BUREAU OF RECLAMATION

Management Agency Agreement

Fiscal Year 2024 Annual Work Plan

October 1, 2023–September 30, 2024

California-Great Basin Region

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; 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.

Contents

Tables

Figures

This page intentionally left blank

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

[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

compliance monitoring station, was undertaken to protect beneficial uses, including irrigation supply in the LSJR from the 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.

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.

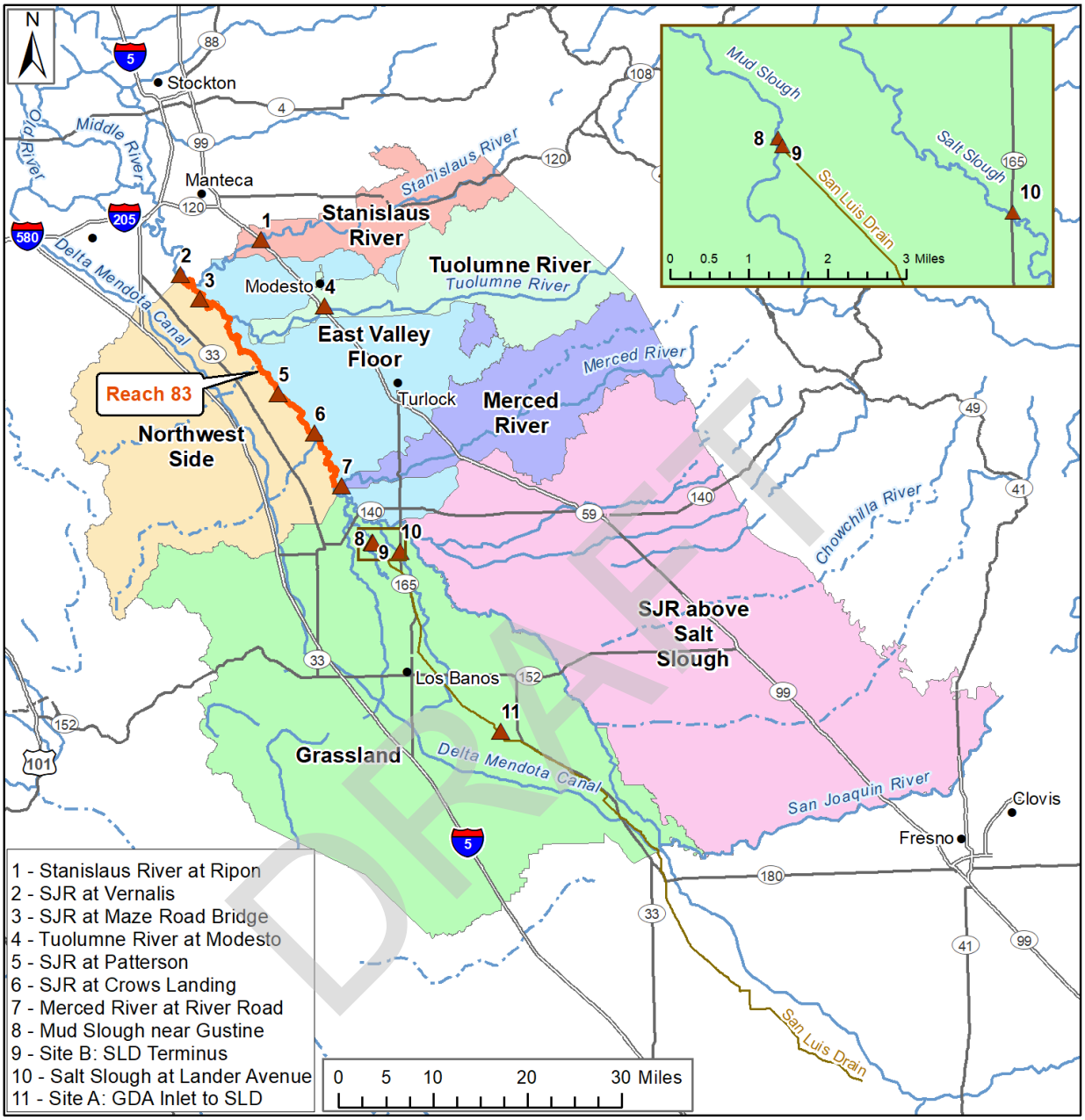

Figure 1. TMDL Subareas for Salt Load Management in the LSJR Basin

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 sunsets on December 31, 2019; the WaterSMART Grant Program; the New Melones Plan of Operations; and the Westside Regional Drainage Plan.

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

This page intentionally left blank

Fiscal Year (FY) 2024 Goals and Objectives

All the activities and technical support planned for FY 2024 are intended to provide resources, information, and support to LSJR stakeholders who wish to participate in the RTMP.

Table 2. Reclamation Goals

FY 2024 Goals
Goal 1. Provide funding for maintaining and improving forecasting tools • Contract with Systech Water Resources, Inc. • Provide funding for technical expert services from Dr. Nigel Quinn via a financial assistance agreement with the GWD • Funding to United Stated Geological Survey (USGS) for upgrade of monitoring stations at Mud and Salt Slough and annual maintenance of five flow and EC monitoring stations in the San Joaquin River Basin
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. These forecasts are posted in Reclamation website (https://www.usbr.gov/mp/ptms/) daily for stakeholders use.
Goal 4: Coordinate with stakeholders • Hold stakeholder meetings in conjunction with San Joaquin Valley Drainage Authority RTMP Steering Committee meetings • Encourage continued participation by East Valley Floor stakeholders – Modesto and Turlock Irrigation Districts
Goal 5: Provide technical support • Provide technical support to stakeholders, upon request, for designing and installing sensor networks and following real-time drainage data quality assurance protocols. • Provide technical support to stakeholders for troubleshooting flow and water quality monitoring instrumentation and telemetry. • Provide assistance to stakeholders in the writing of grant proposals for enhancing the RTMP initiative
Goal 6: Maintain monitoring stations • Provide technical support and assist with grant applications for managed wetland real-time water quality implementation activities support complementary real-time monitoring activities in the adjoining 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 2024 Goals for the RTMP

Goal 1. Provide funding for maintaining and improving forecasting tools

Reclamation intends to continue funding Systech Water Resources, Inc. and Grassland Water District (GWD) during FY 2024. 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. Dr. Nigel Quinn, working cooperatively with GWD, will provide technical support on real-time monitoring activities and continue his role as a stakeholder liaison for the successful implementation of the RTMP. The GWD will continue to monitor and furnish data to Reclamation for maintaining and updating 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

The USGS received funding Reclamation to upgrade the Mud and Salt Slough monitoring stations with acoustic Doppler transducer technology in mid-2022. This upgrade was commissioned to 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. These conditions often produce over-estimates of flow that must be corrected in the data record during data quality control processing. The USGS has completed environmental documentation and permits for the installation. However, personnel changes at the USGS resulted in delays in the ordering of the transducers from the USGS Hydrologic Instrumentation Facility (HIF). Reclamation anticipates the installation will be completed in 2023.

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. Either WARMF or Regression model forecasts are produced daily depending on conditions in the river and time of year. 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 is typically substituted for the Regression model for making forecasts. Such circumstances can include flood events and periods of wetland pond drawdown where a period of high flow from the State, federal and private seasonal wetland is 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.

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. These data retrieval automation will likely improve the model performance and aid eventual technology transfer to stakeholders since stakeholders typically react positively and with greater interest when their own data is been used in the model. The San Joaquin Valley Drainage Authority (SJVDA) has indicated it will become more involved in WARMF model-based forecasting which will help expand access to stakeholder flow and salinity data, which will in turn improve the reliability and accuracy of WARMF model-based forecasts.

Reclamation continues to maintain and improve WARMF model reliability through the following tasks:

- Adjust WARMF model flow and EC values as close as possible to the observed values on the day the forecast is run using an automated calibrator.
- Upgrade the WARMF Hydrologic Simulation Algorithm to simulate backwater effects.
- Improve the algorithm to predict seepage loss more accurately and to fill in missing weather data obtained from the California Irrigation Management Information System (CIMIS).

Goal 3: Provide flow and salinity forecasts

Since FY 2018 Reclamation has used the California 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, Regression forecasts substitute for WARMF model forecasts. Only one modeling of flow and salinity forecasts is posted on the Reclamation PTMS website. WARMF model flow and salinity outputs for additional points on the SJR will be available to stakeholders upon request.

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 include forecast model development. Starting in FY 2020, Reclamation began to hold quarterly stakeholder meetings in collaboration with SJVDA and the RTMP Steering Committee. Reclamation will continue to hold these stakeholder meetings during FY 2024. 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 for meeting RTMP goals posted online using the Regression and WARMF models.

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 was 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. Upon request, Reclamation can provide technical support to stakeholders interesting in implementing real-time drainage data quality assurance, g flow and water quality monitoring, and writing grant proposals for enhancing the RTMP.

Goal 6: Maintain monitoring stations

Reclamation has supported operations and maintenance of monitoring stations by the GWD for the past decade. During FY 2024 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 2024 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 2024 Proposed Reclamation Funding

No.	Funding Program	Previous FYs Funded	FY 2024 Allocation
I.	Systech Water Resources Inc. for providing WARMF technical support	2019-2024	$750,000
	GWD Financial Assistance Agreements	2017-2024	
	Reclamation Staff Resources	Annually	
II.	WaterSMART Program	2024	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 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 the California Department of Water Resources (DWR.) Reporting data to CDEC.
SJR at Fremont Ford	Active. Operated by the USGS funded by Reclamation. Reports data to NWIS/CDEC.
SJR at Newman	Active. Operated by the USGS funded by Reclamation. Reports data to NWIS/CDEC.
SJR near Crows Landing	Active. Operated by the 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 report data to CDEC. Data manually downloaded by DWR until telemetry issues can be resolved.

Location	Status
Westside Drainage Stations	
Salt Slough at Highway 165 (near Stevenson)	Active. Operated by the USGS funded by Reclamation. Reports data to NWIS/CDEC. To be upgraded with acoustic Doppler when site conditions permit in spring 2023 to improve data accuracy and reliability during occasional SJR high flow-induced backwater conditions.
Mud Slough near Gustine	Active. Operated by the USGS funded by Reclamation. Reports data to NWIS/CDEC. To be upgraded with acoustic Doppler when site conditions permit in spring 2023 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 the USGS.
San Luis Drain at Outlet	Active. Operated by the SJVDA. Not reported in CDEC but sent directly to Reclamation.
Los Banos Creek at Highway 140	Active. Operated by the GWD. Reported to GWD HydroMetCloud web portal.
Marshall-Spanish-Moran Drains	Active. Telemetry and sonde upgraded in 2021-2022. Operated by the SJVDA.
Moran Drain	Active. Telemetry and sonde upgraded in March 2022. Operated by the SJVDA.
Westley Wasteway	Active. Telemetry and sonde upgraded in March 2022. Operated by the SJVDA. New culvert installed in February 2022.
Del Puerto Creek	Active. Site moved to the USGS site 11274630. Lat. 37.487, Long. 121.208. Reports data to NWIS.
Hospital Creek	Active. Telemetry and sonde upgraded in 2021. Operated by the SJVDA.
Ingram Creek	Active. Telemetry and sonde upgraded in 2021. Operated by the SJVDA.
Diversion Monitoring Stations	
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.

References

State Water Board D-1641. Implementation of Water Quality Objectives for the San Francisco Bay/Sacramento-San Joaquin Delta Estuary; A Petition to Change Points of Diversion of the Central Valley Project and the State Water Project in the Southern Delta; and A Petition to Change Places of Use and Purposes of Use of the Central Valley Project. State Water Resources Control Board, March 15, 2000.

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 2017. Amendments to the Water Quality Control Plan for the Sacramento River and San Joaquin River Basins to add Electrical Conductivity Water Quality Objectives in the San Joaquin River Between the Mouth of the Merced River and the Airport Way Bridge Near Vernalis. Regional Water Quality Control Board Central Valley Region, June 9, 2017.

Basin Plan. 1994 Water Quality Control Plan (Basin Plan) for the Sacramento River and San Joaquin River Basins, Fourth Edition, California Regional Water Quality Control Board Central Valley Region, updated April 2016.

Reclamation Action Plan 2008. Reclamation's Salinity Management Plan, Actions to Address the Salinity and Boron Total Maximum Daily Load Issues for the Lower San Joaquin River, July 2008 (Updated in November 2010).

Compliance Plan 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; May 2010.

Compliance Report 2010. Compliance Monitoring and Evaluation Report, FY 2000 to Present 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; May 2010.

Management Agency Agreement 2008 and 2014. Management Agency Agreement Between the Central Valley Regional Water Quality Control Board and the United States Bureau of Reclamation, Mid-Pacific Region. A Cooperative Means of Implementing Relevant Provisions of the Regional Water Board's Water Quality Control Plan for the Sacramento River and the San Joaquin River Basins – 4th Edition, executed in December 2008 and updated in December 2014.

Tran, Vi, S. Helmrich, N.W.T. Quinn, P. O'Day. 2022. Manuscript under review. Operationalizing realt-time monitoring data in simulation models using the public 4 domain

HECDSSVue platform. Submitted to ASCE, Journal of Water Resources Planning and Management.