects, and improved regional coordination of local and regional water supply efforts (Water Code section 85021).

Response

See responses to Comment SA02-2 and Comment NG03-4.

Comment SA02-6

Comment

The EIS/R does not analyze the impacts of water transfers during periods when the state and federal water projects are unable to meet existing Delta water quality objectives. In January 2014, Reclamation and the Department of Water Resources jointly filed a Temporary Urgency Change Petition (TUCP) for their water right permits and licenses for the state and federal water projects in response to extreme drought conditions in California. They requested temporary modification of requirements included in the State Water Resources Control Board's Revised Decision 1641; specifically the TUCP requested modifications to the requirement to meet the Delta Outflow Objective. The EIS/R does not analyze the potential impacts of water transfers on Water Quality (Chapter 3.2), Aquatic Resources (Chapter 3.7), Terrestrial Resources (Chapter 3.8), or any other potential Delta impact under these extreme conditions. Given that the current drought may continue into the period of time covered by the EIS/R and is likely to be a reoccurring event, the document should include an analysis of the impacts under extreme hydrologic conditions.

Response

The period of analysis used in modeling for this analysis includes critical and dry periods as well as multi-year drought periods. Tables within Section 3.2, Water Quality provide expected conditions as a result of each alternative for dry and critical water years. While exceedances of water quality standards have occurred, especially during recent drought years, the changes in operations from this project are not expected to significantly affect water quality such that exceedances are affected. Common Response 5 includes an explanation of why the modeled period hydrology is an appropriate representative period.

Comment Letter SA03, Diane Riddle, State Water Resources Control Board

Comment SA03-1

Comment

The State Water Resources Control Board (State Water Board) staff appreciates the opportunity to review and provide comments on the Long-Term Transfers Draft Environmental Impact Statement/Environmental Impact Report (EIS/EIR). Comments on the Draft EIS/EIR are due on

December 1, 2014. State Water Board staff conducted an initial review of the Draft EIS/EIR. Upon further review, the State Water Board may have additional comments.

State Water Board staff's comments are focused on groundwater issues associated with this project given the significant emphasis of the proposed project on groundwater substitution transfers and the recent California groundwater legislation that the State Water Board will have a role in implementing, specifically the Sustainable Groundwater Management Act of 2014 (SGMA). The SGMA requires development of local groundwater sustainability agencies and plans in certain basins, including most of the region covered by the proposed project, and requires sustainable groundwater management within 20 years of plan adoption. The legislation also provides the State Water Board direct authority to intervene when a groundwater basin is not sustainably managed.

Response

The State Water Resources Control Board (SWRCB)'s comments are addressed in the responses to specific comments included in the letter.

Comment SA03-2

Comment

Numerous water interests have long-relied on water transfers from the Sacramento Valley to meet their water supply demands. These transfers are in part made possible by groundwater substitution, and are important to the agricultural economy and municipal water supply needs of California. These transfers can be a critical component of long-term supply strategies for some water users. However, over-reliance on groundwater substitution can result in serious adverse impacts where the groundwater pumping occurs, and can result in depletion of groundwater resources, ecosystem impacts, subsidence, and water quality degradation, specifically during times of drought.

Response

Groundwater Mitigation Measure GW-1 was developed to avoid or reduce potentially significant impacts to groundwater resources to a less than significant level. See Common Responses 6 and 7.

Comment SA03-3

Comment

The Draft EIS/EIR finds that potentially significant impacts to groundwater resources could occur, but that with the proposed monitoring and mitigation program in place, these impacts would be less than significant. However, it is not clear whether these determinations are supportable. Specifically, the Draft EIR/EIS appears to underestimate the impact of the proposed project on local groundwater, does not appear to adequately account for the effect of current drought conditions on groundwater availability, and reaches conclusions that do not appear to be supported by the available data.

Response

The impacts analysis described in Section 3.3 of the EIS/EIR was developed using the best available modeling tools. These tools include modeling of the groundwater aquifer system and its interaction with surface water. The modeling also incorporates the surface processes that lead to deep percolation to the aquifer. Appendix D provides the technical background on the SACFEM2013 groundwater model. Potential groundwater substitution pumping was added to background pumping in the SACFEM2013 model to assess the potential changes to groundwater levels due to the transfers. The SACFEM2013 model was run through the previous wet and dry hydrology of the period from 1976 to 2003. Figure 3.3-27 shows the timing of the groundwater substitution transfer pumping for this hydrologic period, including pumping during drier periods when seller demand and Delta transfer capacity is available. Section 3.3.2, Environmental Consequences/Environmental Impacts, provides several figures that show the potential change in groundwater level both spatially across the Sacramento Valley (Figures 3.3-28 through 3.3-33) and with time (Figures 3.3-34 through 3.3-38; Appendix G).

Comment SA03-4

Comment

Comment #1: The Sustainable Groundwater Management Act

As mentioned above, California State Assembly Bill 1739 and Senate Bills 1168 and 1319 were passed by the Legislature in August 2014, and were signed into law by Governor Brown in September 2014. The package of bills constitutes the SGMA of 2014. The SGMA provides a framework for improved groundwater management by local authorities, and becomes effective January 1, 2015. The legislation requires that local agencies sustainably manage groundwater basins over a long-term planning horizon, and allows for state intervention by the State Water Board when additional efforts are needed to protect groundwater resources. The SGMA defines sustainable groundwater management, provides local agencies with tools and authorities to manage basins, and sets a timeline for implementation. Local groundwater sustainability agencies (GSAs) must be formed by June 2017, and groundwater sustainability plans (GSPs) must be completed for basins with the greatest need by 2022. Basins that must adopt a GSP must achieve sustainability within 20 years of plan adoption.

Sections 3.1.1.2.2, 3.2.1.2.2, 3.3.1.2, and 3.8.1.2 of the Draft EIS/EIR should be updated to include a discussion of the SGMA, which will be implemented during the 10-year timeframe (2015-2024) of the proposed project. The SGMA will affect the proposed buyer and seller regions in regard to their groundwater management, land use, water demands, and water availability. The SGMA also requires that GSAs, address groundwater quality issues and possible effects on groundwater dependent ecosystems (GDEs) caused by groundwater extraction. The Draft EIS/EIR should also be updated to address the management programs and regulatory requirements established under the SGMA, specifically new groundwater data that will be made available as part of a GSP that could be integrated into the proposed monitoring and mitigation program. The Draft EIS/EIR should also be updated to require that any transfers follow requirements (monitoring, reporting, and if necessary limits on pumping) required by a GSA or GSP.

Response

A summary of the SGMA has been added to the Water Supply, Water Quality and Groundwater Resources sections.

Comment SA03-5

Comment

Comment #2: Data and Modeling Issues

The Draft EIS/EIR indicates that the Sacramento Valley is "flexible and can respond to changes in hydrologic conditions and Central Valley Project (CVP) allocations (Executive Summary section 1.2)" as opposed to the southern Central Valley where there is a dire need for water. This conclusion appears to be based on an analysis of existing data primarily consisting of Department of Water Resources (DWR) hydrographs, supply availability data provided from potential sellers, and modeling results from the SACFEM2013 model. The State Water Board has the following comments regarding this assessment.

1. The analysis should include recent data showing significant groundwater depletions in the Sacramento Valley. There are several data sets and reports available from DWR that should be included in the analysis of groundwater availability, but are not. DWR has published a drought report (DWR, April 30th, 2014) showing groundwater declines for significant portions of the Sacramento Valley. The Draft EIR/EIS should include an analysis of how additional water extractions could affect local groundwater levels given the current groundwater elevations and drought status.

Section 3.1.1.3, page 3.1-5, describing the existing conditions of water supplies available for transfer should be updated to include groundwater data (e.g., DWR's California Statewide Groundwater Elevation Monitoring (CASGEM), basin prioritization results, etc.) to support the stated assumptions of the quantity of groundwater available in seller areas for transfer through groundwater substitution.

Response

Section 3.3.1.3 has been revised to include recently published data regarding current drought conditions.

Comment SA03-6

Comment

2. The groundwater quality analysis should include additional assessments of groundwater quality, including the State Water Board's AB2222 report (Communities that Rely on Contaminated Groundwater Source for Drinking Water, available at: http://www.swrcb.ca.gov/water_issues/programs/gama/ab2222/index.shtml), GeoTracker data, and GeoTracker GAMA data to assure that potential impacts from mobilizing contaminant plumes and other groundwater quality impacts are adequately evaluated.

Response

Data from the Groundwater Ambient Monitoring and Assessment (GAMA) program was reviewed and included in Section 3.3.1.3, Affected Environment. As stated in Section

3.3.2, Environmental Consequences/Environmental Impacts, groundwater quality impacts are only expected if the project causes a change in groundwater flow levels and/or flow patterns that persists for a long period of time. The groundwater substitution pumping proposed in this EIS/EIR will occur only during the summer irrigation period.

Comment SA03-7

Comment

3. The statements in sections 3.2.2.4.1 page 3.2-28, and section 3.2.2.5.1, page 3.2-42, that "groundwater quality in the [seller service] area is generally good and sufficient for municipal, agricultural, domestic and industrial uses" is potentially overly broad. The conclusion does not account for current groundwater quality monitoring, including monitoring data from wells in the proposed seller areas that have been identified to be within close proximity of nitrate contamination.

In order to accurately reflect the highly variable groundwater aquifer properties such as hydraulic conductivity and transmissivity, it is necessary to incorporate all well information within a data set. Most aquifers are neither homogeneous nor isotropic, and the hydraulic conductivity can be characterized differently in all directions. If the intent of the modeling analysis is to simulate the effects of the operation of high-productivity irrigation wells screened within the major producing zones, then it would be prudent to characterize these production zones with as much information as possible to avoid bias. In Section D.3.6, paragraph 3, the Draft EIS/EIR states that "all test data from wells that reported a well yield below 100 gallons per minute were eliminated from consideration, as were the test data from wells with a total depth less than 100 feet." Are the criteria for filtering the well test data mutually exclusive or inclusive? If a well had low yield data and was located 600 feet below the surface, then it should be included in the data set. This filtered data set contains one of the most important parameters in the model and can influence flow direction and velocities and should be characterized as accurately as possible. As a result of filtering the data, the results do not reflect heterogeneous/anisotropic conditions seen in the subsurface. These subtle differences in the subsurface are what comprise the hydrodynamic character of each aquifer and without this data, the conclusions drawn by the model are potentially unreliable. The Draft EIS/EIR should have a better description of model parameters and inputs, and the potential effects that inclusion/exclusion of certain types of data could have on model results.

Response

Groundwater quality is described in greater detail in Section 3.3.1.3 because effects to groundwater quality are part of the analysis of impacts to groundwater resources. Section 3.3.1.3 includes identification of groundwater quality concerns in each sub-basin.

As with any numerical groundwater flow model, SACFEM2013 requires the user to construct a mathematical representation of an aquifer system, and to establish boundary conditions that govern how the modeled aquifer interacts with regions outside of the model domain. The assignment of subsurface parameter values during model development does not curtail the ability of the model to compute aquifer responses from imposed hydraulic stresses on the aquifer system. SACFEM2013 was calibrated to historical aquifer conditions over the period 1970 through 2010. The calibration data set contains wide fluctuations in climatic variability ranging from the 1976-1977 and 1987-1992 drought periods as well as extremely wet periods, such as 1983. The ability of the model to adequately replicate observed conditions during these periods demonstrates its ability to simulate aquifer responses for the range of conditions experienced during the calibration period. Reclamation and SLDMWA acknowledge that stochastic modeling would need to have been undertaken to address predictive uncertainty. SACFEM2013 is a deterministic model, as opposed to a stochastic model. As such, it is not possible to quantify a defensible margin of error associated with its forecasts. However, the forecasts are based on reasonable input assumptions and are considered adequate to help inform decision-making.

Comment SA03-8

Comment

4. The project model is based on an abbreviated calibration set from 1970 to 2003 that does not appear to represent current water use, precipitation, and drought conditions or future climate change scenarios, which are generally drier. Groundwater recharge in the northern part of the Central Valley is below normal due to drought conditions.

Consequently, it could take several years to recharge the volume of water exported during a single year of transfers. This project proposes to export as much as 512,000 acre-feet of water annually. With the current drought, basin yield for these projects could be well below the amount used for the project model. As such, the interpretations based on the model may underestimate impacts to the area.

Section 3.1.2, page 3.1-14, describing the assessment methods used to determine the environmental impacts associated with the project should be revisited. The water year time period (1970-2003) used for the model fails to account for current environmental conditions and water use trends. For example, the model assumes that water transfers occur in 12 out of the 33 year time period. However, the State Water Board's Division of Water Rights' Water Transfer Program records indicate that water transfers have occurred for the last six consecutive years of the current program's record (2009-2014). It is reasonable to expect that establishing a long-term transfer program would facilitate a higher frequency of water transfers, which would result in more frequent groundwater substitution transfers.

Response

See Common Response 5.

Comment SA03-9

Comment

In addition, known conditions do not appear to match what is shown in the Draft EIS/EIR. There are many wells in the northern Sacramento Valley that have cones of depression that cover large areas and are not accounted for. DWR maps show groundwater depletions in excess of 20 feet for shallow, intermediate, and deep groundwater aquifers from spring 2004 to spring 2013. The set of wells used to calibrate the model do not include wells that have undergone considerable groundwater elevation losses in excess of 20 feet within the last 10 years. The DWR potentiometric and groundwater elevation maps were created using over 200 wells around the northern Sacramento Valley. Choosing well locations and values that are not located within the cone of depression areas are not reflective of current conditions and will sway model results and how the system responds to future groundwater extraction.

Response

Modeled wells were calibrated to existing data from the simulation period (i.e., 1970-2003). Review Appendix D for details on calibration of the model. See Common Response 4.

Comment SA03-10

Comment

Comment #3: Monitoring and Mitigation

The Draft EIS/EIR references a Draft document titled Technical Information for Preparing Water Transfer Proposals and Addendum for providing guidance on the development of proposals for groundwater substitution water transfers; however, information on these documents were not described in detail. Based upon the information provided in the Draft EIS/EIR, there are several additions and clarifications that could strengthen the Mitigation and Monitoring Program (M&MP):

1. Groundwater elevation data captured by the sellers should be required to be submitted to DWR's CASGEM Program, and sellers should be required to submit their information to any GSA for development of the basin's GSP. Although the sellers may be able to address groundwater depletions within their own service areas, the groundwater extractions may influence areas far outside the boundaries of the seller agencies. The only way to assess basin-scale impacts of exporting hundreds of thousands of acre-feet of water is a comprehensive basin-scale monitoring program. Eventually, development of GSAs will produce basin-scale data repositories. However, those GSAs have not yet been developed. In the interim, CASGEM offers an existing method to compile and analyze the data. As an alternative, the sellers may submit the data to the State Water Board's GeoTracker GAMA system. Local water districts should also be involved in monitoring and mitigation processes so they can provide oversight on the entire area, manage disputes, and activate any mitigation processes.

Response

All data collected as required by Mitigation Measure GW-1 will be submitted to Reclamation as the lead agency. The data provided to Reclamation is considered public.

Comment SA03-11

Comment

2. It is unclear why groundwater elevation monitoring reports should be submitted only to Reclamation. DWR, local agencies (e.g., GSAs, counties, local water districts, others), and

the State Water Board all have regulatory mandates to protect and manage groundwater resources. At a minimum, the data provided through the monitoring reports should be made available to any public agency with local authority to manage groundwater. We suggest making the reports available on a publicly-accessible website or database.

Response

All data collected as required by Mitigation Measure GW-1 will be submitted to Reclamation as the lead agency. The data provided to Reclamation is considered public.

Comment SA03-12

Comment

3. To ensure that impacts to water quality and other users do not occur as a result of this project, the M&MP program should require: sellers to incorporate existing water quality data from CASGEM, the State Water Board's AB 2222 report, GeoTracker GAMA, and GeoTracker; should require an analysis of known potential contaminant sites; and should require setbacks from known contaminant sites or plumes. Where appropriate, the programs should include an analysis of well screen intervals, water source, and potential contaminants in the area. The State Water Boards' GeoTracker system shows the location of thousands of leaking underground storage tanks, including sites within the seller's service areas. Leaking tanks typically affect the shallowest portions of an aquifer. Table 3.3-3 shows that many of the proposed sellers' wells are located in relatively shallow portions of the aquifer. For example, The Natomas Central MWC estimates that wells pumping at 5,500 gallons per minute (gpm) are located at depths as shallow as 150 feet below the ground surface. A contaminant can quickly and easily migrate from the surface to a depth of 150, particularly where the local geology is hydrogeologically conducive for rapid infiltration.

Response

As stated in Section 3.3.4.1, Mitigation Measure GW-1 was based on the "Draft Technical Information for Preparing Water Transfer Proposals" as prepared by DWR and Reclamation. The monitoring and mitigation plan required as part of GW-1 addresses groundwater quality. The Technical Information document lists the specific details of the required water quality testing, including the identification of known contaminated areas. More comprehensive water quality testing may be required for wells in areas with known groundwater quality problems. See Common Responses 6 and 7 for additional information.

Comment SA03-13

Comment

4. The mitigation component is vague, and does not identify trigger points that activate a mitigation process. Nor does the mitigation plan identify who will require the mitigation, who will oversee the mitigation, and who will ensure that mitigation is completed. The document, in Section 3.3.4.1.3, describes a scenario where the seller would be responsible for self-initiating and managing the mitigation plan. Leaving the sellers to self-mitigate is a

potential conflict of interest, and may result in scenarios where adverse impacts to groundwater and other resources go unaddressed.

Response

Mitigation Measure GW-1 requires development of an approved monitoring and mitigation plan to avoid potentially significant impacts from groundwater substitution pumping. Common Responses 6 and 7 provide additional information.

Comment SA03-14

Comment

The M&MP requirements proposed in the Draft EIS/EIR (section 3.3.4.1, page 3.3-88) do not consider all local regulations. Of the 28 proposed seller agencies, 7 agencies have existing Groundwater Management Plans (GWMPs), which include M&M requirements that may be duplicative. The SGMA will require that additional seller districts be part of a GSP (which will replace any existing GWMPs). As with GWMPs, the GSPs will contain local M&MP requirements. The Draft EIS/EIR M&MP should be rewritten to ensure that proposed seller agency activities meet the regulatory requirements in the existing GWMPs or future GSPs.

Response

The text in the last paragraph of Section 3.3.4.1 has been clarified to include Groundwater Sustainability Plans.

Comment SA03-15

Comment

Comment #4: Groundwater/Surface Water Interactions and Groundwater Dependent Ecosystems

Section 3.1.2.4 makes assumptions regarding groundwater availability for groundwater substitution transfers in seller areas that may misrepresent existing groundwater conditions. While the Draft EIS/EIR acknowledges that groundwater/surface water interactions exist, and that groundwater can contribute an important percentage of stream baseflow, the document does not account for potential impacts to surface waters in the sellers' areas that are caused by significant groundwater depletion. As written, the Draft EIS/EIR implies that natural in-stream groundwater recharge has a direct impact on streamflows, but does not consider how groundwater depletion in the sellers' area might reduce surface water baseflow. Additionally, the Draft EIS/EIR assumes that current groundwater levels are being sustainably managed and that there is adequate groundwater available to ensure reliable water sources for the proposed groundwater substitution transfers. The Draft EIS/EIR makes this assumption without demonstrating that current conditions and ongoing practices are not impacting groundwater dependent ecosystems.

Response

Information on existing regional groundwater conditions can be found in Section 3.3. The modeling effort, described in detail in Appendices B and D, included an extensive evaluation to estimate changes in groundwater levels and groundwater-surface water interaction. Section 3.1 includes an analysis of how the changes in groundwater-surface water interaction could affect water supply. Groundwater-surface water interaction could affect other resources, and these potential effects are assessed in Sections 3.7, Fisheries and 3.8, Vegetation and Wildlife.

Comment SA03-16

Comment

The Draft EIS/EIR includes a series of maps (figures 3.3-26 through 3.3-31) showing simulated change in groundwater head, for different depths, for the 1976 and 1990 transfer seasons. Those maps are illustrative, but do not represent current conditions. As noted above, transfers have taken place for the last six consecutive years. In combination with information that a single year's worth of drawdown could reduce shallow-aquifer levels by 15 to 20 feet (e.g., Figure 3.3-31, near the Cordua Irrigation District), there is significant concern that continued transfers will harm groundwater dependent ecosystems. Consecutive years of transfers could lower groundwater elevations to the point that ecosystems (including wetlands, springs, and streams) are disconnected from groundwater, causing harm to local species.

Response

The figures referenced by the commenter represent the change in groundwater level expected due to the transfer pumping. Mitigation Measure GW-1 was developed to avoid or reduce potential impacts to groundwater resources to a less than significant level. Impacts to ecosystems are discussed in Section 3.8, Vegetation and Wildlife.

Comment SA03-17

Comment

Section 3.8.2.1, page 3.8-31, describing the assessment methods used to determine transfer effects on groundwater dependent ecosystems leaves out critical information and appears to make incorrect assumptions in assessing harmful effects to groundwater-dependent ecosystems. (Section 3.8.2.1). The water year time period (pre-2003) used for the model, does not account for current environmental conditions and water use trends. Furthermore, the assumption that there will be no groundwater/surface water interaction where pre-transfer water levels are already more than 15 feet below ground surface is not supported. Baseflows may be disconnected to the stream course in one area of the catchment, but discharge to the land surface as streamflow or a spring in other areas of the basin. In addition, the logic appears to be circular, since pumping related to the proposed transfers can drive groundwater elevations to depths greater than 15 feet below ground surface.

Response

Please see Common Response 11 related to effects on groundwater-dependent vegetation and wildlife and Common Response 5 for a discussion of the model time period.

Comment SA03-18

Comment

Section 3.8.2.1 also discusses impacts to species that could occur where groundwater dependent ecosystems are cut off from their water source due to transfer-related pumping. The assumption that impacted species will be able to adjust to lowering groundwater levels in a single water year is not supported (Section 3.8.2.1.1, page 3.8-31). The 15-foot cutoff is based on a model run that uses decade-old data, and does not account for regional or basin specific geology that defines the extent of surface water-groundwater interactions.

Response

The commenter refers to text in Section 3.8.2.1.1 that is specific to a few locations in the North Delta where groundwater levels are high, and with a maximum reduction of 0.3 to 0.8 feet over the growing season, plants are expected adjust to this small reduction. Appendix F includes the depth of groundwater at other locations. See Common Response 11 for more information on potential effects to vegetation and wildlife from surface water-groundwater interaction.

Comment SA03-19

Comment

The Draft EIS/EIR appears to disregard potential effects to groundwater dependent ecosystems that could occur in the sellers' area. A more thorough discussion of the effects of groundwater extraction on ecosystems in the sellers' area should be included in section 3.8.2.4, page 3.8-46. The associated impacts to the groundwater dependent ecosystems are determined to be not significant with the implementation of Mitigation Measure GW-1. However, the mitigation appears to be inadequate (where the primary mitigation action is to reduce groundwater pumping). To prevent negative impacts to groundwater dependent ecosystems, the mitigation plan should require preventative actions rather than reactive approaches to ensure impacts do not occur.

Response

See Common Responses 6, 10, and 11.

Comment SA03-20

Comment

Comment #5: Groundwater Levels in the Buyers' Area

In Section 3.3 (Table 3.3-7, page 3.3-86 and again on page 3.3-87), the Draft EIS/EIR states that transfers could increase groundwater levels, eliminate or minimize land subsidence, and improve groundwater quality in the Buyer Service Area by reducing groundwater pumping during shortages. This statement is potentially misleading. In order to show that the transfers would increase groundwater levels (presumably through percolation of excess irrigation water, and/or conjunctive recharge), the Draft EIS/EIR should include a water balance for the buyer's areas. In all likelihood, the volume of the transfer would need to be significantly greater than the amounts proposed for long-term transfer in order to replace the amount of groundwater that is currently extracted to meet agricultural demands in the buyer's region. For example, the Draft EIS/EIR states that the average annual groundwater production in the San Joaquin basin is 0.9 million acre feet (Section 3.3, page 3.3-41), which is more than the sum of the proposed transfers. It is not plausible to assume that transfer water will solve the San Joaquin groundwater depletion issues, especially considering precipitation and mountain-front recharge amounts have decreased in response to the drought. While the transfers may slow the rate of groundwater decline in the buyer's area, there is no basis to state that the application of the transfer water alone will raise groundwater levels. Similarly, while the transfers may temporarily slow subsidence, unless the transfer water raises groundwater elevations above historic lows the additional water is unlikely to halt subsidence (although it may slow locally significant rates). It would be more productive to show a simple water balance for the respective buyer's areas, with a discussion of how much groundwater pumping, in addition to transfer water, is needed to sustain current and projected agricultural practices.

Response

The text in Section 3.3.2.4.3 has been revised to state that the project may result in a reduction in the use of groundwater resources. This potential reduction in groundwater use would be a benefit, either by increasing groundwater levels or by reducing the rate at which groundwater levels decline.

Comment Letter LA01, Doug Teeter, Butte County Board of Supervisors

Comment LA01-1

Comment

Butte County and its surrounding region have a vested interest in assuring that the Long-Term Water Transfers Program has the least impact upon the community, agricultural economy and environment. Our region's water resources provide the life blood for our agricultural-based communities, economy and environment. Much of our local water supply comes from the various groundwater basins throughout the region that area recharged through these creeks and rivers.

We are troubled by the short amount of time afforded to provide comments on the EIS/EIR. It has been almost four years since the Bureau released a draft EIS/EIR, yet only provided the public 60 days to review, analyze and comment. The community has a strong interest in the Long-Term Water Transfers Program. So, in fairness, the Bureau of Reclamation (Bureau) should extend the comment period for at least ninety days.

Response

The Lead Agencies are unable to accommodate the request for additional review time beyond CEQA and NEPA requirements.

Comment LA01-2

Comment

Based on our preliminary review, we believe that the EIS/EIR is seriously flawed and will need to be revised and recirculated. The relied upon data is outdated, incomplete and selectively chosen. The result is that the EIS/EIR fails to meet the requirements of the National Environmental Policy Act and the California Environmental Quality Act. Again, due to the inadequate amount of time afforded to comment, the comments provided by the Butte County Board of Supervisors do not reflect a full review of the document.

Response

The 2014 Draft EIS/EIR included the most recent information available in the affected environment sections. The Final EIS/EIR has been updated to include information that has become available since the draft document was published. The amount of time provided for review of, and comment on, the 2014 Draft EIS/EIR is in accordance with the requirements of NEPA and CEQA.

Comment LA01-3

Comment

The Long-Term Water Transfers Program purports to assist water users south of the Delta with immediate implementable and flexible supplemental water supplies to alleviate shortages. The project objectives claim that shortages are expected due to hydrologic conditions, climate variability, and regulatory requirements. Project justification intends to address unforeseen, short-term water supply challenges. The reality that the circumstances facing the water users south of the Delta are neither short-term nor unforeseen. These water supply reliability challenges are baseline conditions that must be addressed at the local and regional level. Ironically, water users north of the Delta face similar challenges in terms of hydrologic conditions and climate variability, but the EIS/EIR inadequately assesses these limitations. The project intends to establish a long-term water transfer program to meet the current and future demands south of the Delta, not based on any viable criteria.

Response

The Lead Agencies establish the purpose and need and project objectives to best describe their underlying reasons for considering an action. While the Lead Agencies recognize that drought causes water supply concerns in other areas of the state, the purpose and need for this EIS/EIR focuses on the area that relates to the parties that may participate in the range of potential transfers described in the document.

Comment LA01-4

Comment

Even though the EIS/EIR identified significant impacts in the Sacramento Valley, the methodology underestimated those impacts. The EIS/EIR identified significant impacts including lower groundwater elevations, changes to groundwater quality, reduction in groundwater recharge and decrease flows in surface water. However, it fails to take into account that the reduction in stream flows and the lowering of Lake Oroville that will harm the local economy. In additional to underestimating these impacts, the mitigation measures in the EIS/EIR are not viable and will not mitigate the significant impacts. The following specific examples highlight the flaws in the EIS/EIR and provides justification for a revised and recirculated EIS/EIR.

Response

The EIS/EIR evaluates the physical effects of decreases in Lake Oroville storage and reductions in stream flows. Mitigation measures to avoid any potentially significant reduction in stream flows were included for those resources affected. Section 3.10 presents an analysis of the potential economic impacts of water transfers, including effects to pumping costs of changes in groundwater levels. As discussed in Section 3.3, the groundwater modeling does account for stream flow depletion. The EIS/EIR evaluates physical impacts to recreation, water supply, flood control and other resources that could be affected by changes in storage or reservoir levels at Lake Oroville. There were not economic effects identified as a result of the small changes in storage in Lake Oroville.

Comment LA01-5

Comment

First, the description of the regulatory setting in Chapter 3 - Groundwater (section 3.3.1.2) is incomplete, misleading and inaccurate. The document makes no mention of the recently enacted Sustainable Groundwater Management Act. The implementation of the Sustainable Groundwater Management Act will occur during the ten year period of the water transfer program. The Sustainable Groundwater Management Act will affect the buyer and seller regions in regard to their groundwater management, land use, and water demands. The data and management programs developed through the Sustainable Groundwater Management Act will change the assumptions in the EIS/EIR.

Second, the EIS/EIR must reference and acknowledge Area of Origin provisions in the Water Code. Specifically, the EIS/EIR must reference Water Code 85031, which states "This division does not diminish, impair, or otherwise affect in any manner whatsoever any area of origin, watershed of origin, county of origin, or any other water rights protections, including, but not limited to, rights to water appropriated prior to December 19, 1914, provided under the law. This division does not limit or otherwise affect the application of Article 1.7 (commencing with Section 1215) of Chapter 1 of Part 2 of Division 2, Sections 10505.5, 11128, 11460, 11461, 11462, and 11463, and Sections 12200 to 12220, inclusive." Honoring are of origin water rights is consistent with state water policy and a foundational element to California's water future. In addition, the EIS/EIR should also discuss how the project complies with SB1X, which calls for a reduced reliance on the Delta and to promote regional water supply reliability.

The description of the local regulatory setting in the EIS/EIR failed to reference the Butte County Groundwater Conservation Ordinance (Chapter 33 of the Butte County Code), which Butte County voters overwhelmingly adopted in 1996. The Groundwater Conservation Ordinance requires a permit for water transfers that include a groundwater substitution component. The primary purpose of this Ordinance is to ensure that an adequate independent environmental review occur and to assure that groundwater resources would not be adversely affected (i.e., overdraft, subsidence, saltwater intrusion) or result in uncompensated injury to overlying groundwater users and others. Additionally, the process of the Groundwater Conservation Ordinance brings a measure of transparency and public involvement that should be part of any water governance process. It is imperative that the proposed program adhere to the spirit and intent of local groundwater ordinances that have been codified since the Drought Water Bank held in the early 1990s. In this regard, the program needs to recognize that groundwater basins can extend across multiple administrative jurisdictions. Groundwater substitution transfers that occur in Colusa or Glenn counties have the potential, over the long term, to draw down groundwater sources shared with Butte County.

Response
Section 3.3.1.2.2 has been revised to include additional text on Senate Bill 1168, Assembly Bill 1739, and Senate Bill 1319.

See Common Response 6 for additional information. The range of potential transfer actions analyzed in the EIS/EIR does not include any groundwater substitution transfers from Butte County, but Section 3.3 does assess potential impacts throughout the Sacramento Valley, including Butte County, from transfers originating in nearby areas.

Comment LA01-6

Comment
The EIS/EIR (Chapter 3, p. 21) includes a limited description of groundwater production, levels and storage in the Sacramento Valley. The section fails to report on the extensive data and analysis of groundwater conditions in this area. The section fails to report on the extensive data and analysis of groundwater conditions in this area. The EIS/EIR bases its analysis on a few

selected wells, and provides a generalized description of regional groundwater conditions based on those wells. What is most troubling is the conclusion that the Sacramento Valley groundwater trends indicate that "wells in the basin have remained steady, declining moderately during extended droughts and recovering to pre-drought levels after subsequent wet periods." This conclusion misrepresents the reality of groundwater conditions in the Sacramento Valley. The EIS/EIR acknowledges that one of the selected wells, 21N03W22A004M, shows a steady decline but current groundwater conditions are being impacted beyond routine seasonal fluctuations and does not account for projected impacts from climate change. In some areas, BMO alert to trigger levels have been reached. There are a number of areas included a more comprehensive analyses of groundwater conditions and locally adopted Basin Management Objectives (BMO), clearly describing how BMOs will be utilized and how the program will address current conditions.

In addition to misrepresenting groundwater elevation data, the EIS/EIR also willfully ignored and misrepresented the current condition of streams and creeks in the Sacramento Valley. The Sacramento Valley subsidence monitoring data are readily available through the Department of Water Resources and the EIS/EIR should have included that data. For specific data and analysis of Butte County groundwater conditions we invite the Bureau to review the annual Groundwater Status Report at: http://www.buttecounty.net/waterresourceconservation/GroundwaterStatusReport.aspx.

Response

See Common Response 4. The statement "wells in the basin have remained steady, declining moderately during extended droughts and recovering to pre-drought levels after subsequent wet periods" is based on past hydrologic conditions. At well 21N03W33A004M (DWR 2014a) groundwater levels recovered after declines noticed during drought conditions between 1975 and 1977. Current drought conditions have caused groundwater levels in some regions to decrease below historic lows noticed from 1900 through 1998. Additional data has been added to the Groundwater Resources section to present data for current dry conditions.

The Lead Agencies acknowledge that basin management objectives (BMO) alerts have been reached in some parts of Butte County. As a clarification, Butte Water District is the only seller in Butte County under the Proposed Action, and it has not proposed groundwater substitution-related pumping within Butte County. The Lead Agencies have reviewed the 2013 Groundwater Status Report (http://www.buttecounty.net/Portals/26/Reports/Butte_14_BMO.pdf) and noted groundwater elevation at well 17N03E16N001M during the fall 2013 monitoring falling below the Fall BMO Stage 1 alert by 0.3 feet, and the fall 2014 measurement falling below the Fall BMO Stage 2 alert by 0.7 feet (https://www.buttecounty.net/wrcdocs/Programs/Monitoring/GWLevels/2014/2014_Fall_BMO_Data.pdf). See Figure R-4 for spring 2014 measurements showing groundwater elevations approximately 2 feet above BMO alert 1 level. This is indicative of seasonal fluctuations in groundwater level with recovery in the post transfer period. The Lead Agencies acknowledge the long-term declining trend noticed between 1976-77 and 1987-92 and, more recently, from 2010 to the present. See Common Response 6.

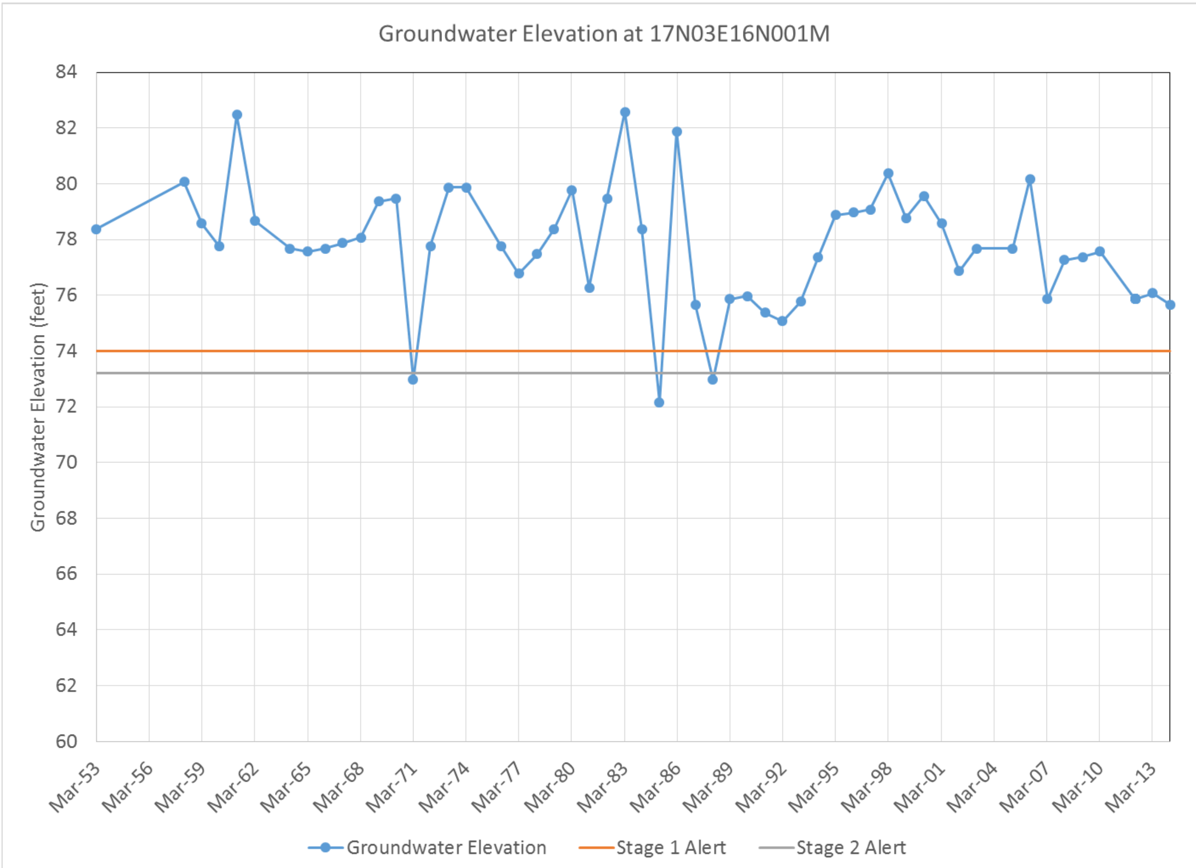


Figure R-4.
Spring 2014 Groundwater Elevation Measurements at Well 17N03E16N001M

The draft CEQ guidance asserts that it is not useful for a NEPA evaluation to link a specific Proposed Action to climatological changes and the environmental impacts thereof. Additionally, while the CEQ acknowledges that the effects of climate on a Proposed Action should be considered, agencies must be cognizant of the scientific limitations on predicting climate change effects, especially for actions of a short-term nature. Based on these considerations, it is not feasible to consider the effects the Proposed Action would have on sensitive aquifer systems in light of the impacts of climate change.

Comment LA01-7

Comment

We have concerns over the modeling methodology and the resultant appraisal of that data. Unfortunately, the limited amount of time afforded to comment precludes Butte County from conducting an in-depth analysis. However, a preliminary review of the modeling data raised a number of questions. One is the implication of the limited dataset to conduct the CalSim II modeling analyses. These choice of data used to establish baseline conditions for the SACFEM2013 analysis is critical to identifying the impacts of the study. The reliance on data from 1970 to 2003 fails to take into account current conditions and trends. For example, the analysis of the data used lead to an assumption that 12 out of 33 years would result in groundwater substitution transfer events. However, recent experience (2000-2014) has shown that transfer programs have actually occurred in 9 of 15 years; more than one and a half times that of the analysis. A reasonable expectation is that having an established Long-Term Transfer Program would facilitate a higher frequency of water transfers and that, in turn, groundwater substitution transfers would occur in most years. The discrepancy between calculated expectations versus actual occurrences demonstrates an obvious fundamental flaw in the EIS/EIR that requires revision.

Response

See Common Response 5.

Comment LA01-8

Comment

One of the most egregious flaws with the EIS/EIR is how the impacts from groundwater substitution transfer programs are identified and mitigated. According to the EIS/EIR (p.3.3-61), "an impact would be potentially significant if implementation of groundwater substitution transfers or cropland idling would result in:

- A net reduction in groundwater levels that would result in adverse environmental effects or effects to non-transferring parties;
- Permanent land subsidence caused by significant groundwater level decline.
- Degradation in groundwater quality such that it would exceed regulatory standards or would substantially impair reasonably anticipated beneficial uses of groundwater;"

Based on our preliminary analysis, the EIS/EIR fails to adequately assess the impacts from groundwater substitution transfer programs. The EIS/EIR underestimates the effects and fails to adequately mitigate those effects in regards to determining whether there is a net reduction in groundwater levels that would result in adverse environmental effects or effects to non-transferring parties. As previously shown, the assumption that groundwater substitution would occur on a limited basis was false, so the simulated changes in water table elevations can only be assumed to be grossly underestimated. Additionally, the EIS/EIR conclusion that most wells in the Sacramento Valley are deeper than the resulting groundwater elevations is not true. In actuality, most of domestic wells are less than 100 feet. The combination of these two erroneous conclusions resulted in the EIS/EIR completely failing to assess the potential impact of the groundwater substitutions to shallow wells would only see a reduction in yield and not go "dry" is equally untrue. During the part two drought periods, Butte County and the Sacramento Valley have responded to numerous incidents of domestic well failing. The EIS/EIR must recognize and analyze how the Long-Term Transfer Program will contribute and exacerbate the impacts of a natural disaster to those who rely on domestic wells.

Response

The groundwater analysis used SACFEM2013 to evaluate potential impacts to groundwater resources, including groundwater levels. See Appendix D for documentation of SACFEM2013, which includes a discussion of why it was selected for this analysis. See Common Response 6 regarding groundwater mitigation. Transfer frequency for groundwater substitution alternatives is based on hydrologic conditions, buyers' priorities for transfer methods, transfer quantities, and ability to export through the Delta.

Table 3.3-4 lists the well depths in the Sacramento Valley Groundwater Basin. Well depths within the Sacramento Valley range from 11 to 1,750 feet and average well depths range from 100 to 250 feet.

Comment LA01-9

Comment

The EIS/EIR (Chapter 3.7) identified that the Long-Term Water Transfers Program will impact local streams and jeopardize critical ecosystems. Of particular concern is the calculated stream flow reduction in Little Chico Creek of more than 1 cubic foot per second and a reduction of more than 10%. The EIS/EIR categorized the impact to Little Chico Creek as a significant impact. Unfortunately, the EIS/EIR underestimated the impacts and relied on outdated information again. As mentioned previously, the EIS/EIR underestimates the frequency of groundwater substitution events, and the data relied upon for analyses are outdated. The stream gaging data along Little Chico Creek was based on data from 1976 to 1995, and the CalSim II modeling results did not include data after 2003. Because the stream data relied upon in the EIS/EIR do not reflect current baseline conditions in the Sacramento Valley, it raises significant doubts to the validity of the conclusion that the resultant reduction in flows, particularly in Little Chico Creek, would not impact spring-run Chinook salmon. Therefore, the Bureau must reevaluate the environmental impacts to streams and aquatic ecosystems based on current data.

Response

See Common Response 5 regarding the hydrology model timeframe.

The stream gage data used for Little Chico Creek were from USGS Stream Gage# A04280 - Little Chico Creek near Chico. Flow data publicly available, and therefore used in this analysis, for this location were for water years 1976-1996. A search of both USGS and DWR (CDEC) databases indicates that there are no other stream gage data publicly available either for A04280 or anywhere else in Little Chico Creek. Note that the text inadvertently indicated the dates for data used were 1976-1995, but this has been corrected to indicate data were for water years 1976-1996.

Comment LA01-10

Comment

The environmental analysis identified a number of significant impacts requiring mitigation. Unfortunately, the proposed mitigation measures, particularly Mitigation Measure GW-1: Monitoring Program and Mitigation Plans, will not mitigate adverse environmental effects or minimize potential effects to other legal water users. The EIS/EIR, as written, does not include criteria or standards that must be met to mitigate significant impacts and the Monitoring Program (3.3.4.1.2) has vague and subjective standards for what constitutes as an acceptable monitoring network. The EIS/EIR should assess the existing monitoring network and identify monitoring gaps based on the locations of potential willing sellers.

Another fundamental flaw is the expectation that potential sellers be required to develop a mitigation plan. The initial premise of the mitigation plan is that the seller's monitoring program would indicate whether the operation of wells for groundwater substitution pumping are causing substantial adverse impacts. Unfortunately, because the definition of substantial adverse impacts is not defined, the process to monitor and mitigate third party impacts lacks clarity. First, the Long-Term Water Transfers Program must define the specific parameters for what constitutes substantial adverse impacts. Then the Long Term Water Transfers Program must have an unambiguous, transparent, locally vetted dispute resolution program. It is imperative that the Long-Term Water Transfers Program recognize that potential impacts associated with the transfer of water from the Sacramento Valley need to be addressed through this type of approach.

Response

Mitigation Measure GW-1 requires a monitoring plan as part of any groundwater substitution transfer proposal to avoid potentially significant adverse impacts. The concept and process for these plans is based on the "Draft Technical Information for Preparing Waters Transfer Proposals." Each monitoring and mitigation plan will be customized for the local conditions surrounding the potential seller. Local conditions make it difficult to pre-define the required monitoring and mitigation efforts specific to each seller. Common Response 6 provides additional information.

Comment LA01-11

Comment

The description of potentially significant unavoidable impacts (Section 3.3.5) contains inaccurate statements and misleading information. First, it is unclear why the Northern Sacramento Valley Integrated Regional Water Management Plan (NSVIRWMP) is included in this section. It appears that the Bureau does not understand the policy and governance of the NSVIRWMP. The NSVIRWMP does not have programs or project priorities that could be construed as potentially causing significant unavoidable impacts. Similarly, the reference to and characterization of the Tuscan Aquifer Investigation Project is inaccurate. The Tuscan Aquifer Investigation Project was a scientific project was a scientific project that intended to improve the understanding of the recharge characteristics of the lower Tuscan Formation and the interconnectedness of the basin. The characterization that the Tuscan Aquifer Investigation Project “would increase pumping within (or near) the Seller Service Area” is categorically false. If the Bureau had taken the time to review the data and reports from the Tuscan Aquifer Investigation, they might have improved their analysis by using current scientific investigation. We demand that the Bureau remove the reference to the Tuscan Aquifer Investigation Project.

Response

As described in Section 3.3.6.1.1, both NSVIRWMP and the Tuscan Aquifer Investigation have been described as studies. Section 3.3.6.1.1 describes the Tuscan Aquifer investigation as a study that will help improve the understanding of aquifer properties, and NSVIRWMP is a study that will help provide management objectives that would be protective of the groundwater resources in the northern Sacramento Valley.

Comment LA01-12

Comment

Finally, we have questions and concerns regarding the designated Lead Agencies in the EIS/EIR. The Department of Water Resources (DWR) should be designated as a lead agency rather than as a Responsible Agency. A number of the participating agencies are State Water Project (SWP) Contractors regulated by DWR and the conveyance for the project will use SWP facilities under the jurisdiction of DWR. One of the risks and uncertainties identified in Chapter 2 of the EIS/EIR was the ability to coordinate water transfers with DWR. Additionally, we fail to understand why the San Luis & Delta-Mendota Water Authority (SLDMWA) is the only lead water agency. Other water agencies have responsibilities equal to those of SLDMWA. The roles and responsibilities of participating agencies (Section 1.5) is inadequate and vague. The EIS/EIR fails to justify the choice of the SLDMWA as the sole lead agency when there is such as clear conflict of interest between the SLDMWA and the northern Sacramento Valley counties that overlie the groundwater sources that will contribute to groundwater substitution transfers. The document fails to provide a rationale for not including other water agencies named in the EIS/EIR as Lead Agencies.

Response

See Common Response 1.

Comment LA01-13

Comment

The magnitude of the proposed program is daunting and raises considerable concerns. In our comments on the scoping of the EIS/EIR in 2011, we surmised that an adequate EIS/EIR may not be possible based on the length and breadth of the proposed program. It appears that our concerns are true.

Response

The EIS/EIR has assessed the potential impacts of a range of potential transfer activities and alternatives on multiple resources, as described in Section 3 and summarized in Table 2-9. See Common Response 14.

Comment LA01-14

Comment

In conclusion, we cannot stress enough that actions through the Long-Term Transfer Program could have grave economic and environmental consequences in the Sacramento Valley that must be addressed. The EIS/EIR woefully fails to meet minimal environmental assessment standards, provides misleading statements and avoids including a complete, current, data set. We recommend that the Bureau of Reclamation extend the comment period for at least 90 days to allow a more complete review. Upon receipt of the comments, the Bureau must remedy the deficiencies in the EIS/EIR and recirculate it for comment.

Response

The EIS/EIR provides a comprehensive analysis of the potential impacts associated with a full range of alternatives, including potential environmental consequences in the Sacramento Valley. See Common Responses 3 and 14 for additional discussion. The EIS/EIR provides a complete and accurate analysis, which is supported by substantial evidence, and responses to all comments received on the 2014 Draft EIS/EIR have been included in this Final EIS/EIR. The Lead Agencies are unable to accommodate the request for additional review time beyond CEQA and NEPA requirements.

Comment Letter LA02, Brendan Vieg, City of Chico

Comment LA02-1

Comment

This letter is to provide the City of Chico's comments regarding the adequacy of the EIS/EIR analysis of the environmental effects, and mitigation for, water transfers from water agencies in northern California to water agencies south of the Sacramento-San Joaquin Delta and in the San Francisco Bay Area.

Through its General Plan, it is Chico's policy to oppose regional sales and transfers of local groundwater, including water export contracts, and the EIS/EIR should acknowledge and clearly highlight such inconsistency with a General Plan (CEQA Guidelines§ 15125(d)). The Tuscan aquifer is the primary groundwater basin underlying and providing municipal and agricultural water to Chico and its Planning Area. It's for this reason that the City opposes transfers of local groundwater in the long-term interest of a safe and reliable municipal water supply, and to support the regional economy and the environment.

Response

There will be no groundwater substitution pumping under the Proposed Action within Chico city limits. The closest groundwater substitution well is approximately 10 miles from the City of Chico. Impacts of potential transfer activities simulated in Section 3.3.2.4 (See Figures 3.3-28 through 3.3.-33) indicate no drawdown will be incurred near the City of Chico.

Comment LA02-2

Comment

While 60 days is the legal minimum for public review and comment on a Draft EIS/EIR, it is not an appropriate review time for such an important and voluminous document that attempts to analyze and mitigate the potential impacts of a six county, 10-year water transfer program. We request that the comment period be extended for at least an additional 90 days.

Response

The Lead Agencies are unable to accommodate the request for additional review time beyond CEQA and NEPA requirements.

Comment LA02-3

Comment

The Federal Register notice for the EIS/EIR states that "[t]ransfers of CVP supplies and transfers that require use of CVP or SWP facilities are subject to review by Reclamation and/or DWR in accordance with the Central Valley Project Improvement Act of 1992, Reclamation's water transfer guidelines, and California State law. Pursuant to Federal and State law and subject to separate written agreement, Reclamation and DWR would facilitate water transfers involving CVP contract water supplies and CVP and SWP facilities" (emphasis added). CEQA Guidelines Section 15367 and Section 15051 suggest that given the prominent role that DWR plays in the proposed water transfers, it is not proper that SLDMWA is the Lead Agency for the purposes of CEQA. A number of the participating water agencies are State Water Project contractors regulated by DWR and the conveyance for the project will use SWP facilities under the jurisdiction of DWR.

Response

See Common Responses 1 and 14.

Comment LA02-4

Comment

The project objectives for the EIS/EIR suggest that water shortages are expected due to hydrological conditions, climatic variability, and regulatory requirements. The project's justification therefore is to address unforeseen, short-term water supply challenges. The reality, however, is that the water supply challenges facing the water users south of the Delta are not unforeseen or short-term--- they are simply a created existing condition. The project objectives for the EIS/EIR need to be revised to accurately reflect the project's true purpose--- establishing a long-term water transfer program to address a created and growing water supply reliability challenge south of the Delta.

Response

The Lead Agencies establish the purpose and need to best describe their underlying reasons for taking an action. While the Lead Agencies recognize that drought causes water supply concerns in other areas of the state, the purpose and need for this EIS/EIR focuses on the area related to the parties participating in the document.

Comment LA02-5

Comment

The EIS/EIR (Chapter 3) provides an incomplete description of groundwater production, levels, and storage in the Sacramento Valley. In particular, the chapter fails to report on the extensive data and analysis of groundwater conditions in Butte County. The EIS/EIR bases its analysis on a few selected wells, and provides a generalized description of regional groundwater conditions based on those wells. The EIS/EIR fails to acknowledge data available from Butte County's Department of Water and Resource Conservation showing that current groundwater conditions are being impacted beyond routine seasonal fluctuations. In Butte County, Groundwater Basin Management Objective (BMO) alert levels have been reached for a number of wells, which requires specific management responses. The EIS/EIR should use recent and available well data to develop a comprehensive baseline condition for groundwater levels, and use locally adopted BMOs to determine appropriate thresholds of significance and mitigating responses for dropping groundwater levels.

Response

See Common Response 4. See response to Comment LA01-6 regarding triggering BMO alerts within Butte County.

Comment LA02-6

Comment

The EIS/EIR fails to consider the potential impacts of lowered groundwater levels on the City's urban forest. We request that the document be amended to include such discussion and analysis. The EIS/EIR acknowledges that groundwater levels would drop in response to groundwater pumping necessary to replace surface water transferred south of the Delta. The EIS/EIR does not provide any discussion or analysis of the relationship between the health of the City's urban forest and dropping groundwater levels. The environmental and economic benefits of a healthy urban forest are well known, and include habitat for migrating birds and other wildlife; protection from the extreme impacts of climate change; filtering for rainwater and groundwater; carbon storage, which reduces the amount of harmful greenhouse gases; energy savings from its shade canopy; aesthetic benefits; and enhancement of property values.

Response

See Section 3.3, Groundwater Resources for a complete description of impacts to groundwater levels. The effects on Little Chico Creek, and thereby the City of Chico's urban forest, are described in the EIS/EIR. As described in the analysis, in-stream reductions would occur when the stream is very low and therefore would not have a substantial adverse effect on this natural community. Urban vegetation is highly dependent on localized landscape irrigation, which would not be affected by the action alternatives.

Comment LA02-7

Comment

The environmental analysis does not adequately account for projected impacts associated with climate change. Reduced snow pack and sustained droughts are identified as key outcomes of climate change in California. Add to this the significant uncertainty regarding stream/aquifer interaction and the multiple dry years experienced by the State. What affect will this have on sensitive aquifer systems in light of the impacts of climate change?

Response

Section 3.6.1.3 of the EIS/EIR acknowledges that climate change could result in reduced snow pack and droughts. Additionally, this section indicates that climate change could potentially affect the aquifers from both over exploitation because of reduced surface water supplies and from saltwater intrusion that could occur from sea level rise (see Section 3.6-12). Impacts to the aquifers from groundwater substitution are discussed in detail in Section 3.3, Groundwater Resources. As described in Section 3.3, any effects on the aquifers from groundwater substitution would be less than significant with implementation of Mitigation Measure GW-1. See Common Response 6 for additional information regarding groundwater monitoring and mitigation. Because of the relatively short-term duration of the range of potential transfer activities under the action alternatives (10 years), they are not expected to have adverse effects on the aquifers, including cumulative effects from climate change.

Comment LA02-8

Comment

The EIS/EIR identifies a number of significant impacts requiring mitigation. Many of the significant impacts rely on Mitigation Measure GW-1: Monitoring Program and Mitigation Plans for mitigation. The EIS/EIR directs that monitoring programs and mitigation plans spelled out by this measure be developed consistent with the 2013 Draft Technical Information for Preparing Water Transfers Proposals and the 2014 Addendum documents prepared by the Bureau of Reclamation and Department of Water Resources. While the EIS/EIR purports that the monitoring and mitigation plans required by this measure will mitigate groundwater and biological impacts, the protocols, methodology, and emphasis outlined in the measure focus primarily on reducing effects to third party groundwater users. This critical mitigation measure needs to show a clear nexus for how it will reduce environmental impacts to groundwater and biological resources that will be caused by dropping groundwater levels.

Response

As stated in Section 3.3.4.1, the objectives of the monitoring and mitigation plan required under Mitigation Measure GW-1 are to mitigate adverse environmental effects that occur, to minimize potential effects to other legal users of water, to provide a process for review and response to reported effects to non-transferring parties, and to assure that a local mitigation strategy is in place prior to the groundwater transfer. The environmental effects listed are not limited to third-party groundwater users. Monitoring of groundwater levels is a simple way to determine impacts to the groundwater system. Impacts to other resources, such as biological resources, would come as a result of decreases in the groundwater levels. Therefore, monitoring the groundwater level serves as a surrogate for monitoring biological resources themselves. The monitoring program proposed as part of the transfer could include groundwater level monitoring targeted near areas that may have environmental concerns, such as biological resources. See Common Responses 6 and 10 for additional information.

Comment LA02-9

Comment

Our greatest concern is that water agencies south of the Delta continue to rely upon a transfer dependent water source that in turn depends on the use of north state groundwater. This proposed long-term water transfer program poses risks which we believe have not been addressed, and would be a precedent for future projects and decisions that could very seriously damage our city's- and our region's- environment, economy, and communities.

Response

See Common Response 3.

Comment Letter LA03, Jim Wallace, Colusa Drain Mutual Water Company

Comment LA03-1

Comment

The Colusa Drain Mutual Water Company (Company) objects to the EIS/EIR in its current form and requests that the Bureau extend the comment period for at least 120 days to allow the Bureau, the Company, and the Company's shareholders additional time to consider more carefully the potential negative impacts of the proposed water transfers.

Response

The Lead Agencies are unable to accommodate the request for additional review time beyond CEQA and NEPA requirements.

Comment LA03-2

Comment

Colusa Drain Mutual Water Company includes 50,000 acres of prime farmland and habitat. Shareholder lands lie both sides of the 2047 drain canal west of the Sacramento River and east of Interstate 5. Its northern border reaches into the southern part of Glenn County. It spans from the north to south borders of Colusa County, and its southern boundary lies well into Yolo County in the Yolo Bypass south of Interstate 80. Shareholder lands lie immediately adjacent to, or proximate to, 7 of the potential sellers identified in the EIS/EIR. Most of the Company's shareholders rely on water from 2047 drain canal as a primary source of irrigation water and many of the Company's shareholders rely on groundwater as a secondary source of irrigation water.

Our shareholders are particularly concerned that the EIS/EIR has not fully considered the negative impact of the proposed alternatives; Crop idling, Crop Shifting, and Conservation, on surface flows in the 2047 drain canal. Maintaining a minimum flow of food quality water throughout the length of the 2047 canal during the irrigation season is essential to our shareholder's farm operations and each of these proposed transfer methods once implemented will most certainly have an immediate negative affect on both water flow and water quality in 2047. The Company believes that the EIS/EIR does not fully account these negative affects nor does it provide sufficient mitigation alternatives. Since the 2047 drain was first constructed in the early 1900's, it has served dual purpose of providing needed drainage for those upstream while providing summer flows for irrigation for those downstream. While difficult at times, this balance between drainage and irrigation has been largely successful for all parties. The company believes the practice of crop idling, crop shifting, and conservation, will result in reduced surface flows in the 2047 and will increase salinity of the reduced remaining flow. If transfers are to be made, a plan to sufficiently mitigate this negative impact must be proposed. We see no such plan in the EIS/EIR.

Response

As described in Section 2.3.2.1, water for transfers is made available by a seller who "must take an action to reduce consumptive use or use water in storage." In addition, "water transfers must be consistent with state and federal law, as discussed in Chapter 1." Water transfers are one of several water management activities favored under state and federal law. See Common Response 14.

If sellers transfer water through cropland idling or crop shifting, they would decrease their diversions only by the amount of applied water that would have been consumed absent the transfer. Without transfers, some of the water applied on each field is consumptively used by the crop (the evapotranspiration of applied water), but some is not used by the crop and becomes percolation to the groundwater or surface runoff. For cropland idling or crop shifting, water that would have been applied to the field but not consumptively used by the crop would continue to be diverted by the seller and would enter the distribution system. Water that would run off fields into drain facilities would continue to flow into these drains, such as 2047; therefore, flows into the drain canals would not be affected.

The range of potential transfer actions includes only one conservation action from Browns Valley ID, which is not near the Colusa Basin Mutual Water Company. Conservation transfers must only transfer water that would have been an irrecoverable loss; therefore, water that would have flowed into an agricultural drain is not able to be transferred.

Comment LA03-3

Comment

The Company is also concerned that, while the EIS/EIR appropriately recognizes that the proposed alternative, groundwater substitution, will have "significant" negative impact on our shareholders groundwater supplies during such transfers, it incorrectly concludes that this impact will be "less than significant" after mitigation. It is the Company's position that the EIS/EIR provides insufficient mitigation measures in the case of groundwater substitution. And further, that the EIS/EIR does not sufficiently address the damage done to shareholders and our entire community due to long-term overdraft of underlying aquifers. In either case, whether in the context of mitigating negative impacts of current groundwater substitution transfers or mitigating negative impacts of long term overdraft of underlying aquifers, the EIS/EIR is inadequate. While groundwater transfers contemplated in the EIS/EIR have not yet taken place, several of the potential sellers identified in the EIS/EIR have already moved ahead with groundwater substitution transfers within Northern California, particularly, to the west side of Colusa, Glenn, and Yolo Counties via the Tehama Canal system. Our Company's shareholders are currently suffering the negative impacts of these groundwater substitution transfers through increased costs of pumping as a result of a lowered aquifers, and in some cases the loss of irrigation water completely, where wells proximate to groundwater substitution wells go dry. Neither the groundwater substitution transfers taking place currently, within Northern California, not the transfers contemplated by the EIS/EIR, provide specific plan to limit the taking groundwater by potential sellers. At a minimum, some responsible limit on the taking of groundwater must be established before surface water can be transferred on the basis of groundwater substitution. To date, no such limits have been set. Our local communities, motivated by heightened awareness as a result of ongoing drought conditions, and as a result of recent state legislation, have begun the process of establishing a system for the responsible management of our community's groundwater. Some communities, like Glenn County, have already made significant progress in this process, while others, Colusa County, for example, have only just begun the process. In no case, however, have sufficient procedures or protections been put in place to adequately provide for responsible execution or reasonable mitigation of groundwater substitution transfers. The Company believes that the alternative "groundwater substitution" should be dropped entirely from the EIS/EIR as a viable alternative until such time as local communities impacted have completed their own studies and evaluations, developed reasonable plans that include reasonable limits for the taking of groundwater, and these studies, plans, and proposed limits then reconciled with conclusions already reached by the EIS/EIR.

Response

The maximum volume of water pumped for transfers (via groundwater substitution, cropland idling/switching, stored reservoir release, or conservation) as part of this EIS/EIR is listed in Table 2-5. To be covered by this EIS/EIR, transfer volumes must be equal to or less than the amounts listed. To mitigate for potential impacts of groundwater pumping, Section 3.3 includes Mitigation Measure GW-1. This measure includes the development of a monitoring plan to record the volume of water pumped as well as changes in groundwater level. This monitoring program will include data collection before, during, and after the transfer. Measure GW-1 also requires that the potential seller develop a mitigation plan detailing the actions to be taken should impacts be observed. The mitigations actions that could be included in the plan are listed in Section 3.3.4.1.3. These include options such as reducing groundwater pumping, lowering the pumping bowls in affected third party wells, and reimbursement for impacts. The mitigation plan will be tailored to the area in question and will include a procedure for the seller to receive reports of environmental or third-party effects, a procedure for investigation of purported effects, development of mitigation options in cooperation with the affected parties, and assurances that adequate financial resources are available to cover mitigation needs. Common Response 6 provides additional information. In general, changes to groundwater levels will need to be in agreement with existing BMOs. In other areas, impacts to third parties will be addressed through coordination with third parties.

Comment LA03-4

Comment

The Long Term Transfers contemplated by the EIS/EIR if approved, will be of historic nature. Taken collectively, these transfers would be one of the largest single transfers of water from North to South. So the necessity to fully account the impacts on all stakeholders, consider all stakeholders concerns, and thoroughly respond to those concerns cannot be overstated. The Bureau, potential sellers, and potential buyers, have collaborated over several years to develop the EIS/EIR. Now they must carefully and patiently listen to those that their plan will affect. They must be prepared to explain how the proposed mitigation measures are sufficient to protect the Company's shareholders, and the community in general, from suffering the negative impacts of their plan. Today we are asking you to extend the comment period for at least 120 days to more reasonably slow for this process to take place. We would welcome an opportunity to listen and discuss in more detail the Bureaus plans. I can be reached directly at 530-218-1396 (cellular).

Response

The EIS/EIR analyzes a range of potential transfer actions, not a single transfer as described in the comment. The Lead Agencies are unable to accommodate the request for additional review time beyond CEQA and NEPA requirements.

Comment Letter LA04, Jennifer Buckman, Friant Water Authority

Comment LA04-1

Comment

The Friant Water Authority (FWA) has reviewed the subject Draft EIS/EIR and has the following comments regarding the sufficiency and conclusions of the document. FWA is a joint powers authority whose members have contracts with Reclamation that entitle them to receive water from the San Joaquin River. A portion of the San Joaquin River water is subject to senior water rights reserved by the Exchange Contractors [Footnote: The remainder of the San Joaquin River rights were purchased, condemned or otherwise acquired by Reclamation for the benefit of the Friant Division contractors. Water available under these rights must be provided to the Friant Division contractors, regardless of whether the terms of the exchange are being fulfilled or not.] and therefore is not available for delivery to the Friant Division until Reclamation has met its priority obligation [Footnote: Reclamation has a "vested priority obligation" to provide substitute water to the Exchange Contractors, consistent with the terms of the Second Amended Exchange Contract. Westlands Water Dist. v. United States, 337 F.3d 1092, 1103-04 (9th Cir. 2003) ("Westlands VII").] to provide substitute water supply to the Exchange Contractors.

The hydrologic conditions in the 2014 Water Year have highlighted the difficulties inherent in moving both CVP and transfer water through the Delta and the export facilities. In the 2014 Water Year, several districts that are identified in the subject DEIS/R as buyers and sellers executed one-year transfer agreements similar to those described and evaluated in the subject DEIS/R. Reclamation has yet to demonstrate how much transfer water has been moved from the sellers and whether or not the conveyance of that transfer water in any way impacted its operations and exports of CVP water needed to meet its priority obligation to the Exchange Contractors.

With this background in mind, we were disappointed to note that the DEIS/R for Long-Term Water Transfers did not address the fact that there is a great potential for the movement of transfer water to adversely affect delivery of CVP supplies south of the Delta. As noted in Section 1.3.1.1, Reclamation acknowledges that it is inappropriate for a transfer to supplant or otherwise adversely affect the delivery of CVP supplies: "Transfer may not cause significant adverse effects on Reclamation's ability to deliver CVP water to its contractors." We assume that Reclamation is using the broad definition of the "CVP water" from the Central Valley Project Improvement Act; that definition includes the substitute supply for the Exchange Contractors as a type of "CVP water." Thus, Reclamation has acknowledged that the delivery of the transfer water may not cause "significant adverse effects" on Reclamation's ability to deliver the substitute supply of water to the Exchange Contractors, or any other CVP water.

Response

Section 3.1.2.4.1 includes an analysis of potential effects to CVP and SWP exports, which includes potential impacts to the Exchange Contractors. The analysis identifies the potential for significant impacts, but these impacts are avoided or reduced by Mitigation Measure WS-1 to less than significant levels. See Common Response 8 for additional information.

Comment LA04-2

Comment

The Project Description in Section 2.3.2.1 describes the criteria used to determine the amounts of water available for transfer under various transfer methods, but it does not describe how such determinations will be made available for public notice or review. Also, Section 2.3.2.3 describes the general operational approaches and actions associated with moving the water from the Seller through the Delta, but it does not describe how or when Reclamation will document that the transferred water did not displace the delivery of substitute water to the Exchange Contractors. Without an adequate description of the procedures and methods to be used to document the development and movement of the transfer water, there is no substantial evidence to support the conclusion that conveying the transfer water has no detrimental effect on the delivery of substitute water to the Exchange Contractors.

Response

Water approved for transfer and quantities transferred by Reclamation and DWR are currently posted at this website: http://www.water.ca.gov/watertransfers/. This method of making information available will continue in the future.

Comment LA04-3

Comment

Since the Project Description does not include features to ensure no adverse effects on Reclamation's ability to deliver substitute water to the Exchange Contractors, Chapter 3 should evaluate the potential for such impacts. Before the transfer program is approved, the DEIS/R should be revised to include, at a bare minimum, the following analyses and information: Whether the transferred quantity is real "wet" (as opposed to "paper") water; Whether the transfer displaces or otherwise diminishes the ability to deliver CVP water south of Delta; What methods will be used to measure the transfer water inputs to the river conveyance system (e.g., foregone diversions or releases from Yuba system), and where will those measurements occur; What criteria and methods will be used to determine that transfer water made available by the selling district either made it to the pumps in the south Delta or was backed into storage (including which reservoir(s) the transferred water is being stored at and in what volumes); What criteria and methods will be used to determine that releases of transfer water from a CVP reservoir do not constitute water that would have otherwise have been released for in-stream uses; and What criteria and methods will be used to determine that water pumped at Jones or Banks pumping plants is in fact transfer water and not water that could have otherwise been pumped due to minimum CVP upstream releases or unregulated flows. Unless this information and these analyses are included in the DEIS/R, it is not possible for the DEIS/R to baldly conclude that the transfer program does not have any potential adverse impacts on the delivery of CVP water supplies.

Response

Chapter 3 does evaluate the potential to reduce CVP Delta exports and deliveries in Section 3.1. It does not distinguish between Exchange Contractors and CVP contractors, but rather works to avoid impacts to both groups with Mitigation Measure WS-1. See Common Response 8 for additional information. Section 2.3.2.1 describes how Reclamation would confirm that water transferred is "real" water. Potential effects to CVP Delta diversions are discussed in Section 3.1.2.4.1. Transfers would be measured as foregone diversions, and monitoring in major waterways and reservoirs would be accomplished using the same monitoring efforts as are used for typical CVP and SWP operations.

Comment Letter LA05, Thaddeus Bettner, Glenn-Colusa Irrigation District

Comment LA05-1

Comment

The Glenn-Colusa Irrigation District (GCID) is providing this initial response letter to Reclamation on the Proposed Long-Term Water Transfer Program Draft EIS/EIR. The purpose of this letter is to inform Reclamation of GCID's intent to develop an independent Groundwater Supplemental Supply Program, as well as provide Reclamation with the District's position on the Long-Term Water Transfer Program. GCID wants to ensure that our local effort and Reclamation's project are not in conflict, and that the project selected to move forward for the Long-Term Program meets GCID's objective to ensure the long term sustainability of surface and groundwater resources in our region. GCID's Supplemental Supply Program over any proposed transfer program within the region, including Reclamation's Long-Term Water Transfer Program (LTWTP). In addition, GCID's potential participation in Reclamation's LTWTP is ultimately subject to the consideration and approval of the GCID Board of Directors, and that has not occurred.

Following is a summary of GCID's proposed Groundwater Supplemental Supply Program, and some preliminary comments on LTWTP Draft EIS/EIR.

GCID Groundwater Supplemental Supply Program: GCID is proposing to install and operate give new groundwater production wells and operate an additional five existing groundwater wells to augment surface water diversions for use within GCID during dry and critically dry water years. The wells would have a production well capacity of approximately 2,500 gallons per minute, and would operate as needed during dry and critically dry water years for a cumulative total annual pumping column not to exceed 28,500 acre-feet. Additional information is available at: http://gcid.net/GroundwaterProgram.php.

The primary objective is to develop a reliable supplemental water source for GCID during dry and critically dry years. The proposed project goals are as follows:

1. Increase system reliability and flexibility.
2. Offset reductions in Sacramento River diversions by GCID during drought years to replace supplies for crops and habitat.
3. Periodically reduce Sacramento River diversions to accommodate fishery and restorations flows.
4. Protect agricultural production.

GCID's surface water supply reliability is becoming less certain as a result of the following:

1. Litigation by environmental organizations challenging the renewal of the Sacramento River Settlement Contracts.
2. Increased delta flow requirements for delta smelt and delta outflows.
3. Increased flows and temperature requirements for fisheries.

Response

The Lead Agencies acknowledge GCID's interest in pursuing a supplemental supply program to augment surface water diversions for use within GCID. This program has been added to the cumulative analysis for groundwater resources. Even though GCID is a potential seller in the range of potential activities analyzed under the Proposed Action in this EIS/EIR, this document does not commit GCID to participating in long-term water transfers. GCID and other sellers and buyers listed in the EIS/EIR ultimately would determine whether specific transfers are proposed, and the Lead Agencies would determine whether and how specific transfers are implemented. See Section 2.3.2.2 of the 2014 Draft EIS/EIR for additional information. See Common Response 14.

Comment LA05-2

Comment

USBR Long-Term Water Transfer Program: GCID received the Draft EIS/EIR this week and had only initially begun its review. It is important for Reclamation to understand that GCID has not approved the operation of any District facilities to the LTWTP Action/Project that is presented in the draft EIS/EIR. GCID will be conducting groundwater modeling for the Groundwater Supplemental Supply Program and will include an analysis of any potential cumulative impacts associated with GCID's Project and the LTWTP.

Based on our initial review of Reclamation's LTWTP Draft EIS/EIR, GCID has the following comments:

Figure 3.3-25. Simulated Groundwater Substitution Transfers: This figure demonstrates those years that a groundwater substitution program would likely occur and the associated quantities of groundwater substitution pumping. To meet the needs of GCID's Supplemental Supply Program, it is likely that pumping would occur simultaneously in many of these years. For example, 1992, 1994, and 1997 were critical water years in which GCID received a 75% water supply allocation and in those years the district would have pumped these wells for supplemental supply only. It is important to underscore that GCID would prioritize pumping during dry and critically dry water years for use in the Groundwater Supplemental Supply Program, and thus wells used under that program would not otherwise be available for the USBR's LTWTP.

Response

As described in Appendix C, the modeling effort did not include transfers from Glenn-Colusa ID in critical years. See response to Comment LA05-1.

Comment LA05-3

Comment

Table 3.3-3 Water Transfer through Groundwater Substitution: Table 3.3-3 lists 11 GCID wells with associated flow rates between 2,389- 3,305 and well depths ranging from 500-1200 feet. GCID would need to thoroughly review this information in greater detail with Reclamation to make sure that well locations, proposed operational parameters, and well characteristics are accurate and which well, if any, could be included in USBR's LTWTP.

Response

Well data modeled and summarized in Table 3.3-3 was based on information received from sellers, including Glenn-Colusa ID. Seller correspondence has been documented in the administrative record.

Comment LA05-4

Comment

Figures 3.3-26 through 3.3-31: The figure does not accurately represent an assessment of cumulative groundwater effects on the groundwater system resulting from other groundwater wells in other districts. As previously mentioned, for the Groundwater Supplemental Supply Program GCID will perform groundwater modeling and will develop new water elevation maps in the vicinity of GCID's project.

Response

Figures 3.3-26 through 3.3-31 from the 2014 Draft EIS/EIR (Figures 3.3-28 through 3.3-33 in the Final EIS/EIR) represent simulated drawdown under the Proposed Action. Cumulative groundwater effects are discussed in Section 3.3.6.

Section 3.3.6 has been revised to include GCID's Groundwater Supplemental Supply Program.

Comment Letter LA06, Thaddeus Bettner, Glenn-Colusa Irrigation District

Comment LA06-1

Comment

As you know, Glenn-Colusa Irrigation District (GCID) sent you a letter on October 14, 2014, providing an initial response to Reclamation on the Proposed Long-Term Water Transfer Program Draft EIS/EIR. The purpose of the letter was to inform Reclamation of GCID's intent to develop an independent Groundwater Supplemental Supply Program, as well as provide to Reclamation the District's position on the Proposed Long-Term Water Transfer Program (LTWTP).

On November 6, 2014, GCID's Board of Directors took the following actions on the LTWTP: Groundwater Substitution

The LTWTP identifies GCID as pumping 25,000 acre-feet in the years that transfers may occur. Importantly, while the LTWTP covers a ten-year period, transfers would occur only in the critical and/or dry years. Because GCID's surface water supply reliability is being challenged and GCID's surface supplies may be less reliable, GCID will need to implement its Groundwater Supplemental Supply Program in dry and critical years, primarily. Based on Figure 3.3-25 in the LTWTP Draft EIS/EIR, GCID would have pumped in 1992, 1994, and 1997, which were Shasta critical water years during which GCID received a 75% water supply allocation.

Based on the potential conflicts between the needs of GCID landowners and the LTWTP, the GCID Board decided that the District should proceed with its own Groundwater Supplemental Supply Program and should not participate in the Groundwater Substitution component in the LTWTP.

Response

Figure 3.3-27 in the Long-Term Water Transfers Final EIS/EIR (Figure 3.3-25 in the 2014 Draft EIS/EIR) shows combined groundwater substitution pumping from all sellers. Glenn-Colusa ID indicated that it would not sell any water through groundwater substitution transfers in Shasta Critical years because that water would be necessary to meet local needs. The modeling effort did not include any groundwater substitution transfers from Glenn-Colusa ID in Shasta Critical years (1977, 1991, 1992, and 1994), as shown in Appendix C.

See response to Comment LA05-01. If Glenn-Colusa ID does not want to participate in a groundwater substitution transfer, then no transfer would move forward.

Comment LA06-2

Comment

Land Idling: The LTWTP identifies GCID as idling up to 20,000 acres (providing up to 66,000 acre-feet of transferrable water), which is based on the 20% land idling maximum. The Board evaluated what was in the best interest of GCID, its landowners, and the regional economy and environment. Based on those factors, the Board decided to decrease and limit its participation in the Land Idling component to no more than 10,000 acres (up to 33,000 acre-feet of transferrable water).

Response

Similar to the response to Comment LA05-1, Glenn-Colusa ID could determine if it wants to transfer water each year, as long as it stays below the upper limits established in the EIS/EIR. The amount proposed in the comment is less than what was analyzed in the EIS/EIR; therefore, no changes to the EIS/EIR are necessary.

Comment LA06-3

Comment
GCID requests that the LTWTP Draft EIS/EIR be revised to show these changes, and include a corresponding re-evaluation of the potential impacts that will be significantly reduced in Glenn and Colusa Counties as well as neighboring counties.

Response
As discussed in responses to Comments LA05-1, LA06-1, and LA06-2, Glenn Colusa ID can choose whether or not to sell water, and analyzing those transfers in this document does not commit the district to selling water. Therefore, no changes to the EIS/EIR are necessary. See Common Response 14.

Comment Letter LA07, Ricardo Ortega, Grassland Water District

Comment LA07-1

Comment
Grassland Water District and Grassland Resource Conservation District ("GWD") submit the following comments on the Long-Term Water Transfers Draft Environmental Impact Statement/Environmental Impact Report ("EIS"). The EIS will cover individual and multi-year water transfers of up to 500,000 acre-feet per year from north-of-delta water users to south-of-delta water users, from 2015 through 2024 ("Project"). GWD is generally supportive of north-to-south water transfers, as long as potential adverse environmental impacts are avoided or mitigated. The following comments pertain to how the Project will affect Reclamation's operation of the Central Valley Project ("CVP") to meet refuge water supply requirements. Section 3406 of the Central Valley Project Improvement Act ("CVPIA") designates refuge water supplies as "mitigation" for "wildlife losses incurred" as a result of the construction, operation, and maintenance of the CVP. Accordingly, these comments have a direct relationship to the Project's impacts on the environment, and each requires a written response under the National Environmental Policy Act.

1. Reclamation should be listed as a potential purchaser of water

First, Grassland Water District is a member agency of the San Luis & Delta Mendota Water Authority ("SLDMWA"), the CEQA lead agency for the Project. As described in the EIS, GWD and other south-of-delta refuges are within the service area of the SLDMWA. (EIS p. ES-4) GWD requests that the Bureau of Reclamation ("Reclamation"), on behalf of GWD and other south-of-delta refuges, be included in the list of potential purchasers of transferred water under the proposed Project.

GWD is informed that the failure to list refuges as potential Project water recipients may be an inadvertent omission. In the past, when refuges were inadvertently omitted from the list of potential recipients of transferred water, Reclamation has revised the applicable NEPA document. (E.g. Supplemental Environmental Assessment and Finding of No Significant Impact for the South of Delta Accelerated Water Transfer Program (2013), available at http://www.usbr.gov/mp/nepa/nepa_projdetails.cfm?Project_ID=6999.) The EIS should be revised to include the possibility that Reclamation may also purchase water from the listed sellers, on behalf of refuges. Making this change would not require any changes to the EIS analysis. Any impacts associated with the transfer of water from north of the delta to refuges south of the delta would be the same as those analyzed in the EIS, if not lessened by the environmental benefits that would accrue to the receiving refuges.

Reclamation has obligations under the CVPIA and section 3(a) of GWD's refuge contract to use its "best efforts" to acquire Incremental Level 4 water supplies. By including refuges in the EIS as potential beneficiaries of the Project's long-term north-to-south water transfer program, Reclamation could better facilitate water purchases for refuges, and would provide an incentive to north-of-delta landowners to offer water for sale to Reclamation's Refuge Water Supply Program. In fact, Reclamation has purchased refuge water supplies from at least one of the potential listed sellers in the EIS, the Anderson-Cottonwood Irrigation District. This year, Reclamation transferred a portion of that water to a south-of-delta refuge. It makes logical sense to include Reclamation as a potential purchaser of Project water, and to include refuges as potential recipients. To exclude this possibility from coverage under the EIS would be arbitrary and capricious, and would illustrate Reclamation's disregard for its duty to pursue the acquisition of Incremental Level 4 Water Supplies for refuges—an obligation that Reclamation persistently fails to meet.

Response

See Common Responses 9 and 14.

Comment LA07-2

Comment

2. Environmental commitments should benefit CVPIA refuges

Second, Reclamation must consider the implementation of environmental commitments that provide direct benefits to CVPIA refuges, to help offset the impacts of the proposed Project on species such as migratory birds, the giant garter snake, and others. CVPIA refuges will become increasingly important sources of habitat for these species if large volumes of Project water are redirected from habitat-beneficial crops such as rice and corn to non-habitat-beneficial crops and to urban water users. With the likely decrease in available habitat that will result from the proposed Project, and other potential impacts identified in the EIS, CVPIA refuges will bear the brunt of responsibility for meeting the habitat needs that result from operation of the CVP.

Reclamation has proposed no environmental commitments, however, that would benefit CVPIA refuges. Reclamation should offer water sellers a choice between making additional mitigation and restoration payments to the CVPIA Restoration Fund, or directly selling a percentage of the proposed water to be transferred to the Refuge Water Supply Program. If only 5 to 10 percent of the proposed water to be transferred were sold to the Refuge Water Supply Program, the persistent deficit in Level 4 refuge water deliveries would be significantly cured.

Response

See Common Response 9.

Comment LA07-3

Comment

3. No adverse impacts on refuge water deliveries may occur

Third, Reclamation must assure refuge contractors that the potential transfer of 500,000 acre-feet of water annually would have no adverse effect on the timing or volume of refuge water deliveries, or the future capability of the CVP to deliver full Level 4 refuge water supplies. CVPIA section 3405(a)(1)(H), and other provisions of Reclamation Law such as the Warren Act, prohibit Reclamation from approving water transfers if they would have any adverse effect on Reclamation's ability to deliver water to meet its contractual or fish and wildlife obligations "because of limitations in conveyance or pumping capacity." This prohibition must not be ignored.

The EIS does not describe the order of priority for use of CVP facilities, other than a statement that transferred water can only be conveyed "after Project needs are met." GWD is increasingly concerned that Reclamation has prioritized the conveyance of water transfers over the delivery of water that refuges are contractually and legally entitled to receive. GWD suffered a 10% reduction in its contractual entitlement to receive firm Level 2 water supplies this year. Despite GWD's repeated requests for an explanation of this deficiency, GWD was instead left with the impression that full Level 2 deliveries this fall and winter may have been denied so as to avoid interference with proposed water transfers. This is unacceptable. Reclamation must provide a written response to this comment to confirm that all refuge water deliveries, including the full potential capacity for Level 4 water deliveries, will take priority over the conveyance of transferred water supplies.

Response

See Common Response 9.

Comment LA07-4

Comment

4. Clarifications and assurances are needed for water transfers by Merced Irrigation District

The EIS contemplates that water may be transferred by Merced Irrigation District ("MID") through a variety of potential conveyance mechanisms. MID has a binding commitment, however, under its Federal Energy Regulatory Commission license, to provide 15,000 acre-feet of water directly to the Merced National Wildlife Refuge. Most of this water (13,500 acre-feet) is credited toward Reclamation's Level 2 water supply obligation to the Merced refuge, and the remainder is credited toward Reclamation's Incremental Level 4 obligation. Reclamation cannot authorize transfers by MID to others unless and until MID's water delivery obligation to Merced National Wildlife Refuge is first met. To act otherwise would violate Reclamation's duties under the CVPIA and under Reclamation's water supply contract with the U.S. Fish and Wildlife Service. Reclamation should revise its EIS or provide a written response to this comment to confirm that water will not be authorized for transfer by MID in any year that MID fails to meet its obligation to provide 15,000 acre-feet of water to the Merced National Wildlife Refuge.

Moreover, the EIS describes a mechanism whereby MID would exchange water to others by delivering water to "refuges in the San Luis unit" that would in turn reduce their water use "from the Delta-Mendota Canal." The EIS must note that under the terms of Reclamation's refuge water contracts, exchanges involving refuge water supplies must be agreed to by the refuge contractor. Furthermore, the proposed refuge exchange mechanism is not adequately described. There are only two refuges that can directly receive water from MID's conveyance system, Merced National Wildlife Refuge and the East Bear Creek Unit of the San Luis National Wildlife Refuge. These refuges are located east of the San Joaquin River, and they do not use water from the Delta-Mendota Canal. The EIS does not sufficiently explain how this proposed exchange mechanism would work.

Response

Merced ID's FERC relicensing process is ongoing, and the license terms are not yet finalized. The FERC license requirements, including current or future requirements to deliver water to the Merced National Wildlife Refuge, will have to be met before water could be transferred under the action alternatives.

All potential transfers analyzed in the EIS/EIR are voluntary, and exchanges with the refuges would require agreement by all parties before they are implemented. See Common Responses 9 and 14.

Comment Letter LA08, Osha Meserve, Local Agencies of the North Delta

Comment LA08-1

Comment

These comments on the Long-Term Water Transfers Environmental Impact Statement/Environmental Impact Report ("EIS/R") ("project") are submitted on behalf of the Local Agencies of the North Delta ("LAND"). LAND is a coalition comprised of reclamation and water districts in the northern geographic area of the Delta. As local agencies in the Delta, LAND is concerned about any actions that would result in water supply and/or quality impacts in the Delta that may occur as a result of the project. This letter addresses the following inadequacies of the EIS/R: (1) use of the wrong lead agency under the California Environmental Quality Act (Pub. Resources Code, §§ 21000 et seq. ("CEQA")); (2) failure to consider the cumulative effects of the project in combination with the Bay Delta Conservation Plan ("BDCP"); and (3) inadequacy of mitigation for significant effects caused by implementation of the project.

Response

See Common Response 1 for more information on the CEQA lead agency. The BDCP was not included in the cumulative analysis because the project is not sufficiently far along that implementation is reasonably foreseeable to be complete during the 10-year analysis period. Some commenters made specific suggestions of topics that could be strengthened within the mitigation measures. These comments led to clarifying edits to Mitigation Measures WS-1, GW-1, AQ-1, and AQ-2. Refer to Common Responses 6, 7, 8, and 10 for additional information.

Comment LA08-2

Comment

San Luis & Delta-Mendota Water Authority is the Wrong Lead Agency: Under CEQA, the "lead agency" is "the public agency which has the principal responsibility for carrying out or approving a project . . . ." (Pub. Resources Code, §21067.) Where several agencies have a role in approving, implementing or realizing a project, CEQA "plainly requires the public agency with principal responsibility to assume the role as lead agency." (Planning & Conservation League v. Department of Water Resources (2000) 83 Cal.App.4th 892, 906.) According to the Third District Court of Appeal, "the lead agency plays a pivotal role in defining the scope of environmental review, lending its expertise in areas within its particular domain, and in ultimately recommending the most environmentally sound alternative." (Id. at 904.) "So significant is the role of the lead agency that CEQA proscribes delegation." (Id. at 907.)

According to the EIS/R, the San Luis & Delta-Mendota Water Authority ("SLDMWA"), "consisting of federal and exchange water service contractors in western San Joaquin Valley, San Benito, and Santa Clara counties, helps negotiate transfers in years when the member agencies could experience shortages." (EIS/R, p. 1-1, italics added.) Furthermore: "This EIS/EIR addresses water transfers to [Central Valley Project ("CVP")] contractors from CVP and non CVP sources of supply that must be conveyed through the Delta using both CVP, SWP, and local facilities. These transfers require approval from Reclamation and/or the Department of Water Resources (DWR), which necessitates compliance with NEPA and CEQA." (EIS/R, p. ES-1, italics added.)

SLDMWA is not the proper CEQA lead agency for the project. Here, it appears that DWR has the principle responsibility with respect to carrying out and approving water transfers and would be the proper lead agency. Much like the lead agency role struck down in the Planning and Conservation League case, SLDMWA's assistance in negotiating transfers is insufficient to give rise to a lead agency role under CEQA. (See 83 Cal.App.4th at p. 906.) As a result of this error, the entire EIS/R process is tainted and must be restarted with the correct lead agency.

Response

See Common Response 1.

Comment LA08-3

Comment

BDCP as a Cumulative Project:

When conducting a cumulative impact analysis, a lead agency has the choice of using either the list-of-projects approach or the summary-of-projections approach, depending on which method is best suited to a particular situation. (CEQA Guidelines, §15130, subd. (b)(1).) According to the EIS/R, "both methods" are used. (EIS/R, p. 4-3.)

Yet the EIS/R fails to consider the effects of the project combined with the implementation of the BDCP. The BDCP is currently undergoing public review (Bureau of Reclamation is also the NEPA lead agency), and could be approved and implemented within the timeframe of the project. (See http://baydeltaconservationplan.com/PlanningProcess/EnvironmentalReview/TheProcess.aspx.)

The BDCP consists of new diversion facilities on the Sacramento River as well as other actions that constitute a proposed Habitat Conservation Plan within the Sacramento-San Joaquin Delta. While the diversion facilities would not be constructed within the 10 year timeframe of the project, other so-called conservation measures could be implemented. The cumulative effects of those aspects of the BDCP that could be implemented within the timeframe of the proposed project must be analyzed.

In particular, cumulative effects from reductions in Delta outflow should be analyzed. According to the EIS/R, the project would lead to changes in Delta hydrology. (EIS/R, p. 3.8-62.) These changes should be considered in conjunction with the BDCP, which may reduce Delta outflow by dramatically increasing the amount of open water habitat in the Delta (up to 65,000 acres tidal marsh). According to DWR data, open water and riparian vegetation consume about 67.5 acre-feet per year, which is much greater than most agricultural uses. (See Exhibit A.)2 The project's potential, in combination with BDCP, to reduce Delta outflow must be considered.

The cumulative effects of weed growth that results from BDCP/habitat projects in the Delta and within the Seller service areas on fallowed lands should also be considered. The EIS/R apparently assumes that invasive weeds will be managed on fallowed lands in the Seller area. Invasive weeds, however, consume significant quantities of water and may result in less water being available for transfer than assumed in the EIS/R. According to a 2004 study, for instance, about "one million acre-feet of water is consumed by star thistle each year in the Central Valley above and beyond what would be consumed by annual grasses."3 In addition to analyzing water demand of weeds in the Delta under BDCP as well as in the Seller service areas, effective weed management should be included as a mitigation measure.

Response

See responses to Comments LA13-9 and LA14-15.

Comment LA08-4

Comment

Inadequacy of Mitigation Measures:

The EIS/R contains inadequate mitigation for the significant effects of the project. In particular, Mitigation Measure GW-1 ("GW-1") does not meet basic CEQA requirements for mitigation. (Cf. CEQA Guidelines, § 15126.4; Communities for a Better Environment v. City of Richmond (2010) 184 Cal.App.4th 70, 94-95 (describing requirements for use of specific performance criteria to ensure the efficacy of the mitigation).) While the EIS/R states that this mitigation measure would reduce impacts related to natural communities in rivers and creeks in the Sacramento River Watershed, for instance (EIS/R, p. 3.8-51), this mitigation measure monitors wells, not river and creek levels. The analysis also assumes without any support that natural recharge will correct any environmental impacts that do occur. GW-1 also leaves entirely open the amount of time an adverse impact could occur and before it will be corrected. This approach fails to meet the requirement to mitigate the project's impacts to the extent feasible, as required by CEQA. (See Pub. Resources Code, § 21002.) While CEQA permits deferral of formulation of mitigation in certain instances, minimum requirements for deferred mitigation are not met by GW-1.

Response

Changes in groundwater-surface water interaction and their results (e.g., streamflow reduction, impacts to ecosystems) are difficult to measure in the field. For a potential reduction in streamflow to occur due to a groundwater substitution pumping transfer, the groundwater level must be lowered. Changes in groundwater levels are quicker and simpler to measure. Therefore, Mitigation Measure GW-1 is specified to avoid potentially significant impacts. Measure GW-1 requires the development of a monitoring and mitigation plan, customized to the seller's conditions, to ensure compliance with performance criteria and to avoid significant impacts. More information related to the natural communities that may be affected by a reduction in streamflow can be found in Sections 3.7, Fisheries and 3.8, Vegetation and Wildlife. See Common Responses 6, 7, and 10.

Comment LA08-5

Comment

Overall, we remain concerned that the project, in combination with other cumulative projects, will significantly affect Delta water supply and quality for in-Delta users. While increased transfers have the potential to increase flows into the Delta, it is not clear that this project will result in such flow increases. Without actual increases in flows, this transfer program could facilitate increased diversions out of the Delta for CVP contractors, leaving in Delta water supplies further depleted and degraded. We respectfully request that the EIS/R be corrected and recirculated to correct the deficiencies identified in these and other comment letters prior to any action being taken on the project. Thank you for considering these comments.

Response

The EIS/EIR included an extensive modeling effort, including both surface water and groundwater modeling, to simulate how the transfers would affect these systems (see Appendices B and D for more information). The modeling effort indicated that additional flows would enter the Delta. Additionally, the analysis included the application of the DSM2 model to estimate changes in Delta water quality, circulation, and water levels (see Appendix E for more information). This analysis did not indicate significant adverse changes to these resources. Section 3.1.6 summarizes the cumulative impacts on water supply of the action alternatives in combination with other existing or reasonably foreseeable future projects.

Comment Letter LA09, Lewis Bair, Reclamation District 108

Comment LA09-1

Comment

Reclamation District 108 ("RD 108") has no concerns with a reasonable groundwater substitution program. Indeed, RD 108 is identified as a potential transferor of groundwater substitution water in the EIS/EIR and may be willing to transfer up to 15,000 acre-feet per year of surface water made available through groundwater substitution. (Draft EIS/EIR, at Table 2-5).

RD 108 is concerned; however, about the intensity and magnitude of the proposed Conaway Preservation Group ("Conaway") groundwater substitution program. RD 108 covers nearly 48,000 acres and will potentially substitute up to 15,000 acre-feet/year of groundwater to replace transferred surface water. RD 108 will thus pump less than 1/3 of an acre-foot/acre of land/year. On the other hand, Conaway owns 16,088 acres of land, but will pump up to 35,000 acre-feet/year under the proposed project. Thus, Conaway's proposed groundwater substitution program, as described in the EIS/EIR, will result in pumping more than 2 acre-feet of groundwater per acre of land owned by Conaway.

Response

Section 2.3.2.2 of the DEIS/EIR indicates that the quantities listed in Table 2-5 are “the potential upper limit of available water for transfer by each agency for each transfer type; however, actual purchases could be less, depending on hydrology, the amount of water the seller is interesting in selling in any particular year, the interest of buyers, and compliance with Central Valley Project Improvement Act transfer requirements, among other possible factors. Additionally, these transfers would not occur every year, but only years when there is demand from buyers and pumping capacity available to convey the transfers (generally dry and critical years).” In other words, significant uncertainty exists with regard to the timing of a potential water transfer, which directly impacts the potential water transfer quantities. The intent of the quantities listed in the DEIR/EIS was to provide flexibility considering the uncertainty in the timing for a potential water transfer. The volume of groundwater pumped per acre is not directly relevant to inelastic land subsidence because other factors influence land subsidence such as groundwater levels and hydrogeologic characteristics.

Any proposed transfer involving groundwater substitution by Conaway Preservation Group would be subject to Mitigation Measure GW-1. Further, any proposal would need to account for proposed transfer pumping in the cumulative context, including total pumping on the Conaway Ranch. The performance criteria and mitigation requirements contained in Mitigation Measure GW-1 would ensure that any contribution to a potentially significant cumulative impact is not considerable. Common Responses 6 and 7 provide additional information.

As explained in Section 2.3.2.2 of the 2014 Draft EIS/EIR, Common Response 14, and as set forth in Measure GW-1, existing local conditions will be taken into account before Reclamation approves a specific transfer proposal. Local conditions such as those in the Conaway Preservation Group area may be such that Reclamation cannot approve a transfer.

Comment LA09-2

Comment

Conaway, however, has an even more ambitious groundwater substitution program than the EIS/EIR indicates. Through an agreement with the Woodland-Davis Clean Water Agency

(WDCWA), Conaway may pump up to an additional 10,000 acre-feet/year to substitute for a transfer of surface water rights to WDCWA. Accordingly, if Conaway pumps the maximum amount of groundwater for which authorization is being sought under the long-term transfer program and the WDCWA Water Agreement, Conaway could pump a maximum annual quantity of 45,000 acre-feet of groundwater. This would result in Conaway pumping nearly 3 acre-feet per acre of land.

While RD 108 has no objection to the provision of water to WDCWA through groundwater substitution, the cumulative impacts of Conaway's groundwater pumping for WDCWA and its groundwater pumping for the long-term transfer program must be fully analyzed as required by the National Environmental Policy Act and the California Environmental Quality Act.

Response

The Woodland-Davis Clean Water Agency (WDCWA) regional surface water supply project has been added to the cumulative analysis. See response to Comment LA09-1 for additional information.

Comment LA09-3

Comment

1. Impacts Analysis: The EIS/EIR's analysis of the environmental impacts of the proposed groundwater substitution program is deficient in at least three respects: A. The EIS/EIR only includes an analysis of impacts related to groundwater pumping for Conaway's proposed 35,000 acre-feet/year groundwater substitution program. Because Conaway intends to pump an additional 10,000 acre-feet/year pursuant to its agreement with WDCWA, the impacts analysis on groundwater levels and land subsidence are artificially deflated. B. Measuring groundwater level drawdown at only one location on Conaway Ranch is inadequate given the magnitude of Conaway's proposed groundwater substitutions. (Draft EIS/EIR, at Figure 3.3-26) As the EIS/EIR indicates, land subsidence has occurred at Conaway Ranch in the past. (Draft EIS/EIR, at 3.3-82) Accordingly, the EIS/EIR should have analyzed more fully the land subsidence and groundwater level drawdown impacts in Conaway's area. Instead, the EIS/EIR analyzes impacts on groundwater levels and subsidence in three locations far from Conaway, while relegating a hydrograph of the Conaway location (Location 30) to the Appendix with little analysis. (Draft EIS/EIR, at E-204-E210) Moreover, as Exhibit 1 to this letter demonstrates, the effects of Conaway's groundwater pumping are already causing land subsidence. But instead of measuring conditions that have already occurred, the draft EIS/EIR relies on a simulation of Conaway's proposed pumping that does not take its current actions into account. Therefore, the final EIS/EIR should evaluate potential environmental impacts based on current conditions, rather than on a simulation in which the data set ends in Water Year 2003. C. Impacts from subsidence related to the Project and Project Alternatives are not presented in the EIS/EIR. This is a particularly important issue in relation to Conaway because Conaway has flood control levees adjacent to its property. One would expect that the increase in the magnitude of subsidence currently experienced at Conaway Ranch from existing pumping (which is not quantified or described in the draft EIS/EIR) would increase in relation to the expected groundwater level declines from the Project. Subsidence is often a delayed response to groundwater level declines and the proposed monitoring for subsidence

is inadequate to assess longer term or delayed effects from subsidence that could occur after pumping for groundwater substitution has ceased.

Response

The volume of water proposed for each potential seller (Table 2-5) is listed as an upper limit. The seller will need to develop a proposed transfer that will meet the criteria set forth in the EIS/EIR (See Common Response 14). These criteria include developing a monitoring and mitigation plan as described in Mitigation Measure GW-1 (Section 3.3.4.1) to ensure compliance with performance standards. Measure GW-1 includes monitoring and mitigation aspects related to groundwater level declines as well as subsidence issues. Common Response 7 also explains changes to Measure GW-1 related to subsidence. These changes apply to all sellers, including Conaway Preservation Group. The requirements of Measure GW-1 may result in certain sellers, including Conaway, reducing or eliminating groundwater substitution pumping transfers, depending on conditions. Common Response 6 provides additional information on groundwater level impacts. See response to Comment LA09-01 for additional information.

Comment LA09-4

Comment

2. Mitigation Measures: The draft EIS/EIR fails to adequately develop and explain how the potentially significant impacts of the project will be mitigated. Mitigation Measure GW-1 is insufficiently robust to reduce impacts from the proposed project to less than significant. In particular, the mitigation measures for land subsidence are inadequate. The mitigation measures proposed in GW-1 for land subsidence are not sufficiently set forth in the EIS/EIR. (See Draft EIS/EIR, at Section 3.3.4.1) Instead, GW-1 defers to a monitoring program to be developed in the future by the U.S. Bureau of Reclamation. Furthermore, the EIS/EIR states that areas with "higher susceptibility to land subsidence will also require more extensive monitoring" without specifying what that more extensive monitoring will involve. Mitigation Measure GW-1 also does not include any provisions for well replacement should well interference or longer term groundwater level declines result in wells going dry and an inability for bowls or pumps to be lowered in response to Project impacts. Most importantly, the bulk of the mitigation responsibility falls on sellers, but the individual sellers' plans are nowhere to be found in the EIS/EIR. In short, the EIS/EIR claims that mitigation measure GW-1 mitigates the potentially significant land subsidence effects without describing what the mitigation program actually entails. The final EIS/EIR should develop and analyze each of these aspects of the mitigation measure in greater detail.

Response

Mitigation Measure GW-1 has been clarified in the EIS/EIR. Common Responses 6 and 7 provide additional information.

Comment LA09-5

Comment

3. Cumulative Impacts Analysis: The cumulative impacts analysis is inadequate in that it does not include an analysis of the WDCWA project. Moreover, the cumulative impacts of other reasonably foreseeable groundwater development projects must be analyzed in the EIS/EIR.

Response

The Woodland-Davis Clean Water Agency (WDCWA) regional surface water supply project has been added to the cumulative analysis in Section 3.3.6.

Comment Letter LA10, Karen Huss, Sacramento Metropolitan Air Quality Management District

Comment LA10-1

Comment

The Sacramento Metropolitan Air Quality Management District (SMAQMD) staff reviewed the Long-Term Water Transfers Draft Environmental Impact Statement/Environmental Impact Report (EIS/EIR). SMAQMD staff provides the following comment regarding the air quality section.

The EIS/EIR provides two measures to reduce air emissions from the project:

- AQ-1: Reduce pumping at diesel or natural gas wells to reduce pumping below significance levels, and
- AQ-2: Operate dual-fired wells as electric engines.

State CEQA Guidelines require mitigation measures to be fully enforceable through permit conditions, agreements, or other legally binding instruments (Sec. 15126.4(a)(2)). Additional details on how AQ-1 and AQ-2 will be implemented and enforced are necessary to ensure the emissions from the project will not have a significant impact to air quality.

Response

Proposed transfers that involve activities such as groundwater pumping with the potential to exceed an air district's significance thresholds for emissions will be required to maintain recordkeeping logs showing the engines' size (horsepower), hours of operation, and applicable emission factor to calculate emissions on a daily basis. The selling agency will compare emissions to significance criteria. Furthermore, records will be maintained for any selling agencies that operate dual-fuel engines (e.g., natural gas and electric) to document that the engines are not operated with natural gas.

Copies of the recordkeeping logs will be sent to Reclamation on a monthly basis as an enforcement provision.

Comment Letter LA11, Garth Hall, Santa Clara Valley Water District

Comment LA11-1

Comment

Thank you for the opportunity to review and comment on the Draft Environmental Impact Statement/Report (EIS/EIR) prepared by the Bureau of Reclamation (Reclamation) and the San Luis & Delta-Mendota Water Authority (SLDMWA) for the proposed Long-Term Water Transfers Project (Project). The Santa Clara Water District (SCVWD) understands that Reclamation is serving as the lead agency under the National Environmental Policy Act (NEPA) and the SLDMWA is serving as the lead agency under the California Environmental Quality Act (CEQA). These comments are provided by SCVWD for both NEPA and CEQA.

SCVWD respectfully requests that Reclamation and SLDMWA provide further discussion regarding the items identified below in order to more fully comply with NEPA, CEQA, and those laws' respective public disclosure and analysis requirements. SCVWD's comments relate primarily to the analysis of the Project's potential impacts to the San Felipe Division related to San Luis Reservoir (SLR).

Information provided in Section 3.2.2.4.2 (pp.3.2-41 and 3.2-42) indicates that the projected SLR storage levels are lower under the Proposed Action. The Draft EIS/EIR recognizes that SLR storage "could decrease by as much as six percent (of water in storage in the No Action/No Project Alternative) during August of critical water years." Based on Table 3.2-27 on p.3.2-42, monthly storage in SLR during a critical year could decrease by as much as 27,300 acre feet (AF) between June and October, when SLR typically has the highest likelihood of reaching its lowest storage levels. The Draft EIS/EIR concludes that "potential storage-related effects on water quality would be less than significant for San Luis Reservoir." SCVWD would like more information to substantiate the statement that "these small changes in storage are not sufficient to…substantially degrade water quality." SCVWD would also like more information on whether deliveries to Santa Clara County could be impaired with the Project.

SCVWD relies on delivery of its Central Valley Project (CVP) water and other imported water supplies from SLR through the San Felipe Division. When SLR storage levels drop below an elevation of 369 feet, about 300,000 AF in storage or the "low point," algal blooms occurring during the summer can enter the lower intake of the Pacheco Pumping Plant and deliveries of SCVWD's CVP supplies can be adversely affected; water quality within the algal blooms is not suitable for municipal and industrial users relying on existing water treatment facilities in Santa Clara County. Deliveries to the San Felipe Division may be severely or completely interrupted when storage levels are drawn down such that there is insufficient hydraulic head to effectively operate Pacheco Pumping Plant. The EIS/EIR should provide more detail on the existing low point issue, and existing Reclamation operational protocols designed to minimize low point conditions. It should also provide greater analysis and detail on the impacts of the Project on SLR storage levels, and on SCVWD's water supplies due to low point conditions.

SCVWD thanks Reclamation and the SLDMWA for the opportunity to review and comment on the Draft EIS/EIR. SCVWD appreciated the Project's overall goal of increasing flexibility and reliability with regard to management of CVP water supplies. However, SCVWD requests that

Reclamation and SLDMWA expand on the issues identified above in order to comply with CEQA and NEPA. SCVWD believes it is necessary to provide a more complete environmental analysis under NEPA and CEQA to help ensure that the Project does not provide a benefit to certain water providers to the potential detriment of others.

Response

A discussion of the San Luis low point algal bloom issue has been added to Section 3.2.2.4.2.

Comment Letter LA12, John Herrick, South Delta Water Agency, Central Delta Water Agency

Comment LA12-1

Comment

The following comments and the attached comments are submitted on behalf of the South Delta Water Agency and the Central Delta Water Agency. Each of these agencies are charged with, and the surrounding lands dependent on good quality water in Delta channels for the protection of agricultural and other beneficial uses. Operations of the Central Valley Project and the State Water Project adversely affect flows, circulation, levels, and quality of water in the channels to the detriment of agricultural and other beneficial water users. By statute, regulation and permit, the United States Bureau of Reclamation ("USBR") and the Department of Water Resources ("DWR") are supposed to fully mitigate their impacts on such other uses as well as maintain various water quality standards intended to project the Delta estuary and in-Delta users. The projects fail to meet these obligations on a regular basis and the proposed Long Term Transfer Project ("Project") may exacerbate DWR and USBR's continued failure to meet their obligations. SDWA and CDWA represent various water right holders who may be affected by the Project.

Response

Section 3.2, Water Quality assesses potential effects from the action alternatives on Delta water quality. In response to comments, additional information on the water supply effects from changes to Delta water levels and circulation have been included in Section 3.1, Water Supply.

Comment LA12-2

Comment

1. The Project in significant part appears to violate the language and spirit of CVPIA, the controlling federal statute for CVP-related water transfers. In 1992, Congress passed and the President signed into law the Central Valley Project Improvement Act, commonly known as "CVPIA" or Public Law 102-575. The provisions of CVPIA fundamentally altered the operation of the CVP, requiring a dedication of water for fish and wildlife purposes, significant habitat and fish population goals and mandates and set forth new criteria for water transfers. CVPIA defined "Central Valley Project water" as "all water that is developed, diverted stored, or delivered by the Secretary in accordance with the statutes authorizing the Central Valley Project and in accordance with the terms and conditions of water rights acquired pursuant to California law." This broad description of CVP water importantly uses

the word "or" to include virtually any water that gets from one place to another via the CVP, notwithstanding any water right under which the water might originally derive.

CVPIA also specifies the terms and conditions under which transfers of CVP water can be made. Section 3405 of the Act allows transfers of any CVP water "under water service or repayment contracts, water rights settlement contracts or exchange contracts…" Thus, any individual or district which receives CVP water can transfer its CVP water if they or it comply with Section 3405.

Section 3405 (a)(1)(I) limits the transfers "to water that would have been consumptively used or irretrievably lost to beneficial use during the year of years of the transfer." The purpose of this provision is to ensure that a transfer of the water does not increase the total amount of water consumed, rather it allows for the shifting of water use from one party to another. This is an important distinction. The transfers are meant to facilitate the movement of water to the highest use, or that use which can afford it especially in dry times. If the transfer criteria allowed the seller to continue to consume the same amount of water, then the system as a whole would be consuming more water during dry times; an obviously counter-productive policy.

The Project being contemplated by USBR and others specifically allows the sellers to replace the transferred water through ground water substitution (see for example ES.3 - ES.4). Hence, the Project is by definition, at least in part contrary to the controlling statute under which the transfers are being contemplated. In the abstract, one could evaluate any transfer wherein the seller replaced the transferred water with another source and estimate the impacts and potentially mitigate the impacts. However, CVPIA as an expression of Congressional intent, has already made the determination that transfers dealing with CVP water shall not result in any total increase in use. Thus the draft EIS/R's analysis of what the impacts of such substitution might be and how they might be mitigated is irrelevant. No transfers which allow the seller to continue to consume any portion of the amount of water being transferred are legal.

It does not matter that the Project intends to allocate a portion of the transfer water to instream or ground water replacement. Any of the Project's transfers which are based on substituting ground water (or any other source) are prohibited under Public Law 102-575.

Response

Section 1.3.1.1 of the EIS/EIR describes the purpose of the CVPIA and its applicability to potential water transfers. Also, see Common Response 14. As indicated therein, the range of potential transfers evaluated under the Proposed Action would only occur in compliance with the provisions of the CVPIA. Also see the response to Comment LA12-49. The Lead Agencies do not agree with the comment that the potential transfer activities evaluated under the action alternatives would conflict with the CVPIA, and such conjecture is not consistent with the analysis in the EIS/EIR.

Comment LA12-3

Comment

2. Transfers under the Project which allow ground water substitution appear to violate CVPIA's mandate that any transfer have no significant impact on the seller's ground water. CVPIA

section 3405 (a)(1)(J) states that no transfer shall be approved unless it is determined that "such transfer will have no significant long-term adverse impacts on groundwater conditions in the transferor's service area." Although the draft EIS/R includes an analysis of impacts to ground water in proposed sellers' areas (see attachment hereto criticizing the DEIS/R analysis), it clearly concludes that specific impacts are not susceptible to determination. Therefore the Project proposes significant monitoring to evaluate the actual effects on ground water levels, and subsequent measures to insure protection of the underlying basins. However, planning to evaluate the impacts of ground water substitution (or other methods of "funding" transfers) is clearly not a determination that any such transfer will have no significant long-term effects on the underlying basins. To comply with the provision of CVPIA, the Bureau would have to arrive at some level of certainty that actions like ground water substitution will indeed not adversely affect the transferor's basin. Future efforts at determining whether or not the basin will be affected are inadequate under the statute. Future mitigation does not insure no harm.

Response

This provision of the CVPIA sunsets on September 30, 1999 (according to CVPIA Section 3405(a)(3)). However, potential impacts on groundwater conditions are assessed in Section 3.3, and the potentially significant impacts to groundwater levels and subsidence are mitigated by Mitigation Measure GW-1. The comment focuses on the monitoring requirements in this measure, but it also requires mitigation plans that identify the actions that would be taken to ensure compliance with performance standards and avoid potential impacts. Refer to Common Responses 6 and 7 for additional information.

Comment LA12-4

Comment

3. The Project is contrary to and does not examine CVPIA's mandate to restore anadromous fish populations. Another provision of CVPIA requires the establishment of an anadromous fish restoration program, or AFRP. This program was developed and adopted by the Fish and Wildlife Service in consultation with the Bureau and other state and federal agencies. The program must double the populations of certain specified fish species. (see webpage http://www.fws.gov/sacramento/fisheries/CAMP-Program/Home/Documents/Final_Restoration_Plan_for_the_AFRP.pdf) This program includes recommended higher flows on many rivers including various small and all the main tributaries to the Sacramento and San Joaquin Rivers (see webpage http://www.waterboards.ca.gov/waterrights/water_issues/programs/bay_delta/bay_delta_plan/water_quality_control_planning/docs/sjrf_spprtinfo/afrp_1995.pdf)

The amounts of flows recommended by the AFRP are significantly higher than currently mandated flows and would necessitate significant "new" sources of water. Since the precipitation in any particular year is finite, to get the increased flows for the AFRP program the Bureau (or FWS or NMFS) would need to purchase water from upstream interests, including not only those who operate other dams on various tributaries, but also current CVP contractors who claim rights to some of that additional supply.

The Project anticipates the transfer of water from the same supply from which AFRP water must come. Hence, the Bureau is moving forward with a program that will prevent it from meeting its federally mandated obligation to double anadromous fish. Although the Bureau may be allowed to move forward on numerous projects and activities at the same time, undertaking a "voluntary" project that will preclude it from meeting a federally mandated obligation is not proper or legal. At a bare minimum, the DEIS/R must examine how the proposed Project will, and to what extent, affect the success of the AFRP. Absent a detailed analysis of this renders the DEIS/R insufficient.

Response

While Reclamation operates to meet multiple purposes and is trying to meet multiple planning objectives, the purpose of the potential water transfer activities evaluated in this EIS/EIR is not to fulfill the requirements of the CVPIA related to anadromous fish. Nor do the water transfer activities analyzed preclude compliance with CVPIA as the EIS/EIR found no effects of the project on anadromous fish. As described in Section 3.7.2.4, there would be no changes in instream flows that would affect spawning, rearing, or migration habitat for anadromous fish in any of the waterways that could potentially be affected.

Comment LA12-5

Comment

4. The Project is contrary to and does not examine its effects on compliance with other federal law. In 2004, Congress passed and the President signed into law the "Water Supply, Reliability, and Environmental Improvement Act" (hereinafter "2004 Act") commonly referred to as HR 2828 or Public Law 108-361 (see webpage https://www.govtrack.us/congress/bills/108/hr2828/text). This statute mandates various duties to the Bureau and other federal agencies with regard to water issues and uses in California.

The 2004 Act required the Bureau to develop a plan to meet all existing water quality standards and objectives for which the (CVP) has responsibility (2004 Act Section 103 (d)(2)(D)(I)). The Bureau (which holds the State issued permits to operate the CVP in California) is assigned the responsibility for meeting numerous water quality standards/objectives. The objectives include not only Delta outflow or X2, but also water flow and quality standards on the San Joaquin River and in the southern Delta. The Bureau must meet fishery flow standards measured at Vernalis during various times of the year, and must meet salinity (measured in electrical conductivity, or EC) standards at Vernalis and at three locations in the southern Delta all year round. [The three interior compliance stations are Brandt Bridge on the San Joaquin, Old River at Middle River, and Old River at the Tracy Blvd. Bridge.] These various standards are set forth in the State Water control Board Decision D-1641 (see webpage http://www.swrcb.ca.gov/waterrights/board_decisions/adopted_orders/decisions/d1600_d1649/wrd1641_1999dec29.pdf).

Compliance with the fishery flow standards requires more water than the Bureau allocates from its reservoirs on the San Joaquin and its tributaries and thus compliance is dependent on there being water purchases. Compliance with the salinity standards also, to varying degrees, is dependent on flows in the river in excess of the amounts the Bureau allocates from its reservoirs. The 2004 Act states that as part of the Program to Meet Standards

"The Secretary shall incorporate into the program the acquisition from willing sellers of water from streams tributary to the San Joaquin River or other sources to provide flow, dilute discharges of salt or other constituents, and to improve the water quality in the San Joaquin River below the confluence of the Merced River… and to reduce the reliance on New Melones Reservoir for meeting water quality and fishery flow objectives." (Section 103 (d)(2)(D)(v))

The Bureau has undertaken no effort to investigate, discuss or identify any willing sellers of water to comply with the above mandates of the 2004 Act nor done any environmental review of such mandatory transfers. Just as it has ignored the AFRP mandate, the Bureau has ignored these mandates and is now identifying potential sellers on the San Joaquin System to transfer water for export to CVP contractors. Again, the finite amount of water produced each year means that the Bureau is acting in a manner which precludes it from meeting federally mandated obligations contained in the 2004 Act. The DEIS/R make no analysis of how the Bureau intends to meet those obligations. As will be seen below, since the Bureau regularly violates its obligations to meet water quality standards its efforts associated with the Project are clearly frustrating not only the law, but in violation of the Bureau's permit and statutory obligations.

Response

Fisheries flow standards are discussed in Section 3.7, Fisheries. A discussion and results regarding changes in salinity (EC) attributable to this project have been added to Section 3.2, Water Quality. Reclamation and DWR have provided information to the SWRCB regarding exceedances at Old River near Tracy Boulevard. Reclamation and DWR have worked to improve water quality in the Delta using measures such as reducing exports at Banks and Jones Pumping Plants, increasing releases from New Melones Reservoir into the Stanislaus River, and modifying operations of agricultural barriers in the Delta. These measures have greatly reduced electroconductivity in the Delta but have not improved quality at this monitoring station. Reclamation and DWR have found that water quality exceedances are not attributable to CVP or SWP operations (Reclamation and DWR 2012).

Comment LA12-6

Comment

5. By undertaking the Project, the Bureau is choosing to not meet is permit obligations to meet water quality standards, contrary to the assumptions in the DEIS/R. Since 2007, California has experienced two significant dry periods. 2007 and 2008 were a dry and a critical year. 2009 started off as being another critical dry year until some rains, especially in February eased the situation. 2012 was a below normal year with 2013 being one of the driest years on record. Those extremely dry conditions continued through 2014. In each of these dry periods, the Bureau (and DWR) were unable to meet their permit conditions for fishery and other water quality standards. The full extent of the hydrological conditions, reservoir operations and the lack of compliance with specific project obligations is too voluminous to repeat here. Reviewing the relevant SWRCB documents (see attached TUCP, http://www.swrcb.ca.gov/waterrights/board_decisions/adopted_orders/orders/wro2009.shtml)

and the attached correspondence between CDWA and SWRCB provides a much more detailed summary. With that said, the following summarizes recent failures of the Bureau to meet its obligations. After a two year drought from 2007-2008, the Bureau, according to its own petition before the SWRCB, had insufficient water in storage to fully supply its highest priority contractor (the Exchange Contractors) and was unable to meet Delta outflow (X2) requirements beginning in early 2009. After a below normal year in 2012 and six months of virtually no precipitation in 2013, the Bureau was unable to meet and sought relief from its obligations to meet the Western Delta agricultural standard and the cold water requirements for Sacramento River fisheries. In 2014, as the drought continued, the Bureau was unable to meet outflow (X2), unable to meet cold water requirements, unable to meet the spring Vernalis fishery pulse flow standard, unable to meet the Vernalis salinity standard, unable to meet the three inferior southern Delta salinity standards and unable to meet the fall Vernalis fishery pulse flow standard. [See for example attached Notices of Violation and EC data from DWR webpage.]

Response

The modeling completed for this project takes into account a period of record from 1970 through 2003. This period included several dry and critical years, in addition to multi-year drought periods. Especially during recent drought years, the changes in operations from this project are not expected to significantly affect water quality such that exceedances are affected. Fisheries flows are explained in Section 3.7, Fisheries.

Comment LA12-7

Comment

This "drought-related" problem is unfortunately not just a function of droughts. The Bureau has also failed to meet the spring fishery pulse flow at Vernalis on a number of occasions and most every year violates the salinity standard at Old River at Tracy Blvd. Bridge. [See attached DWR 2013 and 2014 Water Quality Data] The underlying reason for the Project is to find additional supplies for CVP contractors during years when they do not get enough water under their CVP contracts. It is precisely those years that the Bureau is incapable of meeting its permit obligations to maintain water quality standards. However, instead of taking actions to meet its obligations, the Bureau instead embarks upon a program to find water to provide additional exports. Thus the Bureau has unlawfully elevated export contractor desire for additional water above the Bureau's existing obligations to protect fisheries and other beneficial uses. Although the Bureau's permits condition the delivery of water to its contractors on compliance with all other permit conditions, the Bureau consistently fails to do so. By undertaking the Project, the Bureau is insuring that not only will it not be able to meet its obligations in following years, but it is also making compliance even less likely and violations more severe. There is only so much water in the system. When the Bureau seeks to facilitate transfers of portions of the limited supply to satisfy contractor desires, it necessarily decrease the amount of water available to meet standards. It is important to note that in precisely the years when there is insufficient water to meet permit and other obligations for the protection of water quality, the Project will increase the consumptive use as a whole by allowing sellers to substitute their water supply to fund a transfer.

The DEIS/R purports to examine the Project's effects on stream flow and other waters, but it makes no analysis of how the Project will affect Bureau (and DWR) mandated obligations to meet water quality standards. The DEIS/R, like so many other environmental documents simply assumes that standards will bet met and ignores the reality of the water supply. As we have seen so clearly in the past 8 years, DWR and the Bureau operate to not meet the standards.

Response

Salinity exceedances at Old River at the Tracy Boulevard Bridge are beyond the control of water project operations (see response to Comment LA12-5). Other than the installation of temporary barriers, DWR and Reclamation cannot reasonably impact the salinity level at this location because it is largely the result of local degradation. Based on water quality modeling, changes proposed under this project are not expected to significantly affect salinity within the Delta.

Comment LA12-8

Comment

6. The DEIS/R does not adequately examine the effects of the additional pumping on southern Delta water levels, quality or circulation. Export pumping at the SWP and CVP facilities in the southern Delta and central Delta. [See attached 1980 Report of Effects of CVP]. The DEIS/R reasons that as long as the Bureau and DWR comply with their existing permit conditions and applicable SWRCB orders, no party is harmed. Thus, additional projects, like the contemplated Project will also not cause third party harm. That is to say, if the current regulations on exports protects third parties, those same regulations will prevent any harm from any exports done under altered, but allowed exports. DWR and the Bureau intend to continue compliance with the regulatory scheme. Such assertions are incorrect.

Operations under current CVP permit conditions do cause harm. The SWRCB has partially addressed some of these third party impacts caused by the CVP and SWP in a Cease and Desist order issued against the projects (and subsequently amended). The Cease and Desist Order is WR Order 2006-0006 and its modification is WR Order 2010-0002, both can be found at http://www.swrcb.ca.gov/waterrights/board_decisions/adopted_orders/orders/wro2006.shtml. This Order places limits on export operations, including those wherein the Bureau would use SWP facilities as is contemplated in the Project. The 2006/2010 Order requires the Bureau and DWR to develop water level and quality response plans, the latter of which requires the agencies to give notice of anticipated water quality violations and of actions undertaken to avoid such violations. The Order specifically lists the purchase of additional water for flow on the San Joaquin River as one potential mechanism to meet the standards. The Order also requires those agencies to give notice of actual violations and specify what actions were indeed taken to correct or minimize the violation. To date, DWR and USBR have generally failed to give the appropriate required notice and have taken no additional actions to prevent or minimize violations of water quality standards. The standards are regularly violated.

Response

Appendix E presents an assessment of Delta conditions necessary to assist in evaluation of potential environmental impacts associated with long-term water transfers within the Delta. Water transfers have the potential to affect both the natural system and operation of the CVP and SWP. The analysis applies the DSM2 model to simulate the hydrodynamics and water quality within the Delta when transfer water is made available by various sellers to determine how and where within the Delta the effects are likely to occur under the alternatives. The model outputs Delta conditions for parameters such as water level (stage), water quality, and environmental flows under D-1641 and the biological opinions (BOs) provide a basis for the environmental assessment of the impacts of the alternative compared to the baseline (Base) alternative, the No Action/No Project Alternative without proposed water transfers. The model is used to compare the extent and significance of any differences resulting from the transfers. In order to conduct a comparative analysis the model is run twice, once with conditions representing a baseline and another run with an alternative representing specific changes to Delta operations and/or bathymetry in order to assess the change in modeled outcome due to the given change in model configuration. The assumption is that while the model might not produce results reflecting these changes with absolute certainty, it does produce a reasonably reliable estimate of the relative change in outcome.

The EIS/EIR is comparing the action alternatives to the existing conditions (under CEQA) and No Action Alternative (under NEPA) to assess whether potential changes could affect the environment. Changes in Delta water quality (in Section 3.2), circulation, and water levels (in Section 3.1) were found to be very small compared to the baseline. Therefore, the impacts of the action alternatives were found to be insubstantial.

Comment LA12-9

Comment

Levels. The hydraulics of southern Delta channels are very complicated and difficult to understand. In general, the operation of the SWP and CVP export pumps draw down local water levels to the point where it affects the ability of local diverters to operated their diversion pumps or siphons. The extent of the effects at any particular time are dependent on how much export pumping is occurring, inflow from the San Joaquin River, tidal flows, when (during the tidal cycle) the pumping is occurring, the existence of the temporary tidal barriers [Footnote: Three rock barriers are installed in the South Delta each year from approximately April through November. These barriers are meant to mitigate export effects on water levels by allowing incoming tides to fill the channels but then preventing the ebb tide from lowering water levels.] and the depth and capacity of any particular channel. Although there is a “water level response plan” as required by the CDO as referenced above, that response plan only applies to times when the CVP is using the SWP pumps or vice versa (this use of the other’s facilities is known as joint point of diversion, or JPOD). There is no response plan during other times, yet exports continuously adversely affect local diverters as the barriers are not a complete mitigation and are not installed and operated at all times. Even during times when the response plan is in effect, the practice of the Bureau and DWR is to operate in a manner that harms local diverters.

As can be seen in email and modeling charts provide by DWR/USBR in just this last month (see attached JPOD information), rather than comply with the mandatory seven-day notice requirement in the response plan, the projects “asked” to implement JPOD sooner than the mandated seven days. The modeling provided indicated that they intended to go forward with the JPOD since the water levels would be too low (adversely affect local diverters) anyway, and thus the JPOD was only a minor additional harm, and not significant. It is SDWA's position that when water levels are at the point where they adversely affect local diversions, no additional export pumping should be allowed as it only adds to the harm. None of this is mentioned must less analyzed in the DEIS/R.

This adverse impacts on levels from export pumping is graphically evidenced this past summer. When exports were at historic lows this summer, diverters along Tom Paine Slough had adequate water levels in the Slough. In all prior years, when exports were significantly higher, the Slough did not fully fill on the incoming tide and the diverters were often times incapable of diverting when needed. [See attached Tom Paine Slough data.] Under the Project, additional export pumping will occur, but the impacts to southern Delta diversions is completely unexamined. The DEIS/R is therefore insufficient for two reason. The first is that it makes no inquiry into how increased exports might affect southern Delta diverters ability to divert, and second, it wrongfully assumes that existing compliance with regulatory limitations on export pumping means there is no harm caused by current export pumping levels.

Response

Changes in south Delta water levels were addressed in Appendix E and an impact discussion has been added to Section 3.1 to summarize potential supply impacts. The action alternatives would have very small effects (either no change or as much as a 0.1 foot decline) to water levels in the south Delta. Data supporting this discussion has also been added to Section 3.1. Because the changes in water levels would be so small, these changes would not significantly affect local water diverters' ability to pump from the Delta.

Comment LA12-10

Comment

Quality. It is a similar situation with regards to water quality. First, the DEIS/R makes no mention of the impacts to EC at any of the three interior southern Delta compliance stations where the SWRCB Water Quality Control Plan objectives are measured. The DEIS/R does give information about changes at Vernalis, but again, ignores the three objectives downstream of Vernalis. As stated before, the hydraulics of the area are complicated. Southern Delta salinity (measured in EC) is a function of the salt which flows into the area from the San Joaquin River, local use, riverine evapo-transpiration, incoming tidal flows (and the salt contained therein), and flow changes due to export pumping. As referenced above and in the attached materials, the salinity standard measured at Old River at Tracy Blvd. Bridge is commonly violated. [Footnote: The attached Salinity Measurements material shows DWR information indicating the measured EC at the four compliance stations as well as the 30-day running average. The standard is a 30-day running average of 1.0 EC (September- March) and 0.7 EC (April - August).Thus, any time the 30-day running average in the attached materials exceeds 1.0 EC from September - March or 0.7 EC from April - August there is a water quality violation.] The DEIS/R seems to accept these violations as a base case or accepted practice. By assuming this, the DEIS/R does not fully explain how the current conditions are causing harm to third parties or what or how the incremental effects of the project may also cause harm. The DEIS/R simply assumes current exports and additional exports under the Project do not affect third parties.

Importantly, the DEIS/R notes in Table 3.2.26 that water quality is sometimes worse under the Project at Clifton Court Forebay, the intake for the SWP export facility. If water quality is worse at this location, that means the dilution benefits of the incoming tide are less and the water quality upstream (where the three interior south Delta salinity standards are measured) is necessarily worse, and the resulting impacts unknown.

Response

The Final EIS/EIR has incorporated additional information about Delta water quality in Section 3.2. (This information was in Appendix C of the 2014 Draft EIS/EIR.) Salinity exceedances at Old River at the Tracy Boulevard Bridge are beyond the control of water project operations (see response to Comment LA12-5). Other than the installation of temporary barriers, DWR and Reclamation cannot reasonably impact the salinity level at this location because it is largely the result of local degradation. Based on water quality modeling, changes proposed under this project are not expected to significantly affect salinity within the Delta.

Comment LA12-11

Comment

Circulation. The DEIS/R has no analysis of how any changes in San Joaquin River flows or export levels will affect flow pattern in the southern Delta. As stated above, flows in the area are a function of many things including exports and inflow from the San Joaquin River. Even small changes in either one of these can have significant effects on flow patterns. This is true even during times when the tidal barriers are installed an operating. The barriers are designed and operated in a manner that provides the maximum protection from decreased water levels while also trying to minimize salt from concentrating in the area. The barriers are most efficient at certain levels of inflow as that inflow helps determine how much diluting tidal inflow will enter the area. A complete explanation of these issues is contained in the DWR documents at http://bavdeltaoffice.water.ca.gov/sdb/tbp/index_tbp.cfm (The temporary barrier project site) and http://baydeltaoffice.water.ca.gov/sdb/sdip/index_sdip.cfm (The South Delta Improvement Program site which includes the final EIS/EIR for that project). The documents at these sites are incorporated herein as the underlying technical background of how the southern Delta flow is understood and barrier operations occur.

Response

Appendix E presents a DSM2 modeling analysis of Delta conditions for the alternatives (including changes in San Joaquin River flows because of Merced ID transfers). The modeling addresses regulated parameters to determine the magnitude of changes to these parameters that could occur if the system operations defined by any of the alternatives were implemented instead of Base operations. The flow analysis included changes in south Delta stage heights, as decreases in stage might affect agricultural diversion operations and changes in the magnitude in the combined Old River plus Middle River flow (OMR) from December through June as regulated by the National Marine Fisheries Service (NMFS) and USFWS biological opinions.

Changes in the south Delta stage were calculated for each alternative in comparison with Base at all D-1641 locations, and discussed in the 2014 Draft EIS/EIR only for representative locations; the entire set of results are compiled in the Attachment to Appendix E. Stage changes were assessed via a conservative calculation that compared the monthly average of differences in daily minimum stage. The analyses consider a stage difference of -0.2 ft. to indicate a potentially significant result. Stage decreases were greatest for the Proposed Action/All Transfers alternative at the Old River downstream of agricultural barrier location, but changes of this magnitude only occurred in 7 of the 408 months simulated. These decreases occurred in July and August of dry or critical water years, when south Delta exports increased in comparison with Base. Monthly average decreases in stage were sparse in all other locations and alternatives, with few instances when stage changes reached -0.2 ft. (e.g., in June 1993 in several locations for each of the alternatives). A summary of this assessment has been added to Section 3.1, Water Supply.

Comment LA12-12

Comment

7. The DEIS/R does not adequately examine the impacts of transfers from the San Joaquin River system or how diversions of such transfers upstream of the Delta affect third parties. Table 3.2.25 on page 3.2.38 of the DEIS/R shows decreases in San Joaquin River flow under certain modeling conditions for various months in differing year types. Initially it must be noted that these numbers are averages for the year types. Though potentially helpful in analyzing impacts (assuming the modeling is correct and reliable) any average result is misleading because it mixes the lowest flow with the highest. Thus we cannot see what the lowest flow in any month is only the average of all flows from a set of years for that month. Impacts at these lower flows are therefore not examined and no conclusions should therefore be made about how the project may or may not injure third parties.

The information provided indicates that in some years San Joaquin River flows can decrease (for example) under the Project by up to 84 cfs in June and up to 81.3 cfs in March. These decreases can be significant in that flows on the River are sometimes very low. In the past year alone, Vernalis flow has dropped to 219 cfs in July (see attached DWR Flow Export data). Any change in such low flow would be very significant. Although the decreases in Table 3.2.25 are shown in above normal years, not knowing the flows in all years prevents us from determining if there are decreases in River flow during drier times under the Project.

Response

Section 3.2 includes an assessment of the water quality of Merced ID transfer water diverted upstream from the Delta. Additional information has been added regarding the potential water quality impacts to Delta inflow associated with these diversion locations.

The decrease in river flows represent times when reservoir storage in Lake McClure is refilling after a transfer, which decreases downstream releases. Refill agreements dictate that refill could only occur during wetter periods when it would not affect downstream water quality or flow requirements. The decreases in flow are during wet and above normal years. Flow does not decrease in other year types because it would not be consistent with the terms of the refill agreements.

Comment LA12-13

Comment

The project also anticipates potential diversions of transfer water upstream of Vernalis and between Vernalis and the Delta proper (the later at the diversion of the Banta-Carbona District intake). The DEIS/R makes no real analysis of how such diversions would affect flow or water quality when the water enters the Delta (downstream of the Banta-Carbona intake). The San Joaquin River suffers from decreased flows (see 1980 Report attached hereto) and severe salinity problems due to drainage (surface and subsurface) from the CVP service area (see 1980 Report and Salinity in the Central Valley at www.waterboards.ca.govcentralvalley/water_issues/salinity/central.

Much of the salt entering the San Joaquin River occurs upstream of the River's confluence with the Merced River. Generally, the Merced and other tributary flows downstream provide some dilution to the saline San Joaquin. Depending on where and when the Project might allow diversions along the River (of transferred water) determines the effects on the water quality of the water which eventually enters the Delta. As we have seen, the water quality standards in the Delta are often violated, which means that any change in salinity and flow could affect water quality especially at the locations where the violations occur. Both the amount of inflow and the load of salt are important given the manner in which the CVP and SWP cause salt to collect and concentrate in the southern Delta. In addition, New Melones dam/reservoir on the Stanislaus is used to control salinity on the San Joaquin River at Vernalis through releases. However, New Melones is not operated to meet the standards in the southern Delta. The DEIS/R must examine how any changes in flows due to diversions of transferred water upstream of the Delta (at Banta Carbona's intake and above) affect releases from New Melones and how it may affect interior southern Delta water quality. The DEIS/R does neither.

It is important to note that although the salinity standards are measured at four compliance locations, the standards apply throughout the channels at all locations (see SWRCB 2006 Water Quality Control Plan at page 10; http://www.waterboards.ca.gov/waterrights/water_issues/programs/bay_delta/wq_control_plans/2006wqcp/index.shtml. The DEIS/R does not even cover New Melones storage impacts which might occur due to changes in San Joaquin River flows or quality. Since the 2004 Act requires the Bureau to decrease New Melones use for meeting water quality standards, the DEIS/R is clearly incomplete and inadequate.

Response

Section 3.2 includes an assessment of the water quality of Merced ID transfer water diverted upstream from the Delta. Additional information has been added regarding the potential water quality impacts to Delta inflow associated with these diversion locations

Comment LA12-14

Comment

8. The DEIS/R is an improper "piecemealing" of a project under CEQA and NEPA. According to the November 2013 Draft EIR/EIS for the Bay Delta Conservation Plan (BDCP), "Conveyance of transfer water by Authorized Entities is a covered activity provided that the

transfers are consistent with the operational criteria described in CM1 and the effects analysis described in BDCP Chapter 5, Effects Analysis." (BDCP DEIR/EIS, p. 3-120; see excerpts enclosed herewith.) Because the BDCP will not only facilitate CVP water transfers, but will expressly include them as "covered activit[ies]," under CEQA and NEPA those transfers must be evaluated within the EIR/EIS for the BDCP and not in a separate, independent EIR/EIS.

With regard to CEQA, as the court explains in Orinda Assn v. Board of Supervisors (1986) 182 Cal.App.3d 1145, at page 1171: A public agency is not permitted to subdivide a single project into smaller individual sub-projects in order to avoid the responsibility of considering the environmental impact of the project as a whole. "The requirements of CEQA, 'cannot be avoided by chopping up proposed projects into bite-size pieces which, individually considered, might be found to have no significant effect on the environment or to be only ministerial.' [Citation.]"

As the court in Berkeley Keep Jets Over the Bay Committee v. Board of Port Com'rs (2001) 91 Cal.App.4th 1344, similarly explains: There is no dispute that CEQA forbids "piecemeal" review of the significant environmental impacts of a project. This rule derives, in part, from section 21002.1, subdivision (d), which requires the lead agency ... to "consider[] the effects, both individual and collective, of all activities involved in [the] project."

Moreover, in a similar vein, as the California Supreme Court explains in Laurel Heights Improvement Assn. v. Regents of University of California (1988) 47 Cal.3d 376, at page 396: We hold that an EIR must include an analysis of the environmental effects of future expansion or other action if: (1) it is a reasonably foreseeable consequence of the initial project; and (2) the future expansion or action will be significant in that it will likely change the scope or nature of the initial project or its environmental effects.

CVP water transfers are indeed a "reasonably foreseeable consequence" of the BDCP (for among other reasons, they are in fact a "covered activity" under the BDCP), and those transfers will indeed "likely change the scope or nature of the initial project or its environmental effects." With regard to the latter, the November 2013 Draft EIR/EIS for the BDCP itself acknowledges that the scope of the BDCP would indeed change if CVP water transfers were added to the scope of that EIR/EIS. As that Draft EIR/EIS explains: "[T]he withdrawal of transfer waters from source areas is outside the scope of the covered activity." (BDCP Draft EIR/EIS, p. 3-120; see excerpts enclosed herewith.) Hence, if such withdrawal of transfer waters were included within that scope, it would undisputedly constitute a (significant) change of the scope of the BDCP Draft EIR/EIS (and, hence, its environmental effects).

For these reasons, the instant EIS/EIR is contrary to both CEQA and NEPA. The environmental analysis of the CVP transfers must be undertaken within the pending EIR/EIS for the BDCP and not separately from that EIR/EIS.

Response

The range of potential transfer activities evaluated under the Proposed Action involves voluntary transactions that may or may not occur and which are independent, separate, and distinct from the proposed BDCP. The term of the potential transfer activities evaluated under the Proposed Action ends in 2024 and would be over by the time

BDCP may be implemented. Therefore, BDCP is also not included in the cumulative analysis (see responses to Comments LA13-9 and LA14-15).

Comment LA12-15

Comment

9. The DEIS/R incorrectly assumes there will be no transfers from 2015-2024 absent the Project. On page 2-6 (section 2.3.1) and other places in the DEIS/R is it noted that the Base Case/No Action Alternative assumes no transfers during 2015 - 2024. There is no support for this assumption. Even in this second year of significant drought, the Bureau and DWR conducted JPOD operations of transfer water (see attached JPOD). If such transfers occur under current conditions they will certainly occur sometime in the next 10 years under the Base Case. I note that per the language of CVPIA, any water that moves via CVP facilities is considered "CVP water" and thus comes under both the Project and CVPIA limitations.

Response

See responses to Comments LA12-2 and LA12-73.

Comment LA12-16

Comment

10. The DEIS/R is inadequate in that it is impossible to determine water savings under the crop shifting method of supplying transfer water. One of the methods of supplying transfer water is to account for the amount of water saved by a seller due to a shift of one crop to another that consumes less water. Since transfers are to provide supply in drier times, there is no way to know if the seller would have shifted to that crop anyway because of such drier times. In this past year the SWRCB curtailed all post-1914 water rights and publically considered curtailing pre-1914 water rights, riparian rights and even CVP and SWP contract rights (deliveries). Hence, the pressures of drought can and do affect farming decisions in all areas, including those identified as potential sellers under the Project. There is no method to accurately determine if a seller would have shifted to a different crop absent a transfer, which makes the Project incapable of analysis and precludes any calculation of “how much water was saved.” This issue also is affected by the DEIS/R's failure to review water rights issues associated with any seller. If a seller is getting water from the CVP under a settlement or exchange contract, is the water he uses from his right or from the contract? Is he getting contract water in excess of what his underlying water right would provide under "natural conditions?" Is he making decisions on acreage and crops based on the contract or underlying water right? Does the decision on water use depend on what right is used? Until this morass of issues is resolved, there is no method by which one can determine if a crop shift actually results in more water being available.

Response

When evaluating a proposed crop shifting transfer, Reclamation would not simply take the seller's word for what would have happened absent the transfer. Reclamation would consider planting data from the past five years to better understand the historic cropping pattern and how planting decisions are made on each field. This information would be used to determine water saved. See Common Response 14.

Transfers from CVP contractors could be either Base Supply or Project water. A sentence has been added to Section 2.3.2.1 to clarify this issue. Sellers must take an action to reduce consumptive use of water or release additional water from non-Project reservoir storage (as described in Section 1); therefore, they cannot transfer more water through crop shifting than they have consumptively used in past years.

Comment LA12-17

Comment

11. The DEIS/R incorrectly assumes the CV-SALTS process will decrease salt entering the southern Delta. One of the assumptions used to minimize, ignore or not examine the Project's impact on southern Delta salinity is that the CV-SALTS process will decrease the amount and concentration of salts entering the San Joaquin River. This indicates a misunderstanding of the CV-SALTS process. CV-SALTS is a joint SWRCB, CVRQWCB and stakeholder effort to address the valley/River salt problems. Although the process is developing Basin Plan amendments which can/could limit discharges of salt, the main thrust of the effort is to find a way to get the valley salts out to the Bay and Ocean. Hence, rather than decrease salt loads, the implementation of the Basin Plan will be through a real time monitoring/discharge program already being developed by the Bureau and stakeholders. Under such a program, Highly concentrated salts will be discharged to the River during times when the River is of better quality than the discharge, and such mixing will not exceed the standard. Hence, the plan is to spread the salts out over time so that times of better water quality will be degraded, not improved. The times when the concentration is already too high will not be affected as New Melones currently dilutes the River regardless of the salt concentration. In sum, the San Joaquin River will not improve under the CV-SALTS program, the salts will simply be spread out, degrading the River at all times. The same amount of salts will enter the south Delta as do now. Whether or not those salts will leave the area or be adequately diluted for local use remains unknown, unexamined and unplanned. (See webpage www.cvsalts.com.)

Response

The CV-SALTS process is evaluating alternatives to be adopted in the Salt and Nitrate Management Plan and addressed in a Basin Plan Amendment in order to manage salt and nitrates on a sustainable basis. Real time management is only one of the alternatives being considered. Other alternatives include "in valley" approaches such as regional reuse and desalinization and "out of valley" approaches such as a brine line interceptor.

Comment LA12-18

Comment

Pg ES-1, par3- There is no evidence to support or assure that Buyer's use will be beneficial. Application of water to lands with particularly high latent levels of selenium or boron which further directly degrade the San Joaquin River or cause degrading accretions to the San Joaquin River would not be beneficial.

Response

Buyer's use is considered beneficial based on the additional use of water for agricultural and municipal and industrial (M&I) purposes. Although additional agricultural use will lead to additional irrigation, the runoff associated with this additional irrigation is not expected to cause any significant degradation of water quality. Section 3.2.2.4.2 includes an assessment of whether increased agricultural irrigation in the buyers' area could affect water quality. The assessment indicates that the irrigation would not be focused on drainage-impaired lands because growers would focus limited supplies during shortages on permanent crops or crops planted on prime or important farmland. The impact finding is that agricultural runoff would not significantly degrade water quality in San Joaquin Valley waterways, which would indicate that the effort would not result in water quality-related impacts

Comment LA12-19

Comment

Pg ES-1, par3- There is no evidence to support or assure that the transfer water is not going to "service any new demands". Water used to irrigate new plantings of permanent crops or even an annual crop not yet planted is serving a new demand. As permanent crops mature water demand generally increases and constitutes a new demand. For M&l type uses new connections and increases in use of existing connections adds new demand.

Response

Water transfers are not a reliable source of water to service new demands. As discussed in Chapter 2, transfer water is a supplemental supply to help meet existing demands during a water shortage. In addition, water transfers would not occur each year, as would be necessary if they were servicing new demands. Water transfers would not meet new M&I demands or be used to plant new permanent crops.

Comment LA12-20

Comment

Pg ES-1, par4- SLDMWA is the state lead agency. The SWP operations and facilities are an integral part of the proposed project implementation. DWR must operate the SWP to accommodate these transfers and will be responsible for identifying when excess capacities exist to create the transfer opportunity in the first place. DWR is also the permit holder for the right to operate the SWP that mitigate for the SWP operations. SLDWMA assistance in negotiating transfer agreements between parties is hardly a superior qualification for them as lead agency over DWR who has to operate the system to make the transfers happen. DWR should be the state lead agency.

Response

See Common Response 1.

Comment LA12-21

Comment

Pg ES-2, par2- Other concurrent transfers must be considered for the projects affects on those operations, both directly and indirectly as well as in combination and cumulatively with them, e.g. Lower Yuba River Accord water transfers from YCWA.

Response

Resource evaluations in Chapter 3 evaluate cumulative effects, including potential SWP transfers and the Lower Yuba River Accord. Chapter 4 describes the projects included in the cumulative analysis.

Comment LA12-22

Comment

Pg ES-2, par4- The Purpose and Need limits the consideration to transfers from upstream of the Delta to water users south of the Delta and in the San Francisco Bay. This improperly limits the objective consideration of all reasonable alternatives. Measures other than transfers and measures including transfers within the Buyer area or other parts of the State present reasonable alternatives.

Response

The Lead Agencies establish the purpose and need to best describe their underlying reasons for considering an action. The EIS/EIR considered these alternatives (and others) during the alternatives development process described in Section 2.2 and detailed in Appendix A.

Comment LA12-23

Comment

Pg ES-2, par6- Water transfers are only one potential method to meet supplemental water supply objectives. Water recycling, water conservation, and within water buyer district local conjunctive use, transfers, and land retirement are all other reasonable and effective alternative methods to satisfy this objective.

Response

The EIS/EIR considered these alternatives (and others) during the alternatives development process described in Section 2.2 and detailed in Appendix A. The Lead Agencies screened the alternatives based on their ability to meet key elements of the purpose and need and basic project objectives. Alternatives should be immediately implementable and flexible, and should provide additional water supplies. The alternatives that moved forward for more detailed analysis in the EIS/EIR are those that best meet the NEPA purpose and need and CEQA objectives, minimize negative effects, are potentially feasible, and represent a range of reasonable alternatives.

Comment LA12-24

Comment

Pg ES-2, par8- The premise that the water transfers will occur to make up for regulatory constraint impacts on water supplies is fundamentally flawed. The failure of the projects to develop sufficient supplies to meet regulatory requirements, senior obligations and project contractor desires is the driver. Buyer's desire to acquire through water transfers water which is not truly surplus to the needs within the watersheds of origin.

Response

The buyers' purpose and need for water transfers is identified in Chapter 1, which is the driver for the Proposed Action. Only willing sellers participate in water transfers and they would only transfer water they do not plan to use during the transfer year. See Common Response 14.

Comment LA12-25

Comment

Pg ES-3, figure ES-1- New Melones storage facilities and the Stanislaus River are identified as a potential conveyance for the proposed project, but no potential sellers have been identified in this watershed and no "Area of Analysis" (Table ES-2) was included for this geographic area. Without a willing seller identified with New Melones water rights or water rights in the Stanislaus River basin, the New Melones facilities and the Stanislaus River should not be involved in the proposed project. This was not disclosed in the EIS/R. Since this geographic area and facility was not analyzed or impacts disclosed, the New Melones facilities and the use of the Stanislaus River cannot be covered under this environmental document or for agency decisions or permits issued based on this document.

Response

Water transfers would not occur from agencies on the Stanislaus River or from New Melones Reservoir. These are not conveyance facilities for proposed transfers. Figure ES-1 shows potential sellers and buyers. The water bodies shown are for reference purposes. Each resource evaluation in Chapter 3 shows the area of analysis for that resource.

Comment LA12-26

Comment

Pg ES-3, figure ES-1- The figure and project description fail to identify the water conveyance routes that could be utilized (and which could precipitate different environmental impacts. Without identifying the route in which surface water flows would be affected by the project, there cannot be a proper project level impact analysis. Such impacts have not been adequately identified, characterized, evaluated, quantified, mitigated or disclosed.

Response

Chapter 2, Section 2.3.2.3 describes the range of potential transfers and the waterbodies or conveyance facilities needed for moving transfer water. The Executive Summary is a summary and does not include all of these details.

Comment LA12-27

Comment

Pg ES-5, parES 2.2- The willing sellers are not described in any detail (like the buyers were), they were only included on a list. The map of willing sellers is not sufficiently detailed to determine who is where. As an example, the area south of the town of Davis cannot be determined as to who the land owner(s) may be. Regardless, no conveyance route to deliver the water for a transfer is identified or analyzed for this water transfer so the impacts for the transfers from this property are not disclosed in or covered by this environmental document.

Response

Section 3.1 provides additional information on the sellers related to water supply. Additional detail has been added to the map for the seller services area; however, individual land owners are not shown due to privacy considerations. Chapter 2 describes conveyance routes of transfers by river basin.

Comment LA12-28

Comment

Pg ES-8, par ES 3.2- Alternatives should have included all reasonable measures, including land retirement, within the Buyer area as well as areas of the State other than upstream of the Delta.

Response

Land retirement was considered in the EIS/EIR as part of the Land Retirement in San Joaquin Valley Alternative (see Table 2-1 and Appendix A). It was not carried forward for more detailed analysis because it did not meet the key elements of the purpose and need or basic project objectives as it would not be immediate or flexible, and would not provide additional water. See Appendix A for more details on the screening of this alternative.

Comment LA12-29

Comment

Pg ES-9, Table ES-3- Crop shifting- crop shifting and idling appear to be used interchangeable in the document in terms of creating water supply, but the environmental impacts of them are significantly different in kind and magnitude. The analysis must clearly separate the location, timing, and magnitude of each of these water conservation strategies and address their separate types and magnitudes of impacts.

Response

Chapter 2, Section 2.3.2.1 distinctly describes cropland idling and crop shifting as separate water transfer methods. The resource evaluations in Chapter 3 also describe effects of both transfer methods. If the effects are the same, then the resource chapters may combine the discussion of effects of cropland idling and crop shifting. Where the effects are different, such as Regional Economics (Section 3.10), the effects are described separately.

Comment LA12-30

Comment
Pg ES-9, Table ES-3- Even with the improperly limited alternatives there should have been an alternative 5 which included all other water supply source concepts except seller service area crop idling and shifting so seller service area agricultural impacts from the water transfers could have been identified, characterized, quantified and disclosed. As the alternatives stand, all of the alternatives, except the no action, included seller service area agricultural conservation. This alternative must be included in the revised EIS/R so these impacts can be isolated and quantified and compared to the other alternatives.

Response
In accordance with NEPA and CEQA requirements, the EIS/EIR provides and addresses a reasonable range of alternatives. Alternative 3, No Cropland Modifications, includes all transfer methods except for seller service area cropland idling and crop shifting. All action alternatives do include conservation, but these impacts were isolated and quantified in the separate CEQA document on this transfer (available at http://www.bvid.org/CEQA07102009.html).

Comment LA12-31

Comment
Pg ES-9, Table ES-3- Even with the improperly limited alternatives there should have been an alternative 6 which included all other water supply sources except reservoir releases so reservoir release impacts from the water transfers could have been identified, characterized, quantified and disclosed. Isolating the impacts of storing and conveying water is essential to complying with the requirements of the Warren Act Contract assessment. As the current analysis stands, all of the alternatives except the No Action/No Project included reservoir releases so these CVP reservoir-related water wheeling related impacts cannot be separated from the other project impacts in order to satisfy Warren Act analysis requirements.

Response
A separate analysis of Warren Act actions is not necessary for compliance with Warren Act requirements. The impacts of conveying non-CVP water in CVP facilities are analyzed in this document to satisfy Warren Act requirements.

Comment LA12-32

Comment
Pg ES-9, Table ES-3- Since most willing sellers identified are part of the CVP and SWP, these contractors will also be short on water allocations in years in which the buyers would want to do water transfers. Since the sellers would be short on water supply in these years, they would already be doing the feasible water conservation actions, shifting to less water consumptive

crops, idling farmland and utilizing groundwater as an alternative water supply to their surface water rights. Therefore, the proposed project and other alternative which rely upon seller service area water conservation, crop fallowing, crop shifting and use of alternative groundwater water supply assumptions are fundamentally flawed and unrealistic. Much of the water saving that the project is going to take credit for transfer would already be happening (switching to lower consumptive crops, idling land and switching to groundwater), so the project is claiming false credit for water conservation. The EIS/R must show, defensibly, how the water claimed as saved is actually saved, above and beyond what was going to happen absent the project.

Response

As willing sellers, sellers will only sell water they do not need to meet their water needs for the season. As defined in the project description, water conservation transfers must reduce irrecoverable water losses. Reclamation has measures in place during approval of water transfers to ensure that water being transferred via conservation transfers could not be used by downstream users. There is only one water conservation transfer proposed in the EIS/EIR, from Browns Valley Irrigation District. The Browns Valley Irrigation District water conservation transfer has been evaluated and it complies with the requirements for water conservation transfers.

Comment LA12-33

Comment

Pg ES-9,ES 4 par 2- 'The biological opinions on the Coordinated Operations of the CVP and SWP (U.S. Fish and Wildlife Service [USFWS] 2008; National Oceanic and Atmospheric Administration Fisheries Service [NOAA Fisheries] 2009) analyze transfers through the Delta from July to September (commonly referred to as the "transfer window") that are up to 600,000 AF in dry and critically dry years. For all other year types, the maximum transfer amount is up to 360,000 AF." This statement is correct as to the USFWS OCAP BO, but the NMFS OCAP BO has no similar provision or language. This erroneous assumption/representation distorts the EIS/EIR analysis of impacts to species covered in the NMFS OCAP BO.

Response

Text has been revised relative to transfer amounts allowable under the NOAA Fisheries biological opinion (BO). In dry years following critical years and in dry years following dry years, the maximum transfer amount is also up to 600,000 acre-feet (AF), according to NOAA Fisheries BO Appendix A p. 126-127.

Comment LA12-34

Comment

FWS OCAP BO pg 229, pl, "Water transfers would increase Delta exports by 0 to 360,000 acre-feet (AF) in most years (the wettest 80 percent of years) and by up to 600,000 AF in Critical and some Dry years (approximately the driest 20 percent years). Most transfers will occur at Banks (SWP) because reliable capacity is not likely to be available at Jones except in the driest 20 percent of years. Although transfers can occur at any time of year, the exports for transfers described in this assessment would occur only in the months July-September." The proposed project transfers from April through June are not covered in the FWS OCAP BO impact assessment of water transfers so the proposed project water transfers that would occur in April through June must seek ESA consultation from FWS.

Response

The range of potential water transfers through the Delta evaluated under the Proposed Action and alternatives would occur from July through September. See response to Comment LA12-83 for additional information.

Comment LA12-35

Comment

FWS OCAP BO pg 229, pl, "Delta smelt are rarely present in the Delta in these months, so no increase in salvage due to water transfers during these months is anticipated, but as described above, these transfers might affect delta smelt prey availability." This is why the FWS OCAP BO analysis of impacts of CVP and SWP water transfers in July through September are covered by the current take permits and any other months are not.

Response

See response to Comment LA12-34.

Comment LA12-36

Comment

FWS OCAP BO pg 229, p4, "The pumping capacity calculated is up to the allowable E:I ratio and is limited by either the total physical or permitted capacity, and does not include restrictions due to ANN salinity requirements with consideration of carriage water costs." So the transferred water is allowed to degrade water quality because the flows to maintain salinity standards would cost too much?

Response

Water transfers include carriage water. See response to Comment LA12-82 for additional information. Water quality is evaluated in Section 3.2, which concludes there would be no significant impacts to water quality under the proposed alternatives.

Comment LA12-37

Comment

FWS OCAP BO pg 230, pl, "For all other study years (generally the wettest 80 percent) the available capacity at Banks for transfer ranges from about 0 to 500 TAF (not including the additional 60 TAF accruing from the proposed permitted increase of 500 cfs at Banks. But, over the course of the three months July-September other operations constraints on pumping and occasional contingencies would tend to reduce capacity for transfers. In consideration of those factors, proposed transfers would be up to 360 TAF in most years when capacity is limiting." The project description of the proposed project is not specific as to how much of the potential 511,000+AF are proposed to be transferred by water year type. Therefore, the project description is inconsistent with the limitations for water transfers set in the FWS OCAP BO.

Response

The Lead Agencies have defined the range of potential water transfer activities evaluated under the Proposed Action to comply with the requirements in the biological opinions on the Long-Term Operations of the CVP and SWP, as stated in Section 2.3.2.1. Figure 2-10 shows an exceedance plot of the available export pumping capacity for transfers. The figure shows that in 65 percent of years, there would be no capacity at the pumps to convey transfer water. Capacity is estimated to be mostly available in dry and critically dry years. This is consistent with the NOAA Fisheries and USFWS biological opinions.

Comment LA12-38

Comment

FWS OCAP BO pg 230, p3, "for this assessment proposed exports for transfers (months July-September only) are as follows:

Water Year Type	Maximum Amount of Transfer
Critical	up to 600 kaf
Consecutive Dry	up to 600 kaf
Dry after Critical	up to 600 kaf
All other Years	up to 360 kaf"

Note that the FWS OCAP BO addresses these transfer amounts only during the period of July through September.

Response

The range of potential water transfers through the Delta evaluated under the Proposed Action and alternatives would occur from July through September. See response to Comment LA12-83 for additional information.

Comment LA12-39

Comment

NMFS OCAP BO pg 729 p3, " ... this consultation does not address ESA section 7(a)(2) compliance for individual water supply contracts. Reclamation and DWR should consult with NMFS separately on their issuance of individual water supply contracts, including analysis of the effects of reduced water quality from agricultural and municipal return flows, contaminants, pesticides, altered aquatic ecosystems leading to the proliferation of non-native introduced species (i.e., warm-water species), or the facilities or activities of parties to agreements with the U.S. that recognize a previous vested water right." The NMFS OCAP BO appears to provide that the water transfer seller and recipient agencies will require ESA consultation.

Response

The preceding sentence in the NOAA Fisheries biological opinion states that "take from the administration of water transfers is included in the CVP/SWP operations for this consultation." Therefore, the biological opinion does consider the effects of water transfers. The cited text refers to individual water supply contracts, not water transfers. The range of potential transfer activities under the Proposed Action and alternatives are within the operating requirements of the NOAA Fisheries biological opinion on the Long-Term Operations of the CVP and SWP.

Comment LA12-40

Comment

Pg ES-10, ES 4.1- Specific measures are not set forth to assure that the Seller substitutes groundwater for surface water.

Response

Reclamation has monitoring measures in place as part of the water transfers approval process to make sure transfers are being implemented responsibly, including that real water is being transferred. See Common Response 14.

Comment LA12-41

Comment

Pg ES-10, ES 4.2- "Reclamation would limit transferred water to what would not have otherwise been released downstream absent the transfer." Specific measures to assure that this is the case are not spelled out.

Response

The comment includes part of the definition of reservoir release transfers. Reclamation has monitoring measures in place as part of the approval process to make sure transfers are being implemented responsibly, including that real water is being transferred.

Comment LA12-42

Comment

Pg ES-10, ES 4.2- "Each reservoir release transfer would include a refill agreement between the seller and Reclamation (developed in coordination with DWR) to prevent impacts to downstream users following a transfer." "Refill of the storage vacated for a transfer may take more than one season to refill if the above conditions are not met in the wet season following the transfer." The reduction in storage from the transfer, that according to the document could take years to replace, could cause significant impacts to downstream users, reservoir resources (recreational boat launch access and marinas, warm water fisheries reproduction success, exposure of sensitive archaeological sites in the reservoir fluctuation zone and other significant impacts). The project must only be allowed to release water it has already stored, not release water that it does not yet have as appears to be proposed by the project. If the project is only allowed to release water it has already stored then the impacts to other resources are dramatically reduced. If the release only of water that is already stored is not a part of the project description, it must be a requirement for mitigation of the impacts caused by releasing water before it is stored.

Response

Reservoir release transfers include water that has already been stored in non-Project reservoirs. Water available for transfer is water that would not have been otherwise released downstream absent the transfer.

Comment LA12-43

Comment

Pg ES-11, ES 4.3- If weed cover is not removed then the consumptive use conservation the project claims to be using for the water transfer is not supportable.

Response

Reclamation requires cropland idling participants to control weeds during the transfer period. Participants typically disc their fields once or twice depending on the condition of the field. In past transfers, weed cover has been low.

Comment LA12-44

Comment

Pg ES-11, ES 4.3- Consideration must be given to protecting adjacent properties from herbicide spray drift and weed pressure from fallowed adjacent fields. Mitigation should include monitoring and funding to address these significant project impacts.

Response

Water transfer participants typically disc their fields to control weeds. DWR and Reclamation do not require use of herbicides to control weeds. Some farmers apply herbicides to wet fields where tractors may get stuck, but this is generally not applicable to idled fields. Farmers generally manage weeds to protect neighboring rice fields as a best management practice. This would not be an impact with or without transfers.

Comment LA12-45

Comment

Pg ES-11, ES 4.4- "Transfer water generated by crop shifting is difficult to account for. Farmers generally rotate between several crops to maintain soil quality, so water agencies may not know what type of crop would have been planted in a given year absent a transfer. To calculate water available from crop shifting, agencies would estimate what would have happened absent a transfer using an average water use over a consecutive 5-year baseline period. The change in consumptive use between this baseline water use and the lower water use crop determines the amount of water available for transfer." Due to the speculative aspects of the determination of true water savings this alternative should be deleted.

Response

Calculating water savings from crop shifting is based on data from past cropping patterns and is not speculative.

Comment LA12-46

Comment

Pg ES-12, ES 5- "The No Action/No Project Alternative considers the potential for changed conditions during the 2015-2024 period when transfers could occur, but because this period is relatively short, the analysis did not identify changes from existing conditions." Based on this quote from the document, the No Action/No Project baseline is incorrectly defined. The current OCAP Biological Opinions of NMFS and FWS include many Reasonable and Prudent Alternatives and Actions that the CVP and SWP must legally implement during this period. Some of these actions, e.g. bypass flows to inundate floodplain habitat and fish passage, have flow and operational implications that must be included ·in the No Action/No Project that do not exist (other than current legal obligation) in the Existing Conditions. The EIS/R analysis must be revised to correct for this error in the definitions of the baselines for comparison.

Response

The baseline modeling considers the reasonable and prudent alternatives (RPAs) listed in the biological opinions. Some are included in the modeling, such as Delta Cross Channel, Export/Inflow Ratio, and Lower American River Flow Management. Other actions in the RPAs are not expected to affect flows substantially from existing conditions, and other actions in the RPAs would not be implemented within the 10-year timeframe of potential transfer activities evaluated under the Proposed Action. Therefore, the No Action Alternative modeling does reflect the RPAs to the extent possible with available data at this time and remodeling is not required.

Comment LA12-47

Comment

Pg 1-2, 1.1.2- A project objective identified is, "Develop supplemental water supply for member agencies during times of CVP shortages to meet existing demands." New plantings, the maturing of already planted crops, new service connections in M&l areas and increased use of existing service connections are examples of new demand. The analysis is inconsistent with this objective and there are no significant measures to preclude increased reliance on diversions from the Delta.

Response

See response to Comment LA12-214.

Comment LA12-48

Comment

Pg 1-2, 1.1.2- "Because shortages are expected due to hydrologic conditions, climatic variability, and regulatory requirements, transfers are needed to meet water demands." As pointed out in other comments, the regulatory requirements constrain CVP/SWP operations and when CVP/SWP operations are constrained by regulations there is no excess capacity to support water transfers. This component of the project objectives is not satisfied by any of the project alternatives.

Response

Capacity to convey transfer water through the Delta is a factor that limits the overall amount of transfers that could occur each year. This is described in more detail in Section 2.3.2.5. Reclamation has multiple planning efforts to help meet the many demands on the CVP, and increasing operational capacity is part of separate planning efforts. See Common Response 14.

Comment LA12-49

Comment

Pgs 1-10 & 11, 1.3.1- "According to the CVPIA Section 3405(a), the following principles must be satisfied for any transfer." ... "Transfer will not adversely affect water supplies for fish and wildlife purposes." The impact analysis in the EIR/S identifies several adverse, significant and less than significant proposed project and project alternative impacts to water supplies for fish and wildlife purposes both before and after mitigation. The statute does not limit affects based on significance. The proposed project and its alternatives are in violation of the CVPIA Section 3405(a).

Response

Section 1.3.1 summarizes CVPIA requirements, and has been revised to clarify that the CVPIA does specify that significant effects should be avoided. CVPIA Section 3405(a)(L) includes the following: "The Secretary shall not approve a transfer if the Secretary determines, consistent with paragraph 3405(a)(2) of this title, that such transfer would result in a significant reduction in the quantity or decrease in the quality of water supplies currently used for fish and wildlife purposes, unless the Secretary determines pursuant to finding setting forth the basis for such determination that such adverse effects would be more than offset by the benefits of the proposed transfer."

Comment LA12-50

Comment

Pg 1-11, 1.3.1.2, -"The biological opinion concluded that continued long term operations of the CVP and SWP, as proposed, were "likely to jeopardize" the continued existence of delta smelt without further flow conditions in the Delta for their protection and the protection of designated delta smelt critical habitat." As identified in other comments, reverse Old and Middle River flow limitations, X2 and net delta outflow requirements of the FWS OCAP BO RPAs have (theoretically) been implemented, but other required RPAs such as restoration of delta smelt habitat have not been implemented and are obviously not on schedule for compliance. FWS OCAP BO Action 6, "A program to create or restore a minimum of 8,000 acres of intertidal and associated subtidal habitat in the Delta and Suisun Marsh shall be implemented." "The restoration efforts shall begin within 12 months of signature of this biological opinion and be completed within a 10 year period." Reclamation and DWR do not appear to have met this requirement in that they have not completed project specific designs for these actions, started project specific EIS/R environmental documents or initiated the permitting or contracting processes to implement this action that is required to be implemented by 2018. Since Reclamation and DWR have failed to implement this RPA, then the species are still in jeopardy and the proposed water transfers would only further exacerbate the conditions that led to the original FWS jeopardy opinion.

Response

Reclamation and DWR are working cooperatively with the USFWS and NOAA Fisheries to implement the RPAs. Reclamation and DWR submit annual reports to show progress and status. The existing biological opinions currently govern operations of the CVP and SWP. Water transfers comply with the existing regulatory framework. See Common Response 14.

Comment LA12-51

Comment

Pg 1-11, 1.3.1.2,- "The USFWS developed a Reasonable and Prudent Alternative (RPA) aimed at protecting delta smelt, improving and restoring habitat, and monitoring and reporting results." Reclamation and DWR have not implemented and complied with many of these RPAs and have missed the deadlines for submitting plans, reports, implementations and accomplishing the specific goals of most of the RPAs. Since DWR and Reclamation have not implemented most of the protections that were designed to protect the ESA listed species for jeopardy, the proposed water transfers will only add to and exacerbate the impact of the CVP and SWP operations on those species, which could only result in further jeopardy to these species.

Response

See response to Comment LA12-50.

Comment LA12-52

Comment

Pg 1-11, 1.3.1.2, - "(NOAA Fisheries 2009). This biological opinion concluded that continued long term operations of the CVP and SWP, as proposed, were "likely to jeopardize" the continued existence of Sacramento River winter run Chinook salmon, Central Valley spring run Chinook salmon, Central Valley steelhead, and the southern Distinct Population Segment of North American green sturgeon and were "likely to destroy or adversely modify" designated or proposed critical habitat of these species. NOAA Fisheries also concluded that CVP and SWP operation both "directly altered the hydrodynamics of the Sacramento-San Joaquin River basins and have interacted with other activities affecting the Delta to create an altered environment that adversely influences salmonid and green sturgeon population dynamics." The biological opinion identified an RPA to address these issues and protect anadromous fish species." Reclamation and DWR have not implemented and complied with many of these RPAs and have missed the deadlines for submitting plans, reports, implementations and accomplishing the specific goals of most of the RPAs. Since DWR and Reclamation have not implemented most of the protections that were designed to protect the ESA listed species for jeopardy, the proposed water transfers will only add to and exacerbate the impact of the CVP and SWP operations on those species, which could only result in further jeopardy to these species.

Response

See response to Comment LA12-50.

Comment LA12-53

Comment

Pg 1-12, 1.3.1.2,- "The Opinions included the following operational parameters applicable to water transfers: A maximum amount of water transfers is 600,000 AF per year in dry and critical dry years. For all other year types, the maximum transfer amount is up to 360,000 AF." This EIS/R statement is incorrect with regard to the NMFS BO.

Response

Text has been revised relative to transfer amounts allowable under the NOAA Fisheries biological opinion. In dry years following critical years and in dry years following dry years, the maximum transfer amount is also up to 600,000 AF (NOAA Fisheries Biological Opinion on the Long-Term Operations of the CVP and SWP, Appendix A p. 126-127).

Comment LA12-54

Comment

Pg 1-12, 1.3.1.2,- "Transfer water will be conveyed through DWR's Harvey O. Banks (Banks) Pumping Plant or Jones Pumping Plant during July through September unless Reclamation and/or DWR consult with the fisheries agencies." The operations of the proposed project may not be altered from what is proposed, analyzed and disclosed in this environmental document or the modification of the BOs must be subjected to subsequent piecemealed environmental analysis of altered impacts.

Response

The range of potential water transfers through the Delta evaluated under the Proposed Action and alternatives would occur from July through September. See response to Comment LA12-83. The cited text has been revised for clarity.

Comment LA12-55

Comment

Pg 1-12, 1.3.2,- "Several sections of the California Water Code provide the SWRCB with the authority to approve transfers of water involving post-1914 water rights." Since almost exclusively post-1914 water rights would be transferred under the proposed project, all of the applicable SWRCB and CVRWQCB codes must be disclosed. Reference to and compliance with the applicable Basin Plans must be evaluated in the EIS/EIR.

Response

The subsequent sections (Sections 1.3.2.1 through 1.3.2.5) describe the sections of the Water Code. Compliance with Basin Plans is assessed in Section 3.2.

Comment LA12-56

Comment

Pg 1-12, 1.3.2,- "Section 1725 defines consumptively used water as "the amount of water which has been consumed through use by evapotranspiration, has percolated underground, or has been otherwise removed from use in the downstream water supply as a result of direct diversion." Evapotranspiration is defined as "the sum of evaporation and plant transpiration from the Earth's land and ocean surface to the atmosphere. Evaporation accounts for the movement of water to the air from sources such as the soil, canopy interception, and waterbodies." (Wikipedia) When crops are reported by the universities on their total consumptive use to complete a crop cycle, these water use calculations include the water that is resident in the soil profile at planting from natural precipitation and precipitation that occurs during the crop growth cycle. The EIS/R analysis appears to take credit for saving the entire consumptive use of a crop as estimated by the universities. The project fails to take into account in their water savings calculations that a significant fraction of the water consumption for a crop is not saved by simply not planting the crop. Soil and water surface evaporation from precipitation still occurs even if the crop is not there. A certain amount of precipitation that falls is leached below the soil root zone and is lost to groundwater and that occurs if the crop is planted or not. The proposed project and the EIS/R analysis has made an error in taking credit for water saved for the entire evapotranspiration attributed to a crop when the fallowing of a field (provided it is kept free of vegetation) only saves the crop "transpiration" component of the water consumption attributed to a crop, not the "evaporation" component of water consumption that happens whether the crop is planted or not. The water savings credited for water transfer used by the project for "crop idling" and "crop shifting" are wrong and must be corrected to reflect the continued loss of water through evaporation and natural percolation to groundwater. Even the amount of groundwater substitution actually occurring from foregone surface water diversions is wrong in the EIS/R because of the mistaken project use of the entire evapotranspiration associated with a crop. Only the irrigation component of the crop's total evapotranspiration reported by the university would be saved by the groundwater conjunctive use. The natural precipitation component of the universities reported crop consumptive use would not be saved by the groundwater substitution and cannot be credited to water savings for water transfers as the EIS/R water accounting has proposed. This significant error in the water savings from crop idling, crop shifting and groundwater conjunctive use distorts the analysis and minimizes the impacts to ground and surface water.

Response

The transfers do not take credit for the entire evapotranspiration of the crop. Water available for transfer by cropland idling transfers is only the evapotranspiration of applied water (ETAW), which is the portion of applied surface water that is used by the crop and evaporated from the soil and plant surfaces. The portion of the crop evapotranspiration met by precipitation during the growing season or stored as soil moisture within the root zone before the growing season does not qualify as transferable water. ETAW does not include either applied water lost as deep percolation to groundwater or conveyance losses. Unless the acreage overlies an unusable groundwater basin or discharges to a saline sink, these depletions contribute to the overall water supply and are excluded from the calculation of transferable water.

Comment LA12-57

Comment

Pg 1-18, 1.5,- "Alternatives considered in this EIS/EIR only analyze transfers of to CVP contractors that require use of CVP or SWP facilities. SWP contractors may also transfer water originating north of the Delta to areas south of the Delta. The cumulative analysis evaluates potential SWP transfers, but they are not part of the action alternatives for this EIS/EIR." As a result of this statement and how the alternatives have been formulated and analyzed, no SWP contractor can sell water to the project proponents regardless of whether they use CVP or SWP conveyance to deliver it; Only sales of or from CVP contractors that are delivered through the CVP or SWP to the project proponents are covered by this EIS/R or any agency decisions or permits that are issued based on this EIS/R.

Response

This EIS/EIR analyzes a range of potential transfers to CVP contractors. These transfers could originate from the sellers included in Table 2-4. Some of the sellers are CVP contractors, some are SWP contractors, and some are independent entities. The language on page 1-18 was clarified to indicate transfers to SWP contractors are not analyzed in this EIS/EIR, but transfers from SWP contractors listed in Table 2-4 to CVP contractors are included.

Comment LA12-58

Comment

Pg 1-18, 1.5,- "Buyers and sellers must prepare transfer proposals for submission to Reclamation. Proposals must also be submitted to DWR if the transfers require use of DWR facilities or the transfers involve a seller with a settlement agreement with DWR." The EIS/R fails to define what information must be included with the transfer proposal.

Response

This section was clarified to include additional information regarding specific transfer proposals. See Common Response 14.

Comment LA12-59

Comment

Pg 1-18, 1.5,- "Reclamation reviews transfer proposals to ensure they are in accordance with NEPA, CVPIA, and California State law." This statement fails to include that Reclamation must also consider Warren Act Contract requirements when federal facilities are wheeling nonfederal water (seller or buyer) through federal facilities. A Warren Act Contract Water Wheeling Assessment is required for any non-federal water from either transfer source or recipient that uses any CVP facility. This would appear to include use of San Luis Reservoir even if only SWP conveyance was used.

Response

Clarifying text has been added to this section.

Comment LA12-60

Comment

Pg 1-18, 1.5, - "DWR may also be involved in conveying water for transfers and is interested in verifying that water made available for transfers does not compromise SWP water supplies. For water conveyed through the SWP system, DWR must also determine if the transfer can be made without injuring any legal user of water and without unreasonably affecting fish, wildlife, or other instream beneficial uses and without unreasonably affecting the overall economy or environment of the county from which the water is being transferred." It should be made clear that DWR will be required to develop and approve a separate environmental document for any water transfers that use SWP facilities. San Luis Reservoir is a joint SWP facility so use of these facilities, even if other SWP facilities or water are not involved, should result in the requirement of a separate environmental document from DWR.

Response

As discussed in Section 1.5, DWR is a Responsible Agency under CEQA for the range of potential activities analyzed in the 2014 Draft EIS/EIR, and may choose to use this EIS/EIR if environmental analysis is necessary for transfer-related decisions the agency considers. See Common Response 14.

Comment LA12-61

Comment

Pg 1-18, 1.6, -The EIS/R omitted that if the project proposes to use SWP facilities DWR has decisions it must make. DWR must decide if there is available capacity, if they will conduct the transfer, and they do decide to do the transfer, they must do an EIS/EIR as the SWP transfers are not covered under the proposed project or any of the project alternatives (see EIS/R section 1.5 and the related comment).

Response

See responses to Comments LA12-57 and LA12-60.

Comment LA12-62

Comment

Pg 2-4, Table 2-1- Ag conservation in the Buyer Service Area was inaccurately screened. Some types of ag conservation can be immediate, as an example, crop switching and improvements in irrigation scheduling or irrigation system distribution uniformity. Some ag conservation can be nearly immediate, such as improvements to irrigation systems to more water efficient types, e.g. sub-surface drip instead of flood furrow. Each of these ag conservation examples "provides water" for transfer within the buyer area.

Response

As described in Appendix A, Section 4.1.1, the buyers are CVP contractors and are required to implement water use efficiency best management practices, as required by the Central Valley Project Improvement Act Section 3405(e). The Agricultural Conservation (Buyer Service Area) Alternative would implement water use efficiency measures above and beyond those already being implemented; additional measures would generally require substantial infrastructure and investment and would not be immediately implementable. This alternative was also not analyzed in more detail in the EIS/EIR because it would not provide additional water to the water users affected by CVP shortages.

Comment LA12-63

Comment

Pg 2-4, Table 2-1- The alternatives considered failed to include: Increase water conservation for municipal and industrial uses in Seller Service Area to reduce water demands. It would have provided immediate and flexible water supplies as the buyer service area alternative concept to this option determined, but also would have provided water.

Response

Measures in the seller service area are driven by potential sellers; if no sellers want to participate, the measure is not feasible. No sellers proposed municipal and industrial water conservation in the seller service area to make water available for transfer.

Comment LA12-64

Comment

Pg 2-4, Table 2-1- The determination that reuse of water for ag was not possible for immediate implementation does not appear supportable. This option requires more full investigation for feasibility and consideration in a fair and evenly applied alternatives screening process.

Response

This alternative was analyzed in more detail in Appendix A. As described in Section 4.1.7 of Appendix A, agricultural reuse of water requires the development of infrastructure that would not be immediately implementable.

Comment LA12-65

Comment

Pg 2-4, Table 2-1- Permanent land retirement could be immediate and provides water. It seems a logical compliment to the other concepts of fallowing and crop switching. Permanently retiring marginal farmland has less of an impact than fallowing productive ground. Permanent retirement of land would allow that land to be restored to wildlife habitat. There is no significant habitat value to the fallowed field kept free of vegetation as compared to one that is farmed or one that is permanently retired. Retiring land in the buyer service area is part of the No Action/No Project, including additional permanent land retirement in the buyer area should be part of one of the project alternatives.

Response

As described in Appendix A, Section 4.1.10, land retirement under other efforts has taken many years and has not been found to be an immediately implementable option. Additionally, it would not reduce the environmental effects of cropland idling or crop shifting transfers because it would be a permanent change. A permanent change to these farmlands would have long-term effects to the local economies, farmworkers, land use, and agricultural resources.

Comment LA12-66

Comment

Pg 2-4, Table 2-1- Purchasing water entitlements in the Buyer area is as immediate and creates just as much water as the proposed project long term water transfers. This alternative concept must be fully evaluated in the revised EIS/R.

Response

The concept of purchasing surface water entitlements was considered in the EIS/EIR as part of the Water Rights Purchase Alternative (see Table 2-1 and Appendix A). It was not carried forward for more detailed analysis because it did not meet the key elements of the purpose and need or basic project objectives, as it would not be immediate and would not provide additional water. See Appendix A for more details on the screening of this alternative.

Comment LA12-67

Comment

Pg 2-4, Table 2-1- Groundwater substitution should equally apply to the buyer area in the project alternatives.

Response

The concept of groundwater substitution transfers within the buyer area was considered in the EIS/EIR as part of the Transfers within Buyer Service Area Alternative (see Table 2-1 and Appendix A). It was not carried forward for more detailed analysis because it did not meet the key elements of the purpose and need/basic project objectives because it would not provide additional water to water users that face CVP shortages. See Appendix A for more details on the screening of this alternative.

Comment LA12-68

Comment

Pg 2-4, Table 2-1-The characterization that not applying rice decomposition water does not result in saving (providing) water is unsupportable. Approximately 350,000 acres of rice is flooded for rice straw decomposition (http://www.arb.ca.gov/cc/capandtrade/protocols/rice/pbcs-12-20-13.pdf) and this flooding consumes approximately 175,00AF of water. There are several viable alternatives to applying rice decomposition water including rice straw baling and application of inputs to speed rice stubble decomposition. There are commercially available agricultural inputs that are designed to speed crop residue decomposition (https://www.soiltechcorp.com/product/stubble-digest/, http://www.midwestbioman.com/biocat.htm). Rice straw decomposition loads can be significantly reduced by baling and removing the rice straw (http://calrice.org/pdf/Sustainability+Report.pdf) and is used for erosion control (water quality benefits), cattle feed and power cogeneration (greenhouse gas emission benefit). The best part about this water conservation option (other than the fact it is immediate, flexible and provides water) is that the impacts are beneficial on the local communities by actually increasing the number of jobs rather than destroying them as crop idling does. This project alternative is too good of an opportunity not to be included as an alternative and must be included in the revised EIS/R.

Response

The Rice Decomposition Water Alternative was considered in the EIS/EIR (see Table 2-1 and Appendix A). It was not carried forward for more detailed analysis because it did not meet the key elements of the purpose and need or basic project objectives, as it would not provide additional water to water users that face CVP shortages. The rice decomposition water would not be available during the period when users need the water because it would not be available until after the rice harvest. Additionally, this alternative would not reduce environmental effects because the flooded rice fields are a valuable resource for migratory waterfowl in the Central Valley. See Appendix A for more details on the screening of this alternative.

Comment LA12-69

Comment

Pg 2-4, Table 2-1-Transfer of water stored in CVP or SWP reservoirs should be considered?

Response

Water stored in CVP or SWP reservoirs is part of the CVP or SWP allocation in each year. That water is earmarked to meet allocations under CVP and SWP processes, and transferring that water would reduce supplies to a CVP or SWP contractor. This would not meet the purpose and need or basic project objectives in the EIS/EIR.

Comment LA12-70

Comment

Pg 2-4, Table 2-1-Transfer of water within a buyer area provides water. This alternative and transfers from areas of the State other than upstream of the Delta should be analyzed.

Response

Appendix A further describes the alternatives development process and explains the reasons for the determinations regarding whether alternatives should be carried forward for more detailed analysis. The Transfers within Buyer Service Area Alternative was not carried forward for additional analysis because it would not provide additional water to the buyer service area. As described in Chapter 2 of the EIS/EIR, transfers would occur only in dry and critical years when CVP contractors have demand for water and conveyance capacity is available to move the water through the Delta. While CVP contractors currently engage in in-basin transfers to try to flexibly manage shortages, in-basin transfers do not bring additional water into the area and the CVP contractors would continue to face shortages.

Comment LA12-71

Comment

Pg 2-4, Table 2-1-Developing groundwater wells within a buyer service area provides water and implementing them is fairly immediate. This alternative should be analyzed.

Response

Appendix A further describes the alternatives development process and explains the reasons for the determinations regarding whether alternatives should be carried forward for more detailed analysis. The Groundwater Development Alternative was not carried forward for additional analysis because planning, designing, and installing new wells and conveyance systems would not be an immediate action. Additionally, new groundwater development would not provide a substantial supply because groundwater levels in the buyer service area have declined in response to previous dry years and they typically do not recover without additional recharge.

Comment LA12-72

Comment

Pg 2-4, Table 2-1- The EIS/R must include an alternative that includes continuation of one year transfers.

Response

The EIS/EIR analyzes impacts from a range of potential water transfers, and these transfers could be single-year or multi-year agreements (see Section 2.3.2.7). The environmental impacts do not differ if the transfers are a series of single-year transfers or multi-year transfer agreements; therefore, this alternative is not different from the range of potential activities evaluated under the Proposed Action and alternatives.

Comment LA12-73

Comment

Pg 2-7, 2.3.1, - The No Action/Project should have included the assumption that single year water transfers would still have occurred absent the proposed project. The lack of the implementation of the proposed project or alternatives does not preclude these single year transfers so the project analysis must be revised to correct the current flawed baseline assumption.

Response

The purpose of the No Action/No Project Alternative is to investigate conditions that would occur if the Proposed Action/Proposed Project does not move forward. Including the same action as part of the No Action/No Project Alternative, but assuming it would go through a separate environmental compliance effort, is not consistent with direction under CEQA and NEPA (as described in Section 2.3.1). See Common Response 14.

Comment LA12-74

Comment

Pg 2-9, 2.3.2.1, -"A similar case regarding the NOAA Fisheries biological opinion is before the court. If new biological opinions are completed, the new biological opinions or the findings of the NEPA analysis could change the quantity or timing of transfers. If the biological opinions alter the timing and quantity of transfers, the Lead Agencies will determine if supplemental environmental documentation is necessary to address any changes in potential impacts." An alternative for continuing with short term transfers should be included.

Response

This text has been updated because the findings have been issued related to this court case. The USFWS and NOAA Fisheries Biological Opinions on the Long-Term Operations of the CVP and SWP will remain in place and will guide operations of potential water transfer activities.

Comment LA12-75

Comment

Pg 2-11, Figure 2-3- The figure shows water transfers starting approximately May- June (when the lines are diverging), but the FWS OCAP BO only allows transfers from July- September.

Response

Figure 2-3 is schematic and does not specify a date when reservoir release transfers would begin. Table 2-5 specifies the reservoir release transfers would occur from July through September.

Comment LA12-76

Comment

Pg 2-11, 2.3.2.1,- "The seller could request that Reclamation store the non-CVP water in the CVP reservoir until Delta capacity is available, which would require contractual approval in accordance with the Warren Act of 1911." This statement indicates, as an example, that PCWA could sell water from its' reservoir, PCWA would release the water when they needed to into their tributary, Reclamation would release less water from Shasta into the Sacramento River during the PCWA release and make the saved Shasta reservoir water available for transfer for the project later in the season. There are multiple fisheries impacts in both tributaries and downstream of them from these interbasin proposed changes in water operations. These inter-basin operational changes to proposed project impacts include changes to water temperature suitability for coldwater fisheries resulting in adverse modification of critical habitat for ESA species, increased fish mortality and reduced fecundity; altered attraction flows and water temperatures for migrating fish causing straying which in turn increases redd superimposition, prespawn mortality, reduced fecundity, egg mortality and genetic introgression. These are all serious significant impacts to endangered species that the EIS/R failed to identify, evaluate, characterize, quantify, mitigate or disclose. The EIS/R must be revised to include these impact analyses and to rectify these material deficiencies in this document.

Response

The paragraph cited in the comment begins, "Some entities that could transfer water through reservoir release are upstream of CVP reservoirs and could request to store water temporarily in the CVP reservoirs." This sentence clarifies the subsequent sentence by explaining that this storage would only occur in downstream reservoirs. Therefore, the example cited with Placer County WA storing water in Shasta Reservoir could not occur; releases from Placer County WA would only have the potential to be stored in Folsom Reservoir. Water released in a reservoir release transfer would be water that would have remained in the reservoir absent the transfer. Moving this water from storage in upstream Placer County WA reservoirs into Folsom Reservoir would not alter river flows downstream of Folsom Reservoir during the transfer period. Flows could be affected during reservoir refill, and these potential effects are analyzed throughout the EIS/EIR.

Comment LA12-77

Comment

Pg 2-12, Table 2-3- The table assumes that the amount of water saved for each crop is the same regardless if the crop is idled or it is shifted to another crop. If the field is shifted to another crop it will consume moisture from the soil profile and any precipitation that occurs even if it is not actively irrigated. The water savings for shifting a crop is not the same as for idling a crop.

Response

The table shows Estimated ETAW Values for Various Crops Suitable for Idling or Shifting. The crop shifting description below the table further states, "the difference in the accepted ETAW values between the two crops would be the amount of water that can be transferred." This does not state that cropland idling and shifting result in the same amount of water that can be transferred.

Comment LA12-78

Comment

Pg 2-12, Table 2-3- The proposed project plan of crop shifting is fatally flawed for its vulnerability to gaming by the sellers. There is nothing in the proposed project to assure that real water savings will be realized by crop shifting.

Response

Reclamation and DWR have measures in place in their water transfers approval process to ensure that the correct amount of water is transferred and it is "real" water. See Common Response 14.

Comment LA12-79

Comment

Pg 2-12, 2.3.2.1,- "To calculate water available from crop shifting, agencies would estimate what would have happened absent a transfer using an average water use over a consecutive five-year baseline period." The proposed project and the EIS/R analysis fail to provide any reasonable assurances that real water savings will occur to offset these proposed transfers.

Response

See response to Comment LA12-78.

Comment LA12-80

Comment

Pg 2-13, 2.3.2.2, -"Modeling analysis indicates that using hydrology from 1970-2003, transfers could occur in 12 of the 33 years." The project description, analysis and range of permit conditions should be limited to the same type of water years used for the analysis.

Response

See Common Response 5.

Comment LA12-81

Comment

Pg 2-13, 2.3.2.2,- "Sellers that are not specifically listed in this document may be able to sell water to the buyers as long as: the water that is made available occurs in the same water shed or ground water basin analyzed in this EIS/EIR,... " Unless included within the scope of this EIS/R this would lead to piece-mealing project impacts. Also, New Melones Reservoir and the Stanislaus River were not included in the Areas of Analysis so according to this declaration in the EIS/R, no water from this basin can be included in future water transfers under this project.

Response

Transfers would need to be of a smaller total size than what is analyzed here in order to be within the scope of the EIS/EIR, and the impacts of the transfers would have to be encompassed within the analysis in this EIS/EIR. If transfers that are materially different from those described in this EIS/EIR are later proposed and could result in impacts outside of those analyzed in the EIS/EIR, those transfers would require additional environmental documentation. Transfers from the Stanislaus River or New Melones Reservoir are not analyzed in this EIS/EIR and would require additional environmental documentation if any such transfers were proposed.

Comment LA12-82

Comment

Pg 2-14, Figure 2-4- Water transferred from Merced Irrigation District would have to flow down the San Joaquin River and other channels prior to being diverted by the CVP or SWP pumps in the south Delta or their diversions. The EIS/R analysis did not take into account the amount of that water lost in transit. Evaporative losses and losses to groundwater are likely significant. This type of water loss in the transfer process is also true of all of the other water transfers to varying degrees depending on locations, transit path and times of year. As a result of the flawed assumptions of the EIS/R analysis, the project proposes to divert much more water than would actually be saved and understates the reduction in available water supply for other needs and the related impacts. As a result of the project taking too much credit for the amount of water transferred, the project would actually result in a net deficit of water in the delta and tributaries rather than the neutral flow impact the project analysis claims in the EIS/R. The impacts were not adequately identified, characterized, evaluated, quantified, mitigated or disclosed in the EIS/R. The EIS/R is flawed in its water conveyance loss assumptions and therefore deficient in its analysis and disclosure and must be revised. Attached is a copy of the May 24, 2013 letter from the USBR and DWR to Tom Howard attempting to justify the April 28,2013 violation of the D-1641 salinity objective at Emmaton. The letter highlights a dramatic increase in overall rates of depletion to reservoir releases which was simply not anticipated by project operators and is extreme from a historical perspective". The analysis for the EIS/R is based on the same project operator modeling as was used in the flawed 2013 project operations. Although diversions for rice cultivation were cited the impact of water transfers, depletions of streamflow due to groundwater pumping and interception of accretions to streamflow in the dry year are likely. The models used for the analysis should be subjected to peer review corrections made and the analysis revised accordingly.

Response

Water losses during conveyance would be captured in the "carriage water" calculation. Section 2.3.2.4 includes a description of carriage water that focuses on water used to maintain water quality through Delta outflow. This explanation has been clarified to indicate it also includes instream losses. Carriage water is estimated to be 10 percent for San Joaquin River transfers, but this percentage is updated based on monitoring and modeling efforts during the transfer that estimate real-time conditions.

Comment LA12-83

Comment

Pg 2-16, Table 2-5- FWS OCAP BO pg 229, p1, "Although transfers can occur at any time of year, the exports for transfers described in this assessment would occur only in the months July-September." The analysis conducted in the FWS OCAP BO only addresses water transfers from July through September. Water transfers at any other time of year are not covered in the FWS OCAP BO, so the proposed project transfers in April- June are not covered under the current FWS OCAP Biological Opinion and are therefore not covered under the current CVP/SWP incidental take permits. Water transfers for any months outside of July-September must require additional ESA consultation with FWS.

Response

Transfer water would only be made available in April, May, and June if it can be stored until transfer capacity is available in the Delta during July, August, and September (as explained on page 2-13). Water would only be transferred through the Delta at times that are consistent with the biological opinions on the coordinated operations of the CVP and SWP.

Comment LA12-84

Comment

Pg 2-16, Table 2-5- The reason that the water transfers covered under the FWS OCAP BO only covered July- September is that "Delta smelt are rarely present in the Delta in these months, so no increase in salvage due to water transfers during these months is anticipated, but as described above, these transfers might affect delta smelt prey availability." (FWS OCAP BO pg 229, p1). So water transfers that occur outside of those months, such as the April- June transfers in the proposed project, would result in take as smelt would be present at the pumps. The transfer impacts analyzed and approved in the FWS OACP BO specifically do not include the impacts that would occur from transfers during these other months. The Proposed Project and alternative must be revised to omit the April- June transfers or the project must seek ESA consultation with FWS for a Biological Opinion and incidental take permits that covers the impacts to delta smelt that would occur with water transfers in those months.

Response

See response to Comment LA12-83.

Comment LA12-85

Comment

Pg 2-18, 2.3.2.3,- "Delta conveyance capacity would be available when conditions for sensitive species are acceptable to NOAA Fisheries and USFWS, typically from July through September, but groundwater substitution and cropland idling/crop shifting transfers would be available from April through September." If the south delta pumps of the CVP or SWP are used in the April through June water transfers, regardless of the source or type of water credit being taken as the justification for the transfer, they will result in additional levels of ESA species take that was not covered under the FWS OCAP BO and therefore would require a new ESA consultation with FWS in order to occur. Appropriate environmental analysis for any changes would be required and should be a part of the EIS/R.

Response

See response to Comment LA12-83.

Comment LA12-86

Comment

Pg 2-18, 2.3.2.3,- "Reclamation would only consider storing water for transfers if it would not affect releases for temperature, or if it could be "backed up" into another reservoir (by reducing releases from that reservoir). Backing up water may be possible if the Delta is in balanced conditions and instream standards are met. The decision to back up transfer water would be made on a case-by-case basis, but storage is analyzed in this EIS/EIR so that the analysis is complete in the event Reclamation determines that storage is possible in a specific year." Backing up transfers "into another reservoir by reducing releases from that reservoir" results in complex and significant fisheries impacts from water being released in one tributary at one time vs. a different tributary at a later time. In order for the permits based on this EIS/R to cover this proposed mode of operation of the proposed project, the analysis conducted in this EIS/R must cover the full range of operations proposed to be covered by this document and implemented by the project. The EIS/R claims an analysis of storing water in Shasta was conducted. Analyses for other affected reservoirs must also be conducted.

Response

The text cited in this document is from the section describing transfers on the Sacramento River, where water could potentially be stored in Shasta Reservoir. The subsequent sections identify the potential for American River transfers to be stored in Folsom Reservoir and Feather River transfers to be stored in Lake Oroville. These actions are analyzed in the EIS/EIR.

Comment LA12-87

Comment

Pg 2-18, 2.3.2.3,- "Sacramento River sellers and buyers would generally prefer water transfer options that are more flexible, such as starting groundwater substitution pumping when Delta pumping capacity for transfers is available." The analysis is inadequate to include the broad range of impacts associated with such flexibility.

Response

The flexibility described would reduce the potential impacts of transfers analyzed in this EIS/EIR. The EIS/EIR analyzes cropland idling transfers and groundwater substitution transfers as if they make water available during the full irrigation season of April through September. In many transfer years, storage would not be available for water made available in April, May, and June. In these years, cropland idling transfers cannot be operated to make water available only from July through September because cropland must be idled for the full irrigation season. Water made available from April through June could not be exported in the Delta and the buyers would receive only a small portion of the transfer water made available. Groundwater substitution transfers could be operated for a shorter period, however, which would reduce potential impacts from those described in the EIS/EIR. This flexibility would reduce environmental impacts rather than increase them.

Comment LA12-88

Comment

Pg 2-18, 2.3.2.3,- "Proposed sellers divert water from various locations along the Sacramento River or the Sutter Bypass." The interrelationship of ground and surface water in the seller areas is obvious and difficult to analyze and monitor. After the fact monitoring does not avoid the impact. The groundwater substitution alternative should be rejected.

Response

The impacts to groundwater levels, quality, and subsidence are analyzed in Section 3.3. Interrelated impacts to other resources (surface water supply, vegetation and wildlife, fisheries, recreation, flood control, etc.) are also analyzed in Section 3. The identified impacts to these resources will provide information to decision-makers when choosing an alternative to implement.

Comment LA12-89

Comment

Pg 2-22, 2.3.2.3,- "The Canal experienced substantial losses during conveyance to vegetation along the Canal system. The conservation project replaced the Canal with a pipeline and reduced associated losses to vegetation, thereby creating water for transfers." Reducing vegetation is a critical factor in meaningful water savings. The EIS/R failed to identify, characterize, evaluate, quantify, mitigate or disclose any special status plants, fish or animal species that will be affected by the removal of this water source at the current leaks. Leaks could result in habitat supporting wetland plant communities and associated species. The project failed to mitigate for the wetland habitat that will be destroyed from fixing these leaks. Water from these leaks also would have contributed to adjacent stream flows which provide habitat for yellow and red legged frog, tiger salamander, and steelhead. In addition to the ESA species consultation with the fisheries and wildlife agencies for this action, the project also will need streambed alteration agreements, wetlands alteration, etc. from DFG, USACE and others.

Response

As described on page 2-22, the action to replace the canal with a pipeline to make water available for transfers has already taken place; therefore, the existing conditions, No Action/No Project Alternative, and action alternatives have the same conditions in these areas. This EIS/EIR is analyzing the potential impacts of conveying the water to potential transfer buyers.

Comment LA12-90

Comment

Pg 2-22, 2.3.2.3,- "Cordua ID would transfer water made available through groundwater substitution actions. This transfer would increase flows on the Yuba River downstream of Cordua ID's point of diversion (absent the transfer) during the transfer period." Groundwater and surface water interact. Groundwater wells, especially those physically located in proximity to a tributary, are hydraulically connected to the surface water. When a groundwater cone of depression intersects groundwater maintained by tributary surface flows, the cone of depression increases the rate of loss of surface flows to groundwater and bank recharge. In order to determine the actual increase in surface flows from the foregone diversion of surface water in favor of groundwater use, the location of each groundwater well and its situational relationship to surface water hydraulics must be analyzed. Irrigation district well fields tend to be in locations that are near their surface water diversion locations because the infrastructure to convey the surface water was there first and is required in order to deliver the pumped groundwater. This proximity of irrigation well fields being in proximity to irrigation surface water diversions was well documented in the Sacramento Valley Regional Water Plan "Phase 8" environmental document. This comment and criticism of the incompleteness of the EIS/R analysis of groundwater substitution impacts on surface water flows applies to all of the proposed groundwater substitutions included in the proposed project and alternatives. This deficiency and undisclosed impacts must be corrected in the revised EIS/R. Similarly the overall lowering of the groundwater even from pumping long distances from the rivers and streams will increase losses from the surface flow.

Response

The potential streamflow depletion associated with groundwater substitution transfers was analyzed using CalSim, the SACFEM2013 groundwater model, and the Transfers Operations Model. The models used the well location, depth, and pumping rate to assess potential impacts to groundwater and surface water and the resources that depend on them. The linked models are described in more detail in Appendices B and D.

Comment LA12-91

Comment

Pg 2-26, Figure 2-8- "Water could flow down the Merced River into the San Joaquin River and be diverted through existing facilities within Banta Carbona ID, West Stanislaus ID, or Patterson ID (see Figure 2-8)." The NMFS and FWS OCAP BO analysis does not address this type of operation or these diversion locations for these purposes so the incidental take permits based on those BOs do not cover these operations.

Response

The Long-Term Water Transfers EIS/EIR provides analysis of potential environmental impacts to satisfy requirements of CEQA and NEPA associated with diverting water at these facilities. If necessary, incidental take at these diversion locations would be covered under the existing biological opinions for these facilities. If the existing biological opinions do not provide coverage, new biological opinions would be required.

Comment LA12-92

Comment

Pg 2-29, 2.3.2.4- A number of assurances are missing from this list.

- There must be assurances that the project changes in relative flows and water temperatures for all tributaries affected by earlier or later releases and increased or decreased tributary flows do not adversely affect migratory fish. Changes in flow proportions or relative water temperatures at a tributary confluence can increase salmonid straying. Straying causes increased competition for holding and spawning habitat and associated prespawn mortality and reduction of fecundity; redd superimposition and associated egg mortality and genetic introgression result in a loss of productivity and reductions in the genetic integrity and diversity of the species.

- There must be an environmental commitment to use the stored water to protect water quality to be compliant with all water quality standards prior to any water transfer water being delivered. DWR and Reclamation routinely deliver SWP and CVP water while concurrently violating water quality requirements, including adverse modification of critical habitat for ESA listed species, e.g. dissolved oxygen deficiency in delta smelt critical habitat. This water transfer operation must not be allowed to deliver any water unless all water quality requirements are met and in the event that current water quality requirements are not being met by the CVP/SWP regular operations, this transfer water must be used for these water quality protection purposes first, before transfer water can be delivered.

- Since Reclamation's requirement to comply with the CVPIA is a requisite for their approval of water transfers for the project, the project should include the CVPIA 3405 (a) limitation which provides water transfers cannot "adversely affect water supplies for fish and wildlife purposes" as an environmental commitment.

Response

Section 2.3.2.4 describes key limitations on the size, location, or operations of transfers that are a part of the way transfers work. The concepts identified in this comment are mitigation for potential impacts, and would be included if the analysis in Section 3 identified significant impacts related to these measures. The analysis of impacts to fisheries (Section 3.7) did not identify significant adverse impacts to fisheries; therefore, mitigation measures were not required. The analysis of potential impacts to water quality (Section 3.2) did not identify potentially significant changes in ability to meet water quality standards compared to existing conditions or the No Action/No Project Alternative; therefore, additional mitigation was not required related to this topic.

Comment LA12-93

Comment

Pg 2-29, 2.3.2.4,- "In groundwater basins where sellers are in the same groundwater subbasin as protected aquatic habitats, such as giant garter snake preserves and conservation banks, groundwater substitution will be allowed as part of the long term water transfers if the seller can demonstrate that any impacts to water resources needed for special-status species protection have been addressed. In these areas, sellers will be required to address these impacts as part of their mitigation plan." There are no sub-basins in the proposed seller areas that do not contain protected aquatic habitats. This commitment must be expanded to include all protected habitats that may be affected by the water transfers. Not all special status species are in aquatic habitat. As a very real example of a proposed project impact, the repair of the pipeline as a conservation action will impair habitat for red and or yellow legged frog. A protected aquatic habitat not only includes preserves or conservation banks, but also critical habitat as designated by the ESA. There are no seller area sub-basins that do not have any ESA designated critical habitat so all of the sellers must address these impacts as part of their mitigation plan. These mitigation plans must be part of and disclosed in this EIS/R unless these will be addressed in a separate EIS/R prepared by the sellers as part of their ESA consultation process. To avoid piecemealing the analyses should be included in this document.

Response

Potential impacts to special-status terrestrial species are analyzed in Section 3.8. As discussed in response to Comment LA12-89, the conservation action would not include any construction and would not affect terrestrial species.

Comment LA12-94

Comment

Pg 2-29, 2.3.2.4- "Carriage water (a portion of the transfer that is not diverted in the Delta and becomes Delta outflow) will be used to maintain water quality in the Delta." The analyses must include a defensible calculation of the quantity of the transferred water that actually reaches the delta to contribute to transfers and delta water quality. There are surface water evaporation losses, and loss to groundwater percolation and interception of accretions that must be accounted for that the EIS/R analysis has overlooked. Each potential water conveyance route, with its associated loss rates for the time period of the water transfer must be accounted for in the EIS/R analysis. The EIS/R must be revised to address this material deficiency.

Response

This environmental commitment has been clarified to indicate that it also includes conveyance losses between the water source and the Delta.

Comment LA12-95

Comment

Pg 2-29, 2.3.2.4, -"As part of the approval process for long-term water transfers, Reclamation will have access to the land to verify how the water transfer is being made available and to verify that actions to protect the giant garter snake are being implemented." Access to land does not assure compliance. Monitoring must be by a party without conflict, there must be a real enforcement mechanism and there must be funding for the enforcement effort.. Such assurances are not provided.

Response

This measure indicates that Reclamation would verify that actions to protect the giant garter snake are being implemented.

Comment LA12-96

Comment

P 2-31, 2.3.2.5, - East Bay MUD and Contra Costa WD should have been Lead Agencies as this EIS/R document will inform them for their decision on if to approve this document and to participate in the water transfer program.

Response

See Common Responses 1 and 9. East Bay Municipal Utility District (MUD) and Contra Costa WD have indicated that they would complete separate CEQA documentation (as described in Section 2.3.2.8); therefore, they are not suitable as the CEQA lead agency. SLDMWA has prime responsibility for most of the potential transfer activities described in this EIS/EIR.

Comment LA12-97

Comment

Pg 2-31, 2.3.2.5, -"Transfers to East Bay MUD and Contra Costa WD are limited by available pumping capacity at the Freeport intake and Contra Costa WD's Delta intakes ... " Water diverted at Freeport does not traverse the delta and does not contribute to south delta water quality or net delta outflows.

Response

This section discusses transfer quantities and does not indicate that water diverted at Freeport would enter the Delta.

Comment LA12-98

Comment

Pg 2-34, 2.3.2.7, - "Buyers and sellers may negotiate transfers that last one year or multiple years." The project could result in some land being idled for 10 years straight. This could lead to land use designation changes fostering development or protected habitat. The possible long term impacts should be further analyzed.

Response

Under all proposed alternatives, water transfers would not occur every year. Buyers would only seek water transfers in dry and critical years and in many years, capacity would not be available at the pumps to export water through the Delta. Figure 2-10 shows that in 65 percent of the years, there would be no capacity at the pumps to convey transfer water. Further, cropland idling is the lowest priority transfer method under the Proposed Action and Alternative 3 and buyers would not purchase water from cropland idling in all years that transfers occur. Alternative 4, which includes more frequent cropland idling transfers, includes a mitigation measure to avoid the same land from being consecutively idled.

Comment LA12-99

Comment

Pg 2-39, 2.5, - "While the alternatives would affect different resources in different ways, none of the alternatives are considered to be the environmentally superior alternative. There are no unavoidable significant impacts associated with the Proposed Action that would otherwise be avoided or substantially reduced by an alternative, and each of the alternatives has its own unique set of environmental impacts which, on balance, would be a "trade-off" of environmental impacts in selecting any one alternative over another." A number of significant impacts have been ignored and missed by the EIS/R analysis. The Proposed Action (Alternative 2) is not the environmentally superior alternative. 2.5, provides "Alternative 4 would reduce effects to groundwater levels, quality, and land subsidence." Any land subsidence from groundwater substitution is a significant impact. Alternative 2 includes groundwater substitution and land subsidence impacts, so alternative 4 is clearly environmentally superior.

Response

The commenter’s assertion that the environmental analysis ignored or missed any potentially significant impact of the range of potential transfer activities evaluated under the Proposed Action is unsubstantiated. The commenter’s opinion that Alternative 4 is environmentally superior is noted and will be conveyed to the decision makers for their consideration. Response to Comment NG03-139 further discusses the environmentally superior alternative.

Comment LA12-100

Comment

Pg 2-39, 2.5 - The project should have separated crop idling from crop switching in an alternative as they have very different impacts and operational requirements. Crop switch was proposed and screened as a separate conservation measure from crop idling. If crop switching were made a standalone alternative along with other conservation measures such as irrigation canal lining and leak repair, irrigation system water distribution uniformity and water efficiency improvements and irrigation scheduling water use efficiency improvements, there would have been an alternative which yielded real water for transfer, was flexible and immediate to implement. This combination of measures in an alternative would have yielded substantial water supplies with fewer environmental impacts of the other alternatives.

Response

Crop shifting and conservation are transfer methods included in the Proposed Action. These elements do not provide enough water to meet buyers' needs to be a stand-alone alternative. The transfer quantities were determined with sellers, which did not indicate a substantial amount of water available to transfer from crop shifting or conservation.

Comment LA12-101

Comment

Pg 2-40, Table 2-9, 3.2 - "Cropland idling transfers could result in increased deposition of sediment on water bodies." Some soils carry contaminants with them. This sediment deposition degrades water quality and beneficial uses. Any degradation of beneficial uses is significant for compliance with the Central Valley Regional Water Quality Control Board Basin Plan.

Response

The referenced section is a summary of the impact further described in Section 3.2.2.4. The more detailed analysis indicates that clay soil textures in counties in the seller service area reduce the likelihood of significant erosion.

Comment LA12-102

Comment

Pg 2-40, Table 2-9, 3.2 - "Cropland idling/shifting transfers could change the water quality constituents associated with leaching and runoff." The EIS/R consistently lumps the description of effects of these two very different actions together. These are separate, mutually exclusive actions to implement a piece of ground and they have very different impacts in type and magnitude. The EIS/R must separate the analysis of these two actions and disclose and mitigate their impacts separately. As an example, crop shifting would have very little erosional deposition in tributaries while crop idling may precipitate large and significant soil deposition and contamination to waterways.

Response

Additional discussion of the impacts regarding cropland idling and cropland shifting are provided in Section 3.2, where they are analyzed in separate discussions.

Comment LA12-103

Comment

Pg 2-40, Table 2-9, 3.2 - "Cropland idling/shifting transfers could change the quantity of organic carbon in waterways." Again, the impacts of these two separate and different project actions have been lumped together to obscure the impacts of each-they are not the same.

Response

See response to Comment LA12-102.

Comment LA12-104

Comment

Pg 2-40, Table 2-9, 3.3 - "Groundwater substitution transfers could cause a reduction in groundwater levels in the Seller Service Area." and "Groundwater substitution transfers could cause subsidence in the Seller Service Area." Both were determined by the EIS/R to be a significant impact. The mitigation proposed by the EIS/R is to monitor the groundwater levels and subsidence. Monitoring something does not mitigate the impact of a project, only positive action like having a specific decision threshold for ceasing groundwater pumping activities would be a mitigation. There also needs to be a mitigation plan if groundwater levels do not recover or subsidence occurs even after cessation of groundwater pumping.

Response

Table 2-9 summarizes the potential impacts and mitigation measures for the action alternatives. Mitigation Measure GW-1 is described in more detail in Section 3.3.4.1. See Common Responses 6 and 7 for additional information.

Comment LA12-105

Comment

Pg 2-45, Table 2-9, 3.9 - "Cropland idling water transfers could permanently or substantially decrease the amount of lands categorized as Prime Farmland, Farmland of Statewide Importance, or Unique Farmland under the FMMP ." The EIS/R identifies the alternative 4 impact as significant and alternative 2 as LTS. Although alternative 2 includes groundwater substitution, there is no description in the alternatives which prohibits just as much crop idling in alternative 2 as in alternative 4 so both impacts are significant. If alternative 4 results in 177,000 acres of land being fallowed and alternative 2, because it includes groundwater substitution idles only 100,000 acres, the impact of alternative 2 is still significant even though it is less than alternative 4.

Response

Section 3.9 describes these impacts in more detail. While the upper limit for both alternatives is the same (about 177,000 acre-feet of water, not 177,000 acres of land idled), the frequency at which the transfers would be made would differ. Alternative 2 includes groundwater substitution transfers, which would likely be purchased more frequently because of the flexibility to start transfers in July instead of April (when the water cannot be conveyed through the Delta). Therefore, cropland idling transfers would be less frequent compared to Alternative 4, which includes fewer other options for transfers.

Comment LA12-106

Comment

Pg 2-45, Table 2-9, 3.9 - "Cropland idling water transfers could convert agricultural lands under the Williamson Act and other land resource programs to an incompatible use." There is no support for the LTS impact call when 177,000 acres of crops could be idled and nothing in the project precludes the same land being idled for all 10 years of the program? 10 years of crop idling and using the property for nonagricultural purposes is in direct conflict with the requirements of the Williamson Act. As the Proposed Project and alternatives are defined, the maximum impact to Williamson Act lands is 177,000 acres of crop idling on the same land for 10 years. This is a significant impact that must be mitigated and disclosed.

Response

The maximum annual acreage proposed for idling under the Proposed Action and Alternative 4, the two alternatives that include cropland idling transfers, is 59,973 acres. 177,000 acres would not be idled annually under any proposed alternative. Under all proposed alternatives, water transfers would not occur every year. Buyers would only seek water transfers in dry and critical years, and in many years capacity would not be available at the pumps to export water through the Delta. Figure 2-10 shows that in 65 percent of the years, there would be no capacity at the pumps to convey transfer water. Further, cropland idling is the lowest priority transfer method under the Proposed Action and buyers would not purchase water from cropland idling in all years that transfers occur. Alternative 4, which includes more frequent cropland idling transfers, includes a mitigation measure to avoid the same land from being consecutively idled. Impacts to land enrolled in the Williamson Act are evaluated in Section 3.9.

Comment LA12-107

Comment

Pg B-8, B.4.3.1.2 - "Transfer Operations and Priorities TOM uses an assumed priority for transfer mechanisms used to make water available under Project alternatives." This assumption is a fundamental flaw in the analysis of the impacts of the project. The alternatives clearly say that the sellers can transfer up to a limit amount. The project does not define in what priority or sequence those different sources for water for transfer would be implemented under the project. Operational problems with reservoirs or differences in snowpack in different basins could alter the sequence of implementation of the water transfer sources. As an example, if alfalfa prices were to go to levels that were unprofitable, many growers would first offer to switch to another crop and sell that water to the program. Although there is some rationale provided for the assumption used, the project may very well not operate that way at all in reality. The project must not be approved for operations that deviate from the assumptions used in the project analysis of impacts, otherwise the project has been permitted for impacts that were never analyzed mitigated or disclosed.

Response

The environmental analysis covered a range of transfer mechanisms and options for implementation. The analysis included conservative assumptions that attempted to analyze the maximum volume and frequency of transfers. Priorities regarding which transfer mechanisms would be used were assumed for the hydraulic modeling, but most resource analyses considered the full quantity of water that could be made available. The impacts of different priorities, or of greater or lesser use of certain mechanisms, were addressed under the different alternatives. Alternative 2 analyzed an upper boundary for total transfers by considering all potential mechanisms. Alternative 4 considered potential increases in crop idling that may occur if there were no groundwater substitution. The potential water made available and the environmental impacts of crop shifting are expected to be less than for crop idling, and are therefore covered under the analysis of crop idling transfers.

Comment LA12-108

Comment

Pg B-8, B.4.3.1.2, pl - "TOM simulates the four transfer mechanisms in the following order:

- Groundwater substitution - for alternatives that include this mechanism
- Reservoir release
- Conserved water
- Crop idling - for alternatives that include this mechanism"

The TOM assumptions do not include crop shifting so the model assumptions were incomplete and incorrect to reflect the actions that were included in the alternatives.

Response

Crop shifting makes water available on a monthly pattern based on the difference in evapotranspiration of applied water (ETAW) between the original crop and the shifted crop. The water would be made available and stored in upstream reservoirs for transfer in future months, when possible, or transferred directly from the point of non-diversion to the point of re-diversion under the transfer in the month it is made available. Each of these potential options was analyzed for crop idling transfers. Therefore, the effects of crop shifting on water operations are similar, but of lesser magnitude, than those associated with crop idling.

Comment LA12-109

Comment

Pg B-9, Figure B-4 - The project is only using a 33 year period of record for hydrologic conditions. This truncated hydrologic period skews the impact analysis and fails to use the best available science of the readily available and industry standard utilized 83+ year period of record. The EIS/R must be revised using the best available science as NEPA and CEQA requires.

Response

See Common Response 5.

Comment LA12-110

Comment

Pg B-9, B.4.3.1.2, - "Groundwater substitution transfers from the Sacramento Valley have the potential to create changes in stream-aquifer interaction that affect other parts of the water delivery system." Each tributary reach has unique surface and groundwater interactions. The EIS/R fails to disclose what the modeling assumptions were for the geographic distribution of the estimated groundwater transfers. If the groundwater is drawn from primarily adjacent to a single or limited set of tributaries then the groundwater surface water interactions and impacts would be more severe and focused. It appears the analysis assumed an even distribution of the estimated (with unsound rationale) amount of groundwater substitution across the whole north of Delta seller area. This error in modeling assumption causes the analysis to conclude much lower impacts that would occur within the range of operations the proposed project and alternatives.

Response

The analysis did not assume "an even distribution of the estimated amount of groundwater substitution;" rather, the analysis evaluated transfer volumes and pumping from individual sellers based on information provided by those sellers, demands for transfer water, and capacity to convey transfer water from seller to buyer. Table 2-5 in the 2014 Draft EIS/EIR is a summary of the maximum volume of transfers analyzed, including groundwater substitution transfers, and it provides some information on the geographical distribution of pumping analyzed. Based on this distribution of transfer pumping, the analysis was conducted using the best available tools to estimate the resulting effects on streams.

Comment LA12-111

Comment

Pg B-11, B.4.3.1.2 - "Changes in Delta inflow affect the CVP and SWP differently based on system conditions at the time and COA accounting." This is why we said in an earlier comment that the COA being out of date was a problem for this project that had to be addressed by updating the COA.

Response

The analysis assumed and modeled the current Coordinated Operating Agreement (COA) and operations of the CVP and SWP. Renegotiation of the COA is beyond the scope of this project.

Comment LA12-112

Comment

Pg B-15, B.4.3.1.5, - "Annual volumes were assumed to be made available on a monthly pattern based on the ETAW of rice, the assumed crop to be idled." This is a flawed assumption which leads to underestimating the impacts of the proposed project and alternatives. Rice has the highest ETAW at 3.3AF per acre of any of the crops proposed for idling. This assumption is in conflict with the reality of the program which would have a mix of idled crops with different and lower ET AW water consumption rates. This flawed analysis assumption will either lead to the project estimating that less number of acres will be fallowed to accomplish a given target amount of water for transfer or less water being made available for transfer with a given number of acres idled. Either way, the analysis assumption under-estimates the impacts of the project and the analysis must be revised and recirculated once this material analytical error is corrected.

Response

The monthly pattern was used for modeling purposes and reflects the most water that could be transferred because rice has the highest ETAW of the crops eligible for idling. Any other crop idled would provide less water for transfer for rice, and the changes to flows and storage would be less than what was modeled. There are limits to the amount of non-rice crops that can be idled, so more non-rice crops cannot be idled to reach a target amount of water. The modeling shows a maximum transfer scenario that results in the greatest effects, as is common when models are used to evaluate impacts.

Comment LA12-113

Comment

Pg B-16, B.4.3.1.5, p4 - "Crop idling transfers offer the least flexibility of all transfer mechanisms. The decision to enter into crop idling transfers is typically made in spring months when there is still considerable uncertainty in the water supply forecast and the ability to convey water through the Delta." This is not true. In most years when water transfers are most desired are in years after the first year of a Dry or Critically Dry water year. In those cases when reservoir storage is down, although the exact amount of water allocation may not be announced until the spring, all of the buyers already know that they want to buy water. Each of the water transfer water sources suffer the same limitations on knowing the delta conditions ahead of time and their ability to convey water through the delta. This misperception on the part of the project in terms of the relative desirability of the water sources in the sequence in which water sources would be implemented in the project is flawed. In order to be conservative in identifying the types and magnitude of impacts from the proposed project, the EIS/R should have analyzed the range of actions that it desired to be permitted, not an undefined, unjustified and flawed rationale for generally how the program may or may not be implemented. In order to correct these flawed assumptions and allow a full range of operations as proposed by the project, the analysis needs to do a sensitivity analysis of doing the maximum amount of each water transfer type and in combination with other types. Only then will the potential impacts of the project be disclosed and properly mitigated.

Response

The reduced flexibility in the citation refers to the fact that growers must decide before the planting season whether or not to participate in a cropland idling water transfer, and buyers must commit to purchasing the water months before the July through September transfer period when hydrologic conditions and Delta pumping capacity are better understood. This is less flexible relative to groundwater substitution transfers, where growers are still planting a crop and can switch to groundwater supplies for the transfer during the July through September period. This is also less flexible than reservoir release transfers, where reservoir releases can be controlled for the transfer period.

Comment LA12-114

Comment

Pg B-16, B.4.3.1.5, - "Crop idling transfers make water available on the fixed schedule illustrated in Figure B-10. Therefore, transfer water made available in May and June, a total of 37 percent of the annual volume, can be lost or not diverted ... " Some rice is not planted until the first of June, so the potential transfer loss in those cases is only 22% rather than the 37% as claimed in the EIS/R.

Response

Planting times can vary based on farming conditions and some planting may occur in June; however, most rice is planted in May in the seller service area. The ETAW pattern was confirmed with the sellers.

Comment LA12-115

Comment

Pg B-17, B.4.3.1.6, - "Analysis of the baseline CalSim II simulation of CVP and SWP operations was performed to identify potential opportunities to store both groundwater substitution and crop idling transfer water made available from April through June in upstream CVP and SWP reservoirs." Again, the analysis did not include the assumption of water transfer volumes from crop switching.

Response

Crop shifting makes water available on a monthly pattern based on the difference in evapotranspiration of applied water (ETAW) between the original crop and the shifted crop. The water would be made available and stored in upstream reservoirs for transfer in future months when possible, or transferred directly from the point of non-diversion to the point of re-diversion under the transfer in the month it is made available. Each of these potential options was analyzed for crop idling transfers. Therefore, the effects of crop shifting on water operations are similar, but of lesser magnitude, than those associated with crop idling.

Comment LA12-116

Comment

Pg B-17, B.4.3.1.7, - "TOM simulates shifts in timing of Project water movement at SWP facilities by adjusting baseline Oroville releases and Banks pumping from July through September of some years. Logic in TOM adjusts Oroville releases and Banks pumping to create a more regular monthly pattern of available export capacity." The EIS/R stated that only Reclamation facilities and water transfers would be covered under this document and that any SWP operations in conjunction with this project would be subject to prior DWR approval and a separate environmental document. This analytical assumption seems to belie that EIS/R statement as the modeling assumptions clearly are counting on SWP operations to facilitate the water transfers covered under this environmental document. The EIS/R modeling assumptions must remove the assumption that SWP operations will be altered to facilitate these CVP water transfer operations.

Response

The EIS/EIR identifies in multiple places (pages 1-1, 1-2, 1-18, and 2-9, among others) that the transfers analyzed in this EIS/EIR could be conveyed using CVP or SWP facilities; conveyance of this water through SWP facilities is analyzed in this EIS/EIR. This EIS/EIR does not analyze transfers to SWP contractors; in other words, the buyers listed in Table 2-6 are only CVP contractors. See response to Comment LA12-57 regarding SWP contractors as sellers.

Comment LA12-117

Comment

Pg B-17, B.4.3.1.8.1, - "East Bay MUD diverts both CVP Project water and transfer water at the Freeport Regional Water Project on the Sacramento River near Freeport." The 'water transferred by East Bay MUD through the CVP facilities is covered by the OCAP BOs water transfer provisions. The Freeport Regional Water Project facility is not part of the SWP or CVP that is covered under the OCAP BOs and therefore the ESA species impacts of transferring water through these facilities is not covered by an incidental take permit and must seek ESA consultation prior to implementation.

Response

The comment states that "[t]he Freeport Water Project facility is not part of the SWP or CVP that is covered under the OCAP BOs," and suggests that the associated incidental take permits do not apply to the facility. That statement is not accurate. The Freeport Regional Water Project (FRWP) was included in the actions within the scope of the biological opinions on the Long-Term Coordinated Operations of the CVP and SWP, and the terms therein apply to water diversions that utilize the FRWP, as appropriate. Further, USFWS and NOAA Fisheries issued biological opinions specific to the FRWP, and those opinions incorporate and apply the biological opinions on the Long-Term Coordinated Operations of the CVP and SWP to the FRWP. Among other things, the incidental take statements in both of those FRWP-specific biological opinions address take of listed species that could occur as a result of FRWP operation. See USFWS and NOAA Fisheries biological opinions for the Freeport Regional Water Project, issued December 2004.

Comment LA12-118

Comment

Pg B-18, B.4.3.1.8.2, pl - "Contra Costa WD diverts water under existing water rights, a CVP water service contract, and transfer water from multiple points of diversion in the Delta." The CCWD facilities are not part of the SWP or CVP that is covered under the OCAP BOs and therefore the ESA species impacts of transferring water through these facilities is not covered by an incidental take permit and must seek ESA consultation prior to implementation.

Response

ESA consultation was performed for Contra Costa WD's diversion facilities in association with the Los Vaqueros Reservoir Expansion, Alternate Intake Project, and other projects constructed and operated by Contra Costa WD. Contra Costa WD has consulted with USFWS, NOAA Fisheries, and CDFW and has received the necessary biological opinions and incidental take permits for the operation of its facilities.

Comment LA12-119

Comment

Pg B-18, B.4.3.1.8.2 (this was a document numbering error, it should have been B.4.3.1.8.3),

p 1 - "Transfer water purchased by SLDMWA is conveyed through available export capacity at Jones and Banks pumping plants. Transfers from the Sacramento River assume a 20 percent carriage water adjustment to maintain Delta salinity. Transfers from Merced ID that enter the Delta from the San Joaquin River assume a ten percent carriage water adjustment." The EIS/R must disclose the basis and justification for these carriage water assumptions. Under some conditions, the carriage water requirements to maintain delta water quality would have to be much higher, e.g. 30 or 40%.

Response

This assumption is based on discussions with Central Valley Project Operations. An assumption for carriage water is necessary for analysis and initial planning for transfers. However, the actual method for determining carriage water costs is significantly more complex and involves real-time monitoring, actual conditions, post-transfer modeling, and analyses. The process for calculating carriage water for actual transfers through the CVP/SWP export facilities would be similar to what has occurred in the past and may require a higher or potentially lower percentage than the 20 percent used in the analysis.

Comment LA12-120

Comment

Pg B-18, B.4.3.1.8.2 (this was a document numbering error, it should have been B.4.3.1.8.3), p2 - "Additionally, water made available by Merced ID can be conveyed directly to SLDMWA member agencies through facilities that connect to Merced ID's internal conveyance system and facilities that join the lower San Joaquin River and the DMC without going through CVP/SWP export facilities." These facilities and operations are not covered under the OCAP BO operations or water transfer assumptions so these operations must seek separate ESA consultation with the fisheries agencies prior to implementation.

Response

See response to Comment LA12-91.

Comment LA12-121

Comment

Pg B-18, B.4.4 - The EIS/R must disclose its assumptions as to what projects they included as reasonably foreseeable. If they are elsewhere in the document, the mention of these assumptions should have included a reference as to what section that content could be found. In general this EIS/R is very poor at making the document reader friendly.

Response

The assumptions included in the water operations analysis, including those that are reasonably foreseeable and affect CVP/SWP operations, are included in Appendix C starting on page C-66.

Comment LA12-122

Comment

Pg B-20, B.6.1, - " ... they would need to complete individual NEPA and Endangered Species Act compliance for each transfer ... " Buyers and sellers will need to complete ESA consultations anyway as the OCAP BOs only cover SWP and CVP water transfer activity and specifically exclude coverage of buyer and seller area impacts.

Response

Reclamation is consulting with USFWS on the Proposed Action and has submitted a Biological Assessment to USFWS on Long-Term Water Transfers for Section 7 consultation. In the buyer service area, the use of transfer water would be within the range of existing activities of each CVP contract and associated BO.

Comment LA12-123

Comment

Pg B-20, B.6.2, - "Alternative 2 includes transfers under all potential transfer measures: groundwater substitution, reservoir release, conserved water, and crop idling." . Again, the assumptions leave out crop switching which has very different modeling implications to water use, savings and conveyance than crop idling. The current EIS/R modeling assumptions do not reflect all of the actions included in alternative 2 and the analysis must either be redone with the corrected assumptions or the description of and actions included in alternative 2 must drop crop switching as a component.

Response

Crop shifting was added to the text. Cropland idling was modeled because it represents the largest potential impact to the resources that could occur under Alternative 2. Chapter 3 discusses impacts of crop shifting on the environmental resources in addition to cropland idling.

Comment LA12-124

Comment

Pg B-23, Figure B-14 and Pg B-28, B-24 - The EIS/R stated that only Reclamation facilities and water transfers would be covered under this document and that any SWP operations in conjunction with this project would be subject to prior DWR approval and a separate environmental document. This analytical assumption seems to belie that EIS/R statement as the modeling assumptions clearly are counting on SWP operations to facilitate the water transfers covered under this environmental document. The EIS/R modeling assumptions must remove the assumption that SWP operations will be altered to facilitate these CVP water transfer operations.

Response

See response to Comment LA12-116.

Comment LA12-125

Comment

Pg B-29, Figure B-27 -This figure demonstrates the point regarding project impacts on proportional flows at tributary confluences on salmonid homing and straying. The information to conduct the analysis of project impacts on straying is clearly available and yet the EIS/R did not conduct that analysis, disclose the impacts or mitigate the impacts.

Response

See response to Comment LA12-185.

Comment LA12-126

Comment

Pg B-66, Appendix B, attachment 1-The2005 level of development should not have been used in that the rest of the modeling updates were current up to January 2014. This out of date level of development assumption biased the analysis results as the 2014 level of demand is higher than it was in 2005.

Response

See Common Response 5. Additionally, the model described in Appendix C as being received from Reclamation in January 2014 included demands at a future level of development, approximating forecasted demands in the Sacramento Valley at a 2030 level of development. No CalSim II model includes demands at a 2014 level of development.

Comment LA12-127

Comment

Pg B-66, Appendix B, attachment 1 -The Baseline Assumptions did not include implementation of the existing OCAP BO RPA requirements for restoration of subtidal and intertidal habitat and floodplain habitat. The subtidal and intertidal habitats have tidal exchange impacts to delta water quality and CVP/SWP operations that must be included in the modeling assumptions. These are reasonably foreseeable as they are current legal obligations of the CVP and SWP that are required to be implemented prior to 2015. Since the implementation deadline is so close, the location, design and operational characteristics must be thoroughly defined by now or DWR and Reclamation will not be compliant with the BO requirements. The floodplain habitat restoration results in altered water quality and water consumption from evapotranspiration and changes in the tidal prism that must be accounted for in the modeling and impact analysis. The modeling assumptions must be revised and the analysis rerun to reflect these current legal obligations of the CVP and SWP under the OCAP BOs.

Response

See response to Comment LA12-46.

Comment LA12-128

Comment

Table C-17, pl - "Although D-1641 specifies 14-day durations for mean daily chloride concentration, since most DSM2 boundary conditions are specified as monthly values, it is not sensible to account for this constraint herein." DSM2 reports data on 15 minute time increments, so the data from DSM2 is readily available to do the analysis to determine the frequency, duration and magnitude of exceedances of this water quality parameter as defined and required by D-1641. The EIS/R must use the best available science and this readily available DSM2 data to complete this study. The failure to use the best available is unsupportable. The quantity of data available from DSM2 is why this data is always presented as exceedance graphs to show the frequency, duration and magnitude of water quality exceedances. Monthly averages of this data mean nothing and are obviously designed by the project to obscure the impacts of the project. The EIS/R must be revised to include exceedance plots of the full time series of data that is available from DSM2. This comment applies to all water quality evaluations done from DSM2 data.

Response

While it is possible to output information from DSM2 on a finer time step, the quality of the output would be questionable at that scale. The input information coming from CalSim was at a monthly time step.

The water quality analysis in the EIS/EIR is comparing the action alternatives to the existing conditions (under CEQA) and the No Action Alternative (under NEPA) to determine if changes could affect environmental resources. The modeling output indicates that changes would be very minor and would not significantly affect Delta water quality.

Comment LA12-129

Comment

C.9 - p2 - "1. the daily minimum stage was calculated for all the Base and three Alternative from the 15-minute model output ; 2. daily change from Base stage was calculated (Daily Alternative Min Stage - Daily Base Min Stage) 3. monthly average stage was calculated from the results at step 2." So the analysis took two daily time step data sources and decided to water it down to a nice monthly average that is designed to hide all but extraordinary catastrophic impacts.

Dewatering an ag intake does not have impacts on a monthly basis, it is an impact that occurs on a day by day basis. With the current analysis, the intakes could be dewatered by 6" for 20 of the 30 days of a month and then covered by l' of water for the last 10 days and still show no impact. This analysis and any other used in the EIS/R that used daily source data and analyzed it at a monthly average for the impact assessment must be revised to reflect a best available science use of the full potential of the data sets for a daily impact analysis.

Response

This comment is based on an overly simplified understanding of how the CALSIM boundary conditions are applied. While it is true that DSM2 reads in daily time series for the Sacramento and San Joaquin River inflows, it is not correct to say that the fluctuations in these DSM2 time series are can be considered as daily flows in any practical sense. DSM2 reads in a daily time series that is based on CALSIM monthly modeling results; therefore, the DSM2 flows do not have an adequate level of detail to analyze the results at a daily level. DSM2 in this context is most appropriately viewed as a monthly model in terms of how the comparisons between Alternatives and the existing conditions are made.

The DSM2 model results were intended to compare the action alternatives to the baseline, so determining changes on an average basis provides information about whether the alternatives could affect environmental resources. The changes driven by the action alternatives would apply to the water levels throughout the day (as the water levels increase and decrease based on tides). Appendix E water level information has been clarified to show water level increases as well as water level decreases for a more complete set of data.

Comment LA12-130

Comment

C-48, p4-The Proposed Project" ... alternative sees the largest increases in EC when exports are the greatest, with Critical water years in July seeing the largest percent difference of 4.2% at the SWP location and 3.3 % at the CVP location." This is a very significant impact as the SWP and CVP are constantly in violation of these water quality parameters in Critical water years already. For the proposed project to make that violation worse by over 4% is a very significant impact that must be mitigated.

Response

The following sentences in Appendix E indicated that D-1641 criteria were met at the times of these differences. The alternatives under this project are not expected to directly increase the occurrence of D-1641 salinity violations.

Comment LA12-131

Comment

D.3.6, pl - "The distribution of aquifer properties across the Sacramento Valley is poorly understood. In certain areas with significant levels of groundwater production, the collection of aquifer test data and the measurement of historical groundwater-level trends in response to known groundwater production rates have provided valuable information on aquifer properties. However, in the majority of the valley, these data are not available." Yes, this may be true, but it also invalidates the use of modeling for predicting groundwater and surface water interactions. This model is not generally accepted for these types of analyses and its use for this kind of document and analysis in this geographic area is unprecedented. Peer review and supporting acceptable calibration is not apparent.

Response

SACFEM has undergone an extensive independent peer review performed by an independent consultant with extensive experience in the application of groundwater models to evaluate groundwater systems and surface water-groundwater interaction (WRIME 2011). The objective of the peer review was to evaluate the adequacy of the model to estimate the impacts of groundwater substitution water transfer pumping on third party groundwater users as well as impacts to surface water flows. The results of the peer review identified seven primary enhancements to the model that would improve its accuracy in forecasting pumping impacts on water resources in the Sacramento Valley. All seven of these enhancements have been incorporated into SACFEM2013, the most recent version of SACFEM. Appendix D also includes information on sensitivity studies on the aquifer properties in SACFEM 2013. See also Common Responses 4 and 5 for additional discussion related to existing hydrologic conditions of the Sacramento Valley and to hydrologic modeling completed for the EIS/EIR, respectively.

Comment LA12-132

Comment

Appendix D - The documentation fails to disclose the assumptions used in the model of how the groundwater substitution was geographically distributed or that the model used actual well locations that would be used under the Proposed Project and alternatives. Based on the very generalized description of the data, we conclude that the model used an assumption of an average groundwater source usage distributed evenly across the seller areas. This assumption of course would have no relationship to reality or the impacts that would occur with implementing the project within the boundaries of how it was described. The generalized assumption of distributed groundwater well locations and demand would vastly underestimate the localized groundwater and surface water interaction impacts from the project that would be implemented such that those impacts were not uniformly distributed. The groundwater analysis in the EIS/R must be redone using an accepted model, with specific well locations and water demands.

Response

The modeling effort did not assume an even distribution of groundwater pumping. Appendix C includes a description of which agencies were assumed to sell water during each year of the modeling effort, and it has been updated to show the quantities included in each year. The groundwater modeling effort used well information provided by the sellers (including well location, depth, size, and screened interval) to determine where the pumping would occur in each selling agency area.

A more detailed user's manual for the SACFEM2013 model has been added as Appendix H.

The most recent documentation for the MicroFEM code can be found on the developer's web site: http://www.microfem.com/

Comment LA12-133

Comment

Figure D-4 -There are almost no well data points to characterize the hydraulic conductivity of the aquifer in the Feather River basin in which many seller areas were identified. These areas have almost no data to support the model analysis which render the results unreliable.

Response

Fewer hydraulic conductivity estimates being available in a given subarea does not mean that model forecasts associated with that subarea are unreliable. The technical experts on the model development team used available data regarding aquifer properties across the valley. Although the number of locations in the Feather River Basin at which hydraulic conductivity has been estimated with field data is limited, the modeled aquifer hydraulic properties and associated forecasts in that area are reasonable, in the professional judgment of the experts who prepared the analysis.

Comment LA12-134

Comment

The EIS/R No Action/Project assumptions were not consistent with the BDCP EIR/S and Reclamation Remand EIS. Since Reclamation is a lead agency for all of these projects and they are all on the CVP operations and they all occur over the same time period, it is an inexcusable inconsistency and bias in the outcomes of the analysis to have different baseline assumptions. Since the other documents have undergone public review already, this project's No Action/No Project assumptions must be revised to be consistent with these other documents, reanalyzed and revised, and then recirculated for public comment.

Response

The BDCP and Remand environmental documents describe efforts that would be in effect for a much longer period than the range of potential water transfers analyzed in this EIS/EIR, which would only take place for 10 years. Because the No Action/No Project Alternatives reflect different planning horizons, it makes sense that they include different assumptions about the conditions that exist at those times.

Comment LA12-135

Comment

The geographic area included in the EIS/R impact assessment fails to include areas and tributaries downstream of drainage from water transfer recipient service areas. Transferred water will be applied to buyer areas and some of that water will result in runoff that will be carried downstream of those service areas. Those water transfer runoffs will alter flows and water quality in those downstream tributaries. Some of those downstream tributaries that should have been included in the EIS/R analysis, but were not, include (but are not limited to): San Joaquin River, Coyote Creek, Liaghs Creek, Pescadero Creek, Uva Creek, Stevens Creek, Berryessa

Creek, Alameda Creek, Tassajara Creek, Walnut Creek, Marsh Creek, Kellog Creek, Lone Tree Creek, Hospital Creek, Corral Hallow Creek, Ingram Creek, Salido Creek, Crow Creek, Orestimba Creek, Garzas Creek, Quinto Creek, Romero Creek, Los Banos Creek and others. The San Joaquin River and several of these creeks are documented habitat for ESA species salmonids and therefore the lack of analysis of these ESA species impacts in the EIS/R is a particularly egregious omission.

Response

Analysis of potential runoff to the San Joaquin River is included in Section 3.2. Creeks in the San Francisco Bay region are in areas where transfer water would meet municipal and industrial uses; therefore, it would be treated before distribution and would not likely result in increased runoff to local creeks. The creeks in the San Joaquin Valley (other than the San Joaquin River) are very small and primarily ephemeral. During the irrigation period, these creeks are generally dry or contain agricultural runoff. The contribution from water transfers to these creeks through runoff would be negligible and the concept for this type of impact is captured in the analysis for the Buyer Service Area.

Comment LA12-136

Comment

The geographic area included in the EIS/R impact assessment fails to include areas from the reservoirs involved in the project to the upstream first impassable fish barrier. Fluctuations of the reservoirs from project releases affect the ability for reservoir fish to forage and spawn in the upstream tributaries. The project operations reduce reservoir cold and warm water fisheries access and use of these upstream habitats from exposing sediment wedges in the tributaries at the interface with the reservoir and increasing the frequency and duration of impassable conditions for fish. Cold and warm water fisheries are designated beneficial uses of water in the CV Basin Plan and therefore must be evaluated in a revised EIS/R.

Response

Changes in reservoir levels could have effects within the reservoir, but would not affect flows upstream of the reservoir. These potential effects to fisheries within these reservoirs are assessed in the Fisheries Resources analysis (Section 3.7).

Comment LA12-137

Comment

Both seller and buyer service areas are in unconfined groundwater basins. The impact area of groundwater resources, surface water interactions with groundwater, and fisheries and wildlife resources in the adjacent groundwater basins connected to these seller and buyer service areas must also be fully analyzed in the EIS/R. As the EIS/R stands, these extended impact areas in the interconnected groundwater basins are not identified, characterized, evaluated, quantified, mitigated or disclosed. This serious omission in the extent of the geographic area of impact from the project must be corrected in the revised EIS/R.

Response

The Sacramento Valley Groundwater Basin includes portions of Butte, Colusa, Glenn, Placer, Sacramento, Sutter, Solano, Tehama, Yuba, and Yolo counties. The Sacramento Valley Groundwater Basin is bordered by the Red Bluff Arch to the north, the Coast Range to the west, the Sierra Nevada to the east, and the San Joaquin Valley to the south. Bulletin 118 further divides the Sacramento Valley Groundwater Basin into subbasins (DWR 2003). Figure 3.3-5 shows the Sacramento Valley Groundwater Basin and subbasins. The modeling conducted for the analysis documented in Section 3.3, Appendix E, and Appendix D uses the SACFEM2013 groundwater model. The SACFEM2013 model simulates groundwater conditions throughout the entire Sacramento Valley groundwater basin, including all the subbasins in the valley.

Comment LA12-138

Comment

The EIR must use a full range of significance criteria which are consistent with Reclamation's use in other similar environmental documents. These similar environmental documents from which Reclamation should use the significance criteria include: Remand EIS, Shasta Enlargement, Sacramento Valley Water Management Plan (AKA Phase 8), CALFED, and BDCP. For this project to use anything less than the synthesis of the significance criteria from these recent and similar projects with Reclamation as the lead agency would be an inconsistent application of policy, procedure and science. The EIS/R impact analysis must be revised to address them missing impact criteria and thresholds. The revised EIS/R must be recirculated after addition of this material new information.

Response

The significance criteria in the EIS/EIR are generally based on the examples in CEQA Appendix G. Appendix G recognizes that significance criteria may vary from project to project based on the applicable circumstances and begins with this note: "The following is a sample form and may be tailored to satisfy individual agencies' needs and project circumstances."

Comment LA12-139

Comment

ESA Incidental Take Permit - Impacts from the selling and receiving water service areas are not covered by the OCAP BOs. They will require separate section 7 consultation (BA and BO). NMFS OCAP BO, pg729, p3 - " ... this consultation does not address ESA section 7(a)(2) compliance for individual water supply contracts. Reclamation and DWR should consult with NMFS separately on their issuance of individual water supply contracts, including analysis of the effects of reduced water quality from agricultural and municipal return flows, contaminants, pesticides, altered aquatic ecosystems leading to the proliferation of nonnative introduced species (i.e., warm-water species), or the facilities or activities of parties to agreements with the U.S. that recognize a previous vested water right." The water transfers ESA species impacts in the seller and buyer service areas are not covered under the FWS or NMFS OCAP BOs and therefore a separate section 7 or 10 consultation for the water transfers for the seller and buyer service areas must be conducted and approved prior to the water transfers.

Response

Reclamation is consulting with USFWS on the Proposed Action and has submitted a Biological Assessment to USFWS on Long-Term Water Transfers for Section 7 consultation. In the buyer service area, the use of transfer water would be within the range of existing activities of each CVP contract and associated biological opinion. The text cited in this comment from the NOAA Fisheries biological opinion on the Long-Term Coordinated Operations of the CVP and SWP refers to individual water service contracts; water transfers are included in the consultation.

Comment LA12-140

Comment

Reclamation and DWR have not implemented the OCAP BO RPAs, so the CVP and SWP are not compliant with the terms of their current Incidental Take Permits (ITP). NMFS specifically provides in the OCAP BO that if the agencies are not compliant with the terms of the OCAP BO RPAs that they will rescind their ITP. Since DWR and Reclamation are not compliant with the OCAP BO RPAs (see related comments), NMFS must rescind Reclamation and DWRs ITP and reinitiate ESA re-consultation. FWS and NMFS cannot approve the permits for the proposed water transfers until OCAP BO compliance is achieved.

Response

See response to Comment LA12-50.

Comment LA12-141

Comment

The project will require a 401 Clean Water Act certification to address all types of discharges that occur under the proposed project and alternatives. These discharges by the project which must be permitted include (but are not limited to): releases from each reservoir to each tributary involved in the transfers, leaks from conveyance used in the water transfers (e.g. California Aqueduct), discharge at the water transfer recipient service area, discharges of water used in the buyer service areas, discharge groundwater pumped for groundwater substitution, discharge of groundwater substituted water after use on the fields. These last categories of discharges from groundwater wells and drainage discharge of groundwater substituted fields represent new locations of discharges for the project that would not be covered under any 401 permits the SWP or CVP currently have (if they have any).

Response

The action alternatives would not include any new discharges that would require a Section 401 Clean Water Act certification.

Comment LA12-142

Comment

The project will also need Air Quality permits for project impacts from (but not limited to): electrical load demand from groundwater pumping (this increased electrical load is not offset by not surface water pumping), changes in the timing and location of electrical generation from backing up water in reservoirs for transfer (the foregone generation must be replaced and the timing of the impacts are different), idling crops causes wind erosion and airborne particulate loads, operating equipment on fields receiving water from transfers in the buyer service areas are emissions that would not happen under the No Action/Project. All of these impacts are different from the conditions of the CVP and SWP without the project so these impacts are not covered by any current CVP or SWP air quality permits (if they have any).

Response

Air quality permits must be obtained from the local air districts whenever a stationary source, such as an engine, could increase or decrease criteria pollutant emissions. Although greenhouse gas (GHG) emission increases could also trigger the need for permits, this would only occur for individual stationary sources or facilities with substantial GHG emissions. The action alternatives would not cause an increase in GHG emissions that would trigger the need for additional permitting. Furthermore, any diesel- or natural gas-fueled engines that would be used for groundwater substitution are already permitted (unless exempt) at the local level and the action alternatives would not require any modifications. Emissions from wind erosion are included in the air quality management plans for any regions designated nonattainment or maintenance for PM10 or PM2.5. As such, no additional air quality permitting is required.

Comment LA12-143

Comment

Water Supply: The EIS/R must be revised to evaluate the year to year potential geographic distribution of the sellers and to evaluate the worst case scenario of the distribution (or lack thereof) of the sellers. Since the EIS/R did not evaluate a worst case scenario for how the sales would be distributed, the project must not be approved or permitted for operations that would result in more geographically concentrated impacts than what was represented in the analytical assumptions in the EIS/R. The EIS/R assumed an average water transfer contribution from all seller areas for the available transfer capacity for each water year type. With these assumptions, the impacts are equally spread and are reduced in severity in any geographic location the most of any of the potential operational scenarios. The EIS/R should have conducted and disclosed some sensitivity analysis in which the extremes of operational scenarios were tested and evaluated for their environmental impacts. Several of these scenarios that represented the worst potential impacts from the project should have been fully evaluated. Only under that approach could the project be awarded permits that allow the full amount of water transfer proposed under a set of mitigations that would have addressed the impacts. The analysis took the most optimistic (and completely unrealistic) assumption of even geographic distribution water transfer operations and impacts, each of the identified seller areas should be only allowed to transfer the averaged amount of water that was actually analyzed in the EIS/R. Here is a description and analysis of the critically flawed assumptions the impact analysis used in its impact analysis. The maximum proposed water transfer by the identified water sellers is 511,094AF. In all water years except Critical, Consecutive Dry, and Dry after Critical; the FWS OCAP BO says that the maximum transfer that can be conducted under the permitted conditions is 360,000AF. The EIS/R makes the erroneous assumption that the 360,000AF would be evenly distributed across the seller's area. In reality, the impacts would never be so perfectly distributed and reduced in their severity. The EIS/R should have tested a number of scenarios in which the transfer water was concentrated with various combinations of sellers. The EIS/R should have evaluated the impacts of all of the transfers coming from a single drainage basin under these limited subscription conditions, e.g. all from the Feather River or American River basin and none from the Sacramento River/Shasta drainage basin or visa versa. The scenario of all water transfers from one basin and none from another basin is very plausible as snowpack could favor one basin over another and make more or less water available for transfer or operational considerations of reservoirs in one basin vs. the other could make water storage much more feasible. The EIS/R should have evaluated at least two scenarios of different distribution of willing sellers. These are: all available sellers from the Sacramento and Feather River Service area with none from any of the other seller service areas and another scenario of all transfers being from Merced River, Delta, American River, Yuba River, and Feather River with none from the Sacramento River.

Response
The EIS/EIR did not apply an "optimistic" geographic distribution. As described in Appendix C, the analysis considered the maximum transfers in each year considering conveyance limitations and transfer availability. The buyer demand is limited by available capacity to convey the water to the buyers; therefore, the modeled available capacity was the upper limit for potential demand. The analysis assumed that the largest sellers would be the first to provide water. In most years with capacity for transfers, adequate capacity exists such that most willing sellers could sell water. Multiple sellers indicated that they would sell less during Shasta Critical years or multiple critical years, and these limitations were also included in the modeling.

Additionally, groundwater substitution transfers were the first type of transfers to be purchased in order to assess what would happen with frequent groundwater substitution transfers. The locations of the wells for groundwater substitution transfers were identified by each seller as the wells that could be used in a transfer. Wells were not evenly distributed over the entire seller area, but rather in the locations provided by sellers as the most likely pumping scenario for transfers.

Comment LA12-144

Comment
Water Supply: The EIS/R does not analyze the impacts of the proposed project and alternatives on other existing long-term (e.g. YCWA Lower Yuba River Accord) or year-to-year water transfer opportunities. The proposed project and alternatives preclude or significantly reduce the amount of potentially available excess CVP and SWP capacity for other long- and short-term water transfers which compete to use these same CVP and SWP facilities. Some of the Lower Yuba River Accord water transfers are for environmental objectives. Some or all of these transfers may not occur under the proposed project or alternatives. This is unknown because the EIS/R failed to identify, characterize, evaluate, quantify, mitigate or disclose the impacts to these other water transfers. This omission is a material deficiency of this EIS/R document which must be revised and recirculated.

Response
Section 3.1 analyzes potential cumulative effects to water supply. The action alternatives in this EIS/EIR would not affect the Yuba Accord transfers. Yuba Accord

environmental transfers have access to additional pumping capacity at Banks Pumping Plant that is not available for the CVP transfers analyzed in this document; therefore, they would not compete for conveyance capacity through the Delta. Yuba Accord transfers to SWP contractors would have pumping priority at Banks Pumping Plant and would not be affected by CVP transfers. Yuba Accord transfers to CVP contractors would not necessarily have priority over the transfers under the action alternatives, but the CVP contractors receive both sources and would limit additional purchases to avoid exceeding available capacity.

Comment LA12-145

Comment
Water Supply: The EIS/R proposed "paper water accounting" as the basis for some of its analysis. As an example, the project description says that "These agencies ... would use the water diverted from the San Joaquin River in exchange for their CVP water from the Delta-Mendota Canal." (EIS/R page 2-25, p3). The impacts of the other 4 proposed conveyance routes and operations are very different from the foregone diversions of these other water districts in favor of the proposed San Joaquin River diversion impacts. The different impacts of these different proposed modes of accomplishing this Merced ID water transfer were not analyzed, mitigated or disclosed in the EIS/R. These material omissions and deficiencies in the EIS/R must be corrected in the revised and recirculated EIS/R.

Response
The use of water diverted from the San Joaquin River in exchange for CVP water from the Delta-Mendota Canal is not “paper water.” Under this condition, Merced ID would make water available for transfer by releasing water from Lake McClure that would have remained in storage absent a transfer. The exchanges with Banta Carbona ID, West Stanislaus ID, or Patterson ID would simply provide a way to deliver the water from the San Joaquin River to CVP contractors that receive water from the Delta-Mendota Canal. This delivery mechanism is not discussed in the water supply section because it does not change water supply to these three districts. Diversions at these pumping facilities are discussed in other resource areas where there is the potential for an environmental effect, including Sections 3.2, Water Quality and 3.7, Fisheries.

Comment LA12-146

Comment
Water Supply: If the transferred water is allegedly conserved and does not result from and is limited to an actual reduction in consumptive use (which will vary with the climate) it could reduce runoff to surface flow and percolation to recharge the groundwater.

Response
As described in Section 2.3.2.1, “Conservation transfers must include actions to reduce the diversion of surface water by the transferring entity by reducing irrecoverable water losses. The amount of reduction in irrecoverable losses determines the amount of transferrable water.” The action alternatives include only one conservation transfer from Browns Valley ID. For this transfer, the water available for transfer reflects a decrease in

irrecoverable losses to weeds in conveyance canals. Water available for transfer does not include water that would have been runoff to surface flow or groundwater percolation.

Comment LA12-147

Comment

Water Supply: Is water transferred from outside of basin? E.g. Feather River basin surface water rights transferred, but delivered from Shasta?

Response

No. If water is transferred out of the Feather River, then it must be released from Oroville Reservoir.

Comment LA12-148

Comment

Water Supply: Operational assumptions for reservoir storage for water transfer failed to take into account operational changes required by the OCAP BO RPAs for fish passage at Shasta, Folsom and New Melones.

Response

The baseline modeling considers the RPAs listed in the biological opinions. Some RPA actions are included in the modeling, such as Delta Cross Channel, Export/Inflow Ratio, and Lower American River Flow Management. Other RPA actions are not expected to affect flows substantially from existing conditions, and other RPA actions would not be implemented within the 10-year timeframe of the transfer activities evaluated under the Proposed Action. Therefore, the modeling does reflect the RPAs to the extent possible with available data at this time.

Comment LA12-149

Comment

Water Supply: The EIS/R analysis should be specific on the operations and impacts for each water transfer in order to justify project-level permits required for implementation of the project. The level of specificity of the current EIS/R is only at a programmatic level of detail so the project should be subject to additional project level impact analysis prior to implementation each year.

Response

The EIS/EIR included a detailed modeling effort for the action alternatives that identified operational changes for the transfers included in each alternative. The operations are described in more detail in Appendix C. See also response to Comment NG03-8 for additional discussion regarding program-level versus project-level of analysis.

Comment LA12-150

Comment

Water Supply: The EIS/R analysis should be specific on the operations and impacts for each water transfer and cumulatively for year to year for the project and in combination with all current and other reasonably foreseeable projects, e.g. Lower Yuba River Accord water transfers.

Response

Section 3.1.3 analyzes the cumulative impacts of the alternatives and reasonably foreseeable projects, including the Yuba Accord.

Comment LA12-151

Comment

Water Supply: Each river, stream and location has different geology and hydrology. The EIS/R analysis did not incorporate analysis of all potential operational scenarios that could occur under the range of operations and conditions included in the project description. The project should only be permitted for the operations and conditions analyzed, mitigated and disclosed in the EIS/R, not on the range proposed that were not addressed in the analysis.

Response

The transfer operations model (TOM) analysis used to determine the water supply impacts associated with the alternatives used a 34-year analysis period. This model captured various water year types, including multiple dry years (i.e., 1987-1992) to anticipate future conditions under the alternatives. It used results from SACFEM 2013 to assess potential changes within waterways in the Sacramento Valley. More information on the model timeframe is provided in Common Response 5.

Comment LA12-152

Comment

Water Supply: Water transfers from this project result in discouragement of investment in water conservation or adaptation of water users to more sustainable water uses in the Buyer Service areas. If you can buy water cheaper than the cost of implementing water conservation to achieve an equal amount of water supply then you will always choose the cheaper option of buying the water. This is also why desalination projects or other new water or major conservation efforts (e.g. fixing all the water conveyance leaks) will never occur until all the cheaper water that exists is purchased and transferred. This project and others like it, result in a California that will continue to take water from each other until there is no more water to take before it makes any meaningful investment in water conservation, alternative water supplies, and changes in lifestyle related to water use (hundreds of golf courses in the desert) and water allocation. The BDCP does not count as a project to create new water as this project claims that it "won't divert any more water than current operations" and the real purpose of that project is to just facilitate the transfer of water from a poorer Northern California to a richer Southern California.

Response

The concepts of increasing agricultural water use efficiency and desalination were considered in the EIS/EIR as part of the Agricultural Conservation (Buyer Service Area), Desalination-brackish, and Desalination-seawater alternatives. These alternatives were not carried forward for more detailed analysis, and not because they were more expensive than the remaining action alternatives. These alternatives were not carried forward because they would not reduce environmental effects of the other alternatives or meet key elements of the purpose and need or basic project objectives. These alternatives would not be immediate and would not provide additional water. See Appendix A for more details on the screening of these alternatives.

Comment LA12-153

Comment

Water Supply: CVP and SWP operations are often constrained by net delta outflow requirements. The Net Delta Outflow Index (NDOI) that the SWP and CVP are currently using is grossly over-reporting net delta outflow. "While the NDOI is, at best, an estimate of Delta outflow, there are stations that accurately measure actual Delta outflow. The United States Geological Survey (USGS) has established a series of stations in the Delta to measure flow and water quality parameters. "Four of the USGS gauging stations ... accurately measure Net Delta Outflow (NDO)." ("The Case of the Missing Delta Outflow" California Sportfishing Protection Alliance) DWR's own analysis of NDOI ("Dayflow") estimates vs. the new more accurate USGS gage measurements indicates that the "Dayflow under estimates flow during wet periods and over estimates flow during dry periods." (http://www.water.ca.gov/dayflow/docs/2013 Comments.pdf) This DWR report means that during the majority of the CVP and SWP diversion season (spring through fall), the operations systematically over estimate NDOI and systematically divert more water from the south delta than regulatory operational constraints would allow if NDO was correctly accounted for. As a result of this over-estimation of net delta outflows and the resulting lack of operational constraint, Reclamation and DWR's evaluation of available excess capacity for water transfers for this project will result in more capacity being identified as available as actually would exist if the delta net outflows were being accurately measured. The EIS/R must include an evaluation of the accuracy of the Delta Net Outflow Index accuracy and an adjustment for the water transfer delivery quantities that would result from correctly adhering to the operational constraints of the CVP and SWP from Delta Net Outflow Index requirements. This regular exceedance of regulatory constraints on the CVP and SWP operations must be evaluated in this EIS/R and water transfer amounts included in the project must be limited to amounts that would not result in the CVP and SWP violation of net delta outflow requirements. This over estimation of net delta outflow also results in insufficient carriage water being pulled out of the water transfers to maintain delta water quality and CVP/SWP operational compliance with the OCAP Biological Opinions and the Reclamation Remand court order.

Response

The EIS/EIR is comparing the action alternatives to existing conditions (under CEQA) and the No Action Alternative (under NEPA). The concern that standards are not being accurately measured is something that would apply in both the baseline and the action alternatives. The action alternatives would not affect how the measurement tool works, or cause different environmental effects because of the measurement tool. Considering different measurement techniques is not part of this effort.

Comment LA12-154

Comment

Water Supply: Coordinated CVP/SWP operations, funding and water deliveries are based on the COA. The COA is grossly out of date and has not been updated since 1986. COA determines the proportional distribution of available water supplies and operations. If the COA were updated, the amount and locations of excess capacity in the SWP and CVP system would change. This project must include an update to the COA as part of the scope or the actual amount of conveyance capacity available for transfers cannot be determined.

Response

The EIS/EIR is comparing the action alternatives to existing conditions (under CEQA) and the No Action Alternative (under NEPA). The COA would govern operations for both the baseline and the action alternatives. The action alternatives would not affect how COA works, or cause different environmental effects because of the agreement. Renegotiating the COA is not part of this effort.

Comment LA12-155

Comment

Water Rights: Water rights were not addressed at all in the ES impact summary table.

Response

Existing water rights are described in Section 3.1.1.3.1.

Comment LA12-156

Comment

Water Rights: In 2014, some federal water contractor's had stored some water from the previous year for later release at Reclamation's Friant facility. Due to the drought conditions and lack of available water supply in 2014, Reclamation decided to deliver that water contractor stored water to the Exchange Contractors to fulfill their other standing obligations to the Exchange Contractors rather than to the water agencies that stored their water in Friant. The EIS/R does not address this potential scenario in released water from reservoirs or the "backed up" water operations of the Proposed Project or alternatives. As a very similar scenario example for the Proposed Project or alternatives, water stored in Friant for Merced Irrigation District that was held back specifically for a water transfer could be hijacked by Reclamation to service the Exchange Contractors instead. This scenario could easily occur on the other dams with backed up water released to fulfill minimum flow or senior water rights holders on the downstream tributaries rather than for the project water transfers. Again, there is a difference in the timing and location of impacts for when the water is released and where it is used for the project or for other obligations. Without the project, the backed up water would not have existed so there would not be the impacts of releasing that water to fulfill these other obligations. The difference in release timing and location of use create impacts that the EIS/R did not identify, characterize, evaluate, quantify, mitigate or disclose.

Response

The EIS/EIR considers "backing up" water into storage during the first part of the irrigation season (April through June) when water could be made available for transfer but could not be moved through the Delta. This water would be held in storage until it could be moved through the Delta later in the same season (July through September). If buyers want to store transfer water in between years, they would have to meet requirements of CVP and SWP storage. This water would be lost if the storage facilities fill.

Comment LA12-157

Comment

Water Rights: When downstream senior water right holder settlement agreement (settlement contractors, e.g. Shasta - Tehama and GCID; Oroville - WCWD, BWGWD, Richvale, etc.) water supply is released from storage for transfer to the water buyers under the Proposed Project and alternatives, it may include natural flow water or stored water which is in violation of permit terms and conditions from their Settlement Agreements. The water rights that the settlement contractors have under the settlement agreement are not the same as their original pre-1914 or riparian water right so they should not have the senior water right status for the water transfer. Since they do not have this senior water right status, these actions must not be allowed to affect parties with more senior water rights. All water transfers must be subject to water rights priorities. The EIS/R is deficient as it did not correctly differentiate the water rights level of the settlement contractors and allowed these water transfers to impact the water rights (water quality) of more senior water rights holders.

Response

As described in Section 1.3, water transfers may not violate any federal or state law, including water rights. Water rights of potential sellers, as described in Section 3.1.1.3, were developed in coordination with sellers. The EIS/EIR analyzes potential effects to water quality in Section 3.2, and does not find that the action alternatives would result in significant adverse effects.

Comment LA12-158

Comment

Water Rights: The analysis should cover the requirement or recognition that no water can be exported from the Delta by the projects unless the Delta is first provided an adequate supply (WC 12200 etseq.) and to the extent the transfer is dependent on the water rights of the SWP or CVP the water can be recaptured to serve needs in the watersheds of origin (WC 11460 etseq.).

Response

Section 1.3 summarizes the federal and state laws that pertain to water transfers. All transfers must follow these regulations. See Common Response 14.

Comment LA12-159

Comment

Water Rights: Reclamation and DWR water rights are subordinate to senior rights and conditioned on compliance with statutory requirements as well as permit conditions. The CVP and SWPs post-1914 water rights are junior to most in-Delta water rights and, as a result, the project has no right to divert the natural flows within the Delta if there is not enough natural flows through the Delta to satisfy in-Delta pre-1914 appropriative ·rights. The CVP and SWP, as junior water rights holders, are also not allowed to impair the water quality of the senior water rights holders from the operational impacts of their diversions. Reclamation and DWR, through their CVP and SWP operations, consistently violate these water quality standards and impact the beneficial uses of water for agricultural use of the senior water rights holders in the delta.

Response

See response to Comment LA12-158.

Comment LA12-160

Comment

Water Rights: The SWRCB cannot certify or issue permits on a project which knowingly and consistently violates state surface water rights and the addition of these water transfers under the Proposed Project and alternatives would only exacerbate the frequency, magnitude and duration of these violations. Area of Origin Statutes were enacted during the years when California's two largest water projects, the Central Valley Project and State Water Project, were being developed to protect local Northern California supplies from being depleted as a result of the projects. County of origin statutes provide for the reservation of water supplies for counties in which the water originates when, in the judgment of the State Water Resources Control Board, an application for the assignment or release from priority of State water right filings will deprive the county of water necessary for its present and future development. Watershed protection statutes are provisions which require that the construction and operation of elements of the Federal Central Valley Project and the State Water Project not deprive the watershed, or area where water originates, or immediately adjacent areas which can be conveniently supplied with water, of the prior right to water reasonably required to supply the present or future beneficial needs of the watershed area or any of its inhabitants or property owners. The addition of these water transfers under the Proposed Project and alternatives would only exacerbate the area of origin conflicts.

Response

See response to Comment LA12-158.

The EIS/EIR is comparing the action alternatives to existing conditions (under CEQA) and the No Action Alternative (under NEPA). The analysis does not indicate that the action alternatives would violate surface water rights or have significant adverse effects on water quality.

Comment LA12-161

Comment

Water Rights: The Delta Protection Act, enacted in 1959 (not to be confused with the Delta Protection Act of 1992, which relates to land use), declares that the maintenance of an adequate water supply in the Delta--to maintain and expand agriculture, industry, urban, and recreational development in the Delta area and provide a common source of fresh water for export to areas of water deficiency--is necessary for the peace, health, safety, and welfare of the people of the State, subject to the County of Origin and Watershed Protection laws. The act requires the State Water Project and the federal CVP to provide an adequate water supply for water users in the Delta through salinity control or through substitute supplies in lieu of salinity control. The addition of these water transfers under the Proposed Project and alternatives would only exacerbate the water supply conflicts addressed under the Act.

Response

The EIS/EIR is comparing the action alternatives to existing conditions (under CEQA) and the No Action Alternative (under NEPA). The analysis does not indicate that the action alternatives would adversely affect water supplies in the Delta.

Comment LA12-162

Comment

Water Rights: In 1984, additional area of origin protections were enacted covering the Sacramento, Mokelumne, Calaveras, and San Joaquin rivers; the combined Truckee, Carson, and Walker rivers; and Mono Lake. The protections prohibit the export of ground water from the combined Sacramento River and Sacramento-San Joaquin Delta basins, unless the export is in compliance with local ground water plans. Also, Water Code Section 1245 holds municipalities liable for economic damages resulting from their diversion of water from a watershed." (http://www.waterplan.water.ca.gov/previous/b160-93/b160-93v1/ifrmwk.cfm) The addition of these water transfers under the Proposed Project and alternatives would only exacerbate the water supply and groundwater conflicts addressed under the water code.

Response

The Water Code prohibits direct export of groundwater unless it is in compliance with local groundwater plans, but the action alternatives do not include direct export of groundwater. The EIS/EIR analyzes potential effects of the action alternatives on water supply (Section 3.1) and groundwater (Section 3.3). The results indicate the significant adverse effects on both resources would be mitigated with the mitigation measures included in these sections.

Comment LA12-163

Comment

Water Rights: Reclamation is not compliant with their junior water rights requirements as the CVP operations frequently exceed Delta water quality requirements in violation of the Delta Protection Act of 1959. Transfers of water supplies through the CVP or SWP from conjunctive use of groundwater substitution for surface water supplies are not consistent with local groundwater plans. Water contractors supplied through the SWP are liable for any direct or indirect damages from diverting water from a watershed. These damages may include injury, damage, destruction or decrease in value of any such property, business, trade, profession or occupation resulting from or caused by the taking of any such lands or waters, or by the taking, diverting or transporting of water from such watershed. (Water Code 1245) The addition of these water transfers under the Proposed Project and alternatives would only exacerbate the water quality impacts addressed under the Act.

Response

Section 3.2 of the EIS/EIR analyzes potential effects to water quality in the Delta from the range of transfer activities, and finds that the action alternatives would not have significant adverse effects.

Comment LA12-164

Comment

Water Rights: The Proposed Project and alternatives must consider the water supply, water rights, water quality impairments and other water beneficial use impacts associated with the water transfers of south delta water. The conditions of waters in the delta including direction of flows, water quality and impacts to agriculture, drinking water supplies and fisheries resources are a direct consequence of the CVP and SWP south delta facilities water diversions.

Response

The EIS/EIR analyzes effects to water supply and water quality in Sections 3.1 and 3.2, respectively. The analysis of potential Delta effects included application of the DSM2 model, as described in detail in Appendix E. This model estimated potential effects to water quality, circulation, and water levels in the south Delta. The analysis found that the impacts would not result in a significant, adverse change from the baseline conditions.

Comment LA12-165

Comment

Water Quality: The sellers identified are mostly water districts. When water districts transfer water they typically rotate the fallowed lands from year to year so not the same land or owners are participating from year to year. The EIS/R just assumes there will be some even distribution of the fallowed fields across a water district. They do put some constraints on adjacency to wildlife refuges, but other than that, the fallowing could occur in any location or in any combination of locations or concentrations. By not having specific locations or a very specific rule set about how fallowed fields can be distributed within a water district, the analysis of the impacts from field fallowing is at a programmatic level of detail, not a project site specific level of detail. The rules for how fallowed fields are distributed in a water district are not specific enough to allow detailed analysis of impacts such as reduced ag drainage return flows and resulting drainage flows and water quality impacts. The EIS/R must be revised such that project specific levels of detail on the impacts of field fallowing are conducted. Although the agencies can approve a programmatic EIS/R, this project, because of its lack of project-level analysis of impacts, must have a subsequent environmental analysis prior to implementation.

Response

See response to Comment NG03-8.

Comment LA12-166

Comment

Water Quality: Each groundwater basin and sub-basin area has different water quality, e.g. south of Sutter Buttes has higher saline groundwater than farther to the north. Different depth groundwater aquifers can have different water quality. The differences in groundwater quality that would be substituted for surface water supplies and the specific differences in the water quality of discharge water from the conjunctive use properties in the project are not characterized, evaluated, quantified, mitigated or disclosed in the EIS/R. This material omission of groundwater substitution water quality impacts on surface and groundwater quality must be addressed in a revised and recirculated EIS/R.

Response

Groundwater quality is discussed in Section 3.3, Groundwater Resources. Additional discussion regarding the impacts to surface water is included in Section 3.2, Water Quality. The amount of groundwater substituted for surface water would be relatively small compared to the amount of surface water used to irrigate fields in the seller service area. Return flows from these fields would eventually discharge into receiving water. Pollutants, if any, associated with these discharges may be covered under the SWRCB Agricultural Waivers program, and would likely be related to agricultural applications of fertilizers and pesticides which would occur in the absence of water transfers.

Comment LA12-167

Comment

Water Quality: Ag drainage water quality is lower in the areas of groundwater substitution than if their surface water supplies were utilized. As an example of the impact of the project, groundwater is higher in dissolved minerals (TDS) than surface water. High dissolved minerals in water can have significant adverse impacts on development of juvenile salmonids that occur in the tributary reaches where the proposed project surface water quality degradations would occur from groundwater substitutions. The Sacramento Valley Regional Water Plan (AKA Phase 8) identified and addressed those impacts in their project's conjunctive use analysis, but this project EIS/R did not even though Reclamation was a lead agency on both projects and both involve conjunctive use.

Response

See response to Comment LA12-166.

Comment LA12-168

Comment

Water Quality: The EIS/R also failed to evaluate the impact of fallowed fields on reduced ag return flow volumes and increased contaminant loads which could exceed the discharge permits tolerances, e.g. water temperature difference, TDS, DO, nutrient loading, DOC, ECw, contaminant metals (Hg, Se, Pb, Fe) other (diaznon, DDT, chlorpyrifos, etc.) of the water and reclamation districts. This is a material omission and deficiency of the EIS/R which must be corrected in the revised EIS/R prior to recirculation.

Response

This 2014 Draft EIS/EIR discusses potential impacts of cropland idling in Section 3.2, Water Quality. As discussed in this section, the rice crop cycle and prevalent soil textures in the seller service area would reduce potential impacts from soil erosion and runoff in this region. Additionally, return flows from these fields would not be considered point source discharges, would not be covered by National Pollutant Discharge Elimination System (NPDES) discharge permits, and would not require a mixing zone analyses. Pollutants, if any, associated with these discharges may be covered under the SWRCB Agricultural Waivers program, and would likely be related to agricultural applications of fertilizers and pesticides which would not occur during field fallowing.

Comment LA12-169

Comment

Water Quality: The Proposed Project and alternatives will result in water quality impacts to delta and other beneficial uses which were not fully addressed in the EIS/R.

Response

Section 3.2, Water Quality, includes an assessment of potential effects to Delta water quality. Further data has been added for more locations in the Delta based on comments received.

Comment LA12-170

Comment

Water Quality: The Proposed Project and alternatives idling of fields will result wind erosion of soils which will be deposited into tributaries which will degrade water quality of those tributaries with the associated contaminant loads. The contaminant loads from fallowed field wind and water erosion into surface water tributaries was not fully addressed in the EIS/R because the location and number of fields was not defined by the Proposed Project and alternatives. This significant impact must be more specifically analyzed for the field locations, number and distribution and the significant impacts to surface water quality mitigated and disclosed.

Response

Soil properties are discussed in Section 3.4, Geology and Soils. Based on the low erodibility of soils within the seller service area, impacts resulting from wind erosion on idled fields will not significantly degrade water quality in the region.

Comment LA12-171

Comment

Water Quality: Water quality impacts vary greatly depending on the tributary and groundwater substituted, e.g. Berryessa and Putah Creek flow transfers would mobilize a disproportionate amount of Hg. Transfers from Friant to Westlands would mobilize a disproportionate amount of Se. Both of these project impacts are not fully addressed in the EIS/R. This significant impact must be more specifically analyzed for the tributary locations, timing of substitution and transfer, and volume of those transfers and the significant impacts to surface water quality for the project mitigated and disclosed.

Response

Project impacts are addressed for water bodies that could potentially be affected by the project. Berryessa and Putah Creek are not part of the action alternatives and are not included in this analysis. Westlands Water District would not be a potential seller under this document, and the Friant Water Authority area is not included as either a buyer or a seller.

Comment LA12-172

Comment

Groundwater: If the transferred water is based on an actual reduction in consumptive use (which will vary with the climate) it will reduce runoff to surface flow and percolation to recharge the groundwater. As an example, ag irrigation quantities include a component for leaching salts below the plant root system. The leaching component of irrigation water contributes to groundwater recharge. In the case of proposed project idling of fields or crop switching to lower water use crops, that irrigation leaching component contribution to groundwater recharge is significantly reduced or eliminated all together. The EIS/R failed to identify, characterize, evaluate, quantify, mitigate or disclose this significant impact from the Proposed Project and alternatives. This material omission in the analysis of the EIS/R must be rectified and submitted for public review in a recirculated document.

Response

Section 3.3.3.4 states, "the reduction in percolation would be less than significant because rice is the primary crop and grown on soils with low permeability." In areas where soils have a low permeability, the amount of percolation through these soils is relatively low. The low permeability is the reason water can be ponded on these surfaces for rice production.

Comment LA12-173

Comment

Groundwater: Groundwater drawdown affects of the proposed project and alternatives on adjacent groundwater wells and changes in direction or magnitude of groundwater hydraulic gradient on contribution to surface water flows was not addressed in the EIS/R. The EIS/R Regional Economics section identified "Groundwater substitution transfers could increase groundwater pumping costs for water users in areas where groundwater levels decline as a result of the transfer." as an adverse project impact. Obviously the groundwater section missed this impact, which is a significant impact and must be mitigated.

Response

As discussed in Section 3.3.2.4, Alternative 2: Full Range of Transfers (Proposed Action), groundwater substitution pumping in Alternatives 2 and 3 is expected to decrease groundwater levels (as shown in Figures 3.3-28 through 3.3-38 and Appendix G. The inclusion of Mitigation Measure GW-1 would avoid potentially significant impacts from groundwater level decreases. See Common Responses 6 and 7 for additional information.

Comment LA12-174

Comment

Groundwater: Subsidence impacts from groundwater drawdown in the seller service area as a result of the project were not addressed in the EIS/R. The EIS/R only addressed the reduction of groundwater subsidence in the buyer's service area as a benefit. Since groundwater substitution in the sellers area is a significant component to the source of water for transfer, the one sided and biased EIS/R analysis where the beneficial impact is disclosed, but the significant adverse impact is ignored and goes unmitigated and disclosed, There is an egregious violation of the requirements and intent of NEPA and CEQA.

Response

Section 3.3.2.4 evaluates land subsidence impacts in the seller service areas. Potentially significant land subsidence impacts in the seller service area will be avoided through mitigation. See Common Response 7 for additional information.

Comment LA12-175

Comment

Groundwater: The amount of groundwater substitution/transfer cannot be greater than the maximum sustainable yield or groundwater aquifer collapse occurs. The Proposed Project does not provide operational limits and the EIS/R analysis does not determine how much water can be sustainably withdrawn from groundwater aquifers without risk of collapsing them. The Proposed Project does not define how much groundwater substitution would occur in each seller area from year to year. With both of these critical information components missing in order to ensure protection of the groundwater aquifers, the EIS/R document is deficient and must be revised to correct these omissions. In order to avoid and mitigate the significant impact of the project on groundwater subsidence, the project must include an alternative for a sustainable rate of groundwater withdrawal and/or propose the sustainable rate of groundwater withdrawal as a mitigation of the impacts of the current Proposed Project and alternatives. This "sustainable groundwater alternative" extraction and transfer amount can be calculated for each seller service area groundwater basin using the following generalized methodology. First, determine the current size (TAF) and annual groundwater recharge for each groundwater basin for the 82 year period of hydrologic record. Second, determine the safe and sustainable annual quantity of groundwater yield (including maximum rate of groundwater withdrawal without collapsing water bearing strata) in each basin. Now add the groundwater basin (with size, recharge rates and maximum sustainable rates of withdrawals) as a "reservoir" for each groundwater basin and seller service area to CALSIM (or in a post processing module for analyzing CALSIM results). Next, using the 82 year period of record and the CALSIM model, optimize the amount of seller area water deliveries for each groundwater basin area. Determine the amount of groundwater extraction for transfer that does not accrue into an over-draft of the groundwater basin at any time during the 82 year period of record. The maximum groundwater substitution amount that does not result in over-drafting the groundwater in any year in the 82 year hydrologic period of record will be the maximum contract delivery amount for that groundwater basin and seller service area for use in the "sustainable groundwater" EIS/R alternative or as a mitigation for the significant groundwater aquifer collapse impacts of the Proposed Project. The EIS/R also fails to identify impacts to infrastructure (roads and bridge structural integrity and safety, canal capacity and structural integrity and safety), and other resources (such as surface water drainage) that occur from groundwater withdrawal caused ground level subsidence.

Response

Estimates of safe yield have not been previously calculated for the Sacramento Valley. In lieu of estimates of safe yield, multiple technical studies have been conducted to evaluate the potential impacts to groundwater levels. The models used in these studies were deemed to be the best available tools. The models simulate changes in groundwater levels that may result from the alternatives discussed in the EIS/EIR (see Appendices B and D for more information on the modeling effort). The models were used to estimate the changes in groundwater level that may result from the groundwater substitution pumping in Alternative 2. The results of the model simulations are shown in Section 3.3.2.4. Several figures in Section 3.3 show the historical groundwater levels in several wells throughout the Sacramento Valley. In general, groundwater levels tend to decline in dry or drought periods. In wetter years groundwater levels recharge. The current dry period appears to show trends in decreasing water levels similar to previous years. Figures 3.3-28 through 3.3-33 show the potential change in groundwater level due to groundwater substitution pumping. These figures are for simulated conditions in a historically dry year (1976) and following four years of substitution pumping in a dry period (1990). Figures 3.3-34 through 3.3-38 provide a graphical representation of the change in groundwater level with and without groundwater substitution pumping at several locations in the Sacramento Valley. Appendix G contains figures for additional locations. The rate of aquifer recovery (or recharge) can be seen in the rate at which the blue line (Alternative 2) approaches the dashed-red line (Baseline). Mitigation Measure GW-1 includes actions to avoid potentially significant impacts from groundwater level declines and subsidence. See Common Responses 6 and 7 for additional information.

Comment LA12-176

Comment

Geology & Soils: The EIS/R evaluated the potential loss of top soil from fallowing, but did not address the different soil erosion potentials that occur in different seller areas. The EIS/R analysis must be revised to reflect the site specific soil erosion characteristics at the seller areas; otherwise the analysis is programmatic rather than project specific and would require subsequent environmental analysis prior to implementation of the project.

Response

Figures were added to show, more specifically, the seller water district locations in relation to different surface soil textures. The impact analysis was revised to add detail based on these figures. There were no material changes to the conclusions of the impacts analysis based on the additional information.

Comment LA12-177

Comment

Geology & Soils: The EIS/R did not address salt accumulation and resulting reductions on soil productivity from the water transfers on the buyer areas. The EIS/R analysis must be revised to reflect the continued and increased salt accumulation of soils and reduced soil productivity from the proposed water transfers.

Response

Transfer water would go to existing agricultural lands; it would not be used to expand agricultural production. Hence, there would be no increase in the amount of land that would be irrigated. Transferred water used in the buyer service areas would be surface water, which has lower salinity levels than groundwater. Finally, there are ongoing regional efforts to address the issue of salt accumulation and decreased soil productivity. One such program is Central Valley Salinity Alternatives for Long-Term Sustainability (CV SALTS), which is looking at sustainable salinity and nitrate planning for the Central Valley. These efforts will occur in parallel with the water transfers and continued irrigation in the Central Valley and will develop and implement solutions to salinity issues.

Comment LA12-178

Comment

Geology & Soils: Water released from CVP or SWP facilities for water transfers is on top of the water that would have been released in the No Action/No Project. Most of the water transfer releases of the Proposed Project will be on top of higher natural flows so that less carriage water is required and water diversion yields of the transferred water will be highest at the south delta pumps. This extra flow increment of the transferred water on top of the flows that would be there under the No Action/No Project will result in increased erosion of banks in the tributary reaches below the dams. As an example of this impact, see DWRs settlement agreement and compensation to Emerald Farms on the lower Feather River from increased erosion from the SWP operations. These flow related impacts to bank erosion are a real impact of the Proposed Project and alternatives. The EIS/R failed to analyze these identify, characterize, evaluate, quantify, mitigate or disclose these impacts.

Response

Discussion in the EIS/EIR has been clarified to address these potential impacts. The flow increases would only occur during the dry season of dry and critical years and would result in less than significant impacts to bank erosion. The Flood Control and Recreation sections of the EIS/EIR also address changes in river flows under the Proposed Action, and conclude that impacts would be less than significant.

Comment LA12-179

Comment

Air Quality: The EIS/R identifies a benefit from the reduction of emissions from farm equipment that would not be operated on fallowed water seller fields, but does not address the increase in emissions from farm equipment being operated on buyers fields that would have otherwise been fallowed. This shifting of air quality impacts from farm equipment operations from northern California to the southern central valley is a significant impact as the northern counties generally do not have a problem meeting their air quality attainment requirements and the bay area and southern central valley counties are constantly in violation of their air quality attainment requirements. The EIS/R identification of a beneficial impact while ignoring the more than offsetting corollary significant impact demonstrates the one sided biased nature of the impact assessment. The EIS/R must be revised to disclose and mitigate the air quality impacts of the farm equipment operated in the buyers area under the proposed project which would not occur under the No Action/No Project.

Response

As described in Chapter 1, "[w]ater transfers would be used only to help meet existing demands and would not serve any new demands in the buyers' service areas" (see page 1-1). It is not known at the time of this writing how the buyers would participate in any potential water transfers, so it is not feasible to estimate potential emission increases to the same level of detail as was completed for the sellers. However, because water would only be used to meet existing demand and not to increase growth, any use of farming equipment by the buyers would not be greater than under existing conditions. As such, it is not possible to conclude that impacts would be significant.

Comment LA12-180

Comment

Air Quality: The EIS/R claims that dust from fallowing fields is an overall benefit because there is no tilling and harvest associated dust. This analysis and conclusion is completely biased and is not supportable. Much more soil is eroded from a field that is fallowed and bare of all vegetation all year as compared to a field that is tilled and harvested. This impact is not a benefit, it is a significant impact that must be mitigated.

Response

Fugitive dust emissions from wind erosion, land preparation, and harvesting were estimated using methodologies published by the California Air Resources Board (see CARB 1997, CARB 2003a, and CARB 2003b, as referenced in Section 3.5, Air Quality). The emission calculation methodologies published by CARB support the conclusion in the EIS/EIR that more fugitive dust is generated by land preparation (e.g., tilling) and harvesting than by wind erosion. As a result, no revisions to the EIS/EIR to change the significance determination are required.

Comment LA12-181

Comment

Air Quality: Increased air pollution from increased groundwater and other pumping (e.g. CVP/SWP lift pumps and groundwater pumps) under the proposed project is a significant impact, not a less than significant impact as the EIS/R determined. This significant impact must be mitigated.

Response

As described in Section 3.5, Air Quality, Mitigation Measures AQ-1 and AQ-2 would reduce any potentially significant impacts to less than significant levels. The air quality analysis was conservative in that it assumed every pump for a given water agency would operate continually during project implementation and would be a "noncertified" diesel engine if additional information regarding engine specifications was not known. As a result, any predicted emissions from groundwater substitution are maximized when possible; therefore, the EIS/EIR correctly concludes that air quality impacts would be less than significant with implementation of mitigation measures AQ-1 and AQ-2.

Comment LA12-182

Comment

Climate Change: The EIS/R is analysis is fundamentally flawed because the future project condition to 2024 did not include sea level rise, precipitation or other climate change impact assumptions. NEPA requires the end condition of the project period to be analyzed, in this case 2024. The BDCP has incorporated climate change in its analysis of conditions in 2025, so this EIS/Rs omission of climate change for 2024 is a serious inconsistency in how climate change is addressed between these two similar projects. Reclamation is a lead agency on both projects, both projects cover the same water systems and geographic areas and resources; and yet the BDCP addresses climate change in 2025 and this EIS/R does not for 2024. NEPA guidance and specifically USACE and EPA in their analytical requirements for a 401 permit, require consideration of climate change. Department of Interior, USACE and EPA all have specific methods and assumptions which are required to be utilized in an EIS. The project failed to incorporate these methods and assumptions. This EIS/R must be revised to incorporate climate change assumptions in its Proposed Project, Alternatives and No Action/No Project assumptions. A 401 permit for this project must not be issued without analysis that includes climate change that is consistent with Department of Interior, USACE and EPA analytical method requirements and assumptions.

Response

As described in Appendix C, "[t]he Project's ten-year period allows simulation of a single level of development under the assumptions that conditions are not likely to change significantly over such a short time horizon" (see page B-19). By its very nature, CalSim II incorporates any influence from climate change into the modeling because it considers long-term hydrologic influences from 1922 through 2003 (page B-19). The CalSim II baseline study was further revised in collaboration with Reclamation to account for an existing level of development, requirements, and projects (see page B-

5). As a result, the analysis is consistent with the requirements of NEPA and additional modeling is not required.

The action alternatives would not involve any activities that would trigger the need for permitting under Section 401 of the Clean Water Act. As a result, it is not necessary to change the EIS/EIR to incorporate any additional information required for Section 401 permitting.

Comment LA12-183

Comment
Climate Change: Fallowed fields do not transpire so the cooling effect of the growing crops would not occur in acres fallowed from the implementation of the proposed project or alternatives which include crop idling. Some publications have speculated that the central valley is 10+°F cooler in the summer due to crop irrigation as compared to non-irrigation of the current irrigated acres. The fallowing of crop acres from the project would have similar impacts as those widely recognized for urban heat island effects. The EIS/R is deficient as it did not identify, characterize, evaluate, quantify, mitigate or disclose these impacts and it must be revised to address these omissions.

Response
Any cropland idling that could occur because of a water transfer would only occur during a given water year, and would not be a long-term impact that could cause a permanent temperature increase from the fallowed fields. Additionally, fallowing fields is a normal agricultural practice used by the individual farmers.

Comment LA12-184

Comment
Climate Change: Greenhouse gas emissions from increased groundwater and other pumping (e.g. CVP/SWP lift pumps and groundwater pumps) is a significant impact, not a less than significant impact as the EIS/R determined. This significant impact must be mitigated.

Response
As described in Section 3.6, Climate Change, GHG emissions could increase by 20,078 tons of carbon dioxide equivalent per year under the Proposed Action. As described in the chapter, the significance threshold for GHG emissions was identified as100,000 tons per year; therefore, the EIS/EIR correctly concluded that emissions would be less than significant and no changes to the EIS/EIR are required.

Comment LA12-185

Comment
Aquatic Resources: Increased deliveries of CVP/SWP south of delta service areas of Sacramento Valley basin water supply increases the proportion of "foreign basin" introduction of water and drainage water to the tributaries downstream of the water transfer receiving service areas. The water transfers under the proposed project increases the proportion of foreign basin water into the tributaries downstream of the service areas receiving these transfer waters. The out of basin

water has a different signature as a homing cue for anadromous fish, especially salmonids. False attraction of migrating fish from out of basin water is well documented in published literature and is a major problem with central valley salmonid reproductive survival rates and genetic introgression which is a direct threat to the species diversity and viability. The proposed project is particularly problematic for increasing salmonid straying from out of basin water transfers in that the years where the proposed project water transfers are anticipated to be most active are the years where otherwise the CVP/SWP would have the lowest operational impacts on out of basin caused salmonid straying and genetic introgression. As an example, in 2014, CVP and SWP deliveries to the agricultural users that are the proposed project recipients of the water transfers, their 2014 water deliveries from the CVP and SWP were 0%. This means that in 2014 there would have been no straying and genetic introgression from out of basin transfers from these areas for the San Joaquin River and the South San Francisco Bay and their tributaries. With the proposed project, the out of basin transfers would occur on years of low and no CVP and SWP deliveries which will result in an increase in the proportion of out of basin water in the downstream drainage tributaries and in the rate of salmonid straying, associated mortalities and loss of fecundity and genetic introgression impacts on the species genetic integrity and diversity as compared to the No Action/No Project condition. In the case of years with 0% CVP/SWP water deliveries, to go from zero straying impact from the CVP/SWP operations under the No Action/No Project condition to some increased amount of straying impact is an increase of infinity percent as compared to the baseline condition that occurs without the project water transfers. The EIS/R failed to identify, evaluate, quantify, mitigate or disclose this impact.

Response

The water entering the Delta has historically come from both the Sacramento and San Joaquin rivers and their tributary sources. There is high variability in the spatial and temporal dynamics of water moving through the Central Valley, and native fishes have evolved to manage this variability. The potential transfer of water under the Proposed Action does not add "foreign" or "out of basin" water. Foreign or out of basin water would be new water from outside the Central Valley, which does not occur under the Proposed Action. Potential transfers only slightly change the quantities of water from various sources that have historically flowed through the Delta system and to which native fishes have evolved. The majority of water flowing through the Delta already comes from the Sacramento River.

Comment LA12-186

Comment

Aquatic Resources: The EIS/R must be revised to evaluate the year to year potential geographic distribution of the sellers and to evaluate the worst case scenario of the distribution (or lack thereof) of the sellers. Since the EIS/R did not evaluate a worst case scenario for how the sales would be distributed, the project must not be approved or permitted for operations that would result in more geographically concentrated impacts than what was represented in the analytical assumptions in the EIS/R. The EIS/R assumed an average water transfer contribution from all seller areas for the available transfer capacity for each water year type. The EIS/R average geographic distribution of water seller assumption for the impact analysis is actually the best case scenario for the least impacts as the impacts are equally spread and are reduced in severity in any geographic location the most of any of the potential operational scenario. Any other scenario of seller distribution would result more significant impacts than the average seller distribution assumption used in the EIS/R analysis. The EIS/R should have conducted and disclosed some sensitivity analysis in which the extremes of operational scenarios were tested and evaluated for their environmental impacts. Several of these scenarios that represented the worst potential impacts from the project should have then been fully evaluated to disclose the range of impacts that could or would be precipitated by implementing the proposed project. Only under that "bookend" of worst case scenarios analytical approach should the project be awarded permits that allow the full amount of water transfer proposed with a full set of mitigations to cover the worst case scenarios that would address these impacts. The current EIS/R analysis took the most optimistic (and completely unrealistic) assumption of an evenly distributed geographic spread of water transfer operations and impacts. Under the current set of analysis assumption that assumes only average seller water allocation in the transfers, each of the identified seller areas should be only allowed to transfer the averaged amount of water that was actually analyzed in the EIS/R. Any more water than that allowed under the operations would precipitate impacts that were not analyzed, mitigated or disclosed. Here is a description and analysis of the current critically flawed analytical assumptions the EIS/R used in its impact analysis. The maximum proposed water transfer by the identified water sellers is 511,094AF. In all water years except Critical, Consecutive Dry, and Dry after Critical; the FWS OCAP BO says that the maximum transfer that can be conducted under the permitted conditions is 360,000AF (see related comments). The EIS/R makes the erroneous assumption that the 360,000AF would be evenly distributed across the seller's area. In reality, the impacts would never be so perfectly distributed and reduced in their severity. The EIS/R should have, as described earlier in this comment, tested a number of scenarios in which the transfer water was concentrated with various combinations of sellers. The EIS/R should have evaluated the impacts of all of the transfers coming from a single drainage basin under these limited subscription conditions, e.g. all from the Feather River or American River basin and none from the Sacramento River/Shasta drainage basin and visa versa. The scenario of all water transfers from one basin and none from another basin is very plausible as snowpack could favor one basin over another and make more or less water available for transfer or operational considerations of reservoirs in one basin vs. the other could make water storage much more or much less feasible. The EIS/R should have evaluated at least two scenarios of different distribution of willing sellers. These are: all available sellers from the Sacramento and Feather River Service area with none from any of the other seller service areas and another scenario of all transfers being from Merced River, Delta, American River, Yuba River, and Feather River with none from the Sacramento River. To analyze the salmonid straying effects of the project (see related comments), these scenarios should have also included maximum differences in flow contributions from different operational scenarios for each tributary confluence. At the minimum, these should have included max operations on the Sacramento and no operations on the Feather River and Yuba (and visa versa), max operations on the Feather River and none on the Yuba (and visa versa), max operations on the Sacramento, Feather and Yuba rivers and none on the American (and visa versa). The concept proposed by the project of "backed up water" (see related comments) where water is released earlier in one tributary (e.g. Feather River), water is stored in another tributary basin (e.g. Shasta) and then released later in the other tributary (e.g. Sacramento River) has many more complex flow and water temperature impacts than just the raw number of acre feet in the transfer would indicate by just considering the "upper limits" of transfers as presented in the EIS/R Table 2-5. In the case of "backed up water", the flow impacts on proportional flows at a tributary confluence are doubled. Under the backed up water operational scenario of the proposed project operations, all of the water identified by willing sellers in the Feather and Yuba River and could be released earlier than they otherwise would have in lieu of releases that would have occurred from Shasta. This results in an increase of Feather River flows and a relative decrease in Sacramento River flows at the confluence of the rivers. This is a 2x change in proportional flows at the tributary confluence (e.g. Feather and Sacramento River confluence} (+90,000AF in the Feather River and -90,000AF in the Sacramento River} as compared to the No Action/No Project during the release period. The proposed project does not define when or how short a time period a backed up water transfer could occur (presumably limited by available excess capacity for transfer), but in the absence of supported assumptions provided by the EIS/R we must assume the worst case period ohime and volumes so as to be protective of the endangered fisheries species resources. If the analysis does not specify when, where and how these reservoir backup water transfers would occur, the agencies must assume the worst case scenario and limit the project permitted operations accordingly to assure ESA fish protections. Without these potential flow and temperature change analyses at the confluences of the salmonid migratory tributary confluences, the potential impacts of the range of operations that the project has proposed have not been evaluated, quantified, mitigated or disclosed. The EIS/R is deficient for the lack of this analysis which must be rectified when the document is revised and recirculated.

Response

The EIS/EIR evaluated a maximum transfer scenario in which all transfers would occur based on the available capacity in the Delta. This is a worst case scenario for potential impacts. The range of potential transfers analyzed is based on actual potential sellers that have identified some level of willingness to participate. This EIS/EIR does not include transfers from sellers not included in Chapter 2. Therefore, the transfers were geographically distributed based on actual potential seller locations, including groundwater pumps they identified to include in groundwater substitution transfers, and it would not be realistic to model scenarios where all transfers are "geographically concentrated." See response to Comment LA12-143. Appendix C describes the transfer operations modeling assumptions.

Comment LA12-187

Comment

Aquatic Resources: The Terrestrial species impact analysis determined that "Groundwater substitution could reduce stream flows supporting natural communities in small streams" was a significant impact for alternatives 2 and 3. If groundwater impacts on streams can be significant for terrestrial species, how can it not be significant for aquatic species? The EIS/R must be revised to correct this impact call omission in the aquatic species section.

Response

The nature and relevance of reduced stream flows for terrestrial species differ from those for aquatic species. For the riparian natural community, the root zones of the vegetation would be dewatered, resulting in a significant impact. For fish, the spatial and temporal overlap of flow reductions with fish species would be minimal, resulting in a less than significant impact.

Comment LA12-188

Comment

Aquatic Resources: Vegetation removal from Bouldin Island was required for a water transfer to Semitropic Water District in 2014. The herbicide application resulted in the damage to 10s of thousands of acres of agricultural crops and wildlife habitat. Since Bouldin Island is in the very middle of the delta, the herbicide spray drift that impacted terrestrial habitat would have also have to have contaminated hundreds of acres of aquatic habitat. In this case the aquatic habitat damaged included designated critical habitat for San Joaquin steelhead and Chinook salmon, green sturgeon, delta smelt and other special status species. Previous water transfers have proven that this is a real risk of this type of project and these risks must be evaluated. The EIS/R failed to identify, characterize, evaluate, quantify, mitigate or disclose these very real potential impacts of the proposed project. The EIS/R must be revised and recirculated to address these material omissions and deficiencies in the document.

Response

The Bouldin Island incident was an isolated incident that is still under investigation. For cropland idling transfers, the lead agencies monitor idled lands to look for excessive vegetation that may be resulting in consumptive use of water on the property. If they determine excessive vegetation is present, they request the landowner to disc the field, not to apply herbicide.

Comment LA12-189

Comment

Wildlife: The sellers identified are mostly water districts. When water districts transfer water they typically rotate the fallowed lands from year to year so not the same fields or owners are participating from year to year. The EIS/R just assumes there will be some even distribution of the fallowed fields across a water district. They do put some constraints on adjacency to wildlife refuges, but other than that, the fallowing could occur in any location or in any combination of locations or concentrations. By not having specific locations or a very specific rule set about how fallowed fields can be distributed within a water district, the analysis of the impacts from field fallowing is at a programmatic level of detail, not a project site specific level of detail. The rules for how fallowed field are distributed in a water district are not specific enough to allow detailed analysis of impacts. The lack of specificity of the location and distribution of fields also does not allow for impact analysis to wildlife. There are some vague assurances from the project about not disrupting habitat corridors, but they do not say how this would be determined, what threshold of disruption is acceptable or unacceptable. A single fallowed field is disruptive to habitat connectivity by itself, is that too much? How about two adjacent fields fallowed, too much or OK? How about 3 contiguous fields or 30 contiguous fields? The EIS/R assurances to not disrupt habitat are so vague that these questions cannot be answered and therefore these assurances by the project are meaningless. The EIS/R must be revised such that project specific levels of detail on the impacts of field fallowing are conducted. Although the agencies can approve a programmatic EIS/R, this project, because of its lack of project-level analysis of impacts, must have a subsequent environmental analysis prior to implementation.

Response

The commenter incorrectly states that the 2014 Draft EIS/EIR assumes an even distribution of fallowed fields across a water district. The 2014 Draft EIS/EIR lists the upper limits in acre-feet of water by transfer type for each district/water agency (Table 2-5), but does not assume or require that transfers be distributed across the district in a particular manner. Page 3.8-35 (Section 3.8.2.1.2) of the 2014 Draft EIS/EIR explains that the exact locations of cropland idling/shifting actions would not be known until the spring of each year, when water acquisition decisions are made. The initial decision about whether to idle a parcel is made by the individual landowner.

As further described on page 3.8-35, the effects of cropland idling/shifting are evaluated based on the total acreage idled/shifted, the frequency with which cropland idling/shifting is expected to occur, the value of that cropland to special-status species, and the degree of habitat fragmentation that would likely occur. Reclamation and SLDMWA consider this information sufficient to determine if potentially significant impacts could occur as a result of the identified range of potential water transfer activities. Regarding habitat corridors, water sellers must maintain adequate water in major irrigation and drainage canals used as movement corridors within idled croplands. The analysis acknowledges that cropland idling/shifting has the potential to contribute to habitat fragmentation (page 3.8-35), but this impact was determined to be less than significant based on existing variability of the landscape.

Comment LA12-190

Comment

Wildlife: Farmed fields contribute wildlife habitat values for foraging, refuge, and mating. Fallowed bare ground impacts wildlife by altering habitat values and uses and overall provides lower habitat value than a cultivated field, e.g. no flooded rice when fallowed. Loss of habitat on the international flyway, which the seller areas are in a core area of, impact the United States compliance with the International Migratory Bird Treaty which was not addressed in the EIS/R.

Response

As acknowledged throughout Section 3.8 of the EIS/EIR, fallowed agricultural lands provide suitable habitat for a variety of wildlife species. The value of fallowed versus flooded rice is dependent on the species, with some species benefiting from rice field idling (i.e., Swainson's hawk). Because the range of potential transfer activities analyzed in this EIS/EIR is not expected to adversely affect migratory birds, implementation of those activities would not be in violation of the Migratory Bird Treaty Act.

Comment LA12-191

Comment

Wildlife: Southern Central Valley land that has been fallowed and is put back into production due to a water transfer will destroy the habitat values that have been created while the field was fallowed. Some of the species that move into fallowed fields that would have their habitat destroyed by putting the field back into production by the water made available by the water transfers include giant garter snake, tiger salamander, Alameda whip snake, San Joaquin kit fox, San Joaquin kangaroo rat, and others. The project failed to quantify and mitigate these impacts.

Response

As described in Section 1.1, the purpose of the potential water transfer activities analyzed in this EIS/EIR is to alleviate water shortages and help meet existing demand in water districts identified in the buyer's service area. Water transfers are not expected to result in the conversion of non-agricultural habitat to active cultivation.

Comment LA12-192

Comment

Wildlife: If a field is fallowed for up to 10 years under the Proposed Project, habitat values will be created. The project fails mitigate for the destruction of these created habitat values that will occur at the end of the project period when these lands are put back into production.

Response

Although it is possible for one specific parcel to be fallowed every year as a result of potential water transfer activities, that scenario is highly unlikely and speculative at best. As described in Section 2.3.2.2 of the 2014 Draft EIS/EIR, water transfers would not occur every year, but only in years when there is demand from buyers and pumping capacity is available to convey the transfers (generally dry and critical years). Because crop rotation and idling are a common practice in managed agricultural landscapes, variation within this habitat type from year to year is common and implementation of the potential transfer activities analyzed in this EIS/EIR will not result in permanent destruction of wildlife habitats.

Comment LA12-193

Comment

Wildlife: Vegetation removal from Bouldin Island was required for a water transfer to Semitropic Water District in 2014. The application of herbicide for vegetation removal resulted in the damage to 10s of thousands of acres of agricultural crops and wildlife habitat. In this case the habitat damage included critical habitat for giant garter snake, riparian brush rabbit and rat, tiger salamander, greater sandhill crane, San Joaquin steelhead and Chinook salmon, green sturgeon, delta smelt and other special status species. This spray drift damage has been well documented and publicized (http://wineindustryinsight.com/?p=54211, http://www.winebusiness.com/blog/?go=getBlogEntry&datald=l35322, http://www.lodinews.com/news/article 3c58d352-f196-11e3-8efa-0019bb2963f4.html, http://rivernewsherald.org/articles2014/bouldin 8-6-2014.html). Bouldin Island is only 5,900 acres. The proposed project could idle as much as 177,000 acres in a year if it utilized its maximum transfer capacity covered under the EIS/R using mostly the crop idling strategy component of its proposed project water conservation. If the transfers were maximized for the 10 year project period and utilized mostly crop idling as its water conservation strategy then over the 10 year project period, there would be as many as 1,770,000 acres that required herbicide treatment. If only 1% of the herbicide treatments for the proposed project water transfers go as badly as the Bouldin Island water transfer, the impact of these water transfers could damage 100s of thousands of acres of wildlife habitat. Previous water transfers have proven that this is a real risk of this type of project and these risks must be evaluated. The EIS/R failed to identify, characterize, evaluate, quantify, mitigate or disclose these very real potential impacts of the proposed project. The EIS/R must be revised and recirculated to address these material omissions and deficiencies in the document.

Response

See response to Comment LA12-187 for impacts associated with herbicide application at Bouldin Island. Regarding acres of habitat affected, Tables 3.8-8 and 3.8-9 list the maximum cropland idling/shifting that would occur from long-term water transfers in a given year is as much as 51,473 acres of rice and as much as 8,500 acres of upland crops. The 177,000 acres referenced by the commenter refers to acre-feet of water and not acreages of land.

Comment LA12-194

Comment

Land Use & Agriculture: Improved irrigation management and scheduling as a water conservation measure should have been included as a component to some of the alternatives.

Response

Improved irrigation management and scheduling in the buyers' area are measures that are part of the Agricultural Conservation (Buyer Service Area) Alternative (see Table 2-1 and Appendix A). It was not carried forward for more detailed analysis because it did not meet the key elements of the purpose and need or basic project objectives as it would not be immediately implementable and would not provide additional water. See Appendix A for more details on the screening of this alternative.

Comment LA12-195

Comment

Land Use & Agriculture: The timing and method of vegetation removal was not adequately defined in the EIS/R to ensure water conservation. As an example a previous comment alluded to, Bouldin Island vegetation management was very late, so much of what was supposed to be conserved was not. The EIS/R has failed to provide descriptions, process, monitoring and contingency plans to guarantee idled crop land does not continue to transpire and use water that was supposed to be conserved.

Response

The only conservation transfer analyzed in the 2014 Draft EIS/EIR is from Browns Valley Irrigation District. This project replaced a distribution canal with a pipeline to reduce water use by vegetative growth along the canal. This conservation transfer does not include herbicides or other forms of vegetation management.

Comment LA12-196

Comment

Land Use & Agriculture: Long term transfers conflict with Williamson Act conservation as long term fallowed ground with no vegetation is no longer agriculture.

Response

Water transfers would not result in the permanent conversion of agricultural land uses that are incompatible with Williamson Act contracts. As described in the Land Use and Agriculture section, cropland idling would be temporary in nature and would not result in a permanent conversion of agricultural lands. Landowners would annually choose whether to idle their fields to transfer water and could place fields back into production the following season. Further, buyers have indicated cropland idling transfers are the lowest priority transfer method under the Proposed Action; therefore, it is unlikely that the maximum cropland idling transfer would occur over consecutive years.

Comment LA12-197

Comment

Land Use & Agriculture: Transfers include water conserved from "crop shifting". If a grower was to plant alfalfa (very water consumptive use intensive) and then they say they will take that crop out and plant winter wheat instead and sell the water that was "saved" by not continuing to grow the water use intensive crop, it opens the whole project to gaming and false water savings.

Response

Alfalfa is eligible for cropland idling or shifting on a case-by-case basis. Table 2-3 states, "Only alfalfa grown in the Sacramento Valley floor north of the American River will be allowed for transfers. Fields must be disced on, or prior to, the start of the transfer period. Alfalfa acreage in the foothills or mountain areas is not eligible for transfer." Reclamation will not allow crop shifting if it does not result in a reduction of consumptive use for the crops. As described in Chapter 2, Reclamation has a process in place to account for water savings for crop shifting transfers. See Common Response 14.

Comment LA12-198

Comment

Land Use & Agriculture: "Cropland idling water transfers could permanently or substantially decrease the amount of lands categorized as Prime Farmland, Farmland of Statewide Importance, or Unique Farmland under the FMMP." was determined in the EIS/R to be a Less Than Significant impact for alternative 2. This is an error as irrigation of the land is a core requirement of the definition of "prime farmland. The proposed project and alternatives take irrigation water away from as much as 177,000 acres in any alternative that includes land fallowing. Alternative 2 includes land fallowing, so it is a significant impact. Alternative 2 may have less of this impact than alternative 4, but it is still significant and must be mitigated.

Response

In order for agricultural lands to be categorized as Important Farmland on the Farmland Mapping and Monitoring Program (FMMP) maps, they must have been used for irrigated agricultural production at some point during the four years prior to the Important Farmland Map date (mapping is completed every two years), and the soils must meet the physical and chemical criteria determined by the U.S. Department of Agriculture (USDA) National Resources Conservation Service (NRCS). Therefore, for lands to be reclassified out of Important Farmland categories, the same parcel would need to be idled for four consecutive years. Transfers would not change the soil characteristics of land. The maximum annual cropland idling under both the Proposed Action and Alternative 4 would be 59,973 acres, as shown in Tables 3.9-14 and 3.9-15 in the Land Use and Agriculture section.

Comment LA12-199

Comment

Land Use & Agriculture: The EIS/R fails to identify increased weed pressure on properties adjacent to fallowed fields. This results in additional herbicide applications being required, which has environmental impacts and costs for the adjacent land owner. The EIS/R must be revised to identify, characterize, evaluate, quantify, mitigate and disclose this impact.

Response

This issue has not been observed by Reclamation or DWR staff responsible for monitoring water transfer operations.

Comment LA12-200

Comment

Land Use & Agriculture: Native grasses and herbaceous plants are slow to colonize highly disturbed soils such as idled agricultural fields so the idled fields are primarily initially colonized by exotic and invasive weed species. The EIS/R failed to identify that the proposed project and alternatives operations would increase weed pressure of exotic and invasive plant species. These exotic and invasive plants also alter habitat value for foraging and refuge for wildlife.

Response

The majority of fallowed agricultural lands would be rice crops. Consistent with the provisions contained in Water Code Section 1018, Reclamation and DWR recognize that rice fields and irrigation/drainage ditches can provide habitat for terrestrial wildlife and waterfowl species. Potential sellers are encouraged to incorporate measures in their crop idling proposal to protect habitat value in the areas to be idled. CDFW can advise landowners in the use of nonirrigated cover crops or natural vegetation as it applies to the provision of waterfowl, upland game bird, and other wildlife habitat (DWR and Reclamation 2014). While idling cropland can result in degradation of soils from invasive species, DWR monitors fields and advises landowners to avoid these impacts.

Comment LA12-201

Comment

Land Use & Agriculture: The EIS/R failed to analyze proposed project impacts on the suitability of water temperatures for agricultural irrigation beneficial uses. The proposed project increased reservoir releases and tributary flows which result in reduced water temperatures farther downstream which in turn results in increased coldwater impacts on crops. DWR's Oroville Facilities reached a settlement agreement with the water districts which are affected by water temperatures being too cold for crop production. The settlement agreement has resulted in more than a million dollars per year in compensation to the affected growers. The proposed project operations at Oroville would add to these impacts. Similarly, cold water affects from releases from Shasta reservoir for the project, could precipitate impacts for growers that divert water at TCID and GCID. The EIS/R failed to identify, evaluate, quantify, mitigate or disclose coldwater affect impacts to agricultural irrigation beneficial uses resulting from the Proposed Project or alternatives.

Response

Potential impacts from changes in water temperature are related to lack of adequate cold water supply for fisheries. Transfers are evaluated to determine if there will be a negative impact on the cold water pool in the reservoir needed for later fishery releases. The release of stored water may be beneficially timed to provide instream fisheries benefits.

Thermalito afterbay at the Oroville Facilities serves as a warming basin for agricultural water delivered to farms east of the afterbay, thus addressing potential cold water impacts to agriculture. Increasing storage in the reservoirs could cause increases in the cold water pool, but would not affect water temperatures downstream as water is released. The Feather River water users may experience effects related to cold water; however, Thermalito afterbay and other facilities on the Feather River would not be affected by the action alternatives.

Comment LA12-202

Comment

Land Use & Agriculture: The water transfers must be restricted to avoid inducement of more permanent demand such as conversion of annual crops to permanent crops in the buyer service areas. The EIS/R failed to addressed the impacts of the water transfers in conversion of crop land to permanent crops and development of permanent demand as a result of the project.

Response

The irrigation water in the water transfers will be used for supplemental water supply in dry years. Water transfers will not be used to meet permanent water demand. As stated in Section 1.1 of the EIS/EIR, water transfers would be used to fulfill the need of water users for flexible supplemental water supplies to alleviate shortages.

Comment LA12-203

Comment

Land Use & Agriculture: Fields adjacent and downwind of fallowed fields have yield losses from hot dry and dusty air being blown from the bare fields. This impact was not addressed in the EIS/R.

Response

This impact is addressed in Section 3.4, Geology and Soils. The majority of cropland idling would take place on rice fields. Rice is typically grown on clay soils that are less susceptible to erosion than sandy soils. The rice crop cycle also reduces the potential for erosion. The process of rice cultivation includes incorporating the leftover rice straw into the soils after harvest. The fields are then flooded during the winter to aid in decomposition of the straw. If no irrigation water is applied to the fields after this point, the soils would remain moist until approximately mid-May. Once dried, the combination of the decomposed straw and clay soils produces a hard, crust-like surface. This surface texture would remain until the following winter rains if not disturbed. In contrast to sandy topsoil, this surface type would not be conducive to soil loss from wind erosion. Therefore, idled rice fields would not be conducive to soil loss from wind erosion. In general, soils that contain some percentage of clay content, such as the predominant soils in counties in the sellers service area, are less susceptible to erosion. It is possible that some idling could occur on the more erodible soil textures. While these soils are more susceptible to wind erosion, the amount of potential acres idled is small – a maximum of 1,800 acres of alfalfa, corn, and tomatoes in Glenn, Colusa, and Yolo counties. See Section 3.4.2.4 for a complete analysis of this impact.

Comment LA12-204

Comment

Land Use & Agriculture: Vegetation removal from Bouldin Island was required for a water transfer to Semitropic Water District in 2014. The herbicide application resulted in the damage to 10s of thousands of acres of agricultural crops. In this case the crop damage included large portions of the Lodi wine grape district. This spray drift damage has been well documented and publicized (http://wineindustryinsight.com/?p=54211, http://www.winebusiness.com/blog/?go=getBlogEntry&datald=135322, http://www.lodinews.com/news/article 3c58d352-f196-lle3-8efa-0019bb2963f4.html, http://rivernewsherald.org/articles2014/bouldin 8-6-2014.html) and is estimated to have caused as much as $1Billion in damages. Bouldin Island is only 5,900 acres. The proposed project could idle as much as 177,000 acres in a year if it utilized its maximum transfer capacity covered under the EIS/R using mostly the crop idling strategy component of its proposed project water conservation. If the transfers were maximized for the 10 year project period and utilized mostly crop idling as its water conservation strategy then over the 10 year project period, there would be as many as 1,770,000 acres that required herbicide treatment. If only 1% of the herbicide treatments for the proposed project water transfers go as badly as the Bouldin Island water transfer, the impact of these water transfers could be $3 Billion in damages. If you look at the amount of herbicide damage claims associated with water transfer vegetation removal to date, you will find the damage rate is well above 1%. Just talk to some Forensic Agronomists in

California that deal with these types herbicide drift cases (e.g. Rush Markroft, Whaley and Stienberg, Bahme and Associates) to get a realistic rate of damages which occur. DWR has a particularly bad track record (probably among the worst in the state when compared to the amount of damages vs. the number of herbicide applied acres) when it comes to damages to third parties from herbicide applications. If the project claims that some or most of the water conservation will not come from crop idling that require herbicide spray weed control, then they must define these limits and analyze and disclose them in the EIS/R. Previous water transfers have proven that herbicide spray drift is a real risk of this type of project and these risks must be evaluated. The EIS/R failed to identify, characterize, evaluate, quantify, mitigate or disclose these very real potential impacts of the proposed project. The EIS/R must be revised and recirculated to address these material omissions and deficiencies in the document.

Response

See response to Comment LA12-187 for impacts associated with herbicide application at Bouldin Island. As shown in Section 3.9.2.4, Table 3.9-14, the maximum acreage that could be idled under the Proposed Action is 59,973. Buyers have indicated cropland idling transfers are the lowest priority transfer method under the Proposed Action (see Chapter 2); therefore, it is unlikely that the maximum cropland idling transfer would occur in a given year where transfers take place. Remnant vegetation (weeds, cover crop, or over-winter crop) may remain on idled fields. There is no proposal to remove it with herbicide application (DWR and Reclamation 2014). Excess vegetation on idled fields would only require abatement measures following inspection by Reclamation or DWR. Active management would take the form of discing. There would be no large-scale herbicide application as occurred on Bouldin Island.

Comment LA12-205

Comment

Cultural: The impact criteria for cultural resources are incorrect. It is not an impact only if the reservoir levels are drawn down below historical levels, it is an impact if the reservoir drawdown from proposed project and alternatives operations that result in an increase of the frequency and magnitude of archaeological site exposure within the fluctuation zone of the reservoirs. Any increase in the frequency or magnitude of exposure of cultural or archaeological resources is a significant impact of the project. As an example of a correct impact criteria for this resource in a similar environmental document, see the Cultural Resources reports from the California Department of Water Resources Oroville Facilities Relicensing.

Response

Section 3.13, Cultural Resources, states that "[s]ignificant impacts would be determined when operations expose previously submerged resources, increasing their vulnerability to vandalism and other factors; and expose resources to increased cycles of inundation (erosion) and drawdown" (see page 3.13-14). The significance criteria is consistent with the commenter's statement that impacts would be significant if the frequency or magnitude of exposure to cultural resources is increased. No changes to the significance criteria are warranted.

Comment LA12-206

Comment

Recreation: The impact calls related to reservoir recreation are incorrect. If the proposed project or alternatives result in an increase in the frequency or earlier calendar date of boat ramp dewatering, then the impact is significant and must be mitigated. As an example of a correct impact criteria for this resource in a similar environmental document, see the Recreation Resources reports from the California Department of Water Resources Oroville Facilities Relicensing.

Response

The impacts to reservoir recreation in the 2014 Draft EIS/EIR consider how changes to water surface elevations and river flows could affect recreation at reservoirs potentially affected by transfers. Boat ramp use is a popular recreation activity at the various reservoirs and is reflective of reservoir recreation use. Thus, it is a reasonable parameter to use in analyzing the alternatives' effects to reservoir recreation in the context of the stated significance criteria within the EIS/EIR.

The effects in the Recreation Resources reports from the California DWR Oroville Facilities Relicensing are different from those that would occur in connection with the range of potential transfer activities evaluated under the Proposed Action, thus the use of different significance criteria is appropriate.

Comment LA12-207

Comment

Power: The EIS/R misses the main impact of the proposed project and alternatives 2 and 4 in the impact of increased energy demand from groundwater pumping and from groundwater level drawdown. The amount of groundwater pumping the project can create definitely could be a significant impact to power resources in northern California, especially with power transmission line capacity constraints in the areas where the groundwater power demand can be anticipated. Additionally, "backed up reservoir" water transfers which are include in the proposed project and all alternatives alter the timing and location (see related comments) of hydroelectric power generation associated with these releases as compared to the No Action/No Project. The EIS/R failed to consider these power generation timing and location, changes in location and timing of power consumption and constraints and impacts on power transmission from the proposed project and alternatives. The EIS/R must be revised to correct these omissions and propose mitigations for these undisclosed significant impacts.

Response

The EIS/EIR analyzes the impact of increased groundwater pumping (and the associated increase on energy demand) on climate change (see Section 3.6). The EIS/EIR discloses the anticipated timing of changes in power generation from the alternatives in Section 3.16.2.

Comment LA12-208

Comment

Flood Control: The impact calls relative to project impacts on reservoir storage are flawed. Reservoirs are multipurpose, including flood control and water supply. Flood control comes first in terms of overriding operations as adequate flood control reserve must be managed in the flood control season. If the reservoirs are lower due to proposed project operations, there is no impact to flood control operations as flood control reserve releases are less likely to be triggered and therefore the project has no impact. If flood control reserve releases are activated when the reservoir is fuller due to proposed project operations, the water stored by the project will be spilled first.

Response

Although the commenter is correct that flood operations supersede reserve releases, there will still be an incremental change in storage from existing operational conditions under the action alternatives. As stated in Section 3.17.2, decreases in reservoir storage levels in project-related facilities could potentially benefit flood control; these changes would be very small and would not provide a substantial benefit. No change has been made to the document.

Comment LA12-209

Comment

Regional Economics: "Water transfers from idling alfalfa could increase costs for dairy and other livestock feed." This impact category misses the fact that alfalfa would be one of the primary crops not grown in the component of the proposed project for "crop shifting". When rotation away from water use intensive forage crops in crop shifting is added to the loss of these crop acres in the fallowing part of the proposed project and alternatives, the impact to forage supplies and feed prices to local dairies the impacts could be significant.

Response

See response to Comment LA14-14. Crop shifting was added to this discussion. Use of alfalfa in transfers will be on a case-by-case basis and is limited in some areas. Table 2-3 states, "Only alfalfa grown in the Sacramento Valley floor north of the American River will be allowed for transfers. Fields must be disced on, or prior to, the start of the transfer period. Alfalfa acreage in the foothills or mountain areas is not eligible for transfer."

Comment LA12-210

Comment

Regional Economics: The EIS/R does not disclose if the water transfers are paying proportionate fees for conveyance as the water districts that are paying for the SWP and CVP facilities construction and operations.

Response

Buyers are responsible for fees for use of state and federal facilities to deliver water to their service areas. Water transfers will not affect fees for other state or federal water contractors. Reclamation does not have input regarding the prices of water transfers, as price is negotiated between buyers and sellers. NEPA does not require a discussion of costs in an EIS.

Comment LA12-211

Comment

Regional Economics: Vegetation removal from Bouldin Island was required for a water transfer in 2014. The use of an unregistered combination of herbicides and misapplication of them has resulted in the damage to 10s of thousands of acres of agricultural crops. In this case the habitat damage included critical habitat for giant garter snake, riparian brush rabbit and rat, tiger salamander, greater sandhill crane, San Joaquin steelhead and Chinook salmon, green sturgeon, delta smelt and other special status species. This spray drift damage has been well documented and publicized (http://wineindustryinsight.com/?p=54211, http://www.winebusiness.com/blog/?go=getBlogEntry&dataId=135322, http://www.lodinews.com/news/article 3c58d352-f196-11e3-8efa-0019 bb2963f4.html, http://rivernewsherald.org/articles2014/bouldin 8-6-2014.html) and is estimated to have caused as much as $1Billion in damages. Bouldin Island is only 5,900 acres. The proposed project could idle as much as 177,000 acres in a year if it utilized its maximum transfer capacity covered under the EIS/R using mostly the crop idling strategy component of its proposed project water conservation. If the transfers were maximized for the 10 year project period and utilized mostly crop idling as its water conservation strategy then over the 10 year project period, there would be as many as 1, 770,000 acres that required herbicide treatment. If only 1% of the herbicide treatments for the proposed project water transfers go as badly as the Bouldin Island water transfer, the impact of these water transfers could be $3 Billion in damages. Previous water transfers have proven that this is a real risk of this type of project and these risks must be evaluated and $3 billion in damages to the crops in the seller service areas from the project is a substantial impact to the agricultural industry and local economies that the EIS/R failed to evaluate. The EIS/R failed to identify, characterize, evaluate, quantify, mitigate or disclose these very real potential impacts of the proposed project. The EIS/R must be revised and recirculated to address these material omissions and deficiencies in the document.

Response

See responses to Comments LA12-106 and LA12-204. There would be no large-scale herbicide application as there was on Bouldin Island. All transfers in the Delta will be evaluated on a case-by-case basis. Past cropland idling transfers in other areas of the seller service area have not reported crop damages. Section 3.10 evaluates the potential economic effects of the maximum cropland idling transfers in the seller service area. NEPA and CEQA do not require mitigation for economic effects.

Comment LA12-212

Comment

Environmental Justice: Fallowed ground and shifting to lower water use intensive crops which are typically less labor intensive than more water intensive crops has significant impacts on disadvantaged local communities, employment opportunities, the working poor, and minority farm workers. Regional economics identifies that 500 people would lose their jobs in the water sellers area from fallowing and crop shifting. The vast majority of these people would be minorities. The EIS/R impact call of "No disproportionately high or adverse effect" is not only incorrect, it is not even a proper NEPA or CEQA impact call.

Response

Effects on minority and low-income communities, including farmworkers, are addressed in Section 3.11. As stated in Section 3.11.2, environmental justice effects are analyzed as a part of NEPA and are not considered significant environment effects under CEQA; therefore, no significance determinations are made or mitigation measures required in the impact analyses. Terms such as "adverse and disproportionate" are adequate terms used to describe environmental justice effects as stated in the Council on Environmental Quality's "Environmental justice: guidance under the National Environmental Policy Act." (1997). As described in Section 3.11.2.1.3, to determine if an effect would be adverse and disproportionately high on minority populations, this analysis compares losses in farmworker employment as a result of transfers to total farmworker employment in the region. The change is compared to historical fluctuations in farm worker employment in the region. As shown in Table 3.11-13, cropland idling transfers under the Proposed Action could decrease farm labor demands in environmental justice affected areas by 0.01 percent; however, these effects would be temporary in nature and minimal compared to total farm labor. Effects to the buyer service area would be beneficial, as proposed transfers would increase water supplies in environmental justice affected areas and support farm worker and other employment opportunities.

Comment LA12-213

Comment

Growth inducement was not a section included in the ES summary. Growth inducement consideration is a NEPA requirement.

Response

Growth inducing impacts were evaluated in Chapter 5, Section 5.3. A summary of impacts has been added to the Executive Summary.

Comment LA12-214

Comment

These water transfers result in an increase of the economic disparity between the value of water used for agriculture vs. M&I uses. M&I water uses can justify costs in excess of a thousand $ per acre foot. Almost no crops can be economically grown at a comparable cost to the values that can be justified for M&I uses. The proposed project water transfers inducement creation of permanent demand such as for industrial, urban, commercial or permanent crop use because those water uses can always afford to pay more than the value of the water if it were used for normal row crop production. Therefore, creation of this long term water transfer opportunity from the project has significant growth inducement impact from permanent shifting of water use location and beneficial use that must be evaluated, quantified, mitigated and disclosed by the project. The EIS/R must not be approved until these material deficiencies in how it addresses growth inducing impacts are rectified.

Response

There is no evidence that “These water transfers result in an increase of the economic disparity between the value of water used for agriculture vs. M&I uses.” In general, an increased availability of transfer supply should reduce costs for all users. Water transfer prices are set between willing sellers and willing buyers. SLDMWA has purchased water transfers in past years despite urban water transfers also occurring at sometimes higher prices. Therefore, SLDWMA and its member agencies have not been priced out of the water transfer market and will continue to negotiate water transfers in the future with willing sellers. Water transfers are not a reliable source of water each year. Transfers depend on willing sellers, hydrologic conditions, regulatory restrictions, and capacity to pump through the Delta. These factors can vary each year and can prevent transfers from occurring. Therefore, water transfers would not result in a permanent water source. Growth inducing impacts are discussed in Chapter 5.

Comment LA12-215

Comment

Long-term transfers resulting from this project encourage reliance on this water supply. Annual transfers as an alternative for comparison do not. This difference in growth inducement must be evaluated.

Response

See response to Comment LA12-213.

Comment LA12-216

Comment

The EIS/R analysis must be specific as to each transfer and cumulatively. This cumulative analysis must be in conjunction with single year water transfers and other long-term transfers such as the Lower Yuba River Accord.

Response

Each resource section in Chapter 3 includes a cumulative analysis that evaluates long-term water transfers with other individual transfers, including SWP water transfers and the Lower Yuba River Accord.

Comment Letter LA13, Terry Erlewine, State Water Contractors

Comment LA13-1

Comment

The State Water Contractors ("SWC") appreciate the opportunity to review and comment on the Draft Environmental Impact Statement/Environmental Impact Report ("EIS/EIR") prepared by the Bureau of Reclamation ("Reclamation") and the San Luis & Delta-Mendota Water Authority ("SLDMWA") for the proposed Long-Term Water Transfers Project (the "Project"). The SWC understand that Reclamation is serving as the lead agency under the National Environmental Policy Act ("NEPA") and that SLDMWA is serving as the lead agency under the California Environmental Quality Act ("CEQA"). These comments are provided by the SWC for both NEPA and CEQA.

As Reclamation and SLDMWA know, the SWC is a nonprofit mutual benefit corporation that represents and protects the common interests of its 27 members [Footnote: The SWC members agencies are: Alameda County Flood Control and Water Conservation District Zone 7; Alameda County Water District; Antelope Valley-East Kern Water Agency; Casitas Municipal Water District; Castaic Lake Water Agency; Central Coastal Water Authority; City of Yuba City; Coachella Valley Water District; County of Kings; Crestline-Lake Arrowhead Water Agency; Desert Water Agency; Dudley Ridge Water District; Empire-West Side Irrigation District; Kern County Water Agency; Littlerock Creek Irrigation District; Metropolitan Water District of Southern California; Mojave Water Agency; Napa County Flood Control and Water Conservation District; Oak Flat Water District; Palmdale Water District; San Bernardino Valley Municipal Water District; San Gabriel Valley Municipal Water District; San Gorgonio Pass Water Agency; San Luis Obispo County Flood Control & Water Conservation District; Santa Clara Valley Water District; Solano County Water Agency; and Tulare Lake Basin Water Storage District.] in California's State Water Project ("SWP"). Collectively, the SWC member agencies utilize the SWP and other facilities to deliver water to more than 26 million residents throughout the state and to more than 750,000 acres of agricultural lands. Hence, the SWC have an interest in any project that may impact SWP water supplies.

As described in the EIS/EIR, the Project covers a 10-year period (2015 through 2024) during which water could be transferred between willing sellers and buyers through groundwater substitution, reservoir release, conservation, and other mechanisms. More specifically, the Project would allow Central Valley Project ("CVP") contractors in areas south of the Delta or in the San Francisco Bay area to purchase transferred water. The transferred water would be conveyed to the purchasers by the sellers through the Delta using existing CVP or SWP facilities and pumps.

After reviewing the EIS/EIR, the SWC have several questions regarding the Project and its environmental analysis. Accordingly, the SWC respectfully request that Reclamation and SLDMWA provide further discussion regarding the items identified below in order to more fully comply with NEPA, CEQA, and those laws' respective public disclosure and analysis requirements. Specifically, the SWC's questions relate primarily to the analysis of, and mitigation for, potential impacts associated with the Project's groundwater substitution and reservoir re-operation elements.

Response

Analysis of groundwater substitution and reservoir release transfers is included in Section 3 of the 2014 Draft EIS/EIR and summarized in Table 2-9. Information in response to the commenter's specific comments and questions is provided below.

Comment LA13-2

Comment

1. The SWC request that Reclamation and SLDMWA clarify the criteria for assessing the magnitude of impacts. Based on the SWC's review of the EIS/EIR, it is unclear how thresholds of significance or magnitudes of impacts were utilized to determine whether the Project would result in significant impacts to water supplies. The SWC request that the EIS/EIR be clarified to identify with greater specificity how thresholds were applied in both the groundwater substitution and reservoir re-operation contexts, and what specific magnitude of impacts were used when arriving at a significance conclusion.

Response

The following clarifies the groundwater substitution significance criteria and how effects related to them were evaluated:

(1) A net reduction in groundwater levels that would result in substantial adverse environmental effects or effects to non-transferring parties. Simulated groundwater levels were compared to average domestic and municipal/irrigation well depths shown in Table 3.3.-4. See Common Response 6.

(2) Permanent land subsidence caused by significant groundwater level declines. Simulated groundwater levels were compared to historic lows (see Table 3.3.-5) to determine the potential for subsidence. See Common Response 7.

(3) Degradation in groundwater quality such that it would exceed regulatory standards or would substantially impair reasonably anticipated beneficial uses of groundwater. Migration of reduced quality groundwater is not likely to be a concern unless groundwater levels and/or flow patterns are substantially altered for a long period of time.

The first significance criterion was clarified to indicate that effects to the environment or non-transferring parties must be substantial to be characterized as significant. This change was made to be consistent with CEQA guidelines, which indicates that a substantial change to a resource leads to a significant impact. This change does not affect the findings of significance in the groundwater analysis, but rather clarifies that those findings of significance are based on a substantial change.

Comment LA13-3

Comment

Similarly, when determining whether the Project would result in significant impacts to groundwater resources as a result of groundwater substitution, the EIS/EIR asks whether the Project would cause "[a] net reduction in groundwater levels that would result in adverse environmental effects or effects to non-transferring parties." (EIS/EIR, p. 3.3-61). Thus, the threshold suggests that any net reduction in groundwater levels or any effect to non-transferring parties (regardless how small) may be significant. The SWC request that the EIS/EIR more clearly identify what standard/magnitude of impact was used for assessing significance. Similarly, the threshold asks whether the Project would result in "adverse environmental effects." The SWC's request clarification regarding how "adverse environmental effects" were assessed and what magnitude of impact was used when reaching the significance conclusions in the EIS/EIR.

Response

Groundwater Mitigation Measure GW-1 requires the development of an approved monitoring and mitigation plan to ensure compliance with performance standards and avoid potentially significant impacts from groundwater substitution pumping. Common Response 6 provides additional information. In counties where BMOs currently exist, the BMOs will be used as monitoring criteria. In counties where BMOs do not exist, critical changes to groundwater levels will be avoided through close coordination with third parties.

Comment LA13-4

Comment

Finally, the EIS/EIR could avoid ambiguities by answering the following questions. Is any amount of "permanent land subsidence" considered significant, and how did Reclamation and SLDMWA determine whether "significant groundwater level declines" would occur in the first instance? (See second threshold at EIS/EIR, p. 3.3-61; see also third threshold which appears to be incomplete at EIS/EIR, p. 3.3-61). The SWC request that the EIS/EIR be clarified to more specifically identify how Reclamation and SLDMWA determined the significance/magnitude of Project impacts.

Response

See Common Response 7 regarding subsidence and Common Response 6 regarding groundwater levels. The third threshold is complete; the typographical error at the end of the bulleted phrase has been corrected.

Comment LA13-5

Comment

2. The SWC request that Reclamation and SLDMWA expand the analysis of impacts and also clarify the "Environmental Commitments" and Project features that are relied upon to prevent impacts from arising. a. The SWC request a further elaboration on the Project's impacts on water supply and surface/groundwater interactions. The discussion of water supply impacts and surface/groundwater interaction confirms the Project's groundwater substitutions will cause reduced Delta Pumping Station exports on an annual basis. (EIS/EIR, p. 3.1-17). However, it is unclear how those reductions were calculated or during which specific months of the year they are likely to arise. As the EIS/EIR notes, the Biological Opinions ("BiOps") applicable to the Coordinated Operations of the CVP and SWP typically limit the bulk of Delta exports to the months of July through September. (EIS/EIR, pp. ES-9,

1-11). Accordingly, if Project-induced reductions in exports are all concentrated within a narrow-window (particularly during summertime peak exports), the overall impact on water supply may be disproportionately large. The SWC request clarification regarding what month(s) reductions in exports are likely to occur and what impacts to water supply exports may result.

Response

Section 3.1 has been revised to clarify when the impacts are likely to arise.

Comment LA13-6

Comment

Similarly, the SWC request further discussion regarding the groundwater substitutions. Specifically, the SWC request explanation of which specific surface flows are likely to see the largest flow reductions; when those flow reductions are most likely to manifest; and what the magnitude of those reduced volumes may be. As the EIR acknowledges throughout Section 3.3, the geographic area covered by the Project is large and it hosts a wide variety of hydrological and geologic conditions (annual rainfall, volume of groundwater basin, depth to groundwater, etc.). These varying conditions presumably make certain surface flows more vulnerable to the effects of groundwater substitution impacts than others. (See EIS/EIR, p. 3.1-16 [Figure 3.1-2]). Thus, the EIS/EIR should provide a stream-by-stream discussion of whether flow reductions are likely; when those reductions are likely to arise; and what the magnitude of those reductions may be. As described below, mitigation could then be tailored to more specifically address those impacts.

Response

The impacts of the streamflow depletion, as related to groundwater substitution transfers, on fisheries and on vegetation and wildlife are described in Sections 3.7 and 3.8, respectively. These sections identify estimates of streamflow depletion for smaller streams throughout the Sacramento Valley and provide details on streams that have changes with the potential to affect environmental resources.

Comment LA13-7

Comment

The EIS/EIR also confirms that reservoir re-operations will cause a drawdown in reservoir levels. (EIS/EIR, p. 3.1-19). It is anticipated that this drawdown volume would, over time, be replaced by water that would otherwise flow downstream. (EIS/EIR, p. 3.1-18). However, and again as the EIS/EIR alludes to, there are certain flow and salinity requirements arising from the BiOps that regulate Delta exports. If water that would normally flow downstream and assist in meeting BiOp requirements is now withheld in upstream reservoirs (for example, flows that would normally enter the Delta from the San Joaquin River), that could reduce the SWC's ability to export water from the Delta, an impact that should be described in greater specificity in the EIS/EIR.

Response

The analysis conducted in preparation of the EIS/EIR analyzed both the releases from the reservoir that create additional drawdown, and reductions in releases and downstream flows that refill reservoirs. This analysis included simulation of current regulatory obligations of the CVP/SWP including the biological opinions. Reservoirs cannot, and do not, refill by reducing downstream flows at times when those reductions would result in violation of requirements such as the biological opinions or SWRCB decisions. Rather, reservoirs refill when storage levels approach and reach flood control limits, and at times when water available in the system is in excess of all regulatory requirements. This is true in both the analysis conducted for the EIS/EIR and in actual operations.

Comment LA13-8

Comment

The EIS/EIR also states that reservoir re-operations may result in reservoir drawdowns that require more than one season to refill. (EIS/EIR, p. ES-11). It is unclear how refill would occur, if at all, in periods of multiple drought years akin to the drought conditions that exist today. Ultimately, the SWC request that the EIS/EIR discuss in greater detail how compliance with the BiOps' flow requirements, water quality requirements (such as salinity targets), and release timing requirements would be affected by reservoir re-operations.

Response

Chapter 2.3.2.1 describes how reservoir releases would occur and how refill would occur. In consecutive multiple dry years, the reservoir may not refill completely until subsequent wet conditions occur. Each refill agreement will specify periods when refill should not occur because of downstream conditions; these periods include Delta balanced conditions, times when water is used to meet downstream water quality or flow standards, and times when the water could have been stored in a downstream CVP or SWP reservoir. If refill does occur during these periods, it would affect the CVP and SWP (which would continue to meet standards in the absence of the additional flow). The refill agreement specifies how refill would be monitored to prevent these effects, and compensate the CVP and SWP for the effects if they are not fully avoided. Further detail would be identified in a refill agreement between the seller and Reclamation in coordination with DWR.

Comment LA13-9

Comment

With regard to cumulative impacts, the SWC request clarification of the discussion regarding groundwater substitution and reservoir re-operation. The EIS/EIR confirms that the cumulative effects analysis spans a ten year period (2014-2024). (EIS/EIR, p. 3.3-91). However, elsewhere the EIS/EIR states that residual reservoir drawdowns and stream flow effects may linger for more than one season, potentially even after any transfers have been completed. The SWC request further discussion to confirm that the Project's impacts have been captured, including those impacts that may remain even after the 10-year transfer period has concluded. Additionally, it is unclear how the cumulative impacts analysis accounts for the combined pressures of existing CVP and SWP operations, the ongoing drought, the potential effects of BiOps, and other projects. The SWC request that an expanded discussion of those issues be provided.

Response

The TOM analysis used to determine the water supply impacts associated with the alternatives used a 34-year analysis period, from water year 1970 through 2003. This model captured various water year types, including multiple dry years (i.e., 1987-1992) to anticipate future conditions under the alternatives. The cumulative analysis in each resource area considers cumulative effects in combination with this entire operational period, so impacts that extend after the last transfer are captured. The modeling analysis results in a description of potential changes associated with the action alternatives under a variety of hydrologic conditions (including extended drought) under the current biological opinions and operational pressures.

The cumulative projects analyzed in the 2014 Draft EIS/EIR are based on those that could be implemented during the Proposed Action's 10-year transfer period. The fact that effects could extend for a year or two after the transfer period ends was considered in determining the list of cumulative projects under consideration. For this effort, however, there are no additional projects that could result in cumulative impacts. Commenters have suggested that the BDCP should be included in the cumulative section, but the earliest features would not be complete until 11 years after construction begins (which is still several years away). Commenters also suggest the Yolo Bypass Salmonid Habitat and Fish Passage could be a cumulative project. This effort, which is part of the Reasonable and Prudent Alternative under the NOAA Fisheries Service Biological Opinion on Long-Term Operations of the CVP and SWP, is not likely to be completely constructed and operational before 2024. But even if it were operational during period when transfer effects are still present, these two projects would not have similar effects. The Yolo effort could increase flow into the Yolo Bypass by 6,000 cfs during wet periods, but the range of potential transfers analyzed in this EIS/EIR would not be in effect during these wet periods.

Comment LA13-10

Comment

b. The SWR request that “Environmental Commitments” and Project features be further specified. The EIS/EIR puts forward a number of measures intended to prevent water supply impacts from occurring. The SWC appreciate those efforts, and agree that proactive management is appropriate to prevent impacts from arising. However, the SWC believe that the proposal could be improved with more specific details of those measures specified as part of the current EIS/EIR process. As one example, all transfers (including both groundwater substitution and reservoir re-operation) are subject to a “carriage water” requirement that is aimed at maintaining water quality in the Delta. (EIS/EIR, p. 2-29). It is unclear if this carriage water factors is intended to be duplicative of the stream flow depletion requirement imposed by Mitigation Measure WS-1, or if the carriage water concept is an entirely separate and distinct requirement.

Response

Section 2.3.2.4 has been revised to clarify the meaning of carriage water. As the revised description indicates, carriage water and the streamflow depletion factor, as described in Mitigation Measure WS-1, are distinct terms.

Streamflow depletion accounts for the loss of surface water as a result of groundwater and surface water-groundwater interaction. Carriage water is the amount of water used to increase the outflow from the Delta to maintain Delta water quality and account for conveyance losses.

Comment LA13-11

Comment

As another example, the EIS/EIR states that all reservoir re-operation transfers would be subject to a "refill agreement" between the seller and Reclamation to prevent impacts to downstream users. (EIS/EIR, p. 2-11). However, it is unclear how quickly refill would be required or how such an agreement would be enforced. Likewise, the EIS/EIR states that the refill agreements would require refill of reservoirs only when it would not adversely affect downstream water users." (EIS/EIR, p. 3.1-19). It is unclear to the SWC what standards apply for making that determination and which party (the seller, the buyer, the downstream water user, or DWR/Reclamation) would have the burden to prove or disprove any adverse impact. The SWC request clarification of the specific performance standards and enforcement mechanisms for the refill agreements, such as withholding water to refill reservoirs only occurs during times when Delta water exports are not occurring.

Response

See response to Comment LA13-8.

Comment LA13-12

Comment

The EIS/EIR also confirms that Delta water quality may be adversely impacted by reduced flows or changed timing of flows. Thus, "Reclamation and DWR would need to either decrease Delta exports or release additional flow from upstream reservoirs to meet flow or water quality standards." (EIS/EIR, p. 3.1-16). The SWC request further details on how this Reclamation/DWR process would be implemented; which entity would bear responsibility for documenting the decision; and what factors Reclamation and DWR anticipate applying in deciding whether to cut water supply exports or release upstream reservoir volumes. Similarly, the SWC request elaboration on whether upstream reservoir volumes are likely to be available, particularly as the EIS/EIR elsewhere confirms that total reservoir volume is likely to decrease for more than one season at a time. (See EIS/EIR, p. ES-11).

Response

The EIS/EIR indicates that water quality could be affected if the CVP and SWP would not reoperate to address these changes, but the document concludes that they would alter operations to continue to meet water quality and flow standards. Decisions would continue to be made through the same process as currently exists. Operators of the

CVP and SWP water systems would continue to operate the systems, as they currently do, to meet all flow and water quality standards.

Comment LA13-13

Comment

Finally, the EIS/EIR states that transferred water would only be used to meet existing needs and not future or expanded needs. (EIS/EIR, pp. ES-1, 101). The SWC request elaboration on how this Project feature will be monitored to ensure no unanticipated impacts will arise.

Response

During the 10-year implementation period of the range of potential transfer activities evaluated under the Proposed Action, parties wishing to transfer water would submit information to Reclamation to show that the proposed transfer incorporates the provisions included in this EIS/EIR and would not result in any new or substantially more severe environmental impact than those identified in this environmental document. Reclamation would not approve transfers that do not fit within the selected action alternative without additional environmental documentation. See Common Response 14.

Comment LA13-14

Comment

3. The SWC request that Reclamation and SLDMWA clarify the mitigation to ensure performance with specific criteria. Here – separate and apart from the "Environmental Commitments" and Project feature concerns addressed above – the SWC believe Mitigation Measure WS-1 requires the implementation of a stream flow depletion factor, which will be developed at a future date and subject to change, and which will be designed to offset any water supply impacts and prevent conflict with the "no injury" rule that may otherwise arise from groundwater substitution transfers. (EIS/EIR, p. 3.1-21). However, measure WS-1 does not identify what specific minimum depletion factor would be required. Instead, it appears that this decision is left largely to DWR and Reclamation's future discretion. The SWC request further elaboration on how this factor would be developed and enforced, and the SWC recommend that a minimum stream flow depletion factor percentage be established now as part of the current EIS/EIR process.

Response

See Common Response 8 regarding clarifications to Mitigation Measure WS-1 in response to comments.

Comment LA13-15

Comment

Likewise, measure WS-1 provides that the stream flow depletion factor will be established "in consultation with buyers and sellers." (EIS/EIR, p. 3.1-21). However, many of the entities that may suffer injury as a result of any approved transfer are actually downstream water recipients that are neither the buyer nor the seller in the transfer. Thus, the SWC request that measure WS-1 be modified to state that any depletion factor will only be established in consultation with buyers, seller, and other potentially affected parties.

Response

See Common Response 8 regarding clarifications to Mitigation Measure WS-1 in response to comments. In addition to these clarifications, the lead agencies note that Reclamation and DWR are responsible for protecting CVP and SWP water supplies. As such, including these agencies in the process to determine any potential changes to the minimum depletion factor would represent other potentially affected parties.

Comment LA13-16

Comment

Further, measure WS-1 states that no water transfer will be approved if it violates the "no injury rule." (EIS/EIR, p. 3.1-21). The SWC request that the Mitigation Measure be revised to elaborate on who bears the burden of providing/disproving injury, and what information would be relevant to that determination.

Response

See Common Response 8 regarding clarifications to Mitigation Measure WS-1 in response to comments.

Comment LA13-17

Comment

Similarly, the SWC request that Mitigation Measure GW-1 be revised to further explain how long-term decreases in surface flows will be prevented or mitigated. As set forth above, the EIS/EIR confirms that surface flows may decrease as a result of increased groundwater pumping. The EIS/EIR confirms that surface flows may experience some decrease over baseline conditions as groundwater basins subsequently recharge. Without further details, it appears that surface water flows may be decreased for a period of 10+ continuous years as transfers result in an ongoing tradeoff between groundwater pumping and groundwater recharge (both of which would reduce flows in surface stream). Thus, the SWC would appreciate further explanation of how Mitigation Measure GW-1 will prevent that long-term reduction in surface flows from occurring. One recommendation is to provide a body-by-body performance standard that states how much reduction in surface water flows would be allowed and over what time period in order to assure that no significant impacts result.

In conclusion, the SWC thank Reclamation and the SLDMWA for the opportunity to review and comment upon the EIS/EIR. The SWC appreciate the Project’s overall goal of increasing flexibility and reliability with regard to management of CVP water supplies. However, the SWC do request that Reclamation and SLDMWA expand on the issues identified above in order to comply with CEQA and NEPA. SWC believe it is necessary to provide a fuller and more complete environmental analysis under NEPA and CEQA to help ensure that the Project does not provide a benefit to certain water providers to the potential detriment of others.

Response
See response to Comment LA08-4.

Comment Letter LA14, Patrick Blacklock, Yolo County

Comment LA14-1

Comment
The County of Yolo ("County") submits this letter to provide its initial comments on the Long Term Water Transfers Draft Environmental Impact Statement/Environmental Impact Report ("Draft EIS/EIR"). The County is continuing to review the Draft EIS and may submit further comments in early 2015.

Altogether, the Executive Summary of the Draft EIS/EIR indicates that up to 86,000 acre-feet of surface water could be transferred each year from 2015 through 2024 from properties within Yolo County to buyers in the San Luis & Delta-Mendota Water Agency ("SLDMA") service area, as well as the Contra Costa Water District and East Bay Municipal Utility District. The County's comments focus on proposed transfers within Yolo County and, in particular, on the potential transfer of up to 35,000 acre-feet annually ("af/yr") from Conaway Ranch. Notwithstanding this letter's focus on transfers from Yolo County, however, the following comments apply equally to other proposed transfers and the Draft EIS/EIR generally.

Response
The lead agencies are unable to accommodate the request for additional review time beyond CEQA and NEPA requirements.

Comment LA14-2

Comment
As an overall matter, the County disagrees with the conclusion that Alternative 2 (the "Proposed Action" analyzed in the Draft EIS/EIR) will not have any significant, unavoidable adverse effects. Even considering the "environmental commitments" described in Chapter 2 of the Draft EIR/EIS, it is objectively unreasonable to conclude that the potential transfer of slightly over 500,000 af/yr and associated groundwater substitutions, cropland idling, and other measures within the selling areas will somehow not cause any significant, unavoidable adverse effects. There are a host of specific reasons why this conclusion is inappropriate, including an overreliance on assumptions that lack a sound evidentiary basis and other factors discussed in the following section of this letter.

Response
The EIS/EIR completes a very rigorous analysis before reaching the conclusions related to the impacts in each resource area. These conclusions are based on the best available tools for analysis and reasonable forecasts of future conditions. The determination that the action alternatives would not result in significant impacts is also based on mitigation measures included in multiple resource areas; several of these mitigation measures could limit transfers below the amounts proposed (such as mitigation in air quality and groundwater resources).

Comment LA14-3

Comment

Altogether, these analytical flaws distort the comparison of the Proposed Action to other alternatives that could reduce environmental effects associated with cropland idling (Alternative 3) and groundwater substitutions (Alternative 4). The deficient analysis of the Proposed Action's environmental effects compromises the analysis of Alternatives 3 and 4, as well as the ultimate conclusion that those alternatives are not "environmentally superior" to the Proposed Action.

Response

Refer to response to Comment NG03-139 for discussion of the environmentally superior alternative.

Comment LA14-4

Comment

The timeframe for analysis—a ten-year period between 2015 and 2024—is also artificial and appears to have been contrived for the purpose of environmental analysis, independent of any proposed transactions or other relevant factors. A shorter transactional timeframe (such as five years) should be used to ensure that environmental effects are appropriately studied as they become apparent, rather than dismissed several years from now by virtue of the inappropriate use of a ten-year period in the Draft EIS/EIR.

Response

During the ten-year implementation period for the range of potential transfer activities evaluated under the Proposed Action, parties wishing to transfer water would submit information to Reclamation to show that the proposed transfer incorporates the provisions included in this EIS/EIR and would not result in any new or substantially more severe environmental impact than those identified in this environmental document. Reclamation would not approve transfers that do not fit within the selected action alternative without additional environmental documentation. See Common Response 14.

Comment LA14-5

Comment

These fundamental flaws in the Draft EIS/EIR are alone sufficient to support revising the document in several respects, as noted more specifically below. The Draft EIS/EIR should also be recirculated for further public review after these deficiencies are addressed.

Response

CEQA requires an EIR to be recirculated for public review if "significant new information" is included, as that term is defined in Section 15088.5(a) of the CEQA Guidelines.

As a result of the public comments received, the Lead Agencies have made some revisions to the 2014 Draft EIS/EIR. These revisions include updating the affected environment with additional monitoring data now available and clarifying mitigation measures. The revisions do not constitute significant new information under CEQA and recirculation is not necessary.

Comment LA14-6

Comment

The Draft EIS/EIR fails (albeit understandably) to consider recent information relating to subsidence on the Conaway Ranch during the Summer of 2014. A copy of the report on subsidence produced by MBK Engineers on November 12, 2014 is attached hereto. As that report documents, portions of the Conaway Ranch subsided by up to 17 centimeters (6.5 inches) in a three-month period. That three-month period coincided with the transfer of about 25,000 af of surface water to the Tehama-Colusa Canal Authority via groundwater substitution.

Response

Subsidence noticed at Conaway Ranch has been documented in Section 3.3.1.3.2. Mitigation Measure GW-1 has been clarified in response to public comments and accounts for the recent information relating to the subsidence on the Conaway Ranch. See Common Response 7 for additional information.

Comment LA14-7

Comment

The County acknowledges that it is not possible to determine the relative contribution of increased groundwater pumping and the fallowing of thousands of acres of farmland on Conaway Ranch to the observed subsidence. However, the overall circumstances support a serious concern that further surface water transfers will cause or contribute to similar effects if up to 35,000 af/year is transferred from Conaway Ranch in the future (in addition to 10,000 af/year that Conaway Preservation Group is contractually obligated to deliver to local cities). This concern is particularly acute because the Yolo Bypass passes through Conaway Ranch. The levees of the Yolo Bypass are already known to suffer from various deficiencies, as documented in the Draft EIR for the Central Valley Flood Protection Plan in 2012 and numerous other public documents. Subsidence can further compromise levee integrity (Draft EIS/EIR at p. 3.3-28) and, in turn, increase public safety risks within Yolo County.

Response

See response to Comment LA09-1 and Common Response 7.

Comment LA14-8

Comment

Further analysis is required in the Draft EIS/EIR to determine the potential magnitude of such effects and, in addition, to enable proper consideration of the findings required for surface water transfers by Water Code § 1745.10 (relating to conditions of long-term overdraft in affected groundwater basins). These are serious concerns that deserve specific attention in the Draft EIS/EIR, which should be recirculated after it is revised to include a discussion of the new information available on subsidence within the Conaway Ranch. The potential for adverse short-term subsidence effects should also be considered, as even subsidence of a limited duration could impact levee integrity and increase public safety risks (as well as the environmental consequences of large-scale inundation of urban areas if the Yolo Bypass levees fail).

Response

See Common Response 7.

Comment LA14-9

Comment

In addition, Mitigation Measure GW-1 (Monitoring Program and Mitigation Plans) is legally inadequate. By its own terms, it applies only if "substantial adverse impacts" are determined to occur as a consequence of increased groundwater pumping due to surface water transfers. (Draft EIS/EIR at p. 3.3-90.) It assumes, without any apparent basis, that such "substantial adverse impacts" are entirely reversible and can be reduced to a less than significant level through mitigation plans backed by "financial assurances." Much more is needed to explain the conclusion that such mitigation plans will be effective, that adequate financial assurances can be provided (particularly for impacts on major public infrastructure such as levees), and that Mitigation Measure GW-1 is otherwise sufficient in all instances to reduce even the short-term adverse effects of subsidence and other effects of groundwater pumping to a less than significant level. Additionally, the Draft EIS/EIR should study mitigation measures (or project alternatives) that include common-sense approaches such as lower levels of transfers and/or related groundwater pumping.

Response

See Common Responses 6 and 7.

Comment LA14-10

Comment

The Executive Summary of the Draft EIS/EIR explains that the proposed transfers are primarily intended is to support agriculture within SLDMA boundaries. Ironically however, all of the identified drawbacks of the "no action alternative" in the Draft EIS/EIR--increased groundwater pumping, cropland idling, and land retirement within the SLDMA--could occur within the selling areas if the transfers proceed. These effects range from minor to significant, as explained in Chapter 3.9 of the document.

Response

Water transfers would not result in land retirement in the seller service area. The EIS/EIR includes mitigation measures to avoid or substantially reduce any potentially significant impacts in the seller service area to a less than significant level.

Comment LA14-11

Comment

Despite this, the Draft EIS/EIR does not contain sufficient mitigation measures or other constraints upon the proposed transfers to ensure that the adverse effects of water shortages are not simply transferred from the SLDMA to the selling areas. There is no legal or practical reason why this should be so. For instance, the Draft EIR/EIS could easily contain safeguards that limit transfers to the extent necessary to avoid environmentally and/or economically significant effects on groundwater pumping, cropland idling, and land retirement within the selling areas. Such mitigation measures (or project alternatives) should be included for consideration in a recirculated version of the Draft EIS/EIR. More detailed consideration of the potential for Alternatives 3 and 4 to reduce such effects should also be included in the recirculated document.

Response

Chapter 3 identifies mitigation measures that would reduce significant impacts to a less than significant level. The evaluation concluded these mitigation measures were sufficient to reduce impacts to a less than significant level and additional mitigation was not needed. See Common Responses 6, 7, and 9 for additional information. Alternatives 3 and 4 are evaluated in the Draft EIS/EIR at the same level of detail as the Proposed Action.

Comment LA14-12

Comment

The Draft EIS/EIR also takes an inappropriately narrow view of "agricultural impacts." It focuses largely on whether cropland idling and changes in cropping patterns will "substantially decrease" the amount of affected farmland designated Prime Farmland, Farmland of Statewide Importance, or Unique Farmland during the limited term of the transfer program studied in the Draft EIS/EIR. This impact is deemed less than significant under Alternative 2, primarily because cropland idling will be for relatively short periods of time during the ten-year duration of the studied transfers.

Response

The analysis uses criteria from CEQA Appendix G to analyze the significance of impacts to agricultural lands as a result of the alternatives. An impact would be significant if it converted FMMP farmland to non-agricultural uses, conflicted with agricultural zoning or a Williamson Act contract, or resulted in other changes that converted farmland to a non-agricultural use. Under the alternatives, there would be no long-term conversion of farmland to non-agricultural use and there would be no conflict with agricultural zoning or Williamson Act contracts. In order for agricultural lands to be categorized as Important Farmland on the FMMP maps, they must have been used for irrigated agricultural production at some point during the four years prior to the Important Farmland Map date (mapping is completed every two years) and the soils must meet the physical and chemical criteria determined by the USDA NRCS. Therefore, for lands to be reclassified out of Important Farmland categories, the same parcel would need to be idled for four consecutive years. Transfers would not change the soil characteristics of land.

Comment LA14-13

Comment

This analytical approach is flawed because the water transfers facilitated by the Draft EIS/EIR will lead to continued demand (post-2024) for additional water transfers to support agricultural, municipal, and industrial uses within the boundaries of the SLDMWA and other purchasing entities. For this reason, the ten-year term of the environmental analysis is entirely artificial. It has no connection to real-world demands, which will extend long past 2024, nor does it have any apparent connection to legal or other characteristics of the proposed transfers. A short-term view of the environmental and economic effects of creating a water transfer program is therefore inappropriate because it can be seen with reasonable certainty that, analogous to the growth-inducing effects of urban development projects, the demand for such transfers will continue beyond the limited life of the program. The Draft EIS/EIR should be revised to account for the basic reality that water transfers will lead to (and likely increase the demand for) more water transfers, well beyond the ten-year period of the analysis.

Response

Water transfers under the Proposed Action and alternatives would continue from 2015 through 2024 and discontinue after that. Growth inducing impacts are discussed in Chapter 5. Water transfers are not a reliable source of water each year. Transfers depend on willing sellers, hydrologic conditions, regulatory restrictions, and capacity to pump through the Delta. These factors can vary each year and can prevent transfers from occurring. Water transfers would not result in a permanent water source that can be relied on to meet existing or future demands.

Comment LA14-14

Comment

Finally, the potential adverse economic impacts of the proposed transfers are considerable, particularly within Yolo, Colusa, and Glenn Counties. The Draft EIS/EIR notes that, among other things, over 40,000 acres in rice land alone in the Sacramento Region may not be farmed due to the potential water transfers. In those three counties alone, up to 362 jobs may be lost and the projected declines in labor income and economic output are \$11.1 million and \$45.46 million, respectively.

Response

Section 3.10 discloses the potential economic effects of the proposed alternatives. NEPA does not require a judgment of significance or mitigation measures for economic effects. CEQA does not consider economic or social change resulting from a project as adverse effects on the environment. The economic analysis in Section 3.10 meets the regulatory requirements of NEPA and CEQA.

Comment LA14-15

Comment

These economic effects (and the related potential for indirect environmental effects) deserve considerably more analysis. To use one example, the potential decline of rice cultivation in the Yolo Bypass due to water transfers, ecosystem restoration, and other projects (which should be included in an analysis of cumulative impacts) could lead to a “tipping point”—meaning that rice cultivation ceases to be commercially viable even on unaffected lands throughout the County—due to a decline in rice volumes, the resulting closure of local rice mills, and the eventual rise of unit processing costs to unacceptable levels. None of this appears to have received meaningful consideration in the Draft EIS/EIR.

Response

See response to Comment LA14-14. The analysis of rice crop idling did consider "forward linkages" which represent activities after the rice is harvested, including effects to transportation and rice milling. The impacts shown are inclusive of reductions in output, employment, and income to rice mills and transportation. Additional text was added to Section 3.10.2.1.1 to further explain how IMPLAN calculates forward linkages and long-run effects, which could lead to a "tipping point." IMPLAN calculates the long-run effects of reduced rice milling capacities and does not consider the closure of mills. Mills would shut down when operating revenues can no longer cover variable costs. Rice mills generally service rice growers throughout the valley and not in single counties or local areas, meaning they receive high tonnage of rice from expanded areas. The volume of rice proposed for idling and the frequency of idling transfers would not reduce rice milling capacity to a point where the tonnage of rice milled is less than the shut down volume. Ecosystem restoration in the Yolo Bypass under the BDCP would not be implemented during the timeframe of the potential transfer activities evaluated under the Proposed Action according to the implementation schedule for the BDCP. Nor will the Yolo Bypass Salmonid Habitat Restoration and Fish Passage project be implemented during the timeframe of the Proposed Action. Therefore, these projects are not included in the cumulative analysis. See response to Comment LA13-9 for additional information.

Comment LA14-16

Comment

The Draft EIS/EIS concludes that potential adverse effects on habitat availability and suitability for terrestrial species due to cropland idling/shifting under Alternatives 2 and 4 would be less than significant. This is simply wrong, particularly (though not only) for species that depend on flooded agricultural fields and associated irrigation waterways. Not only does this analytical shortcoming render the Draft EIS/EIR deficient under the California Environmental Quality Act ("CEQA") and the National Environmental Policy Act ("NEPA"), it also calls into question whether the proposed transfers meet the requirements of the Central Valley Project Improvement Act of 1992 (which prohibits water transfers will adversely affect water supplies for fish and wildlife) and similar provisions of the California Water Code (e.g., Cal. Water Code §§ 1725 and 1736).

Response

The commenter alleges, without providing any supporting evidence, that the Draft EIS/EIR's less than significant conclusion regarding impacts of cropland idling/shifting on terrestrial species is wrong and, therefore, is not in compliance with CEQA, NEPA, CVPIA, and the California Water Code. These impacts are analyzed in detail in Section 3.8, and the findings indicate, based on substantial evidence provided therein and in the related technical appendices, that limiting transfers as described in Section 2.3.2.4 would reduce the effects on agriculture-dependent species to less than significant levels.

Comment LA14-17

Comment

For the giant garter snake, the analysis of these issues in the Draft EIS/EIR is particularly deficient. The analysis at pp. 3-8.68 through 3-8.70 is highly general and simply states the obvious (i.e., that some individual members of the species will be subject to increased predation and other risks due to habitat displacement) before concluding that impacts are unlikely to be significant. The conclusion appears to be nothing more than speculation.

Response

As the commenter notes, page 3.8-69 of the 2014 Draft EIS/EIR states that any level of cropland idling/shifting would reduce the availability of stable wetland areas during a particular transfer year and may reduce suitable giant garter snake foraging habitat and increase the risk of predation on individual giant garter snakes. These potential impacts as they pertain to potential water transfer activities are more fully described on page 3.8-70. The document explains that an insubstantial amount of rice acreage would be affected in any given year. See Common Response 10 for additional information.

Comment LA14-18

Comment

Also, the "environmental commitments" described at p. 2-29 are unlikely to be sufficient to protect giant garter snake populations in Yolo County. The commitments primarily limit restrictions on transfers from fields "abutting or immediately adjacent to" the "land side" of the Toe Drain along Willow Slough and Willow Slough Bypass in Yolo County. (Draft EIS/EIS at p. 2-29.) This very narrow restriction that fails to fully account for the wide distribution of the giant garter snake across parcels not immediately adjacent to the Toe Drain. Accordingly, the Draft EIS/EIR does not sufficiently explain how this restriction supports a conclusion that impacts will be less than significant.

Response

The commenter alleges that the environmental commitments are insufficient to protect giant garter snake in Yolo County because they primarily limit restrictions on transfers to a specific area along Willow Slough and Willow Slough Bypass. The purpose of this restriction is to limit water transfers within areas known to support giant garter snake. In addition to specific locations, districts proposing water transfers from idled rice fields must ensure adequate water in priority habitat areas with a high likelihood of giant garter snake occurrences. These areas are identified on priority habitat maps for each of the water districts potentially participating in long-term water transfers and will be maintained by Reclamation. As part of Reclamation's consideration of individual water transfer requests in Yolo County, these maps will be reviewed to determine if priority habitat could be affected and the seller will be required to demonstrate how these habitat areas will be maintained. Potential dispersal corridors must be maintained within water conveyance structures even if adjacent fields are idled. See Common Response 10 for additional discussion.

Comment LA14-19

Comment

Similarly troubling is the complete absence of any analysis of the potential effects of the proposed water transfers on the Swainson's hawk or migratory waterfowl. Numerous passages in Chapter 3-8 indicate that the authors of the Draft EIS/EIR understand that agricultural fields and natural communities affected by the proposed transfers currently support abundant Swainson's hawk and migratory waterfowl populations. Despite this, however, there is no meaningful analysis of potential impacts on the Swainson's hawk or migratory waterfowl. Effects resulting from the fallowing of fields--and for migratory waterfowl, particularly the loss of up to 40,000 in rice annually--need to be analyzed carefully in the Draft EIS/EIR.

Response

Section 3.8.2.1 of the 2014 Draft EIS/EIR describes how wildlife, including birds, could be affected by potential water transfer actions. Impacts on special-status birds resulting from proposed water transfers are more fully described on pages 3.8-74 to 3.8-80 of the 2014 Draft EIS/EIR. A discussion specific to Swainson's hawk is provided in Table N-1 in Appendix N, which states that potential water transfer activities may alter the composition of foraging habitat for Swainson's hawk within the transfer areas, but that these areas would still provide suitable foraging habitat as fallowed fields and no net loss of foraging habitat would occur. Fallowing of upland crops may reduce some sources of forage for small rodents, which provide prey for Swainson's hawks, but potential water transfer activities are not expected to substantially alter the prey population because fallowing would result in an insubstantial loss of residual feed in upland croplands (a maximum 2 percent reduction for Glenn, Colusa, and Yolo counties and a maximum 9 percent reduction within Solano and Sutter counties, as stated on page 3.8-63 of the 2014 Draft EIS/EIR). Rice idling would result in an increase in potential foraging areas for Swainson's hawk because fallowed lands provide higher foraging habitat value than rice. Pages 3.8-74 to 3.8-80 of the 2014 Draft EIS/EIR include an analysis of impacts on migratory birds. Further discussion of effects on migratory waterfowl is provided in Common Response 13.

Comment LA14-20

Comment

Overall, as this letter describes, the Draft EIS/EIR needs significant revisions and recirculation to meet the requirements of CEQA and NEPA. The County requests notice of any hearings or other public discussions of the Draft EIS/EIR or the water transfers studied therein, as well as copies of any documents subsequently produced under CEQA or NEPA for the proposed transfers. Such notice is required by CEQA, as the County is a "responsible agency" within the meaning of that statute. As noted above, the County is continuing to review the Draft EIS and may submit further comments in early 2014.

Response

See response to Comment LA14-5.

Comment Letter LA15, e-PUR, South Delta Water Agency, Central Delta Water Agency

Comment LA15-1

Comment

The analysis in the EIS/EIR of Groundwater Substitution Measures considered within Alternatives 2 and 3 for Long-Term Water Transfers does not properly account the water available. The analysis of the Groundwater Substitution Measures in the EIS/EIR: - improperly quantifies the groundwater depletions that would result from groundwater extraction; - fails to properly account for the timing and quantity of groundwater flow that would have accreted to the rivers as baseflow absent the groundwater extraction; - fails to accurately quantify the effects of exfiltration from the river to groundwater; and - as a result significant quantities of water are being double counted as between available surface water and extracted groundwater. The proposed mitigation measures are inadequate to offset the impacts, in some cases this is due to the inaccurate accounting of water and in other cases it is because the proposed mitigation is too ill-defined to provide substantive protection against impacts.

Response

The modeling completed by Reclamation as part of the EIS/EIR (SACFEM2013, CalSim, Integrated Demand Calculation [IDC], and TOM) represents a comprehensive analysis of the timing of groundwater substitution pumping and the impact on surface water features. Each of the simulations involved incorporates the temporal nature of the resources being modeled.

Mitigation Measure GW-1 was modeled after the DRAFT Technical Information for Preparing Water Transfer Proposals. Measure GW-1 provides for the monitoring of groundwater resources to ensure compliance with performance standards and the mitigation of impacts, should they occur. See Common Response 6 for additional information.

Comment LA15-2

Comment

The SACFEM 2013 groundwater model utilized for analysis in the EIS/EIR for Groundwater Substitution Measures does not properly account the losses of water in the rivers. This is true due to a number of deficiencies in the model’s simulation code, MicroFEM and the SACFEM2013 model’s construction. - SACFEM2013 uses a river stage that does not vary over each time step which in effect makes the river an infinite source of water for each time step.

Response

SACFEM2013 includes monthly stress periods. The assigned stage at a modeled stream node changes with each stress period and is spatially variable within a given modeled stream. During a stress period, a modeled stream node could be a source or sink of water, depending on the position of the modeled water table relative to the assigned stream stage at that node. Thus, a river node in SACFEM2013 includes a two-way boundary condition that governs the groundwater-surface water interaction one month at a time. Appendix H includes the SACFEM2013 User's Manual with more information.

Comment LA15-3

Comment
SACFEM2013 does not accurately account the losses of water in the rivers because it does not contain a mathematical algorithm for accounting the flow or quantity of water in the rivers.

Response
It is a fact that SACFEM2013 is a numerical groundwater flow model that does not compute surface flow in the streams themselves, and some conceptual error is introduced as a result. However, the stages of streams are not expected to change significantly within a single model stress period; thus, it was considered reasonable to use a traditional river (wadi) boundary condition to simulate the groundwater-surface water interaction in SACFEM2013.

Comment LA15-4

Comment
SACFEM2013 does not accurately account the water because it treats flow between the river and aquifer as fully-saturated flow even when the model conditions recognize that hydraulically they are detached.

Response
The assertion contained in the comment is incorrect. MicroFEM accounts for the condition when the modeled water table occurs below the base of the streambed and becomes hydraulically disconnected from the stream. Under this condition, the rate of stream leakage is no longer computed according to the difference in the assigned stream stage and the computed position of the modeled water table (head-dependent), but rather is computed as a constant stream leakage according to the difference in the stream stage and the streambed elevation. When the modeled water table occurs higher than the streambed elevation, the groundwater-surface-water exchange formulation automatically switches back to a head-dependent calculation.

Comment LA15-5

Comment
SACFEM2013 has been configured such that extraction from Groundwater Substitution Measures are hydraulically isolated from the river (for example a vertical anisotropy of 500:1 in hydraulic conductivity at the wells in the model substantially isolates them from the rivers)

Response
The assumed vertical anisotropy in the aquifer sediments reflect the layered nature of the valley fill deposits and does not result in hydraulic isolation of the river system from the effects of groundwater pumping, as evidenced by nonzero stream depletion values.

Comment LA15-6

Comment

SACFEM2013 does not represent accurately the depletions to groundwater that must be refilled by natural recharge or other sources due to its handling the rivers as infinite sources during each model time interval

Response

See response to Comment LA15-3.

Comment LA15-7

Comment

SACFEM2013 is not well calibrated to actual conditions of groundwater elevation near rivers and streams. Due to its lack of calibration to actual groundwater elevation conditions, the predictive outcomes are not reliable as a basis for assessing the locations of impact and the degree of impact to Water Supply, Groundwater Resources, Water Quality, and Terrestrial Resource considerations.

Response

The state of calibration of SACFEM2013 is well within the minimum standards for model calibration used in the industry (See ASTM D5981-96, 2002).

Comment LA15-8

Comment

Neither the quantity of water nor the timing of its removal from surface water is calculated correctly in SACFEM2013 due to the structural deficiencies identified in our review. One of the essential needs in an EIS/EIR on Groundwater Substitution Measures is accurate estimating of the timing of impacts to the flowing rivers and streams; SACFEM2013 does not provide accurate monthly estimates of when peak streamflow depletions will occur if Groundwater Substitution Measures are imposed in large part because of the hydraulic isolation of the pumping from the rivers configured into the model.

Response

See response to Comment LA15-3.

The assumed vertical anisotropy in the aquifer sediments reflect the layered nature of the valley fill deposits and does not result in hydraulic isolation of the river system from the effects of groundwater pumping, as evidenced by nonzero stream depletion values.

Comment LA15-9

Comment

The magnitude of groundwater depletion is underestimated in SACFEM2013 due to its use of infinite river sources.

Response

SACFEM2013 includes monthly stress periods. The assigned stage at a modeled stream node changes with each stress period and is spatially variable within a given modeled stream. During a stress period, a modeled stream node could be a source or sink of water, depending on the position of the modeled water table relative to the assigned stream stage at that node. Thus, a river node in SACFEM2013 includes a two-way boundary condition that governs the groundwater-surface water interaction one month at a time.

Comment LA15-10

Comment

The Proposed Mitigation GW-1 for aquifer desaturation resulting from Groundwater Substitution Measures, GW-1, will not adequately mitigate the impacts to groundwater users in the Seller's Area. This is due in part to the improper accounting of the exchange of surface water and groundwater in SACFEM2013 which attributes too much of the groundwater elevation variability to seasonal recharge and discharge and does not attribute enough of the variability to long term desaturation. However, the Proposed Mitigation, GW-1, will not adequately mitigate for changes in groundwater storage due to the mitigation measure's reliance upon local groundwater-subbasin management-objectives; those objectives are insufficiently quantified and thereby cannot enable timely mitigation of project impacts from Groundwater Substitution Measures.

Response

Each monitoring and mitigation plan required by Mitigation Measure GW-1 will be developed with the specific conditions related to the transfer in question. Reclamation will need to approve the plan prior to approving the transfer. Common Response 6 provides additional information.

Comment LA15-11

Comment

The mitigation proposed for decreases in groundwater saturation of the uppermost aquifer, GW-1, are inadequately considered. SACFEM2013 does not correctly calculate the drawdown of the unsaturated aquifer and its corresponding increase in the weight of the overburden on under consolidated lithologic layers. This will result in greater impacts from Groundwater Substitution Measures than are recognized in the EIS/EIR due to inelastic subsidence and the resulting permanent loss of aquifer storage in the Seller's Area. The proposed mitigation, GW-1, will only recognize or acknowledge inelastic subsidence due to Groundwater Substitution Measures after it has occurred; thus it cannot restore or offset the permanent impact of subsidence.

Response

See Common Response 7.

Comment LA15-12

Comment

The "post-processing tool" referred to under evaluations of Water Supply for Water Operations Assessment does not properly account for water as it uses SACFEM2013, CalSim II, and a spreadsheet model called the Transfer Operations Model (TOM). The potential impacts to Water Supply from Groundwater Substitution Measures do not properly account the water the sources available and depleted in the Water Operations Assessment.

Response

This comment states that the models (SACFEM2013, CalSim II, and TOM), do not properly account for water, but the comment letter does not provide examples or quantification of the alleged errors. It is the opinion of Reclamation and SLDMWA that collectively these three models do properly account for water and for the physical effects of each of the transfers analyzed.

Comment LA15-13

Comment

The CalSim II model utilized for analysis in the EIS/EIR does not properly account the losses of water in the rivers nor the quantities of accretionary flow of groundwater to rivers within the area modeled. Calsim II provides limited useful information to assess potential surface water impacts as the model contains unfounded assumptions, errors, and outdated simulation codes. The very poor precision of the surface water delivery model (CalSim II) used for the baseline assessment on quantities of water moving in and around the CVP and SWP leads to problems in accounting for water losses due to existing groundwater extraction and proposed groundwater extraction as Groundwater Substitution Measures.

Response

The comment makes generalized assertions regarding the adequacy of the modeling but does not provide specific comment regarding any alleged errors. In the professional judgment of the technical experts who prepared the EIS/EIR and supporting analysis, collectively the models used properly account for water losses and for the physical effects of transfers. Additionally, the stream-groundwater interaction calculations in CalSim II were not used in the analysis for the effects of groundwater substitution transfers on the surface water system. SACFEM2013 results were used for this portion of the analysis and were incorporated in the surface water analysis in TOM.

Comment LA15-14

Comment

TOM is utilized in the EIS/EIR to assess Impacts to Water Supply from Groundwater Substitution Measures does not and by virtue of its underpinnings of SACFEM2013 and CalSim II cannot properly account the losses of water in the rivers induced by Groundwater Substitution Measures. TOM simulates water made available under each transfer mechanism, subject to various constraints. TOM uses an assumed priority for transfer mechanisms used to make water available under Project alternatives in the following order:

- Groundwater substitution – for alternatives that include this mechanism
- Reservoir release
- Conserved water
- Crop idling – for alternatives that include this mechanism

Response

See response to Comment LA15-13.

Comment LA15-15

Comment

Priorities for transfer mechanisms are necessary to develop groundwater pumping inputs to SACFEM2013 and simulate all transfers in TOM. Thus TOM appears to bookkeep errors in available water derived in SACFEM2013 and CalSim II. It takes input from SACFEM2013 and CalSim II to bookkeep their inaccurate information but provides no feedback to those models.

Response

TOM simulates the effects of transfers on the surface water system and specifically the CVP and SWP. TOM does not "bookkeep errors" that are alleged to occur in SACFEM2013 and CalSim II. It is true there is no feedback from TOM to SACFEM2013 or CalSim II, but such a feedback loop is not necessary for this analysis because the small changes in streamflow calculated in TOM would result in negligible changes in the groundwater model.

Comment LA15-16

Comment

The methodology by which Groundwater Substitution Measures for Long-Term Water Transfers are being considered and analyzed within the EIS/EIR, improperly accounts quantities of water and as a result significant quantities of water are being double counted as between available surface water and extracted groundwater.

Response

The SACFEM2013 model does include time-varying stream stages as stated in Appendix D. This variable stream stage allows for periods of high and low flow in the stream. Boundary conditions for the streams that are estimated to go dry during portions of the year are also modified to "remove" that stream for the period when the stream is expected to be dry. The "Wadi" package within MicroFEM simulates the flow of water between the surface and groundwater system via flow through the streambed. The specified, time-varying stream stage is the critical factor in establishing the flow of water between the surface and groundwater systems. When conditions are calculated as such, the streams in the SACFEM2013 model become detached from the aquifer. At that point, the rate of flow from the surface water to the groundwater is based solely on the stream stage and not on the difference between the stage and the groundwater table level. This calculation is shown as equation (3) in Appendix D. The anisotropy ratio of 500:1 specified in the model was based on the available data and model calibration. Streams, as mentioned above, contain time-varying stages, and therefore contribute (or accrete) differing flows of water to or from the groundwater system depending on the elevations of the stream stage and the groundwater table during that particular time step.

Comment LA15-17

Comment

Due to the improper accounting of water in Water Supply, the proposed mitigation, WS-1, is inadequate to mitigate the impacts to water availability and water flows into and through the Delta during three important periods of time: (1) the period of Groundwater Substitution pumping, April thru September; (2) the Water Transfers window, July thru September; and, (3) the period following the Water Transfers window, October to April.

Response

See Common Response 8.

Comment LA15-18

Comment

Due to the lack of a specific formulation for the proposed Water Supply mitigation, WS-1, it is unpredictable how the mitigation will be applied. The EIS/EIR references Draft documents on Technical Information for Preparing Water Transfer Proposals (October 2013). (Department of Water Resources and Bureau of Reclamation, 2013. DRAFT Technical Information for Preparing Water Transfer Proposals - Information to Parties Interested in Making Water Available for Water Transfers in 2014, October.) Those documents identify the need for estimating the effects of transfer operations on streamflow and describe the use of a streamflow depletion factor; however they provide no basis for Project Agency approval nor for transfer proponents to submit site-specific technical analysis supporting a streamflow depletion factor. That document which is completely relied upon in establishing proposed mitigation, WS-1, states that:

"Project Agencies are developing tools to more accurately evaluate the impacts of groundwater substitution transfers on streamflow. These tools may be implemented in the near future and may include a site-specific analysis that could be applied to each transfer proposal." (Ibid, at p.33).

This future action provides no established or predictable basis for the mitigation of streamflow depletions due to Groundwater Substitution Measures. Due to the improper accounting of water in both the groundwater and surface water supply models utilized for Water Supply analysis, reliance upon these models or the analysis in this EIS/EIR by the Project Agencies would result in inappropriate estimation of the streamflow depletion factors (SDF) utilized. Examples of appropriate methodologies for quantifying SDF for Water Supply are provided in Appendices A and B. They result in short-term SDF ranging from 8% to 22% of the Groundwater Substitution Measures after the onset of pumping proposed in the EIS/EIR and long-term cumulative SDF ranging from 34% to 108.5% of annual pumping based on evaluation of the 6-year drought from 1987 to 1992.

The mitigation proposed for loss of Water Supply, WS-1, due to Groundwater Substitution transfers is insufficient. It does not adequately account for the impact from the resulting reductions of water available in the rivers and groundwater due to the improper accounting of water in the EIS/EIR analyses. As detailed in our analysis the mitigation measure proposed has no basis in fact, and if it did the project proponents would find that mitigation of the impacts from Groundwater Substitution Measures are not likely to meet the Project Purpose and Need and the Project Objectives.

Response

See Common Response 8.

Comment LA15-19

Comment

Groundwater Substitution Measures for Long-Term Water Transfers effects on Delta outflows and water quality are not properly considered in the EIR/EIS. The EIS/EIR rates the effects on Delta outflows and the impact to Delta Water Quality as Less Than Significant based on improper accounting of water. The effects and impacts are likely to be Significant and thus will require mitigation.

Reservoir Releases for meeting regulatory requirements and or deliveries to Project Contractors may be diminished by streamflow depletions from current and proposed pumping conditions in areas where groundwater saturation falls below the adjoining river stage. These depletions of water available for transfer via Reservoir Releases are not quantified in the EIS/EIR. The effect of these baseline conditions impacts the availability of water to be transferred down the Sacramento River and through the Sacramento San-Joaquin River Delta to the CVP and SWP pumping stations that pump water south via their respective aqueducts, the Delta-Mendota Canal, and the California Aqueduct.

Response

Appendix E describes Delta conditions as necessary to assist in evaluation of potential environmental impacts associated with the Proposed Action within the Delta, including D-1641 requirements. The Delta conditions assessment simulates the hydrodynamics and water quality within the Delta when transfer water is made available by various sellers to determine how and where within the Delta the effects are likely to occur under the alternatives. Output from the Delta conditions assessment addresses environmental flows under D-1641 as well as other parameters such as water level (stage), water quality, and the biological opinions, and thus provides a basis for environmental assessment. Impacts associated with streamflow depletion from groundwater substitution are included in the modeling effort and evaluated in Section 3.2.

Comment LA15-20

Comment

Terrestrial Resource impacts are not properly accounted in the EIS/EIR due in part to the imprecision and inability of the models to assess dehydration of the soils and groundwater aquifer adjoining both small streams and large rivers.

The Proposed Mitigation, GW-1, for potential impacts to Terrestrial Resources is insufficient to mitigate the impacts since it too is not sufficiently quantified in the EIS/EIR nor in the Groundwater Management Plans (GWMPs) referenced. Existing GWMPs do not contain quantified year on year metrics for subbasin depletion and refill. These GWMPs do not identify acceptable ranges of groundwater elevations for short-term or long-term groundwater that will to sustain primary functions like support for natural riparian communities upon which several endangered species rely.

Response

Impacts on terrestrial resources from reduced flows in small streams and large rivers due to groundwater substitution are described in Section 3.8.2.4.1 of the 2014 Draft EIS/EIR. The 2014 Draft EIS/EIR acknowledges the limitations of the models where historic flow data is limited or unavailable; however, based on the data that were available and analyses of those data, the 2014 Draft EIS/EIR provides a reasonable and appropriate basis for drawing conclusions about the potential impacts of the project. Notwithstanding, clarifying information related to groundwater effects is provided in Common Response 10 and clarifying language regarding vegetation effects has been added to Mitigation Measure GW-1 (see Common Response 10).

Comment LA15-21

Comment

The EIS/EIR evaluates at Section 3.3.2 on Environmental Consequences/Environmental Impacts on Groundwater Levels from the Long-Term Water Transfers lists: (1) increased groundwater pumping costs due to increased pumping depth (i.e. increased depth to water in an extraction well); (2) decreased yields from groundwater due to reduction in the saturated thickness of the aquifer; (3) lowered groundwater table elevation to a level below the vegetative root zone, which could result in environmental effects. It then sets out to evaluate Item (1) under Regional Economics and (3) under Vegetation and Wildlife. Further it states that for Environmental Consequences/Environmental Impacts on Land Subsidence that excessive groundwater extraction from confined and unconfined aquifers could lower groundwater levels and decrease pore-water pressure. It notes that compression of fine-grained deposits is largely permanent and lists various negative consequences that could result.

Our review finds the evaluation in the EIS/EIR of impacts to Groundwater Resources from Groundwater Substitution Measures does not properly account for water and as a result is either inaccurate or insufficient to evaluate the potential environmental impacts associated with Groundwater Substitution. Potential Impact Statements from Table ES-4: Groundwater substitution transfers could cause a reduction in groundwater levels in the Seller Service Area.; -

Related Alternatives: 2, 3; -Significance to CEQA: S; Proposed Mitigation: GW-1: Mitigation and Monitoring Plans; Significance After Mitigation Pursuant to CEQA: LTS

Response

See response to Comment LA15-16.

Comment LA15-22

Comment

The two assessment methods utilized for Groundwater Resources in the EIS/EIR are a numerical groundwater model, SACFEM2013, and a qualitative assessment for groundwater conditions in the Redding Area Groundwater Basin outside of the numerical groundwater limits.

The SACFEM 2013 groundwater model does not properly account water in an integrated groundwater to surface water system. This is due in part to the shortcomings in the underlying simulation code used, MicroFEM, to construct the SACFEM 2013 groundwater model. (The following terms, referenced herein, are typical of industry nomenclature: Algorithm - an operation or calculation (e.g., the Darcy equation); Simulation Code - a sequence of programming language commands that encapsulates one or more algorithms (e.g., California DWR's IWFM program); and, Model - an application of a simulation code to a site-specific question (e.g., in this EIS/EIR-evaluation the use of MicroFEM and its construction into the groundwater model SACFEM2013) The MicroFEM simulation code selected for evaluation of the significance of potential impacts to groundwater lacks some essential mathematics for evaluation of the issues presented by Groundwater Substitution Measures. MicroFEM is a simulation code only for fully saturated groundwater systems whereas to evaluate the potential impacts and effects of groundwater extraction near rivers in the Sacramento River Basin it is necessary to properly formulate the discharge of water from the rivers when the river at the bottom of its streambed hydraulically detaches from the groundwater aquifer due to aquifer desaturation. While MicroFEM mathematically notes the transition from saturated to unsaturated it calculates the condition of discharge as if it is fully saturated. This is incorrect and produces substantive miscalculation of the rate and quantity of movement of surface water into groundwater and thus the magnitude of the resulting groundwater depletion.

As can be seen in the following illustration (Figure 1) aquifer desaturation and streamflow detachment, will influence the rate of change in groundwater elevations, groundwater flow, and groundwater interaction with surface water bodies, particularly rivers and streams. We address streamflow under Water Supply. SEE FIGURE 1 Groundwater Surface Water Interactions in the Hydrologic Cycle.

The MicroFEM simulation code lacks the algorithm that would account the water loss from the river under unsaturated and partially saturated conditions. In order to properly account water in the groundwater system and represent the changes in the groundwater elevations as well as the streamflow depletion from the rivers and streams induced by Groundwater Substitution Measures, unsaturated or partially saturated groundwater flow algorithms are essential components of the simulation code and/or the quantitative analysis. Since the MicroFEM simulation code does not have proper algorithms to represent streamflow detachment and the resulting flux to groundwater, then as a result neither does SACFEM2013 model, the model upon which Groundwater Resource evaluations are based.

Response

The assertion contained in the comment is incorrect. MicroFEM accounts for the condition when the modeled water table occurs below the base of the streambed and becomes hydraulically disconnected from the stream. Under this condition, the rate of stream leakage is no longer computed according to the difference in the assigned stream stage and the computed position of the modeled water table (head-dependent), but rather is computed as a constant stream leakage according to the difference in the stream stage and the streambed elevation. When the modeled water table occurs higher than the streambed elevation, the groundwater-surface water exchange formulation automatically switches back to a head-dependent calculation.

Comment LA15-23

Comment

As far as potential impacts to river stage heights induced by decreases in groundwater elevations from Groundwater Substitution Measures, MicroFEM has no algorithm to calculate a change in river stage height that governs the rate of accretion or depletion to the river. Thus calculation of fluxes into and out of a river are inaccurate. They are either overestimated or underestimated based on the relative head difference between groundwater and surface water. The flow into or out of the groundwater system (called groundwater surface-water flux hereinafter) is never correct in MicroFEM due to this missing algorithm and capability in the simulation code.

For each time step the SACFEM2013 model has a user-input river stage that is invariant for the monthly time step. This results in substantive problems in properly accounting the depletion of water in the groundwater aquifer and in the groundwater surface-water flux. First with regard to accounting the depletion of groundwater SACFEM2013 does not account for the origin of surface water flowing into the groundwater domain. Surface water flowing into the groundwater domain during each monthly timestep is treated as an infinite source of water; there is no formulation of river flow in the MicroFEM simulation code and hence the SACFEM2013 model has no river flow accounting to provide proper accounting of this lost surface water (That water loss accounting appears to be attempted later under the Transfer Operations Model which we address under Water Supply). A useful publication from the U.S. Geological Survey (USGS) from 1998, Ground Water and Surface Water A Single Resource, identifies that the hydrologic cycle demonstrates that groundwater surface-water flux behaves dynamically and that groundwater is not a source but rather the system of surface water and groundwater is a finite resource defined and governed by local and regional hydrologic and hydrogeologic conditions. (Winter, T.C., J.W. Harvey, O.L. Franke, and W.M. Alley 1998. Ground Water and Surface Water A Single Resource, USGS Circular 1139, pp. 79, p. 2.) This dynamic interaction of groundwater surface-water fluxes within the context that it is finite in quantity and temporally controlled is not the manner in which groundwater modeling has been done for use in the EIS/EIR. Since the source of surface water in SACFEM2013 that satisfies the model estimated drawdown is mathematically infinite, an improper accounting of water available in the system occurs. This results in the double counting of available water as between available groundwater for substitution transfer and available surface water to transfer. In summary the accounting of surface water available to recharge an aquifer in SACFEM2013 is not correct due to the fundamental construct of the model.

Response

Application of fully integrated groundwater-surface water numerical model codes was considered at the onset of the modeling effort. However, the limited use of such models in industry coupled with the very large modeling domain compelled the model development team to use MicroFEM. This is because its mathematical formulation is similar to that of MODFLOW, a modeling industry standard, but with the added flexibility of subarea node refinements available with the finite-element method. While fully integrated numerical surface/subsurface models may someday be readily available and practical to apply to large domains like the Sacramento Valley, it is the model development team's expert opinion that such a modeling endeavor would not have been practical given the current state and availability of such codes. Further, it is important to acknowledge that having more sophisticated codes that can more accurately simulate more complex flow processes does not automatically result in more reliable forecasts.

Comment LA15-24

Comment

Due to the SACFEM2013 model requirement of groundwater surface-water flux being calculated as a fully saturated flow condition, groundwater surface-water flux where the model calculated head near a river reach is below the bottom of the streambed is not properly calculated in SACFEM2013. Rates of inflow to groundwater where this occurs within the model domain for a particular model stress period are overestimated due to both the incorrect mathematical formulation as fully saturated flow and the invariant stage height in that river reach for that stress period (or the following stress period if there were some model carryover of surface water depletions). Furthermore the underestimation of groundwater depletion from that same stress period is error that is carried over to the next stress period. This cumulative error in accounting the temporal depletion of groundwater in SACFEM2013 is significant because the model then subsequently does not have correct quantification of the amount of required refill water to replenish groundwater from both natural recharge and delivery and application of irrigation water. Thus there are problems in accounting water correctly in the connected groundwater and surface water system due to errors in SACFEM2013.

Response

See response to Comment LA15-23.

Comment LA15-25

Comment

Unlike surface water depletions to groundwater, the accretionary flow of groundwater to the river is calculated in SACFEM 2013, but the calculation is inaccurate due to the invariant stage height during each monthly time step in the model.

Response

See response to Comment LA15-23.

Comment LA15-26

Comment

SACFEM2013 contains an unusual model construction feature with respect to natural or crop consumptive use and evapotranspirational loss of water. It utilizes a calculation module in MicroFEM called Drains to simulate evapotranspirational losses and groundwater discharge to land surface outside of a recognized and model surface water course. Drains were set at land surface rather than at root zone depth. This is altogether an unusual construction and one that reduces the quantity of water removed by vegetation as constructed. Additional details on SACFEM2013 model review and issues noted are provided in Attachment C herein.

Response

The drain package was used to represent discharge of groundwater to small scale tributaries of the larger regional streams explicitly simulated in the model. Discharge only occurs in areas of extremely shallow groundwater and mostly during wet climatic periods. The agricultural processes that occur at the land surface (evapotranspiration [ET], irrigation efficiency, soil moisture storage and depletion) are accounted for using the IDC model.

Comment LA15-27

Comment

SACFEM2013 is not well calibrated to actual conditions of groundwater elevation near rivers and streams. There is almost no mention of model calibration in the EIS/EIR; those two words appear once at page D-13. There are a number of standard references on numerical groundwater modelling that emphasize the importance of model calibration.(Reilly, T.E., and Harbaugh, A.W., 2004, Guidelines for evaluating ground-water flow models: U.S. Geological Survey Scientific Investigations Report 2004-5038, 30 p.) (ASTM 2001, D 5981-96 (Reapproved 2002), “Standard Guide for Calibrating a Ground-Water Flow Model Application”. Published November 1996, 6 p.) (ASTM 1994, D 5490-93,“Standard Guide for Comparing Ground-Water Flow Model Simulations to Site-Specific Information "Published January 1994, 7 p.) The lack of documentation in the EIS/EIR of model calibration such as how it was conducted and what the degree of precision achieved to which outcomes, is a significant omission. Through sources cited in the EIS/EIR we were able to locate calibration information for SACFEM. (WRIME, 2011. Peer review of Sacramento valley Finite Element Groundwater Model (SACFEM2013), October.) The peer review cited in the EIS/EIR stated: “Review of the representative and other calibration hydrographs reveals that significant calibration issues exists in areas that rely mostly on surface water. This is mainly due to the issues of SacFEM’s estimation of stream-aquifer interaction. Calibration quality improves in areas that rely mostly on groundwater.”(Ibid, p. 16.)

The model documentation we reviewed demonstrated local errors in predicting groundwater elevation heads that are greater than 65 feet (see Attachment C). (Lawson, Peter, 2009. Documentation of the SacFEM Groundwater Flow Model. CH2MHill Technical Memorandum. Prepared for Bob Niblack, California Department of Water Resources, February. This document is relied upon heavily in the peer review document cited for Section 3.3 of the EIS/EIR: WRIME,2011.) Calibration errors of this magnitude signify that the groundwater elevations for the water table would fall below the bottom of the uppermost layer in SACFEM2013; the significance of this is that MicroFEM simulation code only calculates unconfined flow conditions in the uppermost layer of a particular model such as SACFEM2013. When actual groundwater elevations fall below the bottom of Layer 1 in a number of locations, the model is miscalculating the groundwater flux. This demonstrates that the SACFEM2013 model was improperly constructed as well as poorly calibrated. Due to its lack of calibration to actual groundwater elevation conditions, the predictive outcomes are not reliable as a basis for assessing the locations of impact and the degree of impact to Water Supply, Groundwater Resources, Water Quality, and Terrestrial Resource considerations. Attachment C herein highlights further critique of the SACFEM2013 based on information found in the EIS/EIR as to the model's construction and documentation that the EIS/EIR relies upon in regard to the model's construction and calibration.

Response

The state of calibration of SACFEM2013 is well within the minimum standards for model calibration used in the industry (See ASTM D5981-96, 2002).

The comments provided in the peer review reflect the state of model calibration of a previous version of SACFEM completed in 2009. Significant model refinements and improvements to model calibration were conducted during the development of SACFEM2013, based on comments provided during the peer review.

Comment LA15-28

Comment

Neither the quantity of water nor the timing of water's removal from surface water is calculated correctly in SACFEM2013 due to the structural deficiencies identified in our review. One of the essential needs in an EIS/EIR on Groundwater Substitution Measures is accurate estimating of the timing of impacts to the flowing rivers and streams; SACFEM2013 does not provide accurate monthly estimates of when peak streamflow depletions will occur if Groundwater Substitution Measures are imposed in large part because of the hydraulic isolation of the pumping from the rivers configured into the model.

Accurately quantifying the changes in groundwater storage and groundwater elevations associated with Groundwater Substitution Measures is foundational to defining the potential impacts and their magnitude, and the metrics for the proposed mitigation measure GW-1.

Response

See response to Comment LA15-16.

Comment LA15-29

Comment

In section 3.3.1.3.1 Redding Area Groundwater Basin the discussion of Groundwater Production, Levels and Storage does not quantify the quantity of current groundwater pumping or the basin safe-yield without mining out groundwater in any of the six subbasins recognized in DWR Bulletin 118. There is no identification of what impacts to base flows occur from current groundwater extractions for either current Municipal & Industrial (M&I) or applied irrigation.

The EIS/EIR does not quantify those groundwater levels (i.e. drawdowns) associated with existing extractions in order to establish what the acceptable groundwater levels (i.e. drawdowns) associated with Groundwater Substitution Measures in this area might be. This is foundational to establish a basis for the proposed mitigation, GW-1, to avoid impacts to existing groundwater users and to avoid impacts to the seasonal base flows in the Sacramento River reaches in the Redding Area Groundwater Basin and those seasonal base flows of the 7 major tributaries to the Sacramento River within the basin. For example our review of the groundwater elevation contours on Figure 3.3-4 indicate that the Sacramento River are between 420 feet and 400 feet above Mean Sea Level between the Clear Creek join and the crossing of the I-5 freeway over the Sacramento at Anderson, CA; since the stream bottom profile of the Sacramento River is approximately 430 feet to 403 feet over this same reach the Sacramento River was losing water in this reach during the Spring of 2013. In addition our review finds that the Sacramento River streambed elevation is above the groundwater elevations of Spring 2013 depicted on Figure 3.3-4 at Colusa, California and southward to the edge of that figure; this means that the Sacramento River from Colusa, California and southward to perhaps Tyndall Landing, California is not only exfiltrating to groundwater but it is also not gaining the accretionary flow of groundwater that historically occurred in these river reaches.

Response
The text in the Groundwater Resources Section (Affected Environment) has been revised to include data on the groundwater level trends. Figures and hydrographs have been provided in Section 3.3.1.3 indicating the current groundwater levels in the Central Valley. These figures and hydrographs show groundwater levels within the Sacramento Valley under current conditions (with current groundwater extractions for either current municipal and industrial or applied irrigation). See Common Response 6 for additional information.

Comment LA15-30

Comment
In Section 3.3.1.3.2 Sacramento Valley Groundwater Basin the discussion of Geology, Hydrogeology and Hydrology notes that it was estimated by the USGS that from 1962 to 2003 that streamflow leakage (also called direct exfiltration) amounted to 19% of total basin recharge and equated to 2,527,000 acre-feet per year (AFY) or 3,490 cubic feet per second of surface-water flow. This quantity of water does not denote the entirety of the streamflow depletion from the basin which is the: denied accretionary groundwater flow to the rivers and streams within the basin. However, it is noted that this USGS estimated leakage-loss that discharges from the rivers and streams to groundwater is accounted in their CVHM model as surface water removed. (11)

(11) Faunt, C.C., ed., 2009, Groundwater Availability of the Central Valley Aquifer, California: U.S. Geological Survey Professional Paper 1766, 225 p.

Response
As noted in Section 3.3.1.3.2, the USGS estimates that 19 percent of groundwater recharge in the Sacramento Valley is from leakage from rivers and streams. The USGS's estimates are based on their studies (Faunt 2009) and included results from

the USGS's CVHM model. The text in this section was clarified to represent the source of this estimate as the USGS's CVHM.

Comment LA15-31

Comment

The impact from surface water leakage to support the groundwater elevations reviewed in Section 3.3 is not quantified and the available response of groundwater elevations to Groundwater Substitution Measures is not quantifiable as a result. In other words if one of the principal sources to groundwater is surface water leakage and that leakage has already reached its maximum rate then the impact from further groundwater extraction must take into account that removal from storage and up gradient flow must meet the demand from Groundwater Substitution Measures.

It appears that neither quantitative nor qualitative evaluation of inflow or outflow to rivers and streams has been done in the EIS/EIR using empirical groundwater and surface water elevation data. Our requests for the database of groundwater elevations used in the EIS/EIR did not yield the Spring 2013 groundwater elevation data used to generate Figure 3.3-4. Further neither the report nor the data provided to our request reveal groundwater elevation data for 2013 in the southerly portions of the Sacramento Valley beyond the extent of Figure 3.3.-4. Comparison of empirical (actual) data to mathematical representations in models is essential to assess whether the models are adequately representing the physics of the real-life system being mathematically modeled. Evaluation of empirical data such as land surface, groundwater elevations, and stream stage heights and rated flow rates, enables assessment of the direction of flux and with more sophisticated tools the probable magnitude of flux.

Response

The specific factors surrounding potential groundwater substitution transfers must be presented and reviewed prior to approval. The factors discussed in the comment vary among potential transfers and must be reviewed for consistency with the analysis provided in the EIS/EIR. See Common Response 14.

The SACFEM2013 simulation period runs from water year 1970 though water year 2010. Therefore, it would not be possible to compare model simulation results with empirical groundwater data sets from spring 2013 for any portions of the Sacramento Valley.

Comment LA15-32

Comment

Proposed Mitigation for Potential Effects on Groundwater Resources:

The Proposed Mitigation GW-1 for groundwater pressure decreases (a.k.a. groundwater elevations) resulting from Groundwater Substitution Measures, GW-1, will not adequately mitigate the impacts to groundwater users in the Seller's Area. Proposed Mitigation GW-1 is not quantified or quantifiable as to what groundwater pressure decreases will constitute an impact to water users in the Seller's Area.

The groundwater elevations necessary to mitigate streamflow depletions under proposed mitigation, GW-1, as well as the stated impact of lowered groundwater levels for existing groundwater users must be quantifiable or else the proposed mitigation is insufficient to reduce the impacts from Groundwater Substitution Measures. For example in the Spring 2013, the Sacramento River streambed elevations are below groundwater elevations from Red Bluff, California to roughly Princeton, California (i.e. the Sacramento River is gaining flow from accretionary flows of groundwater in this lengthy reach) as depicted on Figure 3.3-4 of the EIS/EIR.

Response

See Common Responses 6 and 7.

Comment LA15-33

Comment

The proposed framework for GW-1 is based upon a draft application for preparing water transfer proposals for 2014 from DWR and U.S. Bureau of Reclamation and with the statement that this will be updated as appropriate. (12)

The framework provided for groundwater monitoring and the subsequent proposed mitigation in the EIS/EIR provides no substantive criteria for either monitoring or mitigation. With regard to groundwater monitoring for example at page 3.3-88 under Section 3.3.4.1.2 it states “The monitoring program will incorporate a sufficient number of monitoring wells to accurately characterize groundwater levels and response in the area before, during, and after transfer pumping takes place.”

There is no attempt at defining the minimum number of wells, a spatial resolution laterally or vertically, nor a timeframe. The subsequent subsection on groundwater level measurement requires measurement of groundwater elevations until March of the year following the transfer; this would imply that impacts from one year’s transfer are not anticipated to carry over into the following year or it implies that this is the new baseline for the subsequent year’s transfer withdrawal. There is no discussion or mention of a multi-year monitoring program in the EIS/EIR with year over year metrics nor are in the draft application guidance for groundwater transfer proposals. A typical application of such a monitoring program using best available science and practice is to establish groundwater elevations in a base year and then metric changes as relative drawdown; in this manner groundwater depletion within a basin or subbasin can be assessed if it is occurring and this would encompass protections against injurious harm to Groundwater Resources if natural recharge is less than normal or slower than one seasonal cycle in providing recovery of the depletion from Groundwater Substitution Measures coupled with other groundwater uses or fluxes. With regard to proposed mitigation for example at Section 3.3.4.1.3, the EIS/EIR states: “If the seller’s monitoring efforts indicate that the operation of wells for groundwater substitution pumping are causing substantial adverse impacts, the seller will be responsible for mitigating any significant environmental impacts that occur.” There is no definition provided of what constitutes a substantial adverse impact. Looking back to Section 3.3.2.2 Significance Criteria one finds: “A net reduction in groundwater levels that would result in adverse environmental effects or effects to non-transferring parties” There is no benchmark criterion for mitigation and in fact the EIS/EIR at page 3.3-90 then states: “To ensure that mitigation plans will be feasible, effective, and tailored to local conditions, the plan must include the following elements: 1) A procedure for the seller to receive reports of purported environmental or effects to non-transferring parties; 2) A procedure for investigating any reported effect; 3) Development of mitigation options, in cooperation with the affected parties, for legitimate significant effects; and 4) Assurances that adequate financial resources are available to cover reasonably anticipated mitigation needs."

This text is extremely unclear as to: technically what is the procedure for investigation of effects; what is the meaning of "legitimate significant effects" when a multitude of overlapping influences on groundwater will occur from natural to man-made; and who would be monitoring and reporting on adverse environmental effects if not the Seller's and if so then who would be compensating for that monitoring. Our review finds the GW-1 does not provide adequate mitigation for groundwater decreases in the Seller Service Area as it relies upon poorly defined future actions with no established, reliable, or predictable basis for the monitoring and mitigation.

(12) Department of Water Resources and Bureau of Reclamation, 2013. DRAFT Technical Information for Preparing Water Transfer Proposal – Information to Parties Interested in Making Water Available for Water Transfers in 2014, October.

Response

See Common Responses 6 and 7.

Comment LA15-34

Comment

The groundwater formation in the Seller Service Area west of the Sacramento River is composed of the Tehama Formation.13 The Tehama Formation has exhibited subsidence in Yolo County. According to the EIS/EIR similar formational and hydrogeologic characteristics exist in the Redding Area Groundwater Basin.

Groundwater elevation changes due to long term pumping can increase the effective stress on subsurface materials that are under-consolidated. This is typical of some aquitards whose skeletal materials are typically composed of fine-grained sediments and when deposited by lower-energy hydraulic processes their ionic mineral boundaries keep them under-consolidated. When the effective stress of the soil column on these aquitards is increased due to dehydration of the aquifers above them, their skeletons compact. This is known as inelastic subsidence and it causes both a permanent loss of groundwater aquifer storage capacity and a depression at the land surface (Figure 2).

The groundwater elevations depicted on Figures 3.3-8 and 3.3-9 demonstrate that groundwater elevations in three of the eleven wells selected are at historic lows and under existing hydrogeologic and hydrologic conditions are on decadal declining trends. Specifically wells 11N05E32R001M, 21N03W33A004M, and 15N03W01N001M are all at historic lows at their last measurement discounting for seasonality. Each of these wells is in the western half of the Sacramento Valley Basin and thus would be expected to be overlying the Tehama Formation with its known under-consolidated units. Further groundwater extraction by Groundwater

Substitution Measures will further lower groundwater elevations in both the Redding Area Groundwater Basin and the Sacramento Valley Basin. The assessment of changes in groundwater elevations reported at Table 3.3-5 is based on SACFEM2013 modeling and is incorrect due to the deficiencies and built-in errors noted for SACFEM2013 to accurately represent cumulative drawdown from Groundwater Substitution Measures. Moreover without specific well depth information and screened intervals for the handful of monitoring wells noted it is impossible in our review to assess whether they monitor the groundwater table portions of the aquifers; the unit where desaturation occurs and effective stresses that induce permanent land subsidence generally occur.

Response

See Common Responses 6 and 7.

Comment LA15-35

Comment

Proposed Mitigation:

The mitigation proposed for the potential impacts of land subsidence due to decreases in groundwater saturation of the uppermost aquifer, GW-1, is inadequate. The monitoring measures for land subsidence in the EIS/EIR are stated at page 3.3-89 as: "Subsidence monitoring will include determination of land surface elevation in strategic (determined by Reclamation) locations throughout the transfer area at the beginning and end of each transfer year. If the land surface elevation survey indicates an elevation decrease, then the area will require more extensive monitoring…"

Under this monitoring program approach, permanent inelastic subsidence will have occurred prior to detection. Mitigation is offered in the form of reimbursement for infrastructure (e.g. roadway) structural damage due to permanent subsidence (albeit elastic reversible subsidence would likely also cause infrastructural damage). No mitigation is offered for the permanent loss of aquifer storage capacity.

Under this program of monitoring and mitigation it has to be noted at Section 3.3.5 Potentially Significant Unavoidable Impacts that this permanent impact of lost aquifer storage capacity is not mitigated by GW-1. Under Sections 3.3.6.1 and 3.3.6.2 for Cumulative Effects for Alternatives 2 and 3, respectively, which include Groundwater Substitution Measures the cumulative effects noted for land subsidence are stated as: "The groundwater substitution pumping associated with the SWP transfers would occur in an area that is historically not subject to significant land subsidence. In the overall area of analysis, land subsidence is occurring in several areas, as described in Section 3.3.1.3.2."

The statement is inaccurate. The juxtaposition of Seller locations next to historic subsidence in Yolo County makes the statement inaccurate. The EIS/EIR then goes on to say: "…however, the existing subsidence along with future increases in groundwater pumping in the cumulative condition could cause potentially significant cumulative effects. The impacts of the Proposed Action would be reduced through Mitigation Measure GW-1 (Section 3.3.4.1) to less than significant. Therefore, with implementation of Mitigation Measure GW-1, the Proposed Action's incremental contribution to subsidence impacts would not be cumulatively considerable."

The analysis of changes to groundwater elevations leading to this statement is inaccurate and hence the impacts anticipated are underestimated. Perhaps more to the point the Mitigation Measure, GW-1, as defined will not adequately address the impacts of groundwater drawdown on inelastic subsidence and the resulting permanent loss of aquifer storage in the Seller's Area. The proposed observation of subsidence as mitigation cannot restore or offset the impact of subsidence once it has already occurred.

It is however possible to define a monitoring and mitigation program for the risks and potential impacts of permanent Land Subsidence. Such a program of monitoring and mitigation would require evaluation of historic and current groundwater elevations in the upper groundwater aquifer units over a series of decades long cyclical hydrologic and land use conditions in each Seller Area to determine whether groundwater elevations are at historic lows. If so then mitigation for permanent land subsidence due to Groundwater Substitution Measures would require no Groundwater Substitution Measures for Long Term Water Transfers be approved until groundwater elevations increase above historic lows and within a range that accurate groundwater modeling could demonstrate would not create cumulative lowering of groundwater elevations during the period of approved water transfers.

Response

See Common Response 7.

Section 3.3.1.3.2 discusses groundwater storage trends in the Sacramento Valley. Storage tends to decrease during dry years and increase during wetter periods.

Comment LA15-36

Comment

Water Supply:

At Section 3.1.2 on Environmental Consequences/Environmental Impacts on Water Supply the Assessment Methods states: "Impacts to surface water supplies are analyzed by comparing the conditions in water bodies and surface supplies without implementing transfers to the expected conditions of supplies with implementation"

The quantitative tool to be used in assessing impacts to supplies but not water bodies from water transfers and exports from the Delta is referred to in the EIS/EIR as a "post-processing tool." The "post processing tool" referred to under evaluations of Water Supply for Water Operations Assessment consists of the use of the SACFEM2013 groundwater model, CalSim II, and a spreadsheet model called the Transfer Operations Model (TOM). Our review will focus on these assessment tools to evaluate potential environmental impacts and consequences from the proposed Long-Term Water Transfers Alternatives.

Section 3.1.2.2 Significance Criteria states: "Impacts on surface water supplies would be considered potentially significant if the long term transfers would: 1) Result in substantial long-term adverse effects to water supply for beneficial uses". Putting aside the substantive issue of why short-term adverse effects to water supply for beneficial uses is not considered as a criterion, our review finds the evaluation in the EIS/EIR of impacts to Water Supply from Groundwater Substitution Measures to this criterion is either inaccurate or insufficient to evaluate the potential environmental impacts associated with Groundwater Substitution as the methods of Assessment in the EIS/EIR do not properly account water and as a result cannot be relied upon to assess potential impacts and the means of mitigation or the timing of mitigation needs. Analysis of streamflow depletions due to Groundwater Substitution Measures is not analyzed accurately in the EIS/EIR and the loss of surface water to meet Water Supply needs is not properly accounted. This inaccurate accounting results in a fraction of the groundwater extracted being double counted as available surface water for transfer.

Response

Section 3.1.2.4.1 considers changes to water users in the Sacramento Valley as well as CVP and SWP water users that receive water conveyed through the Delta. The EIS/EIR considers how changes in streamflow could affect water supply, and concludes that the potential effects would be focused on CVP and SWP users that receive water conveyed through the Delta. Mitigation Measure WS-1 would avoid or reduce potential water supply impacts to CVP and SWP users. This measure would address the streamflow changes because of groundwater substitution. See Common Response 8 for additional information.

Comment LA15-37

Comment

No Action Alternative Evaluations in EIS/EIR:

It is notable that the No Action Alternative is to look at the Environmental Consequences/Environmental Impacts in water bodies (presumably rivers and reservoirs) and surface supplies while the evaluation for implementing Long-Term Water Transfers is to look at surface supplies with no mention of evaluating impacts to water bodies such as rivers or reservoirs.

The quantitative tool to be used to aid in assessing impacts to surface water supplies and water bodies is CalSim II for the No Action Alternative.

CalSim II works on a monthly time-step to assess SWP and CVP operations. CalSim II generates flows as a water system operational decision support tool. CalSim II is not a hydraulic model and does not include channel characteristics such as channel roughness or cross-section geometry to simulate the water routing. As a result of CalSim II's limitations, the models inability to schedule reservoir releases on a daily basis creates water accounting inaccuracies of losses caused by routing and attenuation of upstream reservoir releases to phenomena such as streamflow depletions. Additionally, CalSim II uses simplified flow routing rules (on a monthly time-step) which result in inaccuracies associated with how the SWP and CVP operate in extreme hydrologic conditions, especially in the driest years (DWR and USBOR, 2004 & Ford et al., 2006). (14)(15)

CalSim II was developed over a decade ago to assess new storage and conveyance facilities in the CVP & SWP systems on a monthly time-step. Use of CalSim II has yielded significant scrutiny on its ability to provide relevant data to assess potential future impacts (Close, A. et al, 2003). The CalSim II model presented in the EIS was used for the baseline conditions (2014 planning horizon) and was not used to assess potential changes resulting in future land use and hydrologic/metrological conditions. The baseline assessment can only assess how the Long-Term Transfer Project would impact the environment if it was in-place from 1970-2003 and therefore cannot assess potential impacts of future conditions that are different than the baseline conditions such as various climate change scenarios.

(14) Department of Water Resources and U.S. Bureau of Reclamation (DWR and USROR, 2004). Peer Review Response: A Report by DWR/Reclamation in Reply to the Peer Review of the CalSim-II Model Sponsored by the CALFED Science Program In December 2003, August, 2004

(15) Ford, D., Grober, L., Harmon, T., Lund, J.(Chair), McKinney, D. (Ford et al., 2006). Review Panel Report San Joaquin River Valley CalSim II Model Review. CALFED Science Program – California Water and Environment Modeling Forum. January 12, 2006.

Response

CalSim II was used as a basis for the subsequent modeling efforts, but was not used alone to simulate potential effects of the action alternatives. As described in detail in Appendix C, the results of CalSim were the basis for detailed analysis in SACFEM2013 (a groundwater model) and the Transfer Operation Model (a tool to simulate how transfers would change operations).

See Common Response 5 for more details of the modeling period of analysis and changes in land use or hydrology in the future.

Comment LA15-38

Comment

The analysis of Environmental Consequences/Environmental Impacts is not done accurately nor with a complete conceptual model of the interactive groundwater and surface water system that constitute the Water Supply. At page 3.1.5 in Section 3.1.2.4.1 the analysis states that groundwater basins are naturally recharged after drawdown by rainfall and surface water to groundwater flux, thereby depleting available in stream flow. It goes on to state that the accretionary flow of groundwater to surface water can be intercepted by groundwater extraction; however, it fails to note that this is a depletion of available surface water and water for other beneficial uses such as the health of the riparian and hyporheic zones. As detailed further in our review that follows a proper conceptual model of the hydrologic system for Water Supply demonstrates that the water deprived for the natural consumptive use, evapotranspiration and potentially evaporation via Groundwater Substitution Measures is the likely conserved-water available. The analysis of Water Supply is improperly conceptualized.

Additionally at page 3.1.6 in Section 3.1.2.4.1 the EIS/EIR states: “Transfers would not affect whether the water flow and quality standards are met… but only Reclamation and DWR water supplies”

The EIS/EIR notes that it is the State and Federal projects responsibility to maintain water quality standards in the Sacramento River, its tributaries, and the Delta. It then anticipates hypothetically that if the streamflow depletion resulting from Groundwater Substitution Measures results in decreased river flows then USBOR and DWR would modify operations by decreasing Delta exports or release of additional water from reservoirs to meet Delta outflow and/or water quality standards; however as documented in Attachment D herein the Federal and State projects were unable to maintain these standards in 2013 due to dry year conditions and a lack of available in-stream flow and releases of water.

Response

Section 3.1.2.4.1 describes the conceptual model of how groundwater substitution transfers could affect water supplies. The potential to affect riparian vegetation is included in Section 3.8, and the potential to affect fisheries is included in Section 3.7.

The EIS/EIR analyzes potential impacts of the action alternatives compared to existing conditions (under CEQA) and the No Action Alternative (under NEPA). The analysis did not identify changes from these baselines that would indicate significant adverse impacts to water quality in the Sacramento Valley or the Delta.

Comment LA15-39

Comment

The quantitative tool used in assessing impacts to supplies but not water bodies from water transfers and exports from the Delta is referred to in the EIS/EIR as a post-processing tool. From Appendix B, "The post-processing tool also includes changes in flows in waterways caused by streamflow depletion from groundwater substitution. Data for the post-processing tool was provided by the SACFEM2013 model, which includes highly variable hydrology (from very wet periods to very dry periods) was used as a basis for simulating groundwater substitution pumping." The EIS/EIR used two other models, CalSim II and a spreadsheet accounting model referred to as TOM, to attempt to properly account streamflow depletions. A general technical reference from the U.S. Geological Survey (USGS) published in 1998 entitled Ground Water and Surface Water - A Single Resource identifies that the hydrologic cycle demonstrates that groundwater is not a source of water but rather behaves as a reservoir, receiving and releasing water as governed by local and regional hydrologic and hydrogeologic conditions.(17) The use of the combination of three models does not properly account for water and thus the evaluation of "how long-term transfers could benefit or adversely affect water supplies" does not accurately identify potential impacts to available-water for Water Supply.

(17) Winter, T.C., J.W. Harvey, O.L. Franke, and W.M. Alley 1998. Ground Water and Surface Water A Single Resource, USGS Circular 1139, pp. 79, p. 2.

Figure 3 depicts the overall hydrologic cycle in Water Supply.

The only source of true supply is precipitation in the form of rain, snow, or dew. Groundwater is not a source but an interactive reservoir. For groundwater in the wells near enough to a river to have the cone of depression reach the river within the hydraulic capture zone of the well the following statement applies: "When pumping of a well near a river begins, water is drawn, at first, from the water table in the immediate neighborhood of the well. As the zone of influence widens, however, it begins to draw a part of its flow from the river and, ultimately, the river supplies the entire flow" - Robert Glover and Glenn Balmer(18)

This clear statement on the depletion of a river flow by the same rate as that withdrawn from the well is the opening of Glover and Balmer's 1954 paper on their mathematical analysis of river depletion by extraction from a nearby well. Glover and Balmer's work followed upon the first analysis of the depletion of streamflow induced by an extraction well and its zone of capture done by C.V. Theis of the USGS in 1941.(19)

(18) Glover, R.E. and G.G Balmer. (1954). River depletion resulting from pumping a well near a river. Transactions, American Geophysical Union, v. 35

Figure 3 Hydrologic Cycle Overview with regard to Water Supply Evaluation

Dr. Theis commented in his 1941 paper on one aspect of the analysis of the overall effects of extraction in an alluvial river valley on the flow into and from a river: "…the flux 'from the river' will be spoken of in the following treatment, the flux may be either an actual movement of water from the river or a decrease of the customary movement of water to the river" - C.V. Theis

This customary movement of water is also commonly known as the accretionary flow of groundwater to the river; it is accretionary flow of groundwater to a river that provides the observable and measurable flow of water in a free-flowing stream during lengthy dry periods when no rain or snowmelt provides the baseflow in a river or stream (i.e. not an ephemeral stream or arroyo). In the illustration below (Figure 4) it can be seen that consistent with Dr. Theis observation on the flux "from the river" the impact to the river is due to loss of accretionary flow to the river and not as a result of direct streamflow depletion by way of river exfiltration. This phenomena from a well located some distance from the river results in streamflow depletion; the principal difference between this case and the one where the zone of capture to the well reaches the streambed of the river is the timing of the streamflow depletion.

L.K. Wenzel of the USGS in the peer-reviewed Discussion of this seminal paper by Dr. Theis from 1941 offered this observation: "It is possible that in some localities all or a part of the water removed from the well may be obtained indirectly by reducing the amount of water that is transpired by plants from the zone of saturation. This is accomplished, of course, through the lowering of the water-table and capillary fringe to some depth below the roots of the plants." - L.K. Wenzel(20)

(19) Theis, C.V., 1941, The effect of a well on the flow of a nearby stream: Transactions, American Geophysical Union, v. 22, part 3, p. 734-737.

(20) Wenzel, L.K., 1941, Discussion re: The effect of a well on the flow of a nearby stream: Transactions, American Geophysical Union, v. 22, part 3, p. 737-738.

Figure 4 Cross-Sectional View of Extraction Well Depleting the Accretion of Flow to a River

Figure 5 Plan View of Extraction of Groundwater via a Groundwater Substitution Well from which the Zone of Capture to the Well Does not reach the River Figure 5 illustrates that extraction pumping far back from a river's edge (e.g. perhaps more than 1-mile) does not capture water directly from the river but instead results in a loss of accretionary flow of groundwater to the river as depicted by the reduced accretionary flow arrows and the diminished riparian zone flora (and in all likelihood impacts the hyporheic fauna near and beneath the riparian zone that supports the food chain for pelagic fish such as salmonids and the habitat for other threatened species). The deprivation of flow to the river from a groundwater extraction well located some distance from the river is ultimately equal to the quantity of extraction; if the flow to the well is drawn from storage then that storage will be replaced eventually by an equivalent quantity of groundwater via direct recharge and indirect groundwater recharge. As Dr. Wenzel's comment notes the only water not deprived to the river or stream is that water that would otherwise have been withdrawn for consumptive use and evapotranspiration by vegetation that is/was able to utilize water from the zone of saturation (i.e. the water table aquifer).

Evaluation of the timing of streamflow depletion due to groundwater extraction wells was made simpler by a further paper by Dr. Theis and his co-author in 1963. The following graphic (Figure 6) describes the timing of impact to a stream or river's quantity of flow based upon two primary criteria, the ration of the aquifer storage coefficient to the aquifer transmissivity, S/T, and the distance between the extraction well and the river.(21) The coefficients are as described in the Explanation in the chart with the X-axis denoting the time since pumping began.

(21) Theis, C.V. and C.S Conover. 1963 "Chart for Determination of the Percentage of Pumped Water being Diverted from a Stream or Drain" USGS Water Supply Paper 1545-C. pp. C106-C109.

This method of analysis was then added to by Mahdi Hantush in 1965 by incorporating to the mathematical solution a simplified concept of streambed resistance laterally to groundwater flow by way of a vertical layer of impedance to flow.(22)

This group of two general methods was improved upon further by Jenkins in 1968 in several ways but also in describing the residual effects of "streamflow depletion" (a phrase first coined in Jenkins paper) after pumping ceases. (23) Jenkins' addition to the field of groundwater and surface-water interconnection at river boundaries, enabled season-to-season carryover of depletions of groundwater storage and the resulting streamflow depletion that can take place over more than one annual hydrologic cycle. Wallace et al. (1990) carried out a similar analysis for cyclic pumping of wells.(24)

(22) Hantush, M.S., 1965. Wells near streams with semi-pervious beds. Journal of Geophysical Research, v. 70, no. 12: pp2829- 2838

(23) Jenkins, C.T., 1968. Techniques for computing rate and volume of stream depletion by wells. Ground Water, v. 6, no. 2: pp 37-46.

(24) Wallace, R.B., Y. Darama, and M.D. Annable, 1990. Stream Depletion by Cyclic Pumping. Water Resources Research v. 26, no. 6, 1263-1270.

Figure 6 Theis' graphic describing transmissivity and the distance between extraction wells.

Figure 7 Definition Sketch for a partially penetrating well and a river with semi-pervious layer Hunt (1999) Figure 8 Definition Sketch for flow to well in semipermeable aquifer Hunt (2003) Subsequently Bruce Hunt (1999) developed an analytical solution to the question of what is the response in a river that has a lower permeability streambed surrounding it than the permeability of the groundwater aquifer to which it is connected including the conceptualization of an extraction well which only partially penetrates the aquifer adjoining the stream. (25) While the bounding conditions of a homogeneous aquifer of infinite extent are applied to each of the aforementioned methods in order to solve the equations of unsteady flow in which a well or wells are actively extracting constitute an idealized case, the inclusion of a semi-pervious streambed fully to the solution provides an even more realistic estimate of the timing of impact on flow in a river or stream (Figure 7). Lastly, Bruce Hunt (2003) developed an analytical solution to the case of a stream incised into a low permeability layer or formation over top of a more permeable aquifer (Figure 8).(26)

Each of the four analytical mathematical solutions to the question of the impact of extraction well pumping on flow in a stream and the genesis of the water captured by an extraction well remain valid, particularly where the bounding assumptions are met well by the aquifer being pumped. Various mathematical solvers are available to look at streamflow depletion by the appropriate analytical method for each case including some provide by Dr. Bruce Hunt(27); the most recent set of solvers for each of these groundwater to surface-water analytical methods was developed by the USGS (2008).(28) The USGS program STRMDEPL08 enables a sequence of time varying pumping during an irrigation season and it allows for year on year carryover of aquifer depletion to be retained in a subsequent year. This program represents “best available science” for near field assessment of groundwater extraction on the flow in nearby streams. Based upon the information provided in the EIS/EIR with regard to stream aquifer relationships our review determined that the conceptual model of Figure 7, Hunt (1999) best fits the conditions described for the Sacramento Valley. An evaluation of streamflow depletions for select wells near rivers was undertaken for the extended drought period of 1987 to 1992 noted in the EIS/EIR was undertaken and the method and results are presented in Attachment A. These analyses result in a range of streamflow depletion factors (SDF) from in short-term SDF ranging from 8% to 22% by the end of a 1987 extraction scenario proffered in the EIS/EIR and long-term cumulative SDF ranging from 34% to 108.5% of annual pumping based on evaluation of the 6-year drought from 1987 to 1992 again following the extraction scenario proffered in the EIS/EIR due to the cumulative depletion of aquifer storage and the available accretionary flow of groundwater to the river as compared to stream flow from the river to satisfy the capture of water by a groundwater extraction well.

(25) Hunt, B., 1999. Unsteady stream depletion from ground water pumping. Ground Water, 37(1), pp. 98–102.

(26) Hunt, B. 2003. Unsteady Stream Depletion when Pumping from Semiconfined Aquifer. Journal of Hydrologic Engineering, Vol. 8, No. 1, pp. 12-19.

(27) http://www.civil.canterbury.ac.nz/staff/bhunt.asp

(28) Reeves, H.W., 2008,STRMDEPL08—An extended version of STRMDEPL with additional analytical solutions to calculate streamflow depletion by nearby pumping wells: U.S. Geological Survey Open-File Report 2008–1166, 22 p.

Response

In response to the commenter's description of the models used to analyze streamflow depletion, wording in the EIS/EIR may have created some confusion by referring to the Transfer Operations Model (TOM) as both TOM and as a "post-processing tool." The clearest illustration of how the three models interact is Figure C-1 in Appendix C. This figure also illustrates how information from one model is used in the other models and which models produce results relied upon in the environmental analysis.

This comment also describes the hydrologic cycle and many of the technical issues that relate generally to stream-groundwater interaction and streamflow depletion, and provides a brief literature review of key papers on these subjects. The Lead Agencies note these generalized comments, which do not discuss or otherwise pertain to the analysis of impacts, mitigation measures, or alternatives in the 2014 Draft EIS/EIR.

The commenter also describes the results of an analytical solution from a tool developed by the USGS to estimate streamflow depletion factors. The preparers of the EIS/EIR are familiar with the USGS stream depletion tool, STRMDEPL08, but disagree with the commenter's opinion that this simplified analytical tool represents the "best available science" for this analysis. The analytical solution used in STRMDEPL08 is based on many simplifying assumptions regarding stream and aquifer parameters. Those simplifying assumptions render it considerably less defensible than a well-calibrated, peer-reviewed, three-dimensional, numerical model such as SACFEM2013.

Comment LA15-40

Comment

Assessment of SACFEM2013 Model for Water Supply Analysis in the Post Processing Tool:

The SACFEM2013 model in the EIR/EIS does not account for the streamflow depletions induced by groundwater pumping along the lines of any of the analytical methods identified above from the literature. SACFEM2013 has no river flow accounting to account water flow depletions. As for potential impacts to surface water flow rates due to groundwater accretions or depletions SACFEM2013 does not account the quantity of water flowing within a river. There simply is no algorithm in the MicroFEM code to account for changing rates of streamflow and dynamically changing river stage associated with streamflow. Hence these potential impacts are not accounted in the SACFEM2103 model.(29) As a result of this missing algorithm in the model the outflow of surface water to groundwater in a river reach where Groundwater Substitution Measures lower the modeled head in the upper aquifer (ignoring the numerous errors in the formulation of well extractions and in the SACFEM2013 model hydraulic parameters) (30) below the river bottom water is not properly accounted in SACFEM2013. The loss of surface water flowing into the groundwater domain to satisfy the extraction well demand via streamflow depletion is not accounted. Thus the available Water Supply will not be properly accounted using SACFEM2013 with respect to both the magnitude of the impacts to Water

Supply due to Groundwater Substitution pumping and the timing of such impacts to Water Supply and surface water flow in the rivers. This holds for extraction from any of the 327 groundwater extraction wells proposed as a part of Alternatives 2 and 3. This lack of water accounting affects the ability of the "post-processing tool" to properly evaluate water availability under Water Supply due to the shortcomings of the SACFEM2013 model to calculate changes in river flow.

(29) SACFEM2013's agricultral groundwater extraction terms were reportedly developed using the Irrigation Demand Calculator (IDC) within the California Dept. of Water Resources, Integrated Water Flow Model (simulation code). The use of only a portion of the IWFM, simulation code and the manner in which it was done leaves the soil moisture model and the groundwater model uncoupled with no feedback between the two models except that perhaps carried by the user from SACFEM back to the IDC model.

(30) SACFEM 2013 formulation places all extraction wells into Layers 2, 3, and 4 and then artificially imposes a vertical anisotropy of 500:1 at each flow layer.

Response

The SACFEM2013 model uses a monthly time step. Within each time step, the exchange of water between the aquifer and the stream systems is based on a constant river stage. The stages do vary between time steps. Because the quantity of stream flow depletion occurring over a monthly time step in almost all cases is small compared to the flow rates in the streams themselves, stream stage changes due to these depletions would be very small. Varying flow rates within a time step would not result in noticeable changes; therefore, this assumption results in a negligible error in streamflow depletion estimates.

Comment LA15-41

Comment

Further as to the poor accounting of water available to the "post-processing tool," the river outflow is not accounted properly in the SACFEM2013 groundwater model at the river nodes. As mentioned under Groundwater Resources SACFEM2013 sets each river reach's stage height as invariant during a month, irrespective of the groundwater withdrawals. This river stage invariance means that SACFEM2013 calculates as though there is an infinite amount of water in the nearby river (i.e. no streamflow depletion impact on the predicted outflow of water).

Response

The lead agencies considered using fully integrated groundwater-surface water numerical model codes at the beginning of the modeling effort; however, these tools were not determined to be the best option for this application. Fully integrated models have limited use within the industry and have a very large modeling domain. These factors caused the model development team to select MicroFEM. A key reason for this selection is because MicroFEM's mathematical formulation is similar to that of MODFLOW, a modeling industry standard, but with the added flexibility of subarea node refinements available with the finite-element method. While fully integrated numerical surface/subsurface models may someday be readily available and practical to apply to large domains like the Sacramento Valley, it is the model development team's expert opinion that such a modeling effort would not have been practical given the current state and availability of such codes. Further, it is important to acknowledge that having more sophisticated codes that can more accurately simulate more complex flow processes does not automatically result in more reliable forecasts.

Comment LA15-42

Comment

The river inflow (i.e. gaining reaches) is calculated in SACFEM2013. However it is done inaccurately due to the invariant stage height during each monthly time step in the model. This imprecision results in an improper accounting of water. Not surprisingly the peer review for the model done in 2011 found: “Review of the representative and other calibration hydrographs reveals that significant calibration issues exists in areas that rely mostly on surface water. This is mainly due to the issues of SacFEM’s estimation of stream-aquifer interaction. Calibration quality improves in areas that rely mostly on groundwater.” (31)

Using this mathematical formulation in the algorithm for groundwater to surface water flux, the degree of exfiltration in each month from the river to groundwater is too high if flow and stage in the river decrease due to Groundwater Substitution Measures or alternatively the degree of exfiltration is too low if Water Transfer flows increase river stage during the transfer period of July to September as more of that water would be depleted from the stream and not available to the Buyer’s Area. Thus inputs from SACFEM2013 to TOM for subsequent analysis of Water Supply, are inaccurate.

(31) WRIME. 2011. Peer review of Sacramento valley Finite Element Groundwater Model (SACFEM2013), October at page 16

Response

See responses to Comments LA15-40 and LA15-41. The state of calibration of SACFEM2013 is well within the minimum standards for model calibration used in the industry (See ASTM D5981-96, 2002).

Comment LA15-43

Comment

Review of SACFEM2013 by the aforementioned peer review found that SacFEM2013 deep percolation rates are not supported by the fundamental Irrigation Demand Calculation (IDC) module’s methodology (a subcomponent of DWR’s Integrated Water Flow Model, IWFM simulation code) and parameters. This results in a disconnection between SacFEM2013 and IDC. They recommended incorporating a feedback loop between the two models (IDC as constructed for SACFEM2013 input, and SACFEM2013) and subjecting them to convergence criteria. Their review states: “SACFEM deep percolation rates are not consistent with other data sets and it should be ensured that they are supported by historical land use, crop mix, and agricultural practices.”

It is unknown whether these recommendations from 2011 to SACFEM2013 were incorporated to SACFEM2013 based on the documentation provided in the EIS/EIR and on the documents requested and received from the project proponents. Further review of SACFEM2013 is provided in Attachment C herein.

Response

The comments provided in the peer review reflect the state of model calibration of a previous version of SACFEM completed in 2009. Significant model refinements and improvements to model calibration were conducted during the development of SACFEM2013, based on comments provided during the peer review.

Comment LA15-44

Comment

Lastly with regard to SACFEM2013 and Water Supply considerations we note that unlike Appendix B of the EIS/EIR on the uncertainties and limitations of TOM and CalSim II, there are no statements in Appendix D of the EIS/EIR or the main body of the EIS/EIR as to the uncertainties in the modeling assumptions or stated limitations on the utility and intended uses of the SACFEM2013 groundwater model.

Looking at “Best Available Science” for evaluation of potential impacts in the EIS/EIR there is a simulation code available from DWR, IWFM, which can better evaluate the time varying mass balance between surface water and groundwater inclusive of losses or gains in soil moisture to crop demand and precipitation. The IWFM simulation code’s capabilities are summarized in Attachment B herein and documented for the current release by DWR. (32) However, the simulation code with these general capabilities was first publicly released in 2003. Further there is an existing model of the Central Valley in IWFM, C2VSim, which is calibrated for the period 1922 to 2009, which was initially released to the public in 2011. The C2VSim model can be run with either a coarse finite element grid (C2VSim-CG with 1,392 elements, run-time 6 minutes) or with a fine finite element grid (C2VSim-FG with over 35,000 elements, run-time 6 hours). For both versions, the elements are grouped into 21 water-budget sub-regions. (33) The C2VSim-CG model was utilized in our review to assess the cumulative impacts.(34) DWR notes that both C2VSim versions will also be useful tools for integrated regional water management plans, planning studies, groundwater storage investigations, assessing infrastructure improvements, evaluating ecosystem enhancement scenarios, conducting climate change studies, and assessing the impacts of changes to water operations. The results of our assessment of relative streamflow depletions in several river reaches brought about by projected use of available transfer volumes in the extended drought of suggest that streamflow depletions of 8% to 22% depending upon the year and the river reach will result from a mass balanced model. In our review the use of C2VSim-CG provides a reasonable estimate of what best available science would reveal. Use of C2VSim-FG would likely improve upon the accuracy of the estimated streamflow depletions resulting from Groundwater Substitution Measures on Water Supply.

(32)
http://baydeltaoffice.water.ca.gov/modeling/hydrology/IWFM/IWFMv4_0/v4_0_331/downloadables/IWFMv4.0.331_TheoreticalDocumentation.pdf.

(33) As reported by the DWR at http://baydeltaoffice.water.ca.gov/modeling/hydrology/C2VSim/index_C2VSIM.cfm on November 30, 2014

(34) Informal telephonic requests to DWR's Bay Delta Office for C2VSim-FG on November 13, 2014 revealed that they view the model as not ready yet for public release.

Response
The SACFEM2013 user's manual has been added as Appendix H. This document includes Section 4.3, Potential Sources of Error, which describes some sources of uncertainty in the model.

Appendix D has been updated to include a discussion of the model selection process that identified SACFEM2013 as the best available tool. See Appendix D for revised text.

Comment LA15-45

Comment
Assessment of the CalSim II Model for Water Supply Analysis in the Post Processing Tool:

As stated previously for the No Action Alternative, the use of CalSim II has yielded significant scrutiny on its ability to provide relevant data to assess potential future impacts (Close, A. et al, 2003).(35) The CalSim II model presented in the EIS was used for the baseline conditions (2014 planning horizon) and was not used to assess potential changes resulting in future land use and hydrologic/metrological conditions. The baseline assessment can only assess how the Long-Term Transfer Project would impact the environment if it was in-place from 1970-2003 and therefore cannot assess potential impacts of future conditions that are different than the baseline conditions such as various climate change scenarios.

(35) Close, A., Haneman, W.M., Labadie, J.W., Loucks D.P. (Chair), Lund, J.R., McKinney, D.C., and Stedinger, J.R. (Close, A. et al.). Strategic Review of CALSIM II and its Use for Water Planning, Management, and Operations in Central California. Submitted to the California Bay Delta Authority Science Program Association of Bay Governments. Oakland, California. December 4, 2003.

Response
See Common Response 5.

Comment LA15-46

Comment
CalSim II does not provide adequate loss factors to assess potential project impacts. The CalSim II model describes the physical system (e.g., reservoirs, channels, pumping plants), basic operational rules (e.g., flood-control diagrams, channel capacity, evaporation, minimum flows, salinity requirements), and priorities for allocating water to different uses (water quality, ecosystems, etc.). As a result of CalSim II's complexity, very important water loss characteristics such as stream reaches losses, deep groundwater percolation, and stream-aquifer interactions are generalized as basin "efficiencies" rather than losses for specific reaches or stream-aquifer

interactions. The lack of specific loss characteristics within CalSim II yields inaccuracies specific to even seasonal and annual water accounting losses (e.g., stream-aquifer interactions) that have been identified as potential impacts from the proposed Long Term Water Transfers.

Response

This comment states that CalSim II does not properly account for water or the effects of stream-groundwater interaction. The stream-groundwater interaction calculations in CalSim II were not used in the analysis for the effects of groundwater substitution transfers on the surface water system. SACFEM2013 results were used for this portion of the analysis and incorporated into the surface water analysis in TOM. Analysis of how changes in stream-groundwater interaction may affect surface water flows and CVP/SWP operations was performed on specific stream reaches as suggested.

Comment LA15-47

Comment

Hydrology modeling within CalSim II uses a “depletion analysis” to estimate the historical and projected level flows (Ford 2006). (36) As a result of this, CalSim II requires a calculation to estimate the aggregate stream inflow for each sub-watershed. This calculation is identified as the “closure term” of the hydrologic mass balance and is also how the model encompasses errors resulting from over/under estimates of water losses. In recent documentation regarding future development of CalSim II into version III, DWR and Reclamation provided a graphic of “closure term” magnitudes. (37)

In this graphic from Draper 2008 (Figure 9), the “closure term” represents a significant amount of error in CalSim that has to be accounted for to create a hydrologic mass balance. Note that this graph is in thousands of acre-feet/year. Thus the “closure term” necessary to correct for water budget errors in CalSim ranges from (2,000,000) AFY in deficit to 3,000,000 AFY in surplus. CalSim II does not account for water on an annual basis with precision.

CalSim II cannot assess how “Long-Term” water transfers would impact future water demands, water supplies, and required water quality and ecosystem management requirements. Hence the analysis of potential impacts to Water Supply based upon CalSim II is insufficient. CalSim II does not provide adequate detail to assess project impacts. The very poor precision of the surface water delivery model (CalSim II) used for the baseline assessment on quantities of water moving in and around the CVP and SWP leads to problems in accounting for water losses due to existing and proposed groundwater extractions.

(36) Ford, D., Grober, L., Harmon, T., Lund, J.(Chair), McKinney, D. (Ford et al., 2006). Review Panel Report San Joaquin River Valley CalSim II Model Review. CALFED Science Program – California Water and Environment Modeling Forum. January 12, 2006

(37) Draper, A. CalSim-III Hydrology Development Project, CalSim III Implementation, MWH Americas, California Water and Environmental Modeling Forum Annual Meeting, 2008 (Look at comment letter for figure)

Response

The existence of a closure term, also sometimes referred to as the basin accretion/depletion, does not indicate that CalSim II does not maintain mass balance or does not adequately simulate CVP/SWP operations for the purposes used in the EIS/EIR. Basin accretion/depletion terms are used in CalSim II to represent inflows and depletions that are not explicitly simulated elsewhere in the model and to ensure the model remains consistent, from a mass balance perspective, with the historically observed water supply. This comment, combined with others from the commenter, seems to indicate a concern that CalSim II was directly used to evaluate the effects of groundwater substitution transfers and resulting streamflow depletions. This was not the case. CalSim II was used to provide the existing conditions operation of the CVP/SWP. The effects of groundwater substitution transfers, streamflow depletions, and all transfers were analyzed in TOM by simulating changes to the existing condition that occur with transfers.

Comment LA15-48

Comment

As noted in the review of CalSim II in Draper (2008) there is a version of CalSim referred to alternately as CalSim III or CalSim 3 that appears to have been in development and use since approximately 2006.

“The C2VSim-CG model is being used as the basis for the groundwater flow component of CalSim 3, and has also been used to investigate how Sacramento Valley water transfers may affect Delta flows and how an extended drought may impact groundwater levels.”(38)

It would appear that CalSim III represents “Best Available Science” with its focus on improving the significant shortcomings in CalSim II identified in our review and that of others. However, CalSim III was not utilized for the EIS/EIR. An analysis of the outcomes for the project by way of CalSim III use would apper to represent something approaching best available science on the available windows of water for transfer prior to 2003 and post 2003 to present and beyond. The availability and uses of CalSim III by USBOR for the CVP could not be determined during our review.

(38) As reported by the DWR at http://baydeltaoffice.water.ca.gov/modeling/hydrology/C2VSim/index_C2VSIM.cfm on November 30, 2014

Response

CalSim III has been under development since approximately 2006, but has not been released publicly and does not represent the best available tool at this time.

Comment LA15-49

Comment

Assessment of the Transfer Operations Model for Water Supply Analysis in the Post Processing Tool:

TOM was developed to analyze effects of the Long-Term Water Transfer Project on the CVP, SWP, major rivers, and the Delta. TOM does not provide a specialized groundwater, hydrology, or hydraulic simulations of the Long-Term Water Transfer Project but rather provides water accounting based upon inputs from SACFEM2013 and CalSim II. As a result of the water accounting approach, the inaccuracies within CalSim II (e.g., water losses, closure term error, etc.) and SACFEM2013 (e.g., stream-aquifer interactions, groundwater elevation predictions, etc.) are carried over into TOM to quantify and assess potential impacts resulting from the Long-Term Water Transfer Project.

Response

See response to Comment LA15-13.

Comment LA15-50

Comment

Our review of the TOM model provided by the project proponents at our request yielded a number of errors that were also included in the EIS text. Table 1 presents two examples water transfer volumes that were presented in the EIS/EIR Executive Summary Table 2, EIS/EIR descriptive text of each text from section 3.1.1.3, and TOM. (Look at comment letter for Table 1)

Upon review of Table 1, how specific transfer volumes of water are applied in TOM, CalSim II, and SACFEM2013 is neither understood nor constant. Additionally, specific model descriptions of how CalSim II, SACFEM2013 and TOM account for each water transfers are vague. The EIS states that there is a priority of transfer volumes ("…groundwater substitution and reservoir release are more likely transfer mechanisms than crop idling…", Section B.4.3.1.2) but specifically how each transfer was applied to the time series and into each model are not documented. To understand how each transfer volume is applied in each model is essential to properly assess the validity of the analysis of potential impacts.

Response

Table ES-2 does not include the transfer volumes described in Table 1 of the comment letter. The detailed transfer volumes are included in Table 2-5. The transfer quantity for Garden Highway Mutual Water Company in Section 3.1.1.3 has been corrected in the Final EIS/EIR. The quantities for Conaway Preservation Group are the same in Table 2-5, Section 3.1.1, and Appendix C. The TOM model (Appendix C) includes a slightly larger transfer volume from Anderson Cottonwood ID (5,938 acre-feet instead of 5,225 acre-feet in Table 2-5). This small difference reflects a late change in upper limits from Anderson-Cottonwood ID. Because the new quantity was less than the quantity modeled, and the change was small, the modeling was not revised to reflect this small decrease in water availability.

Comment LA15-51

Comment

Within TOM, adjustments in delivered water through the Delta include a portion lost as carriage water which is defined as extra water needed to carry water across the Delta to export facilities. Carriage water is a critical part of the water modeling analyses because the additional water is needed to maintain Delta water quality. Because the majority of the transfer water is made available and diverted upstream of the Delta, TOM assumes carriage percentage adjustments based on the location of the transfer:

1) Transfers from the Sacramento River assume a 20 percent carriage water adjustment;
2) Transfers to Contra Costa Water District assume a 20 percent carriage water adjustment;
3) Transfers from Merced Irrigation District assume a 10 percent carriage water adjustment for water flowing from the San Joaquin River into the Delta.

The use of a single carriage percentage based on location does not adequately address potential impacts to Delta water quality. The concept of carriage water is a complex concept that would require appropriate hydrodynamic models coupled with a hydrology and groundwater model to identify appropriate carriage water volumes over time. The EIS states that the initial estimates for carriage water should later be verified and adjusted and therefore water quality impacts cannot be assessed with the models presented in the EIS/EIR for Long-Term Water Transfers. Additionally, significant stream flow depletion associated with pumping will likely reduce water transfers to the Delta and result in significant water quality impacts and/or limited transfers to water buyers. Therefore, statements with the EIS/EIR claiming limited changes in Delta outflow as well as water quality impacts are unfounded.

Response

Analysis completed in preparation of the EIS/EIR assumed a constant carriage water percentage in order to evaluate through-Delta transfers and the effects on Delta outflow and water quality. The carriage water assumptions used in TOM split how transfer water that enters the Delta leaves the Delta as either Delta outflow or diversions. Results from TOM become the boundary conditions simulated in DSM2, the hydrodynamic model of the Delta used to assess changes in Delta flows and water quality. Therefore, analysis of the effects on Delta water quality provided in the EIS/EIR are representative of what may be expected under each alternative, using the assumed carriage water percentage. The statement "initial estimates for carriage water that must later be verified and adjusted" on page C-6, Appendix C was made to disclose that in actual transfers carriage water is determined based on observed data and conditions before, during, and after the transfer and can vary from the 20 percent estimate used in the EIS/EIR. This statement does not indicate that water quality impacts cannot be assessed with the models used. As the comment suggests, additional factors affect Delta inflow and outflow such as stream-groundwater interaction and changes in upstream reservoir operations. Changes in Delta inflow and outflow from these other physical and operational changes that occur as a result of transfers are also simulated in TOM and passed to DSM2 to evaluate the effects on Delta water quality.

Comment LA15-52

Comment

Carryover of storage water within reservoirs is one of many factors within the EIS/EIR, TOM and CalSim II that lacks a description of application. In other words there is no detail provided on where each of the water volumes in TOM are derived (e.g. groundwater vs. stored water). As a result of streamflow depletion from Groundwater Substitution Measures, the EIS/EIR identifies that small decreases in water supplies to users could occur when the stored reservoir release transfers decrease carryover storage in reservoirs. These operational controls are very important to how storage facilities would operate during extended dry periods. These operational assumptions within the modeling are not described in the EIS/EIR text or models. Therefore, carryover along with other operational assumptions associated with the Long-Term Water Project is not properly assessed and the resulting operational Water Supply impacts could be significant; these potential and probable impacts to Water Supply are not analyzed in the EIS/EIR for Groundwater Substitution Measures.

Response

Changes in reservoir storage are presented in Appendix C, starting with Figure C-12 on page C-22. Reservoir storage changes are presented for the following reservoirs: Shasta, Folsom, Oroville, Camp Far West, Merle Collins, combined Middle Fork Project reservoirs of French Meadows and Hell Hole, Lake McClure, and New Bullards Bar. Storage is presented for all months, not just carryover storage, and for each alternative.

Comment LA15-53

Comment

Summary of Impact Assessment:

Impacts to Water Supply from the Water Operations Assessment are not fully quantified. The improper accounting of water under Groundwater Substitution Measures results in insufficient control on water accounting such that water lost from river flow due to both the impairment of accretionary groundwater flow to support Project operations and the direct losses from river flow to groundwater extraction wells in the Groundwater Substitution program may be counted twice or more. Evaluation of the effects on Water Supply from the Groundwater Substitution Measures requires adequate and accurate analysis of what the sources of water in Water Supply and what appropriate streamflow depletions are for Groundwater Substitution Measures on top of existing conditions to assess short-term and long-term effects on Water Supply from Long-Term Water Transfers. Further the use of Groundwater Substitution Measures has important impacts to Water Supply in regard to operational flexibility. These have been rated to be Less Than Significant in the EIS/EIR but given the substantive errors noted in assessing available water for Long-Term Water Transfers this likely deserves re-examination.

Response

Specific comments on the modeling tools have been addressed in responses to other comments in letter LA15 (including responses to Comments LA15-2, LA15-3, LA15-4, LA15-5, LA15-6, LA15-15, LA15-16, LA15-21, LA15-22, LA15-26, LA15-27, LA15-43, LA15-46, and LA15-47). These responses indicate that the modeling effort estimates the changes in surface water flow caused by groundwater recharge in addition to the baseline flux between the river and the aquifer. The contributions from groundwater substitution transfers are not double-counted in this assessment.

Comment LA15-54

Comment

Proposed Mitigation:

Due to the improper accounting of water in Water Supply, the proposed mitigation WS-1 is inadequate to mitigate the likely impacts to water availability and water flows into and through the Delta during three important periods of time: (1) the period of Groundwater Substitution pumping, April thru September; (2) the Water Transfers window, July thru September; and, (3) the period following the Water Transfers window, October to April.

Response

See Common Response 8.

Comment LA15-55

Comment

The Proposed Mitigation WS-1 to address streamflow depletion resulting from Groundwater Substitution Measures is ill defined and will not adequately mitigate the impacts to Water Supply.

Response

See Common Response 8.

Comment LA15-56

Comment

Due to the lack of a specific formulation for the proposed Water Supply mitigation, WS-1, it is unpredictable how the mitigation will be applied. The EIS/EIR references Draft documents on Technical Information for Preparing Water Transfer Proposals (October 2013). (39) Those documents identify the need for estimating the effects of transfer operations on streamflow and describe the use of a streamflow depletion factor; however they provide no basis for Project Agency approval nor for transfer proponents to submit site-specific technical analysis supporting a streamflow depletion factor. That document which is completely relied upon in establishing proposed mitigation, WS-1, states that: "Project Agencies are developing tools to more accurately evaluate the impacts of groundwater substitution transfers on streamflow. These tools may be implemented in the near future and may include a site-specific analysis that could be applied to each transfer proposal."(40)

(39) Department of Water Resources and Bureau of Reclamation, 2013. DRAFT Technical Information for Preparing Water Transfer Proposals – Information to Parties Interested in Making Water Available for Water Transfers in 2014, October.

(40) Ibid, at p. 33.

Response

See Common Response 8.

Comment LA15-57

Comment

This future action provides no established or predictable basis for the mitigation of streamflow depletions due to Groundwater Substitution Measures. Due to the improper accounting of water in both the groundwater and surface water supply models utilized for Water Supply analysis, reliance upon these models or the analysis in this EIS/EIR by the Project Agencies would result in inappropriate estimation of the streamflow depletion factors utilized. Examples of best available science methodologies for quantifying streamflow depletion factors for Water Supply are provided in Attachment A . They result in short-term streamflow depletion factors ranging from in short-term SDF ranging from 8% to 22% of the Groundwater Substitution Measures proposed in the EIS/EIR and long-term cumulative SDF ranging from 34% to 108.5% of annual pumping based on evaluation of the 6-year drought from 1987 to 1992

Response

See Common Response 8.

Comment LA15-58

Comment

The mitigation proposed for loss of Water Supply, WS-1, due to Groundwater Substitution transfers is insufficient. It does not adequately account for the impact from the resulting reductions of water available in the rivers and groundwater due to the improper accounting of water in the EIS/EIR analyses. As detailed in our analysis the mitigation measure proposed has no basis in fact, and if it did the project proponents would find that mitigation of the impacts from Groundwater Substitution Measures are not likely to meet the Project Purpose and Need and the Project Objectives.

Response

See Common Response 8.

Comment LA15-59

Comment

Groundwater Substitution Measures for Long-Term Water Transfers effects on Delta outflows and water quality are not properly considered in the EIR/EIS. The EIS/EIR rates the effects on Delta outflows and the impact to Delta Water Quality as Less Than Significant based on improper accounting of water. The effects and impacts are likely to be Significant and thus will require mitigation.

Response

Appendix E describes Delta conditions as necessary to assist in evaluation of potential environmental impacts associated with implementation of the Proposed Action within the Delta. The analysis applies the DSM2 model to simulate the hydrodynamics and water quality within the Delta when transfer water is made available by various sellers to determine how and where within the Delta the effects are likely to occur under the alternatives. The model outputs Delta conditions for parameters such as water level (stage), water quality, and environmental flows under D-1641, and the biological opinions provide a basis for the environmental assessment of the impacts of the alternative compared to the No Action/No Project Alternative without proposed water transfers. The model is used to compare the extent and significance of any differences resulting from the transfers. In order to conduct a comparative analysis, the model is run twice: once with conditions representing a baseline, and another run with an alternative representing specific changes to Delta operations and/or bathymetry in order to assess the change in modeled outcome due to the given change in model configuration. The assumption is that while the model might not produce results reflecting these changes with absolute certainty, it does produce a reasonably reliable estimate of the relative change in outcome.

Comment LA15-60

Comment

The analysis of Environmental Consequences/Environmental Impacts is not done accurately nor with a complete conceptual model of the interactive groundwater and surface water system depletions that would affect the Federal and State water projects, CVP and SWP, to meet Water Quality requirements. As noted previously the analysis of components for Water Supply is improperly conceptualized and yet finds that streamflow depletion of significance can occur and must be mitigated by application of an appropriately calculated SDF.

Again from page 3.1.6 in Section 3.1.2.4.1 the EIS/EIR states: "Transfers would not affect whether the water flow and quality standards are met…" but only Reclamation and DWR water supplies"

The EIS/EIR anticipates hypothetically that if the streamflow depletion resulting from Groundwater Substitution Measures results in decreased river flows then USBOR and DWR would modify operations by decreasing Delta exports or release of additional water from reservoirs to meet Delta outflow and/or water quality standards; however as documented in Attachment D herein the Federal and State projects were unable to maintain these standards in 2013 due to dry year conditions and a lack of available instream flow and releases of water.

Response

See response to Comment LA12-10.

Comment LA15-61

Comment

Under Assessment Methods at page 3.2-27 in Section 3.2.2.1.1 states that quantitative analysis relies on hydrologic modeling estimated changes in river flow rates and reservoir storage for the CVP and SWP reservoirs and the rivers they influence. The quantitative analysis is left to Appendix B but the main body states that: "If the changes are small and within the normal range of fluctuations (similar to the No Action/No Project Alternative) for that time period, it is … assumed that any water quality impacts would be less than significant"

According to the EIS/EIR: "CalSim II is the latest version of CalSim available for general use. It represents the Central Valley with a node and link structure to simulate natural and managed flows in rivers and canals. It generates monthly flows showing the effect of land use, potential climate change, and water operations on flows throughout the Central Valley." (41)

With Closure Terms to rectify storage and flow on the order of millions of acre-feet per year (as much as 3,000,000 AFY during the model periods simulated for the EIS/EIR), CalSim II is not an adequate tool for assessing whether flow and required storage changes under the proposed Groundwater Substitution Measures are small, normal or significant to enable the assumption of insignificant water quality impacts. Further CalSim II works on a coarse monthly time-step to assess SWP and CVP operations. However, water quality and ecosystem management decisions require a more detailed weekly or daily time-steps to properly account for potential water availability and timing impacts. CalSim II is not the appropriate modeling system to assess the Long-Term Transfer Project which will cause daily flow changes that require water quality and ecosystem management decisions to mitigate impacts before they occur and does not represent best available science (see earlier comment on CalSim III under Water Supply).

(41) EIS/EIR Public Draft Under Review at page C-5

Response

CalSim II represents the best available tool for simulating changes in CVP and SWP operations. This model is the standard for assessing these types of impacts in the Central Valley, and a superior tool is not available.

Comment LA15-62

Comment

Contracted Reservoir Releases by the Sellers may be diminished by streamflow depletions from current pumping conditions in areas where groundwater saturation falls below the river stage adjoining under existing conditions. These depletions of water available for transfer via Reservoir Releases and are not quantified in the EIS/EIR. The effect of these baseline conditions impacts the availability of water to be transferred down the Sacramento River and through the Sacramento San-Joaquin Rivers Delta to the CVP and SWP pumping stations that pump water south via their respective aqueducts, the Delta-Mendota Canal, and the California Aqueduct.

Response

The depletions from the river systems are estimated through the modeling efforts. Reservoir release transfers would result in small increases in flow downstream of the participating reservoirs. For these transfers to increase streamflow depletion, they would have to substantively increase the stage in rivers that are experiencing streamflow depletion. Reservoir release transfers could occur on the American River, Yuba River, Feather River, or San Joaquin River systems. The largest potential transfers could be on the American River from Placer County Water Agency or on the Merced River and San Joaquin River system from Merced ID. As described in Section 3.3, the American River system is disconnected from the groundwater aquifer, so a small increase in water levels in the river would not affect streamflow depletion. The Merced River and San Joaquin River systems do not include groundwater substitution transfers, so this transfer would not affect streamflow depletion. The remaining transfers are small and would not increase water levels in the streams to a level that would increase recharge and streamflow depletion during a reservoir release transfer.

Comment LA15-63

Comment

The quantitative analysis of potential Water Quality impacts to the Sacramento-San Joaquin Delta is provided in Appendix C. Appendix C states at page C-2 that: "The Delta Conditions analysis is performed with the Delta Simulation Model 2 (DSM2). DSM2 setup relies on the output of three additional tools for this Project: CalSim II, the Transfer Operations Model (TOM), and the Delta Island Consumptive Use model (DICU model). CalSim II outputs simulating California's water delivery system to the Delta are used to supply inflow and export boundary conditions to DSM2."

Use of a CalSim II model with monthly outputs that are crude approximations of actual system performance at best renders use of these outputs to create daily approximations that are supplied to DSM2 useless in assessing the potential for water quality impacts from proposed Groundwater Substitution Measures that will impair the actual timing of surface-water baseflow as a result of streamflow depletion and the quantity of water available to meet Delta Water Quality requirements.

Response

The CalSim II model represents the best available tool to simulate CVP and SWP operations. This tool, in combination with DSM2, sets the standard for analysis of system operations effects on streamflow and Delta water quality, water levels, and circulation. No superior tools exist.

Comment LA15-64

Comment

Proposed Mitigation:

Our review finds that the Less Than Significant assessment in the EIS/EIR lacks sufficiently accurate analysis as to available flows and storage of water in the Sacramento River watershed by virtue of the precision of the models used in the quantitative assessment. Mitigation is likely required to assure sufficient baseflow and stored water availability for CVP and SWP operating requirements for Water Quality.

Response

While the models may not produce results reflecting these changes with absolute certainty, they do produce a reasonably reliable estimate of the relative change in outcome. These changes in outcome aid the understanding of potential environmental effects of the action alternatives; the assessment of these effects did not identify the need for additional mitigation.

Comment LA15-65

Comment

Assessment methods in the EIS/EIR for riparian, wetland, and natural in-stream community (e.g. fauna in the hyporheic zone such as Caddis fly larvae) impacts include SACFEM2013. Reportedly SACFEM2013 predicted changes in groundwater elevations over time were used to assess the potential impacts of groundwater depletion on stream flows in small tributaries and associated natural communities. However, it should be noted that in wetland and riparian habitats, groundwater typically ranges from eight feet to just below the ground surface Faunt (2009). (42) As noted previously under the discussion of Groundwater Resources evaluations, SACFEM2013 contains an unusual model construction feature using model “Drains” with respect to riparian habitats consumptive use of water, its evapotranspiration of water, and groundwater discharge to land surface outside of a recognized and model surface water course. Drains were set at land surface rather than at root zone depth. Thus SACFEM2013 is highly imprecise in its ability to discern where and how much a riparian or riverine habitat is utilizing groundwater or residual soil moisture (see earlier commentary on the decoupling of the soil moisture model from the SACFEM2013 groundwater model)

The EIS/EIR notes that: “…groundwater modeling results indicate that shallow groundwater is typically deeper than 15 feet in most locations under existing conditions, and often substantially deeper…”(43)

Modeling is not the best available science for this analysis when empirical data are available to assess actual or anticipatable depth to a phreatic surface or the capillary fringe of water rising above the phreatic surface in native sediments and soils. For example groundwater elevations of Spring 2013 depicted on Figure 3.3-4 along the Sacramento River main stem from Red Bluff, California to roughly Princeton, California are above the streambed elevations. This indicates that the Sacramento River is gaining flow from accretionary flows of groundwater in this lengthy reach, and the phreatic surface of groundwater would be expected to be eight feet or less below ground surface along the riparian corridor of the river with possible wetlands. Similarly groundwater elevations depicted on Figure 3.3-4 along the Feather River from Oroville to Live Oak are above the streambed elevations. Conditions for the riparian corridor and potential wetlands may exist based on these data. The areas where groundwater elevations are below the elevation of the bottom of river courses was noted in the discussion of Groundwater Resources; yet an analysis of near river and stream course depths to groundwater or the capillary fringe can be reasonably estimated from the data. Data are better than models for current or historic conditions analysis.

Terrestrial Resource impacts are not properly accounted in the EIS/EIR due in part to the imprecision and inability of the models to assess dehydration of the soils and groundwater aquifer adjoining streams and large rivers.

(42) Faunt, C.C., ed., 2009, Groundwater Availability of the Central Valley Aquifer, California: U.S. Geological Survey Professional Paper 1766, 225 p

(43) EIS/EIR Public Draft at page 3.8-32

Response

See Common Response 11. The analysis was based on thresholds that conservatively estimate the potential for effects.

Comment LA15-66

Comment

Proposed Mitigation GW-1 is not quantified or quantifiable as to what groundwater pressure decreases will constitute an impact to natural communities in and near small streams in the Seller Service Area.

The groundwater elevation changes within a conceptual monitoring plan that would be necessary to mitigate stream flows supporting natural communities in small streams under proposed mitigation, GW-1, must be quantifiable or else the proposed mitigation is insufficient to reduce the impacts from Groundwater Substitution Measures. The proposed mitigation, GW-1, is not sufficiently quantified in the EIS/EIR nor in the Groundwater Management Plans (GWMPs) referenced. Existing GWMPs do not contain quantified year on year metrics for subbasin depletion and refill within acceptable ranges to sustain primary functions like support for natural communities.

Response

See Common Responses 10 and 11.

Comment LA15-67

Comment

Much of the discussion of small streams is applicable to large rivers. Additional considerations are noted in the following discussion that demonstrate a finding of Less Than Significant is apparently due to a faulty analysis of the type of impacts, and their foreseeable magnitude and likelihood of creating Significant impact to habitat supported by large rivers.

Water transfers would affect flows in the rivers and creeks adjacent to and downstream of the areas where transfer activities (of all kinds) would occur. Changes in stream flows that would result within the Seller Service Area may affect natural communities, such as riverine, riparian, seasonal wetland, and managed wetland natural communities, which are reliant on CVP and SWP operational outcomes with Water Transfers such as surface-water flow velocity, surface-water quality (in particular water temperature both released and exchanged with groundwater), and the accretion or depletion of groundwater near surface. These operational outcomes and effects could propagate downstream of the areas/locations where pumping occurs.

Response

See Common Response 11.

Comment LA15-68

Comment

The extraction scenarios proffered in the EIS/EIR will cumulatively over time and space reduce the available accretionary flow of groundwater to the large rivers in addition to the loss of water directly from the adjoining large river, where proximate to a well or wells, to satisfy the capture of water by groundwater extraction wells used for Long-Term Water Transfers as Groundwater Substitution Measures.

Response

See Common Response 11.

Comment LA15-69

Comment

Releases of storage water within reservoirs is one of many factors within TOM and CalSim II that lack a sufficient description for the analyses required here for natural habitat flow requirements. An adequate form of model would incorporate anticipated timing of natural flow impacts and controlled releases for Water Transfers. Again the best available science would include implementation of the IWFM simulation code to an appropriately configured model. Due to the IWFM codes ability to account stream flows dynamically in the simulation code's algorithms the timing and magnitude of flows could be quantified. From this foundational quantification additional models on river flow velocities, bed scour, temperatures and other attributes of Seasonally Varying Flow (SVF) that has been found to be essential to riverine habitat. (44) In other words there is no detail provided on where each of the water volumes in TOM are derived (e.g. groundwater vs. stored water). As a result of streamflow depletion from Groundwater Substitution Measures, the EIS identifies that small decreases in water supplies to users could occur when the stored reservoir release transfers decrease carryover storage in reservoirs. These operational controls are very important to how storage facilities would operate during extended dry periods.

(44) Risley, John, Wallick, J.R., Waite, Ian, and Stonewall, Adam, 2010, Development of an environmental flow framework for the McKenzie River basin, Oregon: U.S. Geological Survey Scientific Investigations Report 2010-5016, 94 p.

Response

The best available tool to predict hydrology under various operational scenarios, CalSim II, is configured to use historical hydrology data. Appendix D has been updated with additional information on groundwater model selection. This is additional information is available in Appendix D.

Comment LA15-70

Comment

A reanalysis of the potential impacts of Water Transfers is required using best available science to ascertain the magnitude of potential impacts, system operational constraints on those impacts, and the method and implementation of mitigation, if needed.

Response

The preparers of the EIS/EIR used the best available science to conduct the analyses.

Comment LA15-71

Comment

The findings of Less Than Significant for Fisheries is not supported by the analytical tools based upon the preceding analyses of Groundwater Resources and Water Supply and should be revisited as to availability of water to support riparian and hyporheic zones along the waterways for habitat support for species of special interest identified in Section 3.7.1.2 and as to timing and quantity impacts of river flows due to streamflow depletions evaluated under Water Supply.

Response

The impacts analysis looked at the full range of potential effects to all target species in all waterways that could potentially be affected by each alternative using the best available science and analytical tools possible. The approach is described in Section 3.7.2.1., significance thresholds are listed in Section 3.7.2.2, and the results for each alternative are provided in Sections 3.7.2.3 through 3.7.2.6. The methods, logic, and science behind the findings of less than significant for biological impacts are supported in these sections.

Comment LA15-72

Comment

SACFEM2013 is built using the MicroFEM simulation code. MicroFEM as a groundwater simulation code cannot accurately calculate some of the key physical processes in the water budget such as evapotranspiration within a shallow groundwater aquifer. It is unable to simulate the physical processes and fully account the changes in surface water flow and groundwater to surface water exchange. A proper basis for the selection of a proprietary model code, that has not been independently verified as to its numerical solution's accuracy, and that does not contain necessary algorithms and proper mathematical formulations to the questions at hand, is not provided in Appendix D.

The EIS/EIR in Appendix B states: "SACFEM2013 is a full water budget based, transient groundwater flow model that incorporates all groundwater and surface water budget components on a monthly timestep over the period of simulation. SACFEM2013 provides very high resolution estimates of groundwater levels and stream flow effects due to groundwater pumping within the Sacramento Valley."

This statement is not accurate and is notably not repeated in the text of Appendix D.

Response

The SACFEM2013 User's Manual has been incorporated as Appendix H to provide additional information on the model. The user's manual explains that SACFEM2013 includes transient agricultural water budget components that were simulated using the Integrated Water Flow Model Demand Calculator. Appendix D has been updated to include information on the model selection process that identified SACFEM2013 as the best available tool (see Appendix D for updates). The SACFEM model underwent a peer review process (WRIME 2011) that led to development of the SACFEM2013 model.

Comment LA15-73

Comment
The documentation of SACFEM2013 is grossly inadequate. The documentation of SACFEM2013 is less than that found for SACFEM in 2011. There is no calibration data provided. No discussion of model residuals or fit to any type of observed data. There is no quantification of model uncertainty or limitations provided in Appendix D. In our review we have been unable to comprehend the model from its documentation. Instead it has required exploring primary data inputs through the GIS database from which it was constructed.

SACFEM2013 is built in Version 4.10 of MicroFEM. No documentation for this version of the code is cited or provided.

Vertical Structure goes to base of the freshwater aquifer and treats that boundary as a no-flow boundary.

Response
A more detailed user's manual for the SACFEM2013 model used for the analysis has been included as Appendix H.

The most recent documentation for the MicroFEM code can be found on the developer's web site: http://www.microfem.com/

Comment LA15-74

Comment
Head Dependent Boundaries

Surface Water fluxes

1) 50 individual streams are simulated using the “wadi” package in the current version of SACFEM2013

2) User specified stream stage

2a) Transient monthly “varying distributions” of stream-stage height were developed for each reach with no documentation of how this was calculated)

2b) User specified stream stage imposes error on model outcomes

3) Model calculated head is driver on gradient vs. user specified stage.

4) Streambed Conductance (from subformula)

4a) Dr = streambed thickness = uniformly assumed to be 1 meter

4b) Kv = streambed conductivity

4b1) Assumed to be 2 meters/day on the eastside, and

4b2) 5 meters/day on the westside, two exceptions on Eastside for Bear River and Big Chico Creek

4b3) Review and use of model input data Kv as found in the GIS files to the Delta Water Agencies found Kv values in the eastside ranging from 1 meter/day to 0.1 meter/day in the locations selected.

4c) L = stream length represented by the model node

4d) A = nodal area

4e) W = "field width" of the reach represented by L

4e1) Wetted Stream width taken from aerial photographs at two locations

Appendix D comments that stream length is generally overestimated at river confluences. Manual adjustments were noted without description of how these were calculated.

Streambed elevations were developed from a DEM; there is an odd note of the DEM resolution being lower than stream node resolution when stream node resolution is reported to be on the order of 250 meters and conventional DEM resolution is on the order of 10 to 30 meters with a precision of plus/minus approximately 8 feet.

Response
The comment provides a summary of the assumptions made and the methodology used for model development. No response is required.

Regarding the last sentence, this statement was in error. This condition does not exist with the SACFEM2013 grid.

Comment LA15-75

Comment
SACFEM2013 used the Drain package to simulate the upper land-surface groundwater boundary condition across the domain. Efflux nodes only that are head dependent. Elevation of drain set at land surface. Why were drains not set to the root zone depth to represent ET from the groundwater domain? Formulas provided for the drain stage are under documented

Response
The Drain package was used to represent discharge of groundwater to small scale tributaries of the larger regional streams explicitly simulated in the model. Discharge only occurs in areas of extremely shallow groundwater and mostly during wet climatic periods. The agricultural processes that occur at the land surface (ET, irrigation efficiency, soil moisture storage and depletion) are accounted for using the IDC model.

Comment LA15-76

Comment

Specified Flux Boundaries

These denote boundaries where a influx or outflux of water occurs at a set rate per period that is user specified and not model calculated. Specified flux boundaries were set for:

1) Deep Percolation

2) Mountain Front Recharge

3) Urban Pumping

Deep percolation of water

This was reportedly done by surface water budget approach

1) Water budget estimated using spatial information

1a) Land use

1b) Cropping patterns

1c) Source of Agricultural Water

1d) Surface water availability in different year types and locations

1e) Spatial distribution of precipitation

2) Components

2a) Deep percolation of applied water

2b) Deep percolation of precipitation

2c) Agricultural pumping

3) Developed by intersecting

3a) GIS data developed by DWR (no citation) – Transient Condition on Land Use

3b) With SACFEM model grid

4) Results in a land use for each groundwater model node

5) GIS data on water district and non-district areas derived

6) Water source information to the areas(where does this come from? – no citation or methodology described)

Response

The comment provides a summary of the assumptions made and the methodology used for model development. No response is required.

Most comments and questions regarding model development, input data, and calibration for the SACFEM2013 model are addressed in the document SACFEM2013 Sacramento Valley Finite Element Groundwater Flow Model User's Manual (February 2015), which is included as Appendix H. The commenter is referred to this document in response to this specific comment. Additionally, because the SACFEM model has been revised and improved multiple times since its initial development, where any inconsistencies in data and descriptions used in model development may exist between the 2015 User's Manual and other model documentation, the 2015 User's Manual should be considered the definitive source.

Comment LA15-77

Comment

Methodology for Surface Water Budget

The methodology is underdocumented. Semi physically based soil moisture accounting model used; it is not clear if this is IDC Historic precipitation data simulates root zone processes and calculates applied water demand and deep percolation past the root zone for each node.

Deep percolation was split between applied water and precipitation. Split was dependent on the season and availability of water from each source.

Their calculated values for deep percolation were reportedly compared to DWR Estimated Values for the Year 2000 (no citation). They corresponded with DWR Northern District staff (no citation of who) They adjusted soil parameters in root zone model to reportedly match volumes of percolation to DWR (no citation of DWR data source nor provision of data).

Agricultural Pumping calculated from demand for applied water (no mention found of crop typing or climatic drivers on water demand for applied water) compared to source water availability from surface sources via GIS intersection of districts

1) Split out of groundwater and surface water for certain areas

2) Or all groundwater

3) Mention of a "level of development simulation of CVP operations" was used to calculate availability of surface water

4) Agricultural pumping applied to Layers 2, 3, and 4 only. There is no clear basis for this placement of pumping.

Response

The comment provides a summary of the assumptions made and the methodology used for model development. No response is required.

Layers 2 through 4 represent depth intervals from approximately 100 feet through 550 feet below ground surface (bgs) depending on location. These are the main producing zones for most of the irrigation wells in the Sacramento Valley.

See response to Comment LA15-76.

Comment LA15-78

Comment

Mountain Front Recharge

Utilized an annual formula from Turner 1991 for a Mediterranean climate and converted the total deep percolation estimated per upper watershed into monthly quantities by looking at streamflows in "ungauged" sections of Deer Creek. Water inserted into Layer 1 at the model boundary.

Response

The comment provides a summary of the assumptions made and the methodology used for model development. No response is required.

Comment LA15-79

Comment

Urban Pumping

Used groundwater use data form Urban Water Management Plans, for population centers above 5,000 people that rely on groundwater. For areas that did not have UWMPs used 271 gpd per person times census to get to groundwater use. Areas of North Sacramento County pumping/usage were stated as consistent with the local SacIGSM model (Note that SacIGSM is built in a predecessor code to IWFM)

Response

The comment provides a summary of the assumptions made and the methodology used for model development. No response is required.

Comment LA15-80

Comment

No Flux Boundaries

Bottom of Layer 7, the freshwater interface.

Response

The comment provides a summary of the assumptions made and the methodology used for model development. No response is required.

Comment LA15-81

Comment

Aquifer Properties

To develop hydraulic conductivity they reportedly used 1,000 wells within model domain with construction information and specific capacity data on Well Completion Reports. Shallow wells (<100 feet) and those with production below 100 gpm were eliminated for aquifer properties (except at the margins of the model domain where aquifers were presumed to be thin). Specific capacity data were converted to calculated transmissivity (T) using an empirical method that is not accurate. A specific capacity can be strongly influenced by turbulent head losses at the well if the pumping rate of the well is high relative to the length of well screen and the well screen open area. The calculated T value was reportedly divided by screen length to derive initial Kh.

They state there is not enough data to define depth dependent Kh. Cooper-Jacob confined aquifer method was assumed in their analysis of aquifer transmissivity.

Response

The comment provides a summary of the assumptions made and the methodology used for model development. No response is required.

Comment LA15-82

Comment

Peer Review Comments

Deep Percolation

1) IDC calculated deep percolation rates are excessive

1a) Deep percolation reduction factors were created for IDC outputs before use in SacFEM

2) SacFEM deep percolation rates are not supported by the fundamental IDC model methodology and parameters resulting in a disconnect between SacFEM and IDC.

2a) Recommended incorporating a feedback loop between the 2 models and subjecting them to convergence criteria

2b) SacFEM deep percolation rates are not consistent with other data sets and it should be ensured that they are supported by historical land use, crop mix, and agricultural practices

Response

The comment provides a summary of the assumptions made and the methodology used for model development. No response is required.

Comment LA15-83

Comment

Stream Aquifer interaction

1. The flow exchanged between streams and aquifers is a function of head difference between groundwater elevation and stream stage with impedance by streambed resistance; 2) The assumption of constant stream stage results in stream-aquifer relationship dependent on streambed resistance and groundwater elevation; 3) Assumption of constant stage is not valid; 4) Recommended that SacFEM use time varied stream stage data

The 2011 peer review contained a primary statement of revisions to SACFEM from 2009 that: "Documentation on SacFEM and the IDC Model – Model documentation, with appropriate level of detail on data collection, analysis, and input data preparation should be developed."

Response

The comment provides a summary of the assumptions made and the methodology used for model development. No response is required. Comment is noted.

A comprehensive user's guide to SACFEM2013 that provides the information requested by the commenter is included as Appendix H.

Comment LA15-84

Comment

Model Calibration Information

The following model calibration figures were obtained from the 2009 and 2011 SACFEM model documentation. (SEE ORIGINAL COMMENT FOR FIGURE)

This model calibration demonstrates that in several areas model estimates exceed actual measured data by more than 65 feet, the thickness of Layer 1 in SACFEM2103. This is notable in the region around 150 feet MSL on the attached chart, B-9, found in the 2011 model documentation. Additional calibration figures by well are found on the pages that follow and demonstrate a lack of fit to trend or data at many wells.

Response

The commenter is referring to the 2009 version of SACFEM that was submitted for peer review. Significant improvements to model calibration were achieved during development of SACFEM2013. Overall, the goodness-of-fit to historical groundwater levels achieved by SACFEM2013 is similar to or better than those associated with other regional models of the Sacramento Valley (e.g., CVHM and C2VSIM).

Comment Letter NG01, Kit Custis, AquAlliance, California Sportfishing Protection Alliance, Aqua Terra Aeris Law Group

Comment NG01-1

Comment

This letter provides comments and recommendations on the information provided in the September 2014 Draft Long-Term Water Transfer Environmental Impact Statement/Environmental Impact Report (Draft EIS/EIR) prepared by the U.S. Bureau of Reclamation (BoR) and San Luis & Delta-Mendota Water Authority (SLDMWA). This document evaluates the potential impacts of alternatives over a 10-year period, 2015 through 2024, for transferring Central Valley Project (CVP) and non-CVP water from north of the Sacramento-San Joaquin Delta (Delta) to CVP contractors south of the Delta. These transfers require the use of CVP and State Water Project (SWP) facilities. This Draft EIS/EIR evaluated impacts of alternatives for water transfers made available through groundwater substitution, cropland idling, crop shifting, reservoir release, and conservation.

This letter focuses mostly on the groundwater substitution element of the transfers for the Sacramento Valley groundwater basin and proves comments and recommendations regarding the potential impacts, technical information submitted, and monitoring and mitigation measures. Comments and recommendations are also provided regarding the biological resources, crop idling/crop shifting when those resources or activities impact or are impacted by the groundwater substitution transfers. This letter has two parts. The first part comments on the Draft Long-Term Water Draft EIS/EIR. The second part provides additional technical information on surface water-groundwater interactions that are relevant to the evaluation of potential impacts from the proposed water transfers, monitoring during the transfers and designing and implementing mitigation measures.

Response

Potential effects from groundwater-surface water interaction associated with groundwater substitution transfers are analyzed throughout Section 3, not just in the groundwater resources analysis. Section 3.1 discusses potential effects to surface water supply, Section 3.7 analyzes potential effects to fisheries, Section 3.8 assesses potential effects to riparian vegetation, and multiple other sections (Sections 3.2, 3.15, 3.16, and 3.17, among others) include modeling results that reflect changes in streamflow caused by groundwater-surface water interaction.

Comment NG01-2

Comment

1. Comments and Recommendations on the Draft Long-Term Water Transfer Draft EIS/EIR. The Draft EIS/EIR evaluated a number of potential environmental impacts from the groundwater substitution transfers using a finite element groundwater model, SACFEM2013. The potential impacts evaluated include: groundwater levels; surface water flow; water quality; biological resources, including vegetation, wildlife and fisheries; and the associated cumulative effects and impacts. Two mitigation measures, WS-1 and GW-1, are provided for monitoring and mitigating potential impacts from groundwater substitution transfers. I will

provide comments and recommendations on these topics following seven comments and recommendations on general issues, assumptions and methods that are used throughout the Draft EIS/EIR.

General Comments:

1. The Draft EIS/EIR has an underlying assumption that specific information on each proposed transfer will be evaluated in the future by the Bureau of Reclamation, the California Department of Water Resources (DWR), perhaps the California State Water Resources Control Board (SWRCB), and local agencies, presumably the County, or other designated local agency (Sections 1.5, 3.1.4.1-WS-1 and 3.3.4.1-GW-1). The Draft EIS/EIR relies on the results of the SACFEM2013 groundwater modeling effort to validate the conclusion of less than significant and reasonable impacts that cause no injury from the groundwater substitution transfer pumping. This conclusion is reached based on model simulation results, and assumption of implementation of mitigation measures WS-1 and GW-1. However, the Draft EIS/EIR provides only limited information on the wells to be used in the groundwater substitution transfers (see Table 3.3-3), and no information on non-participating wells that may be impacted. Information that is still needed to evaluate the potential impacts simulated by the groundwater modeling and the potential significance of the groundwater substitution transfer pumping includes, but isn't limited to:

    a. proposed transfer wells locations that are sufficiently accurate to allow for determination of distances between the wells and areas of potential impact,

    b. the distances between the transfer wells and surface water features,

    c. the number of non-participating wells in the vicinity of the transfer wells that may be impacted by the pumping,

    d. the distance between the transfer wells and non-participant wells that may be impacted by the transfer pumping, including domestic, public water supply and agricultural wells,

    e. the number of non-participating wells in the vicinity of the transfer wells that can be expected to be pumped to provide public water supply or irrigation water during the same period as the transfer pumping,

    f. the amount of well interference anticipated at each of the non-participating domestic, public water supply and agricultural wells in the vicinity of transfer wells,

    g. the aquifers that the non-participating wells in the vicinity of the transfer wells are drawing groundwater from,

    h. groundwater level hydrographs near the non-participating and participating transfer wells, to document the pre-transfer trends and fluctuations in groundwater elevations in order to evaluate the current conditions and serve as a reference for monitoring impacts from transfer pumping,.

i. the identity and locations of wells that will be used to monitor groundwater substitution transfer pumping impacts, the aquifers these wells are monitoring, frequency for taking and reporting measurements, and the types and methods for monitoring and reporting,

j. groundwater level decline thresholds at each monitoring well that require actions be taken to reduce or cease groundwater substitution transfer pumping to prevent impacts from excessive drawdown, including impacts to non-participating wells, surface water features, fisheries, vegetation and wildlife, other surface structures, and regional economics.

This list addresses only the minimum of information needed about the groundwater wells and does not address other elements of the groundwater substitution transfer, which I will discuss under separate sections, including the WS-1 and GW-1 mitigation measures, the SACFEM2013 groundwater modeling effort, and stream depletion impacts.

I recommend the Draft EIS/EIR be revised to include the additional well information and monitoring requirements listed above. I recommend that mitigation measures WS-1 and GW-1 be revised to provide specific requirements for monitoring, thresholds of significance, and actions to be taken when the thresholds are exceeded.

Response

Note the locations of the transfer wells are shown in Figures 3.3-28 through 3.3-33. The scale of these figures has also been increased to make them easier to review. The exact location/coordinates of groundwater substitution wells are confidential and cannot be disclosed in a public document.

The SACFEM 2013 User's Manual has been included as Appendix H, and it includes more information about groundwater pumping in the Sacramento Valley that is not transfer-related pumping. Mitigation Measure GW-1 discussed in Section 3.3.4.1 will monitor groundwater levels during transfers to ensure compliance with performance criteria and avoid potentially significant effects. See Common Responses 4 and 6 for additional information.

Comment NG01-3

Comment

2. The only maps provided by the Draft EIS/EIR that show the location of the groundwater substitution transfer wells, and the rivers and streams potentially impacted are the simulated drawdown Figures 3.3-26 to 3.3-31, which are at a scale of approximately 1 inch to 18 miles on letter size paper. These figures show clusters of wells and several rivers, creeks and canals. A few are labeled, but apparently not all of the streams and creeks evaluated for groundwater substitution impacts are shown. Figures 3.7-1 and 3.8-2 show the major rivers and reservoirs evaluated in the biological analyses, and Tables 3.7-2, 3.7-3, and 3.8-3 list up to 34 small rivers or creeks that were apparently evaluated for stream depletion using the SACFEM2013 groundwater model. Without river/stream/creek labels on the drawdown figures at a scale that allows for reasonable measurement and review, it is difficult to determine the anticipated drawdown at the 34 small rivers and creeks or other important habitat areas.

Response

Figures 3.3-26 through 3.3-31 from the Long-Term Water Transfers 2014 Draft EIS/EIR (revised to Figure 3.3-28 through 3.3-33 in the Final EIS/EIR) have been revised to show results at a finer resolution to facilitate the measurement of distances. Each of the rivers/streams simulated in the SACFEM2013 model are shown in these figures.

Comment NG01-4

Comment

The Fisheries Section 3.7, and Vegetation and Wildlife Section 3.8 provide discussions of the potential impacts from groundwater substitution transfer induced stream depletion (Sections 3.7.2.1.1, 3.8.2.1.1, and 3.8.2.1.4). The Well Acceptance Criteria of Table B-1 in Appendix B of the October 2013 joint DWR and BoR document titled Draft Technical Information for Preparing Water Transfer Proposals (DTIPWTP) lists in the table footnotes eight major and three minor surface water features tributary to the Delta that are affected by groundwater pumping. Apparently, the Well Acceptance Criteria in Table B-1 will be applied to these eleven surface water features as part of mitigation measure GW-1. Whether the Well Acceptance Criteria will also be applied to the creeks listed in Tables 3.7-2, 3.7-3 and 3.8-2 is not specifically stated in the Draft EIS/EIR or GW-1.

Response

The comment is incorrect. Mitigation Measure GW-1 does not include or rely upon the well acceptance criteria specified in the Draft Technical Information for Preparing Water Transfer Proposals.

Comment NG01-5

Comment

The lack of maps with sufficient detail to see the relationship between the wells and the surface water features prevents adequate review of the Draft EIS/EIR analysis to determine whether mitigation measures WS-1 and GW-1 will be effective at mitigating pumping impacts. As I will discuss in Part 2 of this letter, the distance between a surface water feature and a pumping well is a critical parameter in estimating the rate and duration of stream depletion. Maps are needed of each seller's service area at a scale that allows for reasonably accurate measurement of distances between the groundwater substitution transfer wells and surface water features, other non-participating wells, proposed monitoring wells, fisheries, vegetation and wildlife areas, critical surface structures, and regional economic features.

Response

See response to Comment NG01-3.

Comment NG01-6

Comment

I recommend the Draft EIS/EIR be revised to provide additional maps of each seller's service area at a scale that allows for reasonably accurate measurement of distances between the groundwater substitution transfer wells and surface water features listed in Tables 3.7-2, 3.7-3, 3.8-3 and B-1 as well as other non-listed surface water dependent features such as wetlands and riparian areas, non-participating wells, the proposed monitoring wells, wildlife areas, critical surface structures, regional economic features, and other structures that might be impacted by groundwater substitution pumping.

Response

See response to Comment NG01-3.

Comment NG01-7

Comment

3. The Draft EIS/EIR evaluated a number of potential environmental impacts from the groundwater substitution transfers using the finite element groundwater model SACFEM2013. The results of the modeling effort were used in the assessment of the potential biological resource impacts from reductions in surface water flows caused by groundwater substitution transfer pumping (pages 3.7-18 to 3.7-30, and 3.8-67). The Draft EIS/EIR assumes that SACFEM2013 model results are sufficiently accurate to justify removing most of the small creeks from a detailed effects analysis (Table 3.7-3 and 3.8-3).

Statements are given that the mean monthly reduction in the Sacramento, Feather, Yuba and American rivers will be less than 10 percent (pages 3.7-25 and 3.8-49) and that other stream requirements of flow magnitude, timing, temperature, and water quality would continue to be met. However, actual SACFEM2013 model results on anticipated changes in flow, temperature and water quality are not provided for all of the surface water features that may be potentially impacted by the groundwater substitution transfer projects. Creeks that passed a preliminary screening, Tables 3.7-3 and 3.7-4, were selected to be modeled by water year type for stream depletion that exceeds 1 cubic feet per second (cfs) and 10% reduction in mean monthly flow. Results of the modeling effort are presented in Tables 3.8-4 to 3.8-7.

Response

See Sections 3.7.2.1 and 3.8.2.1 of the 2014 Draft EIS/EIR and Common Response 11. The SACFEM 2013 model assessed the changes in surface water features for the small creeks for each month in the period of analysis. The Lead Agencies used these results to determine if the stream had the potential for a change of more than 10 percent of flow or 1 cfs.

Comment NG01-8

Comment

The Draft EIS/EIR notes that not all surface water features were evaluated because some lacked sufficient historical flow data, or they were too small to model (page 3.7-20). The Draft EIS/EIR then assumes that the pumping impacts to un-modeled small surface water features are similar to nearby modeled features. No maps with sufficient detail are provided to allow for determination of the spatial relationship between the modeled and un-modeled surface water features, or the relationship between the groundwater substitution transfer wells and the modeled and un-modeled surface water features (see comment no. 2). The distance between a well and a surface water feature is a critical parameter in determining the rate and timing of surface water depletion resulting from groundwater pumping. The validity of the assumption that the un-modeled surface water features will respond similarly to the modeled is dependent on the distance between them and their respective distances to the pumping transfer well(s). I will discuss in more detail in Part 2 the importance of distance in the calculation of stream depletion.

Response

Wells were added to the seller map in Chapter 2.

Comment NG01-9

Comment

The Draft EIS/EIR also provides Figures B-5 and B-6 of Draft EIS/EIR Appendix B that graph in aggregate the changes in stream-aquifer interactions, presumably equal to changes in stream flow, based on the SACFEM2013 simulations. While these graphs are interesting for several reasons, they don't provide information specific to each seller service area on flow losses expected in each river and creek. No figures are provided that show the longitudinal- or cross-sections of channel where impacts are expected, or the rate of stream depletion in each channel section. Maps with rates and times of stream depletion by longitudinal channel section are needed to allow for an adequate review of the Draft EIR/EIS conclusion of less than significant and reasonable impacts with no injury. These maps are also needed to evaluate the specific locations for monitoring potential impacts.

Response

Rates and locations of streamflow depletion are not consistent for each waterway, but vary for each month of the 33-year modeling period because of different pumping patterns and hydrology. This produces too much data to summarize in a map (or a series of maps). The results were examined in detail for the analyses in Sections 3.1, Water Supply; 3.7, Fisheries; and 3.8, Vegetation and Wildlife to determine the locations where additional analysis was needed related to these resources. A summary of the results is included in Appendix E, and additional data relevant to the environmental analyses is found in Sections 3.1, 3.7, and 3.8.

Comment NG01-10

Comment

Statements are made in Section 3.7 that reductions in surface flow due to groundwater substitution pumping would be observed in monitoring wells in the region as required by mitigation measure GW-1. Thus detailed maps that show the locations of the monitoring wells and the areas of potential impact along with the rates and seasons of anticipated stream depletion are needed for each service area. These maps are also needed to allow for evaluation of the cumulative effects whenever pumping by the multiple sellers can impact the same resource. Without site-specific information on expected locations and changes in flow at each potentially impacted surface water feature, it's difficult to evaluate the adequacy of any monitoring effort.

Response

There were no effects found on fisheries and mitigation measures are unnecessary. References to environmental commitments were removed from the fisheries section (Section 3.7) to avoid confusion.

Comment NG01-11

Comment

I recommend the Draft EIS/EIR be revised to provide additional information on the anticipated changes in surface water flow, temperature, water quality and channel geomorphology for each river, creek and surface water feature in the areas of groundwater substitution transfer pumping. In addition, I recommend that maps showing the along channel longitudinal sections, the maximum anticipated changes in flow rate, water temperature, water quality, and the timing of the maximum anticipated rate of stream depletion due to groundwater substitution transfer pumping be provided at an appropriate scale to allow for adequate measurement and review in the Draft EIS/EIR, and for use in the WS-1 and GW1 mitigation monitoring programs.

Response

The analysis provided represents the best available science and analytical tools, consistent with professional practice. Much of the information requested by the commenter has already been provided in the analysis. Some of the information (e.g., water temperature and water quality modeling in potentially affected surface water features) cannot be obtained because no tools are available to provide it. Instead, changes in flow were used as a proxy for changes in temperature and water quality.

Comment NG01-12

Comment

4. The results of the SACFEM2013 simulation are used to evaluate stream depletion quantities and impacts for vegetation and wildlife resources that are dependent on surface water (Sections 3.7 and 3.8), and to determine the expected lowering of groundwater levels in the areas of transfer pumping (Section 3.3). The groundwater substitution transfer pumping simulation was run from water year (WY) 1970 to WY 2003 and assumed 12 periods of groundwater substitution transfer at various annual transfer volumes as shown in Figure 3.3-25. The apparent Draft EIS/EIR baseline for analysis of groundwater pumping impacts ends with WY 2003 because of limitations of the CalSim II surface water operations model. The CalSim II model was jointly developed by DWR and BoR and is used to determine available export capacity of the Delta. The WY 2003 time limitation was adopted in the SACFEM2013 groundwater-modeling effort apparently because if the desire to combine the simulation of groundwater impacts with estimating the timing of when groundwater substitution water could be transferred through the Delta (Section 3.3.2.1.1). The description of the SACFEM2013 modeling effort states that the volume of groundwater pumping was determined by “comparing the supply in the seller service area to the demand in the buyer service area” (page 3.3-60).

Response

Comment noted.

Comment NG01-13

Comment

While this is an interesting modelling exercise, and much can be learned from it, the simulations didn't evaluate the impacts of pumping the maximum annual amount proposed for each of the 10 years of the project. It is important that with any simulation used to analyze potential project impacts that the maximum levels of stress, pumping, proposed by the project be simulated at each of the project locations for the entire duration of the project. This is especially important whenever the simulations are used to justify the conclusion that project impacts will be less than significant, reasonable and cause no injury. Because the groundwater modeling effort didn't include the most recent 11 years of record, it appears to have missed simulating the most recent periods of groundwater substitution transfer pumping and other groundwater impacting events, such as recent changes in groundwater elevations and groundwater storage (DWR, 2014b), and the reduced recharge due to the recent 11 years into account, the results of the SACFEM2013 model simulation may not accurately depict the current conditions or predict the effects from the proposed groundwater substitution transfer pumping during the next 10 years.

Response

See Common Response 5. Additionally, NEPA and CEQA do not require that the analysis include the "worst case possible;" rather, it should focus on the "most likely" scenario. It is not reasonably foreseeable that the maximum annual volumes of groundwater substitution transfers will occur every year for ten consecutive years. Sellers identified maximum annual quantities as an upper limit to what they may make available, and it is unlikely these volumes would or could be provided for ten consecutive years. Additionally, many sellers would reduce the water quantity available for transfer under certain hydrologic conditions such as when Sacramento River Settlement Contract allocations are less than 100 percent, or in consecutive dry years.

Comment NG01-14

Comment

Although the Draft EIS/EIR project description is specific on the volumes and periods of groundwater substitution transfer pumping as shown in Tables 2-4 and 2-5, the write-up of the groundwater modeling effort aggregated the volume pumped (Sections 3.3.2.4.2 and B.4.3.1.2 in Appendix B). The simulated volume of groundwater pumped doesn't reach the maximum being requested by the project in any individual year or for all ten years (Figures B-4 in Appendix B and 3.3-25). Note, the annual groundwater substitution transfer amounts shown in Figure B-4 in Appendix B are not the same as the amounts simulated by the SACFEM2013 model as shown in Figure 3.3-25. The presentation of the SACFEM2013 model results in Sections 3.3.2.4.2 and B.4.3.1.2 don't tabulate or provide detailed maps by seller service area on the pumping rates, cumulative pumped volumes, pumping times and durations, or which aquifers were pumped in the simulations. The model documentation doesn't provide the maximum drawdown or the expected centers of maximum drawdown for each seller service area.

Response

Figure C-4 illustrates the annual groundwater substitution transfer supply identified by the sellers for years with available export capacity and transfer demand. This figure is not intended to illustrate the volume of simulated groundwater pumping in SACFEM2013, because in some years the supply can exceed the available export capacity or transfer demand (e.g., 1989). The groundwater substitution quantities illustrated in Figure C-3 illustrate the volume of simulated pumping and are the same as those illustrated in Figure 3.3-27. Table 2-5 provides the maximum total volume of water that may be transferred via groundwater substitution along with the time of the transfer. Figures in Section 3.3 (e.g., Figure 3.3-28) show the location of the groundwater substitution pumping wells included in this EIS/EIR. Table 3.3-3 lists the range of pumping rates and pumping depths associated with each potential groundwater substitution transfer, by seller. Figures 3.3-28 through 3.3-33 provide contours of the change in groundwater level (drawdown) due to the proposed action. These contour plots show the areas where drawdown may be higher versus those where it may be lower. Figures 3.3-34 through 3.3-38 (and Appendix G) show the timing of drawdown due to the proposed action at several locations throughout the Sacramento Valley.

Comment NG01-15

Comment

The documentation of the SACFEM2013 model results should also discuss the variations in potential impacts that might result from pumping transfer wells other than those simulated. If the groundwater simulation didn't pump all of the transfer wells listed in Table 3.3-3 for each seller at their maximum rate, then the modeling documentation should describe how the impacts from the simulation should be evaluated for the non-simulated transfer wells and for those well simulated at less than maximum pumping. For example, if the modeling effort provides the pumping time and distance drawdown characteristics of each well this information can be used to estimate the drawdown at different distances, pumping rates, and durations of pumping (see pages 238 to 244 in Driscoll, 1986). The Draft EIS/EIR should provide the time-drawdown and the distance-drawdown hydraulic characteristics for each groundwater substitution transfer well so that non-simulated impacts can be estimated. The Draft EIS/EIR should then describe a method(s) for estimating the drawdown at different distances, rates and durations of pumping so that non-participant well owners can estimate and evaluate the potential impacts to their well(s) from well interference due to the pumping of groundwater substitution transfer well(s).

Response

The project description developed in Section 2 provides the maximum volumes that may be transferred as part of the EIS/EIR (Table 2-4). Table 2-5 further divides the volumes from Table 2-4 into volumes for each transfer method. The data in Table 3.3-3 lists the number of wells and range of individual well pumping rates. To provide a conservative assessment of potential impacts, this EIS/EIR simulated the concurrent groundwater substitution pumping of all the wells in Table 3.3-3. Pumping fewer wells and/or pumping wells at lower rates would likely result in lesser impacts than those presented in this EIS/EIR.

Comment NG01-16

Comment

Because the rate of stream depletion is scaled to pumping rate and because the model documentation doesn't indicate the pumping locations, rate, volumes, times or durations that produced the pumped volumes shown in Figure 3.3-25, or the stream depletions shown in Figures B-5 and B-6 in Appendix B, there is uncertainty whether the SACFEM2013 modeling simulated the maximum rate of stream depletion for the proposed 10-year project. The annual volume of groundwater pumping shown in Figure 3.3-25 are less than the maximum requested, and pumping for a continuous 10 years was not simulated. This suggests that the stream-interaction values or stream depletion(?) shown in Figures B-5 and B-6 of Appendix B are not the maximum level of impact that might occur from the 10-year project.

Response

It is unclear what the commenter meant by "the rate of stream depletion is scaled to pumping rate." Stream depletions illustrated in Figures B-5 and B-6 are the simulated stream depletion for the simulated pumping scenario. All quantities of water available for transfer analyzed in the document were developed in close coordination with the individual sellers and are generally considered to be conservative estimates that represent the maximum volume of water that could be made available. Therefore the analysis includes estimates of potential maximum streamflow depletions for a reasonable volume and frequency of transfer over the life of the project. Finally, NEPA and CEQA do not require that the analysis include the "worst case possible;" rather, it should focus on the "most likely" scenario.

Comment NG01-17

Comment

Without information on the rate, timing and duration of the groundwater pumping, there can be no evaluation of whether the annual simulated impacts are representative of the two pumping seasons listed in Table 2-5, or just a single 3-month pumping season. Whenever the simulated annual pumping rate was greater than the single season maximum of 163,571 acre-feet (AF), two seasons of pumping are required, but the percentage in each season is unknown. If the simulated pumping time represents only one season or a mixture of the two seasons, then the simulation may not reflect the actual timing and/or duration of maximum groundwater substitution pumping impacts proposed in Table 2-5. If a simulation doesn't evaluate the project under existing conditions or simulate the maximum stress allowed by the project description, then it raises a question of whether the Draft EIS/EIR adequately evaluated the projects potential impacts. Without thorough documentation of the SACFEM2013 groundwater impact simulation, it is difficult to review and analyze the model's predictions for potential impacts from each seller's groundwater substitution transfer project, or use the model results in designing and setting impact thresholds for the groundwater monitoring required in mitigation measure GW-1.

Response

Section 3.3 includes additional information on the number of wells, depth, and pumping rates. Appendix C has been updated to include monthly transfer amounts from each seller over the period of analysis (see Appendix C for updates).

Comment NG01-18

Comment

I recommend the Draft EIS/EIR be revised to provide a more complete description of the SACFEM2013 groundwater modeling effort, including tabulation of the groundwater substitution pumping rates, volumes durations, and dates for each simulated well; the hydraulic characteristics of each well simulated; the aquifer(s) pumped by each simulation well; the impacts from the maximum proposed pumping, annually and during the 10-years of the proposed project; sufficiently detailed maps of the well locations in each seller's service area that non-participants and the public can use to identify any well's relationship to the groundwater substitution transfer wells and understand the potential impacts to groundwater levels. I recommend the Draft EIS/EIR provide, for each transfer well, the pumping time and distance drawdown characteristics such that drawdown for durations, distances and rates of pumping other than those simulated can be estimated. I recommend the Draft EIS/EIR also provide an explanation of why the simulation is representative of the current (2014) conditions, how the simulation can be used to assess current and future conditions, and how the simulation can be used to evaluate, monitor and set impact thresholds for future impacts from the 10-year project at the maximum groundwater substitution transfer pumping volumes listed in Tables 2-4 and 2-5.

Response

Appendix C has been updated to include monthly transfer amounts from each seller over the period of analysis (see Appendix C for updates). The SACFEM 2013 User's Manual has been added as Appendix H to provide more information about the groundwater model. See Common Response 5.

Comment NG01-19

Comment

5. The Draft EIS/EIR was written from the perspective of the process of transferring surface waters through the Delta. This surface water point of view has carried over into some of the analyses of impacts and mitigations for groundwater pumping. For example, the discussions of potential impacts to surface water users, fisheries, and other stream dependent biological resources are thought of as occurring "downstream" of the groundwater substitution wells. While it is correct that groundwater pumping can impact down gradient resources, pumping can also affect up gradient and lateral resources. A pumped well creates a depression in the surrounding aquifer, often referred to as a "cone of depression." Thus, the area of impact around a pumping well is not a single point, but a region whose extent is sometimes called the "area, radius or zone of influence." The length of stream affected by groundwater pumping is related to the distance between the well and the stream (Figures 16 and 29 from Barlow and Leake, 2012; Exhibits 1.1 and 1.2). Miller and Durnford (2005) noted that for an ideal aquifer and stream at longer durations of pumping, when the stream depletion rate approaches the well pumping rate, 50% the stream depletion occurs within a stream reach length of twice the distance between the stream and well, and 87% of the depletion occurs within a reach length of 10 times the stream to well distance. Obviously, for non-ideal aquifers and streams the length of stream depleted will vary from the ideal, but this illustrates that stream depletion caused by a pumping well is not focused at one point, but occurs along

a length of stream with impacts that occur upstream and downstream from the point on the stream that is typically closest to the well.

Response

Figures 3.3-28 through 3.3-33 show the spatial distribution of the change in groundwater level described by the commenter. The modeling developed in this EIS/EIR incorporates the physical distribution of pumping wells and streams in the calibrated three-dimensional SACFEM2013 model. The simulation of stream-groundwater interaction in the model incorporates the spatial decline in groundwater levels related to the layout of the simulated stream network.

Comment NG01-20

Comment

Because groundwater is generally flowing, the water table or piezometric surface has a slope. This slope causes the cone of depression around a pumping well to elongate along the direction of regional flow. The elongated cone of depression is often referred to as a “capture zone” (Frind and others, 2002) and determining its extent is a basic part of a pump and treat groundwater cleanup program (USEPA, 2008a). This “capture zone” is related to stream depletion capture because the pumping well intercepts groundwater that would eventually discharge to surface water or be used by surface vegetation. If the “capture zone” extents far enough it may cross a surface water feature and induce greater seepage. However, unlike the capture needed for a contaminant plume, stream depletion can occur without the actual molecule of water that enters the well having to originate from the stream (Figure 29; Exhibit 1.2).

Response

See response to Comment NG01-19.

Comment NG01-21

Comment

The stream depletion occurs when groundwater is either intercepted before reaching the stream or seepage from the stream is increased. This water only has to backfill the change in storage caused by pumping, it doesn’t have to enter the well. The “capture zone” also extends upgradient to the recharge area that’s the normal source of water flowing past the well. The aquifer recharge that flows past the pumping well may be derived from a wide mountain front area, it could be a section of another river that crosses the “capture zone”, or an overlying area of agricultural irrigation. In a complex hydrogeologic setting, numerical modeling that utilize particle tracking is needed to define where a pumping well is recharged and where it may deplete surface water features (Frind and others, 2002; Franke and others, 1998).

Response

See response to Comment NG01-19.

Comment NG01-22

Comment

The concepts of a wide zone of influence and an elongated "capture zone" are important for the Sacramento Valley groundwater substitution transfers projects because the analysis and monitoring of potential pumping impacts requires a multidirectional evaluation. It can't be assumed that stream depletion impacts from pumping occur only downstream from the point on the stream closest to the pumping well. Any monitoring of the effects of groundwater substitution pumping on surface or ground water levels, rates and areas of stream depletion, fisheries, vegetation and wildlife impacts, and other critical structures needs to cover a much wider area than what is needed for a direct surface water diversion. This is a fundamental issue with the Draft EIS/EIR. The environmental analyses, monitoring requirements and mitigation measures appear to be developed without adequately considering the multidirectional, wide extent of potential impacts from groundwater substitution transfer pumping.

Response

See response to Comment NG01-19.

Comment NG01-23

Comment

I recommend the Draft EIS/EIR be revised to address the wide extent of potential impacts for groundwater substitution transfer pumping. This should include conducting numerical modeling of the groundwater basin using particle tracking to determine which surface water features and other structures are potentially impacted by the pumping of each transfer well and to determine the extent of stream depletion along each potentially impacted surface water feature. The monitoring and mitigation measures WS-1 and GW-1 should also be revised to account for a wide area of potential impact from groundwater substitution transfer pumping.

Response

See responses to Comments NG01-15 and NG01-19. Both of the mitigation measures mentioned by the commenter (WS-1 and GW-1) apply for all transfers covered by this EIS/EIR. See Common Responses 6, 7, and 8 for additional information.

Comment NG01-24

Comment

6. The Draft EIS/EIR is written with the assumption that project specific evaluation for each seller agency will be done at a later time by the BoR and/or DWR, and at the local level (see Section 3.3.1.2.3, mitigation measure GW-1 in Section 3.3.4.1, and Section 3.1 in the DTIPWRP).

Response

The 2014 Draft EIS/EIR provides detailed analysis of the envrironmental effects of a range of potential transfer activities. The 2014 Draft EIS/EIR does not indicate that subsequent project-level evaluation will be completed for each transfer. Rather, the Lead Agencies would review proposed transfers to consider whether they are analyzed in this EIS/EIR, and to verify that the transfers include the mitigation measures specified in this EIS/EIR. See Section 1.6 of the 2014 Draft EIS/EIR for additional information. See Common Response 14.

Comment NG01-25

Comment

The Draft EIS/EIR lists in Table 3.3-1 and Table 3-1 of the DTIPWRP the Groundwater Management Plans (GMP), agreements and county ordinances that regulate the sellers at a local level. The Draft EIS/EIR discusses only two county ordinances, the Colusa Ordinance No. 615 and Yolo Export Ordinance No. 1617, one agreement, the Water Forum Agreement in Sacramento County, and one conjunctive use program, the American River Basin Regional Conjunctive Use Program. The Table 3-1 in the DTIPWRP lists short descriptions of the county ordinances related to groundwater transfers, if one exists. These descriptions don't always identify the actual ordinance number that applies to a groundwater substitution transfer, but sources for additional information are provided in the table.

Response

Section 3.3.1.2.3 has been revised to include all pertinent groundwater substitution transfers related ordinances and GMPs within the area of analysis (i.e. area underlying transfer-related pumping).

Comment NG01-26

Comment

The DTIPWRP (page 27) and GW-1 (page 3.3-88) instructs the entity participating in a groundwater substitution transfer that they are responsible for compliance with local groundwater management plans and ordinances. Except for the brief discussion of the two ordinances, one agreement, and one conjunctive use program listed above, the Draft EIS/EIR doesn't describe the requirements of local GMPs, ordinances, and agreements listed in Tables 3.3-1 (page 3.3-8) and Table 3-1 (page 27). Thus, the actual groundwater substitution transfer project permit requirements, restrictions, conditions, or exemptions required for each seller service area by BoR, DWR, and one or more County GMP or groundwater ordinance will apparently be determined at a future date. It follows that any actual monitoring requirements, mitigation measures, thresholds of significance required by BoR, DWR or local governing agencies will also be determined at a future date. The mechanism for the public to participate in the determination of the actual groundwater substitution transfer project permit requirements, restrictions, conditions, mitigation measures or exemptions isn't specified in the Draft EIS/EIR.

Response

See response to Comment NG01-25. Reclamation will ensure that all groundwater substitution transfers comply with applicable regulations during the water transfer review and approval process that occurs when specific individual proposals are presented. The public scoping and review periods of the EIS/EIR solicited public opinion on the range of potential transfer activities to be evaluated under the Proposed Action, and provided the public with opportunities to comment on the significance criteria, impact analysis, and mitigation. See Common Responses 6 and 9 for additional information.

Comment NG01-27

Comment

Addition information is needed on what the local regulations require for exporting groundwater out of each seller's groundwater basin. The Draft EIS/EIR needs to discuss how the local regulations ensure that the project complies with California Water Code (WC) Sections 1220, 1745.10, 1810, 10750, 10753.7, 10920-10936, and 12924 (for more detailed discussion of these Water Codes see Draft EIS/EIR Section 3.3.1.2.2). Although the Draft EIS/EIR doesn't document, compare or evaluate the requirements of all local agencies that have authority over groundwater substitution transfers in each seller service area, the Draft EIS/EIR concludes that the environmental impacts from groundwater substitution transfer pumping by each of the sellers will either be less than significant and cause no injury, or be mitigated to less than significant through mitigation measures WS-1, and GW-1 with it's reliance on compliance with local regulations. Because the spatial limits of groundwater substitution pumping impacts are controlled by hydrogeology, hydrology, and rates, durations and seasons of pumping, the impacts may not be limited to the boundaries of each seller's service area, GMPs, or County. There is a possibility that a seller's groundwater substitution area of impact will occur in multiple local jurisdictions, which should results in project requirements coming from multiple local as well as state and federal agencies. The Draft EIS/EIR doesn't discuss which of the multiple local agencies would be the lead agency, how an agreement between agencies would be reached, or how the requirements of the other agencies will be enforced. The Draft EIS/EIR only briefly mentions the Northern Sacramento Valley Integrated Regional Water Management Plan (IRWMP) (page 3.3-91 and -92) and doesn't mention the American River IRWMP (http://www.rwah2o.org/rwa/programs/irwmp/), the Yuba County IRWMP (http://yubairwmp.org/the-plan-irwmp/content/irwmp-plan), or the Yolo County IRWMP (http://www.yolowra.org/irwmp.html). The Draft EIR/EIS doesn't provide information on the water management requirements of the IRWMP covering each seller service area or how the groundwater substitution transfers will be accounted for in the IRWMP process.

Response

Proposed groundwater substitution transfers are subject to the ordinances of the county where groundwater substitution is occurring; if transferring agencies cross political boundaries, the wells within each area would be subject to those ordinances. Section 3.3.1.2.3 has been revised to include all pertinent groundwater substitution transfers related ordinances within the area of analysis where groundwater substitution pumping would occur.

Comment NG01-28

Comment

Because the Draft EIS/EIR requires that each individual transfer project meet the requirements of Water Code sections listed above, and because it assumes that each of the sellers will separately comply with all federal, state and local regulation, GMPs, IRWMPs, ordinances or agreements, the Draft EIS/EIR should provide an analysis of how these local regulations, GMPs, ordinances or agreements will ensure each seller's project achieves the goals of no injury, less than significant and reasonable impacts. Each seller's project analysis should identify what future analyses, ordinances, project conditions, exemptions, monitoring and mitigation measures are required to ensure that each of the seller's project meets or exceed the goals of the Draft EIS/EIR.

Response

See response to Comment NG01-2.

Comment NG01-29

Comment

I recommend the Draft EIS/EIR be revised to include a discussion and comparison of the local regulations, GMPs, IRWMPs, ordinances and agreements that govern each of the seller's proposed groundwater substitution transfers. I recommend each analysis demonstrate that each seller's project will meet or exceed the environmental protection goals of the Draft EIS/EIR. I recommend an analysis that compares local and regional management plans, ordinances, regulations, and agreements with the monitoring and mitigation measures in the Draft EIS/EIR to identify any additional mitigation measures needed to ensure compliance with local, regional, state and federal regulations. I recommend an analysis that includes: (1) a discussion on how the local lead agency will be determined; (2) how multiagency jurisdictions will be enforced; (3) how conflicts between different local, regional, state and federal regulatory jurisdictions will be resolved; and (4) how public participation will occur.

Response

Buyers and sellers are required to comply with any local requirements for water transfers approval (see Section 3.3.1.2). See Common Response 14.

Comment NG01-30

Comment

7. The Draft EIS/EIR provides only one groundwater elevation map of the Sacramento Valley groundwater basin, Figure 3.3-4, which shows contours from wells screened from a depth greater than 100 feet to less than 400 feet below ground surface (bgs) (>100 to < 400 feet bgs) and only for the northern portion of the proposed groundwater substitution transfer seller area. The Draft EIS/EIR doesn't provide maps showing groundwater elevations, or depth to groundwater, for groundwater substitution transfer seller areas in Placer, Sutter, Yolo, Yuba, and Sacramento counties.

Response

Section 3.3.1.3 has been revised to include additional change in groundwater elevation contour maps at varying aquifer depths. Section 3.3.1.3 has been revised to include groundwater elevation hydrographs for representative wells within Yolo, Sutter, and Sacramento counties.

Comment NG01-31

Comment

The DWR provides on a web site a number of additional groundwater level and depth to groundwater maps at:

http://www.water.ca.gov/groundwater/data_and_monitoring/northern_region/GroundwaterLevel/gw_level_monitoring.cfm#Well%20Depth%20Summary%20Maps.

For example, there are maps that show the change in groundwater levels from the spring of 2004 to spring of 2014 for shallow screened wells (<200 feet bgs), intermediate wells (>200 to <600 feet bgs), deep wells (>600 feet bgs), and well screened in the >100 to < 400 feet bgs interval. In addition, the DWR web site has a series of well depth summary maps for Butte, Colusa, Glenn, and Tehama counties, and the Redding Basin that show the density of wells screened at less than 150 feet bgs, and between 150 and 500 feet bgs, along with contours of the depth to groundwater in the summer of 2013. There are also numerous other groundwater elevation contour maps on DWR's web page, going back to 2006. Historical and recent groundwater elevation and depth contours maps for Placer, Sutter, Yolo, Yuba, and Sacramento counties may be available from the groundwater substitution transfer sellers, other water agencies in those counties, the IRWMP documents, or technical reports on groundwater management (for example, Northern California Water Association, 2014a, b, and c).

Response

See Common Response 4 regarding revisions made to Section 3.3.1.3. Additional figures and information from DWR have been included in the Final EIS/EIR.

Comment NG01-32

Comment

Historic change and current groundwater contour maps are critical to establishing an environmental baseline for the groundwater substitution transfers. This information is needed to evaluate the impacts from groundwater substitution transfers because it establishes the present groundwater basin conditions and document the changes and trends in groundwater levels in the last 10-plus years, which were not simulated by the SACFEM2013 modeling.

Response

Section 3.3.1.3 establishes the existing conditions of the groundwater basins. As discussed in Common Response 4, Section 3.3.1.3 has been revised to include additional information regarding current groundwater conditions within the Sacramento Valley.

Comment NG01-33

Comment

Information on the depth to shallow groundwater is critically important because of the analysis of impacts to vegetation and wildlife in Section 3.8 assumed, based on the results of the SACFEM2013 model, that the current depth to shallow groundwater is greater than 15 feet bgs for most of the Sacramento Valley groundwater basin (page 3.8-32). Because the simulation showed a condition of greater than 15 feet depth to groundwater, the Draft EIS/EIR concluded that impacts from lowering of the shallow water table as a result of the groundwater substitution transfer pumping would be less than significant (page 3.8-47).

Response

The 2014 Draft EIS/EIR acknowledges that groundwater substitution for the range of potential water transfer activities analyzed under the Proposed Action could decrease available groundwater for natural communities. As described in the analytical methods and impact analysis, the reductions in groundwater below 15 feet in depth are not likely to affect surface vegetation; therefore, Reclamation and SLDMWA concluded that a substantial adverse impact will not occur and that the impacts are less than significant. However, in an abundance of caution, vegetation effects are further addressed in Mitigation Measure GW-1. See Common Responses 10 and 11.

Comment NG01-34

Comment

This assumption however appears to conflict with the DWR shallow well depth summary maps (DWR, 2014a) that show contours of the depth to groundwater in wells less than 150 feet bgs in the summer 2013. These maps show extensive areas around the Sutter Buttes and to the north were the depth to groundwater is less than 10 feet and 20 feet (Exhibit 2.1). These maps also show extensive areas where the depth to groundwater is less than 40 feet, a depth significant to some tree species such as the valley oak (page 3.8-32). There is also a recent trend of lower groundwater levels in a number of areas in the Sacramento Valley as shown on the DWR 2004 to 2014 groundwater change maps for shallow, intermediate, deep aquifer zones available from the web site listed above (DWR, 2014b). Exhibit 2.1 has a composite map of the shallow zone well depth maps and traces of the shallow zone 2004 to 2014 groundwater elevation change contours.

Response

See response to Comment NG01-33.

Comment NG01-35

Comment

These groundwater elevation, depth and changes in elevation maps are important for documenting baseline groundwater conditions. The recent trend of decreased groundwater levels should be included in the analysis of groundwater substitution pumping impacts because the drawdowns shown in Figures 3.3-26 to 3.3-31 will interact with existing conditions, and may cause additional long-term decreases in groundwater levels. The Draft EIS/EIR's assessment of the impacts from groundwater substitution transfer pumping to existing and future wells, fisheries, vegetation and wildlife, and surface structures should factor in these recent trends in groundwater levels and not rely solely on SACFEM2013 model simulations that ended in 2003. In addition, the hydrographs in Appendix E that show the SACFEM2013 model results should identify wells near the selected 34-hydrograph locations where groundwater level measurements have been taken and show these actual groundwater levels on the hydrographs. Currently the public is left with the task of finding groundwater level data near the 34 selected hydrograph locations and then validating the simulation results by making comparisons between the simulated water levels and the actual water levels. This model validation task should be part of the Draft EIS/EIR.

Response

Section 3.3.1.3 has been revised to include additional information regarding recent groundwater conditions. See Common Response 4 regarding changes made to Section 3.3.1.3. Note that while the groundwater model simulates impacts from the Proposed Action under past hydrologic conditions (WY 1970- 2003), information from the affected environment section that describes current hydrologic conditions and the groundwater modeling results were used to determine the conclusions drawn in the EIS/EIR. Also, see Common Response 5. Model validation and calibration was completed as noted in Appendix D.

Comment NG01-36

Comment

I recommend the Draft EIS/EIR be revised to include maps of recent groundwater levels and depths to groundwater along with changes in groundwater levels and depths for at least the last 11 years for all of the counties where the seller agencies propose a groundwater substitution transfer project. I recommend that the Draft EIS/EIR be revised to provide additional verification of the SACFEM2013 model results by comparing them to measured groundwater levels in the vicinity of the 34 selected modeling hydrograph locations. I also recommend the hydrographs of actual water level measurements in the vicinity be included on the simulation hydrographs, so that the public can review the accuracy of the simulation. I recommend contour maps showing the current depth to groundwater be made from actual shallow groundwater measurements and that these contours be shown on maps of the surface water features identified and evaluated in Draft EIS/EIR Sections 3.3-Groundwater, 3.7-Fisheries (Table 3.7-3), and 3.8-Vegegation and Wildlife (Table 3.8-3). I recommend that the SACFEM2013 simulation drawdowns be combined with the current (2014) groundwater elevations for each groundwater substitution transfer aquifer to show the cumulative impacts of the 10-year project on existing groundwater elevations.

Response

Section 3.3.1.3 has been revised to include recent groundwater trends information. Additional groundwater levels hydrographs and groundwater elevation figures have been included in Section 3.3.1.3. See Common Response 4.

SACFEM2013 model calibration has been completed as noted in Appendix D and in the User's Manual (Appendix H).

Comment NG01-37

Comment

Groundwater Model SACFEM2013. A finite element groundwater model, SACFEM2013, was used to evaluate the potential for changes in groundwater levels and stream depletion from groundwater substitution transfer pumping during the 10-year period of the project. The results of the simulations were used to evaluate the impacts to fisheries, vegetation and wildlife (Section 3.7 and 3.8). Section 3.3.2.1 discusses the use of the model for estimating regional groundwater level declines due to groundwater substitution pumping. Figures 3.3-26 to 3.3-31 provide simulated changes in groundwater elevation or head for three intervals, up to 35 feet bgs, 200 to 300 feet bgs, and 700 to 900 feet bgs. Figures 3.3-32 to 3.3-40 and Appendix E provide hydrographs of model simulations for 34 selected locations shown on the simulated groundwater elevation change maps. Sections 3.7.2.1.1, 3.7.2.1.3, 3.7.2.4.1, 3.8.2.1.1, 3.8.2.1.4, and 3.8.2.4.1 provide discussion on the potential impacts of groundwater substitution transfer pumping on fisheries, vegetation and wildlife resources from a drop in the shallow groundwater table and depletion of stream flows.

The SACFEM2013 model was set up to simulate transient flow conditions from WY 1970 to WY 2010 (page 3.3-60). Historic data from 1970 to 2003 were use to estimate the potential impacts from groundwater substitution transfers during the 10-year period of the project. The simulation terminated at 2003 because that was the last simulation period available for the CalSim II model, a planning model designed to simulate operations of the CVP and SWP reservoirs and water delivery systems. Additional SACFEM2013 model documentation is given in Appendix D, which provides information on the model gridding, layering, assumptions and calculation methods. Several of the model designs and parameters selected likely influenced the model's ability to predict future impacts from the 10-year groundwater substitution transfer project. Those include: the time period of the model, the assumptions about the amount and frequency of groundwater substitution pumping, the model's nodal spacing, estimates of aquifer properties, the number of streams simulated, streambed parameters, and specified-flux boundaries. There are at least two other groundwater simulation models developed for the Sacramento Valley, a U.S. Geological Survey model, USGS-CVHM (Faunt, ed., 2009) and a DWR-C2VSim model (Brush and others, 2013a and 2013b).

A comparison between the SACFEM2013 and these two other models provides an interesting assessment of how these three models estimated the hydrogeologic character and conditions of the Sacramento Valley. A comparison also demonstrates that there is no one correct groundwater model, that models with different parameter distributions can achieve reasonable calibration. With models of differing hydrogeologic characteristics, the predictions of future impacts by each model should be expected to differ. Determining which of the models accurately predicts future impacts requires the validation of each model's prediction with new field data. The Draft EIS/EIR mitigation measures for groundwater substitution transfer pumping shouldn't assume that the SACFEM2013 model results are all that is needed to demonstrate no injury and less than significant impacts from the proposed project. Validation of the model-based conclusion of no impacts requires collection of new field data and comparison to simulation predictions throughout and beyond the 10-year project.

Response

In the early stages of developing this EIS/EIR, Reclamation determined that the modeling of groundwater substitution pumping impacts was critical. Reclamation conducted a model selection process that reviewed the existing available groundwater models. Text has been added to Appendix D that describes the model selection process (see Appendix D for added text). The User's Manual for SACFEM2013 has been added as Appendix H to provide additional information. Both of the other models mentioned by the commenter (CVHM and C2VSIM) were described in this model selection process.

See response to Comment NG01-2 for additional information.

Comment NG01-38

Comment

A comparison of portions of the SACFEM2013 simulation for the Draft EIS/EIR with the two other models is given below. 8. Period of Modeled Historic Groundwater Conditions – Although the model simulation period ended in 2003, the Draft EIS/EIR indicates that the model was run to 2010, but the results were not provided. From the model write-up it is unknown whether the latest groundwater elevations were a factor in the modeling effort. The simulation hydrographs in Appendix E terminate in 2004. Apparently, the hydrologic conditions for the latest 10 years are not included because the Draft EIS/EIR doesn't discuss how the model simulations agree with the current baseline conditions. Specifically, the change in groundwater elevation between 2004 and 2014 as document by DWR (2014b) in a series of three maps. I've provided in attached Exhibits 3.1 to 3.3 maps that are composites of DWR's 2004 to 2014 groundwater change maps with Draft EIS/EIR Figures 3.3-29, 3.3-30 and 3.3-31, the SACFEM2013 1990 hydrologic conditions simulations of drawdown by zone. The 1990 hydrologic condition was selected for comparison because the sequence of groundwater pumping events is the closest match to the actual pumping requested in the Draft EIS/EIR. Note that the depth intervals of the two sets of maps don't exactly coincide, but they are generally grouped as shallow, intermediate and deep aquifers.

Exhibits 3.1 to 3.3 show that the simulated changes in groundwater elevation from the 10-year groundwater substitution transfer project appear to widen the existing groundwater depressions. The pumping depression southwest of Orland will expands to the east and northeast, as will the depression in the Williams area. A pumping depression will develop in the Live Oaks area and to the east. In the southeastern Sacramento area, the pumping depression from the 10-year project will apparently extent southeastward beyond the limits of the Sacramento Valley transfer project boundary. Combining the existing areas of recent sustained groundwater drawdown with the additional drawdown from the groundwater substitution transfer pumping could slow the recovery of groundwater elevations. The 10-year project pumping east of Orland may connect the two existing groundwater depressions around Orland and Chico to create one large depression. Because the DWR 2004 to 2014 groundwater change maps don't extend completely to the southern portions of the Sacramento Valley groundwater substitution transfer area in Placer, Sutter, Yolo, Yuba, and Sacramento counties, no evaluation can be made about the impact of 10 years of groundwater substitution transfer pumping on existing groundwater conditions in those or adjacent areas.

I recommended the Draft EIS/EIR be revised to discuss how the SACFEM2013 simulations incorporate the changes in groundwater level from 2004 to 2014 in assessing the potential impacts from the proposed 10 years of groundwater substitution transfer pumping. I recommended this discussion include evaluation of the rate and duration of groundwater level recovery that factors in the existing (2014) groundwater levels. I also recommend the Draft EIS/EIR be revised to discuss how during the 10 years of project transfers through the Delta will be made with a CalSim II model that's only current to the year 2003.

Response

The available simulation period of the SACFEM2013 model is from WY 1970 through WY 2010. However, SACFEM2013 was only run through WY 2003 for the analysis described in the EIS/EIR. The simulation was terminated in 2003 because the analysis also relied on information from the CalSim model. CalSim model results are only available through 2003.

The CalSim model, which covers conditions only through 2003, is meant to represent future conditions by simulating the varying hydrologic conditions that have occurred between 1970 and 2003. No model can be built to include future conditions as they have not yet occurred. However, using historical hydrologic conditions as guidance in understanding potential future impacts is common. See Common Response 5.

Section 3.3.1.3, Affected Environment, has been expanded to include additional data related to recent changes in groundwater levels. See Common Response 4.

Comment NG01-39

Comment

9. Simulation Pumping Volume and Frequency - The model simulated a series of groundwater pumping events in 12 out of the 34 years of simulation (page 3.3-60). The logic of a multiyear, variable hydrology simulation was that it allowed for evaluation of the cumulative effects of pumping in previous years (page 3.3-61). Figure 3.3-25 shows the simulated periods of groundwater substitution transfer pumping. The 1990 simulation period most closely matches the multiyear pumping being requested by the 10-year project. The 1990 simulation period included groundwater pumping 7 out of 10 years, with pumping values ranging from approximately 95,000 acre-feet per year (AFY) to approximately 262,000 AFY, as measured from Figure 3.3-35. Note the actual pumping rates, volumes, and pumping durations were not provided in the simulation documentation. Apparently, none of the modeled groundwater substitution pumping simulation periods was given the actual maximum groundwater substitution pumping value of 290,495 AFY as calculated from Table 2-5. The time-weighted annual average pumping rate for the 1990 simulation period is approximately 126,900 AF, as measured from Figure 3.3-35. This represents approximately 44% of the maximum pumping rate requested in the Draft EIS/EIR (126,900 AF/290,495 AF = 0.437). Therefore the SACFEM2013 Draft EIS/EIR simulations may only represent a portion of the project's potential impacts from groundwater substitution transfer pumping.

I recommend the Draft EIS/EIR be revised to discuss how the SACFEM2013 simulations provide a full and accurate estimation of the potential impacts from the groundwater substitution transfer pumping throughout the 10-year project. I also recommend the Draft EIS/EIR be revised to include SACFEM2013 simulations at the maximum requested annual volume of 290,495 AF for each of the 10 years of pumping.

Response

See response to Comment NG01-13. Information about pumping in each year of the simulation has been added to Appendix B (see Appendix B for updates).

Comment NG01-40

Comment

10. Simulation Grid Size - The SACFEM2013 documentation states that the grid used for groundwater substitution transfer simulations has 153,812 nodes and 306,813 elements (page D-3 of Appendix D). The model nodal spacing varies from 410 feet to 3,000 feet, with an approximate nodal spacing of 1,640 feet along streams and flood bypasses. While this nodal spacing is reasonable for regional groundwater simulations, the results of the simulations may not provide the detail needed to evaluate drawdown interference between the groundwater substitution transfer wells and adjacent non-participating wells. Information is needed on the locations of the groundwater substitution transfer wells and the adjacent non-participating wells in order to determine whether the current simulation grid spacing can accurately estimate well interference. The Draft EIS/EIR analysis of groundwater substitution pumping impacts should be based on an appropriate model grid spacing to establish accurate maximum thresholds for well interference caused by the transfer well pumping. The Draft EIS/EIR should provide sufficient information that an owner of a non-participating well can determine accurately the maximum anticipated increase in drawdown at their well during the 10 years of groundwater substitution transfer pumping. Whether this amount of increased drawdown is significant at each nonparticipating well is a matter of the current well design and groundwater conditions at each well. The Draft EIS/EIR should establish values for the maximum allowable well interference drawdown from groundwater substitution transfer pumping, which should be based on the costs and inconvenience of lowering the water level. The Draft EIS/EIR should establish the economic costs and level of injury that are reasonable for a non-participating well owner to assume and will keep the impacts from the 10-year project in compliance with the no injury rule as required by WC Section 1706, 1725 and 1736 (Section 1.3.2.3).

I recommend the Draft EIS/EIR be revised to discuss how the maximum thresholds for water level drawdown due to well interference from groundwater substitution transfer pumping will be established for non-participating wells, and provide a process for assigning a threshold to each non-participating well, along with monitoring requirements and specific mitigation measures should the threshold be exceeded. The Draft EIS/EIR also should be revised to provide the threshold values for well system repair costs used in set the maximum allowable well interference drawdown, along with the documentation and analysis of why the well interference drawdown and cost thresholds are considered reasonable and result in no injury to non-participating well owners, and comply with the Water Code.

Response

As described in the Project Description (Chapter 2), the range of potential transfer activities analyzed under the Proposed Action and its alternatives are examined "valley-wide." Therefore, all of the potential groundwater substitution transfers were simulated simultaneously in the SACFEM2013 model. The drawdown contour figures presented in Section 3.3.2 show the potential decline in groundwater elevation (beyond the existing conditions). These figures have been expanded (i.e., zoomed in) to provide additional details regarding the extent of the simulated drawdown.

See Common Responses 6 and 7 for additional information.

Comment NG01-41

Comment

11. Simulation Hydrogeologic Parameter Values - The SACFEM2013 model was developed with seven layers of varying thickness that extend from the shallow water table to the base of fresh water. The USGS-CVHM model has ten layers, while the DWR-C2VSim model has 3 layers. All of the models assume that the uppermost layer, layer 1, was unconfined and the lower layers are confined aquifer. The hydrogeologic parameters values differ for each of these models as shown in a summary table in Exhibit 4.1. Both the CVHM and C2VSim models divided the Central Valley in to 21 subregions (Figure 3, Brush and others, 2013a; Exhibit 4.4). The SACFEM2013 doesn't use subregions from the Sacramento Valley model. As discussed below, the SACFEM2013 appears to use the same distribution of the horizontal hydraulic conductivity, Kh, for all model layers (Figure D-4 of Appendix D). Both the CVHM and the C2VSim models appear to have more varied hydraulic conductivity distributions then SACFEM2013.

Development of the SACFEM2013 simulations used horizontal hydraulic conductivity values derived from the well logs of large-diameter irrigation wells. Shallow and low-yielding wells, less than 100 gallons per minute (gpm), and domestic-type wells were not used (page D-12 of Appendix D). The values of specific capacity (gallons per minute per foot of drawdown) from the DWR well completion reports were used to estimate transmissivity around a well using an empirical equation for confined aquifer developed from Jacob's modified nonequilibrium equation (see equation 8 page D-13 and Appendix 16D of Driscoll, 1986 in Exhibit 4.6). Transmissivity was converted to Kh by assuming the aquifer thickness was equal to the length of the well screen interval. These well Kh values were then averaged using a geometric mean with surrounding wells within a critical distance of 6 miles. The results of the geometric mean averaging were then gridded using a kriging to produce Kh values across the modeled area (Figure D-4 in Appendix D). The transmissivity of each model layer was then calculated at each node by multiplying the kriged geometric mean value of Kh by the aquifer layer thickness. The vertical hydraulic conductivity, Kv, was calculated by assuming a uniform Kh:Kv ratio of 50:1 for layer 1 and 500:1 for layers 2 to 7.

The CVHM model (Faunt, ed., 2009) used the percentage of coarse-grained material from well logs and boreholes as the primary variable in a sediment texture analysis of the Central Valley, which was divided into nine textural provinces and domains (Figures A10 to A14; Exhibits 4.7a to 4.7i). The Sacramento Valley has three textural domains, Redding, eastern, and western Sacramento domains (page 30, Faunt, ed., 2009). The coarse-grained fraction was correlated to horizontal (Kh) and vertical (Kv) conductivity (page 154, Faunt, ed., 2009). The Kh values were estimated using kriging and a weighted arithmetic mean, a type of power mean, whereas the Kv value estimates used either a harmonic or geometric mean. Faunt (ed., 2009) notes that the arithmetic mean is most influenced by the coarser-grained material, whereas the fine-grained material more heavily weights both the harmonic and geometric means. Figure C14 (Exhibit 4.7j) shows the relationship between the percentage of coarse-grained deposits and hydraulic conductivity for the different types of means. For the Sacramento Valley the texture-weighted power-mean value was -0.5, a value midway between the harmonic and geometric means (Table C8, Exhibit 4.3).

Table C8 lists the end member hydraulic conductivity values used in the CVHM model with those for the Sacramento Valley ranging from 670 feet/day (ft/day) for coarse-grained to 0.075 ft/day for fine-grained. The table also lists field and laboratory values of Kh and Kv for coarse and fine-grained deposits. The Redding textural domain has the highest percentage of coarse-grained material of the three in Sacramento Valley, a mean of 39 percent, with the western portion becoming coarser with depth (page 30, Faunt, ed., 2009). The western and eastern Sacramento domains are finer-grained, with the eastern mean at 32 percent coarsegrained deposits, and the western mean at 25 percent. Figure A15B(A?) (Exhibit 4.7k) shows the cumulative distribution of kriged sediment textures for each layer of the CVHM model for the Sacramento Valley. Figures A12A to A12E (Exhibits 4.7c to 4.7g) show the distribution of coarse-grained deposits in CVHM groundwater model layers 1, 3, Corcoran Clay, 6 and 9 for the Sacramento and San Joaquin Valleys. Isolated coarser-grained deposits that occur in layer 1 are associated with the Sacramento River, distal parts of fans from the Cascade Range and northern Sierra Nevada, and the American River (page 30, Faunt, ed., 2009; Figure A14, Exhibit 4.7i). Although the texture maps, Figures A12A to A12E of CVHM, and the hydraulic conductivity distribution map of Figure D4 of SACFEM2013, show different characteristic of each model's hydraulic conductivity, they can be compared by their visual complexity. The CVHM texture also varies by model layer, whereas the SACFEM2013 apparently applied the same Kh distribution to each layer. The CVHM western and eastern Sacramento domains appear to have smaller coarse-grained areas than the SACFEM2013 higher hydraulic conductivity areas (Figures A12, C14 and A15 in Exhibits 4.7c, 4.7j, and 4.7k versus D4 in Appendix D). Figure 12E (Exhibit 4.7g) shows layer 9 with high percentages of coarse-grained deposits that have higher Kh values (Figure C14) in the western parts of the Redding (10) and northern western portion of the western Sacramento (11) province. Whereas Figure D4 of SACFEM2013 shows these same areas as having the lowest Kh values, suggesting finer-grained textures dominate.

The C2Vsim model divided the Sacramento Valley into seven subregions, as did the USGSCVHM model. Like the USGS model, hydraulic conductivity varies with the three model layers for the Sacramento Valley. The spatial variability of the Kh and Kv values for the C2VSim model is greater than with the SACFEM2013 model (compare Figures 34 and 35 from Brush and others, 2013a in Exhibits 4.8a to 4.8f to Figures D4 of Appendix D). Table 5 of Brush and others, 2013a (Exhibit 4.2) shows the range of model parameters for the saturated groundwater portion of the C2VSim model. Kh values range from 2.2 ft/day to 100 ft/day, and Kv from 0.005 ft/day to 0.299 ft/day. The highest Kh value for the C2VSim model is less than for SACFEM2013 (100 ft/day vs 450 ft/day), while the lowest values are lower (0.005 ft/day vs <0.1 ft/day).

I recommend the Draft EIS/EIR discuss the uncertainty in aquifer hydraulic parameter estimations for the groundwater substitution transfer pumping simulations and the sensitivity of the model results to the uncertainty in the groundwater hydraulic parameters. I recommend the Draft EIS/EIR discuss how the uncertainty in hydraulic conductivity parameters influences: (1) estimates of potential stream depletion (Section 3.3), (2) evaluations of fisheries impacts (Section 3.7), (3) evaluations of vegetation and wildlife impacts (Section 3.8), and (4) the screening procedures that removed a number of the small streams from further environmental impact analysis (Table 3.7-3 and 3.8-3).

Response

The content of this comment is simply a factual re-statement of how the SACFEM2013, CVHM, and C2VSIM models are constructed and parameterized. Additional information on sensitivity studies completed as part of the modeling efforts has been added to Appendix D (see Appendix D for updates). The SACFEM2013 User's Manual has been added as Appendix H.

Comment NG01-42

Comment

12. Simulation Groundwater Storage Parameters - The SACFEM2013 simulations assigned to the upper unconfined model layer 1 a uniform specific yield (Sy) value of 0.12 (dimensionless) (page D-14 in Appendix D; Exhibit 4.1). For the confined model layers 2 to 7 a uniform specific storage, Ss, value of 6.5 x 10-5 per foot (ft) was used (page D-14 of Appendix D; Exhibit 4.1). Both the CVHM and C2VSim simulations used a range of values of Sy and Ss that were more variable than SACFEM2013 (Exhibits 4.1, 4.8n, and 4.8o). The CVHM simulation used a range of Sy and Ss values, (CVHM Table C8, Exhibits 4.3). The CVHM simulation also used a range of Ss values for coarse-grain elastic and fine-grained elastic and inelastic deposits to simulating subsidence from groundwater pumping. The C2VSim simulations used a range of Sy values for model layer 1 and separate ranges of Ss values for layers 2 and 3 (C2VSim Table 5, Exhibits 4.2; Exhibits 4.8g to 4.8i). The C2VSim and CVHM models assigned a range of coefficients for elastic (Sce) and inelastic (Sci) deposits used in simulating subsidence (Exhibits 4.1, 4.8j to 4.8m). Note, the Ss values are multiplied by the aquifer thickness at each model node at to obtain the dimensionless value of storativity (S) for confined aquifers (S = Ss x thickness), which is similar to the dimensionless Sy parameter for an unconfined aquifer.

I recommend the Draft EIS/EIR discuss the uncertainty in aquifer storage parameter estimations for the groundwater substitution transfer pumping simulations and the sensitivity of the model results to the uncertainty in the groundwater storage parameters. I recommend the Draft EIS/EIR discuss how uncertainty in groundwater storage parameters influences: (1) estimates of potential stream depletion (Section 3.3), (2) evaluations of fisheries impacts (Section 3.7), (3) evaluations of vegetation and wildlife impacts (Section 3.8), and (4) the screening procedures that removed a number of the small streams from further environmental impact analysis (Table 3.7-3 and 3.8-3).

Response

Information on sensitivity studies completed as part of the modeling effort has been added to Appendix D (See Appendix D for updates).

Comment NG01-43

Comment

13. Simulation River and Stream Parameters - All three models simulated the interactions between the groundwater and streams or rivers. The rate and direction of movement of water between streams and shallow groundwater is governed by the vertical hydraulic conductivity of the streambed, Kvb, thickness of the streambed, m, the wetted perimeter of the stream, w, and the difference in elevation between groundwater table and stream. The hydraulic

parameters of a streambed are combined into a term called conductance, C, which is calculated as the product of Kvb times the wetted perimeter divided by the streambed thickness (C = [Kvb x w]/m).

The SACFEM2013 simulations assigned all eastern streambeds draining from the Sierra Nevada a Kvb value of 6.56 ft/day (2 meters/day), except the Bear River and Big Chico Creek, whose values were unstated (page D-7 of Appendix D). For all western streambeds draining the Coast Ranges, a higher value of Kvb at or above 16.4 ft/day (5 meters/day) was assigned. Figure 3.3-24 in the Draft EIS/EIR shows the SACFEM2013 groundwater boundary and the simulated rivers and streams. This map may not be showing all of the small streams evaluated in the simulation based on the streams listed in Tables 3.7-3 and 3.8-3 (also see general comment no. 2).

The streambed Kvb values used in CVHM simulation are shown in Figure C26 (Exhibit 5.3). The values of Kvb for the Sacramento Valley varying from approximately 0.04 ft/day to 5.6 ft/day are shown in Figure C26. Results of the CVHM simulation of surface water-groundwater interactions, gains and losses, from 1961 to 1977 are compared to measured and simulated stream gauge values in Figures C19A and C19B (Exhibits 5.4a and 5.4b).

The C2VSim simulations also used varying values for streambed Kvb ranging from 0 to 44 ft/day with a mean of 1.8 ft/day and lake bed Kvb of 0.67 ft/day (page 100, Brush and others, 2013a; Exhibit 5.1). Simulated streambed conductance values are shown in Figure 40 of Brush and others, 2013a (Exhibit 5.2).

I recommend the Draft EIS/EIR discuss the uncertainty in streambed parameter estimations for the groundwater substitution transfer pumping simulations and the sensitivity of the model results to the uncertainty in the hydraulic characteristics of the streambeds. I recommend the Draft EIS/EIR discuss how uncertainty in the hydraulic characteristics of the streambeds influences: (1) estimates of potential stream depletion (Section 3.3), (2) evaluations of fisheries impacts (Section 3.7), (3) evaluations of vegetation and wildlife impacts (Section 3.8), and (4) the screening procedures that removed a number of the small streams from further environmental impact analysis (Table 3.7-3 and 3.8-3).

Response

Information on sensitivity studies completed as part of the modeling effort has been added to Appendix D (see Appendix D for updates).

Comment NG01-44

Comment

14. Groundwater Flow Between Sub-regions - Of the three previously discussed regional groundwater models for the Sacramento Valley, only the reports for the C2VSim simulation provided information on the volume of groundwater that flows laterally among groundwater subregions. The C2VSim simulation results show that groundwater flow between subregions has changed significantly in some areas (Figures 81A to 81C of Brush and others, 2013a and Figure 39 of Brush and others, 2013b; Exhibits 6.1a to 6.1c and 6.2). The SACFEM2013 simulations results presented in the Draft EIS/EIR don’t provide information on the exchange between subregion areas used in simulations by the USGS (Faunt, ed., 2009) and DWR

> (Brush and others, 2013a and 2013b). Therefore, the flow of groundwater between the subregions and/or counties of the 10-year project's groundwater substitution transfer sellers wasn't evaluated for potential impacts on neighboring areas. The loss or gain of groundwater from neighboring subregions should be evaluated in the Draft EIS/EIR.

Accounting for subsurface flow among subregions is an important part of the water balance because it is measures of the amount of impact that groundwater pumping in one subregion has on it's neighboring subregions. The subsurface inter-basin movement of groundwater is an important element in the analysis of the environmental impacts from the 10-year groundwater substitution transfer projects because the groundwater substitution transfer pumping by sellers in one region can have a significant impact on the groundwater levels, storage and stream depletion in adjacent regions.

The C2VSim simulations calculated the volume of groundwater that flowed between the subregions and presented the results for three decades, 1922-1929, 1960-1969, and 2000- 2009, and for the total simulation period, 1922-2009. Tables 10 through 13 (Brush and others, 2014a; Exhibits 6.3a to d) provide the sum of inter-region groundwater flow for each model subregion, but not the individual values of flow among adjoining subregions. Figures 81 and 39 (Exhibits 6.1a to 6.1c and 6.2) give the simulated annual volume of inter-region flow for the three decades and from 1922 to 2009. An estimate of a portion of the long-term changes in groundwater storage in each subregion can be made by comparing the change in annual volume and flow direction between sub-regions.

For example, in the 1922 to 1929 simulation period subregion 9 (Sacramento-San Joaquin Delta received 81,000 AFY of groundwater flow from adjoining subregions 6, 8, 10 and 11 (Exhibit 6.1a). By 1969 the simulation shows that subregion 9 was still receiving a small volume, 2,000 AFY, of groundwater flow from subregion 6, but losing approximately 56,000 AFY to subregions 8, 10, and 11 (Exhibit 6.1b). A change in groundwater storage from 1929 to 1969 in the Delta of 135,000 AFY; from a plus 81,000 AFY to a minus 54,000 AFY. For 2002-2009, the simulation shows that the Delta still receiving a small volume, 4,000 AFY, of groundwater flow from subregion 6, but now losing 137,000 AFY to subregions 8, 10 and 11 (Exhibit 6.1c). A loss in storage in the Delta of 214,000 AFY from 1929. The 2000-2009 simulation period shows that subregion 8 is receiving a large portion of the groundwater flow out of the Delta, 112,000 AFY, a reversal in groundwater flow direction and a cumulative annual loss to the Delta from 1922-1929 of 147,000 AFY. Subregion 8 in turn loses 17,000 AFY of groundwater flow to subregion 7 in 2000-2009, and receives 123,000 AFY from subregion 11 (Exhibit 6.1c). A reversal of 1922-1929 when subregion 8 received 1,000 AFY from subregions 7 and gave 1,000 AFY to subregion 11.

The 10-year transfer project proposes under the groundwater substitution to pump up to approximately 75,000 AFY from subregions 7 and 8, Table 2-5. This additional pumping will likely cause additional groundwater to flow from the subregion 9, the Delta, and subregion 11 into subregion 8, and eventually to subregion 7. Similar shifts in direction and annual volumes of groundwater flow have occurred with the other Central Valley subregions. The changes direction and volume of flow between the Delta and surrounding subregions appear to be the largest shift in groundwater flow for in Sacramento Valley area.

I recommend the Draft EIS/EIR be revised to evaluate the subsurface flows between subregions in Sacramento Valley due to the proposed groundwater substitution transfer pumping. I recommend the Draft EIS/EIR be revised to include groundwater model simulations that account for the rates, volumes, times, and changes in direction of groundwater flow between the seller pumping areas and the surrounding non-participating regions. I recommend the Draft EIS/EIR also analysis the short- and long-term impacts from the changes in subregional groundwater flow caused by the 10-year transfer project.

Response

SACFEM2013 is a finite element groundwater flow model with a model domain that extends throughout the Sacramento Valley. The model domain is subdivided into over 300,000 elements, with the model simulating flow into and out of all of these elements during each stress period of the simulation. It is not necessary to identify "subareas" of the model grid to accurately represent subsurface flow, and therefore account for "the rates, volumes, times, and changes in direction of groundwater flow between the seller pumping areas and the surrounding non-participating regions." This is accounted for within each SACFEM2013 simulation.

Comment NG01-45

Comment

Mitigation Measure WS-1. 15. The purpose of mitigation measure WS-1 as stated in Draft EIS/EIR Section 3.1.4.1 is to mitigate potential impacts to CVP and SWP water supplies from stream depletion caused by groundwater substitution transfer pumping. The stream depletion factor (BoR-SDF) is imposed by the BoR and DWR because they will not move transfer water if doing so violates the no injury rule (page 3.1-21). The no injury rule is discussed in Section 1.3.2.3 and cites CA WC Sections 1725, 1736 and 1706. The language from WC 1736 that also requires transfers to not result in unreasonable effects to fish, wildlife, or other instream beneficial uses is discussed in the subsequent Section 1.3.2.4.

Draft EIS/EIR Sections 3.1.2.4.1 (page 3.1-15) and 3.1.6.1 (page 3.1-21) discuss the impacts from groundwater substitution transfers on surface water. On page 3.1-16 the Draft EIS/EIR states that groundwater recharge, presumably greater because of groundwater substitution pumping, occurring during higher flows would decrease flow in surface waterways. During periods of high flow, the decrease in surface flow won't affect water supplies or the ability to meet flow or quality standards. The document also states that if groundwater recharge occurs during dry periods, presumably occurring when groundwater substitution transfers are needed, groundwater recharge would decrease flows and affect BoR and DWR operations. BoR and DWR would then need to either decrease Delta exports or release additional flows from surface storage to meet the required standards. These statements are followed by seemly conflicting statements that: Transfers would not affect whether the water flow and quality standards are met, however, the actions taken by Reclamation and DWR to meet these standards because of instream flow reductions due to the groundwater recharge could affect CVP and SWP water supplies. (page 3.1-16). Increased releases from storage would vacate storage that could be filled during wet periods, but would affect water supplies in subsequent years if the storage is not refilled. (page 3.1-17).

Response

As stated in Section 3.1.2.4.1, "If decreased river flows affect the ability to meet these standards, Reclamation and DWR would need to either decrease Delta exports or release additional flow from upstream reservoirs to meet flow or water quality standards. Transfers would not affect whether the water flow and quality standards are met, however, the actions taken by Reclamation and DWR to meet these standards because of instream flow reductions due to the groundwater recharge could affect CVP and SWP water supplies. Decreased streamflows during dry periods could affect CVP and SWP supplies in the near term or longer term." Implementation of Mitigation Measure WS-1 will lessen the potentially significant impact of Alternatives 2 and 3 to a less-than-significant level. See Common Response 8 for additional information.

Comment NG01-46

Comment

The potential for the reduction in surface water storage to eventually cause reductions in streamflow and water quality isn't clearly addressed in the Draft EIS/EIR. Overall, the increased supplies delivered from water transfers would be greater than the decrease in supply because of streamflow depletion; however, the impacts from streamflow depletion may affect water users that are not parties to water transfers. On average, the losses due to groundwater and surface water interaction would result in approximately 15,800 AF of water annually compared to the No Action/No Project Alternative, or approximately a loss of 0.3 percent of the supply. (page 3.1-18). In a period of multiple dry years (such as 1987-1992), the streamflow depletion causes a 2.8 percent reduction in CVP and SWP supplies, or 71,200 AF. (page 3.1-18). To reduce these effects, Mitigation Measure WS-1 includes a streamflow depletion factor to be incorporated into transfers to account for the potential water supply impacts to the CVP and SWP. Mitigation Measure WS-1 would reduce the impacts to less than significant. (page 3.1-18).

Additional information on the requirements of WS-1 appears to be contained in the October 2013 joint DWR and BoR document titled Draft Technical Information for Preparing Water Transfer Proposals (DTIPWTP) because the discussion in that document's Section 3.4.3 on estimating the effects of transfer operations on streamflow says that a default BoR-SDF of 12 percent will be applied "unless available monitoring data analyzed by Project Agencies supports the need for the development of a transfer proposal site-specific SDF" (page 33). The document also states that: Although real time streamflow depletion due to groundwater substitution pumping for water transfers cannot be directly measured, impacts on streamflow due to groundwater pumping can be modeled. Project Agencies have applied the results from prior modeling efforts to evaluate potential groundwater transfers in the Sacramento Valley to establish an estimated average streamflow depletion factor (SDF) for transfers requiring the use of Project Facilities.

Response

See Common Response 8.

Comment NG01-47

Comment

I have several comments on this analysis of stream depletion impacts and mitigation measure WS-1: a. Sections 2.3.2.2 and 2.3.2.3 discuss potential groundwater substitution and crop idling transfers and the limitations on the timing of the transfers. Transfers typically occur from July to September, but could also occur from April to June if conditions in the Delta allow for transfer. Surface water to be used in groundwater substitution and crop idling transfers would be stored during April to June if the condition of the Delta is unacceptable for transfer.

My understanding of the BoR-SDF in mitigation measure WS-1 is that at the same time transfer surface waters are flowing towards the Delta, a portion of that water is assigned to the waterway to "offset" or compensate for stream depletion caused by groundwater substitution pumping. The Draft EIS/EIR doesn't seem to address the issue of how to compensate for groundwater substitution pumping impacts occurring before or after the transfer water flows to the Delta, the long-term losses caused by the pumping in subsequent years, and cumulative impacts from multiple years of pumping by all sellers. Yet the Draft EIS/EIR acknowledges that stream depletion is cumulative and a cumulative increase in depletion can be significantly greater than with a single event (Section 4.3.1.2 in Appendix B). The SACFEM2013 simulation shows that stream depletion will continue for a number of years after the groundwater substitution pumping event (Figures B-4, B-5 and B-6 in Draft EIS/EIR Appendix B). Mitigation measure WS-1 doesn't appear to fully address how mitigation will occur for stream depletion impacts from groundwater substitution pumping during entire duration of the impact.

I recommend mitigation measure WS-1 be revised to clearly address how reductions in stream flows caused by groundwater substitution transfer pumping will be mitigated to less than significant for all of the times when stream depletion is occurring, including the time before and after the water is physically transferred; long-term impacts; and cumulative impacts from multiple sellers over multiple years of participating in groundwater substitution transfers.

Response

See Common Response 8.

Comment NG01-48

Comment

b. Although mitigation measure WS-1 doesn't state that its implementation is linked to the October 2013 DTIPWTP (that linkage is part of mitigation measure GW-1), the DTIPWTP discusses the use of the BoR-SDF in the methodology for determining the amount of water available for groundwater substitution transfer, and the effects of the groundwater substitution pumping on streamflow in Section 3.4 (page 31). Item 5 on page 31 gives the formula for using four steps in determining the amount of transferable water, one of which is subtraction of the estimated streamflow reduction. Section 3.4.3 states on page 33 of the DTIPWTP that: Although real time streamflow depletion due to groundwater substitution pumping for water transfers cannot be directly measured, impacts on streamflow due to groundwater pumping can be modeled. Project Agencies have applied the results from prior modeling efforts to evaluate potential groundwater transfers in the Sacramento Valley to establish an estimated average streamflow depletion factor (SDF) for transfers requiring the use of Project Facilities. Project Agencies will apply a 12 percent SDF for each project meeting the criteria contained in this chapter unless available monitoring data analyzed by Project Agencies supports the need for the development of a transfer proposal site-specific SDF. Project Agencies are developing tools to more accurately evaluate the impacts of groundwater substitution transfers on streamflow. These tools may be implemented in the near future and may include a site-specific analysis that could be applied to each transfer proposal.

Mitigation measure WS-1 states on page 3.1-21 that: The exact percentage of the streamflow depletion factor will be assessed and determined on a regular basis by Reclamation and DWR, in consultation with buyers and sellers, based on the best technical information available at that time. The percentage will be determined based on hydrologic conditions, groundwater and surface water modeling, monitoring information, and past transfer data.

From these statements it appears that: (1) the BoR, DWR and other Project Agencies have previously analyzed the amount of stream depletion caused by past groundwater substitution transfers, and (2) the default of 12% BoR-SDF may not be applied to groundwater substitution during the 10 years of transfers because transfer-specific studies will be needed. The Draft EIS/EIR doesn't provide information or cite references on the previous modeling and/or monitoring efforts to determine the correct stream depletion factor. It also doesn't provide specific information on the method(s) and review process to be used in implementing mitigation measure WS-1, or what additional assessments are needed to determine the "exact percentage" for the BoR-SDF. Mitigation measure WS-1 appears to require that the assessment, the calculation methodology, and determination of the correct BoR-SDF be done at a future time. The Draft EIS/EIR doesn't state whether other regulatory agencies and/or the public will have an opportunity in the future to review and comment on the methodology and determination of the "exact percentage" of the BoR-SDF for each groundwater substitution transfer seller. The Draft EIS/EIR also doesn't state whether other regulatory agencies and/or public comments will be considered by BoR and DWR in determining the BoR-SDF percentage.

Response

See Common Response 8.

Comment NG01-49

Comment

The statement that real time stream depletion can't be directly measured contradicts other statements in the Draft EIS/EIR, requirements of mitigation measure GW-1, and the scientific literature. For example: Section 3.5 of the DTIPWTP states that one of the objectives of the monitoring plan is to: Determine the extent of surface water-groundwater interaction in the areas where groundwater is pumped for the transfer. (page 34). This objective is in the project's monitoring program therefore it appears to indicate that some method is available for monitoring the surface water-groundwater interactions, not just the pre-pumping model simulations.

Response

Real-time streamflow monitoring during a transfer cannot identify what the streamflow would have been absent a transfer because hydrologic conditions vary every year and the baseline is unknown. Monitoring efforts can provide useful information, primarily related to whether depletions in major waterways follow trends similar to past years. Additionally, groundwater level monitoring provides information to indicate the timing and location of groundwater recharge. Monitoring can provide useful information for estimating potential effects, and that utility is identified in multiple places in the EIS/EIR.

Comment NG01-50

Comment

The Fisheries (3.7) and Vegetation Wildlife (3.8) sections of the Draft EIS/EIR appear to state that flow reductions in surface waterways caused by groundwater substitution pumping will be monitored. Paragraphs similar to the ones given below state that monitoring wells are part of the mitigation measure for surface waters: In addition, flow reductions as the result of groundwater declines would be observed at monitoring wells in the region and adverse effects on riparian vegetation would be mitigated by implementation of Mitigation Measure GW-1 (See Section 3.3, Groundwater Resources), because it requires monitoring of wells and implementing a mitigation plan if the seller's monitoring efforts indicate that the operation of the wells for groundwater substitution pumping are causing substantial adverse impacts. The mitigation plan would include curtailment of pumping until natural recharge corrects the environmental impact. Therefore, the impacts to fisheries resources would be less than significant in these streams. (pages 3.7-26 and 3.7-56). In addition, the Proposed Action has the potential to cause flow reductions of greater than ten percent on other small creeks where no data are available on existing streamflows to be able to determine this. The impacts of groundwater substitution on flows in small streams and associated water ways would be mitigated by implementation of Mitigation Measure GW-1 (see Section 3.3, Groundwater Resources) because it requires monitoring of wells and implementing a mitigation plan if the seller's monitoring efforts indicate that the operation of the wells for groundwater substitution pumping are causing substantial adverse impacts. The mitigation plan would include curtailment of pumping until natural recharge corrects the environmental impact. Implementation of these measures would reduce significant effects on vegetation and wildlife resources associated with streams to less than significant. (pages 3.8-51, 3.8-58 and 3.8-68).

Response

See Common Responses 6 and 10.

Comment NG01-51

Comment

All of these statements seem to contradict the statement in mitigation measure WS-1 that stream depletion can't be measured in real time. Although the Draft EIS/EIR doesn't provide the technical method(s) for determining surface water flow using monitoring in groundwater wells, it's reliance on mitigation measure GW-1 to ensure that streamflows are adequate implies that a method is available. Because WS-1 and GW-1 both have one of the same objectives, to mitigation streamflow losses due to groundwater substitution pumping, the mitigation measure are linked. Thus, the real time monitoring of groundwater intended to mitigate streamflow losses under GW-1 might also facilitate real time monitoring of streamflow needed for WS-1. I'll provide in Part 2 of this letter some additional discussion and references to scientific literature on studies and methods for measuring stream seepage and stream depletion caused by groundwater pumping.

I recommend the Draft EIS/EIR be revised to clearly discuss the methods available for determining the value of the BoR-SDF for each groundwater substitution transfer well. I recommend the Draft EIS/EIR be revised to discuss the procedure for Project Agency review and approval, along with process for review and comment by other public agencies and the public. I recommend the Draft EIS/EIR be revised to discuss the methods and results of prior BoR-SDF determinations. I recommend the Draft EIS/EIR be revised to define the data needed to determine the "exact percentage" of stream depletion from groundwater substitution pumping during the 10-year transfer project, the technical method(s) that will be used to calculate the amount of stream depletion and the BoR-SDF, and the method(s) for monitoring surface water flow losses and verifying the effectiveness of the BoR-SDF and mitigation measure WS-1.

Response

See response to Comment NG01-49 for information on why real-time streamflow monitoring cannot estimate streamflow depletion because without-transfer conditions are not known.

See Common Response 8 for more information on the streamflow depletion factor.

Comment NG01-52

Comment

c. Section 3.4.1 of the DTIPWTP discusses calculation of baseline groundwater pumping for groundwater substitution transfers. Baseline groundwater pumping and stream depletion reduction are part of the four-step process for determining the amount of transferable water (page 31). Water transfer sellers wanting to use groundwater substitution pumping are requested to submit information to: Identify all wells that discharge to the contiguous surface water delivery system within which a well is proposed for use in the transfer program, and The amount of groundwater pumped monthly during 2013 for each well that discharges to the contiguous surface water delivery system.

Section 3.4.2 discusses measuring groundwater pumping provided for groundwater substitution transfers and states that: Sellers should provide pumping records from all wells that discharge to a contiguous surface water delivery system used in groundwater substitution transfers. (page 32)

The requirement that the groundwater transfer pumping baseline and metering of transfer pumping be conditioned on the water being discharged to the contiguous surface water delivery system suggests that if the groundwater substitution pumping discharges to a non-contiguous surface water or directly to a field that the establishment of a pre-transfer pumping baseline and transfer metering aren't required. Is that the case? If it is the case, then how is the amount of transferable water determined whenever the groundwater substitution transfer pumping doesn't discharge to a contiguous surface water deliver system? If the pre-transfer baseline pumping is removed from the calculation, does that increase or decrease the amount of transferable water and how does that change the BoR-SDF requirement? Is metering required for groundwater substitution transfer wells that don't discharge to a contiguous surface streams water delivery system? If not, how will measurement of transferred water and the required amount of the BoR-SDF be verified? All of these factors are relevant because they are linked to mitigation measure WS-1 through the DTIPWTP four-step process to determine the amount of transferrable water. The amount of transferrable water incorporates the BoRSDF to prevent injury and reduce groundwater substitution pumping stream depletion impacts to less than significant.

I recommend the Draft EIS/EIR be revised to provide a discussion of how the baseline for pre-transfer groundwater pumping will be determined and how metering of all groundwater substitution transfer pumping for wells will be done regardless of whether the well discharges to a contiguous surface water delivery system. I recommend the Draft EIS/EIR be revised to discuss how the BoR-SDF will be determined, monitored, and it's effectiveness verified for all groundwater substitution transfer wells regardless of whether the well discharges to a contiguous surface water delivery system.

Response

All groundwater pumping wells that are part of a groundwater substitution pumping transfer must be metered.

Comment NG01-53

Comment

Mitigation Measure GW-1. 16. The Draft EIS/EIR has only two mitigation measures that apply to the groundwater substitution transfers, WS-1 and GW-1. GW-1 is the principle mitigation measure for the 10-year transfer project's Draft EIS/EIR and is discussed in Section 3.3.4.1. The requirements contained in the October 2013 joint DWR and BoR Draft Technical Information for Preparing Water Transfer Proposals (DTIPWTP) and its 2014 Addendum are included in GW-1 by reference. The monitoring and mitigation measures of GW-1 are generally statements of objectives and requirements for development in the future monitoring and mitigation plans that are approved by BoR and perhaps DWR. GW-1 doesn't appear to provide any future opportunity for review and comment by parties that may be impacted by the groundwater substitution transfers such as the non-participating well owners, the public, or other regulatory agencies. GW-1 has statements such as: The monitoring program will incorporate a sufficient number of monitoring wells to accurately characterize groundwater levels and response in the area before, during, and after transfer pumping takes place. (page 3.3-88) The monitoring program will include a plan to coordinate the collection and organization of monitoring data, and communication with the well operators and other decision makers. (page 3.3-89) Potential sellers will also be required to complete and implement a mitigation plan. (page 3.3-89) To ensure that mitigation plans will be feasible, effective, and tailored to local conditions, the plan must include the following elements: (page 3.3-90 and 3.3-91) 1. procedure for the seller to receive reports of purported environmental or effects to non-transferring parties; 2. A procedure for investigating any reported effect; 3. Development of mitigation options, in cooperation with the affected parties, for legitimate significant effects 4.Assurances that adequate financial resources are available to cover reasonably anticipated mitigation needs. Reclamation will verify that sellers adopt and implement these measures to minimize the potential for adverse effects related to groundwater extraction. (page 3.3-91).

GW-1 does have some specifics on requirements for the frequency of groundwater level monitoring, such as weekly monitoring during the transfer period (page 3.3-89). Requirements for the frequency of reporting are less specific. Summary tables to BoR during and after transfer-related groundwater pumping, and a summary report sometime after the post-project reporting period. The project reporting period extends through March of the year following the transfer (page 3.3-90). The requirement for only a single year of groundwater monitoring appears to be insufficient given the duration of the simulated pumping impacts (see Figure B-5 in Appendix B). Other reporting requirements such as groundwater elevation contour maps are given as "should be included" rather than "shall be included" (page 3.3-90).

The BoR should already have monitoring and mitigation plans and evaluation reports based on the requirements of the DTIPWTP for past groundwater substitution transfers, which likely were undertaken by some of the same sellers as the proposed 10-year transfer project. The Draft EIS/EIR should provide these existing BoR approved monitoring programs and mitigation plans as examples of what level of technical specificity is required to meet the objectives of GW-1 that include: (1) mitigate adverse environmental effects that occur; (2) minimize potential effects to other legal users of water; (3) provide a process for review and response to reported effects; and (4) assure that a local mitigation strategy is in place prior to the groundwater transfer (page 3.3-91). In addition, examples of periodic reporting tables and final evaluation reports should be provided to demonstrate the effectiveness of the GW-1 process at preventing or mitigating impacts from the groundwater substitution transfer pumping. Other deficiencies in GW-1 have been discussed above in my comments nos. 1, 2, 3, 5, 6 and 15, and below in comment no. 18.

I recommend the Draft EIS/EIR be revised to include specifics on additional requirements that must be part of mitigation measure GW-1 including: (1) required distances from wells and surface water features, and aquifer zones for groundwater elevation monitoring; (2) the duration of the required post-transfer monitoring that accounts for the effects of the 10 years of pumping; (3) specifics requirements on scale and detail for maps, figures and tables needed to document groundwater substitution pumping impacts; and (4) specific threshold for changes in groundwater elevation, groundwater quality and subsidence that will be considered significant. I recommend the Draft EIR/EIS be revised to provide existing BoR approved monitoring and mitigation plans and reports for past groundwater substitution transfers as examples of the types of technical information necessary to ensure no injury with less than significant impacts and appropriate mitigations. I recommend the Draft EIS/EIR be revised to provide specifics on how the public will be able to participate in the BoR and DWR approval and revision process for the 10-year transfer project monitoring and mitigation plans. I also recommend the Draft EIS/EIR revise GW-1 to include the issues discussed elsewhere in my comments nos. 1, 2, 3, 5, 6, 15 and 18.

Response

See Common Responses 6, 7, and 8. The DRAFT Technical Information for Preparing Water Transfer Proposals was not incorporated by reference, but used as a resource during development of the mitigation measures.

As described in the Project Description (Chapter 2), the proposed project and its alternatives are viewed as a potential "valley-wide" project. Therefore, all potential groundwater substitution transfers were simulated simultaneously in the SACFEM2013 model. The drawdown contour figures presented in Section 3.3.2 show the potential decline in groundwater elevation (beyond the existing conditions). These figures have been expanded (i.e., zoomed in) to provide additional details regarding the extent of the simulated drawdown.

Comment NG01-54

Comment

Water Quality. 17. The Draft EIS/EIR discusses water quality in Section 3.2, but focuses on potential impacts to surface waters. Discussions of impacts from groundwater substitution transfer pumping on groundwater quality are given in Section 3.3 (pages 3.3-33 to 3.3-35). The Draft EIS/EIR discusses the potential for impacts to groundwater quality from migration of contaminants as a result of groundwater substitution pumping, but provides only a general description of the current condition of groundwater quality. Section 3.3 gives the following statements on water quality: Groundwater Quality: Changes in groundwater levels and the potential change in groundwater flow directions could cause a change in groundwater quality through a number of mechanisms. One mechanism is the potential mobilization of areas of poorer quality water, drawn down from shallow zones, or drawn up into previously unaffected areas. Changes in groundwater gradients and flow directions could also cause (and speed) the lateral migration of poorer quality water. (pages 3.3-59 and 3.3-60). Degradation in groundwater quality such that it would exceed regulatory standards or would substantially impair reasonably anticipated beneficial uses of groundwater; or (page 3.3-61) Additional pumping is not expected to be in locations or at rates that would cause substantial long-term changes in groundwater levels that would cause changes to groundwater quality. Consequently, changes to groundwater quality due to increased pumping would be less than significant in the Redding Area Groundwater Basin. (page 3.3-66) Inducing the movement or migration of reduced quality water into previously unaffected areas through groundwater pumping is not likely to be a concern unless groundwater levels and/or flow patterns are substantially altered for a long period of time. Groundwater extraction under the Proposed Action would be limited to short-term withdrawals during the irrigation season. Consequently, effects from the migration of reduced groundwater quality would be less than significant. (page 3.3-83). Groundwater extracted could be of reduced quality relative to the surface water supply deliveries the seller districts normally receive; however, groundwater quality in the area is normally adequate for agricultural purposes. Distribution of groundwater for municipal supply is subject to groundwater quality monitoring and quality limits prior to distribution to customers. Therefore, potential impacts to the distribution of groundwater would be minimal and this impact would be less than significant. (page 3.3-84).

The Draft EIS/EIR notes that several groundwater quality programs are active in the seller regions (pages 3.3-6 to 3.3-10). No maps are provided that show the baseline groundwater quality and known areas of poor or contaminated groundwater. Groundwater quality information on the Sacramento Valley area is available from existing reports by the USGS (1984, 2008b, 2010, and 2011) and Northern California Water Association (NCWA, 2014c). The Draft EIS/EIR doesn't compare the known groundwater quality problem areas with the SACFEM2013 simulated drawdowns to demonstrate that the proposed projects won't draw in or expand the areas of known poor water quality. The Draft EIS/EIR analysis doesn't appear to consider the impacts to the quality of water from private wells. Pumping done as part of the groundwater substitution transfer may cause water quality impacts from geochemical changes resulting from a lowering the water table below historic elevations, which exposes aquifer material to different oxidation/reduction potentials and can alter the mixing ratio of different quality aquifer zones being pumped. Changes in groundwater level can also alter the direction and/or rate of movement of contaminated groundwater plumes both horizontally and vertically, which may expose non-participating wells to contaminants they would not otherwise encounter.

Response

The water quality information provided in Section 3.3.1.3 is provided as a summary of water quality in the project area. Groundwater quality monitoring is required as part of Mitigation Measure GW-1. The water quality monitoring required is discussed in Section 3.3.4.1. As a reference, the DRAFT Technical Information for Preparing Water Transfer Proposals also provides information on the groundwater quality assessment and monitoring that is required. This document also includes the more comprehensive testing that may be required, depending on location conditions.

Potential water quality impacts to third party (i.e., private) wells and the mitigation of these impacts are covered by Measure GW-1. See Common Responses 6 and 7 for additional information.

Comment NG01-55

Comment

As noted above in my general comment no. 7, the DWR well depth summary maps for the northern Sacramento Valley show that there are potentially thousands of private well owners in and adjacent to the proposed project areas of the groundwater substitution drawdown. Exhibit 2.1 has a composite map of DWR's northern Sacramento Valley well depth summary maps (DWR, 2014a) for the shallow aquifer zone, wells less than 150 feet deep and the areas of groundwater decline from 2004 to 2014 (DWR, 2014b). Exhibit 7.1 has a table that summarizes the range of the number of shallow wells by county that lie within the areas of groundwater decline from 2004 to 2014. In my general comment no. 5, I discussed the concept of capture zones for wells and the need for groundwater modeling using particle tracking to identify the areas where a well receives recharge. Particle tracking to define a well capture zone(s) can also be used to determine if known zones or areas of poor or contaminated water will migrate as a result of the groundwater substitution transfer pumping. Particle tracking can also identify private and municipal wells that lie within the capture zone of a groundwater substitution transfer well and might experience a reduction in water quality from the transfer pumping. Particle tracking can identify locations where mitigation monitoring of groundwater quality should be conducted to quantify changes in groundwater quality.

Response

The groundwater modeling conducted using SACFEM2013 was used to develop the areas where changes in groundwater levels can potentially occur due to groundwater substitution pumping. Identification of each private well that may or may not be impacted is not possible given the number of wells. Mitigation Measure GW-1 provides for monitoring of groundwater conditions in the area of a potential groundwater substitution transfer. Common Response 6 provides additional information.

Comment NG01-56

Comment

Even though there are already a number of shallow wells impacted by historic groundwater level declines, the Draft EIS/EIR reaches the conclusion that the groundwater substitution transfer pumping will not cause injury or a significant impact to groundwater quality. This conclusion is reached in part because the assumed beneficial use of groundwater substitution pumped water is agricultural, or urban, where the quality of water delivered is monitored by an urban water agency. Only these two beneficial uses are assumed even though Table 3.2-2 lists numerous other uses for waters in the seller service areas. The Draft EIS/EIR doesn't provide sufficient information on existing water quality conditions in the Sacramento Valley to allow for evaluation of potential geochemical changes that groundwater substitution pumping might cause. The Draft EIS/EIR sets a standard of significance in degradation of groundwater quality that requires contaminants exceed regulatory standards or impair reasonably anticipated beneficial uses (page 3.3-61). This standard of significance ignores the regulatory requirements of the Water Quality Control Basin Plans (Basin Plans) http://www.waterboards.ca.gov/centralvalley/water_issues/basin_plans/index.shtml). The Draft EIS/EIR only briefly discusses the role of the Basin Plans in maintaining water quality (page 3.2-7). In addition this water quality threshold of significance likely violates the State Water Resources Control Board Resolution No. 68-16, titled Statement of Policy with Respect to Maintaining High Quality of Waters in California, that states: "Whenever the existing quality of water is better than the quality established in policies as of the date on which such policies became effective, such existing high quality will be maintained until it has been demonstrated to the state that any change will be consistent with the maximum benefit to the people of the state, will not unreasonably affect present and anticipated beneficial use of such water and will not result in water quality less than that prescribed in the policies." "The nondegradation policy of the State Board (Resolution No. 68-16) applies to surface and groundwaters that are currently better quality than the quality established in 'adopted policies.' In terms of water quality objectives, the basin plans are the source of adopted policies."

I recommend the Draft EIS/EIR be revised to document the known condition of the groundwater quality in the Sacramento Valley and Redding Basin and include available maps. I recommend that this assessment evaluate the potential impacts from migration of known areas of poor groundwater quality that could be further impaired or spread as a result of the groundwater substitution transfer pumping. I recommend a groundwater quality mitigation measure be provided for evaluation the existing water quality in wells (assuming owner cooperation) within and adjacent to known areas of poor groundwater quality that lie within and adjacent to the simulated groundwater transfer drawdown areas, especially those that lie within the capture zone. I recommend the groundwater quality mitigation measure include: (1) procedures for sampling wells, (2) methods of water quality analysis, (3) a QA/QC program, (4) standards and threshold for water quality impairment consistent with public health requirements and Basin Plan beneficial uses and SWRCB Resolution No. 68-16, (5) provisions for independent oversight and review by regulatory agencies and affected well owners, and (6) specific reporting and notification requirements that keep the owners of nonparticipating wells, the public, and regulatory agencies informed. I recommend the groundwater quality mitigation measure include provisions for modification and/or treatment of non-participating wells should the quality of water delivered be significantly altered by groundwater substitution transfers. I recommend the groundwater quality mitigation measure be in effect during the 10-year period of transfer pumping and the following recovery period until groundwater flows return to the pre-project condition. I recommend the Draft EIS/EIR also require a funding mechanism for implementing the groundwater quality mitigation measures for the entire 10-year duration of the groundwater substitution transfers and the recovery period. I recommend the costs of the groundwater quality mitigation monitoring be the responsibility of the project proponents, not the non-participating wells owners or the public. These costs should include reimbursement of any costs incurred by regulatory agency oversight and costs incurred by non-participating well owners.

Response

See response to Comment NG01-54.

Comment NG01-57

Comment

Subsidence. 18. The impacts of subsidence due to groundwater substitution transfer pumping are discussed in Section 3.3. Section 3.3.1.3.2 discusses groundwater-related land subsidence and notes that Global Positioning System (GPS) surveying is conducted by DWR every three years at 339 elevation survey monuments throughout the northern Sacramento Valley (page 3.3-28). In addition, eleven extensometers, as shown in Figure 3.3-11, monitor land subsidence. Figure 3.3-11 provides graphs of the subsidence for five of the eleven extensometers; no information is provided on the results on the GPS surveys. Mitigation measure GW-1 also incorporates by reference the October 2013 DTIPWRP and its 2014 Addendum. The DTIPWRP doesn't add any additional monitoring or mitigation requirements for subsidence, stating that areas that are susceptible to land subsidence may require land surface elevation surveys, and that the Project Agencies will work with the water transfer proponent to develop a mutually agreed upon subsidence monitoring program (pages 34 and 37). Apparently the Draft EIS/EIR expects that the mutually agreed upon subsidence monitoring programs will be a future mitigation measure. The Draft EIS/EIR doesn't discuss how other regulatory agencies or the public will participate in the reviewing and commenting on any future subsidence mitigation measure.

Response

See Common Response 4 regarding revisions to the Affected Environment section. Subsidence trends as documented in DWR's Summary of Recent, Historical, and Estimated Potential for Future Land Subsidence in California (DWR 2014) have been added to Section 3.3.1.3.

See Common Response 7.

Comment NG01-58

Comment

The Draft EIS/EIR relies on local GMPs and county ordinances to prevent impacts from subsidence, but doesn't discuss any specific monitoring or mitigation measures for each proposed groundwater substitution transfer pumping area (page 3.3-7). The Draft EIS/EIR acknowledges that subsidence has occurred in the past in portions of the Sacramento Valley in Yolo County (page 3.3-29), and that the Redding groundwater basin has never been monitored (page 3.3-17). Yet only a qualitative assessment of potential project impacts was done by comparing SACFEM2013 simulated groundwater drawdowns with areas of existing subsidence and by comparing estimates of pre-consolidated heads/historic low heads (page 3.3-61).

Response

Potential for subsidence within the area of analysis was identified using a combination of (1) current subsidence trends and (2) comparing calculated historic low groundwater levels since 2008 and the simulated change in groundwater level due to transfer pumping. See Common Response 7.

Comment NG01-59

Comment

The Draft EIS/EIR relies on the mitigation measure GW-1 to prevent and remedy any significant impacts from subsidence. The requirements in mitigation measure GW-1 for subsidence impacts specify that the BoR will determine, apparently in the future and only when mutually agreed upon, the "strategic" monitoring locations throughout the transfer area where land surface elevations will be measured at the beginning and end of each transfer year (page 3.3-89). When the land surface elevation survey indicates an elevation decrease in an area, more subsidence monitoring will be required, which could include: (1) extensometer monitoring, (2) continuous GPS monitoring, or (3) extensive land-elevation benchmark surveys conducted by a licensed surveyor. More extensive monitoring will be required for areas of documented historic or higher susceptibility to land subsidence (page 3.3-89). The Draft EIS/EIR concludes that with these subsidence monitoring mitigation measures of GW-1, impacts will be reduced to less than significant (page 3.3-66).

Exhibits 8.1a to 8.1c provides composite maps using as a base DWR's Spring 2004 to 2014 Change in Groundwater Elevations (DWR, 2014b) for the shallow (less than 200 feet bgs), intermediate (200 to 600 feet bgs) and the deep (greater than 600 feet bgs) aquifer zones in the northern Sacramento Valley. A map of the natural gas pipelines in the Sacramento Valley (Exhibit 8.6) has been scaled and combined with Exhibits 8.1a to 8.1c. Exhibit 8.2 depicts on DWR's (2014b) intermediate zone change in groundwater elevation map, the locations of extensometers and the GPS subsidence grid (from Figure 6 in DWR, 2008; Exhibit 8.4), and the known subsidence area southeast of Williams and into Yolo County (from Draft EIS/EIR Figure 3.3-11)).

The subsidence area in Yolo County isn't fully shown on the DWR's 2014 groundwater elevation change maps, but is shown in the composite maps (Exhibits 8.1a to 8.1c). These exhibits and Exhibit 8.2 show that the western line of extensometers lies along the eastern edge of the intermediate zone of greatest groundwater elevation change, and aligns with the central axis of the mapped changes in groundwater elevation in deeper aquifer zone. The extensometers don't appear to lie within the area of known subsidence southeast of Williams and into Yolo County (Figure 3.3-11). The GPS subsidence grid network does extend across eastern portion of the known subsidence area southeast of Williams and into Yolo County depicted in Figure 3.3-11 and the groundwater elevation change in the intermediate aquifer zone southwest of Orland (Exhibit 8.2).

Response

See Common Response 7.

Comment NG01-60

Comment

Although there are several areas in the Sacramento Valley of known decrease in groundwater elevations, known areas of subsidence (Faunt, ed., 2009; Exhibit 8.3), and apparently a GPS network with repeated elevation measurements (Exhibit 8.4), the Draft EIS/EIR doesn't provide any specific information on the "strategic" locations where groundwater substitution pumping done under the 10-year transfer project will require additional subsidence monitoring. The historic subsidence data along with the GPS grid elevation data, historic groundwater elevation change data and the future areas of drawdown from the 10 years of groundwater substitution pumping shown in Figures 3.3-26 to 3.3-31 should be sufficient information to develop the initial "strategic" locations for monitoring potential subsidence. The Draft EIS/EIR should be able to provide the specific thresholds of subsidence that will trigger the need for additional extensometer monitoring, continuous GPS monitoring, or extensive land-elevation benchmark surveys by a licensed surveyor as required by GW-1. The Draft EIS/EIR should also specify in mitigation measure GW-1, the frequency and methods of collecting and reporting subsidence measurements, and discuss how the non-participating landowners and the public can obtain this information in a timely manner. In addition, the Draft EIS/EIR should provide a discussion of the thresholds that will trigger implementation of the reimbursement mitigation measure required by GW-1 for repair or modifications to infrastructure damaged by non-reversible subsidence, and the procedures for seeking monetary recovery from subsidence damage (page 3.3-90). The revised Draft EIS/EIR should review the information provided by Galloway and others (2008), and the Pipeline Research Council International (2009) regarding land subsidence hazards.

Response

See Common Response 7.

Comment NG01-61

Comment

An objective of the mitigation measure GW-1 is to mitigate adverse environmental effects from groundwater substitution transfer pumping (page 3.3-88). As part of the preliminary assessment of potential environmental impacts from subsidence due to groundwater substitution pumping, a review and determination of the critical structures that might be impacts is recommended. There are a number of critical structures in the Sacramento Valley that may be susceptible to settlement and lateral movement. These include natural gas pipelines, gas transfer and storage facilities, gas wells, railroads, bridges, water and sewer pipelines, water wells, canals, levees, other industrial facilities. Exhibits 8.5 to 8.11 provide several maps of gas pipeline, and gas and oil related facilities obtained from the web sites of the CA Energy Commission (CEC) and the CA Department of Conservation's Division of Oil, Gas and Geothermal Resources (DOGGR). In addition, composite maps (Exhibits 8.1a to 8.1c) are provided that show the locations of the natural gas pipelines (Exhibit 8.6) with the DWR 2004 to 2014 change in groundwater elevation maps (DWR, 2014b). Additional maps of railroads, bridges, canals, levees, water and sewer pipelines and important industrial facilities should be sought and the location of those structures compared to the potential areas of subsidence from groundwater substitution transfer pumping. Specific "strategic" subsidence monitoring locations should be given in mitigation measure GW-1 based on analysis of the susceptible infrastructure locations and the potential subsidence areas. The local, state and federal agencies that regulate these critical structures and pipelines as well as the facility owners should be contacted for information on the limitations on the amount of movement and subsidence the infrastructures can withstand. The limitations on movement and subsidence should be incorporated into any triggers or thresholds for additional monitoring and implementing mitigations needed to reduce subsidence impacts to less than significant and cause no injury.

I recommend that: (1) the Draft EIS/EIR be revised to provide information on initial "strategic" locations and types of subsidence monitoring that are necessary based on the existing conditions and the proposed groundwater substitution pumping areas; (2) the Draft EIS/EIR and mitigation measure GW-1 be revised to provide specific thresholds of subsidence that will trigger the need for additional subsidence monitoring; (3) mitigation measure GW-1 be revised to include the frequency and methods of collecting and reporting subsidence measurements; (4) the Draft EIS/EIR discuss how the non-participating landowners and the public can obtain subsidence information in a timely manner; (5) the Draft EIS/EIR and GW-1 be revised to provide the thresholds that trigger implementation of the reimbursement mitigation measure required by GW-1 for repair or modifications to infrastructure damaged by nonreversible subsidence along with the procedures for seeking monetary recovery from subsidence damage; and (6) the Draft EIS/EIR be revised to provide a map and inventory of critical structures in the Sacramento Valley that may be susceptible to settlement and lateral movement. These structures should include natural gas pipelines, gas transfer and storage facilities, gas wells, power plants, railroads, bridges, water and sewer pipelines, water wells, canals, levees, other industrial facilities. I further recommend that the Draft EIS/EIR solicit advice from local, state and federal agencies, as well as the infrastructure owners on the amount of subsidence that these critical structures and pipelines can withstand, and provide copies of their responses and incorporate their requirements in mitigation measure GW-1 to ensure the stability and function of these facilities.

Response

See Common Response 7.

Comment NG01-62

Comment

Geology and Seismicity. 19. Environmental impacts from the project to geologic and soil resources are discussed in Section 3.4 of the Draft EIS/EIR. The Draft EIS/EIR assumes that because the projects don't involve the construction or modification of infrastructure that could be adversely affected by seismic events, seismicity is not discussed in this section. The Geology and Soils section therefore focused on chemical processes, properties, and potential erodibility of soils due to cropland idling transfers. Impacts of subsidence are discussed in Section 3.3 of the Draft EIS/EIR and above in my comment no. 18.

The Draft EIS/EIR reasoning that because the projects don't involve new construction or modification of existing structures that there are no potential seismic impacts from the activity undertaken during the transfers is incorrect. The project area has numerous existing structures that could be affected by the groundwater substitution transfer pumping, specifically settlement induced by subsidence. Although the seismicity in the Sacramento Valley is lower than many areas of California, it's not insignificant. There is a potential for the groundwater substitution transfer projects to increase the impacts of seismic shaking because of subsidence causing additional stress on existing structures. The discussion in Section 3.3 on potential subsidence from groundwater substitution pumping was only qualitative because the SACFEM2013 simulations didn't calculate an estimate of subsidence from the transfer projects (page 3.3-61). The subsidence assessment also didn't acknowledge or consider the numerous natural gas pipelines or other critical facilities and structures that occur the Sacramento Valley. Exhibits 8.5 to 8.11 provide a series of maps that show some of the major natural gas pipelines, oil refineries, terminal storage, and power plants in the Sacramento Valley. In addition, there are a number of railroads, bridges, canals, and water and sewer pipelines within the transfer project area. As I discussed in my comment no. 18 on subsidence impacts, some of these existing structures and pipelines are sited within or traverse areas of known subsidence, existing areas of large groundwater drawdown, and areas within the proposed groundwater substitution transfer pumping. There are a number of technical documents on seismic impacts to pipelines (O'Rouke and Norberg, 1992; O'Rouke and Liu, 1999, 2012) as well as a proceeding from a recent ASCE conference on pipelines (Miami, Florida, August 2012).

Response

Groundwater substitution transfers could not increase the potential for seismic shaking. See Common Response 7 regarding mitigation for subsidence.

Comment NG01-63

Comment

The characteristics of future seismic shaking in California can be assessed using the following web resources provided by the California Geological Survey (CGS) in conjunction with the U.S. Geological Survey and other academic and professional organizations: 1. California Fault Activity Map web site: http://www.quake.ca.gov/gmaps/FAM/faultactivitymap.html 2. Probabilistic Seismic Hazard Mapping web site: http://www.consrv.ca.gov/cgs/rghm/psha/pages/index.aspx 3. Probabilistic Seismic Ground Motion Interpolator web site: http://www.quake.ca.gov/gmaps/PSHA/psha_interpolator.html 4. Earthquake Shaking Potential for California Map web site: http://www.conservation.ca.gov/cgs/information/publications/ms/Documents/MS48_revised.pdf

In addition to the potential impacts to existing infrastructure from seismic shaking, the occurrence of faults within the Sacramento Valley may influence the movement of groundwater. The USGS-CVHM groundwater model (Faunt, ed., 2009) incorporated a number of horizontal flow groundwater barriers (Figure C1-A, pages 160, 203, and 204; Exhibits 9.1, 9.2, 9.3a and 9.3b) that appear to align with faults shown in a series of screen plots from the interactive web site 2010 Fault Activity Map for California (CGS, 2010) (Exhibits 9.4a to 9.4d, 9.5 and 9.6). The SACFEM2013 model documentation didn't indicate that faults were considered as potential flow barriers and the resulting simulation maps in Figures 3.3-26 to 3.3-31don't show any flow barriers. I recommend that the Draft EIS/EIR be revised to: (1) assess the potential environmental impacts from seismic shaking on critical structures and pipelines in areas of potential subsidence caused by the groundwater substitution transfer pumping; (2) provide maps that identify and locate existing pipelines and critical structures such as storage facilities, railroads and bridges within the areas affected by groundwater substitution pumping; (3) solicit and provide results of the advice from local, state and federal agencies, as well as the infrastructure owners, on the amount of subsidence that these critical structures and pipelines can withstand under in both static and seismic conditions; (4) provide a mitigation measure(s) that addresses the requirements for monitoring the subsidence in the area of these critical structures and pipelines; and (5) provide specific monitoring and reporting requirements for potential seismic impacts to critical structures that includes establishing any additional structures for monitoring and taking subsidence measurements, and conducting additional periodic surveys of ground elevation and displacement.

I recommend the Draft EIS/EIR be revised to provide the thresholds that trigger implementation of the reimbursement mitigation measure required by GW-1 for repair or modifications to infrastructure that may be damaged by seismic movement in areas that have exceeded the thresholds for non-reversible subsidence, and provide procedures for seeking monetary recovery from subsidence damage. I also recommend the Draft EIS/EIR be revised to discuss the importance and impacts of the horizontal flow barriers and/or faults within the Sacramento Valley on the results of the drawdown and stream depletion simulations of SACFEM2013.

Response

Groundwater substitution transfers could not increase the potential for seismic shaking. See Common Response 7 regarding mitigation for subsidence.

Comment NG01-64

Comment

II. Additional Technical Information Relevant to the Assessment of Potential Environmental Impacts from the 10-Year Groundwater Substitution Transfers. Historic Changes in Groundwater Storage. 20. The Draft EIS/EIR provides SACFEM2013 simulations of groundwater substitution transfer pumping effects for WY 1970 to WY 2003. The discussion of the simulation didn't provide specifics on how the model simulated the current conditions of the Sacramento Valley groundwater system or the potential impacts from the 10-year groundwater substitution transfer project based on current conditions. A DWR groundwater contour map, Figure 3.3-4, shows the elevations in the spring of 2013 for wells screened at depths greater than 100 ft. bgs. and less than 400 ft. bgs. Figures 3.3-8 and 3.3-9 provide the locations and simulation hydrographs for selected monitoring wells in the Sacramento Valley. Appendix E provides additional monitoring well simulation hydrographs for selected wells at locations shown on Figures 3.3-26 to 3.3-31. As discusses above in comments no. 7, these hydrographs appear to show only simulated groundwater elevations. Actual measured groundwater elevations are needed to evaluate the accuracy of the simulations. The Draft EIS/EIR briefly discusses on page 3.3-12 the groundwater production, levels and storage for the Redding Basin, and on pages 3.3-21 to 3.3-27 there is a similar discussion for the Sacramento Valley. Faunt (ed., 2009) is cited for the conditions of the Sacramento Valley groundwater budget and Figure 3.3-10, taken from Faunt (ed., 2009; Figure B9; Exhibit 10.2a), shows the historic change in groundwater storage in the Central Valley as determined by the CVHM model simulations. Based in part on the information in Faunt (ed., 2009), the Draft EIS/EIR concludes that the Sacramento Valley basin's groundwater storage has been relatively constant over the long term, decreasing during dry years and increasing during wetter periods. However, the Draft EIR/EIS's discussion of the status of groundwater in the Sacramento Valley doesn't utilize all of the information on groundwater storage or water balance available in Faunt (ed., 2009), more recent simulation studies by Brush and others (2013a and 2013b), or the summary of groundwater conditions in recent reports by the Northern California Water Association (NCWA) (2014a and 2014b).

Response

The baseline simulation does not include any groundwater substitution transfers that are proposed as part of this EIS/EIR. The simulation is compared to separate simulation that adds in the substitution pumping. A comparison of the change in water level is presented in Section 3.3.2. It should be noted that hydrograph Figures 3.3-32 through 3.3-40 in the 2014 Draft EIS/EIR and those in Appendix G do not represent actual monitoring well locations. The locations shown were selected to be distributed across the valley to provide the general trends the model simulates as a result of the groundwater substitution pumping. See Common Response 5 for additional information.

The affected environment section has been revised to include cumulative change in storage as simulated by CVHM and C2VSim models. Though the conclusions drawn by CVHM and C2VSim differ with respect to simulated storage capacity in the San Joaquin Valley, both models indicate storage capacities in the Sacramento Valley have remained steady since the 1920s. Additionally, Section 3.3.1.3.2 has been revised to include monthly groundwater storage estimates for the Sacramento and San Joaquin Valleys from Famiglietti et al. 2011. See Common Response 4 for additional information.

Comment NG01-65

Comment

Faunt (ed., 2009) provides in Table B3 (Exhibit 10.1) selected average annual hydrologic budget values for WYs 1962-2003. In addition, Figures B10-A and B10-B of Faunt (ed., 2009) show bar graphs for the average annual groundwater budget for the Sacramento Valley and the Delta and Eastside Streams (Exhibits 10.2b and 10.2c). Table B3 gives the water balances for subregions in the Sacramento Valley (1 to 7) and the Eastside Streams (8). Table B3 gives values for the net storage from specific yield and compressibility of water; positive values indicate an increase in storage, while a negative value is a decrease. For Sacramento Valley, the sum of the annual average from 1962 to 2003 in net storage is given as -99,000 AFY and for the Eastside streams -26,000 AFY. Unfortunately, the components in Table B3 don't seem to be a complete groundwater water budget, so following the calculations of the average annual net change in groundwater storage isn't obvious. Figures 10A and 10B (Exhibits 10.2a and10.2b), however, do provide bar graphs of the groundwater water budgets with values for the entire Sacramento Valley and the Delta and Eastside Streams. If it's assumed that groundwater pumping shown as a negative value in Figures 10A and 10B represents an outflow from groundwater storage, then other negative values would also be considered outflows. Positive values are therefore assumed to be inflows to groundwater storage.

For the entire Sacramento Valley (subregions 1 to 7), Faunt (ed., 2009) shows the net change in annual groundwater storage as the sum of the negative outflows and positive inflow in Figure 10A at a negative 650,000 AFY (-0.65 million AFY) (2.88 – [0.29+0.03+1.66+1.37+0.18] = 2.88 – 3.53 = -0.65). The values in Figure 10B can be summed in a similar manner and yield a net change in storage of a positive 90,000 AFY for the Delta and Eastside Streams. Unfortunately, the bar graph in Figure 10B for the Eastside Streams (subregion 8) doesn't have numerical values. A visual comparison of the inflow and outflow bars suggests that for subregion 8 the outflows, mostly pumping, are at or slightly greater than the inflows.

Response

See response to Comment NG01-64.

Comment NG01-66

Comment

The groundwater budget information by Faunt (ed., 2009) can be compared with two other more recent sources of Sacramento Valley information contained in four documents, Brush and others (2013a and 2013b) and NCWA (2014a and 2014b). Brush and others report on the recent version of the C2VSim groundwater model (version R374) and provide simulation results. The NCWA reports also used the C2VSim (R374) model, but provided additional analysis and results of the historic land development, water use and water balances in Sacramento Valley. Some of the information developed by Brush and others (2013a and 2013b), and Faunt (ed., 2009) on the condition of the Sacramento Valley groundwater system was previously discussed in my comments on the SACFEM2013 model simulations, nos. 8 to 14.

Response

See Common Response 4 and response to Comment NG01-64.

Comment NG01-67

Comment

My comment no. 14 on groundwater flow between subregions is also relevant to this discussion of the historic changes in groundwater storage. Accounting for the transfer of groundwater between regions is critical for understanding the impacts of pumping in one region or area on the adjacent regions. The sources of water backfilling a groundwater depression don't all have to come from surface waters, ie., stream depletion, precipitation, deep percolation, and artificial recharge. Some of that "recharge" can come from adjacent aquifers by horizontal and vertical flow. When pumping creates a depression in the water table or piezometric surface, the depression steepens the gradient thereby increasing the rate of flow towards it; the depression can also change the direction of groundwater flow. Often the "recharge" to a pumping depression comes from adjacent groundwater storage that lies outside the zone of influence of the pumping. When the rates and volumes of recharge from surface waters are insufficient to rapidly backfill a pumping depression, the impact on groundwater storage and elevations in adjacent regions increases.

Response

The SACFEM2013 model is a representation of the alluvial groundwater system in the Sacramento Valley. This model does not prohibit groundwater flow between areas/subbasins. Therefore, the groundwater substitution pumping simulated as part of this EIS/EIR allows for the potential flow between different regions in the model. The extent of that flow depends on local conditions including aquifer properties (storage properties, hydraulic conductivity), deep percolation, and interaction with streams.

Comment NG01-68

Comment

Brush and others (2013a) provide a breakdown of water budget by subregion, Tables 10 to 13 (Exhibits 6.3a to 6.3d), but only for the selected three decades (1922-1929, 1960-1969, and 2000-2009), and for the total modeled period from 1922 to 2009. They do provide values for the change in groundwater storage for all 21 of the Central Valley subregions and 5 hydrologic regions. Of particular importance to the discussion of the current condition of the groundwater basin are the results of the C2VSim simulations of the annual average change in groundwater storage for each of the three decades and from 1922 to 2009, Tables 10 to 13 (Exhibits 6.3a to 6.3d). For the Sacramento Valley (subregions 1 to 7), Table 10 lists the 1922-2009 change in storage as -165,417 AFY (I'm assuming the units of the table are acre-feet), and for the Eastern Streams (subregion 8) -135,304 AFY. For the most recent decade, 2000-2009, the average annual change in groundwater storage has increased in both the Sacramento Valley and the Eastern Streams to -303,425 AFY and -140,715 AFY, respectively (Table 13). Although the tables in Brush and others don't list the groundwater flow between subbasins, Figures 81A to 81C (2013a) and Figure 39 (2013b) (Exhibits 6.1a to 6.1c and 6.2) provide this information for the selected decades and for the total simulation period. As discussed above in my comment no. 14, the change in interbasin groundwater flow can be significant particularly when recharge in a region is deficient. The Draft EIS/EIR should specifically discuss and account for any changes in the rate and direction of interbasin groundwater flow. Interbasin groundwater flow may become a hidden long-term impact that increases the time needed for recovery of groundwater levels from groundwater substitution transfer pumping, and can extend the impact from groundwater substitution transfer pumping to areas outside of the groundwater substitution transfer seller's boundary.

Response

See response to Comment NG01-67.

Comment NG01-69

Comment

Two recent reports on the condition of groundwater in the Sacramento Valley are provided by the Northern California Water Association (NCWA, 2014a and 2014b). Tables 3-6, 3-7, and 3-8 in the NCWA technical supplement report (2014b; Exhibits 10.5a to 10.5c) provide water balance information for the Sacramento Valley for the same three decades as Brush and others (2013a). The NCWA tables separate the water balance elements into three types, land uses (Table 3-6), streams and rivers (Table 3-7), and groundwater (Table 3-8). The values of the change in groundwater storage given in Table 3-8 are similar to those given by Brush and others

(2013a). The NCWA technical supplement report (2014b) also provides additional information on the 1922 to 2009 water balance through the use of graphs and bar charts. Figures 3-22 and 3-24 (Exhibits 10.6c and 10.6d) provide graphs of simulated estimates of annual groundwater pumping in the Sacramento Valley and the annual stream accretion. Positive stream accretion occurs when groundwater discharges to surface water, negative when groundwater is recharged. Other graphs include simulated deep percolation, Figures 3-26 and 3-27 (Exhibits 10.6e and 10.6f), annual diversions, Figures 3-19 and 3-20 (Exhibits 10.6a and 10.6b), and relative percentages of surface water to groundwater supplies, Figure 3-29 (10.6g).

The NCWA technical supplement report (2014b) notes in Sections 3.8 and 3.8.4 that negative changes in groundwater storage... suggest that the groundwater basin is under stress and experiencing overdraft in some locations. Review of the Sacramento Valley water balance, as characterized based on C2VSim R374 and summarized in Tables 3-6 through 3-8 reveals substantial changes in water balance parameters over time that affect overall groundwater conditions.… Over time, it appears that losses from surface streams have increased as a result of declining groundwater levels. The declining levels result from increased demand for groundwater as a source of supply without corresponding increases in groundwater recharge. (page 41) A contributing factor to the decrease in accretions to rivers and streams over the last 90 years is that deep percolation of surface water supplies (and other forms of recharge) has not increased in a manner that offsets increased groundwater pumping. (page 48).

The simulated groundwater pumping graph in NCWA Figure 3-22 and stream accretion graph in NCWA Figure 3-24 were combined into one graph by scaling and adjusting their axes (Exhibits 10.7). The vertical scales of these two graphs were adjusted so that a zero value of stream accretion aligned with 1.5 million acre-feet (MAF) of annual groundwater pumping. This alignment was done to reflect the fact that in the early 1920s, groundwater pumping was approximately 0.5 MAF per year (MAFY) while stream accretion was approximately 1.0 MAFY. As shown in the combined graph, stream accretion generally decreases at approximately the same rate as groundwater pumping increases. Thus, at a point of no appreciable groundwater pumping, pre-1920s, the total long-term average annual stream accretion was likely 1.5 MAF, based on the C2VSim simulations.

Response

Section 3.3.1.3, Affected Environment has been revised to clarify the impacts of current drought conditions to the groundwater resources within the area of analysis. Additional data and figures on cumulative change in storage have also been included in Section 3.3.1.3. See Common Response 4 for additional information.

The Lead Agencies acknowledge there is a wealth of supplemental groundwater data available that is not included in the groundwater resources section. The Lead Agencies have collected and presented sufficient data from reputable sources to accurately represent current conditions of groundwater resources within the area of analysis. The information presented in the EIS/EIR provides substantial evidence in support of the evaluation of impacts of the proposed alternatives.

Comment NG01-70

Comment

Drawn on top of the stream depletion and groundwater pumping graphs are several visually fit, straight trend lines. These lines, which run from 1940 to the mid-1970s and the late 1980s to mid-1990s, are mirror images reflected around the horizontal 0 accretion axis. Information provided at the bottom of the composite graph was taken from NCWA Tables 3-7 and 3-8 (Exhibits 10.5b and 10.5c). The slope of the trend line from 1940 to the mid- 1970s is approximately (+-)27,000 AFY, and (+-)85,000 AFY in the late 1980s to the mid- 1990s; a 3-fold increase in slope. After the mid-1990s the slope of groundwater pumping flattens to be similar to that of the 1940s–mid-1970s, while the stream depletion line became almost flat, ie., no change in rate of accretion. The reason for the stream depletion rate being flat is unknown, but there are several factors that could contribute to a fixed rate of stream accretion.

First, after depleting 1.5 MAFY from the Sacramento Valley streams, the surface waters may not be able to provide much more, at least no increase to match the pumping. Second, this may also be a consequence of the model design because the number of streams simulated was limited. Third, the model's grid may not extend out far enough to encompass all of the streams that contribute to groundwater recharge. More information on the areas of where streams gain and lose in the Sacramento Valley is needed to determine if there are any sections of stream, gaining or losing, that might still have the ability to interact at a variable rate in the future, ie., during and after the 10-year groundwater substitution transfer project.

Response

See response to Comment NG01-69.

Comment NG01-71

Comment

A third graph is drawn on the composite accretion-pumping graph in Exhibit 10.7 that shows the C2VSim simulated cumulative change in groundwater storage for the Sacramento Valley from 1922 to 2009. This graph was taken from Figure 35 of Brush and others, 2013b (Exhibit 10.4). A straight trend line with a negative slope of approximately -163,417 AFY is drawn on top of the third graph, which is the value for average annual change in storage from 1922 to 2009 given in Table 10 of Brush and others (2013a; Exhibit 6.3a) for the seven subregions of the Sacramento Valley. The selected graph of the cumulative change in groundwater storage is one of three available.

The graph of cumulative change in groundwater storage for the Sacramento Valley in Figure 35 differs from the graph in Figure 83 in Brush and others (2013a; Exhibit 10.3) and in Figure B9 of Faunt (ed., 2009; Exhibit 10.2a). Both of Figure 83 and Figure B9 show a gain in groundwater storage with their Sacramento Valley graphs lying generally above the horizontal line of zero change in storage. The cumulative change in groundwater storage graph from Figure 35 (Exhibit 10.4) was selected because: 1. its slope is a close match for the average annual change in storage from 1922 to 2009 of -163,417 AFY given in Table 10, 2. the values for change in groundwater storage in the three selected decades are all negative (Table 3-8, NCWA, 2014b), which the other two graphs don't clearly indicate, 3. the calculation of average annual change in groundwater storage from 1962 to 2003 shown in Table B3 and Figures B10-A and B10-B of Faunt (ed., 2009) are negative, which conflicts with Figures B9 and 83, and 4. change in DWR groundwater elevation maps from spring 2004 to spring 2014 (Exhibit 3.1, 3.2 and 3.3) suggest that there are significant regions of the Sacramento Valley that have lost groundwater storage, which suggests that the current condition is one of a loss in storage rather than a gain.

Additional review and analysis of the changes in groundwater storage in the Sacramento Valley is needed. Any additional review of changes in groundwater storage in the Sacramento Valley should consider the recent changes in groundwater elevations such as those shown in DWR (2014b) for WYs 2004 to 2014, and Figures 2-4 and 2-5 of NCWA, 2014b (Exhibit 10.8 and 10.9), as well as other studies such as the support documents for the regional IRWMPs.

I recommend the Draft EIS/EIR be revised to provide a more comprehensive assessment of the historic change in groundwater storage in the Sacramento Valley groundwater basin, and other seller sources areas within the proposed 10-year groundwater substitution transfer project. I also recommend that the Draft EIS/EIR be revised to include an assessment of the impacts of groundwater flow among subregions due to the proposed 10-year groundwater substitution transfer project.

Response

See response to Comment NG01-69.

Comment NG01-72

Comment

The Concept of the Stream Depletion Factor, SDF. 21. The Draft EIS/EIR proposes that a stream depletion factor, BoR-SDF, be applied to groundwater substitution transfers as mitigation for flow losses due to groundwater pumping. The Draft EIS/EIR implies that the BoR-SDF will be a fixed percentage of the transferred groundwater substitution water. The main text of the Draft EIS/EIR doesn't clearly specify the BoR-SDF percentage, but appended documents state that the default is 12%, unless available monitoring data analyzed by Project Agencies supports the need for the development of a transfer proposal site-specific SDF (page 33 in the DTIPWTP). Elsewhere in the Draft EIS/EIR, the average annual surface water–groundwater interaction losses are estimated at approximately 15,800 AF and in multiple dry years losses of 71,200 AFY are anticipated (page 3.1-18). The Draft EIS/EIR proposes mitigation measure WS-1, which utilizes the BoR-SDF with the transfers to account for the losses from stream depletions, and thereby reduces the water supply impacts to less than significant (page 3.1-18). As I discussed above in my comment no. 9, the maximum annual groundwater substitution pumping is 290,495 AF as calculated from Table 2-5. The estimated annual average surface water–groundwater interaction loss of 15,800 AF is 5.4 % of the maximum allowable annual groundwater substitution transfer, while a loss of 71,200 AF is 24.5%.

The use of a fixed percentage of transfer water to mitigate increased stream flow losses from the groundwater substitution pumping may not result in the reduction of stream flow impacts to less than significant. I've discussed above in my comment no. 15 several of the issues about the design of mitigation measure WS-1. The following are additional comments on WS-1 specific to the fixed percentage BoR-SDF and how it differs from the concept of stream depletion commonly used in scientific literature.

Response

The Draft Technical Information for Preparing Water Transfers Proposals was not included in the Draft EIS/EIR as an "appended document." The Technical Information paper describes the information that DWR and Reclamation need as part of a transfer proposal. This document changes annually to reflect lessons learned during transfer implementation, and in the future it will reflect the mitigation requirements included in this EIS/EIR if an action alternative is identified to move forward. The current requirements in the Technical Information paper should not be considered as mitigation requirements in this document unless they are specifically called out as mitigation measures. See Common Response 8 for more information on the streamflow depletion factor.

Comment NG01-73

Comment

Jenkins (1968a and b; Barlow and Leake, 2012) defined the "stream depletion factor" (herein called the Jenkins-SDF) as the product of the square of the distance between a well and a surface water body (a2) multiplied by the storage coefficient (S or Sy) divided by the transmissivity (T) (Jenkins-SDF = distance2 x storage coefficient/transmissivity = a2 x S/T) (see Table 1 and page 14 in Barlow and Leake, 2012). The units of the Jenkins-SDF are in time, ie., days, years, etc. The Jenkins-SDF also occurs in Theis' well function, W(u) (see pages 136 and 150 in Domenico and Schwartz, 1990). Domenico and Schwartz (1990) showed that the Jenkins-SDF can be expressed as a dimensionless Fourier number, which occurs in all unsteady groundwater flow problems. The Jenkins-SDF has several other important characteristics that are not part of the BoR-SDF, which likely influence the actual rate and volume of surface water lost due to groundwater substitution transfer pumping.

Response

The EIS/EIR is not referring to the cited definitions of a streamflow depletion factor. The streamflow depletion factor is defined in Mitigation Measure WS-1, and it has been clarified based on public comments received on the draft document. See Common Response 8 for more information.

Comment NG01-74

Comment

1. The value of stream depletion varies with the duration of pumping and unlike the BoR-SDF isn't a fixed value. For an ideal aquifer (homogeneous, isotropic and infinite), two ideal curves normalized to the Jenkins-SDF value can be created that show stream depletion as a percentage of the total pumping rate or total pumped volume against the normalized logarithm of pumping time (see Figure 1 from Miller and Durnford, 2005; Exhibit 11.1). In Figure 1, equation no. 1 shows the instantaneous rate of stream depletion as a percentage of the maximum pumping rate versus the logarithm of normalized time, and equation no. 2 shows the volume of depletion as a percentage of the total volume pumped versus the

logarithm of normalized time. Jenkins somewhat arbitrarily defined his SDF as the pumping duration equal to the calculated stream depletion factor (a2 x S/T). Jenkins noted that for the ideal aquifer at the time of the SDF, the cumulative volume of water depleted from the stream equals 28% of the total volume pumped (Jenkins, 1968a; Wallace and Durnford, 2005 and 2007). As shown in Figure 1 in Exhibit 11.1, when the actual pumping duration is normalized to the Jenkins-SDF, the ideal volume curve always goes through 28% when the pumping time equals the Jenkins-SDF (time/SDF = 1; Jenkins, 1968a).

Response

See response to Comment NG01-73. The calculations of the percentage for streamflow depletion would be different under Mitigation Measure WS-1 because the definition of the streamflow depletion factor is different.

Comment NG01-75

Comment

2. An important factor in the Jenkins-SDF is that stream depletion varies with the square of the distance between the well and the stream, whereas, the depletion rate varies only linearly with changes in S or T. The ratio of T/S is also called the hydraulic diffusivity, D, which has units of length2/time (see Table 1 and Box A in Barlow and Leake, 2012). The rate that hydraulic stress propagates through an aquifer is a function of the diffusivity. Greater values of D result in more rapid propagation of hydraulic stresses. Barlow and Leake (2012) note that the ratio T/S (or T/Sy) controls the timing of stream depletion and not each value individually. Streamflow depletion can occurs more rapidly in confined aquifers than in unconfined aquifers because S is much smaller than Sy, resulting in a larger D value.

Response

The formulas cited reflect ways to estimate streamflow depletion, but the analysis in the EIS/EIR uses a detailed groundwater model rather than an overall formula. The SACFEM2013 groundwater model is a calibrated groundwater model for the Sacramento Valley that estimates groundwater movement before, during, and after a groundwater substitution transfer. More information about the model is included in the Groundwater Resources section (Section 3.3) and in Appendix D.

Comment NG01-76

Comment

3. For a given duration of pumping, the percentage of instantaneous depletion is greater than the percentage of volume depleted. For the ideal aquifer at a pumping duration equal to the Jenkins-SDF value, the instantaneous depletion is 48% of the maximum pumping rate, while the cumulative volume of depletion is 28% of the total pumped volume (Figure 1, Exhibit 11.1). For a non-ideal aquifer where numerical simulations are needed to estimate stream depletion, eg., the SACFEM2013 simulations, the time when the cumulative volume of stream depletion is at 28% of the total volume pumped can be used as an “effective” Jenkins-SDF to allow for evaluation and comparison of potential impacts from pumping.

Response
See response to Comment NG01-75.

Comment NG01-77

Comment

4. Stream depletion continues to occur after pumping ceases. Jenkins (1968a, b) referred to this as residual depletion. Depending on the duration of pumping and the value of the Jenkins-SDF, stream depletion can be greater after pumping ceases (see pages 42 to 45 in Barlow and Leake, 2012). Barlow and Leake (2012 on page 43) give the following five key points regarding stream depletion after cessation of pumping: a. Maximum depletion can occur after pumping stops, particularly for aquifers with low diffusivity or for large distances between pumping locations and the stream. b. Over the time interval from when pumping starts until the water table recovers to original pre-pumping levels, the volume of depletion will equal the volume pumped. c. Higher aquifer diffusivity and smaller distances between the pumping location and the stream increase the maximum rate of depletion that occurs through time, but decrease the time interval until water levels are fully recovered after pumping stops. d. Lower aquifer diffusivity and larger distances between the pumping location and the stream decrease the maximum rate of depletion that occurs through time, but increase the time interval until water levels are fully recovered after pumping stops. e. Low-permeability streambed sediments, such as those illustrated in figure 11, can extend the period of time during which depletion occurs after pumping stops. f. In many cases, the time from cessation of pumping until full recovery can be longer than the time that the well was pumped.

Response
As discussed in response to Comment NG01-75, the EIS/EIR uses the SACFEM2013 groundwater model to estimate groundwater-stream water interaction. The SACFEM2013 modeling effort also identified that recharge from streams would continue after the transfer occurs, and this concept is discussed in more detail in Section 3.3.2.4.2. See Common Response 8 for more information about how the streamflow depletion factor addresses the timing of groundwater recharge.

Comment NG01-78

Comment

5. As noted above in key point no. 4b, the volume of stream depletion will eventually equal the total pumped volume. The time required for full aquifer recovery from pumping depends on the value of the Jenkins-SDF, availability of water to capture, the rate and duration of recharge above what normally occurs, and other factors like the streambed sediment permeability and aquifer layering. Figure 1 in Exhibit 11.1 also shows that for an ideal aquifer the time needed to reach 95% depletion is approximately 127 times the Jenkins-SDF value. This is consistent with the estimates made by Wallace and others (1990) in Table 3 (Exhibit 11.2) on the time it takes to reach 95% depletion, which they consider a point where a new dynamic equilibrium is established. Although the 127-times-SDF multiplier assumes continuous pumping, the fact is the time for full recovery by residual depletion without pumping shouldn't be any sooner than it takes to obtain 95% stream depletion with pumping. In other words, rate and volume of loss from a stream can't be any higher without pumping

than with pumping, all other parameters being equal. This means that without some additional source of recharge above what normally occurs, including natural wet and dry cycles, the total time required to achieve full recovery from the 10 years of groundwater substitution transfer pumping will be much longer than the 5 years cited in the Draft EIS/EIR (pages 3.3-80). For additional discussion of the stream depletion under natural variations in recharge and discharge see Maddock and Vionnet (1998).

Response

The analysis in Section 3.3 regarding the time required for groundwater recharges uses results from the SACFEM2013 groundwater model. This model is a calibrated model for the Sacramento Valley, and reflects local conditions rather than the conditions in an "ideal aquifer." The estimates of recharge timing were based on results from the best available tool.

Comment NG01-79

Comment

Another factor that isn't clearly acknowledged in the Draft EIS/EIR is the difference between the instantaneous depletion rate and cumulative volumetric depletion rate. The Draft EIS/EIR appears to focus on cumulative volumetric depletion in mitigation measure WS-1. However, the instantaneous stream depletion rate is probably more important when evaluating impacts to fisheries and stream habitat. The instantaneous rate of flow, instantaneous depth of flow and the corresponding instantaneous wetted perimeter of flow at any point in a stream are the best measures of habitat value to the fish and other water dependent species. The cumulative volume of stream depletion relative to the total pumped volume, on the other hand, can't be easily translated stream to instantaneous flow, water depth or wetted perimeter at a point in a stream because discharges having different hydrographs can result in the same total volume of flow. For example, if I estimate that the stream depletion during a 3- to 6-month period of groundwater substitution pumping will be a maximum of 1 cubic-foot-per-second, I can evaluate the significance of this change to the stream's habitat value using the stream's historic hydrograph and fluvial geomorphology. However, if I estimate that over the same period of pumping the stream will lose, at the end of pumping, a total 12 percent of the total volume pumped, I can't determine what changes will occur in the habitat function of the stream at a specific time and place. Perhaps, if I assume that the cumulative volume of stream depletion increases linearly with time, going from zero at time zero, to 12% at the end of pumping, then I could also assume that the instantaneous rate of stream depletion would also change linearly from 0% at the start to 24% of the pumping rate at the end of pumping. Remember that in this case the area under the instantaneous depletion curve is triangular, and therefore the maximum instantaneous depletion rate would be twice the total cumulative depletion rate. In reality, the ratio of instantaneous to volumetric depletion for the ideal Jenkins-SDF curves vary with pumping duration; the ratio is approximately 1.7:1 for time/SDF = 1 (Figure 1, Exhibit 11.1). Figure 1 also shows for the ideal curve that when the instantaneous depletion (eq. 1) is 24%, the volumetric depletion is 10% (eq. 2), a ratio of 2.4:1, and when eq. 1 is at 83%, eq. 2 is at 70%, a ratio of 1.19:1.

Response

The EIS/EIR analyzed streamflow depletion impacts using model results that indicate changes in flow per month, not changes in volume. The water supply section presents annual changes in volume supplied to CVP and SWP contractors; however, this information is based on the changes in monthly flows from the models. Appendix C provides more details.

Effects to fisheries and vegetation and wildlife are analyzed in Sections 3.7 and 3.8, respectively. These sections present changes in flow rates for potentially affected streams. These effects analyses are not based on volumetric changes.

Comment NG01-80

Comment

Mitigation measure WS-1 appears to be based on the cumulative volume of water pumped for each period of groundwater substitution transfers, not the instantaneous rate of stream depletion caused by the pumping. Mitigation measure WS-1 uses of a fixed value for compensating stream losses, which is inconsistent with the hydraulics of stream depletion. Because stream depletion actually increases with pumping time, mitigation measure WS-1 needs to specify the maximum duration of pumping allowed, ensuring that the depletion rate stays below the WS-1 value, ie., 12%. This maximum duration of pumping should be established based on impacts to stream habitat from instantaneous changes in stream flow, not the cumulative change in volume. The maximum duration of allowable pumping would change with the distance between the well and stream and with the diffusivity around each well because these control the rate of stream depletion. The well acceptance criteria in Table B-1 of Appendix B in the DTIPWTP suggests that some calculation has been made to establish the specified setback distances, but no methodology or calculation is given in the Draft EIS/EIR. The Draft EIS/EIR should document how the maximum allowable stream depletion rate, instantaneous and volumetric, and the associated maximum duration of pumping will be calculated for each well in the groundwater substitution transfer project.

Response

As discussed in response to Comment NG01-79, the modeling effort resulted in monthly changes in flow rates for surface water bodies. This information was the basis for the assessment of water supply impacts. As described in Section 3.1.2.4.1, streamflow depletion changes would not affect water supplies during wetter periods. During dry periods, the CVP and SWP would alter operations to continue to meet water quality and flow standards, which could affect water in storage or Delta exports. The model simulates these changes and determines whether the changes would affect water supplies.

Mitigation Measure WS-1 addresses these potential effects to water supplies, which were calculated based on changes in flows from the modeling effort. Mitigation Measure WS-1 does not identify a streamflow depletion factor of 12 percent. See Common Response 8 for more information about Mitigation Measure WS-1.

Comment NG01-81

Comment

Although the Draft EIS/EIR doesn't fully evaluate the potential stream depletion that may occur with the proposed 10-year groundwater substitution transfer project, another report prepared by CH2MHill (2010) and submitted to DWR provides additional analysis on the simulated impacts from the 2009 groundwater substitution transfers. The simulations of the 2009 transfer impacts were done using the SACFEM model, presumably an earlier version of the SACFEM2013 model. Figures 4, 5 and 6 in the CH2MHill 2010 report provide simulation graphs of stream depletion for three groundwater substitution transfer periods, 1976, 1987 and 1994 (Exhibits 11.3a to 11.3c). Graphs (a) to (c) in each figure appear somewhat like Figures B-5 and B-6 in Appendix B of the Draft EIS/EIR in that they show a depletion peak shortly after pumping starts, with a gradual decay following the cessation of pumping. Graphs (d) of Figures 4, 5 and 6 are not provided in the Draft EIS/EIR, but provide important additional information. These (d) graphs show the cumulative depletion for each of the three scenarios and are essentially the volumetric depletion curve of eq. 2 in Miller and Durnford's Figure 1 (Exhibit 11.1). These cumulative volume depletion curves are important because they show the time needed to fully recover from the three groundwater substitution transfer pumping events. For example, Figure 4(d) shows that recovery from the pumping event in 1976 is only approximately 60% after 25 years; much longer than the 5 years for 55% to 75% recovery stated in the Draft EIS/EIR (pages 3.3-70). For comparison, Figure 4(d) of CH2Mhill (2010) is plotted on Miller and Durnford's Figure 1 in Exhibit 11.1 by normalizing the values plotted in 4(d) by an effective Jenkins-SDF value of 2.4 years. Notice that for the simulated Figure 4(d) Jenkins-SDF curve, depletion initially occurs sooner than with an ideal aquifer, but then depletion slows. At 127 times the SDF, approximately 300 years, the depletion is at approximately 80%.

A point can be identified on each graph (d) where the volume of stream depletion is equal to 28%, the Jenkins-SDF point, and the time since pumping started measured. For example, in Figure 4(d) approximately at approximately 2.4 years after the beginning of pumping the volume of depletion reaches 28%. For Figure 5(d) the time to 28% is similar, estimated at 2.3 years. The time interval to 28% volumetric depletion in Figure 6(d) is significantly greater at an estimated 7.5 years. The results presented in both Figures 4 and 5 are from simulation of stream depletion during dry or critically dry years followed by normal or dry years, while the simulation scenario of Figure 6 is for a critical year followed by wet years. All of the cumulative (d) graphs are filtered for the Delta conditions. This may be the reason it takes longer for stream depletion to reach 28% during a wet period than dry period when one might expect the opposite because of the increased stream flow would provides more water for recharge.

Response

The referenced report was completed using a previous version of SACFEM, and the information contained in the report is outdated. The 2014 Draft EIS/EIR analysis uses the updated model, now named SACFEM2013. The 2014 Draft EIS/EIR includes similar analyses of modeling results, but with the updated model version. Section 3.1 provides an analysis of how streamflow depletion could affect water supply, and additional detail is included in Appendix C (see Appendix C for additional information).

Comment NG01-82

Comment

The point of this discussion is that the simulated stream depletions from the SACFEM2013 modeling can also be presented as cumulative depletion response curves that are normalized by the effective Jenkin-SDF time. The stream depletion can then be estimated for any rate or duration of pumping at an individual well when the stream depletion response curves given as percentages of both the maximum pumping rate and total volume pumped are normalized to the effective Jenkins-SDF (without the Delta conditions filter). Losses for different distances between the well and surface water feature can be roughly estimated without the need to run another simulation by adjusting the Jenkins-SDF curves by the ratio of the square of the different distances. Cumulative depletion for different pumping rates during and following the 10-year groundwater substitution transfer project can be estimated by the principle of superposition (Wallace and other, 1990; Barlow and Leake, 2012). As I discussed in my comment no. 15b, additional discussion is needed in the Draft EIS/EIR on how the amount of stream depletion for WS-1 is calculated. This discussion should include normalized stream depletion response curves for each groundwater substitution transfer well so that impacts from pumping can be estimated for different pumping durations and rates.

Response

While it may be possible to perform the analysis suggested by the commenter, it is unclear how the analysis would be used to analyze the environmental effects of the range of potential transfer activities under the Proposed Action. The simplified, analytical approach of the Jenkins-SDF suggested by the commenter was not used as it does not represent the best available science.

Comment NG01-83

Comment

Barlow and Leake (2012) provide an extensive discussion of the factors controlling stream depletion including several misconceptions (pages 39 to 45). Review of their discussion of stream depletion misconceptions is recommended as part of any revision of the Draft EIS/EIR. Barlow and Leake identified the following misconceptions regarding stream depletion (page 39): 1) Misconception 1. Total development of groundwater resources from an aquifer system is “safe” or “sustainable” at rates up to the average rate of recharge. 2) Misconception 2. Depletion is dependent on the rate and direction of water movement in the aquifer. 3) Misconception 3. Depletion stops when pumping ceases. 4) Misconception 4. Pumping groundwater exclusively below a confining layer will eliminate the possibility of depletion of surface water connected to the overlying groundwater system.

I recommend that the Draft EIS/EIR be revised to document stream depletion response curves for each groundwater substitution transfer well. These response curves should be normalized to the effective Jenkins-SDF value, given as a percentage of the pumping rate and total pumped volume, along with the distance between the well and the modeled surface water feature. Multiple stream depletion response curves should be provided, if necessary. I recommend that the Draft EIS/EIR be revised to review how the BoR-SDF value accounts for the variability in rate and volume of stream depletion. I recommend that the Draft EIS/EIR be revised to document how the maximum allowable instantaneous and volumetric stream depletion rates, and the associated maximum duration of pumping will be calculated for each well in the groundwater substitution transfer project to ensure that the BoR-SDR provides adequate flow mitigation. I recommend that the Draft EIS/EIR be revised to discuss how WS-1 addresses the common stream depletion misconceptions noted by Barlow and Leake (2012).

Response

The project team is familiar with USGS Circular 1376, Streamflow Depletion by Wells – Understanding and Managing the Effects of Groundwater Pumping on Streamflow by Barlow and Leake. SACFEM2013 results are consistent with the physical effects of groundwater pumping on streamflow as described in Barlow and Leake. The simplified, analytical approach of the Jenkins-SDF suggested by the commenter was not used as it does not represent the best available science.

Comment NG01-84

Comment

Measurement of Stream Seepage in Real Time. 22. Barlow and Leake (2012) state that methods for determining the effects of pumping on stream flow follow two general approaches: (1) collection and analysis of field data, and (2) analytical and numerical modeling (page 50). The Draft EIS/EIR states in the DTIPWTP that stream depletion can’t be measured in real time (page 33) and instead relies on simulations of groundwater pumping to determine impacts to surface waters. As discussed in my comment no. 15b, the Draft EIS/EIR also states that monitoring of surface water-groundwater interaction is part of mitigation measures WS-1 and GW-1. The statement that stream depletion measurements, ie., stream seepage rates, surface water depths, and surface flows, can’t be done in “real time” conflicts with scientific literature. Measurements of stream flow and water depth are fundamental to stream surveys. Although measurement of the seepage rate from or into a stream is done less often and is generally more difficult than other direct surface water measurements, procedures for making these measurements are well documented (Barlow and Leake, 2012; Rosenberry and LaBaugh, 2008; Zamora, 2008; Stonestrom and Constantz, ed., 2003; Constantz, 2008; Kalbus and others, 2006). Linking field measurements to changes in stream flow and seepage to adjacent groundwater pumping is made more difficult because of the lag between the start of pumping and stream response, damping of the pumping response with increases in distance between the well and measured surface water body, and the variation in seepage rate with the increases in pumping time or pumping cycles. Measurements of surface water and groundwater flow are also difficult because of inherent measurement errors that are sometimes greater than the change in flow being sought. Barlow and Leake (2012) discuss the measurement of stream depletion and conclude that: Two general approaches are used to monitor streamflow depletion: (1) short-term field tests lasting several hours to several months to determine local-scale effects of pumping from a specific well or well field on streams that are in relative close proximity to the location of withdrawal and (2) statistical analyses of hydrologic and climatic data collected over a period of many years to test correlations between long-term changes in streamflow conditions with basinwide development of groundwater resources. Direct measurement of streamflow depletion is made difficult by the limitations of streamflow-measurement techniques to accurately detect a pumping-induced change in streamflow, the ability to differentiate a pumping-induced change in streamflow from other stresses that cause streamflow fluctuations, and by the diffusive effects of a groundwater system that delay the arrival and reduce the peak effect of a particular pumping stress. (Page 77).

The Draft EIS/EIR provides the following statements in the DTIPWTP regarding groundwater substitution transfers, which are therefore part of mitigation measure GW-1: 1)… must account for … the extent to which transfer-related groundwater pumping decreases streamflow (resulting from surface water-groundwater interaction), and the timing of those decreases in available surface water supply. (page 25); 2) Project Agencies are developing tools to more accurately evaluate the impacts of groundwater substitution transfers on streamflow. These tools may be implemented in the near future and may include a site-specific analysis that could be applied to each transfer proposal. (page 33); 3) Water transfer proponents transferring water via groundwater substitution transfers must establish a monitoring program capable of identifying any adverse transfer related effects before they become significant. (page 34);

The objectives of the DTIPWTP groundwater substitution transfer-monitoring program include: 4) Determine the extent of surface water-groundwater interaction in the areas where groundwater is pumped for the transfer; 5) Determine the direct effects of transfer pumping on the groundwater basin, observable until March of the year following the transfer; 6)Assess the magnitude and potential significance of any effects on other legal users of water, instream beneficial uses, the environment, and the economy. (page 34).

All of these statements and monitoring objectives imply that measurement of impacts to surface water from groundwater substitution transfer pumping is possible. While measurement of stream depletion is complex and problematic, it is possible. The conflicting statements in the Draft EIS/EIR that “real time” measurements can’t be done while apparently including a requirement for field monitoring of the effects of stream depletion in mitigation measures WS-1 and GW-1 need further explanation.

I recommend that the Draft EIS/EIR be revised to evaluate and discuss the methods, techniques and procedures available for monitoring and measuring the rate, volume and impacts of stream depletion due to groundwater substitution transfer pumping. The revised Draft EIS/EIR should provide specific mitigation measures, procedures and methods for monitoring groundwater substitution transfer pumping impacts on surface water features, including the frequency of monitoring and reporting.

Response

See response to Comment NG01-49 for information on why real-time streamflow monitoring cannot estimate streamflow depletion because without-transfer conditions are not known. Also note that the Draft Technical Information for Preparing Water Transfer Proposals is not part of the Long-Term Water Transfer EIS/EIR, as described in response to Comment NG01-72.

See Common Response 7 for more information on the streamflow depletion factor.

Comment NG01-85

Comment

Other Available Data to Consider in the Establishing Baseline Conditions 23. The Draft EIS/EIR for the 10-year long-term water transfer project should provide a review of the existing technical documents that describe historic environmental, surface water and groundwater conditions in the Sacramento Valley. The information in these technical documents is critical for establish an accurate and complete environmental baseline and for evaluating the potential impacts from future water transfers. Exhibit 12.1 provides an annotated bibliography provided by researchers with AquAlliance (Nora and Jim) of some of the available technical reports on groundwater resources in the Sacramento Valley. In addition to creating a complete bibliography of relevant technical reports, the Draft EIS/EIR should provide an index map showing the areas or locations covered by each report should be developed. For an example of an index map, see the 1:250000 scale regional geologic map sheets produced by the California Geological Survey.

Response

See Common Response 4.

Comment NG01-86

Comment

Other information is likely available from local government agencies that would document the current condition of the groundwater basin both quantity and quality. For example, Exhibit 12.2 has a list provide by B. Smith, a researcher with AquAlliance, of recently well permits issued since January 1, 2009 for wells that have gone dry in Shasta County. A GIS should be used to plot the locations of the wells that have gone dry. The locations of these dry wells should then be compared to the current groundwater levels, past groundwater substitution transfer pumping areas, and the proposed 10-year long-term project pumping areas. This type of spatial analysis would help to establish an accurate baseline on groundwater elevations and impacts on existing wells, and provide the foundation for assessing the potential impacts from the 10-year long-term groundwater substitution transfer pumping. Other relevant information on baseline conditions in the 10-year Transfer Project area can be found in the Integrated Regional Water Management Plans for the Northern Sacramento Valley Basin, the American River Basin, Yuba County, and Yolo County, see my comment no. 6.

I recommend the Draft EIS/EIR be revised to provide an annotated bibliography and index map(s) of all documents that are relevant to proposed 10-year long-term water transfer project and describe or provide data on the historic and environmental, surface water and groundwater baseline conditions in the Sacramento Valley. I also recommend the Draft EIS/EIR be revised to provide information from local and regional agencies on the conditions of wells within their jurisdictions covering at least the last 10 years. This local information should include, if available, replacement well permits issued for dry wells, complaints or treatment systems installed because of poor water quality, and damage to infrastructure from subsidence or settlement. I recommend this information be mapped and compared to areas of past groundwater substitution transfer pumping, areas of known groundwater level depression, and the pumping area for the proposed 10-year project.

Response

Information has been added to Section 3.3.1.3. Information from DWR on wells going dry has been documented in this section. See Common Response 4 and response to Comment NG01-69.

Comment Letter NG02, ECONorthwest, AquAlliance, California Sportfishing Protection Alliance, Aqua Terra Aeris Law Group

Comment NG02-1

Comment

The US Bureau of Reclamations and San Luis & Delta-Mendota Water Authority released the Public Draft of the Long-Term Water Transfers Draft Environmental Impact Statement/Environmental Impact Report (LTWT) in September 2014. The purpose of the LTWT, as we understand, is to evaluate the potential impacts of three proposed water-transfer alternatives, as well as a no action alternative. AquAlliance asked ECONorthwest to critique and provide written comments on the LTWT.

In general, the analysis described in the LTWT suffers from significant omissions and errors. These omissions and errors matter. As written the report provides stakeholders and decisions makers with a biased and incomplete description of the environmental and economic consequences of water transfers. In the following sections of this report we describe our critiques in detail. Our major critiques include the following.

Response

Responses have been provided to all detailed comments in the submitted comment letter. This comment is assumed to be an introductory comment that does not require a substantive response.

Comment NG02-2

Comment

The LTWT ignores relevant background information about the affected environment that would have helped inform the analysis. The LTWT provides a cursory description of the relevant affected environment that paints an incomplete picture of the context within which water transfers would happen. A more complete, accurate and up-to-date description would have included, for example: information from the many recent reports on California's climate and groundwater conditions; current data on water transfers; and, a market analysis of water prices, prices for agricultural commodities and how price changes influence the number and volumes of water transfers. As such, the deficient description is the shaky foundation upon which a lacking analysis rests. The resulting effort yields questionable results regarding the likely future frequency and amounts of water transfers and their environmental and economic consequences.

Response

As described in CEQA Section 15125(a), "The description of the environmental setting shall be no longer than is necessary to an understanding of the significant effects of the proposed project and its alternatives." This EIS/EIR included substantial information about the affected environment/environmental setting for each resource area in Section 3. Commenters suggested additional information that may help readers understand the potential impacts of the action alternatives, and this information has been included where relevant. More details are included in responses to comments that suggested specific information to include. Some of the examples cited (such as recent reports on groundwater conditions) may not have been available during preparation of this document and have been added to the Final EIS/EIR. Current data on water transfers is included in Section 1.4.2.

Comment NG02-3

Comment

The LTWT relies on outdated and incomplete data. The analysis described in the LTWT relies on obsolete data for certain key variables and ignored other relevant data and information. For example, the analysis assumes a price for water that bears no resemblance to the current reality. It also ignored relevant research results on the impacts of groundwater pumping on stream flow depletion and the current status of groundwater levels as provided by monitoring wells. The water transfers at issue in the LTWT would not happen in an economic vacuum. Growers and water sellers and buyers react to changing prices and market conditions. The analysis described in the LTWT, however, is silent on these forces and how they would influence water transfers.

Response

The baseline information included in the EIS/EIR represents the most recent available information at the time the draft was developed. The price of water reflects a price of past water transfers from a series of years before 2014. The analysis has been updated with a higher price to incorporate the most recent price paid for water transfers. Section 3.3 has been updated with more extensive existing conditions information on groundwater levels. See Common Responses 4 and 5. Buyers and sellers do respond to varying market conditions and negotiate prices and quantities each year. The quantities in the EIS/EIR reflect the maximum potential quantities that can be transferred, though the actual quantities are likely to be lower based on demand, seller interest, and available capacity to pump through the Delta.

Comment NG02-4

Comment

The LTWT underestimates negative impacts on the regional economy in the sellers area. The LTWT acknowledges that negative economic impacts would be worse if water transfers happen over consecutive years. The analysis, however, estimates impacts for single-year transfers, ignoring the data on the frequency of recent consecutive-year transfers. The analysis also fails to address the extent to which water transfers cause economic harm to water-based recreational activities.

Response

NEPA does not require a judgment of significance or mitigation measures for economic effects. CEQA does not consider economic or social change resulting from a project as adverse effects on the environment. Still, as stated in Section 3.10, cropland idling transfers under the Proposed Action are the lowest priority transfers for buyers and would not occur every year in which transfers are implemented. The evaluation in Section 3.10 on regional economies quantifies the effects of a maximum idling action in a single year. During review of the results in response to this comment, the analysis was revised. The updated results reflect greater economic impacts, but continue to be a small percentage of the regional economy and, thus, the relative effect is similar to the previous results. Section 3.10 states, "It is not likely that all the acreage would be idled in a single year. Since the maximum crop acreage would not be idled in most years, the average annual effect would be even less." Text has been added to assessment methods and the regional economic evaluations to further explain how the economic modeling results relate to consecutive year transfers. Section 3.15 evaluated impacts to recreation and did not find any significant impacts; therefore, there would be no indirect effect to economies from changes in recreation and these effects were not evaluated in Section 3.10.

Comment NG02-5

Comment

The LTWT finds significant negative effects but the vague and incomplete proposed monitoring and mitigation plans would not address these effects. The LTWT proposed both a monitoring and mitigation program for significant negative impacts. Implementing these programs would take planning, effort and financial resources on the part of sellers, injured third parties, and regulatory agencies. The LTWT does not include these costs. The monitoring program is vague and depends on potential sellers implementing the program. This conflict of interest pits financial gain from water sales against complete and impartial monitoring efforts. This opens the door to lax, biased, or incomplete monitoring, which could lead to negative environmental and economic consequences for third parties. The monitoring program includes monitoring subsidence, however, the program is vague on requirements and what amount of subsidence would trigger a halt in water transfers. Injured third parties would bear the costs of bringing to the sellers' attention harm caused by groundwater pumping. The analysis described in the LTWT assumes that disagreements regarding third-party damages would be settled cooperatively between third parties and sellers, without presenting evidence substantiating such an optimistic assumption. The LTWT is silent on the economic consequences of sellers and injured third parties not cooperatively agreeing on harm and compensation.

Response

See Common Responses 6, 7, and 8.

Comment NG02-6

Comment

The LTWT ignores the environmental externalities and economic subsidies that water transfers support. The LTWT lists Westlands Water District as one of the CVP contractors expressing interest in purchasing transfer water. The environmental externalities caused by agricultural production on Westlands are well documented, as are the economic subsidies that support this production. To the extent that the water transfers at issue in the LTWT facilitate agricultural production on Westlands, they also contribute to the environmental externalities and economic subsidies of that production. The LTWT is silent on these environmental and economic consequences of the water transfers.

Response

See response to Comment NG02-51.

Comment NG02-7

Comment

The LTWT underestimates the cumulative effects of water transfers. Cumulative effects analyses under NEPA and CEQA are intended to identify impacts that materialize or are compounded when the proposed action is implemented at the same time as or in conjunction with other actions. The LTWT addresses cumulative effects for each resource area and provides a global description of the methods and actions considered for analysis in each resource area. The analysis, however, provides cursory discussion of potential cumulative effects for the regional economy, and ignores the full range of possible cumulative outcomes associated with the proposed transfer

Response

Cumulative effects to regional economies are described in Section 3.10.4. The analysis uses both a project and projection approach to evaluate cumulative effects. These approaches are described in Chapter 4. Use of both approaches incorporates consideration of a broad range of potential cumulative projects that could impact regional economies, as described in Section 3.10.4.

Comment NG02-8

Comment

The US Bureau of Reclamations (BOR) and San Luis & Delta‐Mendota Water Authority (SLDMWA) released the public draft of the Long‐Term Water Transfers Draft Environmental Impact Statement/Environmental Impact Report (LTWT) in September 2014. The LTWT covers water transfers that would happen between 2015 through 2024. Because the transfers would use federal and state infrastructure, the LTWT must comply with NEPA and CEQA guidelines. BOR is the lead agency regarding NEPA requirements, and SLDMWA is the lead agency for CEQA requirements. [Footnote: LTWT, page 1-1, 2-1.]

The premise underlying the proposed water transfers is that sellers, mostly in the Sacramento Valley, would idle cropland, switch to less water---‐intensive crops, and/or substitute groundwater for surface water, and send the surface water they would otherwise have used through the Bay Delta to buyers in the south.

The proposed transfers would happen within a context of environmental conditions that both highlight the increasing demand for water throughout California and raise concerns regarding the environmental and economic effects of the water transfers at issue in the LTWT. These conditions include: 1.Current drought conditions of historic proportion coming on the heals of consecutive dry years. 2.Increasing concerns over the demands on groundwater and groundwater conditions throughout the state, including in the Sacramento Valley. 3.Increasing competition for water from all user groups including agricultural, municipal and industrial users, and environmental requirements that help protect habitats and water quality.

Within this context, regulatory agencies face increasing demands from stakeholders for transparent decisions that rely on the best available science and information when balancing competing demands. For example, the relevant NEPA requirements for the LTWT analysis include: “Rigorous exploration and objective evaluation of all reasonable alternatives, …” [Footnote: LTWT page 2-1]

AquAlliance asked ECONorthwest to review the LTWT and provide comments on the extent to which the analysis described in the report fulfills the NEPA requirement. We describe the results of our initial review and critique of the document in this report. The relatively short public comment period limited the extent of our review. Should the comment period be extended or reopened, we may expand and revise our comments.

The remainder of our report is as follows. In the next section, Section 2, we comment on the LTWT’s incomplete description of the affected environment within which the water transfers would happen. We cite sources with relevant information that if included would yield a more complete and comprehensive description of the affected environment. In Section 3 we highlight deficiencies in the data and analysis described in the LTWT. For example, we note that the model relies on outdated prices for water and agricultural commodities—two central components of the analysis. The analysis also estimates that water transfers would happen in a static environment where water prices and commodity prices remain fixed. These conditions do not reflect the dynamic reality of water demands and use. In Section 4 we note instances in which the analysis described in the LTWT underestimates the impacts of water transfers on the regional economy in the source‐water areas. In Section 5 we draw attention to some of the deficiencies of the proposed monitoring and mitigation programs that the LTWT’s authors claim will adequately address any negative effects of the transfers. These deficiencies include the inherent conflicts of interests in the programs, excluding the costs of the programs, and vague and ill‐defined critical components of the programs. In Section 6 we describe some of the environmental and economic externalities associated with the use of the transferred water. In Section 7, we list some of the deficiencies in the analysis of cumulative effects. For example, the analysis ignores the impacts of transfers that would happen in addition to those at issue in the LTWT.

Response
The Lead Agencies are unable to accommodate the request for additional review time beyond CEQA and NEPA requirements. Responses have been provided to all detailed comments in the submitted comment letter. This comment is assumed to be an introductory comment that does not require a substantive response.

Comment NG02-9

Comment
2 The LTWT ignores relevant background information about the affected environment that would have helped inform the analysis The LTWT provides a cursory description of the relevant affected environment that paints an incomplete picture of the context within which water transfers would happen. A more complete, accurate and up-to-date description would

have included, for example: information from the many recent reports on California's climate and groundwater conditions; current data on water transfers; and, a market analysis of water prices, prices for agricultural commodities and how price changes influence the number and volumes of water transfers. As such, the deficient description is the shaky foundation upon which a lacking analysis rests. The resulting effort yields questionable results regarding the likely future frequency and amounts of water transfers and their environmental and economic consequences. Specific concerns regarding the LTWT's incomplete description of the affected environment in the Sacramento Valley include the following.

Response

See response to Comment NG02-3.

Comment NG02-10

Comment

Incomplete description of current climate conditions. According to the California Department of Water Resources (DWR), 2013 was the driest year on record for many parts of the state. [Footnote: California Department of Water Resources (DWR). 2014a. Public Update for Drought Response Groundwater Basins with Potential Water Shortages and Gaps in Groundwater Monitoring. April 30. Page ii.] Such drought conditions are one reason given for why growers and municipal and industrial (M&I) users in the south would purchase water from other parts of California. The analysis described in the LTWT fails to acknowledge, however, that other parts of the state, including the Sacramento Valley, also feel the effects of drought. How agricultural and M&I water users in the north respond to recent drought conditions would affect water transfers. The authors of the LTWT exclude these factors from their analysis.

For example, in a recent letter to the BOR, the Glenn-Colusa Irrigation District (GCID) indicated they were developing a groundwater supplemental supply program and that developing this program takes priority over participating in water transfers as described in the LTWT. "GCID's position is that it will pursue, as a priority, the proposed Groundwater Supplemental Supply Program over any proposed transfer program within the region, including Reclamation's Long-Term Water Transfer Program (LTWTP)." "… It is important to underscore that GCID would prioritize pumping during dry and critically dry water years for use in the Groundwater Supplemental Supply Program, and thus wells used under that program would not otherwise be available for USBR's LTWTP." [Footnote: Bettner, T. 2014. Letter to Brad Hubbard, Bureau of Reclamation re Draft EIS/EIR on Proposed Long‐Term Water Transfer Program. Glenn‐Colusa Irrigation District. October 14. Pages 1 and 3.]

GCID's focus on its own groundwater program over BOR water transfers is notable because the LTWT lists GCID as a potential seller with the largest volume of water for sale, 91,000 af. [Footnote: LTWT, Table 2-4, page 2-14] GCID's reasons for pursuing its groundwater supply program include concerns over water availability during dry years. "The primary objective is to develop a reliable supplemental water source for GCID during dry and critically dry years. The proposed goals are as follows: 1. Increase system reliability and flexibility 2. Offset reductions in Sacramento River diversions by GCIS during drought years to replace supplies for crops and habitat 3. Periodically reduce Sacramento River diversions to accommodate fishery and restoration flows 4. Protect agricultural production" [Footnote: Bettner, 2014, page 2]

Response

The range of potential transfer activities evaluated in this EIS/EIR consists of voluntary transactions between willing buyers and sellers that may or may not occur over the 10-year period analyzed in the document, based on a host of factors that vary from year to year. See responses to comments in letters LA05 and LA06 for more information on potential transfers from Glenn-Colusa ID. See Common Response 4 for more information about existing conditions for groundwater resources.

Comment NG02-11

Comment

A related point is that the LTWT fails to discuss the possibility that current climate and water conditions may represent a new benchmark rather than a deviation from past trends. The increasing number of years with water transfers (described below), and reports on climate change and its impacts on water conditions, are two arguments in support of exploring this point. For example, according to a report commissioned by the Northern California Water Association (NCWA), “This year [2014] we face unprecedented drought conditions, following a decade of relatively dry years and increased demands on our groundwater resources. These increased demands have two principal causes. The reduced availability of surface water during dry years brings a predictable shift towards greater use of groundwater. The second is expanding and intensifying agricultural land use within the Sacramento Valley, together with increasing urban water demands, leading to increased reliance on groundwater even in ‘normal’ years.” [Footnote: Davids Engineering, Macaulay Water Resources, and West Yost Associates (DMW). 2014. Sacramento Valley Groundwater Assessment Active Management – Call to Action. Prepared for Northern California Water Association. June. Page 2.]

Response

See Common Response 5.

Comment NG02-12

Comment

Fails to consider concerns regarding the oversubscription of water resources. The analysis described in the LTWT fails to acknowledge the problem of supporting water transfers using “paper water,” or oversubscribed water in the Sacramento Valley. A report on water transfer issues in California describes one aspect of this problem. “The inability of interested parties to agree on the volume of transferable water associated with the short-term fallowing of agricultural lands has caused substantial controversy and delays in approving certain water transfer proposals. The primary issue for interested parties is whether a fallowing-based transfer proposal would actually increase the burden on the CVP and SWP to maintain water quality and flow conditions in downstream portions of the Sacramento River and Delta because upstream transfer proponents were allowed to transfer what might prove to be ‘paper’ water.” [Footnote: The Water Transfer Workgroup. 2002. Water transfer issues in California. Final Report to the California State Water Resources Control Board. June, page 20.]

Stakeholders in the Sacramento Valley concerned about this problem researched the extent of paper water and found that rights to water significantly exceed available supply. Testimony by the California Water Impact Network submitted to the State Water Resources Control Board concluded that, “The ratio of total consumptive use claims to average unimpaired flow in the Sacramento River Basin is about 5.6 acre-feet of claims per acre-foot of unimpaired flow.” [Footnote: Stroshane, T. 2012. Testimony on water availability analysis for Trinity, Sacramento, and San Joaquin River basins tributary to the Bay‑Delta Estuary. October 26. California Water Impact Network. For Workshop #3 Analytical Tools for Evaluating the water Supply, Hydrodynamic, and Hydropower Effects of the Bay‑Delta Plan November 13 and 14, 2012. Page 11.] Thus, claims on water in the Sacramento Valley significantly exceed the available supply.

Response

As described in Section 2.3.2.1, "To make water available, the seller must take an action to reduce consumptive use or use water in storage. Water transfers must be consistent with State and Federal law, as discussed in Chapter 1. Transfers involving water conveyed through the Delta are governed by existing water rights, applicable Delta pumping limitations, reservoir storage capacity and regulatory requirements." By definition, water transfers using "paper water" accounting would not occur. See Common Response 14.

Comment NG02-13

Comment

Incomplete description of current groundwater conditions. The LTWT excluded current information on groundwater conditions in the Sacramento Valley. This information includes concerns regarding historically low groundwater levels in certain areas of the Sacramento Valley, related concerns over subsidence caused by depleted groundwater, and a lack of groundwater monitoring information.

According to the DWR, groundwater levels are decreasing through out California, including in the Sacramento Valley. Groundwater levels decreased since the spring of 2013, and “notably” since the spring of 2010. [Footnote: DWR, 2014a, page ii.] A related point, according to the DWR, is that there are “significant” gaps in groundwater monitoring data for areas throughout the state, including the Sacramento Valley. [Footnote: DWR, 2014a, page ii.] There’s also a lack of understanding regarding groundwater recharge and interactions between surface and groundwater in the Sacramento Valley. According to the NCWA report, “[G]roundwater changes can take many years to become apparent, and we have not yet been able to measure with certainty the long‑term impacts of the current level of groundwater use as it affects our measures of sustainability.” “Persistently declining groundwater levels in many areas of the Sacramento Valley over the past decade reveal that groundwater discharge exceeds recharge. Simply put: if the objective is to stem or reverse the trend, the groundwater balance must be adjusted either by putting more water into the ground or taking less out.”[Footnote: DMW, 2014, page 10]

Response

See Common Response 4 and response to Comment NG01-69.

Comment NG02-14

Comment

According to the DWR, the Sacramento River hydrologic region has 23 groundwater basins ranked “high” or “medium” as described by the CASGEM groundwater basin prioritization study. These rankings describe a groundwater basin’s importance in meeting demands for urban and agricultural water use. The San Joaquin River hydrologic region has nine “high,” or “medium” ranked basins. [Footnote: DWR, 2014b. California Groundwater Elevation Monitoring Basin Prioritization Process. June. Page 5.]

A recent report from Glenn County indicates that current groundwater levels in the county are at the lowest levels recorded going back to the start of record keeping in the 1920s. “Data in reference to groundwater levels has been collected from both private and dedicated monitoring wells located within Glenn County, in some cases dating as far back as the 1920’s. The lowest levels in these wells were most frequently associated with measurements from the 1976-77 monitoring period, which coincided with one of the more severe droughts in California’s history. In the years following the 76-77 drought, groundwater levels often approached these historic lows but rarely fell below them. However, recent (2012-13) data indicate levels in many wells have declined below those historic thresholds and are now at the lowest levels observed since monitoring began.” [Footnote: Glenn County Water Advisory Committee, Ad-hoc Committee. 2014. Report on Groundwater Level Declines in Western Glenn County. May 6. Page 5.] “Readily available monitoring data obtained through DWR’s California Statewide Groundwater Elevation Monitoring (CASGEM) is available for 100 wells, and of those 100, 21 still show their lowest levels as occurring in 1977, while 21 had an all-time low water surface elevation level in 2013, and an additional 15 wells reached their lowest point in 2009-2012. Therefore, one out of every five monitored wells in the area was at its lowest-ever recorded level in 2013, and one out of every three wells monitored in the area was at its lowest-ever recorded level between 2009 and 2013.” [Footnote: Glenn County Water Advisory Committee, Ad-hoc Committee. 2014. Report on Groundwater Level Declines in Western Glenn County. May 6. Page 6.]

Response

See Common Response 4 and response to Comment NG01-69.

Comment NG02-15

Comment

Regarding the limited groundwater modeling described in the LTWT, consulting hydrologist Kit Custis comments, “Because the groundwater modeling effort [described in the LTWT] didn’t include the most recent 11 years record, it appears to have missed simulating the most recent periods of groundwater substitution transfer pumping and other groundwater impacting events, such as recent changes in groundwater elevations and groundwater storage [citation omitted], and the reduced recharge due to the recent periods of drought. Without taking the hydrologic conditions during the recent 11 years into account, the results of the SACFEM2013 model simulation may not accurately depict current conditions or predict the effects from the proposed groundwater substitution transfer pumping during the next 10 years.” [Footnote: Custis, K. 2014. Letter to Barbara Vlamis, November 10. RE: Comments and recommendations on U.S. Bureau of Reclamation and San Luis & Delta-Mendota Water Authority Draft Long-Term Water Transfer DRAFT EIS/EIR, dated September 2014. Page 5.]

Response

See Common Response 5.

Comment NG02-16

Comment

The DWR reports that areas of the Sacramento Valley are at risk for subsidence from depleted groundwater. Most of the groundwater basins susceptible to future subsidence are also ranked “high” and “medium” priority by the CASGEM groundwater basin prioritization analysis. According to the DWR and based on data from 2008 through 2014, approximately 36 percent of long-term wells surveyed in the Sacramento Valley are at or below the historical spring low levels. Another measure indicates that 50 percent of groundwater levels in 18 groundwater basins in the Sacramento Valley are at or below historical spring low levels. [Footnote: DWR, 2014c. Summary of Recent, Historical, and Estimated Potential for Future Land Subsidence in California. Pages 9, 11.] A white paper by a consulting engineer on groundwater use and subsidence in the Sacramento Valley noted that subsidence may happen years after groundwater pumping and that real-time monitoring of groundwater pumping “will generally tend to underestimate the long-term settlement of the ground surface.” [Footnote: Mish, D. 2008. Commentary on Ken Loy GCID Memorandum. Page 4.]

Subsidence can cause substantial economic harm. According to a report by consulting engineers studying subsidence in California, “Land subsidence has been discovered in many areas of the state, causing billions of dollars of damage. Impacts from subsidence fall into the following categories: 1. Loss of conveyance capacity in canals, streams and rivers, and flood bypass channels; 2. Diminished effectiveness of levees; 3. Damage to roads, bridges, building foundations, pipelines, and other surface and subsurface infrastructure; and 4. Development of earth fissures, which can damage surface and subsurface structures and allow for contamination at the land surface to enter shallow aquifers.” [Footnote: Borchers, J. and M, Carpenter. 2014. Land Subsidence from Groundwater Use in California. Luhdorff & Scalmanini Consulting Engineers. Support provided by the California Water Foundation. April. Page ES-2.]

Response

Section 3.3 documents areas within the Central Valley where subsidence has been noticed, or which have a higher potential for subsidence based on geology or groundwater levels decreasing below historic lows. See Common Response 7.

Comment NG02-17

Comment

Subsidence in Colusa, Yolo and Solano counties in the Sacramento Valley during the 1976-77 drought caused widespread well casing damages, which made some wells unusable. [Footnote: Borchers, J. and M. Carpenter. 2014. Land Subsidence from Groundwater Use in California. Luhdorff & Scalmanini Consulting Engineers. Support provided by the California Water Foundation. April. Page ES-3.] A recent series of reports by the Stanford Woods Institute for the

Environment and the Bill Lane Center for the American West at the Water in the West center at Stanford University describe the subsidence concerns regarding groundwater pumping in California, including the Sacramento Valley. [Footnote: Water in the West. 2014. Understanding California's Groundwater. waterinthewest.stanford.edu.] Custis notes the types of infrastructure in the Sacramento Valley susceptible to damage from subsidence, "There are a number of critical structures in the Sacramento Valley that may be susceptible to settlement and lateral movement. These include natural gas pipelines, gas transfer and storage facilities, gas wells, railroads bridges, water and sewer pipelines, water wells, canals, levees, other industrial facilities." [Footnote: Custis 2014, Page 28]

Response

Section 3.3 evaluates effects of subsidence in Colusa, Yolo, and Solano Counties. See Common Response 7.

Comment NG02-18

Comment

In response to concerns over groundwater use and related issues, the California legislature recently passed, and Governor Brown signed into law, the Sustainable Groundwater Management Act (Act). [Footnote: opr.ca.gov/s_groundwater.php] The Act will affect groundwater users including those supplying water transfers. The LTWT makes no mention of how the Act could affect the context within which water transfers would happen, or the transfers themselves. This is a significant omission.

Response

Section 3.3.1.2 has been revised to include a summary of the Sustainable Groundwater Management Act.

Comment NG02-19

Comment

Carriage Water Costs. The LTWT assumes that required carriage water component of water transfers from the Sacramento River will account for 20 percent of transferred water. "Transfers from the Sacramento River assume a 20 percent carriage water adjustment to maintain Delta salinity." [Footnote: LTWT page B-18.]

Recent data on the percentage of required carriage water are higher than the 20-percent assumption in the LTWT. For example, the DWR describes a recent carriage water percentage of 30. "Another cost related to transferring water is carriage water… For the Sacramento River, this has generally been about 20 percent of the transfer water… It is worth noting, however, that in 2012 and 2013 carriage water losses for the Sacramento River were as high as 30 percent of transfer water." [Footnote: California Department of Water Resources. 2013. California Water Plan 2013 Update. Bulletin 160-13. Volume 3 Resource Management Strategies. Pages 8-9.]

To the extent that carriage water requirements exceed 20 percent, the LTWT overestimates the amount of water delivered south through the Bay Delta to water purchasers, and thus the economic benefits of these transfers.

Response

The description of carriage water in Section 2.3.2.4 has been revised for clarity. Carriage water includes water to maintain water quality in the Delta as well as conveyance losses, as described in the comment. The precise amount of carriage water is calculated during the transfer based on real-time monitoring information in the Delta. The typical amount for transfers from the Sacramento Valley is about 20 to 30 percent, and the typical amount for transfers from the San Joaquin Valley is about 10 percent.

Comment NG02-20

Comment

Data and modeling ignore recent trends in water transfers. Using water data from 1970 through 2003, the LTWT estimates that future water transfers will happen on average 12 out of 33 years. [Footnote: LTWT, page 3.3-60 and -61.] Twelve of 33 years is a transfer probability of approximately 36 percent. By ignoring water data for years after 2003, the analysis excludes relevant information on the more recent dry trend and current historical drought. For example, Table 1-3 on page 1-17 of the LTWT lists years and amounts of water transfers from 2000 through 2014. This data shows that water transfers happened in 9 of the previous 15 years, or a transfer probability of 60 percent, almost double that used in the LTWT. For years after 2003, transfers happened in eight out of 11 years, for a transfer percent of approximately 73.

Other sources of data on the frequency of water transfers do not support the LTWT's water-transfer results. For example, a report by the Western Canal Water District (WCWD) includes a table showing water transfers from the Sacramento Valley through the Bay Delta from 2001 through projected 2010. The information in this table shows transfers happening in eight out of ten years. [Footnote: Western Canal Water District (WCWD). 2009. Initial Study and Proposed Negative Declaration for Western Canal Water District 2010 Water Transfer Program. Western Canal Water District, Richvale, California. January. Page 25.] A similar report by WCWD in 2014 included a table of water transfers for years 2006 through projected 2014. The data in that table shows transfers happening during seven of nine years. [Footnote: WCWD. 2014. Initial Study and Proposed Negative Declaration for Western Canal Water District 2014 Water Transfer Program. Western Canal Water District, Richvale, California. February. Page 25.] Taken together, these two reports show water transfers from the Sacramento Valley south through the Bay Delta in 11 out of 14 years between 2001 through 2014. This works out to a transfer probability of approximately 79 percent.

These results demonstrate two important points. First, using a transfer probability of 36 percent greatly underestimates the actual years that transfers happened post-2003, the last year of data in the LTWT analysis. Underestimating transfers leads to underestimating the environmental and economic effects of the transfers.

Response

See Common Response 5.

Comment NG02-21

Comment

Second, the data upon which conclusions in the LTWT rest do not depict actual conditions post-2003. That is, by relying on flawed or incomplete data, models that use this data produce flawed or biased results. The estimated transfer frequency (36 percent of years), does not match the recent actual transfer frequency (60, 73, or 79 percent, depending on the source and years included).

At an October 21st, 2014 public hearing in Chico, California on the LTWT, a consultant working with BOR on the LTWT commented on the water model and the 1970 through 2003 data upon which the model relies. In response to questions about why the model did not include data from the previous ten years, or why the period of analysis was not extended out to the current drought situation, the consultant replied that the modeling tools "are not up-to-date." [Footnote: Transcript of October 21, 2014 public hearing in Chico, California on the LTWT EIS/EIR; Hacking, H. 2014. "Sacramento Valley water transfer idea leaves locals fuming. ChicoER News, October 22, 2014, http://www.chicoer.com.]

Response

See Common Response 5.

Comment NG02-22

Comment

According to resource agencies in California, variable, even extreme climate and rainfall conditions are the norm. Climate change is projected to make these trends worse and increase prediction uncertainties. The recent Bay Delta Conservation Plan describes this uncertainty, "Variability and uncertainty are the dominant characteristics of California's water resources." [Footnote: California Department of Water Resources (DWR). 2013. Bay Delta Conservation Plan. Public Draft. November Sacramento, CA. Prepared by ICF International (ICF 00343.12). Sacramento, CA. Page 5-1.] "Precipitation is the source of 97% of California's water supply. It varies greatly from year to year, by season, and by where it falls geographically in the state. With climate change, the state's precipitation is expected to become even more unpredictable." [Footnote: DWR, 2013. Page 5-2] "However, the total volume of water the state receives can vary dramatically between dry and wet years. California may receive less than 100 MAF of water during a dry year and more than 300 MAF in a wet year (Western Regional Climate Center 2011)." [Footnote: DWR, 2013, page 5-2] "The geographic variation and the unpredictability in precipitation that California receives make it challenging to manage the available runoff that can be diverted or captured in storage to meet urban and agricultural water needs." [Footnote: DWR, 2013, page 5-2.] "Historically, precipitation in most of California has been dominated by extreme variability seasonally, annually, and over decade time scales; in the context of climate change, projections of future precipitation are even more uncertain than projections for temperature. Uncertainty regarding precipitation projections is greatest in the northern part of the state, and a stronger tendency toward drying is indicated in the southern part of the state." [Footnote: DWR 2013, page 5-2.]

Consultants working for the BOR admit that the water model and data upon which the LTWT analysis and conclusions rest are not up to date. We note above the model's unreliability and poor projection capabilities regarding water transfers post-2003. The DWR concludes that variability and extremes characterize the state's weather and rainfall conditions, and that climate change is increasing this variability and uncertainty. Taken together, these facts raise questions regarding the veracity of the projected water transfers described in the LTWT, and the estimated environmental and economic consequences of those transfers.

Response

Appendix C summarizes the analytical approach used for the water operations assessment. CalSim II was selected to simulate the surface water system and was used because it represents "the best available model assumptions developed by Reclamation as of January 2014" (see page B-2). It is acknowledged that California's water resources are highly variable, but these hydrologic variables are captured in the CalSim II model because it considers "82 years of historical hydrology from water year 1922 through 2003" (see page B-4). The baseline study used by CalSim II was revised by the project team and Reclamation to consider "an existing level of development, requirements, and projects" (see page B-5). Because of these considerations, the interaction of the three models used in the analysis (CalSim II, SACFEM2013, and TOM) represent the best available tools to capture any variability from climate change and any associated environmental consequences. See Common Response 5 for additional information.

Comment NG02-23

Comment

The analysis does not adequately take into account recent trends in agricultural production. Not included in the LTWT's description of current conditions are recent trends in agricultural production that affect groundwater use and conditions in the Sacramento Valley. For example, according to a recent report, approximately half the increase in irrigated acres in the Sacramento Valley since 2008 (approximately 200,000 acres), happened on lands not served by surface water suppliers. Irrigating these lands takes approximately 300,000 acre-feet (af) of groundwater per year. [Footnote: DMW, 2014, page 7.]

Response

Section 3.3 presents existing conditions for groundwater resources. The section has been expanded to include more information on groundwater levels and trends, which account for agricultural use of groundwater. See Common Response 4. Additional economic baseline condition information on agricultural acreage has also been provided in Section 3.10. Common Response 5 and Appendix H include information about the land use information used in model development.

Comment NG02-24

Comment

A related point is the lack of discussion or analysis in the LTWT of trends in prices for agricultural goods produced with surface and groundwater, trends in prices for water, and how these factors affect grower decisions. For example, the analysis fails to address the extent to which historically high prices for water (discussed below) increase groundwater mining and sale in the Sacramento Valley, and how this affects water transfers and their environmental and economic consequences.

Response

Crop prices do not vary based on use of groundwater or surface water. Data on crop prices has been added to the existing conditions in Section 3.10. Growers voluntarily participate in water transfers and likely consider many factors in their decision to participate, including crop prices, market conditions, production costs, cropping rotations, and many other reasons. These reasons are not the subject of this EIS/EIR. The EIS/EIR evaluates a maximum set of transfers that could occur in the Sacramento Valley. High prices for water do not change the maximum amount of water that could be transferred and there would be no impacts other than those disclosed in the EIS/EIR.

Comment NG02-25

Comment

Another agricultural trend not discussed in the LTWT, but which has implications for water transfers and their consequences, is the increasing use of pressurized irrigation methods in the Sacramento Valley. Pressurized irrigation reduces groundwater recharge by limiting water percolation. Some growers supply their pressurized irrigation systems using groundwater, even when they have access to surface water. According to the report commissioned by the NCWA, “The increasing use of pressurized irrigation systems using groundwater is likely to be an increasingly important factor in the overall management of groundwater and surface water in the Sacramento Valley as a whole, particularly as such system displace the use of available surface water.” [Footnote: DMW, 2014, page 8.]

Response

Section 3.3 describes effects to groundwater levels as a result of water transfers. SACFEM2013 was used for groundwater modeling and groundwater recharge is an input to the model, as described in Appendix D. The cited Northern California Water Association (NCWA) report also states that "From the standpoint of groundwater management, adoption of high-efficiency pressurized systems has a desirable effect in areas irrigated with groundwater because less groundwater pumping is needed to meet demands” (NCWA 2014, page 8).

Comment NG02-26

Comment

In response to the recent trend in high prices for almonds, olives, walnuts and other tree crops, growers in the San Joaquin and Sacramento Valleys planted more acres of these tress and other permanent---‐type crops, and less acres of lower valued annual crops. Such a change increases and “hardens” demand for water in both valleys because growers no longer have the flexibility of idling these acres in response to drought. [Footnote: DMW, 2014, page 7.] Thus, one of the arguments in support of water transfers—that growers south of the Bay Delta planted increased acres of tree crops that have higher water demands—also affects growers and water use and demands north of the Bay Delta. The LTWT is silent on these trends or how they would influence future water transfers from the Sacramento Valley.

Response

The Draft EIS/EIR evaluates the environmental and economic effects of a range of potential water transfers. The Lead Agencies have identified a purpose and need for these potential transfer activities and have identified alternatives that involve only willing sellers. The purpose of the EIS/EIR is not to evaluate the economic conditions that have resulted in the need for water transfers. Further, water transfers are not a reliable source of water to meet San Joaquin Valley demands. Water transfers are a supplemental source. They are not acquired every year and cannot be relied on in dry and critical years because of limits in export capacity at the Delta pumps.

Comment NG02-27

Comment

3 The LTWT relies on outdated and incomplete data. In addition to the deficiencies described in previous sections, the analysis described in the LTWT relies on obsolete data for certain key variables. The analysis also ignored other relevant data and information. These shortcomings include the following.

The LTWT assumes a price for water that bears no resemblance to the current reality. The analysis described in the LTWT assumes a price of water of $225 per af of water. [Footnote: LTWT, page 3.10-27.] This amount drastically underestimates the current price for water. Dollar amounts for water trades are not readily available to the public. However, information on the current price of water from news articles and other sources reveals a range of current prices that exceed $225 by a significant amount.

A report by Bloomberg News on the impacts of drought on water prices reports water prices of $1,000 to $2,000 per af. The article also quotes a spokesman for the BOR, "The rising prices are 'a function of supply and demand in a very dry year and the fact that there are a lot of competing uses for water in California,' said Mat Maucieri, a spokesman for the Bureau of Reclamation."[Footnote: Vekshin, A. 2014. "California Water Prices Soar for Farmers as Drought Grows," Bloomberg. July 24. http://www.bloomberg.com.]

An article in the Sacramento Bee on water transfers noted that one buyer was paying "in the neighborhood of $500 to $600 an acre-foot." [Footnote: Garza, M. 2014. "The Conversation: A controversial water transfer worth millions." The Sacramento Bee. May 25. http://www.sacbee.com/opinion/the-conversation/article99570.html.] The Glenn-Colusa Irrigation District commenting on the LTWT noted that the $225 per af price used in the analysis was the price paid for water over eight years ago. [Footnote: Glenn-Colusa Irrigation District. 2014. Board of Directors Meeting of November 6, 2014, Item 6.]

Water users, sellers and buyers would surely respond differently to a market price of water of $1,000 to $2,000 per af, than they would to a price of $225. As such, the extent to which growers idle cropland, switch to less water intensive crops, and substitute groundwater for surface water in the LTWT likely does not reflect this difference. As we note below, missing from the LTWT analysis is an assessment of the economics of water markets, how sellers and buyers respond to changing water prices, and how this affects the type and amount of water transfers.

Response
Water transfer prices have varied in past years. From 2008 to 2013, SLDMWA agencies paid in the range of $100 per AF to $250 per AF for north-of-Delta water transfers. The price of $225 per AF used in the analysis is within this range. This price was arrived at based on best available data at the time and discussions with the buyers and sellers. Prices paid for water transfers in 2014 were not available at the time the analysis was completed. SLDMWA paid $500 per AF for north-of-Delta transfers in 2014, which is substantially higher than in previous years because of the extreme shortage experienced in 2014 and may not be a permanent trend. The higher price provides an economic benefit in the Seller Service Area.

The analysis in Section 3.10 has been updated with a higher price to incorporate the 2014 water transfer price. See response to Comment NG02-26. The 2014 Draft EIS/EIR does not evaluate economic conditions that lead to a grower’s decision to participate in water transfers. Transfers are between willing sellers and willing buyers. The Lead Agencies have limited the upper quantity of transfers in the proposed alternatives, so a higher water transfer price cannot change the maximum amount transferred.

Comment NG02-28

Comment
Ignored impacts on tax revenues to local governments from IMPLAN results. The LTWT describes estimating impacts of water transfers on employment, labor income and total value of output using IMPLAN. [Footnote: LTWT, page 3.10-21] IMPLAN is a commonly used software and data package that helps analysts estimate economic impacts of policy changes or compare economic impacts of allocation alternatives, e.g., alternative logging proposals or alternative water-transfer amounts. According to the IMPLAN website, IMPLAN “… allows an analyst to trace spending through an economy and measure the cumulative effects of that spending.” [Footnote: IMPLAN web site, implan.com/index.php?option=com_glossary&id=236&letter=E.] IMPLAN traces the economic benefits of increased spending as it works its way through an economy, or, when spending decreases, the negative economic impacts of decreased spending. From our own experience using IMPLAN, and from information on the IMPLAN website, in addition to the employment, labor income and total value of output reported in the LTWT, IMPLAN also quantifies the impacts of alternatives on government finances and tax revenues. [Footnote: IMPLAN. https://implan.com/index.php?option=com_content&view=article&id=532:532&catid=233:KB16.] For example, the IMPLAN website describes how the software can estimate state, local, and federal tax amounts collected (or lost) as a result of a change in an economy, such as reduced agricultural activity. [Footnote: IMPLAN. https://implan.com/index.php?option=com_content&view=article&id=532:532&catid=233:KB16.]

Even though IMPLAN calculates impacts of alternatives on local government finances and tax revenues, the analysis described in the LTWT does not report these results. That is, the authors apparently choose not to report the output from IMPLAN on how the transfer alternatives would affect the dollar amounts of tax revenues to local governments as a result of the reduced agricultural activity and spending. Instead, the report notes that impacts "to local government finances, including tax revenues and costs, are described qualitatively." [emphasis added] [Footnote: LTWT, page 3.10-24.] The report does not explain why the analysts chose to address impacts on local tax revenues of the water-transfer alternatives qualitatively, rather than rely on the estimates of tax impacts produced by IMPLAN.

Response

IMPLAN does calculate impacts to state and local and federal taxes. The impacts are calculated based on tax receipts and not tax rates. State and local tax impacts are presented together and cannot be broken out separately; IMPLAN does not have the underlying data required to do this. The economic analysis focuses on regional economies composed of counties, and the inclusion of state and local tax impacts from IMPLAN does not show the impacts to the actual regional economies evaluated in the analysis. However, the tax impacts from the IMPLAN analysis were calculated and have been included in the section with the explanation that the state and local tax impacts cannot be broken down any further.

Comment NG02-29

Comment

Ignored own research results on stream flow depletion factors. The LTWT makes no mention of the results from studies of the impacts of groundwater pumping in support of water transfers on stream flow depletion. A technical memo on the impacts of groundwater pumping on stream flow depletion describes the analysis and concludes that, "The effect of groundwater substitution transfer pumping on stream flow, when considered as a percent of the groundwater pumped for the program, is significant." [Footnote: Lawson, P. 2010. Technical Memorandum. Groundwater Substitution Transfer Impact Analysis, Sacramento Valley. CH2MHill. March 29. Page 8.] "The three scenarios presented here estimated effects of transfer pumping on stream flow when dry, normal, and wet conditions followed transfer pumping. Estimated stream flow losses in the five-year period following each scenario were 44, 39, and 19 percent of the amount of groundwater pumped during the four-month transfer period." [Footnote: Lawson, 2010, Page 8.]

In spite of these results, information distributed by the DWR and BOR to those interested in making water transfers in 2014, cites a stream flow depletion factor of 12 percent. [Footnote: DWR and BOR, 2014. Addendum to DRAFT Technical Information for Preparing Water Transfer Proposals. Information to Parties Interested in making Water Available for water Transfers in 2014. January. Page 33.] It's not clear how BOR justifies using a 12-percent depletion factor when analyses conducted by their contractors found depletion factors of 44, 39 and 19 percent.

We understand that the same SACFEM model that produced other results in the LTWT also produced the stream flow depletion factors. [Footnote: LTWT, page 3.3-60] Yet, while the LTWT reports other results from SACFEM, it makes no mention of these results. It also ignores the assumed 12-percent depletion factor cited by DWR and BOR. Instead, it states that stream flow depletion will be studied at a later date. [Footnote: LTWT, page 3.1-21] This approach ignores their own modeling results on stream flow depletion.

Response

The referenced technical memo was completed using a previous version of SACFEM, and the information contained in the report is outdated. The 2014 Draft EIS/EIR analysis uses the updated model, now named SACFEM2013. The Draft EIS/EIR includes similar analyses of modeling results, but with the updated model version. Mitigation Measure WS-1 does not identify 12 percent as the streamflow depletion factor. See Common Response 8 for more information on the streamflow depletion factor.

Comment NG02-30

Comment

Incomplete and selective use of information from groundwater monitoring wells. The LTWT omits a significant concluding passage when describing results from a groundwater monitoring well in the Sacramento Valley. For well 21N03W33A004M, the LTWT states, "Water levels at well 21N03W33A004M generally declined during the 1970s and prior to import of surface water conveyed by the Tehama‑Colusa Canal. During the 1980s, groundwater levels recovered due to import and use of surface water supply and because of the 1982 to 1984 wet water years [citation omitted]." [Footnote: LTWT, page 3.3-22] The document cites a DWR report from 2014 on drought response and gaps in groundwater monitoring. [Footnote: LTWT, page 3.3-22] The description in the DWR report, however, includes this additional concluding passage that the LTWT authors excluded, "Water levels declined again in the 2008 drought period, followed by a brief recovery during 2010 to 2011, and then returning to 2008 levels (which are notably lower than the 1977-79 drought levels)." [Footnote: DWR, 2014a, page 24] [emphasis added] The omission matters as it completely changes the conclusion regarding current groundwater conditions as reported by the well.

The description in the LTWT of results from well 15N03W01N001M match those from the DWR source document. That description concludes, "… After the 2008‑2009 drought, water levels declined to historical lows. Water levels recovered quickly during 2010 and 2011, then after returned to the trend of long-term decline." [LTWT, page 3.3-22] [emphasis added]

Taken together these results indicate a long-term trend in declining groundwater levels in areas around the wells. The LTWT discounts or ignores these results instead favoring results from other wells. On this point, consulting hydrologist Custis describes other relevant data on groundwater monitoring, "The Draft EIS/EIR doesn't provide maps showing groundwater elevations, or depth to groundwater, for groundwater substitution transfer seller areas in Sutter, Yolo, Yuba, and Sacramento counties. The DWR provides on a web site a number of additional groundwater level and depth to groundwater maps at: [website omitted]." [Footnote: Custis 2014, pages 9-10]

Custis notes other deficiencies of the groundwater monitoring as described in the LTWT. "…[T]he Draft EIS/EIR provides only limited information on the wells to be used in the groundwater substitution transfers [citation omitted], and no information on the non-participating wells that may be impacted." [Footnote: Custis 2014, page 2.] Custis goes on to list other recommended groundwater monitoring information that the LTWT does not include. [Footnote: Custis 2014, page 2].

Response

Note the EIS/EIR states, "Even though groundwater levels at wells 21N03W33A004M and 15N03W01N001M are generally showing a declining trend, groundwater levels in other wells in the basin have remained steady, declining moderately during extended droughts and recovering to pre-drought levels after subsequent wet periods."

See Common Response 4.

Comment NG02-31

Comment

A related point is the available monitoring data from past water transfers. DWR and BOR apparently already collect information on the impacts of groundwater pumping in support of water transfers on groundwater levels. [Footnote: See for example, DWR and BOR, 2014. DRAFT Technical Information for Preparing Water Transfer Proposals. Information to Parties Interested in making Water Available for water Transfers in 2014. January; DWR and BOR. 2013. DRAFT Technical Information for Preparing Water Transfer Proposals. Information to Parties Interested in Making Water Available for Water Transfers in 2014. October.] The LTWT makes no mention of this data or how it could help inform the analysis of impacts of water transfers at issue in the LTWT on groundwater levels and related concerns. It would seem that BOR has available data relevant to its analysis described in the LTWT but makes no use of this data. On this point Custis notes, "The BoR should already have monitoring and mitigation plans and evaluation reports based on the requirements of the DTIPWTP for past groundwater substitution transfers, which likely were undertaken by some of the same sellers as the proposed 10-year transfer project." [Footnote: Custis 2014, page 24]

Response

Monitoring data from 2014 transfers will not be available until May 2015. Final Monitoring Reports from 2013 transfers (Anderson-Cottonwood ID 2014; Conaway Preservation Group 2014; Eastside MWC 2014; Glenn-Colusa ID 2014; Pleasant Grove Verona MWC, 2014; Pelger MWC, 2014; Reclamation District 1004 2014; and Te Velde Revocable Family Trust 2014) are included in the references section of this document. The groundwater monitoring information indicated that groundwater levels had recovered after 2013 transfers.

Comment NG02-32

Comment

The analysis relies on outdated prices for agricultural commodities. The analysis described in the LTWT uses outdated prices for agricultural commodities to estimate the volume and value of water transfers. The analysis relies on prices for rice, processing tomatoes, corn and alfalfa from 2006 through 2010. [LTWT, page 3.10-27, -28] The analysis compares the price of water, which as we note above bears no resemblance to current prices, with prices for agricultural commodities to estimate cases in which selling water is more profitable than producing crops. Using outdated commodity prices compounds the error of using water prices that greatly underestimate actual prices. The combined effect is misleading results and conclusions regarding the degree of participation by growers in the water transfer program.

Response

The EIS/EIR is not evaluating the degree to which growers will opt to participate in potential transfer activities. In developing alternatives, the Lead Agencies coordinated with the sellers to identify transfer quantities and methods, which translates into the willingness of some growers to participate in the transfers at some time in the transfer period. The Lead Agencies did not use prices for agricultural commodities to estimate the volume and value of water transfers, as suggested by the comment. Further, transfers are entirely voluntary for the buyers and sellers. See response to Comment NG02-27 for additional information. The agricultural prices used were the most recent prices available at the time the analysis was completed. The analysis has been updated with crop prices through 2012.

Comment NG02-33

Comment

No mention of how prices for water and agricultural commodities could impact the affected environment, water transfers and their environmental and economic consequences. The water transfers at issue in the LTWT would not happen in an economic vacuum. Growers and water sellers and buyers react to changing price and market conditions. The LTWT, however, is silent on these forces and how they would influence water transfers.

The analysis depicted in the LTWT assumes a static water price of $225 per af and prices for agricultural commodities as they existed in 2006 through 2010. [Footnote: LTWT, page 3.10-27] Such a static analysis provides a single estimate, or a snapshot view, of estimated water transfers. A more informative and useful analysis would have described how changing water and commodity prices influence the conclusions re the number and volumes of water transfers. Such a sensitivity analysis would allow readers to better compare current or expected future prices with prices in the analysis to see how these conditions affect results.

Response

See responses to Comments NG02-26, NG02-27, and NG02-32. The EIS/EIR evaluates the economic effects of the maximum amount of cropland idling acres for the alternatives. The analysis has been revised with updated water transfer prices and crop prices. The purpose of the 2014 Draft EIS/EIR is to evaluate environmental impacts related to the alternatives, not to evaluate how changing prices can affect transfer quantities. The Lead Agencies set maximum quantities for each alternative in coordination with the sellers.

Comment NG02-34

Comment

The LTWT is also silent on likely transaction costs and how they influence water transfers. Water transactions, particularly out-of-basin and cross-Delta, would require a diverse and substantial set of transaction costs that are not quantitatively included in the analysis. Omitting these transaction costs either overestimates the benefit potential to buyers and sellers of these transactions, or implies that these transaction costs will be borne by the public. Communication, information, and contracting costs have long inhibited water markets in California, and while mechanisms for overcoming these challenges have improved, they do have real costs, particularly across diverse regions and incorporating farmers using differing operations. [Footnote: Haddad, B. M. 2000. Rivers of Gold: Designing Markets to Allocate Water in California. Island Press.] Transaction costs are hurdles to transactions, functionally a third party that must be satisfied before the buyer and seller can find opportunities to both be made better off by the transaction. For example, if a seller is willing to sell water at $250 per af, and a buyer is willing to pay $300 per af, if there are $60 per af in transaction costs, the transaction cannot efficiently take place.

Cross-Delta transaction would also impose a number of costs on the Delta conveyance system. Pumping costs at Banks and Jones Pumping Plants should be incorporated into transaction costs. Transactions could also affect congestion and overall capacity for these plants and the SWP and CVP systems overall. Energy, management, staffing, delays, and other costs and impositions could arise that would either require compensation by the buyers and sellers, or externalities on other parties.

Permitting, liability, and long-term protection of water rights all contribute to additional concerns for buyers and sellers that functionally generate additional forms of transaction costs. If these are incorporated into willingness-to-pay for buyers and willingness-to-accept for sellers, the transactions become less desirable. Alternatively, if these costs are borne by public agencies, as with the variety of other transaction costs mentioned above and referenced qualitatively throughout the LTWT, the burden for taxpayers could be substantial. These public contributions require demonstration of benefits to the public as a whole. The LTWT does not demonstrate benefits to portions of the public that are not party to transactions. On this point Custis notes, "Because the spatial limits of groundwater substitution pumping impacts are controlled by hydrogeology, hydrology, and rates, durations and seasons of pumping, the impacts may not be limited to the boundaries of each seller's service area, GMPs [groundwater management plan], or County. There is a possibility that a seller's groundwater substitution area of impact will occur in multiple local jurisdictions, which should results [sic] in project requirements coming from multiple local as well as state and federal agencies. The Draft EIS/EIR doesn't discuss which of the multiple local agencies would be the lead agency, how an agreement between agencies would be reached, or how the requirements of the other agencies will be enforced." [Footnote: Custis 2014, page 9]

Overall, the estimates of benefits and costs of transactions, as well as identification of efficient transactions, do not include the diverse and substantial set of transaction costs that cross-Delta transfers would require. Therefore the analysis either overestimates the benefits of the LTWT, or hides public costs to manage and overcome these transaction costs.

Response

An EIS is not required to contain a cost-benefit analysis if such an analysis is not relevant to the choice among action alternatives. The potential transfer activities evaluated under the Proposed Action and alternatives are voluntary transactions. The economic analysis in the EIS/EIR is not an evaluation of willingness to pay for water transfers. Transfer costs are negotiated between buyers and sellers. Buyers and sellers consider transaction costs when negotiating the price of water. Reclamation does not have input into or influence over the prices negotiated by buyers and sellers. The Long-Term Water Transfers EIS/EIR is a streamlining tool and would reduce transaction costs because it identifies buyers and sellers, maximum transfer quantities, transfer methods, and required mitigation. The buyers and sellers do not need to negotiate these factors or complete the environmental compliance each year and therefore, actual transaction costs may reduce as a result of the Long-Term Water Transfers EIS/EIR.

Comment NG02-35

Comment

Underestimates economic effects on regional economy in sellers area. In the sections above, we describe omissions and errors regarding the estimated number and volumes of water transfers. Some of these errors could lead to underestimating the number and volume of water transfers, some could have the opposite effect. In this subsection we focus on additional examples of how the LTWT likely underestimates the number and volume of water transfers that will happen in the future. By underestimating the water transfers the LTWT also underestimates the negative impacts of the transfers on the regional economy in the sellers area. The negative economic effects listed in the LTWT include: 1.Approximately 500 lost jobs in Glenn, Colusa, Yolo, Sutter, Butte and Solano counties. 2.Over $20 million in lost labor income and over $61 million in lost economic output in these same counties. 3.Unquantified but increased pumping costs for water users in areas where groundwater levels decline. 4.Unquantified but negative affects on other local economic effects. 5.Unquantified but negative affects on tenant farmers. [Footnote: LTWT, page 3.10-45 and -46.]

The LTWT analysis of some regional economic effects assumes non-consecutive years of water transfers. If water transfers happen in consecutive years, impacts would be greater than reported in the LTWT. “Local effects would be more adverse if cropland idling transfers occurred in consecutive years. Business owners would likely be able to recover from reduced sales in a single year, but it would be more difficult if sales remained low for multiple years.” [Footnote: LTWT, page 3.10-33]

As shown in LTWT Table 1-3 on page 1-17, from 2004 through 2014, there have been eight water-transfer years out of 11, and 5 cases of consecutive transfer years. Given these recent conditions, it is likely that consecutive years of water transfers will happen more frequently than assumed in the LTWT.

Response

The Lead Agencies have not underestimated the volume of potential water transfers. The alternatives include a maximum quantity of water transfers by transfer methods that are evaluated in this EIS/EIR. The buyers cannot purchase additional water for transfer without further environmental documentation. Section 3.10 evaluated the maximum quantity of water transfers under the alternatives. Section 3.10 has been updated with additional text on the effects of consecutive transfers. Common Response 5 includes more information about the frequency of transfers.

Comment NG02-36

Comment

Incomplete description of impacts on pumping costs. The LTWT reports that farmers in the Sacramento and San Joaquin Valleys pay water-pumping costs of approximately $0.32 per af. [Footnote: LTWT, page 3.10-24] The LTWT analysis estimates that as a result of groundwater-substitution transfers, pumping costs for "many growers" would increase by $0.32 to $1.60 per af. [Footnote: LTWT, page 3.10-36] This represents a non-trivial increase of 100 to 500 percent. In some cases, cost increases could be $6.40 to $8.00 per af. [Footnote: LTWT, page 3.10-36.] Expressed on a percentage basis these amounts are increases of 2,000 to 2,500 percent. The LTWT describes these increases in pumping costs as "adverse." The analysis, however, does not report a total estimated increase in pumping costs or describe the increase as a percentage of current costs, either of which would have helped the reader better understand the significance of the increase. [Footnote: A related point is that Figures 3.10-5 and 3.10-6 are confusing in that the captions include "September 1990" and "September 1976," respectively. The discussion on page 3.10-36, which introduces the figures, makes no mention of these dates or their significance.] A related point is that the analysis of pumping costs in the LTWT relies on results from the water modeling, the deficiencies of which we describe above and elsewhere in this report. It's also not clear from the description of the analysis if the "adverse" effects on pumping costs apply only to those participating in water transfers, or also affect third parties that will not benefit from the transfers.

Response

The analysis shows a relative increase in pumping costs for areas where groundwater levels would decline as a result of transfers. Data is not available to estimate a total increase in pumping costs. The percentages calculated by the commenter are incorrect. Pumping costs would increase by $0.32 per AF per foot of lift. Growers are already pumping a certain depth so pumping an AF one additional foot would be an increase in $0.32, which would be a much smaller percentatge of overall pumping costs, not the large percentages indicated in the comment. Further, pumping costs are a small fraction of the total production costs for growers. Section 3.3 includes the groundwater evaluation and a discussion of the years shown on the figures. A reference to this section has been added in Section 3.10. The discussion in Section 3.10 states, "Decreased groundwater levels would increase pumping costs for nearby well owners who are not participating in groundwater substitution transfers."

Comment NG02-37

Comment

No mention of costs of deepening or installing new wells. The LTWT makes no mention of increased costs of deepening or installing new wells as a result of the impacts of groundwater pumping on groundwater levels. As we note above in section 2 under the description of current groundwater conditions, the CASGEM groundwater basin prioritization study lists 23 basins in the Sacramento Valley ranked “high” or “medium” dependent on groundwater. These basins support private residential wells, public water supply wells, and irrigation wells. [Footnote: DWR, 2014b, pages 2-5.] Recent news reports describe the intensity of well drilling operations in California’s Central Valley. [Footnote: Howard, B.C. 2014. California drought spurs groundwater drilling boom in Central Valley. National Geographic. August 15. http://news.nationalgeographic.com/news.2014/08/140815-central-valley-california-drilling-boom-groundwater-drought-wells/; Khokha, S. 2014. Drought has drillers running after shrinking California water supply. National Public Radio. June 30. http://www.npr.org/2014/06/30/325494399/drought-has-drillers-running-after-shrinking-california-water-supply.] To the extent that groundwater pumping in support of water transfers lowers groundwater levels, some current water users depending on groundwater may face increased costs of deepening or installing new wells. The analysis described in the LTWT does not address these costs.

Response

A discussion of the costs of deepening existing wells or installing new wells has been added to Section 3.10.

Comment NG02-38

Comment

Underestimates the significance of impacts on unemployment rates. Any negative impacts of water transfers on agricultural production and related unemployment effects, would take place against a backdrop of already hurting economies. As Figure 3.10-7 illustrates, current unemployment rates in the seller counties runs between approximately 8 and 18 percent. The LTWT analysis estimates that water transfers will idle approximately 500 workers in the Sacramento Valley. The analysis assumes that impacts of transfers on unemployment would be temporary. “Reductions in employment associated with cropland idling transfers would contribute to unemployment in the region. However, cropland idling effects are temporary and under the Proposed Action, cropland idling transfers would not occur each year over the 10-year period.” [Footnote: LTWT, page 3.10-49] As we note above, however, data on the frequency of recent water transfers do not support the LTWT assumptions regarding infrequent future water-transfer years. Thus, the LTWT analysis likely underestimated the negative impacts of the plan on unemployment in the Sacramento Valley.

Response

Text has been added to Section 3.10 to further discuss the effects of consecutive year transfers. See response to Comment LA14-14.

Comment NG02-39

Comment

No mention of economic harm to local economies from lost water-based recreational activities. The analysis of regional economic effects in the LTWT focuses on impacts of water transfers on agricultural production and related businesses. The LTWT ignores other negative impacts on the regional economy. For example, the LTWT is silent on the impacts of water transfers on reservoirs such as Lake Oroville and others in the sellers area, and the related impacts on the region's water-based recreational economy. In their letter commenting on the LTWT, the Butte County Board of Supervisors noted their concerns that the LTWT "… failed to take into account the reduction in stream flows and the lowering of Lake Oroville that will harm the local economy." [Footnote:] Teeter, D. 2014. Letter to Brad Hubbard, BOR, and Frances Mizuno, SLDMWA, November 25. Re: Long-Term Water transfers Program Draft Environmental Impact Statement/Environmental Impact Report (EIS/EIR). Page 2.] In an earlier letter to Governor Brown commenting on the BDCP, the Butte County Board of Supervisors noted the importance of the lake to the region's economy, and the fact that the State of California has not fulfilled commitments made regarding developments at Lake Oroville. [Footnote: Lambert, S. 2012. Letter to The Honorable Edmund G. Brown, Jr. August 14. Re: Butte County's Opposition to the Bay Delta Conservation Plan (BDCP). August 14. Page 2.] Ignoring the potential impacts of water transfers on Lake Oroville and the associated economic impacts compounds the negative effects of the State's failure to fulfill past commitments at the lake.

Response

Economic effects from recreation are generally related to changes in visitor attendance and associated changes in visitor spending in the regional economy. The 2014 Draft EIS/EIR evaluates impacts to recreation in Section 3.15. The analysis found no significant impacts to recreation activities or visitor attendance associated with the proposed alternatives. Therefore, an economic analysis was not necessary. Visitor spending and contributions to the local economies would be similar to existing conditions and to the No Action Alternative.

Comment NG02-40

Comment

Arbitrary limits on crop idling. The analysis in the LTWT relies on arbitrary limits on crop idling as a means of avoiding negative economic impacts. The DWR and BOR document that provides technical guidance for those interested in making water transfers describes the possibility of negative economic effects of crop idling, however, the guidelines for the amount of idling that would cause economic harm appear arbitrary. The relevant passage from the document states, "Cropland idling/crop shifting transfers have the potential to affect the local economy. Parties that depend on farming-related activities can experience decreases in business if land idling becomes extensive. Limiting cropland idling to 20 percent of the total irrigable land in a county should limit economic effects." [Footnote: DWR and BOR, 2013. DRAFT Technical Information for Preparing Water Transfer Proposals. Information to Parties Interested in Making Water Available for Water Transfers in 2014. October. Page 22.] [emphasis added] While the statement may be true, it lacks the analytical rigor that would satisfy NEPA requirements for, "Rigorous exploration and objective evaluation of all reasonable alternatives, …" [Footnote: LTWT page 2-1] As such, the guidelines on crop idling seem arbitrary rather than the result of rigorous and objective analysis.

Response

The limits on cropland idling (established in Chapter 2 for each action alternative) were developed with the sellers and are not arbitrary limits. The sellers provided water quantities and likely crops to be idled in their service areas. The text quoted in the comment refers to the 2013 Draft Technical Information For Preparing Water Transfer Proposals and is not in the EIS/EIR. The analysis discloses the economic effects of a maximum potential idling action for the proposed alternatives.

Comment NG02-41

Comment

Table 3.10-22 lists the total number of acres affected by cropland idling in the analysis described in the LTWT. As shown in this table, approximately 60,000 acres could be idled in Glenn, Colusa, Yolo, Sutter, and Butte counties. [Footnote: LTWT, page 3.10-26] In the table below [See Original Comment Letter], we show the total number of acres of irrigable land in each county, and 20 percent of these acres. According to the guidelines noted above, up to 257,000 acres could be idled in these counties without significant economic effects. This seems doubtful. Rather than relying on arbitrary rules of thumb and assumed limited economic effects of idling, a more complete and transparent assessment of the economic effects of water transfers would take an analytical and quantified approach.

Response

As stated in response to Comment NG02-40, the cropland idling acreages were not developing using a 20 percent criterion. The quantities were developed in coordination with sellers and represent the maximum acreages that can be idled under the alternatives. The 2014 Draft EIS/EIR does not say that "up to 257,000 acres can be idled without significant economic effects" and does not include or evaluate that amount in the alternatives.

Comment NG02-42

Comment

5 The LTWT finds significant negative effects but the vague and incomplete proposed monitoring and mitigation plans would not address these effects. The LTWT concludes that water transfers will have some significantly negative impacts on groundwater resources. As we note in earlier sections of this report, the analysis described in the LTWT likely underestimates the negative effects of water transfers. For example, the analysis likely underestimates the frequency of water-transfer years, and so the negative effects of the transfers. The analysis also ignores negative impacts on water-based recreational activities and the associated negative economic consequences. The monitoring and mitigation plans focus only on the negative effects listed in the LTWT. Thus, they would address only a subset of the likely total negative economic consequences of the water transfers. In addition, the vague and incomplete proposed monitoring and mitigation plans would not adequately address those negative effects listed in the LTWT. Concerns regarding these plans include the following.

Response

The 2014 Draft EIS/EIR evaluates impacts to all environmental resources potentially affected by the proposed alternatives in Chapter 3 and includes mitigation measures to reduce impacts to a less-than-significant level. See Common Response 6 for additional information regarding groundwater mitigation, and Common Response 5 for additional information about transfer frequency. See response to Comment LA14-14 relative to NEPA and CEQA requirements for the evaluation of economic effects. NEPA and CEQA do not require mitigation for economic effects. See response to Comment NG02-39 related to recreation impacts.

Comment NG02-43

Comment
The LTWT ignored the costs of monitoring and mitigation. The LTWT proposes both a monitoring and mitigation program for significant negative impacts of water transfers on groundwater resources. Implementing these programs would take planning, effort and financial resources. The LTWT, however, does not include these costs in their analysis of alternatives. For example, water sellers would be required to monitor and record groundwater conditions and coordinate with regulators regarding the impacts of their groundwater pumping on groundwater levels. Water seller will incur costs monitoring, measuring, recording, and reporting the necessary information. The LTWT excludes these and related costs from the analysis. Likewise, the mitigation of negative groundwater consequences would also require time, effort, and costs to water sellers, third parties negatively affected by groundwater pumping, and regulators. LTWT excludes these costs as well.

Response
An EIS is not required to contain a cost-benefit analysis if such an analysis is not relevant to the choice among action alternatives. Water transfer prices are negotiated between buyers and sellers. Mitigation and monitoring costs are incorporated in the price for water transfers. Reclamation also incurs costs for reviewing water transfer proposals and monitoring. These costs are not required to be disclosed in a NEPA document.

Comment NG02-44

Comment
The monitoring and mitigation programs include inherent conflicts of interests. The monitoring program as described in the LTWT is vague and depends on sellers implementing the program. This conflict of interest pits financial gain from water sales against complete and impartial monitoring efforts. This opens the door to lax, biased, or incomplete monitoring, which could lead to negative environmental and economic consequences for third parties not part of the water transfers. The monitoring program includes provisions for a coordination plan that would share information among "well operators and other decision makers." [Footnote: LTWT, page 3.3-89.] Such confidential results would keep other stakeholders in the dark regarding the impacts of water transfers. Given the fact that multiple wells belonging to multiple property owners can access the same groundwater aquifer, and that groundwater pumping can affect flows of surface water, such a confidential program seems counter to the wellbeing of the regional economy in the sellers area. An open monitoring program with public results would better communicate the potential environmental and economic risks of groundwater pumping in support of water transfers. If the seller's monitoring program finds that water sales are causing "substantial adverse impacts" [Footnote: LTWT, page 3.3-90] the seller will be responsible for implementing a mitigation program. The conflict of interest is obvious.

One method of avoiding the obvious conflicts of interests is requiring monitoring by independent third parties not involved with or affected by groundwater pumping in support of water transfers. Such monitoring could be detailed, transparent and public, which would alleviate concerns over the risks and consequences of negative environmental and economic effects of groundwater pumping. Mitigation decisions and requirements should likewise be detailed, transparent and public for the same reasons.

Response
See Common Response 6. Reclamation is responsible for ensuring that appropriate monitoring and mitigation is completed as needed for each transfer (as indicated in Appendix V). Buying and selling agencies involved in transfers are public information; however, Reclamation and sellers keep personal information on individual growers who participate confidential for privacy and security purposes. A third party is not needed to conduct oversight.

Comment NG02-45

Comment
Insufficient monitoring period. As described in the LTWT, groundwater levels would be monitored through March of the year following a transfer. It's not clear that this limited monitoring period is sufficiently long enough to track potential impacts on groundwater of water transfers. For example, the report cited above for the NCWA states, "…[G]roundwater changes can take many years to become apparent, and we have not yet been able to measure with certainty the long-term impacts of the current level of groundwater use as it affects our measures of sustainability." [Footnote: DMW, 2014, page 10]

An insufficient monitoring period could underestimate the impacts of groundwater pumping on groundwater levels and impacts on stream flow depletions. Lowering groundwater level and increasing stream flow depletions would generate negative environmental and economic impacts. The monitoring period in the LTWT may cause analysts to underestimate the environmental and economic effects of the water-transfers alternatives.

Response
See Common Responses 6 and 7.

Comment NG02-46

Comment
Insufficient monitoring for land subsidence. The monitoring program includes monitoring subsidence, however, the program is vague on monitoring requirements and what amount of subsidence would trigger a halt in water transfers. Custis describes a number of technical deficiencies in the proposed mitigation plan. "The Draft EIS/EIR should be able to provide the specific thresholds of subsidence that will trigger the need for additional extensometer monitoring, continuous GPS monitoring, or extensive land-elevation benchmark surveys by a licensed surveyor as required by GW-1. The Draft EIS/EIR should also specify in mitigation measure GW-1, the frequency and methods of collecting and reporting subsidence measurements, and discuss how the non-participating landowners and the public can obtain this

information in a timely manner. In addition, the Draft EIS/EIR should provide a discussion of the thresholds that will trigger implementation of the reimbursement mitigation measure required by GW-1 for repair or modifications to infrastructure damaged by non-reversible subsidence, and the procedures for seeking monetary recovery from subsidence damage [citation omitted].” “Specific ‘strategic’ subsidence monitoring locations should be given in mitigation measure GW-1 based on analysis of the susceptible infrastructure locations and the potential subsidence areas.” [Footnote: Custis 2014, page 28.]

Implementing the Custis recommendations will take time and financial resources for water sellers, local jurisdictions and third parties negatively affected by groundwater pumping. The LTWT does not include the costs of these measures in the analysis. Thus, the costs of the water transfers described in the LTWT underestimate the true costs of the program.

Response

Refer to Common Response 7 for more information regarding subsidence monitoring and mitigation.

Comment NG02-47

Comment

Vague significance criteria. The mitigation program includes a number of vague descriptions of critical components. Relevant missing descriptions include details on: 1. How regulators and stakeholders would define “substantial adverse impacts” from groundwater pumping. 2. What constitutes a “significant” increase in pumping costs suffered by injured third parties. 3. Required modifications to damaged third-party infrastructure or the installation of new infrastructure. 4. The procedure that injured third parties would use when making claims against a seller. 5. The procedure that regulators and stakeholders would use when investigating third-party claims. 6. What constitutes “legitimate significant effects” on third parties. [Footnote: LTWT, page 3.3-88 through -91]

A vague and ill-defined mitigation program increases risks of environmental and economic harm, and shifts the costs of such harm from water sellers to third parties and society in general. The analysis described in the LWTW does not identify, describe or quantify these risks, costs and consequences. A related point is that the LTWT makes no mention of BOR addressing these or similar issues as part of reviewing past annual water transfers. Including such information from past water transfers – if BOR considered these effects – in the LWTW could help illustrate or describe the uncertainties listed above.

Response

See Common Response 6.

Comment NG02-48

Comment

The mitigation plan puts costs on to injured third parties. Injured third parties bear the costs of bringing to the sellers’ attention harm caused by groundwater pumping. Also, the LTWT states that proposed mitigation options would be developed “in cooperation” [Footnote: LTWT page

3.3-91.] with injured third parties. This approach places costs on injured third parties rather than on sellers. That is, those who would not benefit financially from the program bear the costs of bringing negative impacts to the sellers' attention. They also would incur costs of documenting and presenting their damages in the context of an ill-defined mitigation program. This raises equity concerns that those suffering costs of the program bear the additional costs of identifying, describing and calling attention to their costs. The analysis described in the LTWT further assumes that disagreements regarding third-party damages would be settled cooperatively, without presenting evidence substantiating such an optimistic assumption. The LTWT is silent on the economic consequences of sellers and injured third parties not cooperatively agreeing on harm and compensation. As we note above, information the BOR collected from past water transfers may help inform the types and amounts of costs that injured third parties could incur as a result of the water transfers at issue in the LTWT.

Response

See Common Response 6.

Comment NG02-49

Comment

BOR's role in monitoring and mitigation. The LTWT describes a substantive role for BOR in the monitoring and mitigation program, without specifics of how BOR would implement its responsibilities. Topic not addressed include: 1. The costs to BOR of monitoring and mitigation. 2. The details of interactions between sellers, injured third parties, and BOR staff regarding the details of monitoring and mitigation. 3. The details of collecting, organizing and publishing relevant details of monitoring and mitigation. 4. The details of decision making processes that affect monitoring and mitigation. 5. The details of interactions between BOR and other federal or state agencies, and BOR and local jurisdictions.

Response

The Mitigation Monitoring and Reporting Plan is included as Appendix V, and it includes more information about mitigation and monitoring responsibilities. See Common Response 14.

Comment NG02-50

Comment

Lead CEQA agency. SLDMWA is the lead state agency regarding CEQA compliance. It is also one of three potential buyers for the transferred water. [Footnote: LTWT EIS/EIR, Table 1-2, page 1-5. The other two buyers are Contra Costa Water District and the East Bay Municipal Utility District.] This arrangement creates a conflict of interest in that the lead CEQA agency also has a self interest in facilitating the water transfers. As described on their website, SLDMWA delivers approximately 3 million af of water to member agencies. [Footnote" SLDMWA web site, www.sldmwa.org/learn-more/about-us/.] SLDMWA has a financial and operational interest in delivering water to its members. Thus, SLDMWA is not an impartial agent. The LTWT provides no information on why SLDMWA is the lead state agency and not the California Department of Water Resources.

Response

See Common Response 1.

Comment NG02-51

Comment

6 The LTWT ignores the economic costs of environmental externalities and subsidies that water transfers support. The LTWT lists Westlands Water District as one of the CVP contractors expressing interest in purchasing transfer water. [Footnote: LTWT, page 1-5] The environmental externalities caused by agricultural production in Westlands are well documented, as are the economic subsidies that support this production. To the extent that the water transfers at issue in the LTWT facilitate agricultural production in Westlands, they also contribute to the environmental externalities and economic subsidies of that production. The LTWT is silent on these environmental and economic consequences of the water transfers.

Response

Water transfers are one of several management actions favored under state and federal law. Chapter 3 evaluates effects of water transfers on environmental resources in the buyer service area. Potential impacts are fully disclosed and have not been ignored. Specifically, Section 3.3 discusses the effects to water quality of the use of water transfers on agricultural land in the buyer service area, including Westlands Water District. Economic subsidies are set by government policies outside of the scope of potential activities evaluated in this EIS/EIR.

Comment NG02-52

Comment

In this section we summarize recent information on the environmental externalities and economic subsidies of agricultural production on Westlands that water transfers would support.

The environmental and economic externalities of Westlands have a long history. For decades, high levels of selenium have posed a serious environmental threat to drinking water, soil quality, and agriculture in the Westlands Water District. [Footnote: Environmental Working Group. 2010a, September 28. Throwing Good Money at Bad Land. Environmental Working Group. Retrieved from http://www.ewg.org/Throwing-Good-Money-at-Bad-Land] This naturally occurring element leaches into soil and drinking water when irrigation water is applied and when significant levels accumulate, has been known to cause deformities and death in wildlife and human beings. [Footnote: Environmental Working Group. 2010a, September 28. Throwing Good Money at Bad Land. Environmental Working Group. Retrieved from http://www.ewg.org/Throwing-Good-Money-at-Bad-Land] The most extreme example of this type of degradation occurred from 1981-1986 during the Kesterson Disaster, when the federally operated San Luis Unit diverted selenium- rich wastewater into the Kesterson National Wildlife Refuge, killing over one thousand birds and causing severe birth defects. [Footnote: Environmental Working Group. 2010a, September 28. Throwing Good Money at Bad Land. Environmental Working Group. Retrieved from http://www.ewg.org/Throwing-Good-Money-at-Bad-Land; Environmental Working Group. 2010b, September 28. U.S. Taxpayers Paid nearly $60 million to Farmers on Westlands Toxic Lands. Environmental Working Group. Retrieved from http://www.ewg.org/Throwing-Good-Money-at-Bad-Land; Luoma, Samuel N. and Teresa S. Presser. (2000). Forecasting Selenium Discharges to the San Francisco Bay-Delta Estuary: Ecological Effects of a Proposed San Luis Drain Extension. U.S. Geological Survey. (Open-File Report 00-416). Menlo Park, California.]

Response

See response to Comment NG02-51.

Comment NG02-53

Comment

Current environmental concerns. Since the Kesterson Disaster, the Westlands has followed a "no-discharge policy" where irrigated wastewater is reused on agricultural land or stored in groundwater aquifers. [Footnote: State of California. Central Valley Regional Water Quality Control Board. Irrigated Lands Program – Development of the Long-term Program. http://www.waterboards.ca.gov/centralvalley/water_issues/irrigated_lands/new_waste_discharge_requirements/western_tulare_lake_basin_area_wdrs/index.shtml#octdec2013.] In spite of the well-documented concerns regarding selenium contaminated runoff from Westlands, as yet there is no official monitoring of selenium levels in the district. [Footnote: State of California. Central Valley Regional Water Quality Control Board. Irrigated Lands Program – Development of the Long-term Program. http://www.waterboards.ca.gov/centralvalley/water_issues/irrigated_lands/new_waste_discharge_requirements/western_tulare_lake_basin_area_wdrs/index.shtml#octdec2013.] The San Luis Act (1960) gives the BOR, not the Westlands Water District, responsibility for disposing of Westland Water, [Footnote: US Bureau of Reclamation. 2012a, August 7. CVP Ratebooks - Irrigation, 2012. Retrieved from http://www.usbr.gov/mp/cvpwaterrates/ratebooks/irrigation/2012/index.html; U.S. Bureau of Reclamation. 2012b, September. San Luis Unit Drainage, Central Valley Project. Reclamation: Managing Water in the West. Retrieved from http://www.usbr.gov/mp/PA/docs/fact_sheets/San_Luis_Drainage.pdf.] but as of yet neither entity has implemented any meaningful solution. This failure prompted the Westlands District to bring a lawsuit against the BOR in 1995, which was finally brought to the Ninth Circuit Court of Appeals in 2000. [Footnote: US Bureau of Reclamation. 2012a, August 7. CVP Ratebooks - Irrigation, 2012. Retrieved from http://www.usbr.gov/mp/cvpwaterrates/ratebooks/irrigation/2012/index.html; U.S. Bureau of Reclamation. 2012b, September. San Luis Unit Drainage, Central Valley Project. Reclamation: Managing Water in the West. Retrieved from http://www.usbr.gov/mp/PA/docs/fact_sheets/San_Luis_Drainage.pdf.] The court upheld a lower court's decision to force the BOR to provide drainage to the district but allowed that solutions other than a drain might be considered. [Footnote: US Bureau of Reclamation. 2012a, August 7. CVP Ratebooks- Irrigation, 2012. Retrieved from http://www.usbr.gov/mp/cvpwaterrates/ratebooks/irrigation/2012/index.html; U.S. Bureau of Reclamation. 2012b, September. San Luis Unit Drainage, Central Valley Project. Reclamation: Managing Water in the West. Retrieved from http://www.usbr.gov/mp/PA/docs/fact_sheets/San_Luis_Drainage.pdf.]

At first, it seemed that large-scale retirement of farmland was the solution favored by both the Westlands and the federal government. [Footnote: Westlands Water District. 2001, October 16. Why Land Retirement Makes Sense for Westlands Water District. Westlands Water District.] In 2001, the District released a fact sheet entitled "Why Land Retirement Makes Sense for the Westlands Water District" advocating for a possible deal with the federal government that would retire up to 200,000 acres of agricultural land. According to the federal government's National Economic Development analysis, this option would result in an economic gain of $3.6 million per year excluding any additional savings as a result of reduced crop subsidies. [Footnote: Westlands Water District. 2001, October 16. Why Land Retirement Makes Sense for Westlands Water District. Westlands Water District; Sharp, Renée. 2010, September 28. Throwing Good Money at Bad Land. Environmental Working Group. Retrieved from http://www.ewg.org/agmag/2010/10/throwing-good-money-after-bad-lands.] Instead, after more than a decade of negotiations, the federal government and the Westlands Water District finally signed an agreement in 2014 which lifts the federal government's obligation to provide drainage to the district, forgives the nearly $400 million the district owes to the federal government for its part in the construction of the Central Valley Project (CVP), assures the district almost 900,000 acre---‐feet of water per year from the CVP, and requires only 100,000 acres of land be retired. [Footnote: California Water Impact Network. 2014, October 16. Obama Selling Out California to Westlands Water District. California Water Impact Network. Retrieved from http://www.c-win.org/content/media-release-obama-selling-out-california-westlands-water-district-secret-deal-forgives-gov; US Department of the Interior. 2013, December 6. PRINCIPLES OF AGREEMENT FOR A PROPOSED SETTLEMENT BETWEEN THE UNITED STATES AND WESTLANDS WATER DISTRICT REGARDING DRAINAGE. Retrieved from www.c-win.org/webfm_send/453; Boxall, Bettina. 2014, October 21. Amid California's drought, a bruising battle for cheap water. Los Angeles Times. Retrieved from http://www.latimes.com/local/california/la-me-westlands-20141021-story.html#page=2.] This leaves over 100,000 more acres of selenium---‐degraded land that the Westlands Water District will now need to decide how to drain in the years to come. [Footnote: Environmental Working Group. 2010a, September 28. Throwing Good Money at Bad Land. Environmental Working Group. Retrieved from http://www.ewg.org/Throwing-Good-Money-at-Bad-Land.] In addition, while the BOR's Environmental Assessment found that there would be no significant environmental impact as a result of the interim renewal contracts with the Westlands and other CVP districts, several environmental groups have criticized the study as violating federal environmental requirements, including the National Environmental Policy Act of 1969. [Footnote: US Bureau of Reclamation. 2013, December 7. Central Valley Interim Renewal Contracts for Westlands Water District, Santa Clara Valley Water District, and Pajaro Valley Water Management Agency 2014-2016. (FONSI-13-023). Sacramento, CA; Minton, Jonas, Kathryn Phillips, et al. 2014, January 14. The Environmental Assessment [EA] for Westlands Water District et. al. Central Valley Project Interim 6 Contract Renewals for Approximately 1.2 MAF of water [Letter to Rain Emerson, Bureau of Reclamation].]

Response

Constituents of concern are considered as part of the impact evaluation for water quality.

Comment NG02-54

Comment

Economic subsides to the Westlands water district. As the largest water district in California and the largest recipient of water under the Central Valley Project, the Westlands Water District receives significant crop, water, and power subsidies to supplement its agricultural activities. According to a report by the Environmental Working Group, between 2005 and 2009, the federal government issued almost $55 million of counter cyclical and direct crop subsidies to 356 individuals in the district. [Footnote: Environmental Working Group. 2010a, September 28. Throwing Good Money at Bad Land. Environmental Working Group. Retrieved from http://www.ewg.org/Throwing-Good-Money-at-Bad-Land; Environmental Working Group. 2010b, September 28. U.S. Taxpayers Paid nearly $60 million to Farmers on Westlands Toxic Lands. Environmental Working Group. Retrieved from http://www.ewg.org/Throwing-Good-Money-at-Bad-Land.] The district's 350 farms networks are entitled to over 1.1 million acre-feet of water per year, more than twice the allocation of the City of Los Angeles. [Footnote: Boxall, Bettina. 2014, October 21. Amid California's drought, a bruising battle for cheap water. Los Angeles Times. Retrieved from http://www.latimes.com/local/california/la-me-westlands-20141021-story.html#page=2; Environmental Working Group. 2005, September 14. Soaking Uncle Sam: Why Westlands Water District's New Contract is All Wet. Environmental Working Group. Retrieved from http://www.ewg.org/research/soaking-uncle-sam.] In 2002, the group estimated that the federal government paid $110 million per year in water subsidies, making its water drastically less expensive than that allocated to urban households. [Footnote: Boxall, Bettina. 2014, October 21. Amid California's drought, a bruising battle for cheap water. Los Angeles Times. Retrieved from http://www.latimes.com/local/california/la-me-westlands-20141021-story.html#page=2; Environmental Working Group. 2005, September 14. Soaking Uncle Sam: Why Westlands Water District's New Contract is All Wet. Environmental Working Group. Retrieved from http://www.ewg.org/research/soaking-uncle-sam; Environmental Working Group. 2007, May 30. Power Drain: The Biggest Winner: Westlands. Environmental Working Group. Retrieved from http://www.ewg.org/research/power-drain/biggest-winner-westlands.] In 2002, the Westlands Water District received more than $70 million in power subsidies. Although the Westlands receives 25% of all water from the CVP, it consumes 60% of the electricity required to deliver water to all districts and 60% of all government granted power subsidies to the CVP. [Footnote: Environmental Working Group. 2007, May 30. Power Drain: The Biggest Winner: Westlands. Environmental Working Group. Retrieved from http://www.ewg.org/research/power-drain/biggest-winner-westlands.]

As mentioned above, the federal government has subsidized the Central Valley Project since its construction. While farmers were meant to pay $1 billion of the $3.6 billion project cost fifty years after its completion, it's estimated that by 2008, only 20% of that debt had been repaid. [Footnote: Environmental Working Group. 2010a, September 28. Throwing Good Money at Bad Land. Environmental Working Group. Retrieved from http://www.ewg.org/Throwing-Good-Money-at-Bad-Land.]

Response

See response to Comment NG02-51.

Comment NG02-55

Comment

7 The LTWT underestimates the cumulative effects of water transfers. Cumulative effects analyses under NEPA and CEQA are intended to identify impacts that materialize or are compounded when the proposed action is implemented at the same time as or in conjunction with other actions. In Chapters 3 and 4, the LTWT addresses cumulative effects for each resource area and provides a global description of the methods and actions considered for analysis in each resource area. Section 3.10 provides a cursory discussion of potential cumulative effects for the regional economy, but ignores the full range of possible cumulative outcomes associated with the proposed action.

According to NEPA and CEQA requirements, cumulative effects analysis must examine the possibility of effects occurring across several dimensions. When multiple projects produce effects within the same geographic and temporal range, they may: 1. Expand or contract the set of possible impacts. 2. Increase or decrease the likelihood of specific potential impacts. 3. Accelerate or decelerate the timing of specific potential impacts. 4. Change the trajectory of potential impacts. 5. Increase or decrease the economic importance of specific potential impacts. 6. Shift the distribution of uncertainty or risk borne by different groups.

Cumulative effects may arise as multiple projects interact in a linear fashion, resulting in impacts that are additive. Interactions might also be non-linear, either offsetting each other to be less than additive, or exacerbating each other to be greater than additive. The LTWT does not adequately consider cumulative effects within this framework, so misses important interactions that could result in significant impacts beyond those identified for the project alone.

One of the greatest potential sources of cumulative impacts is non-CVP water transfers. Although transfers under the SWP were considered, the possibility of other transfers occurring was not. Additional transfers would have similar impacts in the sellers' region, and may also lead to net effects that exceed sustainable thresholds and have a larger impact than each would individually. For example, the analysis 1. Ignores cumulative effects of additional water transfers on water prices, and fails to examine the effects of price on the decisions and behaviors of farmers in the context of other water transfers. 2. Ignores effects resulting from additional water transfers that have the potential to influence agricultural prices, and how those agricultural prices influence decisions about water transfers. 3. Treats effects as "temporary" and thus not significant, and thereby fails to adequately account for potential thresholds in the local agricultural economy where short-term effects would become long-term effects. 4. Assumes mitigation for groundwater effects of the proposed action would make farmers whole, so fails to properly account for potential threshold effects in groundwater resources, and associated costs to farmers. 5. Ignores the possibility that increased uncertainty related to groundwater levels, agricultural market conditions, etc. from the proposed action, in conjunction with other actions, would adversely affect farmers. 6. Ignores the cumulative effects of additional water transfers on environmental resources and conditions including aquatic, riparian, terrestrial and avian species and habitats.

Response

Transfers that move water out of the Sacramento Valley must convey water through state or federal facilities. CVP transfers are covered in the Proposed Action and DWR helped to identify SWP transfers that are covered in the cumulative analysis. Refuge water transfers have been added to the cumulative analysis. Additional transfers would not occur without Reclamation or DWR approval; therefore, all relevant transfers were evaluated in the cumulative analysis. The cumulative effects of all water transfers are discussed in all resource sections in Chapter 3, including those that address fisheries and vegetation and wildlife.

Comment Letter NG03, Barbara Vlamis, Bill Jennings, Jason Flanders, AquAlliance, California Sportfishing Protection Alliance, Aqua Terra Aeris Law Group

Comment NG03-1

Comment

AquAlliance, California Sportfishing Protection Alliance ("CSPA"), and Aqua Terra Aeris submit the following comments and questions for the Bureau of Reclamation ("Bureau") and the San Luis Delta Mendota Water Authority's ("SLDMWA") ("Lead Agencies") Draft Environmental Impact Statement ("EIS") and Environmental Impact Report ("EIR") ("EIS/EIR"), for the 2015-2024 Long Term North-to-South Water Transfer Program ("Project" or "2015-2024 Water Transfer Program").

AquAlliance exists to sustain and defend northern California waters. We have participated in past water transfer processes, commented on past transfer documents, and sued the Bureau twice in the last five years. In doing so we seek to protect the Sacramento River's watershed in order to sustain family farms and communities, enhance Delta water quality, protect creeks and rivers, native flora and fauna, vernal pools and recreational opportunities, and to participate in planning locally and regionally for the watershed's long-term future. The 2015-2024 Water Transfer Program is seriously deficient and should be withdrawn. If the Bureau and DWR are determined to purse water transfers from the Sacramento Valley, AquAlliance requests that the agencies regroup and prepare an adequate programmatic EIS/EIR.

This letter relies significantly on, references, and incorporates by reference as though fully stated herein, for which we expressly request that a response to each comment contained therein be provided, the following comments submitted on behalf of AquAlliance:

- Custis, Kit H., 2014. Comments and recommendations on U.S. Bureau of Reclamation and San Luis & Delta-Mendota Water Authority Draft Long-Term Water Transfer DRAFT EIS/EIR, Prepared for AquAlliance. ("Custis," Exhibit A)

- ECONorthwest, 2014. Critique of Long-Term Water Transfers Environmental Impact Statement/Environmental Impact Report Public Draft, Prepared for AquAlliance. ("EcoNorthwest," Exhibit B)

- Mish, Kyran D., 2014. Comments for AquAlliance on Long-Term Water Transfers Draft EIR/EIS. ("Mish," Exhibit C)
- Cannon, Tom, Comments on Long Term Transfers EIR/EIS, Review of Effects on Special Status Fish. Prepared for California Sportfishing Protection Association. ("Cannon," Exhibit D)

In addition, we renew the following comments previously submitted, attached hereto, as fully bearing upon the presently proposed project and request:

- 2009 Drought Water Bank ("DWB"). (Exhibit F)
- 2010-2011 Water Transfer Program. (Exhibit G)
- 2013 Water Transfer Program. (Exhibit G)
- 2014 Water Transfer Program. (Exhibit G)
- C-WIN, CSPA, AquAlliance Comments and Attachments for the Bay Delta Conservation Plan's EIS/EIR. (Exhibit H)
- AquAlliance's comments on the Bay Delta Conservation Plan's EIS/EIR. (Exhibit H)
- CSPA's comments on the Bay Delta Conservation Plan's EIS/EIR. (Exhibit H)

Response

See Common Response 2. The comment letters provided by Custis, ECONorthwest, Mish, and Cannon have been responded to individually as letters NG01, NG02, NG04, and NG05, respectively. The comments and documents contained in Exhibits F-H pertain to other actions and projects separate from, and independent of, the action alternatives under consideration. Written responses to these materials have been provided (or will be provided) in conjunction with the final NEPA/CEQA environmental review documents for those other actions/projects.

Comment NG03-2

Comment

I. The EIS/EIR Contains an Inadequate Project Description.

A "finite project description is indispensable to an informative, legally adequate EIR." County of Inyo v. City of Los Angeles (1977) 71 Cal.App.3d 185, 192. CEQA defines a "project" to include "the whole of an action" that may result in adverse environmental change. CEQA Guidelines § 15378. A project may not be split into component parts each subject to separate environmental review. See, e.g., Orinda Ass'n v. Board of Supervisors (1986) 182 Cal.App.3d 1145, 1171; Riverwatch v. County of San Diego (1999) 76 Cal.App.4th 1428. Without a complete and accurate description of the project and all of its components, an accurate environmental analysis is not possible. See, e.g., Santiago County Water Dist. v. County of Orange (1981) 118 Cal.App.3d 818, 829; Sierra Club v. City of Orange (2008) 163 Cal.App.4th

523, 533; City of Santee v. County of San Diego (1989)214 Cal.App.3d 1438, 1450; Blue Mountains Biodiversity Project v. United States Forest Service, 161 F.3d 1208, 1215 (9th Cir. 2008). As discussed, below, and in the expert reports submitted by Custis, EcoNorthwest, Cannon, and Mish on behalf of AquAlliance, the EIS/EIR fails to comport with these standards.

Response

The EIS/EIR includes three action alternatives that describe a full and complete set of measures to address the purpose and need and project objectives. See Common Response 14.

Comment NG03-3

Comment

a. The Project / Proposed Action Alternative Description Lacks Detail Necessary for Full Environmental Analysis.

Actual transfer buyers, sellers, modes, amounts, criteria, market demands, availability, and timing, are undisclosed.

The Proposed Action Alternative is poorly specified and needs additional clarity before decision-makers and the public can understand its human and environmental consequences. The Lead Agencies tacitly admit that they have no idea how many acre-feet of water may be made available, by what mechanism the water may be made available (fallowing, groundwater substitution, or crop changes), or to what ultimate use (public health, urban, agricultural) the water may be put.

Glenn Colusa Irrigation District is listed as the largest potential seller, but its General Manager, Thad Bettner, asserted publicly on October 7, 2014 that the district hadn't committed to the 91,000 AF found in Table ES-2 (Potential Sellers). GCID subsequently sent the Bureau a letter that states that GCID plans to pursue its own Groundwater Supplemental Supply Program and that, "It is important for Reclamation to understand that GCID has not approved the operation of any District facilities attributed to the LTWTP Action/Project that is presented in the draft EIR/EIS." The letters continues stating that, "It is important to underscore that GCID would prioritize pumping during dry and critically dry water years for use in the Groundwater Supplemental Supply Program, and thus wells used under that program would not otherwise be available for the USBR's LTWTP." First, these public and written comments contradict the EIS/EIR on page 3.8-37 where it states that, "The availability of supplies in the seller service area was determined based on data provided by the potential sellers." Second, the largest potential seller in the 2015-2024 Water Transfer Program is seemingly unable or unwilling to participate in the groundwater substitution component during dry and critically dry years. In addition, GCID has stated that "it will not participate in a groundwater substitution transfer, and for land idling reduce the acreage from 20,000 acres to no more than 10,000 acres." Similarly, the Sacramento Suburban Water District received $2 million from the Governor's Water Action Plan to move groundwater to member agencies that have been "[h]eavily dependent on Folsom reservoir," according to John Woodling of the Sacramento Regional Water Authority. 3 Woodling continues that, "During these dry times, the groundwater basin really is our insurance policy," (Id). Knowing that smart water managers are very aware of this fact, why would

Sacramento Suburban Water District turn around and propose to sell 30,000 AF of water to the out-of-region buyers through groundwater substitution transfers during the Project's "[d]ry and critically dry years"? In short, the EIS/EIR has no way of knowing what transfers may occur, and when.

Response

Chapter 2 identifies potential sellers, types of transfer actions, upper limits of water potentially available for transfer actions, and timing of the potential transfer actions in Table 2-5 (for Alternative 2), Table 2-7 (for Alternative 3), and Table 2-8 (for Alternative 4). Because the source of transfers could shift between years, all transfers identified in Chapter 2 are included in the environmental analysis in Section 3. See responses to comment letters LA05 and LA06 to better understand potential transfers from Glenn-Colusa ID. Sacramento Suburban WD indicates a maximum transfer of up to 30,000 AF, but this transfer would only occur in years when the transfer fits into the district's overall water management plans.

Comment NG03-4

Comment

It is also not possible to determine with confidence just how much water is requested by potential urban and agricultural buyers and how firm the requests are. What are SLDMWA's specific requests for agricultural or urban uses of Project water? What are the SLDMWA's present agricultural water demands for the 850,000 acres that it serves? Left to guess at the possible requests for water, we look at the 2009 DWB where there were between 400,000 and 500,000 AF of presumably urban buyer requests alone (which had priority over agricultural purchases, according to the 2009 DWB priorities) and a cumulative total of less than 400,000 AF from willing sellers. It is highly possible, based on the example during the 2009 DWB, that many buyers are not likely to have their needs addressed by the 2015-2024 Water Transfer Program. How would this affect the project objectives and purpose? How would this affect variable circumstances for other proposed transfers?

The EIS/EIR also fails to address the ability and willingness of potential buyers to pay for Project water given the supplies that may be available. Complaints from agricultural water districts were registered in the comments on the Draft Environmental Water Account EIS/EIR and reported in the Final EIS/EIR in January 2004 indicating that they could not compete on price with urban areas buying water from the EWA. Given the absence of priority criteria, will agricultural water buyers identified in Table ES-1 have the ability to buy water when competing with urban districts? Moreover, since buyers are not disclosed in the EIS/EIR for non-CVP river water, these further effects on water market conditions and competition between agricultural and urban sectors is impossible to evaluate. Who are the buyers that may request non-CVP river water, and what are their maximum requests? That DWR is not the CEQA lead agency further complicates the evaluation of competition for water in the EIS/EIR.

Response

Demands for transfers are driven by overall water demands in each buyer's district and supplies available in each year. The buyers develop a water needs assessment to estimate their future agricultural and M&I water demands. The agricultural water demands are based on crop water requirements and take into account irrigation efficiency, precipitation, acreage, and conveyance lossses. The urban water demands are based on population and per capita demands for residential water demand and total industrial and commerical needs, and also account for losses. The districts compare demands to water sources, including CVP water, and quantities to determine water needs. The districts assume full CVP water contract deliveries for quantities, but, as seen in past years, often receive only a percentage of their CVP contract allocations. This creates a need for supplemental supplies, including water transfers. The following are some examples of buyers' water needs assessments and the resulting demand for water transfers.

- Del Puerto Water District has estimated future agricultural demands to be 142,735 AF and assumes maximum CVP Contract Total supplies of 140,210 AF and groundwater supply of 3,000 AF.
- Mercy Springs Water District has estimated future agricultural water demands to be 16,765 AF and has estimated unmet water demands to be 9,725 AF. The district has a Contract Total of 7,040 AF.
- Pacheco Water District has estimated future agricultural water demands to be 11,630 AF and has a Contract Total of 10,080 AF and local supplies of 4,399 AF.
- Panoche Water District has estimated a total future agricultural water demand of 92,816 AF and has a Contract Total of 94,000 AF.
- San Benito County Water District has total future agricultural and M&I demands of 60,158 AF and a Contract Total of 43,000 AF and groundwater supply of 26,000 AF.
- San Luis Water District has estimated a total future agricultrual water demand of 119,356 AF and a Contract Total of 125,080 AF and groundwater supply of 5,000 AF.
- Santa Clara Valley Water District has estimated total future agricultural and M&I water demands of 595,574 AF. Total future supplies include a Contract Total of 152,500 AF, SWP supply of 74,000 AF, local supply of 164,800, transfers or recycled water of 14,400 AF, and groundwater supply of 33,000 AF, for a total of 438,700 AF. The district estimates an unmet demand of 156,874 AF.
- Westlands Water District has estimated total future agricultural water demands of 1,228,398 AF and M&I demand of 4,938 AF. The district has a Contract Total of 1,150,000 AF and groundwater supply of 175,000 AF.

As seen in their water needs assessment, the buyers assume a maximum CVP contract delivery to meet future demands. Therefore, any reduction in CVP deliveries can create an unmet demand and potential need for water transfers. Water transfers are not intended to meet all the unmet demands for districts. They are immediate and flexible supplemental supplies to reduce effects of a shortage but are not expected to make up for entire shortages experienced by buyers. Generally, demands for water transfers are greater than the available transfers and the capacity to move water through the Delta; therefore, the EIS/EIR includes upper limits for transfers driven by these two factors (as described in more detail in Appendix C).

Water transfer prices for both CVP and non-CVP supplies are set between willing sellers and willing buyers. Potential SWP buyers of SWP transfers are listed in Table 4-2. SLDMWA has purchased water transfers in past years despite urban water transfers also occurring at sometimes higher prices. Therefore, SLDWMA and its member agencies have not been priced out of the water transfer market and would continue to negotiate water transfers in the future with willing sellers. See response to Comment NG02-34 regarding willingness to pay. See Common Response 1 regarding the CEQA lead agency.

Comment NG03-5

Comment

Nor does the 2015-2024 Water Transfer Program prevent rice growers (or other farmers) from "double-dipping," but actually encourages it. Districts and their growers have opted to turn back their surface supplies from the CVP and the State Water Project and substitute groundwater to cultivate their rice crop—thereby receiving premiums on both their CVP contract surface water as well as their rice crop each fall when it goes to market. There appear to be no caps on water sale prices to prevent windfall profits to sellers of Sacramento Valley water — especially for crops with high market prices, such as rice.

The EIS/EIR is inadequate because it fails to identify and analyze the market context for crops as well as water that would ultimately influence the size and scope of the 2015-2024 Water Transfer Program.4 The Project's sellers and buyers are highly sensitive to the influences of prices—prices for water as well as crops such as rice, orchard and vineyard commodities, and other field crops. It is plausible that crop idling would occur more in field crops, while groundwater substitution would be more likely for orchard and vineyard crops. However, high prices for rice—the Sacramento Valley's largest field crop— undermines this logic and leads to substantial groundwater substitution. These potential issues and impacts should be recognized in the EIS/EIR because crop prices are key factors in choices potential water sellers would weigh in deciding whether to idle crops, substitute groundwater, or decline to participate in the Project altogether.

Response

Reclamation has an approval process in place to ensure that real water is transferred in groundwater substitution and cropland idling transfers. For cropland idling transfers, irrigation of the crop is not allowed. Groundwater substitution allows the crop to be irrigated with groundwater and the grower to produce the crop. See Common Response 14. All transfers are between willing sellers and willing buyers; therefore, growers' participation is voluntary. Growers likely consider crop prices in deciding whether to participate or not. Also, buyers and sellers negotiate the water transfer price, and growers likely consider the water transfer price in their decision to participate in transfers. Reclamation is not involved in setting the price. An EIS/EIR is not required to evaluate costs of an alternative and does not assess a grower's decision to participate in transfers. See response to Comment LA14-14. Economic effects related to third parties are described in Section 3.10. The Proposed Action and alternatives place maximum quantities on all transfer types; therefore, the amount of groundwater substitution and cropland idling that could occur is limited.

Comment NG03-6

Comment

To enable a more complete and discrete project description, the EIS/EIR should propose criteria other than price alone to manage allocation of state water resources. The EIS/EIR should consider some priority criteria as was included in the 2009 Drought Water Bank EA/FONSI (p.3-88). Do both authorizing agencies, the Bureau and DWR, lack criteria to prioritize water transfers? Are transfers approved on a first-come first-serve basis, as generated by market conditions alone? What is the legal or policy basis to act without providing priority criteria? A lack of criteria fails to encourage regions to develop their own water supplies more efficiently and cost-effectively without damage to resources of other regions. If criteria will be applied, these need to be disclosed and analyzed in the EIS/EIR.

Additional uncertainty caused by the incomplete project description includes:

- How many of the proposed transfers would be one year in duration, multi-year, or permanent. How will the duration of any agreement be determined? The duration of a transfer agreement will have dramatic effects on the water market as well as the environmental impact analysis.

- The EIS/EIR purports to be a 10 year project, but is there an actual sunset date, since it continues serially in multiple years? Could any transfer be approved in the next 10 years that would extend beyond 2024?

- The proposed program provides no way to know what ultimate use transferred water will be put to; nor does the EIS/EIR provide any way to know what activities may occur on idled cropland. The EIS/EIR assumptions on these points are inherently incomplete and fail to support any discrete environmental analysis.

In sum, the proposed program provides no way to know which transfers may or may not occur, individually or cumulatively. The lack of a stable and finite project description undermines the entire EIS/EIR. As discussed further, below, description of the environmental setting, evaluation of potentially significant impacts, and formulation of mitigation measures, among other issues, all are rendered unduly imprecise, deferred, and incomplete, subject to the theoretical transfers taking shape at some, unknown, future time.

Response

As discussed in Section 1.5 of the EIS/EIR, the transfers included in this document are not part of a “program” where Reclamation would determine which transfers should move forward based on a set of criteria. The EIS/EIR analyzes transfers that would be negotiated between buyers and sellers, as described in the project description. Reclamation would not prioritize transfers, but would evaluate if transfers should be approved and facilitate the approved transfers. See Common Response 14 for more information about the annual review process.

The EIS/EIR only covers the period through 2024; transfers extending after this date would require subsequent environmental compliance. During the 2015-2024 period, transfers could be single year or multi-year (as discussed in Section 2.3.2.7). If a buyer and seller negotiate a multi-year transfer, it does not mean that water would be transferred every year of the transferring period. Rather, it indicates that a buyer has a first right of refusal for that water, and the buyer could purchase that water in dry years with transfer demand and available capacity to move the water. Reclamation would still need to approve these transfers each year, as discussed in Common Response 14.

Section 1 discusses that the transferred water would be used to meet existing demands for agricultural and municipal and industrial water supply. Because the buyers and sellers cannot predict in which years transfers may be made and the quantity of water that may be available, the full range of potential transfer actions have been analyzed in the EIS/EIR to capture the potential environmental effects.

Comment NG03-7

Comment

Historic transfer data is excluded:

Absent from the DEIS/EIR are any of the required monitoring reports from previous transfer projects. See, e.g., Citizens for East Shore Parks v. State Lands Commission (2010) 48 Cal.App.4th 549; communities for a Better Environment v. South Coast Air Quality Mgmt. Dist. (2010) 48 Cal.App.4th 310. Without the required monitoring reports, the public is left in the dark regarding this new proposal to sell up to 600,000 AF annually over a 10 year period. No information is provided regarding the impacts to downstream users, wells near production wells, the Sacramento River and its tributaries, refuges, water quality, special status species and the San Francisco Bay Delta Estuary from past CVP transfers or cumulatively including non-CVP water transfers in the area of origin. For example, groundwater substitution transfers and transfers that result in reduced flows in combination with below normal water years are known to have to have the potential for significant impacts on water quality, fish, wildlife and the flows in the Sacramento River and its tributaries. Providing all such documentation of the terms, conditions, effects, and outcomes of prior transfers is integral to understanding the proposed Project.

Response

See response to Comment NG02-31.

Comment NG03-8

Comment

The Proposed Project is in Fact a Proposed Program:

The lack of any stable, discrete, project description, at best, renders the proposed project a "program," rather than any specific project itself. "[A] program EIR is distinct from a project EIR, which is prepared for a specific project and must examine in detail site-specific considerations." Center for Sierra Nevada Conservation v. County of El Dorado (2012) 202 Cal.App.4th 1156, 1184. As discussed further, below, this EIS/EIR does not and cannot complete site-specific and project-specific analysis of unknown transfers at unknown times. Buyers and sellers have "expressed interest," but no specific transfers or combination of transfers are proposed, and we don't know which may be proposed or ultimately approved.

Put differently, the EIS/EIR project description is not simply inadequate: the EIS/EIR fails to propose or approve any project at all. Instead, the EIS/EIR should be recharacterized and revised as a program EIS/EIR. Indeed, agency documents have referred to this program, as such, for years. (E.g., Federal Register /Vol. 75, No. 248 /Tuesday, December 28, 2010 /Notices Long-Term North to South Water Transfer Program, Sacramento County, CA; Final EA/FONSI for 2010-2011 Water Transfer Program.) And other external sources also support the proposition that this EIS/EIR does not and cannot review and approve specific transfers:

"Each transfer is unique and must be evaluated individually to determine the quantity and timing of real water made available." (BDCP DEIR at 1E-2.)

"Although this document seeks to identify in the best and most complete way possible the information needed for transfer approval, to both expedite that approval and to reduce participant uncertainty, each transfer is unique and must be considered on its individual factual merits, using all the information that is available at the time of transfer approval and execution of the conveyance or letter of agreement with the respective Project Agency in accordance with the applicable legal requirements. This document does not pre-determine those needs or those facts and does not foreclose the requirement and consideration of additional information." (Draft Technical Information for Preparing Water Transfer Proposals ("DTIPWTP") 2014.)

Response

Chapter 2 of the EIS/EIR provides a complete description of each of the action alternatives considered in the EIS/EIR, including the location, scope, elements, and implementation timeframe of each alternative. That project description information provided the basis to complete a comprehensive impacts analysis for the implementation of each alternative. Comments claiming that the project description is too general and that the EIR should be recharacterized as a program EIR are similar to the arguments recently rejected by the California Appellate Court in Citizens for a Sustainable Treasure Island v. City and County of San Francisco, (2014) 227 Cal.App.4th 1036. The Court of Appeal essentially rejected the argument of "project EIR" versus "program EIR" as mere semantics, noting that "many different names have been applied to EIRs" and "[f]or this reason, courts strive to avoid attaching too much significance to titles in ascertaining whether a legally adequate EIR has been prepared for a particular project." The Court pointed out that all EIRs must cover the same general content and that "[t]he level of specificity of an EIR is determined by the nature of the project and the "rule of reason" … rather than any semantic label accorded to the EIR." Relative to the lack of certain details within the project description, the Court found "the EIR cannot be faulted for not providing detail that, due to the nature of the

Project, simply does not now exist." Merely because "all hypothetical details" were not resolved and the EIR did "not anticipate every permutation or analyze every possibility" did not render its project description misleading, inaccurate, or vague; rather, the project description chapter within the EIR accurately described the Project and "remained accurate, stable, and finite throughout the EIR process." See Common Response 14.

Comment NG03-9

Comment

Indeed, the Bureau and DWR have known for over a decade that programmatic environmental review was and is necessary for water transfers from the Sacramento Valley. The following examples highlight the Bureau and DWR's deficiencies in complying with NEPA and CEQA.

a. The Sacramento Valley Water Management Agreement was signed in 2002, and the need for a programmatic EIS/EIR was clear at that time it was initiated but never completed.

b. In 2000, the Governor's Advisory Drought Planning Panel report, Critical Water Shortage Contingency Plan promised a program EIR on a drought-response water transfer program, but was never undertaken.

c. Sacramento Valley Integrated Regional Water Management Plan (2006).

d. The Sacramento Valley Water Management Plan (2007).

e. The CVPIA mandates the Bureau contribute to the State of California's long-term efforts to protect the San Francisco Bay/Sacramento-San Joaquin Delta Estuary, among other things. (EIS/EIR 1-10.)

Accordingly, the EIS/EIR should be revised to state that it does not and cannot constitute sufficient environmental review of any particular, as-of-yet-unknown, water transfer proposal; and instead be revised, restructured, and recirculated to provide programmatic policies, criteria, and first-tier environmental review.

Response

The activities analyzed under the Proposed Action are different from the efforts cited in the comments, and reflect a range of potential transfers that are driven by buyers and sellers. These parties have provided information on upper limits for transfers, where the transfer would occur, the method to make water available, and how it would be conveyed to the buyer. See Common Response 14.

Chapter 2 of the EIS/EIR provides a complete description of each of the action alternatives considered in the EIS/EIR, including the location, scope, elements, and implementation timeframe of each alternative. That project description information provided the basis to complete a comprehensive impacts analysis for the implementation of each alternative. Comments claiming that the project description is too general and that the EIR should be recharacterized as a program EIR are similar to the arguments recently rejected by the California Appellate Court in Citizens for a

Sustainable Treasure Island v. City and County of San Francisco, (2014) 227 Cal.App.4th 1036 (see response to Comment NG03-8).

Comment NG03-10

Comment

The EIS/EIR Improperly Segments Environmental Review of the Whole of this Program:

As discussed throughout these comments, the proposed Project does not exist in a vacuum, but rather is another transfer program in a series of many that have been termed either "temporary," "short term," "emergency," or "one-time" water transfers, and is cumulative to numerous broad programs or plans to develop regional groundwater resources and a conjunctive use system. The 2015-2024 Water Transfer Program is also only one of several proposed and existing projects that affect the regional aquifers.

For example, the proposed Project is, in fact, just one project piece required to implement the Sacramento Valley Water Management Agreement ("SVWMA"). The Bureau has publically stated the need to prepare programmatic environmental review for the SVWMA for over a decade, and the present EIS/EIR covers a significant portion of the program agreed to under the SVWMA. In 2003, the Bureau published an NOI/NOP for a "Short-term Sacramento Valley Water Management Program EIS/EIR." (68 Federal Register 46218 (Aug 5, 2003).) As summarized on the Bureau's current website:

The Short-term phase of the SVWM Program resolves water quality and water rights issues arising from the need to meet the flow-related water quality objectives of the 1995 Bay-Delta Water Quality Control Plan and the State Water Resources Control Board's Phase 8 Water Rights Hearing process, and would promote better water management in the Sacramento Valley and develop additional water supplies through a cooperative water management partnership. Program participants include Reclamation, DWR, Northern California Water Association, San Luis & Delta-Mendota Water Authority, some Sacramento Valley water users, and Central Valley Project and State Water Project contractors. SVWM Program actions would be locally-proposed projects and actions that include the development of groundwater to substitute for surface water supplies, conjunctive use of groundwater and surface water, refurbish existing groundwater extraction wells, install groundwater monitoring stations, install new groundwater extraction wells, reservoir re-operation, system improvements such as canal lining, tailwater recovery, and improved operations, or surface and groundwater planning studies. These short-term projects and actions would be implemented for a period of 10 years in areas of Shasta, Butte, Sutter, Glenn, Tehama, Colusa, Sacramento, Placer, and Yolo counties (Source: http://www.usbr.gov/mp/nepa/nepa_projdetails.cfm?Project_ID=788)

The resounding parallels between the SVWMA NOI/NOP and the presently proposed project are not merely coincidence: they are a piece of the same program. In fact, the SVWMA continues to require the Bureau and SLDMWA to facilitate water transfers through crop idling or groundwater substitution: Management Tools for this Agreement. A key to accomplishing the goals of this Agreement will be the identification and implementation of a "palette" of voluntary water management measures (including cost and yield data) that could be implemented to develop increased water supply, reliability, and operational flexibility. Some of the measures that may be included in the palette are: (v) Transfers and exchanges among Upstream Water Users and with the CVP and SWP water contractors, either for water from specific reservoirs, or by substituting groundwater for surface water . . . (Source:http://www.norcalwater.org/wp-content/uploads/2010/12/sac_valley_water_mgmt_agrmt_new.pdf)

Response

The Proposed Action is not part of the Sacramento Valley Water Management Agreement (SVWMA). At this time, the SVWMA is not moving forward and is not considered in the cumulative analysis.

Comment NG03-11

Comment

It is abundantly clear that the Bureau and SLDMWA are proposing a program through the present draft EIS/EIR to implement this management tool, as required by the SVWMA. But neither CEQA nor NEPA permit this approach of segmenting and piecemealing review of the whole of a project down to its component parts. The water transfers proposed for this project will directly advance SVWMA implementation, and the Bureau and DWR must complete environmental review of the whole of the program, as first proposed in 2003 but since abandoned. For example, the draft EIS/EIR does not reveal that the current Project is part of a much larger set of plans to develop groundwater in the region, to develop a “conjunctive” system for the region, and to integrate northern California’s groundwater into the state’s water supply.

In this vein the U.S. Department of Interior, 2006. Grant Assistance Agreement, Stony Creek Fan Conjunctive Water Management Program and Regional Integration of the lower Tuscan Groundwater formation laid bare the intentions of the Bureau and its largest Sacramento Valley water district partner, Glenn Colusa Irrigation District, to take over the Tuscan groundwater basin to further the implementation of the SVWMA, stating:

GCID shall define three hypothetical water delivery systems from the State Water Project (Oroville), the Central Valley Project (Shasta) and the Orland Project reservoirs sufficient to provide full and reliable surface water delivery to parties now pumping from the Lower Tuscan Formation. The purpose of this activity is to describe and compare the performance of three alternative ways of furnishing a substitute surface water supply to the current Lower Tuscan Formation groundwater users to eliminate the risks to them of more aggressive pumping from the Formation and to optimize conjunctive management of the Sacramento Valley water resources.

Response

See responses to Comments NG03-8 and NG03-10.

Comment NG03-12

Comment

The Project Description Contains an Inadequate Statement of Objectives, Purpose, and Need.

The lack of a stable project description/proposed alternative, as discussed, above, further obfuscates the need for the Project. Further, without programmatic criteria to prioritize certain transfers, the public is not provided with even a basic understanding of the need for the Project.

The importance of this section in a NEPA document can't be overstated. "It establishes why the agency is proposing to spend large amounts of taxpayers' money while at the same time causing significant environmental impacts… As importantly, the project purpose and need drives the process for alternatives consideration, in-depth analysis, and ultimate selection. The Council on Environmental Quality (CEQ) regulations require that the EIS address the "no-action" alternative and "rigorously explore and objectively evaluate all reasonable alternatives." Furthermore, a well-justified purpose and need is vital to meeting the requirements of Section 4(f) (49 U.S.C. 303) and the Executive Orders on Wetlands (E.O. 11990) and Floodplains (E.O. 11988) and the Section 404(b)(1) Guidelines. Without a well-defined, well-established and well-justified purpose and need, it will be difficult to determine which alternatives are reasonable, prudent and practicable, and it may be impossible to dismiss the no-build alternative". (Source: Federal Transportation and Highway Administration, 1990. NEPA and Transportation Decision-making: The Importance of Purpose and Need in Environmental Documents. http://www.environment.fhwa.dot.gov/projdev/tdmneed.asp)

With the importance of a Purpose and Need statement revealed above, the Project's version for purposes of NEPA states that, "The purpose of the Proposed Action is to facilitate and approve voluntary water transfers from willing sellers upstream of the Delta to water users south of the Delta and in the San Francisco Bay Area. Water users have the need for immediately implementable and flexible supplemental water supplies to alleviate shortages," (p. 1-2). Noticeably missing from this section of the EIS/EIR is a statement about the Bureau's purpose and need, not the buyers' purpose and need. The omission of any need on the Bureau's part for this Project highlights the conflicts in the Bureau's mission, deficiencies in planning for both the short and long term, and the inadequacy of the EIS/EIR that should provide the public with the basis for the development of the range of reasonable alternatives and the identification and eventual selection of a preferred alternative. The Reclamation's NEPA Handbook (2012) stresses that, "The need for an accurate (and adequate) purpose and need statement early in the NEPA process cannot be overstated. This statement gives direction to the entire process and ensures alternatives are designed to address project goals." (p.11-1)

For purposes of CEQA, the Project Objectives (p. 1-2) go on to state that,

SLDMWA has developed the following objectives for long-term water transfers through 2024:

- Develop supplemental water supply for member agencies during times of CVP shortages to meet existing demands.
- Meet the need of member agencies for a water supply that is immediately implementable and flexible and can respond to changes in hydrologic conditions and CVP allocations.

Because shortages are expected due to hydrologic conditions, climatic variability, and regulatory requirements, transfers are needed to meet water demands.

But merely asserting that there are "demands" from their member lacks context, specificity, and rigor. It also fails to mention the need of the non-member buying agencies involved in the Project.

Response

The Lead Agencies establish the purpose and need and project objectives to best describe their underlying reasons for considering an action. Reclamation is not prioritizing transfers because this effort is not a "program" led by Reclamation, but rather a range of potential individual transfers that may be negotiated by the sellers and buyers. Reclamation would not prioritize the transfers, but would review and approve (if appropriate) each proposed transfer on an equal level.

Comment NG03-13

Comment

Some context for the policy failures that lead to the stated need for the Project must be presented. First, the hydrologic conditions described on pages ES-1, 1-1, and 1-2 almost always apply to the entire state, including the region where sellers are sought, not just the areas served by SLDMWA and non-member buyers as presented here. Second, SLDMWA has chronic water shortages due to its contractors' junior position in water rights, risks taken by growers to plant permanent crops, and serious long-term overdraft in its service area. Where is this divulged? Third, SLDMWA or its member agencies have sought to buy and actually procured water in many past water years to make up for poor planning and risky business decisions, which violates CEQA's prohibition against segmenting a project to evade proper environmental review. The habitual nature of the transfers is acknowledged on pages ES-1 and 1-1 stating, "In the past decades, water entities have been implementing water transfers to supplement available water supplies to serve existing demands, and such transfers have become a common tool in water resource planning." (See Table 1 for an attempt at documenting transfers since actual numbers are not disclosed in the EIS/EIR).

Response

See response to Comment LA02-3. The 2014 Draft EIS/EIR did consider alternatives that would change cropping patterns or retire land in the buyers area (see Table 2-1 and Appendix A), but these alternatives did not move forward because they did not meet most of the purpose and need and project objectives. Table 1-3 shows historic transfers to the buyers in this document; each of these transfers had independent utility and did not rely on other transfers.

Comment NG03-14

Comment

The Bureau and DWR's facilitation of so-called "temporary" annual transfers in 12 of the last 14 years is illustrated in Table 1 (2014 transfer totals have not been tallied to date). {See Table 1 in comment letter}.

The Project has become an extension of the so-called "temporary" annual transfers based on the demands of junior water rights holders who expect to receive little contract water during dry years. The low priority of their junior water service contracts within the Central Valley Project leaves their imported surface supplies in question year-to-year. It is the normal and appropriate function of California's system of water rights law that makes it so. Yet the efforts of the Bureau and DWR to oversee, approve, and facilitate water sales from the Sacramento, Feather, and Yuba rivers with fallowing and groundwater substation are only intended to benefit the few western San Joaquin Valley farmers whose contractual surface water rights have always been less reliable than most—and whose lands are the most problematic for irrigation. These growers have chosen to harden demand by planting permanent crops, a very questionable business decision, but the Bureau fails to explain why this "tail" in water rights is wagging the dog.

Response

Many of the transfers in Table 1 of the comment letter are not CVP-related and do not involve Reclamation. Table 1-3 includes historic transfers similar to those included in the action alternatives. This EIS/EIR analyzes potential multi-year transfers in addition to single-year transfers. The potential to change cropping patterns in the San Joaquin Valley was considered as an alternative in the EIS/EIR (see Table 2-1 and Appendix A), but was not carried forward for more detailed analysis because it did not meet the purpose and need and project objectives of immediacy and flexibility.

Comment NG03-15

Comment

The Project Description does Not Include all Project Components.

i. Carriage water.

The EIS/EIR's description of and reliance on "carriage water" is completely uncertain, undefined, and provides no meaningful information to the public. The EIS/EIR states that "Outflows would generally increase during the transfer period because carriage water would become additional Delta outflow." (EIS/EIR 3.2-39.) The EIS/EIR also asserts that, "Carriage water (a portion of the transfer that is not diverted in the Delta and becomes Delta outflow) will be used to maintain water quality in the Delta." (EIS/EIR 2-29.) Elsewhere the EIS/EIR references 20% carriage losses for CCWD and SLDMWA in the EIS/EIR (3.2-39, 3.2-57-58, and B-6), while prior documents have used higher estimates:

Historically, approximately 20-30% of the water transferred through the Delta would be necessary to enable the maintenance of water quality standards, which are based largely upon the total amount of water moving through the Bay-Delta system. This water, which is not available for delivery to Buyers, is known as "carriage water." Given historically dry conditions prevailing in 2014, DWR estimates that carriage losses could be higher. (Biggs West Gridley 2014 Water Transfer Neg Dec, p. 4) (Exhibit I). A Bureau spreadsheet that documents the final transfer numbers for 2013 clearly demonstrates that the 30% figure was used for carriage losses (Source: Bureau of Reclamation, 2013-12-17 2013 Total Pumpage (FINAL) nlw.xlsx (Exhibit J)). The spreadsheet further reveals that there are additional water deductions that were made prior to delivery in 2013 for DWR Conveyance Loss (2%) and Warren Act Conveyance Loss (3%). When all the water deductions are tallied for stream depletion, carriage losses, and the two conveyance losses, the actual water available for delivery when groundwater substitution is used is 53%. This is not presented in the EIS/EIR, which allows the Lead Agencies to overestimate the amount of water that is delivered through the Delta to Buyers and therefore the economic benefits of the 2015-2024 Water Transfer Program. What is lacking is any meaningful discussion of the need for, role, availability, and effect of carriage water and conveyance losses in any transfer in the EIS/EIR. Without such information it is not possible to determine the water quality and supply effects of the program.

Response

The description of carriage water in Section 2.3.2.4 has been revised for clarity. Carriage water includes water to maintain water quality in the Delta as well as conveyance losses, as described in the comment. The precise amount of carriage water is calculated during the transfer based on real-time monitoring information in the Delta. As mentioned in the comment, the typical amount for transfers from the Sacramento Valley is about 20 to 30 percent, and the typical amount for transfers from the San Joaquin Valley is about 10 percent. The comment assumes a percentage for a streamflow depletion factor that is not clear, as a specific number was not included in the 2014 Draft EIS/EIR. (Common Response 8 includes updated information on the streamflow depletion factor.) While the exact numbers are not clear until the transfer occurs, the amount a buyer receives from the original transfer is reduced by carriage water losses and the streamflow depletion factor.

Comment NG03-16

Comment

Monitoring and production wells:

The identity and locations of all wells that will be used to monitor groundwater substitution transfer pumping impacts are unknown. The EIS/EIR must include proposed transfer well locations that are sufficiently accurate to allow for determination of distances between the wells and areas of potential impact. These are integral project features that must be disclosed in detail prior to any meaningful effects analysis.

In 2009, GCID installed four production wells to extract 26,530 AF of groundwater as part of its Stony Creek Fan Aquifer Performance Testing Plan. Other districts have also installed production wells, most with public funds, that have been used for past transfers such as Anderson/Cottonwood Irrigation District, Butte Water District, and RD-108. To the extent those wells and any others would be used in this project, they must be considered to be part of the whole of the action, and disclosed and analyzed herein.

Response

The production wells are shown in Figures 3.3-28 through 3.3-33. Monitoring wells may vary in different years as new monitoring facilities become available; the monitoring objectives that must be satisfied are included in Mitigation Measure GW-1. See Common Responses 6 and 7 for additional information. The monitoring wells must be in addition to production wells. The action alternatives do not include installation of new wells; if the sellers want to install additional wells for transfers or other purposes, that effort would require additional environmental compliance.

Comment NG03-17

Comment

"Other" transfers:

The EIS/EIR states that, "Other transfers not included in this EIS/EIR could occur during the same time period, subject to their own environmental review (as necessary)." (EIS/EIR 1-2.) In other words, not only is the EIS/EIR unclear precisely about which transfers are likely to occur and are analyzed in this EIR/EIR, it also leaves open-ended the prospect of some transfers not being covered by the EIS/EIR. This apparent piecemealing of transfer projects short-circuits comprehensive environmental review.

Response

This EIS/EIR has asked potential buyers and sellers to provide the best available information on future water transfers, and any potential transfers identified were included in the evaluation. The cited text refers to other transfers that may occur at the same time to different buyers; these transfers are included in the cumulative analysis and are analyzed in combination with the action alternatives.

Comment NG03-18

Comment

The Project Description Fails to Include Sufficient Locations, Maps, and Boundaries:

The project description must show the location of the project, its component parts, and the affected environmental features. CEQA Guidelines § 15124(a).

Maps are needed of each seller service area at a scale that allows for reasonably accurate measurement of distances between the groundwater substitution transfer wells and surface water features, other non-participating wells, proposed monitoring wells, fisheries, vegetation and wildlife areas, critical surface structures, and regional economic features. Maps with rates and times of stream depletion by longitudinal channel section are needed to allow for an adequate review of the Draft EIR/EIS conclusion of less than significant and reasonable impacts with no injury. These maps are also needed to evaluate the specific locations for monitoring potential impacts. Thus, detailed maps that show the locations of the monitoring wells and the areas of potential impact along with the rates and seasons of anticipated stream depletion are needed for each seller service area. These maps are also needed to allow for evaluation of the cumulative effects whenever pumping by multiple sellers can impact the same resource. The only maps provided by the Draft EIS/EIR that show the location of the groundwater substitution transfer wells, and the rivers and streams potentially impacted are the simulated drawdown Figures 3.3-26 to 3.3-31, which are at a scale of approximately 1 inch to 18 miles. The lack of maps with sufficient detail to see the relationship between the wells and the surface water features prevents adequate review of the Draft EIS/EIR analysis to determine groundwater and surface water impacts.

Response

Figures have been added to Chapter 2 to show more information about surface water features and participating groundwater wells.

Comment NG03-19

Comment

Furthermore, figure 3.1-1, mapping the project area, is impossible to read and determine where each seller and buyer service area actually lies. Nor does the figure itself actually include many geographic points of reference used throughout the EIS/EIR. The EIS/EIR, for example, states that "Pelger MCW is located on the east side of the Sacramento River near Robbins (Figure 3.1-1.)" (EIS/EIR at 3.1-7.) But Robbins is not on the map, and the Pelger MCW is virtually impossible to locate on Figure 3.1-1. Similarly, the EIS/EIR states that the Sacramento River is impaired from Keswick dam to the Delta, but the EIS/EIR contains no description or map showing where Keswick dam is located, or any map enabling an understanding of the geographic scope of this water quality impairment. This problem repeats for literally dozens of existing environmental features described in the EIS/EIR. And, this problem is compounded by the unstable nature of the project description itself, leaving the EIS/EIR to string together multiple combinations of place names where transfers may or may not be imported or exported, and leaving the reader to continually search out secondary information to attempt to follow the EIS/EIR's terse and convoluted descriptions. A clear explanation, with visual aids, of the affected environment, including all local creeks and streams, and transfer water routes, is necessary to enable any member of the general public to grasp the potential types and locations of environmental impacts caused by the proposed program.

Response

Figure 3.1-1 has been revised to add points of reference to the map. Figure 2-4 provides a more detailed map of the location of potential sellers. As described in Section 3.17.1.3.1, Keswick Dam is approximately 9 miles downstream of Shasta Dam. Other facilities within the area of analysis are described and shown visually in the applicable resource areas in Chapter 3.

Comment NG03-20

Comment

The EIS/EIR State Lead Agency Should be DWR, Not SLDMWA:

SLDMWA is not the proper Lead Agency for the Project. California Environmental Quality Act ("CEQA") Guidelines sections 15367 and 15051 require that the California Department of Water Resources ("DWR"), as the operator of the California Aqueduct and who has responsibility to protect the public health and safety and the financial security of bondholders with respect to the aqueduct, is the more appropriate lead agency. In PCL v DWR, the court found that DWR's attempt to delegate lead agency authority impermissibly insulated the department from "public awareness and possible reaction to the individual members' environmental and economic values." {Planning and Conservation League et al. v Department of Water Resources (2000) 83 Cal.App.4th 892, 907, citing Kleist v. City of Glendale (1976) 56 Cal. App. 3d 770, 779.}

Pursuant to CEQA, “lead agency” means the public agency which has the principal responsibility for carrying out or approving a project which may have a significant effect upon the environment.” (Public Res. Code § 21067.) As such, the lead agency must have authority to require imposition of alternatives and mitigation measures to reduce or avoid significant project effects, and must have the authority to disapprove of the project altogether. Here, the DWR clearly fits this description. As the EIS/EIR states, “[t]hese transfers require approval from Reclamation and/or Department of Water Resources (DWR).” (EIS/EIR 1-2.) Additionally, the EIS/EIR reveals the obvious and long-standing relationship between the Bureau and DWR in facilitating surface water transfers. The Bureau and DWR have collaborated on each DTIWT publication, which provides specific environmental considerations for transfer proposals; are said to have “sponsored drought-related programs” together; have created the joint EIS/EIR for the Environmental Water Account (“EWA”); and “cooperatively implemented the 2009 Drought Water Bank.”

SLDMWA should not serve as the lead agency. The 2015-2024 Water Transfer Program has the potential to impact the long-term water supplies, environment, and economies in many California counties far removed from the SLDMWA geographic boundaries. With SLDMWA designated as the lead agency, and no potential sellers or source counties designated as responsible agencies, the process is unreasonably biased toward the narrow functional interests of SLDMWA and its member agencies. According to the EIS/EIR, the SLDMWA’s role is to “[h]elp negotiate transfers in years when the member agencies could experience shortages.” (EIS/EIR 1-1.) Helping to negotiate a transfer is a wholly different role than that of a lead agency with approval authority over a project. All of SLDMWA’s purposes and powers are centered on providing benefit to member organizations,{Source: SLDMWA JPA, para. 6, pp. 4-7} and do not implement the Sustainable Groundwater Management Act.{Source: St. Amant 2014. Letter to Bureau of Reclamation and SLDMWA re the 2015-2024 Water Transfer Program}. Not only would SLDMWA be advocating on behalf of its members in this process, but nothing provided in the EIS/EIR suggests that it has authority to require mitigation measures or alternatives to reduce or avoid significant project impacts, for example, to groundwater resources in the seller service area, as such limitations would clearly be contrary to the specific interests of the SLDMWA members.

Importantly, DWR not only has jurisdiction over the SLDMWA transfers in ways that SLDMWA does not, but also DWR has review and approval authority over potential transfers outside of the SLDMWA altogether, including, for example, the East Bay Municipal Utilities District, as well as “[o]ther transfers not included in this EIS/EIR [that] could occur during the same time period, subject to their own environmental review (as necessary).” (EIS/EIR 1-2.) Environmental review of transfers should be unified and comprehensive, and cumulative across both geography and over time in a way that DWR and not SLDMWA can provide.

Response

See Common Response 1.

Comment NG03-21

Comment

The EIS/EIR Fails to Completely and Accurately Describe the Affected Environmental Setting and Baseline Conditions.

A complete and accurate description of the existing and affected environmental setting is critical for an adequate evaluation of impacts to it. See e.g. San Joaquin Raptor/Wildlife Rescue Ctr. v. County of Stanislaus (1994) 27 Cal.App.4th 713; Galante Vineyards v. Monterey Peninsula Water Mgmt. Dist. (1997) 60 Cal.App.4th 1109, 1122; County of Amador v. El Dorado County Water Agency (1999) 76 Cal.App.4th 931, 955; Cadiz Land Co. v. Rail Cycle (2000) 83 Cal.App.4th 74, 94.

As discussed, below, and in the expert reports submitted by Custis, EcoNorthwest, Cannon, and Mish on behalf of AquAlliance, the EIS/EIR fails to comport with these standards.

Response

See response to Comment NG02-2.

Comment NG03-22

Comment

The EIS/EIR Fails to Describe Existing Physical Conditions.

i. Groundwater Supply

The EIS/EIR fails to provide a comprehensive assessment of the historic change in groundwater storage in the Sacramento Valley groundwater basin, and other seller sources areas within the proposed 10-year groundwater substitution transfer project. Historic change and current groundwater contour maps are critical to establishing an environmental baseline for the groundwater substitution transfers. The EIS/EIR uses SACFEM2013 simulations of groundwater substitution transfer pumping effects for WY 1970 to WY 2003, but the discussion of the simulation didn’t provide specifics on how the model simulated the current conditions of the Sacramento Valley groundwater system or the potential impacts from the 10-year groundwater substitution transfer project based on current conditions. Again, The EIS/EIR relies on only modeling to consider impacts from the Project when it should disclose the results from actual monitoring and reporting for water transfer conducted in 12 of the last 14 years.

The EIS/EIR concludes that the Sacramento Valley basin’s groundwater storage has been relatively constant over the long term, decreasing during dry years and increasing during wetter periods, but the EIR/EIS ignores more recent information and study (e.g. Brush 2013a and 2013b, NCWA, 2014a and 2014b). According to the BDCP EIS/EIR:

Some locales show the early signs of persistent drawdown, including the northern Sacramento County area, areas near Chico, and on the far west side of the Sacramento Valley in Glenn County where water demands are met primarily, and in some locales exclusively, by groundwater. These could be early signs that the limits of sustainable groundwater use have been reached in these areas.”

Response

See Common Response 4 for documentation of current groundwater conditions and Common Response 5 regarding the model timeframe.

Comment NG03-23

Comment

(BDCP EIS/EIR at 7-13.) The Draft EIS/EIR provides only one groundwater elevation map of the Sacramento Valley groundwater basin, Figure 3.3-4, which shows contours only from selected wells that omit many depths and areas. The Draft EIS/EIR doesn't provide maps showing groundwater elevations, or depth to groundwater, for groundwater substitution transfer seller areas in Sutter, Yolo, Yuba, and Sacramento counties. The DWR provides on a web site a number of additional groundwater level and depth to groundwater maps that the EIS/EIR should use to help complete its description of the affected environment {Source: http://www.water.ca.gov/groundwater/data_and_monitoring/northern_region/GroundwaterLevel/gw_level_monitoring.cfm#Well%20Depth%20Summary%20Maps}

Presented below are tables that illustrate maximum and average groundwater elevation decreases for Butte, Colusa, Glenn, and Tehama counties at three aquifer levels in the Sacramento Valley between the fall of 2004 and 2013. {See Comment letter for fall and spring 2004 and 2014 tables}

The DWR data clearly present a different picture of the condition of the Sacramento Valley groundwater basin over time than what is provided in the EIS/EIR. This must be corrected and considered in the NEPA and CEQA process.

Response

See Common Response 4.

Comment NG03-24

Comment

The EIS/EIR omits other critical information needed to understand the project's impacts to area groundwater, including but not limited to:

1. the distances between the transfer well(s) and surface water features;
2. the number of non-participating wells in the vicinity of the transfer wells that may be impacted by the pumping; and,
3. the distance between the transfer wells and non-participant wells that may be impacted by the transfer pumping, including domestic, public water supply and agricultural wells.

Response

Figures 3.3-28 through 3.3-33 show the location of groundwater substitution wells with respect to surface water features within the Sacramento Valley. These figures also show the potential change in groundwater elevation that might occur under the

Proposed Action. The scale of these figures has been increased to make them easier to read.

Mitigation Measure GW-1 described in Section 3.3.4.1 discusses monitoring and mitigation measures adopted during transfers to avoid significant impacts to non-participating wells. Common Response 6 includes information about clarifications to Mitigation Measure GW-1.

Comment NG03-25

Comment

The EIS/EIR assumes that, “The groundwater modeling results indicate that shallow groundwater is typically deeper than 15 feet in most locations under existing conditions, and often substantially deeper.” (3.8-32.) However, existing hydrologic condition documents clearly show Depth to Groundwater levels in shallow portions of the aquifer system that are <15’ from the surface.

1. The Chart titled Depth to Water by Sub-Inventory Unit (SIU) on 2014_10_Summary_Table.PDF page 2/2 shows the Average Depth to Water (feet) in March through October 2014. 7 of 16 Sub-Inventory Units (“SIUs”) in Butte County show average groundwater levels <15’ from the surface at some time of the year {Source: https://www.buttecounty.net/wrcdocs/Programs/Monitoring/GWLevels/2014/2014_10_Summary_Table.pdf https://www.buttecounty.net/wrcdocs/Programs/Monitoring/GWLevels/2014/2014_10_Data_Summary_Update.pdf (Exhibit K)}

2. November 2014 Adobe spreadsheets show numerous monitoring wells with water levels closer than 10’ to the surface. The wells are located in Butte County SIUs designated under the county Basin Management Objective (“BMO”) program. While some of the SIUs are corresponding to an Irrigation District primarily served by surface water, the Butte Sink, Cherokee, North Yuba, Angel Slough, Llano Seco and M&T SIUs have naturally occurring water levels <10’. All 3 pages show ground surface to water surface (feet) {Source: 2014 Monthly Groundwater Depth to Water- CASGEM: https://www.buttecounty.net/wrcdocs/Programs/Monitoring/GWLevels/2014/2014_10_Data_Summary_Update.pdf (Exhibit K)}

3. The January 2014 BUTTE COUNTY DOMESTIC WELL DEPTH SUMMARY shows the 10’ Depth to Groundwater Contour lines in the lower portion of the map.{Source: Butte County shallow Groundwater Contours: www.water.ca.gov/groundwater/data_and_monitoring/northern_region/GroundwaterLevel/WellDepthSummaryMaps/Domestic_BUTTE.pdf (Exhibit L)}

4. The January 2014 COLUSA COUNTY DOMESTIC WELL DEPTH SUMMARY shows the 10’ Depth to Groundwater Contour lines in large portions of the county. {Colusa County shallow Groundwater Contours: www.water.ca.gov/groundwater/data_and_monitoring/northern_region/GroundwaterLevel/WellDepthSummaryMaps/Domestic_COLUSA.pdf (Exhibit M)}

5. The January 2014 GLENN COUNTY DOMESTIC WELL DEPTH SUMMARY shows the 10' Depth to Groundwater Contour lines in the lower portion of the map.{ Source: Glenn County shallow Groundwater Contours: www.water.ca.gov/groundwater/data_and_monitoring/northern_region/GroundwaterLevel/WellDepthSummaryMaps/Domestic_GLENN.pdf (Exhibit N)}

Response

The vegetation and wildlife analysis acknowledges that there are groundwater and surface water interactions, but focuses the analysis primarily on surface water where terrestrial ecosystems are most likely to be affected. Water would continue to flow in the creeks and rivers, and water would seep from the creeks and rivers into the ground, thereby providing a source of water for riparian vegetation. Farther from creeks and rivers, the groundwater table is typically much deeper than 15 feet so a change in the water table would have little effect on vegetation; as described in the Assessment/Evaluation Methods, groundwater levels are substantially below the surface in many areas (i.e., typically below 100 feet in depth, see Appendix G). Therefore, groundwater would be well below the depth of most riparian vegetation. See Common Responses 10 and 11 for more information.

Comment NG03-26

Comment

Dan Wendell of The Nature Conservancy, a panelist at a workshop held by the California Natural Resources Agency, the California Department of Food and Agriculture, and California EPA on March 24, 2014, presented a similar picture as the county summaries above, but also raised the alarm about the existing, significant streamflow losses from groundwater pumping and, even more significantly, how long it takes for those losses to appear:

"The Sacramento Valley still has water levels that are fairly shallow," he said. "There are numerous perennial streams and healthy ecosystems, and the basin is largely within a reasonable definition of sustainable groundwater yield. However, since the 1940s, groundwater discharge to streams in this area has decreased by about 600,000 acre-feet per year due to groundwater pumping, and it's going to decrease an additional 600,000 acre-feet in coming years under 2009 status quo conditions due to the time it takes effects of groundwater pumping to reach streams. It takes years to decades, our work is showing."{Source: http://mavensnotebook.com/2014/04/28/groundwater-management-workshop-part-1-sustainable-groundwater-management-panel/ (Exhibit O)}

What areas in the Sellers' region were used to reach the EIS/EIR conclusion that "[i]ndicate that shallow groundwater is typically deeper than 15 feet"? What prevented the analysis from disclosing the many miles of riparian habitat in the Sacramento Valley that indicate that riparian forest vegetation remains healthy with groundwater levels shallower than 15 feet? As we presented above, there are many areas in the Sellers' region that have groundwater higher than 15 feet below ground surface.

Response

See response to Comment NG03-25.

Comment NG03-27

Comment

In addition, the EIS/EIR fails to provide recharge data for the aquifers. Professor Karin Hoover, Assistant Professor of hydrology, hydrogeology, and surficial processes from CSU Chico, found in 2008 that, "Although regional measured groundwater levels are purported to 'recover' during the winter months (Technical Memorandum 3), data from Spangler (2002) indicate that recovery levels are somewhat less than levels of drawdown, suggesting that, in general, water levels are declining." According to Dudley, "Test results indicate that the 'age' of the groundwater samples ranges from less than 100 years to tens of thousands of years. In general, the more shallow wells in the Lower Tuscan Formation along the eastern margin of the valley have the 'youngest' water and the deeper wells in the western and southern portions of the valley have the 'oldest' water," adding that "the youngest groundwater in the Lower Tuscan Formation is probably nearest to recharge areas." (2005). "This implies that there is currently no active recharge to the Lower Tuscan aquifer system (M.D. Sullivan, personal communication, 2004)," explains Dr. Hoover. "If this is the case, then water in the Lower Tuscan system may constitute fossil water with no known modern recharge mechanism, and, once it is extracted, it is gone as a resource," (Hoover 2008).{ Source: Spangler, Deborah L. 2002. The Characterization of the Butte Basin Aquifer System, Butte County, California. Thesis submitted to California State University, Chico; Dudley, Toccoy et al. 2005. Seeking an Understanding of the Groundwater Aquifer Systems in the Northern Sacramento Valley: An Update; Hoover, Karin A. 2008. Concerns Regarding the Plan for Aquifer Performance Testing of Geologic Formations Underlying Glenn-Colusa Irrigation District, Orland Artois Water District, and Orland Unit Water Users Association Service Areas, Glenn County, California. White Paper. California State University, Chico.}

Response

Section 3.3.2.4 discusses simulated recovery at water tables and pumping zones at Selected Hydrograph Location 21 (near Sycamore Mutual Water Company), Selected Hydrograph Location 14 (near Cordua ID), and Selected Hydrograph Location 31 (near Sacramento County WA). Additional information has been added to Section 3.3.2.4. See Common Response 4.

As discussed in Common Response 4, only a small amount of groundwater substitution-related pumping would be from the Tuscan Aquifer System.

Comment NG03-28

Comment

The Draft EIS/EIR discusses the potential for impacts to groundwater quality by migration of contaminants as a result of groundwater substitution pumping, but provides only a general description of the current condition of groundwater quality. No maps are provided that show the baseline groundwater quality and known areas of poor or contaminated groundwater, or from all areas where groundwater pumping may occur. Groundwater quality information on the Sacramento Valley area is available from existing reports by the USGS (1984, 2008b, 2010, and 2011) and Northern California Water Association (NCWA, 2014c). Determination of groundwater quality prior to pumping is critical to avoiding significant adverse impacts, both to adjacent groundwater users impacted by migrating contaminants, as well as surface water potentially impaired by contaminated runoff from irrigated agriculture or other uses.

Response

Section 3.3.1.3.2 has been revised to include additional groundwater quality information from SWRCB (GeoTracker Clean Up sites). Impacts to groundwater quality are discussed in Section 3.3.2.4.

Comment NG03-29

Comment

There are numerous hazardous waste plumes in Butte County, which could easily migrate with the potential increased groundwater pumping proposed for the Project. The State Department of Toxics Control and the Regional Water Resources Control Boards have a great deal of information readily available for all counties involved with the proposed Project. Fluctuating domestic wells can lead to serious contamination from heavy metals and non-aqueous fluids. Because the Bureau fails to disclose basic standards for the mitigation and monitoring requirements, it is unknown if hazardous plumes in the areas of origin will be monitored or not. Please note the attached map from the State Water Resources Control Board (2008) that highlights areas vulnerable to groundwater contamination throughout the state. A significant portion of both the areas of origin and the receiving areas are highlighted. When the potential for serious health and safety impacts exists, NEPA and CEQA require that this must be disclosed and analyzed.

Response

See response to Comment NG03-28.

Comment NG03-30

Comment

Surface Water Flows:

The EIS/EIR asserts that, under the no action/no project alternative, “Surface water supplies would not change relative to existing conditions. Water users would continue to experience shortages under certain hydrologic conditions, requiring them to use supplemental water supplies.” (3.1-15.) It would be most helpful if the Lead Agencies would explain the geographic scope of this statement since the shortages could be experienced throughout the areas of origin, transmission, and delivery – as well as the entire State of California. The section continues with, “Under the No Action/No Project Alternative, some agricultural and urban water users may face potential shortages under dry and critical hydrologic conditions.” Again, to what geographic areas is the EIS/EIR referring? The final sentence in the section reads, “Impacts to surface water supplies would be the same as the existing conditions.” Without further elaboration or a reference that would further explain what exactly are the “existing conditions, mentioned” this is merely a conclusory assertion without the benefit of factual data. For example, existing conditions vary wildly in California weather patterns and agency allocations can as well. For example, in 2014 CVP Settlement Contractors were threatened with an unprecedented 40 percent allocation, which later became 75 percent when they cooperated with water transfers. Failing to disclose the wide range of natural and agency decisions that comprise the No Action/No Project alternative must be corrected and re-circulated in another draft EIS/EIR.

Response

The geographic scope of the potential water supply impacts from the alternatives is presented in Section 3.1.1.1, Area of Analysis. Existing water supply conditions of the region are described in Section 3.1.1.3, Existing Conditions.

The model period of analysis includes hydrologic conditions that are representative of likely future conditions. While the next ten years are likely to have a broad range of hydrologic conditions, the historic record used in modeling has also exhibited a broad range of hydrologic conditions. See Common Response 5 for additional information.

Comment NG03-31

Comment

The EIS/EIR states that "[b]ecause of the interaction of surface flows and groundwater flows in riparian systems, including associated wetlands, enables faster recharge of groundwater, these systems are less likely to be impacted by groundwater drawdown as a result of the action alternatives;" therefore, "[t]hese systems are less likely to be impacted by groundwater drawdown as a result of the action alternatives." (EIS/EIR 3.8-32.) This flawed assumption has been readily discredited by USGS:

There is more of an interaction between the water in lakes and rivers and groundwater than most people think. Some, and often a great deal, of the water flowing in rivers comes from seepage of groundwater into the streambed. Groundwater contributes to streams in most physiographic and climatic settings… Groundwater pumping can alter how water moves between an aquifer and a stream, lake, or wetland by either intercepting groundwater flow that discharges into the surface-water body under natural conditions, or by increasing the rate of water movement from the surface-water body into an aquifer. A related effect of groundwater pumping is the lowering of groundwater levels below the depth that streamside or wetland vegetation needs to survive. The overall effect is a loss of riparian vegetation and wildlife habitat. {Source: The USGS Water Science School. http://ga.water.usgs.gov/edu/gwdepletion.html}

Response

See Common Response 11.

Comment NG03-32

Comment

Lastly, the EIR/EIS presents the rivers and streams analyzed for impacts from the Proposed Action alternative with numerous omissions and conclusory remarks that are not supported. (3.8-49 – 3.8-51.) Examples include:

1. Table 3.8.3 Screening Evaluation Results for Smaller Streams in the Sacramento River Watershed for Detailed Vegetation and Wildlife Impact Analysis for the Proposed Action fails to designate the counties of origin except for Deer and Mill creeks. Even readers familiar with the region need this basic information.

2. Creeks with groundwater/surface water connections, but omitted from Tehama and Butte counties in Table 3.8.3 include, but are not limited to: Clear, Cottonwood, Battle, Singer, Pine, Zimmershed, Rock, Mud, and Big Chico.

3. The modeling that is used to omit streams from analysis and to select and analyze other streams is completely inadequate to the task. Page D-3 has information about model resolution. It is normal to have five to ten nodes to resolve a feature of interest, but the nodal spacing is listed as ranging from 125 to 1000 meters, with stream node spacing around 500 meters (EIS/EIR p. D-3). This implies that spatial features smaller than about 2 kilometers cannot be resolved with this model. With the physical response of interest below the threshold of resolution even under the best of circumstances, then you have 100% margin of error, because the model cannot "see" that response.{ Source: Mish, p. 8. (Exhibit C)}

Response

The counties that make up the area of origin are not necessary for the fisheries analysis. All of the waterways in the SACFEM2013 model are shown in Figure 14 in Appendix H. Additionally, Figures 3.3-28 through 3.3-33 in the main body of the EIS/EIR show groundwater modeling results, and the smaller waterways are included in these figures. SACFEM2013 modeled Big Chico Creek, which has been added to the table. The remaining small waterways in item two are not included in the model. See response to Comment NG10-28 for additional discussion.

Comment NG03-33

Comment

Surface Water Quality:

The baseline water quality data presented in the EIS/EIR is insufficient to accomplish any meaningful understanding of existing water quality levels throughout the project area. The EIS/EIR fails to show where each affected water body is, or disclose its existing beneficial uses, or numeric water quality objectives. Data that are presented is scattered, inconsistent, incomplete, often severely out of date, and often misleading. Further, the EIS/EIR fails to explain exactly where much of the presented water quality data comes from – indeed, failing to explain exactly where the affected environment is at all.

Response

The 2014 Draft EIS/EIR presents tables summarizing water quality for potentially affected water bodies within the area of analysis. The tables present the minimum, maximum, and average values for selected water quality constituents and provide information regarding the source of the data and the sampling period. The information is sufficient to characterize water quality conditions so the reader can understand the impact analysis.

Figure 3.2-1 shows the area of analysis for water quality and the potentially affected water bodies. The beneficial uses designated for water bodies within the area of analysis are presented in Table 3.2-2 (seller service area) and Table 3.2-3 (buyer service area).

Comment NG03-34

Comment

Many waterways are left out of this section entirely. The biological and vegetation effects of the program are discussed elsewhere in the EIS/EIR, and show that most would be impacted by the proposed program, but these waterways are not discussed in the EIS/EIR water quality section. Diminished flows can affect water quality in a variety of way, for example, causing higher temperatures, lower dissolved oxygen, or high sediment contamination or turbidity. Therefore, these affected waterways should be described and analyzed in the EIS/EIR water quality chapter.

Response

The 2014 Draft EIS/EIR presents tables summarizing water quality for potentially affected water bodies within the area of analysis. Impacts to fish and wildlife resulting from changes in water quality are discussed in Sections 3.7 and 3.8, respectively. The information is sufficient to characterize water quality conditions so the reader can understand the impact analysis.

Comment NG03-35

Comment

In addition, the EIS/EIR only names the California Aqueduct, the Delta-Mendota Canal, and the San Luis Reservoir as affected waters within the buyer areas. Later, the EIS/EIR admits that increased irrigation in the buyers' areas may adversely impact stream water quality, but none of these rivers, streams, creeks, or any other potentially affected waterway of any kind, are described in the buyer project areas. (EIS/EIR 3.2-26.)

Response

This EIS/EIR only evaluates waters that may be impacted by the action alternatives. Within the buyers' area, only San Luis Reservoir may be impacted by the Project. Potential effects to the San Joaquin River or its tributaries are included as part of the sellers' area because they are upstream from the Delta (and include transfers from Merced ID).

Comment NG03-36

Comment

The EIS/EIR also fails to meaningfully describe the existing water quality in the affected environment. The EIS/EIR repeatedly misleads the public and decision-makers regarding the baseline conditions of waters within the project area by labeling them as "generally high quality." For example, the EIS/EIR states that "certain segments of the Sacramento River contain several constituents of concern, including Chlordane, dichlorodiphenyltrichloroethane, Dieldrin, mercury, polychlorinated biphenyls (PCBs), and unknown toxicity (see Table 3.2-1); however, the water quality in the Sacramento River is generally of high quality." What is the basis for this non-sequitur used here, and repeated throughout the existing environmental descriptions in the

EIS/EIR? How do constituents of concern and unknown toxicity translate to generally high quality?

The remaining baseline information presented in the EIS/EIR contains significant gaps that preclude a meaningful understanding of the existing environmental conditions. In order to attempt to characterize the water quality in the affected environmental area, the EIS/EIR lists out beneficial uses, 303(d) impairments, and a variety of water quality monitoring data. The EIS/EIR presents almost no reference to existing numeric water quality objectives, and evaluation of potential breaches of those standards is therefore impossible.

Response

Existing water quality based violations and regulatory compliance issues are discussed in Section 3.7.1.3. Additional discussion of numeric water quality objectives has been added to Section 3.2.

Comment NG03-37

Comment

Table 3.2-1 lists 303(d) impairments within the area of analysis. The table states the approximate mileage or acreage of the portion of each water body that is impaired, but fails to inform the public exactly where these stretches are located. For example, table 3.2-1 states that, within the Delta, approximately 43,614 acres are impaired for unknown toxicity, 20,819 acres are impaired for electrical conductivity, and 8,398 acres are impaired for PCBs; but without knowing which acres within the Delta this table describes, it is impossible to know whether transfer water will affect those particular areas. This problem repeats for all impairments listed in table 3.2-1.

Response

Based on water quality modeling for the Delta region (see Appendix E), it was determined that transfers would not have a significant impact on Delta water quality regardless of current impairment status or specific locations of impairments.

Comment NG03-38

Comment

The baseline environmental condition of the Delta is poorly described. The EIS/EIR states that:

[e]xisting water quality constituents of concern in the Delta can be categorized broadly as metals, pesticides, nutrient enrichment and associated eutrophication, constituents associated with suspended sediments and turbidity, salinity, bromide, and organic carbon. Salinity is a water quality constituent that is of specific concern and is described below. (EIS/EIR at 3.2-21.) The EIS/EIR provides no further information about “metals, pesticides, nutrient enrichment and associated eutrophication, constituents associated with suspended sediments and turbidity.” These contaminants are each the focus of intensive regulation and controversy, and could cause significant adverse impacts if contaminated surface waters are transferred, but no meaningful baseline data of existing conditions is provided to facilitate an evaluation of the effects of the incremental changes caused by the proposed program.

Response

The action alternatives would not affect the remaining constituents referenced by the commenter. Contaminated surface water would not be transferred under any alternative.

Comment NG03-39

Comment

The EIS/EIR provides scattered and essentially useless monitoring data to attempt to describe the existing water quality conditions in the program area. First, the EIS/EIR is unclear exactly what year or years it uses to constitute the baseline environmental conditions. Then, Tables 3.2-4 through 3.2-20 provide data from 1980 through 2014. Some tables average data, some use median data, some present isolated data, and none provide a comparison to existing numeric water quality objectives. Of all of the existing environmental baseline data provided, only table 3.2-15 provides any data regarding contamination caused by metals in the water column, and only for Lake Natoma from April to September of 2008. As a result, any contamination relating to any metals in any transfer water is essentially ignored by the EIS/EIR. Moreover, the scattershot data provided in the EIS/EIR does not provide the public with any information about the actual water quality of transfer water that may be used in any future project. Table 3.2

Response

The 2014 Draft EIS/EIR presents tables summarizing water quality for potentially affected water bodies within the area of analysis. Wherever possible the most recent data was included in the summary tables. The tables present the minimum, maximum, and average values for selected water quality constituents and provide information regarding the source of the data and the sampling period. No data was excluded from the summary statistics. The information is sufficient to characterize water quality conditions so the reader can understand the impact analysis.

Comment NG03-40

Comment

Table 3.2-21 presents mean data from "selected" monitoring stations throughout the Delta. The EIS/EIR states that "[s]ampling period varies, depending on location and constituent, but generally is between 2006-2012." (EIS/EIR 3.2-22.) EIS/EIR readers simply have no way to know what these data actually represent. Columns are labeled "mean TDS," "mean electrical conductivity," and "mean chloride, dissolved." Are these data averaged for the approximate period of 2006-2012? Were any data excluded? The EIS/EIR lists these monitoring stations, but doesn't explain where each is actually located, which should be mapped for ease of reference. Nor does the EIS/EIR state what the applicable water quality objective is at each monitoring point for each parameter; nor how often these water quality objectives were breached.

Response

See response to Comment NG03-39.

Figure 3.2-1 shows the area of analysis for water quality and the potentially affected water bodies. The beneficial uses designated for water bodies within the area of analysis are presented in Table 3.2-2 (seller service area) and Table 3.2-3 (buyer service area). Salinity (EC) water quality objectives are include for the San Joaquin River at Vernalis.

Comment NG03-41

Comment

Figure 3.2-2 presents the monthly median chloride concentrations at selected monitoring sites, and misleadingly states that these median concentrations do not exceed the secondary MCL for chloride of 250 mg/L; but that comparison is irrelevant as the Bay-Delta Plan sets water quality objectives for chloride at 250 mg/day, not monthly mean.

Response

Figure 3.2-2 presents available information on chloride concentrations at Banks Pumping Plant, the Sacramento River at Hood, and the San Joaquin River near Vernalis. While the figure does represent monthly average concentrations, these concentrations are all under 100 milligrams per liter (mg/L) of chloride (with most concentrations under 80 mg/L of chloride).

Comment NG03-42

Comment

Figures 3.2-3 through 3.2-5 show average electrical conductivity at selected monitoring stations, but the EIS/EIR fails to state the relevant water quality standard against which to compare these data, and fails to report the frequency and magnitude of exceedances, which are numerous and great. When do exceedances occur, and how can the proposed program avoid transferring water from or into waterways with elevated EC?

Response

A discussion of electrical conductivity (EC) standards has been added to Section 3.2.

Comment NG03-43

Comment

The EIS/EIR fails to provide any discussion or analysis of how SWRCB Decision 1641 would be implemented. The EIS/EIR states that Decision 1641 “requires Response Plans for water quality and water levels to protect diverters in the south Delta that may affect the opportunity to export transfers.” (EIS/EIR at 2-32.) Later, the EIS/EIR adds that Decision 1641 “require[s] that the Central Valley Project (CVP) and State Water Project (SWP) be operated to protect water quality, and that DWR and/or Reclamation ensure that the flow dependent water quality objectives are met in the Delta (SWRCB 2000).” (EIS/EIR 3.2-10.) Nowhere does the EIS/EIR actually identify what these requirements entail, nor analyze when they would or would not be met by any portion of the proposed program. D-1641 is among the most critical of water quality regulations controlling the proposed program, and the EIS/EIR must provide significantly more analysis of how it would propose to comply with these State Water Board standards. As discussed, below, compliance with D-1641 standards is far from certain.

Response

Appendix E describes Delta conditions as necessary to assist in evaluation of environmental impacts associated with a range of potential transfer activities within the Delta, including D-1641 requirements. The Delta conditions assessment simulates the hydrodynamics and water quality within the Delta when transfer water is made available by various sellers to determine how and where within the Delta the effects are likely to occur under the alternatives. Output from the Delta conditions assessment addresses environmental flows under D-1641 as well as other parameters such as water level (stage), water quality, and the biological opinions, and thus provides a basis for environmental assessment.

Comment NG03-44

Comment

Similarly, the EIS/EIR notes that "DWR has developed acceptance criteria to govern the water quality of non-Project water that may be conveyed through the California Aqueduct. These criteria dictate that a pump-in entity of any non-project water program must demonstrate that the water is of consistent, predictable, and acceptable quality prior to pumping the local groundwater into the SWP." (EIS/EIR at 3.2-10.) Again, however, the EIS/EIR fails to explain what these criteria require, and fails to provide any discussion of whether, when, or how these criteria could be met for each transfer contemplated by the program. This lack of information and analysis is insufficient to support informed public and agency environmental decision-making.

Response

The action alternatives do not propose to add non-Project water to the California Aqueduct. The action alternatives could add non-Project water to the Delta-Mendota Canal, and the potential water quality impacts of this action are analyzed in the water quality section. The discussion of DWR Acceptance Criteria is included for information, and a discussion of the Reclamation water quality standards to add water to the Delta-Mendota Canal has been added.

Comment NG03-45

Comment

The EIS/EIR Fails to Evaluate Inconsistency with Applicable Laws, Plans, and Policies.

a. State Water Policies:

> The EIS/EIR should fully disclose the consolidated places of use for DWR and the Bureau, and what criteria might be applied for greater flexibility claimed for the consolidated place of use necessary for any given year's water transfer program, and what project alternatives could avoid this shift. Could the transfers be facilitated through transfer provisions of the Central Valley Project Improvement Act? Would the consolidation be a permanent or temporary request, and would the consolidation be limited to the duration of just the 2015-2024 Water Transfer Program? How would the consolidated places of use permit amendments to the SWP and CVP permits relate to

their joint point of diversion? Would simply having the joint point of diversion in place under D-1641 suffice for the purpose of the Project?

Response

A consolidated place of use for Reclamation and DWR may or may not be required, depending on the source of the transfer water. If desired, a consolidated place of use would be secured on an annual basis.

Comment NG03-46

Comment

The EIS/EIR should better describe existing water right claims of sellers, buyers, the Bureau, and DWR. In response to inquiries from the Governor's Delta Vision Task Force, the SWRCB acknowledged that while average runoff in the Delta watershed between 1921 and 2003 was 29 million acre-feet annually, the 6,300 active water right permits issued by the SWRCB is approximately 245 million acre-feet {Source: SWRCB, 2008. Water Rights Within the Bay Delta Watershed (Exhibit P.)} (pp. 2-3). In other words, water rights on paper are 8.4 times greater than the real water in California's Central Valley rivers and streams diverted to supply those rights on an average annual basis. And the SWRCB acknowledges that this 'water bubble' does not even take account of the higher priority rights to divert held by pre-1914 appropriators and riparian water right holders (Id. p. 1). More current research reveals that the average annual unimpaired flow in the Sacramento River basin is 21.6 MAF, but the consumptive use claims are an extraordinary 120.6 MAF – 5.6 times more claims than there is available water. {Source:California Water Impact Network, AquAlliance, and California Sportfishing Protection Alliance 2012. Testimony on Water Availability Analysis for Trinity, Sacramento, and San Joaquin River Basins Tributary to the Bay-Delta Estuary. (Exhibit Q)} Informing the public about water rights claims would necessarily show that buyers and the Agencies clearly possess junior water rights as compared with those of many willing sellers. Full disclosure of these disparate water right claims and their priority is needed to help explain the actions and motivations of buyers and sellers in the 2015-2024 Water Transfer Program. Otherwise the public and decision makers have insufficient information on which to support and make informed choices.

To establish a proper legal context for these water rights, the EIS/EIR should also describe more extensively the applicable California Water Code sections about the treatment of water rights involved in water transfers.

Response

Existing water rights of potential sellers are described in Section 3.1.1.3, Existing Conditions, which was developed in consultation with sellers. Section 1.3 summarizes the federal and state laws that pertain to water transfers.

The EIS/EIR is analyzing the potential environmental effects of the action alternatives compared to existing conditions (under CEQA) and the No Action/No Project Alternative (under NEPA). The EIS/EIR analyzes how the action alternatives could affect water supply, water rights, and water quality. The analysis did not identify significant effects after mitigation. The commenter seems to be concerned that the California water rights system is over-allocated, but this issue is outside the scope of this EIS/EIR because it would not be affected by the action alternatives. The "motivation of the buyers" is delineated in Section 1.1 under the discussion of purpose and need and project objectives.

Comment NG03-47

Comment
Like federal financial regulators failing to regulate the shadow financial sector, subprime mortgages, Ponzi schemes, and toxic assets of our recent economic history, the state of California has been derelict in its management of scarce water resources. As we mentioned above we are supplementing these comments on this matter of wasteful use and diversion of water by incorporating by reference and attaching the 2011 complaint to the State Water Resources Control Board of the California Water Impact Network the California Sportfishing Protection Alliance, and AquAlliance on public trust, waste and unreasonable use and method of diversion as additional evidence of a systemic failure of governance by the State Water Resources Control Board, the Department of Water Resources and the U.S. Bureau of Reclamation, filed with the Board on April 21, 2011. (Exhibit Q)

Response
See response to Comment NG03-46. The commenter's Exhibit Q indicates that this concern has been brought to the State Water Resources Control Board, which is the appropriate venue to resolve the concern.

Comment NG03-48

Comment
b. Public Trust Doctrine.

> The State of California has the duty to protect the people's common heritage in streams, lakes, marshlands, and tidelands through the Public Trust Doctrine.[27] The Sacramento, Feather, and Yuba rivers and the Delta are common pool resources. DWR acknowledges this legal reality in its publication, Water Transfer Approval: Assuring Responsible Transfers.[28] The application of the Public Trust Doctrine requires an analysis of the public trust values of competing alternatives, as was directed by the State Water Board in the Mono Lake Case. Its applicability to alternatives for the water transfers planned from the Sacramento, Feather, and Yuba rivers and through the Delta, where species recovery, ecosystem restoration, recreation and navigation are pitted against damage from water exports, is exactly the kind of situation suited to a Public Trust analysis, which should be required by the 2015-2024 Water Transfer Program. The act of appropriating water – whether for a new use or for a new method of diversion or of use – is an acquisition of a property right from the waters of the state, an act that is therefore subject to regulation under the state's public trust responsibilities. Groundwater pumping with adverse effects to public trust surface waters must also be considered.

[27] *National Audubon Society v. Superior Court* (1983) 33 Cal 3d, 419, 441.

[28] California Department of Water Resources, Water Transfer Approval: Assuring Responsible Transfers, July 2012, page 3. Accessible online 16 February 2014 at http://www.water.ca.gov/watertransfers/docs/responsible_water_transfers_2012.pdf. In addition, the Delta Protection Act of 1959 also acknowledges this reality, California Water Code Sections 12200-12205. (Exhibit R)

Response

CDFW is a trustee agency under CEQA because it has "jurisdiction by law over natural resources affected by a project, that are held in trust for the people of the State of California." (CEQA Guidelines Section 21070) CDFW reviewed this EIS/EIR and provided comments, which have been addressed. For more information on the appropriate CEQA lead agency, see Common Response 1.

Comment NG03-49

Comment

c. Local General Plans and Ordinances.

The Draft EIS/EIR discusses only two county ordinances, the Colusa Ordinance No. 615 and Yolo Export Ordinance No. 1617, one agreement, the Water Forum Agreement in Sacramento County, and one conjunctive use program, the American River Basin Regional Conjunctive Use Program. Except for the brief discussion of the two ordinances, one agreement, and one conjunctive use program listed above, the Draft EIS/EIR doesn't describe the requirements of local GMPs, ordinances, and agreements listed in Tables 3.3-1 (page 3.3-8) and Table 3-1 (page 27). Thus, the actual groundwater substitution transfer project permit requirements, restrictions, conditions, or exemptions required for each seller service area by the Bureau, DWR, and one or more County GMP or groundwater ordinance will apparently be determined at a future date.

Additional information is needed on what the local regulations require for exporting groundwater out of each seller's groundwater basin. The Draft EIS/EIR needs to discuss how the local regulations ensure that the project complies with Water Code Sections 1220, 1745.10, 1810. 10750, 10753.7, 10920-10936, and 12924 (for more detailed discussion of these Water Codes see Draft EIS/EIR Section 3.3.1.2.2). Although the Draft EIS/EIR doesn't document, compare or evaluate the requirements of all local agencies that have authority over groundwater substitution transfers in each seller service area, the Draft EIS/EIR concludes that the environmental impacts from groundwater substitution transfer pumping by each of the sellers will either be less than significant and cause no injury, or be mitigated to less than significant through mitigation measures WS-1, and GW-1 with its reliance on compliance with local regulations.

Response

Section 3.3.1.2.3 has been revised to include all pertinent ordinances related to groundwater substitution transfers within the area of analysis (i.e., the area underlying substitution pumping). Transfers must comply with local regulations.

See Common Response 6 regarding clarification of Mitigation Measure GW-1.

Comment NG03-50

Comment

As noted above, this conclusions is derived from information absent from the EIS/EIR and, even if there was information considered by the Lead Agencies, without any apparent analysis. Butte, Glenn, and Shasta counties represent counties with Sellers and all of them have the potential to be heavily impacted by activities in or adjacent to their jurisdictions. AquAlliance has examined their ordinances and found them insufficient to protect other users and the environment (Exhibits U, V, X). Sincere efforts at monitoring for groundwater levels and subsidence become meaningless if the monitoring infrastructure is scant and enforcement absent. The Butte County Department of Water and Resource Conservation also explains that local plans are simply not up to the task of managing a regional resource:

Each of the four counties that overlie the Lower Tuscan aquifer system has their own and separate regulatory structure relating to groundwater management. Tehama County, Colusa, and Butte Counties each have their own version of an export ordinance to protect the citizens from transfer-related third party impacts. Glenn County does not have an export ordinance because it relies on Basin Management Objectives (BMOs) to manage the groundwater resource, and subsequently to protect third parties from transfer related impacts. Recently, Butte County also adopted a BMO type of groundwater management ordinance. Butte County, Tehama County and several irrigation districts in each of the four counties have adopted AB3030 groundwater management plans. All of these groundwater management activities were initiated prior to recognizing that a regional aquifer system exists that extends over more than one county and that certain activities in one county could adversely impact another. Clearly the current ordinances, AB3030 plans, and local BMO activities, which were intended for localized groundwater management, are not well suited for management of a regional groundwater resource like that theorized of the Lower Tuscan aquifer system.29

Response

See Common Response 4 regarding substitution pumping under the Proposed Action being outside the lower Tuscan Aquifer System. No transfer-related pumping is proposed in Butte County.

Mitigation Measure GW-1 takes into account groundwater management activities (BMO and GMP) to avoid or reduce potential impacts to groundwater resources. See Common Responses 6 and 7 for additional information.

Comment NG03-51

Comment

There is a possibility that a seller’s groundwater substitution area of impact will occur in multiple local jurisdictions, which should results in project requirements coming from multiple local as well as state and federal agencies. The Draft EIS/EIR doesn’t discuss the obstacles from cross jurisdictional impacts that are immense because groundwater basins cross county lines thereby eliminating authority. (Id) One obvious example is found with productions wells placed in Glenn County in the lower end of the Tuscan Aquifer Basin that may affect the up-gradient part of the aquifer in Butte and Tehama counties.

If the Project proceeds, each seller's project analysis should identify what future analyses, ordinances, project conditions, exemptions, monitoring and mitigation measures are required to ensure that each of the seller's project meets or exceed the goals of the Draft EIS/EIR.

Response

The commenter is correct in stating that the potential impact of groundwater substitution pumping may cross political boundaries. Section 3.3.1.2, Regulatory Setting, lists the applicable regulations pertaining to transfers. The local regulatory information provided in Section 3.3.1.2.3 is listed for local jurisdictions where groundwater transfers are anticipated. Mitigation measure GW-1 requires a monitoring and mitigation plan be developed to ensure compliance with performance criteria and to avoid potentially significant impacts of transfer-related pumping. The monitoring program will be established to cover an area where impacts might occur, regardless of political jurisdiction.

Comment NG03-52

Comment

V. The EIS/EIR Fails to Adequately Analyze Numerous Environmental Effects.

The EIS/EIR fails to include numerous required elements to support a meaningful analysis of the project's significant adverse impacts. First, the deficiencies in the incomplete and undefined project description, and incomplete description of existing environmental conditions, render any true impact analysis, or hard look at the project effects, impossible. See, e.g., Santiago County Water Dist. v. County of Orange (1981) 118 Cal.App.3d 818; San Joaquin Raptor Rescue Ctr. v. County of Merced (2007) 149 Cal.App.4th 645. Even the analysis provided, however, employs unsupported and inapplicable standards of significance. (CEQA Guidelines § 15064(b); see, e.g., Oakland Heritage Alliance v. City of Oakland (2011) 195 Cal.App.4th 884, 896; Protect the Historic Amador Waterways v. Amador Water Agency (2004) 116 Cal.App.4th 1099, 1111). The EIS/EIR fails to completely analyze the project's significant adverse impacts, and fails to support its conclusions with substantial evidence, failing to characterize the project effects in the proper context and intensity. (Id.; 40 C.F.R. § 1508.27(a); City of Maywood v. Los Angeles Unified School Dist. (2012) 208 Cal.App.4th 362, 391; Laurel Heights Improvement Association v. Regents of Univ. of Cal. (1988) 47 Cal.3d 376, 393; Madera Oversight Coalition, Inc. v. County of Madera (2011) 199 Cal.App.4th 48, 102 ("whether an EIR is sufficient as an informational document is a question of law subject to independent review by the courts.")

As discussed, below, and in the expert reports submitted by Custis, EcoNorthwest, Cannon, and Mish on behalf of AquAlliance, the EIS/EIR fails to comport with these standards.

Response

This comment does not include any specific requests for additional information to be included to help define the project description. Commenters submitted requests for additional data to be included in the existing conditions sections for several resources, and this information has been added to the Final EIS/EIR where relevant. The additional data helped to clarify environmental conditions, but it did not result in changes that modified the impact analyses.

Comment NG03-53

Comment

a. Surface Water Flows.

> The EIS/EIR fails to adequately analyze changes to all surface water flows as a result of the proposed project. While the EIS/EIR presents some level of streamflow drawdown analysis in its vegetation and biological resources section, that analysis is not taken into consideration with respect to affects to other water supply rights. This raises the specter of injury to senior water rights holders, and the EIS/EIR fails to provide sufficient information regarding where such rights are held and in what amounts, and where proposed transfers may interfere.

Response

Streamflow depletion from groundwater substitution has the potential to decrease surface water flows in waterways as the groundwater basin refills. The EIS/EIR estimates these potential effects, including the compounding effects from multiple consecutive years of transfers, using the SACFEM2013 groundwater model, the CalSim model, and the Transfer Operation Model (TOM). The changes in streamflow have the potential to affect multiple resources; these effects are analyzed in Sections 3.1, Water Supply; 3.7, Fisheries; and 3.8, Vegetation and Wildlife. The water supply section investigates how changes in streamflow could affect water supply, and concludes that the potential effects would be focused on CVP and SWP users that receive water conveyed through the Delta.

Comment NG03-54

Comment

Streamflow depletion in the EIS/EIR is evaluated through modeling, but a closer look at the models employed shows significant omissions. First, because the rate of stream depletion is scaled to pumping rate and because the model documentation doesn't indicate the pumping locations, rates, volumes, times or durations that produced the pumped volumes shown in Figure 3.3-25, or the stream depletions shown in Figures B-5 and B-6 in Appendix B, it appears that the SACFEM2013 modeling did not simulate the maximum rate of stream depletion for the proposed 10-year project.

Response

See response to Comment NG01-16.

Comment NG03-55

Comment

Second, the available Delta export capacity was determined from CalSim II model results using only conditions through WY 2003, which fails to account for current conditions, climate change conditions, and future conditions. (EIS/EIR 3.7-18.) The adequacy of CalSIM II has also been called into question. 30

Response

See Common Response 5 in response to analysis through WY 2003. The comment refers to a peer review completed in 2003 without reference to the response to peer review from DWR and Reclamation (2004) or the significant improvements made to CalSim II since 2003. CalSim II is continually being improved, refined, and enhanced. Reclamation reviewed available modeling tools and selected the best available tool for each portion of the analysis.

Comment NG03-56

Comment

In addition, the Bay-Delta Conservation Plan establishes flow limits for the Delta that the EIS/EIR fails to consider. Instead, the EIS/EIR states that the proposed projects could decrease outflows by 0.3 percent in winter and spring, and provides a bare conclusion that this impact is less than significant. (EIS/EIR 3.2-39.) Just this year the Bureau of Reclamation and DWR requested a Temporary Urgency Change from the SWRCB, a modification to Delta flow objectives that were not being met, and D-1641 standards, in order to attempt to manage species protection.

Response

The Bay-Delta Conservation Plan (BDCP) schedule indicates the plan would not be in place during the 10-year period analyzed in this EIS/EIR; therefore, the changes in flows from the BDCP were not incorporated in the analysis. Section 3.2, Water Quality analyzes the potential changes to water quality from water transfers. The analysis finds the changes to Delta water quality from existing conditions and from the No Action/No Project Alternative would be less than significant.

Comment NG03-57

Comment

The EIS/EIR attempts to consider changes in available supplies for project participants, but fails to review what other water rights holders may be affected by diminished flows. This is especially important given the EIS/EIR's conclusion that transfers would be most needed in times of critical shortage.

Response

Section 3.1.2.4.1 considers changes to water users in the Sacramento Valley as well as CVP and SWP water users that receive water conveyed through the Delta. The EIS/EIR considers how changes in streamflow could affect water supply, and concludes that the potential effects would be focused on CVP and SWP users that receive water conveyed through the Delta.

Comment NG03-58

Comment

The EIS/EIR also fails to disclose changes in flows as a result of tailwater and ag drainage, which could lead to significant streamflow impacts.

Response

As described in Section 2.3.2.1, water for transfers is made available by a seller who "must take an action to reduce consumptive use or use water in storage." If sellers transfer water through cropland idling or crop shifting, they would decrease their diversions only by the amount of applied water that would have been consumptively used absent the transfer. Without transfers, some of the applied water on each field is consumptively used by the crop (the evapotranspiration of applied water), but some is not used by the crop and becomes percolation to the groundwater or surface runoff. For cropland idling or crop shifting, water that would have been applied to the field but not consumptively used by the crop would continue to be diverted by the seller and would enter the distribution system. Water that would run off fields into drain facilities would continue to flow into these drains; therefore, flows into the drain canals would not be affected.

Comment NG03-59

Comment

b. Water Quality.

i. The EIS/EIR improperly excludes substantial amounts of water from any meaningful impact evaluation.

The EIS/EIR fails to provide any evidence to support its proposition that "if the change in flow is less than ten cubic feet per second (cfs), it is assumed that there would be no water quality impacts as this is within the error margins of the model." (EIS/EIR 3.2-27.) First, the margin of error of the model has no bearing on actual water quality. Second, NPDES permits regularly regulate flows of less than 10 cfs. According to USGS, 10 cfs equals 6.46 million gallons per day (MGD). The EIS/EIR's assumption that a change in reservoir elevation of less than 1,000 acre feet could not possibly have significant impacts to water quality is similarly baseless. (EIS/EIR 3.2-27.) This amounts to approximately 325,800 gallons of water, more than enough to result in a noticeable difference in water quality. The Federal Clean Water Act is a strict liability statute providing no de minimis exceptions. By way of comparison, the City of Galt Wastewater Treatment Plant maintains flows at 4.5 MGD (NPDES Permit No. CA0081434), the City of Colusa Wastewater Treatment Plant maintains flows of approximately 0.7 MGD (NPDES Permit No. CA0078999), and each of these facilities has been assessed penalties for effluent exceedances by the Regional Water Board in recent years. The EIS/EIR's conclusion that flows equivalent to entire municipal wastewater treatment plants have no ability to compromise water quality standards is simply wrong.

Response

This clause has been removed from Section 3.2.2.1.1. The water quality analysis in Section 3.2 presented changes smaller than these thresholds in the effects analysis. However, small changes in flow and reservoir storage would not be comparable to the examples cited in this comment. These examples focus on discharges of water with poorer water quality than the receiving water. The water quality analysis considers whether small changes in flows or reservoir storage could, in and of themselves, affect water quality through changing dilution factors. This potential impact mechanism is very different from effluent discharge from wastewater treatment facilities.

Comment NG03-60

Comment

Similarly, the EIS/EIR provides the bare conclusion that:

CVP and SWP reservoirs within the Seller Service Area would experience only small changes in storage, which would not be of sufficient magnitude and frequency to result in substantive changes to water quality. Any small changes to water quality would not adversely affect designated beneficial uses, violate existing water quality standards, or substantially degrade water quality. Consequently, potential effects on reservoir water quality would be less than significant. (EIS/EIR 3.2-31.) The EIS/EIR simply provides no evidence or analysis in making this conclusion.

Response

The impact statement referred to in the comment considers whether changes in reservoir storage could affect water quality. Some clarifying text has been added to indicate that changes in storage could affect water quality if they substantially affect the water available for dilution; however, the small changes from the action alternatives would be insubstantial and would not result in this type of effect.

Comment NG03-61

Comment

Lastly, the EIS/EIR provides no actual analysis of potential impacts to San Luis Reservoir as a result of lowering water levels in response to transfers. The EIS/EIR admits that "storage under the Proposed Action would be less than the No Action/No Project Alternative for all months of the year," and asserts that water levels would be lowered between 3%-6% as a result of the Project. (EIS/EIR 3.2-41.) The EIS/EIR then presents the bare conclusion that "These small changes in storage are not sufficient to adversely affect designated beneficial uses, violate existing water quality standards, or substantially degrade water quality." The EIS/EIR provides no basis for this determination, including no comparison of baseline environmental conditions to changes in contaminated runoff as a result of any particular water transfer.

Response

Additional analysis has been added to Section 3.2 regarding San Luis Reservoir and potential impacts relating to operations.

Comment NG03-62

Comment

ii. The EIS/EIR fails to provide any information with which to evaluate impacts from idled crop fields, or farmlands in buyers' areas.

The EIS/EIR assumes certain agricultural practices will occur at idle rice fields, when in reality, property owners would be free to re-purpose idled fields in countless and creative ways.

(EIS/EIR 3-2.30.) For idled alfalfa, corn, or tomato cropland, the EIS/EIR assumes that property owners will put in place erosion control measures to conserve soil. While this may be a reasonable assumption for some farms, others, who may prefer to purse multi-year water transfers, may not have an interest in investing in soil conservation. In addition, the EIS/EIR fails to provide analysis of the degree of effectiveness of soil conservation measures where no groundcover is in place. (EIS/EIR 3.2-29.) If proven to be effective, the EIS/EIR should require the Lead Agencies to condition water transfers on these necessary mitigation measures, and provide monitoring and reporting to ensure their continued implementation. We recommend that the Bureau and DWR require, at a minimum, that local governments select independent third-party monitors, who are funded by surcharges on Project transfers paid by the buyers, to oversee the monitoring that is proposed in lieu of Bureau and DWR staff, and that peer-reviewed methods for monitoring be required. If this is not done, the Project's proposed monitoring and mitigation outline is insufficient and cannot justify the significant risk of adverse environmental impacts.

Response

The potential for erosion from idled croplands is analyzed in Section 3.4, Geology and Soils and found to be less than significant because the soil types are not prone to erosion. This analysis assumes typical agricultural practices on the properties and does not assume erosion control measures are in place. The impact analysis addresses the reasonably foreseeable potential scenarios and is not required to analyze a hypothetical worst case scenario that could result from the Proposed Action.

Comment NG03-63

Comment

The EIS/EIR also states that increased erosion would not be of concern in Butte, Colusa, Glenn, Solano, Sutter, and Yolo counties, due to the prevalence of clay and clay loam soils. (EIS/EIR 3.2-29.) This bare conclusion does not provide any meaningful evaluation of the proposed program's impacts. Does the EIS/EIR really mean to assert that nowhere across six entire counties does soil erosion adversely impact water quality?

Response

New maps prepared for Section 3.4 as well as revised analysis in that section show soil surface textures in the sellers service area and the location of the water districts, with no material changes to the conclusions of the 2014 Draft EIS/EIR. See Section 3.4.2.4 for a discussion of soil textures in the sellers service area and impacts related to erosion.

Comment NG03-64

Comment

The EIS/EIR contradicts itself, stating:

In cases of crop shifting, farmers may alter the application of pesticides and other chemicals which negatively affect water quality if allowed to enter area waterways. Since crop shifting would only affect currently utilized farmland, a significant increase in agricultural constituents of concern is not expected. (EIS/EIR 3.2-30.) Would applications be altered, or remain the same?

The EIS/EIR says both. In truth, due to the programmatic nature of this EIS/EIR, although it is a "project" not a "programmatic" document, one cannot know. This level of impact must be evaluated on a project-by-project basis, yet the Lead Agencies assertion that this is a "project" level EIS/EIR precludes additional CEQA and NEPA review.

Response

Different types of crops may require different use of pesticides and fertilizers. However, crop shifting would only occur on currently utilized farmland, and not on lands converted to agricultural use. Therefore, there will not be a significant change in farming methods such that water quality would be affected.

Comment NG03-65

Comment

The EIS/EIR concludes that water quality impacts in the buyer area would be less than significant, but provides no evidence or assurances whatsoever regarding the ultimate use of the purchased water would be. (EIS/EIR 3.2-41.) The EIS/EIR then considers only impacts resulting from increased crop irrigation, acknowledging that "[i]f this water were used to irrigate drainage impaired lands, increased irrigation could cause water to accumulate in the shallow root zone and could leach pollutants into the groundwater and potentially drain into the neighboring surface water bodies." (EIS/EIR 3.2-41.) The EIS/EIR then dismisses this possibility, assuming that buyers would only use water for "prime or important farmlands." Missing from this section is any analysis of water quality. What does the EIS/EIR consider to be prime or important farm lands? Do all such actual farms exhibit the same water quality in irrigated runoff? The EIS/EIR provides no assurances its assumptions will be met, and moreover, fails to explain what its assumptions actually are.

Response

Section 3.9 of this document addresses agricultural land use. Prime or important farmlands are determined by soil characteristics. The water quality of runoff varies based on these characteristics (among other factors). In general, runoff from prime farmlands is likely to be lower in salinity due to soil characteristics.

Comment NG03-66

Comment

The EIS/EIR then again relies on an improper ratio comparison of the amount of transfer water potentially used in buyer areas, to the total amount of all water used in the buyers' areas. The EIS/EIR adds:

The small incremental supply within the drainage-impaired service areas would not be sufficient to change drainage patterns or existing water quality, particularly given drainage management, water conservation actions and existing regulatory compliance efforts already implemented in that area. (EIS/EIR 3.2-41.) Again, however, any comparison ratio of transferred water to other irrigation simply provides no analysis of what water quality impacts any individual transfer would have after application on any individual farm. Moreover, if indeed a transfer is responding to a shortage, the transfer amount could actually constitute all or a majority of water usage for a particular site. Allusion to "existing regulatory compliance efforts" only suggests that regulatory compliance is not already maintained in each and every potential buyer farmland. There is no reasonable dispute that return flows from irrigated agriculture can often compromise water quality standards, but the EIS/EIR simply brushes this impact aside.

Response

The amount of transfer water that would be provided for irrigation in the buyer's service area is minimal compared to existing applied irrigation in the area. The small incremental supply within the service area would not be substantive enough to change drainage patterns or water quality.

Comment NG03-67

Comment

The EIS/EIR assumes that transfers may only occur during times of shortage (EIS/EIR 3.2-41), yet the proposed project itself is not so narrowly defined, and nothing in the Water Code limits transfers to circumstances where there has been a demonstrated shortfall in the buyer's area. As a result of this open-ended project description, the true water quality impacts in the buyers' areas are completely unknown.

Response

Chapter 2 explains that water transfers could only occur when buyers have demand and capacity is available to convey water to those buyers. Section 2.3.2.5 describes this concept in more detail, and explains that no capacity for transfers existed in 65 percent of the years studied.

Comment NG03-68

Comment

iii. The EIS/EIR ignores numerous potentially significant sources of contamination to surface waters.

The EIS/EIR describes the existing environmental conditions of most of the water bodies within the potential seller areas to be impaired for numerous contaminants; and also provides sampling and monitoring data to show that in-stream exceedances of water quality objectives regularly occur. Yet, the EIS/EIR fails to ever discuss the impact of moving contaminated water from one source to another. For example, where a seller's water is listed as impaired for certain contaminants, any movement of that water to another waterbody will simply spread this impairment. The EIS/EIR provides no information with which to determine the actual water quality of the seller's water for any particular transfer, nor any evaluation or monitoring to determine whether moving these contaminants from one water to another would harm beneficial uses or exceed receiving water limits. The EIS/EIR should provide a more particularized review of potential contaminants and their impacts under the proposed project. For example, the EIS/EIR does not analyze water quality impacts from boron, but the BDCP EIS/EIR states, "large-scale, out-of-basin water transfers have reduced the assimilative capacity of the river, thereby exacerbating the water quality issues associated with boron." (BDCP EIS/EIR at 8-40.) Similarly, dissolved oxygen, among other forms of contamination, pose regular problems pursuant to D-1641. These potentially significant impacts must be disclosed for public and agency review.

What selenium and boron loads in Mud Slough and other tributaries to the San Joaquin River may be expected from application of this water to western San Joaquin Valley lands?

Response

The action alternatives would transfer water through the Delta, that is, from sources that already enter the Delta (the Sacramento, Feather, Yuba, American, and San Joaquin rivers). Additionally, the origins of the transfer water are water bodies that have generally high quality water. Water transfers would result in very small changes to reservoir storage and river flow, but would not change constituents entering these water bodies. For these reasons, water transfers would also not have significant effects on dissolved oxygen in the Delta.

Section 3.2.2.4.2 assesses the potential for transfers to affect water quality in the San Joaquin River through increased agricultural runoff. This assessment includes constituents present in agricultural runoff, including boron. The impact assessment finds that the impacts would be less than significant. The Bay-Delta Conservation Plan (BDCP) text cited refers to a decreased assimilative capacity in the San Joaquin River; the "transfers" discussed refer to moving water from the San Joaquin River out of basin. The action alternatives do not include similar actions.

Comment NG03-69

Comment

The EIS/EIR fails to disclose whether changes in specific conductivity as a result of the program would result in significant impacts to water quality. First, as noted above, the EIS/EIR presents scattered baseline data, much of which appears to show ongoing EC exceedances, but the EIS/EIR fails to disclose what Bay-Delta EC standards are, and the frequency and magnitude of baseline exceedances. Against this backdrop, the EIS/EIR then admits that program transfers would increase EC by as much as 4.3 percent. (EIS/EIR 3.2-39.) The EIS/EIR fails to disclose whether these regular EC increases would exacerbate baseline violation conditions. In addition, the EIS/EIR only presents analysis for one monitoring location, whereas the Bay-Delta plan contains EC limits for over a dozen monitoring locations.

Response

The 2014 Draft EIS/EIR notes on p. 3.2-20 that the San Joaquin River water quality standards include salinity standards at Vernalis, which is just downstream of the confluence with the Stanislaus River. The 2014 Draft EIS/EIR notes that the salinity standard (measured as EC) is 700 microsiemen per centimeter (µS/cm) from April 1 to August 31, and 1000 µS/cm for the remainder of the year. The analysis presents the magnitude of average monthly increases based on the year type (e.g., wet, dry, etc.). Water quality at additional sites in the Delta has been added to the Final EIS/EIR.

Comment NG03-70

Comment
The EIS/EIR fails to disclose the extent to which program transfers could harm water quality by moving the "X2" location through the Delta. D-1641 specifies that, from February through June, the location of X2 must be west of Collinsville and additionally must be west of Chipps Island or Port Chicago for a certain number of days each month, depending on the previous month's Eight River Index. D-1641 specifies that compliance with the X2 standard may occur in one of three ways: (1) the daily average EC at the compliance point is less than or equal to 2.64 millimhos/cm; (2) the 14-day average EC is less than or equal to 2.64 millimhos/cm; or (3) the 3-day average Delta outflow is greater than or equal to the corresponding minimum outflow.

Response
The EIS/EIR considers movement to X2 in Section 3.2.2.4.1, and finds the changes in X2 would remain within water quality standards.

Comment NG03-71

Comment
The EIS/EIR relies on an improper ratio approach to its impact evaluation of increased EC concentrations in the Delta Mendota Canal as a result of San Joaquin River diversions. (EIS/EIR 3.2-40.) The EIS/EIR admits that EC in the canal would increase as a result of these diversions, but fails to disclose by how much, or against what existing environmental conditions. Instead, the EIS/EIR compares the transfer amount, approximately 250 cfs, to the total capacity of the canal, about 4,000 cfs, to conclude that EC changes would not be significant. A comparison of the transfer amount to the total canal capacity simply provides no analysis of or information about EC concentrations.

Response
The assessment of potential impacts to the Delta-Mendota Canal does not rely solely on the flow change into the canal, but also considers the water quality of the potential transferred water. The impact discussion identifies the potential water quality of water captured at Banta Carbona ID (Table 3.2-20) and water quality captured at West Stanislaus ID or Patterson ID (Table 3.2-19). The quality of this water is compared to the quality of water in the Delta-Mendota Canal (Table 3.2-21). The average and maximum EC concentrations at Banta Carbona ID, West Stanislaus ID, and Patterson ID would be higher than the average EC concentration in the Delta-Mendota Canal, but the small amount of water from these sources indicates the overall change to water quality in the Delta-Mendota Canal would be insubstantial.

Comment NG03-72

Comment
The EIS/EIR fails to meaningfully evaluate potentially significant impacts to surface water quality as a result of groundwater substitution. First, the EIS/EIR provides an improper and misleading comparison, stating that the amount of groundwater substituted for surface water under the Proposed Action would be relatively small compared to the amount of surface water

used to irrigate agricultural fields in the Seller Service Area. Groundwater would mix with surface water in agricultural drainages prior to irrigation return flow reaching the rivers. Constituents of concern that may be present in the groundwater could enter the surface water as a result of mixing with irrigation return flows. Any constituents of concern, however, would be greatly diluted when mixed with the existing surface waters applied because a much higher volume of surface water is used for irrigation purposes in the Seller Service Area. Additionally, groundwater quality in the area is generally good and sufficient for municipal, agricultural, domestic, and industrial uses. (EIS/EIR at 3.2-21.) The EIS/EIR's threshold of significance asks whether any water quality objective will be violated, and this must be measured at each discharge point. In turn, any farm that substitutes surface water irrigation for groundwater irrigation must be evaluated against this threshold. The EIS/EIR fails to provide any evidence to support its conclusion that the dilution of the groundwater runoff into surface waters would avoid any significant water quality impacts. On one hand the EIS/EIR asserts that groundwater is of good quality, and on the other hand, asserts that the overall quality would improve as it is mixed with surface water irrigation runoff: which source provides the better water quality in this arrangement? It is widely recognized that irrigated agricultural return flows can transport significant contaminants to receiving water bodies. In addition, the EIS/EIR simply assumes that contaminated groundwater would not be pumped and applied to agricultural lands, despite the fact that groundwater extractions may mobilize PCE, TCE, and nitrate plumes under the City of Chico,32 and fails to disclose the existence of all hazardous waste plumes in the area of origin where groundwater substitution may occur. The assertion that "groundwater is generally good" throughout 6-10 counties is insufficient to provide any meaningful information against which to evaluate any particular transfer.

Response

Groundwater quality is discussed in detail in Section 3.3, Groundwater Resources. The 2014 Draft EIS/EIR describes dilution in the context of general on-farm conditions under which a transfer may result in groundwater substitution. Groundwater in combination with surface water would be applied to specific fields. Return flows from these fields would eventually discharge into receiving water. Pollutants, if any, associated with these discharges would be covered under the SWRCB Agricultural Waivers program, and would likely be related to agricultural applications of fertilizers and pesticides which would occur in the absence of water transfers.

Comment NG03-73

Comment

For "non-Project" reservoirs, the EIS/EIR provides one piece of additional information: modeling projections showing various rates of drawdown in table 3.2-24. The EIS/EIR then concludes that because water quality in these reservoirs is generally good, the reductions would not result in any significant water quality impacts. Again, the EIS/EIR provides no evidence or analysis to support this bare conclusion. Nor does the EIS/EIR present the beneficial uses of Collins Lake, nor Dry Creek, downstream of Collins Lake (see Table 3.2-2). The EIS/EIR does note that Lake McClure, Hell Hole Reservoir, and Camp Far West Reservoir maintain beneficial uses for cold water habitat and wildlife habitat, but fails to evaluate whether these beneficial uses would be impacted. Dissolved oxygen rates will decrease with lower water levels, and any sediment-based contaminant concentration, will increase. And the fact that drawdowns increase in already-critical years only heightens the water quality concerns.

Response

Collins Lake and Dry Creek are not listed for beneficial uses in the Basin Plan. According to the 2011 Sacramento River Basin and San Joaquin River Basin Water Quality Control Plan, "It should be noted that it is impractical to list every surface water body in the Region." Potential impacts to water quality based on each alternative are evaluated.

Comment NG03-74

Comment

The EIS/EIR repeatedly relies on dilution as the solution, with no actual analysis or receiving water assimilative capacity, and no regulatory authority. It is well-established law that a discharger may receive a mixing zone of dilution to determine compliance with receiving water objectives if and only if the permittee has conducted a mixing zone study, submitted to a Regional Board or the State Board for approval. (See, e.g., Waterkeepers N. Cal. v. AG Indus. Mfg., 2005 U.S. Dist. LEXIS 43006 ["A dilution credit is a limited regulatory exception that must be preceded by a site specific mixing zone study"]; Water Quality Standards; Establishment of Numeric Criteria for Priority Toxic Pollutants for the State of California, 65 Fed. Reg. 31682 (May 18, 2000), 31701 ["All waters . . . are subject to the criteria promulgated today. Such criteria will need to be attained at the end of the discharge pipe, unless the State authorizes a mixing zone."]) The EIS/EIR entirely ignores Clean Water Act requirements for obtaining dilution credits, and, with no supporting evidence whatsoever, effectively and illegally grants dilution credits across the board. (See, EIS/EIR 3.2-31, 3.2-35, 3.2-36, 3.2-42, 3.2-59). For each instance in which the EIR/EIS wishes to apply dilution credit to its determination of whether water quality impacts will be significant, it must perform – with the approval of the State or Regional Water Board – a mixing zone study considering the impacted waterbody and the specific types and quantities of the proposed pollutant discharge(s). Short of that, each time the EIS/EIR relies on dilution as the solution, it fails to analyze whether any contaminant in any waterbody in any amount could protect beneficial uses or exceed receiving water standards. The more Project water goes to south-of-Delta agricultural users than to urban users, the higher would be their groundwater levels, the more contaminated the groundwater would be in the western San Joaquin Valley and the more the San Joaquin River would be negatively affected from contaminated seepage and tailwater by operation of the Project.

Response

The 2014 Draft EIS/EIR describes dilution in the context of general on-farm conditions under which a transfer may result in groundwater substitution (see pages 3.2-31 and 3.2-42). Groundwater in combination with surface water would be applied to specific fields. Return flows from these fields would eventually discharge into receiving water. These instances would not be considered point source discharges, would not be covered by NPDES discharge permits, and would not require a mixing zone analyses. Pollutants, if any, associated with these discharges may be covered under the SWRCB Agricultural Waivers program, and would likely be related to agricultural applications of fertilizers and pesticides which would occur in the absence of water transfers.

The 2014 Draft EIS/EIR describes dilution in the context of transfers resulting in increased reservoir releases and increased river flows (see pages 3.2-25, 3.2-26, and 3.2-59). These releases are not covered by NPDES permits and do not require a mixing zone analysis.

Comment NG03-75

Comment

c. Groundwater Resources.

The modeling efforts presented by the EIS/EIR fail to accurately capture the project's groundwater impacts. First, the SACFEM2013 simulations didn't evaluate the impacts of pumping the maximum annual amount proposed for each of the 10 years of the project. Second, because the groundwater modeling effort didn't include the most recent 11 years record, it appears to have missed simulating the most recent periods of groundwater substitution transfer pumping and other groundwater impacting events, such as recent changes in groundwater elevations and groundwater storage (DWR, 2014b), and the reduced recharge due to the recent periods of drought. Without taking the hydrologic conditions during the recent 11 years into account, the results of the SACFEM2013 model simulation may not accurately depict the current conditions or predict the effects from the proposed groundwater substitution transfer pumping during the next 10 years.

Response

See Common Response 5 and response to Comment NG01-13.

Comment NG03-76

Comment

The Lead Agencies are making gross assumptions about the number, size, and behavior of all the surface water resources in the state, just to be able to coerce those assumptions into data that fits into the SACFEM2013 model. The assumptions are driving the modeling instead of the model (and science) driving accurate results. Appendix D is full of inaccurate statements and clear indications that this model is deficient. For example, it's advertised as a 3D model, but it's actually a collection of linked 2D models, and those are driven not by science, but by assumptions, e.g., the model can't calculate the location of the phreatic surface: it relies on assumptions and observations for that data, and that makes the model incapable of prediction.33

Response

As with any groundwater modeling effort, incorporating parameter and boundary condition assumptions in areas of the domain where field data are not available is a requirement, rather than a choice. The Lead Agencies consider the input assumptions reasonable and appropriate. Further, SACFEM2013 was built using the MicroFEM code, a three-dimensional numerical groundwater flow code that simulates horizontal flow through layers as well as vertical flow between layers to simulate a three-dimensional groundwater flow field. MicroFEM has been reviewed by the National Ground Water Association Ground Water journal in the Software Spotlight Column (Ground Water 38, No. 5, p. 649-650). The assertion that SACFEM2013 is incapable of prediction is without basis, provided that end users of SACFEM2013 recognize that it is not possible to predict aquifer and stream responses with absolute certainty. SACFEM2013 is a powerful tool that, when used carefully, provides useful insights into potential outcomes from proposed groundwater management activities.

Comment NG03-77

Comment

The Draft EIS/EIR should provide the time-drawdown and distance-drawdown hydraulic characteristics for each groundwater substitution transfer well so that non-participant well owners can estimate and evaluate the potential impacts to their well(s) from well interference due to the pumping the groundwater substitution transfer well(s). This analysis is not present in the EIS/EIR.

Response

The project description developed in Section 2 provides the maximum volumes that may be transferred as part of the EIS/EIR (Table 2-4). Table 2-5 further divides the volumes from Table 2-4 into volumes for each transfer method. The data in Table 3.3-3 show the number of wells and range of individual well pumping rates. To provide a conservative assessment of potential impacts, this EIS/EIR simulated the concurrent groundwater substitution pumping of all the wells in Table 3.3-3. Pumping fewer wells and/or pumping wells at lower rates would likely result in lesser impacts than those presented in this EIS/EIR. Appendix G includes figures that show groundwater recovery over time at multiple locations throughout the area of analysis.

Comment NG03-78

Comment

The EIS/EIR wrongly assumes that stream depletion impacts from pumping occur only downstream from the point on the stream closest to the pumping well. Any monitoring of the effects of groundwater substitution pumping on surface or ground water levels, rates and areas of stream depletion, fisheries, vegetation and wildlife impacts, and other critical structures needs to cover a much wider area than what is needed for a direct surface water diversion.

Response

The EIS/EIR does not assume that streamflow depletion occurs downstream from pumping wells. The EIS/EIR includes an extensive modeling effort that considered changes in groundwater levels and groundwater-surface water interaction throughout the Sacramento Valley using the SACFEM2013 groundwater model. The results of this model were used in conjunction with the CalSim system operations model and the Transfer Operations Model (see Appendix D) to estimate the timing, location, and extent of groundwater-surface water interaction on streamflows throughout the groundwater basin area. These results were the basis for the analyses in Sections 3.1, Water Supply; 3.3, Groundwater; 3.7, Fisheries; and 3.8, Vegetation and Wildlife.

Comment NG03-79

Comment

The EIS/EIR doesn't compare the known groundwater quality problem areas with the SACFEM2013 simulated drawdowns to demonstrate that the proposed projects won't draw in or expand the areas of known poor water quality. The EIS/EIR analysis doesn't appear to consider the impacts to private well owners. Pumping done as part of the groundwater substitution transfer may cause water quality impacts from geochemical changes resulting from a lowering the water table below historic elevations, which exposes aquifer material to different redox conditions and can alter the mixing ratio of different quality aquifer zones being pumped. Changes in groundwater level can also alter the direction and/or rate of movement of contaminated groundwater plumes both horizontally and vertically, which may expose non-participating wells to contaminants they would not otherwise encounter.

Response

Section 3.3.2.4 describes potential impacts from the Proposed Action to groundwater quality within the seller service area. Groundwater extraction under the Proposed Action would be limited to short-term withdrawals during the irrigation season. Since inducing migration of groundwater is not likely to be a concern unless groundwater levels and/or flow patterns are substantially altered for a long period of time, effects from the migration of reduced groundwater quality would be less than significant.

Comment NG03-80

Comment

The EIS/EIR fails to evaluate any changes in the rate and direction of inter-basin groundwater flow. Inter-basin groundwater flow may become a hidden long-term impact that increases the time needed for recovery of groundwater levels from groundwater substitution transfer pumping, and can extend the impact from groundwater substitution transfer pumping to areas outside of the groundwater substitution transfer seller's boundary.

Response

The modeling analysis performed utilized a three-dimensional groundwater flow model that incorporates changes in groundwater flow in all directions surrounding the groundwater pumping wells. Groundwater flow in the model is not restricted by jurisdictional boundaries such as the potential seller's boundaries. Figures 3.3-28 through 3.3-33 show the spatial distribution of the change in groundwater levels within the Sacramento Valley.

Comment NG03-81

Comment

Finally, the EIS/EIR should evaluate how Project transfers could add to the already high water table in the western San Joaquin Valley? Impacts from a higher water table could include increased groundwater contamination, lower flood resistance, greater erosion, and loss of suitability of certain parcels to particular land uses.

Response

As stated in the Executive Summary and Chapter 1, transferred water will be used to meet existing demand. Because the water is being used to meet existing demand, a substantial increase in groundwater levels is not expected in the area mentioned.

Comment NG03-82

Comment

d. The SACFEM 2013 and CALSIM II Models are Inadequate.

The comments herein are based largely on the attached work of Dr. Custis (Exhibit A) and Dr. Mish (Exhibit C), and we request specific responses to these attached works. The EIR/EIS fails to accurately estimate environmental effects likely to occur during water transfers. The SACFEM2013 model used to predict groundwater resources is flawed by being based on poor technology that is simply not up to the task of accurate large-scale modeling.

The SACFEM2013 model is only partially predictive, in that key aquifer responses are entered as input data instead of being computed as predictive quantities. The model requires considerable data manipulation to be used, and these manipulations are necessarily subject to interpretation. The model description in the EIR/EIS presents no validation results that can be used to provide basic quality-assurance for the analyses used in the EIR/EIS. The model is not predictive in many important responses (as mentioned above), so its results are a reflection of past data (e.g., streamflows, phreatic surface location, etc.) instead of providing a predictive capability for future events. As described in previous sections, both the model and the input data contain gross over-simplifications that compromise the ability to provide accurate estimates of real-world responses of water resources On page 19 of Appendix B, the reader is promised that model uncertainty will be described in Appendix D, but that promise is never delivered. This lack of any formal measure of uncertainty is not an unimportant detail, as it is impossible to provide accurate estimates of margin of error without some formal treatment of uncertainty. Any physical response asserted by the model's results has a margin of error of 100% if that response involves spatial scales smaller than a kilometer or more.

Response

SACFEM has undergone an extensive independent peer review performed by an independent consultant with extensive experience in the application of groundwater models to evaluate groundwater systems and surface water-groundwater interaction (WRIME 2011). The objective of the peer review was to evaluate the adequacy of the model to estimate the impacts of groundwater substitution water transfer pumping on third party groundwater users as well as impacts to surface water flows. The results of the peer review identified seven primary enhancements to the model that would improve its accuracy in forecasting pumping impacts on water resources in the Sacramento Valley. All seven of these enhancements have been incorporated into SACFEM2013, the most recent version of SACFEM. See response to Comment SA03-7 for additional information.

The SACFEM2013 User's Manual has been included as Appendix H, and it includes a discussion of model uncertainty. Additionally, a description of the sensitivity analyses completed as part of the Long-Term Water Transfers EIS/EIR has been added to Appendix D (see Appendix D for changes made).

Comment NG03-83

Comment

The EIR/EIS makes little connection between groundwater extraction process modeled by SACFEM2013 and the all-too-real potential for surface subsidence, and the attendant irreversible loss of aquifer capacity. The problem is especially important during drought years, when groundwater substitution is most likely to occur. In a drought, the aquifer already entrains less groundwater than normal, so that additional stresses due to pumping are visited upon the aquifer skeleton. This is exactly the conditions required to cause loss of capacity and the risk of subsidence. Yet the EIR/EIS makes scant mention of these all-too-real problems, and no serious modeling effort is presented in the EIR/EIS to assess the risk of such environmental degradation.

Response

Section 3.3.2.4 evaluates land subsidence. See Common Response 7.

Comment NG03-84

Comment

In contrast to the shortcomings of the model, the Bureau/DWR's DTIPWT seeks information on interactions between groundwater pumping and groundwater/surface water supplies at various increments of less than one and two miles. (DTIPWT at Appendix B.) Where the EIS/EIR fails to provide information at a level of detail required by BOR and DWR to determine whether significant impacts to water supplies may occur, the EIS/EIR fails to provide information needed to support a full analysis of groundwater and surface water impacts, and fails to support its conclusions with evidence.

Response

Appendix B of the Draft Technical Information Papers for Water Transfers in 2014 discusses well acceptance criteria. It is not a measure of significant impacts. The well acceptance criteria are not included in the EIS/EIR. The evaluation using SACFEM2013 and TOM was a comprehensive evaluation of groundwater-surface water interaction to support the analysis in the EIS/EIR.

Comment NG03-85

Comment

CalSim II is a highly complex simulation model of a complex system that requires significant expertise to run and understand. Consequently, only a few individuals concentrated in the Department of Water Resources, U.S. Bureau of Reclamation and several consulting firms understand the details and capabilities of the model. State Water Resources Control Board (SWRCB) staff cannot run the model. To the extent CalSim II is relied upon, the EIR/EIS must be transparent and clearly explain and justify all assumptions made in model runs. It must explicitly state when findings are based on post processing and when findings are based on direct model results. And results must include error bars to account for uncertainty and margin of safety.

Response

The assumptions included in the CalSim II simulation are set forth in Appendix C, page C-66. This table is a common method for reporting the assumptions in a CalSim II simulation. Figure C-1, page C-4 illustrates the interconnected modeling process used to develop results in the EIR/EIS and indicates what results come from each of the three models. CalSim II is used to simulate the baseline, without transfers, operation of the CVP and SWP. This baseline operation is also included in TOM, but results for any of the with-project alternatives are from TOM, and TOM uses output from SACFEM2013 for analysis of groundwater substitution transfers.

Comment NG03-86

Comment

As an optimization model, CalSim II is hardwired to assume perfect supply and perfect demand. The notion of perfect supply is predicated on the erroneous assumption that groundwater can always be obtained to augment upstream supply. However, the state and federal projects have no right to groundwater in the unadjudicated Sacramento River basin. Operating under this assumption risks causing impacts to ecosystems dependent upon groundwater basins in the areas of origin. The notion of perfect demand is also problematic, as it cannot account for the myriad of flow, habitat and water quality requirements mandated by state and federal statutes. Perfect demand assumes water deliveries constrained only by environmental constraints included in the code. In other words, CalSim II never truly measures environmental harm beyond simply projecting how to maximize deliveries without violating the incorporated environmental constraints. As a monthly time-step model, CalSim II cannot determine weekly, daily or instantaneous effects; i.e., it cannot accurately simulate actual instantaneous or even weekly flows. It follows that CalSim II cannot identify real-time impacts to objectives or requirements. Indeed, DWR admits, "CalSim II modeling should only be used in 'comparative mode,' that is when comparing the results of alternate CalSim II model runs and that 'great caution should be taken when comparing actual data to modeled data."35

Response

CalSim II is a planning model jointly developed by Reclamation and DWR to simulate operations of the CVP and SWP. CalSim II is the only available model that simulates CVP and SWP operations over a long-term period of historical hydrology. Environmental effects were determined based on review of model results and other data. Model results were used in a comparative sense (i.e., by comparing results of simulations with the transfers to a baseline simulation without the transfers) when determining environmental effects. It is unclear what is meant by "perfect supply and perfect demand." There are limitations in the ability of any model to simulate actual, real-time human decision making. However, these limitations are disclosed in the document and do not invalidate the analysis or the effects determined based on the analysis.

Comment NG03-87

Comment
The Department of Civil Engineering University of California at Davis conducted a comprehensive survey of members of California's technical and policy-oriented water management community regarding the use and development of CalSim II in California. Detailed interviews were conducted with individuals from California's water community, including staff from both DWR and USBR (the agencies that created, own, and manage the model) and individuals affiliated with consulting firms, water districts, environmental groups, and universities.

The results of the survey, which was funded by the CalFed Science Program and peer-reviewed, should serve as a cautionary note to those who make decisions based on CalSim II. The report cites that in interviewing DWR and USBR management and modeling technical staff: "Many interviewees acknowledge that using CALSIM II in a predictive manner is risky and/or inappropriate, but without any other agency-supported alternative they have no other option."

The report continues that: "All users agree that CalSim II needs better documentation of the model, data, inputs, and results. CalSim II is data-driven, and so it requires numerous input files, many of which lack documentation," and "There is considerable debate about the current and desirable state of CalSim II's calibration and verification," and "Its representation of the SWP and CVP includes many simplifications that raise concerns regarding the accuracy of results." "The model's inability to capture within-month variations sometimes results in overestimates of the volume of water the projects can export from the Sacramento- San Joaquin Bay-Delta and makes it seem easier to meet environmental standards than it is in real operations." The study concluded by observing, "CalSim II is being used, and will continue to be used, for many other types of analyses for which it may be ill-suited, including in absolute mode."

In sum, the relied-upon models fail to accurately characterize the existing and future environment, fail to assess project-related impacts at a level of detailed required for the EIS/EIR, and fail to support the EIS/EIR's conclusions regarding significance of impacts.

Response
There are limitations to using CalSim II as described in the comment. However, CalSim II is the best available tool for analysis of effects to the CVP and SWP and is still the industry standard for the type of comparative analysis performed in preparation of the EIS/EIR.

Comment NG03-88

Comment
e. Seismicity.

The EIS/EIR reasoning that because the projects don't involve new construction or modification of existing structures that there are no potential seismic impacts from the activity undertaken during the transfers is incorrect. The project area has numerous existing structures that could be affected by the groundwater substitution transfer pumping, specifically settlement induced by subsidence. Although the seismicity in the Sacramento Valley is lower than many areas of California, it's not insignificant. There is a potential for the groundwater substitution transfer projects to increase the impacts of seismic shaking because of subsidence causing additional stress on existing structures.

Response

Subsidence impacts are addressed in Section 3.3, Groundwater Resources, and are addressed by Mitigation Measure GW-1: Monitoring Program and Mitigation Plans. This mitigation measure has also been refined in response to public comment. See Common Response 7 for additional information.

Comment NG03-89

Comment

The EIS/EIR fails to inform the public through any analysis of the potential effects excessive groundwater pumping in the seller area may have on the numerous known earthquake faults running through and about the north Delta area, and into other regions of Northern California. As recently detailed in a paper published by a well-respected British scientific journal, "[u]plift and seismicity driven by groundwater depletion in central California," excessive pumping of groundwater from the Central Valley might be affecting the frequency of earthquakes along the San Andreas Fault, and raising the elevation of local mountain belts. The research posits that removal of groundwater lessens the weight and pressure on the Earth's upper crust, which allows the crust to move upward, releasing pressure on faults, and rendering them closure to failure. Long-Term Water Transfer Agreements have impacted the volume of groundwater extracted as farmers are able to pump and then forego surface water in exchange for money. The drought has exacerbated the need for water in buyer areas, and depleted the natural regeneration of groundwater supply due to the scarcity of rain.

Detailed analyses of this seismicity and focal mechanisms indicate that active geologic structures include blind thrust and reverse faults and associated folds (e.g., Dunnigan Hills) within the Coast Ranges-Sierran Block ("CRSB") boundary zone on the western margin of the Sacramento Valley, the Willows and Corning faults in the valley interior, and reactivated portions of the Foothill fault system. Other possibly seismogenic faults include the Chico monocline fault in the Sierran foothills and the Paskenta, Elder Creek and Cold Fork faults on the northwestern margin of the Sacramento Valley.36

Response

The purpose of Mitigation Measure GW-1 is to monitor groundwater levels during transfers to avoid potentially significant effects. See Common Responses 6 and 7 for additional information. In addition, Reclamation's transfer approval process and groundwater mitigation measures set forth a framework that is designed to avoid and minimize adverse groundwater effects. Reclamation will verify that sellers adopt and implement these measures to minimize the potential for adverse effects related to groundwater extraction. The article "Earthquake Activity in the Central Valley, California and its Implications to Active Geologic Structures and Contemporary Tectonic Stress" referred to in the comment does not mention the role of groundwater pumping on the frequency of earthquakes in central California.

Comment NG03-90

Comment

The gross omissions and errors within the climate change analysis of the EIS/EIR fail to accurately describe the existing climatological conditions into which the project may be approved, fail to accurately describe the diminution of water and natural resources over recent and future years as a result of climate change, fail to integrate these changing circumstances into any future baseline or cumulative conditions, and fail to completely analyze or support the EIS/EIR conclusions regarding the project's potentially significant impacts.

Response

Section 3.6, Climate Change describes the existing climatological conditions for the study area in Section 3.6.1.3, Existing Conditions. Multiple reports were reviewed in detail to determine the projected climate effects that could occur during project implementation. The climate change analysis in the EIS/EIR was also consistent with the groundwater substitution assumptions modeled using CalSim II, SACFEM2013, and the Transfer Operations Model (TOM); see Appendix C for more information on the use and interaction of these three models. Because these models consider any hydrologic changes that could have occurred in the past, the modeling completed for this analysis would have incorporated any changes to water operations that would be occurring from climate change. Furthermore, the modeling was further refined collaboratively with Reclamation because the baseline study was revised for an existing level of development, requirements, and projects (see page C-5). Appendix C states that "[t]he Project's ten-year period allows simulation of a single level of development under the assumptions that conditions are not likely to change significantly over such a short time horizon" (see page C-20). As a result, no additional analysis is required for climate change.

Comment NG03-91

Comment

i. The EIS/EIR Completely Fails to Incorporate Any Climate Change Information into its Analysis.

The EIS/EIR provides no analysis whatsoever of the extent to which climate change will affect the EIS/EIR assumptions regarding water supply, water quality, groundwater, or fisheries. Despite providing an overview of extant literature and study, all agreeing that California temperatures have been, are, and will continue to be rising, the entire EIS/EIR analysis of climate change interactions with the proposed project states:

As described in the Section 3.6.1.3, changes to annual temperatures, extreme heat, precipitation, sea level rise and storm surge, and snowpack and streamflow are expected to occur in the future because of climate change. Because of the short-term duration of the Proposed Action (10 years), any effects of climate change on this alternative are expected to be minimal. Impacts to the Proposed Action from climate change would be less than significant.

(EIS/EIR 3.6-21 to 3.6-22; similarly, the EIS/EIR Fisheries chapter at 3.7-23 states: "Future climate change is not expected to alter conditions in any reservoir under the No Action/No Project Alternative because there will be limited climate change predicted over the ten year project duration (see Section 3.6, Climate Change/Greenhouse Gas).")

First, this "analysis" seriously misstates extant science by claiming that climate change impacts "are expected to occur in the future." The effects of climate change are affecting California's water resources at present, and have been for years. A 2007 DWR fact sheet, for example, states that "[c]limate change is already impacting California's water resources."37 A more recent 2013 report issued by the California Office of Environmental Health Hazard Assessment states that "[m]any indicators reveal already discernible impacts of climate change, highlighting the urgency for the state, local government and others to undertake mitigation and adaptation strategies."38 The report states that:

Climate is a key factor affecting snow, ice and frozen ground, streams, rivers, lakes and the ocean. Regional climate change, particularly warming temperatures, have affected these natural physical systems.

From October to March, snow accumulates in the Sierra Nevada. This snowpack stores much of the year's water supply. Spring warming releases the water as snowmelt runoff. Over the past century, spring runoff to the Sacramento River has decreased by 9 percent. Lower runoff volumes from April to July may indicate: (1) warmer winters, during which precipitation falls as rain instead of snow; and (2) earlier springtime warming.

Glaciers are important indicators of climate change. They respond to the combination of winter snowfall and spring and summer temperatures. Like spring snowmelt, the melting of glaciers supplies water to sustain flora and fauna during the warmer months. Glacier shrinkage results in earlier peak runoff and drier summer conditions—changes with ecological impacts—and contributes to sea level rise.

With warming temperatures over the past century, the surface area of glaciers in the Sierra Nevada has been decreasing. Losses have ranged from 20 to 70 percent.

Over the last century, sea levels have risen by an average of 7 inches along the California coast.

Lake waters have been warming at Lake Tahoe, Lake Almanor, Clear Lake and Mono Lake since the 1990s. Changes in water temperature can alter the chemical, physical and biological characteristics of a lake, leading to changes in the composition and abundance of organisms that inhabit it.

Snow-water content—the amount of water stored in the snowpack—has declined in the northern Sierra Nevada and increased in the southern Sierra Nevada, likely reflecting differences in precipitation patterns.

Reduced runoff means less water to meet the state's domestic, agricultural, hydroelectric power generation, recreation and other needs. Cold water fish habitat, alpine forest growth and wildfire conditions are also impacted.

Response

See Common Response 5 and response to comment LA02-7.

Comment NG03-92

Comment

In addition, climate change threatens to reduce the size of cold water pools in upstream reservoirs and raise temperatures in upstream river reaches for Chinook, and climate change will reduce Delta outflows and cause X2 to migrate further east and upstream. (See, BDCP at 5.B-310, "Delta smelt may occur more frequently in the north Delta diversions area under future climate conditions if sea level rise [and reduced Sacramento River inflow below Freeport] induces movement of the spawning population farther upstream than is currently typical.")

Response

A range of potential transfer activities, including long-term water transfers, within a 10-year timeframe are evaluated in this EIS/EIR. BDCP did not assume any climate change in its 10-year model scenario ("near-term") because predicted changes were within the range of model variation. Climate change likewise was not considered for the modeling evaluation in this EIS/EIR because climate change effects would have been too small to be outside the range of modeling variation.

Comment NG03-93

Comment

And, the EIS/EIR "[f]igure 3.6-1 shows the climate change area of analysis," excluding all of the Sierra Nevadas except those within Placer County, and excluding all of Sacramento County. (EIS/EIR 3.6-2.)

Response

As described in Section 3.6, Climate Change, the "area of analysis for climate change includes counties where cropland idling could occur in the Seller Service Area, counties overlying groundwater basins where groundwater substitution transfers could occur, and counties where transferred water would be used for agricultural purposes in the Buyer Service Area" (page 3.6-2). The exclusion of Sacramento County is an error and Figure 3.6-1 has been revised to include Sacramento County. Areas without cropland idling or groundwater substitution transfers, such as Placer County, are not included in the climate change area of analysis.

Comment NG03-94

Comment

Instead of accounting for these factors in its environmental analysis, the EIS/EIR takes the obtuse approach of relying only on "mid-century" and year 2100 projections to cast climate change as a "long-term" and "future" problem. (See, e.g., EIS/EIR 3.6-10.) First, the U.S. Department of Interior and the California Resources Agency clearly possess better information regarding past, present, and on-going changes to water supplies as a result of climate change than presented in the EIS/EIR, and such information must be incorporated. Second, even the information presented could be more fully described, and where appropriate, extrapolated, to support any meaningful analysis. Presumably these studies and reports provide more than one or two future data points, and instead show curved projections over time. For example, the EIS/EIR states that "[i]n California, snow water equivalent (the amount of water held in a volume of snow) is projected to decrease by 16 percent by 2035, 34 percent by 2070, and 57 percent by 2099, as compared to measurements between 1971 and 2000." (EIS/EIR 3.6-11.) Are these the only three data points provided by the study? Unless the EIS/EIR assumes that the entire percent decreases will be felt exclusively in years 2035, 2070, and 2099, these data should be extrapolated, as follows, to approximate the snow melt decrease over the project term: {See Comment Letter for Figure}

From this it is apparent that snow melt will decrease over the project term. This provides just one example, but the EIS/EIR itself should include meaningful analysis of climate change effects upon annual temperatures, extreme heat, precipitation, evaporation, sea level rise, storm surge, snowpack, groundwater, stream flow, riparian habitat, fisheries, and local economies over the life of the project.

Nine years ago, in 2005, then California Governor Arnold Schwarzenegger stated "[w]e know the science. We see the threat. And we know the time for action is now."{Source:United Nations World Environment Day Conference, June 1, 2005, San Francisco; see also, Executive Order S-3-05}. Here, in contrast, the EIS/EIR says, let's wait another ten years. This is simply unacceptable.

Response

The additional reports cited in the comment letter do not contradict or undermine the information presented in the EIS/EIR, nor do they materially add to the existing discussion. As such, it is not necessary to revise or supplement the existing discussion. As is demonstrated in Section 3.6.1.3, Existing Conditions, the EIS/EIR acknowledges the ways that climate change impacts California and the project study area. Section 3.6.2, Environmental Consequences/Environmental Impacts describes climate change impacts that would occur during the project implementation and concludes that the impacts would be insubstantial, as demonstrated by the data presented in the analysis.

Comment NG03-95

Comment

The EIS/EIR Completely Ignores Increased GHG Emission in the Buyer Areas.

The EIS/EIR impact evaluation of increased GHG emissions in the buyer areas consists of a series of incomplete characterizations and unsupported conclusion. First, the EIS/EIR states: "Water transfers to agricultural users . . . could temporarily reduce the amount of land idled relative to the No Action/No Project Alternative." (EIS/EIR 3.6-22.) This is in part true, but understates the impact, as there is no guarantee that the newly-supported land-uses would either be temporary, or agricultural. Second, the EIS/EIR states that "farmers may also pump less groundwater for irrigation, which would reduce emissions from use of diesel pumps." This too is entirely speculative, and also contradicts the earlier implication that transfer water would only go to idled cropland. Third, the EIS/EIR summarily concludes that, "[t]he total amount of agricultural activity in the Buyer Service Area relative to GHG emissions would not likely change relative to existing conditions and the impact would be less than significant." This again contradicts the EIS/EIR earlier statement that a water transfer could result in less idled cropland; and also defies logic and has no support in fact to suggest that increasing provision of a scarce resource would not induce some growth. At a bare minimum, the EIS/EIR should use its own estimated GHG reduction rates achieved as a result of newly idled cropland in the sellers' service area as means of measuring the estimated GHG emission increases caused by activating idled cropland in the buyers' service areas.

Response

The information presented in the EIS/EIR is not contradictory, as stated by the commenter, because it presents possible outcomes of water use in the buyers' service area and does not state that water would "only" be used in certain ways. Because it is not known how the buyers would use transferred water, it is not possible to estimate GHG emissions to the same level of detail as was completed for the sellers' service area. However, Chapter 1 states that "[w]ater transfers would be used only to help meet existing demands and would not serve any new demands in the buyers' service areas" (see page 1-1). As a result, the assertion in the comment that water transfers would be used to support additional growth is unfounded.

Comment NG03-96

Comment

The EIS/EIR Threshold of Significance for GHG Emissions is Inappropriate.

The EIS/EIR reviews nearly a dozen relevant, agency-adopted, thresholds of significant for GHG emissions, and chooses to select the single threshold that sits a full order of magnitude above all others. The chosen threshold is unsupported in fact or law, and creates internal contradiction within the EIS/EIR. The CEQA Guidelines state that:

A lead agency should consider the following factors, among others, when assessing the significance of impacts from greenhouse gas emissions on the environment: . . .

Whether the project emissions exceed a threshold of significance that the lead agency determines applies to the project.

The extent to which the project complies with regulations or requirements adopted to implement a statewide, regional, or local plan for the reduction or mitigation of greenhouse gas emissions.

(CEQA Guidelines § 15064.4.) Numerous Air Districts within the affected area have established GHG thresholds of significance that the EIS/EIR improperly chooses not to apply. The EIS/EIR argues that these Air District thresholds are meant to apply to stationary sources, an exercise that "would be overly onerous and is not recommended." (EIS/EIR 3.6-18.) This must be rejected. The EIS/EIR fails to provide any reason to believe that Air District regulations would not and should not be applied to activities occurring within each respective Air District. The CEQA Guidelines require the lead agency to use "a threshold of significance that the lead agency determines applies to the project;" here, the lead agency has not determined that the local Air

District thresholds do not apply to the project activities; rather, it has determined that this evaluation would be too onerous. So instead, the EIS/EIR chooses to apply the threshold of significance adopted by the Antelope Valley Air District and the Mojave Desert Air District, each of which would clearly have latitude to adopt lax air quality thresholds owing to the lack of use intensity within each district. With (hopefully) no transfer water heading to the Mojave Desert, the lead agency has no basis to determine that the Mojave Desert Air District's thresholds of significance "applies to the project." The EIS/EIR also notes that the same threshold has been adopted by USEPA for Clean Air Act, Title V permits. But the Title V standard also applies to stationary sources, which the EIS/EIR says are inapplicable. Does any project element require a Title V permit? In short, the EIS/EIR fails to evaluate the project against any threshold of significance that was adopted either (1) for the benefit of an individual air district in which project activities would occur, or (2) for the benefit of regional or statewide GHG emission goals. The EIS/EIR's unsupported grab of the most lax standard it could find, with no bearing on the project whatsoever, must be rejected.

Response

As discussed in the EIS/EIR, "[t]he stationary source threshold used by multiple air districts (i.e., 10,000 metric tons per year) is not intended to cover stationary source emissions owned and operated by multiple parties; rather, it is applicable to individual pieces of equipment, or at most, an individual facility, rather than all equipment affected by the action alternatives" (see page 3.6-19). The 100,000 tons per year threshold was not selected because it is "lax" in comparison to the 10,000 metric tons per year threshold, but rather because it is similar to the prevention of significant deterioration permitting threshold, which is intended to prevent the degradation of air quality. The prevention of significant deterioration permitting threshold was considered suitable for determining the impacts from the combined activity of all groundwater pumps operating throughout the region. It should also be noted that the EIS/EIR does not say stationary source thresholds are not applicable to the action alternatives; rather, it says the 10,000 metric tons per year threshold is applicable to individual stationary sources, not to the combined activities from the entire project.

Comment NG03-97

Comment

AquAlliance shares the widely held view that operation of the Delta export pumps is the major factor causing the Pelagic Organism Decline ("POD") and in the deteriorating populations of fall-run Chinook salmon. In 2012, the State Water Resources Control Board received word in early December that the Fall Midwater Trawl surveys for September and October showed horrendous numbers for the target species. The indices for longfin smelt, splittal, and threadfin shad reveal the lowest in history {Source: http://www.dfg.ca.gov/delta/data/fmwt/Indices/index.asp. (Exhibit CC)}. Delta smelt, striped bass, and American shad numbers remain close to their lowest levels (Id). The 2013 indices were even worse and the 2014 indices are also abysmal (Id). Tom Cannon declared in June 2014 that water transfers have been and will remain devastating to Delta smelt during dry years {Cannon 2014. Declaration for Preliminary Injunction in AquAlliance and CSPA v. United State Bureau of Reclamation. (Exhibit DD)}. "In my opinion, the effect of Delta operations this summer [2014] of confining smelt to the Sacramento Deepwater ship channel upstream of Rio Vista due to adverse environmental conditions in the LSZ that will be exacerbated by the Transfers, both with and without relaxed outflow standards, with no evidence that they can emerge from the ship channel in the fall to produce another generation of smelt, is significant new information showing that the Transfers will have significant adverse impacts on Delta smelt." Mr. Cannon's October report observes that "habitat conditions have been very poor and the Delta smelt population is now much closer to extinction with the lowest summer index on record."

As Mr. Cannon's comments highlight, attached and fully incorporated as though stated in their entirety, herein, the EIS/EIR has inaccurately characterized the existing environment, including the assumption that delta smelt are not found in the Delta in the summer transfer season, when in fact during dry and critical years when transfers would occur, most if not all delta smelt are found in the Delta; and fails to fully assess the significant and cumulative effects to listed species in multiyear droughts when listed fish are already under maximum stress, which effects could be avoided by limiting transfers in the second or later years of drought.

The 2015-2024 Water Transfer Program would exacerbate pumping of fresh water from the Delta, which has already suffered from excessive pumping over the last 12 years. Pumped exports cause reverse flows to occur in Old and Middle Rivers and can result in entrainment of fish and other organisms in the pumps. Pumping can shrink the habitat for Delta smelt (Hypomesus transpacificus) as well, since less water flows out past Chipps Island through Suisun Bay, which Delta smelt often prefer.

Response

As described in the in-Delta analysis (pp. 3.7-31 through 3.7-38), the majority of Delta smelt move downstream towards cooler, ocean-influenced water in the bays during the summer because temperatures in the Delta become too warm, out of the influence of Old and Middle River (OMR) reverse flows and the export facilities in the south Delta.

See pages 3.7-31 through 3.7-38 for a full description.

Comment NG03-98

Comment

The EIS/EIR should also evaluate whether Project effects could alter stream flows necessary to maintain compliance with California Fish and Game Code Section 5937. A recent study issued from the University of California, Davis, documents hundreds of dams failing to maintain these required flows {Source: https://watershed.ucdavis.edu/files/biblio/BioScience-2014-Grantham-biosci_biu159.pdf. (Exhibit EE)}. Both the timing and volumes of transfer water must be considered in conjunction with 5937 flows.

Response

The action alternatives do not include changes to the ability of dams to provide streamflows below the dams; therefore, they are in compliance with California Fish and Game Code Section 5937.

Comment NG03-99

Comment

The EIS/EIR reaches faulty conclusion for Project and cumulative impacts.

Section 3.8.5, Potentially Significant Unavoidable Impacts, declares that, "None of the alternatives would result in potentially significant unavoidable impacts on natural communities, wildlife, or special-status species." Regarding cumulative biological impacts of the proposed Project (Alternative 2), the EIS/EIR concludes, "Long-term water transfers would not be cumulatively considerable with the other projects because each of the projects would have little or no impact flows [sic] in rivers and creeks in the Sacramento River watershed or the vegetation and wildlife resources that depend on them," (p. 3.8-92). This is a conclusory statement without supporting material to justify it, only modeling that has been demonstrated in our comments as extremely deficient.

The EIS/EIR actually discloses there are very likely many significant impacts from the proposed project on terrestrial and aquatic habitat and species. Examples from Chapter 3.8 include:

- "The lacustrine natural communities in the Seller Service Area that would be potentially impacted by the alternatives include the following reservoirs: Shasta, Oroville, New Bullards Bar, Camp Far West, Collins, Folsom, Hell Hole, French Meadows, and McClure," (p. 3.8-10)

- "The potential impacts of groundwater substitution on natural communities in upland areas was considered potentially significant if it resulted in a consistent, sustained depletion of water levels that were accessible to overlying communities (groundwater depth under existing conditions was 15 feet or less). A sustained depletion would be considered to have occurred if the groundwater basin did not recharge from one year to the next," (p. 3.8-33).

- "In addition to changing groundwater levels, groundwater substitution transfers could affect stream flows. As groundwater storage refills during and after a transfer, it could result in reduced availability of surface water in nearby streams and wetlands," (p. 3.8-33).

Response

The text examples in the comment are from the discussions in each impact statement rather than the conclusions. Each impact analysis starts with an italicized impact statement that describes the potential impact being assessed. These statements describe what "could" occur. The analysis then examines the evidence to determine if that type of impact would occur, and the potential magnitude of the impact. This analysis then leads to a conclusion of whether the impact would occur and whether it could be significant. The text cited appears before the full analysis of each impact, which describes the detailed reasons why the impacts would be less than significant.

Comment NG03-100

Comment

It should also be noted that the 2008 U.S. Fish and Wildlife Service (USFWS) and 2009 National Marine Fisheries Service (NMFS) biological opinions did not evaluate potential impacts to in-stream flow due to water transfers involving groundwater substitution. How these potential impacts may adversely affect biological resources in the areas where groundwater pumping will occur, including listed species and their habitat, were also not included {Source: California Department of Fish and Game. 2013. COMMENTS ON THE DRAFT ENVIRONMENTAL ASSESSMENT (2013 DRAFT EA) AND FINDING OF NO SIGNIFICANT IMPACT (FONSI) FOR THE 2013 CENTRAL VALLEY PROJECT (CVP) WATER, p.4. (Exhibit FF)}. To reach the conclusion that the Project “would not be cumulatively considerable with the other projects” based only on modeling fails to provide the public with meaningful analysis of probable impacts.

Response

The impact analysis in Sections 3.7 and 3.8 analyzed the potential impacts to fisheries and vegetation and wildlife from groundwater substitution transfers. Section 7 consultation is being initiated with USFWS for the proposed action. Because Section 3.7 determined that the action alternatives (including groundwater substitution transfers) are not expected to affect federal-listed fish, consultation with NOAA Fisheries is not warranted.

Comment NG03-101

Comment

The 2015-2024 Water Transfer Program has potential adverse impacts for the giant garter snake, a threatened species.

As the Lead and Approving Agencies are well aware, the purpose of the ESA is to conserve the ecosystems on which endangered and threatened species depend and to conserve and recover those species so that they no longer require the protections of the Act. 16 U.S.C. § 1531(b), ESA § 2(b); 16 U.S.C. § 1532(3), ESA §3(3) (defining “conservation” as “the use of all methods and procedures which are necessary to bring any endangered species or threatened species to the point at which the measures provided pursuant to this chapter are no longer necessary”). “[T]he ESA was enacted not merely to forestall the extinction of species (i.e., promote species survival), but to allow a species to recover to the point where it may be delisted.” Gifford Pinchot Task Force v. U.S. Fish & Wildlife Service, 378 F3d 1059, 1069 (9th Cir. 2004). To ensure that the statutory purpose will be carried out, the ESA imposes both substantive and procedural requirements on all federal agencies to carry out programs for the conservation of listed species and to insure that their actions are not likely to jeopardize the continued existence of any listed species or result in the destruction or adverse modification of critical habitat. 16 U.S.C. § 1536. See NRDC v. Houston, 146 F.3d 1118, 1127 (9th Cir. 1998) (action agencies have an “affirmative duty” to ensure that their actions do not jeopardize listed species and “independent obligations” to ensure that proposed actions are not likely to adversely affect listed species). To accomplish this goal, agencies must consult with the Fish and Wildlife Service whenever their actions “may affect” a listed species. 16 U.S.C. § 1536(a)(2); 50 C.F.R. § 402.14(a). Section 7 consultation is required for “any action [that] may affect listed species or critical habitat.” 50

C.F.R. § 402.14. Agency "action" is defined in the ESA's implementing regulations to "mean all activities or programs of any kind authorized, funded, or carried out, in whole or in part, by Federal agencies in the United States." 50 C.F.R. § 402.02.

Response

Section 7 consultation was initiated with USFWS for the Proposed Action on October 7, 2014. A biological assessment prepared by Reclamation in accordance with Section 7 requirements and in connection with that consultation includes an assessment of potential project effects on giant garter snake. Reclamation submitted the biological assessment to USFWS on November 4, 2014. A ROD will not be signed and no Federal Action will be taken until the required Section 7 consultation with USFWS is complete.

Comment NG03-102

Comment

The giant garter snake ("GGS") is an endemic species to Central Valley California wetlands. (Draft Recovery Plan for the Giant Garter Snake ("DRP") 1). The giant garter snake, as its name suggests, is the largest of all garter snake species, not to mention one of North America's largest native snakes, reaching a length of up to 64 inches. Female GGS tend to be larger than males. GGS vary in color, especially depending on the region, from brown to olive, with white, yellow, or orange stripes. The GGS can be distinguished from the common garter snake by its lack of red markings and its larger size. GGS feed primarily on aquatic fish and specialize in ambushing small fish underwater, making aquatic habitat essential to their survival. Females give birth to live young from late July to early September, and brood size can vary from 10 to up to 46 young. Some studies have suggested that the GGS is sensitive to habitat change in that it prefers areas that are familiar and will not typically travel far distances.

If fallowing (idling) occurs, there will be potentially significant impacts to GGS and this is acknowledged on page 3.8-69: "Giant garter snakes have the potential to be affected by the Proposed Action through cropland idling/shifting and the effects of groundwater substitution on small streams and associated wetlands." The Lead Agencies use language found in a 1997 Programmatic Biological Opinion (as well as the 1999 Draft Recovery Plan) to explain that GGS depend on more than rice fields in the Sacramento Valley. "The giant garter snake inhabits marshes, sloughs, ponds, small lakes, low gradient streams, other waterways and agricultural wetlands such as irrigation and drainage canals and rice fields, and the adjacent uplands. Essential habitat components consist of (1) adequate water during the snake's active period, (early spring through mid-fall) to provide a prey base and cover; (2) emergent, herbaceous wetland vegetation, such as cattails and bulrushes, for escape cover and foraging habitat; (3) upland habitat for basking, cover, and retreat sites; and (4) higher elevation uplands for cover and refuge from flood waters." {Source: Programmatic Consultation with the U.S. Army Corps of Engineers 404 Permitted Projects with Relatively Small Effects on the Giant Garter Snake within Butte, Colusa, Glenn, Fresno, Merced, Sacramento, San Joaquin, Solano, Stanislaus, Sutter and Yolo Counties, California}

Even with the explanation above, that clearly illustrates the importance of upland habitat to GGS, the EIS/EIR concludes that idling or shifting upland crops "[a]re not anticipated to affect giant garter snakes, as they do not provide suitable habitat for this species" (p. 3.8-69). The EIS/EIR is internally contradictory and fails to provide any evidence to support its conclusion that GGS will not be impacted by idling or shifting crops in upland areas. In support of the importance of upland acreage to GGS, a Biological Opinion for Gray Lodge found that, "Giant garter snakes also use burrows as refuge from extreme heat during their active period. The Biological Resources Division (BRD) of the USGS (Wylie et al_ 1997) has documented giant garter snakes using burrows in the summer as much as 165 feet (50. meters) away from the marsh edge. Overwintering snakes have been documented using burrows as far as 820 feet (250 meters) from the edge of marsh habitat," (1998) {Source: http://www.usbr.gov/mp/nepa/documentShow.cfm?Doc_ID=15453}

Response

The commenter's description of the life history and habitat information pertaining to giant garter snake and their use of upland habitats is consistent with the data and type assumptions used in the EIS/EIR analysis of potential impacts to the species. Upland cropland provides habitat value for giant garter snake similar to habitat associated with fallowed agricultural lands because these areas would be expected to support small mammal burrows that could be used by giant garter snakes.

Comment NG03-103

Comment

More pertinent background information that is lacking in the EIS/EIR is found in the Bureau's Biological Assessment for the 2009 DWB that disclosed that one GGS study in Colusa County revealed the "longest average movement distances of 0.62 miles, with the longest being 1.7 miles, for sixteen snakes in 2006, and an average of 0.32 miles, with the longest being 0.6 miles for eight snakes in 2007." (BA at p. 16) However, in response to droughts and other changes in water availability, the GGS has been known to travel up to 5 miles in only a few days, and the EIS/EIR should evaluate impacts to GGS survival and reproduction under such extreme conditions.

As the EIS/EIR divulges, flooded rice fields, irrigation canals, streams, and wetlands in the Sacramento Valley can be used by the giant garter snake for foraging, cover and dispersal purposes. The Bureau's 2009 and 2014 Biological Assessments acknowledge the failure of the Bureau and DWR to complete the Conservation Strategy that was a requirement of the 2004 Biological Opinion (BA at p. 19-20). Research was finally initiated "since 2009," but is nowhere near the projected 10-year completion date. The unnecessary delay hasn't daunted the agencies pursuit of transfers that affect GGS despite the absence of the following information that the U.S. Fish and Wildlife Service has explicitly required since the 1990s:

- GGS distribution and abundance.
- Ten years of baseline surveys in the Sacramento Valley
- Five years of rice land idling surveys in the Sacramento Valley Recovery Unit and the Mid-Valley Recovery Unit.

This Project and all North-to-South and North-to-North transfers should be delayed until the Bureau and DWR have completed the Conservation Strategy they have known about for at least a decade and a half.

Response

The Proposed Action is not subject to the requirements of the 2004 BO. Effects associated with the proposed project will be assessed by the USFWS as part of a separate Section 7 consultation that was initiated by Reclamation on October 7, 2014.

Comment NG03-104

Comment

The Bureau and DWR continue to allow an increase in acres fallowed (2013 Draft Technical Information for Preparing Water Transfer Proposals ("DTIPWTP")) since the 2010/2011 Water Transfer Program first proposed to delete or modify other mitigation measures previously adopted as a result of the Environmental Water Account ("EWA") EIR process. The EWA substantially reduced significant impacts for GGS, but without showing that they are infeasible, the Bureau and DWR proposed to delete the 160 acre maximum for "idled block sizes" for rice fields left fallow rather than flooded and to substitute for it a 320 acre maximum. (See 2003 Draft EWA EIS/EIR, p. 10-55; 2004 Final EWA EIS/EIR, Appendix B, p. 18, Conservation Measure # 4.) There was no evidence in 2010 to support this change nor has there been any provided to the present time. In light of the agencies failure to complete the required Conservation Strategy mentioned above and the data gathered in the Colusa County study, how can the EIS/EIR suggest (although it is not presented in the document, but in the agencies Draft Technical Information for Preparing Water Transfer Proposals papers) that doubling the fallowing acreage is in any way biologically defensible? The Lead and Approving Agencies additionally propose to delete the EWA mitigation measure excluding Yolo County east of Highway 113 from the areas where rice fields may be left fallow rather than flooded, except in three specific areas {Source: USBR and DWR, 2013. Draft Technical Information for Preparing Water Transfer Proposals.}. (See 2004 Final EWA EIS/EIR, Appendix B, p. 18, Conservation Measure # 2.) What is the biological justification for this change and where is it documented? What are the impacts from this change?

Deleting these mitigation measures required by the EWA approval would violate NEPA and CEQA's requirements that govern whether, when, and how agencies may eliminate mitigation measures previously adopted under NEPA and CEQA.

Response

The commenter is concerned about mitigation measures contained in an environmental document for a separate project. The range of potential water transfer activities analyzed in this EIS/EIR is not subject to prescribed measures in other CEQA or NEPA project documents. The variance from prior Reclamation projects' environmental commitments related to giant garter snake is further described in Common Response 12.

Comment NG03-105

Comment

Additionally, the 2010/2011 Water Transfer Program failed to include sufficient safeguards to protect the giant garter snake and its habitat. The EA for that two-year project concluded, "The frequency and magnitude of rice land idling would likely increase through implementation of water transfer programs in the future. Increased rice idling transfers could result in chronic adverse effects to giant garter snake and their habitats and may result in long-term degradation to snake populations in the lower Sacramento Valley. In order to avoid potentially significant adverse impacts for the snake, additional surveys should be conducted prior to any alteration in water regime or landscape," (p. 3-110). To address this significant impact the Bureau proposed relying on the 2009 Drought Water Bank ("DWB") Biological Opinion, which was a one-year BO. Both the expired 2009 BO and the 2014 BO highlighted the Bureau and DWR's avoidance of meeting federal and state laws stating, "This office has consulted with Reclamation, both informally and formally, seven times since 2000 on various forbearance agreements and proposed water transfers for which water is made available ["for delivery south of the delta" is omitted in 2014] by fallowing rice (and other crops) or substituting other crops for rice in the Sacramento Valley. Although transfers of this nature were anticipated in our biological opinion on the environmental Water Account, that program expired in 2007 and, to our knowledge, no water was ever made available to EWA from rice fallowing or rice substitution. The need to consult with such frequency on transfers involving water made available from rice fallowing or rice substitution suggests to us a need for programmatic environmental compliance documents, including a programmatic biological opinion that addresses the additive effects on giant garter snakes of repeated fallowing over time, and the long-term effects of potentially large fluctuations and reductions in the amount and distribution of rice habitat upon which giant garter snakes in the Sacramento Valley depend," (p.1-2). And here we are in late 2014 still without that programmatic environmental compliance that is needed under the Endangered Species Act.

If the Project is or isn't approved, we propose that the Lead and Approving Agencies commit to the following conservation recommendations from the 2014 Biological Opinion by changing the word "should" to "shall":

1. Reclamation should [shall] assist the Service in implementing recovery actions identified in the Draft Recovery Plan for the Giant Garter Snake (U.S. Fish and Wildlife Service 1999) as well as the final plan if issued during the term of the proposed action.

2. Reclamation should [shall] work with the Service, Department of Water Resources, and water contractors to investigate the long-term response of giant garter snake individuals and local populations to annual fluctuations in habitat from fallowing rice fields.

3. Reclamation should [shall] support the research goals of the Giant Garter Snake Monitoring and Research Strategy for the Sacramento Valley proposed in the Project Description of this biological opinion.

4. Reclamation should [shall] work with the Service to create and restore additional stable perennial wetland habitat for giant garter snakes in the Sacramento Valley so that they are

> less vulnerable to market-driven fluctuations in rice production. The CVPIA (b)(1)other and CVPCP conservation grant programs would be appropriate for such work.

Response

As the commenter notes, in prior consultations for water transfers USFWS suggested it might be prudent to develop a programmatic approach to ESA compliance. Further discussions with USFWS indicated their objective with this consultation was to consider the potentially compounding effects of multi-year transfers in one consultation process. Reclamation has met this need through the Long-Term Water Transfers EIS/EIR and biological assessment, which assess these potential impacts at a project level. Reclamation submitted a biological assessment for Long-Term Water Transfers to USFWS on November 4, 2014. USFWS is currently considering the biological assessment and working on a biological opinion.

Comment NG03-106

Comment

The EIS/EIR fails to accurately describe the uppermost acreage that could impact GGS.

Page 3.8-69 claims that the Proposed Action "[c]ould idle up to a maximum of approximately 51,573 acres of rice fields," but the Lead and Approving Agencies are well aware that past transfers have or could have fallowed much more acreage and that 20 percent is allowed per county under the Draft Technical Information for Preparing Water Transfer Proposals last written in 2013. Factual numbers for proposed water transfers that included fallowing and groundwater substitution in the last 25 years should be disclosed in a revised and re-circulated draft EIS/EIR. The companion data that should also be presented would disclose how much water was actually transferred each year by seller and delineated by acreage of land fallowed and/or groundwater pumped. This information should not only be disclosed in the EIS/EIR, but it should also be readily available on the Bureau's web site. In addition, the EIS/EIR should cease equivocating with usage of "could" and "approximately" and select and analyze a firm maximum acreage of idled land, which would provide the public with the ability to consider the impacts from a most significant impact scenario.

"In 1992, Congress passed the Central Valley Project Improvement Act (Act, or CVPIA), which amended previous authorizations of the California Central Valley Project (CVP) to include fish and wildlife protection, restoration, enhancement, and mitigation as project purposes having equal priority with power generation, and irrigation and domestic water uses." {Source: U.S. Department of Interior. 10 Year of Progress: Central Valley Project Improvement Act 1993-2002. http://www.waterrights.ca.gov/baydelta/docs/exhibits/SLDM-EXH-03B.pdf (Exhibit GG)}. The 2015-2024 Water Transfer Program fails to take seriously the equal priority for, "[f]ish and wildlife protection, restoration, enhancement, and mitigation."

Response

Table 3.10-22 shows the maximum acreages for cropland idling for the range of potential transfer activities evaluated under the Proposed Action. The proposed acreages are the same under Alternative 4. These are the maximum acreages for idling under the Proposed Action, not 20 percent per county as was included in past documents. The EIS/EIR is analyzing future transfers, so data on past transfers was not needed for the analysis and was not included in the EIS/EIR. The EIS/EIR evaluated effects to all resources, including fish and wildlife, equally among alternatives and provided mitigation measures to reduce significant effects to a less-than-significant level.

Comment NG03-107

Comment

Our comments are based largely upon the EcoNorthwest report produced for AquAlliance, attached and fully incorporated as though stated in their entirety, herein. Once again, the lack of relevant baseline information and discrete project description thwarts any ability to effectively analyze the project, and the lack of any market analysis of water prices, and prices for agricultural commodities, relegates the EIS/EIR to unsupported conclusions about the likely future frequency and amounts of water transfers and their environmental and economic consequences. The EIS/EIR further relies on obsolete data for certain key variables and ignores other relevant data and information. For example, the analysis assumes a price for water that bears no resemblance to the current reality. Growers and water sellers and buyers react to changing prices and market conditions, but the EIS/EIR is silent on these forces and how they would influence water transfers.

Response

See the responses to comment letter NG02 specifically, but not limited to, the following comments: NG02-26, NG02-27, NG02-32, and NG02-33.

Comment NG03-108

Comment

The EIS/EIR underestimates negative impacts on the regional economy in the sellers' area, acknowledging that negative economic impacts would be worse if water transfers happen over consecutive years, but estimating impacts only for single-year transfers, ignoring the data on the frequency of recent consecutive-year transfers.

Response

NEPA does not require a judgment of significance or mitigation measures for economic effects. CEQA does not consider economic or social change resulting from a project as adverse effects on the environment. Still, additional text has been added to Section 3.10 to clarify the economic effects of transfers in consecutive years. See response to Comment NG02-4.

Comment NG03-109

Comment

As discussed, below, the EIS/EIR's inadequate evaluation and avoidance of subsidence will result in additional unaccounted-for economic costs. Injured third parties would bear the costs of bringing to the sellers' attention harm caused by groundwater pumping, and the ability of parties to resolve disputes with compensation is speculative. The EIS/EIR is silent on these and other ripple cost effects of subsidence.

Response

See Common Response 7.

Comment NG03-110

Comment

The EIS/EIR ignores the environmental externalities and economic subsidies that water transfers support. The EIS/EIR lists Westlands Water District as one of the CVP contractors expressing interest in purchasing transfer water. The environmental externalities caused by agricultural production in Westlands WD are well documented, as are the economic subsidies that support this production. To the extent that the water transfers at issue in the EIS/EIR facilitate agricultural production in Westlands WD, they also contribute to the environmental externalities and economic subsidies of that production, but the EIS/EIR is silent on these environmental and economic consequences of the water transfers.

Response

See response to Comment NG02-51.

Comment NG03-111

Comment

The EIS/EIR fails to adequately provide evidence that water transfers, which draw down reservoir surface elevations at Central Valley Project (CVP) and State Water Project (SWP) reservoirs beyond historically low levels, could not potentially adversely affect cultural resources. The EIS/EIR states that the potential of adverse impacts to cultural resources does exist:

3.13.2.4 Alternative 2: Full Range of Transfers (Proposed Action)

Transfers that draw down reservoir surface elevations at CVP and SWP reservoirs beyond historically low levels could affect cultural resources. The Proposed Action would affect reservoir elevation in CVP and SWP reservoirs and reservoirs participating in stored reservoir water transfers. Water transfers have the potential to affect cultural resources, if transfers result in changing operations beyond the No Action/No Project Alternative. Reservoir surface water elevation changes could expose previously inundated cultural resources to vandalism and/or increased wave action and erosion (p. 3.13-15).

This passage states that the Long Range Water Transfers undertaking may have the potential to affect cultural resources if the water transfers lowered reservoir elevations enough to expose cultural resources. The first step for analyzing this would require conducting research for past studies and reports with site specific data for the CVP and SWP reservoirs. The EIS/EIR states:

3.13.1.3 Existing Conditions

This section describes existing conditions for cultural resources within the area of analysis. All data regarding existing conditions were collected through an examination of archival and current literature pertinent to the area of analysis. Because action alternatives associated with the project do not involve physical construction-related impacts to cultural resources, no project specific cultural resource studies were conducted in preparation of this Environmental Impact Statement/Environmental Impact Report (EIS/EIR) (EIS/EIR, p. 3.13-13, emphasis added).

However, there are no references listed for all the data collected which were "pertinent to the area of analysis." Also, the EIS/EIR states on p. 3.13-15 cited above that the lowering of the reservoir water elevations due to water transfers may affect cultural resources. Obviously, such an impact does not need to "[i]nvolve physical construction-related impacts to cultural resources," so this rationale for not conducting specific cultural resource studies contradicts its own assertion.

Response

As demonstrated in Section 3.13.2, Environmental Consequences/ Environmental Impacts, changes in the CVP and SWP reservoir elevations from implementation of the action alternatives would be very similar, and any reservoir fluctuations would be within the historical operating range of the reservoirs.

Comment NG03-112

Comment

Instead of conducting a cultural resources study which locates historic resources and traditional cultural properties (with the use of a contemporary Native American ethnological study), and then assesses the amount of project-related water elevation changes which may affect these resources, the EIS/EIR merely stated that their Transfer Operations Model was used to show that the project's "Impacts to cultural resources at Shasta, Oroville and Folsom reservoirs would be less than significant," (3.13-15, 3.13-16). A chart on page 13.3-15 shows that the proposed project is projected to decrease reservoir elevations at the "critical" level in September by 0.5 ft. at Shasta Reservoir, 2.4 ft. at Lake Oroville, and 1.5 ft. at Folsom Reservoir. (There is no source for this chart, and the reader has to guess that it may be from the Transfer Operations Model. The definitions of the various categories in the chart are also unexplained).

Based upon the findings shown on the chart, it is stated:

The reservoir surface elevation changes under the Proposed Action for these reservoirs would be within the normal operations and would not be expected to expose previously inundated cultural resources to vandalism or increased wave action and wind erosion. Impacts to cultural resources at Shasta, Oroville and Folsom reservoirs would be less than significant (p. 3.13-15).

However, there is no evidence to show that a project-related reservoir drop of 2.4 ft. at Lake Oroville will not uncover cultural resources documented in The Archaeological and Historical Site Inventory at Lake Oroville, Butte County, {Source: Prepared for the California Department of Water Resources by the Archaeological Research Center, Sacramento, and the Anthropological Studies Center, Rohnert Park, 2004. (Exhibit HH)} and expose them "to vandalism or increased wave action and wind erosion," thus adversely affecting these resources.

This study states that there are 223 archaeological and/or historic sites recorded in the water level fluctuation zone of Lake Oroville (p. 12). Where is the Cultural Study which shows that lowering Lake Oroville 2.4 ft. due to water transfers will not expose specific archaeological sites or traditional cultural properties?

Without an inventory of the cultural resources which may be uncovered by the project-related drop in reservoir elevation for all the affected reservoirs, the numbers in the chart on page 13.3-15 mean nothing. The numbers in the chart provide no evidence that the project may or may not have an adverse effect on cultural resources. In contrast, substantial documentation of cultural resources in these areas exists.50 The threat of potential project-related impacts to cultural resources triggers a Section 106 analysis of the project under the requirements of the National Historic Preservation Act, which "[r]equires Federal agencies to take into account the effects of their undertakings on historic properties" [36 CFR 800.1(a)].

Response

See response to Comment NG03-111.

Comment NG03-113

Comment

Although the issue here is the raising of the Shasta Reservoir water levels, cultural impacts related to water levels at the Shasta Reservoir has been an ongoing issue for the Winnemem Wintu Tribe. The Winnemem Wintu Tribe and all tribes within the project area (Area of Potential Effects) need to be consulted by federal and state agencies. A project-specific cultural study under CEQA is also required under 15064.5. Determining the Significance of Impacts to Archaeological and Historical Resources. Consultation with federally recognized tribes and California Native American tribes is required for this project.

Response

See response to Comment NG03-111.

Comment NG03-114

Comment

The EIS/EIR fails to analyze the air quality impacts in all these regions, especially with regard to the Buyers Service Area. Moreover, Appendix F – Air Quality Emissions Calculations exclude portions of the Sellers Service Area in Placer and Merced Counties. Conversely, there was not data supplied in Appendix F concerning the air quality impacts from the water transfers that would affect the Bay Area AQMD counties (Alameda, Contra Costa, Santa Clara), a Monterey Bay Unified APCD county (San Benito) and San Joaquin APCD counties (San Joaquin, Stanislaus, Merced, Fresno and Kings). Consequently, air quality impacts in the Buyers and Sellers Service Areas are unanalyzed and the EIS/EIR conclusions are not supported by evidence.

Response

See response to Comment LA12-179.

Comment NG03-115

Comment

The EIS/EIR attempts to classify which engines would be subject to the ATCM based on whether an agricultural engine is in an air district designated in attainment for particulate matter and ozone, and is more than a half mile away from any residential area, school or hospital (aka sensitive receptors). (See p. 3.5-14). The EIS/EIR claims that the engines in Colusa, Glenn, Shasta and Tehama (part of Sellers Service Area) are exempt from the ATCM. However, 17 CCCR 93115.3 exempts in-use stationary diesel agricultural emissions not only based on the engines being remote, but all also “provided owners or operators of such engines comply with the registration requirements of section 93115.8, subdivisions (c) and (d), and the applicable recordkeeping and reporting requirement of section 93115.10,” which the EIS/EIR ignores. Furthermore, the EIS/EIR fails to present any data about the “tier” the subject agricultural diesel engines fall into. While the EIS/EIR identifies the tiers and concomitant requirements for replacement or repowering, it fails to provide any analysis or evidence evaluating whether the engines being used to pump water are operating within the permissible timeframes, depending on the tier designation.

Response

All engines operated by the water agencies would operate in compliance with the Airborne Toxic Control Measure (ATCM), including any necessary retrofits or repowering. The EIS/EIR has been updated to document that all engines operate in compliance with the emission reduction phase-in requirements described in Section 3.5, Air Quality, including any necessary registrations. Appendix I documents the emission tier assumed for each engine included in the analysis.

Comment NG03-116

Comment

The EIS/EIR analyzes the assessment methods based on existing emissions models from the regulation, diesel emissions factors from USEPA Compilation of Air Pollutant Emission Factors (for Natural gas fired reciprocating engines and gasoline/diesel industrial engines) and CARB Emission Inventory Documentation (for land preparation, harvest operations and windblown dust); and CARB size fractions for particulate matter. None of these references is directly on point to diesel powered water pumps and the emissions caused thereby. Moreover, the EIS/EIR provides absolutely no information as to why these models are appropriate to serve as the basis for thresholds of significance.

Response

The pumps used by the water agencies are driven by natural gas, diesel, and electric-powered engines. Therefore, the emission factors used in the analysis are appropriate because they are published for engines. It is also important to understand that the analysis assumed compliance with California Air Resource Board (CARB)'s Airborne Toxic Control Measure for Stationary Compression Ignition Engines (17 CCR 93115 et seq) and AP-42 was only used to estimate emissions from pollutants or fuels not regulated by the ATCM. Furthermore, the CARB Emission Inventory Documentation is unrelated to the fuel-driven pumps and is not appropriately discussed in this comment.

Because the emission factors are published by reputable sources following extensive research (e.g., CARB and USEPA) and are applicable to the emission sources considered in this analysis, the emission factors are appropriate to serve as the basis for the thresholds of significance.

Comment NG03-117

Comment

The analysis provided in the EIS/EIR is less than complete. Here the "Significance Criteria" were only established and considered for the "sellers in the area of analysis where potential air quality impacts from groundwater substitution and crop idling transfers could occur." (See p. 3.5-25) But that is only half the equation. The unconsidered air quality impacts include what and how increased crop production and vehicle usage would affect the air quality in the Buyers Service Area. Data and evidence of those impacts were not even considered.

In establishing the significance criteria, the EIS/EIR utilized known thresholds of significance from the air districts in the Sellers Service Area that had published them. For the other districts in the Sellers Service Area, the EIS/EIR made the assumption that "[t]he threshold used to define a 'major source' in the [Clean Air Act] CAA (100 tons per year [tpy])" could be "used to evaluate significance." (See p. 3.5-26). There are several flaws with this over broad application of the "major source" threshold. First, agricultural pumps and associated agricultural activity are not typically considered "major sources," especially when compared to major industrial sources. Second, the application of the major source threshold runs counter to the legal requirement that "[u]pwind APCDs are required to establish and implement emission control programs commensurate with the extent of pollutant transport to downwind districts," as announced as a requirement of the California Clean Air Act. (See p. 3.5-11). Finally, the 100 tpy threshold is wildly disproportionate to the limits set in nearby or adjoining air district and covering the same air basin. For example, the Butte AQMD considers significance thresholds for NOx, ROGs/VOCs and PM10 to be 137lbs/day (25 tpy); Feather River AQMD considers significance thresholds for NOx and VOCs to be 25lbs/day (4.5 tpy) and 80 lbs/day (14.6 tpy) for PM10; Tehama APCD considers significance thresholds for NOx, ROGs/VOCs and PM10 to be 137 lbs/day (25 tpy); Shasta AQMD considers significance thresholds for NOx, ROGs/VOCs and PM10 on two levels – Level "B" is 137 lbs/day (25 tpy) and Level "A" is 25lbs/day (4.5 tpy) and 80 lbs/day (14.6 tpy) for PM10; and Yolo AQMD considers significance thresholds for ROGs/VOCs and NOx to be 54.8 lbs/day (10 tpy) and 80 lbs/day (14.6 tpy) for PM10. Clearly, there is a proportional relationship between these thresholds of significance. In contrast, the EIS/EIR, with substantial evidence to the contrary, assumes that the threshold of significance for those air districts who have not published a CEQA Handbook should be 100 tpy, or an increase by magnitudes of 4 to 20 times more than similarly situated Central Valley air districts.

"When considering a project's impact on air quality, a lead agency should provide substantial evidence that supports its conclusion in an explicit, quantitative analysis whenever possible." (See Guide to Air Quality Assessment in Sacramento County, Sacramento Metropolitan Air Quality Management District, 2009, Ch. 2, p. 2-6). Importantly, the EIS/EIR provides no basis, other than an assumption, as to why the major source threshold of significance from the CAA should be used or is appropriate for assessing the significance of the project impacts under CEQA or NEPA. The use of the CAA's threshold of significance for major sources is erroneous as a matter of law. (See Endangered Habitats League v. County of Orange (2005) 131 Cal.App.4th 777, 793 (“The use of an erroneous legal standard [for the threshold of significance in an EIR] is a failure to proceed in the manner required by law that requires reversal.”)) Lead agencies must conduct their own fact-based analysis of the project impacts, regardless of whether the project complies with other regulatory standards. Here, the EIR/EIS uses the CAA threshold without any factual analysis on its own, in violation of CEQA. (Protect the Historic Amador Waterways v. Amador Water Agency (2004) 116 Cal.App.4th 1099, 1109; citing CBE v. California Resources Agency (2002) 103 Cal.App.4th 98, 114; accord Mejia v. City of Los Angeles (2005 130 Cal.App.4th 322, 342 [“A threshold of significance is not conclusive . . . and does not relieve a public agency of the duty to consider the evidence under the fair argument standard.”].) This uncritical application of the CAA’s major source threshold of significance, especially in light of the similarly situated air district lower standards, represents a failure in the exercise of independent judgment in preparing the EIS/EIR.

Response

See response to Comment LA12-179.

As shown in Table 3.5-7 (Federal Attainment Status for the Area of Analysis), Colusa, Glenn, and Shasta Counties are located in areas designated attainment for ozone and particulate matter (PM10 and PM2.5). As such, even though these counties are located in the same air basin (Sacramento Valley) as counties with lower significance thresholds, it is not appropriate to use the same significance thresholds because the air quality issues in the different regions are not the same. It must also be stated that if a lower threshold were to be used, the threshold for Shasta County (137 pounds per day, or approximately 25 tons per year) would be most applicable to the air quality conditions are most similar in these three counties. Even if this lower threshold were used, air quality impacts would remain less than significant because emissions in both counties are less than 25 tons per year for NOx, VOCs, and PM10. In addition, the "major source" threshold used in the Clean Air Act is intended to prevent degradation of air quality and is appropriate to be used in areas designated attainment for a given criteria pollutant because it would be protective of air quality. The EIS/EIR is not applying this standard to a single well, as stated in the comment, but rather all emissions from a participating selling entity.

Comment NG03-118

Comment

The EIS/EIR Fails to Adequately Analyze Numerous Cumulative Impacts.

The Ninth Circuit Court makes clear that NEPA mandates “a useful analysis of the cumulative impacts of past, present and future projects.” Muckleshoot Indian Tribe v. U.S. Forest Service, 177 F.3d 800, 810 (9th Cir. 1999). “Detail is required in describing the cumulative effects of a proposed action with other proposed actions.” Id. CEQA further states that assessment of the project’s incremental effects must be “viewed in connection with the effects of past projects, the effects of other current projects, and the effects of probable future projects.” (CEQA Guidelines § 15065(a)(3).) “[A] cumulative impact consists of an impact which is created as a result of the combination of the project evaluated in the EIR together with other projects causing related impacts.” (CEQA Guidelines § 15065(a)(3).)

An EIR must discuss significant cumulative impacts. CEQA Guidelines §15130(a). Cumulative impacts are defined as two or more individual effects which, when considered together, are considerable or which compound or increase other environmental impacts. CEQA Guidelines § 15355(a). "[I]ndividual effects may be changes resulting from a single project or a number of separate projects. CEQA Guidelines § 15355(a). A legally adequate cumulative impacts analysis views a particular project over time and in conjunction with other related past, present, and reasonably foreseeable future projects whose impacts might compound or interrelate with those of the project at hand. Cumulative impacts can result from individually minor but collectively significant projects taking place over a period of time. CEQA Guidelines § 15355(b). The cumulative impacts concept recognizes that "[t]he full environmental impact of a proposed . . . action cannot be gauged in a vacuum." Whitman v. Board of Supervisors (1979) 88 Cal. App. 3d 397, 408 (internal quotation omitted).

In assessing the significance of a project's impact, the Bureau must consider "[c]umulative actions, which when viewed with other proposed actions have cumulatively significant impacts and should therefore be discussed in the same impact statement." 40 C.F.R. §1508.25(a)(2). A "cumulative impact" includes "the impact on the environment which results from the incremental impact of the action when added to other past, present and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions." Id. §1508.7. The regulations warn that "[s]ignificance cannot be avoided by terming an action temporary or by breaking it down into small component parts." Id. §1508.27(b)(7).

An environmental impact statement should also consider "[c]onnected actions." Id. §1508.25(a)(1). Actions are connected where they "[a]re interdependent parts of a larger action and depend on the larger action for their justification." Id. §1508.25(a)(1)(iii). Further, an environmental impact statement should consider "[s]imilar actions, which when viewed together with other reasonably foreseeable or proposed agency actions, have similarities that provide a basis for evaluating their environmental consequences together, such as common timing or geography." Id. §1508.25(a)(3) (emphasis added).

As discussed, below, and in the expert reports submitted by Custis, EcoNorthwest, Cannon, and Mish on behalf of AquAlliance, the EIS/EIR fails to comport with these standards for cumulative impacts upon surface and groundwater supplies, vegetation, and biological resources; and, the baseline and modeling data relied upon by the EIS/EIR that does not account for related transfer projects in the last 11 years.

Response

Cumulative effects are evaluated in Chapter 3 for each environmental resource including water supply, groundwater resources, vegetation and wildlife, and fisheries. See Common Response 5. Additional responses on the cumulative analyses have been provided in responses to specific comments.

Comment NG03-119

Comment

Recent Past Transfers.

Because the groundwater modeling effort didn't include the most recent 11 years record (1970-2003), it appears to have missed simulating the most recent periods of groundwater substitution transfer pumping and other groundwater impacting events, such as recent changes in groundwater elevations and groundwater storage (DWR, 2014b), and the reduced recharge due to the recent periods of drought. Without taking the hydrologic conditions during the recent 11 years into account, the results of the SACFEM2013 model simulation may not accurately depict the current conditions or predict the effects from the proposed groundwater substitution transfer pumping during the next 10 years.

f. In 2009, the Bureau approved a 1 year water transfer program under which a number of transfers were made. Regarding NEPA, the Bureau issued a FONSI based on an EA.

g. In 2010, the Bureau approved a 2 year water transfer program (for 2010 and 2011). No actual transfers were made under this approval. Regarding NEPA, the Bureau again issued a FONSI based on an EA.

h. The Bureau planned 2012 water transfers of 76,000 AF of CVP water all through groundwater substitution.51

i. In 2013, the Bureau approved a 1 year water transfer program, again issuing a FONSI based on an EA. The EA incorporated by reference the environmental analysis in the 2010-2011 EA.

j. The Bureau and SLDMWA's 2014 Water Transfer Program proposed transferring up to 91,313 AF under current hydrologic conditions and up to 195,126 under improved conditions. This was straight forward, however, when attempting to determine how much water may come from fallowing or groundwater substitution during two different time periods, April-June and July-September, the reader was left to guess.{Source: The 2014 Water Transfer Program's EA/MND was deficient in presenting accurate transfer numbers and types of transfers. The numbers in the "totals" row of Table 2-2 presumably should add up to 91,313. Instead, they add up to 110, 789. The numbers in the "totals" row of Table 2-3 presumably should add up to 195,126. Instead, they add up to 249,997. Both Tables 2-2 and 2-3 have a footnote stating: "These totals cannot be added together. Agencies could make water available through groundwater substitution, cropland idling, or a combination of the two; however, they will not make the full quantity available through both methods. Table 2-1 reflects the total upper limit for each agency."}

These closely related projects impact the same resources, are not accounted for in the environmental baseline, and must be considered as cumulative impacts.

Response
See Common Response 5.

Comment NG03-120

Comment
Yuba Accord:

The relationship between the Lead Agencies is not found in the EIS/EIR, but is illuminated in a 2013 Environmental Assessment. "The Lower Yuba River Accord (Yuba Accord) provides supplemental dry year water supplies to state and Federal water contractors under a Water Purchase Agreement between the Yuba County Water Agency and the California Department of Water Resources (DWR). Subsequent to the execution of the Yuba Accord Water Purchase Agreement, DWR and The San Luis & Delta- Mendota Water Authority (Authority) entered into an agreement for the supply and conveyance of Yuba Accord water, to benefit nine of the Authority's member districts (Member Districts) that are SOD [south of Delta] CVP water service contractors." {Source: Bureau of Reclamation, 2013. Storage, Conveyance, or Exchange of Yuba Accord Water in Federal Facilities for South of Delta Central Valley Project Contractors.}

In a Fact Sheet produced by the Bureau, it provides some numerical context and more of DWR's involvement by stating, "Under the Lower Yuba River Accord, up to 70,000 acre-feet can be purchased by SLDMWA members annually from DWR. This water must be conveyed through the federal and/or state pumping plants in coordination with Reclamation and DWR. Because of conveyance losses, the amount of Yuba Accord water delivered to SLDMWA members is reduced by approximately 25 percent to approximately 52,500 acre-feet. Although Reclamation is not a signatory to the Yuba Accord, water conveyed to CVP contractors is treated as if it were Project water."{Source: Bureau of Reclamation, 2013. Central Valley Project (CVP) Water Transfer Program Fact Sheet.} However, the Yuba County Water Agency ("YCWA") may transfer up to 200,000 under Corrected Order WR 2008-0014 for Long-Term Transfer and, "In any year, up to 120,000 af of the potential 200,000 af transfer total may consist of groundwater substitution. (YCWA-1, Appendix B, p. B-97.)." {Source: State Water Resources Control Board, 2008. ORDER WR 2008 - 0025}

Potential cumulative impacts from the Project and the YCWA Long-Term Transfer Program from 2008 - 2025 are not disclosed or analyzed in the EIS/EIR. The 2015-2024 Water Transfer Program could transfer up to 600,000 AF per year through the same period that the YCWA Long-Term Transfers are potentially sending 200,000 AF into and south of the Delta. How these two projects operate simultaneously could have a very significant impact on the environment and economy of the Feather River and Yuba River's watersheds and counties as well as the Delta. The involvement of Browns Valley Irrigation District and Cordua Irrigation District in both long-term programs must also be considered. This must be analyzed and presented to the public in a revised draft EIS/EIR.

Response

Yuba River Water Accord (Accord) is evaluated in the cumulative analysis, as described in Chapter 4. SLDMWA purchases water each year from the Accord if it is available. In general, SLDMWA would purchase Accord water prior to the potential transfer activities evaluated in this EIS/EIR. Reclamation does not approve water transfers above CVP contract quantities. Chapter 3 evaluates the cumulative effects of the Yuba River Water Accord in combination with the range of potential transfer activities under the Proposed Action, including from Browns Valley Irrigation District and Cordua Irrigation District, to each environmental resource.

Comment NG03-121

Comment

Also not available in the EIS/EIR is disclosure of any issues associated with the YCWA transfers that have usually been touted as a model of success. The YCWA transfers have encountered troubling trends for over a decade that, according to the draft Environmental Water Account ("EWA") EIS/EIR, are mitigated by deepening domestic wells (2003 p. 6-81). While digging deeper wells is at least a response to an impact, it hardly serves as a proactive measure to avoid impacts. Additional information finds that it may take 3-4 years to recover from groundwater substitution in the south sub-basin {Source: 2012. The Yuba Accord, GW Substitutions and the Yuba Basin. Presentation to the Accord Technical Committee. (pp. 21, 22).} although YCWA's own analysis fails to determine how much river water is sacrificed to achieve the multi-year recharge rate. None of this is found in the EIS/EIR. What is found in the EIS/EIR is that even the inadequate SACFEM2013 modeling reveals that it could take more than six years in the Cordua ID area to recover from multi-year transfer events, although recovery is not defined (pp, 3.3-69 to 3.3-70). This is a very significant impact that isn't addressed individually or cumulatively.

Response

The Yuba River Water Accord is included in the cumulative analysis. This EIS/EIR does not evaluate the individual effects of the Yuba River Water Accord. Section 3.3 concludes that the Proposed Action effects and cumulative effects to groundwater levels are potentially significant and require mitigation to avoid significant effects.

Comment NG03-122

Comment

The EIS/EIR fails to include the Bay Delta Conservation Plan ("BDCP") in the Cumulative Impacts section and in any analysis of the 2015-2024 Water Transfer Program. Although we acknowledge that BDCP could not possibly be built during the 10-Year Water Transfer Program's operation, the EIS/EIR misses the point that the 2015-2024 Water Transfer Program is a prelude to what comes later with BDCP. This connection is entirely absent. If the Twin Tunnels (the facilities identified in "Conservation Measure 1") are built as planned with the capacity to take 15,000 cubic feet per second ("cfs") from the Sacramento River, they will have the capacity to drain almost two-thirds of the Sacramento River's average annual flow of 23,490 cfs at Freeport {Source:USGS 2009. http://wdr.water.usgs.gov/wy2009/pdfs/11447650.2009.pdf Exhibit KK)} (north of the planned Twin Tunnels). As proposed, the Twin Tunnels will also increase water transfers when the infrastructure for the Project has capacity. This will occur during dry years when State Water Project ("SWP") contractor allocations drop to 50 percent of Table A amounts or below or when Central Valley Project ("CVP") agricultural allocations are 40 percent or below, or when both projects' allocations are at or below these levels (EIS/EIR Chapter 5). With BDCP, North to South water transfers would be in demand and feasible.

Communication regarding assurances for BDCP indicates that the purchase of approximately 1.3 million acre-feet of water is being planned as a mechanism to move water into the Delta to make up for flows that would be removed from the Sacramento River by the BDCP tunnels {Source: Belin, Lety, 2013. E-mail regarding Summary of Assurances. February 25 (Department of Interior). (Exhibit LL)} . There is only one place that this water can come from: the Sacramento

Valley's watersheds. It is well know that the San Joaquin River is so depleted that it will not have any capacity to contribute meaningfully to Delta flows. Additionally, the San Joaquin River doesn't flow past the proposed north Delta diversions and neither does the Mokelumne River.

Response

See response to Comment LA13-9. Long-term water transfers are not a "prelude" to the BDCP, but a project with independent utility during a different time period. Transfers after 2024 (during the period of implementation of the proposed BDCP) would require subsequent environmental documentation.

Comment NG03-123

Comment

As discussed above, the EIS/EIR also fails to reveal that the 2015-2024 Water Transfer Program is part of many more programs, plans and projects to develop water transfers in the Sacramento Valley, to develop a "conjunctive" system for the region, and to place water districts in a position to integrate the groundwater into the state water supply. BDCP is one of those plans that the federal agencies, together with DWR, SLDMWA, water districts, and others have been pursuing and developing for many years.

Response

Reclamation and DWR have been pursuing many water resources projects throughout California to improve water supplies and management, including groundwater and surface water projects. Water transfers are one of several management actions favored under state and federal law. Potential long-term water transfers are distinct activities, independent of other state and federal water management projects or programs. See Common Response 14.

Comment NG03-124

Comment

The Biggs-West Gridley Water District Gray Lodge Wildlife Area Water Supply Project, a Bureau project, is not mentioned anywhere in the Vegetation and Wildlife or Cumulative Impacts sections {Source: http://www.usbr.gov/mp/nepa/nepa_projdetails.cfm?Project_ID=15381}.This water supply project is located in southern Butte County where Western Canal WD, Richvale ID, Biggs-West Gridley WD, and Butte Water District actively sell water on a regular basis, yet impacts to GGS from this project are not disclosed. This is a serious omission that must be remedied in a recirculated draft EIS/EIR.

Response

The project referenced by the commenter is not within the seller's service area. Impacts to giant garter snake from the range of potential water transfer activities analyzed in this EIS/EIR are insubstantial and are so small they would not be cumulatively considerable. The Biggs-West Gridley Water District water supply project is expected to result in a permanent loss of only 1.32 acre of aquatic habitat for giant garter snake and a short-term temporary disturbance of a total of 24 acres of upland and 24 acres of aquatic habitat during activities at 69 separate locations.

Comment NG03-125

Comment

Other Projects

Court settlement discussions between the Bureau and Westlands Water District over provisions of drainage service. Case # CV-F-88-634-LJO/DLB will further strain the already over allocated Central Valley Project with the following conditions:

k. A permanent CVP contract for 890,000 acre-feet of water a year exempt from acreage limitations.

l. Minimal land retirement consisting of 100,000 acres; the amount of land Westlands claims it has already retired (115,000 acres) will be credited to this final figure. Worse, the Obama administration has stated it will be satisfied with 100,000 acres of "permanent" land retirement.

m. Forgiveness of nearly $400 million owed by Westlands to the federal government for capital repayment of Central Valley Project debt.

n. Five-Year Warren Act Contracts for Conveyance of Groundwater in the Tehama-Colusa and Corning Canals – Contract Years 2013 through 2017 (March 1, 2013, through February 28, 2018).

Response

Pursuant to CVPIA Section 3404(c), Reclamation is in negotiations with Westlands Water District for long-term renewal of its CVP contract. Westlands Water District is currently operating under an interim renewal contract. Contract renewal would not provide additional water supplies to Westlands Water District and use of contract water for agriculture and/or municipal and industrial uses would not change from the purpose of use specified in the existing contracts. A long-term contract would not change CVP water deliveries to Westlands Water District or change water supply reliability. Long-term contract renewal would not have cumulative impacts, and this effort would require NEPA compliance (separate from the Long-Term Water Transfers EIS/EIR) to assess potential impacts of the project. Land has been retired in Westlands Water District, but this does not change the need for water supplies to existing croplands. Land retirement would not have a cumulative effect. A change in Westlands debt would not have cumulative effects related to the potential transfer activities evaluated in this EIS/EIR. Transfers to the Tehama Colusa Canal would not move through the Delta, but the water would stay in the Sacramento Valley. See responses to Comments NG03-141 and NG10-43 for additional information.

Comment NG03-126

Comment

Additional projects with cumulative impacts upon groundwater and surface water resources affected by the proposed project:

a. The DWR Dry Year Purchase Agreement for Yuba County Water Agency water transfers from 2015-2025 to SLDMWA.{Source: SLDMWA Resolution # 2014 386 http://www.sldmwa.org/OHTDocs/pdf_documents/Meetings/Board/Prepacket/2014_1106_Board_PrePacket.pdf}

b. GCID's Stony Creek Fan Aquifer Performance Testing Plan to install seven production wells in 2009 to extract 26,530 AF of groundwater as an experiment that was subject to litigation due to GCID's use of CEQAs exemption for research.

c. Installation of numerous production wells by the Sellers in this Project many with the use of public funds such as Butte Water District,{Source: Prop 13. Ground water storage program: 2003-2004 Develop two production wells and a monitoring program to track changes in ground.} GCID, Anderson Cottonwood Irrigation District,{Source: "The ACID Groundwater Production Element Project includes the installation of two groundwater wells to supplement existing district surface water and groundwater supplies."} and Yuba County Water Authority {Source: Prop 13. Ground water storage program 2000-2001: Install eight wells in the Yuba-South Basin to improve water supply reliability for in-basin needs and provide greater flexibility in the operation of the surface water management facilities. $1,500,00} among others.

Response

The Lower Yuba River Accord project is currently considered (see Chapter 4). Glenn-Colusa Irrigation District's Stony Creek Fan Aquifer Performance Testing (SCFAPT) program concluded with their final report (issued December 2012). The SCFAPT program was a short duration (two irrigation seasons) research program. The two Butte Water District wells have been completed and are part of the existing conditions of the Sacramento Valley (Section 3.3.1). The Anderson Cottonwood ID Groundwater Production Element Project installed two groundwater wells to improve the flexibility and reliability of Anderson Cottonwood ID's water supply. These wells have been installed and are part of the existing conditions of the Redding Basin. The eight new groundwater wells proposed as part of the Yuba County Water Agency's Proposition 13 grant have also already been installed. These wells would be part of the existing conditions in the Sacramento Valley.

Comment NG03-127

Comment

The EIS/EIR Fails to Develop Legally Adequate Mitigation Measures.

CEQA requires that the lead agency consider and adopt feasible mitigation measures that could reduce a project's adverse impacts to less than significant levels. Pub. Resources Code §§ 21002, 21002.1(a), 21100(b)(3), 21151, 22081(a). An adequate environmental analysis in the EIS/EIR itself is a prerequisite to evaluating proper mitigation measures: this analysis cannot be deferred to the mitigation measure itself. See, e.g., Vineyard Area Citizens for Responsible Growth v. City of Rancho Cordova (2007) 40 Cal.4th 412. Moreover, mitigation measures must A mitigation measure is inadequate if it allows significant impacts to occur before the mitigation measure takes effect. POET, LLC v. State Air Resources Board (2013) 218 Cal.App.4th 681, 740. An agency may not propose a list of measures that are "nonexclusive, undefined, untested and of unknown efficacy." Communities for a Better Environment v. City of Richmond (2010) 184 Cal.App.4th 70, 95. Formulation of mitigation measure should generally not be deferred. CEQA Guidelines § 15126.4(a)(1)(B). If deferred, however, mitigation measure must offer precise measures, criteria, and performance standards for mitigation measures that have been evaluated as feasible in the EIR, and which can be compared to established thresholds of significance. E.g., POET, LLC v. State Air Resources Board (2013) 218 Cal.App.4th 681; Preserve Wild Santee v. City of Santee (2012) 210 Cal.App.4th 260; Sacramento Old City Association v. City Council (1991) 229 Cal.App.3d 1011; CEQA Guidelines § 15126.4(a)(1)(B); Defend the Bay v. City of Irvine (2004) 119 Cal.App.4th 1261, 1275. Economic compensation alone does not mitigate a significant environmental impact. See CEQA Guidelines § 15370; Gray v. County of Madera (2008) 167 Cal.App.4th 1099, 1122. Where the effectiveness of a mitigation measure is uncertain, the lead agency must conclude the impact will be significant. Citizens for Open Govt. v. City of Lodi (2012) 70 Cal.App.4th 296, 322; Fairview Neighbors v. County of Ventura (1999) 70 Cal.App.4th 238, 242. An EIR must not only mitigate direct effects, but also must mitigate cumulative impacts. CEQA Guidelines § 15130(b)(3).

Under NEPA, "all relevant, reasonable mitigation measures that could improve the project are to be identified," including those outside the agency's jurisdiction,{Source: http://ceq.hss.doe.gov/nepa/regs/40/40p3.htm} and including those for adverse impacts determined to be less-than-significant (40 C.F.R. § 1502.16(h)).

As discussed, below, and in the expert reports submitted by Custis, EcoNorthwest, Cannon, and Mish on behalf of AquAlliance, the EIS/EIR fails to comport with these standards.

The EIS/EIR illegally defers the development of and commitment to feasible mitigation measures to reduce or avoid a whole host of potentially significant project impacts. The EIS/EIR relies on mitigation measures WS-1 and GW-1 to reduce or avoid significant project effects through the entire environmental review document, not just for surface and ground water supplies, but also for impacts to vegetation, subsidence, regional economics. (3.7-26, 3.7-56, 3.10-37, 3.10-51.) Unfortunately, these mitigation measures fail all standards for CEQA compliance, deferring analysis of the impact in question to a future time, including no criteria or performance standards by which to evaluate success, and failing to demonstrate that the measures are feasible or sufficient.

But the precise relationship of these mitigation measures is unclear. For example, the EIS/EIR relies on GW-1 to mitigate impacts to vegetation and wildlife as a result of stream flow loss; why doesn't the EIS/EIR consider the streamflow mitigation measure for this impact?

Response

Several comments offered suggestions to strengthen the mitigation measures, and Mitigation Measures WS-1, GW-1, AQ-1, and AQ-2 have been revised for clarity. Edits included efforts to help clarify performance standards. The mitigation measures are legally adequate under CEQA and NEPA. See Common Responses 6, 7, and 10 for more information about changes in Mitigation Measure GW-1.

Comment NG03-128

Comment

WS-1 requires that a portion of transfer water be held back to offset streamflow depletion caused by groundwater substitution pumping, but fails to include critical information to ensure that any such mitigation measure could work. First, it is not clear that any transfer release and the groundwater substitution pumping would simultaneously occur, in real time. If groundwater pumping causes streamflow depletion at any time other than exactly when the transfer is made, then the transfer deduction amount will not avoid streamflow drawdown. And, indeed, it is well known that streamflow depletion can continue, directly and cumulatively, after the transfer activity ends. (E.g., figures B-4, B-5 and B-6 in 2014 Draft EIS/EIR Appendix B).

Response

See Common Response 8.

Comment NG03-129

Comment

Next, the EIS/EIR fails to include any meaningful information to determine whether the applicable "streamflow depletion factor" to be applied to any single transfer project will mitigate significant impacts.

The EIS/EIR provides that "The exact percentage of the streamflow depletion factor will be assessed and determined on a regular basis by Reclamation and DWR, in consultation with buyers and sellers, based on the best technical information available at that time." (EIS/EIR at 3.1-21.) More information is required. It is unclear whether WS-1 considers the cumulative volume of water pumped for each groundwater substitution transfers, or the instantaneous rate of stream depletion caused by the pumping. Any factor must be the outcome of numerous measured variables, such as the availability of water to capture, the rate and duration of recharge, the streambed sediment permeability, the duration of pumping, the distance between the well and stream, and others; but the EIS/EIR fails to provide any means of evaluating these various factors. How good must the "best technical information available at that time" be? What is the likelihood it will be available, what constraints does this face, and what requirements are in place to ensure that sufficient information is obtained? Why hasn't this information been analyzed in the EIS/EIR? What roles do the buyers and sellers have in reaching this determination?

Moreover, the EIS/EIR fails to identify the threshold of significance below which significant impacts would not occur. WS-1 purports to avoid "legal injury," but fails to define any threshold or criteria that will be applied in the performance of WS-1 to clearly determine when legal injury would ever occur.

Response

See Common Response 8.

Comment NG03-130

Comment

Groundwater Overdraft:

The EIS/EIR illegally defers formulation and evaluation of mitigation measure GW-1 in much the same way as WS-1. In reliance on GW-1, the EIS/EIR goes so far as to defer the environmental impact analysis that should be provided now, as part of the EIS/EIR itself. Moreover, GW-1 fails to include clear performance standards, criteria, thresholds of significance, evaluation of feasibility, analysis of likelihood of success, and even facially permits significant impacts to occur. And importantly, GW-1 does not, in fact, reduce potentially significant impacts to less-than-significant levels, but rather, attempts to monitor for when significant effects occur, then purports to provide measures to slow the impact from worsening.

Response

Reclamation and SLDMWA have committed themselves to mitigating potential impacts and have established performance standards. The text of Mitigation Measure GW-1 has been clarified based on public comments. See Common Responses 6, 7, and 10 for additional information.

Comment NG03-131

Comment

GW-1 begins by referencing the DRAFT Technical Information for Preparing Water Transfer Proposals (“DTIPWTP”)(Reclamation and DWR 2013) and Addendum (Reclamation and DWR 2014). First, it is worth noting that this document is in DRAFT form, as have all such previous iterations of the Technical Information for Preparing Water Transfer Proposals, leaving any guidance for a final mitigation measure uncertain. Second, the DTIPWTP itself requires a project-specific evaluation of then-existing groundwater and surface water conditions to determine potentially significant impacts to water supplies; but this is exactly the type of impact analysis that must occur now in the self-described project EIS/EIR before any consideration of mitigation measures is possible. Even still, the exact scope of future environmental review is unclear as well. “Potential sellers will be required to submit well data,” but the EIS/EIR does not explain what data or why. (EIS/EIR at 3.3-88.)

Response

Reclamation and DWR continue to update the DRAFT Technical Information for Preparing Water Transfer Proposals document as warranted, and the latest version (for 2015) has been added as a citation to the EIS/EIR. The technical information was cited as a resource used during mitigation measure development. See Common Responses 6, 7, and 10 for additional information.

Comment NG03-132

Comment

GW-1 next requires potential sellers "to complete and implement a monitoring program," but a monitoring program itself cannot prevent significant impacts from occurring. " The monitoring program will incorporate a sufficient number of monitoring wells to accurately characterize groundwater levels and response in the area before, during, and after transfer pumping takes place.' (EIS/EIR 3.3-88.) Again, this should be done now, for public review, to determine the significance of project impacts before the project is approved. Moreover, the EIS/EIR fails to provide any guidance on what constitutes "a sufficient number of monitoring wells." GW-1 then requires monitoring data no less than on a monthly basis, but common sense suggests that significant groundwater pumping could occur in less than a month's time. GW-1 requires that "Groundwater level monitoring will include measurements before, during and after transfer-related pumping," but monitoring after transfer-related pumping can only show whether significant impacts have occurred; it cannot prevent them. Yet this is exactly what the EIS/EIR proposes: "The purpose of Mitigation Measure GW-1 is to monitor groundwater levels during transfers to avoid potential effects. If any effects occur despite the monitoring efforts, the mitigation plan will describe how to address those effects." (EIS/EIR 3.3-91.) Hence, GW-1 only requires elements of the mitigation plan to kick in after monitoring shows significant impacts, which are extremely likely to occur given the fact that monitoring alone amounts to no mitigation or avoidance measure.

Response

The monitoring and mitigation plans required as part of Mitigation Measure GW-1 will be developed by the seller as part of the proposal to initiate a water transfer. The plans will be specific to the seller's situation, including the volume and location of transfers (within the Project Description of this EIS/EIR). Because the plans will need to be developed based on current conditions at the time of transfer, it is not possible to develop the plans at this point. See Common Responses 6, 7, and 14 for additional information.

Comment NG03-133

Comment

Even still, the proposed mitigation plans don't mitigate significant impacts. The mitigation plan includes the following requirements: "Curtailment of pumping until natural recharge corrects the issue." This, of course, could take years and is acknowledged in the EIS/EIR (p. 3.1-17 and 18), and really amounts to no mitigation of the significant impact at all. "Reimbursement for significant increases in pumping costs due to the additional groundwater pumping to support the transfer." In what amount, at what time, as decided by who? Monetary compensation is not always sufficient to cover damages to business operations. "Curtailment of pumping until water levels raise above historic lows if non-reversible subsidence is detected (based on local data to identify elastic versus inelastic subsidence)." It does not follow that any water level above the historic lows avoids or offsets damage from non-reversible subsidence. -only admits that irreversible subsidence may occur. Finally, "[o]ther actions as appropriate" is so vague as to be meaningless. (EIS/EIR 3.3-90.)

The wholesale deferral of these mitigation measures is particularly confusing since the Lead Agencies should already have monitoring and mitigation plans and evaluation reports based on the requirements of the DTIPWTP for past groundwater substitution transfers, which likely were undertaken by some of the same sellers as the proposed 10-year transfer project. The Draft EIS/EIR should provide these existing Bureau approved monitoring programs and mitigation plans as examples of what level of technical specificity is required to meet the objectives of GW-1.

Response
As acknowledged by the commenter, curtailment of pumping is a viable option to reduce impacts if they are deemed significant. The curtailment of pumping does not have a time period associated with it. Therefore, the curtailment of pumping could continue as long as the impacts were still observed.

Section 3.3.4.1.3, Mitigation Plan describes the objectives of the mitigation plan. The mitigation plan will include elements related to a seller receiving reports of purported environmental or other effects to non-transferring parties; the procedure for investigating any reported effect; the development of mitigation options, in cooperation with the affected parties, for legitimate significant effects; and assurances that adequate financial resources are available to cover reasonably anticipated mitigation needs.

Each monitoring and mitigation plan will be customized for the local conditions surrounding the potential seller. Local conditions make it difficult to pre-define the required monitoring and mitigation efforts specific to each seller. In general, changes to groundwater levels will need to be in agreement with existing BMOs. In other areas, impacts to third parties will be determined through coordination and feedback with third parties. Common Response 7 also provides additional information regarding subsidence monitoring and mitigation.

Comment NG03-134

Comment
The DTIPWRP doesn't add any additional monitoring or mitigation requirements for subsidence, stating that areas that are susceptible to land subsidence may require land surface elevation surveys, and that the Project Agencies will work with the water transfer proponent to develop a mutually agreed upon subsidence monitoring program. The monitoring locations in "strategic" locations are similarly deferred with no guiding criteria.

Response
Because of the site-specific nature of each potential seller's location, the details of the monitoring and mitigation plans required under Mitigation Measure GW-1 will be developed when the transfer is proposed. Local subsidence concerns will be incorporated into the plan. Reclamation will have the authority to approve or deny the monitoring and mitigation plan based on its technical understanding of conditions in the seller's area. Common Response 7 provides additional details related to subsidence monitoring and mitigation.

Comment NG03-135

Comment

Lastly, groundwater quality monitoring only appears to be required after a transfer has begun, which again is too late to prevent any significant impact from occurring. (EIS/EIR 3.3-89.)

Response

Section 3.3.4.1.2 states, "samples shall be collected when the seller first initiates pumping, monthly during the transfer period, and at the termination of transfer pumping."

Comment NG03-136

Comment

Mitigation measure GW-1 calls for stopping pumping after significant impacts are detected and then waiting for natural recovery of the water table. This might not be in time for groundwater dependent farms or riparian trees (cottonwoods & willows) to recover from the impact or could greatly extend the time to recovery. In the meantime, riparian-dependent wildlife including Swainson's hawks would be without nesting habitat, migration corridors, and foraging areas. The mitigation measure should require active restoration of important habitat such as riparian and wetland, not natural recovery. Recovery to an arbitrary water level is not necessarily the same as recovery of wildlife habitat and populations of sensitive species.

Response

See Common Responses 10 and 11.

Comment NG03-137

Comment

The water level monitoring in the mitigation measure should give explicit quantitative criteria for significant impact. Stating that a reduction in flow or GW level is "within natural variation" and therefore not significant is deceptive. The natural variation includes extreme cases and the project should not be allowed to add an additional increment to an already extreme condition. The extremes are supposed to be rare, not long-term and chronic. For example, Little Chico Creek may be essentially dry at times but it is not totally dry and that may be all that allows plants and animals to persist until wetter conditions return. If everything dies because the creek becomes totally dry due to the project, then it may never recover.

Response

See response to Comment LA08-4.

Comment NG03-138

Comment

The EIS/EIR is required to evaluate and implement feasible project alternatives that would lessen or avoid the project's potentially significant impacts. Pub. Resources Code §§ 21002, 21002.1(a), 21100(b)(4), 21150; Citizens of Goleta Valley v. Board of Supervisors (1990) 52 Cal.3d 553, 564. This is true even if the EIS/EIR purports to reduce or avoid any or all environmental impacts to less than significant levels. Laurel Heights Improvement Assn. v. Regents of Univ. of Cal. (1988) 47 Cal.3d 376. Alternatives that lessen the project's environmental impacts must be considered even if they do not meet all project objectives. CEQA Guidelines § 15126.6(a)-(b); Habitat & Watershed Caretakers v City of Santa Cruz (2013) 213 Cal.App.4th 1277, 1302; Center for Biological Diversity v. County of San Bernardino (2010) 185 Cal.App.4th 866. Further, the EIS/EIR must contain an accurate no-project alternative against which to consider the project's impacts. CEQA Guidelines § 15126.6(e)(1); Mira Mar Mobile Community v. City of Oceanside (2004) 119 Cal.App.4th 477.

Under NEPA, the alternatives analysis constitutes "the heart of the environmental impact statement" (40 C.F.R. § 1502.14). The agency must "rigorously explore and objectively evaluate all reasonable alternatives" (40 C.F.R. § 1502.14(a), 40 C.F.R. § 1502.14(b)), and to identify the preferred alternative (40 C.F.R. § 1502.14(e)). The agency must consider the no action alternative, other reasonable courses of action, and mitigation measures that are not an element of the proposed action (40 C.F.R. § 1508.25(b)(1)-(3)).

Response

The EIS/EIR considered a wide range of alternatives, as identified in Appendix A. As described in Section 2.2.2, alternatives were identified to move forward because they "best meet the NEPA purpose and need and CEQA objectives, minimize negative effects, are potentially feasible, and represent a range of reasonable alternatives." The Lead Agencies did consider whether other measures could reduce environmental effects when evaluating alternatives.

The EIS/EIR also includes a No Action/No Project Alternative, as required by NEPA and CEQA. This alternative is described in Section 2.3.1. Each resource area analyzes the impacts of this alternative, and it serves as the basis of comparison under NEPA for the evaluation of the action alternatives.

Comment NG03-139

Comment

The EIS/EIR fails to follow the law and significantly misleads the public and agency decision-makers in declaring that none of the proposed alternatives are environmentally superior. (EIS/EIR 2-39.) First, neither CEQA nor NEPA provide the Lead Agencies with discretion to sidestep this determination. As the Council on Environmental Quality (CEQ) has explained, "[t]hrough the identification of the environmentally preferable alternative, the decision maker is clearly faced with a choice between that alternative and the others, and must consider whether the decision accords with the Congressionally declared polices of the Act."65 CEQA provides that "[i]f the environmentally superior alternative is the "no project" alternative, the EIR shall also identify an environmentally superior alternative among the other alternatives." (CEQA Guidelines § 15126.6(e)(2).)

First, the EIS/EIR fails to identify whether the "no project" alternative is environmentally superior to each other alternative. If that is the case, the EIS/EIR must then identify the next most environmentally protective or beneficial alternative. Here, the EIS/EIR presents evidence that Alternative 3 and Alternative 4 each would lessen the environmental impacts of the proposed project. The EIS/EIR however then shirks its responsibility to identify the environmentally superior alternative by casting the benefits of Alternatives 3 and 4 as mere "trade-offs." This gross mischaracterization misleads the public and agency decision-makers, as the only "trade-off" between the proposed alternative and Alternatives 3 or 4 would be more or less adverse environmental effect.

Response

Chapter 2 of the Draft EIS/EIR complies with CEQA by assessing the environmental advantages and disadvantages associated with the Proposed Action and the alternatives evaluated in the environmental analysis. CEQA calls for identification of an environmentally superior alternative, but does not provide specific direction regarding the methodology for comparing alternatives. Alternatives to be considered in the environmental analysis are those that can avoid or substantially lessen one or more of the significant environmental effects of the proposed action. Accordingly, the alternatives comparison typically begins with a summary of the project's significant impacts that cannot be mitigated to insignificance. Highlighting the areas of significant unavoidable impact identifies which alternative would be capable of eliminating or substantially reducing significant adverse environmental effects. Fundamentally, the scope and nature of the alternatives analysis is shaped by the scope and nature of the proposed activities under consideration. Here, the EIS/EIR notes that the range of transfer activities evaluated under the Proposed Action will not result in any significant impacts that cannot be mitigated to a less-than-significant level, while recognizing that an analysis of alternatives also assists in evaluating options that otherwise may be beneficial, or may reduce or avoid impacts that may not be significant. As summarized in Tables 2-9 and 2-10 and Sections 2.4 and 2.5, the Draft EIS/EIR identifies and compares several alternatives to evaluate whether they would result in greater, similar, or lesser impacts. Consistent with the CEQA Guidelines, the impacts and comparative environmental merits of each alternative are discussed. Where, as in this case, no adverse impacts of the Proposed Action or the alternatives are considered significant and unavoidable, the environmental distinctions among them may be relatively insubstantial. The Draft EIS/EIR thus concludes that, on balance, none of the alternatives is clearly environmentally superior, while explaining the environmental advantages and disadvantages of each alternative in comparison with the Proposed Action.

Section 2.4 explains that the No Action/No Project Alternative would maintain the status quo of existing conditions and therefore would not result in any of the adverse environmental impacts of the Proposed Action or other alternatives. Section 2.5 explains that Alternatives 3 and 4 each would have lesser impacts than the Proposed Action on some resources but could have greater impacts on other resources. In particular, Alternative 3 involves no cropland modifications and would reduce the environmental effects associated with cropland idling. Alternative 3 would not have the potential to affect terrestrial resources, particularly the giant garter snake, by idling rice fields and reducing habitat. It would also reduce effects to agricultural land use and economic effects to non-transferring parties. However, because there are fewer options for transfers, more transfers would likely involve groundwater substitution actions, so the effects on groundwater could be slightly greater than Alternative 2. Alternative 4 involves no groundwater substitution and would reduce the environmental effects associated with groundwater substitution transfers. Alternative 4 would reduce effects to groundwater levels, quality, and land subsidence. It would also reduce effects associated with streamflow depletion, including potential effects to aquatic resources, terrestrial resources, and water supply. Because Alternative 4 includes fewer options for transfers, it could involve more cropland idling transfers than Alternative 2 and could increase potential impacts to terrestrial resources and agricultural land use.

The 2014 Draft EIS/EIR's discussions comport with CEQA's goal of providing sufficient information to the public and decision makers to assess the comparative merits of the Proposed Action and alternatives. The commenter's opinion that Alternatives 3 and 4 are environmentally superior is noted and will be conveyed to the decision makers for their consideration.

Comment NG03-140

Comment

The EIS/EIR argument that its conclusion that no project impacts are significant and unavoidable misses the point. Just as an EIS/EIR may not simply omit any alternatives analysis when there is purported to be no significant and unavoidable impact, neither can the agencies decline to identify the environmentally superior alternative. In fact, the proposed project would cause numerous significant and adverse environmental effects, and the EIS/EIR relies on wholly deferred and inadequate mitigation measures to lessen those effects, even allowing some level of significant impacts to occur before kicking in. But mitigation measures alone are not the only way to lessen or avoid significant project effects: the alternatives analysis performs the same function, and should be considered irrespective of the mitigation measures proposed.

Response

Refer to response to Comment NG03-139 for discussion of the environmentally superior alternative.

Comment NG03-141

Comment

Feasible Alternatives to Lessen Project Impacts are Excluded.

In light of the oversubscribed water rights system of allocation in California, changing climate conditions, and severely imperiled ecological conditions throughout the Delta, the EIS/EIR should consider additional project alternatives to lessen the strain on water resources. Alternatives not considered in the EIS/EIR that promote improved water usage and conservation include:

Fallowing in the area of demand. The EIS/EIR proposes fallowing in the area of origin to supply water for the transfers yet fails to present the obvious alternative that would fallow land south of the Delta that holds junior, not senior, water rights. This would qualify as an, "immediately implementable and flexible" alternative that is part of the Purpose and Need section (p.1-2).

Whether or not this is a preference for the buyers, this is a pragmatic alternative that should be fully explored in a recirculated EIS/EIR.

Crop shifting in the area of demand. The EIS/EIR proposes crop shifting in the area of origin to supply water for the transfers yet fails to present the obvious alternative that would shift crops south of the Delta for land that holds junior, not senior, water rights. Hardening demand by planting perennial crops (or houses) must be viewed as a business decision with its inherent risks, not a reason to dewater already stressed hydrologic systems in the Sacramento Valley. This would qualify as an, “immediately implementable and flexible” alternative that is part of the Purpose and Need section (p.1-2). Whether or not this is a preference for the buyers, this is a pragmatic alternative that should be fully explored in a recirculated EIS/EIR.

Mandatory conservation in urban areas. In the third year of a drought, an example of urban areas failing to require serious conservation is EBMUD’s flyer from October’s bills that reflects the weak mandates from the SWRCB.

- Limit watering of outdoor landscapes to two times per week maximum and prevent excess runoff.
- Use only hoses with shutoff nozzles to wash vehicles.
- Use a broom or air blower, not water, to clean hard surfaces such as driveways and sidewalks, except as needed for health and safety purposes.
- Turn off any fountain or decorative water feature unless the water is recirculated.

While it is laudable that EBMUD customers have cut water use by 20 percent over the last decade, before additional water is ever transferred from the Sacramento River watershed to urban areas, mandatory usage cuts must be enacted during statewide droughts. This would qualify as an, “immediately implementable and flexible” alternative that is part of the Purpose and Need section (p.1-2). This alternative should be fully vetted in a recirculated EIS/EIR.

Land retirement in the area of demand. Compounding the insanity of growing perennial crops in a desert is the resulting excess contamination of 1 million acres of irrigated land in the San Joaquin Valley and the Tulare Lake Basin that are tainted with salts and trace metals like selenium, boron, arsenic, and mercury. This water drains back—after leaching from these soils the salts and trace metals—into sloughs and wetlands and the San Joaquin River, carrying along these pollutants. Retirement of these lands from irrigation usage would stop wasteful use of precious fresh water resources and help stem further bioaccumulation of these toxins that have settled in the sediments of these water bodies. The Lead and Approving Agencies have known about this massive pollution of soil and water in the area of demand for over three decades. Accelerating land retirement could diminish south of Delta exports and provide water for non-polluting buyers. Whether or not this is a preference for all of the buyers, this is a pragmatic alternative that should be fully explored in a recirculated EIS/EIR.

Adherence to California’s water rights. As mentioned above, the claims to water in the Central Valley far exceed hydrologic realty by more than five times. Unless senior water rights holders wish to abandon or sell their rights, junior claimants must live within the hydrologic systems of their watersheds. This would qualify as an, “immediately implementable and flexible” alternative that is part of the Purpose and Need section (p.1-2). Whether or not this is a preference for the buyers, this is a pragmatic alternative that should be fully explored in a recirculated EIS/EIR.

Response

The alternatives suggested in this comment are considered in the 2014 Draft EIS/EIR, as summarized in Section 2.2 and detailed further in Appendix A:

"Fallowing in the area of demand" is part of the No Action/No Project Alternative (see Section 2.3.1) and describes a key action that water users would take in response to shortages. Transfers using cropland idling in the buyers service area are considered in the "Transfers within Buyer Service Area" alternative, which was not carried forward for additional analysis because it would not provide additional water to address shortages.

"Crop shifting in the area of demand" is included in the "Change cropping patterns in San Joaquin Valley" alternative. This alternative was not carried forward because it would not provide additional water to address shortages.

"Mandatory conservation in urban areas" is considered in the "Conservation - municipal and industrial" alternative. This conservation alternative explains that reducing water demands in these areas would need to occur in addition to existing and planned water conservation, which would include measures that are more difficult to implement and would involve construction of additional infrastructure. This alternative was not carried forward because it would not provide additional water to address shortages.

"Land retirement in the area of demand" is included in the "Land retirement in the San Joaquin Valley" alternative. This alternative was not carried forward for more detailed evaluation because it would not meet any of the evaluation criteria. The commenter also describes the concept of retiring drainage-impaired lands; Reclamation is considering this concept through a different effort with different objectives (the San Luis Drainage Feature Re-Evaluation).

"Adherence to California's water rights" is included in the "Enforce seniority system to manage deliveries" alternative. This alternative was not carried forward for more detailed evaluation because it would not meet any of the evaluation criteria.

Comment NG03-142

Comment

The EIS/EIR Fails to Disclose Irreversible and Irretrievable Commitment of Resources, and Significant and Unavoidable Impacts.

Under NEPA, impacts should be addressed in proportion to their significance (40 C.F.R. § 1502.2(b)), and all irreversible or irretrievable commitment of resources must be identified (40 C.F.R. § 1502.16). And CEQA requires disclosure of any significant impact that will not be avoided by required mitigation measures or alternatives. CEQA Guidelines § 15093. Here, the EIS/EIR does neither, relegating significant impacts to groundwater depletion, land subsidence, and hardened demand for California's already-oversubscribed water resources, to future study pursuant to inadequately described mitigation measures, if discussed at all.

a. Groundwater Depletion.

As discussed, above, the EIS/EIR groundwater supply mitigation measures rely heavily on monitoring and analysis proposed to occur after groundwater substitution pumping has begun, perhaps for a month or more. Only after groundwater interference, injury, overdraft, or other harms (none of which are assigned a definition or significance threshold) occur, would the EIS/EIR require sellers to propose mitigation measures, which are as of yet undefined. As a result, significant and irretrievable impacts to groundwater are fully permitted by the proposed project.

Response

See response to Comment NG03-143 and Common Responses 6, 7, and 10.

Comment NG03-143

Comment

Subsidence:

Here, again, the EIS/EIR suffers the same flaw of only catching and proposing to mitigate subsidence after it occurs. But damages caused by subsidence can be severe, permanent, and complicated. The EIS/EIR does not purport to avoid these impacts, nor possibly mitigate them to less than significant levels. Instead, the EIS/EIR provides for "Reimbursement for modifications to infrastructure that may be affected by non-reversible subsidence." This unequivocally provides for significant and irreversible impacts to occur.

Response

Reclamation acknowledges that subsidence is a complicated issue. Mitigation Measure GW-1 was developed based on guidance provided in the DRAFT Technical Information for Preparing Water Transfer Proposals and requires the development of a monitoring and mitigation plan to address potentially significant impacts from groundwater substitution pumping. Common Response 7 provides additional information related to subsidence monitoring. See Common Response 14 for additional information regarding interagency review and approval (or denial) of submitted plans.

Comment NG03-144

Comment

Transfer Water Dependency:

The EIS/EIR fails to account for long-term impacts of supporting agriculture and urban demands and growth with transfer water. Agriculture hardens demand by expansion and crop type and urban users harden demand by expansion. Both sectors may fail to pursue aggressive conservation and grapple with long-term hydrologic constraints with the delivery of more northern California river water that has been made available by groundwater mining and fallowing. Since California has high variability in precipitation year-to-year (http://cdec.water.ca.gov/cgi-progs/iodir/WSIHIST) (Exhibit Y), and how will purchased water be used and conserved? Should agricultural water users be able to buy Project water, how will DWR and the Bureau assure that transferred water for irrigation is used efficiently? Could purchased water be used for any kind of crop or landscaping, rather than clearly domestic purposes or strictly for drought-tolerant landscaping?

Without a hierarchy of priority uses among agricultural or urban users for purchasing CVP and non-CVP water, the EIS/EIR fails to ensure that California water resources will not go to waste, and will not be used to harden unsustainable demands.

Response

As described in Chapter 1, transfers would help address shortages related to existing demands and "would not serve any new demands in the buyers' service areas." Transfers would not be used for expansion of either agricultural or urban uses.

Reclamation requires CVP contractors to implement cost-effective BMPs to manage water use. The CVPIA of 1992 and Section 210(b) of the Reclamation Reform Act of 1982 require the preparation and submittal of a water management plan from certain entities that enter into a repayment contract or water service contract with the Reclamation. Each plan is required to be updated every five years. Reclamation develops criteria to evaluate plans prepared by CVP contractors to meet the water conservation requirements. Criteria require contractors to identify BMPs for efficient water use and develop an implementation plan.

Comment NG03-145

Comment

The EIS/EIR Fails to Adequately Evaluate Growth-Inducing Impacts.

The EIS/EIR gives short shrift to the growth inducing impact analyses required under both CEQA and NEPA by absolutely failing to realize or by obfuscating the obvious: these types of Long-Term Water Transfers inherently lead to economic and population growth. Not only are the amount of water sales and types of water sales unknown to the Lead Agencies and the public, but once water is sold and transferred to the buyer agency, there are no use limitations or priority-criteria imposed on the buyer. Whether agricultural support or municipal supply, hydraulic fracturing, industrial use, or onward transfer, the potential growth inducing impacts, both economically and physically are limitless. And once agencies and communities are hooked on buying water to sustain economic conditions or to support development and population growth, while drought conditions continue or are exacerbated, unwinding the clock may prove impossible.

Growth inducing impacts are addressed in Section 15126.2(d) of the CEQA Guidelines, and the Council on Environmental Quality NEPA Sections 1502.16(b) and 1508.8(b). CEQA Section 15126.2(b) requires an analysis of a project's influence on economic or population growth, or increased housing construction and the future developments' associated environmental impacts. The CEQA Guidelines define growth inducing impacts as "…the ways in which the proposed project could foster economic or population growth, or the construction of additional housing, either directly or indirectly, in the surrounding environment." Under NEPA, indirect effects as declared in Section 1508.8(b) include reasonably foreseeable growth inducing effects from changes caused by a project.

Response

See response to Comment NG03-146.

Comment NG03-146

Comment

A project may have characteristics that encourage and facilitate other activities that could significantly affect the environment, either individually or cumulatively. CEQA Guidelines section 15126.2(d) admonishes the planner not to assume that growth in any area is necessarily beneficial, detrimental, or of little significance to the environment. Included here are projects that would remove physical obstacles to growth, such as provision of new water supply achieved through Long Term Water Transfers. Removal of a barrier such as water shortages may lead to the cultivation of crops with higher-level water dependency and higher profit margins at market, or may supplement perceived and actual advantages of living in population-dense locales, leading to increased population growth.

The EIS/EIR states that direct growth-inducing impacts are typically associated with the construction of new infrastructure while projects promoting growth, like increased water supply in dry years, could have indirect growth inducing effects. Claiming that growth inducing impacts would only be considered significant if the ability to provide needed public services is hindered, or the potential for growth adversely affects the environment, the EIS/EIR then incorrectly concludes that the proposed water transfer from willing sellers to buyers, to meet existing demands, would not directly or indirectly affect growth beyond what is already planned. But the EIS/EIR does not describe "what is already planned," nor how binding such plans would be.

Similar to the drought period in the late 1980's and early 1990's, urban agencies demand was approximately 40 percent of the transfer market. During that drought period, dry-year purchases were short term deals, intended to offset lower deliveries. However, this time around most of the transfer water is available to support longer-term growth, not solely to make up for shortfalls during droughts. Under current law, urban water agencies must establish long-term water supply to support new development, and long term transfers can provide this necessary evidence.{Source: California Senate Bills 221 and 610, entered into law, 2001: requires agencies with over 5000 service connections and those with under 5000 service connections to demonstrate at least 20 years of available water supply respectively, for projects in excess of 500 residential units, or equivalent in combined residential and other demand (large service agencies), or for projects demanding least 10 percent growth in local water needs (small service agencies).}

Adding to these concerns is the increase in fracking interests throughout the state, requiring large-scale water demand to extract oil and gas, run by companies with the financial ability to influence water rights through payment. While one county directly south of the boundary involving this proposed transfer agreement recently banned fracking, other counties in California are either involved in the practice of fracking, have yet to ban the practice, or have no interest in a fracking ban. Notably, the Monterey Shale Formation that stretches south through central California is in the buyer-area of the water districts served by this potential Long-Term Water Transfer Agreement. Without use limitations upon water transfers proposed within this agreement, water transferred under this plan may well be used for fracking

The EIS/EIR inappropriately fails to evaluate or disclose these reasonably foreseeable growth-inducing impacts.

Response
The third paragraph under Section 5.3, Growth Inducing Impacts has been revised.

The proposed action would supply water primarily for agricultural purposes and very little for urban uses. As stated by the commenter, urban water agencies must establish 20 years of available water supply to support new development. Water transferred under the proposed action is not a reliable source of water. Furthermore, the proposed action would occur over a 10-year period instead of a 20-year period, further limiting the ability of water agencies to rely on this water supply for growth.

It is highly unlikely that water transferred under the proposed action would be used for industrial purposes or for fracking as the proposed buyers supply water primarily for agricultural purposes. Transfers would not be used for expansion of either agricultural or urban purposes.

Comment NG03-147

Comment
Conclusion:

Taken together, the Bureau, SLDMWA, and DWR treat these serious issues carelessly in the EIS/EIR, the Draft Technical Information for Water Transfers in 2013, and in DWR's specious avoidance of CEQA review. In so doing, the Lead and Approving Agencies deprive decision makers and the public of their ability to evaluate the potential environmental effects of this Project and violate the full-disclosure purposes and methods of both the National Environmental Policy Act and the California Environmental Quality Act. For each of the foregoing reasons, we urge that the environmental review document for this project be substantially revised and recirculated for public and agency review and comment before any subject project is permitted to proceed.

Response
See response to Comment LA14-5.

Comment Letter NG04, Kyran Mish, AquAlliance, California Sportfishing Protection Alliance, Aqua Terra Aeris Law Group

Comment NG04-1

Comment

The Long-Term Water Transfers Environmental Impact Statement/Environmental Impact Report Public Draft (henceforth referred to as the "EIR/EIS") articulates an ambitious plan to transfer water within the state of California. But this ambition is not matched by a similar degree of technical merit, as the modeling components of the EIR/EIS are potentially inadequate, inaccurate, and insufficient to the task. Because of this shortcoming, the EIR/EIS fails to demonstrate that environmental impacts of these transfers will be acceptably small. In particular, the groundwater substitution components of the proposed water transfers are based on modeling assumptions that likely limit their practical accuracy, and on computational simulation techniques that cannot be trusted for their intended use without additional work.

The EIR/EIS as written fails to make a technically-persuasive case for these water transfers, and therefore the proposed transfers should be rejected until the various water transfer stakeholders can advocate more effectively for these transfers by using sound scientific principles instead of mere assertions of negligible impact on the environment.

Response

The purpose of the 2014 Draft EIS/EIR is not to make a technically-persuasive case for water transfers, but rather to provide an analysis of the no action and action alternatives to help decision-makers understand the potential environmental impacts of each alternative. The analysis uses the best available tools to assess potential impacts to groundwater and surface water from groundwater substitution transfers, as described in Appendices B, C, and D. See responses to Comments LA15-44, LA15-61, and LA15-63 for additional information.

Comment NG04-2

Comment

This critique concentrates on the groundwater modeling portions of the EIR/EIS, as those portions of the EIR/EIS provide the least technical information relative to the importance of this particular part of the transfer plans. Groundwater resources are seldom seen directly, but their influence is present throughout the hydrological cycle. When the water table sinks, streams dry up and fish die. And when that phreatic surface drops below the level available to domestic water-supply wells, families lose their water supply. Groundwater mining is an all-too-common source of environmental woes, including irreversible loss of aquifer capacity and subsidence observable at the surface of the ground. So accurate groundwater modeling is an essential component of any trustworthy assessment of potential negative environmental effects.

Response

Impacts to groundwater resources are described in Section 3.3. Section 3.7 describes potential impacts to fisheries and Section 3.8 provides information related to vegetation and wildlife resources. The modeling analysis used in this EIS/EIR is technically robust and accurate, given the available data. See response to Comment LA15-44 for additional information.

Comment NG04-3

Comment

This critique focuses on four particular aspects of the groundwater modeling efforts outlined in the EIR/EIS, namely:

- the lack of a defensible technical basis for the use of the SacFEM2013 groundwater model in assessing man-made hazards due to groundwater substitution activities,
- the inherent assumptions and potential inaccuracies present in the SacFEM2013 model, including an exposition of how better groundwater modeling techniques could have been deployed to engender more trust in the computed results,
- the lack of any formal characterization of uncertainty in the model that might be used to assess the impact of those SacFEM2013 model inaccuracies, and
- some general comments on the EIR/EIS's all-too-often inadequate technical treatment of aquifer mechanics.

Sins of omission and commission are thus found in the EIR/EIS, and this critique will attempt to guide the reader through a discussion of each, towards the goal of more accurate and technically defensible modeling that would be required to support the proposed water transfers.

Response

See responses to Comments NG04-4, NG04-5, NG04-6, and NG01-37.

Comment NG04-4

Comment

This review focuses primarily on the groundwater substitution aspects of the EIR/EIS, because those aspects are where my own expertise is deepest. The groundwater model utilized in the EIR/EIS has enough shortcomings to call into question the trustworthiness of the entire EIR/EIS, and until these shortcomings are remedied, such groundwater transfers should not be permitted. Some representative problems with the SACFEM2013 model are presented below.

Fundamental Technical Problems with the SacFEM2013 Model

In simplest terms, the EIR/EIS fails to make a compelling case for the use of the SacFEM2013 groundwater model in assessing man-made hazards due to groundwater substitution activities. For example Appendix D of the EIR is provided to document the SacFEM2013 model, but this section of the EIR/EIS raises more questions than answers about the suitability of the model. Some of the assertions made in Appendix D are incorrect, while others are irrelevant to the purpose of the EIR/EIS. And the most fundamental problem with the information presented on the SacFEM2013 model is that Appendix D fails to provide enough technical context to justify the use of SacFEM2013. A technically-informed citizen interested in providing accurate public commentary on the EIR/EIS must search the literature and other open-source documents to find relevant information about the suitability of the SacFEM2013 model. Unfortunately, these searches prove fruitless, because there simply is not enough information provided in the EIR/EIS to perform a technically-defensible characterization of the suitability of SacFEM2013. Because of this, some of the my comments include qualifiers such as “appears to be” or “apparently”. These qualifiers do not imply any insufficiency in my own understanding: they are explicit reminders that the EIR/EIS fails to provide an adequate technical basis for use of SacFEM2013.

Response

In the early stages of developing this EIS/EIR, Reclamation determined that the modeling of groundwater substitution pumping impacts was critical. Reclamation conducted a model selection process that reviewed the existing available groundwater models. This document selected SACFEM for use in this analysis. Text has been added to Appendix D to describe the model selection process (see Appendix D for changes). To provide more detailed about the SACFEM2013 model, the User's Manual has been included as Appendix H.

Comment NG04-5

Comment

One example of incorrect modeling assertions in the EIR/EIS is the characterization1 of SacFEM2013 and its parent code MicroFEM as “three-dimensional” and “high-resolution”. In fact, the SacFEM2013 model provides only a linked set of two-dimensional analyses2, and would more charitably be described as “two-and-a-half dimensional” instead of possessing a fully-3D modeling capability. This limitation is not an unimportant detail, as a general-purpose 3D groundwater model could be used to predict many important physical responses, e.g., the location of the phreatic surface within an unconfined aquifer. For the SacFEM2013 model, this prediction is part of the data instead of part of the computed solution, and hence SacFEM2013 apparently has no predictive capability for this all-important aquifer response. Here is the relevant EIR/EIS content on this topic(3):

The uppermost boundary of the SACFEM2013 model is defined at the water table. To develop a total saturated aquifer thickness distribution and, therefore, a total model thickness distribution, it was necessary to construct a groundwater elevation contour map and then subtract the depth to the base of freshwater from that groundwater elevation contour map. Average calendar year groundwater elevation measurements were obtained from the DWR Water Data Library. These measurements were primarily collected biannually, during the spring and fall periods; and these values were averaged at each well location to compute an average water level for each location. These values were then contoured, considering streambed elevations for the gaining reaches of the major streams included in the model, to develop a target groundwater elevation contour map for the year 2000.

Note that, in order to begin a SacFEM2013 analysis, the phreatic surface must be specified instead of predicted, and that this specification is based on past records of water table location instead of on verifiable accurate predictions of future groundwater resources. Since California is currently in an unprecedented drought, and because the assessment of similarly-unprecedented future large-scale groundwater transfers is the whole point of the EIR/EIS, it is technically inappropriate to use an averaged historical basis to locate the water table surface simply because the SacFEM2013 is unable to predict that important parameter from first principles!

(3) EIR/EIS, Appendix D, Page 4

Response

MicroFEM's website provides technical details on the code and its capabilities. The Fact Sheet posted at http://microfem.com/download/microfem.pdf lists several features of MicroFEM that are relevant and critical to the EIS/EIR analysis, including the simulation of "saturated single-density flow; multiple aquifer systems and stratified aquifers; confined, leaky and unconfined conditions; heterogeneous aquifers and aquitards; steady-state and transient flow, partially varying anisotropic aquifers; spatially and temporally varying wells and boundary conditions; and precipitation, evaporation, drain, river and wadi top systems."

All numerical groundwater model simulations require the specification of some type of fixed boundary condition in order to begin the simulation. It is typical for the water table to be specified at the beginning of the simulation period. However, after the initial specification of the water table elevation, the water table is allowed to move up or down as the numerical model solves the groundwater flow equations. There are no other time periods in the SACFEM2013 simulation where the phreatic groundwater table is manually specified. Therefore, for the model simulation period starting in 1970, the water table elevation is calculated by the model, and not specified.

Comment NG04-6

Comment

A good example of an irrelevant assertion in the EIR/EIS is the list of reasons given(4) why MicroFEM was chosen as the modeling platform. The first reason is true of any finite-element code used to model groundwater response, and the second and third arise from the existence of a graphical user interface for the model input and output data. Any modern computational tool (e.g., the word-processing application I'm using to write this critique) possesses such a user interface, so all three reasons apply equally well to any well-designed finite element application, yet they are used to motivate the choice of only one such application. Why this specific choice of MicroFEM was made is never developed in the EIR/EIS, but it should be, as with the choice of computational model comes a set of model constraints that can limit the model's utility.

Technical sidebar: finite element models are particularly easy to develop and deploy graphical user interfaces for, because the interpolation scheme used to generate the finite element results provides uniquely-defined and easy-to-compute results for every point in the spatial domain. In addition to this readily-accessible supply of spatial data available for visual interpretation of results, these models also can produce results at regular time intervals (e.g., monthly) that make it easy to generate animations of the spatial data. So the presence of a graphical user interface is a poor reason to choose a particular finite element application, as custom visualization tools are readily developed at low cost to support the use of the model, or public-domain visualization tools can be utilized instead.

(4): EIR/EIS, Appendix D, Page 1

Response

See response to Comment NG04-4.

Comment NG04-7

Comment

Unfortunately for the results presented in the EIR/EIS, MicroFEM is a poor choice for such large-scale modeling. It is an old code that apparently utilizes only the simplest (and least accurate) techniques for finite-element modeling of aquifer mechanics, and MicroFEM (and hence SacFEM2013) embed serious limitations into the model that compromise the accuracy of the computed results. These limitations include, but are not limited to, the following:

- The model places a remarkably-low upper limit on problem resolution, i.e., 250,000 surface nodes are available to the modeler, but no more. This limit would appear to the technically-oriented reader to indicate that the advanced age of the MicroFEM program has constrained its software architecture so that high-resolution and high-fidelity models are beyond its capabilities. In particular, its MS/DOS origins might indicate an inability to address sufficient computer memory to support a higher-resolution model, or that its solver routines do not scale to support the multiple-processor capabilities available on virtually all current computers. If this is the case, then this problem should be explicitly noted in the EIR/EIS as a model limitation. If it is not the case, then some justification for this upper limit should be provided to aid in the impartial evaluation of the SacFEM2013 model.

Response

The current version of the MicroFEM code can handle up to 250,000 nodes per layer with up to 20 layers. SACFEM2013 provides a nodal resolution of less than 125 meters in areas representing projects. This nodal spacing of 125 meters provides substantially greater resolution than is provided by CVHM and C2VSIM, the other readily-available regional groundwater flow models of the Sacramento Valley. The nodal resolution in SACFEM2013 is considered adequate to help inform decision-making.

Comment NG04-8

Comment

As mentioned above, the SacFEM2013 model is only partially predictive, in that some aquifer responses are entered as input data instead of being computed as predictive quantities. The most serious of these is the lack of ability to predict the location of the phreatic surface in the aquifer. This location is a natural candidate as the single the most important predicted quantity available for understanding near-surface environmental effects of groundwater motion, yet it is apparently not computed by SacFEM2013, which instead relies on its location via the a priori data-entry process quoted above.

Response

SACFEM2013 is parameterized like other regional models groundwater flow models available for the Valley. Aquifer responses are not “entered as input data.” Groundwater levels are computed based on modeled aquifer parameter values and boundary conditions.

Comment NG04-9

Comment

As mentioned earlier, the model is not a three-dimensional model, but instead estimates groundwater response via approximations involving a suite of two-dimensional layers with uniform horizontal permeabilities coupled via estimated leakage parameters that represent the actual three-dimensional flow fields of groundwater resources. The limitations of this self-induced model constraint are outlined in more detail below, but the summary is simple enough: the real-world complexities of California’s groundwater aquifers are over-simplified by the SacFEM2013 model into no more than 25 available two-dimensional layers of uniform composition, and hence the model results are at best computational simplifications not necessarily representative of actual groundwater responses to pumping.

Response

MicroFEM is a three dimensional groundwater flow code that simulates horizontal flow through layers as well as vertical flow between layers to simulate a three dimensional groundwater flow field. A review of the MicroFEM code in the journal Ground Water describes the code as follows: “MicroFEM can simulate steady-state or transient three-dimensional flow of a constant-density fluid in confined, unconfined, and leaky aquifers. Material properties are assigned to elemental nodes. Aquifers and aquitards can be heterogeneous, and aquifers can have spatially-varying anisotropy.” (Ground Water 38, No. 5, p. 649-650). SACFEM2013 does not have uniform horizontal permeabilities as indicated by the commenter.

Comment NG04-10

Comment

In addition to the model not being a true 3D model of the actual geometric nature of the state’s groundwater resources, some other problems with the model include the following:

- The model requires considerable data manipulation to be used, and these manipulations are necessarily subject to interpretation. This fact implies that the model results depend on the choices made by the analyst, and are hence not necessarily reproducible. In other words, adjusting of the results (by accident or by design) is an inherent characteristic of the model, and that characteristic alone erodes trust in the model. There are technically-defensible ways to provide accurate assessments of how such adjustments might affect output results used in decision-making (e.g., sensitivity analyses for these parameters), but these means for evaluating trust in the model are not mentioned in the EIR/EIS, and one can only conclude that they have never been performed.

Response

The Lead Agencies acknowledge that some modeling results depend on choices made by the analyst; this is not unique to SACFEM2013. The assertion that adjusting results is an inherent characteristic of the model is not accurate. The results (i.e., groundwater levels and fluxes) are computed by the model based on the modeled input parameter values and boundary conditions. Information on sensitivity studies completed as part of the modeling effort has been added to Appendix D (see Appendix D for updates).

Comment NG04-11

Comment

The model description in the EIR/EIS presents no validation results that can be used to provide basic quality-assurance for the analyses used in the EIR/EIS. The reader can seek information on the parent code MicroFEM, but precious little data is available on that code's capabilities, so the question of "can the results of this model be trusted?" is not answered by the EIR/EIS. An expert reviewing the EIR/EIS might seek to examine the MicroFEM code directly, but the underlying source code is not available, and the MicroFEM tool can only be purchased for a substantial fee ($1500), so it is infeasible to gain informed public comment on the suitability of MicroFEM or SacFEM2013 without paying a substantial price.

Response

SACFEM2013 was calibrated by computing 40 years of monthly groundwater levels and comparing them with historical groundwater levels available over that same time period. These historical groundwater levels were measured in more than 200 wells during periods exhibiting very dry to very wet climatic conditions. The SACFEM 2013 User's Manual has been added as Appendix H.

MicroFEM has been available for more than 20 years and has been reviewed by the National Ground Water Association Ground Water journal in the Software Spotlight Column (Ground Water 38, No. 5, p. 649-650).

Comment NG04-12

Comment

The model is not predictive in some aquifer responses (as mentioned above), so its results are a reflection of past data (e.g., streamflows, phreatic surface location, etc.) instead of providing a predictive capability for future events. Since accurate prediction of future environmental effects is the whole point of the EIR/EIS, the SacFEM2013 model is arguably not even suitable for use in the EIR/EIS, much less in real-world hydrological practice.

Response

It is not clear which aquifer responses the commenter is referring to when stating that the model does not predict some aquifer responses. SACFEM2013 computes monthly groundwater levels and fluxes at each model node located in each model layer. MicroFEM and custom SACFEM2013 post processing tools compute the forecast impacts to streams using the three dimensional distribution of simulated groundwater levels and fluxes and the stream stages associated with the boundary-condition nodes representing streams.

Comment NG04-13

Comment

The problem of data manipulation mentioned in the first bullet above represents a serious limitation of the SacFEM2013 model. Model quality can be measured by standard quality-assurance processes utilized for software development, such as the CMM model(5) widely used in software practice. The five stages of increasing quality in the CMM model are termed ad hoc (or chaotic), repeatable, defined, managed, and optimized, and the repeatable stage is generally accepted as the minimal level of quality appropriate for any critical analysis methodology. Since analyst intervention in data preparation creates an obvious risk of analyst dependencies in the output data used to set policy, the current SacFEM2013 workflow is likely only at the "ad hoc/chaotic" state of quality assurance for a model. This is simply not appropriate for critical analyses that are used in decision-making on such important resources as water in California.

A typical example of analyst intervention in data preparation can be found in Appendix D of the EIR/EIS(6):

After a transmissivity estimate was computed for each location, the transmissivity value was then divided by the screen length of the production well to yield an estimate of the aquifer horizontal hydraulic conductivity (Kh). The final step in the process was to smooth the Kh field to provide regional- scale information. Individual well tests produce aquifer productivity estimates that are local in nature, and might reflect small-scale aquifer heterogeneity that is not necessarily representative of the basin as a whole. To average these smaller scale variations present in the data set, a FORTRAN program was developed that evaluated each independent Kh estimate in terms of the available surrounding estimates. When this program is executed, each Kh value is considered in conjunction with all others present within a user-specified critical radius, and the geometric mean of the available Kh values is calculated. This geometric mean value is then assigned as the representative regional hydraulic conductivity value for that location. The critical radius used in this analysis was 10,000 meters, or about six miles. The point values obtained by this process were then gridded using the kriging algorithm to develop a Kh distribution across the model domain. The aquifer transmissivity at each model node within each model layer was then computed using the geometric mean Kh values at that node times the thickness of the model layer. Insufficient data were available to attempt to subdivide the data set into depth-varying Kh distributions, and it was, therefore, assumed that the computed mean Kh values were representative of the major aquifer units in all model layers. The distribution of K used throughout most of the SACFEM2013 model layers is shown in Figure D-4. During model calibration, minor adjustments were made to the Kh of model layer one east of Dunnigan Hills and in model layers six and seven in the northern Sacramento Valley based on qualitative assessment of Lower Tuscan aquifer test data in this area.

Note the presence of terms such as "adjustments", "assumed", "insufficient data", and "representative". What is being described in this paragraph is a potentially non-repeatable process that converts the three-dimensional permeability tensor into a homogenized number Kh that is then used to estimate conductivity in a plane parallel to the ground surface. Permeability is a local tensorial property of the aquifer (i.e., it varies from point to point in the 3D subsurface domain), but the resulting Kh is smeared across the domain to convert this tensor with six independent spatially-dependent components into a single number that is applied over a huge geographical area instead. And this conversion is subject to the judgment of each analyst, so the results depend on the skill (or lack thereof) of the particular analyst doing the modeling.

Technical sidebar: it is remarkably straightforward to perform accurate and technically-defensible computational analyses to assess the ultimate effect of these data adjustments. One of the most easily-deployed of these techniques is the use of a sensitivity analysis that measures how computed output results depend on adjustments to input parameters. Sensitivity analyses are readily grafted onto nearly any computational model, and while these computations require more effort than not using them, most of the additional effort can readily be offloaded to the computer, so that undue levels of human efforts are not required for their application. Formal sensitivity analyses can also be used to aid in the assessment of model uncertainty (see discussion below), so their omission in the EIR/EIS is a mystery to the technically-informed impartial reviewer of the EIR/EIS.

(5) M.C. Paulk, C.V. Weber, B. Curtis, M.B. Chrissis, “Capability Maturity Model for Software (Version 1.1)”. Technical Report, Software Engineering Institute, Carnegie Mellon University, 1993

(6) EIR/EIS, Appendix D, Page 13

Response

Applying capability maturity modeling methodology used for software development to environmental modeling is not appropriate. Environmental modeling requires the user to apply professional judgment. The example of “analyst intervention” referred to by the commenter is actually the application of professional judgment to estimate aquifer parameter values from existing hydrologic data sets. The methodology described simply uses available specific capacity data for numerous wells across the model domain to estimate the spatial variability in aquifer transmissivity within the Sacramento Valley aquifer system. Data evaluation and analysis is a routine practice in the development of aquifer parameter distributions for use in groundwater model applications such as SACFEM2013. It is not possible to develop numerical groundwater flow models like SACFEM2013, CVHM, and C2VSIM without “analyst intervention in data preparation.”

The model development team applied a method to distribute aquifer parameter values throughout the domain. That method resulted in a nonuniform distribution of Kh through a given model layer using available specific capacity data. The model underwent calibration to demonstrate its ability to replicate historical monthly groundwater levels over a 40-year period that included a variety of climatic conditions. Although a perfect match between available historical groundwater levels and modeled groundwater levels was not achieved or anticipated, SACFEM2013 has been adequately calibrated to help inform decision-making associated with groundwater management alternatives.
Applying professional judgment during the model development process is a requirement with this type of environmental modeling because field data are not available at all

locations, depths, and times of interest. Information on sensitivity studies completed as part of the modeling effort has been added to Appendix D (see Appendix D for updates).

Comment NG04-14

Comment

And that's only the tip of the larger iceberg of problems with these ad hoc techniques. It is actually quite easy to avoid all these adjustments and oversimplifications entirely, and treat the aquifer as it is, namely as a true three-dimensional physical body of large extent, with a time-varying location of the water table, and with accurate treatment of the complex hydraulic conductivity inherent to the subsurface conditions of California. It's also remarkably simple to include poromechanical effects (see discussion below) in such a 3D model so that accurate local and regional estimates of environmental impacts such as subsidence and loss of aquifer capacity can be predicted and validated. All of this technology has been available for decades, but it is not utilized in the SacFEM2013 model. The citizens of California clearly deserve a better model for decision-making involving one of their most precious resources!

Response

SACFEM has undergone an extensive independent peer review performed by an independent consultant with extensive experience in the application of groundwater models to evaluate groundwater systems and surface water-groundwater interaction (WRIME 2011). The objective of the peer review was to evaluate the adequacy of the model to estimate the impacts of groundwater substitution water transfer pumping on third party groundwater users as well as impacts to surface water flows. The results of the peer review identified seven primary enhancements to the model that would improve its accuracy in forecasting pumping impacts on water resources in the Sacramento Valley. All seven of these enhancements have been incorporated into SACFEM2013, the most recent version of SACFEM.

Comment NG04-15

Comment

Regarding The Need to Characterize Uncertainty in Engineered and Natural Systems:

Some discussion is warranted at this point on the difference between a natural and an engineered system, towards the goal of appreciating why characterizing uncertainty in any proposed water transfer strategy is an essential goal of a well-considered EIR/EIS. An engineered system is designed entirely by humans, so each component of that system is reasonably well-understood a priori, and the uncertainties that are inherent in any system (natural or man-made) are limited to defined uncertainties such as materials chosen, geometric specifications, and conditions of construction and use. So an engineered system such as an automobile (or a groundwater-pumping facility) is uncertain in many aspects, but that uncertainty can in theory be constrained by quality-control efforts or similar means of repeatability. Constraining these uncertainties comes at a price, of course: that is a large part of what we mean when we refer to quality in an engineered system such as in cars or consumer electronics.

A natural system has a much higher threshold for uncertainty, as we often do not even know of all the components of the system, much less their precise characterization (e.g., in a water-bearing aquifer, the materials that entrain the water are by definition unavailable for characterization, and the mere act of digging some of them up for laboratory inspection often changes their physical behaviors so that the tests we perform in the laboratory may not be entirely relevant to the response of the actual subsurface system). So when studying a natural system, a scientist or engineer must exercise due diligence in the examination and characterization of the system's response to stresses of operational use, and must consistently provide means to determine the presence and effect of these inherent uncertainties. To do otherwise is to risk visitation by Murphy's Law, i.e., "anything that can happen, will happen." Thus one of the most obvious metrics for evaluating the quality of any environmental plan is to examine the plan's use of terms such as "uncertainty", as well its technical relatives that include "validation" (testing of models via physical processes such as laboratory experiments), "verification" (testing of models via comparison with other generally-accepted models), and "calibration" (tuning a model using a given set of physical data that will be used as initial conditions for subsequent verification, validation, and uncertainty characterization). These basic operations are fundamental characteristics of any computational model, and are used in everyday life for everything from weather prediction (where uncertainty dominates and limits the best efforts at forecasting) to the simple requirement that important components of infrastructure such as highway bridges be modeled using multiple independent analyses to provide verification of design quality before construction can begin.

Unfortunately, the EIR/EIS does not contain a formal characterization of model uncertainty, either for the SacFEM2013 application itself, or for the underlying data gathered to support the SacFEM2013 analyses. As described in previous sections, both the model and the input data contain simplifications that potentially compromise the model's ability to provide accurate estimates of real-world responses of water resources, and these idealizations create more need for uncertainty characterization, not less. And the all-important technical terms "validation" and "verification" do not appear the EIR/EIS. The term "calibration" occurs twice7 with regard to groundwater models, but only in the context of ad-hoc "adjustments" of the model data.

Response

Terms like "validation" and "verification" are often linked with modeling efforts; however, these terms should be avoided with environmental modeling because they are misleading and set inappropriate expectations (see Oreskes et al., 1994. "Verification, Validation, and Confirmation of Numerical Models in the Earth Sciences," Science, v263, pp. 641-646.). It is preferable to describe whether the model is adequately "calibrated" rather than "validated" or "verified". Model calibration can always be improved, since knowledge of the modeled system evolves as additional data and funding become available to update the model. The preparers of the EIS/EIR, on the basis of their experience and professional judgment, conclude that SACFEM2013 has been adequately calibrated to achieve the current modeling objectives.

Comment NG04-16

Comment

Lack of Trust in the SacFEM2013 Model:

In addition to generally-poor modeling assumptions inherent in the SacFEM2013 model, the all important task of characterizing uncertainty in the model's implementation and data is neglected in the EIR/EIS. On page 19 of Appendix B, the reader is promised that model uncertainty will be described in Appendix D, but that promise is never delivered: the only mention of this essential modeling component occurs merely as an adjunct to discussion of deep percolation uncertainty.

This lack of any formal measure of uncertainty is not an unimportant detail, as it is impossible to provide accurate estimates of margin of error without some formal treatment of uncertainty. Many such formal approaches exist, but apparently none were deployed for the EIR/EIS modeling efforts. In simple terms, this lack of uncertainty characterization removes the basis for trust in the model results, and hence the entire groundwater substitution analysis presented in the EIR/EIS is not technically defensible. Until this omission is remedied, the EIR/EIS simply proposes that water interests in California trust a model that is arguably not worthy of their trust.

Response

The SACFEM2013 user's manual has been incorporated as Appendix H. Section 4.3 of this document includes potential sources of error in the model, which helps address model uncertainty. Additionally, a discussion of sensitivity studies completed during development of the EIS/EIR has been included in Appendix D (see Appendix D for updates).

Comment NG04-17

Comment

And it's even worse than this, as while the model is asserted to be "high-resolution", in fact the SacFEM2013 model is quite the opposite. The actual spatial resolution of the model is given in Appendix D as ranging from 125 meters for regions of interest, up to 1000 meters for areas remote from the transfer effects. Nodal spacing along flood bypasses and streams is given as 500 meters. No mention is made in the EIR/EIS of exactly what this means in terms of trust in the model, but in accepted computational modeling practice, this is not a particularly high resolution.

In fact, there are formal methods for characterizing the ability of a discretized model such as SacFEM2013 to resolve physical responses of interest. These methods are based on elementary aspects of information theory (e.g., the Nyquist-Shannon sampling theorem), and their practical result is that a discrete analog (i.e., a computer model) of a continuous system (i.e., the actual subsurface geological deposits that entrain the groundwater) cannot resolve any feature that is less than a multiple of the size of the discretization spacing. For regular periodic features (e.g., the waveforms that make radio transmission possible), that multiple can be a small as two, but for transient phenomena (e.g., the response of an aquifer), established practice in computational simulation has demonstrated that a factor of five or ten is the practical limit on resolution.

Thus the practical limit of the SacFEM2013 model to "see" (i.e., to resolve) any physical response is measured in kilometers! The model can compute results smaller than this scale, but those results cannot be implicitly trusted: they are potentially the computational equivalent of in optical illusion. For this reason alone, the SacFEM2013 model cannot be trusted without substantial follow-on work that the EIR/EIS gives no indication of ever having been performed. And thus any physical response asserted by the model's results has a margin of error of 100% if that response involves spatial scales smaller than a kilometer or more, i.e., there is little or no predictive power in the model for those length scales.

The additional verification effort required to gain some measure of trust in the model (i.e., refining the nodal spacing by a factor of two and four to create more refined models, and then comparing these higher-resolution results to gain assurance that no computational artifacts exist in the original model, i.e., no optical illusions are being used to set water transfer policy) is quite straightforward and is also standard practice in verifying the utility of a computational model. It is something of a mystery why this standard modeling quality-assurance technique is not presented in the EIR/EIS, but this omission provides yet-another sound technical reason to reject the results of the EIR/EIS until better modeling efforts are provided.

Technical sidebar: one important side benefit of performing verification studies by refining the finite element mesh in the spatial and temporal domains is that this extra effort provides important information as to whether the resolution of the model is sufficient. In practice, improving the resolution of a computer model is only a means to the desired end of gaining higher fidelity, i.e., a closer approximation to reality. So what we really desire from a computer model is not resolution, but fidelity, and while it is notoriously difficult to assess measures of fidelity, verification techniques based on refining the finite element mesh do provide some measure of trust in model results. One particularly simple verification measure involves plotting the computed results for a quantity of interest (e.g., groundwater flux at some point in the aquifer) as a function of model resolution (e.g., a metric indicating the number of the elements in the model, or a representative spatial scale used) for successive refinements of the finite-element mesh. Such plots help the analyst estimate whether the results at any given resolution yield an asymptotically-accurate estimate of the best results the model can provide given its inherent modeling assumptions. When combined with validation data (e.g., model predictions compared to real-world measured data), these verification-and-validation techniques provide a more sound basis for trust in the model than the minimal motivations found in the EIR/EIS.

It is likely that the SacFEM2013 model may be incapable of performing these more refined higher-resolution analyses because of its underlying assumptions (e.g., idealizing the three-dimensional subsurface domain as a set of coupled two-dimensional layers), and if that is the case, then the underlying groundwater model is simply not up to the requirements of accurate regional water transfer modeling. The underlying MicroFEM model is an old simulation tool, originally written for the MS/DOS platform, and it appears to be near the practical limit of its resolution at the stated size8 of 153,812 nodes (compared to the maximum nodal resolution in MicroFEM of 250,000 nodes cited above). But the current generation of desktop computers can easily handle many millions of nodes for such simulations, and enterprise computers well within the budgets of government agencies are routinely utilized to model systems with hundreds of millions of nodes, so if the SacFEM2013 model is already at its limit of resolution, then it's clear that a newer, better computational model should be used to replace it.

Response

The resolution of SACFEM2013 substantially exceeds the resolution provided by the other regional groundwater flow models developed for the Sacramento Valley by the USGS and the Department of Water Resources. In addition, SACFEM has undergone an extensive independent peer review performed by an independent consultant with extensive experience in the application of groundwater models to evaluate groundwater systems and surface water-groundwater interaction (WRIME 2011). The objective of the peer review was to evaluate the adequacy of the model to estimate the impacts of groundwater substitution water transfer pumping on third party groundwater users as well as impacts to surface water flows. The results of the peer review identified seven primary enhancements to the model that would improve its accuracy in forecasting pumping impacts on water resources in the Sacramento Valley. All seven of these enhancements have been performed and are reflected in SACFEM2013, the most recent version of SACFEM.

On average, SACFEM2013 computes monthly groundwater levels in nodes representing calibration-target wells located throughout the Valley over a 40-year simulation period more accurately than is suggested by the commenter.

See response to Comment NG04-15 for additional information.

Comment NG04-18

Comment

Inadequacy of Basic Aquifer Mechanics Principles in the EIR/EIS:

In addition to all the fundamental problems inherent in the SacFEM2013 model, the EIR/EIS presents a biased view of basic principles of aquifer mechanics, and this bias serves to understate the risks of serious environmental problems that have long been a bane of water policy in California. In particular, the EIR/EIS simply understates the risk of these environmental effects, beginning with its executive summary and continuing throughout the rest of the document. Here's a representative sample of the problem at its first occurrence(9):

Groundwater substitution would temporarily decrease levels in groundwater basins near the participating wells. Water produced from wells initially comes from groundwater storage. Groundwater storage would refill (or "recharge") over time, which affects surface water sources. Groundwater pumping captures some groundwater that would otherwise discharge to streams as baseflow and can also induce recharge from streams. Once pumping ceases, this stream depletion continues, replacing the pumped groundwater slowly over time until the depleted storage fully recharges.

The use of the adverb "fully" implies that the original storage is entirely recovered, but this is not necessarily the case. The science of poromechanics demonstrates that irreversible loss of aquifer capacity can occur with groundwater extraction, and while this physical phenomenon is explained elsewhere in the EIS/EIR, it is apparently ignored by the SacFEM2013 model, and hence it is not predicted with any degree of accuracy for use in estimating this important environmental effect. California has seen many examples of the accumulation of this environmental risk, as the readily-observable phenomenon known as subsidence is the surface expression of this loss of aquifer capacity. The small strains induced in the aquifer skeleton by groundwater extraction accumulate over the depth of the aquifer, and are expressed by the slow downward movement of the ground surface. The EIR/EIS makes little connection between groundwater extraction process modeled by SacFEM2013 and the all-too-real potential for surface subsidence, and the attendant irreversible loss of aquifer capacity. It is remarkably simple to model these coupled fluid- and solid-mechanical effects using modern computers, and it is thus a fatal shortcoming of the EIR/EIS that such a rational science-based approach to estimating these environmental risks has not been undertaken.

The problem is especially important during drought years, when groundwater substitution is most likely to occur. In a drought, the aquifer already entrains less groundwater than normal, so that additional stresses due to pumping are visited upon the aquifer skeleton. This is exactly the conditions required to cause loss of capacity and the risk of subsidence. Yet the EIR/EIS makes scant mention of these all-too-real problems, and no serious modeling effort is presented in the EIR/EIS to assess the risk of such environmental degradation.

Response

The exact location of the text cited by the commenter is uncertain based on this comment. However, the existing subsidence conditions experienced in the Sacramento and San Joaquin Valleys are discussed in Section 3.3.1.3, Affected Environment. The potential for subsidence is addressed in Section 3.3.2.4. See Common Responses 6 and 7 for additional information.

Comment NG04-19

Comment

Taken together with the other problems catalogued above, it is clear that the EIR/EIS does not accurately estimate potential environmental risks due to groundwater extraction. And since this component of the water transfer process is only one aspect of how water might be moved within the state, the interested reader of the EIR/EIS can only wonder what other important environmental effects have not been accurately assessed in the EIR/EIS.

Response

The EIS/EIR has been developed to analyze all resources potentially affected by the action alternatives, as described in Chapter 2.

Comment NG04-20

Comment

The current draft version of the EIR/EIS fails to accurately estimate environmental effects likely to occur during water transfers. The model used to predict groundwater resources is flawed by being based on old technology that is apparently not up to the task of accurate large-scale modeling as combined with requisite validation measures and uncertainty characterization efforts needed to justify the use of the model. The reasons given for the use of this model do not stand up even to the most rudimentary examination, and the model neglects important environmental effects that have long been observed in California. The proposed transfers should be rejected until a more sound scientific basis can be established for prediction of all substantial environmental effects, and established practices in the use of computational models are developed and deployed in all aspects of computational prediction of those effects.

Response
See responses to Comments NG01-37 and NG04-4.

Comment Letter NG05, Tom Cannon, AquAlliance, California Sportfishing Protection Alliance, Aqua Terra Aeris Law Group

Comment NG05-1

Comment
Long term transfers represent Reclamation and San Luis Delta Mendota Water Authority's ability to move water from north of the Delta to south of the Delta using its Central Valley Project storage, conveyance, and export facilities, and associated authorities. The EIS/EIR describes the details and effects of Reclamation's actions to carry out such transfers. Water for transfers would come from stored and saved water north of the Delta that would be delivered in summer south of the Delta. The amount of water proposed for transfer by Reclamation could be up to 600,000 af (Federal Register and EIS/EIR at p. 1-5), but is likely to be over 200 thousand acre-ft. Reclamation's EIS/EIR covers myriad proposed transfers. Some additional proposed State transfers are addressed in the EIS/EIR cumulative impacts assessment.

CSPA has undertaken a review of transfers and the EIS/EIR effects analysis on special status fish species. The species addressed include Chinook salmon, Steelhead, Green and White sturgeon, and Longfin and Delta smelt. These fish all depend on Central Valley river and Delta flows and habitats for portions of their life cycles. A summary of this review is presented in this report.

Response
The comment cites the upper limit of 600,000 acre-feet for transfers, but that upper limit is related to transfer quantities addressed in the Biological Opinions on the Coordinated Operations of the CVP and SWP (see Section 1.3.1.2). These quantities reflect the transfer amounts that are addressed in the current biological opinions on CVP and SWP operations in the Delta; the action alternatives in this EIS/EIR are not proposing to transfer this entire quantity. The maximum quantity proposed for transfer under the action alternatives in any year would be about 511,000 acre-feet, and in most years when transfers occur substantially less water would be transferred (see Section 2.3.2.2). An analysis of potential effects to special status fish species is included in Section 3.7.

Comment NG05-2

Comment
1. Change in timing and amount of river flows

Table C2 shows that summer Delta inflows from the Sacramento River in dry and critical water years may increase by several thousand cfs to accommodate transfer Delta exports. With non-CVP transfers the total change is not inconsequential. With minimum river flows of 3000-5000 cfs, transfers can double river flow and Delta inflow in summer of drier years when reservoir levels are low and water deliveries are cut back. Holding Delta outflow near minimum and nearly doubling inflow and exports warms the Delta, increases loss of Delta fishes to export pumps, and degrades freshwater and low salinity zone habitat. For more discussion of this effect see Attachments A and B.

Response

Contrary to the assertion suggested in the comment, reservoir releases and river flows appear to have a minimal influence on in-Delta water temperature. Atmospheric conditions are the primary influencing factor on in-Delta water temperatures (Wagner et al. 2011; see also page 3.7-19 of the EIR/EIS).

Comment NG05-3

Comment

River flows in winter can be lower by 10-20% in dry years as previous year's transfer releases are made up by reservoir water retention. Rivers flows may be reduced by over 1000 cfs although usually in higher precipitation months. The refill of reservoirs the year after summer transfers reduces winter river flows and Delta inflow. The effect is greatest in drier years when river flows and reservoir releases are at a minimum. These indirect winter effects though not as dramatic as direct summer transfer effects have consequences to drier year winter river rearing and migration habitat of salmon and smelt.

Overall effects from flow changes:

- Significant negative effect on winter run salmon: (1) young rearing in lower Sacramento River in summer, (2) smolt migration in winter, (3) adult upstream migration in winter.
- Significant negative effect on delta smelt: (1) young rearing in the Delta in summer of drier years, (2) adults migrating upstream into Delta during winter.

Response

Based on a thorough review of year-round instream flow modeling outputs in the Sacramento River and Delta in each water year type, the effects stated in the comment are unsubstantiated and are therefore not incorporated in the EIS/EIR analysis (see Section 3.7.2.4.1 for details). Mean changes in flows in the Sacramento River are less than 10 percent throughout the year, regardless of water year type.

Comment NG05-4

Comment

Tables C8 and C9 show expected increases in drier year summer exports in the range of 20-60% from CVP transfers. With non-CVP transfer exports of similar magnitude, total drier year exports are near double or even more in critical years like 2014. Higher exports increase entrainment and salvage losses of fish and degrade Delta rearing habitat (higher water temperatures, lower turbidity, and lower primary and secondary production).

Overall effects from export increases in summer:

- Significant negative effect on delta smelt: (1) from increased entrainment of young rearing in the Delta in summer of drier years, (2) from degradation of rearing habitat of young.

Response

As described in Section 3.7.2.6.1, the changes in Delta exports would not have significant effects on aquatic species; refer to this section for additional detail and justification. The combined effects of Long-Term Water Transfers and other water transfers project were evaluated under Cumulative Effects and would be less than significant.

Comment NG05-5

Comment

Water released from reservoirs for transfers in summer is not the same water exported from the Delta. Exports from the South Delta in summer of drier years typically take the cooler, slightly brackish, productive upper low salinity zone that has been in residence in the Delta for some time. The exported water includes nearly all the higher productivity water of the San Joaquin River that enters the Delta. Exported water is replaced by reservoir water including that released for transfers. The added reservoir water in higher Delta inflows degrades Delta habitat with fresher, warmer, clearer water.

Overall effects from changes:

- Significant negative effect on delta smelt from degradation of rearing habitat of young in north, south, and west Delta, and eastern Suisun Bay.

Response

Tidal excursion is 7-13 kilometers per tide, twice a day (Walters et al 1985). As a result, fish living in the western Delta experience a wide range of habitat conditions. Water in the Delta during summer months is not warm due to the reservoirs. Water from the reservoirs is among the coldest water in the system, particularly water from the bottom of the reservoirs. Water conveyed through the Delta is warm, particularly if it "has been in residence in the Delta for some time" as indicated by the commenter. Therefore, the Proposed Action would not degrade rearing habitat for delta smelt.

Comment NG05-6

Comment

As it may take several years or more to replace reservoir water released for transfers, reservoir storage is depleted by transfers in multiyear droughts. Reservoir depletion over several years may reach 500,000 ac-ft or more total. Long term droughts already deplete reservoirs to the point of affecting cold water pools and winter-spring releases that benefit fish especially in droughts. Storage releases in the summer of 2014 were in fact higher than planned or believed needed to sustain transfers, other water demands, and outflow and water quality requirements. Thus the true effect of transfers on reservoir storage is unknown.

Reductions in cold water pools can lead to (1) adult salmon being susceptible to diseases from warm water, (2) delays in salmon spawning, (3) reduced survival of eggs and embryos, (4) lower young survival during rearing, and (5) and delays and lower survival of smolts during emigration.

Overall effects from reservoir storage reductions:

- Significant negative effect on winter run salmon in multiyear droughts: (1) young rearing in lower Sacramento River in summer, (2) migrating smolts in winter, (3) eggs and embryos in summer, and (4) adults from lower winter attraction flows in multiyear droughts.

Response

Model outputs indicate that effects to instream flows below reservoirs would be insubstantial and minimal. Therefore, none of the effects listed in the comment would be significant to aquatic resources. For more information, please see Section 3.7.2.4.1.

Comment NG05-7

Comment

We believe the addition of water transfers places significant added burden on the special status fish species over that already imposed by climate change, drought, increasing water supply use, record-high Delta diversions, increasing demands on surface and groundwater, as well as increased demand forecasted under the BDCP. The EIS fails to address these factors, although it does mention the potential of added effects from other Central Valley transfers through the Delta (i.e., by State Water Project and non-project water) not covered by the EIS. The EIS acknowledges these effects, but simply states that the added and cumulative effects are insignificant without any analyses as to whether the severely depressed populations and habitats of special status species are potentially affected by the added stress. Based on our assessment of cumulative effects, significant added stresses would occur on the fish and their habitats

Response

Section 3.7 discusses direct, indirect, and cumulative impacts to fisheries. More detailed information on the fisheries analysis and the science behind it is provided in response to specific comments.

Comment NG05-8

Comment

Winter Run Salmon:

The cumulative effects of the above stresses with addition of water transfers will put winter-run in continuing jeopardy and inhibit their recovery. Transfers reduce reservoir storage in multiyear droughts as transfer storage releases cannot be made up until wet years again occur. Low storage limits the amount of Shasta Reservoir cold water pool to sustain winter run through summer spawning, incubation, and rearing. Continuing low fall releases limits the extent of rearing habitat and early emigration cues. Higher August and September flows from reservoir transfer releases may improve early rearing habitat in the upper Sacramento River near Redding, but may also deplete the cold-water pool and send emigration cues that may push young into warmer portions of the lower Sacramento River. Low storage levels in multiyear droughts limit the available water for storage releases in winter to sustain young emigration and upstream adult migration through the Delta and Bay to and from the Pacific Ocean.

Response

As indicated in the above responses to Comments NGO 5-2 through NGO 5-7, the nature and extent of “stresses” that this comment references as the basis for cumulative effects are unsubstantiated. Based on substantial evidence presented in the EIS/EIR, cumulative effects on aquatic resources would be less than significant. Refer to Section 3.7.6 for details.

Comment NG05-9

Comment

Spring and Fall Run Salmon:

Lower river flows in winter and spring in drier years would effect downstream emigration success of fry to the Delta. Poor dry year Delta rearing habitat would be further degraded by lower Delta inflows. High late summer transfers would encourage early migrations and maturation of adult fall run only to subsequently be subjected to lower fall flows and higher water temperatures.

Response

It is unknown to which river(s) the commenter is referring. However, mean monthly flows in each of the major rivers except the Bear River (Sacramento, Feather, Yuba, American, San Joaquin, and Merced) would not be reduced by more than 10 percent in any month or water year type. The Bear River would experience an 18 percent reduction in critical years during the month of February. This infrequent reduction is not expected to affect aquatic species, particularly because it occurs during February when temperatures are not high enough to cause concern. Therefore, there would be a less than significant effect.

Comment NG05-10

Comment

Delta Smelt and Longfin Smelt

Adult migration and spawning success would be negatively affected by lower Delta winter and spring inflows in multiyear droughts. Lower Delta inflow in late winter and springs of multiyear droughts will reduce survival of young smelt. Higher summer Delta inflows will reduce survival of rearing pre-adult smelt in the Delta from degradation of the low salinity zone and direct and indirect losses to higher Delta exports.

Response

There would be no substantive change in flows in any river during any month or water year type except in the Bear River in critical years during the month of February, when an 18 percent reduction would occur; therefore Delta inflows would not be affected. As a result, delta smelt will not be affected by the project. See Section 3.7.2.4.1 for details.

Comment NG05-11

Comment

Reclamation argues that the effects of transfers are not “unreasonable”. Their main argument is that the BOs state that planned summer transfers up to 600,000 ac-ft would not constitute jeopardy, and that NMFS and USFWS have “OK’d” individual transfers in summer 2014 and past years. The facts are that winter-run salmon and delta smelt populations have further declined significantly since the BOs were prepared. Based on the present situation after two recent periods of drought (6 of last 8 years being dry or critical) we believe the predicted added stress of the whole array of planned transfers is an unreasonable threat to listed salmon and smelt.

Response

A review of Grandtab winter-run escapement data does not reveal a "further significant decline" in the winter-run population since the 2009 NMFS Biological Opinion as suggested by the commenter. Also, a review of the fall midwater trawl delta smelt index does not reveal a "further significant decline" in the delta smelt population since the 2008 USFWS Biological Opinion. Therefore, water transfers that were allowed in these biological opinions, along with all the other physical, biological, and regulatory factors occurring during the period, do not appear to have added further stress on the populations.

Substantial evidence provided in the analysis supports the conclusion that there would be no significant, unavoidable adverse impacts. All potentially significant impacts would be mitigated to result in less than significant impacts and no additional avoidance measures are necessary.

Comment NG05-12

Comment

As shown in Tables 2-9 and 2-10, the Proposed Action in Reclamation’s opinion would not have any significant, unavoidable adverse impacts. From our review the proposed transfers have significant potential effects that are avoidable. Our review shows that potential effects are greatest in multiyear droughts when listed fish are already under maximum stress. Many of the most significant effects can be avoided by limiting transfers in the second or later years of drought. A more detailed review might yield specific criteria or rules that would allow some transfers to occur under certain circumstances. If transfers cannot be avoided, then other types of restrictions on water supply storage or deliveries could be considered to reduce effects of transfers and risks to the listed species.

Response

See response to Comment NG05-11.

Comment NG05-13

Comment

Major flaws in Reclamation's assessment are as follows:

1) Reclamation assumes delta smelt are not found in the Delta in the summer transfer season, when in fact during dry and critical years when transfers would occur most if not all delta smelt are found in the Delta (see Attachments A and B).

Response

The EIS/EIR indicates that delta smelt are typically not found in the area of influence of the export facilities (this does not include the Cache Slough complex) during this time of year because of elevated water temperatures. Water temperature appears to play a key role in this, as suggested by CDFW data described on Page 3.7-32 through Page 3.7-34.

Comment NG05-14

Comment

Reclamation downplays the potential total amount of all transfers, when in fact the capacity exists for transfer amounts up to 600,000 ac-ft (see EIS/EIR CHART BELOW). "The "up to" amount of transfer water that could be made available in any year is approximately 473,000 acre-feet. However, it is unlikely that this amount of water could be transferred in any year due to Delta regulatory and other constraints." (Source: http://www.usbr.gov/mp/PA/water/docs/2014_water_plan_v10.pdf)

Response

Section 2.3.2.5 explains that the maximum quantities associated with the range of potential transfers is "a total of a little over 500,000 AF," specifically 511,094 AF as shown in Table 2-4. The potential transfer quantities used in the analysis were determined through extensive coordination with all potential selling agencies. The Lead Agencies are not "downplaying" the amount of total transfers that could occur each year. The Lead Agencies relied on sophisticated modeling tools to determine Delta capacity to convey water transfers during the transfer period.

Comment NG05-15

Comment

Reclamation has not assessed the effect on Delta habitat in terms of water temperature, turbidity, and location of the Low Salinity Zone.

Response

The Lead Agencies have assessed the effect on water temperature and have determined that, because instream flows do not influence water temperatures in the Delta, there would be no effects associated with the range of potential transfer activities under the Proposed Action. The effect on the location of the low salinity zone was analyzed, and was determined to be beneficial (X2 location moves farther downstream).

No change to either Delta outflow or the low salinity zone location would result in no change in water quality, including turbidity.

Comment NG05-16

Comment
Reclamation has failed to address population level effects on listed fish.

Response
Each impact conclusion is an assessment of population level effects, all of which are less than significant.

Comment NG05-17

Comment
Reclamation has failed to follow the State Board's recommendation: ""The key is to follow the water, not the agreements. Focus on the source of the actual water moving to the transferee. This is the water being transferred and will guide the types of changes in water rights that may be needed." (p 10-3 of SWRCB Guide to Water Transfers.). Reclamation has failed to identify that the water they divert for transfer in the Delta is not the water released upstream for transfer.

Response
TOM, as described in Appendix C was used to model surface water flows for potential proposed transfers and does not model "agreements." Appendix C lists assumptions made in TOM to model potential water transfers, including how transfer water co-mingles with other water in the system. TOM was developed through extensive coordination with Reclamation, including the Central Valley Operations office.

Comment NG05-18

Comment
Reclamation has failed to assess the cumulative effects on listed fish in multi-year droughts and the consequences of adding transfers on top of emergency drought actions designed to save storage by reducing water demands, exports, and relaxing water quality standards. Reclamation failed to mention its own requests to the State Board for Temporary Urgency Changes in 2013 and 2014 including provisions to exempt transfers from the TUCs that allowed lower Delta outflow and higher salinities in the Delta in summer 2014. Neither BO allowed for transfers under these conditions.

Response
Section 3.7.6 evaluates cumulative effects to fisheries. The period of analysis used in modeling for this analysis includes critical and dry periods as well as multi-year drought periods. Tables in Section 3.2, Water Quality provide expected conditions as a result of each alternative for dry and critical water years. While exceedances of water quality standards have occurred, especially during recent drought years, the changes in operations associated with the range of potential water transfer activities analyzed in this EIS/EIR are not expected to significantly affect water quality or exceedances. See

Common Response 5 for additional information regarding the modeled period hydrology.

Comment NG05-19

Comment

- Transfer may not cause significant adverse effects on Reclamation's ability to deliver CVP water to its contractors. In 2014 Reclamation had to release more water than expected to meet export demands including transfers. The unplanned release of "extra" Shasta and Folsom storage water adversely affects Reclamation's ability to meet its contractual demands and permit requirements. For example, North-of-Delta contractors were initially threatened with a 40 percent allocation that was later changed to 75 percent delivery.

Response

Conditions in 2014 were not typical because of the extreme dry conditions. The 40 percent allocation was not related to releases for transfers; this allocation was made early in the season before any transfers were contemplated. The allocation was low because of the lack of precipitation. It was changed because of increased precipitation and intense cooperation with fisheries resource agencies to protect sensitive species.

Comment NG05-20

Comment

- Transfer will be limited to water that would be consumptively used or irretrievably lost to beneficial use. Water diverted from the Delta is not water that would be consumptively used; it is water that would have eventually move to San Francisco Bay.

Response

This citation from the EIS/EIR relates to how water would be made available for transfers in the sellers' area. Transferred water would increase the water entering the Delta compared to what would enter the Delta without transfers, and a portion of this additional water could be diverted at the Delta conveyance facilities.

Comment NG05-21

Comment

- Transfer will not adversely affect water supplies for fish and wildlife purposes. Transfers results in storage levels lower than predicted, which limit cold-water pools and the ability to maintain downstream "fish flows".

Response

The model outputs indicate there would be no change greater than 10 percent in instream flows in any river evaluated, except in the Bear River during the month of February in critical water years. Therefore, there would be no effect on cold-water pool storage or "fish flows."

Comment NG05-22

Comment

- Transfers cannot exceed the average annual quantity of water under contract actually delivered.

The amount of CVP storage necessary to meet transfer export demands may be double the contracted amount.

Response

Section 3405(a)(1)(A) of the CVPIA refers to how much water can be transferred from willing sellers. Willing sellers cannot sell more water than they have received from the CVP (as an average annual quantity) during the past three years. This description of the CVPIA requirements has been edited for clarity. This clause does not refer to CVP storage, but transfers would only be able to use available storage.

Comment NG05-23

Comment

"Water supplies on the rivers downstream of reservoirs could decrease following stored reservoir water transfers, but would be limited by the refill agreements". The whole subject of "refill agreements" is not adequately covered by Reclamation. The fact that it may take several years or more to refill is a significant effect not addressed.

Response

On page 2-11 of the EIS/EIR, the description of reservoir release includes the following text: "Refill of the storage vacated for a transfer may take more than one season to refill if the above conditions are not met in the wet season following the transfer."

Comment NG05-24

Comment

"Water transfers could change reservoir storage in CVP and SWP reservoirs and could result in water quality impacts." No information as to the specific effects on Shasta, Trinity, or Folsom reservoir storage or downstream tailwater flows was provided.

Response

This impact statement in Section 3.2, Water Quality summarizes the analysis that occurs below each statement (see, for example, page 3.2-31 of the Draft EIS/EIR). This impact statement is related to water quality, and the subsequent analysis includes a table of specific changes to reservoir storage in these reservoirs. Changes in flows downstream of the reservoirs are included as part of subsequent impact statements, and the flow changes are shown in Tables 3.2-25, 3.2-29, and 3.2-32.

Comment NG05-25

Comment

"Water transfers could change reservoir storage non-Project reservoirs participating in reservoir release transfers, which could result in water quality impacts." The effect on reservoir and tailwater water quality in non-refill years of multiyear droughts was not addressed.

Response

The model used in this analysis includes a period of record which contains multi-year droughts. The model results reflect conditions during and after transfers.

Comment NG05-26

Comment

"Water transfers could change river flow rates in the Seller Service Area and could affect water quality." Effects on specific rivers and reaches were not addressed.

Response

The 2014 Draft EIS/EIR presents tables summarizing changes in water flows and associated water quality changes for potentially affected water bodies within the area of analysis (see Table 3.2-25).

Comment NG05-27

Comment

"Water transfers could change Delta outflows and could result in water quality impacts." "Water transfers could change Delta salinity and could result in water quality impacts." Specific effects on Delta water temperature, salinity, and turbidity in drought years like 2014 were not addressed.

Response

See Common Response 5.

Comment NG05-28

Comment

"Transfer actions could alter hydrologic conditions in the Delta, altering associated habitat availability and suitability" Specific effects of transfers on Delta hydrology in drought years like 2014 were not addressed.

Response

Section 3.7 evaluates impacts to habitat in the Delta. See response to Comment NG05-18 for additional information, and Common Response 5 regarding model timeframe.

Comment NG05-29

Comment

"The cumulative analysis evaluates potential SWP transfers, but they are not part of the action alternatives for this EIS/EIR." Given the difficulty of separating these actions and there effects, and that other environmental assessments and biological opinions address joint actions, we see no reason to not address the joint action of transfers through the Delta in this EIR/EIS, especially given the following EIR/EIS statement: "Most of the pumping capacity available would be at the Banks Pumping Plant except for very dry years. Banks is an SWP facility, so SWP-related transfers would have priority. Agreements with DWR would be required for any transfers using SWP facilities. "

Note: In 2013, DWR facilitated about 265 thousand acre-feet of water transfers through State Water Project facilities, nearly double the amount anticipated for CVP transfers. (http://www.water.ca.gov/watertransfers/docs/2014/Transfer_Activities_v11.pdf)

Response

State Water Project transfers are not part of the Proposed Action evaluated in this EIS/EIR. Reclamation does not approve or facilitate SWP transfers and SLDMWA is not engaged in transfers between SWP contractors. Because the Lead Agencies are not involved in these transfers, it is appropriate to include SWP transfers in the cumulative analysis and not the proposed alternatives.

Comment NG05-30

Comment

"Water transfers, which would occur from July through September, would coincide with the spawning period of winter-run Chinook salmon. However, spawning occurs upstream of the areas potentially affected by the transfers. Due in part to elevated water temperatures in these downstream areas during this period, emigration would be complete before water transfers commence in July." P3.7-12

Water transfers also come from Shasta storage releases. Downstream emigration of fry from spawning reaches near Redding commences in July and continues through September.

Response

The last sentence in the referenced text was changed to read: "Due in part to elevated water temperatures in these downstream areas during this period, spawning and egg incubation would be complete before water transfers commence in July" (see page 3.7-13). This revision would not result in a material change to the analysis or conclusions.

Comment NG05-31

Comment

"Summer rearing of CV steelhead would overlap with water transfers occurring in the Seller Service Area (July-September), both in the Sacramento and San Joaquin River and their tributaries (see specific tributaries listed above). Thus water transfers have the potential to affect steelhead. The majority of rearing, however, would occur in the cooler sections of rivers and creeks above the influence for the water transfers." P3.7-14. The "majority" of rearing occurs in tailwaters, which would be affected by transfers (e.g., the lower American River tailwater below Folsom Reservoir).

Response

The last sentence in the referenced text was changed to read: "The majority of rearing, however, would occur in the cooler sections of rivers and creeks (McEwan 2001)" (see page 3.7-16). This revision would not result in a material change to the analysis or conclusions.

Comment NG05-32

Comment

" (Delta smelt) Larvae and juveniles are generally present in the Delta from March through June. Delta smelt have typically moved downstream towards Suisun Bay by July because elevated water temperatures and low turbidity conditions in the Delta are less suitable than those downstream (Nobriga et al. 2008). Some delta smelt reside year-round in and around Cache Slough (Sommer et al. 2011). Delta smelt in Suisun Bay and Cache Slough would be outside of the influence of the export facilities." P3-7-16. In dry and critical years, delta smelt reside primarily in the Delta in summer in the direct path of water moving across the Delta to South Delta export pumps (see Attachments A and B for details).

Response

See response to Comment NG05-13.

Comment NG05-33

Comment

Consistency of Section 3.7 with the provisions of the California Environmental Quality Act (CEQA) and the CEQA Guidelines. Section 3.7 concludes that all effects are less than significant (e.g., p37-37). Using CEQA criteria - An alternative would have a significant impact on fisheries resources if it would:

a. Cause a substantial reduction in the amount or quality of habitat for target species. YES

Response

The evaluation of potential reductions in the amount and quality of habitat for fisheries resources was discussed throughout Section 3.7.2.4 and consistently found less than significant impacts. Very few small reductions to flow rates exist, and these, in total, would not rise to the level of significant impacts on habitat.

Comment NG05-34

Comment

Have a substantial adverse effect, such as a reduction in area or geographic range, on any riverine, riparian, or wetland habitats, or other sensitive aquatic natural community, or significant natural areas identified in local or regional plans, policies, regulations, or by CDFW, NOAA Fisheries, or USFWS that may affect fisheries resources. YES

Response

The evaluation of potential reductions in the area or geographic range of fisheries resources was discussed throughout Section 3.7.2.4 and consistently found less than significant impacts. Very few small reductions to flow rates exist, and these, in total, would not rise to the level of significant impacts on habitat area or geographic range.

Comment NG05-35

Comment
Conflict with the provisions of an adopted HCP, NCCP, or other approved local, regional, or state habitat conservation plan. YES (Delta Water Quality Control Plan)

Response
The Proposed Action does not conflict with any habitat conservation plans or natural community conservation plans because there would be less than significant impacts after mitigation measures are implemented. See Sections 3.7.2.4 and 3.8.2.4 for more detailed explanations.

Comment NG05-36

Comment
Cause a substantial adverse effect to any special-status species, − Have a substantial adverse effect, either directly or through habitat modifications, on any endangered, rare, or threatened species, as listed in Title 14 of the California Code of Regulations (sections 670.2 or 670.5) or in Title 50, Code of Federal Regulations. A significant impact is one that affects the population of a species as a whole, not individual members. YES (WINTER RUN, DELTA SMELT)

Response
Sections 3.7.2.4 and 3.8.4 explain there would be no substantial adverse effects to any endangered, rare, or threatened species or natural community as a result of the action alternatives.

Comment NG05-37

Comment
Have a substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special-status species in local or regional plans, policies, or regulations, or by CDFW, NOAA Fisheries, or USFWS, including substantially reducing the number or restricting the range of an endangered, rare, or threatened species. YES (WINTER RUN, DELTA SMELT)

Response
The evaluation of potential substantial adverse effects on fisheries resources was discussed throughout Section 3.7.2.4 and consistently found less than significant impacts. Very few small reductions to flow rates exist, and these, in total, would not rise to the level of significant impacts on these species.

Comment NG05-38

Comment

Cause a substantial reduction in the area or habitat value of critical habitat areas designated under the federal ESA or essential fish habitat as designated under the Magnusson Stevens Fisheries Act. YES (WINTER, SPRING, FALL, LATE FALL RUN; STEELHEAD, GREEN AND WHITE STURGEON, DELTA AND LONGFIN SMELT)

Response

The evaluation of potential reductions in the amount and quality of habitat for fisheries resources was discussed throughout Section 3.7.2.4 and consistently found less than significant impacts. Therefore, there would be no reduction in designated critical habitat or essential fish habitat.

Comment NG05-39

Comment

Conflict substantially with goals set forth in an approved recovery plan for a federally listed species, or with goals set forth in an approved State Recovery Strategy (Fish & Game Code Section 2112) for a state listed species. YES, RECOVERY PLANS FOR CV SALMON, DELTA SMELT, AND LONGFIN SMELT.

Response

The evaluation of potential significant impacts on fisheries resources was discussed throughout Section 3.7.2.4 and consistently found less than significant impacts. Because the action alternatives would not have significant effects on fisheries, they would not conflict with recovery plans for Central Valley salmonids and smelt. The recovery plans also include plans to recovery these species, but the recovery objectives are not part of the purpose and need/project objectives for this project and are being met through other efforts.

Comment NG05-40

Comment

Summer 2014 Water Transfers:

Transfers were conducted in the summer of 2014 under a Finding of No Significant Impact NEPA document. Our review of the proposed 2014 transfers is presented in Attachment A.

Summer 2014

As background on the overall effect of summer transfers, we present an assessment of the overall effect on Delta Smelt in summer 2014 in Attachment B.

Response

See responses to Comments NG05-41 through NG05-78.

Comment NG05-41

Comment

8. Delta smelt occupy the area of the Delta known as the “low-salinity zone” (“LSZ”). The LSZ is located where fresh water flowing toward San Francisco Bay mixes with salt or brackish water. The LSZ is generally centered around the areas where salinity values equal 2 parts per thousand, a value known as X2. In the summer months in normal or wet water years, normal Delta outflows keep the LSZ, and the Delta smelt population that lives in the LSZ, in the Western Delta, where water temperatures are suitable for Delta smelt and where they are far from the water export pumps located in the South Delta.

9. In my 2013 analysis (Exhibit 2), I conclude that (1) low Delta outflows caused the LSZ (and its population of Delta smelt) to move upstream into the Central and Southern Delta, where water temperatures are significantly higher than the Western Delta; (2) releases of warm water from reservoirs upstream of the Delta (primarily Lake Shasta) in late June caused water temperatures in July in the LSZ to reach temperatures lethal to smelt; and (3) as a result, Delta smelt suffered significant mortality.

10. In my May 2014 analysis (Exhibit 3), I conclude that the 2014 Transfers, in combination with the SWRCB’s May 2, 2014 relaxation of standards that govern Delta flow and water quality will exacerbate a similar increase in Delta smelt mortality because, once again: (1) low Delta outflows will cause the LSZ (and its population of Delta smelt) to move upstream into the Central and Southern Delta, where water temperatures are significantly higher than the Western Delta, and where they are more vulnerable to entrainment in the export pumps; (2) releases of warm water for the Transfers from reservoirs upstream of the Delta (primarily Lake Shasta) in the transfer period (July through September) will cause water temperatures in the transfer period in the LSZ to reach temperatures lethal to smelt; (3) will cause or increase reverse OMR flows making it more likely that any surviving smelt will be entrained in the export pumps; and (4) as a result, Delta smelt will suffer significant mortality.

Response

See pages 3.7-33 through 3.7-38 for details of the EIS/EIR analysis. The analysis indicates that delta smelt would be in the Delta during dry periods only when temperatures allow. If temperatures are too high, the delta smelt will migrate downstream to cooler water despite the higher salinity. The periods of higher water temperatures do not coincide with periods of increased pumping. Therefore, there would be no increased risk of entrainment.

Releases from reservoirs do not drive temperatures in the Delta. Temperatures in water from reservoirs are much cooler than temperatures in the Delta (CDEC data, 6/20/14-6/30/14: Shasta Dam mean daily water temperature = 52.6 F, Sacramento River at Delta mean daily water temperature = 67.4 F), and even much cooler than water in San Francisco Bay at this time of year, even during the severe drought (tidesandcurrents.noaa.gov data, 6/20/14-6/30/14: San Francisco, CA mean daily water temperature = 59.6 F). There is minimal correlation between upstream flows and in-Delta water temperatures (Wagner et al. 2011).

Most important, modeling results indicate there is no decrease in Delta outflow for the range of potential transfer activities evaluated under the Proposed Action during summer months; in fact, there would be a 12.2 percent increase in Delta outflow which, using the logic of the commenter, would provide a benefit to delta smelt.

Comment NG05-42

Comment

In my June 9, 2014, letter (Exhibit 4), I conclude that Delta outflows this summer will be much lower than expected or considered in the Bureau's environmental assessment for the 2014 Transfers because the standard governing Delta outflows (i.e., minimum 3,000 cfs Net Delta Outflow Index ("NDOI") for the transfer period) grossly overestimates actual Delta net outflow. As a result, actual outflows will be close to zero or even negative. This has severe consequences for Delta smelt, because such low outflows exacerbate the conditions that make the standard of 3,000 cfs harmful.

Response

See response to Comment NG05-41.

Comment NG05-43

Comment

12. The Bureau of Reclamation responded to my May 2014 analysis by letter dated May 30, 2014, which included comments provided from Ms. Frances Brewster, a hydrologist, and Dr. Erwin Van Nieuwenhuyse, a biologist. (A true and correct copy of this letter is attached hereto as Exhibit 5.)

13. These reviewers fail to address my main points: that transfers under relaxed standards increase the already high risk from low outflow and exports in summer of critical years when "all" smelt are in the Delta. The main risk is degrading critical habitat by increasing already high water temperatures. My analysis shows that already-critical water temperature will increase in critical habitat habitats of smelt with transfers. All locations in the LSZ will increase in water temperature to near or above critical levels. Thus, while the temperature increases may be small in relative terms, they are critical because temperatures will be near or at lethal levels even without the transfers and relaxation of standards.

Response

See response to Comment NG05-41.

Comment NG05-44

Comment

14. The analysis of impacts of Delta water management operations on Delta smelt involves a number of causes of impacts that must be assessed in combination with each other, not in isolation, including reduced outflow and higher flow through the Delta from transfers. There are also a number of impacts on smelt habitat from these causes, all of which interact with each other. These include higher water temperature, reverse OMR flows, more upstream

location of the LSZ, and reduced food availability. My analysis includes all of these variables.

15. Ms. Brewster, in contrast, selects four values that are not germane to my analysis, and discusses each one in isolation, rather than in combination. Therefore, her conclusions are nonresponsive.

Response
See response to Comment NG05-41. Because temperatures are high in the Delta during this time of year, delta smelt are typically downstream of any risk to entrainment. The effects of potential transfer activities on the foodweb are not easy to discern due to the complexity of the Delta foodweb and an overall lack of understanding about how it works. The explanation provided by Ms. Brewster and Dr. Nieuwenhuyse in the document cited in this comment offers a reasonable explanation for why foodweb effects would be minimal.

For these reasons, there would be no increase in entrainment risk for delta smelt for the range of potential transfer activities evaluated under the Proposed Action.

Comment NG05-45

Comment
Temperature. Ms. Brewster presents data showing that average temperature in the entire three-month transfer period is .5 degrees F higher in the Sacramento River at Rio Vista than at Emmaton. This is the wrong metric for purposes of analyzing the Transfers' impact on Delta smelt. The issue is not whether the transfers under relaxed outflow standards will cause a large average difference, over a 3 month time period, between temperatures at Emmaton and Rio Vista. The issue is whether the transfers under relaxed outflow standards will cause a large enough difference in temperature to kill smelt at any time as compared to either not doing the transfers or doing them under normal outflow standards.

Response
See response to Comment NG05-41. Delta temperatures would not increase and there would be no increase in mortality of delta smelt for the range of potential transfer activities evaluated under the Proposed Action.

Comment NG05-46

Comment
The U.S. Fish and Wildlife Service determination that Delta smelt warrant designation as "endangered" states: "Delta smelt tolerate temperatures ranging from 7.5 C to 25.4 C (45 to 78 F) in the laboratory (Swanson et al. 2000, p. 386, Table 1) ...." (Federal Register, Vol 75, No. 66., p. 17668.) Bennet's peer reviewed study states: "Water temperatures over about 25°C [77°F] are also lethal, and can constrain delta smelt habitat especially during summer and early fall (Swanson and others 2000). Overall, the majority of juveniles and adults in the TNS and MWT have been caught at water temperatures less than 22°C [71.6°F] (Figure 5)." ("Critical assessment of the delta smelt population in the San Francisco Estuary, California" (2005),

William A. Bennet, John Muir Institute of the Environment, Bodega Marine Laboratory, University of California, Davis.) Among biologists, seventy-seven (77) degrees F is a commonly accepted lethal temperature for smelt. In my opinion, prolonged exposure to temperatures above seventy-five (75) degrees F is stressful to smelt.

Response

The comment does not pose any questions or concerns regarding the EIS/EIR; no specific response is needed.

Comment NG05-47

Comment

In my 2013 analysis, I reported that temperatures in late June and July of 2013 reached lethal levels around July 5 in some locations and near-lethal temperatures for a prolonged period of time in many locations. The following table summarizes the data I presented in my 2013 report.

<See Table in original comment>

This data shows that a half-degree increase in temperature is potentially very significant because temperatures are likely to be in the near-lethal to lethal ranges in the LSZ even without transfers and/or relaxed standards. This data also shows that using the small (but potentially significant) difference in the three month average temperature at Emmaton and Rio Vista as a metric for the Transfers' harm to smelt is not useful for predicting impacts on smelt.

Response

See response to Comments NG05-41 and NG05-45.

Comment NG05-48

Comment

Entrainment. Ms. Brewster argues that the 2008 Smelt BO does not have OMR reverse flow limits in the transfer period and that reverse OMR flows can be as high as -8000 cfs in a "typical year." These facts are irrelevant to what is happening in the summer months of dry and critically dry years (i.e., 2013 and 2014) because, in a typical year, the LSZ is in the Western Delta, where water temperatures are suitable for Delta smelt and where they are far from the water export pumps located in the South Delta. One of my key points is that the 2008 Smelt BO fails to address what is happening in the summer months of dry and critically dry years, especially under relaxed D-1641 outflow conditions. Indeed, the USFWS has conceded this point.

Response

See response to Comment NG05-44.

Comment NG05-49

Comment

Smelt Food. Ms. Brewster does not disagree with my opinion that "transfer flows will displace plankton rich, higher turbidity water with plankton poor, low turbidity water." Instead, she asks how this phenomenon differs from normal Delta operations. The USFWS has found that "normal" Delta operations are a significant reason Delta smelt are a "threatened" species and that the "endangered" designation is warranted.3 Ms. Brewster looks at this variable in isolation, rather than in combination with other effects of the transfers under relaxed D-1641 standards. Specifically, doing the transfers under relaxed outflow standards will cause the LSZ where smelt live to be closer to the pumps than they would be in a "normal" year.

Response

See response to Comment NG05-41. Because Delta outflow would remain the same or increase, there would be no relocation of the low-salinity zone (LSZ) closer to the export facilities.

Comment NG05-50

Comment

LSZ Area. Ms. Brewster argues that the area of LSZ is "essentially the same" whether X2 is at Emmaton or Three-mile Slough. This is a red herring, because my opinions are primarily based on the changed location of the LSZ, not its smaller areal extent.

Nevertheless, since Ms. Brewster has focused attention on this value, it is worth noting that using her "Figure B-1," it appears that when X2 moves from Emmaton (at about mile point 90 on the x-axis) to Three-mile Slough (at about mile point 93 on the x-axis), the LSZ loses about 10% of its area (i.e., about 500 of 4,500 hectares). Ms. Brewster suggests no reason, and certainly no biological reason, that 4,000 hectares is "essentially the same" as 4,500 hectares for purposes of assessing impacts on smelt.

Response

See response to Comment NG05-49.

Comment NG05-51

Comment

Dr. Nieuwenhuyse apparently agrees with me that in the coming summer months the LSZ is going to be uninhabitable by smelt due to high temperatures and lack of food. Dr. Nieuwenhuyse suggests that this new state of affairs will not cause harm to smelt because they can find temperature and food refuge in the Sacramento Deepwater ship channel upstream of Rio Vista. I am aware of no scientific basis for this assertion. The U.S. Fish and Wildlife Service's 2008 Smelt Biological Opinion does not suggest that the Sacramento Deepwater ship channel upstream of Rio Vista provides a viable temperature and food refuge for Delta smelt when their only recognized habitat – the LSZ in the Delta – has been rendered unsuitable for their survival by the Bureau's water management decisions.

Response

See response to Comment NG05-49.

Comment NG05-52

Comment

In my opinion, the effect of Delta operations this summer of confining smelt to the Sacramento Deepwater ship channel upstream of Rio Vista due to adverse environmental conditions in the LSZ that will be exacerbated by the Transfers, both with and without relaxed outflow standards, with no evidence that they can emerge from the ship channel in the fall to produce another generation of smelt, is significant new information showing that the Transfers will have significant adverse impacts on Delta smelt.

Response

See response to Comment NG05-49.

Comment NG05-53

Comment

On April 25, 2014, Governor Brown issued a Proclamation of a Continued State of Emergency related to the drought. The Proclamation finds that California's water supplies continue to be severely depleted despite a limited amount of rain and snowfall since January, with very limited snowpack in the Sierra Nevada mountains, decreased water levels in California's reservoirs, and reduced flows in the state's rivers. The Proclamation orders that the provisions of the January 17, 2014 Proclamation remain in full force and also adds several new provisions including: the State Water Board and the Department of Water Resources (DWR) are to expedite requests to move water to areas of need.

Federal water contractors in the Sacramento Valley recently were allocated by the US Bureau of Reclamation (Reclamation) up to 75% of their contract amounts of Central Valley Project (CVP) water this summer, while more "junior" water contractors in the San Joaquin Valley received 0%. The San Joaquin contractors would like to purchase some of the allocated water from the north and transfer it for their use through the federal Central Valley Project export facilities in the Delta to the south. Reclamation, which co-operates the Delta export facilities with the State Water Project, must notice the transfer under the National Environmental Policy Act (NEPA) as a federal action for public review and comment. Reclamation has provided public notice of the proposed transfers under a Finding of No Significant Impact (FONSI) with a supporting Environmental Assessment (EA).

This document summarizes the major findings of my review of Reclamation's findings specifically as they apply to the effects of the proposed water transfers on Longfin and Delta smelt, two endangered species that reside in the Bay-Delta estuary and who may be adversely affected by the proposed water transfers. The Delta Smelt are only found in the Delta and are at their lowest population level ever recorded. Both smelt populations decline significantly in droughts. Water transfers are a contributing stressor in droughts.

Response

See response to Comment NG05-41.

Comment NG05-54

Comment

The proposed water transfers would be carried out under applicable Delta protections for water quality and fish (and other beneficial users). The main protections are from the Delta Water Quality Control Plan (D-1641 Water Quality Standards), two federal Endangered Species Act biological opinions (one from the National Marine Fisheries Service for salmon, steelhead, and sturgeon; the other from the US Fish and Wildlife Service for Delta Smelt), and a State Endangered Species Act Incidental Take Permit (ITP) for state listed salmon, steelhead, and smelt (Longfin and Delta smelt). The State Water Board modifies the Standards regularly with Orders upon receiving requests from the California Department of Water Resources and concurrence from others. Water transfers are generally exempt under these Orders.

The Delta water quality standards have been modified under recent State Water Board orders to save water supplies in reservoirs that have been depleted during the three years of drought. Delta outflow and salinity standards (required minimal limits) have been relaxed for the summer under recent orders to reduce the release of reservoir water to the Delta normally prescribed to block salt water intrusion from San Francisco Bay. The state and federal resource agencies responsible for protecting the listed endangered species in the Delta have generally concurred with provisions of the orders.

Response

See response to Comment NG05-41.

Comment NG05-55

Comment

Water transfers come in various forms and may conform to the existing water quality standards and biological opinions, or have their own special rules from specific Orders or changes to biological opinions after consultations with agencies. The federal Central Valley Project (Shasta, Folsom, and New Melones reservoirs) and State Water Project (Oroville Reservoir) are the major sources of water transfer water. However, generally water transfers involve the sale of water from one entity to another. A good example is the sale of Yuba County Water Agency water from Bullards Bar Reservoir on the North Fork of the Yuba River to state and federal water contractors. The purchased water (often 50,000 acre-feet per year) is released over the summer down the Yuba River into the Delta for export "on top of" normal state and federal Delta exports under a special set of rules. While normal summer exports are limited to 65% of the freshwater inflow to the Delta, water transfer water released from reservoirs to the Delta may be exported at 100% of the added contribution to Delta inflow. Therein lies the basic problem with water transfers through the Delta.

In the Yuba summer transfer example there is a whole array of actions and potential problems or ramifications. First, water is released from the reservoir for an unintended purpose (not Yuba County irrigation). Storage is lowered. Recreation and future supplies are affected. The Yuba River (and Feather River) is subjected to abnormal flow patterns (good and bad). Extra electricity is generated above that normally allowed under the Yuba Accord. Second, the water enters at the north end of the Delta's tidal bowl and is exported on paper at the south end via the

South Delta export pumps. What gets exported is really not Yuba water, but a mix of tidewater habitat with endangered species and their foodweb organisms.

Response

See response to Comment NG05-41.

Comment NG05-56

Comment

Another good example of a water transfer through the Delta is the spring 30-day flow pulse from San Joaquin Valley reservoirs (100-150 thousand acre-feet) under the guise of a "fish flow". Normal rules call for export of only 35% of spring Delta inflow, but this transfer is allowed to export 100% or 1:1. This transfer occurs from mid-April to mid-May with several thousand cfs of water entering the South Delta from the San Joaquin River at Vernalis. The sources of the pulse flow are the Sierra reservoirs on the Stanislaus, Merced, and Tuolumne Rivers.

The problem with transfers is that each is usually small and flies under the radar, but together can have a large cumulative effect that generally is not considered and often ignored. Therefore assessments of transfer effects need consider the individual (local) effects, but more importantly the cumulative effects of the entire array of transfers.

Response

The purpose of this EIS/EIR is to provide an analysis of a range of potential water transfers in combination, as described in Chapter 2, Proposed Action and Description of the Alternative; a cumulative effects analysis of other transfers on aquatic resources is included in Section 3.7.6. Delta outflow would remain the same or increase with the implementation of potential transfer activities evaluated under the Proposed Action. See Common Response 14 and response to Comment NG05-41 for additional information.

Comment NG05-57

Comment

The water transfers proposed by Reclamation are just a subset of the overall transfers proposed this summer. Reclamation's Environmental Assessment covers only proposed federal contractor transfers, and thus does not present sufficient information to assess the true nature and full extent of impacts of all the potential transfers that may occur this summer. Therefore this review is limited only to the specific effects of the proposed federal transfers, with some insights as to the overall effect of all the transfers.

Response

The cumulative impacts analysis provided in Section 3.7.6 includes an assessment of potential additional non-federal transfer activities.

Comment NG05-58

Comment

Under State Water Board orders, export restrictions in the Delta water quality standards would not apply to water transfers. Salinity standards would apply; however, these standards have been relaxed to accommodate water transfers. A small portion of the transfer water amount entering the Delta may not be exported in order to maintain specific salinity standards. Biological opinion export restrictions only apply through June. Thus to avoid these restrictions, the proposal only applies for the summer (July-September). In summer, exports are restricted to 65% of freshwater inflow, but this limitation does not apply to water transfers between state or federal water contractors. The State Water Board orders restrict exports from the Delta to health and safety needs of no more than 1,500 cfs, with the exception of transfers. "Any exports greater than 1,500 cfs shall be limited to natural or abandoned flows, or transfers. Additionally, DWR and Reclamation, in cooperation with the fishery agencies, will consider transfer requests on an individual basis. The Interagency 2014 Drought Transfers Group will help facilitate the approval of proposed transfers." (Source: http://ca.gov/drought/pdf/2014-Operations-Plan.pdf; page 10.)

Response

See response to Comment NG05-41.

Comment NG05-59

Comment

Young Delta smelt being pelagic (open water residing) are at risk to exports from the South Delta under the regular standards and even more so under relaxed standards. Adding higher exports from the water transfers further adds to the risk. Regular without-relaxation conditions occurred as recently as the beginning of May 2014 and are expected to soon revert to the relaxed standard conditions through the summer. Delta smelt young were observed at both the state and federal south Delta export facilities in early May (Smelt Working Group May 12 meeting notes). The process in which young smelt are vulnerable to export is depicted in Figure 4. Early May exports were higher at 2500 cfs than the 1500 cfs of the May 2 State Board Order, because of the San Joaquin River water transfer. Exports of this magnitude, though only about 20% of capacity, draw water south from the central Delta (see my added yellow arrows in Figure 4) to the export facilities (added red circle). Delta outflow in this case was 4000 cfs (the regular standard), slightly higher than that of the 3000 cfs of the relaxed standard. Freshwater inflow in Figure 4 is depicted by my added blue arrows. (Note: freshwater inflow is net inflow and may represent only a small percentage of the actual tidal flows.) Delta smelt collected in the 20-mm Net Survey6 are depicted in Figure 4 by green dots. I also added the approximate location of the average 2 ppt salinity level (red line), which is very near the prescribed location of the regular water quality standard. Under the relaxed standards, this standard location (Emmaton) would move upstream to Three Mile Slough (the left most blue arrow). Note the relocation comes about by less freshwater flow coming down the Sacramento River channel at Three Mile Slough resulting in higher average salinity. With less westward transport young Delta smelt would be less inclined to move west to relative safety. With higher exports and more southerly transport, young smelt would be more inclined to move south across the Delta to the export pumps to their demise. Thus Delta smelt are more vulnerable to being drawn toward south Delta exports under the relaxed outflow standard and higher exports allowed under the transfer.

Response

The referenced Figure 4 presents delta smelt distribution between April 28 and May 1. The period for long-term water transfers is July-September, when temperatures warm to prohibitive levels in the Delta and delta smelt migrate westward to cooler temperatures.

See pages 3.7-33 through 3.7-37 of the 2014 Draft EIS/EIR for further details on temperature and smelt location.

Comment NG05-60

Comment

The young Longfin smelt distribution in the same early May 2014 20-mm Net Survey depicts a different risk pattern with Longfin concentrated further downstream in the Bay (Figure 5) than Delta smelt (Figure 4). Thus the Longfin were less vulnerable to the south Delta exports under these regular water quality standards (4000 cfs outflow and 2 ppt salinity at Emmaton). However, under relaxed standards with lower outflow (3000 cfs) and 2 ppt salinity at Three Mile Slough, Longfin concentrations would likely be further upstream in the central Delta and more vulnerable to exports. Increasing exports with water transfers would thus increase the risk to Longfin smelt albeit a lesser overall risk than that for Delta smelt.

Response

See response to Comment NG05-44.

Comment NG05-61

Comment

To further characterize the risk to smelt, I also looked at the early summer distribution Delta smelt in recent drought years 2009 (Figure 6) and 2013 (Figure 7). In each case outflows were slightly higher than the standards and Delta smelt were concentrated in the west and north Delta. With a change to the relaxed standards, Delta smelt in these two situations would likely shift with the 2 ppt salinity line (solid red line) upstream to a new location (dotted red line) where Delta smelt would be at much higher risk to south Delta exports. Indeed, Delta smelt were observed in south Delta export fish-salvage collections in all three periods with the normal standards, low-outflow, low-export conditions (Figures 8, 9, and 10).

Response

See response to Comment NG05-60.

Comment NG05-62

Comment

While Reclamation has not requested water transfers to occur under normal (non-relaxed) standards, under the Orders water transfers could be conducted in this manner. Such a situation may arise if higher abandoned flows from rainstorms increase reservoir storage or Delta inflows and thus provide for (allow) exports higher than 1500 cfs. In which case, water transfers would occur as they have in past years. With the addition of transfers, the risks to smelt would increase as exports would increase under the same outflow. Delta outflow requirements would be 4000 cfs or higher, plus the added exports would increase risk as they occur under the transfer rule of 100% of inflow compared to the normal export rule of 65% exports/inflows. It is my opinion that the added risk to Delta smelt from transfers is lower the higher the total exports, because the relative proportion of the transfers declines with increasing exports. Thus, the relative effect of transfers is higher under low exports because the transfers represent a higher relative proportion of the inflows and exports. The risk can be amplified if the federal contractor transfers represent only a portion of the potential transfers being proposed this summer.

Response

Model outputs indicate that conveyance through both the state and federal facilities for the range of potential transfer activities under the Proposed Action would not be higher than existing conditions in any water years or months other than the transfer period (during dry and critical years from July through September). Opportunistic flow increases from rainstorms are not likely to occur during these months, and the effects to delta smelt from increasing pumping for water transfers are analyzed in Section 3.7 of the EIS/EIR.

Comment NG05-63

Comment

To assess the potential risk to Delta smelt of adding summer transfers under relaxed standards I looked at the distribution of Delta smelt in these same surveys from the beginning of summer in recent drought years 2009 and 2013 to ascertain the potential risk to the Delta smelt from increased exports from transfers. It is my opinion that the risk to Delta smelt from transfers is greater under the new relaxed standards. As stated above, the relaxation of outflow from 4000 cfs to 3000 cfs moves the concentrations of Delta and Longfin smelt further to the east where they are more likely to be drawn to the south Delta exports. Adding 15-25% to Delta exports from the water transfers under these low-outflow, low-export conditions adds significantly to the risk. Smelt would be more likely to enter the north-to-south, cross-Delta flow-transport stream to the south Delta exports. It is for this reason that the summer export standard to protect all beneficial uses is 65% of Delta inflows. Allowing water transfers to occur at or very near 100% ignores this basic premise for protecting the beneficial uses including smelt, other fish, and their habitat-foodweb resources. If the federal contractor transfers represent only a portion of the potential transfers being proposed this summer, then the risk to Longfin and Delta smelt from higher transfer amounts would be even greater.

Response

The potential transfer activities analyzed under the Proposed Action would occur in water years and months in which smelt would not be present in the Delta due to high water temperatures. Further, Delta outflow would not be reduced in any month, and X2 would be the same or lower (which would be beneficial to smelt). Therefore, delta smelt would not be at higher risk of entrainment due to the potential transfer activities. See response to Comment NG05-41 and the explanation on pages 3.7-33 through 3.7-38 for additional information.

Comment NG05-64

Comment

Opinion on Question 1: Water transfers this summer under normal or relaxed water quality standards would significantly increase the risk to smelt residing in the Delta to being drawn into the south Delta and exported (lost) at the federal and state export facilities.

Response

See response to Comment NG05-63.

Comment NG05-65

Comment

Opinion on Question 2: Water transfers will increase the export of low salinity pelagic habitat; and degrade remaining habitat through increase water temperatures, reduced foodweb productivity, and lower turbidity in smelt nursery areas (from higher river inflows of water transfers); which would reduce growth and survival of Longfin and Delta smelt.

Response

See responses to Comments NG05-44 and NG05-63.

Comment NG05-66

Comment

Opinion on Question 3: The Delta smelt and Longfin smelt populations are at or near record low index levels. Any further stressors such as higher exports from water transfers on the population would significantly increase the already high risk of extinction. The Bay-Delta population of Longfin smelt risk of extinction though less than that of Delta smelt is also higher because the relaxed standards will shift their population upstream from the relative safety of Suisun Bay into the West and Central Delta where the effects of added transfers will be significantly higher.

Response

See response to Comment NG05-63.

Comment NG05-67

Comment

Opinion on Question 4: Water transfers under normal D-1641 standards and under normal dry year conditions with low Delta inflows, low Delta outflows, and low exports pose a significant risk to smelt because transfers have a higher proportional effect on the conditions. Under 1:1 criteria, transfers increase inflow and exports proportionally over outflow, which increases the risk to smelt.

Response

See response to Comment NG05-63.

Comment NG05-68

Comment

Opinion on Question 5: Water transfers in dry year conditions under relaxed D-1641 standards water quality standards would significantly increase the risk to smelt over that under the normal water standards. With even less outflow and a LSZ being further upstream and well into the cross-Delta flow of export water, transfers pose a much greater risk to the smelt

Response

See response to Comment NG05-63.

Comment NG05-69

Comment

(1) The EA for the 2014 North to South Water Transfers does not present sufficient information to assess the true nature and extent of impacts that water transfers may have on Longfin and Delta smelt. Specifically, the EA does not address the added risk from the changes to the water quality standards requested by Reclamation and approved by the State Water Board.

Response

The EA was completed in 2014 and is not included or incorporated by reference in this EIS/EIR. Section 3.7 of the EIS/EIR evaluates effects to fisheries.

Comment NG05-70

Comment

(2) With or without the relaxation of the water quality standards, the transfers are likely to have a significant adverse effect on Longfin and Delta smelt through increased direct loss of young smelt to south Delta exports and indirect loss from degradation of smelt critical habitat by higher water temperatures, lower turbidity, and reduced foodweb productivity.

Response

See responses to Comments NG05-44 and NG05-63.

Comment NG05-71

Comment

(3) State Board Orders and the April 18 Drought Plan call for changes in Delta water quality standards (D-1641) that increase already high risks to the Bay-Delta ecosystem including Longfin and Delta smelt. Adding water transfers under relaxed standards will add significantly to already high risks.

(3.1) Relaxed outflow standards in summer (reduced outflow from 4000 cfs to 3000 cfs) will reduce the amount of low-salinity habitat in the Delta critical to Longfin and Delta smelt (two listed species that reside primarily in the low salinity zone in late spring and summer), and reduce migration cues for smelt that must pass through the Delta to their fall-winter nursery areas in upper San Francisco Bay. In addition to the decline in area of the low salinity zone, the low salinity zone will be located further upstream (to the east) in the Central and Northern Delta which will result in poor water quality (high water temperatures that may reach lethal levels for smelt, and higher concentration of chemicals including ammonia and pesticides potentially lethal to smelt and their food organisms). Further deterioration of the low salinity zone would occur from higher water temperatures, lower turbidity, and poor Delta foodweb production, as well as the potential upstream expansion of invasive non-native Bay clams. Lower turbidity will reduce smelt growth and survival, and lead to increased predation by nonnative fish species on native fish species including smelt. In July there would be no protection for smelt and other pelagic Bay-Delta fish species and their plankton food supply from planned Delta exports that include water transfers. The overall effects will result in potentially dramatic changes to the Bay-Delta endangered fish populations that will last for decades to come.

(3.2) The proposed change in the lower Sacramento agricultural water quality standard from Emmaton to Three Mile Slough (necessary under the relaxed lower Delta outflow) will raise Delta salinities and allow further reductions in Delta outflows to the detriment of smelt, salmon, and steelhead. Salinity at Emmaton and Rio Vista in the lower Sacramento River will more than double (EC will go from 2 to 5 millimhos at EMM). Salinity in water exported from the south Delta including transfer water will also be higher with relaxed standards.

Response

The relaxed standards in 2014 were the result of a unique hydrologic condition. The purpose of this EIS/EIR is to analyze the potential future impacts of the action alternatives. Relaxation of standards is not likely to occur on a regular basis, and would occur only under extreme conditions. The EIS/EIR is analyzing the potential of the action alternatives to reduce Delta water quality beyond the No Action/No Project Alternative. The action alternatives would not affect the CVP and SWP's ability to meet water quality standards in the Delta (or reduced standards in the Delta) because the transfers would be operated with carriage water expressly to maintain the water quality. Additionally, water transfers would increase Delta outflow during the July through September transfer window, which could help alleviate the commenter's concerns about low outflows during extreme dry conditions.

Comment NG05-72

Comment

(4) Only federal Central Valley Project water transfers were included in the Environmental Assessment. Significant other transfers are possible this summer, thus no adequate cumulative effects assessment was conducted by Reclamation.

Response

See Chapter 4 and Section 3.7.6, Cumulative Effects for a description of other reasonably foreseeable transfers anticipated during the period of analysis in the EIS/EIR.

Comment NG05-73

Comment

"Special status species would not be affected by the Proposed Action beyond those impacts considered by the BOs and current consultations with NMFS and USFWS." Neither biological opinion prescribes protection for covered species during the summer. However, both opinions recognize existing water quality standards (mainly 65% export/inflow and Delta salinity standards) as valid protections. (e.g., USFWS BO, pages 29, 128)

Response

Because neither delta smelt nor longfin smelt would be present in the area of influence of the export facilities during the transfer period and neither Delta outflow or X2 position would change, the potential range of transfer activities under the action alternatives would not affect these species. See pages 3.7-33 through 3.7-38 of the 2014 Draft EIS/EIR for further explanation.

Comment NG05-74

Comment

"Special status fish species are generally not in the Delta during the transfer period (July-September)." Longfin and Delta smelt both will reside in the Delta under the relaxed water quality standards as they do in most drought years. Nearly the entire Delta smelt population will reside within the Delta this summer with or without the approved changes to the water quality standards.

Response

See response to Comment NG05-73.

Comment NG05-75

Comment

"Effects to these fish species from transferring water during this timeframe were considered in the NMFS and USFWS BOs." While water transfers up to 600,000 acre-feet were considered in the BOs, such water transfers were assumed to occur under existing water quality standards, not under the specific relaxed standards of: 3000 cfs outflow; and ag-salinity standard moved 2.5 miles upstream from Emmaton to Three Mile Slough.

Response

See responses to Comments NG05-18 and NG05-71.

Comment NG05-76

Comment

"Transfers would slightly increase inflow into the Delta, but would not change outflow conditions compared to the No-Action Alternative." Delta outflow would be controlled by new relaxed standard of 3000 cfs. Delta inflows from the Sacramento River would increase when Sacramento Valley contractors do not divert their allocated water and instead allow it to pass through to the Delta for export.

Response

Section 3.2 evaluates Delta outflow effects on water quality. See responses to Comments NG05-18 and NG05-71.

Comment NG05-77

Comment
"The incremental effects of transfers on special status fish species in the Delta from water transfers would be less than significant." The incremental effect of transfers will be significant, especially under the conditions expected with relaxed standards.

Response
See responses to comments NG05-18 and NG05-71.

Comment NG05-78

Comment
"The Proposed Action will not result in cumulative impacts to any resources previously described." The cumulative effect of all transfers would likely have serious consequences to the smelt populations incrementally above that of the relaxed standards. The Proposed Action being one of the potentially larger transfers would have one of the greatest incremental effects.

Response
The cumulative impacts analysis is presented in Section 3.7.6. For the reasons stated in that section, the incremental contribution of the range of potential transfer activities analyzed in the EIS/EIR would not be cumulatively considerable and cumulative impacts would be less than significant. See responses to comments NG05-18 and NG05-71 for additional information about why the Proposed Action would not have cumulatively considerable impacts. See Common Response 14 for additional information.

Comment Letter NG06, Robyn Difalco, Carol Perkins, Butte Environmental Council, Citizens of Water Watch of Northern California, Butte-Sutter Basin Area Groundwater Users

Comment NG06-1

Comment
Butte Environmental Council (BEC) and the undersigned groups and individuals submit the following comments concerning Long---Term Water Transfers. The comments focus on the legal issues surrounding groundwater substitution water transfers and the technical deficiencies found within Section 3.3 and Appendix D of the EIS/R. Concerned citizens of the northern Sacramento Valley recognize that it is long past the time needed to realize the limitations and variability of our natural water supply. We must learn to live within the confines of that system and stop the exploitation of groundwater and strive to improve protections of this critical, fail-safe source of life.

BEC's policy statement regarding water identifies our concerns for Northern Sacramento Valley water resources. Specifically, we believe that citizens should have control over local resources; that Northern California's watersheds must be protected for future generations; and that its ground and surface water must not be exported out of the area to address misuse, waste, and over-allocation elsewhere in California. The undersigned groups and individuals submit these comments holding to one conviction:

The EIS/R should be withdrawn from public circulation until the issues listed herein can be adequately addressed.

Response
Section 3.3 of the EIS/EIR contains a detailed and extensive analysis of potential impacts of the action alternatives to groundwater resources. The analysis found the potential for significant effects to groundwater levels and subsidence; however, Section 3.3 also includes Mitigation Measure GW-1 to avoid and reduce these significant effects. See Common Responses 6 and 7 for additional information.

Comment NG06-2

Comment
A leading-edge organization for hydrogeologists and groundwater professionals recently posted an opinion on the declining groundwater conditions across the state.

Thirty-six alluvial groundwater basins that have a high degree of groundwater use and reliance may possess greater potential to incur water shortages as a result of drought. The basins exist in the North Coast, Central Coast, Sacramento River, Tulare Lake, and South Coast hydrologic regions (Groundwater Resources Association of California, Hydrovisions Summer 2014).

Response
Section 3.3 describes the affected environment for groundwater resources in the area of analysis and also evaluates effects to groundwater resources as a result of the proposed alternatives, including the Proposed Action.

Comment NG06-3

Comment
This EIS/R is inadequate and lacks clarity concerning findings of “no injury to other legal users of the water involved” and “no unreasonable effects on fish and wildlife.” Many of the inhabitants of the northern Sacramento Valley are solely dependent on and are “legal users of water” from the underlying strata, and varying and often disparate aquifer systems of the Sacramento Valley groundwater basin.

Californians have approved millions in bond funding since 2000 for projects that should help her citizens develop and implement strategies to improve water quality, availability, and affordability. These funds should be allocated and spent prior to the development of any project for which the sole objective is focused on ‘supplemental water.’ California’s water supply is over allocated – the very nature of that adjective means that there exists no supplemental water for anyone or anything.

Response
Potential effects to water users of the "underlying strata" are assessed in Section 3.3, Groundwater Resources. The groundwater analysis includes a modeling effort with multiple tools to simulate potential effects to groundwater levels, groundwater quality, and subsidence. Part of the purpose and need for this effort is to provide immediate water supplies to users that are experiencing shortages, so waiting until bond funding is

fully expended would not meet the purpose and need. See also Common Response 3 for additional discussion specific to the Sacramento Valley.

Comment NG06-4

Comment

The LTWT EIS/R is contrary to laws encompassing NEPA, CEQA and California Water Code.

The EIS/R should be withdrawn and rewritten to reflect a programmatic EIS/R: The very act of invoking Sec 1745.1 of the California Water Code necessitates a programmatic EIS/R. The document must follow NEPA guidelines for length and tiering as well as detailing the plan for the development and delivery of project level EIS/R(s).

NEPA regulation 40 CFR 1502.7 declares that the text of an EIS for "proposals of unusual scope or complexity shall normally be less than 300 pages." It is impossible for organizations interested in thoughtfully responding to the LTWTP documents to be staffed for a thorough NEPA/CEQA review based on the unreasonable size of the released documentation.

NEPA 40 CFR 6.200(f) To eliminate duplication and to foster efficiency, the Responsible Official should use tiering (see 40 CFR 1502.20 and 1508.28) and incorporate material by reference (see 40 CFR 1502.21) as appropriate.

Response

The California Water Code does not specify that a program-level environmental document is required. The range of potential activities analyzed under the Proposed Action does result in an EIS/EIR that is longer than 300 pages, but it includes many analyses requested by commenters during the scoping period. See Common Response 14.

Comment NG06-5

Comment

Associated tiered documentation must be included and show that transfers are consistent with applicable Groundwater Management Plans (GMPs) or, in the absence of a GMP, the transferring water supplier can show a transfer will not create, or contribute to, conditions of long-term overdraft in the groundwater basin

Response

Section 3.3.1.2.3 has been revised to include all pertinent groundwater substitution transfers related ordinances and GMP's within the area of analysis (i.e. area underlying substitution pumping).Section 3.3 evaluates long-term effects to groundwater levels and Mitigation Measures GW-1 sets forth monitoring and mitigation measures to avoid potentially significant effects to groundwater resources within the area of analysis. See Common Response 6 for additional information.

Comment NG06-6

Comment

Groundwater substitution transfers are illegal if sourced from most Sacramento Valley groundwater basins Section 1220 of the California Water Code states that groundwater cannot be exported from these basins unless pumping complies with a GMP. It is inadequate to simply list associated GMPs in a table (Table 3.3-1); each GMP listed must be included with the EIS/R documentation set and clearly show approval 'by vote from all counties that lie within' the Sacramento Valley groundwater basin.

"states that groundwater cannot be exported from these basins unless pumping complies with a GMP, adopted by the county board of supervisors in collaboration with affected water districts, and approved by a vote from the counties that lie within the basin. (EIS/R p. 3.3-5)"

Response

California Water Code 1220 prohibits direct export of groundwater from within the Sacramento and Delta-Central Sierra Basins. The project does not propose direct export of groundwater. Groundwater substitution transfers occur when sellers choose to pump groundwater in lieu of diverting surface water supplies, thereby making the surface water available for transfer.

Section 3.3.1.2.3 has been revised to include all pertinent groundwater substitution transfers related ordinances and GMP's within the area of analysis (i.e. area underlying substitution pumping). Groundwater Substitution Transfers discussed in the EIS/EIR will comply with all county ordinances listed in Section 3.3.1.2.

Comment NG06-7

Comment

According to the CVPIA Section 3405(a), the following principles must be satisfied for any transfer:

(1) Transfer will be limited to water that would be consumptively used or irretrievably lost to beneficial use;

(2) Transfer will not have significant long-term adverse impact on groundwater conditions; and

(3) Transfer will not adversely affect water supplies for fish and wildlife purposes.

Groundwater substitution transfers do not qualify under the intent of the first item. Groundwater substitution transfers involve foregoing the use of surface water and pumping groundwater. But this requires use of a water source that was not or would not be consumptively used given access to surface water rights. Nor is groundwater available that was irretrievably lost to beneficial use. Neither the natural recharge of groundwater nor the 'deep percolation' of excess from applied irrigation water has been defined in California water law as water irretrievably lost to a beneficial use. This first limitation provides no water under groundwater substitution transfers by intent of the law.

Response

Groundwater substitution transfers the sellers' surface water that would have been consumptively used absent the transfer; therefore, these actions meet this provision of the CVPIA. Additional discussion regarding the CVPIA is provided in Section 1.3.1.1 of the EIS/EIR.

Comment NG06-8

Comment

The EIS/R does not provide any defining characteristics of significant long-term adverse impacts to groundwater conditions and fails to adequately identify the current groundwater conditions of the Sacramento Valley. As such, it is impossible for decision makers to decide if impacts might occur from LTWT and to separate from impacts occurring presently.

Response

Significant impacts to groundwater resources analyzed in Section 3.3 (and additional details in Section 3.3.2.2) are impacts that would (1) result in substantial adverse environmental effects or effects to non-transferring parties; (2) cause permanent land subsidence; or (3) degrade groundwater quality such that it would exceed regulatory standards.

Current groundwater conditions within the area of analysis are discussed in Section 3.3.1.3; see Common Response 4. Section 3.3.2.4 describes impacts from the Proposed Action.

The significance criteria for Section 3.3 were clarified to indicate that effects to the environment or non-transferring parties must be substantial to be characterized as significant. This change was made to be consistent with CEQA guidelines, which indicates that a substantial change to a resource leads to a significant impact. This change does not affect the findings of significance in the groundwater analysis, but rather clarifies that those findings of significance are based on a substantial change.

Comment NG06-9

Comment

The EIS/R fails to quantify the interactions between groundwater and surface water, which is known to be a controversial and difficult process. Lacking an understanding of this set of mechanisms leaves public agencies without the proper tools to assess the adverse affects to water supplies for fish and wildlife purposes under current groundwater usage. Increasing groundwater pumping under the climatic stresses of dry and critically dry water years should be unlawful.

Response

The EIS/EIR estimates the groundwater and surface water interaction using the SACFEM2013 groundwater model (see Appendix C) and the Transfer Operations Model (see Appendix D). The linked models estimate the increased recharge to the groundwater aquifer associated with groundwater substitution transfers, and how that recharge could affect stream flows. The model results feed into analyses in multiple sections of the EIS/EIR. Section 3.1.2 analyzes the impacts to water supply associated with the interaction between surface water and groundwater. Section 3.7 assesses potential impacts to fisheries from altered stream flows, and Section 3.8 analyzes potential impacts to riparian vegetation.

Comment NG06-10

Comment

The project description has changed and the EIS/R fails to make this clear. What was stated during and subsequent to the scoping process are in fact no longer correct. It is understood where the 600,000 acre-feet originates. It is the same value that the Bay Delta conservation Plan promotes. What is not clear is why the May 2011 Scoping Report states an entirely different value than documented within this EIS/R.

Commenters were concerned that transfers may include up to 600,000 acre-feet of water annually; however, this EIS/EIR will include a much smaller transfer volume approximately 100,000 to 150,000 acre-feet). [Long-Term Water Transfers: Scoping Report. BOR & SLDMWA. May 2011.]

Response

The Scoping Report described that transfers were limited to an upper limit of 600,000 acre-feet, but would likely involve a much smaller annual volume of 100,000 to 150,000 acre-feet. The 2014 Draft EIS/EIR analyzes an upper limit of 511,000 acre-feet, but also explains in Sections 2.3.2.2, 2.3.2.5, and 2.3.2.6 that transfers in a given year would likely be substantially less than this upper limit.

Comment NG06-11

Comment

Federal regulation 40 CFR 1501.1 requires early NEPA integration into planning process prior to the preparation of the EIS emphasizing cooperative consultation among agencies.

> (b) Emphasizing cooperative consultation among agencies before the environmental impact statement is prepared rather than submission of adversary comments on a completed document.

Response

Reclamation worked to satisfy these requirements by reaching out to agencies and potentially affected parties through the scoping process and meetings on the 2014 Draft EIS/EIR. On December 28, 2010, Reclamation published a Notice of Intent in the Federal Register, and on January 5, 2011, a Notice of Preparation was published with the California State Clearinghouse. These documents started the public scoping process, which is designed to solicit feedback from agencies and potentially affected parties. Public scoping meetings were held between January 11 and 13, 2011 in the cities of Chico, Sacramento, and Los Banos, California. Reclamation and SLDMWA prepared the "Long-Term Water Transfers EIS/EIR Public Scoping Report" (dated May

2011), which summarized the comments and concerns raised during the meetings as well as written comments obtained during the public scoping period.

Comment NG06-12

Comment

Either the Bureau has failed to develop an understanding of the hydrologic system of the northern Sacramento Valley and has abused the mandates of NEPA (40 CFR 1501.1(b)); or the California Department of Water Resources, as a responsible agency to LTWT, is complicit in covering the adverse hydrologic conditions existing in the Sacramento Valley present day.

Response

See Common Response 4.

Comment NG06-13

Comment

Cumulative impact analysis fails to take into consideration all programs present and future: Sec. 1.7 of the EIS/R lists issues of known controversy, yet the cumulative impacts to Water Supply, Water Quality and Groundwater Resources are missing many critical projects and list projects that will not increase dependence on groundwater resources.

The cumulative effects analysis must include all water transfers and programs that result in additional groundwater pumping in the Sacramento region. (EIS/R p. 1-19)

Glenn-Colusa Irrigation District Groundwater Supplemental Supply Project; DWR Future Water Supply Project; and the Bay Delta Conservation Plan currently use groundwater and will increase the exploitation of groundwater supplies from the Sacramento Valley.

Response

The cumulative analysis considers activities expected to be implemented during the timeframe of the range of potential transfer activities evaluated in this EIS/EIR, which is from 2015 to 2024. The BDCP would not be implemented in this timeframe and is not considered in the cumulative analysis. The Glenn Colusa Irrigation District Groundwater Supplemental Supply Project has been added to the cumulative analysis. It is unclear what the DWR Future Water Supply Project is. DWR is working on multiple water storage projects with Reclamation that will not be complete within the timeframe of analysis for the range of potential transfer activities evaluated in the EIS/EIR.

Comment NG06-14

Comment

The purpose and need behind this project is nebulous and imprecise: Facilitating water transfers from willing sellers upstream of the Delta to points south of the Delta are illegal, wasteful, and unnecessary; and do not of themselves define a reasonable purpose for a project.

The purpose of the Proposed Action is to facilitate and approve voluntary water transfers from willing sellers upstream of the Delta… (EIS/R p. 1-2) Water users all over California have a need for immediately implementable and flexible solutions to water supply problems. These problems include shortages from inappropriate allocation of natural supplies; the risks inherent in living in a Mediterranean climate; and poorly envisioned projects that have left behind a wake of environmental destruction and have decimated surface and groundwater supplies.

Water users have the need for immediately implementable and flexible supplemental water supplies to alleviate shortages. (EIS/R p. 1-2) No project should be allowed that focuses on the 'needs' of a few. This seems to be the antithesis of the purposes of NEPA and CEQA, which are set in place to ensure protection of the environment and benefit to the public. There would be no need for a project if California were to mandate that we live within the means of our natural water supply. The timing and place of water flow has been significantly altered, to the detriment of the environment, throughout California from the construction of dams and canals and use of rivers as modified canals. These countless acts have in turn created a limitation on our water supply. The placement and slowing of water in unnatural environments at unnatural times has resulted in water quickly evaporating or percolating to replenish overdrafted groundwater or both.

Response

See response to Comment LA02-4.

Comment NG06-15

Comment

The following issues render this EIS/R incomplete; inadequate to mandated findings of "no injury to other legal users" and "no unreasonable effects on fish and wildlife" under NEPA and CEQA; and misleading: these issues preclude meaningful public review.

The EIS/R should be withdrawn from public circulation until the issues listed here can be adequately addressed.

1. The Sacramento Valley groundwater basin is inadequately characterized to assess findings of significance under NEPA and CEQA.

2. Well logs included in the EIS/R depict only very shallow aquifers of the region.

3. EIS/R fails to adequately describe the existing hydrologic conditions of the Sacramento Valley.

4. The selection process for a 'reasonable' range of alternatives is biased.

5. Mitigation methods are inadequate to address the significant impacts resulting from project alternatives.

Response

The issues cited in the comment were addressed in the 2014 Draft EIS/EIR or have been updated in the Final EIS/EIR. Additional information describing the groundwater basin has been added to Section 3.3 in response to comments; however, this information does not change the characterization of the basin or the impact descriptions. See Common Response 4 regarding existing hydrologic conditions. The alternative selection process is based on the purpose and need and project objectives, and is documented in detail in Appendix A. Commenters did not suggest new alternatives not considered in the 2014 Draft EIS/EIR that would reduce the environmental effects of the action alternatives. Mitigation Measures WS-1, GW-1, AQ-1, and AQ-2 have been clarified in response to comments. See Common Responses 6, 7, 8, and 10 for additional information. These revisions do not trigger the criteria for recirculation set forth in CEQA Guidelines section 15088.5, and recirculation is not necessary.

Comment NG06-16

Comment

BEC incorporates by reference within these comments those of several other correspondents regarding the LTWT.

Response

In accordance with CEQA, the Final EIS/EIR provides written responses to all comments received.

Comment NG06-17

Comment

1. The Sacramento Valley groundwater basin is inadequately characterized to assess findings of significance under NEPA and CEQA for the LTWT EIS/R.

The EIS/R inaccurately and detrimentally characterizes the Sacramento Valley as a large, contiguous, and homogenous groundwater basin that extends from a boundary just north of Red Bluff south to the Cosumnes River. The description of depth to base of fresh water essentially paints the aquifer system as one large alluvial-illed ‘bathtub.’ Inconsistencies exist throughout the EIS/R that understates the complex nature of the aquifer systems that exist within the basin boundaries of the Sacramento Valley. And, statements such as follows, solidify the intention of this document to misrepresent the groundwater system of the Sacramento Valley (see further discussion of this under Issue 3. below).

Figure 3.3-8 and Figure 3.3-9 show the location and groundwater elevation of select monitoring wells that portray the local groundwater elevations within the Sacramento Valley Groundwater Basin. (EIS/R p. 3.3.-22)

The EIS/R fails to provide adequate discussions concerning the unique surface hydrology, geologic and hydrogeologic characteristics of the subbasins found within the Sacramento Valley. For example, there exists no mention of the confining layers and varying stratigraphy created under differing formation periods and depositional environments of the Tuscan Formation. The data and analyses incorporated in the EIS/R are cherry-picked, providing a 30,000-foot view of the basin and fails to provide a rigorous definition of the environment and groundwater conditions of the valley today. This oversight results in a suspect analysis. The process of revealing or exposing only what is favorable to the Lead Agencies shrouds the methodology of the EIS/R, leaving the public and other agencies inadequate tools to assess the results.

Response
Section 3.3.1.3.2, Geology, Hydrogeology, and Hydrology does not describe the fresh-water bearing formation within the Sacramento Valley as a homogenous and contiguous basin. Figures 3.3-8 and 3.3-9 in 2014 Draft EIS/EIR (revised to Figures 3.3-8 a, b, and c in the Final EIS/EIR) have been clarified to show more monitoring well locations. See Common Response 4 for additional information.

Comment NG06-18

Comment

2. Selected well logs included in the EIS/R depict only the very shallow aquifers of the region. Inclusion of this data simply shrouds reality, weakening any credence the associated assessment and analysis may have established with this effort.

The six (6) monitoring wells selected to "portray" local groundwater elevations within the northern Sacramento Valley groundwater basin are all very shallow. The average depth to water below ground surface (bgs) ranges between 5″ and 45″ bgs. While the historical low of any of the wells never exceeded 100″ bgs. These wells do not represent the groundwater elevations nor does the discussion surrounding the hydrographs represent groundwater conditions currently found throughout the northern Sacramento Valley.

Shallow wells shown in the EIS/R may show an endemic decline from underlying aquifers "recovering" water and a long-evolving change in groundwater storage capacity. In the case of confined aquifers, "recovery" might be dewatering the confining layers. Recharge and recovery are not the same hydrologic mechanisms and differ in the ability to ascertain the health of a groundwater production zone. Recovery of groundwater levels in a production zone is not indicative of a balanced aquifer system.

Response
See Common Response 4. Additional groundwater contour maps for the deep, shallow, and intermediate zones have also been included in Appendix D.

Comment NG06-19

Comment
Figure 1 shows a significant decline and little recovery that occurred during the summer of 2007. The City of Chico maintains a very steady draw from their groundwater production wells. These hydrographs depict a stress that has altered the efficacy and perhaps the storage capacity of the production zone that these monitoring wells represent. The questions this EIS/R fails to addressed are considerable. What caused this irreversible change in the groundwater source? What affects does this impact have on the quality of the water sourced from this production zone? What affects will this have on the Central Plume? How many other instances of similar significance have occurred throughout the Sacramento Valley groundwater basin? To what

extent will similar impacts occur under the pumping proposed through the LTWT throughout the Sacramento Valley groundwater basin?

{See comment letter for Figure 1: Monitoring wells of the Central Plume for intermediate and deep aquifer zones.}

Response

There would be no transfers pumping near the City of Chico. The nearest substitution pumping well is located approximately 10 miles from Chico city limits. Impacts analyzed in Section 3.3.2.4 (See Figures 3.3-28 through 3.3.-33) indicate no drawdown from the Proposed Action would be incurred near the City of Chico.

The affected environment section has been revised to clarify decreasing groundwater level trends noticed across the Sacramento Valley due to current hydrologic conditions. Figure 3.3-10 (renamed as Figure 3.3-14(a)) and new Figure 3.3.-14 (b) show the cumulative change in storage as simulated by CVHM and C2VSim models respectively. Though the conclusions drawn by CVHM and C2VSim differ with respect to simulated storage capacity in the San Joaquin Valley, both models indicate storage capacities in the Sacramento Valley have remained steady since the 1920s.

Impacts to groundwater levels and groundwater quality due to groundwater substitution pumping under the proposed action were evaluated in Section 3.3.2.4.

Comment NG06-20

Comment

3. EIS/R fails to adequately describe the existing hydrologic conditions of the Sacramento Valley. Modeling lacks appropriate boundary conditions and fails to evaluate stresses given current and a best assessment of future conditions.

Use of the SACFEM2013 model to simulate stresses on regional surface and subsurface hydrology due to additional groundwater pumping over baseline from groundwater substitution transfers was a useless analysis of the past. Baseline conditions are not delineated and it is unclear if they represent the modeling period or the proposed period for transfers. It is necessary to model impacts under the most accurate assumptions of the hydrologic conditions surrounding the transfer period to understand and mitigate for the most likely range of stresses. The assessment process fails to do just that.

Standard methods of study for groundwater basins are not easily applied to the Sacramento Valley. Standard assumptions cannot account for the hydrogeologic complexity, such as anisotropy, associated with the stratigraphy and range of geologic materials present in the Tuscan, Mehrten and Tehama formations. Numerical groundwater models are intended to help shed light on the possible range of responses a system might exhibit over space and time given predictable changes in stresses. They should not be used to support decisions that may jeopardize the long-term sustainability of water resources of the northern Sacramento Valley.

Response

See response to Comment SA03-7.

Comment NG06-21

Comment

The following statements from the EIS/R show the vagueness surrounding results of the modeling and analyses. The known or estimated impacts are not clearly quantified or defined making it impossible for public officials to assess potential impacts to their jurisdictions. Specifically, terms like long-term recovery and short- term declines must be defined and quantified for every legal user of water supplies sourced above and below the surface.

…most of the recovery near the pumping zone occurs in the year after the transfer event. Groundwater levels return to approximately 75 percent of the baseline level five years after the single year transfer event in WY 1981 and between 50-75 percent six years after the multi-year transfer event… (EIS/R p. 3.3-70)

…the maximum groundwater level declines resulting from substitution transfers within the Sacramento Valley Groundwater Basin range widely depending on the distance from the transfer groundwater pumping.

Seasonal groundwater level declines would be greater than the typical fluctuation when substitution pumping is included, indicating the potential for adverse effects. (EIS/R p. 3.3-81)

The EIS/R fails to define and quantify the following terms: seasonal groundwater level declines and typical fluctuation (there is nothing typical in the changes experienced presently in this valley, see the decadal groundwater elevation changes in Fig. 2.{See comment letter for Figure 2}). What are the “baselines” for the supporting modeling and analyses behind this EIS/R? Were these “baselines” established under climatic and hydrologic conditions of nearly a half century ago?

Response

Long-term refers to trends that are exhibited over a period of several years or more. Short-term trends are on the order of one year or less. The recovery percentages mentioned in this comment were developed from review of the hydrograph figures in Section 3.3 showing the difference in groundwater levels between the no action and proposed action alternatives. The groundwater level change contour figures in Section 3.3 show the spatial distribution of the change varies with location: the farther from the pumping well, the less the predicted change in groundwater level. Seasonal groundwater level changes involve a wide variety of factors including rainfall, wetting of streams, and irrigation pumping. The hydrograph figures in Section 3.3 show the typical seasonal changes in groundwater water (i.e., within a year). These changes can be reviewed for years when transfers occur and when they do not. Figure 3.3-27 shows the years when groundwater substitution pumping is simulated. The baseline condition is a transient model simulation without transfer pumping as simulated in the SACFEM2013 model. Appendix D provides additional information on the SACFEM2013 model, and Appendix H includes the SACFEM2013 User’s Manual.

Comment NG06-22

Comment

The potential for adverse drawdown effects would increase as the amount of extracted water increased. The potential for adverse effects would be higher during dry years, when baseline fluctuations would already be large and groundwater levels would likely be lower than normal. (EIS/R p. 3.3-81)

The EIS/R fails to define and quantify the adverse drawdown effects. What are the differences in stresses to the entire system under dry and critically dry years? It is disingenuous to document, in a time when wells are going dry across the Sacramento Valley, that reduction in well yields is the greatest concern the modeling and analyses behind this EIS/R has uncovered.

Response

Figure 3.3-27 shows the years when groundwater substitution pumping was simulated in the numerical models. The pumping occurred during dry and critical years. The timing of this pumping can be correlated to the hydrograph Figures 3.3-34 through 3.3-38 and in Appendix G. It is important to note that the rate of aquifer recovery following a groundwater substitution transfer is dependent on the hydrology of the period following the transfer. Wetter trailing periods will cause a faster recovery than a drier trailing period. The simulation of six consecutive transfer years (1987 through 1992) is provided to simulate transfer occurring during a longer-term dry period.

Comment NG06-23

Comment

4. The selection process for a ‘reasonable’ range of alternatives is biased.

It appears that alternatives were studied only from the perspective of benefits to water supply and not to the full intent of NEPA and CEQA. The process is unreasonably biased toward the narrow interests of the lead agency SLDMWA and does not adequately protect the region from which the water will be produced. The EIS/R must show substantial treatment, that is rigorous exploration and objective evaluation, of all alternatives.

Metrics used to evaluate alternatives and establish a purpose and need for this project are biased and lack objective criteria (Table 2-1, p. 2-4). Meeting the intent of the CVPIA mandates, such as retiring lands would better serve the entire state and would provide immediate and long-term benefits. All Californians are in need of flexibility in the water supply system during dry or critically dry years. Those of us dependent on groundwater should not fear the extraction of their resource for sale by willing sellers during a time when its use will increase.

Flexibility is not a reasonable or fair metric. There are many other projects the Bureau and SLDMWA can develop to secure the water necessary to meet the needs of the region that are based on hydrologic reality of that region.

Robbing one region of their primary source of water to provide another region with additional water is not a reasonable or fair metric to evaluate alternatives in the context that has been established through this project. For example, Agricultural Conservation in the seller service area somehow meets all three---evaluation metrics while Ag conservation in the buyer service region does not.

Immediate: the term proposed for this EIS/EIR is 2015 through 2024. This period is relatively short, and measures need to be able to provide some measurable benefit within this time period.

Flexible: project participants need water in some years, but not in others. They need measures that have the flexibility to be used only when needed.

Provide Substantial Water: project participants need measures that have the capability of providing additional water to regions that are experiencing shortages. (EIS/R p. ES-7; 2-3; 2-4; and 4-1)

Response

See response to Comment SA02-1. Flexibility and providing water are included as metrics because they represent the purpose and need and project objectives for undertaking the project. In addition, the Lead Agencies considered whether alternatives could minimize environmental effects of the proposed action before identifying alternatives to carry forward for more detailed analysis (as described in Section 2.2.2).

Comment NG06-24

Comment

5. Mitigation methods are inadequate to address the significant impacts resulting from project alternatives.

A ‘reasonable range’ of alternatives was limited by a poorly defined purpose and the screaming bias inherent in the charters of the Lead Agencies’. Environmental impacts and consequences were inappropriately analyzed and lack a fair cumulative analysis. The baseline conditions were not identified or assessed or are nonsense and the existing or known projects dependent on increasing the exploitation of the Sacramento Valley groundwater basin were not included. The EIS/R fails to adequately define the resources that might be impacted: stream flow depletions; irrecoverable groundwater losses; subsidence; and water quality changes in surface and the subsurface. The EIS/R fails to provide a clear line of reasoning in its conclusions related to the direct, indirect, and cumulative impacts. The EIS/R fails to adequately mitigate for potential or known impacts from the project alternatives on the physical, natural, and socioeconomic environment of the region.

Response

In response to comments, information elaborating on the description of the affected environment has been included in the Final EIS/EIR (when available). Similarly, some commenters suggested specific topics that could be strengthened within the mitigation measures. These comments led to clarifying edits to Mitigation Measures WS-1, GW-1, AQ-1, and AQ-2. See Common Responses 6, 7, 8, and 10 for additional information.

Comment NG06-25

Comment

NEPA requires that mitigation involve:

§ 1508.20 Mitigation. Mitigation includes: (a) Avoiding the impact altogether by not taking a certain action or parts of an action. (b) Minimizing impacts by limiting the degree or magnitude of the action and its implementation. (c) Rectifying the impact by repairing, rehabilitating, or restoring the affected environment. (d) Reducing or eliminating the impact over time by preservation and maintenance operations during the life of the action. (e) Compensating for the impact by replacing or providing substitute resources or environments.

Groundwater substitution transfers could decrease flows in neighboring surface water bodies and alter existing subsurface hydrology resulting in a variety of effects to groundwater levels, land subsidence, and groundwater quality. The EIS/R indicates repeatedly that groundwater basins require an unknown amount of time to recharge following a transfer.

The reductions in CVP and SWP supplies are not complete within one year, but can extend over multiple years as the groundwater aquifer refills. (EIS/R p. 3.1-17)

a. Streamflow deletion: Applying a Streamflow Depletion Factor is not a mitigation method (SW-1). It simply and often erroneously identifies how much surface water might be lost due to groundwater pumping. It is a method of charging willing sellers for water the state owns (stream flow) that is assumed to be lost to groundwater pumping. According to Trevor Joseph, DWR, streamflow depletion factors are controversial and little understood with regard to surface and groundwater interactions and the time delays associated with "additional pumping."

Response

As described in Section 3.1.2.4.1, the effects of streamflow depletion on water supplies are uncertain, and are largely dependent on the hydrologic conditions after a transfer (which are unknown when the transfer is negotiated). Mitigation Measure WS-1 is the best available method to mitigate the potentially significant impacts of the alternatives to water supplies as a result of surface water-groundwater interactions. Mitigation Measure WS-1 is not attempting to address all possible impacts associated with surface and groundwater interaction; instead, it focuses solely on the potentially significant effects to SWP and CVP supplies associated with this interaction. The potential effects to other environmental resources are analyzed in Sections 3.3, Groundwater; 3.7, Fisheries; and 3.8, Vegetation and Wildlife. See Common Response 8 for additional information.

Comment NG06-26

Comment

Dependence on GMPs to reduce the significance of impacts as a result of groundwater substitution water transfers is not an adequate mitigation method (GW---1). In 2014, DWR and the California Water Foundation performed separate studies to assess the current state of groundwater management planning in California. Both organizations found GMPs lacking mandated components necessary to promote good groundwater management practices and monitor groundwater levels. DWR found plans that include all California Water Code requirements cover just 17% of the groundwater basins defined in Bulletin 118.

Response

See Common Response 6.

Comment NG06-27

Comment

Subsidence: The potential for serious impacts due to subsidence are clearly defined by DWR's latest report (Summary of Recent, Historical, and Estimated Potential for Future Land Subsidence in California, CA Department of Water Resources, October 2014). The fact that this report is not referenced is problematic, shedding more light on the egregious analytical shortcomings of this EIS/R.

Groundwater extraction for groundwater substitution transfers would decrease groundwater levels, increasing the potential for subsidence. Most areas of the Sacramento Valley Groundwater Basin have not experienced land subsidence that has caused impacts to the overlying land. (EIS/R p. 3.3-82)

Response

This document was not available in time to add data to the 2014 Draft EIS/EIR. In response to this comment, figures and data from DWR's Summary of Recent, Historical, and Estimated Potential for Future Land Subsidence in California have been included in Section 3.3.

Comment NG06-28

Comment

Water quality: The environmental assessment surrounding the LTWT completely ignores groundwater quality issues. There are numerous plumes throughout the Sacramento Valley for which the Department of Toxic Substance Control has oversight.

Response

Section 3.3.1.3 has been revised to include GeoTracker Clean Up Site information.

Comment NG06-29

Comment

The EIS/R should be withdrawn from public circulation; and The EIS/R should be modified to: Reflect the elements and requirements of a programmatic EIS/R, strictly adhering to page limitations and tiering of appropriate project level environmental documentation; and Reflect a legally appropriate lead agency, such as a group of agencies, including SLDMWA and the counties that overlie the DWR Bulletin 118 groundwater basins and confined (deeper) aquifers from which groundwater substitution transfers may occur, organized into a cooperative effort by contract, joint exercise of powers, or similar device.

Response

See Common Response 1 and response to Comment NG03-8.

Comment Letter NG07, Jeffrey Volberg, California Waterfowl

Comment NG07-1

Comment

The California Waterfowl Association is a statewide nonprofit organization whose principal objective is the conservation of the state's waterfowl, wetlands, and hunting heritage. California Waterfowl believes hunters have been the most important force in conserving waterfowl and wetlands. California Waterfowl biologists are leading experts on designing, operating, and maintaining managed wetlands throughout California, including the Sacramento/San Joaquin River Delta and the Suisun Marsh.

Since 1945, California Waterfowl has been active in creating and maintaining managed wetlands habitat for migratory waterfowl, including ducks and geese. Because of the loss of 95 percent of the historical wetlands in California, the remaining wetlands, two-thirds of which are in private ownership, have to be intensively managed to provide the optimum habitat value for migratory waterfowl. While not listed under the state or federal endangered species acts, migratory waterfowl are protected by legislation or treaty, including the North American Wetlands Conservation Act (NACWA) and the international Migratory Bird Treaty.

The state and federal government and private landowners such as farmers and duck clubs have invested millions of dollars in managed wetland for the primary benefit of migratory waterfowl. These managed wetlands also benefit a variety of other bird species, as well as reptiles, fish, and mammals. They use natural and artificial water flows to flood wetlands, and then use developed infrastructure to hold and drain floodwaters as appropriate to provide flood resources and suitable seasonal habitat.

California Waterfowl has reviewed the Draft EIS/EIR on proposed long-term water transfers. As proposed in the current drafts, long-term water transfers could have significant and unavoidable impacts on wetland and waterfowl resources in the Sacramento and San Joaquin. Section 3.8 of Chapter 3 discusses environmental impacts to terrestrial resources from the water transfers. California Waterfowl's main concern is with the natural communities and agricultural habitats in the sellers' service area identified in Section 3.8.1.3.1. California Waterfowl is primarily interested in impacts arising from Alternative 2, 3 and 4.

In California Waterfowl's estimation, the greatest impacts to migratory waterfowl would result from cropland idling and shifting transfers, as discussed in Section 3.8.2.1.2. Migratory waterfowl depend heavily for food resources on the post-harvest and winter flooding of rice fields for decomposition of rice stubble. Section 3.8.2.1.2 correctly identifies the impacts of cropland idling and shifting transfers on migratory waterfowl. The idling of cropland and the shifting of water will deprive waterfowl of food resources and habitat. However, as also pointed out at the top of page 3.8-35, fallowing of fields provides an opportunity to develop nesting habitat.

Response

Section 3.8 presents a comprehensive analysis of potential impacts to biological resources, including waterfowl, and concludes that all impacts would be less than significant or, in the case of groundwater substitution reducing stream flows that support natural communities in some small streams, would be less than significant with mitigation. Contrary to the allegation in the comment, there would be no significant and unavoidable impacts on wetland and waterfowl resources in the Sacramento and San Joaquin River delta. See Common Response 13 for additional discussion.

Comment NG07-2

Comment

California Waterfowl was the sponsor of a bill in the state Legislature that declares it is the policy of the state to encourage the planting of dry cover crops on fallowed fields for the purpose of providing nesting habitat for local, resident birds, such as mallards. SB 749 (Wolk - Chapter 387, Statutes of 2013) requires the Department of Water Resources to provide guidelines to landowners on how to create and maintain nesting cover for resident waterfowl and other birds on fallowed lands. The EIS/EIR should include a requirement of this type of affirmative action to mitigate for the loss of habitat from fallowed fields.

Response

Related to water transfers, SB 749 states landowners shall be encouraged to cultivate or retain non-irrigated cover crops or natural vegetation to provide waterfowl, upland game bird, and other wildlife habitat, provided that all other water transfer requirements are met. New text has been added to Section 2.3.2.1, regarding potential water transfer methods, to describe the habitat benefit of allowing dry cover crops on idled fields.

Comment Letter NG08, Chelsea Tu, Center for Biological Diversity

Comment NG08-1

Comment

The Center for Biological Diversity is a national nonprofit organization with nearly 158,000 members and activists in California who are dedicated to the protection of endangered species and wild places. The Center has worked to protect and restore endangered species and their habitats in the Sacramento River and San Joaquin River watersheds since the late 1990s.

The proposes water transfers would export water from the Sacramento and San Joaquin Regions to the Bay Area and Central Valley from 2015-2024 (project). The Project would occur through methods including reservoir releases, groundwater substitution, and crop idling/shifting. These water transfers would drain both surface and groundwater resource from the Sacramento River and San Joaquin River watersheds (Exporting Areas), imposing significant and irreversible threats to the sensitive species that rely on these water resources and associated aquatic and riparian habitats to survive. However, the DEIS/EIR fails to establish an adequate baseline by which to assess Project impacts, fails to adopt an acceptable methodology for accurately determining existing conditions and potential Project impacts, and fails to sufficiently assess or provide adequate measures to minimize or mitigate the impacts on sensitive species and their habitats within the Exporting Areas.

Response

The EIS/EIR established an adequate baseline as described in the Affected Environment/Environmental Setting sections of the document. The Lead Agencies and the expert preparers of the EIS/EIR applied accepted methods to analyze impacts and evaluated impacts consistent with appropriate significance criteria sections. When necessary, and when impacts were potentially significant, mitigation measures were included to avoid or substantially lessen impacts to a less-than-significant level.

Comment NG08-2

Comment

The DEIS/EIR concludes that reservoir release will have less than significant impacts on natural communities and special-status species since they would not reduce reservoir storage in Export Areas by more than 10% during normal to wet water years. (DEIR/EIR, at 3.8-47). In particular, the DEIS/EIR concludes that, with the exception of Bear River, reservoir releases from the Project under the Proposed Action would reduce surface water flows by less than 10% and therefore less than significant levels in the Sacramento River watershed. (DEIS/EIR, at 3.8-49) The 10% threshold of significance appears arbitrary since it does not correspond with the significance criteria established, and doe not refer to other sections of the DEIS/EIR. (DEIS/EIR, at 3.8-49) Additionally, the DEIS/EIR unreasonably assumes there would be sufficient surface water flows within the Exporting Areas for the 10% drawdown during drought periods.

Response

The significance criteria are based on the CEQA Guidelines, which provide that a significant impact would occur if it would "cause a substantial reduction in the size or distribution of any natural community." Substantial is not defined in the CEQA guidelines, but in this case reductions in reservoir storage of less than 10 percent are not expected to result in a substantial reduction in natural communities because reductions at this level would be within the normal range of operations for the reservoirs. Further, several reservoir operators are also obligated to protect natural resources within the reservoirs and in the downstream rivers. Surface water flows within rivers are also expected to fall within historical ranges and therefore are not expected to result in a substantial reduction in the size or distribution of a natural community.

Comment NG08-3

Comment

The DEIR/EIS also lacks historic flows data on twenty-one smaller rivers that would be impacted by the Project. (DEIR/EIS, ay 3.8-51) Therefore the DEIS/EIR fails to provide sufficient information regarding existing conditions in order to establish an adequate baseline for assessing impacts. Consequently, the DEIR/EIS cannot accurately assess potential Project impacts or provide mitigation measures without first establishing a baseline of existing conditions from which to analyze.

Response

The analysis disclosed there is limited data available for these streams. These streams have a small amount of flow and are not typically gauged (hence the lack of data for the streams), but reductions in groundwater would indicate that in-stream flows could be affected. The analysis concluded that while there may be effects on these streams, any potentially significant effects would be avoided with implementation of Mitigation Measure GW-1.

Comment NG08-4

Comment

The DEIS/EIR also estimates that since the Project would reduce surface water flow and Delta outflow but therefore would have no significant biological impacts. (DEIR/EIS, at 3.8-62; 3.7-12) However, the DEIR/EIS provides inadequate data to support these conclusions. The Project will likely result in significant impacts to listed fish species including Chinook salmon and Central Valley steelhead, green and white sturgeon, and Delta and longfin smelt. For instance, the DEIR/EIS states that water transfers could alter stream flow and temperature in the upper Sacramento River. (DEIR/EIS, at 3.7-12) Yet the DEIS/EIR concludes that the Project would not result in significant effect on this and other species based simply on the 10% flow reduction criteria (DEIS/EIR, at 3.7-25)

Response

The EIS/EIR used the 10 percent (and 1 cfs in smaller streams) flow reduction criteria as initial screening criteria to determine whether a stream needed further evaluation of biological impacts. Refer to Section 3.7.2.1 for more information on the scientific reasoning behind the use of these criteria. See response to Comment NG10-28 for additional information. In the case of reservoir storage affecting instream flows and, therefore, winter-run Chinook salmon spawning or rearing habitat, the analysis found no effect to mean monthly instream flows in the Sacramento River by water year type using the 10 percent criterion. Therefore, it concludes that this habitat would not be affected.

Comment NG08-5

Comment

Additionally, the DEIR/EIS admits that the Project would reduce reservoir waters by 18.2% during critically dry years in August and September. (Id.) These drawdown estimates during critically dry years such as this year are unacceptable since there will unlikely be sufficient water for the Project to operate without depleting the entire reservoir storage during drought periods. The DEIR/EIS is thus misleading by claiming that reduction in reservoir storage would be less than significant over all, while downplaying the fact that drawdown during critically dry years like this one would be significant and likely infeasible.

Response

The reference to a decrease of 18.2 percent refers to a reduction in the overall surface area of the reservoir, not the volume of water held in the reservoir.

The cited changes in reservoir levels are related to reservoir release transfers, where water that would have stayed in storage could be transferred. This type of transfer is only applicable if the water would have stayed in storage during the transfer year, and this type of transfer may not be available in every year. A change in reservoir storage in transfer years would not affect downstream flows or supplies because this water would have stayed in storage absent a transfer and would not have contributed to downstream flows and supplies. After the transfer, as the reservoir refills, downstream flows could be decreased. As stated in Section 2.3.2.1, transfers related to stored reservoir releases would include refill agreements to limit refill to wet periods and therefore would not significantly impact downstream water users.

Comment NG08-6

Comment

First, the data that the DEIR/EIS relies on to assess groundwater substitution impacts on stream water is severely outdated. The impacts of groundwater substitution transfer on steam water depletion was calculated based on data on water export availability in the Region from 1970 to 2003 (DEIS/EIR, at 3.8-38) This method fails to include data that reflect reduced exports based on current water realities or regulatory constraints including the 2008 and 2009 biological opinions. Thus the DEIR/EIR fails to establish an adequate baseline by which to assess Project impacts.

Response

See Common Response 5.

Comment NG08-7

Comment

Similarly, criteria that the DEIS/EIR adopts to evaluate groundwater substitution impacts on surface waterways are also flawed. DEIR/EIS dismisses small waterways near modeled groundwater transfer areas as not warranting further modeling if water flow for these small waterways will be reduced by 1 cubic-foot per second or 10% since "the effect was considered too small to have a substantial effect on terrestrial species." (DEIR/EIS, at 3.8-38). This appears to be an arbitrary threshold of significance for evaluating impacts on small waterways since it does not correspond with significance criteria on 3.8-43 and the DEIR/EIS does not refer to other sections of the document for support. (DEIR/EIS, at 3.8-43). The DEIR/EIS also fails to discuss how groundwater substitution would affect aquatic species in small waterways. A 1 cubic-foot per second reduction in water flow could affect both aquatic and terrestrial species especially in drought periods.

The Project would increase groundwater pumping for irrigation in the Exporting Areas to substitute surface water that would be exported, which the DEIR/EIS states could result in a reduction in a level of groundwater in the vicinity of pumps (DEIR/EIS, at 3.8-31).

However, the DEIR concludes that groundwater drawdown from increased will be less than significant since groundwater modeling results indicate that shallow groundwater is typically deeper than 15 feet in most locations under existing conditions and not associated with groundwater-dependent ecosystems. Even if species such the valley oak rely on deeper groundwater, the DEIR/EIS states groundwater drawdown impacts to these species to be minimal by asserting that "these species have further adapted to California's Mediterranean climate of wet winters and hot dry summers." (DEIR/EIS, at 3.8-32) The DEIR/EIS concludes that groundwater drawdown under the Proposed Action would have less than significant impacts on natural communities and special-status plants. (DEIS/EIR, at 3.8-47) The only justification the DEIR/EIS affords in reaching this conclusion is that "Plants within these communities would be able to adjust to the small reductions in groundwater levels because the drawdown is expected to occur slowly through the growing season, allowing plants to adjust their root growth to accommodate the change." (Id.) These assertions are not supported in the DEIR/EIS.

Response

Additional analysis of small waterways is unnecessary because changes in flow are expected to be within the normal range of annual fluctuation of these waterways. Some waterways are ephemeral and are subject to a wide range of flow conditions dependent on annual hydrology, and others are part of a managed system that also results in variation in flows. Groundwater substitution impacts on surface waterways are generally expected to be within this annual variation. Notwithstanding, Mitigation Measure GW-1 is proposed as an additional precaution to avoid potential significant impacts. See Common Responses 6, 7, and 10 for additional information. Aquatic species in small waterways are not expected to be affected for the same reason. Overall, the vegetation along these waterways are adapted to this fluctuation and to the temporal nature of water in these waterways.

Comment NG08-8

Comment

The DEIR/EIS further dismisses the negative impacts of groundwater drawdown that would result from the Project on riparian ecosystems, stating that "Because of the interaction of surface flows and groundwater flows in riparian systems, including associated wetlands, enables faster recharge of groundwater, these systems are less likely to be impacted by groundwater drawdown as a result of the action alternatives." (Id.) This statement ignores the fact that Exporting Areas will take a double hit of reduce surface and groundwater resources. The DEIR/EIS also inappropriately assumes that there would be sufficient surface waters would to recharge groundwater, ignoring that this is not the case during drought periods. In addition, surface and groundwater resources in the Sacramento region are highly interconnected. (Howard 2010.) Therefore any drawdown of surface water or groundwater would very likely impact the level of the other. Given the Exporting Area's high surface and groundwater connectivity the DEIR/EIS fails to accurately address the likelihood that reducing surface water flow will reduce groundwater recharge potential in the area.

Response

See response to Comment NG01-33.

Comment NG08-9

Comment

The DEIR/EIS would require implementing entities to adopt monitoring program and mitigation plans to alleviate impacts from groundwater substitution transfers. (DEIR/EIS, at 3.3-88 to 3.3-91). However, these measures are inadequate to minimize and mitigate the significant impacts that would result from groundwater drawdown since they do not provide sufficient information for decision-makers or the public to be able to ascertain whether they would be effective or enforceable. In particular, the DEIR/EIS fails to require monitoring and reviewing the impacts groundwater pumping on connected surface waters and groundwater-dependent ecosystems. Furthermore, the DEIR/EIS inappropriately defers the responsibility for developing specific mitigation plans as well as criteria for significance to each individual seller. (DEIR, at 3.3-90.)

Response

Mitigation measure GW-1 states that a monitoring and mitigation plan will be developed as part of the groundwater substitution transfer proposal. The concept and process for these plans is based on DWR's "Draft Technical Information for Preparing Waters Transfer Proposals." Each monitoring and mitigation plan will be customized for the local conditions surrounding the potential seller. Local conditions make it difficult to pre-define the required monitoring and mitigation efforts specific to each seller. The monitoring and measurement of potential impacts to changes in surface water-groundwater interaction and groundwater-dependent ecosystems is difficult to measure on a real-time basis during groundwater substitution pumping. Mitigation measure GW-1 is being implemented to provide a quicker assessment of potential changes in groundwater levels due to groundwater substitution transfers. Changes in groundwater levels would be manifest sooner than a resulting change in groundwater-surface water interaction or ecosystem health. See Common Responses 6, 7, and 10 for additional information.

Comment NG08-10

Comment

Finally, the DEIR/EIS fail to and should be revised to address how it would comply with existing groundwater management plans in the Exporting Areas as well as the statewide groundwater legislation that will be in effect beginning January 1, 2015.

Response

Section 3.3.1.2.3 has been revised to include all pertinent groundwater substitution transfers related ordinances and GMP's within the area of analysis (i.e. area underlying substitution pumping).Summaries of the Sustainable Groundwater Management Act (Senate Bill 1168, Assembly Bill 1739, and Senate Bill 1319) have been included in Section 3.3.1.2.2.

Comment NG08-11

Comment

The Proposed Action would allow idling/shifting of 8,500 acres of upland cropland and 51,473 acres of seasonally flooded agriculture. (DEIR/EIS, at 3.8-63 and 3.8-64.) The DEIR/EIS recognizes that cropland idling/crop shifting would potentially affect some wildlife species that depend on cropland for foraging and/or depend on habitat associated with cropland and managed agricultural lands, as well as downstream habitat dependent upon agricultural flow returns. (DEIR/EIS, at 3.8-33.)

However, the DEIR/EIS states without support that "bird species that would be potentially affected by idling of upland crops would be capable of dispersing to other areas or other non-idled parcels." (Id.) The DEIR/EIS unreasonably assumes that migratory birds will still be able to find adequate food in years when upland crops are fallowed for transfers. However, in drought years, birds are already stressed by lack of food availability. Additionally, the DEIR/EIS itself recognizes yet fails to take into account that birds with limited distribution and specific breeding and foraging requirements including the greater sandhill crane and black tern will not adapt to crop idling/shifting. (DEIR/EIS, at 3.8-26 to3.8-27.)

Response

With respect to the black tern and its inability to adapt to cropland idling/shifting, Shuford's 2001 study states that the approximately 400,000 to 500,000 acres of rice planted annually in the Sacramento Valley may far exceed the average amount of shallow natural water habitat historically available for nesting terns before rice agriculture. Today black terns are heavily dependent on flooded rice fields for nesting. However, during the extensive black tern surveys conducted in 1997 throughout the Sacramento Valley, approximately 1,987 pairs were estimated to be nesting in rice fields at a time when only 75 percent of rice fields were planted due to El Nino (Shuford 2001). Therefore, a reduction of up to 10.5 percent in rice cultivation is not likely to have a significant effect on nesting black terns. With respect to sandhill cranes, water transfers will be limited near known wintering areas in the Butte Sink and will be avoided near refuges, which support more than 50 percent and up to 70 percent of the Central Valley greater sandhill wintering population during October and November (Pogson and Lindstedt 1991). This measure has been refined to minimize crop idling in known wintering areas that support high concentrations of waterfowl and shorebirds, such as wildlife refuges and wildlife areas known to support sandhill cranes. See Common Response 10.

Comment NG08-12

Comment

The DEIR/EIS also admits that crop idling/shifting could contribute to habitat fragmentation by preventing species or moving between areas. (DEIR, at 3.8-35.) The DEIR/EIS acknowledges that the "distribution of these water year types within the action period is unknown. Additionally, the exact locations of cropland idling/shifting actions would not be known until the spring of each year, when water acquisition decisions are made." (DEIR/EIS, at 3.8-35.) The DEIR/EIS does not have or provide sufficient information regarding where/when crop idling/shifting will take place, and therefore cannot calculate the potential for habitat reduction and fragmentation will result from crop idling/shifting activities. Yet the DEIR/EIS concludes that "because crop rotation and idling are standard practices, species that reside in agricultural areas adjust to these types of activities." (Id.) This statement is not supported by fact and contrary to the DEIR/EIS' previous statements regarding recognizing habitat fragmentation as a threat to species survival. (DEIR/EIS, at 3.8-33 to 3.8-35.)

Response

The 2014 Draft EIS/EIR identifies on page 3.8-35 that habitat fragmentation could be a potential effect of cropland idling/shifting and that habitat fragmentation can have a significant negative impact on wildlife. However, these are general statements about cropland idling and habitat fragmentation and are not specific to implementation of the range of potential transfer activities analyzed in the EIS/EIR. Cropland idling/shifting under the action alternatives would occur in addition to standard farming practices (EIS/EIR, page 3.8-35). This statement is not intended to dismiss effects but only to provide information related to existing conditions, which will factor into the effects analysis for each alternative as further described under Section 3.8.2.4. The purpose of Section 3.8.2.1 (pages 3.8-33 to 3.8-35) is to describe how effects on wildlife were evaluated (i.e., qualitatively based on the potential amounts and frequency of cropland idled).

Comment NG08-13

Comment

The DEIR/EIS provides that upland crop idling/shifting would not impact migratory bird populations since there are other areas to forage and species will adapt by looking for other forage areas. (DEIR/EIS, at 3.8-63.) As discussed above, the DEIR/EIS does not adequately address the significant adverse impacts that would result from these activities. The DEIR/EIS also does not provide any measures to mitigate these impacts. Instead, the DEIR/EIS simply states that "cropland idling decisions would be made early in the year before the general breeding season of most birds that have the potential to occur in the area of analysis," without providing further detail on if or how these decisions would reduce impacts to bird species (DEIR, 3.8-63.)

The DEIR/EIS provides that proposed environmental commitments would reduce potential impacts to seasonally flooded cropland idling/shifting to less than significant by ensuring canals bordering rice parcels continue to carry water even when adjacent parcels are idled. (DEIR/EIS, at 3.8-65, 3.8-67.) The DEIR/EIS assumes that watered canals provide sufficient habitat for bird species, and fails to explain how these canals would sufficiently make up for the nearly 51,500 acres of habitat for migratory birds and other birds including the tri-colored blackbird, western pond turtle, giant garter snake, and other protected and sensitive species that would be lost due to fallowing the rice parcels.

This Project will only worsen those existing conditions under the drought, and inadequate mitigation is proposed to mitigate the significant resulting impacts to migratory birds and other species that currently rely on agricultural lands for survival.

Response

See Common Response 12 for a discussion of giant garter snake and Common Response 13 for a discussion of migratory birds. Regarding the commenter's allegation that the 2014 Draft EIS/EIR assumes watered canals provide sufficient habitat for birds and other protected species, that statement is incorrect and unsubstantiated. Maintaining watered canals within idled rice fields minimizes impacts from habitat fragmentation by maintaining dispersal habitat for species such as pond turtle and giant garter snake, and providing some resting and foraging areas for birds.

Comment NG08-14

Comment

Thank you for the opportunity to submit comments on this proposed Project. We look forward to working to assure that the Project and environmental review conforms to the requirements of state and federal law and to assure that all significant impacts to the environment are fully analyzed, mitigated or avoided. In light of many significant, unavoidable environmental impacts that will result from the Project, we strongly urge the Project not be approved in its current form. Please do not hesitate to contact the Center with any questions at the number listed below. We look forward to reviewing the U.S. Bureau of Reclamation's responses to these comments in the Final EIR/EIS for this Project once it has been completed.

Response

See Common Response 2.

Comment Letter NG09, Rachel Zwillinger, Defenders of Wildlife

Comment NG09-1

Comment

I have a quick question about the Long-Term Water Transfers Draft EIS-EIR. Section 6.2.3 of the draft states that "Reclamation will submit a Biological Assessment for USFWS review under Section 7 of the Federal Endangered Species Act." Will there be a single biological opinion that covers all of the transfers that are analyzed in the Draft EIS-EIR? And do you have any sense of when the Section 7 analysis will occur?

Response

The biological opinion (BO) will cover those actions that have potential to result in "a take" of a federally listed species. Section 7 consultation was initiated with USFWS on October 7, 2014 and the biological assessment (BA) was submitted on November 4, 2014. Development of the BO will occur within approximately 135 days after the BA is considered complete. Reclamation expects there will be a single biological opinion for the transfers.

Comment Letter NG10, Rachel Zwillinger, Defenders of Wildlife

Comment NG10-1

Comment

On behalf of Defenders of Wildlife, which has approximately 1,200,000 supporters and members, 180,000 of whom are Californians, we are writing to provide comments on the Long-Term Water Transfers Draft Environmental Impact Statement/Environmental Impact Report ("Draft"). We are sympathetic to the fact that management decisions involving water transfers need to occur quickly, and believe that an Environmental Impact Statement ("EIS")/Environmental Impact Report ("EIR") covering an extended time period could be beneficial. However, the Draft suffers from several fundamental flaws that undermine its ability to provide information regarding the environmental impacts of the proposed long-term water transfers, and that render the document legally inadequate.

First, the Draft includes several "environmental commitments" intended to avoid significant impacts that could be caused by crop idling transfers. These commitments, however, are inadequate to protect the threatened giant garter snake and bird species that depend upon agricultural lands in the project area. Because significant environmental impacts will remain after implementation of the proposed commitments, we have suggested additional environmental commitments that should be included either as part of the project description, or as mitigation measures. Second, the Draft entirely fails to analyze the proposed water transfers' impacts on waterfowl, shorebirds, and south of Delta refuges, although the impacts to these public trust resources could be profound. Third, the Draft uses an arbitrary and not biologically-based screening threshold to avoid analyzing the impacts that flow reductions caused by the proposed transfers could have on fisheries and sensitive terrestrial species. The Draft also fails to account for climate change impacts in its operational modeling, does not consider an adequate range of alternatives, and fails to include foreseeable projects in its cumulative impacts analysis.

Response

This introductory comment includes multiple points that are addressed in more detail in subsequent comments; the detailed responses are included with the subsequent comments.

Comment NG10-2

Comment

These deficiencies and the others that we describe below are so substantial that we believe the Bureau of Reclamation ("Reclamation") and the San Luis & Delta-Mendota Water Authority ("SLDMWA") should issue a revised draft EIS/EIR for the proposed long-term water transfers. Remedying the problems in the current Draft will require modifications to the proposed action and significant new analysis, and the public and the project proponents would benefit from another round of review before the document is finalized. On the pages that follow, we discuss the problems with the Draft in greater detail, and provide suggestions for how the deficiencies should be addressed in a revised draft EIS/EIR.

Response

See response to Comment LA14-5.

Comment NG10-3

Comment

I. The Draft Fails to Adequately Analyze Impacts to Wildlife from Crop Idling Transfers, and Fails to Prescribe Required Mitigation. The National Environmental Policy Act ("NEPA") has "twin aims. First, it places upon [a federal] agency the obligation to consider every significant aspect of the environmental impact of a proposed action. Second, it ensures that the agency will inform the public that it has indeed considered environmental concerns in its decision making process." Baltimore Gas & Elec. Co. v. Natural Res. De! Council, Inc., 462 U.S. 87, 97 (1983) (citation and internal quotation marks omitted). To achieve these goals, "[a]n EIS must include a comprehensive discussion of all substantial environmental impacts and inform the public of any reasonable alternatives which could avoid or minimize these adverse impacts." High Sierra Hikers Ass 'n v. Us. Dep't of Interior, 848 F. Supp. 2d 1036, 1048-1049 (N.D. Cal. 2012) (citing 40 C.F.R. § 1502.1). NEPA "emphasizes the importance of coherent and comprehensive up-front environmental analysis to ensure informed decision making to the end that the agency will not act on incomplete information, only to regret its decision after it is too late to correct." Blue Mts. Biodiversity Project v. Blackwood, 161 F.3d 1208, 1216 (9th Cir. 1998) (quotation marks and citation omitted).

Similarly, the California Environmental Quality Act ("CEQA") is intended to inform decision makers and the public about the potentially significant environmental effects of proposed projects. See, e.g., 14 Cal. Code Regs. § 15002. To this end, an EIR "shall include a detailed statement setting forth ... [a]ll significant effects on the environment of the proposed project" (Cal. Pub. Res. Code § 21100), and "must present information in such a manner that the foreseeable impacts of pursuing the project can actually be understood and weighed." Vineyard Area Citizens for Responsible Growth, Inc. v. City of Ranch 0 Cordova, 40 Cal. 4th 412,450 (2007). If a significant effect on the environment is identified, an EIR is required to include provisions to avoid or mitigate the significant effect. Cal. Pub. Res. Code § 21081. Mitigation must be "fully enforceable through permit conditions, agreements, or other measures," (id. § 21081.6 (b)) and there must be a reporting or monitoring program to ensure that the mitigation measures are implemented (id. § 21081.6 (a)). "The purpose of these requirements is to ensure that feasible mitigation measures will actually be implemented as a condition of development, and not merely adopted and then neglected or disregarded." Cal. Clean Energy Comm. v. City of Woodland, 225 Cal. App. 4th 173, 189 (2014) (citation omitted).

Response

Potential impacts on wildlife are analyzed in Section 3.8.2.4.3 of the 2014 Draft EIS/EIR. See Common Response 10.

Comment NG10-4

Comment

A. The Environmental Commitments are Insufficient to Avoid Significant Impacts to Wildlife from Crop Idling Transfers and Additional Mitigation is Required. The proposed action includes several "environmental commitments," which are intended to "avoid potential environmental impacts from water transfers." Draft EIS/EIR at 2-29. These environmental commitments are critical to the Draft's conclusion that the proposed action will not have a significant impact on special status plant and animal species. For example, the Draft concludes that significant impacts to the following species from crop idling transfers will be avoided, in whole or in part, by implementation of the environmental commitments: giant garter snake (id. at 3.8-70); Pacific pond turtle (id. at 3.8-71 to 3.8-72); greater sandhill crane (id. At 3.8-76); long-billed curlew (id. at 3.8-76); tricolored blackbird (id. at 3.8-77); white-faced ibis (id. at 3.8-78); purple martin (id. at 3.8-79); yellow-headed blackbird [Footnote: We assume that the discussion of the purple martin in the section titled "Yellow-Headed Blackbird" was an error, and that the Draft intended to refer to the yellow-headed blackbird.] (id. at 3.8-79 to 3.8-80); special status plant species (id. at 3.8-67); and special status bird species (id. at 3.8-74,3.8-80).

However, as we explain below, these critically important environmental commitments are inadequate to avoid significant impacts to the species listed above, including the giant garter snake and sensitive birds. Because the impacts from crop idling transfers remain significant after implementation of the environmental commitments, CEQA requires that the action agencies identify additional mitigation measures that, if implemented, would reduce the impacts of the project to below the significance threshold. See Cal. Pub. Res. Code § 21081. In the sections that follow, we explain why the environmental commitments are inadequate to ameliorate significant impacts from crop idling transfers, and suggest additional mitigation measures that, if implemented, would help the agencies comply with legally-required mitigation obligations.

1. The Environmental Commitments Do Not Adequately Protect Giant Garter Snakes. The giant garter snake is listed as threated under both the Federal Endangered Species Act and California Endangered Species Act. See Draft EIS/EIR at 3.8-23. The snake "primarily occurs in areas with dense networks of canals among rice agriculture and wetlands," and has been observed within the Sacramento Valley portion of the Seller Service Area. Id. at 3.8-23 to 3.8-24. The Draft acknowledges that giant garter snakes may be substantially impacted by crop idling transfers. For example, it states that "[a]ny level of cropland idling/shifting would reduce the availability of stable wetland areas during a particular transfer year and may reduce suitable giant garter snake foraging habitat and increase the risk of predation on individual giant garter snakes." Id. at 3.8-69. Yet the Draft concludes that the proposed action would have a less than significant impact on the giant garter snake "because a relatively small proportion (no more than 10.5 percent) of the rice acreage would be affected in any given year and the Environmental Commitments would avoid or reduce many of the potential impacts associated with this activity and the displacement of giant garter snake that could result." Id. at 3.8-70.

The Draft's reliance on the purportedly small amount of rice acreage that would be idled under the proposed action is completely unsupported. The Draft provides no analysis of the population-level impact of a 10.5 percent reduction in habitat. Further, the long-term transfers will occur primarily in dry years, when rice acreage is already substantially reduced. See id. at 1-2 (project purpose and need indicating that transfers will occur during dry years); 3.8-69 (acknowledging that planted rice acreage is reduced by drought conditions). The California Rice Commission, for example, has reported that about 140,000 acres of rice, which amounts to 25 percent of last year's crop, went unplanted this year because of water shortfalls. [Footnote: See, e.g., http://www.capitalpress.com/Californial20141021/rice-growers-wrap-up-drought-diminished-harvest.] A 10.5 percent reduction in suitable habitat on top of already reduced rice acreage is substantial, and the Draft cannot assert that such a reduction is insignificant without biological analysis.

Response

The commentor is incorrect in the statement that biological resources impacts from crop idling transfers remain significant after implementation of the environmental commitments, thereby requiring additional mitigation. Based on the analysis presented in Section 3.8, as supported by substantial evidence provided therewith, impacts associated with cropland idling/shifting under the Proposed Action would be less than significant (see Table 3.8-10). That conclusion takes into account the environmental commitments related to biological resources. See also Common Responses 10, 12, and 13. Regarding current drought impacts, see response to Comment NG13-7.

Comment NG10-5

Comment

This leaves only the environmental commitments to support the no significant impact finding, and these too fail to ensure that significant impacts are avoided. It appears that the giant garter snake-focused environmental commitments were derived from previous Endangered Species Act biological opinions involving water transfers, including the Biological Opinion for Reclamation's 2010-2011 Water Transfer Program. See U.S. Fish and Wildlife Service ("FWS"), Endangered Species Consultation on the Bureau of Reclamation's Proposed Central Valley Project Water Transfer Program for 2010 - 2011 (Mar. 2010) at 5-7 (attached as Exhibit A) (presenting "conservation measures" that are similar to Draft's environmental commitments); see also FWS, Endangered Species Consultation on the Proposed 2009 Drought Water Bank for the State of California (Apr. 2009) at 7-8 (attached as Exhibit B) (same). The biological opinions incorporated conservation measures that are similar to the Draft's environmental commitments into Reasonable and Prudent Measures, and concluded that compliance with those measures was "necessary and appropriate" to minimize the impact of take caused by the proposed crop idling transfers. Exh. A at 40; Exh. B at 38.

The California Department of Water Resources subsequently reaffirmed that "the conservation measures outlined in the USFWS biological opinion for Reclamation's 2010-2011 Water Transfer Program represent the most current and best scientific information on protective measures for the giant garter snake," and indicated that DWR "will require transfer proponents to incorporate in their transfer proposals those conservation measures from the biological opinion relevant to crop idling." California Department of Water Resources, DRAFT Technical Information for Preparing Water Transfer Proposals (Oct. 2013) at 22-23, available at http://www.water.ca.gov/watertransfers/ docs/DTIWT 2014_ Final_Draft.pdf.

The Draft's environmental commitments, however, are considerably less protective than the conservation measures that FWS and DWR have deemed to be necessary and appropriate, and reflective of the best scientific information available. First, the biological opinions required that the block size of idled rice parcels would be limited to 320 acres with no more than 20 percent of rice fields idled cumulatively (from all sources of fallowing) in each county. They further provided that the idled parcels would not be located on opposite sides of a canal or other waterway, and would not be immediately adjacent to another fallowed parcel. Exh. A at 5-6; Exh. B at 7. Prior to the 2009 and 2010 biological opinions, FWS had concluded that a 160-acre limitation on the size of idled rice parcels was appropriate. See FWS, Programmatic Biological Opinion on the Proposed Environmental Water Account Program (Jan. 2004) at 18 (attached as Exhibit C). Defenders of Wildlife previously submitted comments indicating that increasing the parcel size from 160 to 320 acres would be harmful to giant garter snakes because the size of their home range is 40 and 90 acres, and forcing individuals to travel farther than this range may result in mortality. See Comments on Addendum to the Environmental Water Account EIRIEIS (Jan. 2009) (attached as Exhibit D). Yet the current Draft's environmental commitments do not include any limitation on the acreage of fallowed parcels, the cumulative percentage of rice fields in any county that can be idled, or the layout of idled parcels relative to each other and to particular habitat features.

Response

See Common Responses 10 and 12.

Comment NG10-6

Comment

Second, the biological opinions' conservation measures included a requirement that a field cannot be fallowed more than two irrigation seasons in a row. Exh. A at 6; Exh. B at 7. Again, this important conservation measure is entirely missing from the Draft's environmental commitments.

Response

See Common Response 12.

Comment NG10-7

Comment

Third, the biological opinions required that the water seller maintain a depth of at least two feet of water in the major irrigation and drainage canals to provide a movement corridor for giant garter snakes. Exh. A at 6; Exh. B at 7. The Draft, on the other hand, provides that "[c]anal water depths should be similar to years when transfers do not occur or, where information on existing water depths is limited, at least two feet of water will be considered sufficient." Draft EIS/EIR at 2-29. The biological opinions' clear requirement of two feet of water is easier to monitor and enforce, and more protective of the giant garter snake.

Response

The purpose of this environmental commitment (see Section 2.3.2.4) is to maintain habitat within major canals at existing conditions. Where existing conditions cannot be determined, the canal depth will be maintained at a minimum depth of 2 feet to provide suitable dispersal habitat for giant garter snake. This requirement was refined from the prior BOs so that a land owner would not be required to retain more water in a canal than what is typical for that system.

Comment NG10-8

Comment

Finally, the prior biological opinions all prohibited transfers from certain sensitive areas, including the Natomas Basin. Exh. A at 6; Exh. B at 7-8; Exh. C at 18. As discussed in Section 1.A.4, below, the Draft does not make clear whether all transfers from areas with known priority giant garter snake populations will be prohibited. Such a prohibition is essential to protecting the threatened giant garter snake.

Response

Environmental commitments listed in Section 2.3.2.4 state that lands in the Natomas Basin will not be permitted to participate in cropland idling transfers, in addition to locations of other known priority giant garter snake populations.

Comment NG10-9

Comment

The Draft fails to justify its departure from these conservation practices that FWS and DWR have previously deemed to be the minimum requirements necessary and appropriate for protecting sensitive giant garter snake populations from crop idling transfers. Yet it inexplicably concludes that the environmental commitments would avoid or reduce to insignificant levels the proposed action's impacts on giant garter snakes. The Draft's departure from conservation measures that have been widely accepted as necessary to protect the giant garter snake undermines its no significant impact conclusion, and further mitigation is required. At a minimum, the environmental commitments must include all of the giant garter snake protections that were included in the 2009 and 2010 biological opinions. Further, we continue to believe that the 320-acre parcel-size limitation is not biologically justified and is insufficiently protective of the giant garter snake, and that a 160-acre limitation is warranted.

Response

See Common Response 12.

Comment NG10-10

Comment

2. The Environmental Commitments Do Not Protect Birds from Impacts Caused by Crop Idling Transfers Involving Rice Fields. In addition to the giant garter snake, crop idling transfers involving seasonally flooded agricultural lands (i.e., rice) would affect waterfowl, shorebirds, water birds, and riparian songbird that rely on the fields for forage and nesting habitat. The Draft explains that "[s]easonally flooded agriculture, specifically rice fields, and its associated uplands, drainage ditches, irrigation canals, and dikes, provide potentially suitable habitat for ... a variety of water birds including, but not limited to egrets, herons, ducks, and geese." Draft EIS/EIR at 3.8-34. It also indicates that rice fields provide habitat and forage for special status bird species, including the greater sandhill crane, black tern, purple martin, tricolored blackbird, white-faced ibis, yellow-headed blackbird, and long-billed curlew. Id. at 3.8-25 to 3.8-30; 3.8-74. The Draft acknowledges that crop idling transfers will impact these species by reducing available forage and nesting habitat. Id. at 3.8-74 to 3.8-80.

These impacts are likely to be significant. The Draft indicates that the 51,473 acres of rice that could be idled in any year is equivalent to 10.5 percent of the average amount of land in rice production from 1992 to 2012. Id. at 3.8-69. The water transfers will occur in dry years, however, when planted rice acreage, other agricultural habitat, and wildlife refuge habitat are already greatly reduced. Thus, the crop idling transfers, in combination with other dry-year habitat reductions, will likely cause only a small fraction of the food and habitat necessary to sustain the special status bird species and other migratory birds to be available at critical times during the year.

The Draft concludes, however, that the proposed action would have a less than significant impact on special status bird species because there would be a less than significant impact on the habitats that support these species. Id. at 3.8-80. The impacts to seasonally flooded agricultural habitats, it concludes, would not be significant because of implementation of the environmental commitments. Id. at 3.8-65. [Footnote: As discussed infra, Section I.B, the Draft cannot rely on the availability of other suitable habitat to show that the proposed action will not have a significant impact because the Draft provides no analysis of the adequacy or availability of such habitat.] There is only one environmental commitment, however, that is specifically designed to protect birds. It states that, "[i]n order to limit reduction in the amount of over-winter forage for migratory birds, including greater sandhill crane, cropland idling transfers will be minimized near known wintering areas in the Butte Sink." Id. at 2-30.

Clearly, this one environmental commitment that is geographically limited to the Butte Sink is insufficient to mitigate impacts from the idling of rice fields throughout the Sellers' service area because simply limiting habitat loss in one area does not ameliorate the impacts from habitat destruction elsewhere. Further, as discussed in Section I.A.4, the bird-focused commitment is so vague that it would provide little concrete protection for over-wintering birds in the Butte Sink.

Response

See Common Responses 10 and 13.

Comment NG10-11

Comment

To the extent the Draft relies on the environmental commitments that are focused on protecting the giant garter snake, these commitments are inadequate to reduce impacts to bird species to insignificant levels. The giant garter snake commitments focus on habitat that is particularly important for that species, including major irrigation and drainage canals, smaller drains and conveyance infrastructure, and areas with known priority giant garter snake populations. While birds would receive some benefit from these protections, the commitments only reduce impacts to a very small percentage of the important bird habitat that will be lost as a result of the crop idling transfers.

Thus, the Draft's conclusion that impacts to special status bird species will be insignificant because of implementation of the environmental commitments does not withstand scrutiny. The one bird-focused commitment is inadequate, and the giant garter snake protections only address a very small percentage of the important bird habitat that will be impacted by crop idling transfers. Because the proposed action will result in significant impacts to special status bird species, and the environmental commitments are insufficient to ameliorate these impacts, additional mitigation is required.

First, we suggest including an environmental commitment that requires landowners on idled rice fields to cultivate or retain nonirrigated cover crops or natural vegetation to provide habitat and forage. Such a commitment would be in keeping with California Water Code section 1018, which provides that, "[w]hen agricultural lands are being idled in order to provide water for transfer …, landowners shall be encouraged to cultivate or retain nonirrigated cover crops or natural vegetation to provide waterfowl, upland game bird, and other wildlife habitat, provided that all other water transfer requirements are met." A report issued by California Waterfowl suggests that vetch and other cover crops can provide valuable habitat for birds, helping to mitigate impacts from idled rice fields. See California Waterfowl, Rice-Cover Crop Rotation Pilot Project (Feb. 2013) (attached as Exhibit E).

Second, we suggest including an environmental commitment that requires Reclamation to deliver a specific amount, such as 10 percent, of the water transferred in any crop idling transfer to south of Delta wildlife refuges that provide habitat for birds and other species that are impacted by the transfers. This environmental commitment would help to partially offset the habitat loss and refuge impacts caused by the proposed crop idling transfers. [Footnote: The Proposed Action's impacts on south of Delta refuges are discussed in Section III, below.]

Third, we recommend including an environmental commitment that prohibits crop idling transfers on fields that are within 2 kilometers of wetlands and refuges, riparian corridors, and known Sandhill crane roost sites. This commitment is important because landscape context, particularly the amount and proximity of flooded wetland habitat, has been shown to be important to predicting shorebird abundance in wetland-agriculture mosaics. [Footnote: See Taft O. W, and Haig S. M. 2006. Landscape context mediates influence of local food abundance on wetland use by wintering shorebirds in an agricultural valley. Biological Conservation 128: 298-307; Elphick, C. S. 2008. Landscape effects on waterbird densities in California rice fields: Taxonomic differences, scale-dependence, and conservation implications. Water birds 31 :62-69.] Landscape context is also important for other water birds-the vast majority of heron and egret nesting colonies in the Sacramento Valley are in riparian stands along the major rivers and streams, [Footnote: Shuford, W. D. 2014. Patterns of distribution and abundance of breeding colonial water birds in the interior of California, 2009-2012. A report of Point Blue Conservation Science to California Department of Fish and Wildlife and U.S. Fish and Wildlife Service (Region 8). Available at www.fws.gov/mountain-prairie/species/birds/westem colonial.] and these birds must fly out to irrigated agricultural fields (mainly rice, also alfalfa, irrigated pasture, wetlands) to forage for themselves and to bring back food to nestlings. Additionally, wintering Sandhill cranes in the Central Valley forage mainly within 2 km of nighttime roost sites with suitable water depths and isolation from disturbance.7 Restricting crop idling transfers near wetlands and refuges, riparian corridors, and known Sandhill crane roost sites will help to minimize the proposed action's impacts on important bird species. [Footnote: Implementation details for these and other proposed environmental commitments must be developed before they can be integrated into a final EIS/EIR. Allowing time for another round of comments on a revised draft document will help to ensure that all of the environmental commitments are clear and enforceable.]

Response

See Common Responses 10 and 13.

Comment NG10-12

Comment

3. The Environmental Commitments Do Not Protect Birds from Impacts Caused by Crop Idling Transfers Involving Upland Crops. The proposed action also includes idling of up to 8,500 acres of upland crops, including idling of between 16 and 20 percent of existing com acreage, depending on the county. Draft EIS/EIR at 3.8-63. In Sutter and Solano Counties, idling of upland crops could result in a 9 percent loss in residual feed. Id. According to the Draft, some upland crops, such as com and wheat, are "highly beneficial to wildlife" (id. at 3.8-33), and several special status bird species, including greater sandhill cranes, long-billed curlews, and tricolored blackbirds rely on upland crops for forage and habitat. Id. at 3.8-25, 3.8-28, 3.8-29, 3.8-74. The Draft acknowledges that transfers involving the idling of upland crops could affect these species (see, e.g., id. at 3.8-74 to 3.8-77), and the impacts to these birds could be significant. As discussed above, the water transfers will occur in dry years, when other habitat is already substantially reduced. The food supply reduction caused by the crop idling transfers, in combination with other reductions known to occur in dry years, could cause food shortages for special status bird species and other migratory birds that depend upon Central Valley habitats.

The Draft concludes, however, that "[b]ecause of the limited amount of upland crop acreage that would be idled under this alternative, and in conjunction with the environmental commitments described in Section 2.3.2.4, and because this is within the historic range of variation for the individual crops, cropland idling/shifting in the Seller Service Area is not expected to significantly impact wildlife species dependent on upland cropland habitat." Id. at 3.8-63 to 3.8-64.

This conclusion does not withstand scrutiny. First, the Draft provides no analysis to support the conclusion that the elimination of 8,500 acres of upland crop habitat will not have a significant impact, and as discussed above, the impact could be profound. Further, the assertion that the idling is not problematic because it is within the historic range of variation for individual crops misses the point-the crop idling transfers will occur during dry years, when planted acreage is already reduced. The idled acreage will be additive to the reductions that have historically occurred in dry years, and will likely be cumulatively substantial. As discussed in Section I.B, below, the Draft's conclusory statements that impacts to birds will not be significant because there is sufficient alternative habitat and forage available are legally inadequate because they are unsupported by any analysis.

Response

See Common Responses 10 and 13.

Comment NG10-13

Comment

The Draft's reliance on the environmental commitments is also misplaced. The one bird-focused commitment is geographically limited and unacceptably vague, and the protections for giant garter snakes are not relevant to upland crops, as giant garter snakes only exist in flooded agricultural habitats. The Draft's conclusion that crop idling transfers involving upland crops won't have significant impacts on special status bird species is unsupported, and in light of the evidence that impacts to these species will be significant, additional mitigation is required.

As discussed with respect to water transfers involving the idling of rice fields, we recommend including an environmental commitment that requires landowners with idled upland crops to cultivate or retain nonirrigated cover crops or natural vegetation in conformity with Water Code section 1018. We also recommend addition of an environmental commitment requiring Reclamation to deliver a specific percentage of the water made available from any crop idling transfer to south of Delta refuges. Additionally, we suggest including a commitment that prohibits crop idling transfers on fields that are within 2 kilometers of wetlands and refuges, riparian corridors, and known Sandhill crane roost sites.

Response

The analysis and supporting evidence presented in Section 3.8, along with the environmental commitments presented therein, are sufficient to conclude that impacts to special status bird species will be less than significant. No further mitigation is warranted. See also Common Response 10.

Comment NG10-14

Comment

We also recommend addition of a few environmental commitments that are specifically focused on upland crop habitat. Specifically, we suggest including a commitment that prohibits the idling of com, winter wheat/triticale, or other grain crops that are particularly important to cranes and waterfowl. If water transfers involving the idling of these crops are not prohibited, we suggest including two additional commitments. First, the idling of com, winter wheat/triticale, and other grain crops' should be restricted to regions where there is a limited extent of such crops overall, and to areas with little or no current or historical use by greater sandhill cranes. Second, we suggest including an environmental commitment that limits transfers involving the idling of com to areas where this crop is traditionally not flooded after harvest, as flooded com supports a greater variety of bird species than does dry corn. [Footnote: Shuford, W. D., M. E. Reiter, K. M. Strum, C. J. Gregory, M. M. Gilbert, and C. M. Hickey. 2013. The effects of crop treatments on migrating and wintering water birds at Staten Island, 2010-2012. Final Report to The Nature Conservancy, 190 Cohasset Road, Suite 177, Chico, CA 95926.]

Response

As described on page 3.8-63 of the 2014 Draft EIS/EIR, upland cropland idling could result in up to a two percent reduction of residual feed in Glenn, Colusa, and Yolo Counties and up to a nine percent reduction in residual feed in Sutter and Solano Counties. These reductions are well within the historical range of upland variation and would not be a significant change in existing conditions. No mitigation specific to upland cropland is warranted. See Common Response 10 for further discussion of migratory birds.

Comment NG10-15

Comment

4. The Environmental Commitments are Unacceptably Vague and No Enforcement Mechanism is Apparent. According to Reclamation's NEP A Handbook, "[e]nvironmental commitments are written statements of intent made by Reclamation to monitor and mitigate for potential adverse environmental impacts of an action." US Bureau of Reclamation, Reclamation's NEPA Handbook (Feb. 2012) at 3-15, available at http://www.usbr.gov/nepa/docs/NEPA_Handbook2012.pdf. Reclamation is required to allocate funds necessary to carry out the commitments, monitor and evaluate the commitments' effectiveness, and document results. Id.at 3-16. Additionally, while implementation can be delegated to a third party as a permit condition, compliance with the environmental commitments remains Reclamation's responsibility. Id. The Handbook provides details regarding creation of an environmental commitments program, plan, and checklist to ensure the environmental commitments are appropriately implemented. Id. at 9-5 to 9-6.

Further, though they are integrated into description of the proposed action, the environmental commitments effectively operate as mitigation measures. CEQA requires that mitigation measures be "fully enforceable through permit conditions, agreements, or other measures." Cal. Pub. Res. Code § 21 081.6(b). This requirement helps to ensure that "mitigation measures will actually be implemented... , and not merely adopted and then neglected or disregarded." Cal. Clean Energy Comm, 225 Cal. App. 4th at 189.

The Draft, however, does not appear to require that the environmental commitments be integrated as permit conditions, and does not make clear how Reclamation will enforce the commitments. The Draft merely provides that "Reclamation will have access to the land to verify how the water transfer is being made available and to verify that actions to protect the giant garter snake are being implemented," but does not explain how Reclamation will ensure compliance. Draft EIS/EIR at 2-29.

To adhere to Reclamation's NEPA Handbook and CEQA, and to ensure that the environmental commitments are enforced, we recommend that the environmental commitments be incorporated into the terms of contracts governing the water transfers. This approach has been used before-for example, the 2009 Biological Assessment for the Drought Water Bank provided that conservation measures for the giant garter snake "will be incorporated into contracts between DWR and the water seller." 2009 Drought Water Bank Biological Assessment (attached as Exhibit F) at 11. The Biological Assessment elaborated that the contracts would include provisions allowing DWR to access the fallowed parcels to make sure the conservation measures were being implemented. Id. Incorporating similar terms into the contracts governing the long-term water transfers would help to ensure that the environmental commitments are more than empty promises.

Response

See Common Response 10.

Comment NG10-16

Comment

Additionally, the environmental commitments are so vague that enforcement will be impossible, and any potential benefits are likely illusory. First, the bird-focused commitment provides that "cropland idling transfers will be minimized near known wintering areas in the 10 Butte Sink," but it fails to define "minimized" and does not indicate how "known wintering areas" will be identified. Draft EIS/EIR at 2-30. Additionally, it does not specify what entity will oversee the proposed action to ensure that transfers near known wintering habitat are minimized. Unless additional clarity is provided, it will be impossible to effectively implement and enforce this commitment.

Response

See Common Response 10.

Comment NG10-17

Comment

The commitments that focus on the giant garter snake are also so vague that implementation will be impossible. For example, one commitment provides that "[d]istricts proposing water transfers made available from idled rice fields will ensure that adequate water is available for priority habitat with a high likelihood of giant garter snake occurrence." Id. The term "adequate water" is not defined, and the following commitment indicates that crop idling transfers will be permitted in priority habitat. !d. This suggests that a landowner could receive credit for transferring water out of priority habitat while still maintaining adequate water for giant garter snakes. This would likely be impossible because removing water from their habitat exposes giant garter snakes to displacement and the associated risks of predation and reduced food availability. See id. at 3.8-70.

Response

See Common Response 12.

Comment NG10-18

Comment

Additionally, the environmental commitment regarding areas with known priority giant garter snake populations is ambiguous. It provides that:

Areas with known priority giant garter snake populations will not be permitted to participate in cropland idling/shifting transfers. Water sellers can request a case-by-case evaluation of whether a specific field would be precluded from participating in long-term water transfers. These areas include lands adjacent to naturalized lands and refuges and corridors between these areas, such as:

- Fields abutting or immediately adjacent to Little Butte Creek between Llano Seco and Upper Butte Basin Wildlife Area, Butte Creek between Upper Butte Basin and Gray Lodge Wildlife areas, Colusa Basin drainage canal between Delevan and Colusa National Wildlife Refuges, Gilsizer Slough, Colusa Drainage Canal, the land side of the Toe Drain along the Sutter Bypass, Willow Slough and Willow Slough Bypass in Yolo County, Hunters and Logan Creeks between Sacramento and Delevan National Wildlife Refuges; and

- Lands in the Natomas Basin.

Id. at 2-30. It is not clear from the text whether the areas that are specifically listed will be categorically excluded from participating in transfers, or whether landowners within these areas will be able to request a case-by-case determination regarding particular fields. As discussed above, if the latter is the intended interpretation, this is a major departure from the conservation measures included in recent giant garter snake biological opinions. Further, merely permitting landowners to request a parcel-specific evaluation is inadequate-what will be the consequence if a water seller chooses not to request such an evaluation?

Response
All water transfer requests will be evaluated by Reclamation to determine if they are in areas that have the potential to affect known giant garter snake population or areas with a high probability of giant garter snake occurrence. These evaluations are not made by the seller. Further descriptions of priority populations and consistency with prior biological opinions are provided in Common Response 12, Giant Garter Snake.

Comment NG10-19

Comment
Because the vague and unenforceable nature of the environmental commitments will render their benefits illusory, significant impacts will remain from crop idling transfers. The environmental commitments are legally inadequate and must be rewritten so that they are clear, protective, and enforceable, or alternative mitigation measures must be provided.

Response
See Common Response 10.

Comment NG10-20

Comment
B. The Draft Makes Unsupported Assumptions Regarding the Availability of Alternative Habitat and Forage for Birds, Undermining its Conclusion that Impacts from Crop Idling Transfers Will Be Insignificant. To comply with CEQA, "[a] legally adequate EIR must produce information sufficient to permit a reasonable choice of alternatives so far as environmental aspects are concerned." Kings County Farm Bureau v. City of Hanford, 221 Cal. App. 3d 692, 733 (1990) (quotation marks and citation omitted). "A conclusory statement unsupported by empirical or experimental data, scientific authorities, or explanatory information of any kind not only fails to crystallize issues but affords no basis

> for a comparison of the problems involved with the proposed project and the difficulties involved in the alternatives." Whitman v. Board a/Supervisors, 88 Cal. App. 3d 397, 411 (1979) (quotation marks and citations omitted). Similarly, one of NEPA's primary purposes is "to guarantee relevant information is available to the public." N Plains Res. Council, Inc. v. Surface Transp. Bd., 668 F.3d 1067, 1072 (9th Cir. 2011); Natural Res. De! Council v. US Forest Serv., 421 F .3d 797, 811 (9th Cir. 2005) ("Where the information in the initial EIS was so incomplete or misleading that the decision maker and the public could not make an informed comparison of the alternatives, revision of an EIS may be necessary to provide a reasonable, good faith, and objective presentation of the subjects required by NEP A." (quotation marks and citation omitted)).

The Draft's analysis of impacts to birds from crop idling transfers falls far short of these standards. In particular, the Draft relies upon entirely unsubstantiated assertions regarding the availability of alternative forage and habitat to support its conclusion that the proposed action will have a less than significant impact on birds. For example, with respect to rice fallowing, it states that "[t]he decision to idle or shift a field would be made early in the year. So for species that migrate into the area seasonally (mainly birds), those arriving in the spring would not be impacted as they would select suitable habitat upon their arrival." Draft EIS/EIR at 3.8-65. The Draft contains no analysis, however, to show that adequate suitable habitat would be available in all water year types. Similarly, for upland crops, it asserts that "[i]dling would reduce forage areas, but species would respond by looking for forage in other habitats. The bird species that would be potentially affected by idling of upland crops would be capable of dispersing to other areas or other non-idled parcels." Id. at 3.8-63. Again, there is no analysis to show that adequate alternative food supplies exist. With respect to impacts to special status bird species, the Draft asserts that "[t]hese species are highly mobile and could easily relocate to other suitable habitats that would continue to exist in the surrounding areas." Id. at 3.8-80; see also id. at 3.8-75, 3.8-78. The Draft is devoid of information regarding the availability of alternative suitable habitat in the surrounding areas.

Response
See Common Response 13.

Comment NG10-21

Comment
The Draft's assumption that adequate alternative forage and habitat exist ignores the context in which the transfers will occur. Importantly, the Draft fails to account for the fact that water transfers will occur in dry years, when suitable habitat is least likely to be available. For example, during this drought year, 25 percent fewer acres of rice were planted in the Sacramento Valley than were planted the previous year. Additionally, water deliveries to federal, state, and privately managed wildlife refuges were substantially curtailed. The Draft also indicates that State Water Project crop idling transfers will likely occur at the same time as the long-term transfers, further reducing available habitat. Id. at 3.9-46 ("Cropland idling implemented under the SWP transfers could result in a maximum of 26,342 acres of idled rice land.").

Moreover, existing evidence suggests that the Draft's assumption that adequate alternative habitat will be available may be incorrect. For example, Ducks Unlimited used the bioenergetic model TRUEMET to evaluate the impact of California's drought on waterfowl in the Central Valley. See Dr. Mark Petrie, Ducks Unlimited, Inc., California's Drought and Potential Impacts on Waterfowl (May 2014) (attached as Exhibit G). The modeling showed that, under severe drought conditions, dabbling duck food supplies would be exhausted by early December, before bird numbers traditionally peak in the Valley, and dark geese and white geese food supplies would be exhausted by early February and late January, respectively. Id. at 10.

The impacts to birds from habitat reductions caused by the long-term transfers in dry years when habitat is already reduced could be profound. For example, a reduction of food availability would send birds back to their spring breeding grounds in poor condition, which would greatly reduce breeding success. In addition, the significant reduction in waterfowl habitat would cause overcrowding, which has in the past exacerbated outbreaks of avian diseases such as cholera and botulism. Such conditions could affect waterfowl populations for years to come.

Response

See response to Comment NG13-7 and Common Response 13.

Comment NG10-22

Comment

Because the Draft's conclusory statements regarding alternative bird habitat are "unsupported by empirical or experimental data, scientific authorities, or explanatory information of any kind," they fail to comply with applicable law and additional analysis is required. See Whitman, 88 Cal. App. 3d at 411. We suggest that, at a minimum, a revised draft EIS/EIR should include bioenergetics modeling to assess the impact that crop idling transfers will have on available food supplies in various water year types and in light of other reductions in available habitat. TRUEMET modeling was conducted for the Bay Delta Conservation Plan ("BDCP") environmental documents, and such modeling would be appropriate here. See, e.g., BDCP Draft EIS/EIR at 12-729; 12-2559. [Footnote: All chapters from the BDCP Draft EIS/EIR that are cited in this letter are available at http://baydeltaconservationplan.com/PublicReview/PublicReviewDraftEIR-EIS.aspx.]

Response

See Common Response 13.

Comment NG10-23

Comment

II. The Draft Improperly Fails to Analyze Impacts to Waterfowl and Shorebirds

Though the proposed action would likely have substantial impacts on waterfowl and shorebirds, the Draft entirely fails to discuss or analyze impacts to these species. [Footnote: The Draft does, however, acknowledge that waterfowl and shorebirds rely on seasonally flooded agricultural habitat. See, e.g., Draft EIS/EIR at 3.8-14 (indicating that post-harvest winter flooding "provides habitat for waterfowl and other wildlife," that invertebrates in flooded fields "are particularly important to shorebirds," and that "[r]ice fields provide pair, brood, and nesting habitat for birds such as mallard duck, northern pintail, and terns").] Such an analysis is required by CEQA, which provides that "[a]n EIR shall identify and focus on the significant environmental effects of the proposed project." 14 Cal. Code Regs. § 15126.2. [Footnote: NEPA also requires an analysis of the proposed action's effects on waterfowl and shorebirds, as these impacts are an important part of the environmental consequences of the proposed action. See Nat 'I Parks & Conservation Ass'n v. BLM, 606 F.3d 1058, 1072 (9th Cir. 2010) ("Under NEPA, an EIS must contain a 'reasonably thorough' discussion of an action's environmental consequences." (citing State of California v. Block, 690 F.2d 753,761 (9th Cir. 1982))).] "[S]ignificant effect on the environment," in tum, "means a substantial, or potentially substantial, adverse change in any of the physical conditions within the area affected by the project including land, air, water, minerals, flora, fauna, ambient noise, and objects of historic or aesthetic significance." Id. § 15382.

It is clear that crop idling transfers could lead to a substantial adverse change in the condition waterfowl and shorebirds within the project area. For example, modeling of population energy demand and population energy supply for dabbling ducks in the Central Valley shows that reduced winter-flooded rice acreage due to drought causes food demand to exceed supply. California's Drought and Potential Impacts on Waterfowl, Exh. G. When further drought-related habitat reductions are taken into consideration, food demand far exceeds supply for dabbling ducks, and demand also outpaces supply for dark geese and white geese. Id. Water transfers involving the idling of seasonally flooded agricultural habitat will occur primarily in dry years when habitat is already reduced, and will further diminish the already inadequate food supplies available to migratory waterfowl. Shorebirds, which also rely on seasonally flooded agricultural habitat, could be similarly impacted by crop idling transfers. Because impacts to waterfowl and shorebirds are an important part of the significant environmental effects of the proposed action, the Draft must include an analysis of impacts to these species.

The importance and feasibility of this analysis is underscored by the BDCP Draft EIS/EIR, which included substantial assessment of impacts to waterfowl and shorebirds. See, e.g., BDCP Draft EIS/EIR at 12-729 to 12-745. The BDCP environmental document emphasized that "[m]anaged wetlands, tidal natural communities, and cultivated lands (including grain and hay crops, pasture, field crops, rice, and idle lands) provide freshwater nesting, feeding, and resting habitat for a large number of Pacific flyway waterfowl and shorebirds." Id. at 12-729. It recognized that the proposed Plan would modify habitat in a manner that could affect these species, the included substantial analysis to understand the nature and extent of those impacts. See, e.g., id. at 12-729 to 12-745. The BDCP Draft EIS/EIR also acknowledged the Central Valley Joint Venture's conservation goals, and analyzed impacts to waterfowl and shorebirds in light of the Joint Venture's 2006 Implementation Plan. Id. at 12-729 to 12-730. In addition to qualitative discussions of impacts to waterfowl and shorebirds, the BDCP environmental document included analysis from the TRUEMET model to quantify the proposed action's impacts on waterfowl. See, e.g., id. at 12-729.

The long-term water transfers would affect the same shorebirds and waterfowl as the proposed BDCP, and there is no valid reason for the Draft's complete exclusion of these species from its impacts analysis. We recommend that a revised draft EIS/EIR include both qualitative and quantitative analysis of the proposed action's impacts on waterfowl and shorebirds.

Response

See response to Comment NG10-14 and Common Responses 10 and 13.

Comment NG10-24

Comment

III. The Draft Improperly Ignores South of Delta State Wildlife Areas and Federal Wildlife Refuges. A. The Draft Fails to Analyze Potentially Significant Impacts to South of Delta Refuges California law requires that an EIR "must include a description of the physical environmental conditions in the vicinity of the project." 14 Cal. Code Regs. § 15125(a). The CEQA Guidelines emphasize that "[k]nowledge of the regional setting is critical to the assessment of environmental impacts," and that "[s]pecial emphasis should be placed on environmental resources that are rare or unique to that region and would be affected by the project." Id. § 15125(c). A failure to accurately describe the environmental setting may render an EIR inadequate, inter alia, because important environmental impacts from the proposed action are likely to be omitted. See San Joaquin Raptor/Wildlife Rescue Ctr. v. Cnty. Of Stanislaus, 27 Cal. App. 4th 713, 729 (1994) ("For the reasons set forth above, the description of the environmental setting of the project site and surrounding area is inaccurate, incomplete and misleading; it does not comply with State CEQA Guidelines section 15125. Without accurate and complete information pertaining to the setting of the project and surrounding uses, it cannot be found that the FEIR adequately investigated and discussed the environmental impacts of the . . . project."). Similarly NEPA requires a "full and fair discussion of significant environmental impacts," and a failure to discuss a significant impact can render an EIS legally inadequate. 40 C.F.R. § 1502.1.

Here, the Draft is fatally flawed because it fails to include important south of Delta State Wildlife Areas and Federal Wildlife Refuges in its description of the proposed action's environmental setting, and fails to analyze impacts to these important resources. See Draft EIS/EIR at 3.8-15 to 3.8-17. This omission is particularly odd because the Draft acknowledges that, within SLDMWA, "[w]ater for habitat management occurs on approximately 120,000 acres of refuge lands, which receive approximately 250,000 to 300,000 acre-feet (AF) per water year." Id. at ES-4.

Yet it is clear that the proposed action could have significant impacts on south of Delta refuges. First, the proposed action could result in increased avian overcrowding. Crop idling transfers will reduce available habitat and forage in the Sacramento Valley, placing additional pressure on the already-stressed south of Delta habitats. Overcrowding could reduce breeding success for important bird species, exacerbated outbreaks of diseases such as cholera and botulism, and could affect waterfowl populations for years to come.

Response

See Common Response 9.

Comment NG10-25

Comment

Second, the Draft does not clearly discuss the order of priority for use of CVP conveyance facilities. If deliveries to the refuges are not appropriately prioritized, the refuges could be left without adequate water to support migratory bird populations. The Draft states that "[t]ransfers that must be conveyed through the Delta are limited to periods when capacity at C.W. 'Bill' Jones Pumping Plant (Jones Pumping Plant) and Harvey O. Banks Pumping plant (Bank Pumping Plant) is available typically from July through September, and only after Project needs are met." Id. at 2-18 (emphasis added). The Draft must clarify whether "Project needs" includes all deliveries to refuges that are required under the CVPIA. If Level 2 and Level 4 refuge deliveries are not considered "Project needs," then the Draft must analyze how the proposed action could impact water delivers to the south of Delta refuges, and how any potentially reduced deliveries could impact migratory birds and other species that depend upon the refuges.

Response

See Common Response 9.

Comment NG10-26

Comment

Third, the proposed action could increase the price of available water, making it impossible for Reclamation to purchase incremental Level 4 refuge supplies. A revised draft EIS/EIR should analyze how the proposed action will impact water prices, and whether price changes will affect Reclamation's ability to provide full deliveries to the south of Delta refuges.

Response

See Common Response 9.

Comment NG10-27

Comment

B. The Draft Should Include Transfers to South of Delta Refuges. Because it appears that impacts to south of Delta refuges could be significant, the Draft should include measures to mitigate these impacts. See Cal Pub Res. Code § 21081. A first step toward providing this mitigation would be to include transfers to south of Delta refuges in this environmental review. Reclamation needs flexibility to move available water quickly to protect these public trust resources, and including refuge transfers in this EIS/EIR would help to provide this flexibility. In dry years, north-to-south transfers can provide critically important water to south of Delta refuges. For example, this year, Reclamation transferred a portion of the permanent refuge supply that it purchased from the Anderson-Cottonwood Irrigation District from north of Delta refuges that could not physically receive the water, to the Kern National Wildlife Refuge, which is south of the Delta. Including such transfers in the proposed action would streamline approval and reduce transaction costs, allowing Reclamation to expeditiously provide water that is desperately needed for wetland habitat south of the Delta. We hope to see transfers to south of Delta refuges included in the proposed action in a revised draft EIS/EIR.

Response

See Common Response 9.

Comment NG10-28

Comment

IV. The Draft Fails to Adequately Analyze Impacts to Fish and Wildlife from Groundwater Substitution and Reservoir Release Transfers. A. The Draft Uses Inappropriate Screening Thresholds to Avoid Analyzing Biological Impacts from Flow Reductions. 1. The Draft Fails to Analyze Impacts to Fisheries Caused by Flow Reductions. The Draft's analysis of impacts to fisheries from instream flow reductions caused by the proposed action is seriously deficient because the Draft applies an arbitrary, not biologically based screening threshold to avoid analyzing potentially significant impacts. In particular, the Draft concludes that a reduction in instream flow would only be biologically significant if it involved both a 10 percent change in mean flow by water year type and a minimum change in flow of 1 cfs. Draft EIS/EIR at 3.7-20. These two thresholds were used as an initial screen, and further analysis to assess biologically significant impacts to fisheries was only conducted if flow reductions were both greater than 10 percent and greater than 1 cfs. Id. at 3.7-21.

Based on application of these thresholds, the biological impacts from flow reductions in vast majority of waterways in the Sellers' service area were never assessed. For example, the Draft states: Under the Proposed Action, mean monthly modeled flows would be reduced by less than ten percent on the Sacramento, Feather, Yuba, and American rivers. Based on the screening level criteria, these flow reductions are not considered substantial. Therefore, the effects of the Proposed Action on fisheries in these rivers would be less than significant. Id. at 3.7-25. Because the Draft concluded that the impacts would be less significant based on the 10 percent significance threshold, impacts to fisheries on these critically important waterways were not analyzed. Similarly, the screening thresholds were applied to exclude the following waterways from any assessment of biological impacts caused by flow reductions: Deer Creek (in Tehama County), Antelope Creek, Paynes Creek, Elder Creek, Mill Creek (in Tehama County), Thomes Creek, Mill Creek (Thomes Creek tributary), Butte Creek, Auburn Ravine, Freshwater Creek, Colusa Basin Drain, Putah Creek, and Wilson Creek. Id.

The Draft does not, and cannot, adequately justify its use of these arbitrary thresholds. The document explains that "[t]he ten percent threshold was used to determine measurable flow changes based on several major legally certified environmental documents in the Central Valley related to fisheries," including the Trinity River Mainstem Fishery Restoration Record of Decision (December 2000), the San Joaquin River Agreement Record of Decision (March 1999), the Freeport Regional Water Project Record of Decision (January 2005), and the Lower Yuba Accord EIRIEIS (October 2007). Id. at 3.7-20. Reliance on these old documents is misplaced because they do not reflect the best available scientific information, and because most of the documents were drafted for programs that increased flows. The Draft does not include any information regarding the biological significance of these thresholds, such as their relationship to water temperature, available spawning area, or other important factors.

Response

The 10 percent screening threshold for instream flow in rivers and creek is one of multiple criteria used to determine whether there were significant impacts on aquatic and terrestrial resources. Use of the 10 percent threshold is described in Section 3.7.2.1.3. As stated in the text, the use of the 10 percent value is to distinguish between effects that are a result of "model noise" and actual impacts of an alternative. This criterion is commonly used by experts in analyzing potential effects on Central Valley fisheries.

The analysis does not end there; it also evaluates whether an alternative causes a less than 1 cfs change in instream flows. This threshold was more biological in nature and was applied to every month of modeling. If a change of less than 1 cfs occurred in any single month during the entire modeled period (1976-2003), the waterway was examined further for biological effects. The combination of these two criteria provides an extremely conservative screening process which each river must undergo. If either criterion was "violated" for a river or stream, a further analysis was conducted to evaluate the biological significance of the flow change, such as those conducted for the Bear River, Cache Creek, Stony Creek, Coon Creek, and Little Chico Creek.

The EIS/EIR uses a biological basis for its analysis; the 10 percent threshold is justified as a screening threshold of physical modeling outputs and the analysis is extremely conservative, relying on several layers of analysis to arrive at a conclusion.

Comment NG10-29

Comment

Further, agencies have recently used a more conservative screening threshold to determine the potential significance of flow reductions. For example, the December 2013 Draft EIS/EIR for the proposed BDCP used a 5 percent screening threshold: Physical modeling outputs each month and water year type were compared for between model scenarios at multiple locations to determine whether there were differences between scenarios at each location. A "difference" was defined as a >5% difference between the pair of model scenarios in at least one water year type in at least 1 month. If a difference was found at a location, subsequent biological modeling and analyses for fish species that occur in that location were conducted and reported for that location. If no differences were found, subsequent biological modeling and analyses for fish species that occur in that location were deemed unnecessary and were not conducted.

BDCP Draft EIS/EIR at 11-202. The BDCP draft environmental document does not appear to use the additional 1 cfs threshold. Though the Draft and BDCP analyze impacts from flow reductions on the same rivers, the Draft does not attempt to explain why a less conservative threshold is appropriate for analysis of the proposed action's impacts to fish.

Because the Draft's reliance on the 10 percent and 1 cfs screening thresholds is inappropriate, and because impacts to special status fish species on the waterways that were eliminated based on application of the thresholds may be significant, further analysis is required. We recommend that a revised draft EIS/EIR analyze the significance of impacts based only on biological criteria, such as water temperature and changes to habitat quality. Alternatively, if a significance threshold for flow reductions is used, it should be at least as conservative as the 5 percent threshold used in the BDCP Draft EIS/EIR.

Response

BDCP is a different project looking at effects in larger rivers. It involves a different spatial scale and the margin of error is higher on an absolute scale. In addition, a 1 cfs threshold was used as an additional conservative screening criterion. See response to Comment NG10-28 for additional information.

Comment NG10-30

Comment

2. The Draft Fails to Analyze Impacts to Vegetation and Wildlife from Flow Reductions. The Draft uses the same screening thresholds from the fisheries chapter to determine whether flow reductions will have a significant impact on terrestrial species. Draft EIR/EIS at 3.8-38 ("If the flow reduction caused by implementing the transfer action would be less than one cubic feet per second (cfs) and less than ten percent change in mean flow by water year type, then no further analysis was required, because the effect was considered too small to have a substantial effect on terrestrial species."). The Draft justifies its use of these thresholds based on the same outdated documents it relied on in the fisheries section, even though the fisheries section indicates that those environmental reports were "related to fisheries." Id. at 3.8-39, 3.7-20. The use of these thresholds therefore appears to be even more arbitrary with respect to impacts to terrestrial species because the 10 percent threshold was derived from fisheries-related analysis.

Based on application of these thresholds, the vast majority of rivers and streams with special status terrestrial species were eliminated from consideration before biological impacts to those species could be analyzed. The following waterways were eliminated from further consideration based on the screening thresholds: Sacramento River, Feather River, Yuba River, American River, Deer Creek (in Tehama County), Antelope Creek, Paynes Creek, Seven Mile Creek, Elder Creek, Mill Creek (in Tehama County), Thomes Creek, Mill Creek (Thomes Creek tributary), Butte Creek, Auburn Ravine, Honcut Creek, Freshwater Creek, Colusa Basin Drain, Upper Sycamore Slough, Funks Creek, Putah Creek, Spring Valley Creek, Walker Creek, North Fork Walker Creek, Wilson Creek, Stone Corral Creek, Little Chico Creek, and the South Fork of Willow Creek. Id. at 3.8-49 to 3.8-50.

Because application of the screening threshold was inappropriate, and flow reductions from the proposed action could have a significant impact on special status terrestrial species that rely on the eliminated waterways, further analysis is required.

Response

See Common Response 11.

Comment NG10-31

Comment

B. The Draft's Conclusions Regarding Impacts to Fish and Wildlife from Reduced Instream Flows on Specific Rivers are Unsupported 1. The Draft's Conclusions that Important Fish Species Will Not Be Impacted Lack Biological Support. For the rivers in which modeled flow reductions would exceed 10 percent and l cfs in any month, the Draft purports to conduct further biological analysis to determine whether the flow reduction would have a significant impact on special status fish species. Draft EIS/EIR at 3.7-21. The presented analysis, however, is entirely qualitative and extremely cursory. Though the Lead Agencies are familiar with a variety of modeling tools that could have helped to more fully understand the proposed action's impacts on fisheries, no modeling of biological impacts was conducted. The extensive modeling that was used in the BDCP Draft EIS/EIR suggests various tools that could have been used, including SALMOD, the Sacramento Ecological Flows Tool, and the Reclamation Temperature Model. While these and other available models have flaws, they provide important insights into how flow reductions will impact fisheries. The Draft's failure to conduct any modeling substantially undermines its conclusions that the proposed action will not result in significant impacts to special status fish species.

Response

The modeling tools referenced in the comment only apply to specific rivers that were not the subject of further analysis based on the screening analysis of physical modeling outputs, as described in Section 3.7.2.1.3. For example, SacEFT only applies to the Sacramento River, which would experience very little change in flows under the Proposed Action and therefore did not require analysis beyond examining changes in flows. The qualitative analysis used for the smaller streams (i.e., Coon Creek, Stony Creek, Little Chico Creek, and Cache Creek) and larger waterways without other modeling tools (e.g., Bear River) used the best available science because no better quantitative tools were available for use, and the analysis was based on the biology of the species evaluated.

Comment NG10-32

Comment

Further, the Draft's qualitative assessment of biological impacts from flow reductions is of such poor quality that it cannot be considered reliable. For example, for Stony Creek and Coon Creek, the Draft concludes that, because "significant" flow reductions-i.e., greater than 10 percent and 1 cfs – will happen infrequently, the impacts to special status fish species will be less than significant. Draft EIS/EIR at 3.7-28 to 3.7-29. The Draft does not explain, however, why the frequency of a low-flow event is dispositive as to biological impacts, and it is not at all clear that a single occurrence of low flows and high temperatures could not significantly impact sensitive fish populations. Additionally, with respect to Stony Creek, if a 5 percent significance threshold was used instead of a 10 percent threshold, "significant" flow reductions would occur in many more months. Id. at 3.8-56 to 3.8-57. For Coon Creek, the Draft doesn't even mention which species could be impacted. Id. at 3.7-29.

Response

See responses to Comments FA01-55 and NG10-28. The species and life stages present in each waterbody and waterway evaluated, including Coon Creek, are found in Table 3.7-2.

Comment NG10-33

Comment

With respect to Little Chico Creek, the Draft appears to conclude that, because the Creek already suffers from low flows, additional flow reductions will not be problematic. Id. at 3.7-29. The Draft cannot simply write off the biological impacts from an increased frequency of low flow events without providing any analysis of effects on temperature, habitat suitability and availability, and other important factors.

Response

For the same reasons the EIS/EIR analyzes flows in Little Chico Creek during periods when fish are present, there is no need to analyze the flows when the species are not present. Because the creek has low flows under the baseline condition, the species of concern would not be present during the periods stated. There was no attempt to "write off the biological impacts" as the commenter suggests; instead, the analysis compares the conditions in Little Chico Creek with and without the project during months when species are present.

In response to another comment related to this section, an additional analysis of the frequency of dropping below 0 cfs and 0.5 cfs was added to the text in Section 3.7.2.4.1. This additional analysis further supports the conclusion that impacts would be less than significant.

Comment NG10-34

Comment

On Cache Creek, the Draft concludes that there will be no impact to Fall-run Chinook salmon because connectivity for migration only exists in wet years, and there are no significant instream flow reductions in wet years. Id. at 3.7-28. The significance determination is based on the unsupported 10 percent figure, however, and use of a more conservative threshold would show that a significant flow reduction would occur in October in wet years. See id. at 3.8-55.

Response

See response to Comment NG10-28.

Comment NG10-35

Comment

The Draft also appears to erroneously exclude waterways that may contain special status fish species from further biological review. The Draft states that "[n]o field sampling information is available regarding the presence of special-status fish species in the following waterways: Seven Mile Creek, Elder Creek, Spring Valley Creek, North Fork Walker Creek, and Wilson Creek." Id. at 3.7-9. It elaborates that, "[w]ithout further information, it was assumed that these streams could support special-status fish species and, therefore, further biological analyses were conducted in these waterways." Id. In the following paragraph, however, the Draft states that field sampling data and reports indicate that special status fish species are not present in Seven Mile Creek, Spring Valley Creek, North Fork Walker Creek, and Wilson Creek, and accordingly that no further biological analysis was conducted for these waterways. Id. A revised draft EIS/EIR should clarify whether there is field sampling information available for these Creeks, and should conduct biological analysis if information regarding the presence of special status fish species is not available.

Response

The text has been revised to include the correct information. The correction does not materially affect the conclusions of the analysis.

Comment NG10-36

Comment

The impacts of the proposed action on fisheries remain unclear because the Draft uses inappropriate screening thresholds, fails to model biological impacts, and includes logically unsound qualitative assessments of biological impacts from admittedly significant flow reductions. To comply with CEQA and NEPA's legal requirements that an EIS/EIR provide the public with sufficient information to understand the environmental impacts of a proposed project and meaningfully compare alternatives, substantially more analysis is required, including modeling to understand the biological implications of flow reductions.

Response

The impacts analysis looked at the full range of potential effects to all target species in all waterways that could potentially be affected by each alternative using the best available science and analytical tools. The approach is described in Sections 3.7.2.1 and 3.8.2.1, significance thresholds are listed in Sections 3.7.2.2 and 3.8.2.2, and the results for each alternative are provided in Sections 3.7.2.3 through 3.7.2.6 and 3.8.2.3 through 3.8.2.6. The methods, logic, and science behind the findings of less than significant for biological impacts are supported in these sections.

Comment NG10-37

Comment

2. The Draft's Conclusions that Vegetation and Wildlife Will Not Be Impacted Lack Biological Support. Similarly, for terrestrial species, the Draft's analysis of biological impacts on the few waterways that it analyzes after application of the screening thresholds is unacceptably cursory. For example, for Coon Creek, the Draft concludes that impacts to terrestrial species will not be significant because substantial flow reductions will occur infrequently. Draft EIS/EIR at 3.8-59. The Draft does not present any biological information or analysis to show that the frequency of low-flow events determines the impacts of those events on sensitive species.

Response

The EIS/EIR conclusions regarding impacts to vegetation and wildlife are based on the analyses and supporting substantial evidence summarized in Section 3.8. See response to Comment SA01-21 regarding impacts to wildlife in Coon Creek.

Comment NG10-38

Comment

With respect to Little Chico Creek and Bear River, the Draft seems to conclude that flow reductions will have a less than significant impact on terrestrial species because the flow reductions are likely to occur when water levels are already low. Id. at 3.8-59 to 3.8-61. These conclusions are unsupported by data or analysis. Further, it seems that flow reductions could have a particularly profound impact during dry years or periods when streamflow is already low, as every drop of available water would be critical for riparian ecosystems. Further analysis that actually describes the anticipated impacts to the terrestrial species that rely on these waterways is required.

Response

The maximum flow changes predicted at full groundwater substitution would be a maximum 0.04 cfs reduction for Little Chico Creek. This is an insubstantial loss and would not be expected to have a significant effect on either natural communities or special-status wildlife. Bear River flow reductions greater than 10 percent would only be expected to occur during February in the wet season, and are not expected to affect vegetation. Impacts to natural communities and wildlife would be less than significant.

Comment NG10-39

Comment

Finally, for Cache Creek and Stony Creek, the Draft concludes that flow reductions could have a significant impact on the riparian natural communities associated with these streams. Id. at 3.8-52 to 3.8-53, 3.8-58. These impacts would be reduced to less-than-significant levels, the Draft concludes, through implementation of the groundwater mitigation measure. Id. As discussed in the next section, however, the groundwater mitigation measure is insufficiently protective, and significant impacts will remain after its implementation.

Response

Vegetation monitoring requirements have been clarified in Mitigation Measure GW-1. See Common Responses 6 and 10.

Comment NG10-40

Comment

C. The Mitigation Measure for Potentially Significant Impacts from Groundwater Substitution Transfers is Inadequate. In several instances, the Draft: relies on Mitigation Measure OW -1 (see Draft: EIS/EIR at 3.3-88 to 3.3-91) to conclude that otherwise significant impacts will be reduced to less-than significant levels. For example, it relies on the groundwater mitigation measure to avoid significant impact to natural communities along Cache Creek and Stony

> Creek (id. at 3.8-52 to 3.8-53,3.8-58), and to ameliorate potentially significant impacts to fish and terrestrial species associated with small streams for which no historical flow data are available (id. at 3.7-26,3.8-51). Similarly, the Draft: concludes that the groundwater mitigation measure would help to eliminate the possibility of cumulatively significant impacts to fisheries. Id. at 3.7-56. With respect to impacts to vegetation and wildlife, the Draft: generally concludes that the "Environmental Commitments described in Section 2.3.2.4 and Mitigation Measure OW-1 described in Section 3.3 would eliminate or reduce the potentially substantial effects of water transfer actions." Id. at 3.8-90.

Mitigation Measure OW -1 requires potential sellers to comply with a specific set of monitoring provisions, and to create and implement a mitigation plan. Id. at 3.3-88 to 3.3-91. "The purpose of Mitigation Measure OW -1 is to monitor groundwater levels during transfers to avoid potential effects. If any effects occur despite the monitoring efforts, the mitigation plan will describe how to address those effects." Id. at 3.3 -91. The monitoring requirements include measurement of well discharge rates and volumes, groundwater-level measurements, and assessments of land subsidence. Id. at 3.3-88 to 3.3-89. The Draft: requires that a mitigation plan include "[d]evelopment of mitigation options," and suggests particular actions, including curtailment of pumping, reimbursement for increased pumping costs, and reimbursement for expenses caused by infrastructure damage from land subsidence. Id. at 3.3-90 to 3.3-91.

Response

Based on the analysis and supporting evidence summarized in Section 3.8, Mitigation Measure GW-1 is sufficient to reduce impacts to a level that is less than significant. See also Common Response 10.

Comment NG10-41

Comment

There are no specific actions, however, to address significant impacts to fisheries and riparian communities that could result from streamflow depletions associated with groundwater substitution transfers. This is problematic because, as discussed above, the Draft: recognizes that groundwater substitution transfers could cause significant impacts to fish and terrestrial species, and relies on Mitigation Measure OW-l to reduce these impacts to less-than-significant levels. By relying on not-yet-created plans to mitigate impacts to fish and wildlife, without demonstrating how these impacts can be mitigated, the Draft: violates CEQA's prohibition on deferred mitigation. See, e.g., City of Long Beach v. Los Angeles Unified Sch. Dist., 176 Cal. App. 4th 889, 915-16 (2009) ("Impermissible deferral of mitigation measures occurs when an EIR puts off analysis or orders a report without either setting standards or demonstrating how the impact can be mitigated in the manner described in the BIR. "). [Footnote: The environmental commitment focused on groundwater substitution transfers does not fix this problem because it merely requires that mitigation plans address impacts to water resources needed for special status species protection, but does not provide any guidance as to how the impacts can be mitigated. See Draft EIS/EIR at 2-29.]

To remedy this problem, a revised draft EIS/EIR should include particular actions that sellers can take to mitigate significant impacts to fisheries, vegetation, and wildlife caused by groundwater substitution transfers. For example, the revised draft could include a mitigation action requiring a seller who is responsible for a flow reduction that significantly impacts fish and wildlife to curtail pumping and dedicate a portion of his surface water supply to flows for fish and wildlife until the waterway is no longer impacted by the seller's transfer-related groundwater pumping.

Response

Related to fisheries resources, all impacts were found to be less than significant, therefore no mitigation is necessary. All references to mitigation measures were removed from Section 3.7 to avoid confusion.

Vegetation monitoring requirements have been clarified in Mitigation Measure GW-1. See Common Responses 6 and 10.

Comment NG10-42

Comment

V. The Draft Fails to Analyze Impacts to Wildlife from Increased Irrigation of Drainage-Impaired Lands in the Buyers' Service Area. The Draft also fails to adequately analyze impacts to water quality and wildlife that could occur in the Buyers' service area as a result of increased irrigation of drainage-impaired lands. It is well known that substantial acreage within SLDMWA is compromised by the accumulation of selenium-laden drainage water in the shallow groundwater table. For example, as of2006, there were approximately 298,000 acres of drainage-impaired lands within Westlands Water District. U.S. Bureau of Reclamation, San Luis Drainage Feature Re-evaluation Final Environmental Impact Statement (May 2006) at ES-15, available at http://www.usbr.gov/mp/nepa/nepa_projdetails.cfm?Project_ID=61. The Draft acknowledges that increased irrigation of lands with contaminated drainage water could impact surface waters in the region because "increased irrigation could cause water to accumulate in the shallow root zone and could leach pollutants into the groundwater and potentially drain into the neighboring surface water bodies." Draft EIS/EIR at 3.2-41. As is clear from the experience at Kesterson Reservoir, drainage-water discharges to surface waters can have profound impacts on wildlife, including sensitive migratory birds.

The Draft, however, concludes that increased irrigation of drainage-impaired lands will not be a problem because the proposed action would be implemented in dry years, so "most water would be applied to permanent crops or crops planted on prime or important farmlands," and "farmers would continue to leave marginal land and drainage impaired lands out of production and use water provided by the Proposed Action for more productive lands." Id. But this statement is contradicted elsewhere in the Draft. For example, the chapter on agricultural land use states that the proposed action would "increase water supplies and potentially allow growers to place previously idled land into production." Id. at 3.9-48. Additionally, the Draft indicates that the Exchange Contractors could sell up to 150,000 acre feet, and that "both projects could sell their water to the same buyers." Id. at 3.8-93. It clearly remains possible that the proposed action would result in increased irrigation of drainage-impaired lands.

Response

Section 3.2.2.4.2 includes an assessment of whether increased agricultural irrigation in the buyers' area could affect water quality. The assessment indicates the irrigation would not be focused on drainage-impaired lands because growers would focus limited supplies during shortages on permanent crops or crops planted on prime or important farmland. The impact finding is that agricultural runoff would not significantly degrade water quality in San Joaquin Valley waterways, which would indicate the effort would not result in water quality-related impacts to wildlife in the area.

Comment NG10-43

Comment

The Draft also suggests that any drainage created by the proposed action would not be problematic "given drainage management, water conservation actions and existing regulatory compliance efforts already implemented in that area." Id. at 3.2-41. Yet the status of drainage management in the region remains unclear. Reclamation is in the process of finalizing a settlement agreement with Westlands that would shift responsibility for providing drainage services from the federal government to the district. See Principles of Agreement for a Proposed Settlement Between the United States and Westlands Water District Regarding Drainage (Dec. 2013) (attached as Exh. H). Though the draft settlement agreement has not been made public, the attached Principles of Agreement suggest that that the deal may not include important safeguards such as performance' standards, monitoring requirements, federal oversight, and enforcement mechanisms to ensure that any drainage-water discharges are properly managed. Further, the Principles of Agreement indicate that the settlement will only require Westlands to retire 100,000 acres, leaving almost 200,000 acres of drainage-impaired land within the district eligible for irrigation. In light of the major deficiencies in the pending settlement, the Draft cannot rely on "existing regulatory compliance efforts" to avoid addressing the drainage-related impacts that the proposed action could cause.

Because the proposed action could lead to increased irrigation of drainage impaired lands in Westlands and other districts, causing potential impacts to birds and other wildlife, and because it is uncertain whether there will be an effective drainage management plan in place, a revised draft EIS/EIR should include a quantitative analysis of potential environmental impacts from this increased irrigation, including water quality impacts to surface waters in the Buyers' service area, as well as an assessment of potential impacts to migratory birds and other wildlife.

Response

The impact analysis does not rely on specific conditions of the Westlands drainage settlement to find that impacts would be less than significant. The description of the potential impact explains transfer water would not likely be used for irrigation of marginal or drainage-impaired lands. This factor, when combined with other factors such as the small incremental amount of agricultural discharge from water transfers and drainage management in the area, resulted in a less than significant finding. Furthermore, in the absence of a settlement of federal drainage obligations, Reclamation is working to address drainage-impaired lands under the authority and duties imposed by federal law. As part of those activities, the San Luis Drainage Feature Re-Evaluation and Grassland Bypass Project 2010-2019 both underwent a separate environmental compliance and public comment process that thoroughly addressed issues of continued irrigation of agricultural lands with CVP water and the production of drainage. More information on those projects and public review can be found at http://www.usbr.gov/mp/sccao/sld/ and http://www.usbr.gov/mp/grassland/.

See responses to Comments NG03-125 and NG03-141 for additional information.

Comment NG10-44

Comment

VI. The Draft Fails to Analyze an Adequate Range of Alternatives. Both CEQA and NEP A require consideration of a reasonable range of alternative actions that might achieve similar goals with less environmental impact. Cal. Pub. Res. Code §§ 21002, 21061,21100; 14 Cal. Code Regs. § 15126.6; 42 U.S.C. § 4332; 40 C.F.R. §§ 1502.14, 1508.25(b). "The existence of a viable but unexamined alternative renders an environmental impact statement inadequate." Natural Res. Def. Council, 421 F.3d at 813 (quotation marks and citation omitted). Further, CEQA is designed to prevent public agencies from approving projects if feasible alternatives or mitigation measures would substantially lessen the significant environmental effects. Cal. Pub. Res. Code § 21002.

Here, the Draft has failed to analyze an alternative that could achieve the project purpose with a less substantial environmental impact. The Draft analyzes four alternatives: (1) no action/no project; (2) full range of transfers (proposed action); (3) no cropland modifications; and (4) no groundwater substitution. Draft EIS/EIR at 2-6. While the two action alternatives other than the proposed alternative restrict the available methods of transfer, the Draft does not consider any action alternative that restricts the quantity of water that may be transferred. Cropland modification transfers and groundwater substitution transfers affect environmental resources differently, and the alternatives that exclude one or the other method reduce some, but not all, impacts associated with the proposed action. An alternative that reduces the amount of water that could be transferred, for example to 50 percent of the amount included in the proposed action, for both cropland modification transfers and groundwater substitution transfers would reduce almost all of the environmental impacts caused by the proposed action to some extent. Because such an alternative would still meet the project's objectives, and would substantially reduce environmental impacts, it should be included and fully analyzed as an alternative in a revised draft EIS/EIR.

Response

The three action alternatives have different upper limits for water transfers. Alternative 2 could have up to about 511,000 acre-feet of transfers, Alternative 3 could have up to about 391,000 acre-feet of transfers, and Alternative 4 could have up to about 277,000 acre-feet of transfers. These alternatives already represent a range of potential total transfers, with Alternative 4 including about half the total amount of transfers in Alternative 2. The request to analyze different upper limits for transfers is satisfied within this current range of alternatives.

Comment NG10-45

Comment

VII. The Draft Fails to Account for Climate Change Impacts. It is well accepted that changes to California's temperature and precipitation regime will occur in the future, and these changes will affect nearly all aspects of the CVP system. Further, the Draft acknowledges that, among other impacts, "[c]limate change will continue to affect natural ecosystems, including changes to biodiversity, location of species and the capacity of ecosystems to moderate the consequences of climate disturbances such as droughts. In particular, species and habitats that are already facing challenges will be the most impacted by climate change." Draft EIS/EIR at 3.6-13 (citations omitted).

Though it recognizes that climate change impacts are occurring now, the Draft concludes that climate change will not significantly impact the proposed action because of the action's ten year timeframe: "Because of the short-term duration of the Proposed Action (10 years), any effects of climate change on this alternative are expected to be minimal. Impacts to the Proposed Action from climate change would be less than significant." Id. at 3.6-21 to 3.6-22. Similarly, in its analysis of impacts to fisheries, the Draft concludes that climate change will not alter conditions in reservoirs, rivers and creeks, or the Delta because there will be limited climate change predicted over the project's ten year duration. Id. at 3.7-23 to 3.7-24. Beyond these conclusory statements, the Draft includes no modeling or analysis to show the proposed action's impacts in light of expected climate change.

The Draft's approach to climate change is a substantial departure from recently produced environmental documents in which climate change is incorporated into the operational modeling for the project. For example, Reclamation incorporated climate change into the modeling and assessment of environmental impacts for the BDCP's draft environmental documents. See, e.g., BDCP Draft EIS/EIR at 4-6,5-47 to 5-49, and Appendix 3E. In the BDCP Draft EIS/EIR, the "CALSIM model was used to simulate how projected changes in runoff (i.e., reservoir inflows) for two future climate periods, 2025 and 2060 conditions, would affect existing reservoir operations and Delta inflows in the project area." Id. at Appendix 29B-I. Importantly, the above quote reflects that the BDCP Draft EIS/EIR included climate changes impacts in its operational model for 2025 – only one year after the time period covered by the proposed action. The proposed BDCP and the proposed action have overlapping action areas and operational considerations, and BDCP's modeling of climate change impacts in 2025 undermines the Draft's position that climate change impacts within a ten year time frame will be inconsequential.

Because the Draft's analysis and operational modeling does not reflect likely operations in the future with climate change, the Draft's assessment of potential environmental impacts fails to accurately assess the impacts of the proposed action in light of climate change. This approach is not consistent with CEQA or NEPA, and the operational modeling must be revised to incorporate climate change in order to accurately assess potential environmental impacts.

Response

As described in Appendix C, the CalSim II modeling completed for this analysis simulates the operation of the CVP and SWP "using 82 years of historical hydrology from water year 1922 through 2003" (page C-4). Because the modeling incorporates known climatic variability, it by definition considers any changes in hydrology from climate change. The appendix further states that "[t]he Project's ten-year period allows simulation of a single level of development under the assumptions that conditions are not likely to change significantly over such a short time horizon" (see page C-20). Although climate change will continue to occur during the project's implementation, the effects are expected to be minimal as demonstrated in Section 3.6, Climate Change, and specifically in Section 3.6.1.3, Existing Conditions.

Comment NG10-46

Comment

VIII. The Draft Fails to Adequately Assess Cumulative Impacts. The Draft fails to adequately consider cumulative impacts because it fails to include an assessment of potentially cumulative projects. Initial comments on the proposed action that the Glenn-Colusa Irrigation District ("GCID") submitted to Reclamation on October 14, 2014 illustrate the problem. GCID's letter describes its Groundwater Supplemental Supply Program, through which it is proposing to install and operate five new groundwater production wells and operate an additional five existing wells for use within GCID during dry and critically dry water years. The letter indicates that the wells would have a production capacity of approximately 2,500 gallons per minute, and would operate during dry and critically dry water years for a cumulative total annual pumping volume of up to 28,500 acre feet. The letter indicates that pumping under the Groundwater Supplemental Supply Program would likely occur in the same years as the long-term transfers that the Draft analyzes. Yet the Draft does not include GelD's Program in its analysis of cumulative impacts to groundwater resources. See Draft EIS/EIR at 3.3-91 to 3.3-92. The cumulative impacts caused by groundwater substitution transfers covered by the proposed action and groundwater pumping under GelD's new program could be significant, and further analysis is required. More generally, GelD's letter suggests that the Draft's authors did not adequately survey the proposed action's potential sellers to understand their future operations, raising questions about other likely projects that have been excluded from the Draft's cumulative impacts analysis.

Response

Information on GCID's Groundwater Supplemental Supply Program was not available at the time the cumulative analysis was completed for the 2014 Draft EIS/EIR. The cumulative analysis for Groundwater Resources has been updated to include GCID's program.

Comment Letter NG11, Joni Stellar, Frack-Free Butte County

Comment NG11-1

Comment

A profound need exists to reconcile ALL proposed water transfer policies with California’s new Groundwater legislation, existing over-commitment of surface waters, and the current massive, long-term drought conditions. Groundwater levels are in severe decline in Northern California – and proposed transfers will only make this situation worse. Lack of snow and rain is limiting recharge of aquifers. Insufficient surface flows into San Francisco Bay and Delta are negatively impacting this most important estuary to fisheries on the West Coast. There simply isn't enough water to go around.

Many people living in Northern CA express deep and valid concerns about their wells going dry. People need water for personal needs, farming, fishing, recreation, and more. Yet, any hope for a "sustainable relationship" between the North State residents and our water supplies is evaporated by plans to transfer so much water south.

Governmental agencies should use the best, most current and pertinent data to make analyses of water systems so as to make good predictions and plans. However, the baseline data your agency uses to plan transfers of water out of Northern California includes only the years 1973-2003. As the current extensive, severe drought continues, more current data must be incorporated to make appropriate predictions and plans. Careful conservation and wise use of precious water can be better planned using more accurate data.

Response

See Common Response 5.

Comment NG11-2

Comment

Please help everyone in California confront the realities of the current drought and on-going climate change. Conserving water should be the major focus of government agencies and corporations, as well as residents and small farmers. For example, directing farmers to plant crops that use far less water than many current agribusinesses 'need,' and to use drip irrigation instead of 'flood' irrigation methods still in common use. Residents and municipalities should greatly reduce turf grass and other water-intensive landscaping, replacing it with less water-thirsty plantings.

We cannot afford to have Northern California streams, lakes, and groundwater drained just to transfer water to reservoirs and tunnels designed to help Southern California water districts and big agricultural corporations make profits and maintain their status quo. The costs to our communities and environment (including forests, animals, fishes), and taxes, are simply too high. We do not want or need a "Cadillac Desert" in California.

Response

The Lead Agencies recognize the importance of water conservation as part of a water supply portfolio. Reclamation has included Water Re-Use and Conservation as one of the critical CVP/SWP operational considerations to address drought in the "Interagency 2015 Drought Strategy" (available from http://www.usbr.gov/mp/drought/docs/WY2015/Drought_OPInteragency2015_Drought_Strategy.pdf). Additionally, Reclamation requires CVP contractors to implement water use efficiency best management practices as required by CVPIA Section 3405(e). Water conservation efforts included as alternatives to the Proposed Action would need to be in addition to the efforts already planned for implementation; therefore, they represent conservation actions that require substantial infrastructure and investment and would not be immediately implementable.

Comment Letter NG12, Grace Marvin, Sierra Club, Yahi Group

Comment NG12-1

Comment

As Conservation Chair of the Yahi Group of the Sierra Club, I attended your "public meeting" on 10/21/2014 concerning Long-Term Water Transfers Draft EIR/EIS. In light of my concerns about the talk, I asked questions at the meeting linking the need to connect the spirit behind the groundwater legislation adopted by Governor Brown for our state and the transfer policies. Subsequently, I reviewed the Sierra Club water policy (developed by the Club's California Nevada Regional Conservation Policies or CNRCC in 1993 and amended in 2004 and 2009). There I saw how the transfer policy you presented violated the spirit of the club's water policies that are devoted to careful preservation and wise use of our natural resources.

Response

Section 3.3.1.2, Regulatory Setting has been edited to include a summary of the Sustainable Groundwater Management Act adopted in September 2014. Additionally, as stated in Section 3.3.4.1, "basins designated as high- and medium-priority with critical overdraft conditions as part of DWR's sustainable groundwater management act work, will suspend transfers until (1) a groundwater sustainability plan (GSP) is developed and the adopted GSP recognizes transfers as a sustainable practice; or (2) an existing GMP recognizes transfers as a sustainable practice."

This EIS/EIR provides a thorough and systematic evaluation of a broad range of environmental issues and discloses any potential impacts to natural resources (i.e., water supply, water quality, groundwater resources, vegetation and wildlife) as a result of the Proposed Action. This disclosure will help decision-makers select the action to take to move forward.

Comment NG12-2

Comment

The CNRCC states on goal is to "preserve and restore naturally functioning biodiverse, and productive aquatic ecosystems throughout California." In my opinion, to do so requires that agencies use pertinent data to make analyses of water systems so as to make better predictions. But the baseline data your agency uses to plan transfer water out of the north state cover the years 1973-2003. Since we are no seeing uniquely dry conditions now and well into the future, why not use more current data to make predictions? "Careful preservation and wise use" of our water can be better planned using more accurate data.

Response

See Common Response 5.

Comment NG12-3

Comment

Another process that is violated in the transfer policies is the following: "Develop a sustainable relationship between people and the aquatic environment to meet the needs of each." As we heard at the 10/21/2014 meeting a large number of people expressed deep concerns about their wells being either completely dry or nearly so. People need this water for personal needs, farming, fishing, recreation, and more. Yet, any hope for a "sustainable relationship" between many of us in the north state and our water supplies was evaporated by the plans to transfer water south.

Response

The potential for the action alternatives to affect groundwater levels (including the potential to exacerbate drought-related groundwater level declines) is considered in Section 3.3, Groundwater Resources. This section includes Mitigation Measure GW-1, which requires monitoring for groundwater levels and mitigation to avoid potentially significant adverse effects.

Comment NG12-4

Comment

Furthermore, the Water Ethic spelled out in the CNRCC policy is that individuals and organizations should "utilize water conserving practices in agricultural and urban areas." But no mention was made of any kind of effort to direct famers to plant crops that use far less water than many current agribusinesses need."

Response

The concept of increasing agricultural water use efficiency in the buyers' area was considered in the EIS/EIR as part of the Agricultural Conservation (Buyer Service Area) alternative (see Table 2-1 and Appendix A). It was not carried forward for more detailed analysis because it did not meet the key elements of the purpose and need or basic project objectives, as it would not be immediately implementable and would not provide additional water. See Appendix A for more details on the screening of this alternative.

Comment NG12-5

Comment

Finally, Sierra Club is focused on the environment -which we are supposed to enjoy, preserve, and protect. Many other aspects of the CNRCC policy are violated with the water transfer policy, but I ask you to pay special attention to this one, since you are part of an institution that is capable of making such changes: "Adapt water use, pollution control, land use, and other social and economic patterns to reduce and avoid conflicts with environmental needs." Please help us in the north state in confronting the current drought and on-going climate change. We cannot afford to have our streams, lakes, groundwater, and rivers drained in order to transfer water to reservoirs and tunnels designed to help southern water districts and agricultural corporations make profits that cost our environment (including trees, animals, fish) so much. We do not want another "cadillac desert" in California.

Response

See Common Response 2.

Comment Letter NG13, Jay Ziegler, The Nature Conservancy, California Chapter

Comment NG13-1

Comment

As both a conservation organization and land owner in the Delta and Sacramento Valley, The Nature Conservancy (TNC) has been engaged in the Central Valley and Delta for many years to advance the recovery of endangered species, restore and preserve multiple types of habitat, and seek to apply sound science and practical solutions that work for nature and people.

Of particular interest to the Conservancy is the importance of achieving overall sustainable water management practices in California; both for the benefit of people and natural systems. The California Water Action Plan recognizes that this includes imperative actions such as improving groundwater management, better managing our surface flows, restoring wetlands and watersheds, and facilitating water transfers. The challenge facing California's water managers, including the federal agencies and water districts who are the principal entities that will participate in—and benefit from—this Long-Term Water Transfer program, is to implement water transfer programs in a manner that is clear and transparent, based on sound science, and which minimizes impacts by design, especially in areas of origin.

We agree that water transfers are an important tool for overall sustainable water management when properly designed and implemented with appropriate mitigation; however, we are concerned about the potential impacts that could occur with implementation of the Proposed Action, and we are not confident that these impacts have been addressed through the mitigation measures and environmental commitments outlined in the Draft EIS/EIR.

In particular, The Nature Conservancy is concerned about the impacts to fish and wildlife that could result from surface water and groundwater transfers of the magnitude envisioned in the Draft EIS/EIR, especially related to sustainable groundwater and surface water management. We are also concerned that the fallowing described in the Proposed Action may impact wildlife-friendly farming necessary for Pacific Flyway habitat for migratory birds. For example, water transfers are likely to result in the idling of riceland and other compatible agricultural land in the Sacramento Valley, where now the water applied to many of these crops serves multiple purposes and represents a decade of cooperation and innovation between our organization, our partners, and the landowners with whom we work. As we discuss below, more robust environmental commitments are critical to address the potentially significant impacts of the Proposed Action, and also present an opportunity to demonstrate true sustainable water management that works for both people and natural systems. Additionally, the Draft EIS/EIR must demonstrate a clear linkage and rationale between the environmental commitment or measure and what impact will be avoided or mitigated, and use best available science.

Response

The environmental commitments in Section 2.3.2.4 reflect information from consultation with the U. S. Fish and Wildlife Service and the most recent scientific studies on giant garter snakes from the U. S. Geologic Survey. Section 3.7 analyzes potential impacts to fisheries, and finds that changes in streamflow would not significantly affect fish because the changes would be small and/or would not occur at times and locations when fish are present. Section 3.8 assesses potential effects to terrestrial species from cropland idling and riparian vegetation from groundwater substitution.

Comment NG13-2

Comment

1. Environmental commitments are inadequate to avoid or mitigate impacts, and must give environmental consequences a "hard look."

The Draft EIS/EIR includes environmental commitments to mitigate for the impacts of the proposed long- term transfers. The Bureau of Reclamation's NEPA Handbook describes "environmental commitments" as "written statements of intent made by Reclamation to monitor and mitigate for potential adverse environmental impacts of an action associated with any phase of planning, construction, and operation and maintenance (O&M) activities. It is a term used by Reclamation to reflect the concept addressed in 40 CFR 1505.3." Section 1505.3 of part 40 of the Code of Federal Regulations refers to the implementation of mitigation measures. The Draft EIS/EIR also describes the environmental commitments as comparable to the mitigation measures required under CEQA. Thus, the environmental commitments are intended to be mitigation measures.

NEPA requires that the environmental impact statement give a "hard look" at the environmental consequences of the proposed project. Minnesota Public Interest Research Group v. Butz, 541 F.2d 1292, 1301 (8th Cir. 1976), quoting Kleppe v. Sierra Club, 96 S.Ct. 2718 (1976). With respect to mitigation measures, a "hard look" requires that the measures "be discussed in sufficient detail to ensure that environmental consequences have been fairly evaluated." Carmel-by-the-Sea v. U.S. Dept. of Transportation, 123 F.3d 1142, 1154 (9th Cir. 1992) (internal citation omitted). "A mere listing of mitigation measures is insufficient to quality as a reasoned discussion." Northwest Indian Cemetery Protective Assoc. v. Peterson, 795 F.2d 688, 697 (9th Cir. 1986), rev's on other grounds, 108 S.Ct. 1319 (1988). Failure to include a "reasonably thorough discussion of mitigation measures . . . would undermine the action-forcing goals of [NEPA]." Carmel-by-the-Sea, supra, at p. 1154.

CEQA requires that an EIR describe in detail "[m]itigation measures proposed to minimize significant effects on the environment." (Pub. Resources Code, § 21100, subd. (b)(3).) The CEQA Guidelines, the implementing regulations for CEQA[1] set forth the detail required for an adequate description of mitigation measures. Section 15126.4, subdivision (a)(1) provides that an "EIR shall describe feasible measures which would minimize adverse impacts." And section 15126.4, subdivision (a)(2) requires that "[m]itigation measures must be fully enforceable through permit conditions, agreements, or other legally- binding instruments.

Response

The Environmental Commitments in Chapter 2.3.2.4 describe limitations on transfers and operational restrictions that SLDMWA and Reclamation would incorporate in how they review and approve proposed transfers. See Common Response 14. Most of these measures include restrictions related to potential effects on giant garter snakes. Including these environmental commitments does not preclude an analysis of environmental effects. The Draft EIS/EIR analyzes potential environmental consequences to the giant garter snake in compliance with NEPA and CEQA starting on page 3.8-68.

Comment NG13-3

Comment

The environmental commitments included in the project description are inadequate as mitigation measures under both NEPA and CEQA. The descriptions are perfunctory and conclusory. For example, with respect to the impact on fisheries, the Draft EIS/EIR concludes without analysis that "The environmental commitments described in Section 2.3.2.4 incorporated into the project will reduce or eliminate significant impacts to fisheries resources and fish species of management concern. No additional mitigation is required." (Draft EIS/EIR Ch. 3, § 3.7.4.) Presumably based on this conclusion, the Draft EIS/EIR goes on to conclude that "[n]one of the action alternatives would result in potentially significant unavoidable impacts on fisheries." (Draft EIS/EIR Ch. 3, § 3.7.5.) Section 3.7.4 does not specify which of the environmental commitments will mitigate for impacts to fisheries or how that mitigation is expected to occur. More significant, none of the environmental commitments described in Alternative 2, the Proposed Action, addresses impacts to fisheries or measures for protecting fisheries. The Draft EIS/EIR fails to fully describe impacts to fisheries and mitigation for those impacts the requisite hard look and therefore is inadequate.

Response

No effects on fisheries were found and mitigation measures are unnecessary. All references to environmental commitments were removed from the fisheries section (Section 3.7) to avoid confusion, except in Section 3.7.4 which indicates environmental commitments will be incorporated in the project to avoid significant impacts to fisheries resources and fish species of management concern.

Comment NG13-4

Comment

With respect to wetland plants and wildlife, the Draft EIS/EIR Section 3.8, page 3.8-64 states that: "The reduction in available habitat in rice fields and the associated reduction in the availability of waste grains and prey items as forage to wildlife species that use seasonally flooded agriculture for some portion of their lifecycle, could result in potentially significant effects to those species. These impacts are reduced by the environmental commitments in Section 2.3.2.4." There is no elaboration or discussion of the rationale for this conclusion. It is not evident from the list of environmental commitments how any of the commitments would reduce the impacts to migratory birds and other wetland-dependent species that use flooded agricultural land to a less-than-significant level.

At a minimum, environmental commitments or mitigation measures should build on previously accepted protective measures that were determined through robust analysis. For example, environmental commitments should at a minimum include all of the giant garter snake protections that were included in the 2009 and 2010 biological opinions

Response

See Common Responses 10, 12, and 13.

Comment NG13-5

Comment

2. Environmental commitments to address impacts to migratory and resident water birds must be expanded based on best available science and consider cumulative impacts from all sources of habitat reduction in the Central Valley.

The one environmental commitment listed in Section 2.3.2.4 that is specifically written to mitigate for potentially significant impacts to birds states that minimizing cropland idling transfers in the Butte Sink will limit reductions in over-winter forage for migratory birds. As described in the Central Valley Joint Venture (CVJV) Implementation Plan as well as many peer-reviewed journal articles, known wintering areas for migratory water birds as well as priority habitat for shorebirds in spring and late summer extend far beyond the Butte Sink. Additionally, simply minimizing idling transfers in a specific area will not minimize the impact of the Proposed Action on migratory birds and resident waterfowl, as there will still be an overall reduction of available habitat in the Sacramento Valley due to the Proposed Action. Comparing the net reduction in available quality foraging habitat and bioenergetics (food) supply to the needs of the bird population across the Valley is the more appropriate metric to gauge impacts; this type of analysis was done as part of the Bay Delta Conservation Plan EIS/EIR, but not for this Draft EIS/EIR

Response

See Common Responses 10 and 13.

Comment NG13-6

Comment

Crop idling transfers described in the Proposed Action will particularly reduce available habitat and forage in the Sacramento Valley in dry years. Although the Draft EIS/EIR limits idling to 51,473 acres of rice per year, this does not account for the impact already dry conditions may be having on habitat, the majority of which is now provided by flooded agricultural land. Chronic drought conditions over the last 3 years have led to fewer and fewer acres of flooded habitat available for birds at key times and places during their annual Pacific Flyway migration. This year conditions are particularly bad with abundant birds arriving from a good breeding season in the arctic only to find overcrowded conditions on available flooded habitat areas. Our scientists remain vigilant for cholera and botulism outbreaks that may impact special status species. We are so concerned that, with private funding, TNC has been working with landowners to create flooded habitat conditions thousands of acres as an emergency backstop to severe shortages in migratory bird habitat during this drought year.

Response

See Common Response 13.

Comment NG13-7

Comment

Although the Draft EIS/EIR describes the 51,473 acre limit as roughly equivalent to 10.5% of the average land in rice production from 1992 to 2012 (page 3.8-69), only about 140,000 acres of typical rice acreage was in production this year 1, and only about 50,000 acres of those were flooded for post-harvest decomposition, leaving only a small fraction of critical habitat available at critical times to migrating birds. Increased idling of compatible crops from the Proposed Action, particularly in dry years, will place additional pressure on the already-stressed refuges and compatible agricultural habitats, potentially resulting in significant impacts to species that depend on those habitats. There are ways to quantify this impact; for example, Ducks Unlimited has estimated that a "25 percent reduction in the number of acres in rice production would result in a loss of capacity to support about 600,000 ducks."2

Response

The California Rice Commission reported as of October 2014 that 420,000 acres were planted in rice for 2014, a 25 percent reduction from the previous year. Overall, this is a 15 percent reduction from the 20-year mean for rice production within the Sacramento Valley. Post-harvest practices (i.e., flooding, burning, and disking) are highly variable from year to year and predictions regarding the reduction of post-harvest forage impacts are not feasible based solely on the amount of rice planted. It would be expected that for a given year, the percent reduction in rice planted would have a similar percent reduction in post-harvest forage. See Common Response 13 for additional information.

Comment NG13-8

Comment

The fourth environmental commitment listed in the Draft EIS/EIR states that Reclamation will provide maps to the USFWS showing the parcels of riceland that are idled, but provides no further details about the use of these maps or FWS input will mitigate potential impacts described in the Draft EIS/EIR. How will the FWS use this information to make decisions regarding the Proposed Action? Will these maps be developed in conjunction with the FWS prior to the transfer, or after idling decisions are already made? How will this mitigate potential environmental impacts, particularly to terrestrial resources such as migratory birds?

Response

See Common Responses 10 and 12.

Comment NG13-9

Comment

Environmental commitments should be added that minimize the extent of idled land allowable in a basin so that it does not fall below CVJV habitat objectives or other protective, biologically-based thresholds. A maximum allowable percentage of idled rice should be set by county, accounting for all sources of fallowing, including drought and other transfer programs. These limits should be developed with biological analysis that demonstrates the impact on wetland-dependent species will not be significant. For example, bioenergetics modeling (such as

TRUMET3) should be done to assess the impact that crop idling transfers and other habitat reductions cumulatively will have on available food supplies in various water year types, and establish limits that provide adequate food supply. Maps should be developed which compare available shallow mudflat habitat with and without the Proposed Action to gauge potential impacts to shorebird habitat at their critical migration periods.

Response

See Common Responses 12 and 13.

Comment NG13-10

Comment

To lessen impacts to migratory birds, we recommend that the environmental commitments and mitigation measures incorporate consultation with the CVJV partner organizations as well as the FWS, and that the process for review and enforceability be described in detail in the Draft EIS/EIR. The science and conservation organizations and agencies that comprise the CVJV, including the Bureau of Reclamation, work collaboratively to protect, restore, and enhance habitats for birds, in accordance with conservation actions identified in the CVJV Implementation Plan. This Plan sets quantitative habitat objectives based on best available science to ensure sustainable populations of migrant and resident birds in California, a critical area which has lost over 90 percent of its wetlands, within the context of the habitat in the entire Pacific Flyway. The Plan's objectives incorporate a baseline of habitat expected to be provided by private lands. Habitat provided by private wetlands and post-harvest flooded agricultural land is depended on to provide 60 percent of the energetic needs of waterfowl in the Central Valley during winter as well as vital nesting and brooding habitat for many other species.

Partner CVJV organizations, including TNC, have completed studies that establish likelihood of occurrence of shorebirds and other priority migratory bird species over time and space throughout the Central Valley, and have developed maps which should be used to establish where and when crop idling or shifting transfers could occur each year under the Proposed Action to minimize impact to these species. TNC would welcome the opportunity to work with project proponents along with state and federal agencies to advise appropriate use and interpretation of this best available science to minimize impacts to shorebirds and other species, but this must be explicitly described in the environmental commitments or mitigation measures. Such scientific evaluation should consider impacts to flows, floodplains, riparian habitat, and wetlands that reflect multiple habitat values.

Response

Private wetlands, refuges, and established wildlife areas will continue to provide habitat for migratory birds if the range of potential transfer activities analyzed under the Proposed Action is implemented. See Common Responses 10 and 13 for additional information.

Comment NG13-11

Comment

Environmental commitments should include such actions as creating surrogate habitat at key times of year near the idled land. The Proposed Action should be linked to the environmental commitment; for example, flooding idled rice fields using a small reserved proportion of the total quantity of water approved for a transfer could provide habitat for migrating birds at key times of year, while also allowing most water to be transferred. This type of action, in combination with others, could help reduce the impact of some rice idling.

Response

See Common Response 13.

Comment NG13-12

Comment

3. Potential significant impact on Reclamation's ability to deliver water to refuges should be analyzed and lessened through environmental commitments.

We are concerned that expanded transfers through the Delta will affect the Refuge Water Supply Program's ability to acquire, convey, and deliver water to refuges south of the Delta, a statutory obligation of Reclamation per the Central Valley Project Improvement Act (CVPIA).

The Draft EIS/EIR does not analyze the proposed water transfers' impacts on CVPIA refuges, although with increased competition for water conveyance through the Delta, the impacts to these public and private wetlands could be significant, especially in drought years south of the Delta. This year, for example, East Bear Creek Unit (within the San Luis National Wildlife Refuge Complex) and Kern National Wildlife Refuge are receiving very little water due to conveyance constraints and limited water availability. Wetland habitat there will be impacted for several years by these water shortages. With additional competition for water, reduced water availability, and increasing water costs, the Proposed Action could only make the situation more challenging

Response

See Common Response 9.

Comment NG13-13

Comment

The Environmental Setting should include a description of state wildlife areas and federal wildlife refuges. This seems to have been neglected in this Draft EIS/EIR, even though some of the participating agencies are involved in conveying refuge water and Reclamation is responsible for its delivery under CVPIA. Potential significant impacts from the Proposed Action should include water supply impacts to CVPIA wildlife refuges and the special status species they support. An independent panel convened to review the Refuge Water Supply Program (RWSP) in 2008-2009 found that, "The inability to consistently deliver firm and dependable Incremental Level 4 Water has, on occasion, pre-empted spring and summer irrigations and maintenance of pond water, which has compromised the potential to stimulate germination of some plants, to maximize seed production, or to maintain summer pond water, which is required for successful breeding and survival of some of the sensitive and at-risk species that depend on the wetland habitats in refuges." Because refuges already receive less water than what is required by CVPIA, further declines in refuge water deliveries could result in potentially significant impacts to these habitats and the special-status species they support.

Response

See Common Response 9.

Comment NG13-14

Comment

The Draft EIS/EIR (page 2-18) states that transfers through the Delta will be "limited to periods when capacity at C.W. 'Bill' Jones Pumping Plant (Jones Pumping Plant) and Harvey O. Banks Pumping Plant (Bank Pumping Plant) is available typically from July through September, and only after Project needs are met." The Draft EIS/EIR is not explicit about whether refuge water deliveries are considered a Project need. Because delivery of Level 2 and Incremental Level 4 water to refuges is a Central Valley Project obligation required by CVPIA Section 3406(d), we believe that Project needs implicitly include refuge water supplies, and that Level 2 and Incremental Level 4 water should have priority over the water transfers proposed in this Draft EIR. However, if Reclamation does not consider refuge water a Project need, then the Draft should analyze how the Proposed Action could impact water delivers to the south of Delta refuges, and how any potentially reduced deliveries could impact migratory birds and other species that depend upon the refuges.

Response

See Common Response 9.

Comment NG13-15

Comment

Currently the RWSP does not deliver Full Level 4 water supplies to all refuges. The 2013 CVPIA Annual Report "Chapter 6 - Progress to Date Toward CVPIA Performance Goals" reported only 39% progress towards acquiring Incremental Level 4 supplies to date and 36% progress towards conveying Incremental Level 4 water supplies, although 100% attainment was required by 2002.5 The Nature Conservancy has worked for several years to understand these constraints and is currently working with Reclamation and CVP agricultural contractors to develop pilot projects that help address these constraints. One key constraint relevant to the Proposed Action is the increasing costs of acquiring and conveying water to refuges. Currently, because of budget and policy constraints and water availability, the RWSP relies primarily on spot-market water purchases rather than permanent acquisitions to provide some Incremental Level 4 water supplies to refuges. The increasing costs have outpaced the RWSP's limited annual budget to meet Full Level 4 water supplies, resulting in less and less water acquired and delivered each year. The Proposed Action could increase the price of available spot-market water even more, which would impact the RWSP's ability to purchase Incremental Level 4 water supplies, further impacting CVPIA refuge water deliveries and the waterbird populations they support. The Draft EIS/EIR should analyze how the Proposed Action will impact water prices, and whether price changes will affect Reclamation's ability to meet its refuge water obligations under CVPIA.

Response

See Common Response 9.

Comment NG13-16

Comment

To help mitigate impacts to refuge water supplies and the habitats they support, we recommend an environmental commitment be added that makes a percentage of each transfer available for purchase by the Refuge Water Supply Program towards meeting Full Level 4 water obligations. That amount would not be credited to the transferor if the RWSP chose to purchase it, and instead it would be schedulable by the Interagency Refuge Water Management Team for delivery to any delivery-short refuge, with reimbursement to the transferor by the RWSP.

The RWSP could also more efficiently manage its existing water supplies across all refuges and meet CVPIA mandates if north-to-south-of-Delta conveyance of RWSP-acquired water supplies and conserved refuge water was less constrained. The Proposed Action increases those constraints by increasing competition for conveying water transfers through the Delta. The situation is made even more difficult because refuges were not included in the Draft EIS/EIR as potential transferors or recipients of this water. To improve this situation and minimize the potential for significant impact, we recommend that an environmental commitment be added that allocates a percentage of allowable CVP transfer capacity each month to the RWSP. Under the commitment, the RWSP would have the first opportunity to schedule water during the window up to a certain flow or volume, if needed for optimal use of available refuge water supplies. Alternatively, an environmental commitment could be added that reserves a percentage of each transfer through the Delta for use by the RWSP towards meeting Full Level 4 water obligations. The full transfer quantity would be transferred through the Delta when scheduled by the transferring parties, but once south of the Delta, the refuge-reserved percentage could be stored in San Luis Reservoir for later delivery to a south-of-Delta refuge.

Response

See Common Response 9.

Comment NG13-17

Comment

4. Impacts from groundwater substitution transfers should be accurately simulated and more clearly illustrated. The Draft EIS/EIR should account for compounding impacts of multiple or repeated groundwater substitution transfers over time, and water supply and environmental impacts should be mitigated until recovery is achieved.

4a. The connection between groundwater and surface water must be accurately simulated.

The ability to rigorously simulate interaction of groundwater and surface water is of great importance to assessing the potential environmental impacts of groundwater substitution transfers in this EIS/EIR because groundwater substitution pumping ultimately comes at the expense of streamflow. A coupled surface water-groundwater model provides for simultaneous solution of flow conditions in these physically coupled systems, thereby allowing for more representative simulation of the interaction of surface water and groundwater. Unfortunately, the groundwater model used for this Draft EIS/EIR analysis (SACFEM2013) is not coupled in this way. Instead, water levels (stages) in the streams are specified by the user. This does not reflect the reality that stream stage rises and falls through time during operation of surface water facilities and changes in groundwater pumping. This issue is likely most important for smaller streams, where changes in stage may lead to more significant changes in flow to or from the groundwater basin. Using SACFEM2013, how were specified stream stages arrived at, and are they 'conservative' relative to streamflow depletion impact analysis? The Draft EIS/EIR should include a discussion of how stream stages were decided upon, the potential errors that could arise from specifying heads in streams with this model, and demonstrate why these potential errors are negligible in evaluating environmental impacts in both large and small streams or why they do not compromise the validity of the impact evaluation.

Response

Figure 3.3-27 shows the 12 hydrologic years during which groundwater substitution transfers are simulated. Included in this period is a period of six consecutive years (1987 through 1992) of groundwater substitution pumping. Including 1994, there is a period when substitution pumping is simulated for seven of eight years.

Section D.2.3.4, Boundary Conditions (Appendix D), describes the stream stages used in the SACFEM2013 model. The stream stages applied in the model are not constant. The stages vary along each of the simulated streams and also vary in time. The variable stream stage in the model more accurately represents the up-and-down nature of stream depth during wet and dry periods of the year. The SACFEM2013 model also simulates periods when a stream may be dry by removing surface flow from that node. The stream is allowed to re-wet when that stream is likely to have experienced the reintroduction of flow.

Comment NG13-18

Comment

4b. The impacts on riparian communities from lowered groundwater levels must be avoided or mitigated.

Section 3.8.2.4.1 of the Draft EIS/EIR states that the flow in many small streams would be impacted by more than 10 percent with implementation of groundwater substitution transfers described in the Proposed Action. Figures 3.3-31 a, b and c shows that, as a result of these stream depletions, water table levels will be lowered more than one foot over much of the project area including along many streams and tributaries, and in many places drawdown may be as much as five feet. Natural riparian communities for some distance away from the rivers (the riparian corridor), and along many miles of rivers, could be impacted by these lowered groundwater levels; however, the Draft EIS/EIR only addresses potential impacts to riparian communities due to streamflow depletions—it does not estimate the impacts on natural riparian communities from the lowered water levels that will result from the pumping.

The impacts of these groundwater level drawdowns on riparian corridor communities need to be addressed. This is especially important since, as noted on page 3.8-47, groundwater levels that decline any deeper than key threshold levels (estimated at 15 feet below ground surface on page 3.8-47) will not meet the needs of many plants. In this light, declines of 1 to 5 feet could be significant in many riparian areas, and these impacts must be avoided or mitigated, thus the importance of detailed and transparent modeling and monitoring.

Response

See Common Responses 10 and 11.

Comment NG13-19

Comment

4c. Streamflow depletion resulting from groundwater substitution transfers must be fully accounted for, and the compounding quantity and duration of impacts must be reflected in the analysis and mitigation described in detail in Mitigation Measure WS-1.

Groundwater and surface water systems are interconnected; as a result, groundwater pumping ultimately leads to what is termed "streamflow depletion." This streamflow depletion may be the result of either reduced groundwater discharge to the stream, in which case the stream experiences less gain (groundwater inflow) than before pumping was initiated, or it may be the result of additional induced infiltration from the stream, in which case the stream loses more water than it did prior to groundwater pumping. According to well established principles of groundwater-surface water systems, total stream depletion (from both reduced discharge and induced infiltration from the stream) will trend towards the amount of groundwater pumping in a given area over time, less other potential boundary effects such as subsurface outflow from the basin or changes in small watershed inflow.

Streamflow depletion can occur for many years after groundwater pumping has ceased, and this long-term streamflow depletion and associated impacts must be considered and accounted for. Long-term impacts from multiple years of transfers are especially important to account for since impacts are additive and therefore potentially more severe. The Draft EIS/EIR should include a full water budgeting accounting of where pumped groundwater is coming from and the related duration of streamflow depletion to disclose the location, magnitude, and duration of potential impacts.

Response

As described in Section 3.1, the purpose of Mitigation Measure WS-1 is to address potential water supply effects from streamflow depletion on CVP and SWP contractors that receive water conveyed through the Delta. See Common Response 8 for additional information. This comment refers to streamflow depletion effects on smaller streams and watersheds, but these potential effects are different from those described in the water supply analysis.

Streamflow depletion from groundwater substitution has the potential to decrease surface water flows in waterways as the groundwater basin refills. The EIS/EIR estimates these potential effects, including the compounding effects from multiple consecutive years of transfers, using the SACFEM2013 groundwater model, the CalSim model, and the Transfer Operation Model. The changes in streamflow have the potential to affect multiple resources; these effects are analyzed in Sections 3.1, Water Supply; 3.7, Fisheries; and 3.8, Vegetation and Wildlife. The water supply section investigates how changes in streamflow could affect water supply, and concludes the potential effects would be focused on CVP and SWP users that receive water conveyed through the Delta.

The comment seems to focus more on the potential for watershed effects to environmental resources, which are analyzed in Sections 3.7, Fisheries and 3.8, Vegetation and Wildlife. The analysis of impacts to fisheries found the flow changes would be small and would not occur at times or in locations that would adversely affect sensitive species. The analysis of impacts to vegetation and wildlife found the flow changes could affect riparian vegetation along these waterways, but the monitoring measures included in Mitigation Measure GW-1 would reduce these effects to less than significant levels. See Common Responses 6 and 7 for additional information.

Comment NG13-20

Comment
Simulations performed by TNC using DWR's C2VSim integrated ground and surface water model of the Central Valley indicate that groundwater pumping at scales similar to the Proposed Action affects a large area and, very importantly, that streamflow depletion from even a single year of such pumping persists for decades7. The timing of these impacts is illustrated in Figure 1, below.

Figure 1 shows that streamflow depletion is significant for many years after pumping has ceased, with only about 65 percent of ultimate stream depletion expressed even 5 years after pumping has stopped. It takes 25 years for the system to nearly fully "recover" (90 percent "depletion recovery"). Although different assumptions regarding well locations and depth will lead to differently shaped depletion curves, the best information available suggests that impacts from pumping will persist for decades for wells distributed over wide areas and depths, as is the case for the Proposed Action. In contrast, Figure 3.1-3 of the EIS/EIR does not reflect this full duration of impact, at least as expressed in percent changes in CVP and SWP exports. Please explain how the modeling done for this Draft EIS/EIR accounts for the compounding impacts to water supplies from multiple years of pumping, and how the duration of impact through full recovery will be accounted and mitigated under Mitigation Measure WS-1.

Response
Figure 3.3-27 shows the 12 hydrologic years during which groundwater substitution transfers are simulated. Included in this period is a period of six consecutive years (1987 through 1992) of groundwater substitution pumping. Including 1994, there is a period when substitution pumping is simulated for seven of eight years. The SACFEM2013 results from this entire simulation were used as input to the Transfer Operations Model (TOM). Because the entire transient simulation result set is used in the TOM, the TOM results therefore incorporate the "compounding impacts" of transfers in consecutive years. Figure C-6 in Appendix C shows the total change in stream-

aquifer interaction due to the groundwater substitution pumping. The data presented in this figure incorporates the transient simulation results, including the years of consecutive transfers. Mitigation measure WS-1 includes a streamflow depletion factor that is a percentage of the total groundwater substitution transfer that will not be credited to the potential seller. This factor is developed to offset the effects on streamflow due to the groundwater substitution pumping.

Comment NG13-21

Comment

To appropriately characterize the potential water supply and environmental impacts of the Proposed Action, the Draft EIS/EIR must more clearly answer the question, "Which streams are likely to be depleted, by how much, and for how long?" The EIS/EIR needs to better account for the source of pumped water and its related cumulative impacts over time to both water rights holders (both export rights and in-valley rights) and the environment, and avoid or fully mitigate for those impacts. To fully mitigate for groundwater substitution pumping impacts on water supplies, Section 3.1.4.1, Mitigation Measure WS-1, must describe in detail how the streamflow depletion factor will be developed, account for compounding, and be applied over the duration of the project and beyond until recovery is achieved.

Response

As discussed in response to Comment NG13-19, the EIS/EIR used a series of linked models to estimate changes in streamflow for waterways throughout the Sacramento Valley. These potential changes were considered in the water supply impact analysis, but the analysis identified that the potential impacts would be focused on CVP and SWP users that receive water conveyed through the Delta.

See Common Response 8 for additional information.

Comment NG13-22

Comment

In recognition of the potentially significant environmental impacts of streamflow depletion from groundwater substitution transfers, the secondary effects of changes in groundwater levels resulting from the Proposed Action (Section 3.3.2, page 3.3-59) should include: "(4) a reduction in groundwater levels that significantly impacts surface flows (streams or rivers) or the species, habitats, and other beneficial uses of these stream flows." Application of Mitigation Measure WS-1 should include consultation with fish and wildlife agencies during annual development of the streamflow depletion factor so potentially significant environmental impacts can be avoided early.

Response

The paragraph referenced in this comment has been revised to include references to the environmental consequences analysis for fisheries (as described in Section 3.7, Fisheries). The paragraph had already referenced Section 3.8, Vegetation and Wildlife, for impacts to these resources. See Common Response 8.

Comment NG13-23

Comment

5. Environmental commitments should more fully develop a suite of additional actions that ultimately result in additional benefits for nature and provide incentives for those actions such as a transfer priority system to drive their implementation and adoption.

The Central Valley is already highly altered and many aquatic and terrestrial species dependent on its land and watersheds are already on the brink of extinction. The Sacramento Valley has made great advances in using a finite water supply for multiple benefits, such as optimizing diversions so both fish flows, migratory birds, and rice straw decomposition can occur simultaneously, with the same water supply. This progress could be thwarted and significant environmental and water supply impacts could result from transferring hundreds of thousands of acre-feet annually across basins and away from the Sacramento Valley where water is already used for multiple benefits.

To drive improvement and sustainability over time and mitigate for the loss of this progress, we recommend that an additional environmental commitments be included to develop a suite of additional actions that could be done in conjunction with water transfers in such a manner that transfers which also deliver other benefits for nature are prioritized within the system. That is, those agencies or transferring entities which provide the most robust monitoring, wildlife-friendly farming practices, and habitat- protecting regimes should be prioritized over transfers with less attention to environmental values and mitigation. We envision such practices will require both adequate incentives and monitoring to demonstrate performance. For example, the timing, capacity or priority to convey a particular transfer through the Delta could be enhanced to a degree proportional to the benefits created for nature by a chosen set of actions. The suite of actions and their relative value to nature could be developed in conjunction with input from TNC and other NGOs in consultation with state and federal wildlife agencies. Such actions should be designed in a manner that provides flexibility to meet multiple habitat values and applies new, cutting-edge ways to use water for multiple benefits on private and public lands and waterways. Implementing such a program would help drive conservation as a co-equal priority to water transfers designed to benefit urban and agricultural water uses, and will accommodate a broader use of water than otherwise would be accomplished through large scale water transfers.

Response

As an agency, Reclamation has many goals and ongoing projects. It is involved in other efforts to enhance habitat and water supply for migratory birds, but that is not part of the purpose and need for this effort.

Comment Letter IN01, Bob Adams

Comment IN01-1

Comment

Don’t even think about taking water out of Butte County! We’ll be in your face starting now. I’ve never given over $20 to any cause. Starting now, Aqualliance get all my spare cash.

What kind of rotten, disassociated, (with any real people) bastards would even try this kind of crap!

[A sentence from this comment was not disclosed here because of offensive language. The full content of the letter is included in Appendix T.]

Response

See Common Response 2.

Comment Letter IN02, Geoffrey Baugher

Comment IN02-1

Comment

I would like to protest the 10 year water transfer plan and express my frustration at the short period of time for public input.

Response

See Common Response 2. The Lead Agencies are unable to accommodate the request for additional review time beyond CEQA and NEPA requirements.

Comment IN02-2

Comment

Public awareness in Northern CA is growing fast concerning the San Joaquin Valleys misguided water wishes. Along with ground water levels dropping and the ever-expanding tree farms around us, the smell of fear is pushing a greedy political process.

Response

See Common Responses 2 and 4.

Comment IN02-3

Comment

And the fish?

Response

Impacts to fisheries are evaluated in Section 3.7.

Comment Letter IN03, Linda Calbreath

Comment IN03-1

Comment

As a resident of Northern California, I am opposed to the Long-Term Water Transfers of Northern CA. groundwater that is proposed by the Bureau of Reclamation.

Response

See Common Response 2.

Comment IN03-2

Comment

Located in Northern CA., the Tuscan Aquifer is one of the last remaining intact aquifers. Pumping up to 600,000 acre feet of our groundwater pre year for 10 years will cause irreparable harm to the Tuscan Aquifer and Northern CA, as a whole and only serve to benefit a very few water profiteers at the expense of the rest of the population and the environment- our beloved oak trees are already at risk.

Response

The Tuscan Aquifer is a deep water source (more than 500 feet) and is not readily available to oak trees. Oak tree roots lie predominantly within the first 2-3 feet below the ground surface while deeper tap roots can extend to 80 feet. Oak trees obtain groundwater from the upper soil horizons and not directly from aquifers. There may be some increase in the pumping within or near the Tuscan Aquifer, but not nearly as much as the commenter states. The maximum amount of potential transfers is about 511,000 acre-feet, with less than 300,000 acre-feet of groundwater substitution transfers. Additionally, the groundwater substitution transfers would be from multiple groundwater basins and multiple aquifers within each basin (including the Tehama Formation). The effects of groundwater substitution pumping would not be focused on the Tuscan Formation. See Section 3.3, Groundwater Resources and Common Response 4 for additional information.

Comment IN03-3

Comment

California is experiencing of one of the worst droughts in history. The lakes and reservoirs in Northern California are already at or below historic lows. Most streams that used to run year around are very low or dry. Many wells in an around the entire North State are running dry. Long range weather forecasts indicate there will not be any significant rainfall again this year to recharge the groundwater or refill the lakes and reservoirs and yet this proposal would take our water and sell it to those that have already decimated their own water sources.

Rain and snow melt flows into Shasta Dam and Lake Oroville and then is shipped south to Central and Southern CA. Northern CA water is already heavily diverted and now there is this proposal to take our groundwater. Most cities and towns in Northern CA rely solely on groundwater. If that is pumped dry, there are no other alternative water sources.

Over and over again, aquifers throughout California have been overdrawn (more water is taken out than is replaced) and left permanently damaged. Irreparable subsidence (the land sinks when the water is drained from the aquifer) has been the result of many of these aquifers. As only one example, the San Joaquin Valley has seen irreparable subsidence (land sinking) by as much as 25 feet from 1925 to 1977.

Response

Section 3.3 has been revised to clarify the effects of current drought conditions to groundwater resources within the area of analysis. See Common Response 4 for details on information added regarding wells going dry in the Sacramento Valley region.

The evaluation of environmental impacts discussed in Section 3.3.2.4 is based on modeling that simulates past hydrologic trends (1970-2003), including six continuous years of dry weather conditions (1987-1992). This document does not simulate or predict future hydrology trends. Section 3.3.2.4 also discusses subsidence impacts. Mitigation Measure GW-1 (discussed in Section 3.3.4.1) sets forth monitoring and mitigation measures to avoid potentially significant adverse environmental effects. See Common Responses 6 and 7 for additional information.

Comment IN03-4

Comment

California is a semi arid desert. California farmers use 80% of all fresh water available in the state. It makes no sense to allow farmers to continue to use flood irrigation and plant permanent high water use crops in a desert and continue to sacrifice water sources in one area to satisfy the thirst for water in another. Cities that do not have a sustainable source of fresh water need to reuse their water through tertiary water treatment and desalination plants and implement strict conservation measures. Using billions of gallons of fresh water for hydraulic fracturing and then polluting the remaining fresh water with the waste water is absolutely insane. Continuing to dry up sources of fresh water is short sighted. Unless we stop this trend, there will be no fresh water left for crops, environment or people.

Response

The concepts of increasing agricultural water use efficiency and reducing agricultural acreage were considered in the EIS/EIR as part of the Agricultural Conservation (Buyer Service Area) and Land Retirement alternatives, respectively. These alternatives were not carried forward for more detailed analysis because they would not meet key elements of the purpose and need and basic project objectives. Agricultural conservation would not be immediate or provide additional water, and land retirement would not be immediate or flexible, and would not provide additional water. See Appendix A for more details on the screening of these alternatives.

Comment IN03-5

Comment

I am sure you saw the recent 60 minutes episode on this subject which aired November 16. Studies by Hydrologist Jay Famiglietti at UC Irvine should be taken into account as part of the EPA impact study.

Response

Section 3.3.1.3.2 has been revised to include monthly groundwater storage estimates for Sacramento and San Joaquin Valley from Famigletti et al. 2011.

Comment Letter IN04, Lynne Elhardt

Comment IN04-1

Comment

It has only been in recent days that this abhorrent proposal has come to light in our neighborhood. I may not be up on all current events, but because my neighbors, who are farmers, doctors and lawyers, were unaware as well, it is obvious this proposal is sneaky and dirty handed.

The San Joaquin Valley has obviously not been a good steward of their water and now you want to penalize us and put our lively hoods and households in a very grave situation. Everyday I turn on the faucet, hoping my well will still produce. My neighbor, half a mile away, just drilled a new well at a cost of $30,000+. Although, this looks like it's just a transfer of surface water via our canal system, it will mean further tapping of our ground water, which has dropped significantly in the past few years. To approve a proposal, based on a study of water years dating back 40 years, knowing we are in the worst drought on record, is incomprehensible.

I urge you to look at the real picture here and take the $$$ out of the equation.

Response

See Common Response 2.

Comment Letter IN05, Virginia Freeman

Comment IN05-1

Comment

The Sacramento Wild Life Refuge outside of Willows, CA, needs to leave their water where it is. Our area is already groundwater deficient in it's upper levels due to over drafting in the lower levels. I know, because in my area alone, our ground water has "recharged", and I say that lightly. Our upper strata water "came back" after the local nut growers and corn growers stopped irrigating. They *robbed* us of our domestic well water, and since they quit sucking the water out of the ground for THEIR money making farm practices for the year, we have GAINED 35 FEET. (Look over your head and up 35 feet for A CONCEPT of how MUCH that is, then think of how many acres there are of that 35 foot gain of water below us.) This water is going to all disappear once the farmers, once again, steal our water for their nut crops.

KEEP GLENN COUNTY WATER IN GLENN COUNTY and let Merced pump for theirs!

Response

See Common Response 2.

Comment Letter IN06, Heather Gray

Comment IN06-1

Comment

I am writing to strongly disagree with the proposed 10 year water transfer of 195 billion gallons per year to the San Joaquin Valley. ARE YOU INSANE??? With the alarming drought that we are going through and PEOPLES wells going dry right and left, how can you even dream that this is going to happen without a devastating effect to Northern California? Instead of using this water transfer as a pipe dream (literally) why don't you start building systems through out the area for Rain Harvesting?

Thank you for your time. Please show some creative thinking, using your brains and come up with a more sustainable plan for our future.

Response

See Common Response 2.

Comment Letter IN07, Steven Hammond

Comment IN07-1

Comment

I am extremely concerned that the proposed water transfers from Northern California will result in irreparable damage to the aquifer in the area where I live, in Chico, California. I have been following this issue for years, and am convinced that the research on the negative effects of the proposed transfers has been strikingly inadequate. It is no secret that a great deal of the proposed water to be transferred (SOLD) will be substituted by the sellers in my area by "replacing" the water they sold with groundwater, which could deplete the aquifer in this area terribly. Many local wells in outlying areas have already been going dry.

I truly believe that the effects of this could be precipitate a disaster for my home - have you ever been to Chico? It is a very lovely small city for which the saving grace is a well-established canopy of trees. It is not at all a stretch to project that if the groundwater levels fall sufficiently this could become another Owens Valley.

Response

See response to Comment LA02-1.

Comment IN07-2

Comment

Additionally, I think that factors such as the wasteful use of water in the southern districts who want the water have not been adequately addressed either. To continue growing nut trees in the desert, which takes tons of water, is simply not a good reason to deplete another region's water supply! The possibility of stopping this practice, and other possible ways of conserving and using water appropriately, have not been given enough consideration!

I truly think that the proposed massive water transfers are merely an example of robbing Peter to pay Paul - and are not only a mistake, and just plain wrong, but are also very short-sighted and need to be stopped until careful and longitudinal research can be completed.

I have to admit I mistrust your intentions, given what has occurred in this matter so far. I'd like to be shown that you are not in the pocket of those with the money to "BUY" what really shouldn't be available just because they want it, and because there are those who will "SELL" what isn't really theirs to sell: water.

Response

See response to Comment IN03-4.

Comment Letter IN08, Scott Lape

Comment IN08-1

Comment

I'm strongly opposed to any water transfers out of Northern California.

Response

See Common Response 2.

Comment IN08-2

Comment

Local groundwater supplies are seriously depleted, and there is no reason to expect that the aquifer will regenerate any time soon.

Response

Section 3.3 describes the potential environmental consequences of the Proposed Action and alternatives on groundwater resources. Common Response 4 describes how additional information has been added to Section 3.3.1 based on public comments to further characterize the existing conditions of groundwater resources. Section 3.3.2 analyzes the potential for the aquifer to recharge after groundwater substitution transfers.

Comment IN08-3

Comment

We don't know what the effects of climate change will be, and the precautionary principles suggests that we plan for the worst.

Response

Section 3.6 of the EIS/EIR considers potential effects of the alternatives on climate change. Additionally, this section indicates that climate change could potentially affect the aquifers from both over exploitation because of reduced surface water supplies and from saltwater intrusion that could occur from sea level rise (see Section 3.6-12). Impacts to the aquifers from groundwater substitution are discussed in detail in Section 3.3, Groundwater Resources. As described in Section 3.3, any effects on the aquifers from groundwater substitution would be less than significant with implementation of Mitigation Measure GW-1. See Common Response 6 for additional information regarding groundwater monitoring and mitigation. Because of the relatively short-term duration of the range of potential transfer activities under the action alternatives (10 years), they are not expected to have adverse effects on the aquifers, including cumulative effects from climate change.

Comment IN08-4

Comment

We have seen the effects of unsustainable agriculture in the San Joaquin Valley. Why should we allow greedy agribusiness to destroy the Tuscan aquifer the way they have destroyed the aquifers in the San Joaquin Valley?

Response

See Common Responses 2 and 3.

Comment Letter IN09, Linda Lohse

Comment IN09-1

Comment

I do not approve of any transfers of groundwater. No action/no project is the only choice.

Response

See Common Response 2.

Comment Letter IN10, John MacTavish

Comment IN10-1

Comment

Please provide justification for using a study period ending in 2003? Please include in your response California population changes and farmed acres at the end of 2003 compared with 2013. I would also like to know actual water demands (usage) for the years 2003 and 2013. It would also be helpful to see your projections for future water usage going out for the next 100 years.

Response

See Common Response 5.

Comment IN10-2

Comment

Who were the other consultants you considered to provide independent analysis and possible solutions? Was the selection done in a bid for services process? If so, is the RFP and bid submission available for review?

Response

Under NEPA and CEQA, the Lead Agencies are soliciting public comments on substantive comments on the environmental document. This comment is not related to scope, content, or adequacy of the 2014 Draft EIS/EIR, which was prepared in accordance with the requirements of NEPA and CEQA.

Comment IN10-3

Comment

Please provide the names, addresses, qualifications and phone numbers of the "decision makers."

Response

For Reclamation, the decision on how to move forward will be made by Mr. David Murillo, the Regional Director of the Mid-Pacific Region. More information about Mr. Murillo's background is available at http://www.usbr.gov/mp/PA/RD/index.html, and he is available by phone at 916-978-5100. For SLDMWA the decision will be made by the Board of Directors, who can be contacted at 209-826-9696. More information about this decision-making body is available at http://www.sldwma.org/learn-more/board-of-directors/. See Common Response 14.

Comment IN10-4

Comment

Why were there no stakeholders from each of the effected communities/counties included in this process?

Response

Reclamation and SLDMWA reached out to potentially affected parties through the scoping process and meetings on the 2014 Draft EIS/EIR. On December 28, 2010, Reclamation published a Notice of Intent in the Federal Register, and on January 5, 2011, a Notice of Preparation was published with the California State Clearinghouse. These documents started the public scoping process, which is designed to solicit feedback from potentially affected parties. Public scoping meetings were held between January 11 and 13, 2011 in the cities of Chico, Sacramento, and Los Banos, California. Reclamation and SLDMWA prepared the "Long-Term Water Transfers EIS/EIR Public Scoping Report" (dated May 2011), which summarized the comments and concerns raised during the meetings as well as written public comments obtained during the public scoping period. Reclamation and SLDMWA also held public hearings to solicit comments on topics addressed in the 2014 Draft EIS/EIR on October 15, 16, and 21,

2014. During the course of the scoping process, participation and input was received from over 45 parties located throughout the project study area.

Comment IN10-5

Comment

Who initiated the water transfer concept? Reclamation or San Luis/Mendota?

Response

The potential for water transfers is codified in the California Water Code (as described in Section 1.3.2 of the 2014 Draft EIS/EIR). The specific transfers covered under this EIS/EIR would be originated by the parties to the transfer (a seller from Table 2-5 and a buyer from Table 2-6). These parties would submit information to Reclamation for review and approval before the Lead Agencies could facilitate a transfer (as described in Section 1.5). See Common Response 14.

Comment IN10-6

Comment

Why was the alternative of stopping or reducing tree crop plantings in the areas in need of water not offered as a possible solution?

Response

The concept of reducing crops planted in the buyers' area was considered in the EIS/EIR as part of the Land Retirement in San Joaquin Valley alternative (see Table 2-1 and Appendix A). It was not carried forward for more detailed analysis because it did not meet the key elements of the purpose and need or basic project objectives, as it would not be immediate or flexible, and would not provide additional water. See Appendix A for more details on the screening of this alternative.

Comment IN10-7

Comment

Why was the alternative of selling surface water entitlements without groundwater replacements considered as an option?

Response

The concept of purchasing surface water entitlements was considered in the EIS/EIR as part of the Water Rights Purchase alternative (see Table 2-1 and Appendix A). It was not carried forward for more detailed analysis because it did not meet the key elements of the purpose and need or basic project objectives, as it would not be immediate and would not provide additional water. See Appendix A for more details on the screening of this alternative.

Comment IN10-8

Comment

How much ground water in acre feet is in the Tuscan aquifer? Any recent reading within the last year will do. What are the last ten years measurements in acre feet? Please provide the basis/calculation methodology of your response.

Response

The comment refers to the Tuscan Aquifer System; however, pumping for groundwater substitution transfers from Glenn Colusa ID, Reclamation 1004, and Butte WD would be from the Tehama Aquifer System and not the Tuscan Aquifer System. See Common Response 4.

Comment IN10-9

Comment

How do we know for certain that groundwater storage will "recharge" over time? This was the vague unsubstantiated claim made in the consultants report.

Response

The historical water level data presented in Section 3.3.1.3, Affected Environment shows that groundwater levels, in general, tend to decline during dry periods and recover during wet periods.

Comment IN10-10

Comment

This is a personal question to you as one of the "decision makers," how can you in good conscience support pumping groundwater from a finite/fragile resource (when proof exists of other aquifers being damaged or pumped dry) to farm inappropriate crops in arid land? This is so short sighted and wrong.

Response

See Common Response 2.

Comment Letter IN11, H. Elena Middleton

Comment IN11-1

Comment

I strongly oppose the proposed water transfers. I believe that there is not enough knowledge of the potential destructive and irreversible effects on groundwater, creeks, environment and north state farms.

Response

See Common Responses 2 and 3.

Comment Letter IN12, MBK Engineers

Comment IN12-1

Comment

Thank you for the opportunity to review and provide comments to the Long-Term Water Transfers Environmental Impact Statement/Environmental Impact Report Public Draft (Draft EIS/EIR). The purpose of this letter is to provide a list of our comments and observations based on our review of the Draft EIS/EIR and information that we have available to clarify details associated with potential water transfer participants identified in the Draft EIS/EIR. We have attempted to identify the specific page and section for our comments; however, there may be other locations in the Draft EIS/EIR where our comments would apply. Following your review of our letter, please ocntact our office if you require any clarifications or additional information. The following is a list of our comments and observations:

1. Page ES-6, Table ES-2: Based on data provided by Gilsizer Slough Ranch, the maximum potential transfer quantity should be 4,500 acre-feet. This comment also applies to Table 2-4.

Response

The detailed groundwater pumping data provided by Gilsizer Slough indicated they did not have the pumping capacity to provide 4,500 AF. In March, seller information reduced the capacity to 3,900 AF as shown in Tables ES-2 and 2-4.

Comment IN12-2

Comment

2. Page ES-10, 1st Paragraph. Identifies that "…a CVP seller would forbear (i.e., temporarily suspend) the diversion of some of their Base Supply…" We believe that a transfer of water involving a CVP seller may also include a portion of the CVP seller's Project Water supply. Thus, we believe the Draft EIS/EIR should cover water transfers involving Project Water to provide flexibility to the potential water transfer participants.

Response

This paragraph is specifically discussing transfers accomplished through forbearance agreements. Forbearance agreements can only be used for transfers of Base Supply. Project water would be able to be transferred, but such actions would use a more traditional transfer agreement involving the State Water Resources Control Board.

Comment IN12-3

Comment

3. Page ES-10, Section ES.4.1. We believe there may be opportunities to make surface water available during the month of October. For example, the Draft EIS/EIR should provide for the potential that surface water may be made available by groundwater substitution for rice straw decomposition. Thus, we believe the potential period for surface water made available by groundwater substitution should include April through October.

Response

The window to move transferred water through the Delta to the buyers is from July through September (see Section 2.3.2.1). Making water available through rice decomposition was considered as an alternative in this EIS/EIR (see Table 2-1 and Appendix A); however, it was not carried forward for more detailed analysis because it would not be immediate or flexible.

Comment IN12-4

Comment

4. Page ES-11, Section ES.4.4. The description of establishing a baseline for crop shifting should refer to the methodology outlined in the Draft Technical Information for Preparing Water Transfer Proposals (DTIWT) in order to maintain consistency.

Response

The Draft Technical Information for Preparing Water Transfer Proposals includes additional details on how to implement water transfers. Because it is more focused on implementation details, it is not referenced in the Executive Summary.

Comment IN12-5

Comment

5. Page 2-17, Table 2-5. Based on data provided by Gilsizer Slough Ranch, the upper limit for July-September groundwater substitution transfer should be 3,000 acre feet. This comment also applies to Table 2-7 and Appendix A, Table 5-1.

Response

See response to Comment IN12-1.

Comment IN12-6

Comment

6. Page 2-26, 1st paragraph. Identifies that water transfers involving Merced Irrigation District (Merced ID) through delivery methods (excluding Banks and Jones Pumping Plants) could be used throughout the irrigation season of April through September. We believe this should be clarified to provide flexibility for these delivery methods to be used throughout the year for water transfers involving Merced ID.

Response

Transfers involving Merced ID have four potential delivery mechanisms. Three of them involve diverting water from surface water (from the Delta, the San Joaquin River, or the Merced River). The EIS/EIR does not analyze the potential to make those diversions in different times of the year, when impacts could be different from those described. The fourth delivery mechanism, however, would route the transfer water through Merced ID's internal conveyance facilities to one of the refuges in the San Luis Unit for exchange. This transfer method would not change surface water flows or diversions; therefore, it would not affect potential impacts if the timing of the transfer changed. The

EIS/EIR has been clarified to indicate this transfer delivery method could be used year-round.

Comment IN12-7

Comment

7. Pages 3.1-6 through 3.1-12. Quantities listed in the descriptions of the potential sellers should correspond to quantities in Table ES-2 and Table 2-5. Specifically, the quantities for Conaway Preservation Group, Pleasant Grove-Verona Mutual Water Company, Te Velde Revocable Family Trust, Garden Highway Mutual Water Company and Gilsizer Slough Ranch should be revised.

Response

Section 3.1.1.3.1 has been revised to be consistent with Tables ES-2 and 2-4.

Comment IN12-8

Comment

8. Page 3.1-6, Footnote 3. Footnote 3 should be clarified to identify the following: "Conaway Preservation Group (CPG) has assigned portions of its water rights and Sacramento River Settlement Contract to the Woodland Davis Clean Water Agency (Agency). Amendment No. 1 to CPG's Settlement Contract, which identifies the assignment of 10,000 AF to the Agency, is effective upon the earlier of the Agency diverting water or January 15, 2016. After that time, CPG may receive surface water under the portion assigned to the Agency."

Response

Footnote 3 has been revised accordingly.

Comment IN12-9

Comment

9. Page 3.1-8, River Garden Farms. The description should be clarified to identify that River Garden Farms supplements its surface water supply with groundwater wells (i.e., eliminate reference to "three" groundwater wells).

Response

The section has been revised accordingly.

Comment IN12-10

Comment

10. Page 3.1-10, Tule Basin Farms. The description should be clarified to identify that Tule Basin Farms diverts water from the West Borrow Pit of the Sutter Bypass (i.e., eliminate reference to the "Feather River").

Response

The section has been revised accordingly.

Comment IN12-11

Comment

11. Page 3.1-13. Merced Irrigation District. The description should be clarified to identify that: "Merced ID supplies water principally for agricultural purposes." (i.e., eliminate reference to the "M&I" purposes).

Response

The section has been revised accordingly.

Comment IN12-12

Comment

12. Page 3.1-21, Section 3.1.4.1. Relative to the streamflow depletion factor, in the case that the U.S. Bureau of Reclamation (Reclamation) and/or the Department of Water Resources (DWR) believe that the factor is to be refined for the following transfer season, there should be a date by which the water transfer participants, Reclamation, and DWR discuss potential refinements to the streamflow depletion factor (e.g., by December 1).

Response

See Common Response 8.

Comment IN12-13

Comment

13. Page 3.2-31 through Page 3.2-50. It appears that tables identified in Section 3.2 and Sections 3.13 through 3.17 are intended to present the same information for a particular alternative; however, the data in the tables are different. For an example, see Table 3.2-23 and Table 3.17-1. We believe the differences between the relevant tables should be examined in further detail to provide clarification and consistency.

Response

Numbers have been corrected in the Final EIS/EIR to be consistent. The changes were small and did not affect the analysis of potential impacts to environmental resources.

Comment IN12-14

Comment

14. Page 3.2-41, Last Paragraph. There may be other circumstances that affect storage in San Luis Reservoir that would not lead to decreased storage for nearly all months of the year, such as transfer water that may be temporarily held in San Luis Reservoir prior to delivery to the buyer. We believe this should be clarified/explained in additional detail.

Response

Clarifications have been made to the water quality section to incorporate this concept.

Comment IN12-15

Comment

15. Page 3.3-5, 5th Paragraph. In regard to well completion reports, we believe that groundwater wells approved in 2009 through 2014 should be accepted for future groundwater substitution transfers unless technical evidence indicates use of the well could result in impacts to third parties or the environment. This is consistent with the Addendum to Draft Technical Information for Preparing Water Transfer Proposals dated January 2014, prepared by DWR and Reclamation.

Response

The January 2014 document referenced by the commenter was developed to facilitate transfers given the projection that 2014 was to be a critically dry year. The DRAFT Technical Information for Preparing Water Transfer Proposal has since been revised (November 2014) and does not include the pre-approval of previously approved groundwater wells.

Comment IN12-16

Comment

16. Page 3.3-29, 1st Bullet. The land subsidence identified is characterized as "inelastic" from 2013 to 2014. Due to the brief time period following the observed subsidence to date, and considering the persistent drought conditions, we believe that the term "inelastic" should be removed.

Response

The first bulleted item on page 3.3-29 has been revised to read, "DWR observed land subsidence estimated at approximately 0.2 foot from 2012 to 2013 and an additional 0.6 foot from 2013 to 2014 (DWR 2014b)."

Comment IN12-17

Comment

17. Page 3.3-69, Table 3.3-3. The following are clarifications to the data listed in Table 3.3-3, as follows:

- Conaway Preservation Group: 70-980 feet.
- Garden Highway Mutual Water Company: 115-250 feet.
- Natomas Central Mutual Water Company: 110-960 feet.
- Pelger Mutual Water Company: 4 wells, 101-485 feet.
- Pleasant Grove-Verona Mutual Water Company: 34 wells, 99-260 feet.
- Reclamation District 1004: 21 wells, 56-430 feet.
- River Garden Farms: 9 wells, 170-686 feet.
- Te Velde Revocable Family Trust: 150-455 feet.
- Tule Basin Farm: 120-405 feet.

Response

Well data modeled and summarized in Table 3.3-3 was based on information received from potential sellers. Seller correspondence has been documented in the administrative record.

Comment IN12-18

Comment

18. Page 3.3-89, Land Subsidence Bullet. As stated in the current DTIWT, Reclamation and DWR should coordinate with the water transfer proponent to develop a mutually agreed upon subsidence monitoring program for areas with documented historic land subsidence and higher susceptibility to land subsidence. This should be identified in this section, as the current paragraph seems to indicate that subsidence monitoring is required for all participating sellers; however, subsidence may not be necessary for each area.

Response

See Common Response 7.

Comment IN12-19

Comment

19. Page 3.7-1, Section 3.7. The sub-sections to Section 3.7 refer to time periods for potential water transfers. In order to preserve flexibility for the timing of potential water transfers, we believe Section 3.7 should include additional clarification that water transfers may occur during periods other than July through September. This may also need to be addressed in Appendix A (see Page 3-4, Section 3.6.1). One example of the potential for transfers occurring during other periods is identified on Page ES-9: "Through Delta transfers would be limited to the period when USFWS and NOAA Fisheries find transfers to be acceptable, typically July through September, unless a change is made in a particular water year based on concurrence from USFWS and NOAA Fisheries."

Response

See Response to Comment LA12-83.

Comment IN12-20

Comment

20. Section 3.10.1.3. Sacramento County is not included in the Regional Economics analysis. The reason for this is unclear; and should be identified in this section.

Response

Sacramento County is included in the area of analysis for Regional Economics (see Figure 3.10-1). Existing conditions information for Sacramento County has been added. Effects to Sacramento County were evaluated in Section 3.10. There would be no cropland idling in Sacramento County, so effects related to cropland idling transfers described in Section 3.10 would not apply.

Comment IN12-21

Comment

21. Page 3.10-23, Cropland Idling Acreages. It is uncertain whether the analysis for the Draft EIS/EIR would limit the crop acreage that may be idled (or shifted) to the estimates identified in this section, including Sections 3.3, 3.8, and 3.9. We believe that these sections should provide for potential adjustments to the maximum acreage idled or shifted to allow for flexibility.

Response

When transfers are proposed, the Lead Agencies will determine if the impacts are fully captured within this EIS/EIR. Generally, cropland idling transfers would need to stay within the maximum acreages per region identified in Table 3.10-22 because these acreages are analyzed in multiple resource areas of the EIS/EIR. See Common Response 14.

Comment Letter IN13, Mary McCluskey

Comment IN13-1

Comment

I am writing to express my concern over the Environmental Impact Report of the proposed 10 year water transfer program. I have read the report, and even though I am not a lawyer, it is easy to tell that the report was written with little regard to the impacts to Northern California.

Response

See Common Response 3.

Comment IN13-2

Comment

I have also read the letter written to you and to the San Luis Delta-Mendota Water Authority by the Butte County Board of Supervisors. As a resident of Butte County, I fully support their position in the letter - that the report is "seriously flawed" and needs revision.

Response

See the responses to Butte County's letter (LA02).

Comment IN13-3

Comment

I also support their request for an additional 90 days for public review.

Response

The Lead Agencies are unable to accommodate the request for additional review time beyond CEQA and NEPA requirements.

Comment Letter IN14, Peter Ratner

Comment IN14-1

Comment

I am opposed to any water transfer to Southern California unless and until mandatory conservation measures are adopted by the agencies wanting the transfers. In this current drought, it is irresponsible at the least to contrive the use of water for such non sustainable uses as lawns and golf courses and irrigating dessert land for farming.

Response

The action alternatives include water transfers to agricultural water users in the Central Valley, not in southern California. The concept of increasing agricultural water use efficiency was considered in the EIS/EIR as part of the Agricultural Conservation (Buyer Service Area) alternative. This alternative was not carried forward because it would not reduce environmental effects of the other alternatives or meet key elements of the purpose and need or basic project objectives. This alternative would not be immediate and would not provide additional water. See Appendix A for more details on the screening of these alternatives.

Comment Letter IN15, Edwin Roland McNutt

Comment IN15-1

Comment

ES 4.1 Groundwater substitution: "Groundwater storage would fill slowly over time." Unacceptable wording for EIS. We need to know exactly how long…Table 2.9 Proposed Mitigation "None" Unacceptable.

Response

Section ES.4.1 describes groundwater substitution transfers and states that "Groundwater storage would refill (or "recharge") over time." The duration required to recharge the aquifer following a groundwater substitution transfer depends on the hydrology of the years following the transfer. The aquifer would refill more quickly if subsequent years are wet, compared to a slower recharge if the subsequent years are relatively dry. Figures 3.3-34 through 3.3-38 provide a graphical representation of the change in groundwater level with and without groundwater substitution pumping at several locations in the Sacramento Valley. Appendix G contains figures for additional locations. The rate of aquifer recovery (or recharge) can be seen in the rate at which the blue line (Alternative 2) approaches the dashed-red line (Baseline). The lead agencies have identified Mitigation Measure GW-1 to avoid potentially significant environmental impacts. See Common Responses 6 and 7.

Comment IN15-2

Comment

I witnessed your dog and pony show at Chico. The unaddressed elephant in the room, to which almost all comments were directed to, was the issue of regeneration, which was not calculated in

EIS. Groundwater substitution is like inheriting a fortune and squandering it, living high on the hog until it's all gone and you're left in poverty. The wise person sets up that fortune as a public trust, so that its lasts all you life, and your children's and grandchildren's in perpetuity. Northern California says no to water transfers, especially when you have NO DATA on aquifer regeneration.

Response
Section 3.3 describes the potential environmental consequences of the Proposed Action and alternatives on groundwater resources.

Comment Letter IN16, Margaret Rader

Comment IN16-1

Comment
I am in full support of all comments made by members of the audience in Chico on Tuesday 10/20/14.

I particularly agree with one gentleman who felt that the primary basis for long term water transfers is greed. The desire of a few to control our valuable water resources is beyond reason given the current drought situation (not previous drought history) in the Northern Sacramento Valley.

Response
See Common Response 2.

Comment Letter IN17, Sherri Scott

Comment IN17-1

Comment
I would like to share my opposition to the taking or selling ('transfers') of any water that affects my home and evirons, being the North State, not from surface nor from ground sources. They are all intertwined as a whole ecosystem and it all affects me and my health, my livelihood, my thriving agricultural community, and the natural and diverse beauty of nature that brought me to this area. I represent many others who moved to this area for exactly the same reasons and your proposal threatens our way of life!

Response
See Common Response 2.

Comment IN17-2

Comment
Currently I am witnessing a terrible die off of 50-100 year old trees on the farm. This is at a terrible loss of shade and habitat, but in economic terms that adds costs to summer cooling, high costs of employing tree work to prevent the loss of property as the trees fall or loose limbs, as well as the loss to property if the limbs escape maintenance.

Response

Many factors responsible for tree die-off are unrelated to water transfers. Effects of the current statewide drought are far reaching. Groundwater levels supporting many older trees have been dropping for a variety of reasons and could account for the death of some mature trees. Section 3.3 describes the potential environmental consequences of the range of potential activities under the Proposed Action and alternatives on groundwater resources. No additional analysis or changes to the EIR/EIS are needed.

Comment IN17-3

Comment

Many farmers I know had to dig their well deeper this year and/or lost their pump due to a drop in the water. Our ag well that has gone dry each summer for the last 3 years for August, was dry before the summer even began this year. Fortunately we have been able to use a small domestic well as our back up. Regardless, each year knowing that our water supply could be compromised, we make conscious decisions on how much land we can farm and what types of crops can be managed with what we have. This is responsible farming. I refuse to allow folks who view water irresponsibly, relying on water needy crops and industries, to take the water that feeds me, my community, and my ecosystem.

I see all around me in neighborhoods and on hikes that plants and trees are dying. I rely on this shade cover to cool me in the summer. The trees rely on the water that its roots worked so hard over a long period of time to reach. The plants around them rely on the shade and water that the trees provide. The animals, the insects, the birds, the mushrooms, the microorganisms and us humans all rely on this.

I hear repeated stories at the farmers market from customers who are witnessing the same things about the effects of drought: dead/dying trees, more insect pressure, more desperate invasions of their fenced off gardens by deer and other animals. They are noticing for the first time or higher occurrences of large predators desperately roaming into human populated areas to find food.

Response

Several figures in Section 3.3 show historical groundwater levels in several wells throughout the Sacramento Valley. In general, groundwater levels tend to decline in dry or drought periods. In wetter years groundwater levels recharge. The current dry period appears to show trends toward decreasing water levels similar to previous years. Figures 3.3-28 through 3.3-33 show the potential change in groundwater level due to groundwater substitution pumping. These figures are for simulated conditions in a historical dry year (1976) and following four years of substitution pumping in a dry period (1990). Figures 3.3-34 through 3.3-38 provide a graphic representation of the change in groundwater level with and without groundwater substitution pumping at several locations in the Sacramento Valley. Appendix G contains figures for additional locations. The rate of aquifer recovery (or recharge) can be seen in the rate at which the blue line (Alternative 2) approaches the dashed-red line (Baseline). Impacts to vegetation and wildlife are covered in Section 3.8.

Comment IN17-4

Comment
It is inconsiderable to even suggest that the water removal in this water proposal will not affect us residents of the North State, us farmers, us nature lovers, us shade lovers! It is unconscionable to even suggest that the money and needs of Westlands Water District are more important than those that fell in love with this area, moved here, laid their literal and figurative roots down, paid their taxes, and have no real say in actions that SEVERELY affect their way of life and in their livelihoods! It is ridiculous! It is atrocious! IT IS GREEDY!

Response
See Common Response 2.

Comment Letter IN18, Amalie Sorenson

Comment IN18-1

Comment
We are farmers (my family) for generations- and generations to come (hopefully). We farm sustainably. We and outraged others will fight this criminal water-stealing legally. Get a life, please! We could be friends in this, but not by your tactics alone.

[A sentence from this comment was not disclosed here because of offensive language. The full content of the letter is included in Appendix T.]

Response
See Common Response 2.

Comment Letter IN19, Tony St. Amant

Comment IN19-1

Comment
Your agency and the San Luis & Delta-Mendota Water Authority held a hearing in Chico earlier this week on the public draft EIS/EIR for long-term water transfers. The EIS/EIR attempts to justify the transfer of between 360,000 and 600,000 acre feet of water per year for ten years from sellers upstream of the Delta to water users south of the Delta and in the San Francisco Bay Area.

Response
The purpose of the 2014 Draft EIS/EIR is not to justify water transfers, but rather to disclose potential environmental impacts for decision-makers and identify mitigation measures to reduce or avoid those impacts. The comment cites the upper limits of 360,000 to 600,000 acre-feet, but those upper limits are related to transfer quantities addressed in the Biological Opinions on the Coordinated Operations of the CVP and SWP (see Section 1.3.1.2). These quantities reflect the transfer amounts that are addressed in the current biological opinions on CVP and SWP operations in the Delta; the action alternatives in this EIS/EIR are not proposing to transfer this entire quantity.

The maximum quantity proposed under the action alternatives in any year would be about 511,000 acre-feet, and in most years when transfers occur substantially less water would be transferred (see Section 2.3.2.2).

Comment IN19-2

Comment

A critical fact came out during the hearing. The data for EIS/EIR's hydrologic analysis is based on the period 1970-2003. None of the climatologic or hydrologic reality the state has experienced since that time is included: none of the increasing evidence that we are actually in a period of climate change and none of clear, decade-long trends in groundwater declines seen in an increasing number of areas in the Northern Sacramento Valley.

Response

See Common Response 5.

Comment IN19-3

Comment

The excuse offered by Carrie Buckman of CDM Smith, your consultant, was that the chosen water model is not up to date. The unanswered questions would be, "Why was an out-of-date model chosen?" and as, this analysis has been planned since at least late-2010 and modeling shortcomings have been known for at those four years, if none is available, "Why hasn't' an up to date model been developed to fulfill this need that has been identified as critical to a large portion of California agriculture?" If the cost of a transfer program includes the need for an up-to-date model, then the proponent should be responsible for developing that model and validating it through a rigorous peer review process. Choosing an out-of-date model should not be an allowable choice.

I can see how SLDMWA would be pleased with hydrologic data that ended in 2003, but I don’t understand how your agency could support such an analytic shortcoming. It would seem to me that, as a federal agency, the Bureau would have a balanced responsibility between the welfare of water source areas north of the Sacramento Delta and water consumption areas south of the Delta. Your agency's support of this terribly flawed agency, the Bureau would have a balanced responsibility between the welfare of water source area north of the Sacramento Delta and water consumption area south of the Delta. Your agency's support of this terribly flawed analysis results in an inappropriate bias in support of the agencies that wish to import water to compensate for their decades long indifference to sustainable water supplies.

I urge the Bureau to withdraw the EIS/EIR until it is supported by up-to-date hydrologic and climatologic data analyzed through a vigorously peer-reviewed model.

Response

See Common Response 5. Additionally, the SACFEM2013 and CalSim II models represent the best available science for performing the analysis completed in support of the EIS/EIR and are not out of date. These models were reviewed and updated specifically for this project. SACFEM2013 is an update to a previous version of

SACFEM that was peer reviewed in 2011 and revised and refined in response to comments from the peer review. CalSim II was jointly developed by DWR and Reclamation for analysis of CVP and SWP operations and planning studies. Portions of CalSim II have been peer reviewed and revised in response to peer review comments. CalSim II is widely used and accepted and is continually updated in response to changes that can affect CVP/SWP operations.

Comment Letter IN20, Tony St. Amant

Comment IN20-1

Comment
Issue: The San Luis & Delta-Mendota Water Authority is inappropriate as a lead agency for the Long-Term Water Transfers Environmental Impact Statement/Environmental Impact Report, September 2014.

Summary: The SLDMWA does not meet California Environmental Quality Act (CEQA) Requirements to be the lead agency for this EIR, and there is an unmitigable conflict of interest inherent with SLDMWA as the sole lead agency.

Recommendation: The EIS/EIR should be withdrawn from public circulation; and the lead agency should be changed to: An appropriate state agency with SLDMWA and the counties that overlie the DWR Bulletin 118 groundwater basins and confined (deeper) aquifers from which groundwater substitution transfers may occur designated as responsible agencies; or A group of agencies, including SLDMWA and the counties that overlie the DWR Bulletin 188 groundwater basins and confined (deeper) aquifers from which groundwater substitution transfers may occur, organized into a cooperative effort by contract, joint exercise of powers, or similar device (14 CCR Sec. 15051(d)).

Response
See Common Response 1.

Comment IN20-2

Comment
SLDMWA does not meet CEQA requirements to be the lead agency. SLDMWA is a joint powers public agency that encompasses approximately 2.1 million acres of 29 water service contractors within he western San Joaquin Valley and San Benito and Santa Clara counties. Its boundaries are coextensive with those of its members (Amended and Restated Joint Exercise of Powers Agreement [SLDMWA JPA], San Luis & Delta-Mendota Water Agency, January 1, 1992, para. 3, pg. 4.) All of the SLDMWA's purposes and powers are centered on providing benefit to member organizations (SLDMWA JPA, para. 6, pp. 4-7).

SLDMWA is a narrowly purposed regional organization, yet it is designated as the lead-and therefore, certifying - agency for this EIS/EIR, which has the potential to impact the long-term water supplies and environment of a number of California counties well removed from its geographical boundaries. This relationship does not comply with CEQA or Title 14, California

Code of Regulations, nor does it recognize provisions of the Sustainable Groundwater Management Act.

CEQA Sec. 21067 defines a lead agency as the public agency that has the principal responsibility for carrying out or approving a project which may have a significant effect on the environment. SLDMWA represents only half of the long-term water transfer process - the potential buyers. The other half - the potential sellers- is comprised of 29 independent agencies (Long-Term Water Transfers Public Draft EIS/EIR, September 2014, Table ES-2), none of which are designated even as responsible agencies in accordance with CEQA Sec. 21069. 1

4 CCR Sec. 15051 (b)(1), confirms SLDMWA as an inappropriate organization to be the lead agency: "The Lead Agency will normally be the agency with general governmental powers, such as a city or county, rather than an agency with a single or limited purpose…"

Response

See Common Response 1.

Comment IN20-3

Comment

Beyond the environmentally-oriented requirements of CEQA and Title 14, the process should integrate the legislative intent of the Sustainable Groundwater Management Act, which among other things is to recognize and preserve the authority of cities and counties to manage groundwater pursuant to their police powers (Sustainable Groundwater Management Act, Uncodified Findings (b)(5)) and that water transfers must respect applicable city and county ordinances (Sustainable Groundwater Management Act, Sec. 10726.4, (a)(3)). SLDMWA is not the appropriate agency to be certifying findings that may relate to those authorities outside of its own boundaries.

With SLDMWA a lead agency and no potential sellers or source counties designated as responsible agencies, the process is unreasonable biased toward the narrow functional interests of SLDMWA and its joint agencies.

Potential sellers and source counties need to be authoritatively involved in any EIS/EIR certification process that holds the potential for long-term effects on their groundwater sustainability, as does this one. The ability to submit comments for consideration by SLDMWA and USBR falls far short of a valid, balanced process.

Response

See Common Response 1.

Comment IN20-4

Comment

There is an inherent and unmitigable conflict of interest with SLDMWA as the lead agency.

Common law doctrine requires a public officer to exercise his or her powers with disinterested skill and primarily for the benefit of the public. Actual injury is not required. A public officer is barred from putting himself in a position in which he may be tempted by his own private interests to disregard his principals and the interest of others (Conflicts of Interest, Office of the Attorney General, 2010, para. B, pg. 102).

The structure of the unmitigable conflict of interest is embodied in three classes of interests which ought to be on equal ground in the water transfer EIS/EIR process but which are not:

Class 1: Willing buyers , represented by the EIS/EIR lead agency SLDMWA. The willing buyers of transferred water, some or all of the 29 members of the SLDMWA joint powers agreement, are at risk of suffering serious financial losses if they are unable to import water from other areas of the state over the next 10 years. Per its joint powers responsibilities, SLDMWA is obligated to act in the interest of, and for the benefit of, member agencies. Consequently it would be a breach of fiduciary responsibility for SLDMWA to act for the benefit of any other organization at the expense of its joint powers partners. SLDMWA is obligated to seek as much water as its member agencies need from source areas without regard for the economic or environmental impact on those areas. Yet the final EIS/EIR will reflect SLDMWA's independent judgment and analysis (14 CCR 15090(a)(3)), with no requirement to incorporate any concerns of source area public agencies, groundwater-dependent entities, or groundwater-dependent individuals.

Class 2: Willing sellers unrepresented in the EIS/EIR process and representing no one in the source areas but their own individual single-purpose organizations. Willing sellers have no standing in the EIS/EIR. While their actions are integral to execution of the proposed water transfers, they were not accorded Responsible Agency status as seems to be indicated by CEQA Sec. 21069. But even if they had been accorded Responsible Agency status, that status would have put their interests in conflict with the third class of interests, groundwater users in the source areas who are not willing sellers. This conflict exists in the northern Sacramento Valley because the willing sellers share water basins with other groundwater users as described below. The core of this conflict is that willing sellers stand to gain revenue from their sales while those who do not sell - and have no standing in the selling process - stand to incur expenses as water levels decrease from groundwater substitution transfers because of their need to deepen wells and/or drill new wells.

Class 3: Groundwater users in the source area who are not willing sellers, but who share their groundwater sources (basins) with willing sellers. Groundwater users in the northern Sacramento Valley who are not willing sellers of transfer water are groundwater-dependent cities and towns, groundwater-dependent rural homeowners, and groundwater-dependent agriculturalists. They are a large majority of the population in the northern Sacramento Valley in comparison to the estimated two percent of the population who comprise the potential sellers. This class stands to incur expenses as water levels decrease because of the need to deepen wells and/or drill new wells in response to lowered groundwater levels that will result from groundwater substitution transfers. Their appropriate representation would be counties, which also hold statutory authority over groundwater, but counties have not been accorded agency status in the process.

If SLDMWA is a public agency, conflict of interest constraints must disqualify if from its role as sole lead agency for the long-term water transfer EIR. If SLDMWA is not a public agency, it is not eligible to the be the lead agency.

Conflicts of interest abound in the project and in the EIS/EIR, all of which should have been recognized during the scoping process four years ago. The fact they were not could be interpreted as a confirmation of biases that went into developing the project and producing the draft EIS/EIR. The time-frame for moving the water transfer project forward is critical, but SLDMWA's and USBR's failures to properly plan and coordinate this project override the interests of source area organizations and citizens.

SLDMWA's and USBR's failure to integrate agencies into the EIS/EIR effort in a way that balances obvious and well known conflicting interests, whether caused by administrative oversight or bias, cannot be allowed to stand. The stakes for long-term water sustainability in the northern Sacramento Valley are just too high.

Response

See Common Response 1.

Comment Letter IN21, Karen Stinson

Comment IN21-1

Comment

I attended the EIS/EIR Public Meeting in Chico on October 15, 2014. I am writing to you today to show my support for my community and for the natural resources we are so blessed with here in Butte County. I am writing to urge you to have more research done on the long term effects of transferring water from the Sacramento River and from Tuscan Aquifer. In these times of out of control climate change and extreme weather conditions, I urge you to error on the side of caution when it concerns our water. Thank you and God Bless.

Response

See Common Response 3.

Comment Letter IN22, Paula Sunn

Comment IN22-1

Comment

I live north of the Delta and am very concerned at the water transfers that have been occurring on a temporary basis and even more so about the EIS/EIR that would facilitate longer term water transfers.

Historically, in California, areas with less population, but with adequate water supplies have been exploited in order to keep the dryer, desert areas of the state from having to make the difficult decisions about whether current land use patterns are sustainable, regardless of the environmental and economic degradation that occurs in the areas of origin. The Owens Valley is a good example of this.

Response

Water transfers are one of several management actions favored under state and federal law. The comment suggests that an alternative to water transfers is making "difficult decisions" to retire land. The concept of reducing crops planted in the buyers' area was considered in the EIS/EIR as part of the Land Retirement in San Joaquin Valley alternative (see Table 2-1 and Appendix A). It was not carried forward for more detailed analysis because it did not meet the key elements of the purpose and need or basic project objectives, as it would not be immediate or flexible and would not provide additional water. See Appendix A for more details on the screening of this alternative. See Common Response 14.

Comment IN22-2

Comment

The EIS/EIR is flawed in not having a way to take into account that the data used to draw conclusions is outdated and that there are already problems occurring in the north state due to the ongoing drought, exacerbated by the transfers that are happening now. In short, there is no evidence that there will be future water supplies that will be sufficient to maintain the current patterns of usage in the areas of origin, much less enough to transfer water south to sustain agriculture in areas that have already overexploited their supplies, especially during the dryer periods that the EIS/EIR is intended to cover.

Response

See response to Comment IN03-3.

Comment IN22-3

Comment

It strikes me that economic interests of those served by the San Luis & Delta-Mendota Water Authority as well as those in the areas of origin who have surface water rights to sell, while replacing this water with further groundwater pumping, ignores the long term ecological degradation that will occur as well as the populations in the north they rely on these supplies. Economic gain for a few is not what should be driving decisions made about resources relied upon by many.

I urge you to not only reject this current EIS/EIR, but to do what you can to stop the current temporary water transfers.

Response

See Common Response 2.

Comment Letter IN23, Melinda Teves

Comment IN23-1

Comment

No on groundwater substitution transfers.

No on putting these decisions in the hands of buyers and sellers with self-interest in mind.

No on implementing water transfers prior to localities taking over groundwater decisions per recent legislation.

Response
See Common Response 2.

Comment IN23-2

Comment
No on formulating plans based on data before 2004.

Response
See Common Response 5.

Comment IN23-3

Comment
No on these proposed water transfers.

Response
See Common Response 2.

Comment Letter IN24, Sally Wallace

Comment IN24-1

Comment
Everyone I know in Northern California, just about, is violently opposed to this Water Transfer. It is inconceivable that you would not only allow it but instigate it. One bad drought year, and this is the worst we have had in years, is not a good enough reason to send our water to Southern California.

Response
See Common Response 2.

Comment IN24-2

Comment
You might suggest they start desalination projects on ocean water, instead.

Response
The concept of seawater desalination was considered in the EIS/EIR as part of the Desalination - Seawater alternative. This alternative was not carried forward for more detailed analysis because it would not meet the key elements of the purpose and need or basic project objectives, as it would not be immediately implementable. See Appendix A for more details on the screening of this alternative.

Comment IN24-3

Comment
Another solution is more careful watering by the farmers…in the central and southern parts of the state…they have been rather profligate with water use over the years.

Response

The concept of increasing agricultural water use efficiency in the buyers' area was considered in the EIS/EIR as part of the Agricultural Conservation (Buyer Service Area) alternative (see Table 2-1 and Appendix A). It was not carried forward for more detailed analysis because it did not meet the key elements of the purpose and need or basic project objectives, as it would not be immediately implementable and would not provide additional water. See Appendix A for more details on the screening of this alternative.

Comment IN24-4

Comment

Most of all, we have to leave enough water in streams and rivers and forests for the wildlife…#1 priority, or should be.

At the very least, postpone the dams and transfers to the future…its starting to rain, give nature a chance and don't make panic decisions.

Response

See Common Response 3.

Comment Letter IN25, Suzette Welch

Comment IN25-1

Comment

I urge you not to more forward with the proposed water transfers to San Luis and Delta Mendota Water Authority. I am in opposition to the timing of the water transfers "especially in periods of drought" and the size of the proposed water transfers which will allow water to be brought in northern California then sold to a desert area in Central California - the San Luis and Delta Mendota Water Authority.

Response

See Common Response 2.

Comment IN25-2

Comment

The area to receive transfers of water from Northern California is a desert. They have ruined their aquifer by over pumping and now have subsidence so there is less underground space to store water the groundwater that they do get. What should be done in Southern Central Valley is planting of annual crops in years when they have enough water in the area to allow these crops. Instead trees were planted there so that farmers could show that they needed water every year. Now these Southern factory farmers want us to ship water south.

Response

Removing tree crops in favor of annual crops would be similar to the Land Retirement in the San Joaquin Valley alternative in the EIS/EIR. This alternative would not meet the key elements of the purpose and need or basic project objectives because it would not be immediate or flexible, and it would not provide additional water.

Comment IN25-3

Comment

We have need of our water in Northern California to support our many family farms. We especially need to keep all the water possible in years like this year where there is not enough water due to a four year drought.

Response

Water transfers are between willing sellers and willing buyers. It is expected that sellers would not participate in transfers if they need to use water on their farms.

Comment IN25-4

Comment

There is a big fallacy in your report. The hydrologic period analyzed in the EIS/EIR is from 1970-2003, neglecting the last 11 years because the model wasn't up to date. Thus the analysis doesn't take into account the current drought.

Response

See Common Response 5.

Comment IN25-5

Comment

How can you say in your EIR that there will be no environmental impact on the are of origin of the water when there are already wells drying up in this area due to over pumping.

We have wells going dry right now in the foothills and in North and South Chico. People there don't have water to drink and you propose to take more surface water from willing sellers. These sellers are people with water rights and are just out to make money no matter the cost to the land. They sell the surface water and then they pump water out of the aquifer taking needed water from other and making the shallower wells run dry. Pumping the aquifer will drop the depth of water in the water table which will result in loss of our ecosystem. Our beautiful meadows and oak forests will die from lack of water. You will turn around part of California into desert like the Owens Valley.

Response

Section 3.8, Vegetation and Wildlife evaluates impacts from groundwater substitution transfers on natural communities. Mitigation Measure GW-1 (discussed in Section 3.3.4.1) sets forth monitoring and mitigation measures to avoid potentially significant adverse environmental effects. See Common Responses 6 and 7 for additional information.

Comment Letter IN26, Seamus Yeo

Comment IN26-1

Comment

I am writing regarding to your recent proposal for the Long Term Water Transfer, that was uploaded to the Environmental Impact Assessment government website on September 2014. I will be doing as part of a course assignment to review the Public Draft of the Environmental Impact Assessment.

The introductions and proposed actions are well informed in terms of history of the area, location and the different lakes that could be involved, service provided and companies that are involved. However, the lack of explanation on what the current infrastructure of CVP and what method would be used to transfer water from the seller to the buyer. The cost of maintenance of the 10 year period would be questioned and should be mentioned.

Response

Information about the CVP and the key facilities is included in Section 1.2.1, and methods to transfer water are described in Section 2.3.2.1. Because water transfers would not involve new facilities, there would be no increased cost of maintenance above what the CVP and SWP would spend under the No Action/No Project Alternative.

Comment IN26-2

Comment

In the assessment of water, it has been well written for understanding the quality and quantity of supply and the water. Through the use of laws, regulations and information on each lake which water will be extracted, it has given a good overall look. However, the lack of details of each total capacity of water and how much water will used during the transfer is questionable. The only information given was how much water could be extracted but no relation to the overall total amount of water.

Response

Table 2-4 in Chapter 2, Proposed Action and Description of the Alternatives, delineates the maximum potential transfer for each seller in acre-feet. Future transfer amounts would be determined at the time of the agreement. See Common Response 14.

Comment IN26-3

Comment

In the geology and soil, they have provided many different topography of maps regarding to the soil that are present around California, along with the different method of translocation of various soils. It would be good if you can provide a 3D infrastructure of the current CVP, and the area that they have been built on.

Response

Relevant maps are provided showing the resources in the project area that could be affected by the alternatives. None of the alternatives involves changing the CVP infrastructure, so these maps are not necessary for the analysis.

Comment IN26-4

Comment

In Air Quality the data provided for different compounds, in direct impact of Carbon dioxide in water is noted and each different method of transferring water is noted. The cumulative effects are also noted well, there is no need for additional information.

Response

Comment noted.

Comment IN26-5

Comment

In Climate Change, it is well written that the most direct issues are affecting the transfer. However, the indirect to animals and soil is a rather difficult to research in. Note that monitoring the possibility of invasive species invading upstream is a plausible situation, which is not noted in Cumulative effects. If there is an Accelerated erosion doing storm water, would it not also accumulate possible sediments that would damage flood control.

Response

Issues related to invasive species are discussed in Section 3.8, Vegetation and Wildlife. Additionally, issues related to the effects of the action alternatives on flood control are discussed in Section 3.17, Flood Control.

Comment IN26-6

Comment

In the flood control, the information provided is well responded and the mitigation and the acceptance of some area unable to endure flood possibility should be taken into account. However, the flood control also holds some of the key factors into the methane hold possible harm to the environment especially animals that could not survive in acidic environments.

Response

The purpose of the flood control section is to describe existing flood control within the area of analysis and discuss the potential effects on flooding and flood control from the proposed alternatives throughout the entirety of the area of analysis. Effects of the proposed alternatives on methane are discussed in Section 3.5 and effects on vegetation and wildlife are discussed in Section 3.8.

Comment IN26-7

Comment
The Draft Environmental Impact Assessment would provide a useful tool as it cover many aspects of environmental concerns which will help the community in decision and project managers to decide. However, it could use a little more information about the water supply as ecologist and many other scientist in that field may question how much water is "sustainable." You have only stated how much water could be taken out, without having mentioning the total amount of water that is current there.

Overall, I would like to say that in general that the draft environmental statement is well researched and very informative. I would like that if you can add additional material on a more local levels, as it would affect them the most and their knowledge from experience would affect the overall projects and the cost of maintenance over the 10 years and a timeline. In addition, I would like you to add additional information on monitoring as climate change on the over all levels of water and geology and soil, as those two would inhibit many of the long term water transfer and possible damage in the future.

Response
Table 2-4 in Chapter 2, Proposed Action and Description of the Alternatives delineates the maximum potential transfer for each seller in acre-feet. An analysis of the potential long-term impacts to the groundwater aquifer is included in Section 3.3. The impacts associated with climate change and geology and soils are summarized in Sections 3.6 and 3.4, respectively.

Comment Letter IN27, Julian Zener

Comment IN27-1

Comment
I am strongly against the USBR proposal to facilitate the transfer of Sacramento Valley water (mainly by conjunctive use) to south of the Delta and San Francisco Bay water districts.

Response
See Common Response 2.

Comment IN27-2

Comment
Several glaring lapses in the proposal stand out. Limiting the baseline years to 1973 to 2003 avoids the last decade of climate change effects and our severe prolonged current drought.

Response
See Common Response 5.

Comment IN27-3

Comment

In recent years the Sacramento Valley general water table has significantly dropped with accompanying ground subsidence. Residential and agriculture wells have gone dry.

Response

See Common Response 4.

Comment IN27-4

Comment

And the proposed water transfers will occur during drought and severe drought years – just when the immediate and long term harm to our river, streams and aquifer would be the greatest. The USBR suggestion that water tables will generally reconstitute in the future is completely unsubstantiated.

Response

The need for water transfers tends to occur during drier periods when the potential buyers need additional supply. The groundwater and surface water analyses, including numerical and analytical modeling, are documented in several sections throughout the EIS/EIR. Impacts to groundwater levels and surface water-groundwater interaction are discussed in Sections 3.1 and 3.3. Section 3.3.1 provides a discussion of the existing conditions in the Sacramento Valley. This discussion includes hydrographs of past water levels that show, in general, recovery of groundwater levels in wetter years.

Comment IN27-5

Comment

No consideration of the accumulative effects on the watershed (ecology is included) in the USBR analysis.

Response

Sections 3.7 and 3.8 evaluate cumulative effects to fisheries and vegetation and wildlife resources, respectively. Chapter 4 defines the cumulative effects analysis approach.

Comment IN27-6

Comment

No significant long-term economic analysis is evident comparing the transient benefit to the Westlands Water District versus the destruction of the Northern California watershed – the source of 60-70% of California water.

Response

Section 3.10 evaluates the economic effects of the range of potential activities under the Proposed Action and alternatives in the buyer and seller service areas over the 10-year timeframe.

Comment IN27-7

Comment
Please put science above political and lobbying pressures to preserve the Sacramento Valley Watershed. – Thank you.

Response
See Common Response 2.

Comment Letter IN28, John Scott

Comment IN28-1

Comment
This EIS/R must be withdrawn, because it is totally inadequate as any EIR/EIS could ever be.

Response
See Common Responses 2 and 3.

Comment IN28-2

Comment
Follow the comments of the Butte Environmental Council. Your EIS/EIR is so bad that I feel I need to protect and maintain my legal rights in this matter.

Response
Comments from the Butte Environmental Council are in comment letter NG06. Responses to the comments are included with that letter.

Public Hearing PH02, Los Banos, California

Comment PH02-1

Comment
Why were the CVP to CVP refuge related transfers not included in this environmental impact report or statement?

Response
The EIS/EIR analyzes a range of potential transfers from willing sellers to CVP contractors. Reclamation is not a direct party to the transfer, but is involved only to approve and facilitate transfers. See Common Response 14. The CVP refuge transfers are different because Reclamation negotiates and contracts for this transfer water; therefore, they are addressed through a separate environmental compliance process. See Common Response 9.

CVP transfers separate from the range of potential activities analyzed under the Proposed Action, but having the potential to result in cumulative environmental impacts when considered in conjunction with the potential activities under the Proposed Action, have been considered in the cumulative impacts analyses within the EIS/EIR. Such CVP transfers are identified in Chapter 4, and the associated potential for cumulative impacts is addressed where appropriate throughout Chapter 3.

Comment PH02-2

Comment

Will refuge water transfers be affected in any way, either refuge to refuge or CVP contractor to CVP contractor?

Response

The range of potential water transfer activities evaluated in this EIS/EIR would not affect Level 2 or 4 refuge supplies, as discussed in Common Response 9.

Comment PH02-3

Comment

Will refuge transfers have a priority in that they may not meet statutory but contractual obligations?

Response

Transfers will not affect acquisition or delivery of refuge supplies.

Comment PH02-4

Comment

Will this in any way affect Reclamation's ability to get our level two supplies in future years, noting that this year we are at 65 percent when contracts indicate that we would only receive a minimum of 75 percent?

Response

See response to Comment PH02-2.

Public Hearing PH03, Chico, California

Comment PH03-1

Comment

I'd like to comment on the inadequacy of the programmatic EIR. First, there's been an effort to maintain a very tight reign on time, on the time intervals that's being considered. My family came here in 1857. I came 90 years later, but we have a long memory. When my grandparents were young, a part of their annual food budget was pitchforking salmon out of Rock Creek and canning them. Rock Creek no longer flows year round. Several places I can show you where there were Indian villages, which were situated on the banks of now dry creeks. On the end of West Sacramento Avenue, there was a spring, a large spring, that no longer flows. When we first drilled some of our wells, they were artesian. Now we've had to extend the bowls twice. So for a very long time, things have been changing in this valley. We are in the process of doing exactly to this valley what we did to the San Joaquin Valley, and to pretend and restrict sharply the space and the time for this EIR is inexcusable because the cumulative impacts that we have seen on our farm and in our valley have been very substantial and to limit this -- the measurements of subsidence and water drawdown to the area where the water is being donated is indefensible. Thank you.

Response

The EIS/EIR analysis of potential impacts related to land subsidence and groundwater drawdown is not limited to “where the water is being donated.” As described in Section 3.3.1.1 of the EIS/EIR, the area of analysis for potential impacts to groundwater resources, including but not limited to subsidence and groundwater drawdown, addresses both the seller service area, including water districts that have groundwater pumping capabilities and have expressed an interest in groundwater substitution transfers, and the buyer service area. The analysis of potential project-related impacts is measured from a baseline representative of current groundwater conditions, which would have already accounted for changes in groundwater levels compared to previous eras. The EIS/EIR provides an extensive analysis of potential impacts to groundwater resources and, as indicated in Section 3.3.5, concludes that none of the alternatives would result in potentially significant unavoidable impacts after mitigation. Additionally, it should be noted that under CEQA, alternatives are compared to existing environmental conditions (rather than historic conditions) to determine potential environmental impacts. Under NEPA, action alternatives are compared to the future No Action Alternative, which reflects future environmental conditions absent the action alternatives. See Common Responses 6, 7, and 9 for additional information.

Comment PH03-2

Comment

Looking at the map, it looks like most, if not all, of the potential groundwater sellers are figuratively at the bottom of the water barrel. They're at the bottom of the aquifer. They're selling our water out from underneath us. You put a straw at the bottom of that and depressurize the aquifer, like Glenn and Colusa County are doing right now -- yeah, there's water real close to the surface down by the Sacramento River, but when you pull that water out and you sell it and you ship it out of here, the people in the foothills go dry, and everybody else -- and if you look at the county maps of the groundwater that's being monitored, it is depleting nearly a foot a year on average. I don't care how much it rains, and this is a continuing decline of our groundwater, and to transfer any water in our current groundwater catastrophe, which is a worldwide problem, is ludicrous, and to increase the transfers is even more ludicrous. You should be cutting back on not increasing them. This is ridiculous and it is going to put us out of business, and I'm a farmer, and I've already got one well dry. And I've never seen water even close to this, and it's going down quickly. The groundwater is already depleted down in the southern end, and they are not going to be able to use it on dry years. It's gone. It's subsided. The pore space is gone, and they're looking to us to deplete us and we'll be in the same boat. And allowing these private irrigation districts to turn around and sell their water and pump and think that they can fallow a little land and that's okay is another ridiculous aspect. How can you -- how can you even justify that? I don't even know. I don't know where you get your science from. There's all kind of information. It's easily findable.

Response

Multiple technical studies have been conducted to evaluate the potential impacts to groundwater levels. The models used in these studies were considered to be the best available tools. The models simulate changes in groundwater levels that may result from the alternatives discussed in the EIS/EIR. The models were used to estimate the changes in groundwater level that may result from the groundwater substitution pumping in Alternative 2. The results of the model simulations are shown in Section 3.3.2.4. Several figures in Section 3.3 show the historical groundwater levels in several wells throughout the Sacramento Valley. In general, groundwater levels tend to decline in dry or drought periods, and in wetter years groundwater levels recharge. The current dry period appears to show trends toward decreasing water levels similar to previous years. Figures 3.3-28 through 3.3-33 show the potential change in groundwater level due to groundwater substitution pumping. These figures are for simulated conditions in a historically dry year (1976) and following four years of substitution pumping in a dry period (1990). Figures 3.3-34 through 3.3-38 provide a graphical representation of the change in groundwater level with and without groundwater substitution pumping at several locations in the Sacramento Valley. Appendix G contains figures for additional locations. The rate of aquifer recovery (or recharge) can be seen in the rate at which the blue line (Alternative 2) approaches the dashed-red line (Baseline). Mitigation Measure GW-1 includes actions related to impacts from groundwater level declines and subsidence. The inclusion of Measure GW-1 reduces the impact on groundwater resources to less than significant levels. Common Response 6 provides additional information.

Comment PH03-3

Comment

And these mega wells that are going in at the end of our Tuscan Aquifer -- I'm in that aquifer, and these -- you know, they're pumping a million gallons a day and they're transferring and they're selling it out. They're making a lot of money. Now, you take economic impacts down in the southern part where they've already destroyed their aquifer and you compare it to us, we're small potatoes. That is not a fair situation to justify destroying an aquifer.

Response

Table 2-4 provides the upper limit on the volume of water each of the potential sellers may transfer. Table 2-5 provides the distribution of transfers by transfer method. Section 3.3.2, Environmental Consequences/Environmental Impacts provides the results of the analysis of potential impacts to groundwater levels in the aquifer in the Sacramento Valley. Economic analyses relating to the alternatives are provided in Section 3.10, Regional Economics.

Comment PH03-4

Comment

The cumulative effects are already being seen on the flora and fauna in this region, and how it can be more, I don't know. That's it.

Response
Cumulative effects on biological resources are described in Section 3.8.6 of the 2014 Draft EIS/EIR.

Comment PH03-5

Comment
I haven't heard anything here tonight that gives me any assurance that you're not going to pump our aquifer dry. I know you have your models there that are supposed to predict that everything is going to be okay. There's going to be no problem, but if you don't mind if I don't believe that, do you?

Response
Multiple technical studies have been conducted to evaluate the potential impacts to groundwater levels. The models used in these studies were considered to be the best available tools. The models simulate changes in groundwater levels that may result from the alternatives discussed in the EIS/EIR. The models were used to estimate the changes in groundwater level that may result from the groundwater substitution pumping in Alternative 2. The results of the model simulations are shown in Section 3.3.2.4. Section 3.3.2.4.2 specifically shows simulated groundwater levels in the Sacramento Valley groundwater basin. The figures in this section show the change in groundwater level due to the estimated groundwater substitution pumping spatially across the Sacramento Valley (Figures 3.3-28 through 3.3-33) and also throughout the duration of the simulation (Figures 3.3-34 through 3.3-38). Additional model results are shown in figures in Appendix G.

Comment PH03-6

Comment
We've had to live with so much bureaucratic bungling and deal with unattended consequences throughout the years, that this looks like the epitome of them all. I can't believe that you people can sit here in good faith and say that you want to do this to us. Thank you.

Response
See Common Response 2.

Comment PH03-7

Comment
I represent -- my husband and I own a small dairy farm and cheese factory. We are the second smallest area in the State of California. We have just 30 cows on 20 acres of irrigated pasture. We are in Glenn County; however, we do not belong to the Glenn-Colusa Irrigation District. We have two wells on our property, one for domestic use and one to irrigate our pasture. I would like there to be the alternative number one, no action and no program on the basis of the willing sellers. I know Glenn-Colusa Irrigation District has been mentioned. Although I'm in Glenn County, I don't have any voice in what they do, and what they do affects my farm. Therefore, I feel that small farmers, like my husband and I, are disenfranchised in these decision-making

processes. No one comes to our door and say, Tim and Jill, do you mind if we pump a lot of water so that your pump -- your well may run dry? No one has asked me how this affects my farm.

Response

See Common Responses 6 and 7 regarding mitigation and monitoring to avoid potentially significant impacts to third party wells.

Comment PH03-8

Comment

As a board member for the Chico Certified Farmer's Market, I represent many small farmers in Butte County, Glenn County, Colusa County, Tehama County. We are very small farmers. No one is asking us if it's okay if we are willing sellers, and yet, it's our water that our livelihoods depend on that is going to leave the North State for good, and this will have a very drastic economic impact on this region. Thank you.

Response

Reclamation asked water districts throughout the Sacramento Valley if they were interested in participating in the range of potential actions to be analyzed in this EIS/EIR. Agencies identified in Chapter 2 responded to Reclamation with an interest in participating. These districts would ask their growers if they want to sell water for transfer each year. No water will be transferred from a non-willing seller. Section 3.10 evaluates the economic effects of the potential transfers. See Common Response 14.

Comment PH03-9

Comment

I heard an estimate that the amount of water to be shipped out is 20 times more water than the City of Chico uses each year. If that's the case, Chico has a hundred-thousand population. That would be like putting two million people into the area and saying that's not going to damage our aquifer. You have to pave over Glenn County, Colusa County and Butte County to put two million people in there, which is more than the City of Sacramento, slash, Sacramento and Stockton, and supposedly, you're going to ship that much water out per year. So how is that not going to drop the groundwater table and kill all of the oak trees? We live in an oak woodland, not a desert like San Joaquin Valley and not create a new desert? I mean, why would anybody even think that that could be possible?

Response

The maximum potential transfer amount is 511,094 acre-feet per year (Table 2-4). This total includes transfer via multiple mechanisms including groundwater substitution, cropland idling, stored reservoir releases, and conservation. The upper limit on groundwater substitution is 126,921 acre-feet between April and June and 163,574 acre-feet between July and September (Table 2-5).

Comment PH03-10

Comment

So -- and then the other -- in the environmental report, they're saying climate change is a slow thing. Well, we're already in the middle of it. Look at our snow pack. We have almost none of it, and all our wells are running dry, creeks are running dry. It's already happening. It's not a slow process. It's already -- we're already in the middle of it. So it doesn't seem like -- I realize that greed is a motivational factor. I mean, we have a -- as an example, what happened in the San Joaquin Valley by the way you guys managed your water. You guys put in almond trees, when you should have been growing tomatoes. It takes five times more water to grow almonds down there than it does up here, and so now you guys are sucking up more water than you needed to, and then also what about mitigation of factors of water usage for all your cities, Stockton, Fresno. Those are pretty big cities. I don't think you guys are trying to even think about how you could conserve on a much greater level, but it seems like you want to mismanage our water, destroy our valley, like you already did historically.

Response

Climate change is a "slow" process, in that the effects of climate change build gradually over the years. The greatest effects are expected to occur toward the end of the 21st century. The analysis presented in the 2014 Draft EIS/EIR acknowledges that climate change is occurring and ongoing, as discussed in Section 3.6.1.3, Existing Conditions; this section includes projections of predicted climate change effects through the end of the century. For each of the alternatives, the analysis presents both the estimated effects of the alternative on climate change and climate change's potential effect on the alternative. The action alternatives include water transfers up to 10 years in the future, and these were compared to the predicted climate change effects that could occur during this time. Past actions, such as the types of crops grown in the Central Valley, are beyond the scope of this environmental assessment. The effects of the action alternatives on water supply are addressed further in Section 3.1, Water Supply.

Comment PH03-11

Comment

I am a scientist. I am a farmer. I am here because I'm very concerned. As a scientist, I know that models do try to guess the potential situation, and I think it's a flaw if your models don't include drought years. I'm concerned because we have had a lot of problems with water this year. Here. Not in San Joaquin. Here in Butte County. So I wonder if we are going to be embarking in a project which is, more or less, what happened to Owens Valley or Mono Lake with the transfer of water to LA or Hetch Hetchy when they transferred water to San Francisco. I don't know whether there would be a way to go back.

Response

See Common Response 5.

Comment PH03-12

Comment

The other thing that concerns me is that you mentioned sellers and buyers. So that means that there is a profit. Somebody is benefiting. We are transferring water, but money is going into some pockets that is not our pocket; it's a few pockets. So if it's for the common good of California, maybe we should not donate, as the word that was used here, donate our water. We should just give it because there is a public domain necessity. There should not be any profit. So this is similar to the risk that we embarked on when the banks were bailed out in the recent recession. Thank you.

Response

Prices for water transfers are negotiated between the willing sellers and willing buyers and are not a subject of the environmental analysis in this EIS/EIR.

Comment PH03-13

Comment

I would like to address groundwater substitution, as I read in the Environmental Impact Statement. I think executive summary page 4.1, and they define it as regenerating -- no, repumping out groundwater in order to refill surface water that our good neighbors, Glenn-Colusa Irrigation is doing right now. They didn't say that in their quote, but they also said groundwater substitution and regeneration happens, I quote, slowly over time, unquote. This is totally inadequate language for Environmental Impact Report, and I think when it comes time for lawsuits, this would be a soft area that you guys are vulnerable at, and this is the way that we fight this kind of pork barrel legislation. And so your language, not being scientific at all, you need a study on regeneration of groundwater, and of course, nobody knows how that happens. Is that what you're going to say? We don't know, so what we're going to do -- we'll just pump until it goes dry and then we'll know that regeneration doesn't happen, it happens slowly over time, as I quote. So I think I'm willing to put off this groundwater substitution until slowly over time we do a study to find out what exactly is regeneration rate of our aquifer. I haven't got my yellow card yet, so I'm going to read this little --Groundwater substitution is like inheriting a fortune and squandering it, living high on the hog until it's all gone, and you're left with nothing. That's what our Glenn-Colusa Irrigation neighbors are doing. The wise person sets up that inherited fortune as a trust so that it lasts all your life and all your children's lives and the grandchildren and people in perpetuity.

Response

Section 3.3.2.4 discusses simulated recovery at water tables and pumping zones at Location 21 (near Sycamore Mutual Water Company), Location 14 (near Cordua ID) and Location 31 (near Sacramento County WA). Additional data on groundwater levels over time throughout the basin has been added to Section 3.3.2.4.

Comment PH03-14

Comment

Over the years -- I've been in the Chico area 50 years and been in the drilling business for 40 years. During that time, we've punctured about 10,000 wells in the four northern counties, and yeah, we've seen a lot of changes, in the last three years, basically four years. It's basically this year, and you're not addressing the current things, you know, let me give you one current thing. Up at Red Bluff, they have the Red Bluff diversion dam. That was built in the '60s, cost somewhere around 50 million. And the first thing that was wrong with it, we needed to encourage the salmon. So we set up a hatchery and filled the canal with rock, right-sized rock, and the only problem is we run the water through it, but the salmon didn't get that e-mail. They didn't show up. So, well, the problem is the gravel needs to be washed, get away the silt and the moss. So we washed it. I don't know how many million was spent. The next thing we needed to do is redo the pumps because the pumps are pumping too fast and they're killing the smelt. So we pulled them out and for about 12, 15 million, put in Archimedes. I'm going to have to go beyond a little bit. I'm not hurrying -- but Archimedes pumps in, and then, well, I don't know where the orders come from, I guess up there, but they decided that that all had to go. So they allocated 200 million, put in a covert dam, streams, and a tunnel underneath the Red Bank Creek syphon. There's nine big pumps from 300 horse to 600 horse to shovel water through the syphon on down into the canal which terminates down in Dunnigan. There's another small canal that terminates in Corning. Well, when they did this, they said you've got to open up the gates to the dam. Opened the gates three years ago. Since that time, there's been 60 domestic wells dry up in the Antelope area and that's where the water doesn't go around anymore, 60 of them. Now, this is something you folks need to consider because I remember the California Groundwater Association. I do not speak for them. I speak for Wes Heitman, but I've been in lots and lots of meetings, and when you pump groundwater, especially with the kind that they're going to do and are doing in Colusa, a funnel takes place, and the drawdown keeps going down until the pump breaks suction. It may not do it this year, but it will do it, because they're going to pump those pumps 24/7, and they're going to put five more in next year.

Response

Section 3.3.1.3, Affected Environment has been revised to clarify the impacts of current drought conditions to the groundwater resources within the area of analysis. The revised section also includes documented information on wells going dry in the Sacramento Valley.

Comment PH03-15

Comment

Now, there's one thing that all you folks need to look at. Go to your -- go to Google and type in Owens Valley. You'll get a real education.

Response

See Common Response 2.

Comment PH03-16

Comment

I'm a local environmentalist around here, and I would just like to make a few comments. One is that the Tuscan Aquifer that we have, actually is mostly salt water. It's only the top thin layer that's fresh water. So we have far less water than anybody thinks that is actually useable. We have groundwater depletion, a lot of people were talking about. We have a subsidence, and water is vital to our way of life and our economy, and it's just how stupid do you think we are? That's my question. Thank you.

Response

See Common Response 4, pumping for groundwater substitution transfers would occur primarily outside the Tuscan formation.Section 3.3 evaluates impacts to subsidence (also see Common Response 7) and Section 3.10 evaluates impacts to local economies. Mitigation Measure GW-1 (discussed in Section 3.3.4.1) avoids or reduces potential adverse environmental effects.

Comment PH03-17

Comment

I invite the element of water to join us and guide us in this important decision that we are all faced with. To me, the issue of water in my native valley is very simple. Water is our own internal emotional heart. When I look out on the landscape, when I see blocked rivers with dams, I feel it inside my heart. I feel the blocked arteries preventing us as humans, us as the nervous system of the earth to let our senses fully open, to fully embody the love all around us. I invite us to build connections in our community, to consciously reach out and align ourselves with our truest source of power. I invite water to flow beneath the bridges that we built. I also encourage people to pee outside. Thank you.

Response

This comment focuses on project impact on water supply, vegetation and wildlife, fish species, and flood control. See Sections 3.1, 3.8, 3.7, and 3.17, respectively for a description of potential impacts to these resources from the four alternatives.

Comment PH03-18

Comment

I just have a question tonight I was hoping you could answer. It's about the media release put out by Aqua Alliance, Obama selling out to California to Westlands Water District. It basically states that Obama administration has a settlement with -- for a lawsuit filed by Westlands Water District against the Federal Government for failing to provide agricultural draining service, and the settlement gives Westlands 890,000 acre feet of water a year exempt from acreage limitations and the public had no input over that settlement other than trying to influence Congress to change that. That's more water than we're talking about tonight. So doesn't that make this hearing moot? That's my question.

Response

Reclamation is working to address drainage-impaired lands under the authority and duties imposed by federal law. As part of those activities, the San Luis Drainage Feature Re-Evaluation underwent a separate environmental compliance and public comment process. More information on that project and public review can be found at this website: http://www.usbr.gov/mp/sccao/sld/

See responses to Comments NG03-125 and NG03-141 for additional information.

Comment PH03-19

Comment

So just over 30 years ago when I moved into this area, I lived above Bangor in the foothills, and I went to the little store there and met a gentleman who was doing research on the desertification of California, Northern California, on a federal grant. So this is not new information in any way to our Federal Government, and persons, in general, who live here, that water is depleting in our area from a number of sources and stressed from factors within our control and mostly completely out of our control. We have these mega wells. We have the actual drought, which is a lack of precipitation, and then we have a growing population and growing population needs in your areas and global warming. Our temperature is rising significantly. I have cows. I have crops. They all require -- we all require more when it's hot, and when these summers are so long. And we need to think not about those -- those years when we did -- you did include a seven-year drought period. Very good. We're in an unprecedented drought that has not come anywhere near ceasing. So we need to plan for the worst-case scenario. We can't just hope for the best. We need to honor Gaia, this young woman who came here. She's talking about the planet, the earth, what we've been given to take care of. Please let us make good decisions here. Let us make the right decisions. I feel for you. I feel for the land of the swimming pools and green lawns and the nice crops, but we are trying to survive. Those people that live here that have 30 years, 40 years on the land, we just want to survive. We want to leave a little something by for the ones that come after us. Thank you.

Response

This comment focuses on project impact on water supply, agricultural resources, and climate change. See Sections 3.1, 3.9, and 3.6, respectively, for a description of potential impacts to these resources from the range of potential activities under the Proposed Action and alternatives.

Comment PH03-20

Comment

To the CEQA/NEPA document, you need to incorporate the Lawson memo into the analysis that discloses the impacts to streams, therefore, the groundwater because the streams will try to fill the groundwater when it's empty. It could be as serious as 44 percent, and that is not part of your current analysis, and that was from a Public Records Act request to DWR. So it's certainly within the circle of the water brethren.

Response

The referenced Lawson memo was based on the previous SACFEM model, and therefore is outdated. The updated SACFEM2013 model incorporated significant updates in both data and assumptions. This EIS/EIR incorporates the latest data as disclosed within the document. Potential changes to streamflow and their associated environmental effects are assessed in Sections 3.7, Fisheries and 3.8, Vegetation and Wildlife. Section 3.1 analyzes potential effects to water supplies.

Comment PH03-21

Comment

I find it astonishing as well that Big Chico Creek is not listed as a significant tributary. That's a huge oversight.

Response

Big Chico Creek was inadvertently omitted in the initial analysis; however, additional review of the modeling outputs found there are no flow changes of greater than 1 cfs or more than 10 percent, including any related to Big Chico Creek. The results specific to Big Chico Creek have been added to the appropriate sections of the EIS/EIR, including Section 3.8.2.4.1.

Comment PH03-22

Comment

In regards to alternatives. I would like to suggest some in the area of delivery, not in the area of origin. Let's tip this a little on its head. How about some cropland idling in the area of demand? How about changing cropping patterns, as other people have suggested, back to annual crops instead of these perennials.

Response

The concept of reducing crops planted in the buyers' area was considered in the EIS/EIR as part of the Land Retirement in San Joaquin Valley alternative (see Table 2-1 and Appendix A). It was not carried forward for more detailed analysis because it did not meet the key elements of the purpose and need or basic project objectives, as it would not be immediate or flexible, and would not provide additional water. See Appendix A for more details on the screening of this alternative.

Comment PH03-23

Comment

I would also like to offer that there's been some misinformation, and I'm not saying that it's intentional, but in the presentation, it is diminishing the impacts, and it's not helpful to the public. I know you're smart people and you know that the majority here are completely opposed to this heinous idea, but you should at least present honest figures on the high side, not just the low side. When you talked about during -- on those frequency slides, there was 12 out of the last 33 years that transfers occurred. That is not true. You have to add -- and this is a cumulative picture here. It was 12 out of the last 14 years cumulatively there have some been major transfers out of this region. Well, let's get that straight, and I have an idea how I think you guys should do this because there was tremendous misinformation sent over the KZFR radio program news last night, and I know Mr. Moore is a nice man, and I'm sure he's overwhelmed at the Bureau of Reclamation, but my God, some of that information was so wrong that I think you are -- you owe us a correction and a major one in a major way, and I am suggesting a fact sheet. Mr. Willis stated that there would be 511,000 potential acre feet sold through a ten-year period, as I mentioned tonight, and I had your person acknowledge, no, that's each year over ten years. The document, you may plan for 511,000, but you're analyzing up to 600,000. So let's be honest. That is what could happen. And he stated that the comment period ended November 12th. Well, it doesn't end until December 1st, and he also stated, and I thought this was so disingenuous, and again, I don't think he was either thinking clearly or prepared. He said this project may not start for years, like lots of Bureau projects do. Well, this one, they want -- you guys want to go quickly. So I would suggest some major outreach up here that corrects this misinformation what went out over the radio, and we will submit extensive and exhaustive written comments, and we plan to see you in court.

Response

See Common Response 2. Previous transfers to the buyers in the EIS/EIR are discussed in more detail in Section 1.4 of the EIS/EIR.

Comment PH03-24

Comment

I can only imagine the game of straws that landed you all here, and I feel like this is just a formality, that you kind of have to come and let us share our voices, and I'm sorry that it has to happen this way. That we can't actually get to know each other in some way. I'm a farmer here. That's my daughter in the back. She's one year old. One of the wells on our property has gone dry. We've seen 30 feet drop in the water table in five years. We're monitoring. We're keeping track. That put one family out of business on our property. I've been stewing 40 acres on the edge of Chico for six years now. We have another 60 feet before our wells dry. That may be three more years of farming. I've been seeing each year trees that are about a hundred years old dying on our property planted by the man who first planted Golden Gate Park planted the trees on our property and they're dying in very fast numbers. To think that this is not going to turn this land into a desert, just like it did down south is silly to me. It seems like that is happening very quickly, and the only thing I feel left with up here is to let you know that I don't think that any of this is really going to change what you all are going to push through. It seems like your mind is set, that people who want it, that need it, and the money is there. So that would leave us left to continue mobilizing and to boycott all foods grown with this water and all foods grown by people selling this water. So that is my intention to be organized in that way. Thank you.

Response

Section 3.3 evaluates impacts to groundwater resources. Section 3.8 evaluates effects to biological resources, including trees. See Common Response 2 regarding project opposition.

Comment PH03-25

Comment

I'm really sorry to see you here tonight, but I'm here, and I just wanted to bring up an issue that hasn't been brought up. I live on 12 acres. It's a small farm that raises four-season crops, beautiful organic crops, and we live on the edge of Chico, what's called the green line, side of the green line. We have industrial near us from the victor industries to plume. We have a legacy of TCE, and on another side of our property, there's MTBE from the Kinder Morgan Tank Farm. And so recently because our well has gone down 25 feet, the Department of Water and -- I mean, the Regional Water Quality Control Board and the Department of Toxic Substances Control decided to test our well because of -- the contractor told me when he was there testing, that when you change the hydrology of these wells so much by the drop of the water table, you're pulling these toxics faster and in different directions. So I would like that to be part of what you're studying because you're putting people at risk from historical toxic spills. We have at least five plumes in Chico, and people who are in Chico are on municipal water, but those who are immediately outside of the city limits are using wells. And so you have a responsibility to all of us to not draw down our water anymore, and to -- and to make sure that the water that remains to us is safe. Although, I completely oppose everything you're doing here.

Response

Mitigation Measure GW-1 includes requirements related to water quality. See Common Response 6 for additional information.

Comment PH03-26

Comment

And I think I just -- this is the second water meeting I've been to. I appreciate everybody here and the work they're doing. The thing that bothers me is the buyer and seller. People use water. It flows through their land, but who owns the water? And I don't really understand how people can buy and sell land -- water. I understand that people have to use it. So maybe the paradigm that I would like to advocate for is the public process that through -- you know, through our Government that controls the water. There's no private buying and selling of water.

Response

Government regulations allow for, and in fact encourage and promote, the transfer of water. The Lead Agencies have prepared this EIS/EIR as one component of the process to ensure that transfers are implemented responsibly and comply with regulations. See Common Response 14.

Comment PH03-27

Comment

And I would just like to suggest to everyone that they look at the National Geographic's last month's issue. I just got the new issue, so it is last month, but it should be out in the store shelves. But they had a big article on California's water, and the bottom line is the snows are less and less, and I'm sure there are plenty of people here that remember in the good old days the Sierra snows were a lot deeper, and we occasionally would have a big snow, but the general, the decline is there, and the snows are less and less and that has been our -- our storage, and it's declining.

And then the other part is we got more and more people and we keep moving in more and more people, and it's already been mentioned about crops that take more and more water, like almonds, and letting them grow down south where it's dry.

Response

Section 3.6, Climate Change acknowledges that snowpack is projected to decline compared to measurements between 1971 and 2000 (see page 3.6-11). Water transfers would be used only to help meet existing demands and would not serve any new demands in the buyers' service areas (see page ES-1). Therefore, any water transfers would not be used to induce new growth in crops.

Comment PH03-28

Comment

And I think the bottom line is it's really not about water. It's about greed. And we all -- I think a lot of us understand that, and the politicians, we know, are bought off and owned and the news media is corporate owned, and I think a lot of us feel like a little bit helpless standing up to the Government on this kind of thing. And like that woman just said, who owns the water? The wells are interconnected, and we don't even understand the hydrology that's going on, and it just doesn't make sense to me. So thank you.

Response

The EIS/EIR uses extensive data from the groundwater basin and hydrology to evaluate effects of water transfers. The water transfers analyzed in the environmental document are potential transactions between willing buyers and willing sellers. The Lead Agencies (as well as responsible and trustee agencies) ensure that transfers are compliant with existing laws and water rights.

Comment PH03-29

Comment

I just want to make one comment and especially involving economics. When we ship our water down south, if we sell it to southern farmers who grow walnuts or almonds and they sell these products to China, Japan and other countries, we're not only exporting our water out of Northern California; we're exporting our water out of the state.

Response

Water transfers do not affect export policies for crops. Water is being transferred to the San Joaquin Valley, not out of the state.

Comment PH03-30

Comment

I also have a pretty much a big-picture question, is this public hearing, can it have any impact on impeding your process here? That's kind of a big question, I've been formulating while I was watching this process, if our comments can have any impact in impeding your process. Thank you.

Response

See Common Response 2.

Comment PH03-31

Comment

I came to Butte County about 30 years ago, and a couple miles up from where I live -- I live in Yankee Hill, there's a trailer park called Big Bend Trailer Park, and it's been there for quite a few years and this year they were on Channel 13, and basically, a community of 30 homes there, their well's gone dry and they have no water. Basically, I see this whole process here as, you know, a mega transfer for corporations. Corporations, you know, are trying to appease us, the little people, and basically, you know, there's no, you know, possibility that, you know, we are going to get any compensation, even though we're losing our water rights here. And I just want to say that, this is basically a mega transfer for corporations, and you know, this is just kind of a dog and pony show for us to, you know, to be at peace. Thank you.

Response

Figures 3.3-28 through 3.3-33 show the simulated drawdown after a single year and multi-year transfer event. Impacts from groundwater substitution are not expected to cause any drawdown near Yankee Hill.

Mitigation Measure GW-1 (discussed in Section 3.3.4.1) requires mitigation and monitoring to avoid potentially significant effects to other legal users of water within the area of analysis. See Common Responses 6 and 9 for additional information.

Comment PH03-32

Comment

I'm against water transfers. I'd like to know as part of a question, did they reduce any of the water transfers since the drought has started? I would like that answered at the end of the session.

Response

See Common Response 2.

Comment PH03-33

Comment

How do you know the impact it's going to have when I called -- I got bounced around to agencies from Sacramento to Butte County to all over when I said our well, our ag well went dry. We're farmers in Durham, ten miles south of Chico. They had no method of recording it. So how are you analyzing or recording any impact on the residents of the county when there's not even a method to contact those to find out -- our neighbor's well is dry. Wells on the midway are dry. Wells in north Chico are dry. I'm worried that my house in north Chico is going to go dry.

Response

Section 3.3.1.3.2 has been revised to include information collected by DWR on dry wells within the groundwater resources area of analysis.

See Common Response 6 for additional information.

Comment PH03-34

Comment

We have an ag well that gives us ag water, electricity rates. Since that well is now dry, we're now using the house well at the farm I work at. Those rates are double. More than double. So as a cost to a farmer, we're seeing increased prices already. It's having an economic impact on us, your water transfers. They're not helping the water table maintain itself.

Response

Section 3.10 discusses economic effects of changes in groundwater levels as a result of the proposed alternatives and the resulting effects on groundwater pumping costs.

Comment PH03-35

Comment

I'm going to talk as long as I want. It's really emotional. When the cost for a new well, if you can get one drilled, they're telling us it's a one-year wait to get a new well drilled. That a new well would need to go to 400 feet. My house well is at 85 feet now. The water is at about 55 or 60 feet. The ag well is at 65 -- the ag well, we maybe have 10 or 15 more, I'm sorry. At the farm, the house well is within 10 to 15 feet of drying up.

Response

See Common Response 6.

Comment PH03-36

Comment

We were afraid to plant crops this year. Are you going to support us? You all have jobs. You're out conducting these sessions. You all have a job. We will be out of jobs. The residents of Butte County and Sacramento will be out of food, of local grown food. We supply the farmers market in Chico and Sacramento. Without water, we can't grow food.

Response

See Common Response 2.

Comment PH03-37

Comment

Three years ago at the meeting, a long-time farmer from here asked how are we going to prove that our wells are going dry because of water transfers? They said how is a small farmer going to come up with the money to sue you or to sue a farmer that's selling off the Tuscan Aquifer from underneath us. We're here now. Wells are dry. People are getting water trucked in. So not only with the cost of the well -- not only is there a year wait to get a well put in --

Response

See Common Response 6.

Comment PH03-38

Comment

-- about $40,000. So until you people who all have jobs with this water transfer situation volunteer to compensate us residents until you go out door to door and ask people their water situation so you have a clear handle, there should not be one drop of water leaving this county.

Response

See Common Response 2.

Comment PH03-39

Comment

As a citizen of Butte County and Chico with a degree in hydrology, I find the fact that you guys in this Environmental Impact Report cherry picked one of the wettest periods in our history in California egregiously. And I find it twofold, one, because that's the best-case scenario, and two, because these water transfers won't occur during those periods. They would occur during the driest periods, which are the worst-case scenarios, which you're not even studying.

Response

See Common Response 5.

Comment PH03-40

Comment

The problem is when the drawdown occurs, we're going to have subsidence. The woman who was answering questions up here earlier was deflecting the fact that subsidence is not reversible. I'm talking about closed aquifers. You guys aren't going to be pumping from open aquifers. If you are, that's just water coming from the rivers anyway and they're just pumping it back in and making a buck. I'm talking about the closed aquifers that are going to sink and the aquifer is going to lose its storage capacity.

Response

Sacramento Valley is an open aquifer. The storage capacity of the Sacramento Valley has been discussed in detail in Section 3.3.1.3.2. Section 3.3 evaluates effects of subsidence.

Comment PH03-41

Comment

In addition, like many people have brought up, what's going to be the impact on this area because of that? Wells, you know, when someone's well goes dry and they have to have their well drilled deeper or their pump dropped, are they going to reference this meeting and say, well, they said there were monitoring techniques being used. Well, all these vague and ambiguous terms you're using to cover yourself, like "monitoring" and "mitigation" without any real cement anything, that's not going to help out the person with no water. That's not going to help out our community, and you're not addressing that at all.

Response

See Common Response 6.

Comment PH03-42

Comment

My husband and I own a small farm in the foothills above Lake Oroville, and I thank God every day I am able to get water out of our well because it's not a given thing. I'm here tonight to strongly disagree with the proposed ten-year water transfer of the 195 billion gallons per year to the San Joaquin Valley. This is insane.

With the alarming drought that California is going through and people's wells going dry, how can you even dream that this is going to happen without a devastating effect to Northern California? Instead of your water transfer pipe dream, literally, why don't you start building a sustainable system of rain harvesting throughout the area and better yet, throughout California.

Response

See Common Response 2.

Comment PH03-43

Comment

Especially, Frances coming up representing the San Luis Delta-Mendota Water Authority, although, I guess that's who you're representing and probably Westlands Society who gets the water, facing this hostile crowd. Although, I do have to wonder why the Department of Water Resources is not the CEQA lead agency in this, rather than the buyer. It really doesn't make sense. It seems like a real flaw in the study.

Response

See Common Response 1.

Comment PH03-44

Comment

Secondly, during that -- in 2006, the Sacramento Valley Integrated Regional Water Management Plan under the direction of the North California Water Association and DWR engineers put together a draft framework for monitoring the recommendations was to monitor for groundwater-dependent ecosystems. This is monitoring in the shallowest portions of the aquifer that may be impacted by the cumulative demands on the aquifer. These are not Creekside monitoring systems. These are monitoring systems that would make sure that our valley oak groves, the remaining valley oak groves in California that exist in the Sacramento Valley still have access to that 60 to 70 feet of water that they need to survive.

Response

See Common Response 11. Oak trees obtain a majority of their water from their fine roots system located within the first three feet of the soil surface. The main function of the sinker roots and taproot in a mature oak tree is structural support and not mineral and moisture uptake. The lack of direct precipitation (i.e., drought) is a more likely cause of oak tree stress than lowering groundwater.

Comment PH03-45

Comment

Number three, your -- the presentation said groundwater levels would recover in the long run. We heard this over and over again in many situations. Finally, our local DWR people are starting to contest this. Dan McManus, one of our regional DWR leaders wrote a letter saying specifically saying, this is not -- they're not recovering, and it's not climate change. The past 150 years have been unusually wet. California experiences droughts that last decades. We need our groundwater to buffer these. Look at paleoclimatology in your analysis.

Response

Impact analysis tools (SACFEM2013, CalSim) used in this EIS/EIR have been calibrated to historic conditions from WY 1970 through WY 2009. WY 1970 through 2009 include highly variable hydrology from very wet periods to very dry periods. See Common Response 5.

Comment PH03-46

Comment

I strongly urge you to choose alternative 1, the no project, but don't stop there. You've got to stop the so-called temporary transfers that have been occurring and escalating over the past years. We are organized. We will resist this water heist. If you persist in coming to grab our water, we will take you to court.

Response

See Common Response 2.

Comment PH03-47

Comment

I worked in Water Reclamation in the past, and I have a question because I'm kind of new in the area, and as far as the local reclamation facilities -- and maybe somebody can answer this question locally, just keeping it local, how are they redistributing -- redistributing, sorry, their water to the locals, or is it going into Sacramento and kind of being flushed away, and is there any way that that can be -- put money -- somehow bring money in and let's redo our projects to where that water just goes right back to the local farmers like many projects across the nation are doing right now? So that's just a -- I don't know, any way.

Response

The Bureau of Reclamation is a federal agency, and is not related to local reclamation facilities.

Comment PH03-48

Comment

In your analysis, I would like to know if you've addressed the forest cut that has been happening?

Response

The potential water transfer activities analyzed under the Proposed Action will not result in tree removal and as such, forest cutting was not analyzed in the 2014 Draft EIS/EIR.

Comment PH03-49

Comment

The forests in Cohasset above Chico are sick, and creeks are dry. And another point, I understand that the Tuscan Aquifer is not like a big body of water, but it's a sponge. What do we know about this sponge?

Response

The small changes in groundwater levels resulting from the range of potential activities analyzed under the Proposed Action would not affect the Tuscan Aquifer. Additionally, proposed groundwater pumping will be from multiple basins and different aquifers in those basins, including the Tehama Aquifer. The groundwater systems are described in Section 3.3 of the EIS/EIR. Also, see Common Response 4.

Comment PH03-50

Comment

A third thing I'm concerned with, something that was said by Woody Barns at one of the Board of Forestry meetings when it got hot and heavy, and that was, Oh, stop. Stop. Stop. Don't get so excited. We're dealing with 50 years of educated lies. I now read in the Nature Conservancy magazine, by the head of the Nature Conservancy, that we need to cut trees because they're taking our water. I read in the Susanville newspaper that we need to cut the Sierra Nevada. They have a proposed plan for a massive amounts of trees to be cut in the Sierra Nevada, it's the Sierra Nevada's sustainable forest management. They want to cut more trees. The Nature Conservancy's head wants to cut more trees. Anybody that knows about hydrological biology knows that the trees hold the water, and by capillary action, the trees bring water and our oxygen supply to us. These are educated lies. I really caution you to further educated lies.

Response

Tree removal is not proposed as part of the project.

Comment PH03-51

Comment

My family came here in 1836 into the San Francisco Valley. In some fashion, they had farmed in the Bay Area, the San Joaquin and Sacramento Valleys in perpetuity since then. I worked with Bureau of Reclamation as a drill rig operator helper in the early 1970s on the Tehama-Colusa and the Delta-Mendota canal. I currently live on well water in Durham. I'm experiencing some of the things that we heard.

More importantly, I was in -- I was in the cotton field in -- out of the side of Mendota when the lead hydrologists for the USBR CVP had lunch with us, and he said what we're doing here will kill this valley within 40 years. It will be over -- it will be overbuilt. The water will be overused. There will be the expectation that the water will be unlimited from the north, and we will return this back to desert from whence it came, and that's what's happening with out our water here.

Nobody, nobody south of the Delta deserves one drop of our water. Let it go back to fallow like where it came from. They don't deserve it. 75 percent of the crops grown there go outside the United States. The people that are harvesting them are working for poverty wages in poisonous conditions. It does nobody any good and now they want to take from us. It's patently wrong. It's immoral. It's disgusting, and anybody who participates in it is either a creep or a fool.

Response

See Common Response 2.

Comment PH03-52

Comment

I have objections to option 2, 3, and 4. The only one that I would like is the one that says do nothing, other than others that have been brought up, we already have to shut down some of the temporary transfers that are already going on. Taking more water in dry years, as we can see currently, when it's dry, it's dry here, too. So doubling the amount of water you want to take while it's already dry is only going to negatively impact us more.

Response

See Common Response 2.

Comment PH03-53

Comment

I didn't really get a good answer to my question about the economic aspect. It isn't really clearly explained. You lump Butte and Sutter together. There's a negative employment factor of 118, loss of labor encumber 4.16 million and an output loss of 13.84 million. I would like to know if that's every single year or over the entire ten-year period? You can answer me later.

Response

Text has been added to the assessment methods in Section 3.10 to further clarify the economic modeling. Economic effects from cropland idling transfers would occur in years when cropland idling transfers are implemented. These are the maximum effects that could happen in a single year. If maximum cropland idling transfers occurred each year, then these effects would occur each year. Chapter 2 discusses the expected frequency of transfers and the priority order for the transfer methods. Under the Proposed Action, cropland idling transfers have the lowest priority for the buyers.

Comment PH03-54

Comment

Finally, I don't think that you're considering the long-term impacts of eco-tourism, the loss of economy because of dying riparian forest that could happen due to your water transfers. There also will be loss of property value due to dry wells.

Response

As discussed in Section 3.8, water transfers would not have significant impacts on riparian forests. There would be no indirect effects on eco-tourism due to water transfers. Additional analysis has been provided in Section 3.10 on economic effects if wells potentially dry out.

Comment PH03-55

Comment

I'm director of Butte County Department of Water and Resource Conservation. Welcome back. The Butte County Board of Supervisors wrote in comments during the scoping process a number of years ago, and as well as I think a lot of people here voiced concerns and wrote letters in, and it's been a couple of years. You folks have done a lot of work, produced a lot of documents. We've started to go through it. You've heard a lot of passionate comments today and some technical comments. We're going through it also for the county and the board and the community, but you've gone three years or so doing your work. We've had a couple of weeks to provide comments to go through the voluminous documents and analyses, which we will read. We will go through everything, but we're going to need more time. Started to peel away the layers of the onion. There are significant issues, some new issues that have come up at two, you know, be courteous to the community and responsive. I think you really should afford people more time. You've had three years to redo this. You're going to have a ten-year program you're proposing. If nothing else, afford more time, and I think someone suggested, too, come back before you finalize a document. It is a legal document with your response to comments and do this and be responsive, whether you're going to get the answers you want, but afford the community the time to review the materials in detail and come back before you finalize it. Thank you.

Response

The Lead Agencies are unable to accommodate the request for additional review time beyond CEQA and NEPA requirements.

Comment PH03-56

Comment

It's been said that this is the last healthy aquifer in California, but its health is in steady decline, not just in recent years, not just during this drought, but over ten years, over 20 and 30 years. It's been said that our region is in balance with its water supply and its water demands, but you've heard the testimony of people here tonight that shows that that is clearly not the case, and it's not only the human water demand that is falling short. The ecosystem is falling short of its water needs, as well.

Response

Section 3.3 describes groundwater conditions and evaluates and mitigates effects of the alternatives. Section 3.7 evaluates effects to fisheries and Section 3.8 evaluates effects to vegetation and wildlife.

Comment PH03-57

Comment

Other regions of California are out of balance. That is clear. The groundwater legislation in California is supposed to require that each region balance its water budget. What seems clear is that the San Joaquin Valley proposes to balance their water budget with Northern Sacramento Valley water. And we can't allow that to happen.

Response

Section 3.3.1.3 discusses the existing condition of the Sacramento and San Joaquin groundwater basins.

Comment PH03-58

Comment

You haven't heard one speaker here tonight who supports this project. This community is calling for the no action no project alternative.

Response

See Common Response 2.

Comment PH03-59

Comment

I own some land where I live a few blocks from here. My well -- my well was -- the ground table was about 40 feet in July 2010. In late August, it was 67, come up to 61 with the irrigation season ending, but -- and I don't have nearly as much as stake as the people here who earn their livelihood off the land.

Response

Section 3.3 evaluates effects to groundwater resources.

Comment PH03-60

Comment

And I wanted to comment on -- I listened with particular interest to an answer that was given to a question about the economic model that -- well, the modeling that was used and the data that was used, and it only went up to 2003 because something about the modeling tools didn't -- just didn't permit using data beyond 2003, which would have -- could possibly have really skewed the information, and I -- you know, I -- since 1970s, since the early days of the computer industry, I've written computer software, designed it, managed teams of people who create it, and a computer program is -- I respect the technology behind the modeling. Computer program is really a very -- very, very detailed, almost fetishly detailed model that projects things are going to work under a certain set of conditions, and I -- one of the things that I always had to work with many engineers. They get so buried in their technology, that they lose a sense of common sense perspective. So, hey, look, this software you're producing that's supposed to give a financial statement is producing a ludicrous financial statement. It doesn't pass the common sense test. Look up from your numbers for a minute, okay, and think about -- think a little bit, take a step back.And I'm reminded of that when I heard these answers to this question about this model. Look at the people here and the impact and the concern. All these wells are drying up in the midst of an unprecedented drought. Think about that. Think about that. Look at the impact of that. Take that into consideration. It doesn't pass the common sense test.

Response

IMPLAN was the model used for the economic analysis. The analysis used 2011 economic data, which was the most recent available data at the time of the analysis.

Comment PH03-61

Comment

We're all people, right, here? We're all people, and we need water every single day, and our water lives under ground here. So we should leave it there, right? I mean, why do we need to pump it and put it somewhere else? I don't see how ya'll can't understand that. I don't see how -- how you can't hear everyone saying the same thing, that we're in terrible, dry conditions.

Response

See Common Response 2.

Comment PH03-62

Comment

I mean, I'm a farmer here in Chico. Our pumps have dropped -- our well has dropped 20 feet in two years. That burned up one of our submersible pumps, a bunch of money out of the window. It burned it up. So what if it's the worst-case scenario, and actually everything does drop really low and it comes in a desert and all the oak trees die and people move away and it's a really terrible situation. How are you going to feel when that happens? How does that make you guys feel? If you go home you're like, oh, well, we pumped up their water. Oh, well. How are you going to go to bed at night? Shame. Shame on ya'll. Shame.

Response

Section 3.3 evaluates effects to groundwater resources, Section 3.8 evaluates effects to vegetation and wildlife, and Section 3.10 evaluates effects to the regional economies.

Comment PH03-63

Comment

I don't know anything at all about water. I've been sitting in the front row on the left-hand side. There's three people here who have a tongue pinched and pieces of paper in front of them and nobody wrote down a single word all evening, and it just kind of makes me curious as to whether you didn't really hear anything that was worth thinking about or if you just don't gave damn.

Response

All comments from the public hearings were recorded by a court reporter. The transcripts are a part of the Final EIS/EIR, and the Lead Agencies have considered and responded to all comments made during the public hearings.

Comment PH03-64

Comment

I'm here taking pictures for our local online news magazine, Chico Soul, and I've been really trying to be objective, you know, and not say anything, as a photo journalist is supposed to do, but I cannot remain objective. I have to -- I have to get up here and say something because at least four or five of the farmers that grow my food, their well -- I'm hearing their wells are going dry. I'm getting really concerned that the food that they grow for me that I go to the farmers market every week, that is where we buy our food, and if these farmers that feed me, that grow my food, if their wells are going dry, I'm really concerned, and I will be supporting Aqua Alliance to litigate. Thank you.

Response

See Common Response 2.

Comment PH03-65

Comment

I came here four years ago. I am a rainforest child from the Kitsap Peninsula in Washington State. When I came here, I stopped in Portland and they laughed at me, they're like, why are you going to California? There's no water there? And I told them I was chasing the sun. I'm from Seattle. It's the suicide capital of the nation, and I think California may very well take that. What we're witnessing here, is incredible thirst, both through population, scorching temperatures, and as a student of permaculture and I see a small community here that's very solution focused. I definitely encourage the rest of the world to step up.

I'm part of a generation where we realize we have to dig our heels in. My T-shirt is "in soil we trust." God is in the soil, Soil is in us, and if we are to survive as a human race, I think we need to sit down at many tables and possibly put our hearts forward, our money aside, and just think about the long-term projection of this world. I just watched Chasing Ice last night. It's a very beautiful documentary about a very passionate photographer who is doing time lapse photography on two different sites, in Montana and Iceland and Greenland, Siberia and Tibet and watching incredible shrinking of icebergs, and I think maybe tonight is represented in a similar feat underneath our ground where there's a great shrinking.

So I hope all the words here can go into our hearts and our souls and when we go back to our offices and go back to the street and go back to our farms, may we let them sink in a little bit, percolate and come up with some good solutions that we can work with in our communities here and far. Thank you so much for your conscious consideration and being open minded. Thank you.

Response

The purpose and need and project objectives of this 2014 Draft EIS/EIR are to help address the water shortages experienced in California. The 2014 Draft EIS/EIR includes an assessment of the potential impacts to environmental resources, including agricultural resources, from the identified range of potential transfer activities in relation to the no action and action alternatives.

Comment PH03-66

Comment

I just want you to go look at Mt. Lassen. We are at the edge of the Cascades. Paradise is the last butte of the Cascades. The Cascades come in from Canada and they stop right here and Sierra Nevada Brewery is actually brewed with Cascadian water, and if you look up at Mt. Lassen, all of the -- we have five major waterways that come through Chico, and if we don't have snow pack on Mt. Lassen this year, we will have no rivers.

We look at Mt. Shasta, and we see that 5- and 10,000 years of glaciers are melting on the north side of Shasta. If you look at Shasta Lake, you will see it's coming down to a little puddle. It's dropping one to two feet a day. So there is -- if we need -- we need to do rain dances. We need to do everything. You cannot steal the remainder of our water. This is so -- we -- if you were here -- if you spent the night, and you probably aren't, you can wake up and look at Mt. Lassen and Mt. Shasta. If we have no snow pack, no water will come down into Butte Creek, Little Chico Creek, Big Chico Creek, Deer Creek, Mill Creek, we are in a very, very tough year, and we need lots and lots and lots of snow. And we -- if we don't get it, like we got last year, we are going to be suffering for no surface water and then you're stealing our groundwater? Shame.

Response

Section 3.1 analyzes potential changes to surface water supplies associated with the action alternatives. Common Response 5 includes a discussion of recent dry hydrology and how this hydrology fits with the modeled time period. Section 3.6 discusses the potential impacts of the action alternatives on climate change.

Comment PH03-67

Comment

So we all realize there's a lot of money in politics behind what you're going to put forth. We can pretty much be assured of that, and I'll expose some of my ignorance. I'm not sure how people on the Board of Reclamation get their positions. It's certainly not by being voting, I wouldn't guess, but even so, I think I would like to say there's some changes blowing in the wind. I think that people like Paul Gosselin, who was hearing for his community and support them, their wishes, who get their support when times come, and I think in some way or another, people who don't listen to the community, I can't imagine you've heard much different in any of the other two meetings you've been at, that they continue to put forth things that people don't want, won't be in position to have that power for a long time, I think. That's my opinion. And so certainly, I don't support it.

Response
The Bureau of Reclamation is a federal agency, and the Commissioner is appointed by the Secretary of the Interior.

Comment PH03-68

Comment
On the first proposition, I don't quite understand it, and I thought maybe you could explain it to me. It says they want seven-and-a-half-billion dollars in general obligation bonds for the state water supply, infrastructure projects including surface and groundwater storage. Now, where are you getting the groundwater to store? That's my question.

Response
Any of the potential transfer activities evaluated under the action alternatives in this EIS/EIR would not be funded by the recently-passed water bond. The water bond would fund separate studies and projects.

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Appendix S

Comments and Responses on the RDEIR/

SDEIS

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Appendix S Comments and Responses on the 2019 RDEIR/SDEIS

This appendix contains responses to comments received on the Revised Draft Environmental Impact Report/Supplemental Draft Environmental Impact Statement (RDEIR/SDEIS), including all written comments received during the comment period for the RDEIR/SDEIS. The RDEIR/SDEIS public comment period was from February 4, 2019 through March 21, 2019. The comment letters received on the RDEIR/SDEIS are included in Appendix U. Chapter 1 of the RDEIR/SDEIS summarizes the Long-Term Water Transfers Environmental Impact Statement/Environmental Impact Report (EIS/EIR) history. Reclamation and SLDMWA (Lead Agencies) completed the Long-Term Water Transfers Draft EIS/EIR in 2014, which is referred to as 2014 Draft EIS/EIR. This document is the Final EIS/EIR.

All comments are presented in Times New Roman font and all responses are presented in Arial font for easier differentiation by the reader. Table S-1 presents commenters and associated agencies or groups that submitted comments on the RDEIR/SDEIS.

Table S-1.
List of Commenters

Commenter	Agency/Group	Date	Letter ID
Nicole Goi	Sacramento Municipal Utility District	3/14/2019	1
Patrick Soluri	Soluri Meserve	3/18/2019	2
Connell Dunning	United States Environmental Protection Agency	3/14/2019	3
Jeff Henderson	Delta Stewardship Council	3/22/2019	4
Michael Billiou	Billiou Farming Company	3/16/2019	5
Don Hankins	California Indian Water Commission	3/16/2019	6
Charles Center, Barbara Barrigan-Parrilla, Kathryn Phillips, Conner Everts, Jonas Minton	Friends of the River, Restore the Delta, Sierra Club, Environmental Water Caucus, Planning and Conservation League	3/18/2019	7
Pedro Villalobos	California Department of Water Resources	3/20/2019	8
Barbara Vlamis, Bill Jennings, Carolee Krieger, Jason Flanders	AquAlliance, California Sportfishing Protection Alliance, California Water Impact Network, Aqua Terra Aeris Law Group	3/18/2019	9
Richard Macedo	California Department of Fish and Wildlife	3/20/2019	10

The comment letter (number 9) from AquAlliance, California Sportfishing Protection Alliance, California Water Impact Network, and Aqua Terra Aeris Law Group included multiple exhibits.

The comment letter requested responses to Exhibits A and B. Exhibit A is included in this appendix. Exhibit B is the same letter that was submitted on the 2014 Draft EIS/EIR and the responses are included in Appendix R. The remaining exhibits from this letter are references or contain information on related projects, and do not require individual responses.

Some of the comments were previously submitted on the 2014 Draft EIS/EIR, or are related to comment responses for that document. Responses to Comments on the 2014 Draft EIS/EIR are included in Appendix R.

Common Responses

Multiple comments were received on some issues. The common responses below provide responses to these groups of comments.

Common Response 1: Public Review Process

Some comments asked why only parts of the 2014 Draft EIS/EIR were released for review and expressed concern that the Lead Agencies cannot "cobble together" different documents to develop environmental compliance. Those comments do not accurately describe the Lead Agencies' process.

Based on the District Court ruling (described in Section 1.2), the 2015 Final EIS/EIR was decertified. The 2014 Draft EIS/EIR that had been circulated for public comment needed additional information related to several topics identified by the District Court. Chapters containing the additional information and associated analyses are being recirculated for public review and comment pursuant to the process and standards set forth in California Environmental Quality Act (CEQA) Guidelines Section 15088.5. As described in Section 15088.5(c):

> *If the revision is limited to a few chapters or portions of the EIR, the lead agency need only recirculate the chapters or portions that have been modified.*

Under National Environmental Policy Act (NEPA), this document represents a supplemental statement to the Draft EIS, as defined in 40 Code of Federal Regulations (CFR) 1502.9 (c):

> *Agencies shall prepare supplements to either draft or final environmental impact statement if… there are significant new circumstances or information relevant to environmental concerns and bearing on the proposed action or its impacts.*

Some commenters indicated that they did not think that prior comments on the 2014 Draft EIS/EIR would be addressed because the entire document was not recirculated, but those comments are addressed. This Final EIS/EIR includes material from the 2014 Draft EIS/EIR (updated to reflect responses to public comments on that document) along with the contents of the RDEIR/SDEIS (also updated to reflect public comments).

Several commenters also indicated that they thought the project description had changed in a way that was "unstable" because of the decreased upper limit, new sellers, and new buyers. They thought that these changes would lead to a review of the entire document, but these changes do not indicate additional review. The changes to the upper limit (a decrease of the maximum total potential amount) are only a clarification to the project description and do not constitute a material change to the project description, as further discussed in Common Response 2. New potential sellers were assessed in a 2017 Addendum, which found that adding these potential sellers did not change the effects described in the 2014 Draft EIS/EIR. The potential new sellers create additional opportunities for the buyers to try to negotiate transfers, but these transfers would not all be available when buyers may want to purchase them. They would be further limited by buyer demand and conveyance capacity (see Common Response 2). The addition of potential sellers could result in more opportunities for water potentially available to transfer, but it would not increase the amount *actually* transferred, which is capped at the upper limit of 250,000 acre-feet.

Contra Costa Water District (CCWD) and East Bay Municipal Utility District (EBMUD) do not represent new buyers. They were included as potential buyers in the 2014 Draft EIS/EIR for NEPA but not for CEQA. Practically, this did not affect the analysis because the resource evaluations all considered transfers to these two agencies.

When determining the new content for the RDEIR/SDEIS, the Lead Agencies considered changed conditions and included relevant information. This information was incorporated where appropriate, which resulted in changes to the entire groundwater resources section. Other sections required less changes or did not require changes.

Common Response 2: Transfer Upper Limits

The 2014 Draft EIS/EIR included potential transfers up to the upper limits included in the 2008 United States Fish and Wildlife Service (USFWS) and 2009 National Marine Fisheries Service (NMFS) Biological Opinions on the Long-Term Operations of the Central Valley Project (CVP) and State Water Project (SWP). These quantities were further limited by willing sellers, buyer demand, and available capacity, such that the amount actually transferred would be substantially less in most years. This limitation is discussed in Section 2.3.2.5 of the 2014 Draft EIS/EIR.

Some comments on the 2014 Draft EIS/EIR reflected some confusion as to the upper limits for water transfers associated with the Proposed Action. Some reviewers seemed to believe that potential transfers would only be limited by the amounts set forth in the biological opinion (i.e., totals of 600,000 or 360,000 acre-feet, depending on water year type). Some reviewers of the 2014 Draft EIS/EIR generally referred to the upper limit of 600,000 acre-feet as the upper limit of water transfers assessed in the EIS/EIR, but in reality, that upper limit in the biological opinion was only one factor limiting the amount of water transferred and there are several other more restrictive factors that would limit the transfers. To avoid confusion, the RDEIR/SDEIS clarified that transfers up to that upper limit would not occur because of the many other limiting factors, and changed the upper limit for transfers covered by this EIS/EIR to 250,000 acre-feet. This does not represent a substantive change to the project, but rather a clarification of the overall potential size of the project. The analysis in the 2014 Draft EIS/EIR was conservative because it analyzed far more water transfers than would likely occur, and the analysis continues to be conservative with the clarifying change to the upper limit.

Commenters on the RDEIR/SDEIS asked how transfers would be limited to the 250,000 acre-foot upper limit. As described in Appendix R, Common Response 14, Reclamation must review and approve potential transfers annually. This review and approval process provides an opportunity for Reclamation to verify that the overall amount of transfers it approves stays below this upper limit. This is only part of the review process; Reclamation also reviews potential transfers to make sure that they meet all requirements in EIS/EIR and sellers/buyers incorporate mitigation measures.

Some commenters asked how the Lead Agencies would be able to limit all transfers to less than 250,000 acre-feet, but such comments mischaracterize the nature of the Proposed Action and the purpose of the Lead Agencies' review. The upper limit of 250,000 acre-feet for potential transfers would only apply to transfers that constitute the Proposed Action addressed within this Final EIS/EIR. It would not limit all through-Delta transfers, which would continue to be limited by the biological opinions on operations of the CVP and SWP.

Detailed Comments and Responses

Individual responses to comments are presented in the following section.

Comment Letter 1, Nicole Goi, Sacramento Municipal Utility District

Comment 1-1

Comment

Subject: Long Term Water Transfers/ DEIR/ 2011011010

Dear Frances Mizuno,

The Sacramento Municipal Utility District (SMUD) appreciates the opportunity to provide comments on the Draft Revised EIR (DEIR) for the Long-Term Water Transfers Project (Project, 2011011010). SMUD is the primary energy provider for Sacramento County and the proposed Project area. SMUD's vision is to empower our customers with solutions and options that increase energy efficiency, protect the environment, reduce global warming, and lower the cost to serve our region. As a Responsible Agency, SMUD aims to ensure that the proposed Project limits the potential for significant environmental effects on SMUD facilities, employees, and customers.

We have no comments to offer at this time but would appreciate it if the San Luis & Delta-Mendota Water Authority would continue to keep SMUD facilities in mind as environmental review of the Project moves forward. Please reroute the Project analysis for SMUD's review if there are any changes to the scope of the Project.

If you have any questions regarding this letter, please contact SMUD's Environmental Management Specialist, Amy Spitzer, at amy.spitzer@smud.org or 916.732.5384.

Response

As noted in Section 3.16, Power, of the 2014 Draft EIS/EIR (available here:https://www.usbr.gov/mp/nepa/nepa_project_details.php?Project_ID=18361.), the Proposed Action would have a less than significant impact on power generation facilities.

Comment Letter 2, Patrick Soluri, Soluri Meserve

Comment 2-1

Comment

I. <u>The RDEIR/ SDEIS Relies on a Shifting and Unstable Project Description</u>

A. Changes to the Project and Surrounding Circumstances Render the Project Description Inadequate

The RDEIR/SDEIS is framed as a mere revision of the original Draft Environmental Impact Statement/ Environmental Impact Report ("EIS/R") in order to address "the specific issues identified in the ruling." (RDEIR/SDEIS, p. ES-2). This is misleading, as it implies that only the document has changed since 2015. In reality, just about all aspects of the Project have changes, including: a halved time period that commences five years after the original start date; increases in sellers and seller service areas; increases in the available amounts of each "source" of water; and the specious "reduction" to the total amount of water transferred annually.

"An accurate, stable, and finite project description is the sine qua non of an informative and legally sufficient EIR." (*County of Inyo v. City of Los Angeles* (1977) 71 Cal.App.3d 185, 192.) On the other hand, "[a] curtailed, enigmatic or unstable project description draws are a red herring across the path of public input." (*Id.* At 198) By only revising small portions of the RDEIR/SDEIS in response to the District Court Ruling, but failing to make any updates, the BOR and SLDMWA have created a scenario remarkably similar to that of *San Joaquin Raptor Rescue Center v. County of Merced* (2007) 149 Cal.App.4th 645 (*San Joaquin Raptor*). In *San Joaquin Raptor,* the EIR in question indicated both that no mine production increases would be sought, but provided for substantial increases in mine production if the project was approved. (*San Joaquin Raptor, supra,* 149 Cal.App.4th at 655.) The EIR made "assurances . . . that there would be no increase in production" but these were "entirely inconsistent" with indications of potential higher mine production. (*Ibid*.) "These curtailed and inadequate characterizations of the Project were enough to mislead the public and thwart the EIR process." (*Id.* At 656.)

Response

Please refer to Common Response 1 regarding the scope of analysis in the RDEIR/SDEIS, the nature of changes made to the project description, and the process followed to ensure that the Lead Agencies' environmental analysis complies with CEQA and NEPA. With regard to the period of time over which potential transfers have been studied, the RDEIR/SDEIS considers the period from 2019-2024, which would not cause changes to the project description because the end date remains the same.

Comment 2-2

Comment

Here, the RDEIR/SDEIS discusses and analyzes a distinctly different Project than analyzed in the original EIS/R. The Project is now a five year plan, which starts five years later. (RDEIR/SDEIS, p. ES-8.) The Project now includes a naked, unenforceable assurance that transfers in any one year would not exceed 250,000 acre-feet. (*Ibid*.) There are ten new potential sellers, covering an undefined amount of unanalyzed service areas, and which create the potential for more transfers than under the original project. (See RDEIR/ SDEIS, pp. 2-8 to 2-10.) Just as in *San Joaquin Raptor*, the RDEIR/ SDEIS, in conjunction with the prior EIS/R, relies on a shifting project description, rendering it deficient as an informational document.

Response

Please refer to Common Responses 1 and 2, and Response to Comment 2-1.

Comment 2-3

Comment

B. The Reduction in Annual Transfers Is Undefined and Unenforceable

An inaccurate project description results in an EIR that fails to disclose all of the impacts of a project. (*Santiago County Water Dist. v. County of Orange* (1981) 118 Cal.App.3d 818, 829.) A stable project description is necessary to provide the public with enough information to "ascertain the project's environmentally significant effects, assess ways of mitigating them, and consider project alternatives . . . ." (*Sierra Club v. City of Orange* (2008) 163 Cal.App.4th 523, 533.) A project description is deficient where the characterization of expected project operations is inadequately supported by evidence that the project will operate within its described limits. (See *Center for Biological Diversity v. County of San Bernardino* (2016) 247 Cal.App.4th 326, 350.) Here the Project is described as having a limit on annual water transfers, but nothing in the EIR actually demonstrates that BOR and SLDMWA can ensure buyers and sellers adhere to this limit. Therefore, the Project's description is inaccurate.

Response

Please refer to Common Response 2.

Comment 2-4

Comment

The RDEIR/SDEIS artificially caps off annual water transfers to 250,000 acre-feet per year because, supposedly, "[b]uyers have identified that their demand" does not exceed that amount. (RDEIR/SDEIS, p. ES-4.) A reduction in annual water transferred alone creates an unstable and misleading project description. Additionally, the RDEIR/SDEIS does not include any method of enforcing this arbitrary cap on water transfers. There is no mitigation measure, coordinated operations agreement, or any other enforcement mechanism to this effect. The RDEIR/SDEIS only includes conclusory assurances "all transfers (combined) in a year would be limited so as not to exceed 250,000 acre-feet." (RDEIR/SDEIS, p. 1-4.) SLDMWA lacks the necessary authority over the sellers to enforce such a limitation on transfers. SLDMWA's boundaries are coextensive with its member contractors, which do not overlap with any sellers let alone buyers East Bay Municipal Utilities District and Contra Costa Water District. Water could be transferred through SWP facilities, which neither BOR nor SLDMWA have authority over. Transfers from non-CVP contractors that do not use CVP facilities could occur without BOR or SLDMWA approval. The RDEIR/SDEIS concedes that such transfers could occur. (RDEIR/SDEIS, pp. 1-2 ["Other transfers not included in the RDEIR/SDEIS could occur during the same time period"], 1-4 ["For each transfer, buyers and sellers are responsible for identifying one another, initiating discussions, and negotiating the terms of the transfers"].)

Response

Please refer to Common Response 2.

Comment 2-5

Comment

Even if one can presume that buyers and sellers will follow the law by adhering to the cap, there is nothing indicating that other agencies will even know whether their transfers fall within the arbitrary volumetric cap of 250,000 acre-feet per year. The RDEIR/SDEIS does not designate any agency or other authority to keep track of the total amount of water transferred in relationship to this Project. In light of this, it appears that the reduction in total annual transfers is merely a tactic to avoid meaningful analysis of the Project's impacts. The RDEIR/SDEIS repeatedly references that 250,000 acre-feet per year is "less than that which was included in the [Biological Opinions]" (RDEIR/SDEIS, pp. ES-6, 2-4) or that buyer demand does not exceed that figure (RDEIR/SDEIS, pp. ES-4, ES-5, 2-2.) There is absolutely nothing in the RDEIR/SDEIS substantiating the claim that buyers' demands do not exceed 250,000 acre-feet per year. Without a way to enforce or track the total amount of transfers, it is inaccurate to describe the Project as capped at 250,000 acre-feet of transfers per year. Again, as in *San Joaquin Raptor*, the Project is described in one way, while the remainder of the RDEIR/SDEIS contradicts that description.

Response

Please refer to Common Response 2.

Comment 2-6

Comment

II. <u>New Cumulative Projects Must Be Considered in All Cumulative Impact Analyses</u>

CEQA requires agencies to evaluate any impacts of the project that may be "cumulatively considerable," and address the project's incremental effects when combined with the effects of past, current, and probable future projects. (CEQA Guidelines, §§ 15064, subd. (h)(1), 15130 subd. (a).) Cumulative impacts may result from individually less than significant but collectively significant projects taking place over a period of time. (CEQA Guidelines, § 15355 subd. (b).) The purpose of the cumulative impacts analysis is to avoid considering projects "in a vacuum," because failure to consider cumulative harm may risk "environmental disaster." (*Whitman v. Board of Supervisors* (1979) 88 Cal.App.3d 397, 408.) "[T]he greater the existing environmental problems are, the lower the threshold should be for treating a project's contribution to cumulative impacts as significant." (*Communities for a Better Env't v. California Resources Agency* (2002) 103 Cal.App.4th 98, 120.) "One of the most important environmental lessons evident from past experience is that environmental damage often occurs incrementally from a variety of small sources. These sources appear insignificant, assuming threatening dimensions only when considered in light of the other sources with which they interact." (*Kings County Farm Bureau v. City of Hanford* (1990) 221 Cal.App.3d 692, 720.)

Response

The 2014 Draft EIS/EIR includes an analysis of potential cumulative impacts within each resource area section. Based on public comments, one project (Central Valley Salinity Alternatives for Long-term Sustainability, or CV-SALTS) has been updated to show that it has been approved and is being implemented. This project was already included in the analysis; the change reflects the new status of the project, but the impacts were already considered in the cumulative analysis.

Comment 2-7

Comment

The duty to disclose cumulative projects, and analyze cumulative conditions, did not somehow end with the circulation of the original EIS/R. Yet the RDEIR/SDEIS fails to disclose, much less analyze, substantially changed circumstances resulting from several additional proposed projects that were not previously addressed in the original EIS/R's cumulative impact analysis, including whether the Project in conjunction with these additional projects would be substantially more severe than evaluated in the original EIS/R. (CEQA Guidelines, § 15088.5, subd. (a)(1).) As explained more fully in other comment letters, these projects include other water transfer projects as well as the Addendum to the Coordinated Operation Agreement ("COA amendments") and the Water Quality Control Plan for the San Francisco Bay/Sacramento-San Joaquin Delta Estuary Voluntary Settlement Agreement ("VSA"). While these projects clearly have the potential to further affect the availability of water supplies as well as various water quality parameters in the Delta, the EIS/R is simply bereft of any consideration of the combined impacts of these new cumulative projects and the Project.

As these cumulative projects share similar features with the Project, both the COA amendments and VSA could affect the cumulative impact analysis for each resource discussed in the RDEIR/SDEIS. As both the COA amendments and VSA would result in lower Delta outflows they would impact water supply and water quality, as well as fisheries. However, without additional analysis, it is not clear whether these new projects render the Project's cumulative impacts significant. Thus, it is necessary to update the cumulative project list for the entire Project.

Response

Reclamation and SLDMWA considered whether there were new "other plans, projects, or programs" that should be included in the cumulative analysis, but in that review found that none needed to be added. Relative to the two projects suggested in the comment for inclusion in the cumulative analysis, please see below:

- Addendum to the Coordinated Operation Agreement (COA): Reclamation analyzed the potential changes associated with the revised COA and found that the changes to flows and temperatures would be negligible (Reclamation 2018). Because the revisions do not result in notable changes to flows, the revisions were not incorporated into the modeling for the analysis of water transfers.

- Voluntary Settlement Agreement (VSA): the State Water Resources Control Board (SWRCB) considered a proposed Voluntary Settlement Agreement in

December 2018 to address responsibilities for flow releases associated with the Bay-Delta Water Quality Control Plan. The SWRCB issued the following finding about the proposed agreement: "The Delta watershed-wide voluntary agreement is a discrete project encompassing a larger area than the Lower San Joaquin River flow objectives and within the Lower San Joaquin River project area only includes the Tuolumne River. Additional work is necessary to develop an enforceable agreement, join additional parties, analyze the agreement and how it interacts with the Bay-Delta Plan, and assess what, if any, changes may be necessary to the Bay-Delta Plan for the agreement to serve as an implementation mechanism to reasonably protect beneficial uses in the Tuolumne River and applicable portions of the Bay-Delta watershed, while providing a suitable regulatory backstop." The VSA is not sufficiently developed that it is reasonably foreseeable for implementation and the details are not available to include in the cumulative analysis. Therefore, it has not been included in this Final EIS/EIR.

Comment 2-8

Comment

III. <u>An Entirely New EIS/R Should Be Prepared and Circulated</u>

"If the proposed changes render the previous environmental document wholly irrelevant to the decision making process, then it is only logical that the agency start from the beginning under [Public Resources Code] section 21151 by conducting an initial study to determine whether the project may have substantial effects on the environment." (*Friends of College of San Mateo Gardens v. San Mateo County Community College Dist.* (2016) 1 Cal.5th 937, 951 (*San Mateo Gardens*).) The question under CEQA is "when there is a change in plans, circumstances, or available information after a project has received initial approval, the agency's environmental review obligations turn on the value of the new information to the still pending decision making process." (*Id*. at 951-951, internal quotations omitted.) The CEQA lead agency must decide whether project changes require major revisions to the original document. (*Id.* at 952.) NEPA imposes a parallel obligation, requiring an agency to supplement a draft EIS where there are significant new circumstances or information relevant to a project's environmental concerns. (40 C.F.R. 1502.9, subd. (c)(ii); see also *Russell Country Sportsmen v. United States Forest Serv.* (9th Cir. 2011) 668 F.3d 1037, 1045.)

Here, despite changes in "plans, circumstances, [and] available information," BOR and SLDMWA have failed to adequately update the RDEIR/SDEIS.

Response

Please refer to Common Response 1.

Comment 2-9

Comment

The RDEIR/SDEIS is a minimalistic document, which only attempts to rectify past adjudicated mistakes, rather than a good faith effort to inform the public of the Project's impacts. The

RDEIR/SDEIS fails to even consider how changes to the Project, changes in circumstances, or new information are reflected in other resource areas. The geographic area of the Project has changed considerably with the addition of new sellers. More water could be transferred under any of the described methods. As discussed above, new cumulative projects exist, but are not disclosed, let alone addressed in updated cumulative impact analysis. Several resources areas not discussed in the RDEIR/SDEIS are affected by new sellers and an increased transfer capacity. For example, the prior water supply analysis relied on the baseline conditions in the sellers' service area, yet the RDEIR/SDEIS does not include any water supply analysis to update the new sellers. Similarly, the Project's individual water quality impacts relied on the same baseline conditions. BOR and SLDMWA have not offered any evidence that the impacts in these areas remain the same despite the different baseline conditions. The baseline conditions relied on in the 2015 documents are irrelevant to a water transfer scheme occurring from 2019 to 2025, and the new conditions must be disclosed and used for updated analysis.

Response

Please refer to Common Response 1 and Responses to Comments 2-6 and 2-7.

Comment 2-10

Comment

The increase in total transferable water, coupled with the lack of enforcement measures for the 250,000 acre-feet cap, is also significant change to the Project that could result in new unanalyzed impacts. In fact, the purported reduction to 250,000 acre-feet of transfers per year distracts from the reality that more water is available for transfer now than in 2015: water available via groundwater substitution in April–June has increased by 18,535 acre-feet, and by 23,765 acre-feet in July–September; water available via crop idling/shifting in April–June has increased by 32,490 acre-feet, and by 55,320 acre-feet in July–September; and water available via reservoir release has increased by 15,000 acre-feet. Even assuming the 250,000 acre-feet cap is adhered to, there is the potential for more groundwater substitution or more crop idling than evaluated under the original EIR. This possibility necessitates full environmental review of the new Project.

Response

Please refer to Common Response 2.

Comment 2-11

Comment

Simply put, it is not 2015, and much has changed since then. The current proposed Project is markedly different than the one originally contemplated over five years ago, having been significantly changed in scope. California and the Project area are not as they were when environmental analysis for the original project was conducted. The conditions the original project was evaluated against no longer exist. All of these changes warrant BOR and SLDMWA starting from square one, and evaluating this new Project entirely. (See *San Mateo Gardens, supra*, 1 Cal.5th at 951.)

Response

Please refer to Common Response 1.

Comment 2-12

Comment

The RDEIR/SDEIS violates both NEPA and CEQA by failing to adequately address impacts associated with climate change, including the Project's potential to exacerbate the impacts of climate change.

A. The RDEIR/SDEIS Must Address Climate Change Under CEQA

SLDMWA previously argued that it did not need to address climate change under CEQA because there is no evidence that the Project would exacerbate its impacts under *California Building Industrial Association v. Bay Area Air Quality Management District* (2015) 62 Cal.4th 369, 386. New information contained in the RDEIR/SDEIS, however, demonstrates that the Project will exacerbate climate change impacts. RDEIR/SDEIS pages J-13 and 14 reveal that climate change will result in reducing Delta outflow during at least the months of March, April, May and August. RDEIR/SDEIS page 3.3 reveals that the Project will also reduce Delta outflow in at least some of those months. The same is true for salinity in the Delta. (See RDEIR/SDEIS pp. J-5 and 3.2.-3.) Thus, the Project will exacerbate the impact of climate change on Delta outflow and salinity, thereby triggering the need for CEQA review. A revised and recirculated document will need to include CEQA review of climate change.

Response

Page 63 of the District Court ruling stated that "Plaintiffs bear the burden of identifying evidence of exacerbation. This makes sense in light of the fact that the exacerbation standard is an exception to the general rule that an EIR need not evaluate the impacts of the environment on a proposed project. Plaintiffs' motion for summary judgment that the FEIS/R's climate change analysis violates CEQA is DENIED; the Authority's cross-motion is GRANTED.". The ruling is final, and this issue cannot be reasserted. Moreover, the informational purposes of CEQA are served by the review of climate change provided in the RDEIR/SDEIS, confirming that no new or substantially more severe impacts would occur as a result of the Proposed Action. Please refer to Common Response 1 for additional information.

Comment 2-13

Comment

The district court in *AquAlliance* found that the original EIS/R violated NEPA because it failed to address the impact of climate change, specifically that "snow water equivalent will decrease by 16 percent by 2035" as well as a "decrease in inflow during the peak irrigation period of June, July and August." (*AquAlliance, supra,* 287 F. Supp. 3d at 1030-1032.) The RDEIR/SDEIS now purports to address the district court's decision, but leaves more questions than answers.

Specifically, the RDEIR/SDEIS appears to rely on the "CalLite-CV model" that provides various climate change scenarios such as the "Central Tendency," "Hot-Dry" and "Warm-Wet" scenarios." (RDEIR/SDEIS, p. J-6.) What the RDEIR/SDEIS and even its technical report

(Appendix J) fail to explain, however, is whether the CalLite-CV model incorporates the reduced snow water equivalent and temporal inflow shifts relied upon by the District Court to invalidate the original EIS/R. While Appendix J generally discusses these changes in runoff and snowpack, there is no suggestion that the CalLite-CV model actually incorporates them. (RDEIR/SDEIS p. J-5.) In fact, the RDEIR/SDEIS's technical study suggests that it does not by stating, "[I]t remains difficult to attribute observed changes in hydroclimate to historical human influences or anthropogenic forcings." (*Ibid*.) Further, the RDEIR/SDEIS fails to explain the amount of carbon emissions underlying the CalLite-CV model. This is relevant because the District Court in *AquAlliance* specifically disagreed with BOR's claim that the "A2" emission scenario was a "worst case" scenario under NEPA. (*AquAlliance*, supra, 287 F. Supp. 3d at 1029.)

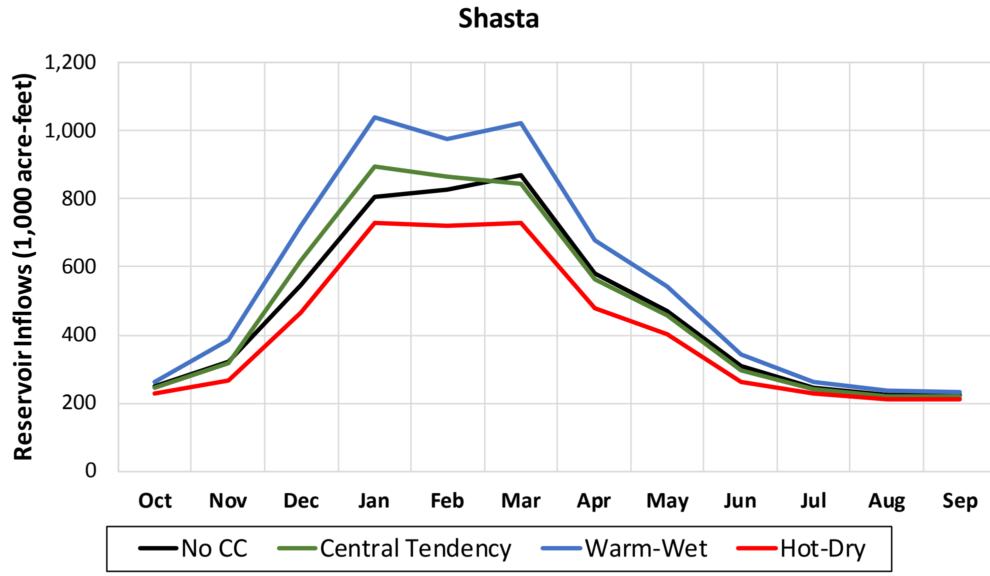
Response

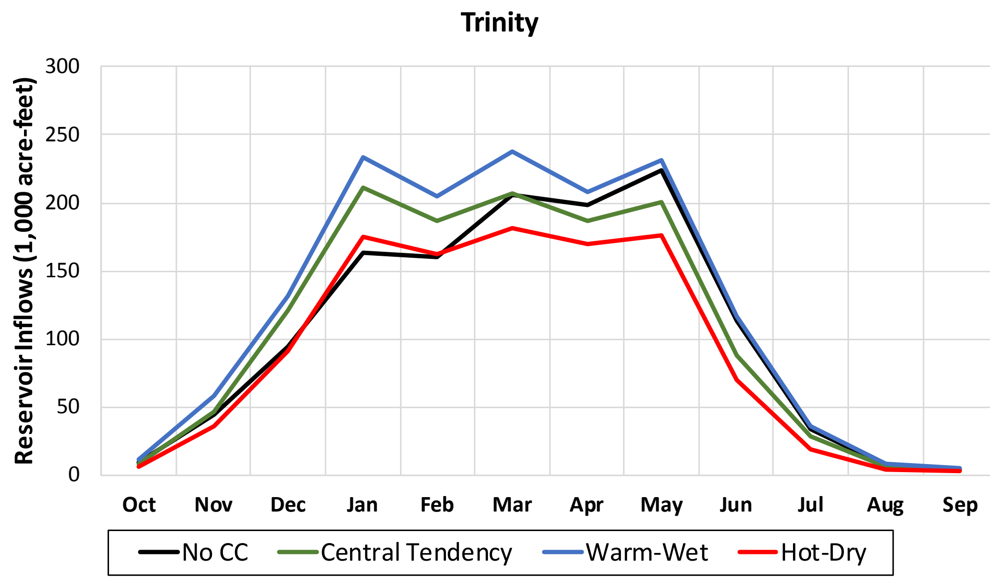
The commenter makes two specific comments that are best addressed individually. These comments are:

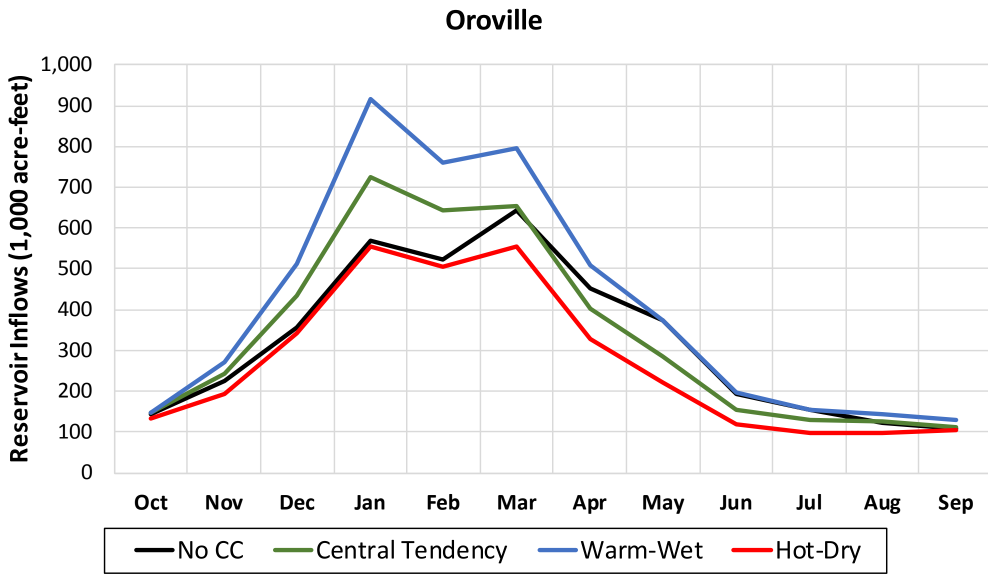
- It is unclear whether the CalLite-CV model incorporates reduced snow water equivalent and temporal inflow shifts.
- The RDEIR/SDEIS fails to explain the amount of carbon emissions underlying the CalLite-CV model.

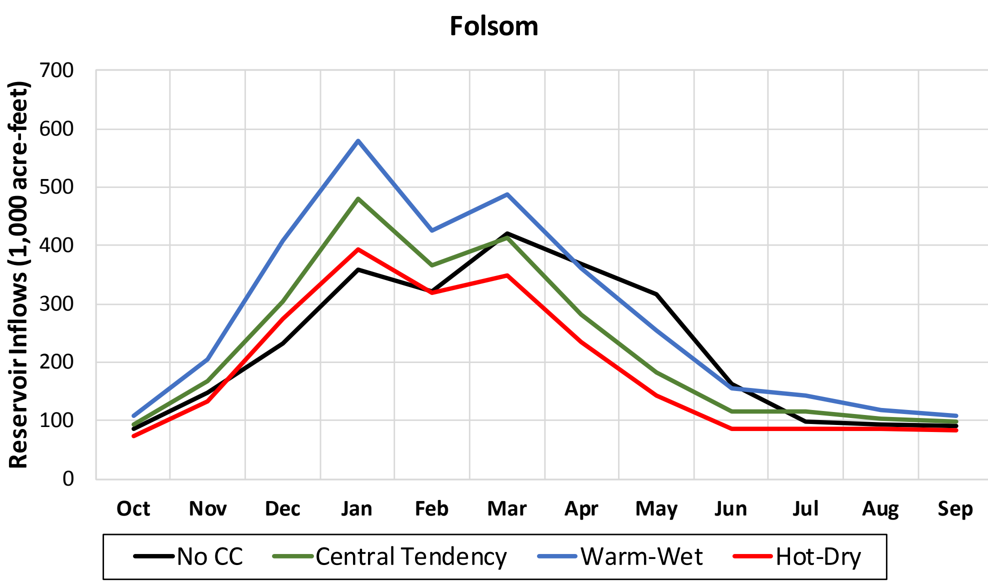
As general background, Appendix J of the RDEIR/SDEIS (renamed to Appendix K) presents a summary of results from CalLite-CV model for representative future climate scenarios: Central Tendency, Hot-Dry, and Warm-Wet. These three future climate scenarios are selected out of the five scenarios that are described as the "ensemble" scenarios. The ensemble scenarios represent a relatively wide range of potential climate conditions that were developed from 175 GCM simulations (Reclamation, 2016b). The wide range of future temperature and precipitation uncertainties expressed in the large ensemble of 175 projections were represented in these ensemble projections. The primary climate factors considered in this climate assessment are temperature and precipitation. The hydrologic process indicators include runoff, evapotranspiration, snowpack accumulation (snow water equivalent), and soil moisture. These parameters are simulated using WEAP-CV and are used as inputs to the CalLite-CV model. Therefore, the CalLite-CV model incorporates the best available information, includes a range of future climate projections, and the associated effects on snow water equivalent and temporal inflow shifts.

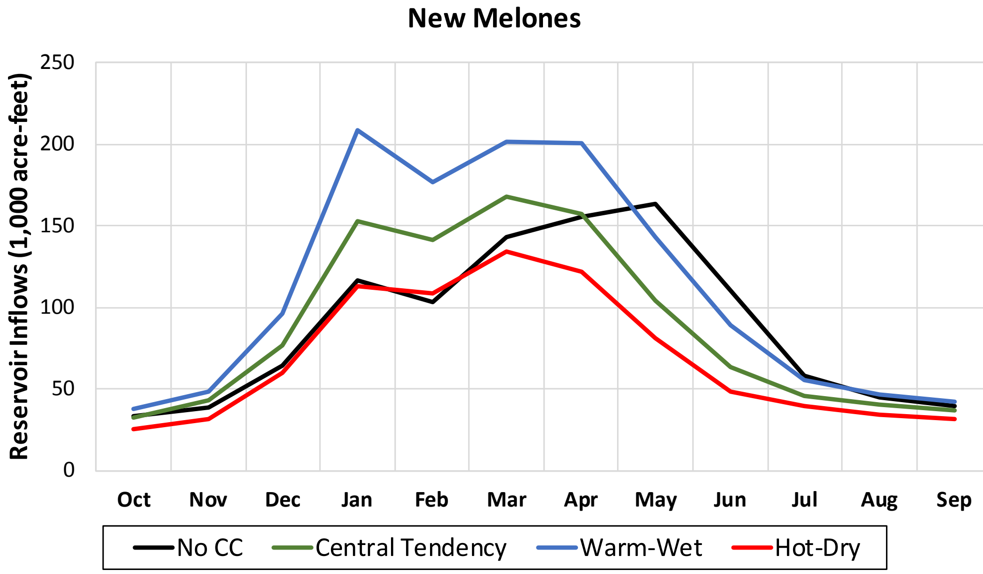
The following figures illustrate the simulated, monthly average inflow to major CVP and SWP reservoirs under the three representative future climate scenarios and a simulated no climate change scenario. These simulated inflows were inputs to the CalLite-CV model.

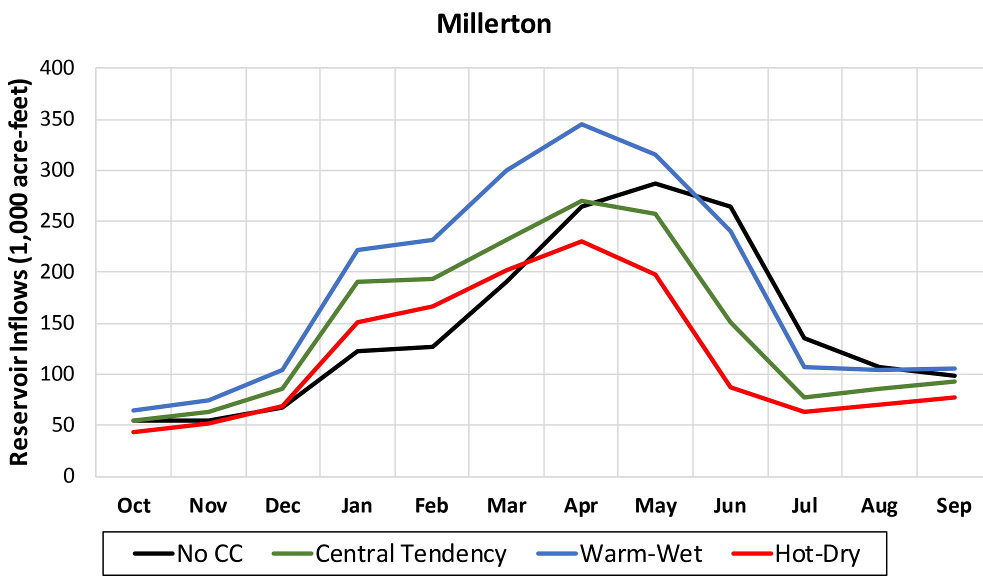

Shasta
Reservoir Inflows (1,000 acre-feet)
1,200
1,000
800
600
400
200
0
Oct
Nov
Dec
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
No CC
Central Tendency
Warm-Wet
Hot-Dry


Trinity
Reservoir Inflows (1,000 acre-feet)
300
250
200
150
100
50
0
Oct
Nov
Dec
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
No CC
Central Tendency
Warm-Wet
Hot-Dry


Oroville
Reservoir Inflows (1,000 acre-feet)
1,000
900
800
700
600
500
400
300
200
100
0
Oct
Nov
Dec
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
No CC
Central Tendency
Warm-Wet
Hot-Dry


Folsom
Reservoir Inflows (1,000 acre-feet)
700
600
500
400
300
200
100
0
Oct
Nov
Dec
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
No CC
Central Tendency
Warm-Wet
Hot-Dry





Comparisons of the no climate change (No CC) inflow with the three representative future climate scenarios illustrate the temporal shift in inflow to the major CVP and SWP reservoirs. The Hot-Dry climate scenario shows reduced inflow, as compared to the no climate change scenario, in June, July, and August, at all reservoirs.

The RDEIR/SDEIS's technical study does not suggest that the CalLite-CV model fails to incorporate reduced snow water equivalent or temporal shifts in inflow, as the commenter states. The commenter quotes a section of Appendix J of the RDEIR/SDEIS (renamed to Appendix K) that simply states it is difficult to attribute changes in hydroclimate to a particular cause.

The carbon emissions scenarios evaluated in the Basin Study, and relied upon for the climate change analysis for long-term water transfers, are described in the Basin Study Technical Report (Reclamation, 2016b). These ensemble scenarios are based on the

Coupled Model Intercomparison Project Phase 5 (CMIP5) (Taylor et al. 2012). Climate models in CMIP5 were driven by the emission scenarios called Representative Concentration Pathways (RCPs). There are four RCPs (RCP2.6, RCP4.5, RCP6.0, and RCP8.5) used in the CMIP5 (van Vuuren et al. 2011). The CMIP5 climate model data is the basis for the Intergovernmental Panel on Climate Change (IPCC) Fifth Assessment Report (AR5) published in 2014, which replaced the Special Report on Emissions Scenarios (SRES) standards employed in two previous IPCC reports. The older SRES scenarios are named by family (A1, A2, B1, and B2) and were replaced by the RCP emission scenarios. The RCPs cover a wider range than the scenarios from the SRES used in earlier reports, as they also represent scenarios with climate policy (IPCC, 2014). These RCP scenarios drive the climate models resulting in the 175 downscaled climate projections that are described earlier, and are represented in the ensemble scenarios analyzed using CalLite-CV.

Detailed information on the different mathematical and computation methods linking the RCP emission scenarios and the ensemble scenarios including the downscaling of climate projections and the ensemble approach can be found in Reclamation, 2016b.

Comment 2-14

Comment

Further, the scope of the RDEIR/SDEIS's climate change "analysis" is impermissibly narrow because it is limited only to whether climate change will affect the physical quantity of water available for transfer. As the RDEIR/SDEIS's technical study makes clear, climate change will have impacts in other areas such as water quality in the Delta vis-à-vis outflow and salinity. (RDEIR/SDEIS p. J-5.) With respect to salinity in particular, the "accelerating" rates of sea level rise "are associated with increasing salinity in the Delta, which influences the suitability of its water for agricultural, urban, and environmental uses." (RDEIR/SDEIS, p. J-5-6.)

Climate change also impacts groundwater, which is directly relevant to the Project and the ability to make water "available" through groundwater substitution as the district court noted in *AquAlliance*:

This is not academic nit-picking. As the CalSim II Appendix explains, this "decrease in inflow during the peak irrigation period of June, July and August will be particularly difficult for existing agricultural water supplies, and will likely require additional groundwater recharge in the spring with increased groundwater pumping in the summer months.

Response

The District Court ruling in *AquAlliance* found that the EIS/EIR did not evaluate the impacts of climate change on the project pursuant to NEPA. The project is defined as a range of potential water transfers and thus, a water supply project. Therefore, to comply with NEPA, the RDEIR/SDEIS evaluated the impacts of climate change scenarios on the quantity of water potentially available for transfer. Appendix J of the RDEIR/SEIS (renamed to Appendix K) discusses salinity in the Delta in regard to sea level changes. The CalLite-CV model, which was used to evaluate impacts of climate change on the project, accounts for sea level rise, see Section J.3.3 (Section K.3.3.) in Appendix J of the RDEIR/SEIS (renamed to Appendix K).

The CalLite-CV model does evaluate climate change impacts to groundwater supplies available for transfer. The methodology and assumptions are described in Section J.5.6 (Section K.5.6) and the results are presented in Section J.6 (Section K.6) in Appendix J of the RDEIR/SEIS (renamed to Appendix K). The model results estimate a long-term average of groundwater substitution supplies to be 65,800 acre-feet under the Central Tendency scenario and 54,800 acre-feet under the No Climate Change scenario. The change in groundwater substitution transfers is related to increased Delta export capacity under the Central Tendency scenario. The change in annual groundwater substitution transfers ranges from a decrease of 65,700 acre-feet in one year to an increase between 43,000 acre-feet to 165,000 acre-feet in five years under the Central Tendency scenario. In eleven of the simulated seventeen years, the change in groundwater substitution transfers would be less than 7,000 acre-feet. Therefore, climate change does not substantially change the volume of potential groundwater substitution transfers under Proposed Action.

Comment 2-15

Comment

Despite the various ways that climate change will affect the Project and its environmental impacts, the RDEIR/SDEIS only considers whether climate change will affect the amount of water available to transfer. This narrow focus violates NEPA by failing to take a hard look at the environmental effects including all foreseeable direct and indirect effects. (*N. Alaska Envtl. Ctr v. Kempthorne* (9th Cir. 2006) 457 F.3d 969, 975 (quoting *Idaho Sporting Congress, Inc. v. Rittenhouse* (9th Cir. 2006) 305 F.3d 957, 963.) It also fails to consider important aspects of the problem. (*Pub. Citizen v. Nuclear Regulatory Com'n* (9th Circ. 2009) 573 F.3d 916, 923.) The RDEIR/SDEIS must incorporate climate change predictions in its analysis of cumulative water quality impacts, and every other section of the RDEIR/SDEIS where such predictions are relevant.

Response

Please refer to Response to Comment 2-14 regarding the analysis of how climate change affects the quantity of water potentially available for transfer, which determines the nature and potential significance of project impacts. The analysis of climate change provided in the RDEIR/SDEIS confirms that no new or substantially more severe impacts would occur as a result of the Proposed Action with regard to any resource area or issue, including water quality. For additional information regarding the nature and scope of the analyses in the RDEIR/SDEIS, please see Common Response 1.

Comment 2-16

Comment

A. The RDEIR/SDEIS Fails to Utilize an Adequate Threshold of Significance for Cumulative Water Quality Impacts

The District Court found that the original EIS/R violated CEQA because it failed to include a threshold of significance and because of "the total absence of consideration" of the "precarious" conditions of the Delta. (*AquAlliance*, *supra*, 287 F. Supp. 3d at 1035-1037.) The District Court faulted the prior EIS/R for not explicitly imposing a three percent threshold of significance, but found that even if the implied threshold was assumed, the cumulative water quality analysis was deficient nonetheless. (*Ibid*.) The RDEIR/SDEIS does nothing to correct these crippling deficiencies, but rather doubles down on them.

Response

The comment does not correctly reflect the District Court's ruling. The District Court indicated that the discussion of cumulative impacts related to water quality did not sufficiently account for existing conditions in the Delta. The ruling also indicated "The FEIS/R does not discount the potential significance of these increases because of the timing, but rather based upon magnitude." The revised cumulative analysis for water quality provided in the RDEIR/SDEIS is more comprehensive in its consideration of both the magnitude and timing of changes in flow when determining the potential for effects. As is explained in that analysis, water transfers would have the potential to result in a small decrease in Delta outflow, but this decrease would only occur at times that would not adversely affect water quality conditions in the Delta, even considering the current conditions within the Delta.

Comment 2-17

Comment

Adopting thresholds of significance promotes consistency, efficiency, and predictability" in evaluating environmental impacts. (See *Communities for a Better Environment v. California Resources Agency* (2002) 103 Cal.App.4th 98, 111.) With respect to cumulative impacts, the relevant inquiry is whether any additional amount of an effect is significant in the context of the existing cumulative conditions. (See *Id*. at 118.) "In the end, the greater the existing environmental problems are, the lower the threshold should be for treating a project's contribution to cumulative impacts as significant." (*Id*. at 120.)

Like the prior EIS/R, the RDEIR/SDEIS fails to include any discernable threshold of significance. The RDEIR/SDEIS claims that "[b]ecause the changes in Delta outflow associated with the potential water transfers are insubstantial" that the Project's cumulative impacts are not significant. (RDEIR/SDEIS, p. 3.2-3.) Similarly, the RDEIR/SDEIS makes the same claim with respect to salinity. (*Ibid*.) This analysis does not provide what would be considered a substantial change. The lack of a threshold of significance undermines what analysis is included in the RDEIR/SDEIS.

Response

Please refer to Response to Comment 2-16.

Comment 2-18

Comment

Considering the District Court's ruling that the prior EIS/R cumulative water quality analysis violated CEQA due to its limited consideration of relevant information, it would seem prudent for the RDEIR/SDEIS update to be more inclusive. And yet, the RDEIR/SDEIS water quality analysis is deficient for its failure to integrate changed circumstances. As discussed above, new cumulative projects have arisen since 2015. Two such projects would have potentially significant impacts on Delta outflows, but the RDEIR/SDEIS makes no mention of them.

Response

Please refer to Response to Comment 2-7.

Comment 2-19

Comment

One conspicuous error is the failure to acknowledge or analyze the Addendum to the COA amendments because BOR is a signatory to that agreement. (See Attachments 1 (COA Amendment), 2 (COA Amendment EA).) On December 12, 2018, DWR and BOR amended the COA to reduce the United States' storage withdrawal percentage responsibility. Under the original COA, the United States was responsible for 75%, but is now only responsible for 65% in dry years and 60% in critical years. Thus, in dry and critical years, the SWP will be required to divert 10-15% more water. This change would exacerbate water quality issues at times when conditions are most dire in the Delta. The COA amendments change when, how often, and how much water will be taken out of California's supply. This Project does the same, as they facilitate water transfers with CVP contractors as the primary recipients. The COA amendments are a cumulative project for purposes of water quality impacts, and all analysis relying on the old COA is now inadequate.

Response

Please refer to Response to Comment 2-7.

Comment 2-20

Comment

The other cumulative project not discussed in the RDEIR/SDEIS is the VSA, of which BOR is also a party to. (See Attachment 3.) Under the VSA, the parties would rely on non-flow related measures to benefit fish and wildlife in the Delta ecosystem at the expense of decreasing flows in normal, dry and critical years. The VSA would also modify the requirements of D-1541, which BOR is responsible for maintaining. Like the Addendum to the COA amendments, the VSA is a water transfer related project involving BOR and CVP contractors. The total failure to acknowledge these new cumulative projects renders the cumulative water quality impact analysis legally inadequate.

Response

Please refer to Response to Comment 2-7.

Comment 2-21

Comment

The RDEIR/SDEIS once again fails to consider the "precarious" condition of the Delta in evaluating cumulative impacts to Delta outflow. The RDEIR/SDEIS makes conclusory and unsupported statements, while continuing to ignore the reality in the Delta. The District Court held that merely categorizing the Project's individual impacts as "small" and highlighting other regulatory constraints on Delta outflows was not sufficient for cumulative impact analysis. (*AquAlliance, supra*, 287 F. Supp. 3d at 1036-1037.) The RDEIR/SDEIS makes the same mistakes, claiming that changes to Delta outflow would be insubstantial, without providing evidence to support that qualitative assertion. (RDEIR/SDEIS, p. 3.2-3.) The RDEIR/SDEIS also includes unsupported assurances such as that "[d]uring balanced conditions, the CVP would be required to release additional flow to maintain the standards in the Central Valley Water Quality Control Plan, so the Delta outflows would not change." (RDEIR/SDEIS, p. 3.2-2.) No supporting evidence demonstrates how or whether this assurance would be enforced. In fact, the COA amendments and VSA modify the CVP's release responsibilities, which this assumption does not consider.

Response

Please refer to Response to Comment 2-16.

Comment 2-22

Comment

NEPA requires an agency to consider how climate change will affect the environmental baseline of a project. (See *Friends of the Wild Swan v. Jewell* (D.Mont. Aug. 21, 2014, No. CV 13-61-M-DWM) 2014 U.S.Dist.LEXIS 116788, at *31-32.) As discussed above, the RDEIR/SDEIS failed to correct the fundamental flaws in its climate change impact analysis. However, the cumulative water quality impact analysis also suffers for the lack of integrating new climate change information. Appendix J to the RDEIR/SDEIS describes the anticipated climate change effects on California, but this information is not represented in the cumulative water quality impact analysis. The updated climate change figures in Appendix J are not mentioned at all, despite its direct relevance to Delta outflow. (See RDEIR/SDEIS, Appen. J, Table J-2.) The failure to utilize this new information in the cumulative water quality impact analysis renders the RDEIR/SDEIS deficient.

Response

Appendix J of the RDEIR/SEIS (renamed to Appendix K)discusses how climate change could change the environmental baseline of the project related to California water resources and CVP/SWP operations. Please refer to Response to Comment 2-15 for additional information.

Comment 2-23

Comment

The district court in *AquAlliance* not only set aside the original EIS/R's analysis and mitigation for giant garter snake ("GGS"), but also set aside the USFWS Biological Opinion ("BiOp") supporting the Project's take of GGS. While purporting to address deficiencies in those earlier documents, the RDEIR/SDEIS provides an even more convoluted and legally deficient analysis and proposed mitigation for GGS that violates the mandates of both CEQA and NEPA.

First, the RDEIR/SDEIS fails as an informational document (CEQA) and also fails to take the requisite hard look (NEPA) at the Project's impacts on GGS. Specifically, water transfers resulting from idling and shifting of rice field and groundwater substitution impact GGS individuals that rely on rice field as important habitat. As explained by the recent USFWS Recovery Plan for the Giant Garter Snake ("Recovery Plan"):

[W]e consider the following to be current threats: changes in water availability; levee and canal maintenance, water management and water deliveries which do not account for the giant garter snake; ***water transfers (resulting from cropland idling/shifting, reservoir releases, conservation measures, or groundwater substitution)***

(See Attachment 4 (emphasis added).)

It is noted that the RDEIR/SDEIS's technical study cites to the draft GGS recovery plan from 2015 ("Draft Recovery Plan"), but ignores the final Recovery Plan that was approved by the USFWS in 2017. Thus, the RDEIR/SDEIS relies on outdated studies and methodologies to analyze and mitigate GGS impacts. Indeed, the Recovery Plan specifically responds to one comment requesting substantiation regarding the negative impacts resulting from water transfers including specifically groundwater substitution. (See Attachment 4, p. V-6.) The RDEIR's conclusory assertion that groundwater substitution would have no impact on GGS fails to address this specific, factual analysis in the Recovery Plan.

Groundwater substitutions resulting from idling/shifting of rice fields is even more problematic because "[s]ince giant garter snake surveys were first conducted in the 1970s, results have demonstrated that active rice fields and the supporting water conveyance infrastructure consisting of a matrix of canals, levees, and ditches have served as alternative habitat that is commonly used by the giant garter snakes in the absence of suitable natural marsh habitat." (See Attachment 4, p. I-2.) Here, the RDEIR/SDEIS attempts to mislead the public by downplaying the importance of rice fields as GGS habitat in addition to canals and ditches. This is not surprising since the RDEIR acknowledges that the Project could eliminate up to "12.8 percent of the average land in rice production within the Sacramento Valley." The RDEIR fails to adequately apply this significant reduction in important GGS habitat to a meaningful significance standard.

Response

In response to this comment, the reference to the Giant Garter Snake Recovery Plan in the RDEIR/SDEIS has been updated to reflect the finalized 2017 version of the plan. The information cited in the RDEIR/SDEIS did not change between the draft and the final Recovery Plan, however, and it thus reflects the most current scientific data for assessing suitable giant garter snake (GGS) habitat and threats to the species as determined by USFWS. The information regarding threats to GGS referenced in the draft and final Recovery Plan is based on the more detailed analysis provided in USFWS's 2012 5-year Status Review for Giant Garter Snake, which is also referenced in the RDEIR/SDEIS.

The commenter asserts that the RDEIR/SDEIS does not adequately identify the Project's impacts on GGS because it does not sufficiently account for GGS threats and effects of water transfers on rice field habitat used by GGS. The commenter references text from the 2017 Recovery Plan, which is also present in the 2015 draft Recovery Plan and the 2012 5-year Status Review. This specific text related to GGS threats is referenced in Appendix I of the RDEIR/SDEIS (renamed Appendix N) (pages N-77). Section 3.8 Vegetation and Wildlife, page 3.8-18, of the RDEIR/SDEIS acknowledges that *Cropland idling/shifting transfer actions are expected to incrementally contribute to idling of rice acreage, thereby reducing available habitat for the species*.

The commenter references the 2017 Recovery Plan's acknowledgement that water transfers can include groundwater substitution, in addition to cropland idling/shifting, reservoir releases, and conservation measures. The Recovery Plan also states that depending on the type of water transfer, if water is transferred away from GGS habitat it is reasonably anticipated to have effects on GGS. The factual analysis that the commenter refers to is not found in the Recovery Plan specific to groundwater substitution. Consistent with the 2017 Recovery Plan, Section 3.8 Vegetation and Wildlife, page 3.8-17 of the RDEIR/SDEIS includes groundwater substitution as a type of water transfer and states that groundwater substitution actions could result in impacts on GGS by reducing available aquatic habitat. Section 3.8 Vegetation and Wildlife, page 3.8-18 of the RDEIR/SDEIS concludes that groundwater substitutions would not be a significant impact on GGS habitat because the managed wetland and agricultural habitats (rice fields and their associated canals) in the area of analysis that provide GGS habitat do not typically depend on the interaction between surface water and groundwater for part or all of their water supply. Managed wetlands within wildlife refuges in the area of analysis have designated water allocations that are not affected by water transfer actions.

The commenter's statement that the RDEIR/SDEIS attempts to mislead the public by downplaying the importance of rice fields and canals/drains as GGS habitat is inaccurate. Section 3.8 Vegetation and Wildlife, page 3.8-18 of the RDEIR/SDEIS states that because of the historic loss of natural wetlands, rice fields and more importantly their associated canals and drains have become important habitat for giant garter snakes within agricultural areas. Section 3.8 Vegetation and Wildlife, page 3.8-18 of the RDEIR/SDEIS also includes references to recent studies (2016 and 2017) that suggest that while rice fields provide a component of aquatic habitat, GGS are more strongly associated with the canals that supply water to and drain water from rice fields because they maintain water longer and support marsh-like conditions for most of the giant garter snake active season. GGS expert Brian Halstead is quoted in Shuford 2017 (Giant Garter Snake: The Role of Rice and Effects of Water Transfers, Report of Point Blue

Conservation Science): "*Snakes depend not only on the rice fields themselves (mainly mid-June through August, i.e., only one-third of the snake's active season) but more so on the associated irrigation and, particularly, drainage canals (or ditches), which provide more stable aquatic habitat than the rice fields themselves*".

Section 3.8 Vegetation and Wildlife, page 3.8-18 of the RDEIR/SDEIS acknowledges that idling of rice fields would reduce available aquatic habitat for GGS. The RDEIR/SDEIS is not downplaying this effect but is acknowledging that while GGS use rice fields, they have a high reliance on the associated canal/drain systems and that mitigation to reduce direct impacts on GGS should focus on maintaining these important corridors in areas where idling occurs, both as a result of water transfers and as part of standard farming practices. Mitigation Measure VEG and WILD-1 includes requirements to maintain water in canals and drains that ensures that GGS movement corridors are maintained and vegetation needed for cover during foraging and predator avoidance remains stable throughout the rice production season.

Comment 2-24

Comment

Second, the RDEIR/SDEIS also fails to adequately analyze the effectiveness of proposed mitigation. The RDEIR proposes as mitigation to prohibit cropland idling/shifting transfers for "fields abutting or immediately adjacent to areas with known important giant garter snake populations.' (RDEIR, p. 3.8-39.) The effectiveness of limiting applicability only to "known" important populations is rebutted by the RDEIR/SDEIS's important concession:

Limited data exists on the actual distribution and occurrence of the giant garter snakes within Central Valley rice lands, and it is difficult to anticipate the level of effects the Proposed Action would have on giant garter snakes because of the challenges associated with quantifying and monitoring giant garter snake ecology.

(RDEIR/SDEIS, p. 3.8-18 (emphasis added).)

In other words, the RDEIR/SDEIS freely concedes that important GGS populations exist that are presently not "known." Thus, limiting the prohibition on water transfers to only "known" populations significantly undercuts this mitigation strategy. Put simply, the RDEIR/SDEIS has not adequately assessed the effectiveness of this mitigation strategy in light of the acknowledged uncertainties in identifying current GGS populations.

Another proposed mitigation measure is to "keep adequate in major irrigation and drainage canals." The effectiveness of this refuted by the fact that both rice fields and their associated canals and ditches provide necessary habitat. (See Attachment 4, p. I-2 (noting that important habitat includes "active rice fields and the supporting water conveyance infrastructure").) The District Court in *AquAlliance* expressed the same concern: "[E]ven assuming snakes are found more frequently in canals and ditches, this does not explain why it is acceptable to focus on retention of waters in canals and ditches to the detriment of maintaining appropriate rice field habitat . . . ." (*AquAlliance*, *supra*, 287 F. Supp. 3d at 1073.) Neither the RDEIR/SDEIS nor its technical report provides an adequate explanation. Indeed, the technical report supports the conclusion that both rice fields and ditches are required by noting, "the study showed that maintaining canals without neighboring rice cultivation led to a decrease in giant garter snake survival rates." (RDEIR/SDEIS, p. I-79.)

In short, the scientific authorities are all in accord that a mitigation strategy of maintaining water only in canals is simply not effective. At the very least, the RDEIR/SDEIS has not adequately assessed the effectiveness of this strategy as required by NEPA. (*South Fork Bank Council of Western Shoshone of Nevada v. US. Dept. of Interior* (9th Cir. 2009) 588 F.3d 718, 727.) Here, however, the effectiveness is even further reduced because the proposed mitigation measure would maintain water only in "major" canals. The RDEIR/SDEIS does not define the scope of "major" canals and ditches that would continue to receive water. There is no assessment of whether keeping water only in "major" canals is effective mitigation.

In short, the RDEIR fails as an informational document by not adequately assessing the Project's impacts on GGS. Further, the RDEIR has not adequately assessed, much less supported, the effectiveness of the two major elements of the GGS mitigation strategy.

Response

The commenter asserts that the RDEIR/SDEIS fails to adequately analyze the effectiveness of proposed mitigation as it relates to protection of known important giant garter snake populations. Although the RDEIR/SDEIS acknowledges that there are GGS populations that are not known throughout their Central Valley range, this does not diminish the benefit of protecting known populations within the area of analysis and the mitigation measure's effectiveness in reducing impacts. Measure 4 in Section 3.8 Vegetation and Wildlife, page 3.8-39 is only one of several measures aimed at reducing impacts on GGS from water transfer actions and is effective at protecting existing known populations by maintaining rice habitat in adjacent fields where they are known to occur. Reclamation is currently funding and will continue to fund GGS occupancy research for the area of analysis and as part of Measures 5 in Section 3.8 Vegetation and Wildlife, page 3.8-40, and results of that research and locations of new detections will be provided to wildlife agencies annually so that conservation measures can be adapted to provide additional benefits consistent with Mitigation Measure VEG and WILD-1.

As it relates to the comment regarding the effectiveness of mitigation aimed at maintaining water in canals and drains, the commenter asserts that this measure is inadequate because both rice fields and their associated canals and drains provide necessary habitat. Section 3.8 Vegetation and Wildlife, page 3.8-18 of the RDEIR/SDEIS acknowledges that flooded rice fields provide a component of aquatic habitat for giant garter snakes that occupy rice-growing regions but their use by GGS is limited to one- third of the GGS active season due to planting and harvesting schedules. The RDEIR/SDEIS concludes that a reduction in rice field cultivation would reduce the availability of this seasonally used habitat but that the canals are important for maintaining populations since they are used throughout the GGS active season and provide the necessary mechanism for snakes to move to other areas where rice field cultivation is active. While snakes may have to travel farther to find flooded rice field habitat due to a reduction in rice production, not maintaining canals and drains with adequate water would inhibit GGS movements and their ability to find rice field habitat even if it is available.

Comment Letter 3, Connell Dunning, United States Environmental Protection Agency

Comment 3-1

Comment

The U.S. Environmental Protection Agency (EPA) has reviewed the Supplemental Draft Environmental Impact Statement (SDEIS) for the Long-Term Water Transfers Project. Our review is provided pursuant to the National Environmental Policy Act, Council on Environmental Quality Regulations (40) CFR Parts 1500-1508), and Section 309 of the Clean Air Act.

EPA reviewed the Draft and Final Environmental Impact Statements for the Long-Term Water Transfers Project and provided comments to the Bureau of Reclamation (Reclamation) on December 15, 2014 and April 27, 2015, respectively. In our DEIS letter, we provided comments regarding the potential for groundwater overdraft, land subsidence, air quality impairments, impacts to fisheries, migratory birds, and terrestrial wildlife, as well as the effectiveness of mitigation measures to offset impacts related to these issues. Our FEIS comments identified concerns with groundwater level impacts on stream flows and wildlife resources, and the effectiveness of mitigation measures to offset such impacts. We recommended the establishment of significance thresholds/ mitigation triggers for all water transfers.

As the SDEIS states, the FEIS was challenged in the case of *AquAlliance, et al., v. U.S. Bureau of Reclamation, et al*. On July 5, 2018, the District Court entered judgement, vacating the 2015 FEIS. As a result, Reclamation has revised the FEIS to address specific issues identified in the ruling: Project Description, Groundwater, Vegetation and Wildlife, Water Quality, Fisheries Resources, Climate Change, and Appendices. Of note, the SDEIS limits water transfers from multiple sellers in a year so as not to exceed 250,000 acre-feet between 2019-2024, a six-year period; whereas the 2014 Draft EIS analyzed transfers of up to 511,094 acre-feet between 2015-2024, a 10-year period.

Response

The comment provides a summary of changes in the RDEIR/SDEIS. Please refer to Common Response 1 regarding the nature and scope of the Proposed Action and clarifications in the RDEIR/SDEIS regarding the project description that do not result in changes to the potential effects.

Comment 3-2

Comment

The SDEIS provides more extensive information on water quality impacts, specifically how changes in Delta inflows, outflows or exports could affect Delta water quality and/or salinity. The SDEIS also assesses the effects of potential future climatic conditions on the Action Alternatives. EPA appreciates that the SDEIS presents more detailed information about Mitigation Measure GW-1, the implementation of a monitoring program with the following components: 1) monitoring well network (participating wells and monitoring wells), 2) groundwater level monitoring (before, during, and after transfer-related pumping at pre-determined frequencies), and 3) identification of groundwater level triggers. In addition, sellers will be required to monitor groundwater levels to ensure that significant adverse effects to deep-rooted vegetation are avoided. Mitigation Measures VEG and WILD-1 include measures to maintain water levels in major irrigation canals that support emergent wetland and riparian vegetation, which can provide added habitat for migratory birds and other species. EPA understands that by utilizing adaptive management, Reclamation intends to identify any unexpected effects of the water transfer program in a timely manner so that corrective actions, if necessary, can be identified. EPA recommends that the adaptive management strategy, along with responsible parties and criteria for action (what thresholds require corrective action, etc.), be as fully described as possible in the Supplemental Final EIS and Record of Decision (ROD).

Response

The Mitigation Monitoring and Reporting Program (MMRP) is included in Appendix V. The MMRP summarizes the monitoring and reporting plans for the mitigation measures identified in the 2014 Draft EIS/EIR and RDEIR/SDEIS. The MMRP provides details of the Mitigation Measures including the actions under the measure, responsible parties, methods for verification, and timing of verification. Adaptive management in Mitigation Measure VEG and WILD-1 includes an annual review with USFWS and other agencies to assess the previous years' cropland idling/shifting transfer actions, recent scientific literature and study results, and effectiveness of currently implemented conservation measures. This annual review will incorporate new research related to GGS status within the sellers area and will facilitate timely implementation of adaptive management related to water transfer actions. The MMRP further defines the adaptive management process.

Comment 3-3

Comment

With respect to the updated Water Quality analysis, the SDEIS acknowledges that the Central Valley Salinity Alternatives for Long-Term Sustainability initiative (CV-SALTS) could affect water quality in the Central Valley. The SDEIS concludes that these standards have not yet met the criteria to be considered reasonably foreseeable; hence, they are not included in the Water Quality Cumulative Effects analysis. In May 2018, the California Regional Water Quality Control Board Central Valley Region adopted Resolution R5-2018-0034,1 which includes amendments to the Water Quality Control Plans for the Sacramento River and San Joaquin River Basins and the Tulare Lake Basin to incorporate a Central Valley-Wide Salt and Nitrate Control Program. It is anticipated that these amendments will be considered for adoption by the State Water Resources Control Board in the near future. Therefore, these criteria are reasonably foreseeable and should be considered for inclusion in the Water Quality Cumulative Effects analysis.

Response

The water quality analysis has been revised to indicate that CV-SALTS has been adopted by the State Water Resources Control Board. CV-SALTS was included in the cumulative analysis as a proposed project in the 2014 Draft EIS/EIR, so this revision did not change the potential cumulative effects.

Comment 3-4

Comment
Effective October 22, 2018, EPA no longer includes ratings in our comment letters. Information about this change and EPA' s continued roles and responsibilities in the review of federal actions can be found on our website at: https://www.epa.gov/nepa/epa-review-process-under-section-309-clean-ai r-act.

EPA appreciates the opportunity to review this SDEIS and we have no further comments at this time. When the Supplemental Final EIS is released for public review, please send one hard copy and one CD to the address above (mail code: ENF-4-2). If you have any questions, please contact me at 415-947- 4161, or contact Ann McPherson, the lead reviewer for this project. Ms. McPherson can be reached at 415-972-3545 or mcpherson.ann@epa.gov.

Response
It is expected that the Final EIS/EIR will be made public in July 2019. If the project is approved by SLDMWA and Reclamation, the Record of Decision (ROD) will be posted in accordance with legal requirements. Both documents will be made available for public review on Reclamation website: https://www.usbr.gov/mp/nepa/nepa_project_details.php?Project_ID=18361. Copies of the Final EIS/EIR will be provided to each party that provided comments on the RDEIR/SDEIS.

Comment Letter 4, Jeff Henderson, Delta Stewardship Council

Comment 4-1

Comment
Thank you for the opportunity to comment on the Long-Term Water Transfers Revised Draft Environmental Impact Report/Supplemental Draft Environmental Impact Statement (Draft RDEIR/SDEIS). The Delta Stewardship Council (Council) recognizes the San Luis & Delta-Mendota Water Authority (SLDMWA) objective to make water transfers more implementable in years when participating member agencies could experience shortages, in order to serve existing demands.

The Council submitted comment letters on both the Draft Long-Term Water Transfers EIS/EIR (2014 Draft EIS/EIR) and the Final Long-Term Water Transfers EIS/EIR (2015 Final EIS/EIR). In both letters, the Council identified: (1) omission of the Delta Plan from the regulatory setting; (2) the need for SLDMWA to determine whether the project is a covered action and, if so, file a Certification of Consistency with the Council; and (3) Delta Plan regulatory policies potentially implicated by the proposed project. Ultimately, none of these concerns were addressed in the 2015 Final EIS/EIR.

Council staff recognizes that the scope of the RDEIR/SDEIS is limited to addressing specific issues identified in a 2018 District Court ruling. We also note that the District Court's decision vacated the 2015 Final EIS/EIR and SLDMWA's decision to approve the project. Therefore, this letter provides comments on the findings of the RDEIR/SDEIS, and reiterates the Council's comments and concerns on elements of the 2015 Final EIS/EIR described above.

Response

Subsection 5001(dd)(3) of the Delta Plan noted that single-year water transfers occurring between the date of the adoption of the Delta Plan (May 2013) and December 31, 2016 (i.e., the "sunset date") would not have a significant impact on the coequal goals, and consequently, would not be considered covered actions. In 2015 the Delta Stewardship Council revisited the requirements under Subsection 5001(dd)(3) and in September 2016, the Delta Plan was revised to remove the sunset provision and statement of intent to consult with the DWR, SWRCB, and stakeholders. Consequently, single-year water transfers are considered exempt action under the Delta Plan.

The Lead Agencies are not managing a bank or program. The participating potential willing buyers and sellers will continue to negotiate and propose individual water transfers, including the transfer quantity, method, and use. Individual transfers would be voluntary, independent transactions between willing buyers and sellers subject to review and approval by Reclamation, the selling entity, and the buying entity (or SLDMWA on the buyer's behalf). Each transfer has independent utility and is not dependent on, nor does it dictate the nature and scope of, the potential for long-term transfers that are analyzed in the EIS/EIR. Implementation of the range of potential water transfers analyzed in this EIS/EIR (annual and multiyear, if any) would be subject to Reclamation's annual review and approval. If the Lead Agencies enter into a multi-year transfers agreement[1], the required Certifications of Consistency with the Council would be filed at that point.

Comment 4-2

Comment

The Council is an independent State of California agency established by the Sacramento-San Joaquin Delta Reform Act of 2009 (SBX7 1; Delta Reform Act). As stated in the Delta Reform Act, the State has coequal goals for the Delta: providing a more reliable water supply for California and protecting, restoring, and enhancing the Delta ecosystem. The coequal goals shall be achieved in a manner that protects and enhances the unique cultural, recreational, natural resource, and agricultural values of the Delta as an evolving place (Water Code §85054). The Council is charged with furthering the coequal goals through the adoption and implementation of the Delta Plan, regulatory portions of which became effective on September 1, 2013.

Through the Delta Reform Act, the Council was granted specific regulatory and appellate authority over certain actions that take place in whole or in part in the Delta and Suisun Marsh, which are referred to as "covered actions". The Council exercises that authority through development and implementation of the Delta Plan. State and local agencies are required to

[1] Sellers and buyers may negotiate terms for a multi-year transfer agreement. A long-term agreement would generally give the buyer the first right of refusal for water that a seller makes available for transfer. The multiyear transfer agreement would not guarantee potential future transfers, transfer would still be subject to Reclamation's annual review and approval and Delta export capacity limitations.

demonstrate consistency with 14 regulatory policies identified in the Delta Plan when carrying out, approving, or funding a covered action.

In our comment letters on the 2014 Draft EIS/EIR and the 2015 Final EIS/EIR, Council staff requested acknowledgement of the Council's regulatory authority, the Delta Plan, and its regulatory policies. The Council's 2015 comment letter noted that the Regulatory Setting in the 2015 Final EIS/EIR identifies federal and state regulations, but does not describe the regulatory authority of the Council and the Delta Plan over covered actions. The RDEIR/SDEIS does not address this deficiency. The final environmental document for this project should identify the Delta Plan and its applicable regulatory policies in the Regulatory Setting, and Council staff strongly recommends that SLDMWA revise the final environmental document to incorporate this information.

Response

Please refer to Common Response 1.

Comment 4-3

Comment

As explained in the Council's comment letter on the 2014 Draft EIS/EIR, it appears that this project meets the definition of a covered action. Water Code section 85057.5(a) provides a four-part test to define activities that would be considered covered actions. The project appears to meet the definition of a covered action considering that it:

1. Would occur in whole or in part within the boundaries of the Legal Delta (Water Code§12220) or Suisun Marsh (Public Resources Code §29101).

   The project would occur, at least in part, within the Delta. Water would be conveyed through the Delta using Central Valley Project (CVP), State Water Project (SWP), and/or local facilities. In addition, at least four of the potential sellers covered by the project are located within the Delta.

2. Would be carried out, approved, or funded by the State or a local public agency.

   The Project would be undertaken by SLDMWA, a public agency. Transfers utilizing SWP infrastructure (Harvey O. Bank Pumping plant) would require approval by the California Department of Water Resources.

3. Would have a significant impact on the achievement of one or both of the coequal goals or the implementation of a government-sponsored flood control program to reduce risks to people, property, and State interests in the Delta.

   The project would have a significant impact on the achievement of the coequal goal of water supply reliability. The Council notes that this effect can either be an increase or decrease in water supply reliability.

4. Would be covered by one or more of the regulatory policies contained in the Delta Plan (23 CCR section 5003-5015).

*Delta Plan Policies **WR P1** and **WR P2** address water transfers through the Delta. These, along with other Delta Plan regulatory policies that may be implicated by the project, are described below.*

Response

Please refer to Response to Comment 4-1.

Comment 4-4

Comment

According to the Delta Reform Act, it is the State or local agency approving, funding, or carrying out the project that ultimately must determine if that project is a covered action and, if so, file a certification of consistency with the Delta Plan (Water Code §85225) prior to project implementation. Council staff recommends that SLDMWA file a certification of consistency with the Delta Plan on behalf of its participating member agencies. More information on covered actions and the certification process can be found on the Council website at http://deltacouncil.ca.gov/covered-actions.

In addition to the program-level analysis of Long-term Water Transfers analyzed in the 2015 Final EIS/EIR and RDEIR/SDEIS, each individual multi-year water transfer agreement that is made possible by this proposed project would need to be considered and evaluated to determine if it meets the definition of a covered action, and if so file a certification of consistency with the Delta Plan.

Response

Please refer to Response to Comment 4-1.

Comment 4-5

Comment

Delta Plan Regulatory Policies

The following section describes regulatory Delta Plan policies that may apply to the proposed project based on the available information in the RDEIR/SDEIS. This information is offered to assist SLDMWA to prepare certified environmental documents that can be used to support the project's eventual certification of consistency.

Regulatory Policies Pertaining to Transfers

In our comment letters on the 2014 Draft EIS/EIR and the 2015 Final EIS/EIR, Council staff explained two of the Delta Plan regulatory policies pertaining to water transfers implicated by this project. We summarize these policies below for reference.

Water Resources Policy 1: Reduce Reliance on the Delta through Improved Regional Water Self-Reliance
Delta Plan Policy **WR P1** (23 CCR §5003) requires proposed actions that export water from, transfer water through, or use water in the Delta shall contribute to reduced reliance on the Delta and improve regional self-reliance.

The Long-Term Water Transfers project proposes to facilitate through-Delta water transfers between willing sellers and buyers. A number of potential sellers are located within the Delta. SLDMWA should describe how all water suppliers that would receive water as a result of the project adequately contribute to reduced reliance on the Delta and improve regional self-reliance. This includes completion of a current Urban or Agricultural Water Management Plan; identification, evaluation, and commencement of implementation activities identified in a plan to reduce reliance on the Delta; and the expected outcome for measurable reduction in Delta reliance and improvement in regional self-reliance.

Water Resources Policy 2: Transparency in Water Contracting
Delta Plan Policy **WR P2** (23 CCR §5004) requires the contracting process for water from the State Water Project and/or the Central Valley Project be done in a publicly transparent manner consistent with applicable policies of the California Department of Water Resources and the Bureau of Reclamation.

Please update the final environmental document or materials prepared as part of a certification of consistency to include information regarding the contracting process and to describe how sellers and buyers will negotiate transfers and use SWP and CVP pumping facilities in a transparent, public manner.

Additional Delta Plan Regulatory Policies
Council staff has identified additional Delta Plan regulatory policies that may be implicated by this project. The following information is offered to assist SLDMWA in describing the relationship between the proposed project and the Delta Plan in the environmental document, as well as to support the project's eventual certification of consistency.

General Policy 1: Detailed Findings to Establish Consistency with the Delta Plan Delta Plan Policy **G P1** (23 CCR §5002) specifies what must be addressed in a certification of consistency by a proponent of a project that is a covered action. The following is a subset of these requirements which a project must fulfill to demonstrate consistency with the Delta Plan:

Mitigation Measures
Delta Plan Policy **G P1** (23 CCR §5002(b)(2)) requires that actions not exempt from CEQA and subject to Delta Plan regulations must include applicable feasible mitigation measures consistent with those identified in the Delta Plan Program EIR or substitute mitigation measures that are equally or more effective. Mitigation measures in the Delta Plan's Mitigation Monitoring and Reporting Program (Delta Plan MMRP) are available at: http://deltacouncil.ca.gov/sites/default/files/documents/files/Agenda%20Item%206a_attach%202.pdf

The RDEIR/SDEIS identifies the following significant impacts that require mitigation: reduction in groundwater levels, land subsidence, groundwater quality changes, impacts to special-status plant species, and impacts to special-status wildlife species and their habitats (including but not limited to the *giant garter snake and greater sandhill crane*). Council staff recommends that SLDMWA review the mitigation measures in the Delta Plan MMRP addressing each of these significant impacts. In particular, Council staff recommend that SLDMWA closely review the proposed Long-Term Water Transfers project mitigation measures in relation to Delta Plan MMRP measures **4-2** and **4-3** as they pertain to selection of seller/source areas for transfers.

Best Available Science

Delta Plan Policy **G P1** (23 CCR §5002(b)(3)) states that actions subject to Delta Plan regulations must document use of best available science as relevant to the purpose and nature of the project. The regulatory definition of "best available science" is provided in Appendix 1A of the Delta Plan (http://deltacouncil.ca.gov/sites/default/files/2015/09/Appendix%201A.pdf)

Best available science is defined in the Delta Plan as the best scientific information and data for informing management and policy decisions. Six criteria are used to define best available science: relevance, inclusiveness, objectivity, transparency and openness, timeliness, and peer review. (23 CCR §5001(f)). This policy generally requires that the process used by the lead agency in analyzing project alternatives, impacts, and mitigation measures of proposed projects be clearly documented and effectively communicated to foster improved understanding and decision making.

Application of this policy would be specifically relevant to analysis of surface water depletion factors and groundwater recharge rates related to groundwater substitution transfers and their potential impact on streamflow conditions and Delta water quality requirements.

Adaptive Management

Delta Plan Policy **G P1** (23 CCR §5002(b)(4)) requires that ecosystem restoration and water management covered actions include adequate provisions for continued implementation of adaptive management, appropriate to the scope of the action. This requirement is satisfied through a) the development of an adaptive management plan that is consistent with the framework described in Appendix 1 B of the Delta Plan (http://deltacouncil.ca.gov/sites/default/files/2015/09/Appendix%201B.pdf), and b) documentation of adequate resources to implement the proposed adaptive management plan. Council staff believe that a long-term transfer such as this project is a water management action, and therefore requires an adaptive management plan. However, we also acknowledge that this policy is to be applied as appropriate to the scope of a project. Given that the project has an end date of 2024, an adaptive management plan may be more limited in this case.

In the development of an adaptive management plan, the RDEIR/SDEIS describes mitigation measures such as GW-1 and WS-1 that will be used to develop information to analyze impacts to groundwater and steam flow due to long term, multi-year water transfers. These and other mitigation measures could be examples of decision triggers that inform step 7 of the Evaluate and Respond Phase of the Adaptive Management Framework.

Response

Please refer to Response to Comment 4-1.

Comment 4-6

Comment

Mitigation Measure WS-1: Streamflow Depletion Factor proposes to mitigate for lower streamflows due to groundwater recharge impacts. The mitigation measure proposes to have Reclamation apply a streamflow depletion factor to mitigate potential water supply impacts from additional groundwater pumping due to groundwater substitution transfers. This mitigation measure addresses the initial streamflow depletion, but it does not address cumulative impacts from multiple multi-year water transfers on streamflow. The measure should be updated to address conditions during various water year types and the cumulative effects of multi-year water transfers from groundwater pumping.

Additionally, the streamflow depletion factor cited in the mitigation measure is a minimum 13 percent, "…but this factor may be adjusted based on additional information on local conditions. The streamflow depletion factor may not change every year, but will be refined as new information becomes available and may become more site-specific as better data and groundwater modeling becomes available." It is not clear when and how this additional information would be collected and provided to evaluate the need to adjust the percentage. Therefore, the Council anticipates that individual water transfer covered actions certifying consistency with the Delta Plan will need to provide additional project-level information related to groundwater impacts beyond the program-level conditions described in the RDEIR/SDEIS.

Response

As noted under Mitigation Measure WS-1, the minimum streamflow depletion factor of 13 percent could be adjusted based on additional information on local conditions. DWR has been collecting additional information related to streamflow depletion as part of the Groundwater Sustainability Plan (GSP) development process. If refinement of the streamflow depletion factor is required based on collected technical information, Reclamation and DWR will make this determination accordingly.

Comment 4-7

Comment

Closing Comments

We encourage SLDMWA to engage with Council staff prior to developing and submitting a certification of consistency for this project. We are available to discuss issues outlined in this letter as you proceed in the next stages of your project and approval processes. Please contact Anthony Navasero at (916) 445-5471 (Anthony.Navasero@deltacouncil.ca.gov) with any questions.

Response

As noted in Response to Comment 4-1, the Lead Agencies will file a certification of consistency if they enter into a multiyear transfer agreement. The Lead Agencies will engage with the Council during the development of any future certification of consistency.

Comment Letter 5, Michael Billiou, Billiou Farming Company

Comment 5-1

Comment

My name is Michael Billiou. I am a farmer, just south of Hamilton City. This year our family ranch enjoys its 150th year of continuous ag operations. I am concerned for its future.

The northeastern area of Glenn County has been repeatedly proposed as a potentially large source of ground water for transfer. I see in the Revised EIR and Supplemental EIS for Water Transfers, that Glenn Colusa Irrigation District is still listed as a Seller of up to 91,000 ac/ft of pumped ground water. I believe this number qualifies for a substantial revision downward, or elimination altogether. I suggest that this is a possible revision that has been overlooked, and ask that it be addressed before the documents are accepted.

Response

Glenn-Colusa Irrigation District (GCID) is listed as a potential seller that may propose to transfer a total of up to 91,000 acre-feet (see Table 2-3 of the RDEIR/SDEIS) including transfer via groundwater substitution pumping and cropland idling/crop shifting. However, the potential groundwater substitution transfers from GCID would be limited to 25,000 acre-feet.

Comment 5-2

Comment

This area from Capay to below Ord Bend, now has a 17+ year history of what happens before, during, and after, export sized groundwater pumping is conducted by GCID.

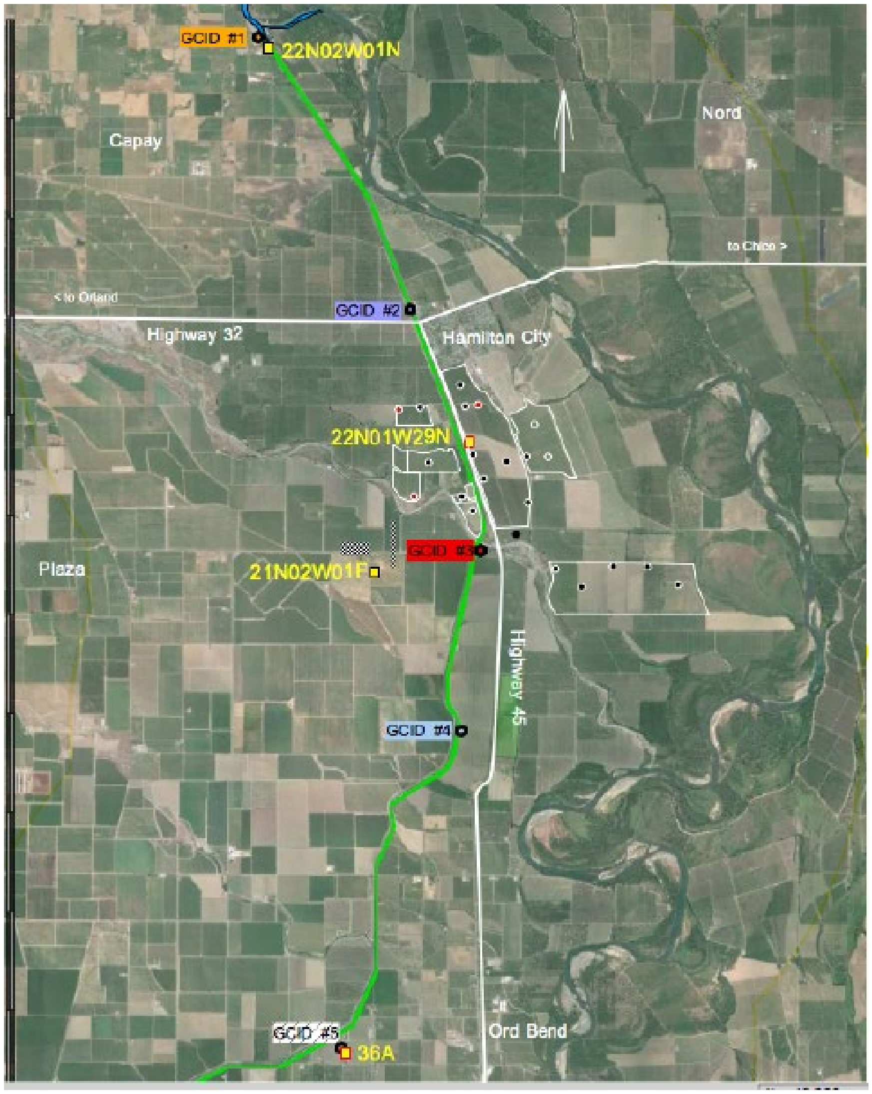
DWR/Glenn County monitoring wells 22N02W01N, 22N01W29N, 21N02W01F, and GC 36A show that GCID pumping a total of 20,000 acre feet, over an eight year period, has caused unacceptable impacts to the area.

Prior to 2007, the aquifers were able to fully recharge with an average rainfall year.

GCID began large scale groundwater pumping in 2007 and continued until July 2015. Although this pumping was ostensibly limited to the 950’---1200’ deep (Tuscan) aquifer, the three overlying aquifer strata at ±600’, 300’ and 100’ have all been affected, and remain compromised.

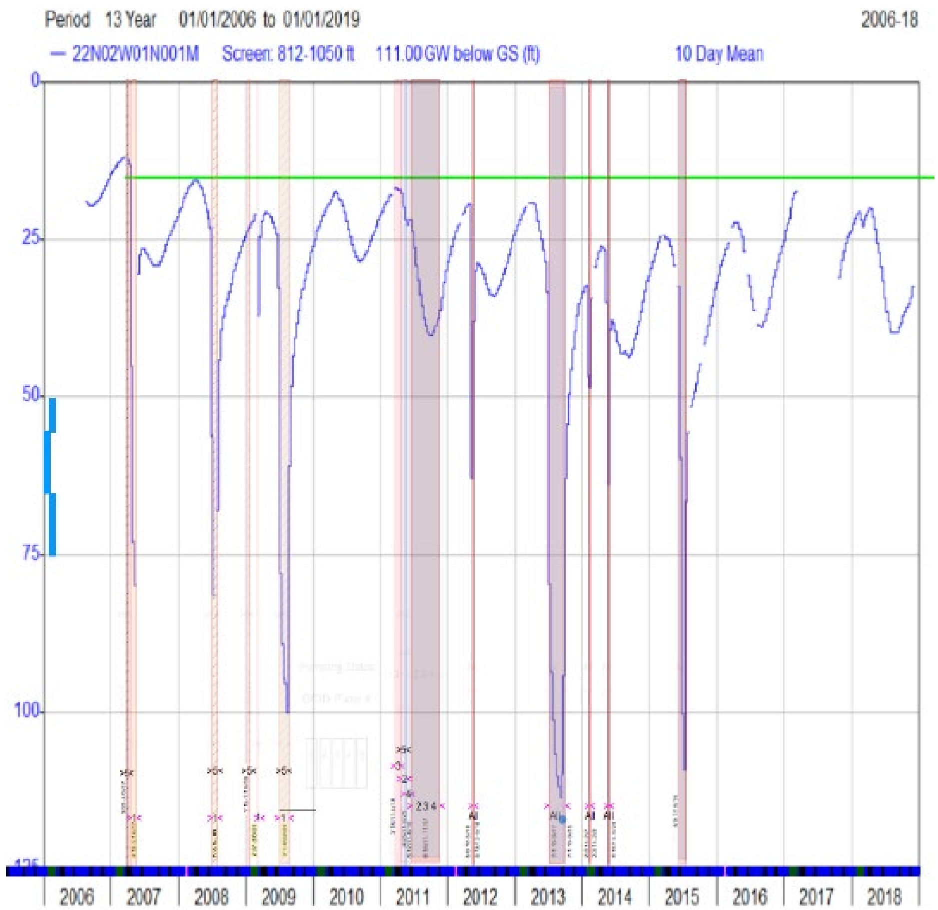
The ranches I operate for my family and friends rely on 19 groundwater wells. Since 2011- 2012 several of these wells have shown abnormal and erratic behavior. Our pump 19 went completely dry on July 19, 2014. In the years since, three important wells have become unusable for several days at a time.

Monitoring well 22N01W29N is sited on my property central to our 1,400 acres of Orchards It is also between GCID Pumps #2 & #3 at Hamilton City, and Road 24.

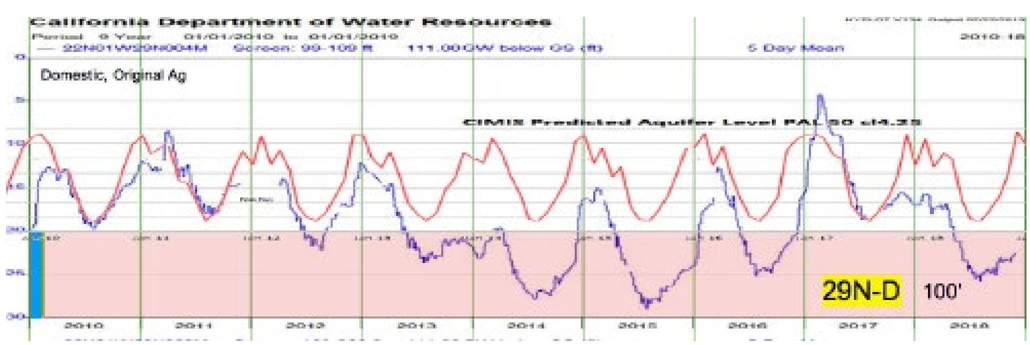


Scale from Pump 1 to 5 is approx. 10 miles.

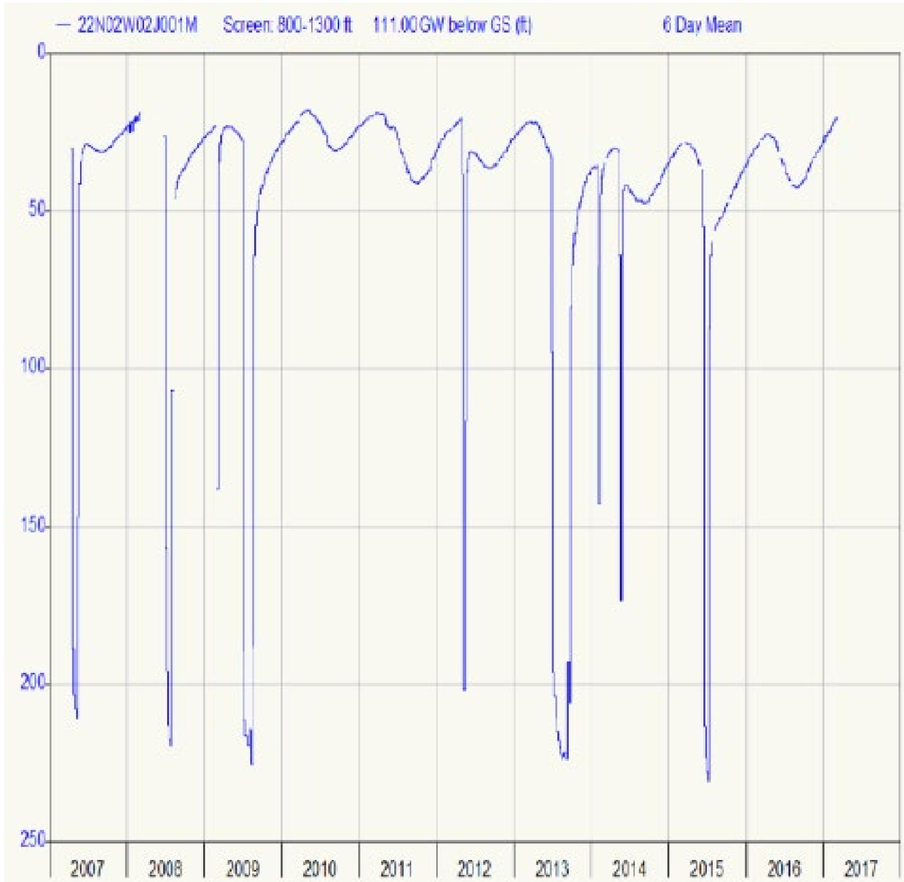
Nearly four years after the pumping ended, the 1000’---1200’ aquifer still has not recovered to 95% recharge levels.



The Predicted Aquifer Level (PAL curve in red) uses evapotranspiration and rainfall data from CIMIS #12 in Durham to predict where the aquifer would be, without the influence of GCID transfer pumping.



When these pumps are turned on, an extremely rapid draw down occurs over a few hours. It is equivalent to a pressure drop of over 10,000 psf . The rapid loss of this pressure is a significant factor in a new situation for our area –overdraft pumping caused subsidence. New cracks in two of our brick homes began to appear after 2007. Even though both are built on heavy foundations and were previously unbroken the gaps are getting more serious with time. This alone has seriously devalued our historic brick and beam ranch house.


— 22N02W02J001M Screen: 800-1300 ft 111.00 GW below GS (ft)
6 Day Mean
0
50
100
150
200
250
2007
2008
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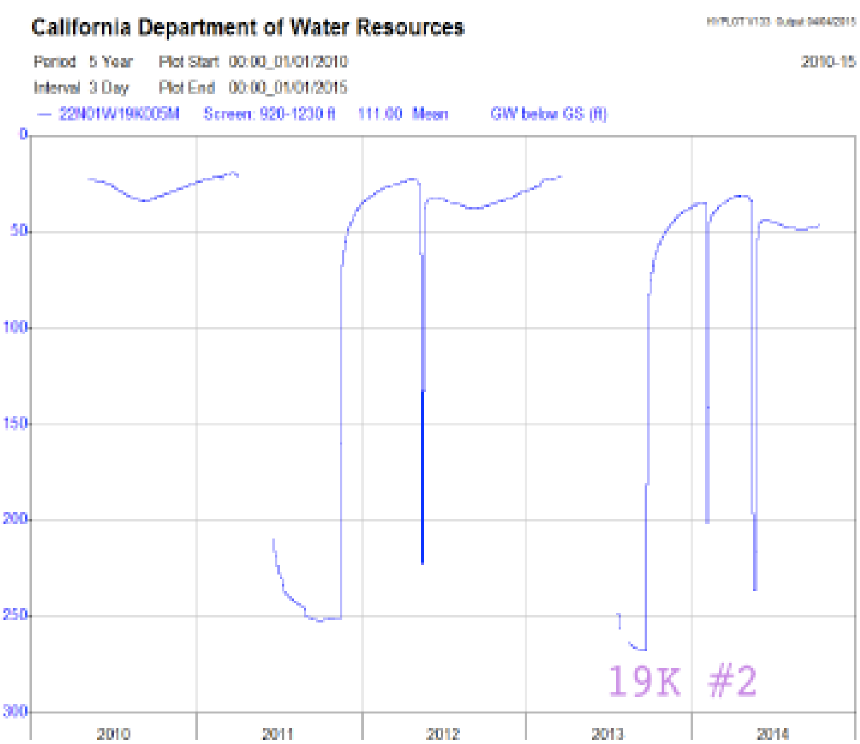
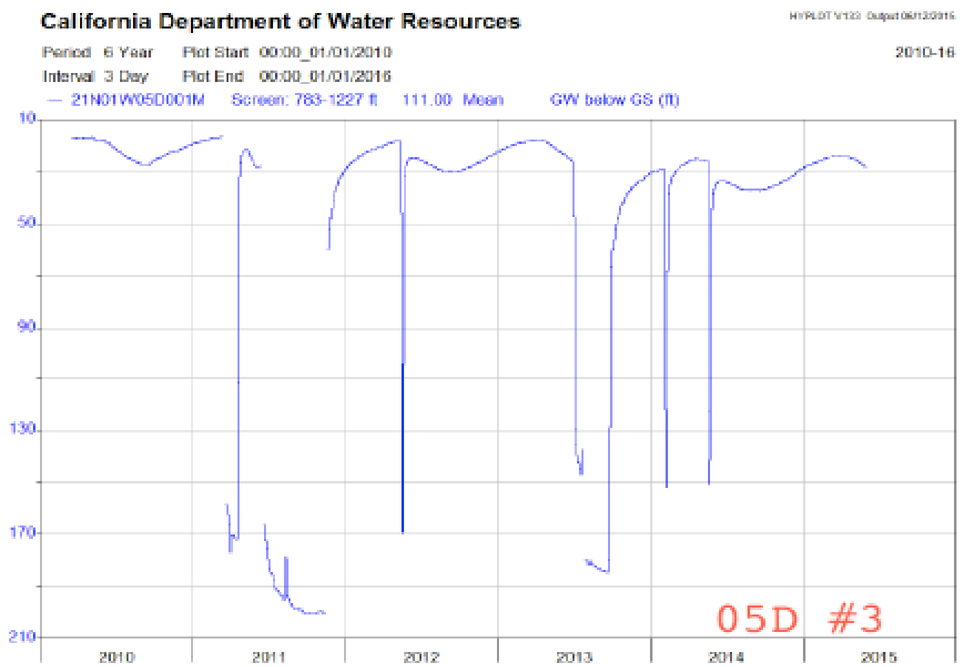
2013
2014
2015
2016
2017


California Department of Water Resources
Period 5 Year
Plot Start 00:00_01/01/2010
Interval 3 Day
Plot End 00:00_01/01/2015
2010-15
— 22N01W19K005M Screen: 920-1230 ft 111.00 Mean GW below GS (ft)
0
50
100
150
200
250
300
19K #2
2010
2011
2012
2013
2014



Summary

8 years of deep well pumping for money has caused local homeowners and farmers surrounding the GCID wells, all kinds of expensive problems. Since most of those affected don't know why, these incidents go largely unreported.

To date, BMOs, monitoring, and mitigation for these problems in our area, have been ineffective. The managing parties are quick to blame the aquifer declines on "the Drought". The rainfall and evapotranspiration numbers have been recorded, and they show otherwise. The declines are clearly a function of removing ±20,000 acre feet from the area, and from the local water equation.

The responsibility for proving damage under this system leaves the average landowner at a severe disadvantage, and I don't believe this is what the law intends. The unraveling of small groundwater dependent farms is a very significant issue that we want to prevent, not mitigate.

I have just replaced one of three wells that have failed since this all began. I had hoped that the cessation of GCID pumping would allow the domestic and main ag stratas to recover enough for them to be useable. Even with above average rainfall in the past 3 years, they have not. I will be out a half million dollars, just on these three replacements. And still have 15 other wells to worry about.

This area has been damaged. To allow any use of existing GCID groundwater pumps for transfer, would further deprecate the aquifers that support non---GCID landowners. The results would be a disaster to the people that live here. The $$$ that GCID sees, directly correlate to what the local humans will see: Subsidence, Salinity, and Sucking Air.

I believe the water code says this cannot happen.

I urge you to review this data in detail, and disallow GCID pumps 1 through 5 from ground water pumping in any manner, if the water is to leave the originating, and recharge, area of NE Glenn County.

Response

Reclamation has coordinated this response with, Glenn-Colusa Irrigation District (GCID). GCID participated in transfers in multiple years between 2007 and 2015. Table 2 below provides the actual transfer volumes from GCID Wells 1 through 5 between 2009 to 2018. As noted by the commenter, three complaints were received in July 2013 regarding impacts to third party wells reportedly attributed to GCID's groundwater substitution pumping. In September 2013, GCID and DWR conducted an investigation of these reported third-party impacts. GCID conducted weekly monitoring at all impacted third-party wells (including wells on the Billou Farming Company property). This investigation concluded that GCID's transfer pumping did not impact third party wells.

Additionally, in response to this commenter's letter on the RDEIR/SDEIS, GCID upon request from the Lead Agencies has prepared a formal response letter, included as, Attachment 1 to this Appendix.

Table 2.
GCID Annual Groundwater Substitution Pumping Volumes from 2009 through 2018.

Well ID	Transfers Volume in 2009 (in acre-feet)	Transfers Volume in 2010 (in acre-feet)	Transfers Volume in 2011 (in acre-feet)	Transfers Volume in 2012 (in acre-feet)	Transfers Volume in 2013 (in acre-feet)	Transfers Volume in 2014 (in acre-feet)	Transfers Volume in 2015 (in acre-feet)	Transfers Volume in 2016 (in acre-feet)	Transfers Volume in 2017 (in acre-feet)	Transfers Volume in 2018 (in acre-feet)
GCID 1	619	0	0	0	1,007	93	308	0	0	0
GCID 2	786	0	0	151	1,070	94	381	0	0	0
GCID 3	0	0	2,242	72	1,031	90	361	0	0	0
GCID 4	0	0	2,053	60	960	92	313	0	0	0
GCID 5	0	0	1,968	61	950	90	361	0	0	0
Total	1,405	0	6,263	344	5,000	459	1,724	0	0	0

Comment Letter 6, Don Hankins, California Indian Water Commission

Comment 6-1

Comment

These comments are provided in response to the subject document, hereafter document. As an Intertribal self-determination organization pursuant to PL 93-6381 these comment are submitted in reverence to the responsibility we uphold to be good stewards of lands and waters. The proposed project, actions and alternatives thereof all fail to meet the needs of the ecology, culture, and metaphysical properties of traditional Indigenous homelands and features impacted. Please see Hankins (2018) to better understand specific shortcomings of analysis as pertains to the project. We have previously advised the Bureau of Reclamation (BOR) to assess ecocultural impacts from their projects and actions by using the Mauriometer (http://mauriometer.com), which assesses impacts to the environment, cultural wellbeing, social wellbeing, and economic wellbeing. The use of this tool should be done in consultation and participation with tribes, traditional cultural practitioners, and tribal organizations (hereafter beneficiaries). The consultation with beneficiaries, including the California Indian Water Commission in the development of the proposed alternatives is clearly lacking.

Response

Please refer to Common Response 1 regarding the scope and nature of the analysis in the RDEIR/SDEIS.

Comment 6-2

Comment

The document, and its precursor, fail to address how this project assists the BOR in fulfilling its tribal trust responsibilities to beneficiaries, interspecies kinship relationships, or impacts there to. The current operations of the Central Valley Project (CVP) is counterintuitive to the laws of nature and our traditional laws, and will continue to adversely affect trust resources, for which BOR is obligated to uphold pursuant to federal laws including PL 93-638. While these projects were developed prior to existence of laws requiring consultation, the Trust responsibilities to tribes has existed, yet there has been no real effort to address direct, indirect, and cumulative impacts to tribal trust resources (e.g., water, fish, wildlife, and other transitory resources) as the intended by law. For instance, prior legal precedence identifies beneficiaries' preeminent rights to surface and ground water (see Winters v. United States and Agua Caliente v. Coachella Valley Water District & Desert Water Agency). Since time immemorial California Indians have stewarded the lands and waters for our own needs, but also to fulfill the needs of the landscape and species therein. Yet, the analysis fails to address this inclusive of all areas impacted by the CVP. In fact, the document hinges water transfers on the contributions of water from others (sellers), without addressing how those rights infringe upon tribal water rights. Furthermore, the document assumes separation between surface and ground water.

Response

The groundwater and surface water analyses in the RDEIR/SDEIS and 2014 Draft EIS/EIR evaluate the linkage between groundwater and surface water supplies. Please refer to Common Response 1 for further information regarding the scope and nature of the analysis in the RDEIR/SDEIS.

Comment 6-3

Comment

Clearly the cases cited above recognize the interconnected nature of surface and groundwater as one. In this sense, substation of surface water from willing sellers while enabling use of groundwater by those sellers is problematic on multiple levels. Allowing a seller to access groundwater in lieu of surface water sold further reduces base flows in surface water. The reduction in base flows adversely impacts tribal trust resources. Utilization of groundwater in this manner may have adverse impacts on groundwater users in surrounding areas, and may be inconsistent with plans developed regionally via California's Sustainable Groundwater Management Act.

Response

The Lead Agencies evaluated the impacts of groundwater substitution transfers, including reductions to base flows of surface water to vegetation and wildlife (see Section 3.8 of the RDEIR/SDEIS) and water supply (see Section 3.1 of the 2014 Draft EIS/EIR). Impacts to Indian tribal assets were evaluated in Section 3.12 of the 2014 Draft EIS/EIR. Section 3.3 of the RDEIR/SDEIS evaluates effects to groundwater levels, including third party impacts, from groundwater substitution transfers. The groundwater basins within the Seller Service area are classified as either medium or high priority and, therefore, require that the basins are managed under GSPs by January 31, 2022. Because the GSPs for these basins have not yet been developed, an updated estimate of sustainable yield for these basins are not available. As noted in Mitigation Measure GW-1, "As GSPs are developed by Groundwater Sustainability Agencies, potential sellers must confirm that the proposed pumping and the following Monitoring Program and Mitigation Plan verified by Reclamation is compatible with applicable GSP."

Comment 6-4

Comment

Given climate change, detailed analysis of the long-term sustainability of the CVP and water transfers should be completed to minimize reliance on water transfers for unsustainable water uses. Analysis should include limits to crop types that can be sustained via dry land farming, converting to ranch lands, or outright land retirement.

The proposed action provides a nexus for a deeper level of analysis of the CVP and its impact on tribal trust resources. Given the lack of comprehensive analysis and consultation, we support the no project alternative.

Response

The RDEIR/SDEIS provided an analysis of how climate change affects water transfers, which is documented in (see Appendix J [renamed Appendix K] and Section 3.6 of the RDEIR/SDEIS). An evaluation of the long-term sustainability of the CVP is outside the scope of the Proposed Action. Dry land farming, converting to ranch lands, and land retirement are not part of the Proposed Action. Appendix A includes the alternatives development process that evaluated land retirement and alternate cropping patterns in San Joaquin Valley as potential options and eliminated them from detailed consideration based on the project's objectives, purpose and need. Please refer to Common Response 1 for further information regarding the scope and nature of the analysis in the RDEIR/SDEIS.

Comment Letter 7, Charles Center, Barbara Barrigan-Parrilla, Kathryn Phillips, Conner Everts, Jonas Minton, Friends of the River, Restore the Delta, Sierra Club, Environmental Water Caucus, Planning and Conservation League

Comment 7-1

Comment

On behalf of Friends of the River, Restore the Delta, Planning and Conservation League, Sierra Club, and Environmental Water Caucus we are writing to provide comments on the Revised Draft Environmental Impact Report and Supplemental Environmental Impact Statement ("RDEIR/SEIS") for the United States Department of the Interior, Bureau of Reclamation ("BOR") and San Luis & Delta-Mendota Water Authority ("SLDMWA") Long-Term Water Transfers ("LTWT"). The proposed project and RDEIR/SEIS fail to satisfy the requirements of the California Environmental Quality Act ("CEQA") and the National Environmental Policy Act ("NEPA") and the lead agencies obligations under state and federal law. By this comment letter our public interest organizations object to approval of the LTWT project and the LTWT project RDEIR/SEIS. Due to the RDEIR/SEIS being fundamentally and basically inadequate and conclusory in nature, any meaningful public review and comment regarding the proposed project is precluded. As such, a new RDEIR/SEIS must be recirculated to provide the public with the data and analysis needed to make an informed decision regarding the environmental impacts of the proposed project. At the core of an EIR/EIS lies a duty to provide both public agencies and the public with detailed information about the effect the project is likely to have on the environment; to list ways in which the significant effects of such a project might be minimized; and to indicate alternatives to such a project.[2] Here, BOR fails to provide both the public and public agencies with sufficient information on multiple fronts through omissions, incomplete data, and unfinished analysis.

Response

Please refer to Common Response 1.

Comment 7-2

Comment

I. GROUNDWATER RESOURCES

[2] California Public Resources Code § 21061

The current RDEIR/SEIS fails to comply with both CEQA and NEPA requirements on groundwater resources by failing to provide current data, analysis of the environmental impacts of the project, and incomplete mitigation analysis.

Response

Section 3.3, Groundwater Resources of the RDEIR/SDEIS documents the existing conditions of groundwater resources within the area of analysis and discusses potential effects of the Proposed Action and Action Alternatives on groundwater resources. Section 3.3.4 includes a detailed description of Mitigation Measure GW-1 as required by NEPA and CEQA regulations. Section 3.3 of the RDEIR/SDEIS also includes discussions of the effectiveness of the mitigation measure in reducing potentially significant impacts on groundwater levels and subsidence in the seller service area.

Comment 7-3

Comment

As research and knowledge regarding the interconnectedness between all water systems in California grows, scientific data continues to emerge showing the negative impacts increased groundwater withdraw has on surface water users and ecosystems throughout the state. This knowledge and data related to California's groundwater systems has grown exponentially over the last decade. Data and analyses have continued to shed light on how groundwater pumping can lead to impacts on nearby streams fairly immediately, while impacts on streams miles from the pumping may not be fully realized for years or even decades.[3] Despite the information readily available, the RDEIR/SEIS fails to incorporate data and analyses into the RDEIR/SEIS that would provide agencies and the public with the information needed to make an informed decision regarding the project.

The RDEIR/SEIS acknowledges the proposed project would have an impact on the surrounding environment as a result of increased groundwater pumping. Under section 3.3.2.2, the RDEIR/SEIS describes that the proposed project would lead to increased groundwater pumping, thus resulting in lower groundwater levels, leading to potential subsidence. These lower groundwater levels also have serious impacts on stream and river systems throughout drainages in California.

Response

The amount of streamflow depletion due to groundwater substitution transfers was estimated using the SACFEM2013 groundwater model. SACFEM2013 simulates groundwater conditions throughout the Sacramento Valley over a 33-year simulation period using historic hydrology. The model quantifies potential streamflow depletion impacts due to substitution pumping spatially in streams throughout the Sacramento Valley and also temporally during the transfer period and subsequent years.

The results of the SACFEM2013 modeling are incorporated in the 2014 Draft EIS/EIR, RDEIR/SDEIS and Final EIS/EIR in multiple sections. Section 3.1, Water Supply of the

[3] The Nature Conservancy, 2014. Groundwater and Stream Interaction in California's Central Valley: Insights for Sustainable Groundwater Management.

2014 Draft EIS/EIR analyzes impacts from groundwater substitution transfers on streamflow depletion that may affect water users that are not parties to water transfers. Sections 3.7, Fisheries of the 2014 Draft EIS/EIR analyzes impacts from streamflow depletion under Proposed Action to fisheries resources. Section 3.8, Vegetation and Wildlife of the RDEIR/SDEIS analyzes impacts from streamflow depletion under the Proposed Action to vegetation.

Comment 7-4

Comment

In analyzing the current state of the multiple groundwater basins impacted by the proposed project, the RDEIR/SEIS paints a stark picture of the state of each of these basins. While some of the impacted groundwater basins are faring better than others, all basins included in the RDEIR/SEIS have been adversely impacted by the excessive taking of groundwater. In describing the Redding Area Groundwater Basin, Section 3.3.1.2.1 states: "Groundwater levels in the Anderson subbasin have recovered to spring 2016 levels but not to pre-drought levels." In the northern Sacramento Valley Groundwater Basin, section 3.3.1.2.2 groundwater levels on average have shown decline, with an average of 10.6 feet in deep aquifer zones. This drop in groundwater levels have caused numerous wells to go dry. Of serious concern is Yolo County within Conaway Ranch, where land subsidence estimated by DWR showed a .2 foot drop from 2012 to 2013 and an additional .6 foot drop from 2013 to 2014. This subsidence is glaring considering that in the previous 22 years land subsidence was less than .1 feet. While the RDEIR/SEIS states subsidence in these zones has reverted to pre-2012 levels in recent years, the proposed project would increase the groundwater draw, thus raising the serious potential for larger subsidence in future years. While the RDEIR/SEIS states that these declines have slowed in 2017, groundwater levels have not recovered to pre-2011 levels. Section 3.3.1.2.3 states that the San Joaquin Valley Groundwater Basin has also shown decline in groundwater levels. These declining groundwater levels have also led to land subsidence, one study described in the section noting two feet of subsidence in portions of the San Joaquin Valley between May 2015 and September 2016. Section 3.3.1.2.4 describes a lowering of groundwater levels in the Santa Clara Valley Groundwater Basin, with Santa Clara County historically experiencing as much as 13 feet of subsidence due to excessive pumping of groundwater. Statewide, the impact of significant groundwater elevation change is clearly shown in Appendix E, Figure E-44. Monitoring wells throughout the state show decreases of over 25 feet from the Spring of 2011 to the Spring of 2017.

The RDEIR/SEIS is important in that it shows the severe impacts, including subsidence, that occur when groundwater pumping and withdraw is increased. These impacts would typically be greater in droughts, and mitigated in wet years as the underlying basins would be recharged. However, the proposed project would *increase* the amount of groundwater withdraw, thus impacting all basins ability to recharge cyclically in wet years following drought years.

Response

As noted in the comments and Section 3.3, Groundwater Resources of the RDEIR/SDEIS, groundwater levels substantially declined in the Sacramento Valley due to persistent dry hydrologic conditions extending from 2006 through 2015. However, as further explained in the RDEIR/SDEIS, groundwater levels in the Sacramento Valley have shown recovery to Spring 2016 levels due to wetter conditions in 2017. Additionally, Section 3.3, Groundwater Resources of the RDEIR/SDEIS summarizes reported land subsidence in the Sacramento Valley.

The RDEIR/SDEIS reports potentially significant impacts from Proposed Action to land subsidence in Seller Service Area (see Section 3.3.2.2). Implementation of Mitigation Measure GW-1 reduces impacts from Proposed Action to less than significant. Impacts to groundwater quality were estimated to be less than significant due to the short-term withdrawals associated with Proposed Action.

Comment 7-5

Comment

Despite the clear environmental impacts associated with the project, in part acknowledged in the RDEIR/SEIS itself, BOR and SLDMWA fails to analyze updated data resulting in conclusory statements regarding the impacts of the proposed project. The following sections address deficiencies in the RDEIR/SEIS related to groundwater impacts of the proposed project. These wide-ranging deficiencies make the RDEIR/SEIS incomplete, and require the RDEIR/SEIS be recirculated after proper data and analysis is provided to give the public the ability to assess the environmental impacts of the project.

Response

Please refer to Responses to Comments 7-3 and 7-4.

Comment 7-6

Comment

A. Reliance on outdated modeling to establish a baseline under both NEPA and CEQA renders the REDEIR/SEIS inadequate, as new modeling with current data is now available.

Fundamental assertions in the FEIR/EIS relied on data that is now outdated. This data, among other uses, was used to provide an environmental baseline for the current project. BOR has now filed the RDEIR/SEIS and has not provided data, other than some referenced in appendices, and failed to analyze that new data, when determining the impacts of the project. This failure runs afoul of recognized procedure and law when conducting both the NEPA and CEQA process.

NEPA prohibits an EIS to substitute a mitigation measure as a proxy for measuring the environmental baseline because without data from before a project is approved, one cannot carefully consider information about significant environment impacts. N. Plains Res. Council v. Surface Transp. Bd., (9th Circ. 2011) 668 F.3d 1067, 1085. With regards to CEQA, the determination of the baseline is the first step in the impact review process. Save our Peninsula Comm. V. Monterey Cty. Bd. Of Supervisors, (2001) 87 Cal.App.4th 99, 125. CEQA Guidelines section 15125(a) states “An EIR must include a description of the physical environmental conditions in the vicinity of the project, as they exist at the time the notice of preparation is published, or if no notice of preparation is published, at the time environmental analysis is commenced, from both a local and regional perspective.” The FEIS/R relied on a variety of models to establish a baseline regarding environmental conditions related to groundwater. The SACFEM2013 model provided a full simulation period of 1970-2010. The CalSim II provided a water year range of 1922 through 2003. Due to the data available for the various models, the FEIS/R primarily relied on a model year period from 1970-2003 for modeling in establishing an environmental baseline.

Not only was the modeling of the conditions related to groundwater based on an older data set, the water supply demand baseline was also based on an older data set. This is described in AquAlliance v. U.S. Bureau of Reclamation, (2018) 287 F.Supp.3d 969, 1022 stating "the Authority explains in its supplemental briefing, the 2010 land use data incorporated into SACFEM2013 was the most recent land use data available in 2011, the time of the initiation of this environmental review." Further, the Court discussed that the Authority conceded that since 2010 the groundwater demand has likely increased due to additional irrigated lands. (Id. At 1021.) We are now approaching a decade after the initial filing of the FEIS/R, with new data readily available to analyze data related to both groundwater modeling as well as water supply demand. The RDEIR/SEIS should include updated data in establishing both a proper baseline for groundwater basins as well as water supply demand.

Further, the current RDEIR/SEIS fails to provide updated data relating to environmental impacts to decreased streamflow related to groundwater withdrawal. This data could be obtained through the C2VSIM model provided by the Department of Water Resources.[4] This updated model was released April 27, 2018 and readily available to be used to analyze impacts decreased groundwater will have on rivers and streams. Despite the availability of the updated modeling capabilities, it is unclear from the RDEIR/SEIS if this updated model was used, and analysis appears absent. A recirculated RDEIR/SEIS should incorporate the data from the updated C2VSIM model into analysis regarding project impacts. If the most current data is not used, the RDEIR/SEIS should state why the data was not used so the public is given complete information to properly analyze environmental impacts of the project.

Response

The comments suggest the SACFEM2013 and CalSim II models operated using "historic" assumptions rather than reflecting current conditions (e.g., the demands, regulations, and operations of the model in a particular year of simulation reflect what historically occurred). Demands in SACFEM2013 are based on land use data and surveys taken as recently as 2010. These land use surveys show an increase in permanent crops and a slight increase in the total irrigated acreage. Additionally, recently developed agricultural lands are in areas outside of existing water districts and away from surface water sources where groundwater is the only source of water. This information is incorporated in SACFEM2013 by combining recent land use surveys with the historic precipitation record to develop demands that vary in each year of the simulation, with higher demands for groundwater in drier years. While there have been changes in demand since 2010, the range of demands simulated in SACFEM2013 is representative of existing conditions in the Sacramento Valley.

[4] https://water.ca.gov/Library/Modeling---and---Analysis/Central---Valley---models---and---tools/C2VSim

CalSim II demands approximate a 2005 level of development and vary in each year of the simulation. The focus of CalSim II is simulation of the surface water system and operations of the CVP and SWP. Demands for surface water within the Sacramento Valley have been relatively stable since 2005. This can be seen through review of Reclamation delivery data to Sacramento River Settlement Contractors, other water service contractors, and diversion data from other river systems. The majority of surface water demands and the associated water rights and contracts were developed many decades ago and have been stable over the most recent decade.

Comment 7-7

Comment

B. The current RDEIR/SEIS fails to provide data and analyze environmental impacts associated with decreased streamflow due to excessive groundwater withdrawal

In analyzing C2VSim model relating to Butte Creek, the Lower American River, and the Lower Merced, graphs of annual and monthly groundwater discharges to river reaches for the 1920s, 1960s, and 2000s show changes in the groundwater-river flow exchange. A 2013 article using this C2VSim modeling explains:

Net annual groundwater discharges have declined for all three reaches, most dramatically on the American River where the flow direction has reversed. The monthly patterns of stream-aquifer flows for the three reaches have also changed over this time. The large seasonal differences on Butte Creek and the Merced River have been reduced. The large summer groundwater discharge on the American River has been replaced by a nearly constant flow of river water into the aquifer. These changes have impacted flow levels and water temperatures in these reaches, and may have also affected water chemistry.[5]

This is further supported in the 2014 article by the Nature Conservancy titled Groundwater and Stream interaction in California's Central Valley: Insights for Sustainable Groundwater Management which states:

Because even small changes in groundwater levels can lead to potentially significant stream depletion, and given lag times that may take decades, *simply monitoring and subsequently reacting to changes* in observed water level data *is not sufficient* for proper integrated water resource management. Use of models is critical in understanding the timing and spatial extent of pumping effects on surface water systems and managing these impacts accordingly.

Despite the availability of updated modeling and data showing the enormous environmental impacts the lowering of groundwater can have on stream and river flow, the REIR/SEIS fails to fully analyze updated data on these impacts. Further data is needed to quantify what impact decreased groundwater would have on streams and rivers within an impacted basin. This is of

[5] Charles F. Brush, Emin C. Dogrul, and Tariq N. Kadir, (2013), Department of Water Resources *Development and Calibration of the California Central Valley Groundwater---Surface Water Simulation Model (C2VSim), version 3.02-CG*

particular importance given the significant lag time before the impacts on streams are fully realized.

Of the stream data provided, six show that there would be a greater than ten percent reduction in flow. Of concern, Table I-1 shows that eleven creeks would have a reduction in cubic feet per second ("CFS"), but it is unknown whether that reduction would be greater than ten percent. This failure makes assessing the environmental impacts associated with the project impossible. As clearly shown by the monitory results in Table I-1, gauge data can be obtained. Given the numerous streams and rivers impacted by the proposed project, and the limited number of data sets presented in Table I-1, additional gauges would make an understanding of the environmental impacts associated with the lowering of stream levels due to groundwater pumping clearer. To effectively monitor changes in groundwater systems, baseline conditions must be established. The United States Department of Agriculture published the *Technical Guide to Managing Ground Water Resources*[6] which states:

Once the status of existing data is established, areas where additional data are needed can be identified and new data obtained. Examples of needs may include new wells and water levels, *new stream gages and stream flows*, water-quality data, and water-use data.

Further gauging would help to understand the impacts of groundwater pumping. This is of considerable importance considering mitigation measure GW-1 relies on groundwater levels as triggering mechanism to stop pumping, not on streamflow data. However, an environmental impact report must contain facts and analysis, not just the bare conclusions of the agency. *Gray v. County of Madera*, (2008) 167 Cal.App.4th 1099. Due to the lag of impacts on stream flow resulting from groundwater pumping, greater mitigation and data is needed to prevent stream flow reduction that may be occurring prior to the groundwater levels reaching their triggering point. This data must be analyzed, and not simply used to state bare conclusions.

Based on the failures to provide data and analysis regarding impacts to streamflow from the proposed project, the RDEIR/SEIS does not satisfy the requirements of NEPA and CEQA.

Response

Please refer to Response to Comment 7-3 regarding streamflow depletion analysis.

Comment 7-8

Comment

C. The current GW-1 fails to comply with the requirements of CEQA and NEPA

The updated GW-1, as provided in the RDEIR/SEIS is incomplete in providing data, analysis, integration, and clarity regarding measures that would mitigate the environmental impacts of the proposed project.

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[6] Steve Glasser, James Gauthier-Warinner, Joseph Gurrieri, Joseph Keely, United States Department of Agriculture (2007). *Technical Guide to Managing Ground Water Resources*

Starting January 31, 2020 Part 2.74 of the Sustainable Groundwater Management Act ("SGMA") states in section 10720.7(a)(1):

By January 31, 2020, all basins designated as high- or medium-priority basins by the department that have been designated in Bulletin 118, as it may be updated or revised on or before January 1, 2017, as basins that are subject to critical conditions of overdraft shall be managed *under a groundwater sustainability plan or coordinated groundwater sustainability plans pursuant to this part.*

Further, SGMA defines "Sustainable groundwater management" as the management and use of groundwater in a manner that can be maintained during the planning and implementation horizon without causing undesirable results. The definitions for "Undesirable result" includes chronic lowering of groundwater levels, significant and unreasonable reduction of groundwater storage, significant and unreasonable seawater intrusion, significant and unreasonable degraded water quality, significant and unreasonable land subsidence that substantially interferes with surface land uses.

Substantial deference to an agency's methodology is not owed if "the agency has completely failed to address some factor consideration of which was essential to making an informed decision." Brower v. Evans, (9th Cir. 2001) 257 F.3d 1058, 1067. Here, the RDEIR/SEIS fails to discuss multiple factors needed for the public to make an informed decision on project impacts.

First, the RDEIR/SEIS fails in the GW-1 to fully integrate future requirements of SGMA into the proposed project. While the proposed project provides in section 3.3.4.2 that "In areas where quantitative BMOs do not exist, sellers will manage groundwater levels to maintain them above the identified historic low groundwater level (trigger) and will initiate the mitigation plan if groundwater levels reach the trigger." However, the RDEIR/SEIS fails to adopt language relating to the January 31, 2020 SGMA requirements under Water Code § 10735.2(a)(3) that would designate a critically-overdraft basin as "probationary" if DWR, in consultation with the Board, determines that the GSP is inadequate or will not achieve sustainability. This creates a potential conflict between the standards laid out as triggering in the GW-1 with those that may be imposed under California law. Further, the alternative provided to potential sellers to use the "historic low groundwater" may also run afoul of California law requiring high and medium priority basins to be managed under a GSP by January 31, 2022.[7]

Response

The comment asserts that Mitigation Measure GW-1 does not comply with NEPA and CEQA requirements because it does not take into consideration the Sustainable Groundwater Management Act (SGMA) requirements. This assumption is incorrect, as Mitigation Measure GW-1 does take SGMA into consideration. As noted in Mitigation Measure GW-1, "*As Groundwater Sustainability Plans (GSPs) are developed by Groundwater Sustainability Agencies, potential sellers must confirm that the proposed*

[7] Water Code § 10720.7(a)(2)

pumping and the following Monitoring Program and Mitigation Plan verified by Reclamation is compatible with applicable GSP."

It should be noted that groundwater basins within the Seller service area are classified as either medium or high priority and, therefore, SGMA require that the basins are managed under GSPs by January 31, 2022. Because the GSPs for these basins have not yet been developed, an updated estimate of sustainable yield for these basins are not available at this time. Therefore, GW-1 requires management of groundwater levels to existing quantitative Basin Management Objectives (BMOs) or historic low groundwater levels. When GSPs are developed and implemented at a future date, sellers must be in compliance with requirements of the relevant GSP.

Comment 7-9

Comment

Second, the RDEIR/SEIS fails to incorporate new data that would help create a GW-1 that would meet mitigation requirements under NEPA and CEQA. NEPA's purpose is twofold: (1) to ensure that agencies carefully consider information about significant environmental impacts and (2) to guarantee relevant information is available to the public. *Roberson v. Methow Valley Citizens Council,* (1989) 490 U.S. 332, 349. Here, because the GW-1 fails to use updated data and modeling describing the interplay between groundwater and surface water, the GW-1 is inadequate. As described earlier, simply monitoring and reacting to changes in observed water data is not adequate for proper integrated water service management. However, this is exactly what the GW-1 contemplates doing. This is done by waiting until groundwater levels reach GSP levels and or historic lows before discontinuing a seller's ability to pump groundwater. Once groundwater levels raise, the GW-1 would permit pumping by sellers, only to have the groundwater level lower to the trigger point again. Thus, the effect would be to keep groundwater levels at or near the GSP level and/or historic low. These long-term impacts need be fully analyzed with current data, and a proper mitigation plan put in place that would avoid a permanently lowered ground water levels.

In analyzing the issues related to decreased water quality, Section 3.3.3.3.1 states "Inducing the movement or migration of reduced quality water into previously unaffected areas due to groundwater substitution pumping is not likely to be a concern *unless groundwater levels and/or flow patterns are substantially altered for a long period of time*." While the RDEIR/SEIS discounts this possibility due to groundwater substitution being limited to short-term withdrawals, the RDEIR/SEIS fails to fully analyze these impacts using current known science. Importantly, the proposed project would lead to a potential altered level over a long period of time. This is based on the proposed project only limiting pumping when the GSP or historic low level is triggered. However, once the level increases, the assumption is that pumping may resume. This results in the groundwater level continually bouncing around near the historic low level, and not recharging to a typical level were the proposed project not be implemented. This is of serious concern as the continual pumping of groundwater can have wide ranging environment impacts, including: lowering of the water table, increasing costs to the user, reduction of water in streams and lakes, land subsidence, and deterioration of water quality.[8]

Response

Please refer to Response to Comment 7-8 regarding adequacy of Mitigation Measure GW-1 and use of SGMA-related information.

Regarding comments on water quality impacts, as noted in Chapter 2, Description of Alternatives of the RDEIR/SDEIS, groundwater substitution transfers would be limited to the six-month transfer period. Mitigation Measure GW-1, requires transfer related pumping to halt when the groundwater levels trigger is reached and transfer related pumping to not resume until groundwater levels have recovered. However, the measure does not override the description of Proposed Action noting that transfer-related pumping would be limited to within the six- or three-month transfer period.

Comment 7-10

Comment

While the RDEIR/SEIS describes the continued decline in groundwater levels being related to consecutive drought years, the RDEIR/SEIS fails to analyze the known factors of climate change and increased groundwater draw as being of equal or greater concern to the groundwater levels. Further, the RDEIR/SEIS states that implementation of Mitigation Measure GW-1 would avoid permanent subsidence and reduce land subsidence impacts to less than significant. However, language relating to monitoring of subsidence which was included in the FEIR/EIS, appears to not be included in the RDEIR/SEIS. Importantly, land subsidence is not simply an adverse effect through the lowering of the land. Land subsidence to over pumping can lead to the permanent loss of natural water storage. During a recent drought, land in the San Joaquin Valley sank nearly three feet, this translated to a permanent loss of natural water storage capacity of between 336,000 and 606,000 acre feet.[9] In *Clover Valley Foundation v. City of Rocklin*, (2011) 197 Cal.App.4th 200, 236, the Court held "Impermissible deferral of mitigation measures occurs when an EIR puts off analysis or orders a report without either setting standards or demonstrating how the impact can be mitigated in the manner described in the EIR." As discussed below, the changes made in the GW-1 regarding subsidence are unclear making a recirculated RDEIR/SEIS necessary.

Response

Please refer to Response to Comment 2-14 regarding impacts of climate change on the Proposed Action.

The effectiveness of Mitigation Measure GW-1 to avoid permanent land subsidence impacts is addressed in Section 3.3.2.2 of the RDEIR/SDEIS. Mitigation Measure GW-1requires halting of transfers if the groundwater level trigger is reached. The groundwater level trigger defaults to the historic low groundwater level in areas without quantitative BMOs. As noted in the RDEIR/SDEIS, there would be potential for land

[8] https://water.usgs.gov/edu/gwdepletion.html
[9] Ker Than, Stanford News (2017). Groundwater over---pumping is reducing San Joaquin Valley's ability to store water

subsidence in some areas of the basin if groundwater levels decline below historic low levels. Therefore, the monitoring and mitigation requirements in the revised Mitigation Measure GW-1 included in the RDEIR/SDEIS would avoid land subsidence from occurring.

Comment 7-11

Comment

II. THE STRUCTURE OF THE RDEIR/SEIS LEADS TO CONFUSION AS TO WHAT THE PROJECT SCOPE, ENVIRONMENTAL IMPACTS, AND MITIGATION MEASURES ARE BEING APPLIED TO THE PROPOSED PROJECT

The RDEIR/SEIS fails to provide clear guidance as to what portion of reports/statements apply to the project, as language is combined between the RDEIR/SEIS and FEIR/EIS. Due to the lack of clarity regarding what sections apply to the proposed project, the RDEIR/SEIS should be recirculated with language making it clear to the public what information is being used and analyzed regarding the current project.

At the core of the NEPA and CEQA process is the requirement that an agency consider environmental impacts and provide them in a format that ensures the general public has sufficient information to weigh the environmental impacts of the proposed project. This is shown in *Roberson v. Methow Valley Citizens Council*, (1989) 490 U.S. 332, 349, which articulates that NEPA's purpose is twofold: (1) to ensure that agencies carefully consider information about significant environmental impacts and (2) to guarantee relevant information is available to the public. Similarly, regarding CEQA "the purpose of an environmental impact report is to provide public agencies and the *public in general with detailed information* about the effect which a proposed project is likely to have on the environment …" Public Resource Code § 21061.

Here, the format of the RDEIR/SEIS makes it impossible to flush out both the impacts and mitigation measures that the agency is applying to the proposed project. Among other issues parsing out the applicable portions of the two reports, two crucial differences stand out.

Response

Section 1.2 of the RDEIR/SDEIS specifies the sections from the 2014 Draft EIS/EIR that were replaced or modified by this RDEIR/SDEIS. Additionally, Figure 1-1 provides a graphic representation of these changes.

Comment 7-12

Comment

First, the original Draft Environmental Impact Statement and Draft Environmental Impact Report ("DEIS/R") analyzed transfers of water relating to the proposed project of up to 511,094 acre-feet. However, in Section 1.2 of the RDEIR/SEIS the BOR says transfers in a year would be limited to not exceed 250,000 acre-feet. However, the potential seller totals in Table ES-2 add more than 100,000 acre feet of water than those in the FEIR/FEIS ES-2. So, while the RDEIR/SEIS is stating that water transfers would be lower, the new RDEIR/SEIS actually includes more sellers with more totals of possible transfers of water. The RDEIR/SEIS provides no framework as to how or why the limit would be 250,000 acre feet, simply stating that it is "based on buyers' demand for transfers." To provide the public with the information needed to assess the current project, the RDEIR/SEIS must clarify how this trigger of a maximum transfer of 250,000 will be enforced and applied to long-term water transfers. Without this information, the conclusory statements regarding the 250,000 cap make the RDEIR/SEIS incomplete.

Response

Please refer to Common Response 2.

Comment 7-13

Comment

Second, in the FEIR/SEIS the mitigation plan included subsidence impacts, and steps to avoid it. However, the RDEIR/SEIS fails to include in the mitigation plan the language and mitigation regarding subsidence. This leaves the public guessing as to what the final mitigation plan and GW-1 would entail, and how well the GW-1 would prevent negative project related.

Response

Section 3.3, Groundwater Resources, of the RDEIR/SDEIS includes an updated Mitigation Measure GW-1 to address concerns from the District Court. This measure addresses concerns about subsidence by not allowing water transfer-related well pumping below the historic low water levels. As stated in Section 3.3.2.2, "irreversible subsidence would only occur when groundwater levels are below historic low levels." Therefore, the modifications to Mitigation Measure GW-1 would prevent subsidence by monitoring groundwater levels.

Comment 7-14

Comment

A recirculated RDEIR/SEIS should address these areas of confusion in order to provide the public and public agencies the ability understand the impacts and mitigations of the current project.

Response

As noted in Response to Comment 7-11, information regarding the RDEIR/SDEIS document structure has been included in the RDEIR/SDEIS. Some revisions were made to the RDEIR/SDEIS to address other public comments received on the document. However, those revisions do not trigger the criteria for recirculation set forth in CEQA Guidelines section 15088.5. Therefore, recirculation is not necessary.

Comment 7-15

Comment

III. THE REDIR/SEIS FAILS TO PROVIDE THE CORRECT SCOPE OF THE PROJECT AS WELL AS PROVIDE THE CORRECT SCOPE OF PROJECTS RELATED TO CUMULATIVE IMPACTS, RESULTING IN PIECEMEAL CEQA AND NEPA REVIEW

The current project fundamentally changes the flow of both surface and groundwater throughout California. The project will do this by increasing transfers from sellers generally in the north, to buyers in the south. The environmental impacts of taking water from the northern watersheds and transferring it to southern buyers is magnified by the recently amended Coordinated Operating Agreement ("COA"). The failure of the RDEIR/DEIS to include recent amendments to the COA in the scope of the current project amounts to improperly chopping up a large project into small pieces.[10]

On December 12, 2018, DWR and the Bureau of Reclamation ("BOR") reached an agreement to update the COA. Important changes include amending Article 6(c) of the COA to alter the storage withdrawal percentage from the parties. Under the original COA each party's responsibility for making storage withdrawals to meet Sacramento Valley in-basin use was fixed, with the United States percentage at 75% and California at 25%. The amended language reduces the United States percentage to 65% in Dry Years and 60% in Critical years. This alteration may lead to serious environmental impacts yet to be addressed in the present RDEIR/SEIS. These amendments render the underlying water use assumptions that have been discussed regarding the present project inadequate.

Significantly concerning is that at times when water is most scarce, in Dry and Critically Dry years, the SWP may have to divert up to 15% more water outside of the SWP system. This will compound environmental issues during years when environmental impacts are the most severe due to water shortage. In addition, the water year classifications are based on Sacramento Valley 40-30-30 Index. However, the likelihood of prolonged drought and unpredictable weather patterns is only expected to increase due to continued changes in our climate.[11] Thus, the clear risk is that California will repeatedly fall into water year classifications of Dry and Critically Dry years. Alarmingly, these are the exact years that SWP will have to contribute more water to meet Sacramento Valley in-basin use.

Thus, the COA amendments changed the frequency, amount, and timing of the taking of water from drainages in California. The current project also will change the frequency, amount, and timing of taking water from drainages in California. The COA amendments and the current project both relate specifically to the transferring of water as well as include the Central Valley Project as a primary participant. Thus, the impacts of both would need to be analyzed to fully grasp the amount of water that will be taken and transferred from the various impacted watersheds and groundwater basins.

Response

Please refer to Response to Comment 2-7.

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[10] CEQA mandates "that environmental considerations do not become submerged by chopping a large project into many little ones, each with a minimal potential impact on the environment, which cumulatively may have disastrous consequences." (Bozung v. Local Agency Formation Com. (1975) 13.3d 263, 283-284.)

[11] "The odds of California suffering droughts at the far end of the scale, like the current one that began in 2012, have roughly doubled over the past century" Justin Gillis, "Hotter Planet Fuels Drought, Scientists Find", New York Times, 2015, A1

Comment 7-16

Comment

Additionally, section 3.8.6 states "The projects considered for the vegetation and wildlife cumulative condition are the SWP water transfers, CVP Municipal and Industrial Water Shortage Policy (WSP), Lower Yuba River Accord, refuge transfers, San Joaquin River Restoration Program (SJRRP), and Exchange Contractors 25-year Water Transfers …" However, the failure of the RDEIR/SEIS to include the California WaterFix ("WaterFix"), Water Supply Contract Amendments ("WSCAs"), and the Contract Extension projects in the scope of the current projects cumulative impacts amounts to improperly chopping up a large project into small pieces.[12] Here, the proposed project would increase the taking of water from sellers, diverting water from the source watersheds, and transferring it to buyers in different water service areas. These impacts would clearly be magnified by the proposals to increase water transfers through the State Water Project WSCAs, and increase supply created by the WaterFix to be transferred and exchanged at an increased rate. This would be then guaranteed over a long-term time horizon due to the contract extension project. This in turn would lead to greater flows of water being moved from PWAs, leading to greater amounts of water being diverted from watersheds and moving to differing uses. This impact would also occur over longer term due to the contract extension. Thus, the projects in *conjunction* would increase impacts over a longer time horizon. These additional projects, not included in the RDEIR/SEIS, would magnify impacts of the proposed project because of the significant overlap of groundwater basins, watersheds, and service areas of the proposed project. This includes the cumulative impacts of the projects on the Delta. This failure creates an inability for the public and public agencies to seriously analyze the environmental impacts of the project.

As the RDEIR/SEIS does not currently address environmental issues raised by the COA amendments, all Environmental Impacts have not been identified. A full analysis, along with data showing what impacts the COA amendments will have on the current project, as well as analyzing the correct scope of cumulative project impacts is needed to provide the public with a clear understanding of the environmental impacts of the current project.

Response

The EIS/EIR considered the California WaterFix when identifying cumulative projects. However, since the release of this document DWR has withdrawn from the previously permitted California WaterFix project and is beginning environmental review and planning for a smaller, single tunnel project (California Natural Resources Agency 2019). Due to proposed changes, the California WaterFix is no longer a reasonably foreseeable project.

CVP and SWP contracts are included in existing conditions, the No Action Alternative, and the action alternatives. Please refer to Response to Comment 2-7 for additional information regarding COA.

[12] CEQA mandates "that environmental considerations do not become submerged by chopping a large project into many little ones, each with a minimal potential impact on the environment, which cumulatively may have disastrous consequences." (Bozung v. Local Agency Formation Com. (1975) 13.3d 263, 283-284.)

Comment 7-17

Comment

IV. THE RDEIR/SEIS FAILS, UNDER BOTH NEPA AND CEQA, TO PROVIDE DATA AND ANALYZE IMPACTS ASSOCIATED WITH CLIMATE CHANGE

The Court in *AquaAlliance v. U.S. Bureau of Reclamation*, (2018) 287 F.Supp.3d 969, 1028 stated "the parties appear to be in agreement that NEPA requires an evaluation of the impact of climate change on a project, at least under certain circumstances." The Court went on to hold that "the FEIS/R fails to address or otherwise explain how this information about the potential impacts of climate change can be reconciled with the ultimate conclusion that climate change impacts to the Project will be less than significant." (*Id.* At 1032)

The FEIR/EIS relied on reports showing that the snow water equivalent in California is projected to decrease by 16 percent by 2035, 34 percent by 2070, and 57 percent by 2099. The relied on reports also projected that late spring streamflow could decline by up to 30 percent. (*Id.* at, 1028.) The Court in *AquAlliance*, in discussing whether the FEIR/EIS was sufficient regarding Climate Change initially stated "Plaintiff's point out, correctly, that the record supports a finding that climate change will have an impact on the water supply, which will in turn put pressure on California's water resources which are already fully utilized by the demands of growing economy and population. (*Id*. At 1027) However, the Court went on to state "Plaintiffs fail to point to record evidence substantiating their position that the Project may exacerbate impacts to water supply caused by climate change. (*Id*. At 1028) The evidence here clearly shows that the proposed project environmental impacts would clearly be exacerbated by climate change.

The proposed project will take water from groundwater and surface water resources and transport them from the basins and watersheds from which they flowed. Section ES.5.2 clearly states this would be in amounts of hundreds of thousands of acre feet. Table ES-4 in the FEIR/EIS acknowledges that the proposed project would have impacts on a wide range of environmental areas that are also projected to be impacted by climate change. BOR concluded that the impacts to these areas would vary in levels of significance, but nonetheless lists that the project would impact multiple areas that overlap with those impacted by climate change. Table ES-4 in the FEIR/SEIS show these include (1) Groundwater substitution transfers could decrease flows in surface water bodies (2) Water supplies on the rivers downstream of reservoirs could decrease following stored reservoir water transfers (3) Changes in Delta diversions could affect Delta water levels (4) Cropland idling/shifting transfers could change the water quality constituents associated with leaching and runoff (5) water transfers could change river flow rates in Seller Service Area and could affect water quality (6) Groundwater substitution transfers could cause a reduction in groundwater levels in the Seller service area. These are but a few of the listed impacts from the FEIR/SEIS table ES-4. All these impacts would be exacerbated by the newest climate change studies.

California's driest consecutive four-year period occurred from 2012 to 2015.[13]The future California faces as result of climate change, based on recent projections, is stark. According to the Fourth Assessment's latest projections, temperatures in California could rise between 2.5 and 2.7 degrees Fahrenheit early this century.[14] According to the Fourth Assessment, by 2050, the state's average water supply from snowpack in the Sierra Nevada is projected to decline by two-thirds compared to historic levels. This is highly important, as "A snow drought, where higher temperatures under climate change reduce snowmelt and change the timing of runoff, will affect imported surface water supplies that many groundwater basin managers rely on for consumptive use and for groundwater storage."[15] These impacts clearly exacerbate the acknowledged impacts the project has on the environment.

Despite numerous articles, including the updated *California's Fourth Climate Assessment*, the RDEIR/SEIS fails to incorporate data and considerations, along with analyses of the projects' environmental impacts with current data. In *AquaAlliance v. U.S. Bureau of Reclamation*, 287 F.Supp.3d 969, 1031, the Court stated "the FEIS/R fails to address or otherwise explain how this information about the potential impacts of climate change can be reconciled with the ultimate conclusion that climate change impacts to the Project will be less than significant." Thus, the Court provided a roadmap to an analysis that was needed to determine environmental impacts associated with, and exacerbated by, climate change. Despite this, in section 3.6.2.4 the RDEIR/SEIS makes the conclusory statement "Therefore, impacts to the proposed action from climate change would be less than significant, since the annual demands, supplies and frequency of transfers do not change much under the without climate and with climate change (Central Tendency) scenarios." The public is left to scratch their head at what, "do not change much" standard is referring to. According to Table 3.6-2, the Central Tendency climate change model would increase existing condition transfer demand and supply by 22 percent. This can have enormous environmental and ecological impacts, yet this increase is discounted as "not changing much."

Due to this lack of data and analyses, the RDEIR/SEIS is fundamentally incomplete and must be recirculated with current data, analyses, and appropriate mitigation measures to address climate change.

Response

Please refer to Common Response 1 and Response to Comment 2-12 regarding CEQA requirements for analysis of climate change impacts on the project.

In response to the District Court ruling regarding NEPA analysis of climate change, the Lead Agencies conducted a quantitative evaluation of climate change impacts on the project, namely water supplies and demands for transfers. Using the CalLite-CV model, the Lead Agencies evaluated three climate change scenarios as compared against the No Climate Change scenario. The scenarios include two extremes (Hot-Dry and Warm-

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[13] Office of Environmental Health Hazard Assessment, California Environmental Protection Agency (2018). *Indicators of Climate Change in California.*

[14] Bruce Lieberman, Yale Climate Connections (2018). *California and Climate Change: Here's what to expect*

[15] Ruth Langridge, Stephan Sepaniak, Amanda Fencl, Linda Esteli Mendez Barrientos, California Natural Resource Agency (2018). *Management of Groundwater and Drought Under Climate Change*

Wet) and a Central Tendency, which is in the middle of the range of all the projected temperatures and precipitations. Results are summarized in Table 3.6-2. Transfer demands would increase by 14,000 acre-feet and supplies would increase by 16,000 acre-feet under the Central Tendency scenario relative to the No Climate Change Scenario. There would be 3 additional years of transfers under the Central Tendency Scenario. These are not substantial differences relative to the No Climate Change Scenario. The analysis concludes that there would be available transfer supply to meet increased demands under a climate change scenario and therefore, climate change would not significantly affect whether or how potential water transfers within the scope of the Proposed Action could be implemented. The climate change modeling conducted for the RDEIR/ SDEIS did not change the conclusions from the previous document that the impacts to the Proposed Action from climate change would be less than significant. This analysis is presented in Section 3.6 and Appendix J of the RDEIR/SDEIS (renamed Appendix K).

Comment 7-18

Comment

V. THE RDEIR/SEIS FAILS TO PROVIDE DATA AND ANALYZE CUMULATIVE IMPACTS ASSOCIATED WITH THE PROJECT

In *AquaAlliance*, the Court held that “the record suggests that the present condition of the Delta is already precarious, due in part to reduced Delta outflows. (*Id*. At 1036) The Court went to hold that the cumulative impacts analysis does not pass muster “because the thresholds utilized do not take into account existing conditions in the Delta. (*Id*. At 1037) In an analysis of the Delta Smelt, 2019 BA states under 2.15.4:

Recent research combining long-term monitoring data with three-dimensional hydrodynamic modeling shows that the spatial overlap of several of the key habitat attributes described above increases as Delta outflow increases (Bever et al. 2016). This means that higher outflow, which lowers salinity of Suisun Bay and Suisun Marsh, increases the suitability of habitat in the estuary by increasing the overlap of some, but not necessarily all, needed elements.

Response

The cited text is not from the Long-Term Water Transfers Biological Assessment (BA) but appears to be from the BA on the *Reinitiation of Consultation on the Coordinated Long-Term Operation of the Central Valley Project and State Water Project*. The cited study, Bever et a. 2016, considered salinity, current speed, and turbidity metrics to predict Delta Smelt catch at different stations in the Delta. This study found that increased Delta outflow improves these metrics for Delta Smelt.

The RDEIR/SDEIS included a revised cumulative analysis of Delta outflow and potential effects on fish. Water transfers would increase Delta outflow during the period when transfers are moving through the Delta, but Delta outflow would decrease a small amount later as surface water and groundwater storage is refilled. The 2014 Draft EIS/EIR analysis focused on the small size of the change in outflow, but in response to the District Court's ruling, the revised analysis also considers the timing of the changes in outflow. The decreased Delta outflow would be at times of higher Delta outflow, when conditions are already good for fish and a small change would not cause adverse effects. Please refer to Response to Comment 2-16 for additional information.

Comment 7-19

Comment

Regarding land subsidence, section 3.3.6.1.1 states that "This subsidence would not likely result in substantial risk to life or property; however, the existing subsidence along with future increases in groundwater pumping in the cumulative condition could cause potentially significant cumulative effects." However, the updated GW-1 appears to have less monitoring and protection for land subsidence than the FEIR/EIS. Unless clarified, it appears the entire proactive monitoring regarding land subsidence was removed from the GW-1 in the current RDEIR/SEIS. Because the GW-1 appears wholly inadequate to prevent subsidence in particular, the RDEIR/SEIS mitigation would not make the cumulative impact of subsidence insubstantial.

Response

Please refer to Response to Comment 7-13.

Comment 7-20

Comment

As to cumulative impacts to water quality, section 3.3.6.1.1 states "most of the Seller Service Area has high quality groundwater and changes in groundwater flow patterns should not cause migration of poor quality groundwater. Therefore, the Proposed Action in combination with other cumulative actions would not result in a cumulatively significant impact related to groundwater quality." It should be noted that the Redding Area Groundwater Basin has, as stated in section 3.3.1.2.1 areas of high salinity (poor water quality) along with localized high concentrations of boron. The Sacramento Groundwater Basin has, from 1994-2000 data, shown 5% of public water supply wells failing to meet the maximum contaminant levels. In addition, section 3.3.6.1.1 states, that "SWP transfers and the Tuscan Aquifer Investigation Project would increase pumping within (or near) seller service area." In sum, seller service areas have areas of poor water quality throughout both basins, and there is the potential due to cumulative impacts of the movement or mobilization of poorer quality groundwater into existing wells. However, the RDEIR/SEIS states "most of the Seller Service Area has high quality groundwater and changes in groundwater flow patterns should not cause migration of poor quality groundwater." The basis for this assertion is unclear, as there is no data and analyses as to potential water movement or mobilization discussion regarding the cumulative projects or the areas with poor water quality. Groundwater moves from areas of high water-levels altitudes to areas of low water-level altitudes.[16] Given the known areas of poor water quality, along with the multiple monitoring sites and modeling of each basin, data could be presented that would show risk areas due to groundwater pumping in certain locations that would lead pockets of poor water quality to flow

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[16] Welch, W.B., Frans, L.M., and Olsen, T.D., 2014, Hydrogeologic framework, groundwater movement, and water budget of the Kitsap Peninsula, west-central Washington: U.S. Geological Survey Scientific Investigations Report 2014-5106, 44 p., *http://dx.doi.org/10.3133/sir20145106.*

to pockets of higher quality water, thus leading to possible contamination. Based on the lack of analysis and data on the projects cumulative impacts on wildlife, subsidence, water quality, and water supply the RDEIR/SEIS should be recirculated with this additional data.

Response

Section 3.3, Groundwater Resources of the RDEIR/SDEIS notes that areas of high salinity are found along the western basin margins of the Redding Area Groundwater Basin which is outside the Seller Service Area. This information is consistent with the information provided in the Anderson-Cottonwood Irrigation District (ACID) Groundwater Management Plan (ACID 2006) and Groundwater Quality in the Northern Sacramento Valley (United States Geological Survey [USGS] 2011c). As noted in Section 3.3.6.1 of the RDEIR/SDEIS, groundwater quality within the Seller Service Area is generally of high quality and Proposed Action in combination with other cumulative actions would not result in a cumulatively significant impact related to groundwater quality.

Comment 7-21

Comment

VI. THE RDEIR/SEIS FAILS TO PROVIDE DATA AND ANALYSE ON THE ALTERNATIVE OF WATER CONSERVATION & REUSE

Throughout the RDEIR/SEIS, BOR and SLDMWA discuss the no project alternative. However, the RDEIR/SEIS does not provide data and analysis regarding an alternative of lowering long-term water transfer amounts and supplementing demand through water conservation.

Water recycling is increasing in California, and is beneficial in that it "provides drought-resistant, cost-effective water supply for local communities, and there are huge opportunities to increase water recycling in the future."[17] Projections for recycled water say that recycled water could augment water supply by 1.8 million to 2.3 million acre-feet per year by 2030.[18] Additionally, State Water Resources Control Board adopted Resolution No. 2018-0057 on December 11, 2018. In addition, the Final Staff Report with Substitute Environmental Documentation Re: Amendments to the Water Quality Control Policy for Recycled Water put out by the State Water Resources Control Board ("SWRCB") was conducted on December 11, 2018. The report addresses goals regarding recycled water goals, mandates, storm water goals, and conservation goals. The RDEIR/SEIS should provide data and analysis, in a portfolio approach, regarding decreased long-term water transfers amounts in the project being offset by reuse and conservation.

The benefits of including updated data and regulations regarding water reuse and conservation when analyzing an alternative would be significant. Lowering total water transfers in the proposed project would lead to less water being diverted from basins and watersheds in the north to those in the south. Out of basin and watershed transfers have significant negative environmental impacts. The RDEIR/SEIS acknowledges the project would lead to a lowering of

[17] ttps://www.nrdc.org/experts/doug---obegi/california---recycled---water---survey---shows---more---work---be---done
[18] Natural Resource Defense Council & Pacific Institute, (2014) *Issue Brief: Water Reuse Potential in California*

groundwater levels due to pumping, less water flowing in streams and rivers, and less water reaching the Delta.

The failure to include in the RDEIR/SEIS an alternative to the proposed project that would lower total water available through long-term water transfers, with the lower water supplemented by reuse and conservation programs, renders the RDEIR/SEIS incomplete.

Response

The process to develop alternatives is documented in Appendix A. Appendix A documents the Lead Agencies considered conservation and reuse (and other alternatives) during the alternatives development process. The Lead Agencies evaluated potential alternatives based on their ability to meet key elements of the purpose and need and basic project objectives. Alternatives should be immediately implementable and flexible, and should provide additional water supplies. The alternatives that moved forward for more detailed analysis in the 2015 Final EIS/EIR are those that best meet the NEPA purpose and need and CEQA objectives, minimize negative effects, are potentially feasible, and represent a range of reasonable alternatives.

The challenge to the 2015 Final EIS/EIR included claims that additional alternatives, including conservation and reuse, should have been evaluated in detail in the 2015 Final EIS/EIR. As was explained to the challengers and to the District Court, these alternatives were eliminated from further consideration because they would not "provide substantial water" during shortages, which was one of the criteria considered in Appendix A. The District Court thus rejected the challengers' claims regarding alternatives and specifically found that "Plaintiffs have failed to demonstrate that the inclusion of 'provide substantial water' criterion is improper or was improperly applied." The ruling is final, and this issue cannot be reasserted.

Comment 7-22

Comment

VII. THE REDEIR/SEIS FAILS TO COMPLY WITH CEQA AND NEPA PROVIDING INCOMPLETE DATA AND ANALYSES REGARDING PROJECT IMPACT TO VEGETATION AND WILDLIFE

The RDEIR/SEIS discusses a variety of impacts on the various water systems resulting from the proposed project. Each of these individual impacts has far reaching environmental impacts that need to be analyzed.

Multiple reservoirs would have significantly lower average end-of-month water storage. Section 3.8.2.3.2 states Camp Far West Reservoir would have in the range of 10.8 to 21.9 percent lower end-of-month storage from July through September during critical water years. Table 3.8-1 shows that Hell Hole, French Meadows, and Lake McClure would have significantly less water under the proposed project in a variety of year types. Despite this, the RDEIR either fails to address and analyze these impacts and/or concludes that they do not need to be addressed due to transfers occurring in the "normal range of operations." This conclusion ignores the responsibility to address a known environmental impact, and not avoid analyses by reaching conclusions without data. The significant lowering of water levels raises a variety of environmental issues. One potential impacts is temperature changes in water due to lower reservoir levels, and the ability to release cooler water downstream for aquatic species. Temperature in reservoirs impacts dissolved-oxygen concentration in water, which is important to aquatic life.[19] Additionally, reservoir temperature and cold water pools are critical for helping regulate water temperature for aquatic life. An example of this is discussed in *Shasta Temperature Management Plan – Key Components*, which stated "Last year, due to lack of ability to regulate water temperatures in the Sacramento River in September and October, water temperature rose to greater than 60 degrees F." This change reduced early lifestage survival of winter run Chinook in the Keswick to Red Bluff section of river from 27 percent in 2002-2012 to 5 percent in 2014. This is but an example of clear impacts the proposed project can have on the environment due to chronic lowering of reservoir levels. The RDEIR/SEIS fails to fully analyze the environmental impacts the project will have as a result of lower average reservoir levels.

Response

As discussed in the RDEIR/SDEIS, Hell Hole and French Meadows Reservoirs operate under existing licenses and permits that that aim to protect natural resources, including special-status plant and wildlife species and natural communities. Water transfers authorized from those reservoirs would be required to comply with those requirements. Camp Far West Reservoir is stocked with sport fish and is not known to support any special-status plant or wildlife species or natural vegetation communities that would be affected by additional reductions in reservoir levels in critically dry years. Shasta Reservoir is operated according to the Reasonable and Prudent Alternative (RPAs) as discussed in the 2009 NMFS and FWS BiOp.

Comment 7-23

Comment

Multiple river and stream flows will be impacted by the proposed project. Table I-1 shows that eleven of the monitored creeks would have a reduction in cubic feet per second ("CFS"), but it is unknown whether that reduction would be greater than ten percent. This failure makes assessing the environmental impacts associated with the project impossible. Further, six creeks monitored would have a greater than 10 percent reduction in flow during certain year classes. In discussing specific impacts to stream drainages, the RDEIR/SEIS states that it would be possible that Cache Creek could have up to 31 percent lower water in critical years during November. Stony Creek could see flows reduced by 10 percent during October in critical water years. The RDEIR/SEIS not only fails to provide data and analyze impacts related to reduced flow, but also timing of flow routings in streams and rivers. It is well accepted that flow routings have large impacts on ecosystem functions.[20] Altering flow variability changes the characteristics of a river system.[21]

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[19] USGS https://water.usgs.gov/edu/temperature.html

[20] "Flow routings have potentially large impacts on ecosystem functions, such as primary and secondary production in pelagic food webs that sustain native fish.." *San Francisco Estuary and Watershed Science,* Vol. 5, iss. 3 [July 2007] pg. 13

[21] "Flow variability is an important characteristic of river systems, with implications for river geomorphology, ecology, and human uses" *Catchment Dynamics and River Processes: Mediterranean and Other Climate Regions*, (2005) G. Mathias Kondolf and Ramon J. Batalla.

The proposed project will undoubtedly change the flow variability on multiple rivers and streams throughout California. Further, the taking of water from sellers north of the Delta leads to a compounding of impacts as drainages downstream of the point of diversion will directly suffer due to the lower flow from the taking upstream. Based on the failures to provide data and analysis regarding impacts to streamflow from the proposed project, the REIR/SEIS does not satisfy the requirements of NEPA and CEQA.

Response

Impacts on vegetation and wildlife related to reduced flows are acknowledged in Section 3.8 Vegetation and Wildlife, on page 3.8-10 of the RDEIR/SDEIS, and potential impacts on special-status species and natural communities are discussed in Section 3.8.2.4.3 for special-status plants, Pacific pond turtle, migratory birds, and natural communities.

Comment 7-24

Comment

The RDEIR/SEIS fails to provide data and analyze the cumulative impacts the project would have on wildlife and vegetation in combination with other projects. The RDEIR/SEIS states in Section 3.8.6.1.2 that the proposed project would not have a significant cumulative effect on vegetation and wildlife resources. On January 31, 2019, the BOR released the Final Biological Assessment regarding the *Reinitiation of the Consultation on the Coordinated Long-Term Operation of the Central Valley Project and State Water Project* ("BA"). The newly filed BA addresses numerous cumulative impacts to wildlife based on the actions that include the proposed project. This report includes updated information regarding multiple species, including the Giant Garter Snake, and the status and potential threats these species face from ongoing proposed projects. Section 7.3.8 states "The proposed action may result in loss of up to 1,049 acres of giant garter snake aquatic and upland habitat. Reclamation will discuss appropriate mitigation ratios with USFWS. The proposed action may affect, is likely to adversely affect, *Giant Garter Snake*." Regarding the Delta Smelt, the BA states "while the proposed action is likely to have some beneficial effects, it is likely to adversely affect *Delta Smelt*." The ESA listed the western DPS of the Yellow-Billed Cuckoo as threatened on October 3, 2014. The 2019 BA lists the critical habitat along the Sacramento River south of Red Bluff in Tehama County to Colusa, California. Current threats include alterations to hydrology. These are but some of the many species that will be negatively impacted by the cumulative effects of the proposed project.

The current RDEIR/SEIS fails to address updated information in the BA. One concern relates to the Yellow-Billed Cuckoo which was listed as threatened in October 3, 2014. The area of critical impact appears to overlap with areas that would be impacted by the proposed project. A listed threat of the Cuckoo includes alterations to hydrology, which the current project impacts. Additionally, the RDEIR/SEIS does not fully address the updates regarding recovery and management with the Giant Gartner Snake.

The RDEIR/SEIS does not appear to have incorporated BA data and analysis into their review of environmental impacts. Data is not provided regarding impacts to multiple species created by the project. Based on the failure to provide data and analyze the data, as well as provide scientifically supported mitigation measures, the RDEIR/SEIS is inadequate.

Response

As stated on Page 3.8-41 of the RDEIR/SDEIS, the Proposed Action's potential effects on groundwater-dependent natural communities would be insubstantial. Additionally, the cumulative effect of the Proposed Action, in combination with SWP water transfers and the WSP, would be less than significant in relation to groundwater dependent natural communities and special-status wildlife. As described on Page 3.8-28, groundwater modeling shows that shallow groundwater levels are more than 15 feet below ground surface in most locations that could be affected by groundwater substitution, and so potential impacts on natural communities are expected to be less than significant. Implementation of Mitigation Measure GW-1 described in Section 3.3.4 of the RDEIR/SDEIS would further minimize potential impacts to natural communities in areas where existing groundwater depths are less than 15 feet below ground surface because deep-rooted vegetation within 0.5 mile of pumping wells will be monitored and a mitigation plan will be implemented to offset any substantial vegetation loss.

Within the Sellers Service Area dense riparian forests represent suitable nesting habitat for Yellow-Billed Cuckoo. However, Proposed Action would not substantially alter flows within these larger river systems that would attribute to loss of these extensive riparian habitats. Proposed Actin will not alter water allocations to wildlife refuges that may also support Yellow-Billed Cuckoo habitat. Because rice fields do not provide suitable nesting or foraging habitat for Yellow-Billed Cuckoos, crop idling/shifting action would not result in the loss of foraging or nesting habitat for this species.

The BA for the Coordinated Long-Term Operation of the Central Valley Project and State Water Project referenced by the commenter evaluates numerous state and federal water projects extending from the Trinity River Watershed south to San Joaquin River Watershed and while the action area evaluated in the BA overlaps with the Proposed Action it does not address the Proposed Action specifically. Therefore, the referenced BA is not directly applicable to the Proposed Action.

See Response to Comment 2-23 related to the final updated 2017 Recovery Plan for giant garter snake.

Comment 7-25

Comment

VIII. CONCLUSION

California faces ever increasing challenges regarding our water supply. As our understanding grows of the interconnectedness of the natural flow of water throughout our state, we have also increased our understanding into how water flow impacts the environment around us. While we have learned much about our water systems, much remains uncertain and poses extreme challenges. These challenges include impacts from our changing climate, how groundwater is best managed, and long-term environmental impacts from taking water and lowering surface and groundwater levels across the state. With this complex and evolving backdrop, the NEPA and CEQA process has become crucial in how best to manage our water resource. Most importantly, the EIR/EIS provides a tool to inform the public about what environmental impacts a project will have on the environment. It is only with this knowledge the public can best understand the threats a project poses to our environment. Upon providing this understanding through current data and analysis, the EIR/EIS process can than formulate rational ways to mitigate adverse impacts. Here, the RDEIR/SEIS fails provide data and analyses to inform the public so that they can understand what impacts this project poses to their environment. Without this understanding, determining proper mitigation and/or project alternatives is not possible.

Response

The 2014 Draft EIS/EIR and the RDEIR/SDEIS analyze the potential environmental effects of the Action Alternatives compared to existing conditions (under CEQA) and the No Action/No Project Alternative (under NEPA) to the environment. In doing so, the RDEIR/SDEIS analysis used the best available tools: (1) impacts of climate change on action alternatives, (2) potential impacts of action alternatives on climate change, (3) impacts from action alternatives on groundwater resources, and (4) impacts from action alternatives on streamflow depletion that would adversely impacts water supply or vegetation and wildlife.

Comment Letter 8, Pedro Villalobos, California Department of Water Resources

Comment 8-1

Comment

The Department of Water Resources (DWR) has reviewed the Revised Draft Environmental Impact Report/ Supplemental Draft Environmental Impact Statement (RDEIS/SDEIR) for the Long-Term Water Transfers (State Clearinghouse # 2011011010).

Under the Alternative 2 (Proposed Action), every year from 2019 through 2024, a number of entities upstream of the Sacramento-San Joaquin Delta (hereinafter referred to as Sellers) would transfer up to 250 thousand acre-feet (TAF) per year of water to willing buyers downstream of the Sacramento-San Joaquin Delta (hereinafter referred to as Buyers) to reduce the water supply shortage effects of the Central Valley Project (CVP). The transfer water would be made available through a combination of groundwater substitution transfers, cropland idling transfers, and reservoir release transfers.

As some of the transfers contemplated in the Proposed Action will be approved by DWR and/or conveyed through State Water Project facilities, DWR has an interest in how the Proposed Action and its impacts are described. As such, DWR offers the following comments on the RDEIS/SDEIR.

Response

As noted in the RDEIR/SDEIS, proposed water transfers that would require use of non-CVP facilities would require approval and facilitation by DWR. See responses below regarding specific comments raised on the RDEIR/SDEIS.

Comment 8-2

Comment

Some data and information referenced in the RDEIS/SDEIR to describe the affected environment are out of date and do not reflect latest conditions, such as the recent drought ended in 2016 and updates to groundwater subbasin boundaries. For example, Section 3.3.1.1 Area of Analysis lists the West Butte subbasin, which does not exist anymore due 2018 SGMA basin boundary modification; and the Sacramento Valley well depths in Table 3.3-4 were based on DWR 2003 data.

Response

The Affected Environment discussion in Section 3.3, Groundwater Resources of the RDEIR/SDEIS has been updated.

Comment 8-3

Comment

DWR recommends updates to the RDEIS/SDEIR description of the Sacramento Valley groundwater pumping-related land subsidence in Section 3.3.1.2.2 to reflect the latest findings from the 2017 GPS Survey Report of the Sacramento Valley Subsidence Network that DWR released on January 29, 2019. This report shows land subsidence in the following areas:(1) up to 2.14 feet in the Arbuckle area in Colusa County, (2) 0.3 to 1.1 feet in Yolo County, (3) 0.44 to 0.59 feet in Glenn County, and (4) 0.20 to 0.36 feet in Sutter County between 2008 and 2017. Most subsidence occurred during the 2014 and 2015 drought due to record low groundwater levels and record amounts of groundwater extraction. In Section 3.3.1.2.1, the RDEIS/SDEIR states there is no land subsidence monitoring in the Redding Area Groundwater Basin, which is inconsistent with DWR's 2019 report. In this same section, under Land Subsidence, the discussion of the geology related to the Seller's location needs to be more comprehensive.

Response

The Affected Environment discussion in Section 3.3, Groundwater Resources of the RDEIR/SDEIS has been updated.

Comment 8-4

Comment

Moreover, DWR has been conducting field experiments to update the consumptive use of different crop types, including rice, and applied the latest data in the 2018 California Water Plan Update. It is important to apply the latest available data and science for the Proposed Action, like DWR land and water use studies (https://water.ca.gov/Programs/Water-Use-And-Efficiency/Land-And-Water-Use).

Response

The range of potential water transfers covered in this document would use the evapotranspiration of applied water (ETAW) reported in the 2018 California Water Plan Update. The total cropland idling acreage would be limited to 60,693 acres of rice annually per the upper limit in the Long-Term Water Transfers 2019-2024 Biological Assessment (See Table 2-5 of the Biological Assessment). The EIS/EIR and the

Biological Assessment both use an ETAW of 3.3 acre-feet/acre and this value is higher than the reported 2.55 acre-feet/acre in the 2018 California Water Plan (DWR 2018). Therefore, assuming the same idled acreage, the maximum volume of water transferred through cropland idling would be lower than the amount analyzed in the EIS/EIR and the Biological Assessment by approximately 45 TAF. Therefore, the impacts from using the ETAW reported in the 2018 California Water Plan would be less severe than the impacts analyzed in this EIS/EIR and the Biological Assessment.

Comment 8-5

Comment

As a likely responsible agency, DWR has an interest in ensuring that land subsidence is properly monitored and addressed. Under Mitigation Measure GW-1, the RDEIS/SDEIR provided a monitoring program that relies solely on groundwater level triggers from different Groundwater Management Plans (GMP) as a proxy to monitor the occurrence of land subsidence. It appears that GMPs for the Sacramento Valley have very little to no quantitative criteria. Also, some Sellers' areas may not have sufficient data to sufficiently demonstrate what the historic low groundwater levels are and, as such, relying on groundwater levels to avoid land subsidence may not be appropriate. In such cases, DWR recommends, in addition to groundwater level monitoring, land surface elevation survey prior to, during, and after the groundwater substitution transfer, to directly monitor land subsidence in the vicinity of Seller's region.

Response

As noted in Response to Comment 7-10, the monitoring and mitigation requirements in revised Mitigation Measure GW-1 included in the RDEIR/SDEIS would avoid permanent land subsidence from occurring by halting transfers if historic low groundwater levels are reached. For wells with a short period of record, the historic low groundwater level would be set to the lowest groundwater level within the period of record. Since this groundwater level would likely be higher than the historic low during the drought period, the groundwater level triggers (described below) would be more restrictive (i.e., the lowest recorded groundwater level could be reached more quickly during transfer-related pumping than occurred in the short period of record when groundwater levels were higher.

Comment 8-6

Comment

In addition, while not discussed or updated in the REIS/SEIR, DWR notes that Mitigation Measure WS-1 of the Long-Term Water Transfers Final Environmental Impact Statement/Environmental Impact Report states that the minimum streamflow depletion factor will be 13 percent, but this factor may be adjusted based on additional information. Additional information related to streamflow depletion is likely to be developed in the near future as Groundwater Sustainability Plans (GSP) that cover the Sellers' areas are adopted and implemented. As contemplated in Mitigation Measure WS-1, DWR, along with the U.S. Bureau of Reclamation, will assess and determine the appropriate streamflow depletion factor based on the new technical information that is developed during GSP development and implementation, or in some other context.

Response

Mitigation Measure WS-1 includes a provision that the streamflow depletion factor may be modified based on additional information, such as a GSP, but must be a minimum of 13 percent.

Comment 8-7

Comment

Lastly, since DWR will be approving or facilitating certain transfers under the Proposed Action, DWR offers its assistance in the review of the completeness and quality of the transfer proposal on a case-by-case basis, including but not limited to: (1) the groundwater level monitoring well network, (2) groundwater level triggers, and (3) mitigation plans, to ensure less than significant impacts from the Proposed Action and protect California natural resources.

Response

As noted under Mitigation Measure GW-1, potential sellers are required to submit monitoring data for Reclamation and, where appropriate, DWR review. Therefore, Reclamation and SLDMWA would require DWR's assistance in reviewing and evaluating the completeness of the transfers proposal and ensuring impacts are less than significant.

Comment 8-8

Comment

The RDEIS/SDEIR should be updated with the latest data and information to better reflect the current environmental setting. Also, additional land subsidence monitoring may be more appropriate in certain areas and under certain circumstances.

DWR would appreciate copies of any subsequent environmental documentation. Please send any future correspondence relating to the proposed Project to:

Response

As noted in Responses to Comments 8-1 and 8-2, the Affected Environment section of Section 3.3, Groundwater Resources will be updated with the latest data and information.

The Final EIS/EIR will be made available for public review. If the project is approved by SLDMWA and Reclamation, the ROD will be posted in accordance with legal requirements. Both documents will be made available for public review on Reclamation website: https://www.usbr.gov/mp/nepa/nepa_project_details.php?Project_ID=18361. Copies of the Final EIS/EIR will be provided to each party that provided comments on the RDEIR/SDEIS or 2014 Draft EIS/EIR. Thank you for your comment.

Comment Letter 9, Barbara Vlamis, Bill Jennings, Carolee Krieger, Jason Flanders, AquAlliance, California Sportsfishing Protection Alliance, California Water Impact Network, Aqua Terra Aeris Law Group

Comment 9-1

Comment

AquAlliance, the California Sportfishing Protection Alliance, and the California Water Impact Network (hereinafter "AquAlliance coalition"), represented by the Aqua Terra Aeris Law Group, submit the following comments and questions for the Bureau of Reclamation ("Reclamation") and the San Luis Delta Mendota Water Authority ("SLDMWA") ("Lead Agencies") in opposition to the Recirculated Draft Environmental Impact Report ("RDEIR") and Supplemental Draft Environmental Impact Statement ("SDEIS") ("RDEIR/SDEIS"), for the 2019-2024 Long Term North-to-South Water Transfer Program ("Project" or "2019/2024 Water Transfer Program").

The Project purpose echoes past attempts by Reclamation and its partner agency, the California Department of Water Resources ("DWR"), to drain as much water as possible from the Sacramento River Watershed and the Delta to provide water for some of the most destructive forms of desert agriculture, urban sprawl, and industrial extraction. The RDEIR/SDEIS attempts to disclose impacts as required by the California Environmental Quality Act ("CEQA") and the National Environmental Policy Act ("NEPA"), but simultaneously obfuscates many of the direct and indirect impacts. The AquAlliance coalition seeks to bring to light some of these hidden impacts and baseline information as we have before and to underscore the destructiveness of the Project that is part-and-parcel of the Sacramento River Water Management Agreement and the WaterFix (Twin Tunnels), which would deplete the Sacramento River Watershed, the Delta, and Sacramento Valley communities, farms, and habitat of essential fresh water.

Response

The purpose of this EIS/EIR is to document and disclose potential direct, indirect, and cumulative impacts of a specified range of potential water transfers to help decision-makers determine how to proceed with proposed transfers on an annual basis. As discussed in Response to Comment 7-16, the permit requests for the California WaterFix have been withdrawn by DWR, and regardless, that project would not have been operational during the period covered by this EIS/EIR.

Comment 9-2

Comment

The RDEIR/SDEIS has numerous deficiencies and should be withdrawn. The absence of disclosure and analysis of significant direct, indirect, and cumulative impacts alone renders the RDEIR/SDEIS seriously deficient. For this and other reasons, the Lead Agencies must withdraw the RDEIR/SDEIS or revise and recirculate it for public review and comment before a final Project RDEIR/SDEIS is considered.

This letter relies significantly on, references, and incorporates by reference as though fully stated herein, for which we expressly request that a response to each comment contained therein be provided, the following comments submitted on behalf of AquAlliance:

- Custis, Kit H., 2019. Comments and recommendations on U.S. Bureau of Reclamation and San Luis & Delta-Mendota Water Authority Draft Long-Term Water Transfer DRAFT SEIS/REIR, Prepared for AquAlliance. ("Custis," Exhibit A)

- Mish, Kyran D., 2014. Comments for AquAlliance on Long-Term Water Transfers Draft EIR/EIS. ("Mish," Exhibit B)

Response

Revisions have been made to the EIS/EIR to address public comments, but they do not trigger the criteria for recirculation set forth in CEQA Guidelines section 15088.5 and recirculation is not necessary. Responses to comments in Exhibit A are included in this appendix. Exhibit B was also submitted on the 2014 Draft EIS/EIR as comment letter NG04, and responses are included in Appendix F of the REIDR/SDEIS (renamed Appendix R).

Comment 9-3

Comment

I. <u>SLDMWA Failed to Follow Required Procedures and Circulate a Draft EIR.</u>

CEQA Guidelines Section 15088.5(c) is inapplicable to the RDEIR, and SLDMWA has failed to circulate a draft environmental review document that complies with CEQA. CEQA provides that "[a] draft environmental impact report, environmental impact report, negative declaration, or mitigated negative declaration prepared pursuant to the requirements of this division shall be prepared directly by, or under contract to, a public agency. " Pub. Resources Code § 21082.1, subd. a). SLDMWA has failed to circulate any of these recognized and required CEQA documents. Instead, SLDMWA only recirculated a revised versions of parts of the EIR/EIS while stating that the parts of the 2014 EIS/EIR left unrevised are for informational purposed only and not subject to comments:

The remaining sections from the 2014 Draft EIS/EIR do not have changes resulting from the Court's ruling and are not included in this RDEIR/SDEIS; however, the 2014 Draft EIS/EIR is still available to the public for informational purposes, as described below in Section 1.6. After public review of this RDEIR/SDEIS, Reclamation and SLDMWA will consider public comments received, respond in writing to any significant environmental issues raised, and develop a Final Long-Term Water Transfers EIS/EIR that incorporates the 2014 Draft EIS/EIR (and responses to comments on that document) and the material in this RDEIR/SDEIS. RDEIR/SDEIS at 1-4.

However, CEQA does not permit a project to proceed based upon a cobbling together of a previously invalidated final EIR and a new and very narrowly focused RDEIR/SDEIS. See *Russian Hill Improvement Ass'n v. Board of Permit Appeals* (1974) 44 Cal.App.3d 158 [compilation of documents does not equate an EIR]. Indeed, SLDMWA's departure from

CEQA's normal and mandatory procedures appears to be expressly intended to limit the broad public participation that would normally accompany a draft EIR. SLDMWA discourages any review and comment of the EIR/S, stating that "After public review of this RDEIR/SDEIS, Reclamation and SLDMWA will consider public comments received, respond in writing to any significant environmental issues raised, and develop a Final Long-Term Water Transfers EIS/EIR that incorporates the 2014 Draft EIS/EIR (and responses to comments on that document) and the material in this RDEIR/SDEIS." RDEIR/SDEIS at 1-4. In other words, comments are only being accepted on the RDEIR/SDEIS, not the EIR/EIS.

Response

Please refer to Common Response 1.

Comment 9-4

Comment

The nature of SLDMWA' procedural violation, above, thwarts CEQA's purpose of meaningful public participation to improve informed environmental decision-making. CEQA requires that EIRs should be organized and written in a manner that will make them "meaningful and useful to decision-makers and to the public." Pub Res Code § 21003(b). The information in an EIR must be presented in a manner that is designed to adequately inform the public and decision-makers. *Vineyard Area Citizens for Responsible Growth v. City of Rancho Cordova* (2007) 40 Cal.4th 412, 442. An EIR should be written in a way that readers are not forced "to sift through" to find important components of the analysis. *San Joaquin Raptor Rescue Ctr. v. County of Merced* (2007) 149 Cal.App.4th 645, 659; see also *California Oak Found. v. City of Santa Clarita* (2005) 133 Cal.App.4th 1219, 1239. Accordingly, an EIR is usually prepared as a stand-alone document. CEQA provides that EIRs should be prepared in a "standard format" when feasible. Pub. Resources Code § 21100(a). It is inappropriate, however, to use a group of documents collected together to serve the function of an EIR, as SLDMWA appears to be attempting here. *See Russian Hill Improvement Ass'n v. Board of Permit Appeals* (1974) 44 Cal.App.3d 158. SLDMWA's EIR/EIS and RDEIR/SDEIS combination clearly fails all of these tests. Presumably, SLDMWA intended a reader to discern its environmental impact analysis by reading the RDEIR/SDEIS, then determining which parts of the prior EIR/EIS remain applicable. This is a difficult exercise for a reader to undertake, not only due to the time-consuming and unwieldly nature of the process.

Response

Please refer to Common Response 1.

Comment 9-5

Comment

It is for these reasons that an EIR may not be comprised of a group of independent documents sewn together (*Russian Hill, supra*, 44 Cal.App.3d 158) and that a reader must not be forced to "to sift through" disparate documents to piece together a project's environmental analysis. *San Joaquin Raptor*, 149 Cal.App.4th at 659; *California Oak Found*., 133 Cal.App.4th at 1239; *Vineyard Area Citizens*, 40 Cal.4th at 442. Indeed, a reader opening the EIR/EIS documents for review would immediately be presented with outdated, inaccurate, and conflicting information, that would stultify public participation. SLDMWA's attempt to cobble together variations of SLDMWA's CEQA documents ignored the requirement to provide a comprehensive index or table of contents to a single EIR, as the law requires. Pub. Resources Code, § 21061; CEQA Guidelines § 15122 ("An EIR shall contain at least a table of contents or an index to assist readers in finding the analysis of different subjects and issues"). The closest the RDEIR/SDEIS comes to provide such an analysis is a confusing table provided on 1-7 of the RDEIR/SDEIS, which fails to provide any meaningful "table of contents or and index." For all these reasons, the RDEIR/SDEIS circulating for review is so disorganized, confusing, and internally inconsistent, as to stifle meaningful public participation.

Response

Section 1.2 of the RDEIR/SDEIS specifies the sections from the 2014 Draft EIS/EIR that were replaced or modified by the RDEIR/SDEIS. Please refer to Common Response 1 for additional information regarding the public review process.

Comment 9-6

Comment

The court in *AquAlliance v. Bureau of Reclamation* could have ordered partial recirculation, as SLDMWA sought, but it did not. *Cf*. Pub. Resources Code, § 21168.9 ["the order shall be limited to that portion of a determination, finding, or decision or the specific project activity or activities found to be in noncompliance only if a court finds that (1) the portion or specific project activity or activities are severable, (2) severance will not prejudice complete and full compliance with this division, and (3) the court has not found the remainder of the project to be in noncompliance with this division, and (3) the court has not found the remainder of the project to be in noncompliance with this division."] Here, the EIS/EIR was "set aside," in other words, it was no longer valid and cannot be used. Nonetheless, SLDMWA is attempting to move forward with the remedy it proposed, partial revision, which the was rejected by the court. *AquAlliance v. United States Bureau of Reclamation* (E.D.Cal. 2018) 312 F. Supp. 3d 878. CEQA Guidelines section 15088.5 does not provide for partial recirculation of an EIR five years after it was certified and subsequently fully vacated by the court. Here, the CEQA and NEPA violations of the vacated EIR/S went to the heart of the Project and could not have been more serious. The Lead Agencies therefore must give the public the opportunity to *meaningfully* comment on the whole of the proposed project.

The leading treatise, for example, explains that "A lead agency may decide to recirculate a revised portion of the draft EIR before preparing the final EIR, or may decide to recirculate a revised portion of the final EIR." Kostka & Zischke at § 16.18. SLDMWA has done neither of these things.

Response

Please refer to Common Response 1.

Comment 9-7

Comment

II. <u>Significant New Information Since the 2014 EIR/S Necessitates Recirculation of the Entire EIR/S.</u>

Four years have almost passed since the prior EIR/S was approved, nearly all of the information in the EIR/S regarding the environmental and regulatory conditions has changed in a considerable way so as to require that an entire new EIR/S be drafted and circulated. The present approach, for the RDEIR/SDEIS to attempt to rely on some (but insufficient) new environmental and regulatory conditions, while the un-recirculated chapters continue to consider environmental and regulatory conditions from 2014 or older, simply renders the whole of the EIR/S internally disjointed, and disconnected from present concerns. An EIR violates CEQA if it "thwarts the statutory goals" of "informed decision making" and "informed public participation." *Kings County Farm Bureau v. City of Hanford* (1990) 221 Cal.App.3d 692, 712. "The EIR is therefore the heart of CEQA." *Laurel Heights Improvement Ass'n v. Regents of the Univ. of Cal.* (1988) 47 Cal.3d 376, 392 (cites and quotes omitted). "An EIR is an 'environmental alarm bell' whose purpose it is to alert the public and its responsible officials to environmental changes before they have reached ecological points of no return." *Id*. (cites and quotes omitted). "The foremost principle under CEQA is that the Legislature intended the act 'to be interpreted in such manner as to afford the fullest possible protection to the environmental within the reasonable scope of the statutory language." *Id*. at 390. Here, following full vacatur of the project and all related approvals, the Lead Agencies abuse their Discretion by failing to update the whole of the EIR/S to include a description of the present-day existing environmental conditions, and an assessment of the proposed project's likely changes to those conditions.

An outline of considerations that must be included in a wholly revised EIR/S follows:

Response

The Lead Agencies considered where new information should be incorporated, and that was the basis for the sections that were included in the RDEIR/SDEIS. This process is described in Section 1.2 of the RDEIR/SDEIS. Please refer to Common Response 1 for additional information.

Comment 9-8

Comment

<u>3.1 Water Supply</u>

- 3.1.1: Affected Environment/ Setting
  - Sellers/buyers may have changed, and/or their capacities/requirements
  - Affected waterways have changed
  - Regulatory Setting: Revisions to Bay-Delta Plan have occurred and are planned; SWRCB Temporary Urgency Change Orders waived critical D-1641 and other protections during transfers years; all county BMOs must be reviewed; federal policy changes from changed executive branch leadership; and

changes/addendum to Coordinated Operations Agreement, December 13, 2018 would affect key issues such as operations and modeling assumptions.
    - 3.1.1.3 Existing Conditions: effects from worst drought in California history have depleted water supplies
- 3.1.2 Environmental Consequences/ Environmental Impacts
    - 3.1.2.1 Assessment Methods: prior EIR/S states that "Reservoir storage data is not available for all reservoirs included in the area of analysis," but this data may be available now; modeling must be updated for existing supplies, demands, regulatory environment, and climate change.
    - Alternatives analysis are outdated, as the project description has changed.
- 3.1.3 Comparative Analysis of Alternatives
    - Alternatives analysis are outdated, as the project description has changed.
- 3.1.4 Environmental Commitments/ Mitigation Measures

Response

As described in Common Response 1, SLDMWA considered whether the addition of new potential sellers would result in the potential for different effects. The results were documented in an Addendum to the 2014 Draft EIS/EIR that found that the changes in sellers would not change effects. This finding was primarily based on the concept that water could be made available for transfers from different sellers, but the overall amount of water transfers (i.e. the upper limit of transfer) would not increase. Although the 2014 Draft EIS/EIR was decertified, the substance of the Addendum's evaluation of new potential sellers remains accurate and reliable and was incorporated into the approach to the Revised Draft EIS/EIR.

The Final EIS/EIR does not include new buyers. East Bay MUD and Contra Costa WD were analyzed under NEPA in the 2014 Draft EIS/EIR and in the Addendum to the 2014 Draft EIS/EIR. Neither potential buyer was specifically evaluated under CEQA in the 2014 Draft EIS/EIR or the Addendum to the 2014 Draft EIS/EIR. However, since the impact analysis in the documents covered all resource area impacts required for CEQA, adding these potential buyers to the CEQA analysis did not substantially affect the impact analysis. The remaining items in this comment did not result in material changes to the Affected Environment/Environmental Setting or Environmental Consequences/Environmental Impacts.

Comment 9-9

Comment

3.2 Water Quality

- 33.1.1: Affected Environmental/ Setting
    - Sellers/ buyers may have changed, and/ or their capacities/ requirements
    - Affected waterways have changes
    - Regulatory Setting: Revisions to Bay-Delta Plan have occurred and are planned; 2010 303(d) list in 2014 EIR/S is outdated; SWRCB Temporary Urgency Change Orders waived critical D-1641 and other protections during transfer years; and

    - changes/addendum to Coordinated Operations Agreement, December 13, 2018 would affect key issues such as operations and modeling assumptions.
- 3.1.2 Environmental Consequences/Environmental Impacts
    - 3.1.2.1 Assessment Methods: prior EIR/S states that "Reservoir storage data is not available for all reservoirs included in the area of analysis," but this data may be available now; modeling must be updated for existing supplies, demands, regulatory environment, and climate change
    - Alternative analysis are outdated, as the project descriptions has changed.
- 3.1.3 Comparative Analysis of Alternatives
    - Alternatives analysis are outdated, as the project description has changed.
- 3.1.4 Environmental Commitments/Mitigation Measures
- 3.1.6 Cumulative Effects: changed buyers/sellers, climate change data and modeling, changed project description, changed recently past, current and future projects, all give rise to new cumulative impact scope. How have the Camp[22,23]and Carr[24] Fires and the 2017 Oroville Dam spillways disaster[25] and reconstruction impacted baseline surface and groundwater quality in areas that are in the sellers' districts?

Response

Please refer to Response to Comment 9-8 regarding new potential buyers and sellers. The affected areas of the Camp Fire in Paradise and the Carr Fire in Shasta and Trinity counties would not overlap with potential sellers in the action alternatives or result in new cumulative impacts. Repair work on the Oroville Dam spillway is largely complete and would not result in the potential for cumulative effects.

Comment 9-10

Comment

3.4 Geology and Soils

- 3.4.2 Environmental Consequences/Environmental Impacts
    - Updated climate models may present new information that must be considered to effectively plan crop idling practices
    - Effects of Carr and Camp Fires should be considered
- 3.4.3 Comparative Analysis of Alternatives
    - project description has changed
- 3.4.6 Cumulative Effects
    - project description has changed

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22 https://buttecountyrecovers.org/
23 http://cdfdata.fire.ca.gov/incidents/incidents_details_info?incident_id=2277
24 http://cdfdata.fire.ca.gov/incidents/incidents_details_info?incident_id=2164
https://krcrtv.com/news/carr-fire/future-concerns-over-drinking-water-quality-in-shasta-county-post-carr-fire
https://www.redding.com/story/news/2018/08/18/carr-fire-rained-down-toxic-ash-redding-now-race-protect-fish-water-sacramento-river-california/990343002/
25 Greene, Todd 2017. Presentation at CSU Chico March 2017 highlighting the known, naturally occurring asbestos that was under the damaged spillways at Oroville Dam. Exhibit D.

  - Camp and Carr Fires and changed recently past, current, and future projects have affected existing soil conditions
  - Crop idling could exacerbate worsened climate effects to soil

Response

The comment does not specify the type of new information in climate models and the Lead Agencies did not identify potential changes to the geology and soils setting. Please refer to Response to Comment 9-8 regarding potential new buyers and sellers and Response to Comment 9-9 regarding cumulative effects.

Comment 9-11

Comment

<u>3.5 Air Quality</u>

- 3.5.1.3 Existing Conditions
  - Are areas still in attainment following Camp and Carr Fires
- 3.5.2 Environmental Consequences/Environmental Impacts
  - Air pollution from cropland idling and pumping: Impacts to air pollution that were assessed could have changed – different conditions now. District requirements may have changed
  - Alternatives analysis is flawed because project description has changed. Also, buyer/sellers may have changed.
- 3.5.3 Comparative Analysis of Alternatives
  - Alternatives analysis is flawed because project description has changed. Also, buyer/sellers may have changed.
- 3.5.6 Cumulative Effects
  - Camp and Carr Fires, the 2017 Oroville Dam spillways disaster and reconstruction, and changed recently past, current, and future projects have adversely affected air quality and project effects may be more cumulatively considerable

Response

The EPA allows air quality data related to exceptional events, including wildfires, to be excluded from the National Ambient Air Quality Standards (NAAQS) attainment status determinations if strict evidence requirements are met. Because the Carr and Camp fires both occurred in 2018, monitoring data associated with those events are likely still being reviewed for quality assurance purposes by the California Air Resources Board (CARB) – monitoring data currently available online (https://www.arb.ca.gov/adam) only goes up to 2017 – and have not yet been used for attainment demonstrations. Regardless, it is expected that monitoring data associated with these fires will meet the exceptional event data requirements and will not directly alter the attainment status for the affected counties or regions.

No significant changes have been made to air district CEQA guidelines that would affect the analysis completed in the EIS/EIR. As described in the EIS/EIR, the air districts have developed guidance that indicates a proposed project would be cumulatively considerable if the air quality impacts are individually significant. Implementation of mitigation measures would reduce the project's individual impacts to less than significant. Therefore, construction of the Oroville Spillway would not change the conclusions in the EIS/EIR.

Comment 9-12

Comment

3.7 Fisheries

- 3.7.1 Affected Environment/Environmental Setting
  - Changes to buyer and seller areas could implicate new species and/or habitat that should be considered
  - Affected special status species have reached yet lower all-time lows, and any impacts should be considered cumulatively considerable in this setting. For example, the status of Delta Smelt was downgraded to endangered in 2009 and this population set progressively lower record population lows in 2004, 2005, 2008, 2009, 2014, 2015, and 2017; and, the 2018 FMWT index was 0 – yet another new low. Longfin smelt set new population lows in 2007, 2015, and 2016. Southern Resident Killer Whale specialize in feeding on salmon and steelhead and this population's continuing decline and subsequent inability to recover have been linked to persistently low production of Central Valley Chinook Salmon (NMFS 2009, 2018). Abundance of all runs of Central Valley Chinook salmon are far lower than they were historically, declining by more than half relative to their 1967-1991 baseline, despite implementation of the current water quality objectives and passage of the federal Central Valley Project Improvement Act (CVPIA) in 1992 – both of these programs were intended to double natural production of Central Valley anadromous fishes (including Chinook Salmon) over the 1967-1991 baseline. After rebounding from a historic low set in the early 1990s, returns of adult winter-run Chinook Salmon exceeded 15,000 in both 2005 and 2006; however, the population has declined since then and returning adults numbered less than 1,000 in 2017. Spring-run Chinook salmon also increased during a wet period between 1995 and 2000, and returning adults numbered greater than 30,000 as recently as 2003; the population has since declined substantially with less than 2000 adults observed in 2017. By 2016, the Southern Resident Killer Whale population had dropped 15%, from 87 in 2005 to 74 individuals in 2018 (Orca Task Force 2018). In addition, one SRKW was stillborn in 2018; failed pregnancies are increasingly common among this population, as a result of inadequate supplies of their main food source, Chinook Salmon (Wasser et al. 2017). The RDEIR/SDEIS must be revised to account for these and other species' significantly worsened conditions.

Response

Please refer to Response to Comment 9-8 about changes to potential buyers and sellers and Response to Comment 2-7 about revisions to the COA. Additional fish monitoring data after 2015 would not change the effects analysis included in the 2014 Draft EIS/EIR and the RDEIR/SDEIS.

Comment 9-13

Comment

Section 3.9 Agricultural Land Use

- 3.9.1 Affected Environment/Environmental Setting
  - Project description has changed – different buyer/seller areas?
  - Significant new economic and water demand data should be incorporated (*see, infra*, Section IX).
  - Have any of the regulatory setting changed?
    - Fed: Conservation Reserve Program
    - State: Williamson Act, California Farmland Conservancy Program (CFCP), Farmland Mapping and Monitoring Program (FMMP)
    - Regional: different county plans may have changed?

- 3.9.2 Environmental Consequences/Environmental Impacts
  - Alternatives analysis: project description has changed, including different buyers and sellers
  - Groundwater levels have changed
  - New climate data likely changes foreseeable agricultural practices

- 3.9.3 Comparative Analysis of Alternatives
  - Alternatives analysis: project description has changed, different buyers/sellers? Groundwater levels have changed, new climate data

- 3.9.6 Cumulative Effects
  - Project timeframe is wrong, it's been changed to 2019 – 2024
  - Seller/ buyer service areas info has likely changed (e.g. using a general plan for Glenn County from 1993) – land use, populations
  - Alternatives analysis: project description has changed, different buyers/sellers?
  - Recently past, current, and future projects.

Response

As described in Common Response 1, SLDMWA considered whether the new sellers would result in the potential for different effects. The results were documented in an Addendum to the 2014 Draft EIS/EIR that found that the changes in sellers would not change effects. The Final EIS/EIR does not include new buyers. East Bay MUD and Contra Costa WD were included and analyzed in the 2014 Draft EIS/EIR. Please refer to Response to Comment 9-8 for additional information.

Agricultural water demands, acreages, and relevant land use regulations have not substantially changed relative to conditions presented in the 2014 Draft EIS/EIR and the effects of cropland idling transfers on agricultural land use would be the same as evaluated in the 2014 Draft EIS/EIR. The cumulative analysis considers population projections through 2030 in the 2014 Draft EIS/EIR, which covers the timeframe of the project and the cumulative analysis in the 2014 Draft EIS/EIR on agricultural land use would not change.

Comment 9-14

Comment

<u>Section 3.10 Regional Economics</u>

- 3.10.1 Affected Environment/Environmental Setting
  - Project description has changed – different buyer/seller areas?
  - Significant new economic and water demand data should be incorporated (*see, infra*, Section IX).
  - Has any of the regulatory setting changed?
    - Fed: Conservation Reserve Program
    - State: Williamson Act, California Farmland Conservancy Program (CFCP), Farmland Mapping and Monitoring Program (FMMP)
  - Regional: different county plans may have changed? Existing conditions have changed. E.g. crop acreage summaries go through 2012, and many of the studies are from 2010/11.

- 3.10.2 Environmental Consequences/Environmental Impacts
  - Alternatives analysis: project description has changed, including different buyers and sellers
  - Groundwater levels have changed
  - New climate data likely changes foreseeable agricultural practices

- 3.10.3 Comparative Analysis of Alternatives
  - changed conditions, changed project description

- 3.10.4 Cumulative Effects
  - Wrong timeframe stated. Changed project description would affect this analysis, since smaller project, other alternatives could exist.

Response

Please refer to Common Response 1 relative to buyers and sellers in the project area and changes in the project description. Regulations identified in the comment have not changed since the 2014 Draft EIS/EIR and do not change the analysis of cropland idling transfers effects on the regional economy. The cumulative analysis considers population projections through 2030 in the 2014 Draft EIS/EIR, which covers the timeframe of the project and the cumulative analysis in the 2014 Draft EIS/EIR on regional economies would not change.

Comment 9-15

Comment

Section 3.11 Environmental Justice

- 3.11.1 Affected Environment/ Environmental Setting: possible changed areas given changed project description
    - In general, the studies cited in the 2014 EIR/S are older, and again fail to account for effects such as present climate change impacts, and/or wildfire effects such as Camp, Carr Fires and the 2017 Oroville Dam spillways disaster and reconstruction, resulting air quality and/or displacement, and the likelihood of such disasters recurring in the sellers' areas. Recently past, current, and future projects must be considered.

Response

Please refer to Common Response 1 relative to buyers and sellers in the project area and changes in the project description. The affected areas of the Camp Fire in Paradise and the Carr Fire in Shasta and Trinity counties would not overlap with potential sellers in the action alternative or result in new cumulative impacts. Repair work on the Oroville Dam spillway is largely complete and would not result in the potential for cumulative effects.

Comment 9-16

Comment

Section 3.14 Visual Resources

- Project description has changed and now affects new areas
- Does not address climate change impacts to reduced river flows.

Each of these items constitutes significant new information that has come into existence since the now-vacated EIR/S was approved, and long since the NOP was released in 2013. It would be an abuse of discretion for the Lead Agencies to rely on environmental analysis that fails to consider these baseline conditions and the concomitant effects.

Response

Please refer to Response to Comment 9-8 regarding potential new buyers and sellers and Common Response 1 about changes to the project description. The comment does not specify climate change impacts to visual resources that should have been included, nor does it identify any substantial evidence that such impacts are reasonably foreseeable. Please refer to Response to Comment 2-12 for additional information regarding impacts of climate change on the project.

Comment 9-17

Comment

III. <u>The REDEIR/SDEIS Contains an Inadequate Project Description</u>

A. The Project Description is Unstable, and Requires a New EIR

The RDEIR/SDEIS incorporates by reference and relies upon the prior EIR. *See* RDEIR/SDEIS 1-3 to 1-4. This results in an unstable project description as the RDEIR/SDEIS analyzes only a 250,000 acre-feet limit, or about 49% of the amount analyzed in the 2014 Draft EIS/EIR:

The 2014 Draft EIS/EIR analyzed transfers of up to 511,094 acre-feet, but this amount of water is substantially greater than the buyer demand or the amounts that actually have been historically transferred. After Reclamation and SLDMWA completed the Long-Term Water Transfers EIS/EIR process, the only year with transfers that occurred under that document was in 2015. In 2015, SLDMWA purchased 164,153 acre-feet, and East Bay Municipal Utility District purchased 13,268 acre-feet (Reclamation 2018). The buyers have considered their demand for transfers between 2019 and 2024 and have determined that their demand is less than what was included in the 2014 Draft EIS/EIR. This RDEIR/SDEIS presents (and analyzes) transfers from multiple sellers, but all transfers (combined) in a year would be limited so as not to exceed 250,000 acre-feet. This change could decrease effects to some resource analyses, but the changes would not represent a material change to the analysis. RDEIR/SDEIS at 1-4.

"An accurate, stable and finite project description is the sine qua non of an informative and legally sufficient EIR." *County of Inyo v. City of Los Angeles*, 71 Cal. App. 3d 185, 193 (1977). "Only through an accurate view of the project may affected outsiders and public decision makers balance the proposal's benefit against its environmental cost, consider mitigation measures, assess the advantage of terminating the proposal . . . and weigh other alternatives in the balance." *Id*. at 192-93. A project description may not provide conflicting signals to decision makers and the public about the nature and scope of the project as such a description is fundamentally inadequate and misleading. *San Joaquin Raptor Rescue Center v. County of Merced*, 149 Cal. App. 4th 645, 655-656 (2007) (EIR on mining project was conflicted when project description asserted that no increases in mine production were being sought, despite also providing for substantial increases in mine production).

Response

Please refer to Common Responses 1 and 2.

Comment 9-18

Comment

Courts have applied *County of Inyo* to find project descriptions conflicting and unlawful when their scope or size reveal internal inconsistencies. *See San Joaquin Raptor*, 149 Cal. App. 4th at 655 (project description unlawful when draft EIR asserted project would not significantly increase a mine's annual output, while proposed permit that would be approved by final EIR permitted a more than doubling of mine output); *Communities for a Better Env't v. City of Richmond*, 184 Cal. App. 4th 70, 84 (2010) project description inadequate when project proponent offered conflicting characterizations of oil refinery project about whether project would allow refinery to process a more polluting product).

Here, the RDEIR/SDEIS purportedly halves the entire project, which results in an unstable description that denies the public or decision makers the ability to "balance the proposal's benefit against its environmental cost, consider mitigation measures, assess the advantage of terminating the proposal . . . and weigh other alternatives in the balance." *County of Inyo*, at 192-93. As the court in *AquAlliance v. United States Bureau of Reclamation* (E.D.Cal. 2018) 287 F. Supp. 3d 969 noted, "The FEIS/R identifies potential buyers and sellers, AR 25370-72, and provides the maximum potential transfer that is covered by the FEIS/R for each seller, for a total maximum of 511,094 Acre Feet ("AF")." *AquAlliance* at 999. Such discrepancies give conflicting signals to the public and decision makers, thereby rendering the RDEIR/SDEIS inadequate and misleading. *See San Joaquin Raptor*, 149 Cal. App. at 655-656

Response

Please refer to Common Response 1.

Comment 9-19

Comment

Moreover, the RDEIS' project description is unstable as it adds new transfers to Alternative 2: "The 2014 Draft EIS/EIR specified that transfers to East Bay MUD and Contra Costa WD were not considered to be part of the Proposed Project, but they are included in Alternative 2 for this document for analysis under CEQA." RDEIR/SDEIS at 2-24. The RDEIR/SDEIS fails to include any updated impact analyses in these newly added districts.

Response

Please refer to Common Response 1.

Comment 9-20

Comment

In addition, and as discussed further, below, the RDEIR/SDEIS does not include an alternatives analysis that assesses these major changes to the project, which likely would lead to other viable alternatives. *See, infra*, Section XI. The RDEIR/SDEIS similarly makes no attempt to consider how or whether any of the project effects may change, instead cursorily concluding that all would be less. By circulating multiple draft EIR documents that describe different projects, the RDEIR/SDEIS consists of an unstable project description that thwarts full and complete analysis and public participation.

Response

As discussed in Common Response 1, the changes to the project description represent clarifications rather than changes. They would not change the alternative formulation process described in Appendix A to develop alternatives that meet the purpose and need/project objectives, described in Section 1.1 of the RDEIR/SDEIS.

Comment 9-21

Comment

Finally, although the RDEIR/SDEIS asserts that groundwater substitution for all participating agencies will be limited to 250,000 acre feet per year, the RDEIR/SDEIS does not indicate how this maximum project level will be monitored or enforced. This is particularly challenging if not impossible where some transfers require no approval by one or either of the Lead Agencies. Table ES-2 further admits that the potential sellers' upper limits available exceeds 250,000 acre feet per year, but says that the buyers would never collectively exceed this amount, with no explanation whatsoever as to how this upper limit can be monitored and maintained. RDEIR/SDEIS ES-5. With no ability to ensure that the project implemented will be the project now proposed, the RDEIR/SDEIS fail to offer a stable project for review.

Response

Please refer to Common Response 2.

Comment 9-22

Comment

B. The Project/ Proposed Action Alternative Description Lacks Detail Necessary for Full Environmental Analysis

1. Statewide demand for water from the Sacramento River Watershed is not identified.

There are extraordinary consumptive claims on water from the Sacramento River basin that exceed the unimpaired runoff by 5.6 times. However, the sources of these claims are not disclosed or considered in the formulation of Project alternatives. The RDEIR/SDEIS also fails to explain that the Central Valley Project ("CVP") and the State Water Project ("SWP") retain junior claims, coming late in California's history. Both the CVP and the SWP are engaged in the Project by the release of waters through Shasta (CVP) and Oroville (SWP) dams, the transmission of transfer water through the Jones and Banks pumping plants in the south Delta, and via canals south of the Delta.

The State of California has been derelict in its management of scarce water resources. We are supplementing these comments on this matter of wasteful use and diversion of water by incorporating by reference and attaching the 2016 complaint to the State Water Resources Control Board on public trust, waste and unreasonable use and method of diversion as additional evidence of a systemic failure of governance by the State Water Resources Control Board, DWR, and Reclamation. (Exhibit C)

Response

The 2014 Draft EIS/EIR analyzed how implementation of the Proposed Action and the action alternatives could affect water supply, water rights, and water quality. The analysis did not identify significant effects after mitigation. The RDEIR/SDEIS supplemented the water quality cumulative effects analysis. The commenter seems to be concerned that the California water rights system is over-allocated, but this issue is outside the scope of this the Lead Agencies' review because it would not be affected by the Proposed Action or action alternatives. The commenter's Exhibit C indicates that this concern has been raised to the SWRCB, which is the appropriate venue to resolve the concern.

Comment 9-23

Comment

1. <u>Specific groundwater conditions in the source watershed are lacking.</u>

The RDEIR/SDEIS must disclose current groundwater conditions beyond the abstract modeling baseline employed. Presented below are tables that illustrate maximum and average groundwater elevation decreases for Butte, Colusa, Glenn, and Tehama counties at three aquifer levels in the Sacramento Valley between the fall of 2004 and 2017.[26] These data present serious, continuing declines that represent county and site-specific issues that aren't captured in the RDEIR/SDEIS. What is presented is modeling with results like Figure 3.3-2, Cumulative Annual Change in Storage as Simulated by the USGS's Central Valley Hydrologic Model.

Modeling, as opposed to actual data, is a way to view groundwater conditions conceptually and at a scale that obfuscates significant local groundwater conditions in counties where groundwater substitution transfers are proposed. It is also fair to say that almost any basin in California would look better than the San Joaquin and Tulare basins due to the massive groundwater abuse by many of the Project's buyers. With only modeling discussed in the opening paragraph of section 3.3.1.2.2, Sacramento Valley Groundwater Basin, the RDEIR/SDEIS asserts that, "[g]roundwater storage in the Sacramento Valley Groundwater Basin has been relatively constant over the long term. Storage tends to decrease during dry years and increase during wetter periods."[27] This is easily contradicted by the results found in DWR's maps that are presented in Table 1 and by information and study (e.g. Brush 2013a and 2013b, NCWA, 2014a and 2014b).

Table 1.
Northern Sacramento Groundwater Changes by County.

County	Deep Wells (Max decrease gwe) Fall '04-'17	Deep Wells (Max decrease gwe) Fall '04-'16
Butte	-13.9	-28.3
Colusa	-67.2	-66.4
Glenn	-166.3	-65.8
Tehama*	-44.0	-35.8

[26] DWR. https://data.cnra.ca.gov/dataset/northern-sacramento-valley-groundwater-elevation-change-maps
[27] Page 3.3-4.

County	Intermediate Wells (Max decrease gwe) Fall ’04- ‘17	Intermediate Wells (Max decrease gwe) Fall ’04- ‘16
Butte	-22.1	-28.3
Colusa	-62.4	-78.9
Glenn	-51.5	-58.3
Tehama*	-35.0	-29.3

County	Shallow Wells (Max decrease gwe) Fall ’04- ‘17	Shallow Wells (Max decrease gwe) Fall ’04- ‘16
Butte	-10.8	-18.3
Colusa	-51.8	-51.7
Glenn	-58.7	-59.6
Tehama*	-28.9	-36.3

* Tehama County portion in the Sacramento Valley groundwater basin

Response

The RDEIR/SDEIS presents both monitoring and modeling data to characterize groundwater conditions. Appendix E of the RDEIR/SDEIS (renamed Appendix F) provides the change in groundwater level by county between Spring 2004-2017, Spring 2011-2017 and Spring 2016-2017 similar to information tabulated above. Additionally, Section 3.3, Groundwater Resources, of the RDEIR/SDEIS (see pages 3.3-5 and 3.3-6) summarizes these results. As noted by the commenter, Section 3.3 also documents the decline in groundwater levels between 2004 and 2017. However, as discussed in Section 3.3, wet conditions in Water Year (WY) 2017 have resulted in overall recovery in groundwater levels in the Sacramento Valley Groundwater Basin to higher than spring 2016 levels but not yet to pre-drought levels (i.e. prior to 2011 levels).

Comment 9-24

Comment

Surprisingly, the next paragraph in the RDEIR/SDEIS starts with, “Groundwater levels in the northern Sacramento Valley Groundwater Basin have declined over the last decade or so (spring 2004 to spring 2017).” p. 3.3-5. However, instead of providing significant well results, averages are used to further confuse the reader.

Response

Appendix E of the RDEIR/SDEIS (renamed Appendix F) provides maps and individual well hydrographs to support the conclusions made in Section 3.3 of the RDEIR/SDEIS.

Comment 9-25

Comment

The Project additionally conflicts with attempts at local management, particularly in areas where there are existing groundwater problems. Just consider that the City of Sacramento, Sacramento County Water Agency, and Sacramento Suburban Water District propose to transfer surface water into the state water market and substitute 35,000 af of groundwater with the Project. However, the Sacramento County Water Agency *Water Management Plan* indicates that intensive use of this groundwater basin has resulted in a general lowering of groundwater elevations that will require extensive conservation measures to remediate.[28] The Sacramento Groundwater Authority provides additional details such as : "These wells [AB3 and AB4] provide groundwater data for three or four depth-specific zones extending to 985 and 1070 feet below ground. Both well locations show a downward vertical flow gradient, from shallow to middle to deep. The water level elevations vary seasonally, but overall, show a somewhat downward trend, based on annual high water level elevations. This trend is likely due to variations in annual precipitation but is also affected by pumping, as shown by the much lower water levels in the middle to deep wells since late 2013."[29]

Failing to present actual groundwater conditions in the areas-of-origin and the receiving areas should be disclosed and addressed in a recirculated CEQA/NEPA document.

Response

As noted in Mitigation Measure GW-1, *"each entity making surface water available for transfer through groundwater substitution actions must confirm that the proposed groundwater pumping will be compatible with state and local regulations and GMPs."*

Appendix E of the RDEIR/SDEIS (renamed Appendix F) provides monitoring information about groundwater conditions in the study area.

Comment 9-26

Comment

General Project Comments

The RDEIR/SDEIS fails to indicate which, if any, responsible and trustee agencies were provided with the RDEIS/SDEIS for comment. This information must be disclosed in any final or revised document.

Response

Section 1.5 of the 2014 Draft EIS/EIR identifies that DWR is a Responsible Agency, and California Department of Fish and Wildlife (CDFW) is a Trustee Agency. The State Clearinghouse distributed the RDEIR/SDEIS to state agencies for public review.

Comment 9-27

Comment

The RDEIR/S should consider transfer potential and sources/deliveries in annual water supply allocations. ES-3, line 2.

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[28] Sacramento Suburban Water District 2016. 2015 Urban Water Management Plan. http://www.waterresources.saccounty.net/scwa/Documents/Engineering%20Reports/Sac_CWA_2015_UWMP_6-28-2016.pdf

[29] Sacramento Groundwater Authority 2016. Basin Management Report 2016 Update. p. 20.

These service areas include a wide range of water contractor entities with different water rights and controls that should be under the oversight and control of the State Board, not Reclamation or DWR. What is the basis for transfer potential of each of the sellers, especially in drought years when buyers need water? If they have such rights, what is their basis for the need for each individual seller and buyer?

How do each of these work as transfers and under what rules? RDEIR ES-6, line 3-8. What is the basis of the 600 taf and justification? What is the basis of the 360 taf? Are the State Board or ESA agencies likely to alter the transfer window based on Delta demands?

Response

This EIS/EIR provides information to the Lead Agencies to help make decisions regarding whether to move forward with potential water transfers. This CEQA/NEPA review does not replace or modify the process that the SWRCB implements to address water rights considerations.

The 2008 USFWS and 2009 NMFS Biological Opinions on Long-Term Operations of the CVP and SWP included transfers in the project descriptions up to 600,000 acre-feet or 360,000 acre-feet, based on year types. These amounts were analyzed as part of those biological opinions, and water transfers cannot exceed these amounts without additional analysis. The biological opinions also established the transfer window.

Comment 9-28

Comment

ES-7, line 2: why are SWP facilities and transfers not mentioned?

ES-11, line 8: what assurance are there that transferred water reaches the Delta?

ES-2, Line 25: water users may have need but not the right to take, store, transport, deliver, or use transfers. Can allocations be made to sellers who have no intention of using, but rather, selling their surface water? Line 36: Allocations for CVP contractors should include specs for that year’s potential transfers.

Response

This EIS/EIR does not analyze the potential effects of SWP water transfers; it addresses an identified range of potential water transfers to CVP contractors using CVP and SWP facilities. Reclamation monitors water moving through the water system and the Delta to verify that transferred water enters the river system and enters the Delta. Monitoring is not precise enough to track each drop of water, but Reclamation works to confirm the quantity of transfer water to the extent feasible.

Water allocations are made to CVP contractors based on water rights and contracts. CVP contractors cannot transfer water unless they take an action to reduce consumptive use of water or release water that would have remained in storage. These provisions prevent contractors from transferring water that they had no intention to use.

Comment 9-29

Comment

C. The DEIR Improperly Segments Environmental Review of the Whole of This Project.

As discussed throughout these comments, the proposed Project does not exist in a vacuum, but rather is another transfer program in a series of many that have been termed either "temporary," "short term," "emergency," or "one-time" water transfers, and is cumulative to numerous broad programs or plans to develop regional groundwater resources and a conjunctive use system. The *2019-2024 Water Transfer Program* is also only one of several proposed and existing projects that affect the regional aquifers.

Response

This comment was previously addressed in Response to Comment NG03-10 on the 2014 Draft EIS/EIR; the comment responses are included in Appendix F of the RDEIR/SDEIS (renamed Appendix R).

Comment 9-30

Comment

For example, the proposed Project is, in fact, just one project piece required to implement the Sacramento Valley Water Management Agreement ("SVWMA"). The Bureau has publicly stated the need to prepare programmatic environmental review for the SVWMA for over a decade, and the present EIS/EIR covers a significant portion of the program agreed to under the SVWMA. In 2003, the Bureau published an NOI/NOP for a "Short-term Sacramento Valley Water Management Program EIS/EIR." (68 Federal Register 46218 (Aug 5, 2003).) As summarized on the Bureau's current website:

The Short-term phase of the SVWM Program resolves water quality and water rights issues arising from the need to meet the flow-related water quality objectives of the 1995 Bay-Delta Water Quality Control Plan and the State Water Resources Control Board's Phase 8 Water Rights Hearing process, and would promote better water management in the Sacramento Valley and develop additional water supplies through a cooperative water management partnership. Program participants include Reclamation, DWR, Northern California Water Association, San Luis & Delta-Mendota Water Authority, some Sacramento Valley water users, and Central Valley Project and State Water Project contractors. SVWM Program actions would be locally-proposed projects and actions that include the development of groundwater to substitute for surface water supplies, conjunctive use of groundwater and surface water, refurbish existing groundwater extraction wells, install groundwater monitoring stations, install new groundwater extraction wells, reservoir re-operation, system improvements such as canal lining, tailwater recovery, and improved operations, or surface and groundwater planning studies. These short-term projects and actions would be implemented for a period of 10 years in areas of Shasta, Butte, Sutter, Glenn, Tehama, Colusa, Sacramento, Placer, and Yolo counties.[30]

The resounding parallels between the SVWMA NOI/NOP and the presently proposed project are not merely coincidence: they are a piece of the same program. In fact, the SVWMA continues to require Reclamation and SLDMWA to facilitate water transfers through crop idling or groundwater substitution:

Management Tools for this Agreement. A key to accomplishing the goals of this Agreement will be the identification and implementation of a "palette" of voluntary water management measures (including cost and yield data) that could be implemented to develop increased water supply, reliability, and operational flexibility. Some of the measures that may be included in the palette are:

. . .

(v) Transfers and exchanges among Upstream Water Users and with the CVP and SWP water contractors, either for water from specific reservoirs, or by substituting groundwater for surface water . . . [31]

It is abundantly clear that Reclamation and SLDMWA continue to propose a program through the RDEIR/SDEIS to implement this management tool, as required by the SVWMA. But neither CEQA nor NEPA permit this approach of segmenting and piecemealing review of the whole of a project down to its component parts. The water transfers proposed for this project will directly advance SVWMA implementation, and Reclamation and DWR must complete environmental review of the whole of the program, as first proposed in 2003 but since abandoned. For example, the draft EIS/EIR does not reveal that the current Project is part of a much larger set of plans to develop groundwater in the region, to develop a "conjunctive" system for the region, and to integrate northern California's groundwater into the state's water supply.

Response

This comment was previously addressed in Responses to Comments NG03-10 and NG03-11 on the 2014 Draft EIS/EIR; the comment responses are included in Appendix F of the RDEIR/SDEIS (renamed Appendix R).

Comment 9-31

Comment

In this vein, the U.S. Department of Interior's 2006 Grant Assistance Agreement, *Stony Creek Fan Conjunctive Water Management Program and Regional Integration of the lower Tuscan Groundwater formation* laid bare the intentions of Reclamation and its largest Sacramento

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[30] Accessed 3/12/19. "NOI/NOP was published on August 5th 2003. Public scoping meetings held August 20/21 2003. Draft and Final EIS/EIR dates to be determined.
"https://www.usbr.gov/mp/nepa/nepa_project_details.php?Project_ID=788

[31] Accessed 3/12/19. http://www.norcalwater.org/wp content/uploads/2010/12/sac_valley_water_mgmt_agrmt_new.pdf

Valley water district partner, Glenn Colusa Irrigation District, to take over the Tuscan groundwater basin to further the implementation of the SVWMA, stating:

GCID shall define three hypothetical water delivery systems from the State Water Project (Oroville), the Central Valley Project (Shasta) and the Orland Project reservoirs sufficient to provide full and reliable surface water delivery to parties now pumping from the Lower Tuscan Formation. The purpose of this activity is to describe and compare the performance of three alternative ways of furnishing a substitute surface water supply to the current Lower Tuscan Formation groundwater users to eliminate the risks to them of more aggressive pumping from the Formation and to optimize conjunctive management of the Sacramento Valley water resources.

Response

This comment was previously addressed in Response to Comment NG03-11 on the 2014 Draft EIS/EIR; the comment responses are included in Appendix F of the RDEIR/SDEIS (renamed Appendix R).

Comment 9-32

Comment

IV. <u>Document Deficiencies in Disclosure or Detail</u>

A. Planning and mitigation is inconsistently presented.

Is the Project depending on the 2014 or the 2015 version of the *DRAFT Technical Information for Preparing Water Transfer Proposals (Water Transfer White Paper) Information for Parties Preparing Proposals for Water Transfers Requiring Department of Water Resources or Bureau of Reclamation Approval* document ("DTIPWTP")? Page ES-6 refers to a 2015 version[32] as the most recent version while page 3.3-25 presents the 2014 version as the most current. The Lead Agencies must correct this. They must also explain whether the May 2015 Addendum to the DTIPWTP remains viable. In addition, Reclamation and DWR, the identified authors of the DTIPWTP, must explain what prevents the agencies from producing a final version as opposed to drafts from four and five years ago. A draft DTIPWTP isn't a regulation, but a guidance document. The Project must have mitigation that complies with CEQA. In order to legally defer any such mitigation measure, the RDEIR/SDEIS must provide the actual regulatory guidance that will be used.

Response

This EIS/EIR reflects the most current version of the "*Technical Information*" from December 2015. The Lead Agencies do not defer to the *Technical Information for Preparing Water Transfer Proposals* (Reclamation and DWR 2015) but include the document as guidance when developing mitigation measures. The mitigation measures included in the EIS/EIR have been developed to be independent, and in several cases, are more restrictive than the measures included in the 2015 guidance document.

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[32] Exhibit E.

Comment 9-33

Comment

B. Hydrographs of simulated groundwater levels are missing.

According to the RDEIR/SDEIS at page 3.3-15, Appendix F, Groundwater Monitoring Results, was supposed to contain a series of hydrographs to simulate groundwater level changes in seven model layers at 34 selected locations. Please provide the material or disclose where it is located. If it was not in the circulated RDEIR/SDEIS, the document must be corrected and recirculated with a clean copy and a redline version. This information is critical to any understanding of the RDEIR/SDEIS's assessment of groundwater impacts in the first instance.

Response

Appendix F of the RDEIR/SDEIS (renamed Appendix G) has been revised. Appendix G includes hydrographs at the 34 selected locations.

Comment 9-34

Comment

C. Assessment Methods section is missing.

"As discussed in the Assessment Methods (Appendix H of the RDEIR/SDEIS), if groundwater levels are more than 15 feet below ground surface, a change in groundwater levels would not likely affect overlying terrestrial resources." p. 3.8-7 "A detailed discussion of the methods for assessing impacts on natural communities and special-status plants and wildlife is contained in Appendix H of the RDEIR/SDEIS. Appendix H of the RDEIR/SDEIS also contains a description of impact mechanisms specific to each transfer type." p. 3.8-5. However, the Assessment Methods are not presented in Appendix H. This is a major omission that requires correction and then recirculation of the RDEIR/SDEIS with a clean copy and a redline version.

Response

Appendix P Methods for Assessing Impacts on Natural Communities and Special-Status Plants and Wildlife has been added to the final document and contains the information referenced in this Final EIS/EIR.

Comment 9-35

Comment

D. Stream Depletion Factor

The RDEIR/SDEIS merely references Mitigation Measure WS-1 in Appendix C, Table C-1. Potential Impacts Summary. The RDEIR/SDEIS lacks credibility by not presenting the full WS-1 in this abbreviated CEQA/NEPA document. WS-1 is the sole mitigation proposed to deal with the following impact that was acknowledged in the 2014 DEIS/EIR: "Groundwater substitution transfers could decrease flows in surface water bodies following a transfer while groundwater basins recharge, which could decrease pumping at Jones and Banks Pumping Plants and/or require additional water releases from upstream CVP reservoirs." p. ES-13. This is a major omission that requires correction and then recirculation of the RDEIR/SDEIS with a clean copy and a redline version.

Response

Please refer to Common Response 1. The Water Supply section did not require changes from the 2014 Draft EIS/EIR and was not included in the RDEIR/SDEIS.

Comment 9-36

Comment

E. Specific Inadequacies in Chapter 3, Groundwater Resources

- Well depth ranges are not disclosed for the Redding Area basin in the northern Sacramento Valley. Anderson-Cottonwood Irrigation district is a seller located in this basin, which necessitates disclosure of similar well depth ranges as presented in Table 3.3-4.[33]
- The data used for Table 3.3-4 are from 2003 and therefore very outdated.[34] This table should be updated.

Response

Well ranges for the Redding Area Groundwater basin has been added to Table 3.3-4. This data from Bulletin 118 2003 update is latest available data, DWR is working to update Bulletin 118 in 2020 but these updates have not been completed.

Comment 9-37

Comment

V. <u>The Long-Term Water Transfers Has Significant Impacts on Species</u>

A. No Agency Has Considered Public Trust Doctrine Duties

For the prior EIR/S, the AquAlliance coalition expressly asked the Lead Agencies to consider and discuss their applicable duties under the common law Public Trust Doctrine. The Lead Agencies refused, stating in full:

CDFW is a trustee agency under CEQA because it has "jurisdiction by law over natural resources affected by a project, that are held in trust for the people of the State of California." (CEQA Guidelines Section 21070) CDFW reviewed this EIS/EIR and provided comments,

[33] Project RDEIR/SDEIS. p. 3.3-19
[34] Id.

which have been addressed. For more information on the appropriate CEQA lead agency, see Common Response 1.

The courts have expressly rejected this approach to compliance with the Public Trust Doctrine: "[T]he brief acknowledgment of the obligation of *other agencies* to protect public trust resources reinforces our conclusion that the [lead agency] did not implicitly consider its own obligations under the public trust doctrine as part of its CEQA review of this project." *San Francisco Baykeeper*, 242 Cal.App.4th at 242. In that case, the court noted the public trust doctrine is not satisfied merely by performing CEQA review. *Id*. (citing *Citizens for East Shore Parks v. State Lands Comm'n* (2011) 202 Cal.App.4th 549). The court went further and held that state agencies have an affirmative duty to perform a public trust consistency analysis, based on substantial evidence in the administrative record, as a part of their CEQA review. *Id.*

Response

The cited case, *San Francisco Baykeeper*, was related to the California State Lands Commission's public trust responsibilities. The court found that the public trust doctrine applied to sand mining leases under consideration and this responsibility was not satisfied by CEQA. This case is not applicable to potential water transfers evaluated or approved by Reclamation and SLDMWA because these agencies do not have similar public trust responsibilities that are applicable to water transfers. For additional information regarding the nature and scope of the analyses in the RDEIR/SDEIS, please see Common Response 1.

Comment 9-38

Comment

Here, the Lead Agencies have committed the errors identified by the court in *S.F. Baykeeper v. California State Lands Commission*. First, the Lead Agencies incorrectly assumed their duty to perform a public trust analysis was discharged by virtue of performing CEQA review. In fact, case law dictates that public trust impact analysis is a necessary component within the greater CEQA review process, not a separate legal hurdle cleared only by virtue of having performed CEQA review. *S.F. Baykeeper*, 242 Cal.App.4th at 242. Second, the mere acknowledgement of the public trust duties of other agencies is not enough to discharge the public trust duties of the lead agencies. *Id*. Accordingly, the EIR remains critically inadequate without an analysis, based on substantial evidence, of the impacts of the Project on public trust uses.

Response

Please refer to Response to Comment 9-37. In the responses to comments on the 2014 Draft EIS/EIR (see Appendix R), the Lead Agencies discussed the public trust responsibilities of the CDFW as a Trustee Agency because that agency has the relevant public trust responsibilities. CDFW reviewed the RDEIR/SDEIS and provided comments in comment letter 10. For additional information regarding the nature and scope of the analyses in the RDEIR/SDEIS, please see Common Response 1.

Comment 9-39

Comment

B. Plants and Wildlife

1. The 2019-2024 Water Transfer Program has potential adverse impacts for fish

a. P3.2-1, line 21: Potential changes **will** likely be made even if only adapt management is used in the next five years as these are also mandated in BOs and recovery plans. This should be considered in cumulative assessment.

Response

The line cited from Section 3.2 Water Quality of the RDEIR/SDEIS is related to the SWRCB's water quality standards, which are not incorporated in the cumulative analysis because they are not yet reasonably foreseeable. The cumulative condition, however, incorporates other cumulative projects and does not assume that the Delta outflow conditions would remain unchanged during the period of the project.

Comment 9-40

Comment

b. Line 33: Dry periods are potentially any month but mainly July through October of wet years. So increases in dam releases in these periods will cause reductions in others or come from storage, which could be detrimental. Decreasing storage releases in spring and increasing fall releases for transfers could have negative consequences in both periods. Spring effects on water quality weigh more than summer/ early fall.

Response

Section 3.2 Water Quality of the RDEIR/SDEIS indicates that the Proposed Action, in conjunction with other past, present, and cumulative actions, would have a significant cumulative effect on water quality. The Proposed Action's contributions to changes to Delta outflow throughout the year would be small, but the key issue is the timing of those changes. Water transfers would not be able to decrease Delta outflow during balanced Delta conditions[35] because the CVP would be required to release additional flow to maintain the standards in the Bay Delta Water Quality Control Plan. Water transfers could only affect Delta outflow during excess conditions[36], when more Delta outflow is available than needed to meet standards. Because of the timing of these

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[35] Balanced conditions are when inflows into the Delta are equal to the flow required to meet in-Delta needs and Delta outflows (Reclamation and DWR 1986). Typically, these conditions occur when Reclamation and/or DWR are releasing flows from upstream storage to meet standards within the Delta or for Delta outflow.

[36] Excess conditions are when inflows into the Delta are greater than what is required to meet in-Delta needs and Delta outflows (Reclamation and DWR 1986), so Delta outflow is greater than required by applicable standards.

changes, the Proposed Action's incremental contribution to potentially significant cumulative water quality impacts would not be cumulatively considerable.

Comment 9-41

Comment

c. P3.2-2, line 3: The RDEIR/S must assess changes associated with impacts flow and temperature, turbidity, salinity, in Rivers and Delta prior to Delta diversion that will change with unregulated transfers. For example, reduced spring calls on reservoir water will lower river flows and raise water temperatures during critical salmon migrations. Bumps in warmer reservoir outflows could delay spawning and lead to redd dewatering later in fall or early winter. There is a general call for more natural flow patterns in Valley rivers and Delta inflow – transfers will cause the opposite.

Response

The 2014 Draft EIS/EIR addressed the potential for changes in reservoir levels, river flows, and Delta conditions to affect water quality and fisheries. These analyses were not identified by the District Court as requiring revision. The cumulative analysis is focused on how changes in Delta outflows could affect water quality and fisheries, in response to the ruling from the District Court. For additional information regarding the nature and scope of the analyses in the RDEIR/SDEIS, please see Common Response 1.

Comment 9-42

Comment

d. Line 16 para: if inflows are reduced in spring-early summer and increased in late summer/fall, there could be substantial spring-summer water quality effect, especially given unknown controls on Delta project and non-project diversions. For example, Yuba calls in spring-early summer say 50,000 af, how will that water be protected on its way to south Delta pumps? If 50,000 af of base flows are saved from fallowing or groundwater substitution in spring-summer, how will it be protected, captured and stored/used by buyers downstream? What about groundwater substitutions that draw from river aquifers? It will be different water with effects on Delta water quality from taking the different water. How will fall inflows be protected from Other non-project Delta diversions. If other diversions are not controlled, there could be detrimental effects from reduced outflow – from lack of adequate accounting.

Response

The 2014 Draft EIS/EIR analyzed potential effects to water quality associated with changes in Delta inflows. This analysis was not identified by the District Court as requiring revision, so it is not included in the RDEIR/SDEIS. This comment also asks how water is managed as it travels from sellers to buyers, both for potential water transfers covered in this EIS/EIR and other projects. Water diversions in California are controlled by the SWRCB. The range of potential water transfers analyzed in this

EIS/EIR would only occur during balanced Delta conditions, which would also help track water as it moves through the system. For additional information regarding the nature and scope of the analyses in the RDEIR/SDEIS, please see Common Response 1.

Comment 9-43

Comment

e. Section 3.7.6.1, para 1

f. The effects on fisheries from real changes to river flows and associated water quality and project and non-project diversions in the rivers and in the Delta must also be analyzed. Salmon need spring summer water in river for transport, turbidity, and lower water temperatures. High fall transfer water flows and temperatures delay spawners and hinder gonad development, and may lead to later increase risks to redd dewatering.

Response

Please refer to Response to Comment 9-41.

Comment 9-44

Comment

The REIS fails to adequately address the potential effects on specific river flows and water temperatures. For example, summer Yuba transfers are detrimental to Yuba ecology, steelhead, and salmon: opposite of natural flow pattern; attracts stray salmon bound for upper Sac River, Battle Creek, and other tributaries; can keep Yuba too cold stimulating early salmon spawning, salmon spawning in marginal habitat, lower steelhead growth, or early salmon smolt emigration toward warmer downstream areas; also bad for bed scouring and riparian vegetation. Similar effects may occur below many of the Valley's rim dams that may accommodate transfers. Similar problems may occur with changes to Delta inflow/export ratio under unchanged outflow.

Any change in river flows or Delta inflows can effect non-project diversions. For example, lower Sac River irrigation diversion rates are partially controlled by water levels. Each transfer will have unique footprint and ramifications, and potential for impact to fish and fish habitat.

Response

The 2014 Draft EIS/EIR analyzed potential direct, indirect, and cumulative effects to fisheries associated with river flows and Delta inflows. These analyses were not identified by the District Court as requiring revision. The cumulative analysis is focused on how changes in Delta outflows could affect water quality and fisheries, based on the ruling from the District Court. For additional information regarding the nature and scope of the analyses in the RDEIR/SDEIS, please see Common Response 1.

Comment 9-45

Comment

2. <u>The 2019-2024 Water Transfer Program has potential adverse impacts for the giant garter snake, a threatened species.</u>

As the Lead and Approving Agencies are well aware, the purpose of the ESA is to conserve the ecosystems on which endangered and threatened species depend and to conserve and recover those species so that they no longer require the protections of the Act. 16 U.S.C. § 1531(b), ESA § 2(b); 16 U.S.C. § 1532(3), ESA §3(3) (defining "conservation" as "the use of all methods and procedures which are necessary to bring any endangered species or threatened species to the point at which the measures provided pursuant to this chapter are no longer necessary"). "[T]he ESA was enacted not merely to forestall the extinction of species (i.e., promote species survival), but to allow a species to recover to the point where it may be delisted." Gifford Pinchot Task Force v. U.S. Fish & Wildlife Service, 378 F3d 1059, 1069 (9th Cir. 2004). To ensure that the statutory purpose will be carried out, the ESA imposes both substantive and procedural requirements on all federal agencies to carry out programs for the conservation of listed species and to insure that their actions are not likely to jeopardize the continued existence of any listed species or result in the destruction or adverse modification of critical habitat. 16 U.S.C. § 1536. See NRDC v. Houston, 146 F.3d 1118, 1127 (9th Cir. 1998) (action agencies have an "affirmative duty" to ensure that their actions do not jeopardize listed species and "independent obligations" to ensure that proposed actions are not likely to adversely affect listed species). To accomplish this goal, agencies must consult with the Fish and Wildlife Service whenever their actions "may affect" a listed species. 16 U.S.C. § 1536(a)(2); 50 C.F.R. § 402.14(a). Section 7 consultation is required for "any action [that] may affect listed species or critical habitat." 50 C.F.R. § 402.14. Agency "action" is defined in the ESA's implementing regulations to "mean all activities or programs of any kind authorized, funded, or carried out, in whole or in part, by Federal agencies in the United States." 50 C.F.R. § 402.02.

The giant garter snake ("GGS") is an endemic species to Central Valley California wetlands.[37] The giant garter snake, as its name suggests, is the largest of all garter snake species, not to mention one of North America's largest native snakes, reaching a length of up to 64 inches. Female GGS tend to be larger than males. GGS vary in color, especially depending on the region, from brown to olive, with white, yellow, or orange stripes. The GGS are distinguished from the common garter snake by its lack of red markings and its larger size. GGS feed primarily on aquatic fish and specialize in ambushing small fish underwater, making aquatic habitat essential to their survival. Females give birth to live young from late July to early September, and brood size can vary from 10 to up to 46 young. Some studies have suggested that the GGS is sensitive to habitat change in that it prefers areas that are familiar and will not typically travel far distances.

Response

This comment was previously addressed in Responses to Comments NG03-101 and NG03-102 on the 2014 Draft EIS/EIR; the comment responses are included in Appendix F of the RDEIR/SDEIS (renamed Appendix R).

[37] USFWS 2017. Final Recovery Plan for the Giant Garter Snake. p. I-2.

Comment 9-46

Comment

The RDEIR/SDEIS finds that the proposed Project, "[h]as the potential to subject more snakes to the stressors of finding new foraging areas" and that this is a significant impact. p. 3.8-19. The RDEIR/SDEIS relies on Mitigation Measure VEG and WILD-1 that is intended to, "[r]educe the potential for death or decreased fitness of individual giant garter snake" by keeping "[a]dequate water in water conveyance ditches and canals adjacent to idled/shifted fields," providing verification of requirements by Reclamation, and prohibiting "[t]ransfers from areas with important giant garter snake populations." (*Id*.) These measures are an attempt to protect GGS, but fail to encompass the complete needs of the species. Any habitat modification, not just areas with "important" GGS populations, may result in "take" under the ESA, and should be considered significant. Further, mitigation measures VEG and WILD-1 must account for these impacts considerations, which they do not.

Response

Section 3.8 Vegetation and Wildlife, Page 3.8-19, of the RDEIR/SDEIS acknowledges that the stressors of finding additional foraging habitat when fields are fallowed may result in death or decreased fitness of individual GGS, which is considered a significant impact. The habitat need that is specifically affected by fallowing rice fields is a reduction in prey availability. Implementation of Mitigation Measure VEG and WILD-1 aims to reduce these potential mortalities by preserving movement corridors with adequate cover and forage so that snakes have the ability to relocate to areas with active rice production where additional foraging opportunities area available.

Comment 9-47

Comment

The Final Recovery Plan for the Giant Garter Snake ("GGS Recovery Plan") provides extensive information about GGS needs, most of which are not discussed in the RDEIR/SDEIS but are essential to evaluating the project's impacts to GGS.

Response

The commenter did not identify any impact analysis or substantial evidence of a potential impact that was not considered in the EIS/EIR. The GGS Recovery Plan was referenced as it relates to habitat needs and threats from potential water transfer activities. Please refer to Response to Comment 2-23 and Common Response 1 for additional information.

Comment 9-48

Comment

<u>Thermal Ecology</u>

The GGS Recovery Plan discusses the thermal ecologic needs of the species. "Snakes are ectothermic animals, relying on external sources of heat to warm their bodies. Ectothermic animals regulate their body temperatures by daily behavioral activities such as basking in the sun or resting on a warm rock to heat their bodies, or by resting under vegetation or in the water to cool their bodies (Lincoln et al. 2001; Pough et al. 2001). A snake's ability to thermoregulate its body within narrow limits using external sources of heating and cooling are believed to play an important role in feeding and digestion, growth, reproduction, and in their vulnerability to predation, such as when basking without cover (Pough et al. 2001). Wylie et al. (2009a) found that giant garter snakes remain cool during hot days by remaining in underground burrows and warm themselves in cool weather by basking on canal banks."[38] How has the Project required that these needs are addressed?

Response

The basic thermoregulation needs of giant garter snakes as well as all reptilian species are not inhibited by the Proposed Action. Water transfer actions will not alter upland refugia habitat including underground burrows and Mitigation Measure VEG and WILD-1 includes measures to maintain water within canals and drains so the availability of water and emergent vegetation will continue to be available throughout the snake's active period.

Comment 9-49

Comment

Reproduction

The RDEIR/SDEIS fails to focus on reproductive needs and stresses even with some basic commentary presented in Appendix H. The Final Recovery Plan for the Giant Garter Snake provides facts "Male giant garter snakes are believed to reach sexual maturity in an average of 3 years and females in an average of 5 years (USFWS 1993); therefore, we estimate that a generation is 5 years for the giant garter snake. The mating season is believed to extend from March, soon after emergence, into May (Coates et al. 2009). The giant garter snake usually gives birth in summer to early fall after a gestation period of 2 -3 months. R. Hansen and G. Hansen (1990) found that parturition (giving birth) for female giant garter snakes taken into captivity occurred from late July through early September, and neonates (newly born young) emerge from the female fully developed. Litter size is variable with the giant garter snake, and averages between 17 and 23 young (R. Hansen and G. Hansen 1990; Halstead et al. 2011)."[39] How will the Project protect the reproductive lives and offspring since it operates through the GGS active season?

Response

As discussed in Section 3.8 Vegetation and Wildlife, page 3.8-19 of the RDEIR/SDEIS, if GGS need to relocate to other areas due to reduction in rice fields in order to find additional food resources there could be a greater impact to young snakes (two years old and less) because they may be particularly vulnerable to increased predation risk. There is little scientific data on use of rice fields by young snakes because it is not feasible to track them using radio transmitters due to their small size. It is expected that

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[38] (*Id.*) p. I-5
[39] (*Id.)*

as shown for adult snakes, juvenile snakes are likely to rely heavily on canals and drains for refuge, forage, and thermoregulation.

Comment 9-50

Comment

Predation

"A number of native mammals and birds are known, or are likely, predators of giant garter snakes, including raccoons (Procyon lotor), striped skunks (Mephitis mephitis), otters (Lontra canadensis), hawks and harriers (Buteo species, Accipiter species, Circus cyaneus), and great blue herons (Ardea herodias). Many areas supporting giant garter snakes have been documented to have abundant predators (R. Hansen 1980; G. Hansen and Brode 1993; Wylie et al. 1997a). However, predation is not believed to be a limiting factor in areas that provide abundant cover, high concentrations of prey items, and connectivity to a permanent water source (Wylie et al. 1997a)." The RDEIR/SDEIS adds, "Although individual snakes that must relocate would be subject to greater risk of predation as they move to find new suitable foraging areas, it is likely that some individuals would be able to successfully relocate in suitable habitat elsewhere within the area. Young snakes (two years old and less) that need to relocate may be particularly vulnerable to increased predation risk." pp. 3.8-18 to 3.8.19. The RDEIR/SDEIS fails to propose mitigation requirements that will consider the vulnerabilities experienced by all GGS, most particularly the young.

Response

Section 3.8 Vegetation and Wildlife, page 3.8-19 of the RDEIR/SDEIS addresses the potential increased predation risk with implementation of Mitigation Measure VEG and WILD-1, which as stated, will reduce the potential for death or decreased fitness of individual GGS due to reduced water availability by maintaining adequate water in water conveyance canals adjacent to idled/shifted fields. This measure ensures that GGS movement corridors are maintained, prey species remain available in the same densities, and vegetation needed for cover during foraging and predator avoidance remains the same as it would if there were no idling/shifting transfers.

Comment 9-51

Comment

Foraging

The RDEIR/SDEIS acknowledges the potential for significant impacts despite knowing what are GGS foraging needs. "The reduction in suitable foraging habitat within rice fields could cause some individuals to relocate away from an area that may have been their foraging area in prior years. Giant garter snakes occupying canals adjacent to fields that are fallowed in a particular year may disperse to canals that are in close proximity to active rice fields in order to obtain sufficient prey throughout their life-cycle. Although individual snakes that must relocate would be subject to greater risk of predation as they move to find new suitable foraging areas, it is likely that some individuals would be able to successfully relocate in suitable habitat elsewhere within the area. Young snakes (two years old and less) that need to relocate may be particularly vulnerable to increased predation risk." pp. 3.8-18 to 3.8.19. Sadly, the foraging needs are not addressed in the proposed Mitigation Measure VEG and WILD-1.

Response

GGS foraging needs are addressed on Page H-81, referencing ideal habitat characteristics, which include available prey in the form of small amphibians and small fish. Section 3.8 Vegetation and Wildlife, page 3.8-19 of the RDEIR/SDEIS addresses the potential reduction in foraging habitat with implementation of Mitigation Measure VEG and WILD-1, which would maintain water in smaller drains and conveyance canals with emergent vegetation for GGS escape and foraging habitat. Because rice fields themselves do not typically provide adequate cover and prey until late June after flooding and sufficient growth, it is assumed that snakes in rice growing regions are foraging primarily within the canals and drains in the early part of their active period (April through June). Therefore, maintaining these habitats will avoid or substantially lessen impacts from reduction of prey associated with fallowing.

Comment 9-52

Comment

Conclusion

The RDEIR/SDEIS attempts downplays the significance of the Project on the federal and state listed threatened species by revealing why GGS continue to decline. "Because giant garter snakes in the Seller Service Area are within an active rice growing region that experiences variability in rice production and farming activities, they are already subject to these risks in the absence of the Proposed Action." p. 3.8-19. The AquAlliance Coalition would assert that the RDEIR/SDEIS misses the mark here as the Project's possible 60,693 acres of fallowed rice fields are hardly a norm in the lucrative rice market. Correctly, the RDEIR/SDEIS concludes that, "The Proposed Action has the potential to subject more snakes to the stressors of finding new foraging areas. This potential impact would be significant."

Response

The excerpt from Section 3.8 Vegetation and Wildlife, page 3.8-19 of the RDEIR/SDEIS that is cited by the commenter is not attempting to explain why GGS continue to decline. This statement is made in reference to the need for some snakes to relocate to areas with adjacent active rice fields or increase distance of daily foraging movements when fields are fallowed. Variability in rice production has and will continue to depend on a number of factors including, climatic conditions that affect water availability, market forces, and regular crop rotations that can ultimately lead to large fluctuations in rice acreage over short time spans. The RDEIR/SDEIS acknowledges that the Project has the potential to subject more snakes to stressors associated with finding new foraging areas but is pointing out that this is not a new stressor, as snakes in rice growing regions have continued to persist in this highly variable and managed habitat. Please refer to Response to Comment 9-50 that describes how Mitigation Measure VEG and WILD -1 maintains dispersal corridors to avoid or substantially lessen this potential impact.

Comment 9-53

Comment

The RDEIR/SDEIS uses the research of Gabriel A. Reyes, et al to illustrate the most Project-friendly statement: “While giant garter snakes are known to use rice fields seasonally, the species is strongly associated with the canals that supply water to and drain water from rice fields; these canals provide much more stable habitat than rice fields because they maintain water longer and support marsh-like conditions for most of the giant garter snake active season (Reyes et. al. 2017).”

Response

The statement referenced by the commenter is based on recent telemetry work conducted by USGS scientists at sites throughout rice-growing regions within the Sacramento Valley and represents the most current scientific data available as it relates to GGS use of canals and rice fields in these managed landscapes.

Comment 9-54

Comment

The RDEIR/SDEIS refers the reader to Appendix H for “in-depth discussion” of GGS use of rice land (p. 3.8-18), however this appendix filled with 74 pages of animal and plant species tables and only 3.5 pages of general information about GGS. Appendix H acknowledges that canals are important as “movement corridors” (p. H-78), but that many other needs are ideal. Unfortunately, these ideal, or to put it another way, vital needs are not listed as part of Mitigation Measure Veg and Wild-1, such as:

- Water present from March through November.
- Slow moving or static water flow with mud substrate.
- Presence of emergent and bankside vegetation that provides cover from predators and may serve in thermoregulation.
- Absence of a continuous canopy of riparian vegetation.
- Available prey in the form of small amphibians and small fish.
- Thermoregulation (basking) sites with supportive vegetation such as folded tule clumps immediately adjacent to escape cover.
- Absence of large predatory fish.
- Absence of recurrent flooding, or, where flooding is probable, the presence of upland refugia.

Response

Measure VEG and WILD-1 in the RDEIR/SDEIS is to maintain the existing habitat that is present within canals and drains in the area of analysis, which supports these vital needs since GGS are known to occupy them. For example, maintaining sufficient water (minimum of 2 feet) within canals and ditches within the project area will address the first 5 bullets listed above because existing conditions would be maintained that provide these aquatic habitat characteristics. Basking sites and upland refugia would not be altered because the project will not directly modify upland habitat. The presence or absence of predatory fish within aquatic habitats is not affected by water transfer activities.

Comment 9-55

Comment

Noticeably some additional research that conflicts with the Project impact analysis and mitigation are omitted:

- "Although our study indicated that giant gartersnakes make little use of rice fields themselves, and avoid cultivated rice relative to its availability on the landscape, rice is a crucial component of the modern landscape for giant gartersnakes."[40]
- "[m]aintaining canals without neighboring rice fields would be detrimental to giant gartersnake populations, with decreases in giant gartersnake survival rates associated with less rice production in the surrounding landscape."[41]
- "The abundances of fish and frogs at a site in a given year were positively correlated."[42]

Response

In response to the commenter's first excerpt from the summary abstract in Reyes et. al. 2017, this statement is referring to rice as a landscape that includes both the fields and their associated canals and drains. The statement immediately following this excerpt in the summary abstract is: "Giant gartersnakes are strongly associated with the canals that supply water to and drain water from rice fields; these canals provide much more stable habitat than rice fields because they maintain water longer and support marsh-like conditions for most of the giant gartersnake active season".

In response to the second excerpt from Reyes et. al. 2017, this study found a negative relationship between GGS survival rates and the amount of rice on the landscape but also stated that the mechanism underlying this decrease in survival is unclear. This EIS/EIR is not attempting to discount the importance of rice fields as habitat for GGS and on page 3.8-18 states, "Cropland idling/shifting transfer actions are expected to incrementally contribute to idling of rice acreage, thereby reducing available habitat for the species".

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[40] Reyes, Gabriel A., et al., 2017. *Behavioral Response of Giant Gartersnakes (Thamnophis gigas) to the Relative Availability of Aquatic Habitat on the Landscape*. p. 1.
[41] (Id.)
[42] Rose, Jonathan P., et al.2018. *Spatial and Temporal Variability in Growth of Giant Gartersnakes: Plasticity, Precipitation, and Prey*. Journal of Herpetology, Vol. 52, No. 1, 40–49

In response to the third excerpt, this seems to be incomplete and it is unclear what the commenter is specifically commenting on.

Comment 9-56

Comment

The RDEIR/SDEIS incorrectly concludes that, "[i]mpacts from cropland idling/shifting transfer actions on the giant garter snake would be reduced to a less-than-significant level" because VEG and WILD-1 will minimize effects to individual garter snakes because 1) "[r]equiring that: transfers be reviewed to ensure cropland idling does not occur in or adjacent to areas with known important giant garter snake populations" and 2) "[b]y keeping at least 2 feet of water in the major irrigation and drainage canals (or no less than existing conditions)" and 3)"[b]y maintaining water in smaller drains and conveyance canals with emergent vegetation for GGS escape and foraging habitat." p. 3.8-19. By focusing so heavily on these three requirements, the RDEIR/SDEIS ignores the importance of this species vulnerability when forced to leave its historic neighborhood habitat as sections of the RDEIR/SDEIS and Appendix H reveal as we note above.

Response

Mitigation Measure VEG and WILD-1 of the RDEIR/SDEIS focuses on maintaining existing habitat components that are heavily relied upon by GGS throughout its active season, namely canals and drains. Proposed Action has the potential to reduce up to 12.8 percent of the average land in rice production within the Sacramento Valley during maximum water transfers. Based on USGS giant garter snake study results for 2016, maintaining a minimum of 60 percent rice production in the landscape optimizes capture rates (USGS 2017 unpublished data: *Effects of Rice Idling on Occupancy Dynamics of Giant Gatersnakes (Thamnophis gigas) in the Sacramento Valley of California, Data Summary of Field Observations May – September 2016*). When rice production decreases below 60 percent in a given area, capture rates decrease and presumably giant garter snakes move out of those areas and into areas where rice production is higher. Under the Project, cropland idling/shifting could result in contiguous blocks of fallow rice fields; however, the overall agricultural landscape within the area of analysis is expected to support sufficient rice production (more than 60 percent) to maintain GGS populations within the area of analysis (USGS 2017). These studies by USGS also demonstrate that GGS aquatic habitat use is highest within the associated canals and drains, which will be maintained by implementation of Mitigation Measure VEG and WILD-1.

Comment 9-57

Comment

The flawed less-than-significant conclusion also plainly ignores the impacts to GGS at a population level. "Implementation of Mitigation Measure VEG and WILD-1 will ensure potential effects to ***individual*** giant garter snake are minimized" by requiring the three items above: review to keep fallowing from occurring near or in important GGS areas; maintain a minimum of two feet of water in the major irrigation and drainage canals; and keeping some water in smaller drains and canals. (emphasis added) These measures contradict what little science exists as well as other discussion in the RDEIR/SDEIS that explains more needs of the species. Failing to fully consider individual impacts and population impacts at all, is significant.

Response

This EIS/EIR acknowledges the scarcity of science as it relates to GGS in rice growing regions and therefore includes measures to monitor the GGS population in the seller's Area of Analysis. However, recent studies on GGS (within the last 5 years) have been conducted by USGS within the Sacramento Valley, including the area of analysis. This research includes studies to document the response of GGS to changes in water availability within the landscape (Reyes et. al. 2017), studies to assess variables affecting the distribution of GGS (Halstead et. al. 2015), and studies to identify variables that can be used to predict distribution of GGS within modified landscapes (Halstead et. al. 2016). This research represents the best and most appropriate science available for the area of analysis and was used to assess impacts from the project and to identify the most appropriate mitigation to reduce potential impacts. Additionally, Reclamation has conducted annual GGS monitoring within the area of analysis in compliance with the USFWS Biological Opinion for the Bureau of Reclamation's Proposed Central Valley Project Long Term Water Transfers (2015-2024).

As described in Measure 8 of Mitigation Measure VEG and WILD-1 1 on page 3.8-40 of Section 3.8 Vegetation and Wildlife, Reclamation will continue to fund annual GGS distribution and occupancy research within the rice-growing regions of the Sacramento Valley and evaluate the effectiveness of conservation measures to maintain GGS occupancy in areas participating in water transfers. Measure 5 describes how these studies will be summarized in annual monitoring reports along with current and historic crop idling/shifting water transfer data. Measure 6 describes how this information will be submitted to and reviewed with the wildlife agencies to identify if the Project is having unanticipated effects on GGS and whether the conservation measures are effective at maintaining occupancy. Measure 7 describes how this information will be used to make future decisions about where and how much crop idling/shifting water transfers are authorized under this program.

Comment 9-58

Comment

The GGS Recovery Plan also presents these crucial points:

Depending on the type of water transfer that occurs, if transfers are away from giant garter snake habitat, the following effects to giant garter snakes and their habitat can reasonably be anticipated: increased stress on snakes that must disperse further to find suitable habitat (including summer water) and prey items, increased predation on snakes due to the loss of refugia, increased competition for food and shelter resources between displaced and resident snakes, and ultimately, reduced reproduction and recruitment as females are displaced from familiar retreats and basking sites and neonates and juveniles are deprived of essential nutrients to facilitate growth and sexual maturation. These detrimental impacts to individuals have the potential to become population-level effects as the quality of habitat and food resources is reduced persistently, over time, or undergoes annual fluctuations of high magnitude. p. V-6.

An additional and noticeable detail is missing from the RDEIR/SDEIS. While rice fields abutting or immediately adjacent to important GGS habitat will not be permitted to participate in cropland idling/shifting transfers, there is no definition of how large a buffer would be required between a participating fallowed field and important GGS habitat areas. This issue must be clarified and corrected.

Response

The commenter references Measure 4 of Mitigation Measure VEG and WILD – 1 on page 3.8-39 of Section 3.8 Vegetation and Wildlife as it relates to rice fields abutting or immediately adjacent to areas with known important giant garter snake populations and requests clarification regarding the definition and size of buffers between participating fields and GGS habitat areas. However, the EIR/EIS does not discuss buffers and buffers are not referenced in the mitigation measure. This measure is not intending to provide a defined buffer distance, rather it is aimed at excluding idling/shifting transfer participation from areas abutting stream/canal habitats with known important GGS populations.

Comment 9-59

Comment

Please explain the inclusion of the following paragraph in the RDEIR/SDEIS. Voluntary practices are not enforceable and are not mitigation for impacts from the Project.

Standard farm practices associated with participating in cropland idling/shifting water transfers (e.g. valve or gate operations, equipment transportation, facility maintenance), may also increase risk to giant garter snakes if they were to encounter personnel or equipment. This could result in injury, death, or decreased fitness of giant garter snakes. These risks are minimized because sellers voluntarily perform giant garter snake best management practices, including educating maintenance personnel to recognize and avoid contact with giant garter snakes, cleaning only one side of a conveyance channel per year, and implementing other measures to enhance habitat for giant garter snake. Additionally, ditch maintenance is typically done when there is no water in the canals and ditches. This means that giant garter snake adjacent to fields idled/shifted under the Proposed Action will not be affected by ditch maintenance during their active season. p. 3.8-19.

Response

The referenced excerpt from the RDEIR/SDEIS was added to explain existing farming practices within the Seller's Area of Analysis and is not meant to be a mitigation measure. Because Mitigation Measure Veg and WILD-1 addresses the protection of a managed habitat resources (namely canals and drains), it is important to note that canal maintenance activities include best management practices (BMPs) that protect GGS during these activities and are expected to continue to do so. The canals and drains associated with active rice growing would be maintained in the absence of water transfers and where water transfers result in fallowing, the canals will be maintained in the same manner as existing conditions.

Comment 9-60

Comment

Finally, any loses of GGS should be considered in a cumulative context, since the species has been more than decimated from historical levels, hence its special status listings. As the Lead Agencies are aware, the 2015 BO and the amended BO were vacated through *AquAlliance v. United States Bureau of Reclamation* (E.D.Cal. 2018) 312 F. Supp. 3d 878, 880, 5 U.S.C. § 706(2)(A), and no revised BO has been adopted. Nevertheless, even the 2015 BO conceded that "the overall status of the snake has not improved since its listing," and that "by far the most serious threats to snake continues to be loss and fragmentation of habitat from . . . changes in rice production." The final rule listing the GGS as threatened explained, "fluctuations in rice production and changes in water management including reductions in water availability due to drought and water transfers were cited as threats to the continued existence of the snake." GGS are in further peril by cumulative impacts from warming climate, which effects the Project would aggravate. For each of these reasons, VEG and WILD-1 fails to ensure that impacts to GGS as a result of fallowing will be detected by qualified, third-party scientists or mitigated to less than significant levels, through binding, enforceable and objective performance standards.

Response

Please refer to Response to Comment 2-23 related to effects to GGS described in the RDEIR/SDEIS. Mitigation Measure VEG and WILD-1 requires that Reclamation and SLDMWA coordinate with the USFWS on implementation and findings of water transfers. The measure also requires Reclamation to monitor effectiveness of conservation measures by funding research by USGS. Reclamation, USFWS, and USGS have qualified scientists to evaluate effects of water transfers, to ensure implementation of the identified mitigation measures, and ensure that significant effects to GGS populations do not occur from water transfers. Regarding climate change impacts, please refer to Common Response 1 and Responses to Comments 2-12 and 7-17.

Comment 9-61

Comment

The Lead Agencies must revise the RDEIR/SDEIS to incorporate the GGS Recovery Plan's first priority that is to:

Establish an incentive or easement program(s) to encourage private landowners and local agencies to provide or maintain agricultural practices (e.g. rice cultivation) and wetland habitats that benefit the giant garter snake. Work with nonprofit organizations (such as land trusts) to assist private landowners in conserving and recovering the giant garter snake through economic and other incentive programs. Agricultural incentives should be developed and made available to landowners and water districts and users who conserve giant garter snakes on their property or who may provide suitable habitat. (Priority 1)[43]

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[43] USFWS 2017. Final Recovery Plan for the Giant Garter Snake. p. III-2

Response

Recovery Plans prepared under the Endangered Species Act (ESA) are advisory documents, not regulatory documents that provide guidance to USFWS, States, and other partners on ways to eliminate or reduce threats to listed species. These plans include measurable objectives against which to measure progress towards recovery. For purposes of project level evaluations, recovery plans provide useful information that can be used to evaluate project impacts.

Comment 9-62

Comment

The RDEIR/SDEIS requires that "The water seller will keep adequate water in major irrigation and drainage canals," but fails to define what constitutes a "major irrigation and drainage canal," nor does the RDEIR/SDEIS demonstrate that irrigation and drainage canals *not* deemed to be "major" would *not* provide habitat for GGS, pond turtles, or impacted avian species. RDEIR/SDEIS 3.8-39. Thus, but the impact assessment and the deferred mitigation measure are unduly vague to support adequate informational disclosure, and lack objective performance standards to ensure impacts will be mitigated. To determine how much water is "adequate," the RDEIR/SDEIS states that "water depths should be similar to years when transfers do not occur," but given climatic and other variations in California water management, this could easily present a range of water depths to choose from, some of which may be inadequate. If the project results in only the minimum historical/non-transfer year water depths being made permanent, which VEG and WILD-1 could permit, on their face, then the project's significant impact to these habitats would not be avoided. VEG and WILD-1 similarly provide no objective performance standard to determine if adequate water would remain in smaller canals and ditches. RDEIR/SDEIS 3.8-39. "Loose or open-ended performance criteria" are prohibited. (Rialto Citizens for Responsible Growth v. City of Rialto (2012) 208 Cal.App.4th 899, 944.) "[T]entative plans for future mitigation after completion of the CEQA process," without any "specific performance criteria for evaluating the efficacy of the measures" violate CEQA. (POET, LLC v. Calif. Air Resources Bd. (2013) 218 Cal.App.4th 681, 738; see also Guidelines, § 15121(a).) It is also unclear if this aspect of the mitigation measure would ensure that adequate water could and would be provided before any crop idling transfer would be approved or commence.

Finally, it is unclear if Reclamation has recommenced consultation with USFWS, and/or if any new BO is expected prior to project implementation, both of which would be required under the ESA.

Response

The use of the term "major" when describing irrigation and drainage canals is not attempting to rule out any canals as habitat.

In response to the commenter's statement relating to adequacy of maintaining water in major irrigation and drainage canals, the measure requires a minimum water depth of at least two feet be maintained in drains and canals. Maintaining sufficient water (minimum of 2 feet) within canals and ditches within the project area will address the first 5 bullets listed in Response to Comment 9-55, because existing conditions would be maintained that provide these aquatic habitat characteristics. The commenter asserts that this measure does not include performance standards by which to determine successful implementation. As noted previously, a minimum of two feet of water is required under Mitigation Measure VEG and WILD-1 to maintain existing conditions that provide aquatic habitat characteristics and thus avoid any significant adverse effects on the species or its habitat. Additionally, Mitigation Measure VEG and WILD-1 also includes a requirement to identify whether the project conservation measures are effective in avoiding take and thus reducing impacts on giant garter snake to a less than significant level. The inclusion of giant garter snake research and monitoring, annual meetings and reports, and adaptive management flexibility will allow Reclamation to identify unexpected effects of the water transfer program and discuss appropriate corrective actions with USFWS and USGS in a timely manner.

In compliance with the ESA, Reclamation has updated the Biological Assessment prepared for the Proposed Action and has reinitiated consultation with USFWS for water transfers effects on GGS.

Comment 9-63

Comment

2. The 2019-2024 Water Transfer Program has potential adverse impacts for plants.

Regarding impacts to vegetation, GW-1 permits that "If historic data show that groundwater levels in the area where actions are being taken to make water available for transfer have typically varied by more than this amount annually during the proposed transfer period [between 10 to 25 feet below ground surface], then the transfer may be allowed to proceed." RDEIR/SDEIS 3.3-28. Here the RDEIR/SDEIS fails to provide any evidence that this would avoid impact to deep rooted vegetation, since it is not known whether (1) any historic period in which such groundwater levels were breached could have itself had significant effects to vegetation, and/or (2) new vegetation could have taken root since that time.

Very disconcertingly, the RDEIR/SDEIS seems to simply allow groundwater substitution to continue even if impacts to deep rooted vegetation occur. The RDEIR/SDEIS never states that pumping must stop if such effects occur, but rather, requires that, "If significant adverse impacts to deep-rooted vegetation (that is, loss of a substantial percentage of the deep-rooted vegetation as determined by Reclamation based on site-specific circumstances in consultation with a qualified biologist) occur as a result of the transfer despite the monitoring efforts and implementation of the mitigation plan, the seller will prepare a report documenting the result of the restoration activity to plant, maintain, and monitor restoration of vegetation for 5 years to replace the losses."

RDEIR/SDEIS 3.3-28. Mitigation measures identified in an EIR are legally inadequate if they are so undefined that it is impossible to gauge their effectiveness. *Preserve Wild Santee v City of Santee* (2012) 210 Cal.App.4th 260, 281 (plan for active habitat management did not describe anticipated management actions or include standards or guidelines for actions that might be taken).

GW-1 is woefully inadequate to protect vegetation from groundwater extraction, where it provides:

If no monitoring wells with the requirements discussed in the previous paragraph exist, monitoring would be based on visual observations by a qualified biologist of the health of these areas of deep-rooted vegetation until it is feasible to obtain or install shallow groundwater monitoring. If significant adverse impacts to deep-rooted vegetation (that is, loss of a substantial percentage of the deep-rooted vegetation as determined by Reclamation based on site-specific circumstances in consultation with a qualified biologist) occur as a result of the transfer despite the monitoring efforts and implementation of the mitigation plan, the seller will prepare a report documenting the result of the restoration activity to plant, maintain, and monitor restoration of vegetation for 5 years to replace the losses.

RDEIR/SDEIS 3.3-28. First, there are no objective performance standards to determine how a qualified biologist can determine if tree health is affected by project groundwater pumping. Worse, the ultimate determination of whether any effects are significant rests not with the qualified biologist, but rather with Reclamation, with no guiding standards at all, in its sole discretion, to determine whether "significant adverse impacts" are occurring to a "substantial percentage" of deep-rooted vegetation across some undefined "area." How frequently would visual monitoring occur? How quickly would Reclamation review a biologist's report? How would Reclamation or a biologist determine whether impacts have "occur[ed] as a result of the transfer", especially in a cumulative context where multiple effects may be limiting water supply to deep-rooted vegetation, during times of shortage in which transfers are intended to occur? The mitigation measure makes no mention of whether any impacted vegetation may provide habitat to any special species, for which additional impact disclosure and mitigation would be required. Nor does GW-1 indicate by when any mitigation efforts through replanting vegetation must be completed, nor how like-for-like vegetation will be provided. Where deep-rooted vegetation may be significantly mature, for example, mitigation at a 1:1 ratio would not suffice, nor would regrowth over the 5-year replacement period proposed by GW-1. Finally, any loses of mature vegetation should be considered in a cumulative context, where oak and riparian habitat has been more than decimated from historical levels, and is further threatened by cumulative impacts from warming climate, which effects this project would exacerbate. For each of these reasons, GW-1 fails to ensure that impacts to vegetation as a result of groundwater pumping will be detected or mitigated to less than significant levels, through binding, enforceable and objective performance standards.

Response

The monitoring and mitigation plan for deep rooted vegetation under Mitigation Measure GW-1 has been revised to (1) establish a baseline conditions for the health of deep-rooted vegetation by adding requirements to conduct monitoring before the start of transfer; (2) establish specific standard for significant impacts to deep rooted vegetation; and (3) establish success criteria for revegetation and restoration actions.

Comment 9-64

Comment

VI. <u>Hydrology</u>

A. Streamflow

1. Significant Past, Present, and Future Streamflow Depletion is Not Disclosed

Streamflow depletion is only mentioned in generalities in the RDEIR/SDEIS. Historic streamflow changes must be provided so the public and policy makers may have a basic understanding of how water development in the Sacramento River Watershed has been affected by the CVP and SWP. The RDEIR/SDEIS also fails to disclose or map exactly where the areas are with depressed groundwater levels and where the rivers are losing flow. We submit one of DWR's maps that indicate areas of depressed groundwater[44] and stipulate that a revised and recirculated RDEIR/SDEIS must contain this and all other maps and data that would provide an adequate depiction of the existing conditions and problems.

Response

Discussion of streamflow depletion from groundwater substitution pumping is contained in Section 3.1, Water Supply. Appendix F of the RDEIR/SDEIS (renamed Appendix G) includes maps that show simulated groundwater level drawdowns under Proposed Action.

Comment 9-65

Comment

Custis illuminates the RDEIR/SDEIS problems with inadequate disclosure and analysis for streamflow depletion.

The 2018 RDEIR/SDEIS evaluates the potential for groundwater substitution transfer pumping to impact rivers and creeks using the SACFEM2013 groundwater model simulations for years 1970 to 2003. The document sets as the threshold of significance standard, a reduction in mean monthly flow of 10 percent and greater than one cubic foot per second (cfs) change in flow. The document relies on groundwater level monitoring requirements and mitigations in GW-1 to prevent impacts to terrestrial species, natural communities and special-status species. The document doesn't provide data or analysis on why the proposed ten percent and 1 cubic foot per second (10% & 1 cfs) threshold is an appropriate standard of protection. The 10% & 1 cfs standard isn't compared to existing instream flow standards such as those utilized by the California Department of Fish and Wildlife. Mitigation GW-1 doesn't require that baseline conditions be measured or documented. There are no standards for monitoring, and no standards for the level of environmental significance for the species and resources being protected. The other terrestrial mitigation, VEG and WILD-1, is only for cropland idling transfer and therefore doesn't provide monitoring or mitigation for groundwater substitution transfers. Mitigation GW-1 has no specific requirements to monitor these biological resources prior, during or after transfer pumping. The 2018 RDEIR/SDEIS also claims that many streams are "essentially" dry during periods of pumping and therefore pumping can't cause an impact. This assessment ignores the

[44] DWR at https://data.cnra.ca.gov/dataset/northern-region-groundwater-elevation-change-maps. Exhibit F. Maps are being moved to the url above soon, as the former url is no longer operable (http://www.water.ca.gov/groundwater/data_and_monitoring/northern_region/GroundwaterLevel/gw_level_monitoring.cfm).

long-term implications of surface water capture discussed in my comment No. 5, in particular, the increase in stream seepage caused by lowering the water table, the third type surface water capture. Long-term impacts from lowering groundwater levels beneath streams and the effect on reducing surface water flows aren't considered in the document or mitigated in GW-1. p. 5.

Response

Appendix P, Methods for Assessing Impacts on Natural Communities and Special-Status Plants and Wildlife, has been added and Section P.3.4 discusses the basis for streamflow depletion threshold that would result in significant impacts to natural communities and special status species.

Comment 9-66

Comment

There was a time when the public and policy makers believed that the CVP and the SWP operated within the law, albeit with more water on paper than could ever be available. Once the limits of hydrology caused DWR, Reclamation, and some of their contractors to look for tools to game the law – and the hydrology - of California, it became clearer that the state and federal governments have facilitated a destructively unrealistic demand for water. Ever willing to destroy natural systems to meet demand for profit, the San Joaquin River dried up and subsidence caused by groundwater depletion in the San Joaquin Valley is even cracking water conveyance facilities.[45] The continual, long-term groundwater overdraft in the San Joaquin Valley, the expansion of new permanent crops in both the San Joaquin and Sacramento valleys, and groundwater substitution transfers by CVP and SWP contractors *all* cause streamflow depletion. Failing to disclose how the CVP and SWP cause streamflow depletion is a major omission, as is the current state of streamflow depletion in the Sacramento River Hydrologic Region, the source for the CVP and SWP.[46]

Expert testimony supports this "[t]hat the Sacramento Valley is already impacted by historical groundwater pumping with a decrease in the level of groundwater, the decrease in groundwater storage, and loss of flow in surface waters. These negative historical impacts to groundwater are consistent with the medium to high CASGEM ranks for the groundwater basins and the need to develop Sustainable Groundwater Management Plans."[47]

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[45] Sneed, et al., 2012. Abstract: Renewed Rapid Subsidence in the San Joaquin Valley, California. "The location and magnitude of land subsidence during 2006–10 in parts of the SJV were determined by using an integration of Interferometric Synthetic Aperture Radar (InSAR), Global Positioning System (GPS), and borehole extensometer techniques. Results of the InSAR measurements indicate that a 3,200-km2 area was affected by at least 20 mm of subsidence during 2008–10, with a localized maximum subsidence of at least 540 mm. Furthermore, InSAR results indicate subsidence rates doubled during 2008. Results of a comparison of GPS, extensometer, and groundwater-level data suggest that most of the compaction occurred in the deep aquifer system, that the critical head in some parts of the deep system was exceeded in 2008, and that the subsidence measured during 2008–10 was largely permanent." Conference presentation at *Water for Seven Generations: Will California Prepare For It?*, Chico, CA.

[46] Custis, 2014. Graph for AquAlliance, Comparison of Ground Water Pumping and Accretion, Sacramento Valley 1920-2009. Exhibit R

[47] Custis, Kit 2016. Testimony for Part 1of the BDCP/WaterFix Change in Point of Diversion State Water Resources SWRCB hearing. p. 11. Exhibit G

The significant past, present, and future Project and cumulative streamflow depletion must be presented, analyzed, and included in a recirculated RDEIR/SDEIS. Moreover, it must identify the threshold of significance below which significant impacts would not occur. WS-1 purports to avoid "legal injury" where it is explained in the 2014 Long-Term Transfer DEIS/EIR, but fails to define any threshold or criteria that will be applied in the performance of WS-1 to clearly determine when legal injury would ever occur.

Response

Discussion of groundwater surface water interaction, including potential effects of streamflow depletion, is in Section 3.1, Water Supply of the 2014 Draft EIS/EIR.

Comment 9-67

Comment

B. The RDEIR/SDEIS Fails to Correct the Lack of Disclosure of the Lead Agencies and DWR's Conjunctive Use and Water Transfer Plans, Programs, Project, and Funding.

The RDEIR/SDEIS fails to reveal that the current Project is part of many more plans, programs, projects, and funding to develop groundwater in the Sacramento Valley, to develop a "conjunctive" system for the region, and to place water districts in a position to integrate the groundwater into the state water supply. These are plans that Reclamation, together with DWR, water districts, and others have been pursuing and developing for many years. [48] [49]

An environmental impact statement should consider "[c]onnected actions." 40 C.F.R. §1508.25(a)(1). Actions are connected where they "[a]re interdependent parts of a larger action and depend on the larger action for their justification." *Id.* §1508.25(a)(1)(iii). Further, an environmental impact statement should consider "[s]imilar actions, which when viewed together with other *reasonably foreseeable or proposed agency actions*, have similarities that provide a basis for evaluating their environmental consequences together, such as common timing or geography." *Id.*§1508.25(a)(3). Reclamation's participation in funding, planning, attempting to execute, and frequently executing the programs, plans and projects has circumvented the requirements of NEPA. DWR's failure to conduct project or programmatic level CEQA review for water transfers and comprehensive environmental review for the *Sacramento Valley Water Management Agreement* has segmented a known, programmatic project for decades, which means that Reclamation is also failing to comply with state law as the CVPIA mandates. A list of connected actions and similar actions is found in the Cumulative Impacts section below.

Response

Cumulative effects are evaluated in Chapter 3 of the 2014 Draft EIS/EIR for each environmental resource. Cumulative impacts to water quality, groundwater resources, fisheries, and vegetation and wildlife were updated in the RDEIR/SDEIS.

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[48] Hauge, Carl, 2011. Presentation to the State Water Commission, September 14, 2011. pp. 11,12,14.
[49] McManus, Dan, 2014. Presentation to the State Water Commission, March 3, 2014. p. 2. "Future Water Supply Program (FWSP), Provides data collection and analysis to facilitate and support Sacramento Valley groundwater substitution transfers and conjunctive mgmt."

Comment 9-68

Comment

C. The RDEIR/SDEIS Fails to Disclose Adequately the Existing Geology that is the Foundation of the Sacramento River's Hydrology and the Sacramento Valley's Groundwater Basins.

The RDEIR/SDEIS fails, as did the 2015 FEIS/EIR for the Project, to note a significant geographic feature in the Sacramento River hydrologic region: the Cascade Range (p. 3.3-6). The Cascade Range is the genesis of the Sacramento River and some of its most significant tributaries: the Pit and the McCloud Rivers. The enormous influence of the Cascade Mountain Range on not only the Sacramento River, but the geology, soils, and hydrology of the Sacramento Valley's ground water basin is also completely missing. The California Department of Conservation describes the Range thusly: "The Cascade Range, a chain of volcanic cones, extends through Washington and Oregon into California. It is dominated by Mt. Shasta, a glacier-mantled volcanic cone, rising 14,162 feet above sea level. The southern termination is Lassen Peak, which last erupted in the early 1900s. The Cascade Range is transected by deep canyons of the Pit River. The river flows through the range between these two major volcanic cones, after winding across interior Modoc Plateau on its way to the Sacramento River."[50] The Sacramento River Watershed Program provides another simple, adequate description of its namesake: "The Sacramento River is the largest river and watershed system in California (by discharge, it is the second largest U.S. river draining into the Pacific, after the Columbia River). This 27,000–square mile basin drains the eastern slopes of the Coast Range, Mount Shasta, the western slopes of the southernmost region of the Cascades, and the northern portion of the Sierra Nevada. The Sacramento River carries 31% of the state's total surface water runoff."[51]

The repeated failure of the Lead Agencies to provide this most basic geologic, geographic and hydrologic information on which the entire Project depends causes the reader to wonder what else has been ignored or purposely omitted in the document.

Response

Section 3.4, Geology of the 2014 Draft EIS/EIR includes geologic and geographic information of the Seller Service Area.

Comment 9-69

Comment

D. The DEIR Fails to Disclose the Over Appropriation of Water Rights in the Sacramento River Watershed.

As mentioned above, the public is presented with inadequate baseline data with which to consider the consequences of the Project. The comparison of the average unimpaired flow of the

[50] California Department of Conservation, California Geological Survey, 2002. *California Geomorphic Provences*. [sic]
[51] http://www.sacriver.org/aboutwatershed/roadmap/sacramento-river-basin

Sacramento River Watershed stacked against the claims that have been made for water is but one example. The average annual unimpaired flow in the Sacramento River basin is 21.6 MAF, but the consumptive use claims are an extraordinary 120.6 MAF![52] Informing the public about water rights claims would necessarily show that buyers, Reclamation, and DWR clearly possess junior water rights as compared with those of many willing sellers. Full disclosure of these disparate water right claims and their priority is needed to help explain the actions and motivations of buyers and sellers in the 2019-2024 Water Transfer Program. Otherwise the public and decision makers have insufficient information on which to support and make informed choices.

To establish a proper legal context for these water rights, the RDEIR/SDEIS should also describe more extensively the applicable California Water Code sections about the treatment of water rights involved in water transfers, such as:

> *California Water Code Section 1810 and the CVPIA protect against injury to third parties as a result of water transfers. Three fundamental principles include (1) no injury to other legal users of water; (2) no unreasonable effects on fish, wildlife or other in-stream beneficial uses of water; and (3) no unreasonable effects on the overall economy or the environment in the counties from which the water is transferred.*

Like federal financial regulators failing to regulate the shadow financial sector, subprime mortgages, Ponzi schemes, and toxic assets of recent economic history, the state of California has been derelict in its management of scarce water resources. As we mentioned above we are supplementing these comments on this matter of wasteful use and diversion of water by incorporating by reference and attaching the 2016 complaint to the State Water Resources Control Board of the California Water Impact Network the California Sportfishing Protection Alliance, and AquAlliance on public trust, waste and unreasonable use and method of diversion as additional evidence of a systemic failure of governance by the State Water Resources Control Board, DWR and Reclamation. (Exhibit C)

Response

This comment was previously addressed in Responses to Comments NG03-46 and NG03-47 on the 2014 Draft EIS/EIR; the comment responses are included in Appendix F of the RDEIR/SDEIS*R* (renamed Appendix R). Please refer to Response to Comment 9-22 for additional information.

Comment 9-70

Comment

E. The EIS/EIR Fails to Disclose Irreversible and Irretrievable Commitment of Resources, and Significant and Unavoidable Impacts.

Under NEPA, impacts should be addressed in proportion to their significance (40 C.F.R. § 1502.2(b)), and all irreversible or irretrievable commitment of resources must be identified (40

[52] California Water Impact Network, AquAlliance, and California Sportfishing Protection Alliance 2012. *Testimony on Water Availability Analysis for Trinity, Sacramento, and San Joaquin River Basins Tributary to the Bay-Delta Estuary.*

C.F.R. § 1502.16). And CEQA requires disclosure of any significant impact that will not be avoided by required mitigation measures or alternatives. CEQA Guidelines § 15093. Here, the RDEIR/SDEIS does neither, relegating significant impacts to groundwater depletion, land subsidence, and hardened demand for California's already-oversubscribed water resources, to future study pursuant to inadequately described mitigation measures, if discussed at all.

Response

This comment was previously submitted on the 2014 Draft EIS/EIR and is responded to in Response to Comment NG03-143 and Common Responses 6, 7, and 10. However, the response is strengthened based on the RDEIR/SDEIS because this document has further defined Mitigation Measure GW-1. Rather than multiple different thresholds for different conditions, the threshold for groundwater levels and subsidence is set at historic low levels or local BMO thresholds (if more conservative). Section 3.3 documents why this revised measure will be effective at avoiding impacts to groundwater depletion and land subsidence, which would avoid irreversible and irretrievable commitment of resources and significant and unavoidable impacts. More information on demand hardening is discussed in Responses to Comments 9-111 and 9-112.

Comment 9-71

Comment

I. The RDEIR/SDEIS Analysis of Groundwater Impacts is Inadequate

As discussed, above, the RDEIR/SDEIS groundwater supply mitigation measures rely heavily on monitoring and analysis proposed to occur after groundwater substitution pumping has begun, perhaps for a month or more. Only after groundwater interference, injury, overdraft, or other harms (none of which are assigned a definition or significance threshold) occur, would the RDEIR/SDEIS require sellers to implement mitigation measures, which are as of yet undefined and therefore unknown to the public. As a result, significant and irretrievable impacts to groundwater are fully permitted by the proposed project.

Response

Mitigation Measure GW-1 requires monitoring to occur prior to transfer pumping. Excerpt from GW-1: "*Groundwater levels will be measured in both the participating pumping well(s) and the monitoring well(s) monthly from March in the year of the proposed transfer-related substitution pumping until the start of the transfer. Monitoring will also be conducted on the day that the transfer-related substitution pumping begins, prior to the pump being turned on.*"

Comment 9-72

Comment

In addition, noticeably missing is disclosure and analysis of the quantity of groundwater that must be pumped to irrigate crops with a groundwater substitution transfer. "There is a question of what amount of groundwater would need to be pumped to maintain the crops that were irrigated by the transferred surface water. This can be estimated by accounting for the losses in transfer water of 33 to 43 percent resulting from the BoR-SDF and the carriage water loss. For example, if the crop was irrigated with 1,000 acre-feet of surface water, the maximum amount of allowable transfer water would range from 570 to 670 acre-feet. If it is assumed that the crop needs 1,000 acre-feet of irrigation, then the ratio of groundwater pumped to transferred water ranges from 1.5 to 1.75 (1,000 /670 = 1.5; 1,000 / 570 = 1.75). **Therefore, the proposed transfer of up to 250,000 acre-feet per year would require pumping 375,000 to 437,500 acre-feet of groundwater each year to meet the same irrigation demand.** Based on size of the graph bars for annual transfer volume in Figure 3.3-4, the SACFEM2013 modeling doesn't appear to have simulated the maximum groundwater volume that would need to be pumped in any one year or during the combined 6 years that the project is proposing."[53] (Emphasis added).

Response

Groundwater substitution transfers would result in streamflow depletion and this accounted for through the application of a streamflow depletion factor to groundwater substitution transfers. By applying a streamflow depletion factor, the volume of water actually transferred would not the same as the volume of groundwater pumped through a substitution action. The amount of water that can justifiably be considered to be transferred is the volume of substitution pumping less the amount of induced leakage and the amount of intercepted groundwater flow. The Proposed Action includes measures that would reduce the amount of water the Buyers would receive by an estimated 13 percent depletion factor to prevent any adverse impacts associated with groundwater/surface water interaction.

Comment 9-73

Comment

Groundwater Effects

"Water made available for transfer from groundwater substitution pumping actions would reduce groundwater levels near the participating wells, which could affect surrounding third parties or potentially cause subsidence. These effects would be reduced through monitoring and mitigation plans. If groundwater levels fall below local Basin Management Objectives or historic low groundwater levels, transfer pumping would stop until groundwater levels recover. This requirement would avoid potential groundwater pumping related-land subsidence, which could occur when groundwater levels fall below historic low levels." ES-10.

The RDEIR/SDEIS' description of groundwater levels in the Sacramento Valley Groundwater Basin is incomplete in inconsistent. The RDEIR/SDEIS's repeated refrain that storage tends to decrease in dry years and increase in wet years simply ignores the reality that groundwater demands have and are continuing to increase. The RDEIR/SDEIS does acknowledge that "Urban pumping in the Sacramento Valley increased from approximately 250,000 acre-feet annually in 1961 to more than 800,000 acre-feet annually in 2003," but more important and not included would be information regarding increased demand since 2003 for both urban and agricultural uses, and/or projected into the future for the life of this proposed project. RDEIR/SDEIS 3.3-4.

[53] Custis, Kit H. 2019. Exhibit A. pp. 31-32.

Without factoring increased recent, present, and near-term demand, the RDEIR/SDEIS does disclose that

"Groundwater levels in the northern Sacramento Valley Groundwater Basin have declined over the last decade or so (spring 2004 to spring 2017)." RDEIR/SDEIS 3.3-5. This period does include both wet and dry periods, and again belies the RDEIR/SDEIS's unsupported assumption that groundwater always recovers.

Response

Section 3.3, Groundwater Resources, in the RDEIR/SDEIS includes current groundwater conditions in the Seller Service Area including available groundwater level information and change in groundwater levels in recent years.

Comment 9-74

Comment

Similarly, the RDEIR/SDEIS admits, without further analysis or concern, that "Approximately 7.3 percent of the wells showed a continued decline in groundwater levels between spring 2016 and spring 2017; this decline is attributed to changes in irrigation practices and land use trends in the valley." RDEIR/SDEIS 3.3-5. And despite the fact that "Water Year 2017 was classified as one of the wettest years on record since 1983," the RDEIR/SDEIS states that "Changes in groundwater levels between spring 2011 and spring 2017 show a decline of 2.6, 5.2 and 5.8 feet in the shallow, intermediate and deep aquifer zones, respectively" in the Sacramento Valley. RDEIR/SDEIS 3.3-5.

Response

Text in Section 3.3. has been revised to include a reference. The two sentences following the cited text include:

> "In summary, groundwater levels in the Sacramento Valley Groundwater Basin have recovered to better than spring 2016 levels but have not improved to pre-drought levels (prior to 2011). It should be noted that groundwater level declines discussed above were due to five consecutive drought years and only partial recovery from one wet year is consistent with historic patterns of drawdown and recovery."

The groundwater analysis explains that the aquifer partially recovered during 2017, but one wet water year was not adequate to fully recover from a multi-year drought.

Comment 9-75

Comment

Table 3.3-2.
Historic Groundwater Pumping and Groundwater Basin Safe Yields for Potential Buyers

Potential Buyer Agency	Underlying Groundwater Basin	Safe Yield of Groundwater Basin (acre-feet)	Groundwater Pumping (acre-feet/year)
Westlands WD[1]	Westside subbasin	200,000	15,000-600,000[2]
SCVWD[3]	Santa Clara Plain subbasin	373,000-383,000	93,500-122,300[4]
	Llagas subbasin	150,000-165,000	41,600-49,700[4]
Contra Costa WD[5]	-	-	3,000

[1] Source: Westlands WD 1996. Based on data from 1988 to 2011.
[2] Average pumping is approximately 218,600 acre-feet/year
[3] Source: SCVWD 2012
[4] Based on data from 2000 to 2009. Combined average pumping for Santa Clara Plain and Llagas subbasins is approximately 156,330 acre-feet/year
[5] Source: Contra Costa WD 2011

RDEIR/SDEIS 3.3-11. What is the source of these data? Citations are unclear.

Nothing stops buyers in these areas from continuing these pumping rates, even with project transfer water.

Response
Data sources for Table 3.3-2 are:

- Westlands WD. 1996. Westlands Water District GMP. Available at: http://www.westlandswater.org/long/200207/gwmp2.pdf?title=Groundwater%20Management%20Plan%20(AB3030)&cwide=1440
- SCVWD. 2012. Santa Clara Valley Water District Groundwater Management Plan. Available at: http://www.valleywater.org/Services/Groundwater.aspx
- Contra Costa WD. 2011. Urban Water Management Plan. June. Available at: http://www.water.ca.gov/urbanwatermanagement/2010uwmps/Contra%20Costa%20Water%20District/CCWD_FINAL%202010%20UWMP.pdf

These citations are included as footnotes in the table and the full document citations are in Section 3.3 of this Final EIS/EIR.

Comment 9-76

Comment
The RDEIR/SDEIS's stated threshold of significance, that groundwater impacts would be significant if it caused "A net reduction in groundwater levels that would result in substantial

adverse environmental effects or effects to non-transferring parties" is circular and so vague as to render the threshold completely susceptible to the Lead Agencies' subjective interpretations. RDEIR/SDEIS 3.3-10. Nevertheless, the RDEIR/SDEIS asserts that "Impacts of Action Alternatives on groundwater levels were analyzed using a quantitative approach with a numerical groundwater model." This is simply irreconcilable with the vague and non-objective threshold of significance set forth.

Response

The commenter is quoting text in Assessment Methodology section of Section 3.3, Groundwater Resources in the RDEIR/SDEIS. The detailed impacts analysis in Section 3.3.2.2 provides additional information on the types of third-party impacts evaluated in the document.

Comment 9-77

Comment

For the Redding Area Groundwater Basin, the RDEIR/SDEIS concludes, with no supporting facts or analysis whatsoever, that "Additional pumping is not expected to be in locations or at rates that would cause substantial long-term changes in groundwater levels that would cause changes to groundwater quality. Changes to groundwater quality due to increased pumping would be less than significant in the Redding Area Groundwater Basin." RDEIR/SDEIS 3.3-12.

Response

Text in Section 3.3, Groundwater Resources, has been updated to provide clarification. However, this revision did not result in changes to findings of significance.

Comment 9-78

Comment

The RDEIR/SDEIS modeling in the Sacramento Valley indicates that "Groundwater levels at this location return to near-baseline conditions approximately three to four years after the single year groundwater substitution transfer event in WY 1981. Recovery occurs after approximately six years following the multi-year transfer event from WY 1986 to WY 1994." RDEIR/SDEIS 3.3-15. In another modeled location, "Groundwater levels return to approximately 75 percent of the 1 baseline level five years after the single year transfer event in WY 1981 and between 50-75 2 percent six years after the multi-year transfer event from WY 1986 to WY1994." RDEIR/SDEIS 3.3-16. These long and uncertain recovery, and even partial recovery, periods would extend beyond the duration of the proposed project itself. And a six year recovery for a single year transfer could easily lead to significant effects for multiple year transfers. Added to this, the RDEIR/SDEIS fails to account for increased climate variability, temperatures, and demand. See, *infra* at section VIII below.

Response

As noted in Section 3.3, Groundwater Resources, groundwater level recovery is highly dependent on (1) hydrology in the year following the groundwater substitution transfer; (2) proximity of the pumping well to surface water; (3) pumping in the following year (i.e., if the subsequent year also includes groundwater substitution pumping to make surface water available for transfer); and (4) aquifer properties. Simulated recovery trends between WY1986 to WY 1994 discussed above is based on (1) six consecutive years of transfer; and (2) six continuous years of dry or critical dry hydrologic conditions.

The CalLite-CV model does evaluate climate change impacts to groundwater supplies available for transfer. The methodology and assumptions are described in Section K.5.6 and the results are presented in Section K.6 in Appendix K.

Comment 9-79

Comment

The RDEIR/SDEIS asserts that there is a chance of subsidence at only two well locations, but this information is difficult to support. The figures and tables in this section do not match the text or each other. They talk about subsidence at two locations out of eight locations, and refer to Figure E-10 in Appendix E. They also list wells in Table 3.3-5, but it is unclear what two subsidence wells are on the Figure E-10. In fact, it is unclear if any of the wells in Table 3.3-5 are on Figure E-10.

Response

Excerpt from Section 3.3.2.2: "*Based on the calculated historic low, groundwater levels since 2008 and the simulated change in groundwater level due to groundwater substitution pumping, there is potential for land subsidence at two of the eight monitoring wells (22N01E28J003M and 19N02W13J001M) presented in Table 3.3-5.*"

As noted in Section 3.3.2.2, there is potential for subsidence at 22N01E28J003M and 19N02W13J001M. The locations of these wells are shown in Figure E-10.

Comment 9-80

Comment

Page 3.3-20 refers to a hydrograph at Location 30 in Appendix F, but there are no hydrographs in Appendix F. Appendix F has the maps of the simulated drawdown, but no hydrographs. Even the 2014 EIR/S Appendix E hydrographs do not indicate any of the lowest historical groundwater levels or a trigger level. As a result, it is impossible to confirm the RDEIR/SEIS's conclusions.

Response

Appendix G has been updated to include hydrographs for all 34 selected locations and seven model layers i.e. 238 hydrograph locations.

Comment 9-81

Comment

To determine subsidence potential, the RDEIR/SDEIS should look at groundwater levels when the transfer is proposed and estimate what the normal drawdown would be without the transfer, and then add in the drawdown from transfer. Given measurement margins of error, if this is even close to exceeding the threshold, the transfer shouldn't be allowed. Second, the drawdowns in Table 3.3-5 are at some unspecified distance from the wells, where drawdown levels and subsidence risk are far lower than at or adjacent to the production well itself.

Response

As discussed in Section 3.3, Groundwater Resources of the RDEIR/SDEIS, irreversible subsidence would only occur when groundwater levels are below historic low levels (USGS 2017). Therefore, stopping transfer related pumping if groundwater levels reach historic low level would avoid any potential irreversible (permanent) subsidence.

Comment 9-82

Comment

The RDEIR/SDEIS's conclusion that groundwater pumping would not risk spreading any areas of contaminated groundwater is also conclusory, not supported by evidence, and internally inconsistent. The RDEIR/SDEIS asserts that since "Groundwater substitution pumping under the Proposed Action would be limited to short-term withdrawals during the irrigation season. Effects from the migration of reduced groundwater quality would be less than significant." The

RDEIR/SDEIS asserts that "Inducing the movement or migration of reduced quality water into previously unaffected areas due to groundwater substitution pumping is not likely to be a concern unless groundwater levels and/or flow patterns are substantially altered for a long period of time." The RDEIR/SDEIS fails to provide evidence or analysis of any evidence as to why increased groundwater extraction would not cause this effect. The RDEIR/SDEIS's qualitative speculation that pumping would not substantially alter flow patterns for a long period of time is contradicted by the RDEIR/SDEIS's own model results (which we believe understate the impact) which indicate up to 5 or 6 years of recharge can be required to offset effects from a *single year* of groundwater substitution pumping.

Response

The SACFEM2013 model was used to identify and quantify changes in groundwater levels resulting groundwater substitution pumping from the Proposed Action. The model results are shown in figures in Section 3.3 and Appendix F of the RDEIR/SDEIS (renamed Appendix G). The presence of drawdown should not be interpreted as a change in groundwater flow direction. Groundwater flow direction and rate of flow is governed by the head gradient (i.e., a difference in groundwater elevation). A change in groundwater flow direction or rate that would cause a change in movement of low-quality groundwater could be caused by a change in the magnitude or direction of the groundwater head gradient. While the introduction of additional pumping may cause a change in groundwater flow gradient during the pumping period, the change in gradient is expected to be maintained only during the periods of active groundwater substitution pumping groundwater (up to six months). Groundwater gradients would be expected to begin to return to pre-substitution values after the six-month substitution pumping period. While groundwater level drawdown due to groundwater substitution pumping may take multiple years to fully recover (as noted by the commenter), changes in groundwater head gradients are not expected to be maintained for this same duration.

Comment 9-83

Comment

The RDEIR/SDEIS misleadingly states that "The Proposed Action may result in a reduced use of groundwater resources during periods of shortage by supplementing water supply with transferred water. Therefore, the impact of the Proposed Action on groundwater levels in the Buyer Service Area would be beneficial." RDEIR/SDEIS 3.3-23. This conclusion is unsupported by evidence and misleading. Agricultural and municipal demand have steadily increased in the Buyer Service Areas. The RDEIR/SDEIS fails to present any information to rebut this trend, which supports the opposite conclusion that groundwater not needed to meet existing demands would then be available to meet growth demands.

Response

The impacts discussion for Proposed Action in Section 3.3, Groundwater Resources compares impacts under Proposed Action to No Action Alternative. Therefore, this analysis does not suggest an overall increase in groundwater levels in the Buyer Service Area.

See Response to Comment NG-03-144 on the 2014 Draft EIS/EIR on growth inducing demands.

Comment 9-84

Comment

Mitigation measure GW-1 first requires that potential sellers submit well data as "detailed in the most current version of the *DRAFT Technical Information for Preparing Water Transfer Proposals* (Reclamation and DWR 2014)." RDEIR/SDEIS 3.3-25. The RDEIR/SDEIS fails to provide any further information on this point, rendering GW-1 completely incapable of being analyzed. What types of information would be necessary in order to sufficiently and effectively evaluate the effects of any transfer and any subsequent mitigation measures; and does the *DRAFT TIPWTP* necessarily include this information?

Response

Appendix B of the *DRAFT Technical Information for Preparing Water Transfer Proposals* (Reclamation and DWR 2015) provides a detailed checklist the sellers would need to fill out as part of the transfer proposal. The information checklist in Appendix B is not a Mitigation Measure but helps to provide the information that is required in Mitigation Measure GW-1.

Comment 9-85

Comment

GW-1 next requires that "Potential sellers must complete and implement a monitoring program subject to Reclamation's approval that shall include, at a minimum, the following components . . ." RDEIR/SDEIS 3.3-25. Is there a clear mechanism for Reclamation to require these submissions and enforce this mitigation measure as to any seller districts that are not transferring water subject to Reclamation approval? Will Reclamation have legal authority to deny any project that fails to include a suitable monitoring well program?

Response

The "Evaluation and Reporting" section of Mitigation Measure GW-1 discusses the procedures for sellers to collect and submit monitoring data to Reclamation. Reclamation will review the information to verify that it is consistent with the requirements of Mitigation Measure GW-1. Please refer to Common Response 14 in Appendix F of the RDEIR/SDEIS (renamed Appendix R), for information regarding the water transfers annual review process.

Comment 9-86

Comment

GW-1 explains that "Suitable monitoring well(s) would: (1) be within a two-mile radius of the seller's transfer pumping well; (2) be located within the same Bulletin subbasin as the pumping well; and (3) 4 have a screen depth(s) in the same aquifer level (shallow, intermediate, or deep) as the pumping well." RDEIR/SDEIS 3.3-26. The expert comment of Kit Custis, submitted concurrently herewith, demonstrate that groundwater impacts may occur nearer, and over 10 miles away.[54] For a single well at a distance of up to two miles, it simply does not follow that "Monitoring requirements at the participating pumping well and suitable monitoring well(s) would detect impacts to third parties." RDEIR/SDEIS 3.3-26.

Response

As noted in the RDEIR/SDEIS, groundwater level declines due to pumping occur initially at the pumping well and then propagate outward from that location. The magnitude of groundwater level decline caused by pumping also decreases with increasing distance from the pumping well. Therefore, monitoring of groundwater levels within a two-mile radius from the pumping well would detect groundwater level declines sooner than at well father away from the pumping well. Therefore, the two-mile radius requirements would adequately capture impacts from groundwater level declines.

Comment 9-87

Comment

Next, the RDEIR/SDEIS reveals, for the first time, that as a result of the worst drought in California history, the RDEIR/SDEIS is actually *lowering* its threshold of significance to no effects greater than groundwater levels during the historic drought period. 3.3-26. The RDEIR/SDEIS states "Wells with short historic records could be considered, but short records (that do not extend to 2014 or earlier) could limit the transfer because the historic low would not reflect the persistent dry weather from 2011 to 2015. In this situation, the lowest groundwater level for the short period of record would be used, but because the groundwater level would likely be higher than the historic low during the prior drought period, the groundwater level triggers (described below) would be more restrictive (i.e., the lowest recorded groundwater level could be reached more quickly during transfer-related pumping than occurred in the short period of record when groundwater levels were higher." 3.3-26.

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[54] Custis, Kit H. 2019. Comments on the Long-Term Water Transfers, RDEIR/SDEIS. p. 11.

Could the BMOs, or the RDEIR/SDEIS' threshold of significant for areas without a BMO, also lower their threshold of significance *every year there is a lower historical low*? This is tantamount to no limit at all. Is there any historical pattern of this for how each county manages its BMOs?

Response

As noted under Mitigation Measure GW-1, water transfer related pumping would be halted if groundwater levels reach historic low groundwater levels. Stopping transfer-related pumping would stabilize groundwater levels to above historic low levels. Therefore, transfer related pumping would not result in lowering of historic low groundwater levels.

The comment indicates that this is a less restrictive threshold of significance than in the 2014 Draft EIS/EIR, but this is not accurate. The 2014 Draft EIS/EIR included provisions to compare monitoring wells to local BMOs; most local BMOs manage groundwater levels to stay above historic lows. In these areas, there is no change. In areas that have more restrictive BMOs, Mitigation Measure GW-1 would continue to use these BMOs. The only change is for areas that do not have a local BMO, and these areas would be held to the historic low groundwater level because this is the concept most frequently used for groundwater management (and it would avoid irreversible subsidence).

Comment 9-88

Comment

The groundwater monitoring threshold of significant in the RDEIR/SDEIS, which aims to maintain groundwater above "historic low" levels, fails to consider whether the projects' incremental effects may nonetheless be cumulatively considerable. Where, for example, an aquifer is already in a state of decline or near historic low levels, adding groundwater substitution demands that help the aquifer to persist in an overdraft condition, at or near historically low levels, should be considered to be cumulatively considerable.

Response

Under Mitigation Measure GW-1, transfer-related pumping would be halted if historic low groundwater levels are reached and transfer-related pumping would not continue below historic low groundwater levels. Cumulative impacts on Groundwater Resources are discussed in Section 3.3.6, and the analysis shows that transfer-related effects on groundwater resources would not be cumulatively considerable with implementation of Mitigation Measure GW-1.

Comment 9-89

Comment

The RDEIR/SDEIS should include each relevant BMO it proposes to use, since the Lead Agencies are in possession of this information, and this would clearly disclose the proposed project's potential effects. The use of some BMOs may require clarification. For example, Butte County has adopted various "Alert Stages" related to its BMO implementation, and the RDEIR/SDEIS should clarify that the initial BMO, and not subsequent lower "Alert Stage" levels, will be used. Some Butte County BMOs were established "by taking the historical low reading and adding 20% of the range of measurements, calculated from the first year on record through 2006." (Groundwater Status Report, Butte County, 2017.) The RDEIR/SDEIS does not adopt this approach for areas where no BMO is set (which includes some areas within Butte County), but rather, simply uses historical low groundwater levels. The RDEIR/SDEIS misleadingly says that most BMOs are based on historical lows, but this is plainly untrue where Butte County adds an additional protective measure of 20%. The RDEIR/SDEIS's use of historical lows is thus arbitrary and, rather obviously, not protective of groundwater.

Response

The range of potential water transfers analyzed in the Proposed Action does not include groundwater substitution pumping in Butte County.

Regarding the comment on quantitative BMOs, Mitigation Measure GW-1 notes that quantitative BMOs do not exist in all Seller Service Areas (see Appendix L [Table L-2] for existing BMOs in the Seller Service Area). As part of a seller's transfer proposal subject to Reclamation's review and approval, the seller will need to identify the monitoring wells and the specific groundwater level trigger for each well (established through the local BMO or the historic low groundwater level for that well).

Comment 9-90

Comment

The RDEIR states that "it is likely that groundwater levels in the pumping well would decline to the historic low level sooner than at the monitoring well(s)," RDEIR/SDEIS 3.3-27, but depending on the heterogeneity of the aquifer, this may not be the point at which the impact is most severe, and provides no information for any slope to the water table, nor where the greatest opening in any aquifer may be occurring. See, e.g., Appendix E, Figs E-46 to E-54. The RDEIR/SDEIS must, but fails to, provide sufficient well monitoring for subsidence effects.

Response

As discussed in Section 3.3, Groundwater Resources of the RDEIS/SDEIS, groundwater level declines from transfer related pumping would be highest at the participating pumping well and dissipate away from the well. Therefore, as noted in the comment and the RDEIR/SDEIS, groundwater levels in the pumping well would decline to the historic low level sooner than at the monitoring well(s).

In response to the commenter concerns about impacts farther away from the pumping well, Mitigation Measure GW-1 does require monitoring at a suitable monitoring well(s) within a 2-mile radius from the participating pumping well.

Comment 9-91

Comment

GW-1 impermissibly defers formulation of critical components of the mitigation measure itself by requiring that "The monitoring program will include a plan to coordinate the collection and organization of monitoring data. This plan will describe how input from third parties (i.e. groundwater wells not participating in water transfers) will be incorporated into the monitoring program and will include a plan for communication with Reclamation as well as other decision makers and third parties." RDEIR/SDEIS 3.3-28 (emphasis added). This is simply a plan to create a plan. "[T]entative plans for future mitigation after completion of the CEQA process," without any "specific performance criteria for evaluating the efficacy of the measures" violate CEQA. (*POET, LLC, supra*, 218 Cal.App.4th 681, 738; *see also* Guidelines, § 15121(a).) There is no reason that this plan cannot and should not be provided now. For instance, GW-1 next provides that "Reclamation, SLDMWA, and potential seller(s) will coordinate closely with potentially affected third parties to collect and monitor groundwater data." RDEIR/SDEIS 3.3-28. DWR already possess well permit information, including location, for all wells in the vicinity of each potential groundwater substitution production pump. This information should be sought out and disclosed now in the RDEIR/SDEIS. Instead, Reclamation is simply illegally deferring this analysis to a later date, as part of the mitigation measure. Surely, Reclamation would be required to review publicly available DWR well data at such time as it would determine the "potentially affected third parties" in the future. GW-1 states that "If a third party expects that it may be affected by a proposed transfer, that party should contact Reclamation and the seller with its concern." RDEIR/SDEIS 3.3-28. But how would a third party know that a groundwater substitution is about to occur? It should be the duty of Reclamation and the seller to contact the potentially affected third party with sufficient time in advance of the transfer for the affected third party to provide information regarding their well and groundwater. Indeed, as stated, those individuals should be knowable and included in the RDEIR/SDEIS now. In addition, other aspects of this future possible plan are very likely infeasible or of very limited value, and that information needs to be recognized before the EIR is certified and Reclamation issues a Record of Decision allowing approval of an inadequate mitigation measure. The court has already rejected prior GW-1 language as inadequate to articulate any meaningful threshold of significance regarding impacts to third parties, and this RDEIR/SDEIS relies on the same plan to "coordinate closely" with potentially affected third parties, with no objective thresholds of what impacts will be considered potentially significant, and no performance standards to reduce those to a less than significant level.

Response

Mitigation Measure GW-1 contains specific information that must be included in the monitoring plan and mitigation plan that must be submitted and approved annually before each transfer. This information functions as performance standard to establish that the plans contain required components.

This comment inaccurately summarizes the District Court's ruling on performance standards for the groundwater mitigation. The District Court considered whether the previous performance standard, coordination with third parties to identify potential impacts, was an adequate standard for areas that do not have BMOs (which serve as the performance standard where they exist). The District Court ruling included this assessment:

What exactly is the impact to be avoided? Although GW-1 generically identifies increased pumping costs and decreased yield as types of impacts to third parties, there is no indication of when such impacts might be considered "significant."

To address this concern, the revised Mitigation Measure GW-1 in the RDEIR/SDEIS has a quantitative performance standard related to impacts to groundwater resources and third parties. Mitigation Measure GW-1 uses BMO thresholds, where they exist, to avoid potential impacts related to groundwater levels or subsidence. For areas that do not have BMOs, groundwater levels must be maintained above historic low groundwater levels. The RDEIR/SDEIS analyzed this mitigation and found that it would be effective at avoiding significant impacts (see Section 3.3.2.2 of the RDEIR/SDEIS). While the Lead Agencies still plan to communicate with third parties, this communication is not the basis for the performance standard in Mitigation Measure GW-1.

Comment 9-92

Comment

The RDEIR/SDEIS recognizes that Glenn-Colusa ID adopted a new "Supplemental Supply program proposes to operate ten groundwater wells (five existing wells and five proposed wells) to augment surface water diversions." RDEIR/SDEIS 3.3-31. The RDEIR/SDEIS asserts that this project will have no cumulatively considerable impact for the sole reason that "Glenn-Colusa ID's supplemental supply program and Glenn-Colusa ID's groundwater substitution pumping to make surface water available for transfer are not expected to occur simultaneously." This fails to support any conclusion that the projects, in conjunction, would not have significant cumulative impacts, since the RDEIR/SDEIS does acknowledge that its own groundwater substitution effects could take years to recover from any single transfer. If the GCID Supplemental Supply program draws down groundwater that the RDEIR/SDEIS assumes is recharging and offsetting groundwater substitution effects, then the two projects taken together would be cumulatively considerable. The RDEIR/SDEIS also fails to acknowledge that GCID abandoned the Supplemental Supply program in 2016: "This letter is to inform you that the Glenn-Colusa Irrigation District (GCID) Board of Directors has made the decision to suspend the environmental review process for the Groundwater Supplemental Supply Project and corresponding Environmental Impact Report (EIR), and instead independently pursue the development of a comprehensive Water Resource Plan (WRP)."[55] How this changes GCID's transfer program is unclear and should be considered.

Response

Text in Section 3.3.6 has been revised to analyze cumulative impacts from the GCID's Water Resource Plan.

Comment 9-93

Comment

The RDEIR/SDEIS provides no analysis of the cumulative effects in conjunction with the Davis-Woodland Water Supply Project. The RDEIR/SDEIS simply concludes that GW-1 will prevent any significant effects, but fails to consider entirely whether both projects can be fulfilled

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[55] Bettner, Thad 2016. Memo: *Development of a Comprehensive GCID Water Resource Plan and Suspension of the Environmental Review Process for the Groundwater Supplemental Supply Project*. p. 1. Exhibit H

without adversely affecting other groundwater users, nor considering the cumulative effects of both projects, in conjunction, at all.

Response

Section 3.3.6 evaluates the cumulative impacts of Proposed Action and other past, present and reasonably foreseeable projects including the Davis-Woodland Water Supply Project.

Comment 9-94

Comment

The RDEIR/SDEIS concludes that GW-1 will absolutely avoid any cumulatively considerable impacts, but it will not. As discussed, GW-1 is premised only upon maintaining groundwater levels at or below historically low groundwater levels, but admits that as historical groundwater levels lower further still, GW-1 will simply incorporate the new historically low groundwater level as a baseline. Thus, if a groundwater substitution project reaches but does not exceed historical lows, but a subsequent cumulative project does exceed that historical low, the following year transfer project may incorporate the new historical low, thus cumulatively creating a significant effect. Alternatively, even assuming that these projects also prohibited groundwater drawdown below historical lows, and assuming that GW-1 allows this project's groundwater substitutions to reach historical lows, then there would simply be no remaining groundwater available for the cumulative projects, resulting in a significant effect to their implementation. This would further violate CVPIA's mandate that any transfer have no significant impact on the seller's groundwater. CVPIA Section 3405 (a)(l)(J) states that no transfer shall be approved unless it is determined that "such transfer will have no significant long-term adverse impacts on groundwater conditions in the transferor's service area." To comply with the provision of CVPIA, the Bureau will have to arrive at some level of certainty that groundwater substitution will not adversely affect the transferor's basin under current operations or the preferred alternative. Again, this must be developed and presented in a revised and recirculated CEQA/NEPA document.

Response

Please refer to Response to Comment 9-88.

Comment 9-95

Comment

II. <u>Subsidence</u>

The RDEIR/SDEIS suffers the same flaw of catching and proposing to mitigate subsidence impacts after they occur just as planned with groundwater levels, Damages from both groundwater levels dropping and subsidence can be severe, permanent, and complicated. The RDEIR/SDEIS at least acknowledges this when it identifies subsidence as "irreversible," "permanent/irreversible," and "irreversible (permanent) ." pp. 3.3-22, 3.3-26. Despite this acknowledgement, the RDEIR/SDEIS purports to avoid these impacts to less than significant levels:

Potential sellers must complete and implement a mitigation plan to avoid potentially significant groundwater impacts and ensure prompt corrective action in the event unanticipated effects occur. If groundwater level triggers are reached at the participating pumping well(s) or the suitable monitoring well (s) (either BMO triggers or historic low groundwater levels), transfer-related pumping would stop from the participating pumping well that reached the trigger. Transfer related pumping would be stopped when the trigger is first reached at either the participating pumping well(s) or the suitable monitoring well(s). Transfer-related pumping could not continue from this well (in the same year or a future year) until groundwater levels recovered to above the groundwater level trigger. Implementation of the mitigation plan thus avoids any potentially significant groundwater impacts. Other corrective actions could include:

- Lowering of pumping bowls in non-transferring wells affected by substitution pumping.
- Reimbursement to non-transferring third parties for significant increases in their groundwater pumping costs due to the groundwater substitution pumping action, as compared with their costs absent the transfer.
- Reimbursement to non-transferring third parties for modifications to infrastructure that may be affected.
- Other appropriate actions based on local conditions. p. 3.3-29.

As noted in section VI of our comments above, the groundwater monitoring threshold of significant in the RDEIR/SDEIS, which aims to maintain groundwater above “historic low” levels, fails to consider whether the projects’ incremental effects may nonetheless be cumulatively considerable. Also discussed is the fact that it is misleadingly says that most BMOs are based on historical lows when this is clearly untrue since Butte County adds an additional protective measure of 20%. The RDEIR/SDEIS’s use of historical lows is thus arbitrary and, rather obviously, not protective of groundwater.

Response

Response to Comment 9-87 includes information about why the selected performance standard to avoid subsidence would be effective in avoiding adverse effects. Response to Comment 9-88 discusses the cumulative analysis. The analysis of BMOs is focused on the areas where agencies may sell water through groundwater substitution transfers, and no groundwater substitution transfers would originate in Butte County.

Comment 9-96

Comment

Even if there are adequate thresholds of significance through so-called historic lows or BMOs, stopping groundwater pumping does not necessarily stop subsidence. Delayed subsidence should be monitored according to the findings of Kyran D. Mish, PhD. Dr. Mish notes that, “It is important to understand that all pumping operations have the potential to produce such settlement, and when it occurs with a settlement magnitude sufficient enough for us to notice at the surface, we call it subsidence, and we recognize that it is a serious problem (since such settlements can wreak havoc on roads, rivers, canals, pipelines, and other critical infrastructure)”[56] Dr. Mish further explains that “[b]ecause the clay soils that tend to contribute the most to ground settlement are highly impermeable, their subsidence behavior can continue well into the future, as the rate at which they settle is governed by their low permeability.”[57] “Thus simple real-time monitoring of ground settlement can be viewed as an unconservative measure of the potential for subsidence, as it will generally tend to underestimate the long-term settlement of the ground surface.”[58] (emphasis added)

Response

As discussed in Exhibit I, Commentary on Ken Loy GCID Memorandum, there are two types of subsidence, elastic and inelastic subsidence. In the elastic case, when pumping stops, the soil returns to its undisturbed configuration and no permanent settlement is produced. In the inelastic case, the settlement is essentially irreversible, and these irrecoverable strains decrease the storage capacity of the aquifer essentially forever, while they also create the risk of permanent subsidence at the ground’s surface. As noted in Section 3.3, Groundwater Resources, irreversible subsidence would only occur when groundwater levels are below historic low levels (USGS 2017). Therefore, this measure would also avoid any potential irreversible (permanent) subsidence and consequently any delayed subsidence as noted by the commenter.

Comment 9-97

Comment

The model used for the Project is not equipped to handle the tasks necessary to predict Project impacts like subsidence and damage to an aquifers capacity.

It is actually quite easy to avoid all these adjustments and oversimplifications entirely, and treat the aquifer as it is, namely as a true three-dimensional physical body of large extent, with a time-varying location of the water table, and with accurate treatment of the complex hydraulic conductivity inherent to the subsurface conditions of California. It’s also remarkably simple to include poromechanical effects (see discussion below) in such a 3D model so that accurate local and regional estimates of environmental impacts such as subsidence and loss of aquifer capacity can be predicted and validated. All of this technology has been available for decades, but it is not utilized in the SacFEM2013 model. *The citizens of California clearly deserve a better model for decision-making involving one of their most precious resources*![59]

Response

In 2011, prior to selecting the SACFEM model for use in the 2014 Draft EIS/EIR, an extensive independent peer review was performed by an independent consultant with extensive experience in the application of groundwater models to evaluate groundwater systems and surface water-groundwater interaction (WRIME 2011). The objective of the peer review was to evaluate the adequacy of the model to estimate the impacts of groundwater substitution water transfer related pumping on third party groundwater

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[56] Mish, Kyran D. 2008. *Commentary on Ken Loy GCID Memorandum*. p. 3. Exhibit I.
[57] (*Id.)* p. 4.
[58] *(Id.)*
[59] Mish, Kyran D. 2014, Exhibit B.

users as well as impacts to surface water flows. The results of the peer review identified seven primary enhancements to the model that would improve its accuracy in forecasting pumping impacts on water resources in the Sacramento Valley. All seven of these enhancements were incorporated into SACFEM2013, the most recent version of SACFEM. Though several updates have been made to other groundwater models (C2VSIM and CVHM) since 2011, the project enhancements made to the SACFEM model makes this the best available tool to analyze impacts under Proposed Action.

Comment 9-98

Comment

Subsidence in the Sacramento Valley

The RDEIR/SDEIS asserts that, "Land subsidence has not been monitored in the Redding Area Groundwater Basin. However, there would be potential for subsidence in some areas of the basin if groundwater levels decline below historic low levels. The groundwater basin west of the Sacramento River is composed of the Tehama Formation. This formation has exhibited subsidence in Yolo County and the similar hydrogeologic characteristics in the Redding Area Groundwater Basin could be conducive to land subsidence."[60] That the vulnerable Redding Area Basin (as classified in the RDEIR/SDEIS) hasn't been monitored, is contradicted in a report that was released in December of 2018, which states, "The [subsidence monitoring] network encompasses all or part of 11 counties, from Shasta County at the north end of the valley to Solano and Sacramento counties in the south."[61] The report, *2017 GPS Survey of the Sacramento Valley Subsidence Network* ("Subsidence Report"), also notes that this monitoring network was established in *2008*.[62]

Response

Text in Section 3.3.1.2 has been revised to document latest available subsidence monitoring information in the area of analysis. However, this revision did not result in changes to findings of significance.

Comment 9-99

Comment

The Subsidence Report demonstrates that between 2008 and 2017, "The Arbuckle area (Colusa County) showed the most subsidence with a maximum change of -2.14 feet (ft.). Surrounding stations and InSAR data confirm this result with changes ranging from -0.49 to -1.00 ft. In eastern Yolo County (Zamora to Davis), the largest spatial extent of station declines was observed with several benchmarks showing changes between -0.3 and -1.1 ft. In Glenn County (Artois and Orland area), three stations, ARTO, K852, and AGUI showed changes of -0.59 ft., -0.46 ft., and -0.44 ft., respectively. An area on the south side of the Sutter Buttes showed changes

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[60] Project RDEIR/SDEIS/SDEIS p. 3.3-3.
[61] DWR, 2018. *2017 GPS Survey of the Sacramento Valley Subsidence Network.* p. v. Exhibit Q.
[62] (*Id.)*

ranging from -0.19 to -0.36 ft. The remainder of the valley shows little change overall."[63] Later in the report it states, "Of greatest concern for comparison were stations SECO and HAHN in the Arbuckle area that showed major changes of -2.14 and -1.69 ft., respectively."[64]

Response

Please refer to Response to Comment 9-98.

Comment 9-100

Comment

The subsidence monitoring that is taking place in the Redding Area Basin as noted in the Subsidence Report is not acknowledged in the RDEIS/SDEIS and it also fails to mention the subsidence monitoring network as well. The RDEIR/SDEIS does acknowledge that, "Historically, land subsidence occurred in the eastern portion of Yolo County and the southern portion of Colusa County, owing to groundwater extraction and geology. Due to groundwater withdrawal over several decades, as much as four feet of land subsidence has occurred east of the town of Zamora," but without a citation.[65] It would benefit the reader to know what is meant by "historically" in this context and how this was reported prior to the subsidence monitoring network's existence and reports. If the Lead Agencies seek to plead they knew nothing of the 2018 subsidence results due to the timing of the preparation of the RDEIR/SDEIS, they surely knew about preliminary results that were released in August 2015 by DWR[66] and the National Aeronautic and Atmospheric Administration.[67]

Response

Please refer to Response to Comment 9-98.

Comment 9-101

Comment

<u>Inadequacy of Mitigation</u>

As Custis presents, GW-1 is not up to the task to even monitor impacts let alone mitigate impacts. Mitigation GW-1 doesn't require the seller to comply with DWR's Best Management Practices for land subsidence monitoring networks. Mitigation GW-1 lacks specific information on what rate and amount of land subsidence would be considered significant and therefore trigger the corrective action to provide financial reimbursement to third parties for modification of their wells or infrastructure damaged by land subsidence. Mitigation GW-1 doesn't require that transfer sellers demonstrate that they have the financial assurance to reimburse third parties for mitigation costs. Mitigation GW-1 doesn't identify the procedures for third parties to making a claim of land subsidence damage. pp. 5-6.

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[63] (*Id.)*
[64] (*Id.)* p. 16.
[65] Project RDEIR/SDEIS/SDEIS. p. 3.3-6.
[66] DWR 2015. Press Release. Exhibit J.
[67] Farr, Tom G. et al. 2015. Progress Report: Subsidence in the Central Valley, California. Exhibit K.

As copied above, the RDEIR/SDEIS provides for:

- Lowering of pumping bowls in non-transferring wells affected by substitution pumping.
- Reimbursement to non-transferring third parties for significant increases in their groundwater pumping costs due to the groundwater substitution pumping action, as compared with their costs absent the transfer.
- Reimbursement for modifications to infrastructure that may be affected by non-reversible subsidence."

This unequivocally provides for significant and irreversible impacts to occur.

Response

Please refer to Response to Comment 9-81 regarding subsidence monitoring in Mitigation Measure GW-1.

Mitigation Measure GW-1 provides a coordination plan that summarizes requirements for collecting and responding to third party complaints.

Comment 9-102

Comment

III. Transfer Water Dependency

The EIS/EIR fails to account for long-term impacts of supporting agriculture and urban demands and growth with transfer water. Agriculture hardens demand by expansion and crop type and urban users harden demand by expansion. Both sectors may fail to pursue aggressive conservation and grapple with long-term hydrologic constraints with the delivery of more northern California river water that has been made available by groundwater mining and fallowing. Since California has high variability in precipitation year-to-year (http://cdec.water.ca.gov/cgi-progs/iodir/WSIHIST) (Exhibit Y), and how will purchased water be used and conserved? Should agricultural water users be able to buy Project water, how will DWR and Reclamation assure that transferred water for irrigation is used efficiently? Could purchased water be used for any kind of crop or landscaping, rather than clearly domestic purposes or strictly for drought-tolerant landscaping?

Without a hierarchy of priority uses among agricultural or urban users for purchasing CVP and non-CVP water, the EIS/EIR fails to ensure that California water resources will not go to waste, and will not be used to harden unsustainable demands.

Response

This comment was previously addressed in Response to Comment NG-03-144 on the 2014 Draft EIS/EIR; the comment responses are included in Appendix F of the RDEIR/SDEIS (renamed Appendix R).

Comment 9-103

Comment

VII. <u>RDEIR/SDEIS Fails to Analyze Climate Change Impacts</u>

A number of high-profile studies on climate change in California since 2014, when the prior EIR/S was approved, have concluded that climate change is already impacting California's water supplies and will continue to do so. These reports include California's Fourth Climate Change Assessment issued in 2018 (http://www.climateassessment.ca.gov) and a joint study by the California Office of Environmental Health Hazard Assessment and California Environmental Protection Agency dated May 9, 2018 (https://oehha.ca.gov/climate-change/report/2018-report-indicators-climate-change-california). Neither of these reports were cited in the RDEIR/SDEIS, which must be revised to accurately describe existing and project-duration conditions. As detailed in these reports, indicators such as rising temperatures, a pattern of increasing dryness, more extreme weather, and decreases in Sierra snowpack and runoff among others underscore how critical climate change is a factor to any water management plan in California. The impacts of this project will undoubtedly exacerbate those of climate change.

Response

The indicators noted in the comment are included in the CalLite-CV model, which is described in Appendix J of the RDEIR/SDEIS (renamed Appendix K). The CalLite-CV model considers a range of representative climate future scenarios. The analysis in the RDEIR/SDEIS uses the "Central Tendency," "Hot-Dry" and "Warm-Wet" scenarios." These three climate change scenarios are selected out of the five scenarios that are described as the "ensemble" scenarios. The ensemble scenarios represent a relative wide range of potential climate conditions that were developed from 175 GCM simulations (Reclamation, 2016b). The wide range of future temperature and precipitation uncertainties expressed in the large ensemble of 175 projections were represented in these ensemble projections simulated using CalLite-CV. These ensemble scenarios are based on the Intergovernmental Panel on Climate Change (IPCC) Fifth Assessment Report (AR5) published in 2014 which replaced the Special Report on Emissions Scenarios (SRES) standards employed in two previous IPCC reports.

The reports referenced in the comment do not include level of detail at the CalLite-CV model to quantitatively evaluated climate change scenarios. Please refer to Common Response 1 and Response to Comments 2-12 and 7-17 for additional information.

Comment 9-104

Comment

It is undeniable that temperatures in California are rising. California's Fourth Climate Change Assessment concluded that "present-day (1986-2016) temperatures throughout the state have warmed above temperatures recorded during the first six decades of the 20th century (1901-1960)." Bedsworth, Louise, Dan Cayan, Guido Franco, Leah Fisher, Sonya Ziaja. (California Governor's Office of Planning and Research, Scripps Institution of Oceanography, California Energy Commission, California Public Utilities Commission), 2018. Statewide Summary Report, California's Fourth Climate Change Assessment, Publication number: SUMCCCA4-2018-013

("CFCCA Summary"), at 12. The report by the Office of Environmental Health Hazard Assessment and California Environmental Protection Agency similarly concluded that "California temperatures have risen since records began in 1895" and that the "last four years showed unprecedented temperatures: 2014 is the warmest on record, followed by 2015, 2017 and 2016." Office of Environmental Health Hazard Assessment, California Environmental Protection Agency (2018), Indicators of Climate Change in California (2018) ("OEHHA/CALEPA Report") at 53. This is significant new information since the 2014 EIR/S was approved, necessitating a more comprehensive update than the present RDEIR/SDEIS provides.

Response

The CalLite-CV model considers a range of representative climate future scenarios that incorporate temperature, precipitation, and runoff. The analysis in the RDEIR/SDEIS uses the "Central Tendency," "Hot-Dry" and "Warm-Wet" scenarios." These three climate change scenarios are selected out of the five scenarios that are described as the "ensemble" scenarios. The ensemble scenarios represent a relative wide range of potential climate conditions that were developed from 175 Global Climate Model (GCM) simulations, as stated in Reclamation 2016b. The wide range of future temperature and precipitation uncertainties expressed in the large ensemble of 175 projections were represented in these ensemble projections simulated using CalLite-CV. This model has been accepted by the industry to evaluate climate change impacts.

Comment 9-105

Comment

Droughts in California have also become more extreme. "A universally used indicator of drought — the Palmer Drought Severity Index — shows that California has become drier over time. Five of the eight years of severe to extreme drought (when index values fell below -3) occurred between 2007 and 2016, with unprecedented dry years in 2014 and 2015." OEHHA/CALEPA Report at S-5.

Response

Please refer to Responses to Comments 9-103 and 9-104.

Comment 9-106

Comment

Precipitation patterns are also becoming more extreme, with "models projecting less frequent but more extreme daily precipitation, year-to-year precipitation becomes more volatile and the number of dry years increases." CFCCA Summary, at 22. As air temperatures warm, more moisture is lost from soils, which in turn leads to drier conditions seasonally even when precipitation increases. CFCCA Summary, at 23. Summer dryness may become prolonged. *Id*.

The amount of precipitation has become increasingly variable statewide. "In seven of the last ten years, statewide precipitation has been below the statewide average (22.9 inches)" and "California's driest consecutive four-year period occurred from 2012 to 2015." OEHHA/CALEPA Report at S-5.

Response

Please refer to Responses to Comments 9-103 and 9-104.

Comment 9-107

Comment

The CFCCA report noted that "Current management practices for water supply and flood management in California may need to be revised for a changing climate […] in part because such practices were designed for historical climatic conditions, which are changing and will continue to change during the rest of this century and beyond." CFCCA Summary, at 11.

Response

Section 3.6 of the RDEIR/SDEIS evaluates how climate change may affect water transfers and the supply and demand of water transfers under climate change conditions. The analysis incorporates a range of climate conditions that inform the Lead Agencies about management of potential water transfers.

Comment 9-108

Comment

Another important factor is the reduction in snowpack and snowmelt. From "1950 to present, snow-water content in both the northern and southern Sierra Nevada long-term snow courses have been declining." OEHHA/CALEPA Report at 115. Similarly, "Since 1906, the fraction of annual unimpaired snowmelt runoff that flows into the Sacramento River between April and July has decreased by about nine percent." *Id*. at 109.

Response

See Appendix J of the RDEIR/SDEIS (renamed Appendix K)for a discussion of snowmelt and snowpack as it relates to climate change and how it is incorporated in the CalLite-CV model for the analysis of climate change on the project.

Comment 9-109

Comment

These studies and others released since the EIR/EIS implicate almost every aspect of the proposed project, including groundwater recharge, surface water quality, delta outflow, water supplies and demands, and carriage water. However, the RDEIR/SDEIS fails to sufficiently analyze these effects, and the dated RDEIR/SDEIS climate model fails to incorporate this significant new information that will actually describe existing environmental conditions and likely project effects. Climate change is an existing condition and hazard and its effects could potentially exacerbated by the proposed project, yet the RDEIR/SDEIS fails to sufficiently evaluate these effects in violation of CEQA. See *East Sacramento Partnerships for a Livable City v. City of Sacramento*, 5 Cal. App. 5th 281, 296-97, 209 Cal. Rptr. 3d 774 (2016), *as modified on denial of rehearing* (Dec. 6, 2016) ("*ESPLC*"). The project may exacerbate impacts to water supply caused by climate change. For example, ground subsidence from groundwater pumping is linked to climate change as more groundwater is pumped during droughts, yet groundwater pumping by the project could exacerbate these impacts. The Project depends on surface water for recharge. Climate change anticipates more rain and less snow, thereby flashier storms, thus slowing and altering groundwater recharge patterns that the RDEIR/SDEIS profoundly relies upon to mitigate groundwater pumping impacts. The RDEIR/SDEIS fails to meaningfully address climate change impacts to and from proposed groundwater pumping and recharge. RDEIR/SDEIS section 3.3 states:

> groundwater levels in the Sacramento Valley Groundwater Basin have recovered to better than spring 2016 levels but have not improved to pre-drought levels (prior to 2011) It should be noted that groundwater level declines discussed above were due to five consecutive drought years and only partial recovery from one wet year is consistent with historic patterns of drawdown and recovery. Past groundwater trends are indicative of groundwater levels declining during extended droughts and recovering to pre-drought levels after subsequent wet periods. RDEIR/SDEIS at 3.3.6.

Here, the RDEIR/SDEIS simply ignores the fact raised in the recent climate changes studies noted above that droughts in California have become more extreme as noted by the climate changes studies above: "A universally used indicator of drought — the Palmer Drought Severity Index — shows that California has become drier over time. Five of the eight years of severe to extreme drought (when index values fell below -3) occurred between 2007 and 2016, with unprecedented dry years in 2014 and 2015." OEHHA/CALEPA Report at S-5.

Response

Please refer to Common Response 1 and Responses to Comments 2-12 and 7-17. The CalLite-CV model does evaluate climate change impacts to groundwater supplies available for transfer, as described in Appendix J of the RDEIR/SDEIS (renamed Appendix K). See Response to Comment 2-14.

Comment 9-110

Comment

Mitigation measure VEG and WILD-1 relies on recent water depths in canals in non-transfer years as sufficient to provide adequate habitat for GGS and other aquatic/riparian species, but if those water levels have been lowered in recent years due to warming temperatures, increasing demands, and climate variability, then that baseline may be insufficient to protect these threatened and special status species, and the project's effects would clearly exacerbate those of a changing climate. The same can be said of the lowered, historical low groundwater level baseline, that occurred following the 2015 drought, which this project will institutionalize as the new normal and threshold of significance: again, the project's effects on groundwater will be cumulatively considerable in conjunction with climate change. Similarly, the EIR/S streamflow depletion factor, expressed as a percentage of normal flows, may now and in the future operate from a baseline of even lower flows, less able to withstand a 10% reduction by the project. And GW-1 plainly allows impacts to deep-rooted vegetation, which effects will only exacerbate the strain on this vegetation caused by warmer temperatures, and decreased and less predictable water availability. The RDEIR/SDEIS fails to assess any of these climate effects in a cumulative context. The model utilized by the RDEIR/SDEIS to evaluate groundwater recharge is fundamentally outdated and needs to consider new climate data such as California's Fourth Climate Change Assessment issued in 2018 (http://www.climateassessment.ca.gov) and a joint study by the California Office of Environmental Health Hazard Assessment and California

Environmental Protection Agency dated May 9, 2018 (https://oehha.ca.gov/climate-change/report/2018-report-indicators-climate-change-california).

Response

Regarding the comment on VEG and WILD-1 water depth in canals, these waterways are controlled waterways used for water supply deliveries and irrigation return flows. Therefore, water depths in these canals are mostly impacted by water deliveries and less by climate variability.

Please refer to Response to Comment 9-109 for additional information.

Comment 9-111

Comment

VIII. <u>Growth Inducing Impacts</u>

Evidence in the RDEIR/SDEIS itself makes clear that transfer water is necessary to support any growth in the buyer service areas. The RDEIR/SDEIS states that “[u]nder the No Action/No Project Alternative, some agricultural and urban water users may face potential shortages in the absence of water transfers. These potential shortages will likely be met by increasing groundwater pumping, idling cropland, reducing landscape irrigation, land retirement, or rationing water.” p. ES-8. “In the past decades, water entities have been implementing water transfers to supplement available water supplies to serve existing demands.” RDEIR/SDEIS p. 1-1. With transfer water in place, however, this groundwater is plainly available to meet growth demands. Providing transfer water therefore has the effect of supporting growth in buyer areas.

Response

The cited language from the RDEIR/SDEIS refers to the inability to meet existing demands, not the ability to meet growth demands. There is a mismatch between existing demands and available supplies, and potential water transfers could help address this mismatch.

Comment 9-112

Comment

Buyer districts *are* on average growing, and therefore additional transfer water received by these districts could and *would* support current and future growth. An analysis of almond agriculture in California illustrates this growth trend. A 2017 California Department of Food and Agriculture report on almond data shows a consistent increase in the number of bearing acres of almonds over the last 20 years: 442,000 acres were recorded in 1997, 545,000 acres in 2002, 640,000 acres in 2007, 820,000 acres in 2012, and an estimated 1,000,000 acres in 2017.68 These data are echoed by the 2018 annual report of the California Almond Board which reports a steady increase in almond bearing acreage from 710,000 in 2008/09 to an estimated 1,070,000 acres in 2018/19.4769 County of Fresno Department of Agricultural reports going back to the 1950s

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[68] California Department of Food and Agriculture , 2018. *2017 California Almond Nursery Sales Report.* p.2. Exhibit L

[69] Almond Board of California, 2018. *Almond Almanac 2018*. p. 35, http://newsroom.almonds.com/document/2018- annual-report

further illustrates this steady trend of growth in acreage devoted used for almonds. 1,248 bearing acres of almonds in Fresno County were reported in 1957 (1957 Report at 12), 4,360 acres in 1967 (1967 Report at 10), 16,862 acres in 1977 (1977 Report at 20), 30,648 acres in 1987 (1987 Report at 6), 45,529 acres in 1997 (1997 Report at 7), 116,700 acres in 2007 (2007 Report at 7), and 228,109 acres in 2017 (2017 Report at 15).70 Gross production value of fruits and nuts generally in Fresno County grew from $746,702,000 in 1987, to $1,362,559,800 in 1997, to $1,806,133,000 in 2004, to $1,992,093,000 in 2005, to $2,056,619,000 in 2006, and to $2,112,735,000 in 2007.71

The RDEIR/SDEIS simply fails to acknowledge and analyze these persistent growth trends, nor acknowledge that as demands grow, so, too, shortages—without new water supplies—will worsen. Thus, this project approval will foreseeably create a newly available water supply that can and will be factored in to growth and demand projections. As growth continues, it will be simply impossible to state whether transfer water approved by this project will serve historic demands or growth demands. Thus, these and related growth inducing effects must be fully analyzed in this RDEIR/SDEIS. Commenters were able only to uncover scattered data regarding buyer service area historic, present, and foreseeable future growth and demands, but such data is fully in the Lead Agencies' possession and must be fully disclosed to enable a meaningful review of the project's effects.

Response

As described in Chapter 1 of the 2014 Draft EIS/EIR, the range of potential water transfers evaluated would help address shortages related to existing demands and "would not serve any new demands in the buyers' service areas." Transfers would not be used for expansion of either agricultural or urban uses. Additionally, the range of potential transfers analyzed only includes potential water transfers through 2024; this short period would not be considered a reliable source to induce growth of agricultural production.

Comment 9-113

Comment

IX. <u>The Cumulative Impacts Analysis Is Flawed</u>

As discussed above, the Project is dependent on the hydrology of the Sacramento River and Delta watersheds to implement the proposed Project. The cumulative impact analysis is abysmal as it fails to consider other past, present and reasonably foreseeable future actions in the Delta watersheds by deferring analysis to a future day.

The Ninth Circuit Court makes clear that NEPA mandates "a useful analysis of the cumulative impacts of past, present and future projects." *Muckleshoot Indian Tribe v. U.S. Forest Service*, 177 F.3d 800, 810 (9th Cir. 1999). "Detail is required in describing the cumulative effects of a proposed action with other proposed actions." *Id.* CEQA further states that assessment of the project's incremental effects must be "viewed in connection with the effects of past projects, the

[70] Reports available at https://www.co.fresno.ca.us/departments/agricultural-commissioner/crop-report-history.
[71] Fresno County, 2007. Ag. Report, p.17; see also, https://fas.org/sgp/crs/misc/R44093.pdf/ (2015).

effects of other current projects, and the effects of probable future projects." (CEQA Guidelines §15065(a)(3).) "[A] cumulative impact consists of an impact which is created as a result of the combination of the project evaluated in the EIR together with other projects causing related impacts." (CEQA Guidelines § 15065(a)(3).)

An EIR must discuss significant cumulative impacts. CEQA Guidelines §15130(a). Cumulative impacts are defined as two or more individual effects which, when considered together, are considerable or which compound or increase other environmental impacts. CEQA Guidelines § 15355(a). "[I]ndividual effects may be changes resulting from a single project or a number of separate projects. CEQA Guidelines § 15355(a). A legally adequate cumulative impacts analysis views a particular project over time and in conjunction with other related past, present, and reasonably foreseeable future projects whose impacts might compound or interrelate with those of the project at hand. Cumulative impacts can result from individually minor but collectively significant projects taking place over a period of time. CEQA Guidelines § 15355(b). The cumulative impacts concept recognizes that "[t]he full environmental impact of a proposed . . . action cannot be gauged in a vacuum." *Whitman v. Board of Supervisors* (1979) 88 Cal. App. 3d 397, 408 (internal quotation omitted).

Response

This comment was previously addressed in Response to Comment NG03-118 and Common Response 5 on the 2014 Draft EIS/EIR; the comment responses are included in Appendix F of the RDEIR/SDEIS (renamed Appendix R).

Comment 9-114

Comment

In assessing the significance of a project's impact, Reclamation must consider "[c]umulative actions, which when viewed with other proposed actions have cumulatively significant impacts and should therefore be discussed in the same impact statement." 40 C.F.R. §1508.25(a)(2). A "cumulative impact" includes "the impact on the environment which results from the incremental impact of the action when added to other past, present and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions." Id. §1508.7. The regulations warn that "[s]ignificance cannot be avoided by terming an action temporary or by breaking it down into small component parts." Id. §1508.27(b)(7).

Response

This comment was previously addressed in Response to Comment NG03-118 and Common Response 5 on the 2014 Draft EIS/EIR; the comment responses are included in Appendix F of the RDEIR/SDEIS (renamed Appendix R).

Comment 9-115

Comment

An environmental impact statement should also consider "[c]onnected actions." Id. §1508.25(a)(1). Actions are connected where they "[a]re interdependent parts of a larger action and depend on the larger action for their justification." Id. §1508.25(a)(1)(iii). Further, an environmental impact statement should consider "[s]imilar actions, which when viewed together with other reasonably foreseeable or proposed agency actions, have similarities that provide a basis for evaluating their environmental consequences together, such as common timing or geography." Id. §1508.25(a)(3) (emphasis added).

As discussed, below, the RDEIR/SDEIS fails to comport with these standards for cumulative impacts upon surface water and groundwater supplies, subsidence, vegetation, and biological resources. The baseline and modeling data (WY 1970-2003) relied upon by the RDEIR/SDEIS do not account for related transfer projects since 2001 (see below). It also fails to use the baseline for all related transfer projects since the CalFed ROD was signed in 2000.

Response

This comment was previously addressed in Response to Comment NG03-118 and Common Response 5 on the 2014 Draft EIS/EIR; the comment responses are included in Appendix F of the RDEIR/SDEIS (renamed Appendix R).

Comment 9-116

Comment

A. Delta Outflow

The RDEIR/SDEIS cumulative impacts analysis is flawed because it relies on the same type of analysis regarding cumulative effects to net delta outflow that the Court found illegal in its order. See Order, at 74-77. In its order, the Court relied on *Kings County [Farm Bureau v. City of Hanford*, 221 Cal. App. 3d 692, 718 (1990), *Los Angeles Unified (Sch. Dist. v. City of Los Angeles*, 58 Cal. App. 4th 1019 (1997), and *Communities for a Better Environment. v. California Resources Agency*, 103 Cal. App. 4th 98 (2002) ("*CBE*") for the general rule that "the greater the existing environmental problems are, the lower the threshold should be for treating a project's contribution to cumulative impacts as significant." Order at 74-75, quoting CBE at 120. The Court held that Defendants failed to account for the fact that "the Condition of the Delta is already precarious, due in part to reduced Delta outflows," when they asserted that changes to outflows would be small and subject to other regulatory constraints without more environmental analysis. *Id*. at 75. This "total absence of consideration of the existing environmental problems related to outflow is a legal failure." *Id*. The Court further held that since the FEIS/R discounted the effects of outflow increases because of magnitude, and not timing, they had the potential to be prejudicial under CEQA. *Id*.

Response

Please refer to Response to Comment 2-16.

Comment 9-117

Comment

Here, the RDEIR/SDEIS repeats these problems identified the Court by again failing to properly evaluate environmental impacts. Although the RDEIR/SDEIS includes information on the timing of flow increases or decreases, which is a step in the right direction, it still makes conclusory assertions regarding the *insignificance* of changes to flows without any analysis of the environmental impacts such as those on fish species. RDEIR/SDEIS 3.2.4.1 "Changes in Delta outflows could result in water quality impacts" subsection states, in part:

Because of existing degraded water quality conditions in the Delta, the combination of cumulative actions is considered to have significant impacts on water quality in the Delta. The range of potential water transfers that constitute the Proposed Action would increase Delta outflows slightly during the transfer period because carriage water would become additional Delta outflow, which would not adversely affect Delta water quality. The range of potential water transfers that constitute the Proposed Action would increase Delta outflows slightly during the transfer period because carriage water would become additional Delta outflow, which would not adversely affect Delta water quality. During other times of the year, transfers of water analyzed under this RDEIR/SDEIS could decrease Delta outflows. […] The decreases to Delta outflow could only occur during wetter periods when the Delta is in excess conditions. During balanced conditions, the CVP would be required to release additional flow to maintain the standards in the Central Valley Water Quality Control Plan, so the Delta outflows would not change. Because the changes in Delta outflow associated with the potential water transfers are insubstantial and occur only during wetter conditions, the Proposed Action's incremental contribution to potentially significant cumulative water quality impacts would not be cumulatively considerable.

Response

Please refer to Response to Comment 2-16.

Comment 9-118

Comment

This subsection relies on discounting flow changes as "insubstantial" or changing flows only "slightly," without any analysis of environmental impacts of these changes, even though they are occurring in an area that the Court has held to be "precarious." The RDEIR/SDEIS 3.2.4.1 "Changes in Delta inflows, outflows, and exports could affect Delta salinity" states, in part:

Because of existing salinity concerns in the Delta, the combination of past, present, and future cumulative actions is considered to have significant impacts on salinity in the Delta. As shown in the water quality modeling, the Proposed Action would result in nominal decreases in Delta outflows and changes in the position of X2. Decreased water quality conditions (associated with decreased Delta outflow and downstream movement of the X2 position) would occur only during wetter periods because the CVP is required to maintain conditions during periods when the Delta is in balanced conditions. During balanced conditions, the CVP must release flow from upstream reservoirs to provide adequate flows to meet in-Delta water supply needs and standards for water quality and flow (see footnote 2, above). Because the changes in Delta outflow associated with the potential water transfers are insubstantial and occur only during wetter conditions, the Proposed Action's incremental contribution to potentially significant cumulative salinity impacts in the Delta would not be cumulatively considerable.

Again, SLDMWA relies on conclusory assertions regarding the significance of an increase or decrease, when the precarious state of the Delta demands an analysis of the environmental impacts. The RDEIR/SDEIS must be revised to explain the actual effect of this change.

Response

Please refer to Response to Comment 2-16.

Comment 9-119

Comment

RDEIR/SDEIS Appendix J assessed five possible scenarios posed by climate change, as well as a "No Climate Change" scenario. Appendix J at J-7 to J-9. These scenarios resulted in a wide range of run-off volumes for the Sacramento and San Joaquin river systems. Appendix J, Figures J-4 and J-5, at J-12. The scenarios differ not only in run-off volumes, but also in timing. J-15 to J-16. However, RDEIR/SDEIS/S 3.2.4 Cumulative Impacts section fails to include any analysis of impacts from climate change on net delta outflow, despite the significant possible changes in outflow identified in Appendix J. The scenarios contemplated in RDEIR/SDEIS/S 3.2.4 Table 3.2-1 do not include the scenarios detailed in Appendix J. The Project will thus exacerbate the impacts caused by climate change. As detailed in Appendix J, outflows can impact seller and buyer behavior, which in turn could exacerbate the changed runoff patterns caused by climate change. *See* e.g., Appendix J Figure J-22, at J-28 ("Results summarized in Table J-5 show climate change may create considerable variability in the annual average volume of transfers that may occur"); *see also*, Appendix J Table J-5, at J-29.

Response

As described in Appendix J of the RDEIR/SEIS (renamed Appendix K), climate change could result in drier or wetter conditions. Regardless of these changes in conditions, the trends assessed in the cumulative effects analysis would continue. During dry periods when transfers could occur, the action alternatives would have a small increase in Delta outflow. Decreases would occur after transfers are made during wet periods when surface and groundwater storage refills. The timing of tranfers is the key issue in the impact analysis for the Proposed Action. This timing of transfer issue would be the same under the simulated with climate change scenarios i.e. Hot-Dry, Warm-Wet and Central Tendency scenarios described in Appendix J of the RDEIR/SEIS (renamed Appendix K).

Comment 9-120

Comment

B. Sites Reservoir

The Sites Reservoir project would consist of a 1.2 to 1.8 million acre-foot reservoir created by two large dams on Stone Corral Creek and Funks Creek. Water to fill the Sites Reservoir would be diverted from the Sacramento River and pumped into the reservoir. Some water to fill Sites could also be diverted from the Colusa Drain. Sites could produce an estimated annual yield of 236 to 428 thousand acre-feet of water, depending on various diversion scenarios and constraints. How this water could be part of the Project, operated in conjunction with the Project, and how it would impact the Project are not disclosed or analyzed, failing CEQA's mandate that an assessment of the project's incremental effects must be "viewed in connection with the effects of past projects, the effects of other current projects, and the effects of probable future projects." (CEQA Guidelines § 15065(a)(3).) "[A] cumulative impact consists of an impact which is created as a result of the combination of the project evaluated in the EIR together with other projects causing related impacts." (CEQA Guidelines § 15065(a)(3).)

Response

The Sites Reservoir project is scheduled to be in construction from 2022 – 2029 (Sites Project Authority 2018). The potential operations of this facility would not interact with the range of potential water transfers in this EIS/EIR because it only considers transfers through 2024.

Comment 9-121

Comment

The SVWMA NOI/NOP, mentioned above in II. B., specifically discloses the Sites Reservoir project.[72] "Role of Sites Reservoir. The Parties recognize that new off-stream surface storage is an essential part of the long-term water management program, and agree that Sites Reservoir is a potentially significant off-stream surface-water storage project that could help meet the goals and objectives of this Agreement, including providing capacity to increase the reliability of water supplies for Upstream and Export Water Users, flexibility during critical fish migration periods on the Sacramento River, and storage benefits for other CALFED programs. Work being undertaken pursuant to CALFED's Sites MOU will be integrated into this Agreement and the Parties will work with CALFED to accelerate feasibility studies and completion of appropriate environmental and permitting processes for the reservoir."[73]

Response

Please refer to Response to Comment 9-120.

Comment 9-122

Comment

C. Recently, Past, Current, and Future Transfers are Not Disclosed.

As mentioned above in the Hydrology section, the RDEIR/SDEIS failed to present significant past transfer records. Therefore, the public is deprived of knowledge or connection to recent periods of groundwater substitution transfer pumping and other groundwater impacting events, such as recent changes in groundwater elevations and groundwater storage, and the reduced recharge due to the recent periods of drought. Below is a list of transfers from the recent past that at a minimum should have been considered in the RDEIR/SDEIS.

1. North-to-South Transfers

The RDEIR/SDEIS fails to illustrate the early history of water transfers and to provide more current information. Here are significant context and history that should be presented in another CEQA/NEPA document.

- 1991. WY – Critical. Reported transfers amounted to 820,000 af.
- 1992. WY – Critical. Reported transfers amounted to 193,000 af. (Id.)

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[72] 2001. The Sacramento Valley Water Management Agreement. pp. 8, 12, etc.
[73] *(Id.)* p. 12.

- 1993. WY – Above Normal. No transfers appear to have occurred. (Id.)
- 1994. WY – Critical. Reported transfers amounted to 220,000 af. (Id.)
- 2002. WY - Dry. Settlement Contractors in the Sacramento Valley received 100% of their allocation. Reported transfers amounted to 172,000 af.
- 2003. WY - Above Normal. Settlement Contractors in the Sacramento Valley received 100% of their allocation. Reported transfers amounted to 206,000 af. (*Id.*)
- 2004. WY - Below Normal. Settlement Contractors in the Sacramento Valley received 100% of their allocation. Reported transfers amounted to 120,500 af. (*Id.*)
- 2005. WY – Above Normal. Settlement Contractors in the Sacramento Valley received 100% of their allocation. Reported transfers amounted to 5 af. (*Id.*)
- 2006. WY – Wet. Settlement Contractors in the Sacramento Valley received 100% of their allocation. No transfers were reported. (*Id.*)
- 2007. WY – Dry. Settlement Contractors in the Sacramento Valley received 100% of their allocation. Reported transfers amounted to 147,000 af. (*Id.*)
- 2008. WY - Critical. Settlement Contractors in the Sacramento Valley received 100% of their allocation. GCID alone planned an 85,000 af transfer[74] of an expected cumulative total from the Sacramento Valley of 360,000 af.[75] Another source revealed that the actual transfers for that year were 233,000 af.[76]
- 2009. WY – Dry. Reclamation approved a one-year water transfer program under which a number of transfers were made. Settlement Contractors in the Sacramento Valley received 100% of their allocation. Regarding NEPA, Reclamation issued a FONSI based on an EA. DWR opined that, "As the EWA's exclusive mechanism in 2009 for securing replacement water for curtailed operations through transfers, the DWB is limited to the maximum 600,000 acre feet analyzed in the EIS/EIR for the program." Reported transfers amounted to 274,000 af.
- 2010-2011. WY Below Normal, Wet. Reclamation approved a two-year water transfer program. No actual transfers were made under this approval. Regarding NEPA, Reclamation again issued a FONSI based on an EA. Settlement contractors in the Sacramento Valley received 100% of their allocation for both years. The 2010-2011 Water Transfer Program sought approval for 200,000 AF of CVP related water transfers and suggested there would be a cumulative total of 395,910 af of CVP and non-CVP water. Reclamation asserted that no actual transfers were made under the 2010/2011 Water Transfer Program, however, a Western Canal Water District Negative Declaration

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[74] GCID, 2008. Initial Study and Proposed Negative Declaration for *Option Agreement Between Glenn-Colusa Irrigation District, San Luis & Delta-Mendota Water Authority and the United States Bureau of Reclamation for 2008 Operations, and Related Forbearance Program.*

[75] USBR, 2008. Draft Environmental Assessment for the Option *Agreement Between Glenn-Colusa Irrigation District, Bureau of Reclamation, and the San Luis & Delta-Mendota Water Authority for 2008 Operations*. (pp. 4 and 17)

[76] Western Canal Water District, 2015. *Initial Study and Proposed Negative Declaration for Western Canal Water District 2015 Water Transfer Program*. (p. 21)

declared that 303.000 af were transferred from the Sacramento Valley and through the Delta in 2010.77

- 2012. WY – BN. Settlement contractors in the Sacramento Valley received 100% of their allocation. Reclamation planned 2012 water transfers of 76,000 AF of CVP water all through groundwater substitution, but it is unclear if CVP transfers occurred. SWP contractors and the Yuba County Water Agency ("YCWA") did transfer water and the cumulative total transferred is stated to be 190,000 af.78
- 2013. WY – Dry. Settlement contractors in the Sacramento Valley received 100% of their allocation. Reclamation approved a 1-year water transfer program, again issuing a FONSI based on an EA. The EA incorporated by reference the environmental analysis in the 2010-2011 EA. The *2013 Water Transfer Program* proposed the direct extraction of up to 37,505 AF of groundwater (pp. 8, 9, 11, 28, 29, 35), the indirect extraction of 92,806 AF of groundwater (p. 31), and the cumulative total of 190,906 (p. 29).79 Reported transfers amounted to 210,000 af.80
- 2014. WY - Critical. Federal Settlement Contractors in the Sacramento Valley received 75%and State Settlement Contractors received 100% of their allocations. Total maximum proposed north-to-south transfers were 378,733 af and total maximum proposed north-to-north transfers were 295,924 af.81 Reported north-to-south transfers amounted to 198,000 af.82
- 2015. WY – Critical. SLDMWA purchased 164,153 acre-feet, and East Bay Municipal Utility District 18 purchased 13,268 acre-feet.83
- 2018-2022. Western Canal Water District and Richvale Irrigation District Water may transfer up to 60,000 af per year to south of the Delta though fallowing.[84]

Response

Sources for many of these transfers were not provided. Some bullets have sources, and these transfers appear to be planned transfers rather than executed transfers. Agencies complete environmental compliance in advance because hydrologic conditions are uncertain. By the time the hydrologic conditions are clear enough that agencies know if they want to pursue transfers, there is not sufficient time to complete environmental compliance. As a result, environmental documents are often completed when transfers

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[77] Western Canal Water District, 2012. *Initial Study and Proposed Negative Declaration for Western Canal Water District 2012 Water Transfer Program*. (p. 25)

[78] Western Canal Water District, 2015. *Initial Study and Proposed Negative Declaration for Western Canal Water District 2015 Water Transfer Program*. (p. 21)

[79] USBR, 2013. Draft Environmental Assessment and Findings of No Significant Impact for the *2013 Water Transfers*. (p. 29)

[80] Western Canal Water District, 2015. *Initial Study and Proposed Negative Declaration for Western Canal Water District 2015 Water Transfer Program*. (p. 21)

[81] AquAlliance, 2014. *2014 Sacramento Valley Water Transfers*. (Data from: 1) USBR, 2014 EA for 2014 Tehama- Colusa Canal Authority Water Transfers; 2) USBR and SLDMWA, 2014. EA/Negative Declaration, *2014 San Luis & Delta Mendota Water Authority Transfers*.)

[82] Western Canal Water District, 2015. *Initial Study and Proposed Negative Declaration for Western Canal Water District 2015 Water Transfer Program*. (p. 21)

[83] USBR/SLDMWA 2018. *Long-Term Water Transfers* RDEIR/SDEIS . p. 1-4.

[84] Western Canal/Richvale ID, 2018. *Western Canal Water District and Richvale Irrigation District Water Transfers from 2018 to 2022 Environmental Impact Report, Final*. p. 2-1.

do not occur. Table 1-3 in the 2014 Draft EIS/EIR includes historic transfers to SLDMWA member agencies through 2014, and the RDEIR/SDEIS includes transfers since that time.

Comment 9-123

Comment

2. Additional Water Transfer Plans and Programs

Reclamation's *Sacramento Valley Regional Water Management Plan (2006)* (SVRWMP) and the forbearance water transfer program that the Bureau and DWR facilitate jointly. As noted above, the Programmatic EIS for the 2002 Sacramento Valley Water Management Agreement or Phase 8 Settlement was initiated, but never completed, so the SVRWMP was the next federal product moving the Phase 8 Settlement forward. The purported purpose of the Phase 8 Settlement and the SVRWMP were to improve water quality standards in the Bay-Delta and local, regional, and statewide water supply reliability. In the 2008 forbearance program, 160,000 af was proposed for transfer to points south of the Delta. To illustrate the ongoing significance of the demand on Sacramento Valley water, we understand that GCID alone entered into "forbearance agreements" to provide 65,000 af of water to the San Luis and Delta Mendota Water Authority in 2008, 80,000 af to State Water Project contractors in 2005, and 60,000 af to the Metropolitan Water District of Southern California in 2003.

The Bureau, its contractors, and its partner DWR are party to numerous current and reasonably foreseeable water programs that are related to the water transfers contemplated in the RDEIR/SDEIS including, but not limited to, the following:

- Sacramento Valley Integrated Regional Water Management Plan (2006)
- Sacramento Valley Regional Water Management Plan (January 2006)
- Stony Creek Fan Conjunctive Water Management Program
- Sacramento Valley Water Management Agreement (Phase 8, October 2001)
- Draft Initial Study for 2008-2009 Glenn-Colusa Irrigation District Landowner Groundwater Well Program
- Regional Integration of the Lower Tuscan Groundwater Formation into the Sacramento Valley Surface Water System Through Conjunctive Water Management (June 2005) (funded by the Bureau)
- Stony Creek Fan Aquifer Performance Testing Plan for 2008-09
- Annual forbearance agreements (2008 had an estimated 160,000 acre feet proposed).

These closely related impacts must be assessed in a cumulative impact context. CEQA Guidelines, §§§15065(a)(3), 15130(b)(1)(A), 15355(b).

Response

The Sacramento Valley Integrated Regional Water Management Plan and Sacramento Valley Regional Water Management Plan identify potential projects to assist regional water management, but these projects require environmental compliance and funding to implement. Until projects have environmental compliance and funding, they are not reasonably forseeable to move forward. GCID's Stony Creek Fan Aquifer Performance Testing (SCFAPT) program concluded with their final report (issued December 2012). The SCFAPT program was a short duration (two irrigation seasons) research program. The Sacramento Valley Water Management Agreement was related to Phase 8 of the Bay-Delta Water Rights process, but that process has been replaced with the Bay-Delta Plan update. The GCID Landowner Groundwater Well Program and Regional Integration effort have not been implemented. These projects have not been implemented and are not included in the cumulative effects analysis.

Forbearance agreements could potentially be considered to implement water transfers, as discussed in Section 2.2.2.1 of the RDEIR/SDEIS.

Comment 9-124

Comment

3. <u>South-of-Delta Transfers</u>

There are numerous south-of-delta transfers to some of the same buyers that are not disclosed or discussed cumulatively. There are most assuredly many more that the Lead Agencies must disclose and consider.

a) *West Side farmers to benefit from water agreement*

   Apr 05, 2013 | Patterson Irrigator

   In the face of major cuts to their water supply, West Side farmers received good news this week after two irrigation districts agreed to sell Stanislaus River water that will be available to many local farm water districts. Oakdale Irrigation District's board of directors agreed Tuesday, April 2, to sell up to 40,000 acre-feet of river water to the San Luis and Delta-Mendota Water Authority and the state Department of Water Resources. South San Joaquin Irrigation District's board agreed to sell the same amount to those agencies on March 26.

   The agreement will aid the water authority's 29 agencies in the western San Joaquin Valley and San Benito and Santa Clara counties, including most irrigation districts on the West Side. The extra water comes during a critically dry year when West Side farmers have only been allowed to draw up to 20 percent of their full federal Central Valley Project water allotments from the Delta-Mendota Canal. Exhibit M.

b) J.G. Boswell sold 14,000 af to Westlands WD, which paid $28,011,916.51 for "water purchases." Exhibits N and O.

c) Change in Point of Use 2016

"Notes: There was a revision due to an increase of the total CPOU amount from 305,820 af to 307,900 af. The 305,820 af was the amount submitted to SWRCB on March 28, 2016. The 307,900 af was the final amount approved by the SWRCB on July 21,2016." Exhibit P.

d) Reclamation released draft environmental documents for Harris Farms and Shows Family Farms multi-year banking and transfer program

FRESNO, Calif. – The Bureau of Reclamation has released for public review the Draft Environmental Assessment and Draft Finding of No Significant Impact for the proposed approval of annual transfers of up to 15,000 acre-feet per year of available Central Valley Project water supplies over a nine-year period. Central Valley Project contractors would transfer water to Harris Farms and Shows Family Farms either for direct agricultural use on their lands located within Westlands Water District, San Luis Water District, and Semitropic Water Storage District, or for banking in Semitropic and/or the Kern Water Bank for later use on their lands within those same districts.

The documents are available at https://www.usbr.gov/mp/nepa/nepa_project_details.php?Project_ID=32081.

Response

The buyers have limits in the amount of water that can be purchased and conveyed through the Delta. Table 1-3 in the 2014 Draft EIS/EIR includes all water purchased by SLDMWA through 2014, and Section 1.2 includes transfers after this time. The upper limit included in the RDEIR/SDEIS (and this Final EIS/EIR) of 250,000 acre-feet reflects the upper limit that the buyers would consider for all potential water transfers analyzed in this document.

Comment 9-125

Comment

D. Yuba River Transfers

The Yuba River is the major tributary to the Feather River. The RDEIR/SDEIS lists the Yuba River Accord in the following cumulative impacts sections: Fisheries, Water Quality, and Vegetation and Wildlife. The Yuba Accord is defined in the RDEIR/SDEIS : "The set of agreements of the Lower Yuba River Accord is designed to provide additional water to meet fisheries needs in the lower Yuba River. In addition, up to 60,000 acre-feet of water per year would be made available for purchase by Reclamation and DWR for fish and environmental purposes. The Proposed Action would not affect the ability of the Accord to provide a benefit to environmental resources within its action area. Both efforts combined, however, could affect Delta exports." p. 3-1.

From this definition, a reader would conclude that the only transfers from the Yuba River are for fish and the environment. Conspicuously missing are additional transfer agreements/plans. For example, the relationship between the federal and state agencies seeking or facilitating transfer water is illuminated in a 2013 Environmental Assessment. "The Lower Yuba River Accord (Yuba Accord) provides supplemental dry year water supplies to state and Federal water contractors under a Water Purchase Agreement between the Yuba County Water Agency and the California Department of Water Resources (DWR). Subsequent to the execution of the Yuba Accord Water Purchase Agreement, DWR and The San Luis & Delta- Mendota Water Authority (Authority) entered into an agreement for the supply and conveyance of Yuba Accord water, to benefit nine of the Authority's member districts (Member Districts) that are SOD [south of Delta] CVP water service contractors." [85]

Response

The Yuba Accord is considered as a cumulative project in the cumulative analysis. This comment was previously addressed in Response to Comment NG03-120 on the 2014 Draft EIS/EIR; the comment responses are included in Appendix F of the RDEIR/SDEIS (renamed Appendix R).

Comment 9-126

Comment

Also absent in the SDEIS/REDIR is clarity found in a Bureau Fact Sheet regarding DWR's involvement and some numerical context to the Yuba Accord by stating, "Under the Lower Yuba River Accord, up to 70,000 acre-feet can be purchased by SLDMWA members annually from DWR. This water must be conveyed through the federal and/or state pumping plants in coordination with Reclamation and DWR. Because of conveyance losses, the amount of Yuba Accord water delivered to SLDMWA members is reduced by approximately 25 percent to approximately 52,500 acre-feet. Although Reclamation is not a signatory to the Yuba Accord, water conveyed to CVP contractors is treated as if it were Project water." [86]

Response

This comment was previously addressed in Response to Comment NG03-120 on the 2014 Draft EIS/EIR; the comment responses are included in Appendix F of the RDEIR/SDEIS (renamed Appendix R).

Comment 9-127

Comment

Additionally, cumulative impacts from the Project and the YCWA Long-Term Transfer Program from 2008 - 2025 are not disclosed or considered. The Yuba County Water Agency ("YCWA") may transfer up to 200,000 under Corrected Order WR 2008-0014 for Long-Term Transfer and, "In any year, up to 120,000 af of the potential 200,000 af transfer total may consist of groundwater substitution. (YCWA-1, Appendix B, p. B-97.)." [87] How the Project and the total of Yuba River transfers could simultaneously have a very significant impact on the environment

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[85] Bureau of Reclamation, 2013. Storage, Conveyance, or Exchange of Yuba Accord Water in Federal Facilities for South of Delta Central Valley Project Contractors.
[86] Bureau of Reclamation, 2013. Central Valley Project (CVP) Water Transfer Program Fact Sheet.
[87] State Water Resources Control Board, 2008. ORDER WR 2008 - 0025

and economy of the watersheds and counties of origin as well as the Delta is not any part of the Project's RDEIR/SDEIS.

Response

This comment was previously addressed in Response to Comment NG03-120 on the 2014 Draft EIS/EIR; the comment responses are included in Appendix F of the RDEIR/SDEIS (renamed Appendix R).

Comment 9-128

Comment

Also not available in the RDEIR/SDEIS is disclosure of any controversial issues associated with the Yuba River transfers that have usually been touted as a model of success. The Yuba County Water Agency ("YCWA") transfers have encountered troubling trends for over a decade that, according to the draft Environmental Water Account's EIS/EIR, were mitigated by deepening domestic wells (2003 p. 6-81). While digging deeper wells is at least a response to an impact, it hardly serves as a proactive measure to avoid impacts. Additional information finds that it may take 3-4 years to recover from groundwater substitution in the south sub-basin[88] although YCWA's own analysis fails to determine how much river water is sacrificed to achieve the multi-year recharge rate. None of this is found in the Project's RDEIR/SDEIS . What was found in the *2015-2024 Long-Term Water Transfer Program's* environmental review is that even the inadequate SACFEM2013 modeling reveals that it could take more than six years in the Cordua ID area to recover from multi-year transfer events, although recovery was not defined (pp, 3.3-69 to 3.3-70). This is a very significant impact that is not addressed cumulatively here.

Response

This comment was previously addressed in Response to Comment NG03-121 on the 2014 Draft EIS/EIR; the comment responses are included in Appendix F of the RDEIR/SDEIS (renamed Appendix R).

Comment 9-129

Comment

In addition,

- "Past and current projects, including SWP transfers, refuge transfers, and the Yuba Accord, have affected Delta outflows and degraded water quality in the Delta. These effects on Delta outflow would generally be insubstantial but would be increasing outflow during dry periods of the year." p. 3.2-1. This conclusory assertion that "effects on Delta outflow would generally be insubstantial" is completely uncertain, undefined, and provides no meaningful information to the public.

- "The projects considered for the vegetation and wildlife cumulative condition are the SWP water transfers, CVP Municipal and Industrial Water Shortage Policy (WSP), Lower Yuba River Accord, refuge transfers, San Joaquin River Restoration Program

[88] 2012. *The Yuba Accord*, *GW Substitutions and the Yuba Basin*. Presentation to the Accord Technical Committee. (pp. 21, 22).

> (SJRRP), and Exchange Contractors 25-Year Water Transfers, described in more detail Chapter 4 of the 2014 Draft EIS/EIR. SWP transfers could involve groundwater substitution pumping in the Seller Service 2 Area and, therefore, could affect vegetation and wildlife resources." pp. 3.8-40 to 3.8-41.

If the Project is not withdrawn, the Yuba Accord and other Yuba River water transfers' cumulative impacts must be analyzed and presented to the public in a revised and recirculated draft NEPA/CEQA document.

Response

The Yuba Accord is included as a cumulative project in the cumulative effects analysis.

Comment 9-130

Comment

E. WaterFix and Interrelated Projects/ Actions

If the WaterFix is built as planned with the capacity to take from 9,000 to 15,000 cubic feet per second ("cfs") from the Sacramento River, the Twin Tunnels will have the capacity to drain between 38% - 63% of the Sacramento River's average annual flow of 23,490 cfs at Freeport[89] (north of the planned WaterFix). As proposed, the WaterFix will also increase water transfers when the infrastructure for the Project has capacity:

> "Alternative 4 provides a separate cross-Delta facility with additional capacity to move transfer water from areas upstream of the Delta to export service areas and provides a longer transfer window than allowed under current regulatory constraints. In addition, the facility provides conveyance that would not be restricted by Delta reverse flow concerns or south Delta water level concerns. As a result of avoiding those restrictions, transfer water could be moved at any time of the year that capacity exists in the combined cross-Delta channels, the new cross-Delta facility, and the export pumps, depending on operational and regulatory constraints, including BDCP permit terms as discussed in Alternative 1A."[90]

Here, the Project's RDEIR/SDEIS fails to present any of this information, obscuring analysis of significant cumulative impacts.

Response

As discussed in Response to Comment 7-16, the California WaterFix would not be operational during the period covered by this EIS/EIR.

Comment 9-131

Comment

1. <u>SWP Contract Extensions</u>

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[89] USGS 2009. http://wdr.water.usgs.gov/wy2009/pdfs/11447650.2009.pdf
[90] Bay Delta Conservation Plan/WaterFix 2016. FEIS/EIR p. 5-112.

DWR's efforts to facilitate and finance the massive and costly Delta tunnels project known as California WaterFix resulted in three separate SWP Contract Extension environmental review documents over protest:

- DWR approved the California WaterFix project on July 21, 2017 based on its certification of the Final BDCP/WaterFix CEQA document. DWR's WaterFix decision-making, and a project order relating to WaterFix (Project Order No. 40) filed the same day without any environmental review, failed to confront the WaterFix project's lack of legal and contractual authority for WaterFix revenue bonds, particularly in the absence of specific changes to timing and facilities limitations in the existing the existing SWP contracts that would otherwise preclude eligibility. Reclamation has yet to complete its NEPA process for the BDCP/WaterFix EIS.

Response

Potential delivery changes related to the California WaterFix would not occur during the period analyzed in this EIS/EIR, as discussed in Response to Comment 7-16.

Comment 9-132

Comment

- DWR approved the Water Supply Contract Extension Project on December 11, 2018, based on a Final EIR for that project DWR certified on November 13, 2018. DWR's decision and certification treated California WaterFix as a "separate, independent project" having independent utility in addressing debt compression problems under the long-term water supply contracts (Contract Extension Final EIR, 2-9). However, DWR's review failed to address testimony, analyses and comments during 2018—some from DWR itself, or from other state reviewers—that demolished the foundation for this assumption of independence from WaterFix. They also demonstrated that the misnamed "extension" amendments proposed risky redefinition of contractual terms that would remove certain specific obstacles to imposing revenue bond debt for WaterFix in current SWP contracts.

Response

Please refer to Response to Comment 9-131.

Comment 9-133

Comment

- The third of three segmented EIRs addressing DWR's intertwined efforts to facilitate and finance the massive and costly Delta tunnels project presents the *State Water Project Water Supply Contract Amendments for Water Management and California WaterFix* project. The comment period closed on January 9, 2019. The proposed contract amendments would increase water transfers and exchanges with the SWP.

The Project's RDEIR/SDEIS fails to present any of this information, obscuring analysis of significant cumulative impacts.

Response

Please refer to Response to Comment 9-131.

Comment 9-134

Comment

F. Bay-Delta Water Quality Control Plan

DWR and the California Department of Fish and Wildlife are facilitating possible "Voluntary Agreements" in the hope of avoiding SWRCB action that would require flow criteria for the Sacramento River, Feather River, Yuba River, American River, Mokelumne River, Tuolumne River, Friant Division of the Central Valley Project, and Delta. The stated voluntary effort seeks to "[t]o integrate flow and non-flow measures to establish water quality conditions that support (1) the viability of native fishes in the Bay-Delta watershed, and (2) the achievement of related objectives in the Bay-Delta Plan, as amended."[91] "The SRSCs propose that during above normal, below normal and dry years, which cumulatively total about 58% of all years according the Sacramento Valley 8-station index, they would make available 100,000 acre-feet through land fallowing/crop shifting (or limited groundwater substitution) within their service areas."[92]

Response

Please refer to Response to Comment 2-7.

Comment 9-135

Comment

G. State Water Project Water Supply Contract Amendments for Water Management and California WaterFix

"DWR and the PWAs have agreed to enter into the process for amending the Contracts to confirm and supplement certain provisions for several water management actions, including transfers and exchanges, and to address changes in financial provisions related to the costs of California WaterFix."

Response

Please refer to Response to Comment 9-131.

Comment 9-136

Comment

H. Species

There is a clear history of formal consultation and commitments that are not considered here. There must be cumulative disclosure and analysis of impacts to the giant garter snake from

[91] Mancebo, Gene, et al., 2019. Cover Letter for the *Planning Agreement Proposing Project Description and Procedures for the Finalization of the Voluntary Agreements to Update and Implement the Bay-Delta Water Quality Control Plan*. p. 1.

[92] Nemeth, Karla A. and Charlton H. Bonham, 2019. *Planning Agreement Proposing Project Description and Procedures for the Finalization of the Voluntary Agreements to Update and Implement the Bay-Delta Water Quality Control Plan*. p. 1.

recently past, current, and future transfer, infrastructure, and agricultural projects. A particular failure for cumulative analysis and attempts at recovery are revealed in the 2015 GGS Biological Opinion, which acknowledged that the USFWS consulted eight times formally or informally with Reclamation since 2000. "The Service has consulted with Reclamation, both informally and formally, eight times since 2000 on various forbearance agreements and proposed water transfers for which water is made available in the Sacramento Valley by fallowing rice (and other crops), substituting other crops for rice, or substituting groundwater for surface supplies. Although transfers of this nature were anticipated in our 2004 biological opinion on the Environmental Water Account (EWA; Service Pile 03-F-0321), that program expired in 2007 and, to our knowledge, no water was ever made available to EWA from rice fallowing or rice crop substitution."[93] The 2015 BO was designated a "programmatic" document albeit with less stringent requirements than past annual transfer BOs. Naming a BO as programmatic does not make so. As the Lead Agencies are aware, the 2015 BO and the amended BO were vacated through *AquAlliance v. United States Bureau of Reclamation* (E.D.Cal. 2018) 312 F. Supp. 3d 878, 880. 5 U.S.C. § 706(2)(A).

Response

The consultation history is considered as part of the ESA consultation process. Since the 2015 BO was vacated, Reclamation requested formal consultation with USFWS, for the proposed action, on November 6, 2018. Cumulative effects of the Proposed Action and past, present and reasonably foreseeable projects on GGS are evaluated in Section 3.8.6 of the RDEIR/SDEIS.

Comment 9-137

Comment

I. Other Projects

Additional projects with cumulative impacts upon groundwater and surface water resources affected by the proposed project:

1. The DWR Dry Year Purchase Agreement for Yuba County Water Agency water transfers from 2015-2025 to SLDMWA.[94]

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[93] Appendices A1-A10. p. A-6.
[94] SLDMWA Resolution # 2014 386 http://www.sldmwa.org/OHTDocs/pdf_documents/Meetings/Board/Prepacket/2014_1106_Board_PrePacket.pdf

2. Installation of numerous production wells by Project water districts that sell water, many with the use of public funds such as Butte Water District,[95] GCID, Anderson Cottonwood Irrigation District,[96] RD108, and Yuba County Water Authority, [97]among others.

Response

The dry year purchase agreement is part of the Yuba Accord, which is included as a cumulative project in the cumulative effects analysis.

Groundwater effects are assessed by considering changes in groundwater levels (estimated by modeling) compared to actual groundwater levels (from groundwater monitoring). Installation and operation of groundwater wells is reflected in the groundwater monitoring information that is used as the baseline for impacts.

Comment 9-138

Comment

X. RDEIR/SDEIS Fails to Evaluate Reasonable Range of Alternatives

The RDEIS/SDEIS fails to evaluate a reasonable range of alternatives, instead relying wholly upon the alternatives evaluated in 2014. By relying on alternatives from a vacated environmental document, the Lead Agencies fail to take into account any and all new analysis and information in the revised/supplemental EIR/S, including the revised project description, and changed regulatory settings, to determine whether its range of alternatives is reasonable, and whether any alternatives would reduce or avoid significant or potentially significant project effects.

The RDEIS/SDEIR is required to evaluate and implement feasible project alternatives that would lessen or avoid the project's potentially significant impacts. Pub. Resources Code §§ 21002, 21002.1(a), 21100(b)(4), 21150; *Citizens of Goleta Valley v. Board of Supervisors* (1990) 52 Cal.3d 553, 564. This is true even if the EIS/EIR purports to reduce or avoid any or all environmental impacts to less than significant levels. *Laurel Heights Improvement Assn. v. Regents of Univ. of Cal.* (1988) 47 Cal.3d 376. Alternatives that lessen the project's environmental impacts must be considered even if they do not meet all project objectives. CEQA Guidelines § 15126.6(a)-(b); *Habitat & Watershed Caretakers v City of Santa Cruz* (2013) 213 Cal.App.4th 1277, 1302; *Center for Biological Diversity v. County of San Bernardino* (2010) 185 Cal.App.4th 866. Further, the EIS/EIR must contain an accurate no-project alternative against which to consider the project's impacts. CEQA Guidelines § 15126.6(e)(1); *Mira Mar Mobile Community v. City of Oceanside* (2004) 119 Cal.App.4th 477.

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[95] Prop 13. Ground water storage program: 2003-2004 Develop two production wells and a monitoring program to track changes in ground.

[96] "The ACID Groundwater Production Element Project includes the installation of two groundwater wells to supplement existing district surface water and groundwater supplies." http://www.usbr.gov/mp/nepa/nepa_projdetails.cfm?Project_ID=8081

[97] Prop 13. Ground water storage program 2000-2001: Install eight wells in the Yuba-South Basin to improve water supply reliability for in-basin needs and provide greater flexibility in the operation of the surface water management facilities. $1,500,00

Under NEPA, the alternatives analysis constitutes "the heart of the environmental impact statement" (40 C.F.R. § 1502.14). The agency must "rigorously explore and objectively evaluate all reasonable alternatives" (40 C.F.R. § 1502.14(a), 40 C.F.R. § 1502.14(b)), and to identify the preferred alternative (40 C.F.R. § 1502.14(e)). The agency must consider the no action alternative, other reasonable courses of action, and mitigation measures that are not an element of the proposed action (40 C.F.R. § 1508.25(b)(1)-(3)).

Response

Please refer to Response to Comment 7-21.

Comment 9-139

Comment

A. Feasible Alternatives to Lessen Project Impacts are Excluded

Alternatives must feasibly meet most of the project objectives. Here, the objectives for long-term water transfers through 2024 are twofold: (1) "Develop supplemental water supply for member agencies during times of CVP shortages to meet existing demands," and (2) "Meet the need of member agencies for a water supply that is immediately implementable and flexible and can respond to changes in hydrologic conditions and CVP allocations." RDEIR/SDEIS 1.2. Moreover, "Because shortages in water supplies are expected due to hydrologic conditions, climatic variability, and regulatory requirements, transfers are needed to meet water demands." RDEIR/SDEIS/S 1-2.

However, given the changed circumstances, including better climate data, and changed project description and demands, new alternatives should be considered. For example, as discussed above, the RDEIR/SDEIS analyzes only a 250,000 acre-feet limit, or about 49% of the amount analyzed in the 2014 Draft EIS/EIR, yet no additional alternatives have been presented to account for such a major change. See RDEIR/SDEIS at 1-4.

Response

Please refer to Response to Comment 7-21.

Comment 9-140

Comment

The summary discussion of alternatives is highly skewed and misleading. First, the RDEIR/SDEIS omits co-equal informational disclosure of the no project alternative, since "the analysis did not identify changes from existing conditions." p. ES-8. Second, the RDEIR/SDEIS states that "Cropland idling could include a variety of crops but idling in upland areas would be within the historic range of Long-Term Water Transfers Revised Draft EIR/Supplemental Draft EIS variation and would have less than significant effects on natural communities and special-status 1 species." p. ES-9-ES-10. This is simply unintelligible as written.

Response

Text has been edited for clarity.

Comment 9-141

Comment

In light of the oversubscribed water rights system of allocation in California, changing climate conditions, and severely imperiled ecological conditions throughout the Delta, the EIS/EIR should consider additional project alternatives to lessen the strain on water resources. Alternatives not considered in the EIS/EIR that promote improved water usage and conservation include:

Response

This comment was previously addressed in Response to Comment NG03-141 on the 2014 Draft EIS/EIR; the comment responses are included in Appendix F of the RDEIR/SDEIS (renamed Appendix R).

Comment 9-142

Comment

Fallowing in the area of demand. The EIS/EIR proposes fallowing in the area of origin to supply water for the transfers yet fails to present the obvious alternative that would fallow land south of the Delta that holds junior, not senior, water rights. This would qualify as an, "immediately implementable and flexible" alternative that is part of the Purpose and Need section. Whether or not this is a preference for the buyers, this is a pragmatic alternative that should be fully explored in a recirculated EIS/EIR.

Response

This comment was previously addressed in Response to Comment NG03-141 on the 2014 Draft EIS/EIR; the comment responses are included in Appendix F of the RDEIR/SDEIS (renamed Appendix R).

Comment 9-143

Comment

Crop shifting in the area of demand. The EIS/EIR proposes crop shifting in the area of origin to supply water for the transfers yet fails to present the obvious alternative that would shift crops south of the Delta for land that holds junior, not senior, water rights. Hardening demand by planting perennial crops (or houses) must be viewed as a business decision with its inherent risks, not a reason to dewater already stressed hydrologic systems in the Sacramento Valley. This would qualify as an, "immediately implementable and flexible" alternative that is part of the Purpose and Need section. Whether or not this is a preference for the buyers, this is a pragmatic alternative that should be fully explored in a recirculated EIS/EIR.

Response

This comment was previously addressed in Response to Comment NG03-141 on the 2014 Draft EIS/EIR; the comment responses are included in Appendix F of the RDEIR/SDEIS (renamed Appendix R).

Comment 9-144

Comment

Mandatory conservation in urban areas. In the third year of a drought, an example of urban areas failing to require serious conservation is EBMUD's flyer from October's bills that reflects the weak mandates from the SWRCB.

- Limit watering of outdoor landscapes to two times per week maximum and prevent excess runoff.
- Use only hoses with shutoff nozzles to wash vehicles.
- Use a broom or air blower, not water, to clean hard surfaces such as driveways and sidewalks, except as needed for health and safety purposes.
- Turn off any fountain or decorative water feature unless the water is recirculated.

While it is laudable that EBMUD customers have cut water use by 20 percent over the last decade, before additional water is ever transferred from the Sacramento River watershed to urban areas, mandatory usage cuts must be enacted during statewide droughts. This would qualify as an "immediately implementable and flexible" alternative that is part of the Purpose and Need section. This alternative should be fully vetted in a recirculated EIS/EIR.

Response

This comment was previously addressed in Response to Comment NG03-141 on the 2014 Draft EIS/EIR; the comment responses are included in Appendix F of the RDEIR/SDEIS (renamed Appendix R).

Comment 9-145

Comment

Land retirement in the area of demand. Compounding the insanity of growing perennial crops in a desert is the resulting excess contamination of 1 million acres of irrigated land in the San Joaquin Valley and the Tulare Lake Basin that are tainted with salts and trace metals like selenium, boron, arsenic, and mercury. This water drains back—after leaching from these soils the salts and trace metals—into sloughs and wetlands and the San Joaquin River, carrying along these pollutants. Retirement of these lands from irrigation usage would stop wasteful use of precious fresh water resources and help stem further bioaccumulation of these toxins that have settled in the sediments of these water bodies. The Lead and Approving Agencies have known about this massive pollution of soil and water in the area of demand for over three decades. Accelerating land retirement could diminish south of Delta exports and provide water for non-polluting buyers. Whether or not this is a preference for all of the buyers, this is a pragmatic alternative that should be fully explored in a recirculated EIS/EIR.

Response

This comment was previously addressed in Response to Comment NG03-141 on the 2014 Draft EIS/EIR; the comment responses are included in Appendix F of the RDEIR/SDEIS (renamed Appendix R).

Comment 9-146

Comment

Adherence to California's water rights. As mentioned above, the claims to water in the Central Valley far exceed hydrologic realty by more than five times. Unless senior water rights holders wish to abandon or sell their rights, junior claimants must live within the hydrologic systems of their watersheds. This would qualify as an, "immediately implementable and flexible" alternative that is part of the Purpose and Need section. Whether or not this is a preference for the buyers, this is a pragmatic alternative that should be fully explored in a recirculated EIS/EIR.

Response

This comment was previously addressed in Response to Comment NG03-141 on the 2014 Draft EIS/EIR; the comment responses are included in Appendix F of the RDEIR/SDEIS (renamed Appendix R).

Comment 9-147

Comment

Given the significantly revised project description, as well as the significantly changed existing environmental conditions, the EIS/EIR must consider these and other potentially feasible alternatives that would lessen the project's adverse environmental effects.

Response

Please refer to Response to Comment 7-21.

Comment 9-148

Comment

B. No Environmentally Superior Alternative is Identified.

The RDEIS/SDEIR fails to follow the law and significantly misleads the public and agency decision-makers in declaring that none of the proposed alternatives are environmentally superior. (p. 2-29.) Neither CEQA nor NEPA provide the lead agencies with discretion to sidestep this determination. As the Council on Environmental Quality (CEQ) has explained, "[t]hrough the identification of the environmentally preferable alternative, the decision maker is clearly faced with a choice between that alternative and the others, and must consider whether the decision accords with the Congressionally declared polices of the Act."[98] CEQA provides that "[i]f the environmentally superior alternative is the "no project" alternative, the EIR shall also identify an environmentally superior alternative among the other alternatives." (CEQA Guidelines § 15126.6(e)(2).)

[98] Forty Most Asked Questions Concerning CEQ's NEPA Regulations, 48 Fed. Reg. 18,026 (Mar.16, 1981) Questions 6a.

Response

This comment was previously addressed in Response to Comment NG03-139 on the 2014 Draft EIS/EIR; the comment responses are included in Appendix F of the RDEIR/SDEIS (renamed Appendix R).

Comment 9-149

Comment

First, the RDEIR/SDEIS fails to identify whether the "no project" alternative is environmentally superior to each other alternative. If that is the case, the RDEIR/SDEIS must then identify the next most environmentally protective or beneficial alternative. Here, the RDEIR/SDEIS presents evidence that Alternative 3 and Alternative 4 each would lessen the environmental impacts of the proposed project (p. 2-19). The RDEIR/SDEIS however then shirks its responsibility to identify the environmentally superior alternative by casting the benefits of Alternatives 3 and 4 as mere "trade-offs." This gross mischaracterization misleads the public and agency decision-makers, as the only "trade-off" between the proposed alternative and Alternatives 3 or 4 would be more or less adverse environmental effect.

Response

This comment was previously addressed in Response to Comment NG03-139 on the 2014 Draft EIS/EIR; the comment responses are included in Appendix F of the RDEIR/SDEIS (renamed Appendix R).

Comment 9-150

Comment

The RDEIR/SDEIS argument that its conclusion that no project impacts are significant and unavoidable misses the point. Just as an EIS/EIR may not simply omit any alternatives analysis when there is purported to be no significant and unavoidable impact, neither can the agencies decline to identify the environmentally superior alternative. In fact, the proposed project would cause numerous significant and adverse environmental effects, and the RDEIR/SDEIS relies on wholly deferred and inadequate mitigation measures to lessen those effects, even allowing some level of significant impacts to occur before kicking in. But mitigation measures alone are not the only way to lessen or avoid significant project effects: the alternatives analysis performs the same function, and should be considered irrespective of the mitigation measures proposed. It is prejudicial error for the Lead Agencies to fail to identify an environmentally superior alternative, and deprives the public and decision-makers with information necessary to sound environmental decision-making.

Response

This comment was previously addressed in Responses to Comments NG03-139 and NG03-140 on the 2014 Draft EIS/EIR; the comment responses are included in Appendix F of the RDEIR/SDEIS (renamed Appendix R).

Comment 9-151

Comment

XI. Additional Comments and Questions

A. Reduced Reliance on Water From the Delta

Water Code Section 85021 requires that all regions of California reduce their dependence on water imported from the Delta: "The policy of the State of California is to reduce reliance on the Delta in meeting California's future water supply needs through a statewide strategy of investing in improved regional supplies, conservation, and water use efficiency. Each region that depends on water from the Delta watershed shall improve its regional self-reliance for water through investment in water use efficiency, water recycling, advanced water technologies, local and regional water supply projects, and improved regional coordination of local and regional water supply efforts." How will the proposed Project adhere to this requirement?

Response

The purpose and need/project objectives included in this Final EIS/EIR are focused on addressing the mismatch between water supply and demand in dry years. Please refer to Common Response 1 and Response to Comment 4-1 regarding the relationship of potential water transfers to the activities of the Delta Stewardship Council, the Delta Plan, and Water Code section 85021.

Comment 9-152

Comment

Impacts of water transfers on buyer water quality must be evaluated

Surface water quality in potential buyer's areas is often poor and compromised by salts and irrigation runoff. For example, selenium runoff in the Westlands Water District is a well-known and serious issue, which threatens birds and other wildlife. *See* https://psmag.com/environment/cleaning-up-californias-three-decades-old-water-problem.

A baseline analysis of buyer's water quality must account for up-to-date information on contaminants. Moreover, the additional environmental impacts of runoff caused by the Project must be evaluated for all potential buyers.

Response

Water quality effects within the Buyer Service Area were assessed in Section 3.2 of the 2014 Draft EIS/EIR. Please refer to Common Response 1 for additional information regarding the nature and scope of analysis in the RDEIR/SDEIS.

Comment 9-153

Comment

XII. Conclusion

The Lead Agencies careless treatment of the serious issues enumerated above leave the RDEIR/SDEIS woefully inadequate. In so doing, this deprives decision makers and the public of their ability to evaluate the potential environmental effects of this Project and violates the full-disclosure purposes and methods of CEQA. For each of the foregoing reasons, we urge the Lead Agencies to withdraw the environmental review document for this Project. If Reclamation and SLDMWA chose to move forward, they must substantially revise and recirculate another CEQA/NEPA document for public and agency review and comment.

The AquAlliance coalition respectfully requests notification of any meetings or actions that address the Project.

Response

Revisions have been made to address public comments, but they do not trigger the criteria for recirculation set forth in CEQA Guidelines section 15088.5 and recirculation is not necessary.

Exhibit A

Comment 9-154

Comment

This letter provides comments and recommendations on the information in the December 2018 U.S. Bureau of Reclamation [BoR] and San Luis and Delta-Mendota Water Authority [SLDMWA] Revised Draft Environmental Impact Report and Supplemental Draft Environmental Impact Statement for Long-Term Water Transfers of water from the Sacramento Valley (2018 RDEI R/SDEIS).

This document evaluates the potential impacts over a 6-year period, 2019 through 2024, of transferring Central Valley Project (CVP) and non-CVP water from north of the Sacramento-San Joaquin Delta (Delta) to CVP contractors south of the Delta. These transfers require the use of CVP and State Water Project (SWP) facilities. The 2018 RDEIR/SDEIS evaluated impacts of alternatives for water transfers made available through groundwater substitution, cropland idling, crop shifting, reservoir release, and conservation. The combined upper limit for transfers by all methods in any one year would be 250,000 acre-feet with up to 60,693 acres of cropland idled (pages ES-8 and ES-9, Alternatives 2, 3 or 4).

In 2014, BoR and SLDMWA prepared a joint Draft Long-Term Water Transfer EIS/EIR (2014 Draft EIS/EIR) for water transfers from sellers north to buyers south of Sacramento River Delta and issued a Final Long-Term Water Transfer EIS/EIR in March 2015 (2015 Final EIS/EIR). The 2014 Draft EIS/EIR and 2015 Final EIS/EIR were challenged in United States District Court 35 for the Eastern District of California in the case *AquAlliance, et al., v. U.S. Bureau of Reclamation, et al*. On July 5, 2018, the U.S. District Court entered judgment vacating SLDMWA's decisions to approve the Final Long-Term Water Transfers EIS/EIR and approve the Proposed Action, vacating the 2015 Final EIS/EIR, and vacating the U.S. Fish and Wildlife Service's biological opinion. The 2018 RDEIR/SDEIS was prepared to address specific issues identified in the ruling (page ES-1 and ES-2).

Response

Section 1.2 of the RDEIR/SDEIS includes a summary of the District Court ruling and resulting changes in the RDEIR/SDEIS. Please refer to Common Response 1 for additional information regarding the nature and scope of analysis in the RDEIR/SDEIS.

Comment 9-155

Comment

The proposed action in the 2018 RDEIR/SDEIS is Alternative 2, the full range of transfers, that includes groundwater substitution, cropland idling/shifting, stored reservoir release, and conservation. The 2018 RDEIR/SDEIS proposes two mitigation measures, GW-1 for groundwater impacts, and VEG-WILD-1 for impacts to terrestrial species, along with the stream depletion factor mitigation measure WS-1 from Section 3.1.4.1 in the 2015 Final EIS/EIR to address the potential impacts from the water transfers from sellers north of the Sacramento Delta to buyers south of the Sacramento Delta (See Table C-1 in Appendix C for list of potential impact mitigations measures). This letter focuses on the groundwater substitution element of the water transfers from the Sacramento Valley groundwater basin and provides comments and recommendations regarding the deficiencies in the analysis of potential environmental impacts, the technical information submitted, and the monitoring and mitigation measures, and provides recommendations for amending the monitoring and mitigation measures.

This letter provides comments and recommendations on eleven subject areas. The following is a brief description of these eleven comments on the 2018 RDEIR/SDEIS.

1. The 2018 RDEIR/SDEIS acknowledges that groundwater substitution transfers will result in long-term depletion of groundwater storage, which affects surface water resources. The document however doesn't analyze the potential impacts of long-term depletion to surface waters, wildlife and vegetation, or groundwater aquifer systems. Furthermore, mitigations GW-1 and WS-1 don't require long-term monitoring and do not address or mitigate any potential impacts.

Response

Detailed responses to the eleven subject areas evaluated in this comment letter are provided below. See Responses to Comments 9-166 to 9-169 for response to subject area 1.

Comment 9-156

Comment

2. The information and analysis in the 2018 RDEIR/SDEIS are insufficient to demonstrate how the monitoring and mitigation measures proposed in GW-1 and VEG-WILD-1 provide adequate corrective actions to mitigate all potential impacts from groundwater substitution transfer pumping to less than significant. Specifically, the document fails to show how the proposed monitoring and corrective actions for declining groundwater levels will effectively

mitigate potential significant and harmful changes in groundwater quality, increased basin overdraft, increased subsidence, or harm to groundwater dependent ecosystems.

Response

Detailed responses to the eleven subject areas evaluated in this comment letter are provided below. See Responses to Comments 9-170 to 9-174 for response to subject area 2.

Comment 9-157

Comment

3. The information and analysis in the 2018 RDEIR/SDEIS are insufficient to demonstrate how the monitoring and mitigation measures proposed in GW-1 will ensure compliance with the Sustainable Groundwater Management Act of 2014 (SGMA) (California Water Code Sections 10720 to 10933). In addition, restriction in GW-1 on the placement of groundwater monitoring wells, the lack of process and procedures for notifying third party well owners within the entire area of potential groundwater pumping impacts, and restriction on eligibility of third parties to seek monetary reimbursement to correct transfer pumping impacts, all run counter to the goals of preventing and mitigating potential impacts to a level of insignificance.

Response

Detailed responses to the eleven subject areas evaluated in this comment letter are provided below. See Responses to Comments 9-175 to 9-179 for response to subject area 3.

Comment 9-158

Comment

4. The 2018 RDEIR/SDEIS mitigation measures GW-1 and WS-1 don't require any specific corrective actions to mitigate the long-term impacts from transfer pumping to the current overdraft groundwater basins of the proposed sellers in groundwater substitution transfers. Mitigations WS-1 and GW-1 only require year-of-transfer monitoring and mitigation measures, which fails to analyze or address impacts that occur after the transfer and the cumulative impacts from each additional transfer event. The document doesn't address how the mitigations will maintain the 2015 baseline basin conditions that are assumed in SGMA, or how the mitigations will contribute to maintaining basin sustainability within the 50-year SGMA planning and implementation horizon [California Water Code Section 10721(r)]. Stating that groundwater substitution transfers will comply in the future with the requirements of one or more Groundwater Sustainability Plans once they are developed doesn't provide the analysis or specific mitigations needed to address the long-term impacts

of groundwater substitute transfer on basin sustainability that occur prior to the development of the Groundwater Sustainability Plans.

Response

Detailed responses to the eleven subject areas evaluated in this comment letter are provided below. See Responses to Comments 9-180 to 9-183 for response to subject area 4.

Comment 9-159

Comment

5. The 2018 RDEIR/SDEIS fails to inform and analyze potential impacts from groundwater substitute transfers using currently available published scientific documents on surface water and groundwater interactions. The document doesn't analyze the long-term impacts of groundwater pumping on the volume of stored groundwater, changes in surface water flows, or reductions in water availability to sustain groundwater dependent ecosystems. Three available groundwater modeling studies indicate that long-term impacts from transfer pumping are significant and continue beyond the year of the transfer. Instead of recognizing known long-term impacts of transfer pumping, mitigation WS-1 states that *"[t]he exact percentage of the streamflow depletion will be assessed and determined on a regular basis by Reclamation and DWR,"* and it "… *will be refined as new information becomes available and may become more site specific as better data and groundwater modeling becomes available."* Although the revised document acknowledges there are long-term impacts to stream and groundwater storage (See my comment no. 1), mitigations WS-1 and GW-1 don't require that currently available scientific methods be used to calculate the stream depletion factor for a transfer pumping well. Failure to use readily available scientific methods to calculate and mitigate stream depletion and aquifer storage loss from transfer pumping will likely result in inadequate mitigation of the potential impacts to both surface water and ground water resources.

Response

Detailed responses to the eleven subject areas evaluated in this comment letter are provided below. See Responses to Comments 9-184 to 9-189 for response to subject area 5.

Comment 9-160

Comment

6. The 2018 RDEIR/SDEIS analysis of potential impacts to water quality fails to inform, analyze, monitor, or mitigate known water quality problems in the proposed groundwater transfer substitution source areas of Sacramento Valley. The evaluation for potential migration of known chemical pollutants consists of a general statement that water quality is typically good, based on concentrations of total dissolved solids, but then notes that there are also 481 active contaminant clean-up sites in Sacramento Valley. There are no actions or standards in mitigation GW-1 that require sellers to demonstrate that the transfer pumping will not re-direct or spread known contaminated groundwater. The document does however

provide analysis that suggests that transfer pumping will result in change in the direction of groundwater flow that can draw shallow groundwater contaminants into deeper aquifer zones.

Response

Detailed responses to the eleven subject areas evaluated in this comment letter are provided below. See Responses to Comments 9-190 to 9-198 for response to subject area 6.

Comment 9-161

Comment

7. The 2018 RDEIR/SDEIS mitigations GW-1, and VEG and WILD-1 don't require identifying, evaluating, monitoring or mitigating groundwater dependent vegetation with roots shallower than 10 feet. Monitoring and mitigation is required only for deep-rooted vegetation, which they define as vegetation with a tap root greater than 10 feet long. Monitoring is required only within a half-mile radius of the transfer pumping well and when groundwater levels are between 10 and 25 feet below the ground surface. The document refers to an assessment-methods section in Appendix H for justification of this limited monitoring requirement. However, this assessment isn't actually included in Appendix H. The failure of GW-1 to require protection of shallow root vegetation and all groundwater dependent ecosystems that may be impacted by the transfer pumping will likely result in significant impacts to these resources.

Response

Detailed responses to the eleven subject areas evaluated in this comment letter are provided below. See Responses to Comments 9-199 to 9-204 for response to subject area 7.

Comment 9-162

Comment

8. The 2018 RDEIR/SDEIS mitigation GW-1 requires that if there are no wells meeting the requirements for monitoring deep-rooted or shallow-rooted vegetation, then monitoring can be done visually by a qualified biologist. Mitigation GW-1 doesn't provide any requirement or standards for establishing baseline conditions of the vegetation, require any reporting of the baseline condition, or documentation of pre- and post-transfer conditions and any changes in vegetation during the period of transfer. Mitigation GW-1 fails to recognize that multiple years of transfer will have a cumulative effect on the health of vegetation. No long-term monitoring of changes to vegetation are required. No standard is defined for revegetation plan development and revegetation success criteria, and there is no requirement to continue revegetation efforts until the vegetation is re-established and meets or exceeds the revegetation standard. Mitigation GW-1 doesn't require the seller to coordinate biological monitoring with state or local agencies such as California Department of Fish and Wildlife. Mitigation GW-1 doesn't require the seller provide any financial assurance to ensure that

revegetation will be completed successfully and doesn't indicate who will complete the revegetation should the seller fail to comply with the mitigation measures.

Response

Detailed responses to the eleven subject areas evaluated in this comment letter are provided below. See Responses to Comments 9-205 to 9-207 for response to subject area 8.

Comment 9-163

Comment

9. The 2018 RDEIR/SDEIS evaluates the potential for groundwater substitution transfer pumping to impact rivers and creeks using the SACFEM2013 groundwater model simulations for years 1970 to 2003. The document sets as the threshold of significance standard, a reduction in mean monthly flow of 10 percent and greater than one cubic foot per second (cfs) change in flow. The document relies on groundwater level monitoring requirements and mitigations in GW-1 to prevent impacts to terrestrial species, natural communities and special-status species. The document doesn't provide data or analysis on why the proposed ten percent and 1 cubic foot per second (10% & 1 cfs) threshold is an appropriate standard of protection. The 10% & 1 cfs standard isn't compared to existing instream flow standards such as those utilized by the California Department of Fish and Wildlife. Mitigation GW-1 doesn't require that baseline conditions be measured or documented. There are no standards for monitoring, and no standards for the level of environmental significance for the species and resources being protected. The other terrestrial mitigation, VEG and WILD-1, is only for cropland idling transfer and therefore doesn't provide monitoring or mitigation for groundwater substitution transfers. Mitigation GW-1 has no specific requirements to monitor these biological resources prior, during or after transfer pumping. The 2018 RDEIR/SDEIS also claims that many streams are "*essentially*" dry during periods of pumping and therefore pumping can't cause an impact. This assessment ignores the long-term implications of surface water capture discussed in my comment No. 5, in particular, the increase in stream seepage caused by lowering the water table, the third type surface water capture. Long-term impacts from lowering groundwater levels beneath streams and the effect on reducing surface water flows aren't considered in the document or mitigated in GW-1.

Response

Detailed responses to the eleven subject areas evaluated in this comment letter are provided below. See Response to Comment 9-208 for response to subject area 9.

Comment 9-164

Comment

10. Except for monitoring of groundwater levels and stopping pumping when trigger levels are reached, mitigation GW-1 doesn't require any other specific actions to prevent subsidence and provides only general statements about reimbursing third parties for modifications of wells or infrastructure, and other appropriate actions. The impact analysis, and monitoring

and mitigation measures, lack information regarding the current areas and amounts of subsidence, the methods, timing and organizations that the transfer sellers need to coordinate their subsidence monitoring. Mitigation GW-1 doesn't require the seller to comply with DWR's Best Management Practices for land subsidence monitoring networks.[99] Mitigation GW-1 lacks specific information on what rate and amount of land subsidence would be considered significant and therefore trigger the corrective action to provide financial reimbursement to third parties for modification of their wells or infrastructure damaged by land subsidence. Mitigation GW-1 doesn't require that transfer sellers demonstrate that they have the financial assurance to reimburse third parties for mitigation costs. Mitigation GW-1 doesn't identify the procedures for third parties to making a claim of land subsidence damage.

Response

Detailed responses to the eleven subject areas evaluated in this comment letter are provided below. See Responses to Comments 9-209 to 9-214 for response to subject area 10.

Comment 9-165

Comment

11. The 2018 RDEIR/SDEIS used the SACFEM2013 groundwater model to evaluate potential impacts from groundwater substitution pumping on groundwater levels, water quality, and stream depletion from historical transfer pumping during the water years 1970 to 2003. The SACFEM2013 modeling effort's failure to use data on historical conditions or transfers after 2003 is a significant limitation on the utility of the model for estimating potential impacts from the proposed 6 years of groundwater substitution transfers. Sacramento Valley groundwater basin hydrologic conditions after 2003 include continued localized decreases in groundwater levels, decreases water quality, and development of areas of land subsidence. The decrease in groundwater levels and quality has resulted in the many of the Sacramento Valley groundwater subbasins being listed as medium to high priority under SGMA. These subbasins are considered unsustainable under current conditions, and therefore require management under a Groundwater Sustainability Plan. The modeling effort doesn't appear to account for the causes of the SGMA ranking or clearly address the potential for creating or expanding any SGMA undesirable results. The modeling effort didn't evaluate the impacts from 6 continuous years of groundwater substitution transfers at the proposed maximum transfer volume and didn't state the modeled volume of groundwater pumping. Because the 2018 RDEIR/SDEIS didn't use the existing degraded hydrologic conditions in modeling the

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[99] https://water.ca.gov/-/media/DWR-Website/Web-Pages/Programs/Groundwater-Management/Sustainable-Groundwater-Management/Best-Management-Practices-and-Guidance-Documents/Files/BMP-2-Monitoring-Networks-and-Identification-of-Data-Gaps.pdf

potential impacts from the transfers, the assessments and conclusions in the document likely underestimate the potential environmental impacts.

Response

Detailed responses to the eleven subject areas evaluated in this comment letter are provided below. See Responses to Comments 9-215 to 9-225 for response to subject area 11.

Comment 9-166

Comment

<u>Comments and Recommendations for 2018 RDEIR/SDEIS</u>

1. The 2018 RDEIR/SDEIS acknowledges that groundwater pumped for groundwater substitution transfers lowers groundwater levels by taking water out of groundwater storage and then surface water recharge refills the depleted groundwater, provided surface waters are available, and that the process of refilling will occur slowly over time.

> *"Groundwater substitution would temporarily decrease levels in groundwater basins near the participating wells. Water produced from wells initially comes from groundwater storage. Groundwater storage would refill (or "recharge") over time, which affects surface water sources. Groundwater pumping captures some groundwater that would otherwise discharge to streams as baseflow and can also induce recharge from streams. Once pumping ceases, this stream depletion continues, replacing the pumped groundwater slowly over time until the depleted storage fully recharges (page 2-5, lines 4-19).*

The fact that the 2018 RDEIR/SDEIS recognizes that refilling the groundwater extracted for groundwater substitution transfers will slowly over an extended period of time decrease surface water flows is critical to understanding the environmental impacts from the transfers. The proposed mitigation measure for decreases in surface water flows is listed in the Potential Impacts Summary Table C-1 of Appendix C as WS-1: the Stream Depletion Factor, which is from the 2015 Final EIS/EIR. Although this mitigation measure isn't discussed in the 2018 RDEIR/SDEIS it is used as a mitigation measure in the revised document and stream depletion is repeatedly discusses (see pages ES-7, ES-10, 2.9 and 3.3-1). The text for mitigation WS-1 is given in the 2015 Final EIS/EIR in Section 3.1.4.1 on pages 3.1-22 and 3.1-23. In addition, requirements for the BoR-SDF are also given in the 2015 DRAFT Technical Information for Preparing Water Transfer Proposals (2015 Water Transfer White Paper) (DWR-BoR, 2015b). These requirement are also relevant to stream depletion mitigation and WS-1 because the 2018 RDEIR/SDEIS requires *"[a]ll transfer must be consistent with the guidance provided in the most recent version of the DRAFT Technical Information for Preparing Water Transfer Proposals,"* and the May 2015 addendum (DWR-BoR, 2015a) revised the stream flow depletion factor discussed in Section 3.4.3 of the Water Transfer White Paper from 12 percent to 13 percent. Apparently, both WS-1 and the Water Transfer White Paper are linked because they both have mitigation measures for stream depletion and a BoR-SDF of 13 percent.

Response

As noted in the comment, the 2014 Draft EIS/EIR and the RDEIR/SDEIS discuss the potential for streamflow depletion from groundwater substitution transfers under Proposed Action. Detailed analysis of groundwater surface water interaction is contained in Section 3.1, Water Supply of the 2014 Draft EIS/EIR. As required in Mitigation Measure WS-1, a minimum streamflow depletion factor of 13 percent will be applied to groundwater substitution transfers in this document. The 2014 Draft EIS/EIR also analyzed the potential effects of the changes in streamflow on fisheries (Section 3.7), and the RDEIR/SDEIS analyzed potential effects of changes in streamflow on vegetation and wildlife (Section 3.8).

Comment 9-167

Comment

Mitigation GW-1 is proposed in Table C-1 of Appendix C for lowering of groundwater levels in sellers' service areas from groundwater substitution transfers. However, the proposed corrective actions for the surface water losses in mitigations WS-1 and GW-1 for lowering of groundwater levels as a result of storage losses don't account for the continued loss in surface water flows, impacts of lowering groundwater levels on wildlife and vegetation, or the slow refilling of pumped groundwater beyond the year of the transfer. Although the stated intent of mitigation WS-1 (2015 Final EIS/EIR, Section 3.1.4.1 on pages 3.1-22 and 3.1-23) is to "…*offset the streamflow effects of the added groundwater pumping due to transfer*," the current minimum value in WS-1 for the BoR steam depletion factor (BoR-SDF) is 13 percent in the year of transfer, which provides no mitigation for stream flow losses in successive years as the remaining groundwater storage lost during a transfer is recharged.

Response

As noted in Section 3.1, Water Supply of the 2014 Draft EIS/EIR groundwater substitution transfers could result in streamflow depletion that may affect water users that are not parties to water transfers. Above comment reflects a misunderstanding about the purpose of this mitigation measure. This comment indicates that Mitigation Measure WS-1 would help with potential streamflow depletion impacts to small streams and their biological resources. Implementation of Mitigation Measure WS-1 and applying a minimum streamflow depletion factor of 13 percent reduced the potentially significant impacts to non-transferring water users to a less than significant level.

Potential impacts from streamflow depletions to wildlife and vegetation in the Seller Service Area are discussed in Section 3.8 of the RDEIR/SDEIS, Vegetation and Wildlife. As noted in Section 3.8, groundwater substitution transfers could have significant impacts on streamflow in Cache Creek, Stony Creek, and on other small creeks where no existing streamflow data is available. Consequently, the reduction in streamflow at these streams could negatively impact natural communities and special-status species dependent on these creeks. This analysis is based on the groundwater model, which simulates groundwater aquifer recharge over multiple years and the changes it would produce in neighboring surface water bodies. Implementation of Mitigation Measure GW-1 requires monitoring (groundwater level monitoring or visual observation) to identify if groundwater substitution transfers are negatively impacting vegetation, and if so, avoid or mitigate those effects. Mitigation Measure GW-1 requires curtailment of transfers until natural recharge corrects the environmental impacts. As noted in Mitigation Measure GW-1, "*Transfer-related pumping could not continue from this well (in the same year or a future year) until groundwater levels recovered to above the groundwater level trigger*". The 2014 Draft EIS/EIR and RDEIR/SDEIS do not depend on Mitigation Measure WS-1 to mitigate impacts to vegetation and wildlife from groundwater substitution transfers.

Comment 9-168

Comment

While the mitigation WS-1 does indicate that BoR and the California Department of Water Resources (DWR) will refine the BoR-SDF as new information becomes available, the statement in the 2018 RDEIR/SDEIS that acknowledges surface water will slowly refill the depleted storage seems to be sufficient information to require revision of mitigations WS-1 and GW-1 to require that the seller provide for continued augmentation of the flows in streams impacted by the transfer up to the volume of the total water transferred and the full duration of the impact. With the current BoR-SDF of 13 percent, up to an additional 87 percent of the volume pumped needs to be withheld and released slowly over a long time to mitigate the known impacts to surface waters. The outstanding questions for the seller, BoR, and other water users include the rate, volume and timing that long-term stream depletion mitigation waters should be released to the affected stream. In addition, WS-1 doesn't address how transfer pumping-affected streams and water bodies that aren't directly connected to the transferred surface waters will be mitigated by the BoR-SDF. Recent studies by Leake and others (2008, 2010) using superposition groundwater modeling to simulate river depletion by groundwater wells in Arizona's Upper San Pedro Basin and the lower Colorado River could assist in providing a method for answering these questions. Leake and others, 2010, attached as Exhibit 8.

I recommend that the 2018 RDEIR/SDEIS be revised to provide specific monitoring and mitigation measures that address the potential long-term impacts from groundwater substitution transfers depleting groundwater storage, and the resulting impacts to surface water resources and all surface water dependent wildlife and vegetation.

Response

The commenter is indicating that because all of the groundwater pumped is eventually refilled from surface water, the entire amount pumped must be used to address potential effects of the transfer. However, as explained in Section 3.1.2.4 of the 2014 Draft EIS/EIR, some of the recharge would occur during wet conditions when it would not result in environmental effects:

A portion of the groundwater recharge would occur during periods when there is higher flow in waterways. During these times, although the recharge would decrease flows in the waterways, the decreased flows would not affect water supplies or the ability to meet flow or quality standards.

The portion of groundwater recharge that occurs during dry conditions is the portion that has the potential to affect water supplies and the ability to meet flow and water quality criteria. The modeling effort, using SACFEM2013 and CalSim II, considered the effects of recharge during dry conditions as the basis for developing the 13 percent.

The impact analysis for fisheries and vegetation and wildlife considered the potential for effects year-round, but found that the potential for effects were during the dry season. See Response to Comment 9-167 regarding the groundwater and surface water interaction analysis in this EIS/EIR.

Comment 9-169

Comment

2. Mitigation measure GW-1 deals with groundwater substitution transfer impacts has several required monitoring program elements (Section 3.3.4, pages 3.3-25 through 3.3-29). The main monitoring requirement of GW-1 is measurement of groundwater levels. The mitigation requires that transfer pumping stops if groundwater levels drop to the depth of a trigger level, typically an elevation at or below the known historic low (Section 3.3.4.3, page 3.3-29). Although mitigation GW-1 lists monitoring elements other than groundwater levels, such as groundwater quality, flow metering of pumped groundwater, and shallow groundwater monitoring for deep-rooted vegetation, the corrective actions listed for GW-1 are primarily based on making engineering fixes to wells or infrastructure caused by a drop in groundwater levels. The evaluation and reporting element of GW-1 requires a transfer summary report that identifies transfer-related effects on groundwater and surface water, local groundwater users, and ecological resources such as fish, wildlife and vegetation resources. However, GW-1 doesn't require, or obviously link to other monitoring and/or mitigation measures that require, monitoring, assessment and reporting of the baseline conditions of the resources whose transfer impacts should be reported per GW-1. Establishment of baseline conditions is fundamentally necessary to quantify changes that occurred during transfer pumping and transfer-related impacts.

Response

Mitigation Measure GW-1 has been revised to include corrective actions to significant adverse impacts to deep rooted vegetation. Excerpt from Mitigation Measure GW-1: "*If adverse impacts to deep-rooted vegetation occur, the seller will perform restoration activities by replanting similar vegetation at a 1:1 ratio (for every 1 inch diameter at breast height (dbh) lost, 1 inch in dbh will be planted. For example if 12-inch dbh of oak is lost then the seller would have to plant 12 gallon oak sapling at around 1-inch dbh. Therefore, the seller would plant more trees than lost). The seller will plant, irrigate, maintain, and monitor restoration of vegetation for 3 years to replace the losses.*"

Impacts to fisheries resources are analyzed in detail in Section 3.7, Fisheries, of the 2014 Draft EIS/EIR. The analysis considers surface water flow changes from transfer operations and streamflow depletion caused by groundwater basins refilling after groundwater substitution transfers. The analysis concluded that flow changes in streams and rivers would be less than significant. The analysis indicated that reductions in flow would not occur at times or in locations that would have significant adverse effects on sensitive fish species.

Regarding the comment on providing baseline, Mitigation Measure GW-1 requires monitoring to occur prior to transfer pumping. Excerpt from GW-1: "*Groundwater levels will be measured in both the participating pumping well(s) and the monitoring well(s) monthly from March in the year of the proposed transfer-related substitution pumping until the start of the transfer. Monitoring will also be conducted on the day that the transfer-related substitution pumping begins, prior to the pump being turned on.*" Additionally, monitoring reports would be developed during transfer years and this information would also be available to develop baseline conditions for future years.

Comment 9-170

Comment

In addition to GW-1 not requiring establishment of baseline conditions, the surface water mitigation measure WS-1 from 2015 Final EIS/EIR only addresses the stream depletion factor but has no requirement to identify existing instream flow requirements, or measure and calculate the minimal instream flows, or other minimal stream characteristic such as depth of flow, temperature, or the condition of the fisheries, wildlife or riparian habitats. Without establishing baseline conditions and minimal threshold triggers for the surface water, assessment of transfer pumping impacts is difficult. Mitigation WS-1 doesn't require knowledge of pre-pumping conditions to ensure that flows in the stream will be sufficient to allow for all of the existing surface water diversions as well as the depletion caused by transfer pumping. Mitigation WS-1 doesn't require that the sellers use established methods for evaluating minimum instream flows and habitat values such as those provided by the California Department of Fish and Wildlife.[100] The requirements for establishing minimal stream flows and habitat values should follow accepted methods and be used to guide the timing and volume of releases of the BoR-SDF mitigation waters and to establish standards for evaluating the effectiveness of the WS-1 as a mitigation measure.

Response

As noted in response to Comment 9-167, the commenter describes a misunderstanding regarding the purpose of Mitigation Measure WS-1. The purpose of Mitigation Measure WS-1 is to reduce potentially significant water supply impacts to other CVP and SWP water users.

Section 3.7, Fisheries, of the 2014 Draft EIS/EIR analyzes the impacts from streamflow depletion to fisheries resources. The analysis concluded that flow changes in streams and rivers would be less than significant. The analysis indicated that reductions in flow would not occur at times or in locations that would have significant adverse effects on sensitive fish species. Please refer to Common Response 1 for additional information regarding the nature and scope of analysis in the RDEIR/SDEIS.

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[100] https://www.wildlife.ca.gov/Conservation/Watersheds/Instream-Flow

Comment 9-171

Comment

A third 2018 RDEIR/SDEIS mitigation measure, VEG-WILD-1, only deals with terrestrial species associated with cropland idling transfers (Section 3.8.4, page 3.8-38 through 3.8-40). Despite limiting the VEG-WILD-1 mitigation measure to cropland idling transfers, Table C-1 of Appendix C links GW-1 and VEG-WILD-1 together as revised mitigations for a number of potential vegetation and wildlife impacts associated with groundwater substitution transfers (See pages C-8 through C-10).

Response

As noted in Response to Comment 9-167, implementation of Mitigation Measure GW-1 would reduce potentially significant impacts from streamflow depletions to wildlife and vegetation in the Seller Service area.

Comment 9-172

Comment

In addition to the three mitigations given in the 2018 RDEIR/SDEIS, there are other potential monitoring and mitigation measures that seem to be incorporated by reference in the 2015 DWR-BoR document titled Draft Technical Information for Preparing Water Transfer Proposals (2015 Water Transfer White Paper). In particular, Appendix B in the 2015 Water Transfer White Paper is a Transfer Information Checklist for both cropland idling and groundwater substitution information requirements. The monitoring and mitigation measures in the 2015 Water Transfer White Paper and the Appendix B checklist appear to be linked to mitigations WS-1, GW-1, and VEG and WILD-1 because of repeated reference in the 2018 RDEIR/SDEIS to the 2015 Water Transfer White Paper. (See pages ES-6, 1-4, 3.3-25, and 3.3-28 for the discussion of the 2105 Water Transfer White Paper in the 2018 RDEIR/SDEIS.) However, many of the monitoring and mitigation measures in the 2015 Water Transfer White Paper aren't included in the 2018 RDEIR/SDEIS and in places they are contradicted.

Response

CEQA defines Mitigation Measures as actions within the power of the responsible agency that would substantially lessen or avoid any significant effect the project would have on the environment. Mitigation measures were included in the 2014 Draft EIS/EIR and RDEIR/SDEIS to reduce or avoid significant effects, but were not included if no significant effects were identified.

Appendix B of the *DRAFT Technical Information for Preparing Water Transfer Proposals* (Reclamation and DWR 2015) includes an information checklist for sellers proposing to transfer water. The Appendix B checklist is intended to assist sellers in developing a complete transfer proposal which will facilitate review by Reclamation. The information checklist in Appendix B is not a Mitigation Measure, but helps to provide the information that is required in Mitigation Measure GW-1.

Comment 9-173

Comment

For example, the corrective actions in GW-1 are focused on mitigating impacts to pumping costs and infrastructure from changes in groundwater levels using engineered modifications. The GW-1 list of mitigation corrective actions includes lowering the pump intakes, cost reimbursement for impacts to non-transferring third-party wells, and other undefined appropriate actions. Mitigation GW-1 doesn't appear to require monitoring or estimation of the rate and duration of natural refilling of the loss in groundwater storage caused by transfer pumping, even though the objective of the mitigation is stated wanting to "avoid significant adverse environmental effects from groundwater level declines." GW-1 doesn't appear to require any specific corrective action(s) to replace the stored groundwater extracted by the transfers other than requiring the groundwater level to rise above the trigger level before transfer pumping can continue. The basic assumption of GW-1 seems to be that any detrimental effects from groundwater extracted for transfers are either temporary and/or they can be mitigated with engineering. This appears to conflict with the statement that [o]nce pumping ceases, this stream depletion continues, replacing the pumped groundwater slowly over time until the depleted storage fully recharges" (section ES.4.1, page ES-7; Section 2.2.2.1, page 2-5).

Response

Mitigation Measure GW-1 has multiple corrective actions to avoid potential significant impacts. The corrective actions listed in the comments (such as lowering pump intakes and cost reimbursement for impacts to third party wells) provide a backup to address the potential for third party effects; however, these effects should be avoided based on the provision that groundwater substitution transfers would stop if groundwater levels reach historic low levels. At this point, groundwater storage would refill over time.

The RDEIR/SDEIS identifies potential significant impacts to vegetation and wildlife from changes in streamflow in Cache Creek, Stony Creek, and on other small creeks where no existing streamflow data is available. Reduction in streamflow at these streams could negatively impact natural communities and special-status species dependent on these creeks. Mitigation Measure GW-1 includes a monitoring program, mitigation plan and corrective actions for identified impacts from streamflow depletion to vegetation. These measures are different than the measures cited in this comment.

Comment 9-174

Comment

I recommend that the mitigations WS-1, GW-1, and VEG and WILD-1 be revised to incorporate monitoring, mitigations and corrective actions using acceptable methods that provide specific standards for: (1) measuring baseline environmental conditions; (2) establishing minimum instream flows requirements, including minimal stream characteristics such as depth of flow and temperature; (3) establishing minimal habitat value for fisheries, riparian habitats, wildlife and vegetation that occur within the area of transfer drawdown; (4) establishing the locations, timing and volume of releases of the BoR-SDF mitigation waters needed to protect the potentially impacted resources; (5) incorporating the monitoring and mitigation requirements of the 2015 Water Transfer White Paper; and (6) requiring communications and regulatory interactions with local and state agencies who have the responsibility to protect fisheries, wildlife and vegetation species, including obtaining all necessary permits.

Response

This is a summary of the prior comments; please see Responses to Comments 9-169 to 9-173.

Comment 9-175

Comment

3. The 2018 RDEIR/SDEIS doesn't require analyses of the long-term impacts of groundwater substitution transfer pumping to groundwater levels or of the sustainable yield of the seller's groundwater basin and any adjacent basins. Maintaining the sustainable yield of a groundwater basin as now required by the 2014 Groundwater Sustainability Management Act (SGMA) (Water Code Sections 10720 to 10933). Instead the seller is required to "*confirm*" by an unspecified procedure that their proposed groundwater pumping is "*compatible*" with state and local regulation including, Groundwater Management Plans (Appendix D, page D-7), and Groundwater Sustainability Plans developed by Groundwater Sustainability Agencies (Appendix D, page D-5). The 2018 RDEIR/SDEIS doesn't specify whether the local or state agencies in charge of administering these plans and SGMA need to provide written comments and approvals of the transfer proposals, issue permits, or whether the seller can self-certify the transfer proposal's compatibility.

Response

Mitigation Measure GW-1 requires groundwater levels not drop below the groundwater level trigger discussed in Section 3.3, Groundwater Resources of the RDEIR/SDEIS. The groundwater level trigger is defined as the quantitative BMO in areas where they exist and the historic low groundwater level in other areas. The groundwater basins in seller area in the RDEIR/SDEIS have been prioritized as either medium or high priority. Groundwater basins with this designation do not need to be managed under a GSP before January 31, 2022. To date, GSPs have not been developed for these groundwater basins. Potential sellers must confirm that the proposed pumping is compatible with the applicable GSPs when these plans are developed and adopted. This process to confirm compatibility would occur during Reclamation's annual review and approval process for the transfer.

Comment 9-176

Comment

The transfer proposal compatibility with local and state regulations may be incomplete because the limits that GW-1 places on a "*suitable*" groundwater transfer monitoring network are that monitoring wells be within a two-mile radius of the seller's transfer pumping well, and that wells be located within the same Bulletin 118 subbasin as the pumping well (page 3.3-26). This limit in mitigation GW-1 on the maximum distance for a suitable monitoring well and the limit of monitoring only in the pumping well's DWR Bulletin 118 subbasin may result in unmonitored and therefore unmitigated impacts in areas outside the two-mile radius and/or adjacent subbasins. This restriction on monitoring area may be difficult to demonstrate to SGMA agencies that the transfer proposal will effectively monitor all potential impacts. For example, in the 2015 Environmental Impact Report for the Glenn-Colusa Irrigation District (GCID, 2015) Groundwater Supplemental Supply Project the groundwater modeling done to forecast the extent of groundwater level drawdown from pumping up to 10 agriculture production wells at a rate of 2,500 gallons per minute and a maximum annual production of 28,500 acre-feet per year found shallow groundwater drawdown extending beyond a two-mile radius from the pumping wells and extending into adjacent counties and DWR Bulletin 118 subbasins.

Response

This comment indicates that the requirements for a suitable monitoring well may be limiting such that some transfers may not monitored. However, if there is no monitoring well within a two-mile radius and the same Bulletin 118 subbasin, then the transfer cannot occur. Mitigation Measure GW-1 specifies:

If a suitable monitoring well(s) is not identified for a participating pumping well, the participating pumping well will not be allowed to participate in water transfers until a suitable monitoring well(s) is identified.

While groundwater drawdown may extend past the two-mile radius, the greatest potential drawdown would be close to the participating pumping well (as discussed in Response to Comment 9-177 in more detail).

Comment 9-177

Comment

The rate and volume of pumping for the GCID wells is similar to that proposed for transfer wells in the 2018 RDEIR/SDEIS. (See Table 2-2 for the proposed range for annual volumes of transfer and Table 3.3-3 for proposed range of pumping rates). Attached Exhibit 1 is a map of the extent of the simulated shallow groundwater drawdown taken from the 2015 GCIS EIR, which shows that the radius of drawdown is much greater than two miles; the maximum extend is approximately 12 miles. Attached Exhibit 2 is a figure that combines the Exhibit 1 limits of the shallow groundwater drawdown from pumping the GCID wells with the DWR Bulletin 118 subbasin boundaries. This figure shows that effects of GCID pumping extend into two and possibly four adjacent subbasins. Attached Exhibit 3 is a figure that combines the limits of shallow groundwater drawdown with the number of domestic wells in each section. Exhibit 3 shows that the extent of the drawdown from pumping GCID's wells will impact a large number of domestic wells and many of these well are outside a two-mile radius and outside the pumping well's DWR Bulletin 118 subbasin.

Response

As noted in Section 3.3 of the RDEIR/SDEIS, groundwater level declines due to pumping occur initially at the pumping well and then propagate outward from that location. The magnitude of groundwater level decline caused by pumping also decreases with increasing distance from the pumping well. Therefore, monitoring of groundwater levels within a two-mile radius from the pumping well would detect groundwater level declines sooner than at wells further away from the pumping well.

Therefore, the two-mile radius requirements would adequately capture impacts from groundwater level declines.

Reclamation, and where appropriate DWR, will verify that sellers implement the monitoring program and mitigation plan to avoid potentially significant adverse effects of transfer-related groundwater extraction.

Comment 9-178

Comment

Therefore, the limits that GW-1 places on suitable monitoring wells may result in a number of domestic wells and, potentially, production wells that are impacted by the transfer pumping without receiving adequate monitoring. Some of the affected well owners will likely have no access to any of the corrective actions listed in GW-1 (page 3.3-29) because they're assumed to be outside the area of impact. In addition, it is likely that third parties with wells within the two-mile radius, but outside of the DWR Bulletin 118 subbasin of the transfer pumping, will not receive notice of the transfer pumping plan and also be ineligible for the GW-1 corrective actions. Therefore, well owners outside of the GW-1 defined mitigation area may have no opportunity to provide input into the transfer coordination plan as required in GW-1 (page 3.3-28), and lose the right to remedies of the GW-1 mitigations, in particular, monetary reimbursement to correct for impacts to their wells or other infrastructure.

Response

Section 3.3, Groundwater Resources of the RDEIR/SDEIS does not suggest that impacts from groundwater substitution pumping would be limited to a two-mile radius from the participating pumping well. Mitigation Measure GW-1 does require monitoring to occur within a two-mile radius of the participating pumping well, in order to detect groundwater level declines beyond the groundwater level trigger. As noted in the Response to Comment 9-86, this requirement is more restrictive as it would detect groundwater level declines beyond the groundwater level trigger more quickly. These limitations prevent sellers from relying on groundwater monitoring that is far away, in a different basin, or at a different aquifer depth that may not show groundwater level changes early enough to modify pumping and avoid effects.

Comment 9-179

Comment

I recommend that mitigation GW-1 be revised to extend the monitoring, mitigation and corrective actions out to all areas of potential impact from groundwater substitution transfers regardless of the distance from the well or the Bulletin 118 subbasin. Mitigation GW-1 should also be revised to require that the transfer proposal include analysis, monitoring, mitigation measures and corrective action for potential impacts to the groundwater that could otherwise prevent long-term sustainability management as required by SGMA for all subbasins potentially impacted by the transfer pumping. The transfer proposal should include demonstrating how the monitoring and mitigation measures will prevent SGMA undesirable results [See Water Code 10721(x)].

Response

The proposed changes would not help avoid potential impacts to groundwater resources, but would increase the potential for these effects. Please refer to Response to Comments 9-175 to 9-178 for additional information.

Comment 9-180

Comment

4. The 2018 RDEIR/SDEIS mitigation measures GW-1 and WS-1 from the 2015 Final EIS/EIR don't require any specific corrective actions to mitigate the long-term impacts from groundwater substitution transfer pumping to the sustainable yield of a proposed seller's currently overdrafted groundwater basins or any of the adjacent subbasins. Mitigations WS-1 and GW-1 only require year-of-transfer monitoring and mitigation measures, which fails to analyze or address transfer impacts that occur after the transfer, or the cumulative impacts from each additional transfer event.

Response

As noted in response to comment 9-175, groundwater basins within the Seller Service area are classified as either medium or high priority. These basins are required to be managed under a GSP by January 31, 2022. The current estimates of sustainable yields for the basins in the area of analysis may be outdated. As noted under Mitigation Measure GW-1, "*As Groundwater Sustainability Plans (GSPs) are developed by Groundwater Sustainability Agencies, potential sellers must confirm that the proposed pumping and the following Monitoring Program and Mitigation Plan verified by Reclamation is compatible with applicable GSPs.*"

Comment 9-181

Comment

The lack of a requirement to maintain the groundwater sustainable yield conflicts with the fact that many of the Sacramento Valley DWR Bulletin 118 subbasins proposed as a source for groundwater substitution transfers are in overdraft for a variety of reasons. Many of the source area basins are therefore ranked by DWR's CASGEM3 program as having a medium to high priority under the SGMA which requires that groundwater sustainability agencies (GSA) or the State Water Resources Control Board (SWRCB) develop and manage the basins using groundwater sustainability plans (GSP). For the Sacramento Valley, the GSPs must be developed by January 31, 2022 with the medium- to high-priority basins achieving sustainability within 20 years, by 2042. The ending date the 2018 RDEIR/SDEIS is 2024, or two years past the start date for implementing the GSPs. Appendix D Section 1.3 and Table D-1 in the 2018 RDEIR/SDEIS provides a list of the GSA, and the subbasins of each jurisdiction along with any web sites or other contact information. Attached as Exhibit 4 is a map of the DWR subbasin ranking for the Sacramento Valley.

Response

The comment indicates the areas that may transfer water through groundwater substitution transfer are currently in overdraft conditions. See Response to Comment 9-180 regarding a definition of these conditions. Based on the groundwater monitoring presented in Section 3.3.1.2 of the RDEIR/SDEIS, groundwater levels have fluctuated throughout the historical record, with groundwater levels declining during dry periods and recovering during wet periods. The monitoring information does not indicate long-term groundwater level declines in the areas that may participate in water transfers.

Comment 9-182

Comment

The document doesn't address how the mitigations will contribute to achieving the sustainable yield and prevent undesirable results in the seller's basin and any adjacent impacted basin within the 50-year SGMA planning and implementation horizon (California Water Code Section 10721(r)). Instead the 2018 RDEIR/SDEIS states that groundwater substitution transfers will comply in the future with the requirements of one or more Groundwater Sustainability Plans once they are developed. This requirement doesn't provide the analysis or specific mitigations needed in 2018 RDEIR/SDEIS document to demonstrate that the potential long-term impacts of groundwater substitute transfer on basin sustainability that occur prior to the plan development, but continue after the plan implementation in 2022, have been addressed and mitigated.

Response

As discussed in the Response to Comment 9-180, up-to-date estimates of sustainable yield are under development as GSPs are developed. Mitigation Measure GW-1 requires groundwater pumping to be limited to the historic low groundwater level trigger. As discussed in Response to Comment 9-180, upon the completion of GSPs, sellers would be required to comply with GSP requirements.

Comment 9-183

Comment

The effects on the long-term impacts to sustainable yield from groundwater transfer pumping are acknowledged but left unanalyzed in the 2018 RDEIR/SDEIS. Mitigations WS-1 and GW-1 deal only with impacts during the year of transfer and don't require monitoring or evaluating long-term impacts or provide corrective measures for the long duration that might be required to refill the groundwater pumped as part of a transfer. There are no required mitigations of long-term impacts that refilling the groundwater basin will have on surface water resources, terrestrial resources, vegetation and wildlife, or on other users of the groundwater and surface water supplies. The lack of long-term monitoring and mitigation measures or corrective actions in the 2018 RDEIR/SDEIS likely means that most of the long-term impacts from groundwater substitution transfer pumping won't be measured or mitigated.

I recommend that mitigations WS-1 and GW-1 be revised to require analysis, and mitigate for long-term impacts from groundwater substitution transfers, to achieve groundwater sustainability of the seller's basin and any adjacent impacted basins out to at least the 50-year SGMA planning and implementation horizon.

Response

The effects of multi-year groundwater refill were analyzed both in the groundwater system (using the SACFEM2013 model) and the surface water system (CalSim II) in

Section 3.2 of the 2014 Draft EIS/EIR and Section 3.3 of the RDEIR/SDEIS. The mitigation was identified based on the impacts resulting from this evaluation. Please refer to Responses to Comments 9-180 to 9-182 for additional information.

Comment 9-184

Comment

5. Any effort to correct the lack of analysis in the 2018 RDEIR/SDEIS of the long-term impacts from transfers to the sustainability of the groundwater basins in the source areas needs to utilize the existing scientific literature on surface water and groundwater interactions. Fundamental to evaluating the surface water and groundwater interactions associated with transfers is recognition that pumped groundwater is first taken from groundwater storage and then over time the lost storage is replaced by recharging surface waters. This concept was acknowledged in the 2018 RDEIR/SDEIS (See my comment no. 1) but the importance of this process is lacking in the analysis of environmental impacts and development of monitoring requirements, mitigation measures and corrective actions. Konikow and Leake published a paper in 2014 titled: "Depletion and Capture: Revisiting ''The Source of Water Derived from Wells," attached as Exhibit 5. In their paper, they analyze the trade-offs between depletion of groundwater storage and replenishment of storage through "capture" of surface waters. Figure 1 in their paper, attached as Exhibit 6a, shows the two theoretical curves that give the changes in percentages of storage depletion and surface water capture with increased duration of pumping. Note the sum of storage depletion and surface water capture equals 100 percent. Exhibit 6a shows that the percentage of loss of groundwater storage is highest at the start of pumping, while the percentage of pumped water taken by capturing of surface waters is lowest. The increased pumping duration and the expanding cone of depression around the pumping well causes increases in hydraulic impacts to intersected surface waters. Therefore, the percentage of capture as a source of the water pumped by a well increases and correspondingly less water is taken out of groundwater storage. The importance of the Exhibit 6a is that the decrease with pumping time in percentage loss of groundwater storage is countered by an increase in capture percentage. In other words, the loss of surface waters increases with duration of pumping. The two sources of water being extracted by a well balance each other, unless there is no more surface water to capture, then the extraction is "mining" the water stored in the groundwater system because there is no replacement.

Response

As discussed in Response to Comment 9-167, the streamflow depletion factor imposed through Mitigation Measure WS-1 is focused on mitigating impacts to CVP and SWP water users. This percentage would account for supply impacts in transfer years and years following transfers. The CVP and SWP would be responsible for using this retained water to account for current and future supply impacts.

Response to Comment 9-168 discusses that the potential of effects from surface water changes associated with groundwater storage refill varies by season. While the amount of refill is the same as the amount of water pumped, the analysis found that the refill would not result in impacts during wet periods.

Comment 9-185

Comment

The term "capture" used by Konikow and Leake includes several hydrologic factors and processes that include the BoR's streamflow depletion factor (BoR-SDF), which was analyzed as part of mitigation WS-1. However, their paper expands the concept of surface water capture by a pumping groundwater well to include the four hydrologic processes of: (1) increased recharge through induced infiltration from streams or other surface water bodies; (2) decreased groundwater discharge to springs, streams, and other surface water bodies (i.e., decreases in stream base flow); (3) increased recharge as a result of water-table declines from pumping in areas where potential recharge from precipitation under natural conditions is normally rejected and runs off the land surface because high water tables preclude infiltration; and (4) decreased evapotranspiration in areas where the water table that is close to the land surface drops, reducing the plant roots' access to water, which results in stress or die off of vegetation and thereby lowers evapotranspiration. Only capture processes 1 and 2 are covered by the BoR-SDF in mitigation WS-1 from 2015 Final EIS/EIR.

Response

As noted in several comments above, Mitigation Measure GW-1 would mitigate impacts from groundwater substitution pumping to vegetation (i.e. capture process 4 discussed above). Implementation of WS-1 captures streamflow depletion induced leakage and intercepted groundwater flow (i.e. capture processes 1, 2, and 3).

Comment 9-186

Comment

The 2014 Konikow and Leake paper provides estimates of the percentages of long-term cumulative storage depletion and surface water capture in 31 areas and aquifers within the United States. The Central Valley of California (Central Valley) is one of the areas studied. Their analysis of groundwater storage depletion and surface water capture for the Central Valley was based on results of the U.S. Geological Survey's (USGS) 2009 Central Valley Hydrologic Model developed for the years 1961 through 2003 (Faunt and others, 2009). Figure 14 in Konikow and Leake's 2014 paper, attached as Exhibit 6b, shows groundwater storage and surface water capture curves from that model. Konikow and Leake conclude that in 2003 the Central Valley, on average, 14.7 percent of the groundwater pumped is taken from groundwater storage and the remaining 85.3 percent is derived from capture of surface waters (See Exhibit 5 page 2 of Table S1). This estimate is consistent with my estimate taken from the 2014 Northern California Water Association's analysis of DWR's 2013 C2VSim groundwater model that the loss in surface water flows in the Sacramento Valley since the 1920s is approximately equal to 80 percent of the groundwater currently being extracted (See comment no. 20 and Exhibit 10.7 in my November 25, 2014 letter on the 2014 DEIS/EIR).

Response

These studies indicate that a portion of groundwater pumping (14.7 percent according to Konikow and Leake) draws water from groundwater storage that is not recharged. However, this analysis considers the entire Central Valley and all types of groundwater pumping, including pumping in areas where transfers would not occur that have declining groundwater levels. The SACFEM2013 modeling work considered if water transfers could cause long-term declines in groundwater levels. While the analysis finds the potential for significant effects because of local drawdown, the modeling does not indicate that transfers would result in a long-term decrease in groundwater storage (see Figures 3.3-5 through 3.3-9 in the RDEIR/SDEIS).

Comment 9-187

Comment

Konikow and Leake's 2014 paper is also consistent with the previous analysis by CH2MHill (2010) of the 2009 Drought Water Bank Program in Sacramento Valley groundwater substitution transfer impacts for water years 1970 to 2003 using SACFEM groundwater model, attached as Exhibit 7 (Also see my comment no. 21 and Exhibits 11.3a in my November 25, 2014 letter on the 2014 DEIS/EIR). The 2009 study provided graphs of the cumulative stream flow depletion caused by groundwater substitution pumping. These graphs show that streamflow losses extend for at least 25 years following the end of pumping, and at the end of that time approximately 60% of the groundwater storage loss had been refilled for the stream impacts from the 1976 transfer pumping (See Figure 4d in attached Exhibit 7). One of the conclusions from the CH2MHill report is that:

> *"The effect of groundwater substitution transfer pumping on stream flow, when considered as a percent of the groundwater pumped for the program, is significant. The impacts were shown to vary as the hydrology of the periods following the transfer program varied. The three scenarios presented here estimated effects of transfer pumping on stream flow when dry, normal, and wet conditions followed transfer pumping. Estimated stream flow losses in the five-year period following each scenario were 44, 39, and 19 percent of the amount of groundwater pumped during the four month transfer period."*

These scientific studies of the impacts on Central Valley surface water from groundwater extractions demonstrates that the environmental analysis of impacts from groundwater substitution pumping in the 2018 RDEIR/SDEIS is still deficient because it: (1) lacks any estimates of the potential long-term rate for refilling the loss in groundwater storage from transfer pumping; (2) lacks specific performance standards in mitigations WS-1 or GW-1 to measure the impacts from long-term refilling of lost groundwater storage; and (3) lacks any methods for measuring the effectiveness of any corrective actions taken to mitigate the long-term impacts from transfer pumping on surface water flows, groundwater storage, groundwater dependent ecosystems and wildlife, or the sustainability of water resources in the seller's water source area.

Response

Please refer to Response to Comment 9-186 regarding long-term impacts from transfer-related pumping.

Please refer to Response to Comment 9-91 regarding performance standards for Mitigation Measure GW-1. As stated above, Mitigation Measure WS-1 was developed to avoid impacts related to water supply, and the standard is that at least 13 percent of a groundwater substitution transfer would be used to avoid effects.

The monitoring and mitigation plan for deep rooted vegetation under Mitigation Measure GW-1 has been revised to (1) establish a baseline conditions for the health of deep-rooted vegetation by adding requirements to conduct monitoring before the start of transfer; (2) establish specific standard for significant impacts to deep rooted vegetation; and (3) establishing success criteria for revegetation and restoration actions.

Comment 9-188

Comment

As discusses in my comment no. 1, recent studies by Leake and others (2008, 2010) using superposition groundwater modeling to simulate river depletion by groundwater wells in Arizona's Upper San Pedro Basin and the lower Colorado River could assist in providing a method for answering these questions. Leake and others, 2010, is attached as Exhibit 8.

Response

The study cited in Exhibit B uses a superposition model to consider groundwater-surface water interaction. For this EIS/EIR, the Lead Agencies considered a variety of modeling tools and identified SACFEM2013 (coupled with CalSim II) as the best method to estimate potential effects (see Response to Comment 9-97).

Comment 9-189

Comment

I recommend that mitigations WS-1 and GW-1 be amended to address the long-term impacts from transfer pumping by adding monitoring requirements for assessing the rate and volume of long-term stream depletion and refilling of the loss in groundwater storage caused by transfer pumping, provide procedures and standards for estimating long-term stream depletion and groundwater storage loss, provide mitigation measures and corrective actions for impacts to stream flow, stream and terrestrial habitats, and third party users of surface water and groundwater for the duration of the impacts.

Response

Please refer to Responses to Comments 9-184 to 9-186.

Comment 9-190

Comment

The 2018 RDEIR/SDEIS addresses the issue of potential impacts to water quality from groundwater substitution transfer pumping with the statements that: "[g]roundwater quality in the Sacramento Valley Groundwater Basin is generally good and sufficient for municipal, agricultural, domestic, and industrial uses. However, there are some localized groundwater quality issues in the basin." (page 3.3-6), and "[g]roundwater in the Redding Area Groundwater Basin is typically of good quality, as evidenced by its low total dissolved solids (TDS) concentrations, which range from 70 to 360 milligrams per liter (mg/L)." (page 3.3-3). It also states that: "…. *groundwater quality impacts were analyzed using a qualitative approach*." (page 3.3-7), and that "…. *[g]roundwater quality impacts were assessed by considering areas of known water quality concerns and determining whether modeled groundwater drawdown could cause those areas to migrate*." (page 3.3-10). The 2018 RDEIR/SDEIS notes that the

"Sacramento Valley has 481 active clean-up program sites, 234 leaking underground tank sites, 54 Military sites (includes military privatized UST sites), and one land disposal site as of August 29, 2018." (page 3.3-7). Figure E-55 in Appendix E of the 2018 RDEIR/SDEIS shows the locations of known contaminated sites in the Sacramento Valley taken from the SWRCB's GeoTracker GIS website. The 2018 RDEIR/SDEIS then concludes that: *"[i]n the Seller Service Area, groundwater pumping would be expected to continue on the same pattern as currently observed. Therefore, the potential for groundwater quality degradation in the Seller Service Area would be the same as existing conditions."* (page 3.3-11). With this analysis, the 2018 RDEIR/SDEIS found that no mitigation measure is needed to address potential changes in groundwater quality from groundwater substitution transfer pumping (page C-4 of Table C1 in Appendix C).

Response

As noted by the commenter, the RDEIR/SDEIS concludes that groundwater substitution transfers would result in less than significant impacts to groundwater quality through migration of reduced quality water, agricultural use of reduced quality water, or the distribution of reduced quality water.

Comment 9-191

Comment

The 2018 RDEIR/SDEIS discussion of the groundwater level drawdown modeling for groundwater substitution transfer pumping impacts refers to a series of hydrographs of simulated groundwater levels changes in seven model layers at 34 selected locations that were supposed to be included in Appendix F of the 2018 RDEIR/SDEIS. Unfortunately, these 238 hydrographs aren't included in Appendix F. There are however, five hydrographs at selected locations that record simulated changes in groundwater levels in two model layers, 0-to-70 feet below the ground surface (bgs), and 690-to-910 feet bgs, Figures 3.3-5 to 3.3-9 (pages 3.3-16 through 3.3-18). Four of these combined hydrographs, 3.3-5, 3.3-6, 3.3-8, and 3.3-9, show that during a period of no transfer pumping there is an upward vertical groundwater gradient between the shallow and deep model layers. That is, the head in the deep pumping zone is higher than the head in the water table. But during modeled periods of transfer pumping the vertical gradient is downward, that is, the shallow zone groundwater head is higher than the deeper zone head. This reversal of gradient means that transfer pumping can cause groundwater in the shallower zones to flow into the deeper zones. This would be expected because pumping forces water to flow towards the well both horizontally and vertically. This reversal however, also increases the potential for the migration of shallow contaminated groundwater into deeper aquifer zones. The 2018 RDEIR/SDEIS assumes that because this is normal, the potential for degradation of groundwater quality would be the same as existing conditions. However, this assessment of environmental impacts doesn't provide any actual data or information on the current groundwater quality in the areas of the proposed transfer pumping, or how the groundwater flow model simulation demonstrates contaminants won't migrate to the transfer wells.

Response

Appendix F of the RDEIR/SDEIS (renamed Appendix G) has been updated to include hydrographs for all 34 selected locations and seven model layers i.e. 238 hydrograph locations. The examples in the main body of the RDEIR/SDEIS (Figures 3.3-5 through

3.3-9) were selected because they were representative examples, so the remaining hydrographs do not present information that changes the effects determinations.

Regarding comments on Figures 3.3-5 through 3.3-9, these figures show the change in groundwater head between the baseline and Proposed Action conditions. These figures do not show the groundwater head as the commenter suggests. Therefore, the deductions the commenter has made regarding groundwater gradient are not accurate.

Regarding the vertical migration of reduced quality groundwater, vertical hydraulic conductivity is significantly lower than horizontal hydraulic conductivity. Therefore, inducing vertical migration of reduced quality water is not likely to be a concern unless groundwater levels are substantially altered for a long period of time. Groundwater pumping under Proposed Action would be limited to short-term withdrawals, migration of reduced quality groundwater is expected to be less than significant. Text in Section 3.3, Groundwater Resources in the Final EIR/EIS has been revised to clarify the analysis considers vertical and horizontal migration of reduced quality groundwater.

Comment 9-192

Comment

Attached Exhibits 9a, 9b and 9c are composite figures that show the contaminate sites from GeoTracker given in Figure E-55. They are overlain by the outlines of the model simulated groundwater drawdown under the 1990 conditions for the 200-to-300-foot aquifer depth taken from Figures F-5a, F-5b and F-5c in Appendix F of the 2018 RDEIR/SDEIS. The 200-to-300-foot model zone was selected for comparison because it's the next zone below the shallowest aquifer and the most likely to be receive the shallow contaminants as a result of transfer pumping. These three figures show that there are a number of existing contaminate sites within the area of groundwater drawdown from transfer pumping.

Response

Figure E-55 shows the location of contaminant sites across Sacramento Valley. As noted in Section 3.3, Groundwater Resources, migration of groundwater is not likely to be a concern unless groundwater levels and/or flow patterns are substantially altered for a long period of time. Transfer pumping under Proposed Action would be short-term and would not result in migration of contaminated groundwater.

Comment 9-193

Comment

In addition to Figure E-55, information on existing groundwater contaminants in the transfer source area north of the Sacramento Delta can be obtained from the SWRCBs' Geotracker and Geotracker-GAMA web sites, and scientific literature. Attached Exhibit 10 is a screen print of the Geotracker contaminant site for the Redding area that wasn't included in Figure E-55, which shows there are a number of contaminated sites in the Redding area that may be impacted by the Anderson-Cottonwood Irrigation District's transfer pumping. Exhibits 11a, 11b and 11c are screen prints of the GeoTracker-GAMA[101] web site that show the number of wells contaminated with one or more pesticides in the transfer source area north of the Sacramento Delta. Exhibit 12 is a table showing the number of wells with chromium VI, nitrate-N, or total dissolved solids (TDS) above selected concentrations in each of the ten transfer Counties in Sacramento Valley. Information in Exhibit 12 was taken from the GeoTracker-GAMA web site.

Exhibit 12 shows that there are 1,684 wells with chromium VI concentrations equal to or greater than 5 micrograms per liter (ug/L) with concentrations in 531 wells or approximately 32 percent of those wells above the health-based screening level (HBSL) of 20 ug/L. The table also shows that 1,184 wells have nitrate concentrations above 5 ug/L with concentrations in approximately 39 percent of those wells, 459 wells, at or above the maximum contaminant level (MCL) of 10 milligrams per liter (mg/L). The number of wells with total dissolved solids greater than 1,000 mg/l MCL is 327. Exhibits 13, 14 and 15 give the GeoTracker-GAMA screen prints for each of the three contaminants in each of the 10 counties in the Sacramento Valley seller's transfer water source area. The 2018 RDEIR/SDEIS didn't graphically document the known occurrences of contaminated wells and the relationship to potential transfer pumping wells.

Response

Exhibit 10 shows both active and inactive cleanup sites within the Redding Area Groundwater Basin, several of the sites shown in Exhibit 10 are closed sites. There are 19 active open cleanup sites within the Anderson subbasin (Anderson Cottonwood Irrigation District is predominantly within the Anderson subbasin) with 3 sites currently under verification monitoring i.e. the sites have been cleaned up. As noted in Section 3.3, Groundwater Resources, migration of groundwater is not likely to be a concern unless groundwater levels and/or flow patterns are substantially altered for a long period of time. Transfer pumping under Proposed Action would be short-term and would not result in migration of contaminated groundwater.

Appendix E (Figure E-55 [Figure F-55]) of the RDEIR/SDEIS (renamed Appendix F) shows the active Geotracker Cleanup Sites in Sacramento Valley Groundwater. Section 3.3, Groundwater Resources includes a discussion on groundwater quality concerns in the Sacramento Valley including information on nitrate, volatile organic compounds (VOCs), inorganic compound, organic compounds, radiological compound and pesticide detections. CEQA Guidelines Section 15125 requires the Affected Environment discussion to be no longer than is necessary to an understanding of the significant effects of the proposed project and its alternatives. The discussion of groundwater quality in Section 3.3, Groundwater Resources, describes groundwater quality in Seller Service Area. As discussed in Section 3.3, groundwater quality in the Sacramento Valley is generally of good quality with some localized areas of concern.

[101] http://geotracker.waterboards.ca.gov/gama/gamamap/public/

Comment 9-194

Comment

Exhibits 16a and 16b are figures taken from a study on the occurrence of chromium VI [Cr(VI)] in California by Isbecki and others (2015; the full report is attached as Exhibit 16c), that show the areal extent of chromium-containing rocks and soils in California, and the range of concentrations found in public water supply wells from 2000 to 2012. Chromium VI is a known carcinogen and is on California's Proposition 65 notification list, see attached Exhibit 17. Isbecki and others concluded that: *"[h]igh Cr(VI) occurs in water from wells in alluvial aquifers along the west-side of the Central Valley results from high-chromium in source rock eroded to form those aquifers, and areal recharge processes (including irrigation return) that can mobilize chromium from the unsaturated zone. Cr(VI) co-occurred with oxyanions having similar chemistry, including vanadium, selenium, and uranium. Cr(VI) was positively correlated with nitrate, consistent with increased concentrations in areas of agricultural land use and mobilization of chromium from the unsaturated zone by irrigation return."* The results of this study suggest that potential presence of naturally occurring contaminants in soils and groundwater along the west side of the Sacramento Valley are consistent with the finding of 1,684 wells with chromium VI occurring throughout the valley, Exhibits 12 and 13.

Response

Based on the Groundwater Quality Reports from the SWRCB's Groundwater Ambient Monitoring and Assessment (GAMA) program, less than 1 percent of the primary aquifers in the Middle and Southern Sacramento Valley have detected high concentrations (i.e. higher than the HBSL of 20 ug/L) of chromium (USGS 2011a and USGS 2011b).

Comment 9-195

Comment

Information provided in Figure E-55 and attached Exhibits 9 to 16 show that the seller's water source area north of the Sacramento Delta has a significant number of known contaminated sites and potential for groundwater pollution from natural or released contaminants, based on the detections in numerous wells within the seller's transfer water source area north of the Delta. When combined with groundwater simulations results that show transfer pumping can cause a change in vertical groundwater flow from normally upward flowing to downward flowing during transfer pumping, the assumption that transfer pumping won't degrade groundwater quality isn't sufficiently supported by the existing data or the analysis in the 2018 RDEIR/SDEIS to reach the conclusion that no water quality mitigation measures are required. These Geotracker-GAMA derived exhibits clearly show that existing groundwater quality in the Sacramento Valley can't be assumed to be "*generally good*" and water quality monitored for known contaminants should be required of water extracted during the groundwater substitution transfer pumping.

Response

Please refer Response to Comments 9-193 and 9-194 regarding the quality of groundwater in the Seller Service Area.

Regarding the groundwater quality impacts analysis, SACFEM2013 model was used to identify and estimate changes in groundwater levels resulting groundwater substitution pumping from the Proposed Action. As noted in Section 3.3, Groundwater Resources, inducing the movement or migration of groundwater would occur if groundwater levels and/or flow patterns are substantially altered over a long period of time. Transfer-related pumping would be short-term and is not expected to cause migration of reduced quality groundwater.

Comment 9-196

Comment
The 2018 RDEIR/SDEIS determination that there is no mitigation requirement for potential impacts to groundwater quality in the seller's water supply area (Appendix C, page C-4) doesn't agree with the stated purpose of the monitoring plan required by the 2015 Water Transfer White Paper. The requirements of the 2015 Water Transfer White Paper monitoring plan are relevant because the 2018 RDEIR/SDEIS states that *"[a]ll transfers must be consistent with the guidance provided…*" (page ES-6). The stated purpose of the 2015 Water Transfer White Paper monitoring program is to "… *[i]dentify any changes in groundwater levels or quality so that the seller can take actions to avoid or mitigate any injury to legal users of water due to the water transfer*." (2015 Water Transfer White Paper Section 3.5, page 31). One of the required elements of the monitoring program is the submittal of detailed information on the *"[i]dentification of known contaminated areas that could be affected by transfer pumping*." (Section 3.5.2, page 32). The 2015 Water Transfer White Paper also states that some wells may require more comprehensive water quality testing, such as wells in areas of known groundwater quality problems (Section 3.5.2, page 34). The failure of the 2018 RDEIR/SDEIS to require the documentation of known contaminant areas and known polluted wells in the seller's water source areas for a groundwater substitution transfer.

Response
The *Technical Information for Preparing Water Transfer Proposals* (Reclamation and DWR 2015) and Mitigation Measure GW-1 both require comprehensive groundwater quality monitoring at participating municipal pumping wells and measurement of specific conductance at participating agricultural pumping wells.

Comment 9-197

Comment
The 2018 RDEIR/SDEIS should provide more site-specific information on the current groundwater quality in the areas of the seller's transfer wells to support the general statement that water quality is good and therefore monitoring and migration of poor-quality or polluted water isn't likely, which resulted in the conclusion that no mitigation measure for transfer pumping impact to groundwater quality is required. Because of the known number of contaminated sites and polluted wells in the seller's water source area north of the Sacramento Delta, mitigation measure GW-1 should be amended to require a groundwater quality monitoring and sampling plan for contaminants of concern at the start of transfer pumping, at approximately the middle of the expected pumping duration, and at the end of pumping. The sellers should seek review and approval from the Central Valley Regional Water Quality Control Board, and

any other state or local agency responsible for water quality and environmental health, that the contaminates to be sampled in the water quality monitoring and sampling plan and the field sampling procedures are appropriate. This would include the laboratory testing methods and reporting limits so that the results of the transfer sampling can be incorporated into the SWRBC's water quality database.

Response

Based on the information provided in Section 3.3, Groundwater Resources, the RDEIR/SDEIS concludes that (1) transfer-related pumping would be limited to short-term withdrawal and would not result in the migration of reduced groundwater quality water; (2) groundwater quality in the Sacramento Valley is good for most agricultural and municipal uses in the Sacramento Valley and would not result in agricultural use of reduced quality water or distribution of reduced quality groundwater.

Water transfer proposals and the monitoring and mitigation program would be subject to Reclamation review and approval as explained in the EIS/EIR's description of the Proposed Action.

Comment 9-198

Comment

I recommend that mitigation GW-1 be revised to require in the transfer proposal that: (1) the seller conduct a contaminant screening study by contacting local and state environmental quality agencies and searching available water quality databases such as Geotracker, to determine the potential source and types of contaminants in groundwater, surface water and soils within the area of transfer pumping impact; (2) a water quality sampling and reporting program be developed and implemented for specific chemical contaminants identified during the transfer contaminant screening study; (3) transfer pumping immediately stop at any well where a contaminant of concern is measured in a monitoring well above the action level, and the concentrations of all measured water quality constituents and contaminants should be reported immediately to the Regional Water Quality Control Board and the local agency responsible for water quality and environmental health; and (4) notifications be given to third party well owners within the area of influence for the transfer pumping wells when any impairment to water quality is found. Water quality and environmental health agencies may also require notification of other third party well owners in the area adjacent to the polluted transfer well(s).

Response

Please refer to Responses to Comments 9-190 to 9-197.

Comment 9-199

Comment

6. Mitigation measure GW-1 requires monitoring only in areas with deep-rooted vegetation, which it defines as vegetation with tap roots greater than 10 feet deep (page 3.3-27). Monitoring associated with deep-rooted vegetation is required only within a one-half mile radius of a pumping groundwater substitution transfer well and areas where groundwater levels are between 10 and 25 feet below the surface of the ground (bgs) prior to the start of

transfer pumping (page 3.3-28). All groundwater level monitoring wells around pumping wells participating in transfers are required by GW-1 to: *"(1) be within a two-mile radius of the seller's transfer pumping well; (2) be located within the same Bulletin 118 subbasin as the pumping well; and (3) have a screen depth(s) in the same aquifer level (shallow, intermediate, or deep) as the pumping well."* (page 3.3-23.) As discussed above in my comment no. 3, the radius of pumping drawdown will likely exceed the two-mile maximum limit of GW-1, and extend drawdown and potential impacts into adjacent DWR Bulletin subbasins.

Response

Please refer to Response to Comment 9-177 regarding the two-mile monitoring radius discussed in Mitigation Measure GW-1.

Comment 9-200

Comment

The 2018 RDEIR/SDEIS states that an Assessment Methods section of Appendix H determined that monitoring and mitigation measures aren't required for shallow rooted vegetation because when "… *groundwater levels are more than 15 feet below ground surface, a change in groundwater levels would not likely affect overlying terrestrial resources*." (Section 3.8.2.4.1, page 3.8-7). Unfortunately, Appendix H doesn't appear to have a section labeled Assessment Methods. The text in Appendix H starts on page H-72 and continues through H-89 with assessing a number of "special-status species," but there doesn't appear to be a discussion of groundwater levels and the relationship to terrestrial resources and groundwater dependent ecosystems (GDEs) in the Sacramento Valley to document that when the water table is more than 15 feet below ground surface a lowering of groundwater levels would not likely affect overlying terrestrial resources. No analysis is provided for setting the deep-rooted vegetation threshold at 10 feet bgs, while the shallower rooted terrestrial resources threshold is 15 feet bgs.

The 2018 RDEIR/SDEIS does discuss the relationship between shallow groundwater levels and terrestrial resources and wildlife in the main portion of the document. For example, Section 3.8.2.4.1 states that in the few locations north of the Sacramento Delta associated with wetlands where the depth to groundwater is less than 15 feet, the modeling indicates that the maximum drawdown from transfer pumping would be 0.8 feet, and then concludes that plant roots would be able to adjust to this drawdown (page 3.8-7.) The 2018 RDEIR/SDEIS doesn't provide any maps that show the distribution of the shallow- or deep-rooted terrestrial resources or GDEs relative to the simulated drawdown maps such as those in Appendix F, or areas where the depth to groundwater is less than 15 feet. Mitigation GW-1 does refer to the DWR Natural Communities Commonly Associated with Groundwater GIS[102] web site (DWR-GDEs-GIS) for GDE maps to identify deep-rooted vegetation (page 3.3-28). This reference to DWR's web site for GDE maps appears to suggest that there may be other GDEs in the seller's transfer water source area, but GW-1 recommends using this web mapping resource to only identify deep-rooted vegetation.

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[102] https://data.ca.gov/dataset/natural-communities-commonly-associated-groundwater

Response

Appendix P, Methods for Assessing Impacts on Natural Communities and Special-Status Plants and Wildlife, has been added to the final document and contains the information referenced in the RDEIR/SDEIS. Page P-3 includes a discussion about vegetation communities, namely riparian, that are more likely to depend on groundwater. These areas are more likely to rebound from a temporary drop in the groundwater levels because of the interaction of surface flows and groundwater flows in riparian systems. In upland habitats, vegetation that relies on shallow groundwater may be more sensitive to changes in groundwater levels; however, it is expected that the monitoring triggers would catch the lowering of groundwater levels soon enough (i.e., 10 feet reduction in shallow groundwater areas) to allow for recharge before there is a substantial reduction in health of deep-rooted vegetation. While some species may be affected by the temporary reduction in groundwater levels, many species of deep-rooted plants in California's uplands are accustomed to periods of prolonged drought and can rebound from reductions in water availability.

Appendix F of the RDEIR/SDEIS (renamed Appendix G) has been updated and includes hydrographs that contains the information regarding the depth to groundwater in the water table.

Mitigation Measure GW-1 notes: "*Existing resources such as DWR's groundwater dependent ecosystem maps (https://gis.water.ca.gov/app/NCDatasetViewer/) or any existing biological survey data in the area could be used to identify deep rooted vegetation near the participating pumping well.*" Therefore, Mitigation Measure GW-1 is not trying to limit groundwater dependent ecosystems (GDEs) from DWR's database. It identifies site-specific data to be used, where available.

Comment 9-201

Comment

Based on my review of the DWR-GDEs-GIS web site, more than just deep-rooted vegetation is mapped in the seller's transfer water source area north of the Sacramento Delta. Attached Exhibit 18 is screen print from the DWR-GDEs-GIS web site for the middle portion of the transfer water source area surrounding Sutter Buttes that shows numerous areas of vegetation. Attached Exhibits 19a, 19b, and 19c are color coded Spring 2018 groundwater depth contour maps of the Sacramento Valley taken from DWR's Groundwater Information Center Interactive Map Application[103]. Attached Exhibit 20 is a composite of the area in Exhibit 18 with Exhibit 19b a color shaded contour map of the depth to groundwater in the Spring of 2018. This composite map shows that there are a number of areas of terrestrial vegetation where the depth to groundwater is 10 feet or less. The depth to 15 feet can be interpolated between the 10- and 20-foot contours. Therefore, the existing data on GDEs and shallow groundwater depths in the seller's transfer water source area north of the Sacramento Delta suggest that there are a number of areas where GDEs could be impacted by a lowering of groundwater level during transfer

[103] https://gis.water.ca.gov/app/gicima/

pumping. Mitigation GW-1 should be amended to require monitoring and mitigation measures for all terrestrial resources and GDEs.

Response

Please refer to Response to Comment 9-200. As noted in the response, the RDEIR/SDEIS impact analysis focuses on impacts to deep rooted vegetation as it is more likely to be impacted by groundwater level drawdown due to groundwater substitution pumping.

The comment suggests some confusion with the requirements for deep rooted vegetation monitoring discussed under Mitigation Measure GW-1. Excerpt from Mitigation Measure GW-1: "*This monitoring is only required in areas with deep-rooted vegetation (i.e. oak trees and riparian trees that would have tap roots greater than 10 feet deep) within a one-half mile radius of the participating pumping well and areas where groundwater levels are between 10 to 25 feet below ground surface prior to starting the transfer of surface water made available from groundwater substitution actions.*" Therefore, the recommended monitoring where groundwater levels is greater than 10 feet is based on the typical depth of the tap roots.

Comment 9-202

Comment

There is additional evidence on the normal depth to groundwater in the seller's transfer water source area during non-transfer pumping periods in the 34 selected simulation hydrographs from the SACFEM2013 groundwater modeling that are supposed to be in Appendix F (page 3.3-15; See my comment no. 6). Attached as Exhibit 21 is a table that identifies the depth to shallow groundwater characteristics for 22 of the 34 selected model locations, 65%, where the simulated non-transfer depth to shallow groundwater was equal to or less than 10 feet. Eight of these hydrographs have simulated groundwater heads above the surface of the ground during periods of no transfer pumping. At 22 of the 34 simulation locations, the maximum simulated decline in shallow groundwater level during periods of transfer pumping was at least 10 feet, 65%, and at 15 locations, 44%, the decline was at least 15 feet. The maximum simulated depth to groundwater during periods of transfer pumping at 18 locations, 53%, was equal to or lower than 15 feet bgs. At 12 of the wells, 55%, the drawdown during transfer pumping was greater than the simulated baseline. These simulation hydrographs appear to contradict the assumption in the 2018 RDEIR/SDEIS that shallow groundwaters in the transfer pumping area is too deep to support shallow rooted vegetation or GDEs during periods of non-transfer. That during the simulated periods of transfer pumping, groundwater levels drop more than the baseline at 12 selected locations, a majority at 55%, suggests that transfer pumping can have an impact of shallow-rooted vegetation and GDEs.

Response

The commenter notes that simulated decline in shallow groundwater levels during the transfer period was at least 10 feet. As shown in Figures F-1(a) to1(c) and Figures 4(a) to 4(c), simulated shallow groundwater levels areare less than 6 feet at all locations modeled in SACFEM2013.

Comment 9-203

Comment

Several conclusions can be made from the above discussion:

A. Failure to require groundwater level monitoring out to the predicted limits of the transfer pumping drawdown, regardless of the subbasin, will likely result in unmonitored and therefore unmitigated environmental impacts to vegetation and wildlife that depends on the vegetation.

B. The data on the distribution of GDEs and the depth to shallow groundwater equal to or less than 15 feet suggest that there is a significant percentage of the seller's transfer water source area north of the Sacramento Delta that supports GDEs that can be impacted by groundwater substitution transfer pumping.

C. Mitigation GW-1 fails to protect GDEs with roots extending less than 10 feet deep by not requiring the mapping and monitoring of all GDEs within the anticipated transfer pumping drawdown area.

Response

The shallow groundwater level monitoring for deep rooted vegetation in Mitigation Measure GW-1 requires (1) identification of deep-rooted vegetation near the pumping wells; (2) shallow groundwater level monitoring or visual observation surveys to avoid significant adverse effects to deep rooted vegetation; and (3) corrective actions. This mitigation measure avoids significant adverse effects to vegetation.

Comment 9-204

Comment

I recommend that mitigation measure GW-1 should be revised to require the identification and mapping of all GDEs and other wildlife habitats that lie within the anticipated area of shallow groundwater drawdown, and require monitoring of changes in shallow groundwater in a sufficient number of monitoring wells in the vicinity of the mapped GDEs and wildlife areas to characterize the changes in groundwater pre-transfer, during transfer pumping, and post-transfer. GW-1 should require the use of shallow groundwater level triggers that are biologically based for the type of GDEs being monitored. GDE triggers should be established based on the most vulnerable species, while ensuring protecting of all GDEs in the area.

Response

Please refer to Response to Comments 9-199 to 9-203 regarding the adequacy of Mitigation Measure GW-1 to address impacts to GDEs.

Comment 9-205

Comment

8. Mitigation GW-1 requires that if there are no wells that meet the requirements for monitoring deep-rooted vegetation, then monitoring can be done based on visual observations by a qualified biologist (page 3.3-28). If there is significant adverse impact to a substantial

percentage of the deep-rooted vegetation as a result of transfer pumping, then the seller will prepare a report on restoration activities and monitor revegetation efforts for 5 years. Mitigation GW-1 provides no guidance on what standards should be followed to establish whether deep-rooted, or shallow rooted, vegetation has been significantly impacted. There is no requirement to provide a restoration plan for agency approval prior to beginning restoration work. No requirement to confer with wildlife agencies on the adequacy of the restoration plan and work. No standards are given for how to develop a plan for vegetation restoration, how to monitor the restoration, how to determine restoration success, or to determine if the restored vegetation can survive more than 5 years.

Response

The monitoring and mitigation plan for deep rooted vegetation under Mitigation Measure GW-1 has been revised to (1) establish a baseline conditions for the health of deep-rooted vegetation by adding requirements to conduct monitoring before the start of transfer; (2) establish specific standard for significant impacts to deep rooted vegetation; and (3) establish success criteria for revegetation and restoration actions.

Comment 9-206

Comment

Mitigation GW-1 doesn't require establishing a baseline condition for the deep-rooted, or shallow rooted, vegetation, or other terrestrial resources within the area of potential transfer pumping impact (See my comment no. 7) with or without wells monitoring of groundwater level changes. A baseline of the vegetation and terrestrial resource conditions is necessary so that there is a standard to measure transfer pumping impacts against. This baseline would also be used to develop a restoration plan and establish the restoration success criteria. The requirement in GW-1 to implement restoration work is based on BoR's determination that a substantial percentage of the vegetation has been lost, but there is no standard for measuring or calculating the percentage of lose (page 3.3-28). GW-1 doesn't require that a restoration plan be developed or approved by any wildlife agency, it only requires consultation with BoR and reporting of restoration activities. Only one restoration report is required at the end of 5 years or possibly earlier if restoration succeeds before that time. GW-1 doesn't require any consultation with other wildlife agencies such as U.S. Fish and Wildlife or California Department of Fish and Game, or DWR on the restoration activities. GW-1 doesn't require posting of any financial assurances to complete the work if the seller can't complete the restoration work. If restoration work isn't completed, then oversight agencies should have funds available to continue the work and complete the restoration. The financial assurances are in fact required as an element of a mitigation plan in the 2015 Water Transfer White Paper, which requires *"[a]dequate financial resources are available to cover reasonably anticipated mitigation needs"* (Section 3.6.2, page 36).

Response

Please refer to Response to Comment 9-205.

Comment 9-207

Comment

I recommend that mitigation GW-1 be amended to require: (1) specific technical standards for monitoring the baseline health of vegetation, both shallow- and deep-rooted, and other terrestrial resources; (2) baseline surveys be done by qualified biologist using standards and protocols acceptable to wildlife oversight agencies; (3) written documentation of the baseline vegetation, stream habitats, and terrestrial resources conditions; (4) standards for vegetation, stream, and/or terrestrial resource restoration and monitoring plans should corrective action be necessary; (5) biological monitoring out to the anticipate extent of groundwater drawdown before, during and after transfer pumping; (6) the hydrological monitoring of surface water conditions and habitats if necessary before, during and after transfer pumping; (8) provide standards and methods for establishing biologically based groundwater and surface water triggers that prevent significant impacts; and (7) standards and procedures for demonstrating and providing financial assurances for potential mitigation corrective actions prior to the start of transfer pumping.

Response

Please refer to Response to Comment 9-205.

Comment 9-208

Comment

9. In the discussion of environmental consequences and environmental impacts to rivers and creeks, the 2018 RDEIR/SDEIS relies heavily on the results of the simulations of transfer pumping drawdown from the SACFEM2013 groundwater modeling to identify potential impacts to terrestrial species, natural communities and special-status species. (Section 3.8.2, pages 3.8-10 through 3.8-26). Mitigation measure GW-1 is also relied on to reduce impacts to these resources to less than significant. However, there are several areas in the discussion of impacts and mitigations where the findings and recommendations appear to contradict one another. For example:

> In the discussion of the Sacramento River Watershed, a statement is made that: *"[i]n addition, an initial screening evaluation of modeled flows in several smaller creeks was conducted (See Section 3.8.2.1 for details). The evaluation concluded that impacts to terrestrial species in the following waterways are less than significant: …. Little Chico Creek, (Table I-1 in Appendix I of the RDEIR/SDEIS)."* (page 3.8-10, lines 10 to 18)

This statement was followed by:

> *"Historical flow data are limited or not available for …. the percentage change in flow in these streams due to the Proposed Action could not be determined. Therefore, the Proposed Action has the potential result in a greater than ten percent change in mean monthly flows and greater than one cubic foot per second (cfs) change in at least one water year type and month of the year for these streams." (page 3.8-10, lines 19 to 25)*

> *"Under the Proposed Action, …., Little Chico Creek, …. would potentially experience a greater than ten percent change in mean monthly flows and greater than one cubic foot*

per second (cfs) change in at least one water year type and month of the year (Table I-1 in Appendix I of the RDEIR/SDEIS)." (page 3.8-10, lines 31 to 34).

"As modeled, flows in Little Chico Creek would be reduced by more than ten percent in multiple water year types during July through October (up to 100 percent of instream flows)." (page 3.8-12, lines 4 and 5)

The rivers and creek discussion concludes that:

"Because flow reductions would be small and only during months when the creek is essentially dry, changes in stream flow would not substantially reduce natural communities or special-status plant and wildlife species habitat. Therefore, the Proposed Action would have a less than significant impact on natural communities and special-status species habitat along Little Chico Creek" (page 3.8-12, lines 18 to 22).

In the discussions on natural communities and special-status species, mitigation GW-1 is relied on repeatedly to mitigate, to less than significant, impacts from reduced flows in creeks, flows to wetlands, and riparian habitats. There is a problem with the reliance on GW-1 to prevent impacts to terrestrial species, natural communities and special-status species from groundwater substitution transfer pumping because the mitigation measure doesn't require groundwater levels triggers to be set to protect these resources. As with vegetation mitigations discussed above in my comment no. 8, GW-1 doesn't require baseline studies; gives no technical requirements or standards for how to conduct monitoring studies, no standards for determining the level of significance of impact. Mitigation GW-1 doesn't require monitoring terrestrial species, natural communities and special-status species prior, during and post transfer pumping. Mitigation GW-1 requires monitoring of deep-rooted vegetation only within a half mile of the pumping transfer well and where pre-pumping groundwater is 10 to 25 feet deep (page 3.3-28). As discussed above in my comments nos. 3 and 7, the distance for potential drawdown is likely to be greater than a half mile from the transfer pumping well. As noted in my comment no. 7, there is no discussion or analysis of how or why terrestrial species, natural communities and special-status species shouldn't be evaluated, monitored, and protected by mitigations in pumping impact areas where the depth to groundwater is less than 10 to 25 feet.

I recommend that the 2018 RDEIR/SDEIS be amended to clarify the apparent conflicting statements on potential impacts to rivers, streams and creeks by groundwater substitution transfer pumping. Amended to provide the information recommended in my comments nos. 3, 7 and 8.

Response

Text in Section 3.8, Vegetation and Wildlife, has been revised to clarify that flow reductions in Little Chico Creek would be greater than 10 percent. However, because the flows during the transfer season would be less than 1 cfs, these impacts would be less than significant.

Please refer to Response to Comments 9-199 to 9-203 regarding the adequacy of Mitigation Measure GW-1 to address impacts to GDEs.

Comment 9-209

Comment

10. The monitoring well network in mitigation GW-1 is intended to measure groundwater levels to "… identify potential concerns for both third party impacts and irreversible subsidence based on the identified trigger points" (page 3.3-26). The trigger levels for groundwater elevation are either existing Best Management Objectives (BMO) (See Table D-2 in Appendix D), or the historic low groundwater level when no BMO exists (page 3.3-27). Sellers of transfer water will manage groundwater levels, presumably through management of pumping, to the triggers and the initiate corrective actions in the GW-1 mitigation plan if groundwater levels reach the trigger (page 3.3-27). The primary corrective action in the GW-1 mitigation plan when groundwater levels reach the trigger is to stop pumping and then wait for levels to recover above the trigger before pumping can continue. Mitigation GW-1 doesn't provide additional specific corrective actions to mitigate potential impacts from subsidence except general statements of reimbursement to third parties for modifications need to repair affected wells or infrastructure, and other appropriate actions based on local conditions (page 3.3-29).

Response

Mitigation Measure GW-1 requires halting of transfer related pumping if groundwater levels reach historic low groundwater level or quantitative BMOs. Therefore, implementation of GW-1 would avoid irreversible land subsidence from transfer-related pumping. Please refer to Response to Comment 7-10 for additional information.

Comment 9-210

Comment

The 2018 RDEIR/SDEIS monitoring and mitigation measures don't require all of the monitoring or mitigation elements required in the 2015 Water Transfer White Paper, which the seller's transfer proposal is required to follow (page ES-6). For example, the 2015 Water Transfer White Paper monitoring program requires for subsidence (page 46):

(1) "A monitoring well network that adequately covers the surface area and aquifer intervals within the affected pumping area. The Project Agencies recommend using dedicated monitoring wells to the maximum extent possible."

(2) A "[m]ethod to detect land subsidence or a determination that land subsidence is unlikely to occur."

(3) "Plans to coordinate data collection and cooperate with regional monitoring efforts."

The 2015 Water Transfer White Paper mitigation plan also requires (page 36 and 46):

(1) "A procedure for the transfer proponent to receive reports of purported impacts to other legal users of water or environmental resources, including reports of potential subsidence" (page 36).

(2) "A procedure for the seller to receive reports of purported environmental or local economic effects and to report that information to the Project Agencies and, as required, to local agencies" (page 46).

(3) "A procedure and schedule for investigating any reported effect." (pages 36 and 46)

(4) "A procedure for developing mitigation options for legitimate effects and schedule for implementing those options in cooperation with the affected third parties, including a strategy for conflict resolution." (pages 36 and 46)

(5) "Assurances that adequate financial resources are available to cover reasonably anticipated mitigation needs." (page 36 and 46)

These monitoring and mitigation requirements of the 2015 Water Transfer White Paper are missing or restricted by the requirements of mitigation GW-1. For example, GW-1 limits the monitoring network to a two-mile radius from the transfer pumping well, which conflicts with the 2015 Water Transfer White Paper requirement to "cover the surface area within the affected pumping area." The coordination plan, and the evaluation and reporting requirements of GW-1 only address collection, organization and reporting of transfer pumping related monitoring data (pages 3.3-28 and 3.3-29). Mitigation GW-1 doesn't address or require procedures: (1) to develop mitigation options; (2) for scheduling implementing those options in cooperation with the affected third parties; or (3) for developing a conflict resolution strategy. Mitigation GW-1 does require that if a third party expects that the transfer may affect them, they should contact BoR and the seller with their concerns (pages 3.3-28 and 3.3-29). Mitigation GW-1 does state that non-transferring third parties could be reimbursed for groundwater substitution pumping impacts, as compared with their costs absent the transfer. However, mitigation GW-1 doesn't provide any specific procedure for calculating the increases in cost of pumping or assessing the design and cost of modifications to infrastructure. Mitigation GW-1 has no stated procedure for a third party making a claim, how and by whom a claim will be reviewed and approved, what information is required to make a claim, or whether a claim of impacts or injury that occurs after the year of the transfer pumping will be accepted. Without standards and procedures for making a claim, affected third parties will have difficulty in preparing the needed evidence for their claim, which may result in denial of the claim.

Response

Please refer to Responses to Comments 7-10 and 7-13 regarding subsidence mitigation under GW-1. See Response to Comment 9-86 addressing the monitoring requirement within a two-mile radius from the pumping well.

Mitigation Measure GW-1 provides a coordination plan that summarizes requirements for collecting and responding to third party complaints. Mitigation Measure GW-1 has been revised to include the requirements on reporting and investigation of third-party impacts from the *Technical Information for Preparing Water Transfer Proposals* (Reclamation and DWR 2015).

Comment 9-211

Comment

The 2015 Water Transfer White paper states that the "project agencies will work with the transfer proponent to develop a mutually agreed upon subsidence monitoring program consistent with Mitigation Measure GW-1 contained in the Long-Term EIS/EIR." (page 34). While the 2018 RDEIR/SDEIS states that all transfers must be consistent with the latest version of the Water Transfer White Paper (page ES-6). The 2015 Water Transfer White Paper requires a subsidence monitoring program unless it's determined "… that land subsidence is unlikely to occur." Apparently, the 2018 RDEIR/SDEIS has made the determination that land subsidence isn't likely because groundwater level monitoring and BMO triggers required in GW-1 will prevent subsidence. However, this determination of no potential for subsidence in the transfer pumping area north of the Sacramento Delta doesn't appear to have utilize the data from the most recent December 2018 DWR subsidence report for the Sacramento Valley, attached as Exhibits 22a and 22b. In addition, GW-1 doesn't require any data be collected or analyzed to confirm that subsidence has ceased in the transfer pumping area north of the Sacramento Delta or that GW-1 will prevent transfer pumping from contributing to subsidence caused by other groundwater pumpers in the area of transfer pumping.

Response

Mitigation Measure GW-1 in the RDEIR/SDEIS has been revised and is different from the measure discussed in the *Technical Information for Preparing Water Transfer Proposals* (Reclamation and DWR 2015).

As noted in Response to Comment 7-10, Mitigation Measure GW-1 requires halting of transfer related pumping if groundwater levels reach historic low groundwater level or quantitative BMOs. As discussed in Section 3.3, Groundwater Resources of the RDEIR/SDEIS, irreversible subsidence would only occur when groundwater levels are below historic low levels (USGS 2017). Therefore, stopping transfer-related pumping if groundwater levels reach historic low levels would avoid any potential irreversible (permanent) subsidence.

In response to the comment regarding recent subsidence studies published by DWR, note that Section 3.3, Groundwater Resources, has been updated to include the latest available information. However, this does not change the findings of significance on land subsidence impacts in Chapter 3.3, Groundwater Resources, of the RDEIR/SDEIS.

Comment 9-212

Comment

The 2015 Water Transfer White Paper states that *"[t]he monitoring program could include periodic determination of land surface elevation at strategic locations throughout the transfer area up to and including installation and monitoring of extensometers and/or continuous GPS stations."* (page 34). Mitigation GW-1 does address the requirement for monitoring land surface elevation, subsidence or reporting on subsidence that occurred during transfer pumping. Mitigation GW-1 doesn't have a requirement for a land surface subsidence trigger that would require transfer pumping to stop if the land surface elevation dropped below the trigger elevation. Mitigation GW-1 doesn't require communication with agencies overseeing subsidence conditions, such as DWR or the USGS, or require during the proposed 6 years of transfer pumping that periodic measurements of land surface elevation be made at strategic locations to evaluate whether mitigation GW-1 has been effective at preventing subsidence. Unless covered under the "*other appropriate actions*" category for reimbursements to impacted third parties, mitigation GW-1 doesn't have any mitigation requirements or procedures to pay for additional subsidence monitoring and reporting should it be needed. For example, additional land surveys, installation and monitoring of extensometers and/or GPS stations, or other subsidence monitoring as recommended as Best Management Practice (BMP) by DWR (2016). Periodic surveys of land elevation in the transfer pumping area, regular communication with regional subsidence monitoring agencies, and regular review and reporting on the status of subsidence in the Sacramento Valley are all critical actions needed to show that mitigation GW-1 is effective at preventing and mitigating subsidence. These actions should be added to the monitoring plan and mitigation measures in GW-1.

Response

Please refer to Response to Comment 7-10.

Comment 9-213

Comment

Mitigation GW-1 is essentially a reactive and not preventative because sellers of groundwater substitution transfer water are only required to wait until groundwater levels drop to the elevation of a pre-defined trigger before taking corrective action. The sellers aren't required to evaluate as part of the transfer proposal whether the anticipated drawdown from the proposed transfer pumping will result in groundwater levels being lower than the trigger. Mitigation GW-1 doesn't require as part of an assessment of the feasibility of a proposed groundwater substitution transfer that the sellers use the hydraulic and hydrogeologic information about a well and the adjacent aquifers gained from previous transfers. Examples include the extent and magnitude of any previous drawdown, or regional trends in groundwater levels or climate such as a downward trend in water levels or predictions that the upcoming transfer pumping season will be a below normal water year. Information of past transfer pumping drawdown could be combined with groundwater modeling with current conditions to predict the drawdown from the proposed transfer. A proposal for a groundwater substitution transfer should utilize all of the technical information available including information on trends in regional groundwater pumping and subsidence that might cause groundwater levels to hit or exceed the trigger(s). This should include predicting the drawdown from pumping other non-transfer wells. The transfer proposal assessment should determine if the transfer pumping would contribute along with other non-transfer pumping in lowering groundwater levels down to the trigger level. If this could occur, then the transfer shouldn't proceed because of the fundamental requirement that transfers cannot cause "injury to any legal user of the water involved." (page D-2 in Appendix D; Water Code Section 1810).

Response

Please refer to Section 3.3.4 of the RDEIR/SDEIS and Response to Comment 7-10 regarding the monitoring and mitigation requirements for land subsidence impacts.

Mitigation Measure GW-1 requires transfer-related pumping to be halted if groundwater levels reach the groundwater triggers. Implementation of Mitigation Measure GW-1 would avoid "injury to any legal user of the water involved."

Comment 9-214

Comment

I recommend that mitigation GW-1 be amended to: (1) require the subsidence monitoring and mitigation measures provided in the 2015 Water Transfer White Paper and the DWR (2016) subsidence BMPs; (2) require a transfer proposal to use all available and historical data and information about the well hydraulics and the hydrogeologic characteristics of the aquifer system to evaluate the potential for the propose transfer pumping to lower groundwater levels to the triggers and/or cause subsidence; (3) require coordination with those agencies that are responsible for monitoring subsidence and utilize the most current subsidence data in the transfer proposal, (4) require the transfer seller contribute funds to monitoring subsidence in the area of the transfer pumping if the existing network isn't adequate to manage subsidence, (5) require hydrographs be reported for all transfer pumping and monitoring wells that show the all historical and transfer period groundwater level measurements and the trigger levels; (6) require annual reporting that evaluates the regional subsidence in the area that might be affected by transfer pumping, including the results of GPS station or land surveys elevation measurements and/or extensometers readings; and (7) require transfer sellers to demonstrate that they have sufficient financial assurances to fund any potential mitigation measures.

Response

Please refer to Responses to Comment 9-209 to 9-213.

Comment 9-215

Comment

11. The 2018 RDEIR/SDEIS used the SACFEM2013 groundwater model to evaluate potential impacts rom groundwater substitution pumping on groundwater levels (page 3.3-10. 3.3-13, and 3.3-20) and stream depletion (page 3.8-10). The model simulated transfer pumping from the water years (WY) 1970 to 2003. SACFEM2013 documentation is given in Appendix D of the 2014 10-Year Long-Term Draft EIS/EIR. The model was calibrated to historical conditions from WY 1970 through WY 2009. However, the simulated time period of transfer pumping was reduced to the WY 1970 to 2003 because CalSim II results are available only through 2003 (2014 DEIS/DEIR page 3.3-60). It is unclear if the model's termination at WY 2003 would capture any of the changes in groundwater conditions from 2004 to 2009. The SACFEM2013 model simulation used historical annual transfers volumes for pumping volumes, Figure 3.3-4 (page 3.3-13, lines 9 to 11). The maximum simulated one-year transfer volume is slightly greater than 300,000 AF in WY 1987 (see Figure 3.3-4). Results of the SACFEM2013 model are given for two hydrologic scenarios, WY 1976 (a critical dry year) and WY 1990 (year four of a multiyear drought). Drawdown maps of simulations of change in groundwater level are given in Appendix F.

Response

SACFEM2013 simulates demands at a fixed level of development (2010 level of development). This means that population, land use, and agricultural demands used in the model is representative of demands that existed in 2010. These demands are then used with historic hydrology inputs, primarily precipitation, reservoir inflows, and unregulated flows, in model simulations. Therefore, demands simulated in the models are representative of approximately 2010 levels of development.

Regarding the comment on model capturing groundwater conditions after 2003, the Final EIS/EIR is intended to assess environmental conditions resulting from implementation of the range of potential transfer activities under the Proposed Action for a 5-year period. A key consideration, therefore, is whether there exists within the period of analysis any 5-year period that is representative of a reasonable worst-case condition for Sacramento Valley hydrology. Within the period of analysis, there are several periods longer than the 5-year period and considerably drier than the recent dry hydrologic conditions (2007 through 2016). For example, the average annual runoff for the 10-year period 1985 through 1994 is 12.7 MAF. This is comparable to the minimum average annual runoff, 12.3 MAF in 1928 through 1937, and 13.3 MAF in 2007 through 2016. Therefore, the analysis includes a period similar to recent dry hydrologic conditions from 2007 to 2016.

Comment 9-216

Comment

The SACFEM2013 modeling using no data on historical conditions or transfers after 2003 is a significant limitation on the utility of the model for estimating potential impacts from the 2018 RDEIR/SDEIS proposed 6 years of groundwater substitution transfers. There have been significant changes in the condition of the groundwater and surface water resources in the Sacramento Valley in the 16 years since 2003. For example, Appendix E in the 2018 RDEIR/SDEIS presents a series of contour maps for a portion of the Sacramento Valley, Figures E-46 through E-54, that show the change in groundwater depth in three aquifer zones, shallow, (<200 feet bgs) intermediate (200 to 600 feet bgs), and deep (>600 feet bgs). These maps give contours and statistics for changes in the depth for three time intervals, 2004 to 2017, 2011 to 2017, and 2016 to 2017. Attached Exhibit 23 is a table summarizing the data in these maps that gives the maximum and average changes in depth to groundwater, by County, for the three aquifer zones and three periods. Exhibit 23 shows that:

A. The maximum decrease in the depth to groundwater between 2004 and 2017 ranged from 2.3 to 60.2 feet in the shallow zone, 3.2 to 64.3 feet in the intermediate zone, and 0 to 51.5 feet in the deep zone.

B. The maximum decrease in the depth to groundwater between 2011 and 2017 ranged from 6.9 to 34.7 feet in the shallow zone, 0.3 to 49.5 feet in the intermediate zone, and 0 to 39.6 feet in the deep zone.

C. The maximum decrease in the depth to groundwater between 2016 and 2017 ranged from 0 to 15.4 feet in the shallow zone, 0 to 8.4 feet in the intermediate zone, and 0 to 4.0 feet in the deep zone.

D. The annual rate of maximum decrease in depth to groundwater between the year 2011 and 2017 is generally greater than the annual rate from 2014 to 2017. This suggests that groundwater levels declined faster during the later years.

E. The one-year rate of maximum decrease in depth to groundwater in 2016 to 2017 is greater than the annual rate of decline between 2004 and 2017 in eight out of the eighteen areas, or 44 percent. This suggests that at least locally the groundwater system continues to decline.

Exhibit 23 also gives the average change in the depth to groundwater, which generally shows a decline, but sometimes a rise. In particular, the average change in 2016-2017 shows a rise even though the maximum decline is often greater than the long-term annual averages. This seeming contradiction points to an important issue when using groundwater level statistics, mainly, that the location of the measurement is important. The distribution of the locations for measurements used for a statistic like the average can significantly impact the utility of the information. A statistic like an average doesn't take into account the location of the information. Therefore, when a number of measurements are taken in proximity, they can have a similar value and unreasonably weight the average. For example, the significance of a decrease in depth to groundwater of 50 feet at one location can be reduced by ten measurements of a 5-foot increase measured in a small area or scattered throughout the basin. The resulting 0-foot average change hides the significance of a developing large groundwater depression. The fact that in one area there was a 50-foot decline in water level is critical information about the state of the basin. Therefore, understanding the changes in the depth of the groundwater in a basin requires knowledge of the distribution of the changes, which are best shown by contour maps like Figures E-46 to E-54, the maximum decrease in depth, and the long-term annual rate of change in depth. Average values are of little value for understanding the state of the basin unless the data are collected at appropriate locations and properly weighted in calculating the statistic.

Response

Please refer to Response to Comment 9-215 regarding the adequacy of the analysis to capture recent dry hydrologic conditions.

The information the commenter has tabulated in Exhibit 23 is presented graphically in Appendix E of the RDEIR/SDEIS (renamed Appendix F). As noted in Section 3.3, Groundwater Resources, approximately 7.3 percent of the wells showed a continued decline in groundwater levels between spring 2016 and spring 2017 which is consistent with the information presented in Exhibit 23. As noted in the RDEIR/SDEIS, groundwater level declines over five consecutive drought years and only partial recovery from one wet year is consistent with historic patterns of drawdown and recovery.

Comment 9-217

Comment

Figures E-46 to E-54 show that a number of areas of decreased groundwater depth throughout the Sacramento Valley, likely the result of ongoing pumping that exceeds recharge. With the long-term continuation of depletion, the depth of the depression increases, and width expands when the rate of recharge is less than the rate of extraction. The greater annual rate of decrease in WY 2011 to 2017 suggests that volume of recharge is less than the volume of extraction. Some of these depressions are associated with areas of subsidence. Compare the groundwater depth depressions around Orland, and Williams to Woodland, with the land subsidence measurements shown in Exhibits 22a and 22b. Therefore, the SACFEM2013 model likely fails to accurately simulate the potential of transfer pumping impacts for the proposed project because it doesn't report on basin conditions after 2003.

Response

Please refer to Response to Comment 9-216 regarding groundwater level trends in the Sacramento Valley. Section 3.3, Groundwater Resources, of the RDEIR/SDEIS determined that implementation of the Proposed Action could result in significant impacts related to subsidence. However, implementation of Mitigation Measure GW-1 would limit transfer-related pumping to historic low groundwater levels and this would reduce effects related to potential land subsidence to less than significant.

Comment 9-218

Comment

Recently updated groundwater change maps for the Sacramento Valley for WY 2004 to 2018 are attached as Exhibits 24a to 24d[104]. The areas of groundwater depression are similar to those in E-46, E-49 and E-52, although the width of the depressions appears to be greater in the 2018 maps. The overall maximum change in depth of groundwater is also greater for all areas except the Redding area. Maximum groundwater decline during the 14 years and annual decline are now respectively, 57.7 feet and 4.12 feet per year for the shallow zone, 70.6 feet and 5.04 feet per year for the intermediate zone, and 112.4 feet and 8.03 feet per year for the deep zone. The 2018 groundwater change maps now provide statistics on groundwater elevation change by DWR subbasin, which is useful for implementing SGMA.

Response

Appendix E of the RDEIR/SDEIS (renamed Appendix F) has been updated to include changes in groundwater elevation maps for Spring 2017 to Spring 2018.

Comment 9-219

Comment

There is an additional issue with the SACFEM2013 modeling in that the simulations are for historical transfer values, not the proposed 2018 RDEIR/SDEIS maximum annual transfer of 250,000 acre-feet. It is unclear if the simulated volume of groundwater pumped is equal to the

[104] 7 https://data.ca.gov/dataset/northern-sacramento-valley-groundwater-elevation-change-maps

transfer value or to the value necessary to replace the irrigation water needed to meet crop requirements. The 2018 RDEIR/SDEIS notes on page 3.3-1 that *"[t]he volume of groundwater pumped is higher than the total volume of surface water transferred to account for the streamflow depletion losses and carriage water."* The carriage water loss values are said to typically range from 20 to 30 percent of the transfer volume (page 2-13). The streamflow depletion value, BoR-SDF, for a groundwater substitution transfer is assumed to be that in the 2015 Water Transfer White Paper, or 13 percent of the transfer amount (See page ES-6 and my comment no. 2). This results in a range of loss of 33 to 43 percent for a groundwater substitution transfer.

Response

Figure 3.3-4 in the RDEIR/SDEIS shows the simulated groundwater substitution transfer volumes in SACFEM2013. As shown in the figure the model simulated transfer volumes greater than 250,000 acre-feet in certain years. As discussed in Chapter 2 of the RDEIR/SDEIS, total amount of water transferred under Proposed Action would not exceed 250,000 acre-feet. Therefore, the analysis is considered conservative.

Comment 9-220

Comment

The maximum annual transfer amount for the 6-year project is up to 250,000 acre-feet (page 2-2). There is a question of what amount of groundwater would need to be pumped to maintain the crops that were irrigated by the transferred surface water. This can be estimated by accounting for the losses in transfer water of 33 to 43 percent resulting from the BoR-SDF and the carriage water loss. For example, if the crop was irrigated with 1,000 acre-feet of surface water, the maximum amount of allowable transfer water would range from 570 to 670 acre-feet. If it is assumed that the crop needs 1,000 acre-feet of irrigation, then the ratio of groundwater pumped to transferred water ranges from 1.5 to 1.75 (1,000 / 670 = 1.5; 1,000 / 570 = 1.75). Therefore, the proposed transfer of up to 250,000 acre-feet per year would require pumping 375,000 to 437,500 acre-feet of groundwater each year to meet the same irrigation demand.

Response

As noted by the commenter, carriage water losses ranging from 20 to 30 percent and streamflow depletion factor of 13 percent would be applied to groundwater substitution transfers. Therefore, as noted by the commenter, 375,000 to 437,500 acre-feet of groundwater substitution pumping would be required to transfer 250,000 acre-feet. However, as discussed in Chapter 2, the Proposed Action only identifies 332,795 acre-feet from groundwater substitution and groundwater substitution pumping would be limited to this amount. The Proposed Action also includes other water transfer methods (cropland idling, cropland shifting, and reservoir releases) and this would reduce groundwater pumping transfer volumes.

Comment 9-221

Comment

Based on size of the graph bars for simulated annual groundwater substitution transfer volume in Figure 3.3-4, the SACFEM2013 modeling doesn't appear to have simulated the maximum groundwater volume that would need to be pumped in any one year or during the combined 6 years that the project is proposing. Because depletion of groundwater storage and stream depletion increase in rate, volume and area with greater pumping, and the impacts accumulate with each subsequent pumping event, the groundwater modeling effort should have simulated multiple years of pumping at the project's maximum volume and rate to fully calculate changes under recent hydrological conditions to reasonably assess the project's potential environmental impacts.

Response

As shown in Figure 3.3-4, SACFEM2013 simulated about 300,000 acre-feet of groundwater substitution for transfer in 1987. However, as noted in response to Comment 9-220, groundwater substitution transfers of this magnitude would not occur.

The modeling effort first considered the transfer capacity in the Delta to identify the maximum potential transfer per year. This capacity was increased by estimated carriage water, and the resulting quantity was the amount of water that was transferred each year in the model. The modeling effort first looked to transfer all water through groundwater substitution if it was available. (Availability was limited by sellers and hydrologic conditions.) Some years in Figure 3.3-4 have smaller groundwater substitution transfers because of limited through-Delta capacity and lack of interested sellers (because of dry hydrology and other factors). This methodology is discussed in more detail in Appendix B of the 2014 Draft EIS/EIR (renamed Appendix C) .

Comment 9-222

Comment

The modeled area for SACFEM2013 that's reported in the 2018 RDEIR/SDEIS doesn't extend south into the Delta area (See Figures F-1 to F-6). Table D-1 (page D-6) lists the Northern Delta Groundwater Sustainability Agency (GSA) as part of the Solano subbasin and indicates declining groundwater levels and salt intrusion as the reasons for the high CASGEM priority ranking under SGMA. Exhibit 25 is a Spring 2017 groundwater contour map for Delta and southern Sacramento Valley areas. The map shows a red line for sea level or zero elevation contour that defines a north-south oriented trough, along with added labels that identify the low points inside the sea level contours. This elongated trough is likely caused by groundwater pumping in excess of recharge and likely intercepts fresh groundwater that historically flowed from the Sierra Nevada towards the Delta. Pumping by several of the proposed groundwater transfer agencies in Placer and Sacramento counties will likely increase the interception of fresh groundwater and possibly surface water to the Delta by expanding the depression that forms the north-south below-sea-level trough and/or increasing depletion from the rivers draining off the Sierra Nevada. The SACFEM2013 modeling does show drawdown in aquifer zones in the Placer and Sacramento counties in Figures F-1c to F-6c, but fails to analyze or assess the potential impacts to the Delta groundwater levels or quality from transfer pumping. A lack of fresh water flowing into the Delta likely contributes to the salinity problem in the quality of the groundwater. The lack of analysis, monitoring and mitigation measures for salinity issues in the Delta is a significant deficiency in the 2018 RDEIR/SDEIS.

Response

Potential sellers in the RDEIR/SDEIS are all within the Sacramento Valley or Redding Area Groundwater Basins. Therefore, the SACFEM2013 model domain only simulates Sacramento Valley. As discussed in Section 3.3, Groundwater Resources, impacts from transfer pumping in Redding Area Groundwater Basin was analyzed qualitatively. The potential for changes in surface water flow to affect groundwater in the Delta would be insubstantial given the very limited changes in Delta inflow (see Figure B-28 [C-28] in Appendix B of the 2014 Draft EIS/EIR [renamed Appendix C]).

Regarding the comment on impacts in the Solano Subbasin, potential groundwater substitution sellers in Solano Subbasin are Reclamation District 2068, Reclamation District 2060, and Pope Ranch. The maximum groundwater substitution transfer volume from these sellers would be limited to 10,300 acre-feet per year. As shown in Figures F-1 through F-6, impacts from pumping in this region are within the district boundaries and do not extend beyond the subbasin. Additionally, as discussed in Section 3.3, Groundwater Resources, migration of groundwater would likely not be a concern unless groundwater levels and/or flow patterns are substantially altered for a long period of time. Transfer-related pumping under the Proposed Action (2019-2024) would be limited to short-term withdrawals during the irrigation season and would not result in saltwater intrusion.

Comment 9-223

Comment

The 2018 RDEIR/SDEIS only briefly mentions the fact that the transfer source areas in the Sacramento Valley are ranked as medium to high CASGEM priority and need a groundwater sustainability plan as required by SGMA (See Mitigation Measure GW-1 page 3.3-25; Table D-1 in Appendix D; my comment no. 4 and my Exhibit 4). Many of the basins have been operating under existing Groundwater Management Plans, yet they are ranked medium to high priority (See Table D-2 in Appendix D). Several general reasons for the CASGEM rankings listed in Table D-1 for the Sacramento Valley subbasins suggest there are already undesirable results, high-priority basins are ranked because of:

A. Participation in Type A groundwater transfers (Redding-Anderson and Sutter subbasins).

B. Localized groundwater quality issues and subsidence (Yolo subbasin).

C. Declining groundwater levels and localized groundwater quality issues (West Butte subbasin).

D. Localized groundwater contamination and declining groundwater levels (North and South American subbasin).

E. Declining groundwater levels, localized groundwater quality issues, and increased housing development (Colusa subbasin).

F. Declining groundwater levels and salt intrusion (Solano subbasin).

The SACFEM2013 model simulations don't appear to address the question of potential transfer impacts on groundwater basin sustainability and the development or expansion of undesirable results [See Water Code Section 10721(x)] because these issues aren't specifically acknowledged except in Table D-1.

Response

Please refer to Response to Comment 7-8 regarding consideration of SGMA in the analysis and Mitigation Measure GW-1. Regarding the comment on basins being managed by groundwater management plans, Appendix L (Table L-2) discusses existing groundwater management plans in the Seller Service Area. It should be noted that not all groundwater subbasins have clear/quantitative BMOs. Therefore, though many of the subbasins have groundwater management plans, they do not have clear and quantitative BMOs.

Comment 9-224

Comment

In summary, the SACFEM2013 groundwater modeling likely doesn't accurately evaluate the potential impacts from the proposed 2018 RDEIR/SDEIS 6-year transfer project because:

A. The model year terminates at 2003, which doesn't account for documented decreases in groundwater levels from 2004 to recent years.

B. The modeling didn't simulate the proposed transfers at the maximum rate being requested by the project for each of the 6 years.

C. The volume of groundwater pumped in the simulations, while unstated, likely isn't the amount of water needed to maintain crops when the project maximum annual transfer volume of 250,000 acre-feet is made entirely by groundwater substitution.

D. The model doesn't appear to address the conditions in the subbasins identified in the SGMA rankings or how the transfers will affect the continuation or development of undesirable results and groundwater sustainability.

Response

Please refer to Response to Comments 9-215 to 9-223.

Comment 9-225

Comment

I recommend that the groundwater modeling for evaluating the impacts from groundwater substitution pumping for the proposed 6-year transfer project be revised to: (1) use the current hydrologic conditions in the Sacramento Valley and Delta areas; (2) analyze the changes to groundwater and surface water resources from pumping at the maximum rates and volumes associated with the maximum transfer volume; (3) analyze the changes to groundwater and surface water resources from pumping for a continuous 6 years at the maximum rate; (4) analyze the effects of groundwater pumping on salinity in the Delta; (5) evaluate the long-term impacts to groundwater and surface water resources such as storage depletion, stream depletion and GDEs; and (7) evaluate the impact the transfer pumping will have on subbasin SGMA sustainability and the creation or continuation of undesirable results.

Response

Please refer to Response to Comments 9-215 to 9-223.

Comment Letter 10, Richard Macedo, California Department of Fish and Wildlife

Comment 10-1

Comment

The California Department of Fish and Wildlife (CDFW) received a Notice of Availability of a revised EIR/supplemental EIS (RDEIR/SDEIS) from San Luis and Delta-Mendota Water Authority (SLDMWA) for the Project pursuant the California Environmental Quality Act (CEQA) and CEQA Guidelines.[105] CDFW previously submitted comments in response to the originally circulated Draft EIR/EIS (enclosed)

Thank you for the opportunity to provide comments and recommendations regarding those activities involved in the Project that may affect California fish and wildlife. Likewise, we appreciate the opportunity to provide comments regarding those aspects of the Project that CDFW, by law, may be required to carry out or approve through the exercise of its own regulatory authority under the Fish and Game Code.

CDFW ROLE

CDFW is California's Trustee Agency for fish and wildlife resources and holds those resources in trust by statute for all the people of the State. (Fish & G. Code, §§ 711.7, subd. (a) & 1802; Pub. Resources Code, § 21070; CEQA Guidelines § 15386, subd. (a).) CDFW, in its trustee capacity, has jurisdiction over the conservation, protection, and management of fish, wildlife, native plants, and habitat necessary for biologically sustainable populations of those species. (Fish & G. Code,§ 1802.) Similarly, for purposes of CEQA, CDFW is charged by law to provide,

[105] CEQA is codified in the California Public Resources Code in section 21000 et seq. The “CEQA Guidelines” are found in Title 14 of the California Code of Regulations, commencing with section 15000.

as available, biological expertise during public agency environmental review efforts, focusing specifically on projects and related activities that have the potential to adversely affect fish and wildlife resources.

CDFW is also submitting comments as a Responsible Agency under CEQA. (Pub. Resources Code, § 21069; CEQA Guidelines, § 15381.) CDFW expects that it may need to exercise regulatory authority as provided by the Fish and Game Code. As proposed, for example, the Project may be subject to CDFW's lake and streambed alteration regulatory authority. (Fish & G. Code, § 1600 et seq.) Likewise, to the extent implementation of the Project as proposed may result in "take" as defined by State law of any species protected under the California Endangered Species Act (CESA) (Fish & G. Code, § 2050 et seq.), the project proponent may seek related take authorization as provided by the Fish and Game Code.

Response

The comment summarizes the RDEIR/SDEIS and CDFW's role.

Comment 10-2

Comment

PROJECT DESCRIPTION SUMMARY

Proponent: Reclamation and SLDMWA

Objective: The objective of the Project is to:

Develop supplemental water supply for member agencies during times of Central Valley Project (CVP) shortages to meet existing demands,

Meet the needs of member agencies for a water supplies that are immediately implementable and flexible and can respond to changes in hydrologic conditions and CVP allocations.

The SLDMWA and Reclamation will allow the transfer of water from willing sellers to willing buyers to meet the buyer's water needs. Primary Project activities include making water available for transfer and developing the infrastructure for the transfer. This requires implementing actions to reduce consumptive use of water by the seller, which include the use of groundwater to make surface water available or the release of additional water from reservoir storage.

Location: Sellers and buyers include water districts from the Central Valley and the Delta.

Timeframe: Through 2024.

Response

The comment summarizes the project objectives and timeframe.

Comment 10-3

Comment

COMMENTS AND RECOMMENDATIONS

CDFW offers the comments and recommendations below to assist the SLDMWA in adequately identifying and/or mitigating the Project's significant, or potentially significant, direct, and indirect impacts on fish and wildlife (biological) resources. Editorial comments or other suggestions may also be included to improve the document. Based on the potential for the Project to have a significant impact on biological resources, CDFW concurs that an Environmental Impact Report is appropriate for the Project.

Response

The material in the RDEIR/SDEIS, along with the text from the 2014 Draft EIS/EIR, will be part of the Final EIS/EIR.

Comment 10-4

Comment

Comment 1:

Section #: ES 7.1, Page #: ES-1 0

Issue: Under the heading 'Groundwater Substitution,' the Executive Summary (ES) indicates that groundwater monitoring will be used to 'avoid changing groundwater levels that could affect stream flows or riparian vegetation.' Non-riparian, phreatophyte vegetation is not included in this monitoring protection.

Specific impact: This exclusion of groundwater dependent vegetation located outside the riparian zone from groundwater monitoring may lead to degraded or lost phreatophyte habitat.

Why impact would occur: A failure to monitor groundwater levels under groundwater dependent vegetation will lead to an inability to effectively manage groundwater pumping for substitution transfers. Phreatophytes can be sensitive to depth to groundwater threshold impacts (Naumburg et al. 2005, Froend and Sommer 2010). Without data on groundwater elevation near vegetated groundwater-dependent ecosystems, vegetation stress or loss may occur without notice and without necessary changes to pumping regimes.

Evidence impact would be significant: There are significant potential vegetated GDEs in the Seller Service Area according to the Department of Water Resources Natural Communities Commonly Associated with Groundwater Dataset (DWR 2018), not all of which are riparian.

NOTE: Page 3.3-28 does address deep-rooted vegetation in the context of monitoring systems, but deep-rooted/groundwater dependent vegetation should also be acknowledged in the ES.

Response

Please refer to Responses to Comments 9-200 and 9-201. While there may be a significant amount of deep-rooted vegetation within the Seller's Area of Analysis, much of this vegetation is not expected to be dependent on shallow groundwater. Appendix P has been added to this Final EIS/EIR and Page P-3 states, "The groundwater modeling results indicate that shallow groundwater is typically deeper than 15 feet in most locations under existing conditions, and often substantially deeper. This is substantially below the rooting depth of typical vegetation associated with upland communities."

Mitigation Measure GW-1 addresses deep-rooted vegetation, regardless of whether it is considered riparian habitat.

The Executive Summary is intended as a brief summary of the overall document, but the document as a whole should be considered to understand the potential impacts and benefits of the action alternatives.

Comment 10-5

Comment

Comment 2:

Section #: 3.3.1.2.2, Page #: 3.3-4

Issue: Groundwater use in 'Sacramento Valley Groundwater Basin' is noted as less than 30% of annual supply under normal hydrologic conditions. This RDEIR/SDEIS is intended to help address CVP water supply shortages, most of which occur in dry hydrologic conditions.

Specific impact: Analyzing basin groundwater reliance for this RDEIR/SDEIS under normal hydrologic conditions when the need for groundwater substitutions transfers increases with dry hydrologic conditions may overestimate available groundwater supply in the Seller Service Area and underestimate potential local and cumulative basin impacts.

Response

As discussed in Section 3.3 of the RDEIR/SDEIS, Groundwater Resources, impacts of action alternatives on groundwater level were analyzed using the SACFEM2013 model. The SACFEM2013 model simulated impacts over a 34-year period from WY1970 through 2003. This period of analysis included different year types including some Shasta Critical years. The model estimates groundwater pumping based on changes in surface water deliveries, so the model included increased groundwater extraction during dry and critical years.

Comment 10-6

Comment

Comment 3:

Section #:3.3.2 Page #: 3.3-11

The two subheadings: 'Groundwater pumping would not cause groundwater level declines that would lead to permanent land subsidence,' and 'Groundwater pumping would not cause groundwater level declines that would lead to migration of poor quality groundwater.'

- The paragraphs below each caveat these subheadings, noting that the potential for groundwater level declines that would cause the adverse impact in the Seller or Buyer Service Area under the 'No Action Alternative' would be 'the same as existing conditions.'

Therefore, the subheadings/statements in italics may be misleading if significant subsidence and/or migration of poor quality groundwater is actively happening already. A thorough analysis of 'No Action Alternative' should account for current subsidence and groundwater quality impacts cause by pumping in the Seller/Buyer Service Areas.

Response

Section 3.3.2.1 discusses subsidence and groundwater quality impacts under the No Action Alternative. Section 3.3.1.2, Affected Environment includes current subsidence and groundwater quality trends in the area of analysis.

Comment 10-7

Comment

Comment 4:

Section #: 3.3.4 Page #: 3.3-28

Issue: The subheading 'Shallow Groundwater Level Monitoring for Deep Rooted Vegetation' explains how monitoring will trigger mitigation activities.

- Mitigation under this subheading may be triggered too late, both where monitoring wells exist, and where biologists are required to observe vegetation response.

Specific impact: Late mitigation triggers could lead to irreversible, or slowly reversible, loss of vegetated groundwater dependent ecosystems and the species therein.

Why impact would occur: Where monitoring wells exist, the requirement to mitigate action is triggered after groundwater levels have dropped below the local vegetation rooting depth. Recovery time for groundwater levels is unknown and prone to pumping lag impacts, meaning vegetation may have to endure substantial periods of stress. Furthermore, where monitoring wells are not required, a loss of deep-rooted vegetation triggers mitigation actions. The term 'loss' suggests vegetation can no longer serve habitat functions - it is already beyond short-term recovery - which in turn can lead to species loss.

Evidence impact would be significant: Some plant and animal species have low resiliency, and may not survive late or un-protective mitigation triggers, potentially permanently reducing the plant or animal species populations.

Response

Please refer to Response to Comment 9-63. *Appendix* P has been added to the final document and Page P-3 includes a discussion about vegetation communities, namely riparian, that are more likely to depend on groundwater. These areas are more likely to rebound from a temporary drop in the groundwater levels because of the interaction of surface flows and groundwater flows in riparian systems. In upland habitats, vegetation that relies on shallow groundwater may be more sensitive to changes in groundwater levels; however, it is expected that the monitoring triggers would catch the lowering of groundwater levels soon enough (i.e., 10 feet reduction in shallow groundwater areas) to allow for recharge before there is a substantial reduction in health of deep-rooted vegetation. While some species may be affected by the temporary reduction in groundwater levels, many species of deep-rooted plants in California’s uplands are accustomed to periods of prolonged drought and can rebound from reductions in water availability.

Comment 10-8

Comment

Comment 5:

Section #3.8.2.4.3: Page#: Starting 3.8-17

Issue: The RDEIR/SDEIS proposes that Mitigation Measure GW-1 will reduce potentially significant impacts from groundwater substitution pumping on special status species. This Mitigation Measure may be insufficient to address potential significant impacts because:

1. Mitigation Measure GW-1 hinges on triggers that could be too late to prevent habitat and species loss (see comment above);

2. Mitigation Measure GW-1 does not require paired groundwater and surface water monitoring, and therefore may not be able to accurately predict the relationship between groundwater pumping and local impacts to surface water/wetlands; and

3. The RDEIR/SDEIS assumes a <10% reduction in surface water will not cause significant impacts on species, which may not always hold true and is dependent on each stream's respective hydrology, water availability, and species needs[106].

Specific impact: Habitat and species loss.

Why impact would occur: Inadequate mitigation triggers, insufficient monitoring, and un-protective thresholds allow for habitat degradation - both vegetated and aquatic - to go unnoticed and unmitigated until species loss has already occurred.

Evidence impact would be significant: The presence of GDEs in the Seller Service Area (DWR 2018) suggests that the potential for habitat and species loss could be significant if the monitoring and mitigation requirements are not strengthened.

Response

In response to item 1, see Response to Comments 10-7 and 9-63 related to triggers for shallow groundwater monitoring.

In response to item 2, substantial surface water monitoring exists throughout northern California. Reclamation and DWR carefully track changes in flows because they affect deliveries in northern California and exports from the Delta; unexpected changes in flows attract attention quickly because of those changes. Reclamation and DWR

[106] Richeter et al. suggest a high level of ecological protection with unimpaired flow alterations of less than 10%, but few streams in California flow unimpaired (Richter 2011). Therefore, while a 10% depletion on an unimpaired stream may have minimal ecological harm, the same percentage reduction on an impaired stream may have significant impacts on ecological function.

already monitor surface water flows for a different primary purpose, but the results would also protect affects to surface water and wetlands described in this comment.

In response to item 3, the potential reduction in surface water flows within creeks and rivers was based on modeling data that is provided in Appendix P, which has been added to the final document. Page P-3 states "The less than 10 percent reduction in flow threshold was used to determine measurable flow changes based on several major legally certified environmental documents in the Central Valley (Trinity River Mainstem Fishery Restoration ROD, December 19, 2000; San Joaquin River Agreement ROD in March 1999; Freeport Regional Water Project ROD, January 4, 2005; Lower Yuba Accord Final EIR/EIS). In these documents, there is consensus that differences in modeled flows of less than ten percent would be within the noise of the model outputs and beyond the ability to measure actual changes". In addition to the less than 10 percent threshold, an additional threshold of less than one cfs change in flow was also used to make the conclusion that there would not be significant impacts on plant and wildlife resources that are present within those aquatic systems.

Comment 10-9

Comment

Comment 6:

Section # 1.4, Page # 1-5

Issue: 'When proposing or approving a specific water transfer in the future, the Lead Agencies and/or Responsible Agencies will consider whether the proposed transfer was analyzed in the Final Long-Term Water Transfers EIS/EIR. If so, the Lead Agencies can rely on the analysis in the Final Long-Term Water Transfers EIS/EIR. If it is not covered or there have been significant changes, the Lead Agencies may need to supplement the Final Long-Term Water Transfers EIS/EIR."

Re-initiation of Consultation of the Long-Term Operations of the CVP and State Water Project (SWP) proposes numerous significant changes to water operations under the existing National Oceanic and Atmospheric Administration (NOAA) and U.S. Fish and Wildlife Service (USFWS) Biological Opinions (BOs) are proposed under the recently submitted Biological assessments (BA) for long-term operations of the CVP and SWP. The CalSim analysis upon which this RDEIR/SDEIS is based on will no longer be valid and will need to supplement this RDEIR/SDEIS upon implementation. These changes include widening of the current transfer window evaluated in this document to also include October and November.

Specific impact: The new USFWS and NOAA BOs proposed changes to operating requirements, including widening of the transfer window, would lead to dewatering and potentially significant impacts to salmonid redds. Therefore, upon implementation of new CVP and SWP operating criteria the lead agencies would have to conclude that the analysis provided for proposed transfers this RDEIR/SDEIS or in the previous EIR/EIS is no longer valid.

Why impact would occur: Analysis in this RDEIR/SDEIS is based on current CVP and SWP operating criteria which are likely to be substantially modified under Reinitiation of Consultation of the Long-Term Operations of the CVP and State Water Project (SWP). As such, the analysis provided is insufficient to adequately analyze impacts upon implementation of new CVP and SWP operation criteria and is not valid for the term proposed in this RDEIR/SDEIS which is 2024. In particular, the current transfer window avoids part of the state and federally listed Spring-run Chinook salmon spawning and fall/late fall Chinook salmon spawning periods which occur August through January. The egg incubation period for salmonids is approximately 90 days dependent on water temperature. Water transfers during October and November could result in flows being higher for a short period in which salmonids would build redds in margin habitat that would not be sustained for the duration of egg incubation. This would result in redd dewatering mortality when the transfer flows end. There is no analysis for redd dewatering potential during October and November.

Evidence impact would be significant: Water transfers during the extended October and November period are not described or analyzed. Thus, there is the potential for significant impact.

The lead agencies will need to supplement the Final Long-Term Water Transfers EIS/EIR analysis once a new CVP/SWP operations under the new BOs are implemented. This supplement will require new analysis which includes the new CVP SWP long term operations criteria as the existing analysis provided in this document will no longer be valid. New operational criteria for the CVP and SWP are likely to be implemented prior to the time period that this RDEIR/SDEIS proposes to cover operations through 2024.

Response

The Reinitiation of Consultation of the Long-Term Operations of the CVP and State Water Project process is analyzing an expanded transfer window in the Biological Assessment for the ESA consultation. If an expanded transfer window is part of the biological opinions for that project, Reclamation would also analyze the potential effects of moving water during that period as part of the NEPA process for that project. This future NEPA compliance would be the basis of a decision on the expanded transfer window; this Final EIS/EIR does not include a project description with an extended transfer window.

Comment 10-10

Comment

Comment 7:

Section # 2.2.2.1 Page # 2.5

Issue: The Coordinated Operations Agreement (COA) was renegotiated and has recently been implemented. It is unclear if the analysis provided accounts for this change and it is unlikely that the change was incorporated in this RDEIR/SDEIS.

Specific impact: The potential impact is that the analysis provided does not rely on current operations of the SWP and the CVP Why impact would occur: The entire analysis could be incorrect. Potential changes could be significant with subsequent significant species impacts.

Evidence impact would be significant: This project proposes to conduct transfers when conditions are balanced. COA dictates the respective shares that the CVP and the SWP must release from storage to meet in-basin demands including the State Water Resources Control Board Decision -1641 for implementation of the water quality objectives for the San Francisco Bay/San Joaquin Delta Estuary. While the in-basin demands do not change the switch in percentages each project must release water to meet these demands, it does have an effect in overall operations due to differences in the projects. The SWP has lower storage capacity but higher export capacity while the CVP has higher storage capacity and lower export capacity.

These differences may lead to changes in how reservoirs are refilled with subsequent changes to outflow that may not be reflected in Table 3.7-1 which is the basis of the conclusions that impacts to fisheries resources are less than significant.

CDFW recommends that if the COA was not incorporated into the analysis, the analysis be redone to include the COA since Table 3.7-1 does not accurately reflect current operations.

Response

Please refer to Response to Comment 2-7.

Comment 10-11

Comment

Comment 8:

Section# 3.7 Page# 3.7-1

Issue: "Water transfer actions under the Proposed Action would have a less than significant impact on fisheries resources that may be influenced by Delta outflow, as mean changes in Delta outflow would be small (1.2 percent or lower than baseline depending on month and water year type) in all months and water year types (Table 3.7-1). All cumulative water operations projects affecting Delta exports would be required to meet existing Delta water quality standards (e.g., D-1641) and meet the requirements of the USFWS and NOAA Fisheries BOs for the long-term coordinated operations of the CVP and SWP."

By presenting averages, actual impacts to species may appear to be insignificant. By examining this more thoroughly there is take of listed longfin smelt that must be fully mitigated under CESA.

Specific Impact: While the percentages in given months are small, the total for Above Normal water year types (AN years) is -105.8 thousand-acre feet less outflow from January through June (Table 3.7.1). This would result in a significant impact on CESA listed longfin smelt. Similar but smaller reductions in outflow would occur in all other year types during the January through June period resulting in smaller but cumulatively significant impacts to Longfin smelt.

Why impact would occur: The Kimmerer 2008 regression is a January through June flow-survival relationship utilized to analyze impacts on longfin smelt juvenile recruitment. As per the Kimmerer regression analysis, reduction in outflow will result in take of CESA listed Longfin smelt that must be fully mitigated under CESA. This analysis must be applied to the information presented in Table 3.7.1 to fully analyze the impacts to Longfin smelt. These potentially significant impacts are not offset by minimal summer outflow increases due to carriage water associated with water transfers as the species is not dependent on outflow during this time period.

Evidence impact would be significant: The Kimmerer 2008 analysis was not conducted for this RDEIR/SDEIS; however, because this analysis is an outflow survival dependent relationship the identified reductions in outflow during January through June will result in take of CESA listed Longfin smelt. While the text states that the PA will adhere to the current USFWS and NOAA BOs these do not cover longfin smelt which are a state listed species only. Similar to the previous comments, the current CVP and SWP operating criteria are being revised and this RDEIR/SDEIS will need to be updated to reflect those substantial changes upon implementation of new CVP and SWP operating criteria.

Response

As discussed in the Assessment/Evaluation Methods section of the 2014 Draft EIS/EIR (Section 3.7.2.1.3, p.3.7-21), flow changes of less than 10 percent were considered to be within the noise of modeling outputs and beyond the ability to measure actual changes. The 10 percent threshold was based on the several major legally certified documents in the Central Valley (Trinity River Mainstem Fishery Restoration Record of Decision, December 19, 2000; San Joaquin River Agreement Record of Decision in March 1999; Freeport Regional Water Project Record of Decision, January 4, 2005; Lower Yuba Accord Final EIR/EIS).

The commenter is presumably referring to the Kimmerer et al. (2009) method for X2-abundance analysis, which was subsequently revisited and updated in the context of the California WaterFix analysis for the CESA ITP Application. Application of the updated X2-abundance relationship (described in Appendix 4.D of the California WaterFix ITP application) to the mean X2 values for the Long Term Water Transfers base and proposed action modeling results gives differences in mean predicted Longfin Smelt fall midwater trawl abundance index (proposed action minus base) of -4% in critical years, -3% in dry years, 0% in below normal and wet years, and -1% in above normal years. These differences are insubstantial in relation to the prediction intervals for the estimates, which range from around 60% to nearly 300% of the predicted values, indicating considerable uncertainty in the predictions.

The proposed action is compliant with existing criteria related to Delta outflow; as noted in the 2014 Draft EIS/EIR (p.3.7-32), the State Water Resources Control Board's Water Rights Decision-1641 imposes flow and water quality objectives in the 1995 Bay-Delta Plan upon the SWP and CVP operations to assure protection of beneficial uses in the Delta, including fish such as Longfin Smelt. Because changes in flows in Delta channels are predicted to be insubstantial and there are additional protections for fisheries and aquatic resources already in place under the ESA and D-1641, the impact to Longfin Smelt was assessed to be less than significant; should the State Water Resources Control Board change its Delta outflow criteria under its revisions to the Bay-Delta Plan, operations of the SWP and CVP, including the proposed action, would be required to meet the changed criteria.

Comment 10-12

Comment

ENVIRONMENTAL DATA

CEQA requires that information developed in environmental impact reports and negative declarations be incorporated into a database which may be used to make subsequent or supplemental environmental determinations. (Pub. Resources Code, § 21003, subd. (e).) Accordingly, please report any special status species and natural communities detected during Project surveys to the California Natural Diversity Database (CNDDB). The CNNDB field survey form can be found at the following link: **https://www.wildlife.ca.gov/Data/CNDDB/Submitting-Data**. The completed form can be mailed electronically to CNDDB at the following email address: **CNDDB@wildlife.ca.gov**. The types of information reported to CNDDB can be found at the following link: **https://www.wildlife.ca.gov/Data/CNDDB/Piants-and-Animals**.

Response

The Lead Agencies have not conducted surveys under this process that would result in data for submittal to the California Natural Diversity Database (CNDDB). Reporting of special status species occurrences will be in accordance to VEG and WILD-1. Additionally, any special status surveys will be conducted by permitted personnel with reporting requirements (including CNDDB).

Comment 10-13

Comment

FILING FEES

The Project, as proposed, would have an impact on fish and/or wildlife, and assessment of filing fees is necessary. Fees are payable upon filing of the Notice of Determination by the Lead Agency and serve to help defray the cost of environmental review by CDFW. Payment of the fee is required in order for the underlying project approval to be operative, vested, and final. (Cal. Code Regs., tit. 14, § 753.5; Fish & G. Code, § 711.4; Pub. Resources Code,§ 21089.)

CONCLUSION

CDFW appreciates the opportunity to comment on the RDEIR/SDEIS to assist the SLDMWA in identifying and mitigating Project impacts on biological resources.

Questions regarding this letter or further coordination should be directed to CDFW staff Karen Carpio, Senior Environmental Scientist at (916) 653-3864 or **Karen.Carpio@wildlife.ca.gov**.

Response

SLDMWA will pay the applicable filing fee when filing the Final EIS/EIR.

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