RECLAMATION

Managing Water in the West

Quarterly Activity and Monitoring Report

April 1 – June 30, 2014

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

Delta-Mendota Canal near Tracy, California

August 14, 2014

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Abbreviations and Acronyms

Action Plan	Actions to Address the Salinity and Boron TMDL Issues for the Lower San Joaquin River November 2008
Authority	San Luis & Delta-Mendota Water Authority
Basin Plan	Water Quality Control Plan for the Sacramento and San Joaquin River Basins, 4th Edition
BMP	Best Management Practices
BO	Biological Opinion
CALFED	California Bay-Delta Authority
CCID	Central California Irrigation District
CDEC	California Data Exchange Center
CDFW	California Department of Fish and Wildlife
Corps	U.S. Army Corps of Engineers
CVO	Central Valley Operations
CVP	Central Valley Project
CVPIA	Central Valley Project Improvement Act
CV Water Board	Central Valley Regional Water Quality Control Board
CV-SALTS	Central Valley Salinity Alternatives for Long Term Sustainability
DMC	Delta-Mendota Canal
DSS	Decision Support System
DWR	California Department of Water Resources
EC	electrical conductivity
GBP	Grassland Bypass Project
GDA	Grassland Drainage Area
GOES	Geostationary Operational Environmental Satellites
GRCD	Grassland Resource Conservation District
GWD	Grassland Water District
LBNL	Lawrence Berkeley National Laboratory
LSJR	Lower San Joaquin River
MAA	Management Agency Agreement
µS/cm	micro Siemens per centimeter
mg/L	milligram(s) per liter (parts per million)
Reclamation	United States Bureau of Reclamation
RTMP	Real Time Management Program

Service	U.S. Fish and Wildlife Service
SJR	San Joaquin River
SJRIP	San Juan Recovery Implementation Program
TAF	thousand acre-feet
TDS	total dissolved solids
TMDL	total maximum daily load
VAMP	Vernalis Adaptive Management Plan
WARMF	Watershed Analysis Risk Management Framework
WARMF – SJR	Watershed Analysis Risk Management Framework San Joaquin River
WDR	Waste Discharge Requirement
WQO	water quality objective
WRDP	Westside Regional Drainage Plan
WSI	Water Supply Index
YSI	Yellow Springs Instrument Company

Purpose

The Central Valley Regional Water Quality Control Board's (CV Water Board) Salt and Boron Total Maximum Daily Load (TMDL) was approved and placed into effect on July 28, 2006. In response to the Salt 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 CV Water Board on December 22, 2008. The MAA describes the actions Reclamation will take to meet the obligations allocated to it by the Salt and Boron TMDL for the Lower San Joaquin River (LSJR). The MAA states, in part:

> 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 Action Plan. 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 CV Water Board'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. 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 CV Water Board (Reclamation 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 provided dilution flows from the New Melones Project and through purchases for the Vernalis Adaptive Management Plan (VAMP). The dilution flow provision in the VAMP expired recently; stakeholders within the watershed are currently negotiating a new agreement to replace the VAMP. Flow actions include but are not limited to: 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, Congress reauthorized and expanded the New Melones unit (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 the 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 on the various runs of Chinook salmon, Central Valley steelhead, and green sturgeon, and their designated critical habitat.

The Sacramento and San Joaquin River Basin Plan was amended in 2004 to include a Control Program for Salt and Boron Discharges into the LSJR. Items 12 and 13 of the Salt and Boron Control Program state:

Item 12. Salt loads in water discharged into the 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 SJR at the Airport Way Bridge near Vernalis.

Item 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 (CV Water Board 2004c).

Activities

- Reclamation continues to operate its facilities to comply with State Water Board D-1641, the applicable Biological Opinions and the Stanislaus River at Ripon monitoring station dissolved oxygen criteria.

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

$A_{dil} = Q_{dil} * (C_{dil} – WQO) * 0.8293$

Where:

A_{dil} = dilution flow allocation in thousand tons[1] of salt per month
Q_{dil} = dilution flow volume in thousand acre-feet (TAF) per month – above base flows
C_{dil} = dilution flow electrical conductivity (EC) in micro-Siemens per centimeter (μS/cm)
WQO = salinity water quality objective for the LSJR at Airport Way Bridge near Vernalis in μS/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, 2014 is 1.1, which classifies 2014 as a critically dry year.**

Dilution Flow Allocation: WY2014 classified as a Critical 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], μS/cm	C_{dil} (monthly average EC at Orange Blossom Bridge) [d], μS/cm	Dilution Flow Allocation, A_{dil}, tons
Apr-14	92	28	64	700	72	-33,331
May-14	77	28	49	700	64	-25,844
June-14	16	0	16	700	64	-8,439

Source: Reclamation 2014a
[a] http://www.usbr.gov/mp/cvo/reports.html
[b] Reclamation 2010 Compliance Monitoring and Evaluation Plan
[c] CV Water Board 2004a and 2004b Appendix 1: Technical TMDL Report
[d] http://cdec.water.ca.gov/cgi-progs/staSearch

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 have equal priority with agriculture, municipal and industrial, and power uses. To meet water

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

acquisition needs under the CVPIA, the U.S. Department of the Interior developed a Water Acquisition Program, a joint effort by Reclamation and the U.S. Fish and Wildlife Service (Service). The program's purpose is to acquire water supplies to meet the habitat restoration and enhancement goals of the CVPIA and to improve Interior's ability to meet regulatory water quality requirements.

Activities

- Reclamation did not acquire any additional water this quarter.

Quantification Methodology: The discussion on dilution flow allocation presented under New Melones Reservoir Operations is pertinent here as well. Please refer to the Table IV-8 (CV Water Board 2004c) dilution allocation formula stated for the Table 1 calculation above.

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 LSJR. 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

- No new activities related to this project have occurred.

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 Valley. As part of this effort, Reclamation historically supported the Westside Regional Drainage Plan (WRDP) through grants and in-kind services. Salt Load Reduction Actions include the Grassland Bypass Project (GBP), implementation of the WRDP, and the following conservation programs: Water Conservation Field Services Program, WaterSMART Program (formerly Water 2025 Grants Program), and the California Bay Delta Authority (CALFED) Bay-Delta Water Use Efficiency Program.

1. Grassland Bypass Project

Brief Description: The GBP is a multi-agency stakeholder project currently based upon the 2009 Use Agreement[2] between the Reclamation and the San Luis and Delta-Mendota Water Authority (Authority) to manage and reduce the volume of agricultural drain water produced within the

[2] 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

Grassland Drainage Area (GDA), and to use a 28-mile segment of the San Luis Drain to convey this drain water to Mud Slough, a tributary of the SJR. The GBP has removed agricultural drainage water from most wetland water supply conveyance channels, facilitated drainage management that maintained the viability of agriculture in the GDA, and promoted continuous improvement in water quality in the SJR.

Activities

- The load of salts discharged from the GDA has been significantly reduced through the implementation of the Grassland Bypass Project in 1996 and the development of the San Joaquin River Improvement Project (SJRIP) in 2002.
- The reduction of salts is the result of activities conducted by the Grassland Area Farmers including source control in the GDA, tail water recycling, and displacement of agricultural drainage water across the SJRIP re-use area.
- Preliminary data for WY[3] 2014 (October – June 2014) indicate that 4,500 acre-feet of agricultural drain water containing 32,000 tons of salts and 60 tons of boron, have been discharged to the San Joaquin River through the San Luis Drain. Figures 1, 2, and 3 (below) compare the current management of drain water to pre-project conditions..
- Reclamation and the Grassland Area Farmers continue to assist CV Water Board staff with the revision of the 2001 Waste Discharge Requirement (WDR)[4] for the discharge of agricultural drain water into Mud Slough (north), a tributary of the SJR.
- Reclamation continues to implement the monitoring requirements for the 2001 WDR. Reclamation continues to collect and analyze water samples from nine sites for selenium, boron, salts, nutrients, and molybdenum.
- The draft water quality chapters for the 2012-2013 GBP Annual Report have been prepared and will be posted by the San Francisco Estuary Institute.

[3] Water Year = October - September

[4] California Regional Water Quality Control Board, Central Valley Region, September 21, 2001. Waste Discharge Requirements No. 5-01-234 for the San Luis & Delta-Mendota Water Authority and the United States Department of the Interior, Grassland Bypass Channel Project (Phase II), Fresno and Merced Counties.

Figure 1. Grassland Bypass Project - Management of Agricultural Drain Water (Acre-feet)

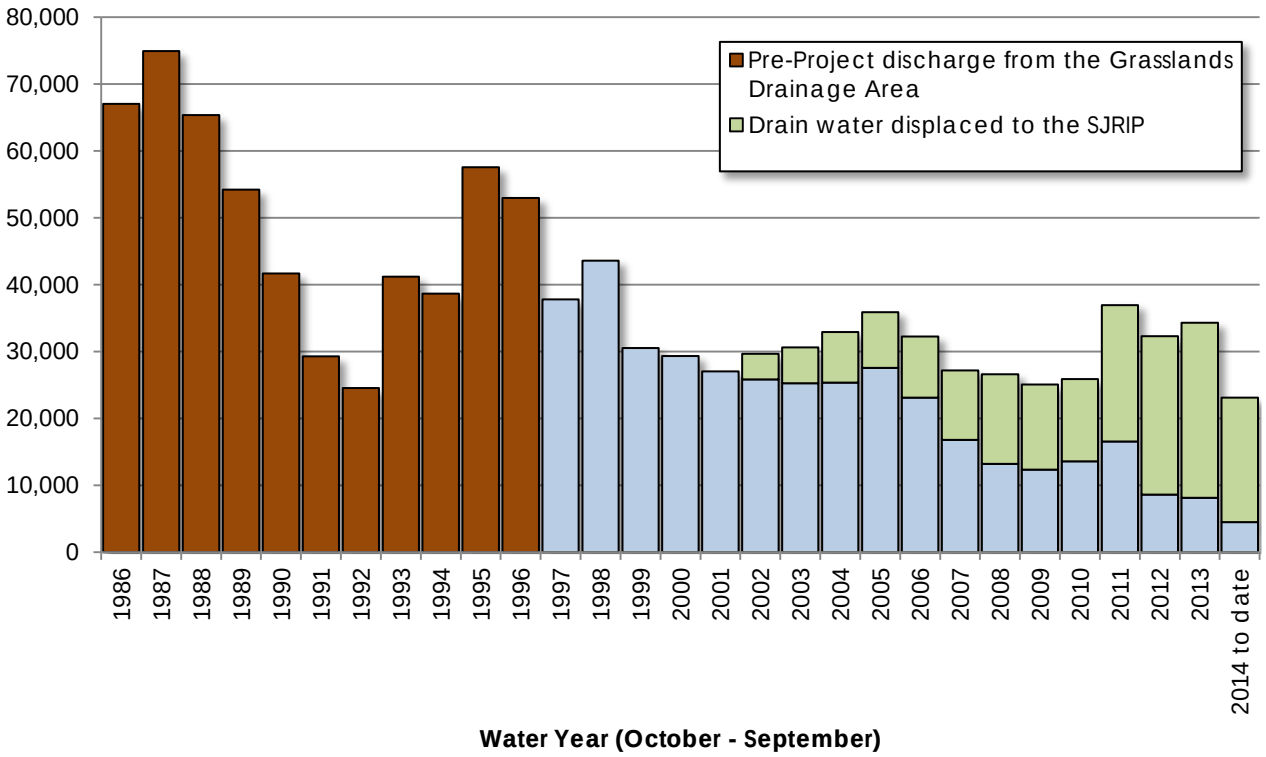


Figure 2. Salts Discharged from the Grasslands Drainage Area (tons)

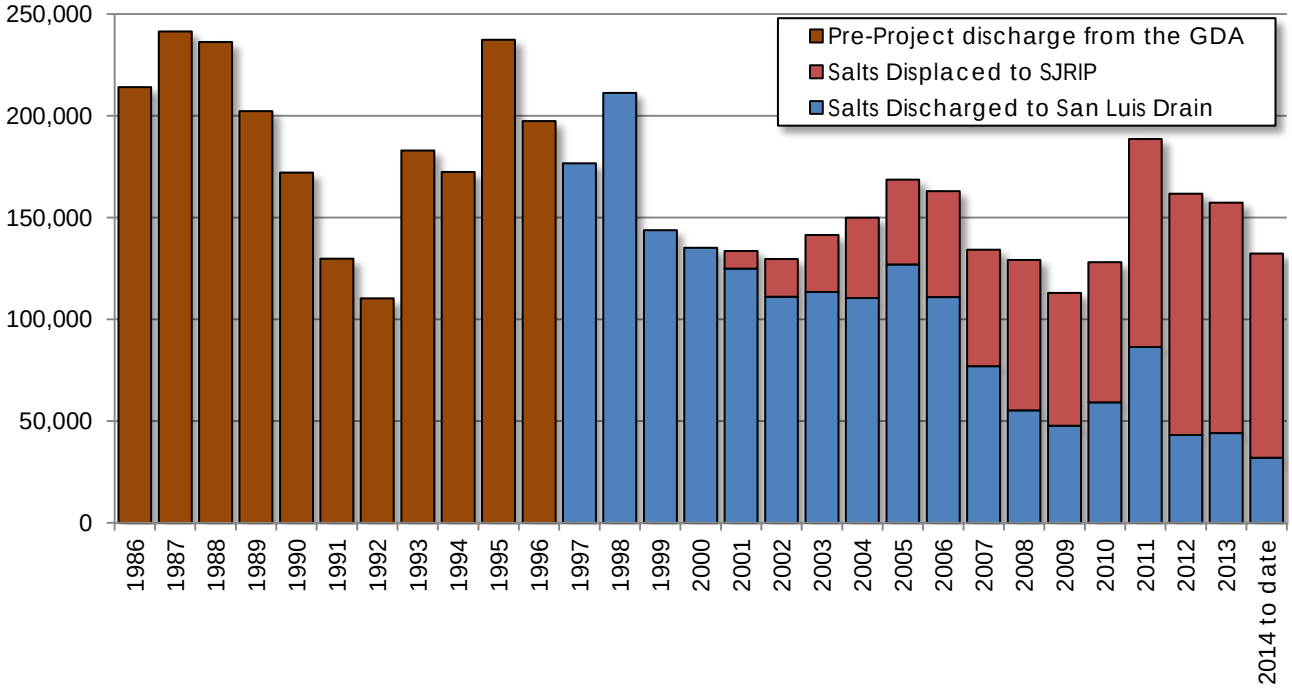
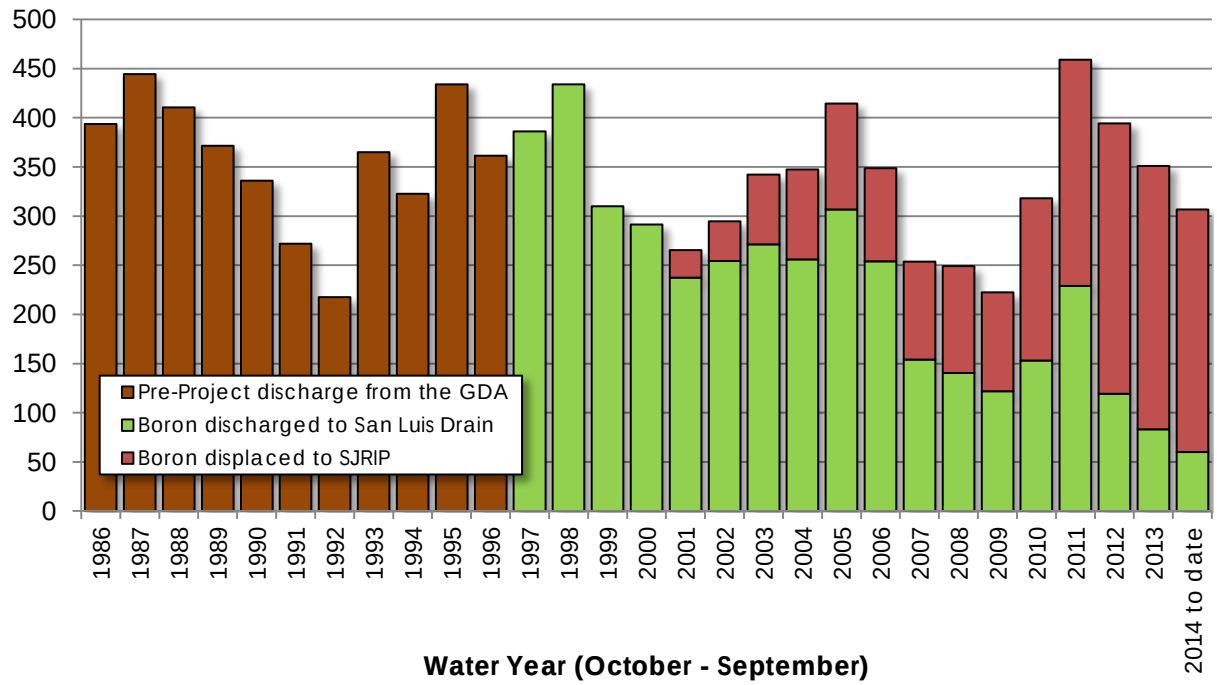


Figure 3. Boron Discharged from the Grasslands Drainage Area (tons)



2. Westside Regional Drainage Plan

Brief Description: The Westside Regional Drainage Plan (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 SJR. 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 SJR, while maintaining productivity of agriculture lands in the San Joaquin valley and enhancing water supplies for the region.

Reclamation provided $37,700,000 in grant funding to implement the WRDP since 2002.

Activities

- Reclamation continues to administer four grants with Panoche Drainage District worth $22,700,000 to implement the WRDP for source control activities, groundwater management, reuse of drain water and salt treatment/disposal. We will soon execute a fifth grant worth $3.8 million.
- Panoche Drainage District has used most of this money to develop the SJRIP through construction of infrastructure, planting salt-tolerant crops, and environmental mitigation.
- Preliminary data for WY 2014 (October – June 2014) indicate that 18,605 acre-feet of agricultural drain water containing 100,300 tons of salts and 247 tons of boron, have been displaced to the SJRIP. Absent the SJRIP, all of this would have been discharged to the San Joaquin River.

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 Reclamation's water conservation efforts in the basin. Through WaterSMART and the CALFED Bay-Delta Restoration program, since 2006 Reclamation awarded 82 projects in the San Joaquin Valley that required performance measures. As information is collected from these projects, quantifiable benefits may be determined in the future.

Activities

Under the 2014 Reclamation/Natural Resources Conservation Service Agricultural Water Conservation and Efficiency Grants, both agencies continue to offer grants to support projects within the San Joaquin Valley. Reclamation selected two grant recipients in 2014. Projects awarded include:

Central California Irrigation District ($418.5K)

- Central California Irrigation District has been awarded $418,500 for Oil Station system improvements. The Oil Station system is a combined pipeline and unlined ditch system with inadequate capacity to meet its delivery needs and inhibits the conversion to high-efficiency irrigation systems within its service area. The proposed project will install a combination PVC pipe and concrete-lined canal and a mid-system reservoir, replacing the westerly half of the Oil Station system with new facilities. The proposed project is estimated to achieve water savings of 1,055 acre-feet annually.

Firebaugh Canal Water District ($1 Million)

- Firebaugh Canal Water District has been awarded $1M to replace about 2.6 miles of an existing earthen channel with a concrete-lined canal and upgrade the flow-control capabilities and metering of a primary pump station. The existing channel is a primary lift canal for Firebaugh Canal Water District with a capacity of 120 cubic feet per second for this reach of the canal. Because the canal is unlined, it loses about 336 acre-feet per year through seepage. This lost water is not only unavailable for irrigation uses but also contributes to the discharge of saline subsurface drain water to the San Joaquin River system. The proposed project is estimated to achieve water savings of 336 acre-feet annually.

The 2014 WaterSMART Water and Energy Efficiency Program grants have been announced; Reclamation did not award projects within the San Joaquin valley in 2014.

The CALFED Bay-Delta Program provides financial support to water efficiency projects with the objective of improving ecosystem health, water supply reliability and water quality. Reclamation did not select water use efficiency projects in the San Joaquin valley in 2014.

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 LSJR so as to occur during times of sufficient river assimilative capacity, and (2) assisting wetland managers with the development and implementation of innovative wetland best management practices (BMP) for salinity. Reclamation actively supports the development of RTMP throughout the basin and is currently developing the San Joaquin River Forecast Model for assimilative capacity.

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 SJR. Reclamation is working with SJR stakeholders and CV-SALTS to support the development of a stakeholder-driven program.

Activities

- Reclamation continues working to increase stakeholder involvement opportunities in developing a RTMP. During the second quarter of 2014 Reclamation has worked through the CVSALTS Lower San Joaquin River Committee to continue the dialog with west-side entities including Grassland Water District, Patterson and West Stanislaus Irrigation districts. Once the west-side station telemetry updates have been accomplished the cooperation of the big-three diverters will be encouraged to permit information to be shared on daily diversions and diversion estimates over the forecast period. As is shown by the attached project report from Claire Keller and Berkeley National Laboratory – which uses the WARMF model to demonstrate the sensitivity of Vernalis EC to San Joaquin River diversions – diversion data and forecasts are key to accurate assimilative capacity estimation.
- The RTMP Framework and Memorandum of Understanding draft documents were previously created and distributed for comment by all interested parties. The current targeted milestone for approval of the RTMP is October 2014.
- Reclamation has completed several updates to the public draft of the RTMP Framework document with assistance from the Westside Drainage Coalition, Grassland Water District and the San Luis and Delta Mendota Water Authority. The Framework document identifies the major tasks under each of the four phases of the Real-Time Management Program together with milestones and progress metrics. The major focus of the Framework document is the necessary requirements to establish a Water Board-approved RTMP based on the requirements under the 2008 Salt and Boron TMDL.

2. RTMP – Technical Support

Brief Description: A successful RTMP will require a real-time monitoring network and a model capable of forecasting SJR assimilative capacity. The concept behind the RTMP is to enable the use of available assimilative capacity to export salt loads from the basin. The WARMF-SJR River Forecast model, currently being enhanced to make it more robust, less time-consuming to operate and more user-friendly, is one component of the RTMP decision support system. Reclamation is committed to participate in the continued development of decision-support tools. Reclamation will continue to support the development of the RTMP; activities this quarter are described below.

Activities

- The RTMP pilot study includes developing a visualization tool that helps wetland water managers to characterize salt loading, estimate salt loads leaving their management areas, compare loads being discharged and target salt loads. Reclamation continues to work with GWD to support further development of the visualization tool and update the tool as new stations are brought on-line and new capabilities are sought.

Figure 4. San Joaquin River at New Jerusalem Drain Monitoring Station

- The WISKI software was purchased for Grassland Water District in late 2013 and has been successfully installed on a dedicated server also purchased for the District. Reclamation continues to cooperate with GWD staff to improve the functionality of the existing monitoring network to calculate flow and salt loading at locations that are optimal for salinity management decision making.
- A new prototype visualization tool for the lower San Joaquin was developed under Reclamation's Science and Technology Program, based on some of the routines and technology developed for the GWD visualization tool. This tool performs spatial integration of flow, EC and salt load data for all major River, tributary and diversion sites. At the current time only three of the west-side tributary sites are reporting real-time data, none of the east-side sites and none of the major three diversions. As these sites are brought online – this tool will become more useful.
- The WARMF-SJR model has been under continual development with Reclamation and outside funding for the past 3 years. Current efforts have been directed at improving the accuracy of west-side tributary simulations by better matching west-side tributary watershed areas with the representations in WARMF. Until the recent effort undertaken by Berkeley National Laboratory, WARMF-SJR watersheds were defined by water district boundaries. The new WARMF-SJR west-side tributary watersheds cut across

several water district boundaries in many instances (for example Ingram and Hospital Creeks include El Solyo, West Stanislaus and Del Puerto districts). Continuing work will calibrate the model to more accurately depict west-side tributary hydrology under all water year types.

- Monthly meetings of the WARMF Technical Review Team were held during the second quarter of 2014 at the Regional Water Quality Control Board office in Rancho Cordova. The objective of the meeting is to involve interested parties with the current planned improvements to the WARMF-SJR forecast model interface. The goal of the team is to improve the WARMF-SJR Forecast Model interface in the following ways:

    - Make it easier to assemble the data sets and model inputs
    - Improve forecasts of SJR salt assimilative capacity.
    - Improve model visualization of each forecast to make it easier to interpret model output.

    Current activities are focusing on stability of the model, output graph unit conversions and automation of some of the data processing steps associated with making forecasts of flow, EC and salt load assimilative capacity.
- LBNL and Reclamation continue to work closely with Systech Water Resources, Inc. 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.
- The USGS has used the current WARMF-SJR diversion estimates to update the Reclamation-sponsored WESTSIM-HM model (a more refined version of the USGS CVHM model – specifically focused on the west-side of the San Joaquin Basin). These estimates more accurately depict the seasonality of surface water diversions from the River. Likewise west-side drainage data that were measured routinely between 2005 and 2009 have also been provided to support the USGS modeling effort.
- An updated version of the WARMF forecasting manual was completed this past quarter. The ongoing data automation efforts have changed a number of data importing procedures which required supplementation and updating of the current manual, developed by Lisa Rainger (Reclamation). This manual evolved from the initial manual development work by Thomas Connor and Noemie Borel – both student interns at Berkeley National Laboratory. The most recent update was done by LBNL intern Claire Keller.

3. Wetland Best Management Practices Plan

The CDFW and the GRCD operate under BMPs to reduce the impact of discharges from managed wetlands into the SJR. 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.

Activities

- Reclamation continues support of the network of real-time flow and water quality monitoring stations at some wetland pond sites and in all major inflow and outflow conveyances within the GWD.
- The LBNL WISKI database, which stores migrated hourly data from the YSI-EcoNET site, from GWD since 2006 was migrated from LBNL to the GWD and training is ongoing with GWD personnel on its use. This software provides GWD with the capability of doing real-time data quality assurance – an essential part of real-time water quality management that has been technically challenging in the past owing to a lack of a suitable software tool.

4. Participation in CV-SALTS Program

Brief Description: The CV Water Board and State Water Resources Control Board 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 stakeholder group 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 the following sub-committees of the program: Executive, Technical Advisory, and LSJR. In addition:

- Reclamation continues to provide funding for the co-chair of the Technical Subcommittee who also attends the Executive Committee Policy meetings.
- Reclamation participates in the CV-SALTS Executive Committee and the Lower San Joaquin River Committee as they create a salt and nutrient management plan, evaluate beneficial use designations and review a potential amendment of the Basin Plan.

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 San Luis Canal, and the San Joaquin River/Mendota Pool. Most CVP water is pumped from the Delta into the DMC through the C.W. "Bill" Jones Pumping Plant located near Tracy, California. CVP water is conveyed south to DMC Check 13 near Santa Nella, California, where water is either mixed with the State Water Project in O'Neill Forebay and then either pumped into San Luis Reservoir for later delivery through the DMC or San Luis Canal, or conveyed further south to the DMC terminus at the Mendota Pool. During periods of drought, groundwater and river water are pumped into the DMC at several locations. 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 CV Water Board (Reclamation 2010) which outlines the criteria and methodology for determining DMC loads and credits.

Quantification Methodology: The monthly amount of CVP water supply delivered to each district is pro-rated according to the area of each district within either the Grassland subarea, Northwest subarea, or outside of these subareas. The monthly mean salinity of CVP water is calculated from average daily measurements taken at three locations along the DMC. The salinity of CVP water delivered to each district is associated with the salinity monitoring site closest to the District's turnout along the DMC.

The Basin Plan allocates a salt load to Reclamation for water delivered to the Grassland and Northwest Subareas. This background load allocation is calculated according to Table IV-8 Summary of Allocations and Credits (CV Water Board 2004c):

$$LA_{DMC} = Q_{DMC} * 52 \text{ mg/L} * 0.00136$$

Where:

LA_{DMC}	= Load Allocation of salts, in tons
Q_{DMC}	= monthly amount of CVP water delivered to Grassland and Northwest Subareas, in acre - feet
52 mg/L	= "background" salinity of water in the SJR released at Friant Dam (per the Basin Plan) measured as total dissolved solids (TDS)
0.00136	= factor for converting units into tons

Actual DMC salt loads are calculated by the following equation:

$$L_{DMC} = Q_{DMC} * C_{DMC} * 0.00136$$

Where:

L_{DMC}	= Actual DMC Load, in tons
Q_{DMC}	= monthly amount of water delivered to Grassland and Northwest Subareas, in acre - feet
C_{DMC}	= monthly average of salinity of the water delivered to Grassland and Northwest Subareas, in mg/L TDS
0.00136	= factor for converting units into tons

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

$$L_{DMC} = 0.00136 * \Sigma(Q_{DMC} * C_{DMC})_{\text{Subareas}}$$

This equation is then broken into calculations for each subarea based on the source of CVP water. Table 2 lists the monthly volumes of CVP water and salts delivered to the Grassland and Northwest subareas and an estimate of the salts delivered in excess of the Monthly Load Allocation.

Table 2. Calculation of DMC Salt Allocations and Loads												
	Grassland Subarea						Northwest Subarea					Total
Month	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	Total Excess Load from CVP Deliveries, thousand tons
Jan-13	5.950	0.915	1.275	13.89	0.982	7.158	0.120	0.081	0.337	0.024	0.177	7.336
Feb-13	35.898	7.113	3.481	81.46	5.757	40.735	3.292	1.596	8.974	0.634	4.254	44.989
Mar-13	29.779	8.275	4.754	78.81	5.570	37.238	2.808	2.309	10.031	0.709	4.408	41.646
Apr-13	32.803	5.778	6.140	76.34	5.395	39.326	3.084	2.711	10.680	0.755	5.040	44.366
May-13	45.159	11.243	7.422	147.78	10.44	53.380	4.418	2.491	17.737	1.253	5.656	59.036
Jun-13	43.718	11.910	8.715	141.74	10.01	54.326	4.167	4.824	21.143	1.494	7.497	61.823
Jul-13	40.632	11.288	6.229	164.92	11.65	46.494	3.687	5.186	27.137	1.918	6.955	53.449
Aug-13	39.895	12.434	4.143	122.18	8.635	47.837	3.781	3.134	15.335	1.084	5.831	53.669
Sep-13	32.415	16.177	3.433	98.628	6.970	45.055	0.872	1.833	5.195	0.367	2.338	47.393
Oct-13	28.112	10.675	3.416	84.895	5.999	36.204	0.394	1.589	4.240	0.300	1.683	37.887
Nov-13	14.296	2.353	2.325	33.221	2.348	16.626	0.213	0.747	1.768	0.125	0.835	17.461
Dec-13	7.132	0.562	0.524	12.413	0.877	7.341	0.183	0.290	0.711	0.050	0.423	7.764
Jan-14	6.510	1.435	3.407	15.741	1.112	10.240	0.218	0.841	1.417	0.100	0.959	11.198
Feb-14	14.473	1.613	2.755	25.847	1.827	17.014	0.976	0.943	2.526	0.179	1.740	18.755
Mar-14	13.235	0.851	3.464	24.899	1.760	15.790	1.207	0.569	2.637	0.186	1.590	17.380
Apr-14	14.726	1.706	3.461	33.279	2.352	17.541	1.339	0.834	4.071	0.288	1.885	19.427
May-14	24.497	5.184	5.739	68.384	4.833	30.587	2.401	1.810	8.926	0.631	3.580	34.168
Jun-14	42.690	7.263	7.948	101.56	7.178	50.723	3.789	2.677	12.059	0.852	5.614	56.337

E. Reporting Requirements

In the MAA, Reclamation agreed to provide quarterly reports to the CV Water Board. Reclamation will consult with the CV Water Board 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
June 30, 2014	August 14, 2014

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	Technical Support to Meet Salinity Objectives for Vernalis	Execution of the 2013 modification; 2014 modification to be submitted	FY2012 - FY2015
Program to Meet Standards	Technical Support for LSJR Meeting Water Quality Objectives: WARMF online	Contract modification Awarded	FY2013 – FY2016
Salinity Control	Westside Regional Drainage Plan	Execute 2014 Grant Funding ($3.8M)	FY2014 – FY2016
Salinity Control	Grassland Bypass Project	Obligate 2014 Funding ($880k)	FY2014
Program to Meet Standards	Cooperative Agreement with Grassland Water District Real Time Management Program Pilot Study	Awarded 2014 financial assistance for the Cooperative Agreement	FY2012 - FY2017

G. References

CV Water Board 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.

CV Water Board 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.

CV Water Board 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.

Quinn, N.W.T., J. Herr, K. Van Woekhoven, T. Connor, N. Borel, H. Bergstrom and T. Murakami.. 2013. Opportunistic real-time management of saline drainage conjoined with San Joaquin River Restoration. Final Report, Regents of the University of California Agreement 442140-NQ-18214, HEADS, Berkeley National Laboratory, 1 Cyclotron Road, Berkeley, CA 94720

Keller C. 2014 — Forecasting and assessment of the WARMF model for real-time salinity management in the San Joaquin River. US Dept. of Energy Office and Science, Science Undergraduate Laboratory Internship (SULI), Summer 2014.

Keller C. et al., 2014 — WARMF Forecasting User's Manual. Version 2.1. US Bureau of Reclamation, August 7, 2014.

Reclamation 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.

Reclamation 2014a — Calculations for Quarterly Report, Q2-2014, Table 1: Goodwin Dam Monthly Dilution Flow Allocations, US Bureau of Reclamation, Draft, August 12, 2014

Reclamation 2014b — Delta-Mendota Canal Water Quality Monitoring Program Report for April–June 2014. US Bureau of Reclamation, Draft, July 28, 2014.