Chapter 3
Scope of Analysis

3.1 Geographic Scope of the Analysis

As described in Chapter 2, "Project Description," Section 2.1.2, "Project Location," the geographic scope for evaluation of direct and indirect impacts of the Long-Term Operations of the State Water Project (SWP) facilities in the Sacramento–San Joaquin Delta (Delta), Suisun Marsh, and Suisun Bay (Proposed Project) includes the following waters and facilities:

- Sacramento River from the confluence with the Feather River to the Delta
- SWP facilities in the Delta
- Waters of the Delta
- SWP facilities in Suisun Marsh and Suisun Bay
- Suisun Marsh and Suisun Bay

The rationale for including these waterbodies and facilities in the geographic area potentially affected by the Proposed Project and excluding other areas is provided in Appendix 2D, "Geographic Scope of Project's Influence on Flow."

3.2 Issues Eliminated from Detailed Consideration in the DEIR

Before beginning preparation of this Draft Environmental Impact Report (DEIR), an Initial Study was prepared to consider the wide range of environmental resource topics contained in Appendix G of the State California Environmental Quality Act (CEQA) Guidelines. The Initial Study is provided in Appendix 3A. Based on this Initial Study, the scope of this DEIR has been focused on those environmental resources that potentially would be significantly affected by the Proposed Project, and the following environmental topics have been eliminated from detailed consideration in this DEIR:

- Aesthetics
- Agriculture and Forestry Resources
- Air Quality
- Biological Resources (Terrestrial)
- Cultural Resources
- Energy
- Geology and Soils
- Greenhouse Gas Emissions

- Hazards and Hazardous Materials
- Land Use and Planning
- Mineral Resources
- Noise
- Population and Housing
- Public Services
- Recreation
- Transportation/Traffic
- Utilities and Service Systems
- Wildfire

The following environmental topics are addressed in this DEIR:

- Surface Water Hydrology
- Surface Water Quality
- Aquatic Biological Resources
- Tribal Cultural Resources
- Environmental Justice
- Climate Change Resiliency and Adaptation

The Initial Study, provided in Appendix 3A of this DEIR, concluded that the proposed long-term operations of the SWP would not result in significant impacts on hydrology or surface water resources. However, although the Proposed Project would alter existing hydrology in a manner that would not be considered significant, such changes could result in impacts on resources dependent upon existing hydrologic conditions. These resources include water quality and aquatic biological resources.

To provide the reader with an understanding of the potential project impacts on water quality and aquatic biological resources, this DEIR presents a description of the existing hydrologic setting and compares it with the estimated hydrology associated with the Proposed Project in the following discussion. The DEIR then analyzes potential impacts on water quality, aquatic biological resources, Tribal cultural resources, environmental justice, and climate change resiliency and adaptation that could result from the changes to hydrology.

3.3 Environmental Baseline

An EIR must include a description of the physical conditions in the project's vicinity, often referred to as the "baseline." Lead agencies refer to the baseline when determining whether a project's impact is significant. Pursuant to Section 15125(a), generally, the baseline should consist of conditions that exist at the time the Notice of Preparation (NOP) is published. Where conditions change or fluctuate over time and where necessary to provide the most accurate picture practically possible of the project's impacts, a lead agency may define the baseline by referencing historical conditions or conditions expected when the project becomes operational, or both, that are supported with substantial evidence. A lead agency may also define the baseline in reference to both existing conditions and projected future conditions that are supported by reliable projections based on substantial evidence. The purpose of this requirement is to give the public and decision makers the most accurate and understandable picture practically possible of the project's impacts.

The baseline in this DEIR includes the physical conditions that existed at the time of NOP publication on June 16, 2023 as well as implementation of the Yolo Bypass Salmonid Habitat Restoration and Fish Passage Project, commonly referred to as the "Yolo Bypass Big Notch Project" or "Yolo Notch Project." While the Yolo Notch Project was not operational on June 16, 2023, it is anticipated to be complete before approval of this Project and inclusion of such operation would present a more accurate and understandable representation of conditions for Project comparison purposes. Modeling was used to identify the Baseline Conditions, pursuant to Section 15125(a), as described above. One aspect of the baseline is the manner in which the SWP and Central Valley Project (CVP) jointly operate to meet Delta regulatory requirements under the Coordinated Operation Agreement (COA). The COA was originally executed in 1986 and subsequently updated in 2018 through the 2018 COA Addendum. The baseline used in this DEIR includes the 2018 COA Addendum.

The baseline for this EIR also includes State Water Resources Control Board Decision 1641 and the 2021 Interim Operations Plan for CVP and SWP operations, among other regulatory requirements.

3.4 Impact of Climate Change

As explained in the Initial Study (provided in Appendix 3A, "Initial Study"), the Proposed Project would have no impact either directly or indirectly on greenhouse gas emissions. CEQA generally does not require any further analysis of climate change impacts, such as an evaluation of the environment's impacts on a project, unless the project may exacerbate existing environmental hazards. The Proposed Project is not expected to exacerbate any hazards, such as flood potential, because river flows and SWP pumping would remain within historical operating range. Analysis and discussion of impacts of climate change on the environmental resources addressed in the DEIR and how the Proposed Project will improve climate resiliency and adaptation is presented in Chapter 9, "Climate Change Resiliency and Adaptation."

Even though climate change effects need not be discussed further in this EIR, the California Department of Water Resources (DWR) voluntarily chose to prepare a sensitivity analysis of operational changes to the Baseline Conditions at the time of the NOP (June 2023) and the Proposed Project scenarios under climate change and sea-level-rise conditions. The purpose of the sensitivity analysis is to present, for informational purposes, a more comprehensive picture about the incremental changes between operations under the Existing Conditions and the Proposed Project scenarios under the projected climate conditions (Appendix 4E, "Climate Sensitivity").

3.5 Approach to Modeling

The discussions presented in this DEIR rely on analyses by professional experts and calculations performed by various computer and mathematical models. The following sections identify and describe the various computer models that constitute a major component of the DEIR findings and conclusions.

3.5.1 CalSim 3

DWR and the U.S. Department of the Interior, Bureau of Reclamation (Reclamation) have jointly developed a new version of CalSim, known as CalSim 3. CalSim 3 replaces its predecessor, CalSim II, for conducting planning studies relating to operations of SWP and CVP. CalSim 3 contains many additions and enhancements over CalSim II. These include the following:

- Expansion of model domain to dynamically simulate the mountain watersheds of the Sacramento and San Joaquin valleys using a physically based network schematic, which is available in geo-referenced form.
- Delineation of over 230 mountain and foothill (rim) watersheds and corresponding unimpaired runoff to major reservoirs and to mountain rivers and streams at points of diversion and points of measurement.
- Finer spatial resolution, whereby water demands are based on individual water districts and water agencies rather than large geographic regions and points of diversion are based on contracts and water rights.
- Updated agricultural land use, crop water demands, and irrigation efficiencies.
- Updated urban demands based on 2020 Urban Water Management Plans.
- Improved simulation of groundwater flows and storage, including stream-groundwater interaction, by linking CalSim 3 to a distributed, finite element groundwater model and improved distinction between surface water use and groundwater use.
- Extended period of simulation to include water years 2004 through 2021.

DWR and Reclamation have extensively reviewed CalSim 3 performance through comparison to CalSim II and to recent historical observed data. CalSim 3 is considered the best available tool for performing planning studies and supporting environmental review of proposed projects and programs.

3.5.2 Delta Simulation Model II

DSM2 is a one-dimensional hydrodynamic and water quality simulation model used to simulate hydrodynamics, water quality, and particle tracking in the Delta. DSM2 can calculate stages, flows, velocities, mass transport processes for conservative and non-conservative constituents including salts, water temperature, dissolved oxygen, and trihalomethane formation potential, and transport of individual particles. DSM2 thus provides a powerful simulation package for analysis of complex hydrodynamic, water quality, and ecological conditions in riverine and estuarine systems.

In 2013, DWR released DSM2 version 8.1.2, which included major changes, such as updated bathymetric reference to NAVD 88 and modified representation of dispersion in DSM2-QUAL. DWR also recalibrated DSM2 with this updated version and found that the performance of the model in simulating observed hydrodynamics and salinity conditions was very close to the 2009 calibration (Liu and Sandhu 2013). Most recently, DWR released DSM2 v8.2.0 (California Department of Water Resources 2021), modifying the way that consumptive use and net channel depletion are estimated for the legal Delta. More specifically, v8.1.2 uses the Delta Island Consumptive Use (DICU) model, while v8.2.0 employs the Delta Channel Depletion (DCD) model in deriving Delta channel depletion as well as consumptive use.

DCD has finer temporal and spatial resolutions than its predecessor that provide simulations at a daily scale for 168 subareas in the Delta. DCD also incorporates several enhancements including updated parameterization and the addition of physical processes related to Delta channel depletions (Liang and Suits 2017, 2018). In light of this difference, the DSM2 v8.2.0 hydrodynamics and electrical conductivity were calibrated and validated using observed data up to 2021 (California Department of Water Resources 2021).

3.5.3 Semi-Implicit Cross-Scale Hydroscience Integrated System Model

The Bay-Delta Semi-Implicit Cross-scale Hydroscience Integrated System Model (SCHISM) is an application of the 3D open-source SCHISM hydrodynamic and water quality suite to the San Francisco Bay Delta estuary. The project is a collaboration between DWR and the Virginia Institute of Marine Sciences.

Target applications include the following:

- Habitat creation and conveyance options for the Delta
- Salinity intrusion changes during drought conditions or sea level rise
- Velocity changes following the installation of drought barriers
- Fate of mercury produced in the Liberty Island complex
- Temperature, flow, and food production in the estuary as part of a three-model full life cycle bioenergetic model of salmon

See Appendix 6C, "SCHISM Model Results," for a more detailed description of the SCHISM methodologies applied for the analyses presented in this EIR.

3.5.4 Biological Modeling

Several models were used to support the quantitative assessment of impacts on aquatic biological resources. These models were developed from empirical studies conducted by DWR and others in the Delta over several years. The models, methodologies, and results associated with the use of these models are described in detail in Appendix 6B, "Biological Modeling Methods and Selected Results," and are briefly identified below.

3.5.4.1 Delta Passage Model

The Delta Passage Model (DPM) simulates the migration of Chinook Salmon smolts entering the Delta from the Sacramento River at Fremont Weir, and estimates survival to Chipps Island. The DPM uses available time-series data and values taken from empirical studies or other sources to parameterize model relationships and inform uncertainty, using the greatest amount of data available to dynamically simulate responses of smolt survival to changes in water management.

3.5.4.2 Survival, Travel Time, and Routing Simulation Model

The Survival, Travel Time, and Routing Simulation model (STARS) is a stochastic, individual-based simulation model designed to predict survival of a cohort of fish that experience variable daily river flows as they migrate through the Delta. The parameters on which the STARS model is based were derived from a Bayesian mark-recapture model that jointly estimated reach-specific travel time, migration routing, and survival of juvenile Chinook Salmon. This model extends the work of Perry et al. (2010) to estimate the impact of the Delta Cross Channel and Delta inflows as measured in the Sacramento River at Freeport (U.S. Geological Survey stream gage 11447650) on survival, travel time, and routing of juvenile Chinook Salmon in eight reaches of the Delta.

3.5.4.3 ECO-PTM

ECO-PTM is an individual-based juvenile salmon migration model based on a random-walk particle-tracking method with fish-like behaviors attached to the particles. The behavioral parameters are estimated from acoustic telemetry tag data of juvenile late-fall-run Chinook Salmon (Tag Data) from various field studies (Perry et al. 2018). A stochastic optimization tool, Particle Swarm Optimization, is used to calibrate the swimming behavior parameters. ECO-PTM can simulate juvenile salmonid migration timing, routing, and survival. Further detail is provided by Wang (2019).

3.5.4.4 San Joaquin River Juvenile Chinook Salmon Through-Delta Survival (Structured Decision Model Routing Application)

The Delta Structured Decision Model Chinook Salmon Routing Application was developed by the Central Valley Project Improvement Act Science Integration Team to evaluate the effect of different management decisions on the survival and routing of juvenile fall-run Chinook Salmon. The model relies on survival-environment relationships and routing-environment relationships from acoustic studies conducted in the Sacramento and San Joaquin rivers and at the state and federal south Delta export facilities.

3.5.4.5 Delta Smelt Life Cycle Model with Entrainment

The Delta Smelt Life Cycle Model with Entrainment (LCME) model estimates annual population replacement rate (lambda) as a function of various covariates acting on six different life stages using R statistical software (R Core Team 2023).

3.5.4.6 Other Biological Modeling Tools

Various other quantitative methods and tools were used in the analyses of potential impacts on aquatic biological resources. These methods include statistical analyses of empirical data and hydrology/hydrodynamic-population dynamic relationships using various tools including commercially available or open-source statistical software packages. These methods and tools are described in detail in Appendix 6B, “Biological Modeling Methods and Selected Results.”

3.5.5 Appropriate Use of Modeling

Modeling used in this document is for a planning analysis based on CalSim 3 simulations. A planning analysis is conducted to understand long-term changes in the CVP and SWP system due to a proposed change. CalSim 3 includes a generalized and simplified representation of a complex water resources system, and as such, its results cannot be compared to historical observed data. Even so, the models used are informative and helpful in understanding the performance and potential impacts (both positive and negative) of the operation of a project and its interaction with the water resources system under consideration. Even though some of the models used in this planning analysis such as DSM2 are calibrated and validated to represent physical processes, given the nature of the boundary conditions used (derived from CalSim 3), DSM2 results would only tend to represent generalized long-term trends. Similarly, all the models used in the analysis that use CalSim 3 outputs as inputs should primarily be used to understand the potential long-term trends. The level of confidence, in the results of any well-calibrated predictive model, is only as good as the level of confidence in the input boundary conditions used.

Even though CalSim 3 does not replicate the recent historical conditions, the 100 years simulated generally represent the range of hydrologic conditions expected to occur over the period of long-term operations of the SWP. It also includes a generalized representation of existing regulations, facilities and demands. CalSim 3 simulates water volumes, flows, and water quality, and does not have the capability to simulate fish or turbidity. However, fish presence and turbidity are the primary factors in determining the permissible Old and Middle River flow direction and magnitude, which at times (January through mid-June) acts as a constraint on export levels in real-time operations. To represent operations governed by fish presence or other real-time variables, CalSim 3 includes simplifying operational assumptions based on historical data, which is a common practice especially with representing fishery-based actions in a planning analysis. Real-time operations can vary, and the general operating conditions may not represent all the possibilities associated with fish-based regulatory criteria. Information included in Section 4.1 demonstrates that CalSim 3 Baseline Conditions scenario results reasonably encompass the range of Delta hydrologic conditions over the last decade. Despite its limitations, CalSim 3 offers the best tool available to simulate SWP and CVP operational alternatives over a range of hydrologic conditions. Comparative analysis of different operational regimes (including regulatory conditions) using CalSim 3 allows for reasonable inference of how differently the projects might perform under the differing conditions.