

Quarterly Activity and Monitoring Report

October 1 – December 31, 2011

*In compliance with the “Management Agency Agreement between the
Central Valley Regional Water Quality Control Board and the United States
Bureau of Reclamation” executed on December 22, 2008*

February 15, 2012

Table of Contents

Abbreviations and Acronyms	ii
Purpose.....	1
A. Flow Actions	1
1. New Melones Reservoir Operations – Provision of Dilution Flow	2
2. Water Acquisitions.....	3
3. DMC Recirculation Pilot Studies – Provision of Dilution Water.....	4
B. Salt Load Reduction Actions.....	4
1. Grassland Bypass Project.....	5
2. Westside Regional Drainage Plan.....	6
3. Conservation Efforts	6
C. Mitigation Actions.....	8
1. RTMP – Development of Stakeholder-Driven Program	8
2. RTMP – Technical Support	9
3. Wetlands BMP Plan.....	10
4. Participation in CV-SALTS Program	11
D. Central Valley Project Deliveries Load Calculation.....	11
E. Reporting Requirements.....	14
F. Funding Reporting	14
G. References.....	15

Tables

Table 1. Goodwin Dam Monthly Dilution Flow Allocation

Table 2. Calculation of DMC Allocations and Loads

Table 3. Quarterly Report Submission Schedule

Table 4. Program Funding Initiatives

Abbreviations and Acronyms

Action Plan	Actions to Address the Salinity and Boron TMDL Issues for the LSJR
ARRA	American Recovery and Reinvestment Act of 2009
Authority	San Luis & Delta-Mendota Water Authority
Basin Plan	Water Quality Control Plan for the Sacramento and San Joaquin River Basins, 4 th Edition
BMP	Best Management Practices
BO	Biological Opinion
CALFED	CALFED Bay-Delta Program
CCID	Central California Irrigation District
CDEC	California Data Exchange Center
CDFG	California Department of Fish and Game
cfs	cubic feet per second
Corps	U.S. Army Corps of Engineers
CVO	Central Valley Operations
CVP	Central Valley Project
CVPIA	Central Valley Project Improvement Act
CVRWQCB	Central Valley Regional Water Quality Control Board
CV-SALTS	Central Valley Salinity Alternatives for Long Term Sustainability
DCRT	Data Collection and Review Team
DMC	Delta-Mendota Canal
DWR	California Department of Water Resources
EC	electrical conductivity
GBP	Grassland Bypass Project
GDA	Grassland Drainage Area
GREA	Grassland Ecological Area
GRCD	Grassland Resource Conservation District
GWD	Grassland Water District
Interior	U.S. Department of the Interior
LSJR	Lower San Joaquin River
MAA	Management Agency Agreement
MID	Modesto Irrigation District
µS/cm	micro Siemens per centimeter
µg/L	microgram(s) per liter (parts per billion)

mg/L	milligram(s) per liter (parts per million)
PDD	Panoche Drainage District
Reclamation	Bureau of Reclamation
RTMP	Real Time Management Program
Secretary	Secretary of the Interior
Service	U.S. Fish and Wildlife Service
SJR	San Joaquin River
SWP	State Water Project
SWRCB	State Water Resources Control Board
TAF	thousand acre-feet
TDS	total dissolved solids
TMDL	total maximum daily load
USBR	US Bureau of Reclamation
VAMP	Vernalis Adaptive Management Plan
WAP	Water Acquisition Program
WARMF	Watershed Analysis Risk Management Framework
WCFSP	Water Conservation Field Service Program
WDR	Waste Discharge Requirement
WQO	water quality objective
WEAP	Water Evaluation and Planning System
WRDP	Westside Regional Drainage Plan
WSI	Water Supply Index
YSI	Yellow Spring Instrument

Purpose

The Central Valley Regional Water Quality Control Board's (CVRWQCB) Salt and Boron Total Maximum Daily Load (TMDL) was approved and placed into effect on July 28, 2006. In response to the Salinity and Boron TMDL, the United States Bureau of Reclamation (Reclamation) developed the salinity management plan, *Actions to Address the Salinity and Boron TMDL Issues for the Lower San Joaquin River* (Action Plan) and entered into a Management Agency Agreement (MAA) with the CVRWQCB on December 22, 2008. The MAA describes the actions Reclamation will take to meet the obligations allocated to it by the Salinity and Boron TMDL for the Lower San Joaquin River. The MAA states:

Reclamation will submit quarterly reports to the Regional Water Board by 45 days after the end of the calendar quarter. The quarterly reports will include a summary of activities conducted by Reclamation during the quarter in conjunction with each element included in their Action Plan, including activities related to developing a Real Time Management Program. In addition Reclamation will include data collected relevant to DMC load evaluation.

The "Quarterly Activity and Monitoring Report" summarizes the activities conducted by Reclamation in conjunction with each element outlined in its salinity control plan for the Lower San Joaquin River. The Action Plan describes Reclamation's past, current and planned practices and procedures to mitigate and manage adverse impacts of salt and boron imported into the San Joaquin Basin via the Delta Mendota Canal (DMC) in order to help achieve compliance with the objectives contained in the CVRWQCB's *Water Quality Control Plan for the Sacramento River and the San Joaquin River Basins – 4th Edition* (Basin Plan).

Organization of Quarterly Report

The quarterly report provides a synopsis of the various activities associated with each element identified in the Action Plan. The Action Plan describes the actions contemplated by Reclamation to implement the MAA. Action categories include Flow, Salt Load Reduction, and Mitigation. For each action a brief description and list of activities are identified. The quarterly report includes calculations of salt loads based on DMC deliveries and calculations of assimilative capacity provided through dilution flows. The calculation methods used in this report are provisional and some elements in this report do not include estimations of benefits at this time. Reclamation submitted the *Compliance Monitoring and Evaluation Plan* to the CVRWQCB (USBR 2010) which outlines the criteria and methodology for determining DMC loads and credits.

A. Flow Actions

Reclamation agreed to provide mitigation and dilution flows to meet the Vernalis salinity and boron objectives. Historically, Reclamation has provided dilution flows from the New Melones Project and through purchases for the Vernalis Adaptive Management Plan (VAMP). Flow actions include: dilution flows from New Melones Reservoir, water acquisitions, and recirculation.

1. New Melones Reservoir Operations – Provision of Dilution Flow

Brief Description: In the Flood Control Act of October, 1962, the Congress reauthorized and expanded the New Melones project (P.L. 87-874) to a multipurpose unit to be built by the U.S. Army Corps of Engineers (Corps) and operated by the Secretary of Interior as part of the Central Valley Project (CVP), thus creating the New Melones Unit. The multipurpose objectives of the unit include flood control, irrigation, municipal and industrial water supply, power generation, fishery enhancement, water quality improvement, and recreation. Since June of 2009, New Melones has been operated to meet the National Marine Fisheries Service Biological Opinion (BO) to Reclamation on the effects of the continued operation of the CVP and the California State Water Project (SWP) on the various runs of Chinook salmon, Central Valley steelhead, and green sturgeon, and their designated critical habitat.

Items 12 and 13 of the Control Program for Salt and Boron Discharges into the Lower San Joaquin River of the Basin Plan Amendment states:

12. Salt loads in water discharged into the Lower San Joaquin River (LSJR) or its tributaries for the express purpose of providing dilution flow are not subject to load limits described in this control program if the discharge:

- a. complies with salinity water quality objectives for the LSJR at the Airport Way Bridge near Vernalis;
- b. is not a discharge from irrigated lands; and
- c. is not provided as a water supply to be consumptively used upstream of the San Joaquin River at the Airport Way Bridge near Vernalis.

13. Entities providing dilution flows, as described in item 12, will obtain an allocation equal to the salt load assimilative capacity provided by this flow. This dilution flow allocation can be used to:

- 1) offset salt loads discharged by this entity in excess of any allocation or;
- 2) trade, as described in item 10. The additional dilution flow allocation provided by dilution flows will be calculated as described in Table IV-8 (CVRWQCB 2004c).

Activities

- *Operated system to comply with Biological Opinions and Ripon dissolved oxygen criteria.*

Quantification Methodology: Table IV-8 (CVRWQCB 2004c) states that dilution flow allocations are calculated as follows:

$$A_{\text{dil}} = Q_{\text{dil}} * (C_{\text{dil}} - \text{WQO}) * 0.8293$$

Where:

- A_{dil} = dilution flow allocation in thousand tons¹ of salt per month
- Q_{dil} = dilution flow volume in thousand acre-feet per month (TAF) – above base flows
- C_{dil} = dilution flow electrical conductivity (EC) in micro-seimens per centimeter ($\mu\text{S}/\text{cm}$)
- WQO = salinity water quality objective for the LSJR at Airport Way Bridge near Vernalis in $\mu\text{S}/\text{cm}$

Table 1 lists data and monthly calculations for the past quarter. Data for flow releases from Goodwin Dam, the Stanislaus River “design flows,” and salinity at Orange Blossom Bridge are used to calculate the monthly dilution flow allocations. The water-year type is estimated based on the 75% probability of exceedance found in California Department of Water Resources (DWR) Water Supply Index Forecasts (<http://cdec.water.ca.gov/cgi-progs/iodir/WSI>) for the San Joaquin Valley. The 75% exceedance forecast for May 1, 2011 is 5.1, which classifies 2011 as a wet year.

Dilution Flow Allocation: WY2011 classified as a wet year.

Table 1: Goodwin Dam Monthly Dilution Flow Allocation

	Goodwin Dam Flow (GDF) ^a TAF	Base Design Flow (DF) ^b TAF	Q_{dil} , TAF GDF-DF= Q_{dil}	WQO ^c , $\mu\text{S}/\text{cm}$	C_{dil} (monthly average EC at Orange Blossom Bridge) ^d , $\mu\text{S}/\text{cm}$	Dilution Flow Allocation, A_{dil} , tons
July-11	138	8	130	1000	69	100,370
Aug-11	34	12	22	1000	39	17,533
Sept-11	31	13	18	1000	49	14,196

Source: USBR 2011a

^a <http://www.usbr.gov/mp/cvo/reports.html>

^b USBR 2010 Compliance Monitoring and Evaluation Plan

^c CVRWQCB 2004a and 2004b Appendix 1: Technical TMDL Report

^d <http://cdec.water.ca.gov/cgi-progs/querydaily>

2. Water Acquisitions

Brief Description: The Central Valley Project Improvement Act (CVPIA) signed into law on October 30, 1992, modified priorities for managing water resources of the CVP. CVPIA altered the management of the CVP to make fish and wildlife protection, restoration, and enhancement as project purposes having equal priority with agriculture, municipal and industrial, and power uses. To meet water acquisition needs under CVPIA, the U.S. Department of the Interior (Interior) developed a Water Acquisition Program (WAP), a joint effort by Reclamation and the U.S. Fish and Wildlife Service (Service). The program's purpose is to acquire water supplies to

¹ This is a typographical error in the Basin Plan Amendment. The units are actually tons.

meet the habitat restoration and enhancement goals of the CVPIA and to improve Interior's ability to meet regulatory water quality requirements. Under the Basin Plan Amendment, performance of the VAMP spring pulse flow does not provide dilution flows, so it is not reported here.

Activities

- *Reclamation executed a one year extension of the San Joaquin River Agreement which provided fall flows for 2011.*
- *Reclamation did not acquire any water this quarter.*

Quantification Methodology: The discussion on dilution flow allocation presented under New Melones Reservoir Operations is pertinent here as well. Table IV-8 (CVRWQCB 2004c) states that dilution flow allocations are calculated as follows:

$$A_{\text{dil}} = Q_{\text{dil}} * (C_{\text{dil}} - \text{WQO}) * 0.8293$$

Where:

- A_{dil} = dilution flow allocation in thousand tons² of salt per month
- Q_{dil} = dilution flow volume in thousand acre-feet per month
- C_{dil} = dilution flow electrical conductivity in $\mu\text{S}/\text{cm}$
- WQO = salinity water quality objective for the LSJR at Airport Way Bridge near Vernalis in $\mu\text{S}/\text{cm}$

3. DMC Recirculation Pilot Studies – Provision of Dilution Water

Brief Description: The DMC Recirculation Project studied the feasibility of using CVP flows to provide dilution water for salinity management. As part of the project studies, Reclamation conducted three pilot recirculation studies in 2004, 2007, and 2008. The pilot studies pumped water from the Delta at Tracy and conveyed it through the DMC to the Newman Wasteway, where it is then conveyed to the Lower San Joaquin River. The “Delta-Mendota Canal Recirculation Feasibility Study, Plan Formulation Report” is complete and available at <http://www.usbr.gov/mp/dmcrecirc/docs/final/index.html>.

Activities

- *Reclamation participated in a SWRCB workshop to inform the Board on the results of the DMC Recirculation Feasibility Study on March 15, 2011.*

B. Salt Load Reduction Actions

Reclamation is under a court order to provide drainage to its San Luis Unit, on the Westside of the Lower San Joaquin River. As part of its efforts to provide drainage, Reclamation has historically supported the Westside Regional Drainage Plan (WRDP) through monetary grants and in-kind services. Reclamation recognizes there is still much to be done to implement the

² *ibid*

Westside Regional Drainage Plan. Salt Load Reduction Actions include the Grassland Bypass Project (GBP), the Westside Regional Drainage Plan, and conservation programs [Water Conservation Field Services Program (WCFSP), WaterSMART Program (formerly Water 2025 Grants Program), and the CALFED Bay-Delta Program (CALFED) Water Use Efficiency Program].

1. Grassland Bypass Project

Brief Description: The GBP is a multi-agency stakeholder project based upon an agreement³ between the Reclamation and the San Luis and Delta-Mendota Water Authority (Authority) to use a 28-mile segment of the San Luis Drain to convey agricultural subsurface drainage water from the 97,000 acre Grassland Drainage Area (GDA) to Mud Slough, a tributary of the San Joaquin River. The purpose of the project is to separate unusable agricultural drainage water discharged from the GDA from wetland water supply conveyance channels, facilitate drainage management that maintains the viability of agriculture in the GDA, and promote continuous improvement in water quality in the San Joaquin River.

Activities

- *The Grassland Area Farmers met the 2011 annual load limits for salts specified in the Use Agreement and have met the monthly limits for January – December 2011.*
- *Flows did not exceed the capacity of the San Luis Drain through displacement across the San Joaquin River Water Quality Improvement Project re-use area.*
- *Reclamation and the Grassland Area Farmers are assisting CVRWQCB staff with the development of a revised Waste Discharge Requirement (WDR) for the GBP.*
- *Reclamation continues to implement the monitoring requirements for the 2001 WDR. Reclamation collected and analyzed water samples from nine sites for selenium, boron, salts, nutrients, and molybdenum, and operated auto-samplers in the San Luis Drain and in the river at Crows Landing.*
- *The Interagency Data Collection and Review Team (DCRT) continues to implement the monitoring program that includes quarterly biota sampling at seven locations, acute and chronic toxicity analyses, flow and water quality monitoring, and sediment monitoring for the accumulation of selenium. The DCRT will revise the GBP monitoring program to make it consistent with the revised WDR.*
- *The DCRT completed the 2008-2009 report which was published by San Francisco Estuary Institute. Most of the 2010 report is complete, pending biological analyses; and most data for 2011 have been compiled.*
- *The DCRT will revise the environmental monitoring program based on scientific requirements and the new WDR.*
- *On November 9, 2011, six environmental groups, lead by the Pacific Coast Federation of Fishermen's Associations, sued Reclamation and the Authority for failure to comply with the Clean Water Act permit system and to halt operation of the GBP. Court activities will begin in March 2012.*

³ U.S. Bureau of Reclamation and the San Luis and Delta-Mendota Water Authority, December 22, 2009. Agreement for Continued Use of the San Luis Drain for the Period January 1, 2010 through December 31, 2019. Agreement No. 10-WC-20-3975

2. Westside Regional Drainage Plan

Brief Description: The WRDP is a local stakeholder program developed by integrating all consistent elements of drainage management developed by government and local agencies and private partnerships. The original efforts of the WRDP focused on reducing selenium discharges to the San Joaquin River. Success of the original effort prompted a proposal to expand the WRDP to go beyond regulatory requirements and eliminate selenium, boron, and salt discharges to the San Joaquin River, while maintaining productivity of agriculture lands in the solution area and enhancing water supplies for the region.

While Reclamation lacks control of many of the resources needed to be an active participant in the WRDP, Reclamation provides annual funding to support and sustain the WRDP.

Activities

- *Reclamation continues to negotiate a long-term agreement with Panoche Drainage District to treat and dispose of high saline groundwater in six sumps that currently discharge into the DMC. This will reduce the load of salts delivered to the Mendota Pool, Grasslands wetlands, irrigated lands, and lower San Joaquin River.*
- *Reclamation continues to administer two grants with Panoche Drainage District to implement the WRDP for construction of infrastructure, source control activities, and environmental mitigation. A new grant for \$4.2 million is being negotiated.*
- *The grants have assisted Panoche Drainage District to displace over 108,000 tons of salts and 1,860 tons of boron in 2011(PDD 2011).*

3. Conservation Efforts

Brief Description: The water use efficiency program includes several grant programs which fund actions to assure efficient use of existing and any new water supplies. Efficiency actions can alter the pattern of water diversions and reduce the magnitude of diversions, providing additional benefits. Efficiency actions can also result in reduced discharge of effluent or drainage and improve water quality. Although Reclamation is unable to quantify the benefits of the various funded projects as related to salinity reduction, the following information is provided to depict the agency's water conservation efforts in the basin. Through the WaterSMART, CALFED, and the WCFSP, Reclamation has awarded 73 projects in the San Joaquin Valley that required performance measures since 2006. Through the American Recovery and Reinvestment Act (ARRA), Reclamation awarded 3 grant projects and 1 contract that required performance measures. As information is collected from these projects, quantifiable benefits may be determined in the future.

Activities

Under the 2011 WaterSMART Bay-Delta Agriculture Efficiency Program, Reclamation awarded five projects within the San Joaquin basin:

- *Buena Vista Water Storage District received \$999,681 to line one mile of earthen canal to reduce seepage losses, build new turnouts for more efficient water deliveries, retrofit*

meters, and install a supervisory control and data acquisition system. The total project cost is \$2,081,648.

- *South San Joaquin Irrigation District received \$1,000,000 to build a state-of-the-art, pressurized irrigation system, replace an open channel system to irrigate approximately 3,800 acres, and will capture agricultural run-off for irrigation re-use. The total project cost is \$12,996,280.*
- *Semitropic Water Storage District received \$711,170 to implement district-level improvements to increase the district's water and energy efficiencies by adding pumping capacity at two conveyance facilities and add a turbine to one of the district's pumping plants. The total project cost is \$1,474,640.*
- *Henry Miller Reclamation District 2131 received \$434,975 to install four long-crested weirs on the main canal to precisely control canal-water levels and help prevent system spills. The total project cost is \$886,802.*
- *Firebaugh Canal Water District received \$1,000,000 to concrete-line 2.6 miles of earthen canal to prevent seepage and sediment in delivered surface water. The total project cost is \$2,814,000.*

Under the 2011 WaterSMART Water and Energy Efficiency Program, Reclamation awarded three projects within the San Joaquin basin as follows:

- *Kaweah Delta Water Conservation District received \$918,500 to construct a levee perpendicular to Deep Creek, construct a check structure with automated gates and advanced flow management, and install a supervisory control and data acquisitions system. The total project cost is \$1,850,000.*
- *North San Joaquin Water Conservation District received \$300,000 to divert Mokelumne River high flows to Tracy Reservoir to recharge groundwater pumping through the Tracy Lake bed in the critically overdrafted Eastern San Joaquin County Groundwater Basin. The total project cost is \$854,700.*
- *Ivanhoe Irrigation District received \$300,000 to automate an existing irrigation system by relocating its flow control point downstream and automating five control ingate valves. The total project cost is \$833,000.*

Under the 2011 Field Services Program, Reclamation awarded three projects within the San Joaquin basin:

- *Kern-Tulare Water District received \$50,000 to fund a mobile irrigation laboratory for completing on farm irrigation system evaluations. The District is expecting to better manage 7,500 acre-feet per year. The total project cost is \$136,000.*
- *Madera Irrigation District received \$100,000 to install automated gate control and SCADA for Franchi Dam and Big Main. The District is expected to conserve 1,650 acre-feet per year. The total project cost is \$210,000.*
- *Madera Irrigation District received \$50,000 to continue an existing grant to implementing a meter replacement program for its aging and under-performing open-flow propeller meters located at farm turnouts. It is anticipated to conserve 1,920 acre-feet per year and better manage 19,200 acre-feet per year. The total project cost is \$100,000.*

Under the 2011 CALFED Water Use Efficiency Program, Reclamation awarded two projects within the San Joaquin Basin.

- *Merced Irrigation District received \$1,000,000 for canal lining and reconfiguration of the Arena Canal and Howard Lateral to reduce seepage and spillage within the system. The project will conserve 5,000 acre-feet per year. The total project cost is \$2,312,715.*
- *Pacheco Water District received \$262,000 to line three miles of an existing earthen channel with a flexible, water-tight rubber liner. The project will eliminate seepage losses of 8,000 acre-feet per year. The total project cost is \$524,000.*

C. Mitigation Actions

Reclamation's Action Plan identifies two mitigation actions to reduce salinity loads: (1) a Real Time Management Program (RTMP) to improve the timing of west-side discharge of saline drainage to the San Joaquin River so as to occur during times of sufficient San Joaquin River assimilative capacity. (2) implementation of innovative wetland best management practices (BMP) for salinity – these could include early drawdown and re-flooding during years of water surplus; delayed wetland drawdown (cannot be practiced on the same land two years in a row without damaging wetland habitat) and recirculation of wetland drainage. Reclamation actively supports the development of a real time monitoring and salt assimilative capacity forecasting program in the San Joaquin River and in managed seasonal wetlands.

1. RTMP – Development of Stakeholder-Driven Program

Brief Description: The RTMP is described in the TMDL as a stakeholder driven effort to use “real-time” water quality and flow monitoring data to support water management operations in order to maximize the use of assimilative capacity in the San Joaquin River. The CVRWQCB describes this assimilative capacity as up to 85% of the load determined by Vernalis salinity objective. Reclamation is working with its consultant and Berkeley National Laboratory to support the development of a stakeholder-driven program.

Activities

- *Reclamation continues working with its consultants to facilitate stakeholder involvement in developing a RTMP. The RTMP team is evaluating options and opportunities for engaging stakeholder through participation in the Central Valley Salinity Alternatives for Long Term Sustainability (CVSALTS) and the lower San Joaquin River Subcommittee within the larger CVSALTS effort.*
- *Reclamation is working with Berkeley National Laboratory to develop a hydrological data management system for continuous assessment of real-time water quality data and enhancement of data sharing between stakeholders.*
 - *The real-time water quality management system under development for the Grassland Water District (GWD) and the State and Federal refuges is serving as a useful prototype for the basin-wide system. Many of the same issues of data sharing and coordination of drainage schedules among and between organizations apply equally to the Grassland Regional Ecological Area (GREA) wetlands as they do to the San Joaquin Basin.*

- *Started work on automating data uploads to the WISKI server. The ftp technology for pulling data off the NIVIS EcoNet server and migrating it to WISKI exists but navigating the firewalls on the Berkeley National Laboratory server has proved to be challenging. This issue won't be resolved until YSI Inc. changes the software to allow daily downloads – Reclamation is working with YSI Technical Support to accomplish this.*
- *Modesto Irrigation District (MID) requested assistance in assessing the utility of WISKI for their Water District. MID would like to discuss some of the experiences encountered while developing the system for GWD. WISKI would provide a common data management platform for Turlock, Modesto, and Merced Irrigation District's.*
- *The wetland drainage recirculation project proposed for the north GWD is in the design phase. This project will allow reuse of wetland drainage during the September 15 through February 15 each year. The project is expected to recover between 5,000 and 11,700 acre-feet per year.*
- *Work is progressing on a GIS-based wetland drainage planning model. Initial work on this concept concentrated on evaluating the decision support tool Water Evaluation and Planning System (WEAP) for this purpose. The model has great utility as a flow simulator but has proved to be cumbersome for handling of salinity. The model may be too complex for use by water district personnel for scheduling wetland drainage decisions. An alternative approach is being evaluated where the model is run within ArcGIS and a customized graphical user interface designed specifically for decision making at the water district level. Licensing issues will need to be resolved if this approach is to be cost-effective.*

2. RTMP – Technical Support

Brief Description: A successful RTMP will require a real time monitoring network and a model capable of forecasting San Joaquin River assimilative capacity. The concept behind the RTMP is to enable the use of available assimilative capacity to export salt loads from the basin and to improve the scheduling of salinity loading to the river at times when there is significant dilution capacity. Matching salt load export with river assimilative capacity will reduce the frequency with which the river's capacity for salinity is exceeded (to the extent that exceedances are caused by discharges and not by background or allowed loads). Development of an accurate forecast model will serve as a decision making tool to help manage salinity loads in the river without violating water quality standards. Reclamation is committed to participate in the development and support of these tools. Reclamation staff has valuable experience in both of these areas. The technical support of this program will follow the stakeholder process.

Activities

- *Reclamation is working with its contractor to gather the necessary information to identify general infrastructure needs to engage real time management stakeholders. This study is scheduled to be completed later this year.*
- *Reclamation is working with its contractor to provide technical support for the upstream salinity studies as they relate to RTMP. The main thrust of this work is the improved calibration and validation of the simulation model Watershed Analysis Risk Management*

Framework for the San Joaquin River (WARMF-SJR) that will be used for forecasting assimilative capacity.

- *Reclamation executed a multi-year contract to obtain technical support to meet the salinity objectives at Vernalis in the lower San Joaquin River. The program is in the preliminary stages of developing an approach strategy.*
- *Berkeley National Laboratory and Reclamation are working closely with Systech Water Resources and the US Geological Survey to improve the resolution of the current surface and groundwater simulation models by redefining watersheds to match water districts on the west-side of the San Joaquin Basin and improving automation of data assimilation for real-time forecasting. One of the results of this coordinated effort will be to resolve some of the diversion data confusion for the exchange contractors and refugees.*

3. Wetlands BMP Plan

Brief Description: The Service, California Department of Fish and Game (CDFG), and the Grassland Resource Conservation District (GRCD) in coordination with Reclamation are developing BMP plans to reduce the impact of discharges from managed wetlands into the San Joaquin River. Reclamation also provides resources to support the development of a real-time monitoring network and other potential BMP analysis tools within Federal, State, and private managed wetlands. At present, the BMP plan has not been completed and released to the public.

Activities

- *Reclamation is continuing to support a network of real-time flow and water quality monitoring stations at both wetland pond sites and major inflow and outflow conveyances within the GREA. Reclamation has sponsored research to reduce the per-unit cost of telemetered monitoring and web-access of real-time data. Reclamation has installed two MACE Agriflow data collection and telemetry platforms adjacent to the monitoring wells at the Volta.*
- *Reclamation is working with the Service, CDFG, and local wetlands managers to update and finalize the BMP Plan. During 2009 and 2010 new flow and water quality monitors came on-line which are quantifying the volume and quality of return flows into the District from Central California Irrigation District (CCID) and the San Luis Canal Water District. This quantification will improve water management in the South GWD and improve water use efficiency.*
- *Reclamation's contractors completed the two production wells located in the Volta Wildlife Management Area. Wells began production in late October 2011. Each site is instrumented with well discharge and EC sensors at each well head in addition to a stage sensor measuring well drawdown. These sensors will report directly to the current YSI-EcoNet sensor network. The MACE Agriflow loggers will report the monitoring well levels to the MACE sensor website for the project. A comprehensive monitoring and operations plan are in place to ensure compliance with water quality objectives and sustain optimal habitat for the giant garter snake. Well discharge will be continuously monitored to assess long term impacts on refuge water quality and local groundwater resources. Berkeley National Laboratory is assisting Reclamation with a hydrologic data management system to tie this well monitoring program into the larger WISKI-based real-time water quality monitoring program for the GREA.*

4. Participation in CV-SALTS Program

Brief Description: The CVRWQCB and SWRCB initiated a comprehensive effort to address salinity problems in California's Central Valley and adopt long-term solutions that will lead to enhanced water quality and economic sustainability. The CV-SALTS is a collaborative basin planning effort aimed at developing and implementing a comprehensive salinity management program. The goal of CV-SALTS is to maintain a healthy environment and a good quality of life for all Californians by protecting the state's most essential and vulnerable resource: water.

Activities

Reclamation continues to participate in various sub-committees of the program (Executive, Technical Advisory and Economic, Education and Outreach, and Lower San Joaquin). In addition:

- *Reclamation chaired the "Knowledge Gained" (formerly "Lessons Learned") Subcommittee until June 2011, however, Reclamation is very active with this committee. The Subcommittee has completed a draft framework for regional salt and nitrate information collection that can be applied basin-wide and intends to finalize this document in early November, 2011. Reclamation continues to lead the Technical Subcommittee and regularly attends the Executive Committee and other subcommittees.*
- *Reclamation's consultants continue to make progress on the Westside Salt Sources Assessment, which complements the CV-SALTS Pilot Salt Sources Study. This effort includes assistance in updating the WESTSIM and WARMF-SJR models, improvements to model calibration and development of a spreadsheet-based model, and summary of water and salinity budgets for agricultural and wetland uses on the west-side.*
- *The Westside Salt Sources Assessment. The integration of the surface water and ground water models continues to be problematic. However, Reclamation is documenting the approach and lessons learned to help the future study teams.*
- *Reclamation will partner with CVSALTS Lower San Joaquin River Committee. As they develop plans for Basin Plan updates, Reclamation will assist in the development of quality plans, a Stakeholder Participation Plan, and an approach for Real-time Management.*

D. Central Valley Project Deliveries Load Calculation

Brief Description: The CVP delivers water to both the Grassland and Northwest subareas (as described in the Basin Plan) through the DMC. The DMC starts at the pumping headworks in the Delta, the C.W. Jones (Jones) Pumping Plant at Tracy, California. Water is conveyed south to the San Luis Reservoir, where water is mixed with the State Water Project in O'Neill Forebay and then either pumped into San Luis Reservoir for later delivery, or conveyed further south through the DMC to the Mendota Pool. Turnouts and groundwater pump-ins occur at several locations along the DMC. "Reach 1" of the DMC includes turnouts between the Jones Pumping Plant and the San Luis Reservoir. Deliveries for Reach 1 are made through the San Luis Canal and the Cross Valley Canal, as well as directly out of the DMC. "Reach 2" of the DMC includes turnouts between the O'Neill Forebay and the Mendota Pool. "Reach 3" covers deliveries made

out of the Mendota Pool. Some simplification of this system has been made for accounting purposes, as some districts take portions of their deliveries through several turnouts.

Quantification Methodology: The Basin Plan allocates a load to Reclamation for water delivered to the Grassland and Northwest side Subareas. This load allocation is calculated according to Table IV-8 Summary of Allocations and Credits (CVRWQCB 2004c):

$$LA_{DMC} = Q_{DMC} * 52 \text{ mg/L} * 0.0013599$$

Where:

- LA_{DMC} = Load Allocation of salts, in tons
- Q_{DMC} = monthly amount of water delivered to Grassland and Northwest side subareas, in acre - feet
- 52 = "background" total dissolved solids (TDS) of water in the San Joaquin River at Friant per the Basin Plan
- 0.0013599 = factor for converting units into tons

Actual DMC salt loads are calculated by the following equation:

$$L_{DMC} = Q_{DMC} * (C_{DMC}) * 0.0013599$$

Where:

- L_{DMC} = Actual DMC Load, in tons
- Q_{DMC} = monthly amount of water delivered to Grassland and Northwest side subareas, in acre - feet
- C_{DMC} = monthly average (arithmetic mean) of salinity of the water delivered to Grassland and Northwest Subareas, in mg/L TDS
- 0.0013599 = factor for converting units into tons

Each delivery reach's Q_{DMC} is calculated and then paired with the associated monthly average EC for that reach, so the equation essentially becomes:

$$L_{DMC} = 0.0013599 * \Sigma(Q_{DMC} * C_{DMC})_{\text{Reach 1-3}}$$

This equation is then broken into two calculations, one for each subarea. Table 2 illustrates the excess loads from the subareas and the total excess loads from CVP deliveries.

Table 2. Calculation of DMC Allocations and Loads

	Grassland Subarea						Northwest Subarea					Total
	San Joaquin River and Mendota Pool Deliveries from CVP, load in thousand tons	Delta- Mendota Canal Deliveries from CVP, load in thousand tons	San Luis and Cross Valley Canal Deliveries from CVP, load in thousand tons	Total Flow, thousand acre-feet	Load Allocation, thousand tons	Actual Load - Load Allocation, thousand tons	San Joaquin River and Mendota Pool Deliveries from CVP, load in thousand tons	Delta- Mendota Canal Deliveries from CVP, load in thousand tons	Total Flow, thousand acre-feet	Load Allocation, thousand tons	Actual Load - Load Allocation, thousand tons	
September to March Standard, 1000 µS/cm												
Oct-0	1.3	6.0	2.3	85.5	6.0	33.7	0.6	0.4	2.2	0.2	0.9	34.5
Nov-09	11.0	5.4	1.6	39.1	2.8	15.2	0.4	0.6	2.0	0.1	0.8	16.0
Dec-09	0.0	3.3	0.4	6.9	0.5	3.2	0.0	0.3	0.5	0.0	0.3	3.4
Jan-10	1.3	3.1	0.5	7.6	0.5	4.5	0.0	0.1	0.2	0.0	0.1	4.6
Feb-10	20.2	1.5	1.4	8.0	2.7	20.4	0.5	0.3	1.4	0.1	0.7	21.1
Mar-10	19.6	6.2	3.4	54.2	3.8	25.3	1.7	1.2	5.3	0.4	2.5	27.8
April to September Standard, 700 µS/cm												
Apr-10	16.0	2.2	3.9	37.1	2.6	19.5	0.9	0.8	3.2	0.2	1.5	21.0
May-10	35.6	10.2	5.3	123.9	8.8	42.4	3.3	2.5	16.3	1.1	4.6	47.0
Jun-10	33.5	9.2	6.1	165.0	11.7	37.1	3.0	3.1	21.6	1.5	4.6	41.7
Jul-10	32.9	10.2	5.8	191.8	13.5	35.4	3.0	4.7	32.4	2.3	5.4	40.8
Aug-10	37.2	12.0	4.2	171.5	12.1	41.3	3.4	4.5	24.4	1.7	6.2	47.4
September to March Standard, 1000 µS/cm												
Sep-10	35.8	17.6	0.2	133.7	9.4	46.2	2.5	1.9	11.3	0.8	3.7	49.9
Oct-10	26.9	8.4	2.8	87.3	6.2	31.8	0.2	1.2	3.9	0.3	1.2	33.0
Nov-10	13.7	3.8	2.1	42.	3.0	16.6	0.5	0.3	2.0	0.1	0.7	17.3
Dec-10	10.3	0.5	0.4	23.8	1.7	9.4	0.5	0.04	1.2	0.1	0.5	9.9
Jan-11	8.7	0.2	0.6	5.6	0.4	9.2	0.03	0.01	0.08	0.01	0.03	9.2
Feb-11	17.4	1.9	2.3	22.9	1.6	20.0	0.8	0.5	4.1	0.3	1.1	21.1
Mar-11	13.5	3.5	2.5	23.1	1.6	17.9	1.1	0.4	4.7	0.3	1.1	19.0
April to September Standard, 700 µS/cm												
Apr-11	17.6	2.2	2.2	22.6	1.6	20.5	1.6	1.1	9.7	0.7	2.0	22.5
May-11	29.7	7.0	3.1	49.8	3.5	36.3	2.7	2.3	18.3	1.3	3.7	40.0
Jun-11	31.4	5.4	4.4	49.0	3.5	37.8	2.6	1.9	18.7	1.3	3.3	41.0
Jul-11	34.8	7.6	5.1	86.9	6.1	41.3	3.2	3.8	31.9	2.3	4.8	46.1
Aug-11	36.3	10.5	4.3	80.0	5.6	45.4	3.4	3.5	28.1	2.0	5.0	50.4
September to March Standard, 1000 µS/cm												
Sep-11	23.8	10.2	1.7	66.9	4.7	30.9	1.7	1.8	13.7	1.0	2.5	33.4
Oct-11	18.4	3.7	1.2	33.3	2.4	21.1	1.0	0.6	5.9	0.4	1.2	22.3
Nov-11	8.6	4.9	1.5	28.2	2.0	13.1	0.6	0.4	3.5	0.2	0.8	13.9
Dec-11	0.9	9.0	1.1	26.5	1.9	9.1	0.02	1.1	2.9	0.2	0.9	9.9

Source: USBR 2011b

E. Reporting Requirements

In the MAA, Reclamation agreed to provide quarterly reports to the CVRWQCB. Reclamation will consult with the CVRWQCB before proposing any changes to the sample report format. Quarterly reports are due 45 days after the end of the calendar quarter:

Table 3. Quarterly Report Submission Schedule

End of Calendar Quarter	Due Date of Quarterly Report
Dec 31, 2008	February 15, 2009
March 31, 2009	May 15, 2009
June 30, 2009	August 15, 2009
September 30, 2009	November 15, 2009
December 31, 2009	February 15, 2010
March 31, 2010	May 15, 2010
June 30, 2010	August 15, 2010
September 30, 2010	November 15, 2010
December 31, 2010	February 15, 2011
March 31, 2011	May 15, 2011
June 30, 2011	August 15, 2011
September 30, 2011	November 15, 2011
December 31, 2011	February 15, 2012
March 31, 2012	May 15, 2012
June 30, 2012	August 15, 2012
September 30, 2012	November 15, 2012
December 31, 2012	February 15, 2013

F. Funding Reporting

Reclamation agreed in the MAA to seek additional funding, including grant funding, to support salinity control efforts. Table 4 summarizes Reclamation's funding initiatives.

Activities

Table 4. Program Funding Initiatives

Program	Description	Status	Period of Performance
Program to Meet Standards	Salinity Objectives for Vernalis	Execution	FY 2012
Program to Meet Standards	Salinity Objectives for Vernalis	Modification for Optional Tasks	FY2013-FY2014
Real-Time Management Program	Stakeholder Facilitation to Initiate RTMP	Execution	FY 2012
Real-Time Management Program	Technical Support, Data Analysis, and Infrastructure Study	Execution	FY 2012
Westside Salt Assessment	Fate and Transport Study	Execution	FY2012-FY2013
Salinity Control	Salinity and Boron TMDL	Execution	FY 2012
Salinity Control	Westside Regional Drainage Plan	Requested Funding	FY2012-FY2013
Salinity Control	Grasslands Bypass Project	Requested Funding	FY2012-2013

G. References

- PDD 2011 Panoche Drainage District Water Monitoring Data Summary, USBR, Chris Eacock, December 2011.
- CVRWQCB 2004a Amendments to the Water Quality Control Plan for the Sacramento River and San Joaquin River Basins for the Control of Salt and Boron Discharges Into the Lower San Joaquin River Draft Final Staff Report **Appendix 1: Technical TMDL Report**, Regional Water Quality Control Board Central Valley Region, July 4, 2004.
- CVRWQCB 2004b Amendments to the Water Quality Control Plan for the Sacramento River and San Joaquin River Basins for the Control of Salt and Boron Discharges into the Lower San Joaquin River Final Draft Staff Report. Appendix D: Background Salt and Boron Loading, Appendix E: Alternate Methods For Calculating Salt Loading from the Northwest Side of the Lower San Joaquin River. Regional Water Quality Control Board Central Valley Region, July 4, 2004.
- CVRWQCB 2004c Amendments to the Water Quality Control Plan for the Sacramento River and San Joaquin River Basins for the Control of Salt and Boron Discharges into the Lower San Joaquin River Final Staff Report. **Table IV-8 Summary of Allocations and Credits, Dilution Flow Allocations**, Regional Water Quality Control Board Central Valley Region, September 10, 2004
- USBR 2010 Compliance Monitoring and Evaluation Plan, In Compliance with the “Management Agency Agreement between the Central Valley Regional Water Quality Control Board and the Bureau of Reclamation” executed on December 22, 2008. US Bureau of Reclamation, November 2010.
- USBR 2011a Calculations for Quarterly Report, Q4-2011, Table 1: Goodwin Dam Monthly Dilution Flow Allocations, US Bureau of Reclamation, February 15, 2012.
- USBR 2011b Delta-Mendota Canal Water Quality Monitoring Program Report for October to December 2011. US Bureau of Reclamation, February 15, 2012.