BUREAU OF RECLAMATION

Management Agency Agreement

Fiscal Year 2023 Annual Work Plan

October 1, 2022, to September 30, 2023

California-Great Basin Region

U.S. Department of the Interior

May 2022

Mission Statements

The U.S. 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.

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Abbreviations and Acronyms

Action Plan	Actions to Address the Salinity and Boron TMDL Issues for the Lower San Joaquin River, July 9, 2008 (updated November 2010)
Basin Plan	1994 Water Quality Control Plan for the Sacramento and San Joaquin River Basins, 4th Edition (updated April 2016)
CALFED	California Bay-Delta Authority
CDEC	California Data Exchange Center
CESU	Cooperative of Ecosystem Studies Unit
CV Water Board	Central Valley Regional Water Quality Control Board
CV-SALTS	Central Valley Salinity Alternatives for Long-Term Sustainability Stakeholder Group
D-1641	State Water Resources Control Board Revised Water Right Decision 1641
DWR	California Department of Water Resources
EC	electrical conductivity
GWD	Grassland Water District
LSJR	Lower San Joaquin River
MAA	Management Agency Agreement
NWIS	National Water Information System
PTMS	Program to Meet Standards
Reclamation	United States Bureau of Reclamation
RTMP	Real-Time Management Program
SJR	San Joaquin River
SJVDA	San Joaquin Valley Drainage Authority
TMDL	Total Maximum Daily Load
USACE	United States Army Corps of Engineers

USGS	United States Geological Survey
µS/cm	Micro Siemens Per Centimeter
WARMF	Watershed Analysis Risk Management Framework
WQOs	Water Quality Objectives

Purpose

Reclamation, in response to the passage of the "Water Supply, Reliability, and Environmental Improvement Act" (Public Law 108-361), which includes the California Bay-Delta Authority (CALFED), has initiated implementation of the Program to Meet Standards (PTMS). This program intends to provide greater flexibility in meeting existing water quality standards for the Central Valley Project. Reclamation currently utilizes the CALFED funding authorization for the PTMS, which includes the Real-Time Management Program (RTMP).

The Central Valley Regional Water Quality Control Board's (CV Water Board) Salt and Boron Total Maximum Daily Load (TMDL) for the Lower San Joaquin River (LSJR) was approved and placed into effect on July 28, 2006. In response to the Salt and Boron TMDL, Reclamation drafted a memorandum entitled "Actions to Address the Salinity and Boron TMDL Issues for the Lower San Joaquin River" on July 9, 2008, and updated it in November 2010 (Action Plan). Reclamation subsequently entered into a management agency agreement (MAA) with the CV Water Board on December 22, 2008. The Action Plan was created to accompany the MAA and provide details of Reclamation planned activities to comply with the TMDL-based water quality control plan objectives. Figure 1 shows seven TMDL subareas for salt load management in the LSJR Basin.

A Reclamation compliance plan and a compliance report were prepared in May 2010 to provide the methodology used for the activities described in the Reclamation Action Plan. These documents contain information regarding the technical analysis, computation, and methodology utilized for each Reclamation activity. The 2008 MAA was updated in December 2014. It is consistent with Reclamation's focus on developing the basic infrastructure that supports the RTMP for the LSJR. The annual work plan continues the work that was initiated in the Reclamation Action Plan and summarizes annual planned activities to be conducted by Reclamation in conjunction with each element outlined in the MAA. This Work Plan includes support of Phase 3 and Phase 4 activities listed in the RTMP Framework document, approved by the CV Water Board in December 2014.

The primary purpose of the CV Water Board–approved RTMP is to implement salinity management activities to meet seasonal quantitative salinity objectives at Vernalis, Crows Landing, and Maze Road Bridge.[1] The Basin Plan amendment, establishing the Crows Landing compliance monitoring station, was undertaken to protect beneficial uses, including irrigation supply in the LSJR from the

[1] An amendment to the Water Quality Control Plan for the Sacramento and San Joaquin River Basins was adopted by the CV Water Board on 6/9/17, and approved by the State Water Resources Control Board on 1/9/18, by the Office of Administrative Law on 4/19/18, and by USEPA on 12/17/18. The amendment established new water quality objectives (WQOs) for the San Joaquin River, Reach 83 (from the mouth of the Merced River to Airport Way Bridge) of 1,550 microsiemens per centimeter (µS/cm) during most years, and 2,470 µS/cm during extended dry periods. During extended dry periods a maximum annual average of 2,200 µS/cm will apply. The amendment also includes a performance goal of 1,350 µS/cm. The existing WQOs of 700 µS/cm (April to August) and 1,000 µS/cm (September to March) will remain in effect. Crows Landing and Maze Road Bridge are the two compliance points for the new WQOs. For the purposes of the RTMP, forecast efforts will focus on meeting the new WQOs at Crows Landing and Maze Road together with the WQOs at Airport Way Bridge near Vernalis.

mouth of the Merced River to Airport Way Bridge near Vernalis. The U.S. Environmental Protection Agency (USEPA) approved the Basin Plan amendment on December 17, 2018. The amendment went into effect in January 2020. The RTMP is also designed to encourage export of surface-water salt loads in accordance with the provisions in the Basin Plan during times of high river assimilative capacity for salt, to reduce reliance on the New Melones Reservoir for dilution flows to the LSJR, and to establish an organizational approach for the continuing development, implementation, and coordination of the RTMP.

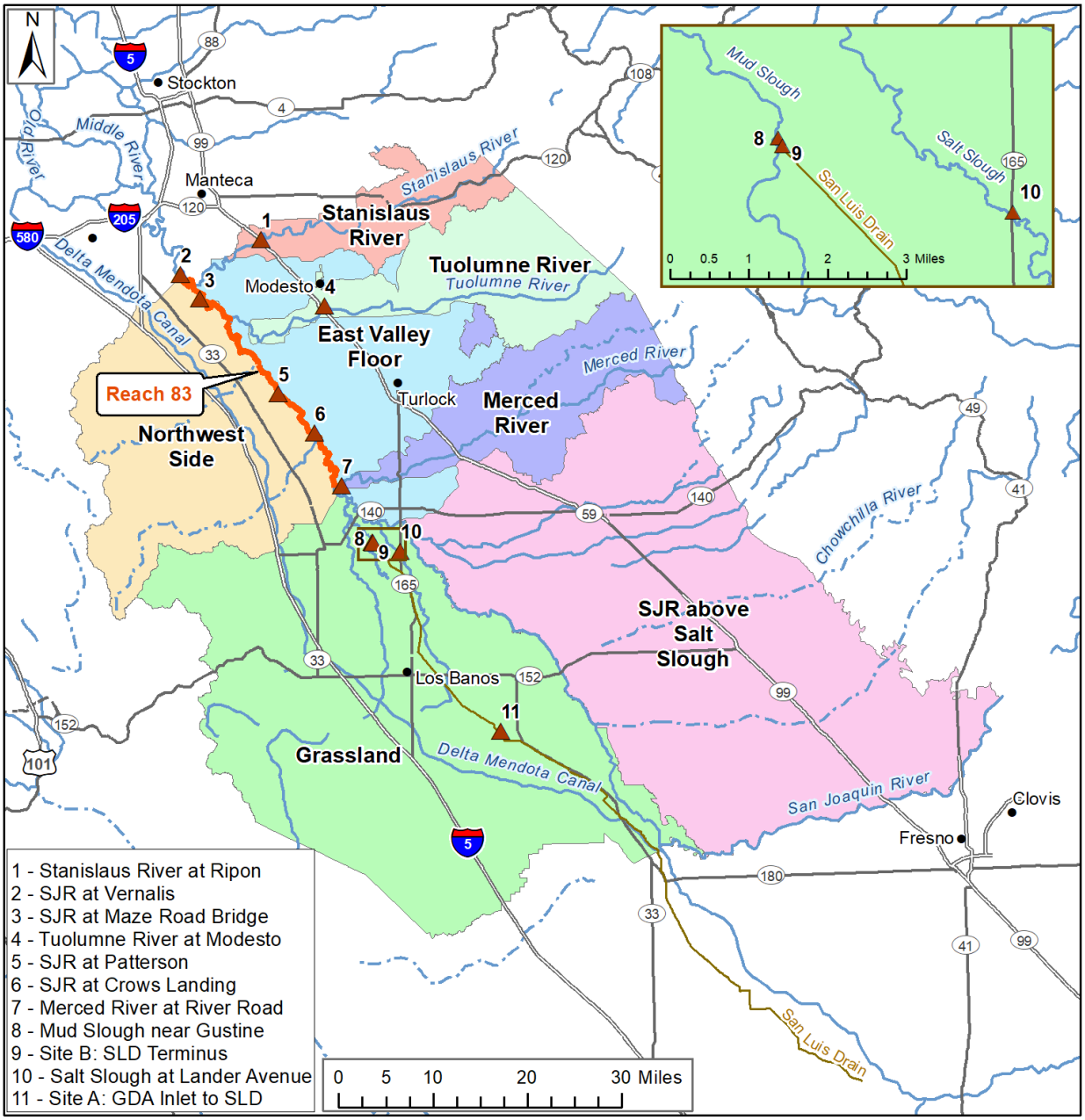

Figure 1. TMDL Subareas for Salt Load Management in the LSJR Basin.

Reclamation has no role in recommending stakeholder drainage release schedules and salinity management practices within the Basin. Rather Reclamation's primary role is developing decision

support tools to provide forecasts of salinity in the San Joaquin River at Maze Road, Crows Landing, and Vernalis compliance monitoring locations. Salinity forecasts will extend two weeks into the future, which was suggested as a good compromise between model predictive uncertainty and stakeholders' ability to undertake timely actions during periods of potential 30-day running average salinity exceedance.

In addition to its commitment to the RTMP, Reclamation performs a variety of salinity management activities within the San Joaquin watershed, such as the Grassland Bypass Project which sunset on December 31, 2019; the WaterSMART Grant Program; the New Melones Plan of Operations; and the Westside Regional Drainage Plan.

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Reclamation Staff Resources

Table 1 lists Reclamation staff resources utilized in the Salt and Boron Control Program on the LSJR.

Table 1. Reclamation Staff Involved in the RTMP

Name	Role
Jobaid Kabir	Project Management
Grace Windler	Regional Water Quality Coordinator
Jun Wang	Watershed Analysis Risk Management Framework (WARMF) Modeler
James Lu	Regression Modeler
Junaid As-Salek	Contracting Support

Fiscal Year (FY) 2023 Goals and Objectives

All the activities and technical support planned for FY 2023 are intended to provide resources, information, and support to LSJR stakeholders who wish to participate in the RTMP.

Table 2. Reclamation Goals

FY 2023 Goals
Goal 1. Provide funding for maintaining and improving forecasting tools • Contract with Systech Water Resources, Inc. • Cooperative Ecosystem Studies Unit (CESU) agreement with University of California at Merced for technical expert services from Dr. Nigel Quinn • Funding United Stated Geological Survey (USGS) for maintaining five monitoring stations
Goal 2. Maintain and improve forecasting tools and methods • Continue to assess WARMF and Regression model accuracy in forecasting flow and salinity • Recalibrate WARMF model using most available hydrology, water quality and managed flow data • Create an auto-calibration utility program to improve WARMF model performance in the day of forecasting by using the most available real time data of the day • Work with stakeholders to improve access to their flow and salinity data that may enhance WARMF forecasting
Goal 3. Provide flow and salinity forecasts • Using the WARMF and Regression models, provide 14-day forecasts of flow and salinity at Vernalis, Maze Road Bridge, and Crows Landing compliance monitoring stations
Goal 4: Coordinate with stakeholders • Hold stakeholder meetings in conjunction with San Joaquin RTMP Steering Committee meetings • Encourage continued participation of East Valley Floor stakeholders
Goal 5: Provide technical support • When requested, provide technical support to stakeholders for implementing real-time drainage data quality assurance • When requested, provide technical support to stakeholders for flow and water quality monitoring. • When requested, provide stakeholder support in writing grant proposals for enhancing RTMP

FY 2023 Goals
Goal 6: Maintain monitoring stations • Provide technical support and/or funding for managed wetland real-time water quality implementation activities and coordinated actions with State and Federal refuges
Goal 7: Participate in Central Valley Salinity Alternatives for Long-Term Sustainability (CV-SALTS) • Continue to participate in CV-SALTS

Detailed Description of FY 2023 Goals for the RTMP

Goal 1. Provide funding for maintaining and improving forecasting tools

Reclamation intends to continue funding Systech Water Resources, Inc., University of California at Merced, and Grassland Water District (GWD) during FY 2023. Systech Water Resources, Inc. will continue to provide technical support in maintaining and improving the WARMF model, which includes keeping the model updated with current hydrology and watershed data. University of California at Merced will provide technical expert Dr. Nigel Quinn, who will continue to work closely with stakeholders for the successful implementation of the RTMP. The GWD will continue to monitor and furnish data to Reclamation for maintaining and upgrading the WARMF model.

Reclamation will fund the USGS to maintain five monitoring stations in the San Joaquin River Basin. The stations are:

1. 11261500 - SAN JOAQUIN R FREMONT FORD CA
2. 11273400- SAN JOAQUIN R ABOVE NEWMAN CA
3. 11274550 - SAN JOAQUIN R NR CROWS LANDING CA
4. 11262900 - MUD SLOUGH NR GUSTINE CA
5. 11261100 - SALT SLOUGH A HWY 165 NR STEVINSON CA

In addition, the USGS has been funded to upgrade the Mud and Salt Slough stations with acoustic Doppler transducer technology. This upgrade will improve the accuracy of flow measurement and eliminate backwater episodes where high flows in the San Joaquin reduce discharges into the river while artificially increasing stage in both sloughs. This results in elevated estimated flow that must be corrected in the data record after the event. The USGS is completing environmental documentation and securing permits for the installation. Current projections are for the new transducers to be operable at both locations by the end of the summer 2022.

Goal 2. Maintain forecasting tools and methods

Using the WARMF and Regression models, Reclamation will continue to produce14-day forecasts of flow and salinity at Vernalis, Maze Road, and Crows Landing compliance monitoring stations. While WARMF forecasts will be produced weekly, Regression model forecasts will continue to be

produced daily. Under circumstances that cause water quality conditions in the San Joaquin River to deviate from the inverse relationship between flow and EC, the WARMF model can be run daily and substituted for Regression model forecasts until prior conditions are restored. Such circumstances can include flood events and periods of wetland pond drawdown where higher flows can be associated with degraded water quality.

Reclamation will periodically assess the forecasting accuracy of both the WARMF and Regression models by comparing their performance with observations of flow and salinity. These assessments will be used to update previous reports on the same topic.

Reclamation continues to develop automated methods for data retrieval from various sources to minimize the time taken to update the WARMF model and reduce potential error associated with manual data processing. This will likely improve the model performance and make technology transfer to stakeholders more feasible. The San Joaquin Valley Drainage Authority (SJVDA) has expressed interest in becoming more involved in WARMF model-based forecasting and simplifying the process through automation will increase the prospect for this eventuality. This increased cooperation can also help expand access to stakeholder flow and salinity data, which will in turn improve the reliability and accuracy of WARMF model-based forecasting of compliance with WQOs.

Reclamation continues to maintain and improve WARMF model accuracy by the following two tasks:

- Recalibrate WARMF model using most available hydrology, water quality and managed flow data.
- Create an auto-calibration utility program to improve WARMF model performance in the day of forecasting by using the most available real time data of the day.

Goal 3: Provide flow and salinity forecasts

Since FY 2018 Reclamation has used the California Nevada River Forecast Center flow forecasts for both WARMF and Regression model-based forecasts of SJR water quality at San Joaquin River compliance monitoring stations.

Using the WARMF and Regression models, Reclamation will continue to produce 14-day forecasts of flow and salinity at Vernalis, Maze Road, and Crows Landing compliance monitoring stations. As previously stated, under conditions in which the inverse relationship of flow and EC in the San Joaquin River persist, WARMF forecasts will be produced weekly and Regression forecasts will be provided daily. Regression flow and salinity forecasts will be posted on the Reclamation website daily, while WARMF flow and salinity forecasts will be available to stakeholders upon request. At certain times of the year when Regression model performance is compromised, forecasts from the more physically-based WARMF model are posted on the website daily instead. These limiting conditions can be recognized through existing sensor network data that is shared with Reclamation.

Goal 4: Coordinate with stakeholders

Reclamation has been conducting informational meetings jointly with the SJVDA and the RTMP Steering Committee to solicit feedback on Reclamation tool-building activities and help guide the

SJVDA's own decision support activities that will include forecasting model development. Starting in FY 2020, Reclamation holds quarterly stakeholder meetings in collaboration with SJVDA and the RTMP Steering Committee. Reclamation will continue to hold these stakeholder meetings during FY 2023. During these meetings Reclamation typically briefs stakeholders on the progress it made during the previous quarter and informs stakeholders of planned activities for the upcoming quarter. Reclamation encourages continued participation of eastside and westside San Joaquin Basin stakeholders in RTMP activities and continues to work with cooperating water districts and interested stakeholders to disseminate flow and salinity forecasts posted online using the Regression and WARMF models for meeting RTMP goals.

Goal 5: Provide technical support

There has been a significant need for real-time data quality assurance processing tools for several decades. There is also great interest in developing software tools or routines that parse these data that have undergone quality assurance checks as input to decision support models such as the WARMF model. A toolbox has been developed by UC Merced personnel that works on cloud web servers such as HostGator and as add-ons to popular hydrologic data management software platforms such as the U.S. Army Corps of Engineers (USACE) software HEC-DSSVue. This software was developed by the USACE to visualize time series data widely used in their hydraulic and water resource management models. When requested, Reclamation can provide technical support to stakeholders for implementing real-time drainage data quality assurance, monitoring flow and water quality monitoring, and writing grant proposals for enhancing RTMP.

Goal 6: Maintain monitoring stations

Reclamation has supported operations and maintenance of monitoring stations by the GWD for the past decade. During FY 2023 Reclamation will continue this support and will work to make these data readily accessible for inclusion in WARMF model-based forecasts. Reclamation also continues to support the GWD HydroMetCloud web portal that provides access to flow and EC data at more than 30 stations in the district. GWD has acknowledged stakeholder feedback that suggests significant stakeholder reliance on these data.

Goal 7: Participate in CV-SALTS

During FY 2023 Reclamation will continue to participate in the CV-SALTS stakeholder group as a member of the Executive Committee and the LSJR Committee. Continued coordination with the CV Water Board staff is especially critical as the CV-SALTS Prioritization and Optimization (P&O) Study gets underway and stakeholders provide feedback on the implementation of newly adopted water quality objectives (WQOs) for the LSJR, and other Basin Plan amendments.

Funding and Status of the Monitoring Program

Funding amounts listed in Table 3 are subject to allocation by Congress and are to be considered estimates until allocations have been completed. The PTMS allocation is utilized to fund Reclamation activities directly related to salinity in the SJR. The WaterSMART Program also provides salinity management benefits to the SJR and accordingly is listed in Table 3.

The USGS will continue operation and maintenance of Mud Slough, Salt Slough, Crows Landing, Newman, and Fremont Ford monitoring stations needed for WARMF forecasting.

Table 3. FY 2023 Proposed Reclamation Funding

No.	Funding Program	Previous FYs Funded	FY 2023 Allocation
I.	Systech Water Resources Inc. for providing WARMF technical support	2019-2023	$750,000
	GWD	2017-2023	
	University of California at Merced CESU agreement	Annually	
	Reclamation Staff Resources	Annually	
II.	WaterSMART Program	2023	TBD

Monitoring stations are located on the LSJR and on the west side of the SJR Basin, as reported in the 2014 SJR RTMP Framework Document. These stations are directly supported by Reclamation and the SJVDA. Their current status and Reclamation's roles are listed in Table 4.

Table 4. Status of Monitoring Stations

Location	Status
San Joaquin River Stations	
SJR at Lander Avenue	Active. Operated by California Department of Water Resources (DWR.) Reporting data to CDEC.
SJR at Fremont Ford	Active. Operated by USGS funded by Reclamation. Reports data to NWIS/CDEC.
SJR at Newman	Active. Operated by USGS funded by Reclamation. Reports data to NWIS/CDEC.

Location	Status
SJR near Crows Landing	Active. Operated by USGS funded by Reclamation. Reports data to NWIS/CDEC.
SJR at Maze Road bridge	Active although has been subject to data telemetry issues during 2021 and 2022. Operated by DWR. Issues reporting data to CDEC. Data manually downloaded by DWR until telemetry issues can be resolved.
Westside Drainage Stations	**Status**
Salt Slough at Highway 165 (near Stevenson)	Active. Operated by USGS funded by Reclamation. Reports data to NWIS/CDEC. To be upgraded with acoustic Doppler by late summer 2022 to improve data accuracy and reliability during occasional SJR high flow-induced backwater conditions.
Mud Slough near Gustine	Active. Operated by USGS funded by Reclamation. Reports data to NWIS/CDEC. To be upgraded with acoustic Doppler by late summer 2022 to improve data accuracy and reliability during occasional SJR high flow-induced backwater conditions.
Orestimba Creek near River Road, Crows Landing	Inactive. Site abandoned by USGS.
San Luis Drain at Outlet	Active. Operated by SJVDA. Not reported in CDEC, but sent directly to Reclamation.
Los Banos Creek at Highway 140	Active. Operated by GWD. Reported to GWD HydroMetCloud web portal.
Marshall-Spanish-Moran Drains	Active. Telemetry and sonde upgraded in 2021-2022. Operated by SJVDA.
Moran Drain	Active. Telemetry and sonde upgraded in March 2022. Operated by SJVDA.
Westley Wasteway	Active. Telemetry and sonde upgraded in March 2022. Operated by SJVDA. New culvert installed in February 2022.
Del Puerto Creek	Active. Site moved to USGS site 11274630. Lat. 37.487, Long. 121.208. Reports data to NWIS.
Hospital Creek	Active. Telemetry and sonde upgraded in 2021. Operated by SJVDA.

Location	Status
Ingram Creek	Active. Telemetry and sonde upgraded in 2021. Operated by SJVDA.
Diversion Monitoring Stations	**Status**
Patterson Irrigation District	Reporting weekly via e-mail bulletin for use in forecasting.
West Stanislaus Irrigation District	Reporting weekly via e-mail bulletin for use in forecasting.

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