RECLAMATION

Managing Water in the West

Environmental Assessment

Sutter National Wildlife Refuge Reclamation District No. 1004 Refuge Level 2 Water Conveyance Pilot Project - Extension for Year 3

EA 19-13-MP

U.S. DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION

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Mission Statements

The Department of the Interior protects and manages the Nation's natural resources and cultural heritage; provides scientific and other information about those resources; and honors its trust responsibilities or special commitments to American Indians, Alaska Natives, and affiliated island communities.

The mission of the Bureau of Reclamation is to manage, develop, and protect water and related resources in an environmentally and economically sound manner in the interest of the American public.

List of Abbreviations, Acronyms, and Definitions

CVP	Central Valley Project
CVPIA	Central Valley Project Improvement Act
DWR	Department of Water Resources
EBD	East Borrow Ditch
ITA	Indian Trust Asset
NEPA	National Environmental Policy Act
NHPA	National Historic Properties Act
NMFS	National Marine Fisheries Service
RD 1004	Reclamation District 1004
SNWR	Sutter National Wildlife Refuge
SWP	State Water Project Contractors
SWRCB	State Water Resources Control Board
Reclamation	U.S. Bureau of Reclamation
USFWS	U.S. Fish and Wildlife Service
WBD	West Borrow Ditch
WY	Water Year

Section 1 Introduction

1.1 Background

In conformance with the National Environmental Policy Act of 1969, Council on Environmental Quality regulations (40 CFR 1500-1508), and Department of the Interior Regulations (43 CFR Part 46), the Bureau of Reclamation (Reclamation) prepared this Environmental Assessment (EA) to evaluate and disclose potential environmental impacts associated with extending the existing two-year conveyance agreement an additional year with Reclamation District 1004 (RD 1004 or District) for the Sutter National Wildlife Refuge (SNWR) RD 1004 Refuge Level 2 (L2) Water Conveyance Pilot Project (Proposed Action). The result of the Proposed Action would convey L2 Refuge Water provided from Central Valley Project (CVP) yield from the Sacramento River through RD 1004's conveyance system to Butte Creek continuing to either or both of two Points of Delivery (PoD) on the SNWR boundary. The Proposed Action is expected to yield sufficient data for Reclamation to determine if this conveyance alternative would be an efficient and reliable method for long-term conveyance of Central Valley Project Improvement Act (CVPIA) refuge water supplies to the SNWR.

Under the Proposed Action, up to 12,000 acre-feet per year of CVPIA L2 water would be conveyed to either or both of the specified PoD on the SNWR. In addition to the L2 water, Reclamation would also provide CVP water to cover conveyance losses through RD 1004's system and conveyance losses through Butte Creek, Butte Slough, and East Borrow Ditch (EBD). Reclamation would extend the existing conveyance agreement with RD 1004 to convey water from the Sacramento River diverted at the Princeton Pumping Plant through 15.3 miles of the District's conveyance system of earthen canals to a PoD on the Dredger Cut (Dredger Cut PoD). This water would continue from Dredger Cut on to Butte Creek and then travel approximately 27 miles through Butte Creek, Butte Slough, and the EBD to the SNWR PoD. Figure 1 shows the proposed route from the Princeton Pumping Plant to the SNWR. Water would be conveyed from September through January in accordance with a generally agreed upon schedule that serves to help meet SNWR needs. The "Diversion, Conveyance, and Streamflow Monitoring for the Sutter National Wildlife Refuge Reclamation District No. 1004 Level 2 Refuge Water Conveyance Pilot Project" (Streamflow Monitoring Plan) (Appendix A) will continue to be implemented by Reclamation through the Proposed Action third year to collect data on the volume of L2 water as it flows down Butte Creek and the EBD, tracking flows and determining water conveyance losses and any effects the additional L2 volume may have on local water operations within this conveyance course. The Streamflow Monitoring Plan will also identify a detailed communication plan between all pilot project partners, including agencies/stakeholders responsible for various water control structures along Butte Creek and the EBD, and also stakeholders who may potentially be affected by the Proposed Action. The "Water Quality Monitoring Plan for the Sutter National Wildlife Refuge Level 2 Water Pilot Project (Revised May 2019)" (WQ Monitoring Plan) (Appendix C) will also continue to be implemented by Reclamation through the Proposed Action third year. The WQ Monitoring Plan provides for collecting water samples for analysis of identified constituents to

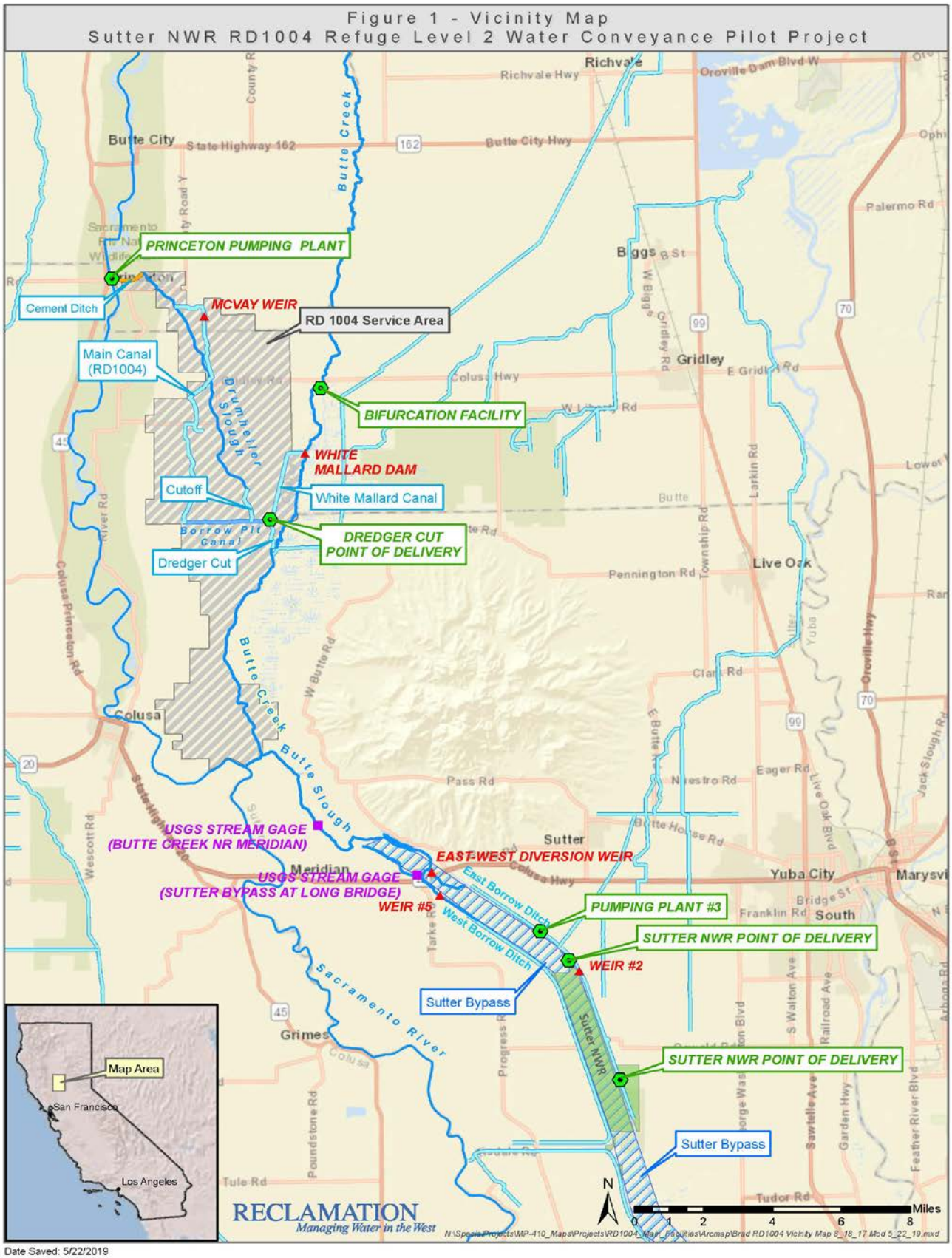
Figure 1 - Vicinity Map
Sutter NWR RD1004 Refuge Level 2 Water Conveyance Pilot Project
PRINCETON PUMPING PLANT
Cement Ditch
MCVAY WEIR
RD 1004 Service Area
Main Canal (RD1004)
BIFURCATION FACILITY
WHITE MALLARD DAM
Cutoff
White Mallard Canal
DREDGER CUT POINT OF DELIVERY
Dredger Cut
USGS STREAM GAGE (BUTTE CREEK NR MERIDIAN)
EAST-WEST DIVERSION WEIR
USGS STREAM GAGE (SUTTER BYPASS AT LONG BRIDGE)
WEIR #5
PUMPING PLANT #3
SUTTER NWR POINT OF DELIVERY
WEIR #2
Sutter Bypass
SUTTER NWR POINT OF DELIVERY
Sutter Bypass
Map Area
San Francisco
Los Angeles
Richvale
Butte City
Biggs
Gridley
Colusa
Live Oak
Sutter
Meridian
Yuba City
South
Grimes
Pennington Rd
Pass Rd
Eager Rd
Clark Rd
Tule Rd
Tudor Rd
Palermo Rd
Oroville Dam Blvd W
Richvale Hwy
State Highway 162
Butte City Hwy
Colusa Hwy
Butte Creek
Drumheller Slough
Borrow Pit Canal
Butte Slough
Sacramento River
East Borrow Ditch
West Borrow Ditch
Sutter NWR
Larkin Rd
Township Rd
Oroville Hwy
Railroad Ave
Garden Hwy
Feather River Blvd
Colusa Princeton Rd
River Rd
W Butte Rd
Pumpkin Hollow Creek
Wescott Rd
Tarke Rd
Progress Rd
Poundstone Rd
Sawtelle Ave
S Walton Ave
Franklin Rd
Bridge St
Butte House Rd
Nuestro Rd
Jack Slough Rd
Arboga Rd
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characterize the quality of water provided through the Proposed Action in relation to beneficial use for fish and wildlife. Data collected through these two monitoring plans for the first two years of the pilot project combined with data collected during the Proposed Action third year will be evaluated by Reclamation to determine the viability of utilizing this conveyance option on a long-term basis to meet the annual scheduled CVPIA water needs of the SNWR.

The Proposed Action would provide for conveyance of L2 water to the SNWR during an identified conveyance period over each of three water years, adding a third conveyance period during a third water year. Water year (WY) is defined as the period from and including March 1 of each calendar year through the last day of February of the following calendar year. Reclamation's Central Valley Operations Office (CVO) will make the determination which WYs CVP supplies will be available for the Proposed Action. Factors affecting CVO's determination include annual hydrology and Reclamation's north-of-Delta annual CVP allocations.

CVPIA Public Law 102-575, Title 34, Section 3406(d) directs the Secretary of the Interior, through Reclamation, to deliver specific quantities of water of suitable quality to 19 identified federal wildlife refuges, State wildlife areas, and privately owned/managed wetlands (collectively referred to as Refuges) within the Central Valley, and to meet the Refuges' scheduled water needs. The SNWR is among these Refuges. CVPIA identifies two water types to be provided to the Refuges: L2 and Level 4 (L4) water supplies. L2 water is the quantity provided primarily from CVP yield, and is considered a base supply for the Refuges necessary to maintain the Refuges close to their habitat state as existed prior to passage of CVPIA in 1992. L4 water represents the total amount needed by each Refuge for optimal habitat management. L4 water includes L2 quantities.

To date, Reclamation has not had the ability to deliver any CVPIA water to the SNWR due to lack of an identified and secured conveyance route with the capacity to meet SNWR's water schedule needs, with the exception of L2 water conveyed through RD1004's system during years one and two of this Pilot Project. Reclamation has identified several potential conveyance alternatives including the option in the Proposed Action.

The U.S. Fish and Wildlife Service (USFWS) (owner/manager of SNWR) has continued to exercise their water rights from Butte Creek to provide limited amounts of water to the SNWR, meeting some of the habitat needs on the refuge. The USFWS diverts their water rights water from the EBD usually through a gravity feed channel, but this is limited to when the EBD water level is high enough for diversion into the gravity channel. Alternatively, the USFWS utilizes temporary pumps (usually in the fall), positioned on the EBD, to augment limited gravity flows when EBD water levels are lower, to increase water deliveries for fall flood up needs to provide additional habitat for migrating waterfowl. However, water obtained through the USFWS's water rights is limited by timing, availability, volume and EBD water levels, and is not a substitute for the reliable water supplies mandated by CVPIA.

1.2 Need for the Proposed Action

The Proposed Action is needed to collect additional data for Reclamation to determine the capability of the identified conveyance course for utilization as Reclamation's reliable long-term conveyance conduit for providing full L4 Refuge Water supplies to the SNWR. The Proposed Action would allow Reclamation to assess data collected for a third year aggregated with data collected from years one and two and ascertain if this conveyance option could be adopted as the long-term reliable conveyance course to meet its CVPIA obligations to provide full L4 water to the SNWR.

Section 2 Alternatives Including the Proposed Action

2.1 No Action Alternative

Under the No Action Alternative, Reclamation would not extend the agreement with RD 1004. SNWR would continue its normal water operations without the potential temporary benefit of L2 water conveyed from the Sacramento River. Reclamation and USFWS would continue to pursue other alternatives to provide reliable conveyance of full L4 water to SNWR. SNWR's normal ongoing water operations do not meet its full L2 quantities and its scheduled timing needs, let alone meeting full L4 amounts which would allow SNWR to attain optimal habitat management.

2.2 Proposed Action

As a result of Reclamation extending the agreement with RD 1004, up to 12,000 acre-feet per year of CVPIA L2 water would be delivered to a specified PoD on the SNWR. Reclamation would also provide CVP water to cover conveyance losses through RD 1004's system, currently estimated at 12%; and conveyance losses through Butte Creek currently estimated at 5%. Using a Reclamation accepted conveyance loss formula to calculate conveyance losses quantities, the amount of additional CVP water provided to cover losses results in up to 2,354 acre-feet for each conveyance year. Therefore, the total annual diversion through RD 1004 would be up to 14,354 acre-feet. As a result of the Proposed Action, Reclamation would extend its agreement with RD 1004 to convey water from the Sacramento River diverted at the Princeton Pumping Plant through 15.3 miles of the District's conveyance system of earthen canals to the Dredger Cut PoD. This water would continue from Dredger Cut on to Butte Creek and then travel approximately 27 miles through Butte Creek, Butte Slough, and the EBD to the SNWR PoD (Figure 1). Water would be conveyed from September through January in accordance with a generally agreed upon schedule that serves to help meet SNWR needs. The Streamflow Monitoring and WQ Monitoring plans developed under the two-year pilot project would continue to be implemented by Reclamation to collect data (Appendix A and C, respectively), with both plans revised to cover the Proposed Action third year. Data collected through these two monitoring plans during the first two years of the pilot project and this third year (the Proposed Action) will be evaluated by Reclamation to determine the viability of utilizing this conveyance option on a long-term basis to meet the annual scheduled CVPIA water needs of the SNWR. The Proposed Action will comply with applicable USFWS and National Marine Fisheries Service (NMFS) operations biological opinions.

Butte Slough splits into the EBD and the West Borrow Ditch (WBD) at the northern portion of Sutter Bypass. This could pose a challenge in managing flows to the SNWR. At the split, about 60 % of the water flows into the EBD and 40 % flows into the WBD. The flow distribution can be modified through the use of Weir No. 5 on the WBD and the East-West Diversion Weir on the EBD. In cooperation with the Butte Slough Irrigation Company, who owns and operates these weirs, flows can be managed to convey additional water to the EBD to meet the Proposed Action's goals. Water would be conveyed through a 27-mile long stretch of stream (Butte Creek, Butte Slough, and EBD) that is not managed by a water district or water master. About twenty-one individuals, water districts, and agencies have licenses to divert water along this stretch with diversion rights that generally range from 0.5 to 3 cfs. Because there is no management of water rights in this area, the opportunity exists for water conveyed under the Proposed Action to be diverted before it reaches the SNWR. In discussions with landowners in the area, this possibility does not appear to be a major concern in non-drought years. According to Frank Rogers, RD 1004 Board member, farmer, and water rights holder along Butte Creek, the land along Butte Creek has been fully developed and farmers have sufficient water during non-drought years.

Under drought conditions, water rights holders along Butte Creek receive reduced allocations and plan irrigation accordingly. Therefore, Mr. Rogers believes that water security may not be of major concern. During 2014, the State Water Resources Control Board (SWRCB) curtailed post- 1914 water rights on Butte Creek and the Sutter Bypass EBD and WBD. SWRCB staff conducted inspections of lands subject to the curtailment (Reclamation, 2015).

Rice production on lands adjacent to Butte Creek, Butte Slough, and the EBD, between the Dredger Cut PoD and the PoDs (at SNWR) usually includes flooding of fields in the spring time, and during September farmers are usually dewatering their fields in preparation for harvest. Weir 2 is a water control structure located on the EBD near the northern end of the SNWR, owned and operated by the California Department of Water Resources (DWR). To facilitate this dewatering of fields, DWR generally manages Weir 2 to maintain an upstream water surface elevation of 18.5 feet. This allows farmers to drain their fields and prevent seepage back into their fields. When maintained at this elevation, SNWR is unable to divert water from the EBD into their gravity-fed ditch (northern SNWR PoD). DWR will not adjust or modify their operations to facilitate the Proposed Action because the DWR operated Weir 2 structure near the northern SNWR PoD is designed to maintain water surface elevations regardless of minor changes in upstream flows, such as those presented by the Proposed Action.

Reclamation may fund water management services along the 27-mile portion of the conveyance route to ensure that the SNWR's water is not being illegally diverted prior to arriving at the refuge. This may include reading existing and/or installing new flow measurement devices (if necessary) at various locations along the delivery route. Reclamation has entered into discussions with DWR and other key stakeholders in the area to begin developing a water monitoring strategy for the Proposed Action. The Streamflow Monitoring Plan describes how water diverted and conveyed under the Proposed Action will be measured and reported (Appendix A).

Section 3 Affected Environment and Environmental Consequences

3.1 Cultural Resources

The Proposed Action is an undertaking as defined at 36 CFR § 800.16(y). Reclamation determined the undertaking has no potential to cause effects on historic properties, pursuant to 36 CFR § 800.3(a)(1), and, therefore, would result in no significant impacts to cultural resources. As such, Reclamation has no further obligations under 54 U.S.C. § 306108, commonly known as Section 106 of the National Historic Preservation Act (NHPA).

3.2 Indian Trust Assets

Indian Trust Assets (ITA) are legal interests in assets that are held in trust by the United States for federally recognized Indian tribes or individuals. There are no Indian reservations, rancherias or allotments in the project area. The nearest Indian Trust Asset is the Cachil DeHe Band of Wintun Indians of the Colusa Indian Community, about 17 miles to the northeast of the project site. Based on the nature of the planned work it does not appear to be in an area that will impact Indian hunting or fishing resources or water rights nor is the proposed activity on actual Indian lands. It is reasonable to assume that the Proposed Action will not have any impacts on ITAs.

3.3 Indian Sacred Sites

Executive Order 13007 (May 24, 1996) requires Federal agencies to protect and preserve Indian religious practices on Federal lands through accommodating access to and ceremonial use of Indian sacred sites by Indian religious practitioners and avoiding adversely affecting the physical integrity of such sacred sites. Executive Order 13007 is applicable to sacred sites identified by Federally-recognized Indian tribes on Federal land. The Proposed Action does not involve access restricting actions on Federal land. As such, the Proposed Action would result in no impacts related to the access or use of Indian sacred sites.

3.4 Environmental Justice

Executive Order 12898 requires each Federal agency to identify and address disproportionately high and adverse human health or environmental effects, including social and economic effects of its program, policies, and activities on minority populations and low-income populations. Reclamation has not identified adverse human health or environmental effects on any population as a result of implementing the Proposed Action. Therefore, implementing the Proposed Action could not have a significant or disproportionately negative impact on low-income or minority individuals within the Proposed Action area.

3.5 Air Quality

Neither the Proposed Action, nor the No Action Alternative would require construction or modification of facilities to move the L2 water to SNWR. Since no impacts to air quality would occur; a determination of general conformity under the Clean Air Act is not required.

3.6 Land Use

There would be no development or land conversion under the Proposed Action; L2 water would only be conveyed to actively managed wetland areas through existing facilities. The Proposed Action would modify water supply reliability but would not change deliveries from within historical ranges. Therefore, land use would not change under either of the alternatives.

3.7 Water Resources

3.7.1 Affected Environment

Sacramento River and RD 1004

The Proposed Action is located within the Sacramento River Hydrologic Region, which covers 17.4 million acres in 22 counties. The Pit, Feather, Yuba, Bear and American rivers drain to the central feature of the hydrologic region: the Sacramento River. The region is bounded to the north and east by the Cascade mountain range, where annual precipitation ranges from 40 to greater than 80 inches. Snowpack from this area supplies the Sacramento River with runoff during summer months. The hydrologic region is bounded to the west by the Coast and Klamath mountain ranges, which largely drain west to the coast, and to the south by the San-Joaquin Delta, to which the Sacramento River drains. Runoff in the Sacramento River hydrologic region represents 1/3 of that in California and supports the approximate 2 million acres of agriculture in the Sacramento Valley (Reclamation, 2016, pg. 11).

Water availability varies from year to year for CVP water service contractors. CVP water supply for any given contract year is based on forecasted reservoir inflows and Central Valley hydrologic conditions; amounts of storage in CVP reservoirs; regulatory requirements; and management of Section 3406(b)(2) resources and Refuge water supplies in accordance with implementation of the CVPIA.

RD 1004 is located on the east side of the Sacramento River approximately two miles east of the town of Colusa and directly west of the Sutter Buttes. The District is primarily in Colusa County, with the southeastern most portion extending into Sutter County and the extreme northern portion extending into Glenn County. Butte Creek is located along the eastern edge of the RD 1004 service area, and Butte Slough is located on the southeastern edge. The District's service area encompasses approximately 26,000 acres and includes 48 landowners. Rice is the predominant crop grown within the District. RD 1004 has a Sacramento River Settlement Contract for 56,400 AF of Base Supply and 15,000 AF of Project Water. The RD 1004 Contract Total is currently addressed in a contract entered into with Reclamation in 1964, Contract No. 14-06-200-890A (Contract No. 890A), which contract was renewed in 2005. This contract provides for an agreement between RD 1004 and the United States on RD 1004's diversion of water from the Sacramento River during the period April 1 through October 31 of each Year. In addition to the Settlement Contract, RD 1004 has established water rights to both Butte Creek and Butte Slough, and may divert water from these sources (SVRWMPAU, 2012).

Butte Creek and East Borrow Ditch

The hydrology of the Butte Creek watershed is complex. Much of the following description is taken from the Butte Creek Watershed Project's (BCWP) Final Existing Conditions Report (BCWP 1999). Water diverted from three adjacent watersheds co-mingles with the natural flows of Butte Creek and often comprises the major portion of the flow. Feather River water enters Butte Creek via the West Branch Feather River into DeSabla Reservoir. Flows from both Big and Little Chico Creeks enter Butte Creek, including agricultural return flows that drain into Little Butte Creek. Flows from the Sacramento River reach Butte Creek from various diversion points from as far north as the mouth of Big Chico Creek to the RD 1004 pumps located near Princeton. Other agricultural return flows enter Butte Creek in many locations. The creek flows year-round and peaks during storms and spring runoff.

Butte Creek originates from snow and rainfall and gathers flow from many tributaries as it drops through the upper basin. The creek passes through a series of wide meadows in the Butte Meadows area, where it is characterized by a series of pools and riffles. This area is subject to flooding during high, warm precipitation events when snowpack is present. Butte Creek flows from the Butte Meadows area for about 25 miles through a steep canyon, where it enters the Sacramento Valley floor southeast of Chico. Numerous small tributaries and springs enter the creek in the canyon area. Within the canyon section, flows from the west branch of the Feather River are diverted into Butte Creek through the Hendricks and Toadtown Canals for power generation. As part of the canyon hydropower system, three dams divert water from Butte Creek and three powerhouses generate power. The lower dam, Centerville Diversion Dam, is generally considered the uppermost limit of anadromous fish migration. Little Butte Creek, which enters Butte Creek near the end of the canyon, makes a minimal contribution to Butte Creek flows.

After leaving the canyon, Butte Creek flows through its valley reach between Chico and Butte Sink. Much of the creek in this reach is bordered by levees. Four dams and numerous diversions take water from Butte Creek for agricultural purposes. The first of these dams is the Parrott- Phelan Dam, which diverts water into the Comanche Creek delivery system. Farther downstream, the creek passes the Durham Mutual Dam, Adams Dam, and Gorrill Dam. All of these dams have recently had new fish screens and fish ladders installed. Recently removed dams include the Western Canal Dams (1997), McGowan Dam (1998), and McPherrin Dam (1998). The Point Four Dam was removed in 1993. The Parrott-Phelan Dam diverts water year round, but most others divert during April through September. Just downstream of the Durham Mutual Dam, the Little Chico Creek diversion carries excess flood waters from Little Chico Creek into Butte Creek. A levee system on Butte Creek begins at this point and continues downstream for about 14.5 miles. Other major water conveyance channels entering Butte Creek within the valley reach are Hamlin Slough and Reclamation District 1048 Slough just above the old Western Canal Dams site, Western Canal Water District Main Drain just above the old McGowan Dam site, and Howard Slough just above the old McPherrin Dam site.

Below the McPherrin Dam site, Butte Creek is joined by Little Dry Creek before reaching Butte Sink. At the Sanborn Slough Bifurcation in the upper end of Butte Sink, part of Butte Creek's flows are divided east into Sanborn Slough to the North Weir where it is either diverted to the northern portion of the Butte Sink or into the Crosscut Canal to the Reclamation District 833 Main Drain. Remaining Butte Creek water flows west along the western side of Butte Sink. Angel Slough enters Butte Creek below the bifurcation. White Mallard Dam is located approximately two miles downstream of the Bifurcation Dam and sets the stage for diversion of water through the White Mallard Canal to the White Mallard Gun Club and RD 1004. Return flows, including Sacramento River water, re-enter Butte Creek through the Drumheller Slough Outfall.

Butte Slough, another branch of the Butte Creek watershed, begins at the Butte Slough Outfall Gates on the Sacramento River and extends east and south along the west side of the southern end of Butte Sink and the Sutter Buttes for eight miles where it ends at the East-West Diversion Weir at the head-end of the Sutter Bypass. The EBD and WBD extend from the downstream end of Butte Slough southeast along both sides of the Sutter Bypass for approximately 30 miles. The EBD ends at Nelson Slough, a small slough of the Feather River floodplain.

The mean annual impaired hydrograph for Butte Creek near Chico (USGS Gauge 11390000) indicates that for the water years 1931-1994, annual flows in Butte Creek as it enters the Sacramento Valley average 288,700 acre-feet, equivalent to a mean annual flow of 398 cubic feet per second (cfs). The median monthly flow was 205 cfs. The highest daily flows occur December through March. Flows in this location are supplemented by imported water from the Feather River diverted into Butte Creek at the Centerville Powerhouse. The variance in these flows is determined by precipitation within the watershed, and is characteristic of a Mediterranean climate. Downstream of the gauge, the flow regime varies significantly from this hydrograph. In the lower 30 miles of the stream, flows are seasonally influenced by the diversion dams that divert water for agriculture and waterfowl habitat management.

The hydrology of the lower Butte Creek system varies substantially on an annual, seasonal, and daily basis. In winter and spring of wet years, the Butte Sink and Sutter Bypass is flooded most of the time. During dry periods, water flows are low or even absent from some channels. Water imported from the Sacramento and Feather rivers substantially augments natural flows during dry years. At times, the Sacramento River rises and spills water at the Colusa and Moulton Weirs with flows that reach the Butte Sink. The Sacramento River also spills at the Tisdale Weir, through the Tisdale Bypass, and into the Sutter Bypass below the SNWR. These conditions occur before the Sacramento River is considered to be at flood stage; however, Butte Creek can already be at flood stage at the same time as a result of upstream inflow conditions.

The hydraulic capacity of existing waterways in the lower Butte Creek system is small in relation to the runoff associated with significant rainfall or seasonal return flow from agricultural operations. An unmanageable or uncontrollable condition exists when surface flow is so large that structures are inundated and or operational decisions cannot be made and implemented to affect the stage, rate, or direction of water flow in the system. From fall through spring, when the most significant fish migration is occurring, hydraulic conditions can change several times in a season from manageable to unmanageable. The efficiency of fish screens and ladders can be impaired during unmanageable conditions.

SNWR

L2 and L4 water supplies needed for management of SNWR are summarized in the Sutter National Wildlife Refuge Water Supply Conveyance Study (Reclamation 2015, Table 3-1, pg. 3-4). Reclamation's goal under this study is to verify a conveyance alternative that can provide full L4 water supplies to the refuge. L2 supplies represent the amount of water necessary to maintain the SNRW close to its habitat state as existed prior to passage of CVPIA in 1992, at 23,500 AF per year. L4 water supplies refer to the amount of water required for full habitat development to meet the objectives of CVPIA and total 30,000 AF per year. The CVPIA L4 allocation includes the L2 quantity. The increment between L2 and L4 amounts is referred to as Incremental L4 (IL4) water, which is the additional water above L2 to meet L4 requirements. L2 water would be provided by Reclamation from CVP yield. Under the CVPIA, Reclamation must acquire IL4 water supplies

through voluntary measures including purchase and conjunctive use. As a result, alternate sources for IL4 water must be explored which include purchase of water from State Water Project (SWP) and CVP contractors or other willing sellers.

SNWR management has changed since the L2 and L4 delivery schedule was originally developed in Reclamation's Report on Refuge Water Supply Investigation (Reclamation, 1989). SNWR diverts water from the EBD through a gravity feed intake channel located approximately ½ mile upstream from Weir No. 2 and uses temporary pumps when needed, downstream of Weir 2.

3.7.2 Environmental Consequences

No Action Alternative
Reclamation would not extend the agreement with RD 1004 and the SNWR would continue its normal water operations without the potential temporary benefit of L2 water conveyed from the Sacramento River. Reclamation would be unable to determine if the Proposed Action would result in reliable long-term conveyance conduit for providing full L4 Refuge Water supplies to the SNWR.

Proposed Action

Sacramento River and RD 1004
Up to 14,354 acre-feet of water (per year) for the Proposed Action will come from CVP supply in the Sacramento River. This water is part of the CVP yield and if not diverted under this Proposed Action would have either remained in storage or would have been delivered and consumptively used in the CVP service area subject to the Water Shortage and Apportionment provisions of the CVP contracts or otherwise would have been used to meet other legal obligations. Similar to the No Action Alternative, the Proposed Action would not increase or decrease the amount of CVP water any contractor receives under contract with Reclamation. There would be no adverse impacts to RD 1004 or to any other local water users or districts and their respective CVP water supplies from facilitating this conveyance pilot project. Regular coordination among the parties involved would ensure that Reclamation's obligations to deliver water to other CVP contractors, Refuges, and other requirements would not be adversely impacted by the Proposed Action. Because the Proposed Action would only influence water conveyance from the place of diversion on the Sacramento River to the SNWR PoD, upstream operations, including power production, would not be affected.

L2 would be rediverted by RD 1004 at the Princeton Pumping Plant on the Sacramento River at a varying rate of up to 75 cfs. Upon rediversion at the Princeton Pumping Plant, the L2 water will be conveyed through RD 1004's conveyance system to the Dredger Cut PoD. The L2 water would continue on to the point where Dredger Cut enters Butte Creek, approximately nine miles southeast of the Princeton Pumping Plant. The water diverted through RD 1004's Princeton Pumping Plant would be within the range of RD 1004's normal diversion pumping patterns and would only occur during the period of September through January. The Proposed Action L2 pumping would only occur when such diversion off the Sacramento River and conveyance through RD 1004 would not adversely affect RD 1004's typical ongoing diversions and would not affect internal agricultural deliveries. RD 1004's Princeton Pumping Plant is a screened facility to prevent adverse impacts to fisheries.

Butte Creek

Sacramento River water rediverted at the Princeton Pumping Plant would enter Butte Creek near the Dredger Cut PoD. The Proposed Action would involve a maximum additional discharge into Butte Creek of approximately 75 cfs. This discharge would be coordinated between the RD 1004 manager, the SNWR manager, DWR Weir 2 manager, and the Butte Slough Irrigation Company manager who controls the weirs along Butte Creek. The temporary addition of up to 75 cfs into Butte Creek between September and January would cause a minimal increase in the overall flows occurring in Butte Creek. Monitoring would be performed to determine the actual temporary increase in flow. Based on the temporary nature of the action, the volume of water involved, and the projected flow rate, the addition of L2 water and the increase in flow would not cause significant adverse impacts to Butte Creek hydrology.

Average monthly flows for the month of September to January from 2007 to 2017 are provided in the table below for the Butte Creek at Meridian California Data Exchange Center (CDEC) site.

Butte Creek at Meridian Flow Data
Average Monthly Flows (cfs)

	September	**October**	**November**	**December**	**January**
2007	754	1,186	2,812	1,931	-
2008	410	423	453	363	958
2009	1,620	1,190	1,251	704	996
2010	360	399	552	836	399
2011	428	488	181	428	563
2012	1,314	879	367	445	1,605
2013	407	485	201	277	15,418
2014	245	362	471	444	199
2015	443	425	4,403	350	240
2016	994	468	210	129	402

These averages are calculated from flow readings captured every 20 minutes and posted by DWR on the CDEC website (accessed 7/10/17). Upon examination of the table above, it can be seen that average monthly flows can vary significantly between subsequent years. The addition of 75 cfs to these average monthly flows would be within existing flow volumes, and flows during each month during project implementation are expected to be below the maximums seen in peak years.

EBD and SNWR

The Proposed Action would involve a maximum additional discharge into EBD of around 75 cfs. This additional flow in the EBD is expected to average less than 75 cfs during the duration of the Proposed Action due to scheduled flow changes and expected conveyance losses along the Butte Creek reach.

Average monthly flows in the EBD are expected to mimic flows in Butte Creek. However flows are expected to be at a slightly lower magnitude due to conveyance losses.

Water Rights Considerations

The total quantity of water proposed to be delivered under the California State Board petition for a temporary water right transfer will be up to 14,354 acre-feet of water previously stored at Shasta Reservoir.

Reclamation would make the L2 refuge water available in the Sacramento River for diversion/re-diversion by Reclamation at a facility owned by RD 1004 and re-diversion by Reclamation at the SNWR owned by USFWS for beneficial use by USFWS at SNWR. The CVP water would be conveyed to the USFWS and accomplished through direct delivery. The Proposed Action would temporarily assist Reclamation in meeting a portion of its obligation pursuant to the CVPIA (Section 3406 (d)) to provide reliable refuge water supply to the SNWR.

The L2 refuge water supply is subject to provisions included in the *Memorandum of Understanding Between the U.S. Bureau of Reclamation and the U.S. Fish and Wildlife Service Providing for Project and Acquired Water Supplies to the Sacramento, Delevan, Colusa, and Sutter National Wildlife Refuges California, No. 01-WC-20-1757* (Reclamation, 2001). The Proposed Action is in support of the above referenced MOU. The Proposed Action would not affect water delivery quantities to contractors and refuges within the Sacramento Valley, including the Sacramento River Settlement Contractors. There would be no expansion of existing obligations, or increases in demands, to provide CVP water supplies.

The Proposed Action would be subject to the following parameters:

- No native or untilled land (fallow for three consecutive years or more) will be cultivated with the water involved in this action.
- The purposes of water use are consistent with existing authorized purposes of use.
- The delivery of CVP refuge water will be limited to existing supply and will not increase overall consumptive use.
- The delivery of CVP refuge water will not lead to any land conversion.
- The delivery of CVP refuge water will comply with all applicable Federal, State, Local or Tribal laws or requirements imposed for the protection of the environment ITAs.
- The delivery of CVP refuge water will not alter the flow regime of streams, creeks, ponds, pools, wetlands, etc.
- The Proposed Action does not include construction or modification of facilities.

The proposed diversions and re-diversions would occur only at existing facilities that have been operating in the Sacramento River and Butte Creek system for many years. The Proposed Action will be conducted to comply with applicable USFWS and NMFS operations biological opinions.

3.8 Biological Resources

3.8.1 Affected Environment

Sacramento River and RD 1004

The Sacramento River is the longest river entirely within the state of California. Starting at the confluence of the South Fork and Middle Fork of the Sacramento River, near Mount Shasta in the mountains of the Cascade Range, the river flows south for 447 miles through the northern Central Valley of California, between the Pacific Coast Range and the Sierra Nevada. The Sacramento River is a vital source for natural resources, agricultural (providing water for most of the Sacramento Valley's agricultural lands), and municipal water supplies throughout the state. The Sacramento River supports multiple federally protected aquatic species and is designated as critical habitat for some of them. The riparian corridor supports critical habitat for several federally protected terrestrial species as well.

Within the vicinity of the project area the Sacramento River riverine habitat is characterized by freshwater aquatic and shaded riparian. The adjacent riparian habitat has been modified by trails (both paved and unpaved), levees, and general recreation activities. Flows are relatively slow within the project area, exhibiting deep channel characteristics with levied banks. Vegetative cover/shading along the channel banks is dependent upon the adjacent habitat (i.e., exposed annual grassland or riparian habitat). Channel substrate generally consists of fine sandy-loam with sparse areas of imported rip-rap along the banks used to reinforce the adjacent levees.

Water for the Proposed Action will be rediverted from the Sacramento River at RD 1004's Princeton Pumping Plant. The pumping facility is approximately 75 miles north of Sacramento in Glen County. The Princeton Pumping Plant diverts Sacramento River water, through a fish screen, into RD 1004 which provides irrigation service, mostly through surface flow, to approximately 15,000 acres of agricultural land and 10,000 acres of migratory waterfowl wetland habitat within the Butte Basin in Glen and Colusa counties. RD 1004's conveyance facilities terminate in the southern portion of their district where flows enter Butte Creek.

Butte Creek Watershed

The Butte Creek Watershed has historically exhibited exceptional features that made Butte Creek one of the most important streams in the Sacramento Valley for fish, particularly spring-run Chinook salmon. A natural barrier below the Centerville Powerhouse head dam limits most upstream access upstream of Magalia, California. Chinook population estimates in the mid-1950s to mid-1960s were generally less than 6,000. Beginning in 1966, the population crashed to less than 100 spawning individuals and ranged up to approximately 1,000 fish for the next 30 years. In 1995 the run was estimated at 7,500 fish, but the numbers fell off again dramatically the next year. In 1998 more than 20,000 salmon returned and in 2001, an estimated 18,000 spring-run Chinook salmon spawned in Butte Creek, with 2002, 2005, and 2008 also having good numbers. However, estimated 2009 figures were far lower, at under 1,000 individuals. Steelhead trout populations fluctuate annually as well. Several other important native fish species including Pacific Lamprey and Sacramento Pikeminnow, plus numerous non-native species are also present in Butte Creek (CWRCB, 2009).

In 1994 restoration activities associated with the Butte Creek Fish Passage Improvement Project began. Efforts associated with that project has resulted in average spring-run Chinook salmon returns of 10,000. Prior to 1995, spring-run Chinook salmon returns averaged well below 1,000. Improvements to habitat included the removal of four dams from Butte Creek which restored 25 miles of uninhibited flow downstream of the Gorrill Ranch Diversion and Fish Ladder in Esquon, California.

The Butte Creek Watershed also contains important vernal pool habitat for listed plant and invertebrate species, and riparian areas provide habitat for important avian and other wildlife species. Loss of riparian habitat is of particular concern, as it provides multiple benefits to both the aquatic and terrestrial communities. The oak woodlands support numerous species, including portions of the large Tehama Deer Herd that call this watershed home, either permanently or while passing through. Impacts from a variety of invasive non-native plant and wildlife species have been significant and continue to threaten the native populations (CWRCB, 2009).

3.8.2 Environmental Consequences

No Action Alternative

Under the No Action Alternative, Reclamation would not extend the agreement with RD 1004 and the SNWR would continue its normal water operations without the potential temporary benefit of L2 water conveyed from the Sacramento River. Reclamation would be unable to determine if the Proposed Action would result in reliable long-term conveyance conduit for providing full L4 Refuge Water supplies to the SNWR. As a result, there will be no changes affecting biological resources.

Proposed Action
The Proposed Action would not alter CVP operations, release patterns from CVP facilities, or the maximum volume of water delivered to the Contractors. The Proposed Action is to support existing uses and conditions on the SNWR and will be implemented in accordance with existing regulatory constraints and guidance. For example, the Proposed Action will be implemented in compliance with the USFWS 2008 Biological Opinions (BO) and the NMFS 2009 BO (and 2011 amendment). The proposed temporary diversion is relatively small compared to many other Sacramento River diversions, and, in the aggregate, accounts for a minority share of the volume of water diverted from the Sacramento River. The Proposed Action would result in a minor shift in the location of water use.

Potential effects to fish species or habitat from the Proposed Action have been analyzed in the USFWS 2008 BO and the NMFS 2009 BO because it addressed general operations of the CVP (and State Water Project), with which this L2 water delivery will be consistent. Likewise, there are no conditions of the action that would alter Reclamation's finding of "not likely to adversely affect" terrestrial species, including but not limited to the giant garter snake, with which the USFWS concurred in the 2008 BO. Waterfowl and other wetland species would not be adversely affected by the Proposed Action, because delivery of L2 water is to benefit these species habitats. Because this action occurs entirely within the Sacramento Basin and North of Delta, there are no concerns for species that are present South of Delta.

Operations associated with the Proposed Action would be within the historic limits covered by the consultations for the Programmatic Environmental Impact Statement for the CVPIA. A full assessment of the fishery resources and Endangered Species Action Considerations is included in Appendix B of that document– Biological Technical Memorandum.

In general, the addition of a maximum average of 75 cfs during project implementation may have insignificant effects on water quality and volume between the Princeton pumping station and the PoD at SNWR. Any potential effects are expected to be positive and associated with increased water quality and quantity during conveyance. The volume of water being delivered to the SNWR will not be outside the range of historic flows and therefore it is expected that there will be no determinable effects on wildlife or habitat within the Proposed Action area. Upon delivery to SNWR, the water will be used to support existing management goals for the benefit of wildlife and habitat.

Cumulative Effects
The Proposed Action has been designed to avoid adverse effects on water or biological resources, and therefore would not have cumulative effects.

Section 4 Consultation and Coordination

4.1 Agencies and Persons Consulted During Preparation of the EA

Individuals consulted in the process of developing this EA include those involved with the planning and development of the three-year pilot project. Those include staff from USFWS, CDFW, DWR, NMFS, RD 1004, Sutter Bypass and Butte Creek Water Users Association, and Burleson Consulting.

4.2 ESA Consultation

No consultation is required because Reclamation made a no effect determination based on a technical assessment of all potential impacts to listed species (See Appendix B – Endangered Species Act Compliance Technical Memorandum).

Section 5 References

Butte Creek Watershed Project (BCWP). 1999. *Final Existing Conditions Report*. California State University, Chico.

National Marine Fisheries Service (NMFS). 2009. *Biological Opinion for the Continued Operations of the CVP and SWP*.

Sacramento River Settlement Contractors (SRSR). 2012. *Sacramento Valley Regional Water Management Plan Annual Update*.

State of California Water Resources Control Board (CWRCB). 2009. *Sacramento Valley Regional Water Management Plan Annual Update.*

U.S. Bureau of Reclamation. 1999. *Programmatic Environmental Impact Statement (PEIS) for the CVPIA*; October 1999.

_____2016. *Environmental Assessment, Accelerated Water Transfer and Exchange Program for Sacramento Valley Central Valley Project Contractors – Contract Years 2016- 2020.*

_____ 2015. *Sutter National Wildlife Refuge Water Supply Conveyance Study*, January 2015, p. 5-19, Alternative 2 (without construction).

_____. 2001. Memorandum of Understanding Between the U.S. Bureau of Reclamation and the U.S. Fish and Wildlife Service Providing for Project and Acquired Water Supplies to the Sacramento, Delevan, Colusa, and Sutter National Wildlife Refuges California.

_____.2001. *Final NEPA Environmental Assessment and CEQA Initial Study, Refuge Water Supply Long-Term Water Supply Agreements, Sacramento River Basin*, January 2001. (U.S. Bureau of Reclamation, U.S. Fish and Wildlife Service, and California Department of Fish and Wildlife).

U.S. Fish and Wildlife Service. 2008. *Biological Opinion for the Continued Operations of the CVP and SWP*.

APPENDIX A - STREAM-FLOW MONITORING PLAN

RECLAMATION

Managing Water in the West

Diversion, Conveyance, and Streamflow Monitoring for the Sutter National Wildlife Refuge Reclamation District No. 1004 Refuge Level 2 Water Conveyance Pilot Project

Streamflow Monitoring Plan

U.S. Department of the Interior
Bureau of Reclamation
Mid-Pacific Region

June 2019

Table of Contents

A.1 PROJECT BACKGROUND

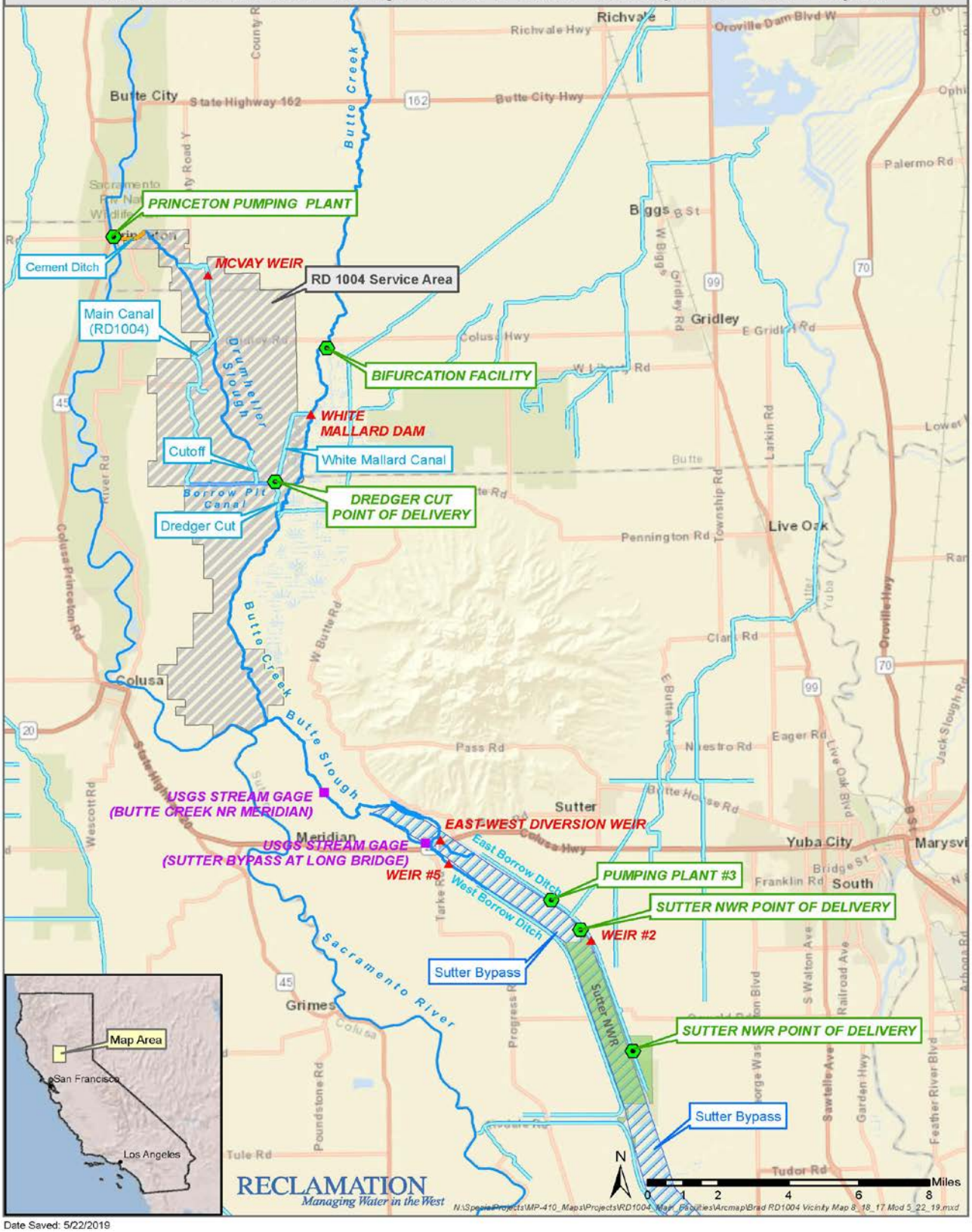
The Bureau of Reclamation (Reclamation) proposes extending the "Sutter National Wildlife Refuge Reclamation District No. 1004 Refuge Level 2 Water Conveyance Pilot Project" (Pilot Project) for a third year (Proposed Action). The Proposed Action would continue conveyance of Level 2 Refuge Water provided from Central Valley Project (CVP) yield from the Sacramento River through Reclamation District No. 1004's (RD 1004 or District) conveyance system to Butte Creek continuing to either or both of two (2) Points of Delivery (PoD) on the Sutter National Wildlife Refuge (SNWR) (see Figure 1, Vicinity Map). Refuge water would be conveyed under the Pilot Project identified conveyance period for a third year, from September 2019 through January 2020. The purpose of the Proposed Action is to collect additional data for a third year so as to provide sufficient data for Reclamation to determine if this conveyance alternative would be an efficient and reliable method for long-term conveyance of Central Valley Project Improvement Act (CVPIA) refuge water supplies to the SNWR. The "Diversion, Conveyance and Streamflow Monitoring for the Sutter National Wildlife Refuge Reclamation District No. 1004 Refuge Level 2 Water Conveyance Pilot Project" (Streamflow Monitoring Plan) will be extended for a third year as part of the Proposed Action. The Streamflow Monitoring Plan is expected to provide streamflow, conveyance and diversion data for combination with data obtained from the Water Quality Monitoring Plan to allow Reclamation to analyze all collected data and determine if this conveyance alternative would be an efficient and reliable method for long-term conveyance of water to the SNWR in accordance with the CVPIA.

For a complete description of the Proposed Action and background refer to the "Sutter National Wildlife Refuge Reclamation District No. 1004 Refuge Level 2 Water Conveyance Pilot Project – Extension for Year 3" Environmental Assessment (EA Number 19-13-MP) (EA).

A.1.1 RD 1004 Losses

An estimate for water conveyance losses through RD 1004's conveyance facilities (from the Princeton Pumping Plant to the east District boundary) of 12% was identified in the Sutter National Wildlife Refuge Water Supply Conveyance Study (Reclamation, 2015) and confirmed via discussions with the RD 1004 manager (T. Bressler, pers. comm. April 20, 2017).

Figure 1 - Vicinity Map
Sutter NWR RD1004 Refuge Level 2 Water Conveyance Pilot Project



Date Saved: 5/22/2019

A.1.2 Butte Creek Losses

Included as Appendix G to the Sutter National Wildlife Refuge Water Supply Conveyance Study (2015) is a Technical Memorandum by RMC (Consulting Firm) titled "Evaluation of SNWR water conveyance losses in Butte Creek." This technical memorandum concludes that the estimated average annual total loss of water through the Butte Creek conveyance reach (from the confluence of Dredger Cut and Butte Creek, through Butte Creek, Butte Slough and East Borrow Ditch to the SNWR PoD) to be approximately 4.7% (Reclamation, 2015, Appendix G). The estimated losses through this conveyance course have been rounded up to 5% for the purposed of implementing the Proposed Action.

A.2 MONITORING AND REPORTING PLAN

A.2.1 Diversion Measurements

Pursuant to RD 1004's Central Valley Project (CVP) Sacramento River Settlement Contract (SRS Contract), Contract Number 14-06-200-890A-R-1, all CVP water diverted from the Sacramento River is measured by Reclamation. Reclamation sends staff out once a month during the period April 1 through November 1, to read the meters at the Princeton Pumping Plant. Diversion records for this point of diversion are available going back several decades (Reclamation, 2005, 1964). Reclamation will make this data available for the Proposed Action monitoring purposes.

Reclamation will continue to read the Princeton Pumping Plant meters during the Proposed Action operations period. Reclamation and the District will work cooperatively to determine and report the quantity representing SRS Contract diversions and the quantity representing L2 diversions during the Pilot Project operations period in acre-feet for the months of September and October. During the period of November through March RD 1004 diverts "winter water" from the Sacramento River.

Reclamation and the District will work cooperatively to determine and report the quantity of L2 diversions and the quantity of winter water diversions for each month from November through January that RD 1004 diverts winter water during the Proposed Action operations period, in acre-feet.

Monthly diversion measurements will continue during the pilot project operations on the following schedule:

> On the 1st of every month, October 1 through February 1, unless the 1st of the month falls on a weekend or Federal holiday following the pilot project delivery months of November through January. For those situations, Reclamation may read the meter immediately before or after the respective weekend or Federal holiday on which the 1st of the month falls. The date of data collection and the diversion amount shall be recorded and entered into an EXCEL spreadsheet, including the breakout of SRS Contract quantities and Proposed Action quantities. Reclamation staff will collect monthly measurement data during the SRS Contract period and continuing through the end of the Proposed Action period (April 1 to Feb 1). Reclamation's measurement device, which otherwise would be pulled for annual maintenance, will be left in place through February 1.
>
> Should the Proposed Action initial water conveyance commence later in September, after the September 1 date, a meter reading will be taken by Reclamation on the first date CVP Level 2 water is diverted from the Sacramento River through the Princeton Pumping Plant. Advance notice to Reclamation will be provided by USFWS and RD 1004 to allow this meter reading to be scheduled by Reclamation staff.
>
> Reclamation will provide the monthly data in a quarterly monitoring report and in a final annual report to the Sutter National Wildlife Refuge Reclamation District 1004 Refuge Level 2 Water Conveyance Pilot Project Manager as part of the overall pilot project.

A.2.2 Conveyance Measurements at Dredger Cut PoD

RD 1004 will install a Reclamation approved flow measurement device at the Dredger Cut PoD to measure flow volume in acre-feet. RD 1004 will collect flow data weekly and provide the meter readings at the beginning and end of the week and total weekly volume to Reclamation's Sutter National Wildlife Refuge Reclamation District 1004 Refuge Level 2 Water Conveyance Pilot Project Manager and to USFWS' SNWR manager. This data should also include daily average discharge (cfs) through the culvert at the discharge point. Annually, Reclamation will analyze the results of the discharge data collection and document it in a report along with pertinent conclusions. Upon completion, the annual report will be distributed by Reclamation to all Project Partners (listed in the Coordination/Communication Plan section).

Should the Proposed Action initial water conveyance commence later in September, after the proposed September 1 pilot project delivery period beginning date, an initial flow meter reading will be taken by RD 1004 on the first day CVP Level 2 water arrives at Dredger Cut from the Princeton Pumping Plant.

A.2.3 Diversions at Sutter National Wildlife Refuge

Monthly, USFWS will collect diversion information consistent with past measurement methods. USFWS will collect this data and provide monthly measurement data to Reclamation and RD 1004 in a manner similar to current reporting methods.

A.2.4 Streamflow Measurements in Butte Creek

The California Department of Water Resources (DWR) manages a number of streamflow monitoring/gaging stations on Butte Creek which have data telemetry features. DWR operates and maintains the California Data Exchange Center (CDEC), an extensive hydrologic data collection network, providing both real-time data and data storage, available to the public online. Data from these Butte Creek monitoring stations is uploaded to the CDEC. Monthly, the Project Partners will utilize the existing CDEC Butte Creek at Meridian streamflow gaging station information. A new streamflow gaging station may be installed between the point where Dredger Cut enters Butte Creek and the SNWR PoD for the benefit of the Proposed Action. Data from this new gaging station may be made available for incorporation to CDEC in collaboration with DWR. USFWS will access available CDEC data and provide a quarterly report of the flow measurements to all Project Partners.

A.2.5 Coordination/Communication Plan

The following table outlines the list of project partners, contact information and roles/responsibilities:

Name	Org.	Email	Phone	Role	Responsibilities
Sonya Nechanicky	USBR, MP	snechanicky@usbr.gov	(916) 978-5559	Conveyance Contract Administrator	Administration of RD 1004 conveyance contract; review of water conveyance measurement data and reports in support of contract conveyance; coordination with MP-157 on implementation of water quality monitoring plan.
Dale Garrison	FWS	dale_garrison@fws.gov	(916) 414-6728	Project Manager	Project Management for USFWS ; review and analysis of flow measurement data and reports; Organization of pilot project check-in meetings as needed
Natalie Wolder	USBR, NCAO	nwolder@usbr.gov	(530) 934-1356	Water accounting support	Review and analysis of water accounting and reports
Mike D'Errico	FWS	michael_derrico@fws.gov	(530) 782-2923	Refuge manager	Communicates water needs to RD 1004 and DWR; collects and reports water use at SNWR PoD

Name	Org.	Email	Phone	Role	Responsibilities
Terry Bressler	RD 1004	hay_bres@yahoo.com	(530) 682-9796	RD 1004 Manager	Ensures SNWR water order is conveyed from Princeton Pump Plants to Dredger Cut PoD; collects and reports flow data
Joel Farias	DWR	Joel.Farias@water.ca.gov	(530) 755-0071	DWR Sutter Yard Manager	Communicates with SNWR concerning water need; informs SNWR of pending changes to EBD flows/elevations
Andy Duffey	Butte Slough Water Assoc.	aduffey@succeed.net	(530) 682-2996	Butte Slough Irrigation Co. LTD. Manager	Communicates with SNWR concerning water needs associated with the pilot project

Ordering Water

Clear, timely and continuous communication are key in contributing to the success of the Pilot Project including the Proposed Action additional third year. It is estimated CVP Level 2 water diverted at the Princeton Pumping Plant will take approximately 48 hours to reach Dredger Cut, and an additional 48 hours for this water to reach the SNWR PoD after leaving Dredger Cut. In addition, RD 1004 would have up to 48 hours to respond to receipt of a formal SNWR water conveyance order from USFWS. When the SNWR requires CVP water to be delivered under this proposed action, the SNWR manager (Mike D'Errico) will contact both DWR (Joel Farias) and RD 1004 (Terry Bressler) by telephone and/or email and identify the volume of water requested for the SNWR and projected date of delivery to the SNWR PoD. Contact by telephone will be documented in writing. DWR will provide information on its expected flows and operations of the East Borrow Ditch (EBD) and Terry Bressler will provide information on RD 1004's ability to convey ordered CVP flows. With this information, Mike D'Errico will place a formal water order at least four to six days before SNWR plans on diverting the CVP water from the EBD at the SNWR PoD, including the needed cubic feet per second (cfs) at the SNWR PoD. Upon receipt of a pilot project water conveyance order, RD 1004 would have up to 48 hours to divert CVP water from the Sacramento River through the Princeton Pump plant for conveyance through their system to the Dredger Cut PoD. RD 1004 will pump sufficient water at the Princeton Pump plant to cover RD 1004's internal conveyance losses and estimated Butte Creek losses. RD 1004 will ensure discharge at the Dredger Cut PoD is sufficient to cover the SNWR water order and estimated Butte Creek losses. To modify a water order, including cessation, SNWR will repeat the above process. Pilot Project Refuge water will not be available for order in the event flows at the Butte Creek at Meridian exceed 1,000 cfs.

Weir 2 Access

A separate "Water Quality Monitoring Plan for the Sutter National Wildlife Refuge Level 2 Water Pilot Project" (WQ Monitoring Plan) will be developed and implemented by Reclamation for the pilot project. The WQ Monitoring Plan (Appendix C of the EA) includes collecting water samples for analysis. One of the water sampling sites is located in the EBD (EBD collection site), just upstream of Weir 2. The northern section of the SNWR, including the northern SNWR PoD and the EBD collection site, is closed to public access and hunting. The EBD collection site would be accessed by Reclamation staff via McClatchy Road (public road) and foot- travel across EBD water control structure Weir #2 (owned and operated by DWR). Access over Weir #2 is restricted. DWR has approved access over Weir 2 by Reclamation staff for water quality monitoring activities for the Pilot Project through coordination between Reclamation, USFWS and DWR.

B.1 ADAPTIVE MANAGEMENT

An adaptive management process is incorporated in the Streamflow Monitoring Plan to support achieving the stated objectives for the Pilot Project and support continued refuge water conveyance through the Proposed Action additional third year period without causing cumulative adverse impacts to wildlife populations and associated habitat, as well as the local waterways or adjacent water users. The process follows the guidance provided in "Adaptive Management: The U.S. Department of Interior Technical Guide" (Williams, 2009). This document can be found at: http://www.doi.gov/initiatives/AdaptiveManagement/documents.html.

If it is determined that continued diversion and conveyance under the Pilot Project for the Proposed Action will lead to adverse, irreversible or third party impacts, RD 1004 will cease conveying water and USFWS will cease diverting L2 refuge water under the Proposed Action. Reclamation, RD 1004 and USFWS will identify and agree on an appropriate course of action.

Reference Citations

Bressler, Terry (Bressler, T., 20017), Personal Communication, On-site meeting, April 20,

2017. US Department of Interior, Bureau of Reclamation, 2015, (Reclamation, 2015)

Sutter National
Wildlife Refuge Water Supply Conveyance Study, January 2015.

_____1964, Sacramento River Settlement Contract.

_____2005, Sacramento River Settlement Contract.

Williams, B.K.R.C. Szaro, and C.D. Shapiro. 2009, Adaptive Management: The U.S. Department of the Interior Technical Guide. Adaptive Management Working Group, U.S. Department of the Interior, Washington, DC.
http://www.doi.gov/initiatives/AdaptiveManagement/documents.html

Appendix B - Endangered Species Act Compliance Technical Memorandum

MP-152
ENV-7.00

MEMORANDUM

To: Levi Johnson
Project Manager, CVPIA Resources Management; MP-400

From: Dan Cordova

Natural Resources Specialist

Subject: Endangered Species Act Section 7 Determination for the Sutter National Wildlife Refuge Reclamation District No. 1004 Refuge Level 2 Water Conveyance Pilot Project

The Bureau of Reclamation (Reclamation) proposes to enter into a new two-year conveyance agreement with Reclamation District 1004 (RD1004) for the conveyance of up to 28,708 acre-feet (14,354 per year)(Proposed Action). The result of the Proposed Action would convey Level 2 (L2) Refuge Water provided from Central Valley Project (CVP) yield from the Sacramento River through RD 1004's conveyance system to Butte Creek continuing to either or both of two (2) Points of Delivery (PoD) on the Sutter National Wildlife Refuge (SNWR) boundary. The Proposed Action, implemented during two water years, is expected to yield sufficient data for Reclamation to determine if this conveyance alternative would be an efficient and reliable method for long-term conveyance of Central Valley Project Improvement Act (CVPIA) refuge water supplies to the SNWR. The maximum average scheduled conveyance of water would add 75 cubic feet per second into the delivery system during.

Changes in water deliveries has the potential to adversely affect federally listed species protected under the Endangered Species Act of 1973 (as amended). In the area of the proposed action, these species could include winter run Chinook salmon (*Oncorhynchus. tshawytscha*) and giant garter snake (*Thamnophis gigas*). The Proposed Action has no construction or ground disturbance component and would not alter CVP water operations, release patterns from CVP facilities, or the maximum volume of water delivered to CVP Contractors. The Proposed Action would result in a minor shift in the location of water use. The Proposed Action supports existing uses and management goals on the SNWR and will be implemented in compliance with the USFWS 2008 Biological Opinion (BO) and the NMFS 2009 BO (and 2011 amendment). Potential effects to fish species or habitat from the Proposed Action have been analyzed in the USFWS 2008 BO and the NMFS 2009 BO because they addressed general operations of the CVP (and State Water Project), with which this L2 water delivery will be consistent. Likewise, there are no conditions of the action that would alter Reclamation's finding of "not likely to adversely affect" terrestrial species, including but not limited to the giant garter snake, with which the USFWS concurred in the 2008 BO. Because this action occurs entirely within the Sacramento Basin and North of Delta, there are no concerns for species that are present South of Delta.

The conveyance of a maximum average of 75 cfs during project implementation may have insignificant effects on water quality and volume between the Princeton pumping station and the PoD at SNWR. The potential effects to listed species are expected to be positive and associated with immeasurable to minor increases of water quality and quantity during conveyance. The volume of water being delivered to the SNWR will not be outside the range of historic flows within the conveyance system and therefore it is expected that there will be no determinable effects on wildlife or habitat within the Proposed Action area. Upon delivery to SNWR, the water will be used to support existing management goals for the benefit of wildlife and habitat.

Reclamation has determined that entering into a new conveyance agreement with RD1004 would have no effect on federally protected species that was not considered in the USFWS 2008 BO and the NMFS 2009 BO (and 2011 amendment). This concludes Reclamation's responsibility under Section 7 of the ESA. However, if new information is made available or the project description changes, then Reclamation may need to revisit its ESA responsibility. Please retain a copy of this memo as part of the administrative record.

Appendix C - Water Quality Monitoring Plan

RECLAMATION
Managing Water in the West

Water Quality Monitoring Plan for the Sutter National Wildlife Refuge Reclamation District No. 1004 Refuge Level 2 Water Conveyance Pilot Project

May 2019 Revision

U.S. Department of the Interior
Bureau of Reclamation

May, 2019

Mission Statements

The mission of the Department of the Interior is to protect and manage the Nation's natural resources and cultural heritage; provide scientific and other information about those resources; and honor its trust responsibilities or special commitments to American Indians, Alaska Natives, and affiliated island communities.

The mission of the Bureau of Reclamation is to manage, develop, and protect water and related resources in an environmentally and economically sound manner in the interest of the American public.

RECLAMATION
Managing Water in the West

Water Quality Monitoring Plan for the Sutter National Wildlife Refuge Reclamation District No. 1004 Refuge Level 2 Water Conveyance Pilot Project

May 2019 Revision

Prepared by:

US Department of the Interior
Bureau of Reclamation
Laura Benninger
Physical Scientist, Environmental Affairs

Approved by:

05/22/19
US Department of the Interior **Date**
Bureau of Reclamation
Tiago Oliveira
Supervisory Physical Scientist, Environmental Affairs

5/23/2019
US Department of the Interior **Date**
Bureau of Reclamation
Sonya Nechanicky
Refuge Water Conveyance Project Manager, Resources Management

Water Quality monitoring for the Sutter National Wildlife Refuge District No. 1004 Refuge Level 2 Water Conveyance Pilot Project supports Reclamation's obligation under the Central Valley Project Improvement Act to provide reliable water supplies to the Sutter National Wildlife Refuge.

Contents

Preamble

This Water Quality Monitoring Plan (*WQMP 5/2019 Revision*) replaces the *Water Quality Monitoring Plan for the Sutter National Wildlife Refuge Reclamation District No. 1004 Refuge Level 2 Water Conveyance Pilot Project* (*WQMP 9/2017* and the *WQMP 3/2018 Update*). The purpose of the "Sutter National Wildlife Refuge Reclamation District No. 1004 Refuge Level 2 Water Conveyance Pilot Project" (Pilot Project) is to determine if the Pilot Project conveyance alternative can provide long-term Central Valley Project Improvement Act (CVPIA) Refuge water conveyance for the Sutter National Wildlife Refuge (SNWR). The Pilot Project and associated *WQMP 9/2017* identified a five-month conveyance period due to current capacity limitations of Reclamation District No. 1004's (RD1004) conveyance facilities. The *WQMP 3/2018 Update* and this Revision, accommodate the expansion of study objectives to include monitoring during potential periods of Refuge water conveyance to the SNWR (April through January) through the Proposed Action third year of the Pilot Project.

The *WQMP 3/2018 Update* and *5/2019 Revision* differ from the original *WQMP 9/2017* as follows:

1) Under the *WQMP 3/2018 Update* and *5/2019 Revision*, monitoring will occur all months that the RD1004 system is operational (typically April through January). Originally, monitoring was to occur only during the Pilot Project conveyance period (September through January).

2) Under the *WQMP 3/2018 Update* and *5/2019 Revision*, monitoring at station "East Borrow Ditch at SNWR" permanently replaces monitoring at station "SNWR PoD" (Figure 2). This shift in monitoring location ensures collection of water that is representative of water as it is delivered to both the North and South points of delivery to the SNWR. Monitoring at this station is also expanded to include year-round measurement of temperature and specific conductance.

3) Under the *WQMP 3/2018 Update* and *5/2019 Revision*, during months that RD1004 delivers water to its District members but Pilot Project water is not conveyed (typically April through August), monitoring at station "RD1004 @ Gridley Road" replaces monitoring at station "Dredger Cut" (Figure 2). This seasonal shift in location is needed because during the spring and summer period, water at the Dredger Cut point of delivery may originate from RD1004 District deliveries, Butte Creek back-flow, or a mix of these sources. In addition, water located at the Dredger Cut, may at times be stagnant and affected by evaporation. Monitoring at "RD1004@Gridley Road" allows collection of water that is representative of RD1004 water as it is delivered to its District members without the additional (Sacramento River-sourced) flow that would be conveyed should the Pilot Project be implemented.

Introduction

The Sutter National Wildlife Refuge (SNWR) is located in the Sacramento Valley, approximately twelve miles southwest of Yuba City, CA. Owned and managed by the US Fish and Wildlife Service (USFWS), the SNWR provides habitat for migratory birds and serves to reduce crop depredation.

Wetland and riparian areas within the bounds of the Sutter Bypass comprise the majority of the nearly 2600-acre SNWR; the remaining acreage is made up of adjoining grasslands and grasslands located immediately east of the Sutter Bypass. In addition to providing habitat for more than 300,000 overwintering waterfowl, SNWR supports a range of breeding and migratory bird populations. Additionally, the SNWR provides habitat for several threatened and endangered species including Chinook salmon, Giant garter snake, Swainson's Hawk and Western Yellow-Billed Cuckoo.

The SNWR is one of 19 Central Valley national wildlife refuges, State wildlife areas, and privately owned/managed wetlands (collectively referred to as Refuges) identified in the Central Valley Project Improvement Act (CVPIA), Public Law 102-575, Title 34, Section 3406(d). Pursuant to CVPIA, Reclamation is obligated to provide these Refuges with firm water supplies of "suitable quality" to maintain and improve wetland habitat. Reclamation is implementing the "Sutter National Wildlife Refuge Reclamation District No. 1004 Refuge Level 2 Water Conveyance Pilot Project" (Pilot Project), in order to convey Central Valley Project (CVP) Level 2 water to the SNWR. A critical component of the Pilot Project is to evaluate whether the quality of water diverted for, and ultimately delivered to, the SNWR is of sufficient quality to meet the needs of migratory and resident species that depend on SNWR habitat.

Goals and Objectives

The primary intent of the SNWR Pilot Project Water Quality Monitoring Plan (WQMP) is to evaluate whether water provided to the SNWR through the Pilot Project conveyance route would be of "suitable" quality to protect the following Beneficial Uses of SNWR waters:

- freshwater aquatic life habitat
- bird and wildlife water consumption
- irrigation suitability (to support vegetative habitat)

Background

Section 3406(d) of the CVPIA directs the Secretary of the Interior, through Reclamation, to deliver specific quantities of water to 19 identified Federal

wildlife refuges, State wildlife areas, and privately owned/managed wetlands (collectively referred to as Refuges) within the Central Valley, to meet the Refuges' scheduled water needs. CVPIA identifies two water types that are to be provided to the Refuges: Level 2 (L2) and Level 4 (L4) water supplies. L2 water is the quantity provided primarily from CVP yield; it is a base supply, necessary to maintain the Refuges (those Refuges in existence around 1989) close to their habitat state as it existed prior to passage of CVPIA in 1992. L4 water represents the total water quantity needed by each Refuge for optimal habitat management and includes L2 quantities.

To date, Reclamation has not had the ability to deliver any CVPIA water to the SNWR due to lack of an identified and secured conveyance route with the capacity to meet SNWR's water schedule needs, with the exception of L2 water conveyed through RD1004's system during years one and two of this Pilot Project. Reclamation has identified several potential conveyance alternatives including the option in this Pilot Project.

The USFWS exercises their water rights from Butte Creek to provide limited amounts of water to the SNWR, meeting some of the Refuge habitat needs. The USFWS diverts their water rights water from the East Borrow Ditch (EB Ditch), usually through a gravity feed channel. This diversion is limited to seasonal periods when the EB Ditch water level is high enough to allow flow into the gravity channel. During the fall, the USFWS may also install temporary Crisafulli pumps on the EB Ditch to augment limited gravity flows. This increases water deliveries for fall flood-up needs to provide additional habitat for migrating waterfowl. Timing, availability, volume, and EB Ditch water levels all limit access to water obtained through the USFWS's water rights. This water is not a substitute for the reliable water supplies mandated by CVPIA.

Water Conveyance Pilot Project Overview

The Pilot Project conveys L2 water (provided from CVP yield) from the Sacramento River to the SNWR. Water is conveyed September through January in accordance with a generally agreed upon schedule that serves to help meet SNWR needs. Data collected through the Pilot Project will allow Reclamation to determine if this conveyance alternative can be an efficient and reliable method for long-term conveyance of CVPIA Refuge water supplies to the SNWR.

To implement the Pilot Project, Reclamation entered into a short-term conveyance contract with Reclamation District No. 1004 (RD1004; District) to convey CVP L2 water from the Sacramento River to a Point of Delivery (PoD) on the Dredger Cut. Under this contract, surface water diverted from the Sacramento River at the Princeton Pumping Plant is conveyed September through January, traveling 15.3 miles of the District's system of concrete lined and earthen canals (Concrete Ditch, Main Canal, Drumheller Slough), to the Dredger Cut PoD. Conveyance of L2 water to the Dredger Cut PoD completes RD1004's contract obligation.

From the Dredger Cut PoD, Pilot Project water flows into Butte Creek, then travels approximately 27 miles through (sequentially) Butte Creek, Butte Slough, and the EB Ditch to either, or both of, the two PoDs on the boundary of the SNWR. Water from the EB Ditch can be diverted into SNWR's gravity feed channel at the northern PoD and pumped from the EB Ditch at the southern PoD.

The Pilot Project vicinity map (Figure 1) shows the proposed conveyance route from the Princeton Pumping Plant to the SNWR.

Pilot Project Monitoring Plans

Two separate, but interrelated, monitoring plans have been implemented to support the Pilot Project.

Streamflow volumes and rates are monitored under the "Diversion, Conveyance, and Streamflow Monitoring for the Sutter National Wildlife Refuge Reclamation District No. 1004 Refuge Level 2 Conveyance Pilot Project" plan (Streamflow MP). The purpose of the Streamflow MP is to estimate conveyance losses and help identify potential impacts that additional L2 water may have on local water operations. The Streamflow MP also includes a communication plan between Pilot Project partners.

Water quality monitoring is conducted under this Water Quality Monitoring Plan. The WQMP provides for measurement of physical water quality characteristics and analysis of chemical constituents within collected water samples. Analytical data helps characterize the quality of Pilot Project water and evaluate its suitability for SNWR beneficial water use.

Reclamation will evaluate data collected through the WQMP and the Streamflow MP to help determine the viability of utilizing this conveyance option on a long-term basis to meet the annual scheduled CVPIA water needs of the SNWR.

Water Quality Monitoring

Monitoring Stations

Monitoring stations are shown in Table 1 and Figure 2.

Princeton Pumping Plant Diversion Point (PPP) The quality of Sacramento River water, prior to conveyance through the RD1004 system, is monitored at the Concrete Ditch. This station is located ~ 200 meters downstream from the Princeton Pumping Plant point of diversion from the Sacramento River to the RD1004 conveyance system.

Dredger Cut Point of Delivery (DC) Monitoring at this station is limited to periods of active Pilot Project conveyance. Data collected at station DC reflects the quality of Pilot Project water after it has travelled through the RD1004 conveyance system prior to mixing with Butte Creek water.

RD1004 @ Gridley Road (RD) Monitoring at this station is limited to months that District Deliveries are occurring but Pilot Project conveyance is inactive. Data collected at this station reflects the quality of RD1004 water deliveries to District members without the additional (Sacramento River-sourced) flow that would be conveyed should the Pilot Project be implemented. Water at this station has travelled through the majority of the RD1004 conveyance system, but has not mixed with Butte Creek water.

Butte Creek @ Colusa Hwy (BC) The background quality of Butte Creek water, prior to mixing with Pilot Project conveyed water, is monitored at the Colusa Highway bridge crossing over Butte Creek.

East Borrow Ditch at SNWR (EBD) The quality of Pilot Project Conveyance Route water, as it is delivered to the SNWR, is monitored within the East Borrow Ditch at a point immediately upstream of Weir #2.

Target Analytes

A broad suite of inorganic and organic constituents are monitored under the WQMP (Table 2). Target analytes include: common physical water quality indicators such as temperature and pH; inorganic constituents that commonly occur in the Northern Central Valley and that are known to influence plant, fish, and wildlife health; and organic chemicals, including common rice herbicides and pesticides, that are likely to be present in local agricultural drainage.

Note that following evaluation of the first four months of the Pilot Project water quality data, monitoring of organic constituents was expanded to include the full suite of related organic chemicals that can be detected under the targeted analytical methods. This change was made as the analytical laboratory explained that they would supply the additional data at no extra cost.

Schedule

Under the Proposed Action, the Pilot Project will provide conveyance of L2 water to the SNWR during a 5-month conveyance period (September through January) over each of three (3) consecutive water years (WY)[1].

Under the original *WQMP 9/2017* (applicable September 2017 through February 2018), water quality monitoring was restricted to periods of active Pilot Project water conveyance. Under the *WQMP 3/2018 Update* (applicable beginning March 2018), and under this WQMP *5/2019 Revision* (applicable beginning 9/1/2019) monitoring is scheduled to occur year-round through the end of the Proposed Project third year - excluding periods when the conveyance route portion through RD1004 is closed for wintertime maintenance. This extended monitoring period is

[1] Water Year (WY) is defined as the period including March 1 of each calendar year through the last day of February of the following calendar year.

appropriate as it accommodates the expansion of study objectives to include monitoring during potential periods of water conveyance to the SNWR.

Each year of the Pilot Project, the first monitoring event will take place as soon as possible after Pilot Project water deliveries have reached the SNWR PoD. CVP L2 water takes approximately four days to travel from the Princeton Pumping Plant diversion point to the SNWR PoD, thus the first event of each monitoring year will be scheduled to occur four to six days following notification that RD1004 conveyance of Pilot Project CVP L2 water has begun. Monthly monitoring will occur during the Pilot Project conveyance period (September to January) and when RD1004 is only delivering water to its District members (April through August). Additional monitoring events may be scheduled in September and October during the rice-field drainage season and November through January to accommodate sampling the first significant rain event of the year. Monitoring will not occur during the period that the RD1004 system is shut down for wintertime maintenance (typically February through Mid-April).

Samples will be analyzed for inorganic constituents on a monthly basis. Additionally, samples will be tested for organic chemicals following the first rain event of the year, when crops are sprayed, and when rice fields are drained.

The Pilot Project task schedule is summarized below and in Table 3.

Field Measurements:

- Measure pH, dissolved oxygen, temperature, specific conductance and turbidity at all sites, any time that water quality samples are collected.
- Beginning April 2018 and continuing through the remainder of the Pilot Project, measure specific conductance and temperature at site EBD on an hourly basis using a deployed instrument.
- Download and review data on a quarterly basis.

Sample Collection and Analysis:

- During periods of active Pilot Project conveyance, collect water samples once each month at stations PPP, DC, BC, and EBD. During periods that RD1004 deliveries are occurring, but Pilot Project deliveries are not, replace monitoring at station DC with monitoring at station RD.
- Once each month that either Pilot Project water or District deliveries are occurring, analyze water samples for targeted inorganic and physical constituents.
- April through August (the period that agricultural chemicals are likely to be applied to local crops), analyze for targeted organic constituents in addition to the regular monthly (inorganics and physicals) monitoring.

- At least once during the rice-field drainage period (typically late September or early October) and as frequent as once per week, analyze target organic constituents at sites DC, BC, and EBD.
- Collect water at site PPP at the beginning and end of each Pilot Project conveyance period (likely September and January) and a third time at the beginning of RD1004 Spring/Summer District deliveries (likely April). Monitor targeted physical, inorganic, and organic constituents.
- If a suitably large rain event occurs during Pilot Project conveyance period (likely November to January), collect water at sites PPP, DC, BC and EBD. Monitor targeted physical, inorganic, and organic constituents. This sampling will occur only if the following two conditions are met: 1) rain within the project area appeared to be of sufficient intensity or duration to wash accumulated constituents from soils into adjacent creeks and 2) Reclamation staff are available to sample within 24 hours of the rain event.

Monitoring Date Selection

In mid-August of each active Pilot Project year, Reclamation water quality monitoring staff will contact Agricultural Extension staff, the RD1004 Manager, and/or SNWR staff, to determine likely periods when rice fields will be drained. Specific sampling dates will be scheduled according to the length of the year's rice drainage period.

Each year that a large rain event occurs, organics sampling will be scheduled to take place within 24 hours of the first large event of the year. If staff are not available, this organics collection event will not take place.

To accommodate quality assurance (QA) activities and laboratory receiving hours, water quality samples will not be collected on a Thursday, Friday or Saturday. Measurement of physical water quality indicators does not involve QA activities and therefore can be collected any day.

Site Access

There are no access restrictions for the PPP, DC and BC sites. The sites are easily reached via well-maintained public roads.

The EBD sampling location will be accessed via McClatchy Road (public road) and if needed, foot-travel over the EB Ditch water control structure (Weir #2).

Due to safety concerns voiced by DWR staff, Reclamation staff will only access the site during daylight hours. Field staff will travel in pairs, will carry charged cells phones, and each time the site is visited, will call an off-site USBR staff member upon entering, and exiting the site.

Monitoring Procedures

All sample collection, sample transportation, and record keeping procedures will be performed in accordance with Reclamation's Environmental Monitoring Branch (MP-157) standard operating procedures (Reclamation, 2017). At all times, care will be taken to ensure that environmental samples are representative of the water as it exists in the environment. Nitrile gloves will be worn for all sample collection activities; only pre-cleaned equipment and bottles will be used; and samples will be preserved appropriately. These steps ensure that sample chemical characteristics are not altered after collection.

Surface water grab samples will be collected directly, or using a high-density polyethylene sample churn-splitter, then transferred to appropriate sample bottles. On dates of sample collection, physical water quality characteristics will be measured *in situ* using a pre-calibrated Yellow Springs Instrument (YSI) 600 XL or YSI EXO multi-parameter Sonde. Sonde calibration, maintenance and data uploading procedures will be performed in accordance with manufacturer's recommended procedures as summarized in *Standard Operating Procedures for Environmental Monitoring* (Reclamation, 2017).

Hourly temperature and specific conductance readings will be recorded automatically using a continuously deployed ONSETU24-001 HOBO data logger. The instrument will be maintained, and data downloaded, at least once every three months. As per manufacturer specifications, instrument recalibration is not required.

When logistically possible, grab samples will be collected from the center of the stream/canal; if a central collection is not possible, care will be taken to ensure that water is collected away from any eddy and taken in fast moving water.

Analytical Methods

Chemical analyses will be performed by contracted analytical laboratories following standard analysis methods. Specific procedures are described in analytical methods documents, available either on-line or by request from Reclamation's QA and Data Management Branch (MP-156) personnel.

When available, analytical methods were selected to have reporting limits (RLs) below the lowest applicable water quality limit. Due to matrix effects and other sample-specific analytical complexities, achieved RLs will not always match method RLs.

Quality Assurance Methods

MP-156 personnel will evaluate field practices, laboratory practices, and analytical results in order to ensure that monitoring data and results are of the highest possible quality. For an in-depth description of the QA procedures

associated with this project, see the *MP-156 Standard Operating Procedures Manual for Quality Assurance* (Reclamation, 2014).

Data Assessment Methods

Water quality will be assessed by comparing constituent concentrations with water quality standards for the protection of the beneficial uses identified for the SNWR: fish and wildlife habitat, bird and wildlife water consumption, and suitability for irrigating habitat vegetation. The water quality will be evaluated using: California and National Toxics Rules for the protection of Fresh Water Aquatic Life, Irrigation Suitability limits, and limits designed to evaluate the suitability of water for poultry and livestock watering. Poultry and livestock limits are appropriate because specific limits do not exist for evaluating water quality for water consumption by birds and wildlife.

Reporting and Other Actions

If data results reveal any WQ issues of significant concern, MP-157 will immediately notify Reclamation's Refuge Water Conveyance Project Manager, and the Refuge Water Supply Program Natural Resources Specialist.

Data collected the first year of the Pilot Project (September 2017 – August 2018) was compiled and presented to the Refuge Water Conveyance Project Manager as an informal progress in November of 2018. A final WQ Assessment Report will be submitted to the Refuge Water Conveyance Project Manager approximately three months after completion of the three-year Pilot Project. The Pilot Project will end the last month of refuge water conveyance through RD1004, most likely the end of January 2020. The final report will contain compiled analytical results tables, a comparison of results with relevant WQ standards, monitoring recommendations, and a summary of QA findings.

WQMP Revision Process

Annual reviews of the WQMP and associated Sampling and Analysis Plan identify and document any procedural changes necessary to the monitoring plan. As needed, WQMP and SAP revisions reflect potential changes in contracted analytical laboratories, contact information, water quality standards, changes mandated through the adaptive management process, and any other circumstances affecting the monitoring effort.

Adaptive Management

An adaptive management plan will be developed between RD1004 and Reclamation, and/or SNWR and Reclamation, or between all three parties, as needed to address water quality concerns or issues that may arise during the Pilot

Project. In the event that an adaptive management plan is needed, the plan will be developed within 45 calendar days of identifying the concern or issue that needs to be addressed. In order to meet SNWR water quality and water delivery goals and objectives, SNWR and Reclamation will coordinate to develop and agree upon measures to address the concerns. Adaptive management measures may include curtailing or modifying Pilot Project operations, amending sampling schedules, or updating water quality thresholds to match current standards. Measures will ensure that the L2 water supply conveyed during the Pilot Project will not adversely affect RD1004 or SNWR water quality.

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References

Reclamation, 2017, Standard Operating Procedures for Environmental Monitoring, United States Bureau of Reclamation, Mid Pacific Region, Environmental Monitoring and Hazardous Materials Branch, April, 133p.

Reclamation, 2014, Standard Operating Procedures for Quality Assurance, Revision 2014-11, United States Bureau of Reclamation, Mid Pacific Region, Environmental Monitoring and Hazmat Branch, November, 157p.

FIGURE 1 - VICINITY MAP
Sutter NWR RD 1004 Refuge Level 2 Water Conveyance Pilot Project

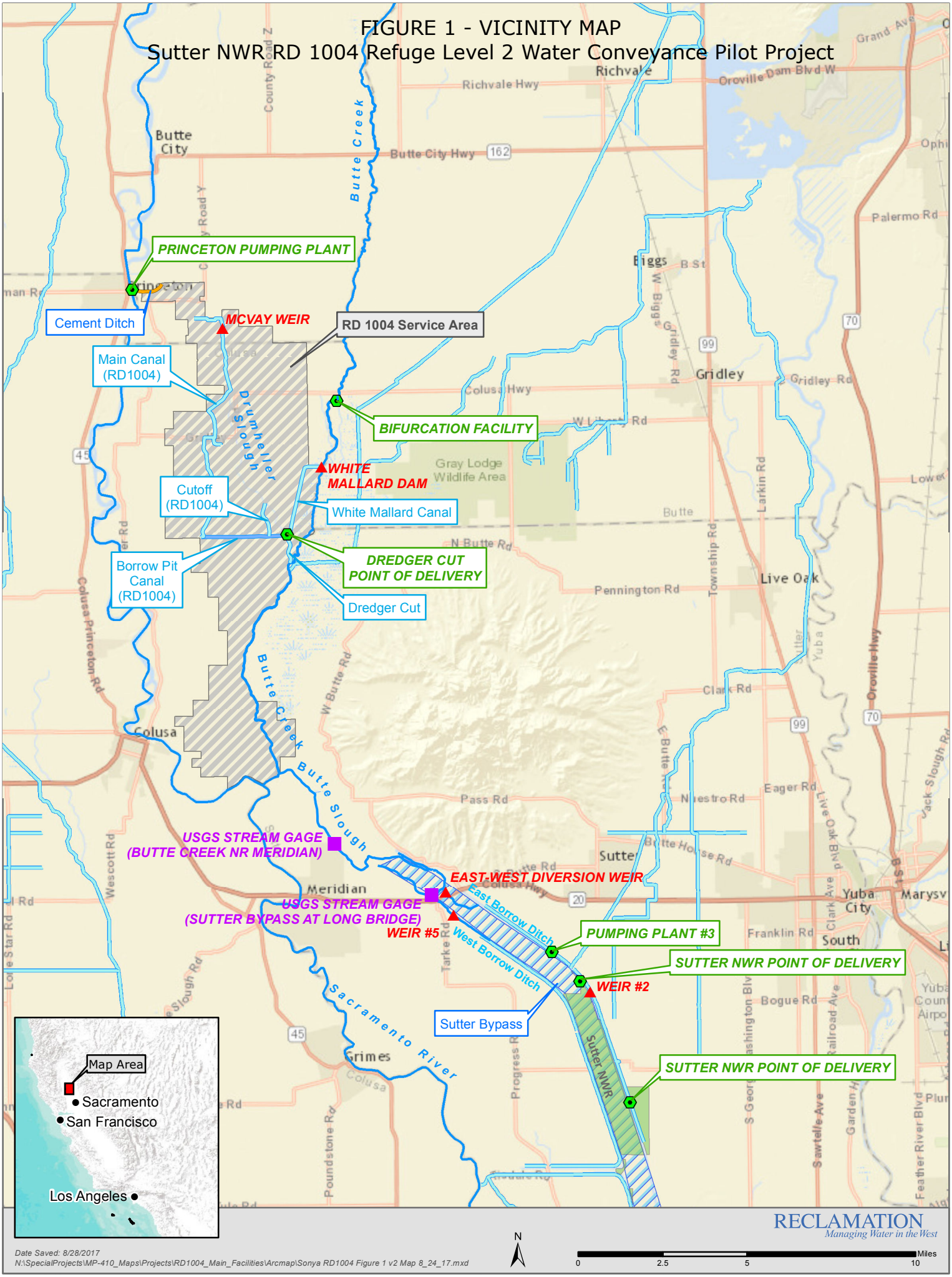

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FIGURE 2 - WATER QUALITY MONITORING SITES
Sutter NWR RD 1004 Refuge Level 2 Water Conveyance Pilot Project

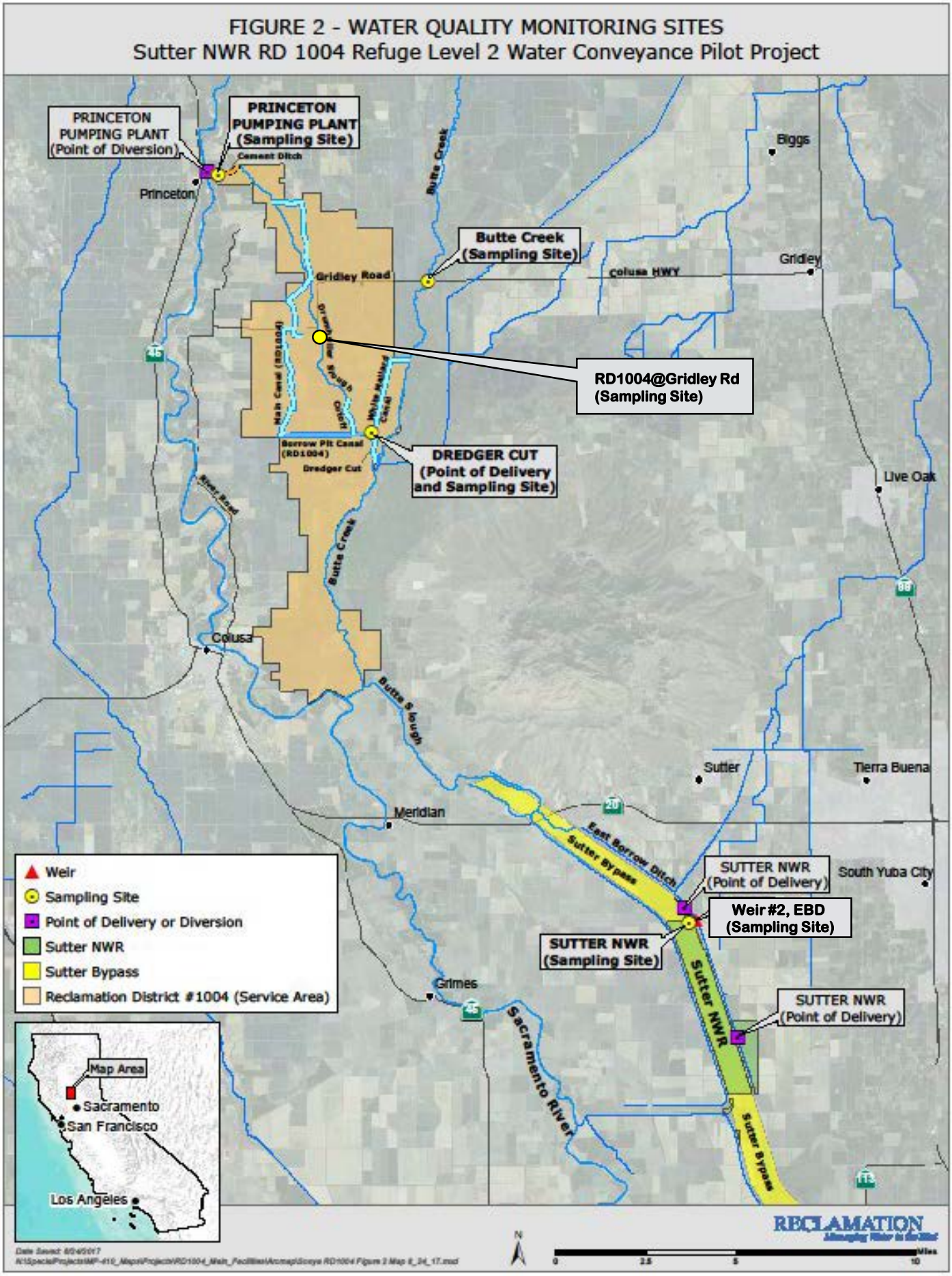

Table 1. Site Locations

Station Name	Latitude (N)	Longitude (W)
Princeton Pumping Plant Diversion Point (PPP)	39.406079°	-122.001052°
Butte Creek @ Colusa Hwy (BC)	39.361849°	-121.892771°
Dredger Cut Point of Delivery (DC)	39.301386°	-121.922628°
RD1004 @ Gridley Road (RD)	39.343298°	-121.962613°
East Borrow Ditch @ SNWR (EBD)	39.102743°	-121.758817°

Table 2. Target Analytes

Physical Characteristics	Inorganic Constituents	
Electrical Conductivity at 25°C	Alkalinity	Magnesium
Oxygen, dissolved	Bicarbonate Alkalinity	Manganese
pH	Aluminum	Mercury (dissolved)
Temperature	Ammonia (as N)	Molybdenum
Turbidity	Arsenic	Nickel
	Boron	Nitrate
	Cadmium	Phosphate phosphorus
Organic Constituents	Calcium	Potassium
Herbicides and insecticides commonly used in Colusa, Glenn and Sutter Counties	Chloride	Silver
	Chromium, total	Sodium
Dissolved organic carbon	Copper	Sodium Absorption Ratio
	Hardness	Sulfate
	Iron	Total Dissolved Solids
	Lead	Zinc

Table 3. Monitoring Schedule

Pilot Project Year 1 (2017/18)

Ag Extension experts estimate rice drainage period began between 8/30/17 and 9/11/17 and will finish by 10/6/17.

Month	Day	Year	Station	# of Sites	Physicals	Inorganics	Organics	Reason for Event
September	27	2017	BC, DC, SR PPP	4	x	x	x	Start of Pilot Project deliveries; inorganics monthly event, rice drainage organics event
October	3	2017	BC, DC, SR	3	x	x	x	Inorganics monthly event; rice drainage organics event
October	10	2017	BC, DC, SR	3	x		x	Rice drainage organics event
November	14	2017	BC, DC, SR	3	x	x		Inorganics monthly event
Nov-Jan	≤ 24 hrs after large rain event		BC, DC, SR PPP	4	x	x	x	Possible influx of contaminants moved by overland flow of rain. Only sample if a large rain event occurs
December	12	2017	BC, DC, SR	3	x	x		Inorganics monthly event
January	30	2018	BC, DC, SR PPP	4	x	x	x	End of Pilot Project deliveries; inorganics monthly event
February								No sample collection; RD1004 maintenance period
March								No sample collection; RD1004 maintenance period
April	17	2018	BC, RD, EBD PPP	4	x	x	x	Start of RD1004 deliveries to District members; agricultural spraying begins
May	15	2018	BC, RD, EBD	3	x	x	x	Inorganics and organics monthly event; ag-spraying period
June	12	2018	BC, RD, EBD	3	x	x	x	Inorganics and organics monthly event; ag-spraying period
July	10	2018	BC, RD, EBD	3	x	x	x	Inorganics and organics monthly event; ag-spraying period
August	14	2018	BC, RD, EBD PPP	4	x	x	x	Inorganics/organics monthly event; end of RD1004 District deliveries, end of agricultural spray season

Pilot Project Year 2 (2018/19)

Ag Extension estimate on period of rice drainage to be determined in mid-August, 2018

Month	Approx. Day		Station	# of Sites	Physicals	Inorganics	Organics	Reason for Event
September	4	2018	BC, DC, EBD PPP	4	x	x	x	Start of Pilot Project deliveries; inorganics monthly event, rice drainage organics event
September	11	2018	BC, DC, EBD	3	x		x	Possible rice drainage organics event
September	25	2018	BC, DC, EBD	3	x		x	Possible rice drainage organics event
October	2	2018	BC, DC, EBD	3	x		x	Possible rice drainage organics event
October	9	2018	BC, DC, EBD	3	x	x	x	Inorganics monthly event; possible rice drainage organics event
November	13	2018	BC, DC, EBD	3	x	x		Inorganics monthly event
Nov-Jan	≤ 24 hrs after large rain event	2018	BC, DC, EBD PPP	4	x	x	x	Possible influx of contaminants moved by overland flow of rain. Only sample if a large rain event occurs
December	11	2018	BC, DC, EBD	3	x	x		Inorganics monthly event
January	8	2019	BC, DC, EBD PPP	4	x	x	x	End of Pilot Project deliveries; inorganics monthly event
February								No sample collection; RD1004 maintenance period
March								No sample collection; RD1004 maintenance period
April	14	2019	BC, RD, EBD PPP	4	x	x	x	Start of RD1004 District deliveries; agricultural spraying begins
May	11	2019	BC, RD, EBD	3	x	x	x	Inorganics and organics monthly event; ag-spraying period
June	16	2019	BC, RD, EBD	3	x	x	x	Inorganics and organics monthly event; ag-spraying period
July	13	2019	BC, RD, EBD	3	x	x	x	Inorganics and organics monthly event; ag-spraying period
August	11	2019	BC, RD, EBD PPP	3	x	x	x	Inorganics and organics monthly event; end of RD1004 District deliveries, end of agricultural spray season

Pilot Project Year 3 (2019/20)

Ag Extension estimate on period of rice drainage to be determined in mid-August, 2019

Month	Approx. Day		Station	# of Sites	Physicals	Inorganics	Organics	Reason for Event
September	3	2019	BC, DC, EBD PPP	4	x	x	x	Start of Pilot Project deliveries; inorganics monthly event, rice drainage organics event
September	10	2019	BC, DC, EBD	3	x		x	Possible rice drainage organics event
September	17	2019	BC, DC, EBD	3	x		x	Possible rice drainage organics event
October	1	2019	BC, DC, EBD	3	x		x	Possible rice drainage organics event
October	8	2019	BC, DC, EBD	3	x	x	x	Inorganics monthly event; possible rice drainage organics event
November	12	2019	BC, DC, EBD	3	x	x		Inorganics monthly event
Nov-Jan	≤ 24 hrs after large rain event	2019	BC, DC, EBD PPP	4	x	x	x	Possible influx of contaminants moved by overland flow of rain. Only sample if a large rain event occurs
December	10	2019	BC, DC, EBD	3	x	x		Inorganics monthly event
January	7	2020	BC, DC, EBD PPP	4	x	x	x	End of Pilot Project deliveries; inorganics monthly event