GUIDANCE DOCUMENT
Old and Middle River Flow Management
LTO Implementation
February 24, 2020

I. PURPOSE[1]

This document provides implementation guidance on Old and Middle River (OMR) management pursuant to Section 4.10.5.10 of the U.S. Bureau of Reclamation's (Reclamation) and California Department of Water Resources' (DWR) Proposed Action, and the U.S. Fish and Wildlife Service's (FWS) and NOAA's National Marine Fisheries Service's (NMFS) Biological Opinions and Incidental Take Statements (ITS). The scope of guidance includes the deliverables, schedule, and processes of different agency and stakeholder teams. The primary deliverables are notes from monitoring team meetings, a weekly summary of the hydrologic, operational, and temperature data related to OMR management; an assessment of potential actions for OMR management; and documentation of the operations decisions.

II. OMR Management

This section provides the applicable verbatim language for OMR Management from the Proposed Action, USFWS Incidental Take Statement (ITS), and NMFS ITS.

Proposed Action:

4.10.5.10 OMR Management

Reclamation and DWR propose to operate the CVP and SWP in a manner that maximizes exports while minimizing entrainment of fish and protecting critical habitat. Net flow OMR provides a surrogate indicator for how export pumping at Banks and Jones Pumping Plants influence hydrodynamics in the south Delta. The management of OMR, in combination with other environmental variables, can minimize or avoid the entrainment of fish in the south Delta and at CVP and SWP salvage facilities. Reclamation and DWR propose to maximize exports by incorporating real-time monitoring of fish distribution, turbidity, temperature, hydrodynamic models, and entrainment models into the decision support for the management of OMR to focus protections for fish when necessary and provide flexibility where possible, consistent with the WIIN Act Sections 4002 and 4003, as described below. Estimates of species distribution will be described by multi-agency Delta-focused technical teams.

From the onset of OMR management to the end, Reclamation and DWR will operate to an OMR index no more negative than a 14-day moving average of -5,000 cfs unless a storm event occurs (described below). Grimaldo et al. (2017) indicate that -5,000 cfs is an inflection point in OMR for fish entrainment. OMR could be more positive than -5,000 cfs if additional real-time OMR restrictions are triggered (described below) or constraints other than OMR control exports. Reclamation and DWR propose to operate to an OMR index computed using an equation. An

[1] Upon the California Department of Fish and Wildlife's (CDFW) issuance of a forthcoming Incidental Take Permit to DWR, it is expected that this guidance will need to be revised to incorporate any additional requirements, deliverables, and processes required of DWR.

OMR index allows for shorter-term operational planning and real-time adjustments. Reclamation and DWR will make a change to exports within 3 days of the trigger when monitoring, modeling, and criteria indicate protection for fish is necessary. The 3-day trigger allows for efficient power scheduling.

Onset of OMR Management:

Reclamation and DWR shall start OMR management when one or more of the following conditions have occurred:

- Integrated Early Winter Pulse Protection ("First Flush" Turbidity Event): To minimize project influence on migration (or dispersal) of Delta Smelt, Reclamation and DWR proposes to reduce exports for 14 consecutive days so that the 14-day averaged OMR index for the period shall not be more negative than -2,000 cfs, in response to "First Flush" conditions in the Delta. The population-scale migration of Delta Smelt is believed to occur quickly in response to inflowing freshwater and turbidity (Grimaldo et al. 2009; Sommer et al. 2011). Thereafter, the best available scientific information suggests that fish make local movements, but there is no evidence for further population-scale migration (Polanksy et al. 2018). "First Flush" conditions may be triggered between December 1 and January 31 and include:
    - running 3-day average of the daily flows at Freeport is greater than 25,000 cfs and
    - running 3-day average of the daily turbidity at Freeport is 50 NTU or greater, or
    - real-time monitoring (Appendix C) indicates a high risk of migration and dispersal into areas at high risk of future entrainment.

    This "First Flush" may only be initiated once during the December through January period and will not be required if:

    - spent female Delta Smelt are collected in monitoring surveys.
- Salmonids Presence: After January 1, if more than 5 percent of any one or more salmonid species (wild young-of-year Winter-Run, wild young-of-year Spring-Run, or wild Central Valley Steelhead) are estimated to be present in the Delta as determined by their appropriate monitoring working group based on available real-time data, historical information, and modeling.

Additional Real-Time OMR Restrictions and Performance Objectives:

Reclamation and DWR shall manage to a more positive OMR than -5,000 cfs based on the following conditions:

- Turbidity Bridge Avoidance ("South Delta Turbidity"): After the Integrated Early Winter Pulse Protection (above) or February 1 (whichever comes first) and until a ripe or spent female is detected or April 1 (whichever is first), Reclamation and DWR propose to manage exports in order to maintain daily average turbidity in Old River at Bacon Island (OBI) at a level of less than 12 NTU. The purpose of this action is to minimize the risk to adult Delta smelt in the Old and Middle River Corridor, where they are subject to higher entrainment risks. This action seeks to avoid the formation of a turbidity bridge from the San Joaquin River shipping channel to the south Delta fish facilities, which historically

has been associated with elevated salvage of pre-spawning adult Delta Smelt. If the daily average turbidity at Bacon Island cannot be maintained less than 12 NTU, Reclamation and DWR will manage exports to achieve an OMR no more negative than -2,000 cfs until the daily average turbidity at Bacon Island drops below 12 NTU. However, if 5 consecutive days of OMR less negative than -2,000 cfs do not reduce turbidity at Bacon Island below 12 NTU in a given month, Reclamation and DWR may determine that OMR restrictions to manage turbidity are infeasible, and will instead implement an OMR target that is deemed protective, based on turbidity, adult Delta smelt distribution and salvage, but not a more negative OMR than -5,000 cfs.

Reclamation and DWR recognize that readings at individual sensors or localized groups of sensors can generate spurious results in real-time. To avoid triggering an OMR flow action during a sensor error or a localized turbidity spike that might be caused by local flows or a wind-driven event, Reclamation and DWR will consider and review data from other locations. In the event that the daily average turbidity at OBI is 12 NTU (or greater) and Reclamation and DWR believe that a Turbidity Bridge Avoidance action is not warranted based on additional data sources (isolated and/or wind-driven turbidity event at OBI), Reclamation and DWR will take no additional action and provide the supporting information to the Service within 24 hours.

Larval and Juvenile Delta Smelt: Reclamation and DWR will use results produced by USFWS approved life cycle models to manage the annual entrainment levels of larval/juvenile Delta Smelt. The Service's models will be publicly vetted and peer reviewed prior to March 15, 2020. The USFWS will coordinate with the Delta Fish Monitoring Working Group to identify a Delta smelt recruitment level that Reclamation and DWR can use in OMR management. The life cycle models statistically link environmental conditions to recruitment, including factors related to loss as a result of entrainment such as OMR flows. In this context, recruitment is defined as the estimated number of post-larval delta smelt in June per number of spawning adults the prior February-March.

Reclamation and DWR, in coordination with the Service will operationalize the life cycle model results through the use of real-time monitoring for the spatial distribution of Delta Smelt. On or after March 15 of each year, if QWEST is negative, and larval or juvenile delta smelt are within the entrainment zone of the pumps based on real-time sampling of spawning adults or young of year life stages, Reclamation and/or DWR will run hydrodynamic models and forecasts of entrainment, informed by the EDSM or other relevant survey data to estimate the percentage of larval and juvenile delta smelt that could be entrained. If necessary, Reclamation will manage exports to limit entrainment to be protective based on the modeled recruitment levels. Reclamation and DWR will re-run hydrodynamic models when operational changes or new sampling data indicate a potential change in entrainment risk. This process will continue until the offramp criteria have been met as described in the "End of OMR Management" below. In the event the life cycle models cannot be operationalized in a manner that can be used to inform real-time operations then Reclamation, DWR and the Service will coordinate to develop an alternative plan to provide operational actions protective of this life stage.

- Cumulative Loss Threshold:
    - Reclamation and DWR propose to avoid exceeding cumulative loss thresholds over the duration of the Biological Opinions for:
        - Natural Winter-Run Chinook Salmon (cumulative loss= 8,738)
        - Hatchery Winter-Run Chinook Salmon (cumulative loss= 5,356)
        - Natural Central Valley Steelhead from December through March (cumulative loss= 6,038)
        - Natural Central Valley Steelhead from April 1 through June 15th (cumulative loss= 5,826).

    Natural Central Valley Steelhead are separated into two time periods to protect San Joaquin origin fish that historically appear in the Mossdale trawls later than Sacramento origin fish. The loss threshold and loss tracking for hatchery Winter-Run Chinook Salmon does not include releases into Battle Creek. Loss (for development of thresholds and ongoing tracking) for Chinook salmon are based on length-at-date criteria.

    - The cumulative loss thresholds shall be based on cumulative historical loss from 2010 through 2018. Reclamation's and DWR's performance objectives are intended to avoid loss such that this cumulative loss threshold (measured as the 2010-2018 average cumulative loss multiplied by 10 years) will not be exceeded by 2030.
    - If, at any time prior to 2024, Reclamation and DWR exceed 50% of the cumulative loss threshold, Reclamation and DWR will convene an independent panel to review the actions contributing to this loss trajectory and make recommendations on modifications or additional actions to stay within the cumulative loss threshold, if any.
    - In the year 2024, Reclamation and DWR will convene an independent panel to review the first five years of actions and determine whether continuing these actions are likely to reliably maintain the trajectory associated with this performance objective for the duration of the period.
    - If, during real-time operations, Reclamation and DWR exceed the cumulative loss threshold, Reclamation and DWR would immediately seek technical assistance from USFWS and NMFS, as appropriate, on the coordinated operation of the CVP and SWP for the remainder of the OMR management period. In addition, Reclamation and DWR shall, prior to the next OMR management season, charter an independent panel to review the OMR Management Action consistent with "Chartering of Independent Panels" under the "Governance" section of this Proposed Action. The purpose of the independent review shall be to evaluate the efficacy of actions to reduce the adverse effects on listed species under OMR management and the non-flow measures to improve survival in the south Delta and for San Joaquin origin fish.
- Single-Year Loss Threshold:

- In each year, Reclamation and DWR propose to avoid exceeding an annual loss threshold equal to 90% of the greatest annual loss that occurred in the historical record from 2010 through 2018 for each of:

- Natural Winter-Run Chinook Salmon (loss= 1.17% of JPE)

- Hatchery Winter-Run Chinook Salmon (loss= 0.12% of JPE)

- Natural Central Valley Steelhead from December through March (loss =1,414)

- Natural Central Valley Steelhead from April through June 15 (loss = 1,552)

Natural Central Valley Steelhead are separated into two time periods to protect San Joaquin Origin fish that historically appear in the Mossdale trawls later than Sacramento origin fish. The loss threshold and loss tracking for hatchery Winter-Run Chinook Salmon does not include releases into Battle Creek. Loss (for development of thresholds and ongoing tracking) for Chinook salmon are based on length-at-date criteria.

- During the year, if Reclamation and DWR exceed the average annual loss from 2010 through 2018, Reclamation and DWR will review recent fish distribution information and operations with the fisheries agencies at WOMT and seek technical assistance on future planned operations. Any agency may elevate from WOMT to a Directors discussion, as appropriate.

- During the year, if Reclamation and DWR exceed 50% of the annual loss threshold, Reclamation and DWR will restrict OMR to a 14-day moving average OMR index of no more negative than -3,500 cfs, unless Reclamation and DWR determine that further OMR restrictions are not required to benefit fish movement because a risk assessment shows that the risk is no longer present based on real-time information.

- The -3500 OMR operational criteria adjusted and informed by this risk assessment will remain in effect for the rest of the season. Reclamation and DWR will seek NMFS technical assistance on the risk assessment and real-time operations.

- During the year, if Reclamation and DWR exceed 75% of the annual loss threshold, Reclamation and DWR will restrict OMR to a 14-day moving average OMR index of no more negative than -2,500 cfs, unless Reclamation and DWR determine that further OMR restrictions are not required to benefit fish movement because a risk assessment shows that the risk is no longer present based on real-time information.

- The -2500 OMR operational criteria adjusted and informed by this risk assessment will remain in effect for the rest of the season. Reclamation and

DWR will seek NMFS technical assistance on the risk assessment and real-time operations.

- Risk assessments (identified above): Reclamation and DWR will evaluate and adjust OMR restrictions under this section by preparing a risk assessment that considers several factors including, but not limited to, real-time monitoring, historical trends of salmonids exiting the delta, entering the south delta, fish detected in salvage, and relevant environmental conditions. Risks will be measured against the potential to exceed the next single year loss threshold. Reclamation and DWR will share its risk assessment and supporting documentation with USFWS and NMFS, seek their technical assistance, discuss the risk assessment and future operations with WOMT at its next meeting, and elevate to the Directors as appropriate.

- If, during real-time operations, Reclamation and DWR exceed the single-year loss threshold, Reclamation and DWR would immediately seek technical assistance from USFWS and NMFS, as appropriate, on the coordinated operation of the CVP and SWP for the remainder of the OMR management period. In addition, Reclamation and DWR shall, prior to the next OMR management season, charter an independent panel to review the OMR Management Action consistent with "Chartering of Independent Panels" under the "Governance" section of this Proposed Action. The purpose of the independent review shall be to evaluate the efficacy of actions to reduce the effects on listed species under OMR management and the non-flow measures to improve survival in the south Delta and for San Joaquin origin fish.

Reclamation and DWR propose to continue monitoring and reporting the salvage at the Tracy Fish Collection Facility and Skinner Delta Fish Protection Facility. Reclamation and DWR propose to continue the release and monitoring of yearling Coleman NFH late-fall run as yearling Spring-Run Chinook Salmon surrogates.

Storm-Related OMR Flexibility:

Reclamation and DWR may operate to a more negative OMR up to a maximum (otherwise permitted) export rate at Banks and Jones Pumping Plants of 14,900 cfs (which could result in a range of OMR values) to capture peak flows during storm-related events. A storm related event occurs when precipitation falls in the Central Valley and Delta watersheds and Reclamation and DWR determine that the Delta outflow index indicates a higher level of flow available for diversion. Reclamation and DWR will define storm-related events in the first year of implementation of this proposed action. Reclamation and DWR will continue to monitor fish in real-time and will operate in accordance with "Additional Real- time OMR Restrictions," above. Under the following conditions, Reclamation and DWR shall not pursue storm-related OMR flexibility for capturing peak flows from storm-related events if:

- Integrated Early Winter Pulse Protection (above) or Additional real-time OMR restrictions (above) are triggered. Under such conditions, Reclamation and DWR have already determined that more restrictive OMR is required.

- An evaluation of environmental and biological conditions indicates more negative OMR would likely cause Reclamation and DWR to trigger an Additional real-time OMR restriction (above).
- Salvage of yearling Coleman NFH late-fall run as yearling Spring-Run Chinook Salmon surrogates exceeds 0.5% within any of the release groups.
- Reclamation and DWR identify changes in spawning, rearing, foraging, sheltering, or migration behavior beyond those anticipated to occur under OMR management.

Reclamation and DWR will continue to monitor conditions may resume management of OMR to no more negative than -5,000 cfs if conditions indicate the above offramps are necessary to avoid additional adverse effects. If storm-related flexibility causes the conditions in "Additional Real-Time OMR Restrictions", Reclamation and DWR will implement additional real-time OMR restrictions.

End of OMR Management:

OMR criteria may control operations until June 30 (for Delta Smelt and Chinook salmon), until June 15 (for steelhead/rainbow trout), or when the following species-specific off ramps have occurred, whichever is earlier:

- Delta Smelt: when the daily mean water temperature at CCF reaches 77°F for 3 consecutive days;
- Salmonids:
    - when more than 95 percent of salmonids have migrated past Chipps Island, as determined by their monitoring working group, or
    - after daily average water temperatures at Mossdale exceed 71.6°F for 7 days during June (the 7 days do not have to be consecutive).

Real-Time Decision Making and Salvage Thresholds

When real-time monitoring demonstrates that criteria in "Additional Real-Time OMR Restrictions and Performance Objectives" are not supported, then Reclamation and DWR may confer with the Directors of NMFS, USFWS, and CDFW if they desire to operate to a more negative OMR than what is specified in this section. Upon mutual agreement, the Directors of NMFS and USFWS may authorize Reclamation and DWR to operate to a more negative OMR than the "Additional Real-Time OMR Restrictions", but no more negative than -5000 cfs. This process would be separate from the risk analysis process referenced above.

USFWS ITS:

16.0 INCIDENTAL TAKE STATEMENT

Amount or Extent of Anticipated Take

In the BiOp, the Service has determined that incidental take is reasonably certain to occur as follows:

The Service anticipates that the PA will result in the incidental take of individual delta smelt due to hydrodynamic effects caused by the operation of the CVP and SWP export facilities in the south Delta, the fish facilities in the south Delta, and other CVP or SWP water diversion and water distribution systems in other parts of the Delta and Suisun Marsh. Regarding the CVP and SWP export of water from the Delta, the Service anticipates take in the form of kill or harm of all delta smelt within the south Delta affected by water operations and other areas of the Delta affected by reduced habitat quality.

Incidental take associated with this action is expected in the following forms: mortality and harm of delta smelt adults, juveniles, and larvae. It is difficult to determine the number of individuals that could be injured or killed (including harm as a result of significant habitat modification) because free-swimming aquatic animals are difficult to observe in large water bodies and because delta smelt have become very rare in recent years. The Service anticipates injury and mortality of individual delta smelt will occur as a result of entrainment and whenever habitat conditions do not support the successful completion of the species' full life cycle.

Surrogate Approach

In accordance with 50 CFR 402.14(i)(1)(i), a surrogate may be used to express the amount or extent of anticipated incidental take if the BiOp or ITS describes the causal link between the surrogate and anticipated take, explains why it is not practical to express the amount or extent of anticipated take or to monitor take-related impacts in terms of individuals, and sets a clear standard for determining when the level of anticipated take has been exceeded.

Surrogates are used for this ITS because, as described throughout this BiOp, it is impossible to accurately quantify and monitor the amount or number of individuals that are expected to be incidentally taken as a result of the PA due to the variability associated with the effects of the PA, the declining population size of delta smelt, difficulty in detecting individuals entrained or impinged, annual variations in the timing of various parts of the species' life cycle, and variation in how individual fish use habitat within the Action Area.

The Service is using the ecological conditions described below as the incidental take surrogates for individual delta smelt.

Take from South Delta Entrainment

The Service has determined for the purposes of this BiOp that delta smelt that enter the Old and Middle river corridors are entrained whether or not they survive long enough to reach the CVP or SWP fish facilities. Adult delta smelt have substantial capacity to control their distribution in the Bay-Delta. Thus, some adult delta smelt may 'entrain' themselves during their winter dispersal, while others may cue on hydrodynamics resulting from the export of water while moving up the San Joaquin River and be entrained due to project operations. Delta smelt larvae have some ability to control their distribution but less than older, more competently swimming life stages, making them more vulnerable to tidal currents and the net displacement (or flow) of water over multiple tidal cycles. No delta smelt life stage is known to seek cover in beds of aquatic vegetation, such as those that have proliferated around much of the shallower waterways in

Delta, and particularly in the south Delta and its associated flooded islands. Rather, delta smelt are attracted to turbidity in open-water habitats. The hydrodynamic conditions indexed by net negative flow in Old and Middle rivers can affect the dispersal of turbidity into and through the South Delta. During winter dispersal and spring spawning, when turbidity of more than 12 NTU is present in Old and Middle rivers, adult delta smelt may be more likely to move into these channels, become entrained, and become subject to the reduced quality habitat in the channels, adjoining canals, and associated flooded islands (e.g., Mildred Island) due to operations, or be injured or killed as a result of entering the export facilities. Additionally, entrained adult delta smelt may spawn in areas where their progeny will be lost to the population due to some unquantifiable combination of predation loss associated with submerged vegetation or eventual transport to the CVP and SWP facilities.

Therefore, the level of turbidity present in the South Delta can be causally linked to the level of incidental take of adult delta smelt and some of their offspring due to entrainment caused by operations. The analysis of effects in this BiOp is based, in part, on the PA avoiding the formation of a continuous band of turbidity from the Sacramento River to the export facilities to minimize the number of adult delta smelt that disperse into unfavorable habitat conditions, thus minimizing entrainment of pre-spawning adult delta smelt and the subsequent loss of larval and juvenile delta smelt later in the spring. In addition to potential losses of larvae that may hatch from locations in the south Delta, current information indicates that the hydrodynamic conditions indexed by net negative flow in Old and Middle rivers are one factor that can affect the dispersal of delta smelt larvae spawned outside the south Delta into the channels, adjoining canals, and associated flooded islands of the south Delta (e.g., Mildred Island) where the Service has determined they are considered entrained for the purposes of this BiOp.

The following specific ecological conditions reflect the conditions commensurate with the level of incidental take through entrainment that is anticipated in this BiOp.

1. During the early winter, if and when the single annual, system-wide first flush has been identified pursuant to the criteria identified in the PA, net negative flow in Old and Middle rivers should be held to no greater than a 14-day averaged OMR of -2000 cfs for 14 days to prevent turbidity from being pulled into the south Delta and creating a continuous band of turbidity from the Sacramento River to the export facilities.

2. During the winter and early spring, net negative OMR flows should be held at levels no more negative than a 14-day averaged OMR of -2000 cfs, for at least 5 days, when turbidity at the Bacon Island monitoring station (OBI) is a daily average of 12 NTU or greater. To avoid triggering an OMR flow action during a sensor error or a localized turbidity spike that might be caused by local flows or a wind-driven event, Reclamation and DWR will consider and review data from other locations. In the event that the daily average turbidity at OBI is 12 NTU (or greater) and Reclamation and DWR believe that a Turbidity Bridge Avoidance action is not warranted based on additional data sources (isolated and/or wind-driven turbidity event at OBI), Reclamation and DWR will take no additional action and provide the supporting information to the Service within 24 hours.

3. During March-June, negative OMR flows should be managed at no more negative than -5000 cfs on a 14-day moving average or at the flow determined through use of Service-approved life cycle models to limit recruitment to stable levels.

Injury and mortality of adult, larval, and juvenile delta smelt are anticipated to be minimized due to active real-time management of OMR flow and turbidity in the south Delta as described in the PA. Incidental take resulting from operations of all south Delta CVP and SWP facilities is addressed in the ecological conditions described above consistent with the index equation approach to OMR Management described in the PA. If the conditions described above are not

maintained, the amount or extent of the anticipated level of incidental take will be considered exceeded and reinitiation will be required pursuant to 50 CFR 402.16.

Effect of the Take

In the accompanying biological opinion, the Service determined that the level of anticipated take is not likely to result in jeopardy to the delta smelt.

Reasonable and Prudent Measures

The Service has determined that the following reasonable and prudent measures are necessary and appropriate to minimize impacts of incidental take of the delta smelt:

1. Minimize the adverse effects of the south Delta pumping facilities on delta smelt.

2. […]

3. […]

4. […].

Terms and Conditions

In order to be exempt from the prohibitions of section 9 of the Act, Reclamation and DWR shall comply with the following terms and conditions, which implement the reasonable and prudent measures described above and outline required reporting/monitoring requirements. These terms and conditions are nondiscretionary.

The following Terms and Conditions implement Reasonable and Prudent Measure Number 1:

1. Reclamation and DWR shall ensure the frequency of sampling for the south Delta export facilities (Banks and Jones) will be at least 25% of the time the export facilities are in operation. If this cannot be achieved, the Service shall be notified on a real-time basis.

2. Reclamation and DWR shall update and provide fish salvage protocols for Skinner Fish Facility and the Tracy Fish Collection Facility to the Service within 1 year of the issuance of this

biological opinion. Annual reports of salvage activities will be submitted to the Service documenting the operation and monitoring activities of the fish salvage facilities.

3. If it is determined that an independent panel is necessary to determine the efficacy of the proposed OMR Management actions, Reclamation shall seek technical assistance from the Service on development of the charter for that panel.

4. If Reclamation or DWR determine that a Turbidity Bridge Avoidance action is not necessary because the event is not believed to be related to an actual turbidity bridge, they will provide the supporting information, including the reason why the action is not warranted, within 24 hours, and the Service will respond within 24 hours. The action will be initiated until Reclamation, DWR, and the Service are in agreement that an action is not necessary.

5. Reclamation and DWR shall monitor OMR flow and turbidity levels (the surrogate parameter identified in the Amount or Extent of Anticipated Take section) at locations identified in the PA on a real-time basis. Reclamation and DWR shall ensure monitoring stations have appropriate redundancy to reduce the likelihood of data collection failure due to malfunction. This information shall be made available to the Service on a real-time basis to document the management of the system. This can be done through Bay Delta Live or a similar system. If the Service determines that conditions have led to the exceedance of anticipated take, reinitiation would be required.

6. Reclamation and DWR shall use Service life cycle models or other Service-approved models when available for the purposes of estimating proportion of the population affected by entrainment.

7. Reclamation shall seek technical assistance from the Service on the development of the charter for the independent panel for the proposed Four-Year Review of the "OMR management and measures to improve survival through the south Delta".

8. Reclamation and DWR will comply with all monitoring and reporting requirements as identified in the Reporting Requirements section, below.

Reporting Requirements

In order to monitor whether the amount or extent of incidental take anticipated from implementation of the PA is approached or exceeded, Reclamation shall adhere to the following reporting requirements. Should this anticipated amount or extent of incidental take be exceeded, Reclamation must reinitiate formal consultation as per 50 CFR 402.16.

1. Comply with reporting requirements included in the above Terms and Conditions.

2. […]

3. The Service must be notified within 24 hours of the finding of any injured or dead delta smelt or any unanticipated damage to its habitat associated with the PA. Notification will be made to the contact below and must include the date, time, and precise location of the individual/incident clearly indicated on a U.S. Geological Survey 7.5 minute quadrangle or other maps at a finer scale, as requested by the Service, and any other pertinent information. When an injured or dead individual of the delta smelt is found, Reclamation and DWR shall follow the steps outlined in the Disposition of Individuals Taken section below.

NMFS ITS:

Section 13.3.5.3 CVP and SWP Pumping Facilities

At year five post-implementation of this Opinion, Reclamation and NMFS shall revisit the anticipated level of incidental take with new science and an expected new population-level index to determine the appropriate scalable take level.

Table 1. Maximum anticipated annual incidental take levels of listed species at the Bay-Delta pumping facilities.

Species	Measurement	Maximum Annual Quantity
Winter-run Chinook salmon	Loss of natural winter-run	1.3% of the juvenile production estimate (JPE) on a three-year rolling average or 2.0% of the JPE in any single year.
Winter-run Chinook salmon	Loss of hatchery winter-run - Sacramento River	0.8% of the estimated hatchery JPE (fish surviving to the Delta) from LNSFH released into the upper Sacramento River on a three-year rolling average or 1.0% of the JPE in any single year.
Winter-run Chinook salmon	Loss of hatchery winter-run - Battle Creek	0.8% of the estimated hatchery JPE (fish surviving to the Delta) from LNSFH released into Battle Creek on a three-year rolling average or 1.0% of the JPE in any single year.
CV Spring-run Chinook salmon - yearlings	Loss of late fall-run Chinook salmon from CNFH	1% of the estimated number of late fall-run Chinook salmon released from CNFH in each surrogate release group released into Battle Creek.
CCV Steelhead (naturally-produced)	Loss of CCV steelhead December 1 - March 31	1,571 juveniles as a three-year rolling average or total loss of 2,760 in any single year
CCV Steelhead (naturally-produced)	Loss of CCV steelhead April - June 15	1,725 juveniles as a three-year rolling average or total loss of 3,040 in any single year
Southern DPS Green Sturgeon	Salvage of sDPS Green Sturgeon	74 juveniles

Section 13.5
RPM 5: Reclamation and DWR shall minimize the impact of the amount or extent of incidental take of listed species during operations of the Bay-Delta Division.

a. […]

b. Reclamation and DWR shall monitor the salvage and loss of winter-run Chinook salmon, CV spring-run Chinook salmon, fall-run Chinook salmon, late fall-run Chinook salmon, sDPS green sturgeon, and CCV steelhead, associated with the operation of the CVP's Jones and SWP's Harvey Banks pumping facilities.

   i. Reclamation and DWR shall monitor and calculate salvage and loss for winter-run Chinook salmon, CV spring-run Chinook salmon, CV fall-run Chinook salmon, CV late fall-run Chinook salmon, CCV steelhead, and salvage of sDPS green sturgeon at the Tracy Fish Collection Facility and Skinner Delta Fish Protective Facility.

      (a) Reclamation and DWR shall prepare and submit to NMFS daily reports from October 1 through June 30 of each water year (or provide data online) regarding the observations of both salmonids and sDPS green sturgeon in the fish salvage facilities. Daily salvage sheets and the operational information needed to calculate salvage and loss shall be provided to NMFS (to a list of recipients updated each water year) or made available online. If, during the period from July 1 to September 30, salmonids and/or sDPS green sturgeon are observed in salvage, Reclamation and/or DWR shall notify NMFS through electronic mail and include the daily salvage sheets and operational information, or direct NMFS to where this information is available online.

      (b) During the October through June period of each water year, DWR and Reclamation shall prepare and submit to NMFS, Delta operations for salmonids and sturgeon and other relevant technical teams weekly reports summarizing salvage and loss over the previous week and for the water year to date (or provide data online).

      (c) No later than December 31, Reclamation and DWR shall submit to NMFS an annual report summarizing salvage and loss over the previous water year (October 1 to September 30).

   ii. Reclamation and DWR shall undertake tissue sampling programs from natural origin salmonids, and coded wire tag samples from adipose fin-clipped juvenile winter-run Chinook salmon, CV spring-run Chinook salmon, and CCV steelhead and CV late-fall run Chinook salmon at the Tracy Fish Collection Facility and Skinner Delta Fish Protective Facility, for genetic analysis or tag removal/reading pursuant to appropriate sampling protocols and statistical power analyses.

      (a) Reclamation and DWR shall submit incidental take reports from Tracy Fish Collection Facility and Skinner Delta Fish Protective Facility by December 31 of each year, to include the genetic results of the tissue samples.

(b) Reclamation and DWR shall develop and submit for review and concurrence by NMFS a plan for tissue and whole fish or head processing and storage by December 31, 2020.

c. Reclamation and DWR shall minimize incidental take through the application of best management practices at the fish salvage facilities by developing coordinated protocols within 18 months of the effective date of this Opinion for the following three topics. Be the effective date of the Opinion, Reclamation and DWR shall provide the protocols currently being used.

i. Protocols for fish sampling and handling (from salvage through release), including a description of training procedures and the process for quality assurance and quality control of data.

ii. Protocols for daily estimation of salvage or loss for each ESA-listed anadromous fish that include relevant calculations and identify the data and information sources necessary to perform the relevant calculations used to estimate fish salvage or loss. Each facility shall include in their protocol a process to provide to NMFS, FWS, CDFW, DWR, and Reclamation staff the relevant data and information necessary to calculate fish salvage or loss. The protocol should specify whether and how pumping will be restricted during any salvage disruption, and whether and how salvage disruptions will be reflected in the estimation of salvage or loss. The protocol should include procedures used to implement the single year and cumulative loss thresholds for Delta operations.

iii. Procedures for reporting salvage and loss for each ESA-listed anadromous fish (or relevant surrogate), including a description of the general content, frequency, and distribution of reports. Salvage and loss shall be reported daily (excepting weekends and holidays) from October 1 through June 30 and DWR and Reclamation shall submit to NMFS an annual report summarizing salvage and loss over the previous water year no later than December 31 of each year.

RPM 7: Reclamation and DWR shall monitor and report the amount and extent of incidental take described in Section 2.1 as necessary to implement this Opinion.

a. Reclamation and DWR shall monitor the amount and extent of incidental take through the continued use of programs and processes described in Appendix [C] (Should be C). Reclamation and DWR also shall annually maintain and update Appendix [C]G (should be C) as appropriate to describe the intended monitoring programs and how they will be used to monitor the amount and extent of take, how they will be applied to CVP and SWP water operation decision making and how they will be used for validation and effectiveness monitoring of Collaborative Planning actions.

III. DELIVERABLES

Deliverables resulting from this effort follow the coordination described in Appendix C of the Proposed Action, and include the Monitoring Team notes, Fish and Water Operations Outlook and assessments. Section IV herein describes the processes to achieve the deliverables. Agendas are attached that describe the expected topics for the monitoring teams and the contents for the notes.

Fish and Water Operations Outlook

Information on upcoming water operations and the relevant actions for protecting fish species. This information supports a WOMT meeting and stakeholder coordination.

Salmon Monitoring Team Notes

Results from discussion on the status of species, the exposure to operation of the CVP and SWP, and the potential sensitivity to changes to behaviors.

Smelt Monitoring Team Notes

Results from discussion on the status of species, the exposure to operation of the CVP and SWP, and the potential sensitivity to changes to behaviors.

Assessment – Old and Middle River Management
Technical analyses to support on operation for OMR including actions to meet performance measures for salmon and steelhead; actions to manage environmental surrogates for Delta Smelt; and actions for storm-related flexibility.

IV. PROCESS

Reclamation and/or DWR will convene and facilitate the teams and workgroup, to include:

- meeting scheduling and coordination,
- agenda development and distribution,
- coordinate preparation of presentation materials,
- take notes, and
- post notes and reports (including annual reports) online

A. Monitoring Teams

For the purpose of OMR Management, the Salmon Monitoring Team and Smelt Monitoring Team will each meet weekly as early as November 1 through June 30 of the water year, typically on Tuesday. The Teams will include representatives from federal and state agencies and will provide information to Reclamation and DWR on species abundance, species distribution, life stage transitions, and relevant physical parameters. The Teams' main focus is to review and comment on Reclamation's preliminary assessment, and evaluate hydrologic, operational, fishery, and water quality data related to OMR management as further described in the agendas (see BOX 1 for Salmonid Monitoring Team agenda and BOX 2 for Smelt Monitoring Team agenda). The results of the Salmonid and Smelt monitoring team discussions will be captured in notes that include the status of species, the exposure to operation of the CVP and SWP, and the potential sensitivity to environmental and operational changes. Typically, draft monitoring team notes will be distributed by Reclamation to the teams for review and edits by close of business the day of the meeting, edits will be provided to Reclamation within 2 business days of the meeting, and notes will be finalized and posted on Reclamation's website four business days after the meeting. Information from the monitoring team notes is expected to be reflected in other deliverables such as the Fish and Water Operations Outlook and Assessment.

B. Assessment for Old and Middle River Management

Reclamation and DWR will undertake a weekly assessment (see BOX 3) of intended real-time operational actions to evaluate the likelihood of exceeding the single-year loss thresholds including actions to reduce the future likelihood of exceeding the single-year loss thresholds for salmon and steelhead and manage environmental surrogates for Delta Smelt. Also, if a single-year loss threshold is exceeded, Reclamation and DWR will evaluate and adjust OMR restrictions by preparing an assessment measured against the potential to exceed the next single-year loss threshold using the same template (see BOX 3).

The assessments will include:

- current and projected operational actions and environmental conditions
- population status
- exposure to real-time operations and potential sensitivity to intended real-time operationa actions
- risk to not meeting proposed action and ITS requirements
- evaluation of alternative operations, if any

Reclamation and DWR will use information from the monitoring teams, apply models, and provide the assessment to WOMT by Tuesday afternoon for discussion at the Wednesday WOMT meeting.

C. Water Operations Management Team (WOMT)

The Smelt Monitoring and Salmon Monitoring Team will provide weekly notes to Reclamation and DWR, which will be used in assessments and final weekly operational outlooks provided to WOMT.

D. Updates to Guidance Document

It is expected that as this guidance is being implemented there will be necessary revisions to the document to provide further clarification and refinement. Reclamation and DWR, with technical assistance from the FWS, NMFS, and CDFW, commit to reviewing this implementation guidance following each OMR management season, at a minimum. to identify and incorporate any necessary revisions.

BOX 1: SALMON MONITORING TEAM AGENDA

Date

Roster

Agency, Office, Name, Alternate(s)

Topics

1. Introductions
2. Relevant Actions and Triggers, e.g. OMR Onset, Salvage Performance Measures, OMR Offramp
3. Operations- Previous and Outlook
4. Review of Environmental Data (OMR: index and USGS tidally filtered, water temperature, turbidity)
5. Fish Abundance, Distribution, and Life stage
    a. Upper Sacramento River Fish Monitoring (redd counts and sampling at rotary screw traps)
    b. Lower Sacramento and Delta Fish Monitoring (sampling in trawls and beach seines)
    c. Migration Status: Estimated percentage of the population upstream of Knight's Landing, In the Delta, and Past Chipps Island for winter run, spring run, and steelhead
    d. Migration Cues: Other factors and indicators of fish distribution and life stage
    e. Delta Distribution: Estimated Risk of Entrainment based on percentages of the population in different strata within the Delta
6. Fish Exposure and Behavioral Cues
    a. Historical Patterns (Comparison of abundance, timing, and loss to prior years)
    b. Current Conditions (e.g. Analysis, DSM2 Modeling, Entrainment Projections)
    c. Sensitivity to Operational Actions
7. Additional Considerations
8. Next Meeting

Materials

9. Preliminary Assessment

BOX 2: SMELT MONITORING TEAM AGENDA

Date

Roster

Agency, Office, Name, Alternate(s)

Topics

1. Introductions
2. Relevant Actions and Triggers (e.g. OMR Onset, OMR Offramp)
3. Operations- Previous and Outlook
4. Review of Environmental Data (OMR: index and USGS tidally filtered, water temperature, turbidity)
5. Fish Abundance, Distribution, and Life stage (i.e. Delta and Longfin Smelt)
    a. Survey updates (counts by regions, and body conditions)
    b. Salvage monitoring
    c. Migration Cues: Other factors and indicators of fish distribution and life stage
6. Fish Exposure and Behavioral Cues
    a. Historical Patterns (Comparison of abundance and timing to prior years)
    b. Current Conditions (i.e. PTM, turbidity modeling)
    c. Sensitivity to Operational Actions
7. Additional Considerations
8. Next Meeting

Materials

- Preliminary Assessment

BOX 3: ASSESSMENT FOR OLD AND MIDDLE RIVER FLOW MANAGEMENT

The information and modeling tools identified in below are not intended to be exhaustive, nor does it preclude Reclamation and/or DWR from utilizing other information and modeling tools to inform their assessments.

Operational Conditions

Water Operations Conditions

- Antecedent Actions, e.g. DCC Closure, Triggers such as First Flush, D-1641, Etc.
- Current Controlling Factor(s)
- Water Temperatures (Clifton Court, Mossdale, 3-Station Average (Mossdale, Antioch, Rio Vista)
- Tidal Cycle (neap/spring)
- Turbidity (Bacon Island, Freeport)
- Salinity (Location of X2)

Water Operations Outlook

- Meteorological Forecast
- CVP/SWP operations (e.g. diversions, releases, planned outages)
- Assumptions

Projection

Date, DCC Status, Freeport Flows, Vernalis Flows, OBI Turbidity, Exports, OMR
Storm Event Projection

Winter-Run Chinook Salmon

Cohort Status

JPE/Hatchery Release
Distribution, Wild Sacramento, LSNFH Releases, Battle Creek
% Of Juveniles Upstream of the Delta
% In Delta
% Past Chipps Island

Exposure

Sensitivity to Entrainment into the Central Delta from the Sacramento River and Western Delta

- In-Delta Distribution of Fish
- Distributional monitoring surveys, acoustic telemetry
- Survey Trend Analysis (Historical Timing)
- Hydraulic Footprint
- Predictive Models (e.g. STARS Model, Enhanced PTM (in progress))

Sensitivity to Entrainment into the South Delta from the San Joaquin and Central Delta

- In-Delta Distribution of Fish
- Distributional monitoring surveys, acoustic telemetry
- Hydraulic Footprint
- Predictive Models (Enhanced PTM (In Development))

Sensitivity to Entrainment in Salvage from the South Delta

- Monitoring Team In-Delta Distribution of Fish

- Distributional monitoring surveys, acoustic telemetry
- Salvage Trend Analysis (Historical Timing)
- Predictive Modeling (Survival Analysis (e.g. Zeug and Cavallo CWT Model, In Development); Tillotson Entrainment Model (In Development); Enhanced PTM, (In Development))

Evaluate

- After January 1, are more than 5% of juveniles from one or more salmonid species present in the Delta?
- Does the action impact fish movement and change the potential distribution of fish?
- How much loss has occurred in past week?
- What is the likelihood of increased loss exceeding the next single year loss threshold (75%, 90%) based on population distribution, abundance, and behavior of fish in Delta?
- If a single-year loss threshold has been exceeded, do continued OMR restrictions benefit fish movement based on real-time information?
- If OMR is more negative than -5,000, are there changes in spawning, rearing, foraging, sheltering, or migration behavior beyond those anticipated to occur under OMR management at -5,000?

Intended Real-Time Operational Action

Spring-Run Chinook Salmon
[similar to winter-run, includes additional tributaries from tributary-specific teams, e.g. Clear Creek]

Steelhead
[similar to winter-run, includes additional tributaries]

Green Sturgeon

Population Status

Exposure

Intended Real-Time Operational Action

Delta Smelt

Cohort Information

- Abundance estimates and trends
- Modeled Distribution (LCM historical model based on seasonal environmental conditions(In Development)
- Biological Conditions (Spawned/Unspawned)

Exposure

- Monitoring Team information on Distribution of Fish (historical model of adult distribution)
- Distribution Monitoring Surveys
- Survey and Salvage Trend Analysis (Historical Timing)

- DSM2-PTM outputs (informed by adult distribution, larval distribution, or LCM historical model of larval entrainment
- Temperature conditions
- Turbidity conditions

Evaluation

- Between December 1 and January 31, has any first flush condition been exceeded?
- Do DSM have a high risk of migration and dispersal into areas at high risk of future entrainment? (December 1- January 31)
- Has a spent female been collected?
- If OMR of -2000 does not reduce OBI turbidity below 12NTU, what OMR target is deemed protective between -2000 and -5000?
- If OBI is 12NTU, what do other station locations show?
- If OBI is 12NTU, is a turbidity bridge avoidance action not warranted? What is the supporting information?
- After March 15 and if QWEST is negative, are Larval or juvenile DSM within the entrainment zone of the CVP and SWP pumps based on surveys?
- What is the OMR level to manage the annual larval entrainment based on Delta Smelt recruitment level from the FWS LCM? How does the information from the real-time spatial distribution of DSM operationalize the LCM?
- What do hydrodynamic models, informed by EDSM or other relevant data, suggest the estimated percentage of larval and juvenile DSM that could be entrained may be?

Intended Real-Time Operational Action

Longfin Smelt
[Similar to Delta Smelt]

BOX 4: Weekly Water and Fishery Operational Outlook

DRAFT For discussion 1/24/20

Weekly Operational Outlook

This Week's (1/21/19-1/27/19) Weather:

Light to Moderate Precipitation Today 1/21 into Tonight. Dry conditions return for most of week. Chance of wet weather pattern developing late next weekend.

Tributary/Division	Proposed Operational (Ranges)	Environmental and Fish Conditions Outlook (January 13-20, 2020)
Clear Creek	Whiskeytown Release: 275 cfs Temperature at Igo: N.A.	SCS eggs in gravel, hatching has begun FCS eggs in gravel, no hatching yet STH spawning to start soon.
Sacramento R	Shasta Storage: 3.35 MAF Shasta Release: 5000 cfs Temperature at Control Point (currently Ball's Ferry): N.A.	N.AWCS outmigrating GST adults outmigrating SCS eggs in gravel, hatching has begun FCS eggs in gravel, no hatching yet STH spawning to start soon.
Feather	Oroville Storage: 2.13 MAF Oroville Release to Feather: 1,750-2,000 cfs	SCS eggs in gravel, hatching has begun FCS eggs in gravel, no hatching yet STH spawning to start soon.
American R	Folsom Storage: .48 MAF Nimbus Release to American: 2,000 cfs Temperature at Watt Avenue: N.A.	SCS eggs in gravel, hatching has begun FCS eggs in gravel, no hatching yet STH spawning to start soon.
Stanislaus R	New Melones Storage: 1.98 MAF Goodwin Release to Stanislaus: 800 cfs OBB Temperature: N.A.	FCS eggs in gravel, no hatching yet STH spawning to start soon.
Delta	Freeport: 15,000-16,000 cfs Vernalis: 2,000-2,200 cfs Delta Outflow index: 10,000-14,000 cfs JPP Export: 4,200 cfs CC Export: 2,100 cfs OMR Index Daily Value: -4,800 to -5,100 cfs X2 positions: 80 km QWEST: 0 to -2,000 cfs DCC: Closed	53-67% WCS present 40-45% SCS present STH outmigrating DSM: Not in high entrainment zone LFS: Not in high entrainment zone GST: Uncertain

Species/run	Threshold	Current Status	Weekly Trend	Updated through
Natural Winter-run Chinook cumulative loss	1% of the Juvenile Production Estimate = to be determined	Loss = 0 (based on LAD until genetic results received)	N/A	01/20/2020
Winter run and Older Chinook daily loss density	1) Interim JPE based trigger, first stage: **5.23** genetic WRC and yearling SRC/TAF 2) Interim JPE based trigger trigger second stage: **10.45** genetic WRC and yearling SRC/TAF 3) 8 fish/TAF: first stage trigger IV.3 15 fish/TAF: second stage trigger IV.3	Weekly Density range = 0 to 0.22 fish/TAF	Increasing	01/20/2020
Hatchery Winter-run Chinook cumulative loss	0.5% of each release group Trigger (Action IV.2.3): TBD Incidental Take Limits (1% of estimated # of survivors to Delta): TBD Have not been released yet	Not applicable	N/A	01/20/2020
Steelhead salvage density	First level trigger: > 8 fish/TAF Second level trigger: > 12 fish/TAF	Weekly Density range = 0 to 0 fish/TAF	N/A	01/20/2020
Spring-run Chinook surrogates, tagged fish	0.5% of each release group; 1. 12-9-2019: 84,869 (424.3) 2. 12-18-2019: 77,672 (388.4) 3. 01-13-2020: 77,866 (389.3) ITL 1% of release	1. 15.88 2. 25.03 N/A	Increasing	01/10/2020
Steelhead, non-clipped	Cumulative salvage = 3,000 fish	Salvage = 0	N/A	01/20/2020
Green sturgeon	Cumulative salvage = 74	Salvage = 0	N/A	01/20/2020
Delta Smelt	No First Flush identified Daily Avg. < 12 NTU at OBI March-June: OMR no more negative than -5000 cfs	Turbidity < 5NTU	No Change expected	12/17/2019
Longfin Smelt	Dec.- Feb.: Cumulative Salvage Index (CSI) >5 OMR Advice Warranted Jan. - July: larvae found in at least 8 of 12 Stations Catch per tow exceeds 15 in at least 4 stations Larvae are detected at station 716	CSI < 5 Advice not Warranted	No Change expected	12/17/2019