DRAFT

MONITORING SPECIAL STUDY PLAN

PREPARED FOR:

California State Water Resources Control Board

PREPARED BY:

California Department of Water Resources
United States Bureau of Reclamation

IN CONSULTATION WITH:

South Delta Water Agency
Delta Watermaster
Contra Costa Water District

August 2022

California Department of Water Resources
United States Bureau of Reclamation

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State Water Resources Control Board
South Delta Water Agency
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Acronyms and Abbreviations

TERM	DESCRIPTION
Bay–Delta Plan	Water Quality Control Plan for the San Francisco Bay/Sacramento–San Joaquin Delta Estuary
CVP	Central Valley Project
D-1641	Water Right Decision 1641
DSM2	Delta Simulation Model II
DWR	California Department of Water Resources
EC	Specific Conductance
GTM	General Transport Model
GPS	global positional system
MSS	Monitoring Special Study
Reclamation	U.S. Bureau of Reclamation
SCHISM	Semi-Implicit Cross-Scale Hydroscience Integrated System Model
State Water Board	State Water Resources Control Board
SWP	State Water Project
WT	WT
WWTP	wastewater treatment plants

1 Introduction

In the *1995 Water Quality Control Plan for the San Francisco Bay/Sacramento–San Joaquin Delta Estuary* (Bay–Delta Plan), as amended through 2006, the State Water Resources Control Board (State Water Board) set salinity objectives for the interior southern Delta. In Water Right Decision 1641 (D-1641), as part of the implementation of the 1995 Bay–Delta Plan, the California Department of Water Resources (DWR) and U.S. Bureau of Reclamation (Reclamation) were assigned partial responsibility for meeting these objectives, including maintaining Specific Conductance (EC) levels at three monitoring stations (Interagency Stations No. C-6, C-8, and P-12) in the interior southern Delta waterways (Figure 3-1)[1]. In 2018, the State Water Board adopted amendments to the Bay–Delta Plan. Per the 2018 Bay-Delta Plan amendments, DWR and Reclamation are working to develop a Monitoring Special Study (MSS).

This document serves as the study plan for the MSS and identifies three goals, consistent with section B(1)(iv) of the 2018 Bay–Delta Plan. Since early 2021, using best-science practices, DWR and Reclamation have been soliciting input from participating agencies and working with State Water Board staff to design technical studies to accomplish the following goals.

1) Characterize the spatial and temporal distribution and associated dynamics of water level, flow, and salinity conditions in the southern Delta waterways.
2) Identify the extent of low- or null-flow conditions and any associated concentration of local salt discharges.
3) Inform the development of a Long-Term Monitoring and Reporting Plan that will:
    a. Assess attainment of the salinity objective in the interior southern Delta; and
    b. Include long-term monitoring and reporting protocols, including specific compliance monitoring locations in, or monitoring protocols for, the three river segments that comprise the interior southern Delta salinity compliance locations (see Figure 3-1).

DWR and Reclamation have conducted several studies investigating salinity conditions at the Interagency monitoring stations where intermittent exceedances of compliance levels have occurred. Building on the understanding gained from prior studies and analyses, the MSS is intended to accomplish the following objectives.

- Better understand salinity, flow, and stage conditions in the interior southern Delta, including data collection and/or analysis of:
    - Flow and salinity levels measured at and downstream of Vernalis;
    - A range of interior southern Delta export pumping scenarios at C.W. Jones Pumping Plant and H.O. Banks Pumping Plant;

[1] D-1641 and related State Water Board communications clarify that enforcement action against DWR and Reclamation to implement the water quality objectives for agricultural beneficial uses in the south Delta is not appropriate where any noncompliance is the result of actions beyond the reasonable control of the State Water Project (SWP) and Central Valley Project (CVP); (D-1641, p.159, para. 6; Letter from Celeste Cantú, Executive Director, State Water Board, to Lester Snow, Director, DWR, re: Delta Salinity Cease and Desist Order in State Water Board Order WR 2006-0006 (Oct. 13, 2006).

  - Flows during and after temporary agricultural barrier season; and
  - Interior southern Delta processes (i.e., land use patterns, measurement of agricultural and municipal flow and EC).

- Assess whether existing compliance stations are representative of river segments in the interior southern Delta.

To achieve the MSS goals and meet this study plans' objectives, DWR and Reclamation, in consultation with participating agencies and State Water Board staff, developed five technical studies, described further in Chapter 3. These studies are:

1) High-Speed Salinity Transect Mapping
2) Salinity Point Source and Ion Sampling
3) SCHISM 3D Hydrodynamic and Water Quality Modeling
4) Water Quality Data Assimilation Modeling
5) Paradise Cut Flushing Study

However, due to drought conditions anticipated to occur during the study period and the potential for increased salinity loads that flushing Paradise Cut could introduce to Old River, DWR and Reclamation have proposed to delay the Paradise Cut Flushing Study until a preliminary model is conducted to show the effects of this study. Therefore, only the first four technical studies are moving forward at this time and included in this MSS plan.

This study plan summarizes relevant content from each technical study and explains how each study addresses the goals of the MSS, consistent with the 2018 Bay–Delta Plan. The technical studies contribute to meeting the goals of the MSS both individually and combined. Work plans for the four technical studies have been included as attachments to this study plan and include detailed methodologies, tasks, schedules, and deliverables specific to each technical study. When concluded, each technical study will be presented in a report with interpretations and analyses that will serve to inform a Long-Term Monitoring and Reporting Plan (LTMRP). Information obtained from the MSS will also be used to inform development of the Comprehensive Operations Plan (COP).

2 The 2018 Bay–Delta Plan and MSS Requirements

Requirements for developing the MSS are described on pages 35–38 of the 2018 Bay–Delta Plan. Section B(1)(ii) describes existing interior southern Delta compliance locations and the river segments that comprise the 2018 Bay–Delta Plan interior southern Delta salinity compliance locations[2]. Section B(1)(iv) details the requirements of the MSS.

> *ii. Interior Southern Delta Compliance Locations: In D-1641 the State Water Board concluded that DWR and USBR[3] are partially responsible for salinity problems in the southern Delta due to hydrologic changes caused by export pumping. D-1641 imposes conditions on DWR's and USBR's water rights requiring implementation of EC levels of 0.7 mmhos/cm from April through August and 1.0 mmhos/cm from September through March at the three compliance stations in the interior southern Delta (Interagency Stations No. C-6, C-8, and P-12). As part of implementing the salinity water quality objective for the interior southern Delta, the State Water Board will amend DWR's and USBR's water rights to continue to require implementation of the interior southern Delta salinity water quality objectives consistent with this plan. The State Water Board may also consider the responsibility of others for implementing the interior southern Delta salinity objective based on implementation or completion of the Comprehensive Operations Plan, Monitoring Special Study, modeling, or Monitoring and Reporting Plan described below, or development of other information.*
>
> *The interior southern Delta salinity compliance locations are comprised of three river segments rather than three specific point locations so that compliance with the southern Delta salinity objective can be better determined in a Delta environment subject to alternating tidal flows. DWR's and USBR's water rights shall be conditioned to require development of information that will be used to determine the appropriate locations and methods to assess attainment of the salinity objective in the interior southern Delta, including through the Comprehensive Operations Plan, Monitoring Special Study, Modeling, and Monitoring and Reporting Plan described below. Prior to State Water Board approval of the Monitoring and Reporting Plan, compliance with the salinity objective for the interior southern Delta will be assessed at stations C-6, C-8, and P-12, which USBR and DWR shall be required to continue to operate as a condition of their water rights. Chapter III of this plan provides the general rule that unless otherwise provided, water quality objectives cited for a general area are applicable for all locations in that general area. Consistent with this, the use of compliance locations and gage stations to determine compliance by DWR and USBR shall not be interpreted as a limitation on the applicability of the southern Delta salinity objective, which applies throughout the southern Delta.*
>
> *iv. Special Studies, Modeling and Monitoring and Reporting: To implement and determine compliance with the salinity objective in these river segments, and to inform the COP[4], the State Water Board will require DWR and USBR to complete the following activities. The State Water Board will require compliance with these activities pursuant to its Porter-Cologne Water Quality Control Act authority to require technical and monitoring requirements, or as a requirement of a water right order:*

[2] SWP and CVP will continue to be operated in accordance with D-1641 until a new water rights decision is adopted by the State Water Board.
[3] United States Bureau of Reclamation, referred to in this study plan as Reclamation.
[4] The COP is being developed in a separate document by DWR and Reclamation.

a. *Monitoring Special Study: Prior to development of the long-term Monitoring and Reporting Plan, described below, DWR and USBR shall work with State Water Board staff and solicit stakeholder [participating organization[5]] input to develop and implement a special study to characterize the spatial and temporal distribution and associated dynamics of water level, flow, and salinity conditions in the southern Delta waterways. The study shall identify the extent of low or null flow conditions and any associated concentration of local salt discharges. The State Water Board will request local agricultural water users and municipal dischargers to provide data regarding local diversions and return flows or discharges. DWR and USBR shall submit a plan for this special study to the Executive Director for approval within six months from the date of OAL's approval of this amendment to the Bay–Delta Plan. Once approved, the monitoring contained in this plan shall be conducted until superseded by the long-term Monitoring and Reporting Plan, described below, is approved.*

b. *Modeling: DWR and USBR shall provide modeling and other technical assistance necessary to prepare and update the COP, and otherwise assist in implementing the southern Delta agricultural salinity objective. DWR and USBR will be required to continue to provide this assistance as required by State Water Board Order WR 2010-0002, which modifies paragraph A.3 of Order WR 2006-0006.*

c. *Monitoring and Reporting Plan: DWR and USBR shall develop long-term monitoring protocols to measure compliance with the performance goals of the COP, and to assess attainment of the salinity objective in the interior southern Delta. These monitoring and reporting protocols shall be based on the information obtained in the Monitoring Special Study, and shall include specific compliance monitoring locations in, or monitoring protocols for, the three river segments that comprise the interior southern delta salinity compliance locations. The Executive Director may approve changes to the gage stations at which compliance is determined, except monitoring station C-10, in Table 2, if information shows that other gage stations more accurately represent salinity conditions in the interior southern Delta. The Monitoring and Reporting Plan will be required to be integrated and coordinated with existing monitoring and special studies programs in the Delta. DWR and USBR shall submit the Monitoring and Reporting Plan to the Executive Director for approval within 18 months from the date of OAL's approval of this amendment to the Bay–Delta Plan.*

[5] This document uses the term *participating organization* instead of *stakeholder.*

3 MSS Study Area and Technical Studies

Study Area

The MSS study area consists of the interior southern Delta waterways and includes the compliance locations identified under Table 2, on page 12, of the 2018 Bay–Delta Plan. It lists the river segments between the existing southern Delta compliance locations, including the San Joaquin River from Vernalis to Brandt Bridge, Middle River from Old River to Victoria Canal, and Old River/Grant Line Canal from Head of Old River to West Canal (see Table 3-1 under *Southern Delta*).

Table 3-1: Table 2 from the 2018 Bay–Delta Plan (Lists the Southern Delta Waterways between D-1641 Compliance Station Locations and the Associated EC Objectives for Agricultural Beneficial Uses)

Table 2
Water Quality Objectives For Agricultural Beneficial Uses

COMPLIANCE LOCATIONS	INTERAGENCY STATION NUMBER (RKI [1])	PARAMETER	DESCRIPTION (UNIT) [2]	WATER YEAR TYPE [3]	TIME PERIOD	VALUE
WESTERN DELTA						
Sacramento River at Emmaton	*D-22 (RSAC092)*	*Electrical Conductivity (EC)*	*Maximum 14-day running average of mean daily EC (mmhos/cm)*		*0.45 EC April 1 to date shown*	*EC from date shown to Aug 15 [4]*
				W	*Aug 15*	*----*
				AN	*Jul 1*	*0.63*
				BN	*Jun 20*	*1.14*
				D	*Jun 15*	*1.67*
				C	*----*	*2.78*
San Joaquin River at Jersey Point	*D-15 (RSAN018)*	*Electrical Conductivity (EC)*	*Maximum 14-day running average of mean daily EC (mmhos/cm)*		*0.45 EC April 1 to date shown*	*EC from date shown to Aug 15 [4]*
				W	*Aug 15*	*----*
				AN	*Aug 15*	*----*
				BN	*Jun 20*	*0.74*
				D	*Jun 15*	*1.35*
				C	*----*	*2.20*
INTERIOR DELTA						
South Fork Mokelumne River at Terminous	*C-13 (RSMKL08)*	*Electrical Conductivity (EC)*	*Maximum 14-day running average of mean daily EC (mmhos/cm)*		*0.45 EC April 1 to date shown*	*EC from date shown to Aug 15 [4]*
				W	*Aug 15*	*----*
				AN	*Aug 15*	*----*
				BN	*Aug 15*	*----*
				D	*Aug 15*	*----*
				C	*----*	*0.54*
San Joaquin River at San Andreas Landing	*C-4 (RSAN032)*	*Electrical Conductivity (EC)*	*Maximum 14-day running average of mean daily EC (mmhos/cm)*		*0.45 EC April 1 to date shown*	*EC from date shown to Aug 15 [4]*
				W	*Aug 15*	*----*
				AN	*Aug 15*	*----*
				BN	*Aug 15*	*----*
				D	*Jun 25*	*0.58*
				C	*----*	*0.87*
SOUTHERN DELTA						
San Joaquin River at Airport Way Bridge, Vernalis **-and-** *San Joaquin River from Vernalis to Brandt Bridge* **-and-** *Middle River from Old River to Victoria Canal* **-and-** *Old River/Grant Line Canal from Head of Old River to West Canal*	*C-10 [5] (RSAN112)* *C-6 [5] (RSAN073)* *C-8 [5] (ROLD69)* *P-12 [5] (ROLD59)*	*Electrical Conductivity (EC)*	*Maximum 30-day running average of mean daily EC (dS/m/m [6])*	*All*	*Year-round*	*1.0*
EXPORT AREA						
West Canal at mouth of Clifton Court Forebay **-and-** *Delta-Mendota Canal at Tracy Pumping Plant*	*C-9 (CHWST0)* *DMC-1 (CHDMC004)*	*Electrical Conductivity (EC)*	*Maximum monthly average of mean daily EC (mmhos/cm)*	*All*	*Oct-Sep*	*1.0*

Table 2 Footnotes:

[1] River Kilometer Index station number.

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As specified in the 2018 Bay–Delta Plan, "The interior southern Delta salinity compliance locations are comprised of three river segments rather than three specific point locations so that compliance with the southern Delta salinity objective can be better determined in a Delta environment subject to alternating tidal flows." DWR and Reclamation consider the three river segments—San Joaquin River from Vernalis to Brandt Bridge, Middle River from Old River to Victoria Canal, and Old River/Grant Line Canal from Head of Old River to West Canal—as the geographic scope of and the area of focus for the MSS. The following map (Figure 3-1) shows the study area where the MSS will be focusing monitoring and modeling efforts, beginning at Airport Way Bridge, Vernalis, and concluding at West Canal.

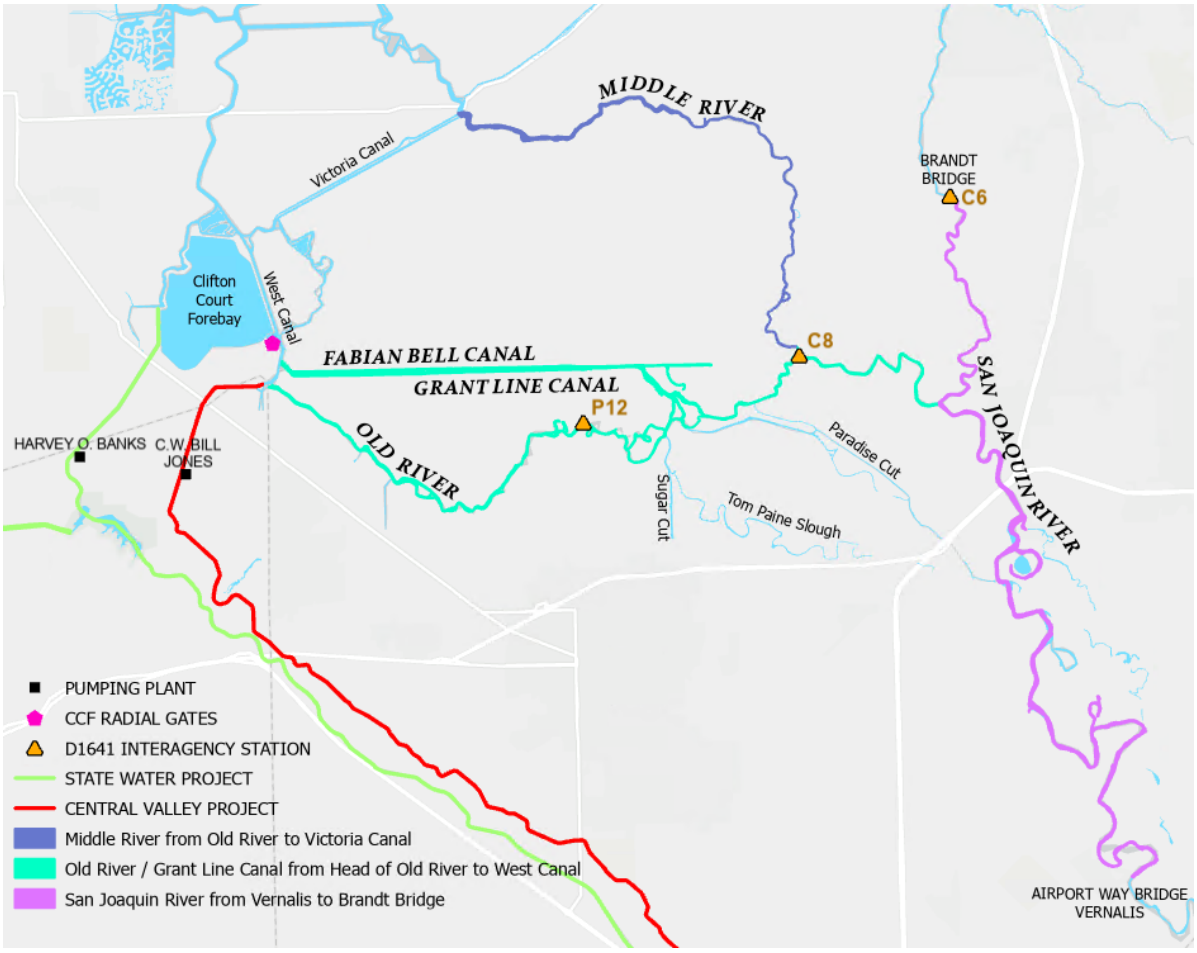

Figure 3-1: South Delta Map Showing Interagency Compliance Station Locations and River Segments Defined by the 2018 Bay–Delta Plan.

Description of Technical Studies

The MSS comprises four technical studies, two of which fall within the category of monitoring efforts; the other two are modeling efforts. The following is a brief description of each technical study.

1) High-Speed Salinity Transect Mapping Study

This study's goal is to collect and map salinity data in the interior southern Delta. The study is conducted by using a boat equipped with a water-intake system, which collects

in-channel water from the waterway and measures the salinity (EC) every second. While collecting EC measurements, the boat simultaneously captures the global positional system (GPS) coordinates, showing the changes in salinity over space. Data is then plotted to show salinity conditions across different waterway segments. The timing of transects have been planned to account for variability in tidal, operational, and seasonal conditions.

2) Salinity Point Source and Ion Sampling Study

This study is a comprehensive data-collection effort that involves installing temporary EC monitoring stations in targeted areas to improve modeling resolution and increase confidence in modeling results. Ion samples will also be collected and analyzed to develop ionic fingerprints that could distinguish between salinity sources. Additional monitoring efforts will be conducted as needed, including dye-tracing experiments that will provide models with improved dispersion rates and confirm mean-flow direction in channels with low-flow magnitude, such as Paradise Cut.

3) SCHISM 3D Hydrodynamic and Water Quality Modeling Study

The Semi-Implicit Cross-scale Hydroscience Integrated System Model (SCHISM) component of the MSS is intended to provide a means of synthesizing observations from enhanced monitoring, examining hypotheses, and applying insights to developing monitoring protocols for the three interior southern Delta river segments. The model will be used to define and assess different approaches to compliance across the three river segments and can be used to assess the likelihood of compliance under different flow regimes. Simulations will also be performed to assess the relative influence of Vernalis inflow, Vernalis water quality, State and Federal Project exports, and in-Delta sources. Early stages of this study will require refining the mesh for the interior southern Delta to achieve better resolution of small bathymetric and flow features. A finer mesh will also inform data collection and analysis and identify knowledge gaps concerning the spatial and temporal distribution of null-flow zones.

4) Water Quality Data Assimilation Modeling Study[6]

Data assimilation is a modeling technique that is used to infer unknown salinity sources to integrate observational data with a mechanistic model to provide additional insight on EC sources and identify data gaps required to better monitor the system. The inferred salinity loads as a data product can be used to improve model performance of EC outputs for both DSM2-GTM (Delta Simulation Model II – General Transport Model) and SCHISM. This model utilizes data that are quality assured and controlled from an extensive, continuous monitoring network, hosted on DWR's Water Data Library and the U.S. Geological Survey's National Water Information System, along with additional data collected from the monitoring components of the MSS, and integrates the data with a mechanistic water-quality model. The inference of the EC sources is based on the spatial and temporal variations in the modeled EC errors. This approach can provide insight to the underlying causes of the high level of salinity observed in the southern Delta.

[6] This study was formerly referred to as Agricultural Return Flow Water Quality Data Integration in Chapter 5 of the December 2020 Draft COP.

Additionally, with hydrodynamic and salinity-transport models, data assimilation can provide more realistic modeling of the spatial and temporal distribution of water level, flow, and salinity conditions in the southern Delta system.

In addition to the four technical studies described above, flow-monitoring efforts will also be conducted throughout the duration of the MSS. Although not a separate technical study, flow experiments have been scoped to support initial findings of low- and null-flow convergence zones identified in lower Old River. Additionally, flow-monitoring stations upstream of the temporary agricultural barriers are being assessed to determine if multiple rating equations are needed to account for changes in channel velocities while barriers are in place. This work, along with identification of low and null zones, will be summarized and included in technical memoranda as work is completed.

Collectively, the four technical studies, along with supplemental flow-monitoring activities, have been designed to inform an LTMRP that will include long-term monitoring and reporting protocols to measure compliance with the salinity objective in the interior southern Delta, including specific compliance monitoring locations in or monitoring protocols for the three river segments that comprise the interior southern Delta salinity-compliance locations. Evaluation of data collected during the MSS will be used to better understand local water quality dynamics, including how low- or null-flow conditions may contribute to increased salinity by concentrating local salt discharges, and will be used to reevaluate the interior southern Delta water quality–monitoring network. The addition of high-speed salinity transects between sites, discrete sampling at locations with elevated salinity, and integration of data about the volume and quality of agricultural return flows are intended to help develop and validate more-accurate water-quality modeling. With the integration of the salinity sources and the spatial distribution of salinity informing improved salinity modeling throughout the channels, the proposed monitoring and modeling can then be used to develop reasonably practicable methods to measure salinity and assess whether compliance criteria are attainable, all of which will inform development of the LTMRP.

4 Approach for Meeting the MSS Goals

Although past studies have provided context to the complexity of water quality and hydrodynamics in the interior southern Delta, more monitoring efforts, modeling, and additional data-collection efforts are needed to properly characterize salinity, flow, and stage levels. Additionally, coordination and cooperation with participating agencies are vital to obtaining key pieces of information, including local and municipal water users' diversion rates, land-use applications, and return flow rates and EC levels.

To meet the goals of the MSS, DWR and Reclamation will analyze the existing flow, stage, and water quality monitoring stations and begin deploying additional temporary flow and water quality monitoring stations. The additional data will be modeled with SCHISM and data assimilation. The models will be utilized, to the extent possible, to characterize the flow and water quality conditions in the interior southern Delta and will also help identify where additional flow or water quality data is needed to improve water quality modeling results. Additional data collection and modeling will occur until enough data is obtained to improve confidence in the modeling results. Figure 4-1 shows the relationship between the different

modeling and monitoring efforts; it is also included in Attachment 3: *SCHISM 3D Water Quality Modeling Work Plan*.

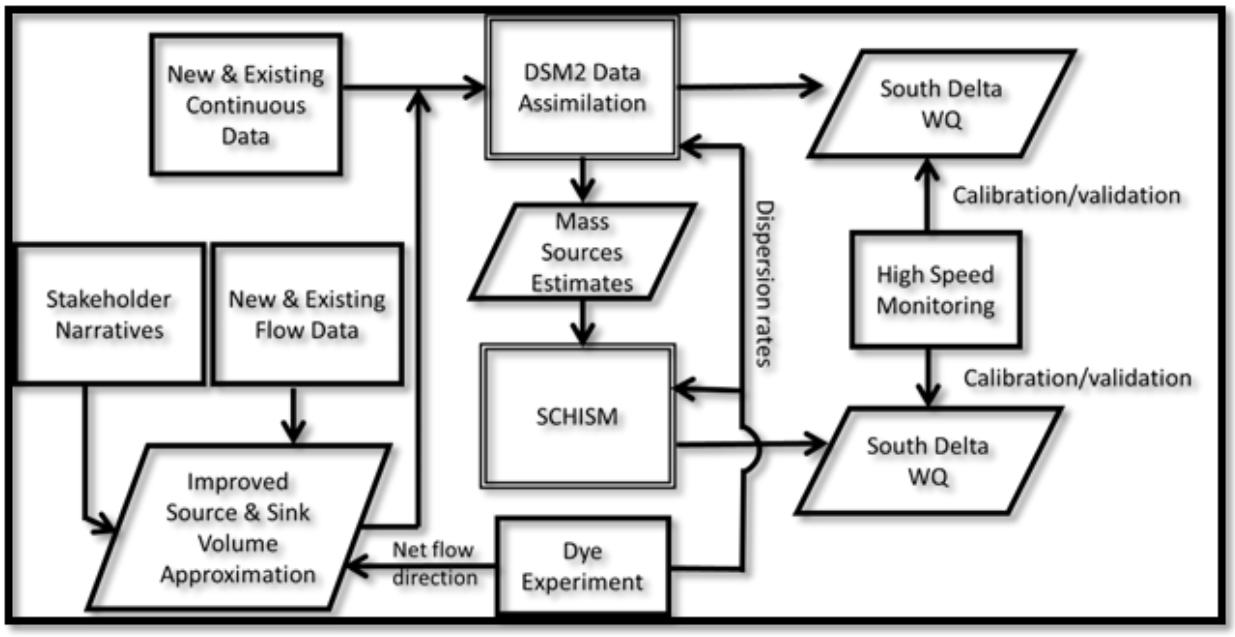

Figure 4-1: Flow Chart of MSS Monitoring and Modeling Efforts. *New and Existing Continuous Data* Includes, but Is Not Limited to, Data Collected from the Salinity Point Source and Ion Sampling Study.

With the general approach outlined above, the goals of the MSS have been restated below to show how each technical study addresses specific goals, followed by bulleted objectives of the studies.

Meeting Goal #1

Characterize the spatial and temporal distribution and associated dynamics of water level, flow, and salinity conditions in the southern Delta waterways.

This goal will be achieved by completing the technical studies, as described below.

- High-Speed Salinity Transect Mapping
    - Salinity transects provide timestamps of salinity conditions across all major river segments in the interior southern Delta, including adjacent dead-end sloughs, like Paradise Cut and Sugar Cut.
    - Transects will capture salinity variability and be analyzed based on tidal, seasonal, and operational changes in the interior southern Delta.
    - Transects are scheduled throughout the navigable interior southern Delta waterways over 2 years to capture a wide range of water level, flow, and EC conditions in the study area.
    - Transects are scheduled to capture a range of tidal scenarios with differing magnitudes.

- Salinity Point Source and Ion Sampling
    - Additional temporary EC stations will provide high-resolution data and improve understanding of temporal variation in salinity in areas known to have high EC concentrations.
    - Collected ion samples will be analyzed to determine relationships between different interior southern Delta channels, providing context to salinity sources and improving the characterization of in-channel salinity.

- SCHISM 3D Hydrodynamic and Water Quality Modeling
    - Modeling will simulate interactive effects of San Joaquin inflow and water quality, State Water Project (SWP) and Central Valley Project (CVP) exports, temporary agricultural barriers, and local mass sources on Delta water quality.

- Water Quality Data Assimilation Modeling
    - Modeling will provide a more realistic model of salinity, flow, and stage conditions by utilizing inferred EC sources and corroborating them with measured points.

Meeting Goal #2

Identify the extent of low- or null-flow conditions and any associated concentration of local salt discharges.

This goal will be achieved by completing the technical studies, as described below.

- High-Speed Salinity Transect Mapping
    - Once mapped, data that show areas higher in salinity relative to surrounding channels will be analyzed to show if salinity changes throughout multiple runs or during different conditions. The spatial data could identify where in Lower Old River up and downstream tidal movement converges.
    - High frequency temporal and spatial measurements can identify areas with concentrated salinity. The maps will help identify the sphere of influence of high-salinity discharges in the study area.

- Salinity Point Source and Ion Sampling
    - Supporting salinity discharge data will inform the effects of low- and null-flow zones on in-channel salinity conditions.

- SCHISM 3D Hydrodynamic and Water Quality Modeling
    - SCHISM's high spatial resolution modeling has informed DWR's flow staff of a potential need to recalibrate existing flow stations within the southern interior Delta. Temporary flow stations are planned to be installed to bisect existing flow stations and identify the extent of null flows in the region.

Meeting **Goal #3**

Inform a Long-Term Monitoring and Reporting Plan that will:

a. Assess attainment of the salinity objective in the interior southern Delta; and

b. Include long-term monitoring and reporting protocols, including specific compliance monitoring locations in, or monitoring protocols for, the three river segments that comprise the interior southern Delta salinity compliance locations.

This goal will be achieved by completing the technical studies, as described below.

- High-Speed Salinity Transect Mapping
    - Salinity transects will provide insight about salinity conditions between stationary EC-monitoring locations. Maps will be analyzed to assess existing compliance objectives and inform recommendations for long-term monitoring protocols.
    - The data collected during the transects will be used to help develop and validate any modeling outputs of interior southern Delta EC.
    - Salinity transects may be incorporated into a long-term monitoring plan as a tool for periodic validation during development of monitoring protocols.

- Salinity Point Source and Ion Sampling
    - Additional EC monitoring locations will inform recommendations for movement of existing compliance locations and improve model outputs for establishing new monitoring protocols for salinity compliance.

- SCHISM 3D Hydrodynamic and Water Quality Modeling
    - SCHISM modeling will be used as a virtual testbed for concepts to test development of monitoring protocols, representation, and equitability of compliance proposals.
    - These models are planned to be transitioned into an operational planning tool to assess probable salinity and water level outcomes of federal, state, and local operations.

- Water Quality Data Assimilation Modeling
    - Model simulations will help identify a range of natural conditions to test EC compliance during development of monitoring protocols.
    - The model will be used to optimize the current continuous observational network and identify data gaps that can reduce model uncertainties when evaluating placement of compliance monitoring stations.
    - Near real-time simulations of spatial and temporal variations of EC fields makes data assimilation a good modeling technique that could potentially be developed into an operational EC model.

5 Tasks

The following tasks are anticipated to occur over the MSS study period. Specific tasks may vary, and removal or addition of tasks might occur based on modeling results, participating agency feedback, or other unanticipated factors.

1) Analyze historical data.
    a. Review existing CDEC continuous monitoring stations.
    b. Review past southern Delta salinity reports.
    c. Identify low- and null-flow zones.
    d. Identify zones of high, concentrated salinity.
    e. Identify and prioritize bathymetry surveys.

2) Collect additional data.
    a. Conduct high-speed salinity transects and develop maps.
    b. Deploy additional water quality monitoring stations.
    c. Collect ion samples at various monitoring sites.
    d. Deploy additional temporary flow stations in low- and null-flow zones.
    e. Conduct Rhodamine water tracer (WT) dye studies.
    f. Analyze wastewater treatment plants (WWTP) and other publicly available water quality and flow data.
    g. Conduct additional bathymetry surveys.

3) Model southern Delta salinity conditions.
    a. Prepare model inputs (i.e., flow, EC, stage, and operations of hydraulic structures).
    b. Identify data gaps and uncertainties in the model, including:
        i. Uncertainty in the amplitude and direction of mean flow during low-flow periods near the null zone on Old River;
        ii. Uncertainty in the flow diversion and drainage into Paradise Cut; and
        iii. Uncertainty concerning the locations of the most significant EC loads/sources.
    c. Prepare continuous surfaces from recent bathymetric surveys for use in DSM2 and SCHISM.
    d. Provide recommendations for additional data collection and integrate newly collected data to refine model results of EC and flow.
    e. Perform scenario tests to quantify the influence of the model uncertainties on the spatial and temporal variations in EC.

4) Engage with participating organizations.
    a. Schedule technical workshops to relay and receive information for local water users.
    b. Conduct site visits with local participants and regulatory staff.

5) Draft technical study chapters

c. Complete chapter on High-Speed Salinity Transect Mapping.
d. Complete chapter on Salinity Point Source and Ion Sampling.
e. Complete chapter on Bay–Delta SCHISM 3D Modeling.
f. Complete chapter on Water Quality Data Assimilation Modeling.

6) Develop MSS final report that will inform development of a draft LTMRP.

6 Estimated Schedule

Data collection and modeling began in calendar year 2021 and are expected to continue through calendar years 2022 and 2023. Table 6-1 shows the currently anticipated schedule for completing the tasks in the MSS Plan.

Table 6-2: MSS Plan Estimated Schedule of Completion

Task Number	Task Description	Estimated Task Delivery Schedule	Responsible Organizations/Individuals
1	Historical Data Analysis	January 2021–December 2021	DWR Water Quality Evaluation Section, and DWR Bay–Delta Office
2	Additional Data Collection	July 2021–December 2023	DWR Water Quality Evaluation Section, and DWR Flow and Special Studies Section
3	Modeling Southern Delta Salinity Conditions	July 2021–December 2023	DWR Bay–Delta Office
4	Engagement with Participating Agencies	January 2021–December 2024 (minimum quarterly or more frequently, if needed)	MSS Team and Meeting Facilitator
5	Drafting Technical Studies	January 2024–June 2024	Technical Study Leads
6	MSS Final Report Preparation	July 2024–December 2024	Project Manager

7 References

State Water Resources Control Board. 2018. *Water Quality Control Plan for the San Francisco Bay/Sacramento–San Joaquin Delta Estuary.* December 12.

8 Attachments

Attachments of the technical study work plans have been included for reference. Detailed methodologies, schedules, along with other information can be found in these attachments.

- Attachment 1: High-Speed Salinity Transect Mapping Draft Work Plan
- Attachment 2: Salinity Point Source and Ion Sampling Draft Work Plan
- Attachment 3: SCHISM 3D Hydrodynamic and Water Quality Modeling Draft Work Plan
- Attachment 4: Water Quality Data Assimilation Modeling Draft Work Plan

9 Appendices

- Appendix A: *Response to Comments on the Draft Monitoring Special Study*
- Appendix B: *Outreach to Participating Organizations Informing Development of the Draft Monitoring Special Study*