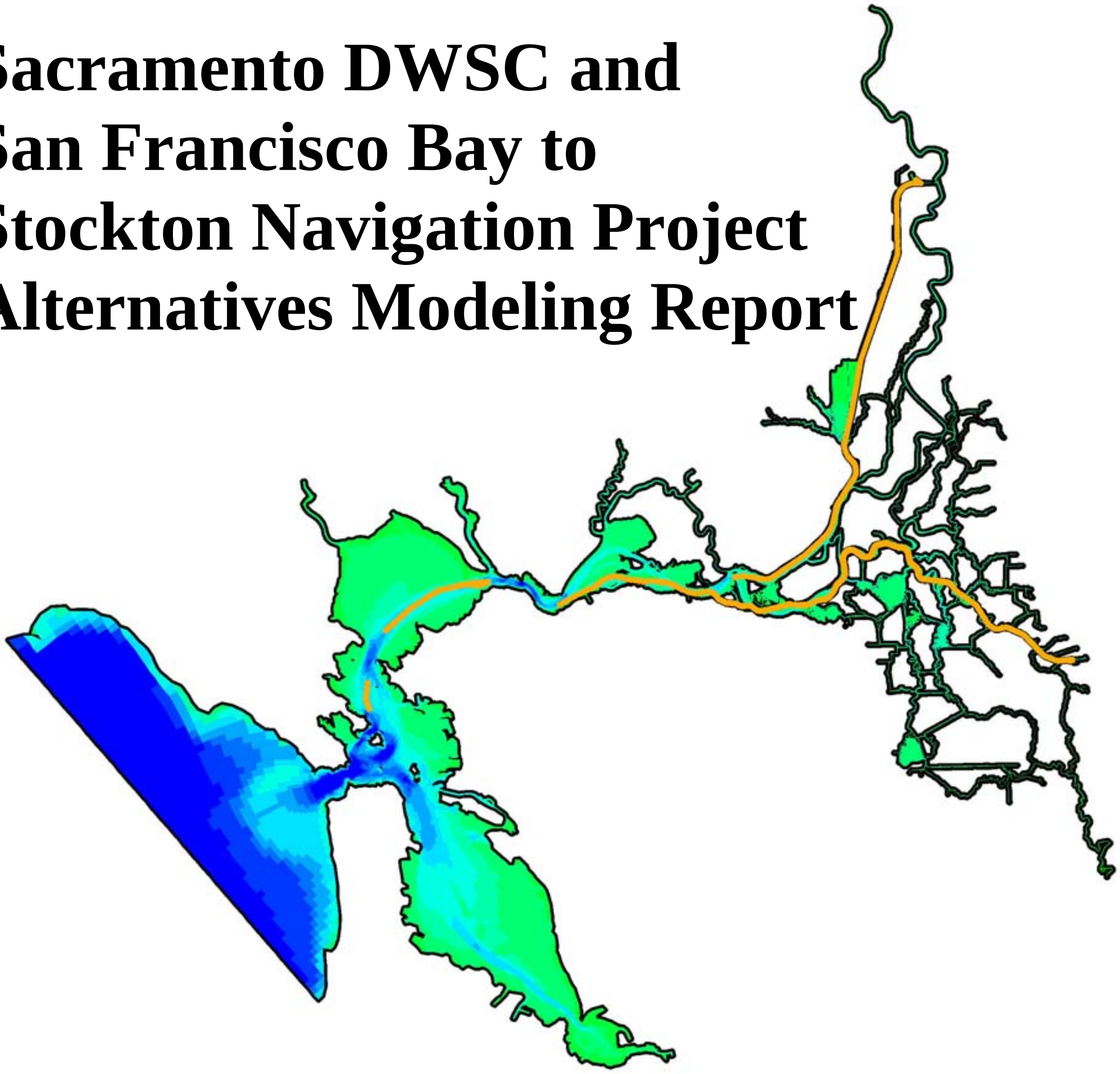
APPENDIX L
SUMMARY OF THE SACRAMENTO DWSC AND SAN FRANCISCO BAY TO STOCKTON NAVIGATION PROJECT ALTERNATIVES MODELING REPORT (2010)

SACRAMENTO AND STOCKTON DEEP WATER SHIP CHANNEL
3-D HYDRODYNAMIC AND SALINITY MODELING STUDY

Sacramento DWSC and San Francisco Bay to Stockton Navigation Project Alternatives Modeling Report



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June 14, 2010

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Executive Summary

The U.S. Army Corps of Engineers is conducting two reevaluation studies for deepening the Sacramento River and the San Joaquin River navigation channels. The Sacramento project is a Limited Reevaluation Study, while the San Joaquin project is a General Reevaluation Study. Given concerns about increased salt intrusion into the Sacramento-San Joaquin Delta (Delta) which may result from these deepening projects, a three-dimensional hydrodynamic and salinity model was used to simulate salt intrusion under currently maintained conditions and under the proposed channel deepening alternatives under both existing and future conditions.

This report presents the results of a detailed hydrodynamic and salinity study of the potential impacts that may result from the deepening of the Sacramento DWSC and the San Francisco Bay to Stockton Navigation Project channels (San Francisco Bay to Stockton DWSC). The UnTRIM Bay-Delta model was applied to simulate salt intrusion under the currently maintained Baseline DWSC configuration and under project alternatives that entail the deepening of the Sacramento DWSC and the San Francisco Bay to Stockton DWSC. The potential hydrodynamic and salinity impacts resulting from the proposed deepening projects were evaluated under base year conditions and under future conditions scenarios, which include both the effects of sea level rise and potential changes to Delta operations.

Three different DWSC configurations were modeled. The Baseline DWSC conditions represent the “currently maintained” conditions for both the Sacramento DWSC and the San Francisco Bay to Stockton DWSC. The Sacramento DWSC Only Deepening scenario incorporates the proposed deepening of the Sacramento DWSC with no changes to the San Francisco Bay to Stockton DWSC. The Both DWSC Deepening scenario incorporates both the proposed deepening of the Sacramento DWSC and the proposed deepening of the San Francisco Bay to Stockton DWSC.

For each of the three DWSC configurations, a one year simulation period was analyzed under base year (Year 0) and future year (Year 50) conditions. An additional future conditions simulation was made that considers the impact of the proposed deepening scenarios under modified Delta operations (Year 50 with Potential Project).

For each simulation period the model predictions were analyzed to allow for comparison of the effects of the proposed DWSC deepening scenarios on hydrodynamics and salinity in San Francisco Bay and the Sacramento-San Joaquin Delta. Comparisons were made between predicted stage, flow, and salinity at an extensive set of monitoring stations. The impact of the proposed projects on the compliance with the D-1641 water quality standards under the same operational conditions was evaluated.

Comparison of depth-averaged daily-averaged salinity maps were used to identify the spatial extent of salinity impacts during each simulation period. For each scenario, X2 was calculated and the predicted impacts on X2 for each scenario were evaluated. Lastly,

the potential effects of the proposed DWSC on bed shear stress and storm surge were analyzed.

Hydrodynamic output for each scenario simulation was provided to HydroQual for use with the ECOM Water Quality model of the San Joaquin River to evaluate the impact of the deepening of the San Francisco Bay to Stockton DWSC on water quality in the San Joaquin River. The results of this water quality analysis are presented in a separate report prepared by HydroQual.

The analysis presented in this document constitutes a comprehensive analysis of the potential effects of the deepening of the Sacramento DWSC and the San Francisco Bay to Stockton DWSC on hydrodynamics and salinity in San Francisco Bay and the Sacramento-San Joaquin Delta.

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Document Issue Details:

Date	Description	Rev.	Notes
09/23/2009	Incomplete Draft	1.0	Draft Scenario Analysis for Preliminary Year 0 Simulations.
03/31/2010	Incomplete Draft	2.0	Draft Scenario Analysis for Year 50 Simulations.
04/30/2010	Incomplete Draft	3.0	Draft Scenario Analysis for Year 0 and Year 50 Simulations.
06/14/2010	Complete Draft	4.0	Analysis of Year 0, Year 50, and Year 50 with Potential Project Scenario Simulations.

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Abbreviations

1D	One-Dimensional
2D	Two-Dimensional
3D	Three-Dimensional
ADCP	Acoustic Doppler Current Profiler
AIP	Alternative Intake Point
BAAQCD	Bay Area Air Quality Control District
BBID	Byron Bethany Irrigation District
BDCP	Bay Delta Conservation Plan
BO	Biological Opinion
CCWD	Contra Costa Water District
CDEC	California Data Exchange Center
CIMIS	California Irrigation Management Information System
CSUMB	California State University Monterey Bay
CVP	Central Valley Project
DCC	Delta Cross Channel
DHCCP	Delta Habitat Conservation & Conveyance Program
DICU	Delta Island Consumptive Use
DEM	Digital Elevation Model
DFG	Department of Fish and Game
DMC	Delta-Mendota Canal
DRMS	Delta Risk Management Strategy
DSS	Data Storage System
DWR	Department of Water Resources
DWSC	Deep Water Ship Channel
EC	Electrical Conductivity
GLC	Grant Line Canal
GLS	Generic Length Scale
HOR	Head of Old River
IEP	Interagency Ecological Program
MLLW	Mean Lower Low Water
MR	Middle River
NAD27	North American Datum of 1927
NBA	North Bay Aqueduct
NGVD 29	National Geodetic Vertical Datum of 1929
NMFS	National Marine Fisheries Service
NOAA	National Oceanic & Atmospheric Administration
NOS	National Ocean Service (NOAA)
NRC	National Research Council
OMR	Old and Middle River
ORT	Old River near Tracy
POD	Pelagic Organism Decline
PP	Potential Project
PTM	Particle Tracking Model
RPA	Reasonable and Prudent Alternative

SCWA	Solano County Water Agency
SFML	Seafloor Mapping Lab
SFPORTS	San Francisco Physical Oceanographic Real-Time System
SLR	Sea Level Rise
SMSCG	Suisun Marsh Salinity Control Gates
SWP	State Water Project
SWRCB	State Water Resources Control Board
TBP	Temporary Barriers Project
TRIM	Tidal, Residual, Intertidal & Mudflat Model
UNESCO	United Nations Educational, Scientific and Cultural Organization
UnTRIM	Unstructured Tidal, Residual, Intertidal & Mudflat Model
USACE	United States Army Corps of Engineers
USBR	United States Bureau of Reclamation
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey
UTM	Universal Transverse Mercator

1. Introduction

This report presents the results of a detailed hydrodynamic and salinity study of the potential salinity and water quality impacts that may result from the deepening of the Sacramento DWSC and San Francisco Bay to Stockton DWSC. The UnTRIM Bay-Delta model developed for this project builds on previous applications (e.g., MacWilliams et al., 2007; MacWilliams et al., 2008), and was further refined to increase the model grid resolution within the Deep Water Ship Channels and incorporate the most recent ship channel bathymetric survey data into the model grid (MacWilliams et al., 2009). The UnTRIM Bay-Delta model was used to simulate salt intrusion under the currently maintained Baseline DWSC configuration and under project alternatives that entail the deepening of the Sacramento DWSC and the San Francisco Bay to Stockton DWSC. The potential hydrodynamic and salinity impacts resulting from the proposed deepening projects were evaluated under base year conditions and under future conditions scenarios, which include both the effects of sea level rise and potential changes to Delta operations. This report is divided into eight major sections:

- **Section 1. Introduction.** This section presents the project approach and objectives, as well as a summary of the scope and organization of the report.

- **Section 2. Alternative Descriptions.** This section provides a description of the DWSC deepening alternatives simulated for this study.

- **Section 3. Alternative Assessment Approach.** This section describes the analysis approach used to evaluate potential salinity impacts resulting from the deepening alternatives.

- **Section 4. Evaluation of Alternative for Year 0.** This section presents the predicted salinity impacts resulting from the deepening alternatives under base year (Year 0) conditions.

- **Section 5. Evaluation of Alternatives for Year 50.** This section presents the predicted salinity impacts resulting from the deepening alternatives under future (Year 50) conditions.

- **Section 6. Evaluation of Alternatives for Year 50 with Potential Project.** This section presents the predicted salinity impacts resulting from the deepening alternatives under future (Year 50) conditions operating with an isolated conveyance project.

- **Section 7. Analysis of Potential Effects of DWSC Deepening on Bed Shear Stress and Storm Surge Propagation.** This section provides additional analysis of the potential effects of the DWSC deepening scenarios on bed shear stress and storm surge.

- **Section 8. Summary and Conclusions.** This section presents a brief summary of the alternatives modeling results and an overview of the primary conclusions.

2. Alternative Descriptions

The primary objective of this study is to simulate salt intrusion under the currently maintained DWSC configurations and under the proposed project alternatives that entail the deepening of the Sacramento DWSC and the San Francisco Bay to Stockton DWSC in order to evaluate potential salinity impacts which may result from the proposed channel deepening. Three separate DWSC channel configurations were modeled in this study: Baseline conditions, deepening of the Sacramento DWSC only, and deepening of both the Sacramento DWSC and the San Francisco Bay to Stockton DWSC. Each of these scenario configurations is discussed below.

2.1 Baseline DWSC Conditions

Baseline conditions represent the "currently maintained" conditions for both the Sacramento DWSC and the San Francisco Bay to Stockton DWSC. Baseline conditions are defined as the depths at which the DWSCs are currently maintained including the two feet of allowable overdepth. The "existing conditions" used in model calibration were based on the most recent survey data for the DWSC reaches. The Baseline conditions differ from the existing conditions in that, under the Baseline scenario, each reach in which the existing survey data shows that the channel is not as deep as the allowable currently maintained depth (plus 2 feet of overdepth) is deepened to the currently maintained depth for that reach. As a result, the Baseline conditions can be slightly deeper than existing conditions (but never shallower), such that the Baseline conditions accurately represent the channel depths as they are expected to be maintained under no project conditions.

Figure 2.2-1 shows the alignment of the Sacramento DWSC navigation project. From the downstream end of the Sacramento DWSC to mile 35, the Sacramento DWSC is currently maintained at a depth of 30 feet MLLW. Starting from mile 35 and continuing upstream to the Port of Sacramento, the Sacramento DWSC is currently maintained at a depth of 35 feet MLLW. Currently maintained bathymetry for the Sacramento DWSC, including currently maintained side slopes and alignments, was provided by Towill, Inc., and incorporated into the Baseline scenario UnTRIM model grid. Including overdepth, the lower 35 miles of the Sacramento DWSC are incorporated into the Baseline scenario grid at the currently maintained depth of 32 feet MLLW, and the upper 8 miles at a depth of 37 feet MLLW.

Figure 2.3-1 shows the alignment of the San Francisco Bay to Stockton DWSC navigation project, which includes the John F. Baldwin and Stockton Ship Channels, which extend 75 nautical miles from the Pacific Ocean, just outside the Golden Gate, to the Port of Stockton. The West Richmond Channel, including the maneuvering area adjacent to terminal facilities at Richmond Outer Harbor, is currently maintained at a depth of 35 feet MLLW. The Pinole Shoal Channel is currently maintained at a depth of 35 feet MLLW. The Suisun Bay Channel from Martinez to near Pittsburg is currently maintained at a depth of 35 feet MLLW. The existing channel between Pittsburg and Stockton is authorized to a depth of 35 feet MLLW. Currently maintained bathymetry for the San Francisco Bay to Stockton DWSC, including currently maintained side slopes and alignments, was provided by Towill, Inc., and incorporated into the

Baseline scenario UnTRIM model grid. Including overdepth, all reaches of the Stockton DWSC are represented in the Baseline scenario grid at a depth of 37 feet MLLW.

2.2 Sacramento DWSC Only Deepening Scenario

For the Sacramento DWSC Only Deepening scenario, the Sacramento DWSC extending from Mile 0 near Collinsville to Mile 35 is deepened from 30 feet MLLW to 35 feet MLLW. Since the upstream reach from Mile 35 to the Port of Sacramento has already been deepened to a depth of 35 feet MLLW, no additional deepening of this reach is applied in this scenario. Bathymetry for the proposed Sacramento DWSC deepening, including proposed side slopes and alignments, was provided by Towill, Inc., and incorporated into the Sacramento DWSC Only Deepening scenario UnTRIM model grid. Including overdepth, all reaches of the Sacramento DWSC are modeled at a depth of 37 feet MLLW under the Sacramento DWSC Only Deepening scenario.

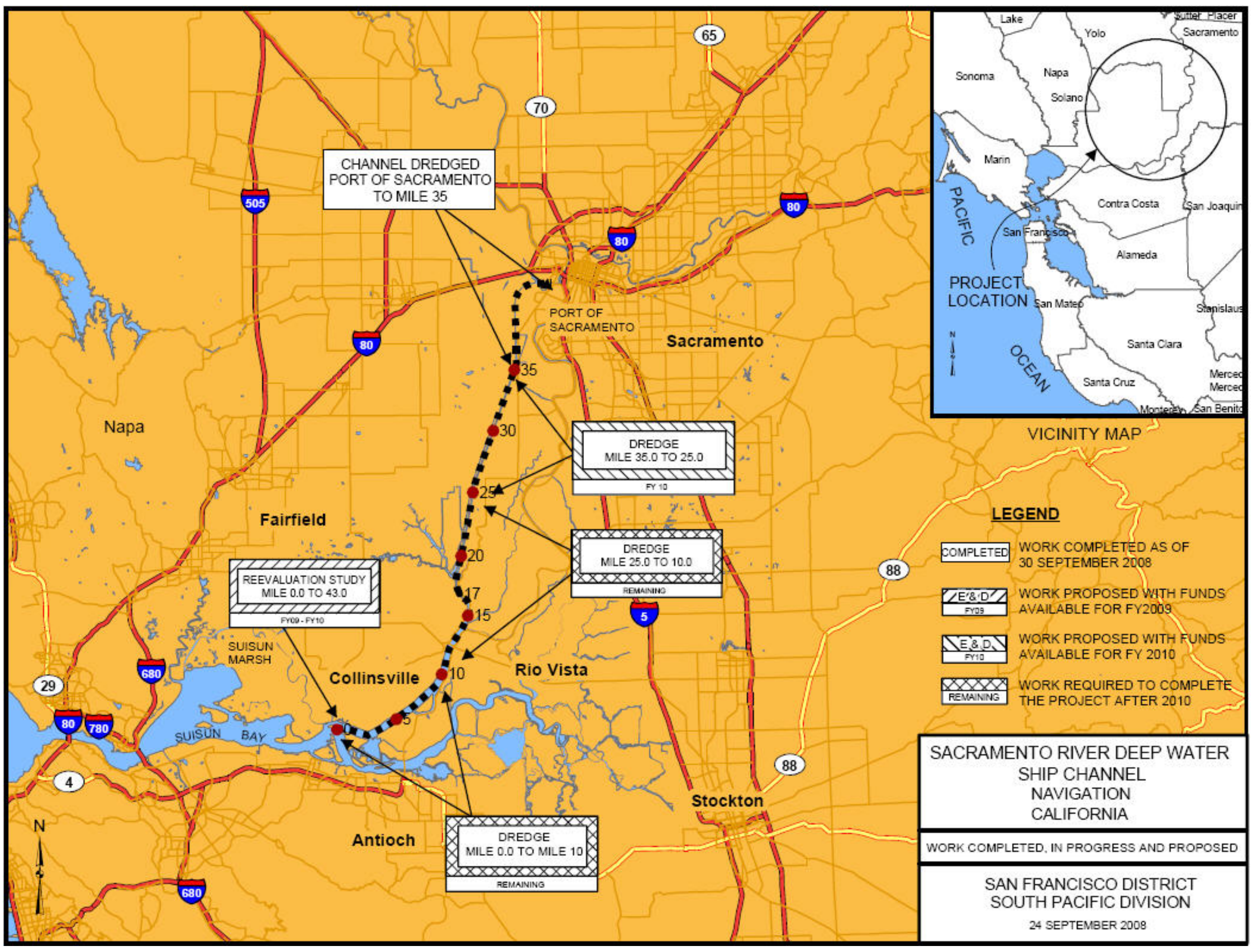


Figure 2.2-1 Map showing the Sacramento River Deep Water Ship Channel Navigation Project.

2.3 Both DWSC Deepening Scenario

Under the Both DWSC Deepening scenario, both the Sacramento DWSC and the San Francisco Bay to Stockton DWSC are deepened. Under this scenario, the Sacramento DWSC is deepened exactly as described in Section 2.2 and the San Francisco Bay to Stockton DWSC is deepened as described below.

The San Francisco Bay to Stockton Navigation Project (San Francisco Bay to Stockton DWSC) includes the John F. Baldwin and Stockton Ship Channels, which extend 75 nautical miles from the Pacific Ocean, just outside the Golden Gate, to the Port of Stockton. The project is divided into two separate ship channels, with the John F. Baldwin Ship Channel extending from the Golden Gate to Chipps Island, and the Stockton Ship Channel extending from Chipps Island to the Port of Stockton. Portions of the channels have been deepened in the past; however, not all reaches attained authorized dimensions. Currently, the Corps is reevaluating the authorized Federal project to determine the extent to which changes to channel dimensions are warranted. The project study area can be portioned into 7 distinct reaches:

Reach 1. The Main Ship Channel across the San Francisco Bar is authorized and currently maintained at a depth of 55 feet MLLW, with a bottom width of 2,000 feet. No changes to this reach are applied in this scenario.

Reach 2. The West Richmond Channel, including the maneuvering area adjacent to terminal facilities at Richmond Outer Harbor, is authorized at a depth of 45 feet MLLW, with a bottom width of 600 feet. This channel is currently maintained at a depth of 35 feet MLLW. This channel is proposed to be deepened to a depth of 45 feet MLLW in this scenario.

Reach 3. The Pinole Shoal and Carquinez Strait Channels from Point San Pablo to Martinez, including maneuvering areas at Oleum and Martinez are authorized at a depth of 45 feet MLLW, with a channel bottom width of 600 feet. These channels are currently maintained at a depth of 35 feet MLLW. These channels are proposed to be deepened to a depth of 45 feet MLLW in this scenario.

Reach 4. The Suisun Bay Channel from Martinez to near Pittsburg is authorized at a depth of 45 feet MLLW. The channel bottom width is authorized to 600 feet from Martinez to the vicinity of Port Chicago, and 400 feet above. This reach is currently maintained at a depth of 35 feet MLLW. This channel is proposed to be deepened to a depth of 45 feet MLLW in this scenario.

Reach 5. The existing channel between Pittsburg and Antioch through New York Slough is authorized to a depth of 35 feet MLLW, with a bottom width of 400 feet. This channel is currently maintained at a depth of 35 feet MLLW. This channel is proposed to be deepened to a depth of 40 feet MLLW in this scenario.

Reach 6. A harbor maneuvering area is authorized to a depth of 35 feet MLLW at Antioch, including an access channel 400 feet wide and a turning basin south of the eastern extremity of West Island, immediately downstream from Antioch Bridge. This reach is currently maintained at a depth of 35 feet MLLW. This reach is proposed to be deepened to a depth of 40 feet MLLW in this scenario.

Reach 7. The channel between Antioch and the mouth of False River is authorized to a depth of 35 feet MLLW over the existing 400-foot bottom width. False River Cutoff is authorized to a depth of 35 feet and a bottom width of 225 feet (250 feet on bends) except for a 400-foot width across Franks Tract. The Stockton Deep Water Ship Channel, from the upstream junction of False River Cutoff and San Joaquin River to the Port of Stockton, is authorized to a depth of 35 feet MLLW over the 225-foot bottom width. This reach is proposed to be deepened to a depth of 40 feet MLLW in this scenario, with a turning basin near the Port of Stockton deepened to a depth of 45 feet MLLW.

Bathymetry for the proposed San Francisco Bay to Stockton Navigation Project deepening, including proposed side slopes and alignments, was provided by Towill, Inc., and incorporated into the Both DWSC Deepening scenario UnTRIM model grid. Including overdepth, all reaches of the San Francisco Bay to Stockton DWSC proposed to be deepened to 45 feet MLLW are modeled at a depth of 47 feet MLLW, and the remaining reaches proposed to be deepened to a depth of 40 feet MLLW are modeled at a depth of 42 feet MLLW, including overdepth, under the Both DWSC Deepening scenario.

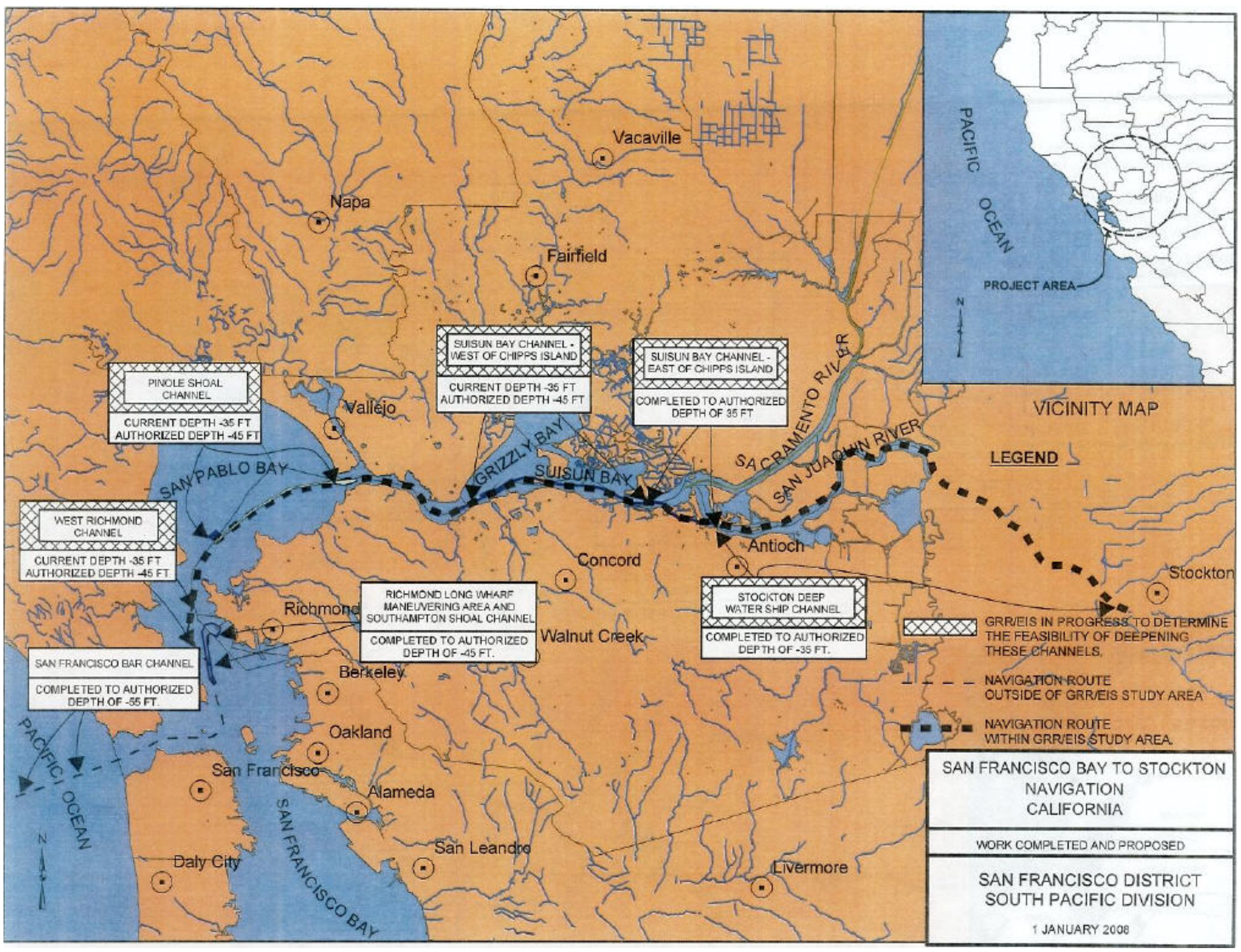


Figure 2.3-1 Map showing the San Francisco Bay to Stockton Navigation Project.

3. Alternative Assessment Approach

In order to evaluate the potential salinity and water quality impacts that may result from the deepening of the Sacramento DWSC and San Francisco Bay to Stockton Navigation Project, three-dimensional hydrodynamic simulations under Baseline conditions and under the proposed channel deepening scenarios were made using the UnTRIM Bay-Delta model. The proposed deepening scenarios were evaluated under base year conditions (Year 0), future conditions with existing Delta operations (Year 50), and future conditions with the operation of a potential project consisting of an isolated conveyance facility (Year 50 with Potential Project). The purpose of these simulations is to predict the potential impacts of the DWSC deepening scenarios under various project alternatives, expected future sea level rise, and a range of potential future operational plans for the Delta.

For each simulation period, predicted salinity under Baseline DWSC conditions was compared to predicted salinity for the deepening of the Sacramento DWSC only, and for the deepening of both the Sacramento DWSC and the San Francisco Bay to Stockton DWSC. The difference between predicted salinity under each of the proposed deepening scenarios and the Baseline DWSC scenario were used to evaluate the potential impacts of deepening for each of the simulation periods. The modeling approach, simulation periods, and methods used to evaluate salinity and water quality impacts are discussed below.

3.1 UnTRIM Bay-Delta Model Description

The primary tool used in this technical study was the three-dimensional hydrodynamic model UnTRIM (Casulli and Zanolli, 2002). A complete description of the governing equations, numerical discretization, and numerical properties of UnTRIM are described in Casulli and Zanolli (2002; 2005; 2008), Casulli (1999), and Casulli and Walters (2000).

The UnTRIM San Francisco Bay-Delta model (UnTRIM Bay-Delta model) is a three-dimensional hydrodynamic model of San Francisco Bay and the Sacramento-San Joaquin Delta. The UnTRIM Bay-Delta model applied in this project extends from the Pacific Ocean through the entire Sacramento-San Joaquin Delta. The UnTRIM Bay-Delta model takes advantage of the grid flexibility allowed in an unstructured mesh by gradually varying grid cell sizes, beginning with large grid cells in the Pacific Ocean and gradually transitioning to finer grid resolution in the smaller channels of the Sacramento-San Joaquin Delta. This approach offers significant advantages both in terms of numerical efficiency and accuracy, and allows for local grid refinement for detailed analysis of local hydrodynamics, while still incorporating the overall hydrodynamics of the larger estuary in a single model.

The UnTRIM Bay-Delta model developed for this project builds on previous applications (e.g., MacWilliams et al., 2007; MacWilliams et al., 2008), and was further refined to increase the model grid resolution within the Deep Water Ship Channels and incorporate the most recent ship channel bathymetric survey data into the model grid. Model calibration was performed for a one year period spanning from April 2007 through March 2008, a period selected due to the large amount of available flow, stage, and salinity monitoring data in the Delta. The model was validated for a one year period spanning from April 1994 through March 1995, a period selected due to the availability of extensive field data from the Entrapment Zone Study in spring of 1994 in Carquinez Strait and Suisun Bay (Burau et al., 1998; Kimmerer et al., 1998). A third period, spanning calendar year 2001, was simulated to provide hydrodynamic output for coupling with and validation of a water quality model of the San Joaquin River (HydroQual, 2006).

The calibration and validation of the UnTRIM Bay-Delta model for this project is documented in a separate report (MacWilliams et al., 2009). The UnTRIM Bay-Delta model was calibrated using water level, flow, and salinity data collected in San Francisco Bay and the Sacramento-San Joaquin Delta. Predicted water levels were compared to observed water levels at NOAA and DWR stations in San Francisco Bay, and DWR and USGS flow and stage monitoring stations in the Sacramento-San Joaquin Delta. The water level and flow calibration for the 2007-2008 simulation period demonstrates that the UnTRIM Bay-Delta model is accurately predicting water levels throughout San Francisco Bay, and water levels and tidal and net flows in the Sacramento-San Joaquin Delta. Accurate prediction of water levels in San Francisco Bay demonstrates that tides are accurately propagating from the Pacific Ocean through the Bay and into the Delta. Comparisons of predicted flows to observations in the Delta demonstrate the degree to which the model captures the instantaneous, tidally-averaged, and net flows in specific channels within the Delta. The hydrodynamic calibration and validation demonstrates that the model is accurately predicting water levels from the Golden Gate through the Sacramento-San Joaquin Delta, and accurately predicting both tidal time-scale and tidally-averaged (net) flows in the Sacramento-San Joaquin Delta.

Predicted salinity was compared to observed salinity along the axis of San Francisco Bay at the USGS synoptic salinity monitoring stations, and at USGS, DWR, and USBR continuous salinity monitoring stations in San Francisco Bay and the Sacramento-San Joaquin Delta. Salinity comparisons during three full one-year periods demonstrate that the UnTRIM Bay-Delta model is accurately predicting salinity in San Francisco Bay and the Sacramento-San Joaquin Delta under a wide range of flow conditions. The salinity calibration under a wide range of flow conditions demonstrates that the UnTRIM Bay-Delta model is accurately representing the physical processes, such as stratification and gravitational circulation, which result in salinity entrainment into the Delta. Thus, the UnTRIM Bay-Delta model can be used to assess the potential changes to these processes which may occur as a result of the proposed deepening of the Sacramento and San Francisco Bay to Stockton Deep Water Ship Channels.

3.2 Simulation Periods

The proposed channel deepening alternatives were evaluated for three different simulation periods. These simulations provide an assessment of the potential range of project impacts on salinity under current conditions and a range of future conditions in the Delta. The simulation periods were selected to represent base year (~2011/2012) and future (~2061/2062) conditions, with and without project other potential Delta infrastructure projects, such as an isolated conveyance facility.

The primary source of Sacramento-San Joaquin Delta boundary conditions for inflows, exports, and operations for the base year (Year 0) and future year (Year 50) conditions were the current and future conditions developed for "The State Water Project Delivery Reliability Report 2009" (DWR, 2009a). As part of the SWP Delivery Reliability Report, the CALSIM II model was used to develop scenarios for current conditions and future conditions with and without climate change. These simulations incorporate the U.S. Fish and Wildlife Service (USFWS) Biological Opinion (BO) and the National Marine Fisheries Service (NMFS) Biological Opinion.

The USFWS Biological Opinion released on December 15, 2008 has Reasonable and Prudent Alternative (RPA) actions to protect threatened delta smelt. The RPA actions in the U.S. Fish and Wildlife Service Biological Opinion include limits on exports to control Old and Middle River (OMR) flows and managing the X2 position in the fall through increasing Delta outflow when the preceding year was wetter than normal. A full description of these management actions and their proposed implementation into CALSIM II is discussed in Appendix A-1 of the "The State Water Project Delivery Reliability Report 2009" (DWR, 2009a).

The NMFS Biological Opinion and conference opinion released on June 4, 2009 has RPA actions to protect endangered Sacramento River winter-run Chinook salmon, threatened Central Valley spring-run Chinook salmon, threatened Central Valley steelhead, threatened Southern Distinct Population Segment of North American green sturgeon, and Southern Resident killer whale (DWR, 2009a). The RPA in the National Marine Fisheries Service Biological Opinion includes pulse flows on Clear Creek, modifications to Shasta Dam operations, modifications to Red Bluff Diversion Dam operations, changes to the flow requirements for Wilkins Slough, the Lower American River, the Stanislaus River, modifications to the Delta Cross Channel (DCC) gate operation, and additional flow management requirements within the Delta. A full description of these management actions and their proposed implementation into CALSIM II is discussed in Appendix A-2 of the "The State Water Project Delivery Reliability Report 2009" (DWR, 2009a).

The CALSIM II output from "The State Water Project Delivery Reliability Report 2009" (DWR, 2009a) provides the best currently-available representation of expected inflows to the Delta and exports from the Delta subject to the most recent operational representation of the current regulatory requirements for both the base year (2011/2012) conditions and future year (2061/2062). Three separate CALSIM II simulations were completed as part of the "The State Water Project Delivery Reliability Report 2009" (DWR, 2009a). The first simulation was used for estimating current (2009) SWP delivery reliability and two simulations were used for estimating future (2029) SWP delivery reliability. The following sections describe how these three CALSIM II simulations were used to develop the boundary conditions used in the UnTRIM Bay-Delta model Year 0 and Year 50 simulations of the DWSC deepening scenarios. However, the "The State Water Project Delivery Reliability Report 2009" (DWR, 2009a) does not include representation of new facilities such as alternative conveyance options being considered as part of the Bay Delta Conservation Plan (BDCP), and CALSIM II output from the BDCP is not yet publicly available. As a result, some additional assumptions were needed to represent the operation of "Year 50 with Potential Project" conditions as discussed below.

3.2.1 Base Year Conditions (Year 0)

The base year conditions are defined based on the expected bathymetric, hydrologic, and operating conditions in years 2011 and 2012 for the Sacramento DWSC and the San Francisco Bay to Stockton DWSC, respectively. The base year scenario simulations represent the "Year 0" conditions, which are an estimate of possible conditions that may exist at the approximate time that a deepening project is completed. The current conditions (2009) CALSIM II output from "The State Water Project Delivery Reliability Report 2009" (DWR, 2009a) was used to develop "Year 0" boundary conditions for the Sacramento-San Joaquin Delta. The CALSIM II output spans an 82-year period from water year 1922 through water year 2003.

Since the exact weather, hydrology, and operations conditions for a future year cannot be predicted in advance, each water year within this 82-year period represents one possible permutation of "current year" conditions. The hydrologic sequence of simulated years is based on historical precipitation and runoff patterns for water years 1922 through 2003 (DWR, 2009a), but with current (as opposed to historic) Delta operations, flow management requirements, and water quality standards as represented in CALSIM II. For the DWSC Year 0 conditions, a single year from this 82-year record was selected. Delta inflow, export, and barrier operation conditions for the period spanning from April 1, 1994 through April 1, 1995 was selected for the "Year 0" analysis. The 1994-1995 period was selected for the Year 0 analysis because the model validation for the DWSC UnTRIM Bay-Delta model validation was conducted for this historic period (MacWilliams et al., 2009), and because the 1994-1995 period spans a large range of flow conditions in the Delta. The 1994-1995 simulation period spans across water years 1994 and 1995. Water year 1994 (from October 1, 1993 through September 30, 1994) was classified as a "critical" year, the lowest flow classification, on both the Sacramento River and the San Joaquin River. Water Year 1995 (from October 1, 1994 through September 30, 1995) was classified as a "wet" year, the highest flow classification, on both the Sacramento River and the San Joaquin River (DWR, 2009b). Thus, the selection of the 1994-1995 period for the Year 0 conditions provides an opportunity to evaluate the impacts of the DWSC deepening scenarios under both extremely low flow and extremely high flow conditions.

The CALSIM II current conditions output provides monthly inflow values for each of the major Delta inflows including the Sacramento River, Yolo Bypass, the Cosumnes River, Mokelumne River, the Calaveras River, and the San Joaquin River. The CALSIM II output also includes monthly export rates for each of the major Delta exports including the State Water Project, the Central Valley Project, the North Bay Aqueduct, and the CCWD exports at Rock Slough, Old River and Victoria Canal. The total inflow and exports from these sources during the Year 0 simulation period are shown in Figure 3.2-1.

CALSIM II output also provides inflow salinity for the San Joaquin River and the number of days each month that the Delta Cross Channel is open. Operation of the Suisun Marsh Salinity Control Gates, the Head of Old River Barrier and the temporary agricultural barriers on Middle River, Grant Line Canal, and Old River at the Delta-Mendota Canal is specified using the operating rules applied in DSM2 for planning studies (USBR, 2008). The timing of inflows into Clifton Court Forebay are specified using "Priority 3" operations typical of DSM2 planning studies (Wilde, 2006). For the Year 0 simulation period, the DICU implementation in the

UnTRIM Bay-Delta model assumed a 2005 level of land use development, to be consistent with the level of land uses specified in the CALSIM II current conditions scenario (DWR, 2009a). The Pacific Ocean boundary was specified using observed 1994-1995 water levels at Fort Point, with no additional sea level rise. All other UnTRIM Bay-Delta model boundary conditions such as wind, evaporation, precipitation, non-Delta inflows, are based on 1994-1995 historic values as described by MacWilliams et al. (2009).

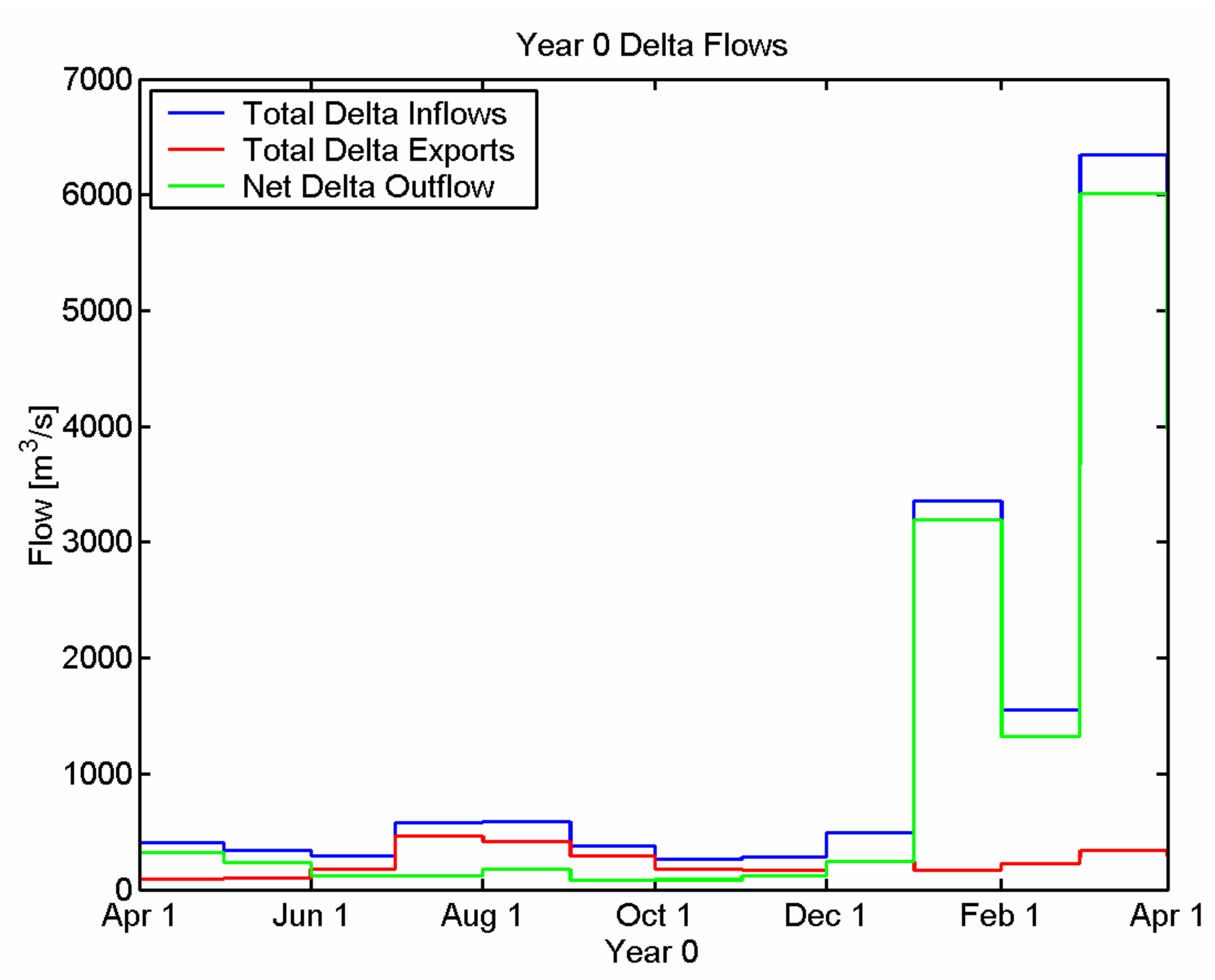


Figure 3.2-1 Total Delta inflow and exports during the Year 0 simulation period.

3.2.2 Future Conditions (Year 50)

The future conditions for the Sacramento and Stockton DWSCs are defined based on year 2061 and 2062, respectively. The future conditions represent 50 years after the projected start of project construction for each of the projects.

In "The State Water Project Delivery Reliability Report 2009" (DWR, 2009a), the future conditions were developed by interpolating between two different future conditions simulations. The first future conditions scenario, "future conditions (2029)" (DWR, 2009a), assumes no sea level rise (SLR) and no climate change. It assumes future levels of development land-use for the Sacramento Valley and uses the DICU based on a 2020 level of land-use development and full entitlement demands for southern California. The second future conditions scenario, "future conditions (2029) with climate change" (DWR, 2009a), assumes 1 ft SLR and uses the MPI-ECHAM5 climate change model and A2 greenhouse gas emissions, with a 2050 level of emissions. The 2020 level land-use development and southern California demands are the same as in the "future conditions (2029)" scenario (Erik Reyes, DWR, personal communication). In "The State Water Project Delivery Reliability Report 2009" (DWR, 2009a), SWP deliveries were interpolated between the future conditions without climate change and the future conditions with 2050 level of climate change to estimate SWP deliveries for 2029.

For the current study, the CALSIM II output from the "future conditions (2029) with climate change" scenario (DWR, 2009a), which assumes 1 ft SLR and uses the MPI-ECHAM5 climate change model and A2 greenhouse gas emissions with a 2050 level of emissions, is the best available approximation of future Delta conditions for 2061/2062, since this CALSIM II simulation is designed to represent Delta conditions for 2050.

However, for the future conditions scenarios in this study, future sea level rise (SLR) rates to be considered are based on the USACE's planning guideline ER 1105-2-100 (E-24, k (2) sea level rise, April 22, 2000). It suggests that the historical rate of 0.11 m / 50 years is considered as the minimum SLR rate and the rate of 0.60 m / 50 years based on the NRC curve #3 is considered as the maximum SLR rate, if local subsidence doesn't play an important role. For the future conditions, a sea level rise of 60 cm was applied to the ocean boundary condition rather than the 1 ft of SLR that was assumed in the CALSIM II simulation. Thus, the operational response in CALSIM II is for a simulated 1 ft (30.48 cm) of SLR, while the DWSC scenario simulations will apply 60 cm (1.97 ft) of SLR at the ocean boundary. As a result, it is expected that even under the Baseline (currently maintained) conditions, the current water quality standards may not be met since a larger amount of SLR is simulated. However, the future Delta inflow and export boundary conditions estimated by CALSIM II under this scenario, provide the best available scenario boundary conditions for future Year 50 conditions, and the relative impact of the proposed DWSC deepening projects can be effectively evaluated relative to the Baseline conditions.

In the "future conditions (2029) with climate change" CALSIM II scenario, the historical record of precipitation information for the Central Valley for the period from 1922 through 2003 is modified to reflect future climate projections (DWR, 2009a), and future water operations are assumed as described above. For the Year 50 conditions, a single year from this 82-year record was selected. Delta inflow, export, and barrier operation conditions for the period spanning from April 1, 1994 through April 1, 1995 was selected for the Year 50 simulations. This is the same calendar period used for the Year 0 conditions, however, in the Year 50 scenario, the Delta inflows, exports, and operations are based on future level of land use, water demand, sea level rise, and climate change as incorporated into the CALSIM II scenario.

The CALSIM II "future conditions (2029) with climate change" output provides monthly inflow values for each of the major Delta inflows including the Sacramento River, Yolo Bypass, the Cosumnes River, Mokelumne River, the Calaveras River, and the San Joaquin River. The CALSIM II output also includes monthly export rates for each of the major Delta exports including the State Water Project, the Central Valley Project, the North Bay Aqueduct, and the CCWD exports at Rock Slough, Old River and Victoria Canal. The total inflow and exports from these sources during the Year 50 simulation period are shown in Figure 3.2-2.

CALSIM II output also provides inflow salinity for the San Joaquin River and the number of days each month that the Delta Cross Channel is open. Operation of the Suisun Marsh Salinity Control Gates, the Head of Old River Barrier and the temporary agricultural barriers on Middle River, Grant Line Canal, and Old River at the Delta-Mendota Canal is specified using the operating rules applied in DSM2 for planning studies (USBR, 2008). The timing of inflows into Clifton Court Forebay are specified using "Priority 3" operations typical of DSM2 planning studies (Wilde, 2006). For the Year 50 scenarios, the DICU implementation in the UnTRIM Bay-Delta model assumed a 2020 level of land use development, to be consistent with the level of land uses used in the CALSIM II "future conditions (2029) with climate change" scenario (DWR, 2009a). The Pacific Ocean boundary was specified using observed 1994-1995 water levels at Fort Point, with a 60 cm offset applied to account for project SLR. All other UnTRIM Bay-Delta model boundary conditions such as wind, evaporation and precipitation, non-Delta inflows, are based on 1994-1995 historic values as described by MacWilliams et al. (2009) and are not adjusted for climate change.

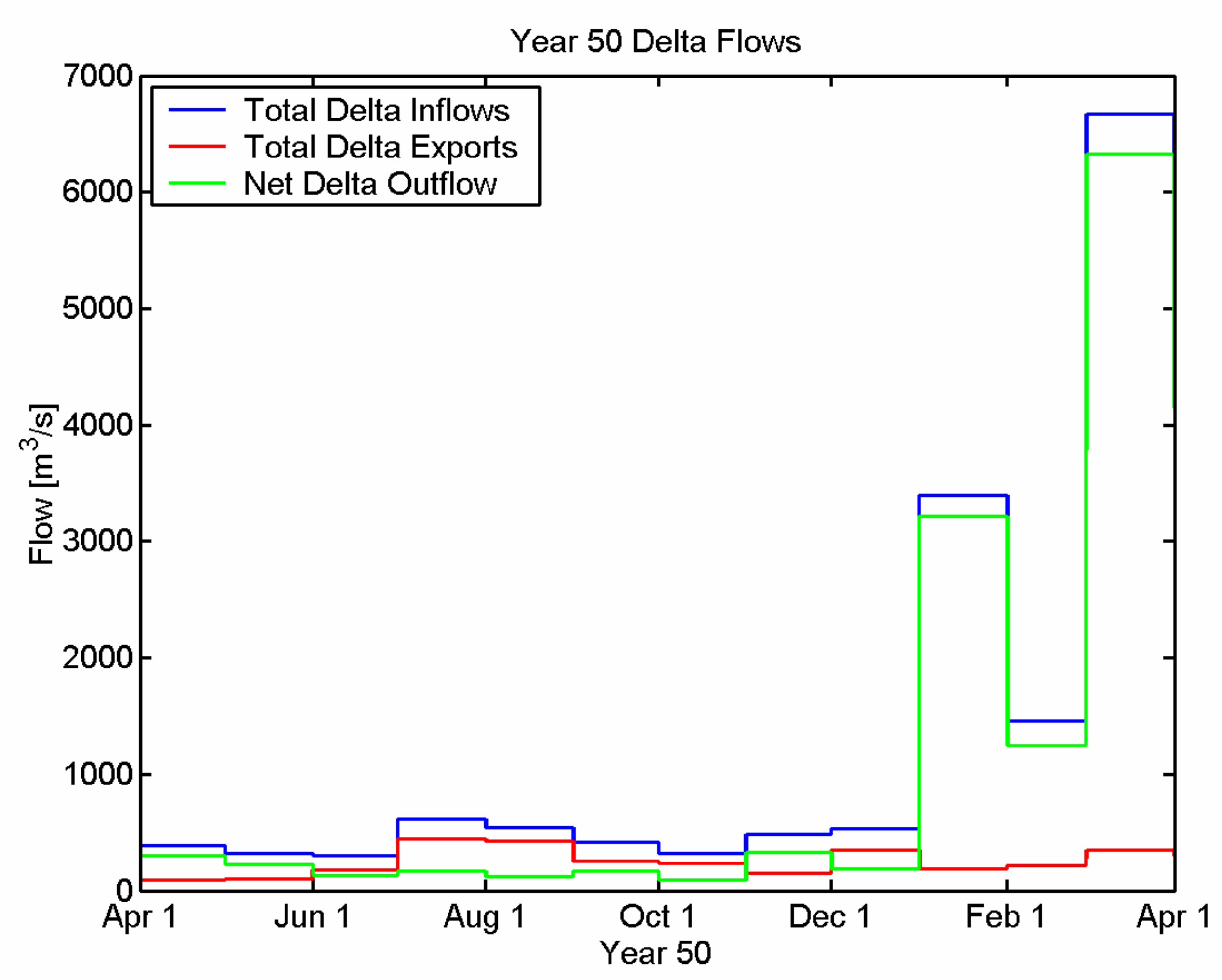


Figure 3.2-2 Total Delta inflow and exports during the Year 50 simulation period.

3.2.3 Future Conditions with Potential Project (Year 50 PP)

The Future Conditions with Potential Project (PP) scenario is intended to address the potential range of future conditions which are likely to occur in the Delta. As part of the BDCP, a variety of alternative conveyance options are being considered, ranging from dual conveyance to isolated conveyance. For the purpose of this study, the "Potential Project" which will be considered is an isolated conveyance facility. The purpose of this simulation is to evaluate any differences between the impact of the proposed DWSC deepening under future conditions with a potential project, and the impact under future conditions which assume no project is constructed.

The Future Conditions with Potential Project (Year 50 PP) scenario uses the same assumptions about future hydrology and sea level rise as the future conditions described in Section 3.2.2, but incorporates the operations of an isolated conveyance facility. The isolated conveyance facility assumes that flow is diverted from the Sacramento River upstream of the Delta Cross Channel, and that south Delta exports are reduced by an amount corresponding to the specified upstream diversion.

The CALSIM II output from the BDCP which includes the operation of an isolated conveyance facility is not yet publicly available. In order to approximate Delta conditions with the operation of a isolated conveyance facility, the CALSIM II Delta inflows and exports from the Year 50 future conditions scenario described in Section 3.2.2 were adjusted using simplified operation rules based on the isolated conveyance operating rules currently being considered as part of the BDCP. As a result, the Year 50 with Potential Project conditions differ from the Year 50 conditions only in the geographic distribution of the Delta exports. The total exports each month and the net Delta outflow each month do not change as a result of the Potential Project. Under the Year 50 with Potential Project conditions, an isolated conveyance facility is added along the Sacramento River between Courtland and Clarksburg and a portion of the South Delta exports are shifted to this "Potential Project" facility under the operating criteria described below.

The Initial Operating Criteria specified by the SAIC Proposed Long-Term BDCP Water Operations Analytical Range (SAIC, 2010) were used to determine the North Delta Diversion Bypass flows which were required to be maintained, and any additional available Sacramento River flows were allocated to the isolated conveyance facility in the Year 50 with Potential Project simulation. Under the Initial Operational Criteria (SAIC, 2010) constant low flow pumping diversions of up to 6% of the river flow for flows greater than 5,000 cfs is allowed from December through June in order to protect the initial flood pulse. Following the initial pulse period, the Level II Post-Pulse operations were used to determine the required bypass flow for the remaining period from December through June. From July through September the Initial Operational Criteria specify that a minimum of 5,000 cfs bypass flow must remain in the Sacramento River. During October and December the Initial Operating Criteria specify that 7000 cfs bypass flows must remain in the Sacramento River.

Using these criteria, the monthly output from CALSIM II for the Sacramento River from the "future conditions (2029) with climate change" scenario (DWR, 2009a), which assumes 1 ft SLR and uses the MPI-ECHAM5 climate change model and A2 greenhouse gas emissions with a

2050 level of emissions, was compared to the Sacramento River bypass flow required for each month under the Initial Operating Criteria. Any flows above the required Sacramento River bypass flows were available for diversion at the isolated conveyance facility exports. However, because the total monthly Delta exports in the Year 50 with Potential Project scenario were kept constant to maintain the same monthly net Delta outflow as the Year 50 simulation period, the monthly diversions at the isolated conveyance facility was specified as the minimum of either available flow for diversion or the sum of the CVP and SWP exports. When the flow available for export at the isolated facility exceeded the sum of the CVP and SWP exports, the SWP and CVP exports were reduced to 0 and the sum of the CVP and SWP exports were instead taken from the isolated facility. Any available flow above the sum of the CVP and SWP exports was allowed to remain in the Sacramento River. When the sum of the SWP and CVP exports exceed the flow available for diversion at the isolated facility, the total flow available at the isolated facility was diverted at the isolated facility, and the SWP and CVP exports were reduced proportionally by the amount of the isolated facility exports.

Figure 3.2-3 shows the CVP and SWP exports used in the Year 50 simulation period and the modified CVP and SWP exports together with the isolated facility exports used in the Year 50 with Potential Project simulation. From April through June, the isolated facility exports account for between 37% and 47% of the total exports, with the SWP and CVP accounting for the remaining exports. During July, August, September, November, February and March, the available flow for diversion at the isolated facility exceeds the CVP and SWP exports so all exports are taken from the isolated facility and SWP and CVP exports are set to 0. During October the isolated facility accounts for about 40% of the exports, with the SWP and CVP accounting for the remaining exports. During December the isolated facility accounts for less than 9% of the total exports, so there are significant exports from the SWP and CVP during December.

The exports allocated to the isolated conveyance facility as allowed by the BDCP Initial Operating Criteria are distributed evenly between five separate export facilities in the UnTRIM Bay-Delta model located along the Sacramento River between Courtland and Clarksburg, which approximate the proposed intake site recommendations developed as part of the DHHCP Program (DWR, 2010).

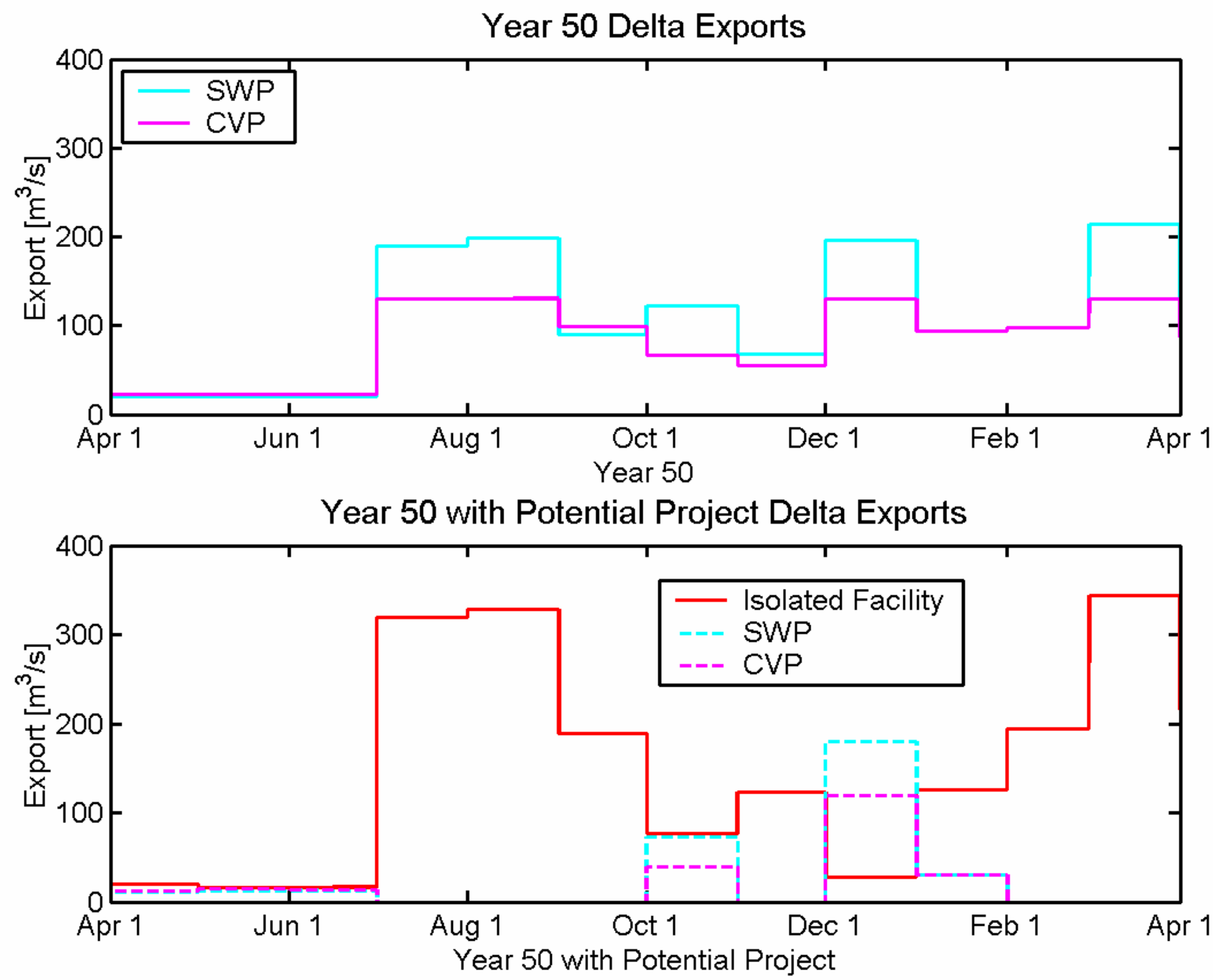


Figure 3.2-3 SWP and CVP exports for Year 50 simulation (top); SWP, CVP, and Isolated Facility exports for Year 50 with Potential Project simulation (bottom).

3.3 Evaluation of Potential Hydrodynamic and Salinity Impacts

In order to evaluate the potential impacts of deepening the Sacramento DWSC and the San Francisco Bay to Stockton DWSC, the predicted conditions under the Baseline scenarios were compared to conditions under the proposed DWSC deepening scenarios for each of the simulation periods described in Section 3.2. The specific metrics used to evaluate potential impacts are discussed below.

3.3.1 Evaluation of Impacts on Water Levels

Water level (stage) time series provide information about potential water level impacts over time at a fixed location. For each simulation period, water level time series comparisons were made at 10 stage monitoring stations in San Francisco Bay and the Sacramento-San Joaquin Delta, shown on Figure 3.3-1. For each comparison, three separate plots are shown. The top plot shows the tidal time-scale variability of stage over a 15-day period for the Baseline scenario, the Sacramento DWSC Only Deepening scenario, and the Both DWSC Deepening scenario. The middle plot shows daily-averaged stage during the full simulation year for each scenario. The bottom plot shows the predicted change in daily-averaged stage for the Sacramento DWSC Only Deepening scenario and Both DWSC Deepening scenario relative to the corresponding Baseline scenario. The figures provide a quantitative measure of potential impacts of the proposed DWSC deepening projects on stage on both tidal and annual time scales.

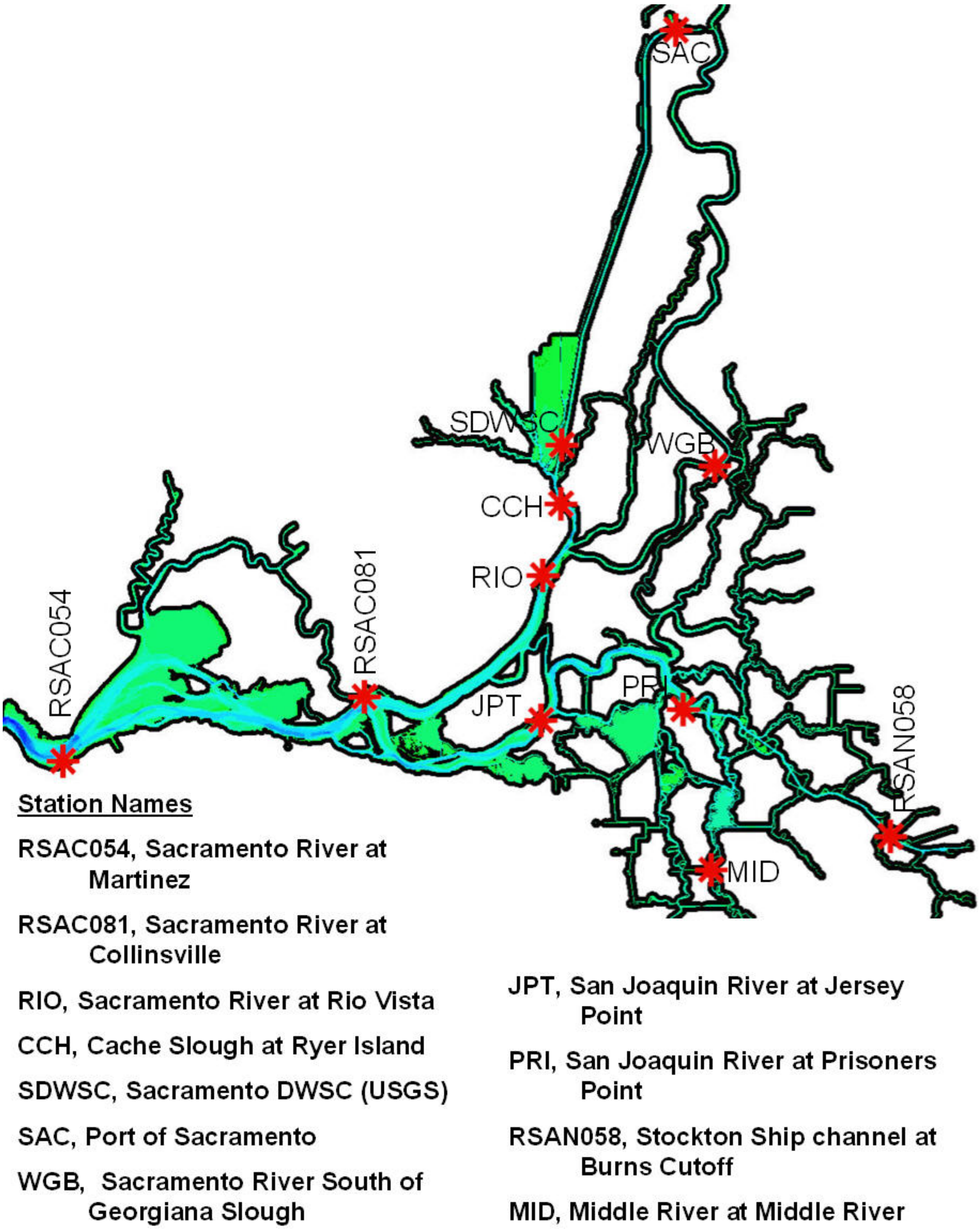


Figure 3.3-1 Location of continuous monitoring stations in San Francisco Bay and the Sacramento-San Joaquin Delta where water level time series comparisons are made to evaluate potential water level impacts resulting from the proposed DWSC deepening scenarios.

3.3.2 Evaluation of Impact on Tidal Flows

Flow time series provide information about potential impacts to tidal flows over time at a fixed location. For each simulation period, flow comparisons were made at 18 flow monitoring stations in San Francisco Bay and the Sacramento-San Joaquin Delta, shown on Figure 3.3-2. For each comparison, three separate plots are shown. The top plot shows the tidal time-scale variability of flow over a 15-day period for the Baseline scenario, the Sacramento DWSC Only Deepening scenario, and the Both DWSC Deepening scenario. The middle plot shows daily-averaged flow during the full simulation year for each scenario. The bottom plot shows the predicted change in daily-averaged flow for the Sacramento DWSC Only Deepening scenario and Both DWSC Deepening scenario relative to the Baseline scenario. The figures provide a quantitative measure of potential impacts of the proposed DWSC deepening projects on tidal and net flows on both tidal and annual time scales.

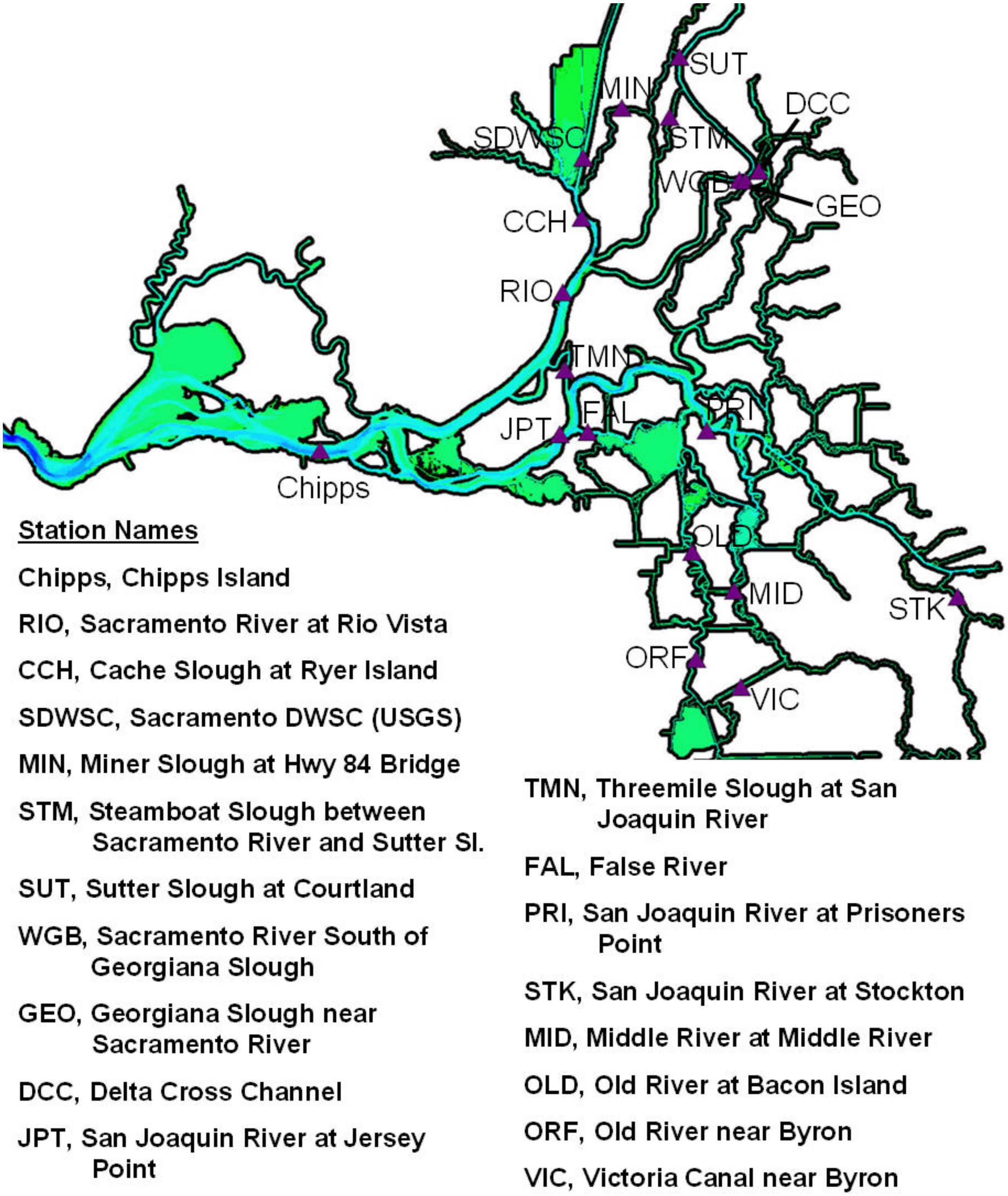


Figure 3.3-2 Location of continuous flow monitoring stations in San Francisco Bay and the Sacramento-San Joaquin Delta where flow time series comparisons are made to evaluate potential impacts on tidal and net flows resulting from the proposed DWSC deepening scenarios.

3.3.3 Evaluation of Salinity Impacts on X2

By definition X2 is the distance in kilometers from the Golden Gate to the tidally-averaged near-bed 2-psu isohaline. The 1995 Bay-Delta agreement established standards for salinity in the estuary. Specifically, the standards determine the degree to which salinity is allowed to penetrate up-estuary, with salinity to be controlled through Delta outflow (IEP, 2009). This regulation is based on observations that the abundance or survival of several estuarine biological populations in the San Francisco Estuary is positively related to freshwater flow (Jassby et al. 1995), although recent studies suggest that some of these relationships have changed (Sommer et al. 2007).

As reported in the Water Rights Decision 1641 (D-1641; SWRCB, 2000), diversion by the USBR at Banks Pumping Plant is not authorized when the Delta is in excess conditions (excess conditions exist when upstream reservoir releases plus unregulated natural flow exceed Sacramento Valley in-basin uses, plus exports) and such diversion causes the location of X2 to shift upstream so far that:

(a) It is east of Chipps Island (75 river kilometers upstream of the Golden Gate) during the months of February through May, or

(b) It is east of Collinsville (81 kilometers upstream of the Golden Gate) during the months of January, June, July, and August, or

(c) During December it is east of Collinsville and delta smelt are present at Contra Costa Water District's point of diversion under Permits 20749 and 20750 (Application 20245).

For the purposes of this standard, X2 is the furthest downstream location of either the maximum daily-averaged or the 14-day running average of the 2.64 mmhos/cm isohaline (SWRCB, 2000). Additional restrictions reported in D-1641 restrict CCWD from refilling Los Vaqueros Reservoir during the months of February through May if X2 is east of Chipps Island. In January, June, and August, CCWD is restricted from filling Los Vaqueros if X2 is east of Collinsville. Further restrictions apply in December if delta smelt are present at the intake on Old River and X2 is east of Collinsville (SWRCB, 2000).

Jassby et al. (1995) provide a graphical depiction of X2 (Figure 3.3-3), showing X2 measured from the Golden Gate. The inset figure shows an X2 of about 75 km at Chipps Island and 81 km at Collinsville. In the UnTRIM Bay-Delta model, X2 is calculated along the axis of the estuary along the transects shown in Figure 3.3-4. For X2 greater than 75 km, the distance from the Golden Gate to the location of 2 psu bottom salinity is measured along both the Sacramento and San Joaquin transects, and the reported predicted reported "average X2" is the average of the Sacramento and San Joaquin X2 distances.

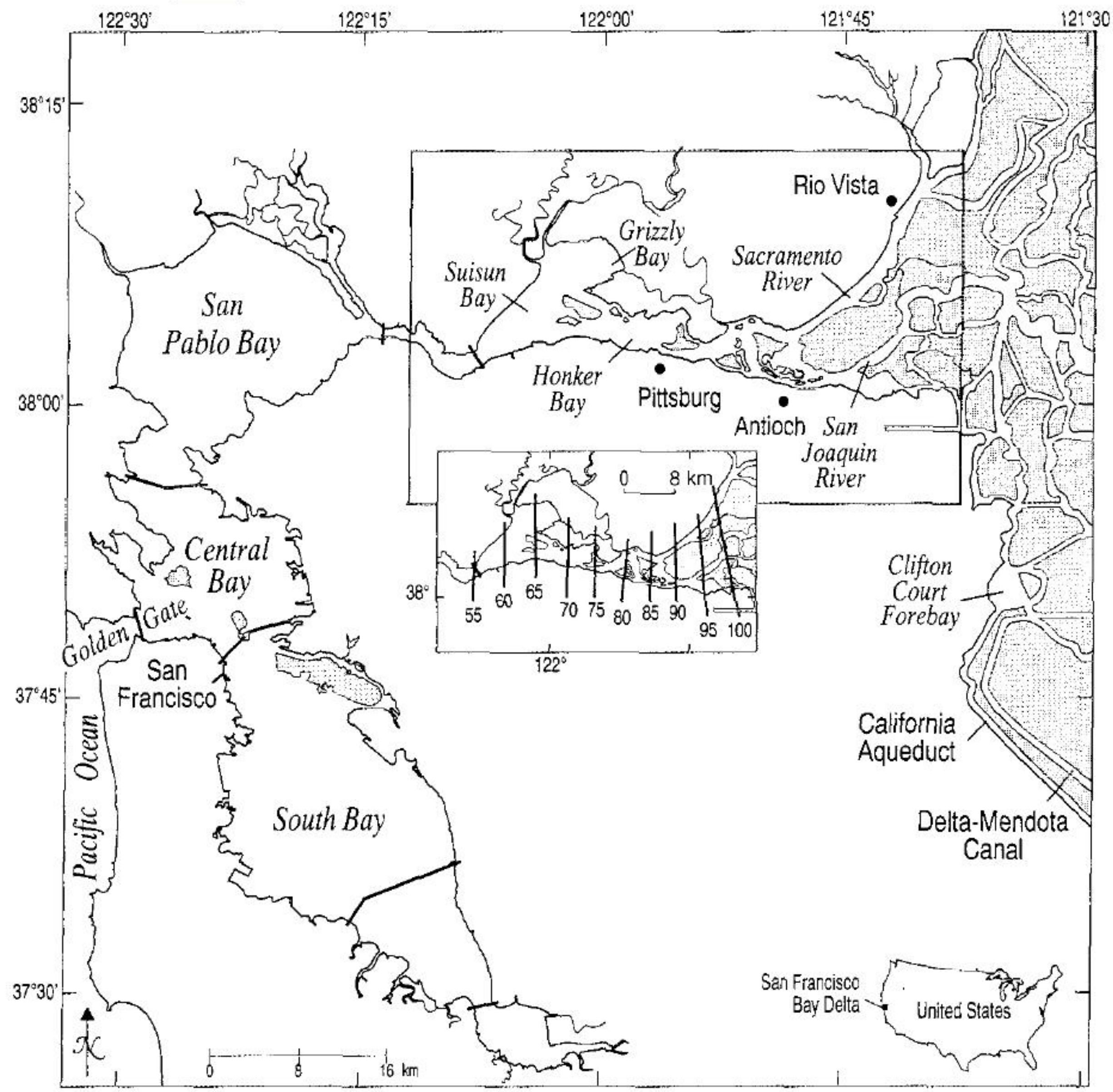


Figure 3.3-3 Map of San Francisco Bay and the Sacramento-San Joaquin Delta, with inset showing X2 locations in Suisun Bay and the western Delta (from Jassby et al., 1995).

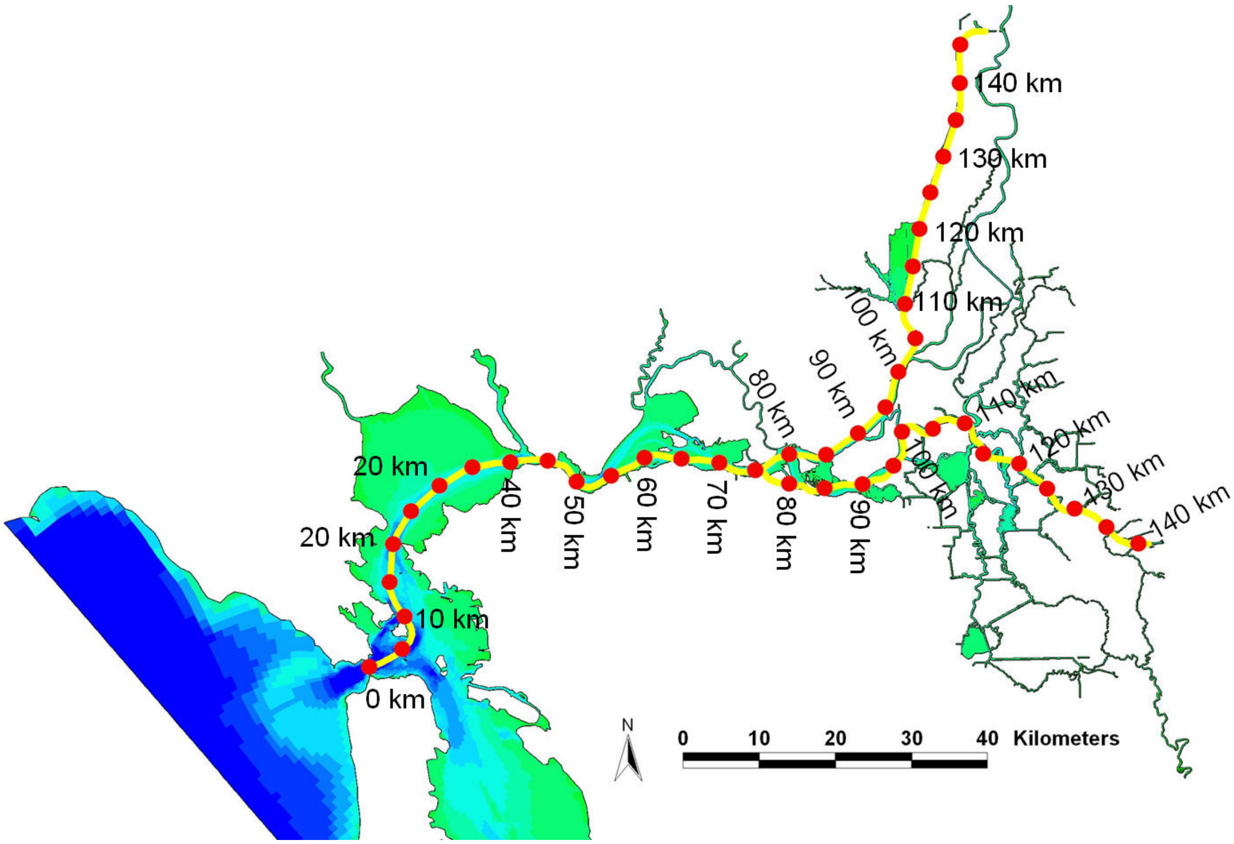


Figure 3.3-4 Transects along the axis of northern San Francisco Bay used to measure X2 in the UnTRIM Bay-Delta model.

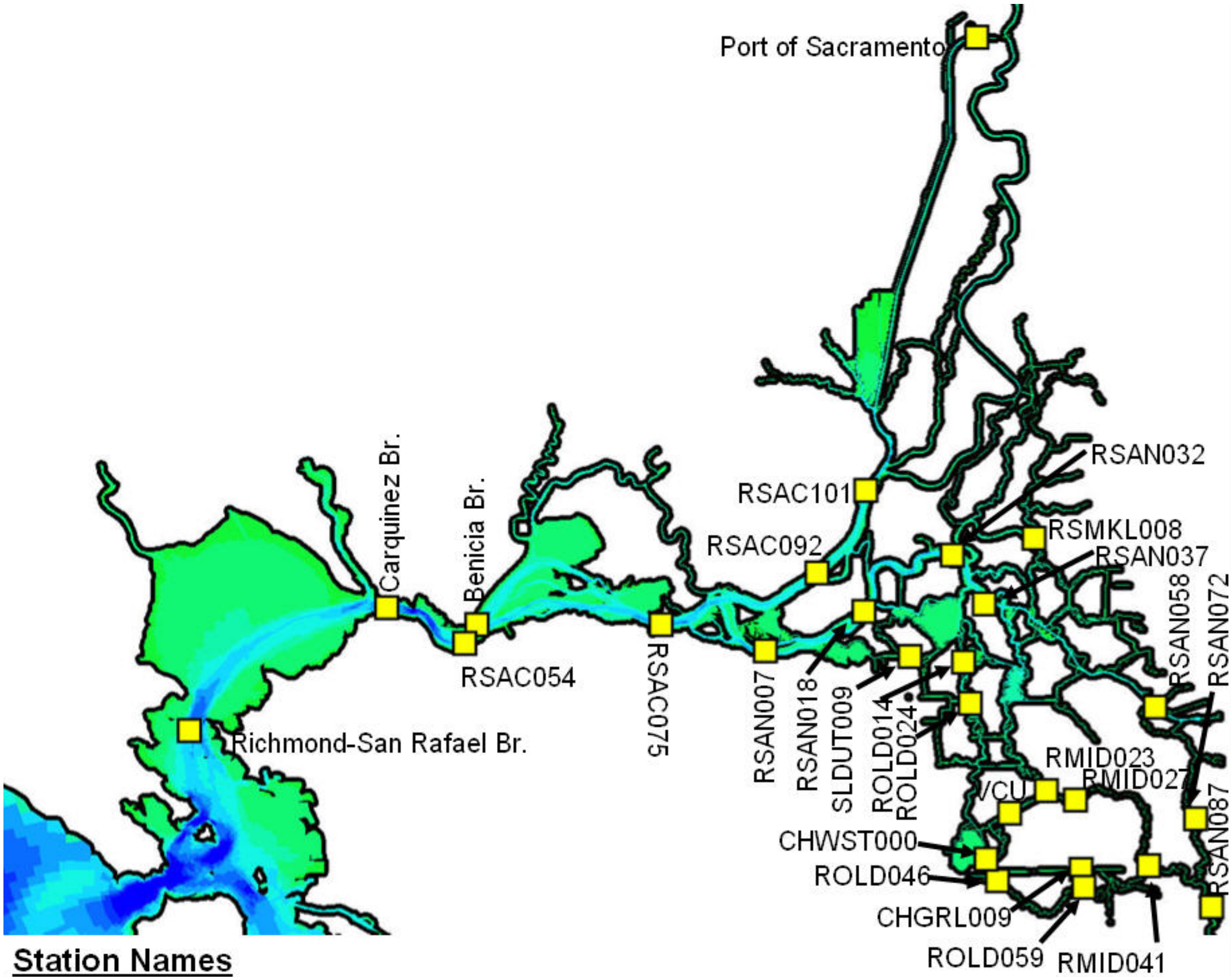
3.3.5 Depth-averaged Daily-averaged Salinity Maps

Depth-averaged daily-averaged salinity maps provide an effective way to make visual comparisons between predicted salinity under a range of scenarios. For each set of scenarios, the depth-averaged salinity is computed at each model time step and then averaged over each day. The resulting Depth-averaged daily-averaged salinity maps for each DWSC deepening scenario can then be compared to the salinity for the corresponding Baseline scenario to show the spatial distribution of the predicted increase in daily-averaged salinity. For each set of scenarios, the salinity map comparisons are made on the first day of each month, and on the day with the maximum predicted X2 during each simulation period.

3.3.6 Salinity Time Series Comparisons

Salinity time series provide information about potential salinity impacts over time at a fixed location. For each simulation period, time series comparisons were made at twenty-six continuous salinity monitoring stations in San Francisco Bay and the Sacramento-San Joaquin Delta, shown on Figure 3.3-5. For each comparison, three separate plots are shown. The top plot shows the tidal time-scale variability over a 15-day period for the Baseline scenario, the

Sacramento DWSC Only Deepening scenario, and the Both DWSC Deepening scenario. The middle plot shows daily-averaged salinity during the full simulation year for each scenario. The bottom plot shows the predicted change in daily-averaged salinity for the Sacramento DWSC Only Deepening scenario and Both DWSC Deepening scenario relative to the corresponding Baseline scenario. The figures provide a quantitative measure of potential impacts of the proposed DWSC deepening projects on salinity in San Francisco Bay and the Sacramento-San Joaquin Delta on both tidal and annual time scales.



Station Names

RSAC054, Sacramento River at Martinez
RSAC075, Sacramento R. near Mallard Is.
RSAC092, Sacramento River at Emmaton
RSAC101, Sacramento River at Rio Vista
RSAN007, San Joaquin River at Antioch
RSAN018, San Joaquin R. at Jersey Point
RSAN032, San Joaquin R. at San Andreas
RSAN037, San Joaquin R. at Prisoners Pt.
RSAN058, Stockton Ship C. at Burns Cutoff
RSMKL008, SF Mokelumne R. at Staten Is.
SLDUT009, Dutch Slough at Jersey Island
ROLD014, Old River at Mandeville Island
ROLD024, Old River at Bacon Island
RMID023, Middle River at Borden Hwy.
RMID027, Middle River at Tracy Blvd.
VCU, Victoria Canal near Byron
CHWST000, Clifton Court Forebay Radial Gates
ROLD046, Old River near Delta-Mendota
ROLD059, Old River at Tracy Blvd.
CHGRL009, Grant Line Canal at Tracy B.
RMID041, Middle River near Old River
RSAN072, San Joaquin R. at Brandt Br.
RSAN087, San Joaquin R. at Mossdale

Figure 3.3-5 Location of continuous monitoring stations in San Francisco Bay and the Sacramento-San Joaquin Delta where time series comparisons are made to evaluate potential salinity impacts resulting from the proposed DWSC deepening scenarios.

3.4 Impact on D-1641 Water Quality Objectives

Water Rights Decision 1641 (D-1641; SWRCB, 2000) contains the current water right requirements to implement the Bay-Delta flow-dependent objectives. Several specific water quality objectives for municipal and industrial, agricultural, and fish and wildlife beneficial uses stipulated by D-1641 are presented in this section. Each of the scenarios modeled in this study is evaluated based on each of the standards listed below.

The D-1641 water quality standards are typically based on either Electrical Conductivity (EC), measured in mmhos/cm, or concentrations of Cl^-, measured in mg/l. Salinity simulations in the UnTRIM Bay-Delta model are made in units of psu, which is a conservative quantity (whereas electrical conductivity is not conservative). For the purposes of evaluating compliance with the D-1641 standards, salinity in psu was converted to either EC or mg/l Cl^-.

Conversion from EC to salinity in psu is described in detail by Schoellhamer and Buchanan (2009). In the range of 2-42 practical salinity units (psu), salinity is converted to specific conductance (electrical conductivity normalized to a temperature of 25 degrees Celsius) using the 1985 UNESCO standard (UNESCO, 1985). Salinities below 2 psu were converted using the extension of the practical salinity scale proposed by Hill et al. (1986).

To convert salinity in psu to an exact concentration of Cl^- requires significant additional information due to spatial variability in the concentrations of various dissolved salts. This conversion was done using an empirical relationship between EC and Cl^- developed by Contra Costa Water District (CCWD) from collocated EC and Cl^- measurements collected at the CCWD intakes and MWQI data in the same region of the Delta (Deanna Sereno, CCWD, personal communication).

For this analysis salinity (psu) was first converted to EC using the equations described by Schoellhamer and Buchanan (2009). Then, EC was converted to Cl^- using the CCWD empirical relationships given by:

$$Concentration\ Cl^- = 0.15\ EC - 12 \qquad \text{for EC} < 281\ [\mu\text{mhos/cm}]$$

and

$$Concentration\ Cl^- = 0.285\ EC - 50 \qquad \text{for EC} > 281\ [\mu\text{mhos/cm}]$$

where EC is in µmhos/cm and the concentration of Cl^- is in mg/l. The first equation is representative of the concentration of Cl^- in agricultural drainage, while the second equation is representative of the concentration of Cl^- resulting from sea water intrusion. Using these relationships, the 250 mg/l Cl^- water quality standard corresponds to an EC of 1053 µmhos/cm and the150 mg/l Cl^- water quality standard corresponds to an EC of 702 µmhos/cm.

3.4.1Water Quality Objectives for Municipal and Industrial Beneficial Uses

The D-1641 water quality objectives for municipal and industrial beneficial uses, shown in Table 3-1, are based on concentration of Cl^- at water export locations. The first set of standards stipulate the number of days that maximum mean daily concentration of Cl^- must be less than 150 mg/l (~0.25 psu) either at Contra Costa Canal at Pumping Plant #1, or at the Antioch Water Works intake. The minimum number of days that this objective should be met ranges from 155 days for a "critical" water year to 240 days for a "wet" water year. The second set of standards stipulates a maximum allowable concentration of 250 mg/l Cl^- (~0.41 psu) at the municipal water intakes. The D-1641 standards stipulate this objective for Contra Costa Canal at Pumping Plant #1, West Canal at mouth of Clifton Court Forebay, Delta-Mendota Canal at Tracy Pumping Plant, Barker Slough at North Bay Aqueduct Intake, and Cache Slough at the City of Vallejo Intake. For the purposes of this study, this standard is also evaluated at the CCWD intake on Old River (ROLD034), and at the CCWD alternative intake point (AIP) on Victoria Canal. The locations of the eight stations at which impacts on water quality objectives for municipal and industrial beneficial uses are evaluated are shown on Figure 3.4-1.

Table 3-1 D-1641 Water Quality Objectives for Municipal and Industrial Beneficial Uses.

Compliance Location	Station Index	Parameter	Description	Water Year Type	Time Period	Value
Contra Costa Canal at Pumping Plant #1 **-or-** San Joaquin River at Antioch Water Works Intake	CHCCC06 RSAN007	Chloride (Cl^-)	Maximum mean daily 150 mg/l Cl^- for at least the number of days shown during the Calendar Year. (Percentage of calendar year shown in parentheses)	 W AN BN D C		No. of days ≤ 150 mg/l Cl^- 240 (66%) 190 (52%) 175 (48%) 165 (45%) 155 (42%)
Contra Costa Canal at Pumping Plant #1 **-and-** West Canal at mouth of Clifton Court Forebay **-and-** Delta-Mendota Canal at Tracy Pumping Plant **-and-** Barker Slough at North Bay Aqueduct Intake **-and-** Cache Slough at City of Vallejo Intake	CHCCC06 CHWST0 CHDMC04 SLSAR3 SLCCH16	Chloride (Cl^-)	Maximum mean daily (mg/l)	All	Oct – Sep (all year)	250 mg/l Cl^-

3.4.2 Water Quality Objectives for Agricultural Beneficial Uses

The D-1641 water quality objectives for agricultural beneficial uses, shown in Table 3-2, are based on EC at stations in the western Delta, central Delta, southern Delta, and at two export areas. In the western and southern Delta, water quality objectives for agricultural beneficial use are based on the maximum 14-day running average of mean daily EC, and are in place from April 1 to August 15. The specific standards vary at each location, and depend on water year classification. In the southern Delta, water quality objectives for agricultural beneficial use require that the maximum 30-day running average of mean daily EC is less than 0.7 mmhos/cm (0.34 psu) from April-August and less than 1.0 mmhos/cm (0.49 psu) from September through March for all water year types. At the export areas, water quality objectives for agricultural beneficial use require that the maximum monthly average of mean daily EC be less than 1.0 mmhos/cm (0.49 psu) during all months for all water year types. The locations of the eight stations at which impacts on water quality objectives for agricultural beneficial uses are evaluated are shown on Figure 3.4-2.

Table 3-2 D-1641 Water Quality Objectives for Agricultural Beneficial Uses.

Compliance Location	Station Index	Parameter	Description	Water Year Type	Time Period	Value
Western Delta					0.45 EC April 1 to:	EC from date shown to Aug 15
Sacramento River at Emmaton	RSAC092	Electrical Conductivity (EC)	Maximum 14-day running average of mean daily EC (mmhos/cm).	W	Aug 15	----
				AN	Jul 1	0.63
				BN	Jun 20	1.14
				D	Jun 15	1.67
				C	----	2.78
					0.45 EC April 1 to:	EC from date shown to Aug 15
San Joaquin River at Jersey Point	RSAN018	Electrical Conductivity (EC)	Maximum 14-day running average of mean daily EC (mmhos/cm).	W	Aug 15	----
				AN	Aug 15	----
				BN	Jun 20	0.74
				D	Jun 15	1.35
				C	----	2.20
Interior Delta					0.45 EC April 1 to:	EC from date shown to Aug 15
South Fork Mokelumne River at Terminous	RSMKL08	Electrical Conductivity (EC)	Maximum 14-day running average of mean daily EC (mmhos/cm).	W	Aug 15	----
				AN	Aug 15	----
				BN	Aug 15	----
				D	Aug 15	----
				C	----	0.54
					0.45 EC April 1 to:	EC from date shown to Aug 15
San Joaquin River at San Andreas Landing	RSAN032	Electrical Conductivity (EC)	Maximum 14-day running average of mean daily EC (mmhos/cm).	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 at Brandt Bridge **-and-** Old River near Middle River **-and-** Old River at Tracy Road Bridge	RSAN112 RSAN073 ROLD069 ROLD059	Electrical Conductivity (EC)	Maximum 30-day running average of mean daily EC (mmhos/cm).	All	Apr-Aug Sep-Mar	0.7 1.0
Export Area						
West Canal at mouth of Clifton Court Forebay **-and-** Delta-Mendota Canal at Tracy Pumping Plant	CHWST0 CHDMC04	Electrical Conductivity (EC)	Maximum monthly average of mean daily EC (mmhos/cm).	All	Oct-Sep (all year)	1.0

3.4.3 Water Quality Objectives for Fish and Wildlife Beneficial Uses

The D-1641 water quality objectives for fish and wildlife beneficial uses, shown in Table 3-3, are based on EC at stations on the San Joaquin River and in Suisun Marsh. On the San Joaquin River, water quality objectives for fish and wildlife beneficial use require the maximum 14-day running average of mean daily EC to be less than 0.44 mmhos/cm (0.21 psu), and are in place for the months of April and May for all water year types except during "critical" water years. The water quality objectives for fish and wildlife beneficial use in Suisun Marsh require maximum monthly average of both daily high tide EC values to be below specified values for the months and periods shown in Table 3-3. The locations of the eight stations at which impacts on water quality objectives for fish and wildlife beneficial uses are evaluated are shown on Figure 3.4-3.

Table 3-3 D-1641 Water Quality Objectives for Fish and Wildlife Beneficial Uses

Compliance Location	Station Index	Parameter	Description	Water Year Type	Time Period	Value
San Joaquin River Salinity						
San Joaquin river at and between Jersey Point and Prisoners Point	RSAN018 **-and-** RSAN038	Electrical Conductivity (EC)	Maximum 14-day running average of mean daily EC (mmhos/cm).	W, AN, BN, D	Apr-May	0.44
Eastern Suisun Marsh Salinity						
Sacramento River at Collinsville **-and-** Montezuma Slough at National Steel **-and-** Montezuma Slough near Beldon Landing	RSAC081 SLMZU25 SLMZU11	Electrical Conductivity (EC)	Maximum monthly average of both daily high tide EC values (mmhos/cm), or demonstrate that equivalent or better protection will be provided at the location.	All	Oct Nov-Dec Jan Feb-Mar Apr-May	19.0 15.5 12.5 8.0 11.0
Western Suisun Marsh Salinity						
Chadbourne Slough at Sunrise Duck Club **-and-** Suisun Slough, 300 feet south of Volanti Slough	SLCBN1 SLSUS12	Electrical Conductivity (EC)	Maximum monthly average of both daily high tide EC values (mmhos/cm), or demonstrate that equivalent or better protection will be provided at the location.	All but deficiency period[1]	Oct Nov Dec Jan Feb-Mar Apr-May	19.0 16.5 15.5 12.5 8.0 11.0
				Deficiency period[1]	Oct Nov Dec-Mar Apr May	19.0 16.5 15.6 14.0 12.5

[1] A deficiency period is: (1) the second consecutive "dry" water year following a "critical" year; (2) a "dry" water year following a year in which the Sacramento River Index was less than 11.35 AF; or (3) a "critical" year following a "dry" or "critical" water year. See footnotes to Table 3 in SWRCB (2000) for additional details.

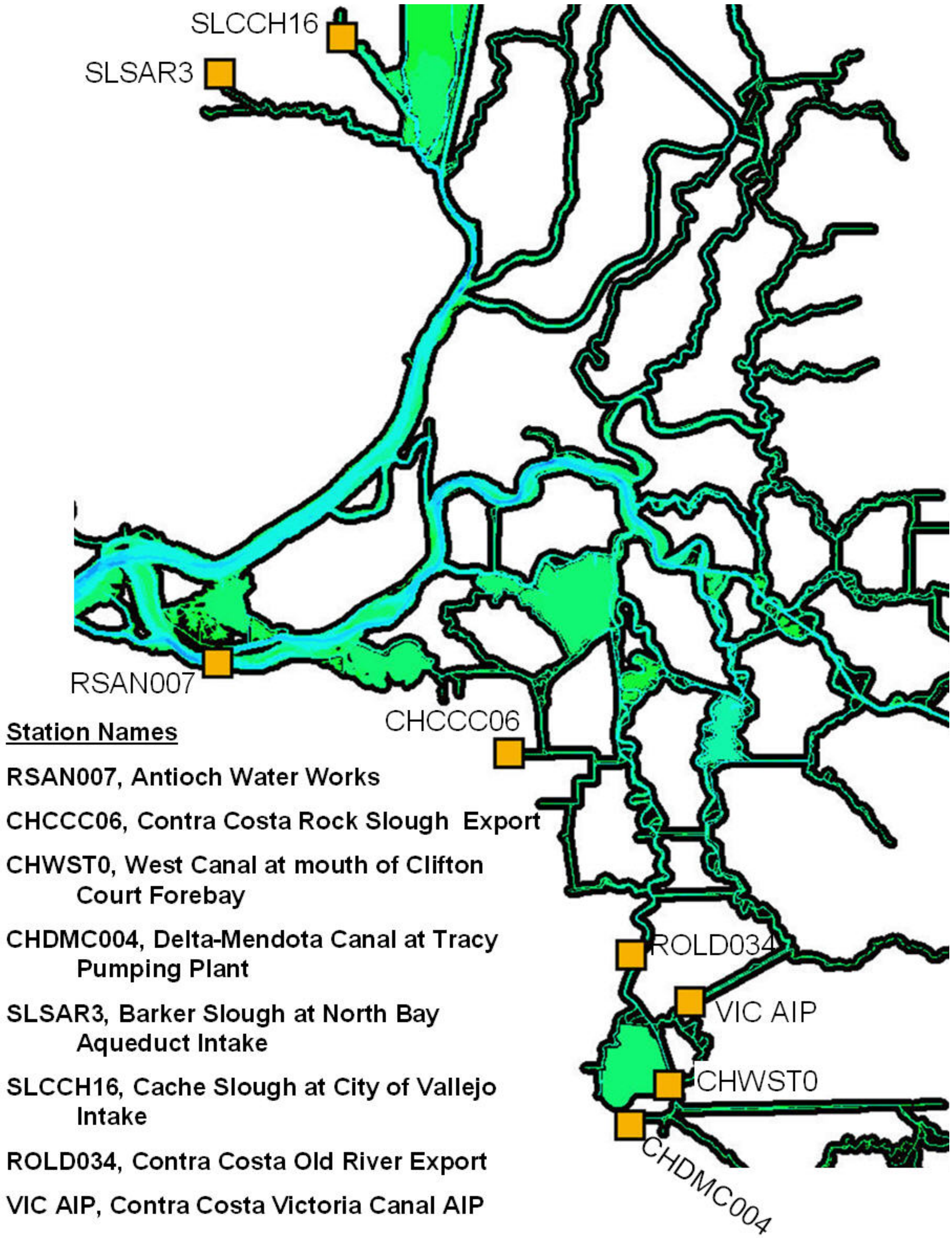


Figure 3.4-1 Locations of D-1641 water quality monitoring stations for municipal and industrial beneficial uses at which salinity impacts resulting from the proposed DWSC deepening scenarios are evaluated.

Figure 3.4-2 Locations of D-1641 water quality monitoring stations for agricultural beneficial uses at which salinity impacts resulting from the proposed DWSC deepening scenarios are evaluated.

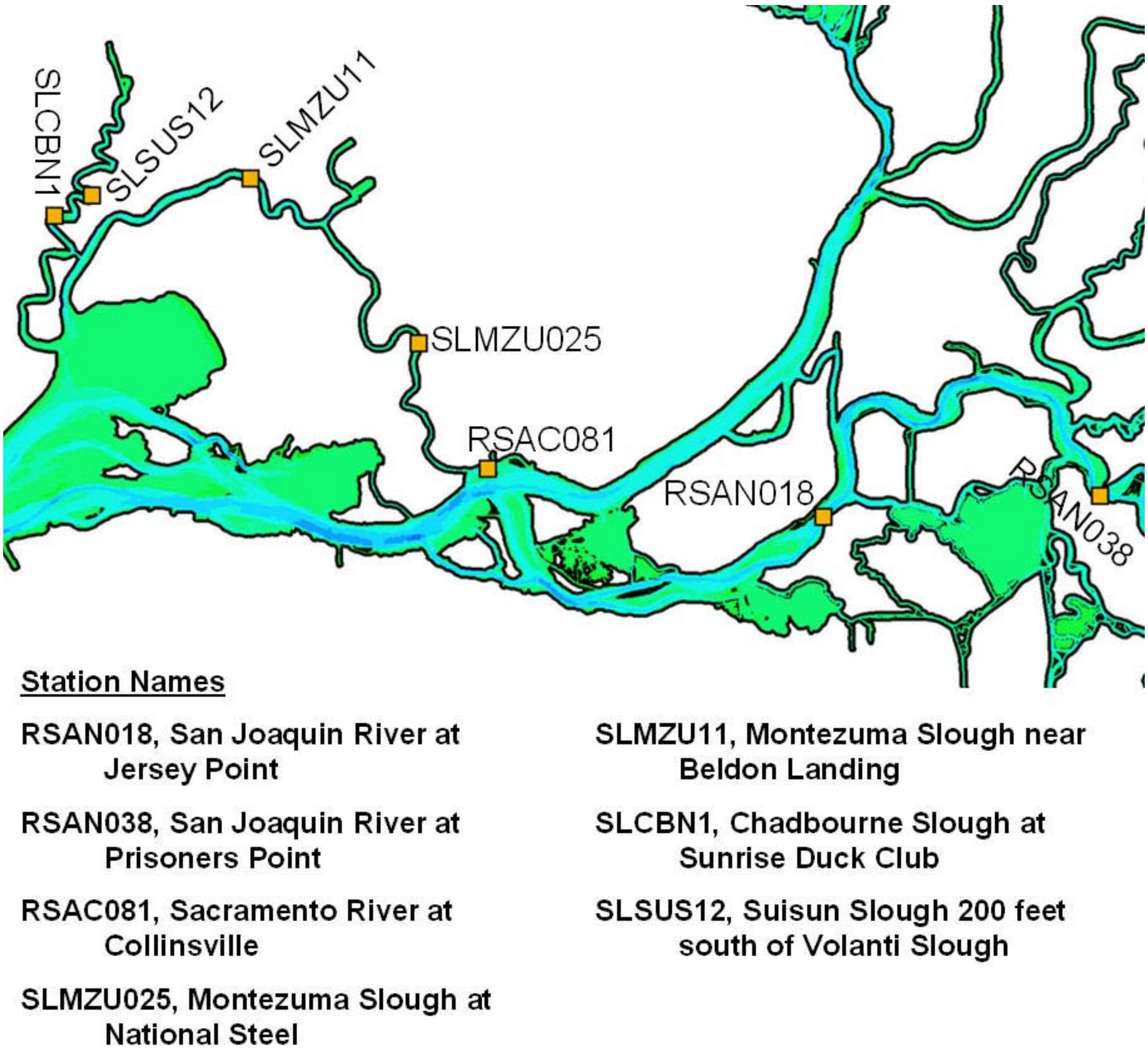


Figure 3.4-3 Locations of D-1641 water quality monitoring stations for fish and wildlife beneficial uses at which salinity impacts resulting from the proposed DWSC deepening scenarios are evaluated.

4. Evaluation of Alternatives under Base Year Conditions (Year 0)

This section presents an evaluation of the potential impacts resulting from the proposed channel deepening scenarios, discussed in Section 2, under base year conditions, as described in Section 3.2.1. The base year conditions are defined based on the expected bathymetric, hydrologic, and operating conditions in years 2011 and 2012 for the Sacramento DWSC and the San Francisco Bay to Stockton DWSC, respectively. The base year conditions simulation represents the "Year 0" conditions, which are an estimate of possible conditions that may exist at the approximate time that a deepening project is completed. Potential hydrodynamic, salinity and water quality impacts of the deepening scenarios under base year conditions are evaluated based on the metrics described in Section 3.3 and 3.4.

In order to facilitate preparation of separate EIS/EIR documents for the Sacramento DWSC Project and the San Francisco Bay to Stockton DWSC Project, two sets of comparisons are presented in each section. The first set of comparisons are between the Year 0 Baseline scenario and the Year 0 Sacramento DWSC Only Deepening scenario. The second set of comparisons are between the Year 0 Baseline scenario, the Year 0 Sacramento DWSC Only Deepening scenario, and the Year 0 Both DWSC Deepening scenario.

4.1 Evaluation of Impact on Water Levels

Water level time series provide information about potential impacts on water levels (stage) over time at a fixed location. Water level time series comparisons were made at eleven continuous stage monitoring stations in San Francisco Bay and the Sacramento-San Joaquin Delta, shown on Figure 3.3-1. Comparisons for the Year 0 simulation period between predicted water levels for the Year 0 Baseline scenario and the Year 0 Sacramento DWSC Only Deepening scenario are shown in Section 4.1.1. Comparisons for the Year 0 simulation period between predicted water levels for the Year 0 Baseline scenario, the Year 0 Sacramento DWSC Only Deepening scenario, and the Year 0 Both DWSC Deepening scenario are shown in Section 4.1.2.

4.1.1 Year 0 Sacramento DWSC Only Deepening

For each water level comparison figure included in this section, the top plot shows the tidal time-scale water level variability over a 15-day period for the Year 0 Baseline scenario and the Year 0 Sacramento DWSC Only Deepening scenario. The middle plot shows daily-averaged stage during the full simulation year for each scenario. The bottom plot shows the predicted change in daily-averaged stage for the Year 0 Sacramento DWSC Only Deepening scenario relative to the Year 0 Baseline scenario. In cases where the predicted stage is identical between scenarios, some lines are not fully visible. Since the lines are plotted in the order listed on the legend, for periods where the predicted stage for the Year 0 Baseline scenario is not fully visible, the predicted stage for the Year 0 Baseline scenario is identical to the visible line for the Year 0 Sacramento DWSC Only Deepening scenario.

Figure 4.1-1 shows the predicted stage at Sacramento River at Martinez (RSAC054) for the Year 0 Baseline scenario and the Year 0 Sacramento DWSC Only Deepening scenario. During the second half of November (top panel of Figure 4.1-1), the predicted stage for both scenarios is identical. Similarly, the daily-averaged stage is nearly identical between both scenarios over the entire simulation year. No change in stage relative to the Year 0 Baseline scenario is predicted at Martinez for the Year 0 Sacramento DWSC Only Deepening scenario.

Figure 4.1-2 shows the predicted stage at Sacramento River at Collinsville (RSAC081) for the Year 0 Baseline scenario and the Year 0 Sacramento DWSC Only Deepening scenario. During the second half of November (top panel of Figure 4.1-2), the predicted stage for both scenarios is identical. Similarly, the daily-averaged stage is nearly identical between both scenarios over the entire simulation year. No change in stage relative to the Year 0 Baseline scenario is predicted under the Year 0 Sacramento DWSC Only Deepening scenario.

Figure 4.1-3 shows the predicted stage at Sacramento River at Rio Vista (RIO) for the Year 0 Baseline scenario and the Year 0 Sacramento DWSC Only Deepening scenario. During the second half of November (top panel of Figure 4.1-3), the predicted stage for both scenarios is identical. Similarly, the daily-averaged stage is nearly identical between both scenarios over the entire simulation year. A slight decrease in daily-averaged stage of less than 0.01 m is predicted under the Year 0 Sacramento DWSC Only Deepening scenario during the high flow period between January and March. This decrease in stage is likely the result of the increased conveyance along the Sacramento River resulting from the deepening of the Sacramento DSWC in this reach.

Figure 4.1-4 shows the predicted stage at Cache Slough at Ryer Island (CCH) for the Year 0 Baseline scenario and the Year 0 Sacramento DWSC Only Deepening scenario. During the second half of November (top panel of Figure 4.1-4), the predicted stage for both scenarios is identical. Similarly, the daily-averaged stage is nearly identical between both scenarios over the entire simulation year. A slight decrease in daily-averaged stage of less than 0.02 m is predicted under the Year 0 Sacramento DWSC Only Deepening scenario during the high flow period between January and March. This decrease in stage is likely the result of the increased conveyance in Cache Slough resulting from the deepening of the Sacramento DSWC in this reach.

Figure 4.1-5 shows the predicted stage at the Sacramento DWSC (USGS Station 11455335) for the Year 0 Baseline scenario and the Year 0 Sacramento DWSC Only Deepening scenario. During the second half of November (top panel of Figure 4.1-5), the predicted stage for both scenarios is identical. Similarly, the daily-averaged stage is nearly identical between both scenarios over the entire simulation year. A slight decrease in daily-averaged stage of less than 0.03 m is predicted under the Year 0 Sacramento DWSC Only Deepening scenario during the high flow period between January and March. This decrease in stage is likely the result of the increased conveyance in Cache Slough which results in a decrease in stage in Cache Slough, and a corresponding decrease in stage in the man-made portion of the Sacramento DSWC.

Figure 4.1-6 shows the predicted stage at the Port of Sacramento for the Year 0 Baseline scenario and the Year 0 Sacramento DWSC Only Deepening scenario. During the second half of November (top panel of Figure 4.1-6), the predicted stage for both scenarios is identical. Similarly, the daily-averaged stage is nearly identical between both scenarios over the entire simulation year. A slight decrease in daily-averaged stage of up to 0.02 m is predicted under the Year 0 Sacramento DWSC Only Deepening scenario during the high flow period between January and March. This decrease in stage at the Port of Sacramento is likely the result of the increased conveyance in Cache Slough which results in a decrease in stage in Cache Slough, and a corresponding decrease in stage in the man-made portion of the Sacramento DSWC.

Figure 4.1-7 shows the predicted stage at Sacramento River South of Georgiana Slough (WGB) for the Year 0 Baseline scenario and the Year 0 Sacramento DWSC Only Deepening scenario. During the second half of November (top panel of Figure 4.1-7), the predicted stage for both scenarios is identical. Similarly, the daily-averaged stage is nearly identical between both scenarios over the entire simulation year. A slight decrease in daily-averaged stage of less than 0.01 m is predicted under the Year 0 Sacramento DWSC Only Deepening scenario during the high flow period between January and March.

Figure 4.1-8 shows the predicted stage at San Joaquin River at Jersey Point (JPT) for the Year 0 Baseline scenario and the Year 0 Sacramento DWSC Only Deepening scenario. During the second half of November (top panel of Figure 4.1-8), the predicted stage for both scenarios is identical. Similarly, the daily-averaged stage is nearly identical between both scenarios over the entire simulation year. No change in stage relative to the Year 0 Baseline scenario is predicted under the Year 0 Sacramento DWSC Only Deepening scenario.

Figure 4.1-9 shows the predicted stage at San Joaquin River at Prisoners Point (PRI) for the Year 0 Baseline scenario and the Year 0 Sacramento DWSC Only Deepening scenario. During the second half of November (top panel of Figure 4.1-9), the predicted stage for both scenarios is identical. Similarly, the daily-averaged stage is nearly identical between both scenarios over the entire simulation year. No change in stage relative to the Year 0 Baseline scenario is predicted under the Year 0 Sacramento DWSC Only Deepening scenario.

Figure 4.1-10 shows the predicted stage at Stockton Ship Channel at Burns Cutoff (RSAN058) for the Year 0 Baseline scenario and the Year 0 Sacramento DWSC Only Deepening scenario. During the second half of November (top panel of Figure 4.1-10), the predicted stage for both scenarios is identical. Similarly, the daily-averaged stage is nearly identical between both scenarios over the entire simulation year. No change in stage relative to the Year 0 Baseline scenario is predicted under the Year 0 Sacramento DWSC Only Deepening scenario.

Figure 4.1-11 shows the predicted stage at Middle River at Middle River (MID) for the Year 0 Baseline scenario and the Year 0 Sacramento DWSC Only Deepening scenario. During the second half of November (top panel of Figure 4.1-11), the predicted stage for both scenarios is identical. Similarly, the daily-averaged stage is nearly identical between both scenarios over the entire simulation year. No change in stage relative to the Year 0 Baseline scenario is predicted under the Year 0 Sacramento DWSC Only Deepening scenario.

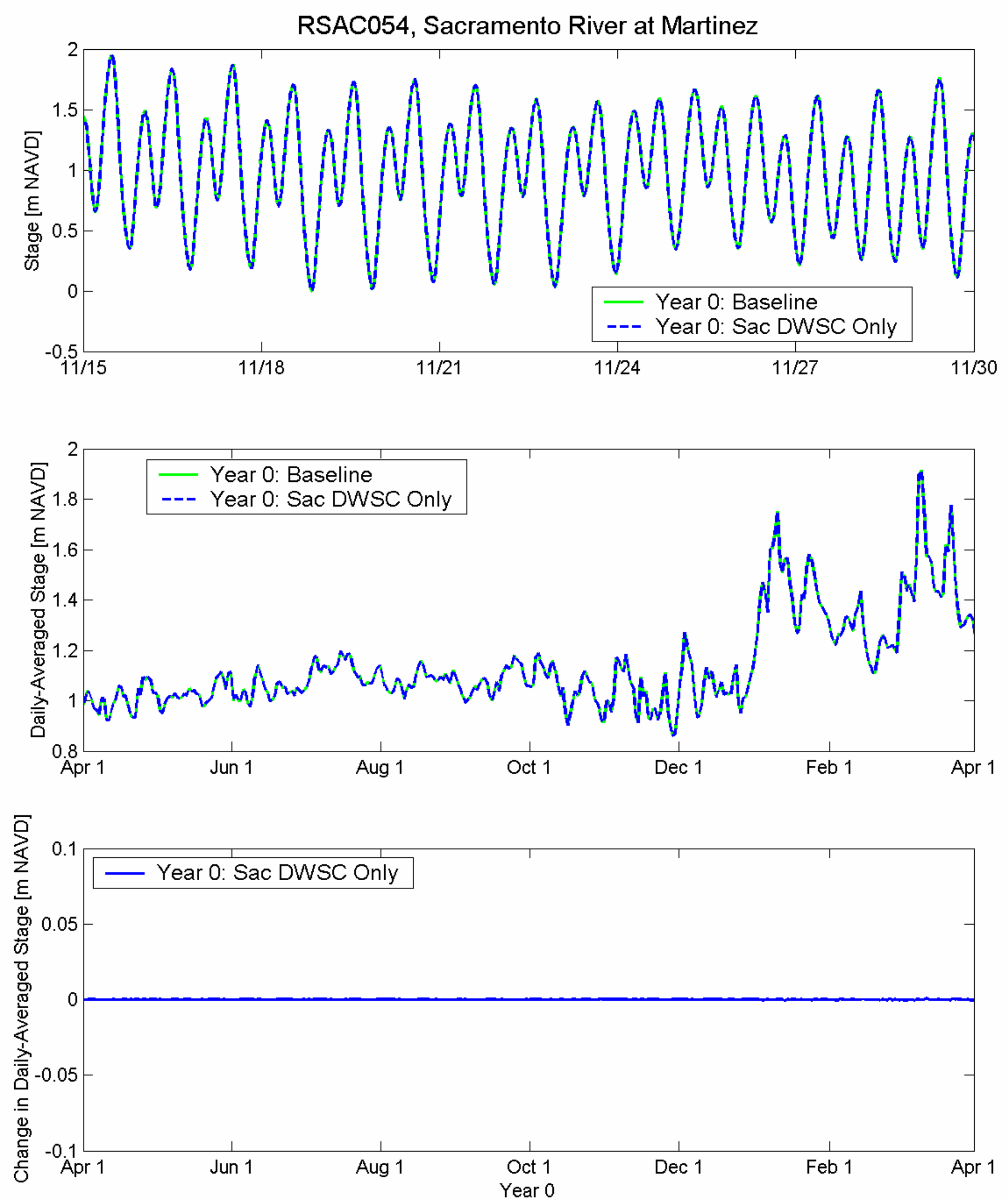


Figure 4.1-1 Predicted stage at Sacramento River at Martinez (RSAC054) for the Year 0 Baseline scenario and the Year 0 Sacramento DWSC Only Deepening scenario: tidal time-scale variability over a 15-day period (top); daily-averaged stage for the Year 0 simulation period (middle); predicted increase in daily-averaged stage for the Year 0 Sacramento DWSC Only Deepening scenario relative to the Year 0 Baseline scenario (bottom).

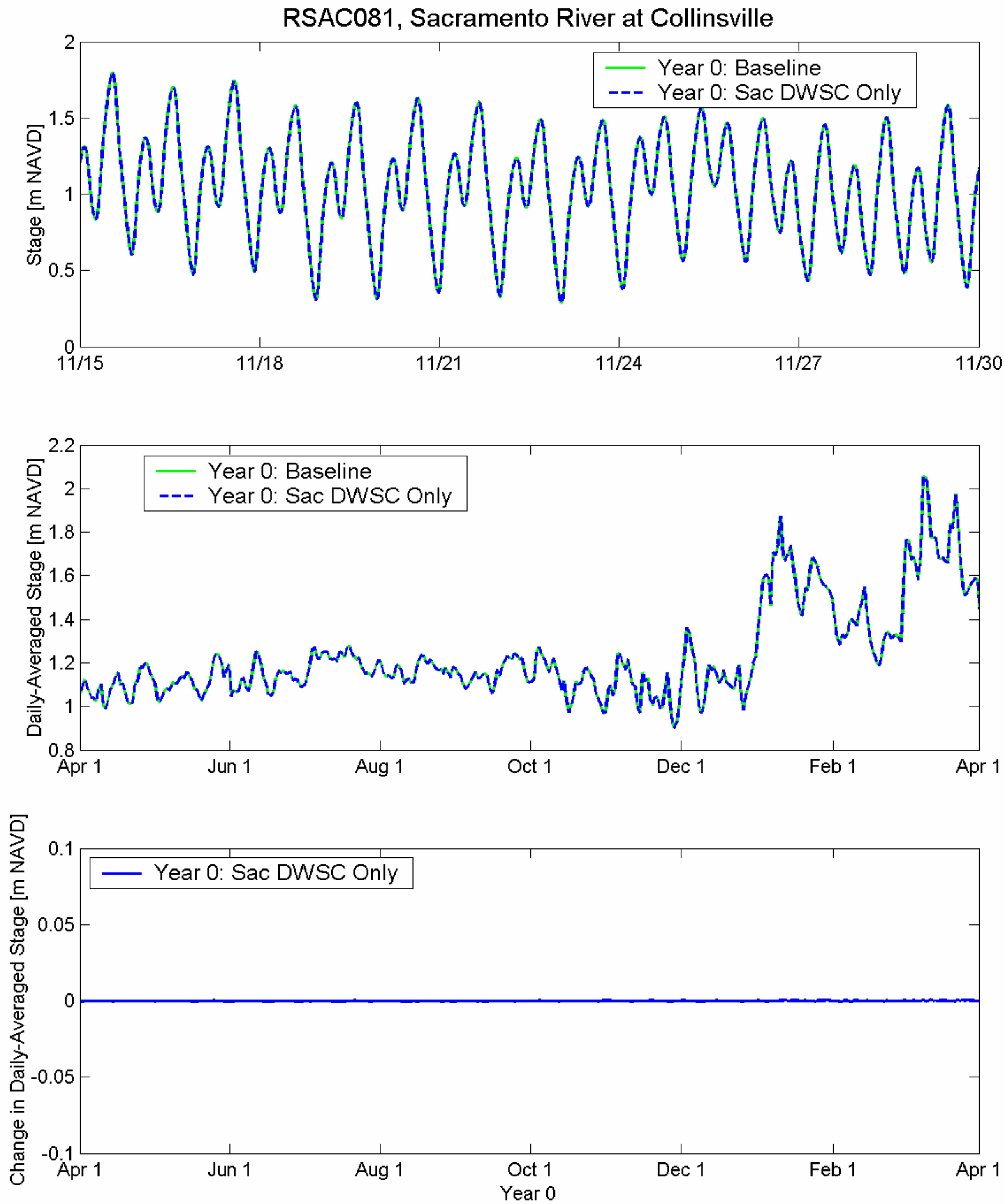


Figure 4.1-2 Predicted stage at Sacramento River at Collinsville (RSAC081) for the Year 0 Baseline scenario and the Year 0 Sacramento DWSC Only Deepening scenario: tidal time-scale variability over a 15-day period (top); daily-averaged stage for the Year 0 simulation period (middle); predicted increase in daily-averaged stage for the Year 0 Sacramento DWSC Only Deepening scenario relative to the Year 0 Baseline scenario (bottom).

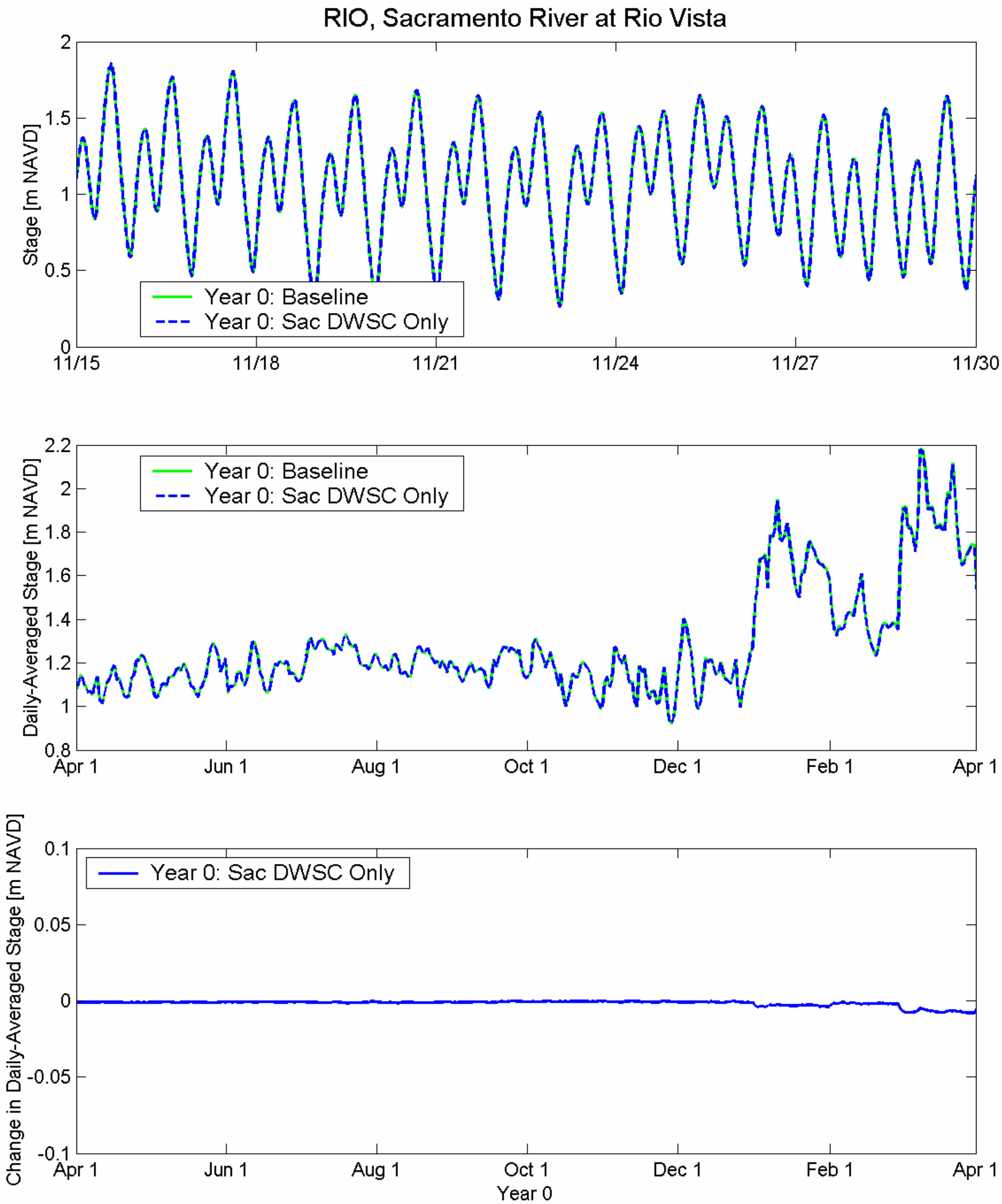


Figure 4.1-3 Predicted stage at Sacramento River at Rio Vista (RIO) for the Year 0 Baseline scenario and the Year 0 Sacramento DWSC Only Deepening scenario: tidal time-scale variability over a 15-day period (top); daily-averaged stage for the Year 0 simulation period (middle); predicted increase in daily-averaged stage for the Year 0 Sacramento DWSC Only Deepening scenario relative to the Year 0 Baseline scenario (bottom).

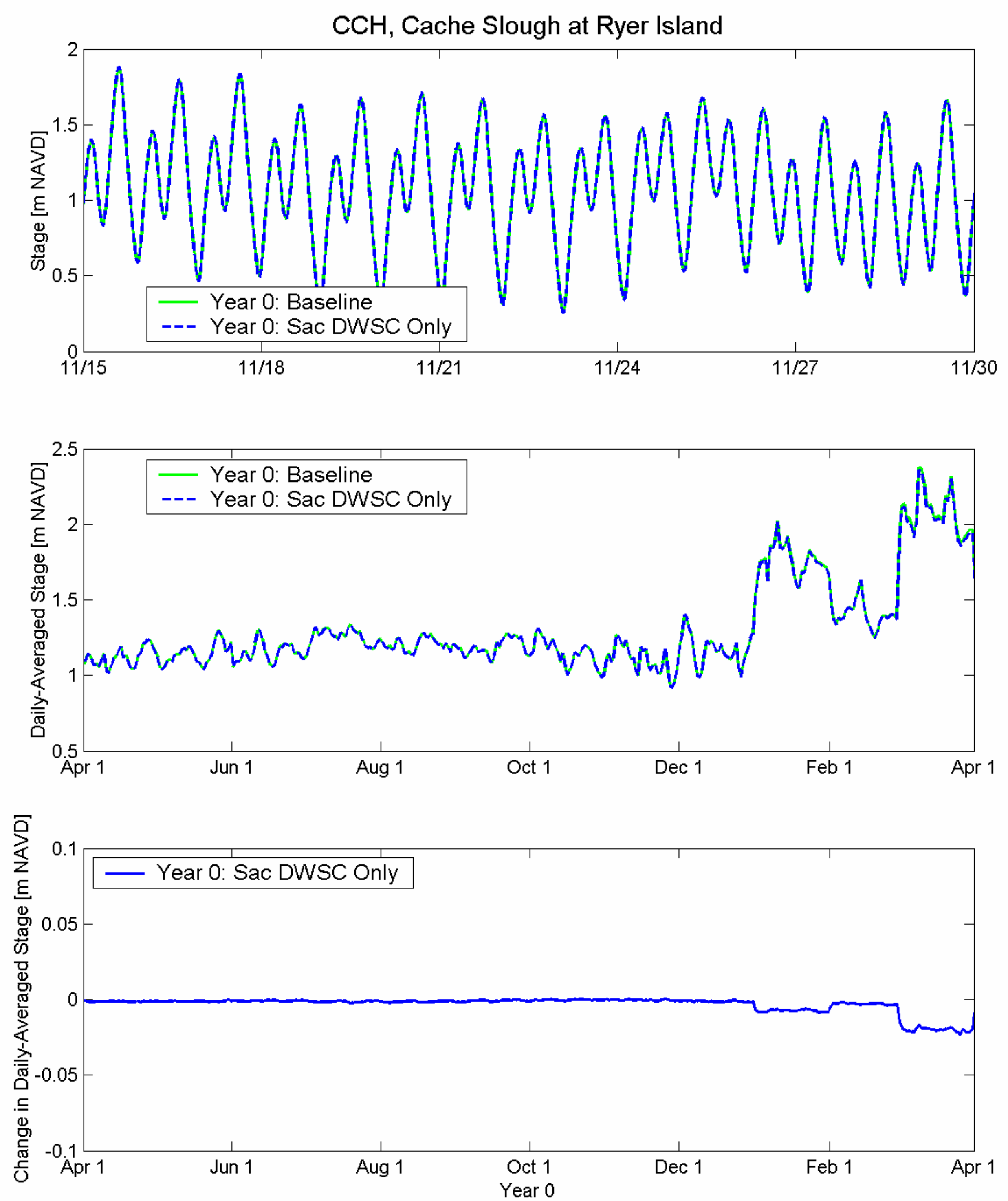


Figure 4.1-4 Predicted stage at Cache Slough at Ryer Island (CCH) for the Year 0 Baseline scenario and the Year 0 Sacramento DWSC Only Deepening scenario: tidal time-scale variability over a 15-day period (top); daily-averaged stage for the Year 0 simulation period (middle); predicted increase in daily-averaged stage for the Year 0 Sacramento DWSC Only Deepening scenario relative to the Year 0 Baseline scenario (bottom).

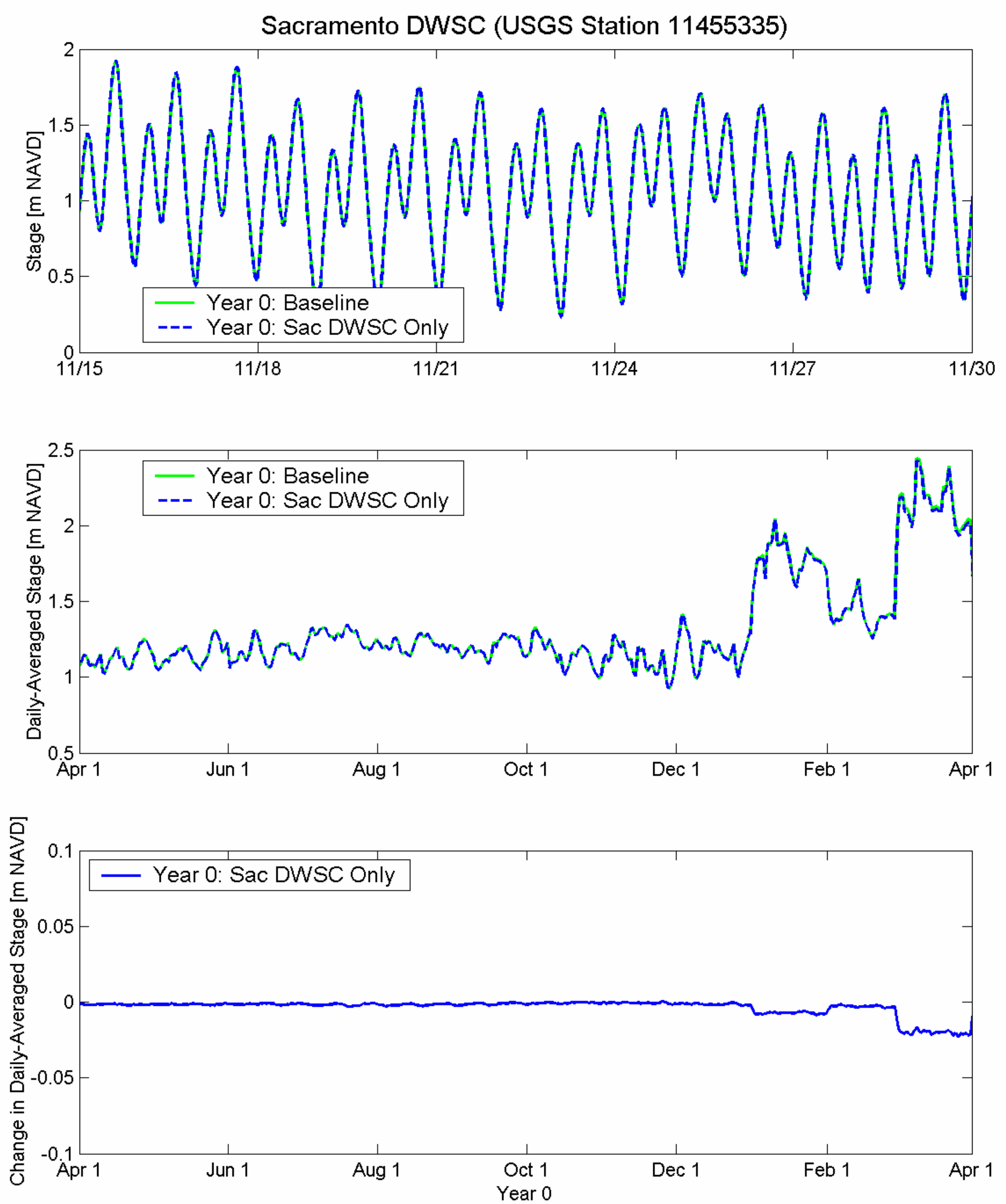


Figure 4.1-5 Predicted stage at Sacramento DWSC (USGS Station 11455335) for the Year 0 Baseline scenario and the Year 0 Sacramento DWSC Only Deepening scenario: tidal time-scale variability over a 15-day period (top); daily-averaged stage for the Year 0 simulation period (middle); predicted increase in daily-averaged stage for the Year 0 Sacramento DWSC Only Deepening scenario relative to the Year 0 Baseline scenario (bottom).

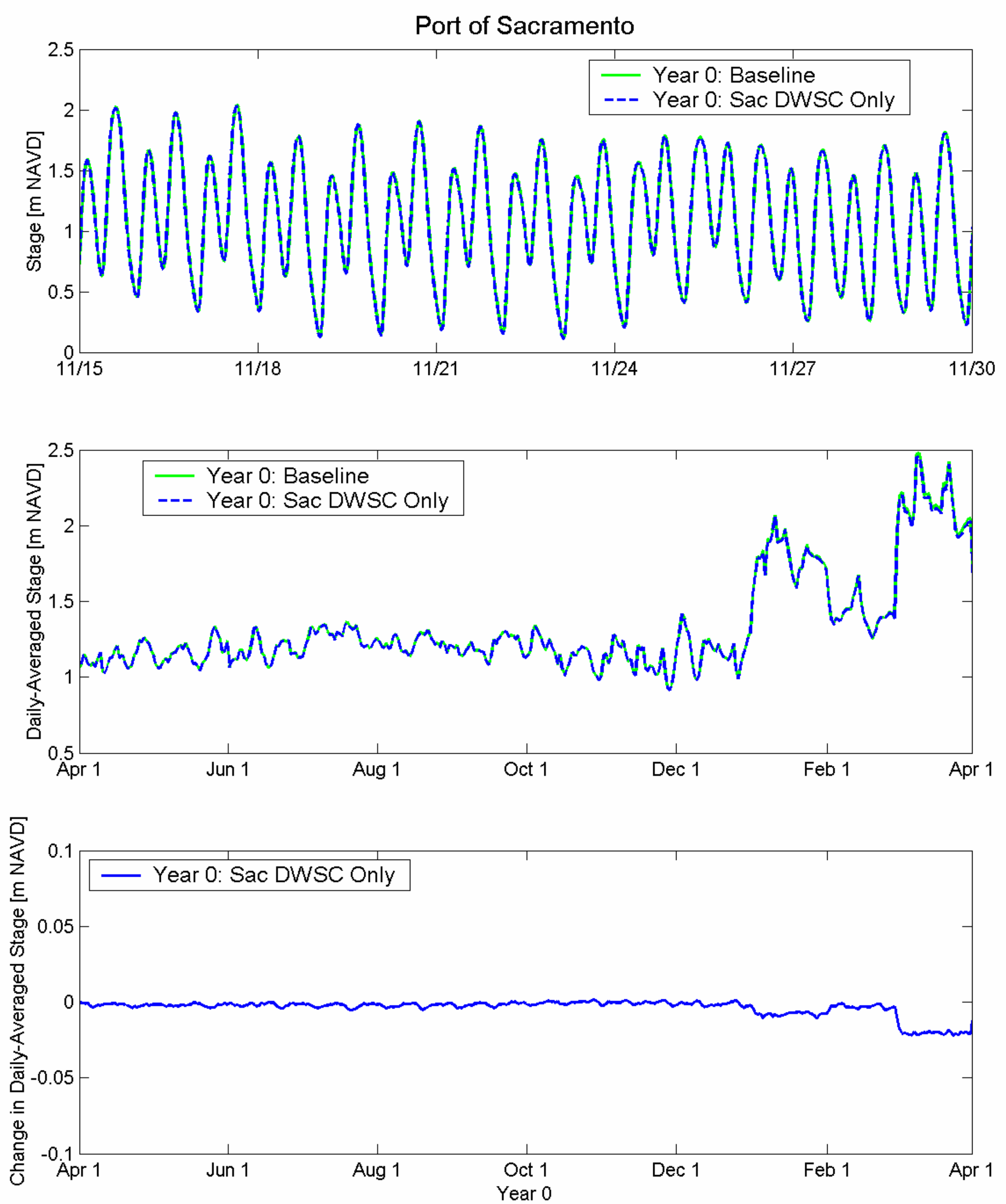


Figure 4.1-6 Predicted stage at the Port of Sacramento for the Year 0 Baseline scenario and the Year 0 Sacramento DWSC Only Deepening scenario: tidal time-scale variability over a 15-day period (top); daily-averaged stage for the Year 0 simulation period (middle); predicted increase in daily-averaged stage for the Year 0 Sacramento DWSC Only Deepening scenario relative to the Year 0 Baseline scenario (bottom).

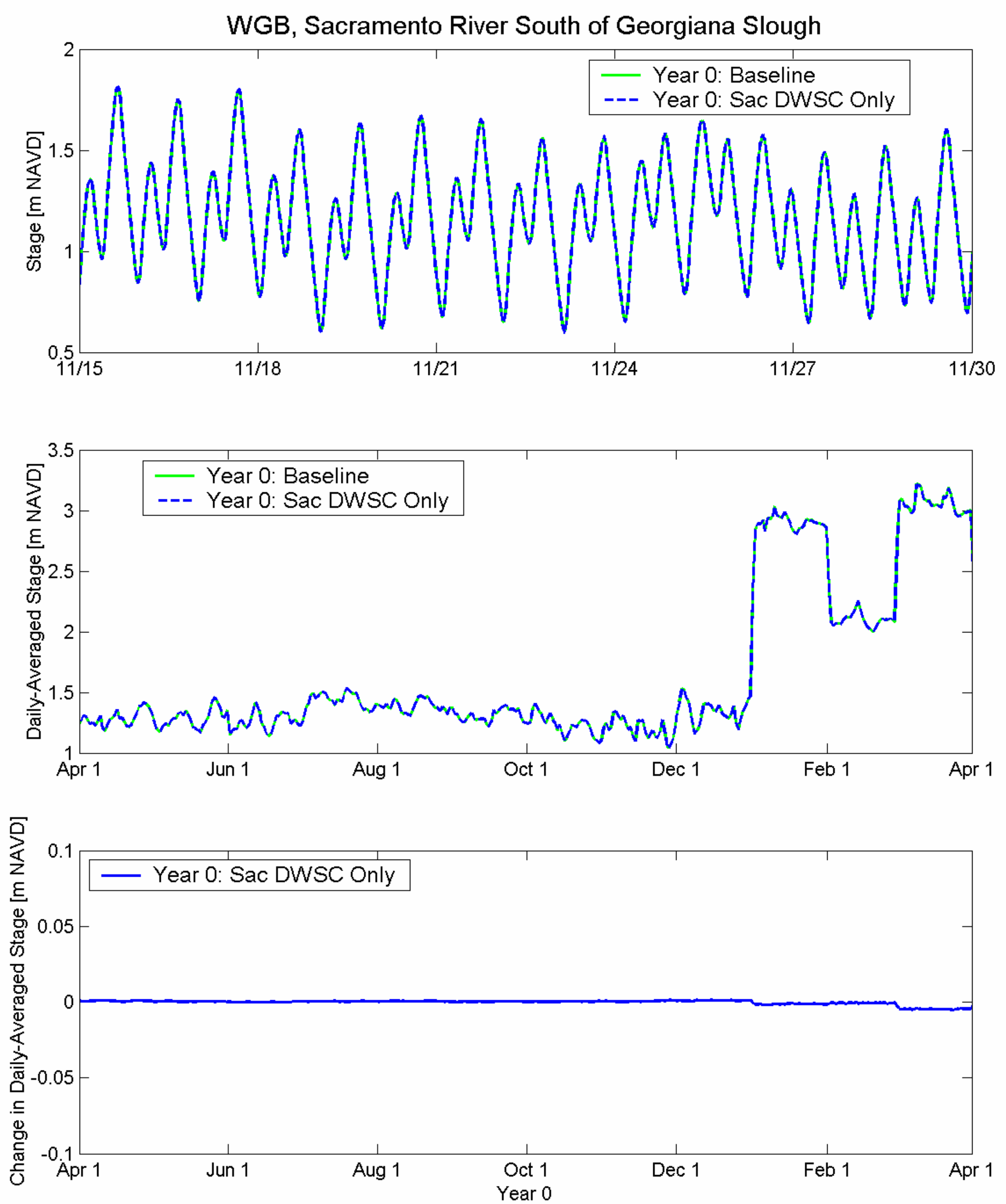


Figure 4.1-7 Predicted stage at Sacramento River South of Georgiana Slough (WGB) for the Year 0 Baseline scenario and the Year 0 Sacramento DWSC Only Deepening scenario: tidal time-scale variability over a 15-day period (top); daily-averaged stage for the Year 0 simulation period (middle); predicted increase in daily-averaged stage for the Year 0 Sacramento DWSC Only Deepening scenario relative to the Year 0 Baseline scenario (bottom).

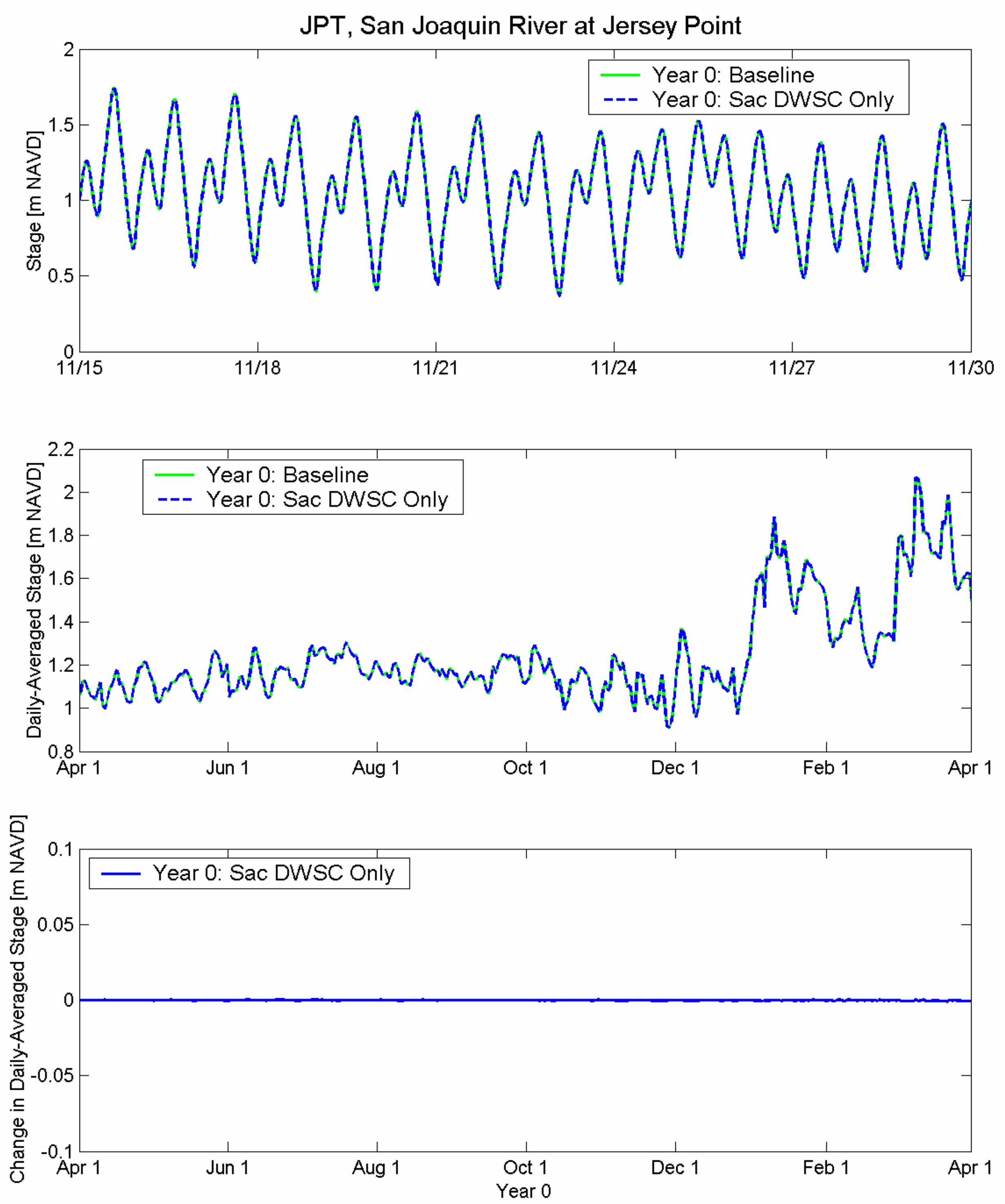


Figure 4.1-8 Predicted stage at San Joaquin River at Jersey Point (JPT) for the Year 0 Baseline scenario and the Year 0 Sacramento DWSC Only Deepening scenario: tidal time-scale variability over a 15-day period (top); daily-averaged stage for the Year 0 simulation period (middle); predicted increase in daily-averaged stage for the Year 0 Sacramento DWSC Only Deepening scenario relative to the Year 0 Baseline scenario (bottom).

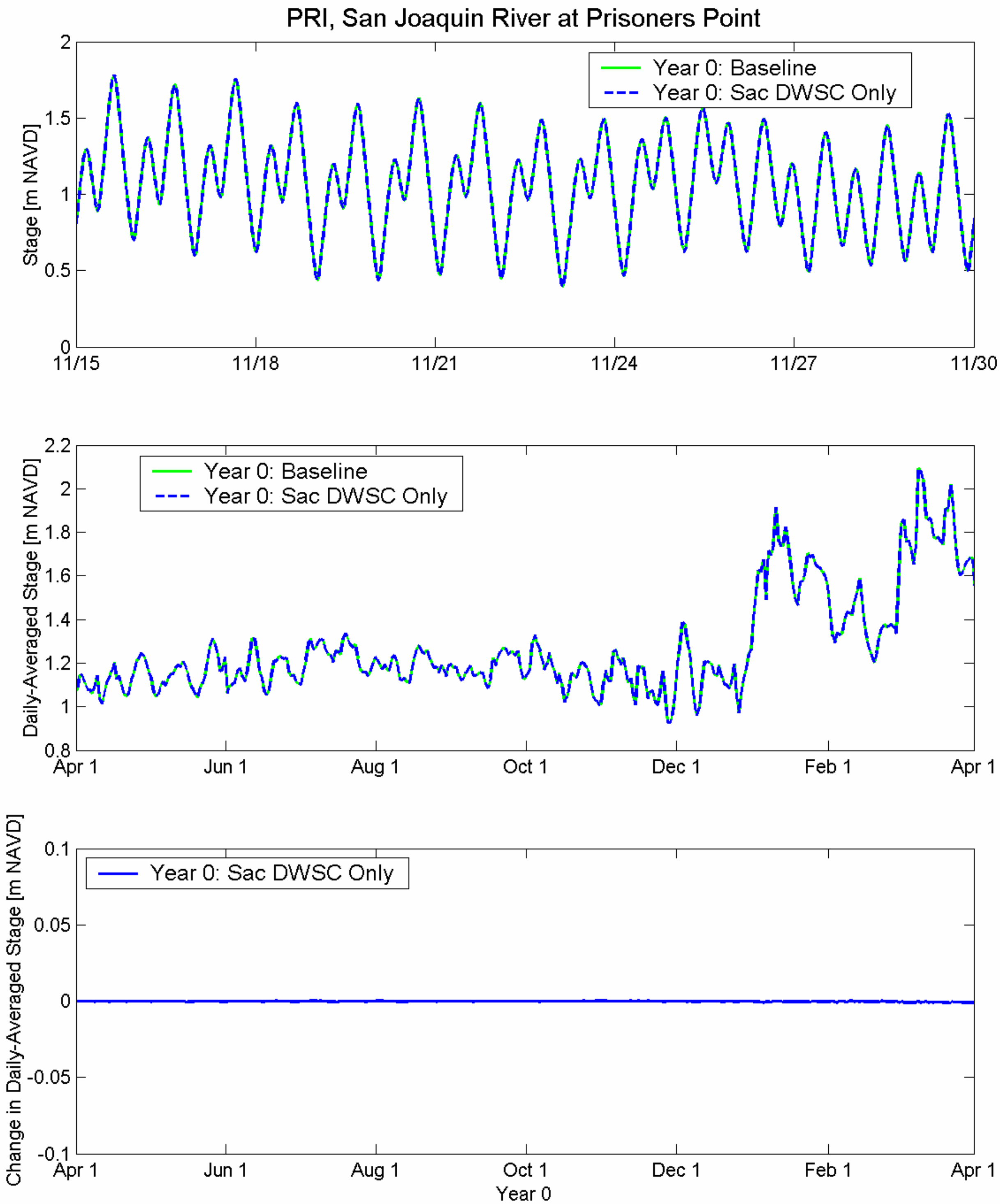


Figure 4.1-9 Predicted stage at San Joaquin River at Prisoners Point (PRI) for the Year 0 Baseline scenario and the Year 0 Sacramento DWSC Only Deepening scenario: tidal time-scale variability over a 15-day period (top); daily-averaged stage for the Year 0 simulation period (middle); predicted increase in daily-averaged stage for the Year 0 Sacramento DWSC Only Deepening scenario relative to the Year 0 Baseline scenario (bottom).

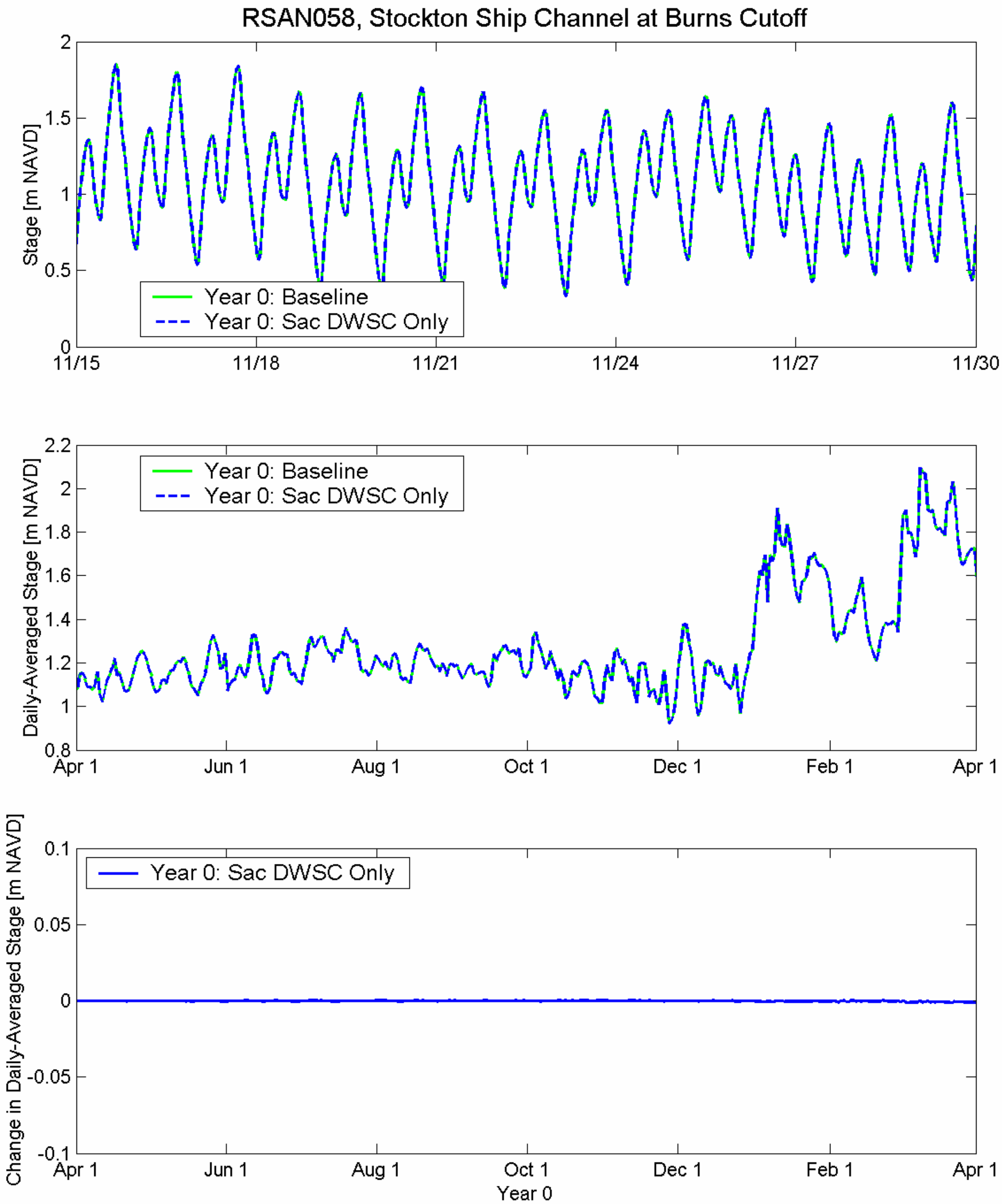


Figure 4.1-10 Predicted stage at Stockton Ship Channel at Burns Cutoff (RSAN058) for the Year 0 Baseline scenario and the Year 0 Sacramento DWSC Only Deepening scenario: tidal time-scale variability over a 15-day period (top); daily-averaged stage for the Year 0 simulation period (middle); predicted increase in daily-averaged stage for the Year 0 Sacramento DWSC Only Deepening scenario relative to the Year 0 Baseline scenario (bottom).

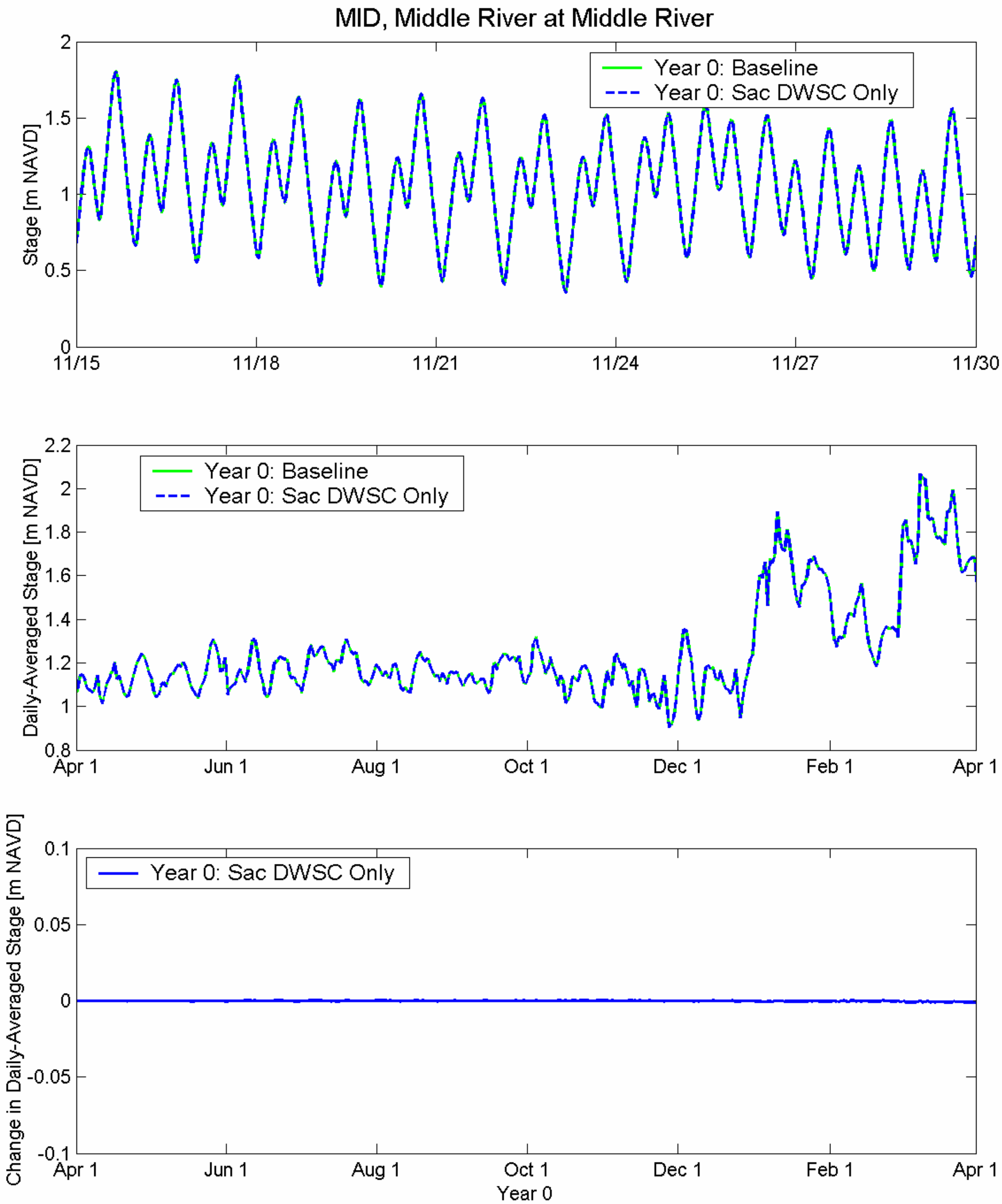


Figure 4.1-11 Predicted stage at Middle River at Middle River (MID) for the Year 0 Baseline scenario and the Year 0 Sacramento DWSC Only Deepening scenario: tidal time-scale variability over a 15-day period (top); daily-averaged stage for the Year 0 simulation period (middle); predicted increase in daily-averaged stage for the Year 0 Sacramento DWSC Only Deepening scenario relative to the Year 0 Baseline scenario (bottom).

4.1.2 Year 0 Both Sacramento DWSC & SF Bay to Stockton DWSC Deepening

For each stage comparison figure included in this section, the top plot shows the tidal time-scale water level variability over a 15-day period for the Year 0 Baseline scenario, the Year 0 Sacramento DWSC Only Deepening scenario, and the Year 0 Both DWSC Deepening scenario. The middle plot shows daily-averaged stage during the full simulation year for each scenario. The bottom plot shows the predicted change in daily-averaged stage for the Year 0 Sacramento DWSC Only Deepening scenario and the Year 0 Both DWSC Deepening scenario relative to the Year 0 Baseline scenario. In cases where the predicted stage is identical between scenarios, some lines are not fully visible. Since the lines are plotted in the order listed on the legend, for periods where the predicted stage for the Year 0 Baseline scenario or the Year 0 Sacramento DWSC Only Deepening scenario are not fully visible, the predicted stage for these scenarios is identical to the visible line(s).

Figure 4.1-12 shows the predicted stage at Sacramento River at Martinez (RSAC054) for the Year 0 Baseline scenario, the Year 0 Sacramento DWSC Only Deepening scenario, and the Year 0 Both DWSC Deepening scenario. During the second half of November (top panel of Figure 4.1-12), the predicted stage for all three scenarios is identical. Similarly, the daily-averaged stage is nearly identical between the three scenarios over the entire simulation year. No change in stage relative to the Year 0 Baseline scenario is predicted at Martinez for either the Year 0 Sacramento DWSC Only Deepening scenario or the Year 0 Both DWSC Deepening scenario.

Figure 4.1-13 shows the predicted stage at Sacramento River at Collinsville (RSAC081) for the Year 0 Baseline scenario, the Year 0 Sacramento DWSC Only Deepening scenario, and the Year 0 Both DWSC Deepening scenario. During the second half of November (top panel of Figure 4.1-13), the predicted stage for all three scenarios is identical. Similarly, the daily-averaged stage is nearly identical between the three scenarios over the entire simulation year. A slight decrease in daily-averaged stage of less than 0.005 m is predicted under the Year 0 Both DWSC Deepening scenario during the high flow period between January and March. This decrease in stage is likely the result of the increased conveyance resulting from the Both DSWC deepening scenario.

Figure 4.1-14 shows the predicted stage at Sacramento River at Rio Vista (RIO) for the Year 0 Baseline scenario, the Year 0 Sacramento DWSC Only Deepening scenario, and the Year 0 Both DWSC Deepening scenario. During the second half of November (top panel of Figure 4.1-14), the predicted stage for all three scenarios is identical. Similarly, the daily-averaged stage is nearly identical between the three scenarios over the entire simulation year. A slight decrease in daily-averaged stage of less than 0.01 m is predicted under both the Year 0 Sacramento DWSC Only Deepening scenario and the Year 0 Both DWSC Deepening scenario during the high flow period between January and March. This decrease in stage is likely the result of the increased conveyance along the Sacramento River resulting from the deepening of the Sacramento DSWC in this reach.

Figure 4.1-15 shows the predicted stage at Cache Slough at Ryer Island (CCH) for the Year 0 Baseline scenario, the Year 0 Sacramento DWSC Only Deepening scenario, and the Year 0 Both

DWSC Deepening scenario. During the second half of November (top panel of Figure 4.1-15), the predicted stage for all three scenarios is identical. Similarly, the daily-averaged stage is nearly identical between the three scenarios over the entire simulation year. A slight decrease in daily-averaged stage of less than 0.02 m is predicted under the Year 0 Sacramento DWSC Only Deepening scenario and a decrease of less than 0.03 m is predicted under the Year 0 Both DWSC Deepening scenario during the high flow period between January and March. This decrease in stage is likely the result of the increased conveyance in Cache Slough resulting from the deepening of the Sacramento DSWC in this reach.

Figure 4.1-16 shows the predicted stage at the Sacramento DWSC (USGS Station 11455335) for the Year 0 Baseline scenario, the Year 0 Sacramento DWSC Only Deepening scenario, and the Year 0 Both DWSC Deepening scenario. During the second half of November (top panel of Figure 4.1-16), the predicted stage for all three scenarios is identical. Similarly, the daily-averaged stage is nearly identical between the three scenarios over the entire simulation year. A slight decrease in daily-averaged stage of less than 0.03 m is predicted under both the Year 0 Sacramento DWSC Only Deepening scenario and the Year 0 Both DWSC Deepening scenario during the high flow period between January and March. This decrease in stage is likely the result of the increased conveyance in the Cache Slough reach of the Sacramento DWSC, which results in a decrease in stage in Cache Slough, and a corresponding decrease in stage in the man-made portion of the Sacramento DSWC.

Figure 4.1-17 shows the predicted stage at the Port of Sacramento for the Year 0 Baseline scenario, the Year 0 Sacramento DWSC Only Deepening scenario, and the Year 0 Both DWSC Deepening scenario. During the second half of November (top panel of Figure 4.1-17), the predicted stage for all three scenarios is identical. Similarly, the daily-averaged stage is nearly identical between the three scenarios over the entire simulation year. A slight decrease in daily-averaged stage of less than 0.025 m is predicted under both the Year 0 Sacramento DWSC Only Deepening scenario and the Year 0 Both DWSC Deepening scenario during the high flow period between January and March. This decrease in stage is likely the result of the increased conveyance in Cache Slough which results in a decrease in stage in Cache Slough, and a corresponding decrease in stage in the man-made portion of the Sacramento DSWC upstream to the Port of Sacramento.

Figure 4.1-18 shows the predicted stage at Sacramento River South of Georgiana Slough (WGB) for the Year 0 Baseline scenario, the Year 0 Sacramento DWSC Only Deepening scenario, and the Year 0 Both DWSC Deepening scenario. During the second half of November (top panel of Figure 4.1-18), the predicted stage for all three scenarios is identical. Similarly, the daily-averaged stage is nearly identical between the three scenarios over the entire simulation year. A slight decrease in daily-averaged stage of less than 0.01 m is predicted under both the Year 0 Sacramento DWSC Only Deepening scenario and the Year 0 Both DWSC Deepening scenario during the high flow period between January and March.

Figure 4.1-19 shows the predicted stage at San Joaquin River at Jersey Point (JPT) for the Year 0 Baseline scenario, the Year 0 Sacramento DWSC Only Deepening scenario, and the Year 0 Both DWSC Deepening scenario. During the second half of November (top panel of Figure 4.1-19), the predicted stage for all three scenarios is identical. Similarly, the daily-averaged stage is nearly identical between the three scenarios over the entire simulation year. No change in stage relative to the Year 0 Baseline scenario is predicted under the Year 0 Sacramento DWSC Only Deepening scenario. A slight decrease in daily-averaged stage of less than 0.01 m is predicted under the Year 0 Both DWSC Deepening scenario during the high flow period between January and March.

Figure 4.1-20 shows the predicted stage at San Joaquin River at Prisoners Point (PRI) for the Year 0 Baseline scenario, the Year 0 Sacramento DWSC Only Deepening scenario, and the Year 0 Both DWSC Deepening scenario. During the second half of November (top panel of Figure 4.1-20), the predicted stage for all three scenarios is identical. Similarly, the daily-averaged stage is nearly identical between the three scenarios over the entire simulation year. No change in stage relative to the Year 0 Baseline scenario is predicted under the Year 0 Sacramento DWSC Only Deepening scenario. A slight decrease in daily-averaged stage of less than 0.01 m is predicted under the Year 0 Both DWSC Deepening scenario during the high flow period between January and March.

Figure 4.1-21 shows the predicted stage at Stockton Ship Channel at Burns Cutoff (RSAN058) for the Year 0 Baseline scenario, the Year 0 Sacramento DWSC Only Deepening scenario, and the Year 0 Both DWSC Deepening scenario. During the second half of November (top panel of Figure 4.1-21), the predicted stage for all three scenarios is identical. Similarly, the daily-averaged stage is nearly identical between the three scenarios over the entire simulation year. No change in stage relative to the Year 0 Baseline scenario is predicted under the Year 0 Sacramento DWSC Only Deepening scenario. A slight decrease in daily-averaged stage of less than 0.02 m is predicted under the Year 0 Both DWSC Deepening scenario during the high flow period between January and March.

Figure 4.1-22 shows the predicted stage at Middle River at Middle River (MID) for the Year 0 Baseline scenario, the Year 0 Sacramento DWSC Only Deepening scenario, and the Year 0 Both DWSC Deepening scenario. During the second half of November (top panel of Figure 4.1-22), the predicted stage for all three scenarios is identical. Similarly, the daily-averaged stage is nearly identical between the three scenarios over the entire simulation year. No change in stage relative to the Year 0 Baseline scenario is predicted under the Year 0 Sacramento DWSC Only Deepening scenario. A slight decrease in daily-averaged stage of less than 0.01 m is predicted under the Year 0 Both DWSC Deepening scenario during the high flow period between January and March.

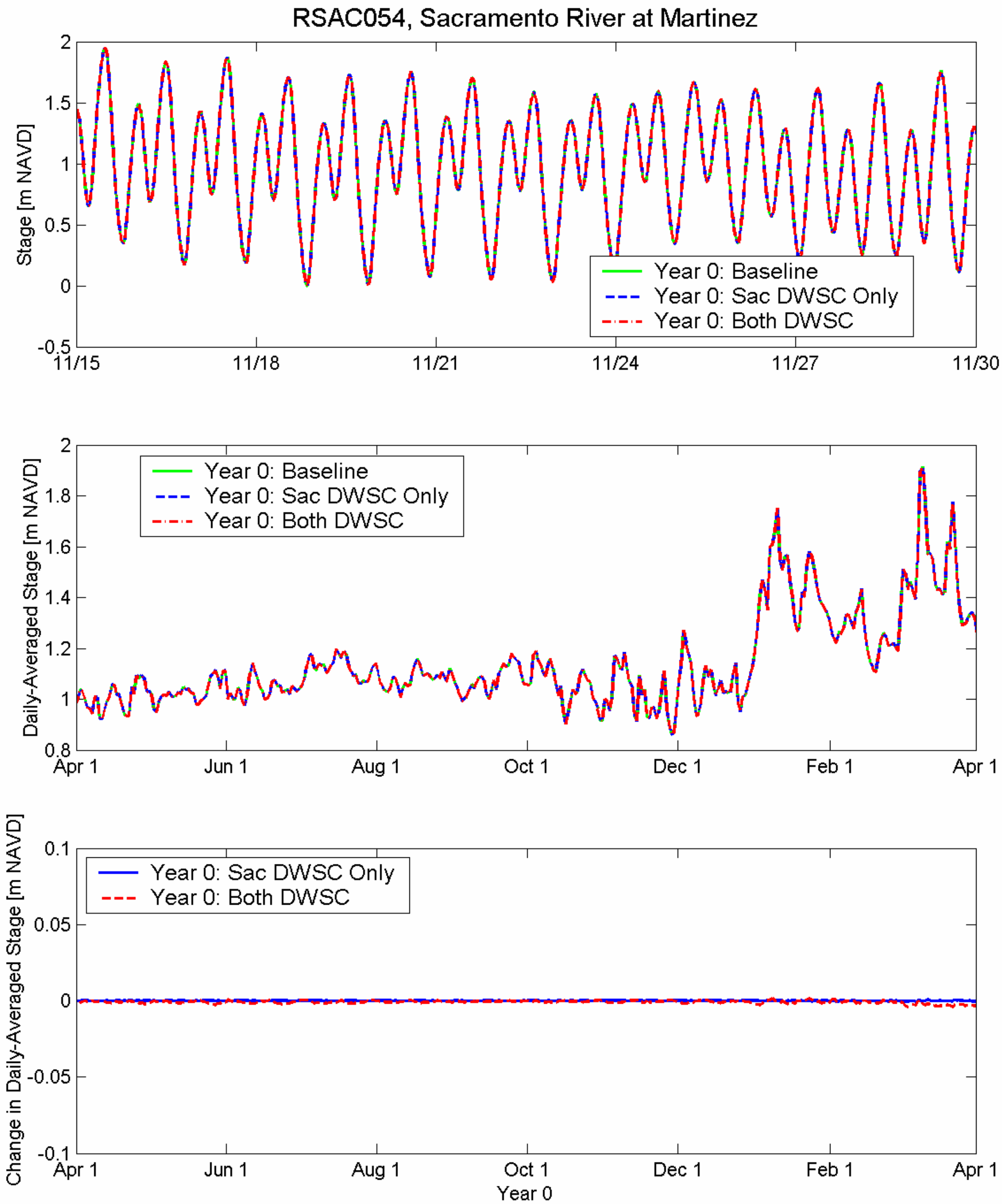


Figure 4.1-12 Predicted stage at Sacramento River at Martinez (RSAC054) for the Year 0 Baseline scenario, the Year 0 Sacramento DWSC Only Deepening scenario, and the Year 0 Both DWSC Deepening scenario: tidal time-scale variability over a 15-day period (top); daily-averaged stage for the Year 0 simulation period (middle); predicted increase in daily-averaged stage for the Year 0 Sacramento DWSC Only Deepening scenario and the Year 0 Both DWSC Deepening scenario relative to the Year 0 Baseline scenario (bottom).

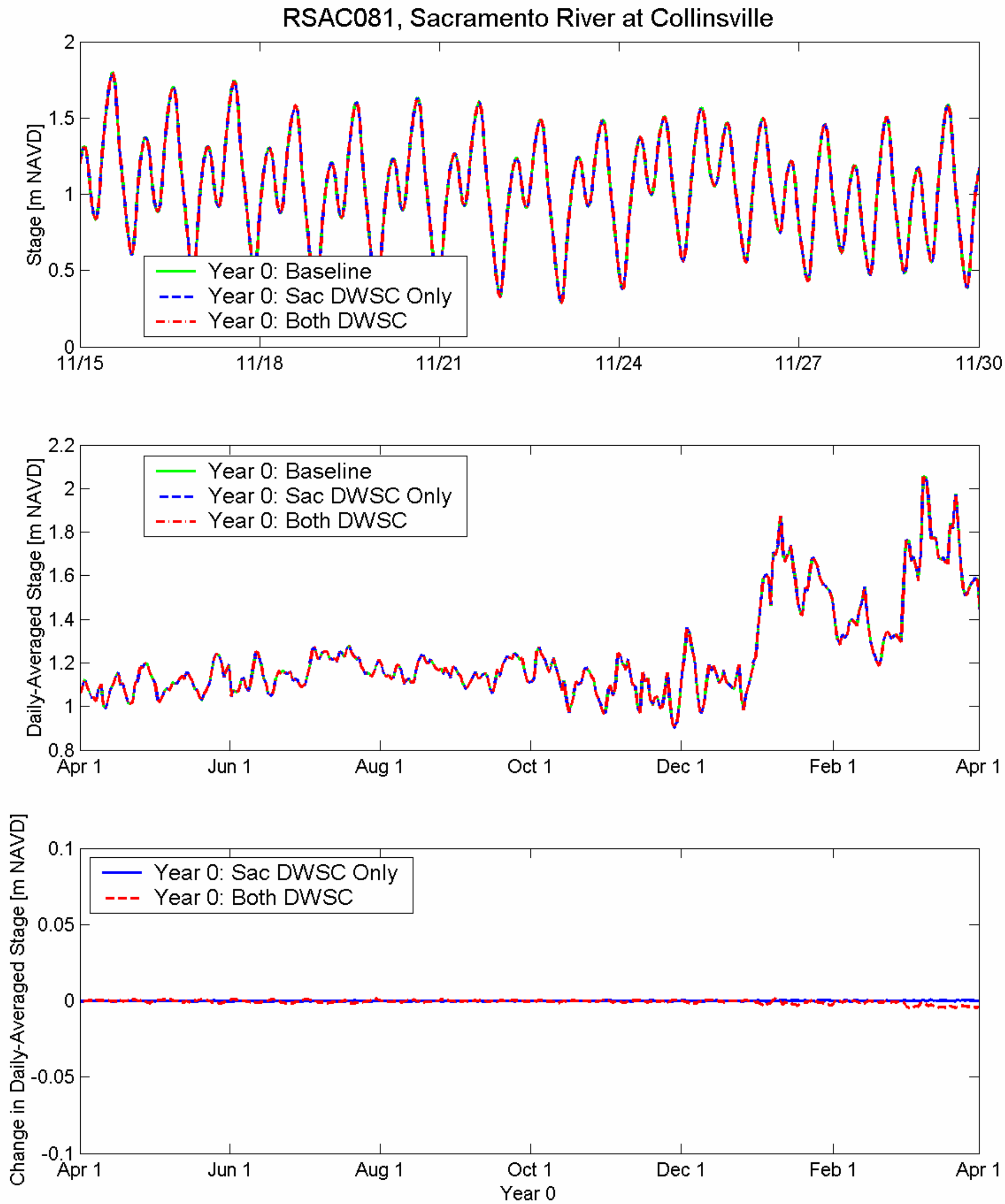


Figure 4.1-13 Predicted stage at Sacramento River at Collinsville (RSAC081) for the Year 0 Baseline scenario, the Year 0 Sacramento DWSC Only Deepening scenario, and the Year 0 Both DWSC Deepening scenario: tidal time-scale variability over a 15-day period (top); daily-averaged stage for the Year 0 simulation period (middle); predicted increase in daily-averaged stage for the Year 0 Sacramento DWSC Only Deepening scenario and the Year 0 Both DWSC Deepening scenario relative to the Year 0 Baseline scenario (bottom).

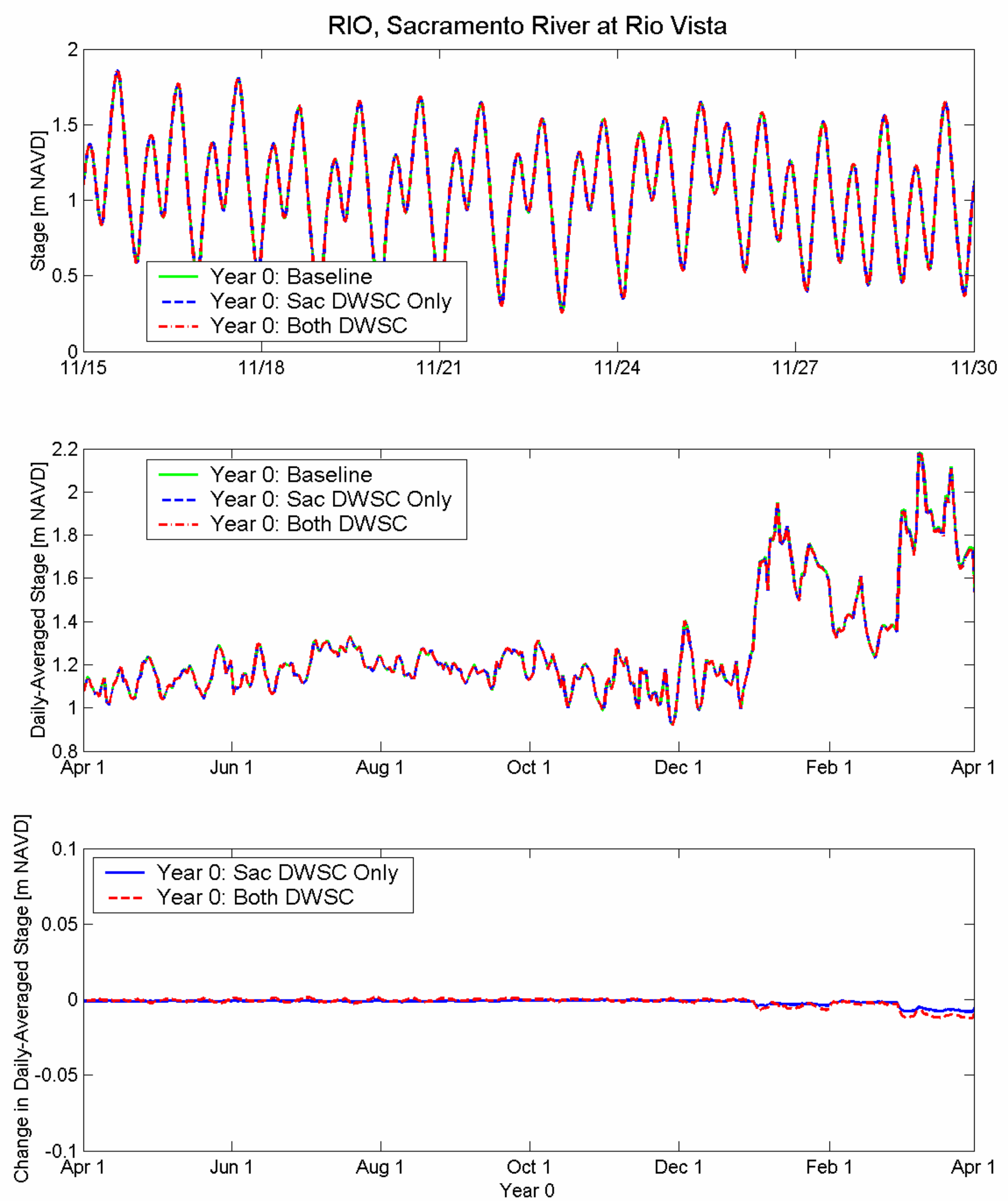


Figure 4.1-14 Predicted stage at Sacramento River at Rio Vista (RIO) for the Year 0 Baseline scenario, the Year 0 Sacramento DWSC Only Deepening scenario, and the Year 0 Both DWSC Deepening scenario: tidal time-scale variability over a 15-day period (top); daily-averaged stage for the Year 0 simulation period (middle); predicted increase in daily-averaged stage for the Year 0 Sacramento DWSC Only Deepening scenario and the Year 0 Both DWSC Deepening scenario relative to the Year 0 Baseline scenario (bottom).

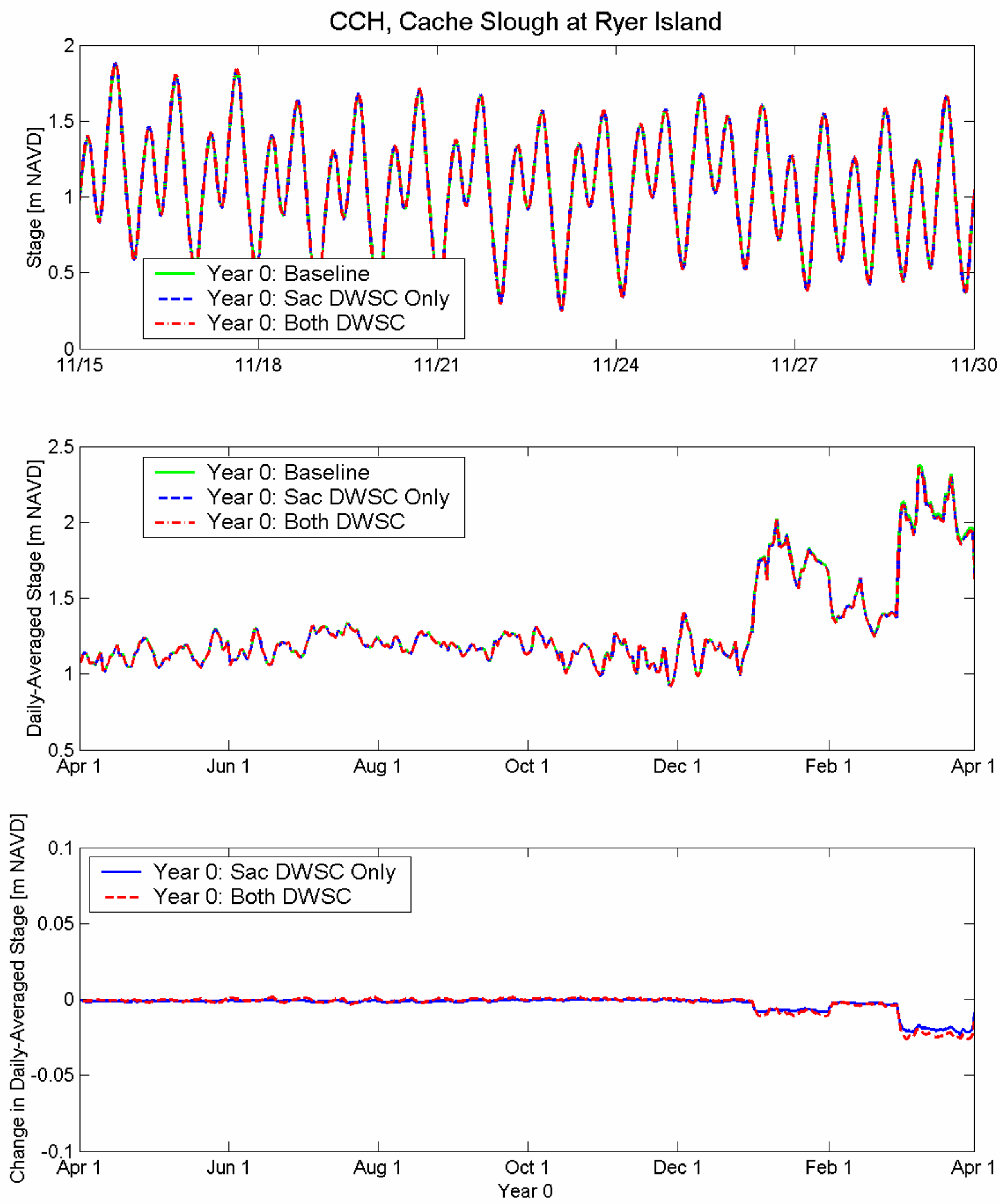


Figure 4.1-15 Predicted stage at Cache Slough at Ryer Island (CCH) for the Year 0 Baseline scenario, the Year 0 Sacramento DWSC Only Deepening scenario, and the Year 0 Both DWSC Deepening scenario: tidal time-scale variability over a 15-day period (top); daily-averaged stage for the Year 0 simulation period (middle); predicted increase in daily-averaged stage for the Year 0 Sacramento DWSC Only Deepening scenario and the Year 0 Both DWSC Deepening scenario relative to the Year 0 Baseline scenario (bottom).

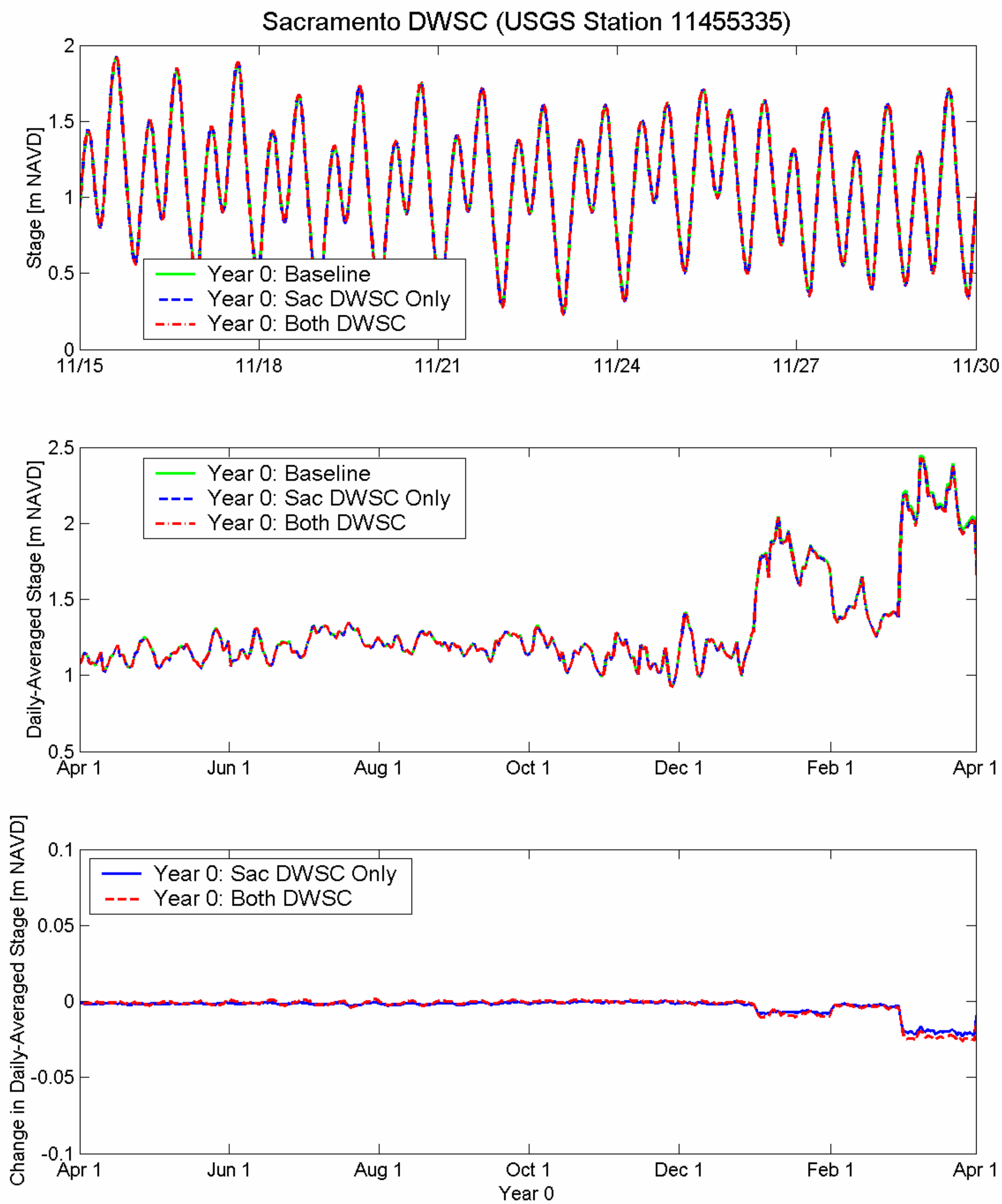


Figure 4.1-16 Predicted stage at Sacramento DWSC (USGS Station 11455335) for the Year 0 Baseline scenario, the Year 0 Sacramento DWSC Only Deepening scenario, and the Year 0 Both DWSC Deepening scenario: tidal time-scale variability over a 15-day period (top); daily-averaged stage for the Year 0 simulation period (middle); predicted increase in daily-averaged stage for the Year 0 Sacramento DWSC Only Deepening scenario and the Year 0 Both DWSC Deepening scenario relative to the Year 0 Baseline scenario (bottom).

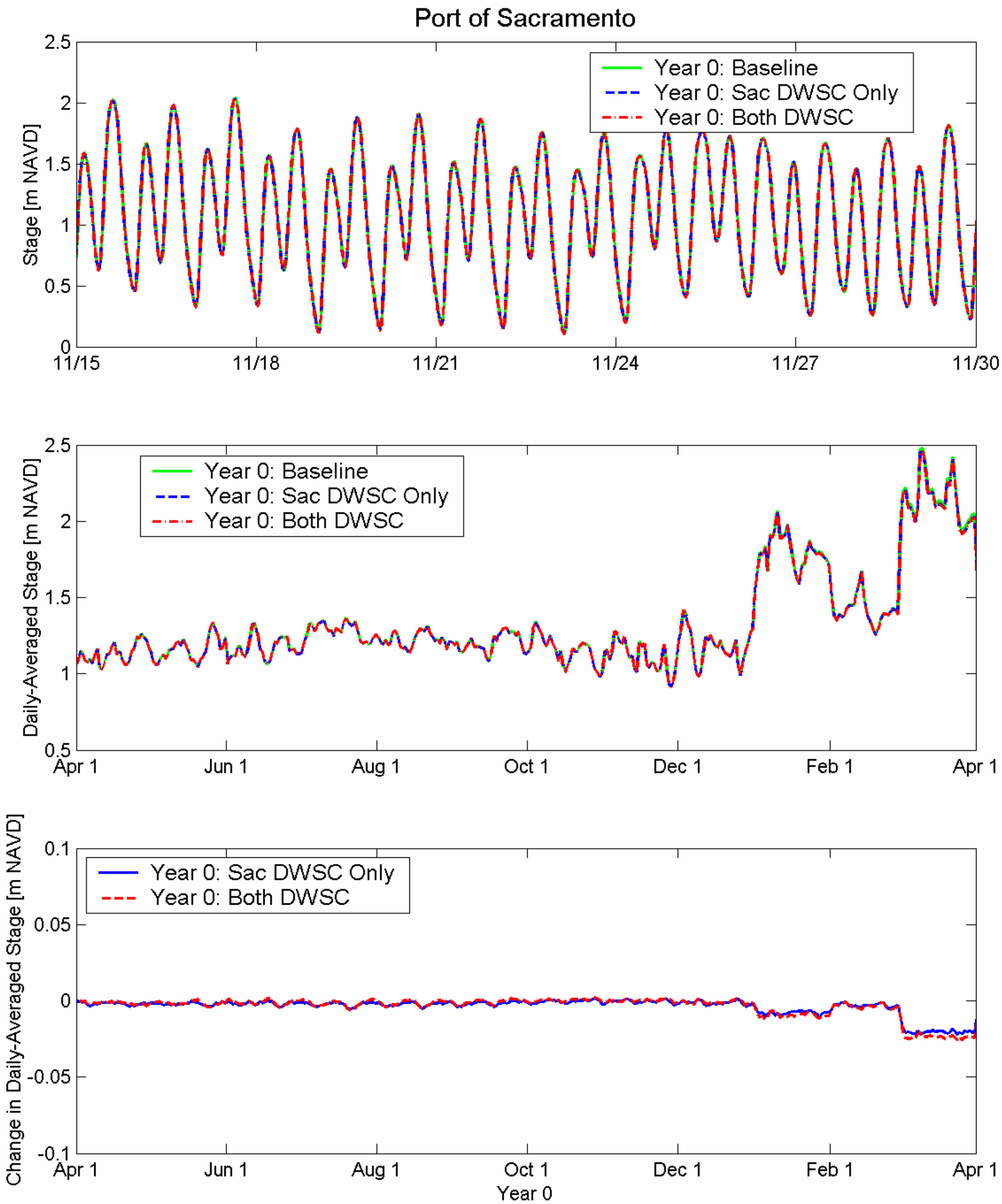


Figure 4.1-17 Predicted stage at the Port of Sacramento for the Year 0 Baseline scenario, the Year 0 Sacramento DWSC Only Deepening scenario, and the Year 0 Both DWSC Deepening scenario: tidal time-scale variability over a 15-day period (top); daily-averaged stage for the Year 0 simulation period (middle); predicted increase in daily-averaged stage for the Year 0 Sacramento DWSC Only Deepening scenario and the Year 0 Both DWSC Deepening scenario relative to the Year 0 Baseline scenario (bottom).

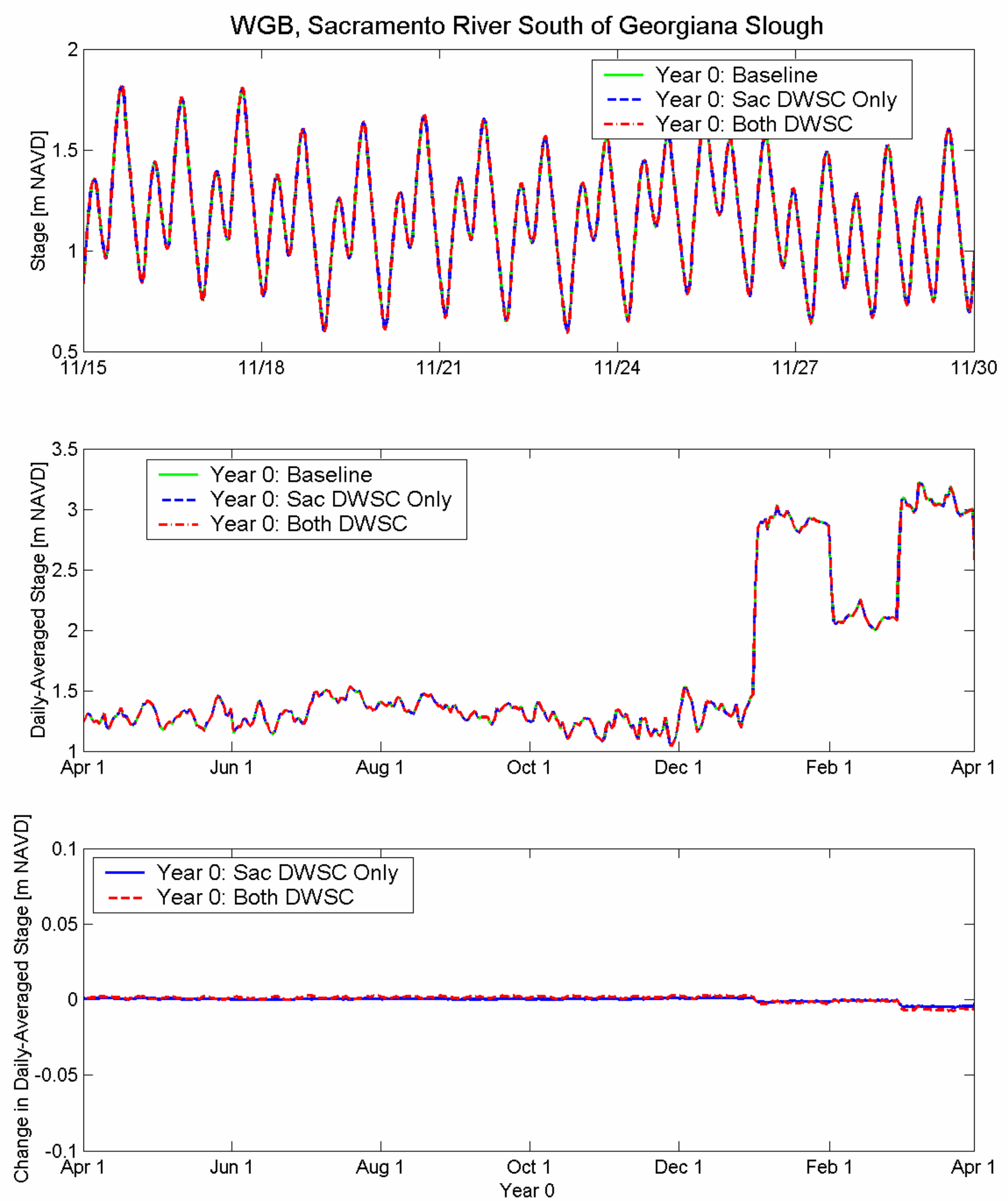


Figure 4.1-18 Predicted stage at Sacramento River South of Georgiana Slough (WGB) for the Year 0 Baseline scenario, the Year 0 Sacramento DWSC Only Deepening scenario, and the Year 0 Both DWSC Deepening scenario: tidal time-scale variability over a 15-day period (top); daily-averaged stage for the Year 0 simulation period (middle); predicted increase in daily-averaged stage for the Year 0 Sacramento DWSC Only Deepening scenario and the Year 0 Both DWSC Deepening scenario relative to the Year 0 Baseline scenario (bottom).

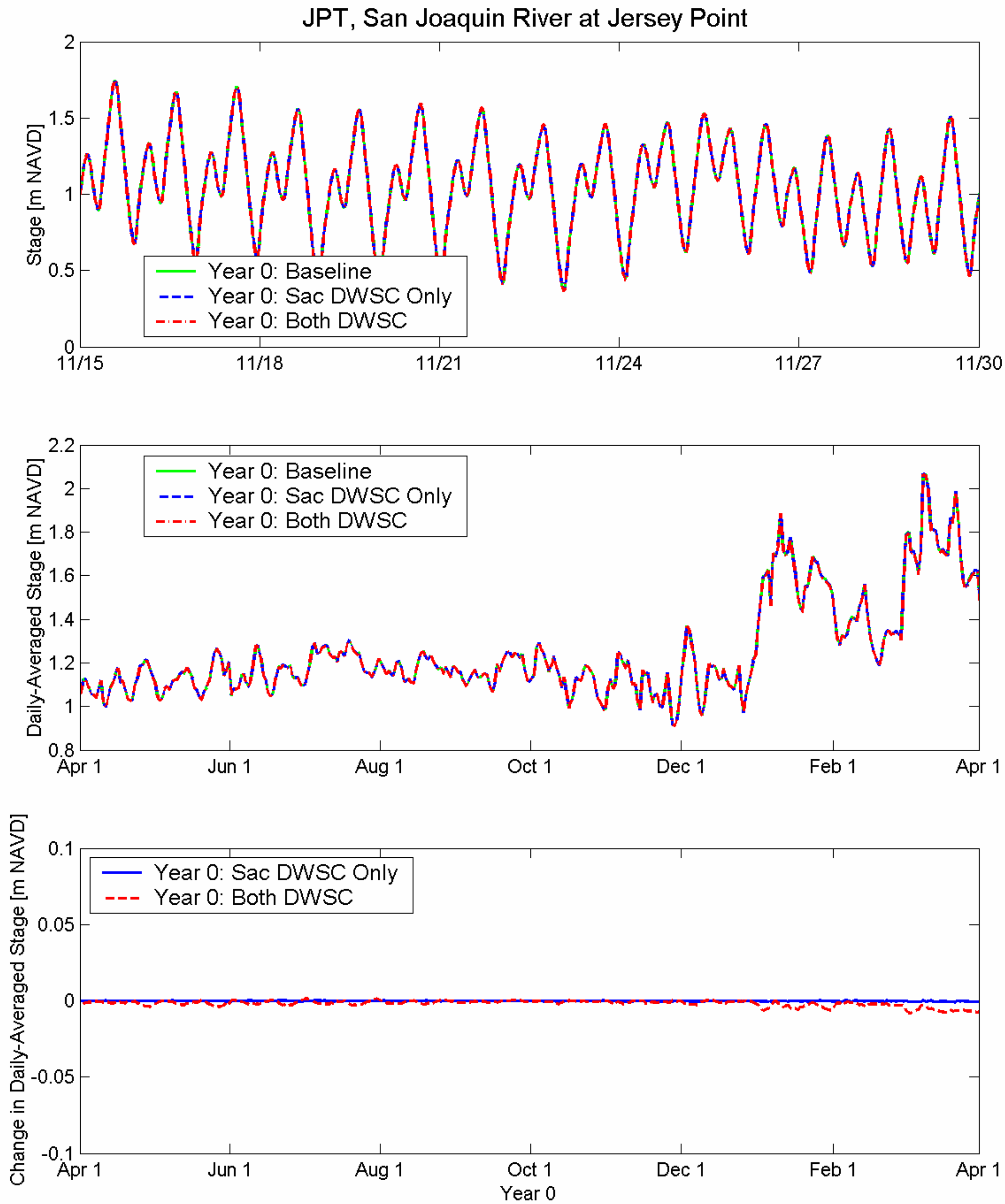


Figure 4.1-19 Predicted stage at San Joaquin River at Jersey Point (JPT) for the Year 0 Baseline scenario, the Year 0 Sacramento DWSC Only Deepening scenario, and the Year 0 Both DWSC Deepening scenario: tidal time-scale variability over a 15-day period (top); daily-averaged stage for the Year 0 simulation period (middle); predicted increase in daily-averaged stage for the Year 0 Sacramento DWSC Only Deepening scenario and the Year 0 Both DWSC Deepening scenario relative to the Year 0 Baseline scenario (bottom).

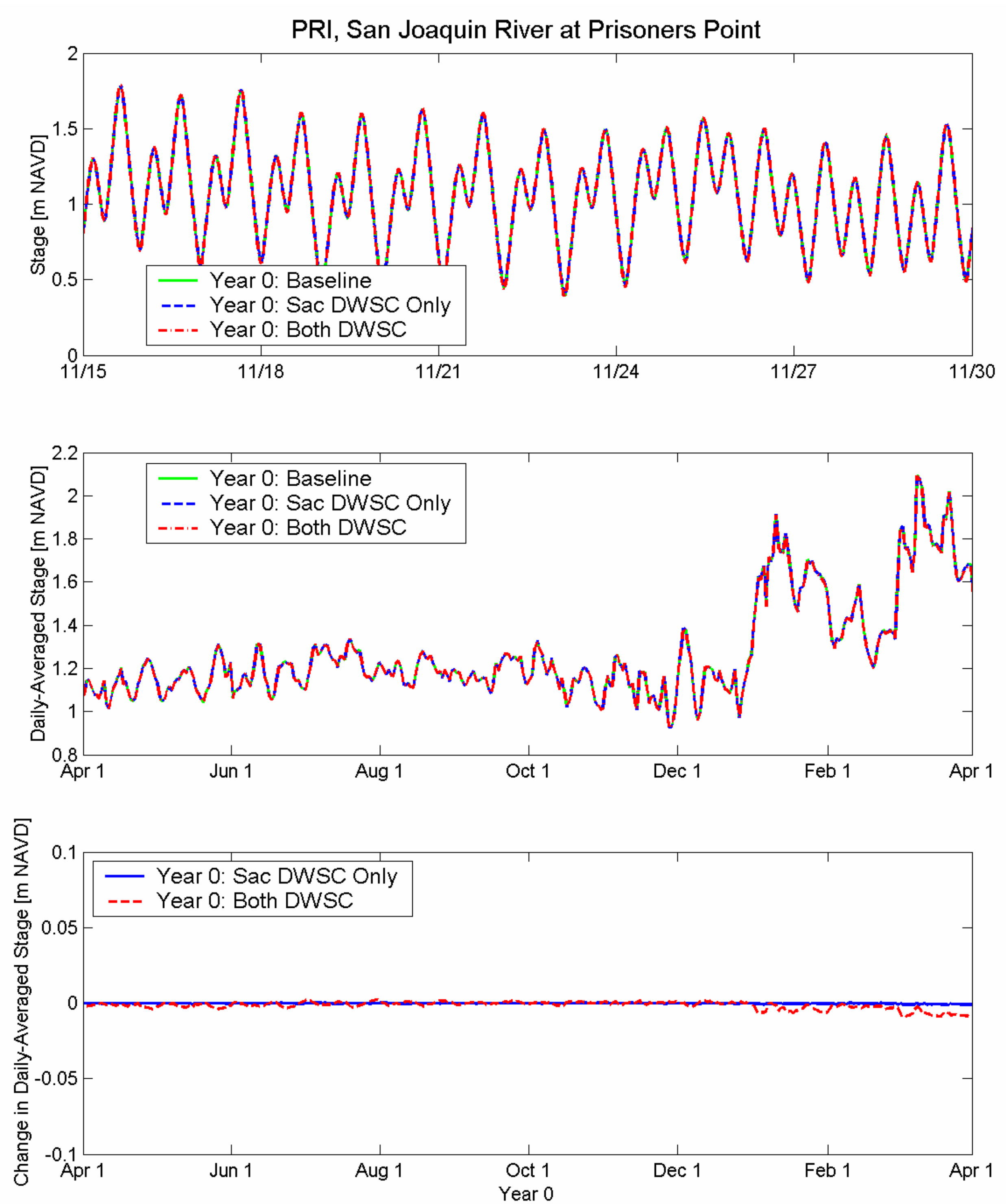


Figure 4.1-20 Predicted stage at San Joaquin River at Prisoners Point (PRI) for the Year 0 Baseline scenario, the Year 0 Sacramento DWSC Only Deepening scenario, and the Year 0 Both DWSC Deepening scenario: tidal time-scale variability over a 15-day period (top); daily-averaged stage for the Year 0 simulation period (middle); predicted increase in daily-averaged stage for the Year 0 Sacramento DWSC Only Deepening scenario and the Year 0 Both DWSC Deepening scenario relative to the Year 0 Baseline scenario (bottom).

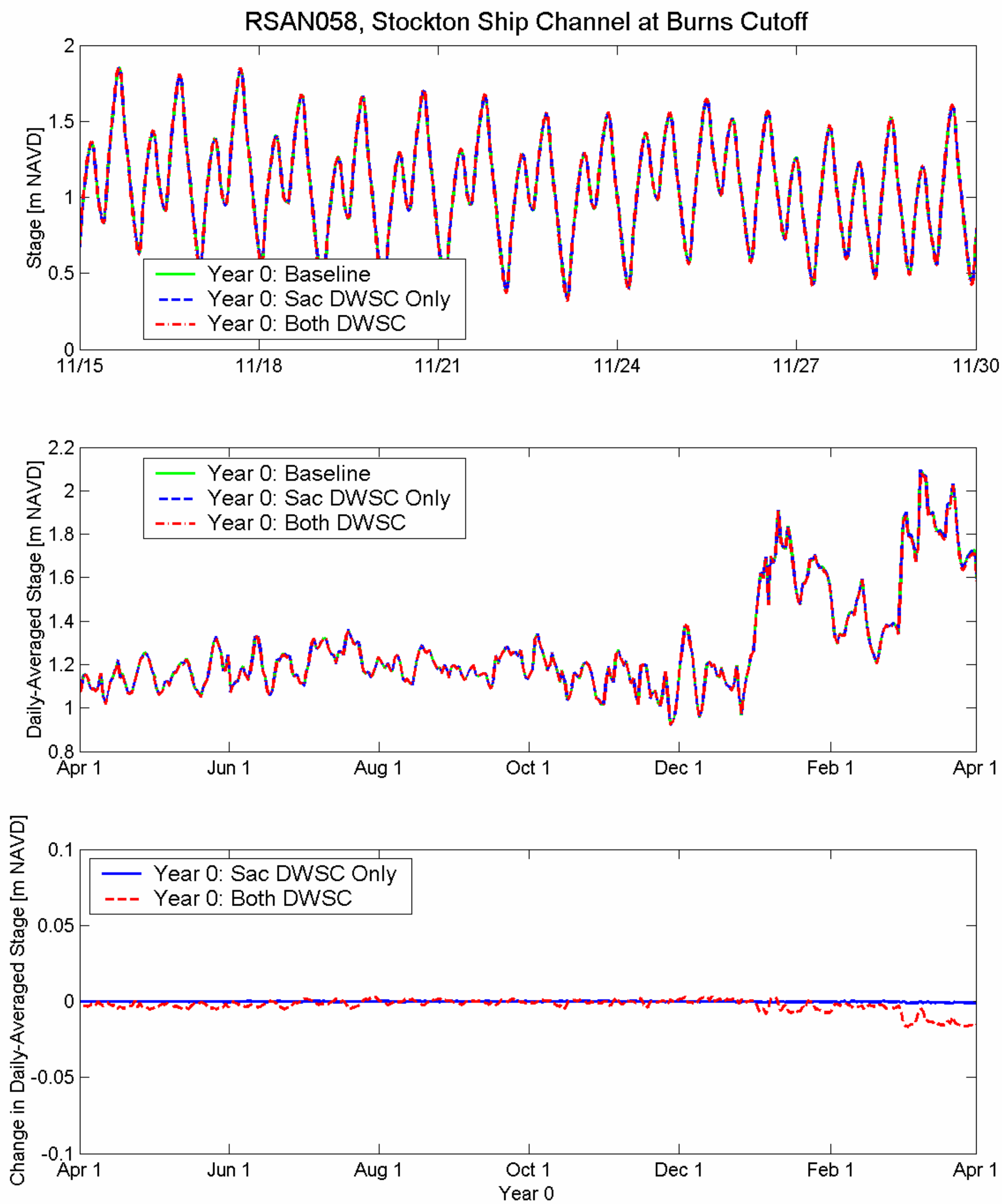


Figure 4.1-21 Predicted stage at Stockton Ship Channel at Burns Cutoff (RSAN058) for the Year 0 Baseline scenario, the Year 0 Sacramento DWSC Only Deepening scenario, and the Year 0 Both DWSC Deepening scenario: tidal time-scale variability over a 15-day period (top); daily-averaged stage for the Year 0 simulation period (middle); predicted increase in daily-averaged stage for the Year 0 Sacramento DWSC Only Deepening scenario and the Year 0 Both DWSC Deepening scenario relative to the Year 0 Baseline scenario (bottom).

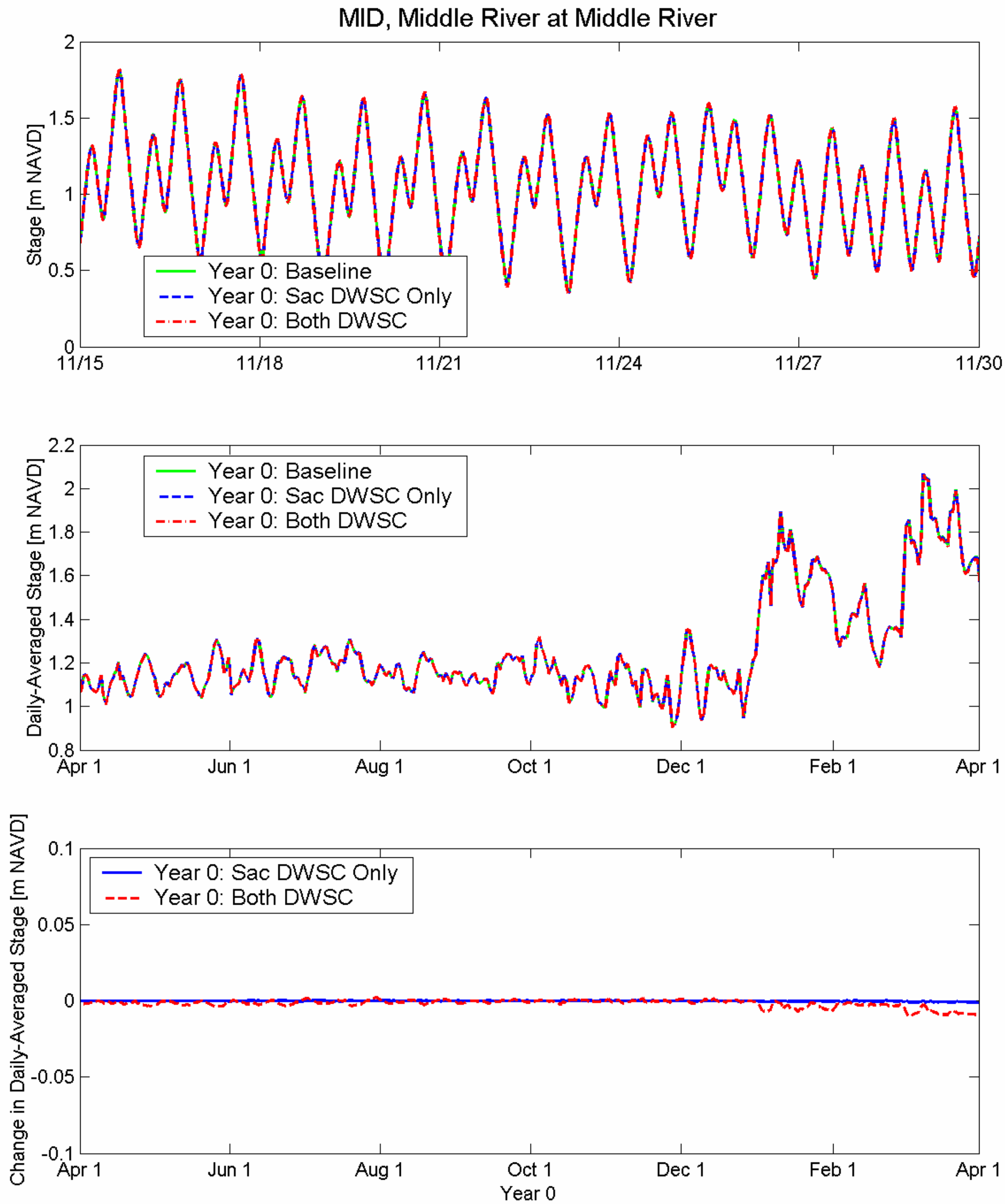


Figure 4.1-22 Predicted stage at Middle River at Middle River (MID) for the Year 0 Baseline scenario, the Year 0 Sacramento DWSC Only Deepening scenario, and the Year 0 Both DWSC Deepening scenario: tidal time-scale variability over a 15-day period (top); daily-averaged stage for the Year 0 simulation period (middle); predicted increase in daily-averaged stage for the Year 0 Sacramento DWSC Only Deepening scenario and the Year 0 Both DWSC Deepening scenario relative to the Year 0 Baseline scenario (bottom).

4.2 Evaluation of Impact on Tidal Flows

Flow time series provide information about potential impacts on tidal flows over time at a fixed location. Flow time series comparisons were made at nineteen continuous flow monitoring stations in San Francisco Bay and the Sacramento-San Joaquin Delta, shown on Figure 3.3-2. Comparisons for the Year 0 simulation period between predicted flows for the Year 0 Baseline scenario and the Year 0 Sacramento DWSC Only Deepening scenario are shown in Section 4.2.1. Comparisons for the Year 0 simulation period between predicted flows for the Year 0 Baseline scenario, the Year 0 Sacramento DWSC Only Deepening scenario, and the Year 0 Both DWSC Deepening scenario are shown in Section 4.2.2.

4.2.1 Year 0 Sacramento DWSC Only Deepening

For each flow comparison figure included in this section, the top plot shows the tidal time-scale flow variability over a 15-day period for the Year 0 Baseline scenario and the Year 0 Sacramento DWSC Only Deepening scenario. The middle plot shows daily-averaged flow during the full simulation year for each scenario. The bottom plot shows the predicted change in daily-averaged flow for the Year 0 Sacramento DWSC Only Deepening scenario relative to the Year 0 Baseline scenario. In cases where the predicted flow is identical between scenarios, some lines are not fully visible. Since the lines are plotted in the order listed on the legend, for periods where the predicted flow for the Year 0 Baseline scenario is not fully visible, the predicted flow for the Year 0 Baseline scenario is identical to the visible line for the Year 0 Sacramento DWSC Only Deepening scenario.

Figure 4.2-1 shows the predicted flow at Chipps Island for the Year 0 Baseline scenario and the Year 0 Sacramento DWSC Only Deepening scenario. During the second half of November (top panel of Figure 4.2-1), the predicted flow for both scenarios is identical. Similarly, the daily-averaged flow is nearly identical between both scenarios over the entire simulation year. The change in daily-averaged flow plot (lower panel of Figure 4.2-1) shows some small differences in daily-averaged flow between the Year 0 Baseline scenario and the Year 0 Sacramento DWSC Only Deepening scenario. These differences are very small relative to the daily-averaged flow magnitude, and are likely the result of a small increase in tidal prism and small phase differences in tidal propagation resulting from the Sacramento DWSC deepening.

Figure 4.2-2 shows the predicted flow at Sacramento River at Rio Vista (RIO) for the Year 0 Baseline scenario and the Year 0 Sacramento DWSC Only Deepening scenario. During the second half of November (top panel of Figure 4.2-2), the predicted flow for both scenarios is identical. Similarly, the daily-averaged flow is nearly identical between both scenarios over the entire simulation year. The change in daily-averaged flow plot (lower panel of Figure 4.2-2) shows some small differences in daily-averaged flow between the Year 0 Baseline scenario and the Year 0 Sacramento DWSC Only Deepening scenario. These differences are very small relative to the daily-averaged flow magnitude, and are likely the result of a small increase in tidal prism and small phase differences in tidal propagation resulting from the Sacramento DWSC deepening.

Figure 4.2-3 shows the predicted flow at Cache Slough at Ryer Island (CCH) for the Year 0 Baseline scenario and the Year 0 Sacramento DWSC Only Deepening scenario. During the second half of November (top panel of Figure 4.2-3), the predicted flow for both scenarios is identical. Similarly, the daily-averaged flow is nearly identical between both scenarios over the entire simulation year. The change in daily-averaged flow plot (lower panel of Figure 4.2-3) shows some small differences in daily-averaged flow between the Year 0 Baseline scenario and the Year 0 Sacramento DWSC Only Deepening scenario. These differences are very small relative to the daily-averaged flow magnitude, and are likely the result of a small increase in tidal prism and small phase differences in tidal propagation resulting from the Sacramento DWSC deepening.

Figure 4.2-4 shows the predicted flow at the Sacramento DWSC (USGS Station 11455335) for the Year 0 Baseline scenario and the Year 0 Sacramento DWSC Only Deepening scenario. During the second half of November (top panel of Figure 4.2-4), the predicted flow for both scenarios is identical. Similarly, the daily-averaged flow is nearly identical between both scenarios over the entire simulation year. The change in daily-averaged flow plot (lower panel of Figure 4.2-4) shows some small differences in daily-averaged flow between the Year 0 Baseline scenario and the Year 0 Sacramento DWSC Only Deepening scenario. These differences are small relative to the daily-averaged flow magnitude, and are likely the result of a small increase in tidal prism and small phase differences in tidal propagation resulting from the Sacramento DWSC deepening.

Figure 4.2-5 shows the predicted flow at Miner Slough at Highway 84 Bridge (MIN) for the Year 0 Baseline scenario and the Year 0 Sacramento DWSC Only Deepening scenario. During the second half of November (top panel of Figure 4.2-5), the predicted flow for both scenarios is identical. Similarly, the daily-averaged flow is nearly identical between both scenarios over the entire simulation year. The change in daily-averaged flow plot (lower panel of Figure 4.2-5) shows a slight reduction in daily-averaged flow in Miner Slough in the Year 0 Sacramento DWSC Only Deepening scenario relative to the Year 0 Baseline scenario during most of the year.

Figure 4.2-6 shows the predicted flow at Steamboat Slough between Sacramento River and Sutter Slough (STM) for the Year 0 Baseline scenario and the Year 0 Sacramento DWSC Only Deepening scenario. During the second half of November (top panel of Figure 4.2-6), the predicted flow for both scenarios is identical. Similarly, the daily-averaged flow is nearly identical between both scenarios over the entire simulation year. No significant change in daily-averaged flow relative to the Year 0 Baseline scenario is predicted for the Year 0 Sacramento DWSC Only Deepening scenario.

Figure 4.2-7 shows the predicted flow at Sutter Slough at Courtland (SUT) for the Year 0 Baseline scenario and the Year 0 Sacramento DWSC Only Deepening scenario. During the second half of November (top panel of Figure 4.2-7), the predicted flow for both scenarios is identical. Similarly, the daily-averaged flow is nearly identical between both scenarios over the entire simulation year. The change in daily-averaged flow plot (lower panel of Figure 4.2-7) shows a slight reduction in daily-averaged flow in Sutter Slough during most of the year under the Year 0 Sacramento DWSC Only Deepening scenario.

Figure 4.2-8 shows the predicted flow at Sacramento River South of Georgiana Slough (WGB) for the Year 0 Baseline scenario and the Year 0 Sacramento DWSC Only Deepening scenario. During the second half of November (top panel of Figure 4.2-8), the predicted flow for both scenarios is identical. Similarly, the daily-averaged flow is nearly identical between both scenarios over the entire simulation year. The change in daily-averaged flow plot (lower panel of Figure 4.2-8) shows a slight increase in daily-averaged flow in the Sacramento River South of Georgiana Slough during most of the year under the Year 0 Sacramento DWSC Only Deepening scenario. The flow increase in the Sacramento River at Georgiana Slough is similar in magnitude to the flow decrease predicted in Sutter Slough and Miner Slough suggesting that the deepening of the Sacramento DWSC is resulting in slightly less flow into Sutter Slough and a corresponding higher flow remaining in the Sacramento River.

Figure 4.2-9 shows the predicted flow at Georgiana Slough near the Sacramento River (GEO) for the Year 0 Baseline scenario and the Year 0 Sacramento DWSC Only Deepening scenario. During the second half of November (top panel of Figure 4.2-9), the predicted flow for both scenarios is identical. Similarly, the daily-averaged flow is nearly identical between both scenarios over the entire simulation year. No significant change in daily-averaged flow relative to the Year 0 Baseline scenario is predicted under the Year 0 Sacramento DWSC Only Deepening scenario.

Figure 4.2-10 shows the predicted flow at the Delta Cross Channel (DCC) for the Year 0 Baseline scenario and the Year 0 Sacramento DWSC Only Deepening scenario. During the second half of November (top panel of Figure 4.2-10), the predicted flow for both scenarios is identical. Similarly, the daily-averaged flow is nearly identical between both scenarios over the entire simulation year. The change in daily-averaged flow plot (lower panel of Figure 4.2-10) shows a slight increase in daily-averaged flow through the Delta Cross Channel during periods when the Delta Cross Channel is open under the Year 0 Sacramento DWSC Only Deepening scenario.

Figure 4.2-11 shows the predicted flow at San Joaquin River at Jersey Point (JPT) for the Year 0 Baseline scenario and the Year 0 Sacramento DWSC Only Deepening scenario. During the second half of November (top panel of Figure 4.2-11), the predicted flow for both scenarios is identical. Similarly, the daily-averaged flow is nearly identical between both scenarios over the entire simulation year. The change in daily-averaged flow plot (lower panel of Figure 4.2-11) shows some small differences in daily-averaged flow between the Year 0 Baseline scenario and the Year 0 Sacramento DWSC Only Deepening scenario. Under the Year 0 Sacramento DWSC Only Deepening scenario, a decrease in net flow is predicted during the high flow periods between January and March.

Figure 4.2-12 shows the predicted flow at Threemile Slough at San Joaquin River (TMN) for the Year 0 Baseline scenario and the Year 0 Sacramento DWSC Only Deepening scenario. During the second half of November (top panel of Figure 4.2-12), the predicted flow for both scenarios is identical. Similarly, the daily-averaged flow is nearly identical between both scenarios over the entire simulation year. The change in daily-averaged flow plot (lower panel of Figure 4.2-12) shows some small differences in daily-averaged flow between the Year 0 Baseline scenario and the Year 0 Sacramento DWSC Only Deepening scenario. Under the Year 0 Sacramento DWSC Only Deepening scenario, an increase in net flow indicates less flow is flowing south through Threemile Slough during the high flow period between January and March (resulting in the decrease in daily-averaged flow predicted at Jersey Point during this period).

Figure 4.2-13 shows the predicted flow at False River (FAL) for the Year 0 Baseline scenario and the Year 0 Sacramento DWSC Only Deepening scenario. During the second half of November (top panel of Figure 4.2-13), the predicted flow for both scenarios is identical. Similarly, the daily-averaged flow is nearly identical between both scenarios over the entire simulation year. No significant change in daily-averaged flow relative to the Year 0 Baseline scenario is predicted for the Year 0 Sacramento DWSC Only Deepening scenario.

Figure 4.2-14 shows the predicted flow at San Joaquin River at Prisoners Point (PRI) for the Year 0 Baseline scenario and the Year 0 Sacramento DWSC Only Deepening scenario. During the second half of November (top panel of Figure 4.2-14), the predicted flow for both scenarios is identical. Similarly, the daily-averaged flow is nearly identical between both scenarios over the entire simulation year. No significant change in daily-averaged flow relative to the Year 0 Baseline scenario is predicted for the Year 0 Sacramento DWSC Only Deepening scenario.

Figure 4.2-15 shows the predicted flow at San Joaquin River at Stockton (STK) for the Year 0 Baseline scenario and the Year 0 Sacramento DWSC Only Deepening scenario. During the second half of November (top panel of Figure 4.2-15), the predicted flow for both scenarios is identical. Similarly, the daily-averaged flow is nearly identical between both scenarios over the entire simulation year. No significant change in daily-averaged flow relative to the Year 0 Baseline scenario is predicted for the Year 0 Sacramento DWSC Only Deepening.

Figure 4.2-16 shows the predicted flow at Middle River at Middle River (MID) for the Year 0 Baseline scenario and the Year 0 Sacramento DWSC Only Deepening scenario. During the second half of November (top panel of Figure 4.2-16), the predicted flow for both scenarios is identical. Similarly, the daily-averaged flow is nearly identical between both scenarios over the entire simulation year. No significant change in daily-averaged flow relative to the Year 0 Baseline scenario is predicted for the Year 0 Sacramento DWSC Only Deepening scenario.

Figure 4.2-17 shows the predicted flow at Old River at Bacon Island (OLD) for the Year 0 Baseline scenario and the Year 0 Sacramento DWSC Only Deepening scenario. During the second half of November (top panel of Figure 4.2-17), the predicted flow for both scenarios is identical. Similarly, the daily-averaged flow is nearly identical between both scenarios over the entire simulation year. No significant change in daily-averaged flow relative to the Year 0 Baseline scenario is predicted for the Year 0 Sacramento DWSC Only Deepening scenario.

Figure 4.2-18 shows the predicted flow at Old River near Byron (ORF) for the Year 0 Baseline scenario and the Year 0 Sacramento DWSC Only Deepening scenario. During the second half of November (top panel of Figure 4.2-18), the predicted flow for both scenarios is identical. Similarly, the daily-averaged flow is nearly identical between both scenarios over the entire simulation year. No significant change in daily-averaged flow relative to the Year 0 Baseline scenario is predicted for the Year 0 Sacramento DWSC Only Deepening scenario.

Figure 4.2-19 shows the predicted flow at Victoria Canal near Byron (VIC) for the Year 0 Baseline scenario and the Year 0 Sacramento DWSC Only Deepening scenario. During the second half of November (top panel of Figure 4.2-19), the predicted flow for both scenarios is identical. Similarly, the daily-averaged flow is nearly identical between both scenarios over the entire simulation year. No significant change in daily-averaged flow relative to the Year 0 Baseline scenario is predicted for the Year 0 Sacramento DWSC Only Deepening scenario.

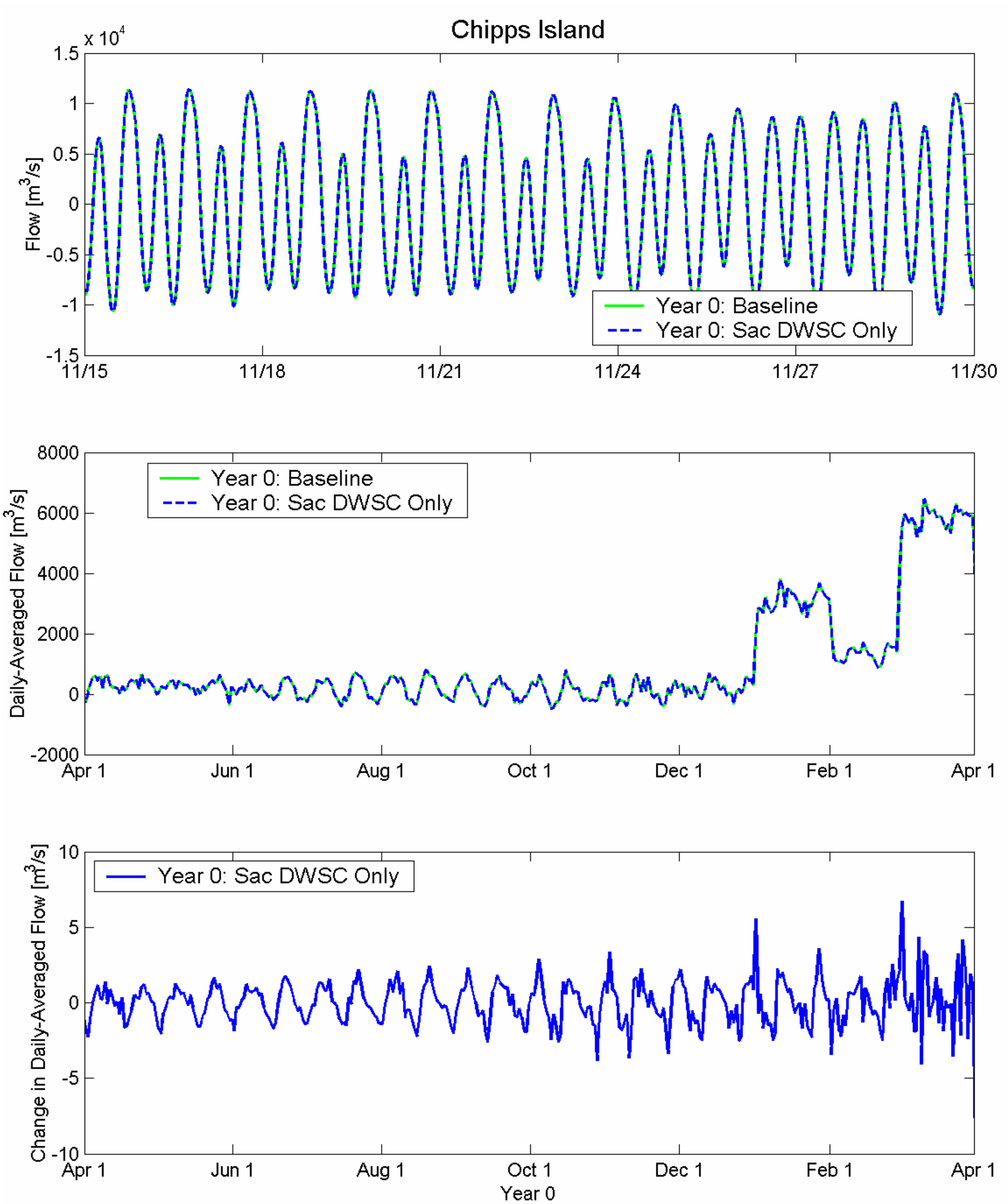


Figure 4.2-1 Predicted flow at Chipps Island for the Year 0 Baseline scenario and the Year 0 Sacramento DWSC Only Deepening scenario: tidal time-scale variability over a 15-day period (top); daily-averaged flow for the Year 0 simulation period (middle); predicted increase in daily-averaged flow for the Year 0 Sacramento DWSC Only Deepening scenario relative to the Year 0 Baseline scenario (bottom).

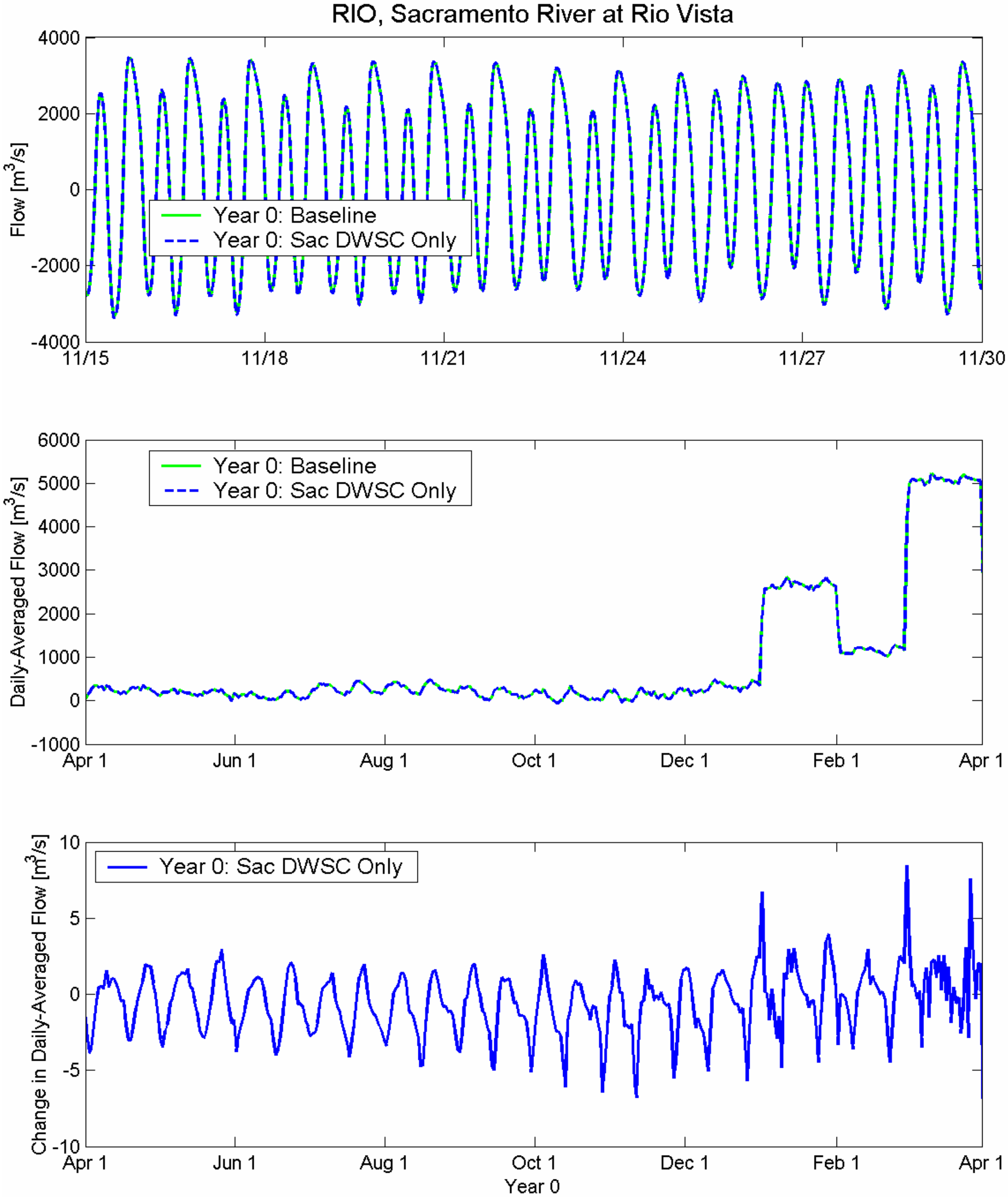


Figure 4.2-2 Predicted flow at Sacramento River at Rio Vista (RIO) for the Year 0 Baseline scenario and the Year 0 Sacramento DWSC Only Deepening scenario: tidal time-scale variability over a 15-day period (top); daily-averaged flow for the Year 0 simulation period (middle); predicted increase in daily-averaged flow for the Year 0 Sacramento DWSC Only Deepening scenario relative to the Year 0 Baseline scenario (bottom).

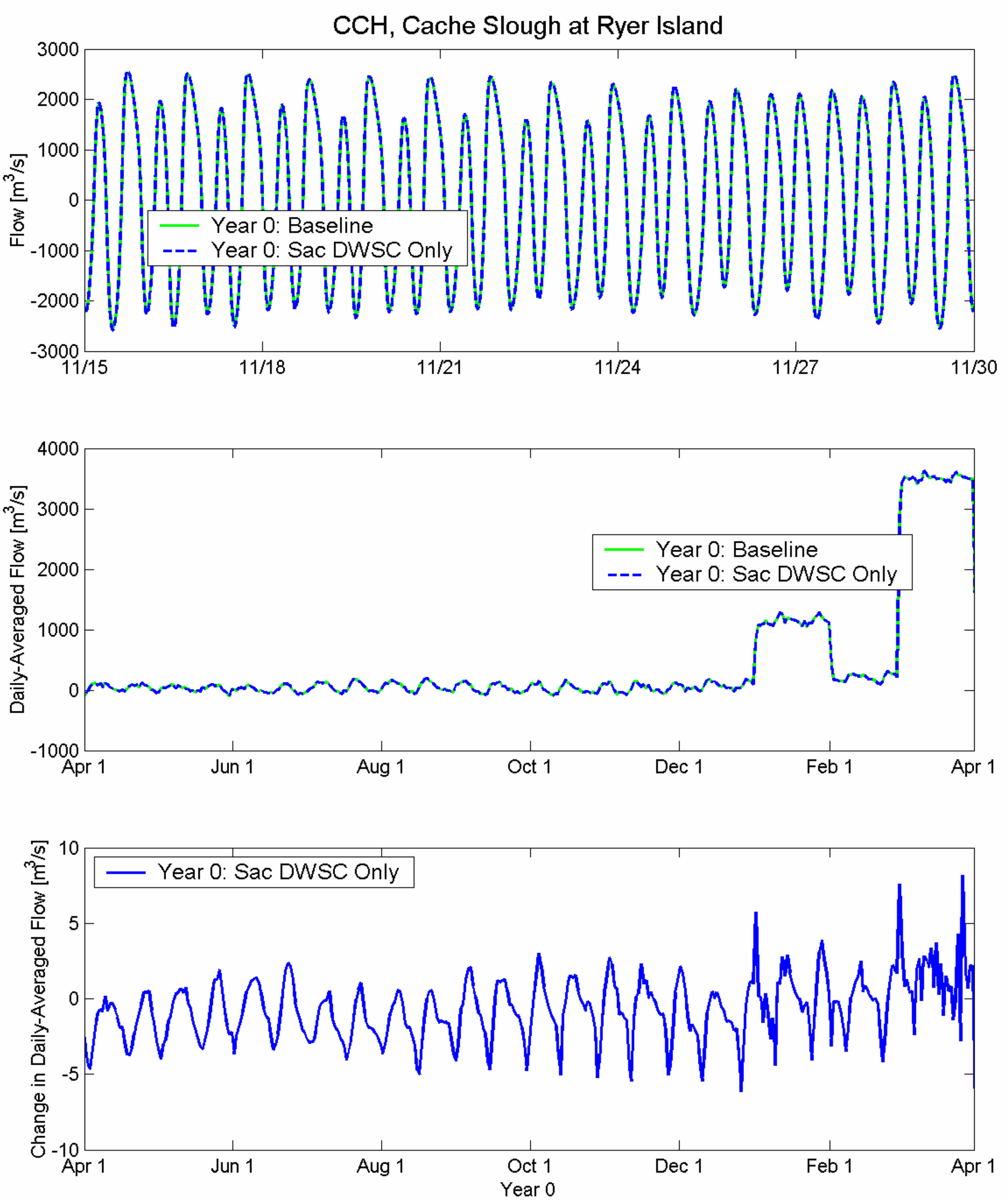


Figure 4.2-3 Predicted flow at Cache Slough at Ryer Island (CCH) for the Year 0 Baseline scenario and the Year 0 Sacramento DWSC Only Deepening scenario: tidal time-scale variability over a 15-day period (top); daily-averaged flow for the Year 0 simulation period (middle); predicted increase in daily-averaged flow for the Year 0 Sacramento DWSC Only Deepening scenario relative to the Year 0 Baseline scenario (bottom).

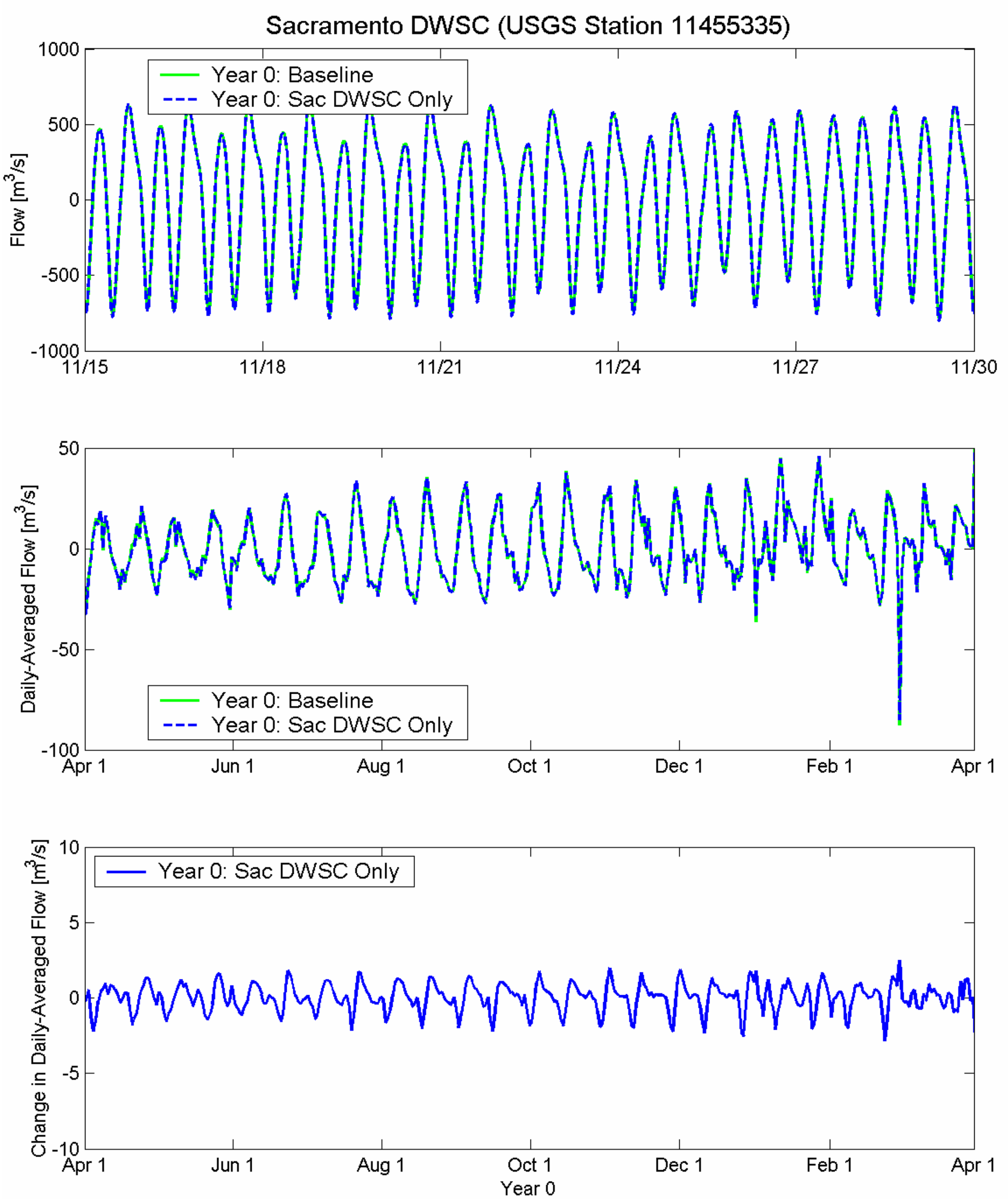


Figure 4.2-4 Predicted flow at Sacramento DWSC (USGS Station 11455335) for the Year 0 Baseline scenario and the Year 0 Sacramento DWSC Only Deepening scenario: tidal time-scale variability over a 15-day period (top); daily-averaged flow for the Year 0 simulation period (middle); predicted increase in daily-averaged flow for the Year 0 Sacramento DWSC Only Deepening scenario relative to the Year 0 Baseline scenario (bottom).

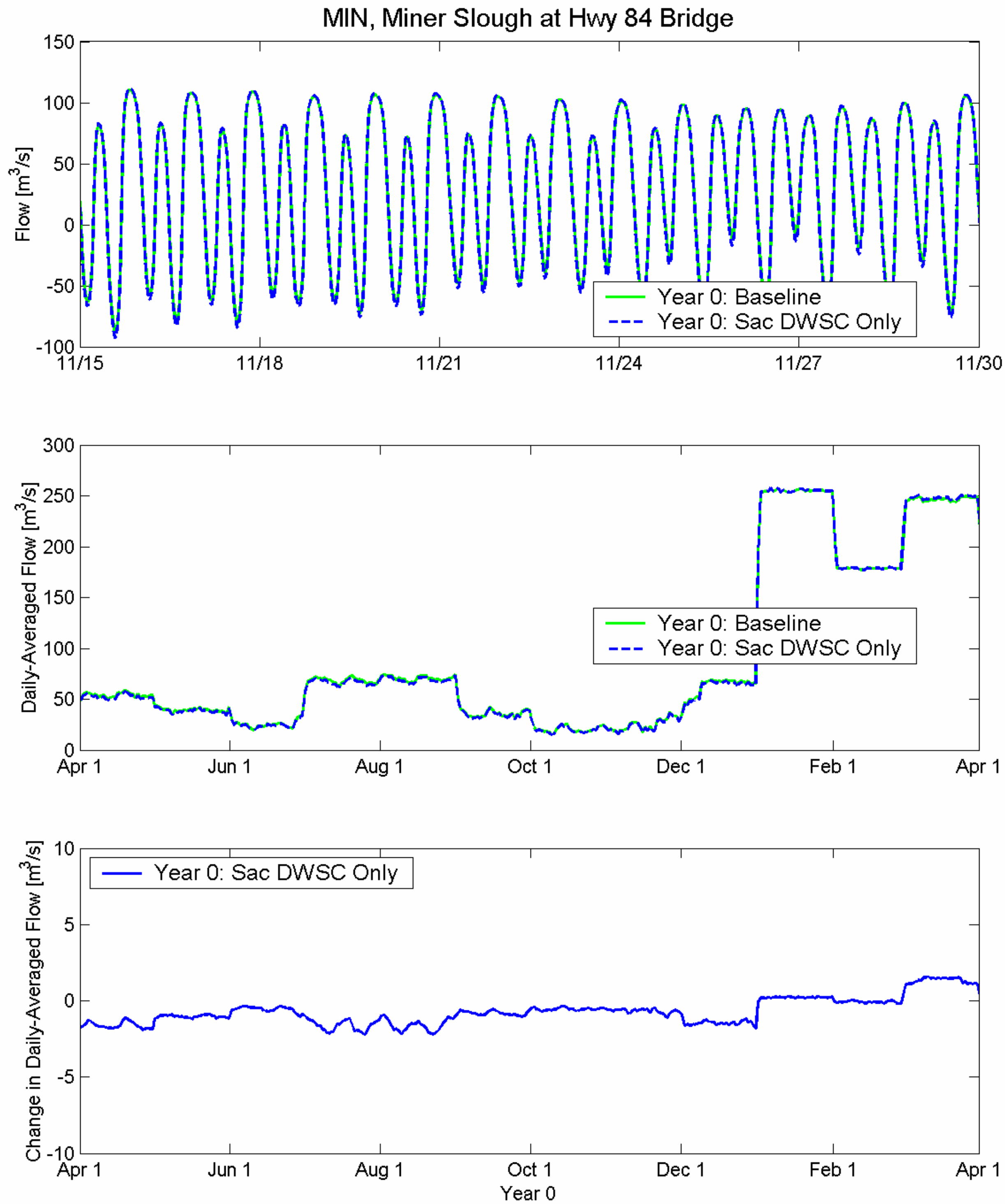


Figure 4.2-5 Predicted flow at Miner Slough at Highway 84 Bridge (MIN) for the Year 0 Baseline scenario and the Year 0 Sacramento DWSC Only Deepening scenario: tidal time-scale variability over a 15-day period (top); daily-averaged flow for the Year 0 simulation period (middle); predicted increase in daily-averaged flow for the Year 0 Sacramento DWSC Only Deepening scenario relative to the Year 0 Baseline scenario (bottom).

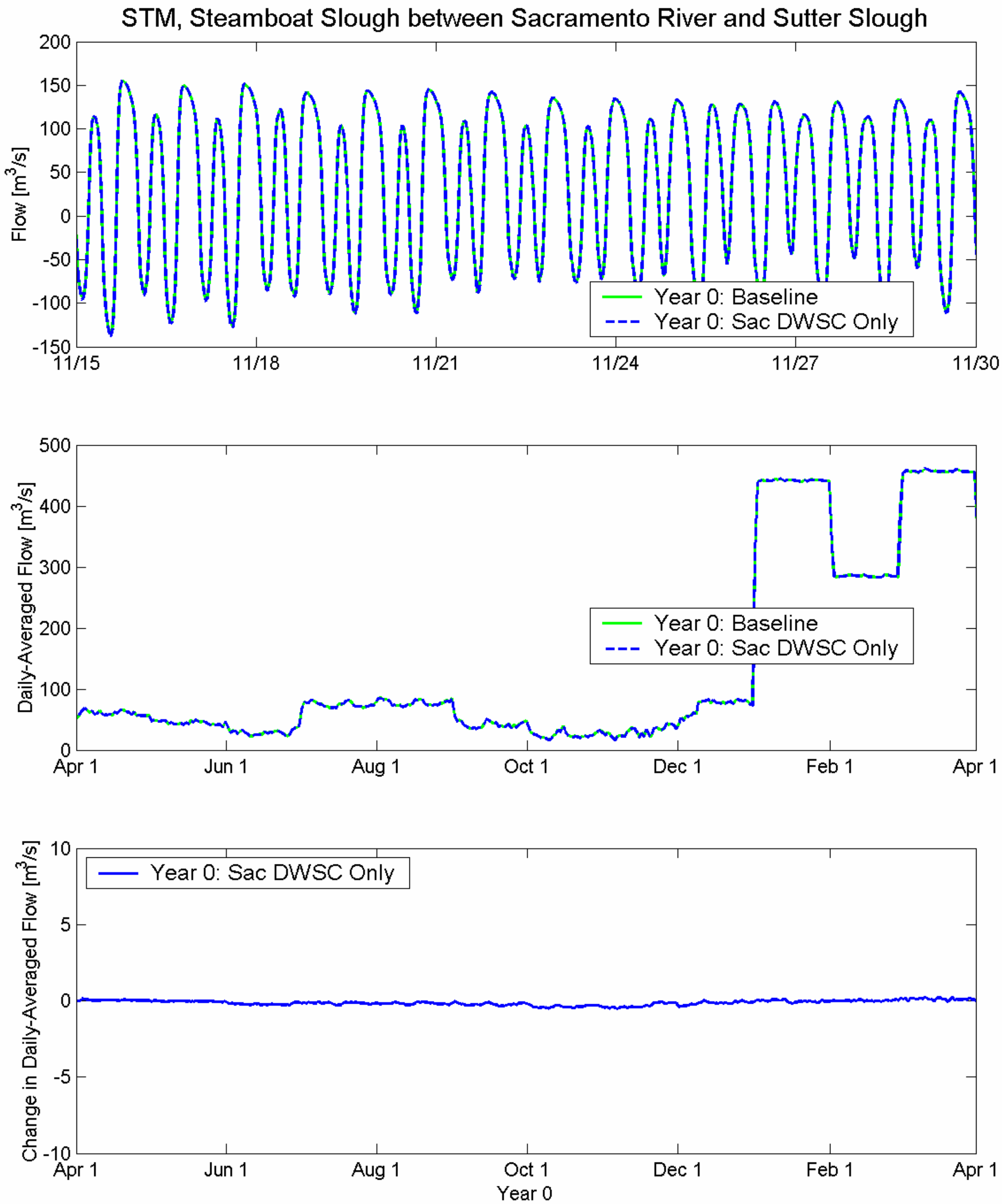


Figure 4.2-6 Predicted flow at Steamboat Slough between Sacramento River and Sutter Slough (STM) for the Year 0 Baseline scenario and the Year 0 Sacramento DWSC Only Deepening scenario: tidal time-scale variability over a 15-day period (top); daily-averaged flow for the Year 0 simulation period (middle); predicted increase in daily-averaged flow for the Year 0 Sacramento DWSC Only Deepening scenario relative to the Year 0 Baseline scenario (bottom).

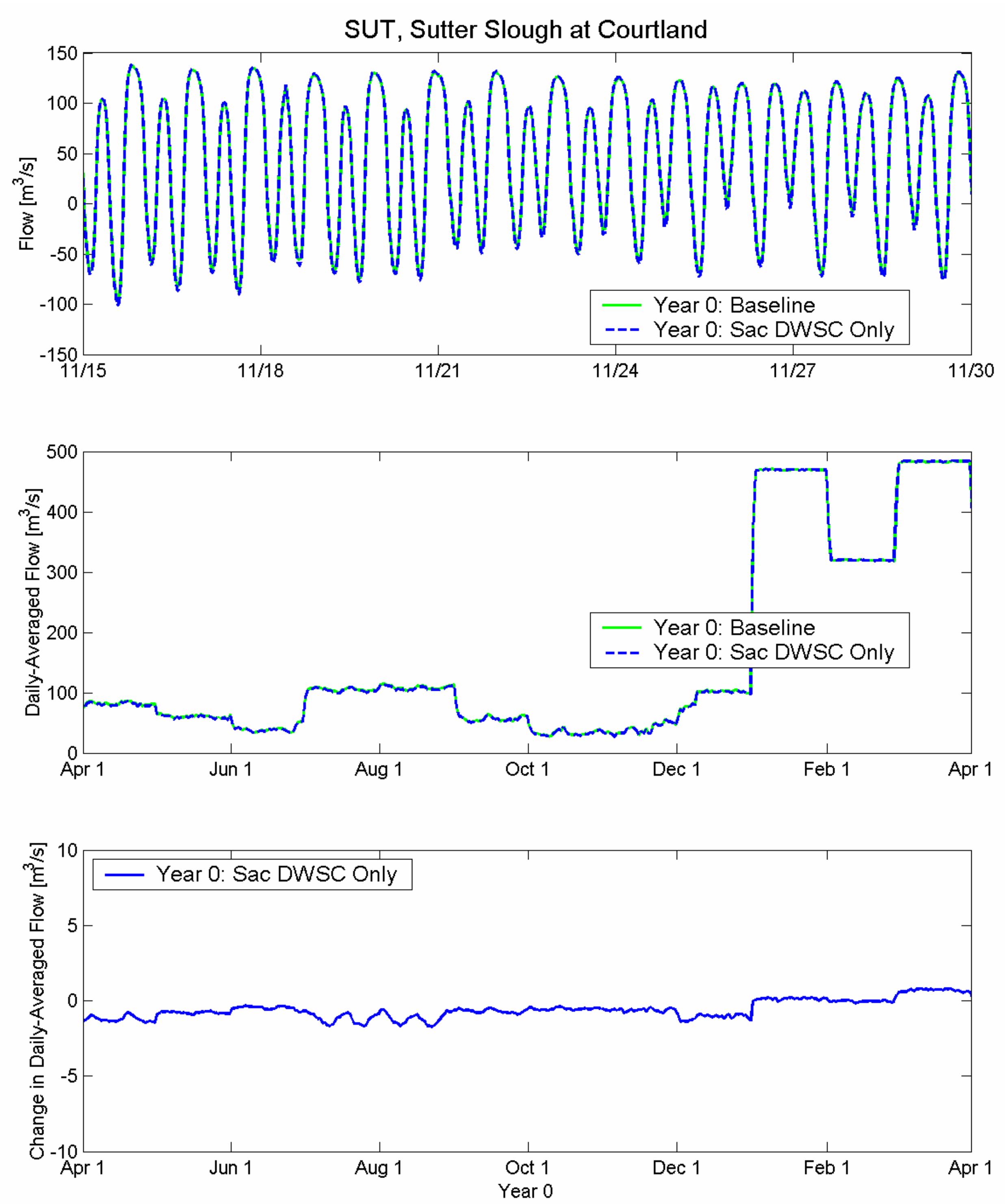


Figure 4.2-7 Predicted flow at Sutter Slough at Courtland (SUT) for the Year 0 Baseline scenario and the Year 0 Sacramento DWSC Only Deepening scenario: tidal time-scale variability over a 15-day period (top); daily-averaged flow for the Year 0 simulation period (middle); predicted increase in daily-averaged flow for the Year 0 Sacramento DWSC Only Deepening scenario relative to the Year 0 Baseline scenario (bottom).

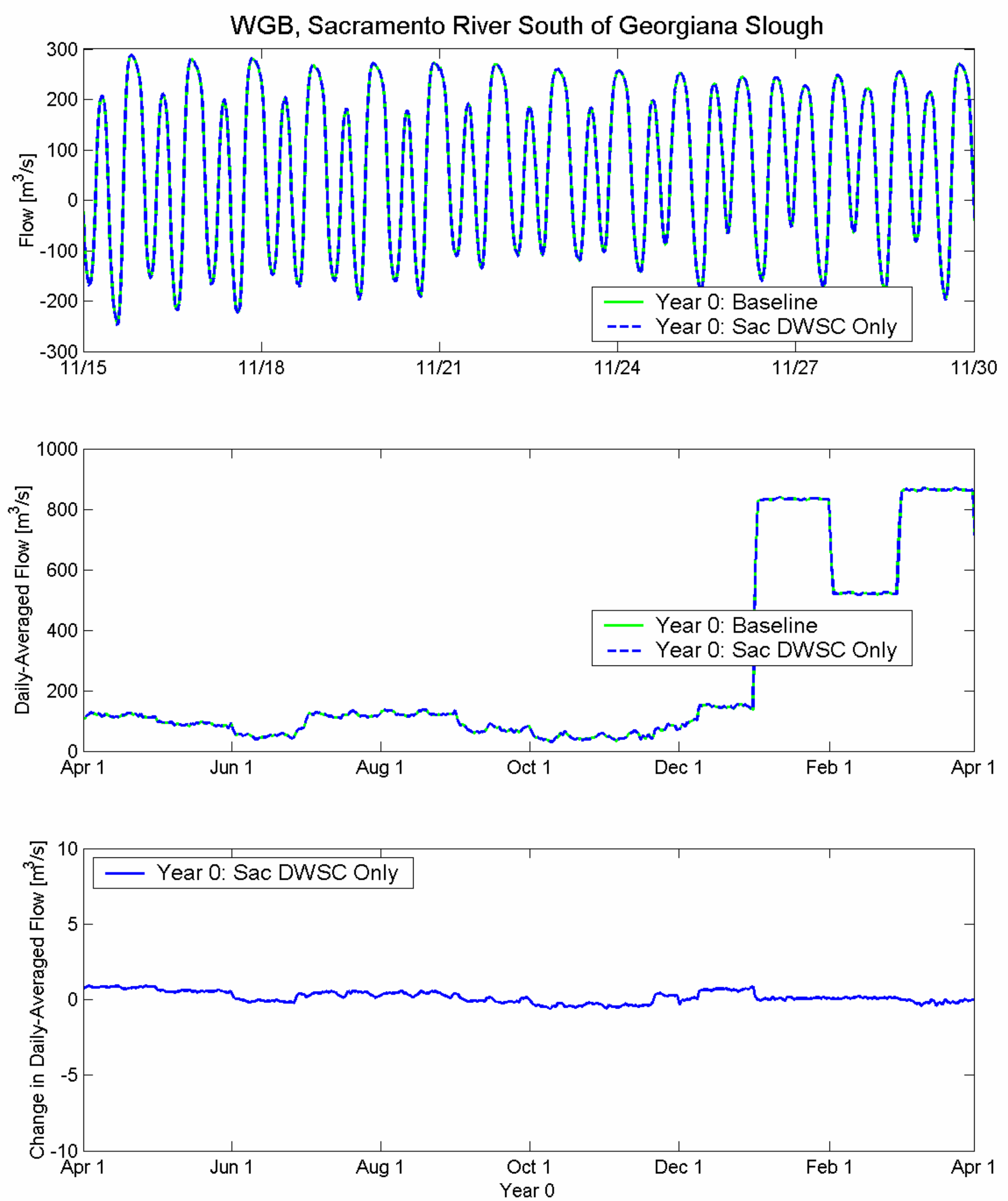


Figure 4.2-8 Predicted flow at Sacramento River South of Georgiana Slough (WGB) for the Year 0 Baseline scenario and the Year 0 Sacramento DWSC Only Deepening scenario: tidal time-scale variability over a 15-day period (top); daily-averaged flow for the Year 0 simulation period (middle); predicted increase in daily-averaged flow for the Year 0 Sacramento DWSC Only Deepening scenario relative to the Year 0 Baseline scenario (bottom).

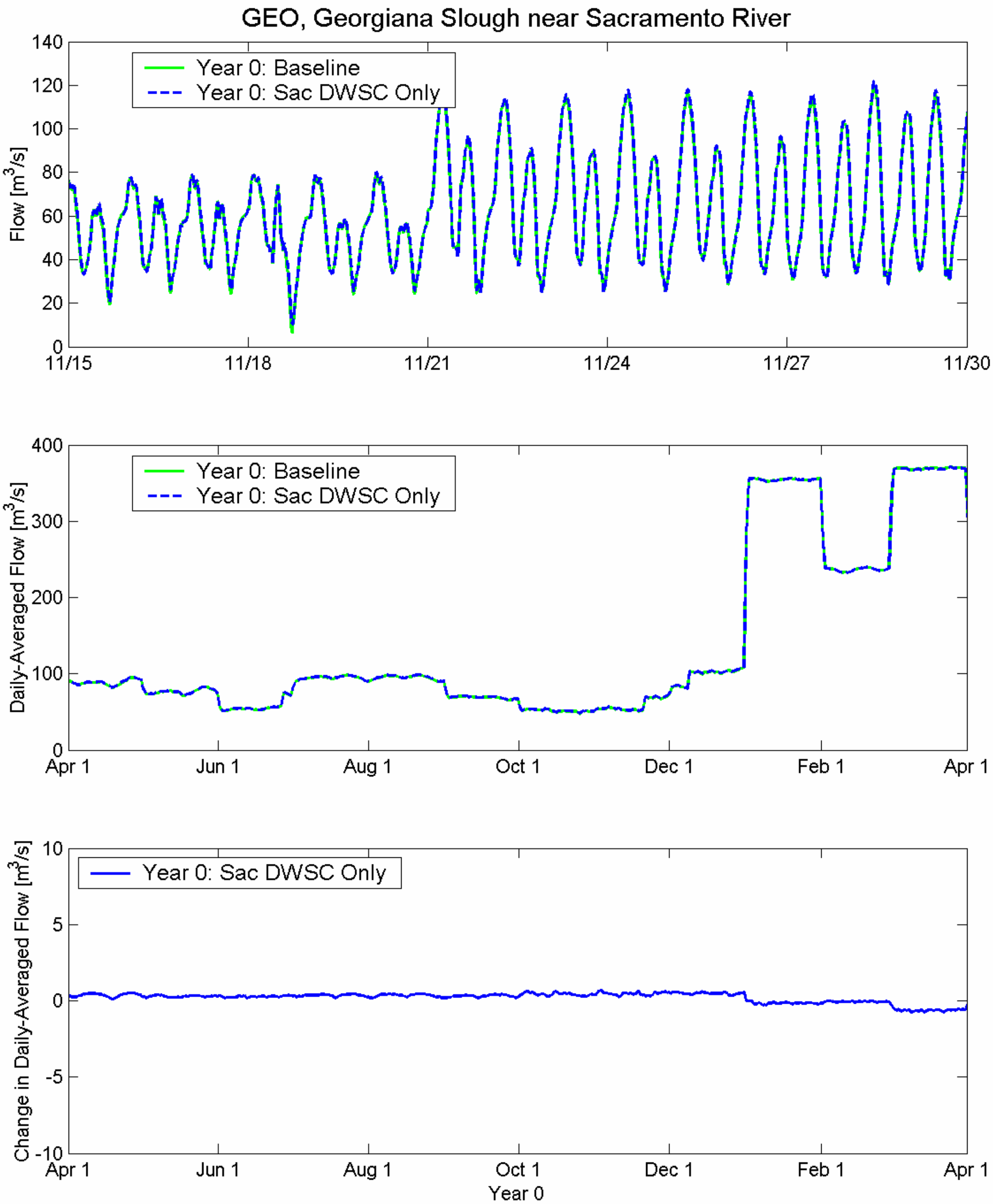


Figure 4.2-9 Predicted flow at Georgiana Slough near Sacramento River (GEO) for the Year 0 Baseline scenario and the Year 0 Sacramento DWSC Only Deepening scenario: tidal time-scale variability over a 15-day period (top); daily-averaged flow for the Year 0 simulation period (middle); predicted increase in daily-averaged flow for the Year 0 Sacramento DWSC Only Deepening scenario relative to the Year 0 Baseline scenario (bottom).

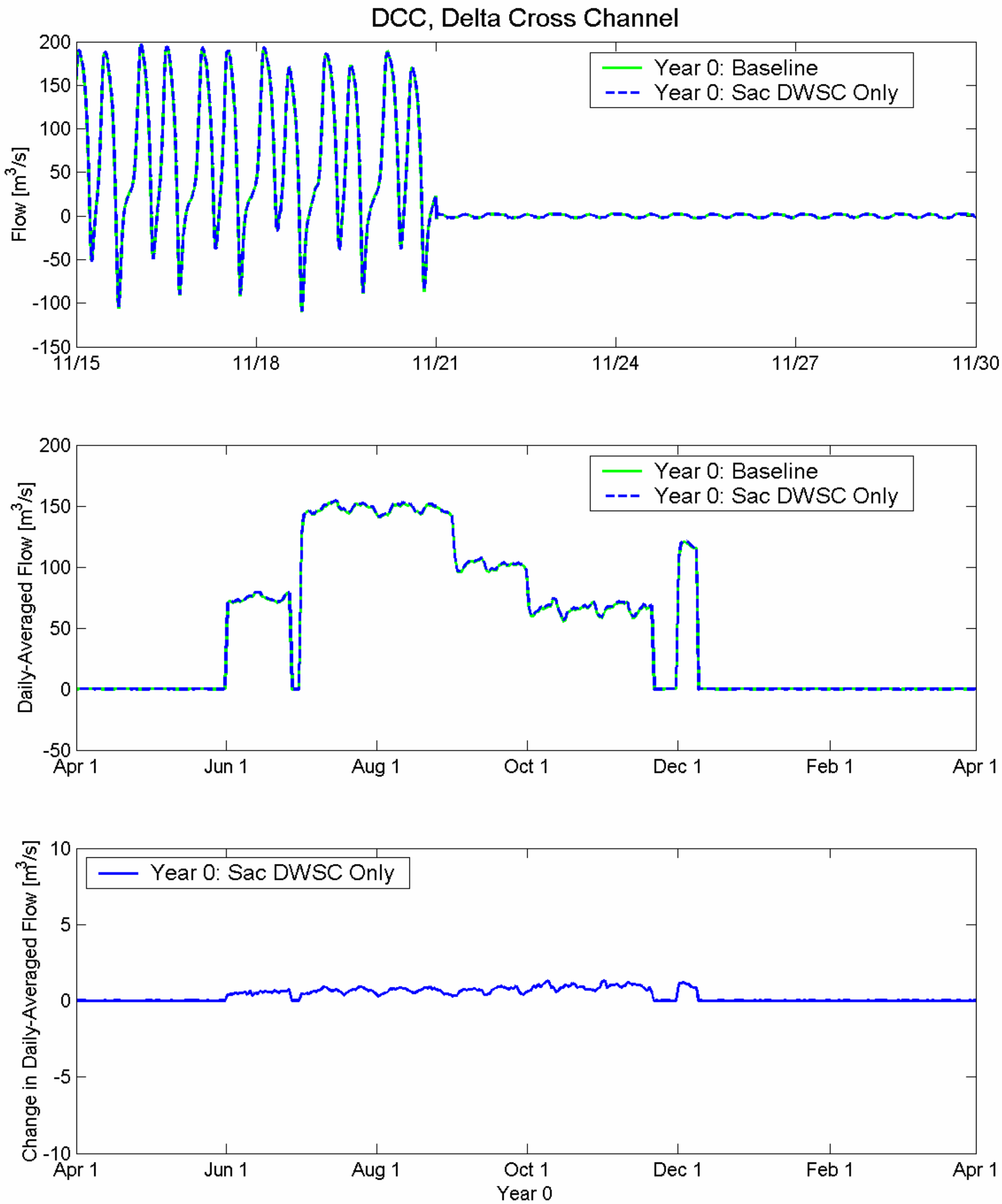


Figure 4.2-10 Predicted flow at the Delta Cross Channel (DCC) for the Year 0 Baseline scenario and the Year 0 Sacramento DWSC Only Deepening scenario: tidal time-scale variability over a 15-day period (top); daily-averaged flow for the Year 0 simulation period (middle); predicted increase in daily-averaged flow for the Year 0 Sacramento DWSC Only Deepening scenario relative to the Year 0 Baseline scenario (bottom).

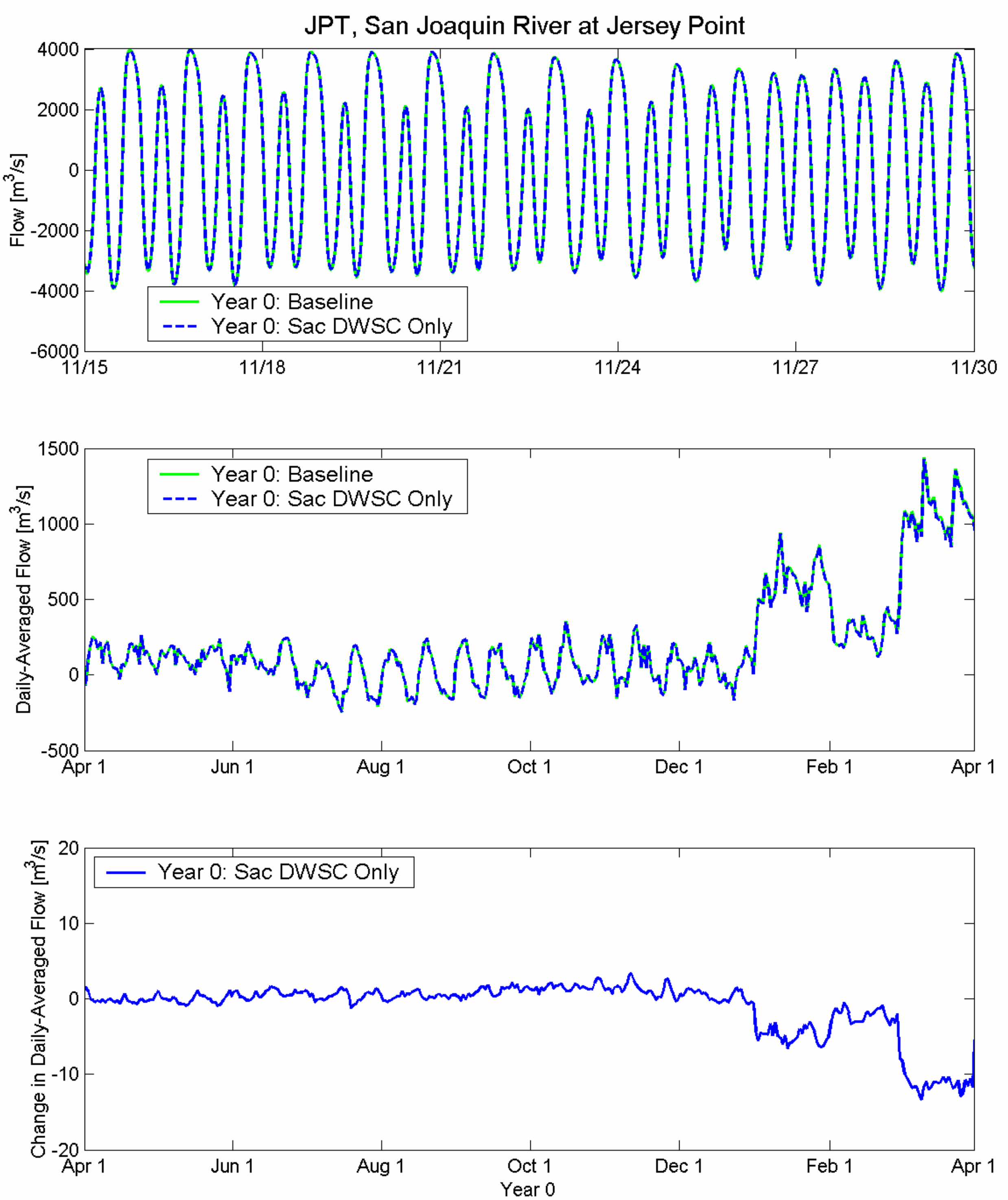


Figure 4.2-11 Predicted flow at San Joaquin River at Jersey Point (JPT) for the Year 0 Baseline scenario and the Year 0 Sacramento DWSC Only Deepening scenario: tidal time-scale variability over a 15-day period (top); daily-averaged flow for the Year 0 simulation period (middle); predicted increase in daily-averaged flow for the Year 0 Sacramento DWSC Only Deepening scenario relative to the Year 0 Baseline scenario (bottom).

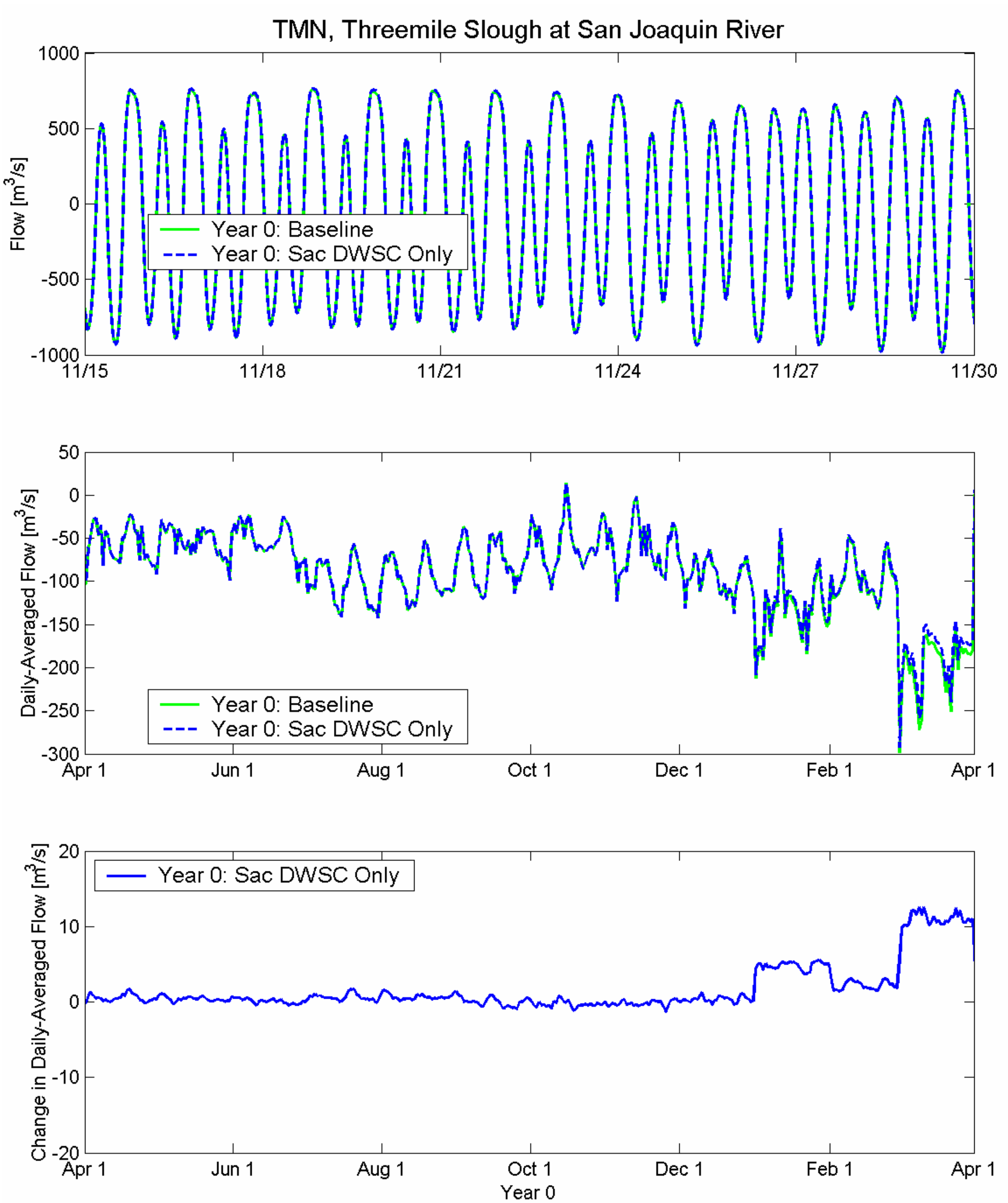


Figure 4.2-12 Predicted flow at Threemile Slough at San Joaquin River (TMN) for the Year 0 Baseline scenario and the Year 0 Sacramento DWSC Only Deepening scenario: tidal time-scale variability over a 15-day period (top); daily-averaged flow for the Year 0 simulation period (middle); predicted increase in daily-averaged flow for the Year 0 Sacramento DWSC Only Deepening scenario relative to the Year 0 Baseline scenario (bottom).

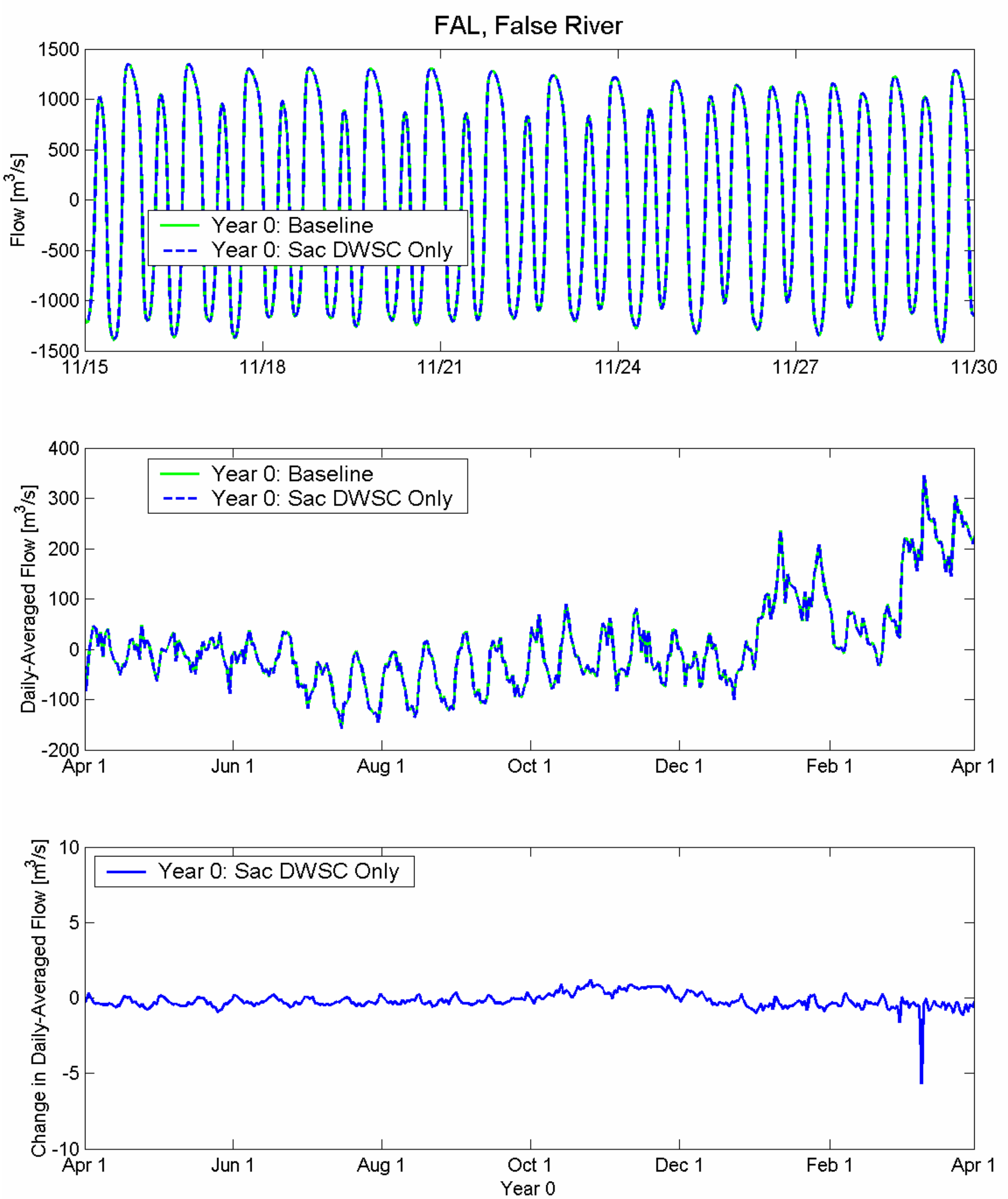


Figure 4.2-13 Predicted flow at False River (FAL) for the Year 0 Baseline scenario and the Year 0 Sacramento DWSC Only Deepening scenario: tidal time-scale variability over a 15-day period (top); daily-averaged flow for the Year 0 simulation period (middle); predicted increase in daily-averaged flow for the Year 0 Sacramento DWSC Only Deepening scenario relative to the Year 0 Baseline scenario (bottom).

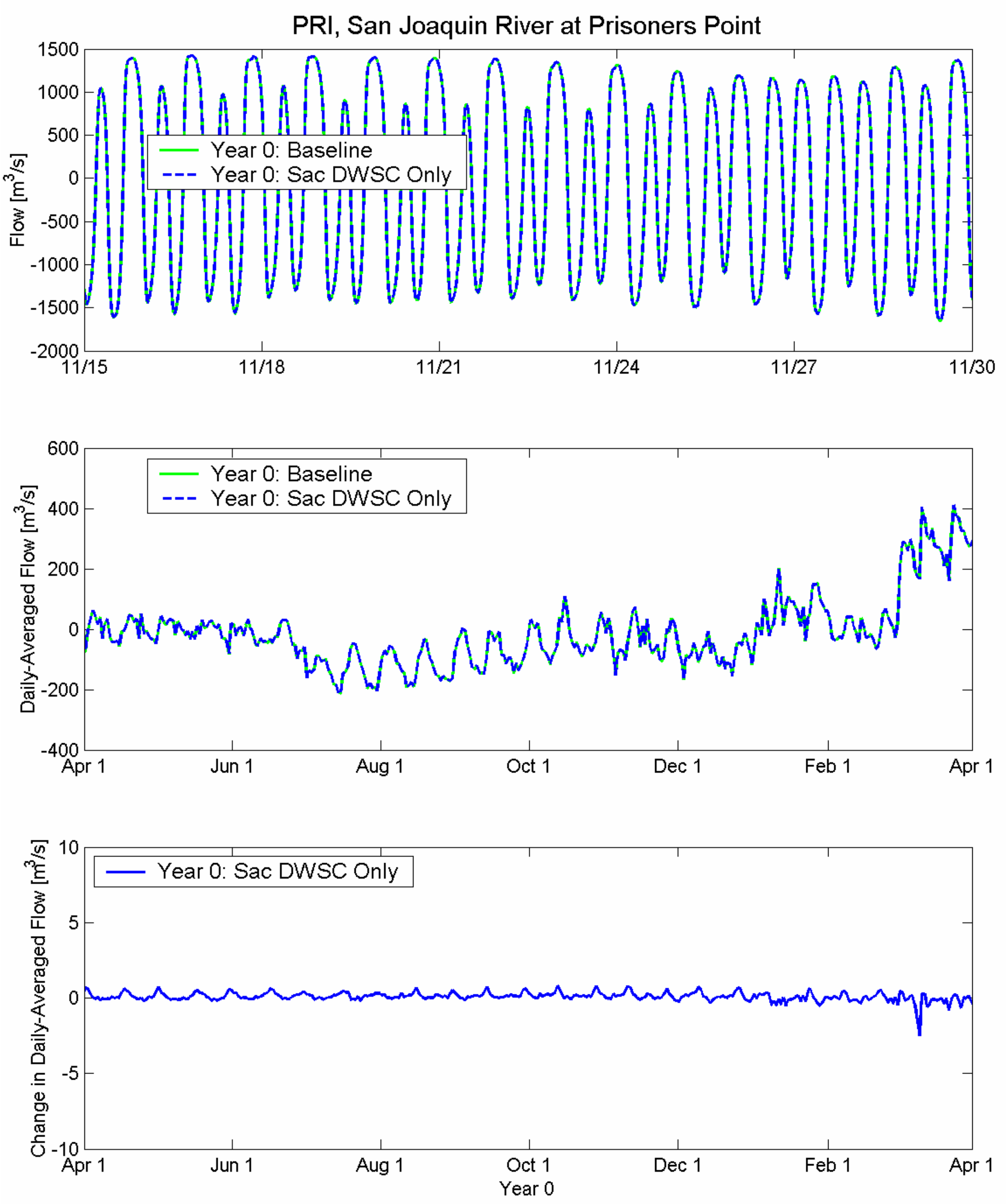


Figure 4.2-14 Predicted flow at San Joaquin River at Prisoners Point (PRI) for the Year 0 Baseline scenario and the Year 0 Sacramento DWSC Only Deepening scenario: tidal time-scale variability over a 15-day period (top); daily-averaged flow for the Year 0 simulation period (middle); predicted increase in daily-averaged flow for the Year 0 Sacramento DWSC Only Deepening scenario relative to the Year 0 Baseline scenario (bottom).

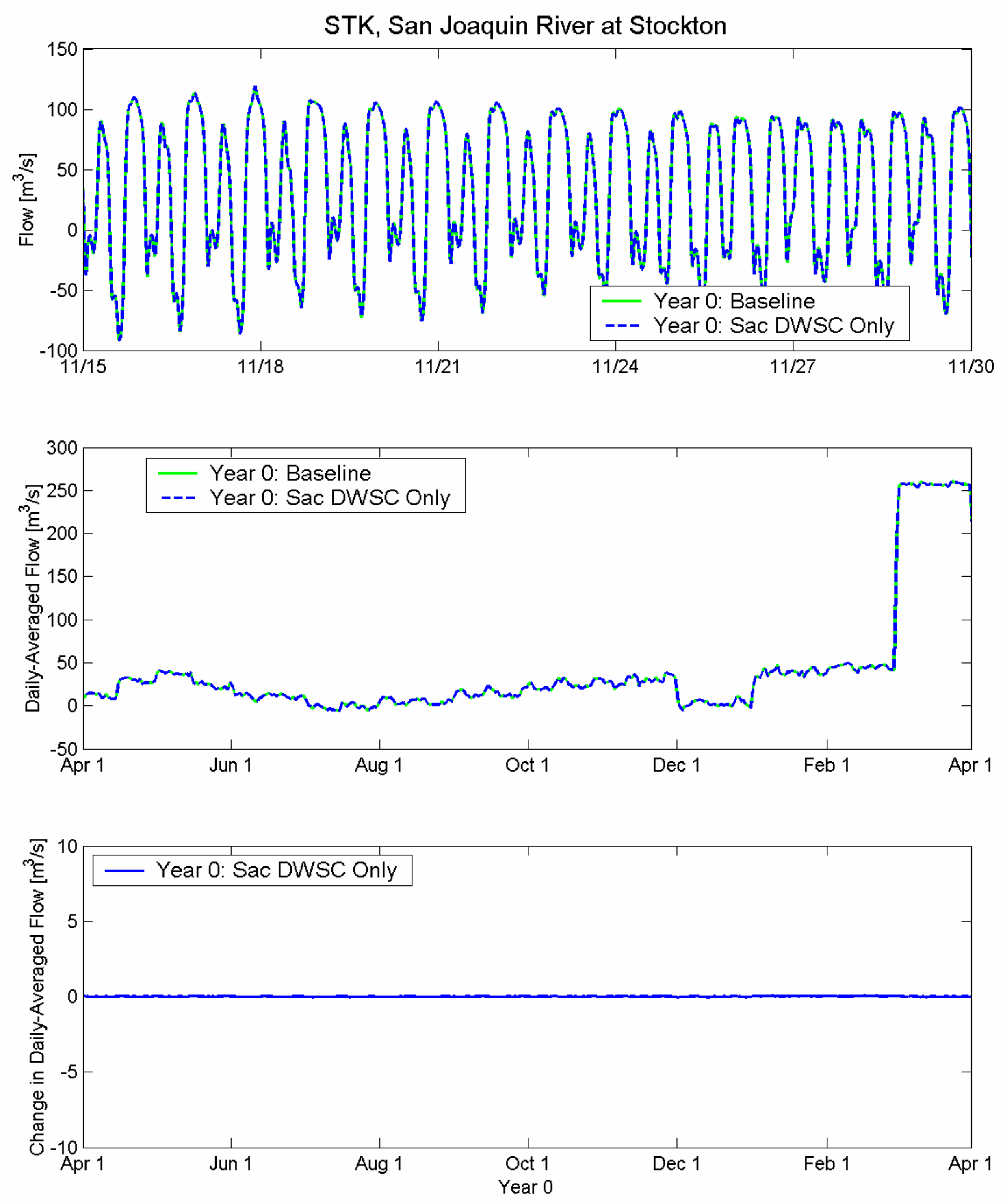


Figure 4.2-15 Predicted flow at San Joaquin River at Stockton (STK) for the Year 0 Baseline scenario and the Year 0 Sacramento DWSC Only Deepening scenario: tidal time-scale variability over a 15-day period (top); daily-averaged flow for the Year 0 simulation period (middle); predicted increase in daily-averaged flow for the Year 0 Sacramento DWSC Only Deepening scenario relative to the Year 0 Baseline scenario (bottom).

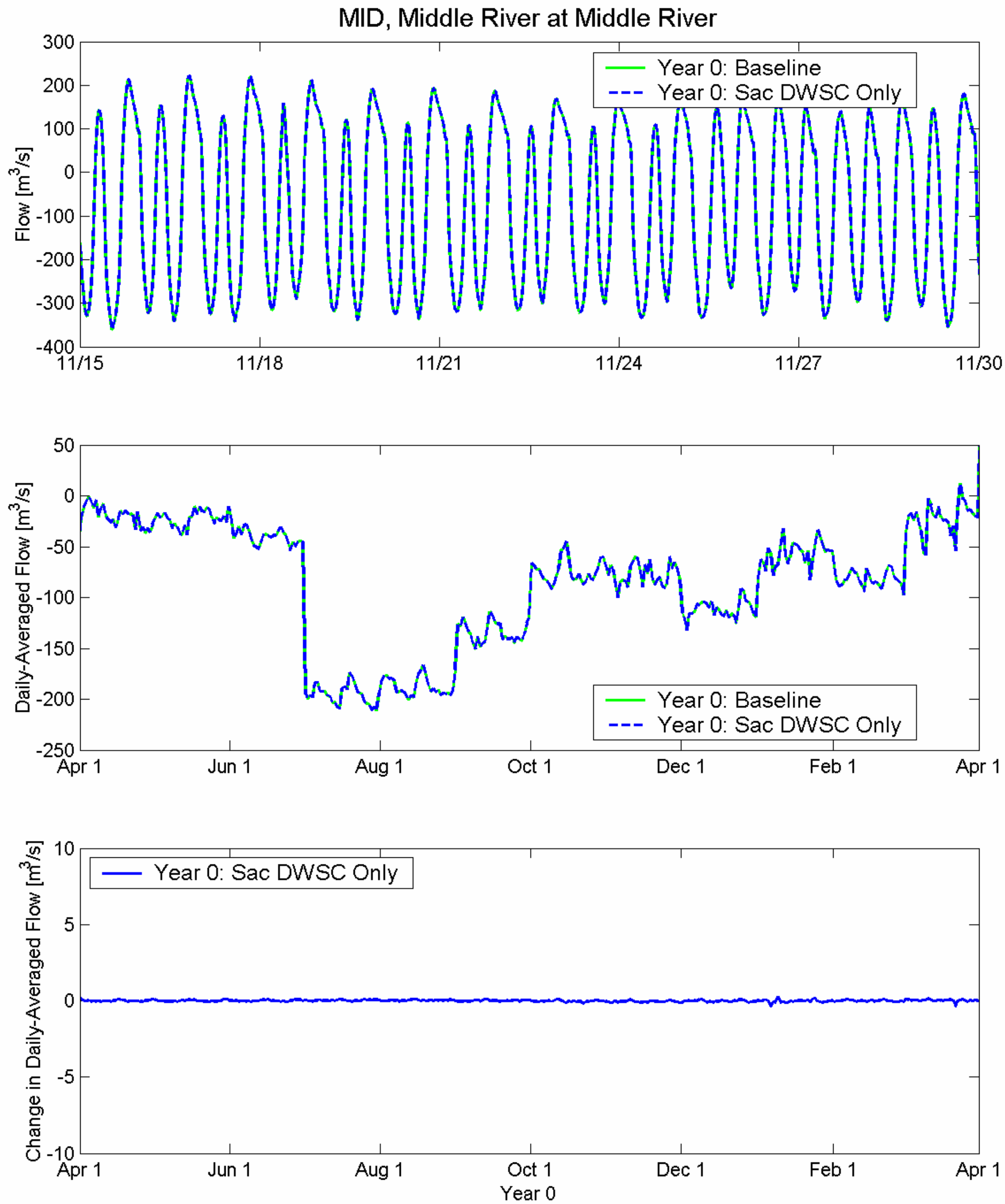


Figure 4.2-16 Predicted flow at Middle River at Middle River (MID) for the Year 0 Baseline scenario and the Year 0 Sacramento DWSC Only Deepening scenario: tidal time-scale variability over a 15-day period (top); daily-averaged flow for the Year 0 simulation period (middle); predicted increase in daily-averaged flow for the Year 0 Sacramento DWSC Only Deepening scenario relative to the Year 0 Baseline scenario (bottom).

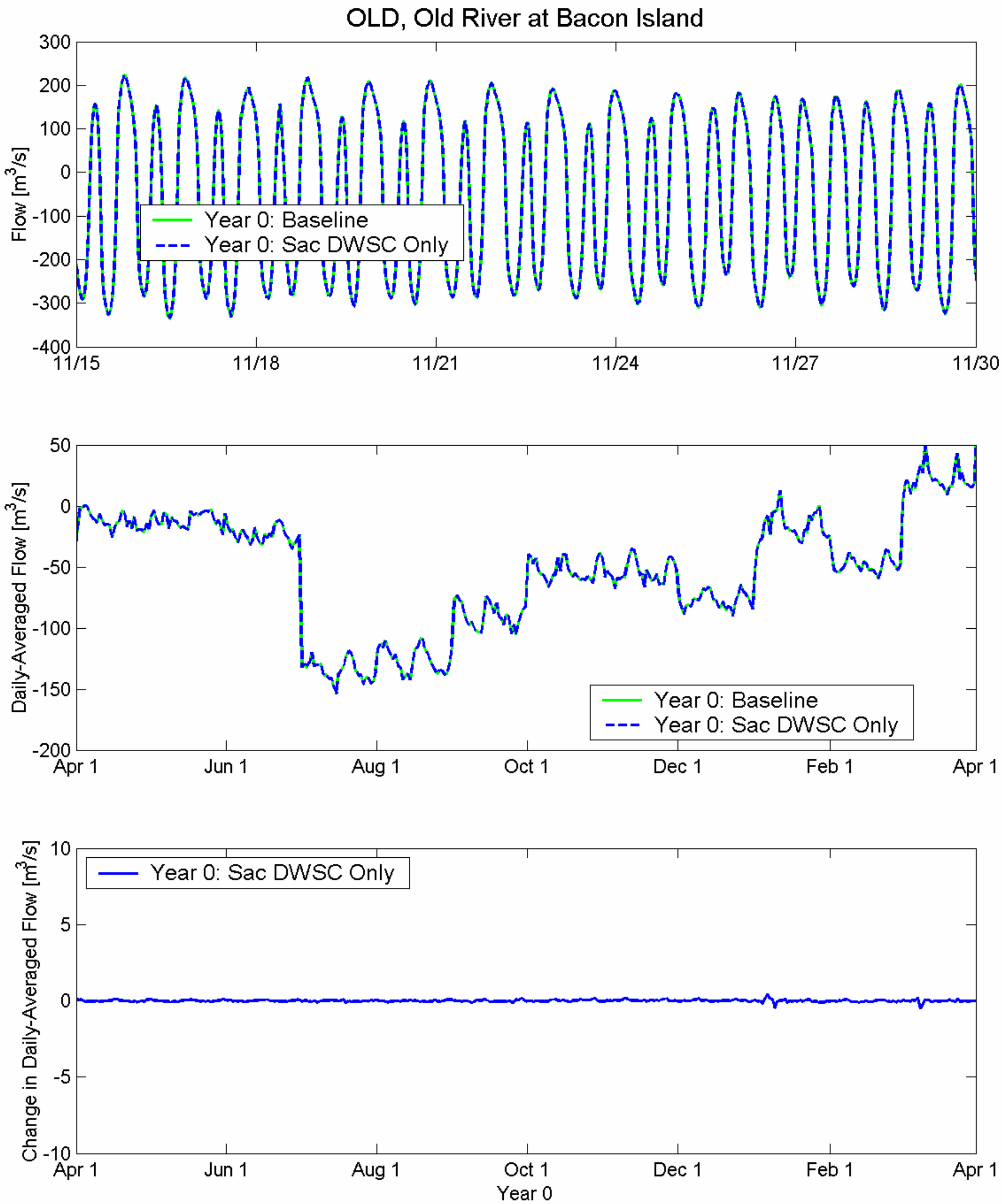


Figure 4.2-17 Predicted flow at Old River at Bacon Island (OLD) for the Year 0 Baseline scenario and the Year 0 Sacramento DWSC Only Deepening scenario: tidal time-scale variability over a 15-day period (top); daily-averaged flow for the Year 0 simulation period (middle); predicted increase in daily-averaged flow for the Year 0 Sacramento DWSC Only Deepening scenario relative to the Year 0 Baseline scenario (bottom).

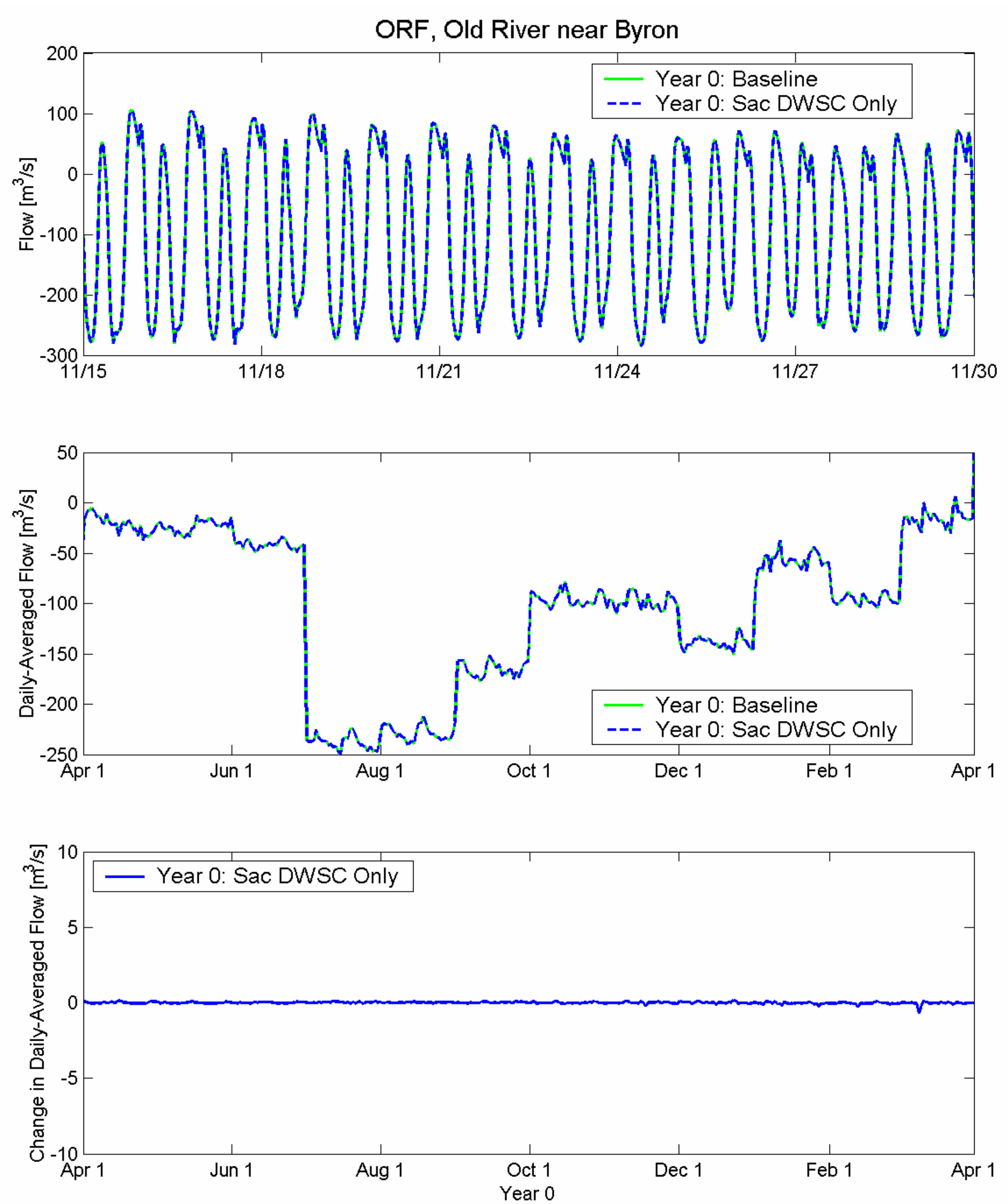


Figure 4.2-18 Predicted flow at Old River near Byron (ORF) for the Year 0 Baseline scenario and the Year 0 Sacramento DWSC Only Deepening scenario: tidal time-scale variability over a 15-day period (top); daily-averaged flow for the Year 0 simulation period (middle); predicted increase in daily-averaged flow for the Year 0 Sacramento DWSC Only Deepening scenario relative to the Year 0 Baseline scenario (bottom).

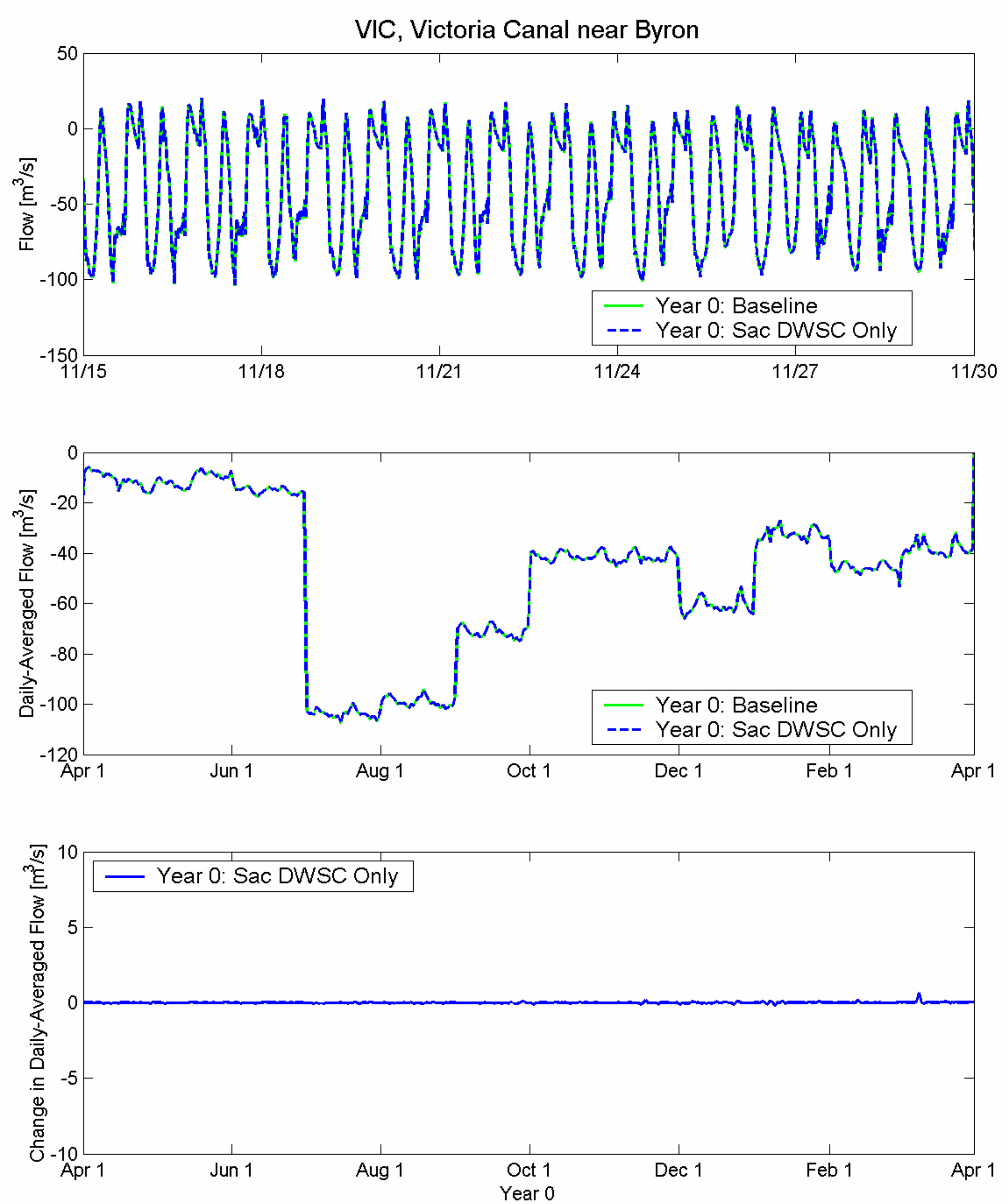


Figure 4.2-19 Predicted flow at Victoria Canal near Byron (VIC) for the Year 0 Baseline scenario and the Year 0 Sacramento DWSC Only Deepening scenario: tidal time-scale variability over a 15-day period (top); daily-averaged flow for the Year 0 simulation period (middle); predicted increase in daily-averaged flow for the Year 0 Sacramento DWSC Only Deepening scenario relative to the Year 0 Baseline scenario (bottom).

4.2.2 Year 0 Both Sacramento DWSC & SF Bay to Stockton DWSC Deepening

For each flow comparison figure included in this section, the top plot shows the tidal time-scale flow variability over a 15-day period for the Year 0 Baseline scenario, the Year 0 Sacramento DWSC Only Deepening scenario, and the Year 0 Both DWSC Deepening scenario. The middle plot shows daily-averaged flow during the full simulation year for each scenario. The bottom plot shows the predicted change in daily-averaged flow for the Year 0 Sacramento DWSC Only Deepening scenario and the Year 0 Both DWSC Deepening scenario relative to the Year 0 Baseline scenario. In cases where the predicted flow is identical between scenarios, some lines are not fully visible. Since the lines are plotted in the order listed on the legend, for periods where the predicted flow for the Year 0 Baseline scenario or the Year 0 Sacramento DWSC Only Deepening scenario are not fully visible, the predicted flow for these scenarios is identical to the visible line(s).

Figure 4.2-20 shows the predicted flow at Chipps Island for the Year 0 Baseline scenario, the Year 0 Sacramento DWSC Only Deepening scenario, and the Year 0 Both DWSC Deepening scenario. During the second half of November (top panel of Figure 4.2-20), the predicted flow for all three scenarios is similar, however the peak tidal flows under the Year 0 Both DWSC Deepening scenario are about 1.5% greater than under the Year 0 Baseline scenario indicating a slight increase in tidal prism of the Delta under the Year 0 Both DWSC Deepening scenario. The daily-averaged flow is nearly identical between the three scenarios over the entire simulation year. The change in daily-averaged flow plot (lower panel of Figure 4.2-20) shows some small differences in daily-averaged flow between the Year 0 Baseline scenario and both the Year 0 Sacramento DWSC Only Deepening scenario and the Year 0 Both DWSC Deepening scenario. These differences are very small relative to the daily-averaged flow magnitude, and are likely the result of small phase differences in tidal propagation and a slight increase in tidal prism resulting from the Sacramento DWSC and San Francisco Bay to Stockton DWSC deepening.

Figure 4.2-21 shows the predicted flow at Sacramento River at Rio Vista (RIO) for the Year 0 Baseline scenario, the Year 0 Sacramento DWSC Only Deepening scenario, and the Year 0 Both DWSC Deepening scenario. During the second half of November (top panel of Figure 4.2-21), the predicted flow for all three scenarios is identical. Similarly, the daily-averaged flow is nearly identical between the three scenarios over the entire simulation year. The change in daily-averaged flow plot (lower panel of Figure 4.2-21) shows some small differences in daily-averaged flow between the Year 0 Baseline scenario and both the Year 0 Sacramento DWSC Only Deepening scenario and the Year 0 Both DWSC Deepening scenario. These differences are very small relative to the daily-averaged flow magnitude, and are likely the result of a small increase in tidal prism and small phase differences in tidal propagation resulting from the Sacramento DWSC deepening.

Figure 4.2-22 shows the predicted flow at Cache Slough at Ryer Island (CCH) for the Year 0 Baseline scenario, the Year 0 Sacramento DWSC Only Deepening scenario, and the Year 0 Both DWSC Deepening scenario. During the second half of November (top panel of Figure 4.2-22), the predicted flow for all three scenarios is identical. Similarly, the daily-averaged flow is nearly identical between the three scenarios over the entire simulation year. The change in daily-averaged flow plot (lower panel of Figure 4.2-22) shows some small differences in daily-averaged flow between the Year 0 Baseline scenario and both the Year 0 Sacramento DWSC Only Deepening scenario and the Year 0 Both DWSC Deepening scenario. These differences are very small relative to the daily-averaged flow magnitude, and are likely the result of a small increase in tidal prism and small phase differences in tidal propagation resulting from the Sacramento DWSC deepening.

Figure 4.2-23 shows the predicted flow at the Sacramento DWSC (USGS Station 11455335) for the Year 0 Baseline scenario, the Year 0 Sacramento DWSC Only Deepening scenario, and the Year 0 Both DWSC Deepening scenario. During the second half of November (top panel of Figure 4.2-23), the predicted flow for all three scenarios is identical. Similarly, the daily-averaged flow is nearly identical between the three scenarios over the entire simulation year. The change in daily-averaged flow plot (lower panel of Figure 4.2-23) shows some small differences in daily-averaged flow between the Year 0 Baseline scenario and both the Year 0 Sacramento DWSC Only Deepening scenario and the Year 0 Both DWSC Deepening scenario. These differences are small relative to the daily-averaged flow magnitude, and are likely the result of a small increase in tidal prism and small phase differences in tidal propagation resulting from the Sacramento DWSC deepening.

Figure 4.2-24 shows the predicted flow at Miner Slough at Highway 84 Bridge (MIN) for the Year 0 Baseline scenario, the Year 0 Sacramento DWSC Only Deepening scenario, and the Year 0 Both DWSC Deepening scenario. During the second half of November (top panel of Figure 4.2-24), the predicted flow for all three scenarios is identical. Similarly, the daily-averaged flow is nearly identical between the three scenarios over the entire simulation year. The change in daily-averaged flow plot (lower panel of Figure 4.2-24) shows a slight reduction in daily-averaged flow in Miner Slough in both the Year 0 Sacramento DWSC Only Deepening scenario and the Year 0 Both DWSC Deepening scenario relative to the Year 0 Baseline scenario during most of the year.

Figure 4.2-25 shows the predicted flow at Steamboat Slough between Sacramento River and Sutter Slough (STM) for the Year 0 Baseline scenario, the Year 0 Sacramento DWSC Only Deepening scenario, and the Year 0 Both DWSC Deepening scenario. During the second half of November (top panel of Figure 4.2-25), the predicted flow for all three scenarios is identical. Similarly, the daily-averaged flow is nearly identical between the three scenarios over the entire simulation year. No significant change in daily-averaged flow relative to the Year 0 Baseline scenario is predicted for either the Year 0 Sacramento DWSC Only Deepening scenario or the Year 0 Both DWSC Deepening scenario.

Figure 4.2-26 shows the predicted flow at Sutter Slough at Courtland (SUT) for the Year 0 Baseline scenario, the Year 0 Sacramento DWSC Only Deepening scenario, and the Year 0 Both DWSC Deepening scenario. During the second half of November (top panel of Figure 4.2-26), the predicted flow for all three scenarios is identical. Similarly, the daily-averaged flow is nearly identical between the three scenarios over the entire simulation year. The change in daily-averaged flow plot (lower panel of Figure 4.2-26) shows a slight reduction in daily-averaged flow in Sutter Slough during most of the year in both the Year 0 Sacramento DWSC Only

Deepening scenario and the Year 0 Both DWSC Deepening scenario relative to the Year 0 Baseline scenario.

Figure 4.2-27 shows the predicted flow at Sacramento River South of Georgiana Slough (WGB) for the Year 0 Baseline scenario, the Year 0 Sacramento DWSC Only Deepening scenario, and the Year 0 Both DWSC Deepening scenario. During the second half of November (top panel of Figure 4.2-27), the predicted flow for all three scenarios is identical. Similarly, the daily-averaged flow is nearly identical between the three scenarios over the entire simulation year. The change in daily-averaged flow plot (lower panel of Figure 4.2-27) shows a slight increase in daily-averaged flow in the Sacramento River South of Georgiana Slough during most of the year in both the Year 0 Sacramento DWSC Only Deepening scenario and the Year 0 Both DWSC Deepening scenario relative to the Year 0 Baseline scenario. The flow increase in the Sacramento River at Georgiana Slough is similar in magnitude to the flow decrease predicted in Sutter Slough and Miner Slough suggesting that the deepening of the Sacramento DWSC is resulting in slightly less flow into Sutter Slough and a corresponding higher flow remaining in the Sacramento River.

Figure 4.2-28 shows the predicted flow at Georgiana Slough near the Sacramento River (GEO) for the Year 0 Baseline scenario, the Year 0 Sacramento DWSC Only Deepening scenario, and the Year 0 Both DWSC Deepening scenario. During the second half of November (top panel of Figure 4.2-28), the predicted flow for all three scenarios is identical. Similarly, the daily-averaged flow is nearly identical between the three scenarios over the entire simulation year. No significant change in daily-averaged flow relative to the Year 0 Baseline scenario is predicted for either the Year 0 Sacramento DWSC Only Deepening scenario or the Year 0 Both DWSC Deepening scenario.

Figure 4.2-29 shows the predicted flow at the Delta Cross Channel (DCC) for the Year 0 Baseline scenario, the Year 0 Sacramento DWSC Only Deepening scenario, and the Year 0 Both DWSC Deepening scenario. During the second half of November (top panel of Figure 4.2-29), the predicted flow for all three scenarios is identical. Similarly, the daily-averaged flow is nearly identical between the three scenarios over the entire simulation year. The change in daily-averaged flow plot (lower panel of Figure 4.2-29) shows a slight increase in daily-averaged flow through the Delta Cross Channel during periods when the Delta Cross Channel is open under the Year 0 Sacramento DWSC Only Deepening scenario. No significant change in daily-averaged flow relative to the Year 0 Baseline scenario is predicted for the Year 0 Both DWSC Deepening scenario.

Figure 4.2-30 shows the predicted flow at San Joaquin River at Jersey Point (JPT) for the Year 0 Baseline scenario, the Year 0 Sacramento DWSC Only Deepening scenario, and the Year 0 Both DWSC Deepening scenario. During the second half of November (top panel of Figure 4.2-30), the predicted flow for all three scenarios is similar, however the peak tidal flows under the Year 0 Both DWSC Deepening scenario are about 2% greater than under the Year 0 Baseline scenario. The daily-averaged flow is nearly identical between the three scenarios over the entire simulation year. The change in daily-averaged flow plot (lower panel of Figure 4.2-30) shows some small differences in daily-averaged flow between the Year 0 Baseline scenario and both the Year 0 Sacramento DWSC Only Deepening scenario and the Year 0 Both DWSC Deepening scenario.

Under the Year 0 Sacramento DWSC Only Deepening scenario, a decrease in net flow is predicted during the high flow periods between January and March. Most of these differences are very small relative to the daily-averaged flow magnitude, and are likely the result of small phase differences in tidal propagation and a slight increase in tidal prism resulting from the Sacramento DWSC deepening.

Figure 4.2-31 shows the predicted flow at Threemile Slough at San Joaquin River (TMN) for the Year 0 Baseline scenario, the Year 0 Sacramento DWSC Only Deepening scenario, and the Year 0 Both DWSC Deepening scenario. During the second half of November (top panel of Figure 4.2-31), the predicted flow for all three scenarios is identical. Similarly, the daily-averaged flow is nearly identical between the three scenarios over the entire simulation year. The change in daily-averaged flow plot (lower panel of Figure 4.2-31) shows some small differences in daily-averaged flow between the Year 0 Baseline scenario and both the Year 0 Sacramento DWSC Only Deepening scenario and the Year 0 Both DWSC Deepening scenario. Under the Year 0 Sacramento DWSC Only Deepening scenario, an increase in net flow indicates less flow is flowing south through Threemile Slough during the high flow period between January and March (resulting in the decrease in daily-averaged flow predicted at Jersey Point during this period). Most of these differences are very small relative to the daily-averaged flow magnitude.

Figure 4.2-32 shows the predicted flow at False River (FAL) for the Year 0 Baseline scenario, the Year 0 Sacramento DWSC Only Deepening scenario, and the Year 0 Both DWSC Deepening scenario. During the second half of November (top panel of Figure 4.2-32), the predicted flow for all three scenarios is identical. Similarly, the daily-averaged flow is nearly identical between the three scenarios over the entire simulation year. No significant change in daily-averaged flow relative to the Year 0 Baseline scenario is predicted for the Year 0 Sacramento DWSC Only Deepening scenario. The change in daily-averaged flow plot (lower panel of Figure 4.2-32) shows a slight reduction in daily-averaged flow in False River during most of the year in under the Year 0 Both DWSC Deepening scenario relative to the Year 0 Baseline scenario, with the largest predicted decreases during the high flow period between January and March.

Figure 4.2-33 shows the predicted flow at San Joaquin River at Prisoners Point (PRI) for the Year 0 Baseline scenario, the Year 0 Sacramento DWSC Only Deepening scenario, and the Year 0 Both DWSC Deepening scenario. During the second half of November (top panel of Figure 4.2-33), the predicted flow for all three scenarios is similar, however the peak tidal flows under the Year 0 Both DWSC Deepening scenario are about 5% greater than under the Year 0 Baseline scenario. The daily-averaged flow is nearly identical between the three scenarios over the entire simulation year. No significant change in daily-averaged flow relative to the Year 0 Baseline scenario is predicted for the Year 0 Sacramento DWSC Only Deepening scenario. The change in daily-averaged flow plot (lower panel of Figure 4.2-33) shows some small differences in daily-averaged flow between the Year 0 Baseline scenario and the Year 0 Both DWSC Deepening scenario. These differences are very small relative to the daily-averaged flow magnitude, and are likely the result of small phase differences in tidal propagation and a slight increase in tidal prism resulting from the Stockton DWSC deepening.

Figure 4.2-34 shows the predicted flow at San Joaquin River at Stockton (STK) for the Year 0 Baseline scenario, the Year 0 Sacramento DWSC Only Deepening scenario, and the Year 0 Both

DWSC Deepening scenario. During the second half of November (top panel of Figure 4.2-34), the predicted flow for all three scenarios is identical. Similarly, the daily-averaged flow is nearly identical between the three scenarios over the entire simulation year. No significant change in daily-averaged flow relative to the Year 0 Baseline scenario is predicted for either the Year 0 Sacramento DWSC Only Deepening scenario or the Year 0 Both DWSC Deepening scenario.

Figure 4.2-35 shows the predicted flow at Middle River at Middle River (MID) for the Year 0 Baseline scenario, the Year 0 Sacramento DWSC Only Deepening scenario, and the Year 0 Both DWSC Deepening scenario. During the second half of November (top panel of Figure 4.2-35), the predicted flow for all three scenarios is identical. Similarly, the daily-averaged flow is nearly identical between the three scenarios over the entire simulation year. No significant change in daily-averaged flow relative to the Year 0 Baseline scenario is predicted for the Year 0 Sacramento DWSC Only Deepening scenario. The change in daily-averaged flow plot (lower panel of Figure 4.2-35) shows some small increases in daily-averaged flow between the Year 0 Baseline scenario and the Year 0 Both DWSC Deepening scenario. These differences are very small relative to the daily-averaged flow magnitude.

Figure 4.2-36 shows the predicted flow at Old River at Bacon Island (OLD) for the Year 0 Baseline scenario, the Year 0 Sacramento DWSC Only Deepening scenario, and the Year 0 Both DWSC Deepening scenario. During the second half of November (top panel of Figure 4.2-36), the predicted flow for all three scenarios is identical. Similarly, the daily-averaged flow is nearly identical between the three scenarios over the entire simulation year. No significant change in daily-averaged flow relative to the Year 0 Baseline scenario is predicted for the Year 0 Sacramento DWSC Only Deepening scenario. The change in daily-averaged flow plot (lower panel of Figure 4.2-36) shows some small differences in daily-averaged flow between the Year 0 Baseline scenario and the Year 0 Both DWSC Deepening scenario. These differences are very small relative to the daily-averaged flow magnitude.

Figure 4.2-37 shows the predicted flow at Old River near Byron (ORF) for the Year 0 Baseline scenario, the Year 0 Sacramento DWSC Only Deepening scenario, and the Year 0 Both DWSC Deepening scenario. During the second half of November (top panel of Figure 4.2-37), the predicted flow for all three scenarios is identical. Similarly, the daily-averaged flow is nearly identical between the three scenarios over the entire simulation year. No significant change in daily-averaged flow relative to the Year 0 Baseline scenario is predicted for either the Year 0 Sacramento DWSC Only Deepening scenario or the Year 0 Both DWSC Deepening scenario.

Figure 4.2-38 shows the predicted flow at Victoria Canal near Byron (VIC) for the Year 0 Baseline scenario, the Year 0 Sacramento DWSC Only Deepening scenario, and the Year 0 Both DWSC Deepening scenario. During the second half of November (top panel of Figure 4.2-38), the predicted flow for all three scenarios is identical. Similarly, the daily-averaged flow is nearly identical between the three scenarios over the entire simulation year. No significant change in daily-averaged flow relative to the Year 0 Baseline scenario is predicted for either the Year 0 Sacramento DWSC Only Deepening scenario or the Year 0 Both DWSC Deepening scenario.

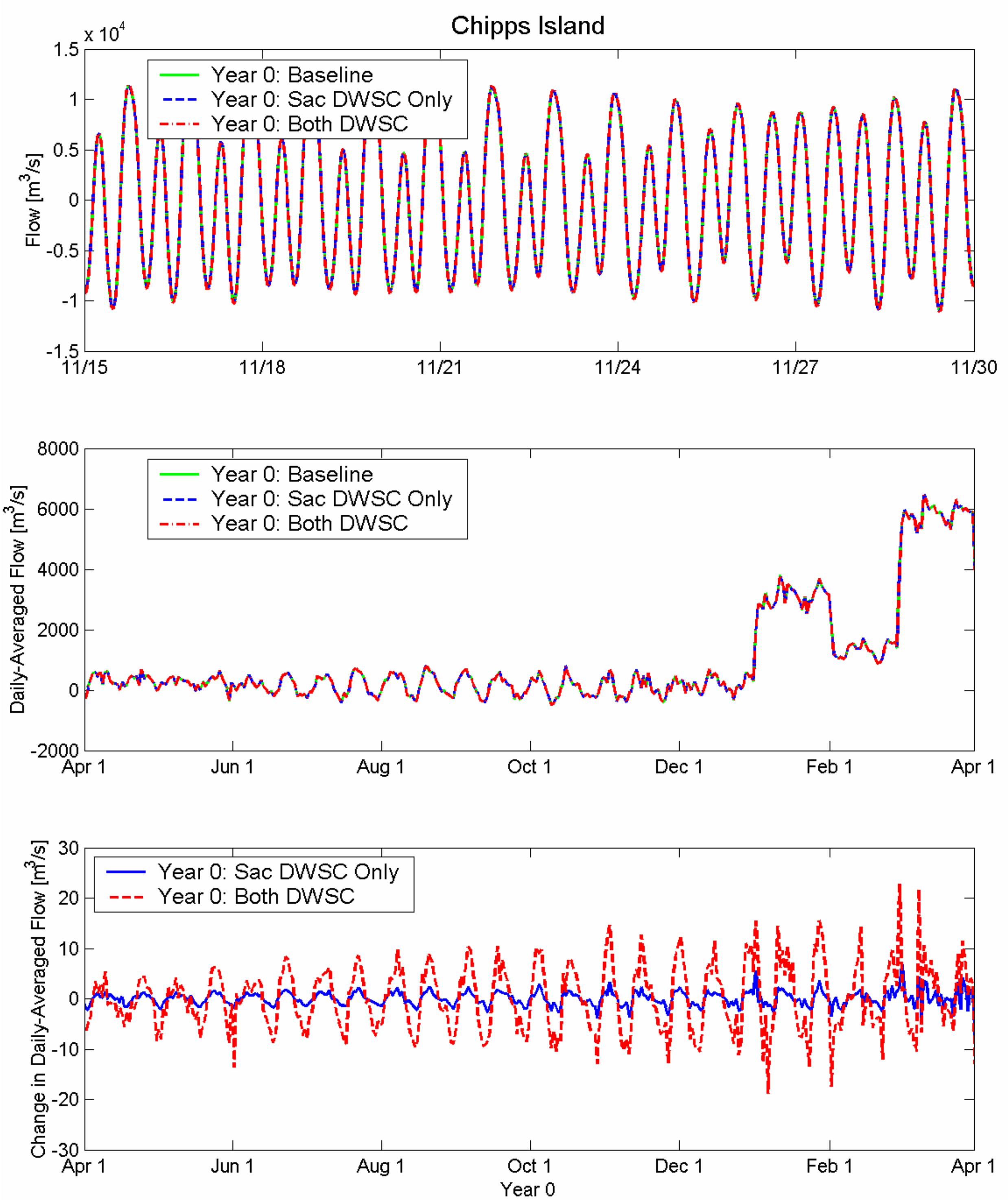


Figure 4.2-20 Predicted flow at Chipps Island for the Year 0 Baseline scenario, the Year 0 Sacramento DWSC Only Deepening scenario, and the Year 0 Both DWSC Deepening scenario: tidal time-scale variability over a 15-day period (top); daily-averaged flow for the Year 0 simulation period (middle); predicted increase in daily-averaged flow for the Year 0 Sacramento DWSC Only Deepening scenario and the Year 0 Both DWSC Deepening scenario relative to the Year 0 Baseline scenario (bottom).

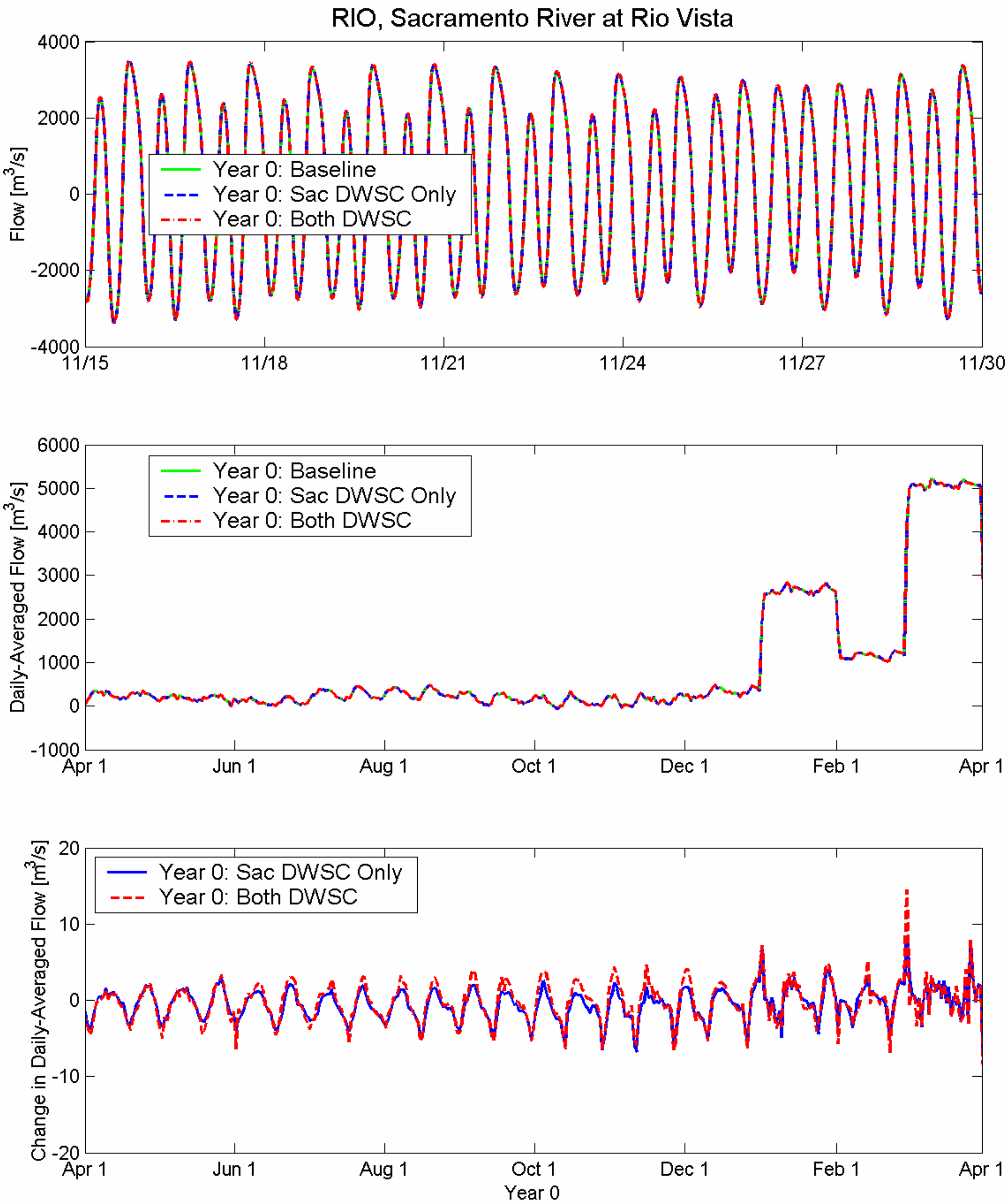


Figure 4.2-21 Predicted flow at Sacramento River at Rio Vista (RIO) for the Year 0 Baseline scenario, the Year 0 Sacramento DWSC Only Deepening scenario, and the Year 0 Both DWSC Deepening scenario: tidal time-scale variability over a 15-day period (top); daily-averaged flow for the Year 0 simulation period (middle); predicted increase in daily-averaged flow for the Year 0 Sacramento DWSC Only Deepening scenario and the Year 0 Both DWSC Deepening scenario relative to the Year 0 Baseline scenario (bottom).

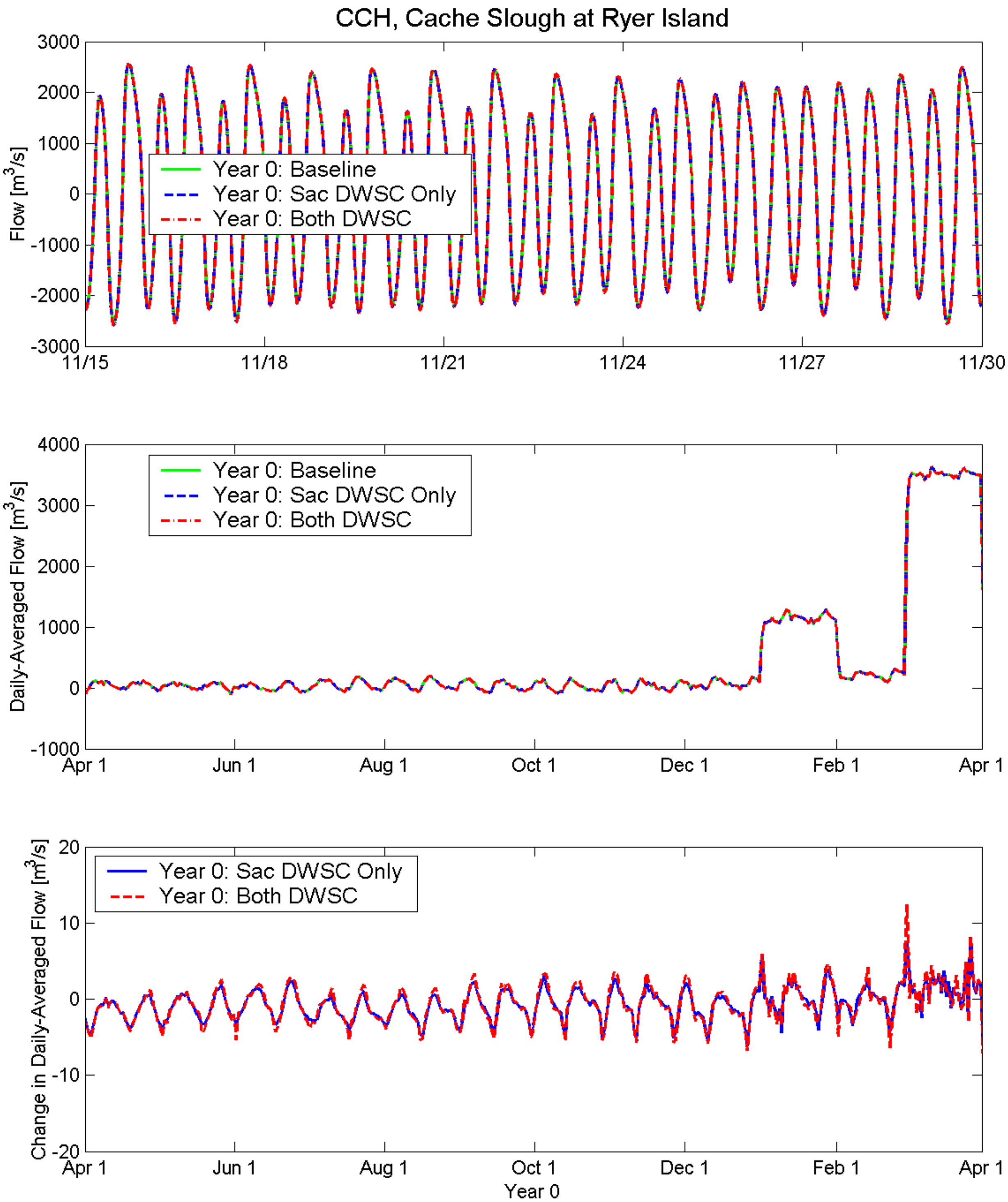


Figure 4.2-22 Predicted flow at Cache Slough at Ryer Island (CCH) for the Year 0 Baseline scenario, the Year 0 Sacramento DWSC Only Deepening scenario, and the Year 0 Both DWSC Deepening scenario: tidal time-scale variability over a 15-day period (top); daily-averaged flow for the Year 0 simulation period (middle); predicted increase in daily-averaged flow for the Year 0 Sacramento DWSC Only Deepening scenario and the Year 0 Both DWSC Deepening scenario relative to the Year 0 Baseline scenario (bottom).

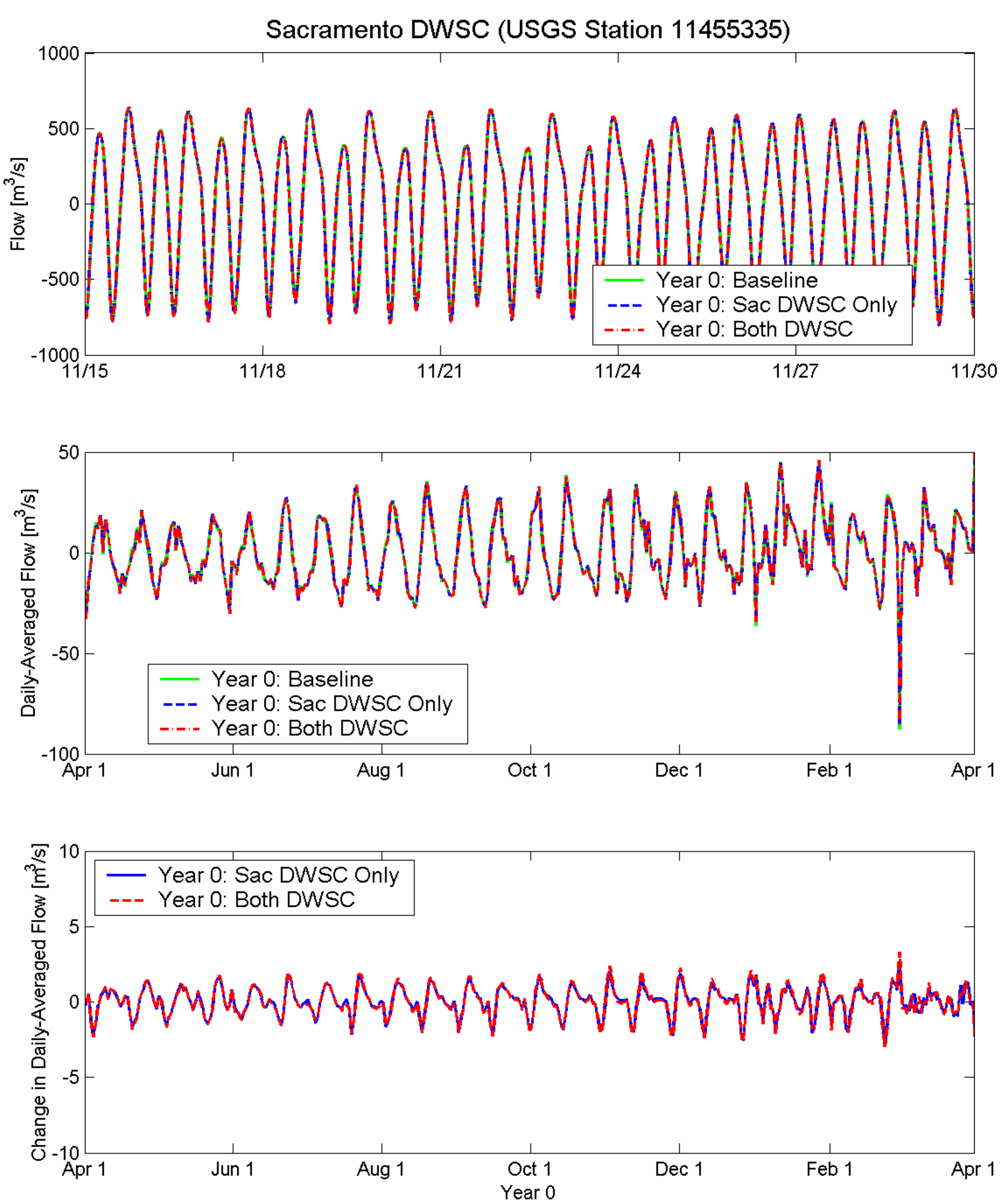


Figure 4.2-23 Predicted flow at Sacramento DWSC (USGS Station 11455335) for the Year 0 Baseline scenario, the Year 0 Sacramento DWSC Only Deepening scenario, and the Year 0 Both DWSC Deepening scenario: tidal time-scale variability over a 15-day period (top); daily-averaged flow for the Year 0 simulation period (middle); predicted increase in daily-averaged flow for the Year 0 Sacramento DWSC Only Deepening scenario and the Year 0 Both DWSC Deepening scenario relative to the Year 0 Baseline scenario (bottom).

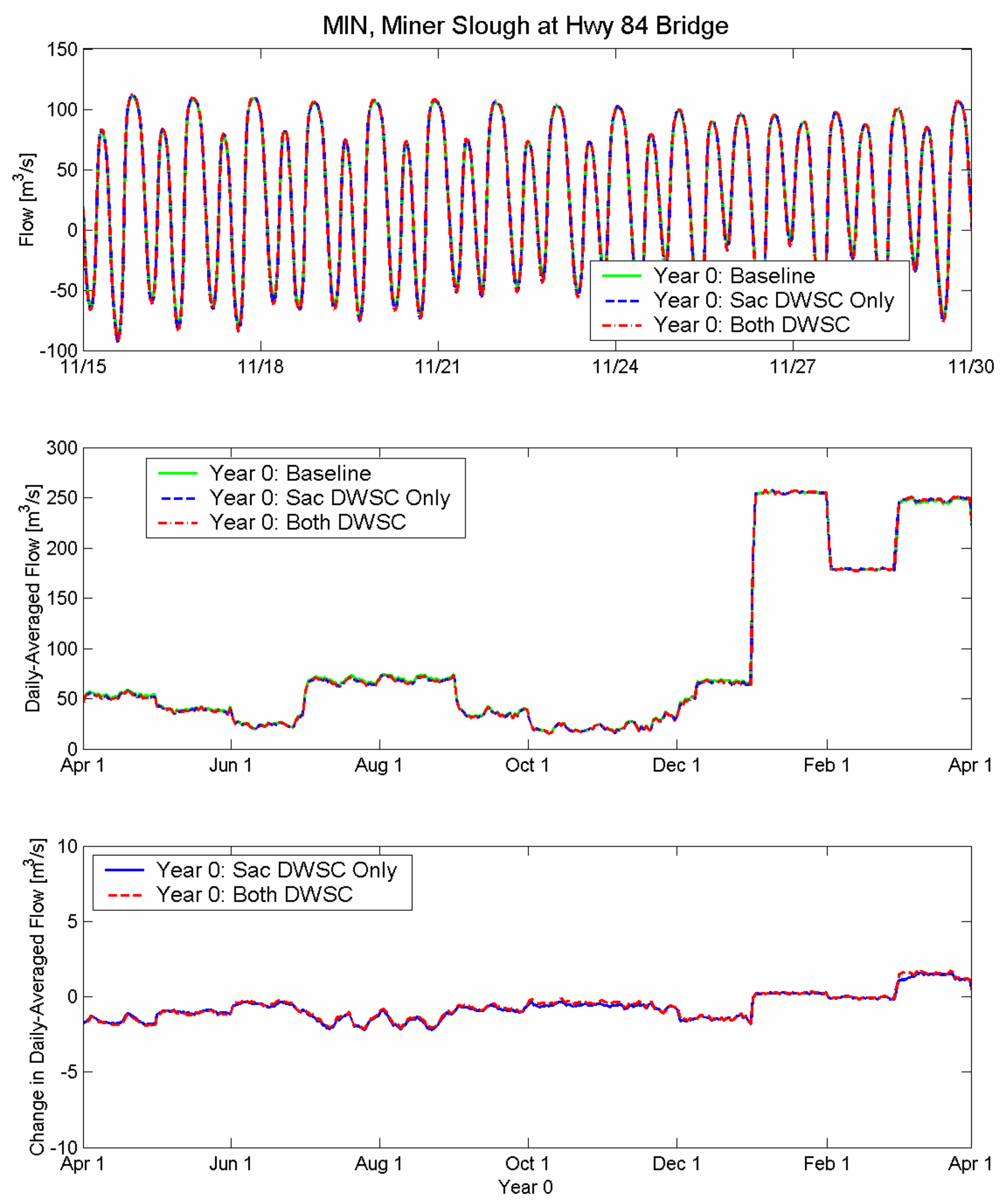


Figure 4.2-24 Predicted flow at Miner Slough at Highway 84 Bridge (MIN) for the Year 0 Baseline scenario, the Year 0 Sacramento DWSC Only Deepening scenario, and the Year 0 Both DWSC Deepening scenario: tidal time-scale variability over a 15-day period (top); daily-averaged flow for the Year 0 simulation period (middle); predicted increase in daily-averaged flow for the Year 0 Sacramento DWSC Only Deepening scenario and the Year 0 Both DWSC Deepening scenario relative to the Year 0 Baseline scenario (bottom).

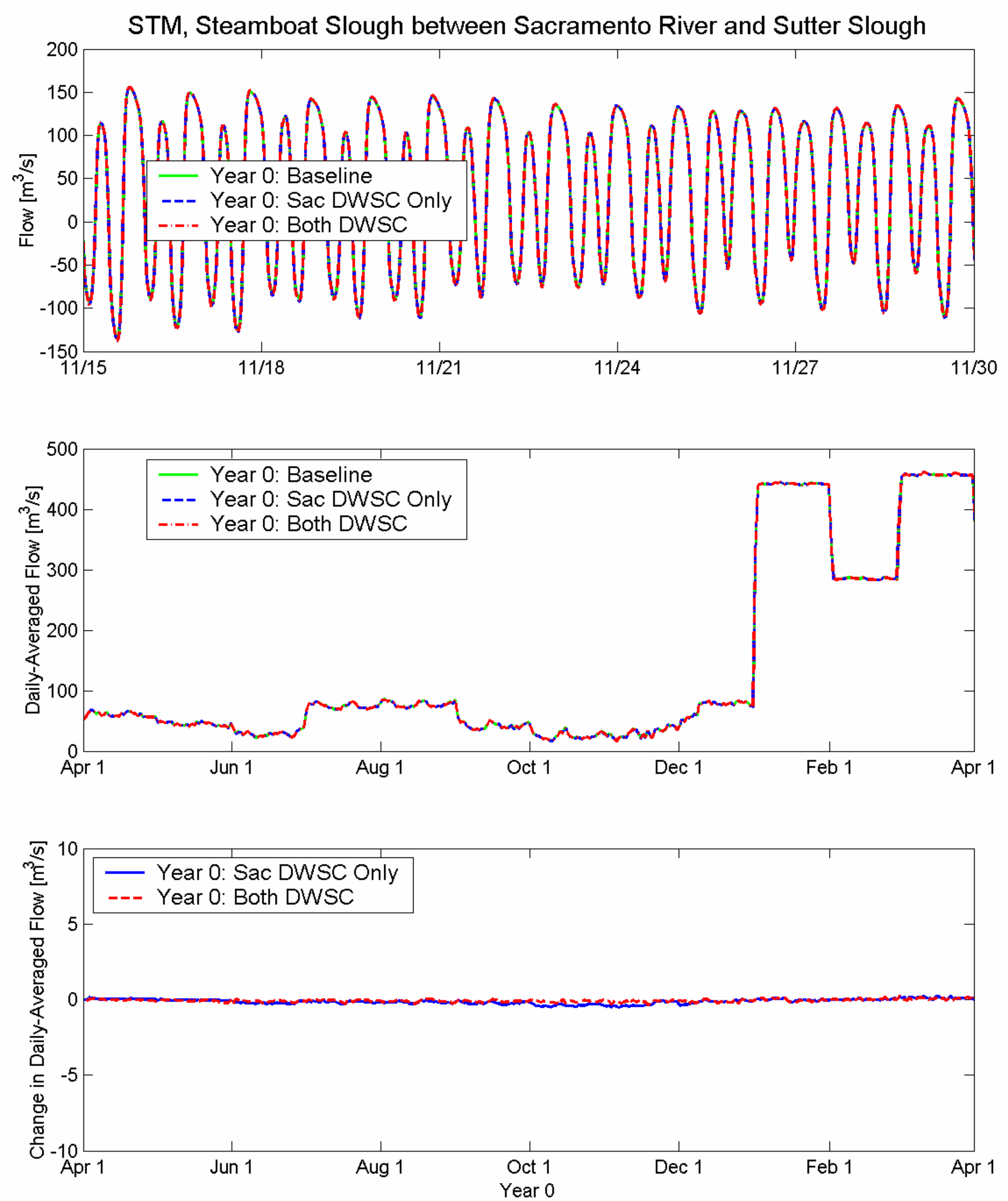


Figure 4.2-25 Predicted flow at Steamboat Slough between Sacramento River and Sutter Slough (STM) for the Year 0 Baseline scenario, the Year 0 Sacramento DWSC Only Deepening scenario, and the Year 0 Both DWSC Deepening scenario: tidal time-scale variability over a 15-day period (top); daily-averaged flow for the Year 0 simulation period (middle); predicted increase in daily-averaged flow for the Year 0 Sacramento DWSC Only Deepening scenario and the Year 0 Both DWSC Deepening scenario relative to the Year 0 Baseline scenario (bottom).

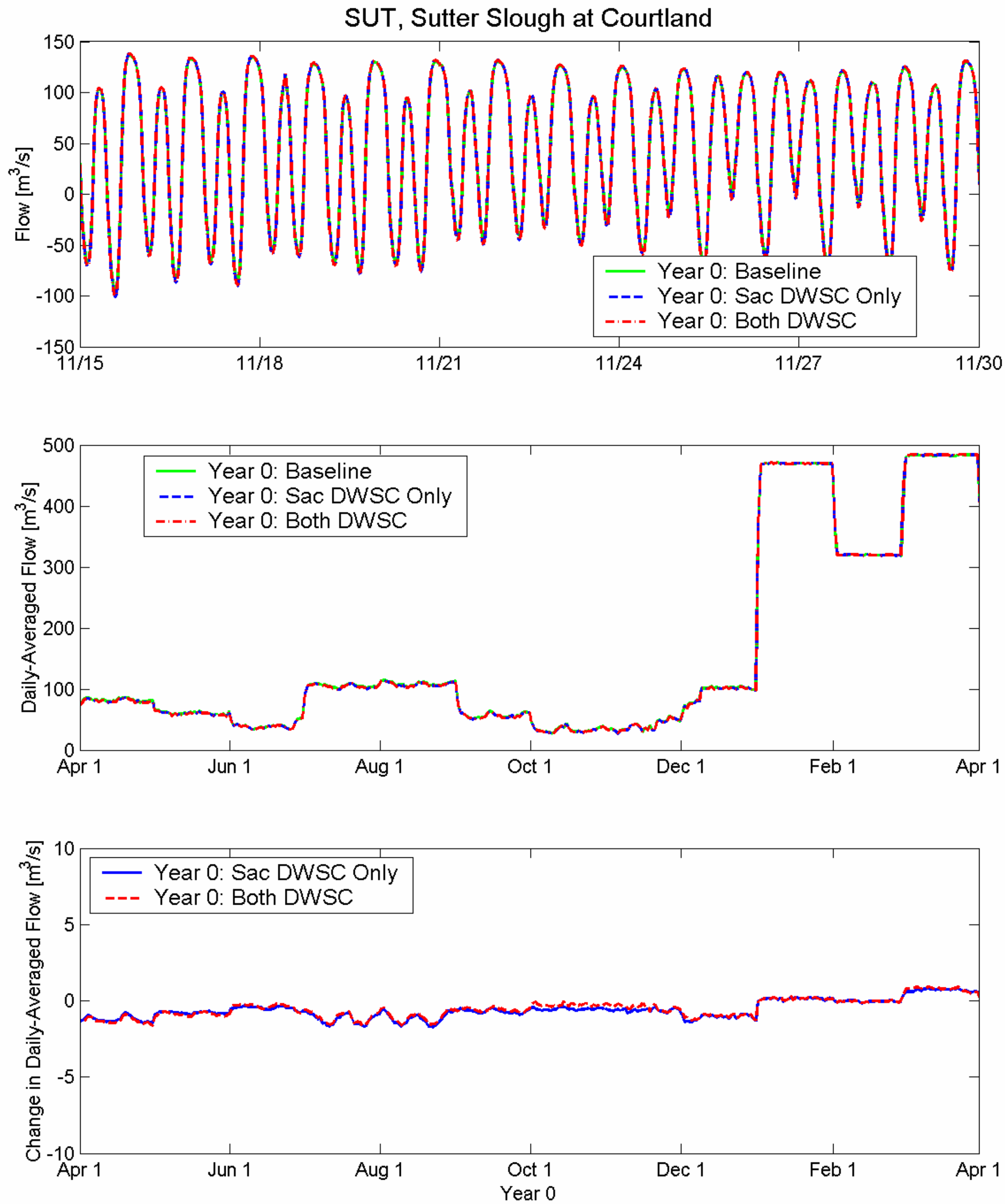


Figure 4.2-26 Predicted flow at Sutter Slough at Courtland (SUT) for the Year 0 Baseline scenario, the Year 0 Sacramento DWSC Only Deepening scenario, and the Year 0 Both DWSC Deepening scenario: tidal time-scale variability over a 15-day period (top); daily-averaged flow for the Year 0 simulation period (middle); predicted increase in daily-averaged flow for the Year 0 Sacramento DWSC Only Deepening scenario and the Year 0 Both DWSC Deepening scenario relative to the Year 0 Baseline scenario (bottom).

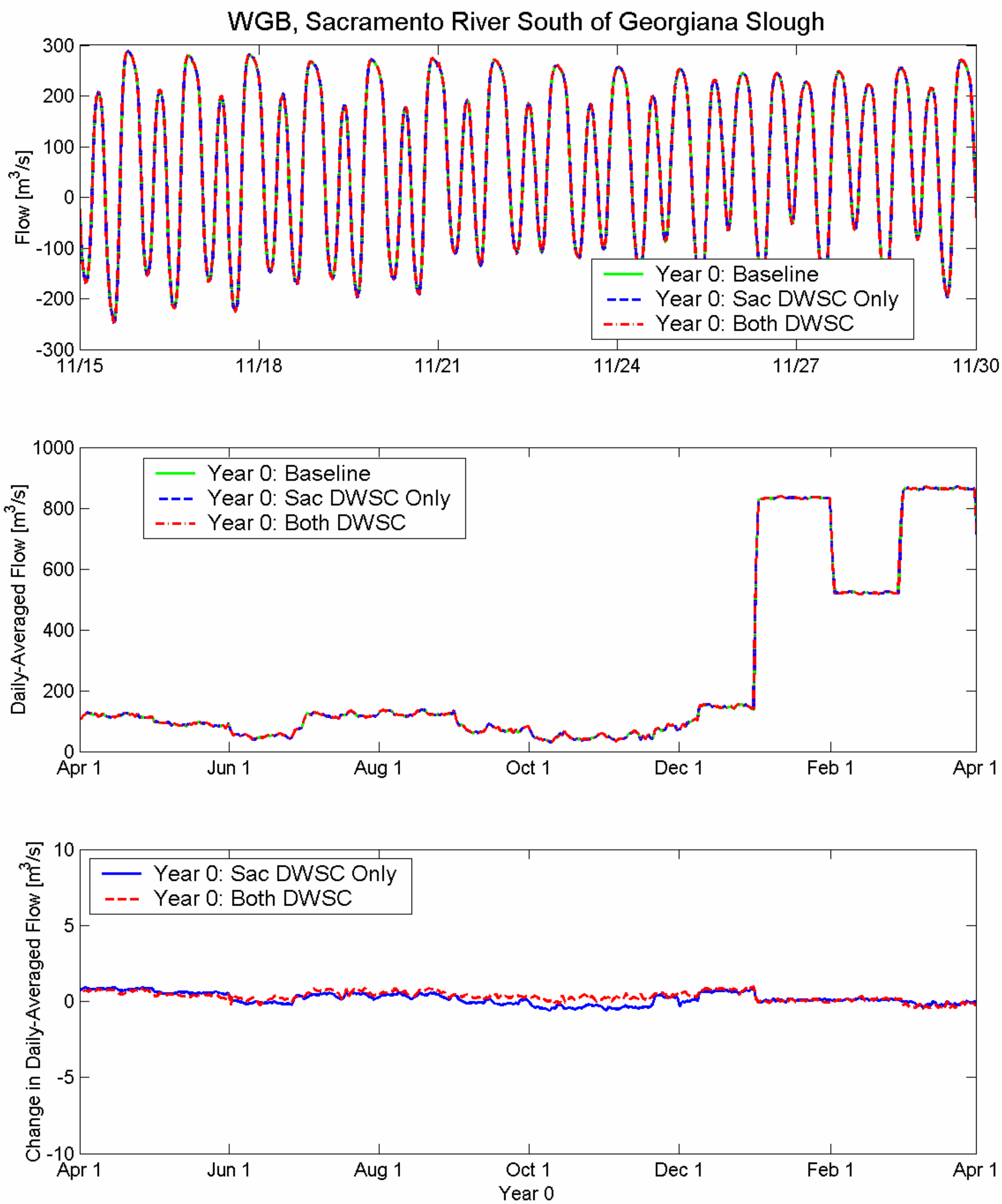


Figure 4.2-27 Predicted flow at Sacramento River South of Georgiana Slough (WGB) for the Year 0 Baseline scenario, the Year 0 Sacramento DWSC Only Deepening scenario, and the Year 0 Both DWSC Deepening scenario: tidal time-scale variability over a 15-day period (top); daily-averaged flow for the Year 0 simulation period (middle); predicted increase in daily-averaged flow for the Year 0 Sacramento DWSC Only Deepening scenario and the Year 0 Both DWSC Deepening scenario relative to the Year 0 Baseline scenario (bottom).

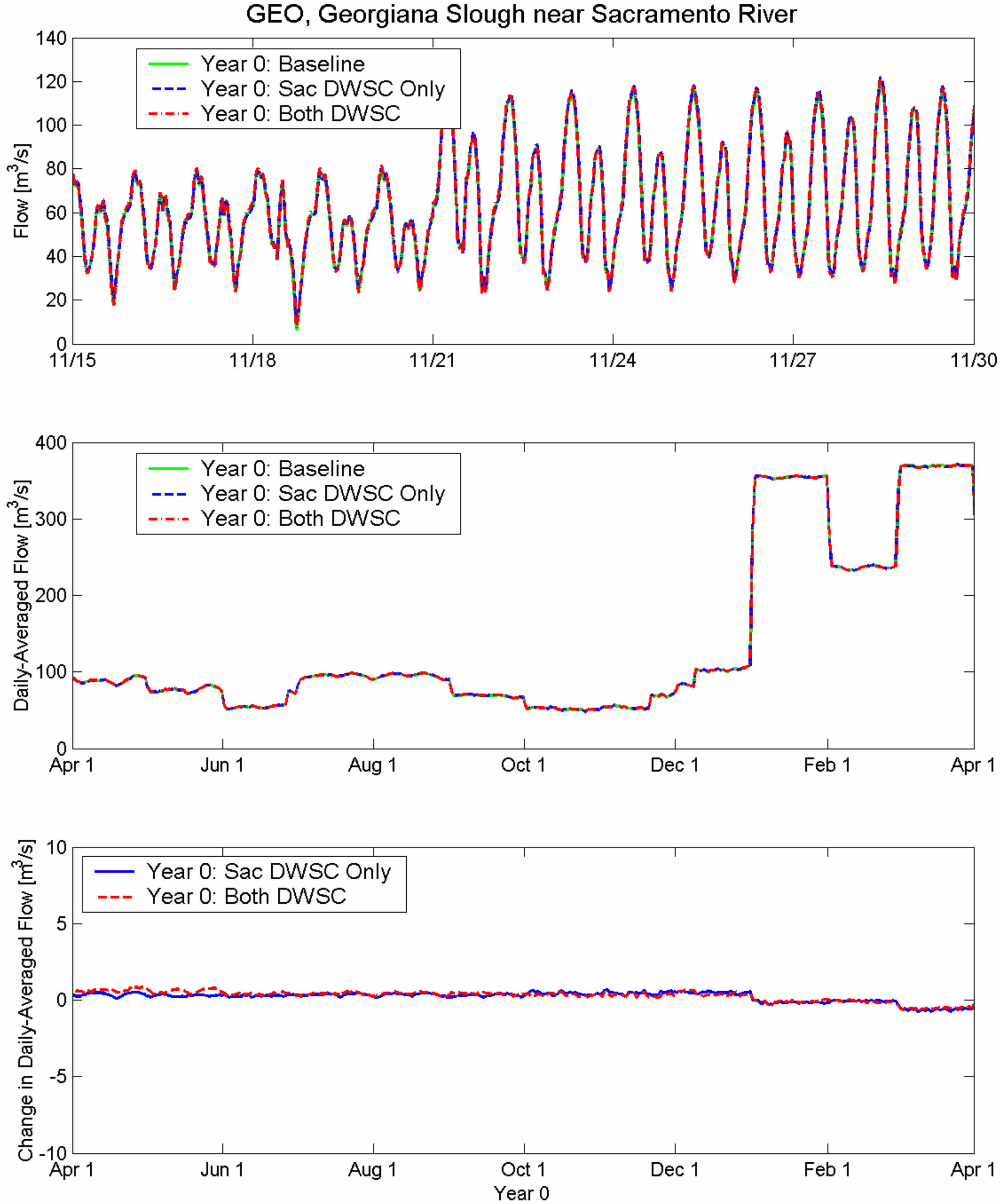


Figure 4.2-28 Predicted flow at Georgiana Slough near Sacramento River (GEO) for the Year 0 Baseline scenario, the Year 0 Sacramento DWSC Only Deepening scenario, and the Year 0 Both DWSC Deepening scenario: tidal time-scale variability over a 15-day period (top); daily-averaged flow for the Year 0 simulation period (middle); predicted increase in daily-averaged flow for the Year 0 Sacramento DWSC Only Deepening scenario and the Year 0 Both DWSC Deepening scenario relative to the Year 0 Baseline scenario (bottom).

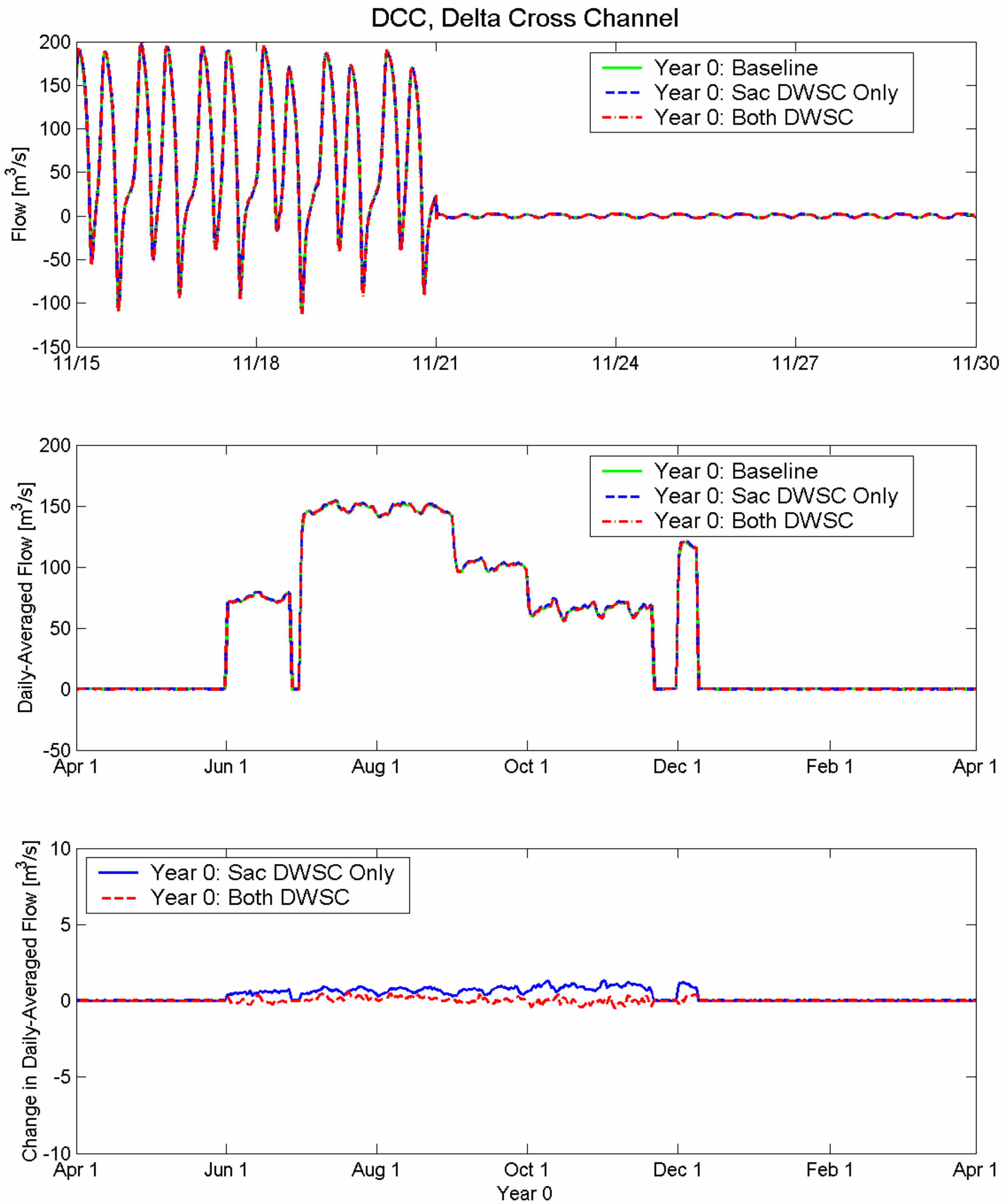


Figure 4.2-29 Predicted flow at the Delta Cross Channel (DCC) for the Year 0 Baseline scenario, the Year 0 Sacramento DWSC Only Deepening scenario, and the Year 0 Both DWSC Deepening scenario: tidal time-scale variability over a 15-day period (top); daily-averaged flow for the Year 0 simulation period (middle); predicted increase in daily-averaged flow for the Year 0 Sacramento DWSC Only Deepening scenario and the Year 0 Both DWSC Deepening scenario relative to the Year 0 Baseline scenario (bottom).

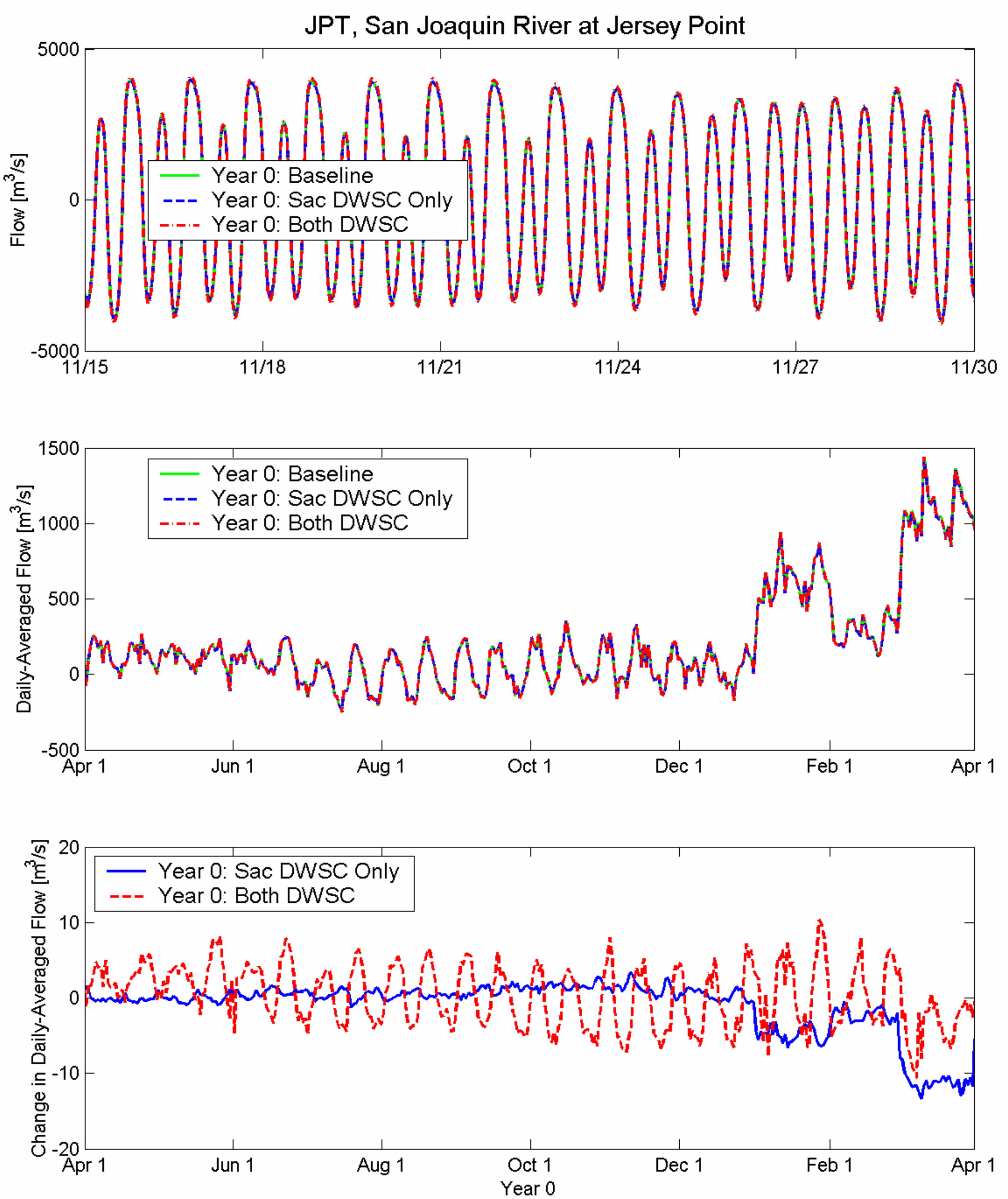


Figure 4.2-30 Predicted flow at San Joaquin River at Jersey Point (JPT) for the Year 0 Baseline scenario, the Year 0 Sacramento DWSC Only Deepening scenario, and the Year 0 Both DWSC Deepening scenario: tidal time-scale variability over a 15-day period (top); daily-averaged flow for the Year 0 simulation period (middle); predicted increase in daily-averaged flow for the Year 0 Sacramento DWSC Only Deepening scenario and the Year 0 Both DWSC Deepening scenario relative to the Year 0 Baseline scenario (bottom).

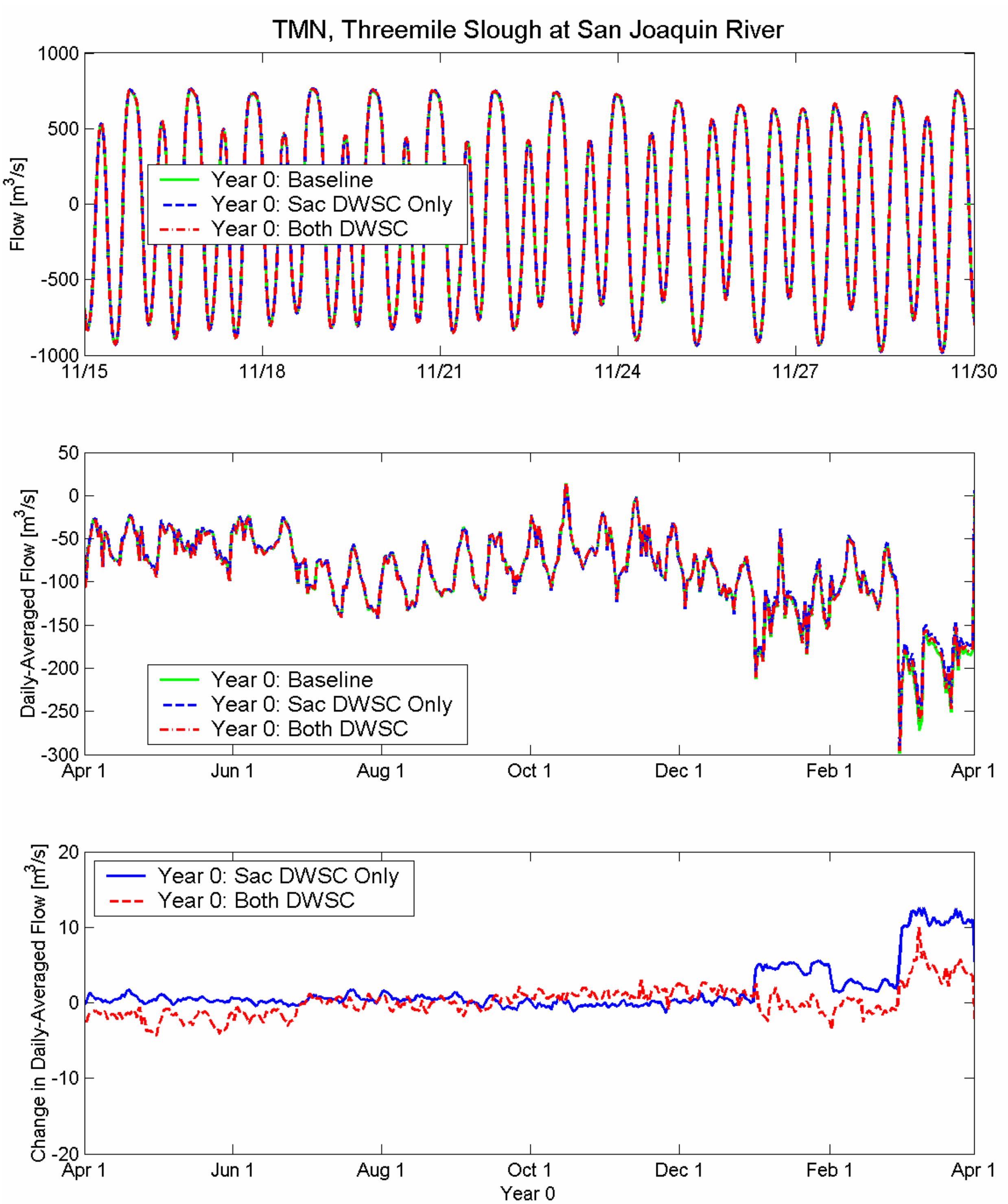


Figure 4.2-31 Predicted flow at Threemile Slough at San Joaquin River (TMN) for the Year 0 Baseline scenario, the Year 0 Sacramento DWSC Only Deepening scenario, and the Year 0 Both DWSC Deepening scenario: tidal time-scale variability over a 15-day period (top); daily-averaged flow for the Year 0 simulation period (middle); predicted increase in daily-averaged flow for the Year 0 Sacramento DWSC Only Deepening scenario and the Year 0 Both DWSC Deepening scenario relative to the Year 0 Baseline scenario (bottom).

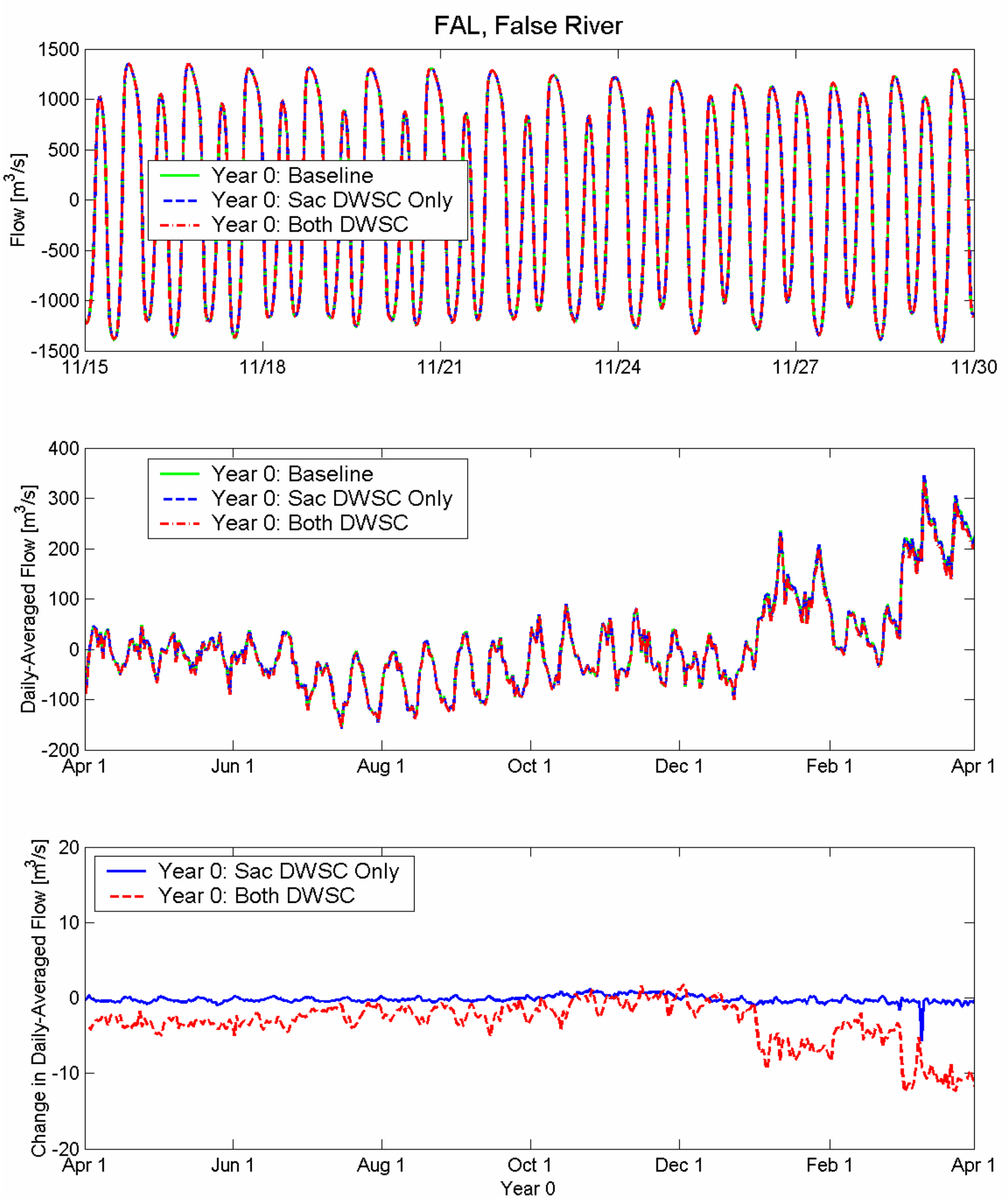


Figure 4.2-32 Predicted flow at False River (FAL) for the Year 0 Baseline scenario, the Year 0 Sacramento DWSC Only Deepening scenario, and the Year 0 Both DWSC Deepening scenario: tidal time-scale variability over a 15-day period (top); daily-averaged flow for the Year 0 simulation period (middle); predicted increase in daily-averaged flow for the Year 0 Sacramento DWSC Only Deepening scenario and the Year 0 Both DWSC Deepening scenario relative to the Year 0 Baseline scenario (bottom).

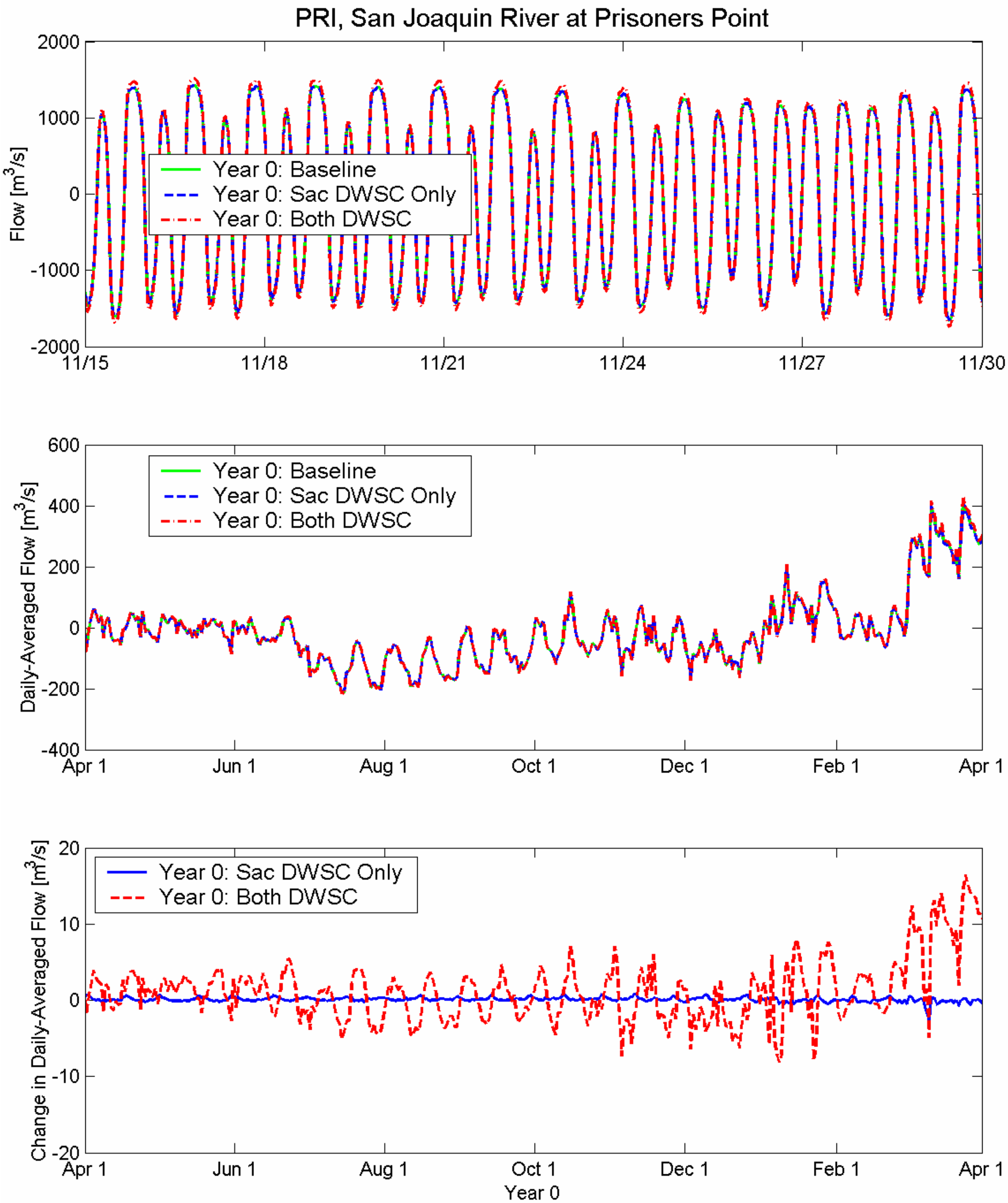


Figure 4.2-33 Predicted flow at San Joaquin River at Prisoners Point (PRI) for the Year 0 Baseline scenario, the Year 0 Sacramento DWSC Only Deepening scenario, and the Year 0 Both DWSC Deepening scenario: tidal time-scale variability over a 15-day period (top); daily-averaged flow for the Year 0 simulation period (middle); predicted increase in daily-averaged flow for the Year 0 Sacramento DWSC Only Deepening scenario and the Year 0 Both DWSC Deepening scenario relative to the Year 0 Baseline scenario (bottom).

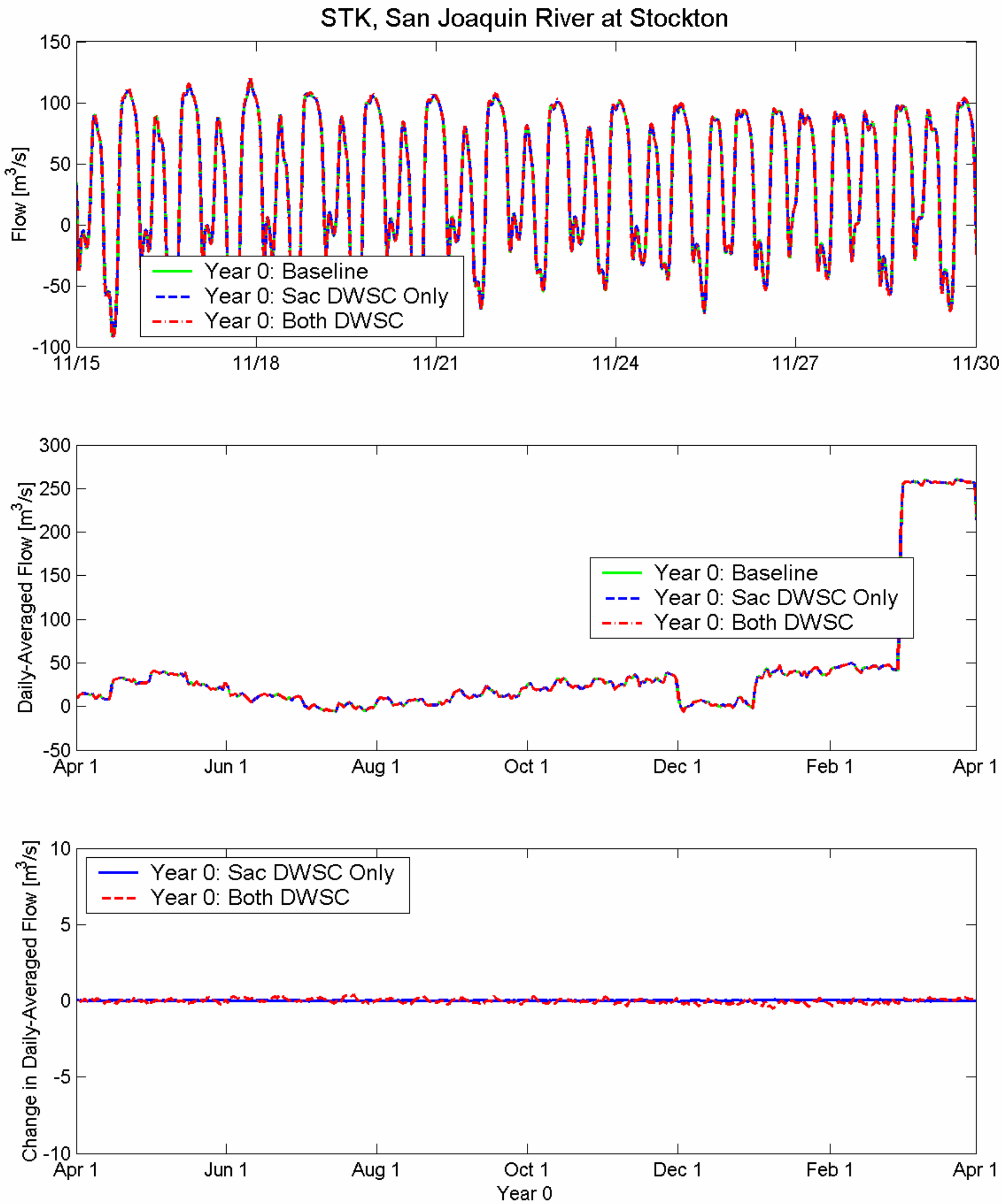


Figure 4.2-34 Predicted flow at San Joaquin River at Stockton (STK) for the Year 0 Baseline scenario, the Year 0 Sacramento DWSC Only Deepening scenario, and the Year 0 Both DWSC Deepening scenario: tidal time-scale variability over a 15-day period (top); daily-averaged flow for the Year 0 simulation period (middle); predicted increase in daily-averaged flow for the Year 0 Sacramento DWSC Only Deepening scenario and the Year 0 Both DWSC Deepening scenario relative to the Year 0 Baseline scenario (bottom).

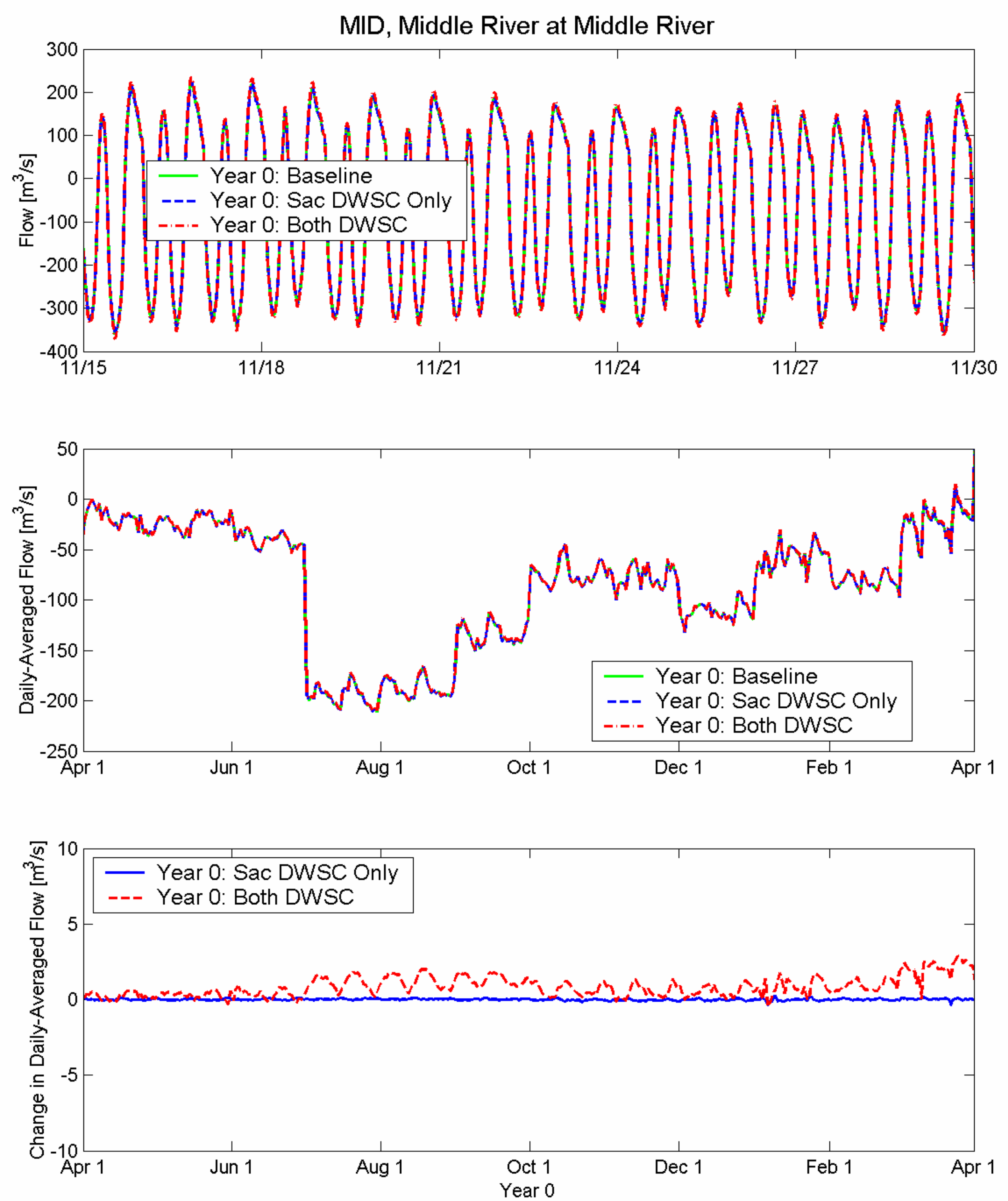


Figure 4.2-35 Predicted flow at Middle River at Middle River (MID) for the Year 0 Baseline scenario, the Year 0 Sacramento DWSC Only Deepening scenario, and the Year 0 Both DWSC Deepening scenario: tidal time-scale variability over a 15-day period (top); daily-averaged flow for the Year 0 simulation period (middle); predicted increase in daily-averaged flow for the Year 0 Sacramento DWSC Only Deepening scenario and the Year 0 Both DWSC Deepening scenario relative to the Year 0 Baseline scenario (bottom).

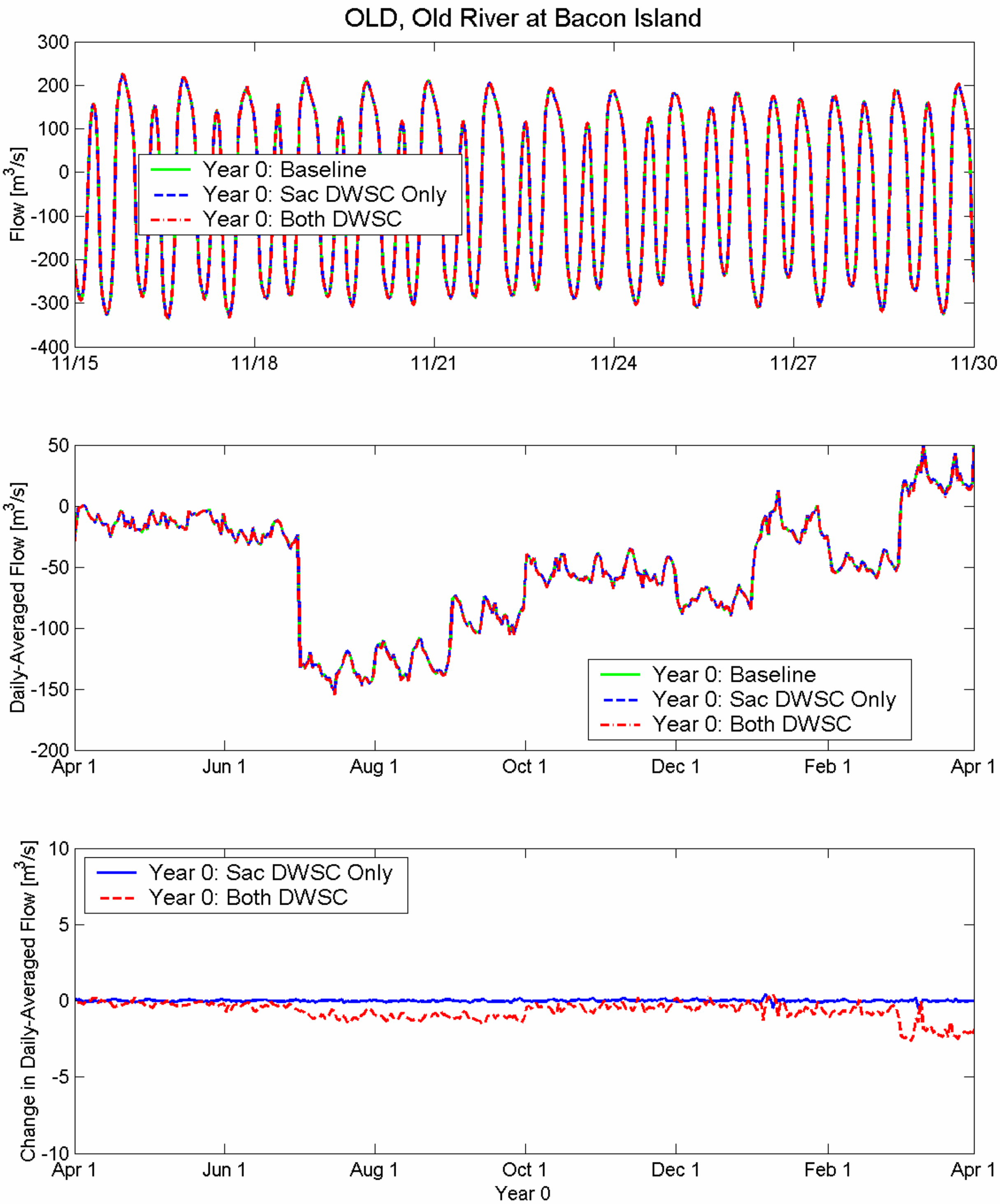


Figure 4.2-36 Predicted flow at Old River at Bacon Island (OLD) for the Year 0 Baseline scenario, the Year 0 Sacramento DWSC Only Deepening scenario, and the Year 0 Both DWSC Deepening scenario: tidal time-scale variability over a 15-day period (top); daily-averaged flow for the Year 0 simulation period (middle); predicted increase in daily-averaged flow for the Year 0 Sacramento DWSC Only Deepening scenario and the Year 0 Both DWSC Deepening scenario relative to the Year 0 Baseline scenario (bottom).

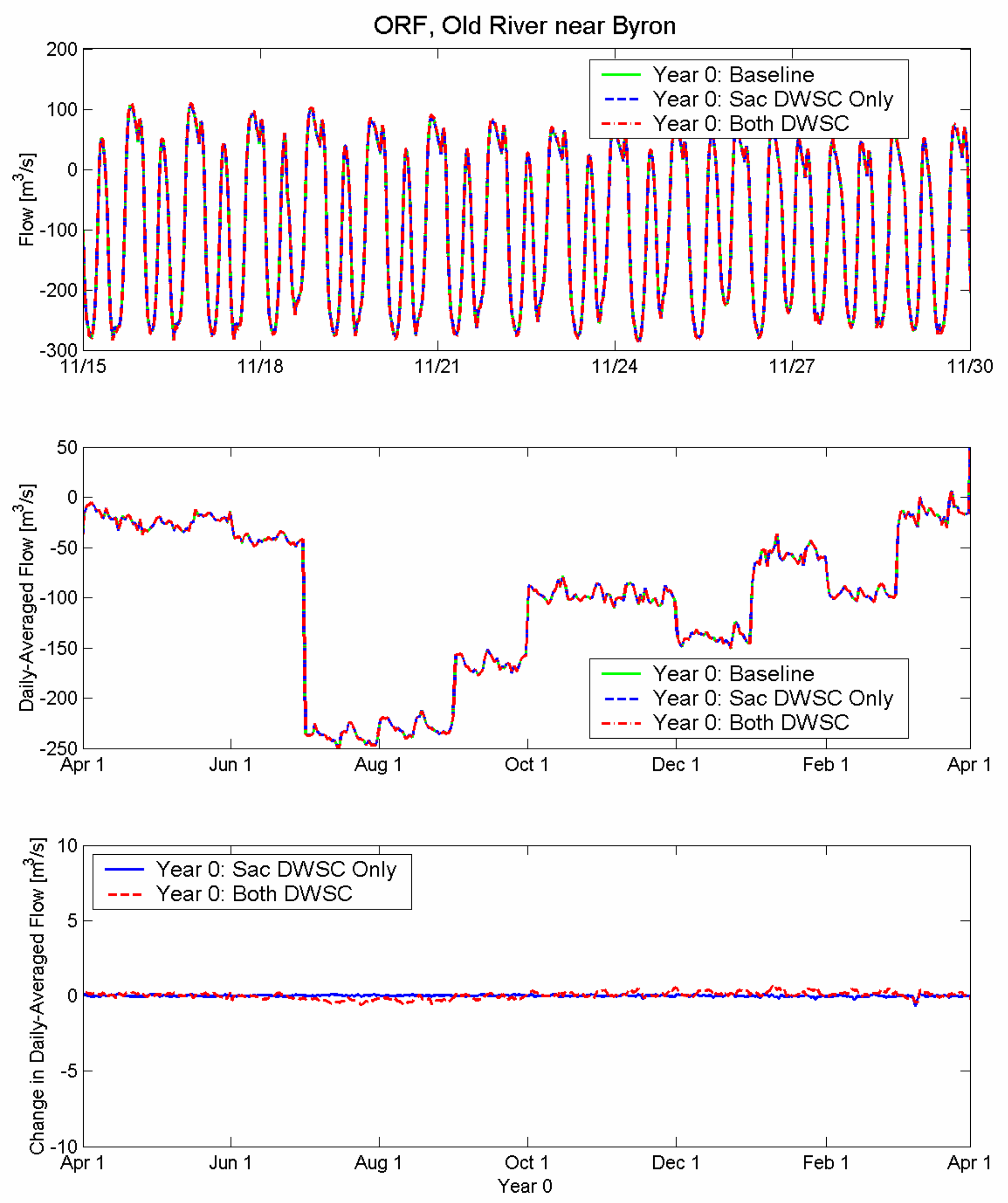


Figure 4.2-37 Predicted flow at Old River near Byron (ORF) for the Year 0 Baseline scenario, the Year 0 Sacramento DWSC Only Deepening scenario, and the Year 0 Both DWSC Deepening scenario: tidal time-scale variability over a 15-day period (top); daily-averaged flow for the Year 0 simulation period (middle); predicted increase in daily-averaged flow for the Year 0 Sacramento DWSC Only Deepening scenario and the Year 0 Both DWSC Deepening scenario relative to the Year 0 Baseline scenario (bottom).

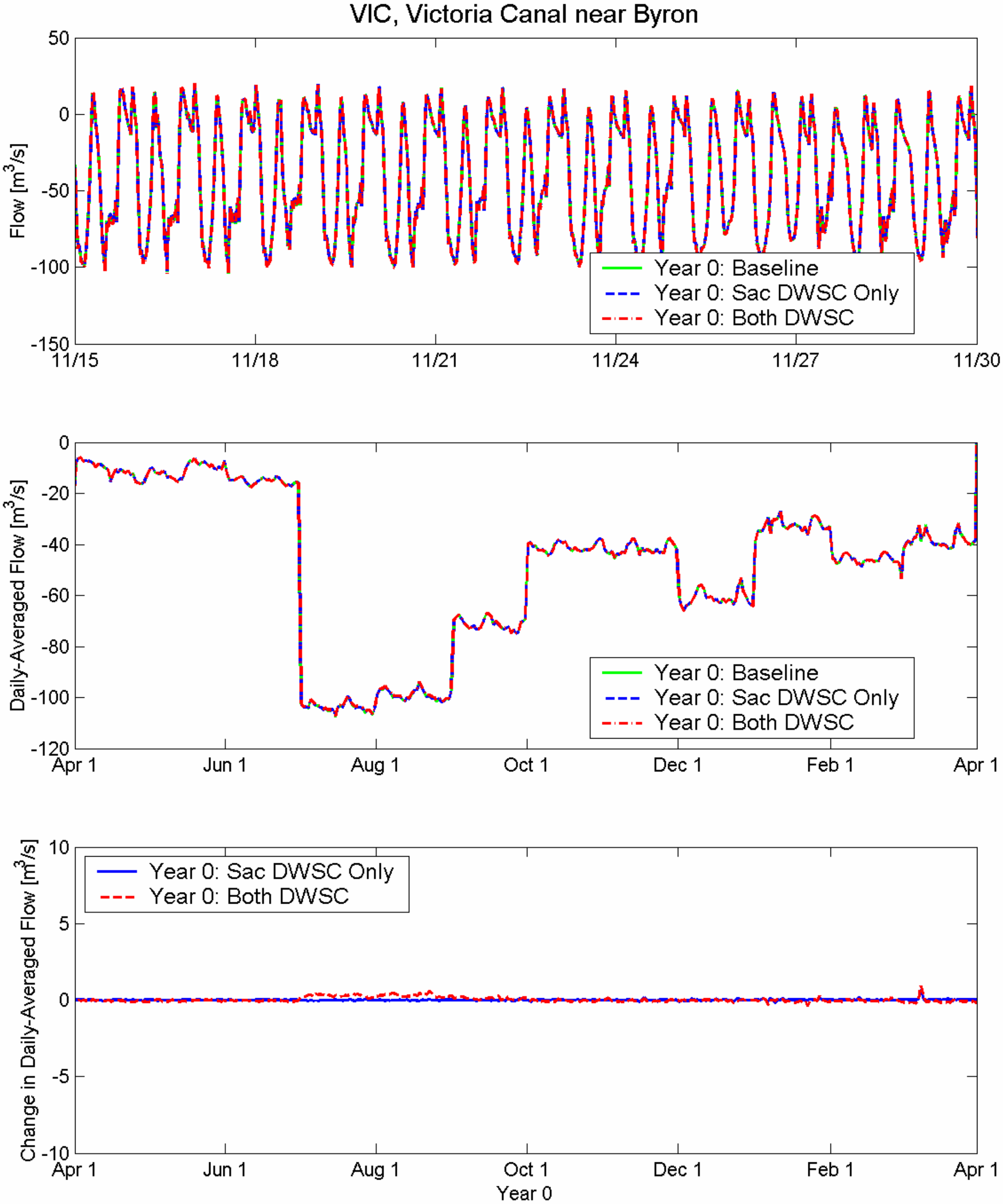


Figure 4.2-38 Predicted flow at Victoria Canal near Byron (VIC) for the Year 0 Baseline scenario, the Year 0 Sacramento DWSC Only Deepening scenario, and the Year 0 Both DWSC Deepening scenario: tidal time-scale variability over a 15-day period (top); daily-averaged flow for the Year 0 simulation period (middle); predicted increase in daily-averaged flow for the Year 0 Sacramento DWSC Only Deepening scenario and the Year 0 Both DWSC Deepening scenario relative to the Year 0 Baseline scenario (bottom).

4.3 Evaluation of Salinity Impacts on X2

For each scenario simulation, the daily-averaged salinity along the transects shown on Figure 3.3-4 were used to compute the predicted X2, measured from the Golden Gate, along both the Sacramento and San Joaquin River transects. The "average X2" was also computed by averaging the computed X2 distance measured along the two transects, as described in Section 3.3.3.

4.3.1 Year 0 Sacramento DWSC Only Deepening

Figure 4.3-1 shows the predicted daily-averaged salinity profile along the axis of San Francisco Bay from the Golden Gate to the Port of Sacramento on December 3, the day of maximum predicted X2, for the Year 0 Baseline scenario and the Year 0 Sacramento DWSC Only Deepening scenario. The vertical red line indicates the position of the Sacramento transect X2 for the Year 0 Baseline scenario. On December 3 the predicted X2 measured along the Sacramento transect is 96.3 km for the Year 0 Baseline scenario, and 97.2 km for the Year 0 Sacramento DWSC Only Deepening scenario (an increase of 0.9 km).

Figure 4.3-2 shows the predicted daily-averaged salinity profile along the axis of San Francisco Bay from the Golden Gate to the Port of Stockton on December 3, the day of maximum predicted X2, for the Year 0 Baseline scenario and the Year 0 Sacramento DWSC Only Deepening scenario. The vertical red line indicates the position of the San Joaquin transect X2 for the Year 0 Baseline scenario. On December 3 the predicted X2 measured along the San Joaquin transect is 99.3 km for the Year 0 Baseline scenario, and 99.7 km for the Year 0 Sacramento DWSC Only Deepening scenario (an increase of 0.4 km).

Figure 4.3-3 shows the predicted X2 measured from the Golden Gate to the Port of Sacramento during the Year 0 simulation period for the Year 0 Baseline scenario and the Year 0 Sacramento DWSC Only Deepening scenario. For the periods from April through June and January through March, the predicted X2 along the Sacramento transect (Figure 4.3-3) for the Year 0 Baseline scenario is nearly identical to the predicted X2 along the Sacramento transect for the Year 0 Sacramento DWSC Only Deepening scenario. This suggests that the deepening of the Sacramento DWSC only affects X2 during the summer to early winter period when X2 is past Collinsville. Between July and January, salt intrusion into the region of the Sacramento DWSC leads to enhanced gravitational circulation under the Year 0 Sacramento DWSC Only Deepening scenario relative to the Year 0 Baseline scenario.

Figure 4.3-4 shows the predicted X2 measured from the Golden Gate to the Port of Stockton during the Year 0 simulation period for the Year 0 Baseline scenario and the Year 0 Sacramento DWSC Only Deepening scenario. The Year 0 Sacramento DWSC Only Deepening scenario results in only a very small increase in X2 measured along the San Joaquin transect. This shows that the deepening of the Sacramento DWSC Only has a relatively small impact on salt intrusion along the San Joaquin River side of the Delta.

Figure 4.3-5 shows the predicted “average X2” measured from the Golden Gate during the Year 0 simulation period for the Year 0 Baseline scenario and the Year 0 Sacramento DWSC Only Deepening scenario. Because the Year 0 Sacramento DWSC Only Deepening scenario has a more pronounced impact on salt intrusion on the Sacramento transect than the San Joaquin transect, the computed change in “average X2” (Figure 4.3-5) shows a smaller increase in X2 than is predicted along the Sacramento transect (Figure 4.3-3). On December 3 the predicted “average X2” is 97.8 km for the Year 0 Baseline scenario and 98.4 km for the Year 0 Sacramento DWSC Only Deepening scenario (an increase of 0.6 km). The 0.6 km increase in “average X2” is less than the 0.9 km increase in X2 predicted along the Sacramento transect on December 3.

Figure 4.3-6 shows the cumulative number of days during the year that the change in predicted X2 measured along the Sacramento transect for the Year 0 Sacramento DWSC Only Deepening scenario exceeds the corresponding Sacramento transect X2 predicted under the Year 0 Baseline Scenario by a specific distance. The maximum change in X2 measured along the Sacramento transect during the Year 0 Sacramento DWSC Only Deepening scenario is 2.69 km. A change in X2 measured along the Sacramento transect of 2.0 km or more is predicted on 4 days for the Year 0 Sacramento DWSC Only Deepening scenario. A change in X2 measured along the Sacramento transect of 1.0 km or more is predicted on 52 days. The median predicted change in X2 measured along the Sacramento transect under the Year 0 Sacramento DWSC Only Deepening scenario is 0.13 km. For 182 days during the year under the Year 0 Sacramento DWSC Only Deepening scenario, the predicted change in X2 measured along the Sacramento transect is more than 0.13 km, whereas for 182 days the predicted change in X2 measured along the Sacramento transect under the Year 0 Sacramento DWSC Only Deepening scenario is less than 0.13 km.

Figure 4.3-7 shows the cumulative number of days during the year that the change in predicted X2 measured along the San Joaquin transect for the Year 0 Sacramento DWSC Only Deepening scenario exceeds the corresponding San Joaquin transect X2 predicted under the Year 0 Baseline Scenario by a specific distance. The maximum change in X2 measured along the San Joaquin transect during the Year 0 Sacramento DWSC Only Deepening scenario is 0.86 km. A change in X2 measured along the San Joaquin transect of 0.5 km or more is predicted on 17 days for the Year 0 Sacramento DWSC Only Deepening scenario. The median predicted change in X2 measured along the San Joaquin transect under the Year 0 Sacramento DWSC Only Deepening scenario is 0.04 km. For 182 days during the year under the Year 0 Sacramento DWSC Only Deepening scenario, the predicted change in X2 measured along the San Joaquin transect is more than 0.04 km, whereas for 182 days the predicted change in X2 measured along the San Joaquin transect under the Year 0 Sacramento DWSC Only Deepening scenario is less than 0.04 km.

Figure 4.3-8 shows the cumulative number of days during the year that the change in predicted average X2 for the Year 0 Sacramento DWSC Only Deepening scenario exceeds the corresponding average X2 predicted under the Year 0 Baseline Scenario by a specific distance. The maximum change in average X2 during the Year 0 Sacramento DWSC Only Deepening scenario is 1.54 km. A change of average X2 of 1.0 km or more is predicted on 13 days for the Year 0 Sacramento DWSC Only Deepening scenario. The median predicted change in average under the Year 0 Sacramento DWSC Only Deepening scenario is 0.11 km. For 182 days during the year under the Year 0 Sacramento DWSC Only Deepening scenario, the predicted change in average X2 is more than 0.11 km, whereas for 182 days the predicted change in average X2 under the Year 0 Sacramento DWSC Only Deepening scenario is less than 0.11 km.

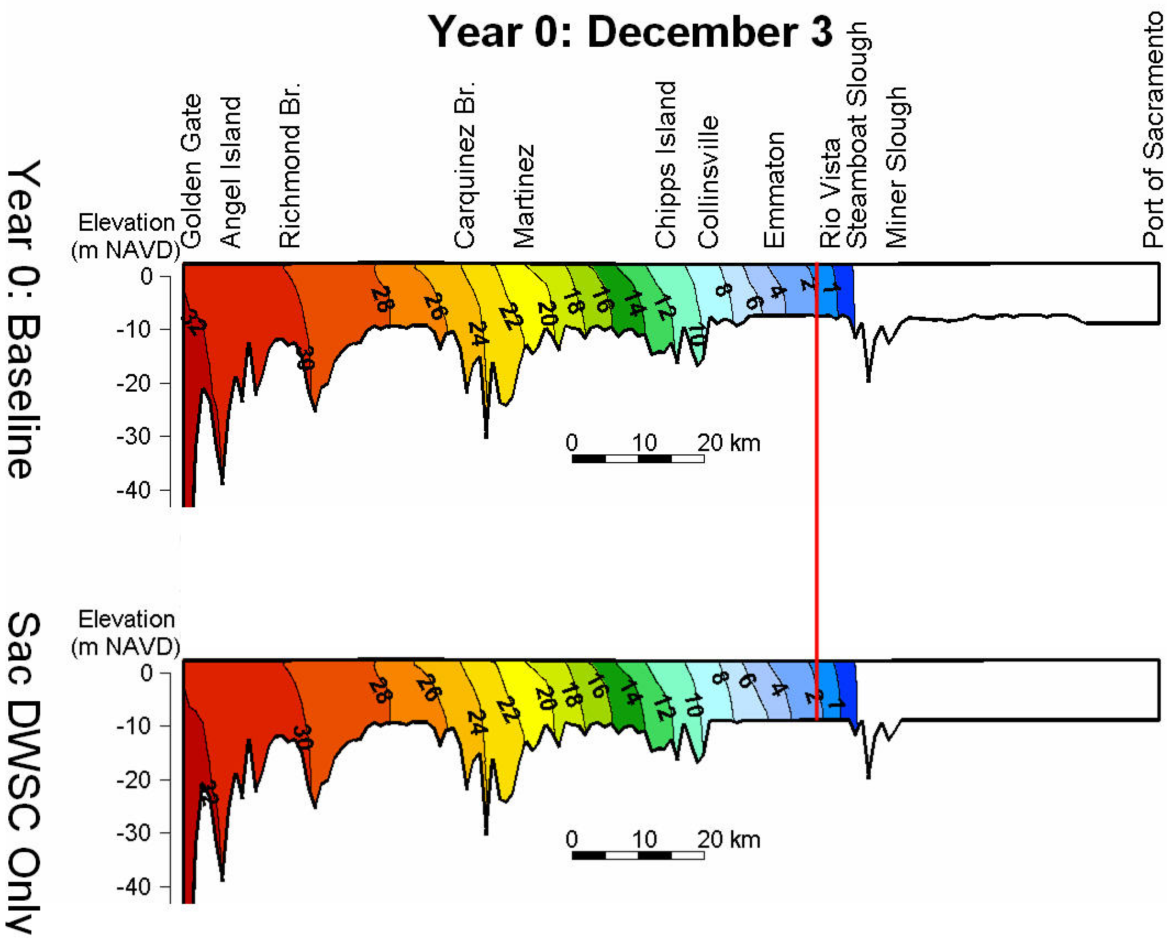


Figure 4.3-1 Predicted daily-averaged salinity profile along the axis of San Francisco Bay from the Golden Gate to the Port of Sacramento on December 3, the day of maximum predicted X2, for the Year 0 Baseline scenario (top) and the Year 0 Sacramento DWSC Only Deepening scenario (bottom). The vertical red line indicates X2 for the Year 0 Baseline scenario.

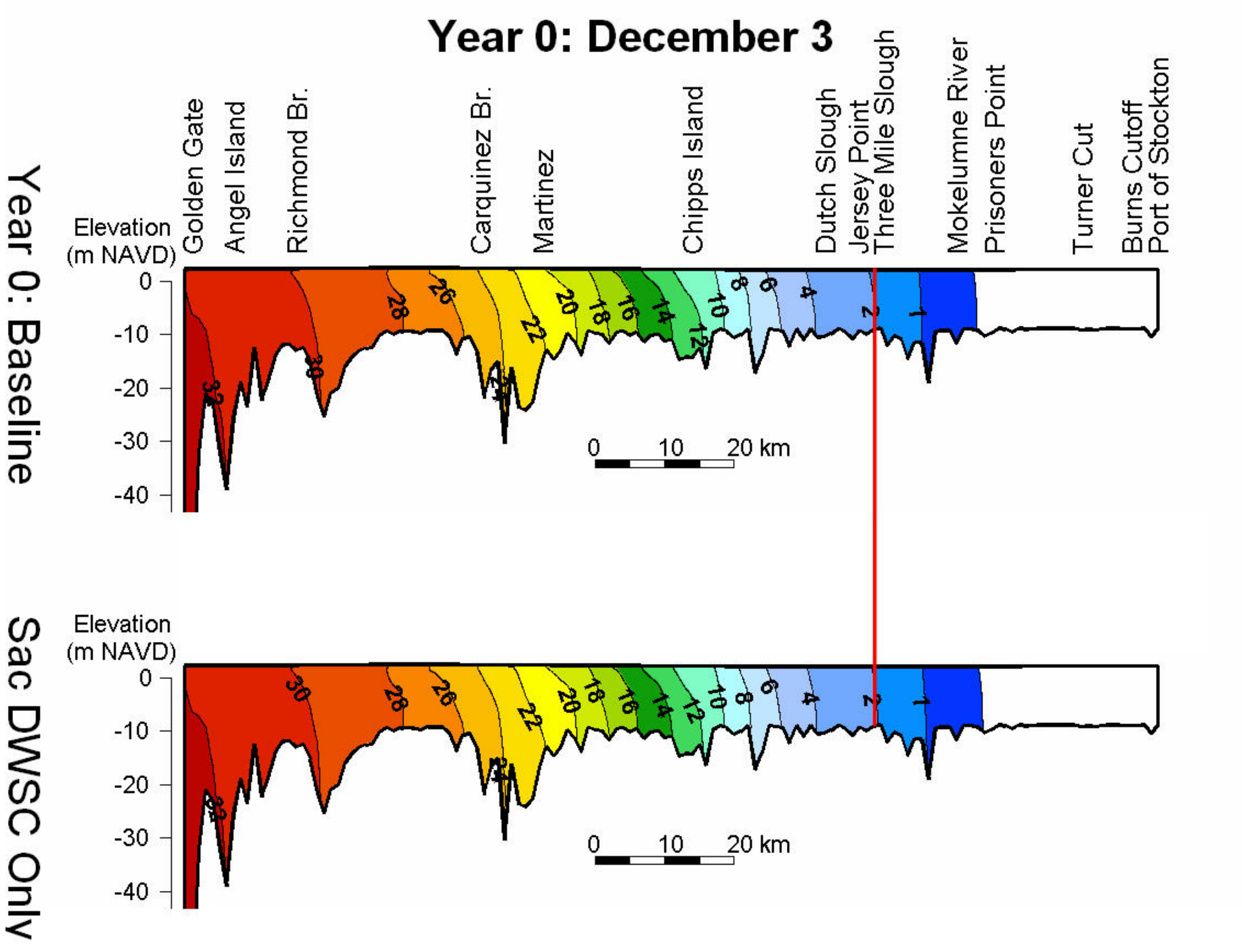


Figure 4.3-2 Predicted daily-averaged salinity profile along the axis of San Francisco Bay from the Golden Gate to the Port of Stockton on December 3, the day of maximum predicted X2, for the Year 0 Baseline scenario (top) and the Year 0 Sacramento DWSC Only Deepening scenario (bottom). The vertical red line indicates X2 for the Year 0 Baseline scenario.

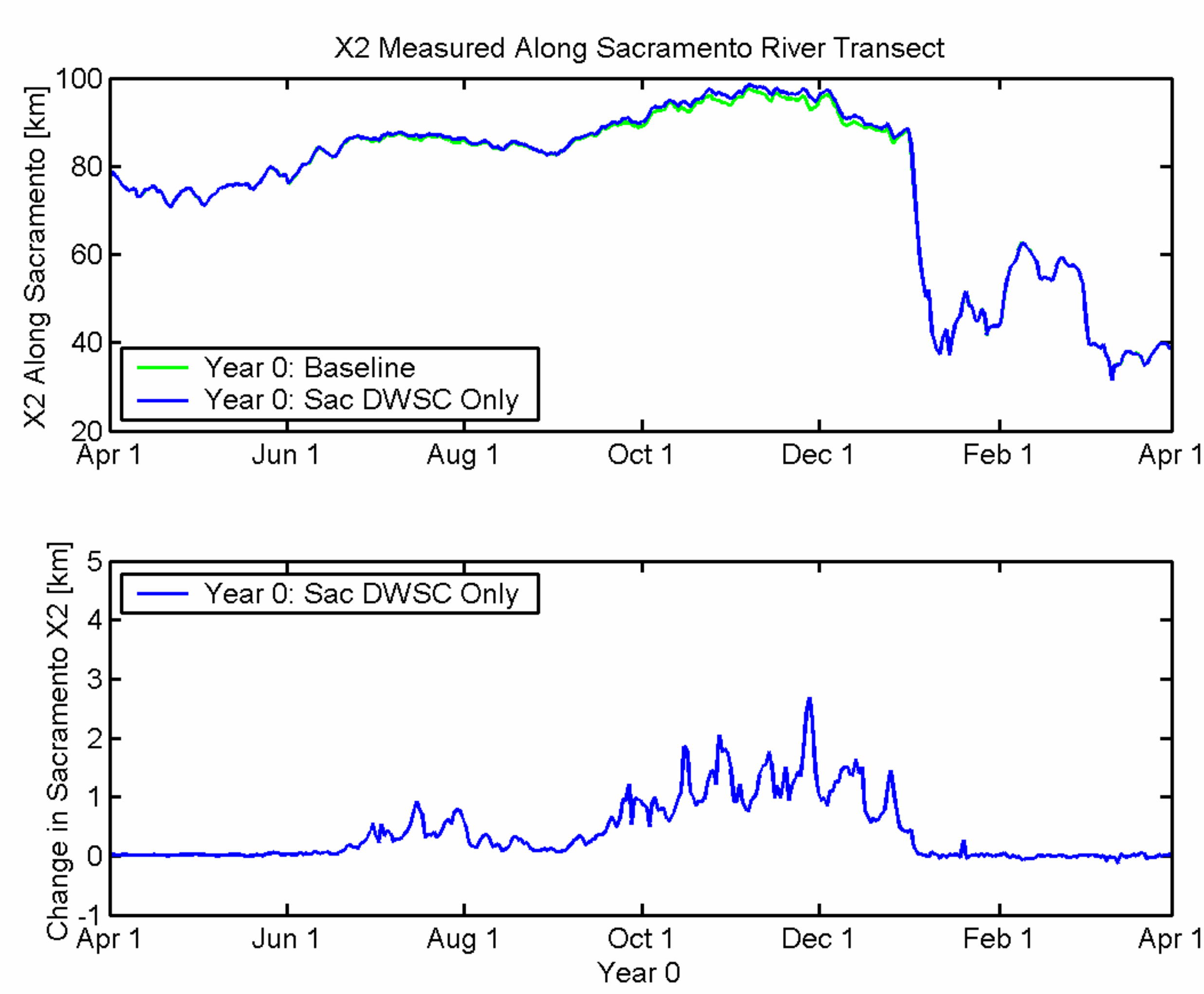


Figure 4.3-3 Predicted X2 measured from the Golden Gate to the Port of Sacramento along the Sacramento transect on Figure 3.3-4 for the Year 0 Baseline scenario and the Year 0 Sacramento DWSC Only Deepening scenario (top); Predicted change in X2 measured along the Sacramento transect relative to the Year 0 Baseline scenario for the Year 0 Sacramento DWSC Only Deepening scenario (bottom).

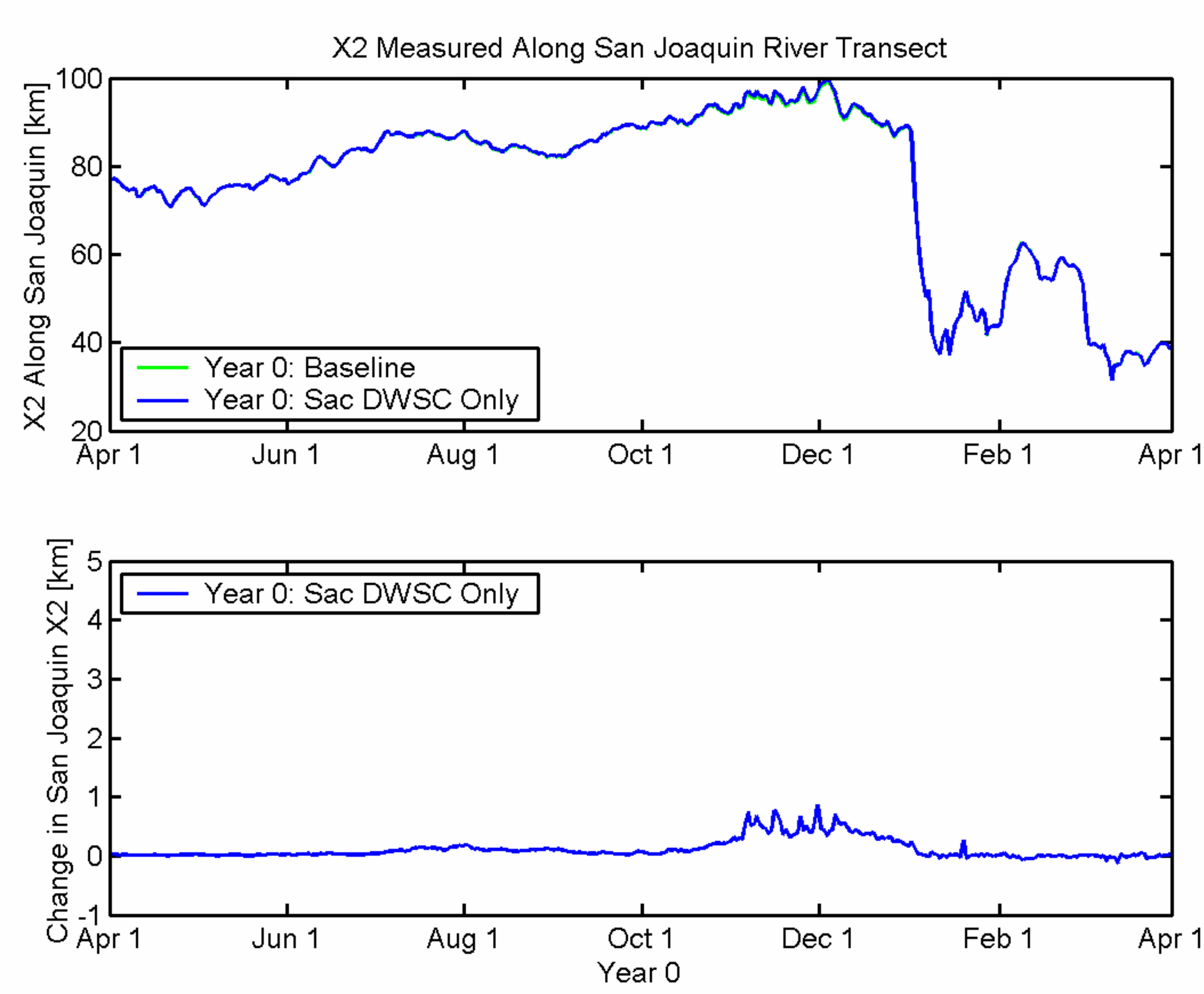


Figure 4.3-4 Predicted X2 measured from the Golden Gate to the Port of Stockton along the San Joaquin transect on Figure 3.3-4 for the Year 0 Baseline scenario and the Year 0 Sacramento DWSC Only Deepening scenario (top); Predicted change in X2 measured along the San Joaquin transect relative to the Year 0 Baseline scenario for the Year 0 Sacramento DWSC Only Deepening scenario (bottom).

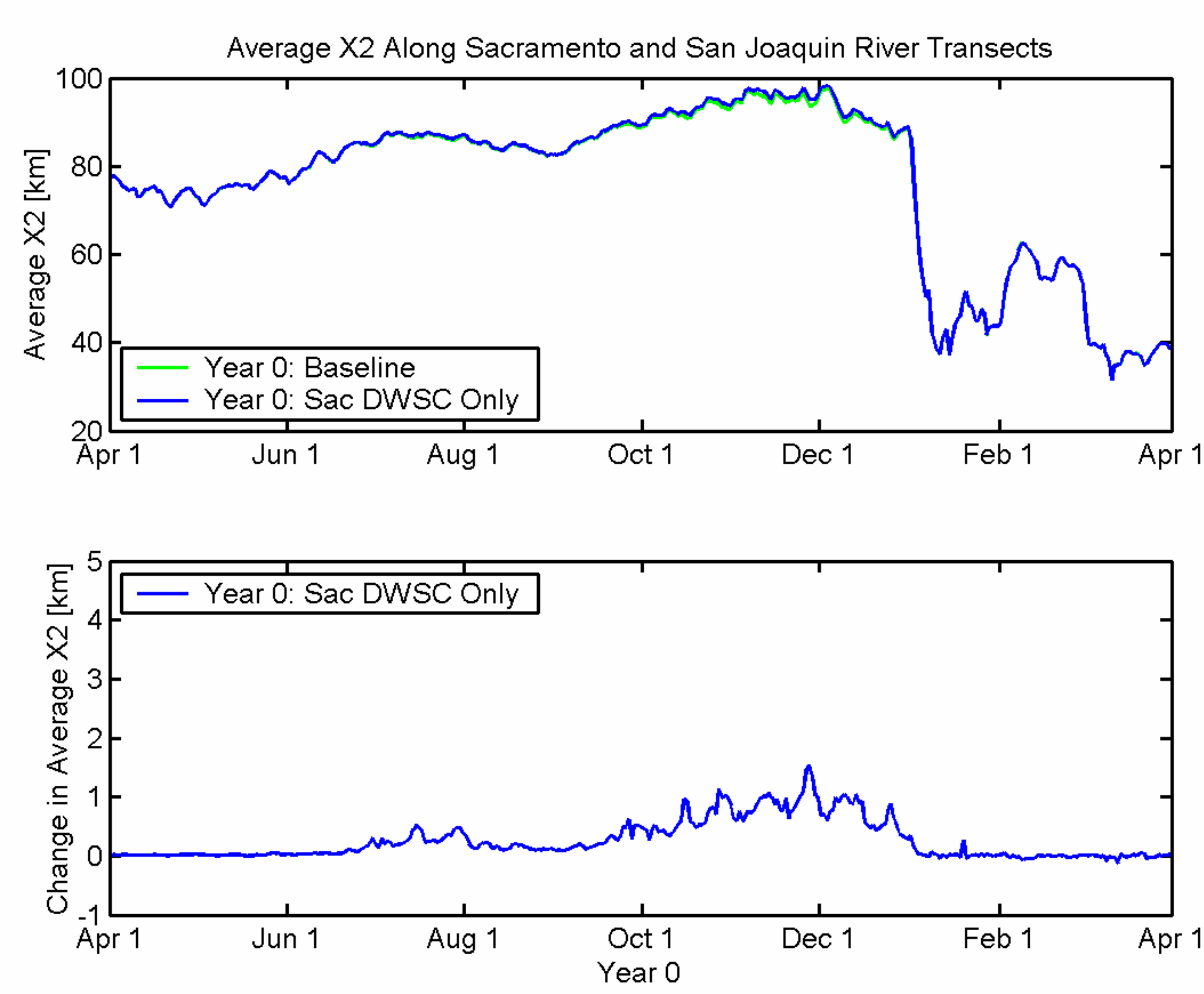


Figure 4.3-5 Predicted "average X2" for the Year 0 Baseline scenario and the Year 0 Sacramento DWSC Only Deepening scenario (top); Predicted change in "average X2" relative to the Year 0 Baseline scenario for the Year 0 Sacramento DWSC Only Deepening scenario (bottom).

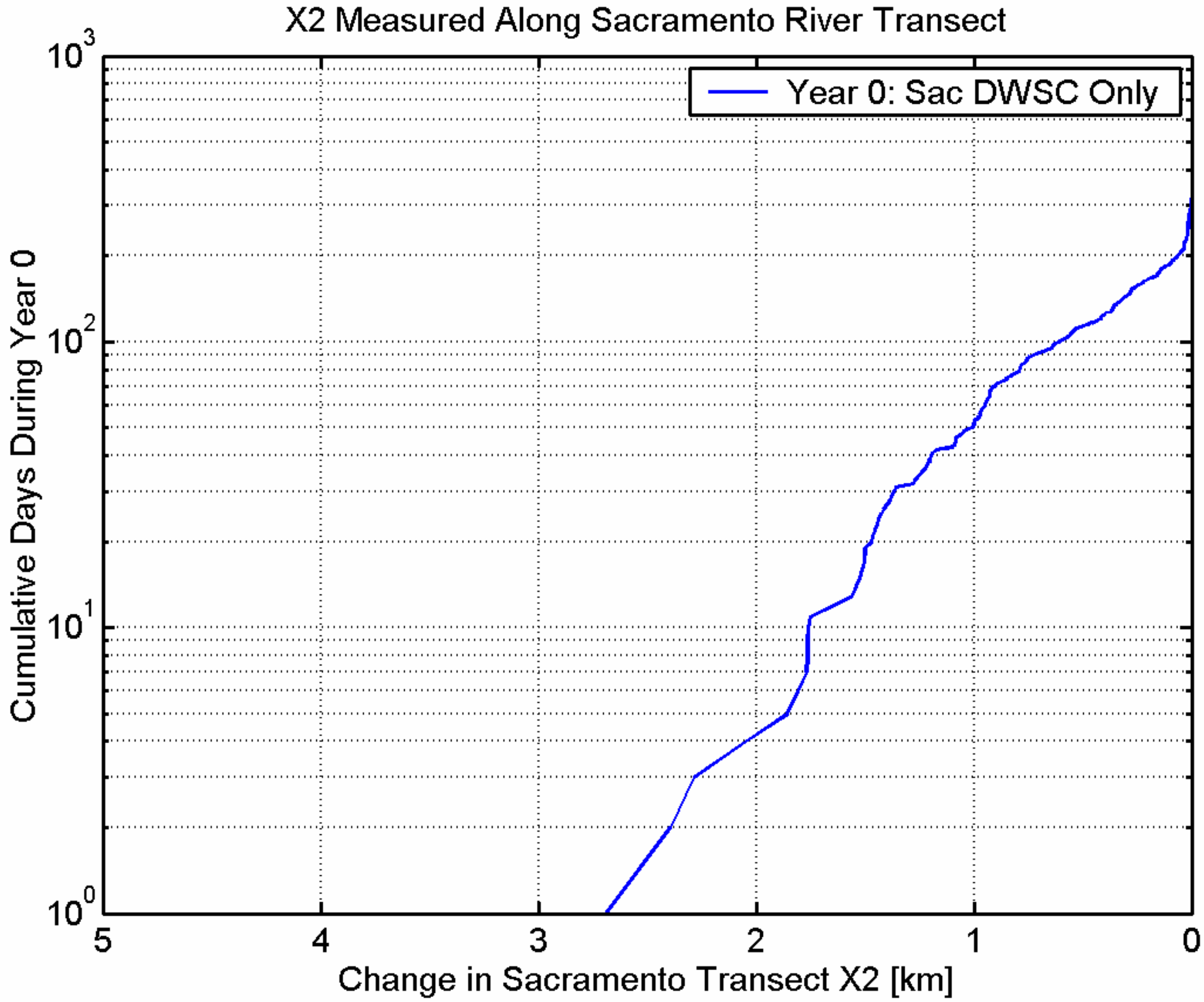


Figure 4.3-6 Cumulative number of days during the year that the change in predicted X2 measured along the Sacramento transect for the Year 0 Sacramento DWSC Only Deepening scenario exceeds the corresponding Sacramento transect X2 predicted under the Year 0 Baseline Scenario by a specific distance.

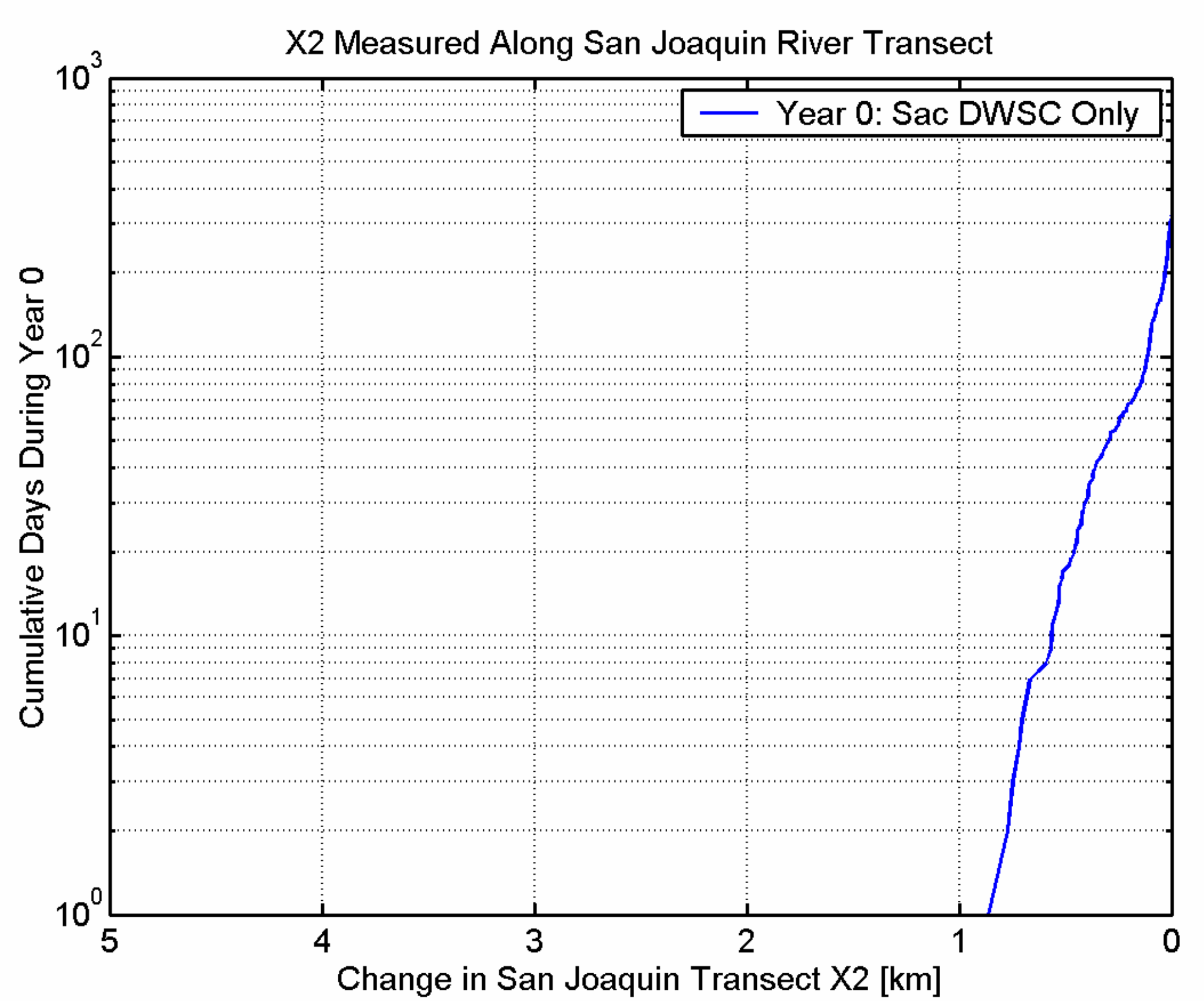


Figure 4.3-7 Cumulative number of days during the year that the change in predicted X2 measured along the San Joaquin transect for the Year 0 Sacramento DWSC Only Deepening scenario exceeds the corresponding San Joaquin transect X2 predicted under the Year 0 Baseline Scenario by a specific distance.

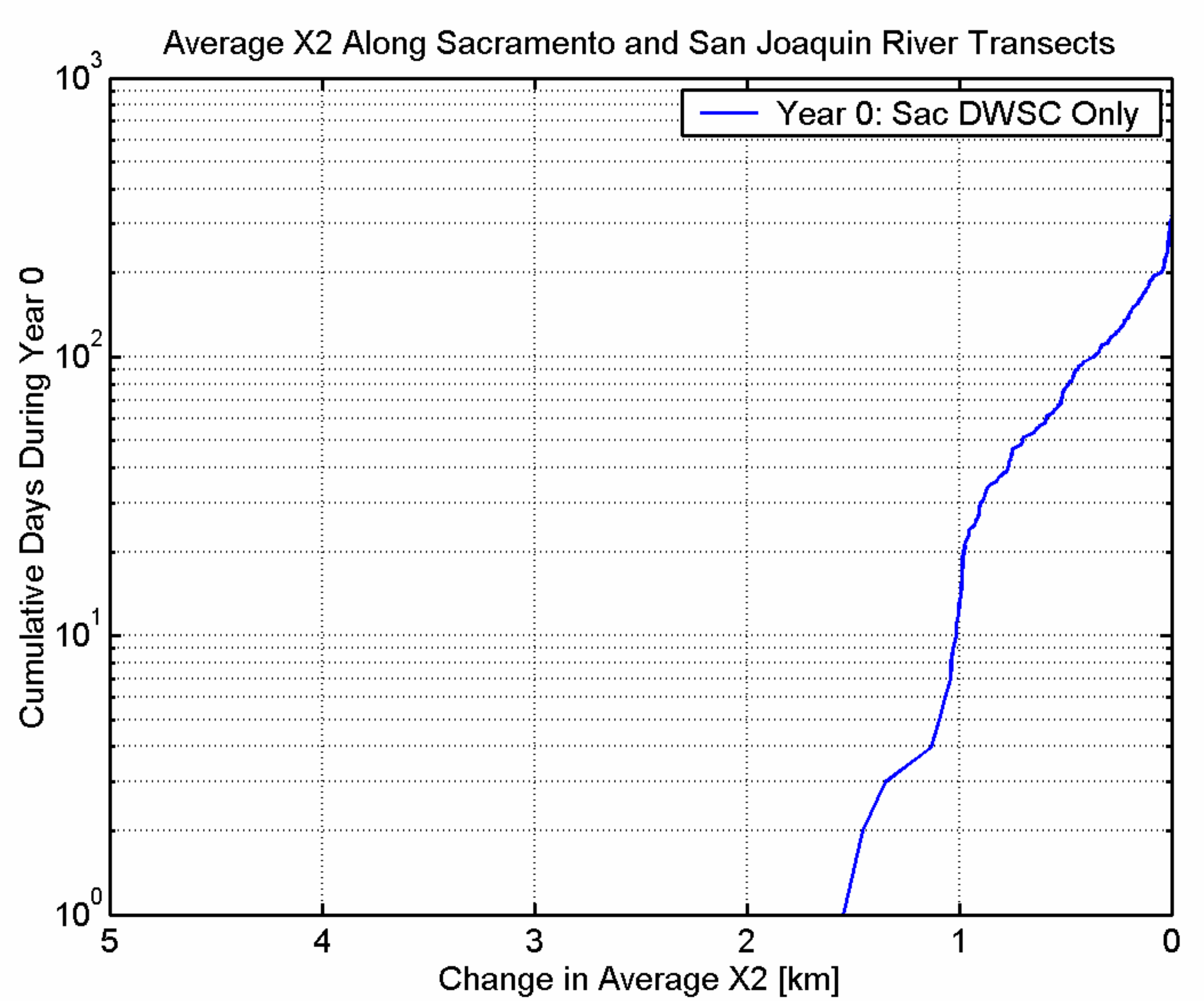


Figure 4.3-8 Cumulative number of days during the year that the change in predicted average X2 for the Year 0 Sacramento DWSC Only Deepening scenario exceeds the corresponding average X2 predicted under the Year 0 Baseline Scenario by a specific distance.

4.3.2 Year 0 Both Sacramento DWSC & SF Bay to Stockton DWSC Deepening

Figure 4.3-9 shows the predicted daily-averaged salinity profile along the axis of San Francisco Bay from the Golden Gate to the Port of Sacramento on December 3, the day of maximum predicted X2, for the Year 0 Baseline scenario, the Year 0 Sacramento DWSC Only Deepening scenario, and the Year 0 Both DWSC Deepening scenario. The vertical red line indicates the position of the Sacramento transect X2 for the Year 0 Baseline scenario. On December 3 the predicted X2 measured along the Sacramento transect is 96.3 km for the Year 0 Baseline scenario, 97.2 km for the Year 0 Sacramento DWSC Only Deepening scenario (an increase of 0.9 km), and 97.7 km for the Year 0 Both DWSC Deepening scenario (an increase of 1.4 km).

Figure 4.3-10 shows the predicted daily-averaged salinity profile along the axis of San Francisco Bay from the Golden Gate to the Port of Stockton on December 3, the day of maximum predicted X2, for the Year 0 Baseline scenario, the Year 0 Sacramento DWSC Only Deepening scenario, and the Year 0 Both DWSC Deepening scenario. The vertical red line indicates the position of the San Joaquin transect X2 for the Year 0 Baseline scenario. On December 3 the predicted X2 measured along the San Joaquin transect is 99.3 km for the Year 0 Baseline scenario, 99.7 km for the Year 0 Sacramento DWSC Only Deepening scenario (an increase of 0.4 km), and 101.0 km for the Year 0 Both DWSC Deepening scenario (an increase of 1.7 km).

On December 3, the predicted combined “average X2” is 97.8 km for the Year 0 Baseline scenario, 98.6 km for the Year 0 Sacramento DWSC Only Deepening scenario (an increase of 0.6 km), and 99.3 km for the Year 0 Both DWSC Deepening scenario (an increase of 1.5 km).

Figure 4.3-11 shows the predicted X2 measured from the Golden Gate to the Port of Sacramento during the Year 0 simulation period for the Year 0 Baseline scenario, the Year 0 Sacramento DWSC Only Deepening scenario, and the Year 0 Both DWSC Deepening scenario.

Figure 4.3-12 shows the predicted X2 measured from the Golden Gate to the Port of Stockton during the Year 0 simulation period for the Year 0 Baseline scenario, the Year 0 Sacramento DWSC Only Deepening scenario, and the Year 0 Both DWSC Deepening scenario.

Figure 4.3-13 shows the predicted “average X2” measured from the Golden Gate during the Year 0 simulation period for the Year 0 Baseline scenario, the Year 0 Sacramento DWSC Only Deepening scenario, and the Year 0 Both DWSC Deepening scenario.

Predicted X2 measured along both the Sacramento transect (Figure 4.3-11) and the San Joaquin transect (Figure 4.3-12) for the Year 0 Both DWSC Deepening scenario is greater than the predicted X2 for the Year 0 Baseline scenario throughout the simulation period. Since the San Francisco Bay to Stockton DWSC deepening affects the West Richmond Channel, the Pinole Shoal Channel though San Pablo Bay and the Stockton DWSC through Suisun Bay, salinity gradients are present in deepened reaches throughout the year. Throughout most of the Year 0 simulation period, the predicted X2 for the Year 0 Both DWSC Deepening scenario is approximately 1 km to 3 km greater than for the Year 0 Baseline scenario along both the Sacramento and the San Joaquin transects, indicating increased salt intrusion throughout the simulation period. Because the Year 0 Both DWSC Deepening scenario has a similar impact on salt intrusion on the Sacramento transect and the San Joaquin transect, the computed change in "average X2" (Figure 4.3-13) shows a similar increase in X2 to that predicted along the Sacramento transect (Figure 4.3-11) and the San Joaquin transect (Figure 4.3-12).

Figure 4.3-14 shows the cumulative number of days during the year that the change in predicted X2 measured along the Sacramento transect for the Year 0 Sacramento DWSC Only Deepening scenario and the Year 0 Both DWSC Deepening scenario exceeds the corresponding Sacramento transect X2 predicted under the Year 0 Baseline Scenario by a specific distance. The maximum change in X2 measured along the Sacramento transect during the Year 0 Sacramento DWSC Only Deepening scenario is 2.69 km and the maximum change in X2 measured along the Sacramento transect during the Year 0 Both DWSC Deepening scenario is 4.04 km. A change in X2 measured along the Sacramento transect of 2.0 km or more is predicted on 4 days under the Year 0 Sacramento DWSC Only Deepening scenario and 43 days under the Year 0 Both DWSC Deepening scenario. A change in X2 measured along the Sacramento transect of 1.0 km or more is predicted on 52 days under the Year 0 Sacramento DWSC Only Deepening scenario and 282 days under the Year 0 Both DWSC Deepening scenario. The median predicted change in X2 measured along the Sacramento transect under the Year 0 Sacramento DWSC Only Deepening scenario is 0.13 km. For 182 days during the year under the Year 0 Sacramento DWSC Only Deepening scenario, the predicted change in X2 measured along the Sacramento transect is more than 0.13 km, whereas for 182 days the predicted change in X2 measured along the Sacramento transect under the Year 0 Sacramento DWSC Only Deepening scenario is less than 0.13 km. The median predicted change in X2 measured along the Sacramento transect under the Year 0 Both DWSC Deepening scenario is 1.19 km. For 182 days during the year under the Year 0 Both DWSC Deepening scenario, the predicted change in X2 measured along the Sacramento transect is more than 1.19 km, whereas for 182 days the predicted change in X2 measured along the Sacramento transect under the Year 0 Both DWSC Deepening scenario is less than 1.19 km.

Figure 4.3-15 shows the cumulative number of days during the year that the change in predicted X2 measured along the San Joaquin transect for the Year 0 Sacramento DWSC Only Deepening scenario and the Year 0 Both DWSC Deepening scenario exceeds the corresponding San Joaquin transect X2 predicted under the Year 0 Baseline Scenario by a specific distance. The maximum change in X2 measured along the San Joaquin transect during the Year 0 Sacramento DWSC Only Deepening scenario is 0.86 km and the maximum change in X2 measured along the San Joaquin transect during the Year 0 Both DWSC Deepening scenario is 4.04 km. A change in X2 measured along the San Joaquin transect of 2.0 km or more is predicted on 0 days under the Year 0 Sacramento DWSC Only Deepening scenario and 66 days under the Year 0 Both DWSC Deepening scenario. A change in X2 measured along the San Joaquin transect of 1.0 km or more is predicted on 13 days under the Year 0 Sacramento DWSC Only Deepening scenario and 297 days under the Year 0 Both DWSC Deepening scenario. The median predicted change in X2 measured along the San Joaquin transect under the Year 0 Sacramento DWSC Only Deepening scenario is 0.04 km. For 182 days during the year under the Year 0 Sacramento DWSC Only Deepening scenario, the predicted change in X2 measured along the San Joaquin transect is more than 0.04 km, whereas for 182 days the predicted change in X2 measured along the San Joaquin transect under the Year 0 Sacramento DWSC Only Deepening scenario is less than 0.04 km. The median predicted change in X2 measured along the San Joaquin transect under the Year 0

Both DWSC Deepening scenario is 1.30 km. For 182 days during the year under the Year 0 Both DWSC Deepening scenario, the predicted change in X2 measured along the San Joaquin transect is more than 1.30 km, whereas for 182 days the predicted change in X2 measured along the San Joaquin transect under the Year 0 Both DWSC Deepening scenario is less than 1.30 km.

Figure 4.3-16 shows the Cumulative number of days during the year that the change in predicted average X2 under the Year 0 Sacramento DWSC Only Deepening scenario and the Year 0 Both DWSC Deepening scenario exceeds the corresponding average X2 predicted under the Year 0 Baseline Scenario by a specific distance. The maximum change in average X2 during the Year 0 Sacramento DWSC Only Deepening scenario is 1.54 km and the maximum change in average X2 during the Year 0 Both DWSC Deepening scenario is 4.04 km. A change of average X2 of 2.0 km or more is predicted on 0 days under the Year 0 Sacramento DWSC Only Deepening scenario and 54 days under the Year 0 Both DWSC Deepening scenario. A change of average X2 of 1.0 km or more is predicted on 13 days under the Year 0 Sacramento DWSC Only Deepening scenario and 302 days under the Year 0 Both DWSC Deepening scenario. The median predicted change in average X2 under the Year 0 Sacramento DWSC Only Deepening scenario is 0.11 km. For 182 days during the year under the Year 0 Sacramento DWSC Only Deepening scenario, the predicted change in average X2 is more than 0.11 km, whereas for 182 days the predicted change in average X2 under the Year 0 Sacramento DWSC Only Deepening scenario is less than 0.11 km. The median predicted change in average X2 under the Year 0 Both DWSC Deepening scenario is 1.24 km. For 182 days during the year under the Year 0 Both DWSC Deepening scenario, the predicted change in average X2 is more than 1.24 km, whereas for 182 days the predicted change in average X2 under the Year 0 Both DWSC Deepening scenario is less than 1.24 km.

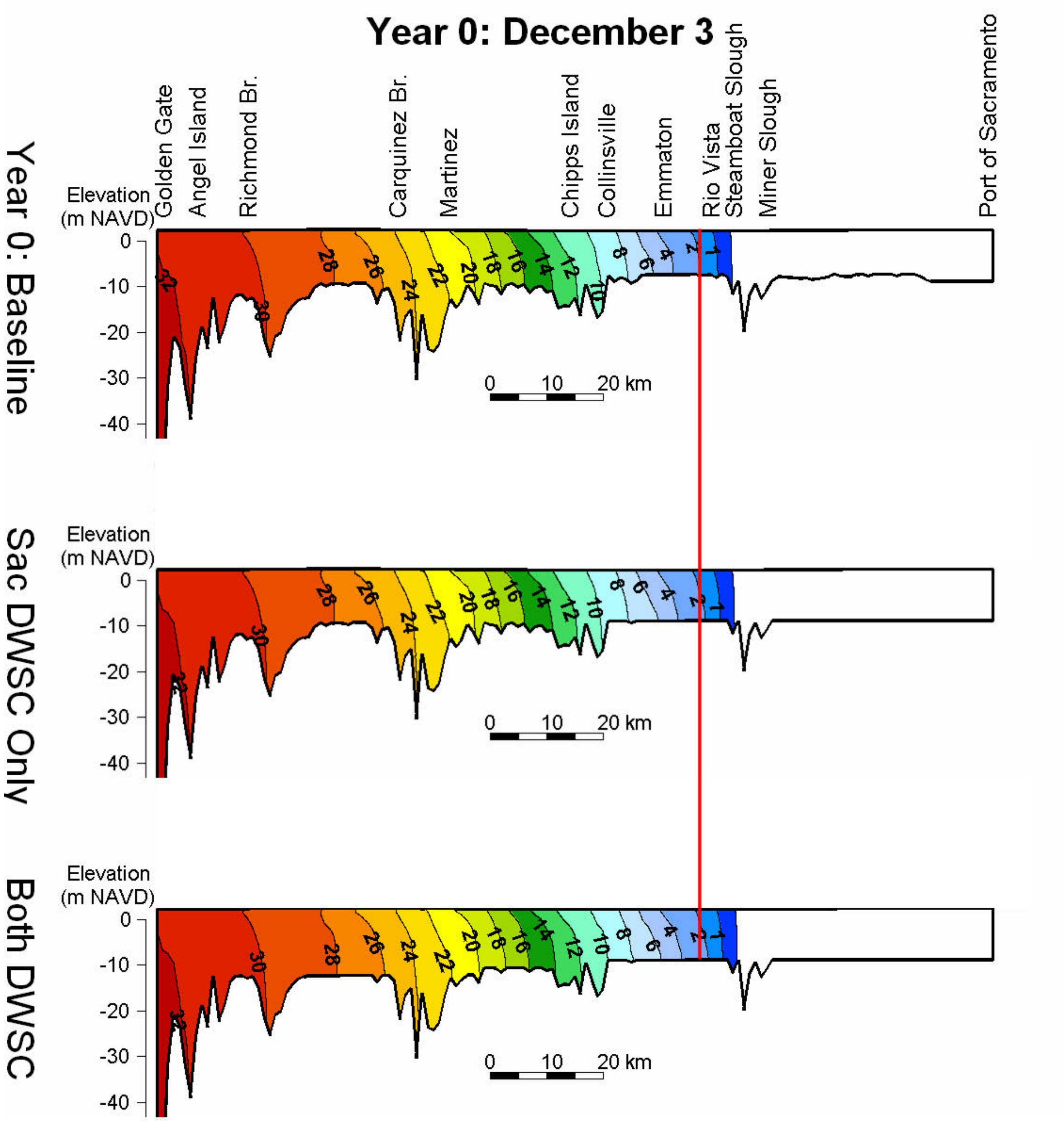


Figure 4.3-9 Predicted daily-averaged salinity profile along the axis of San Francisco Bay from the Golden Gate to the Port of Sacramento on December 3, the day of maximum predicted X2, for the Year 0 Baseline scenario (top), the Year 0 Sacramento DWSC Only Deepening scenario (middle), and the Year 0 Both DWSC Deepening scenario (bottom). The vertical red line indicates X2 for the Year 0 Baseline scenario.

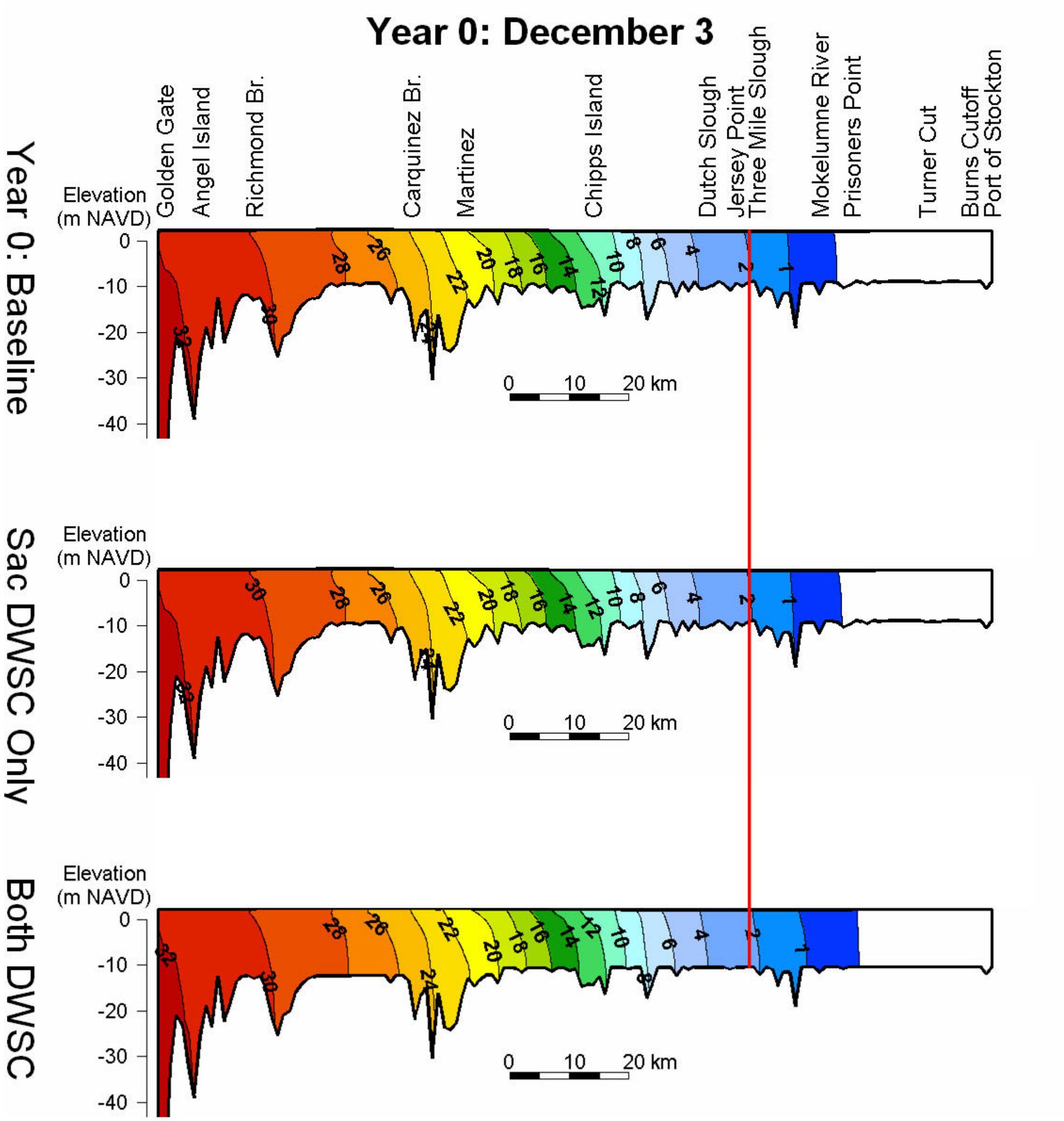


Figure 4.3-10 Predicted daily-averaged salinity profile along the axis of San Francisco Bay from the Golden Gate to the Port of Stockton on December 3, the day of maximum predicted X2, for the Year 0 Baseline scenario (top), the Year 0 Sacramento DWSC Only Deepening scenario (middle), and the Year 0 Both DWSC Deepening scenario (bottom). The vertical red line indicates X2 for the Year 0 Baseline scenario.

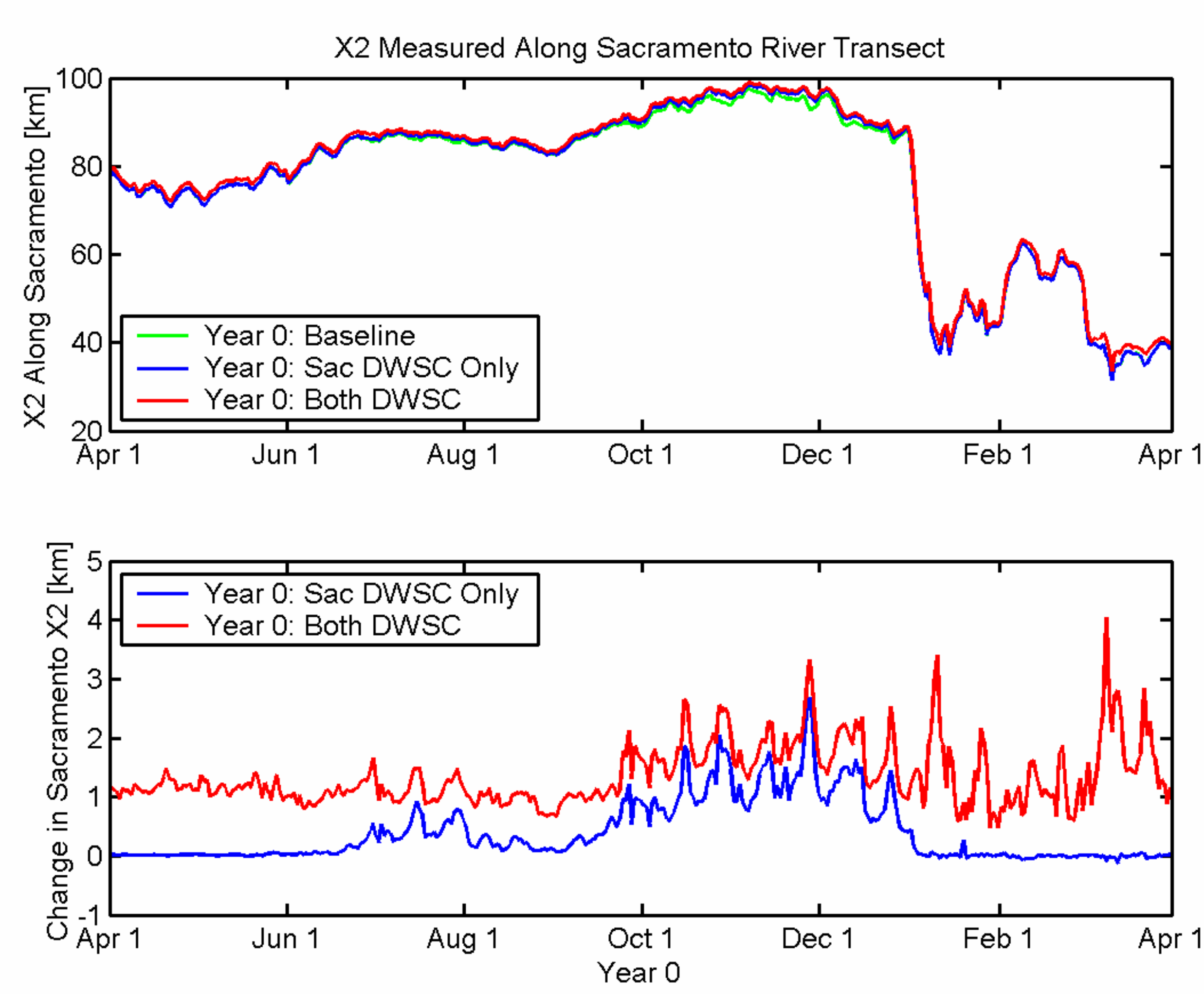


Figure 4.3-11 Predicted X2 measured from the Golden Gate to the Port of Sacramento along the Sacramento transect on Figure 3.3-4 for the Year 0 Baseline scenario, the Year 0 Sacramento DWSC Only Deepening scenario, and the Year 0 Both DWSC Deepening scenario (top); Predicted change in X2 measured along the Sacramento transect relative to the Year 0 Baseline scenario for the Year 0 Sacramento DWSC Only Deepening scenario and the Year 0 Both DWSC Deepening scenario (bottom).

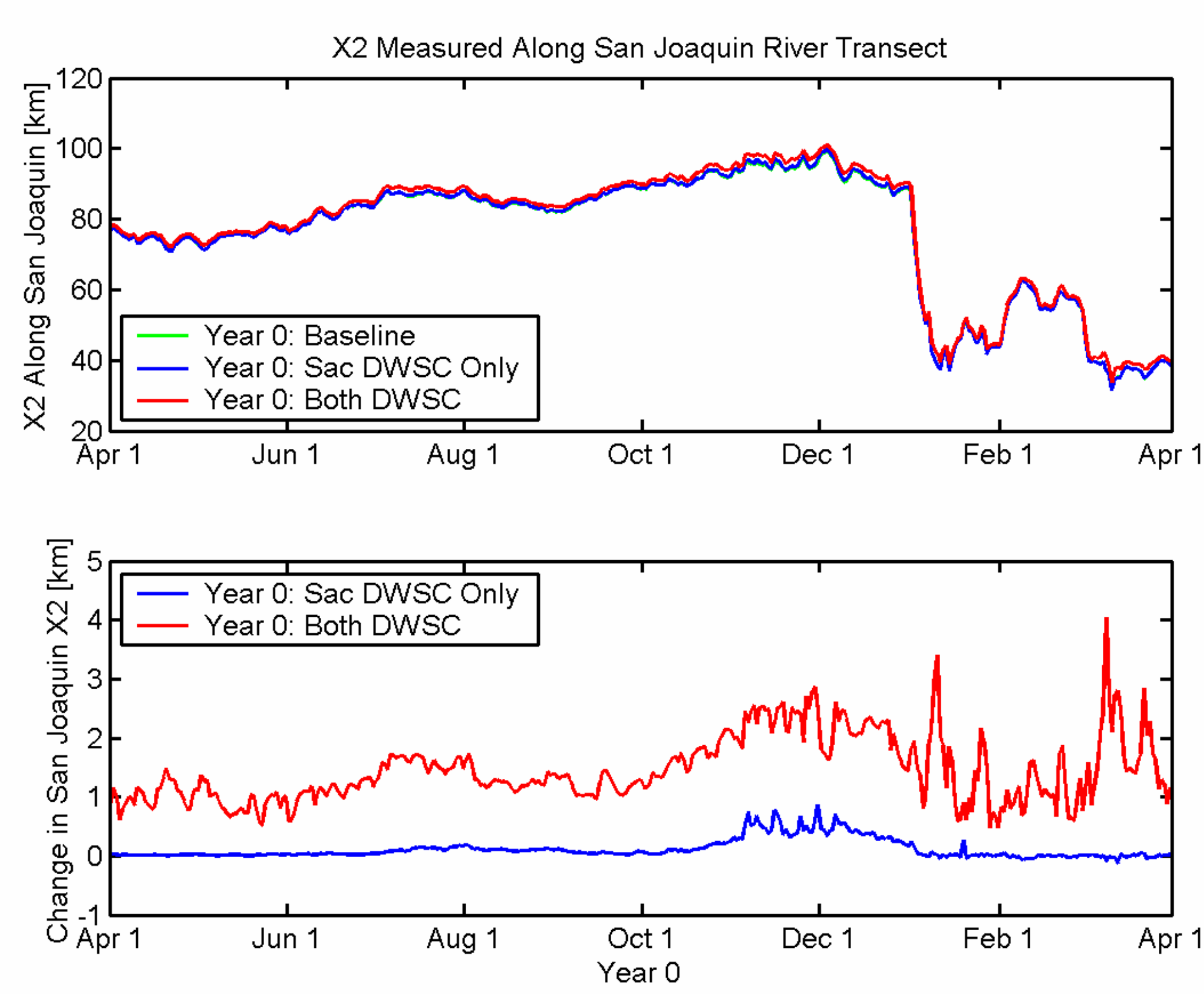


Figure 4.3-12 Predicted X2 measured from the Golden Gate to the Port of Stockton along the San Joaquin transect on Figure 3.3-4 for the Year 0 Baseline scenario, the Year 0 Sacramento DWSC Only Deepening scenario, and the Year 0 Both DWSC Deepening scenario (top); Predicted change in X2 measured along the San Joaquin transect relative to the Year 0 Baseline scenario for the Year 0 Sacramento DWSC Only Deepening scenario and the Year 0 Both DWSC Deepening scenario (bottom).

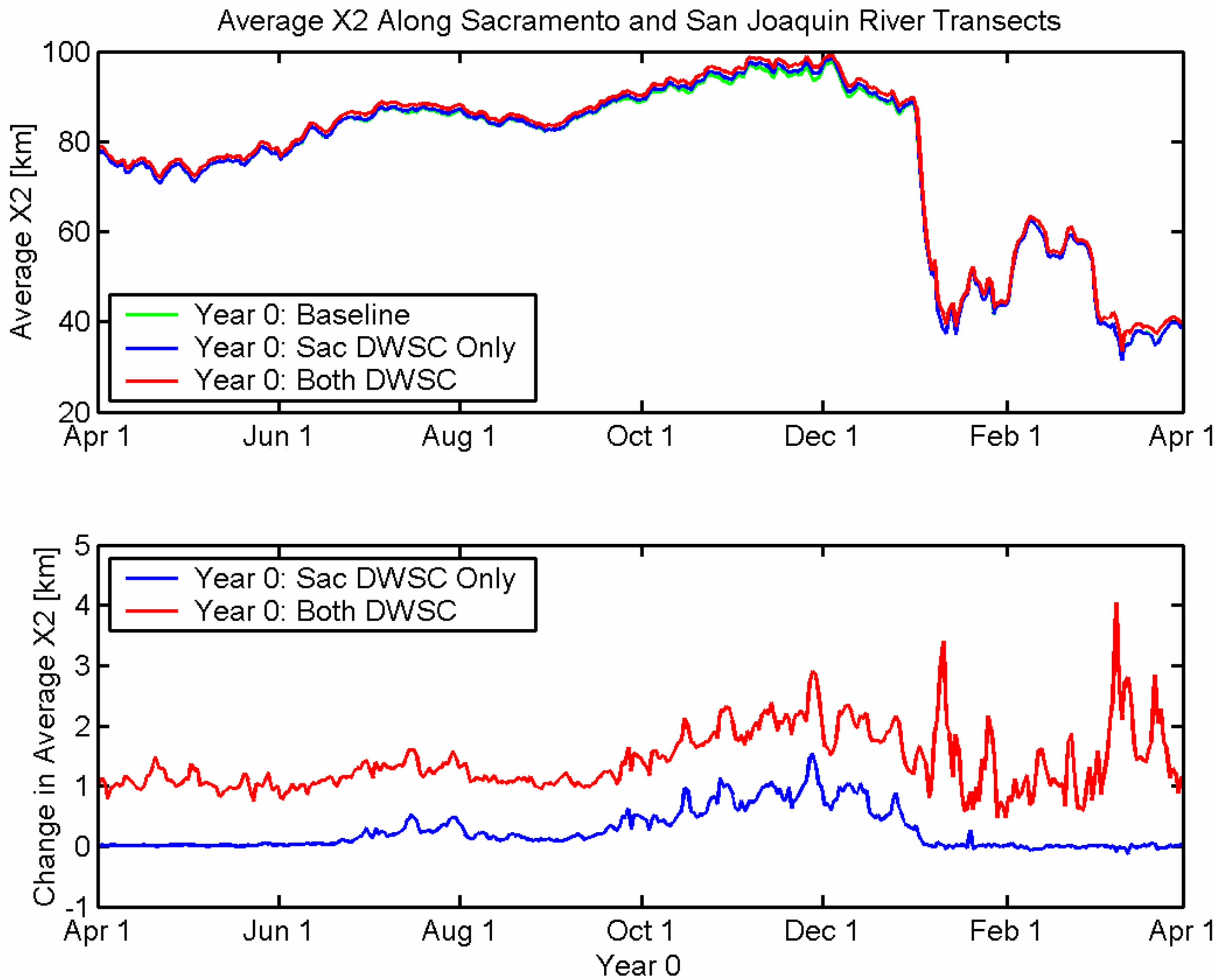


Figure 4.3-13 Predicted "average X2" for the Year 0 Baseline scenario, the Year 0 Sacramento DWSC Only Deepening scenario, and the Year 0 Both DWSC Deepening scenario (top); Predicted change in "average X2" relative to the Year 0 Baseline scenario for the Year 0 Sacramento DWSC Only Deepening scenario and the Year 0 Both DWSC Deepening scenario (bottom).

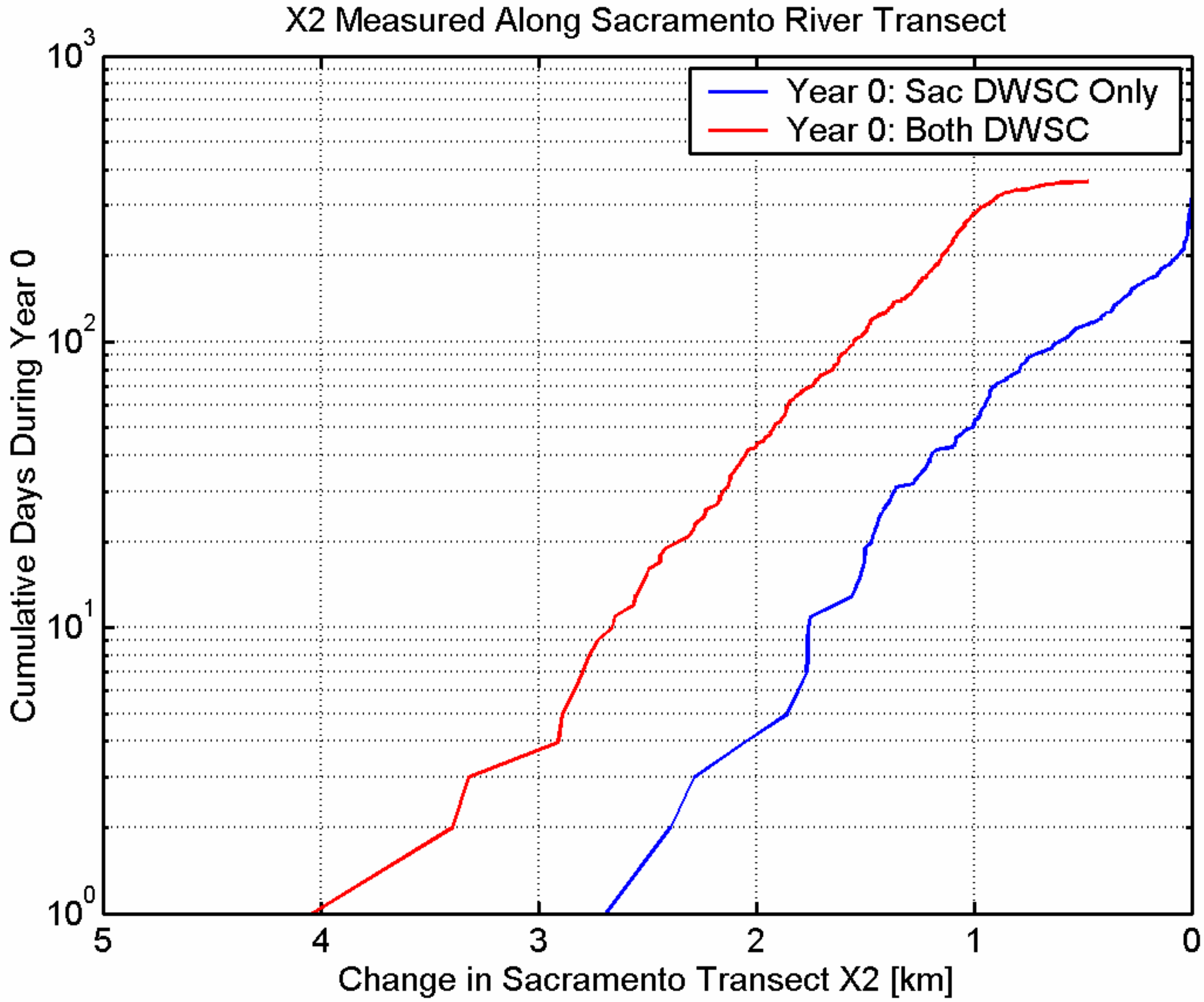


Figure 4.3-14 Cumulative number of days during the year that the change in predicted X2 measured along the Sacramento transect for the Year 0 Sacramento DWSC Only Deepening scenario and the Year 0 Both DWSC Deepening scenario exceeds the corresponding Sacramento transect X2 predicted under the Year 0 Baseline Scenario by a specific distance.

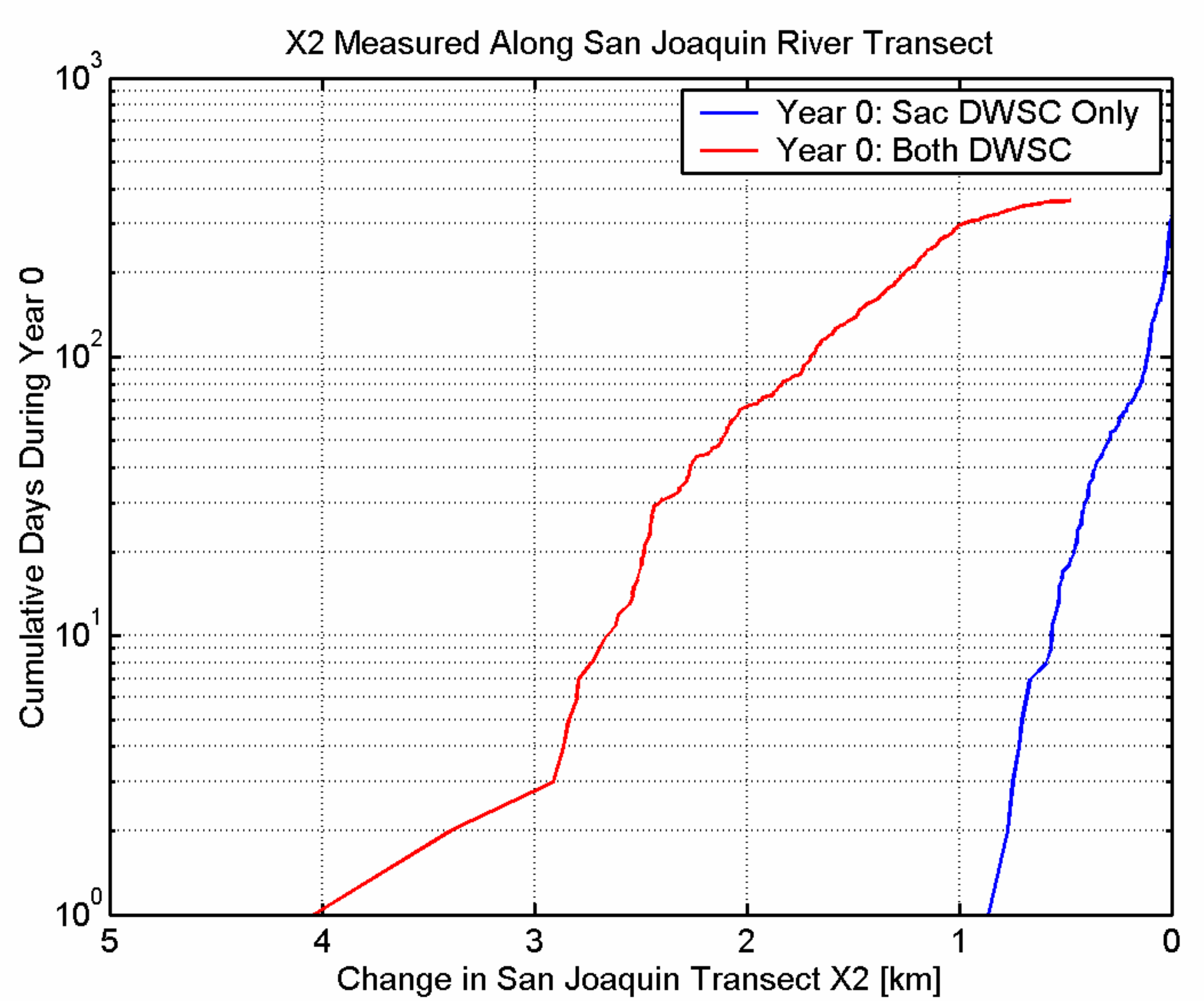


Figure 4.3-15 Cumulative number of days during the year that the change in predicted X2 measured along the San Joaquin transect for the Year 0 Sacramento DWSC Only Deepening scenario and the Year 0 Both DWSC Deepening scenario exceeds the corresponding San Joaquin transect X2 predicted under the Year 0 Baseline Scenario by a specific distance.

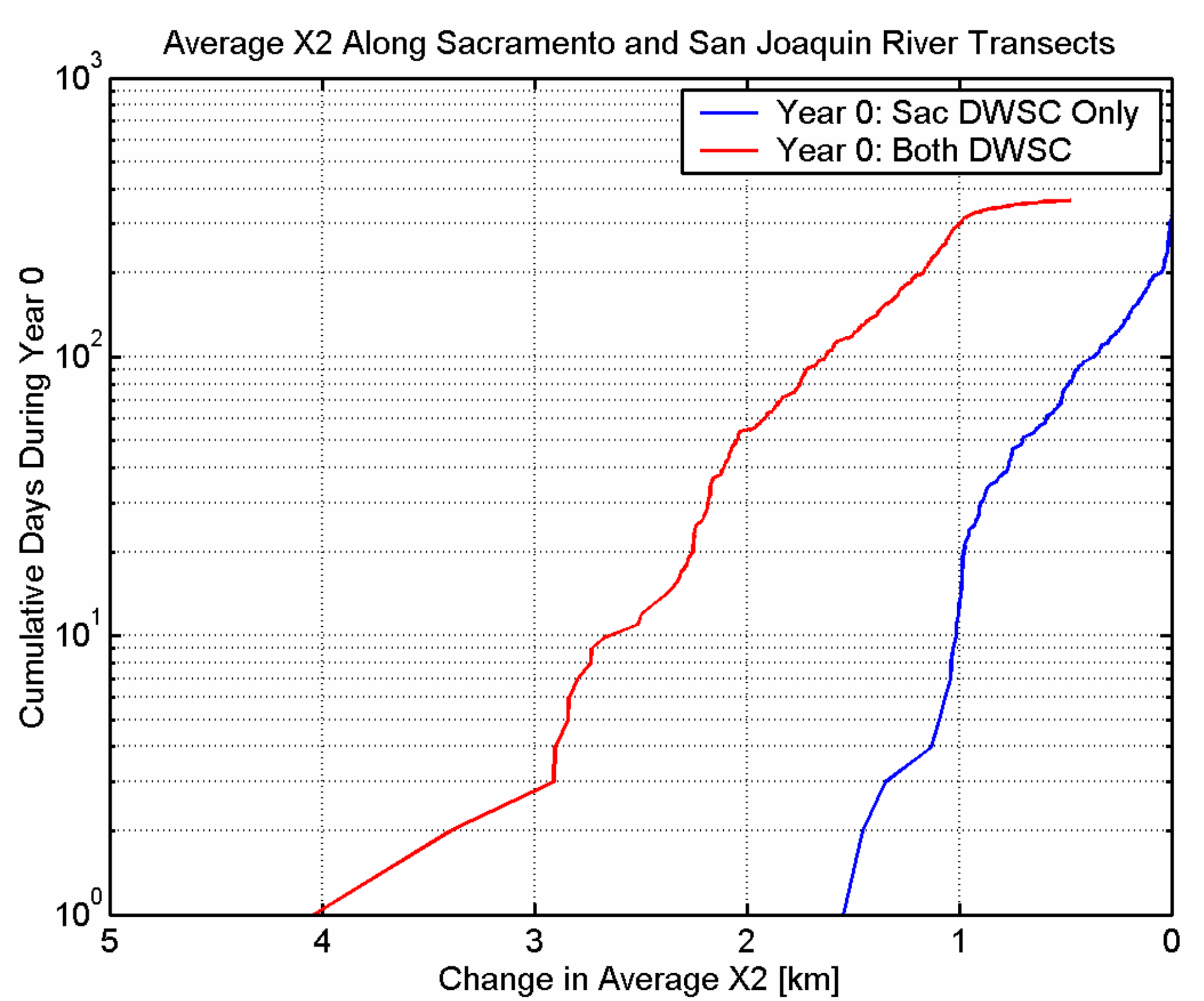


Figure 4.3-16 Cumulative number of days during the year that the change in predicted average X2 under the Year 0 Sacramento DWSC Only Deepening scenario and the Year 0 Both DWSC Deepening scenario exceeds the corresponding average X2 predicted under the Year 0 Baseline Scenario by a specific distance.

4.4 Depth-Averaged Daily-Average Salinity Maps

Depth-averaged daily-averaged salinity maps were computed for the first day of each month, and for December 3, the day of maximum X2 for the Year 0 Baseline scenario, the Year 0 Sacramento DWSC Only Deepening scenario, and the Year 0 Both DWSC Deepening scenario under Year 0 conditions. On each of these days, the daily-averaged depth-averaged salinity for each of the deepening scenarios was compared to the Depth-averaged daily-averaged salinity for the Year 0 Baseline scenario to compute the salinity increase. Each figure also shows the vertical salinity profile along the axis of San Francisco Bay to provide a reference for the longitudinal position of salinity gradients and the location and strength of salinity stratification in San Francisco Bay. Depth-averaged daily-averaged salinity comparisons for the Year 0 Sacramento DWSC Only Deepening scenario and the Year 0 Both DWSC Deepening scenario are presented in the following sections.

4.4.1 Year 0 Sacramento DWSC Only Deepening

Figure 4.4-1 shows the predicted daily-averaged salinity profile along the axis of San Francisco Bay from the Golden Gate to the Port of Sacramento, depth-averaged daily-averaged salinity map, and predicted salinity increase relative to the Year 0 Baseline scenario for the Year 0 Sacramento DWSC Only Deepening scenario at the beginning of the analysis period for the Year 0 simulation on April 1. On April 1, X2 is between of Chipps Island and Collinsville, and the 0.5 psu salinity isohaline is between Collinsville and Emmaton. The predicted salinity increase for the Year 0 Sacramento DWSC Only Deepening scenario is less than 0.05 psu (~108 μmhos/cm) over the entire model domain. Since salt intrusion is not present in the region upstream of Collinsville where the Sacramento DWSC deepening occurs, no additional salt intrusion is predicted. This condition persists with relatively little change on May 1 (Figure 4.4-2). On June 1 (Figure 4.4-3) X2 has moved further upstream, with the 2 psu isohaline between Chipps Island and Collinsville. The predicted salinity increase for the Year 0 Sacramento DWSC Only Deepening scenario is less than 0.05 psu over the entire model domain on June 1.

During summer conditions, salt intrusion into the Delta increases as seen on July 1 (Figure 4.4-4) and August 1 (Figure 4.4-5). Salinity increases of between 0.05 and 0.10 psu are predicted in some reaches of the Sacramento DWSC between Collinsville and Emmaton on July 1 (see Figure 4.4-17) and August 1 (see Figure 4.4-18).

Due to slightly higher net Delta outflow during August than during July (see Figure 3.2-1), the location of the 2 psu isohaline on September 1 is near Collinsville, and the salinity increase for the Year 0 Sacramento DWSC Only Deepening scenario is again less than 0.05 psu over the entire model domain (Figure 4.4-6).

During September, net Delta outflow is reduced to 85 m^3/s (from 175 m^3/s during August) resulting in increased salt intrusion during September. By October 1 (Figure 4.4-7), the predicted salinity at Collinsville is approximately 5 psu and the 1 psu isohaline is upstream of Emmaton. Salinity increases between 0.05 and 0.20 psu are evident in some reaches of the Sacramento DWSC between Collinsville and Emmaton (see Figure 4.4-20).

Net Delta outflow remains low (86 m^3/s) through October, with increasing salt intrusion occurring during October. On November 1 (Figure 4.4-8), the predicted salinity at Collinsville is approximately 8 psu and the 1 psu isohaline is near Rio Vista. Salinity increases of between 0.05 and 0.30 psu are evident in Sacramento River reach between Emmaton and Rio Vista and extending into Cache Slough. The maximum salinity increase within the DWSC is between 0.2 and 0.3 psu (see Figure 4.4-21). Salinity increases between 0.05 and 0.10 psu are predicted in Threemile Slough, along the San Joaquin River between Jersey Point and Fisherman's Cut, and in False River and Little Franks Tract.

During November, Delta outflow increases slightly to 115 m^3/s from 86 m^3/s during October (see Figure 3.2-1). On December 1 (Figure 4.4-9), the predicted salinity at Collinsville is approximately 8 psu and the 1 psu isohaline is near Rio Vista. Salinity increases of between 0.05 and 0.30 psu are evident in Sacramento River reach between Emmaton and Rio Vista and extending into Cache Slough. The maximum salinity increase within the DWSC is between 0.2 and 0.3 psu (see Figure 4.4-22). Salinity increases between 0.10 and 0.20 psu are predicted in Threemile Slough. Salinity increases between 0.05 and 0.10 psu are predicted along the San Joaquin River between Jersey Point and Fisherman's Cut, in False River and Little Franks Tract, throughout most of Franks Tract, and extending down Old River (see Figure 4.4-22). Similar conditions persist on December 3 (Figure 4.4-10), the day of maximum annual X2 for both the Year 0 Baseline scenario and the Year 0 Sacramento DWSC Only Deepening scenario. On December 3 significant stratification is evident in the reach of the Sacramento River between Collinsville and Rio Vista, resulting in increased salt intrusion in this reach due to the deepening of the Sacramento DWSC (Figure 4.4-23).

During December, Delta outflow increases significantly to 241 m^3/s. As a result, much of the salt that intruded into the western Delta during October and November has been flushed out of the Delta by January 1 (Figure 4.4-11), resulting in only a small region of the Sacramento DWSC and Sherman Lake where predicted salinity increases of 0.05 to 0.10 psu are evident on January 1 (see Figure 4.4-24).

Large Delta outflows during January (Figure 3.2-1) flush most of the salt out of the Delta and Suisun Bay, with the 0.5 psu isohaline near Carquinez on February 1 (Figure 4.4-12). No predicted salinity increases resulting from the Year 0 Sacramento DWSC Only Deepening scenario are predicted on February 1 or March 1 (Figure 4.4-13).

Figure 4.4-14 through Figure 4.4-26 show the predicted increase in salinity in the Sacramento-San Joaquin Delta for the first day of each month and on December 3, the day of maximum predicted X2 for the Year 0 Sacramento DWSC Only Deepening scenario during the Year 0 simulation period. These figures allow for closer inspection of salinity increases within the Delta on each of the days on which salinity profiles and maps are shown in Figures 4.4-1 through 4.4-13.

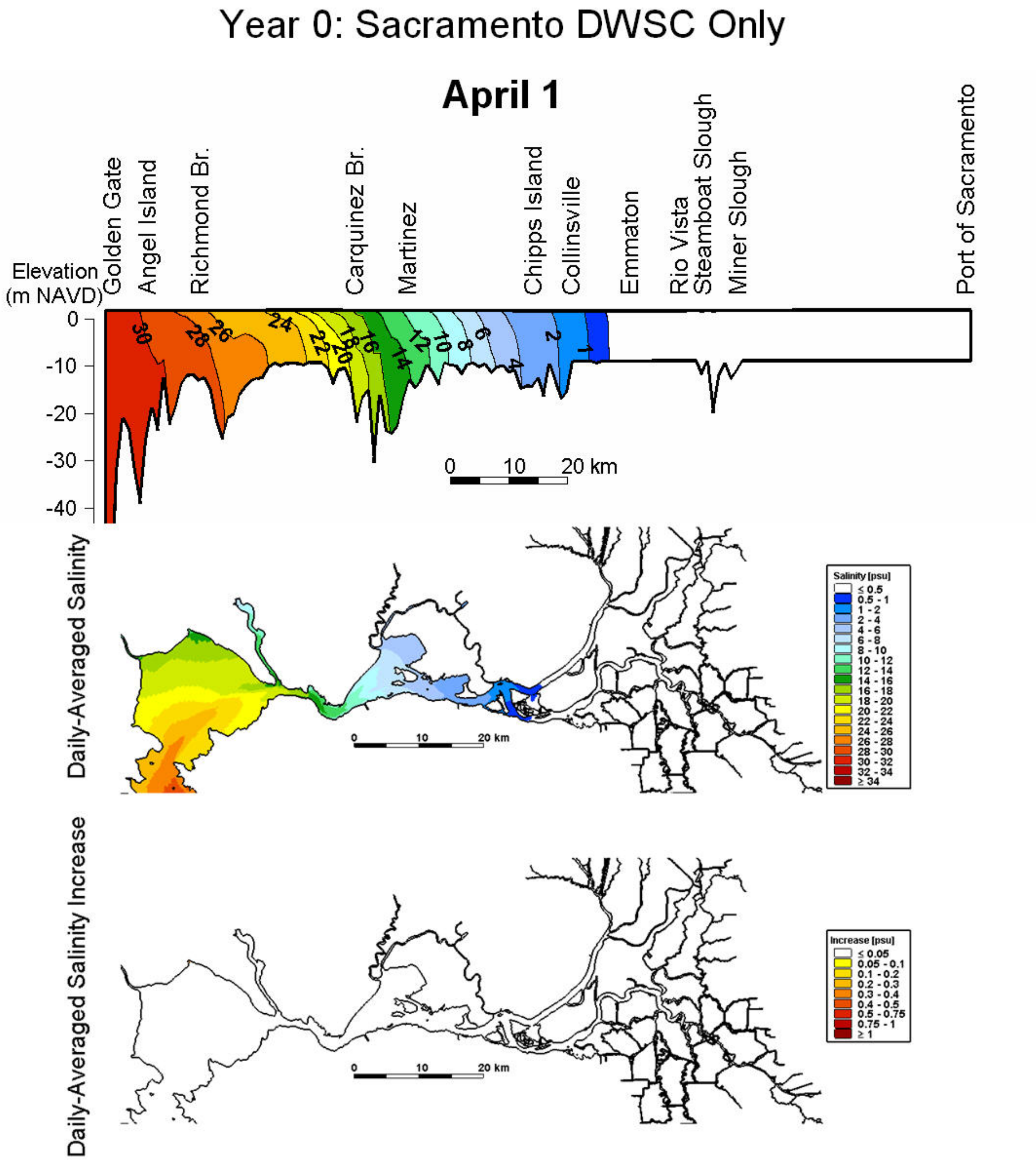


Figure 4.4-1 Predicted daily-averaged salinity profile along the axis of San Francisco Bay from the Golden Gate to the Port of Sacramento on April 1 for the Year 0 Sacramento DWSC Only Deepening scenario (top); predicted depth-averaged daily-averaged salinity on April 1 for the Year 0 Sacramento DWSC Only Deepening scenario (middle); predicted increase in depth-averaged daily-averaged salinity on April 1 relative to the Year 0 Baseline scenario for the Year 0 Sacramento DWSC Only Deepening scenario.

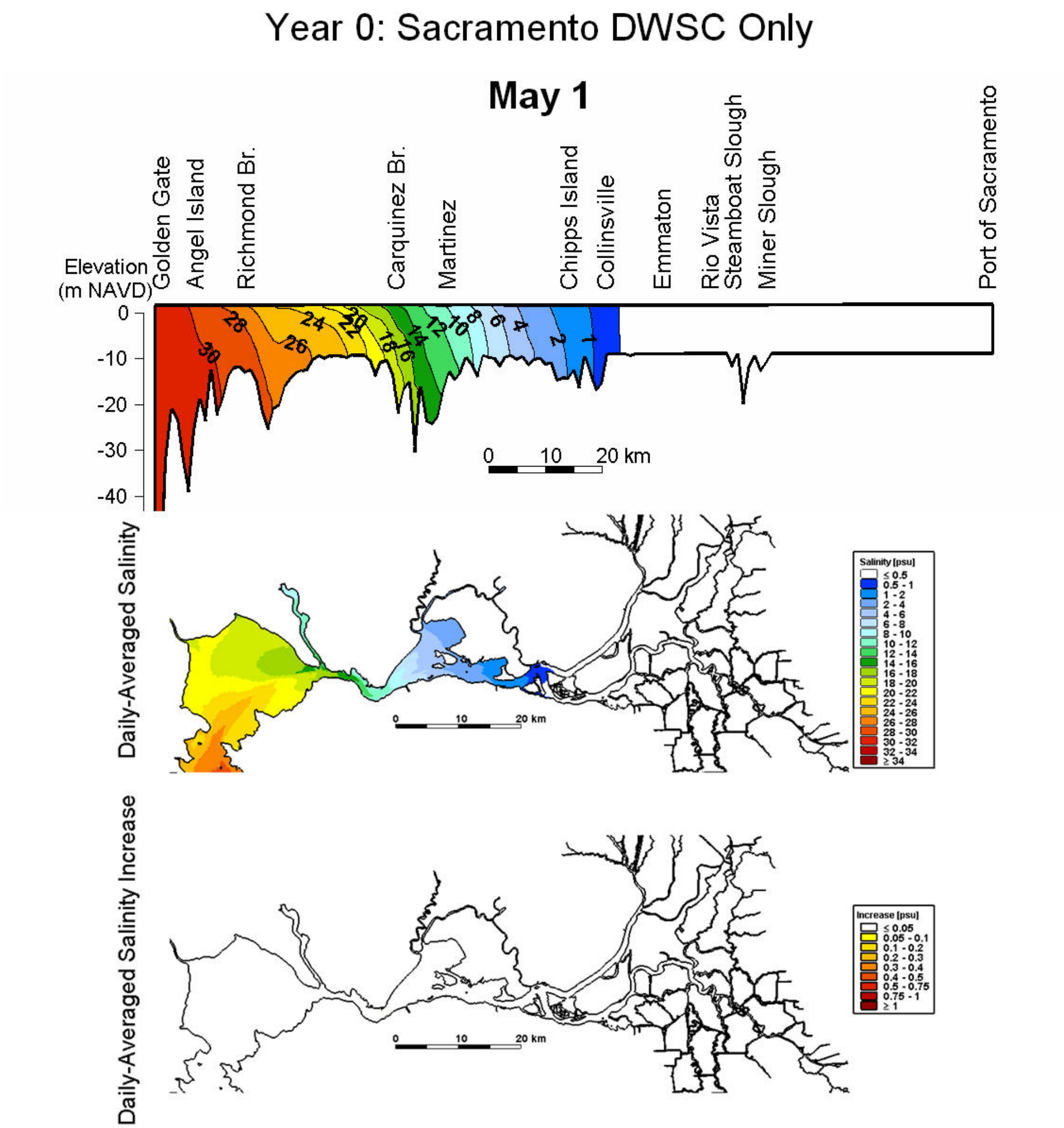


Figure 4.4-2 Predicted daily-averaged salinity profile along the axis of San Francisco Bay from the Golden Gate to the Port of Sacramento on May 1 for the Year 0 Sacramento DWSC Only Deepening scenario (top); predicted depth-averaged daily-averaged salinity on May 1 for the Year 0 Sacramento DWSC Only Deepening scenario (middle); predicted increase in depth-averaged daily-averaged salinity on May 1 relative to the Year 0 Baseline scenario for the Year 0 Sacramento DWSC Only Deepening scenario.

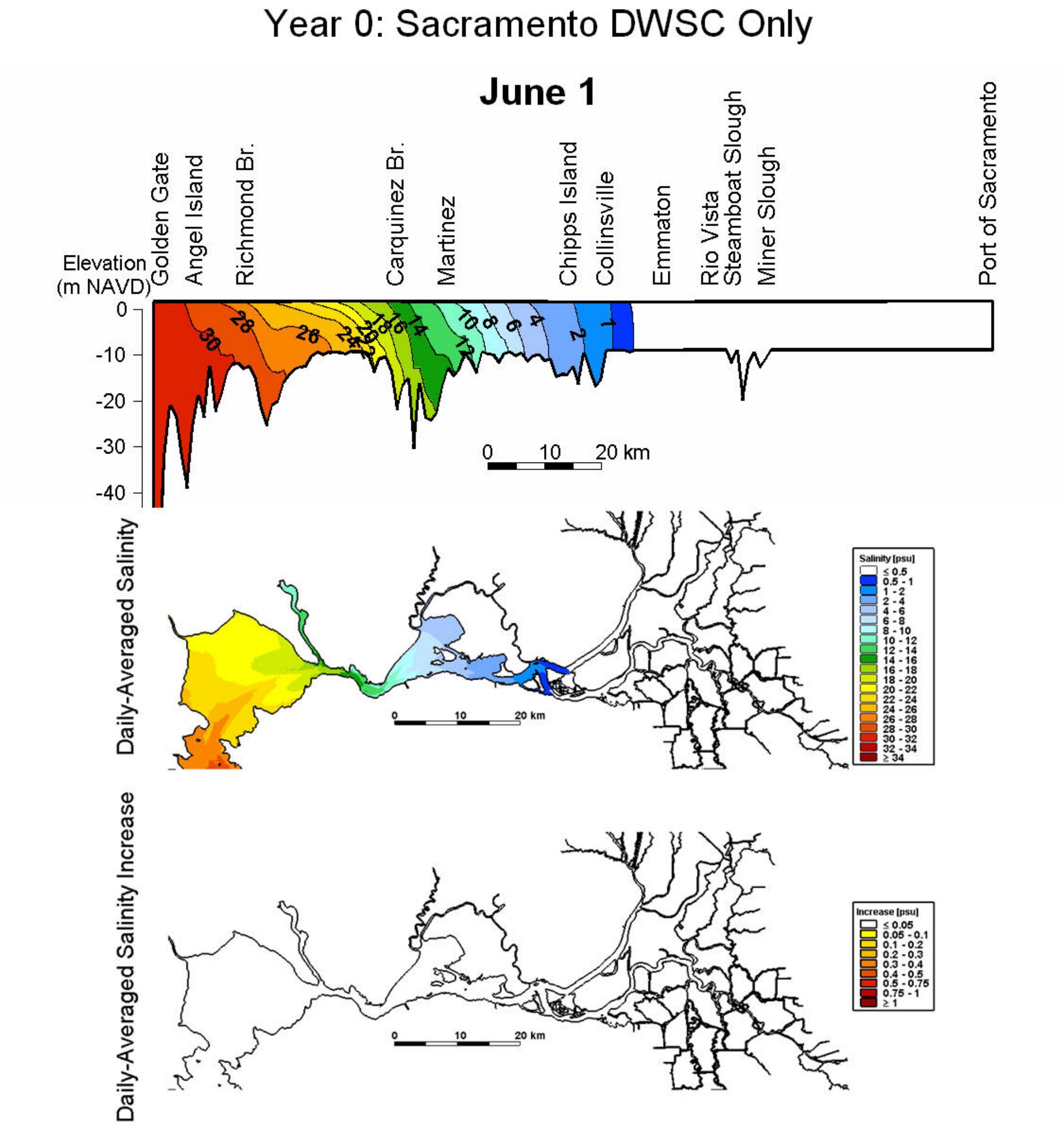


Figure 4.4-3 Predicted daily-averaged salinity profile along the axis of San Francisco Bay from the Golden Gate to the Port of Sacramento on June 1 for the Year 0 Sacramento DWSC Only Deepening scenario (top); predicted depth-averaged daily-averaged salinity on June 1 for the Year 0 Sacramento DWSC Only Deepening scenario (middle); predicted increase in depth-averaged daily-averaged salinity on June 1 relative to the Year 0 Baseline scenario for the Year 0 Sacramento DWSC Only Deepening scenario.

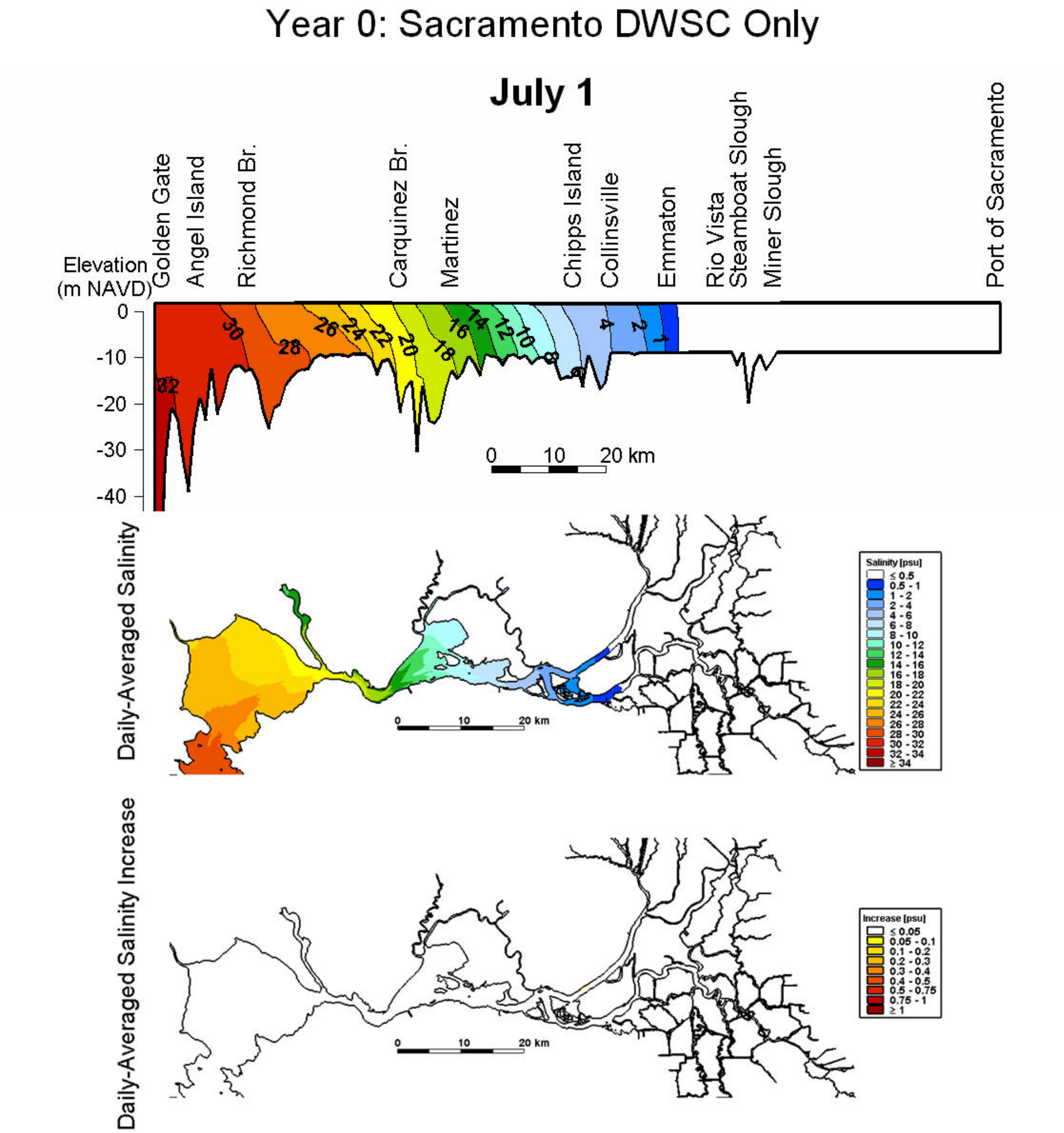


Figure 4.4-4 Predicted daily-averaged salinity profile along the axis of San Francisco Bay from the Golden Gate to the Port of Sacramento on July 1 for the Year 0 Sacramento DWSC Only Deepening scenario (top); predicted depth-averaged daily-averaged salinity on July 1 for the Year 0 Sacramento DWSC Only Deepening scenario (middle); predicted increase in depth-averaged daily-averaged salinity on July 1 relative to the Year 0 Baseline scenario for the Year 0 Sacramento DWSC Only Deepening scenario.

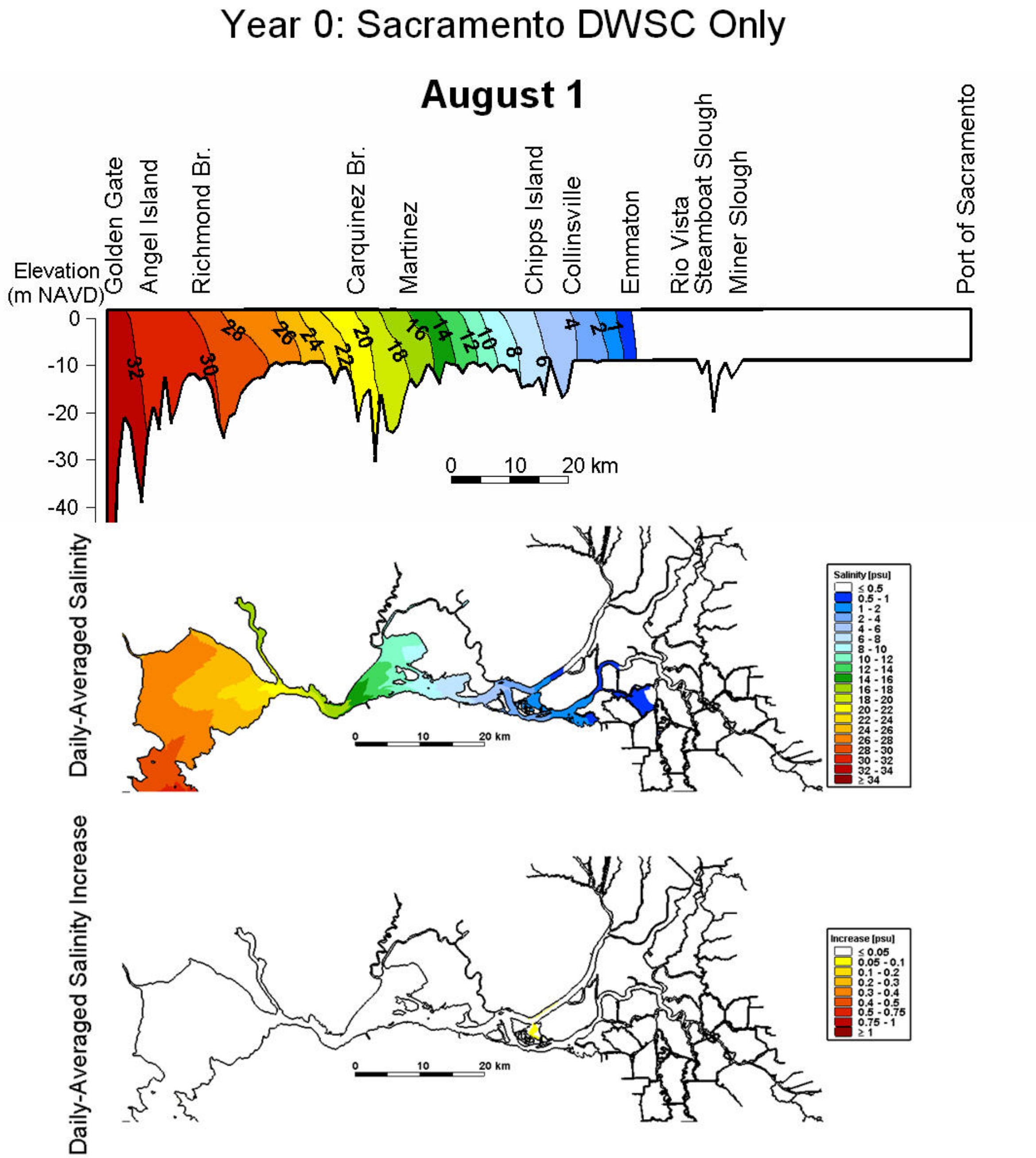


Figure 4.4-5 Predicted daily-averaged salinity profile along the axis of San Francisco Bay from the Golden Gate to the Port of Sacramento on August 1 for the Year 0 Sacramento DWSC Only Deepening scenario (top); predicted depth-averaged daily-averaged salinity on August 1 for the Year 0 Sacramento DWSC Only Deepening scenario (middle); predicted increase in depth-averaged daily-averaged salinity on August 1 relative to the Year 0 Baseline scenario for the Year 0 Sacramento DWSC Only Deepening scenario.

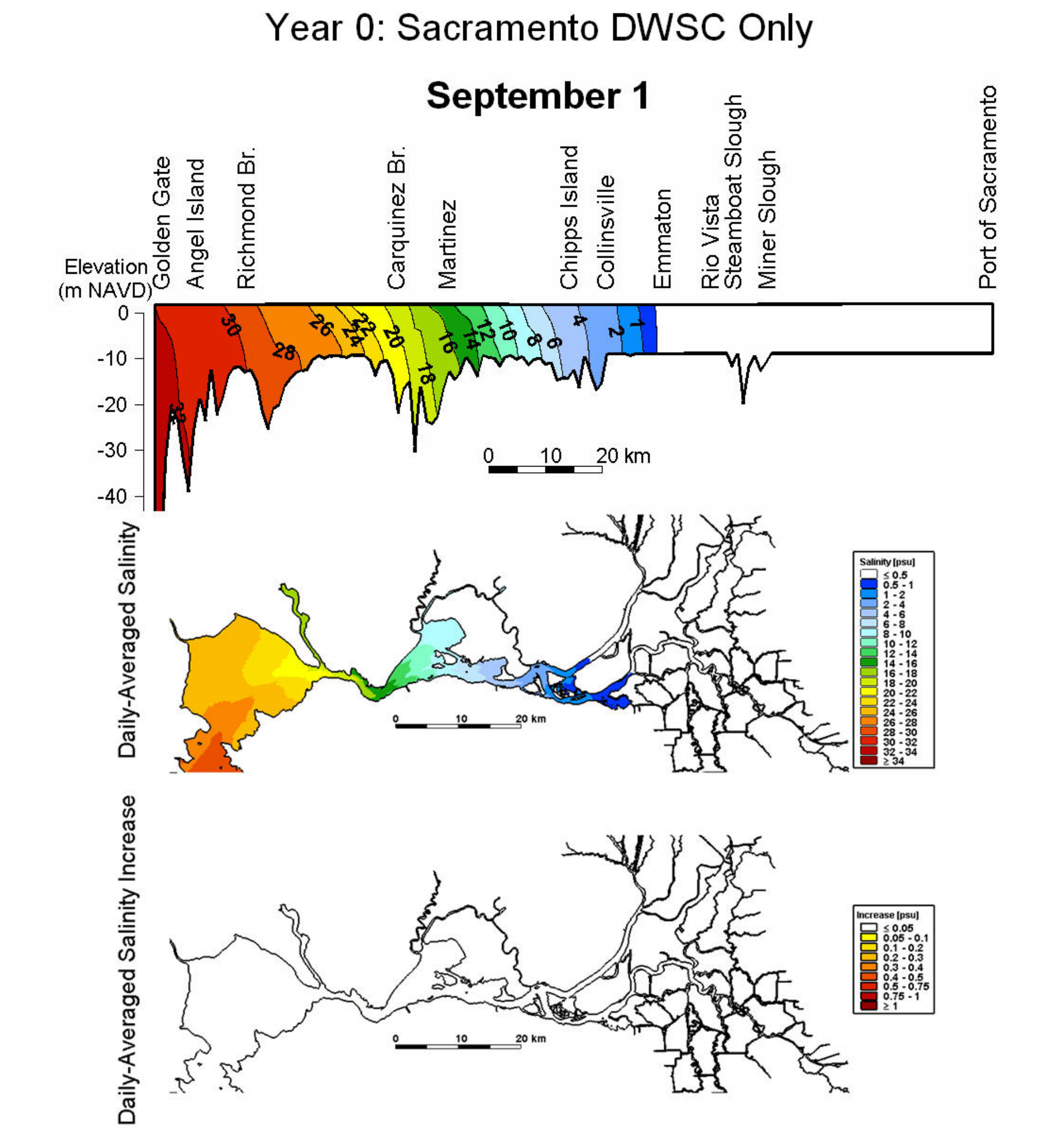


Figure 4.4-6 Predicted daily-averaged salinity profile along the axis of San Francisco Bay from the Golden Gate to the Port of Sacramento on September 1 for the Year 0 Sacramento DWSC Only Deepening scenario (top); predicted depth-averaged daily-averaged salinity on September 1 for the Year 0 Sacramento DWSC Only Deepening scenario (middle); predicted increase in depth-averaged daily-averaged salinity on September 1 relative to the Year 0 Baseline scenario for the Year 0 Sacramento DWSC Only Deepening scenario.

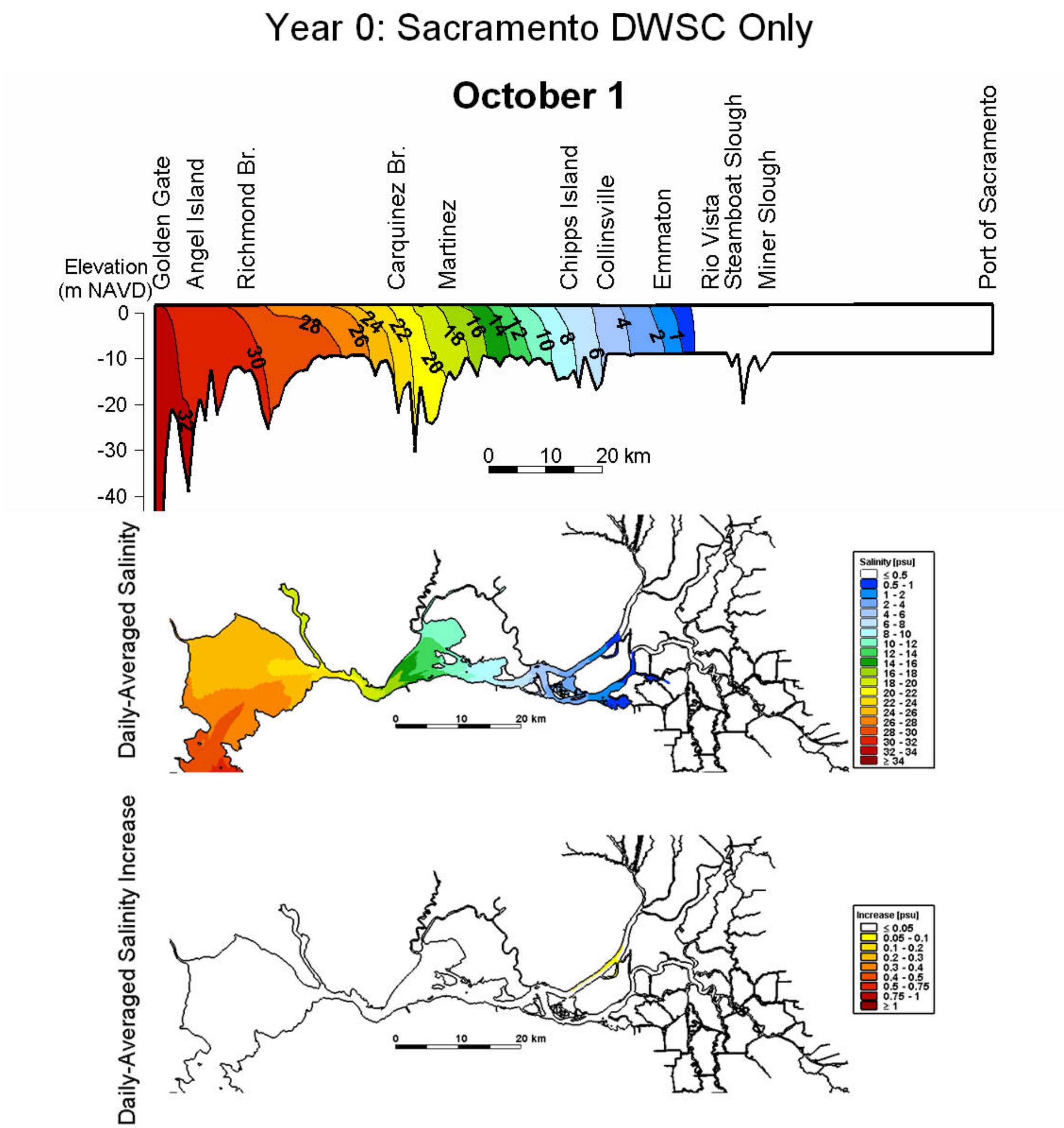


Figure 4.4-7 Predicted daily-averaged salinity profile along the axis of San Francisco Bay from the Golden Gate to the Port of Sacramento on October 1 for the Year 0 Sacramento DWSC Only Deepening scenario (top); predicted depth-averaged daily-averaged salinity on October 1 for the Year 0 Sacramento DWSC Only Deepening scenario (middle); predicted increase in depth-averaged daily-averaged salinity on October 1 relative to the Year 0 Baseline scenario for the Year 0 Sacramento DWSC Only Deepening scenario.

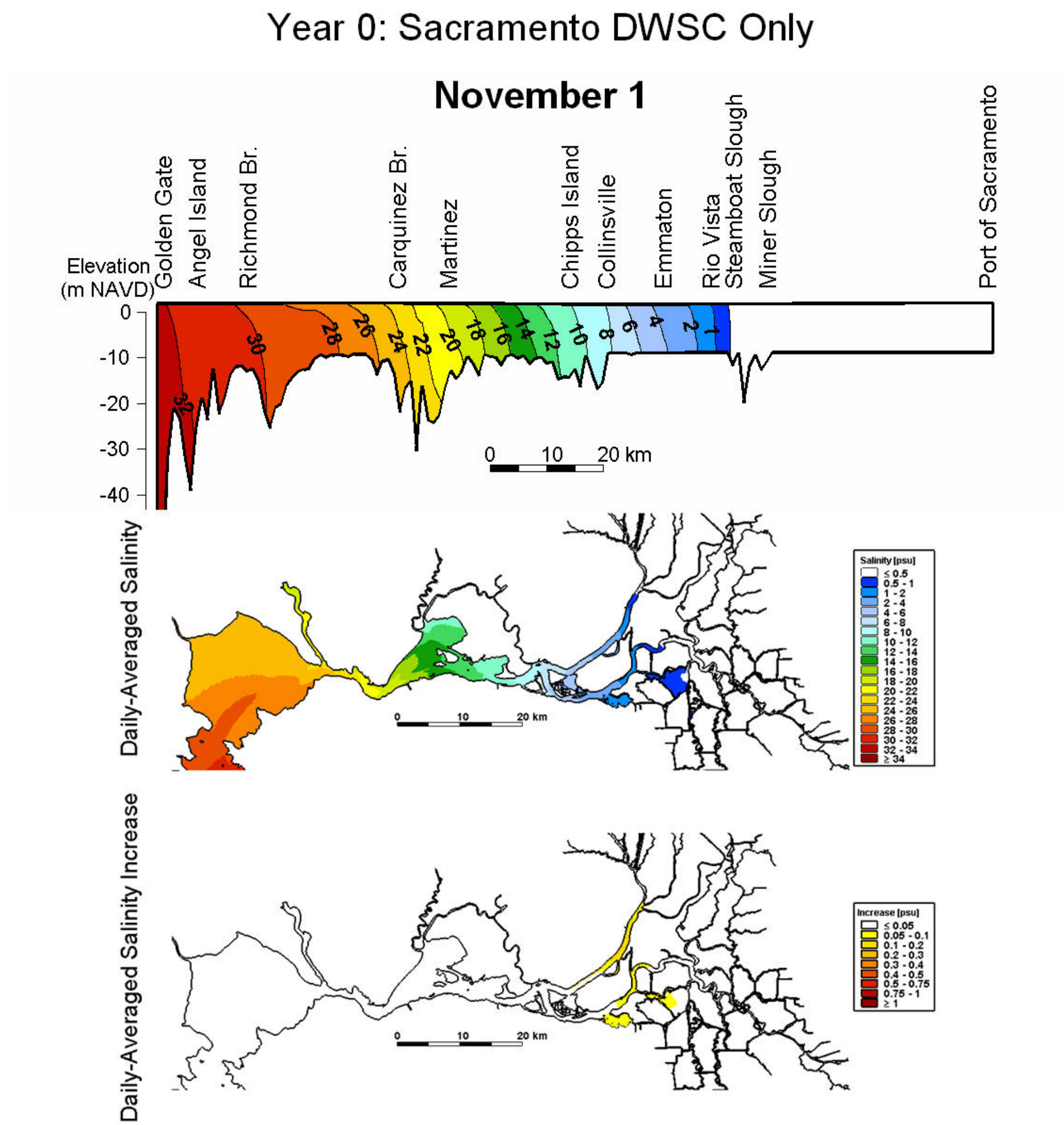


Figure 4.4-8 Predicted daily-averaged salinity profile along the axis of San Francisco Bay from the Golden Gate to the Port of Sacramento on November 1 for the Year 0 Sacramento DWSC Only Deepening scenario (top); predicted depth-averaged daily-averaged salinity on November 1 for the Year 0 Sacramento DWSC Only Deepening scenario (middle); predicted increase in depth-averaged daily-averaged salinity on November 1 relative to the Year 0 Baseline scenario for the Year 0 Sacramento DWSC Only Deepening scenario.

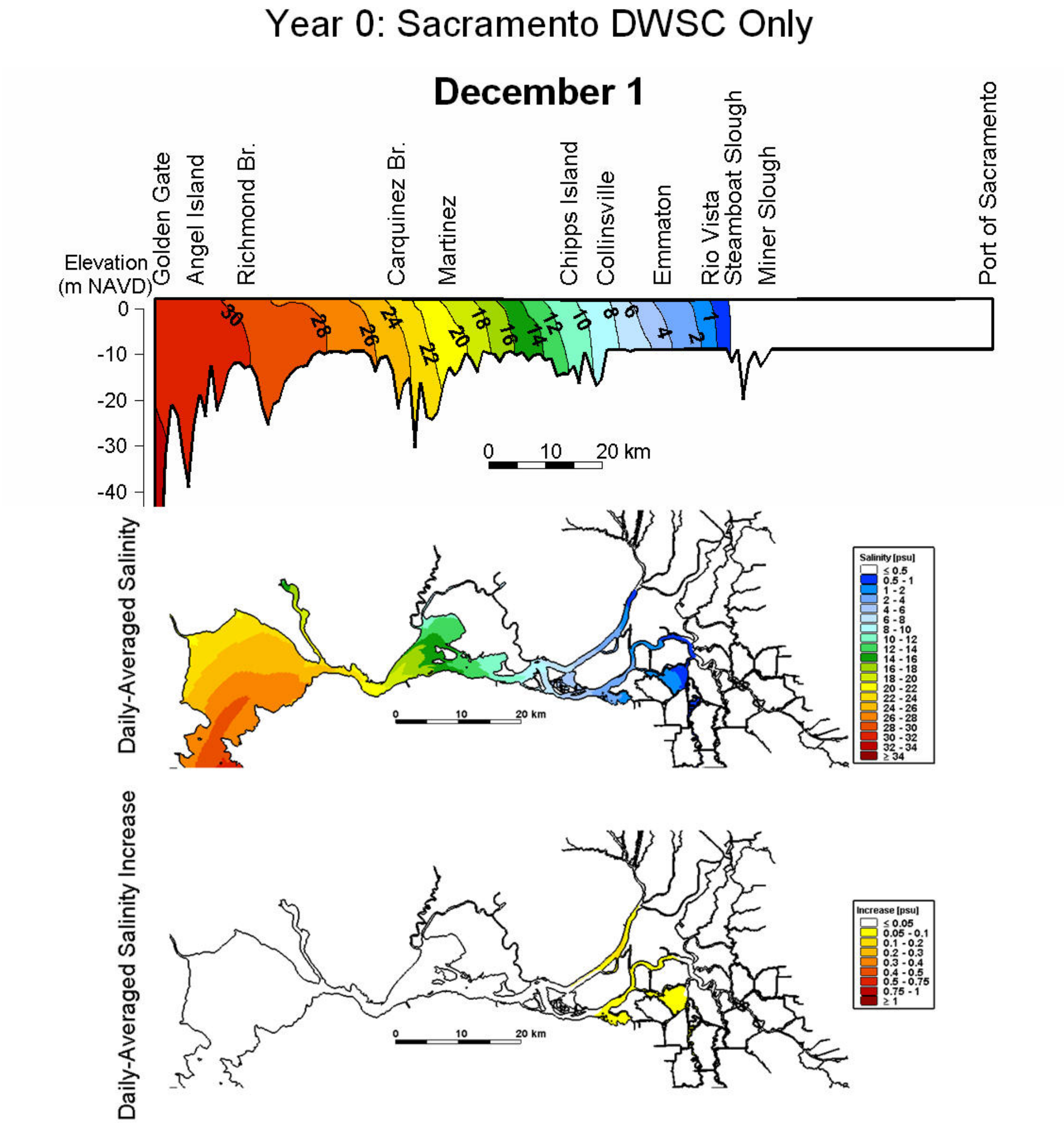


Figure 4.4-9 Predicted daily-averaged salinity profile along the axis of San Francisco Bay from the Golden Gate to the Port of Sacramento on December 1 for the Year 0 Sacramento DWSC Only Deepening scenario (top); predicted depth-averaged daily-averaged salinity on December 1 for the Year 0 Sacramento DWSC Only Deepening scenario (middle); predicted increase in depth-averaged daily-averaged salinity on December 1 relative to the Year 0 Baseline scenario for the Year 0 Sacramento DWSC Only Deepening scenario.

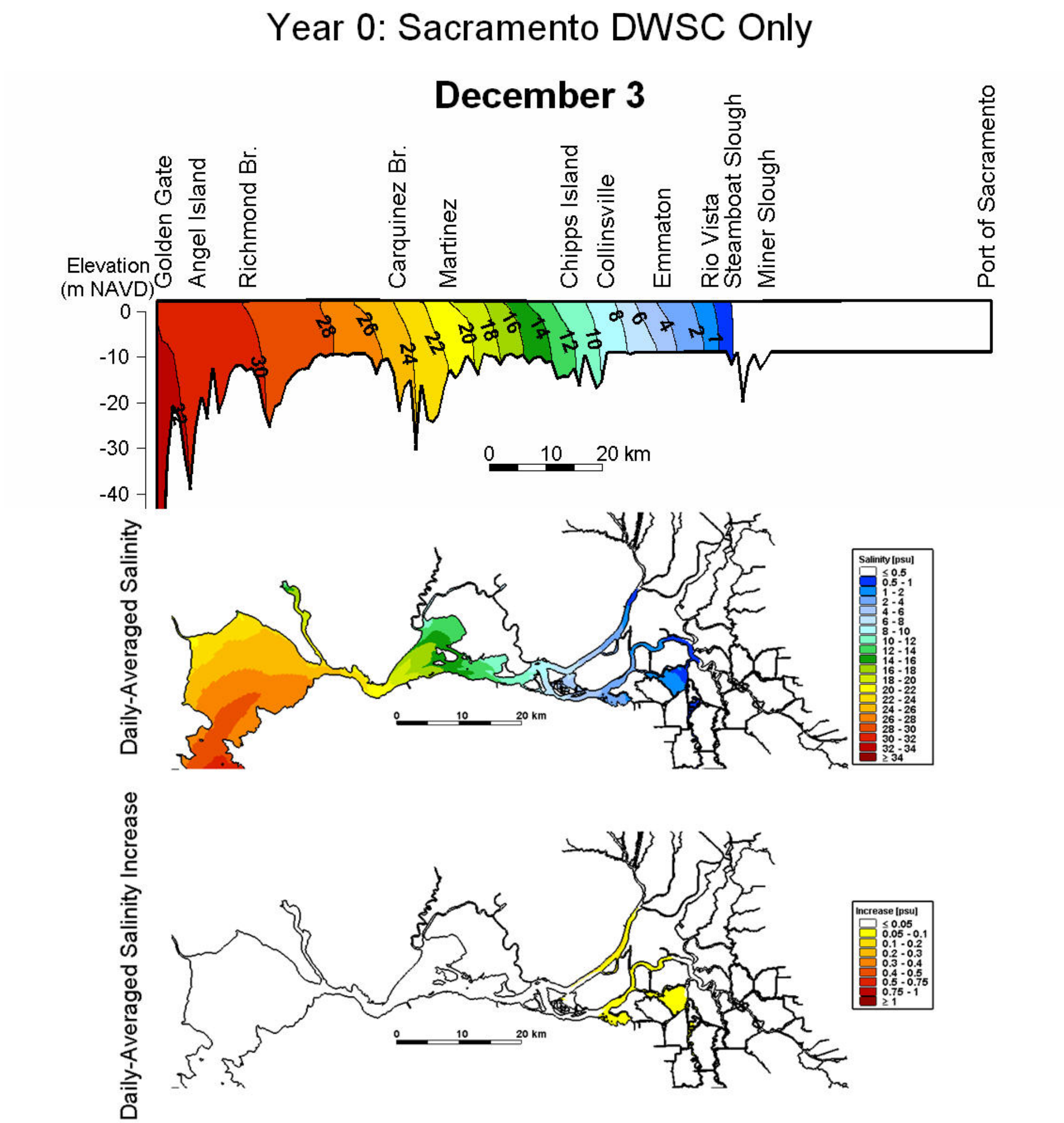


Figure 4.4-10 Predicted daily-averaged salinity profile along the axis of San Francisco Bay from the Golden Gate to the Port of Sacramento on December 3, the day of maximum predicted X2, for the Year 0 Sacramento DWSC Only Deepening scenario (top); predicted depth-averaged daily-averaged salinity on December 3 for the Year 0 Sacramento DWSC Only Deepening scenario (middle); predicted increase in depth-averaged daily-averaged salinity on December 3 relative to the Year 0 Baseline scenario for the Year 0 Sacramento DWSC Only Deepening scenario.

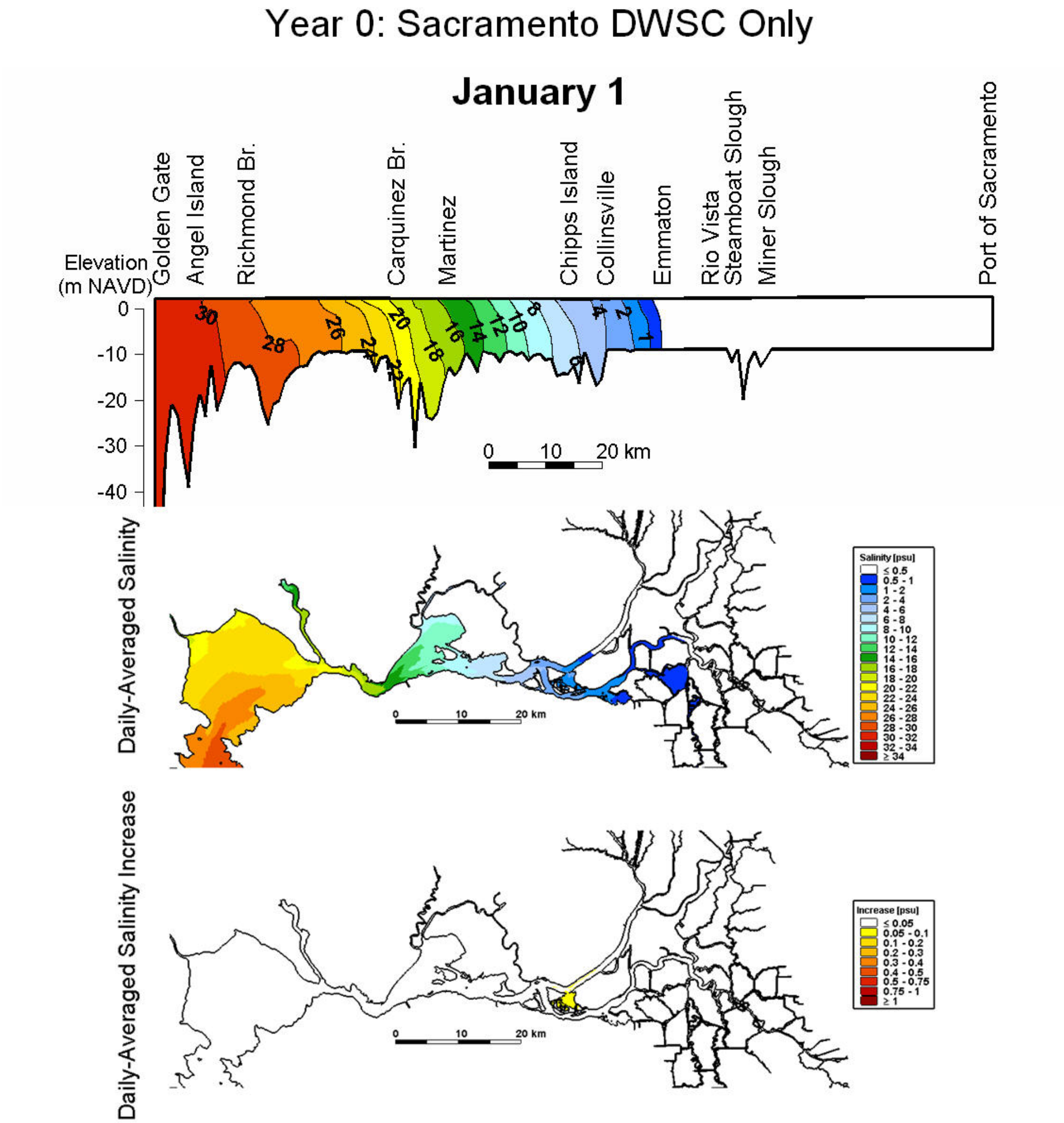


Figure 4.4-11 Predicted daily-averaged salinity profile along the axis of San Francisco Bay from the Golden Gate to the Port of Sacramento on January 1 for the Year 0 Sacramento DWSC Only Deepening scenario (top); predicted depth-averaged daily-averaged salinity on January 1 for the Year 0 Sacramento DWSC Only Deepening scenario (middle); predicted increase in depth-averaged daily-averaged salinity on January 1 relative to the Year 0 Baseline scenario for the Year 0 Sacramento DWSC Only Deepening scenario.

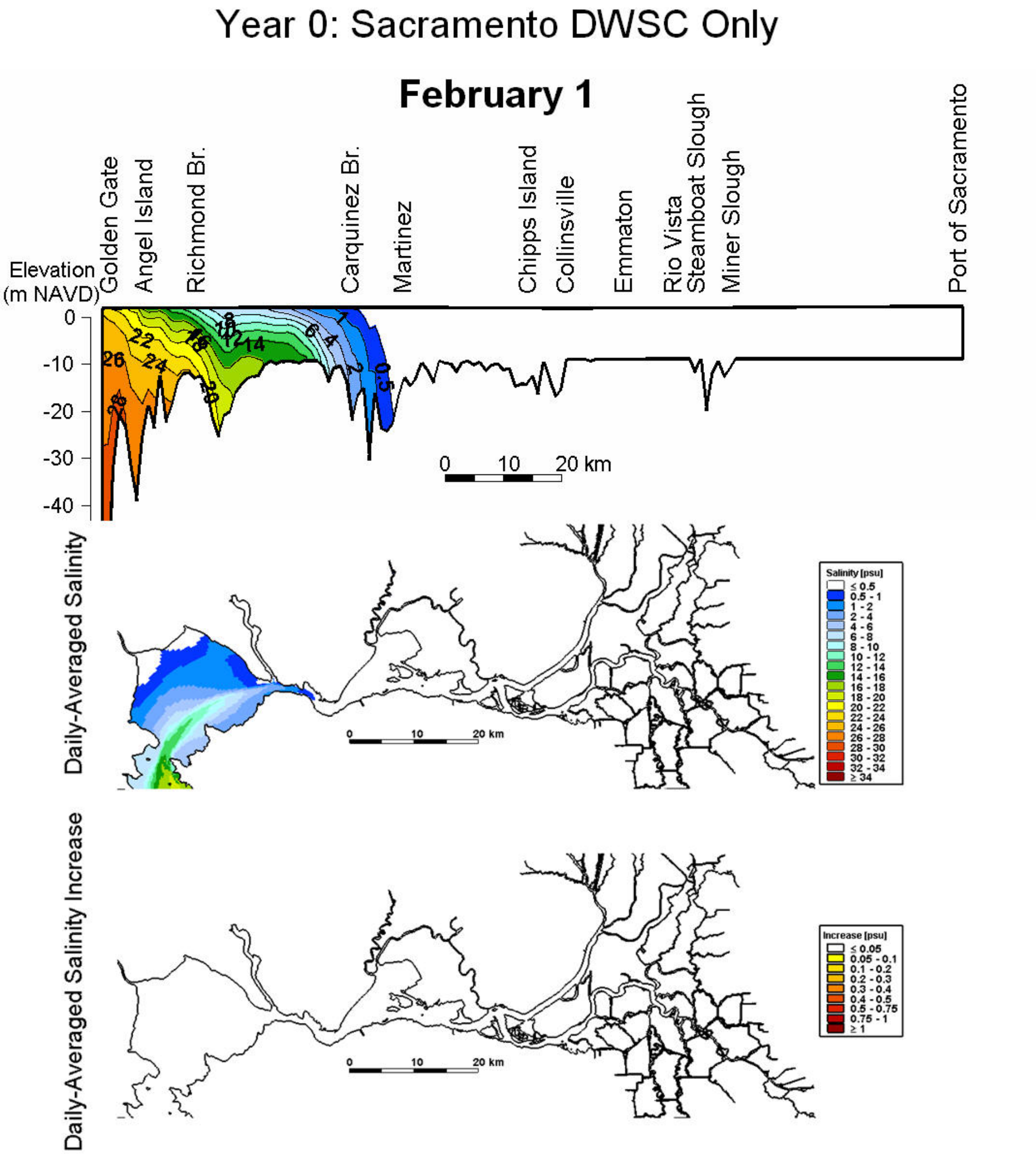


Figure 4.4-12 Predicted daily-averaged salinity profile along the axis of San Francisco Bay from the Golden Gate to the Port of Sacramento on February 1 for the Year 0 Sacramento DWSC Only Deepening scenario (top); predicted depth-averaged daily-averaged salinity on February 1 for the Year 0 Sacramento DWSC Only Deepening scenario (middle); predicted increase in depth-averaged daily-averaged salinity on February 1 relative to the Year 0 Baseline scenario for the Year 0 Sacramento DWSC Only Deepening scenario.

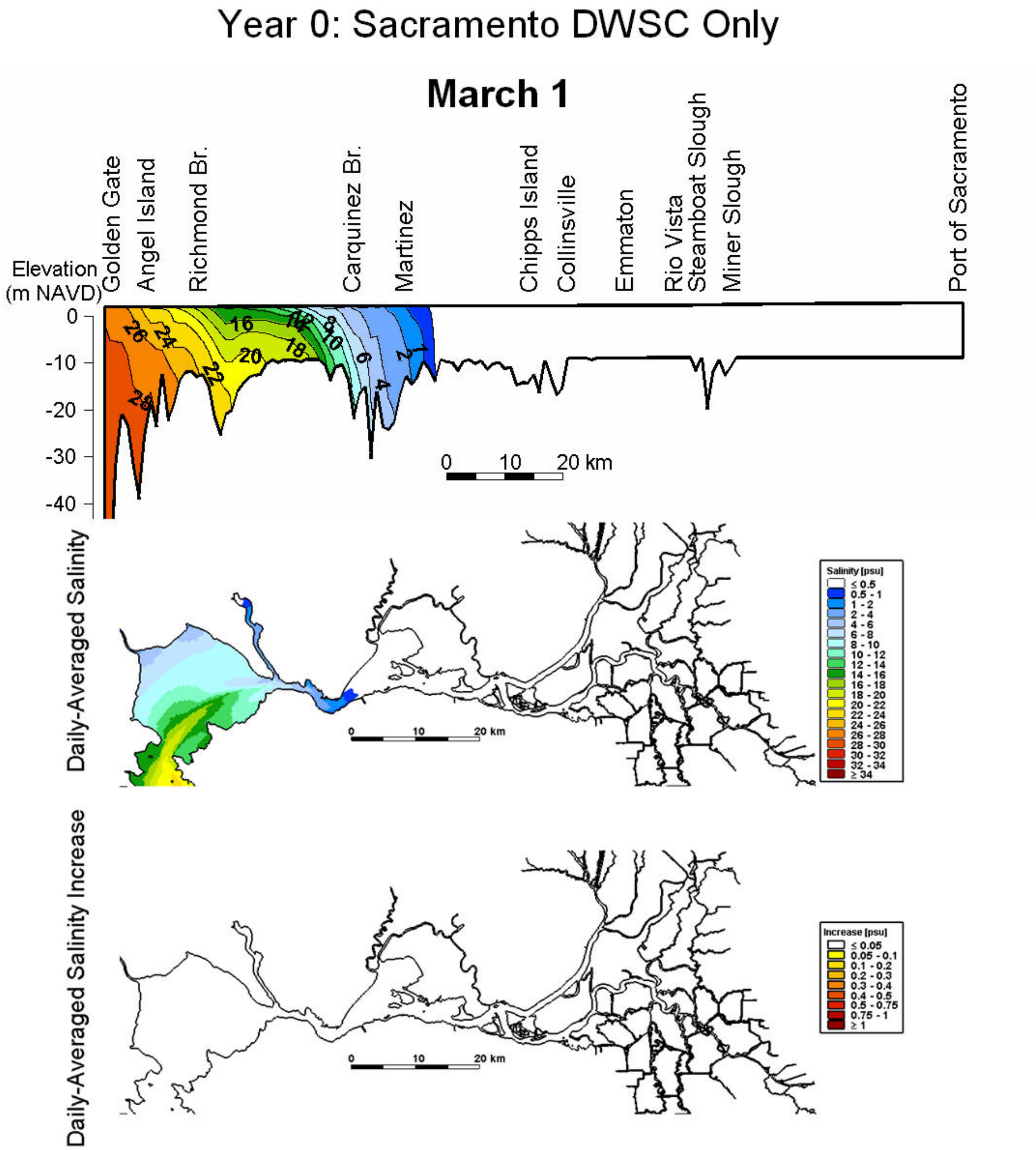


Figure 4.4-13 Predicted daily-averaged salinity profile along the axis of San Francisco Bay from the Golden Gate to the Port of Sacramento on March 1 for the Year 0 Sacramento DWSC Only Deepening scenario (top); predicted depth-averaged daily-averaged salinity on March 1 for the Year 0 Sacramento DWSC Only Deepening scenario (middle); predicted increase in depth-averaged daily-averaged salinity on March 1 relative to the Year 0 Baseline scenario for the Year 0 Sacramento DWSC Only Deepening scenario.

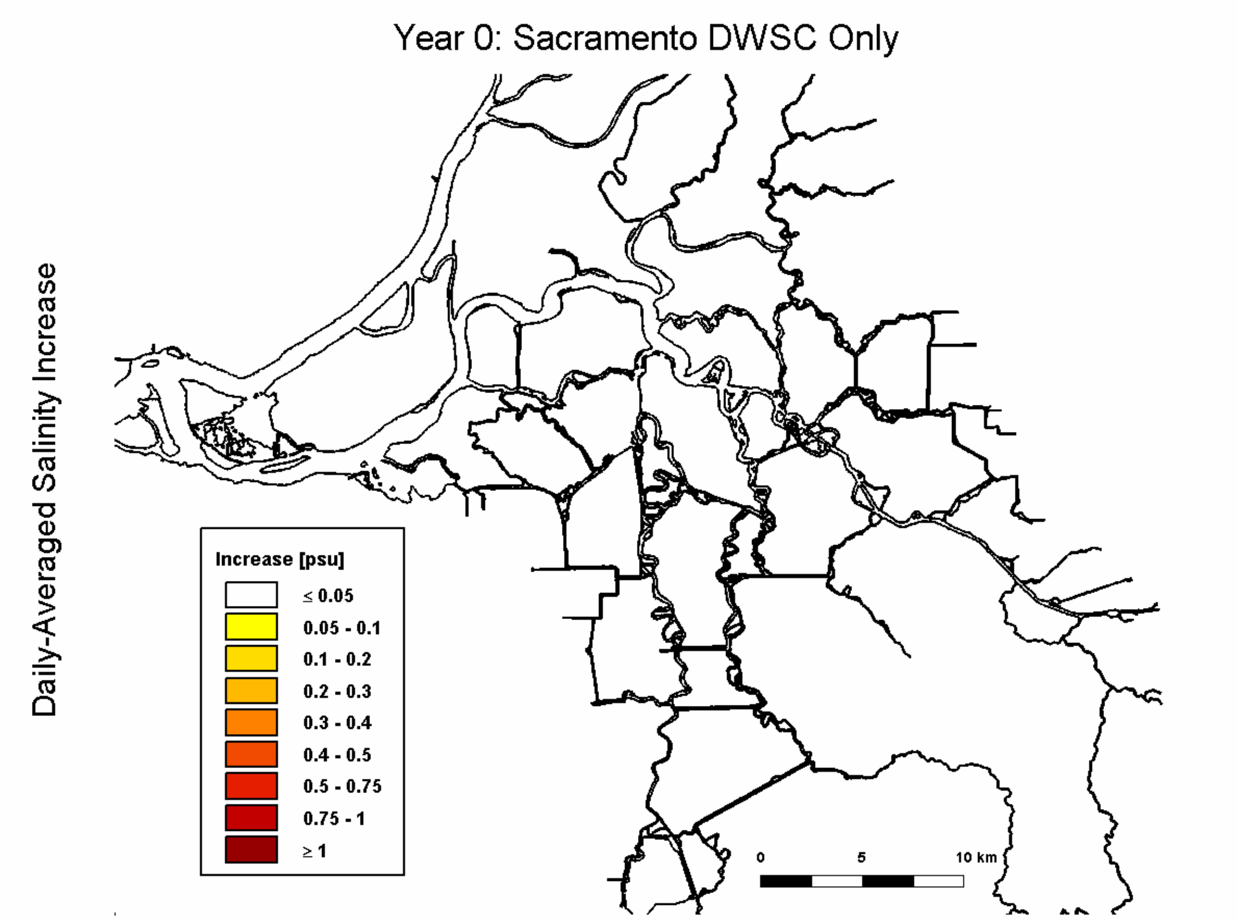


Figure 4.4-14 Predicted depth-averaged daily-averaged salinity increase in the Sacramento-San Joaquin Delta on April 1 for the Year 0 Sacramento DWSC Only Deepening scenario relative to the Year 0 Baseline scenario.

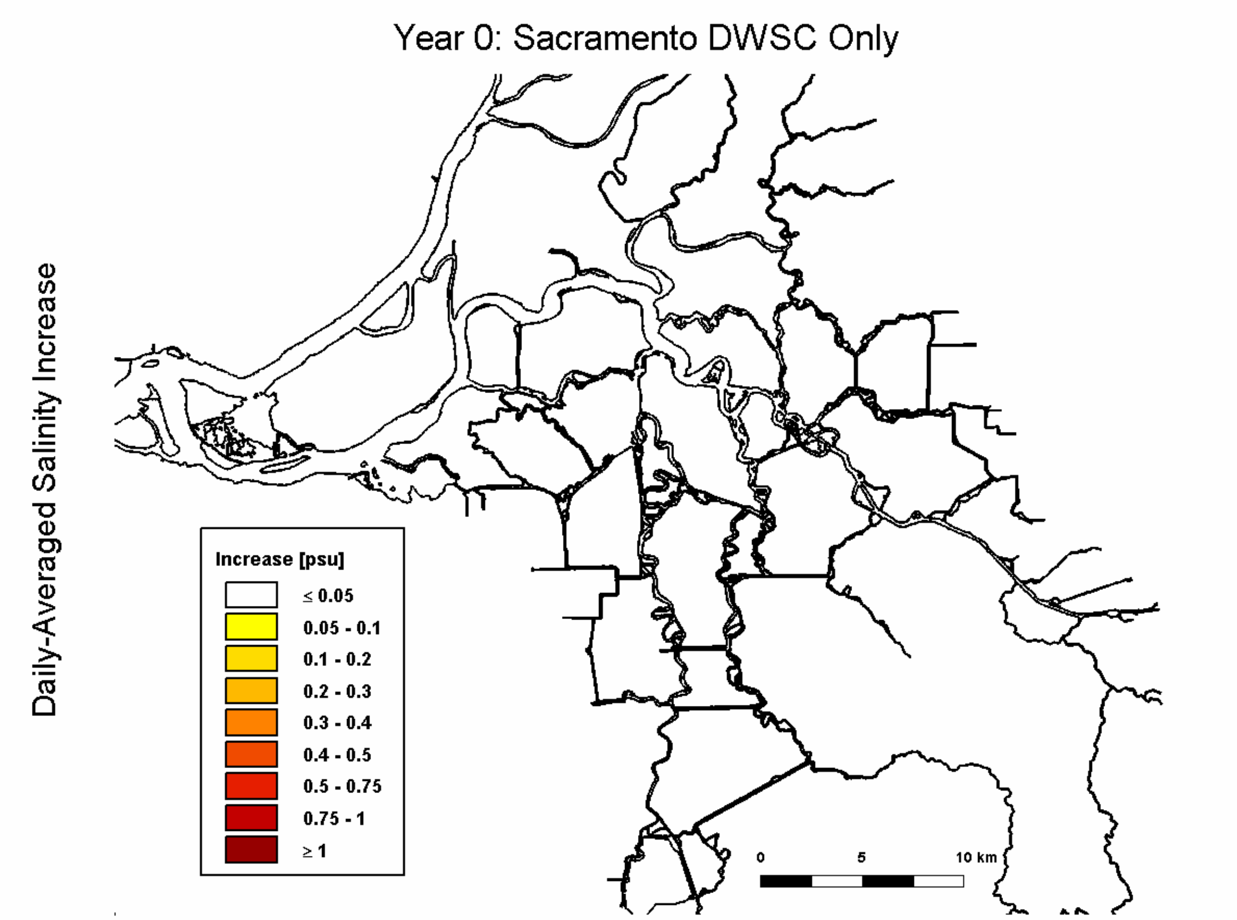


Figure 4.4-15 Predicted depth-averaged daily-averaged salinity increase in the Sacramento-San Joaquin Delta on May 1 for the Year 0 Sacramento DWSC Only Deepening scenario relative to the Year 0 Baseline scenario.

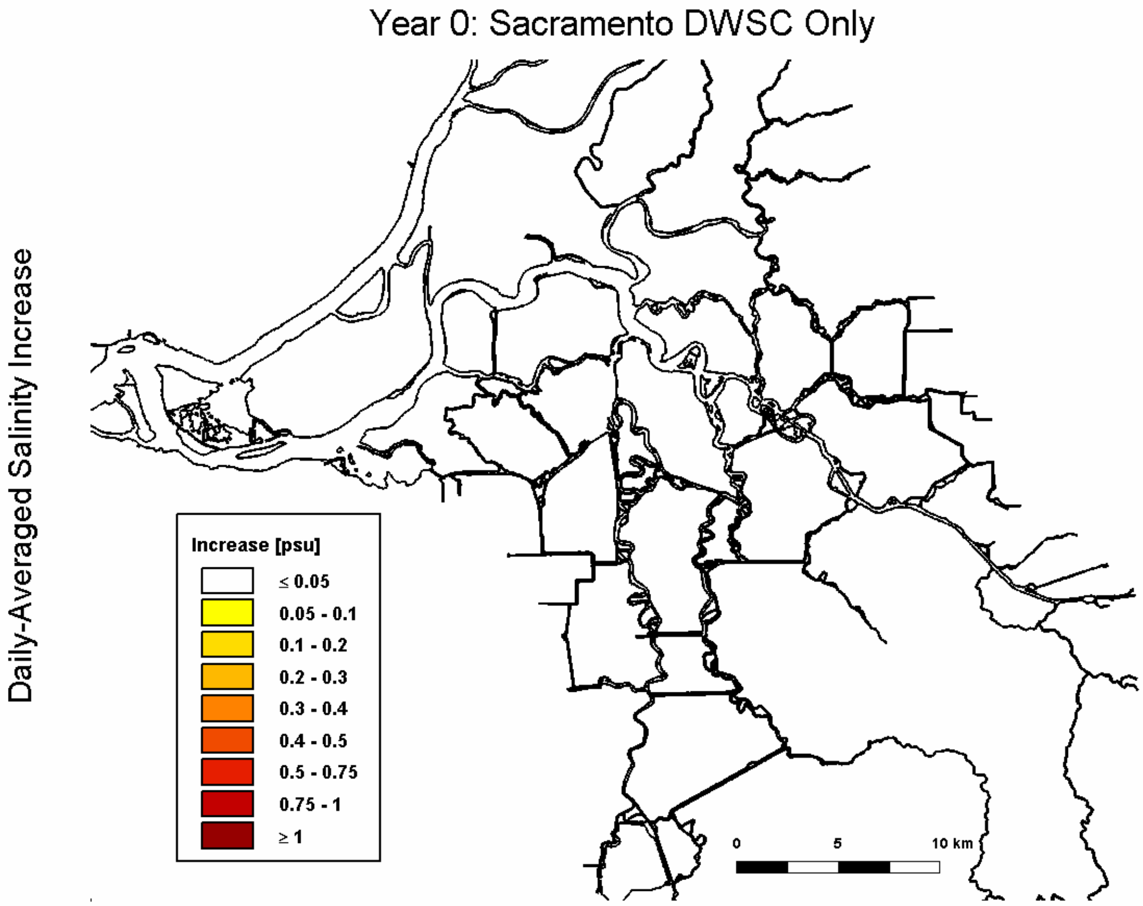


Figure 4.4-16 Predicted depth-averaged daily-averaged salinity increase in the Sacramento-San Joaquin Delta on June 1 for the Year 0 Sacramento DWSC Only Deepening scenario relative to the Year 0 Baseline scenario.

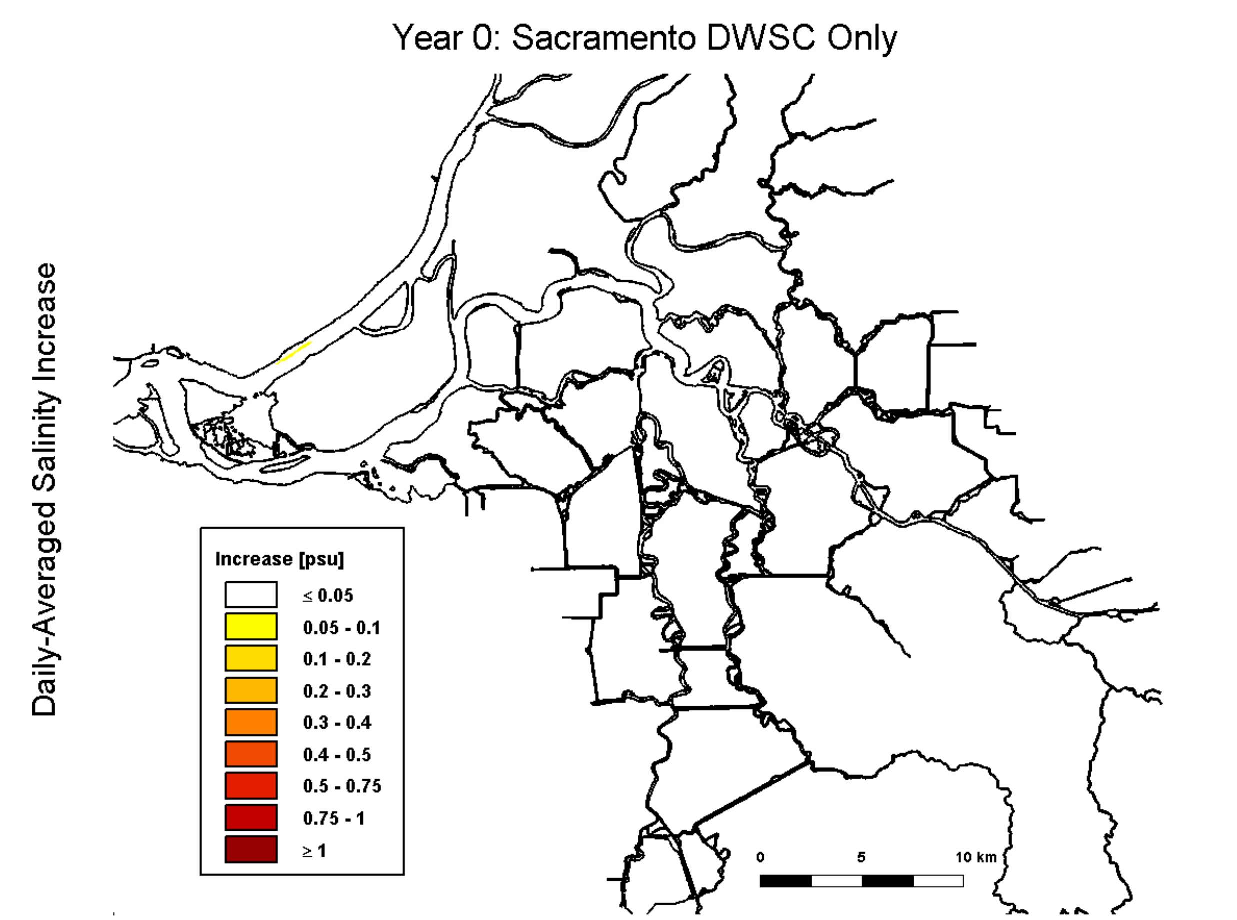


Figure 4.4-17 Predicted depth-averaged daily-averaged salinity increase in the Sacramento-San Joaquin Delta on July 1 for the Year 0 Sacramento DWSC Only Deepening scenario relative to the Year 0 Baseline scenario.

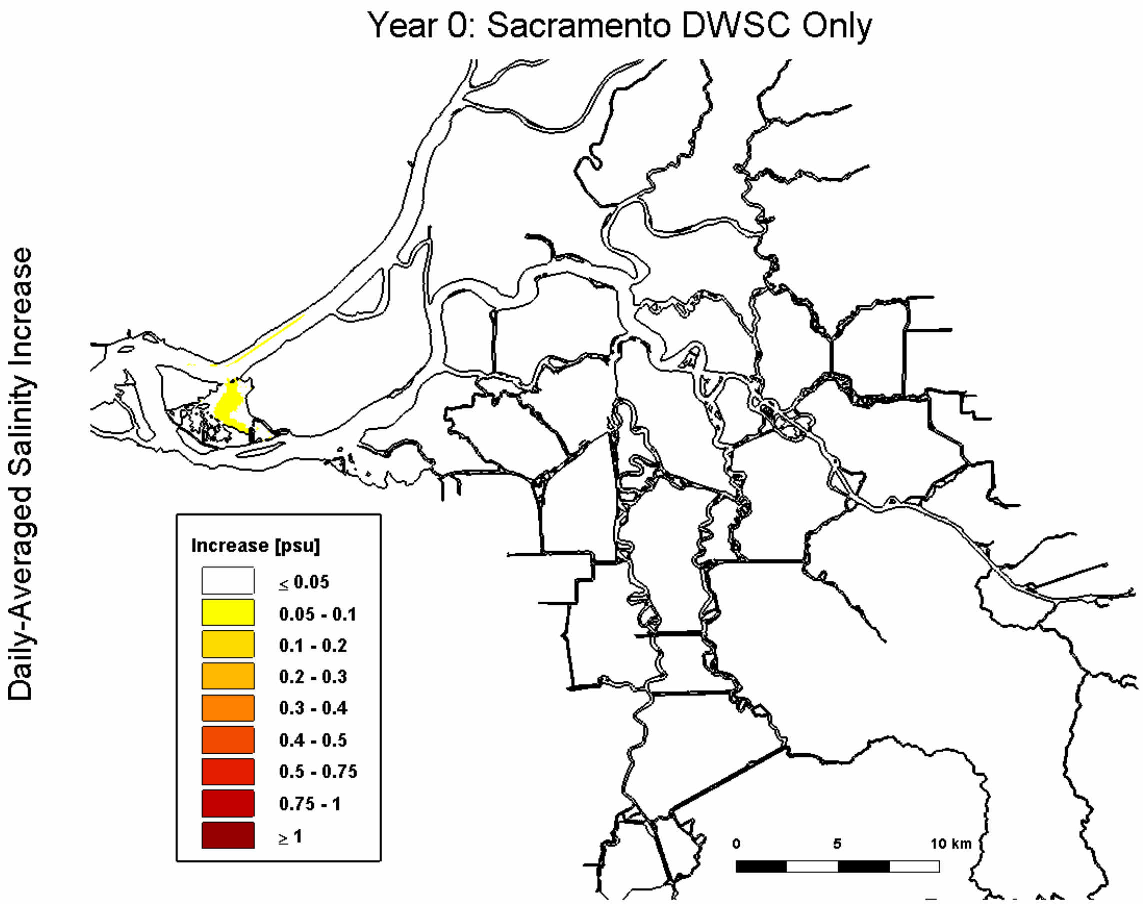


Figure 4.4-18 Predicted depth-averaged daily-averaged salinity increase in the Sacramento-San Joaquin Delta on August 1 for the Year 0 Sacramento DWSC Only Deepening scenario relative to the Year 0 Baseline scenario.

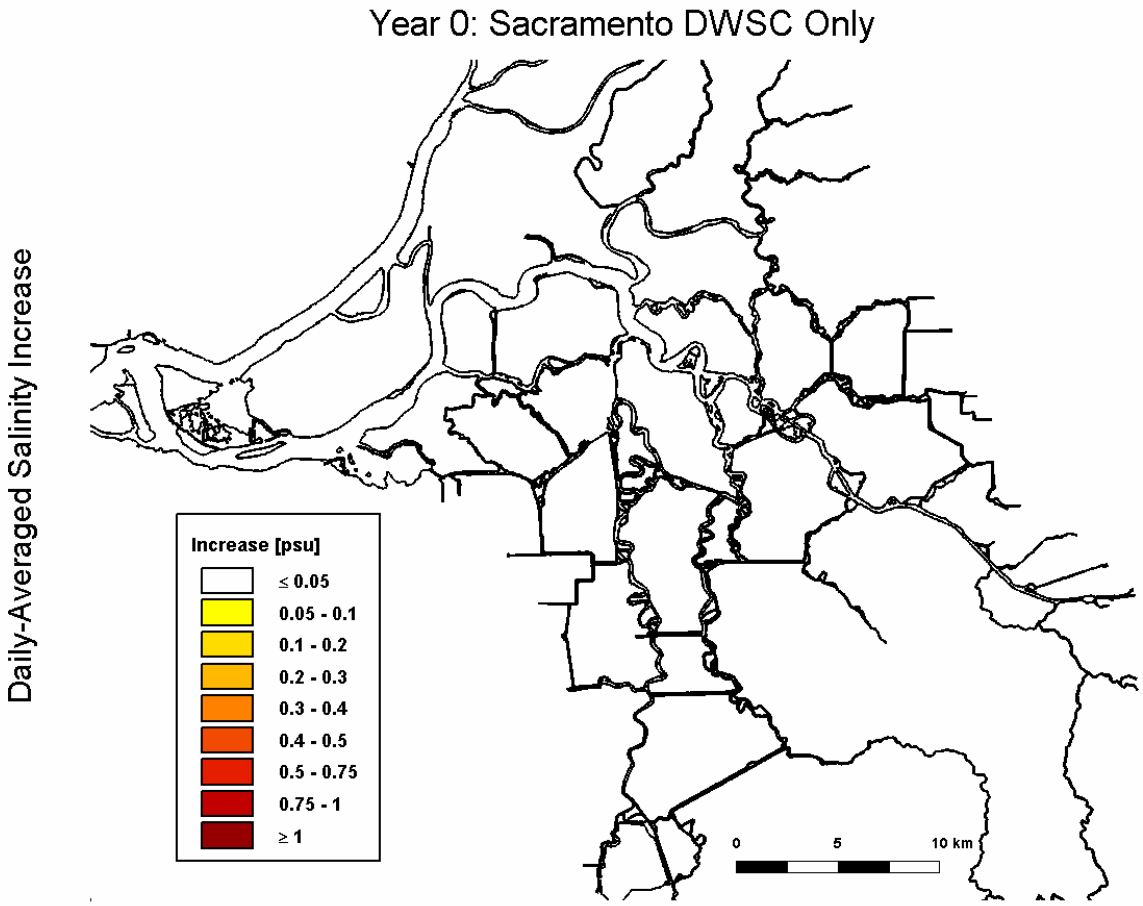


Figure 4.4-19 Predicted depth-averaged daily-averaged salinity increase in the Sacramento-San Joaquin Delta on September 1 for the Year 0 Sacramento DWSC Only Deepening scenario relative to the Year 0 Baseline scenario.

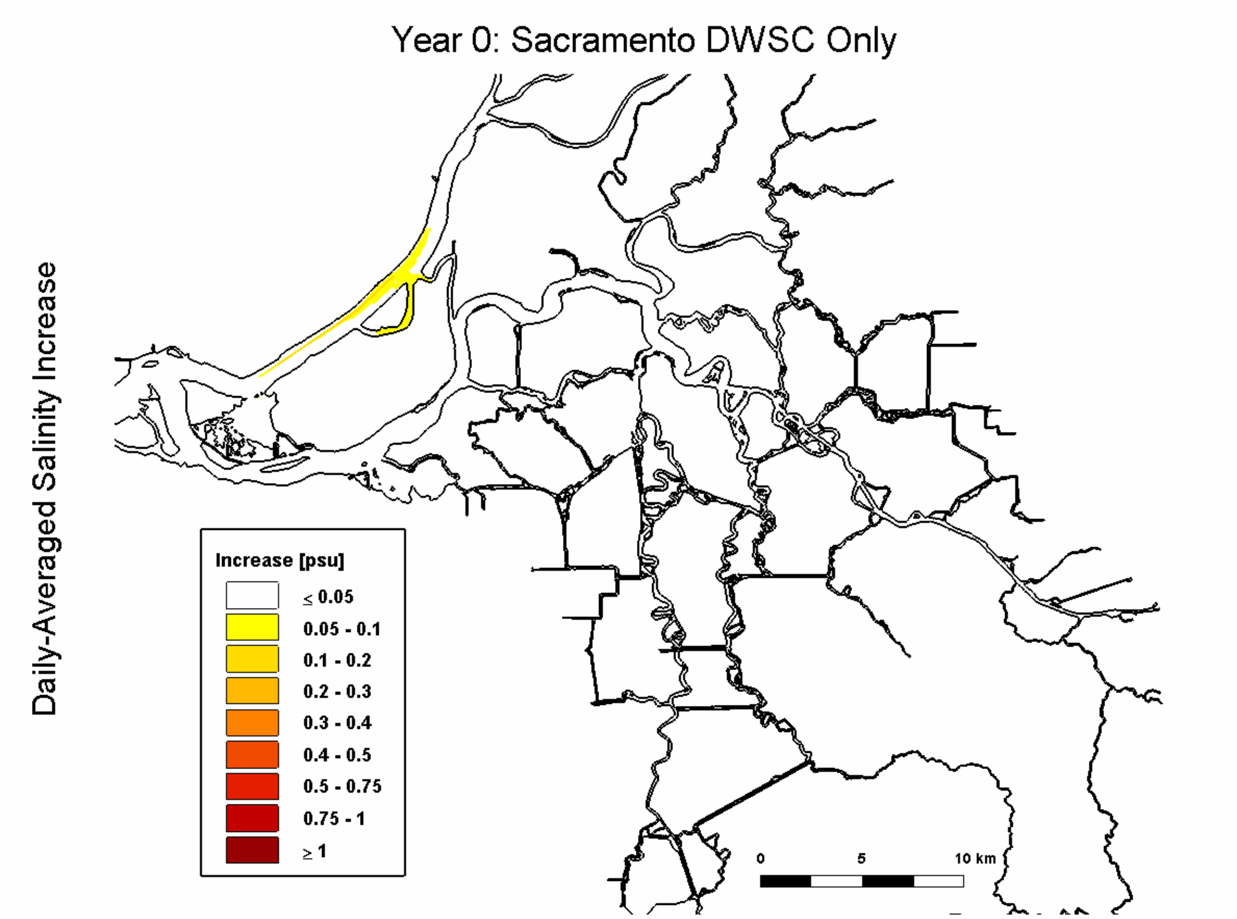


Figure 4.4-20 Predicted depth-averaged daily-averaged salinity increase in the Sacramento-San Joaquin Delta on October 1 for the Year 0 Sacramento DWSC Only Deepening scenario relative to the Year 0 Baseline scenario.

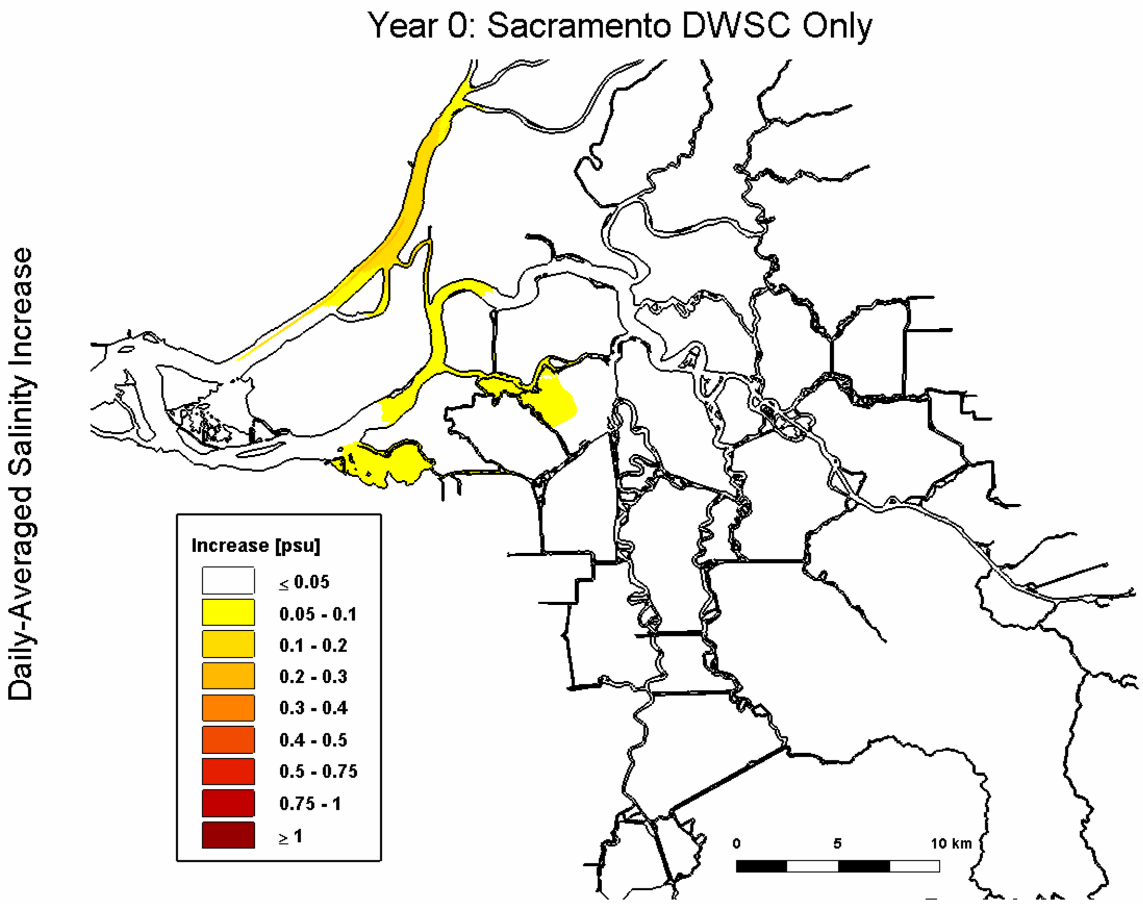


Figure 4.4-21 Predicted depth-averaged daily-averaged salinity increase in the Sacramento-San Joaquin Delta on November 1 for the Year 0 Sacramento DWSC Only Deepening scenario relative to the Year 0 Baseline scenario.

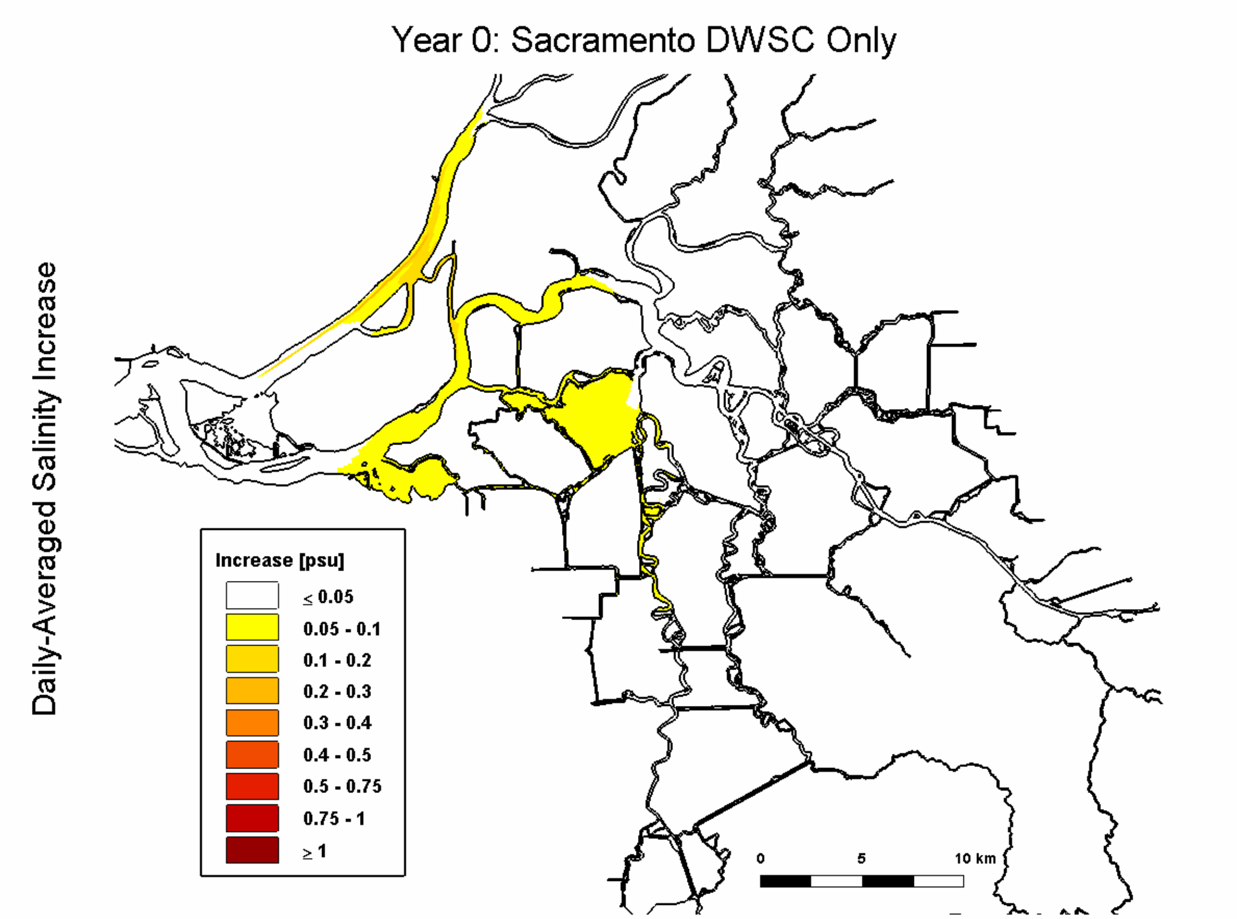


Figure 4.4-22 Predicted depth-averaged daily-averaged salinity increase in the Sacramento-San Joaquin Delta on December 1 for the Year 0 Sacramento DWSC Only Deepening scenario relative to the Year 0 Baseline scenario.

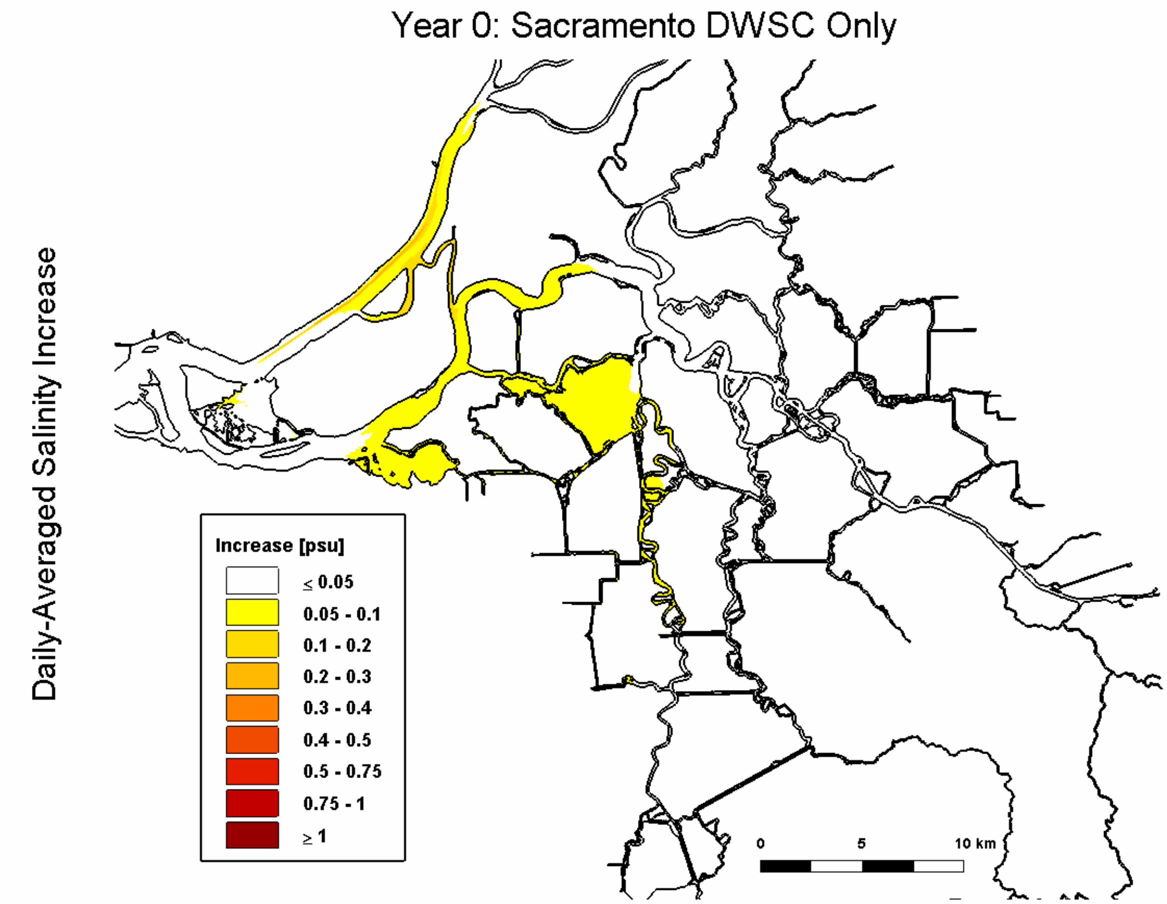


Figure 4.4-23 Predicted depth-averaged daily-averaged salinity increase in the Sacramento-San Joaquin Delta on December 3, the day of maximum predicted X2, for the Year 0 Sacramento DWSC Only Deepening scenario relative to the Year 0 Baseline scenario.

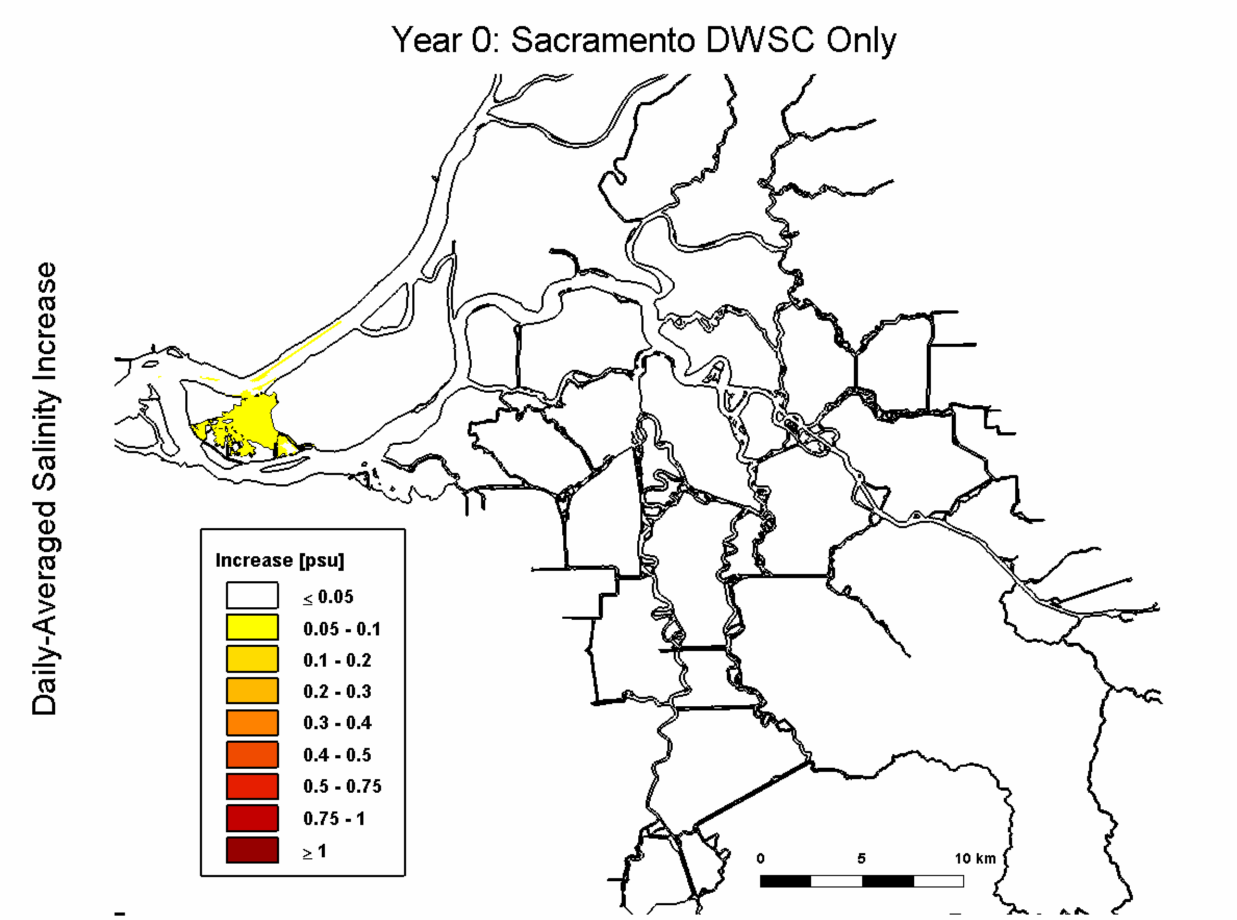


Figure 4.4-24 Predicted depth-averaged daily-averaged salinity increase in the Sacramento-San Joaquin Delta on January 1 for the Year 0 Sacramento DWSC Only Deepening scenario relative to the Year 0 Baseline scenario.

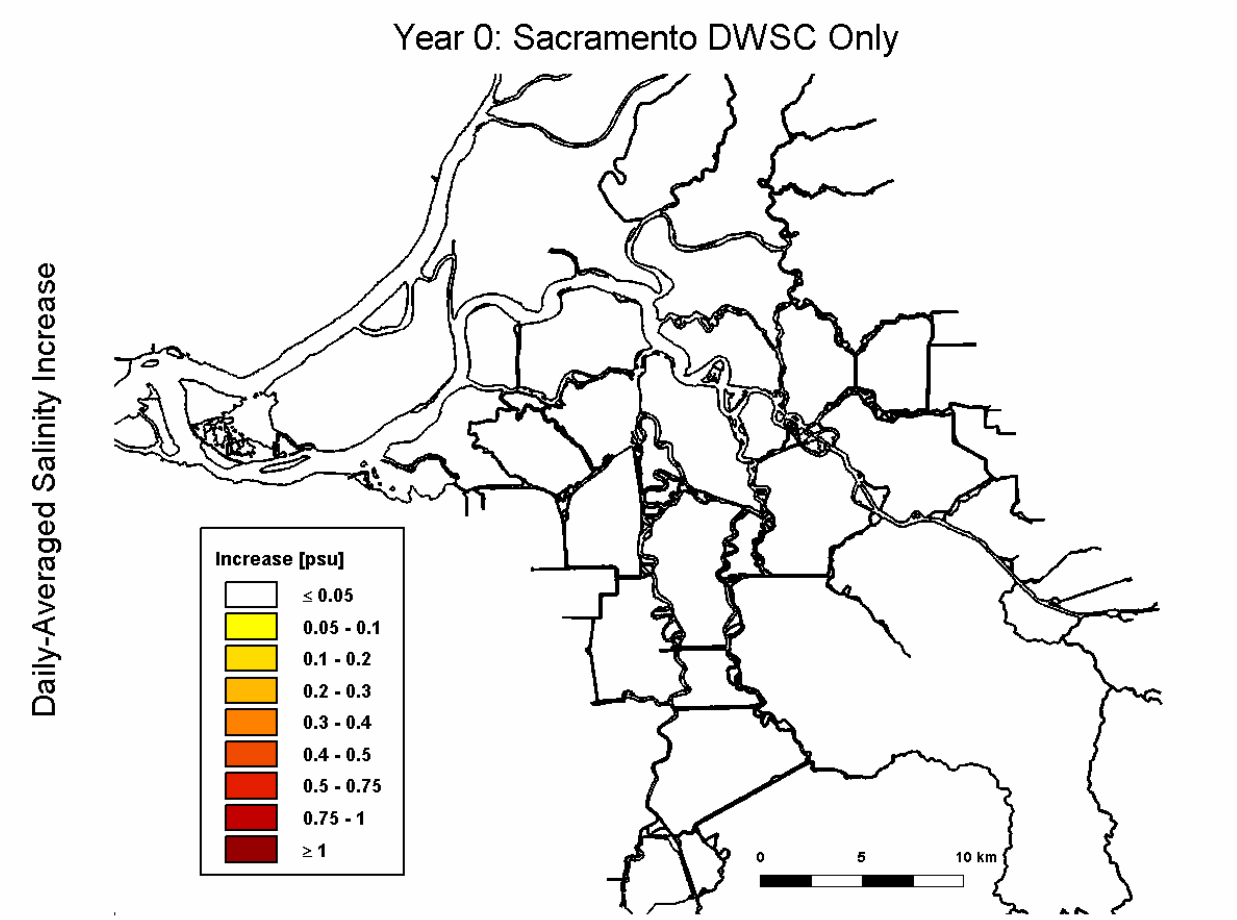


Figure 4.4-25 Predicted depth-averaged daily-averaged salinity increase in the Sacramento-San Joaquin Delta on February 1 for the Year 0 Sacramento DWSC Only Deepening scenario relative to the Year 0 Baseline scenario.

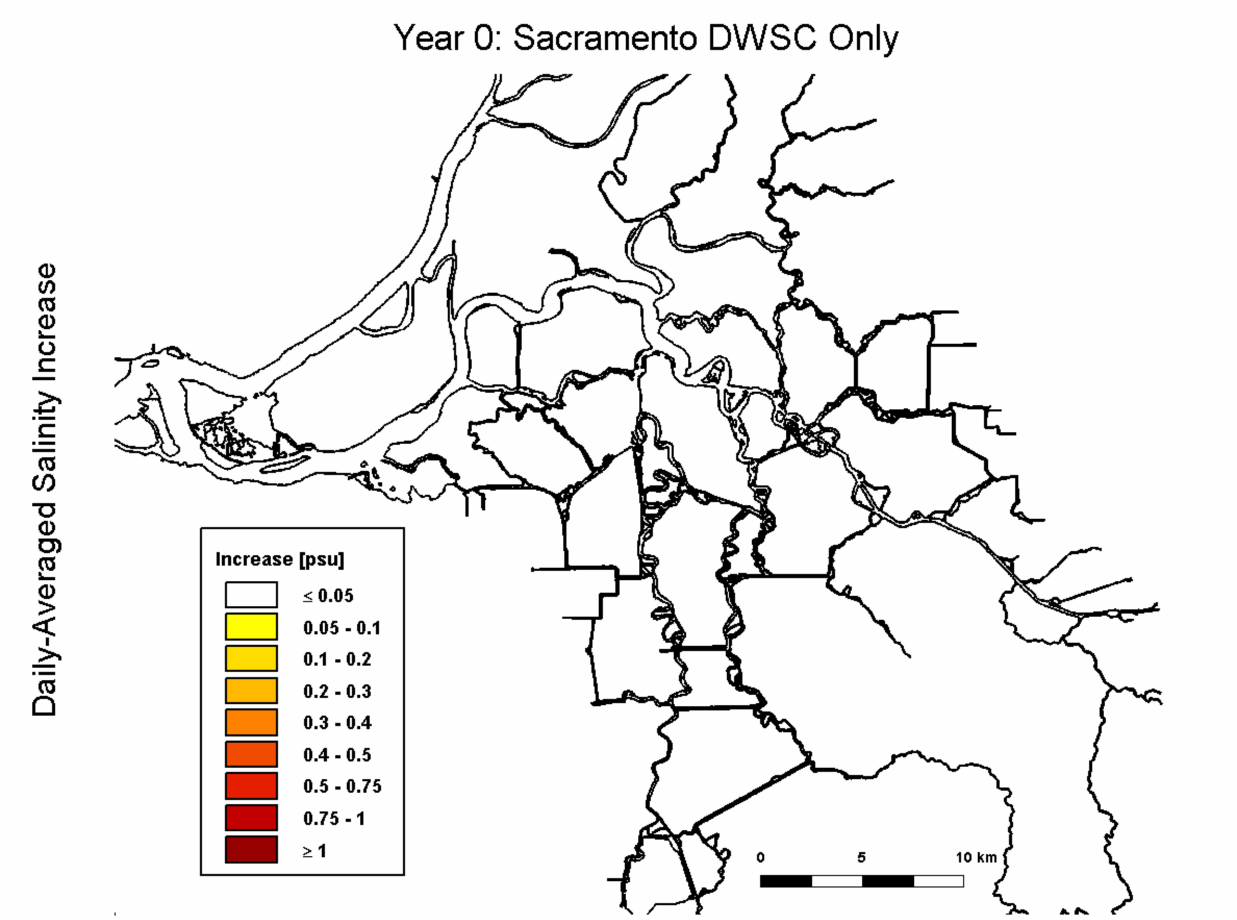


Figure 4.4-26 Predicted depth-averaged daily-averaged salinity increase in the Sacramento-San Joaquin Delta on March 1 for the Year 0 Sacramento DWSC Only Deepening scenario relative to the Year 0 Baseline scenario.

4.4.2 Year 0 Both Sacramento DWSC & SF Bay to Stockton DWSC Deepening

Figure 4.4-27 shows the predicted daily-averaged salinity profile along the axis of San Francisco Bay from the Golden Gate to the Port of Stockton, depth-averaged daily-averaged salinity map, and predicted salinity increase relative to the Year 0 Baseline scenario for the Year 0 Both DWSC Deepening scenario at the beginning of the analysis period for the Year 0 simulation on April 1. On April 1, X2 is west of Chipps Island, and the 0.5 psu salinity isohaline is upstream of Collinsville. Predicted salinity increases on April 1 for the Year 0 Both DWSC Deepening scenario are evident in San Pablo Bay, Suisun Bay, and into the western Delta. The largest salinity increases are evident within the Pinole Shoal Channel in San Pablo Bay and through Carquinez Strait, where predicted salinity increases range between 0.4 psu and 1.0 psu. The strong stratification evident west of the Carquinez Bridge suggests that strong gravitational circulation is occurring in this region. The deepening of the Pinole DWSC results in increased salt intrusion through San Pablo Bay. Salinity increases of between 0.3 and 0.50 psu are evident in much of Suisun Bay, with the largest salinity increases predicted in and near the Stockton DWSC.

During late spring and early summer conditions on May 1 (Figure 4.4-28) and June 1 (Figure 4.4-29) predicted depth-averaged daily-averaged salinity increases are predicted in San Pablo Bay and Suisun Bay resulting from the Year 0 Both DWSC Deepening scenario. Salinity increases of between 0.05 and 0.3 psu are predicted in much of San Pablo Bay and salinity increases of between 0.3 and 0.5 psu are predicted in much of Suisun Bay.

On July 1 (Figure 4.4-30), the predicted salinity at Chipps Island is approximately 6 psu and the 0.5 psu isohaline is between Dutch Slough and Jersey Point. Salinity increases in San Pablo Bay and Suisun Bay are similar to the salinity increases predicted during May and June, however larger salinity increases are predicted in the western Delta (see Figure 4.4-43).

On August 1 (Figure 4.4-31) salinity increases of between 0.05 and 0.3 psu are predicted in eastern San Pablo Bay, and salinity increases of between 0.2 and 0.4 psu are predicted in most of Suisun Bay. Predicted salinity increases of at least 0.05 psu extend up the Sacramento River past Emmaton, along the San Joaquin River past Threemile Slough, and throughout most of Franks Tract (see Figure 4.4-44).

Due to slightly higher net Delta outflow during August than during July (see Figure 3.2-1), much of the salt that intruded into the western Delta during July has been pushed out by September 1 (Figure 4.4-32), with predicted salinity increases in the San Joaquin River past Threemile Slough and in Franks Tract less than 0.05 psu on September 1 (Figure 4.4-45).

During September, net Delta outflow is reduced to 85 m^3/s (from 175 m^3/s during August) resulting in increased salt intrusion during September. By October 1 (Figure 4.4-33), salinity increases of between 0.05 and 0.10 psu are predicted in Franks Tract and Old River (Figure 4.4-46), similar to the increase predicted on August 1 (Figure 4.4-44).

Net Delta outflow remains low (86 m^3/s) through October, with increasing salt intrusion occurring during October. On November 1 (Figure 4.4-34) the predicted salinity at Chipps Island is more than 10 psu, and the 2 psu isohaline is between Dutch Slough and Jersey Point. Salinity increases of between 0.10 and 0.20 psu are predicted in Franks Tract, and salinity increases of between 0.05 and 0.10 psu are predicted down Old River and into Clifton Court Forebay (Figure 4.4-47).

During November, Delta outflow increases slightly to 115 m^3/s from 86 m^3/s during October (see Figure 3.2-1). On December 1 (Figure 4.4-35), the predicted salinity at Chipps Island is approximately 12 psu and the 1 psu isohaline is between Threemile Slough and the Mokelumne River. Salinity increases of between 0.30 to 0.40 psu are predicted along the Sacramento River between Collinsville and Rio Vista, with predicted salinity increases of between 0.40 and 0.50 psu in the Sacramento DWSC (Figure 4.4-48). Salinity increases of between 0.20 and 0.30 psu are predicted in Franks Tract, and salinity increases of between 0.05 and 0.20 psu are predicted down Old River and along the San Joaquin River past Middle River. Similar conditions persist on December 3 (Figure 4.4-36), the day of maximum annual X2 for both the Year 0 Baseline scenario and the Year 0 Both DWSC Deepening scenario during the Year 0 simulation period. Salinity increases of between 0.05 and 0.10 psu are predicted in Clifton Court Forebay, Mildred Island, and along the San Joaquin River upstream to Turner Cut (Figure 4.4-49).

During December, Delta outflow increases significantly to 241 m^3/s. As a result, some of the salt that intruded into the western and central Delta during October and November has been flushed out of the Delta by January 1 (Figure 4.4-37), particularly along the Sacramento River. However, predicted salinity increases of between 0.05 and 0.20 psu are predicted throughout Franks Tract, Old River, Mildred Island, Clifton Court Forebay, and along the San Joaquin River upstream to Turner Cut (Figure 4.4-50).

Large Delta outflows during January (Figure 3.2-1) flush most of the salt out of the Delta and Suisun Bay, with the 0.5 psu isohaline near Carquinez on February 1 (Figure 4.4-12). During these high flows, salinity increases of more than 1 psu are predicted within the Pinole Shoal DWSC on February 1 (Figure 4.4-38) and March 1 (Figure 4.4-39), with predicted salinity increases between 0.05 and 0.50 psu in the remainder of San Pablo Bay and through Carquinez Strait. No predicted salinity increases resulting from the Year 0 Both DWSC Deepening scenario are predicted in the Sacramento-San Joaquin Delta on February 1 (Figure 4.4-51) or March 1 (Figure 4.4-52).

Figure 4.4-40 through Figure 4.4-52 show the predicted increase in salinity in the Sacramento-San Joaquin Delta for the first day of each month and on December 3, the day of maximum predicted X2 for the Year 0 Both DWSC Deepening scenario during the Year 0 simulation period. These figures allow for closer inspection of salinity increases within the Delta on each of the days on which salinity profiles and maps are shown in Figures 4.4-27 through 4.4-39.

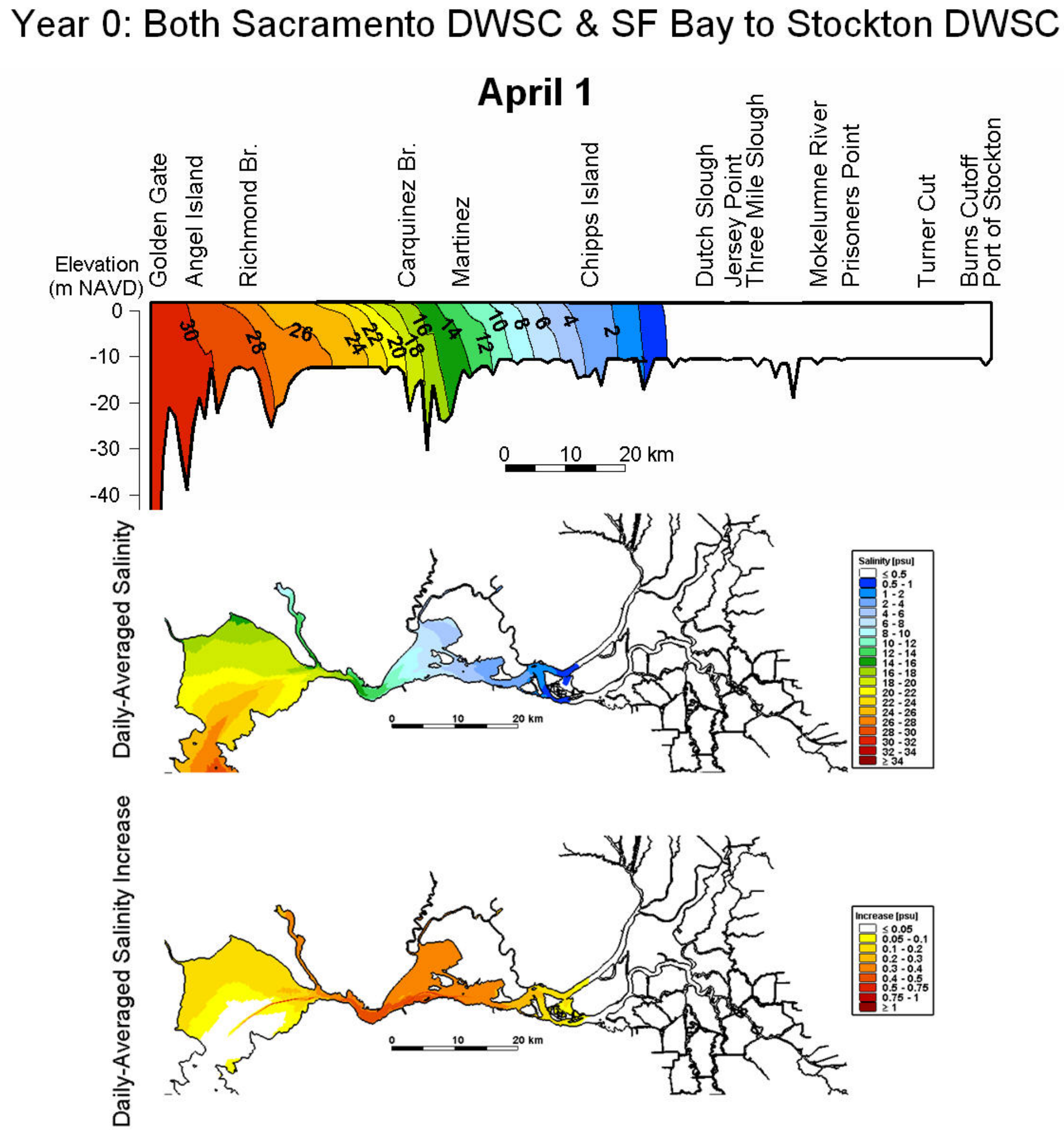


Figure 4.4-27 Predicted daily-averaged salinity profile along the axis of San Francisco Bay from the Golden Gate to the Port of Stockton on April 1 for the Year 0 Both DWSC Deepening scenario (top); predicted depth-averaged daily-averaged salinity on April 1 for the Year 0 Both DWSC Deepening scenario (middle); predicted increase in depth-averaged daily-averaged salinity on April 1 relative to the Year 0 Baseline scenario for the Year 0 Both DWSC Deepening scenario.

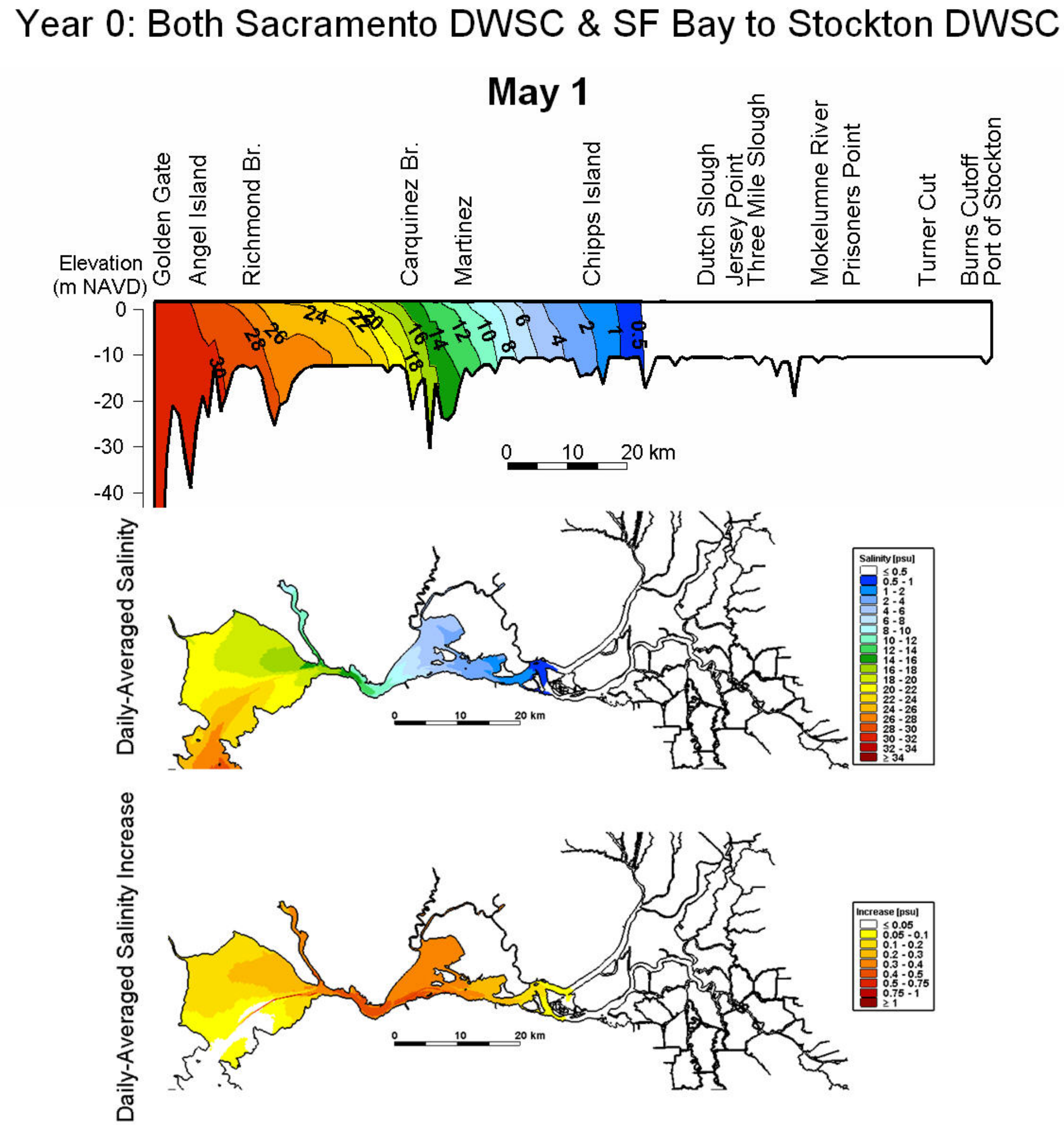


Figure 4.4-28 Predicted daily-averaged salinity profile along the axis of San Francisco Bay from the Golden Gate to the Port of Stockton on May 1 for the Year 0 Both DWSC Deepening scenario (top); predicted depth-averaged daily-averaged salinity on May 1 for the Year 0 Both DWSC Deepening scenario (middle); predicted increase in depth-averaged daily-averaged salinity on May 1 relative to the Year 0 Baseline scenario for the Year 0 Both DWSC Deepening scenario.

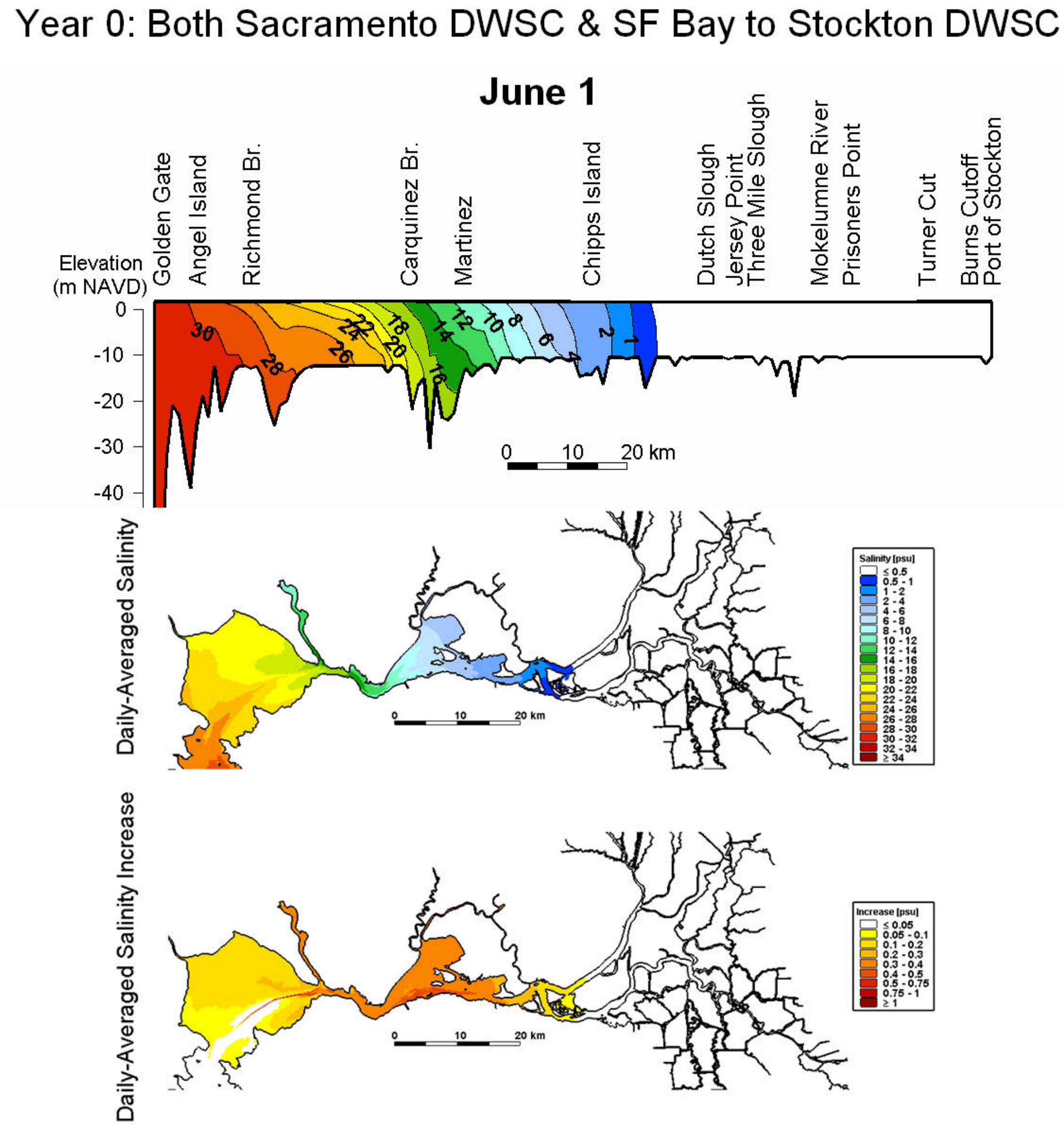


Figure 4.4-29 Predicted daily-averaged salinity profile along the axis of San Francisco Bay from the Golden Gate to the Port of Stockton on June 1 for the Year 0 Both DWSC Deepening scenario (top); predicted depth-averaged daily-averaged salinity on June 1 for the Year 0 Both DWSC Deepening scenario (middle); predicted increase in depth-averaged daily-averaged salinity on June 1 relative to the Year 0 Baseline scenario for the Year 0 Both DWSC Deepening scenario.

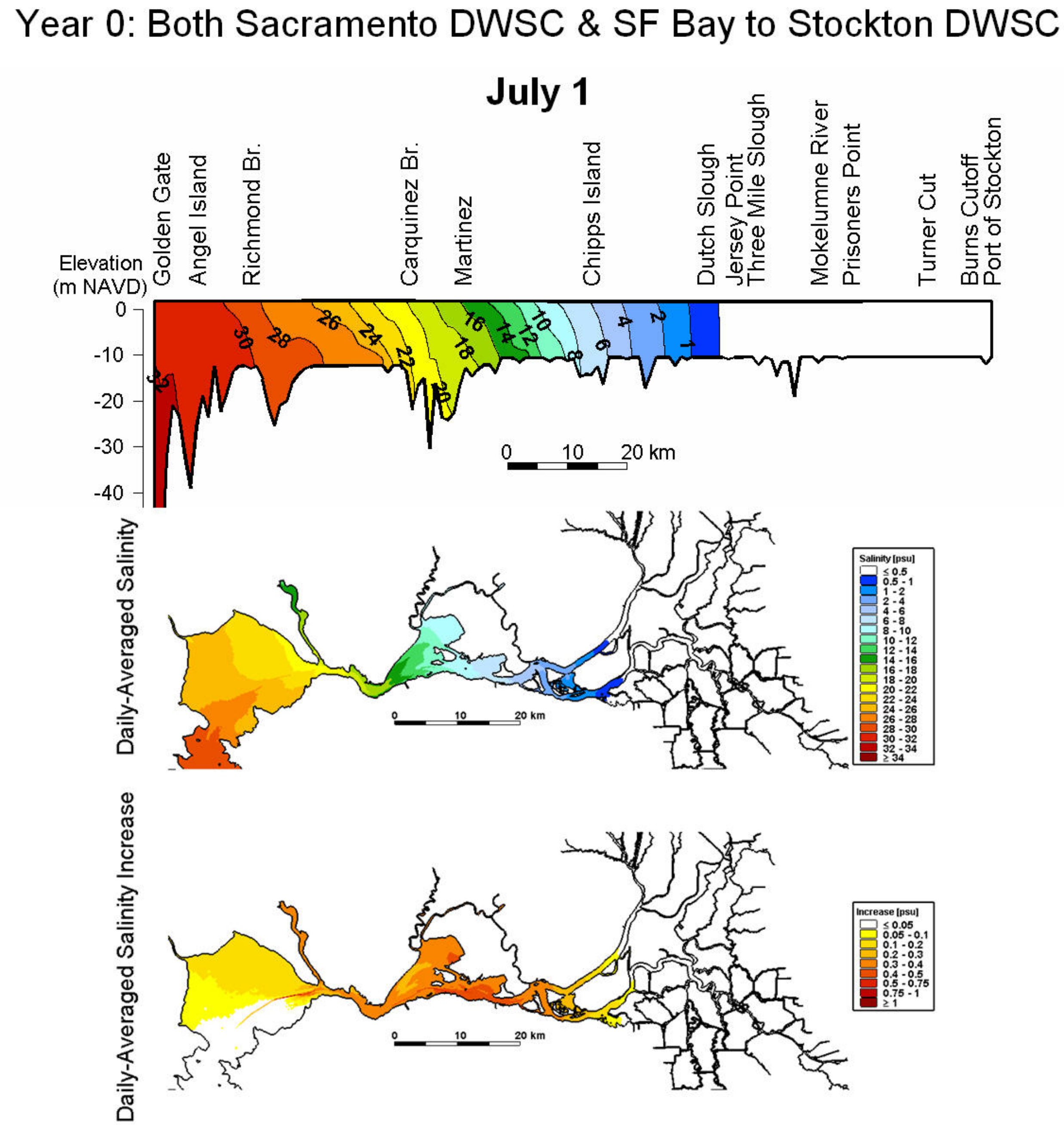


Figure 4.4-30 Predicted daily-averaged salinity profile along the axis of San Francisco Bay from the Golden Gate to the Port of Stockton on July 1 for the Year 0 Both DWSC Deepening scenario (top); predicted depth-averaged daily-averaged salinity on July 1 for the Year 0 Both DWSC Deepening scenario (middle); predicted increase in depth-averaged daily-averaged salinity on July 1 relative to the Year 0 Baseline scenario for the Year 0 Both DWSC Deepening scenario.

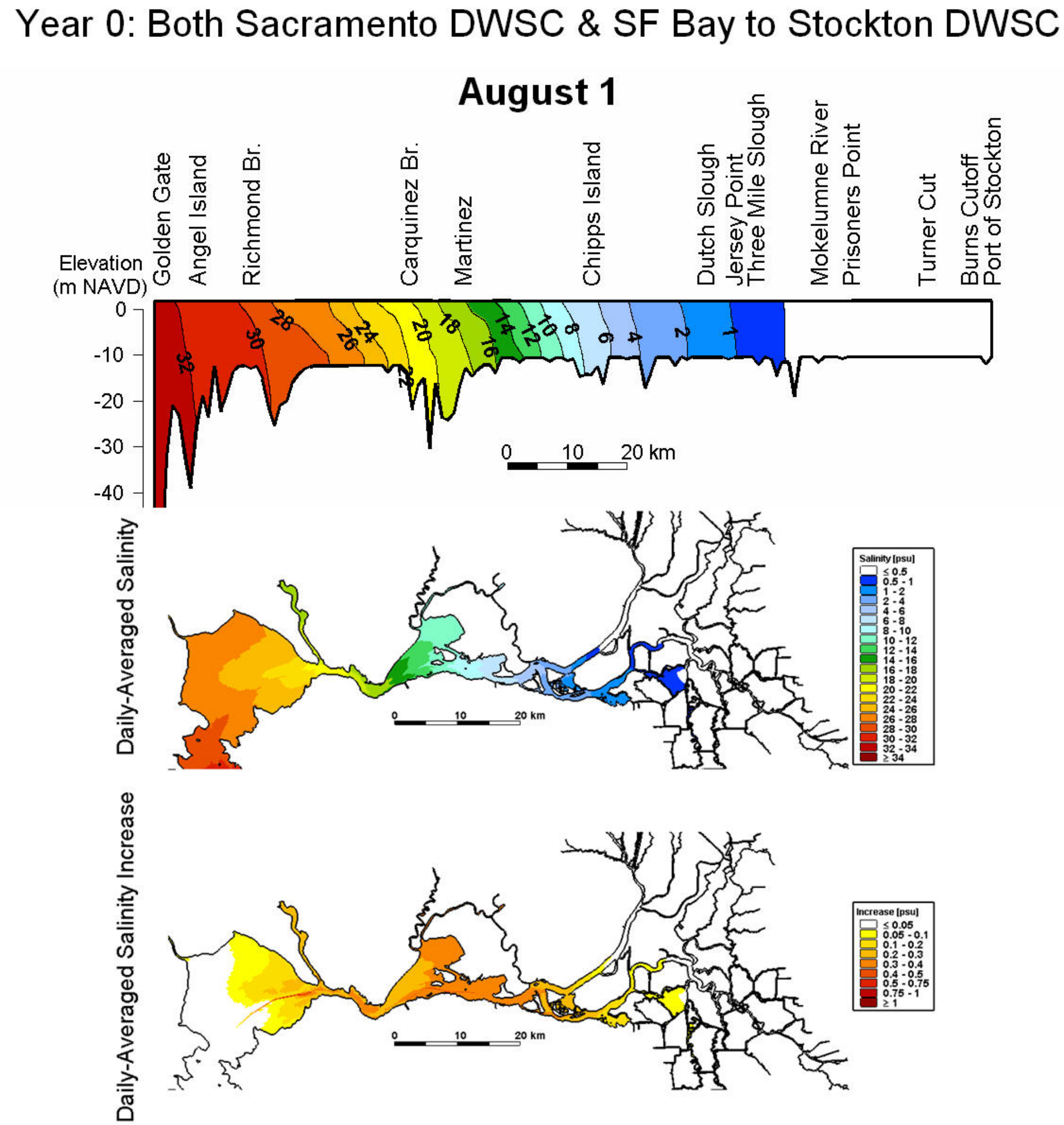


Figure 4.4-31 Predicted daily-averaged salinity profile along the axis of San Francisco Bay from the Golden Gate to the Port of Stockton on August 1 for the Year 0 Both DWSC Deepening scenario (top); predicted depth-averaged daily-averaged salinity on August 1 for the Year 0 Both DWSC Deepening scenario (middle); predicted increase in depth-averaged daily-averaged salinity on August 1 relative to the Year 0 Baseline scenario for the Year 0 Both DWSC Deepening scenario.

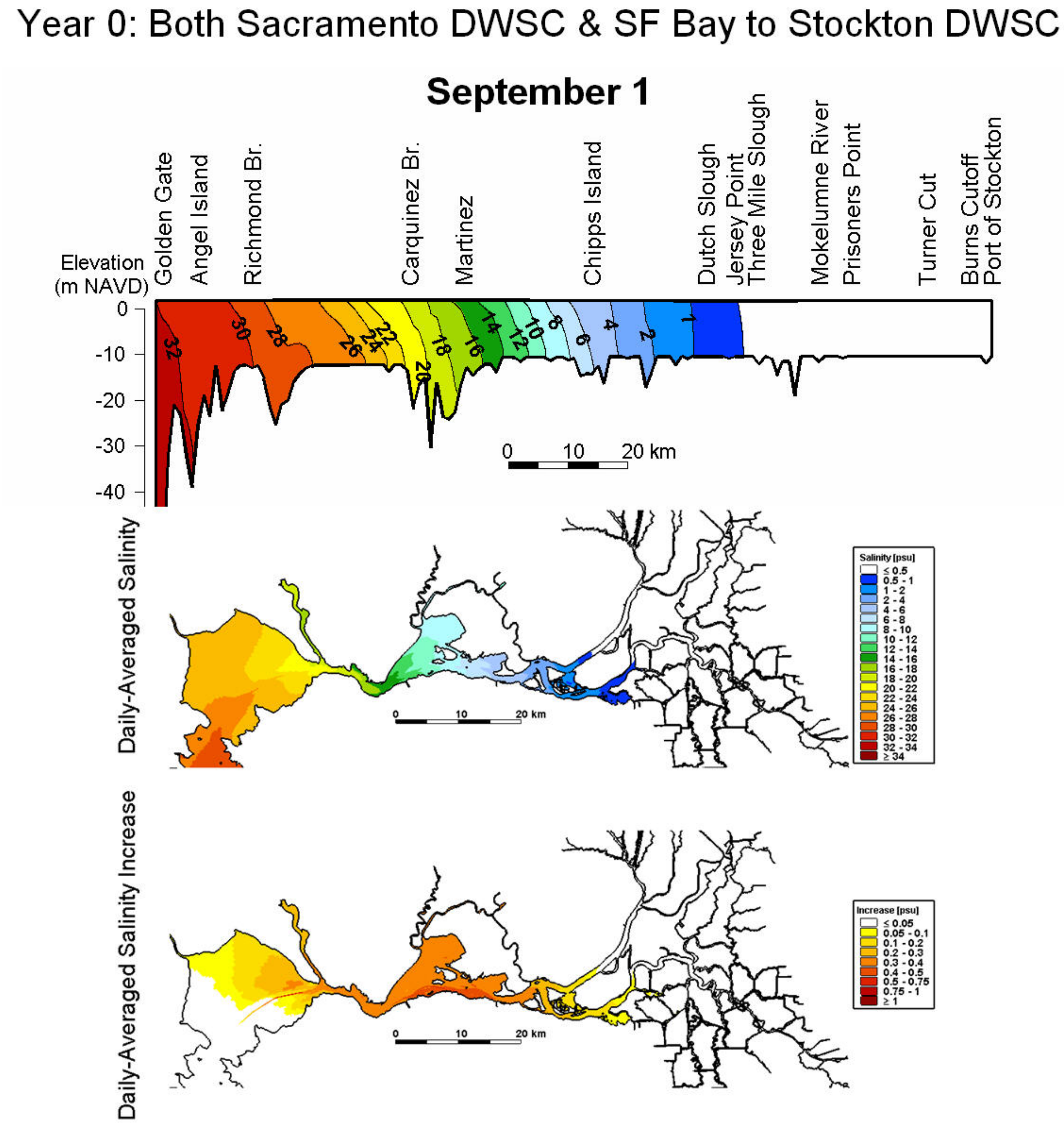


Figure 4.4-32 Predicted daily-averaged salinity profile along the axis of San Francisco Bay from the Golden Gate to the Port of Stockton on September 1 for the Year 0 Both DWSC Deepening scenario (top); predicted depth-averaged daily-averaged salinity on September 1 for the Year 0 Both DWSC Deepening scenario (middle); predicted increase in depth-averaged daily-averaged salinity on September 1 relative to the Year 0 Baseline scenario for the Year 0 Both DWSC Deepening scenario.

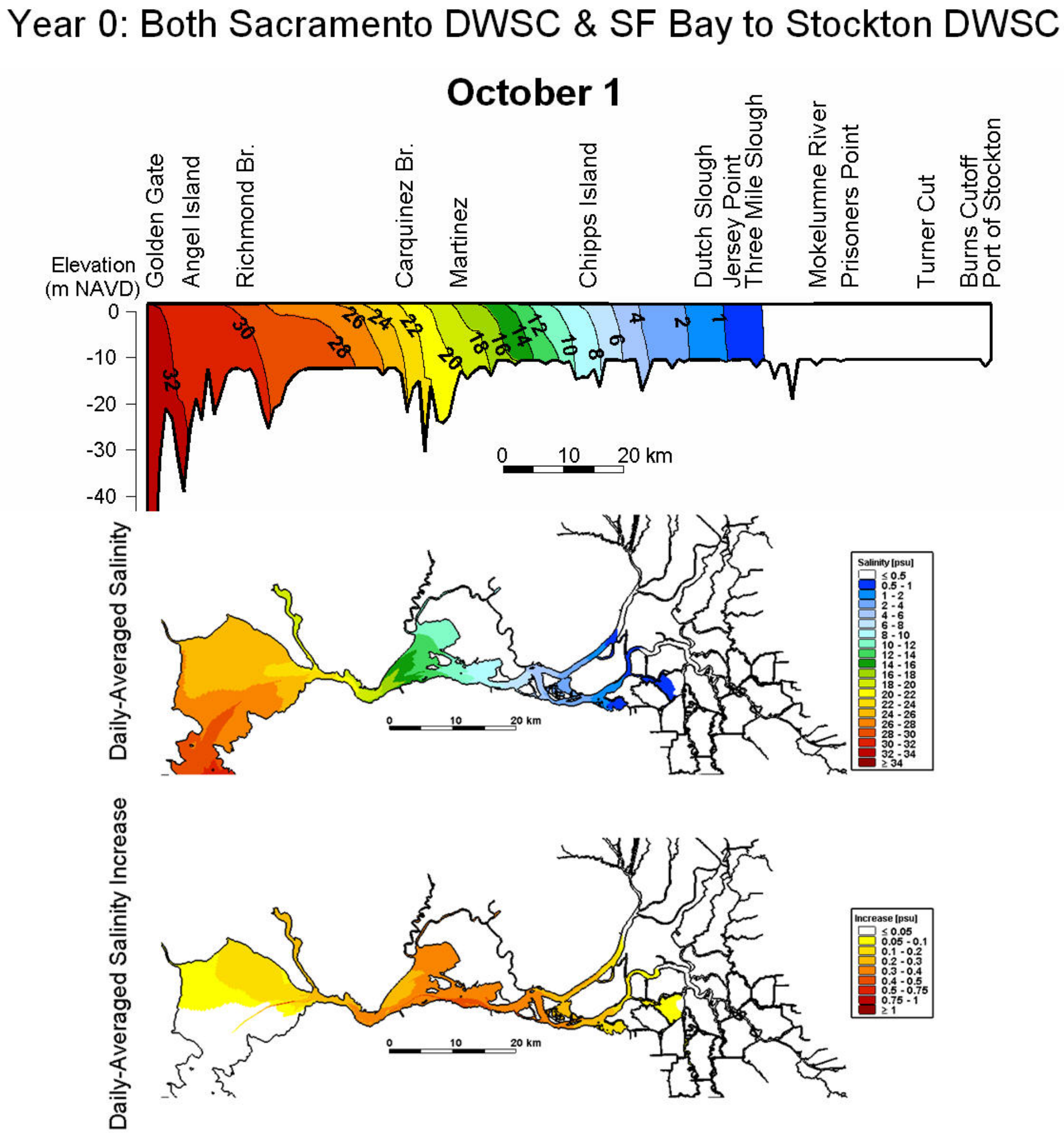


Figure 4.4-33 Predicted daily-averaged salinity profile along the axis of San Francisco Bay from the Golden Gate to the Port of Stockton on October 1 for the Year 0 Both DWSC Deepening scenario (top); predicted depth-averaged daily-averaged salinity on October 1 for the Year 0 Both DWSC Deepening scenario (middle); predicted increase in depth-averaged daily-averaged salinity on October 1 relative to the Year 0 Baseline scenario for the Year 0 Both DWSC Deepening scenario.

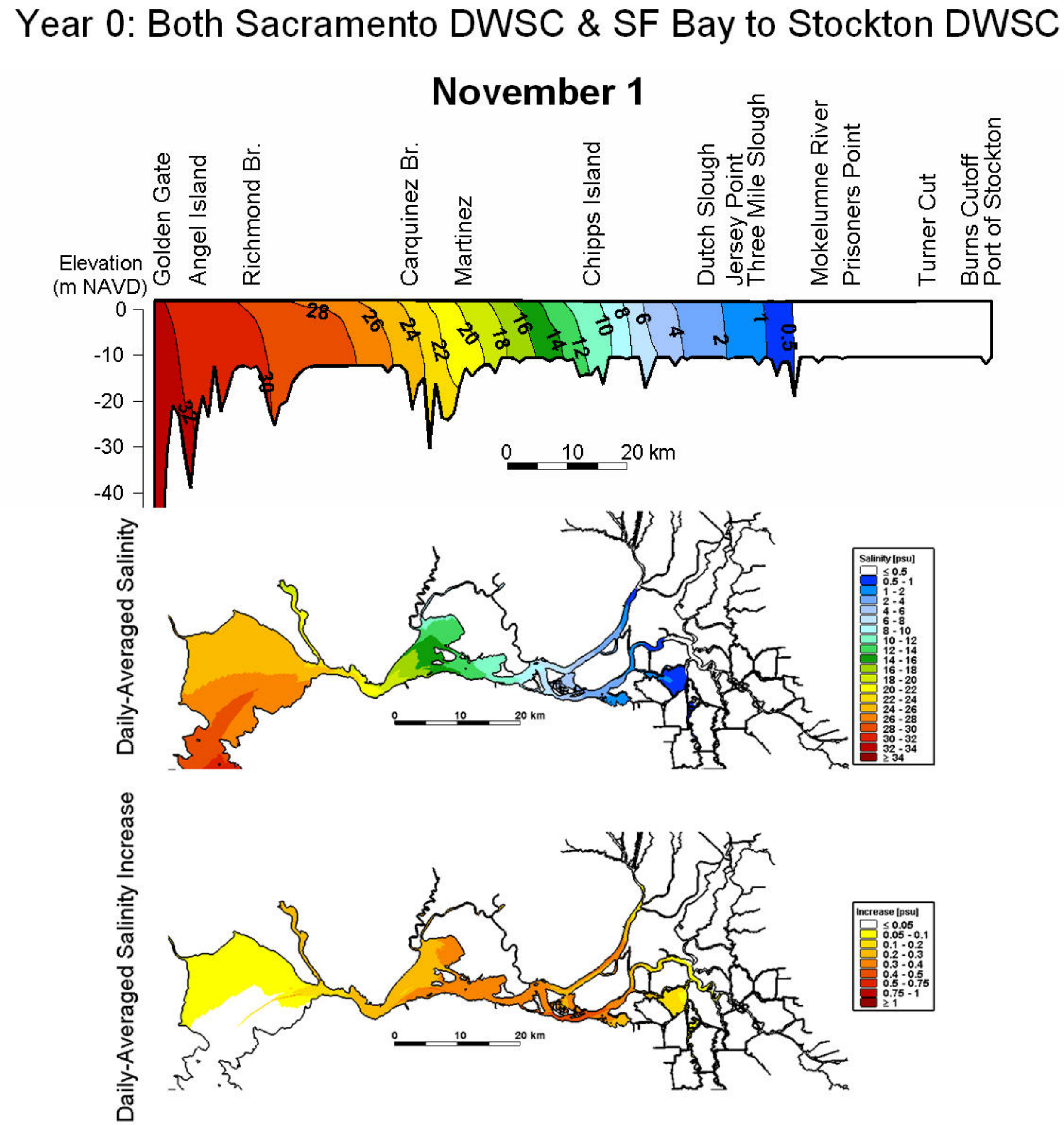


Figure 4.4-34 Predicted daily-averaged salinity profile along the axis of San Francisco Bay from the Golden Gate to the Port of Stockton on November 1 for the Year 0 Both DWSC Deepening scenario (top); predicted depth-averaged daily-averaged salinity on November 1 for the Year 0 Both DWSC Deepening scenario (middle); predicted increase in depth-averaged daily-averaged salinity on November 1 relative to the Year 0 Baseline scenario for the Year 0 Both DWSC Deepening scenario.

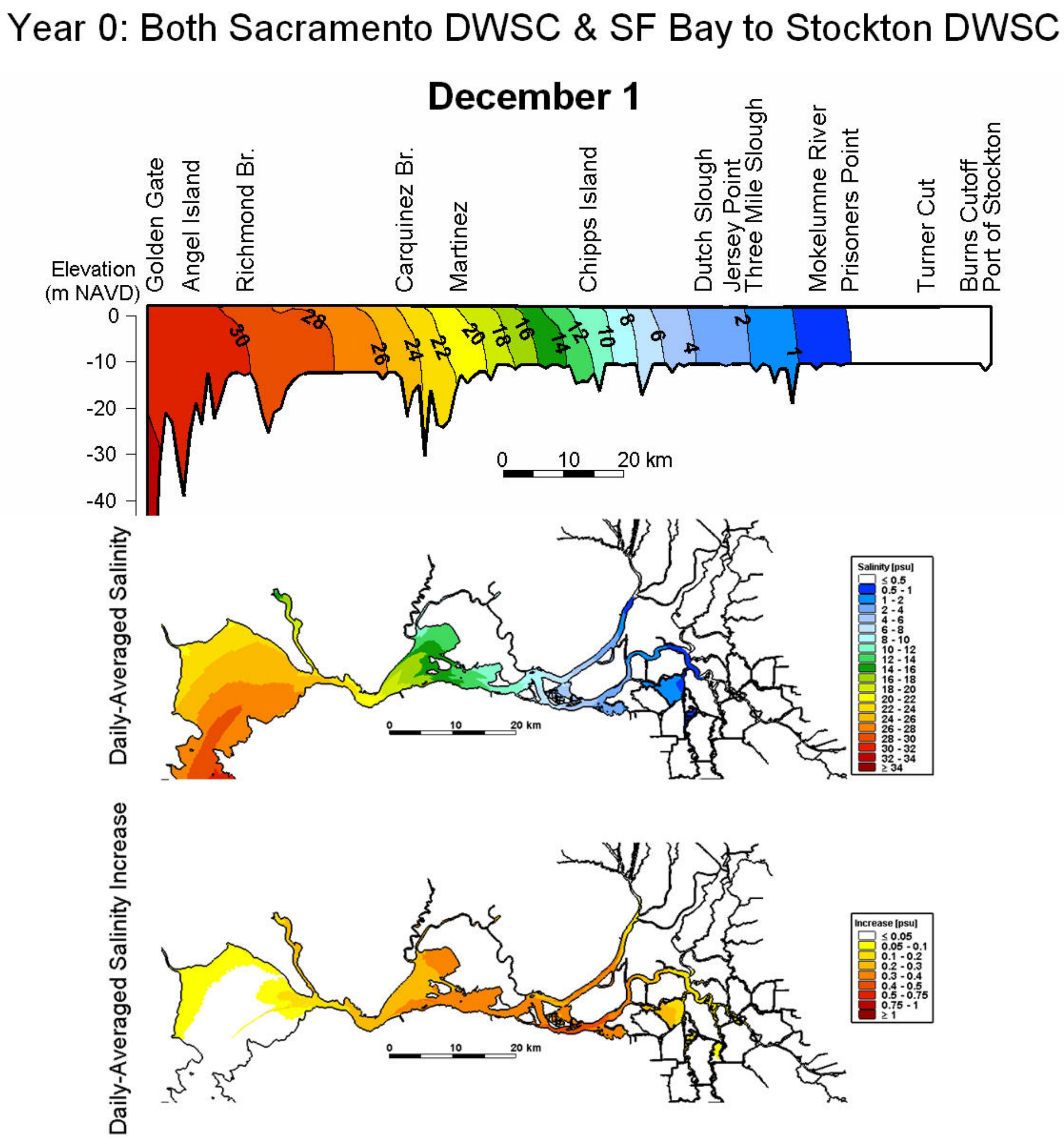


Figure 4.4-35 Predicted daily-averaged salinity profile along the axis of San Francisco Bay from the Golden Gate to the Port of Stockton on December 1 for the Year 0 Both DWSC Deepening scenario (top); predicted depth-averaged daily-averaged salinity on December 1 for the Year 0 Both DWSC Deepening scenario (middle); predicted increase in depth-averaged daily-averaged salinity on December 1 relative to the Year 0 Baseline scenario for the Year 0 Both DWSC Deepening scenario.

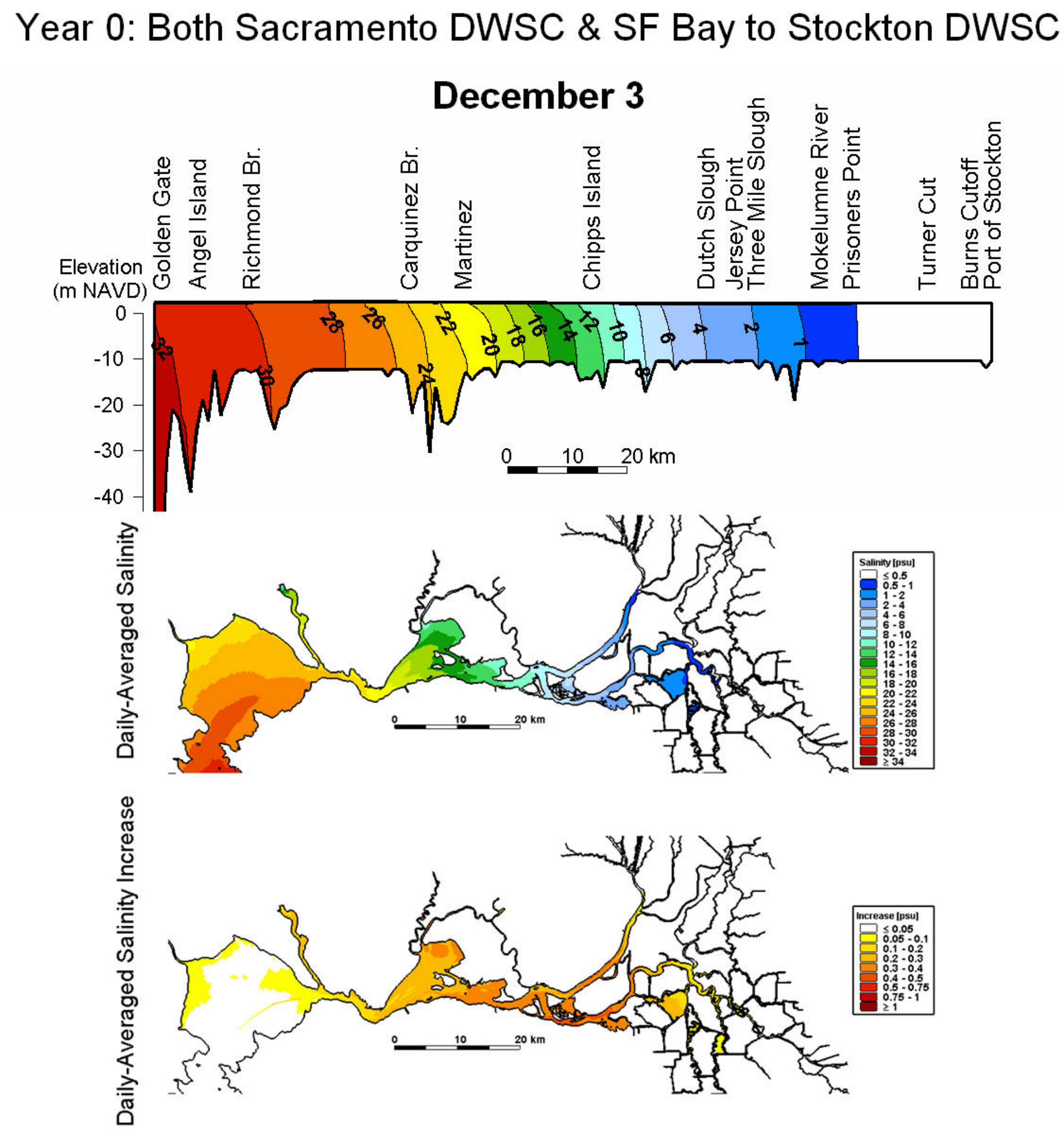


Figure 4.4-36 Predicted daily-averaged salinity profile along the axis of San Francisco Bay from the Golden Gate to the Port of Stockton on December 3, the day of maximum predicted X2, for the Year 0 Both DWSC Deepening scenario (top); predicted depth-averaged daily-averaged salinity on December 3 for the Year 0 Both DWSC Deepening scenario (middle); predicted increase in depth-averaged daily-averaged salinity on December 3 relative to the Year 0 Baseline scenario for the Year 0 Both DWSC Deepening scenario.

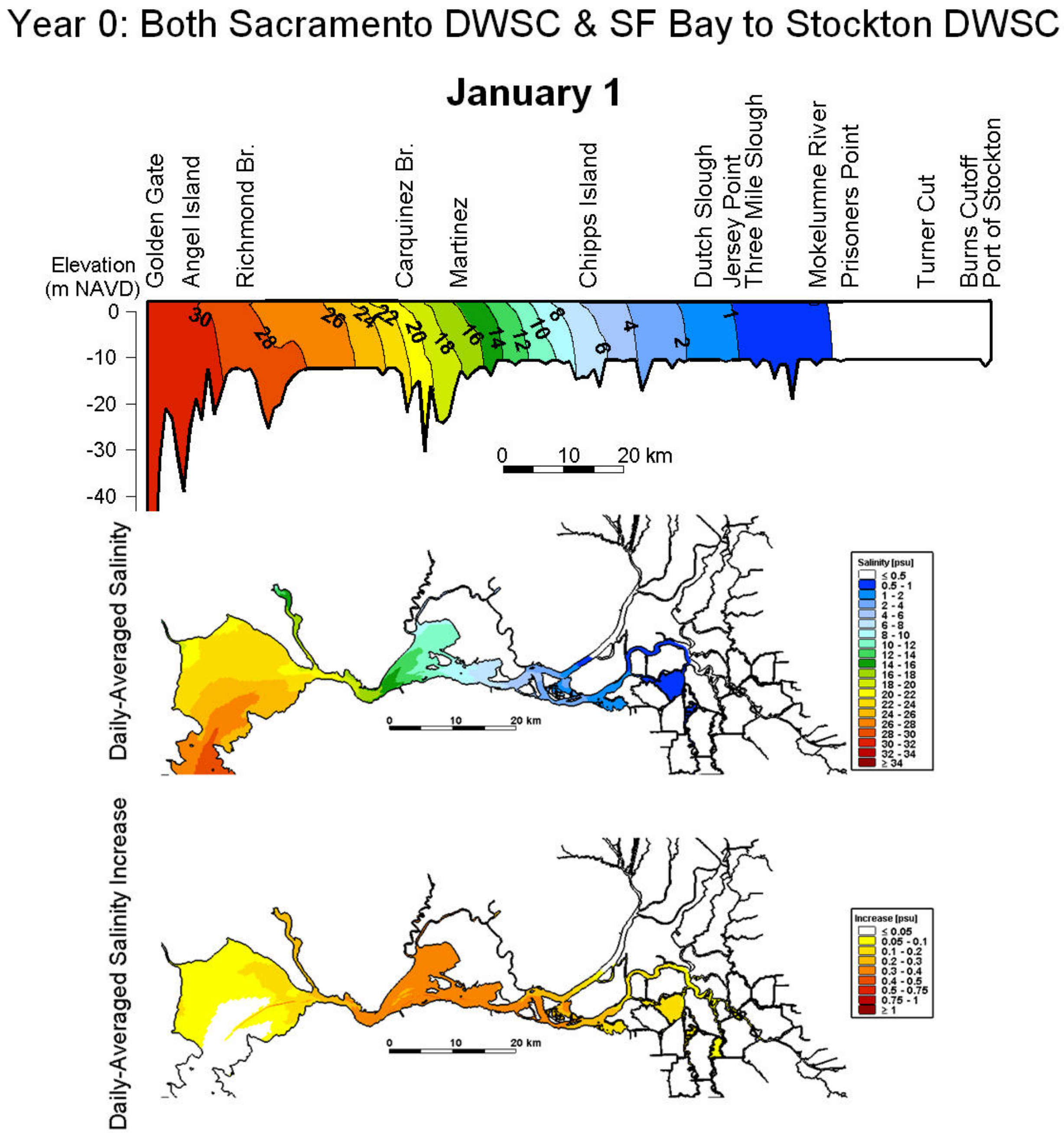


Figure 4.4-37 Predicted daily-averaged salinity profile along the axis of San Francisco Bay from the Golden Gate to the Port of Stockton on January 1 for the Year 0 Both DWSC Deepening scenario (top); predicted depth-averaged daily-averaged salinity on January 1 for the Year 0 Both DWSC Deepening scenario (middle); predicted increase in depth-averaged daily-averaged salinity on January 1 relative to the Year 0 Baseline scenario for the Year 0 Both DWSC Deepening scenario.

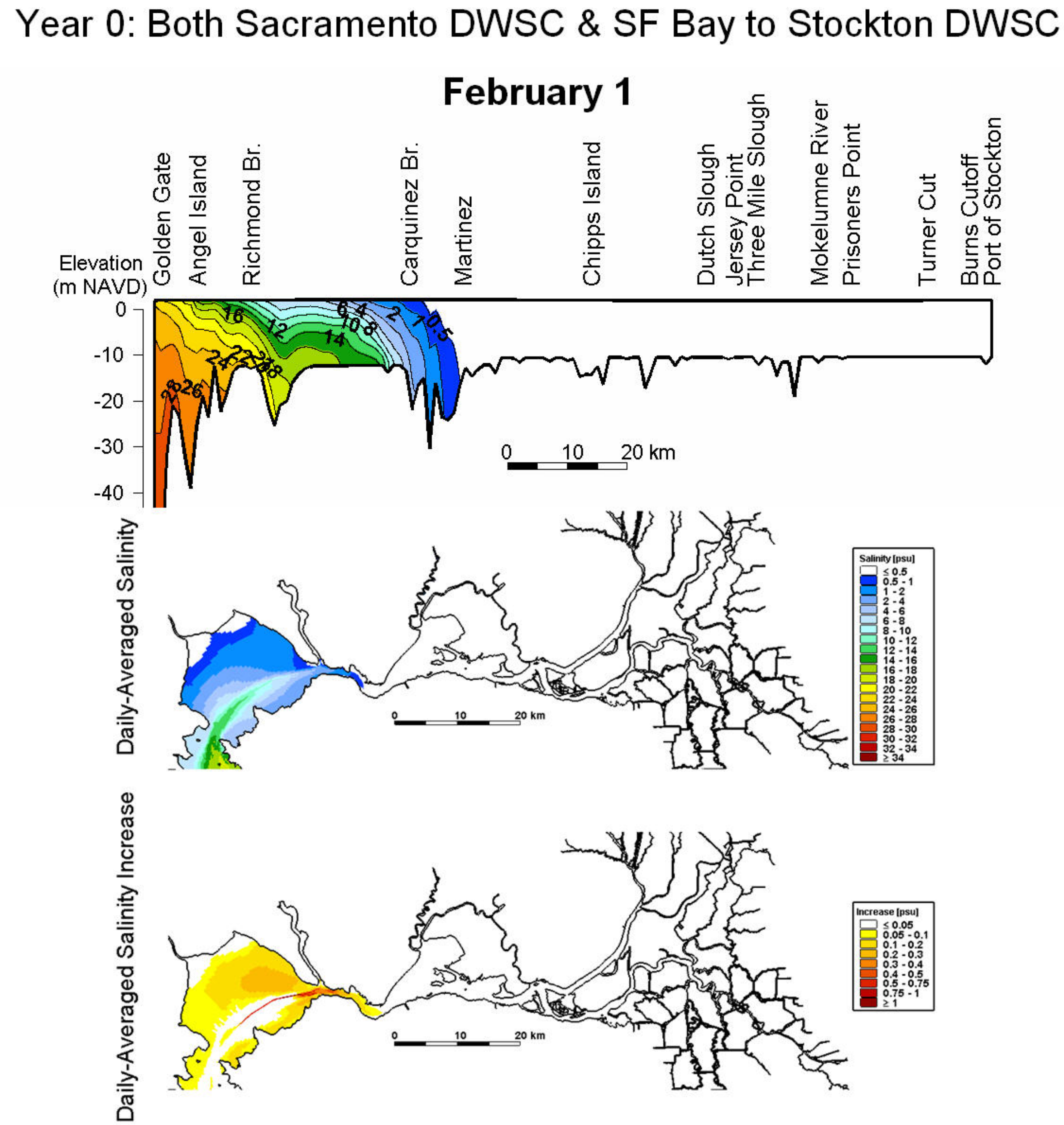


Figure 4.4-38 Predicted daily-averaged salinity profile along the axis of San Francisco Bay from the Golden Gate to the Port of Stockton on February 1 for the Year 0 Both DWSC Deepening scenario (top); predicted depth-averaged daily-averaged salinity on February 1 for the Year 0 Both DWSC Deepening scenario (middle); predicted increase in depth-averaged daily-averaged salinity on February 1 relative to the Year 0 Baseline scenario for the Year 0 Both DWSC Deepening scenario.

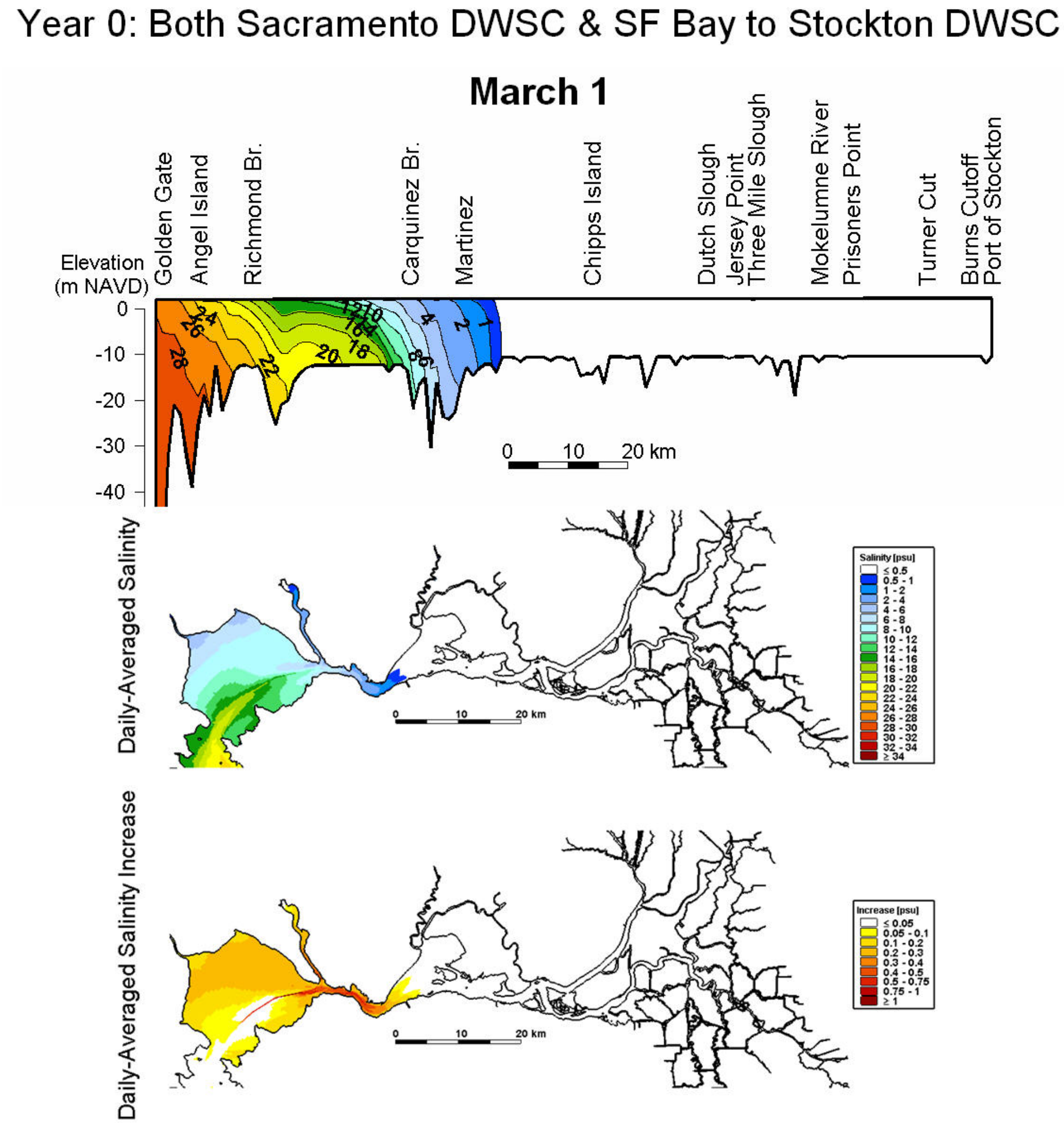


Figure 4.4-39 Predicted daily-averaged salinity profile along the axis of San Francisco Bay from the Golden Gate to the Port of Stockton on March 1 for the Year 0 Both DWSC Deepening scenario (top); predicted depth-averaged daily-averaged salinity on March 1 for the Year 0 Both DWSC Deepening scenario (middle); predicted increase in depth-averaged daily-averaged salinity on March 1 relative to the Year 0 Baseline scenario for the Year 0 Both DWSC Deepening scenario.

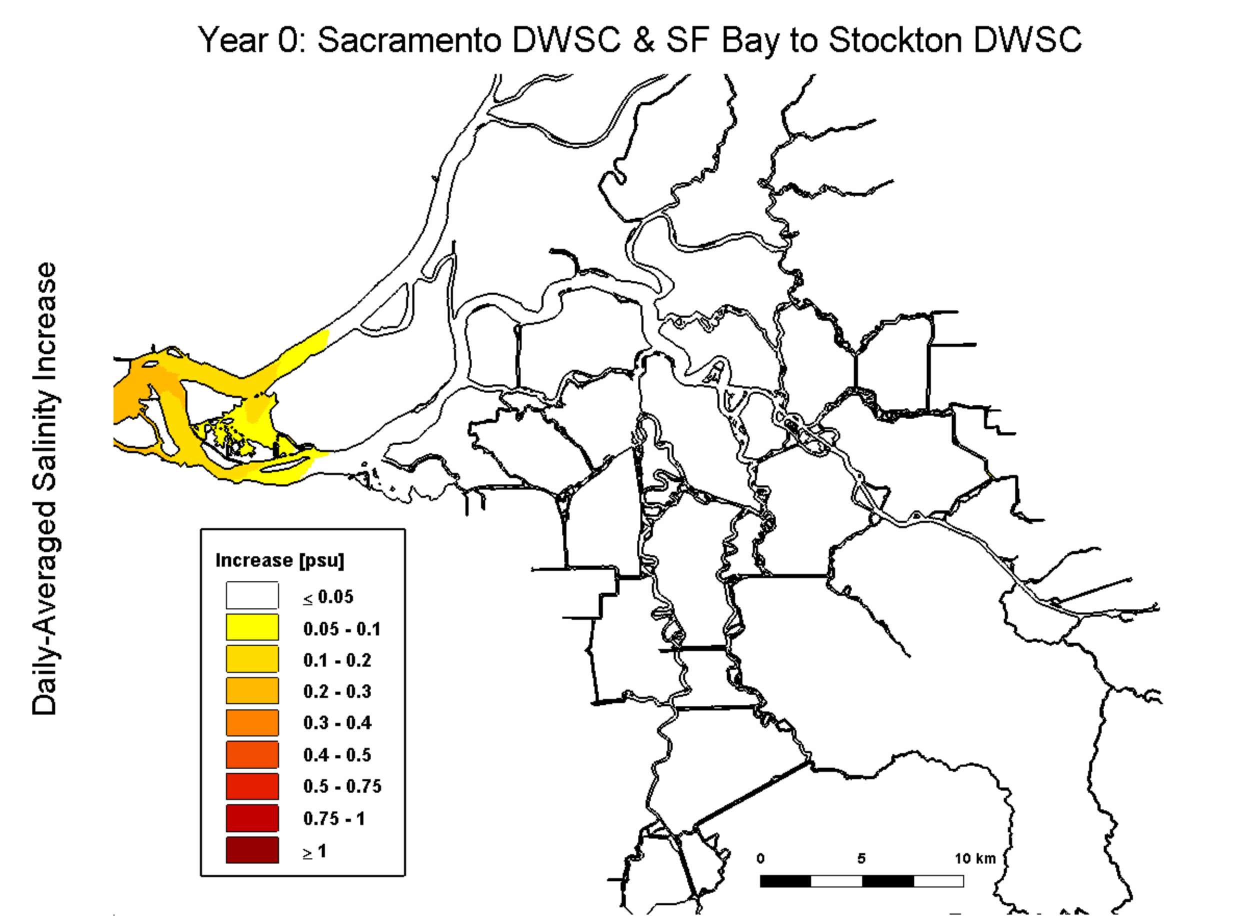


Figure 4.4-40 Predicted depth-averaged daily-averaged salinity increase in the Sacramento-San Joaquin Delta on April 1 for the Year 0 Both DWSC Deepening scenario relative to the Year 0 Baseline scenario.

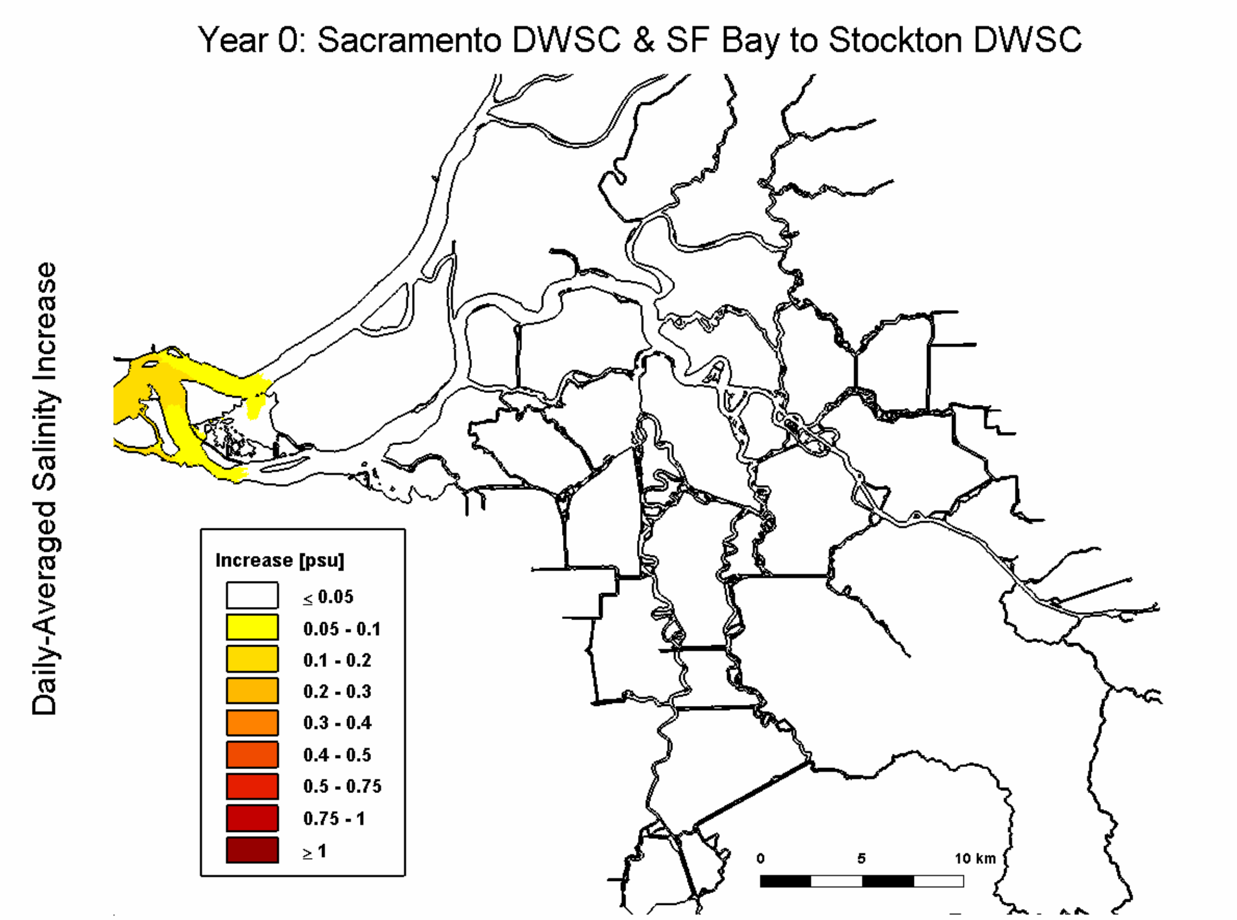


Figure 4.4-41 Predicted depth-averaged daily-averaged salinity increase in the Sacramento-San Joaquin Delta on May 1 for the Year 0 Both DWSC Deepening scenario relative to the Year 0 Baseline scenario.

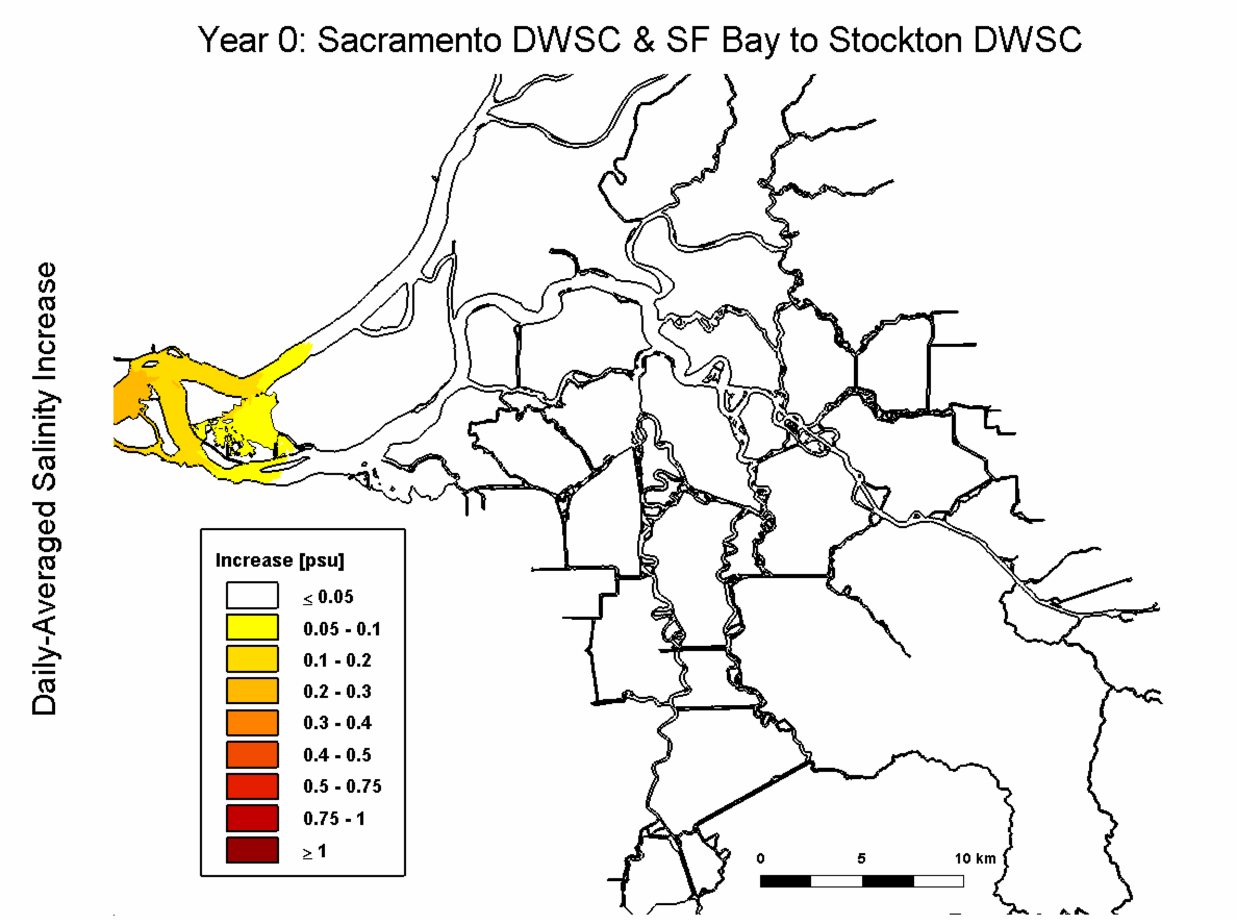


Figure 4.4-42 Predicted depth-averaged daily-averaged salinity increase in the Sacramento-San Joaquin Delta on June 1 for the Year 0 Both DWSC Deepening scenario relative to the Year 0 Baseline scenario.

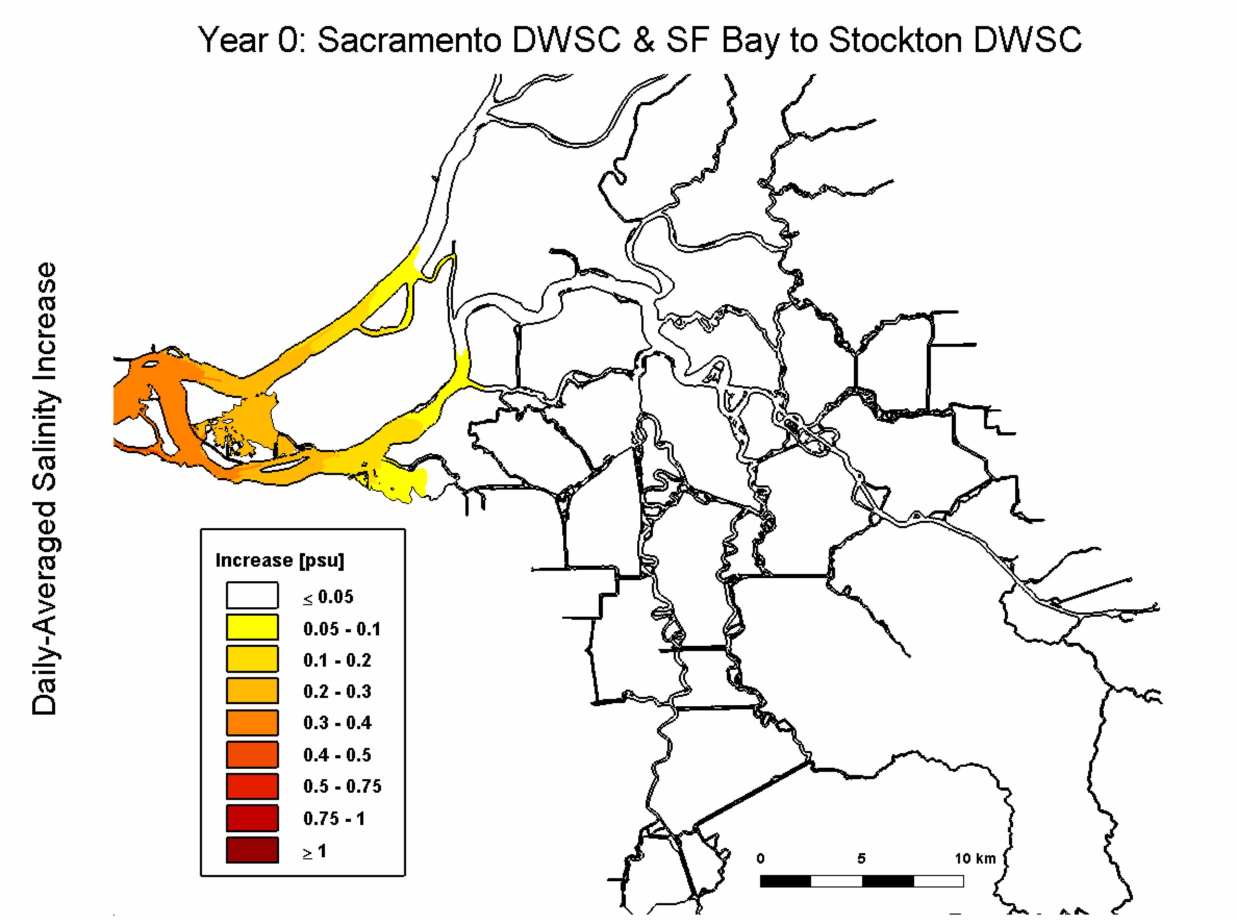


Figure 4.4-43 Predicted depth-averaged daily-averaged salinity increase in the Sacramento-San Joaquin Delta on July 1 for the Year 0 Both DWSC Deepening scenario relative to the Year 0 Baseline scenario.

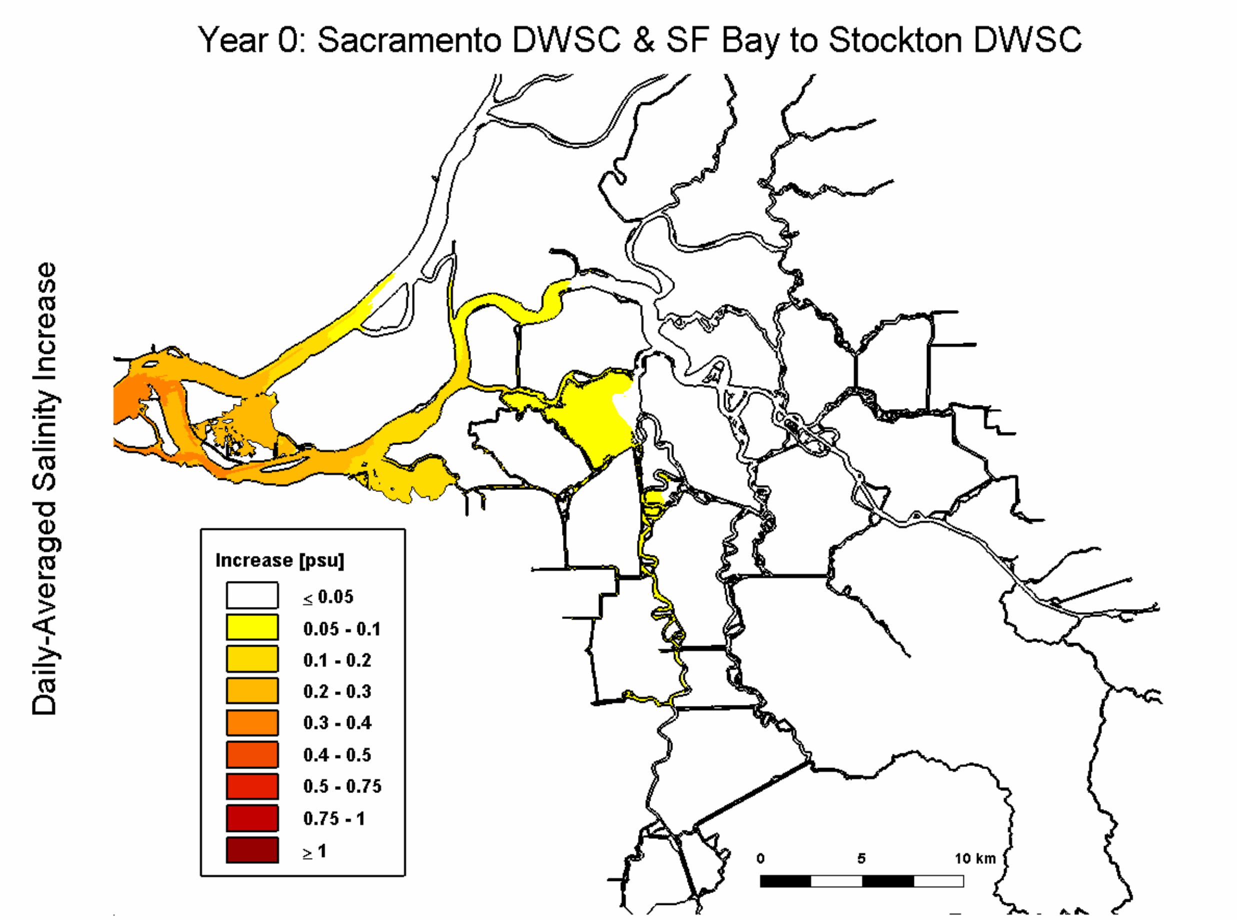


Figure 4.4-44 Predicted depth-averaged daily-averaged salinity increase in the Sacramento-San Joaquin Delta on August 1 for the Year 0 Both DWSC Deepening scenario relative to the Year 0 Baseline scenario.

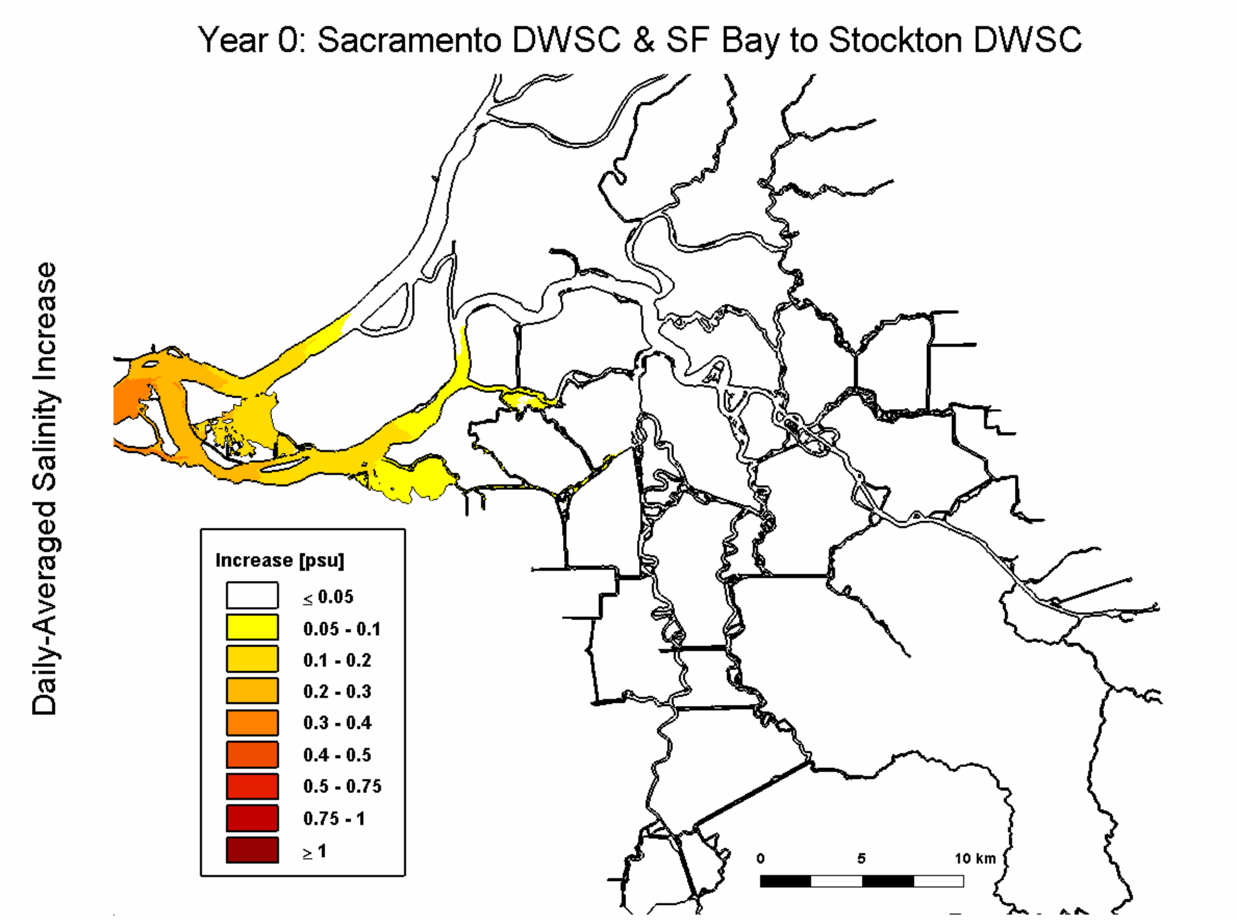


Figure 4.4-45 Predicted depth-averaged daily-averaged salinity increase in the Sacramento-San Joaquin Delta on September 1 for the Year 0 Both DWSC Deepening scenario relative to the Year 0 Baseline scenario.

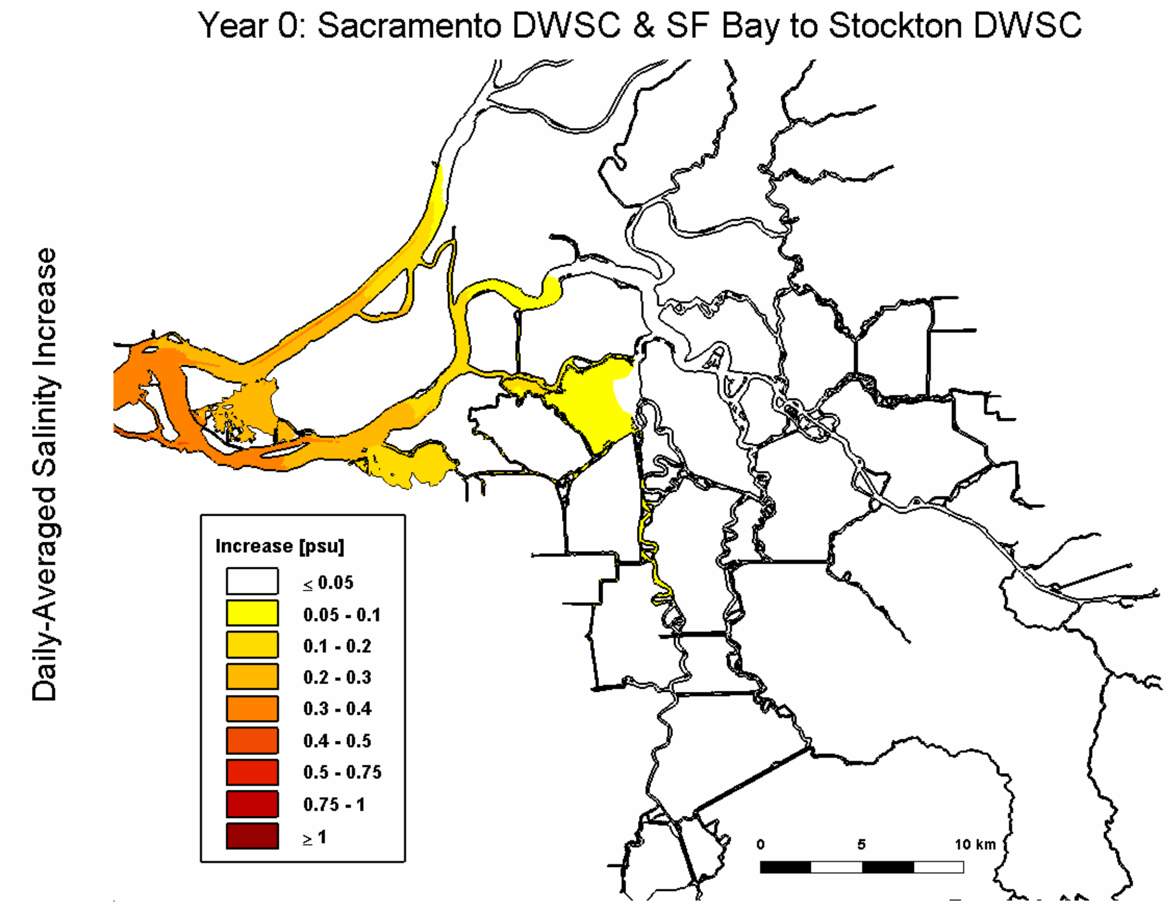


Figure 4.4-46 Predicted depth-averaged daily-averaged salinity increase in the Sacramento-San Joaquin Delta on October 1 for the Year 0 Both DWSC Deepening scenario relative to the Year 0 Baseline scenario.

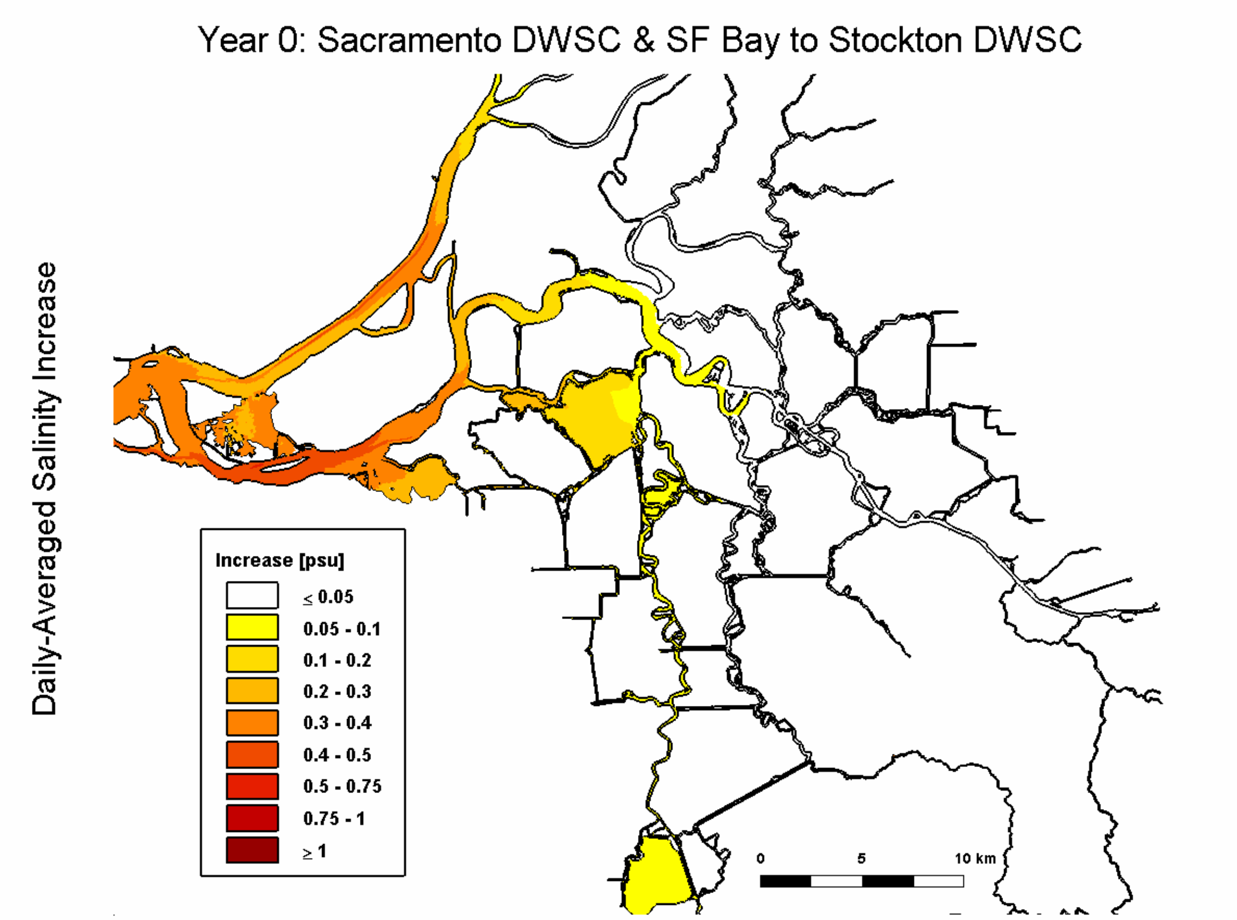


Figure 4.4-47 Predicted depth-averaged daily-averaged salinity increase in the Sacramento-San Joaquin Delta on November 1 for the Year 0 Both DWSC Deepening scenario relative to the Year 0 Baseline scenario.

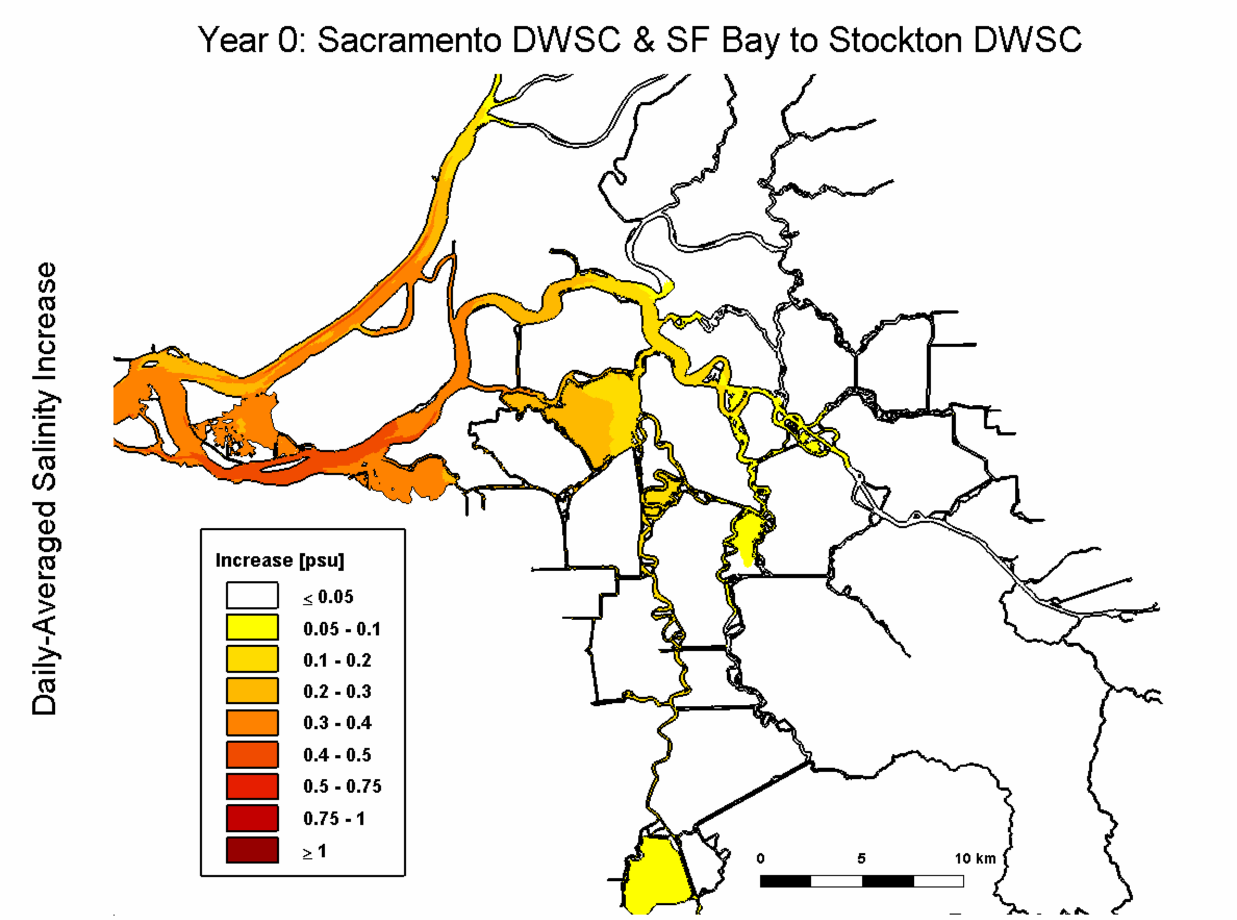


Figure 4.4-48 Predicted depth-averaged daily-averaged salinity increase in the Sacramento-San Joaquin Delta on December 1 for the Year 0 Both DWSC Deepening scenario relative to the Year 0 Baseline scenario.

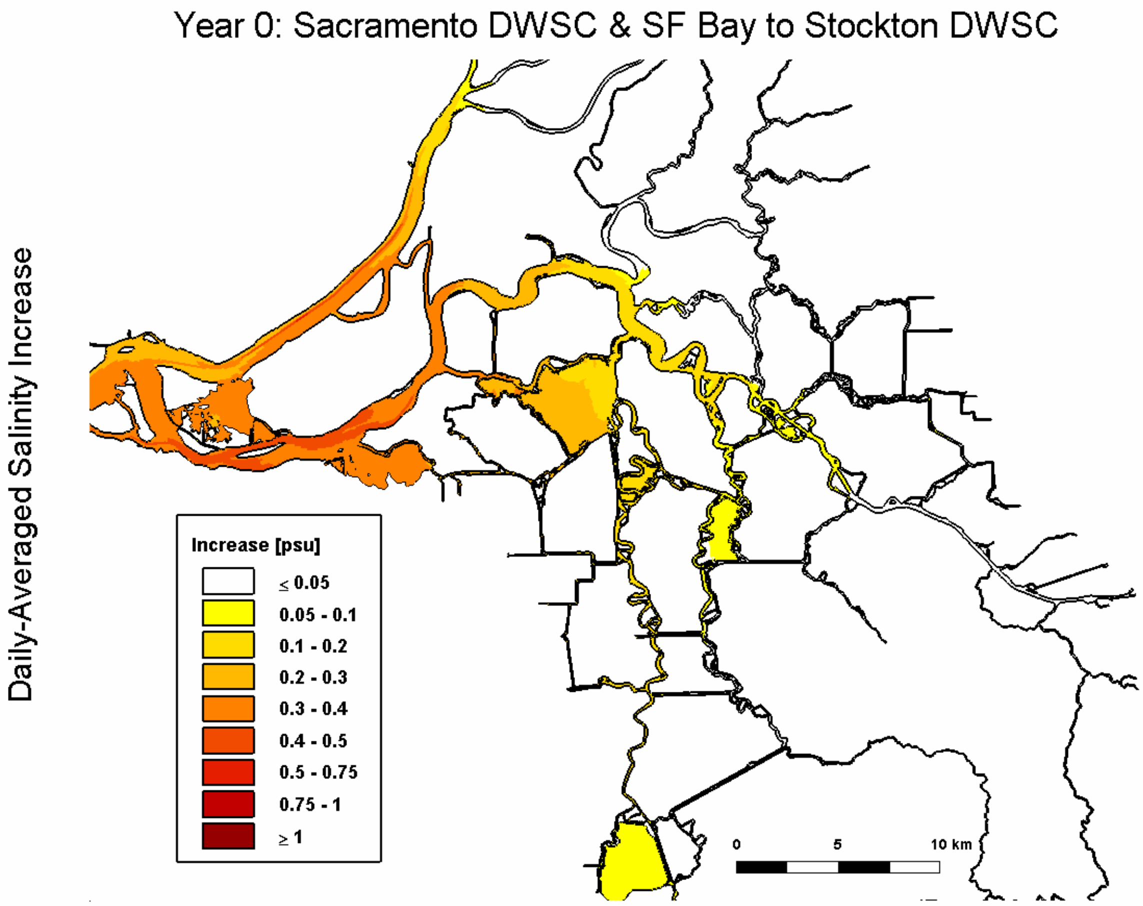


Figure 4.4-49 Predicted depth-averaged daily-averaged salinity increase in the Sacramento-San Joaquin Delta on December 3, the day of maximum predicted X2, for the Year 0 Both DWSC Deepening scenario relative to the Year 0 Baseline scenario.

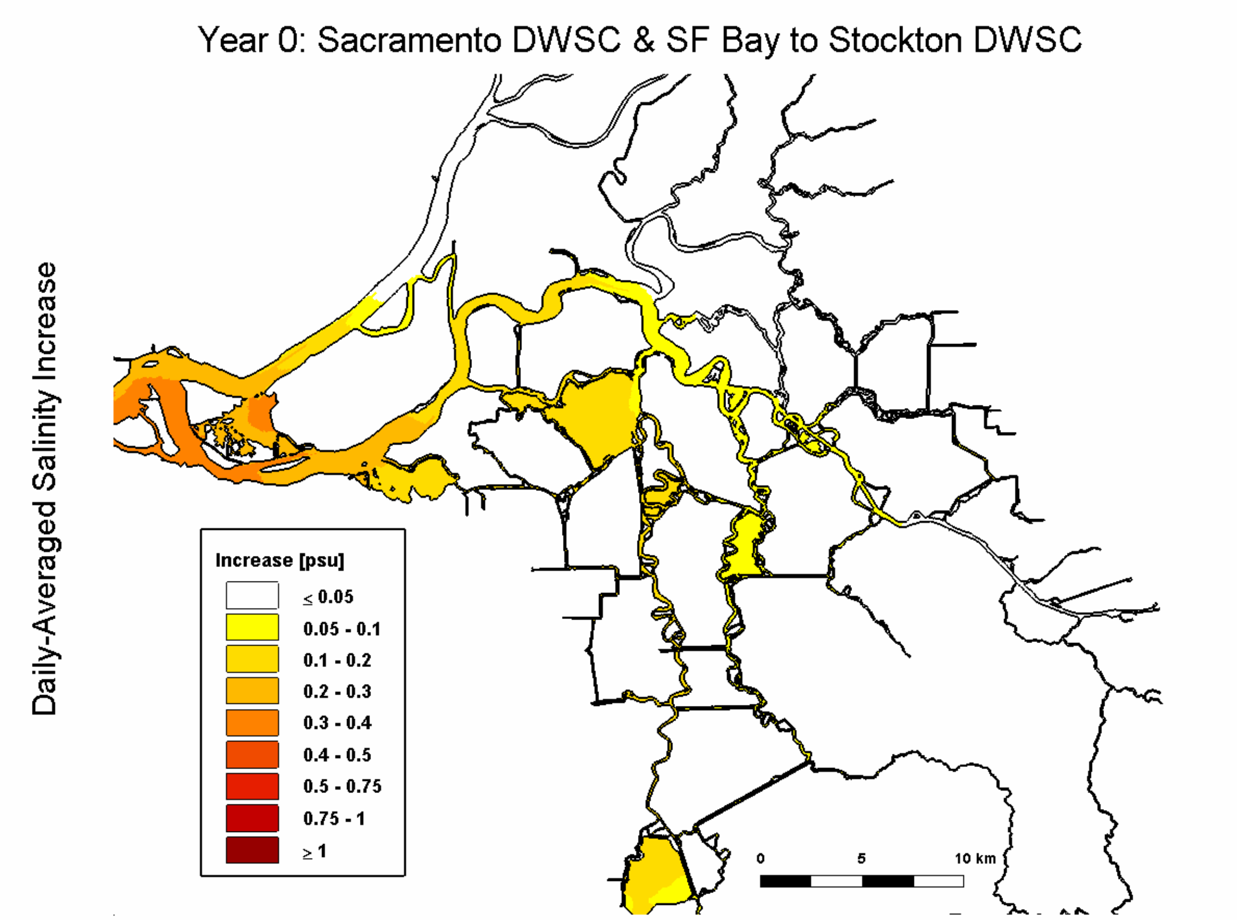


Figure 4.4-50 Predicted depth-averaged daily-averaged salinity increase in the Sacramento-San Joaquin Delta on January 1 for the Year 0 Both DWSC Deepening scenario relative to the Year 0 Baseline scenario.

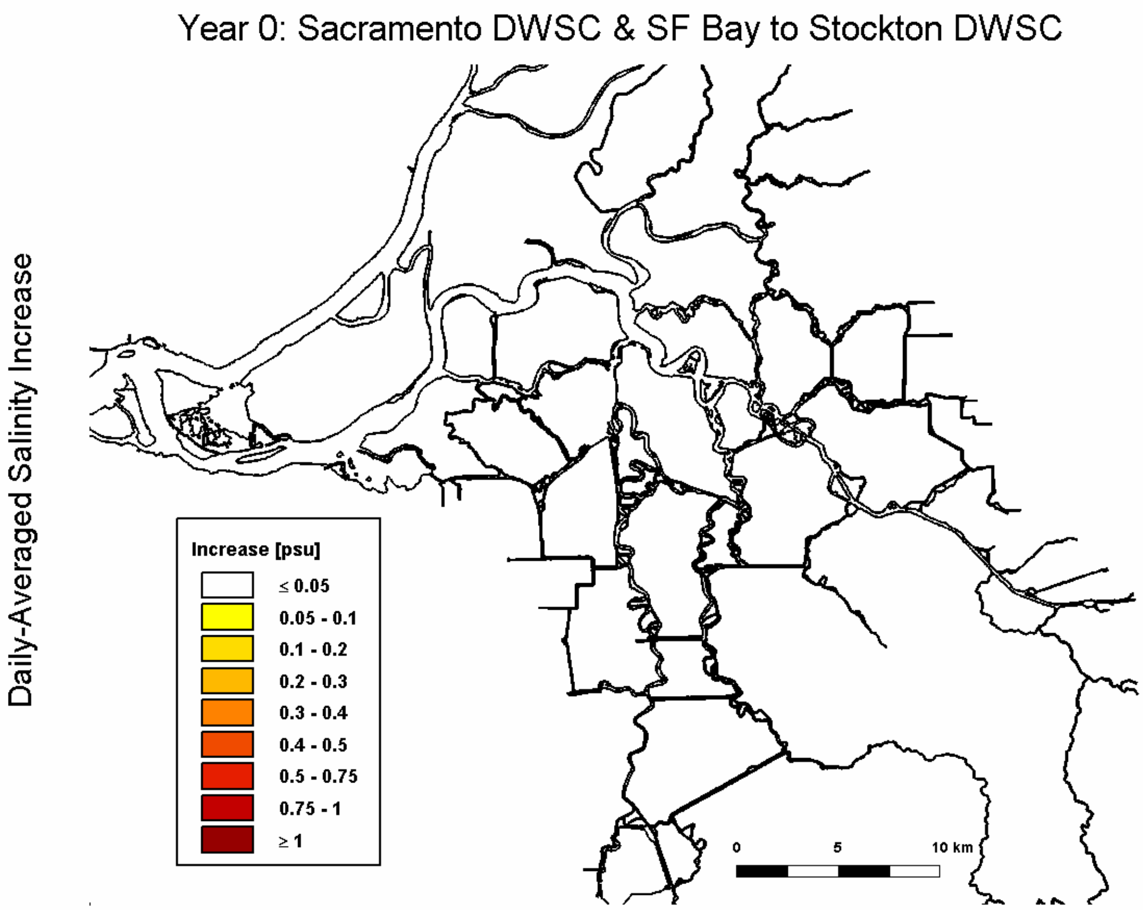


Figure 4.4-51 Predicted depth-averaged daily-averaged salinity increase in the Sacramento-San Joaquin Delta on February 1 for the Year 0 Both DWSC Deepening scenario relative to the Year 0 Baseline scenario.

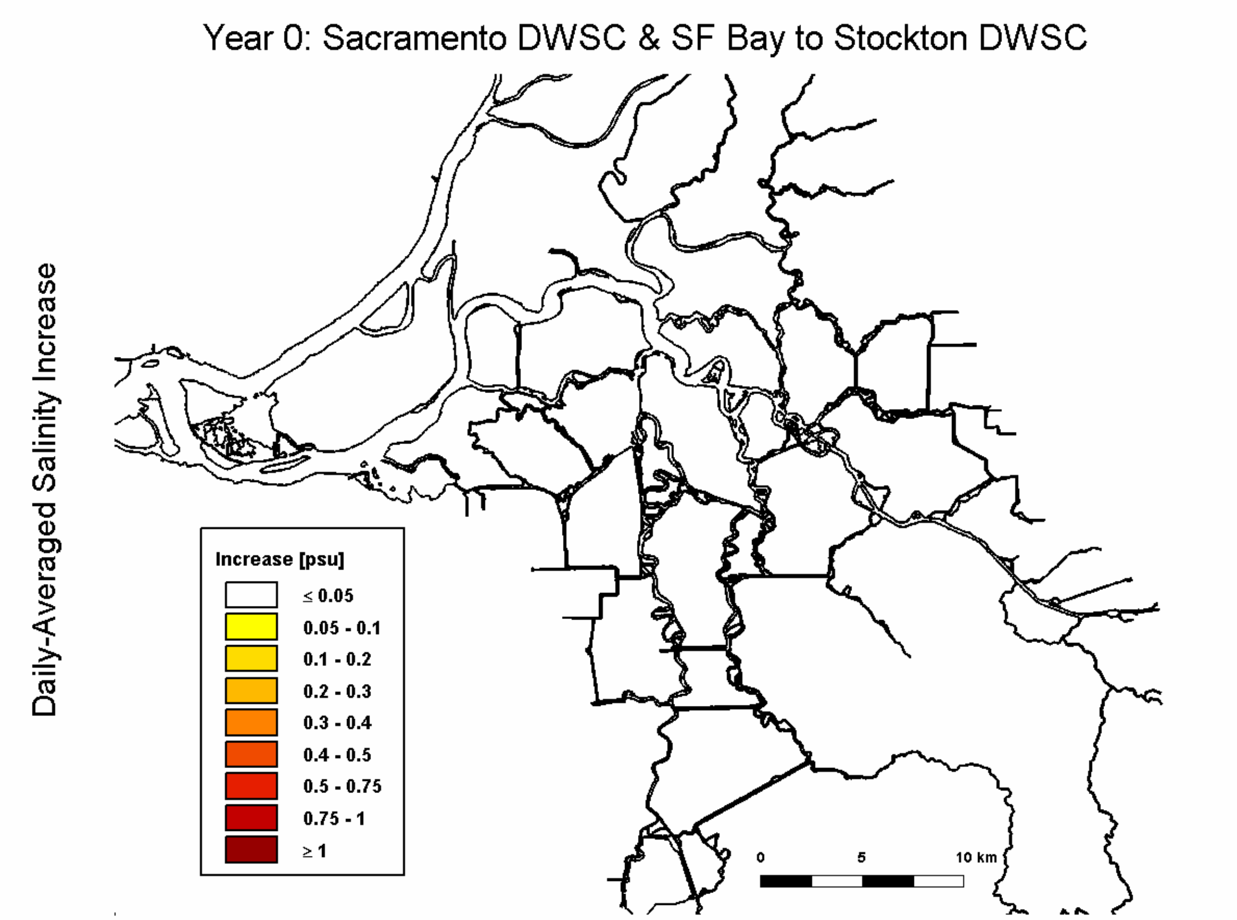


Figure 4.4-52 Predicted depth-averaged daily-averaged salinity increase in the Sacramento-San Joaquin Delta on March 1 for the Year 0 Both DWSC Deepening scenario relative to the Year 0 Baseline scenario.

4.5 Salinity Time Series Comparisons

Salinity time series provide information about potential salinity impacts over time at a fixed location. Salinity time series comparisons were made the twenty-seven continuous salinity monitoring stations in San Francisco Bay and the Sacramento-San Joaquin Delta, shown on Figure 3.3-5. Comparisons for the Year 0 simulation period between predicted salinity for the Year 0 Baseline scenario and the Year 0 Sacramento DWSC Only Deepening scenario are shown in Section 4.5.1. Comparisons for the Year 0 simulation period between predicted salinity for the Year 0 Baseline scenario, the Year 0 Sacramento DWSC Only Deepening scenario, and the Year 0 Both DWSC Deepening scenario are shown in Section 4.5.2.

<u>4.5.1 Year 0 Sacramento DWSC Only Deepening</u>

For each salinity comparison figure included in this section, the top plot shows the tidal time-scale variability over a 15-day period for the Year 0 Baseline scenario and the Year 0 Sacramento DWSC Only Deepening scenario. The middle plot shows daily-averaged salinity during the full simulation year for each scenario. The bottom plot shows the predicted increase in daily-averaged salinity for the Year 0 Sacramento DWSC Only Deepening scenario relative to the Year 0 Baseline scenario. In cases where the predicted salinity is identical between scenarios, some lines are not fully visible. Since the lines are plotted in the order listed on the legend, for periods where the predicted salinity for the Year 0 Baseline scenario is not fully visible, the predicted salinity for the Year 0 Baseline scenario is identical to the visible line for the Year 0 Sacramento DWSC Only Deepening scenario.

Figure 4.5-1 shows the predicted salinity at the Richmond-San Rafael Bridge Lower Sensor for the Year 0 Baseline scenario and the Year 0 Sacramento DWSC Only Deepening scenario. During the second half of November (top panel of Figure 4.5-1), the predicted salinity for both scenarios is nearly identical. Similarly, the daily-averaged salinity is nearly identical between the two scenarios over the entire simulation year. The predicted salinity increase for the Year 0 Sacramento DWSC Only Deepening scenario is almost exactly zero during the whole year indicating no predicted salinity increase at the Richmond-San Rafael Bridge Lower Sensor resulting from the Year 0 Sacramento DWSC Only Deepening scenario. The predicted salinity for the Year 0 Sacramento DWSC Only Deepening scenario shows some very small transient salinity differences during the high flow periods, but these should not be considered to represent a significant impact.

Figure 4.5-2 shows the predicted salinity at the Carquinez Bridge Lower Sensor for the Year 0 Baseline scenario and the Year 0 Sacramento DWSC Only Deepening scenario. During the second half of November (top panel of Figure 4.5-2), the predicted salinity for the Year 0 Baseline scenario and the Year 0 Sacramento DWSC Only Deepening scenario are nearly identical. Similarly, the predicted daily-averaged salinity for the Year 0 Sacramento DWSC Only Deepening scenario is nearly identical to the predicted daily-averaged salinity under the Year 0 Baseline scenario. The predicted salinity increase for the Year 0 Sacramento DWSC Only Deepening scenario is very close to zero during the whole year except for very small differences during January and February during high flows, indicating almost no predicted salinity impact at the Carquinez Bridge Lower Sensor resulting from the Year 0 Sacramento DWSC Only Deepening scenario.

Figure 4.5-3 shows the predicted salinity at the Sacramento River at the Martinez Surface Sensor for the Year 0 Baseline scenario and the Year 0 Sacramento DWSC Only Deepening scenario. During the second half of November (top panel of Figure 4.5-3), the predicted salinity for the Year 0 Baseline scenario and the Year 0 Sacramento DWSC Only Deepening scenario are nearly identical. Similarly, the predicted daily-averaged salinity for the Year 0 Sacramento DWSC Only Deepening scenario is nearly identical to the predicted daily-averaged salinity under the Year 0 Baseline scenario. The predicted salinity increase for the Year 0 Sacramento DWSC Only Deepening scenario is very close to zero during the whole year, indicating no predicted salinity increase at the Martinez Surface Sensor resulting from the Year 0 Sacramento DWSC Only Deepening scenario.

Figure 4.5-4 shows the predicted salinity at the Benicia Bridge Lower Sensor for the Year 0 Baseline scenario and the Year 0 Sacramento DWSC Only Deepening scenario. During the second half of November (top panel of Figure 4.5-4), the predicted salinity for the Year 0 Baseline scenario and the Year 0 Sacramento DWSC Only Deepening scenario are nearly identical. Similarly, the predicted daily-averaged salinity for the Year 0 Sacramento DWSC Only Deepening scenario is nearly identical to the predicted daily-averaged salinity for the Year 0 Baseline scenario. The predicted salinity increase for the Year 0 Sacramento DWSC Only Deepening scenario is very close to zero during the whole year, indicating no predicted salinity increase at the Benicia Bridge Lower Sensor resulting from the Year 0 Sacramento DWSC Only Deepening scenario.

Figure 4.5-5 shows the predicted salinity at the Sacramento River near Mallard Island Surface Sensor for the Year 0 Baseline scenario and the Year 0 Sacramento DWSC Only Deepening scenario. During the second half of November (top panel of Figure 4.5-5), the predicted salinity for the Year 0 Baseline scenario and the Year 0 Sacramento DWSC Only Deepening scenario are nearly identical. Similarly, the predicted daily-averaged salinity for the Year 0 Sacramento DWSC Only Deepening scenario is nearly identical to the predicted daily-averaged salinity for the Year 0 Baseline scenario. The predicted salinity increase for the Year 0 Sacramento DWSC Only Deepening scenario is very close to zero during the whole year, indicating no predicted salinity increase at the Sacramento River near Mallard Island Surface Sensor resulting from the Year 0 Sacramento DWSC Only Deepening scenario.

Figure 4.5-6 shows the predicted salinity at the Sacramento River at Emmaton Surface Sensor for the Year 0 Baseline scenario and the Year 0 Sacramento DWSC Only Deepening scenario. During the second half of November (top panel of Figure 4.5-6), the predicted salinity for the Year 0 Sacramento DWSC Only Deepening scenario is slightly higher than the predicted salinity for the Year 0 Baseline scenario. The predicted salinity for the Year 0 Sacramento DWSC Only Deepening scenario is nearly identical to the predicted salinity for the Year 0 Baseline scenario, except during July through December when the predicted salinity for the Year 0 Sacramento DWSC Only Deepening scenario is up to 0.10 psu higher than the Year 0 Baseline salinity.

Figure 4.5-7 shows the predicted salinity at Sacramento River at Rio Vista for the Year 0 Baseline scenario and the Year 0 Sacramento DWSC Only Deepening scenario. The predicted salinity for the Year 0 Sacramento DWSC Only Deepening scenario is nearly identical to the predicted salinity for the Year 0 Baseline scenario, except during October through December when the predicted salinity for the Year 0 Sacramento DWSC Only Deepening scenario is up to 0.13 psu higher than the Year 0 Baseline salinity.

Figure 4.5-8 shows the predicted salinity at the Port of Sacramento for the Year 0 Baseline scenario and the Year 0 Sacramento DWSC Only Deepening scenario. The predicted salinity for the Year 0 Sacramento DWSC Only Deepening scenario is nearly identical the predicted salinity for the Year 0 Baseline scenario throughout the year, with no predicted salinity increases resulting from the Year 0 Sacramento DWSC Only Deepening scenario.

Figure 4.5-9 shows the predicted salinity at the San Joaquin River at Antioch for the Year 0 Baseline scenario and the Year 0 Sacramento DWSC Only Deepening scenario. During the second half of November (top panel of Figure 4.5-9), the predicted salinity for the Year 0 Baseline scenario and the Year 0 Sacramento DWSC Only Deepening scenario are nearly identical. Similarly, the predicted daily-averaged salinity for the Year 0 Sacramento DWSC Only Deepening scenario is nearly identical to the predicted daily-averaged salinity for the Year 0 Baseline scenario. The predicted salinity increase for the Year 0 Sacramento DWSC Only Deepening scenario is very close to zero during the whole year, with a maximum predicted salinity increase of 0.07 psu during December.

Figure 4.5-10 shows the predicted salinity at the San Joaquin River at Jersey Point for the Year 0 Baseline scenario and the Year 0 Sacramento DWSC Only Deepening scenario. The predicted salinity for both scenarios is nearly identical from April through September and from January through March. From October through December, the predicted salinity for the Year 0 Sacramento DWSC Only Deepening scenario is slightly higher than the predicted salinity for the Year 0 Baseline scenario, with predicted salinity increases of up to 0.09 psu.

Figure 4.5-11 shows the predicted salinity at the San Joaquin River at San Andreas Landing for the Year 0 Baseline scenario and the Year 0 Sacramento DWSC Only Deepening scenario. The predicted salinity for both scenarios is nearly identical from April through September and from January through March. During November and December, the predicted salinity for the Year 0 Sacramento DWSC Only Deepening scenario is slightly higher than the predicted salinity for the Year 0 Baseline scenario, with predicted salinity increases of up to 0.03 psu.

Figure 4.5-12 shows the predicted salinity at the San Joaquin River before Prisoners Point for the Year 0 Baseline scenario and the Year 0 Sacramento DWSC Only Deepening scenario. The predicted salinity for both scenarios is nearly identical from April through September and from January through March. During November and December, the predicted salinity for the Year 0 Sacramento DWSC Only Deepening scenario is slightly higher than the predicted salinity for the Year 0 Baseline scenario, with predicted salinity increases of up to 0.03 psu.

Figure 4.5-13 shows the predicted salinity at the Stockton Ship Channel at Burns Cutoff for the Year 0 Baseline scenario and the Year 0 Sacramento DWSC Only Deepening scenario. The predicted salinity for the Year 0 Sacramento DWSC Only Deepening scenario is nearly identical the predicted salinity for the Year 0 Baseline scenario throughout the year, with no predicted salinity increases resulting from the Year 0 Sacramento DWSC Only Deepening scenario.

Figure 4.5-14 shows the predicted salinity at the South Fork Mokelumne River at Staten Island for the Year 0 Baseline scenario and the Year 0 Sacramento DWSC Only Deepening scenario. The predicted salinity for both scenarios is nearly identical throughout the year, with no predicted salinity increases resulting from the Year 0 Sacramento DWSC Only Deepening scenario.

Figure 4.5-15 shows the predicted salinity at Dutch Slough at Jersey Island for the Year 0 Baseline scenario and the Year 0 Sacramento DWSC Only Deepening scenario. The predicted salinity for both scenarios is nearly identical from April through September and from January through March. During November and December, the predicted salinity for the Year 0 Sacramento DWSC Only Deepening scenario is slightly higher than the predicted salinity for the Year 0 Baseline scenario, with predicted salinity increases of up to 0.08 psu.

Figure 4.5-16 shows the predicted salinity at Old River and Holland Cut at Mandeville Island for the Year 0 Baseline scenario and the Year 0 Sacramento DWSC Only Deepening scenario. During the second half of November (top panel of Figure 4.5-16), the predicted salinity for the Year 0 Sacramento DWSC Only Deepening scenario is typically 0.03 psu higher than the predicted salinity for the Year 0 Baseline scenario throughout the tidal cycle. The predicted daily-averaged salinity for both scenarios is nearly identical from April through September and from January through March. During late October, the predicted salinity for the Year 0 Sacramento DWSC Only Deepening scenario is slightly higher than the predicted salinity for the Year 0 Baseline scenario, with predicted salinity increases of up to 0.06 psu.

Figure 4.5-17 shows the predicted salinity at Old River at Bacon Island for the Year 0 Baseline scenario and the Year 0 Sacramento DWSC Only Deepening scenario. During the second half of November (top panel of Figure 4.5-17), the predicted salinity for the Year 0 Sacramento DWSC Only Deepening scenario is typically 0.03 psu higher than the predicted salinity for the Year 0 Baseline scenario throughout the tidal cycle. The predicted daily-averaged salinity for both scenarios is nearly identical from April through September and from January through March. During November and December, the predicted salinity for the Year 0 Sacramento DWSC Only Deepening scenario is slightly higher than the predicted salinity for the Year 0 Baseline scenario, with predicted salinity increases of up to 0.06 psu.

Figure 4.5-18 shows the predicted salinity at Middle River at Borden Highway for the Year 0 Baseline scenario and the Year 0 Sacramento DWSC Only Deepening scenario. During the second half of November (top panel of Figure 4.5-18), the predicted salinity for the Year 0 Sacramento DWSC Only Deepening scenario is typically 0.01 psu higher than the predicted salinity for the Year 0 Baseline scenario throughout the tidal cycle. The predicted daily-averaged salinity for both scenarios is nearly identical from April through October and from December through March. During December, the predicted salinity for the Year 0 Sacramento DWSC Only Deepening scenario is slightly higher than the predicted salinity for the Year 0 Baseline scenario, with predicted salinity increases of up to 0.02 psu.

Figure 4.5-19 shows the predicted salinity at Middle River at Tracy Boulevard for the Year 0 Baseline scenario and the Year 0 Sacramento DWSC Only Deepening scenario. During the second half of November (top panel of Figure 4.5-19), the predicted salinity for the Year 0 Sacramento DWSC Only Deepening scenario is nearly identical to the predicted salinity for the Year 0 Baseline scenario throughout the tidal cycle. The predicted daily-averaged salinity for both scenarios is nearly identical throughout the year. Salinity increases of up to 0.02 psu are predicted under the Year 0 Sacramento DWSC Only Deepening scenario.

Figure 4.5-20 shows the predicted salinity at Victoria Canal near Byron for the Year 0 Baseline scenario and the Year 0 Sacramento DWSC Only Deepening scenario. During the second half of November (top panel of Figure 4.5-20), the predicted salinity for the Year 0 Sacramento DWSC Only Deepening scenario is typically 0.01 psu higher than the predicted salinity for the Year 0 Baseline scenario throughout the tidal cycle. The predicted daily-averaged salinity for both scenarios is nearly identical from April through October and from November through March. During December, the predicted salinity for the Year 0 Sacramento DWSC Only Deepening scenario is slightly higher than the predicted salinity for the Year 0 Baseline scenario, with predicted salinity increases of up to 0.02 psu.

Figure 4.5-21 shows the predicted salinity at the Clifton Court Forebay Radial Gates for the Year 0 Baseline scenario and the Year 0 Sacramento DWSC Only Deepening scenario. During the second half of November (top panel of Figure 4.5-21), the predicted salinity for the Year 0 Sacramento DWSC Only Deepening scenario is up to 0.02 psu higher than the predicted salinity for the Year 0 Baseline scenario throughout the tidal cycle. The predicted daily-averaged salinity for both scenarios is nearly identical from April through October and from January through March. From November through January, the predicted salinity for the Year 0 Sacramento DWSC Only Deepening scenario is slightly higher than the predicted salinity for the Year 0 Baseline scenario, with predicted salinity increases of up to 0.03 psu.

Figure 4.5-22 shows the predicted salinity at Old River near Delta-Mendota Canal (Downstream of Barrier) for the Year 0 Baseline scenario and the Year 0 Sacramento DWSC Only Deepening scenario. During the second half of November (top panel of Figure 4.5-22), the predicted salinity for the Year 0 Sacramento DWSC Only Deepening scenario is up to 0.02 psu higher than the predicted salinity for the Year 0 Baseline scenario throughout the tidal cycle. The predicted daily-averaged salinity for both scenarios is nearly identical from April through October and from January through March. During November and December, the predicted salinity for the Year 0 Sacramento DWSC Only Deepening scenario is slightly higher than the predicted salinity for the Year 0 Baseline scenario, with predicted salinity increases of up to 0.02 psu.

Figure 4.5-23 shows the predicted salinity at Old River at Tracy Boulevard for the Year 0 Baseline scenario and the Year 0 Sacramento DWSC Only Deepening scenario. The predicted salinity for both scenarios is nearly identical throughout most of the year. During November, the predicted salinity for the Year 0 Sacramento DWSC Only Deepening scenario is slightly higher than the predicted salinity for the Year 0 Baseline scenario, with predicted salinity increases of up to 0.015 psu.

Figure 4.5-24 shows the predicted salinity at Grant Line Canal at Tracy Boulevard for the Year 0 Baseline scenario and the Year 0 Sacramento DWSC Only Deepening scenario. The predicted salinity for both scenarios is nearly identical throughout the year, and no salinity increases are predicted for the Year 0 Sacramento DWSC Only Deepening scenario.

Figure 4.5-25 shows the predicted salinity at Middle River near Old River for the Year 0 Baseline scenario and the Year 0 Sacramento DWSC Only Deepening scenario. The predicted salinity for both scenarios is nearly identical throughout the year, and no salinity increases are predicted for the Year 0 Sacramento DWSC Only Deepening scenario.

Figure 4.5-26 shows the predicted salinity at San Joaquin River at Brandt Bridge for the Year 0 Baseline scenario and the Year 0 Sacramento DWSC Only Deepening scenario. The predicted salinity for both scenarios is nearly identical throughout the year, and no salinity increases are predicted for the Year 0 Sacramento DWSC Only Deepening scenario.

Figure 4.5-27 shows the predicted salinity at San Joaquin River at Mossdale for the Year 0 Baseline scenario and the Year 0 Sacramento DWSC Only Deepening scenario. The predicted salinity for both scenarios is nearly identical throughout the year, and no salinity increases are predicted for the Year 0 Sacramento DWSC Only Deepening scenario.

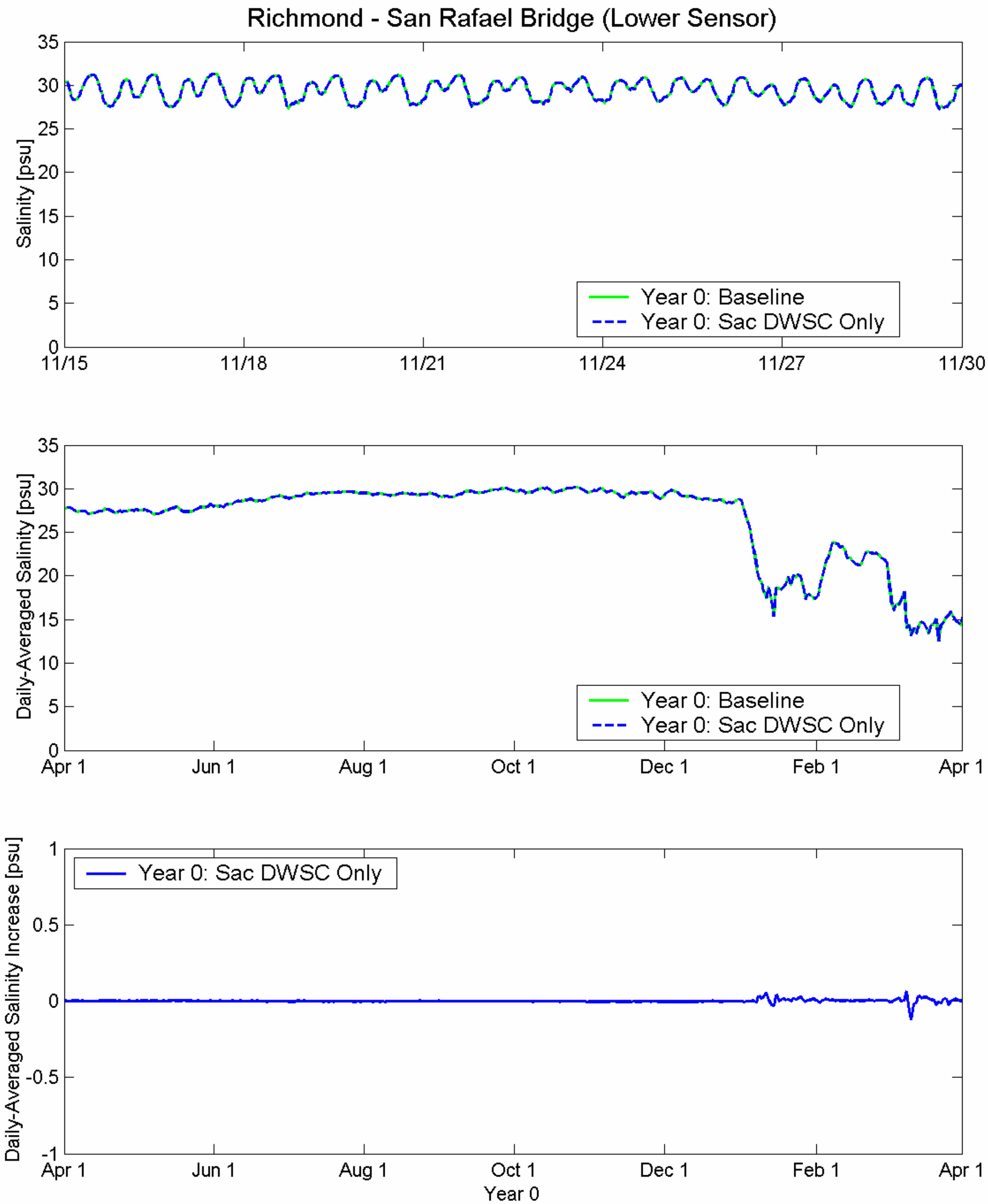


Figure 4.5-1 Predicted salinity at Richmond-San Rafael Bridge Lower Sensor for the Year 0 Baseline scenario and the Year 0 Sacramento DWSC Only Deepening scenario: tidal time-scale variability over a 15-day period (top); daily-averaged salinity for the Year 0 simulation period (middle); predicted increase in daily-averaged salinity for the Year 0 Sacramento DWSC Only Deepening scenario relative to the Year 0 Baseline scenario (bottom).

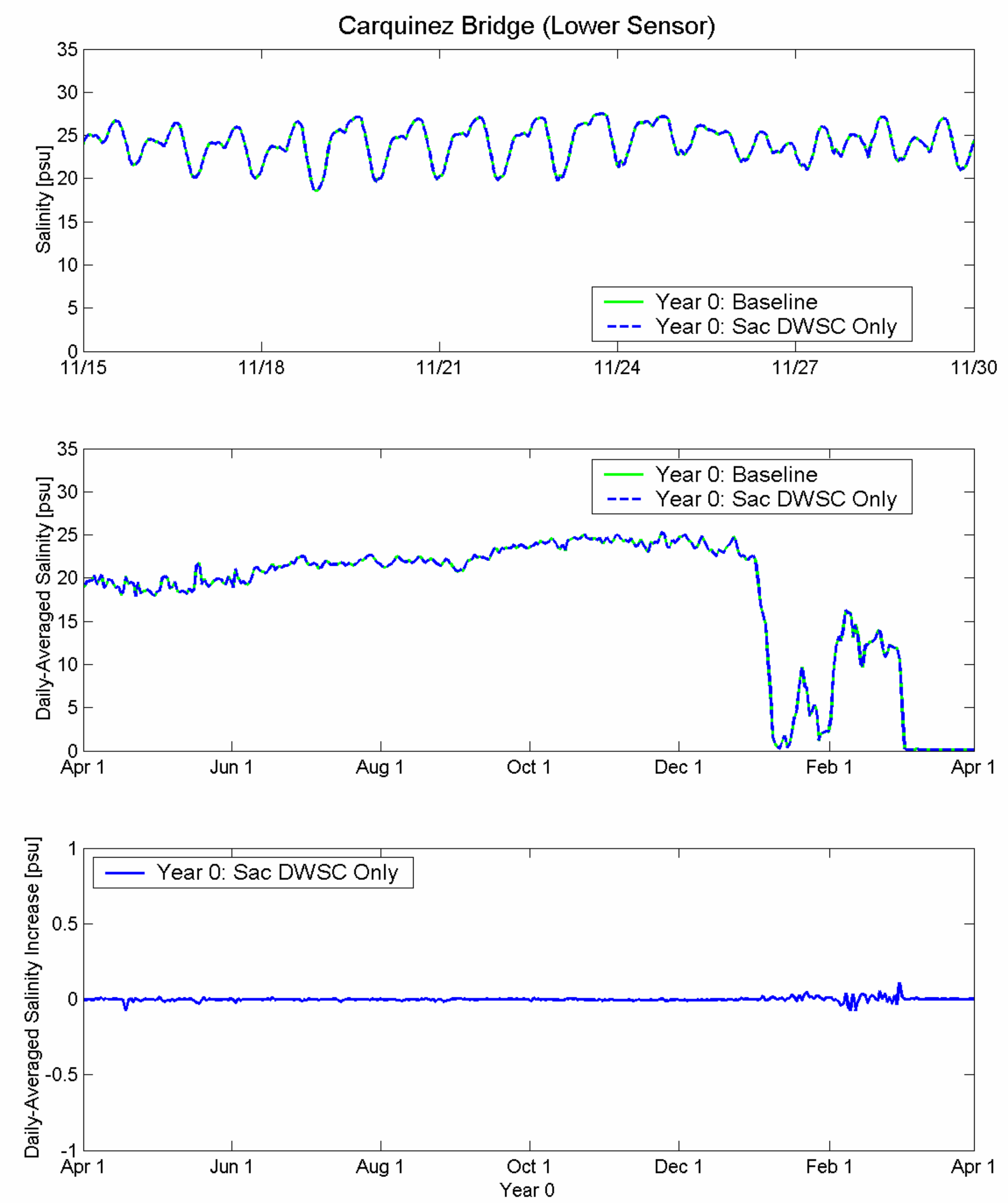


Figure 4.5-2 Predicted salinity at Carquinez Bridge Lower Sensor for the Year 0 Baseline scenario and the Year 0 Sacramento DWSC Only Deepening scenario: tidal time-scale variability over a 15-day period (top); daily-averaged salinity for the Year 0 simulation period (middle); predicted increase in daily-averaged salinity for the Year 0 Sacramento DWSC Only Deepening scenario relative to the Year 0 Baseline scenario (bottom).

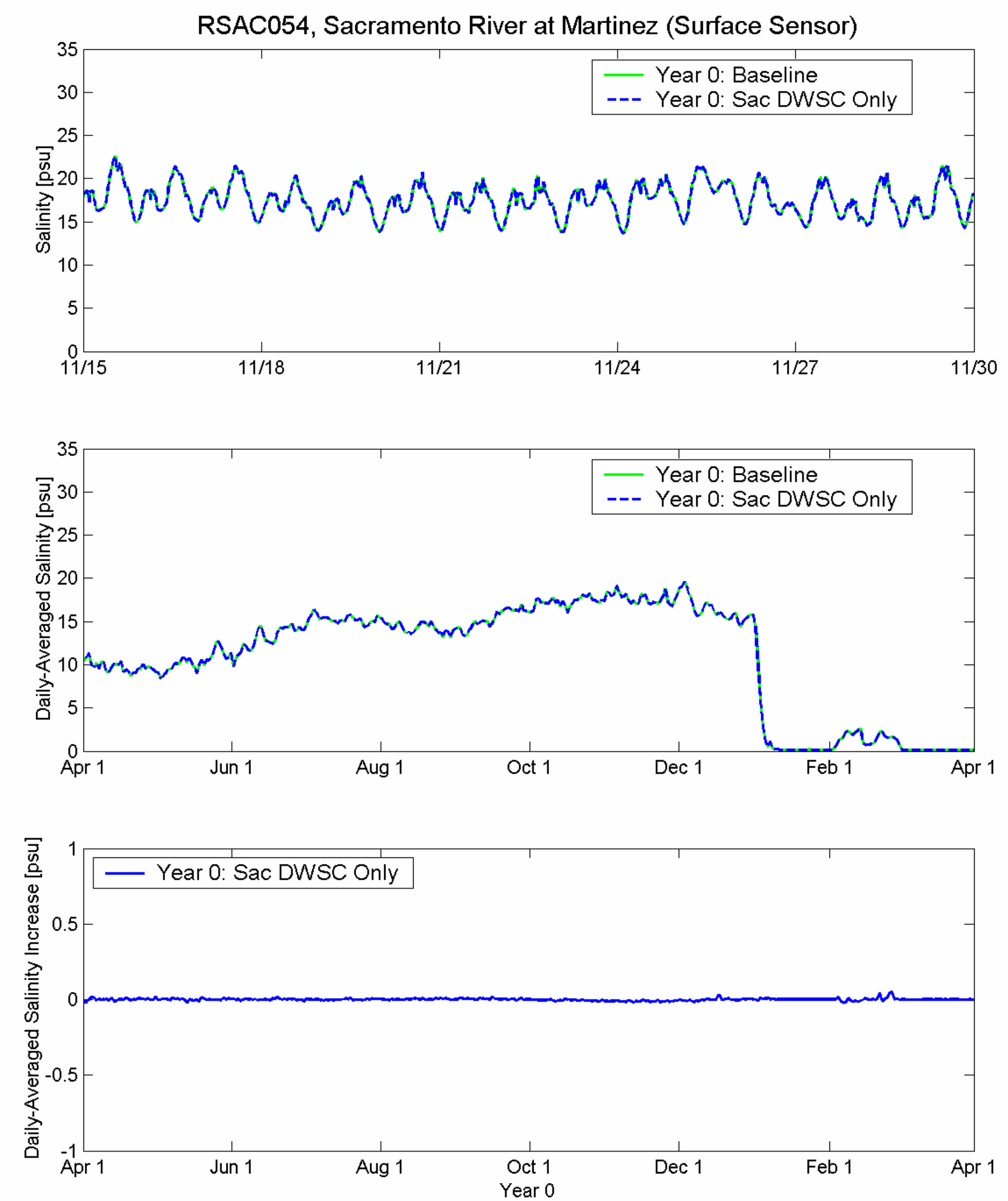


Figure 4.5-3 Predicted salinity at Sacramento River at Martinez (RSAC054) for the Year 0 Baseline scenario and the Year 0 Sacramento DWSC Only Deepening scenario: tidal time-scale variability over a 15-day period (top); daily-averaged salinity for the Year 0 simulation period (middle); predicted increase in daily-averaged salinity for the Year 0 Sacramento DWSC Only Deepening scenario relative to the Year 0 Baseline scenario (bottom).

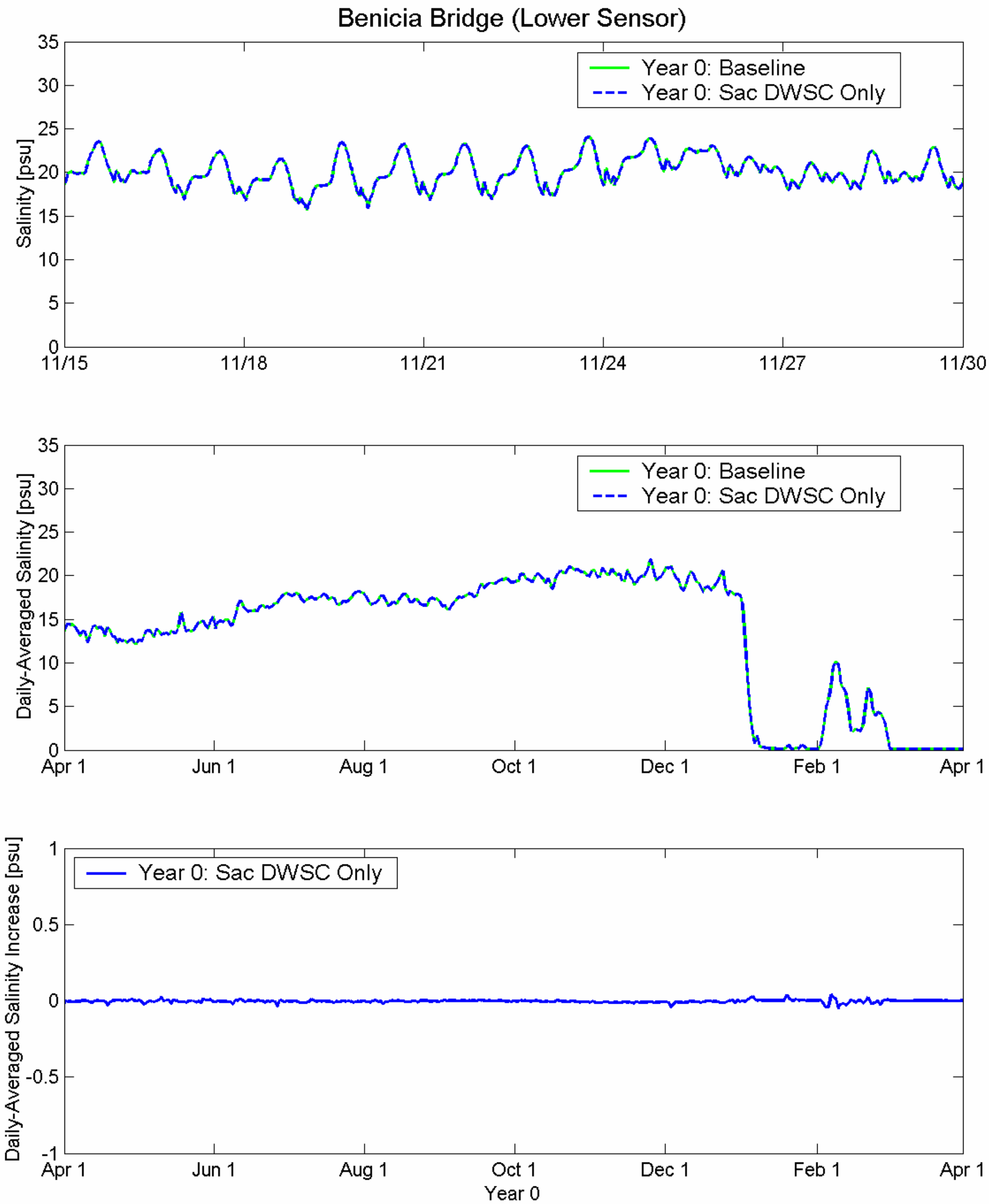


Figure 4.5-4 Predicted salinity at Benicia Bridge Lower Sensor for the Year 0 Baseline scenario and the Year 0 Sacramento DWSC Only Deepening scenario: tidal time-scale variability over a 15-day period (top); daily-averaged salinity for the Year 0 simulation period (middle); predicted increase in daily-averaged salinity for the Year 0 Sacramento DWSC Only Deepening scenario relative to the Year 0 Baseline scenario (bottom).

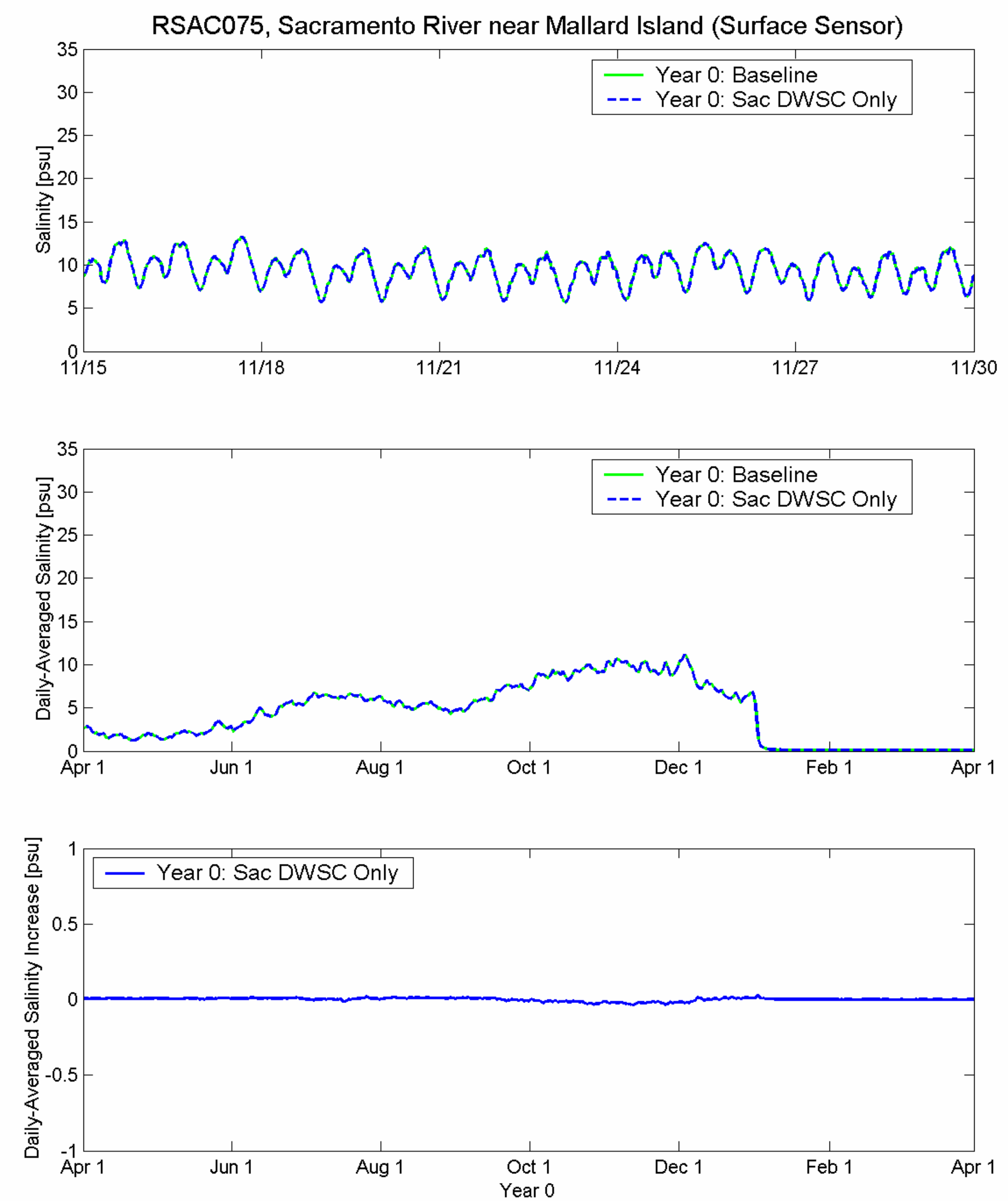


Figure 4.5-5 Predicted salinity at the Sacramento River near Mallard Island (RSAC075) Surface Sensor for the Year 0 Baseline scenario and the Year 0 Sacramento DWSC Only Deepening scenario: tidal time-scale variability over a 15-day period (top); daily-averaged salinity for the Year 0 simulation period (middle); predicted increase in daily-averaged salinity for the Year 0 Sacramento DWSC Only Deepening scenario relative to the Year 0 Baseline scenario (bottom).

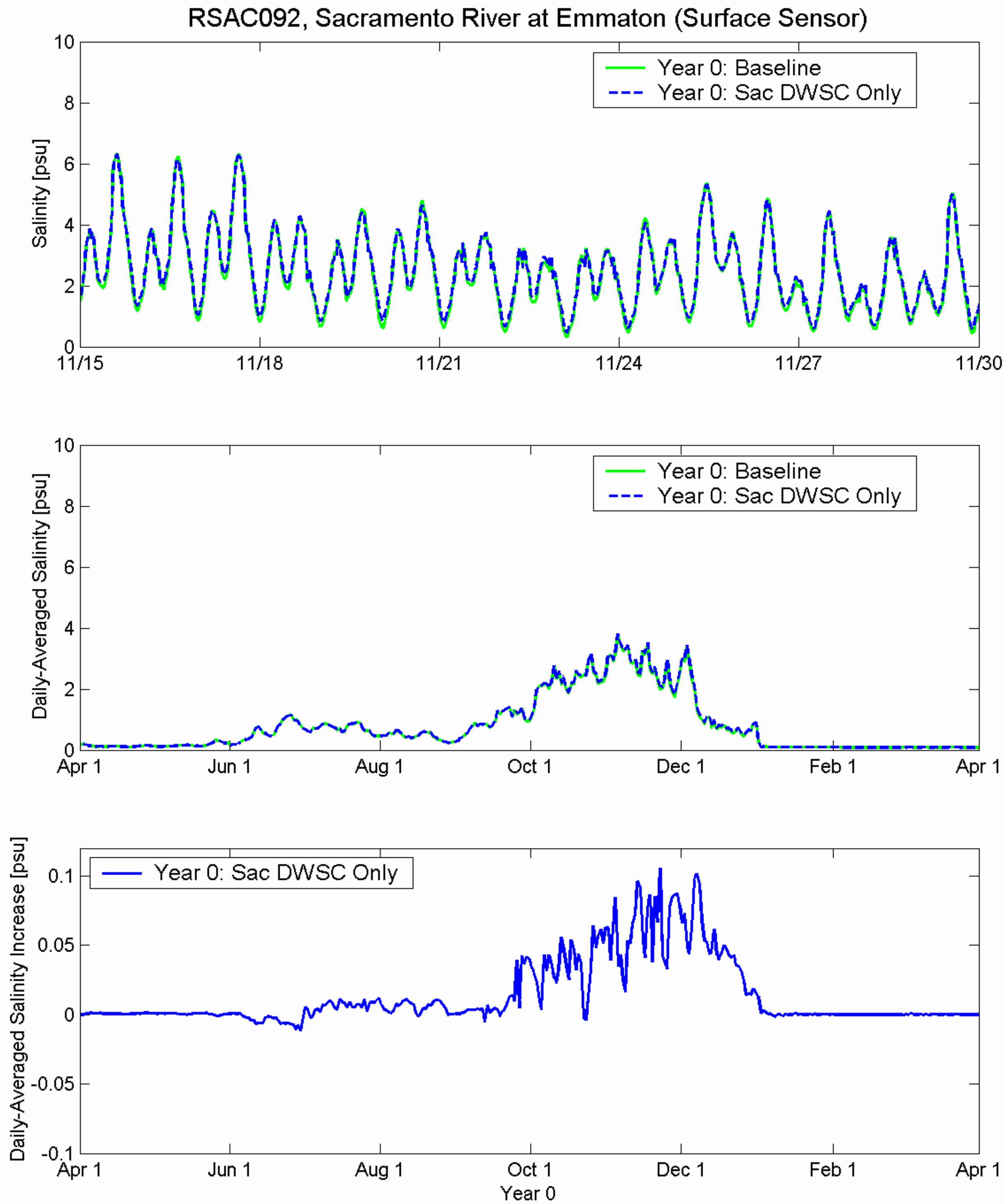


Figure 4.5-6 Predicted salinity at the Sacramento River at Emmaton (RSAC092) Surface Sensor for the Year 0 Baseline scenario and the Year 0 Sacramento DWSC Only Deepening scenario: tidal time-scale variability over a 15-day period (top); daily-averaged salinity for the Year 0 simulation period (middle); predicted increase in daily-averaged salinity for the Year 0 Sacramento DWSC Only Deepening scenario relative to the Year 0 Baseline scenario (bottom).

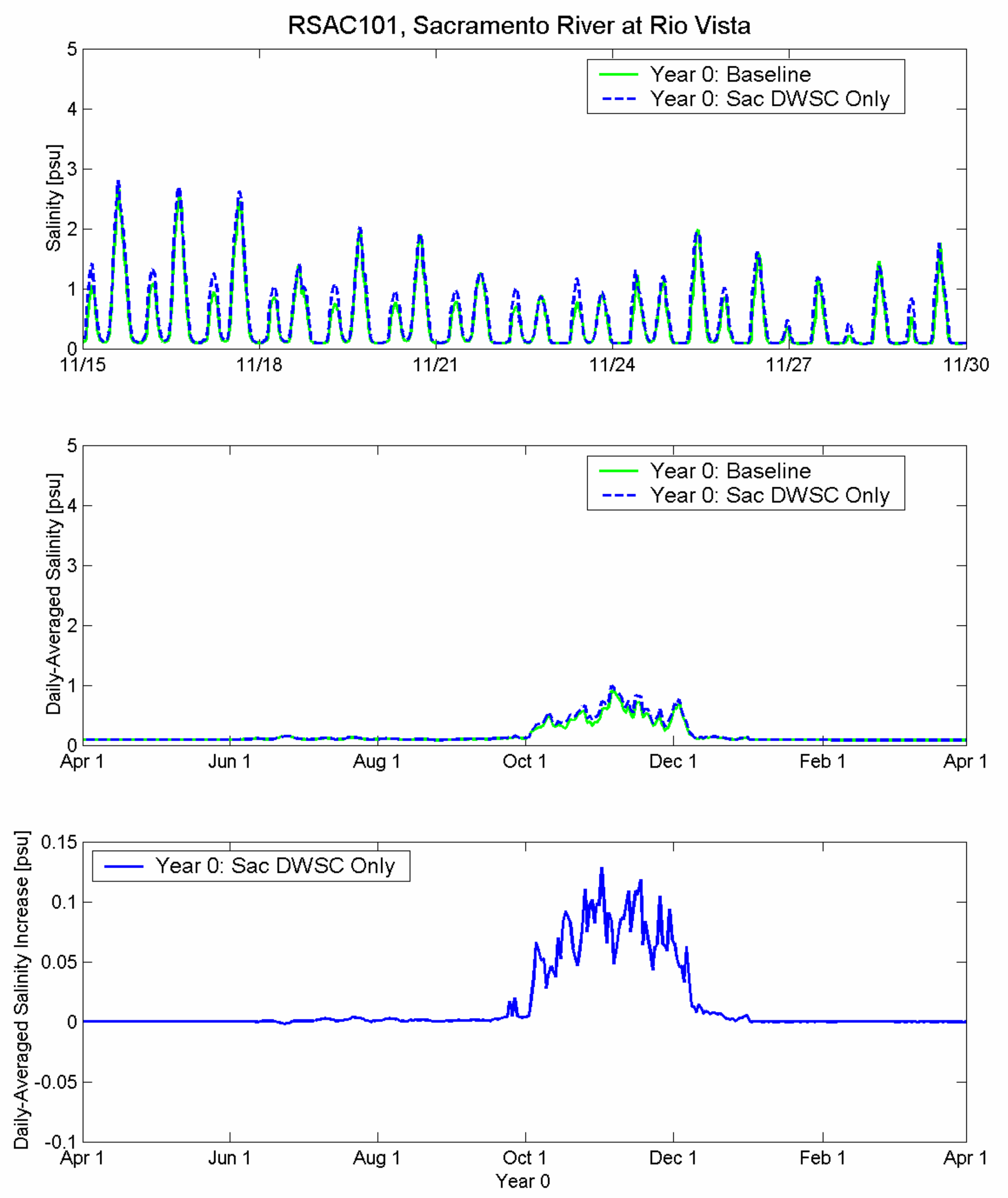


Figure 4.5-7 Predicted salinity at Sacramento River at Rio Vista (RSAC101) for the Year 0 Baseline scenario and the Year 0 Sacramento DWSC Only Deepening scenario: tidal time-scale variability over a 15-day period (top); daily-averaged salinity for the Year 0 simulation period (middle); predicted increase in daily-averaged salinity for the Year 0 Sacramento DWSC Only Deepening scenario relative to the Year 0 Baseline scenario (bottom).

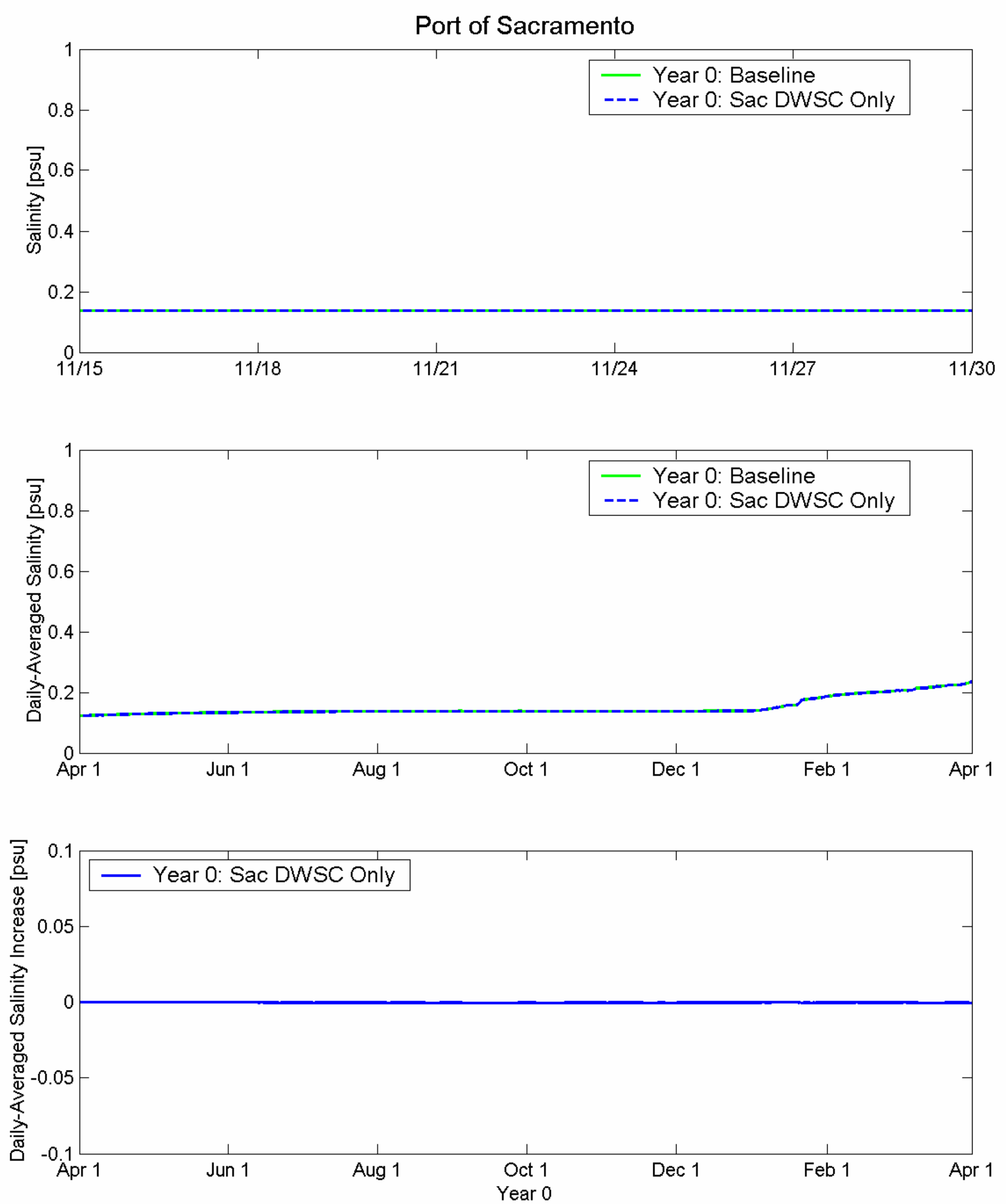


Figure 4.5-8 Predicted salinity at the Port of Sacramento for the Year 0 Baseline scenario and the Year 0 Sacramento DWSC Only Deepening scenario: tidal time-scale variability over a 15-day period (top); daily-averaged salinity for the Year 0 simulation period (middle); predicted increase in daily-averaged salinity for the Year 0 Sacramento DWSC Only Deepening scenario relative to the Year 0 Baseline scenario (bottom).

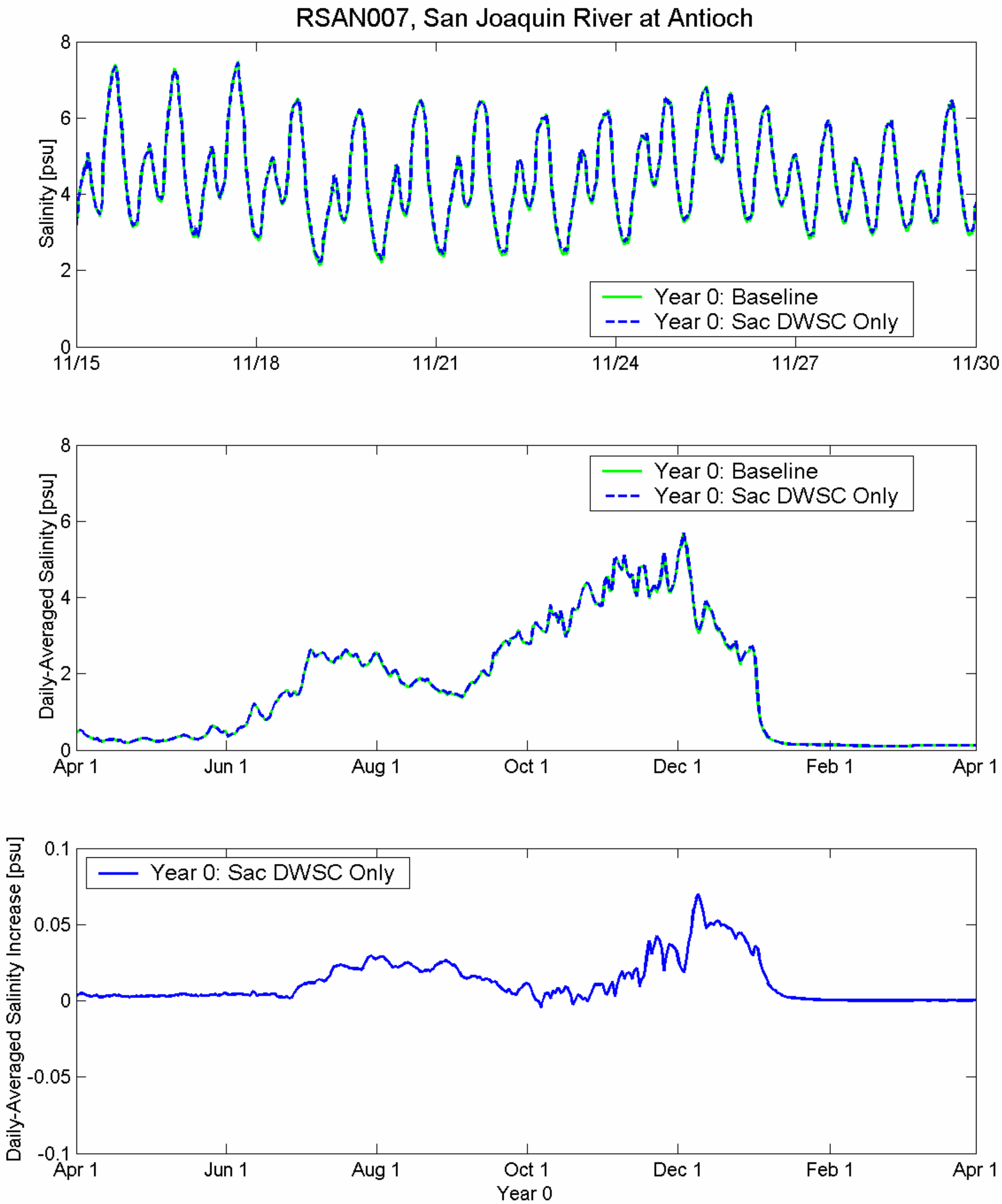


Figure 4.5-9 Predicted salinity at San Joaquin River at Antioch (RSAN007) for the Year 0 Baseline scenario and the Year 0 Sacramento DWSC Only Deepening scenario: tidal time-scale variability over a 15-day period (top); daily-averaged salinity for the Year 0 simulation period (middle); predicted increase in daily-averaged salinity for the Year 0 Sacramento DWSC Only Deepening scenario relative to the Year 0 Baseline scenario (bottom).

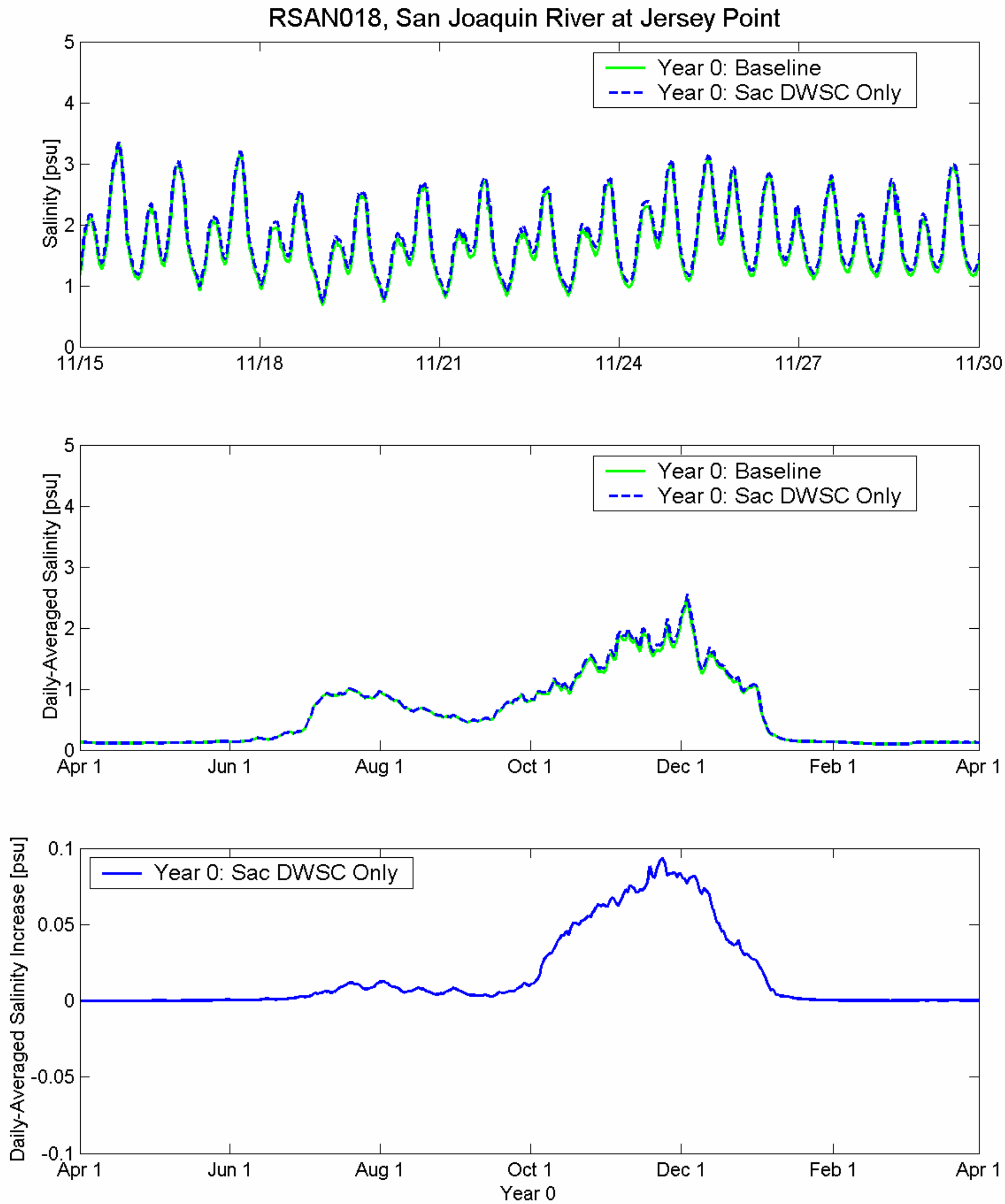


Figure 4.5-10 Predicted salinity at San Joaquin River at Jersey Point (RSAN018) for the Year 0 Baseline scenario and the Year 0 Sacramento DWSC Only Deepening scenario: tidal time-scale variability over a 15-day period (top); daily-averaged salinity for the Year 0 simulation period (middle); predicted increase in daily-averaged salinity for the Year 0 Sacramento DWSC Only Deepening scenario relative to the Year 0 Baseline scenario (bottom).

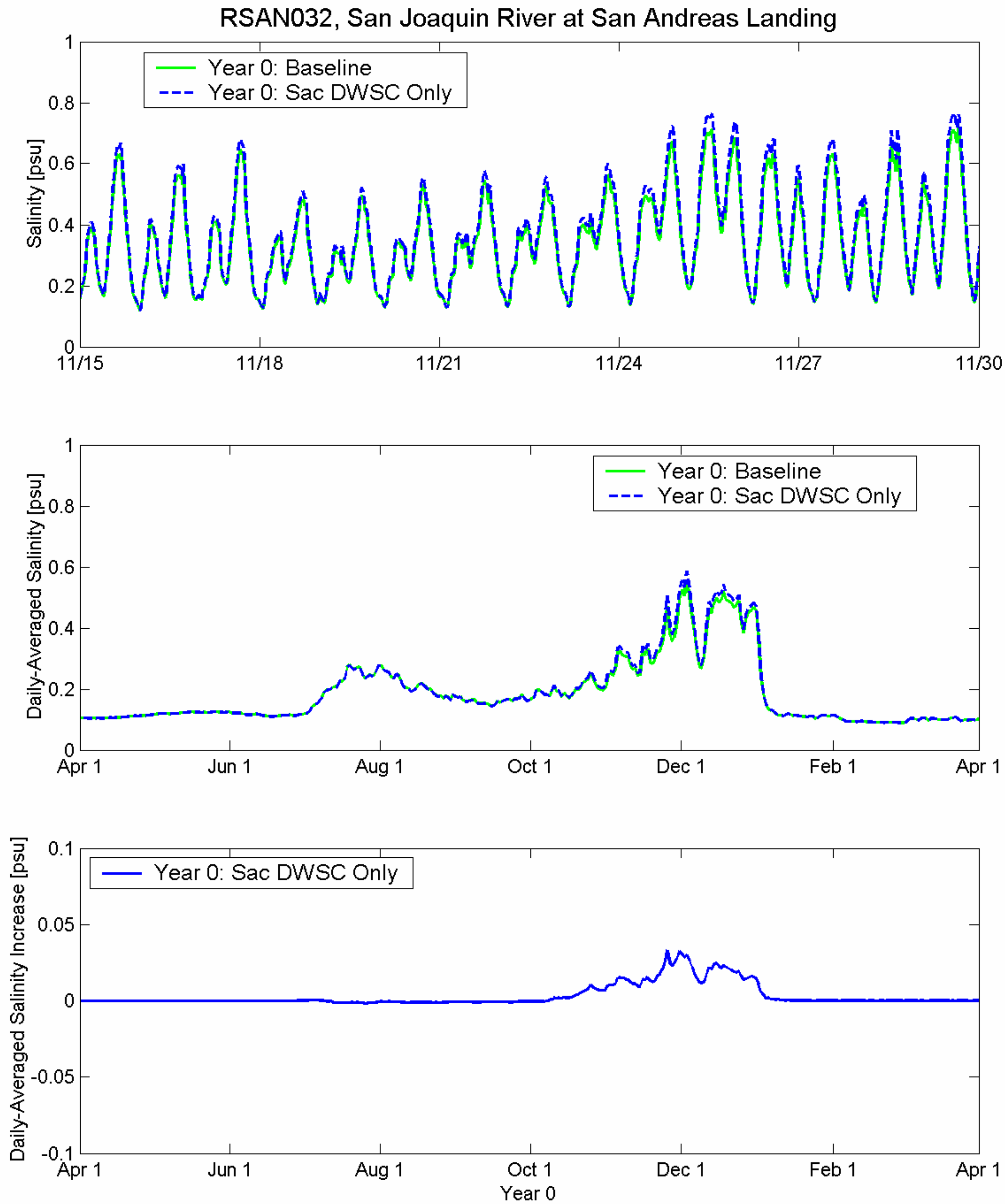


Figure 4.5-11 Predicted salinity at San Joaquin River at San Andreas Landing (RSAN032) for the Year 0 Baseline scenario and the Year 0 Sacramento DWSC Only Deepening scenario: tidal time-scale variability over a 15-day period (top); daily-averaged salinity for the Year 0 simulation period (middle); predicted increase in daily-averaged salinity for the Year 0 Sacramento DWSC Only Deepening scenario relative to the Year 0 Baseline scenario (bottom).

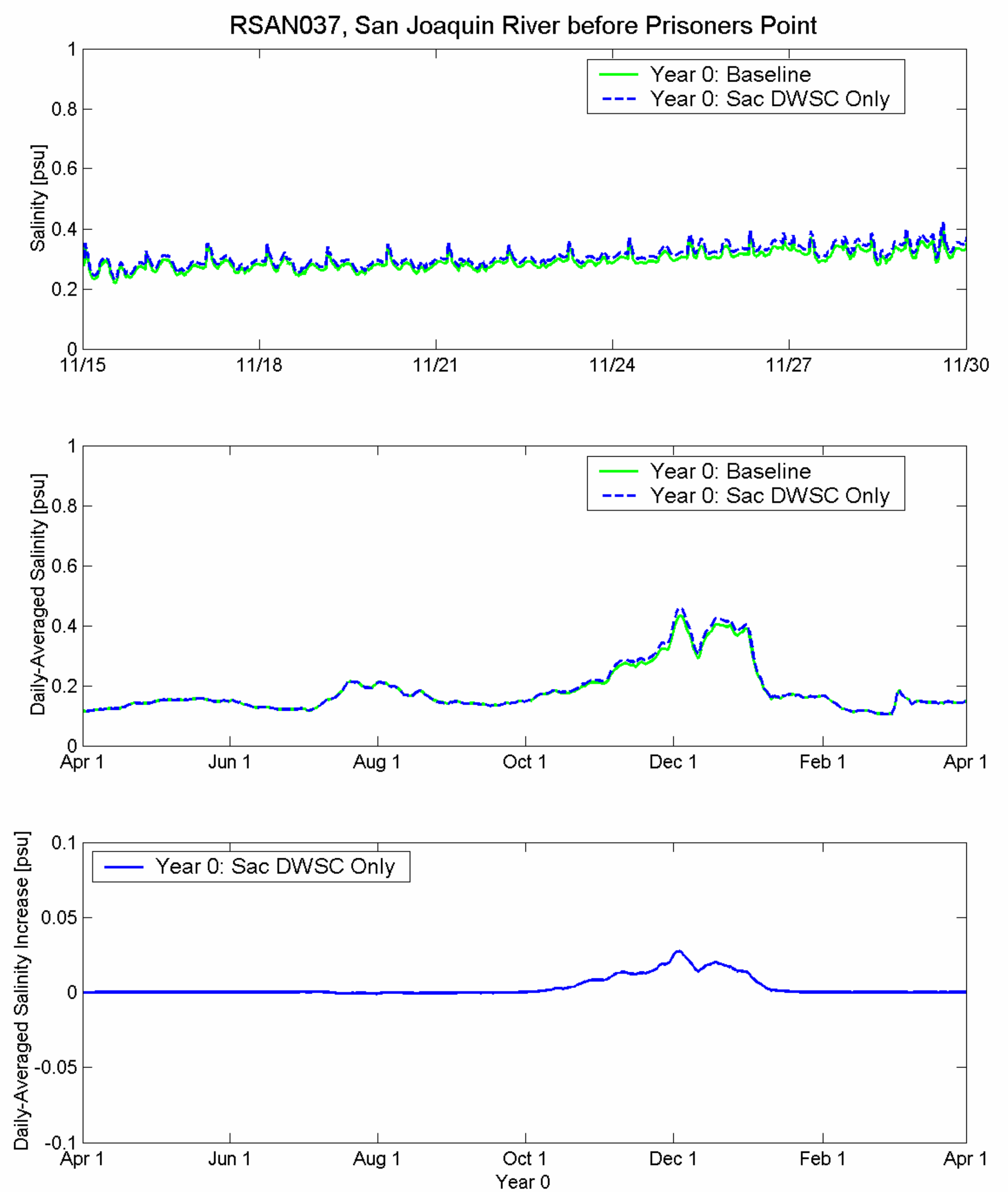


Figure 4.5-12 Predicted salinity at San Joaquin River before Prisoners Point (RSAN037) for the Year 0 Baseline scenario and the Year 0 Sacramento DWSC Only Deepening scenario: tidal time-scale variability over a 15-day period (top); daily-averaged salinity for the Year 0 simulation period (middle); predicted increase in daily-averaged salinity for the Year 0 Sacramento DWSC Only Deepening scenario relative to the Year 0 Baseline scenario (bottom).

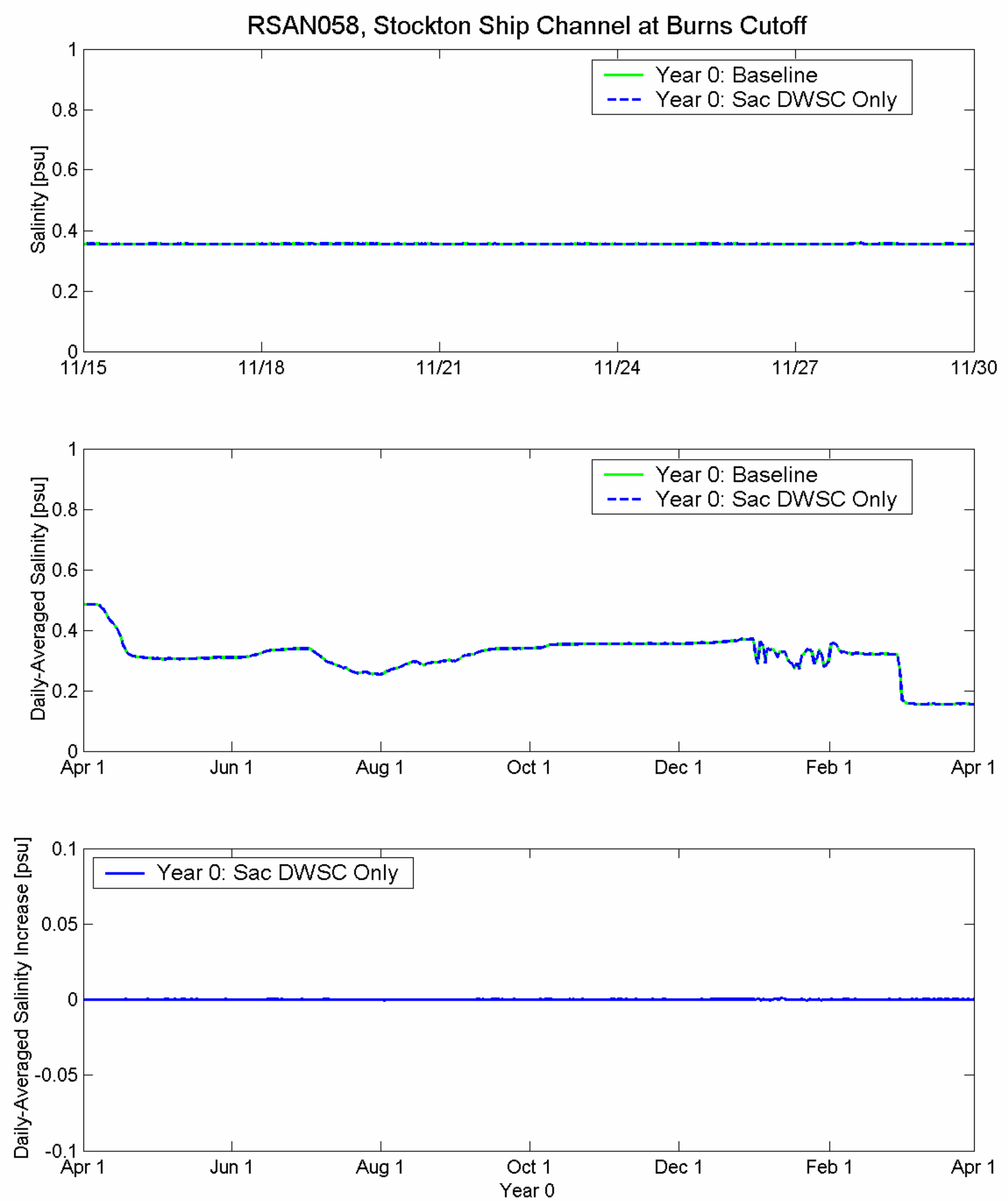


Figure 4.5-13 Predicted salinity at Stockton Ship Channel at Burns Cutoff (RSAN058) for the Year 0 Baseline scenario and the Year 0 Sacramento DWSC Only Deepening scenario: tidal time-scale variability over a 15-day period (top); daily-averaged salinity for the Year 0 simulation period (middle); predicted increase in daily-averaged salinity for the Year 0 Sacramento DWSC Only Deepening scenario relative to the Year 0 Baseline scenario (bottom).

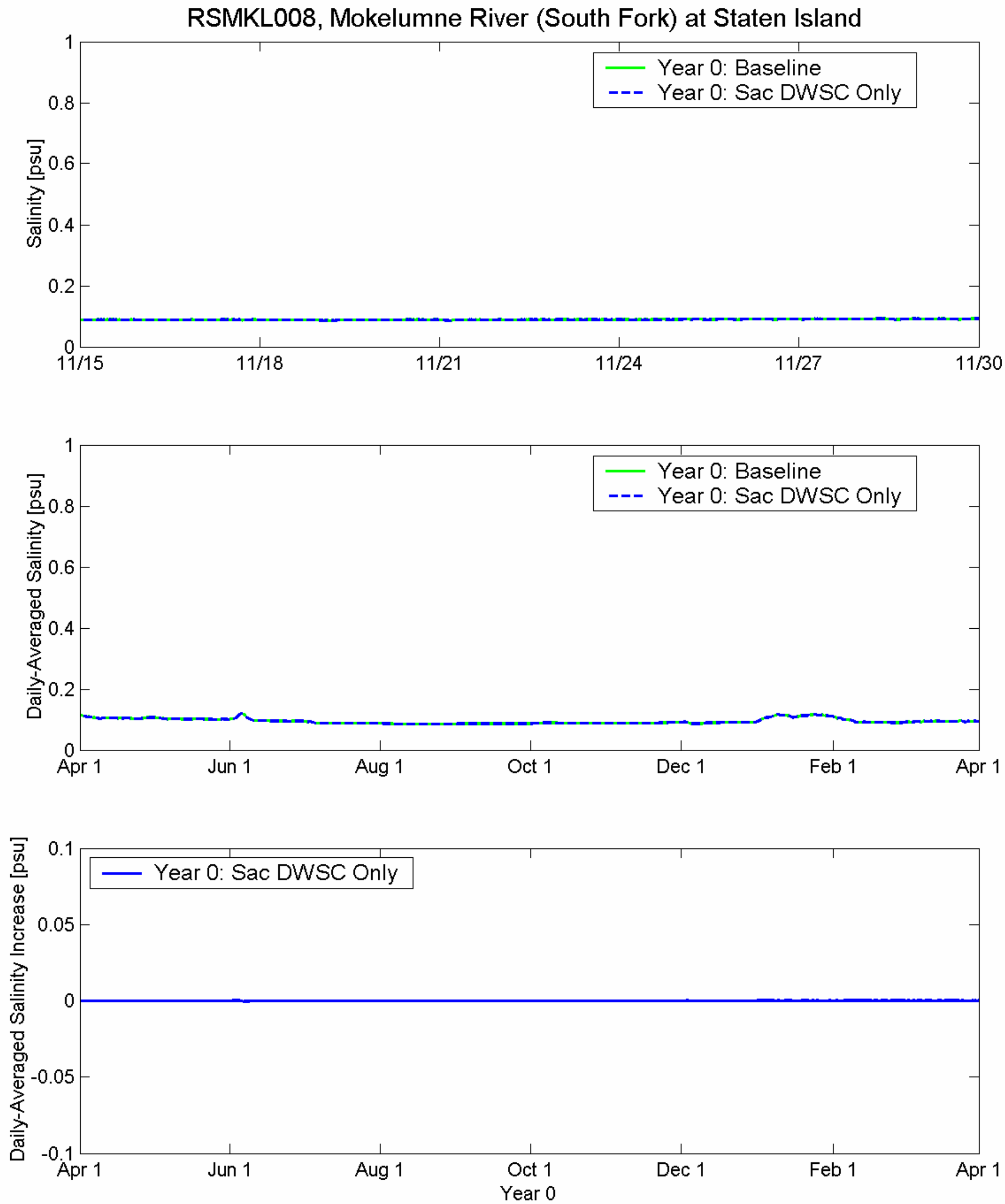


Figure 4.5-14 Predicted salinity at South Fork Mokelumne River at Staten Island (RSMKL008) for the Year 0 Baseline scenario and the Year 0 Sacramento DWSC Only Deepening scenario: tidal time-scale variability over a 15-day period (top); daily-averaged salinity for the Year 0 simulation period (middle); predicted increase in daily-averaged salinity for the Year 0 Sacramento DWSC Only Deepening scenario relative to the Year 0 Baseline scenario (bottom).

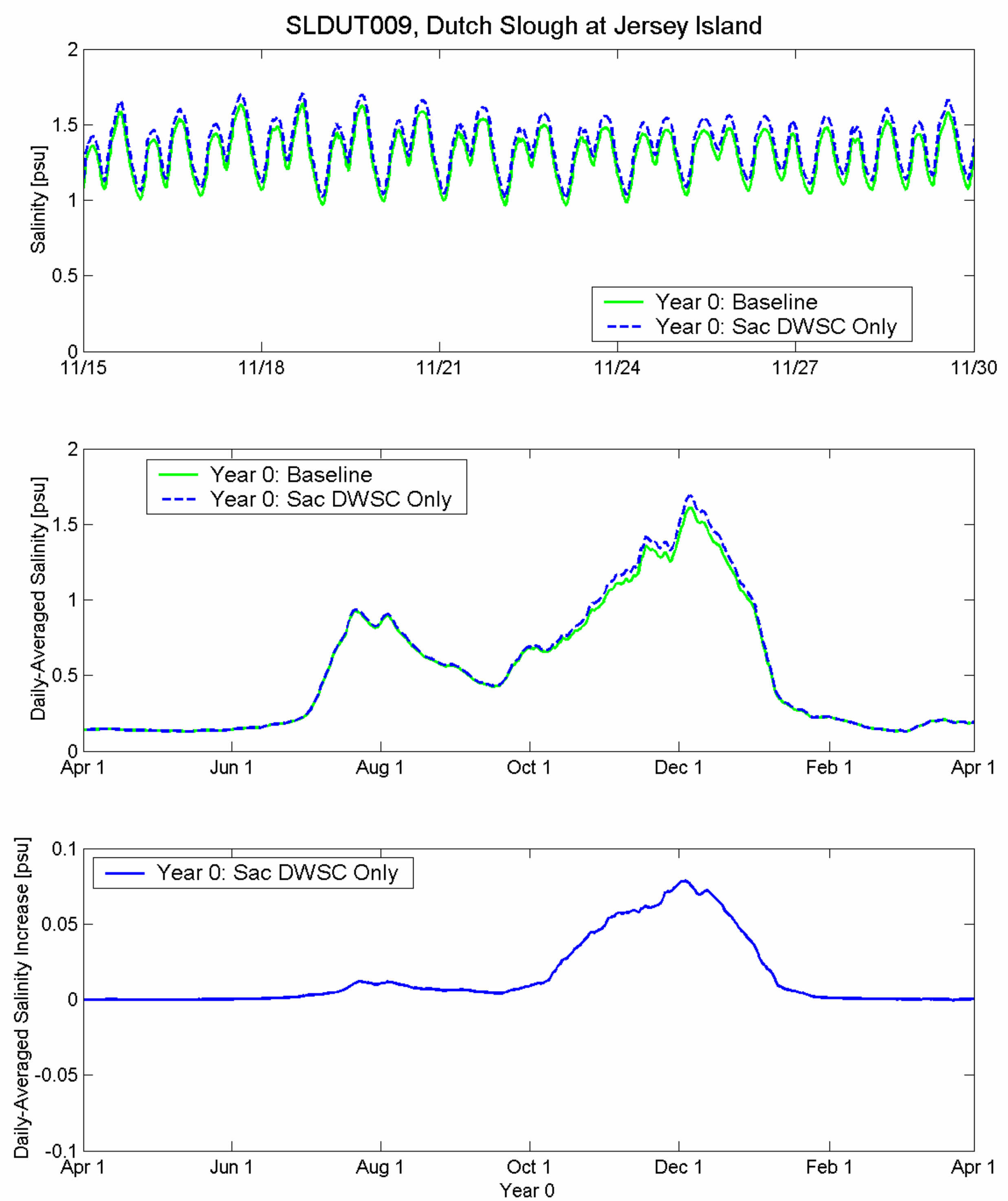


Figure 4.5-15 Predicted salinity at Dutch Slough at Jersey Island (SLDUT009) for the Year 0 Baseline scenario and the Year 0 Sacramento DWSC Only Deepening scenario: tidal time-scale variability over a 15-day period (top); daily-averaged salinity for the Year 0 simulation period (middle); predicted increase in daily-averaged salinity for the Year 0 Sacramento DWSC Only Deepening scenario relative to the Year 0 Baseline scenario (bottom).

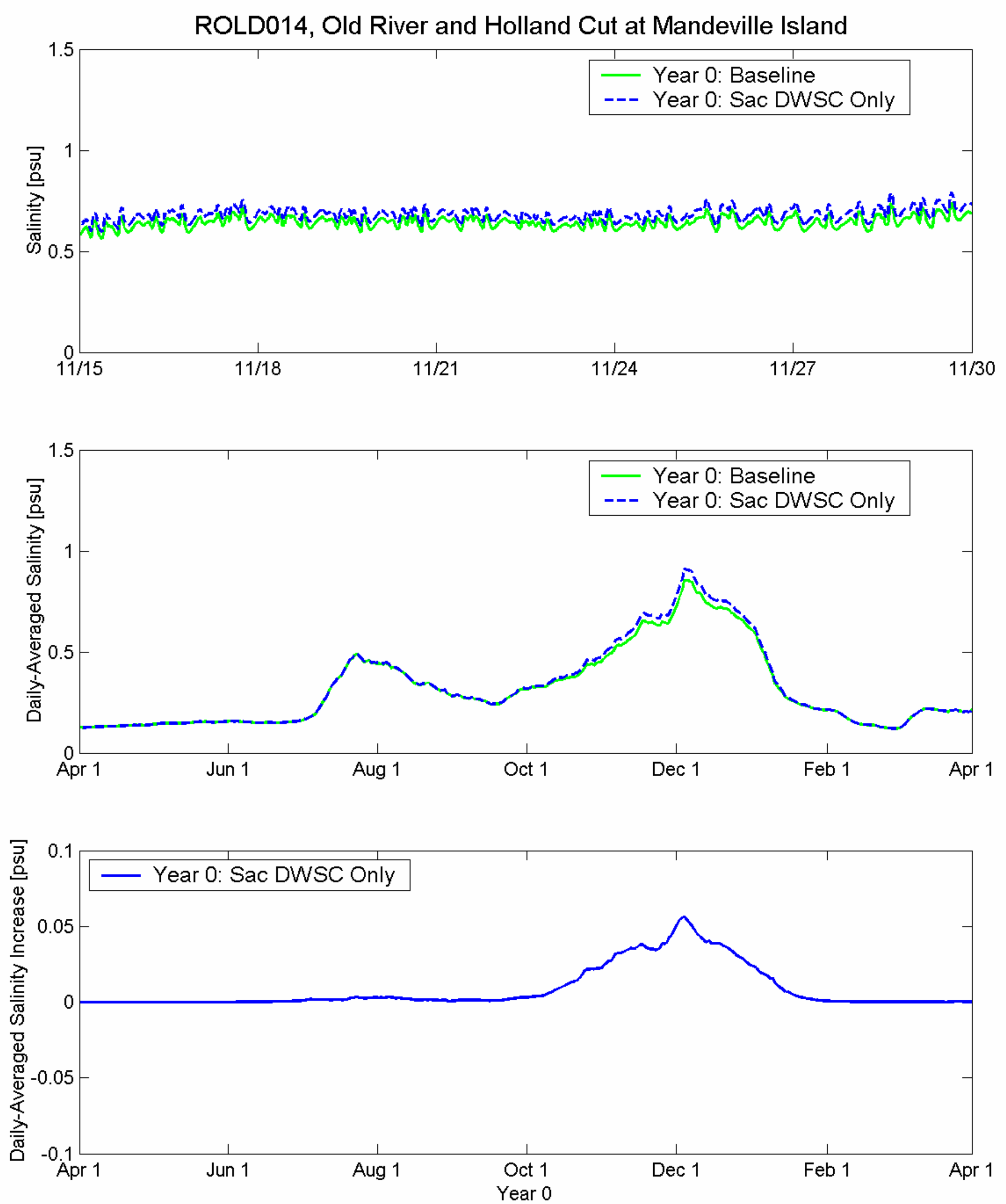


Figure 4.5-16 Predicted salinity at Old River and Holland Cut at Mandeville Island (ROLD014) for the Year 0 Baseline scenario and the Year 0 Sacramento DWSC Only Deepening scenario: tidal time-scale variability over a 15-day period (top); daily-averaged salinity for the Year 0 simulation period (middle); predicted increase in daily-averaged salinity for the Year 0 Sacramento DWSC Only Deepening scenario relative to the Year 0 Baseline scenario (bottom).

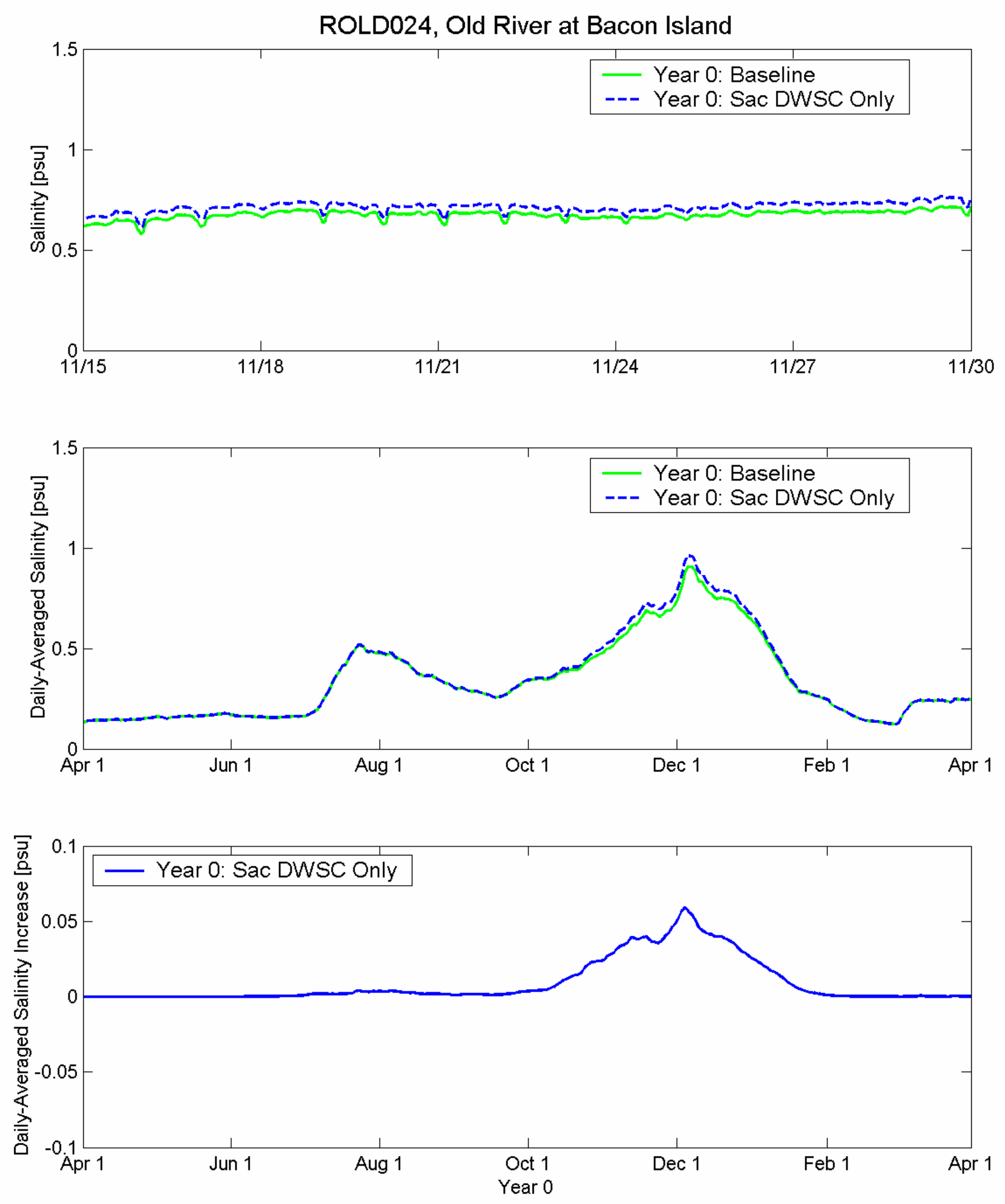


Figure 4.5-17 Predicted salinity at Old River at Bacon Island (ROLD024) for the Year 0 Baseline scenario and the Year 0 Sacramento DWSC Only Deepening scenario: tidal time-scale variability over a 15-day period (top); daily-averaged salinity for the Year 0 simulation period (middle); predicted increase in daily-averaged salinity for the Year 0 Sacramento DWSC Only Deepening scenario relative to the Year 0 Baseline scenario (bottom).

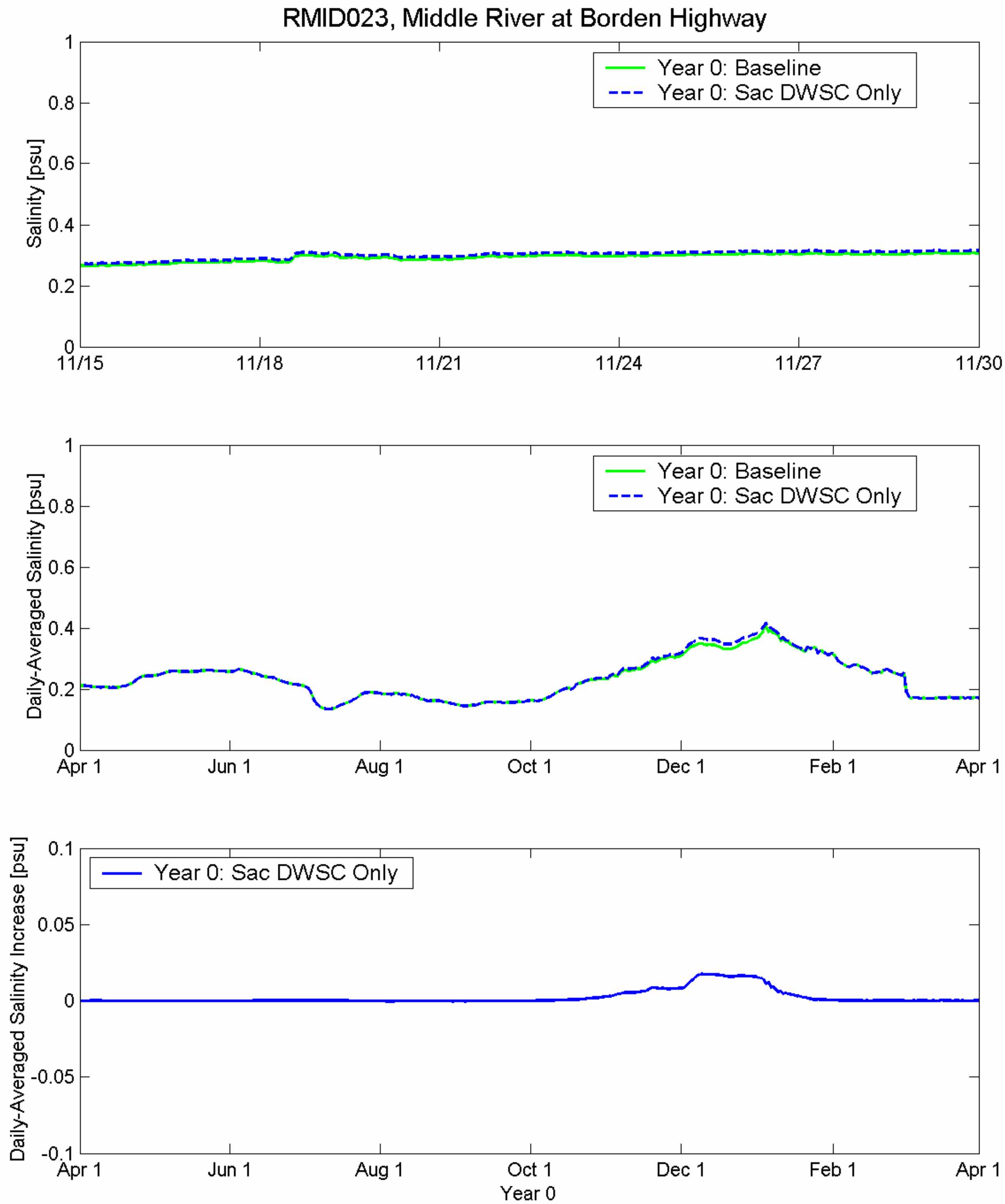


Figure 4.5-18 Predicted salinity at Middle River at Borden Highway (RMID023) for the Year 0 Baseline scenario and the Year 0 Sacramento DWSC Only Deepening scenario: tidal time-scale variability over a 15-day period (top); daily-averaged salinity for the Year 0 simulation period (middle); predicted increase in daily-averaged salinity for the Year 0 Sacramento DWSC Only Deepening scenario relative to the Year 0 Baseline scenario (bottom).

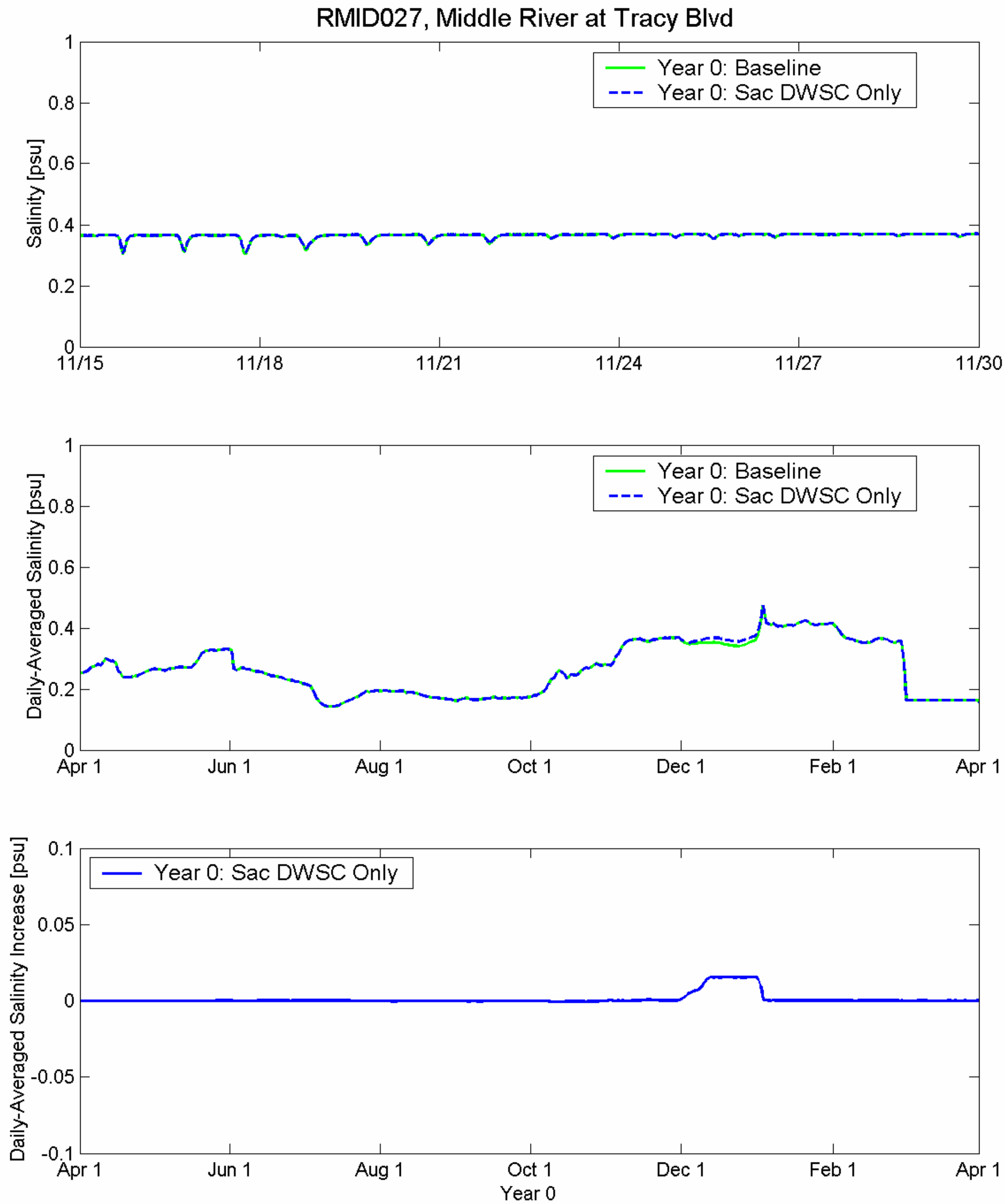


Figure 4.5-19 Predicted salinity at Middle River at Tracy Boulevard (RMID027) for the Year 0 Baseline scenario and the Year 0 Sacramento DWSC Only Deepening scenario: tidal time-scale variability over a 15-day period (top); daily-averaged salinity for the Year 0 simulation period (middle); predicted increase in daily-averaged salinity for the Year 0 Sacramento DWSC Only Deepening scenario relative to the Year 0 Baseline scenario (bottom).

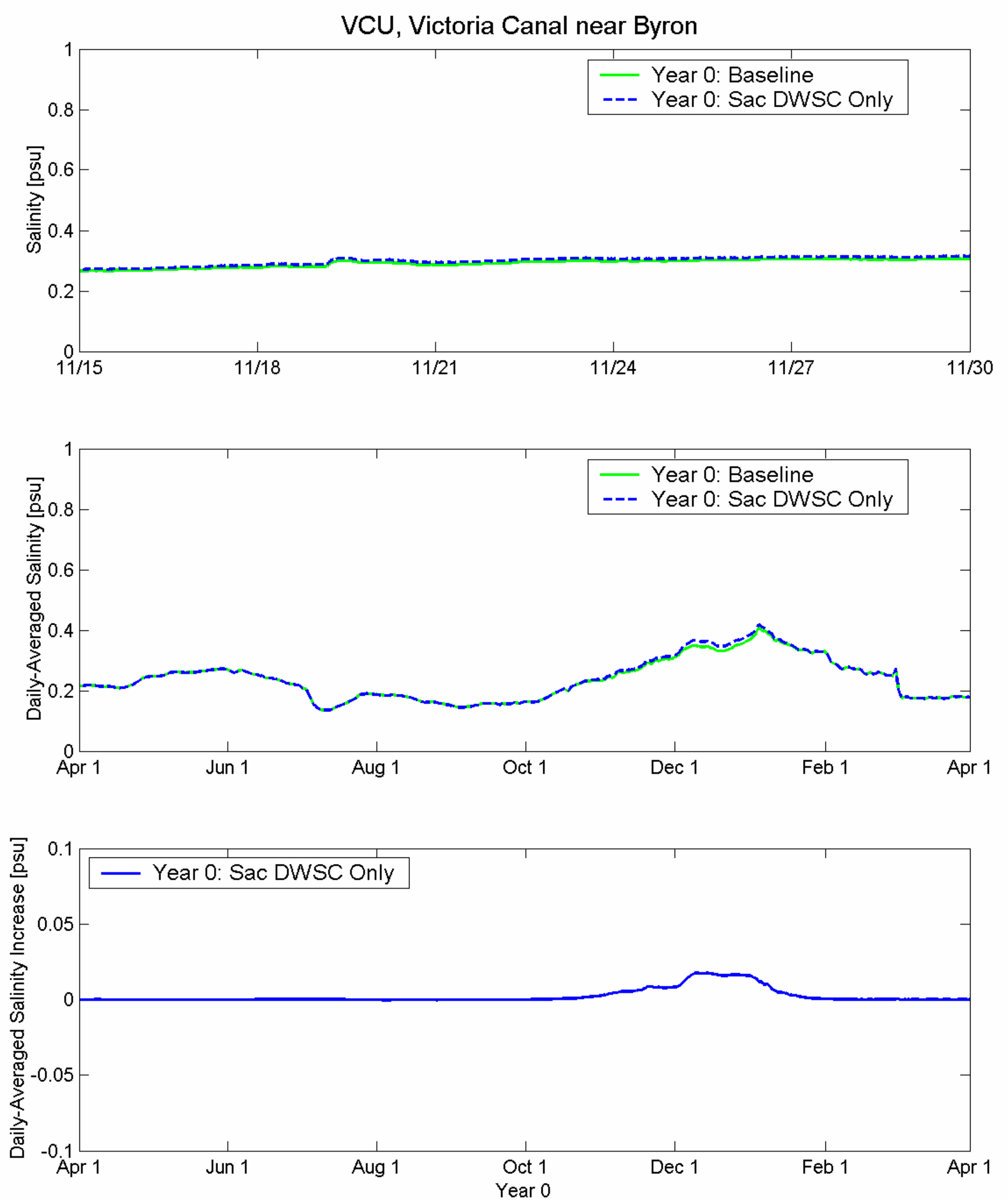


Figure 4.5-20 Predicted salinity at Victoria Canal near Byron (VCU) for the Year 0 Baseline scenario and the Year 0 Sacramento DWSC Only Deepening scenario: tidal time-scale variability over a 15-day period (top); daily-averaged salinity for the Year 0 simulation period (middle); predicted increase in daily-averaged salinity for the Year 0 Sacramento DWSC Only Deepening scenario relative to the Year 0 Baseline scenario (bottom).

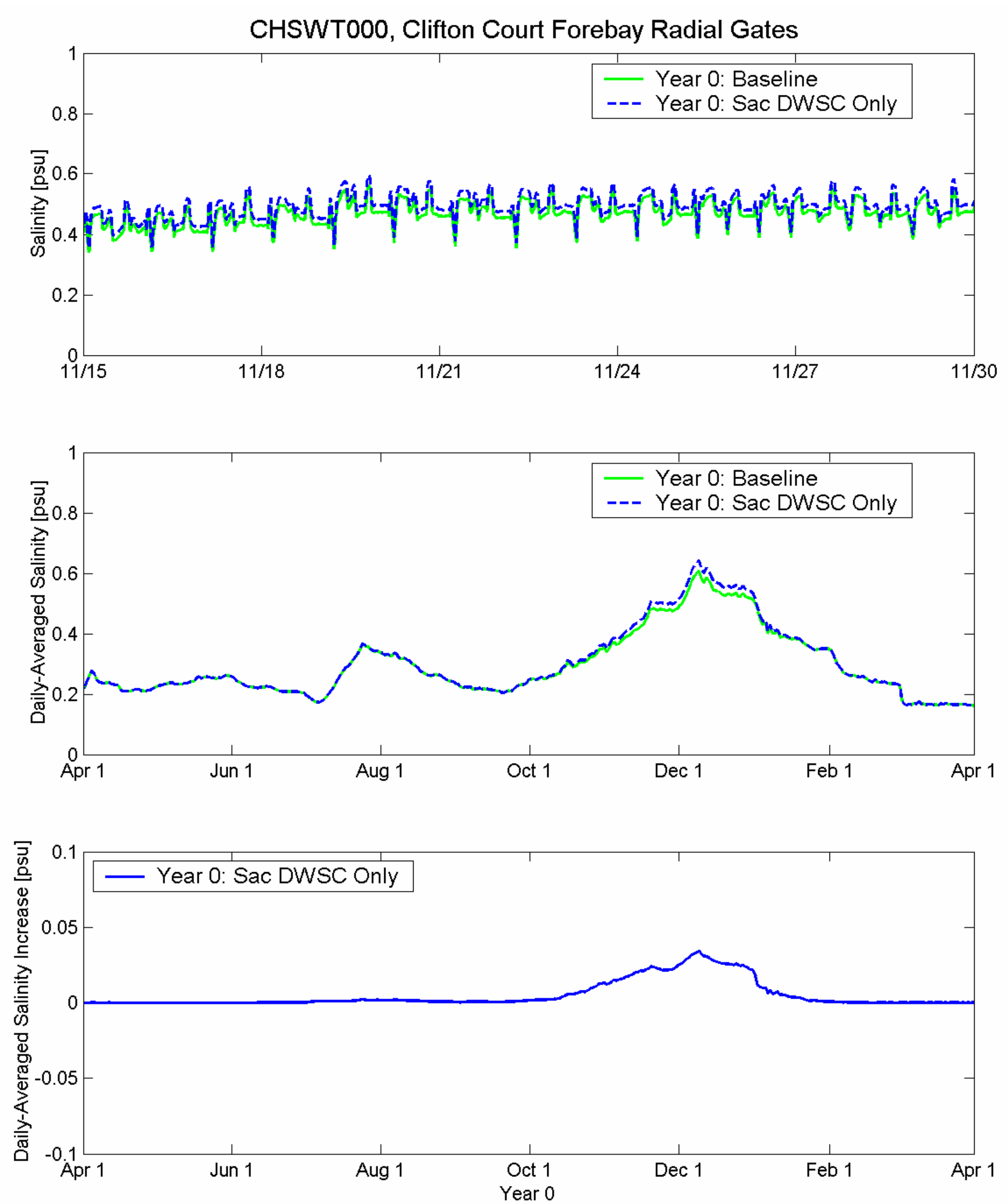


Figure 4.5-21 Predicted salinity at Clifton Court Forebay Radial Gates(CHWST000) for the Year 0 Baseline scenario and the Year 0 Sacramento DWSC Only Deepening scenario: tidal time-scale variability over a 15-day period (top); daily-averaged salinity for the Year 0 simulation period (middle); predicted increase in daily-averaged salinity for the Year 0 Sacramento DWSC Only Deepening scenario relative to the Year 0 Baseline scenario (bottom).

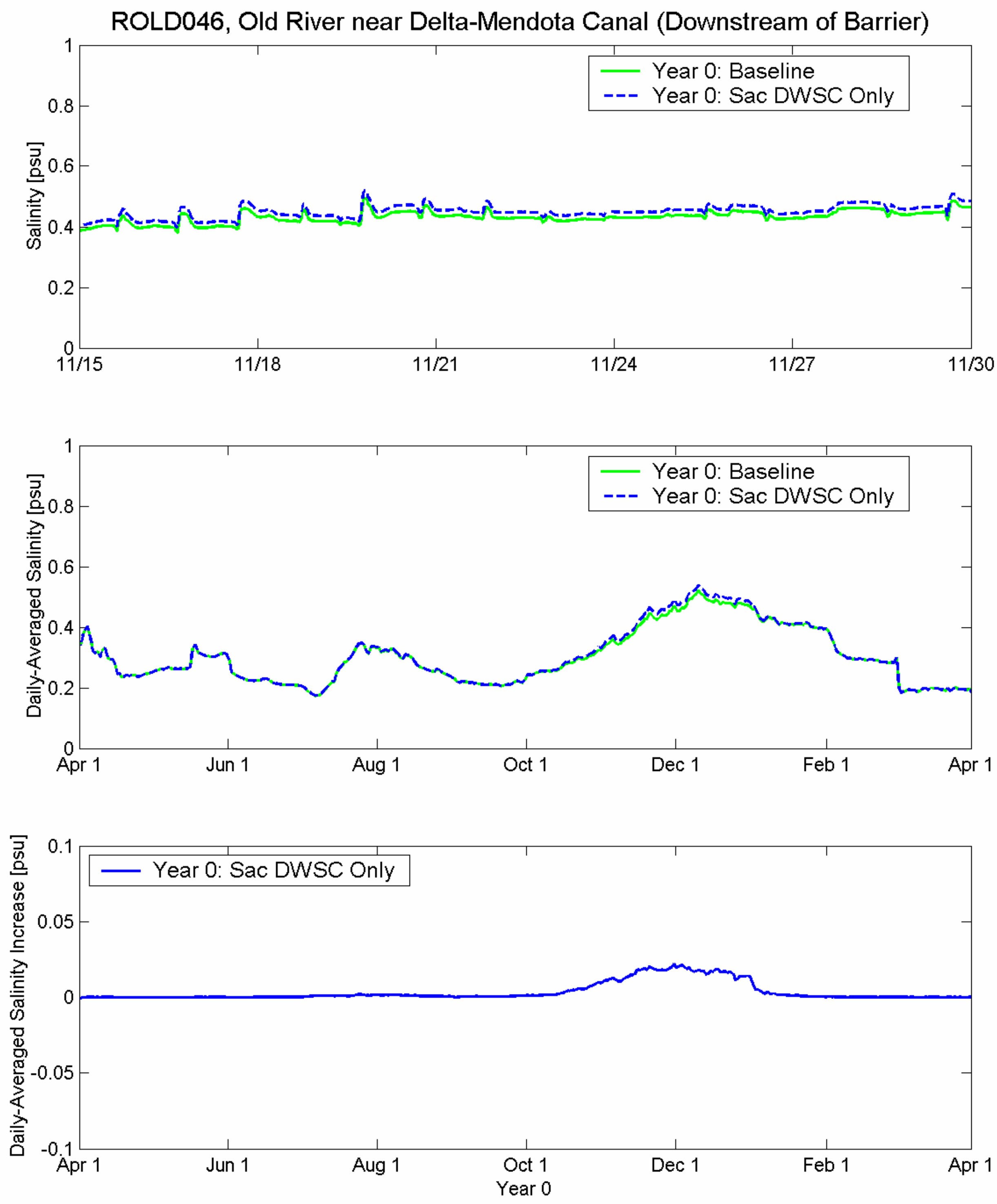


Figure 4.5-22 Predicted salinity at Old River near Delta-Mendota Canal Downstream of Barrier (ROLD046) for the Year 0 Baseline scenario and the Year 0 Sacramento DWSC Only Deepening scenario: tidal time-scale variability over a 15-day period (top); daily-averaged salinity for the Year 0 simulation period (middle); predicted increase in daily-averaged salinity for the Year 0 Sacramento DWSC Only Deepening scenario relative to the Year 0 Baseline scenario (bottom).

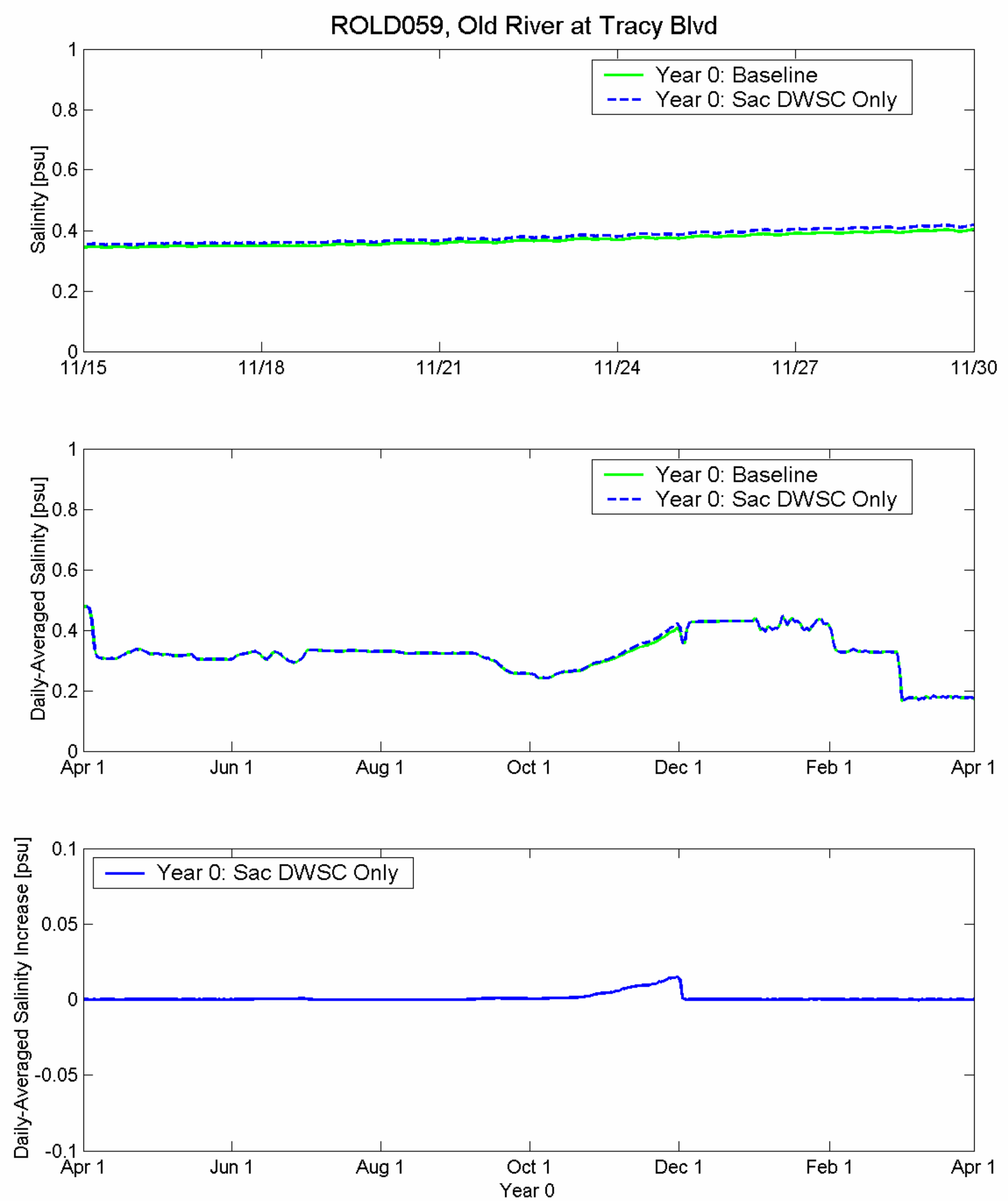


Figure 4.5-23 Predicted salinity at Old River at Tracy Boulevard (ROLD059) for the Year 0 Baseline scenario and the Year 0 Sacramento DWSC Only Deepening scenario: tidal time-scale variability over a 15-day period (top); daily-averaged salinity for the Year 0 simulation period (middle); predicted increase in daily-averaged salinity for the Year 0 Sacramento DWSC Only Deepening scenario relative to the Year 0 Baseline scenario (bottom).

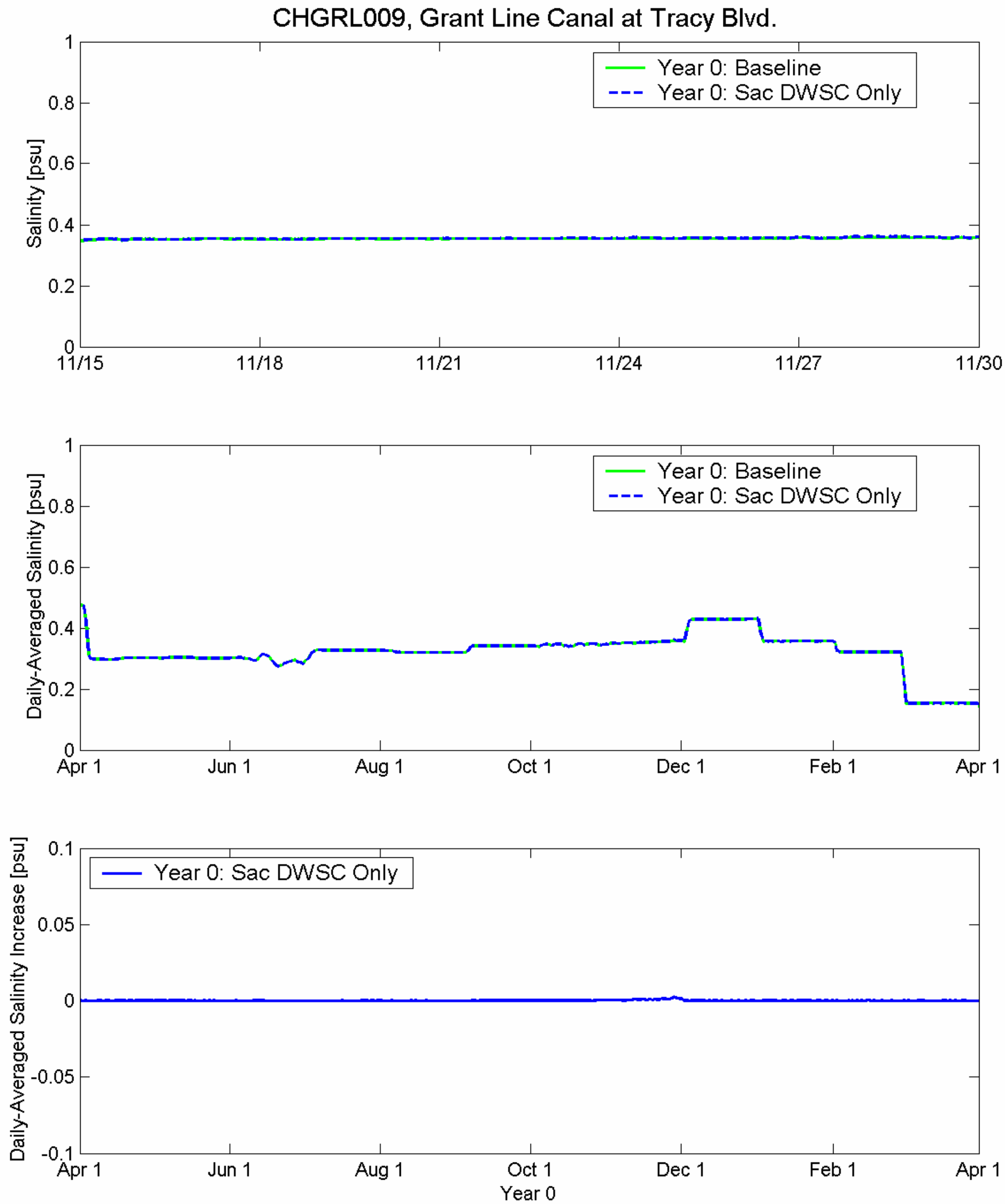


Figure 4.5-24 Predicted salinity at Grant Line Canal at Tracy Boulevard (CHGRL009) for the Year 0 Baseline scenario and the Year 0 Sacramento DWSC Only Deepening scenario: tidal time-scale variability over a 15-day period (top); daily-averaged salinity for the Year 0 simulation period (middle); predicted increase in daily-averaged salinity for the Year 0 Sacramento DWSC Only Deepening scenario relative to the Year 0 Baseline scenario (bottom).

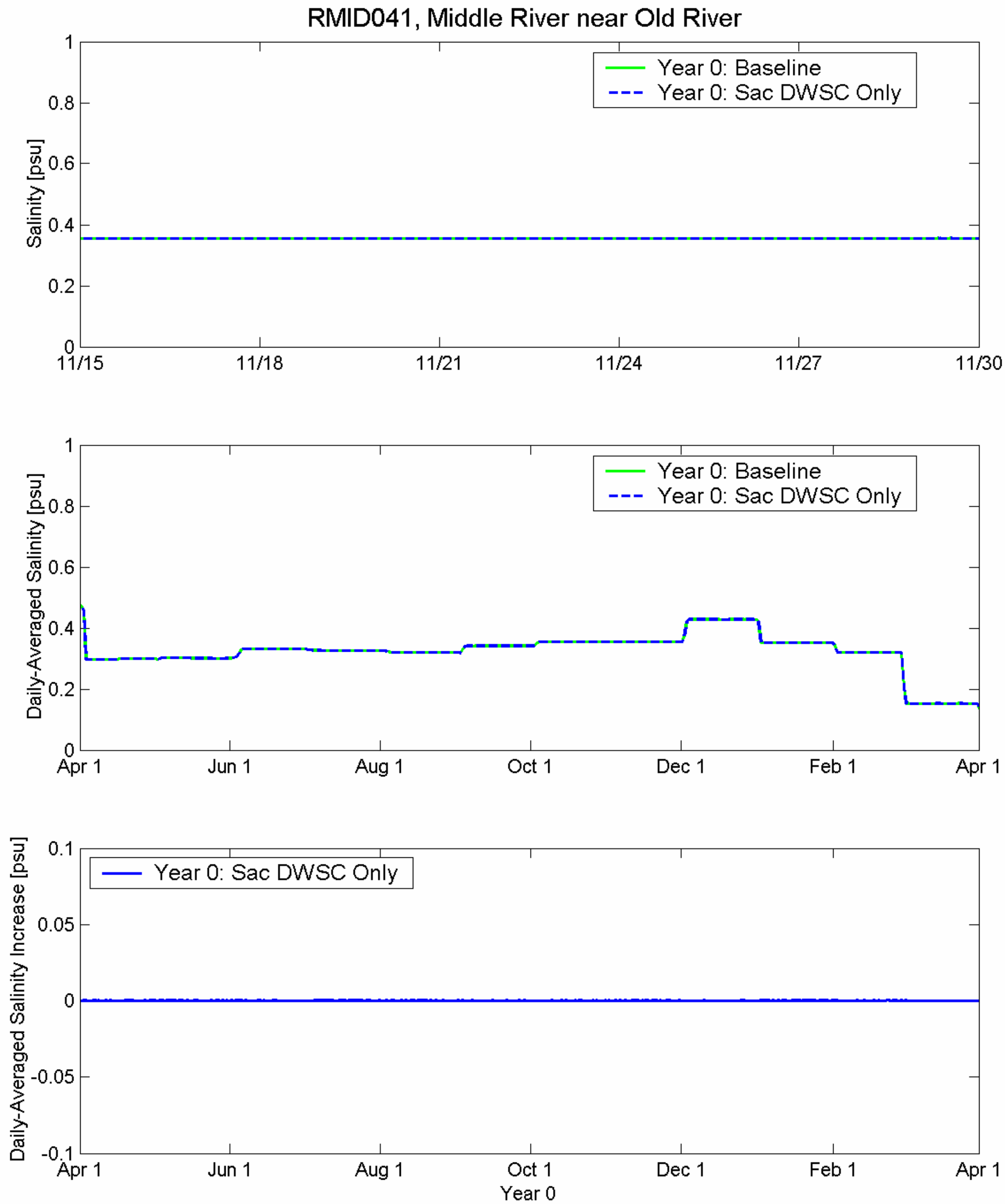


Figure 4.5-25 Predicted salinity at Middle River near Old River (RMID041) for the Year 0 Baseline scenario and the Year 0 Sacramento DWSC Only Deepening scenario: tidal time-scale variability over a 15-day period (top); daily-averaged salinity for the Year 0 simulation period (middle); predicted increase in daily-averaged salinity for the Year 0 Sacramento DWSC Only Deepening scenario relative to the Year 0 Baseline scenario (bottom).

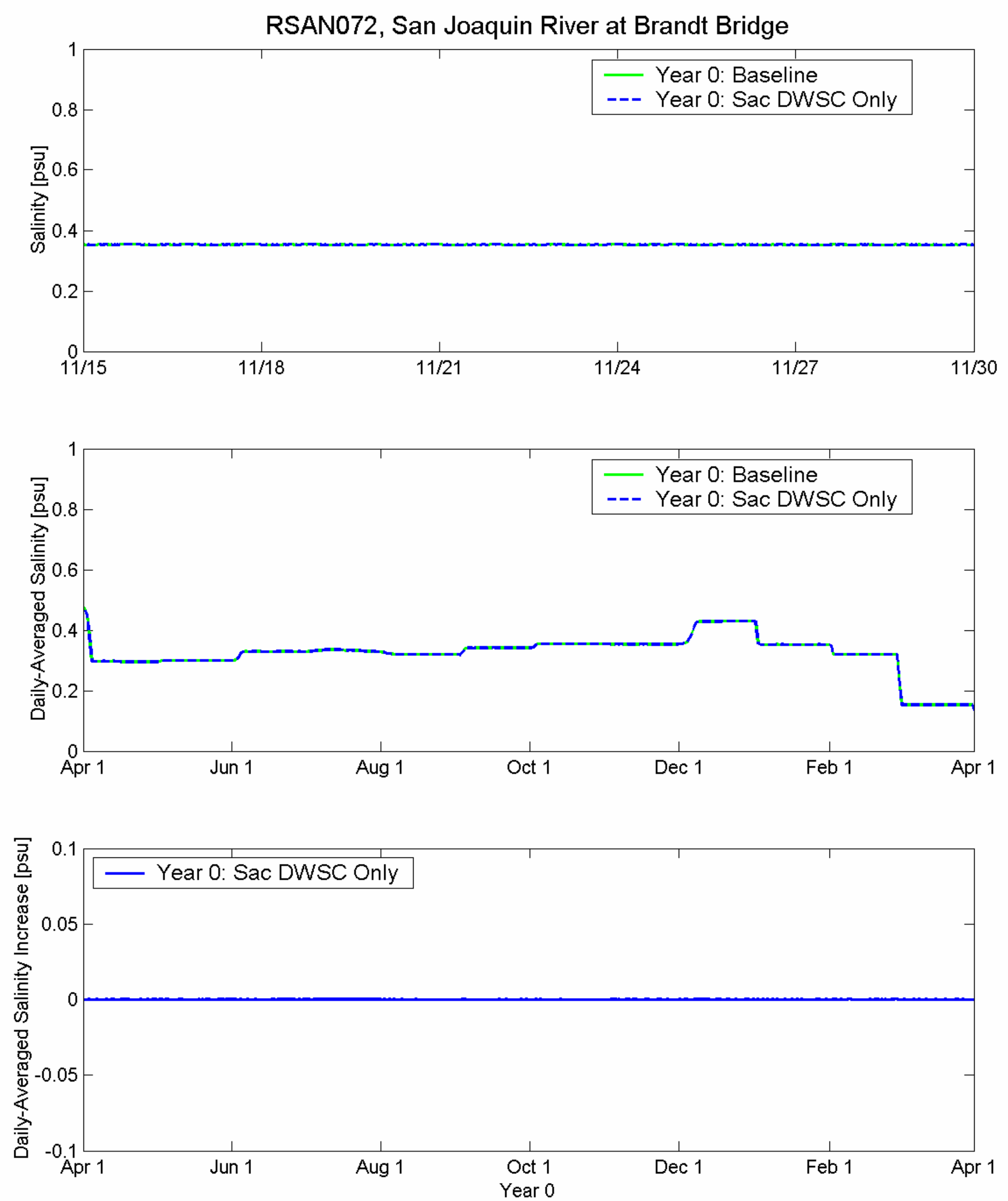


Figure 4.5-26 Predicted salinity at San Joaquin River at Brandt Bridge (RSAN072) for the Year 0 Baseline scenario and the Year 0 Sacramento DWSC Only Deepening scenario: tidal time-scale variability over a 15-day period (top); daily-averaged salinity for the Year 0 simulation period (middle); predicted increase in daily-averaged salinity for the Year 0 Sacramento DWSC Only Deepening scenario relative to the Year 0 Baseline scenario (bottom).

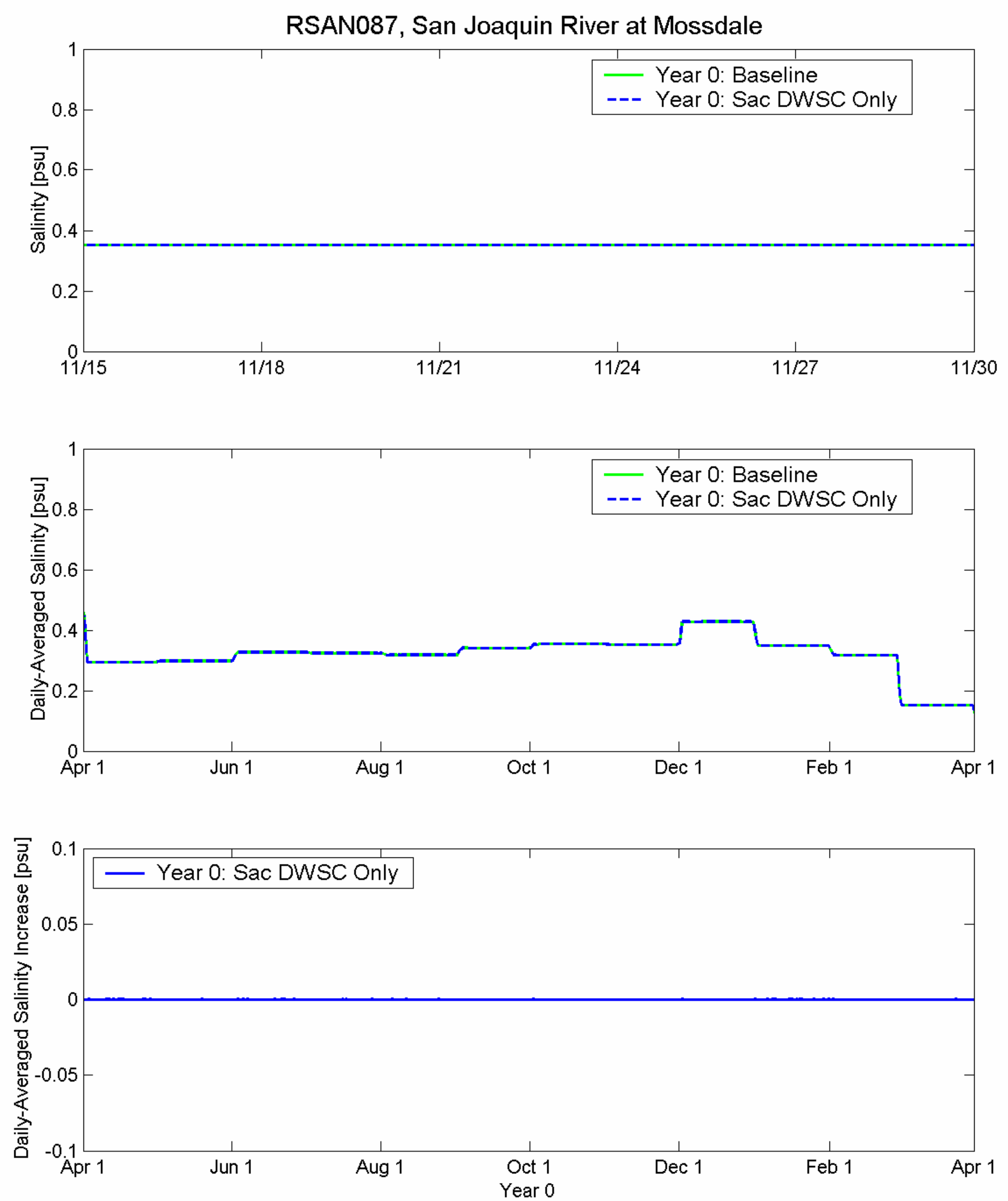


Figure 4.5-27 Predicted salinity at San Joaquin River at Mossdale (RSAN087) for the Year 0 Baseline scenario and the Year 0 Sacramento DWSC Only Deepening scenario: tidal time-scale variability over a 15-day period (top); daily-averaged salinity for the Year 0 simulation period (middle); predicted increase in daily-averaged salinity for the Year 0 Sacramento DWSC Only Deepening scenario relative to the Year 0 Baseline scenario (bottom).

4.5.2 Year 0 Both Sacramento DWSC & SF Bay to Stockton DWSC Deepening

For each salinity comparison figure included in this section, the top plot shows the tidal time-scale variability over a 15-day period for the Year 0 Baseline scenario, the Year 0 Sacramento DWSC Only Deepening scenario, and the Year 0 Both DWSC Deepening scenario. The middle plot shows daily-averaged salinity during the full simulation year for each scenario. The bottom plot shows the predicted increase in daily-averaged salinity for the Year 0 Sacramento DWSC Only Deepening scenario and the Year 0 Both DWSC Deepening scenario relative to the Year 0 Baseline scenario. In cases where the predicted salinity is identical between scenarios, some lines are not fully visible. Since the lines are plotted in the order listed on the legend, for periods where the predicted salinity for the Year 0 Baseline scenario or the Year 0 Sacramento DWSC Only Deepening scenario are not fully visible, the predicted salinity for these scenarios is identical to the visible line(s).

Figure 4.5-28 shows the predicted salinity at the Richmond-San Rafael Bridge Lower Sensor for the Year 0 Baseline scenario, the Year 0 Sacramento DWSC Only Deepening scenario, and the Year 0 Both DWSC Deepening scenario. During the second half of November (top panel of Figure 4.5-28), the predicted salinity for all three scenarios is nearly identical. Similarly, the daily-averaged salinity is nearly identical between the three scenarios over the entire simulation year. The predicted salinity increase for the Year 0 Sacramento DWSC Only Deepening scenario is almost exactly zero during the whole year indicating no predicted salinity increase at the Richmond-San Rafael Bridge Lower Sensor resulting from the Year 0 Sacramento DWSC Only Deepening scenario. The predicted salinity for the Year 0 Both DWSC Deepening scenario shows some very small salinity differences during the high flow periods, however, overall the salinity comparison at the Richmond-San Rafael Bridge Lower Sensor shows no significant predicted salinity impact resulting from either DWSC deepening scenario for Year 0 conditions.

Figure 4.5-29 shows the predicted salinity at the Carquinez Bridge Lower Sensor for the Year 0 Baseline scenario, the Year 0 Sacramento DWSC Only Deepening scenario, and the Year 0 Both DWSC Deepening scenario. During the second half of November (top panel of Figure 4.5-29), the predicted salinity for the Year 0 Baseline scenario and the Year 0 Sacramento DWSC Only Deepening scenario are nearly identical, with a slightly higher predicted salinity for the Year 0 Both DWSC Deepening scenario. Similarly, the predicted daily-averaged salinity for the Year 0 Sacramento DWSC Only Deepening scenario is nearly identical to the predicted daily-averaged salinity under the Year 0 Baseline scenario, while the predicted daily-averaged salinity for the Year 0 Both DWSC Deepening scenario is slightly higher than for the Year 0 Baseline scenario. The predicted salinity increase for the Year 0 Sacramento DWSC Only Deepening scenario is very close to zero during the whole year except for very small differences during January and February during high flows, indicating almost no predicted salinity impact at the Carquinez Bridge Lower Sensor resulting from the Year 0 Sacramento DWSC Only Deepening scenario. The predicted salinity for the Year 0 Both DWSC Deepening scenario is typically 0.4 to 0.6 psu higher than the predicted salinity for the Year 0 Baseline scenario, with predicted salinity increases between January and March of up to 1.5 psu during high flows (see Figure 3.3-1).

Figure 4.5-30 shows the predicted salinity at the Sacramento River at Martinez Surface Sensor for the Year 0 Baseline scenario, the Year 0 Sacramento DWSC Only Deepening scenario, and the Year 0 Both DWSC Deepening scenario. During the second half of November (top panel of Figure 4.5-30), the predicted salinity for the Year 0 Baseline scenario and the Year 0 Sacramento DWSC Only Deepening scenario are nearly identical, with a slightly higher predicted salinity for the Year 0 Both DWSC Deepening scenario. Similarly, the predicted daily-averaged salinity for the Year 0 Sacramento DWSC Only Deepening scenario is nearly identical to the predicted daily-averaged salinity under the Year 0 Baseline scenario, while the predicted daily-averaged salinity for the Year 0 Both DWSC Deepening scenario is slightly higher than for the Year 0 Baseline scenario. The predicted salinity increase for the Year 0 Sacramento DWSC Only Deepening scenario is very close to zero during the whole year, indicating no predicted salinity increase at the Martinez Surface Sensor resulting from the Year 0 Sacramento DWSC Only Deepening scenario. The predicted salinity for the Year 0 Both DWSC Deepening scenario is typically 0.4 to 0.5 psu higher than the predicted salinity for the Year 0 Baseline scenario throughout the year, except during January and March when high flows push the 0.50 psu isohaline as far west as Martinez.

Figure 4.5-31 shows the predicted salinity at the Benicia Bridge Lower Sensor for the Year 0 Baseline scenario, the Year 0 Sacramento DWSC Only Deepening scenario, and the Year 0 Both DWSC Deepening scenario. During the second half of November (top panel of Figure 4.5-31), the predicted salinity for the Year 0 Baseline scenario and the Year 0 Sacramento DWSC Only Deepening scenario are nearly identical, with a slightly higher predicted salinity for the Year 0 Both DWSC Deepening scenario. Similarly, the predicted daily-averaged salinity for the Year 0 Sacramento DWSC Only Deepening scenario is nearly identical to the predicted daily-averaged salinity for the Year 0 Baseline scenario, while the predicted daily-averaged salinity for the Year 0 Both DWSC Deepening scenario is slightly higher than for the Year 0 Baseline scenario. The predicted salinity increase for the Year 0 Sacramento DWSC Only Deepening scenario is very close to zero during the whole year, indicating no predicted salinity increase at the Benicia Bridge Lower Sensor resulting from the Year 0 Sacramento DWSC Only Deepening scenario. The predicted salinity for the Year 0 Both DWSC Deepening scenario is typically 0.4 to 0.5 psu higher than the predicted salinity for the Year 0 Baseline scenario through the year, with maximum predicted salinity increases at the beginning of the January high flows and during February.

Figure 4.5-32 shows the predicted salinity at the Sacramento River near Mallard Island Surface Sensor for the Year 0 Baseline scenario, the Year 0 Sacramento DWSC Only Deepening scenario, and the Year 0 Both DWSC Deepening scenario. During the second half of November (top panel of Figure 4.5-32), the predicted salinity for the Year 0 Baseline scenario and the Year 0 Sacramento DWSC Only Deepening scenario are nearly identical, with a slightly higher predicted salinity for the Year 0 Both DWSC Deepening scenario. Similarly, the predicted daily-averaged salinity for the Year 0 Sacramento DWSC Only Deepening scenario is nearly identical to the predicted daily-averaged salinity for the Year 0 Baseline scenario, while the predicted daily-averaged salinity for the Year 0 Both DWSC Deepening scenario is slightly higher than the predicted daily-averaged salinity for the Year 0 Baseline scenario. The predicted salinity increase for the Year 0 Sacramento DWSC Only Deepening scenario is very close to zero during the whole year, indicating no predicted salinity increase at the Sacramento River near Mallard

Island Surface Sensor resulting from the Year 0 Sacramento DWSC Only Deepening scenario. The predicted salinity for the Year 0 Both DWSC Deepening scenario is typically 0.30 to 0.40 psu higher than the predicted salinity for the Year 0 Baseline scenario from April through December, with no increase predicted during the high flow period from January through March when salinity gradients are pushed west of Mallard Island.

Figure 4.5-33 shows the predicted salinity at the Sacramento River at Emmaton Surface Sensor for the Year 0 Baseline scenario, the Year 0 Sacramento DWSC Only Deepening scenario, and the Year 0 Both DWSC Deepening scenario. During the second half of November (top panel of Figure 4.5-33), the predicted salinity for the Year 0 Sacramento DWSC Only Deepening scenario and the Year 0 Both DWSC Deepening scenario are slightly higher than the predicted salinity for the Year 0 Baseline scenario. The predicted salinity for the Year 0 Sacramento DWSC Only Deepening scenario is nearly identical to the predicted salinity for the Year 0 Baseline scenario, except during July through December when the predicted salinity for the Year 0 Sacramento DWSC Only Deepening scenario is up to 0.10 psu higher than the Year 0 Baseline salinity. The predicted salinity for the Year 0 Both DWSC Deepening scenario shows increases of up to 0.31 psu during late fall conditions, and is nearly identical to Baseline salinity during spring conditions when high flows result in very low salinities in the western Delta.

Figure 4.5-34 shows the predicted salinity at the Sacramento River at Rio Vista for the Year 0 Baseline scenario, the Year 0 Sacramento DWSC Only Deepening scenario, and the Year 0 Both DWSC Deepening scenario. The predicted salinity for the Year 0 Sacramento DWSC Only Deepening scenario is nearly identical to the predicted salinity for the Year 0 Baseline scenario, except from October through December when the predicted salinity for the Year 0 Sacramento DWSC Only Deepening scenario is up to 0.13 psu higher than the Year 0 Baseline salinity. The predicted salinity for the Year 0 Both DWSC Deepening scenario is slightly higher than the Year 0 Baseline salinity from June through September; during October through December the predicted salinity for the Year 0 Both DWSC Deepening scenario is up to 0.23 psu higher than the Year 0 Baseline salinity.

Figure 4.5-35 shows the predicted salinity at the Port of Sacramento for the Year 0 Baseline scenario, the Year 0 Sacramento DWSC Only Deepening scenario, and the Year 0 Both DWSC Deepening scenario. The predicted salinity for all three scenarios is nearly identical throughout the year, and no salinity increases are predicted for either the Year 0 Sacramento DWSC Only Deepening scenario or the Year 0 Both DWSC Deepening scenario.

Figure 4.5-36 shows the predicted salinity at the San Joaquin River at Antioch for the Year 0 Baseline scenario, the Year 0 Sacramento DWSC Only Deepening scenario, and the Year 0 Both DWSC Deepening scenario. During the second half of November (top panel of Figure 4.5-36), the predicted salinity for the Year 0 Baseline scenario and the Year 0 Sacramento DWSC Only Deepening scenario are nearly identical, with a slightly higher predicted salinity for the Year 0 Both DWSC Deepening scenario. Similarly, the predicted daily-averaged salinity for the Year 0 Sacramento DWSC Only Deepening scenario is nearly identical to the predicted daily-averaged salinity for the Year 0 Baseline scenario, while the predicted daily-averaged salinity for the Year 0 Both DWSC Deepening scenario is slightly higher than for the predicted daily-averaged salinity for the Year 0 Baseline scenario. The predicted salinity increase for the Year 0

Sacramento DWSC Only Deepening scenario is very close to zero during the whole year, with a maximum predicted salinity increase of 0.07 psu during December. The predicted salinity for the Year 0 Both DWSC Deepening scenario is higher than the predicted salinity for the Year 0 Baseline scenario from April through January, with the largest predicted salinity increases of up to 0.42 psu during late fall.

Figure 4.5-37 shows the predicted salinity at the San Joaquin River at Jersey Point for the Year 0 Baseline scenario, the Year 0 Sacramento DWSC Only Deepening scenario, and the Year 0 Both DWSC Deepening scenario. The predicted salinity for all three scenarios is nearly identical from April through May and from January through March. From October through December, the predicted salinity for the Year 0 Sacramento DWSC Only Deepening scenario is slightly higher than the predicted salinity for the Year 0 Baseline scenario, with predicted salinity increases of up to 0.09 psu. From June through December, the predicted salinity for the Year 0 Both DWSC Deepening scenario is higher than the predicted salinity for the Year 0 Baseline scenario; salinity increases of up to 0.35 psu are predicted during November and December for the Year 0 Both DWSC Deepening scenario.

Figure 4.5-38 shows the predicted salinity at the San Joaquin River at San Andreas Landing for the Year 0 Baseline scenario, the Year 0 Sacramento DWSC Only Deepening scenario, and the Year 0 Both DWSC Deepening scenario. The predicted salinity for all three scenarios is nearly identical from April through June and from January through March. During November and December, the predicted salinity for the Year 0 Sacramento DWSC Only Deepening scenario is slightly higher than the predicted salinity for the Year 0 Baseline scenario, with predicted salinity increases of up to 0.03 psu. Salinity increases of up to 0.14 psu are predicted during November and December for the Year 0 Both DWSC Deepening scenario.

Figure 4.5-39 shows the predicted salinity at the San Joaquin River before Prisoners Point for the Year 0 Baseline scenario, the Year 0 Sacramento DWSC Only Deepening scenario, and the Year 0 Both DWSC Deepening scenario. The predicted salinity for all three scenarios is nearly identical from April through June and from February through March. During November and December, the predicted salinity for the Year 0 Sacramento DWSC Only Deepening scenario is slightly higher than the predicted salinity for the Year 0 Baseline scenario, with predicted salinity increases of up to 0.03 psu. Salinity increases of up to 0.12 psu are predicted during November and December for the Year 0 Both DWSC Deepening scenario.

Figure 4.5-40 shows the predicted salinity at the Stockton Ship Channel at Burns Cutoff for the Year 0 Baseline scenario, the Year 0 Sacramento DWSC Only Deepening scenario, and the Year 0 Both DWSC Deepening scenario. The predicted salinity for the Year 0 Sacramento DWSC Only Deepening scenario is nearly identical the predicted salinity for the Year 0 Baseline scenario throughout the year, with no predicted salinity increases resulting from the Year 0 Sacramento DWSC Only Deepening scenario. The predicted salinity for the Year 0 Both DWSC Deepening scenario is nearly identical the predicted salinity for the Year 0 Baseline scenario throughout the year, however some salinity increases and decreases of up to 0.03 psu are predicted. For the Year 0 Both DWSC Deepening scenario, salinity decreases are predicted during several periods, particularly during periods when salinity of Delta inflows on the Calaveras River or San Joaquin River are increasing. Salinity decreases occur because the increased volume of the Stockton DWSC under the deepening scenario results in a longer time required for the salinity in the DWSC to reach the concentration of the inflow salinities due to a larger volume within the DWSC which dilutes inflow salinity during the periods of increasing inflow salinity.

Figure 4.5-41 shows the predicted salinity at the South Fork Mokelumne River at Staten Island for the Year 0 Baseline scenario, the Year 0 Sacramento DWSC Only Deepening scenario, and the Year 0 Both DWSC Deepening scenario. The predicted salinity for all three scenarios is nearly identical throughout the year, and no salinity increases are predicted for either the Year 0 Sacramento DWSC Only Deepening scenario or the Year 0 Both DWSC Deepening scenario.

Figure 4.5-42 shows the predicted salinity at Dutch Slough at Jersey Island for the Year 0 Baseline scenario, the Year 0 Sacramento DWSC Only Deepening scenario, and the Year 0 Both DWSC Deepening scenario. The predicted salinity for all three scenarios is nearly identical from April through June and from February through March. During December and January, the predicted salinity for the Year 0 Sacramento DWSC Only Deepening scenario is slightly higher than the predicted salinity for the Year 0 Baseline scenario, with predicted salinity increases of up to 0.08 psu. Salinity increases of up to 0.27 psu during November and December are predicted for the Year 0 Both DWSC Deepening scenario.

Figure 4.5-43 shows the predicted salinity at Old River and Holland Cut at Mandeville Island for the Year 0 Baseline scenario, the Year 0 Sacramento DWSC Only Deepening scenario, and the Year 0 Both DWSC Deepening scenario. During the second half of November (top panel of Figure 4.5-43), the predicted salinity for the Year 0 Sacramento DWSC Only Deepening scenario is typically 0.03 psu higher than the predicted salinity for the Year 0 Baseline scenario throughout the tidal cycle, and the predicted salinity for the Year 0 Both DWSC Deepening scenario is typically 0.12 psu higher than the predicted salinity for the Year 0 Baseline scenario throughout the tidal cycle. The predicted daily-averaged salinity for all three scenarios is nearly identical from April through June and from February through March. During late October, the predicted salinity for the Year 0 Sacramento DWSC Only Deepening scenario is slightly higher than the predicted salinity for the Year 0 Baseline scenario, with predicted salinity increases of up to 0.06 psu. Salinity increases of up to 0.17 psu are predicted during October through December for the Year 0 Both DWSC Deepening scenario.

Figure 4.5-44 shows the predicted salinity at Old River at Bacon Island for the Year 0 Baseline scenario, the Year 0 Sacramento DWSC Only Deepening scenario, and the Year 0 Both DWSC Deepening scenario. During the second half of November (top panel of Figure 4.5-44), the predicted salinity for the Year 0 Sacramento DWSC Only Deepening scenario is typically 0.03 psu higher than the predicted salinity for the Year 0 Baseline scenario throughout the tidal cycle, and the predicted salinity for the Year 0 Both DWSC Deepening scenario is typically 0.12 psu higher than the predicted salinity for the Year 0 Baseline scenario throughout the tidal cycle. The predicted daily-averaged salinity for all three scenarios is nearly identical from April through June and from February through March. From November through December, the predicted salinity for the Year 0 Sacramento DWSC Only Deepening scenario is slightly higher than the predicted salinity for the Year 0 Baseline scenario, with predicted salinity increases of up to 0.06 psu. Salinity increases of up to 0.18 psu are predicted during November and December for the Year 0 Both DWSC Deepening scenario.

Figure 4.5-45 shows the predicted salinity at Middle River at Borden Highway for the Year 0 Baseline scenario, the Year 0 Sacramento DWSC Only Deepening scenario, and the Year 0 Both DWSC Deepening scenario. During the second half of November (top panel of Figure 4.5-45), the predicted salinity for the Year 0 Sacramento DWSC Only Deepening scenario is typically 0.01 psu higher than the predicted salinity for the Year 0 Baseline scenario throughout the tidal cycle, and the predicted salinity for the Year 0 Both DWSC Deepening scenario is typically 0.03 psu higher than the predicted salinity for the Year 0 Baseline scenario throughout the tidal cycle. The predicted daily-averaged salinity for all three scenarios is nearly identical from April through June and from February through March.
During December, the predicted salinity for the Year 0 Sacramento DWSC Only Deepening scenario is slightly higher than the predicted salinity for the Year 0 Baseline scenario, with predicted salinity increases of up to 0.02 psu. Salinity increases of up to 0.09 psu are predicted during December for the Year 0 Both DWSC Deepening scenario. Similar to the Stockton Ship Channel at Burns Cutoff comparison (Figure 4.5-40), salinity decreases under the Year 0 Both DWSC Deepening scenario are predicted during some periods when salinity is increasing.

Figure 4.5-46 shows the predicted salinity at Middle River at Tracy Boulevard for the Year 0 Baseline scenario, the Year 0 Sacramento DWSC Only Deepening scenario, and the Year 0 Both DWSC Deepening scenario. During the second half of November (top panel of Figure 4.5-46), the predicted salinity for the Year 0 Sacramento DWSC Only Deepening scenario is nearly identical to the predicted salinity for the Year 0 Baseline scenario throughout the tidal cycle; the predicted salinity for the Year 0 Both DWSC Deepening scenario is up to 0.02 psu higher than the predicted salinity for the Year 0 Baseline scenario during some portions of the tidal cycle. The predicted daily-averaged salinity for all three scenarios is nearly identical from April through June and from January through March. During December, the predicted salinity for the Year 0 Sacramento DWSC Only Deepening scenario is slightly higher than the predicted salinity for the Year 0 Baseline scenario, with predicted salinity increases of up to 0.02 psu. Salinity increases of up to 0.08 psu are predicted during December for the Year 0 Both DWSC Deepening scenario.

Figure 4.5-47 shows the predicted salinity at Victoria Canal near Byron for the Year 0 Baseline scenario, the Year 0 Sacramento DWSC Only Deepening scenario, and the Year 0 Both DWSC Deepening scenario. During the second half of November (top panel of Figure 4.5-47), the predicted salinity for the Year 0 Sacramento DWSC Only Deepening scenario is typically 0.01 psu higher than the predicted salinity for the Year 0 Baseline scenario throughout the tidal cycle; the predicted salinity for the Year 0 Both DWSC Deepening scenario is typically 0.03 psu higher than the predicted salinity for the Year 0 Baseline scenario throughout the tidal cycle. The predicted daily-averaged salinity for all three scenarios is nearly identical from April through June and from February through March. During December, the predicted salinity for the Year 0 Sacramento DWSC Only Deepening scenario is slightly higher than the predicted salinity for the Year 0 Baseline scenario, with predicted salinity increases of up to 0.02 psu. Salinity increases of up to 0.09 psu are predicted during December for the Year 0 Both DWSC Deepening scenario.

Figure 4.5-48 shows the predicted salinity at the Clifton Court Forebay Radial Gates for the Year 0 Baseline scenario, the Year 0 Sacramento DWSC Only Deepening scenario, and the Year 0 Both DWSC Deepening scenario. During the second half of November (top panel of Figure 4.5-48), the predicted salinity for the Year 0 Sacramento DWSC Only Deepening scenario is up to 0.02 psu higher than the predicted salinity for the Year 0 Baseline scenario throughout the tidal cycle; the predicted salinity for the Year 0 Both DWSC Deepening scenario is typically 0.08 psu higher than the predicted salinity for the Year 0 Baseline scenario throughout the tidal cycle. The predicted daily-averaged salinity for all three scenarios is nearly identical from April through June and from February through March. From November through January, the predicted salinity for the Year 0 Sacramento DWSC Only Deepening scenario is slightly higher than the predicted salinity for the Year 0 Baseline scenario, with predicted salinity increases of up to 0.03 psu. Salinity increases of up to 0.12 psu are predicted during November and December for the Year 0 Both DWSC Deepening scenario.

Figure 4.5-49 shows the predicted salinity at Old River near Delta-Mendota Canal (Downstream of Barrier) for the Year 0 Baseline scenario, the Year 0 Sacramento DWSC Only Deepening scenario, and the Year 0 Both DWSC Deepening scenario. During the second half of November (top panel of Figure 4.5-49), the predicted salinity for the Year 0 Sacramento DWSC Only Deepening scenario is up to 0.02 psu higher than the predicted salinity for the Year 0 Baseline scenario throughout the tidal cycle; the predicted salinity for the Year 0 Both DWSC Deepening scenario is up to 0.07 psu higher than the Year 0 Baseline scenario throughout the tidal cycle. The predicted daily-averaged salinity for all three scenarios is nearly identical from April through June and from February through March. During November and December, the predicted salinity for the Year 0 Sacramento DWSC Only Deepening scenario is slightly higher than the predicted salinity for the Year 0 Baseline scenario, with predicted salinity increases of up to 0.02 psu. Salinity increases are predicted during July through December for the Year 0 Both DWSC Deepening scenario with predicted salinity increases of up to 0.08 psu.

Figure 4.5-50 shows the predicted salinity at Old River at Tracy Boulevard for the Year 0 Baseline scenario, the Year 0 Sacramento DWSC Only Deepening scenario, and the Year 0 Both DWSC Deepening scenario. The predicted salinity for all three scenarios is nearly identical throughout the year. During November, the predicted salinity for the Year 0 Sacramento DWSC Only Deepening scenario is slightly higher than the predicted salinity for the Year 0 Baseline scenario, with predicted salinity increases of up to 0.015 psu. From September through November, the predicted salinity for the Year 0 Both DWSC Deepening scenario is higher than the predicted salinity for the Year 0 Baseline scenario, with predicted salinity increases of up to 0.06 psu.

Figure 4.5-51 shows the predicted salinity at Grant Line Canal at Tracy Boulevard for the Year 0 Baseline scenario, the Year 0 Sacramento DWSC Only Deepening scenario, and the Year 0 Both DWSC Deepening scenario. The predicted salinity for all three scenarios is nearly identical throughout the year, and no significant salinity increases are predicted for either the Year 0 Sacramento DWSC Only Deepening scenario or the Year 0 Both DWSC Deepening scenario.

Figure 4.5-52 shows the predicted salinity at Middle River near Old River for the Year 0 Baseline scenario, the Year 0 Sacramento DWSC Only Deepening scenario, and the Year 0 Both

DWSC Deepening scenario. The predicted salinity for all three scenarios is nearly identical throughout the year, and no salinity increases are predicted for either the Year 0 Sacramento DWSC Only Deepening scenario or the Year 0 Both DWSC Deepening scenario.

Figure 4.5-53 shows the predicted salinity at San Joaquin River at Brandt Bridge for the Year 0 Baseline scenario, the Year 0 Sacramento DWSC Only Deepening scenario, and the Year 0 Both DWSC Deepening scenario. The predicted salinity for all three scenarios is nearly identical throughout the year, and no salinity increases are predicted for either the Year 0 Sacramento DWSC Only Deepening scenario or the Year 0 Both DWSC Deepening scenario.

Figure 4.5-54 shows the predicted salinity at San Joaquin River at Mossdale for the Year 0 Baseline scenario, the Year 0 Sacramento DWSC Only Deepening scenario, and the Year 0 Both DWSC Deepening scenario. The predicted salinity for all three scenarios is nearly identical throughout the year, and no salinity increases are predicted for either the Year 0 Sacramento DWSC Only Deepening scenario or the Year 0 Both DWSC Deepening scenario.

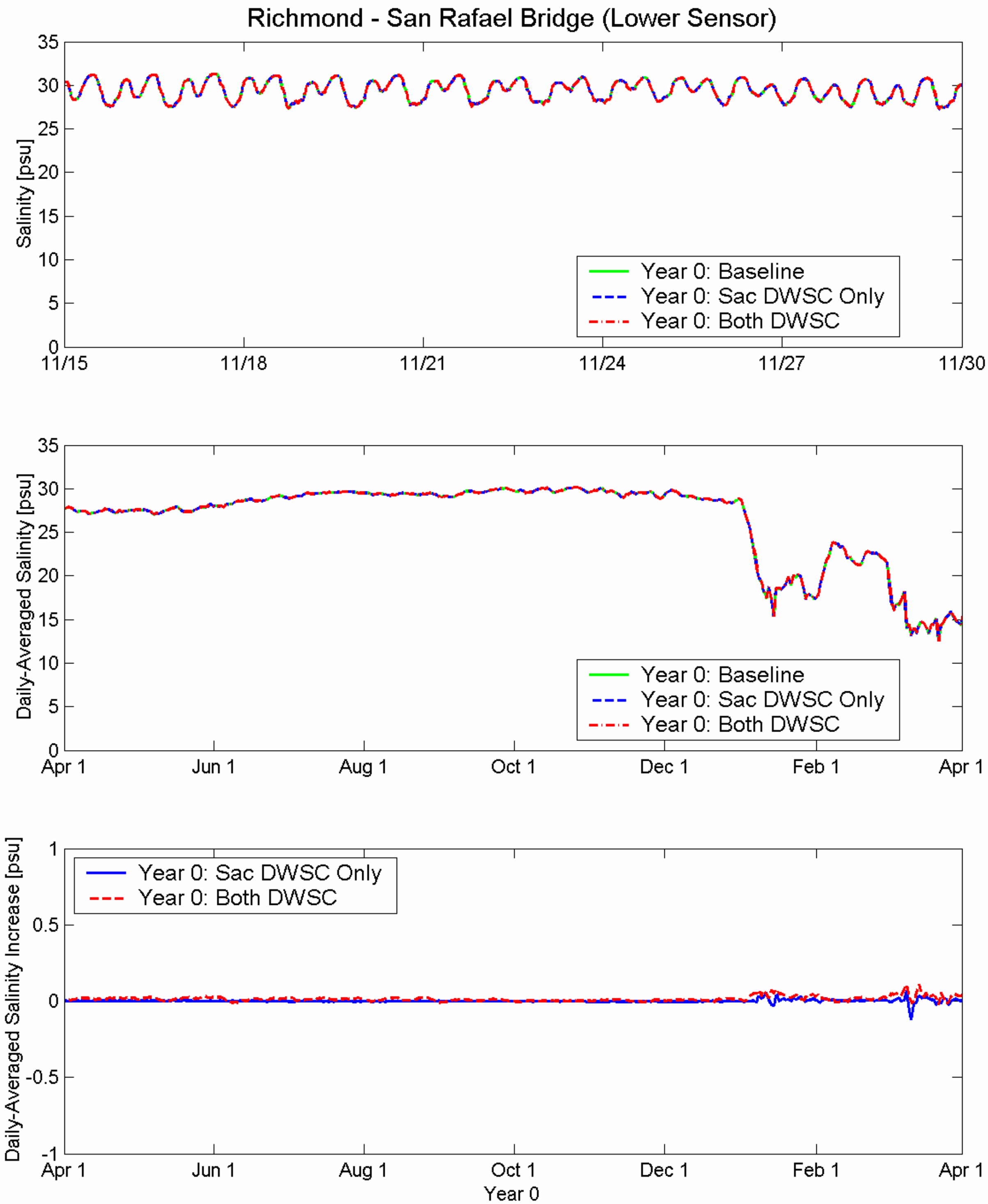


Figure 4.5-28 Predicted salinity at Richmond-San Rafael Bridge Lower Sensor for the Year 0 Baseline scenario, the Year 0 Sacramento DWSC Only Deepening scenario, and the Year 0 Both DWSC Deepening scenario: tidal time-scale variability over a 15-day period (top); daily-averaged salinity for the Year 0 simulation period (middle); predicted increase in daily-averaged salinity for the Year 0 Sacramento DWSC Only Deepening scenario and the Year 0 Both DWSC Deepening scenario relative to the Year 0 Baseline scenario (bottom).

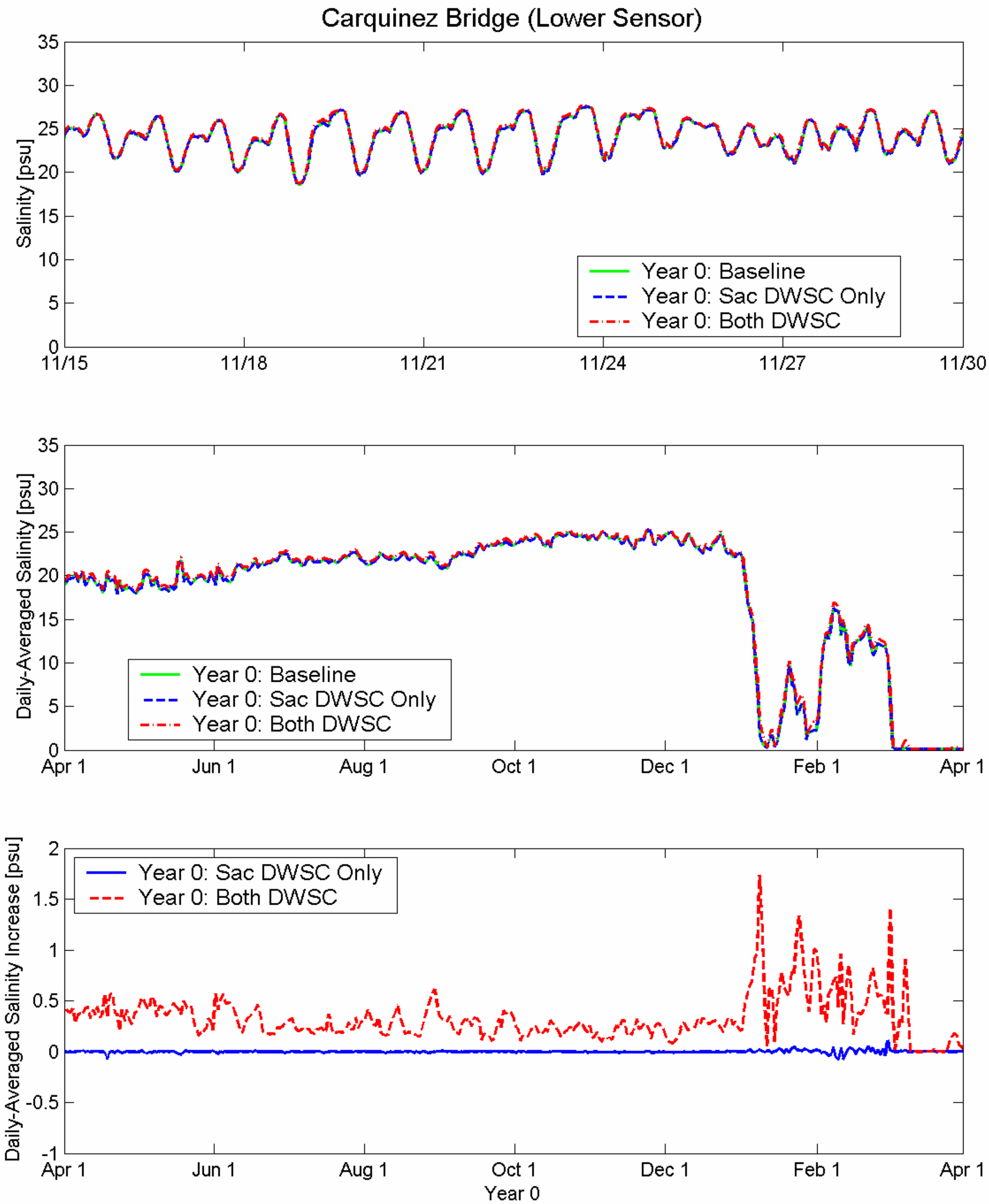


Figure 4.5-29 Predicted salinity at Carquinez Bridge Lower Sensor for the Year 0 Baseline scenario, the Year 0 Sacramento DWSC Only Deepening scenario, and the Year 0 Both DWSC Deepening scenario: tidal time-scale variability over a 15-day period (top); daily-averaged salinity for the Year 0 simulation period (middle); predicted increase in daily-averaged salinity for the Year 0 Sacramento DWSC Only Deepening scenario and the Year 0 Both DWSC Deepening scenario relative to the Year 0 Baseline scenario (bottom).

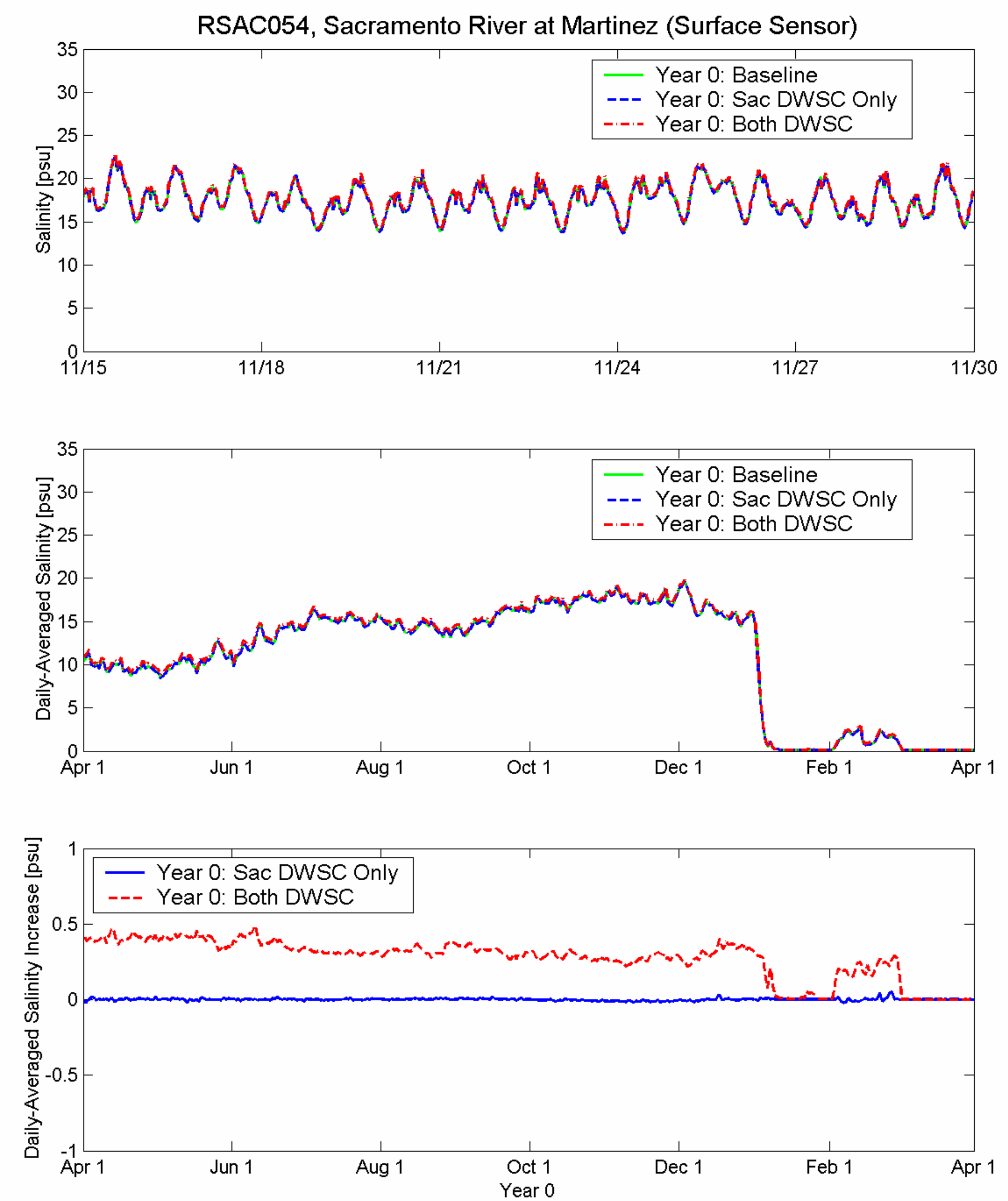


Figure 4.5-30 Predicted salinity at Sacramento River at Martinez (RSAC054) for the Year 0 Baseline scenario, the Year 0 Sacramento DWSC Only Deepening scenario, and the Year 0 Both DWSC Deepening scenario: tidal time-scale variability over a 15-day period (top); daily-averaged salinity for the Year 0 simulation period (middle); predicted increase in daily-averaged salinity for the Year 0 Sacramento DWSC Only Deepening scenario and the Year 0 Both DWSC Deepening scenario relative to the Year 0 Baseline scenario (bottom).

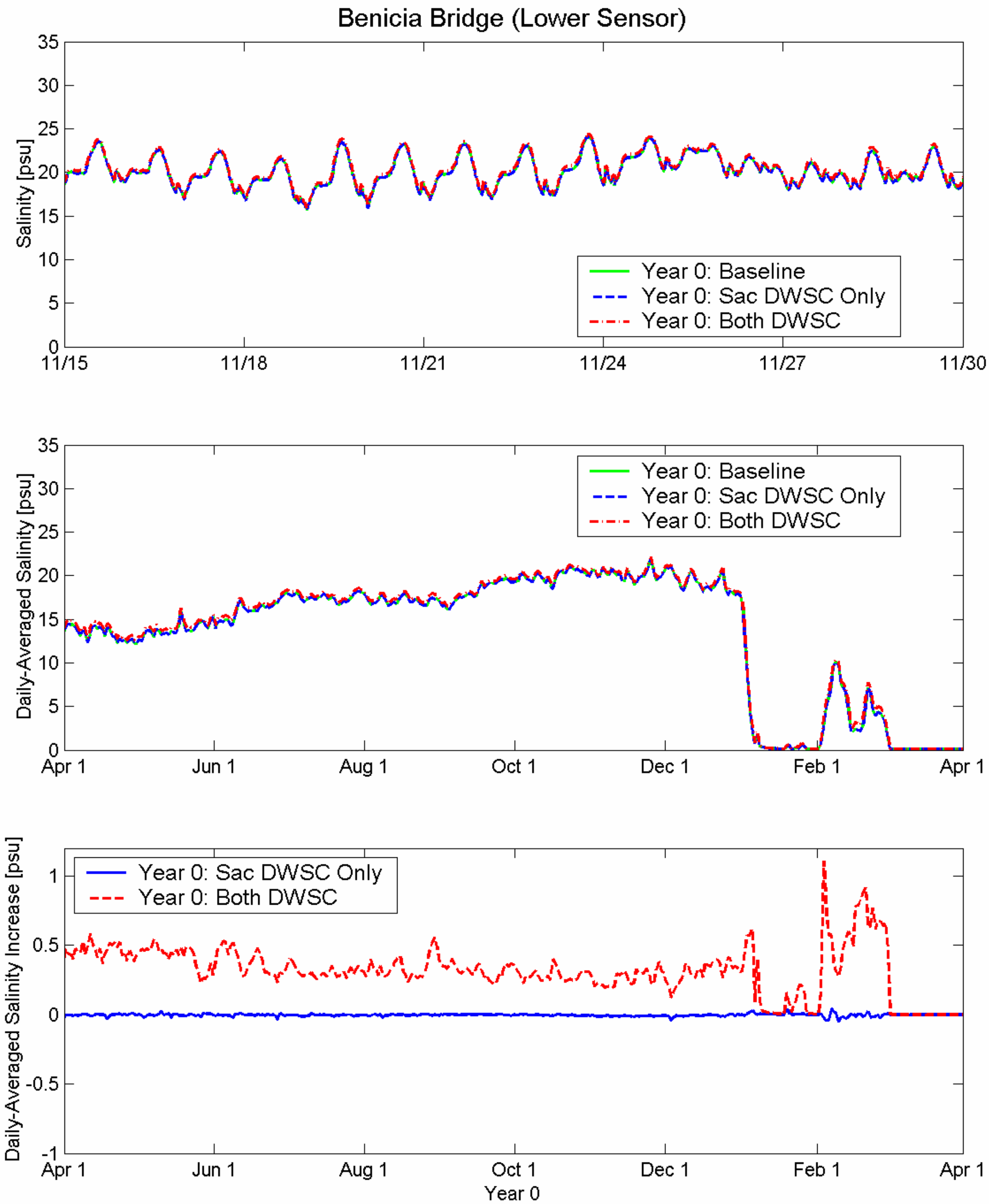


Figure 4.5-31 Predicted salinity at Benicia Bridge Lower Sensor for the Year 0 Baseline scenario, the Year 0 Sacramento DWSC Only Deepening scenario, and the Year 0 Both DWSC Deepening scenario: tidal time-scale variability over a 15-day period (top); daily-averaged salinity for the Year 0 simulation period (middle); predicted increase in daily-averaged salinity for the Year 0 Sacramento DWSC Only Deepening scenario and the Year 0 Both DWSC Deepening scenario relative to the Year 0 Baseline scenario (bottom).

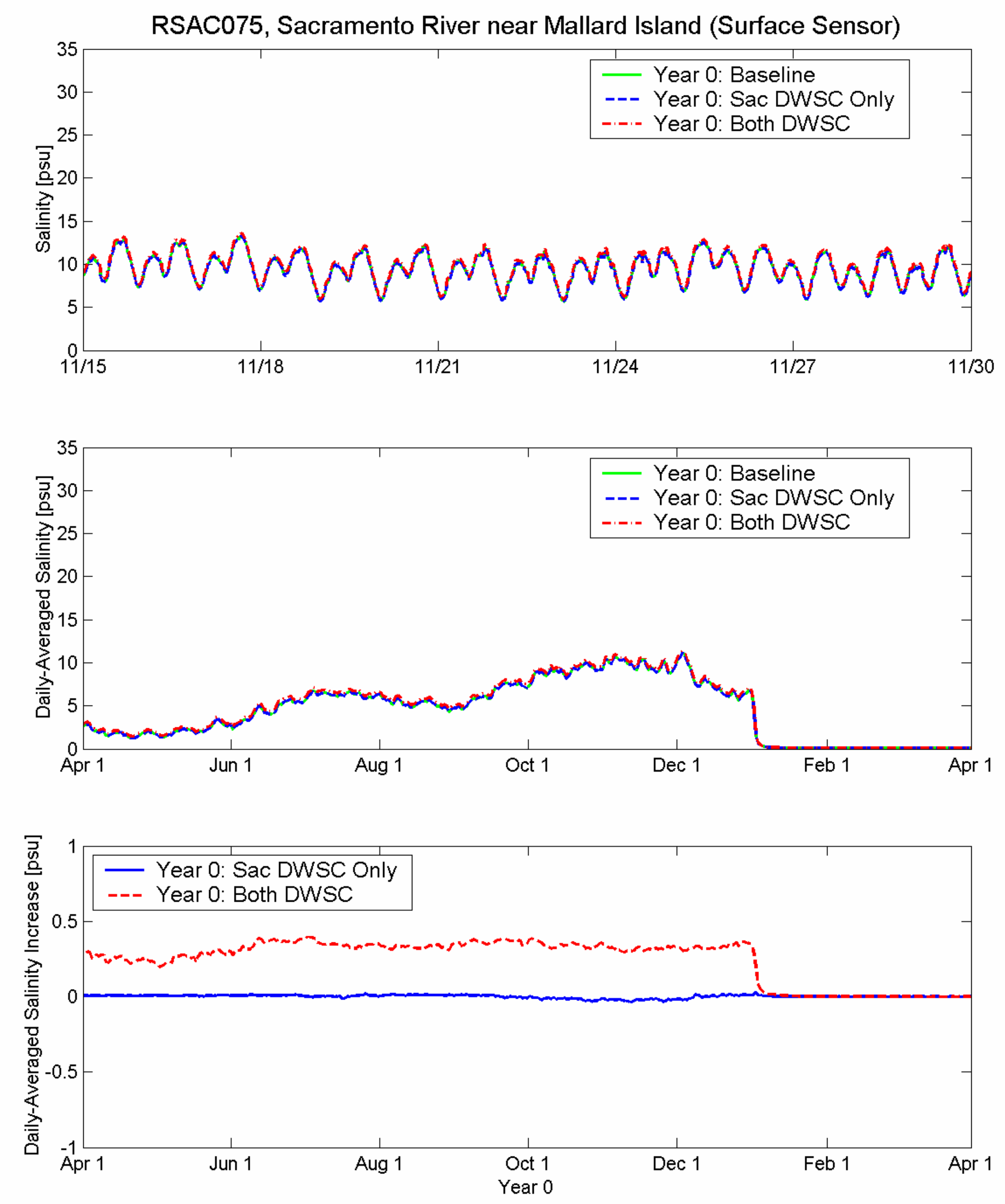


Figure 4.5-32 Predicted salinity at Sacramento River near Mallard Island (RSAC075) for the Year 0 Baseline scenario, the Year 0 Sacramento DWSC Only Deepening scenario, and the Year 0 Both DWSC Deepening scenario: tidal time-scale variability over a 15-day period (top); daily-averaged salinity for the Year 0 simulation period (middle); predicted increase in daily-averaged salinity for the Year 0 Sacramento DWSC Only Deepening scenario and the Year 0 Both DWSC Deepening scenario relative to the Year 0 Baseline scenario (bottom).

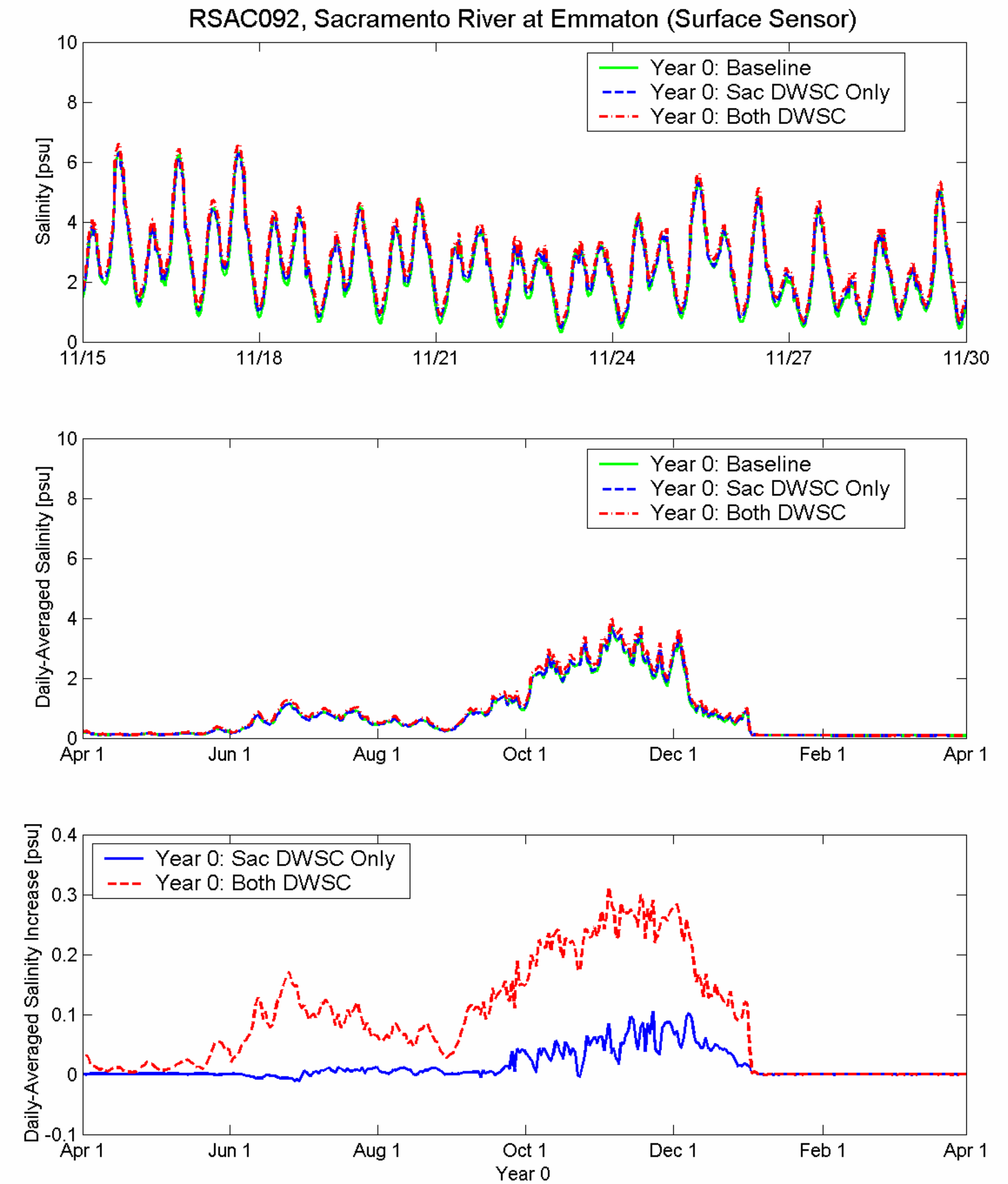


Figure 4.5-33 Predicted salinity at the Sacramento River at Emmaton (RSAC092) Surface Sensor for the Year 0 Baseline scenario, the Year 0 Sacramento DWSC Only Deepening scenario, and the Year 0 Both DWSC Deepening scenario: tidal time-scale variability over a 15-day period (top); daily-averaged salinity for the Year 0 simulation period (middle); predicted increase in daily-averaged salinity for the Year 0 Sacramento DWSC Only Deepening scenario and the Year 0 Both DWSC Deepening scenario relative to the Year 0 Baseline scenario (bottom).

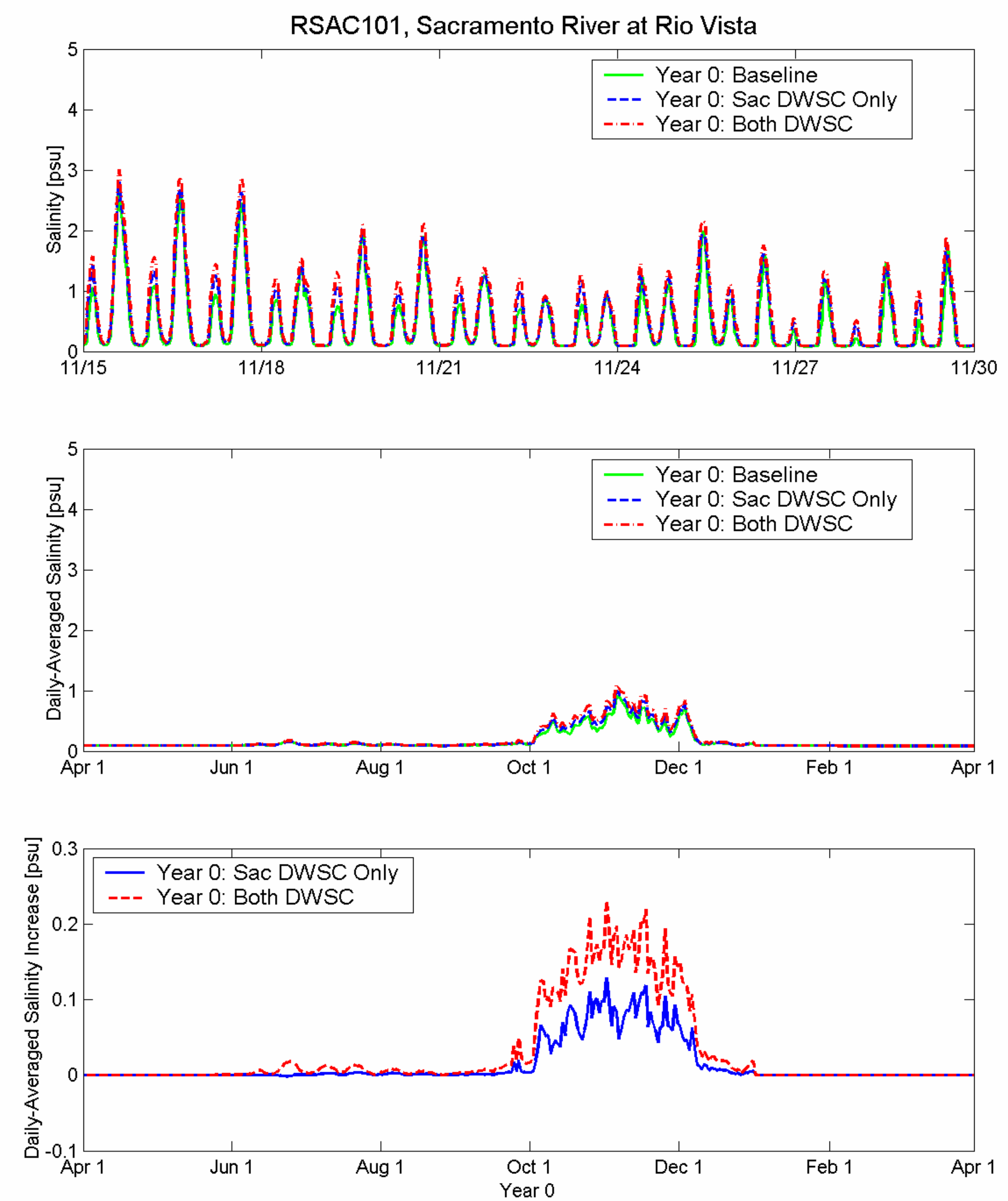


Figure 4.5-34 Predicted salinity at Sacramento River at Rio Vista (RSAC101) for the Year 0 Baseline scenario, the Year 0 Sacramento DWSC Only Deepening scenario, and the Year 0 Both DWSC Deepening scenario: tidal time-scale variability over a 15-day period (top); daily-averaged salinity for the Year 0 simulation period (middle); predicted increase in daily-averaged salinity for the Year 0 Sacramento DWSC Only Deepening scenario and the Year 0 Both DWSC Deepening scenario relative to the Year 0 Baseline scenario (bottom).

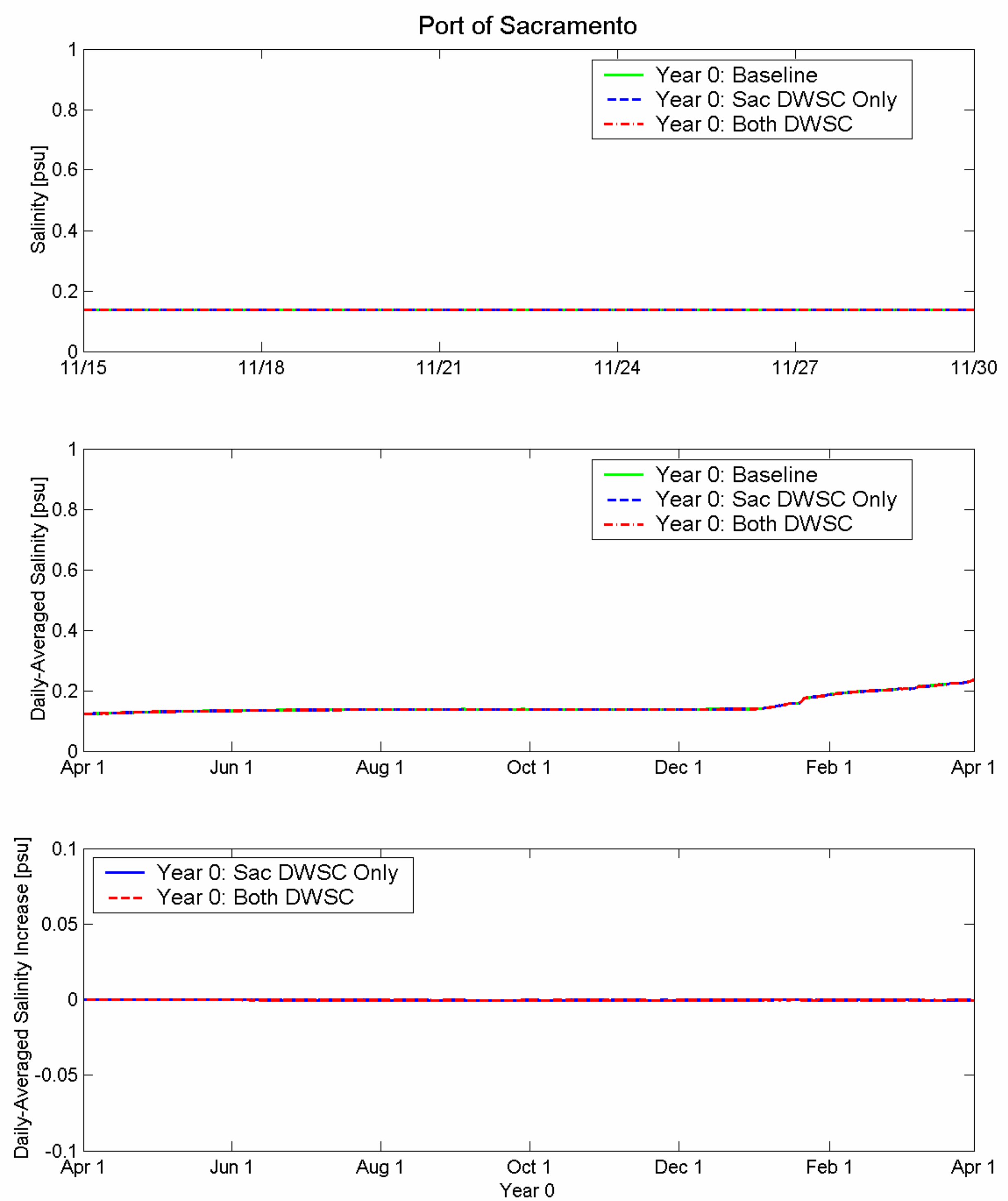


Figure 4.5-35 Predicted salinity at the Port of Sacramento for the Year 0 Baseline scenario, the Year 0 Sacramento DWSC Only Deepening scenario, and the Year 0 Both DWSC Deepening scenario: tidal time-scale variability over a 15-day period (top); daily-averaged salinity for the Year 0 simulation period (middle); predicted increase in daily-averaged salinity for the Year 0 Sacramento DWSC Only Deepening scenario and the Year 0 Both DWSC Deepening scenario relative to the Year 0 Baseline scenario (bottom).

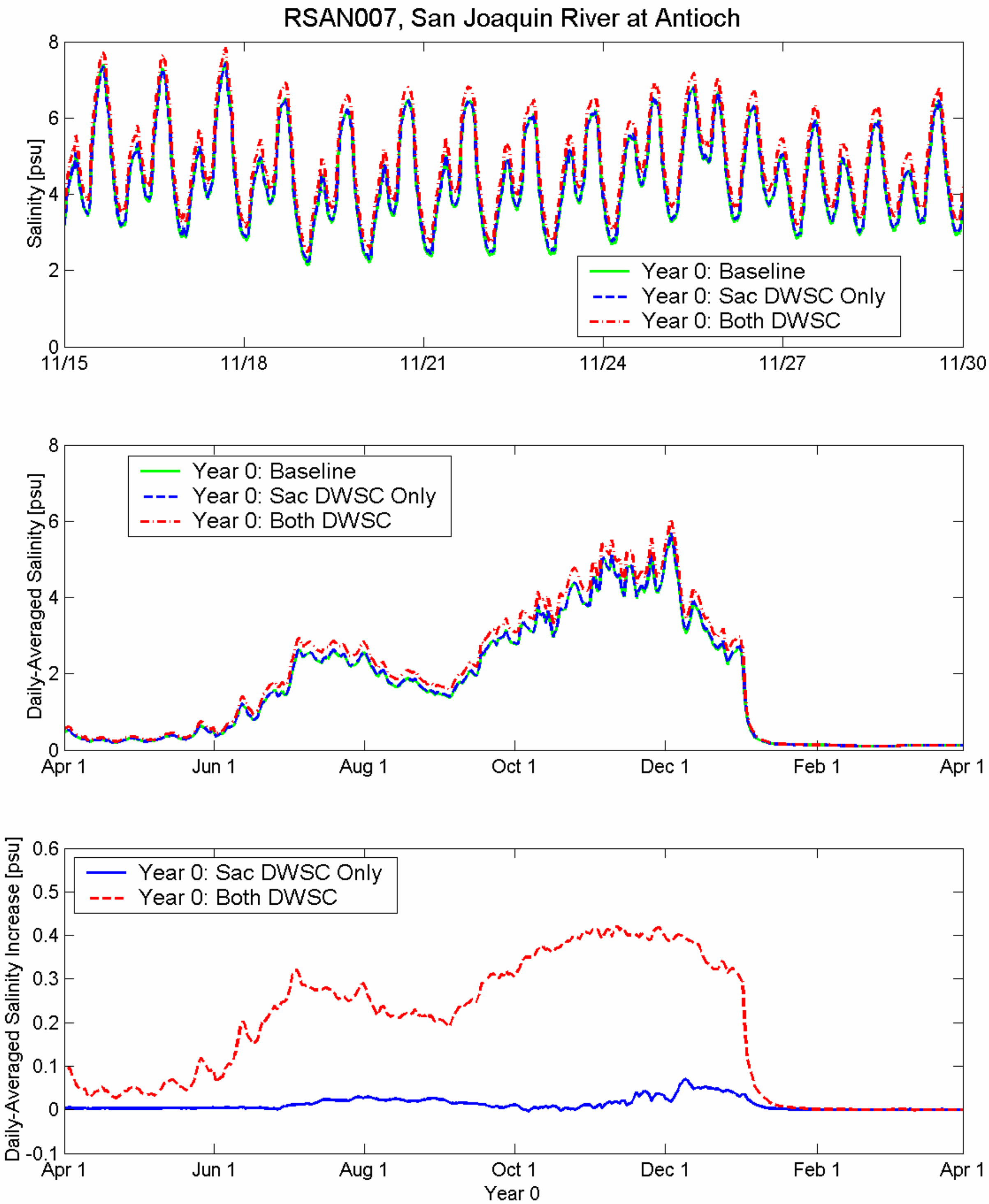


Figure 4.5-36 Predicted salinity at San Joaquin River at Antioch (RSAN007) for the Year 0 Baseline scenario, the Year 0 Sacramento DWSC Only Deepening scenario, and the Year 0 Both DWSC Deepening scenario: tidal time-scale variability over a 15-day period (top); daily-averaged salinity for the Year 0 simulation period (middle); predicted increase in daily-averaged salinity for the Year 0 Sacramento DWSC Only Deepening scenario and the Year 0 Both DWSC Deepening scenario relative to the Year 0 Baseline scenario (bottom).

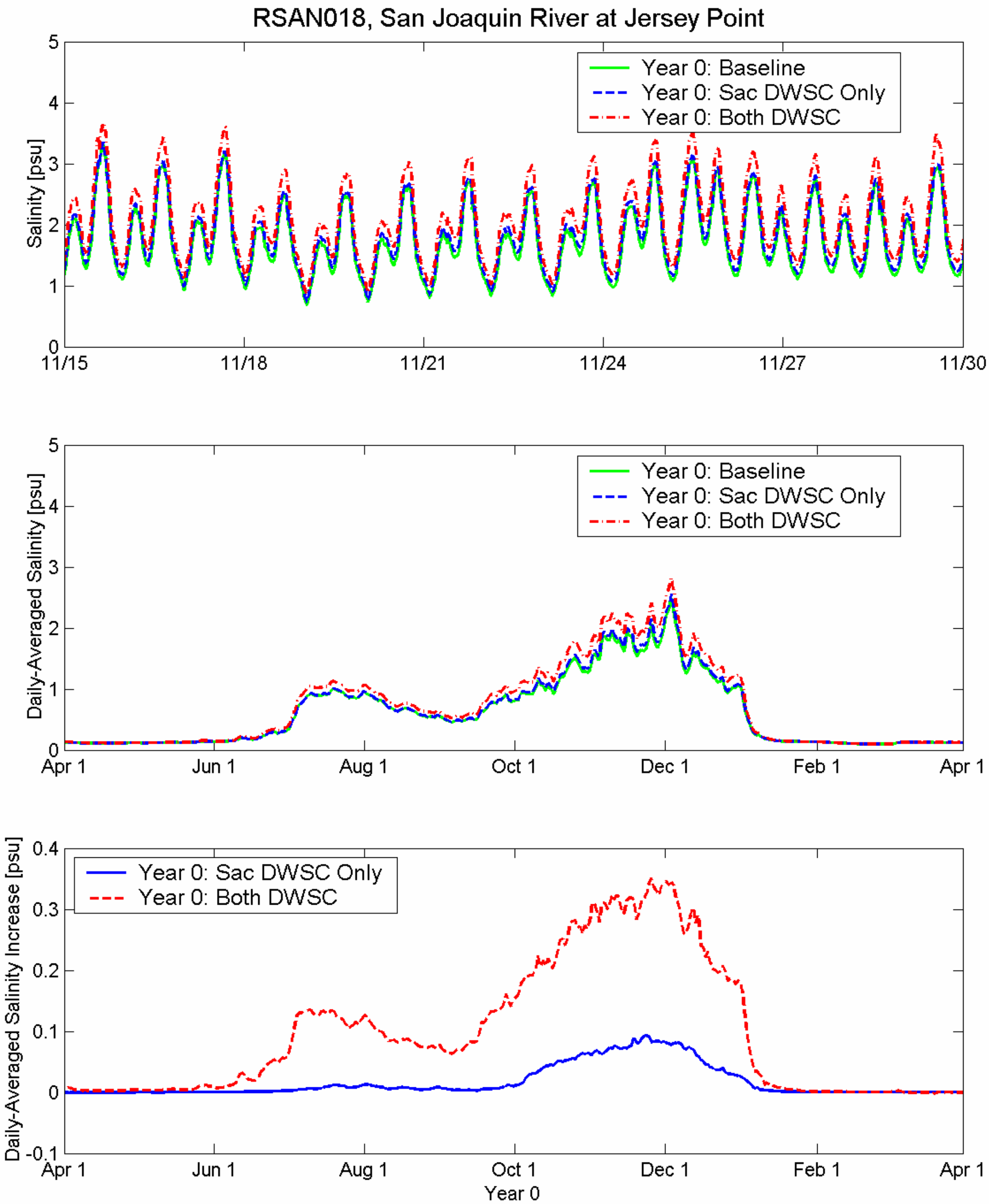


Figure 4.5-37 Predicted salinity at San Joaquin River at Jersey Point (RSAN018) for the Year 0 Baseline scenario, the Year 0 Sacramento DWSC Only Deepening scenario, and the Year 0 Both DWSC Deepening scenario: tidal time-scale variability over a 15-day period (top); daily-averaged salinity for the Year 0 simulation period (middle); predicted increase in daily-averaged salinity for the Year 0 Sacramento DWSC Only Deepening scenario and the Year 0 Both DWSC Deepening scenario relative to the Year 0 Baseline scenario (bottom).

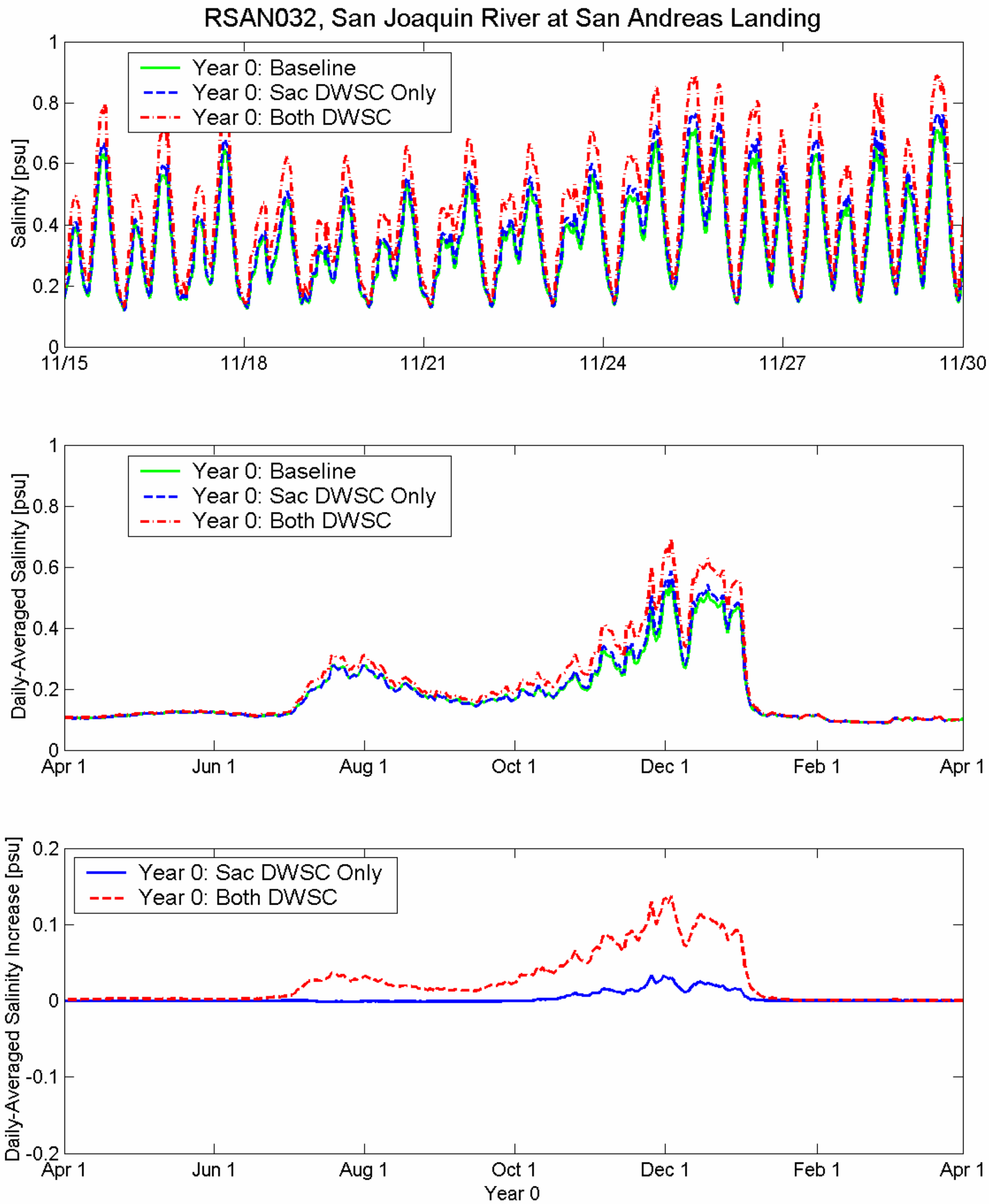


Figure 4.5-38 Predicted salinity at San Joaquin River at San Andreas Landing (RSAN032) for the Year 0 Baseline scenario, the Year 0 Sacramento DWSC Only Deepening scenario, and the Year 0 Both DWSC Deepening scenario: tidal time-scale variability over a 15-day period (top); daily-averaged salinity for the Year 0 simulation period (middle); predicted increase in daily-averaged salinity for the Year 0 Sacramento DWSC Only Deepening scenario and the Year 0 Both DWSC Deepening scenario relative to the Year 0 Baseline scenario (bottom).

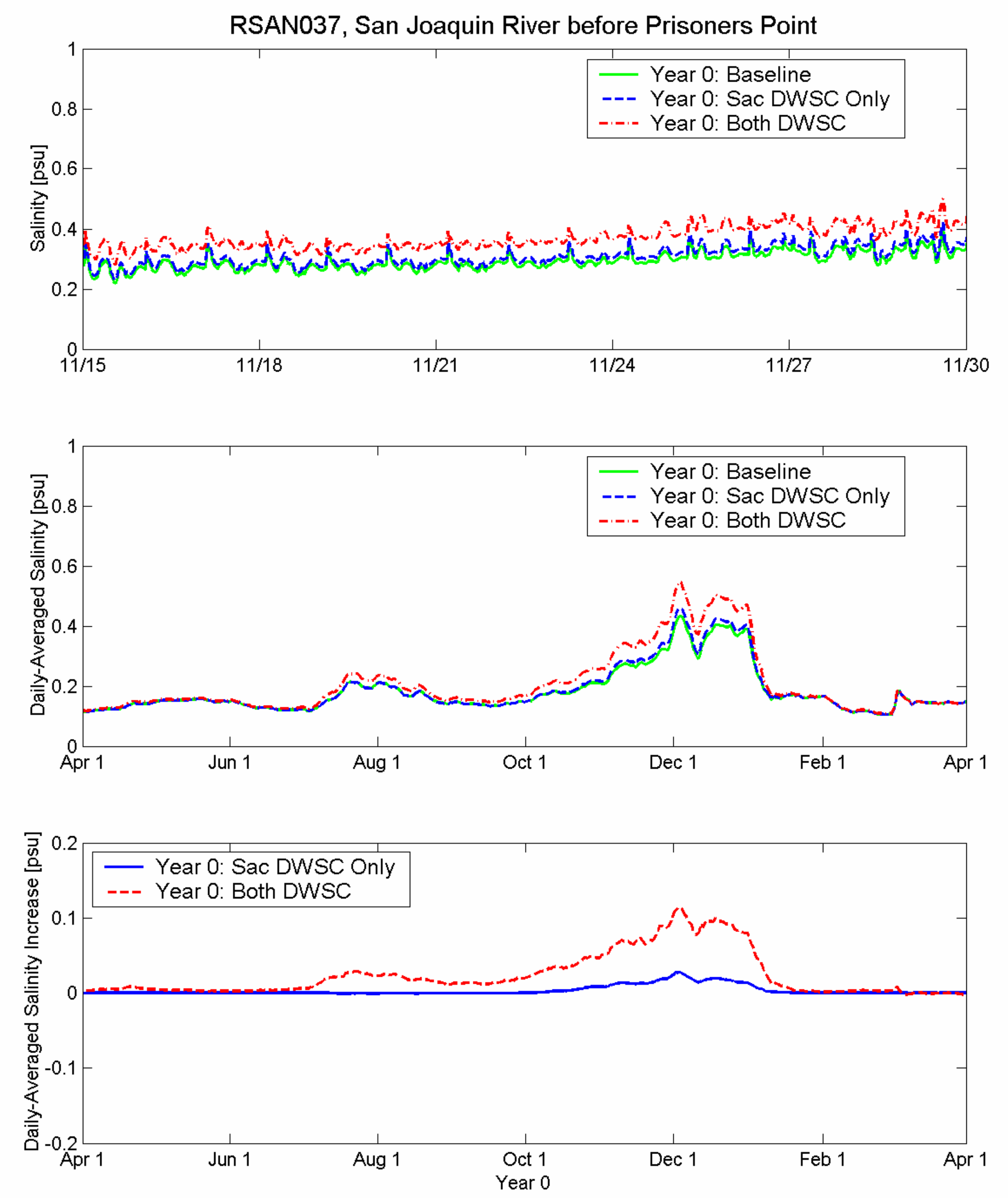


Figure 4.5-39 Predicted salinity at San Joaquin River before Prisoners Point (RSAN037) for the Year 0 Baseline scenario, the Year 0 Sacramento DWSC Only Deepening scenario, and the Year 0 Both DWSC Deepening scenario: tidal time-scale variability over a 15-day period (top); daily-averaged salinity for the Year 0 simulation period (middle); predicted increase in daily-averaged salinity for the Year 0 Sacramento DWSC Only Deepening scenario and the Year 0 Both DWSC Deepening scenario relative to the Year 0 Baseline scenario (bottom).

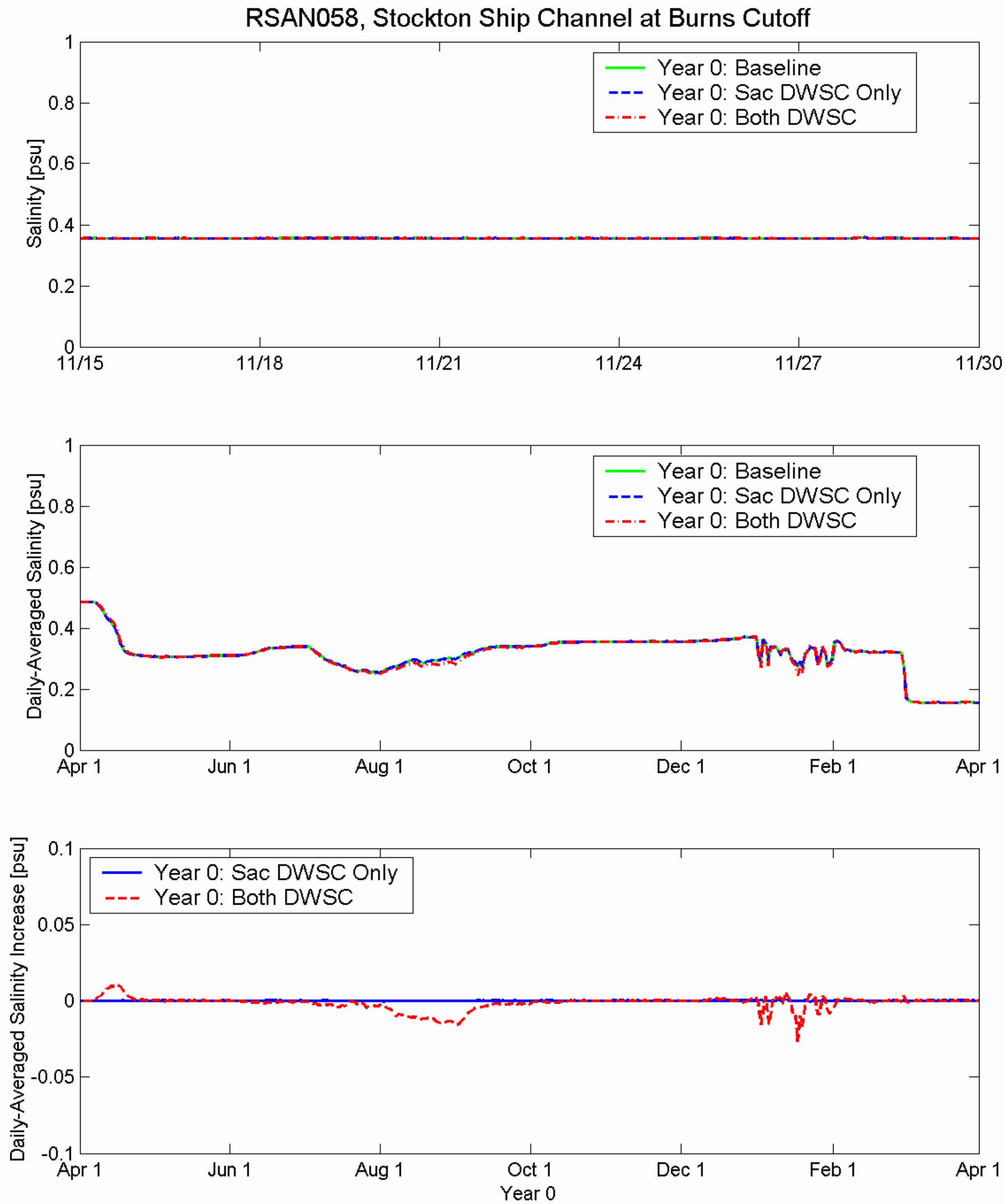


Figure 4.5-40 Predicted salinity at Stockton Ship Channel at Burns Cutoff (RSAN058) for the Year 0 Baseline scenario, the Year 0 Sacramento DWSC Only Deepening scenario, and the Year 0 Both DWSC Deepening scenario: tidal time-scale variability over a 15-day period (top); daily-averaged salinity for the Year 0 simulation period (middle); predicted increase in daily-averaged salinity for the Year 0 Sacramento DWSC Only Deepening scenario and the Year 0 Both DWSC Deepening scenario relative to the Year 0 Baseline scenario (bottom).

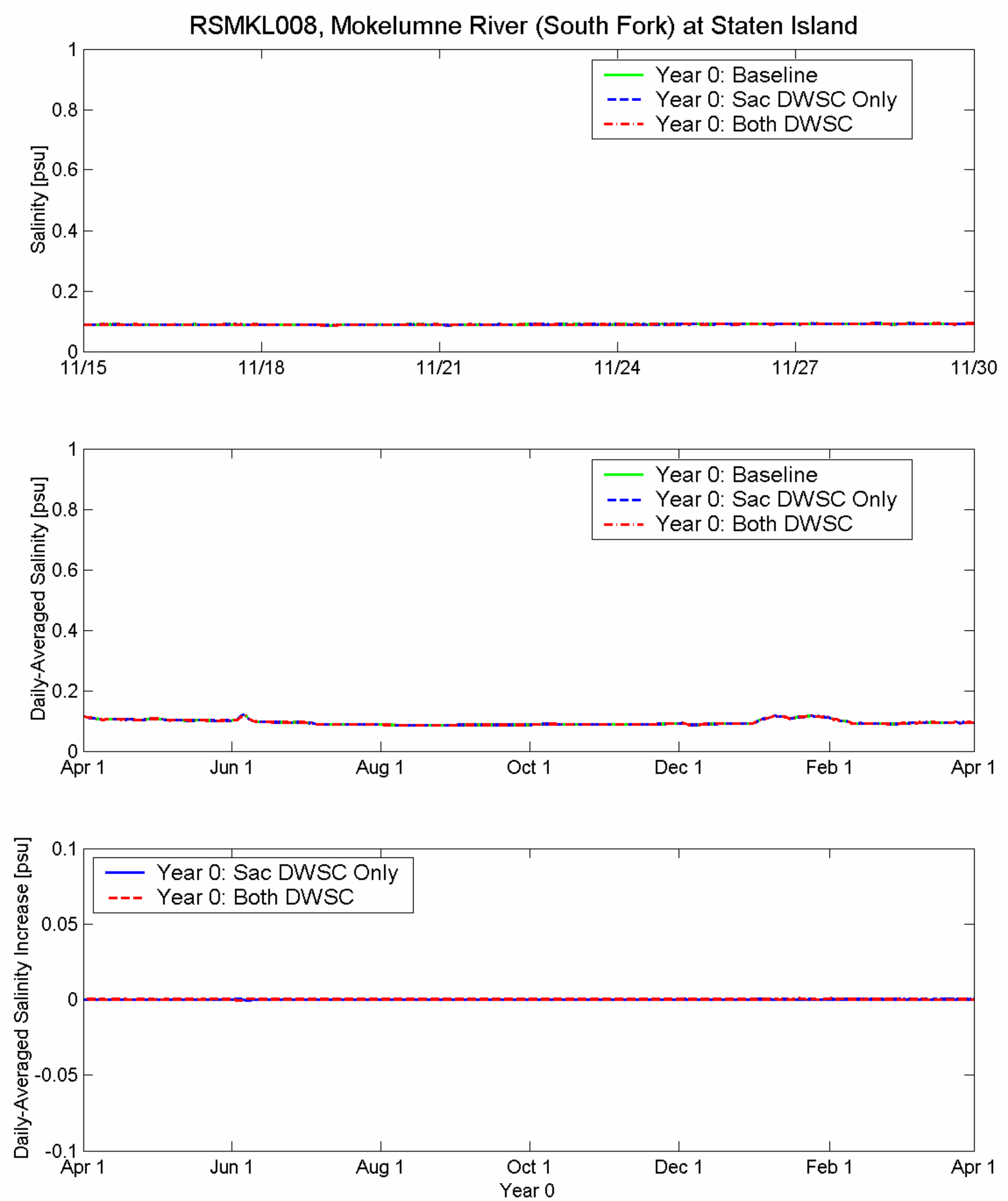


Figure 4.5-41 Predicted salinity at South Fork Mokelumne River at Staten Island (RSMKL008) for the Year 0 Baseline scenario, the Year 0 Sacramento DWSC Only Deepening scenario, and the Year 0 Both DWSC Deepening scenario: tidal time-scale variability over a 15-day period (top); daily-averaged salinity for the Year 0 simulation period (middle); predicted increase in daily-averaged salinity for the Year 0 Sacramento DWSC Only Deepening scenario and the Year 0 Both DWSC Deepening scenario relative to the Year 0 Baseline scenario (bottom).

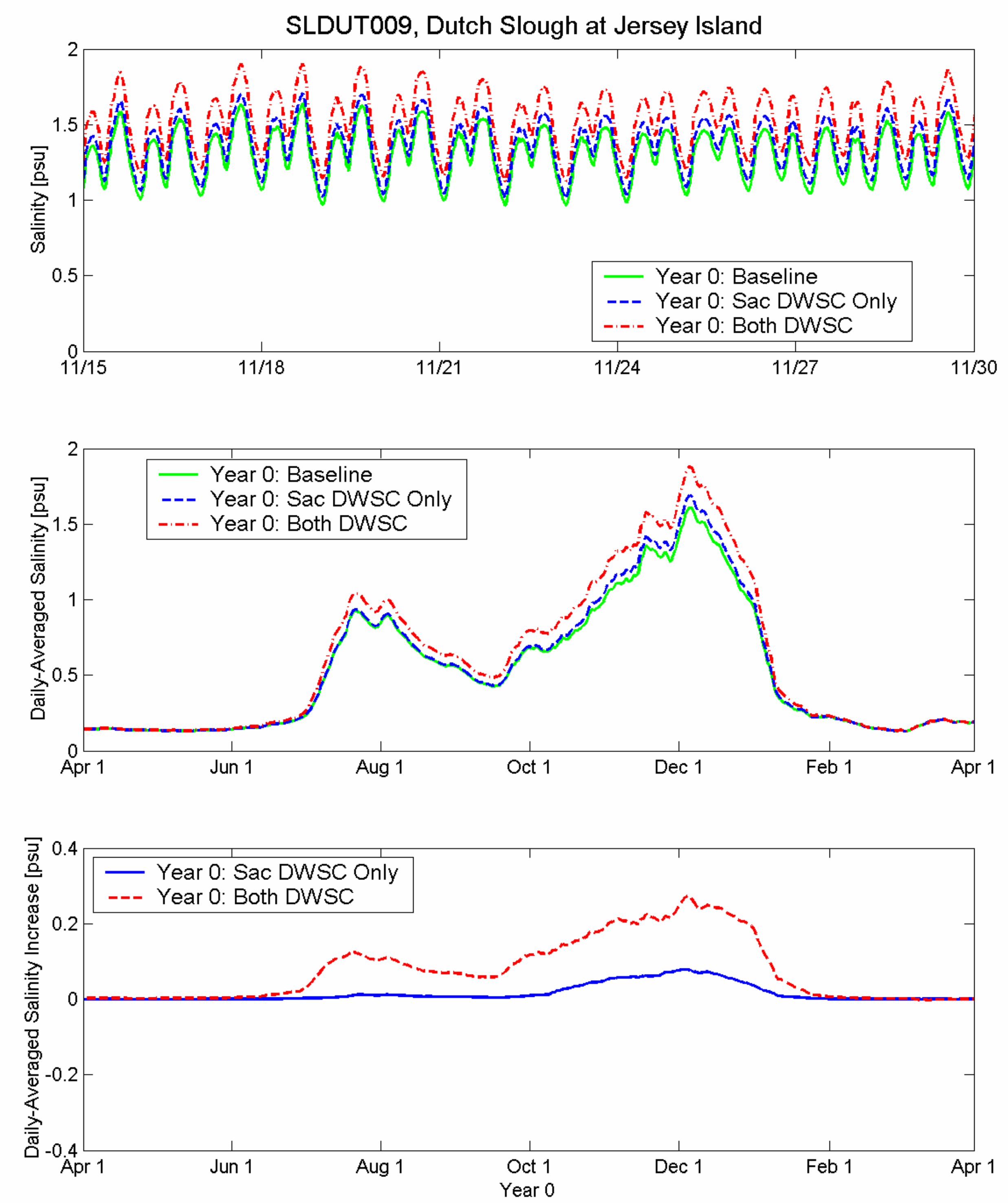


Figure 4.5-42 Predicted salinity at Dutch Slough at Jersey Island (SLDUT009) for the Year 0 Baseline scenario, the Year 0 Sacramento DWSC Only Deepening scenario, and the Year 0 Both DWSC Deepening scenario: tidal time-scale variability over a 15-day period (top); daily-averaged salinity for the Year 0 simulation period (middle); predicted increase in daily-averaged salinity for the Year 0 Sacramento DWSC Only Deepening scenario and the Year 0 Both DWSC Deepening scenario relative to the Year 0 Baseline scenario (bottom).

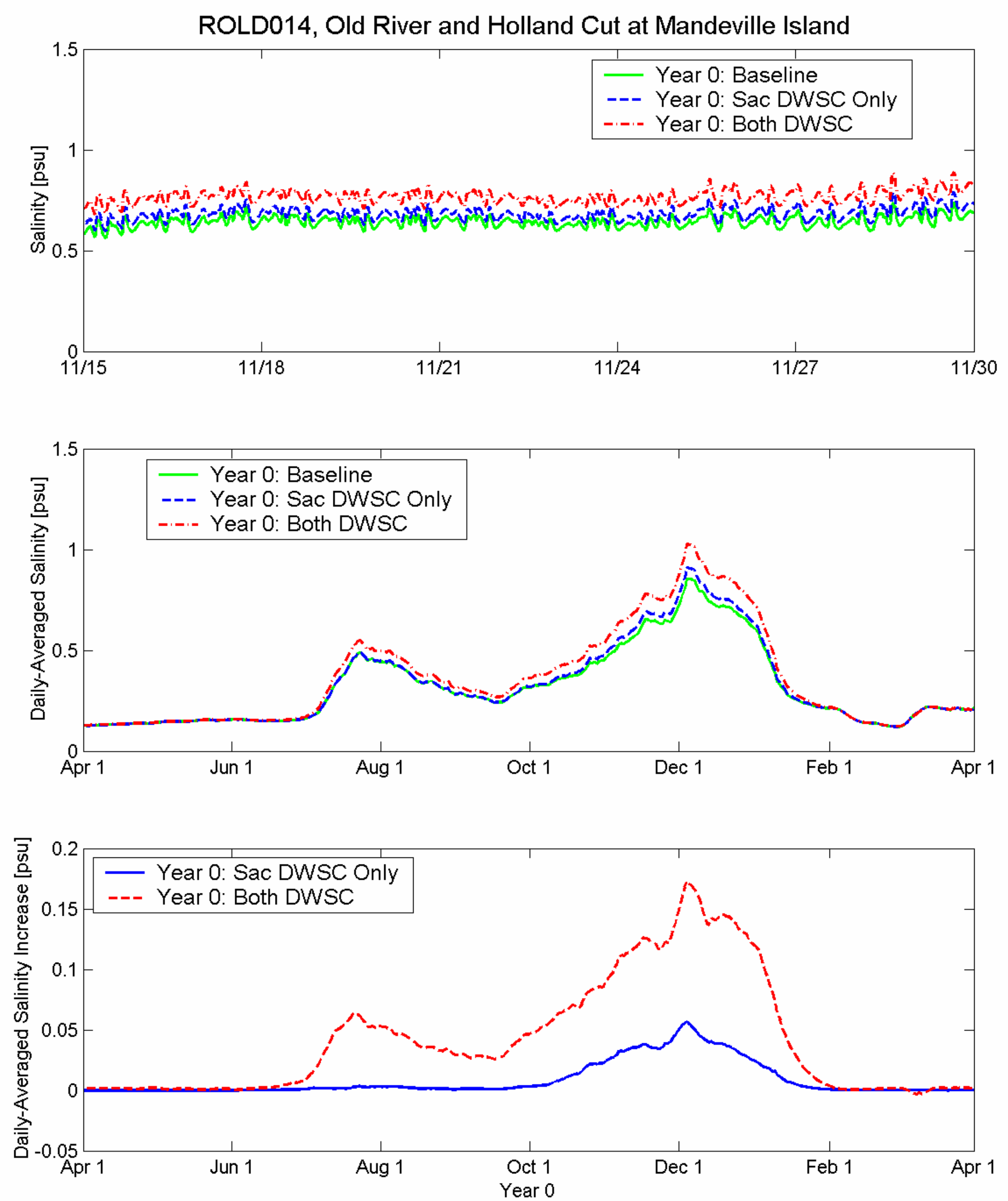


Figure 4.5-43 Predicted salinity at Old River and Holland Cut at Mandeville Island (ROLD014) for the Year 0 Baseline scenario, the Year 0 Sacramento DWSC Only Deepening scenario, and the Year 0 Both DWSC Deepening scenario: tidal time-scale variability over a 15-day period (top); daily-averaged salinity for the Year 0 simulation period (middle); predicted increase in daily-averaged salinity for the Year 0 Sacramento DWSC Only Deepening scenario and the Year 0 Both DWSC Deepening scenario relative to the Year 0 Baseline scenario (bottom).

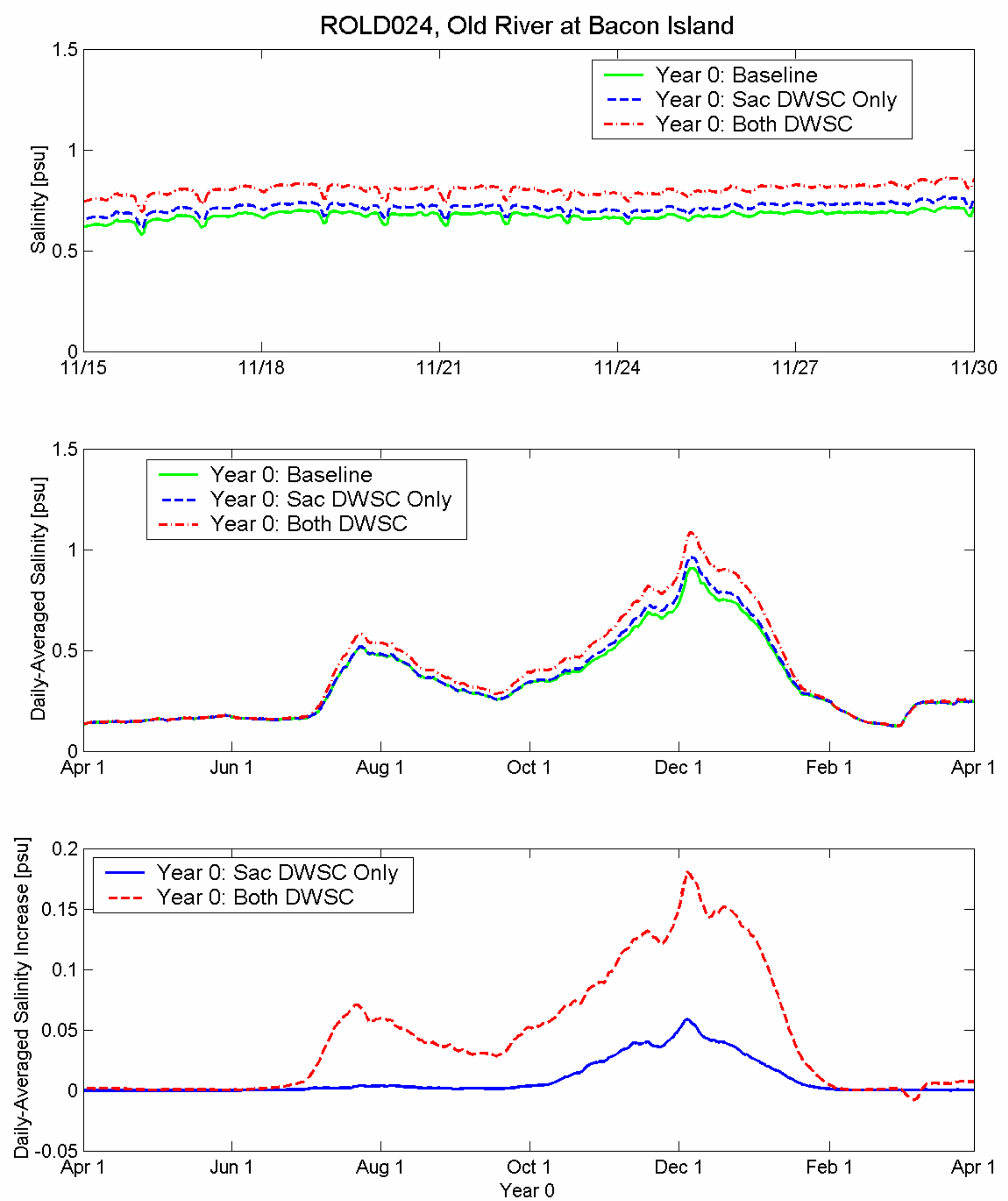


Figure 4.5-44 Predicted salinity at Old River at Bacon Island (ROLD024) for the Year 0 Baseline scenario, the Year 0 Sacramento DWSC Only Deepening scenario, and the Year 0 Both DWSC Deepening scenario: tidal time-scale variability over a 15-day period (top); daily-averaged salinity for the Year 0 simulation period (middle); predicted increase in daily-averaged salinity for the Year 0 Sacramento DWSC Only Deepening scenario and the Year 0 Both DWSC Deepening scenario relative to the Year 0 Baseline scenario (bottom).

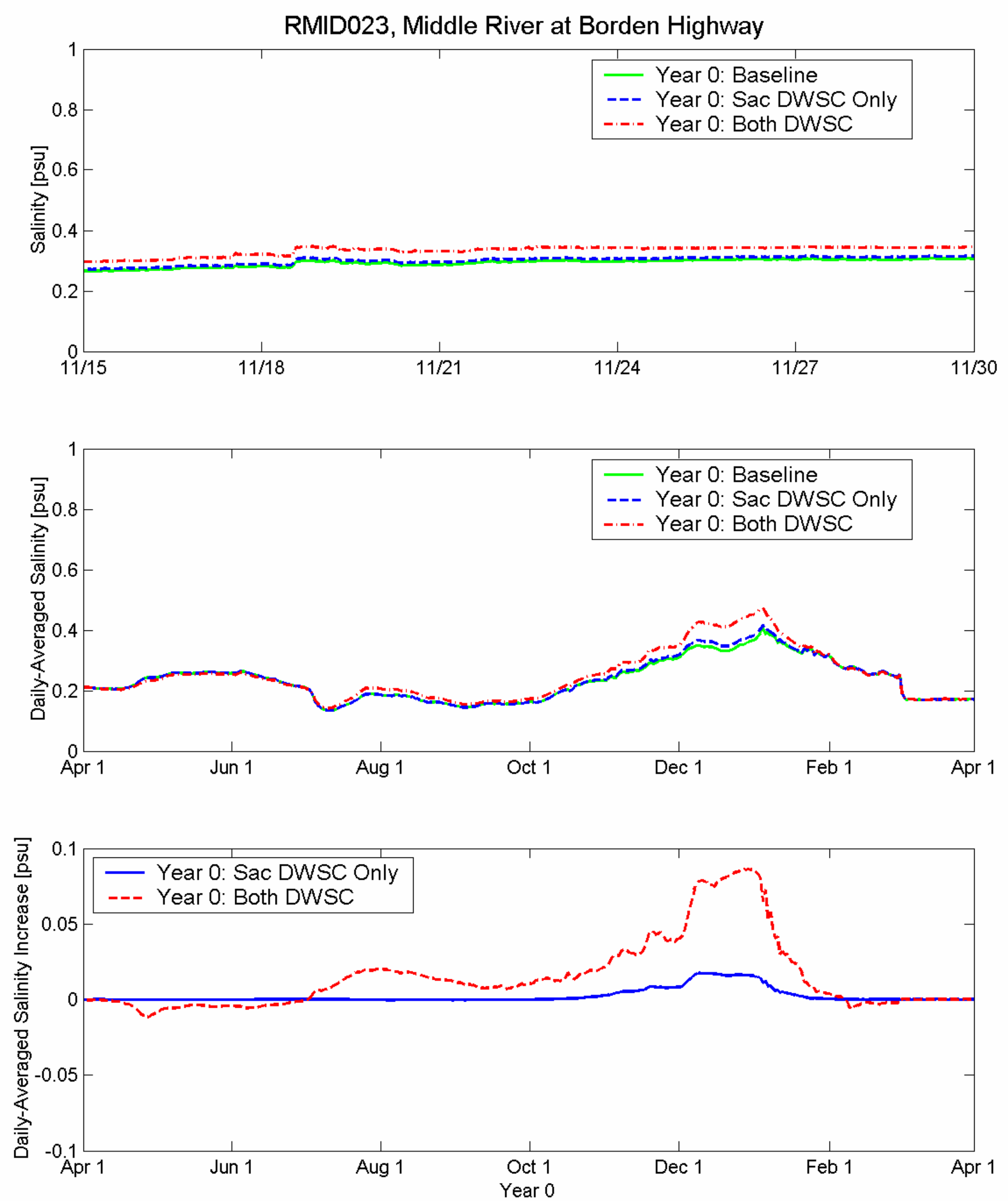


Figure 4.5-45 Predicted salinity at Middle River at Borden Highway (RMID023) for the Year 0 Baseline scenario, the Year 0 Sacramento DWSC Only Deepening scenario, and the Year 0 Both DWSC Deepening scenario: tidal time-scale variability over a 15-day period (top); daily-averaged salinity for the Year 0 simulation period (middle); predicted increase in daily-averaged salinity for the Year 0 Sacramento DWSC Only Deepening scenario and the Year 0 Both DWSC Deepening scenario relative to the Year 0 Baseline scenario (bottom).

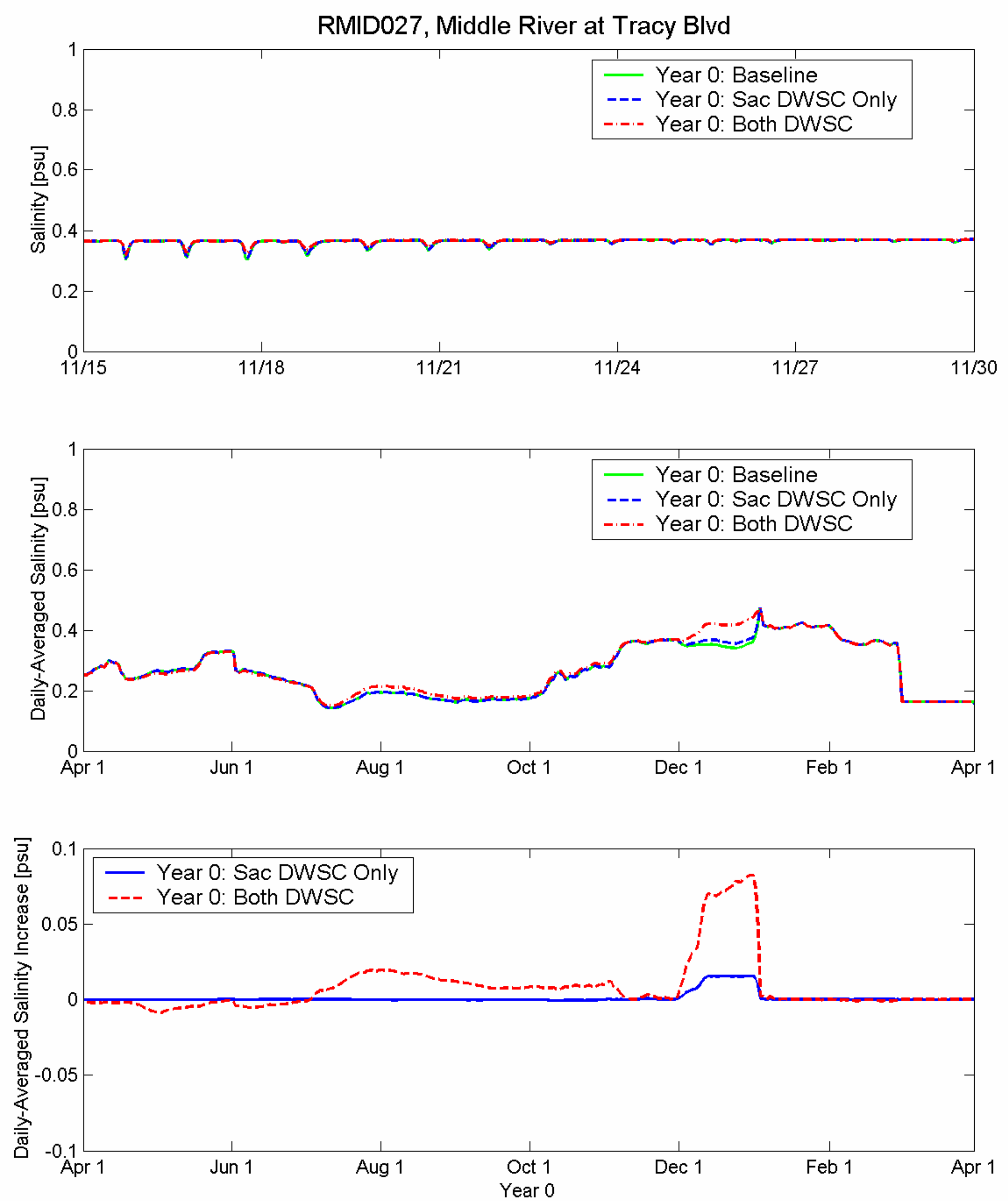


Figure 4.5-46 Predicted salinity at Middle River at Tracy Boulevard (RMID027) for the Year 0 Baseline scenario, the Year 0 Sacramento DWSC Only Deepening scenario, and the Year 0 Both DWSC Deepening scenario: tidal time-scale variability over a 15-day period (top); daily-averaged salinity for the Year 0 simulation period (middle); predicted increase in daily-averaged salinity for the Year 0 Sacramento DWSC Only Deepening scenario and the Year 0 Both DWSC Deepening scenario relative to the Year 0 Baseline scenario (bottom).

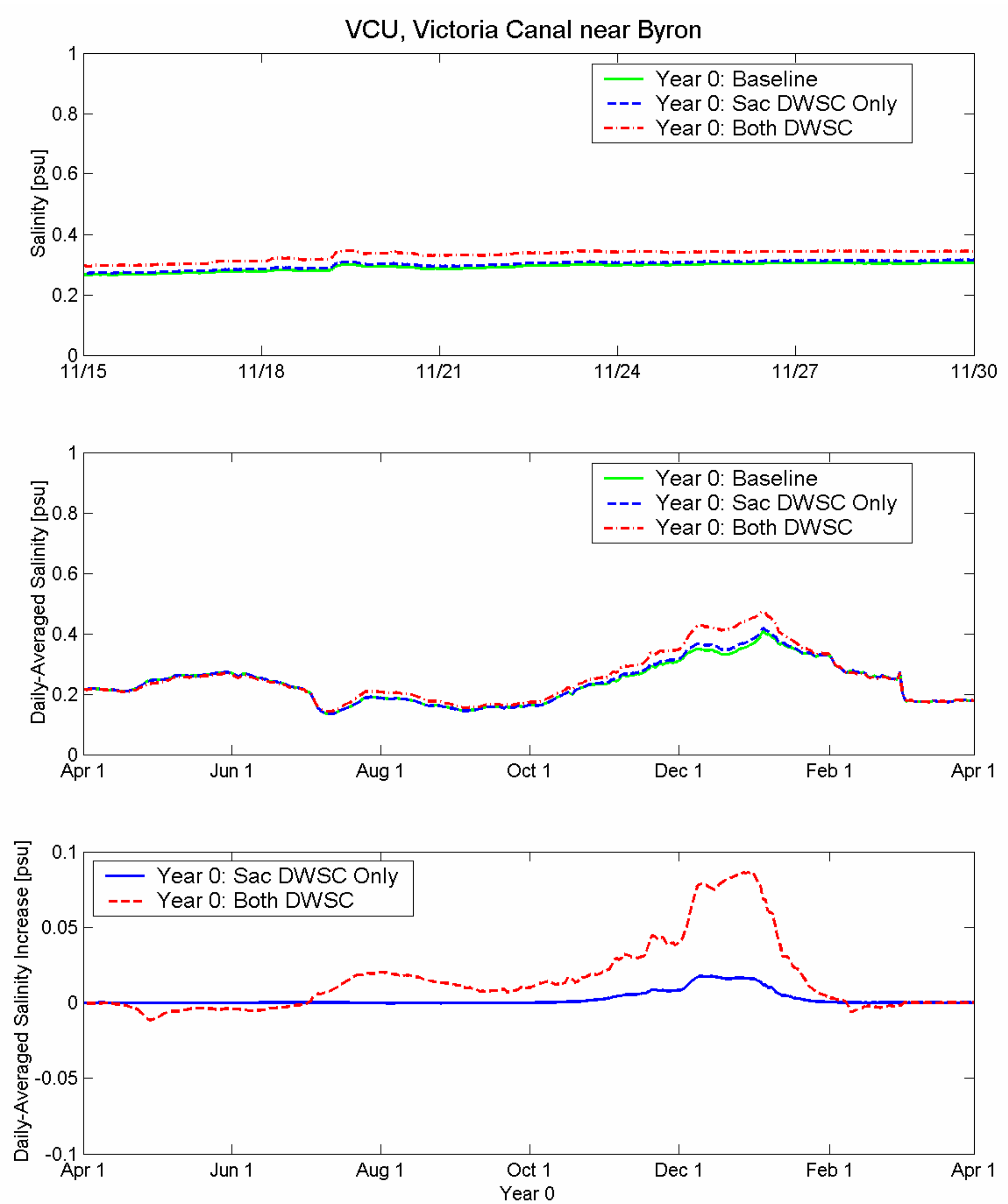


Figure 4.5-47 Predicted salinity at Victoria Canal near Byron (VCU) for the Year 0 Baseline scenario, the Year 0 Sacramento DWSC Only Deepening scenario, and the Year 0 Both DWSC Deepening scenario: tidal time-scale variability over a 15-day period (top); daily-averaged salinity for the Year 0 simulation period (middle); predicted increase in daily-averaged salinity for the Year 0 Sacramento DWSC Only Deepening scenario and the Year 0 Both DWSC Deepening scenario relative to the Year 0 Baseline scenario (bottom).

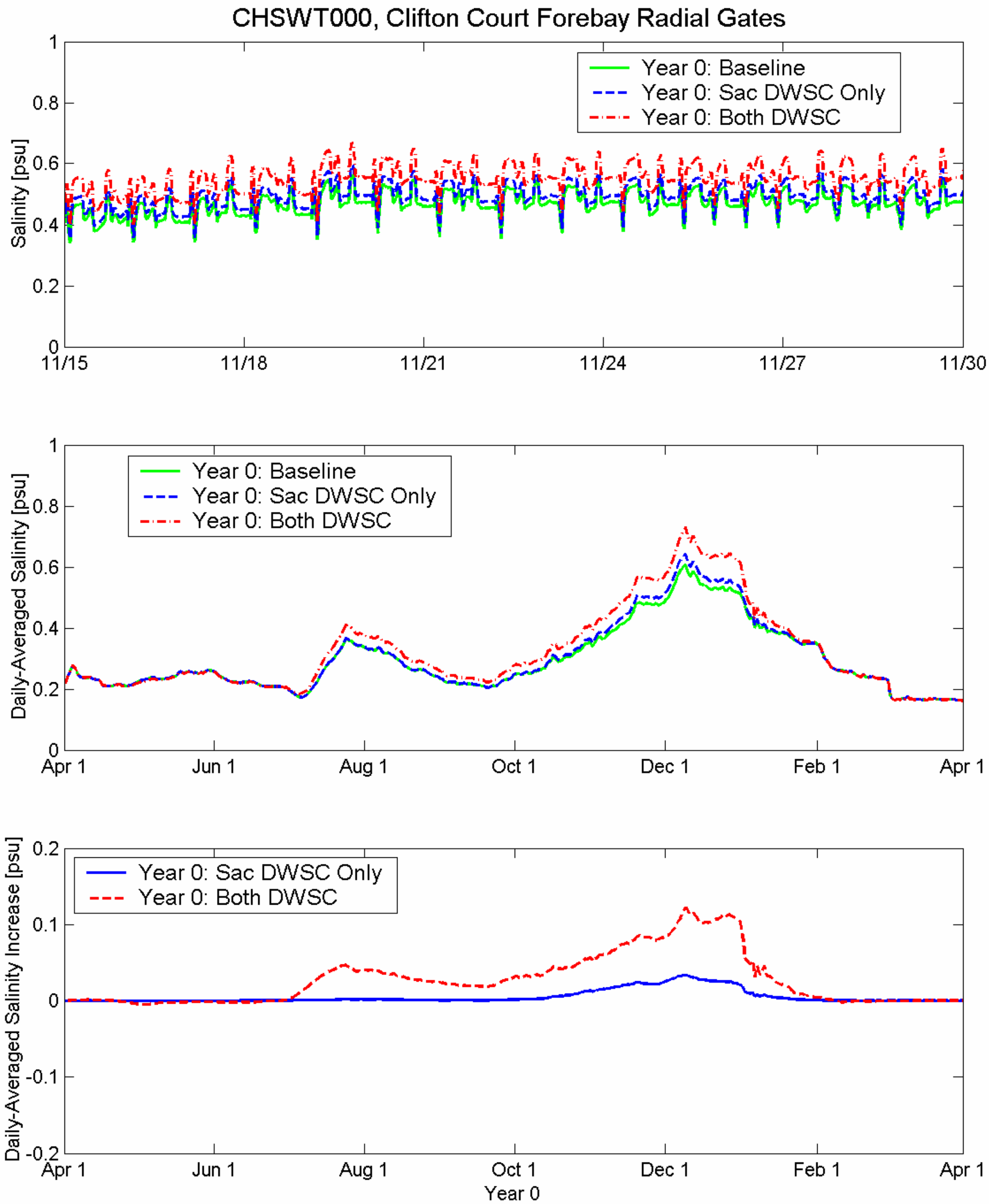


Figure 4.5-48 Predicted salinity at Clifton Court Forebay Radial Gates (CHWST000) for the Year 0 Baseline scenario, the Year 0 Sacramento DWSC Only Deepening scenario, and the Year 0 Both DWSC Deepening scenario: tidal time-scale variability over a 15-day period (top); daily-averaged salinity for the Year 0 simulation period (middle); predicted increase in daily-averaged salinity for the Year 0 Sacramento DWSC Only Deepening scenario and the Year 0 Both DWSC Deepening scenario relative to the Year 0 Baseline scenario (bottom).

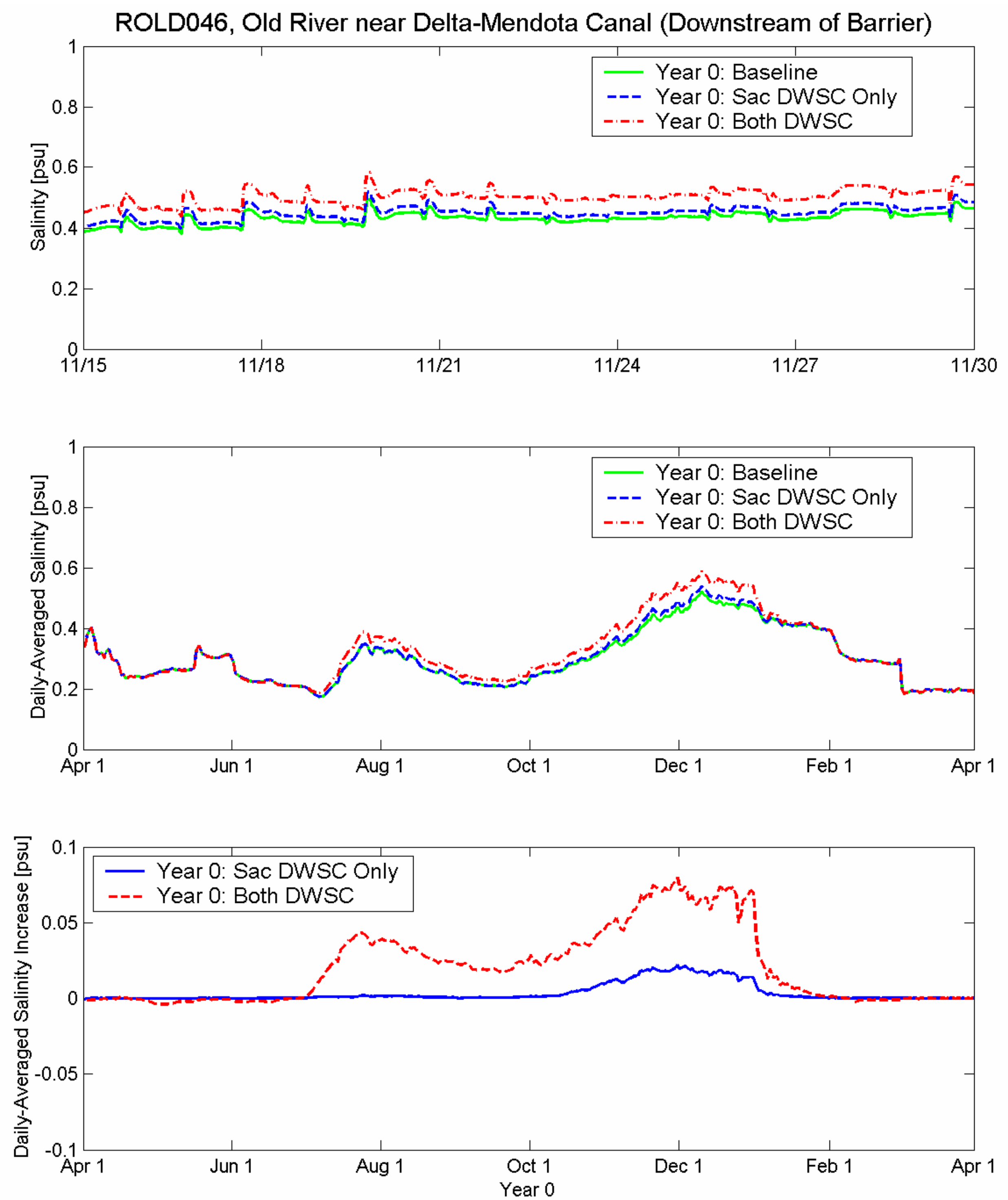


Figure 4.5-49 Predicted salinity at Old River near Delta-Mendota Canal Downstream of Barrier (ROLD046) for the Year 0 Baseline scenario, the Year 0 Sacramento DWSC Only Deepening scenario, and the Year 0 Both DWSC Deepening scenario: tidal time-scale variability over a 15-day period (top); daily-averaged salinity for the Year 0 simulation period (middle); predicted increase in daily-averaged salinity for the Year 0 Sacramento DWSC Only Deepening scenario and the Year 0 Both DWSC Deepening scenario relative to the Year 0 Baseline scenario (bottom).

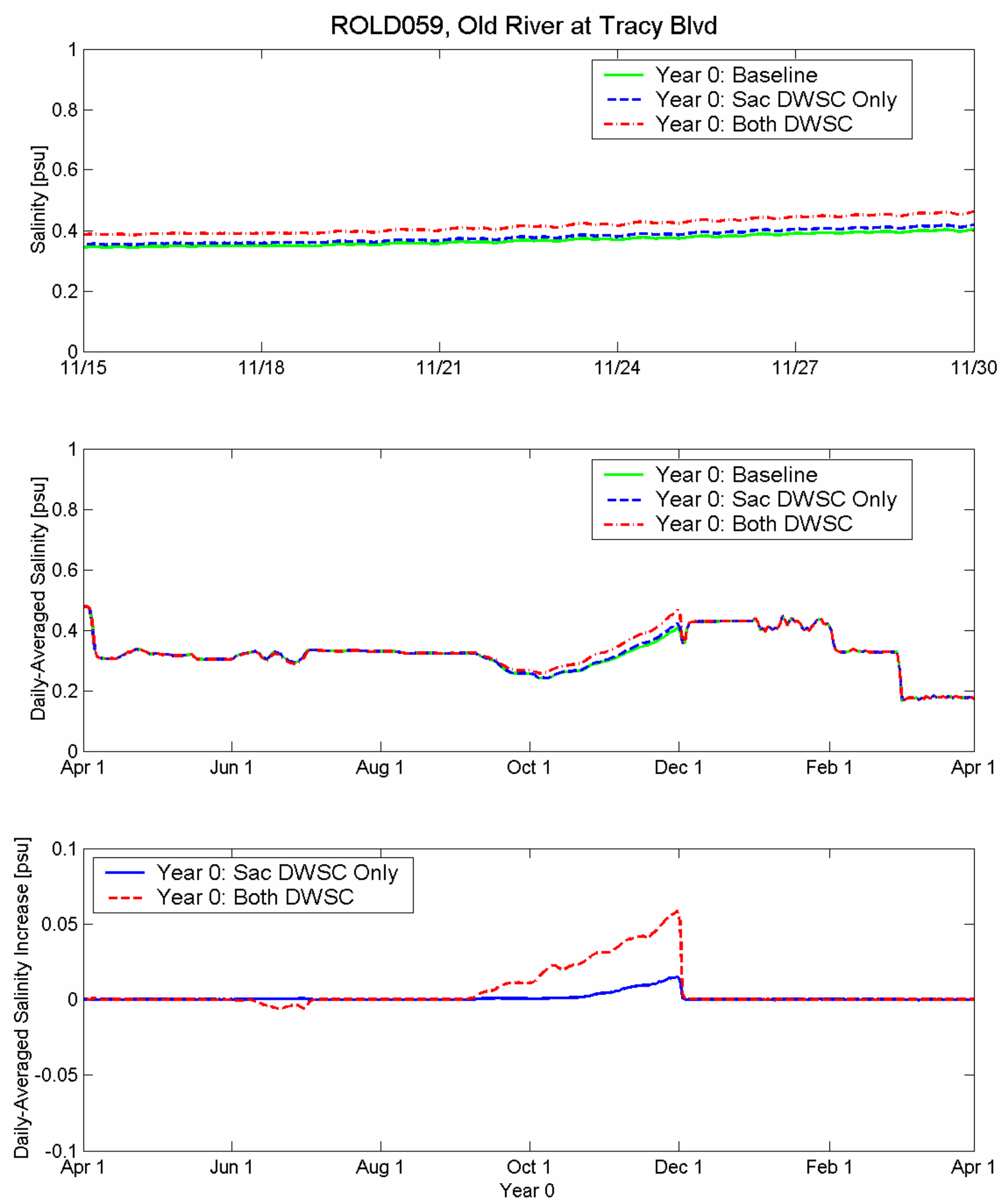


Figure 4.5-50 Predicted salinity at Old River at Tracy Boulevard (ROLD059) for the Year 0 Baseline scenario, the Year 0 Sacramento DWSC Only Deepening scenario, and the Year 0 Both DWSC Deepening scenario: tidal time-scale variability over a 15-day period (top); daily-averaged salinity for the Year 0 simulation period (middle); predicted increase in daily-averaged salinity for the Year 0 Sacramento DWSC Only Deepening scenario and the Year 0 Both DWSC Deepening scenario relative to the Year 0 Baseline scenario (bottom).

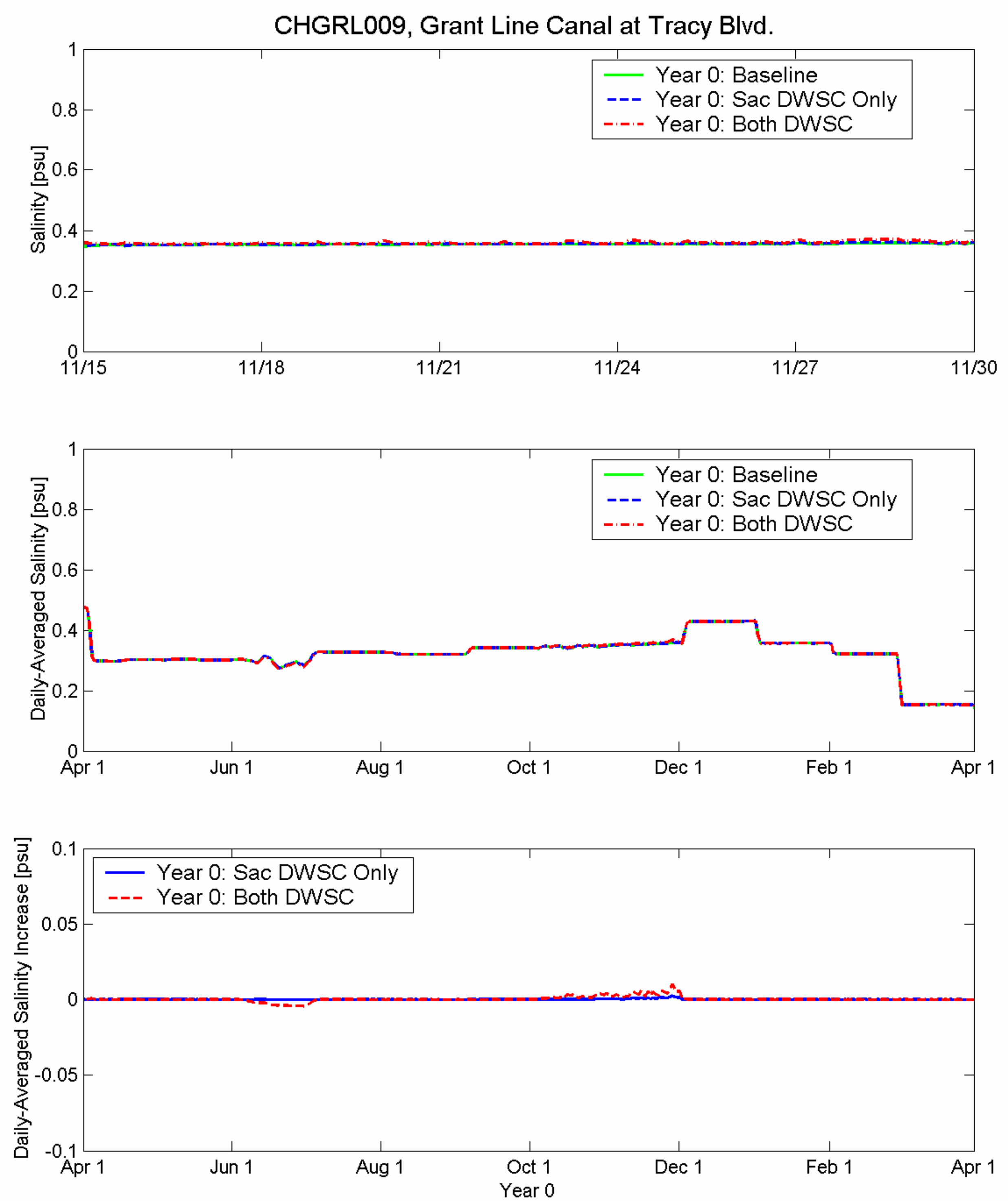


Figure 4.5-51 Predicted salinity at Grant Line Canal at Tracy Boulevard (CHGRL009) for the Year 0 Baseline scenario, the Year 0 Sacramento DWSC Only Deepening scenario, and the Year 0 Both DWSC Deepening scenario: tidal time-scale variability over a 15-day period (top); daily-averaged salinity for the Year 0 simulation period (middle); predicted increase in daily-averaged salinity for the Year 0 Sacramento DWSC Only Deepening scenario and the Year 0 Both DWSC Deepening scenario relative to the Year 0 Baseline scenario (bottom).

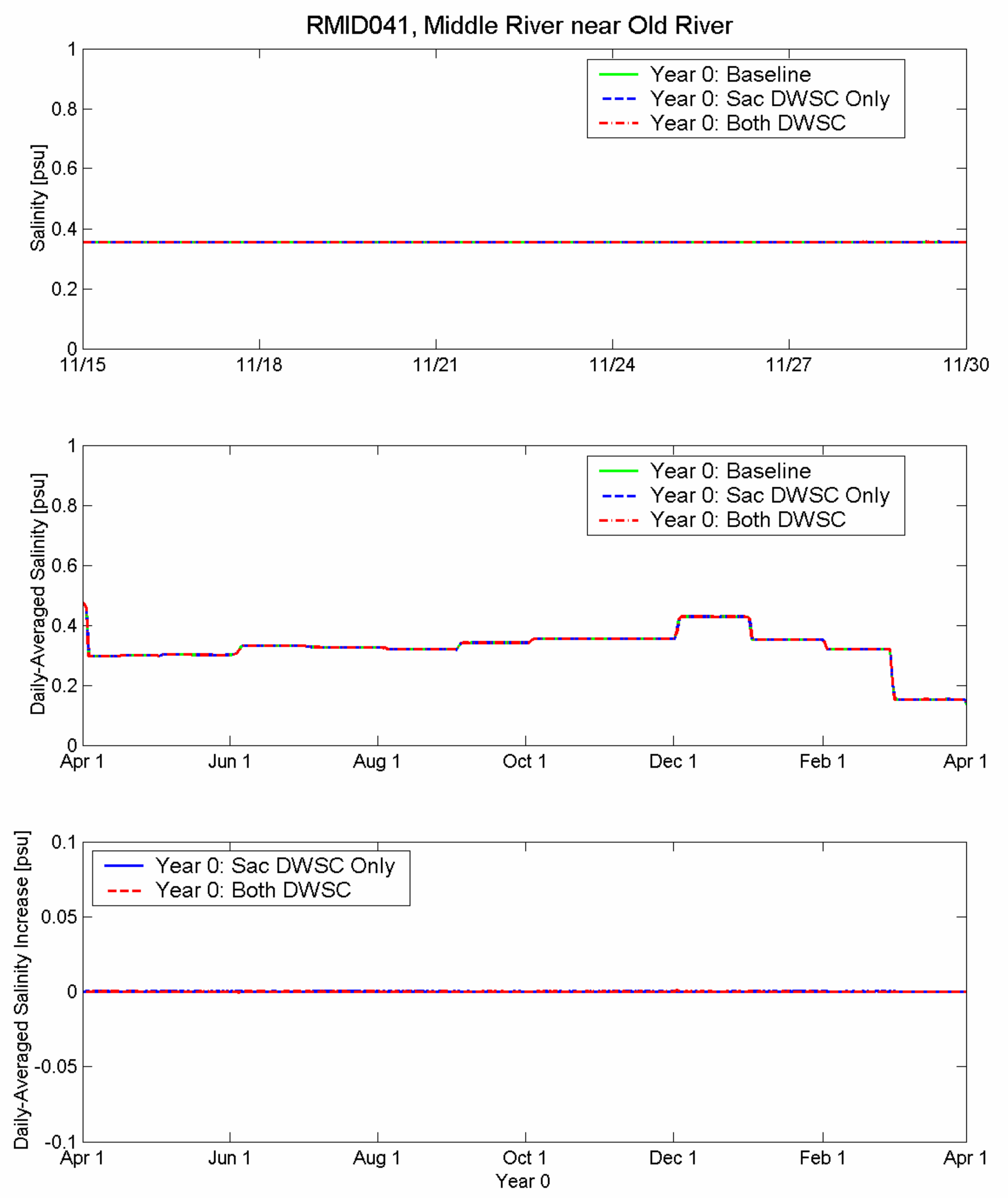


Figure 4.5-52 Predicted salinity at Middle River near Old River (RMID041) for the Year 0 Baseline scenario, the Year 0 Sacramento DWSC Only Deepening scenario, and the Year 0 Both DWSC Deepening scenario: tidal time-scale variability over a 15-day period (top); daily-averaged salinity for the Year 0 simulation period (middle); predicted increase in daily-averaged salinity for the Year 0 Sacramento DWSC Only Deepening scenario and the Year 0 Both DWSC Deepening scenario relative to the Year 0 Baseline scenario (bottom).

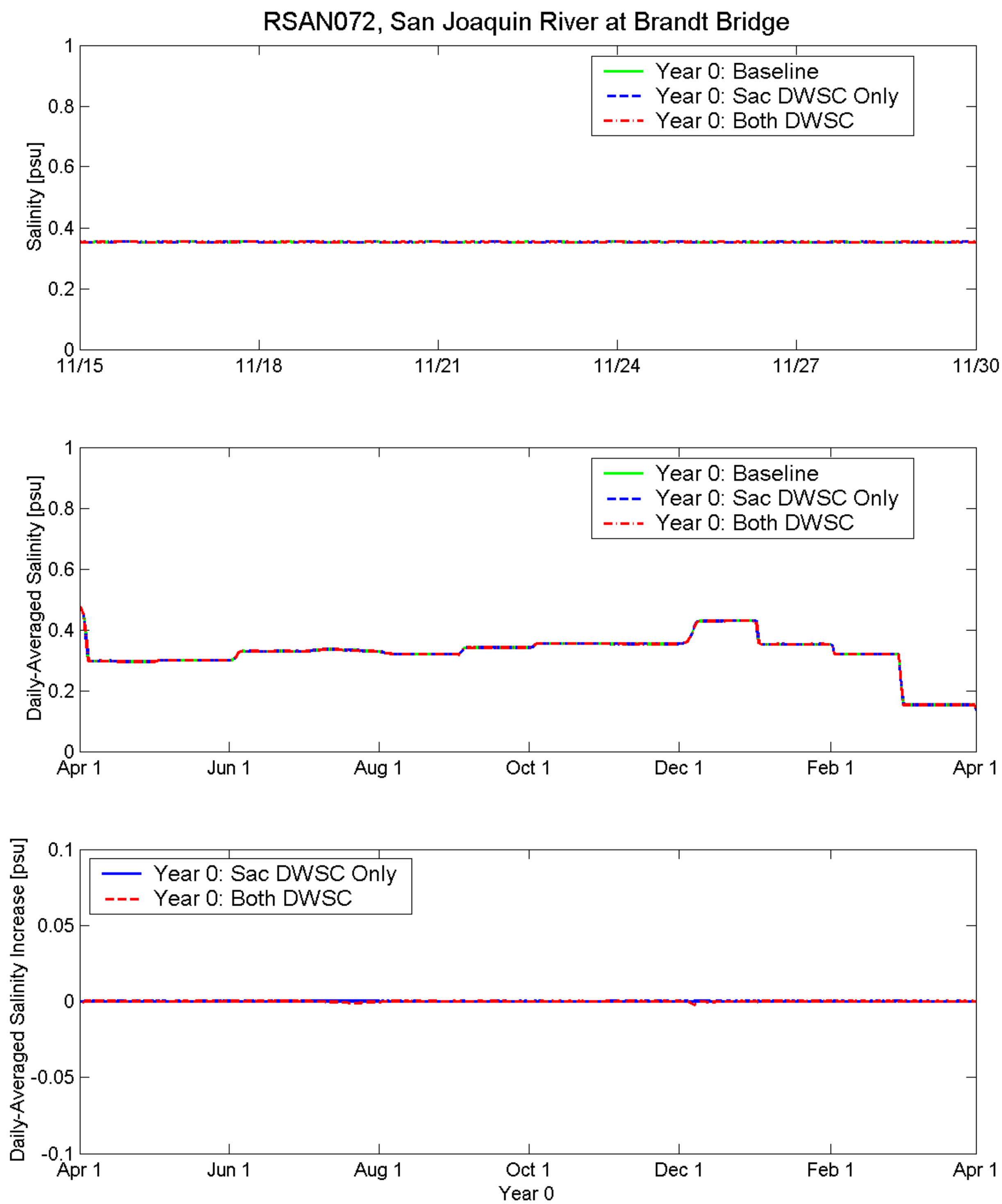


Figure 4.5-53 Predicted salinity at San Joaquin River at Brandt Bridge (RSAN072) for the Year 0 Baseline scenario, the Year 0 Sacramento DWSC Only Deepening scenario, and the Year 0 Both DWSC Deepening scenario: tidal time-scale variability over a 15-day period (top); daily-averaged salinity for the Year 0 simulation period (middle); predicted increase in daily-averaged salinity for the Year 0 Sacramento DWSC Only Deepening scenario and the Year 0 Both DWSC Deepening scenario relative to the Year 0 Baseline scenario (bottom).

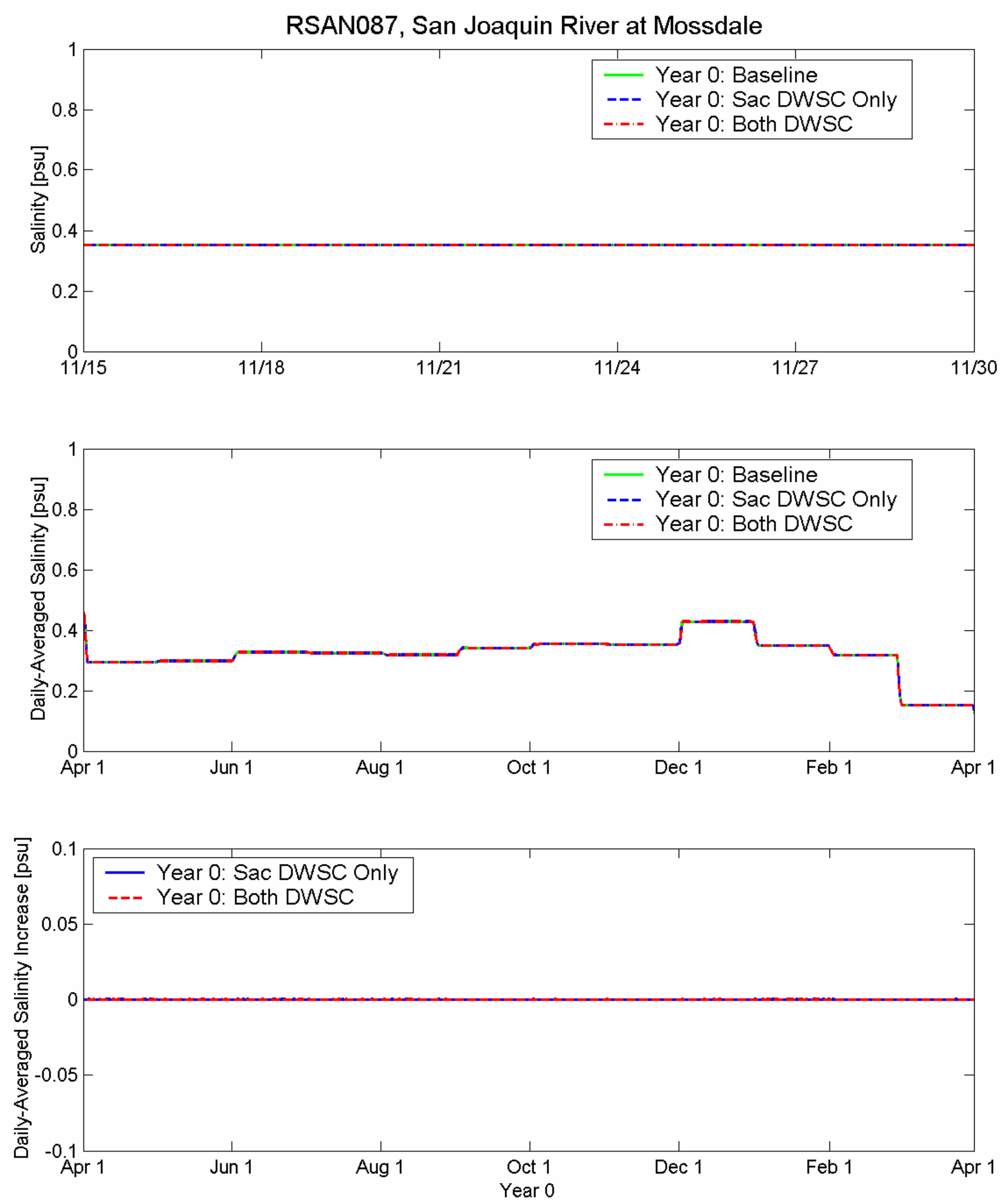


Figure 4.5-54 Predicted salinity at San Joaquin River at Mossdale (RSAN087) for the Year 0 Baseline scenario, the Year 0 Sacramento DWSC Only Deepening scenario, and the Year 0 Both DWSC Deepening scenario: tidal time-scale variability over a 15-day period (top); daily-averaged salinity for the Year 0 simulation period (middle); predicted increase in daily-averaged salinity for the Year 0 Sacramento DWSC Only Deepening scenario and the Year 0 Both DWSC Deepening scenario relative to the Year 0 Baseline scenario (bottom).

4.6 Impact of Year 0 Sacramento DWSC Only Deepening on D-1641 Water Quality Objectives

Section 3.4 presents the water quality objectives for municipal and industrial, agricultural, and fish and wildlife beneficial uses stipulated by D-1641. The performance of the Year 0 Baseline scenario and the Year 0 Sacramento DWSC Only Deepening scenario simulations in meeting these water quality objectives is presented in this section.

4.6.1 Water Quality Objectives for Municipal and Industrial Beneficial Use

The D-1641 water quality objectives for municipal and industrial beneficial uses, shown in Table 3-1, are based on concentration of Cl^- at water export locations, shown on Figure 3.4-1. The first set of standards stipulate the number of days that daily mean salinity must be less than 150 mg/l either at Contra Costa Canal at Pumping Plant #1, or at the Antioch Water Works intake. The minimum number of days that this objective should be met ranges from 155 days for a “critical” water year to 240 days for a “wet” water year.

Water year 1994 (from October 1, 1993 through September 30, 1994) was classified as a “critical” year, the lowest flow classification, on both the Sacramento River and San Joaquin River. Water Year 1995 (from October 1, 1994 through September 30, 1995) was classified as a “wet” year, the highest flow classification, on both the Sacramento River and the San Joaquin River (DWR, 2009b). As a result, the Year 0 simulation year spans part of a “critical” year and part of a “wet” water year on the Sacramento River.

Figure 4.6-1 shows the number of days that the maximum mean daily concentration of Cl^- is less than 150 mg/l at CHCCC06 and RSAN007. To meet the “critical year” water quality objective, the number of days that mean daily concentration of Cl^- is less than 150 mg/l should exceed 155 days at either CHCCC06 or RSAN007. At CHCCC06, the mean daily concentration of Cl^- is less than 150 mg/l for 161 days under the Year 0 Baseline scenario and 159 days for the Year 0 Sacramento DWSC Only Deepening scenario (a decrease of 2 days relative to the Year 0 Baseline scenario). At RSAN007, the mean daily concentration of Cl^- is less than 150 mg/l for 129 days under the Year 0 Baseline scenario and 127 days for the Year 0 Sacramento DWSC Only Deepening scenario (a decrease of 2 days relative to the Year 0 Baseline scenario). Since this standard stipulates that daily mean salinity must be less than 150 mg/l for at least 155 days either at Contra Costa Canal at Pumping Plant #1, or at the Antioch Water Works intake, this standard is met for both the Year 0 Baseline scenario and the Year 0 Sacramento DWSC Only Deepening scenario since this water quality standard is met at CHCCC06 under both scenarios.

The second set of D-1641 water quality objectives for municipal and industrial beneficial use stipulate a maximum allowable concentration of Cl^- at the municipal water intakes. The D-1641 standards stipulate this objective for Contra Costa Canal at Pumping Plant #1, West Canal at mouth of Clifton Court Forebay, Delta-Mendota Canal at Tracy Pumping Plant, Barker Slough at North Bay Aqueduct Intake, and Cache Slough at City of Vallejo Intake (Table 3-3). For the purposes of this study, this standard is also evaluated at the CCWD intake on Old River (ROLD304), and at the CCWD alternative intake point (AIP) on Victoria Canal.

Figure 4.6-2 shows the predicted mean daily chloride concentration at the Contra Costa Rock Slough Export for the Year 0 Baseline scenario and the Year 0 Sacramento DWSC Only Deepening scenario. Increases in chloride concentration under the Year 0 Sacramento DWSC Only Deepening scenario are predicted between November and January. Under the Year 0 Baseline scenario the water quality objective of 250 mg/l Cl^- is exceeded for 6 days in November, 31 days in December, 31 days in January, 1 day in February, and 17 days in March. Under the Year 0 Sacramento DWSC Only Deepening scenario, the water quality objective of 250 mg/l Cl^- is exceeded for 1 day during July (an increase of 1 day), 9 days during November (an increase of 3 days), 31 days during December (no change relative to Year 0 Baseline), 31 days during January (no change relative to Year 0 Baseline), 1 day during February (no change relative to Year 0 Baseline), and 17 days during March (no change relative to Year 0 Baseline). Thus the Year 0 Sacramento DWSC Only Deepening scenario results in a total increase of 4 days that the water quality objective of 250 mg/l Cl^- is exceeded at the Contra Costa Rock Slough Export, relative to the Year 0 Baseline scenario.

Figure 4.6-3 shows the predicted mean daily chloride concentration at West Canal at mouth of Clifton Court Forebay for the Year 0 Baseline scenario and the Year 0 Sacramento DWSC Only Deepening scenario. Increases in chloride concentration under the Year 0 Sacramento DWSC Only Deepening scenario are predicted between November and January. Under the Year 0 Baseline scenario the water quality objective of 250 mg/l Cl^- is exceeded for 27 days during December. Under the Year 0 Sacramento DWSC Only Deepening scenario, the water quality objective of 250 mg/l Cl^- is exceeded for 31 days during December (an increase of 4 days). Thus the Year 0 Sacramento DWSC Only Deepening scenario results in a total increase of 4 days that the water quality objective of 250 mg/l Cl^- is exceeded at West Canal at mouth of Clifton Court Forebay, relative to the Year 0 Baseline scenario.

Figure 4.6-4 shows the predicted mean daily chloride concentration at the Delta-Mendota Canal at Tracy Pumping Plant for the Year 0 Baseline scenario and the Year 0 Sacramento DWSC Only Deepening scenario. Increases in chloride concentration under the Year 0 Sacramento DWSC Only Deepening scenario are predicted between November and January. Under the Year 0 Baseline scenario the water quality objective of 250 mg/l Cl^- is exceeded for 7 days during December. Under the Year 0 Sacramento DWSC Only Deepening scenario, the water quality objective of 250 mg/l Cl^- is exceeded for 12 days during December (an increase of 5 days). Thus the Year 0 Sacramento DWSC Only Deepening scenario results in a total increase of 5 days that the water quality objective of 250 mg/l Cl^- is exceeded at the Delta-Mendota Canal at Tracy Pumping Plant, relative to the Year 0 Baseline scenario.

Figure 4.6-5 shows the predicted mean daily chloride concentration in Barker Slough at North Bay Aqueduct Intake for the Year 0 Baseline scenario and the Year 0 Sacramento DWSC Only Deepening scenario. The predicted mean daily chloride concentration is nearly identical for both scenarios, indicating that there is no predicted effect on chloride concentration in Barker Slough at the North Bay Aqueduct Intake resulting from the Year 0 Sacramento DWSC Only Deepening scenario. The water quality objective of maximum mean daily concentration of 250 mg/l Cl^- is not exceeded under either the Year 0 Baseline or the Year 0 Sacramento DWSC Only Deepening scenario.

Figure 4.6-6 shows the predicted mean daily chloride concentration in Cache Slough at City of Vallejo Intake for the Year 0 Baseline scenario and the Year 0 Sacramento DWSC Only Deepening scenario. The predicted mean daily chloride concentration is nearly identical for both scenarios, indicating that there is no predicted effect on chloride concentration in Cache Slough at City of Vallejo Intake resulting from the Year 0 Sacramento DWSC Only Deepening scenario. The water quality objective of maximum mean daily concentration of 250 mg/l Cl^- is not exceeded under either the Year 0 Baseline or the Year 0 Sacramento DWSC Only Deepening scenario.

Figure 4.6-7 shows the predicted mean daily chloride concentration at the Contra Costa Old River Export for the Year 0 Baseline scenario and the Year 0 Sacramento DWSC Only Deepening scenario. Increases in chloride concentration under the Year 0 Sacramento DWSC Only Deepening scenario are predicted between November and January. Under the Year 0 Baseline scenario the water quality objective of 250 mg/l Cl^- is exceeded for 13 days during November, 31 days during December, and 4 days during January. Under the Year 0 Sacramento DWSC Only Deepening scenario, the water quality objective of 250 mg/l Cl^- is exceeded for 14 days during November (an increase of 1 day), 31 days during December (no change relative to Year 0 Baseline) and 5 days during January (an increase of 1 day). Thus the Year 0 Sacramento DWSC Only Deepening scenario results in a total increase of 2 days that the water quality objective of 250 mg/l Cl^- is exceeded at the Contra Costa Old River Export, relative to the Year 0 Baseline scenario.

Figure 4.6-8 shows the predicted mean daily chloride concentration at the Contra Costa Victoria Canal Alternative Intake Point for the Year 0 Baseline scenario and the Year 0 Sacramento DWSC Only Deepening scenario. Increases in chloride concentration under the Year 0 Sacramento DWSC Only Deepening scenario are predicted between November and January. The water quality objective of maximum mean daily concentration of 250 mg/l Cl^- is not exceeded at the Contra Costa Victoria Canal Alternative Intake Point under either the Year 0 Baseline or the Year 0 Sacramento DWSC Only Deepening scenario.

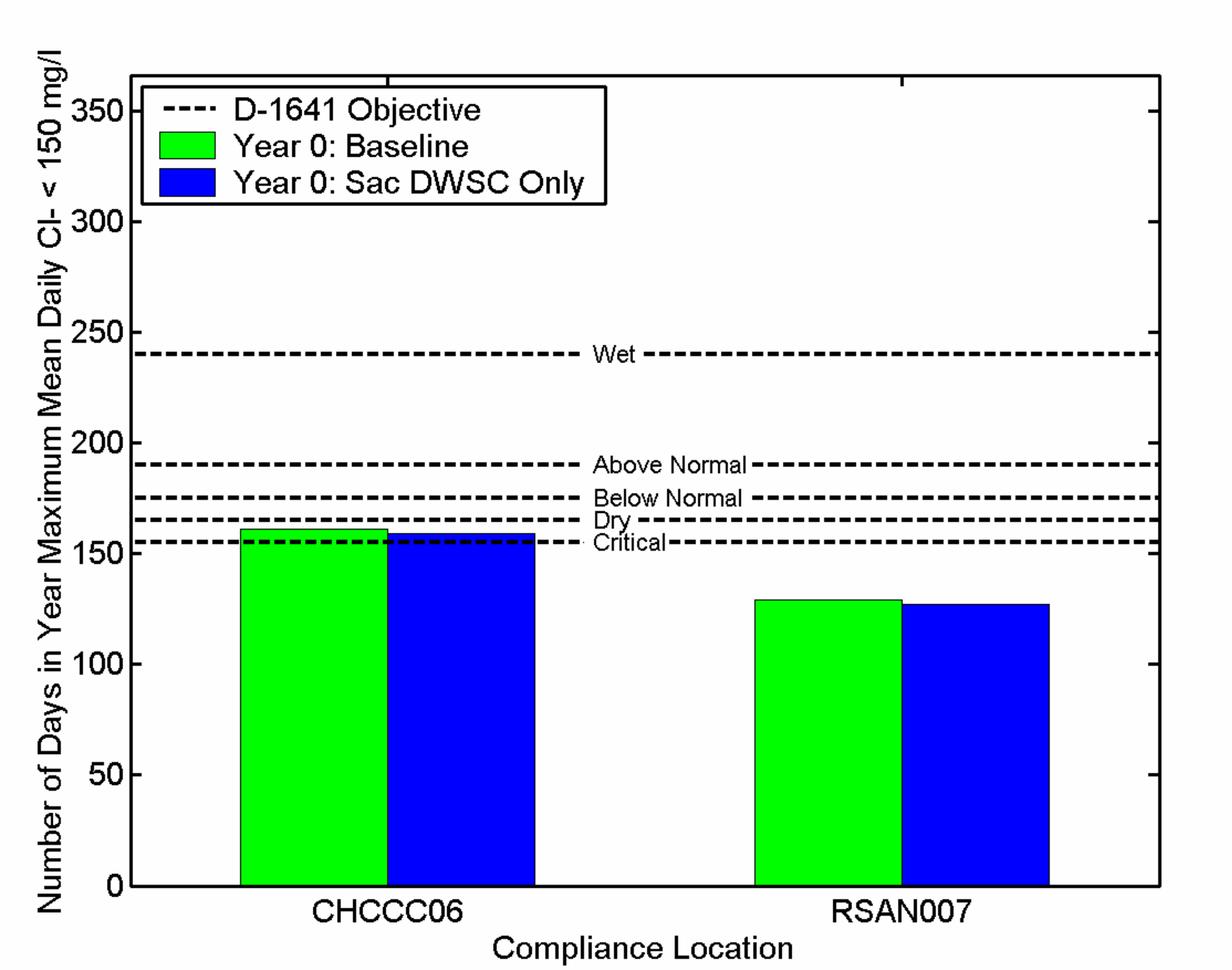


Figure 4.6-1 Number of days during the Year 0 simulation period that predicted mean daily concentration of Cl^- is less than 150 mg/l at Contra Costa Canal at Pumping Plant #1 (CHCCC06) and the Antioch Water Works intake (RSAN007) for the Year 0 Baseline scenario and the Year 0 Sacramento DWSC Only Deepening scenario.

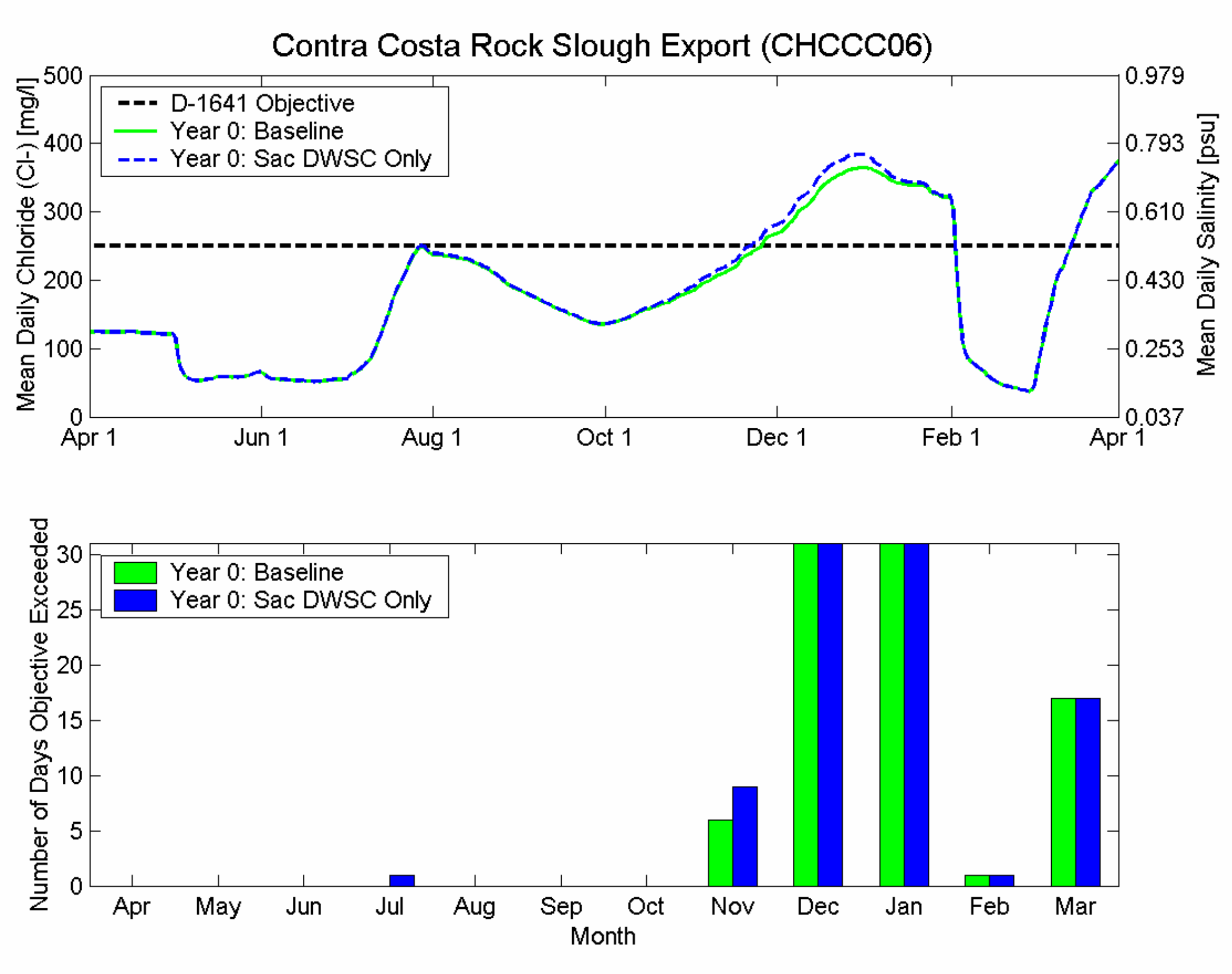


Figure 4.6-2 Predicted mean daily Cl^- concentration at Contra Costa Rock Slough Export (CHCCC06) for the Year 0 Baseline scenario and the Year 0 Sacramento DWSC Only Deepening scenario (top); number of days each month that predicted mean daily concentration of Cl^- at CHCCC06 exceeds 250 mg/l Cl^- for each scenario during the Year 0 simulation period (bottom).

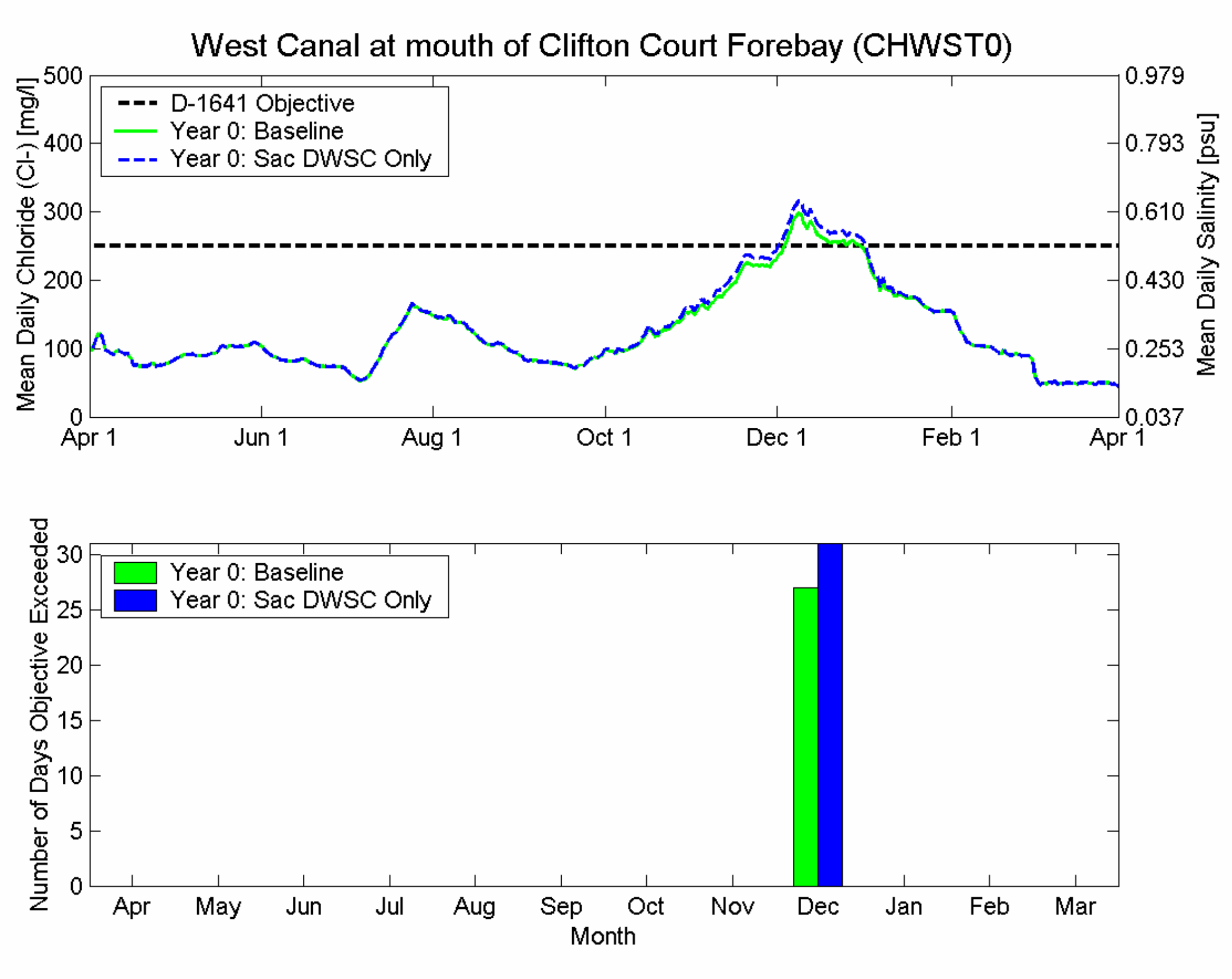


Figure 4.6-3 Predicted mean daily Cl^- concentration at West Canal at mouth of Clifton Court Forebay (CHWST0) for the Year 0 Baseline scenario and the Year 0 Sacramento DWSC Only Deepening scenario (top); number of days each month that predicted mean daily concentration of Cl^- at CHWST0 exceeds 250 mg/l Cl^- for each scenario during the Year 0 simulation period (bottom).

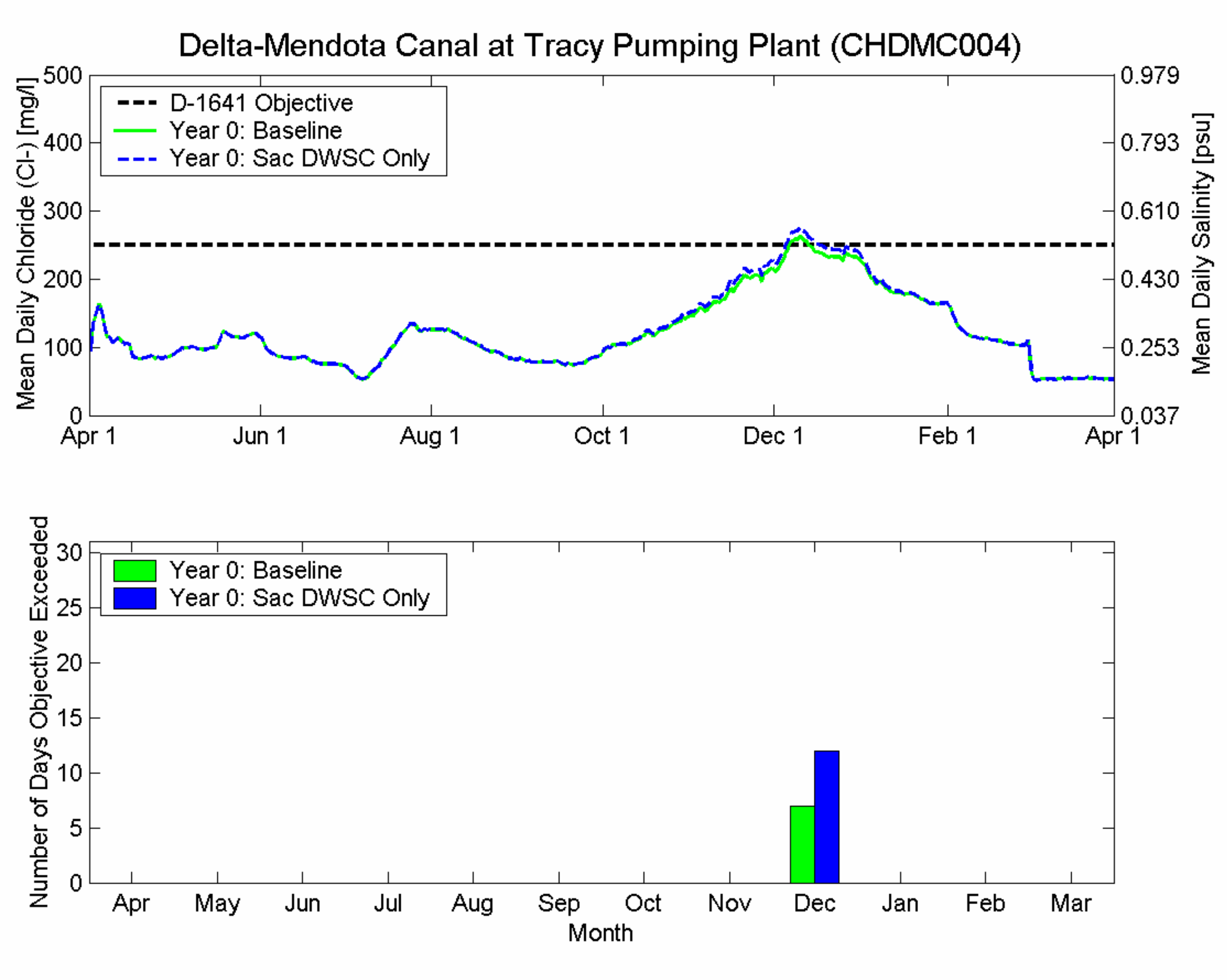


Figure 4.6-4 Predicted mean daily Cl^- concentration at Delta-Mendota Canal at Tracy Pumping Plant (CHDMC004) for the Year 0 Baseline scenario and the Year 0 Sacramento DWSC Only Deepening scenario (top); number of days each month that predicted mean daily concentration of Cl^- at CHDMC004 exceeds 250 mg/l Cl^- for each scenario during the Year 0 simulation period (bottom).

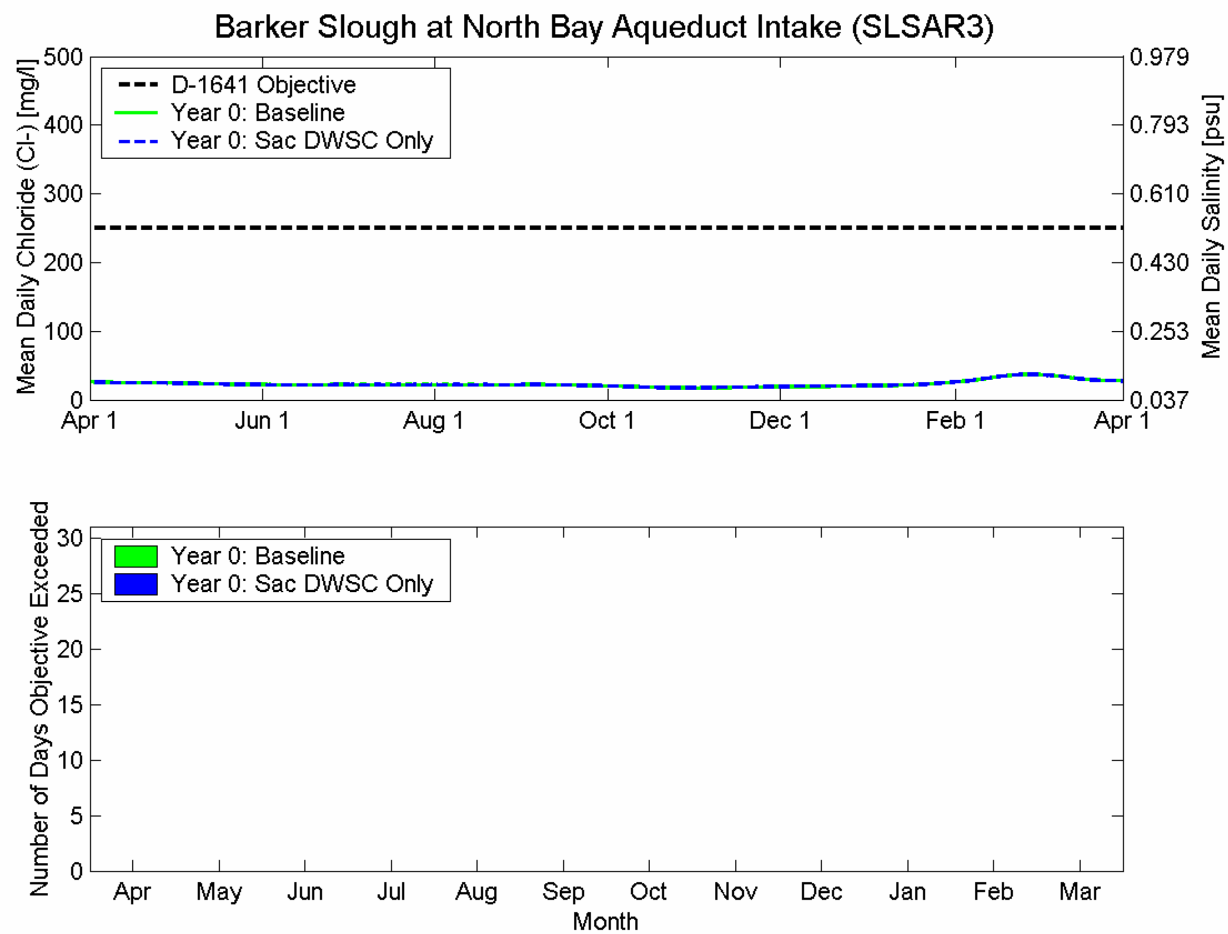


Figure 4.6-5 Predicted mean daily Cl^- concentration at Barker Slough at North Bay Aqueduct Intake (SLSAR3) for the Year 0 Baseline scenario and the Year 0 Sacramento DWSC Only Deepening scenario (top); number of days each month that predicted mean daily concentration of Cl^- at SLSAR3 exceeds 250 mg/l Cl^- for each scenario during the Year 0 simulation period (bottom).

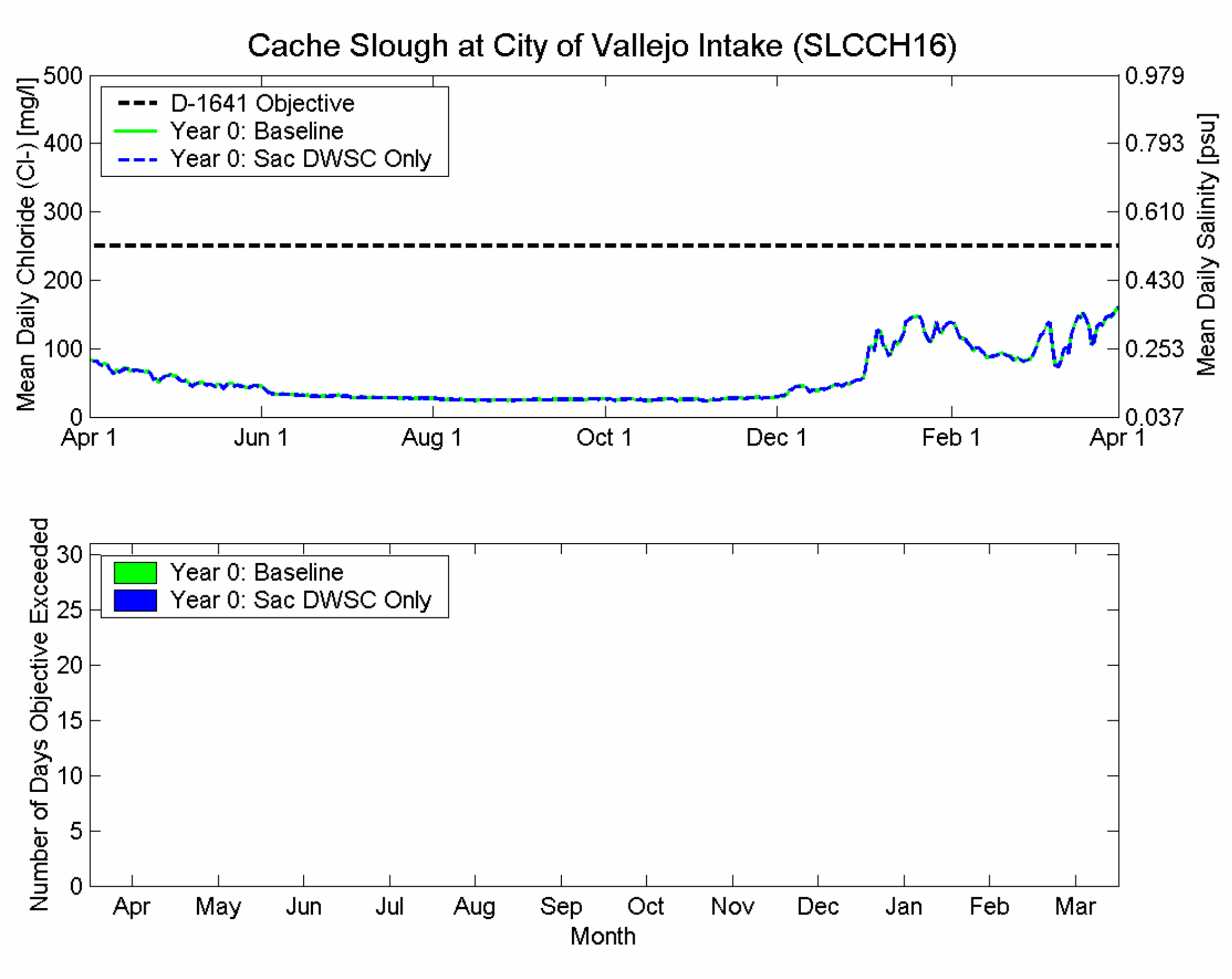


Figure 4.6-6 Predicted mean daily Cl^- concentration at Cache Slough at City of Vallejo Intake (SLCCH16) for the Year 0 Baseline scenario and the Year 0 Sacramento DWSC Only Deepening scenario (top); number of days each month that predicted mean daily concentration of Cl^- at SLCCH16 exceeds 250 mg/l Cl^- for each scenario during the Year 0 simulation period (bottom).

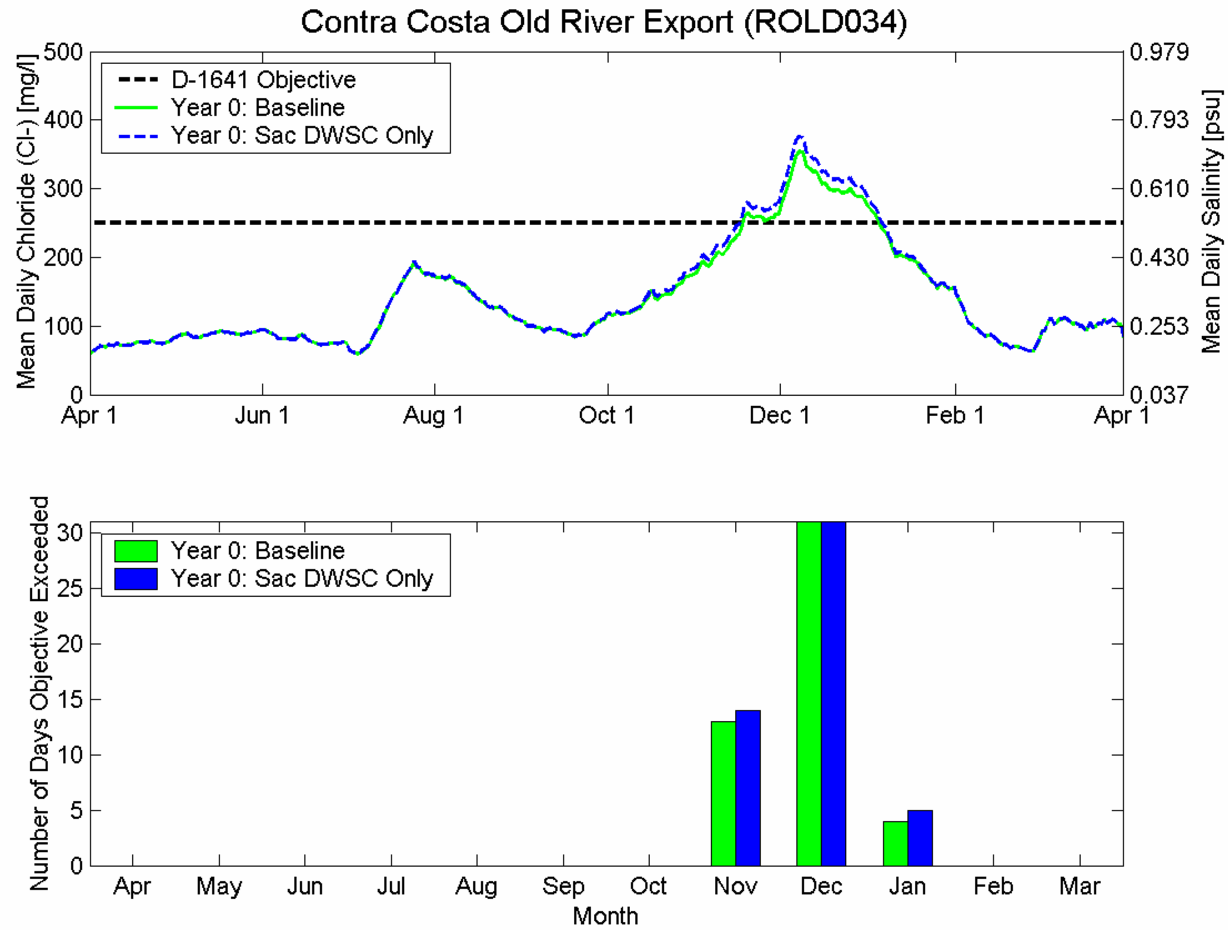


Figure 4.6-7 Predicted mean daily Cl^- concentration at Contra Costa Old River Export (ROLD034) for the Year 0 Baseline scenario and the Year 0 Sacramento DWSC Only Deepening scenario (top); number of days each month that predicted mean daily concentration of Cl^- at ROLD034 exceeds 250 mg/l Cl^- for each scenario during the Year 0 simulation period (bottom).

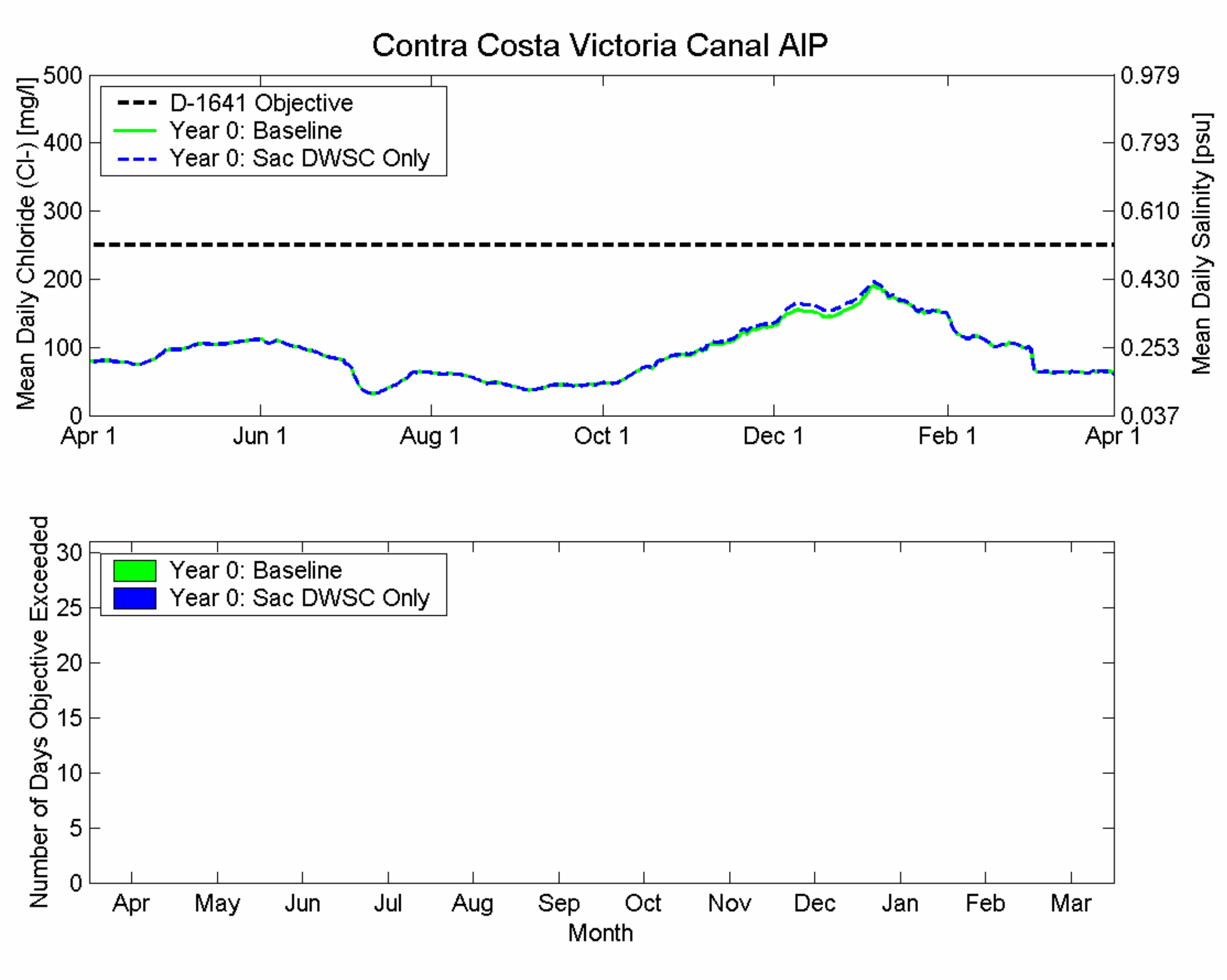


Figure 4.6-8 Predicted mean daily Cl^- concentration at Contra Costa Victoria Canal Alternative Intake Point for the Year 0 Baseline scenario and the Year 0 Sacramento DWSC Only Deepening scenario (top); number of days each month that predicted mean daily concentration of Cl^- at Contra Costa Victoria Canal Alternative Intake Point exceeds 250 mg/l Cl^- for each scenario during the Year 0 simulation period (bottom).

4.6.2 Water Quality Objectives for Agricultural Beneficial Use

The D-1641 water quality objectives for agricultural beneficial uses, shown in Table 3-2, are based on either maximum 14-day running average EC, maximum 30-day running average EC, or maximum monthly average of mean daily EC at the stations shown on Figure 3.4-2. The western Delta and interior Delta water quality objectives for agricultural beneficial use depend on water year type on the Sacramento River and apply only from April 1 to August 15, while the southern Delta and export area water quality objectives for agricultural beneficial use apply uniformly across all water year types during the whole year.

Water year 1994 (from October 1, 1993 through September 30, 1994) was classified as a "critical" year, the lowest flow classification, on both the Sacramento River and San Joaquin River. Water Year 1995 (from October 1, 1994 through September 30, 1995) was classified as a "wet" year, the highest flow classification, on both the Sacramento River and the San Joaquin River (DWR, 2009b). Since the April 1 through August 15 period falls within water year 1994, the "critical" year water quality objectives shown in Table 3-2 are applied for the western Delta and interior Delta stations.

Figure 4.6-9 shows the predicted 14-day running average EC on the Sacramento River at Emmaton for the Year 0 Baseline scenario and the Year 0 Sacramento DWSC Only Deepening scenario. Small increases in 14-day running average EC under the Year 0 Sacramento DWSC Only Deepening scenario are predicted between November and December. The water quality objectives for agricultural beneficial use apply from April 1 through August 15. The water quality objective of maximum 14-day running average EC on the Sacramento River at Emmaton is not exceeded for any days under the Year 0 Baseline scenario or the Year 0 Sacramento DWSC Only Deepening scenario.

Figure 4.6-10 shows the predicted 14-day running average EC on the San Joaquin River at Jersey Point for the Year 0 Baseline scenario and the Year 0 Sacramento DWSC Only Deepening scenario. Small increases in 14-day running average EC under the Year 0 Sacramento DWSC Only Deepening scenario are predicted between November and January. The water quality objectives for agricultural beneficial use apply from April 1 through August 15. The water quality objective of maximum 14-day running average EC on the San Joaquin River at Jersey Point is not exceeded under the Year 0 Baseline scenario or the Year 0 Sacramento DWSC Only Deepening scenario.

Figure 4.6-11 shows the predicted 14-day running average EC on the South Fork Mokelumne River at Terminous for the Year 0 Baseline scenario and the Year 0 Sacramento DWSC Only Deepening scenario. The predicted 14-day running average EC is nearly identical for both scenarios indicating that there is no predicted effect on EC on the South Fork Mokelumne River at Terminous resulting from the Year 0 Sacramento DWSC Only Deepening scenario. The water quality objectives for agricultural beneficial use apply from April 1 through August 15. The water quality objective of maximum 14-day running average EC on the South Fork Mokelumne River at Terminous is not exceeded under the Year 0 Baseline scenario or the Year 0 Sacramento DWSC Only Deepening scenario.

Figure 4.6-12 shows the predicted 14-day running average EC on the San Joaquin River at San Andreas Landing for the Year 0 Baseline scenario and the Year 0 Sacramento DWSC Only Deepening scenario. Small increases in 14-day running average EC under the Year 0 Sacramento DWSC Only Deepening scenario are predicted between November and January. The water quality objectives for agricultural beneficial use apply from April 1 through August 15. The water quality objective of maximum 14-day running average EC on the San Joaquin River at San Andreas Landing is not exceeded under the Year 0 Baseline scenario or the Year 0 Sacramento DWSC Only Deepening scenario.

Figure 4.6-13 shows the predicted 30-day running average EC on the San Joaquin River at Airport Way Bridge, Vernalis for the Year 0 Baseline scenario and the Year 0 Sacramento DWSC Only Deepening scenario. The predicted 30-day running average EC is identical for both scenarios indicating that there is no predicted effect on EC on the San Joaquin River at Vernalis resulting from the Year 0 Sacramento DWSC Only Deepening scenario. The water quality objectives for agricultural beneficial use apply all year. The water quality objective of maximum 30-day running average EC on the San Joaquin River at Vernalis is exceeded for 21 days during April both scenarios. Since the predicted EC at Vernalis is almost entirely dependent on the specified inflow concentration on the San Joaquin River which is provided as part of the CALSIM II output, the compliance with this objective is dependent on the inflow concentration which is not impacted by the deepening scenario.

Figure 4.6-14 shows the predicted 30-day running average EC on the San Joaquin River at Brandt Bridge for the Year 0 Baseline scenario and the Year 0 Sacramento DWSC Only Deepening scenario. The predicted 30-day running average EC is nearly identical for both scenarios indicating that there is no predicted effect on EC on the San Joaquin River at Brandt Bridge resulting from the Year 0 Sacramento DWSC Only Deepening scenario. The water quality objectives for agricultural beneficial use apply all year. The water quality objective of maximum 30-day running average EC on the San Joaquin River at Brandt Bridge is exceeded for 24 days during April for both the Year 0 Baseline scenario and the Year 0 Sacramento DWSC Only Deepening scenario. Since the predicted EC at Brandt Bridge is largely dependent on the specified inflow concentration on the San Joaquin River at Vernalis, and the compliance with this objective is not impacted by the deepening scenario.

Figure 4.6-15 shows the predicted 30-day running average EC on Old River near Middle River for the Year 0 Baseline scenario and the Year 0 Sacramento DWSC Only Deepening scenario. The predicted 30-day running average EC is identical for both scenarios indicating that there is no predicted effect on EC on Old River near Middle River resulting from the Year 0 Sacramento DWSC Only Deepening scenario. The water quality objectives for agricultural beneficial use apply all year. The water quality objective of maximum 30-day running average EC on Old River near Middle River is exceeded for 24 days during April for both the Year 0 Baseline scenario and the Year 0 Sacramento DWSC Only Deepening scenario. The compliance with this water quality objective is not impacted by the deepening scenario.

Figure 4.6-16 shows the predicted 30-day running average EC on Old River at Tracy Road Bridge for the Year 0 Baseline scenario and the Year 0 Sacramento DWSC Only Deepening scenario. The predicted 30-day running average EC is nearly identical for both scenarios indicating only a very small effect on EC on Old River at Tracy Road Bridge resulting from the Year 0 Sacramento DWSC Only Deepening scenario. The water quality objectives for agricultural beneficial use apply all year. The water quality objective of maximum 30-day running average EC on Old River at Tracy Road Bridge is exceeded for 29 days during April for both scenarios. Compliance with this objective during April is largely dependent on the inflow concentration at Vernalis which is not impacted by the deepening scenario.

The D-1641 water quality objectives for agricultural beneficial uses at the export areas stipulate that the monthly average of mean daily EC not exceed 1.0 mmhos/cm. Figure 4.6-17 and Figure 4.6-18 show the predicted monthly average of mean daily EC for the two export areas shown in Table 3-2 which have water quality objectives for agricultural beneficial uses.

Figure 4.6-17 shows the predicted monthly average of mean daily EC at West Canal at mouth of Clifton Court Forebay for the Year 0 Baseline scenario and the Year 0 Sacramento DWSC Only Deepening scenario. The Year 0 Sacramento DWSC Only Deepening scenario has a very small effect on monthly average EC West Canal at mouth of Clifton Court Forebay except during November through January when slightly larger EC values associated with the Year 0 Sacramento DWSC Only Deepening scenario are predicted. Under both the Year 0 Baseline Scenario and the Year 0 Sacramento DWSC Only Deepening scenario, the water quality objective is met at West Canal at mouth of Clifton Court Forebay for all months except December, January, and March. In December, the predicted monthly average of mean daily EC is 1.32 mmhos/cm for the Year 0 Baseline scenario and 1.39 mmhos/cm for the Year 0 Sacramento DWSC Only Deepening scenario (an increase of 0.07 mmhos/cm). In January, the predicted monthly average of mean daily EC is 1.37 mmhos/cm for the Year 0 Baseline scenario and 1.39 mmhos/cm for the Year 0 Sacramento DWSC Only Deepening scenario (an increase of 0.02 mmhos/cm). In March, the predicted monthly average of mean daily EC is 1.04 mmhos/cm for the Year 0 Baseline scenario and 1.04 mmhos/cm for the Year 0 Sacramento DWSC Only Deepening scenario (no change relative to Year 0 Baseline).

Figure 4.6-18 shows the predicted monthly average of mean daily EC at the Delta-Mendota Canal at Tracy Pumping Plant for the Year 0 Baseline scenario and the Year 0 Sacramento DWSC Only Deepening scenario. The Year 0 Sacramento DWSC Only Deepening scenario has an extremely small effect on monthly average EC at the Delta-Mendota Canal at Tracy Pumping Plant except during November and December when slightly larger EC values associated with the Year 0 Sacramento DWSC Only Deepening scenario are predicted. Under both the Year 0 Baseline Scenario and the Year 0 Sacramento DWSC Only Deepening scenario, the water quality objective is met at the Delta-Mendota Canal at Tracy Pumping Plant for all months except December. In December, the predicted monthly average of mean daily EC is 1.10 mmhos/cm for the Year 0 Baseline scenario and 1.15 mmhos/cm for the Year 0 Sacramento DWSC Only Deepening scenario (an increase of 0.05 mmhos/cm).

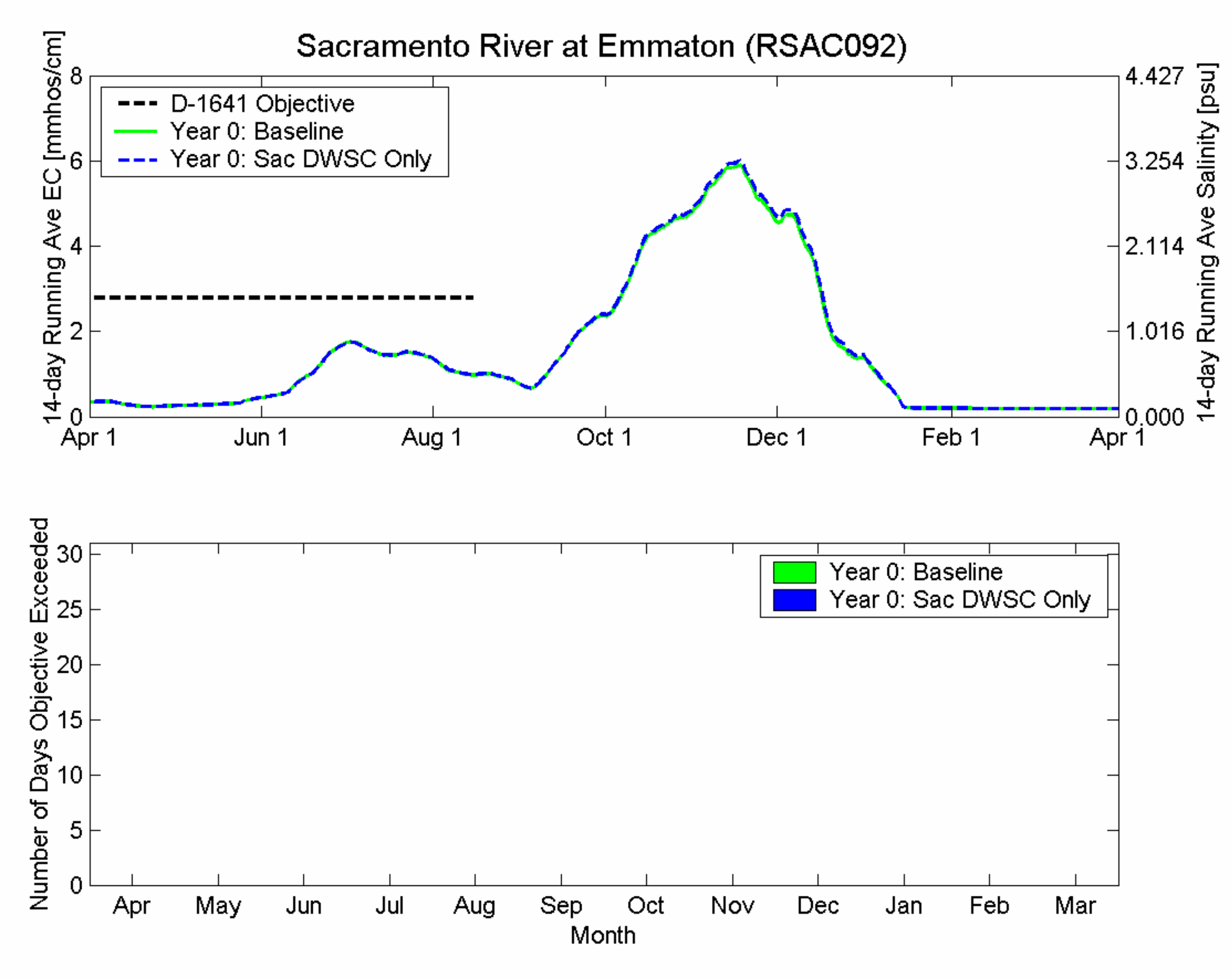
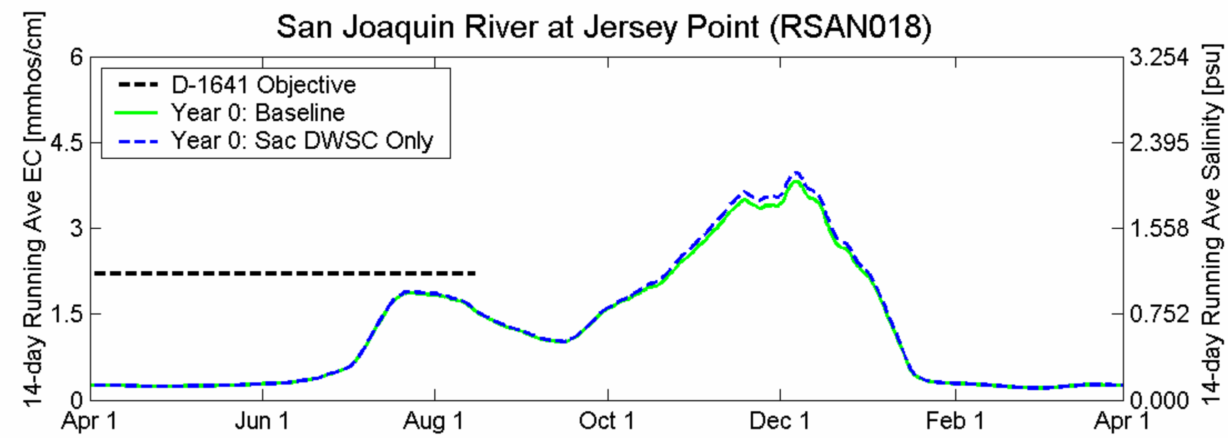


Figure 4.6-9 Predicted 14-day running average EC at Sacramento River at Emmaton (RSAC092) for the Year 0 Baseline scenario and the Year 0 Sacramento DWSC Only Deepening scenario (top); number of days each month that predicted 14-day running average EC at RSAC092 exceeds D-1641 water quality objectives for each scenario during the Year 0 simulation period (bottom).



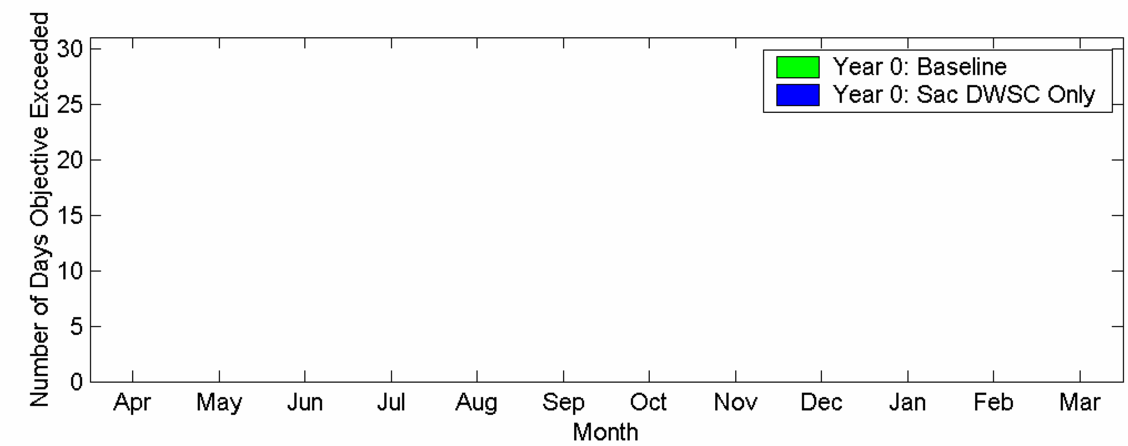


Figure 4.6-10 Predicted 14-day running average EC at San Joaquin River at Jersey Point (RSAN018) for the Year 0 Baseline scenario and the Year 0 Sacramento DWSC Only Deepening scenario (top); number of days each month that predicted 14-day running average EC at RSAN018 exceeds D-1641 water quality objectives for each scenario during the Year 0 simulation period (bottom).

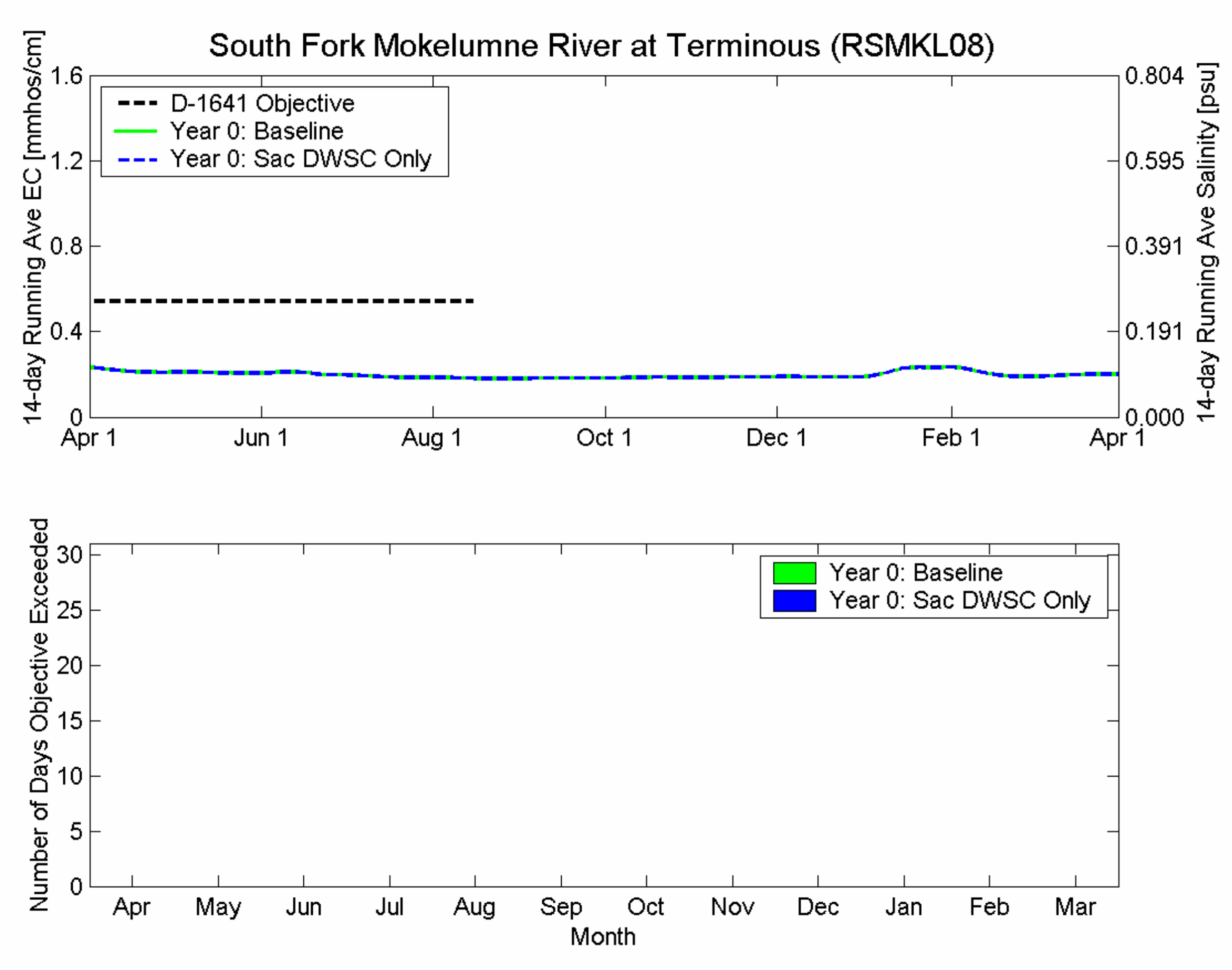


Figure 4.6-11 Predicted 14-day running average EC at South Fork Mokelumne River at Terminous (RSMKL08) for the Year 0 Baseline scenario and the Year 0 Sacramento DWSC Only Deepening scenario (top); number of days each month that predicted 14-day running average EC at RSMKL08 exceeds D-1641 water quality objectives for each scenario during the Year 0 simulation period (bottom).

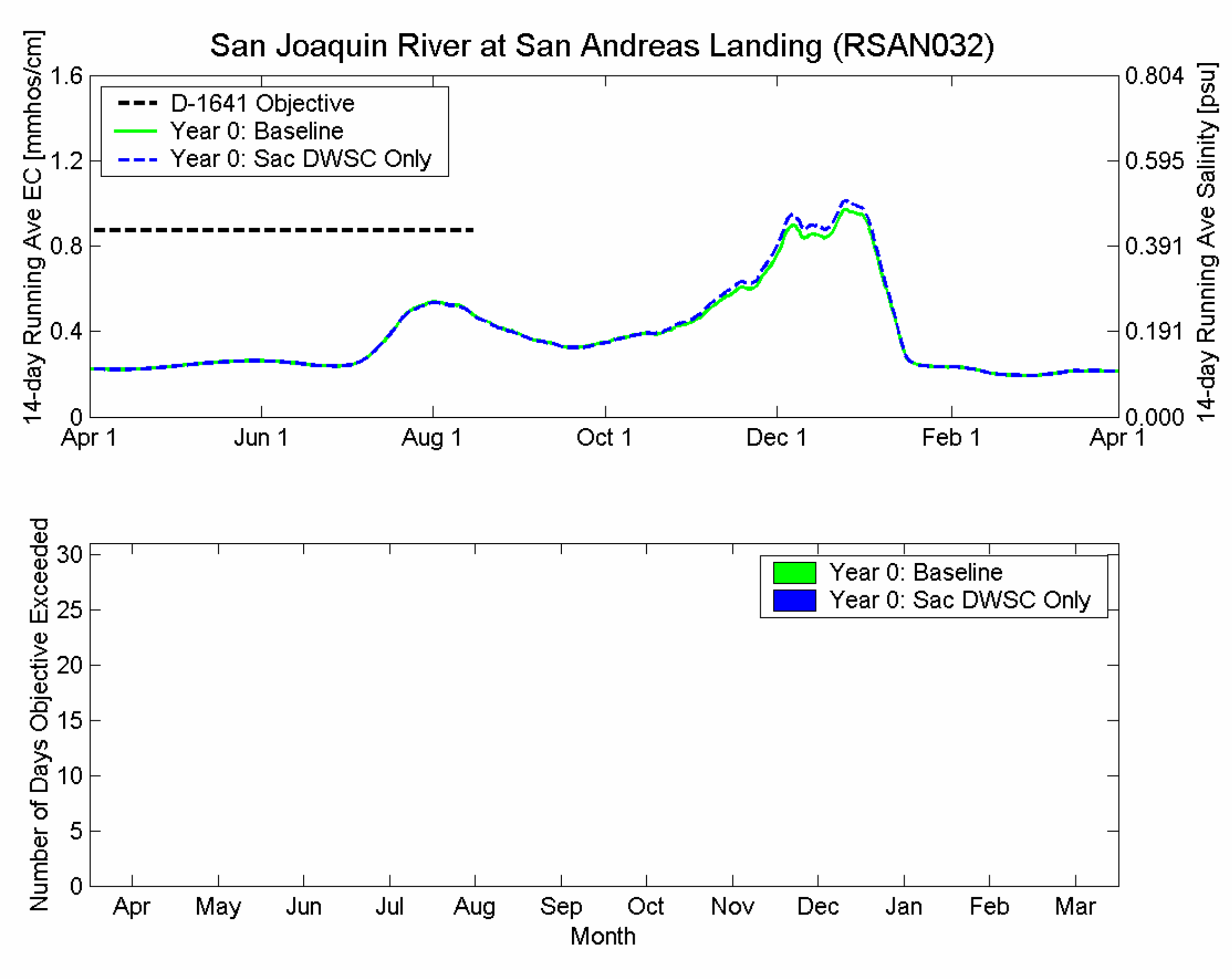


Figure 4.6-12 Predicted 14-day running average EC at San Joaquin River at San Andreas Landing (RSAN032) for the Year 0 Baseline scenario and the Year 0 Sacramento DWSC Only Deepening scenario (top); number of days each month that predicted 14-day running average EC at RSAN032 exceeds D-1641 water quality objectives for each scenario during the Year 0 simulation period (bottom).

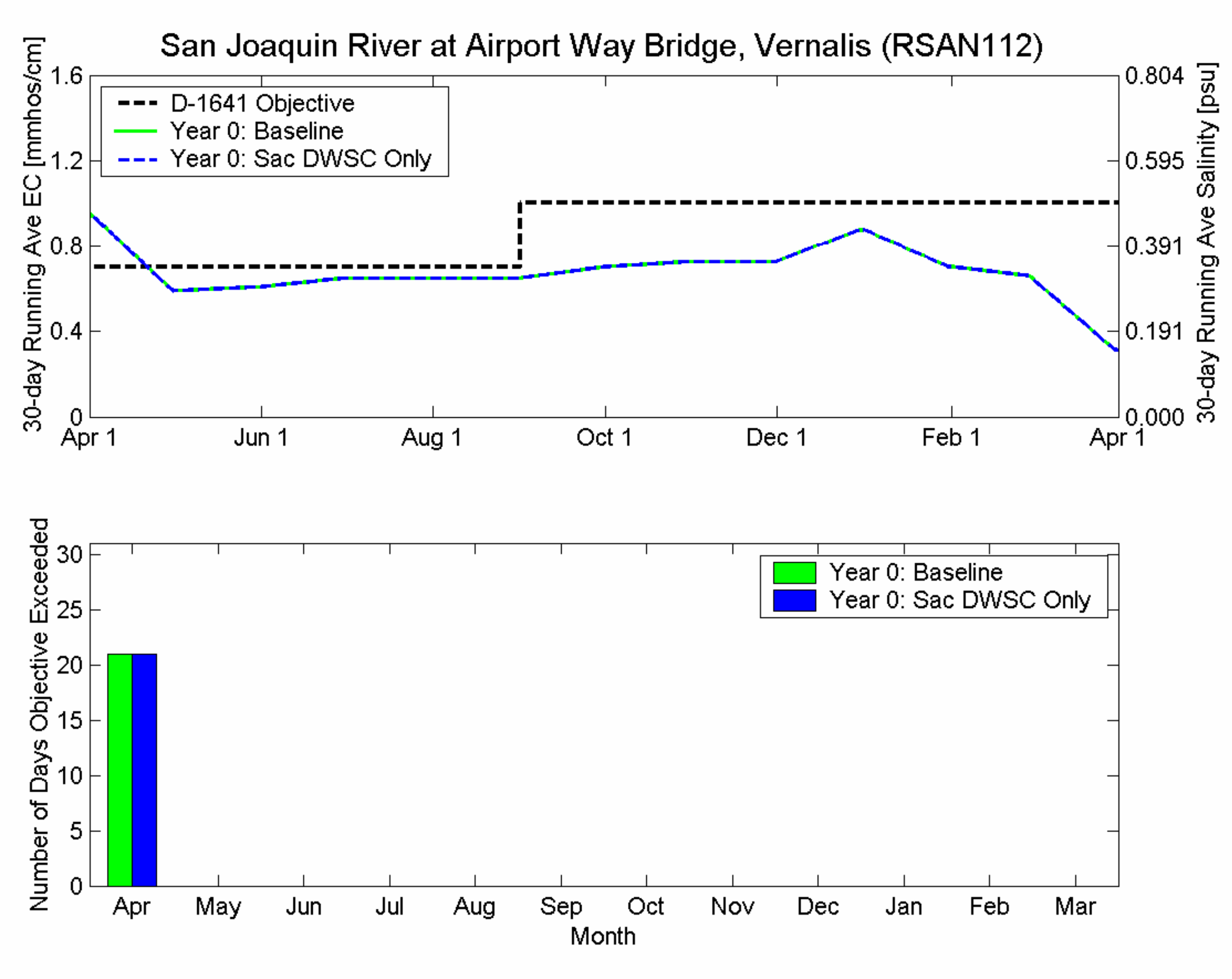


Figure 4.6-13 Predicted 30-day running average EC at San Joaquin River at Airport Way Bridge, Vernalis (RSAN112) for the Year 0 Baseline scenario and the Year 0 Sacramento DWSC Only Deepening scenario (top); number of days each month that predicted 14-day running average EC at RSAN112 exceeds D-1641 water quality objectives for each scenario during the Year 0 simulation period (bottom).

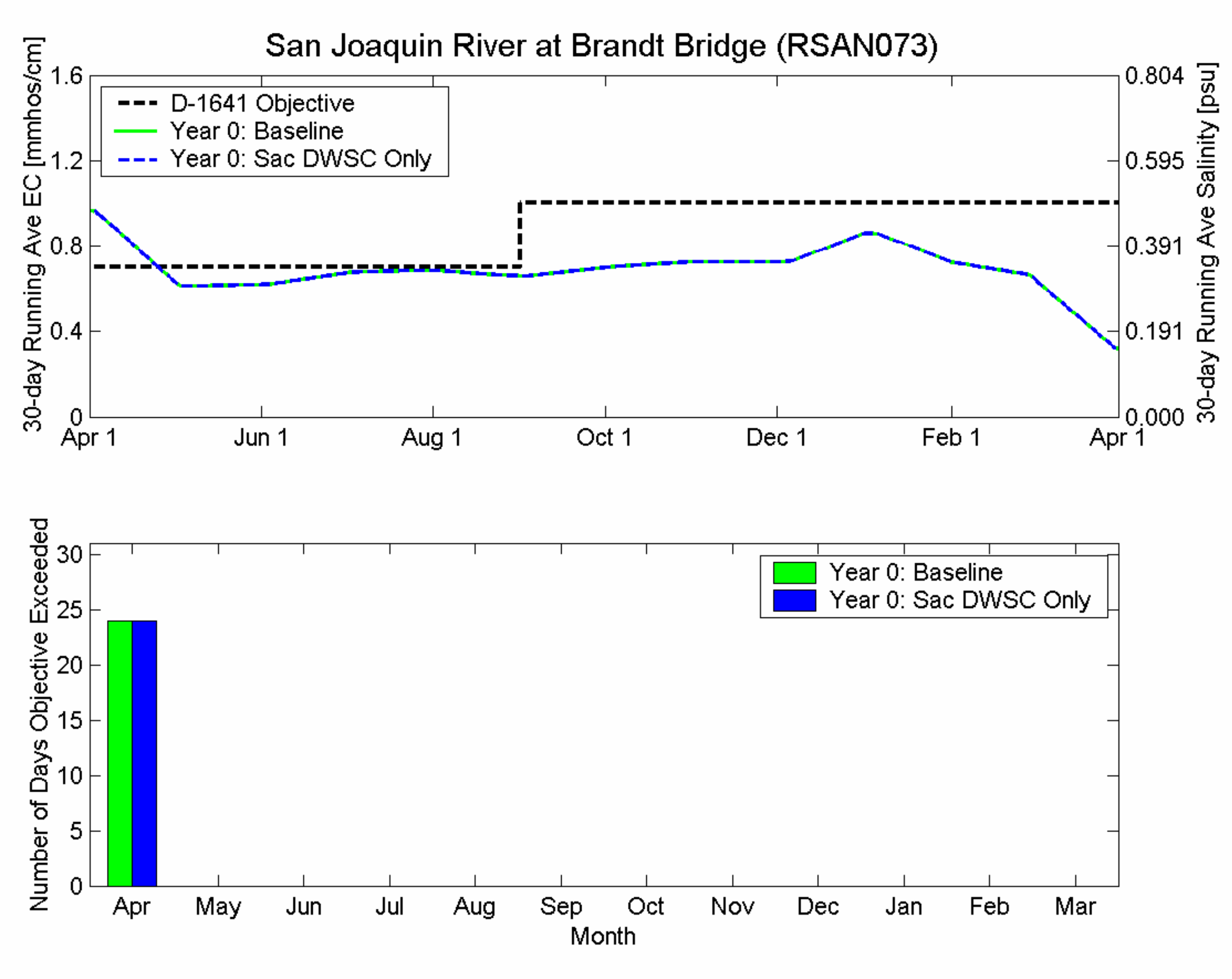
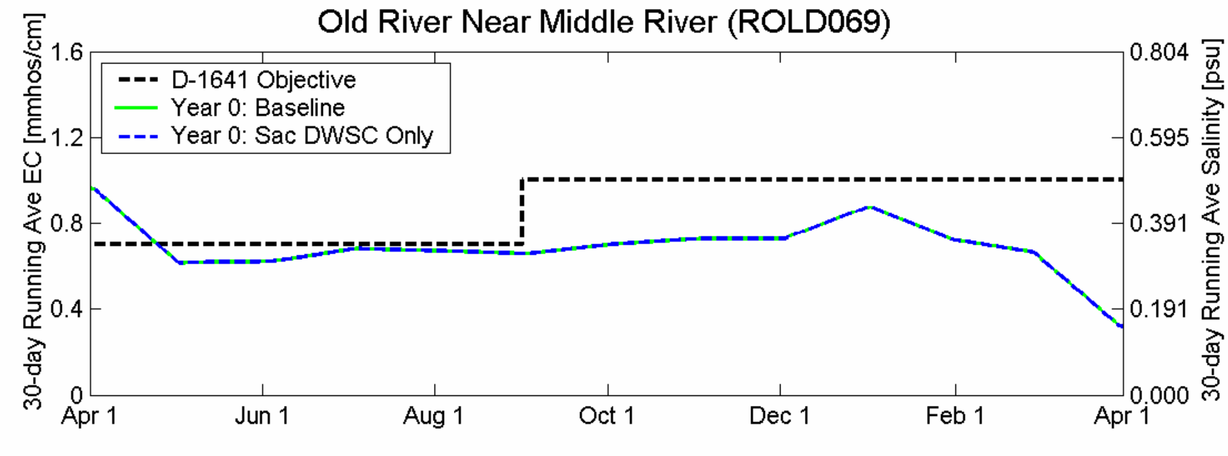


Figure 4.6-14 Predicted 30-day running average EC at San Joaquin River at Brandt Bridge (RSAN073) for the Year 0 Baseline scenario and the Year 0 Sacramento DWSC Only Deepening scenario (top); number of days each month that predicted 14-day running average EC at RSAN073 exceeds D-1641 water quality objectives for each scenario during the Year 0 simulation period (bottom).



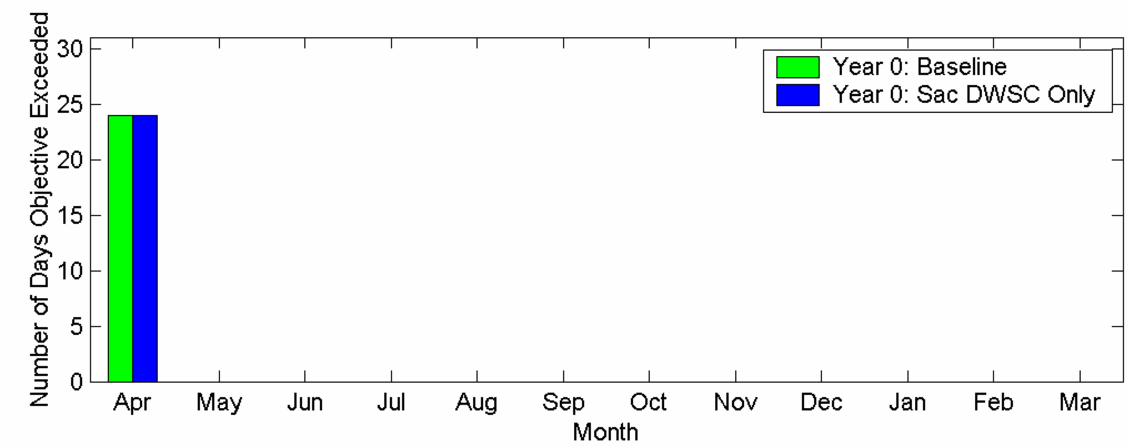


Figure 4.6-15 Predicted 30-day running average EC at Old River Near Middle River (ROLD069) for the Year 0 Baseline scenario and the Year 0 Sacramento DWSC Only Deepening scenario (top); number of days each month that predicted 14-day running average EC at ROLD069 exceeds D-1641 water quality objectives for each scenario during the Year 0 simulation period (bottom).

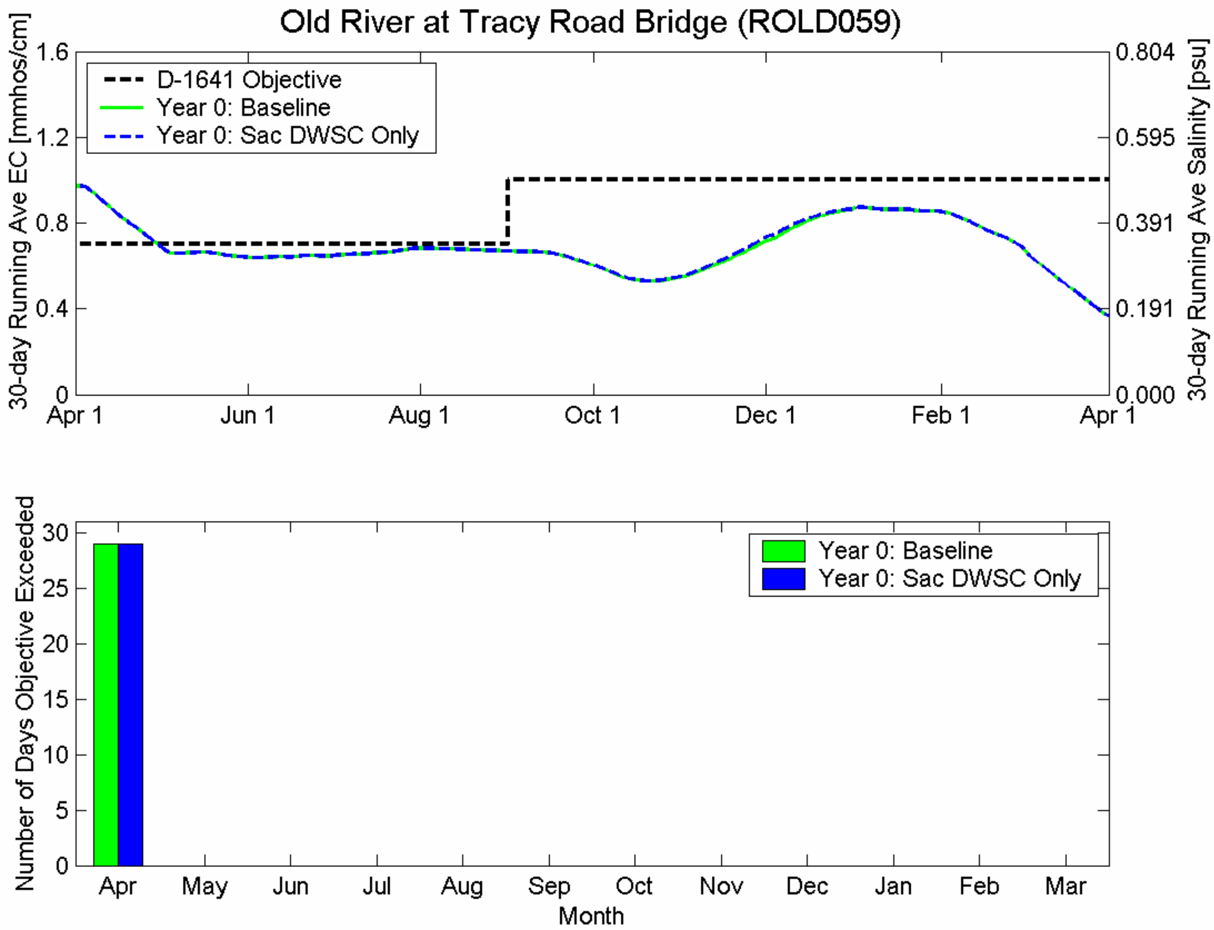


Figure 4.6-16 Predicted 30-day running average EC at Old River at Tracy Road Bridge (ROLD059) for the Year 0 Baseline scenario and the Year 0 Sacramento DWSC Only Deepening scenario (top); number of days each month that predicted 14-day running average EC at ROLD059 exceeds D-1641 water quality objectives for each scenario during the Year 0 simulation period (bottom).

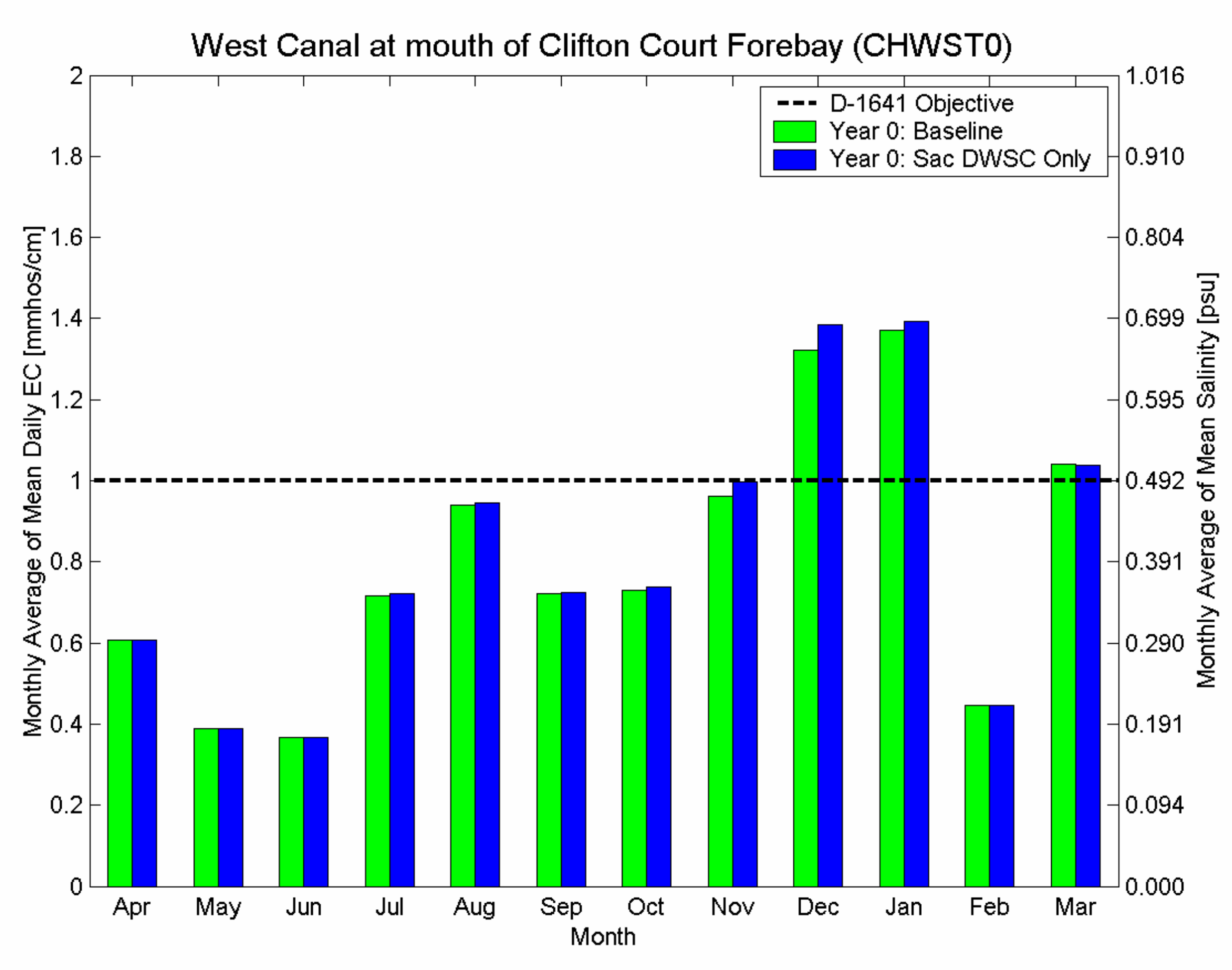


Figure 4.6-17 Predicted monthly average of mean daily EC at West Canal at mouth of Clifton Court Forebay (CHWST0) for the Year 0 Baseline scenario and the Year 0 Sacramento DWSC Only Deepening scenario, shown relative to the D-1641 water quality objectives for agricultural beneficial uses.

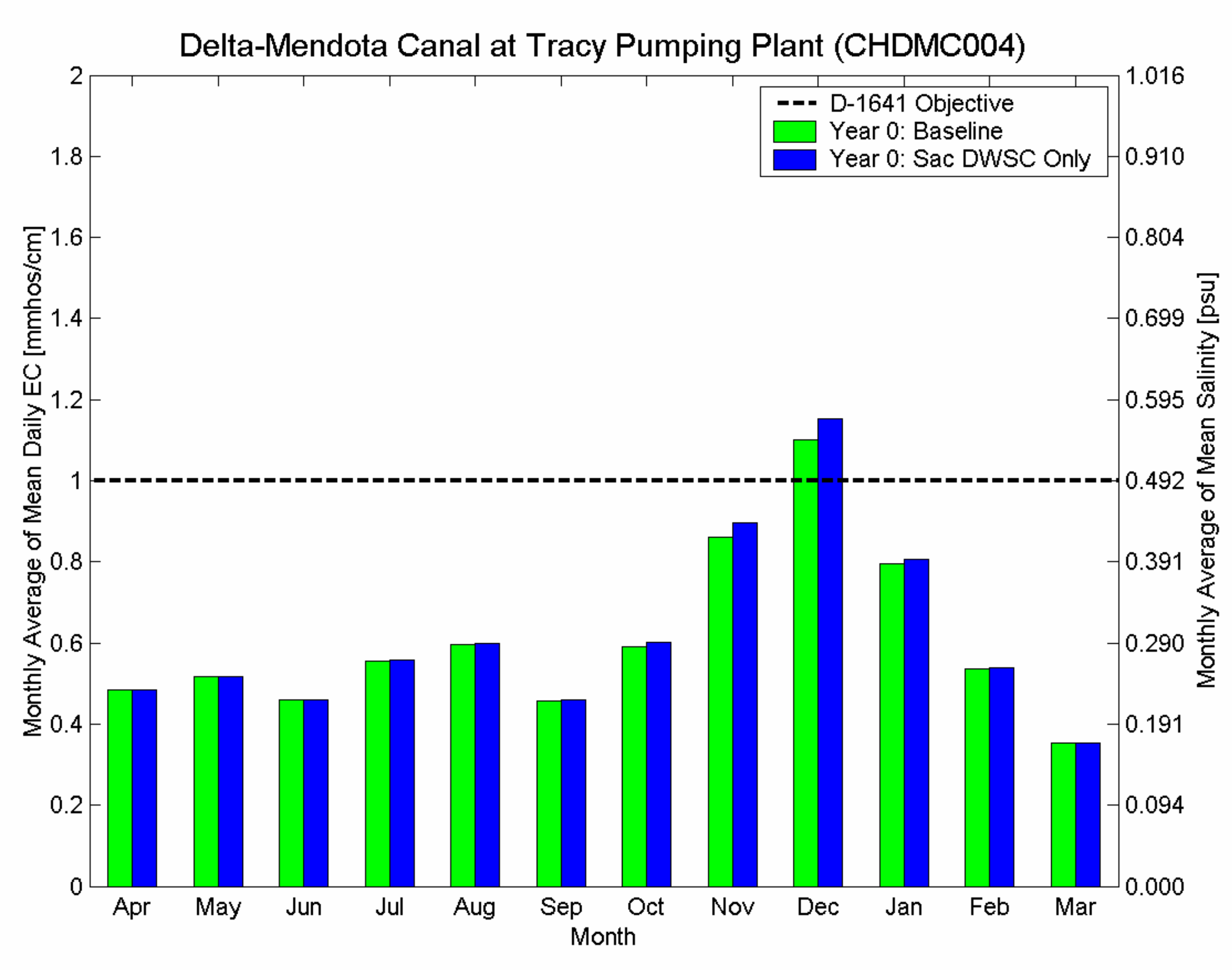


Figure 4.6-18 Predicted monthly average of mean daily EC at Delta-Mendota Canal at Tracy Pumping Plant (CHDMC004) for the Year 0 Baseline scenario and the Year 0 Sacramento DWSC Only Deepening scenario, shown relative to the D-1641 water quality objectives for agricultural beneficial uses.

4.6.3 Water Quality Objectives for Fish and Wildlife Beneficial Uses

The D-1641 water quality objectives for fish and wildlife beneficial uses, shown in Table 3-3, are based on the maximum 14-day running average EC at two stations on the San Joaquin River, and on the monthly average of both daily high tide EC values at three stations in eastern Suisun Marsh and two stations in western Suisun Marsh (shown on Figure 3.4-3).

On the San Joaquin River, the water quality objectives for fish and wildlife beneficial uses stipulate that the 14-day running average of mean daily EC on the San Joaquin River “at and between Jersey Point and Prisoners Point” is less than 0.44 mmhos/cm during the months of April and May for all water year types except “critical” years. Although April and May 1994 fall within a “critical” water year, which means that this standard does not apply for this simulation, the impact of the proposed DWSC deepening scenarios on this water quality objective is shown in Figures 4.6-19 and 4.6-20 for reference.

Figure 4.6-19 shows the predicted 14-day running average EC on the San Joaquin River at Jersey Point for the Year 0 Baseline scenario and the Year 0 Sacramento DWSC Only Deepening scenario. No increases in 14-day running average EC are predicted under the Year 0 Sacramento DWSC Only Deepening scenario during April or May. The water quality objective of maximum 14-day running average EC on the San Joaquin River at Jersey Point is not exceeded under either the Year 0 Baseline scenario or the Year 0 Sacramento DWSC Only Deepening scenario during the two months that the objectives would apply for water year types that are not “critical.”

Figure 4.6-20 shows the predicted 14-day running average EC on the San Joaquin River at Prisoners Point for the Year 0 Baseline scenario and the Year 0 Sacramento DWSC Only Deepening scenario. No increases in 14-day running average EC are predicted under either the Year 0 Sacramento DWSC Only Deepening scenario during April or May. The water quality objective of maximum 14-day running average EC on the San Joaquin River at Prisoners Point is not exceeded under either the Year 0 Baseline scenario or the Year 0 Sacramento DWSC Only Deepening scenario during the two months that the objectives would apply for water year types that are not “critical.”

The eastern Suisun Marsh and western Suisun Marsh water quality objectives for fish and wildlife beneficial uses are based on the monthly average of both daily high tide EC values. The water quality objectives apply from October through May for all water year types, as shown in Table 3-3.

Figure 4.6-21 shows the predicted monthly average of both daily high tide EC values on the Sacramento River at Collinsville for the Year 0 Baseline scenario and the Year 0 Sacramento DWSC Only Deepening scenario. For the Year 0 Sacramento DWSC Only Deepening scenario, minimal to no increase in monthly average of both daily high tide EC values is predicted during all months. The water quality objectives for fish and wildlife beneficial uses on the Sacramento River at Collinsville are met for all months except January and February under the Year 0 Baseline scenario and the Year 0 Sacramento DWSC Only Deepening scenario.

Figure 4.6-22 shows the predicted monthly average of both daily high tide EC values on Montezuma Slough at National Steel for the Year 0 Baseline scenario and the Year 0 Sacramento DWSC Only Deepening scenario. For the Year 0 Sacramento DWSC Only Deepening scenario, minimal to no increase in monthly average of both daily high tide EC values is predicted during all months. The water quality objectives for fish and wildlife beneficial uses on Montezuma Slough at National Steel are exceeded during November, January, and February under both the Year 0 Baseline scenario and the Year 0 Sacramento DWSC Only Deepening scenario, but are met during all other months.

Figure 4.6-23 shows the predicted monthly average of both daily high tide EC values on Montezuma Slough near Beldon Landing for the Year 0 Baseline scenario and the Year 0 Sacramento DWSC Only Deepening scenario. For the Year 0 Sacramento DWSC Only Deepening scenario, minimal to no increase in monthly average of both daily high tide EC values is predicted during all months. The water quality objectives for fish and wildlife beneficial uses on Montezuma Slough near Beldon Landing are exceeded during November, January, and February under both the Year 0 Baseline scenario and the Year 0 Sacramento DWSC Only Deepening scenario, but are met during all other months.

Figure 4.6-24 shows the predicted monthly average of both daily high tide EC values on Chadbourne Slough at Sunrise Duck Club for the Year 0 Baseline scenario and the Year 0 Sacramento DWSC Only Deepening scenario. For the Year 0 Sacramento DWSC Only Deepening scenario, minimal to no increase in monthly average of both daily high tide EC values is predicted during all months. The water quality objectives for fish and wildlife beneficial uses on Chadbourne Slough at Sunrise Duck Club are exceeded during April, December, January, February, and March under both the Year 0 Baseline scenario and the Year 0 Sacramento DWSC Only Deepening scenario.

Figure 4.6-25 shows the predicted monthly average of both daily high tide EC values on Suisun Slough, 300 feet south of Volanti Slough for the Year 0 Baseline scenario and the Year 0 Sacramento DWSC Only Deepening scenario. For the Year 0 Sacramento DWSC Only Deepening scenario, minimal to no increase in monthly average of both daily high tide EC values is predicted during all months. The water quality objectives for fish and wildlife beneficial uses on Suisun Slough, 300 feet south of Volanti Slough are exceeded during, December, January, February, and March under both the Year 0 Baseline scenario and the Year 0 Sacramento DWSC Only Deepening scenario.

The evaluation of water quality objectives in eastern Suisun Marsh and western Suisun Marsh demonstrates that the deepening of the Sacramento DWSC Only is unlikely to have any impact on EC in these regions during Year 0. This is consistent with the salinity maps for the Year 0 Sacramento DWSC Only Deepening scenario discussed in Section 4.4 (Figures 4.4-1 though 4.4-13), which showed that no salinity increases greater than 0.05 psu are predicted in Suisun Marsh under the Year 0 Sacramento DWSC Only Deepening scenario.

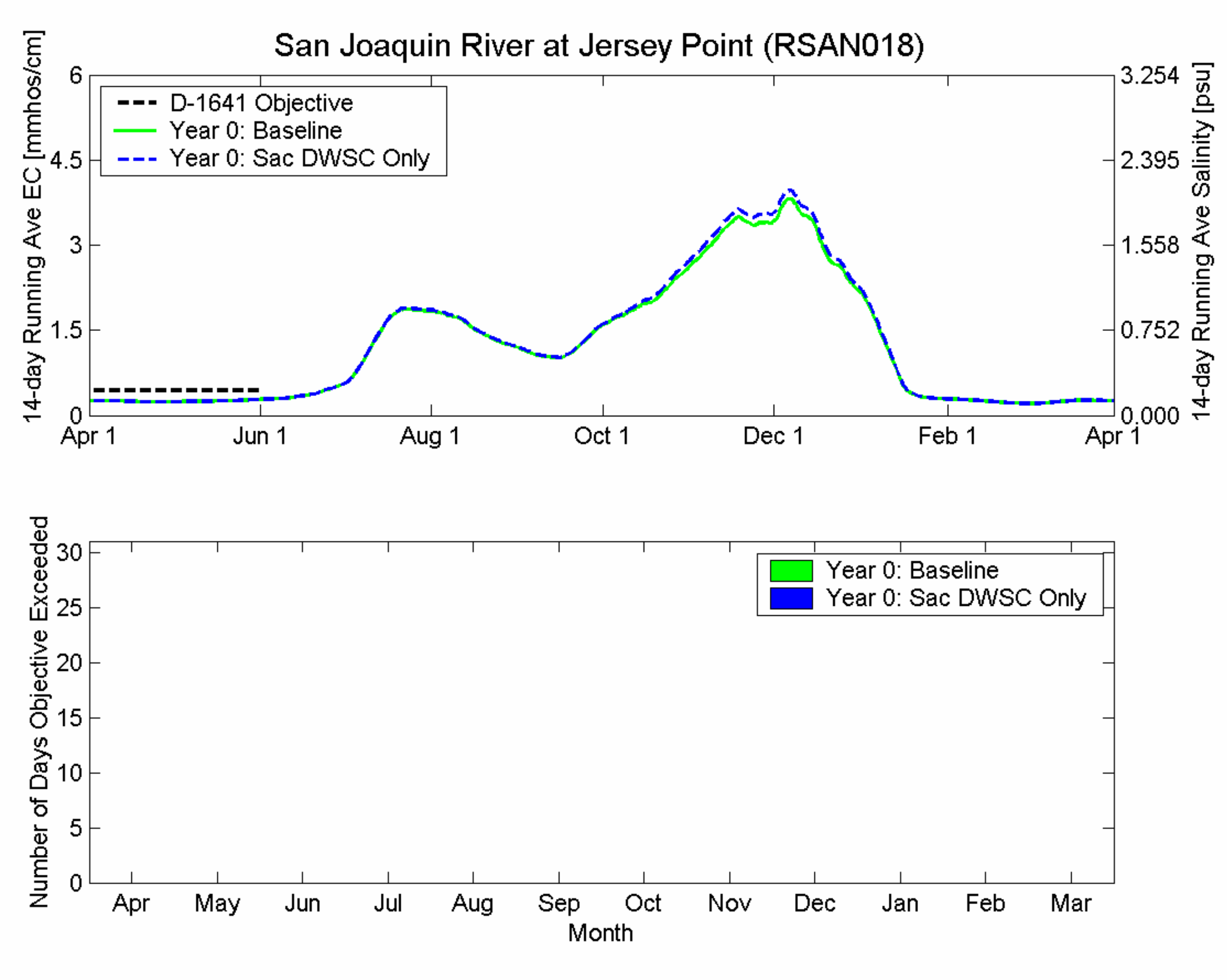


Figure 4.6-19 Predicted 14-day running average EC at San Joaquin River at Jersey Point (RSAN018) for the Year 0 Baseline scenario and the Year 0 Sacramento DWSC Only Deepening scenario (top); number of days each month that predicted 14-day running average EC at RSAN018 exceeds D-1641 water quality objectives for each scenario during the Year 0 simulation period (bottom).

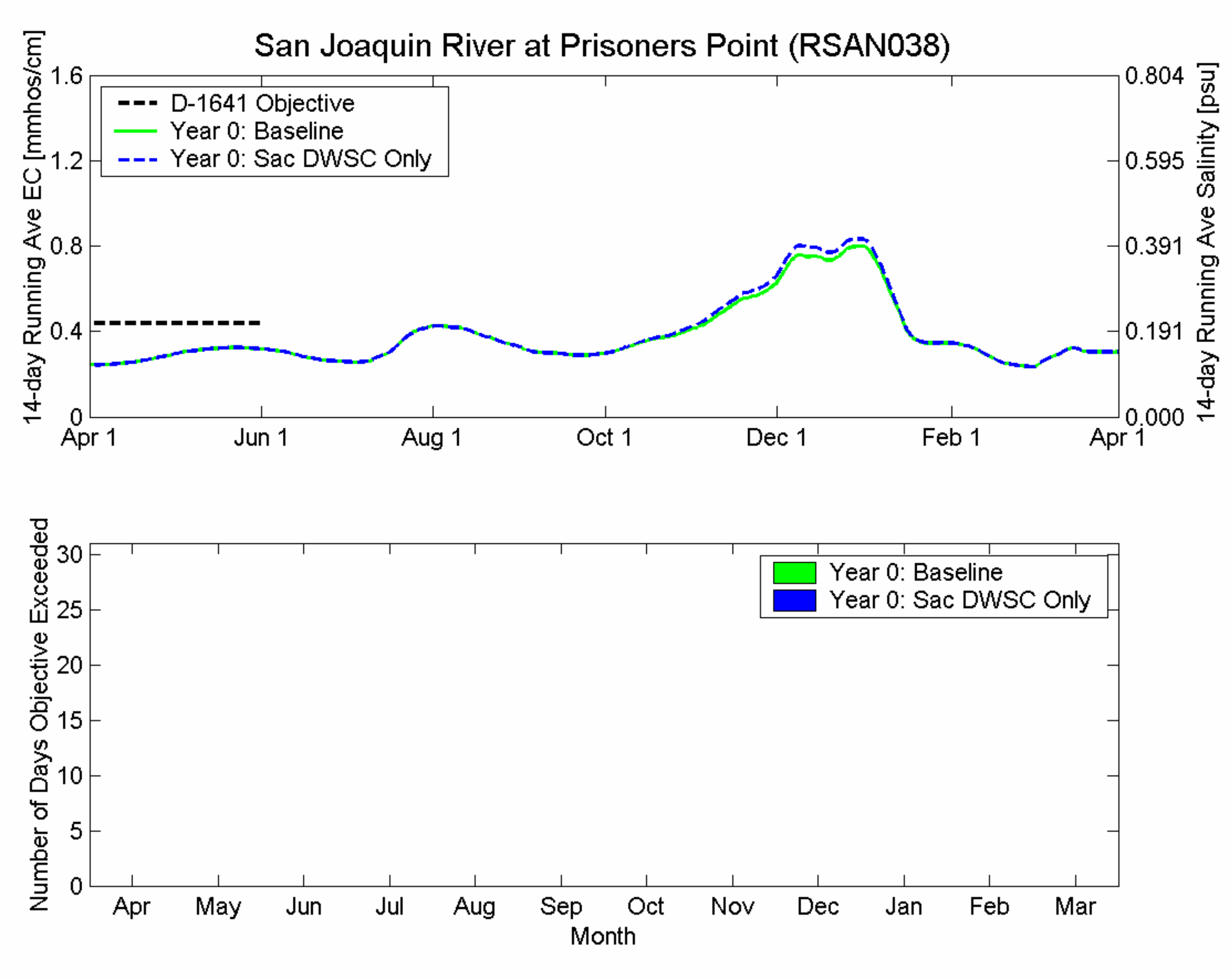


Figure 4.6-20 Predicted 14-day running average EC at San Joaquin River at Prisoners Point (RSAN038) for the Year 0 Baseline scenario and the Year 0 Sacramento DWSC Only Deepening scenario (top); number of days each month that predicted 14-day running average EC at RSAN038 exceeds D-1641 water quality objectives for each scenario during the Year 0 simulation period (bottom).

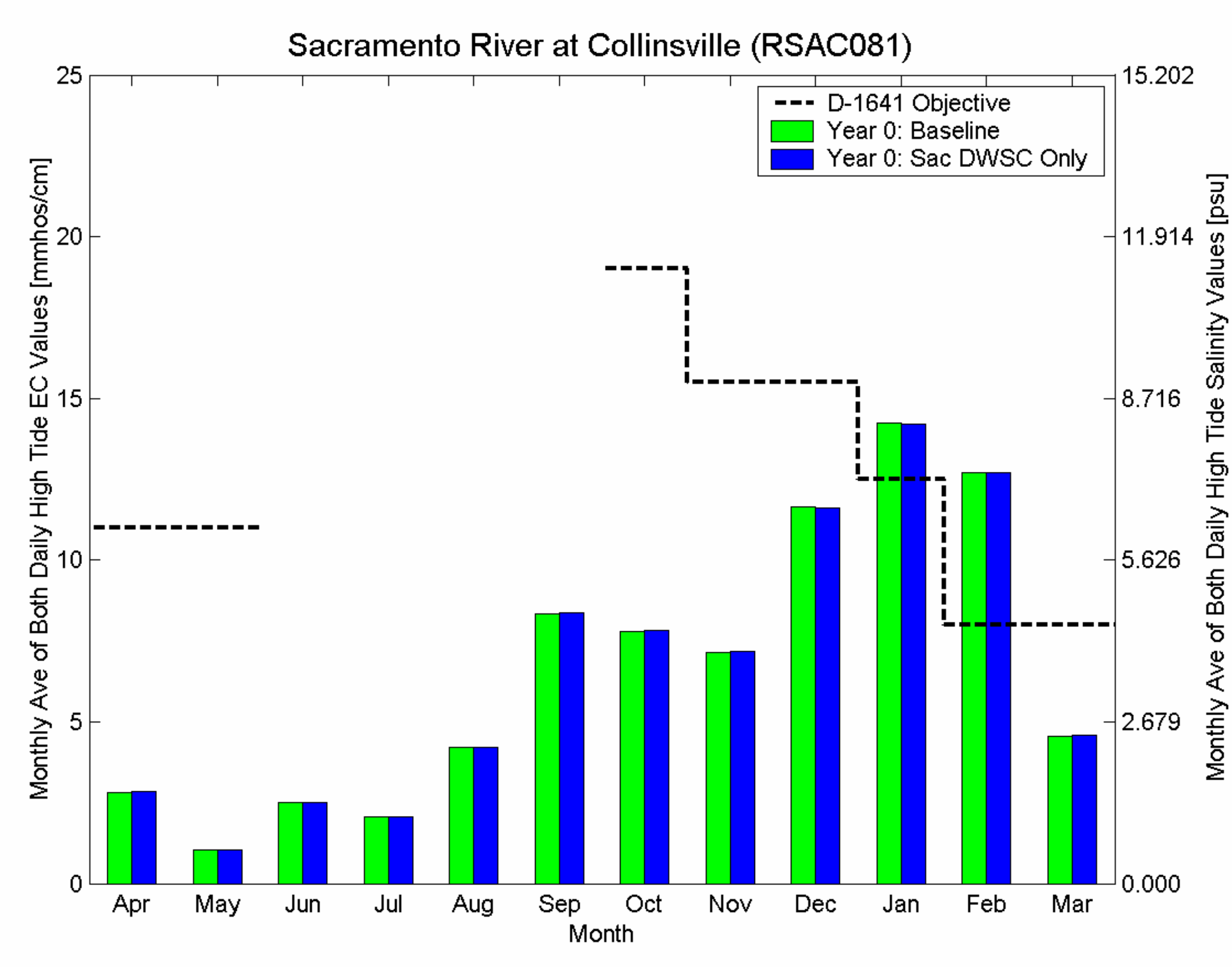


Figure 4.6-21 Predicted monthly average of both daily high tide EC values at Sacramento River at Collinsville (RSAC081) for the Year 0 Baseline scenario and the Year 0 Sacramento DWSC Only Deepening scenario, shown relative to the D-1641 water quality objectives for fish and wildlife beneficial uses.

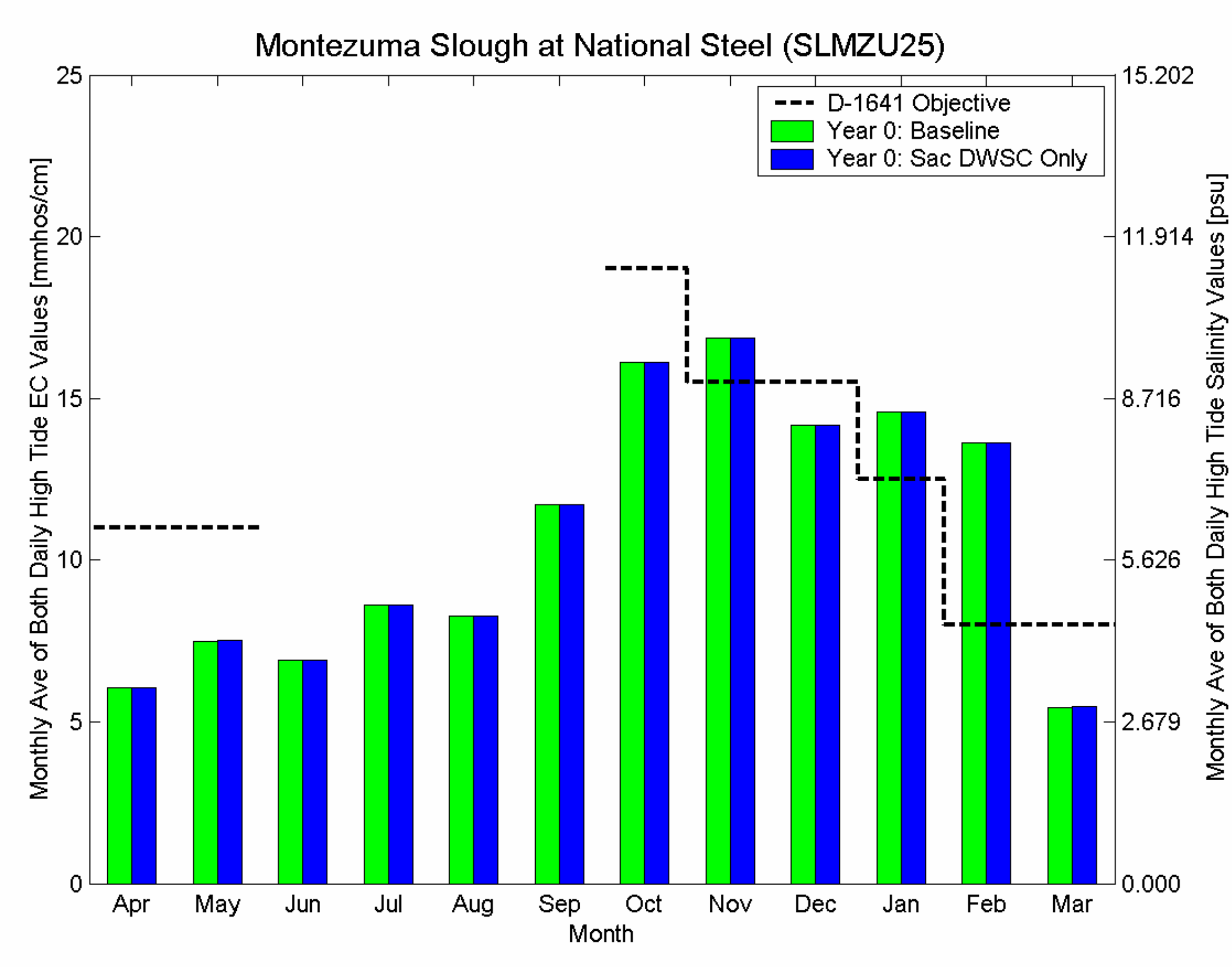


Figure 4.6-22 Predicted monthly average of both daily high tide EC values at Montezuma Slough at National Steel (SLMZU25) for the Year 0 Baseline scenario and the Year 0 Sacramento DWSC Only Deepening scenario, shown relative to the D-1641 water quality objectives for fish and wildlife beneficial uses.

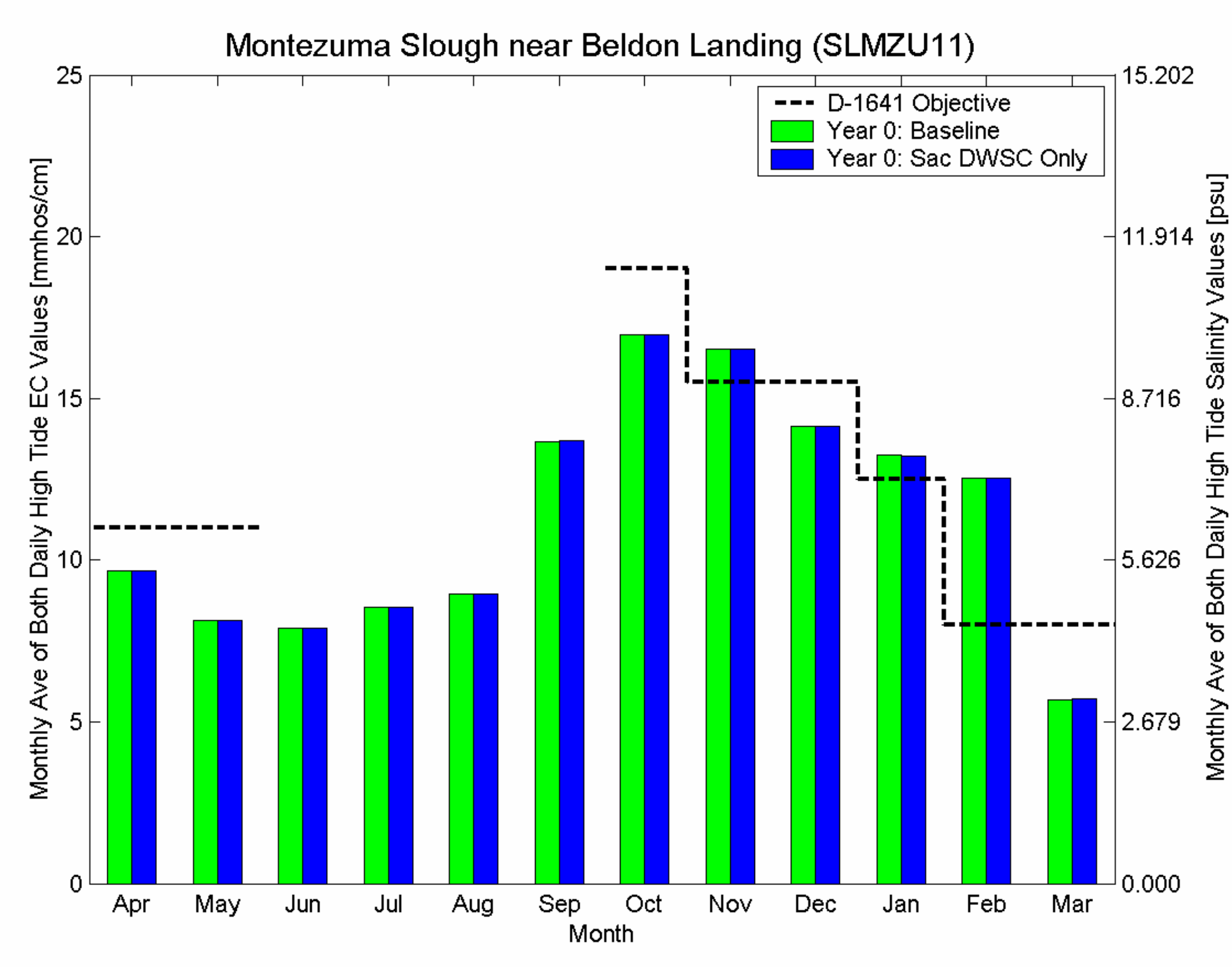


Figure 4.6-23 Predicted monthly average of both daily high tide EC values at Montezuma Slough near Beldon Landing (SLMZU11) for the Year 0 Baseline scenario and the Year 0 Sacramento DWSC Only Deepening scenario, shown relative to the D-1641 water quality objectives for fish and wildlife beneficial uses.

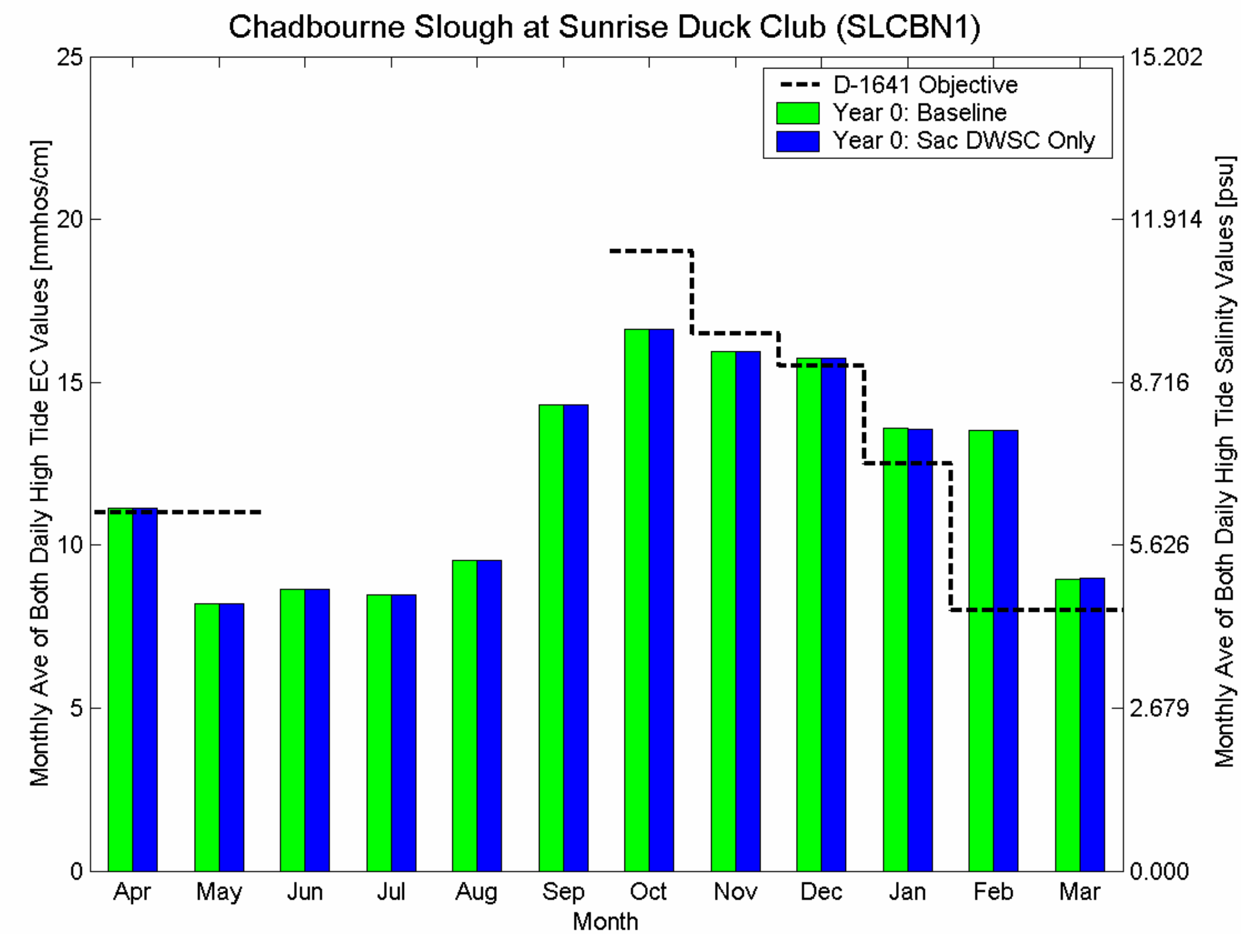


Figure 4.6-24 Predicted monthly average of both daily high tide EC values at Chadbourne Slough at Sunrise Duck Club (SLCBN1) for the Year 0 Baseline scenario and the Year 0 Sacramento DWSC Only Deepening scenario, shown relative to the D-1641 water quality objectives for fish and wildlife beneficial uses.

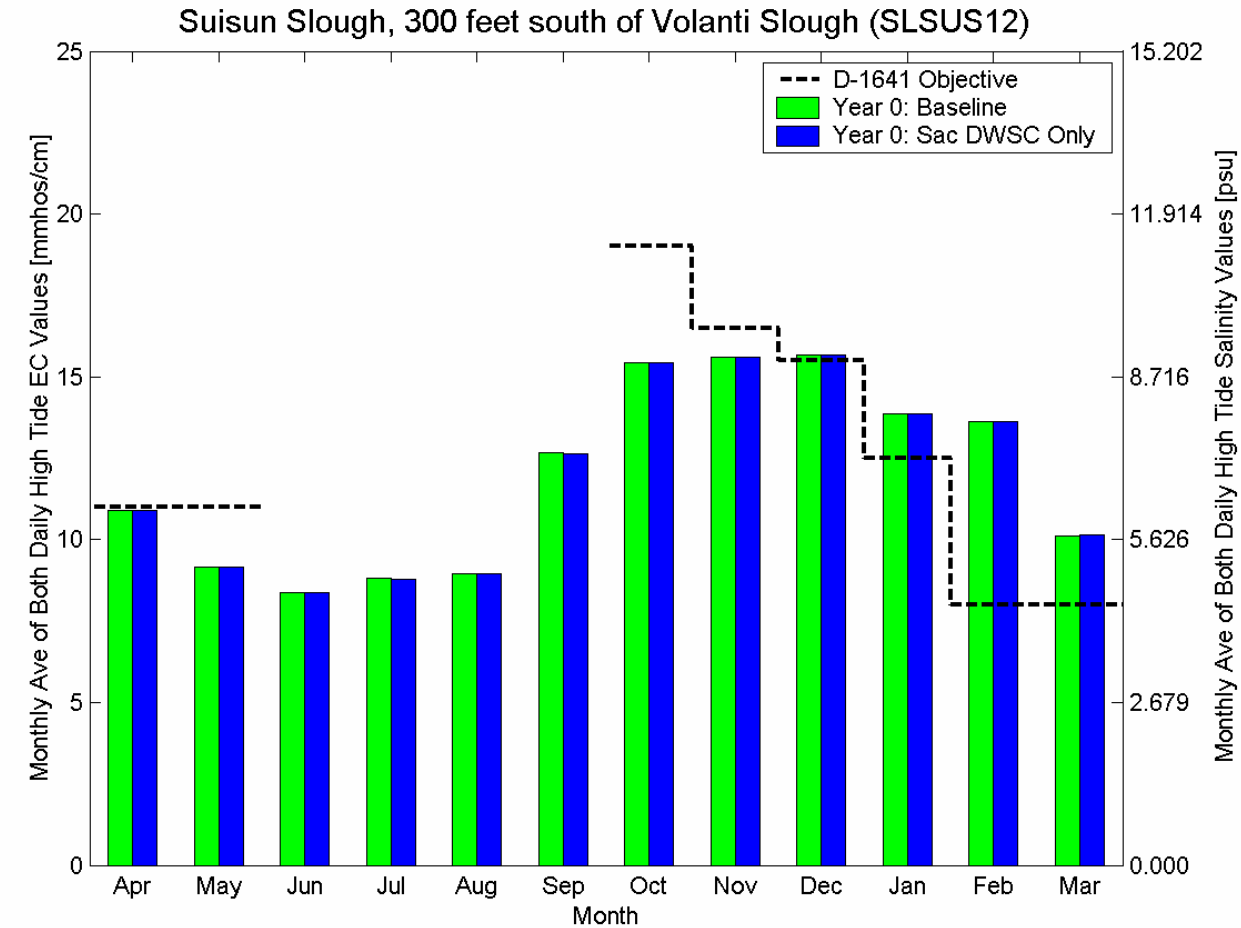


Figure 4.6-25 Predicted monthly average of both daily high tide EC values at Suisun Slough, 300 feet south of Volanti Slough (SLSUS12) for the Year 0 Baseline scenario and the Year 0 Sacramento DWSC Only Deepening scenario, shown relative to the D-1641 water quality objectives for fish and wildlife beneficial uses.

4.7 Impact of Year 0 Both Sacramento DWSC & SF Bay to Stockton DWSC Deepening on D-1641 Water Quality Objectives

Section 3.4 presents the water quality objectives for municipal and industrial, agricultural, and fish and wildlife beneficial uses stipulated by D-1641. The performance of the Year 0 Baseline scenario, the Year 0 Sacramento DWSC Only Deepening scenario, and the Year 0 Both DWSC Deepening scenario simulations in meeting these water quality objectives is presented in this section.

4.7.1 Water Quality Objectives for Municipal and Industrial Beneficial Use

The D-1641 water quality objectives for municipal and industrial beneficial uses, shown in Table 3-1, are based on concentration of Cl^- at water export locations, shown on Figure 3.4-1. The first set of standards stipulate the number of days that daily mean salinity must be less than 150 mg/l either at Contra Costa Canal at Pumping Plant #1, or at the Antioch Water Works intake. The minimum number of days that this objective should be met ranges from 155 days for a “critical” water year to 240 days for a “wet” water year.

Water year 1994 (from October 1, 1993 through September 30, 1994) was classified as a “critical” year, the lowest flow classification, on both the Sacramento River and San Joaquin River. Water Year 1995 (from October 1, 1994 through September 30, 1995) was classified as a “wet” year, the highest flow classification, on both the Sacramento River and the San Joaquin River (DWR, 2009b). As a result, the Year 0 simulation year spans part of a “critical” year and part of a “wet” water year on the Sacramento River.

Figure 4.7-1 shows the number of days that the maximum mean daily concentration of Cl^- is less than 150 mg/l at CHCCC06 and RSAN007. To meet the “critical year” water quality objective, the number of days that mean daily concentration of Cl^- is less than 150 mg/l should exceed 155 days at either CHCCC06 or RSAN007At CHCCC06, the mean daily concentration of Cl^- is less than 150 mg/l for 161 days under the Year 0 Baseline scenario, 159 days for the Year 0 Sacramento DWSC Only Deepening scenario (a decrease of 2 days relative to the Year 0 Baseline scenario), and 139 days for the Year 0 Both DWSC Deepening scenario (a decrease of 22 days relative to the Year 0 Baseline scenario). At RSAN007, the mean daily concentration of Cl^- is less than 150 mg/l for 129 days under the Year 0 Baseline scenario, 127 days for the Year 0 Sacramento DWSC Only Deepening scenario (a decrease of 2 days relative to the Year 0 Baseline scenario), and 114 days for the Year 0 Both DWSC Deepening scenario (a decrease of 14 days relative to the Year 0 Baseline scenario). Since this standard stipulates that daily mean salinity must be less than 150 mg/l for at least 155 days either at Contra Costa Canal at Pumping Plant #1, or at the Antioch Water Works intake, this standard is met for both the Year 0 Baseline scenario and the Year 0 Sacramento DWSC Only deepening scenario, but is not met for the Year 0 Both DWSC Deepening scenario.

The second set of D-1641 water quality objectives for municipal and industrial beneficial use stipulate a maximum allowable concentration of Cl^- at the municipal water intakes. The D-1641 standards stipulate this objective for Contra Costa Canal at Pumping Plant #1, West Canal at mouth of Clifton Court Forebay, Delta-Mendota Canal at Tracy Pumping Plant, Barker Slough at North Bay Aqueduct Intake, and Cache Slough at City of Vallejo Intake (Table 3-3). For the purposes of this study, this standard is also evaluated at the CCWD intake on Old River (ROLD304), and at the CCWD alternative intake point (AIP) on Victoria Canal.

Figure 4.7-2 shows the predicted mean daily chloride concentration at the Contra Costa Rock Slough Export for the Year 0 Baseline scenario, the Year 0 Sacramento DWSC Only Deepening scenario, and the Year 0 Both DWSC Deepening scenario. Increases in chloride concentration under the Year 0 Sacramento DWSC Only Deepening scenario are predicted between November and January, and increases in chloride concentration under the Year 0 Both DWSC Deepening scenario are predicted between July and January. Under the Year 0 Baseline scenario the water quality objective of 250 mg/l Cl^- is exceeded for 6 days in November, 31 days in December, 31 days in January, 1 day in February, and 17 days in March. Under the Year 0 Sacramento DWSC Only Deepening scenario, the water quality objective of 250 mg/l Cl^- is exceeded for 1 day during July (an increase of 1 day), 9 days during November (an increase of 3 days), 31 days during December (no change relative to Year 0 Baseline), 31 days during January (no change relative to Year 0 Baseline), 1 day during February (no change relative to Year 0 Baseline), and 17 days during March (no change relative to Year 0 Baseline). Under the Year 0 Both DWSC Deepening scenario, the water quality objective of 250 mg/l Cl^- is exceeded for 9 days during July (an increase of 9 days), 15 days during August (an increase of 15 days), 18 days during November (an increase of 12 days), 31 days during December (no change relative to Year 0 Baseline), 31 days during January (no change relative to Year 0 Baseline), 1 day during February (no change relative to Year 0 Baseline), and 17 days during March (no change relative to Year 0 Baseline). Thus the Year 0 Sacramento DWSC Only Deepening scenario results in a total increase of 4 days that the water quality objective of 250 mg/l Cl^- is exceeded at the Contra Costa Rock Slough Export, relative to the Year 0 Baseline scenario, and the Year 0 Both DWSC Deepening scenario results in a total of 36 days that the water quality objective of 250 mg/l Cl^- is exceeded at the Contra Costa Rock Slough Export, relative to the Year 0 Baseline scenario.

Figure 4.7-3 shows the predicted mean daily chloride concentration at West Canal at mouth of Clifton Court Forebay for the Year 0 Baseline scenario, the Year 0 Sacramento DWSC Only Deepening scenario, and the Year 0 Both DWSC Deepening scenario. Increases in chloride concentration under the Year 0 Sacramento DWSC Only Deepening scenario are predicted between November and January, and increases in chloride concentration under the Year 0 Both DWSC Deepening scenario are predicted between July and January. Under the Year 0 Baseline scenario the water quality objective of 250 mg/l Cl^- is exceeded for 27 days during December. Under the Year 0 Sacramento DWSC Only Deepening scenario, the water quality objective of 250 mg/l Cl^- is exceeded for 31 days during December (an increase of 4 days). Under the Year 0 Both DWSC Deepening scenario, the water quality objective of 250 mg/l Cl^- is exceeded for 13 days during November (an increase of 13 days), 31 days during December (an increase of 4 days) and 2 days during January (an increase of 2 days).

Figure 4.7-4 shows the predicted mean daily chloride concentration at the Delta-Mendota Canal at Tracy Pumping Plant for the Year 0 Baseline scenario, the Year 0 Sacramento DWSC Only Deepening scenario, and the Year 0 Both DWSC Deepening scenario. Increases in chloride concentration under the Year 0 Sacramento DWSC Only Deepening scenario are predicted between November and January, and increases in chloride concentration under the Year 0 Both DWSC Deepening scenario are predicted between July and January. Under the Year 0 Baseline scenario the water quality objective of 250 mg/l Cl^- is exceeded for 7 days during December. Under the Year 0 Sacramento DWSC Only Deepening scenario, the water quality objective of 250 mg/l Cl^- is exceeded for 12 days during December (an increase of 5 days). Under the Year 0 Both DWSC Deepening scenario, the water quality objective of 250 mg/l Cl^- is exceeded for 2 days during November (an increase of 2 days), 30 days during December (an increase of 23 days), and 1 day during January (an increase of 1 day).

Figure 4.7-5 shows the predicted mean daily chloride concentration in Barker Slough at North Bay Aqueduct Intake for the Year 0 Baseline scenario, the Year 0 Sacramento DWSC Only Deepening scenario, and the Year 0 Both DWSC Deepening scenario. The predicted mean daily chloride concentration is nearly identical for all three scenarios indicating that there is no predicted effect on chloride concentration in Barker Slough at the North Bay Aqueduct Intake resulting from the proposed project scenarios. The water quality objective of maximum mean daily concentration of 250 mg/l Cl^- is not exceeded under any of the scenarios.

Figure 4.7-6 shows the predicted mean daily chloride concentration in Cache Slough at City of Vallejo Intake for the Year 0 Baseline scenario, the Year 0 Sacramento DWSC Only Deepening scenario, and the Year 0 Both DWSC Deepening scenario. The predicted mean daily chloride concentration is nearly identical for all three scenarios indicating that there is no predicted effect on chloride concentration in Cache Slough at City of Vallejo Intake resulting from the proposed project scenarios. The water quality objective of maximum mean daily concentration of 250 mg/l Cl^- is not exceeded under any of the scenarios.

Figure 4.7-7 shows the predicted mean daily chloride concentration at the Contra Costa Old River Export for the Year 0 Baseline scenario, the Year 0 Sacramento DWSC Only Deepening scenario, and the Year 0 Both DWSC Deepening scenario. Increases in chloride concentration under the Year 0 Sacramento DWSC Only Deepening scenario are predicted between November and January, and increases in chloride concentration under the Year 0 Both DWSC Deepening scenario are predicted between July and January. Under the Year 0 Baseline scenario the water quality objective of 250 mg/l Cl^- is exceeded for 13 days during November, 31 days during December, and 4 days during January. Under the Year 0 Sacramento DWSC Only Deepening scenario, the water quality objective of 250 mg/l Cl^- is exceeded for 14 days during November (an increase of 1 day), 31 days during December (no change relative to Year 0 Baseline) and 5 days during January (an increase of 1 day). Under the Year 0 Both DWSC Deepening scenario, the water quality objective of 250 mg/l Cl^- is exceeded for 20 days during November (an increase of 7 days), 31 days during December (no change relative to Year 0 Baseline) and 8 days during January (an increase of 4 days). Thus the Year 0 Sacramento DWSC Only Deepening scenario results in a total increase of 2 days that the water quality objective of 250 mg/l Cl^- is exceeded at the Contra Costa Old River Export, relative to the Year 0 Baseline scenario, and the Year 0 Both DWSC Deepening scenario results in a total of 11 days that the water quality objective of 250 mg/l Cl^- is exceeded at the Contra Costa Old River Export, relative to the Year 0 Baseline scenario.

Figure 4.7-8 shows the predicted mean daily chloride concentration at the Contra Costa Victoria Canal Alternative Intake Point for the Year 0 Baseline scenario, the Year 0 Sacramento DWSC Only Deepening scenario, and the Year 0 Both DWSC Deepening scenario. Increases in chloride concentration under the Year 0 Sacramento DWSC Only Deepening scenario are predicted between November and January, and increases in chloride concentration under the Year 0 Both DWSC Deepening scenario are predicted between July and January. Despite these predicted increases in chloride concentration, the water quality objective of maximum mean daily concentration of 250 mg/l Cl^- is not exceeded at the Contra Costa Victoria Canal Alternative Intake Point under any of the Year 0 scenarios.

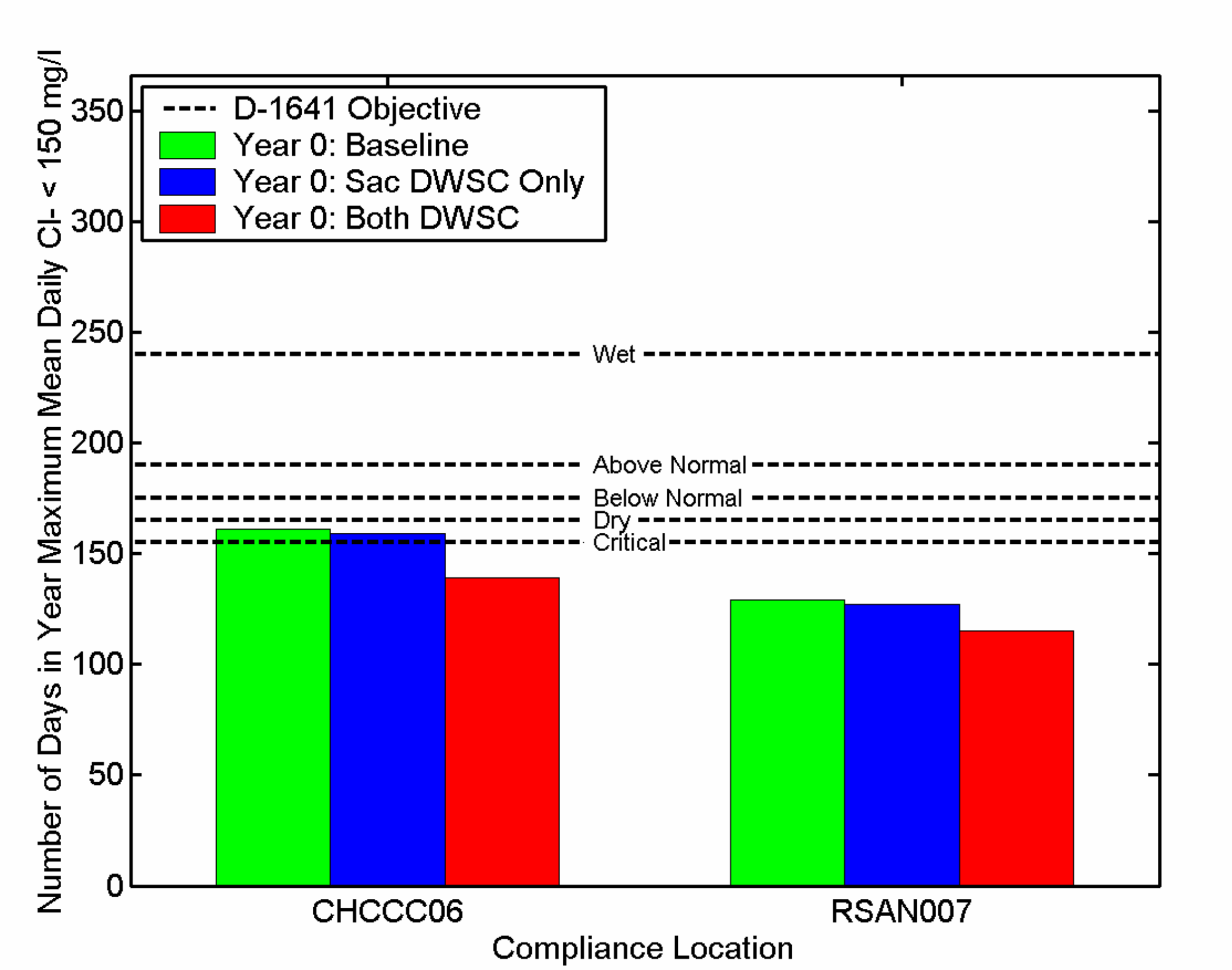


Figure 4.7-1 Number of days during the Year 0 simulation period that predicted mean daily concentration of Cl^- is less than 150 mg/l at Contra Costa Canal at Pumping Plant #1 (CHCCC06) and the Antioch Water Works intake (RSAN007) for the Year 0 Baseline scenario, the Year 0 Sacramento DWSC Only Deepening scenario, and the Year 0 Both DWSC Deepening scenario.

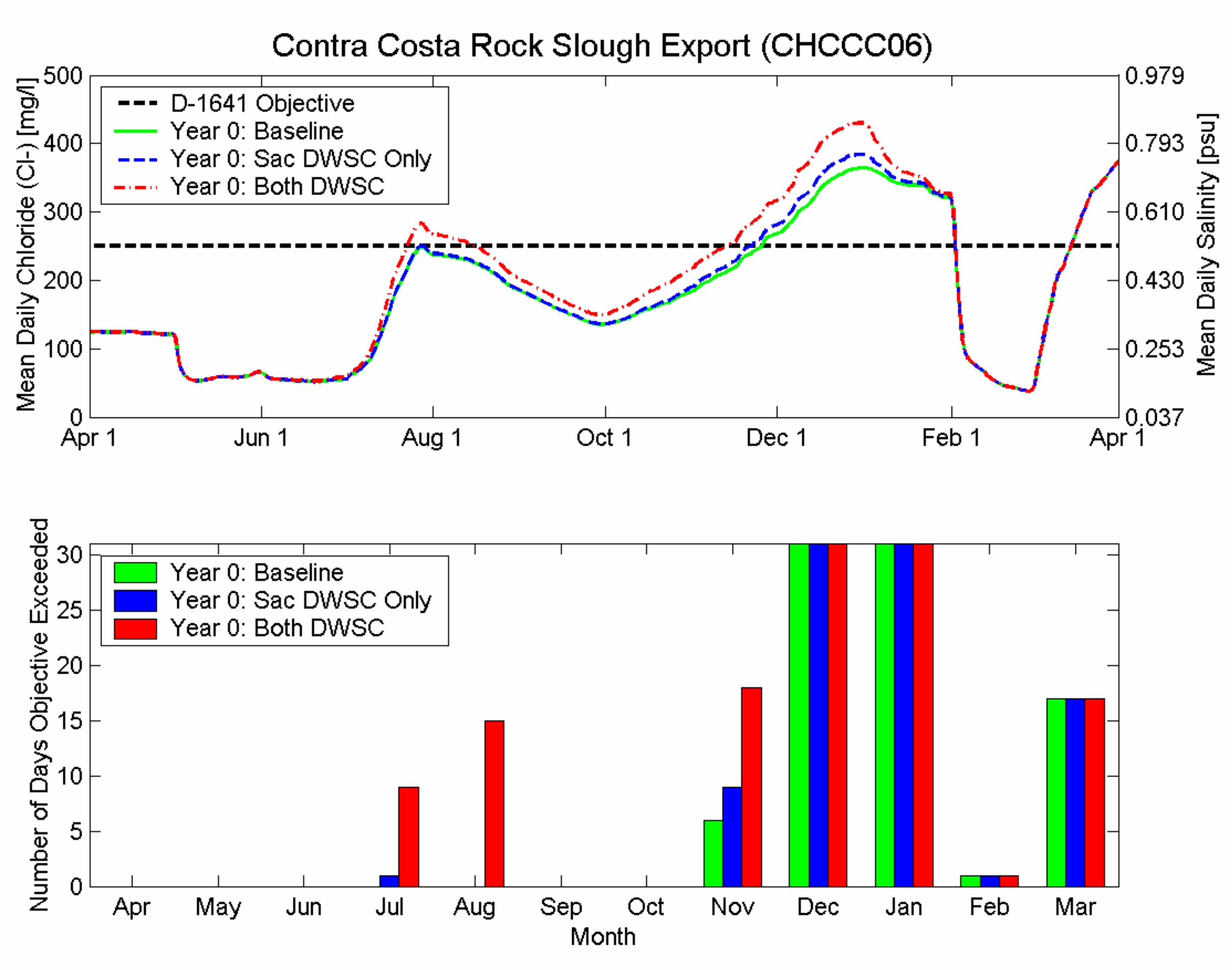


Figure 4.7-2 Predicted mean daily Cl^- concentration at Contra Costa Rock Slough Export (CHCCC06) for the Year 0 Baseline scenario, the Year 0 Sacramento DWSC Only Deepening scenario, and the Year 0 Both DWSC Deepening scenario (top); number of days each month that predicted mean daily concentration of Cl^- at CHCCC06 exceeds 250 mg/l Cl^- for each scenario during the Year 0 simulation period (bottom).

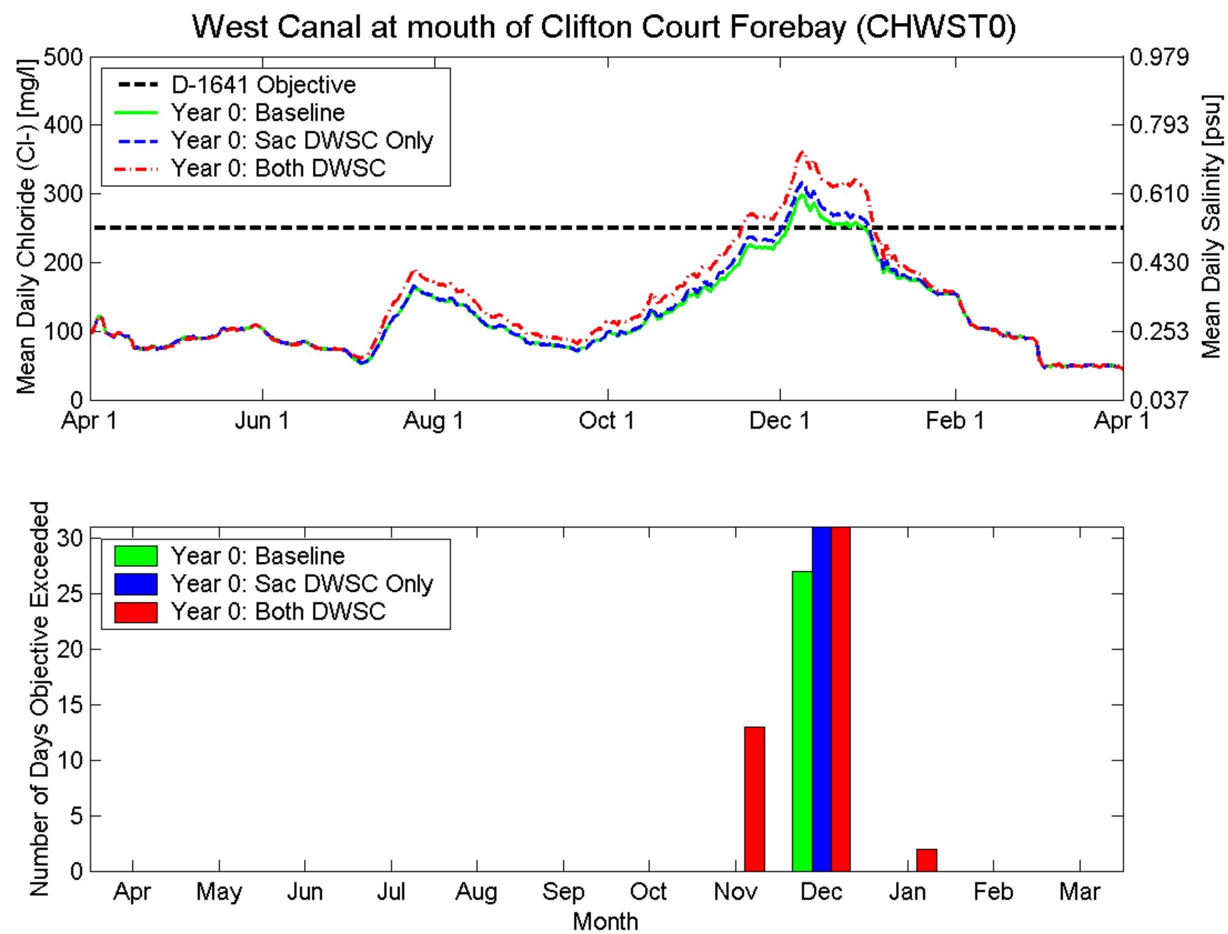


Figure 4.7-3 Predicted mean daily Cl^- concentration at West Canal at mouth of Clifton Court Forebay (CHWST0) for the Year 0 Baseline scenario, the Year 0 Sacramento DWSC Only Deepening scenario, and the Year 0 Both DWSC Deepening scenario (top); number of days each month that predicted mean daily concentration of Cl^- at CHWST0 exceeds 250 mg/l Cl^- for each scenario during the Year 0 simulation period (bottom).

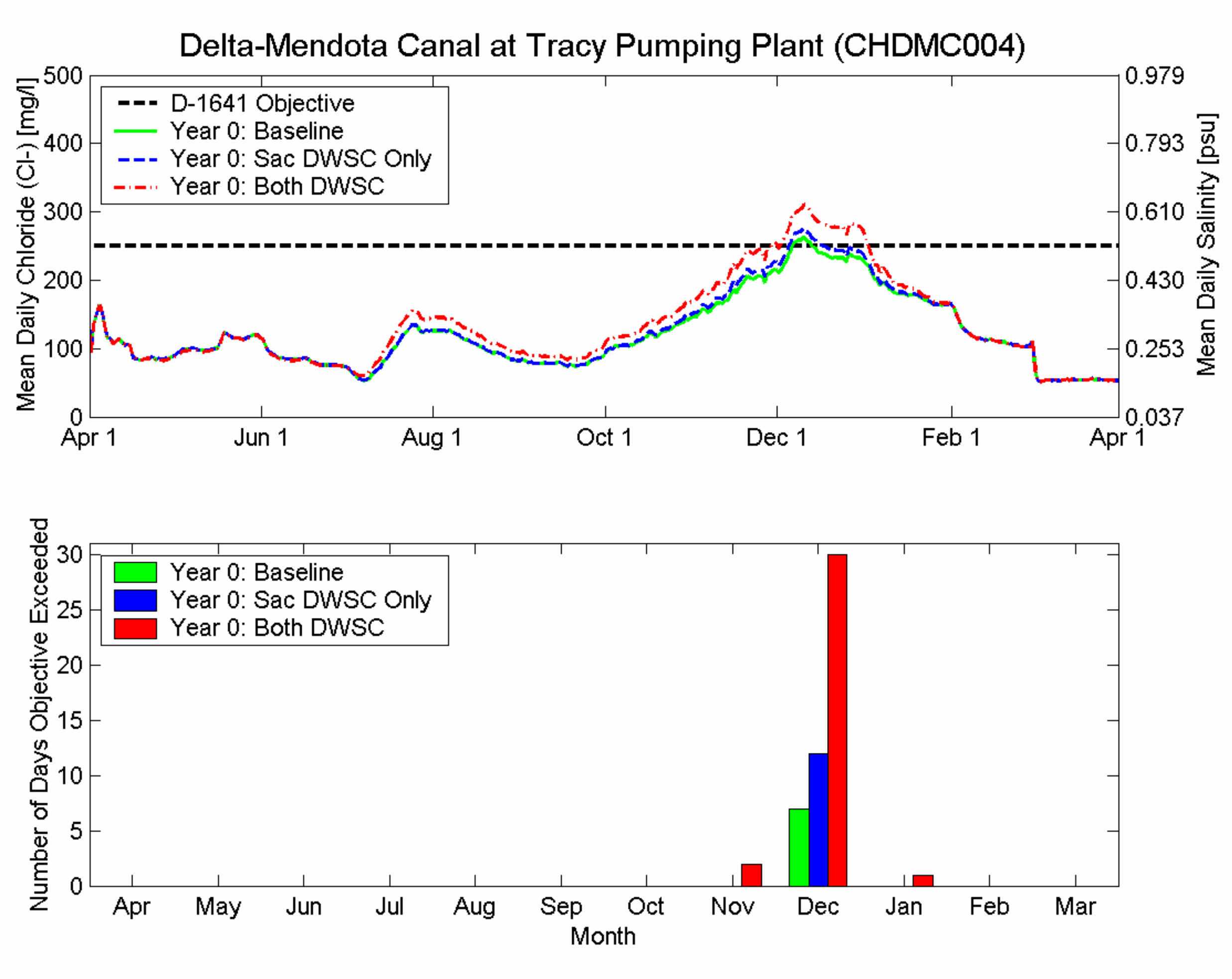


Figure 4.7-4 Predicted mean daily Cl^- concentration at Delta-Mendota Canal at Tracy Pumping Plant (CHDMC004) for the Year 0 Baseline scenario, the Year 0 Sacramento DWSC Only Deepening scenario, and the Year 0 Both DWSC Deepening scenario (top); number of days each month that predicted mean daily concentration of Cl^- at CHDMC004 exceeds 250 mg/l Cl^- for each scenario during the Year 0 simulation period (bottom).

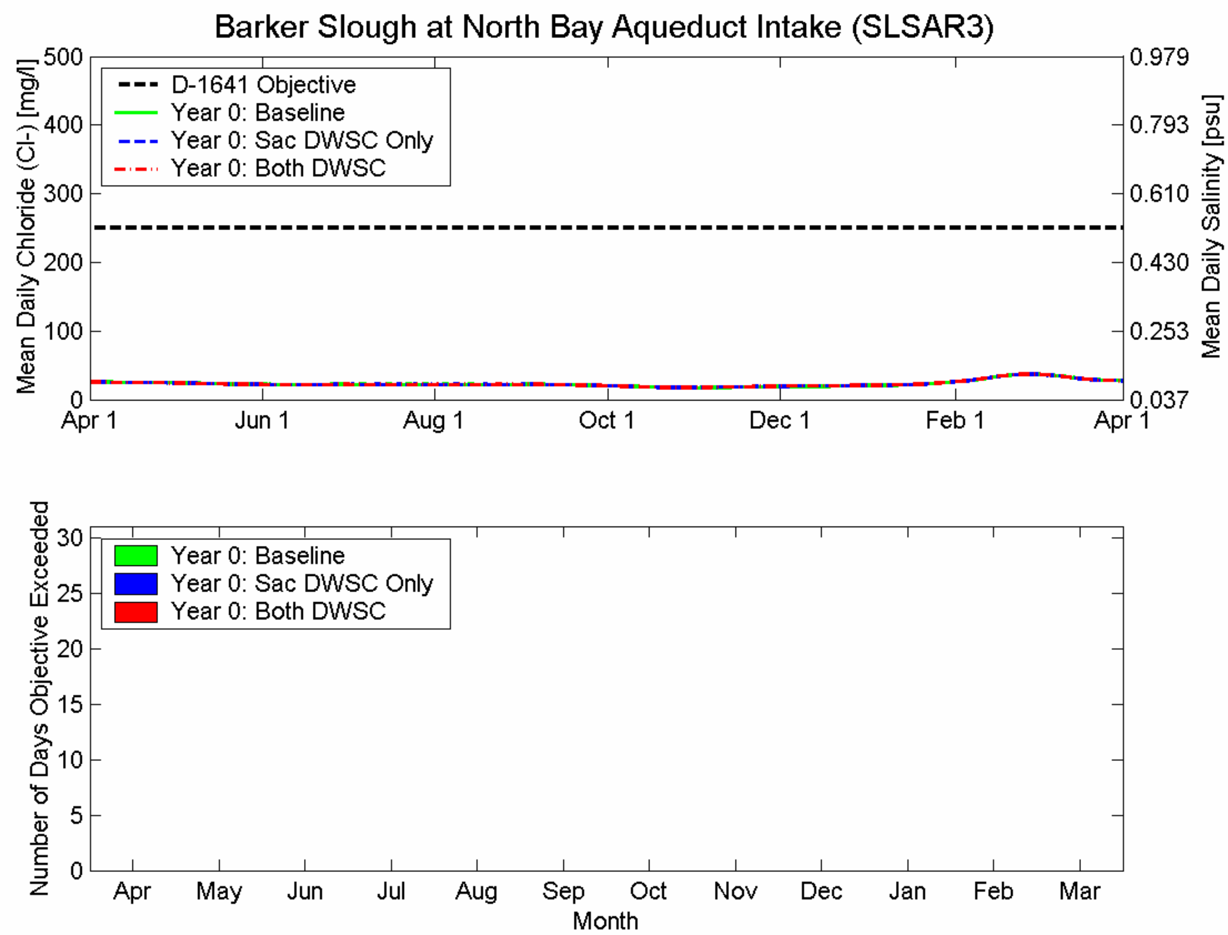


Figure 4.7-5 Predicted mean daily Cl^- concentration at Barker Slough at North Bay Aqueduct Intake (SLSAR3) for the Year 0 Baseline scenario, the Year 0 Sacramento DWSC Only Deepening scenario, and the Year 0 Both DWSC Deepening scenario (top); number of days each month that predicted mean daily concentration of Cl^- at SLSAR3 exceeds 250 mg/l Cl^- for each scenario during the Year 0 simulation period (bottom).

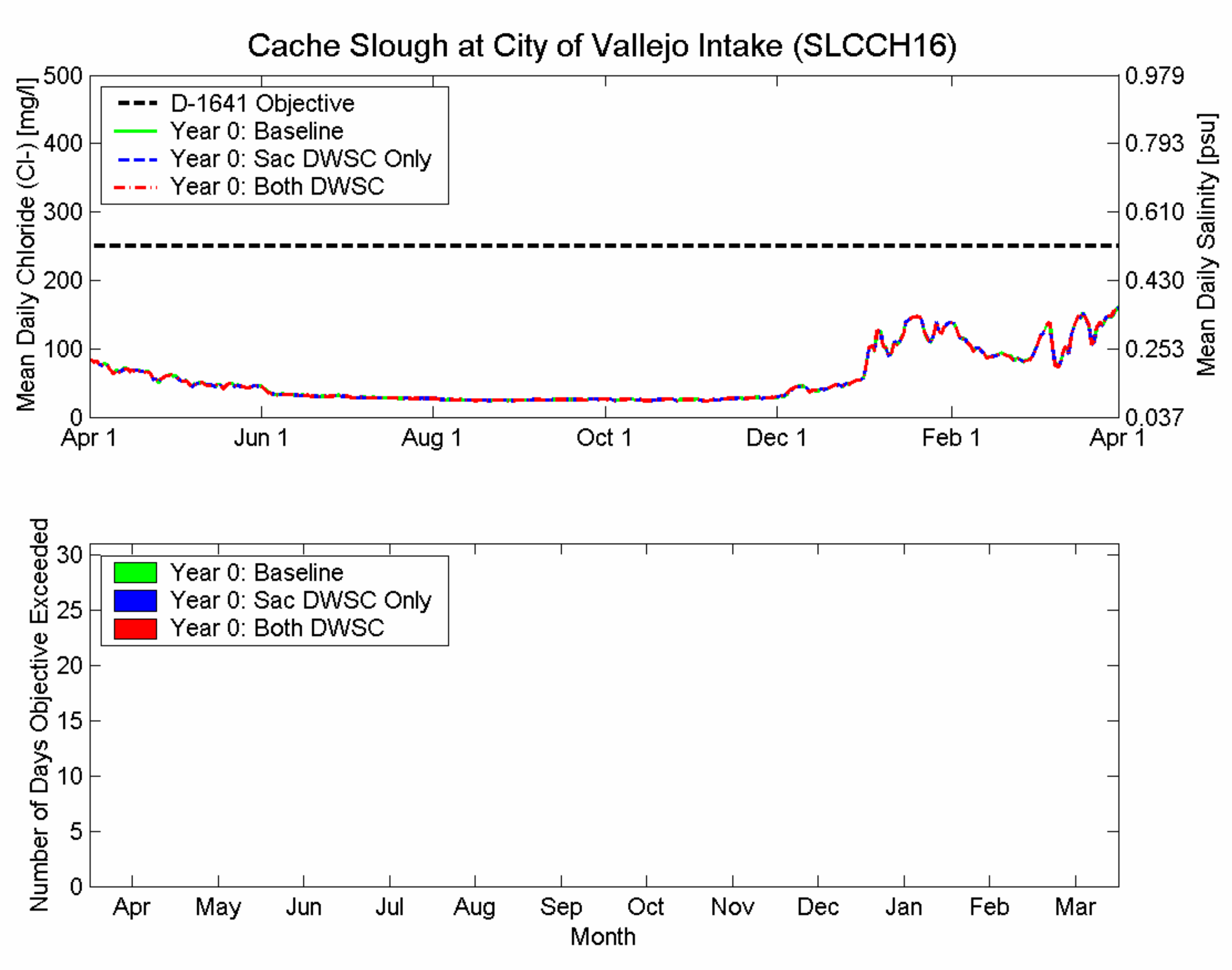


Figure 4.7-6 Predicted mean daily Cl^- concentration at Cache Slough at City of Vallejo Intake (SLCCH16) for the Year 0 Baseline scenario, the Year 0 Sacramento DWSC Only Deepening scenario, and the Year 0 Both DWSC Deepening scenario (top); number of days each month that predicted mean daily concentration of Cl^- at SLCCH16 exceeds 250 mg/l Cl^- for each scenario during the Year 0 simulation period (bottom).

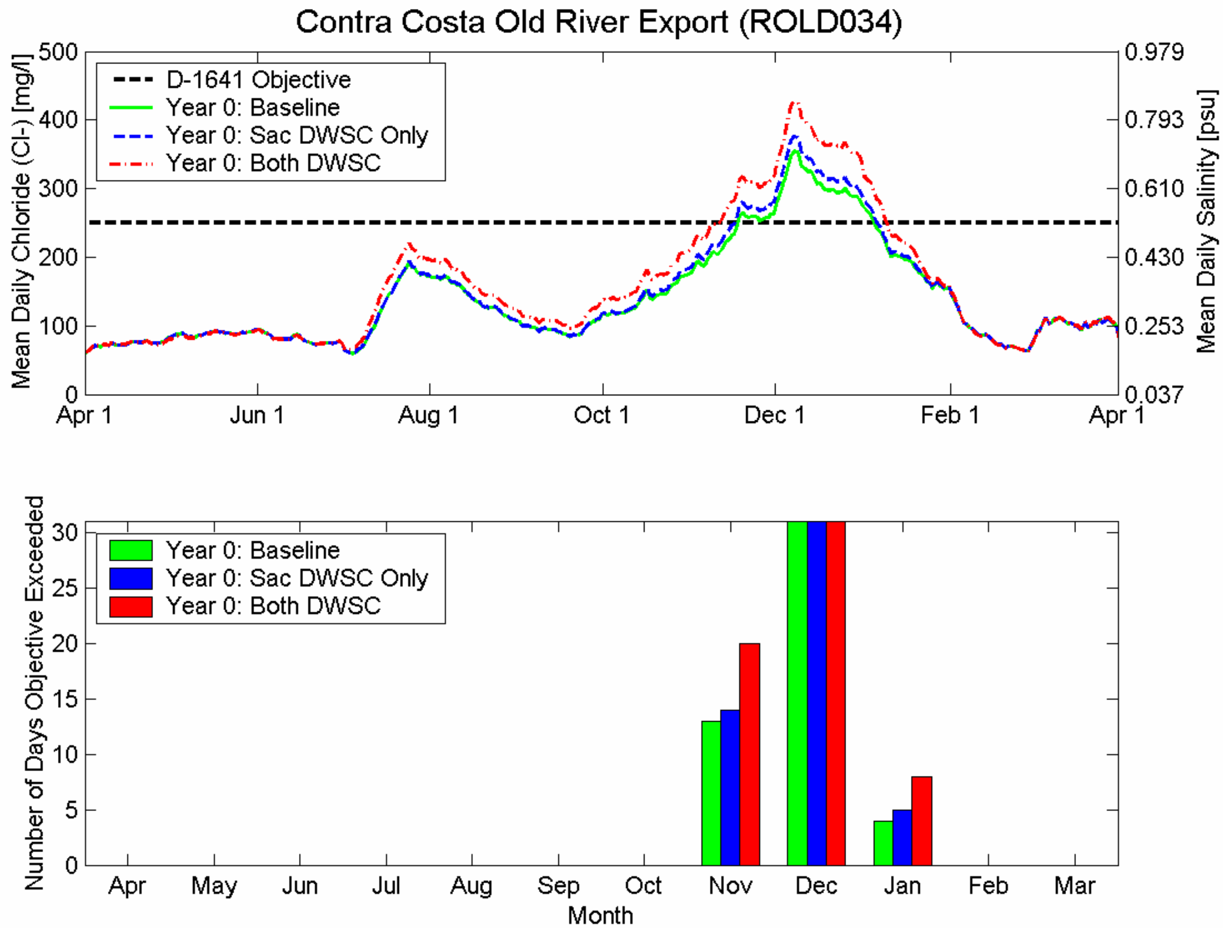


Figure 4.7-7 Predicted mean daily Cl^- concentration at Contra Costa Old River Export (ROLD034) for the Year 0 Baseline scenario, the Year 0 Sacramento DWSC Only Deepening scenario, and the Year 0 Both DWSC Deepening scenario (top); number of days each month that predicted mean daily concentration of Cl^- at ROLD034 exceeds 250 mg/l Cl^- for each scenario during the Year 0 simulation period (bottom).

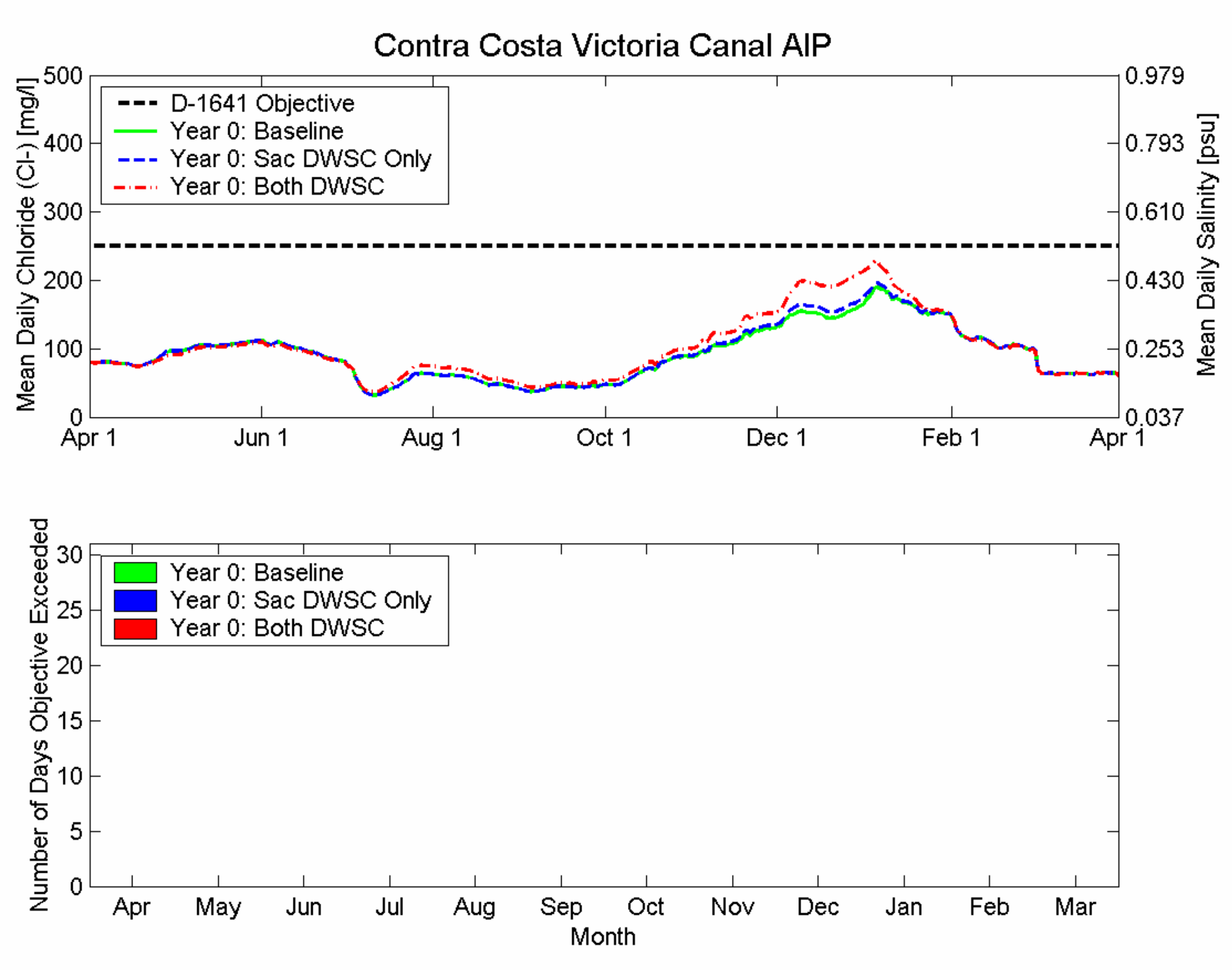


Figure 4.7-8 Predicted mean daily Cl^- concentration at Contra Costa Victoria Canal Alternative Intake Point for the Year 0 Baseline scenario, the Year 0 Sacramento DWSC Only Deepening scenario, and the Year 0 Both DWSC Deepening scenario (top); number of days each month that predicted mean daily concentration of Cl^- at Contra Costa Victoria Canal Alternative Intake Point exceeds 250 mg/l Cl^- for each scenario during the Year 0 simulation period (bottom).

4.7.2 Water Quality Objectives for Agricultural Beneficial Use

The D-1641 water quality objectives for agricultural beneficial uses, shown in Table 3-2, are based on either maximum 14-day running average EC, maximum 30-day running average EC, or maximum monthly average of mean daily EC at the stations shown on Figure 3.4-2. The western Delta and interior Delta water quality objectives for agricultural beneficial use depend on water year type on the Sacramento River and apply only from April 1 to August 15, while the southern Delta and export area water quality objectives for agricultural beneficial use apply uniformly across all water year types during the whole year.

Water year 1994 (from October 1, 1993 through September 30, 1994) was classified as a "critical" year, the lowest flow classification, on both the Sacramento River and San Joaquin River. Water Year 1995 (from October 1, 1994 through September 30, 1995) was classified as a "wet" year, the highest flow classification, on both the Sacramento River and the San Joaquin River (DWR, 2009b). Since the April 1 through August 15 period falls within water year 1994, the "critical" year water quality objectives shown in Table 3-2 are applied for the western Delta and interior Delta stations.

Figure 4.7-9 shows the predicted 14-day running average EC on the Sacramento River at Emmaton for the Year 0 Baseline scenario, the Year 0 Sacramento DWSC Only Deepening scenario, and the Year 0 Both DWSC Deepening scenario. Small increases in 14-day running average EC under the Year 0 Sacramento DWSC Only Deepening scenario are predicted between November and December, and increases in 14-day running average EC under the Year 0 Both DWSC Deepening scenario are predicted from June through mid-January. The water quality objectives for agricultural beneficial use apply from April 1 through August 15. The water quality objective of maximum 14-day running average EC on the Sacramento River at Emmaton is not exceeded under any of the scenarios during this period.

Figure 4.7-10 shows the predicted 14-day running average EC on the San Joaquin River at Jersey Point for the Year 0 Baseline scenario, the Year 0 Sacramento DWSC Only Deepening scenario, and the Year 0 Both DWSC Deepening scenario. Small increases in 14-day running average EC under the Year 0 Sacramento DWSC Only Deepening scenario are predicted between November and January, and increases in 14-day running average EC under the Year 0 Both DWSC Deepening scenario are predicted between June and January. The water quality objectives for agricultural beneficial use apply from April 1 through August 15. The water quality objective of maximum 14-day running average EC on the San Joaquin River at Jersey Point is not exceeded under any of the scenarios during this period.

Figure 4.7-11 shows the predicted 14-day running average EC on the South Fork Mokelumne River at Terminous for the Year 0 Baseline scenario, the Year 0 Sacramento DWSC Only Deepening scenario, and the Year 0 Both DWSC Deepening scenario. The predicted 14-day running average EC is nearly identical for all three scenarios indicating that there is no predicted effect on EC on the South Fork Mokelumne River at Terminous resulting from the proposed project scenarios. The water quality objectives for agricultural beneficial use apply from April 1 through August 15. The water quality objective of maximum 14-day running average EC on the

South Fork Mokelumne River at Terminous is not exceeded under any of the scenarios during this period.

Figure 4.7-12 shows the predicted 14-day running average EC on the San Joaquin River at San Andreas Landing for the Year 0 Baseline scenario, the Year 0 Sacramento DWSC Only Deepening scenario, and the Year 0 Both DWSC Deepening scenario. Small increases in 14-day running average EC under the Year 0 Sacramento DWSC Only Deepening scenario are predicted between November and January, and increases in 14-day running average EC under the Year 0 Both DWSC Deepening scenario are predicted between July and January. The water quality objectives for agricultural beneficial use apply from April 1 through August 15. The water quality objective of maximum 14-day running average EC on the San Joaquin River at San Andreas Landing is not exceeded under any of the scenarios during this period.

Figure 4.7-13 shows the predicted 30-day running average EC on the San Joaquin River at Airport Way Bridge, Vernalis for the Year 0 Baseline scenario, the Year 0 Sacramento DWSC Only Deepening scenario, and the Year 0 Both DWSC Deepening scenario. The predicted 30-day running average EC is identical for all three scenarios indicating that there is no predicted effect on EC on the San Joaquin River at Vernalis resulting from the proposed project scenarios. The water quality objectives for agricultural beneficial use apply all year. The water quality objective of maximum 30-day running average EC on the San Joaquin River at Vernalis is exceeded for 21 days during April for all three scenarios. Since the predicted EC at Vernalis is almost entirely dependent on the specified inflow concentration on the San Joaquin River which is provided as part of the CALSIM II output, the compliance with this objective is dependent on the inflow concentration which is not impacted by either of the deepening scenarios.

Figure 4.7-14 shows the predicted 30-day running average EC on the San Joaquin River at Brandt Bridge for the Year 0 Baseline scenario, the Year 0 Sacramento DWSC Only Deepening scenario, and the Year 0 Both DWSC Deepening scenario. The predicted 30-day running average EC is nearly identical for all three scenarios indicating that there is no predicted effect on EC on the San Joaquin River at Brandt Bridge resulting from the proposed project scenarios. The water quality objectives for agricultural beneficial use apply all year. The water quality objective of maximum 30-day running average EC on the San Joaquin River at Brandt Bridge is exceeded for 24 days during April for all three scenarios. Since the predicted EC at Brandt Bridge is largely dependent on the specified inflow concentration on the San Joaquin River at Vernalis, and the compliance with this objective is not impacted by either of the deepening scenarios.

Figure 4.7-15 shows the predicted 30-day running average EC on Old River near Middle River for the Year 0 Baseline scenario, the Year 0 Sacramento DWSC Only Deepening scenario, and the Year 0 Both DWSC Deepening scenario. The predicted 30-day running average EC is identical for all three scenarios indicating that there is no predicted effect on EC on Old River near Middle River resulting from the proposed project scenarios. The water quality objectives for agricultural beneficial use apply all year. The water quality objective of maximum 30-day running average EC on Old River near Middle River is exceeded for 24 days during April for all three scenarios. The compliance with this water quality objective is not impacted by either of the deepening scenarios.

Figure 4.7-16 shows the predicted 30-day running average EC on Old River at Tracy Road Bridge for the Year 0 Baseline scenario, the Year 0 Sacramento DWSC Only Deepening scenario, and the Year 0 Both DWSC Deepening scenario. The predicted 30-day running average EC is nearly identical for both scenarios indicating only a very small effect on EC on Old River at Tracy Road Bridge resulting from the Year 0 Sacramento DWSC Only Deepening scenario. Increases in 30-day running average EC under the Year 0 Both DWSC Deepening scenario are predicted from October through January. The water quality objectives for agricultural beneficial use apply all year. The water quality objective of maximum 30-day running average EC on Old River at Tracy Road Bridge is exceeded for 29 days during April for all three scenarios. Compliance with this objective during April is largely dependent on the inflow concentration at Vernalis which is not impacted by either of the deepening scenarios.

The D-1641 water quality objectives for agricultural beneficial uses at the export areas stipulate that the monthly average of mean daily EC not exceed 1.0 mmhos/cm. Figure 4.7-17 and Figure 4.7-18 show the predicted monthly average of mean daily EC for the two export areas shown in Table 3-2 which have water quality objectives for agricultural beneficial uses.

Figure 4.7-17 shows the predicted monthly average of mean daily EC at West Canal at mouth of Clifton Court Forebay for the Year 0 Baseline scenario, the Year 0 Sacramento DWSC Only Deepening scenario, and the Year 0 Both DWSC Deepening scenario. The Year 0 Sacramento DWSC Only Deepening scenario has a very small effect on monthly average EC West Canal at mouth of Clifton Court Forebay except during November through January when slightly larger EC increases associated with the Year 0 Sacramento DWSC Only Deepening scenario are predicted. The Year 0 Both DWSC Deepening scenario has a small effect on monthly average EC from April through June, with larger increases predicted from July through January. Under both the Year 0 Baseline Scenario and the Year 0 Sacramento DWSC Only Deepening scenario, the water quality objective is met at West Canal at mouth of Clifton Court Forebay for all months except December, January, and March. Under the Year 0 Both DWSC Deepening scenario, the water quality objective is not met in August, November, December, January, and March. The predicted monthly average of mean daily EC for the Year 0 Both DWSC Deepening scenario is 1.03 mmhos/cm in August and 1.10 mmhos/cm in November. In December, the predicted monthly average of mean daily EC is 1.32 mmhos/cm for the Year 0 Baseline scenario, 1.39 mmhos/cm for the Year 0 Sacramento DWSC Only Deepening scenario (an increase of 0.07 mmhos/cm), and 1.53 mmhos/cm for the Year 0 Both DWSC Deepening scenario (an increase of 0.21 mmhos/cm). In January, the predicted monthly average of mean daily EC is 1.37 mmhos/cm for the Year 0 Baseline scenario, 1.39 mmhos/cm for the Year 0 Sacramento DWSC Only Deepening scenario (an increase of 0.02 mmhos/cm), and 1.45 mmhos/cm for the Year 0 Both DWSC Deepening scenario (an increase of 0.08 mmhos/cm). In March, the predicted monthly average of mean daily EC is 1.04 mmhos/cm for all three scenarios.

Figure 4.7-18 shows the predicted monthly average of mean daily EC at the Delta-Mendota Canal at Tracy Pumping Plant for the Year 0 Baseline scenario, the Year 0 Sacramento DWSC Only Deepening scenario, and the Year 0 Both DWSC Deepening scenario. The Year 0 Sacramento DWSC Only Deepening scenario has an extremely small effect on monthly average

EC at the Delta-Mendota Canal at Tracy Pumping Plant except during November and December when slightly larger EC increases associated with the Year 0 Sacramento DWSC Only Deepening scenario are predicted. The Year 0 Both DWSC Deepening scenario has an extremely small effect on monthly average EC from April through June, with larger EC increases predicted from July through January. Under all three scenarios, the water quality objective is met at the Delta-Mendota Canal at Tracy Pumping Plant for all months except December. In December, the predicted monthly average of mean daily EC is 1.10 mmhos/cm for the Year 0 Baseline scenario, 1.15 mmhos/cm for the Year 0 Sacramento DWSC Only Deepening scenario (an increase of 0.05 mmhos/cm), and 1.30 mmhos/cm for the Year 0 Both DWSC Deepening scenario (an increase of 0.20 mmhos/cm).

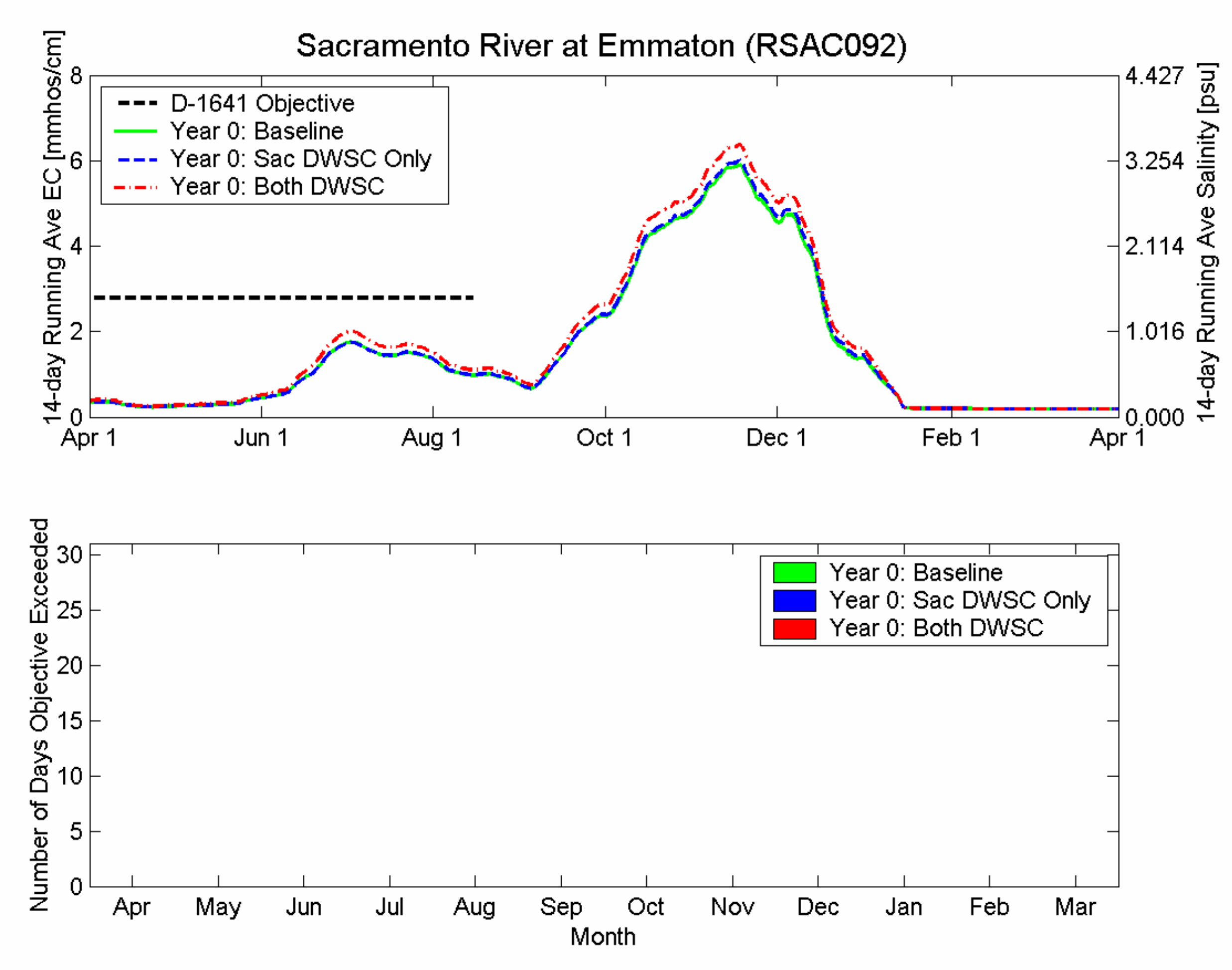


Figure 4.7-9 Predicted 14-day running average EC at Sacramento River at Emmaton (RSAC092) for the Year 0 Baseline scenario, the Year 0 Sacramento DWSC Only Deepening scenario, and the Year 0 Both DWSC Deepening scenario (top); number of days each month that predicted 14-day running average EC at RSAC092 exceeds D-1641 water quality objectives for each scenario during the Year 0 simulation period (bottom).

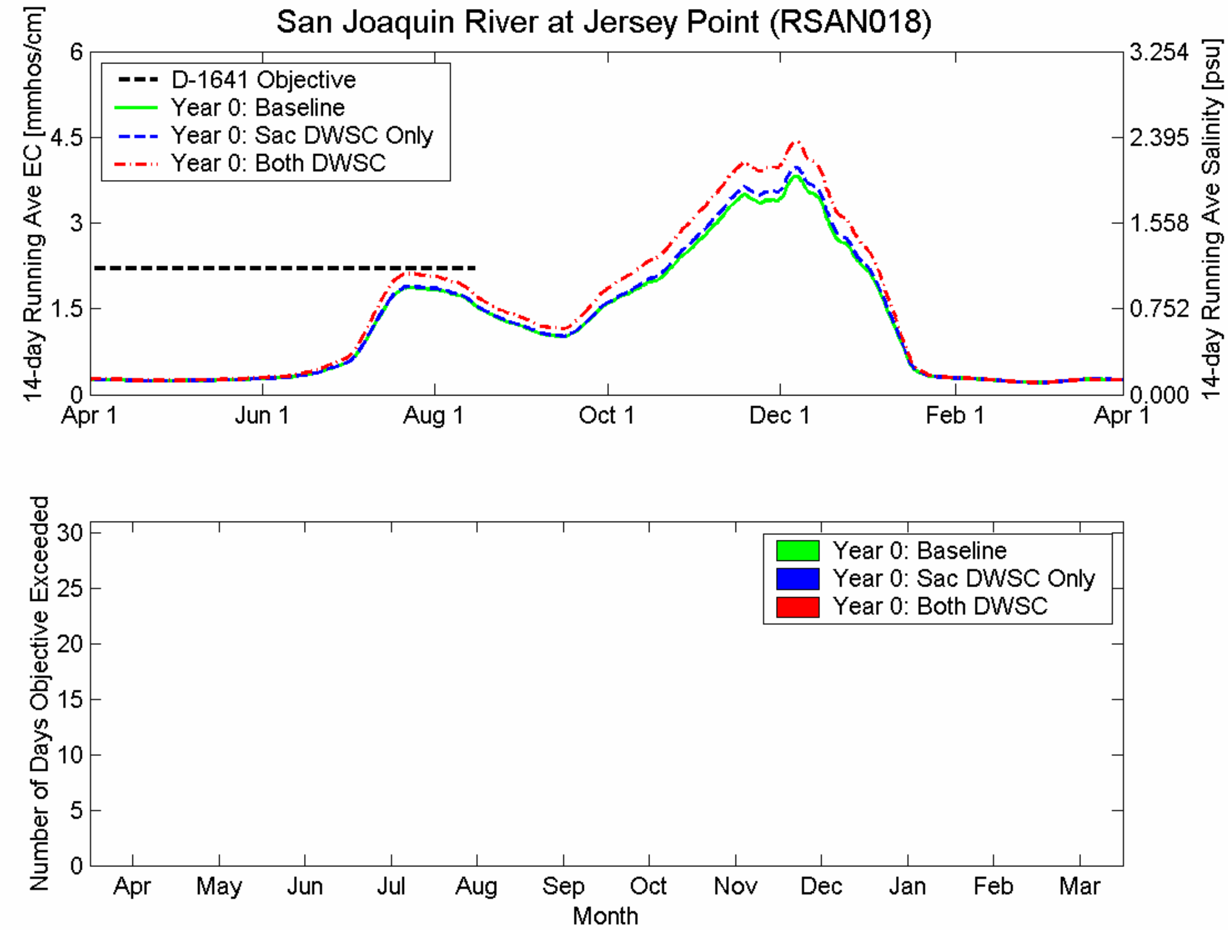


Figure 4.7-10 Predicted 14-day running average EC at San Joaquin River at Jersey Point (RSAN018) for the Year 0 Baseline scenario, the Year 0 Sacramento DWSC Only Deepening scenario, and the Year 0 Both DWSC Deepening scenario (top); number of days each month that predicted 14-day running average EC at RSAN018 exceeds D-1641 water quality objectives for each scenario during the Year 0 simulation period (bottom).

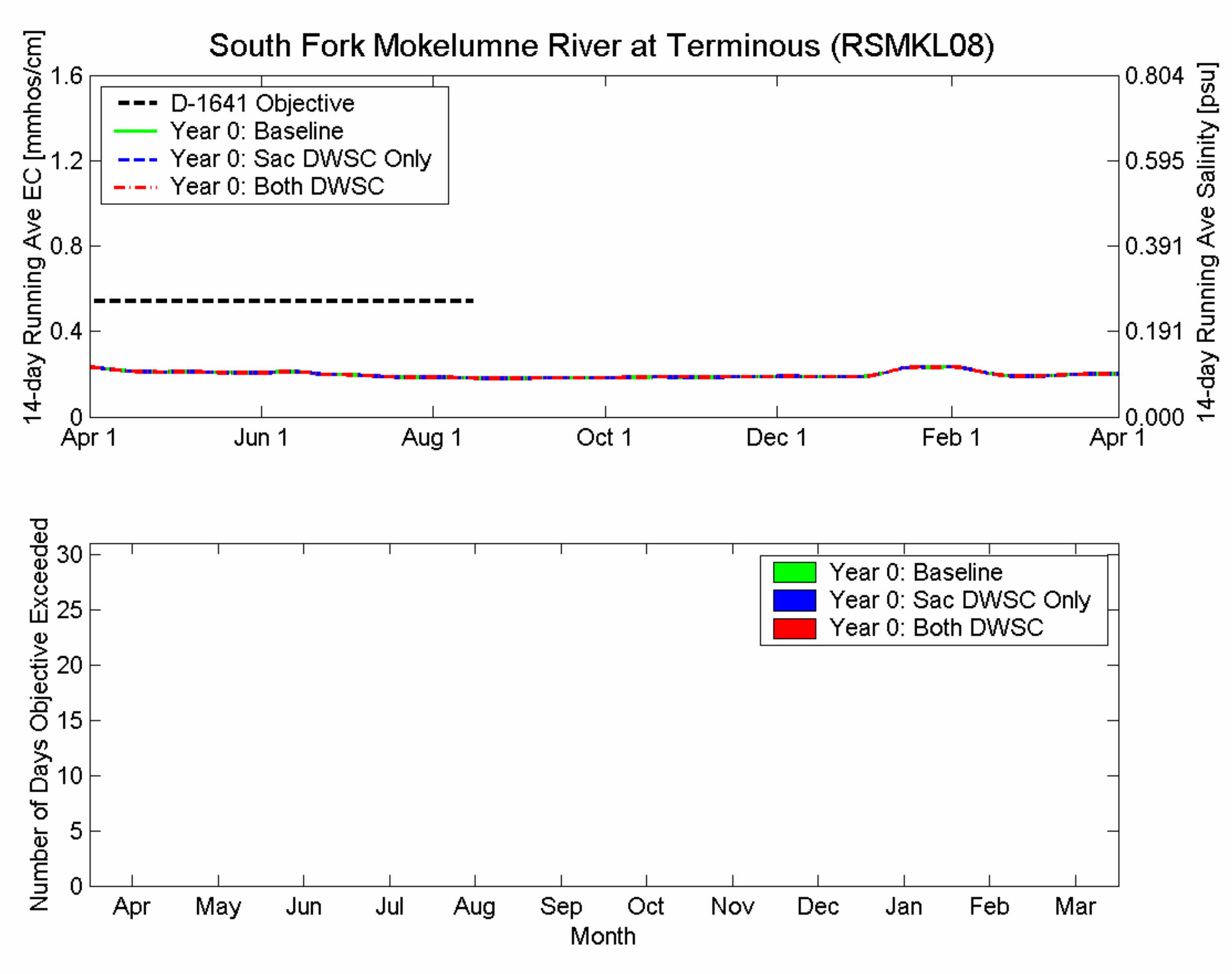


Figure 4.7-11 Predicted 14-day running average EC at South Fork Mokelumne River at Terminous (RSMKL08) for the Year 0 Baseline scenario, the Year 0 Sacramento DWSC Only Deepening scenario, and the Year 0 Both DWSC Deepening scenario (top); number of days each month that predicted 14-day running average EC at RSMKL08 exceeds D-1641 water quality objectives for each scenario during the Year 0 simulation period (bottom).

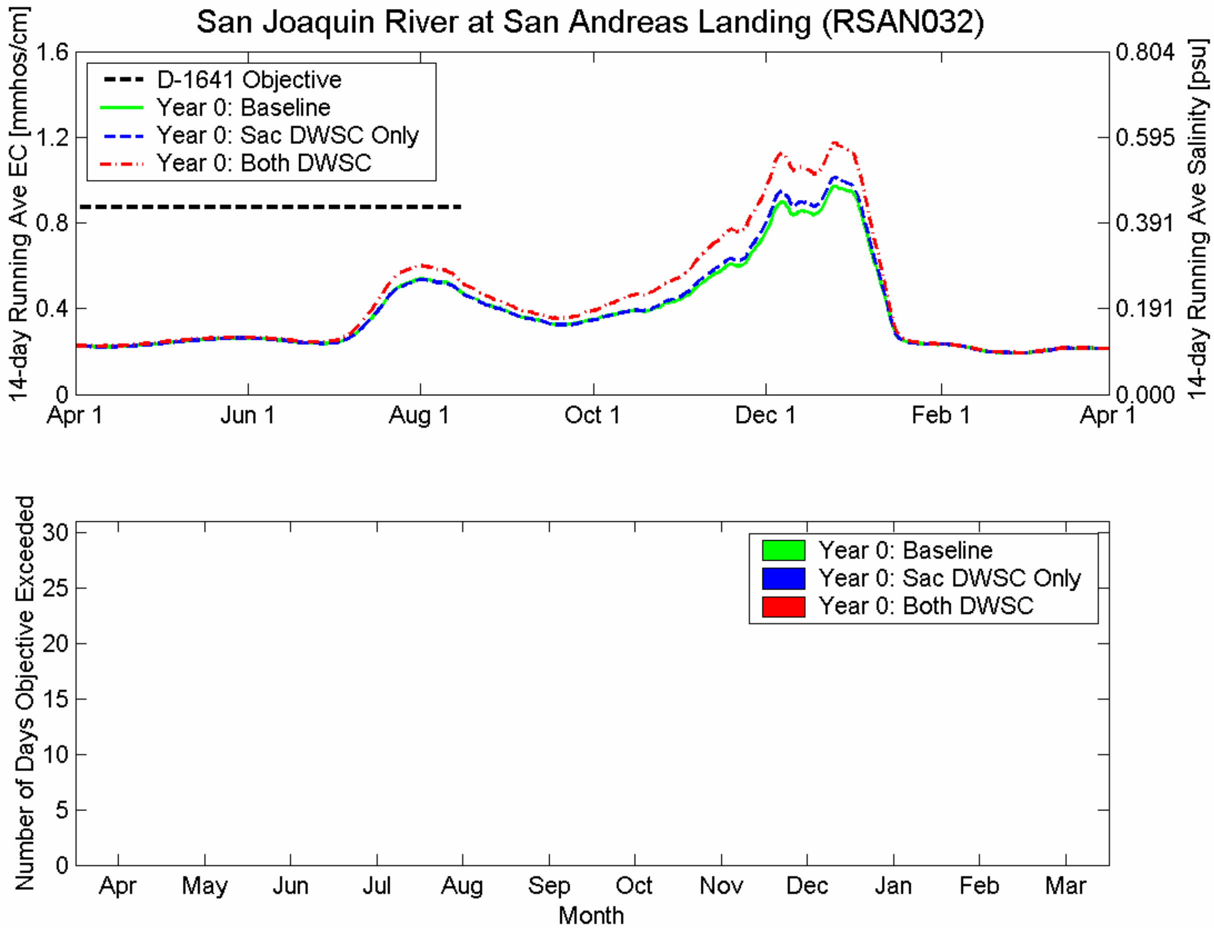


Figure 4.7-12 Predicted 14-day running average EC at San Joaquin River at San Andreas Landing (RSAN032) for the Year 0 Baseline scenario, the Year 0 Sacramento DWSC Only Deepening scenario, and the Year 0 Both DWSC Deepening scenario (top); number of days each month that predicted 14-day running average EC at RSAN032 exceeds D-1641 water quality objectives for each scenario during the Year 0 simulation period (bottom).

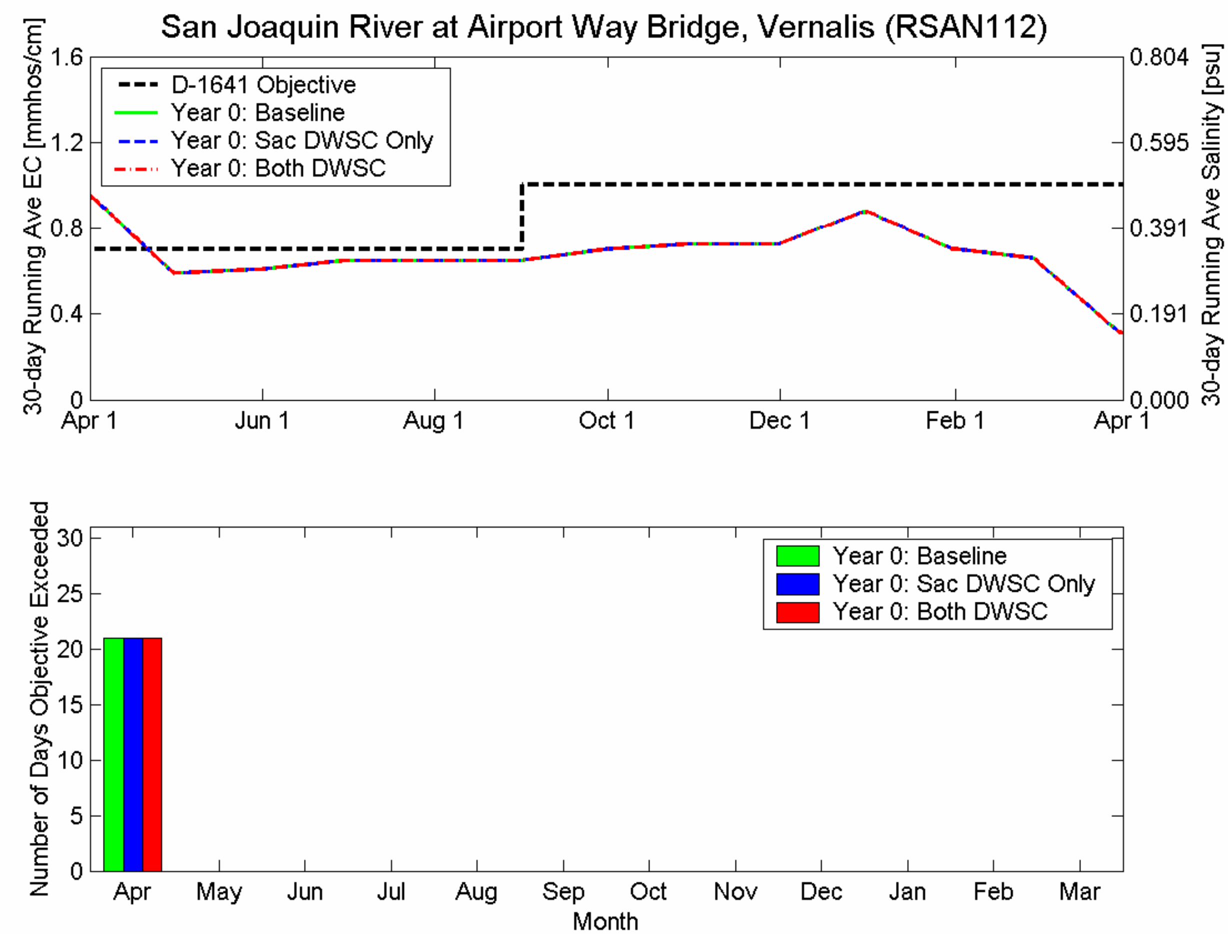


Figure 4.7-13 Predicted 30-day running average EC at San Joaquin River at Airport Way Bridge, Vernalis (RSAN112) for the Year 0 Baseline scenario, the Year 0 Sacramento DWSC Only Deepening scenario, and the Year 0 Both DWSC Deepening scenario (top); number of days each month that predicted 14-day running average EC at RSAN112 exceeds D-1641 water quality objectives for each scenario during the Year 0 simulation period (bottom).

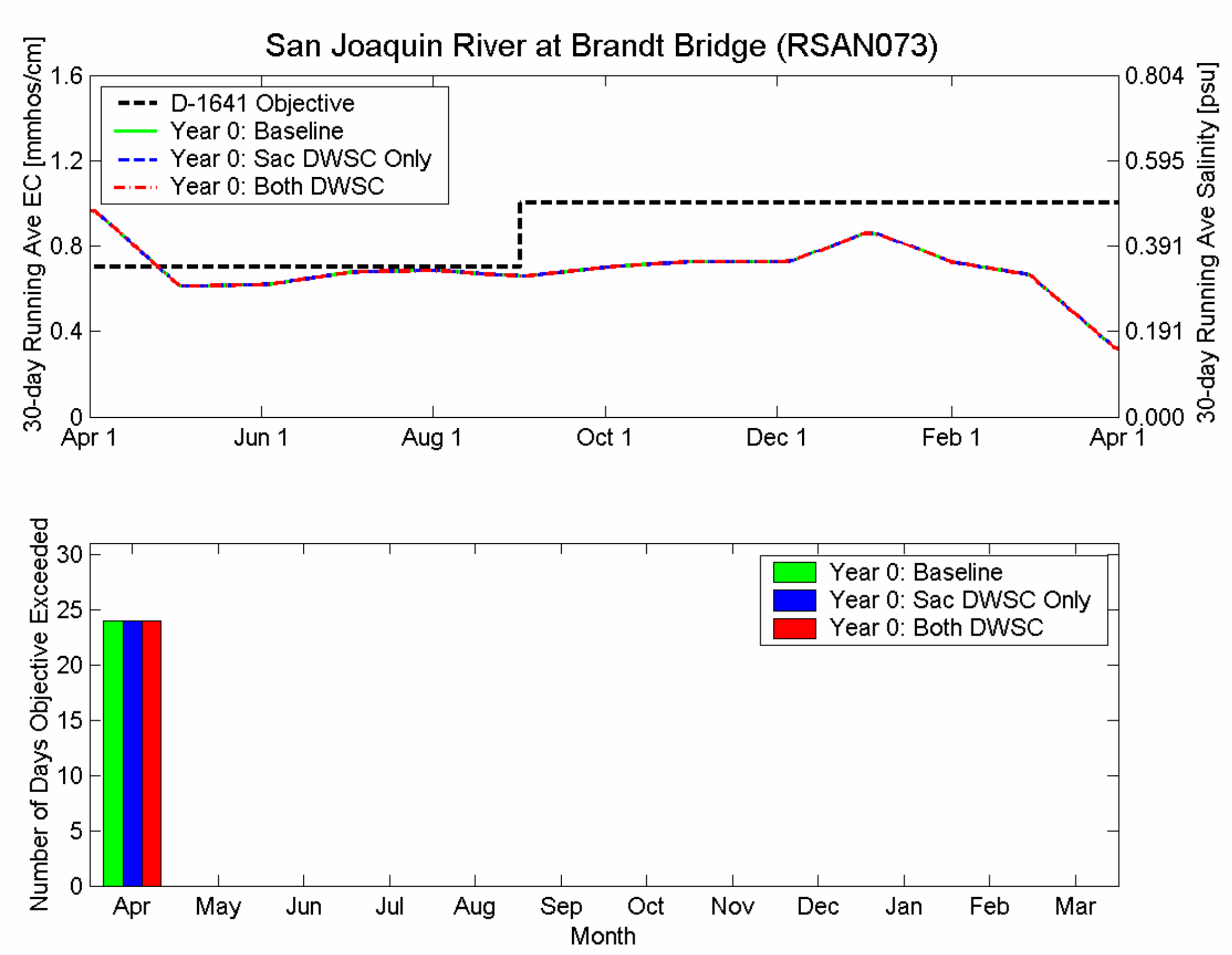


Figure 4.7-14 Predicted 30-day running average EC at San Joaquin River at Brandt Bridge (RSAN073) for the Year 0 Baseline scenario, the Year 0 Sacramento DWSC Only Deepening scenario, and the Year 0 Both DWSC Deepening scenario (top); number of days each month that predicted 14-day running average EC at RSAN073 exceeds D-1641 water quality objectives for each scenario during the Year 0 simulation period (bottom).

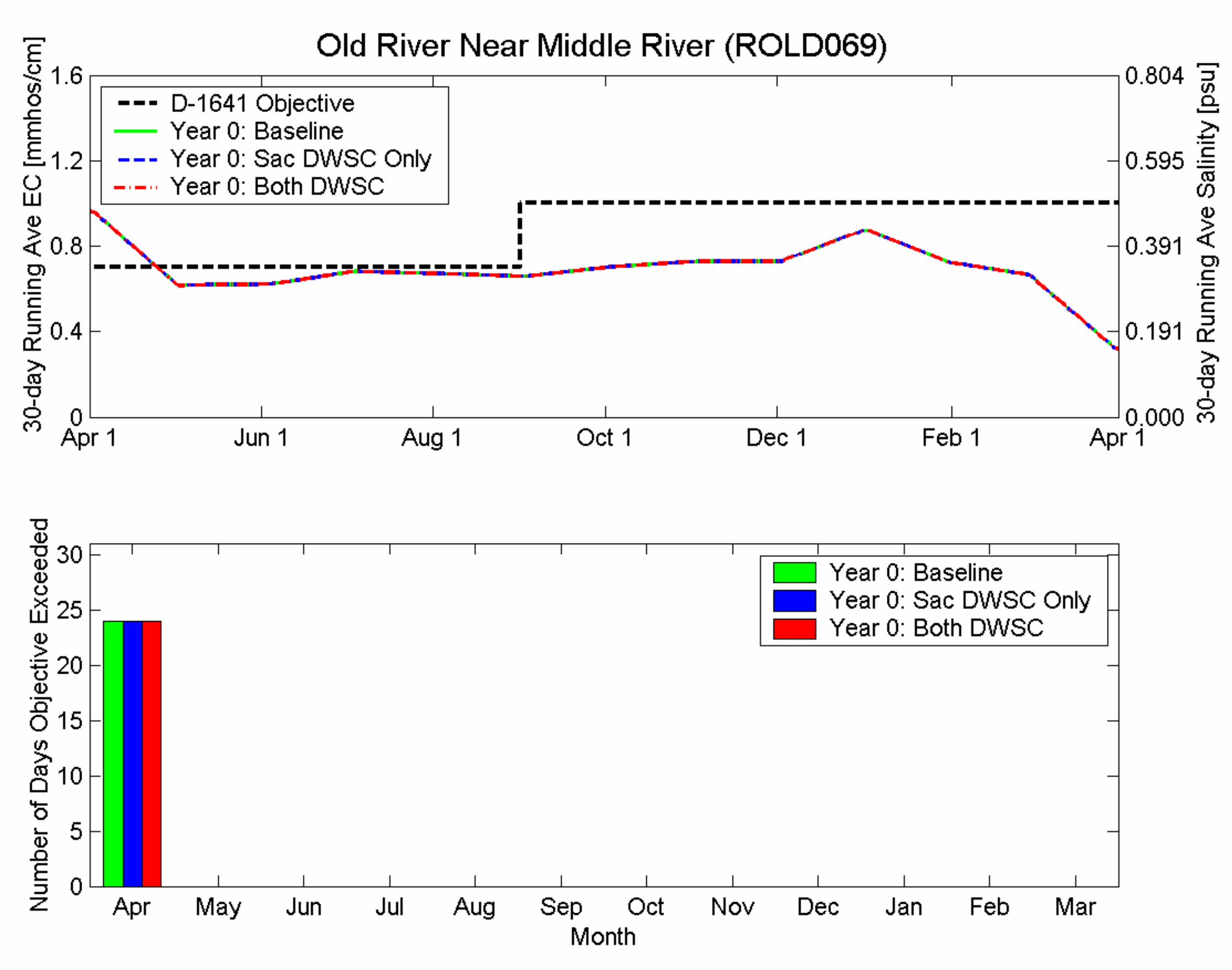


Figure 4.7-15 Predicted 30-day running average EC at Old River Near Middle River (ROLD069) for the Year 0 Baseline scenario, the Year 0 Sacramento DWSC Only Deepening scenario, and the Year 0 Both DWSC Deepening scenario (top); number of days each month that predicted 14-day running average EC at ROLD069 exceeds D-1641 water quality objectives for each scenario during the Year 0 simulation period (bottom).

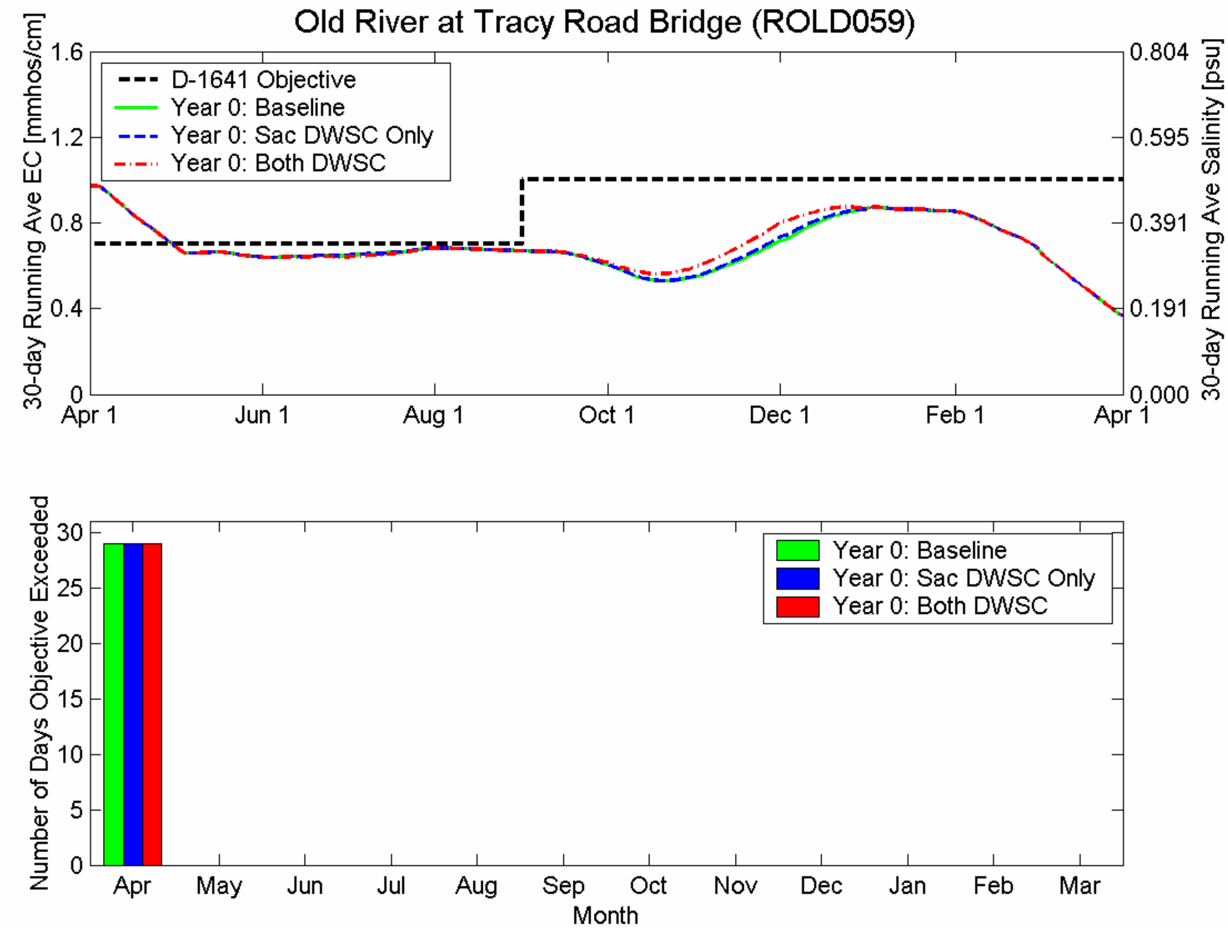


Figure 4.7-16 Predicted 30-day running average EC at Old River at Tracy Road Bridge (ROLD059) for the Year 0 Baseline scenario, the Year 0 Sacramento DWSC Only Deepening scenario, and the Year 0 Both DWSC Deepening scenario (top); number of days each month that predicted 14-day running average EC at ROLD059 exceeds D-1641 water quality objectives for each scenario during the Year 0 simulation period (bottom).

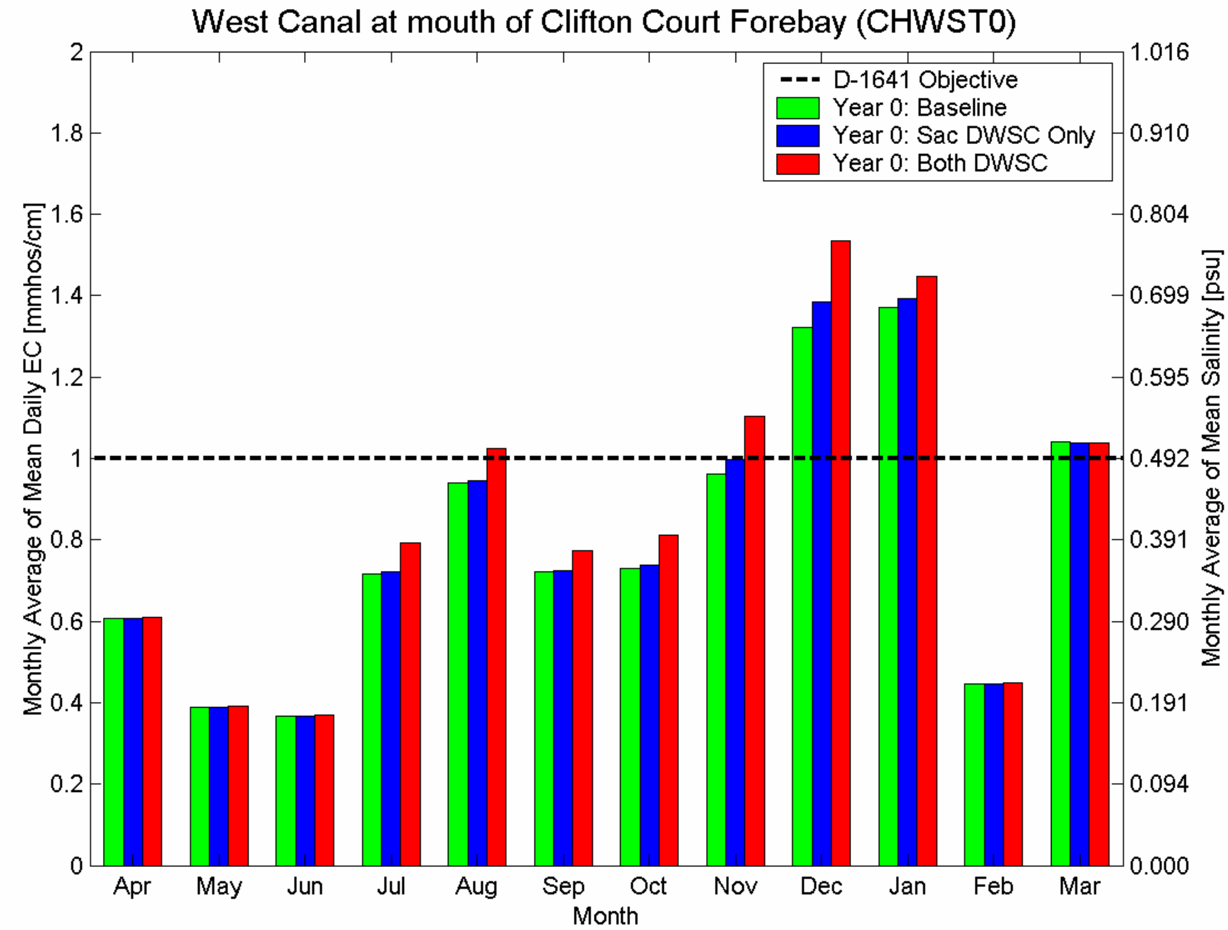


Figure 4.7-17 Predicted monthly average of mean daily EC at West Canal at mouth of Clifton Court Forebay (CHWST0) for the Year 0 Baseline scenario, the Year 0 Sacramento DWSC Only Deepening scenario, and the Year 0 Both DWSC Deepening scenario, shown relative to the D-1641 water quality objectives for agricultural beneficial uses.

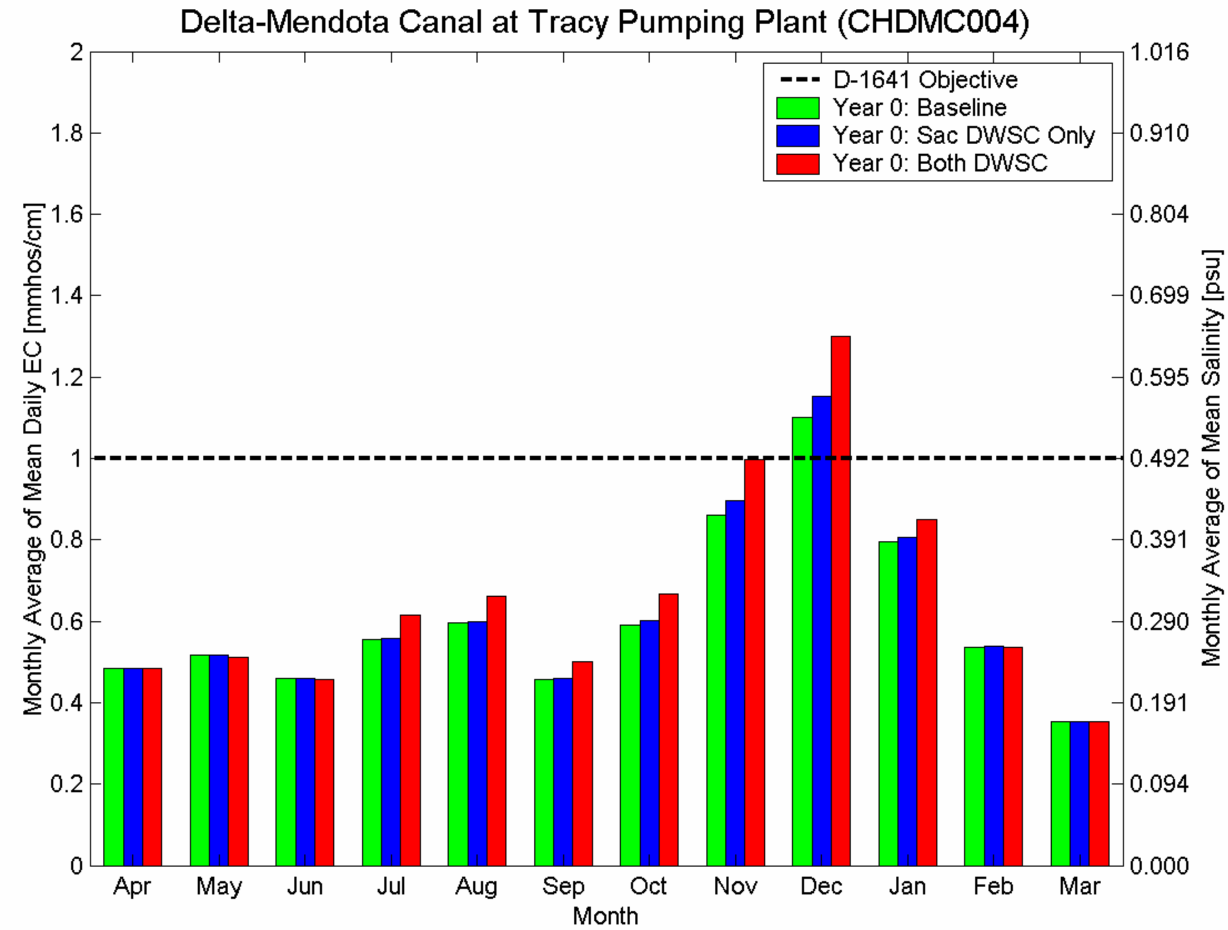


Figure 4.7-18 Predicted monthly average of mean daily EC at Delta-Mendota Canal at Tracy Pumping Plant (CHDMC004) for the Year 0 Baseline scenario, the Year 0 Sacramento DWSC Only Deepening scenario, and the Year 0 Both DWSC Deepening scenario, shown relative to the D-1641 water quality objectives for agricultural beneficial uses.

4.7.3 Water Quality Objectives for Fish and Wildlife Beneficial Uses

The D-1641 water quality objectives for fish and wildlife beneficial uses, shown in Table 3-3, are based on the maximum 14-day running average EC at two stations on the San Joaquin River, and on the monthly average of both daily high tide EC values at three stations in eastern Suisun Marsh and two stations in western Suisun Marsh (shown on Figure 3.4-3).

On the San Joaquin River, the water quality objectives for fish and wildlife beneficial uses stipulate that the 14-day running average of mean daily EC on the San Joaquin River "at and between Jersey Point and Prisoners Point" is less than 0.44 mmhos/cm during the months of April and May for all water year types except "critical" years. Although April and May 1994 fall within a "critical" water year, which means that this standard does not apply for this simulation, the impact of the proposed DWSC deepening scenarios on this water quality objective is shown in Figures 4.7-19 and 4.7-20 for reference.

Figure 4.7-19 shows the predicted 14-day running average EC on the San Joaquin River at Jersey Point for the Year 0 Baseline scenario, the Year 0 Sacramento DWSC Only Deepening scenario, and the Year 0 Both DWSC Deepening scenario. No increases in 14-day running average EC are predicted under either the Year 0 Sacramento DWSC Only Deepening scenario or the Year 0 Both DWSC Deepening scenario during April or May. The water quality objective of maximum 14-day running average EC on the San Joaquin River at Jersey Point is not exceeded under any of the scenarios during the two months that the objectives would apply for water year types that are not "critical."

Figure 4.7-20 shows the predicted 14-day running average EC on the San Joaquin River at Prisoners Point for the Year 0 Baseline scenario, the Year 0 Sacramento DWSC Only Deepening scenario, and the Year 0 Both DWSC Deepening scenario. No increases in 14-day running average EC are predicted under either the Year 0 Sacramento DWSC Only Deepening scenario or the Year 0 Both DWSC Deepening scenario during April or May. The water quality objective of maximum 14-day running average EC on the San Joaquin River at Prisoners Point is not exceeded under any of the scenarios during the two months that the objectives would apply for water year types that are not "critical."

The eastern Suisun Marsh and western Suisun Marsh water quality objectives for fish and wildlife beneficial uses are based on the monthly average of both daily high tide EC values. The water quality objectives apply from October through May for all water year types, as shown in Table 3-3.

Figure 4.7-21 shows the predicted monthly average of both daily high tide EC values on the Sacramento River at Collinsville for the Year 0 Baseline scenario, the Year 0 Sacramento DWSC Only Deepening scenario, and the Year 0 Both DWSC Deepening scenario. For the Year 0 Sacramento DWSC Only Deepening scenario, minimal to no increase in monthly average of both daily high tide EC values is predicted during all months. For the Year 0 Both DWSC Deepening scenario, predicted increases in monthly average of both daily high tide EC values are typically on the order of 0.5 mmhos/cm. The water quality objectives for fish and wildlife beneficial uses on the Sacramento River at Collinsville are met for all months except January and February under the Year 0 Baseline scenario, the Year 0 Sacramento DWSC Only Deepening scenario, and the Year 0 Both DWSC Deepening scenario.

Figure 4.7-22 shows the predicted monthly average of both daily high tide EC values on Montezuma Slough at National Steel for the Year 0 Baseline scenario, the Year 0 Sacramento DWSC Only Deepening scenario, and the Year 0 Both DWSC Deepening scenario. For the Year 0 Sacramento DWSC Only Deepening scenario, minimal to no increase in monthly average of both daily high tide EC values is predicted during all months. For the Year 0 Both DWSC Deepening scenario, predicted increases in monthly average of both daily high tide EC values are typically on the order of 0.5 mmhos/cm. The water quality objectives for fish and wildlife beneficial uses on Montezuma Slough at National Steel are exceeded during November, January, and February under all three scenarios, but are met during all other months.

Figure 4.7-23 shows the predicted monthly average of both daily high tide EC values on Montezuma Slough near Beldon Landing for the Year 0 Baseline scenario, the Year 0 Sacramento DWSC Only Deepening scenario, and the Year 0 Both DWSC Deepening scenario. For the Year 0 Sacramento DWSC Only Deepening scenario, minimal to no increase in monthly average of both daily high tide EC values is predicted during all months. For the Year 0 Both DWSC Deepening scenario, predicted increases in monthly average of both daily high tide EC values are typically on the order of 0.5 mmhos/cm. The water quality objectives for fish and wildlife beneficial uses on Montezuma Slough near Beldon Landing are exceeded during November, January, and February for all three scenarios.

Figure 4.7-24 shows the predicted monthly average of both daily high tide EC values on Chadbourne Slough at Sunrise Duck Club for the Year 0 Baseline scenario, the Year 0 Sacramento DWSC Only Deepening scenario, and the Year 0 Both DWSC Deepening scenario. For the Year 0 Sacramento DWSC Only Deepening scenario, minimal to no increase in monthly average of both daily high tide EC values is predicted during all months. For the Year 0 Both DWSC Deepening scenario, predicted increases in monthly average of both daily high tide EC values are typically on the order of 0.5 mmhos/cm. The water quality objectives for fish and wildlife beneficial uses on Chadbourne Slough at Sunrise Duck Club are exceeded during April, December, January, February, and March under all three scenarios. Under the Year 0 Both DWSC Deepening scenario, the water quality objectives for fish and wildlife beneficial uses on Chadbourne Slough at Sunrise Duck Club are also exceeded during November.

Figure 4.7-25 shows the predicted monthly average of both daily high tide EC values on Suisun Slough, 300 feet south of Volanti Slough for the Year 0 Baseline scenario, the Year 0 Sacramento DWSC Only Deepening scenario, and the Year 0 Both DWSC Deepening scenario. For the Year 0 Sacramento DWSC Only Deepening scenario, minimal to no increase in monthly average of both daily high tide EC values is predicted during all months. For the Year 0 Both DWSC Deepening scenario, predicted increases in monthly average of both daily high tide EC values are typically on the order of 0.5 mmhos/cm. The water quality objectives for fish and wildlife beneficial uses on Suisun Slough, 300 feet south of Volanti Slough are exceeded during December, January, February, and March under all three scenarios.

The evaluation of water quality objectives in eastern Suisun Marsh and western Suisun Marsh demonstrates that the deepening of the Sacramento DWSC Only is unlikely to have any impact on EC in these regions during Year 0. This is consistent with the salinity maps for the Year 0 Sacramento DWSC Only Deepening scenario discussed in Section 4.4 (Figures 4.4-1 though 4.4-13), which showed that no salinity increases greater than 0.05 psu are predicted in Suisun Marsh under the Year 0 Sacramento DWSC Only Deepening scenario. However, the corresponding maps for the Year 0 Both DWSC Deepening scenario in Section 4.4 (Figures 4.4-27 through 4.4-37) showed a predicted salinity increase on the order of 0.2-0.5 psu during most of the year in Suisun Bay and Suisun Marsh, indicating that increased salt intrusion resulting from the Year 0 Both DWSC Deepening scenario is likely to have a more significant impact on EC in Suisun Marsh throughout the year.

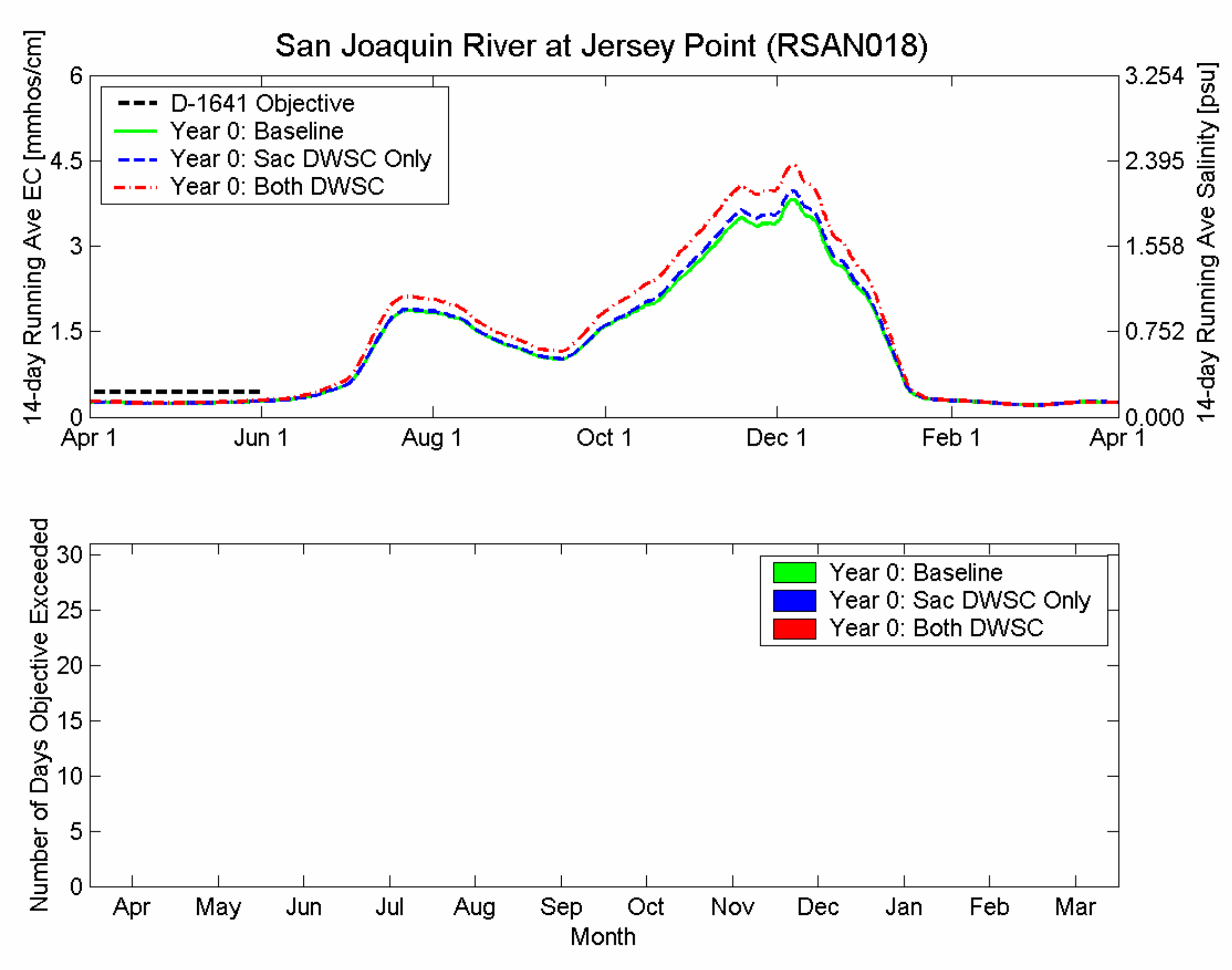


Figure 4.7-19 Predicted 14-day running average EC at San Joaquin River at Jersey Point (RSAN018) for the Year 0 Baseline scenario, the Year 0 Sacramento DWSC Only Deepening scenario, and the Year 0 Both DWSC Deepening scenario (top); number of days each month that predicted 14-day running average EC at RSAN018 exceeds D-1641 water quality objectives for each scenario during the Year 0 simulation period (bottom).

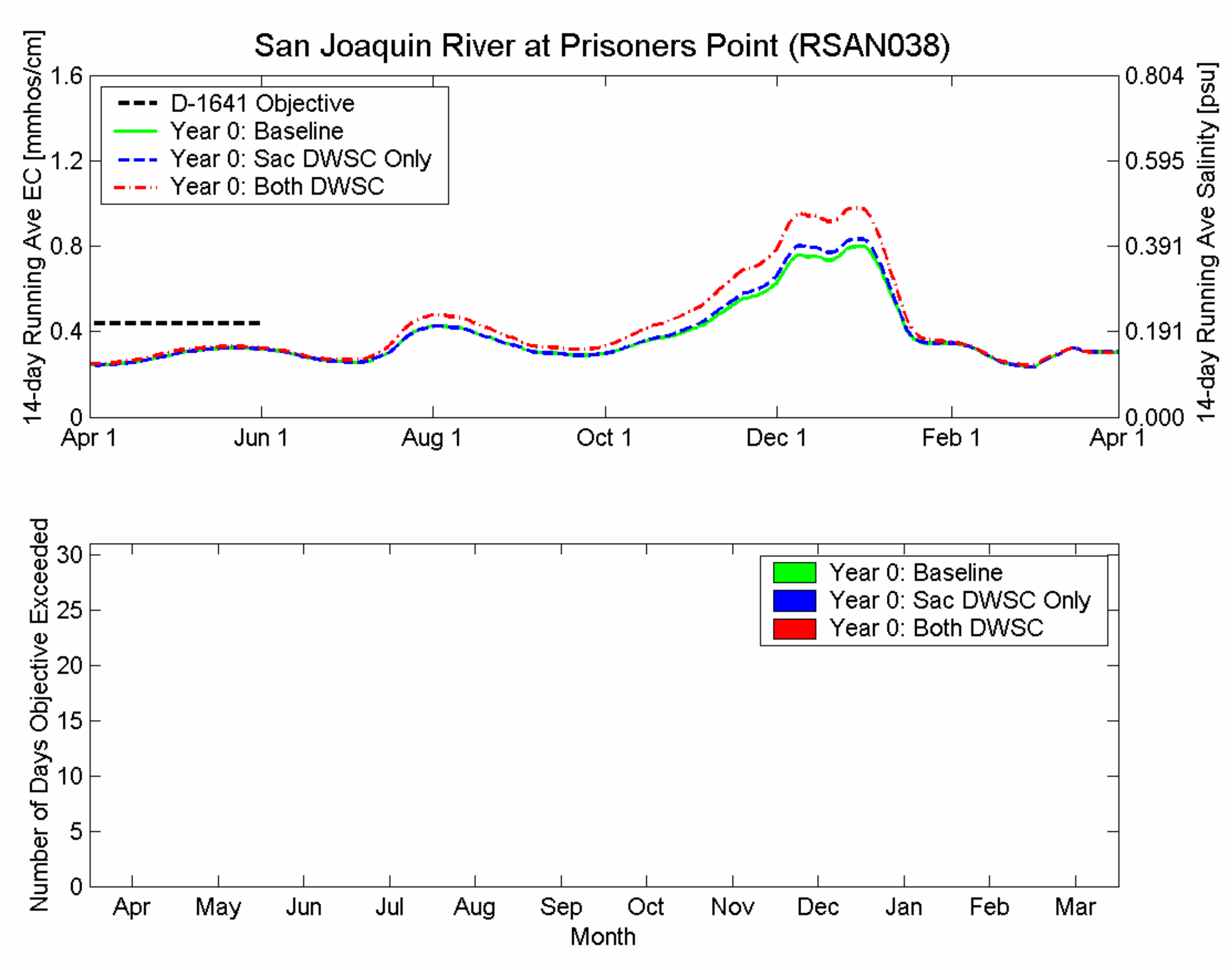


Figure 4.7-20 Predicted 14-day running average EC at San Joaquin River at Prisoners Point (RSAN038) for the Year 0 Baseline scenario, the Year 0 Sacramento DWSC Only Deepening scenario, and the Year 0 Both DWSC Deepening scenario (top); number of days each month that predicted 14-day running average EC at RSAN038 exceeds D-1641 water quality objectives for each scenario during the Year 0 simulation period (bottom).

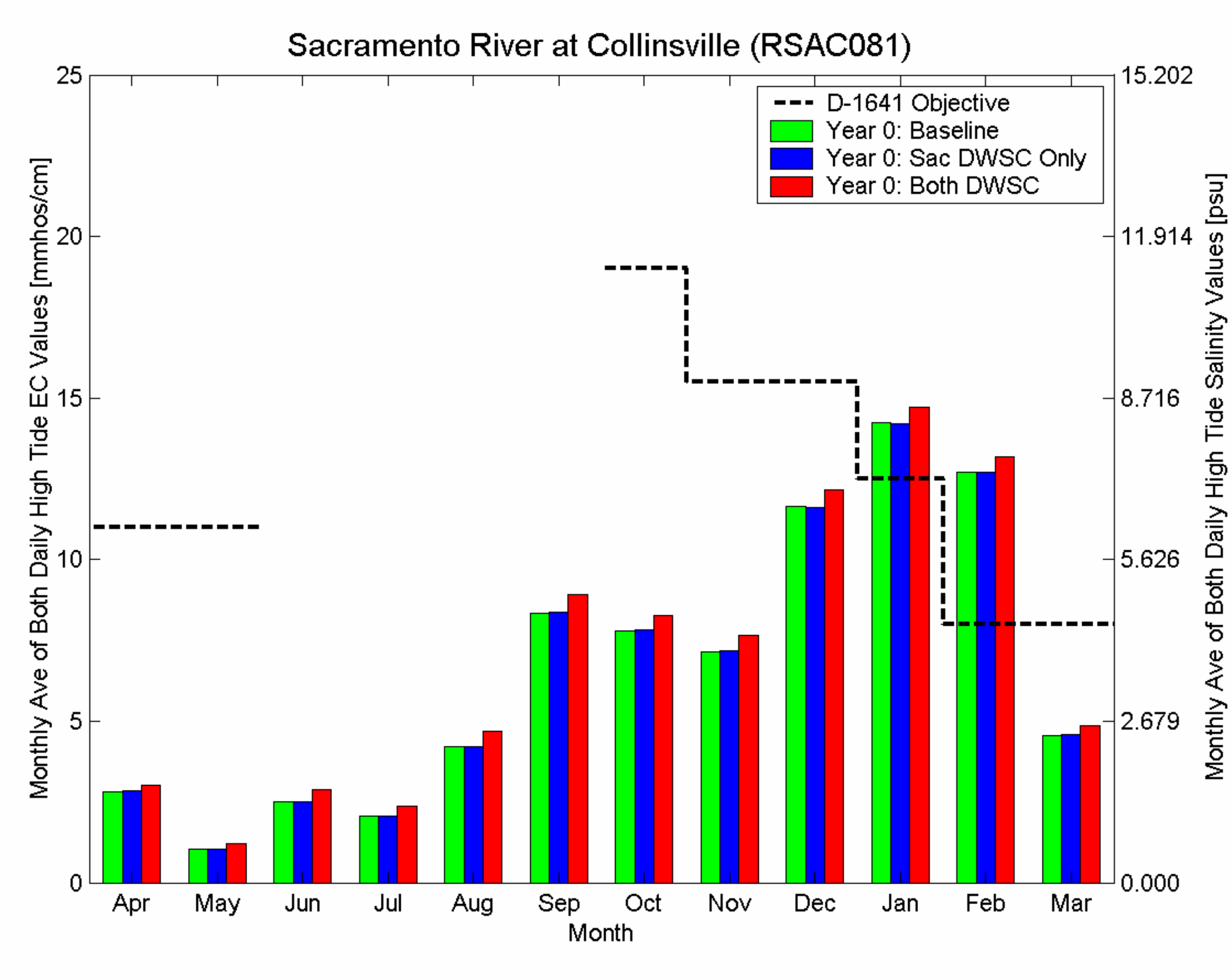


Figure 4.7-21 Predicted monthly average of both daily high tide EC values at Sacramento River at Collinsville (RSAC081) for the Year 0 Baseline scenario, the Year 0 Sacramento DWSC Only Deepening scenario, and the Year 0 Both DWSC Deepening scenario, shown relative to the D-1641 water quality objectives for fish and wildlife beneficial uses.

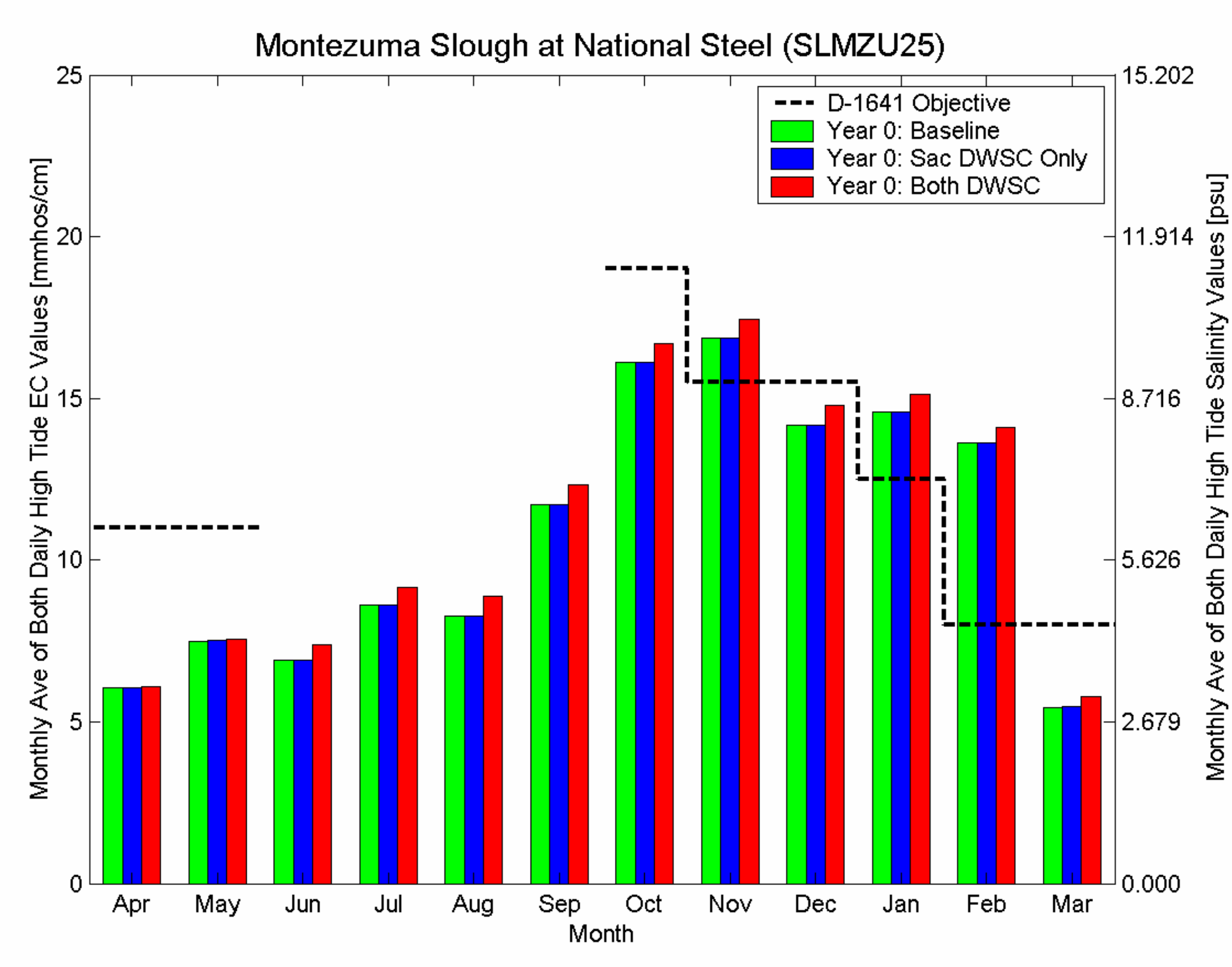


Figure 4.7-22 Predicted monthly average of both daily high tide EC values at Montezuma Slough at National Steel (SLMZU25) for the Year 0 Baseline scenario, the Year 0 Sacramento DWSC Only Deepening scenario, and the Year 0 Both DWSC Deepening scenario, shown relative to the D-1641 water quality objectives for fish and wildlife beneficial uses.

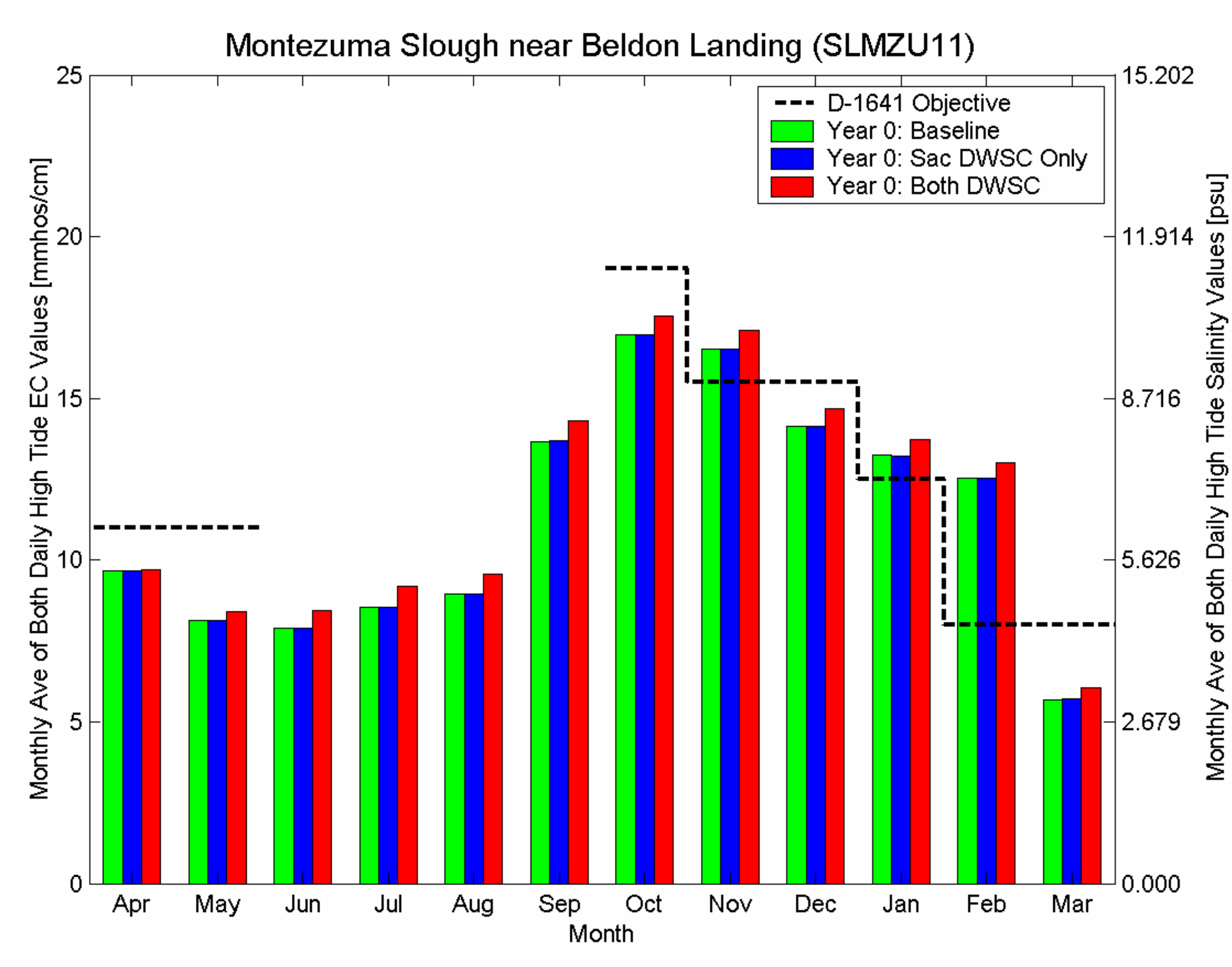


Figure 4.7-23 Predicted monthly average of both daily high tide EC values at Montezuma Slough near Beldon Landing (SLMZU11) for the Year 0 Baseline scenario, the Year 0 Sacramento DWSC Only Deepening scenario, and the Year 0 Both DWSC Deepening scenario, shown relative to the D-1641 water quality objectives for fish and wildlife beneficial uses.

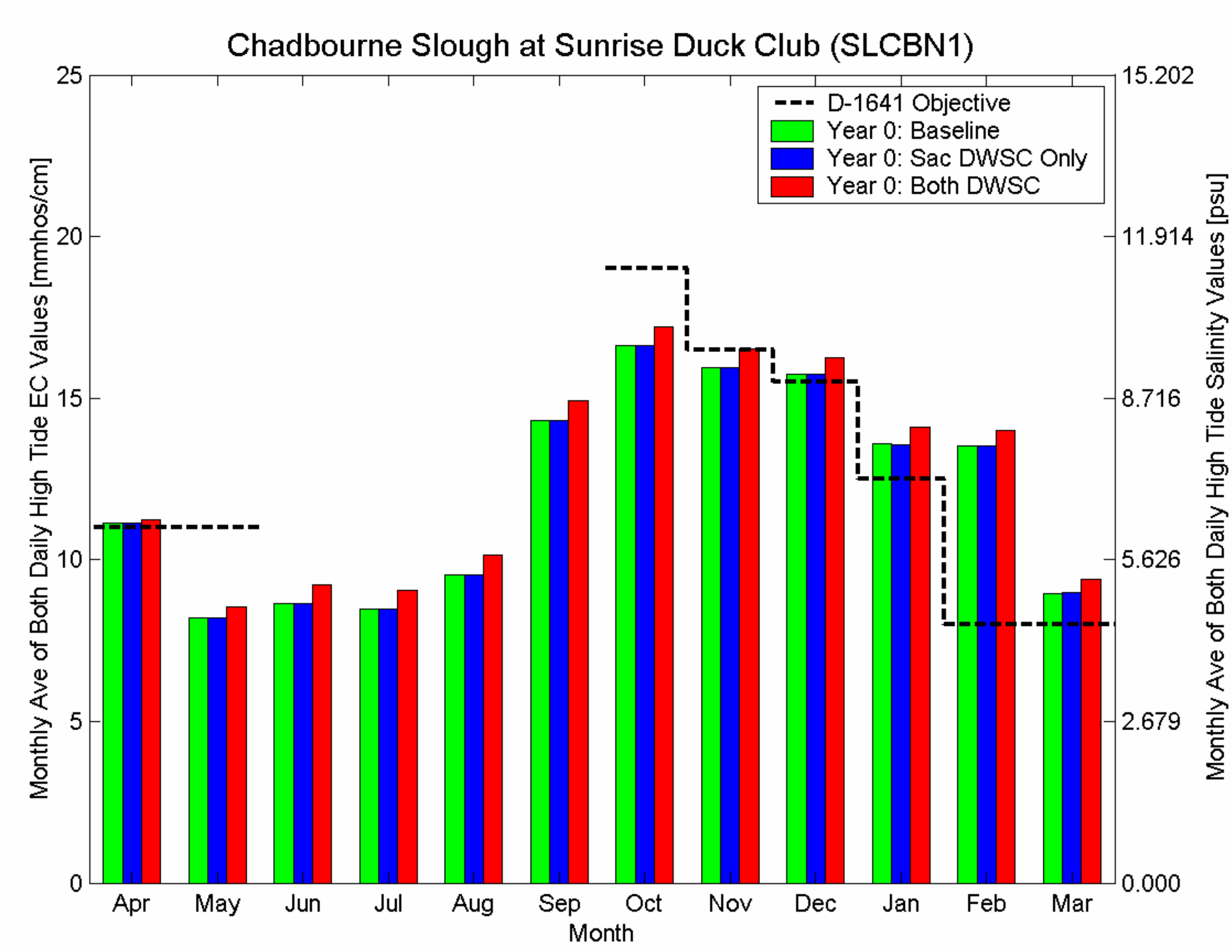


Figure 4.7-24 Predicted monthly average of both daily high tide EC values at Chadbourne Slough at Sunrise Duck Club (SLCBN1) for the Year 0 Baseline scenario, the Year 0 Sacramento DWSC Only Deepening scenario, and the Year 0 Both DWSC Deepening scenario, shown relative to the D-1641 water quality objectives for fish and wildlife beneficial uses.

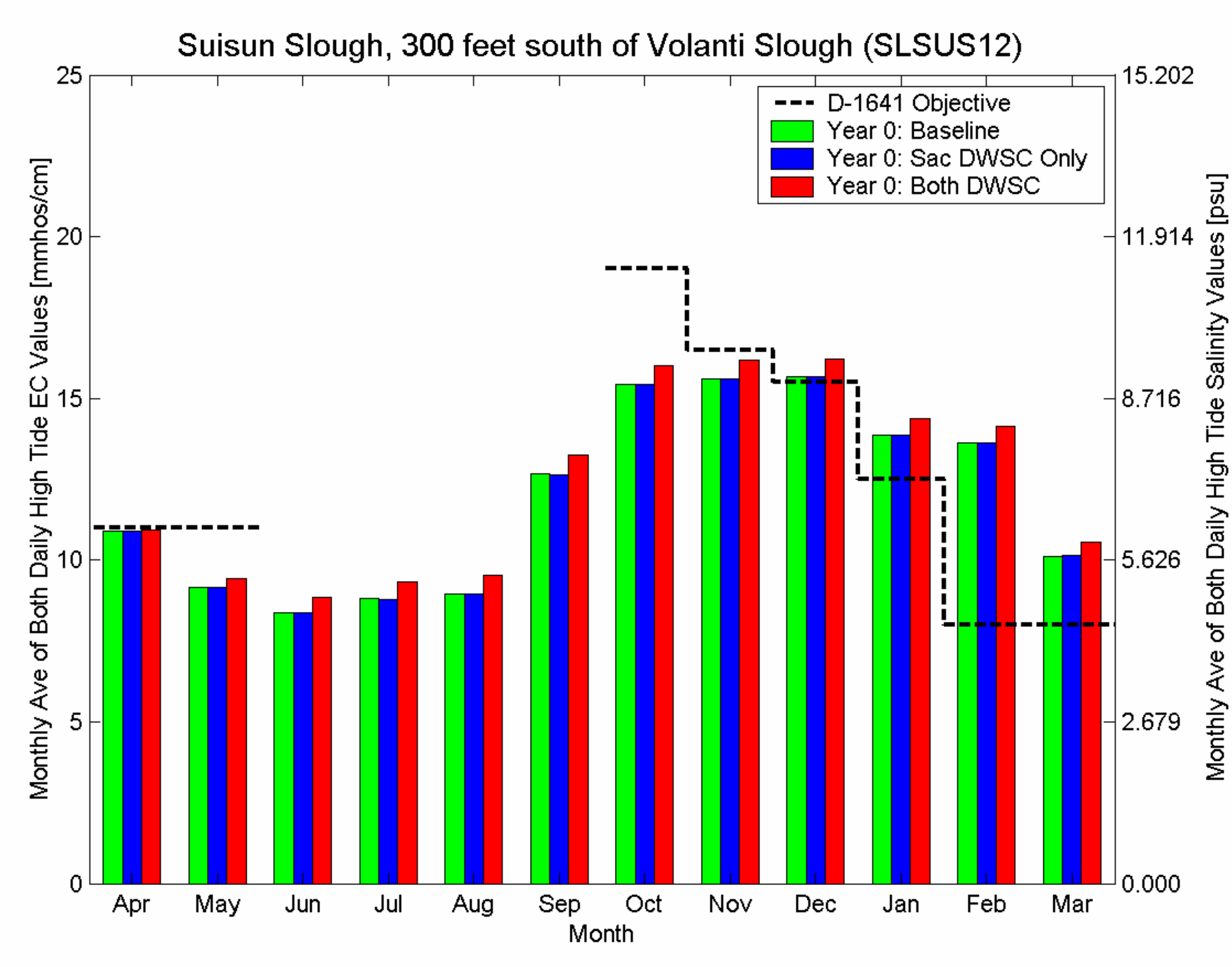


Figure 4.7-25 Predicted monthly average of both daily high tide EC values at Suisun Slough, 300 feet south of Volanti Slough (SLSUS12) for the Year 0 Baseline scenario, the Year 0 Sacramento DWSC Only Deepening scenario, and the Year 0 Both DWSC Deepening scenario, shown relative to the D-1641 water quality objectives for fish and wildlife beneficial uses.

4.8 Discussion of DWSC Deepening Alternatives under Year 0 Conditions

The Year 0 simulation period represents an estimate of possible conditions that may exist at the approximate time that a deepening project is completed. The Year 0 simulation incorporates the expected bathymetric, hydrologic, and operating conditions in years 2011 and 2012 for the Sacramento DWSC and the San Francisco Bay to Stockton DWSC, respectively.

4.8.1 Discussion of Year 0 Sacramento DWSC Only Deepening Scenario

The Year 0 Sacramento DWSC Only Deepening scenario was compared to the Year 0 Baseline scenario to evaluate the potential impacts of the proposed deepening of the Sacramento DWSC under Year 0 conditions. Predicted water surface elevation, flow, and salinity under the Year 0 Sacramento DWSC Only Deepening scenario were compared to the corresponding model predictions under the Year 0 Baseline scenario.

Time series comparisons of stage (Section 4.1.1) show that during most of the year the deepening of the Sacramento DWSC does not have a noticeable impact on stage in the San Francisco Bay or the Sacramento-San Joaquin Delta. During high flows, a slight decrease in daily-averaged stage of less than 0.03 m is predicted along the Sacramento DWSC. This decrease in stage is likely the result of increased conveyance capacity along the Sacramento DWSC resulting from the channel deepening. Time series comparisons of flow (Section 4.2.1) show that during most of the year the deepening of the Sacramento DWSC does not have a significant effect on tidal flows in San Francisco Bay or the Sacramento-San Joaquin Delta. The deepening of the Sacramento DWSC results in a very small increase in the tidal prism along the Sacramento DWSC, however these changes to tidal prism are evident only along the Sacramento River and Cache Slough.

Time series comparisons of salinity (Section 4.5.1) show that during spring and winter periods, the deepening of the Sacramento DWSC does not have a significant effect on salinity in San Francisco Bay or the Sacramento-San Joaquin Delta. Depth-averaged daily-averaged salinity maps (Section 4.4.1) show that the predicted salinity increase in the entire Sacramento-San Joaquin Delta is less than 0.05 psu from April 1 through June 1 and from February 1 through March 1 for the Year 0 Sacramento DWSC Only Deepening scenario. From July to January, salinity increases of up to 0.13 psu are predicted along the Sacramento River between Emmaton and Rio Vista. These salinity increases result in a maximum increase in X2 (Section 4.3.1) measured along the Sacramento transect of 2.69 km during the Year 0 Sacramento DWSC Only Deepening scenario. The deepening of the Sacramento DWSC has a much smaller impact on salinity along the San Joaquin River with predicted salinity increases of up to 0.07 psu at Antioch and 0.09 psu at Jersey Point. The salinity increase results in a maximum increase in X2 measured along the San Joaquin River transect of 0.86 km during the Year 0 Sacramento DWSC Only Deepening scenario. The maximum change in average X2 during the Year 0 Sacramento DWSC Only Deepening scenario is 1.54 km. A change of average X2 of 1.0 km or more is predicted on 13 days for the Year 0 Sacramento DWSC Only Deepening scenario. The deepening of the Sacramento DWSC does not have an impact on salinity during periods when X2 is less than 75 km.

Evaluation of the impact of the Year 0 Sacramento DWSC Only Deepening scenario on the compliance with the D-1641 water quality objectives (Section 4.6) indicates a small increase in the number of days the water quality objectives for municipal and industrial beneficial uses are not met at the Contra Costa Rock Slough Export, West Canal at the mouth of Clifton Court Forebay, the Delta-Mendota Canal at the Tracy Pumping Plant, and at the Contra Costa Old River Export. No change in the number of days the water quality objectives for municipal and industrial beneficial uses are met is predicted at Barker Slough at the North Bay Aqueduct Intake, Cache Slough at the City of Vallejo Intake, or at the Contra Costa Victoria Canal AIP. No changes to the compliance with the water quality objectives for agricultural beneficial uses are predicted under the Year 0 Sacramento DWSC Only Deepening scenario except at West Canal at the mouth of Clifton Court Forebay and at Delta-Mendota Canal at Tracy Pumping Plant. No changes to the compliance with the water quality objectives for Fish and Wildlife beneficial uses are predicted under the Year 0 Sacramento DWSC Only Deepening scenario.

4.8.2 Discussion of Year 0 Both DWSC Deepening Scenario

The Year 0 Both DWSC Deepening scenario was compared to the Year 0 Baseline scenario and the Year 0 Sacramento DWSC Only Deepening scenario to evaluate the potential impacts of the proposed deepening of Both DWSC under Year 0 conditions. Predicted water surface elevation, flow, and salinity under the Year 0 Both DWSC Deepening scenario were compared to the corresponding model predictions under the Year 0 Baseline scenario and the Year 0 Sacramento DWSC Only Deepening scenario.

Time series comparisons of stage (Section 4.1.2) show that during most of the year the deepening of Both DWSC does not have a noticeable impact on stage in the San Francisco Bay or the Sacramento-San Joaquin Delta. During high flows, a slight decrease in daily-averaged stage of less than 0.03 m is predicted along both the Sacramento DWSC and the San Francisco Bay to Stockton DWSC within the Delta. This decrease in stage is likely the result of increased conveyance capacity along both the Sacramento DWSC and the San Francisco Bay to Stockton DWSC resulting from the channel deepening. Time series comparisons of flow (Section 4.2.2) show that the channel deepening associated with the Year 0 Both DWSC Deepening scenario results in a small increase in tidal prism of the Delta. Peak tidal flows at Chipps Island under the Year 0 Both DWSC Deepening scenario are about 1.5% greater than under the Year 0 Baseline scenario indicating a slight increase in tidal prism of the Delta under the Year 0 Both DWSC Deepening scenario. A similar percentage increase in tidal prism is predicted along the San Joaquin River past Prisoners Point, and a smaller increase in tidal prism is predicted along the Sacramento River.

Depth-averaged daily-averaged salinity maps (Section 4.4.2) show that salinity increases are predicted in San Pablo Bay and Suisun Bay throughout the year. During high flows, the predicted salinity increase in the entire Sacramento-San Joaquin Delta is less than 0.05 psu from February 1 through March 1 for the Year 0 Both DWSC Deepening scenario, but salinity increases are predicted in the Sacramento-San Joaquin Delta throughout most of the year. Time series comparisons of salinity (Section 4.5.2) show predicted salinity increases of between 0.5 psu and 1.0 psu from Carquinez Straight through western Suisun Bay throughout the year.

Salinity increases of up to 0.31 psu are predicted on the Sacramento River at Emmaton and salinity increases of up to 0.35 psu are predicted on the San Joaquin River at Jersey Point.

Since the San Francisco Bay to Stockton DWSC deepening affects the West Richmond Channel, the Pinole Shoal Channel though San Pablo Bay and the Stockton DWSC through Suisun Bay, salinity gradients are present in deepened reaches throughout the year. These salinity increases result in an increase in salt intrusion and a resulting increase in X2 (Section 4.3.2) throughout the year under the Year 0 Both DWSC Deepening scenario. Throughout most of the Year 0 simulation period, the predicted X2 for the Year 0 Both DWSC Deepening scenario is approximately 1 km to 2 km greater than for the Year 0 Baseline scenario along both the Sacramento and the San Joaquin transects, indicating increased salt intrusion throughout the simulation period. The maximum change in average X2 during the Year 0 Both DWSC Deepening scenario is 4.04 km. A change of average X2 of 2.0 km or more is predicted on 54 days under the Year 0 Both DWSC Deepening scenario and a change of average X2 of 1.0 km or more is predicted on 302 days under the Year 0 Both DWSC Deepening scenario.

Evaluation of the impact of the Year 0 Both DWSC Deepening scenario on the compliance with the D-1641 water quality objectives (Section 4.7) indicates an increase in the number of days the water quality objectives for municipal and industrial beneficial uses are not met at the Contra Costa Rock Slough Export, West Canal at the mouth of Clifton Court Forebay, the Delta-Mendota Canal at the Tracy Pumping Plant, and at the Contra Costa Old River Export. No change in the number of days the water quality objectives for municipal and industrial beneficial uses are met is predicted at Barker Slough at the North Bay Aqueduct Intake, Cache Slough at the City of Vallejo Intake, or at the Contra Costa Victoria Canal AIP. No changes to the compliance with the water quality objectives for agricultural beneficial uses are predicted under the Year 0 Both DWSC Deepening scenario except at West Canal at the mouth of Clifton Court Forebay and at Delta-Mendota Canal at Tracy Pumping Plant. Due to predicted salinity increases on the order of 0.2 to 0.5 psu during most of the year in Suisun Bay and Suisun Marsh, increased salt intrusion resulting from the Year 0 Both DWSC Deepening scenario results in a decline in compliance with the water quality objectives for fish and wildlife beneficial uses in eastern Suisun Marsh and western Suisun Marsh.

5. Evaluation of Alternatives under Future Conditions (Year 50)

This section presents an evaluation of the potential impacts resulting from the proposed channel deepening scenarios, discussed in Section 2, under future conditions, as described in Section 3.2.2. The future year conditions are defined based on the expected bathymetric, hydrologic, and operating conditions in years 2061 and 2062 for the Sacramento DWSC and the San Francisco Bay to Stockton DWSC, respectively. The future year conditions simulation represents the "Year 50" conditions, which are an estimate of possible conditions that may exist fifty years following the time that a deepening project is completed, assuming that no other significant modifications to the Delta are made in the interim period. Potential hydrodynamic, salinity and water quality impacts of the deepening scenarios under future conditions are evaluated based on the metrics described in Section 3.3 and 3.4.

In order to facilitate preparation of separate EIS/EIR documents for the Sacramento DWSC Project and the San Francisco Bay to Stockton DWSC Project, two sets of comparisons are presented in each section. The first set of comparisons are between the Year 50 Baseline scenario and the Year 50 Sacramento DWSC Only Deepening scenario. The second set of comparisons are between the Year 50 Baseline scenario, the Year 50 Sacramento DWSC Only Deepening scenario, and the Year 50 Both DWSC Deepening scenario.

5.1 Evaluation of Impact on Water Levels

Water level time series provide information about potential impacts on water levels (stage) over time at a fixed location. Water level time series comparisons were made at eleven continuous stage monitoring stations in San Francisco Bay and the Sacramento-San Joaquin Delta, shown on Figure 3.3-1. Comparisons for the Year 50 simulation period between predicted water levels for the Year 50 Baseline scenario and the Year 50 Sacramento DWSC Only Deepening scenario are shown in Section 5.1.1. Comparisons for the Year 50 simulation period between predicted water levels for the Year 50 Baseline scenario, the Year 50 Sacramento DWSC Only Deepening scenario, and the Year 50 Both DWSC Deepening scenario are shown in Section 5.1.2.

5.1.1 Year 50 Sacramento DWSC Only Deepening

For each water level comparison figure included in this section, the top plot shows the tidal time-scale water level variability over a 15-day period for the Year 50 Baseline scenario and the Year 50 Sacramento DWSC Only Deepening scenario. The middle plot shows daily-averaged stage during the full simulation year for each scenario. The bottom plot shows the predicted change in daily-averaged stage for the Year 50 Sacramento DWSC Only Deepening scenario relative to the Year 50 Baseline scenario. In cases where the predicted stage is identical between scenarios, some lines are not fully visible. Since the lines are plotted in the order listed on the legend, for periods where the predicted stage for the Year 50 Baseline scenario is not fully visible, the predicted stage for the Year 50 Baseline scenario is identical to the visible line for the Year 50 Sacramento DWSC Only Deepening scenario.

Figure 5.1-1 shows the predicted stage at Sacramento River at Martinez (RSAC054) for the Year 50 Baseline scenario and the Year 50 Sacramento DWSC Only Deepening scenario. During the second half of November (top panel of Figure 5.1-1), the predicted stage for both scenarios is identical. Similarly, the daily-averaged stage is nearly identical between both scenarios over the entire simulation year. No change in stage relative to the Year 50 Baseline scenario is predicted at Martinez for the Year 50 Sacramento DWSC Only Deepening scenario.

Figure 5.1-2 shows the predicted stage at Sacramento River at Collinsville (RSAC081) for the Year 50 Baseline scenario and the Year 50 Sacramento DWSC Only Deepening scenario. During the second half of November (top panel of Figure 5.1-2), the predicted stage for both scenarios is identical. Similarly, the daily-averaged stage is nearly identical between both scenarios over the entire simulation year. No change in stage relative to the Year 50 Baseline scenario is predicted under the Year 50 Sacramento DWSC Only Deepening scenario.

Figure 5.1-3 shows the predicted stage at Sacramento River at Rio Vista (RIO) for the Year 50 Baseline scenario and the Year 50 Sacramento DWSC Only Deepening scenario. During the second half of November (top panel of Figure 5.1-3), the predicted stage for both scenarios is identical. Similarly, the daily-averaged stage is nearly identical between both scenarios over the entire simulation year. A slight decrease in daily-averaged stage of less than 0.01 m is predicted under the Year 50 Sacramento DWSC Only Deepening scenario during the high flow period between January and March. This decrease in stage is likely the result of the increased conveyance along the Sacramento River resulting from the deepening of the Sacramento DSWC in this reach.

Figure 5.1-4 shows the predicted stage at Cache Slough at Ryer Island (CCH) for the Year 50 Baseline scenario and the Year 50 Sacramento DWSC Only Deepening scenario. During the second half of November (top panel of Figure 5.1-4), the predicted stage for both scenarios is identical. Similarly, the daily-averaged stage is nearly identical between both scenarios over the entire simulation year. A slight decrease in daily-averaged stage of less than 0.03 m is predicted under the Year 50 Sacramento DWSC Only Deepening scenario during the high flow period between January and March. This decrease in stage is likely the result of the increased conveyance in Cache Slough resulting from the deepening of the Sacramento DSWC in this reach.

Figure 5.1-5 shows the predicted stage at the Sacramento DWSC (USGS Station 11455335) for the Year 50 Baseline scenario and the Year 50 Sacramento DWSC Only Deepening scenario. During the second half of November (top panel of Figure 5.1-5), the predicted stage for both scenarios is identical. Similarly, the daily-averaged stage is nearly identical between both scenarios over the entire simulation year. A slight decrease in daily-averaged stage of less than 0.03 m is predicted under the Year 50 Sacramento DWSC Only Deepening scenario during the high flow period between January and March. This decrease in stage is likely the result of the increased conveyance in Cache Slough which results in a decrease in stage in Cache Slough, and a corresponding decrease in stage in the man-made portion of the Sacramento DSWC.

Figure 5.1-6 shows the predicted stage at the Port of Sacramento for the Year 50 Baseline scenario and the Year 50 Sacramento DWSC Only Deepening scenario. During the second half of November (top panel of Figure 5.1-6), the predicted stage for both scenarios is identical. Similarly, the daily-averaged stage is nearly identical between both scenarios over the entire simulation year. A slight decrease in daily-averaged stage of less than 0.02 m is predicted under the Year 50 Sacramento DWSC Only Deepening scenario during the high flow period between January and March. This decrease in stage at the Port of Sacramento is likely the result of the increased conveyance in Cache Slough which results in a decrease in stage in Cache Slough, and a corresponding decrease in stage in the man-made portion of the Sacramento DSWC.

Figure 5.1-7 shows the predicted stage at Sacramento River South of Georgiana Slough (WGB) for the Year 50 Baseline scenario and the Year 50 Sacramento DWSC Only Deepening scenario. During the second half of November (top panel of Figure 5.1-7), the predicted stage for both scenarios is identical. Similarly, the daily-averaged stage is nearly identical between both scenarios over the entire simulation year. A slight decrease in daily-averaged stage of less than 0.01 m is predicted under the Year 50 Sacramento DWSC Only Deepening scenario during the high flow period between January and March.

Figure 5.1-8 shows the predicted stage at San Joaquin River at Jersey Point (JPT) for the Year 50 Baseline scenario and the Year 50 Sacramento DWSC Only Deepening scenario. During the second half of November (top panel of Figure 5.1-8), the predicted stage for both scenarios is identical. Similarly, the daily-averaged stage is nearly identical between both scenarios over the entire simulation year. No change in stage relative to the Year 50 Baseline scenario is predicted under the Year 50 Sacramento DWSC Only Deepening scenario.

Figure 5.1-9 shows the predicted stage at San Joaquin River at Prisoners Point (PRI) for the Year 50 Baseline scenario and the Year 50 Sacramento DWSC Only Deepening scenario. During the second half of November (top panel of Figure 5.1-9), the predicted stage for both scenarios is identical. Similarly, the daily-averaged stage is nearly identical between both scenarios over the entire simulation year. No change in stage relative to the Year 50 Baseline scenario is predicted under the Year 50 Sacramento DWSC Only Deepening scenario.

Figure 5.1-10 shows the predicted stage at Stockton Ship Channel at Burns Cutoff (RSAN058) for the Year 50 Baseline scenario and the Year 50 Sacramento DWSC Only Deepening scenario. During the second half of November (top panel of Figure 5.1-10), the predicted stage for both scenarios is identical. Similarly, the daily-averaged stage is nearly identical between both scenarios over the entire simulation year. No change in stage relative to the Year 50 Baseline scenario is predicted under the Year 50 Sacramento DWSC Only Deepening scenario.

Figure 5.1-11 shows the predicted stage at Middle River at Middle River (MID) for the Year 50 Baseline scenario and the Year 50 Sacramento DWSC Only Deepening scenario. During the second half of November (top panel of Figure 5.1-11), the predicted stage for both scenarios is identical. Similarly, the daily-averaged stage is nearly identical between both scenarios over the entire simulation year. No change in stage relative to the Year 50 Baseline scenario is predicted under the Year 50 Sacramento DWSC Only Deepening scenario.

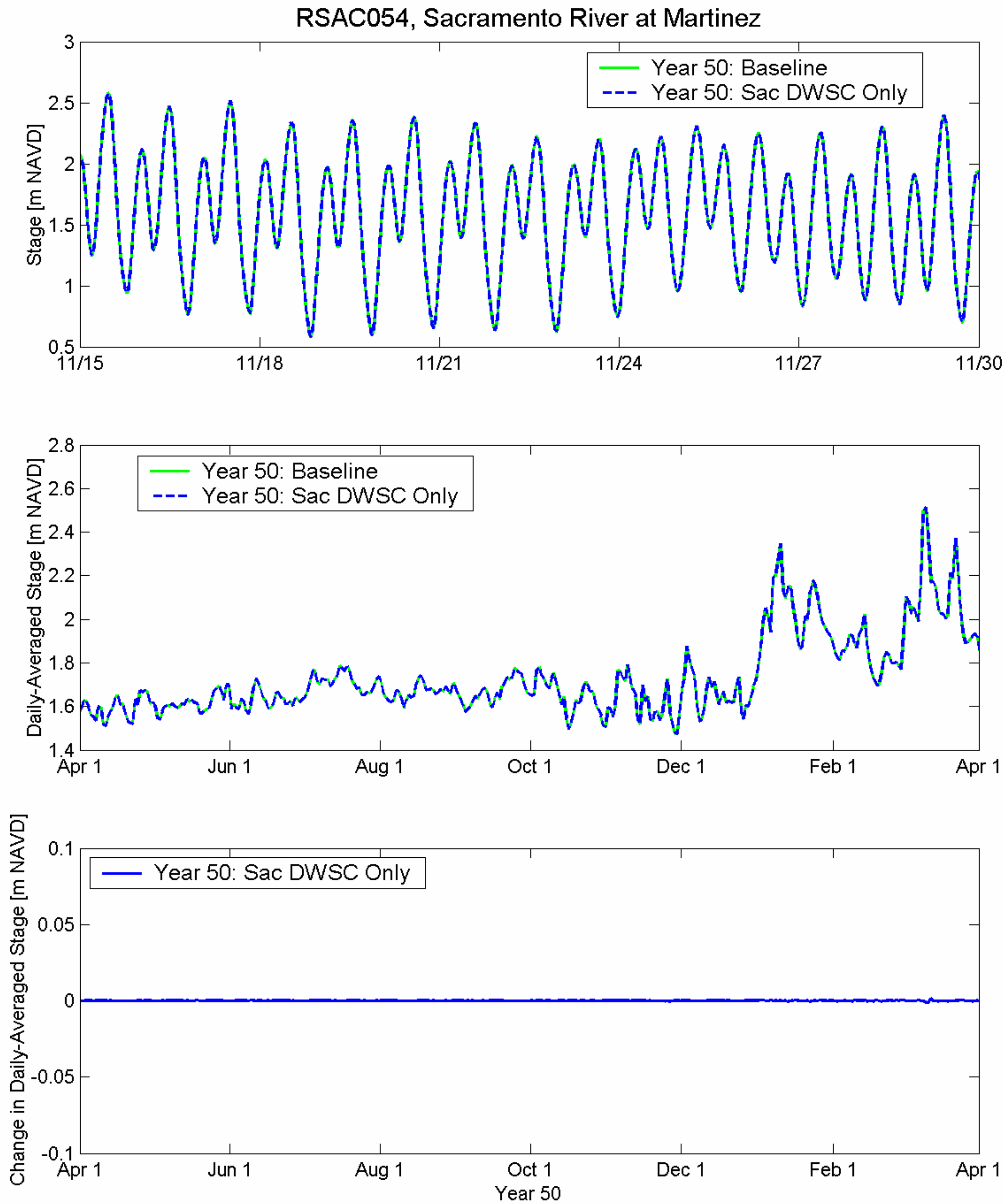


Figure 5.1-1 Predicted stage at Sacramento River at Martinez (RSAC054) for the Year 50 Baseline scenario and the Year 50 Sacramento DWSC Only Deepening scenario: tidal time-scale variability over a 15-day period (top); daily-averaged stage for the Year 50 simulation period (middle); predicted increase in daily-averaged stage for the Year 50 Sacramento DWSC Only Deepening scenario relative to the Year 50 Baseline scenario (bottom).

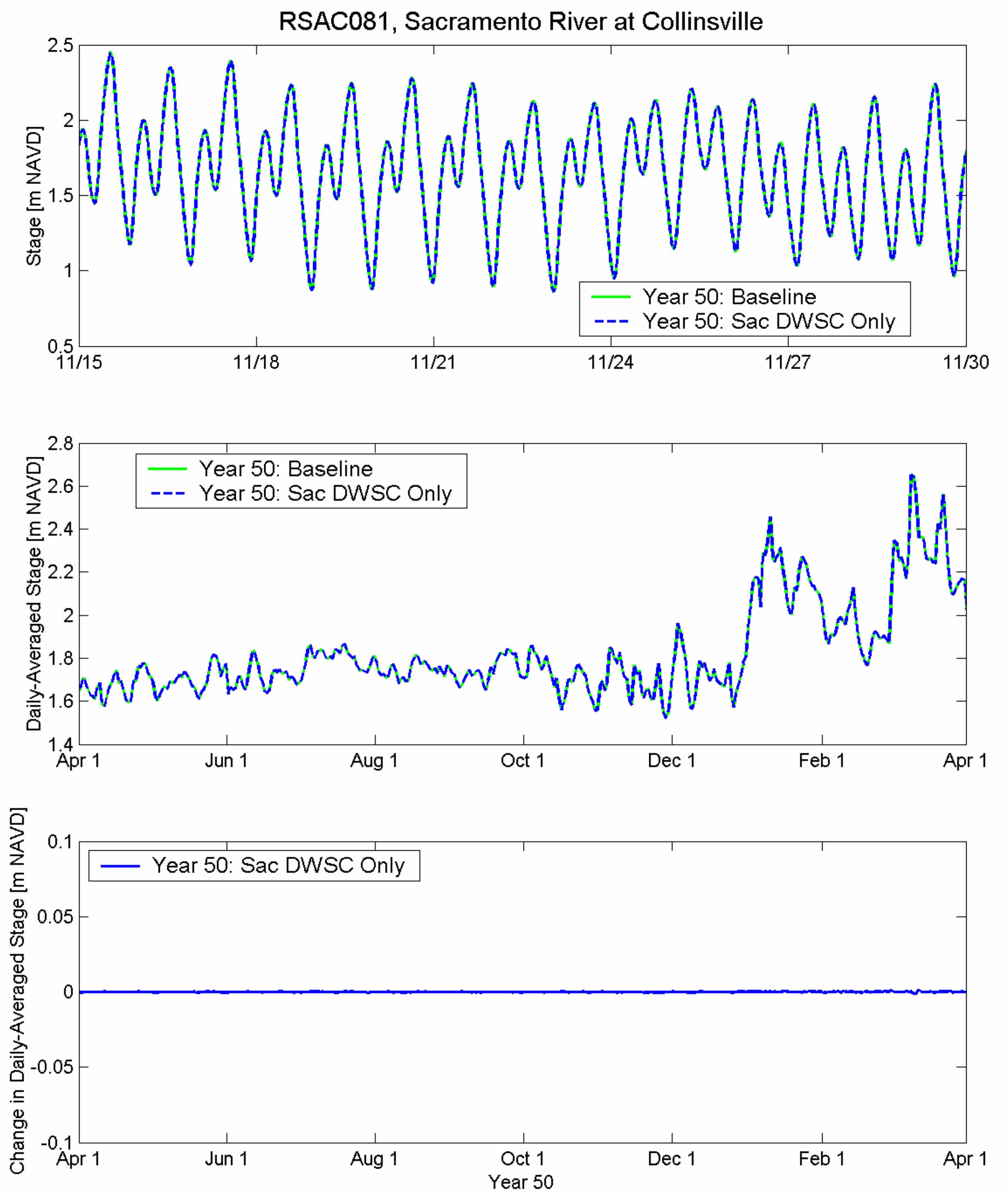


Figure 5.1-2 Predicted stage at Sacramento River at Collinsville (RSAC081) for the Year 50 Baseline scenario and the Year 50 Sacramento DWSC Only Deepening scenario: tidal time-scale variability over a 15-day period (top); daily-averaged stage for the Year 50 simulation period (middle); predicted increase in daily-averaged stage for the Year 50 Sacramento DWSC Only Deepening scenario relative to the Year 50 Baseline scenario (bottom).

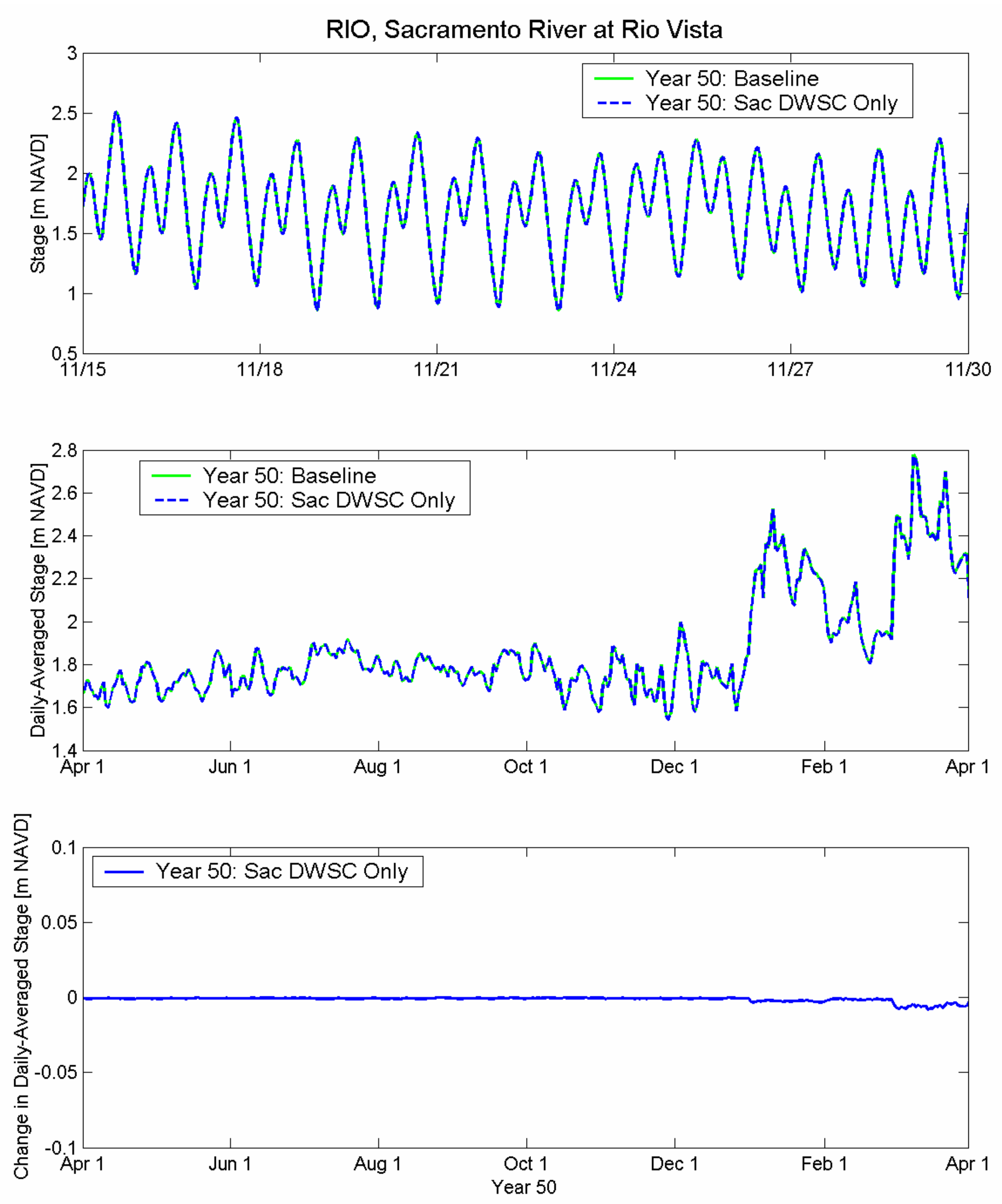


Figure 5.1-3 Predicted stage at Sacramento River at Rio Vista (RIO) for the Year 50 Baseline scenario and the Year 50 Sacramento DWSC Only Deepening scenario: tidal time-scale variability over a 15-day period (top); daily-averaged stage for the Year 50 simulation period (middle); predicted increase in daily-averaged stage for the Year 50 Sacramento DWSC Only Deepening scenario relative to the Year 50 Baseline scenario (bottom).

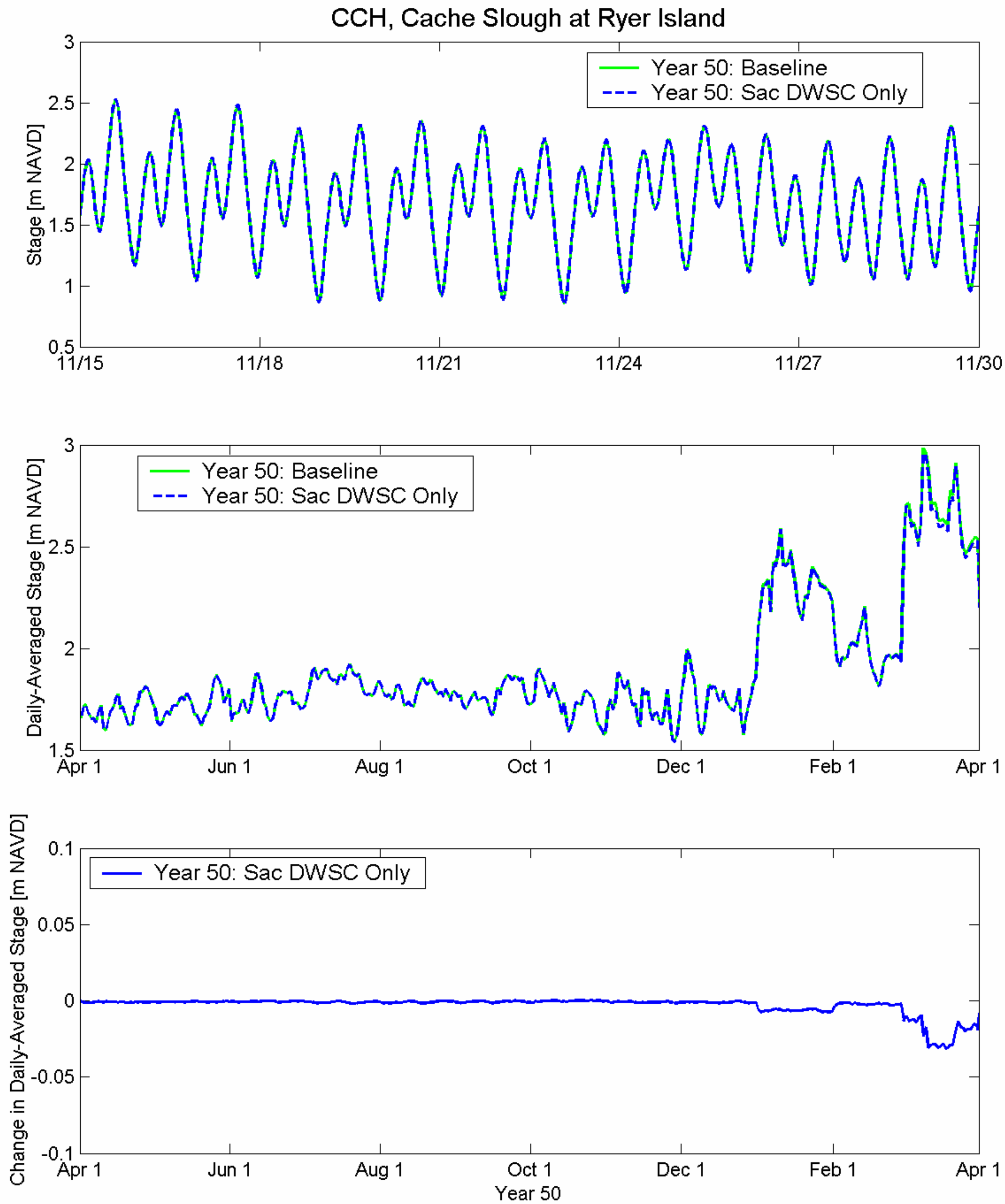


Figure 5.1-4 Predicted stage at Cache Slough at Ryer Island (CCH) for the Year 50 Baseline scenario and the Year 50 Sacramento DWSC Only Deepening scenario: tidal time-scale variability over a 15-day period (top); daily-averaged stage for the Year 50 simulation period (middle); predicted increase in daily-averaged stage for the Year 50 Sacramento DWSC Only Deepening scenario relative to the Year 50 Baseline scenario (bottom).

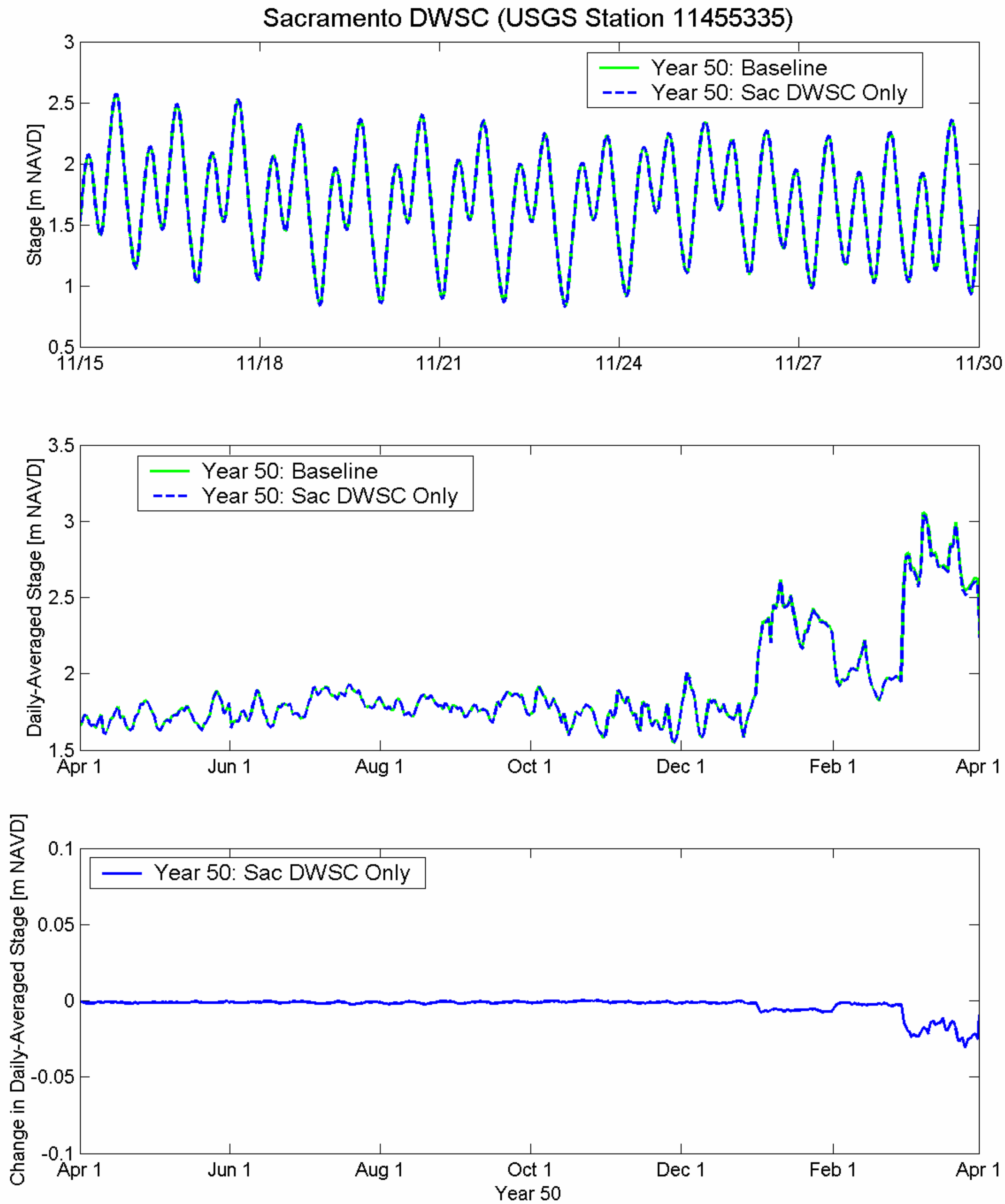


Figure 5.1-5 Predicted stage at Sacramento DWSC (USGS Station 11455335) for the Year 50 Baseline scenario and the Year 50 Sacramento DWSC Only Deepening scenario: tidal time-scale variability over a 15-day period (top); daily-averaged stage for the Year 50 simulation period (middle); predicted increase in daily-averaged stage for the Year 50 Sacramento DWSC Only Deepening scenario relative to the Year 50 Baseline scenario (bottom).

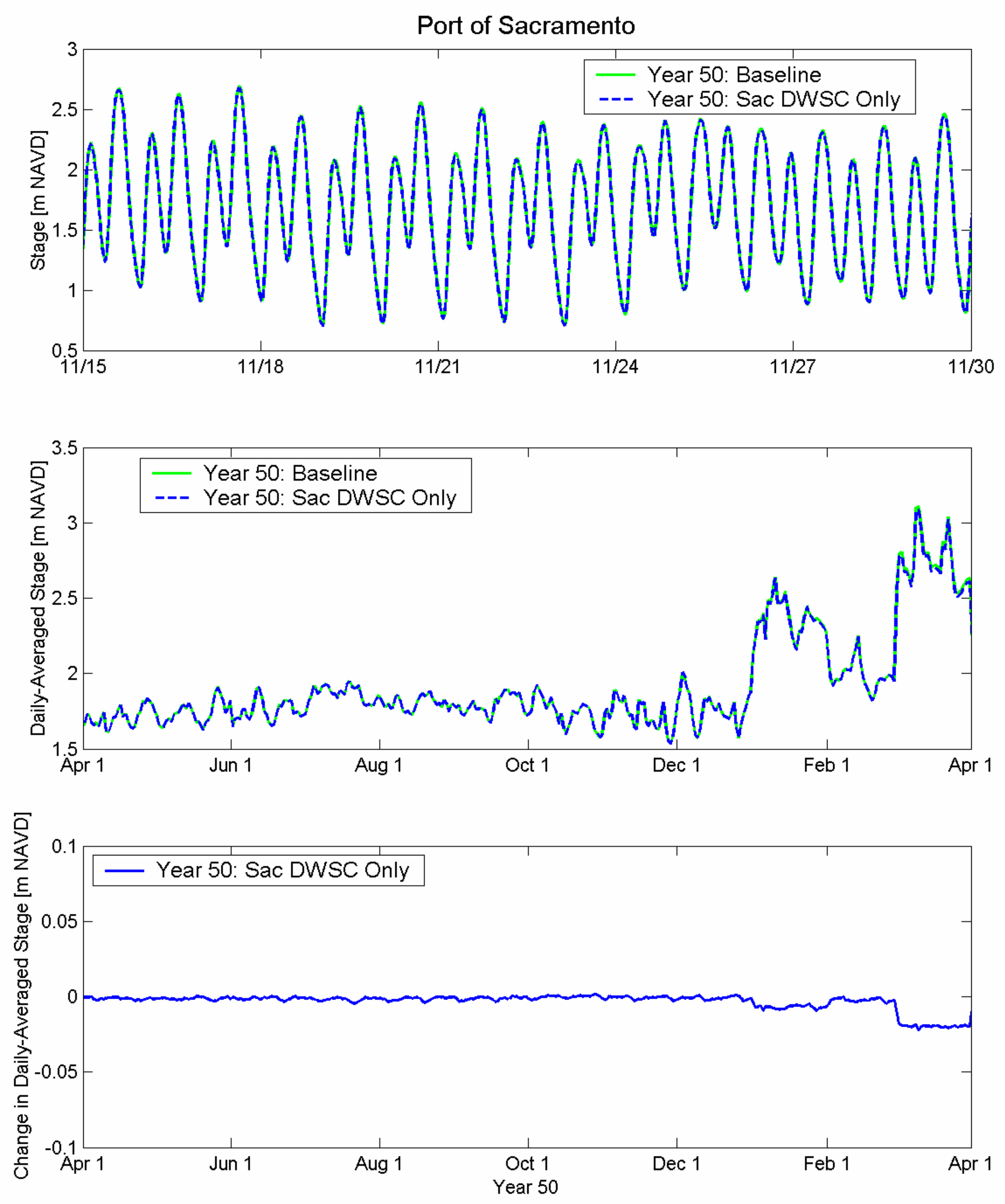


Figure 5.1-6 Predicted stage at the Port of Sacramento for the Year 50 Baseline scenario and the Year 50 Sacramento DWSC Only Deepening scenario: tidal time-scale variability over a 15-day period (top); daily-averaged stage for the Year 50 simulation period (middle); predicted increase in daily-averaged stage for the Year 50 Sacramento DWSC Only Deepening scenario relative to the Year 50 Baseline scenario (bottom).

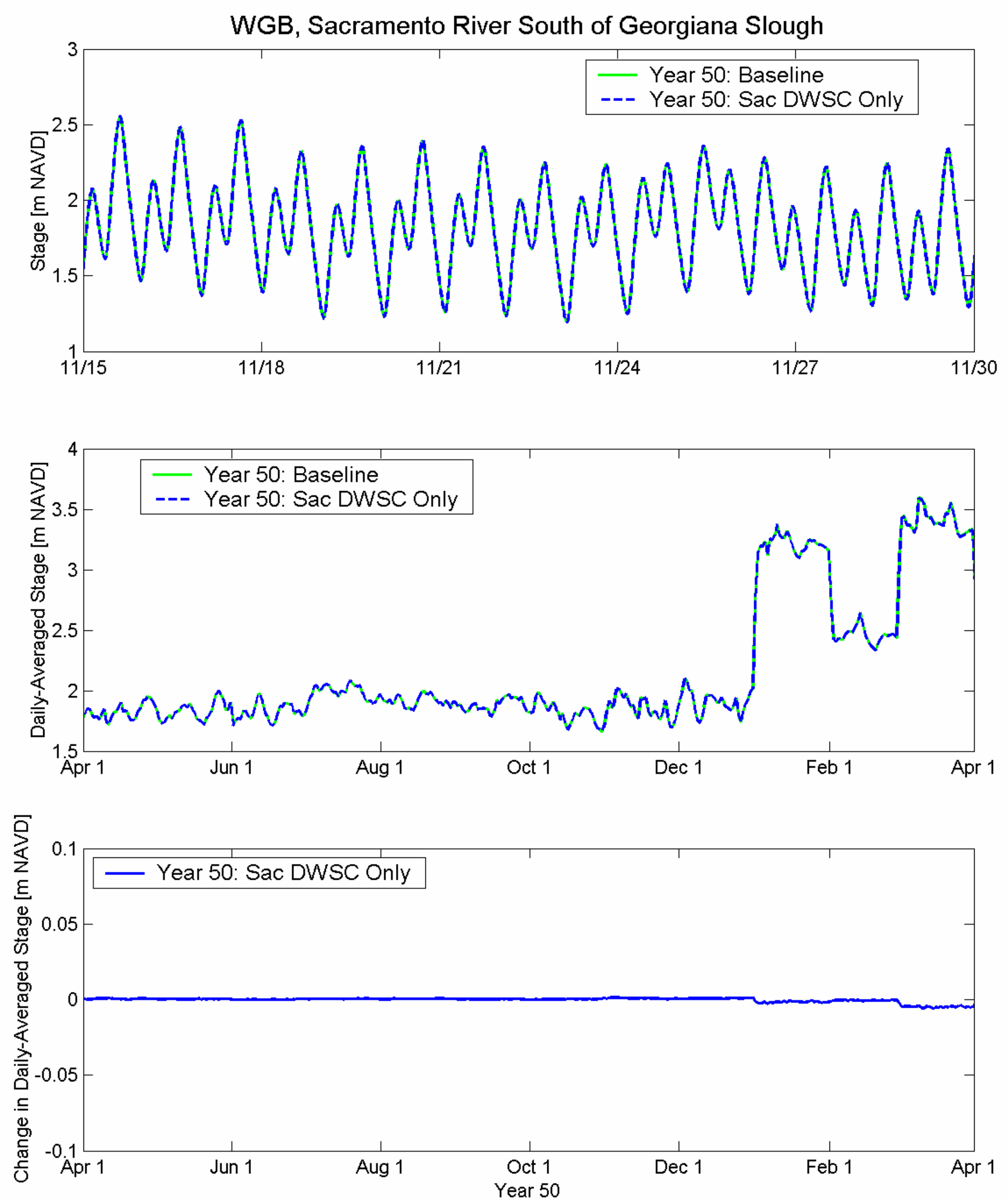


Figure 5.1-7 Predicted stage at Sacramento River South of Georgiana Slough (WGB) for the Year 50 Baseline scenario and the Year 50 Sacramento DWSC Only Deepening scenario: tidal time-scale variability over a 15-day period (top); daily-averaged stage for the Year 50 simulation period (middle); predicted increase in daily-averaged stage for the Year 50 Sacramento DWSC Only Deepening scenario relative to the Year 50 Baseline scenario (bottom).

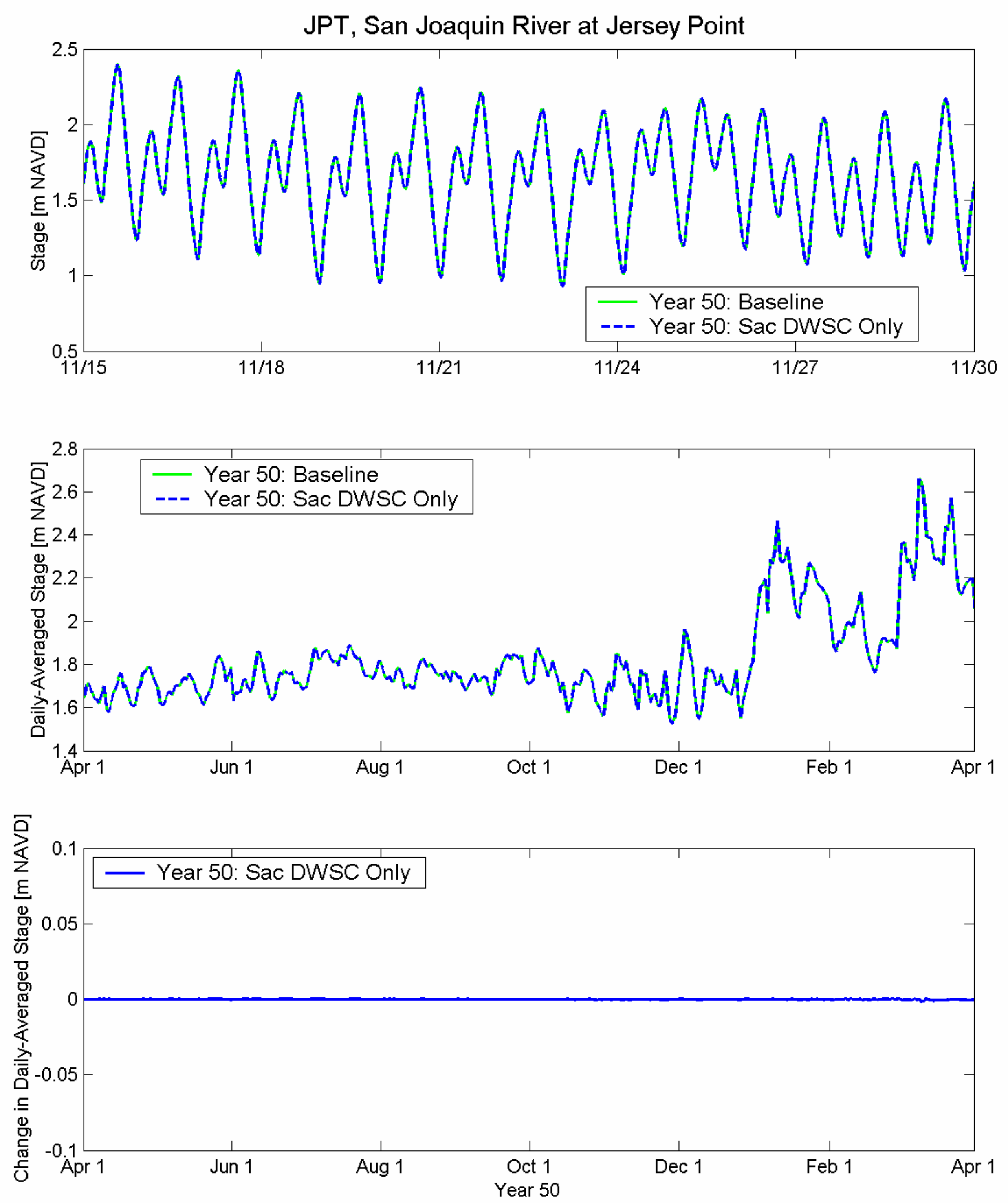


Figure 5.1-8 Predicted stage at San Joaquin River at Jersey Point (JPT) for the Year 50 Baseline scenario and the Year 50 Sacramento DWSC Only Deepening scenario: tidal time-scale variability over a 15-day period (top); daily-averaged stage for the Year 50 simulation period (middle); predicted increase in daily-averaged stage for the Year 50 Sacramento DWSC Only Deepening scenario relative to the Year 50 Baseline scenario (bottom).

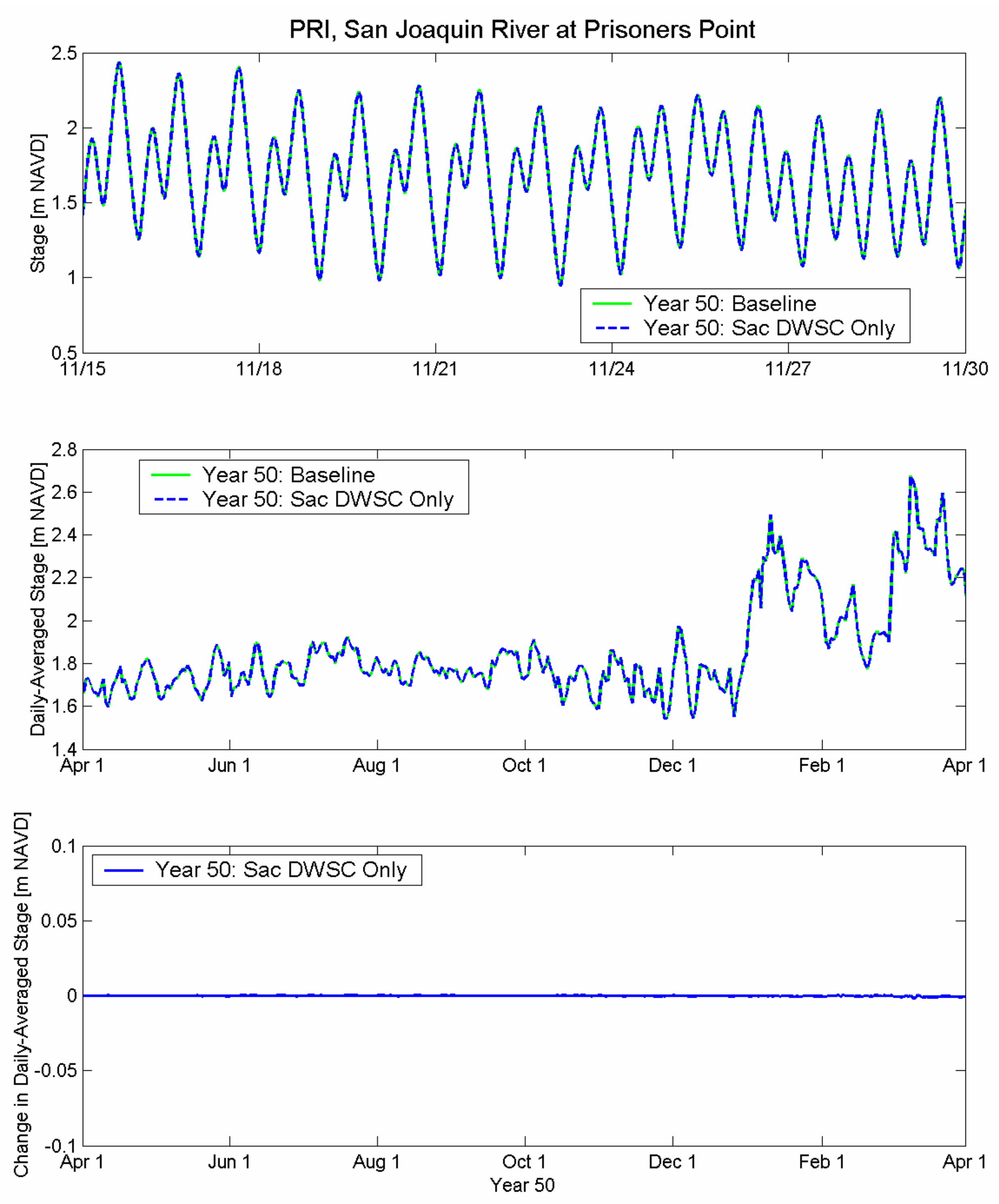


Figure 5.1-9 Predicted stage at San Joaquin River at Prisoners Point (PRI) for the Year 50 Baseline scenario and the Year 50 Sacramento DWSC Only Deepening scenario: tidal time-scale variability over a 15-day period (top); daily-averaged stage for the Year 50 simulation period (middle); predicted increase in daily-averaged stage for the Year 50 Sacramento DWSC Only Deepening scenario relative to the Year 50 Baseline scenario (bottom).

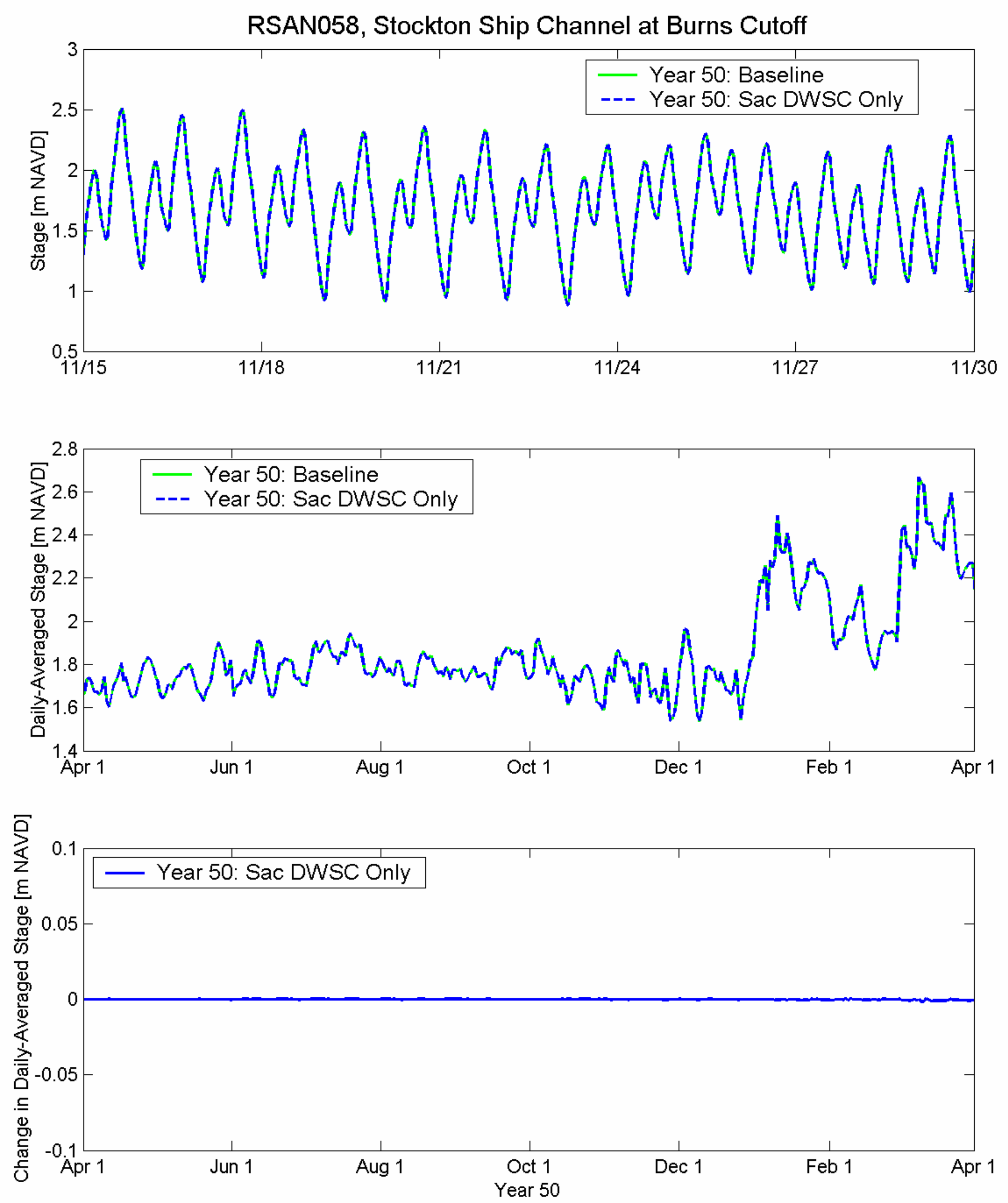


Figure 5.1-10 Predicted stage at Stockton Ship Channel at Burns Cutoff (RSAN058) for the Year 50 Baseline scenario and the Year 50 Sacramento DWSC Only Deepening scenario: tidal time-scale variability over a 15-day period (top); daily-averaged stage for the Year 50 simulation period (middle); predicted increase in daily-averaged stage for the Year 50 Sacramento DWSC Only Deepening scenario relative to the Year 50 Baseline scenario (bottom).

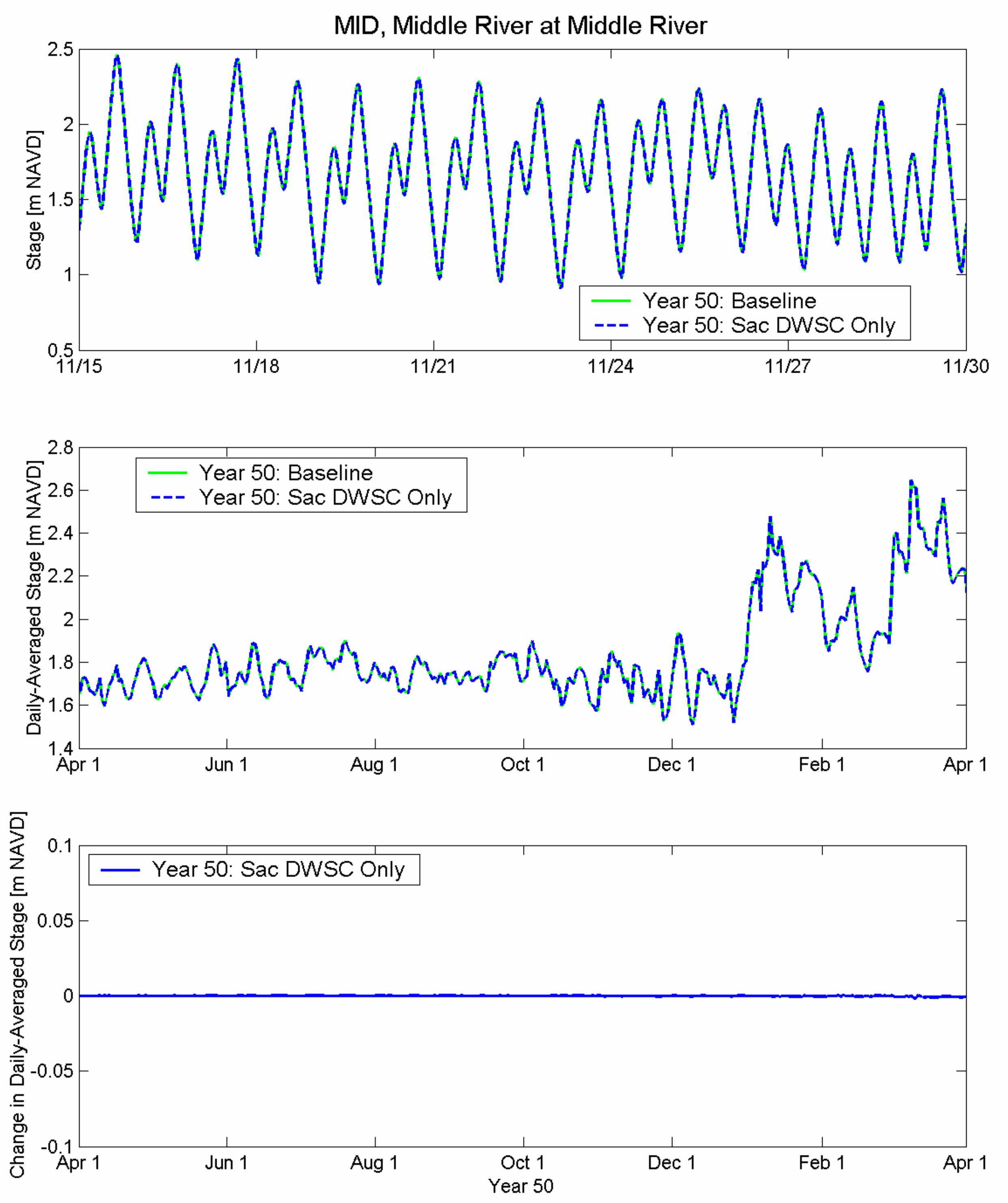


Figure 5.1-11 Predicted stage at Middle River at Middle River (MID) for the Year 50 Baseline scenario and the Year 50 Sacramento DWSC Only Deepening scenario: tidal time-scale variability over a 15-day period (top); daily-averaged stage for the Year 50 simulation period (middle); predicted increase in daily-averaged stage for the Year 50 Sacramento DWSC Only Deepening scenario relative to the Year 50 Baseline scenario (bottom).

5.1.2 Year 50 Both Sacramento DWSC & SF Bay to Stockton DWSC Deepening

For each stage comparison figure included in this section, the top plot shows the tidal time-scale water level variability over a 15-day period for the Year 50 Baseline scenario, the Year 50 Sacramento DWSC Only Deepening scenario, and the Year 50 Both DWSC Deepening scenario. The middle plot shows daily-averaged stage during the full simulation year for each scenario. The bottom plot shows the predicted change in daily-averaged stage for the Year 50 Sacramento DWSC Only Deepening scenario and the Year 50 Both DWSC Deepening scenario relative to the Year 50 Baseline scenario. In cases where the predicted stage is identical between scenarios, some lines are not fully visible. Since the lines are plotted in the order listed on the legend, for periods where the predicted stage for the Year 50 Baseline scenario or the Year 50 Sacramento DWSC Only Deepening scenario are not fully visible, the predicted stage for these scenarios is identical to the visible line(s).

Figure 5.1-12 shows the predicted stage at Sacramento River at Martinez (RSAC054) for the Year 50 Baseline scenario, the Year 50 Sacramento DWSC Only Deepening scenario, and the Year 50 Both DWSC Deepening scenario. During the second half of November (top panel of Figure 5.1-12), the predicted stage for all three scenarios is identical. Similarly, the daily-averaged stage is nearly identical between the three scenarios over the entire simulation year. No change in stage relative to the Year 50 Baseline scenario is predicted at Martinez for either the Year 50 Sacramento DWSC Only Deepening scenario or the Year 50 Both DWSC Deepening scenario.

Figure 5.1-13 shows the predicted stage at Sacramento River at Collinsville (RSAC081) for the Year 50 Baseline scenario, the Year 50 Sacramento DWSC Only Deepening scenario, and the Year 50 Both DWSC Deepening scenario. During the second half of November (top panel of Figure 5.1-13), the predicted stage for all three scenarios is identical. Similarly, the daily-averaged stage is nearly identical between the three scenarios over the entire simulation year. A slight decrease in daily-averaged stage of less than 0.01 m is predicted under the Year 50 Both DWSC Deepening scenario during the high flow period between January and March. This decrease in stage is likely the result of the increased conveyance resulting from the Year 50 Both DSWC Deepening scenario.

Figure 5.1-14 shows the predicted stage at Sacramento River at Rio Vista (RIO) for the Year 50 Baseline scenario, the Year 50 Sacramento DWSC Only Deepening scenario, and the Year 50 Both DWSC Deepening scenario. During the second half of November (top panel of Figure 5.1-14), the predicted stage for all three scenarios is identical. Similarly, the daily-averaged stage is nearly identical between the three scenarios over the entire simulation year. A slight decrease in daily-averaged stage of less than 0.01 m is predicted under both the Year 50 Sacramento DWSC Only Deepening scenario and the Year 50 Both DWSC Deepening scenario during the high flow period between January and March. This decrease in stage is likely the result of the increased conveyance along the Sacramento River resulting from the deepening of the Sacramento DSWC in this reach.

Figure 5.1-15 shows the predicted stage at Cache Slough at Ryer Island (CCH) for the Year 50 Baseline scenario, the Year 50 Sacramento DWSC Only Deepening scenario, and the Year 50 Both DWSC Deepening scenario. During the second half of November (top panel of Figure 5.1-15), the predicted stage for all three scenarios is identical. Similarly, the daily-averaged stage is nearly identical between the three scenarios over the entire simulation year. A slight decrease in daily-averaged stage of less than 0.03 m is predicted under both the Year 50 Sacramento DWSC Only Deepening scenario and the Year 50 Both DWSC Deepening scenario during the high flow period between January and March. This decrease in stage is likely the result of the increased conveyance in Cache Slough resulting from the deepening of the Sacramento DSWC in this reach.

Figure 5.1-16 shows the predicted stage at the Sacramento DWSC (USGS Station 11455335) for the Year 50 Baseline scenario, the Year 50 Sacramento DWSC Only Deepening scenario, and the Year 50 Both DWSC Deepening scenario. During the second half of November (top panel of Figure 5.1-16), the predicted stage for all three scenarios is identical. Similarly, the daily-averaged stage is nearly identical between the three scenarios over the entire simulation year. A slight decrease in daily-averaged stage of less than 0.03 m is predicted under both the Year 50 Sacramento DWSC Only Deepening scenario and the Year 50 Both DWSC Deepening scenario during the high flow period between January and March. This decrease in stage is likely the result of the increased conveyance in the Cache Slough reach of the Sacramento DWSC which results in a decrease in stage in Cache Slough, and a corresponding decrease in stage in the man-made portion of the Sacramento DSWC.

Figure 5.1-17 shows the predicted stage at the Port of Sacramento for the Year 50 Baseline scenario, the Year 50 Sacramento DWSC Only Deepening scenario, and the Year 50 Both DWSC Deepening scenario. During the second half of November (top panel of Figure 5.1-17), the predicted stage for all three scenarios is identical. Similarly, the daily-averaged stage is nearly identical between the three scenarios over the entire simulation year. A slight decrease in daily-averaged stage of less than 0.03 m is predicted under both the Year 50 Sacramento DWSC Only Deepening scenario and the Year 50 Both DWSC Deepening scenario during the high flow period between January and March. This decrease in stage is likely the result of the increased conveyance in Cache Slough which results in a decrease in stage in Cache Slough, and a corresponding decrease in stage in the man-made portion of the Sacramento DSWC upstream to the Port of Sacramento.

Figure 5.1-18 shows the predicted stage at Sacramento River South of Georgiana Slough (WGB) for the Year 50 Baseline scenario, the Year 50 Sacramento DWSC Only Deepening scenario, and the Year 50 Both DWSC Deepening scenario. During the second half of November (top panel of Figure 5.1-18), the predicted stage for all three scenarios is identical. Similarly, the daily-averaged stage is nearly identical between the three scenarios over the entire simulation year. A slight decrease in daily-averaged stage of less than 0.01 m is predicted under both the Year 50 Sacramento DWSC Only Deepening scenario and the Year 50 Both DWSC Deepening scenario during the high flow period between January and March.

Figure 5.1-19 shows the predicted stage at San Joaquin River at Jersey Point (JPT) for the Year 50 Baseline scenario, the Year 50 Sacramento DWSC Only Deepening scenario, and the Year 50

Both DWSC Deepening scenario. During the second half of November (top panel of Figure 5.1-19), the predicted stage for all three scenarios is identical. Similarly, the daily-averaged stage is nearly identical between the three scenarios over the entire simulation year. No change in stage relative to the Year 50 Baseline scenario is predicted under the Year 50 Sacramento DWSC Only Deepening scenario. A slight decrease in daily-averaged stage of less than 0.01 m is predicted under the Year 50 Both DWSC Deepening scenario during the high flow period between January and March.

Figure 5.1-20 shows the predicted stage at San Joaquin River at Prisoners Point (PRI) for the Year 50 Baseline scenario, the Year 50 Sacramento DWSC Only Deepening scenario, and the Year 50 Both DWSC Deepening scenario. During the second half of November (top panel of Figure 5.1-20), the predicted stage for all three scenarios is identical. Similarly, the daily-averaged stage is nearly identical between the three scenarios over the entire simulation year. No change in stage relative to the Year 50 Baseline scenario is predicted under the Year 50 Sacramento DWSC Only Deepening scenario. A slight decrease in daily-averaged stage of less than 0.01 m is predicted under the Year 50 Both DWSC Deepening scenario during the high flow period between January and March.

Figure 5.1-21 shows the predicted stage at Stockton Ship Channel at Burns Cutoff (RSAN058) for the Year 50 Baseline scenario, the Year 50 Sacramento DWSC Only Deepening scenario, and the Year 50 Both DWSC Deepening scenario. During the second half of November (top panel of Figure 5.1-21), the predicted stage for all three scenarios is identical. Similarly, the daily-averaged stage is nearly identical between the three scenarios over the entire simulation year. No change in stage relative to the Year 50 Baseline scenario is predicted under the Year 50 Sacramento DWSC Only Deepening scenario. A slight decrease in daily-averaged stage of less than 0.01 m is predicted under the Year 50 Both DWSC Deepening scenario during the high flow period between January and March.

Figure 5.1-22 shows the predicted stage at Middle River at Middle River (MID) for the Year 50 Baseline scenario, the Year 50 Sacramento DWSC Only Deepening scenario, and the Year 50 Both DWSC Deepening scenario. During the second half of November (top panel of Figure 5.1-22), the predicted stage for all three scenarios is identical. Similarly, the daily-averaged stage is nearly identical between the three scenarios over the entire simulation year. No change in stage relative to the Year 50 Baseline scenario is predicted under the Year 50 Sacramento DWSC Only Deepening scenario. A slight decrease in daily-averaged stage of less than 0.01 m is predicted under the Year 50 Both DWSC Deepening scenario during the high flow period between January and March.

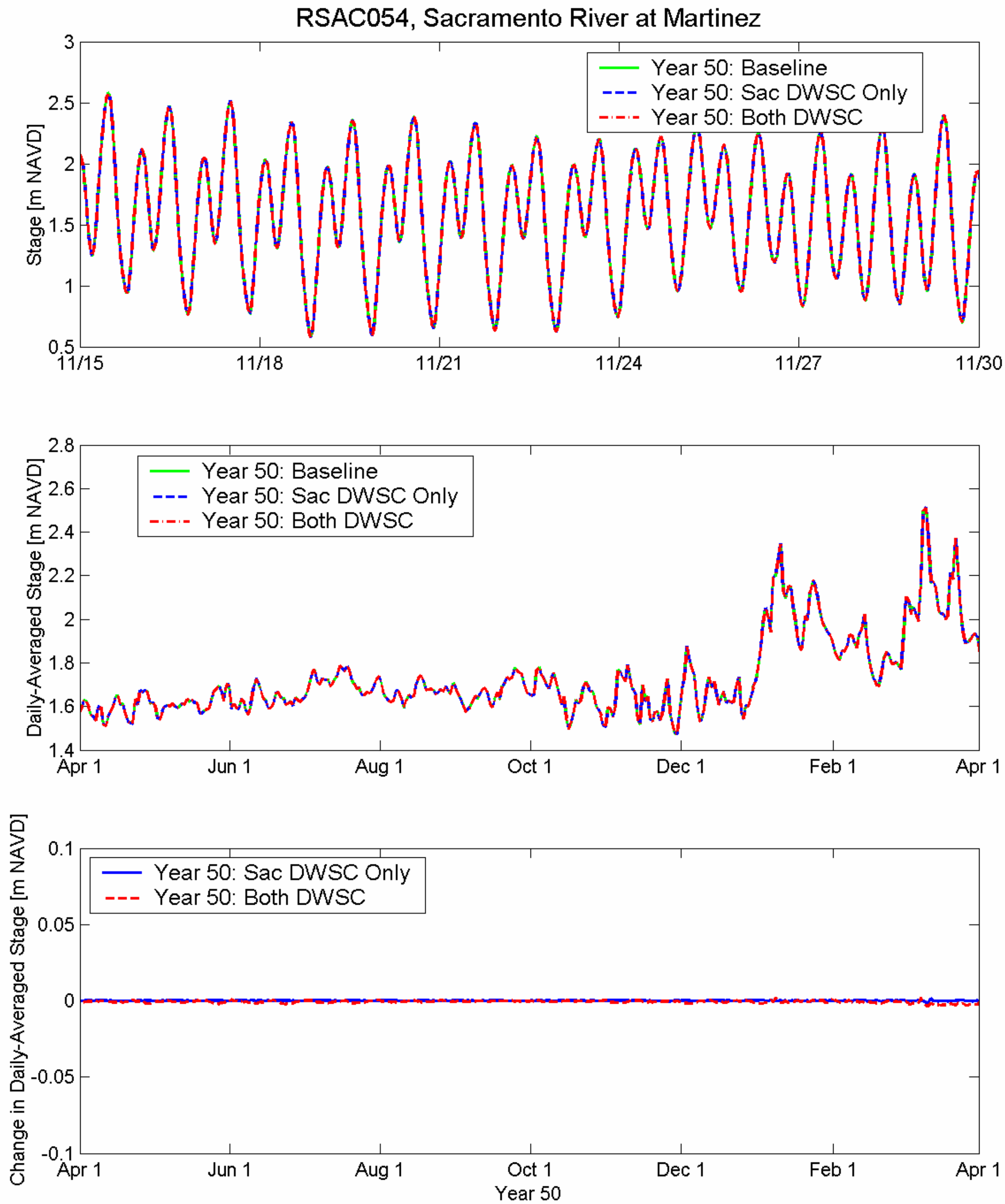


Figure 5.1-12 Predicted stage at Sacramento River at Martinez (RSAC054) for the Year 50 Baseline scenario, the Year 50 Sacramento DWSC Only Deepening scenario, and the Year 50 Both DWSC Deepening scenario: tidal time-scale variability over a 15-day period (top); daily-averaged stage for the Year 50 simulation period (middle); predicted increase in daily-averaged stage for the Year 50 Sacramento DWSC Only Deepening scenario and the Year 50 Both DWSC Deepening scenario relative to the Year 50 Baseline scenario (bottom).

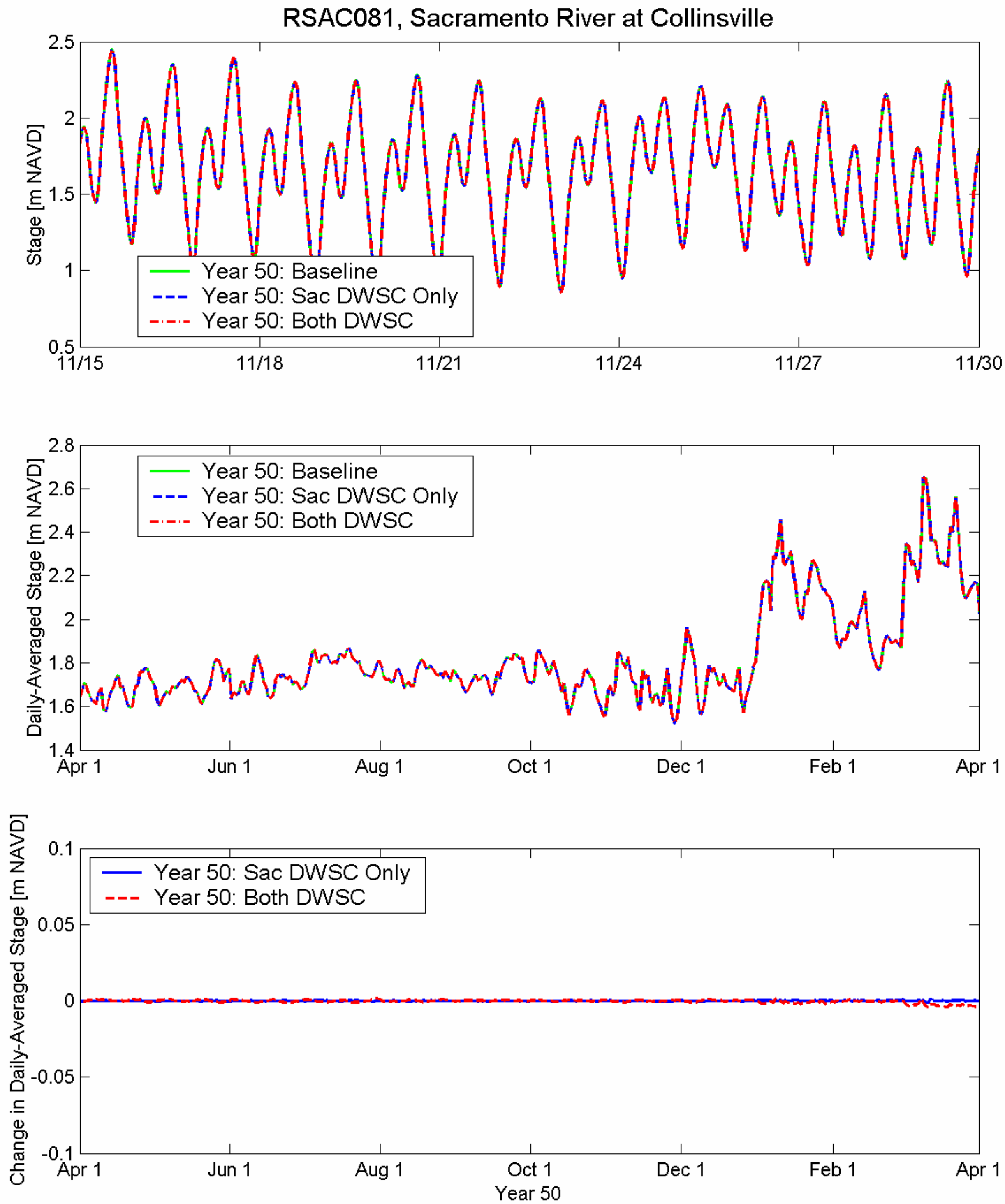


Figure 5.1-13 Predicted stage at Sacramento River at Collinsville (RSAC081) for the Year 50 Baseline scenario, the Year 50 Sacramento DWSC Only Deepening scenario, and the Year 50 Both DWSC Deepening scenario: tidal time-scale variability over a 15-day period (top); daily-averaged stage for the Year 50 simulation period (middle); predicted increase in daily-averaged stage for the Year 50 Sacramento DWSC Only Deepening scenario and the Year 50 Both DWSC Deepening scenario relative to the Year 50 Baseline scenario (bottom).

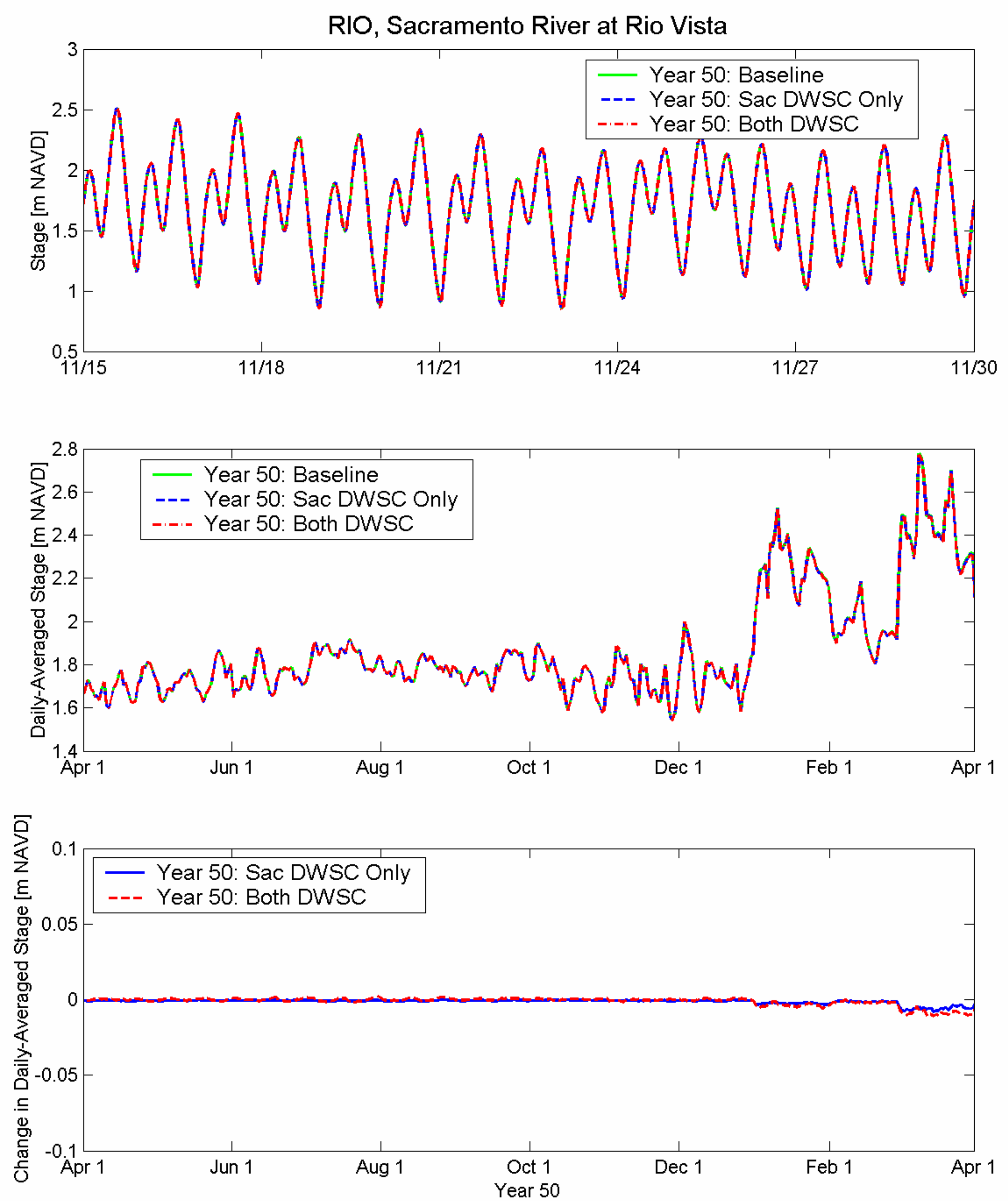


Figure 5.1-14 Predicted stage at Sacramento River at Rio Vista (RIO) for the Year 50 Baseline scenario, the Year 50 Sacramento DWSC Only Deepening scenario, and the Year 50 Both DWSC Deepening scenario: tidal time-scale variability over a 15-day period (top); daily-averaged stage for the Year 50 simulation period (middle); predicted increase in daily-averaged stage for the Year 50 Sacramento DWSC Only Deepening scenario and the Year 50 Both DWSC Deepening scenario relative to the Year 50 Baseline scenario (bottom).

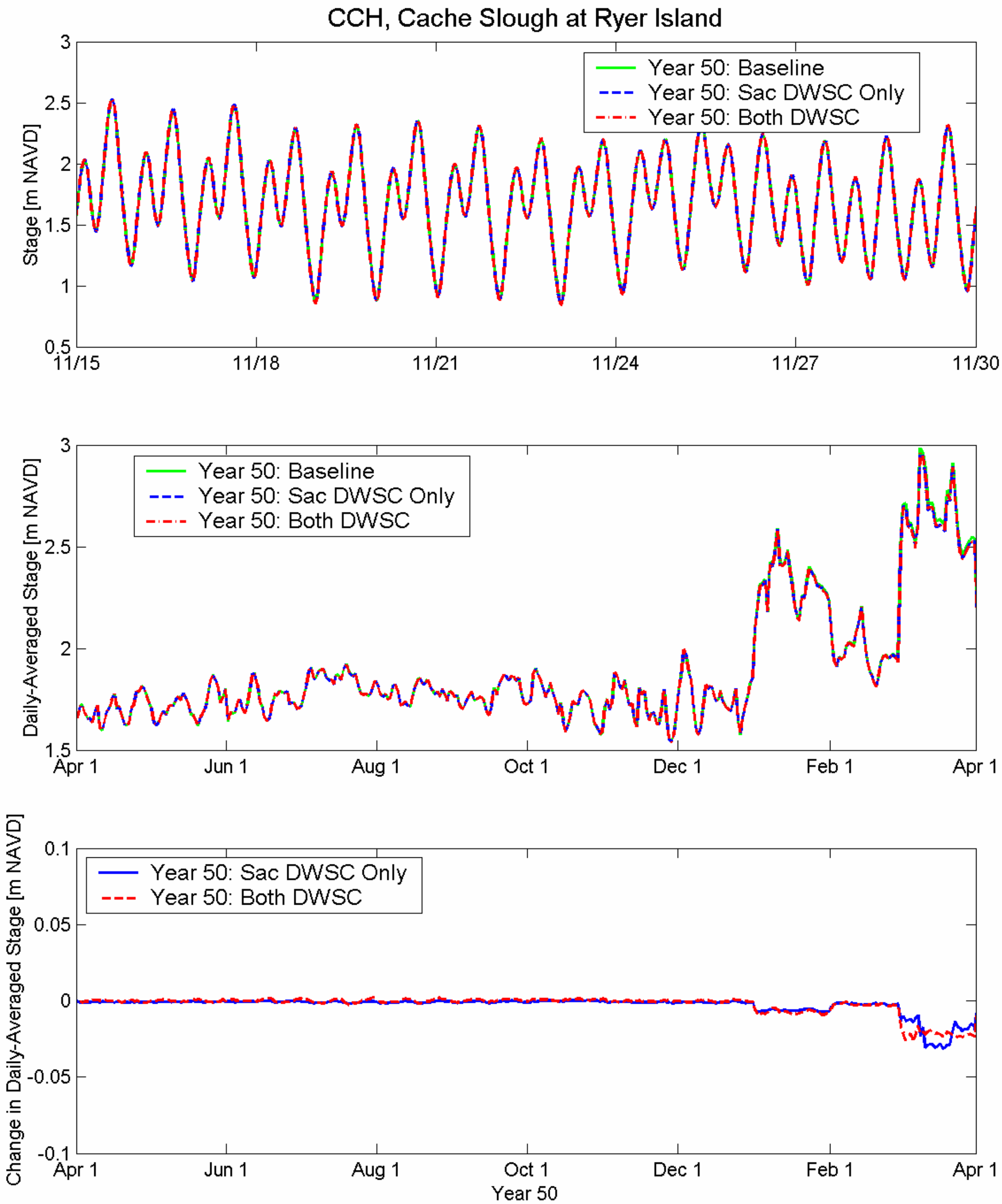


Figure 5.1-15 Predicted stage at Cache Slough at Ryer Island (CCH) for the Year 50 Baseline scenario, the Year 50 Sacramento DWSC Only Deepening scenario, and the Year 50 Both DWSC Deepening scenario: tidal time-scale variability over a 15-day period (top); daily-averaged stage for the Year 50 simulation period (middle); predicted increase in daily-averaged stage for the Year 50 Sacramento DWSC Only Deepening scenario and the Year 50 Both DWSC Deepening scenario relative to the Year 50 Baseline scenario (bottom).

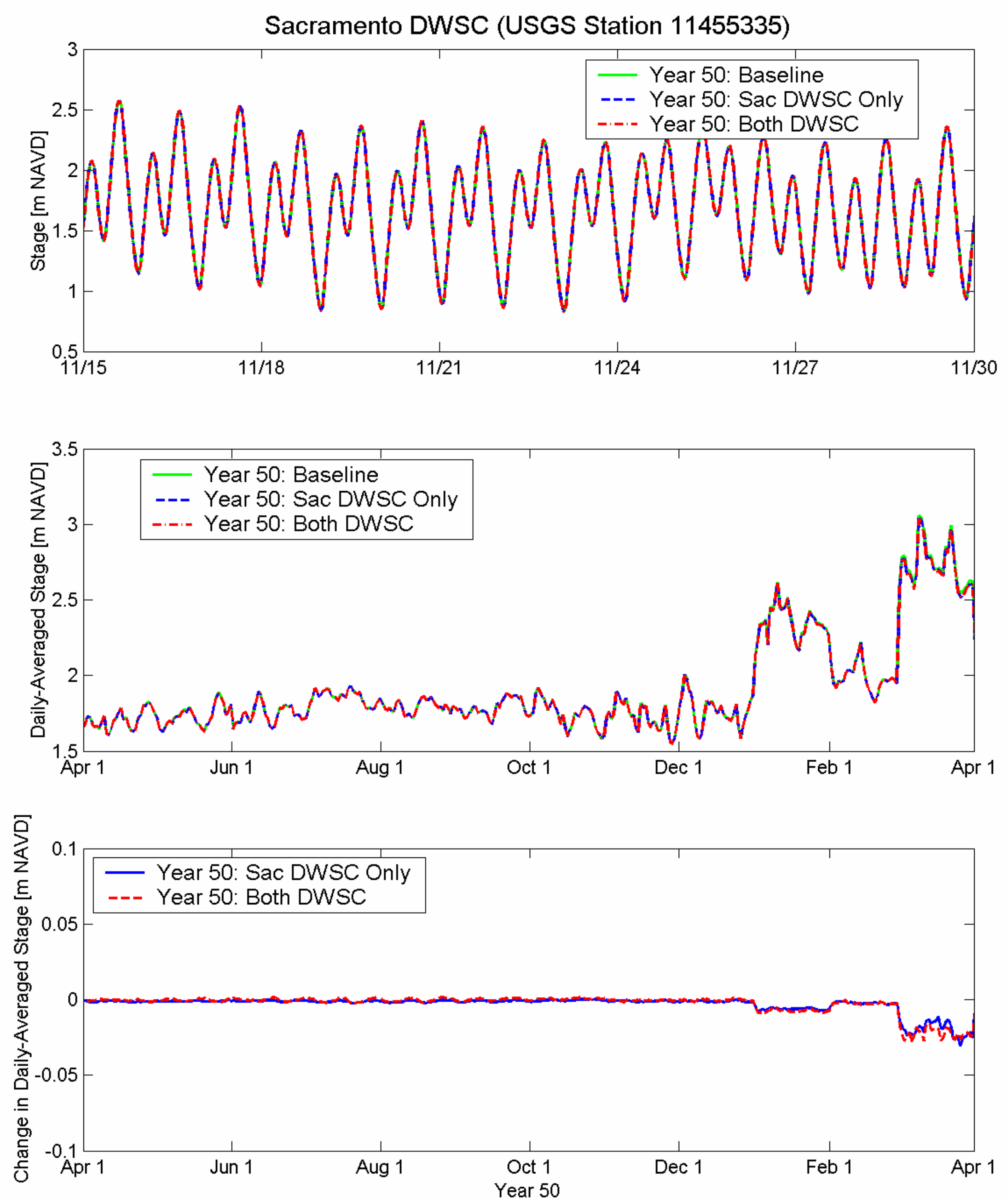


Figure 5.1-16 Predicted stage at Sacramento DWSC (USGS Station 11455335) for the Year 50 Baseline scenario, the Year 50 Sacramento DWSC Only Deepening scenario, and the Year 50 Both DWSC Deepening scenario: tidal time-scale variability over a 15-day period (top); daily-averaged stage for the Year 50 simulation period (middle); predicted increase in daily-averaged stage for the Year 50 Sacramento DWSC Only Deepening scenario and the Year 50 Both DWSC Deepening scenario relative to the Year 50 Baseline scenario (bottom).

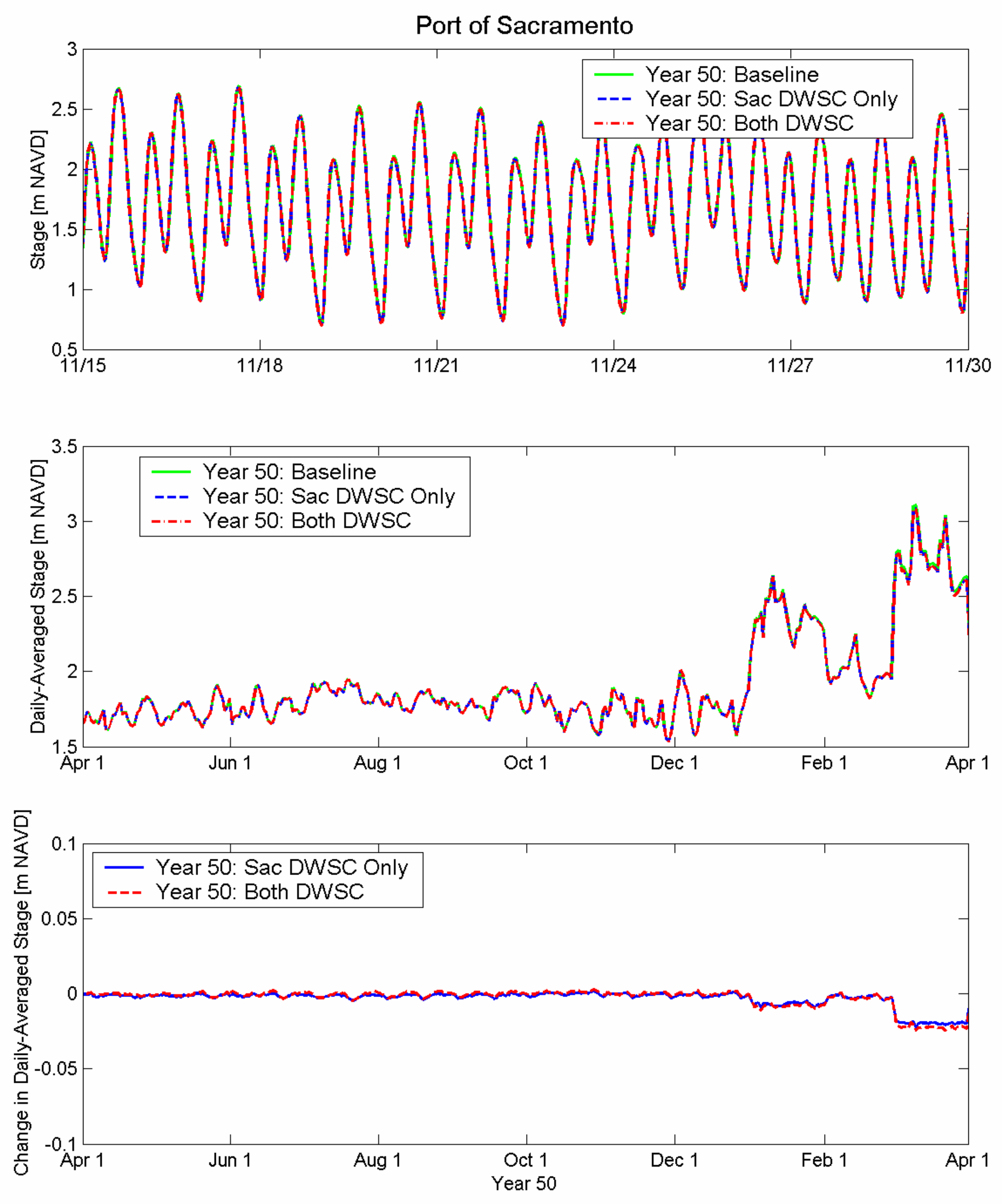


Figure 5.1-17 Predicted stage at the Port of Sacramento for the Year 50 Baseline scenario, the Year 50 Sacramento DWSC Only Deepening scenario, and the Year 50 Both DWSC Deepening scenario: tidal time-scale variability over a 15-day period (top); daily-averaged stage for the Year 50 simulation period (middle); predicted increase in daily-averaged stage for the Year 50 Sacramento DWSC Only Deepening scenario and the Year 50 Both DWSC Deepening scenario relative to the Year 50 Baseline scenario (bottom).

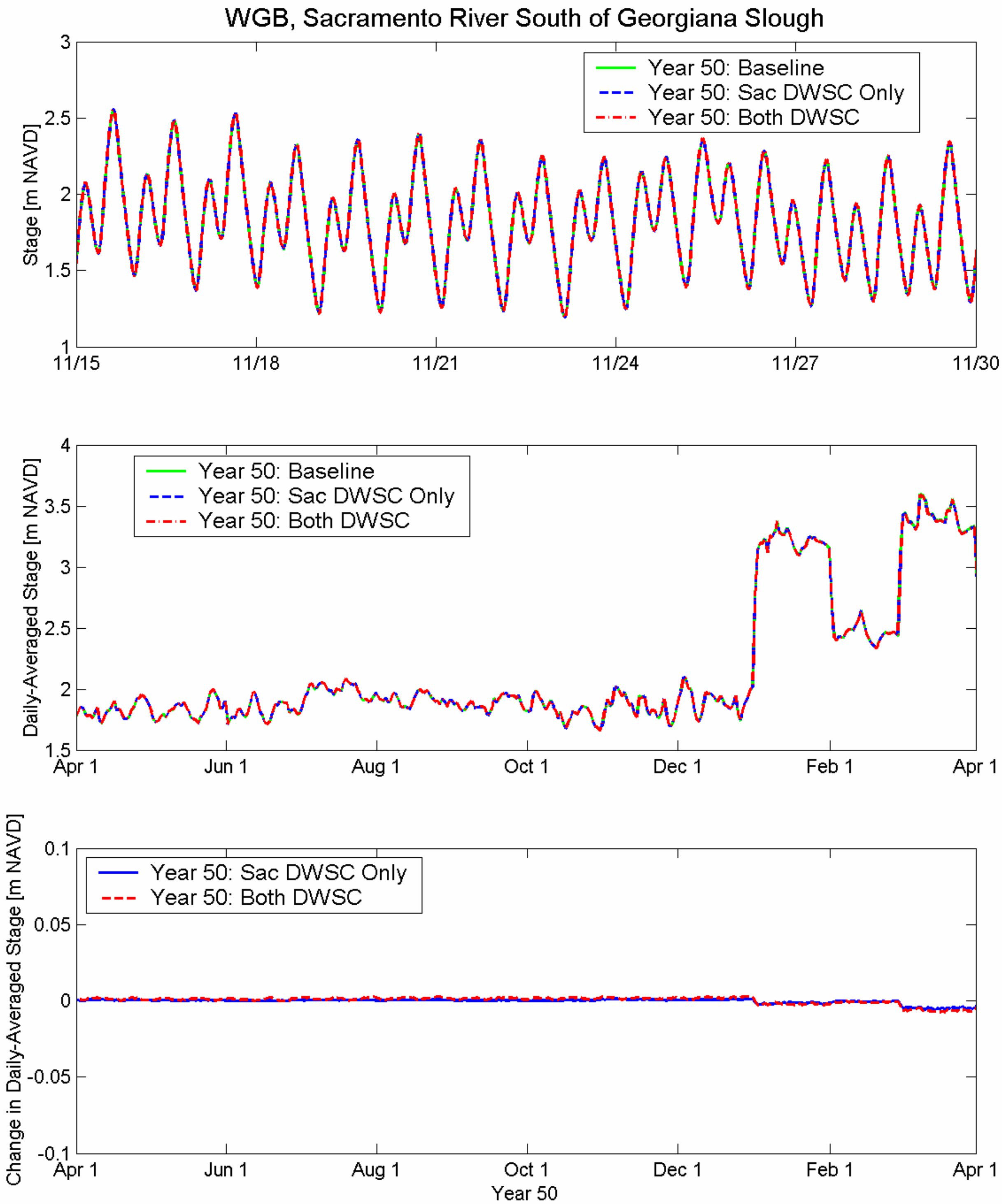


Figure 5.1-18 Predicted stage at Sacramento River South of Georgiana Slough (WGB) for the Year 50 Baseline scenario, the Year 50 Sacramento DWSC Only Deepening scenario, and the Year 50 Both DWSC Deepening scenario: tidal time-scale variability over a 15-day period (top); daily-averaged stage for the Year 50 simulation period (middle); predicted increase in daily-averaged stage for the Year 50 Sacramento DWSC Only Deepening scenario and the Year 50 Both DWSC Deepening scenario relative to the Year 50 Baseline scenario (bottom).

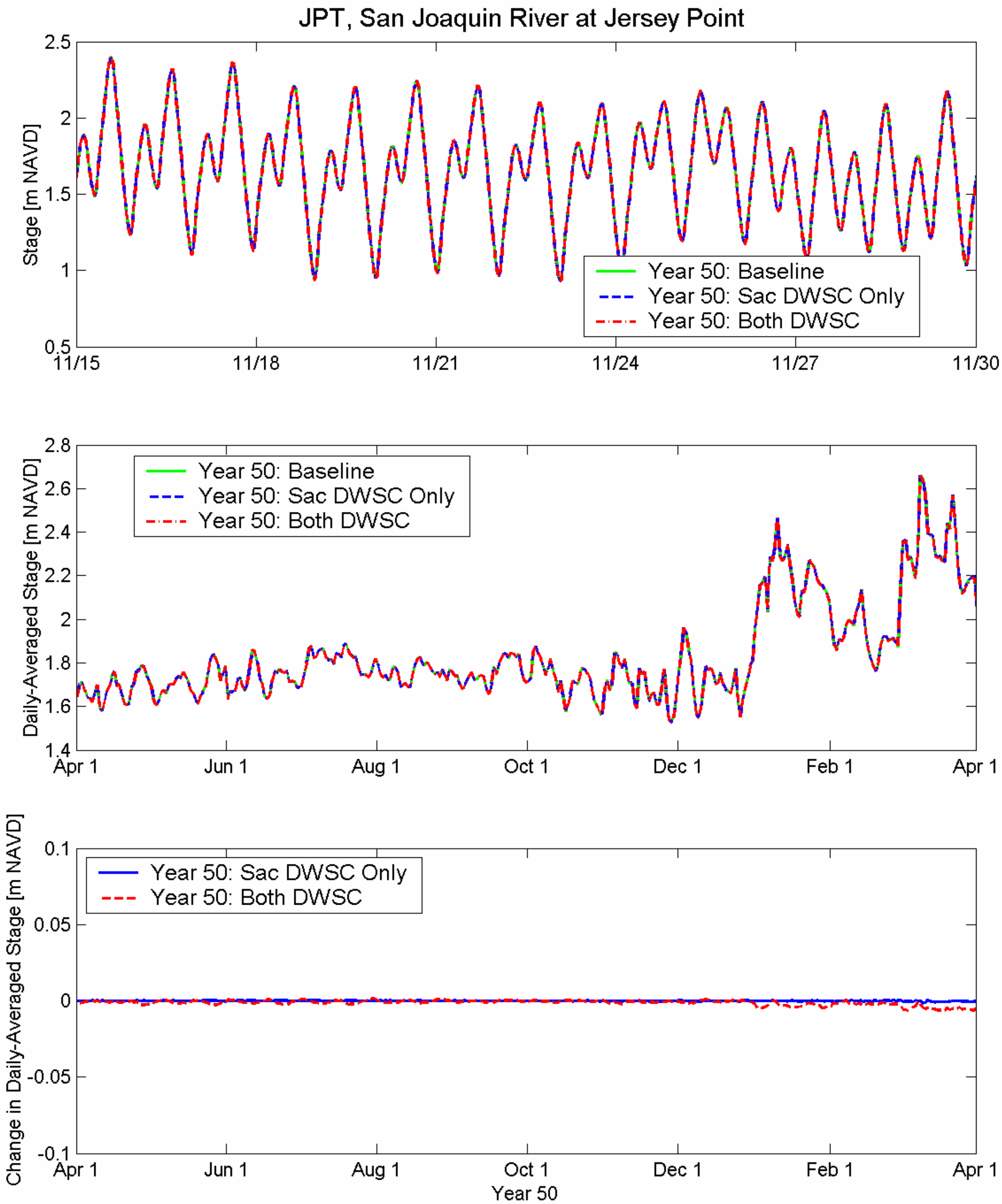


Figure 5.1-19 Predicted stage at San Joaquin River at Jersey Point (JPT) for the Year 50 Baseline scenario, the Year 50 Sacramento DWSC Only Deepening scenario, and the Year 50 Both DWSC Deepening scenario: tidal time-scale variability over a 15-day period (top); daily-averaged stage for the Year 50 simulation period (middle); predicted increase in daily-averaged stage for the Year 50 Sacramento DWSC Only Deepening scenario and the Year 50 Both DWSC Deepening scenario relative to the Year 50 Baseline scenario (bottom).

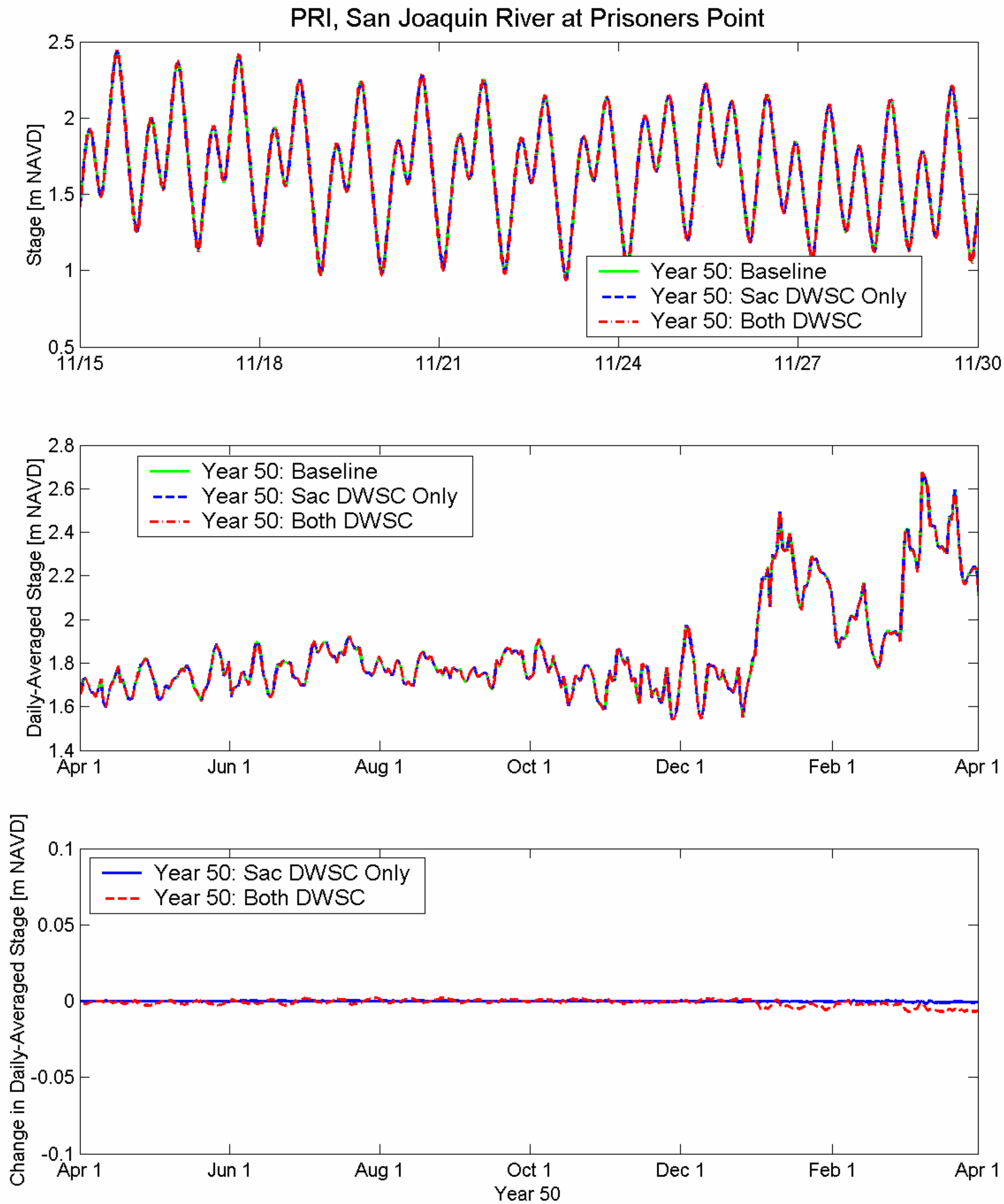


Figure 5.1-20 Predicted stage at San Joaquin River at Prisoners Point (PRI) for the Year 50 Baseline scenario, the Year 50 Sacramento DWSC Only Deepening scenario, and the Year 50 Both DWSC Deepening scenario: tidal time-scale variability over a 15-day period (top); daily-averaged stage for the Year 50 simulation period (middle); predicted increase in daily-averaged stage for the Year 50 Sacramento DWSC Only Deepening scenario and the Year 50 Both DWSC Deepening scenario relative to the Year 50 Baseline scenario (bottom).

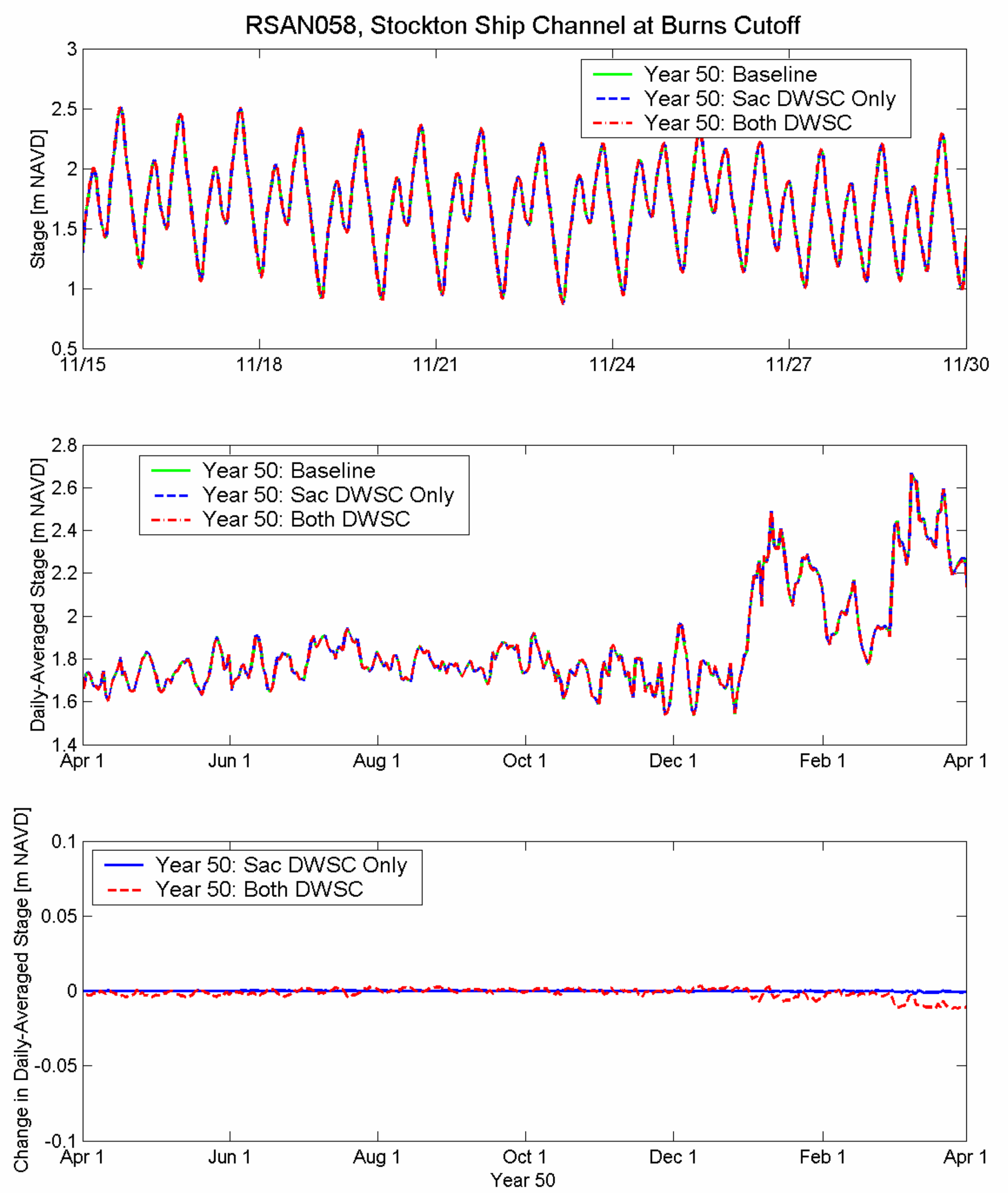


Figure 5.1-21 Predicted stage at Stockton Ship Channel at Burns Cutoff (RSAN058) for the Year 50 Baseline scenario, the Year 50 Sacramento DWSC Only Deepening scenario, and the Year 50 Both DWSC Deepening scenario: tidal time-scale variability over a 15-day period (top); daily-averaged stage for the Year 50 simulation period (middle); predicted increase in daily-averaged stage for the Year 50 Sacramento DWSC Only Deepening scenario and the Year 50 Both DWSC Deepening scenario relative to the Year 50 Baseline scenario (bottom).

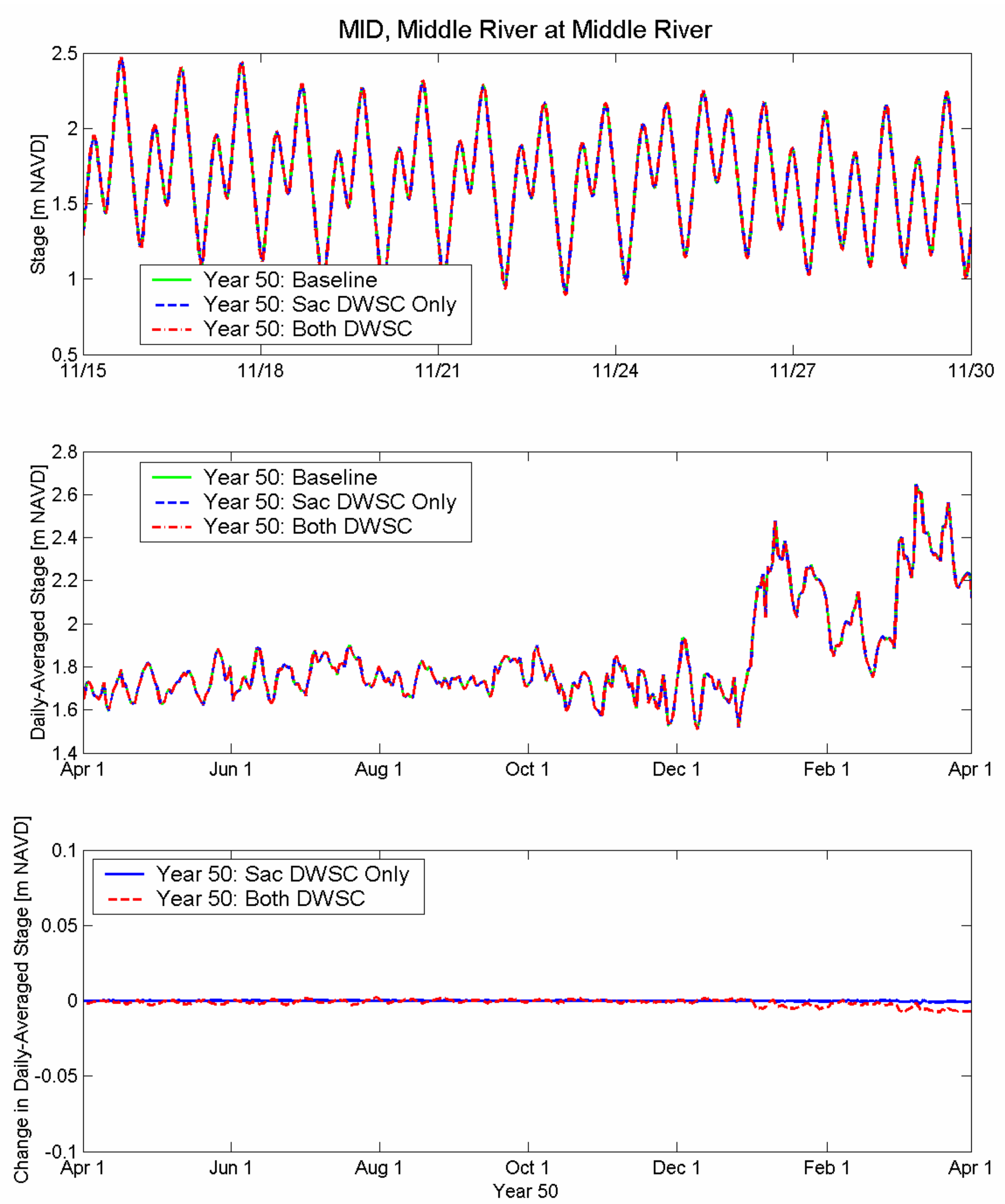


Figure 5.1-22 Predicted stage at Middle River at Middle River (MID) for the Year 50 Baseline scenario, the Year 50 Sacramento DWSC Only Deepening scenario, and the Year 50 Both DWSC Deepening scenario: tidal time-scale variability over a 15-day period (top); daily-averaged stage for the Year 50 simulation period (middle); predicted increase in daily-averaged stage for the Year 50 Sacramento DWSC Only Deepening scenario and the Year 50 Both DWSC Deepening scenario relative to the Year 50 Baseline scenario (bottom).

5.2 Evaluation of Impact on Tidal Flows

Flow time series provide information about potential impacts on tidal flows over time at a fixed location. Flow time series comparisons were made at nineteen continuous flow monitoring stations in San Francisco Bay and the Sacramento-San Joaquin Delta, shown on Figure 3.3-2. Comparisons for the Year 50 simulation period between predicted flows for the Year 50 Baseline scenario and the Year 50 Sacramento DWSC Only Deepening scenario are shown in Section 5.2.1. Comparisons for the Year 50 simulation period between predicted flows for the Year 50 Baseline scenario, the Year 50 Sacramento DWSC Only Deepening scenario, and the Year 50 Both DWSC Deepening scenario are shown in Section 5.2.2.

5.2.1 Year 50 Sacramento DWSC Only Deepening

For each flow comparison figure included in this section, the top plot shows the tidal time-scale flow variability over a 15-day period for the Year 50 Baseline scenario and the Year 50 Sacramento DWSC Only Deepening scenario. The middle plot shows daily-averaged flow during the full simulation year for each scenario. The bottom plot shows the predicted change in daily-averaged flow for the Year 50 Sacramento DWSC Only Deepening scenario relative to the Year 50 Baseline scenario. In cases where the predicted flow is identical between scenarios, some lines are not fully visible. Since the lines are plotted for in the order listed on the legend, for periods where the predicted flow for the Year 50 Baseline scenario is not fully visible, the predicted flow for the Year 50 Baseline scenario is identical to the visible line for the Year 50 Sacramento DWSC Only Deepening scenario.

Figure 5.2-1 shows the predicted flow at Chipps Island for the Year 50 Baseline scenario and the Year 50 Sacramento DWSC Only Deepening scenario. During the second half of November (top panel of Figure 5.2-1), the predicted flow for both scenarios is identical. Similarly, the daily-averaged flow is nearly identical between both scenarios over the entire simulation year. The change in daily-averaged flow plot (lower panel of Figure 5.2-1) shows some small differences in daily-averaged flow between the Year 50 Baseline scenario and the Year 50 Sacramento DWSC Only Deepening scenario. These differences are very small relative to the daily-averaged flow magnitude, and are likely the result of a small increase in tidal prism and small phase differences in tidal propagation resulting from the Sacramento DWSC deepening.

Figure 5.2-2 shows the predicted flow at Sacramento River at Rio Vista (RIO) for the Year 50 Baseline scenario and the Year 50 Sacramento DWSC Only Deepening scenario. During the second half of November (top panel of Figure 5.2-2), the predicted flow for both scenarios is identical. Similarly, the daily-averaged flow is nearly identical between both scenarios over the entire simulation year. The change in daily-averaged flow plot (lower panel of Figure 5.2-2) shows some small differences in daily-averaged flow between the Year 50 Baseline scenario and the Year 50 Sacramento DWSC Only Deepening scenario. These differences are very small relative to the daily-averaged flow magnitude, and are likely the result of a small increase in tidal prism and small phase differences in tidal propagation resulting from the Sacramento DWSC deepening.

Figure 5.2-3 shows the predicted flow at Cache Slough at Ryer Island (CCH) for the Year 50 Baseline scenario and the Year 50 Sacramento DWSC Only Deepening scenario. During the second half of November (top panel of Figure 5.2-3), the predicted flow for both scenarios is identical. Similarly, the daily-averaged flow is nearly identical between both scenarios over the entire simulation year. The change in daily-averaged flow plot (lower panel of Figure 5.2-3) shows some small differences in daily-averaged flow between the Year 50 Baseline scenario and the Year 50 Sacramento DWSC Only Deepening scenario. These differences are very small relative to the daily-averaged flow magnitude, and are likely the result of a small increase in tidal prism and small phase differences in tidal propagation resulting from the Sacramento DWSC deepening.

Figure 5.2-4 shows the predicted flow at the Sacramento DWSC (USGS Station 11455335) for the Year 50 Baseline scenario and the Year 50 Sacramento DWSC Only Deepening scenario. During the second half of November (top panel of Figure 5.2-4), the predicted flow for both scenarios is identical. Similarly, the daily-averaged flow is nearly identical between both scenarios over the entire simulation year. The change in daily-averaged flow plot (lower panel of Figure 5.2-4) shows some small differences in daily-averaged flow between the Year 50 Baseline scenario and the Year 50 Sacramento DWSC Only Deepening scenario. These differences are small relative to the daily-averaged flow magnitude, and are likely the result of a small increase in tidal prism and small phase differences in tidal propagation resulting from the Sacramento DWSC deepening.

Figure 5.2-5 shows the predicted flow at Miner Slough at Highway 84 Bridge (MIN) for the Year 50 Baseline scenario and the Year 50 Sacramento DWSC Only Deepening scenario. During the second half of November (top panel of Figure 5.2-5), the predicted flow for both scenarios is identical. Similarly, the daily-averaged flow is nearly identical between both scenarios over the entire simulation year. The change in daily-averaged flow plot (lower panel of Figure 5.2-5) shows a slight reduction in daily-averaged flow in Miner Slough in the Year 50 Sacramento DWSC Only Deepening scenario relative to the Year 50 Baseline scenario.

Figure 5.2-6 shows the predicted flow at Steamboat Slough between Sacramento River and Sutter Slough (STM) for the Year 50 Baseline scenario and the Year 50 Sacramento DWSC Only Deepening scenario. During the second half of November (top panel of Figure 5.2-6), the predicted flow for both scenarios is identical. Similarly, the daily-averaged flow is nearly identical between both scenarios over the entire simulation year. No significant change in daily-averaged flow relative to the Year 50 Baseline scenario is predicted for the Year 50 Sacramento DWSC Only Deepening scenario.

Figure 5.2-7 shows the predicted flow at Sutter Slough at Courtland (SUT) for the Year 50 Baseline scenario and the Year 50 Sacramento DWSC Only Deepening scenario. During the second half of November (top panel of Figure 5.2-7), the predicted flow for both scenarios is identical. Similarly, the daily-averaged flow is nearly identical between both scenarios over the entire simulation year. The change in daily-averaged flow plot (lower panel of Figure 5.2-7) shows a slight reduction in daily-averaged flow in Sutter Slough during most of the year under the Year 50 Sacramento DWSC Only Deepening scenario.

Figure 5.2-8 shows the predicted flow at Sacramento River South of Georgiana Slough (WGB) for the Year 50 Baseline scenario and the Year 50 Sacramento DWSC Only Deepening scenario. During the second half of November (top panel of Figure 5.2-8), the predicted flow for both scenarios is identical. Similarly, the daily-averaged flow is nearly identical between both scenarios over the entire simulation year. The change in daily-averaged flow plot (lower panel of Figure 5.2-8) shows a slight increase in daily-averaged flow in the Sacramento River South of Georgiana Slough during most of the year under the Year 50 Sacramento DWSC Only Deepening scenario. The flow increase in the Sacramento River at Georgiana Slough is similar in magnitude to the flow decrease predicted in Sutter Slough and Miner Slough suggesting that the deepening of the Sacramento DWSC is resulting in slightly less flow into Sutter Slough and a corresponding higher flow remaining in the Sacramento River.

Figure 5.2-9 shows the predicted flow at Georgiana Slough near the Sacramento River (GEO) for the Year 50 Baseline scenario and the Year 50 Sacramento DWSC Only Deepening scenario. During the second half of November (top panel of Figure 5.2-9), the predicted flow for both scenarios is identical. Similarly, the daily-averaged flow is nearly identical between both scenarios over the entire simulation year. No significant change in daily-averaged flow relative to the Year 50 Baseline scenario is predicted under the Year 50 Sacramento DWSC Only Deepening scenario.

Figure 5.2-10 shows the predicted flow at the Delta Cross Channel (DCC) for the Year 50 Baseline scenario and the Year 50 Sacramento DWSC Only Deepening scenario. During the second half of November (top panel of Figure 5.2-10), the predicted flow for both scenarios is identical. Similarly, the daily-averaged flow is nearly identical between both scenarios over the entire simulation year. The change in daily-averaged flow plot (lower panel of Figure 5.2-10) shows a slight increase in daily-averaged flow through the Delta Cross Channel during periods when the Delta Cross Channel is open under the Year 50 Sacramento DWSC Only Deepening scenario.

Figure 5.2-11 shows the predicted flow at San Joaquin River at Jersey Point (JPT) for the Year 50 Baseline scenario and the Year 50 Sacramento DWSC Only Deepening scenario. During the second half of November (top panel of Figure 5.2-11), the predicted flow for both scenarios is identical, . Similarly, the daily-averaged flow is nearly identical between both scenarios over the entire simulation year. The change in daily-averaged flow plot (lower panel of Figure 5.2-11) shows some small differences in daily-averaged flow between the Year 50 Baseline scenario and the Year 50 Sacramento DWSC Only Deepening scenario. Under the Year 50 Sacramento DWSC Only Deepening scenario, a decrease in net flow is predicted during the high flow periods between January and March.

Figure 5.2-12 shows the predicted flow at Threemile Slough at San Joaquin River (TMN) for the Year 50 Baseline scenario and the Year 50 Sacramento DWSC Only Deepening scenario. During the second half of November (top panel of Figure 5.2-12), the predicted flow for both scenarios is identical. Similarly, the daily-averaged flow is nearly identical between both scenarios over the entire simulation year. The change in daily-averaged flow plot (lower panel of Figure 5.2-12) shows some small differences in daily-averaged flow between the Year 50 Baseline scenario and the Year 50 Sacramento DWSC Only Deepening scenario. Under the

Year 50 Sacramento DWSC Only Deepening scenario, an increase in net flow indicates less flow is flowing south through Threemile Slough during the high flow period between January and March (resulting in the decrease in daily-averaged flow predicted at Jersey Point during this period).

Figure 5.2-13 shows the predicted flow at False River (FAL) for the Year 50 Baseline scenario and the Year 50 Sacramento DWSC Only Deepening scenario. During the second half of November (top panel of Figure 5.2-13), the predicted flow for both scenarios is identical. Similarly, the daily-averaged flow is nearly identical between both scenarios over the entire simulation year. No significant change in daily-averaged flow relative to the Year 50 Baseline scenario is predicted for the Year 50 Sacramento DWSC Only Deepening scenario.

Figure 5.2-14 shows the predicted flow at San Joaquin River at Prisoners Point (PRI) for the Year 50 Baseline scenario and the Year 50 Sacramento DWSC Only Deepening scenario. During the second half of November (top panel of Figure 5.2-14), the predicted flow for both scenarios is identical. Similarly, the daily-averaged flow is nearly identical between both scenarios over the entire simulation year. No significant change in daily-averaged flow relative to the Year 50 Baseline scenario is predicted for the Year 50 Sacramento DWSC Only Deepening scenario.

Figure 5.2-15 shows the predicted flow at San Joaquin River at Stockton (STK) for the Year 50 Baseline scenario and the Year 50 Sacramento DWSC Only Deepening scenario. During the second half of November (top panel of Figure 5.2-15), the predicted flow for both scenarios is identical. Similarly, the daily-averaged flow is nearly identical between both scenarios over the entire simulation year. No significant change in daily-averaged flow relative to the Year 50 Baseline scenario is predicted for the Year 50 Sacramento DWSC Only Deepening.

Figure 5.2-16 shows the predicted flow at Middle River at Middle River (MID) for the Year 50 Baseline scenario and the Year 50 Sacramento DWSC Only Deepening scenario. During the second half of November (top panel of Figure 5.2-16), the predicted flow for both scenarios is identical. Similarly, the daily-averaged flow is nearly identical between both scenarios over the entire simulation year. No significant change in daily-averaged flow relative to the Year 50 Baseline scenario is predicted for the Year 50 Sacramento DWSC Only Deepening scenario.

Figure 5.2-17 shows the predicted flow at Old River at Bacon Island (OLD) for the Year 50 Baseline scenario and the Year 50 Sacramento DWSC Only Deepening scenario. During the second half of November (top panel of Figure 5.2-17), the predicted flow for both scenarios is identical. Similarly, the daily-averaged flow is nearly identical between both scenarios over the entire simulation year. No significant change in daily-averaged flow relative to the Year 50 Baseline scenario is predicted for the Year 50 Sacramento DWSC Only Deepening scenario.

Figure 5.2-18 shows the predicted flow at Old River near Byron (ORF) for the Year 50 Baseline scenario and the Year 50 Sacramento DWSC Only Deepening scenario. During the second half of November (top panel of Figure 5.2-18), the predicted flow for both scenarios is identical. Similarly, the daily-averaged flow is nearly identical between both scenarios over the entire simulation year. No significant change in daily-averaged flow relative to the Year 50 Baseline scenario is predicted for the Year 50 Sacramento DWSC Only Deepening scenario.

Figure 5.2-19 shows the predicted flow at Victoria Canal near Byron (VIC) for the Year 50 Baseline scenario and the Year 50 Sacramento DWSC Only Deepening scenario. During the second half of November (top panel of Figure 5.2-19), the predicted flow for both scenarios is identical. Similarly, the daily-averaged flow is nearly identical between both scenarios over the entire simulation year. No significant change in daily-averaged flow relative to the Year 50 Baseline scenario is predicted for the Year 50 Sacramento DWSC Only Deepening scenario.

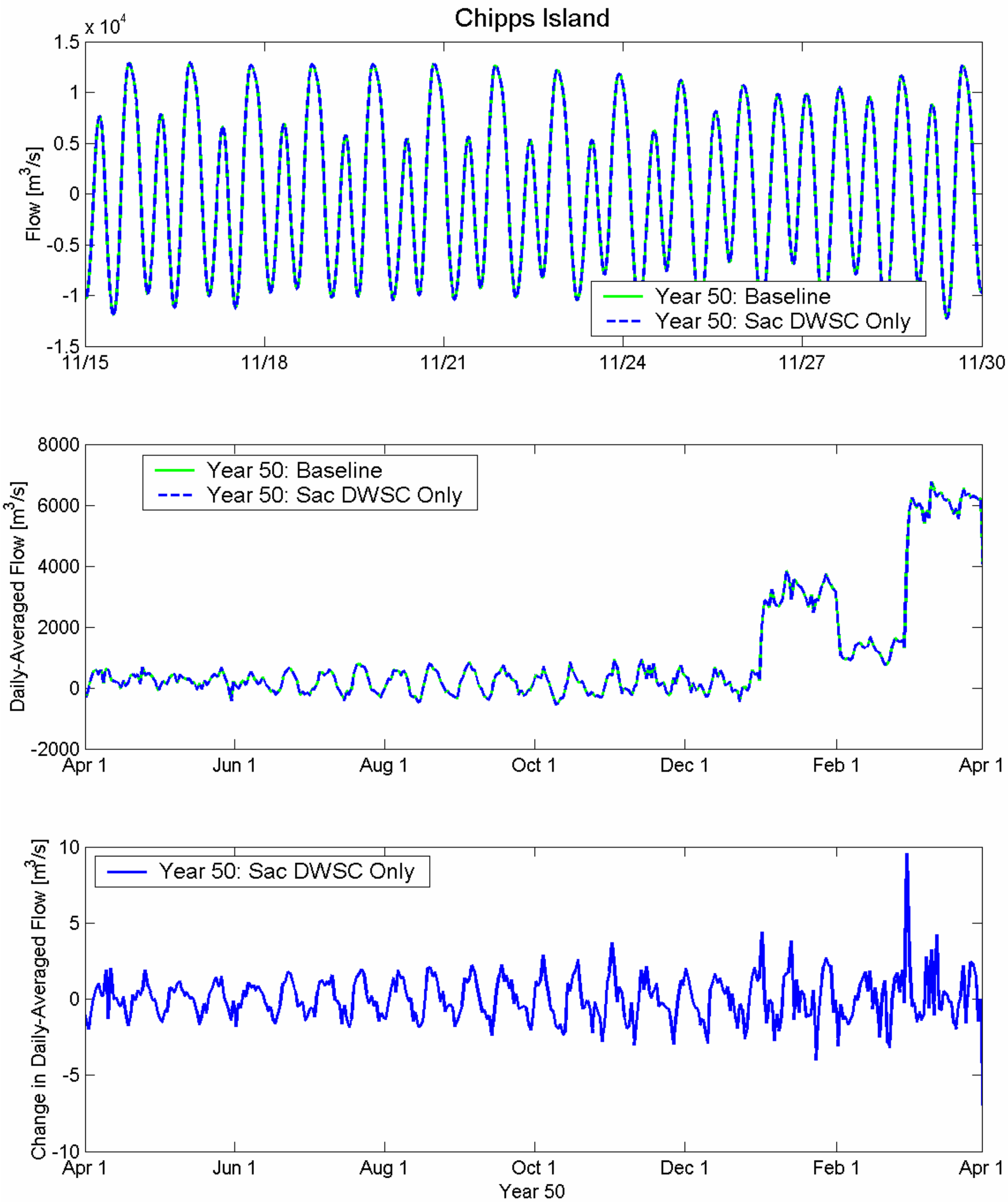


Figure 5.2-1 Predicted flow at Chipps Island for the Year 50 Baseline scenario and the Year 50 Sacramento DWSC Only Deepening scenario: tidal time-scale variability over a 15-day period (top); daily-averaged flow for the Year 50 simulation period (middle); predicted increase in daily-averaged flow for the Year 50 Sacramento DWSC Only Deepening scenario relative to the Year 50 Baseline scenario (bottom).

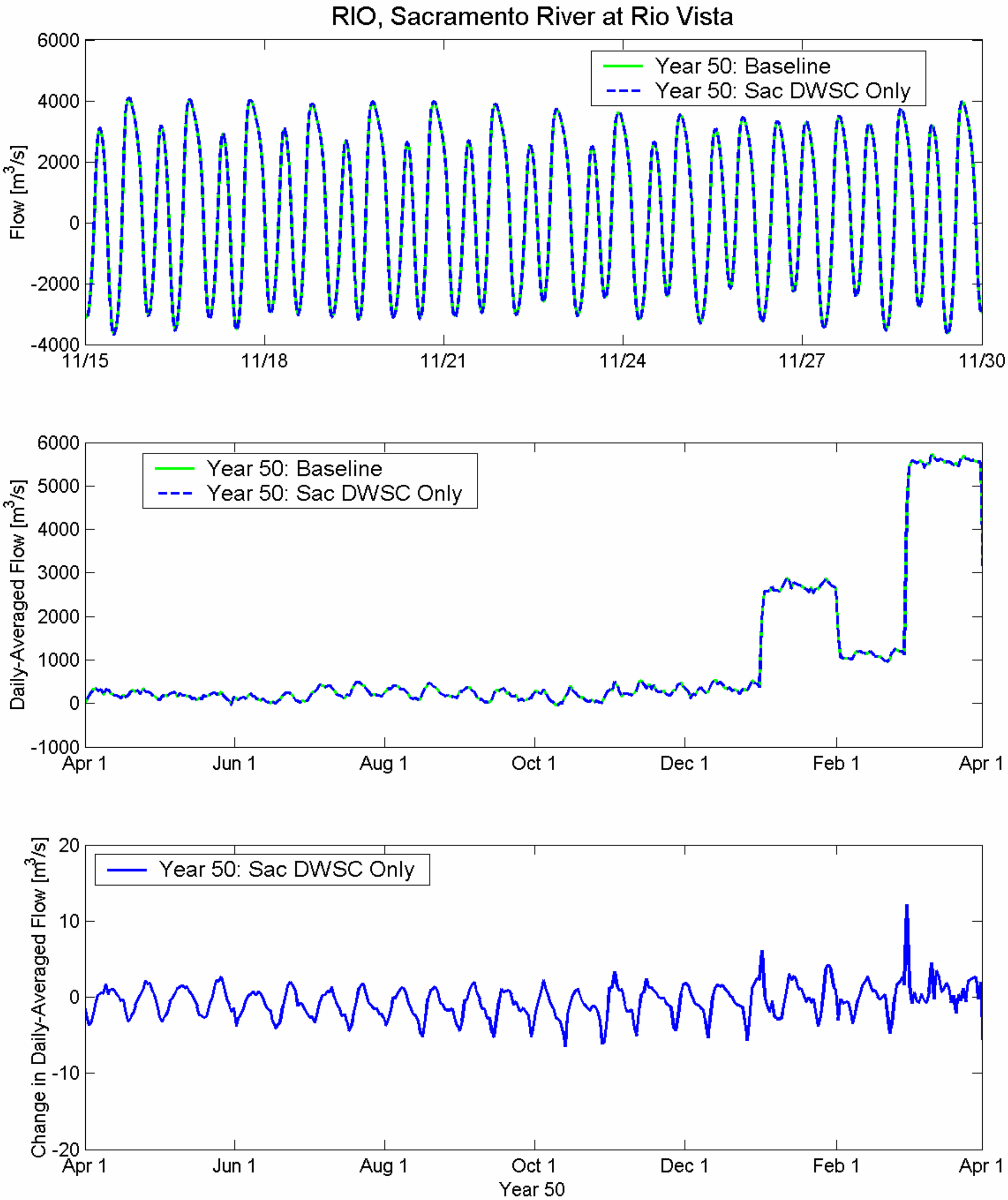


Figure 5.2-2 Predicted flow at Sacramento River at Rio Vista (RIO) for the Year 50 Baseline scenario and the Year 50 Sacramento DWSC Only Deepening scenario: tidal time-scale variability over a 15-day period (top); daily-averaged flow for the Year 50 simulation period (middle); predicted increase in daily-averaged flow for the Year 50 Sacramento DWSC Only Deepening scenario relative to the Year 50 Baseline scenario (bottom).

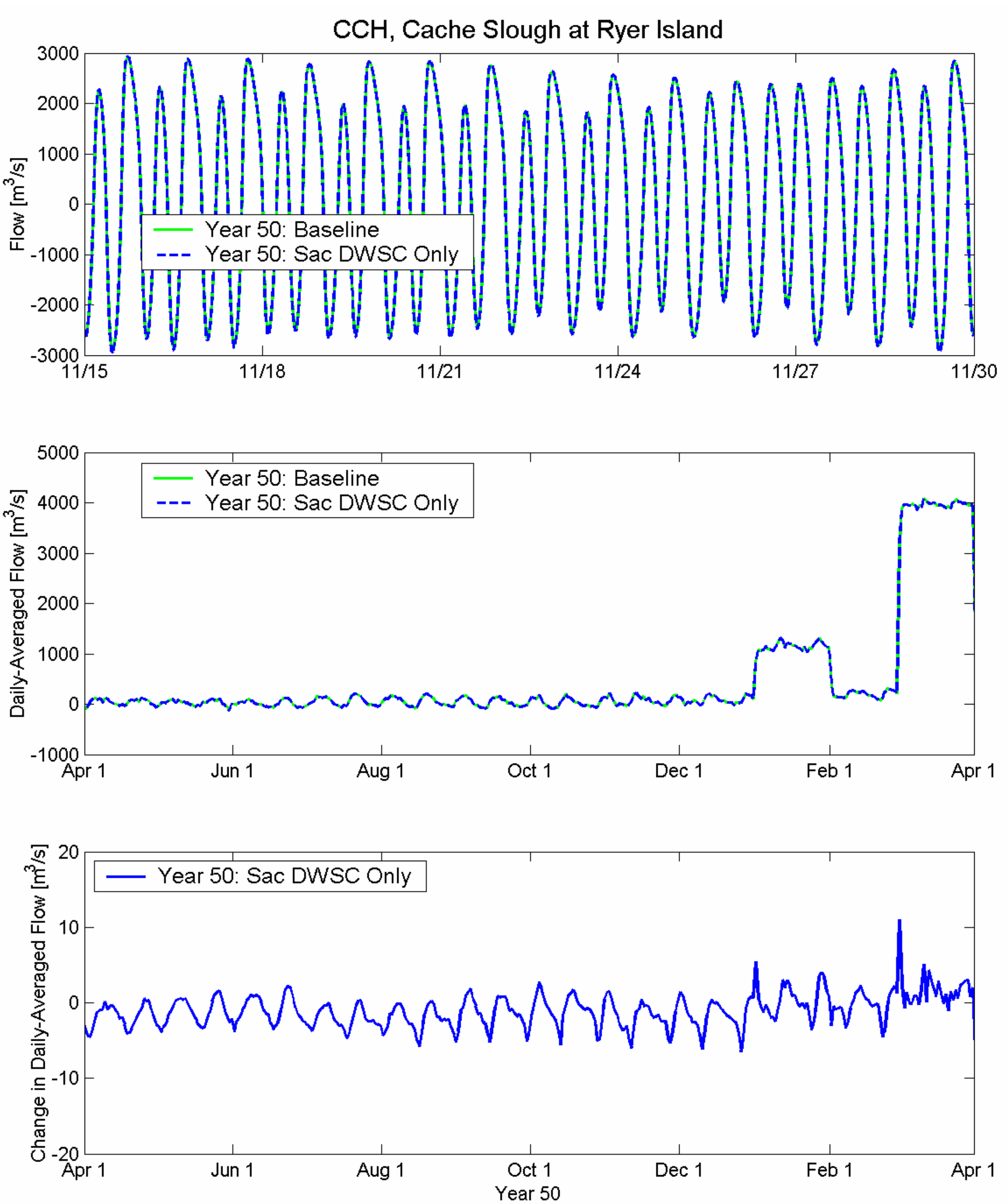


Figure 5.2-3 Predicted flow at Cache Slough at Ryer Island (CCH) for the Year 50 Baseline scenario and the Year 50 Sacramento DWSC Only Deepening scenario: tidal time-scale variability over a 15-day period (top); daily-averaged flow for the Year 50 simulation period (middle); predicted increase in daily-averaged flow for the Year 50 Sacramento DWSC Only Deepening scenario relative to the Year 50 Baseline scenario (bottom).

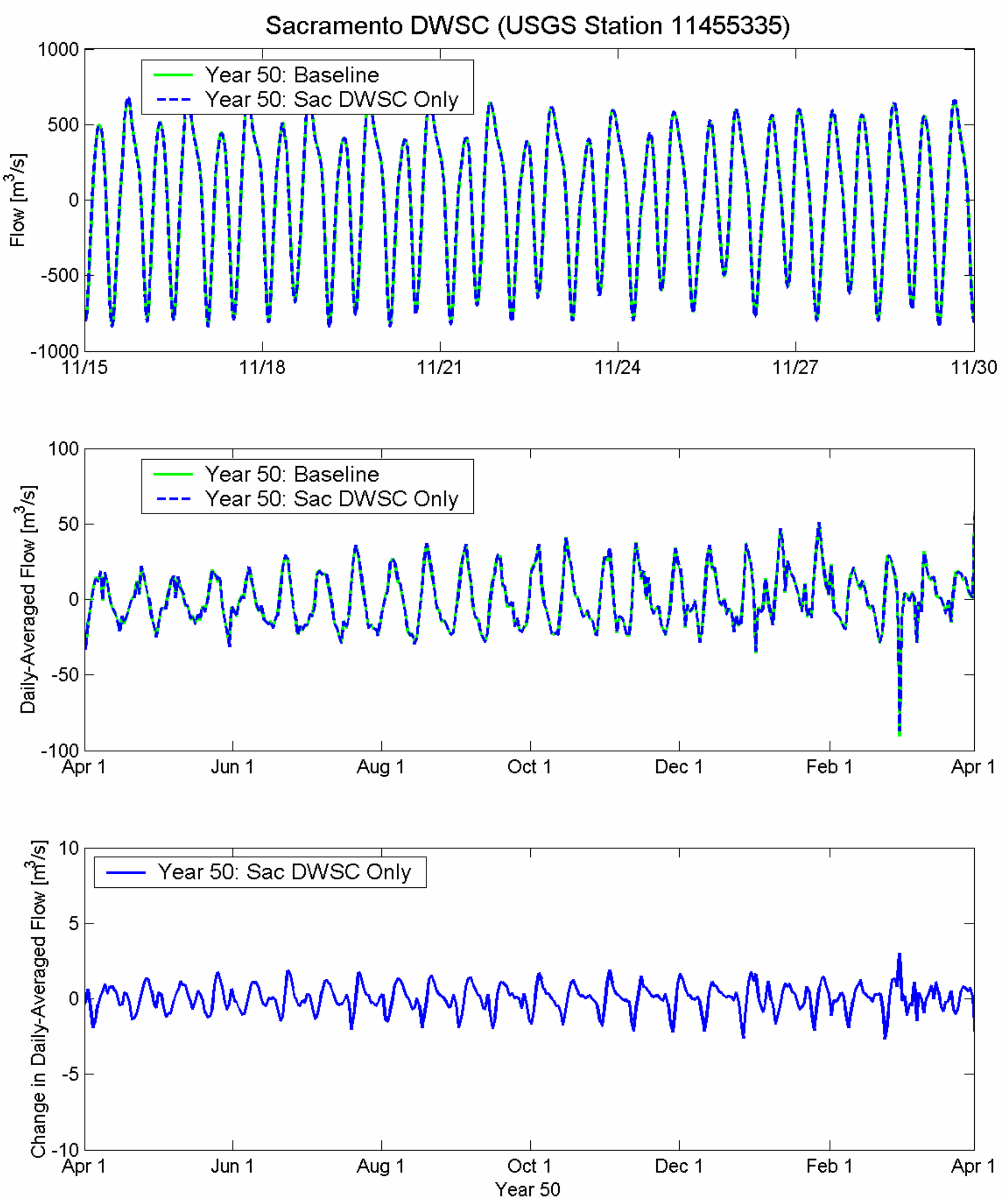


Figure 5.2-4 Predicted flow at Sacramento DWSC (USGS Station 11455335) for the Year 50 Baseline scenario and the Year 50 Sacramento DWSC Only Deepening scenario: tidal time-scale variability over a 15-day period (top); daily-averaged flow for the Year 50 simulation period (middle); predicted increase in daily-averaged flow for the Year 50 Sacramento DWSC Only Deepening scenario relative to the Year 50 Baseline scenario (bottom).

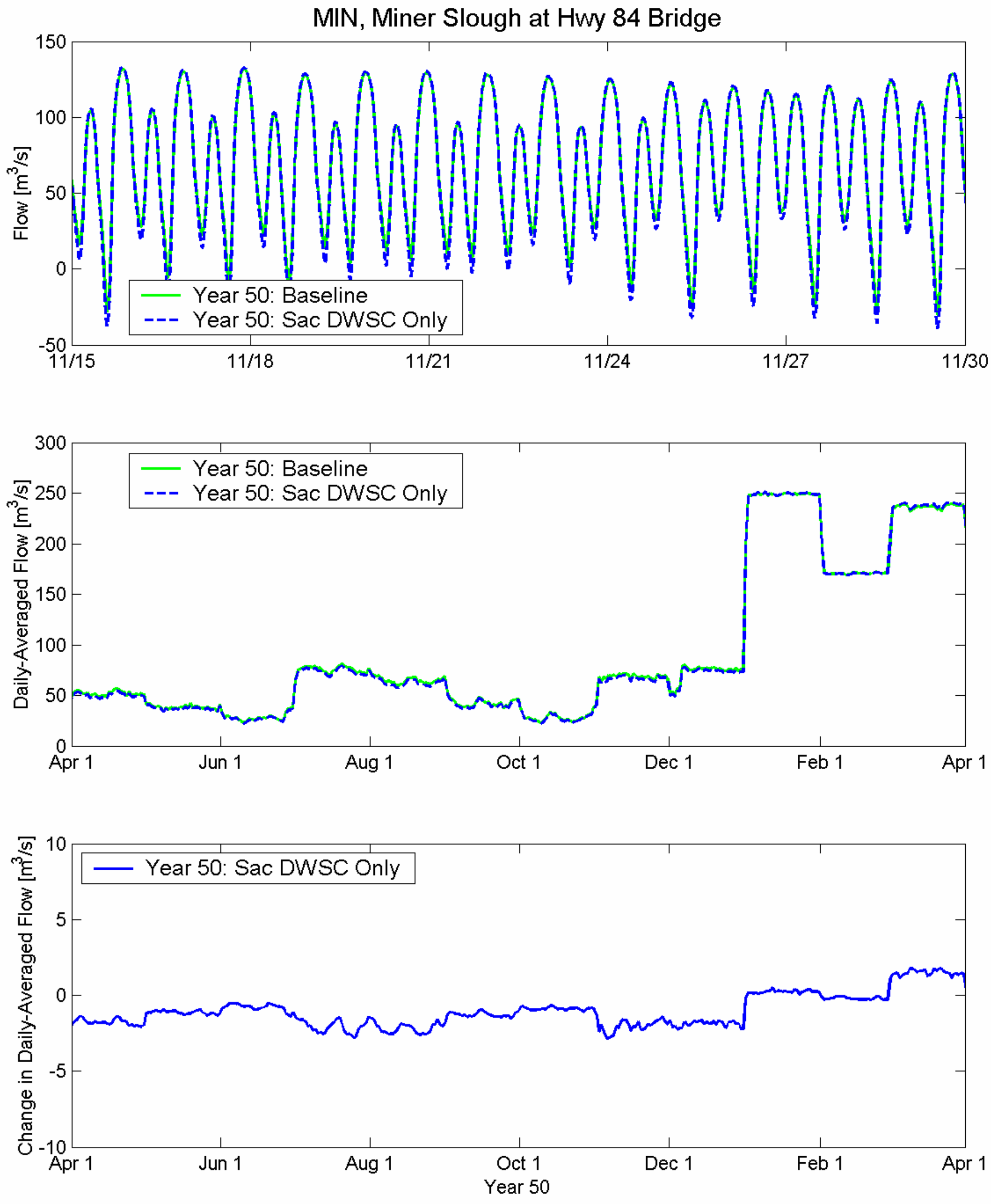


Figure 5.2-5 Predicted flow at Miner Slough at Highway 84 Bridge (MIN) for the Year 50 Baseline scenario and the Year 50 Sacramento DWSC Only Deepening scenario: tidal time-scale variability over a 15-day period (top); daily-averaged flow for the Year 50 simulation period (middle); predicted increase in daily-averaged flow for the Year 50 Sacramento DWSC Only Deepening scenario relative to the Year 50 Baseline scenario (bottom).

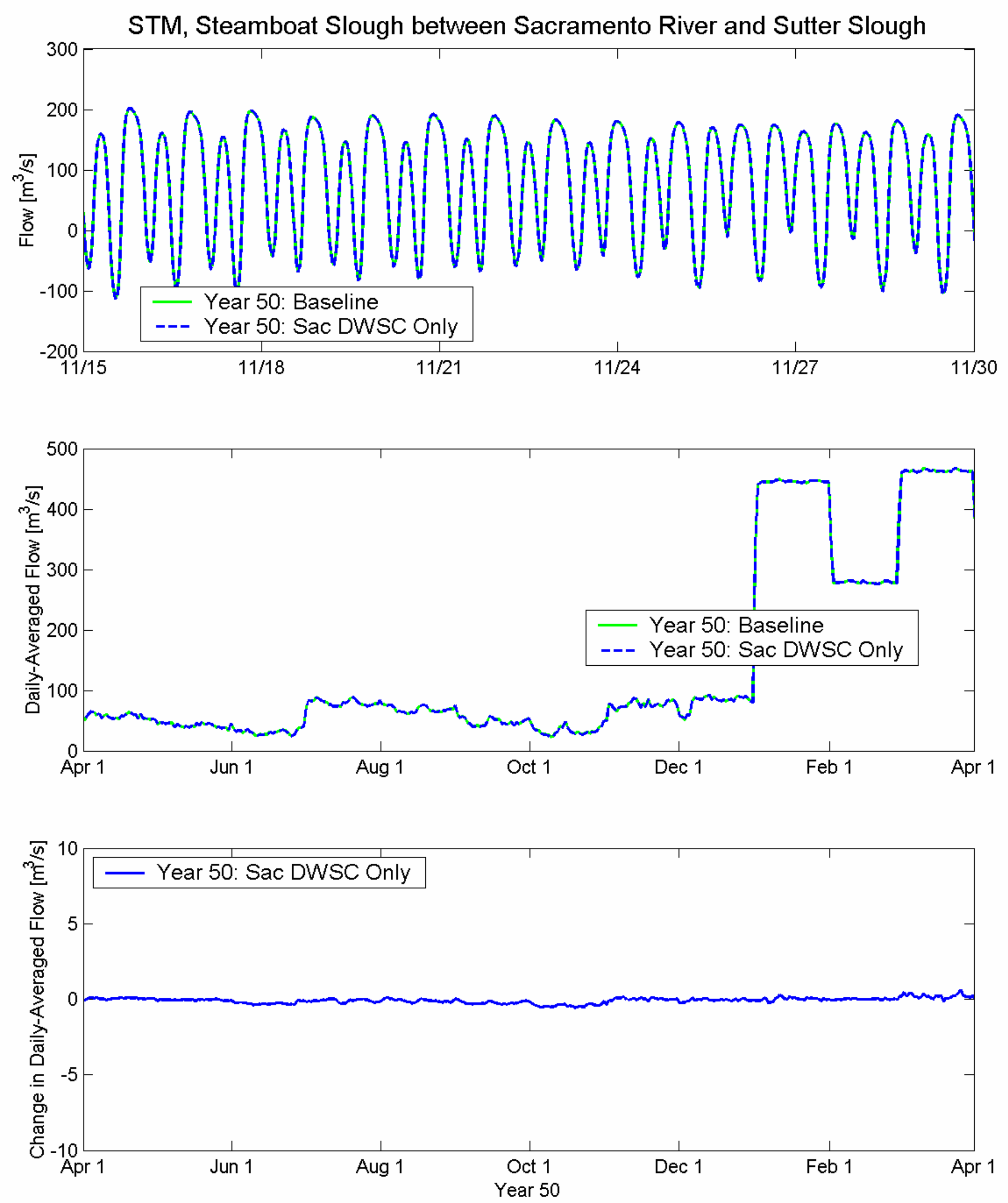


Figure 5.2-6 Predicted flow at Steamboat Slough between Sacramento River and Sutter Slough (STM) for the Year 50 Baseline scenario and the Year 50 Sacramento DWSC Only Deepening scenario: tidal time-scale variability over a 15-day period (top); daily-averaged flow for the Year 50 simulation period (middle); predicted increase in daily-averaged flow for the Year 50 Sacramento DWSC Only Deepening scenario relative to the Year 50 Baseline scenario (bottom).

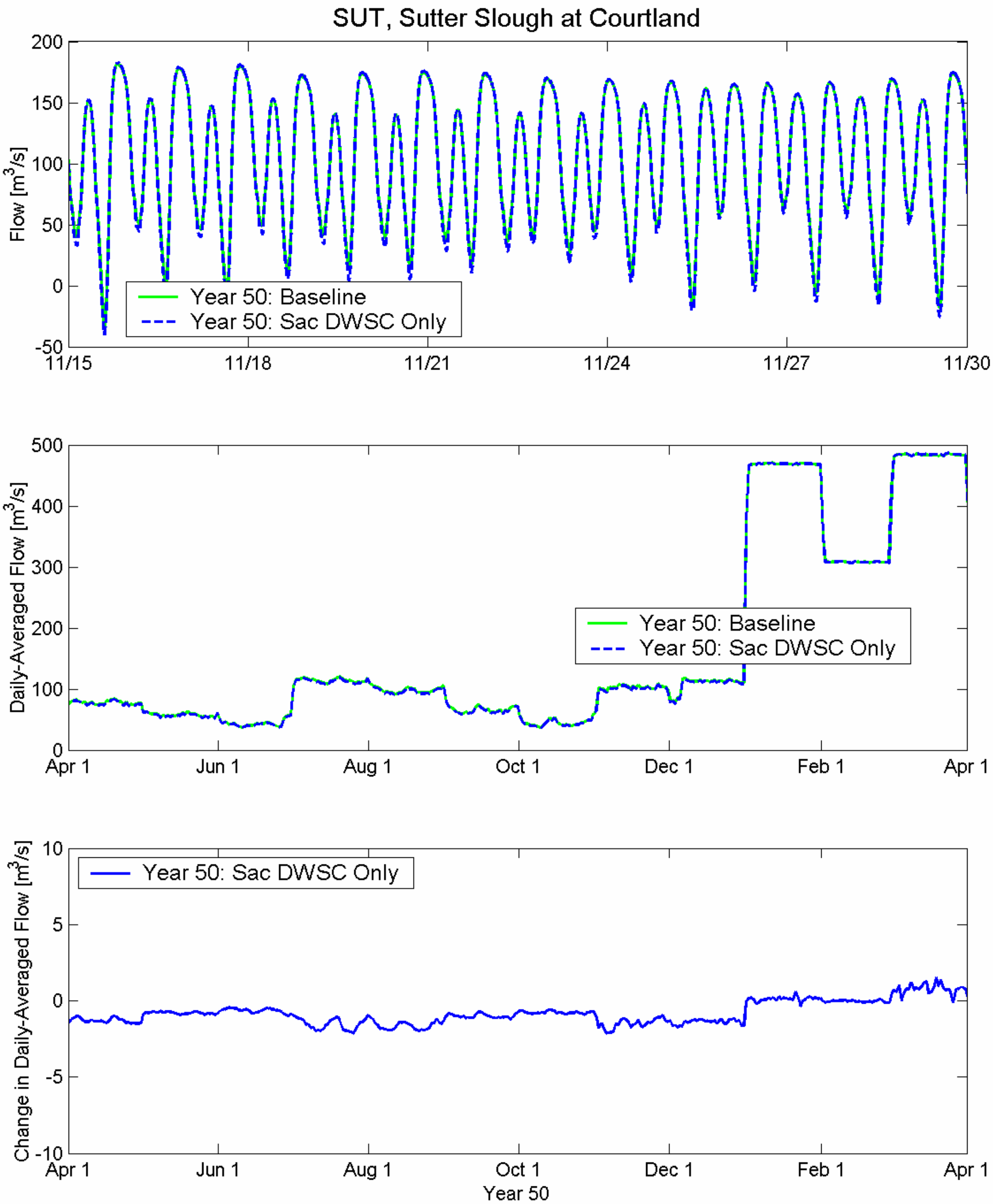


Figure 5.2-7 Predicted flow at Sutter Slough at Courtland (SUT) for the Year 50 Baseline scenario and the Year 50 Sacramento DWSC Only Deepening scenario: tidal time-scale variability over a 15-day period (top); daily-averaged flow for the Year 50 simulation period (middle); predicted increase in daily-averaged flow for the Year 50 Sacramento DWSC Only Deepening scenario relative to the Year 50 Baseline scenario (bottom).

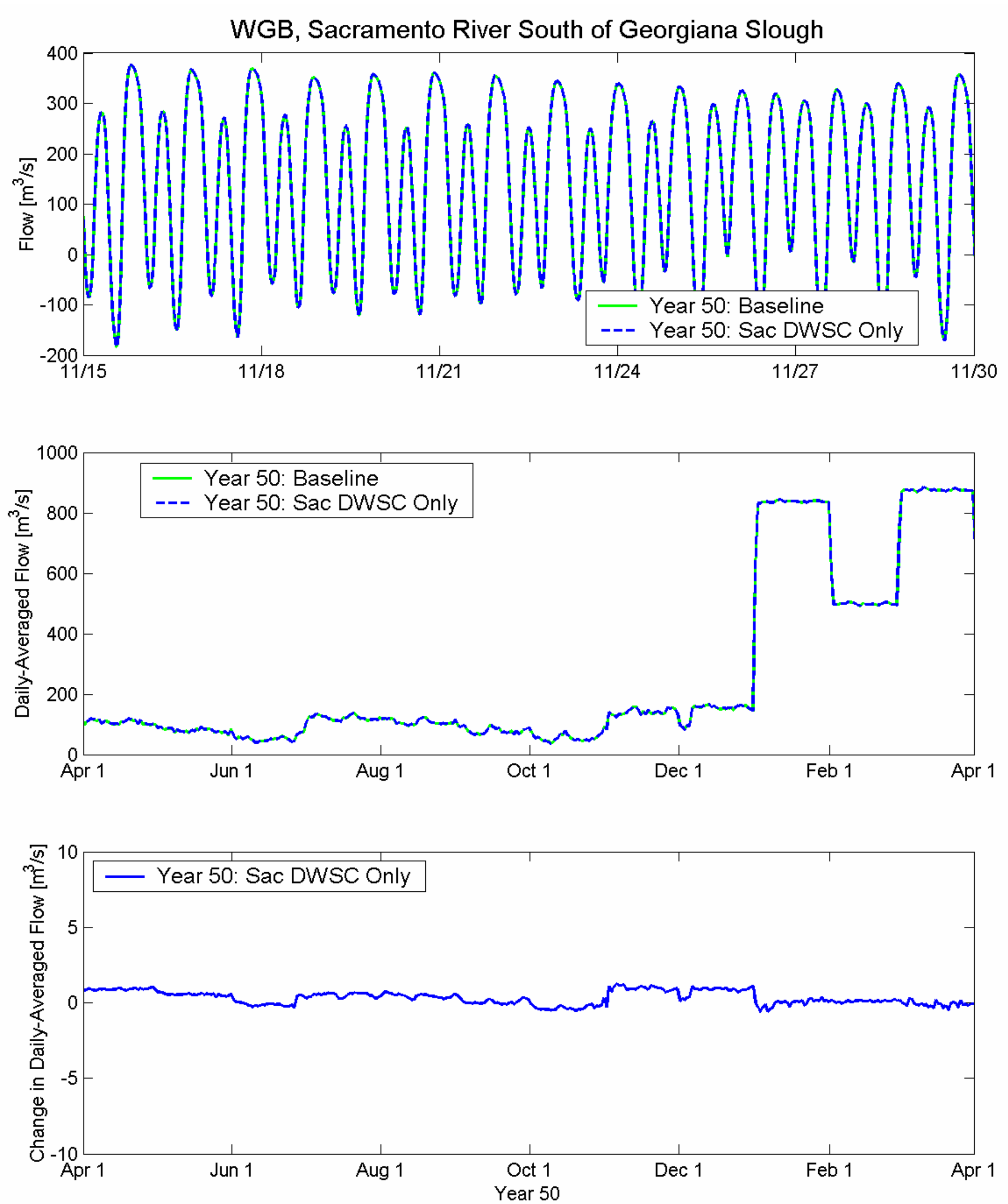


Figure 5.2-8 Predicted flow at Sacramento River South of Georgiana Slough (WGB) for the Year 50 Baseline scenario and the Year 50 Sacramento DWSC Only Deepening scenario: tidal time-scale variability over a 15-day period (top); daily-averaged flow for the Year 50 simulation period (middle); predicted increase in daily-averaged flow for the Year 50 Sacramento DWSC Only Deepening scenario relative to the Year 50 Baseline scenario (bottom).

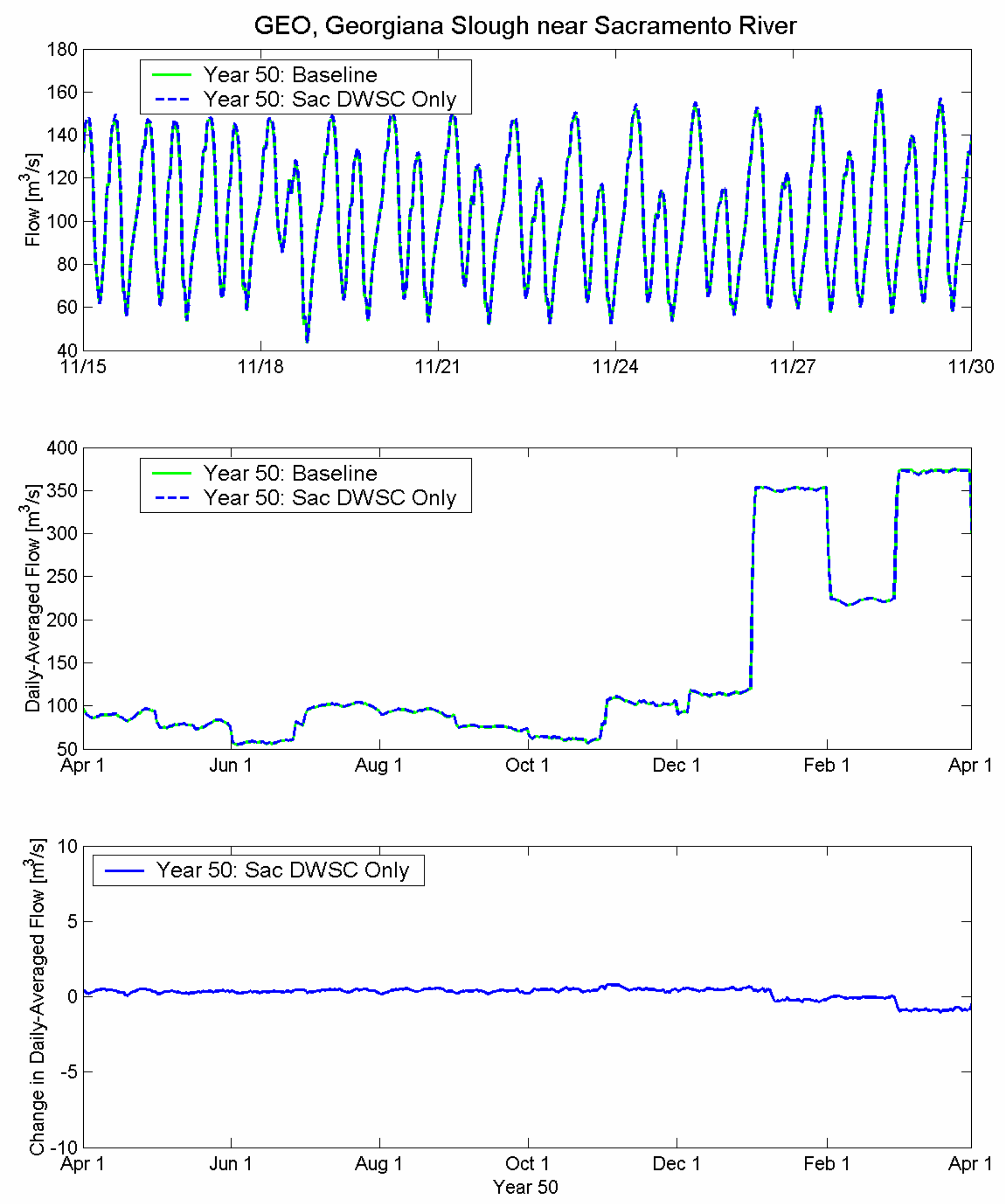


Figure 5.2-9 Predicted flow at Georgiana Slough near Sacramento River (GEO) for the Year 50 Baseline scenario and the Year 50 Sacramento DWSC Only Deepening scenario: tidal time-scale variability over a 15-day period (top); daily-averaged flow for the Year 50 simulation period (middle); predicted increase in daily-averaged flow for the Year 50 Sacramento DWSC Only Deepening scenario relative to the Year 50 Baseline scenario (bottom).

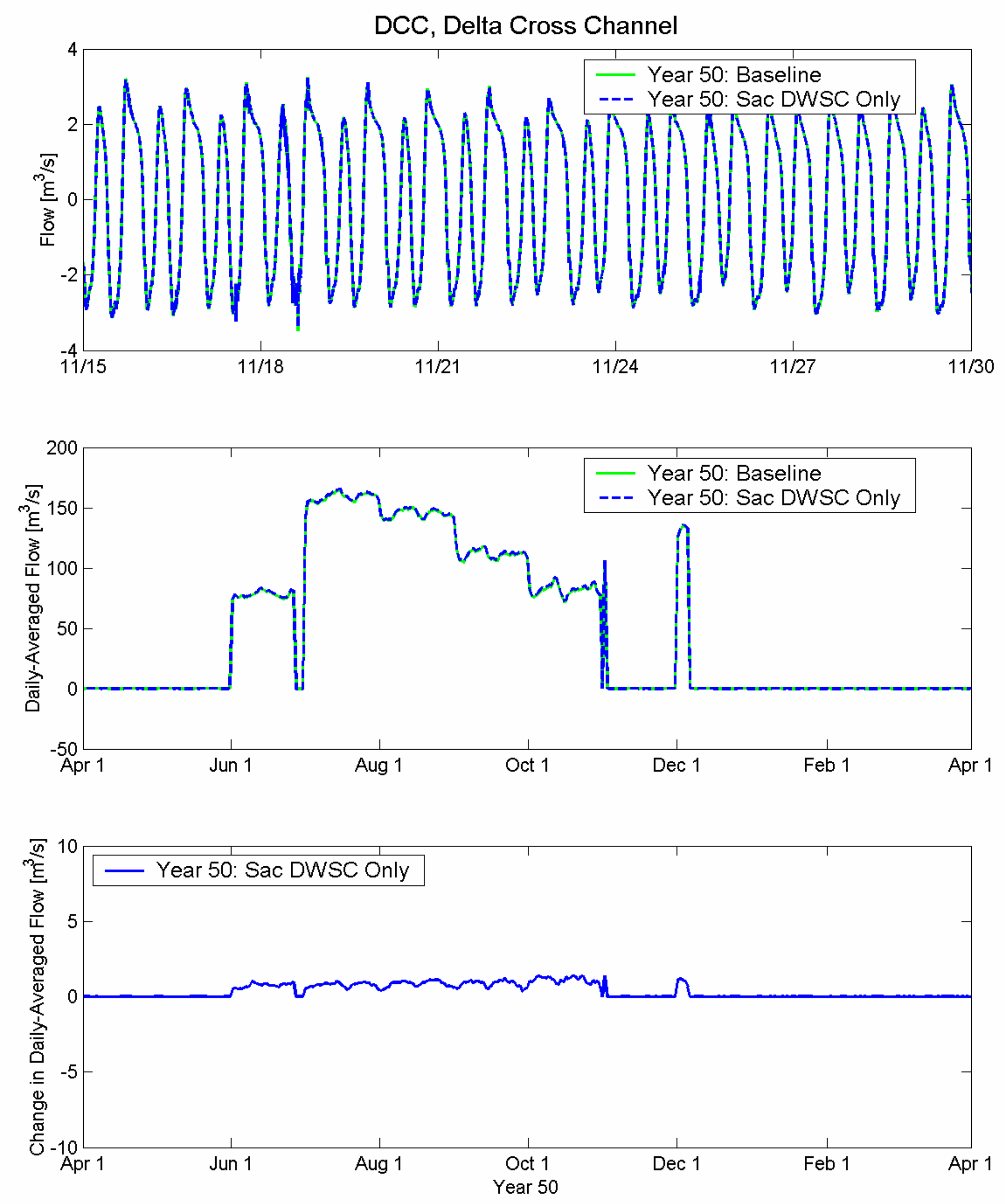


Figure 5.2-10 Predicted flow at the Delta Cross Channel (DCC) for the Year 50 Baseline scenario and the Year 50 Sacramento DWSC Only Deepening scenario: tidal time-scale variability over a 15-day period (top); daily-averaged flow for the Year 50 simulation period (middle); predicted increase in daily-averaged flow for the Year 50 Sacramento DWSC Only Deepening scenario relative to the Year 50 Baseline scenario (bottom).

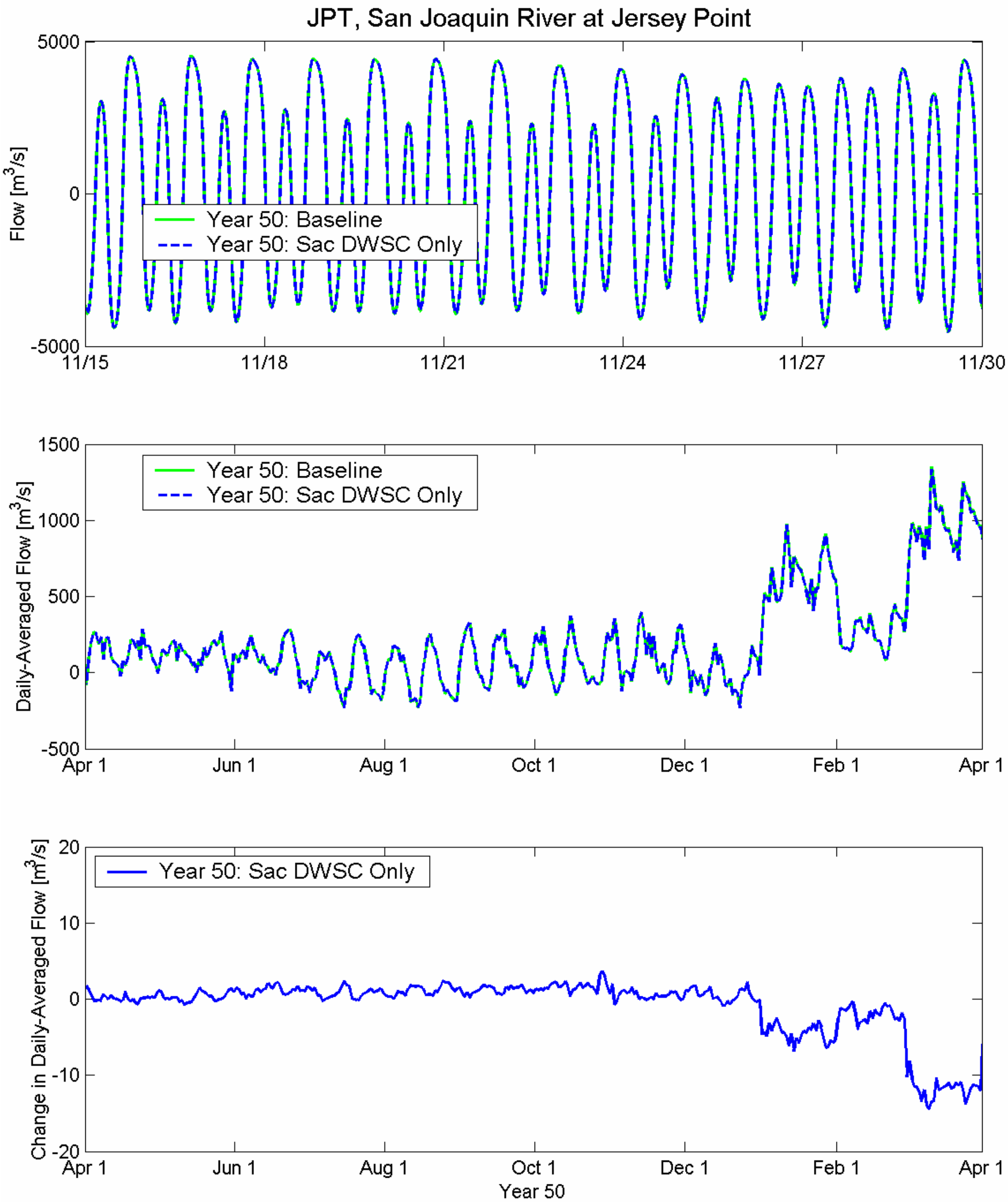


Figure 5.2-11 Predicted flow at San Joaquin River at Jersey Point (JPT) for the Year 50 Baseline scenario and the Year 50 Sacramento DWSC Only Deepening scenario: tidal time-scale variability over a 15-day period (top); daily-averaged flow for the Year 50 simulation period (middle); predicted increase in daily-averaged flow for the Year 50 Sacramento DWSC Only Deepening scenario relative to the Year 50 Baseline scenario (bottom).

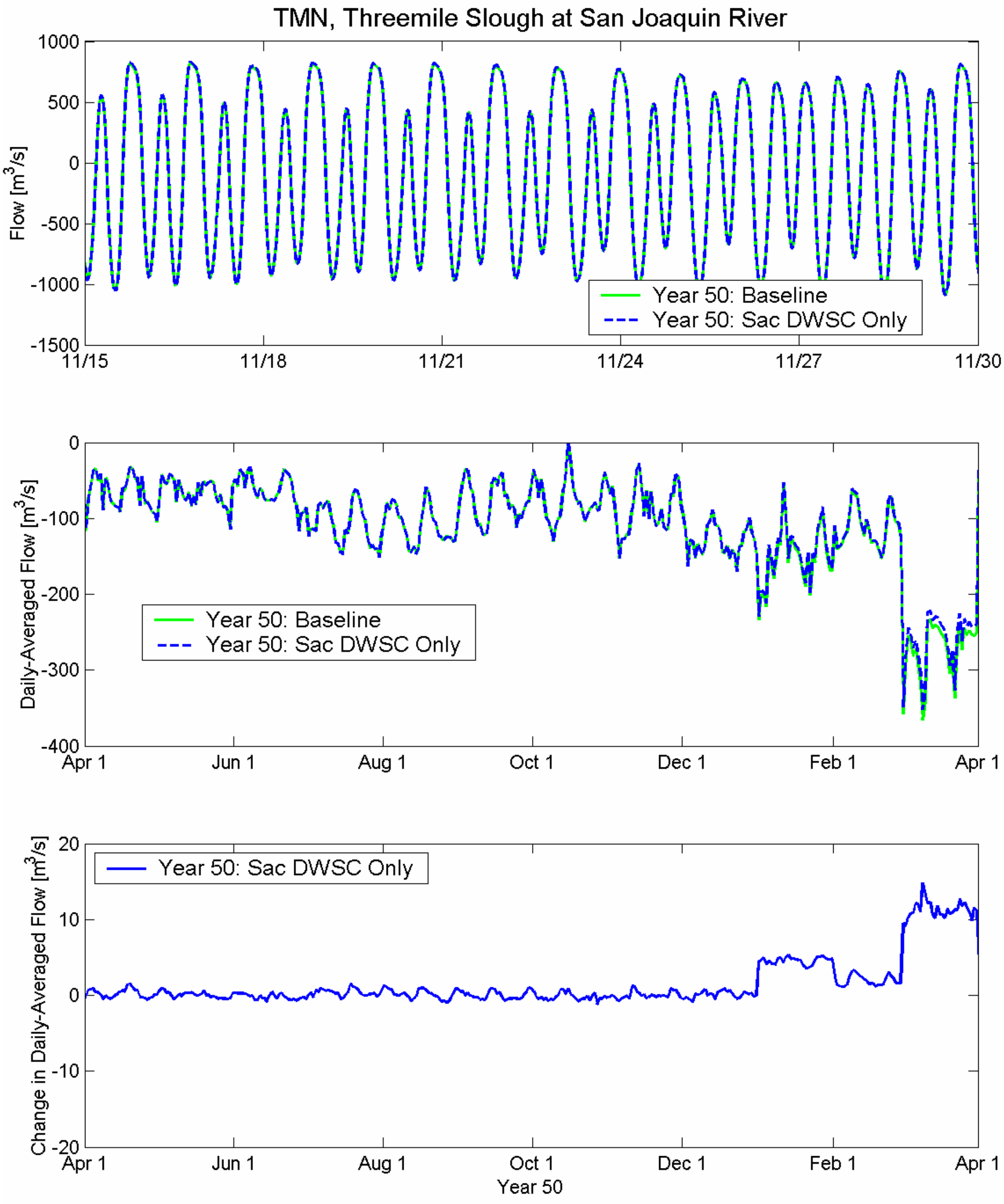


Figure 5.2-12 Predicted flow at Threemile Slough at San Joaquin River (TMN) for the Year 50 Baseline scenario and the Year 50 Sacramento DWSC Only Deepening scenario: tidal time-scale variability over a 15-day period (top); daily-averaged flow for the Year 50 simulation period (middle); predicted increase in daily-averaged flow for the Year 50 Sacramento DWSC Only Deepening scenario relative to the Year 50 Baseline scenario (bottom).

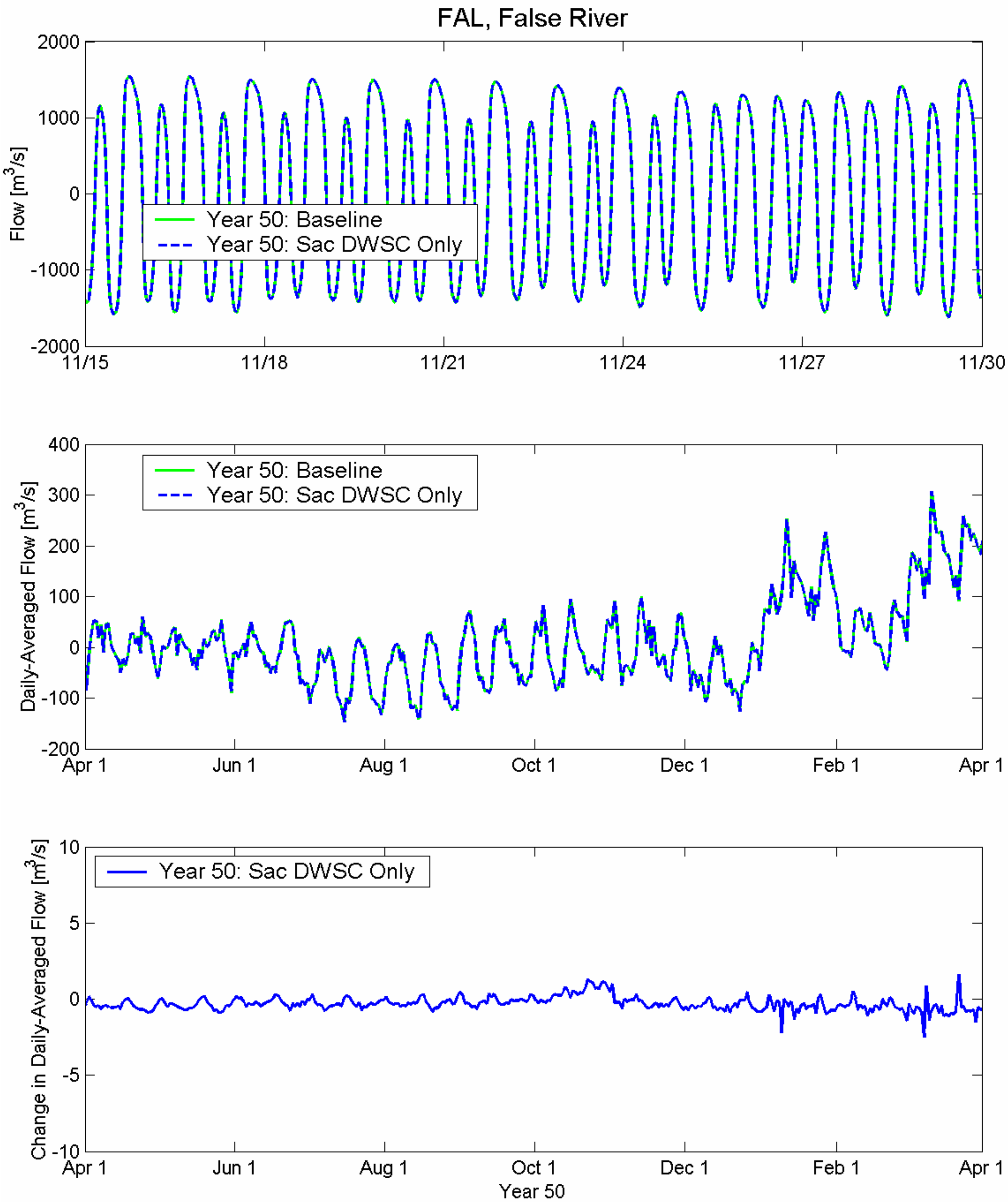


Figure 5.2-13 Predicted flow at False River (FAL) for the Year 50 Baseline scenario and the Year 50 Sacramento DWSC Only Deepening scenario: tidal time-scale variability over a 15-day period (top); daily-averaged flow for the Year 50 simulation period (middle); predicted increase in daily-averaged flow for the Year 50 Sacramento DWSC Only Deepening scenario relative to the Year 50 Baseline scenario (bottom).

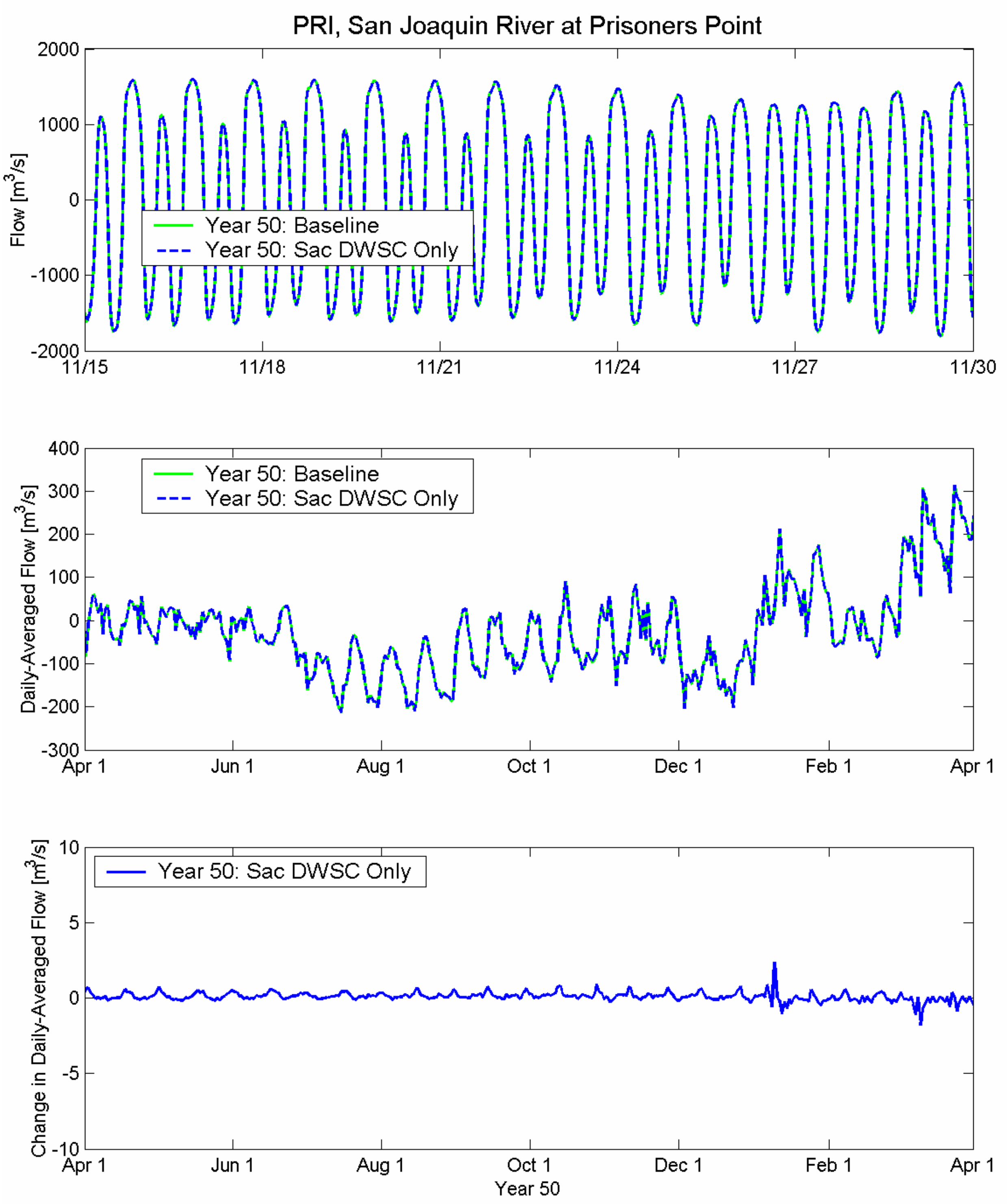


Figure 5.2-14 Predicted flow at San Joaquin River at Prisoners Point (PRI) for the Year 50 Baseline scenario and the Year 50 Sacramento DWSC Only Deepening scenario: tidal time-scale variability over a 15-day period (top); daily-averaged flow for the Year 50 simulation period (middle); predicted increase in daily-averaged flow for the Year 50 Sacramento DWSC Only Deepening scenario relative to the Year 50 Baseline scenario (bottom).

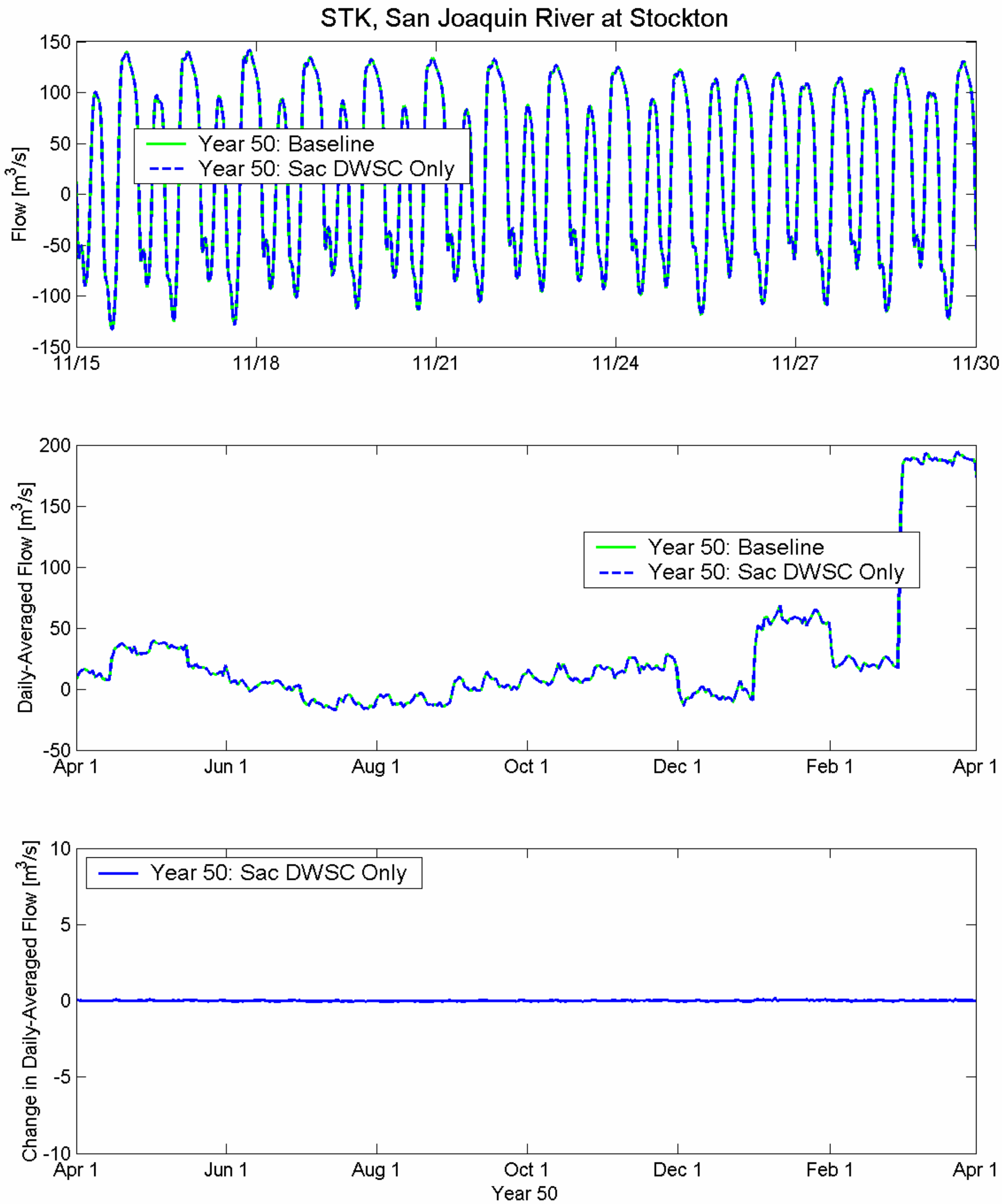


Figure 5.2-15 Predicted flow at San Joaquin River at Stockton (STK) for the Year 50 Baseline scenario and the Year 50 Sacramento DWSC Only Deepening scenario: tidal time-scale variability over a 15-day period (top); daily-averaged flow for the Year 50 simulation period (middle); predicted increase in daily-averaged flow for the Year 50 Sacramento DWSC Only Deepening scenario relative to the Year 50 Baseline scenario (bottom).

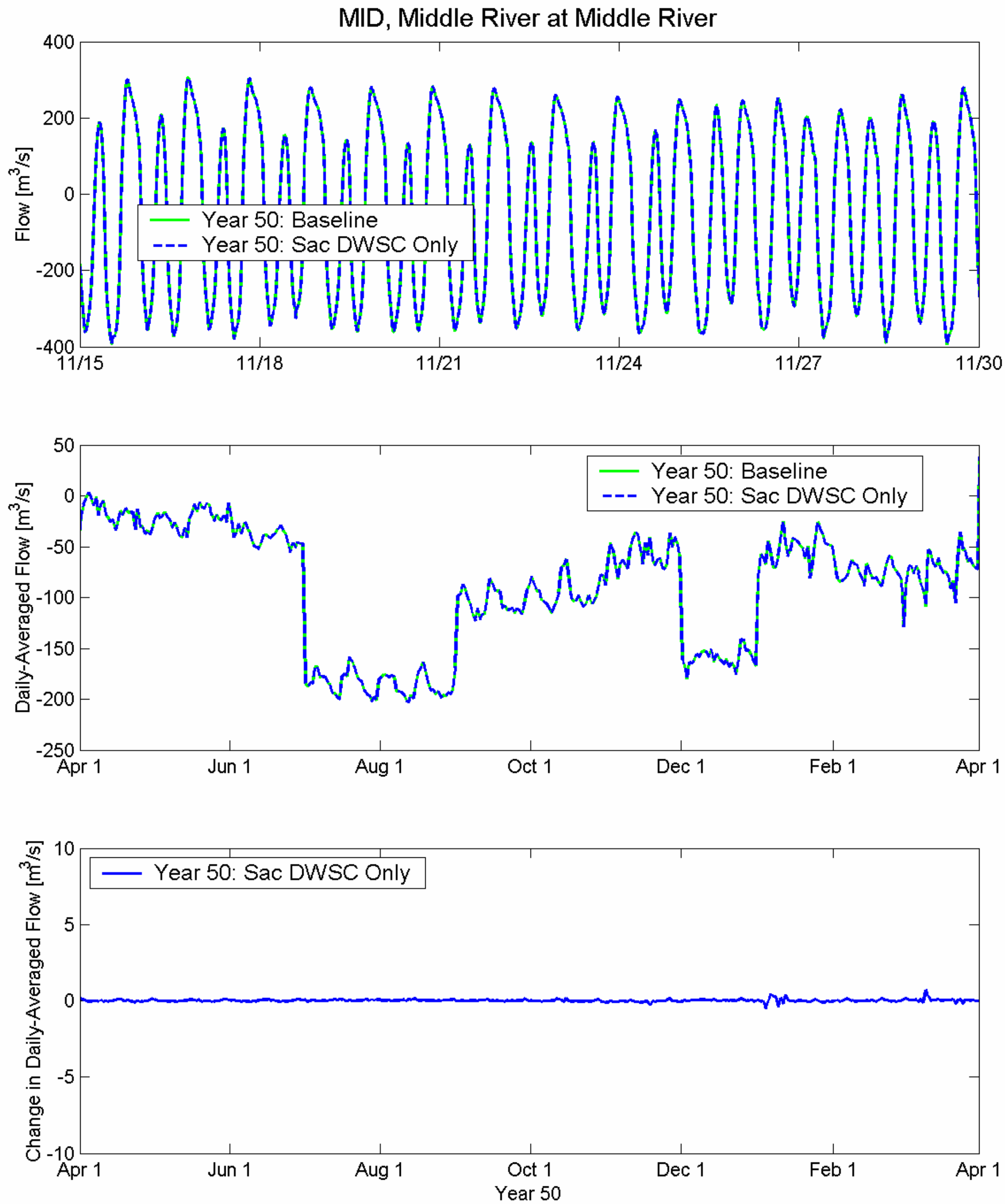


Figure 5.2-16 Predicted flow at Middle River at Middle River (MID) for the Year 50 Baseline scenario and the Year 50 Sacramento DWSC Only Deepening scenario: tidal time-scale variability over a 15-day period (top); daily-averaged flow for the Year 50 simulation period (middle); predicted increase in daily-averaged flow for the Year 50 Sacramento DWSC Only Deepening scenario relative to the Year 50 Baseline scenario (bottom).

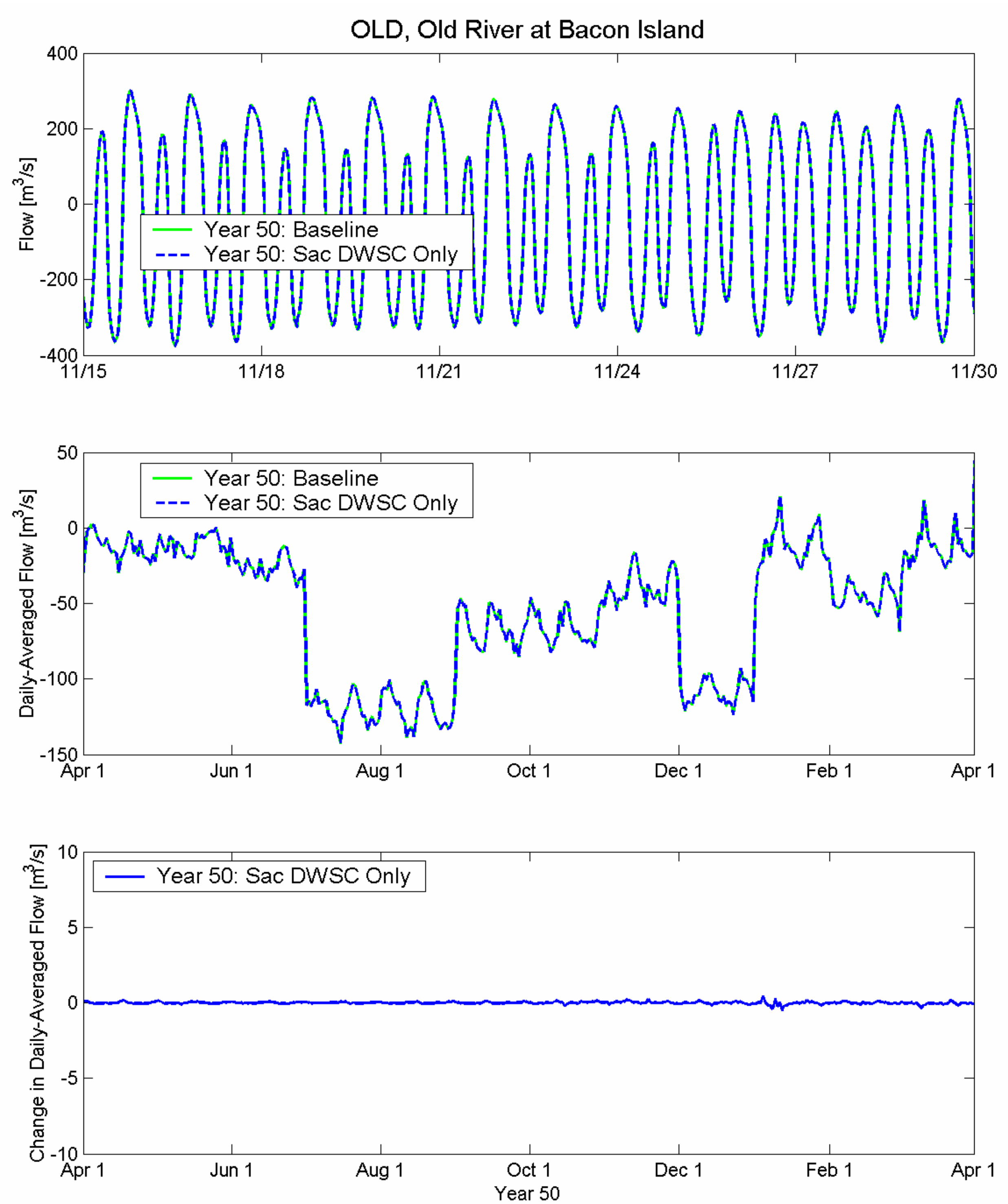


Figure 5.2-17 Predicted flow at Old River at Bacon Island (OLD) for the Year 50 Baseline scenario and the Year 50 Sacramento DWSC Only Deepening scenario: tidal time-scale variability over a 15-day period (top); daily-averaged flow for the Year 50 simulation period (middle); predicted increase in daily-averaged flow for the Year 50 Sacramento DWSC Only Deepening scenario relative to the Year 50 Baseline scenario (bottom).

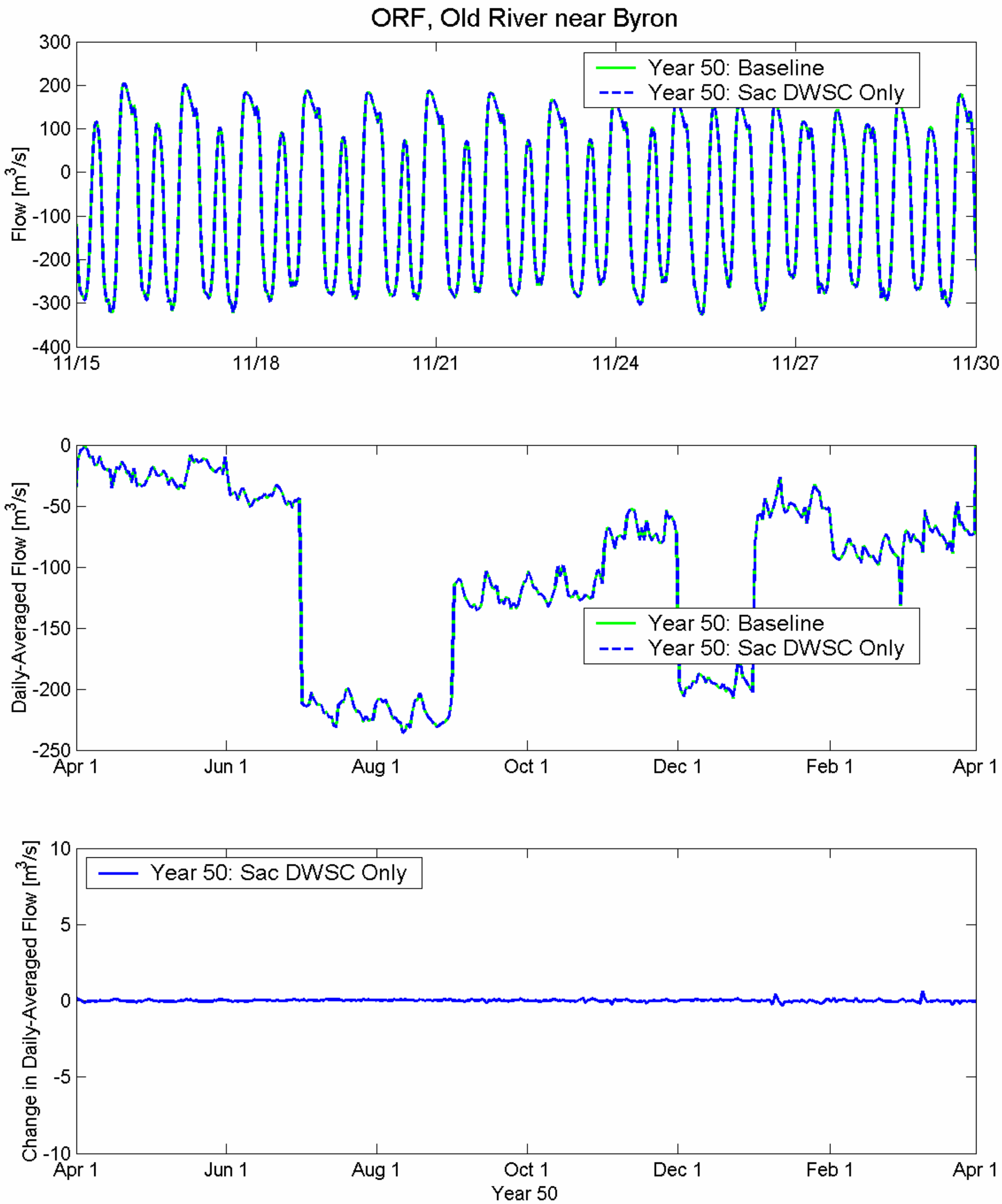


Figure 5.2-18 Predicted flow at Old River near Byron (ORF) for the Year 50 Baseline scenario and the Year 50 Sacramento DWSC Only Deepening scenario: tidal time-scale variability over a 15-day period (top); daily-averaged flow for the Year 50 simulation period (middle); predicted increase in daily-averaged flow for the Year 50 Sacramento DWSC Only Deepening scenario relative to the Year 50 Baseline scenario (bottom).

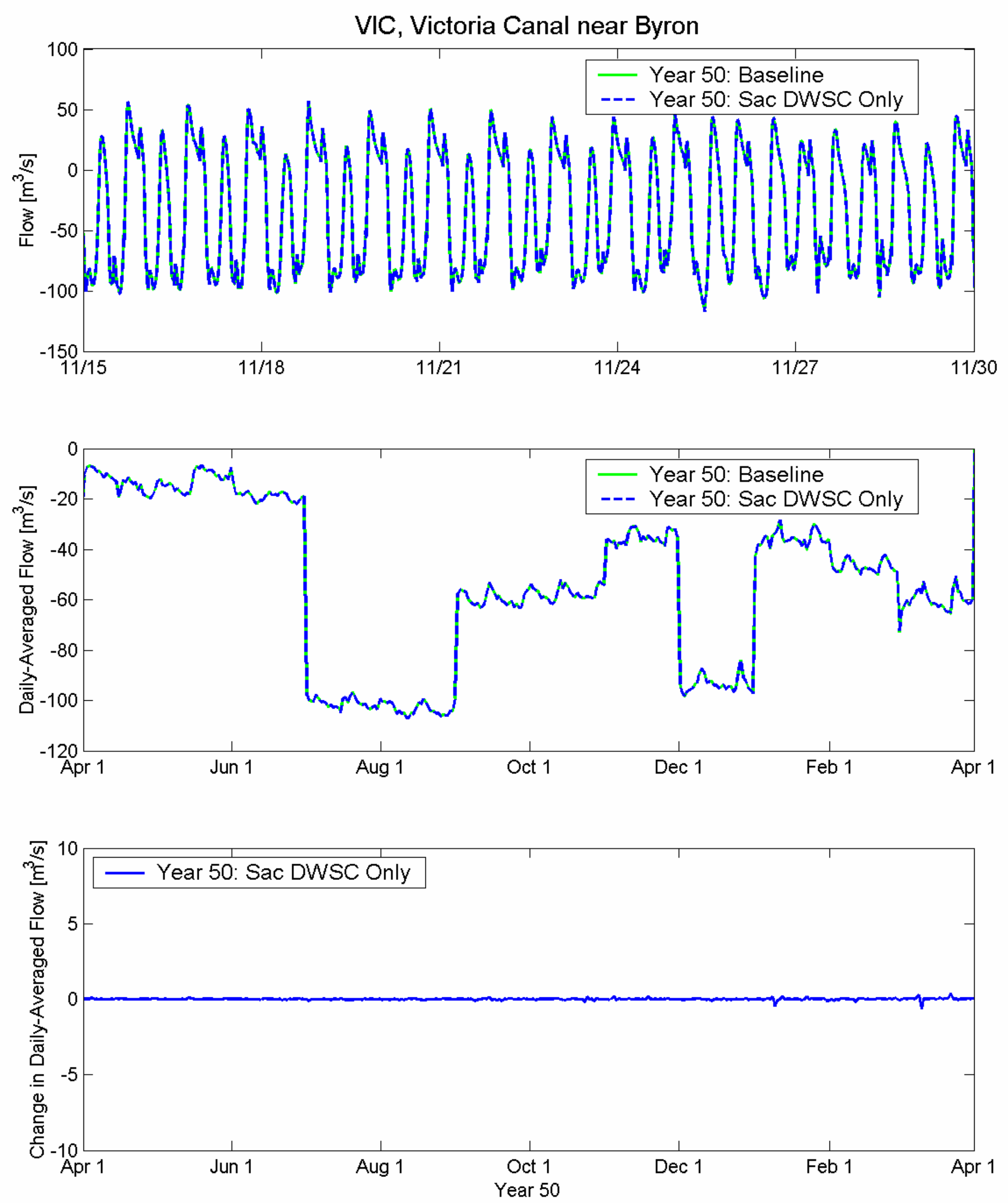


Figure 5.2-19 Predicted flow at Victoria Canal near Byron (VIC) for the Year 50 Baseline scenario and the Year 50 Sacramento DWSC Only Deepening scenario: tidal time-scale variability over a 15-day period (top); daily-averaged flow for the Year 50 simulation period (middle); predicted increase in daily-averaged flow for the Year 50 Sacramento DWSC Only Deepening scenario relative to the Year 50 Baseline scenario (bottom).

5.2.2 Year 50 Both Sacramento DWSC & SF Bay to Stockton DWSC Deepening

For each flow comparison figure included in this section, the top plot shows the tidal time-scale flow variability over a 15-day period for the Year 50 Baseline scenario, the Year 50 Sacramento DWSC Only Deepening scenario, and the Year 50 Both DWSC Deepening scenario. The middle plot shows daily-averaged flow during the full simulation year for each scenario. The bottom plot shows the predicted change in daily-averaged flow for the Year 50 Sacramento DWSC Only Deepening scenario and the Year 50 Both DWSC Deepening scenario relative to the Year 50 Baseline scenario. In cases where the predicted flow is identical between scenarios, some lines are not fully visible. Since the lines are plotted in the order listed on the legend, for periods where the predicted flow for the Year 50 Baseline scenario or the Year 50 Sacramento DWSC Only Deepening scenario are not fully visible, the predicted flow for these scenarios is identical to the visible line(s).

Figure 5.2-20 shows the predicted flow at Chipps Island for the Year 50 Baseline scenario, the Year 50 Sacramento DWSC Only Deepening scenario, and the Year 50 Both DWSC Deepening scenario. During the second half of November (top panel of Figure 5.2-20), the predicted flow for all three scenarios is similar, however the peak tidal flows under the Year 50 Both DWSC Deepening scenario are about 1.5% greater than under the Year 50 Baseline scenario indicating a slight increase in tidal prism of the Delta under the Year 50 Both DWSC Deepening scenario. The daily-averaged flow is nearly identical between the three scenarios over the entire simulation year. The change in daily-averaged flow plot (lower panel of Figure 5.2-20) shows some small differences in daily-averaged flow between the Year 50 Baseline scenario and both the Year 50 Sacramento DWSC Only Deepening scenario and the Year 50 Both DWSC Deepening scenario. These differences are very small relative to the daily-averaged flow magnitude, and are likely the result of small phase differences in tidal propagation and a slight increase in tidal prism resulting from the Sacramento DWSC and San Francisco Bay to Stockton DWSC deepening.

Figure 5.2-21 shows the predicted flow at Sacramento River at Rio Vista (RIO) for the Year 50 Baseline scenario, the Year 50 Sacramento DWSC Only Deepening scenario, and the Year 50 Both DWSC Deepening scenario. During the second half of November (top panel of Figure 5.2-21), the predicted flow for all three scenarios is identical. Similarly, the daily-averaged flow is nearly identical between the three scenarios over the entire simulation year. The change in daily-averaged flow plot (lower panel of Figure 5.2-21) shows some small differences in daily-averaged flow between the Year 50 Baseline scenario and both the Year 50 Sacramento DWSC Only Deepening scenario and the Year 50 Both DWSC Deepening scenario. These differences are very small relative to the daily-averaged flow magnitude, and are likely the result of a small increase in tidal prism and small phase differences in tidal propagation resulting from the Sacramento DWSC deepening.

Figure 5.2-22 shows the predicted flow at Cache Slough at Ryer Island (CCH) for the Year 50 Baseline scenario, the Year 50 Sacramento DWSC Only Deepening scenario, and the Year 50 Both DWSC Deepening scenario. During the second half of November (top panel of Figure 5.2-22), the predicted flow for all three scenarios is identical. Similarly, the daily-averaged flow is nearly identical between the three scenarios over the entire simulation year. The change in daily-averaged flow plot (lower panel of Figure 5.2-22) shows some small differences in daily-averaged flow between the Year 50 Baseline scenario and both the Year 50 Sacramento DWSC Only Deepening scenario and the Year 50 Both DWSC Deepening scenario. These differences are very small relative to the daily-averaged flow magnitude, and are likely the result of a small increase in tidal prism and small phase differences in tidal propagation resulting from the Sacramento DWSC deepening.

Figure 5.2-23 shows the predicted flow at the Sacramento DWSC (USGS Station 11455335) for the Year 50 Baseline scenario, the Year 50 Sacramento DWSC Only Deepening scenario, and the Year 50 Both DWSC Deepening scenario. During the second half of November (top panel of Figure 5.2-23), the predicted flow for all three scenarios is identical. Similarly, the daily-averaged flow is nearly identical between the three scenarios over the entire simulation year. The change in daily-averaged flow plot (lower panel of Figure 5.2-23) shows some small differences in daily-averaged flow between the Year 50 Baseline scenario and both the Year 50 Sacramento DWSC Only Deepening scenario and the Year 50 Both DWSC Deepening scenario. These differences are small relative to the daily-averaged flow magnitude, and are likely the result of a small increase in tidal prism and small phase differences in tidal propagation resulting from the Sacramento DWSC deepening.

Figure 5.2-24 shows the predicted flow at Miner Slough at Highway 84 Bridge (MIN) for the Year 50 Baseline scenario, the Year 50 Sacramento DWSC Only Deepening scenario, and the Year 50 Both DWSC Deepening scenario. During the second half of November (top panel of Figure 5.2-24), the predicted flow for all three scenarios is identical. Similarly, the daily-averaged flow is nearly identical between the three scenarios over the entire simulation year. The change in daily-averaged flow plot (lower panel of Figure 5.2-24) shows a slight reduction in daily-averaged flow in Miner Slough in both the Year 50 Sacramento DWSC Only Deepening scenario and the Year 50 Both DWSC Deepening scenario relative to the Year 50 Baseline scenario.

Figure 5.2-25 shows the predicted flow at Steamboat Slough between Sacramento River and Sutter Slough (STM) for the Year 50 Baseline scenario, the Year 50 Sacramento DWSC Only Deepening scenario, and the Year 50 Both DWSC Deepening scenario. During the second half of November (top panel of Figure 5.2-25), the predicted flow for all three scenarios is identical. Similarly, the daily-averaged flow is nearly identical between the three scenarios over the entire simulation year. No significant change in daily-averaged flow relative to the Year 50 Baseline scenario is predicted for either the Year 50 Sacramento DWSC Only Deepening scenario or the Year 50 Both DWSC Deepening scenario.

Figure 5.2-26 shows the predicted flow at Sutter Slough at Courtland (SUT) for the Year 50 Baseline scenario, the Year 50 Sacramento DWSC Only Deepening scenario, and the Year 50 Both DWSC Deepening scenario. During the second half of November (top panel of Figure 5.2-26), the predicted flow for all three scenarios is identical. Similarly, the daily-averaged flow is nearly identical between the three scenarios over the entire simulation year. The change in daily-averaged flow plot (lower panel of Figure 5.2-26) shows a slight reduction in daily-averaged flow in Sutter Slough during most of the year in both the Year 50 Sacramento DWSC Only Deepening scenario and the Year 50 Both DWSC Deepening scenario relative to the Year 50 Baseline scenario.

Figure 5.2-27 shows the predicted flow at Sacramento River South of Georgiana Slough (WGB) for the Year 50 Baseline scenario, the Year 50 Sacramento DWSC Only Deepening scenario, and the Year 50 Both DWSC Deepening scenario. During the second half of November (top panel of Figure 5.2-27), the predicted flow for all three scenarios is identical. Similarly, the daily-averaged flow is nearly identical between the three scenarios over the entire simulation year. The change in daily-averaged flow plot (lower panel of Figure 5.2-27) shows a slight increase in daily-averaged flow in the Sacramento River South of Georgiana Slough during most of the year in both the Year 50 Sacramento DWSC Only Deepening scenario and the Year 50 Both DWSC Deepening scenario relative to the Year 50 Baseline scenario. The flow increase in the Sacramento River at Georgiana Slough is similar in magnitude to the flow decrease predicted in Sutter Slough and Miner Slough suggesting that the deepening of the Sacramento DWSC is resulting in slightly less flow into Sutter Slough and a corresponding higher flow remaining in the Sacramento River.

Figure 5.2-28 shows the predicted flow at Georgiana Slough near the Sacramento River (GEO) for the Year 50 Baseline scenario, the Year 50 Sacramento DWSC Only Deepening scenario, and the Year 50 Both DWSC Deepening scenario. During the second half of November (top panel of Figure 5.2-28), the predicted flow for all three scenarios is identical. Similarly, the daily-averaged flow is nearly identical between the three scenarios over the entire simulation year. No significant change in daily-averaged flow relative to the Year 50 Baseline scenario is predicted for either the Year 50 Sacramento DWSC Only Deepening scenario or the Year 50 Both DWSC Deepening scenario.

Figure 5.2-29 shows the predicted flow at the Delta Cross Channel (DCC) for the Year 50 Baseline scenario, the Year 50 Sacramento DWSC Only Deepening scenario, and the Year 50 Both DWSC Deepening scenario. During the second half of November (top panel of Figure 5.2-29), the predicted flow for all three scenarios is identical. Similarly, the daily-averaged flow is nearly identical between the three scenarios over the entire simulation year. The change in daily-averaged flow plot (lower panel of Figure 5.2-29) shows a slight increase in daily-averaged flow through the Delta Cross Channel during periods when the Delta Cross Channel is open under the Year 50 Sacramento DWSC Only Deepening scenario. No significant change in daily-averaged flow relative to the Year 50 Baseline scenario is predicted for the Year 50 Both DWSC Deepening scenario.

Figure 5.2-30 shows the predicted flow at San Joaquin River at Jersey Point (JPT) for the Year 50 Baseline scenario, the Year 50 Sacramento DWSC Only Deepening scenario, and the Year 50 Both DWSC Deepening scenario. During the second half of November (top panel of Figure 5.2-30), the predicted flow for all three scenarios is similar, however the peak tidal flows under the Year 50 Both DWSC Deepening scenario are about 2% greater than under the Year 50 Baseline scenario. The daily-averaged flow is nearly identical between the three scenarios over the entire simulation year. The change in daily-averaged flow plot (lower panel of Figure 5.2-30) shows some small differences in daily-averaged flow between the Year 50 Baseline scenario and both the Year 50 Sacramento DWSC Only Deepening scenario and the Year 50 Both DWSC Deepening scenario. Under the Year 50 Sacramento DWSC Only Deepening scenario, a decrease in net flow is predicted during the high flow periods between January and March.

Most of these differences are very small relative to the daily-averaged flow magnitude, and are likely the result of small phase differences in tidal propagation and a slight increase in tidal prism resulting from the Sacramento DWSC deepening.

Figure 5.2-31 shows the predicted flow at Threemile Slough at San Joaquin River (TMN) for the Year 50 Baseline scenario, the Year 50 Sacramento DWSC Only Deepening scenario, and the Year 50 Both DWSC Deepening scenario. During the second half of November (top panel of Figure 5.2-31), the predicted flow for all three scenarios is identical. Similarly, the daily-averaged flow is nearly identical between the three scenarios over the entire simulation year. The change in daily-averaged flow plot (lower panel of Figure 5.2-31) shows some small differences in daily-averaged flow between the Year 50 Baseline scenario and both the Year 50 Sacramento DWSC Only Deepening scenario and the Year 50 Both DWSC Deepening scenario. Under the Year 50 Sacramento DWSC Only Deepening scenario, an increase in net flow indicates less flow is flowing south through Threemile Slough during the high flow period between January and March (resulting in the decrease in daily-averaged flow predicted at Jersey Point during this period). Most of these differences are very small relative to the daily-averaged flow magnitude.

Figure 5.2-32 shows the predicted flow at False River (FAL) for the Year 50 Baseline scenario, the Year 50 Sacramento DWSC Only Deepening scenario, and the Year 50 Both DWSC Deepening scenario. During the second half of November (top panel of Figure 5.2-32), the predicted flow for all three scenarios is identical. Similarly, the daily-averaged flow is nearly identical between the three scenarios over the entire simulation year. No significant change in daily-averaged flow relative to the Year 50 Baseline scenario is predicted for the Year 50 Sacramento DWSC Only Deepening scenario. The change in daily-averaged flow plot (lower panel of Figure 5.2-32) shows a slight reduction in daily-averaged flow in False River during most of the year in under the Year 50 Both DWSC Deepening scenario relative to the Year 50 Baseline scenario, with the largest predicted decreases during the high flow period between January and March.

Figure 5.2-33 shows the predicted flow at San Joaquin River at Prisoners Point (PRI) for the Year 50 Baseline scenario, the Year 50 Sacramento DWSC Only Deepening scenario, and the Year 50 Both DWSC Deepening scenario. During the second half of November (top panel of Figure 5.2-33), the predicted flow for all three scenarios is similar, however the peak tidal flows under the Year 50 Both DWSC Deepening scenario are about 5% greater than under the Year 50 Baseline scenario. The daily-averaged flow is nearly identical between the three scenarios over the entire simulation year. No significant change in daily-averaged flow relative to the Year 50 Baseline scenario is predicted for the Year 50 Sacramento DWSC Only Deepening scenario. The change in daily-averaged flow plot (lower panel of Figure 5.2-33) shows some small differences in daily-averaged flow between the Year 50 Baseline scenario and the Year 50 Both DWSC Deepening scenario. These differences are very small relative to the daily-averaged flow magnitude, and are likely the result of small phase differences in tidal propagation and a slight increase in tidal prism resulting from the Stockton DWSC deepening.

Figure 5.2-34 shows the predicted flow at San Joaquin River at Stockton (STK) for the Year 50 Baseline scenario, the Year 50 Sacramento DWSC Only Deepening scenario, and the Year 50

Both DWSC Deepening scenario. During the second half of November (top panel of Figure 5.2-34), the predicted flow for all three scenarios is identical. Similarly, the daily-averaged flow is nearly identical between the three scenarios over the entire simulation year. No significant change in daily-averaged flow relative to the Year 50 Baseline scenario is predicted for either the Year 50 Sacramento DWSC Only Deepening scenario or the Year 50 Both DWSC Deepening scenario.

Figure 5.2-35 shows the predicted flow at Middle River at Middle River (MID) for the Year 50 Baseline scenario, the Year 50 Sacramento DWSC Only Deepening scenario, and the Year 50 Both DWSC Deepening scenario. During the second half of November (top panel of Figure 5.2-35), the predicted flow for all three scenarios is identical. Similarly, the daily-averaged flow is nearly identical between the three scenarios over the entire simulation year. No significant change in daily-averaged flow relative to the Year 50 Baseline scenario is predicted for the Year 50 Sacramento DWSC Only Deepening scenario. The change in daily-averaged flow plot (lower panel of Figure 5.2-35) shows some small differences in daily-averaged flow between the Year 50 Baseline scenario and the Year 50 Both DWSC Deepening scenario. These differences are very small relative to the daily-averaged flow magnitude.

Figure 5.2-36 shows the predicted flow at Old River at Bacon Island (OLD) for the Year 50 Baseline scenario, the Year 50 Sacramento DWSC Only Deepening scenario, and the Year 50 Both DWSC Deepening scenario. During the second half of November (top panel of Figure 5.2-36), the predicted flow for all three scenarios is identical. Similarly, the daily-averaged flow is nearly identical between the three scenarios over the entire simulation year. No significant change in daily-averaged flow relative to the Year 50 Baseline scenario is predicted for the Year 50 Sacramento DWSC Only Deepening scenario. The change in daily-averaged flow plot (lower panel of Figure 5.2-36) shows some small differences in daily-averaged flow between the Year 50 Baseline scenario and the Year 50 Both DWSC Deepening scenario. These differences are very small relative to the daily-averaged flow magnitude.

Figure 5.2-37 shows the predicted flow at Old River near Byron (ORF) for the Year 50 Baseline scenario, the Year 50 Sacramento DWSC Only Deepening scenario, and the Year 50 Both DWSC Deepening scenario. During the second half of November (top panel of Figure 5.2-37), the predicted flow for all three scenarios is identical. Similarly, the daily-averaged flow is nearly identical between the three scenarios over the entire simulation year. No significant change in daily-averaged flow relative to the Year 50 Baseline scenario is predicted for either the Year 50 Sacramento DWSC Only Deepening scenario or the Year 50 Both DWSC Deepening scenario.

Figure 5.2-38 shows the predicted flow at Victoria Canal near Byron (VIC) for the Year 50 Baseline scenario, the Year 50 Sacramento DWSC Only Deepening scenario, and the Year 50 Both DWSC Deepening scenario. During the second half of November (top panel of Figure 5.2-38), the predicted flow for all three scenarios is identical. Similarly, the daily-averaged flow is nearly identical between the three scenarios over the entire simulation year. No significant change in daily-averaged flow relative to the Year 50 Baseline scenario is predicted for either the Year 50 Sacramento DWSC Only Deepening scenario or the Year 50 Both DWSC Deepening scenario.

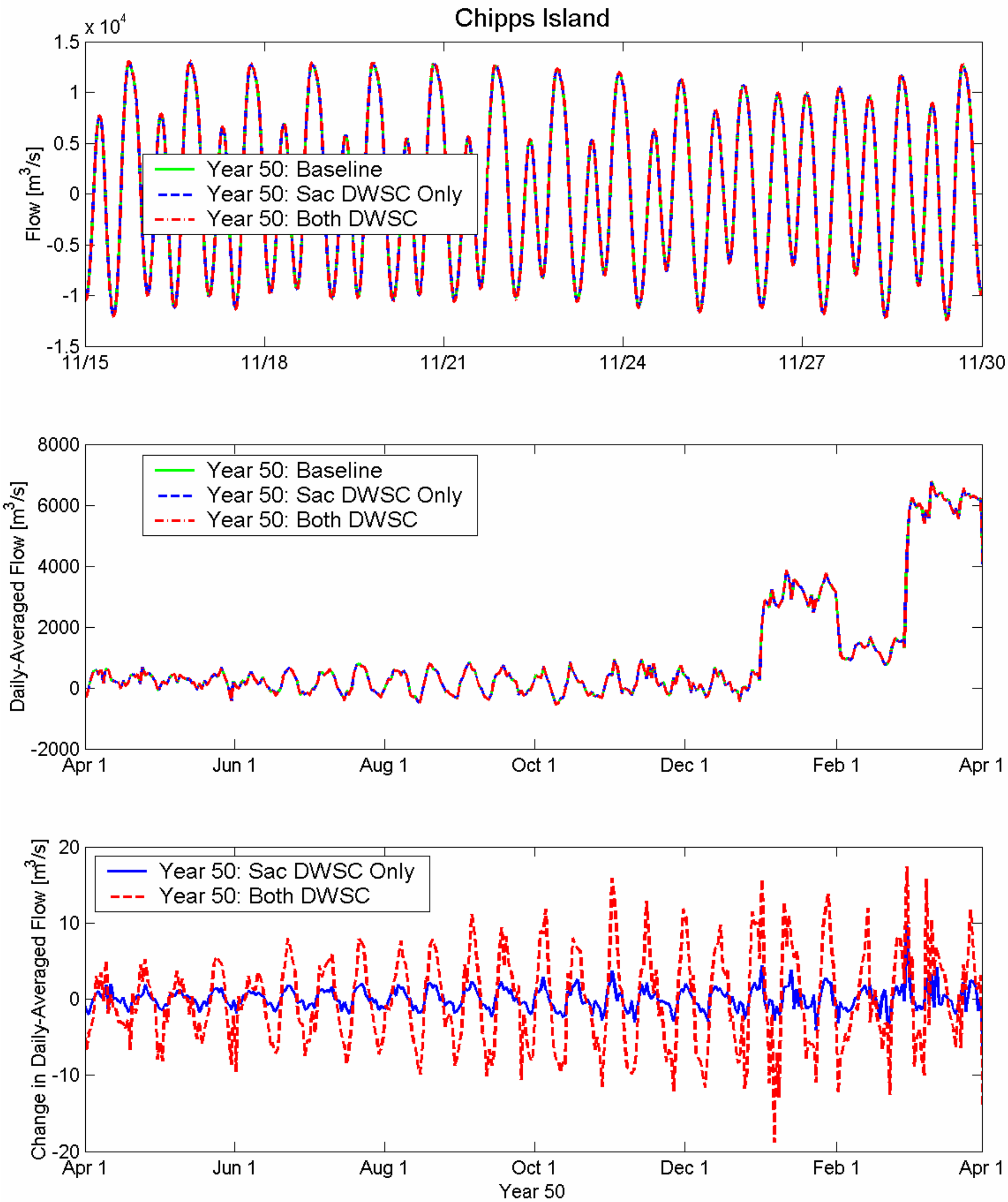


Figure 5.2-20 Predicted flow at Chipps Island for the Year 50 Baseline scenario, the Year 50 Sacramento DWSC Only Deepening scenario, and the Year 50 Both DWSC Deepening scenario: tidal time-scale variability over a 15-day period (top); daily-averaged flow for the Year 50 simulation period (middle); predicted increase in daily-averaged flow for the Year 50 Sacramento DWSC Only Deepening scenario and the Year 50 Both DWSC Deepening scenario relative to the Year 50 Baseline scenario (bottom).

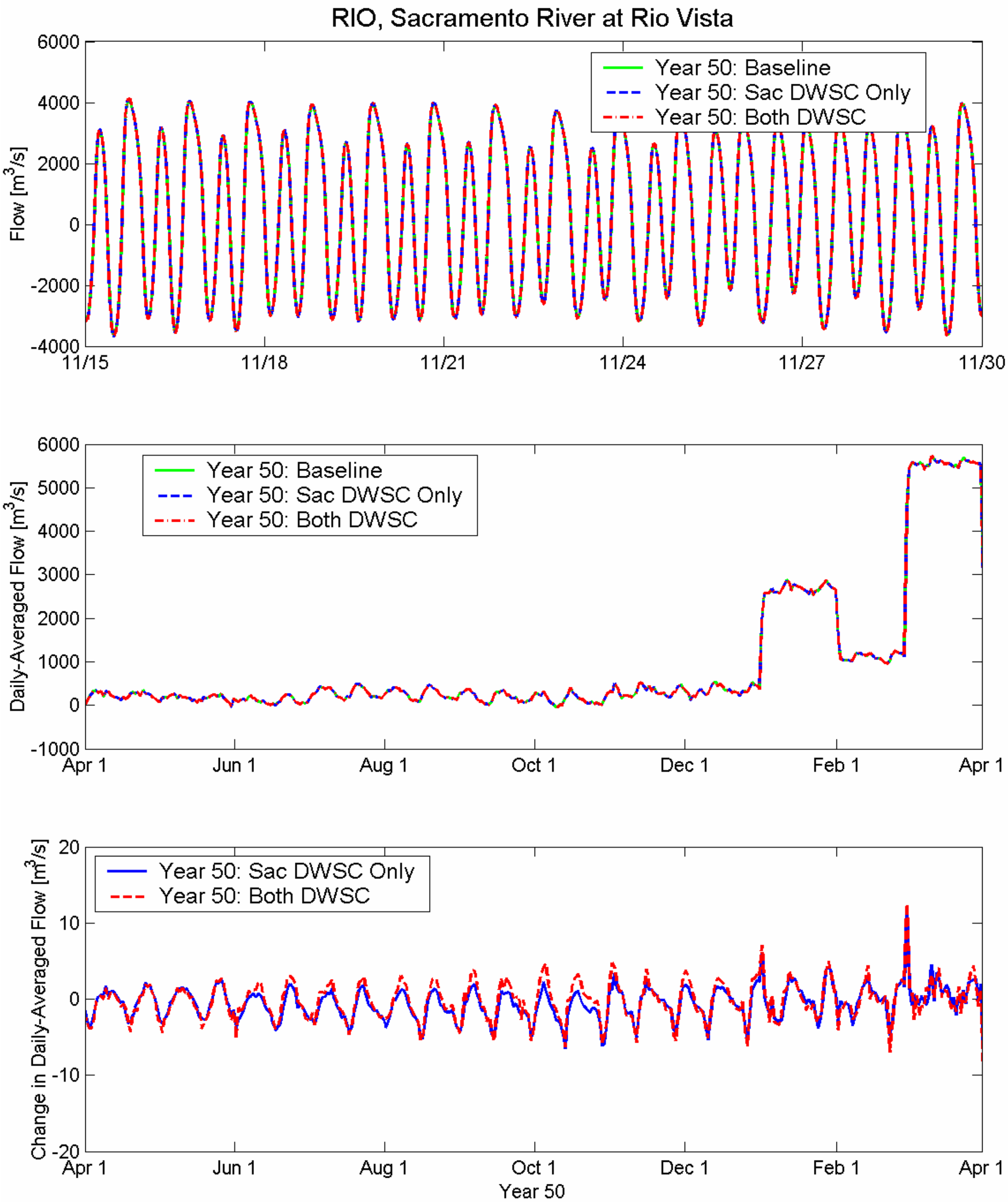


Figure 5.2-21 Predicted flow at Sacramento River at Rio Vista (RIO) for the Year 50 Baseline scenario, the Year 50 Sacramento DWSC Only Deepening scenario, and the Year 50 Both DWSC Deepening scenario: tidal time-scale variability over a 15-day period (top); daily-averaged flow for the Year 50 simulation period (middle); predicted increase in daily-averaged flow for the Year 50 Sacramento DWSC Only Deepening scenario and the Year 50 Both DWSC Deepening scenario relative to the Year 50 Baseline scenario (bottom).

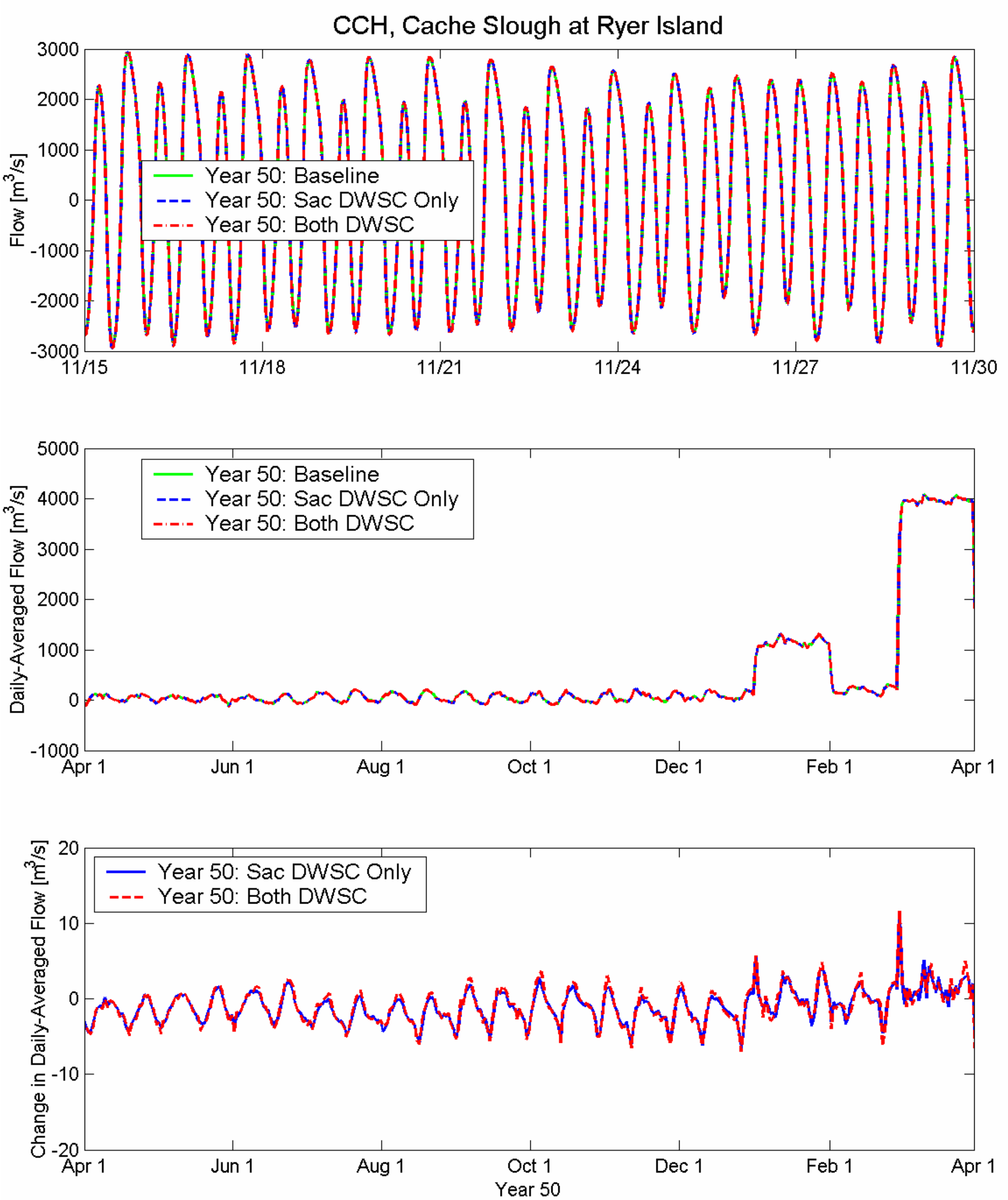


Figure 5.2-22 Predicted flow at Cache Slough at Ryer Island (CCH) for the Year 50 Baseline scenario, the Year 50 Sacramento DWSC Only Deepening scenario, and the Year 50 Both DWSC Deepening scenario: tidal time-scale variability over a 15-day period (top); daily-averaged flow for the Year 50 simulation period (middle); predicted increase in daily-averaged flow for the Year 50 Sacramento DWSC Only Deepening scenario and the Year 50 Both DWSC Deepening scenario relative to the Year 50 Baseline scenario (bottom).

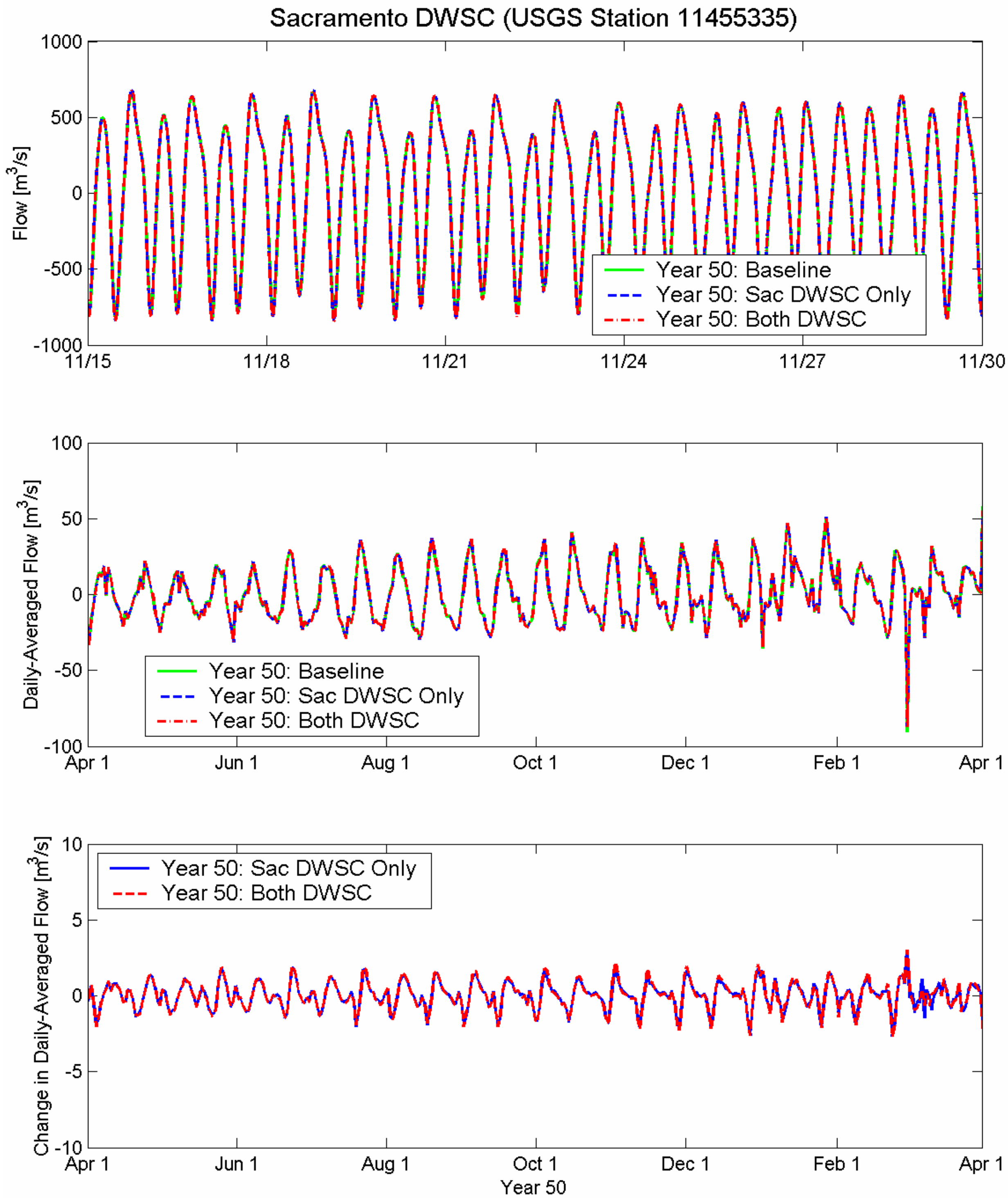


Figure 5.2-23 Predicted flow at Sacramento DWSC (USGS Station 11455335) for the Year 50 Baseline scenario, the Year 50 Sacramento DWSC Only Deepening scenario, and the Year 50 Both DWSC Deepening scenario: tidal time-scale variability over a 15-day period (top); daily-averaged flow for the Year 50 simulation period (middle); predicted increase in daily-averaged flow for the Year 50 Sacramento DWSC Only Deepening scenario and the Year 50 Both DWSC Deepening scenario relative to the Year 50 Baseline scenario (bottom).

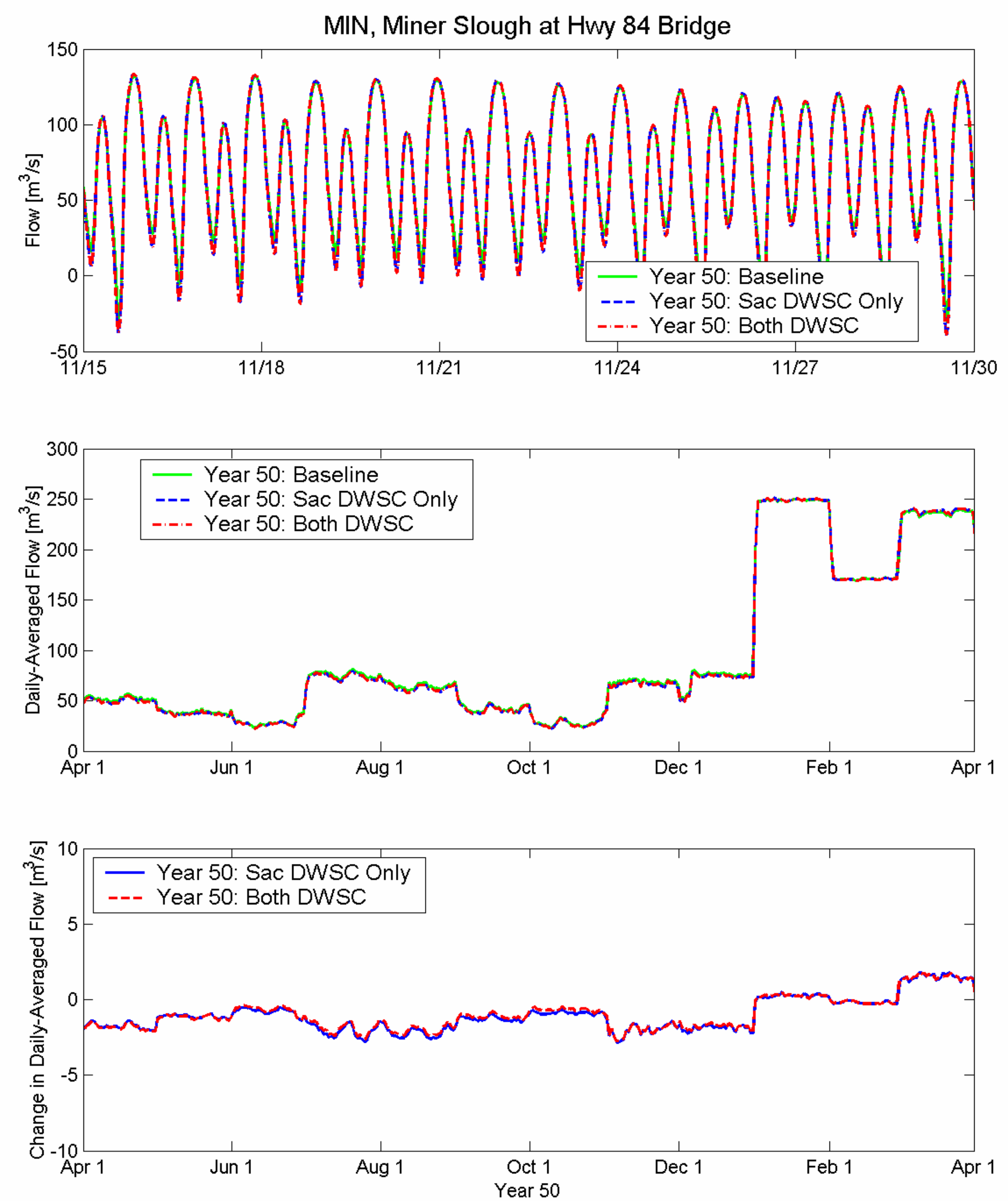


Figure 5.2-24 Predicted flow at Miner Slough at Highway 84 Bridge (MIN) for the Year 50 Baseline scenario, the Year 50 Sacramento DWSC Only Deepening scenario, and the Year 50 Both DWSC Deepening scenario: tidal time-scale variability over a 15-day period (top); daily-averaged flow for the Year 50 simulation period (middle); predicted increase in daily-averaged flow for the Year 50 Sacramento DWSC Only Deepening scenario and the Year 50 Both DWSC Deepening scenario relative to the Year 50 Baseline scenario (bottom).

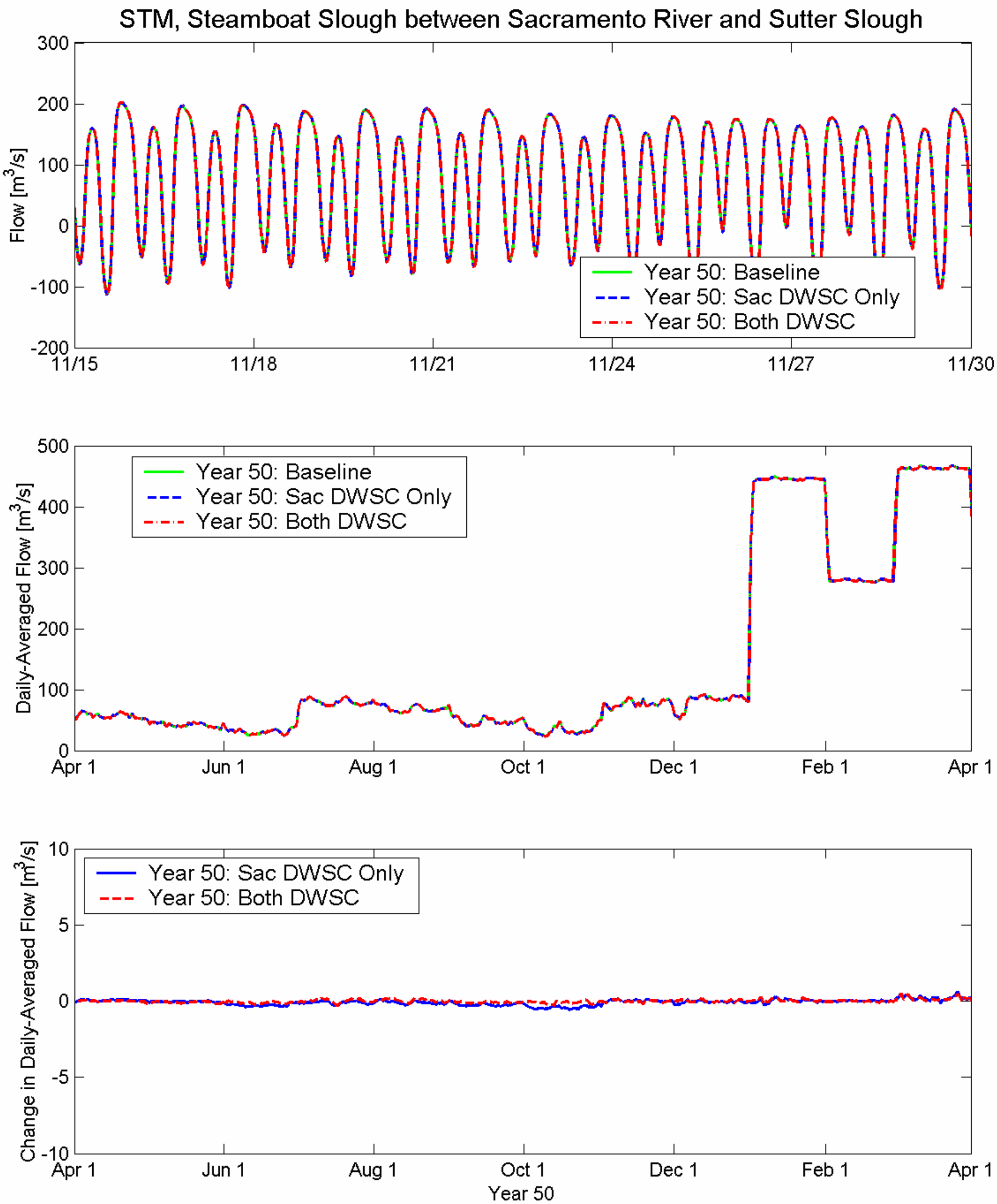


Figure 5.2-25 Predicted flow at Steamboat Slough between Sacramento River and Sutter Slough (STM) for the Year 50 Baseline scenario, the Year 50 Sacramento DWSC Only Deepening scenario, and the Year 50 Both DWSC Deepening scenario: tidal time-scale variability over a 15-day period (top); daily-averaged flow for the Year 50 simulation period (middle); predicted increase in daily-averaged flow for the Year 50 Sacramento DWSC Only Deepening scenario and the Year 50 Both DWSC Deepening scenario relative to the Year 50 Baseline scenario (bottom).

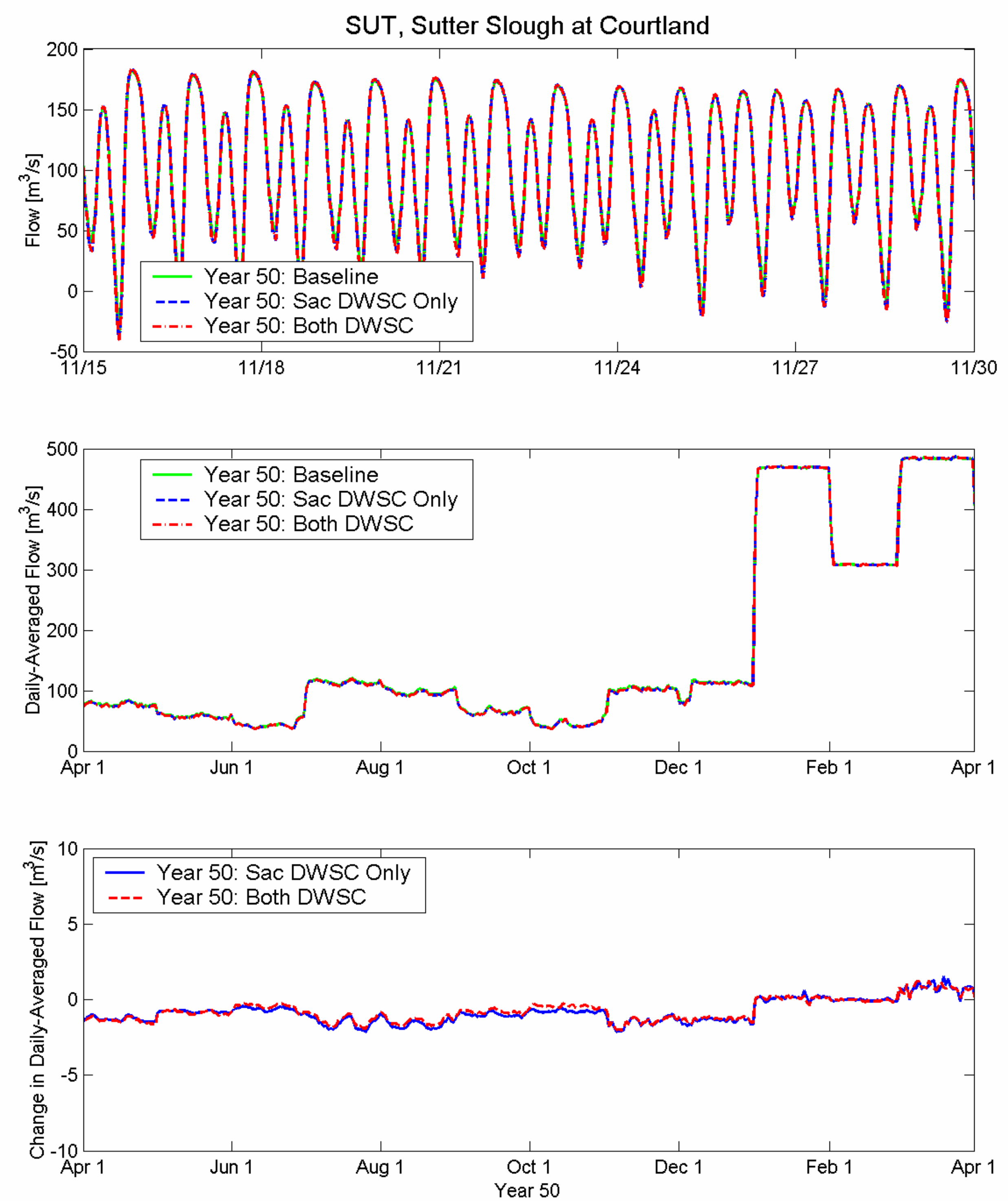


Figure 5.2-26 Predicted flow at Sutter Slough at Courtland (SUT) for the Year 50 Baseline scenario, the Year 50 Sacramento DWSC Only Deepening scenario, and the Year 50 Both DWSC Deepening scenario: tidal time-scale variability over a 15-day period (top); daily-averaged flow for the Year 50 simulation period (middle); predicted increase in daily-averaged flow for the Year 50 Sacramento DWSC Only Deepening scenario and the Year 50 Both DWSC Deepening scenario relative to the Year 50 Baseline scenario (bottom).

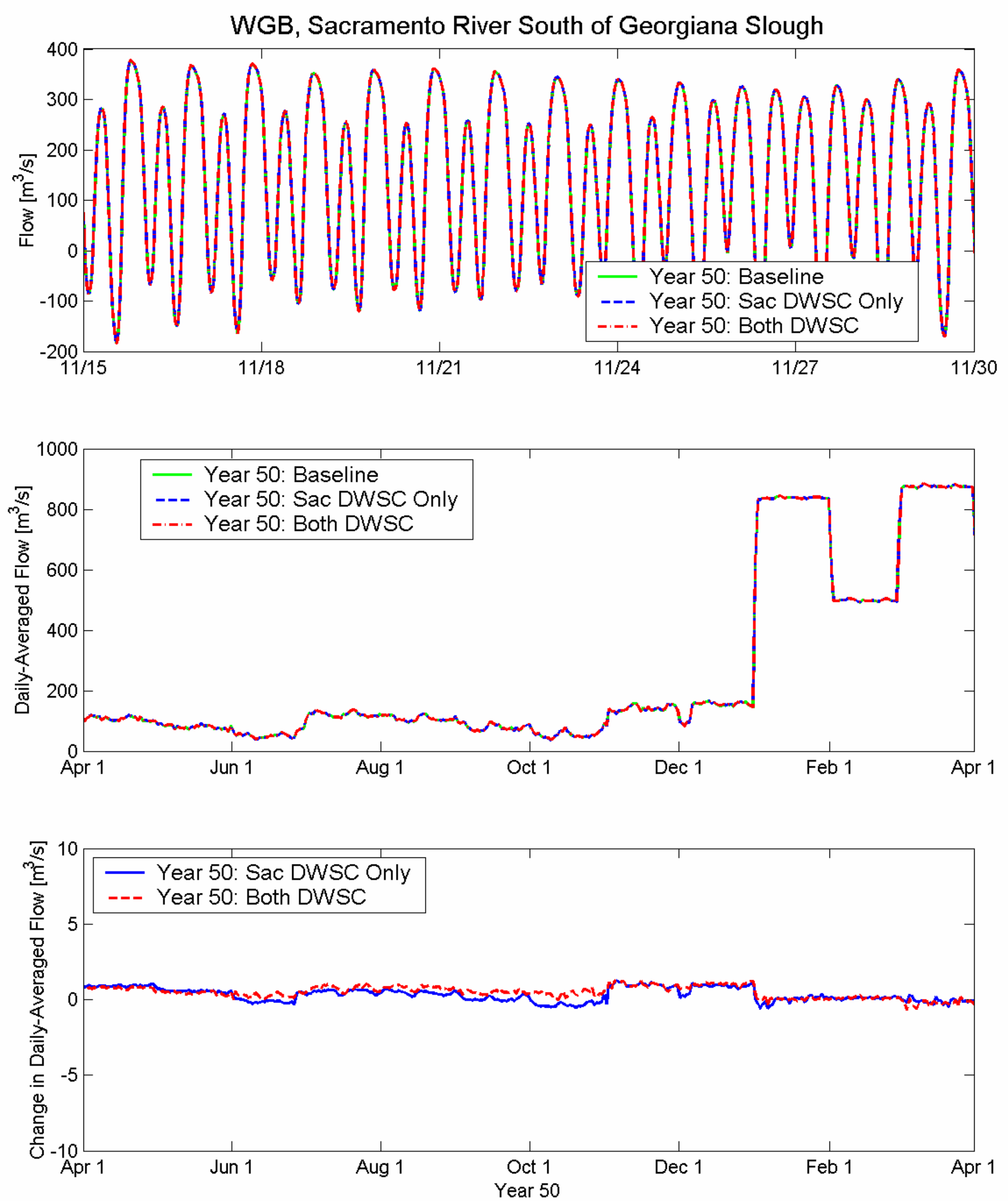


Figure 5.2-27 Predicted flow at Sacramento River South of Georgiana Slough (WGB) for the Year 50 Baseline scenario, the Year 50 Sacramento DWSC Only Deepening scenario, and the Year 50 Both DWSC Deepening scenario: tidal time-scale variability over a 15-day period (top); daily-averaged flow for the Year 50 simulation period (middle); predicted increase in daily-averaged flow for the Year 50 Sacramento DWSC Only Deepening scenario and the Year 50 Both DWSC Deepening scenario relative to the Year 50 Baseline scenario (bottom).

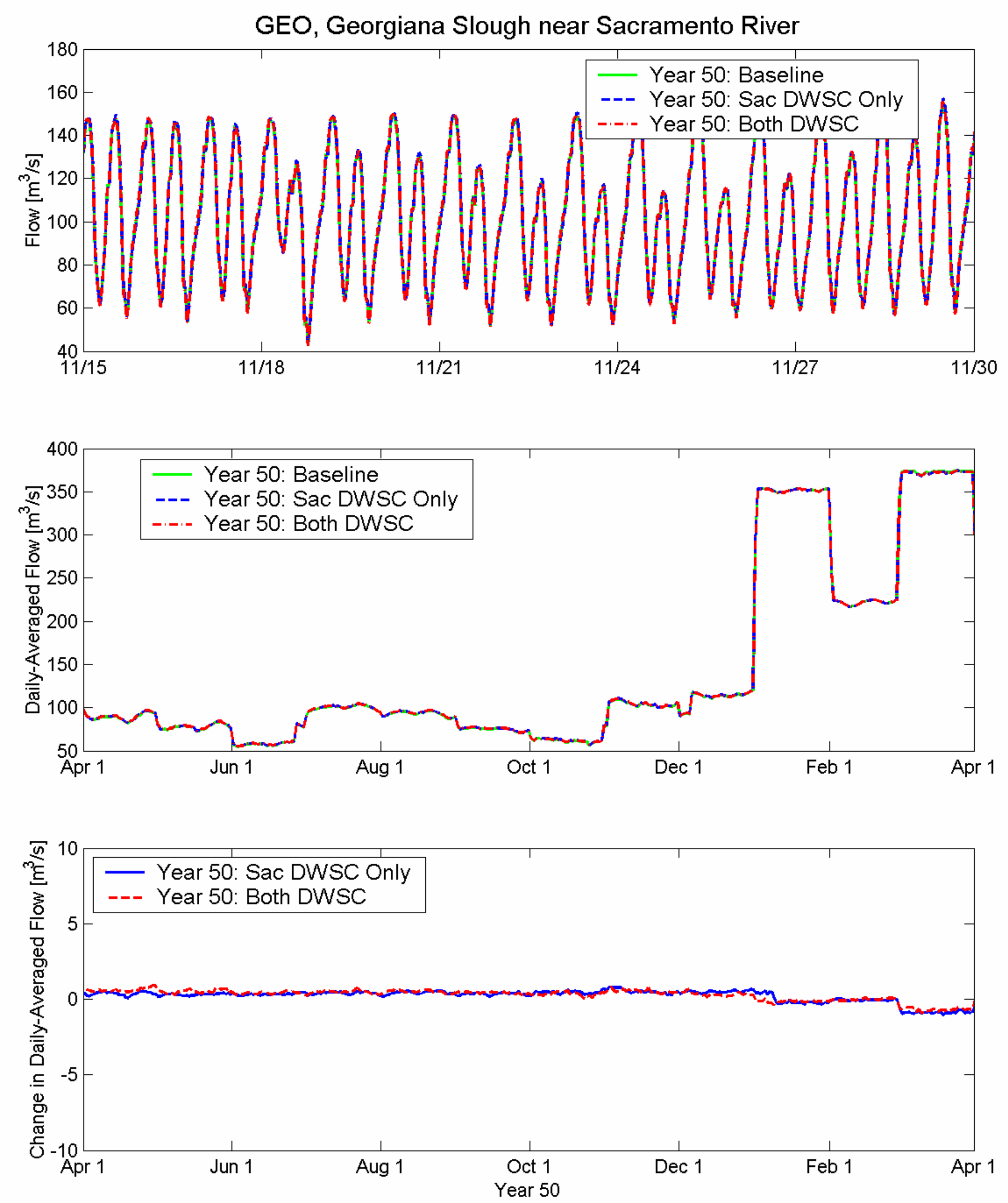


Figure 5.2-28 Predicted flow at Georgiana Slough near Sacramento River (GEO) for the Year 50 Baseline scenario, the Year 50 Sacramento DWSC Only Deepening scenario, and the Year 50 Both DWSC Deepening scenario: tidal time-scale variability over a 15-day period (top); daily-averaged flow for the Year 50 simulation period (middle); predicted increase in daily-averaged flow for the Year 50 Sacramento DWSC Only Deepening scenario and the Year 50 Both DWSC Deepening scenario relative to the Year 50 Baseline scenario (bottom).

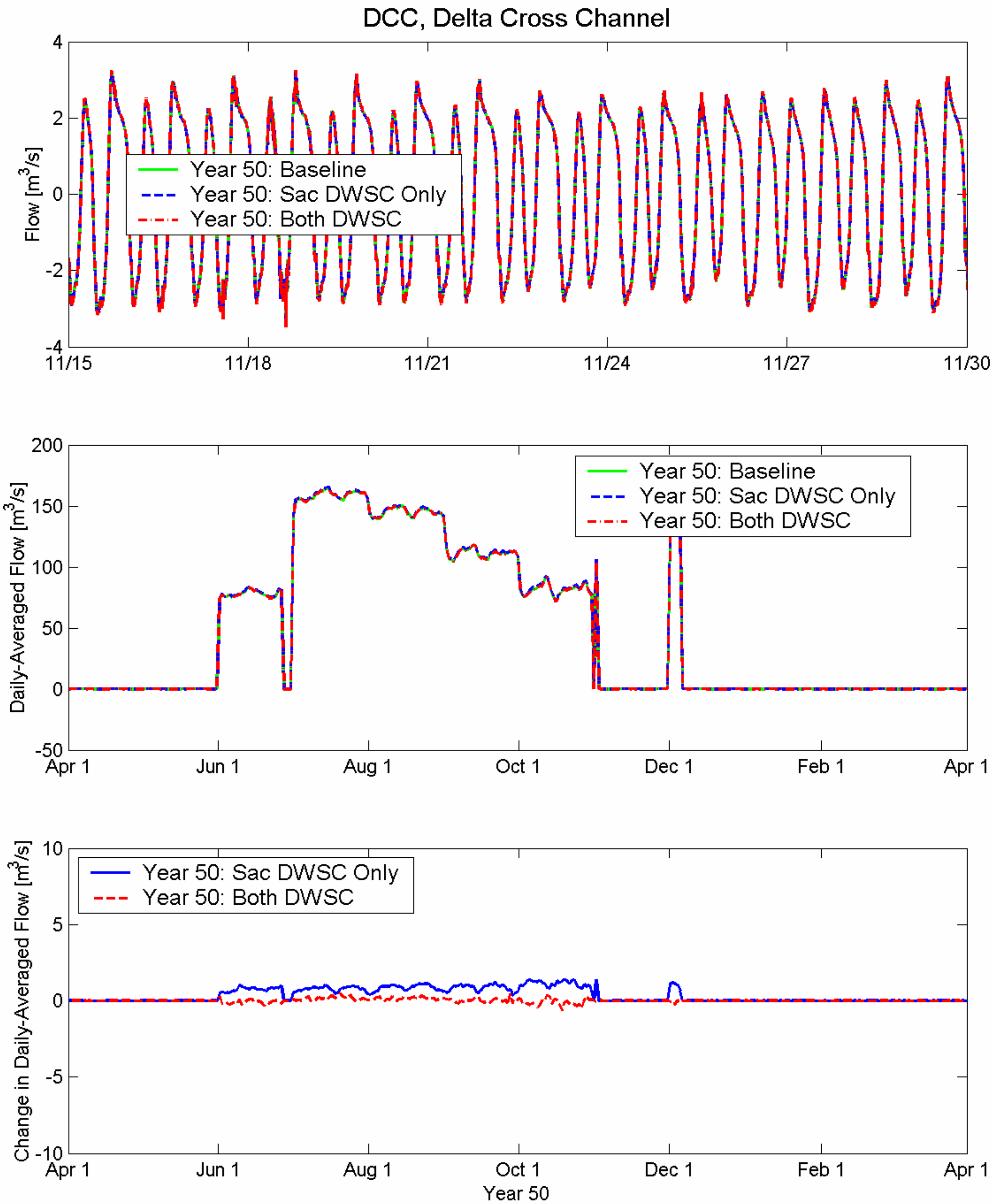


Figure 5.2-29 Predicted flow at the Delta Cross Channel (DCC) for the Year 50 Baseline scenario, the Year 50 Sacramento DWSC Only Deepening scenario, and the Year 50 Both DWSC Deepening scenario: tidal time-scale variability over a 15-day period (top); daily-averaged flow for the Year 50 simulation period (middle); predicted increase in daily-averaged flow for the Year 50 Sacramento DWSC Only Deepening scenario and the Year 50 Both DWSC Deepening scenario relative to the Year 50 Baseline scenario (bottom).

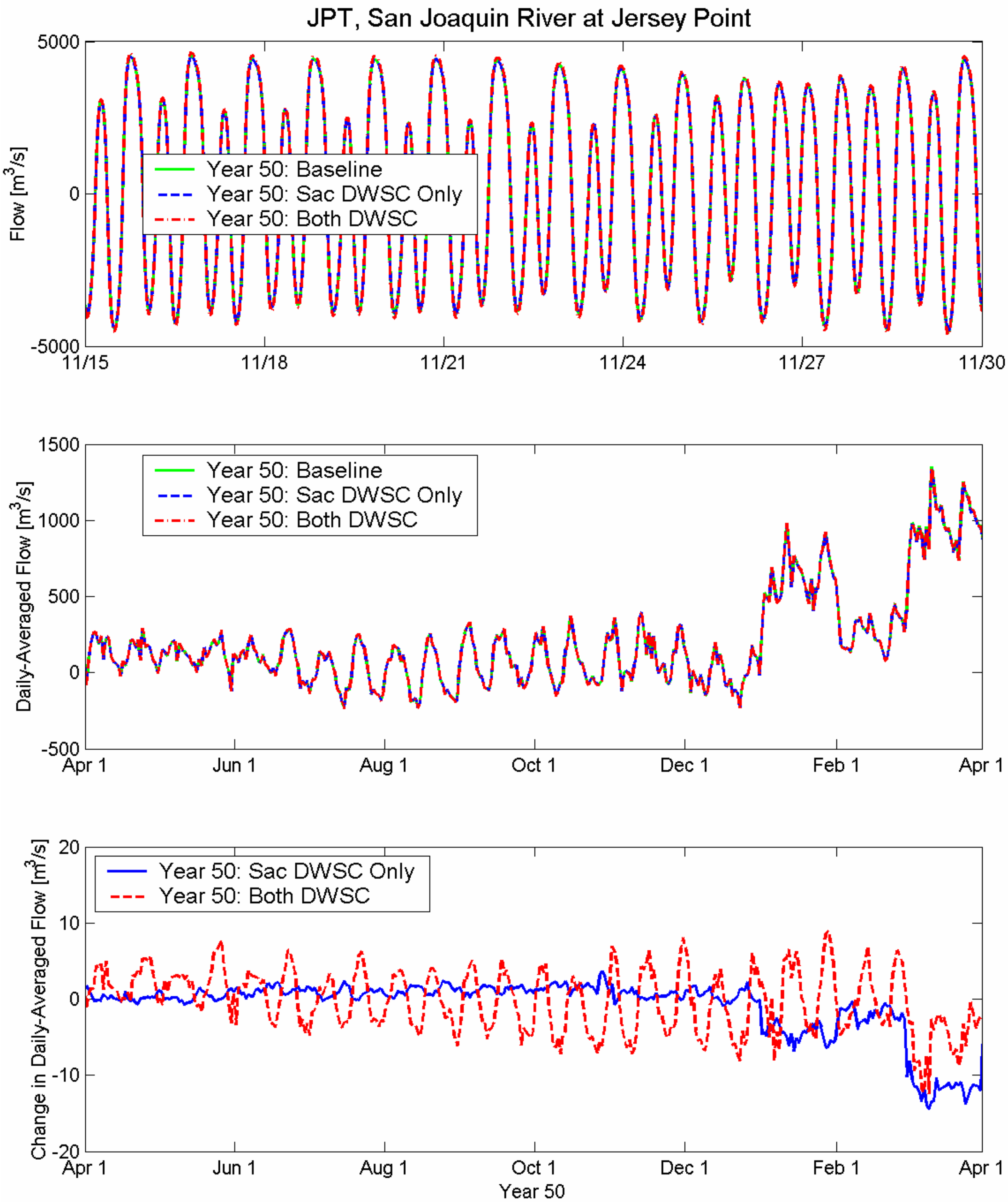


Figure 5.2-30 Predicted flow at San Joaquin River at Jersey Point (JPT) for the Year 50 Baseline scenario, the Year 50 Sacramento DWSC Only Deepening scenario, and the Year 50 Both DWSC Deepening scenario: tidal time-scale variability over a 15-day period (top); daily-averaged flow for the Year 50 simulation period (middle); predicted increase in daily-averaged flow for the Year 50 Sacramento DWSC Only Deepening scenario and the Year 50 Both DWSC Deepening scenario relative to the Year 50 Baseline scenario (bottom).

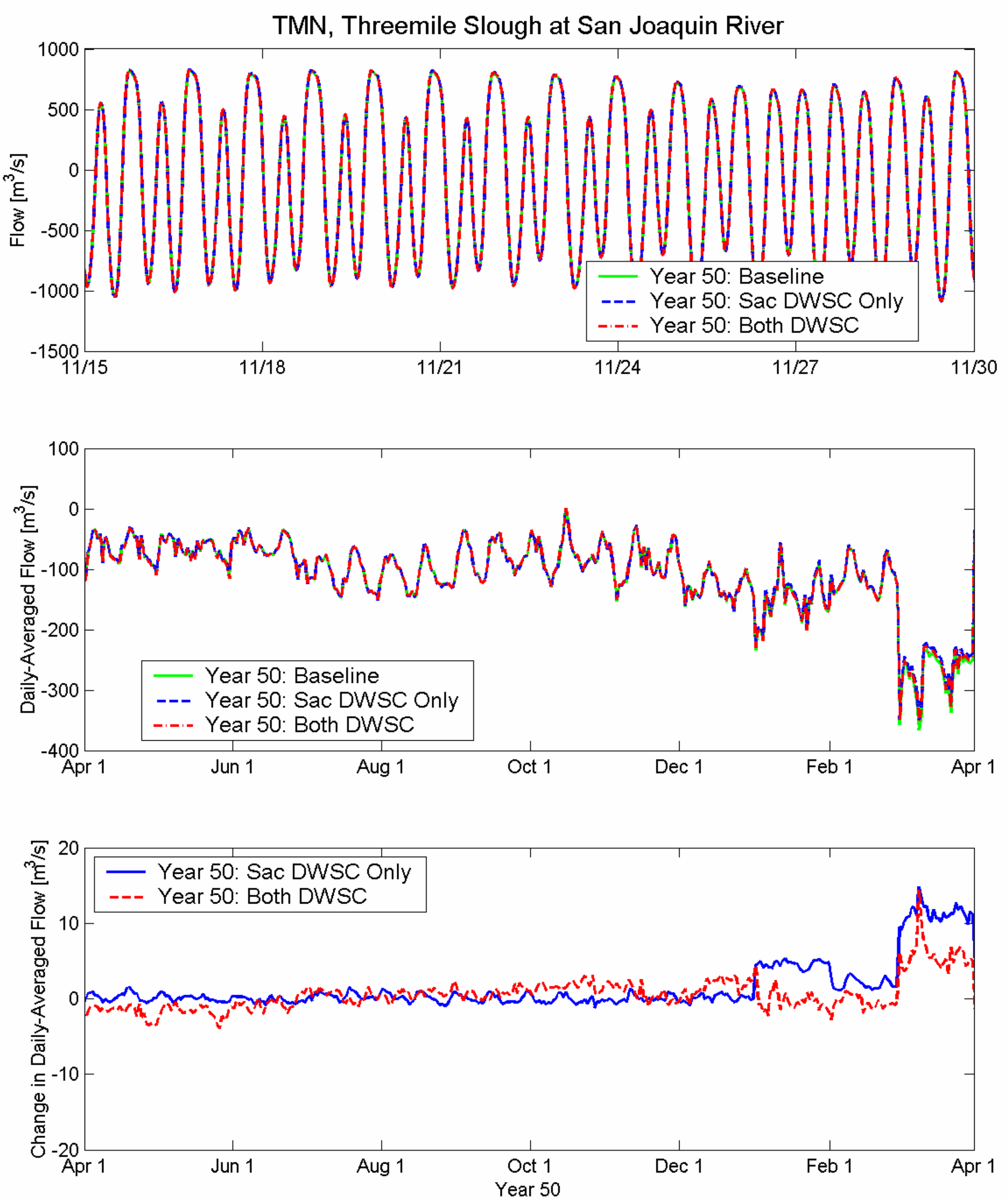


Figure 5.2-31 Predicted flow at Threemile Slough at San Joaquin River (TMN) for the Year 50 Baseline scenario, the Year 50 Sacramento DWSC Only Deepening scenario, and the Year 50 Both DWSC Deepening scenario: tidal time-scale variability over a 15-day period (top); daily-averaged flow for the Year 50 simulation period (middle); predicted increase in daily-averaged flow for the Year 50 Sacramento DWSC Only Deepening scenario and the Year 50 Both DWSC Deepening scenario relative to the Year 50 Baseline scenario (bottom).

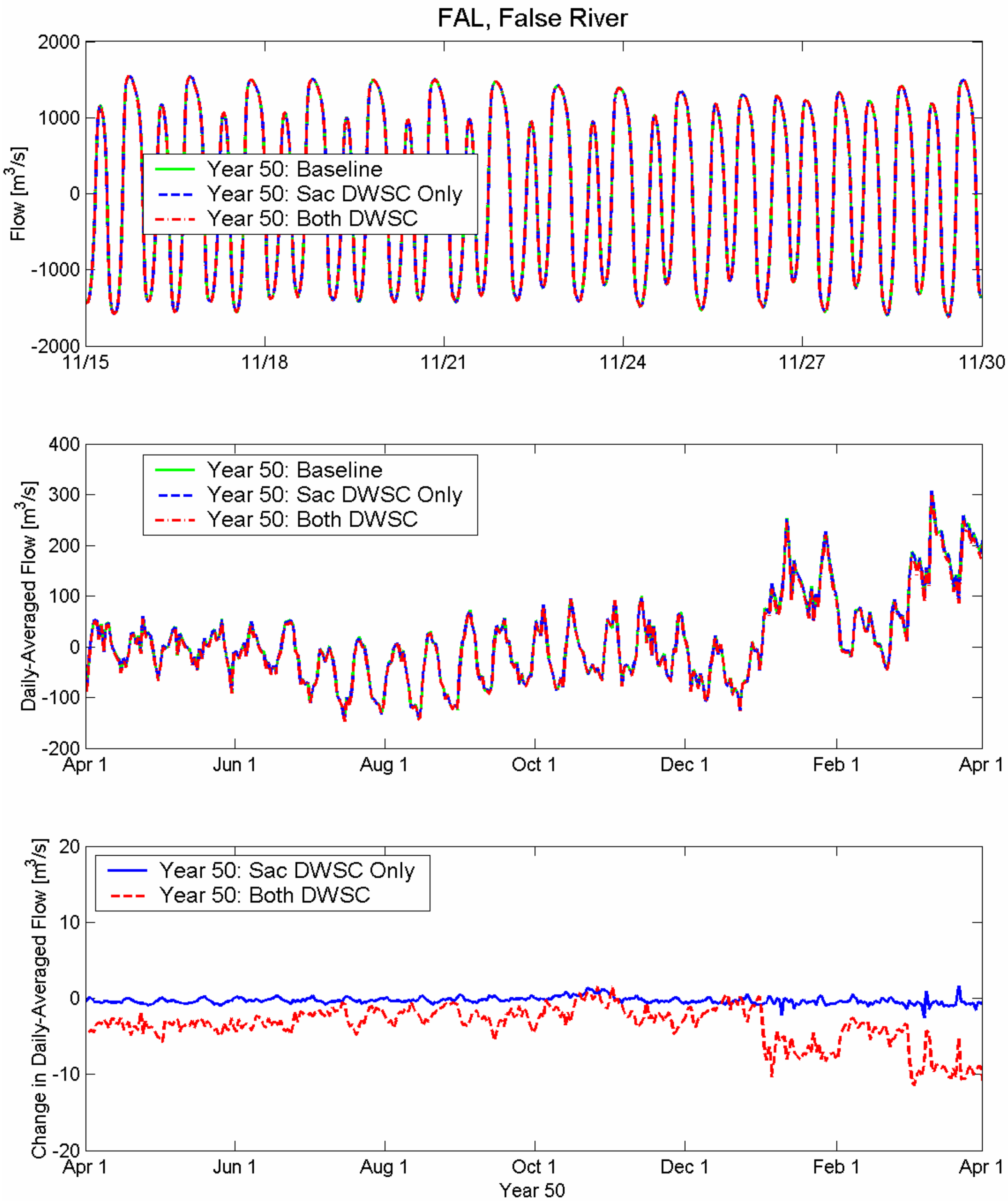


Figure 5.2-32 Predicted flow at False River (FAL) for the Year 50 Baseline scenario, the Year 50 Sacramento DWSC Only Deepening scenario, and the Year 50 Both DWSC Deepening scenario: tidal time-scale variability over a 15-day period (top); daily-averaged flow for the Year 50 simulation period (middle); predicted increase in daily-averaged flow for the Year 50 Sacramento DWSC Only Deepening scenario and the Year 50 Both DWSC Deepening scenario relative to the Year 50 Baseline scenario (bottom).

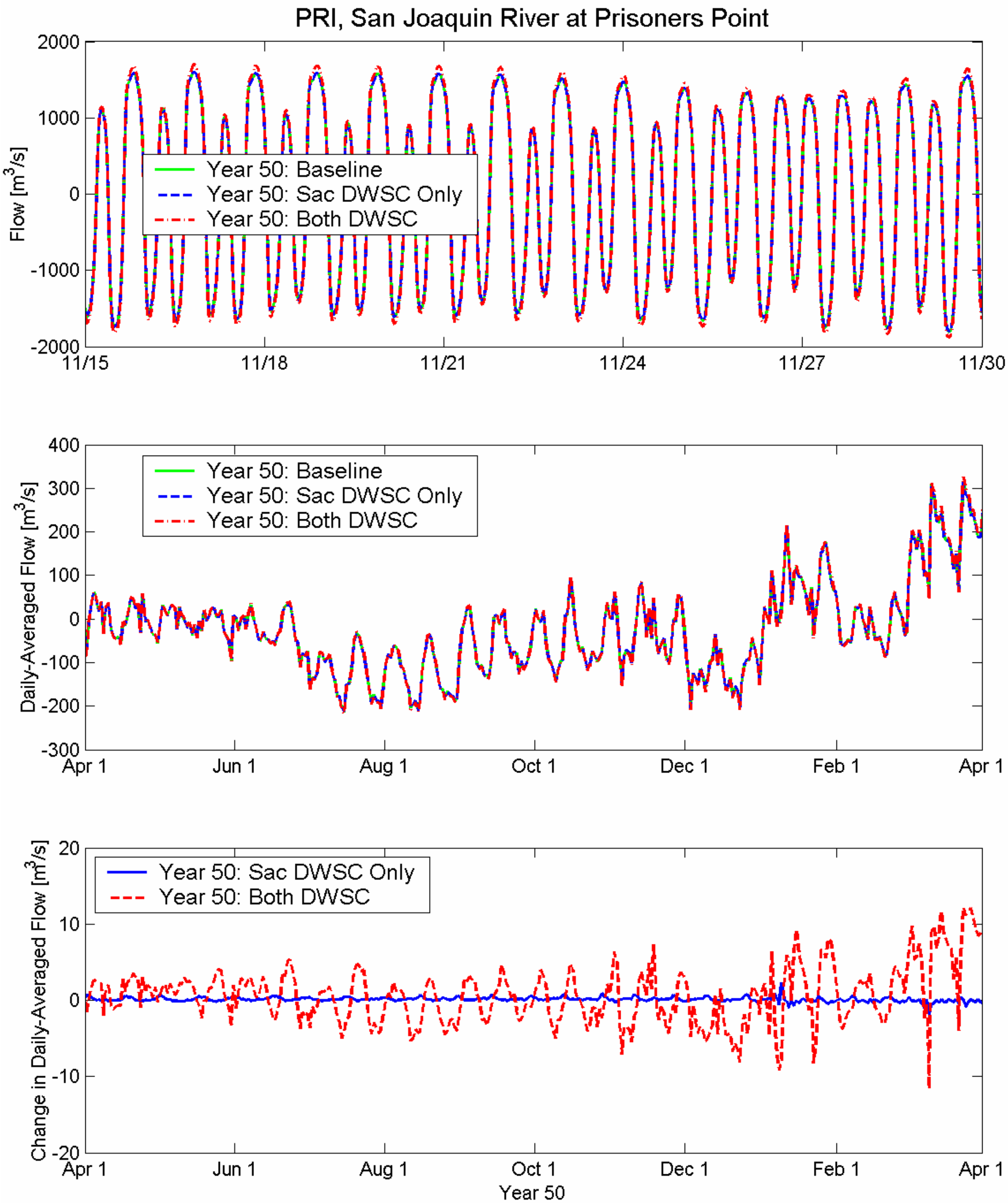


Figure 5.2-33 Predicted flow at San Joaquin River at Prisoners Point (PRI) for the Year 50 Baseline scenario, the Year 50 Sacramento DWSC Only Deepening scenario, and the Year 50 Both DWSC Deepening scenario: tidal time-scale variability over a 15-day period (top); daily-averaged flow for the Year 50 simulation period (middle); predicted increase in daily-averaged flow for the Year 50 Sacramento DWSC Only Deepening scenario and the Year 50 Both DWSC Deepening scenario relative to the Year 50 Baseline scenario (bottom).

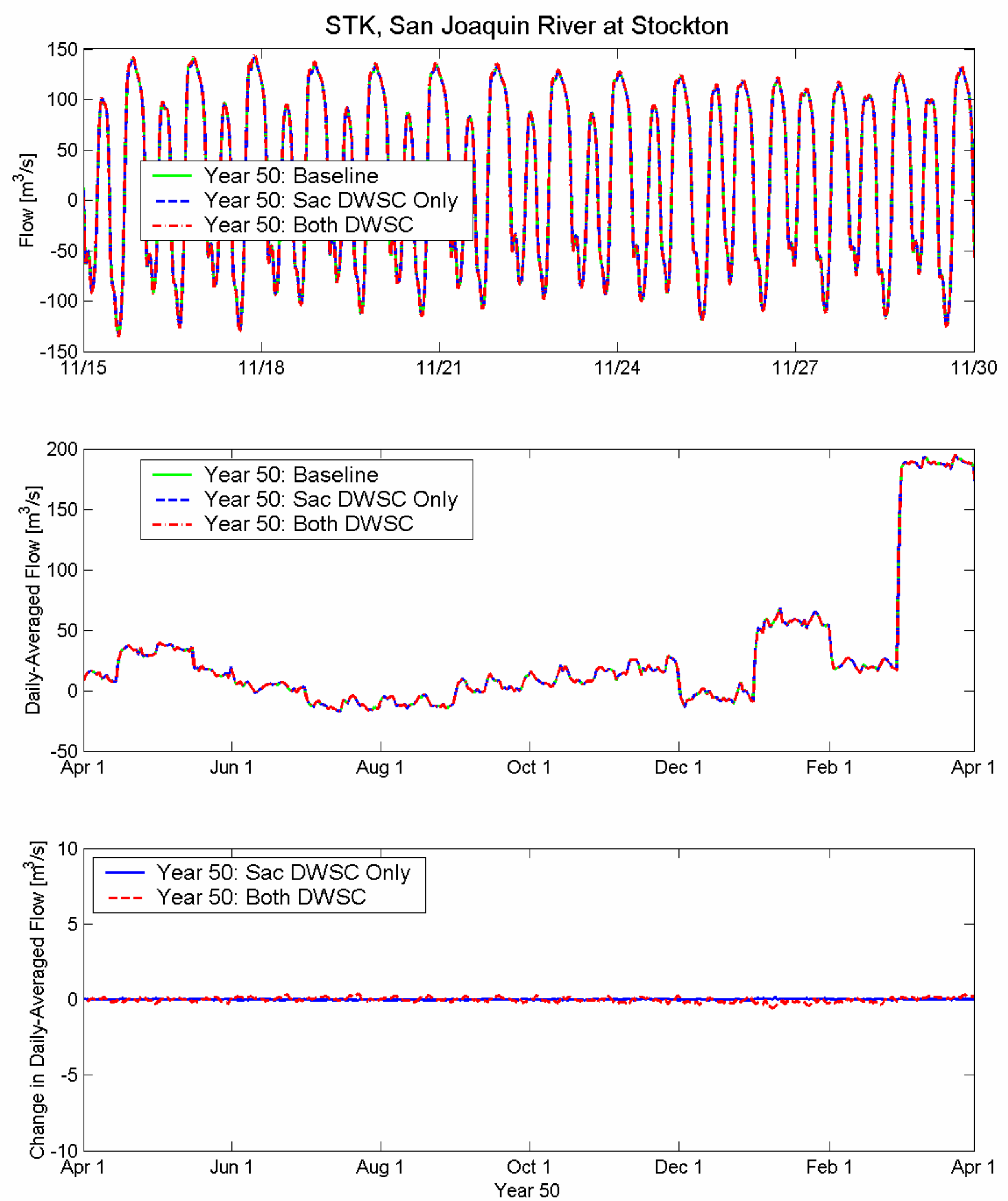


Figure 5.2-34 Predicted flow at San Joaquin River at Stockton (STK) for the Year 50 Baseline scenario, the Year 50 Sacramento DWSC Only Deepening scenario, and the Year 50 Both DWSC Deepening scenario: tidal time-scale variability over a 15-day period (top); daily-averaged flow for the Year 50 simulation period (middle); predicted increase in daily-averaged flow for the Year 50 Sacramento DWSC Only Deepening scenario and the Year 50 Both DWSC Deepening scenario relative to the Year 50 Baseline scenario (bottom).

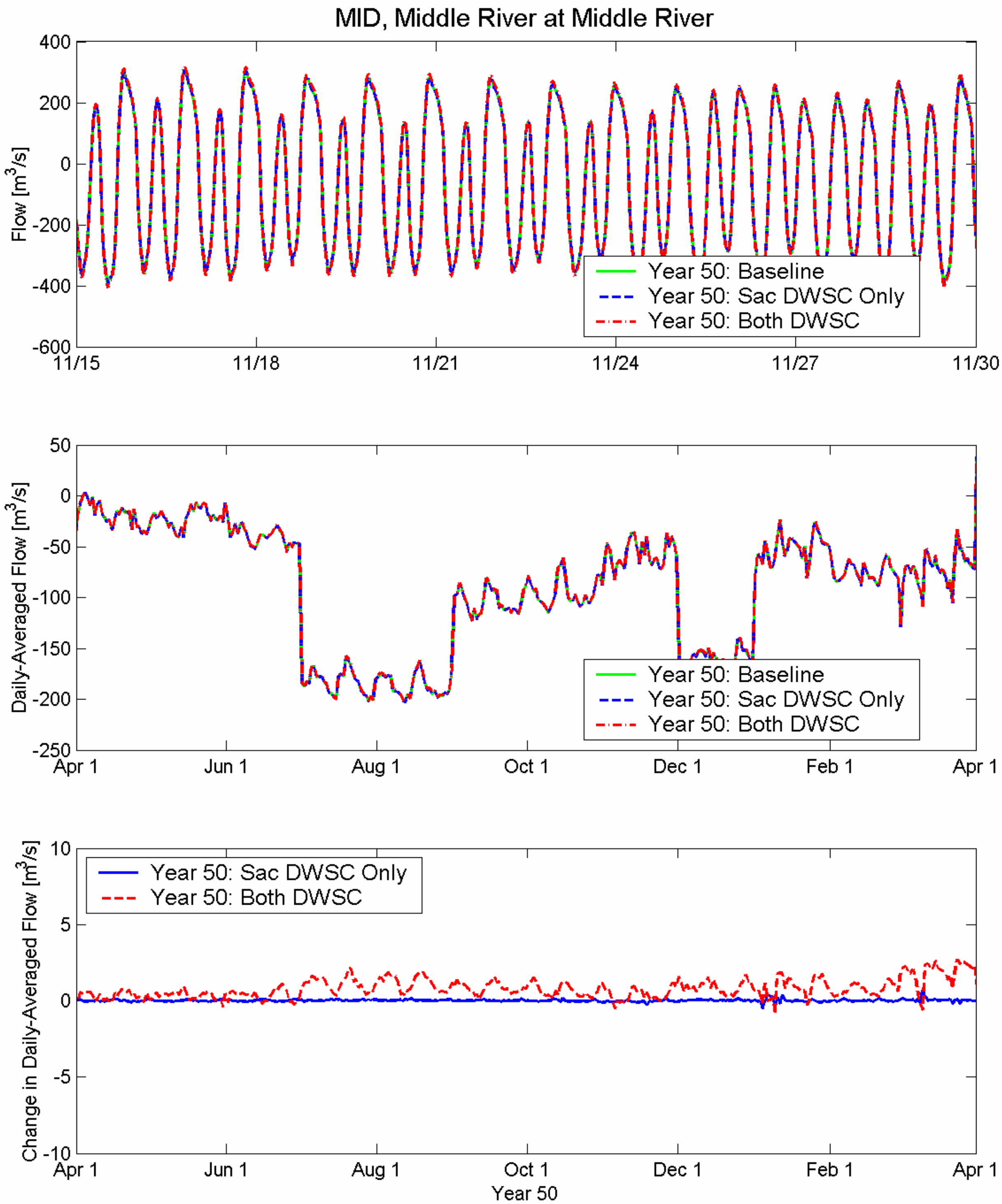


Figure 5.2-35 Predicted flow at Middle River at Middle River (MID) for the Year 50 Baseline scenario, the Year 50 Sacramento DWSC Only Deepening scenario, and the Year 50 Both DWSC Deepening scenario: tidal time-scale variability over a 15-day period (top); daily-averaged flow for the Year 50 simulation period (middle); predicted increase in daily-averaged flow for the Year 50 Sacramento DWSC Only Deepening scenario and the Year 50 Both DWSC Deepening scenario relative to the Year 50 Baseline scenario (bottom).

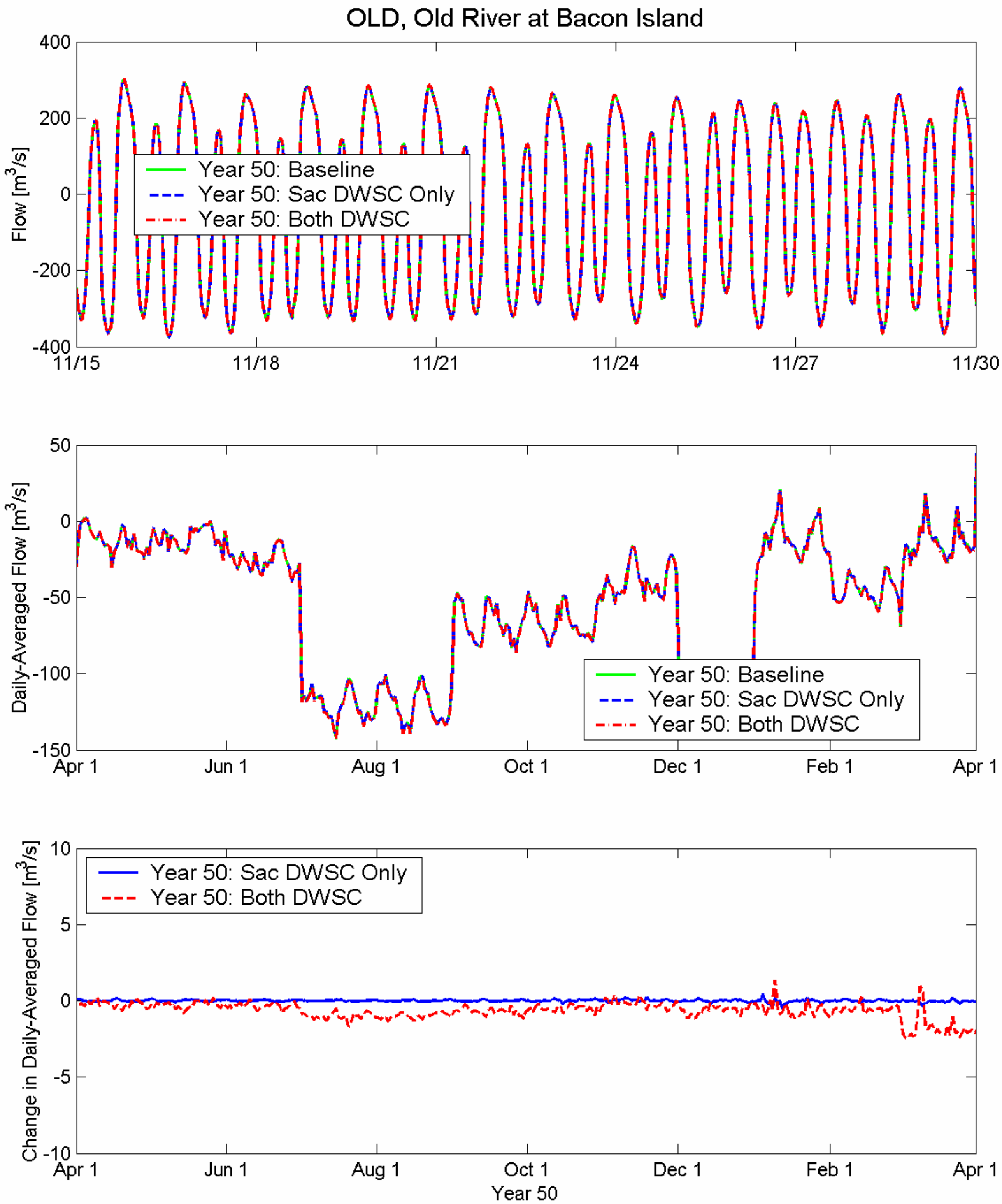


Figure 5.2-36 Predicted flow at Old River at Bacon Island (OLD) for the Year 50 Baseline scenario, the Year 50 Sacramento DWSC Only Deepening scenario, and the Year 50 Both DWSC Deepening scenario: tidal time-scale variability over a 15-day period (top); daily-averaged flow for the Year 50 simulation period (middle); predicted increase in daily-averaged flow for the Year 50 Sacramento DWSC Only Deepening scenario and the Year 50 Both DWSC Deepening scenario relative to the Year 50 Baseline scenario (bottom).

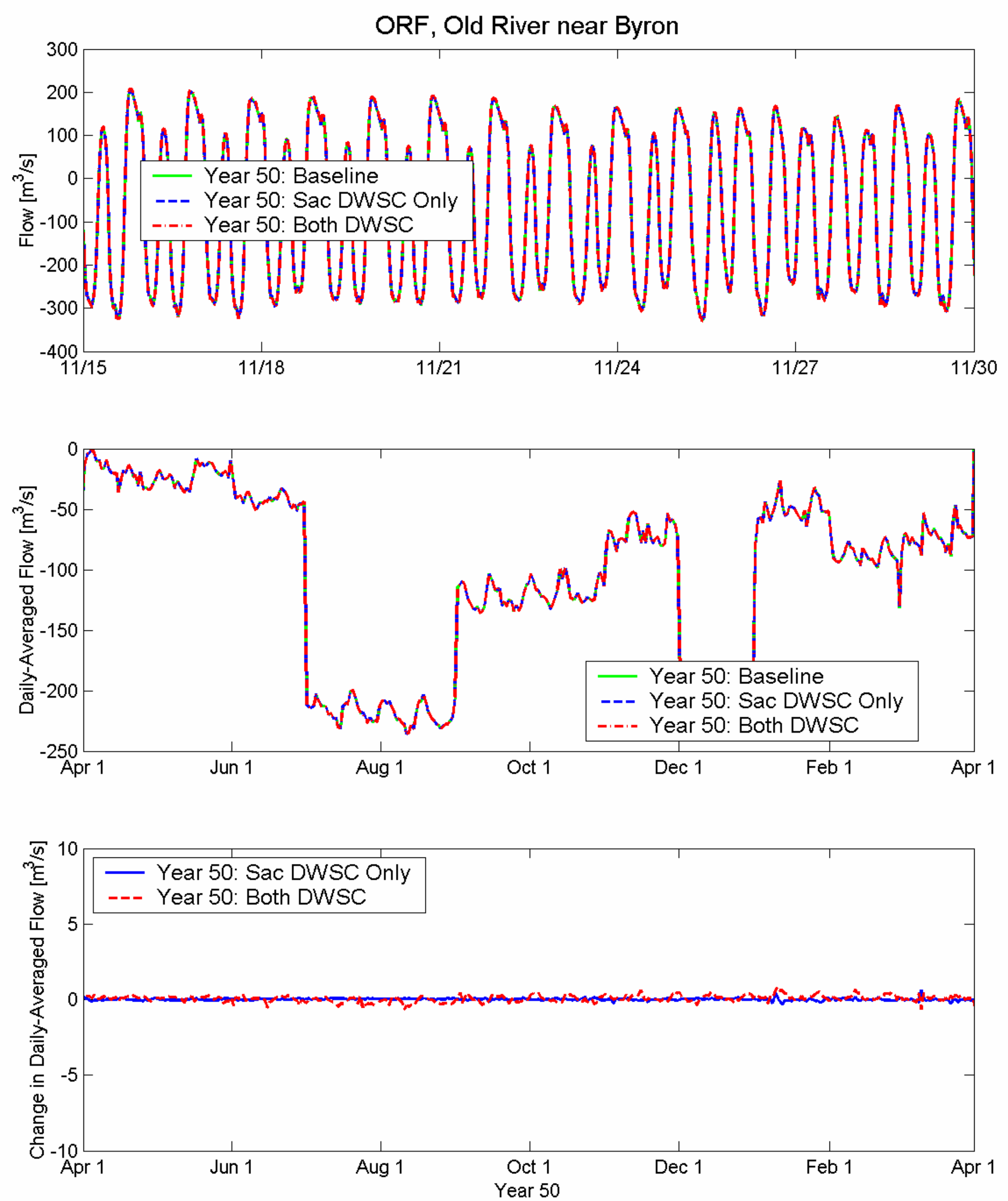


Figure 5.2-37 Predicted flow at Old River near Byron (ORF) for the Year 50 Baseline scenario, the Year 50 Sacramento DWSC Only Deepening scenario, and the Year 50 Both DWSC Deepening scenario: tidal time-scale variability over a 15-day period (top); daily-averaged flow for the Year 50 simulation period (middle); predicted increase in daily-averaged flow for the Year 50 Sacramento DWSC Only Deepening scenario and the Year 50 Both DWSC Deepening scenario relative to the Year 50 Baseline scenario (bottom).

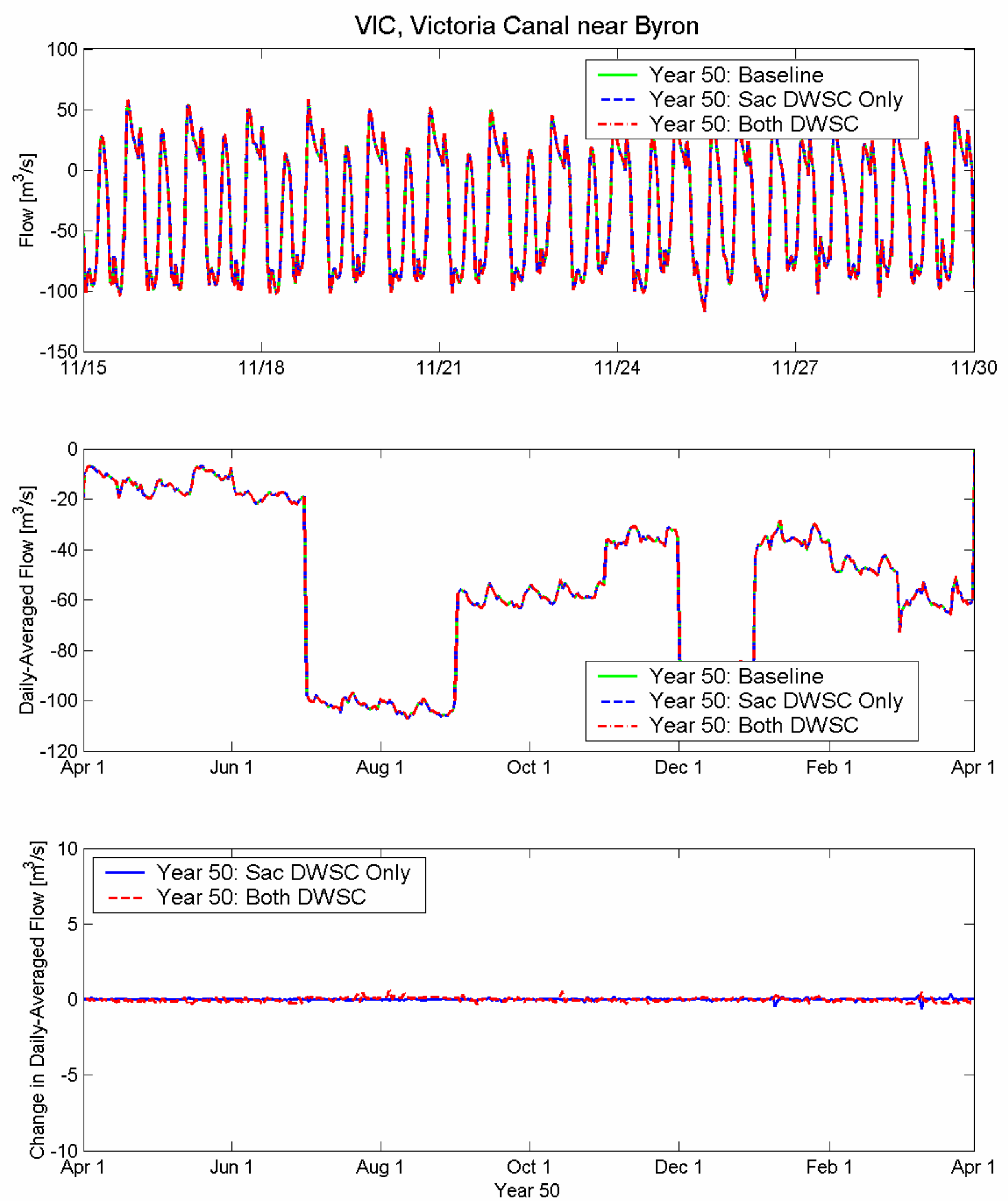


Figure 5.2-38 Predicted flow at Victoria Canal near Byron (VIC) for the Year 50 Baseline scenario, the Year 50 Sacramento DWSC Only Deepening scenario, and the Year 50 Both DWSC Deepening scenario: tidal time-scale variability over a 15-day period (top); daily-averaged flow for the Year 50 simulation period (middle); predicted increase in daily-averaged flow for the Year 50 Sacramento DWSC Only Deepening scenario and the Year 50 Both DWSC Deepening scenario relative to the Year 50 Baseline scenario (bottom).

5.3 Evaluation of Salinity Impacts on X2

For each scenario simulation, the daily-averaged salinity along the transects shown on Figure 3.3-4 were used to compute the predicted X2, measured from the Golden Gate, along both the Sacramento and San Joaquin River transects. The "average X2" was also computed by averaging the computed X2 distance measured along the two transects, as described in Section 3.3.3.

5.3.1 Year 50 Sacramento DWSC Only Deepening

Figure 5.3-1 shows the predicted daily-averaged salinity profile along the axis of San Francisco Bay from the Golden Gate to the Port of Sacramento on October 24, the day of maximum predicted X2, for the Year 50 Baseline scenario and the Year 50 Sacramento DWSC Only Deepening scenario. The vertical red line indicates the position of the Sacramento transect X2 for the Year 50 Baseline scenario. On October 24 the predicted X2 measured along the Sacramento transect is 96.5 km for the Year 50 Baseline scenario, and 97.8 km for the Year 50 Sacramento DWSC Only Deepening scenario (an increase of 1.3 km).

Figure 5.3-2 shows the predicted daily-averaged salinity profile along the axis of San Francisco Bay from the Golden Gate to the Port of Stockton on October 24, the day of maximum predicted X2, for the Year 50 Baseline scenario and the Year 50 Sacramento DWSC Only Deepening scenario. The vertical red line indicates the position of the San Joaquin transect X2 for the Year 50 Baseline scenario. On October 24 the predicted X2 measured along the San Joaquin transect is 94.6 km for the Year 50 Baseline scenario, and 94.8 km for the Year 50 Sacramento DWSC Only Deepening scenario (an increase of 0.2 km).

Figure 5.3-3 shows the predicted X2 measured from the Golden Gate to the Port of Sacramento during the Year 50 simulation period for the Year 50 Baseline scenario and the Year 50 Sacramento DWSC Only Deepening scenario. For the periods from April through June and January through March, the predicted X2 along the Sacramento transect (Figure 5.3-3) for the Year 50 Baseline scenario is nearly identical to the predicted X2 along the Sacramento transect for the Year 50 Sacramento DWSC Only Deepening scenario. This suggests that the deepening of the Sacramento DWSC only affects X2 during the summer to early winter period when X2 is past Collinsville. Between July and January, salt intrusion into the region of the Sacramento DWSC leads to enhanced gravitational circulation under the Year 50 Sacramento DWSC Only Deepening scenario relative to the Year 50 Baseline scenario.

Figure 5.3-4 shows the predicted X2 measured from the Golden Gate to the Port of Stockton during the Year 50 simulation period for the Year 50 Baseline scenario and the Year 50 Sacramento DWSC Only Deepening scenario. The Year 50 Sacramento DWSC Only Deepening scenario results in only a very small increase in X2 measured along the San Joaquin transect. This shows that the deepening of the Sacramento DWSC Only has a relatively small impact on salt intrusion along the San Joaquin River side of the Delta.

Figure 5.3-5 shows the predicted "average X2" measured from the Golden Gate during the Year 50 simulation period for the Year 50 Baseline scenario and the Year 50 Sacramento DWSC Only

Deepening scenario. Because the Year 50 Sacramento DWSC Only Deepening scenario has a more pronounced impact on salt intrusion on the Sacramento transect than the San Joaquin transect, the computed change in “average X2” (Figure 5.3-5) shows a smaller increase in X2 than is predicted along the Sacramento transect (Figure 5.3-3). On October 24 the predicted “average X2” is 95.6 km for the Year 50 Baseline scenario and 96.3 km for the Year 50 Sacramento DWSC Only Deepening scenario (an increase of 0.7 km). The 0.7 km increase in “average X2” is significantly less than the 1.3 km increase in X2 predicted along the Sacramento transect on October 24.

Figure 5.3-6 shows the cumulative number of days during the year that the change in predicted X2 measured along the Sacramento transect for the Year 50 Sacramento DWSC Only Deepening scenario exceeds the corresponding Sacramento transect X2 predicted under the Year 50 Baseline Scenario by a specific distance. The maximum change in X2 measured along the Sacramento transect during the Year 50 Sacramento DWSC Only Deepening scenario is 1.94 km. A change in X2 measured along the Sacramento transect of 1.0 km or more is predicted on 23 days for the Year 50 Sacramento DWSC Only Deepening scenario. A change in X2 measured along the Sacramento transect of 0.5 km or more is predicted on 106 days. The median predicted change in X2 measured along the Sacramento transect under the Year 50 Sacramento DWSC Only Deepening scenario is 0.24 km. For 182 days during the year under the Year 50 Sacramento DWSC Only Deepening scenario, the predicted change in X2 measured along the Sacramento transect is more than 0.24 km, whereas for 182 days the predicted change in X2 measured along the Sacramento transect under the Year 50 Sacramento DWSC Only Deepening scenario is less than 0.24 km.

Figure 5.3-7 shows the cumulative number of days during the year that the change in predicted X2 measured along the San Joaquin transect for the Year 50 Sacramento DWSC Only Deepening scenario exceeds the corresponding San Joaquin transect X2 predicted under the Year 50 Baseline Scenario by a specific distance. The maximum change in X2 measured along the San Joaquin transect during the Year 50 Sacramento DWSC Only Deepening scenario is 1.22 km. A change in X2 measured along the San Joaquin transect of 1.0 km or more is predicted on 1 day during the Year 50 Sacramento DWSC Only Deepening scenario. A change in X2 measured along the San Joaquin transect of 0.5 km or more is predicted on 1 day during the Year 50 Sacramento DWSC Only Deepening scenario. The median predicted change in X2 measured along the San Joaquin transect under the Year 50 Sacramento DWSC Only Deepening scenario is 0.04 km. For 182 days during the year under the Year 50 Sacramento DWSC Only Deepening scenario, the predicted change in X2 measured along the San Joaquin transect is more than 0.04 km, whereas for 182 days the predicted change in X2 measured along the San Joaquin transect under the Year 50 Sacramento DWSC Only Deepening scenario is less than 0.04 km.

Figure 5.3-8 shows the cumulative number of days during the year that the change in predicted average X2 for the Year 50 Sacramento DWSC Only Deepening scenario exceeds the corresponding average X2 predicted under the Year 50 Baseline Scenario by a specific distance. The maximum change in average X2 during the Year 50 Sacramento DWSC Only Deepening scenario is 1.05 km. A change of average X2 of 1.0 km or more is predicted on 1 day during the Year 50 Sacramento DWSC Only Deepening scenario. The median predicted change in average X2 under the Year 50 Sacramento DWSC Only Deepening scenario is 0.17 km. For 182 days during the year under the Year 50 Sacramento DWSC Only Deepening scenario, the predicted change in average X2 is more than 0.17 km, whereas for 182 days the predicted change in average X2 under the Year 50 Sacramento DWSC Only Deepening scenario is less than 0.17 km.

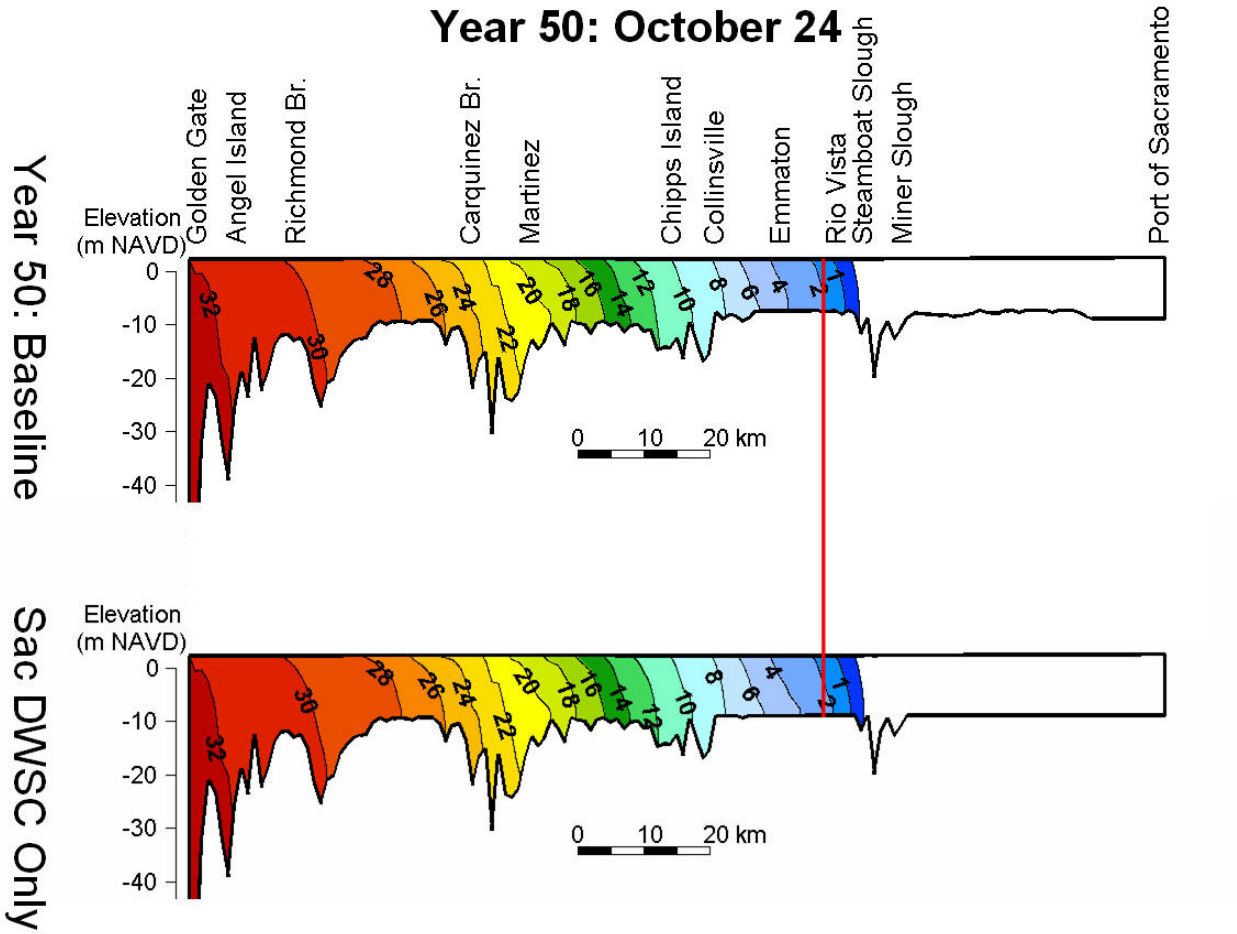


Figure 5.3-1 Predicted daily-averaged salinity profile along the axis of San Francisco Bay from the Golden Gate to the Port of Sacramento on October 24, the day of maximum predicted X2, for the Year 50 Baseline scenario (top) and the Year 50 Sacramento DWSC Only Deepening scenario (bottom). The vertical red line indicates X2 for the Year 50 Baseline scenario.

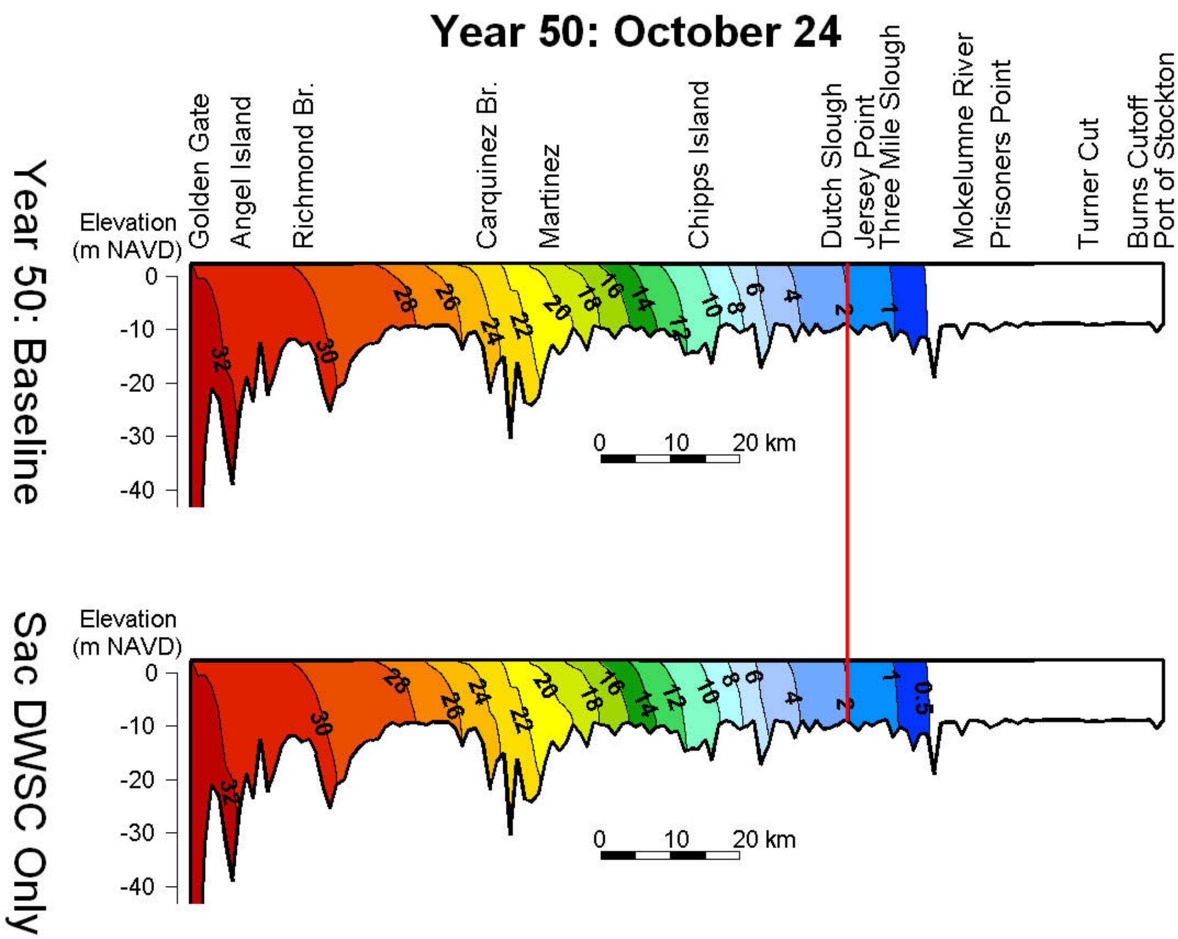


Figure 5.3-2 Predicted daily-averaged salinity profile along the axis of San Francisco Bay from the Golden Gate to the Port of Stockton on October 24, the day of maximum predicted X2, for the Year 50 Baseline scenario (top) and the Year 50 Sacramento DWSC Only Deepening scenario (bottom). The vertical red line indicates X2 for the Year 50 Baseline scenario.

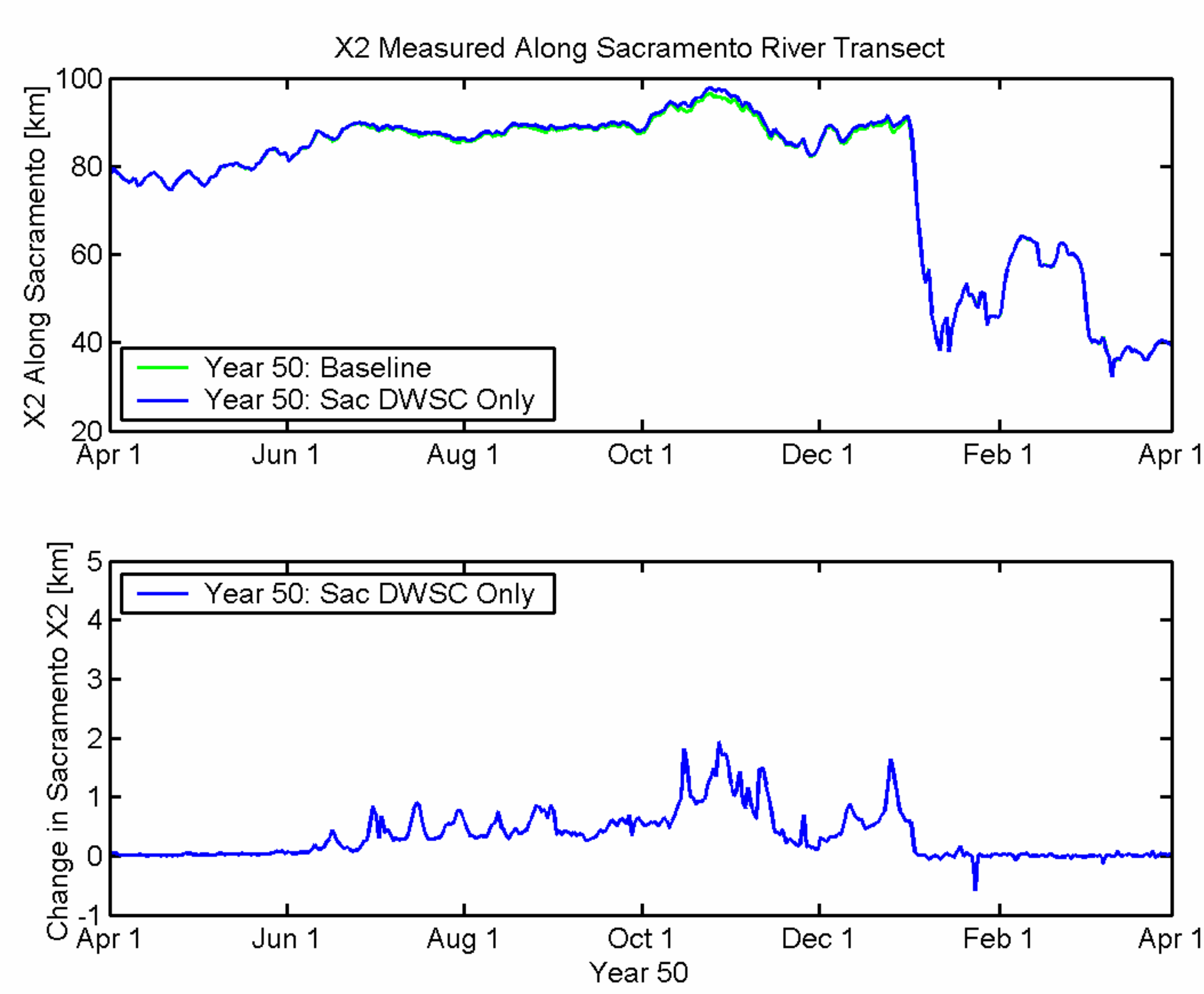


Figure 5.3-3 Predicted X2 measured from the Golden Gate to the Port of Sacramento along the Sacramento transect on Figure 3.3-4 for the Year 50 Baseline scenario and the Year 50 Sacramento DWSC Only Deepening scenario (top); Predicted change in X2 measured along the Sacramento transect relative to the Year 50 Baseline scenario for the Year 50 Sacramento DWSC Only Deepening scenario (bottom).

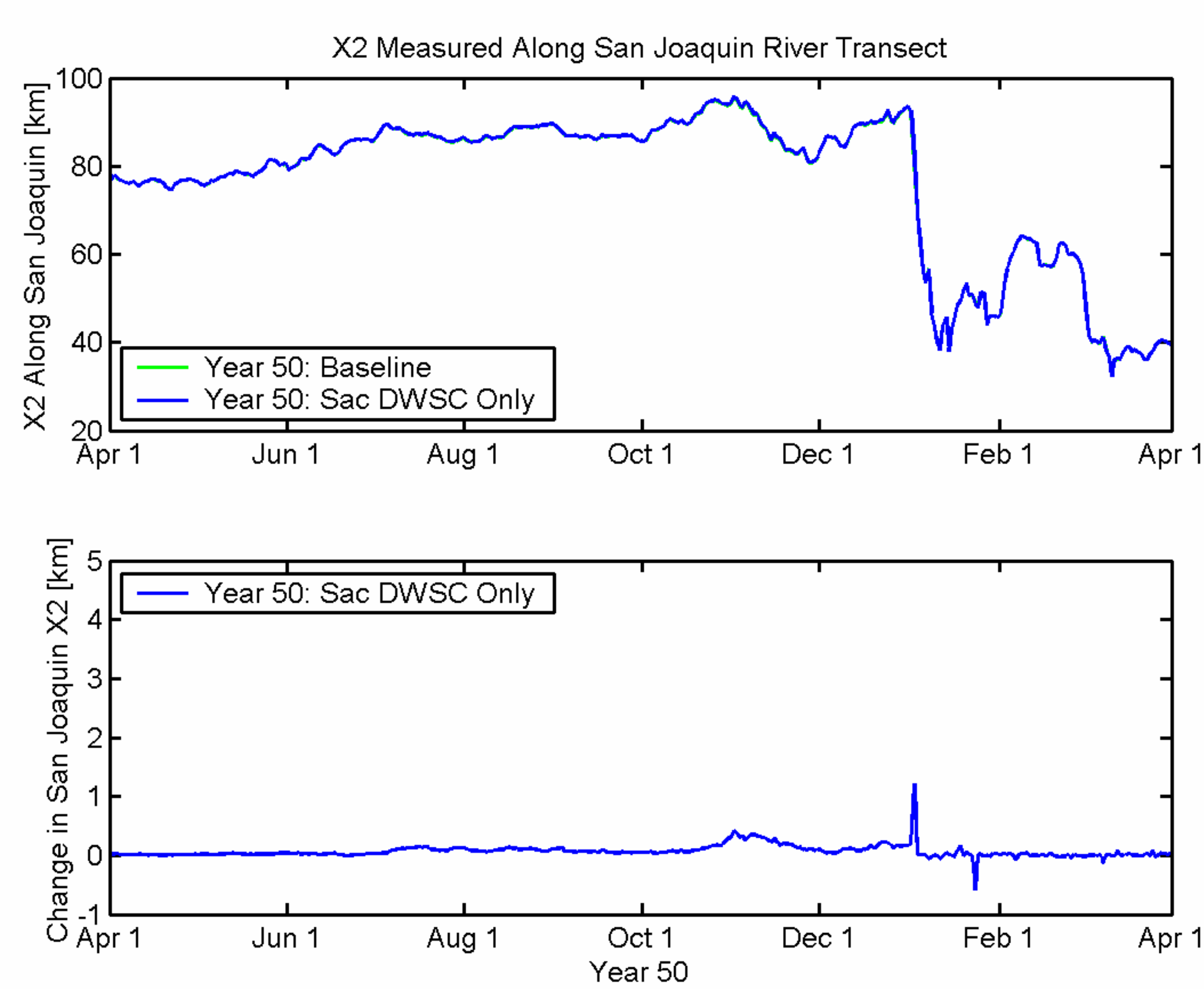


Figure 5.3-4 Predicted X2 measured from the Golden Gate to the Port of Stockton along the San Joaquin transect on Figure 3.3-4 for the Year 50 Baseline scenario and the Year 50 Sacramento DWSC Only Deepening scenario (top); Predicted change in X2 measured along the San Joaquin transect relative to the Year 50 Baseline scenario for the Year 50 Sacramento DWSC Only Deepening scenario (bottom).

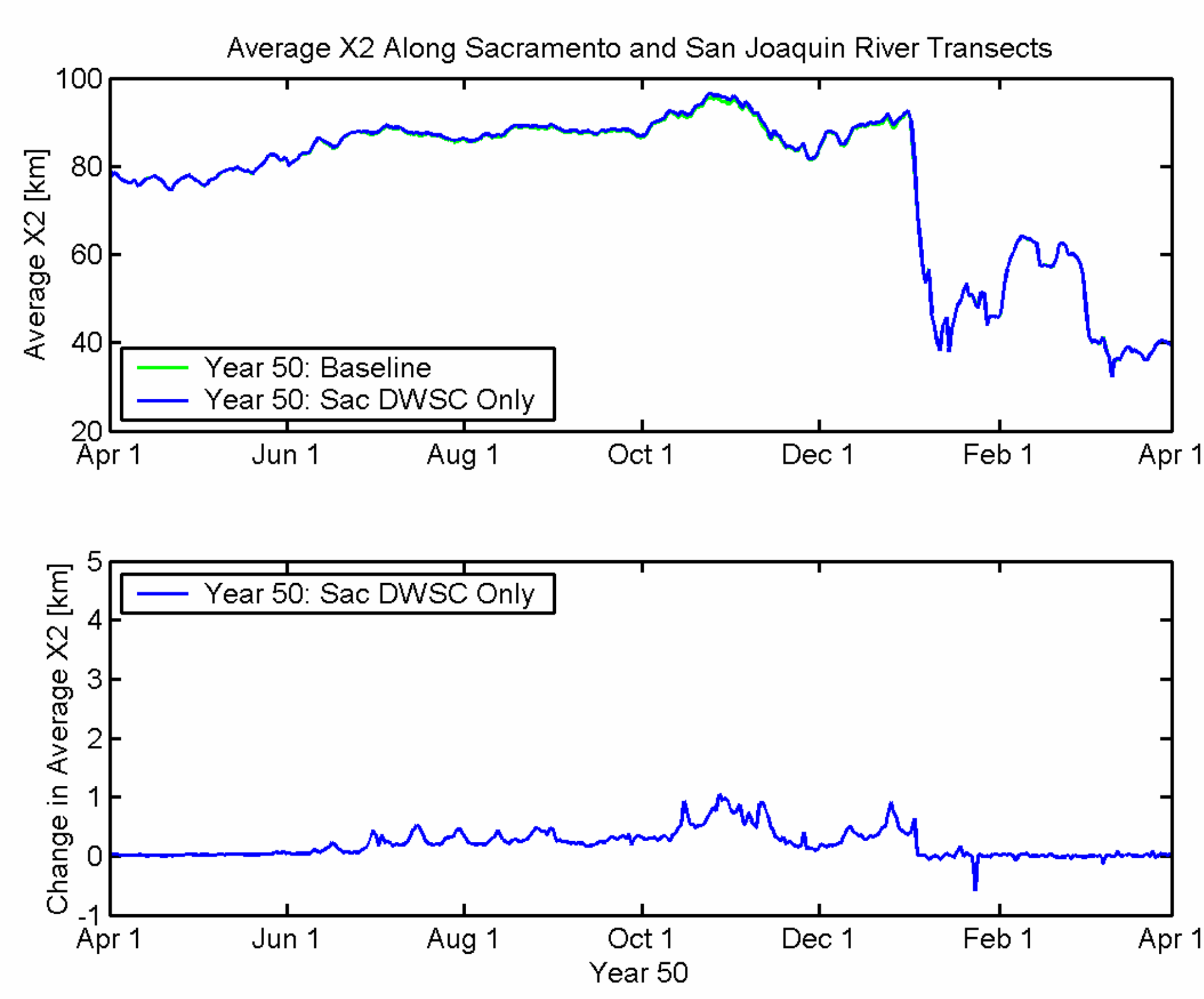


Figure 5.3-5 Predicted "average X2" for the Year 50 Baseline scenario and the Year 50 Sacramento DWSC Only Deepening scenario (top); Predicted change in "average X2" relative to the Year 50 Baseline scenario for the Year 50 Sacramento DWSC Only Deepening scenario (bottom).

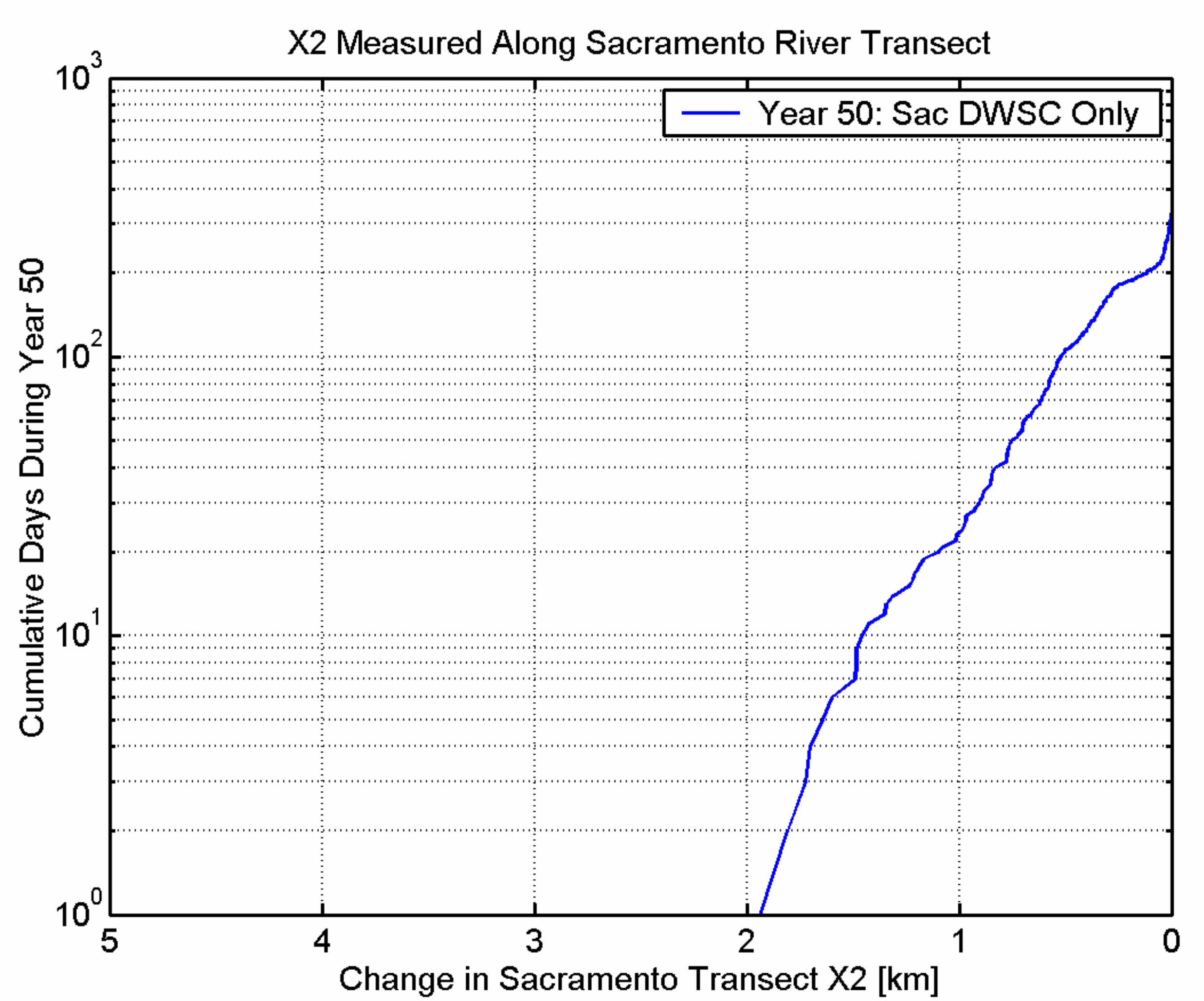


Figure 5.3-6 Cumulative number of days during the year that the change in predicted X2 measured along the Sacramento transect for the Year 50 Sacramento DWSC Only Deepening scenario exceeds the corresponding Sacramento transect X2 predicted under the Year 50 Baseline Scenario by a specific distance.

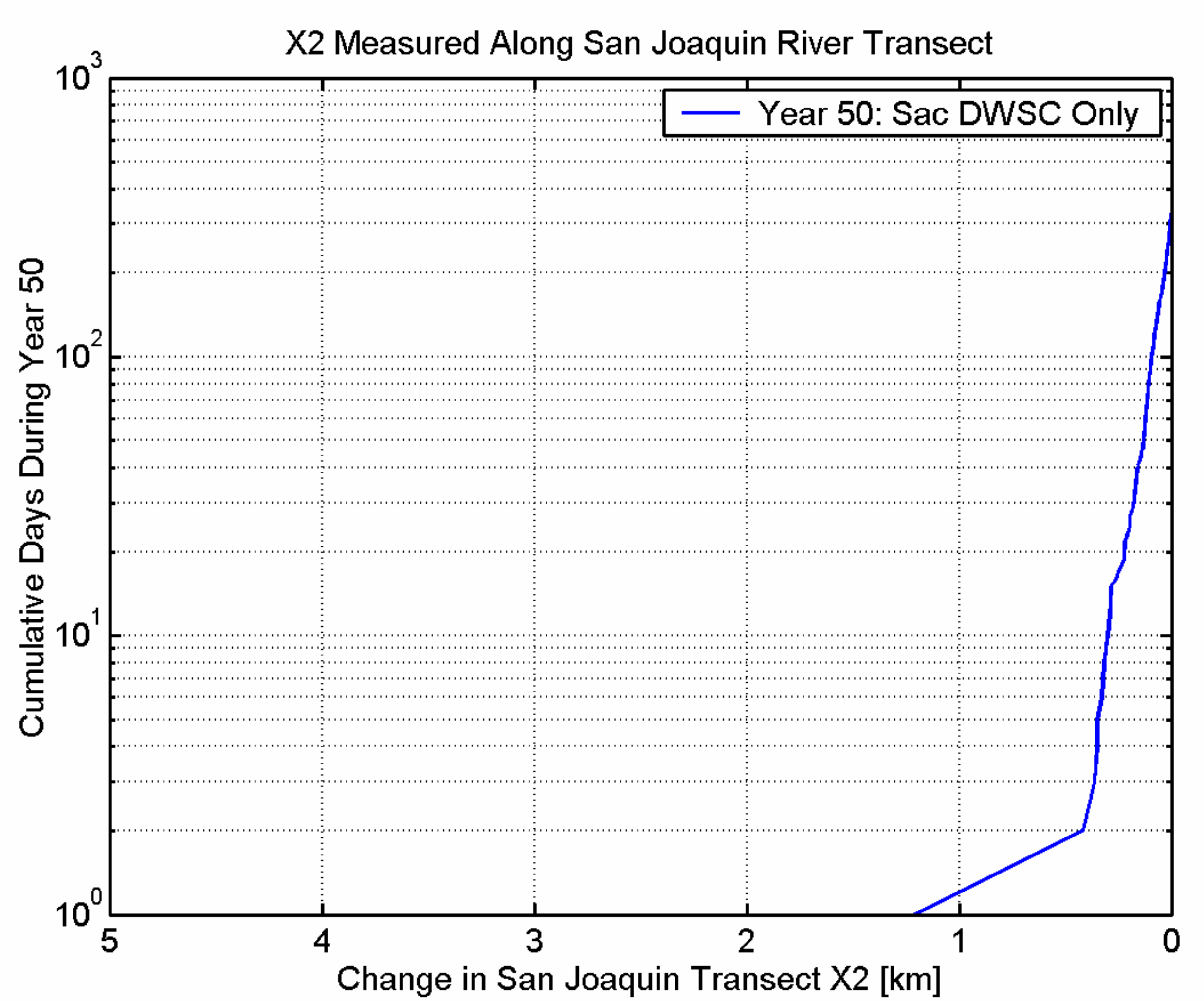


Figure 5.3-7 Cumulative number of days during the year that the change in predicted X2 measured along the San Joaquin transect for the Year 50 Sacramento DWSC Only Deepening scenario exceeds the corresponding San Joaquin transect X2 predicted under the Year 50 Baseline Scenario by a specific distance.

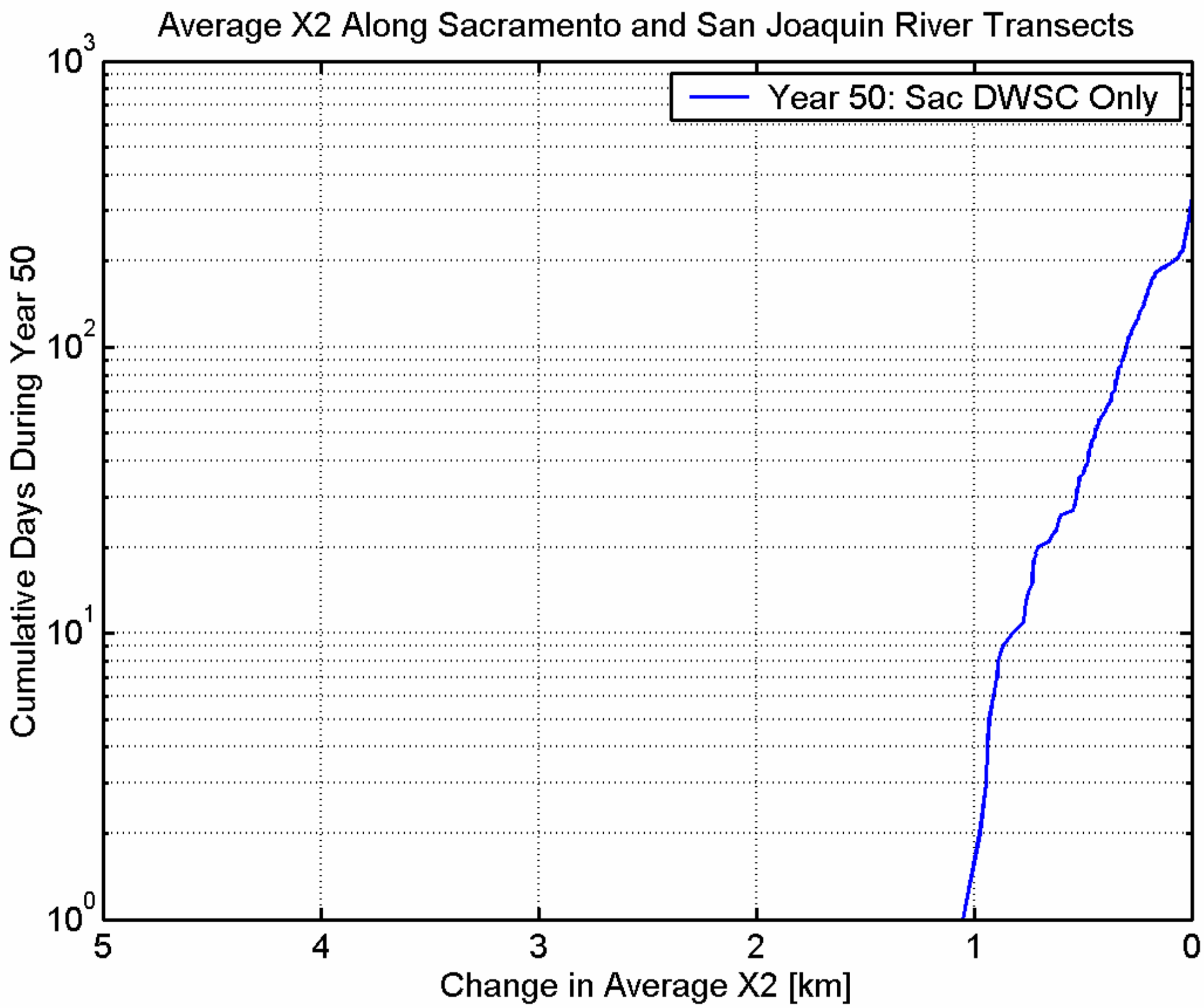


Figure 5.3-8 Cumulative number of days during the year that the change in predicted average X2 for the Year 50 Sacramento DWSC Only Deepening scenario exceeds the corresponding average X2 predicted under the Year 50 Baseline Scenario by a specific distance.

5.3.2 Year 50 Both Sacramento DWSC & SF Bay to Stockton DWSC Deepening

Figure 5.3-9 shows the predicted daily-averaged salinity profile along the axis of San Francisco Bay from the Golden Gate to the Port of Sacramento on October 24, the day of maximum predicted X2, for the Year 50 Baseline scenario, the Year 50 Sacramento DWSC Only Deepening scenario, and the Year 50 Both DWSC Deepening scenario. The vertical red line indicates the position of the Sacramento transect X2 for the Year 50 Baseline scenario. On October 24 the predicted X2 measured along the Sacramento transect is 96.5 km for the Year 50 Baseline scenario, 97.8 km for the Year 50 Sacramento DWSC Only Deepening scenario (an increase of 1.3 km), and 98.3 km for the Year 50 Both DWSC Deepening scenario (an increase of 1.8 km).

Figure 5.3-10 shows the predicted daily-averaged salinity profile along the axis of San Francisco Bay from the Golden Gate to the Port of Stockton on October 24, the day of maximum predicted X2, for the Year 50 Baseline scenario, the Year 50 Sacramento DWSC Only Deepening scenario, and the Year 50 Both DWSC Deepening scenario. The vertical red line indicates the position of the San Joaquin transect X2 for the Year 50 Baseline scenario. On October 24 the predicted X2 measured along the San Joaquin transect is 94.6 km for the Year 50 Baseline scenario, 94.8 km for the Year 50 Sacramento DWSC Only Deepening scenario (an increase of 0.2 km), and 96.9 km for the Year 50 Both DWSC Deepening scenario (an increase of 2.3 km).

On October 24, the predicted combined “average X2” is 95.6 km for the Year 50 Baseline scenario, 96.3 km for the Year 50 Sacramento DWSC Only Deepening scenario (an increase of 0.7 km), and 97.6 km for the Year 50 Both DWSC Deepening scenario (an increase of 2.0 km).

Figure 5.3-11 shows the predicted X2 measured from the Golden Gate to the Port of Sacramento during the Year 50 simulation period for the Year 50 Baseline scenario, the Year 50 Sacramento DWSC Only Deepening scenario, and the Year 50 Both DWSC Deepening scenario.

Figure 5.3-12 shows the predicted X2 measured from the Golden Gate to the Port of Stockton during the Year 50 simulation period for the Year 50 Baseline scenario, the Year 50 Sacramento DWSC Only Deepening scenario, and the Year 50 Both DWSC Deepening scenario.

Figure 5.3-13 shows the predicted “average X2” measured from the Golden Gate during the Year 50 simulation period for the Year 50 Baseline scenario, the Year 50 Sacramento DWSC Only Deepening scenario, and the Year 50 Both DWSC Deepening scenario.

Predicted X2 measured along both the Sacramento transect (Figure 5.3-11) and the San Joaquin transect (Figure 5.3-12) for the Year 50 Both DWSC Deepening scenario is greater than the predicted X2 for the Year 50 Baseline scenario throughout the simulation period. Since the San Francisco Bay to Stockton DWSC deepening affects the West Richmond Channel, the Pinole Shoal Channel though San Pablo Bay and the Stockton DWSC through Suisun Bay, salinity gradients are present in deepened reaches throughout the year. Throughout most of the Year 50 simulation period, the predicted X2 for the Year 50 Both DWSC Deepening scenario is approximately 1 km to 2 km greater than for the Year 50 Baseline scenario along both the

Sacramento and the San Joaquin transects, indicating increased salt intrusion throughout the simulation period. Because the Year 50 Both DWSC Deepening scenario has a similar impact on salt intrusion on the Sacramento transect and the San Joaquin transect, the computed change in “average X2” (Figure 5.3-13) shows a similar increase in X2 to that predicted along the Sacramento transect (Figure 5.3-11) and the San Joaquin transect (Figure 5.3-12).

Figure 5.3-14 shows cumulative number of days during the year that the change in predicted X2 measured along the Sacramento transect for the Year 50 Sacramento DWSC Only Deepening scenario and the Year 50 Both DWSC Deepening scenario exceeds the corresponding Sacramento transect X2 predicted under the Year 50 Baseline Scenario by a specific distance. The maximum change in X2 measured along the Sacramento transect during the Year 50 Sacramento DWSC Only Deepening scenario is 1.94 km and the maximum change in X2 measured along the Sacramento transect during the Year 50 Both DWSC Deepening scenario is 4.40 km. A change in X2 measured along the Sacramento transect of 2.0 km or more is predicted on 0 days under the Year 50 Sacramento DWSC Only Deepening scenario and 27 days under the Year 50 Both DWSC Deepening scenario. A change in X2 measured along the Sacramento transect of 1.0 km or more is predicted on 23 days under the Year 50 Sacramento DWSC Only Deepening scenario and 277 days under the Year 50 Both DWSC Deepening scenario. The median predicted change in X2 measured along the Sacramento transect under the Year 50 Sacramento DWSC Only Deepening scenario is 0.24 km. For 182 days during the year under the Year 50 Sacramento DWSC Only Deepening scenario, the predicted change in X2 measured along the Sacramento transect is more than 0.24 km, whereas for 182 days the predicted change in X2 measured along the Sacramento transect under the Year 50 Sacramento DWSC Only Deepening scenario is less than 0.24 km. The median predicted change in X2 measured along the Sacramento transect under the Year 50 Both DWSC Deepening scenario is 1.18 km. For 182 days during the year under the Year 50 Both DWSC Deepening scenario, the predicted change in X2 measured along the Sacramento transect is more than 1.18 km, whereas for 182 days the predicted change in X2 measured along the Sacramento transect under the Year 50 Both DWSC Deepening scenario is less than 1.18 km.

Figure 5.3-15 shows the cumulative number of days during the year that the change in predicted X2 measured along the San Joaquin transect for the Year 50 Sacramento DWSC Only Deepening scenario and the Year 50 Both DWSC Deepening scenario exceeds the corresponding San Joaquin transect X2 predicted under the Year 50 Baseline Scenario by a specific distance. The maximum change in X2 measured along the San Joaquin transect during the Year 50 Sacramento DWSC Only Deepening scenario is 1.22 km and the maximum change in X2 measured along the San Joaquin transect during the Year 50 Both DWSC Deepening scenario is 5.94 km. A change in X2 measured along the San Joaquin transect of 2.0 km or more is predicted on 0 days under the Year 50 Sacramento DWSC Only Deepening scenario and 29 days under the Year 50 Both DWSC Deepening scenario. A change in X2 measured along the San Joaquin transect of 1.0 km or more is predicted on 1 day under the Year 50 Sacramento DWSC Only Deepening scenario and 281 days under the Year 50 Both DWSC Deepening scenario. The median predicted change in X2 measured along the San Joaquin transect under the Year 50 Sacramento DWSC Only Deepening scenario is 0.04 km. For 182 days during the year under the Year 50 Sacramento DWSC Only Deepening scenario, the predicted change in X2 measured along the San Joaquin transect is more than 0.04 km, whereas for 182 days the predicted change in X2 measured along the San Joaquin transect under the Year 50 Sacramento DWSC Only Deepening scenario is less than 0.04 km. The median predicted change in X2 measured along the San Joaquin transect under the Year 50 Both DWSC Deepening scenario is 1.28 km. For 182 days during the year under the Year 50 Both DWSC Deepening scenario, the predicted change in X2 measured along the San Joaquin transect is more than 1.28 km, whereas for 182 days the predicted change in X2 measured along the San Joaquin transect under the Year 50 Both DWSC Deepening scenario is less than 1.28 km.

Figure 5.3-16 shows the cumulative number of days during the year that the change in predicted average X2 for the Year 50 Sacramento DWSC Only Deepening scenario and the Year 50 Both DWSC Deepening scenario exceeds the corresponding average X2 predicted under the Year 50 Baseline Scenario by a specific distance. The maximum change in average X2 during the Year 50 Sacramento DWSC Only Deepening scenario is 1.05 km and the maximum change in average X2 during the Year 50 Both DWSC Deepening scenario is 4.40 km. A change of average X2 of 2.0 km or more is predicted on 0 days under the Year 50 Sacramento DWSC Only Deepening scenario and 31 days under the Year 50 Both DWSC Deepening scenario. A change of average X2 of 1.0 km or more is predicted on 1 day under the Year 50 Sacramento DWSC Only Deepening scenario and 293 days under the Year 50 Both DWSC Deepening scenario. The median predicted change in average X2 under the Year 50 Sacramento DWSC Only Deepening scenario is 0.17 km. For 182 days during the year under the Year 50 Sacramento DWSC Only Deepening scenario, the predicted change in average X2 is more than 0.17 km, whereas for 182 days the predicted change in average X2 under the Year 50 Sacramento DWSC Only Deepening scenario is less than 0.17 km. The median predicted change in average X2 under the Year 50 Both DWSC Deepening scenario is 1.22 km. For 182 days during the year under the Year 50 Both DWSC Deepening scenario, the predicted change in average X2 is more than 1.22 km, whereas for 182 days the predicted change in average X2 under the Year 50 Both DWSC Deepening scenario is less than 1.22 km.

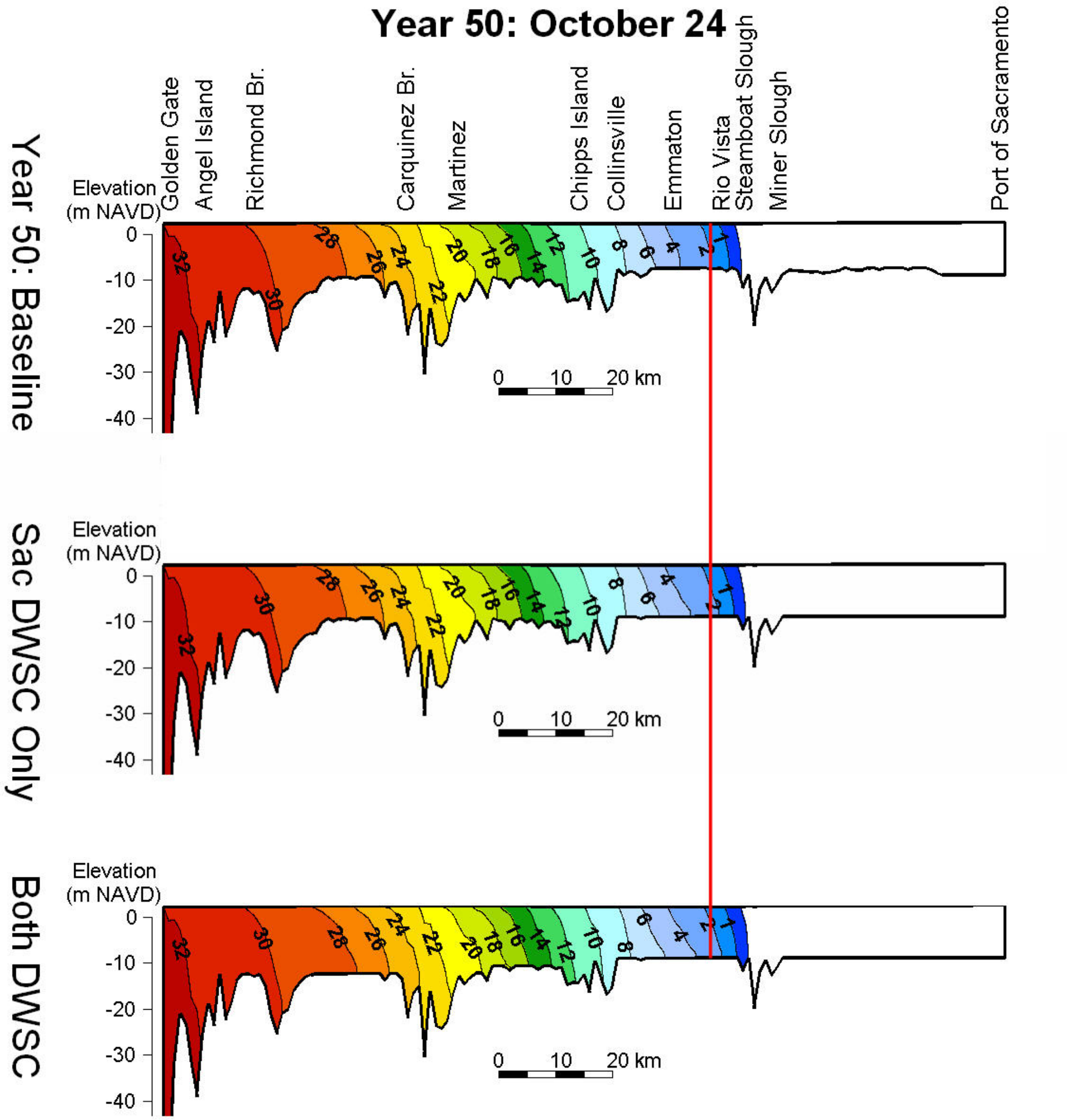


Figure 5.3-9 Predicted daily-averaged salinity profile along the axis of San Francisco Bay from the Golden Gate to the Port of Sacramento on October 24, the day of maximum predicted X2, for the Year 50 Baseline scenario (top), the Year 50 Sacramento DWSC Only Deepening scenario (middle), and the Year 50 Both DWSC Deepening scenario (bottom). The vertical red line indicates X2 for the Year 50 Baseline scenario.

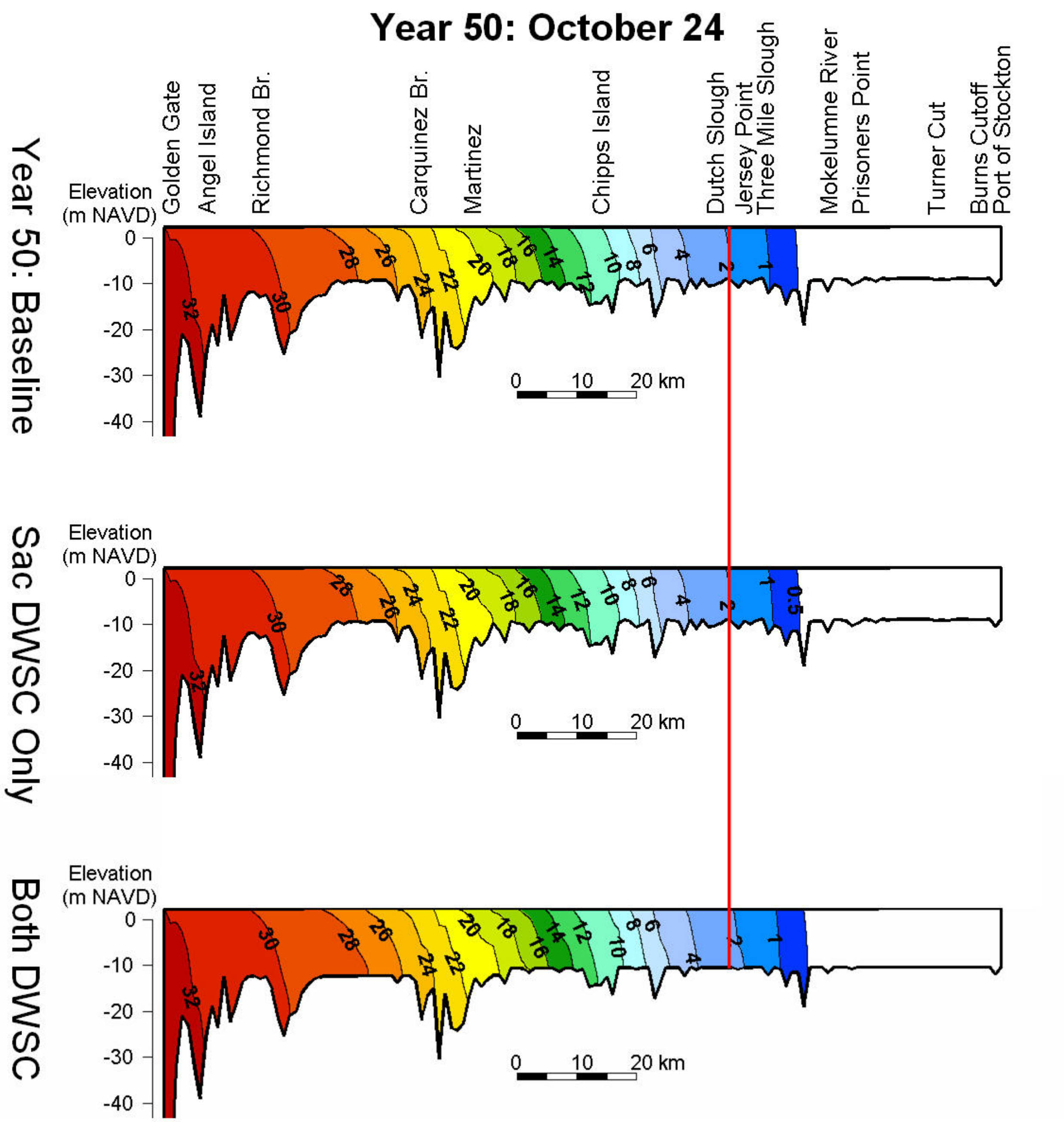


Figure 5.3-10 Predicted daily-averaged salinity profile along the axis of San Francisco Bay from the Golden Gate to the Port of Stockton on October 24, the day of maximum predicted X2, for the Year 50 Baseline scenario (top), the Year 50 Sacramento DWSC Only Deepening scenario (middle), and the Year 50 Both DWSC Deepening scenario (bottom). The vertical red line indicates X2 for the Year 50 Baseline scenario.

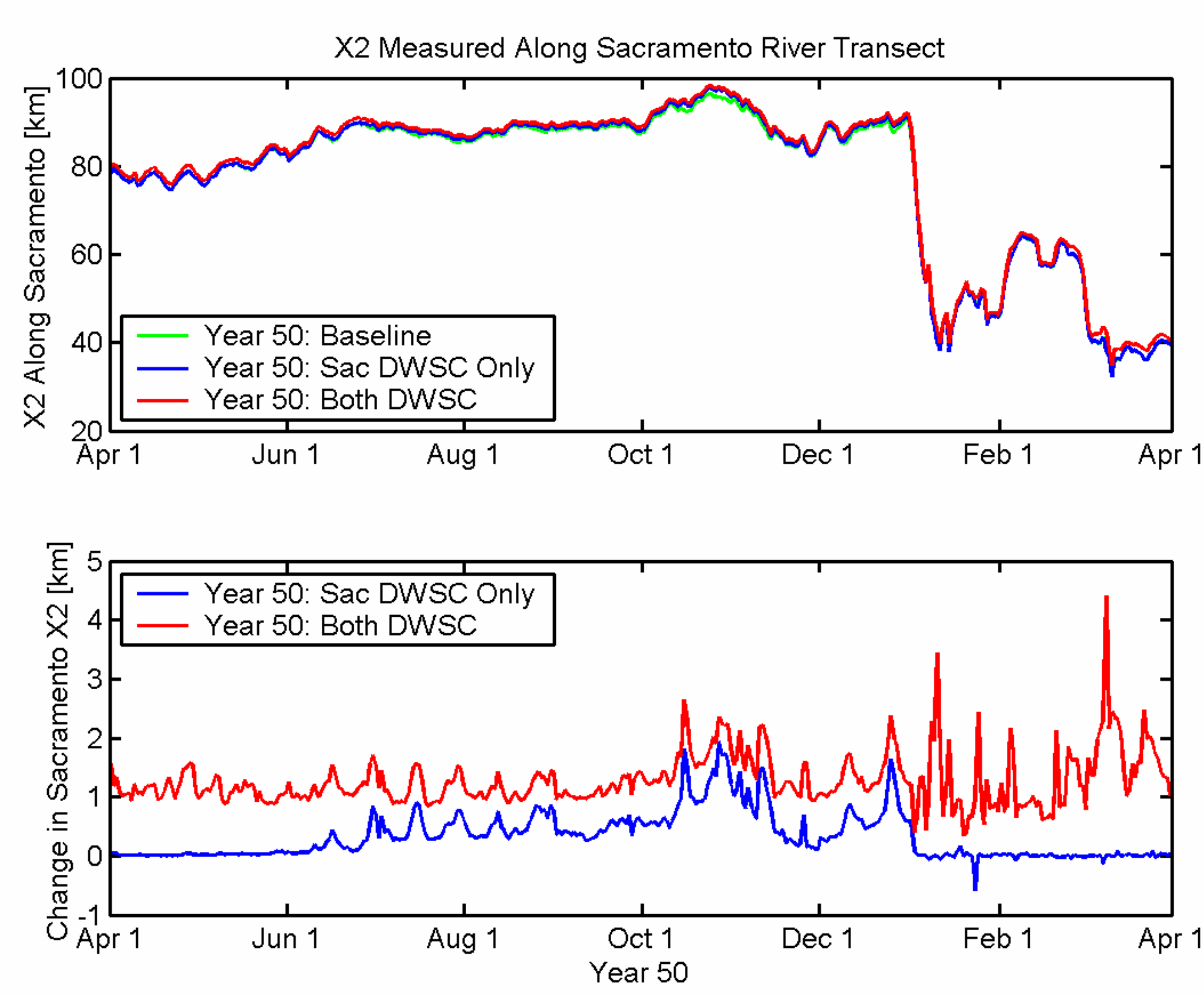


Figure 5.3-11 Predicted X2 measured from the Golden Gate to the Port of Sacramento along the Sacramento transect on Figure 3.3-4 for the Year 50 Baseline scenario, the Year 50 Sacramento DWSC Only Deepening scenario, and the Year 50 Both DWSC Deepening scenario (top); Predicted change in X2 measured along the Sacramento transect relative to the Year 50 Baseline scenario for the Year 50 Sacramento DWSC Only Deepening scenario and the Year 50 Both DWSC Deepening scenario (bottom).

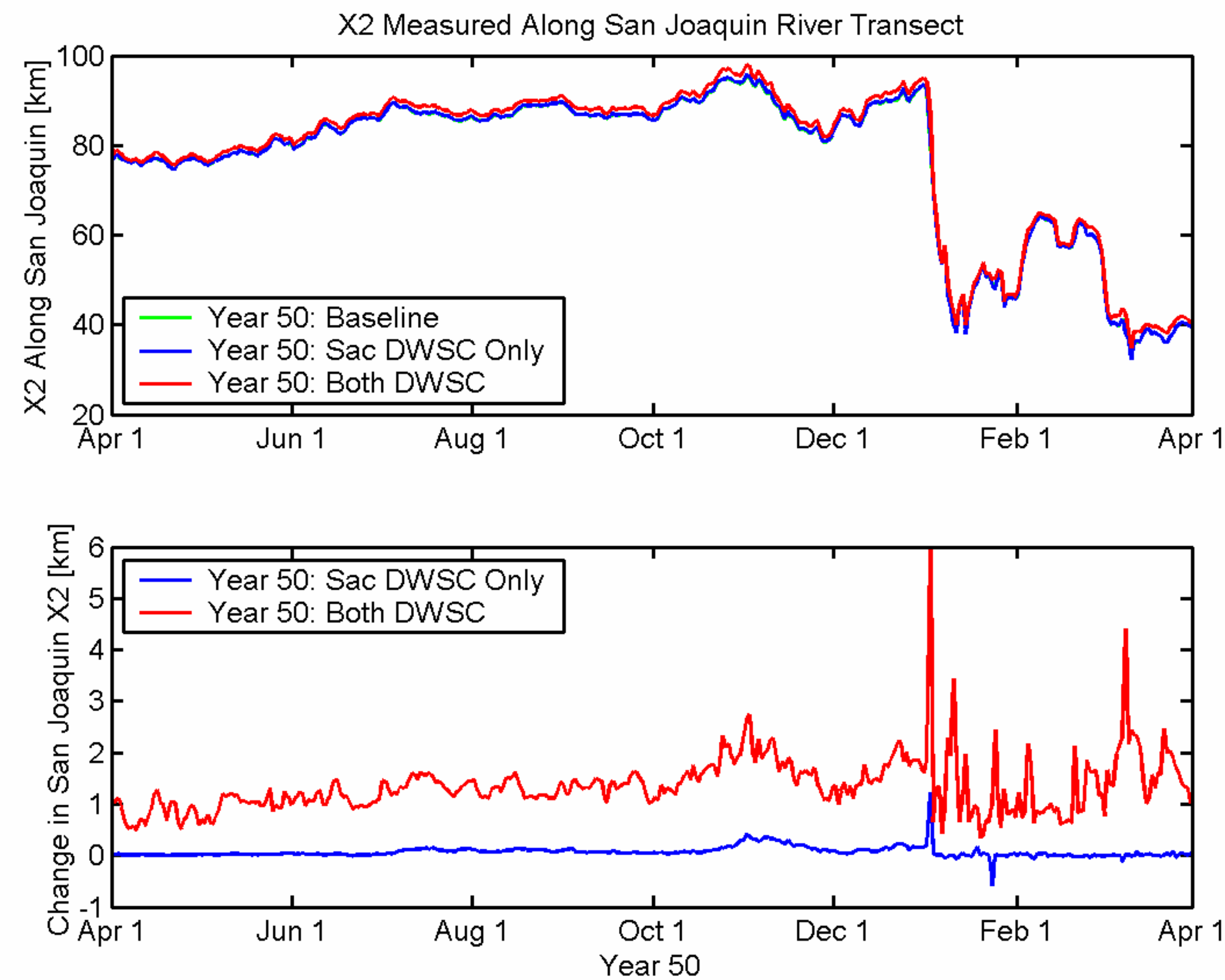


Figure 5.3-12 Predicted X2 measured from the Golden Gate to the Port of Stockton along the San Joaquin transect on Figure 3.3-4 for the Year 50 Baseline scenario, the Year 50 Sacramento DWSC Only Deepening scenario, and the Year 50 Both DWSC Deepening scenario (top); Predicted change in X2 measured along the San Joaquin transect relative to the Year 50 Baseline scenario for the Year 50 Sacramento DWSC Only Deepening scenario and the Year 50 Both DWSC Deepening scenario (bottom).

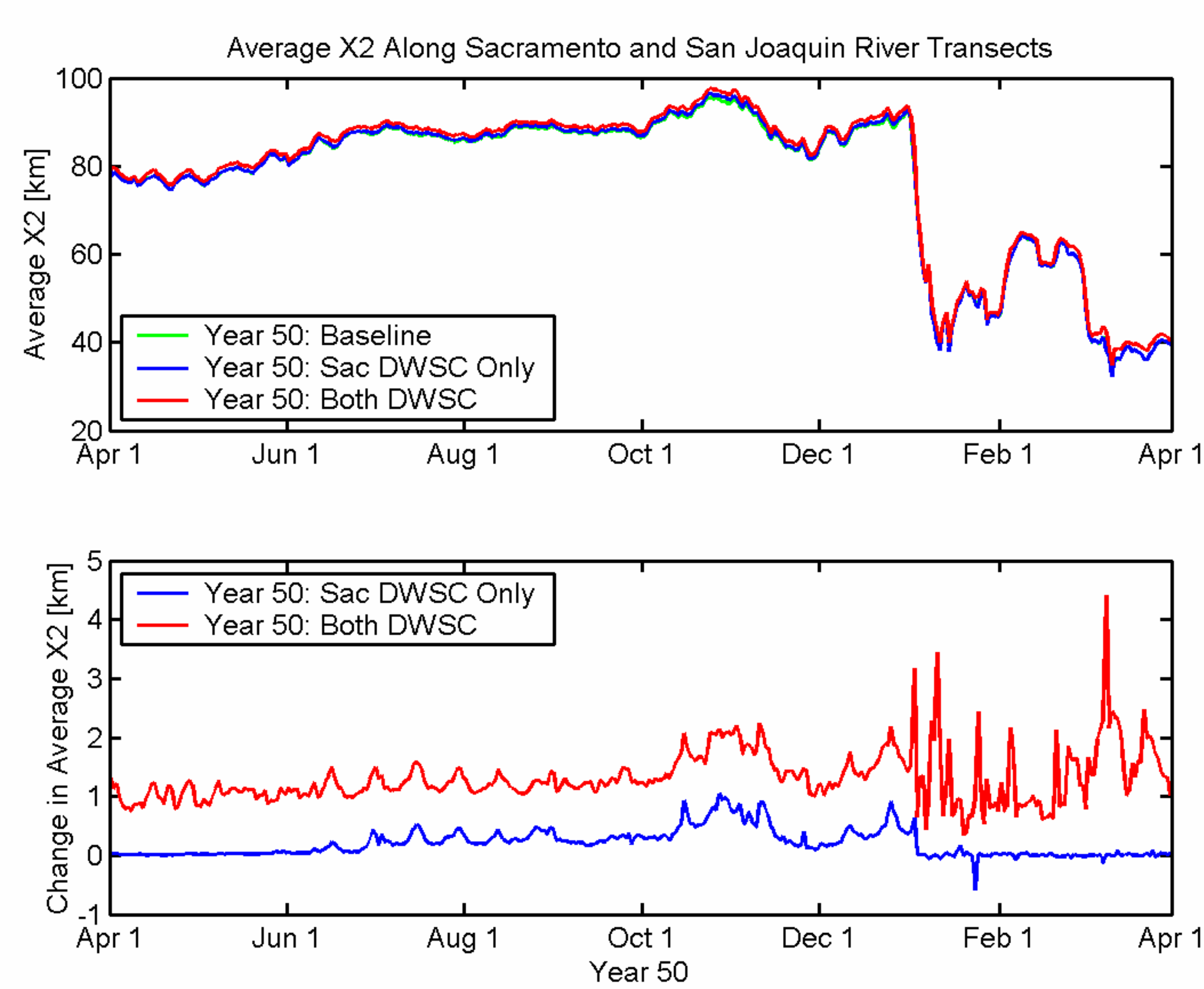


Figure 5.3-13 Predicted “average X2” for the Year 50 Baseline scenario, the Year 50 Sacramento DWSC Only Deepening scenario, and the Year 50 Both DWSC Deepening scenario (top); Predicted change in “average X2” relative to the Year 50 Baseline scenario for the Year 50 Sacramento DWSC Only Deepening scenario and the Year 50 Both DWSC Deepening scenario (bottom).

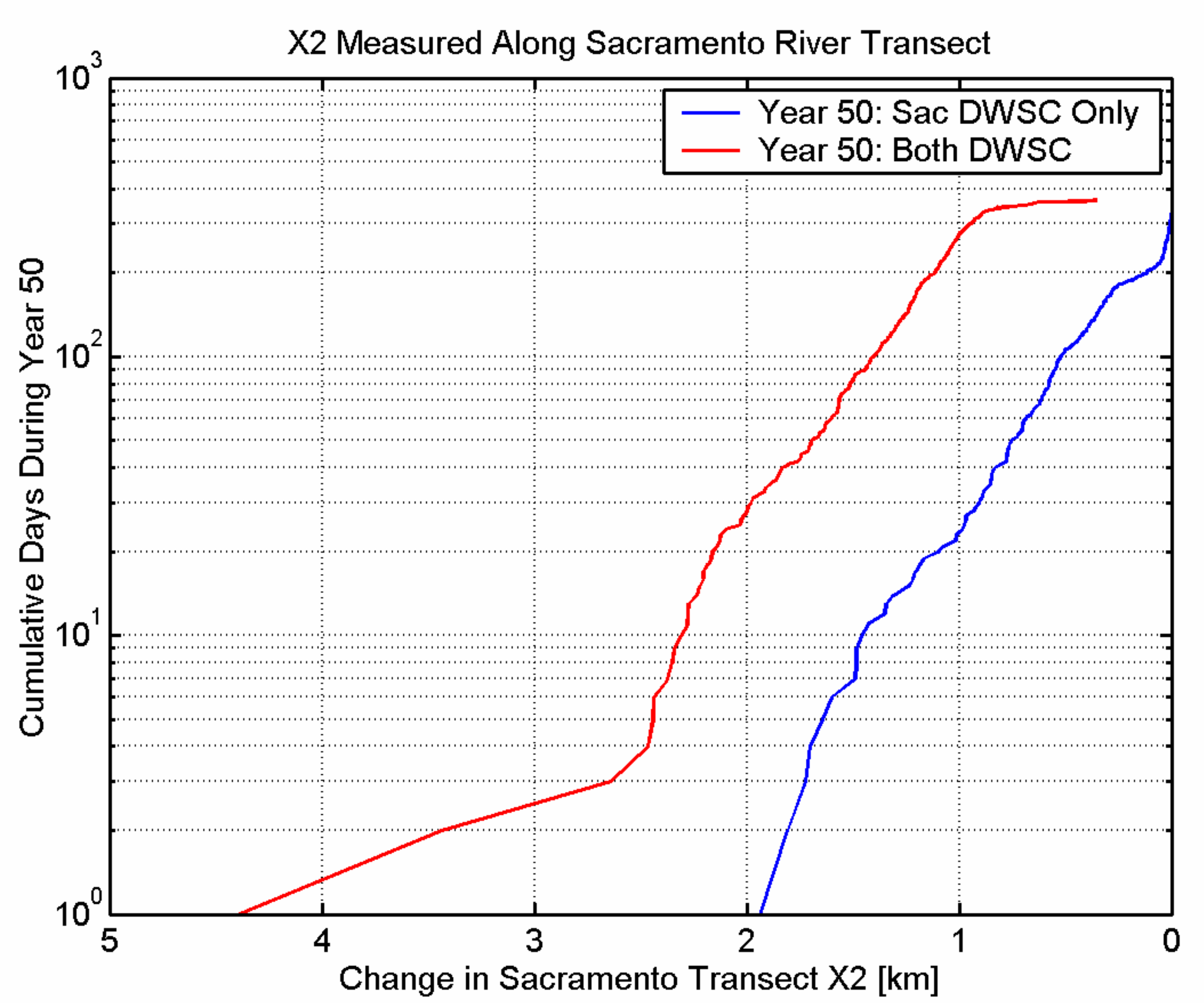


Figure 5.3-14 Cumulative number of days during the year that the change in predicted X2 measured along the Sacramento transect for the Year 50 Sacramento DWSC Only Deepening scenario and the Year 50 Both DWSC Deepening scenario exceeds the corresponding Sacramento transect X2 predicted under the Year 50 Baseline Scenario by a specific distance.

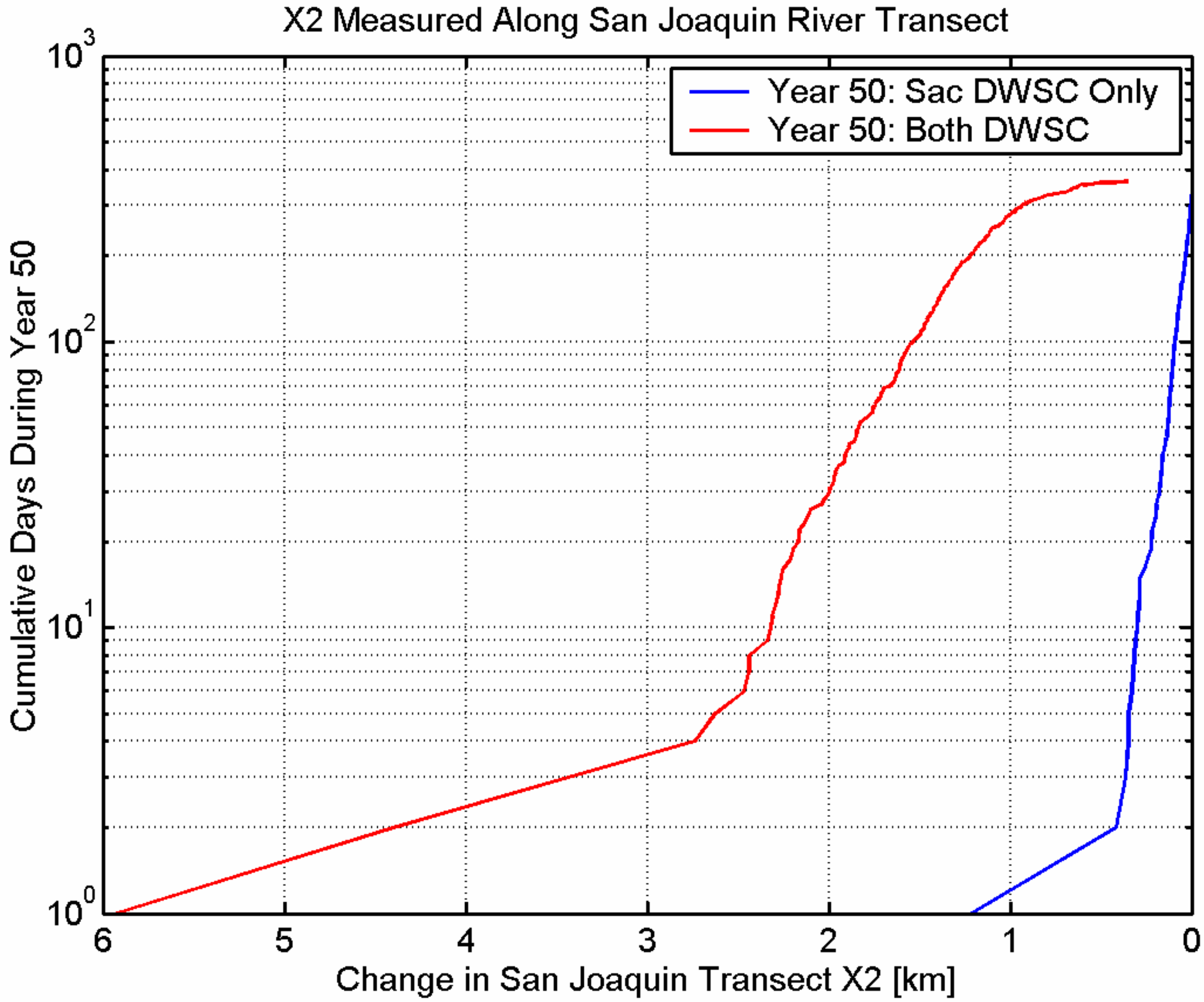


Figure 5.3-15 Cumulative number of days during the year that the change in predicted X2 measured along the San Joaquin transect for the Year 50 Sacramento DWSC Only Deepening scenario and the Year 50 Both DWSC Deepening scenario exceeds the corresponding San Joaquin transect X2 predicted under the Year 50 Baseline Scenario by a specific distance.

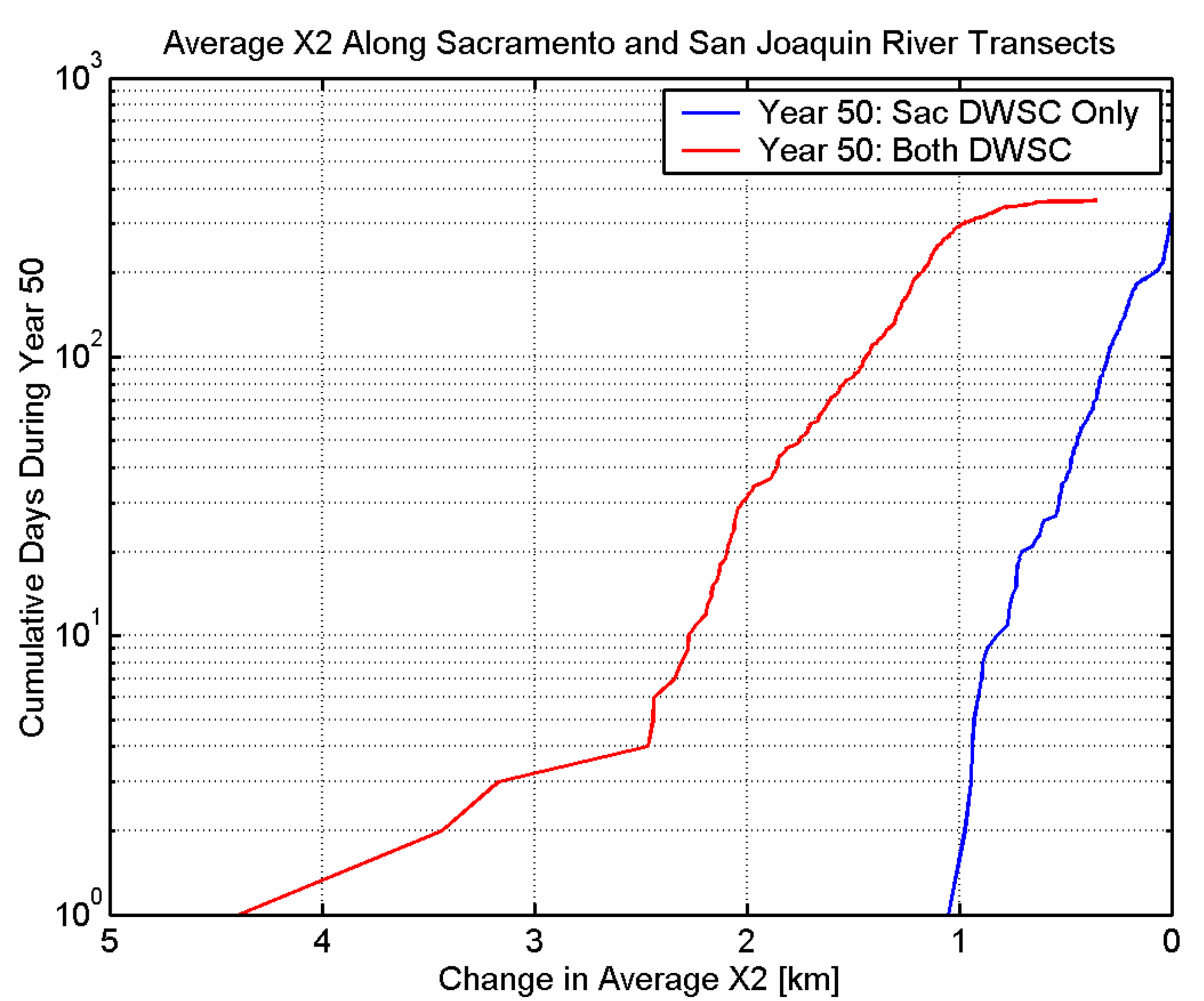


Figure 5.3-16 Cumulative number of days during the year that the change in predicted average X2 for the Year 50 Sacramento DWSC Only Deepening scenario and the Year 50 Both DWSC Deepening scenario exceeds the corresponding average X2 predicted under the Year 50 Baseline Scenario by a specific distance.

5.4 Depth-Averaged Daily-Average Salinity Maps

Depth-averaged daily-averaged salinity maps were computed for the first day of each month, and for October 24, the day of maximum X2 for the Year 50 Baseline scenario, the Year 50 Sacramento DWSC Only Deepening scenario, and the Year 50 Both DWSC Deepening scenario under Year 50 future conditions. On each of these days, the daily-averaged depth-averaged salinity for each of the deepening scenarios was compared to the depth-averaged daily-averaged salinity for the Year 50 Baseline scenario to compute the salinity increase. Each figure also shows the vertical salinity profile along the axis of San Francisco Bay to provide a reference for the longitudinal position of salinity gradients and the location and strength of salinity stratification in San Francisco Bay. Depth-averaged daily-averaged salinity comparisons for the Year 50 Sacramento DWSC Only Deepening scenario and the Year 50 Both DWSC Deepening scenario are presented in the following sections.

5.4.1 Year 50 Sacramento DWSC Only Deepening

Figure 5.4-1 shows the predicted daily-averaged salinity profile along the axis of San Francisco Bay from the Golden Gate to the Port of Sacramento, depth-averaged daily-averaged salinity map, and predicted salinity increase relative to the Year 50 Baseline scenario for the Year 50 Sacramento DWSC Only Deepening scenario at the beginning of the analysis period for the Year 50 simulation on April 1. On April 1, X2 is between of Chipps Island and Collinsville, and the 0.5 psu salinity isohaline is between Collinsville and Emmaton. The predicted salinity increase for the Year 50 Sacramento DWSC Only Deepening scenario is less than 0.05 psu (~108 μmhos/cm) over the entire model domain. Since salt intrusion is not present in the region upstream of Collinsville where the Sacramento DWSC deepening occurs, no additional salt intrusion is predicted. This condition persists with relatively little change on May 1 (Figure 5.4-2). On June 1 (Figure 5.4-3) X2 has moved further upstream, with the 2 psu isohaline near Collinsville, however the 1 psu and 0.5 psu isohalines are nearly vertical indicating little to no stratification in this reach. The predicted salinity increase for the Year 50 Sacramento DWSC Only Deepening scenario is less than 0.05 psu over the entire model domain on June 1.

During summer conditions, salt intrusion into the Delta increases as seen on July 1 (Figure 5.4-4) and August 1 (Figure 5.4-5). Salinity increases of between 0.05 and 0.10 psu are predicted in some reaches of the Sacramento DWSC between Collinsville and Emmaton on July 1 and August 1. Conditions on September 1 (Figure 5.4-6) show increasing salt intrusion into Franks Tract and the western Delta, with predicted salinity increases between 0.05 and 0.10 psu in some reaches of the Sacramento DWSC between Collinsville and Emmaton and in Sherman Lake (see Figure 5.4-19).

By October 1 (Figure 5.4-7), the predicted salinity at Collinsville is approximately 4 psu and the 1 psu isohaline is near Emmaton. Salinity increases between 0.05 and 0.10 psu are evident in some reaches of the Sacramento DWSC between Collinsville and Emmaton and in Sherman Lake (see Figure 5.4-20).

As seen in Figure 3.2-2, Delta outflow during October in the Year 50 simulation is at an annual low of 86 m^3/s, compared to 167 m^3/s in September and 334 m^3/s in November. As a result, significant salt intrusion occurs during October leading to an annual maximum X2 for all scenarios on October 24. On October 24 (Figure 5.4-8), the day of maximum predicted X2 during the Year 50 simulation period, significant stratification is evident in the reach of the Sacramento River between Collinsville and Rio Vista, resulting in increased salt intrusion in this reach due to the deepening of the Sacramento DWSC. Salinity increases of between 0.05 and 0.10 psu are evident in Sacramento River reach between Emmaton and Rio Vista, in Threemile Slough, along the San Joaquin River between Jersey Point and Fisherman's Cut, and in False River and Little Franks Tract. The maximum salinity increase within the DWSC is between 0.2 and 0.3 psu (see Figure 5.4-21). On November 1 (Figure 5.4-9), predicted salinity increases are similar to those on October 24, with larger predicted salinity increases seen in Big Break and the western part of Franks Tract (see Figure 5.4-22).

During November, Delta outflow increases significantly to 334 m^3/s (from 86 m^3/s during October), due largely to lower exports during November (see Figure 3.2-2). As a result, much of the salt that intruded into the western Delta during October has been flushed out of the Delta by December 1 (Figure 5.4-10), resulting in only a small region of the Sacramento DWSC where predicted salinity increases of 0.05 to 0.10 psu are evident on December 1 (see Figure 5.4-23). During December net Delta outflow decreases to 182 m^3/s resulting in additional salt intrusion during December. On January 1 (Figure 5.4-11), predicted salinity increases of between 0.05 and 0.10 psu are evident along the Sacramento River near Emmaton and in Sherman Lake (see Figure 5.4-24).

Large Delta outflows during January (Figure 3.2-2) flush most of the salt out of the Delta and Suisun Bay, with the 0.5 psu isohaline near Martinez on February 1 (Figure 5.4-12). No predicted salinity increases resulting from the Year 50 Sacramento DWSC Only Deepening scenario are predicted on February 1 or March 1 (Figure 5.4-13).

Figure 5.4-14 through Figure 5.4-26 show the predicted increase in salinity in the Sacramento-San Joaquin Delta for the first day of each month and on October 24, the day of maximum predicted X2 for the Year 50 Sacramento DWSC Only Deepening scenario during the Year 50 simulation period. These figures allow for closer inspection of salinity increases within the Delta on each of the days on which salinity profiles and maps are shown in Figures 5.4-1 through 5.4-13.

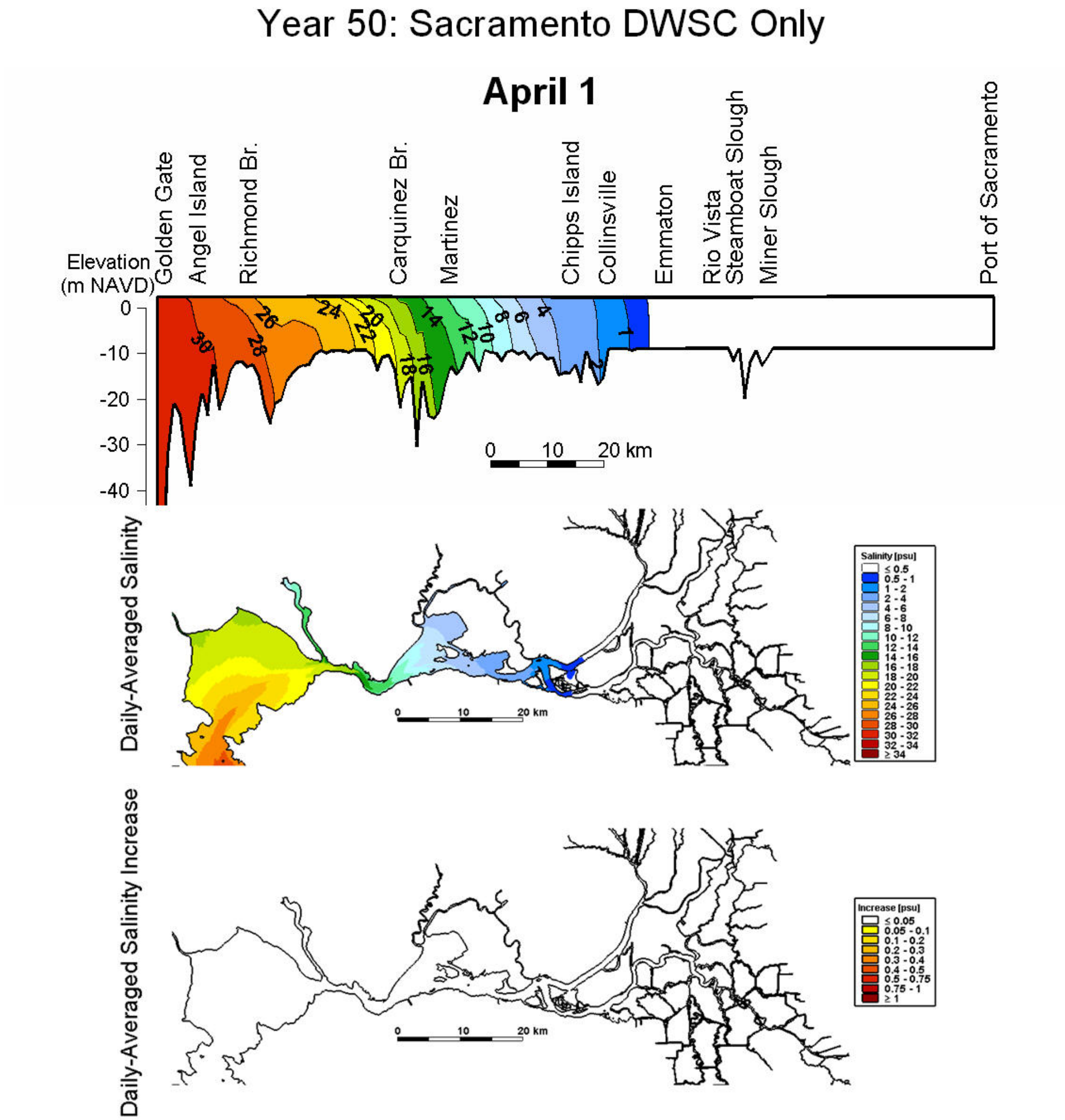


Figure 5.4-1 Predicted daily-averaged salinity profile along the axis of San Francisco Bay from the Golden Gate to the Port of Sacramento on April 1 for the Year 50 Sacramento DWSC Only Deepening scenario (top); predicted depth-averaged daily-averaged salinity on April 1 for the Year 50 Sacramento DWSC Only Deepening scenario (middle); predicted increase in depth-averaged daily-averaged salinity on April 1 relative to the Year 50 Baseline scenario for the Year 50 Sacramento DWSC Only Deepening scenario.

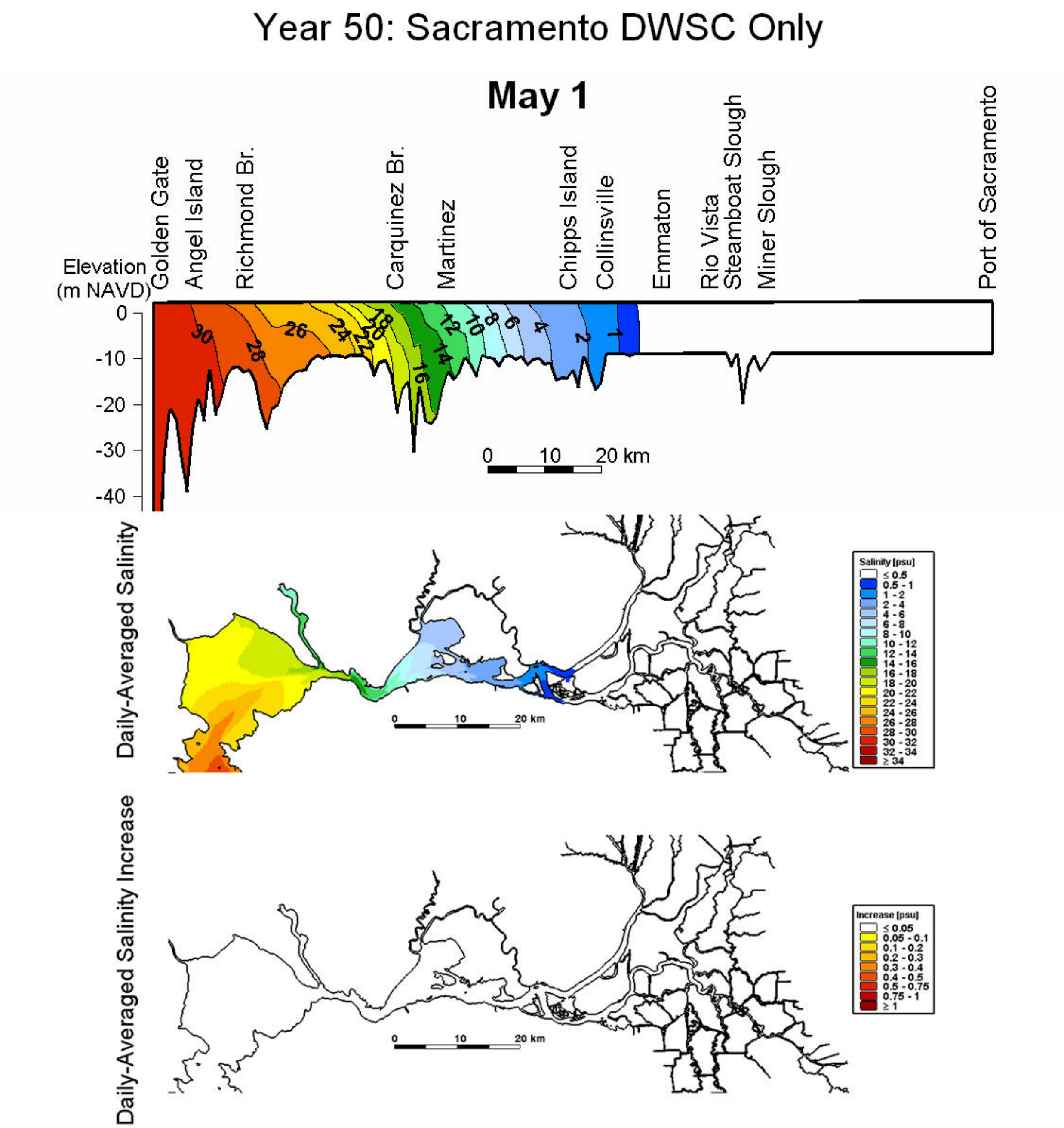


Figure 5.4-2 Predicted daily-averaged salinity profile along the axis of San Francisco Bay from the Golden Gate to the Port of Sacramento on May 1 for the Year 50 Sacramento DWSC Only Deepening scenario (top); predicted depth-averaged daily-averaged salinity on May 1 for the Year 50 Sacramento DWSC Only Deepening scenario (middle); predicted increase in depth-averaged daily-averaged salinity on May 1 relative to the Year 50 Baseline scenario for the Year 50 Sacramento DWSC Only Deepening scenario.

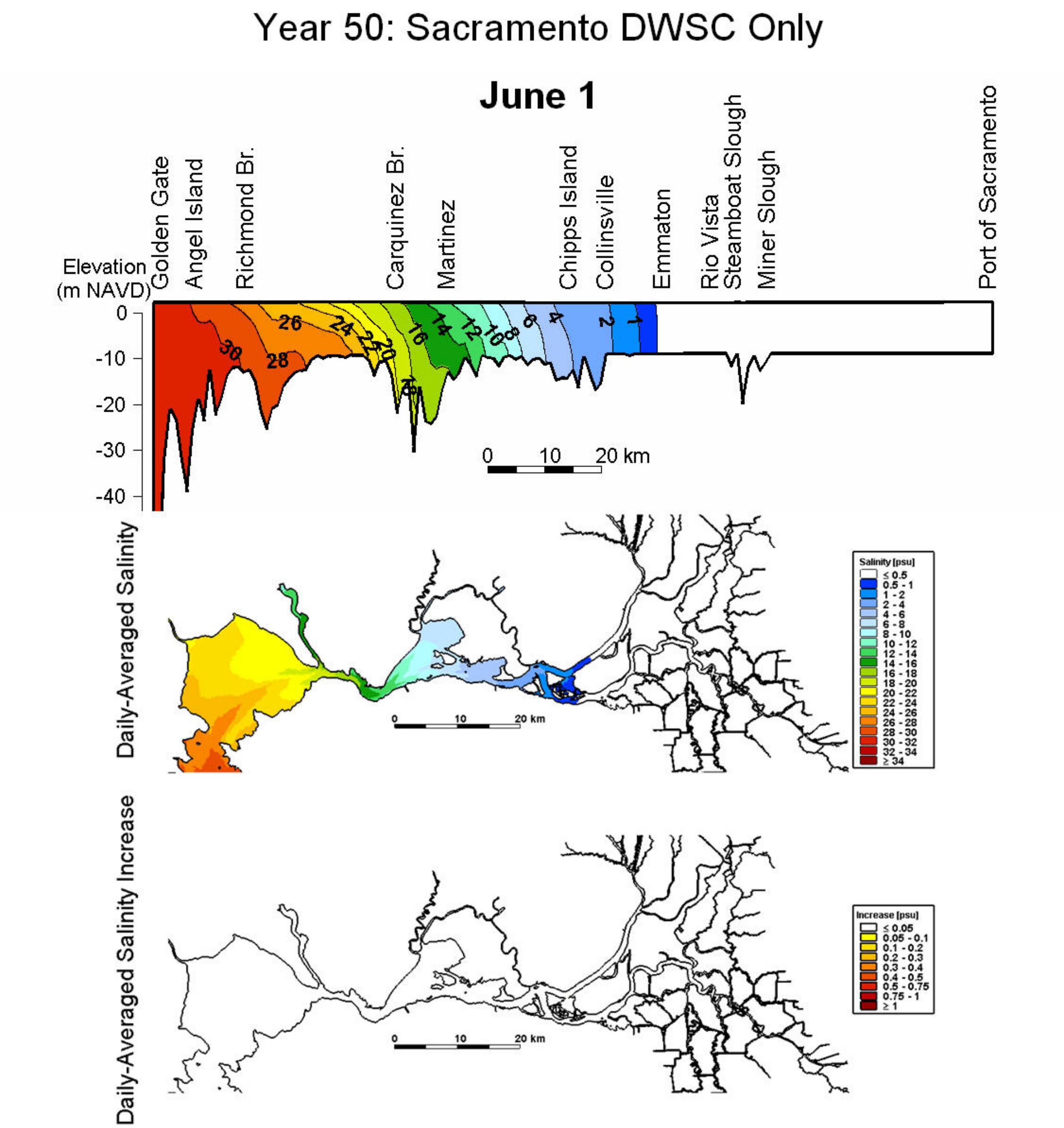


Figure 5.4-3 Predicted daily-averaged salinity profile along the axis of San Francisco Bay from the Golden Gate to the Port of Sacramento on June 1 for the Year 50 Sacramento DWSC Only Deepening scenario (top); predicted depth-averaged daily-averaged salinity on June 1 for the Year 50 Sacramento DWSC Only Deepening scenario (middle); predicted increase in depth-averaged daily-averaged salinity on June 1 relative to the Year 50 Baseline scenario for the Year 50 Sacramento DWSC Only Deepening scenario.

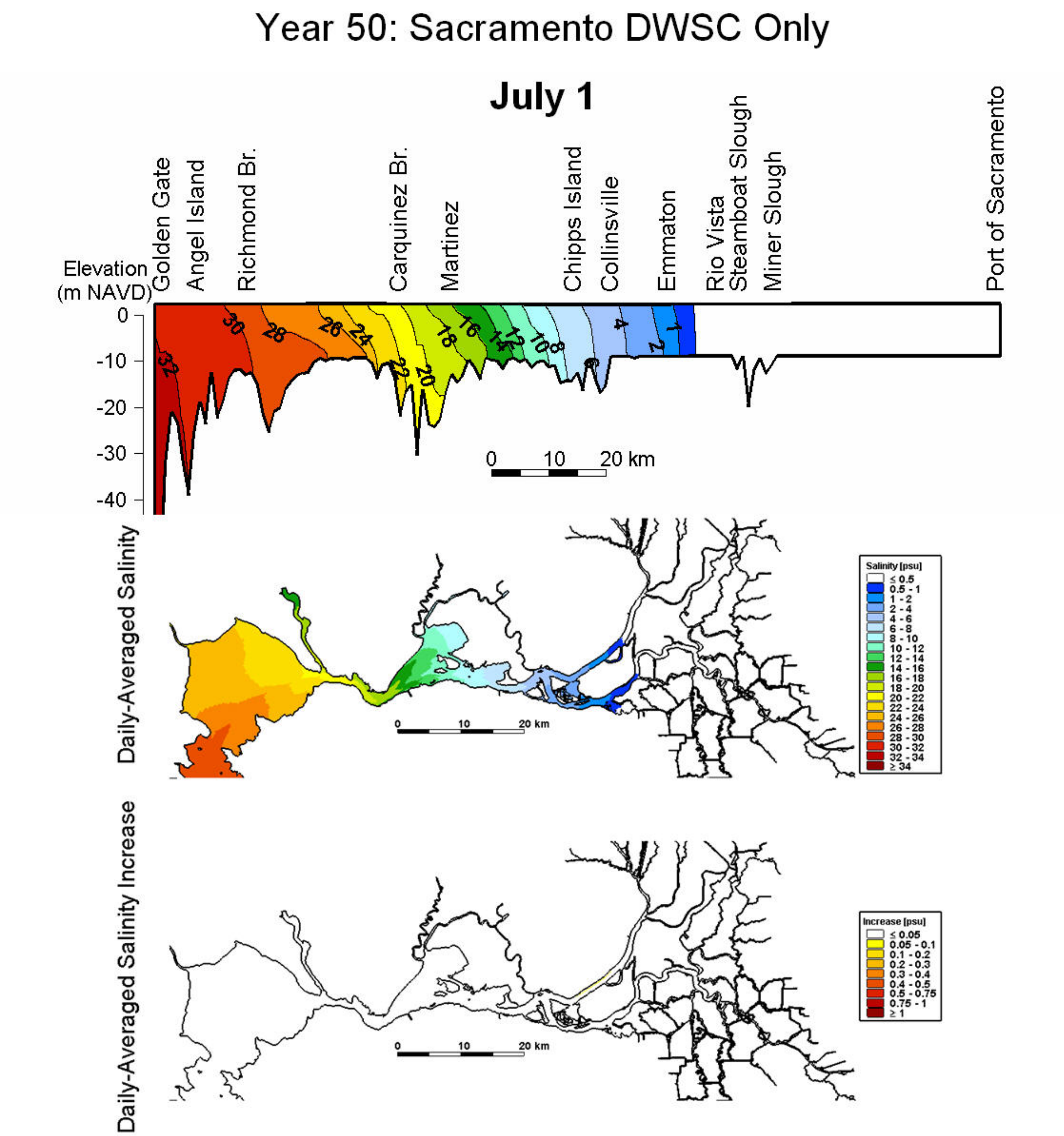


Figure 5.4-4 Predicted daily-averaged salinity profile along the axis of San Francisco Bay from the Golden Gate to the Port of Sacramento on July 1 for the Year 50 Sacramento DWSC Only Deepening scenario (top); predicted depth-averaged daily-averaged salinity on July 1 for the Year 50 Sacramento DWSC Only Deepening scenario (middle); predicted increase in depth-averaged daily-averaged salinity on July 1 relative to the Year 50 Baseline scenario for the Year 50 Sacramento DWSC Only Deepening scenario.

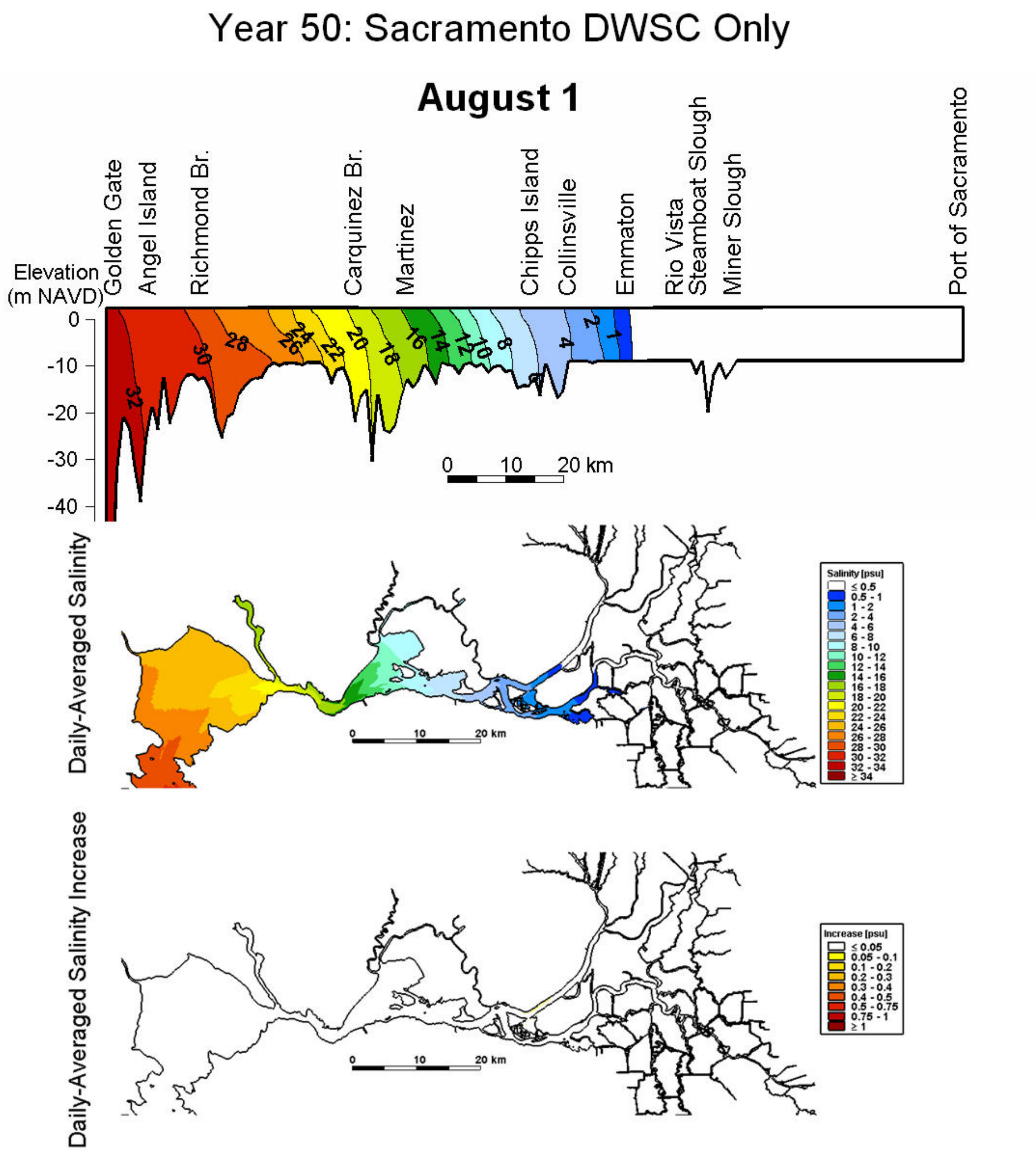


Figure 5.4-5 Predicted daily-averaged salinity profile along the axis of San Francisco Bay from the Golden Gate to the Port of Sacramento on August 1 for the Year 50 Sacramento DWSC Only Deepening scenario (top); predicted depth-averaged daily-averaged salinity on August 1 for the Year 50 Sacramento DWSC Only Deepening scenario (middle); predicted increase in depth-averaged daily-averaged salinity on August 1 relative to the Year 50 Baseline scenario for the Year 50 Sacramento DWSC Only Deepening scenario.

Year 50: Sacramento DWSC Only

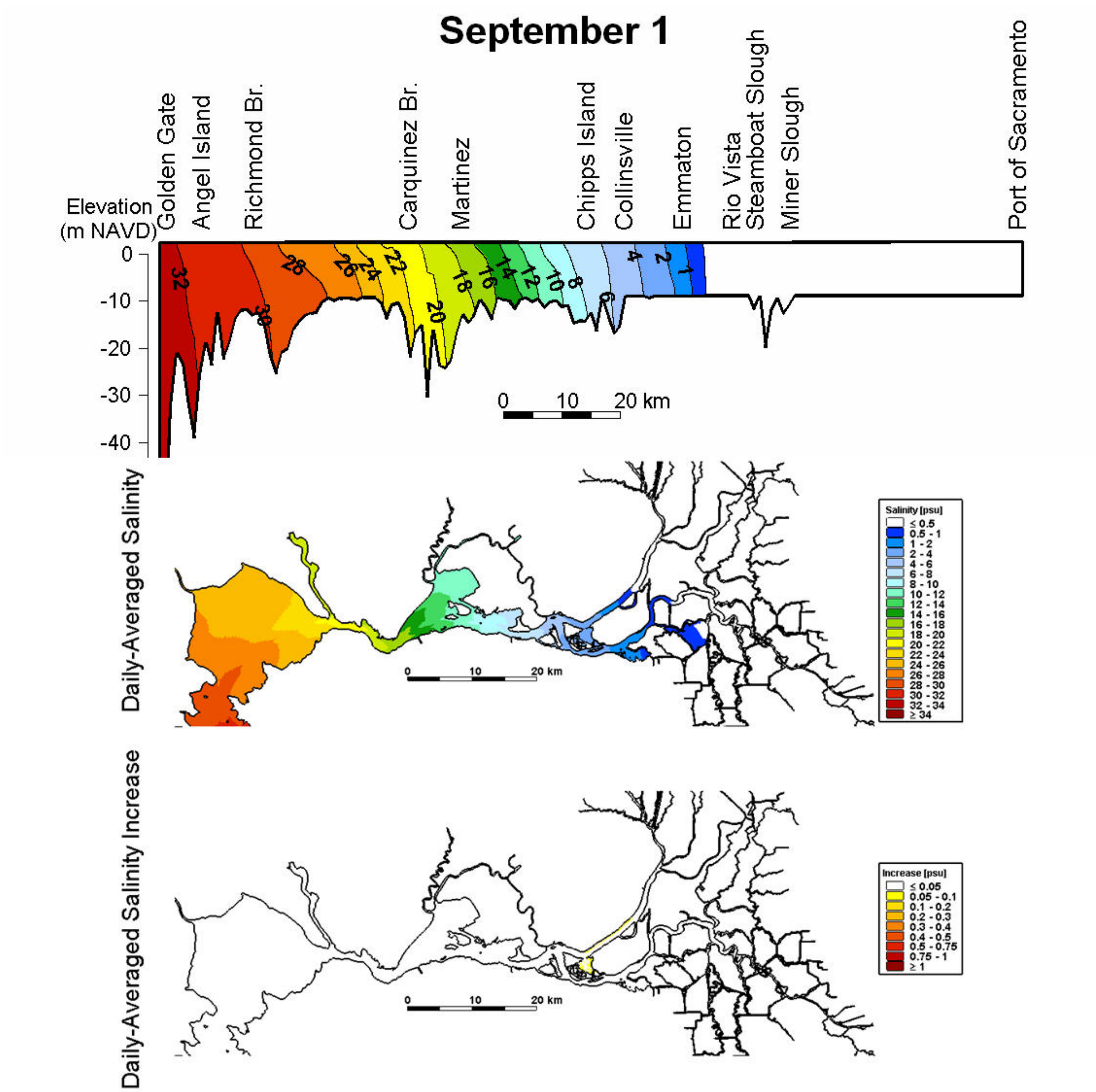


Figure 5.4-6 Predicted daily-averaged salinity profile along the axis of San Francisco Bay from the Golden Gate to the Port of Sacramento on September 1 for the Year 50 Sacramento DWSC Only Deepening scenario (top); predicted depth-averaged daily-averaged salinity on September 1 for the Year 50 Sacramento DWSC Only Deepening scenario (middle); predicted increase in depth-averaged daily-averaged salinity on September 1 relative to the Year 50 Baseline scenario for the Year 50 Sacramento DWSC Only Deepening scenario.

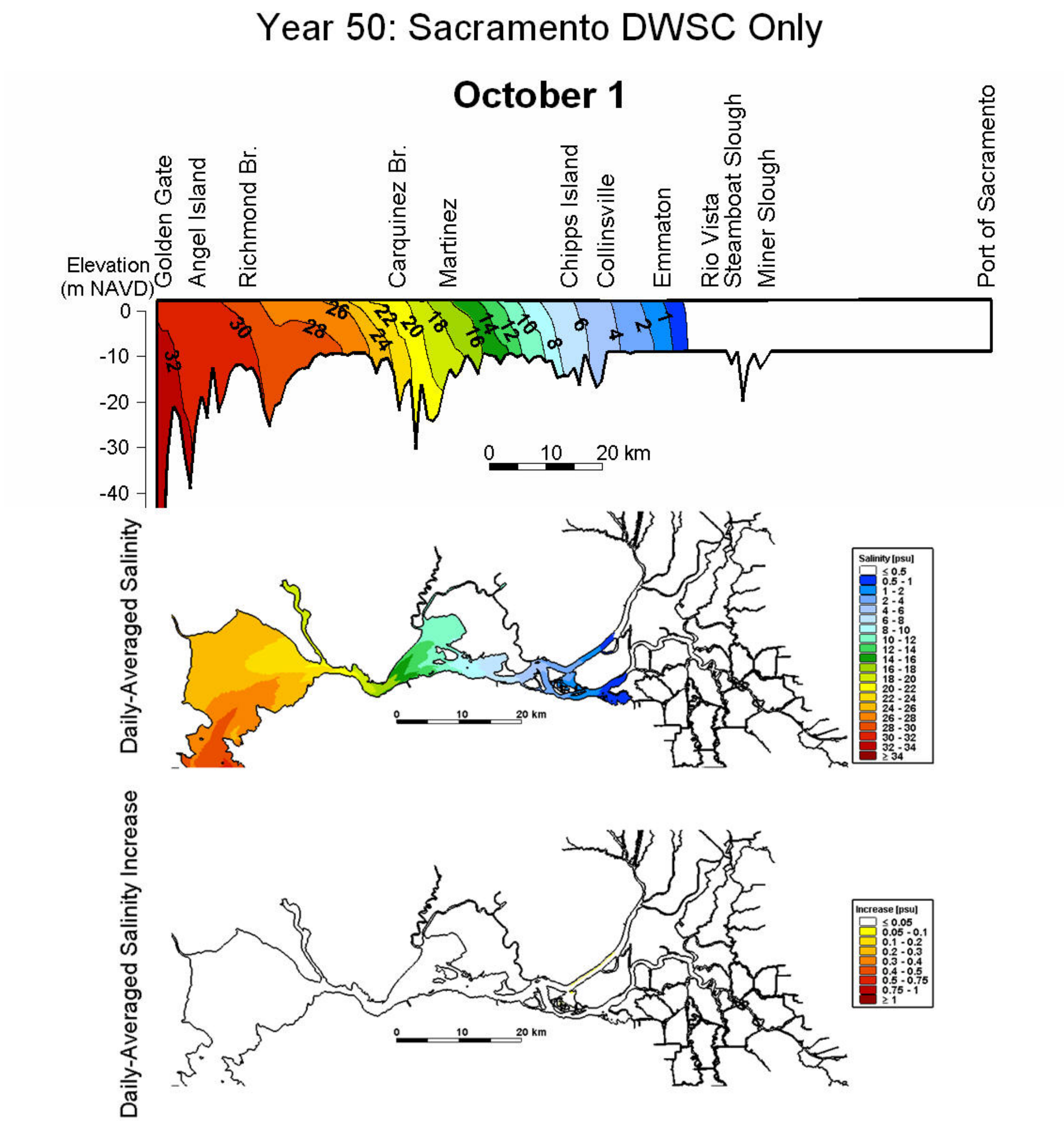


Figure 5.4-7 Predicted daily-averaged salinity profile along the axis of San Francisco Bay from the Golden Gate to the Port of Sacramento on October 1 for the Year 50 Sacramento DWSC Only Deepening scenario (top); predicted depth-averaged daily-averaged salinity on October 1 for the Year 50 Sacramento DWSC Only Deepening scenario (middle); predicted increase in depth-averaged daily-averaged salinity on October 1 relative to the Year 50 Baseline scenario for the Year 50 Sacramento DWSC Only Deepening scenario.

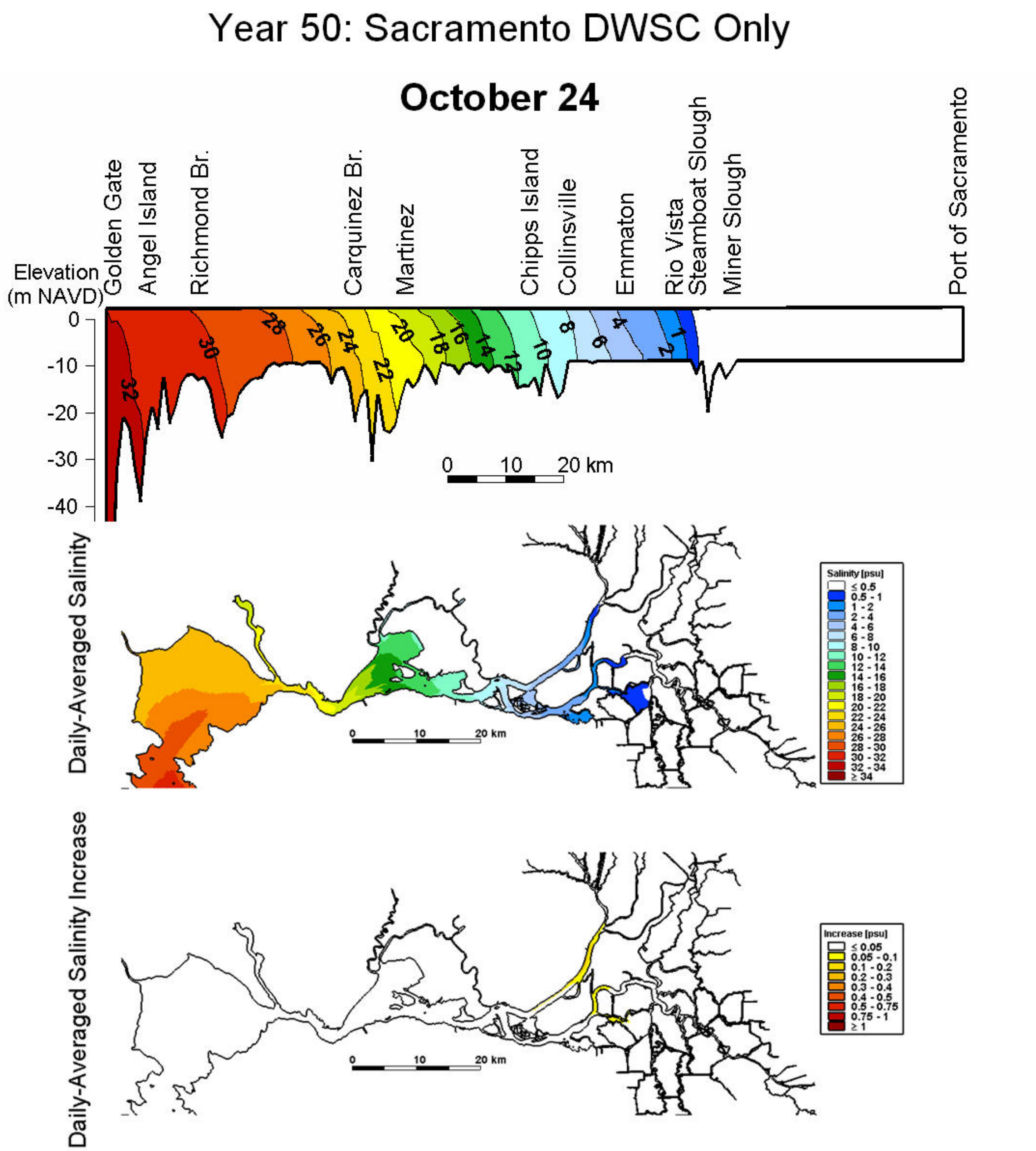


Figure 5.4-8 Predicted daily-averaged salinity profile along the axis of San Francisco Bay from the Golden Gate to the Port of Sacramento on October 24, the day of maximum predicted X2, for the Year 50 Sacramento DWSC Only Deepening scenario (top); predicted depth-averaged daily-averaged salinity on October 24 for the Year 50 Sacramento DWSC Only Deepening scenario (middle); predicted increase in depth-averaged daily-averaged salinity on October 24 relative to the Year 50 Baseline scenario for the Year 50 Sacramento DWSC Only Deepening scenario.

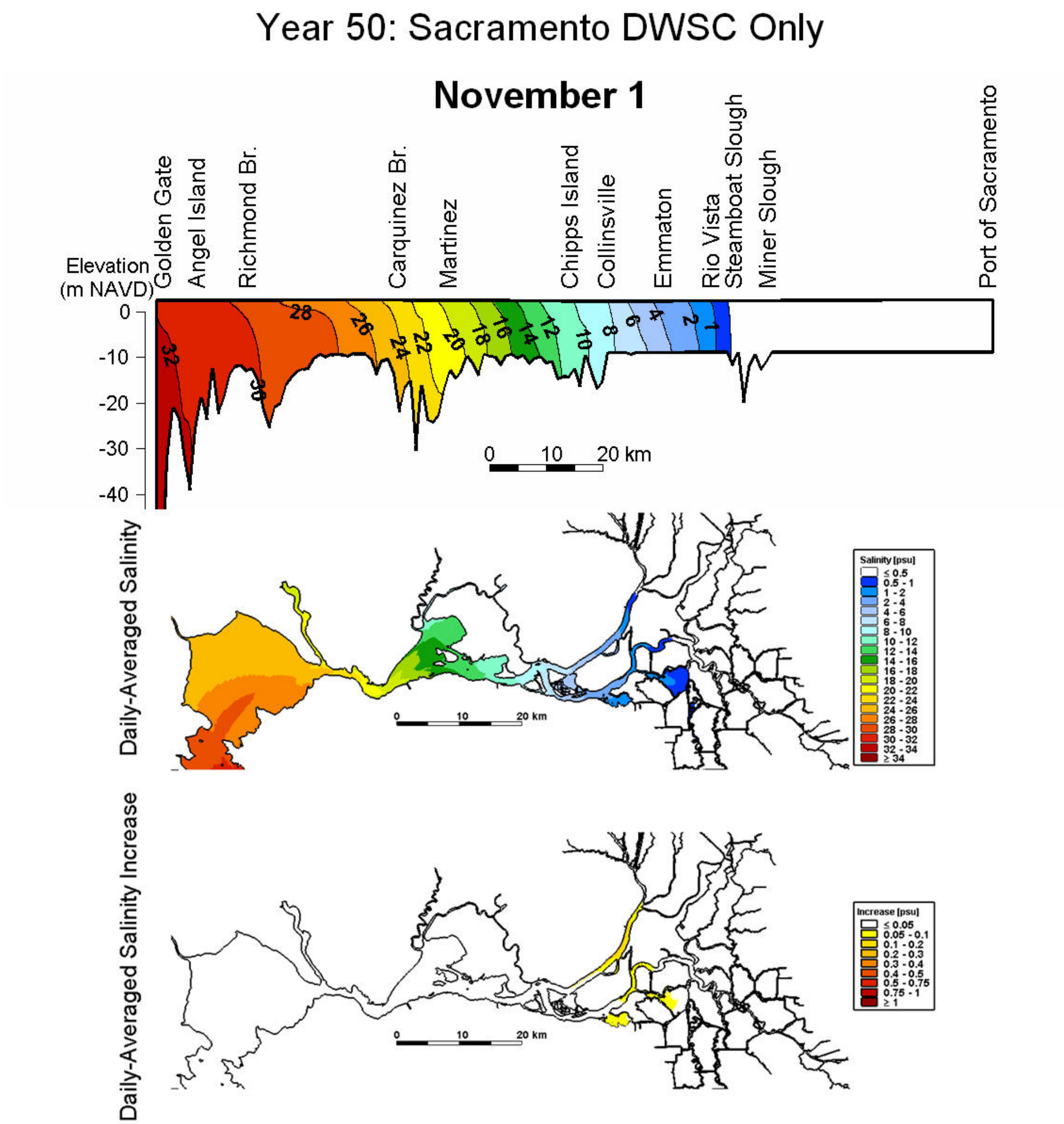


Figure 5.4-9 Predicted daily-averaged salinity profile along the axis of San Francisco Bay from the Golden Gate to the Port of Sacramento on November 1 for the Year 50 Sacramento DWSC Only Deepening scenario (top); predicted depth-averaged daily-averaged salinity on November 1 for the Year 50 Sacramento DWSC Only Deepening scenario (middle); predicted increase in depth-averaged daily-averaged salinity on November 1 relative to the Year 50 Baseline scenario for the Year 50 Sacramento DWSC Only Deepening scenario.

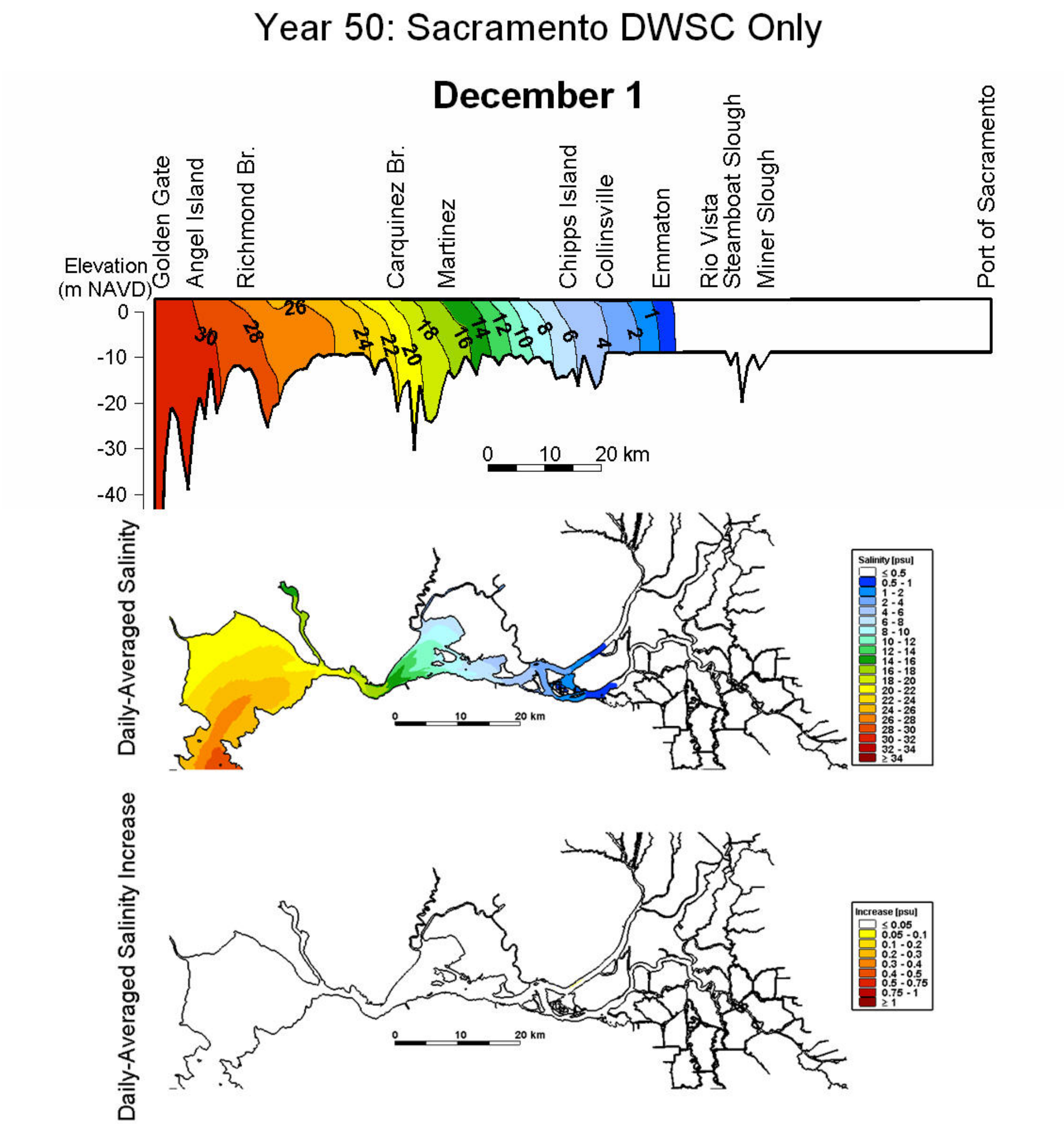


Figure 5.4-10 Predicted daily-averaged salinity profile along the axis of San Francisco Bay from the Golden Gate to the Port of Sacramento on December 1 for the Year 50 Sacramento DWSC Only Deepening scenario (top); predicted depth-averaged daily-averaged salinity on December 1 for the Year 50 Sacramento DWSC Only Deepening scenario (middle); predicted increase in depth-averaged daily-averaged salinity on December 1 relative to the Year 50 Baseline scenario for the Year 50 Sacramento DWSC Only Deepening scenario.

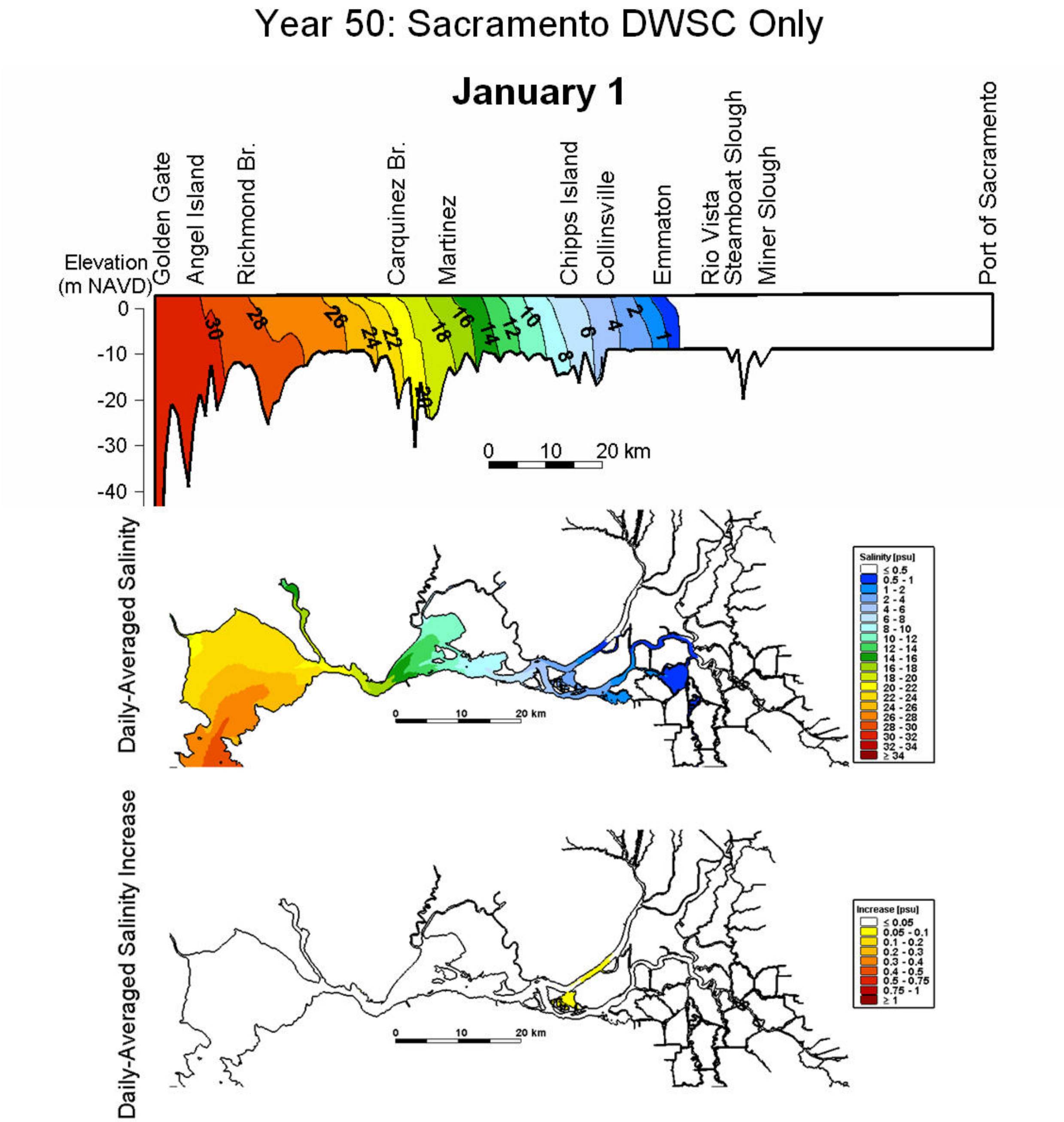


Figure 5.4-11 Predicted daily-averaged salinity profile along the axis of San Francisco Bay from the Golden Gate to the Port of Sacramento on January 1 for the Year 50 Sacramento DWSC Only Deepening scenario (top); predicted depth-averaged daily-averaged salinity on January 1 for the Year 50 Sacramento DWSC Only Deepening scenario (middle); predicted increase in depth-averaged daily-averaged salinity on January 1 relative to the Year 50 Baseline scenario for the Year 50 Sacramento DWSC Only Deepening scenario.

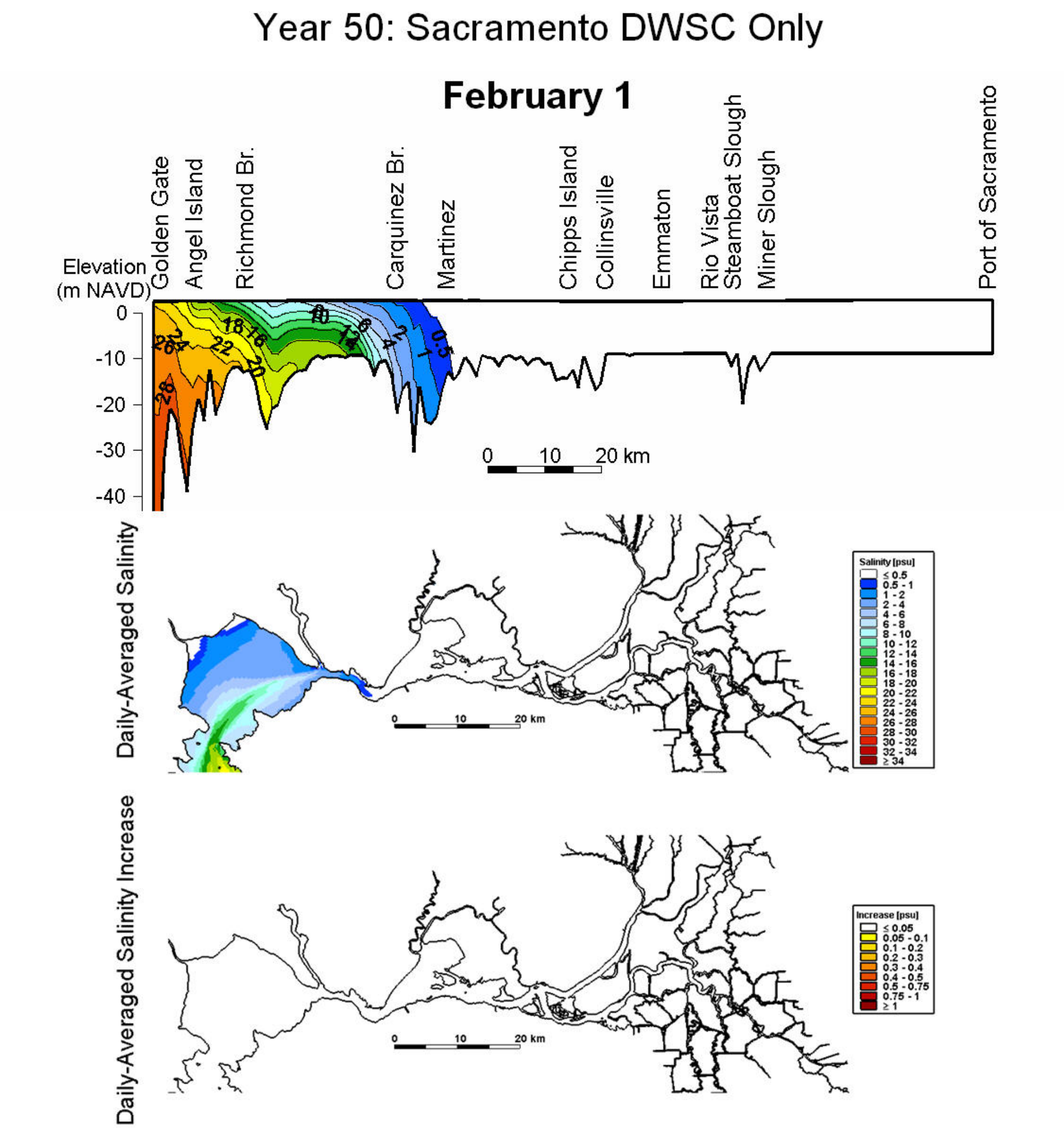


Figure 5.4-12 Predicted daily-averaged salinity profile along the axis of San Francisco Bay from the Golden Gate to the Port of Sacramento on February 1 for the Year 50 Sacramento DWSC Only Deepening scenario (top); predicted depth-averaged daily-averaged salinity on February 1 for the Year 50 Sacramento DWSC Only Deepening scenario (middle); predicted increase in depth-averaged daily-averaged salinity on February 1 relative to the Year 50 Baseline scenario for the Year 50 Sacramento DWSC Only Deepening scenario.

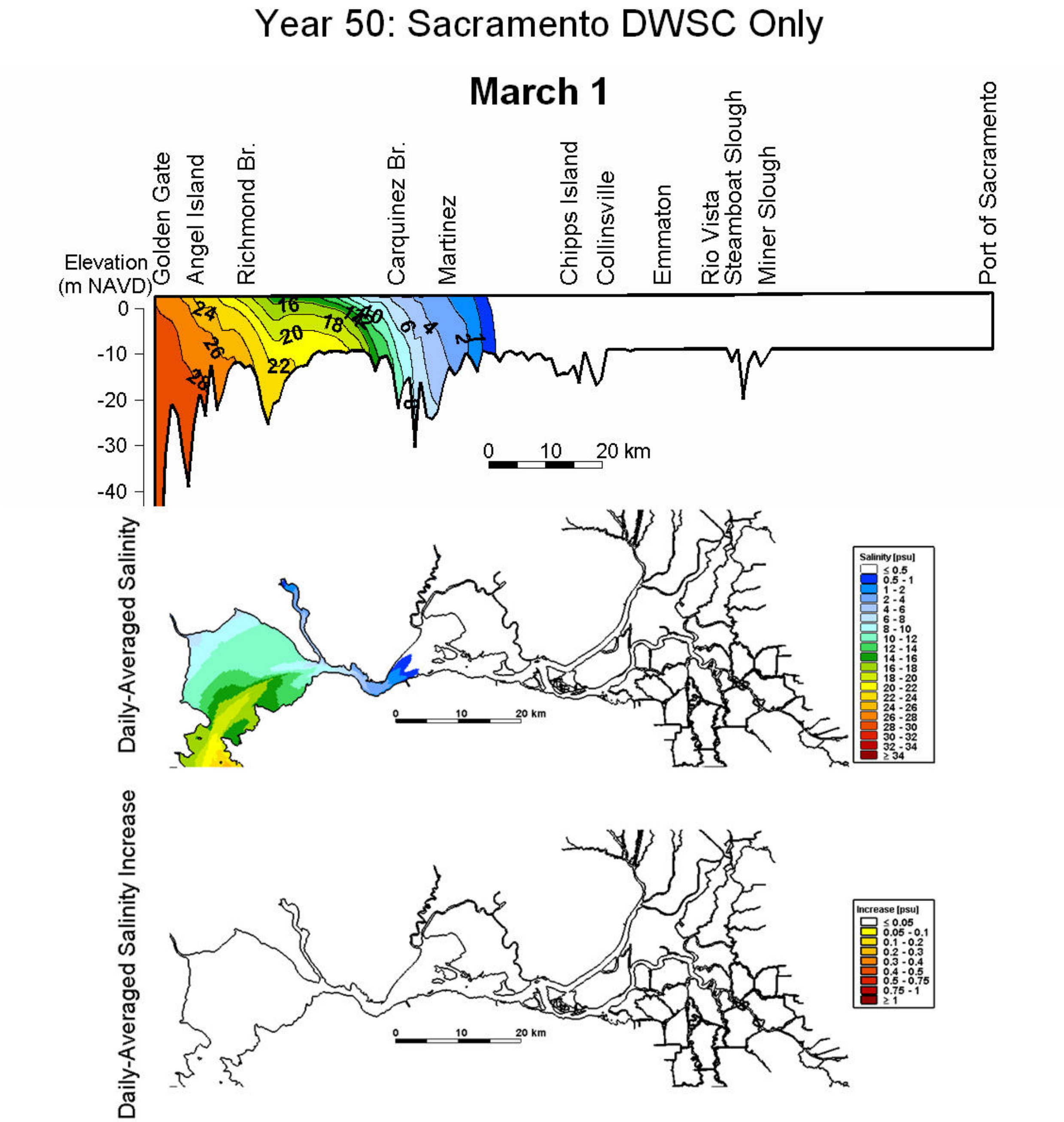


Figure 5.4-13 Predicted daily-averaged salinity profile along the axis of San Francisco Bay from the Golden Gate to the Port of Sacramento on March 1 for the Year 50 Sacramento DWSC Only Deepening scenario (top); predicted depth-averaged daily-averaged salinity on March 1 for the Year 50 Sacramento DWSC Only Deepening scenario (middle); predicted increase in depth-averaged daily-averaged salinity on March 1 relative to the Year 50 Baseline scenario for the Year 50 Sacramento DWSC Only Deepening scenario.

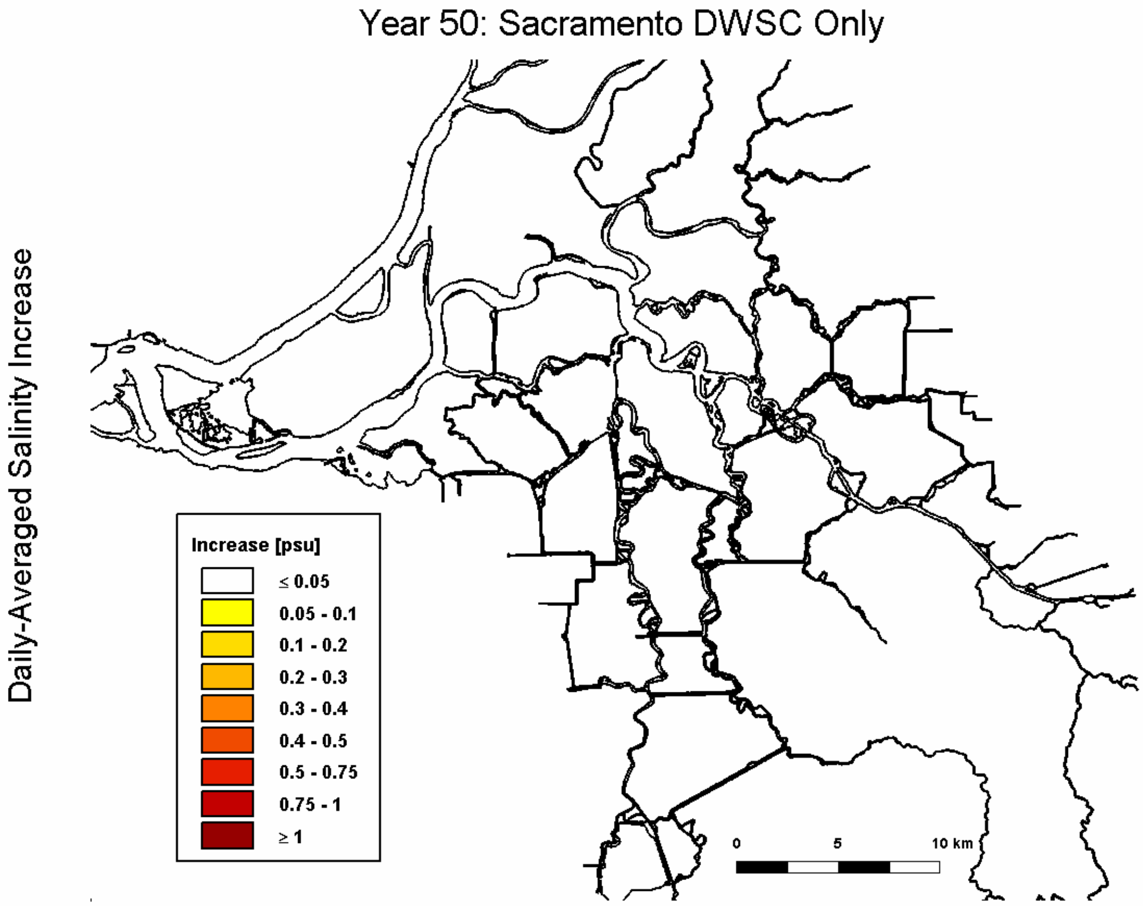


Figure 5.4-14 Predicted depth-averaged daily-averaged salinity increase in the Sacramento-San Joaquin Delta on April 1 for the Year 50 Sacramento DWSC Only Deepening scenario relative to the Year 50 Baseline scenario.

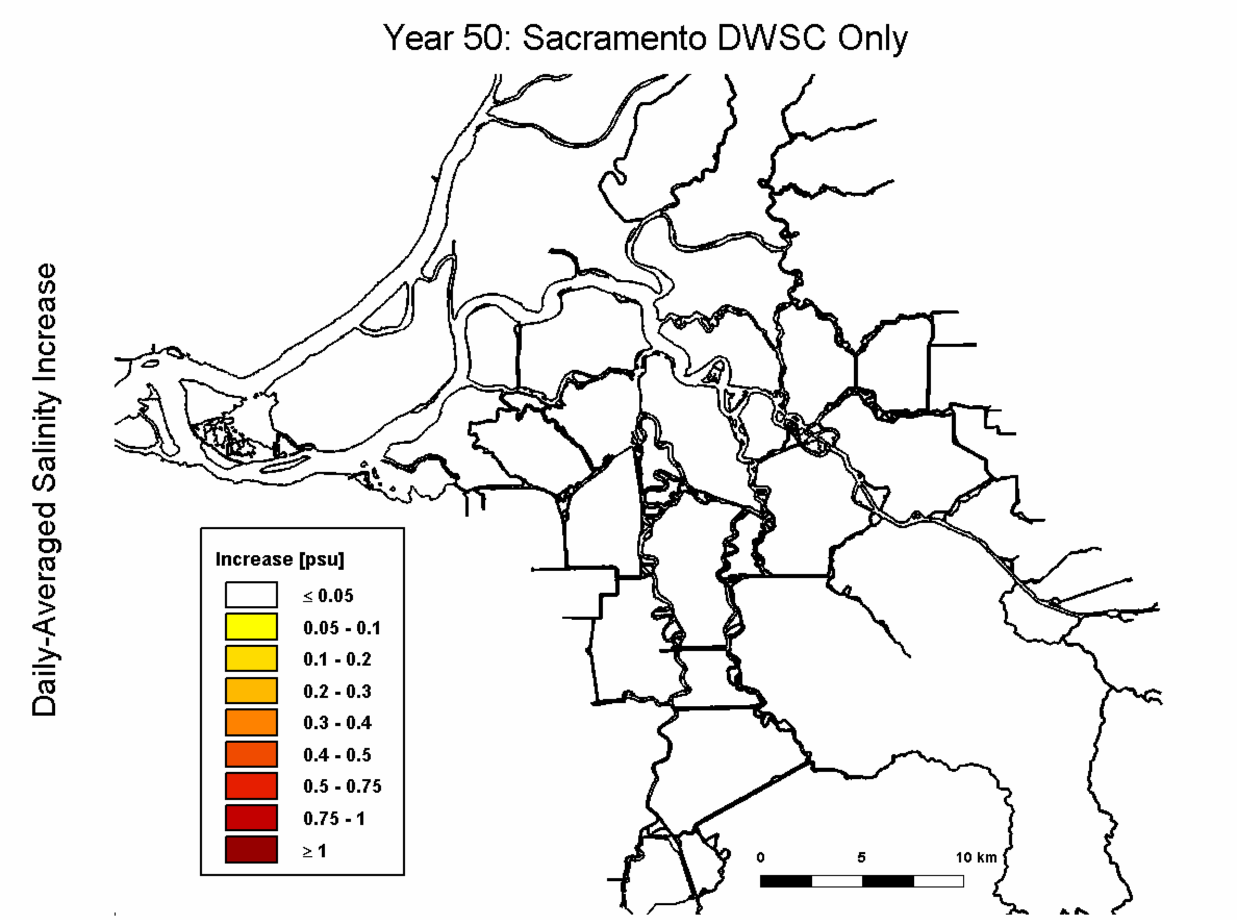


Figure 5.4-15 Predicted depth-averaged daily-averaged salinity increase in the Sacramento-San Joaquin Delta on May 1 for the Year 50 Sacramento DWSC Only Deepening scenario relative to the Year 50 Baseline scenario.

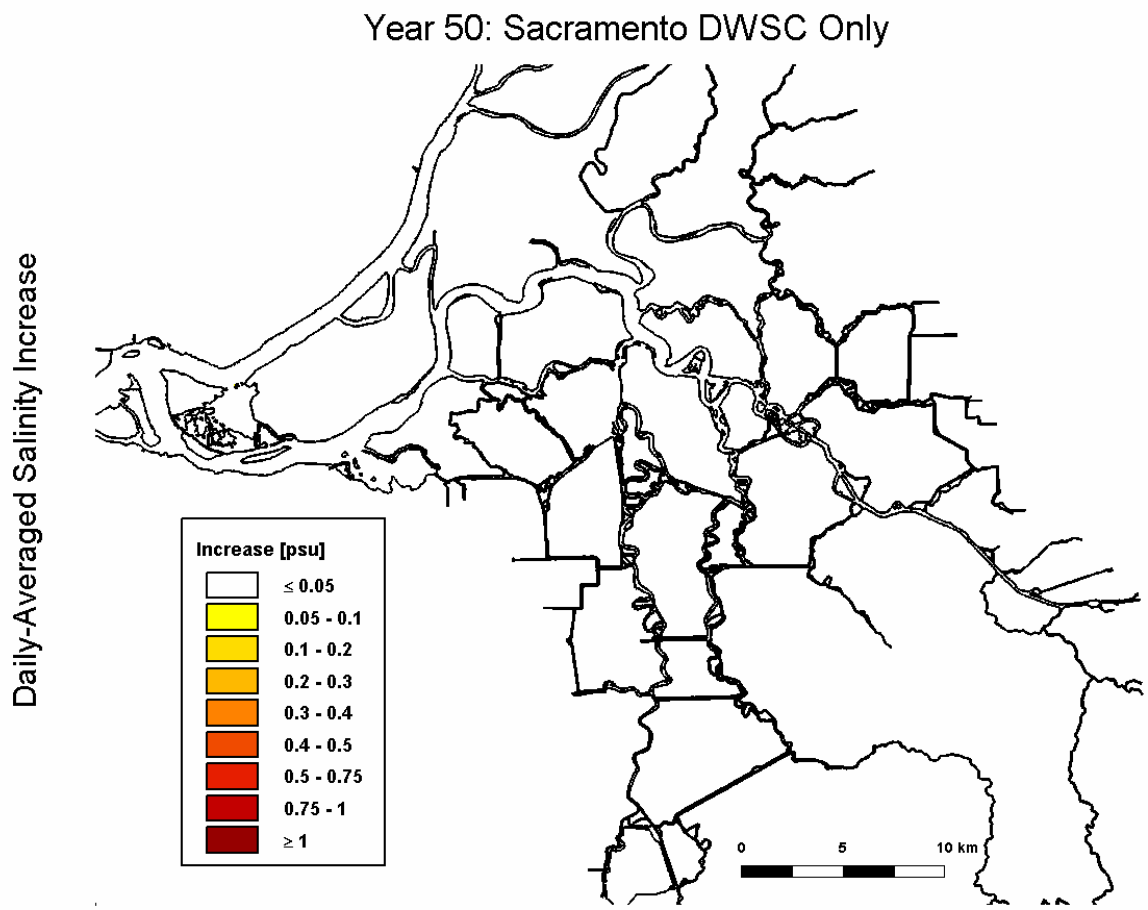


Figure 5.4-16 Predicted depth-averaged daily-averaged salinity increase in the Sacramento-San Joaquin Delta on June 1 for the Year 50 Sacramento DWSC Only Deepening scenario relative to the Year 50 Baseline scenario.

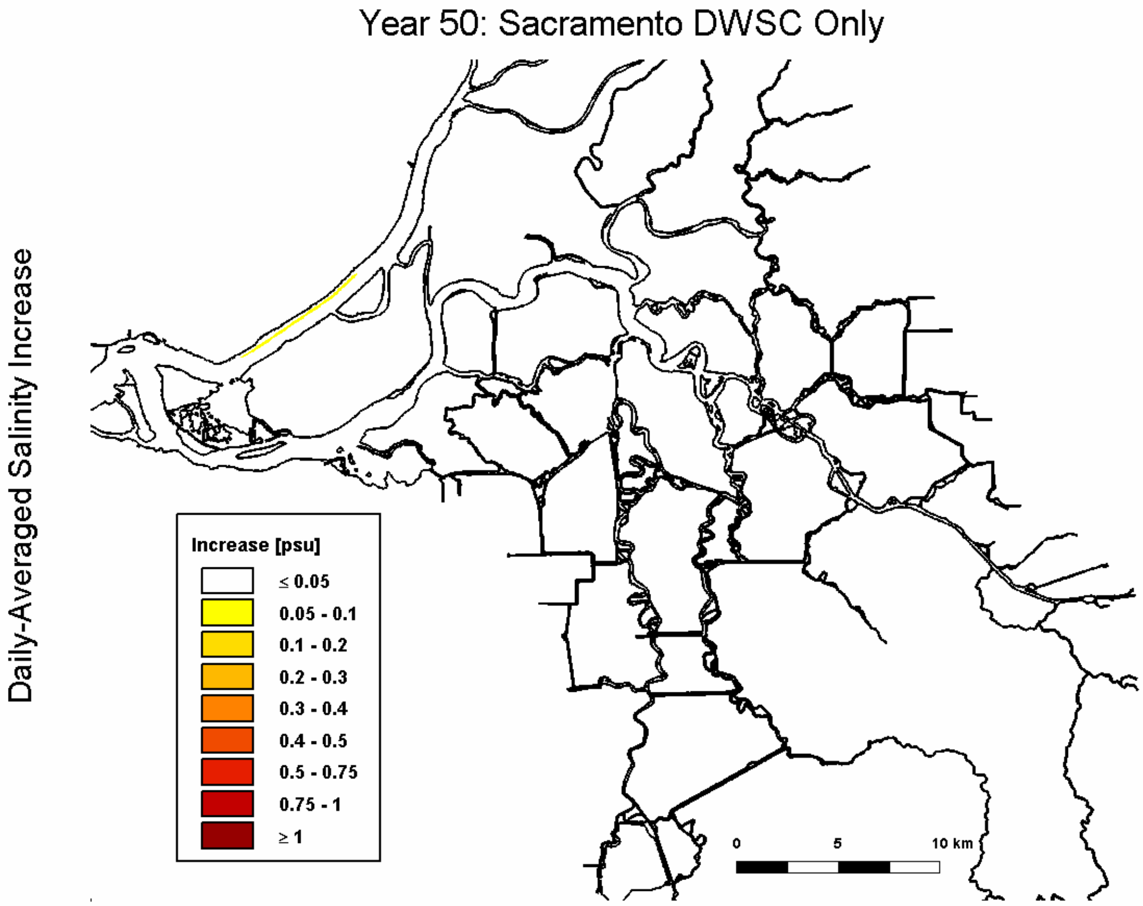


Figure 5.4-17 Predicted depth-averaged daily-averaged salinity increase in the Sacramento-San Joaquin Delta on July 1 for the Year 50 Sacramento DWSC Only Deepening scenario relative to the Year 50 Baseline scenario.

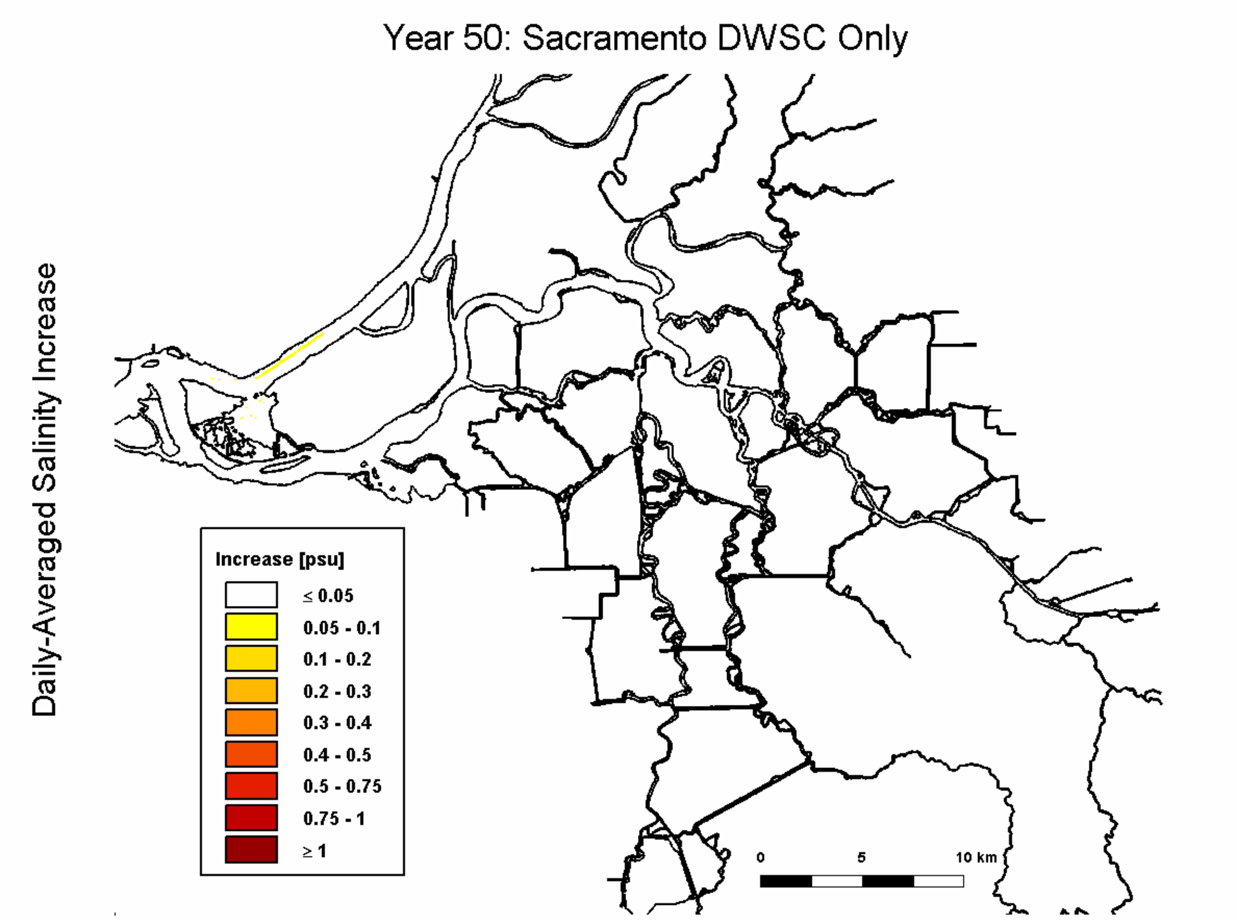


Figure 5.4-18 Predicted depth-averaged daily-averaged salinity increase in the Sacramento-San Joaquin Delta on August 1 for the Year 50 Sacramento DWSC Only Deepening scenario relative to the Year 50 Baseline scenario.

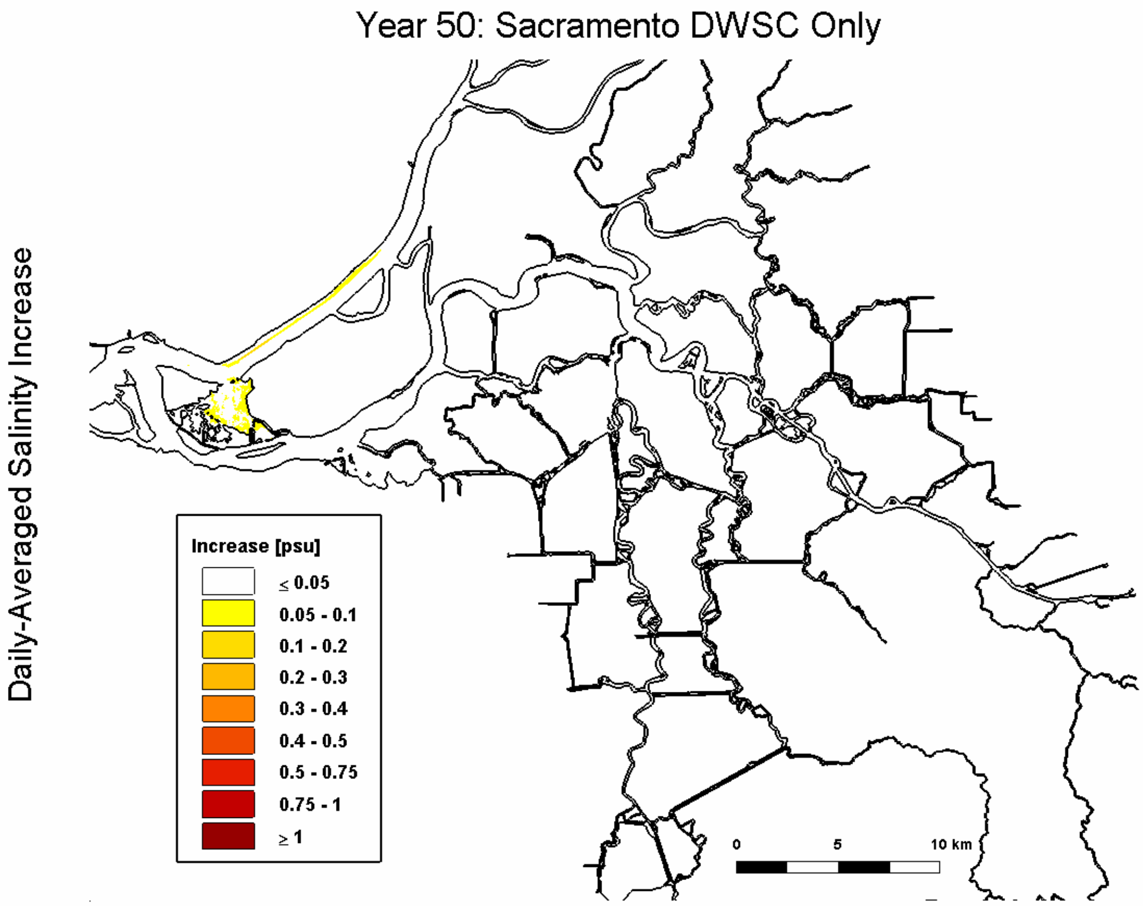


Figure 5.4-19 Predicted depth-averaged daily-averaged salinity increase in the Sacramento-San Joaquin Delta on September 1 for the Year 50 Sacramento DWSC Only Deepening scenario relative to the Year 50 Baseline scenario.

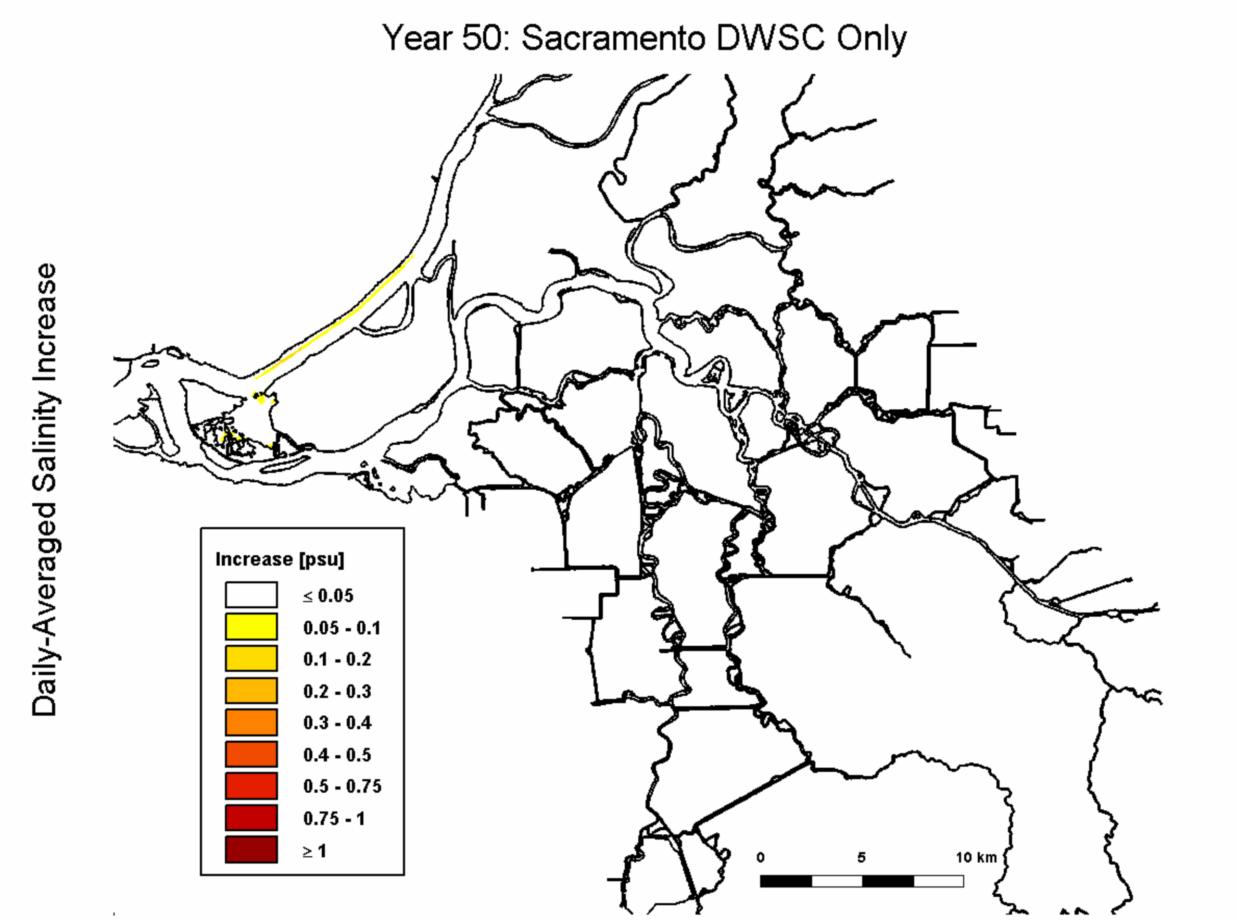


Figure 5.4-20 Predicted depth-averaged daily-averaged salinity increase in the Sacramento-San Joaquin Delta on October 1 for the Year 50 Sacramento DWSC Only Deepening scenario relative to the Year 50 Baseline scenario.

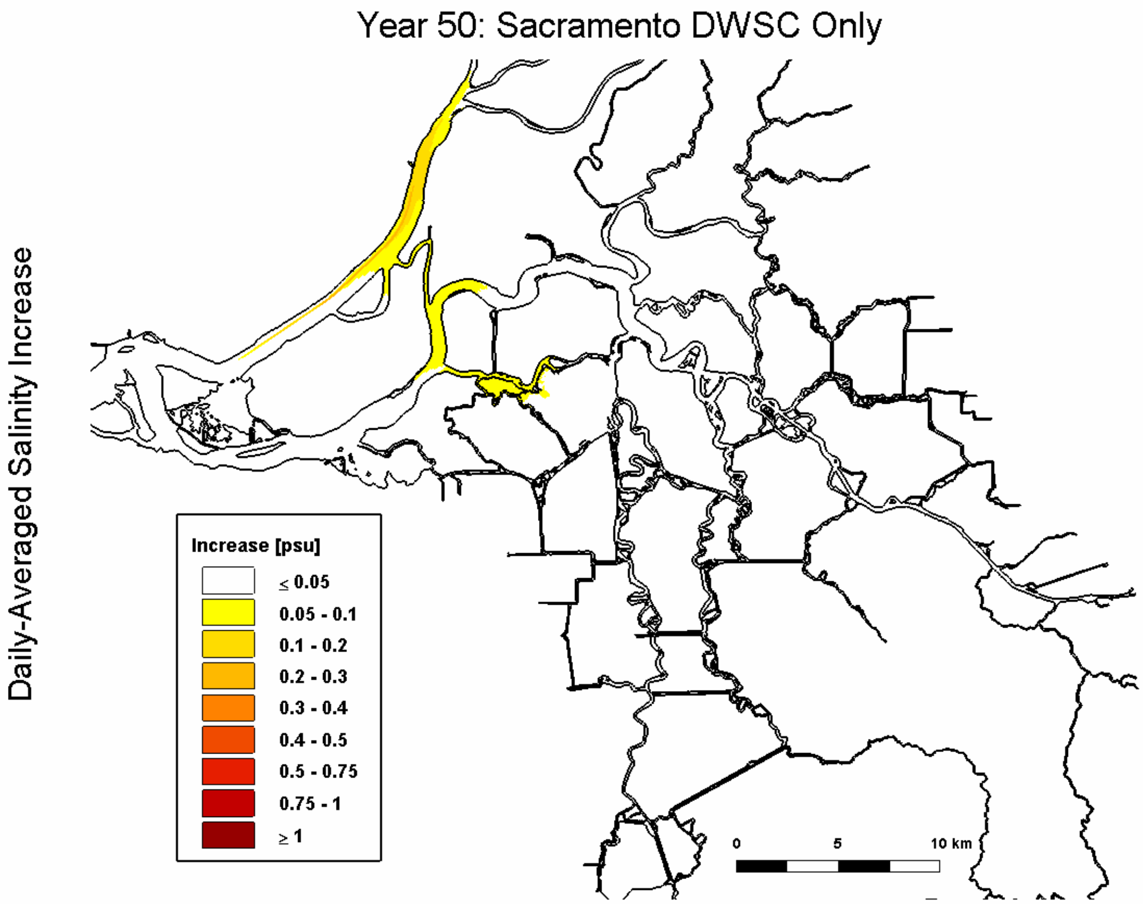


Figure 5.4-21 Predicted depth-averaged daily-averaged salinity increase in the Sacramento-San Joaquin Delta on October 24, the day of maximum predicted X2, for the Year 50 Sacramento DWSC Only Deepening scenario relative to the Year 50 Baseline scenario.

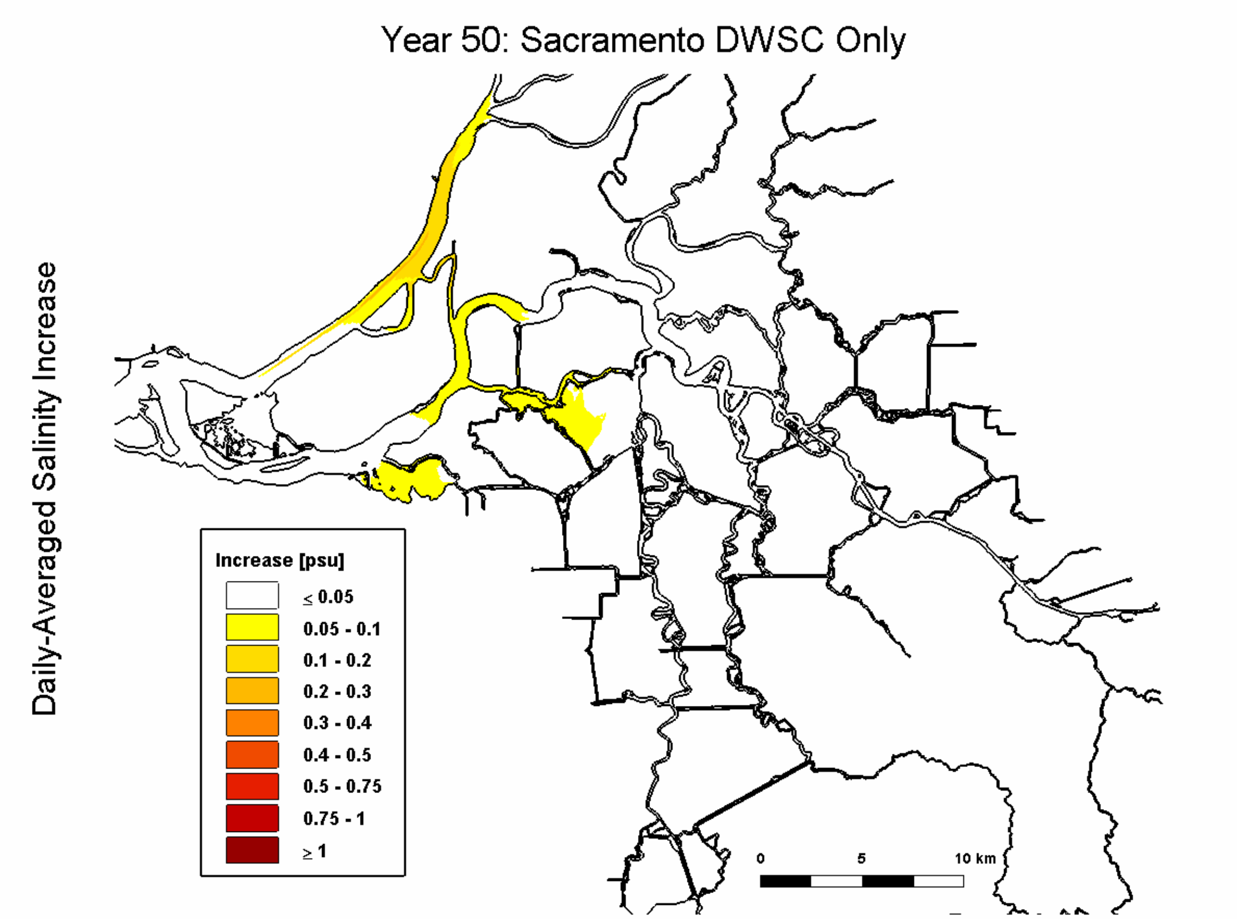


Figure 5.4-22 Predicted depth-averaged daily-averaged salinity increase in the Sacramento-San Joaquin Delta on November 1 for the Year 50 Sacramento DWSC Only Deepening scenario relative to the Year 50 Baseline scenario.

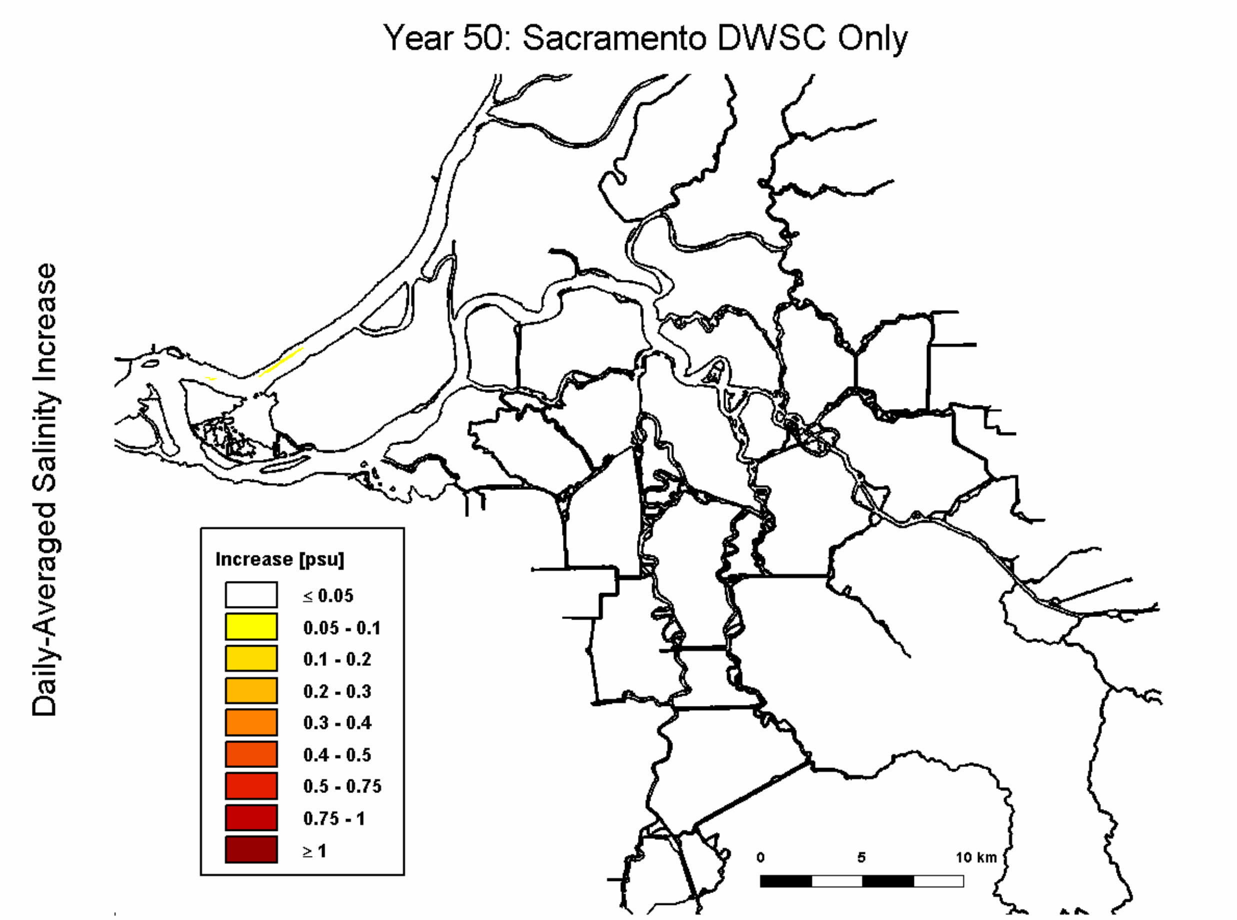


Figure 5.4-23 Predicted depth-averaged daily-averaged salinity increase in the Sacramento-San Joaquin Delta on December 1 for the Year 50 Sacramento DWSC Only Deepening scenario relative to the Year 50 Baseline scenario.

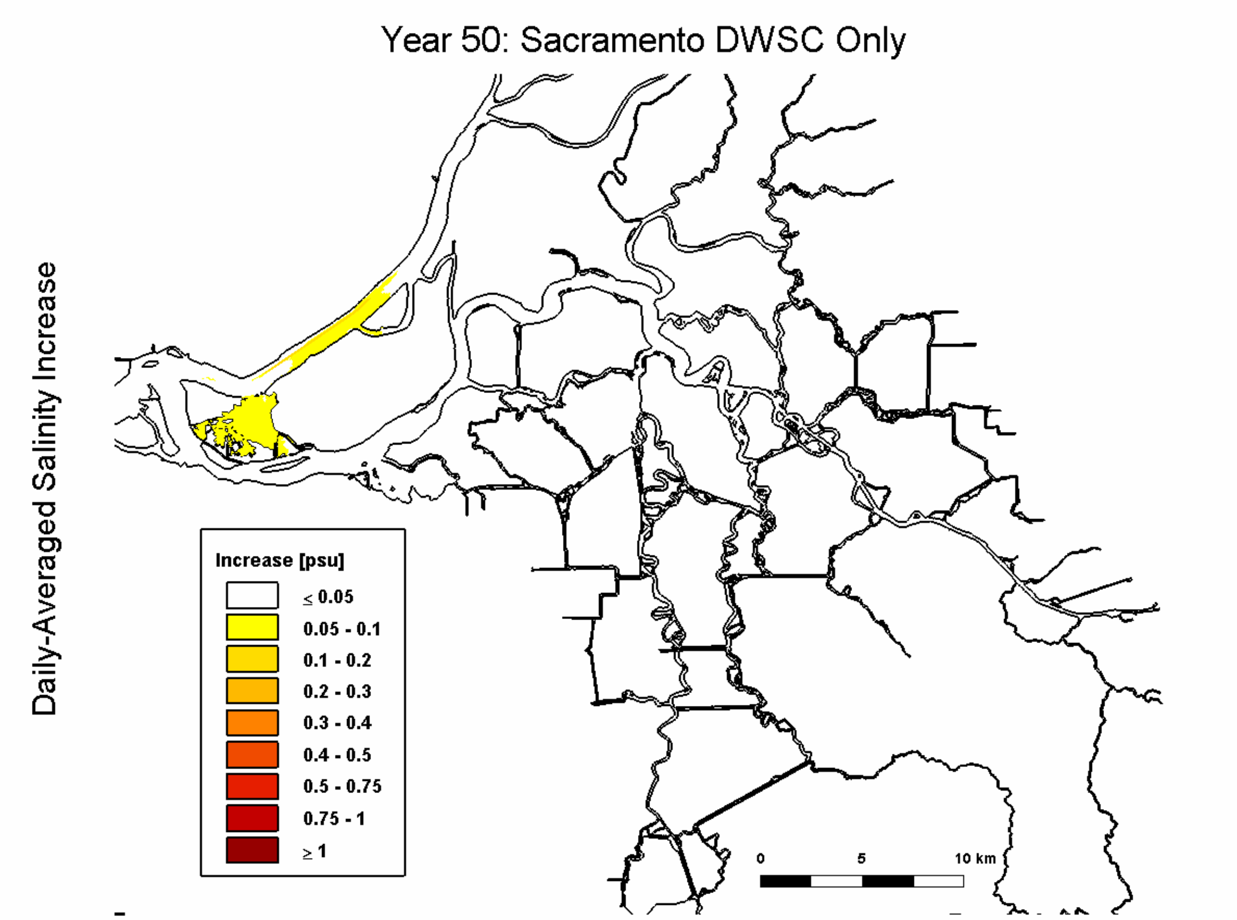


Figure 5.4-24 Predicted depth-averaged daily-averaged salinity increase in the Sacramento-San Joaquin Delta on January 1 for the Year 50 Sacramento DWSC Only Deepening scenario relative to the Year 50 Baseline scenario.

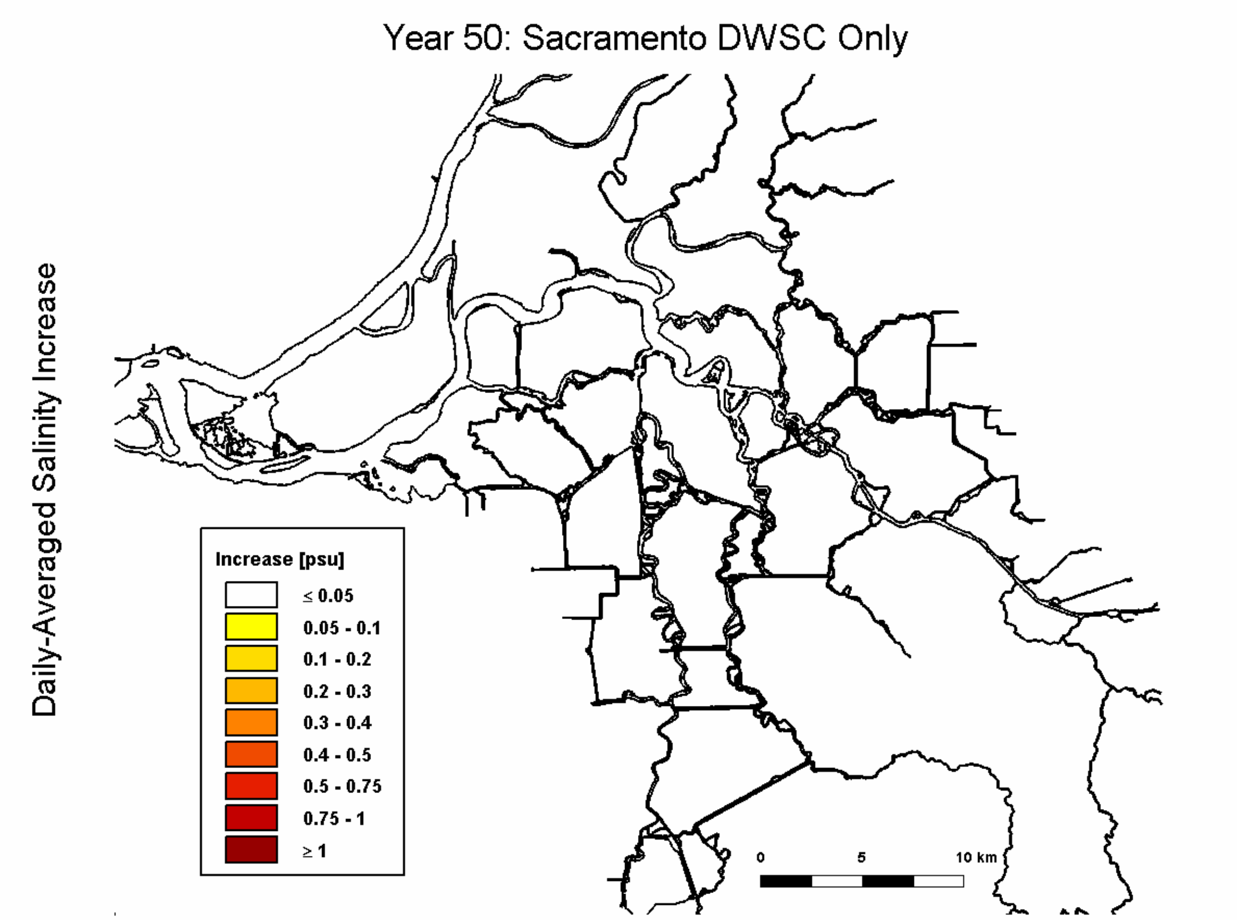


Figure 5.4-25 Predicted depth-averaged daily-averaged salinity increase in the Sacramento-San Joaquin Delta on February 1 for the Year 50 Sacramento DWSC Only Deepening scenario relative to the Year 50 Baseline scenario.

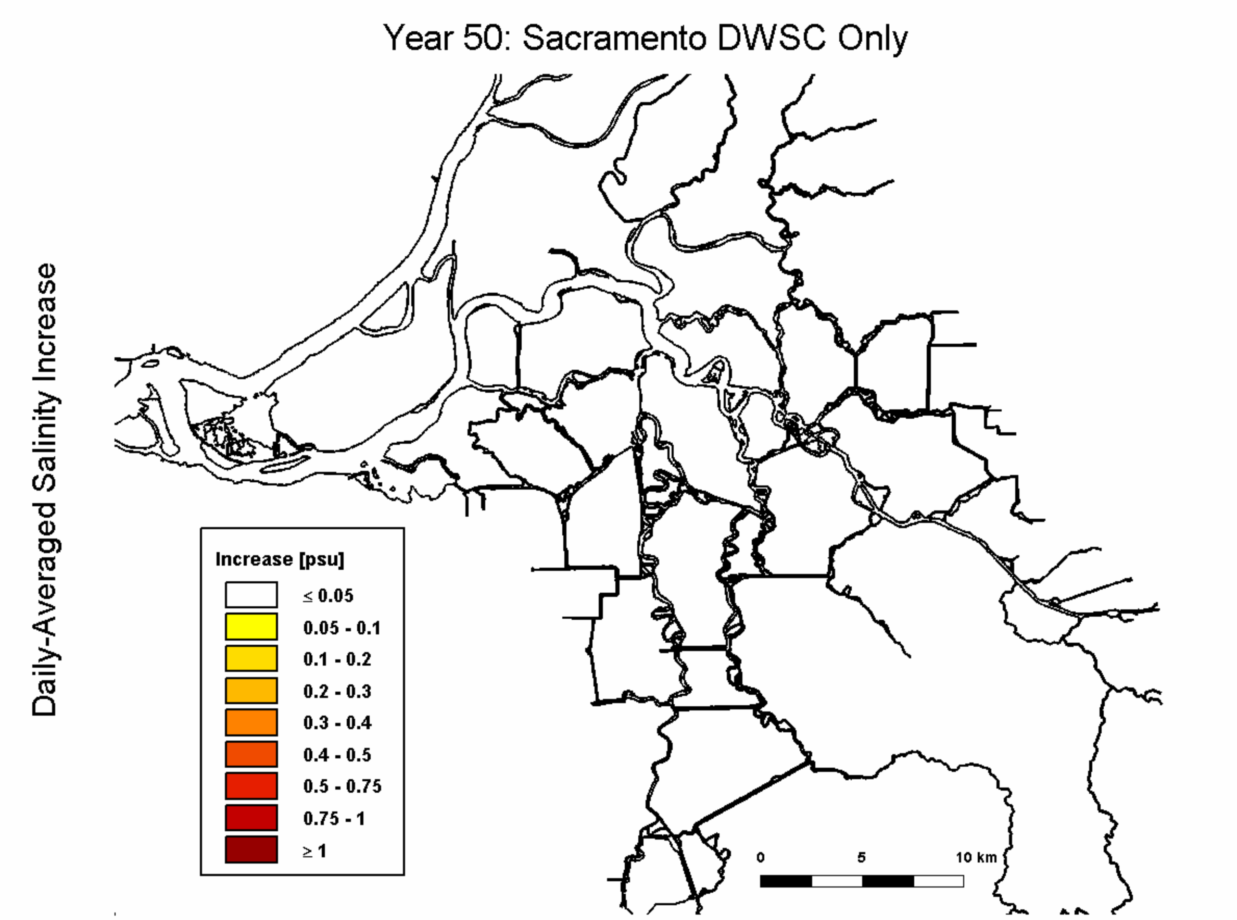


Figure 5.4-26 Predicted depth-averaged daily-averaged salinity increase in the Sacramento-San Joaquin Delta on March 1 for the Year 50 Sacramento DWSC Only Deepening scenario relative to the Year 50 Baseline scenario.

5.4.2 Year 50 Both Sacramento DWSC & SF Bay to Stockton DWSC Deepening

Figure 5.4-27 shows the predicted daily-averaged salinity profile along the axis of San Francisco Bay from the Golden Gate to the Port of Stockton, depth-averaged daily-averaged salinity map, and predicted salinity increase relative to the Year 50 Baseline scenario for the Year 50 Both DWSC Deepening scenario at the beginning of the analysis period for the Year 50 simulation on April 1. On April 1, X2 is between of Chipps Island and Collinsville, and the 0.5 psu salinity isohaline is upstream of Antioch (note that both of these isohalines are shifted upstream relative to the Year 50 Sacramento DWSC Only Deepening scenario salinity profile shown on Figure 5.4-1). Predicted salinity increases on April 1 for the Year 50 Both DWSC Deepening scenario are evident in San Pablo Bay, Suisun Bay, and into the western Delta. The largest salinity increases are evident within the Pinole Shoal Channel in San Pablo Bay and through Carquinez Strait, where predicted salinity increases range between 0.5 psu and 1.0 psu. The strong stratification evident west of the Carquinez Bridge suggests that strong gravitational circulation is occurring in this region. The deepening of the Pinole DWSC results in increased salt intrusion through San Pablo Bay. Salinity increases of between 0.3 and 0.50 psu are evident in much of Suisun Bay, with the largest salinity increases predicted in and near the Stockton DWSC.

During late spring and early summer conditions on May 1 (Figure 5.4-28) and June 1 (Figure 5.4-29) predicted depth-averaged daily-averaged salinity increases are predicted in San Pablo Bay and Suisun Bay resulting from the Year 50 Both DWSC Deepening scenario. Salinity increases of between 0.05 and 0.2 psu are predicted in much of San Pablo Bay and salinity increases of between 0.3 and 0.5 psu are predicted in much of Suisun Bay.

On July 1 (Figure 5.4-30), the 0.5 psu isohaline is between Jersey Point and Threemile Slough and the 1 psu isohaline is near Dutch Slough. Salinity increases in San Pablo Bay and Suisun Bay on July 1 are similar to the salinity increases predicted during May and June, however larger salinity increases are predicted in the western Delta (see Figure 5.4-43).

On August 1 (Figure 5.4-31) salinity increases of between 0.05 and 0.3 psu are predicted in eastern San Pablo Bay, and salinity increases of between 0.3 and 0.5 psu are predicted in most of Suisun Bay. Predicted salinity increases of at least 0.05 psu extend up the Sacramento River past Emmaton, along the San Joaquin River past Threemile Slough, and throughout most of Franks Tract (see Figure 5.4-44).

On September 1 (Figure 5.4-32), salinity increases of between 0.05 and 0.3 psu are predicted in eastern of San Pablo Bay, and salinity increases of between 0.3 and 0.5 psu are predicted in most of Suisun Bay. Predicted salinity increases of 0.05 psu extend up the Sacramento River past Emmaton, and along the San Joaquin River past Sevenmile Slough. Salinity increases between 0.05 and 0.1 psu are predicted in Franks Tract and extend south along Old River past Victoria Canal (see Figure 5.4-45).

During September, Delta outflow is somewhat higher (167 m^3/s) than during August (122 m^3/s), and exports during September are significantly lower than during August (see Figure 3.3-2). As a result, by October 1 (Figure 5.4-33), predicted salinity increases in Franks Tract and Old River are significantly less than on September 1.

As seen in Figure 3.2-2, Delta outflow during October in the Year 50 simulation is at an annual low of 86 m^3/s, compared to 167 m^3/s in September and 334 m^3/s in November. As a result, significant salt intrusion occurs during October leading to an annual maximum X2 for all scenarios on October 24. On October 24 (Figure 5.4-34), the day of maximum predicted X2 during the Year 50 simulation period, salinity increases of between 0.1and 0.2 psu are predicted in most of Franks Tract and salinity increases of between 0.05 and 010 psu extend down Old River past Victoria Canal.

On November 1 (Figure 5.4-35), predicted salinity increases are similar to those on October 24, with larger predicted salinity increases seen in the western part of Franks Tract and salinity increases of between 0.05 and 0.10 psu in Clifton Court Forebay (see Figure 5.4-48).

During November, Delta outflow increases significantly to 334 m^3/s (from 86 m^3/s during October), due largely to lower exports during November (see Figure 3.2-2). As a result, much of the salt that intruded into the western Delta during October has been flushed out of the Delta by December 1 (Figure 5.4-36). However salinity increases of between 0.05 and 0.10 psu are predicted in most of the central Delta and in Clifton Court Forebay (see Figure 5.4-49).

During December net Delta outflow decreases to 182 m^3/s resulting in additional salt intrusion during December. On January 1 (Figure 5.4-37), predicted salinity increases of between 0.2 and 0.3 psu are evident in Franks Tract and along Old River (see Figure 5.4-50).

Large Delta outflows during January (Figure 3.2-2) flush most of the salt out of the Delta and Suisun Bay, with the 0.5 psu isohaline near Martinez on February 1 (Figure 5.4-38). On February 1 no salinity increases greater than 0.05 psu are predicted east of Martinez resulting from the Year 50 Both DWSC Deepening scenario on February 1 (Figure 5.4-38) or March 1 (Figure 5.4-39).

Figure 5.4-40 through Figure 5.4-52 show the predicted increase in salinity in the Sacramento-San Joaquin Delta for the first day of each month and on October 24, the day of maximum predicted X2 for the Year 50 Both DWSC Deepening scenario during the Year 50 simulation period. These figures allow for closer inspection of salinity increases within the Delta on each of the days on which salinity profiles and maps are shown in Figures 5.4-27 through 5.4-39.

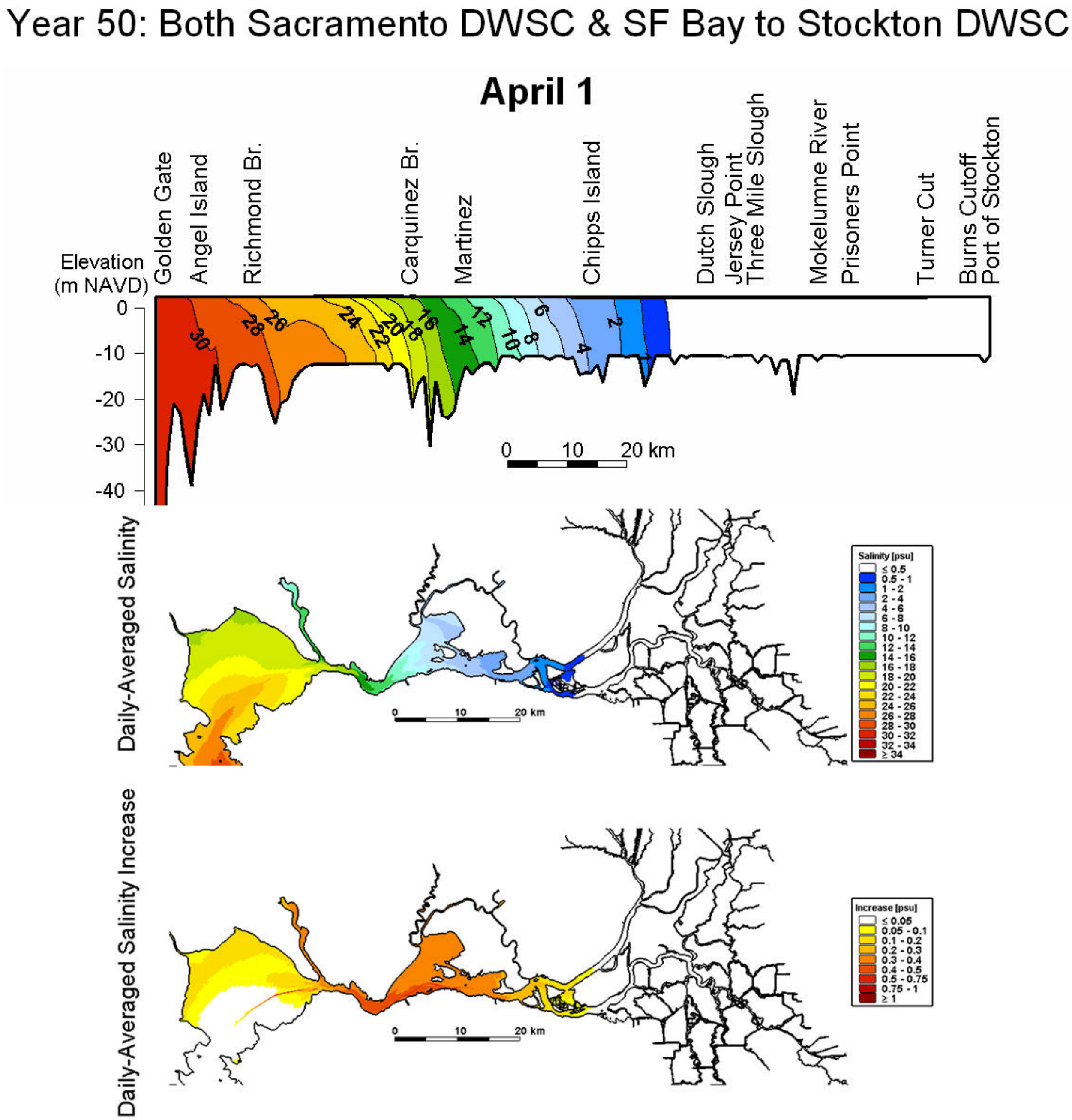


Figure 5.4-27 Predicted daily-averaged salinity profile along the axis of San Francisco Bay from the Golden Gate to the Port of Stockton on April 1 for the Year 50 Both DWSC Deepening scenario (top); predicted depth-averaged daily-averaged salinity on April 1 for the Year 50 Both DWSC Deepening scenario (middle); predicted increase in depth-averaged daily-averaged salinity on April 1 relative to the Year 50 Baseline scenario for the Year 50 Both DWSC Deepening scenario.

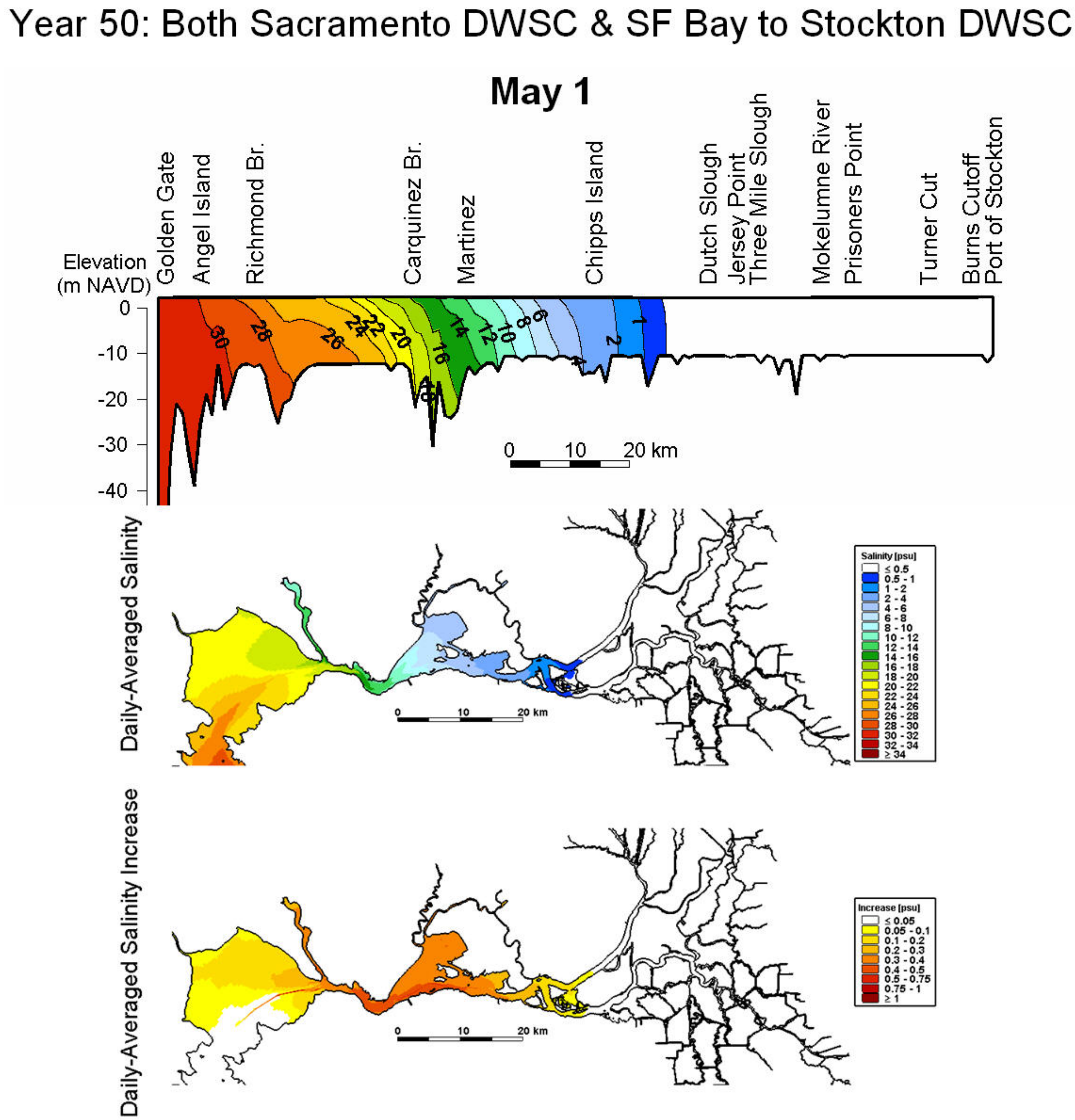


Figure 5.4-28 Predicted daily-averaged salinity profile along the axis of San Francisco Bay from the Golden Gate to the Port of Stockton on May 1 for the Year 50 Both DWSC Deepening scenario (top); predicted depth-averaged daily-averaged salinity on May 1 for the Year 50 Both DWSC Deepening scenario (middle); predicted increase in depth-averaged daily-averaged salinity on May 1 relative to the Year 50 Baseline scenario for the Year 50 Both DWSC Deepening scenario.

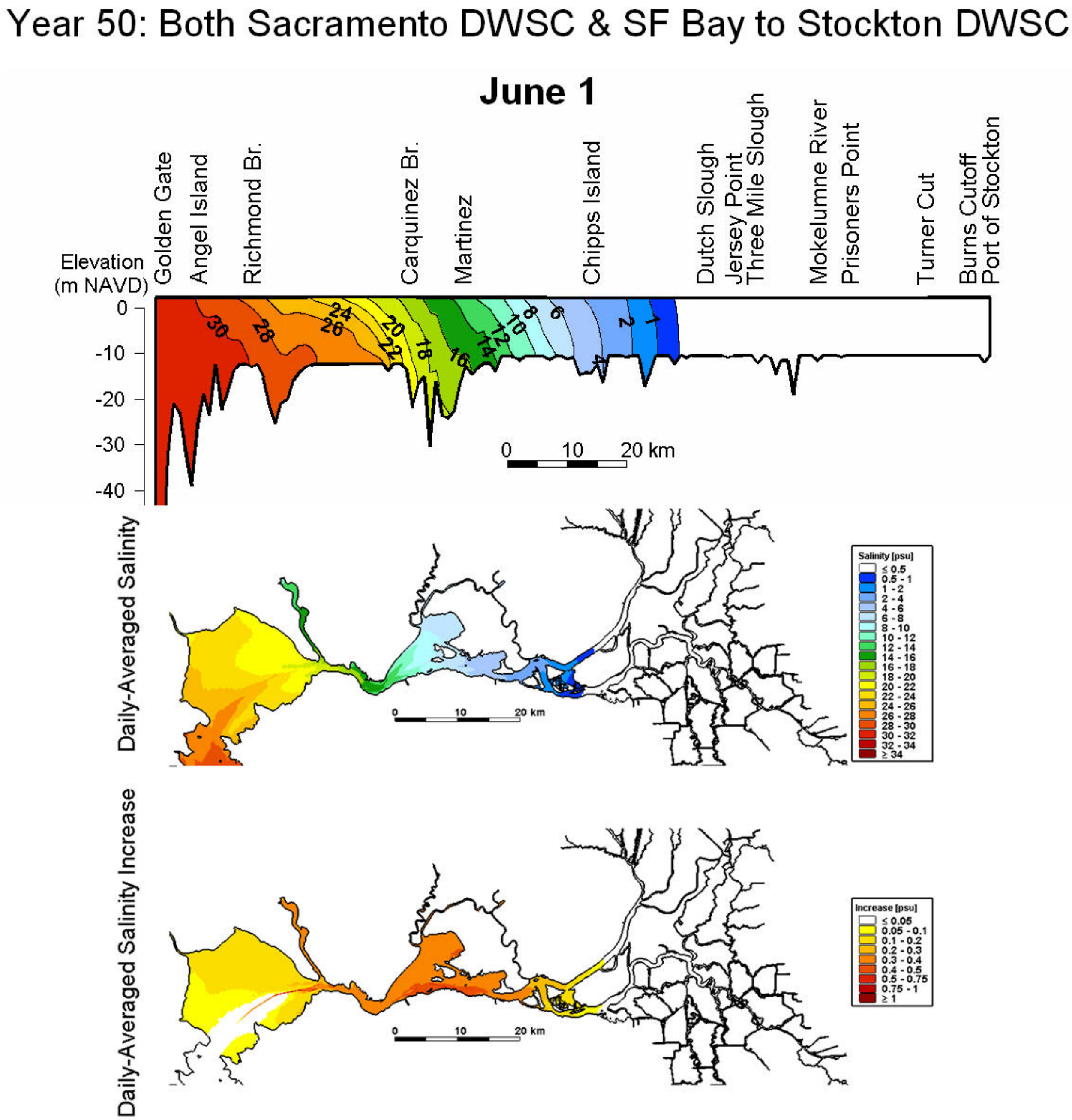


Figure 5.4-29 Predicted daily-averaged salinity profile along the axis of San Francisco Bay from the Golden Gate to the Port of Stockton on June 1 for the Year 50 Both DWSC Deepening scenario (top); predicted depth-averaged daily-averaged salinity on June 1 for the Year 50 Both DWSC Deepening scenario (middle); predicted increase in depth-averaged daily-averaged salinity on June 1 relative to the Year 50 Baseline scenario for the Year 50 Both DWSC Deepening scenario.

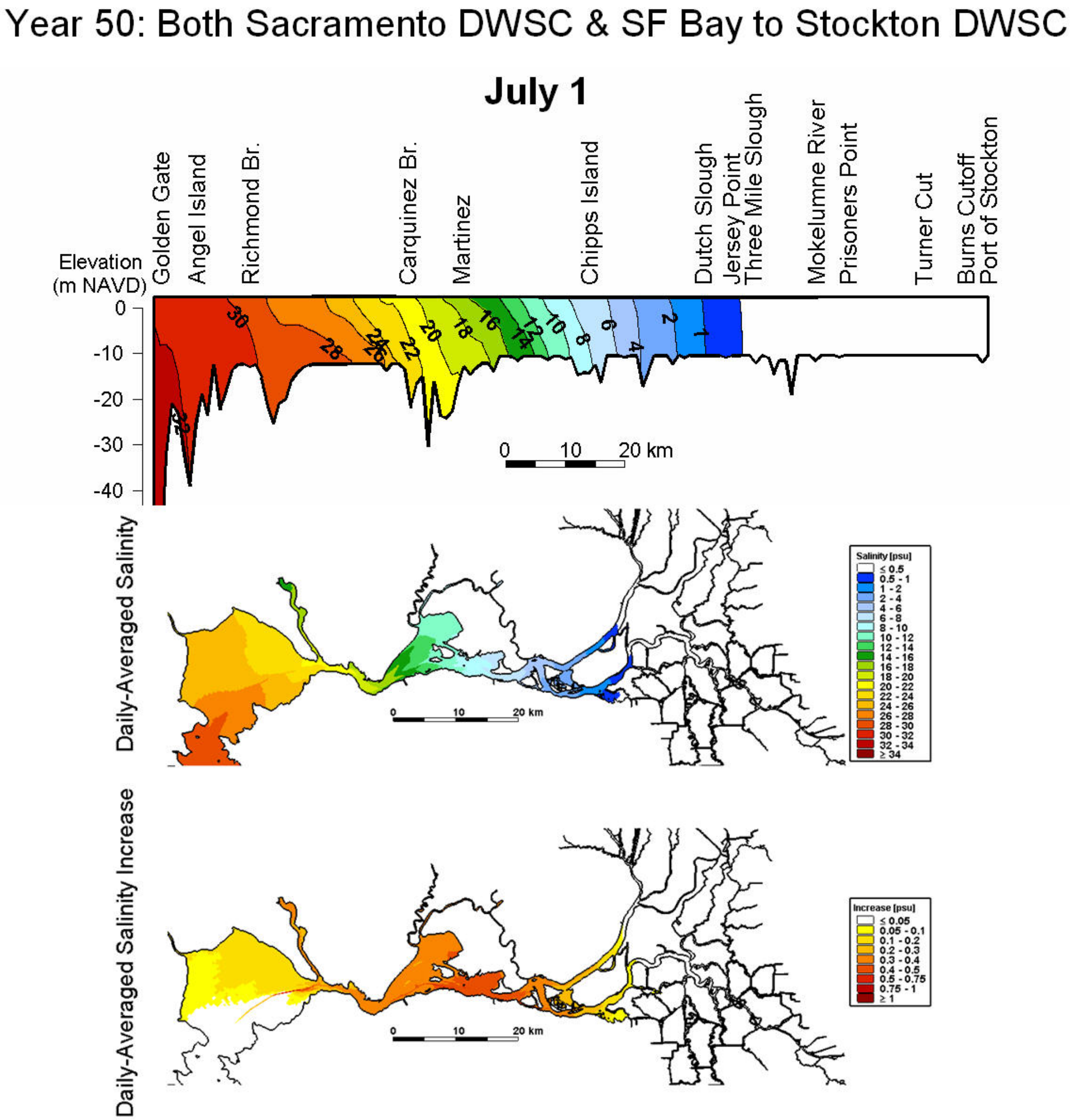


Figure 5.4-30 Predicted daily-averaged salinity profile along the axis of San Francisco Bay from the Golden Gate to the Port of Stockton on July 1 for the Year 50 Both DWSC Deepening scenario (top); predicted depth-averaged daily-averaged salinity on July 1 for the Year 50 Both DWSC Deepening scenario (middle); predicted increase in depth-averaged daily-averaged salinity on July 1 relative to the Year 50 Baseline scenario for the Year 50 Both DWSC Deepening scenario.

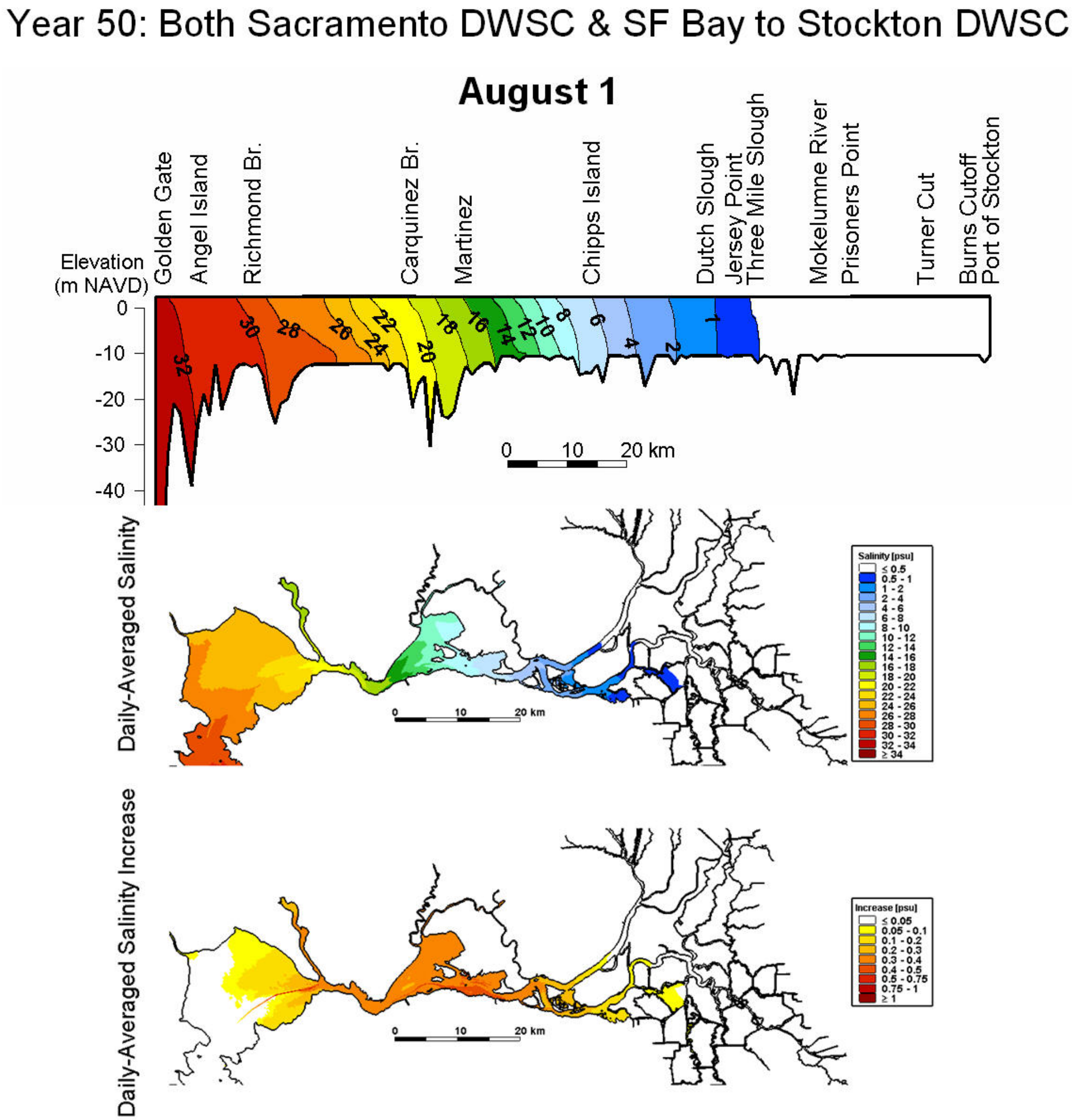


Figure 5.4-31 Predicted daily-averaged salinity profile along the axis of San Francisco Bay from the Golden Gate to the Port of Stockton on August 1 for the Year 50 Both DWSC Deepening scenario (top); predicted depth-averaged daily-averaged salinity on August 1 for the Year 50 Both DWSC Deepening scenario (middle); predicted increase in depth-averaged daily-averaged salinity on August 1 relative to the Year 50 Baseline scenario for the Year 50 Both DWSC Deepening scenario.

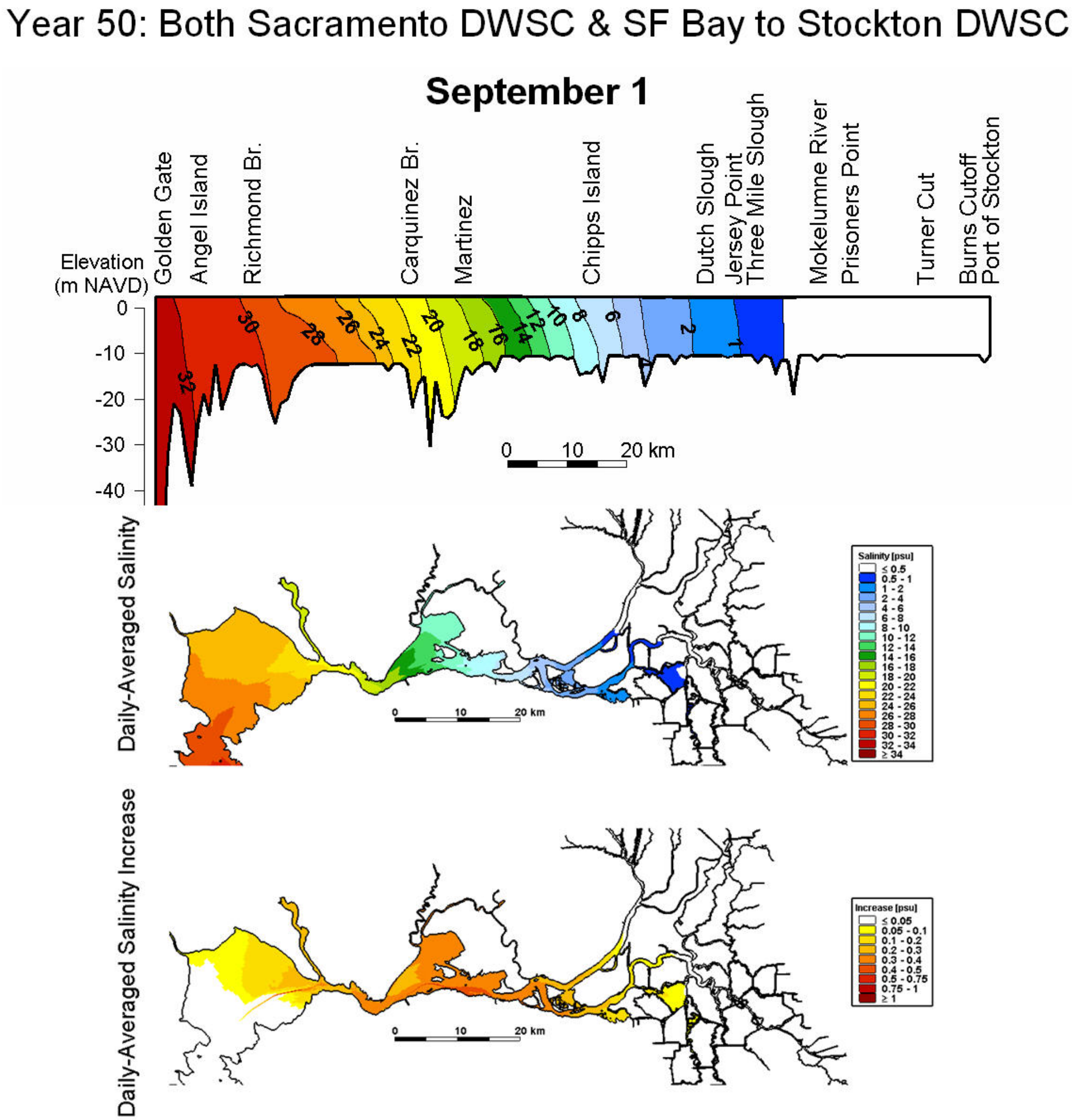


Figure 5.4-32 Predicted daily-averaged salinity profile along the axis of San Francisco Bay from the Golden Gate to the Port of Stockton on September 1 for the Year 50 Both DWSC Deepening scenario (top); predicted depth-averaged daily-averaged salinity on September 1 for the Year 50 Both DWSC Deepening scenario (middle); predicted increase in depth-averaged daily-averaged salinity on September 1 relative to the Year 50 Baseline scenario for the Year 50 Both DWSC Deepening scenario.

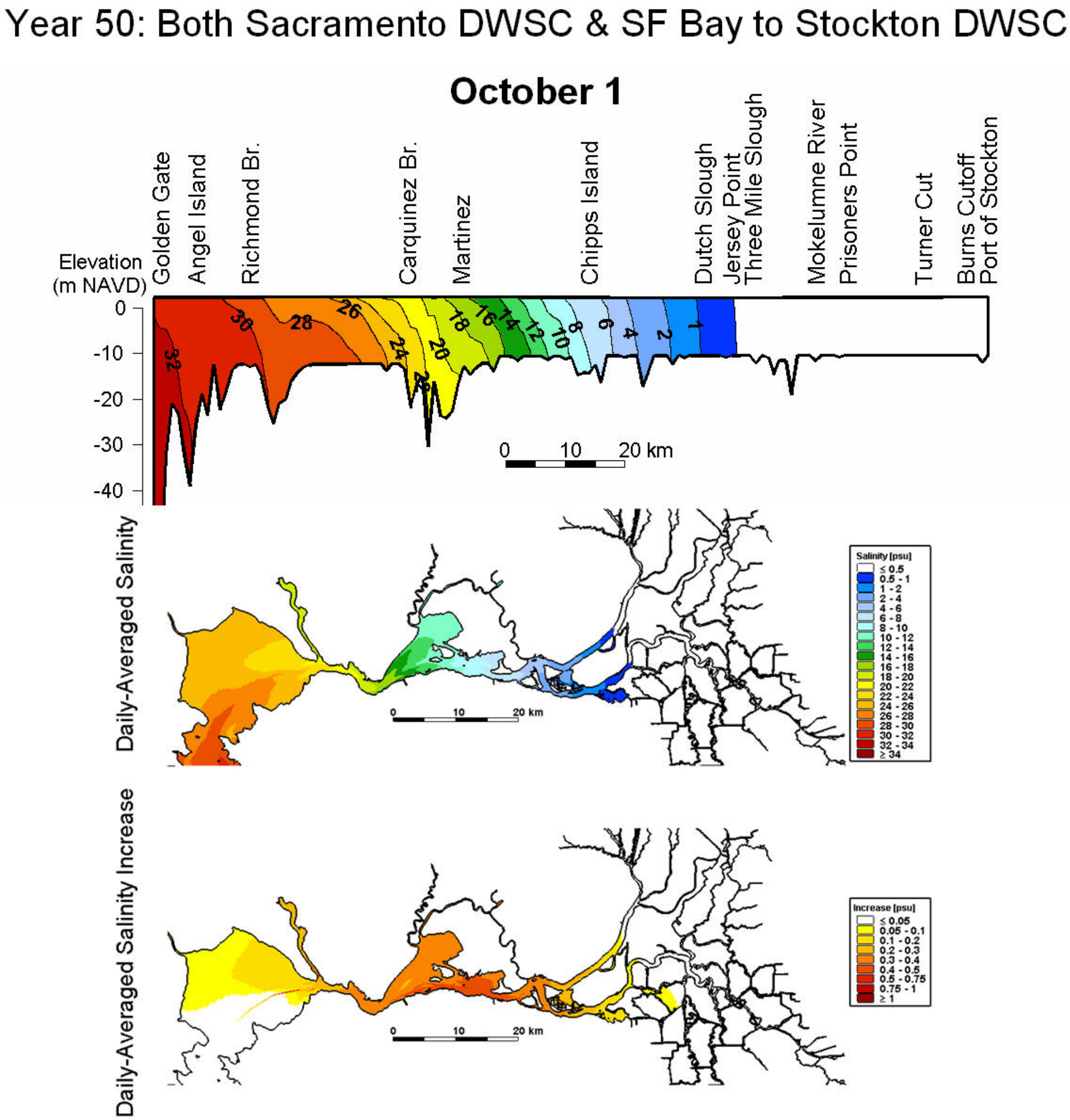


Figure 5.4-33 Predicted daily-averaged salinity profile along the axis of San Francisco Bay from the Golden Gate to the Port of Stockton on October 1 for the Year 50 Both DWSC Deepening scenario (top); predicted depth-averaged daily-averaged salinity on October 1 for the Year 50 Both DWSC Deepening scenario (middle); predicted increase in depth-averaged daily-averaged salinity on October 1 relative to the Year 50 Baseline scenario for the Year 50 Both DWSC Deepening scenario.

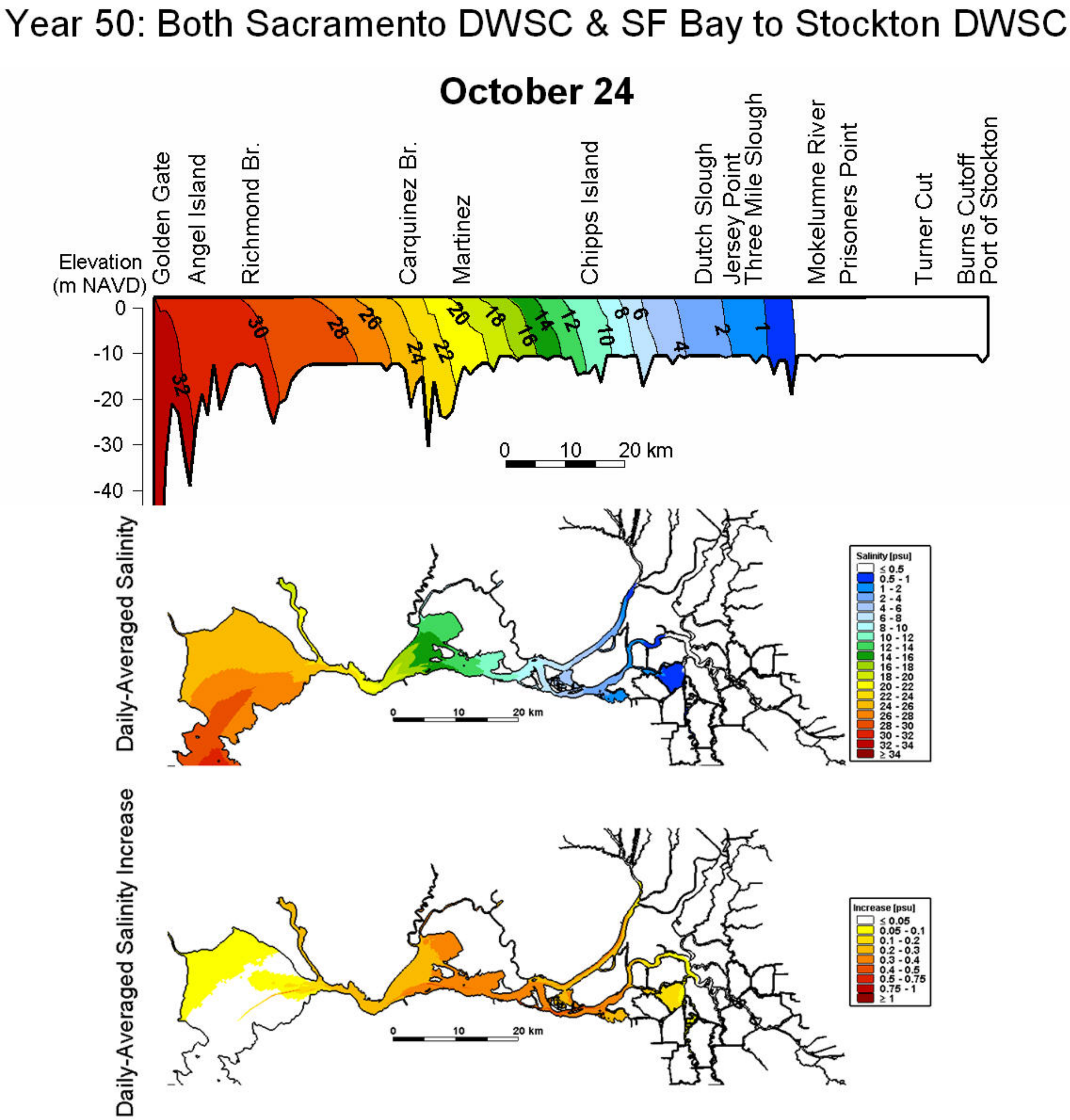


Figure 5.4-34 Predicted daily-averaged salinity profile along the axis of San Francisco Bay from the Golden Gate to the Port of Stockton on October 24, the day of maximum predicted X2, for the Year 50 Both DWSC Deepening scenario (top); predicted depth-averaged daily-averaged salinity on October 24 for the Year 50 Both DWSC Deepening scenario (middle); predicted increase in depth-averaged daily-averaged salinity on October 24 relative to the Year 50 Baseline scenario for the Year 50 Both DWSC Deepening scenario.

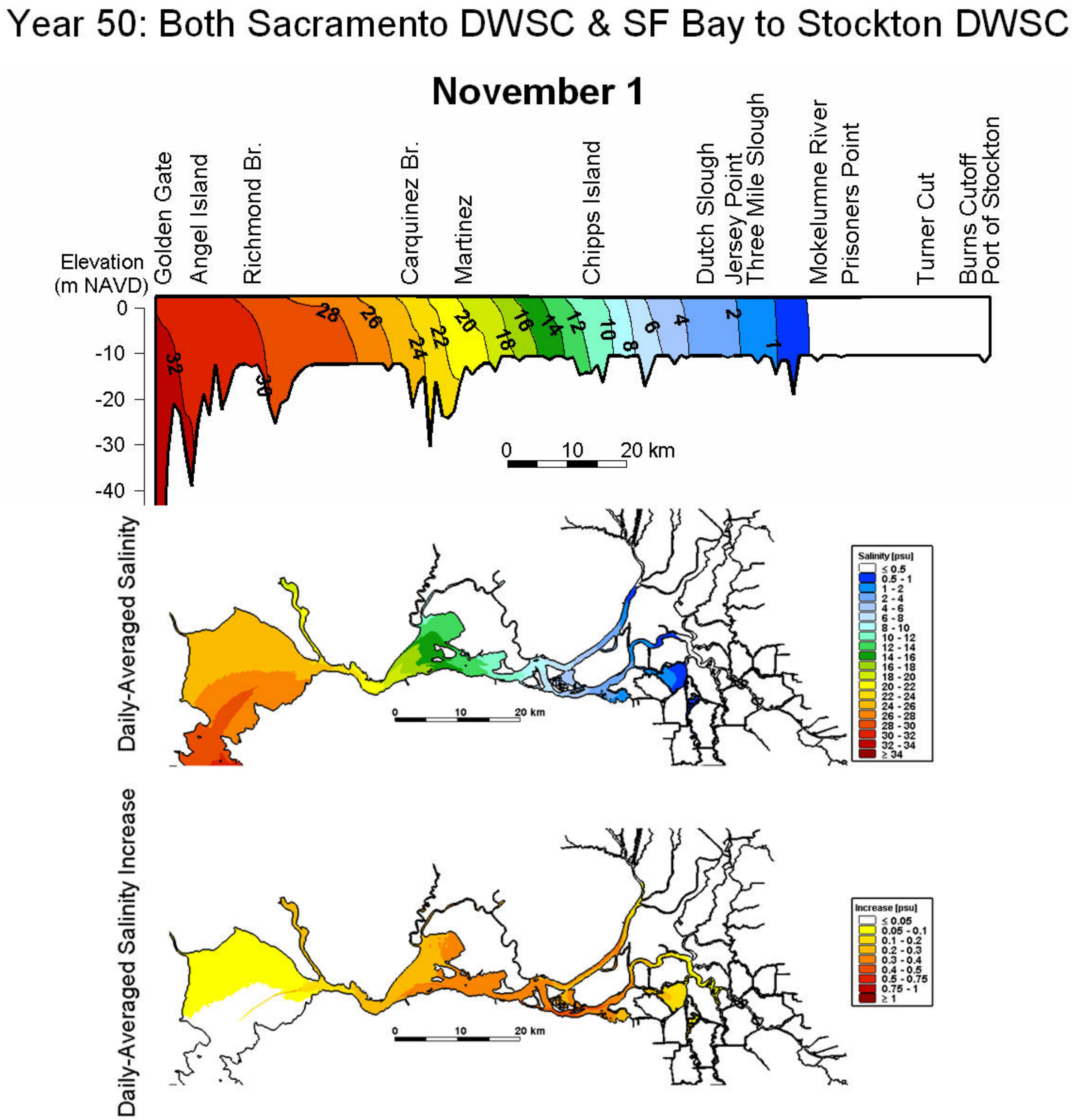


Figure 5.4-35 Predicted daily-averaged salinity profile along the axis of San Francisco Bay from the Golden Gate to the Port of Stockton on November 1 for the Year 50 Both DWSC Deepening scenario (top); predicted depth-averaged daily-averaged salinity on November 1 for the Year 50 Both DWSC Deepening scenario (middle); predicted increase in depth-averaged daily-averaged salinity on November 1 relative to the Year 50 Baseline scenario for the Year 50 Both DWSC Deepening scenario.

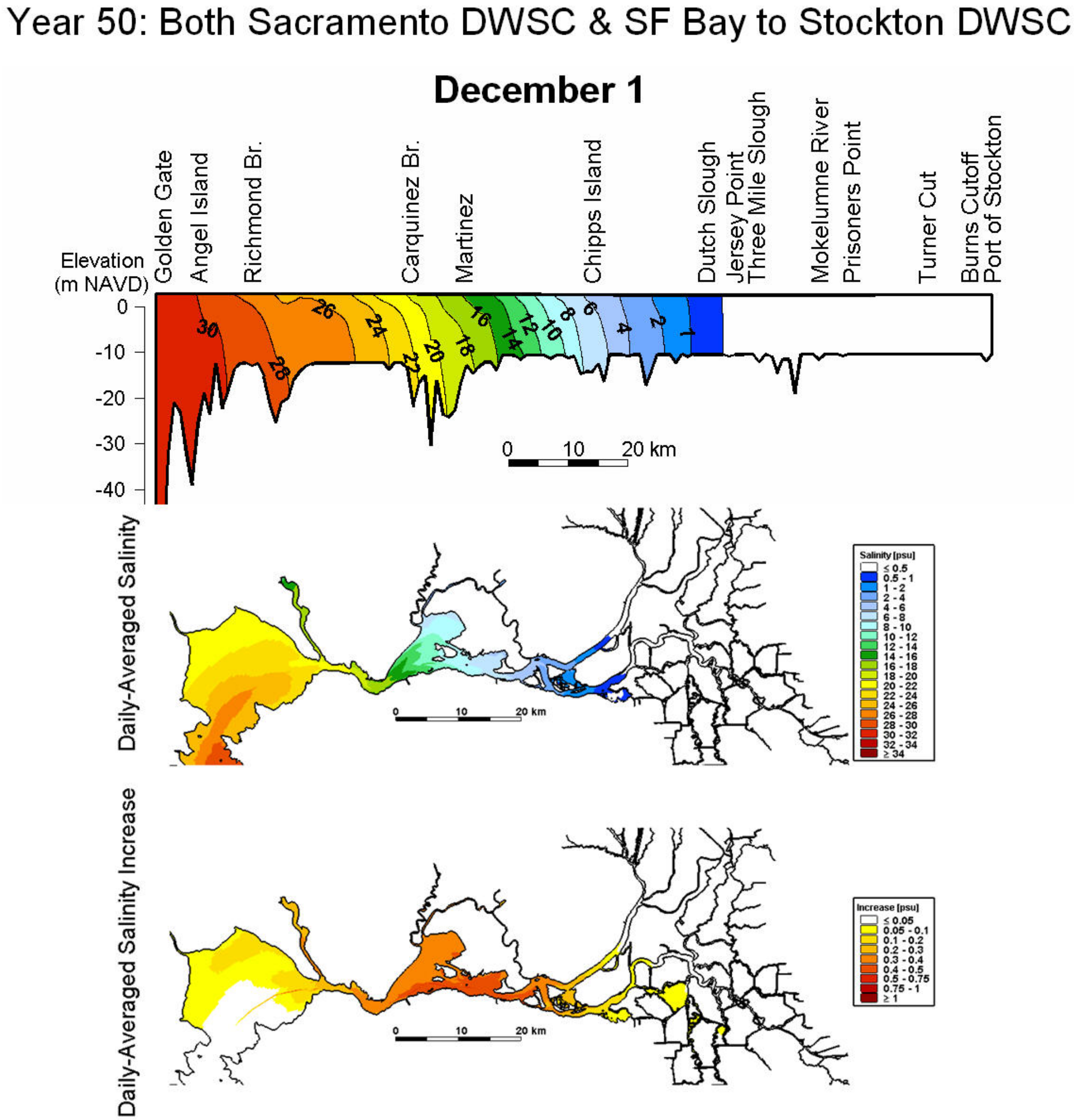


Figure 5.4-36 Predicted daily-averaged salinity profile along the axis of San Francisco Bay from the Golden Gate to the Port of Stockton on December 1 for the Year 50 Both DWSC Deepening scenario (top); predicted depth-averaged daily-averaged salinity on December 1 for the Year 50 Both DWSC Deepening scenario (middle); predicted increase in depth-averaged daily-averaged salinity on December 1 relative to the Year 50 Baseline scenario for the Year 50 Both DWSC Deepening scenario.

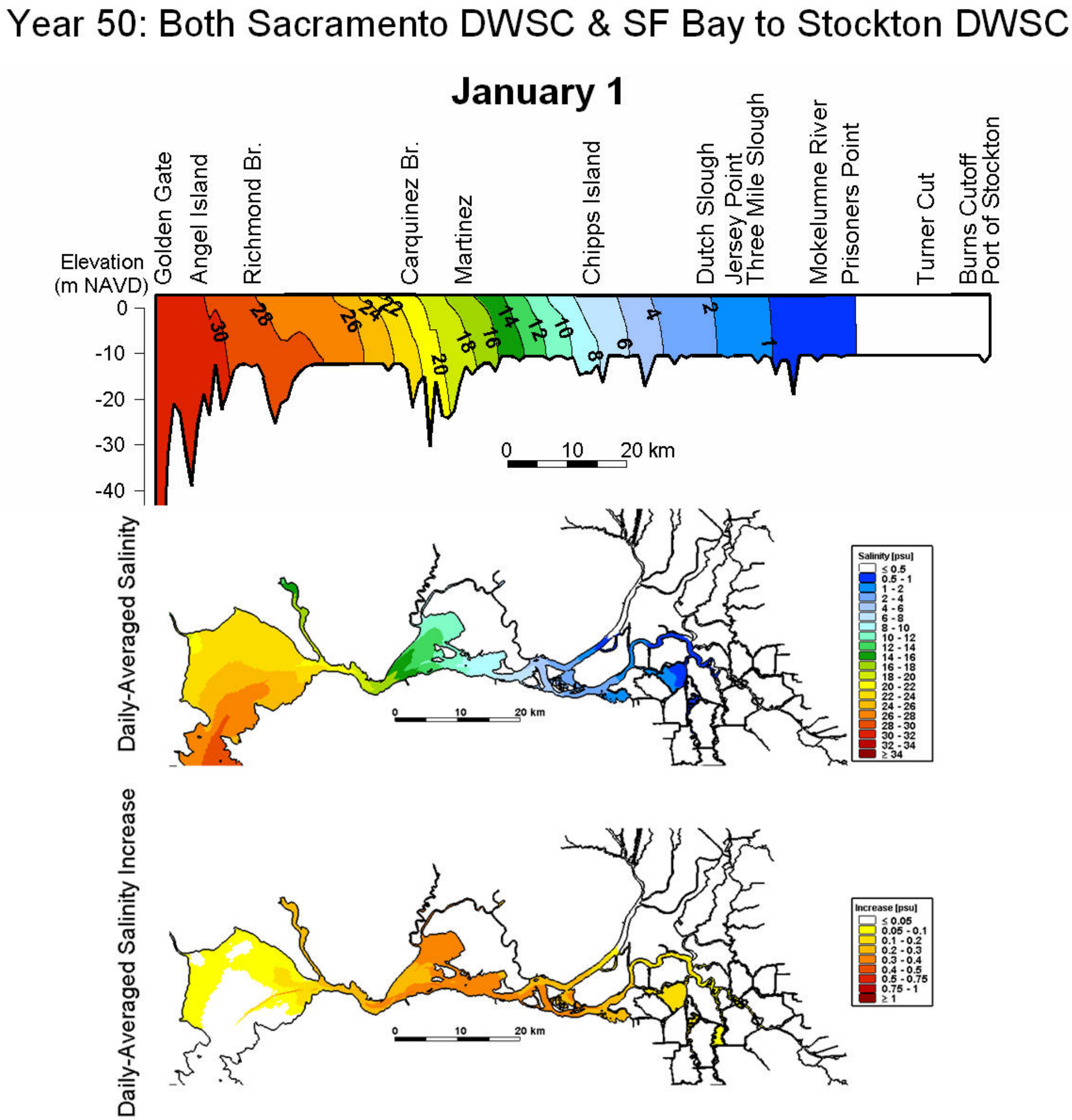


Figure 5.4-37 Predicted daily-averaged salinity profile along the axis of San Francisco Bay from the Golden Gate to the Port of Stockton on January 1 for the Year 50 Both DWSC Deepening scenario (top); predicted depth-averaged daily-averaged salinity on January 1 for the Year 50 Both DWSC Deepening scenario (middle); predicted increase in depth-averaged daily-averaged salinity on January 1 relative to the Year 50 Baseline scenario for the Year 50 Both DWSC Deepening scenario.

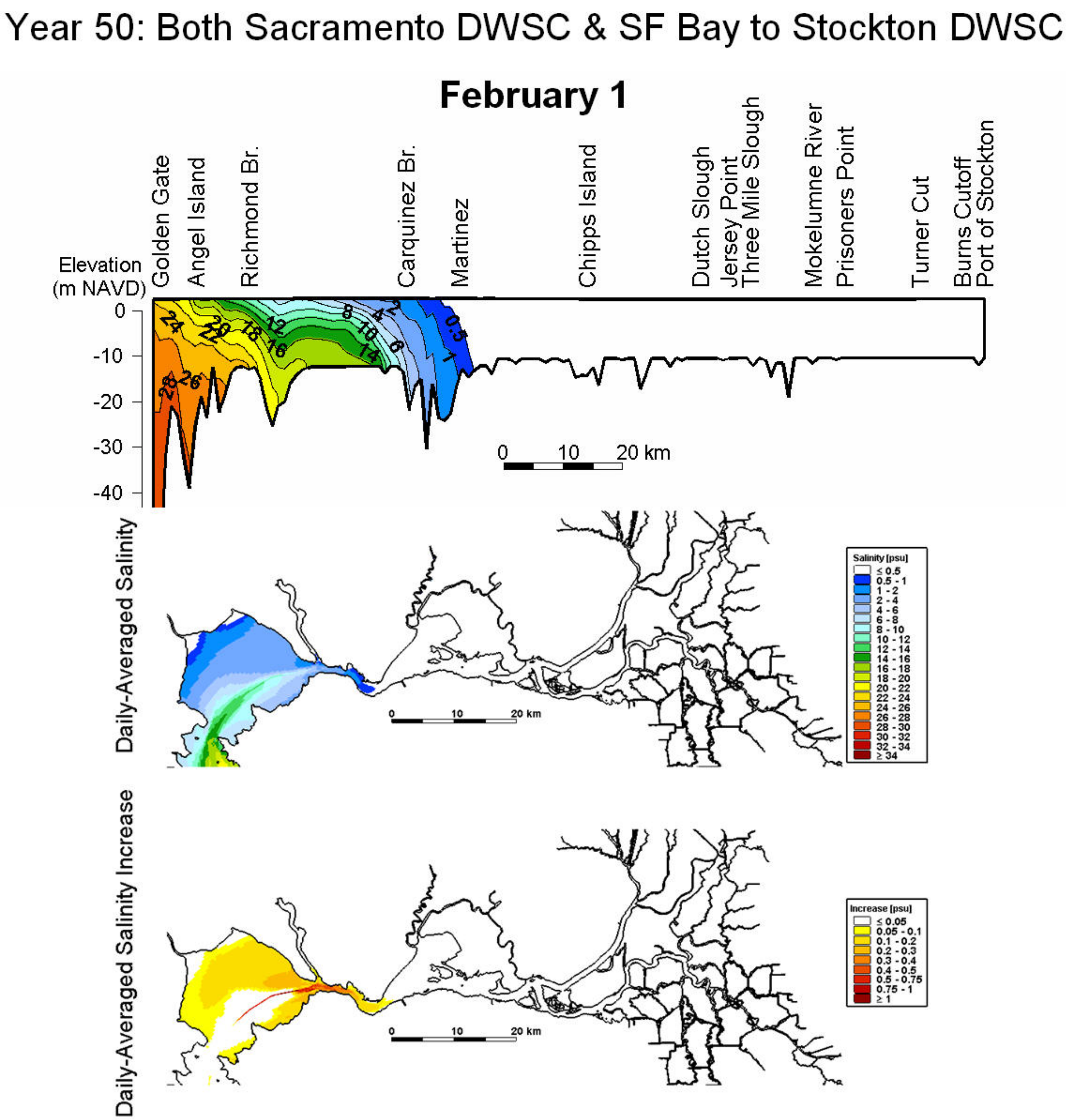


Figure 5.4-38 Predicted daily-averaged salinity profile along the axis of San Francisco Bay from the Golden Gate to the Port of Stockton on February 1 for the Year 50 Both DWSC Deepening scenario (top); predicted depth-averaged daily-averaged salinity on February 1 for the Year 50 Both DWSC Deepening scenario (middle); predicted increase in depth-averaged daily-averaged salinity on February 1 relative to the Year 50 Baseline scenario for the Year 50 Both DWSC Deepening scenario.

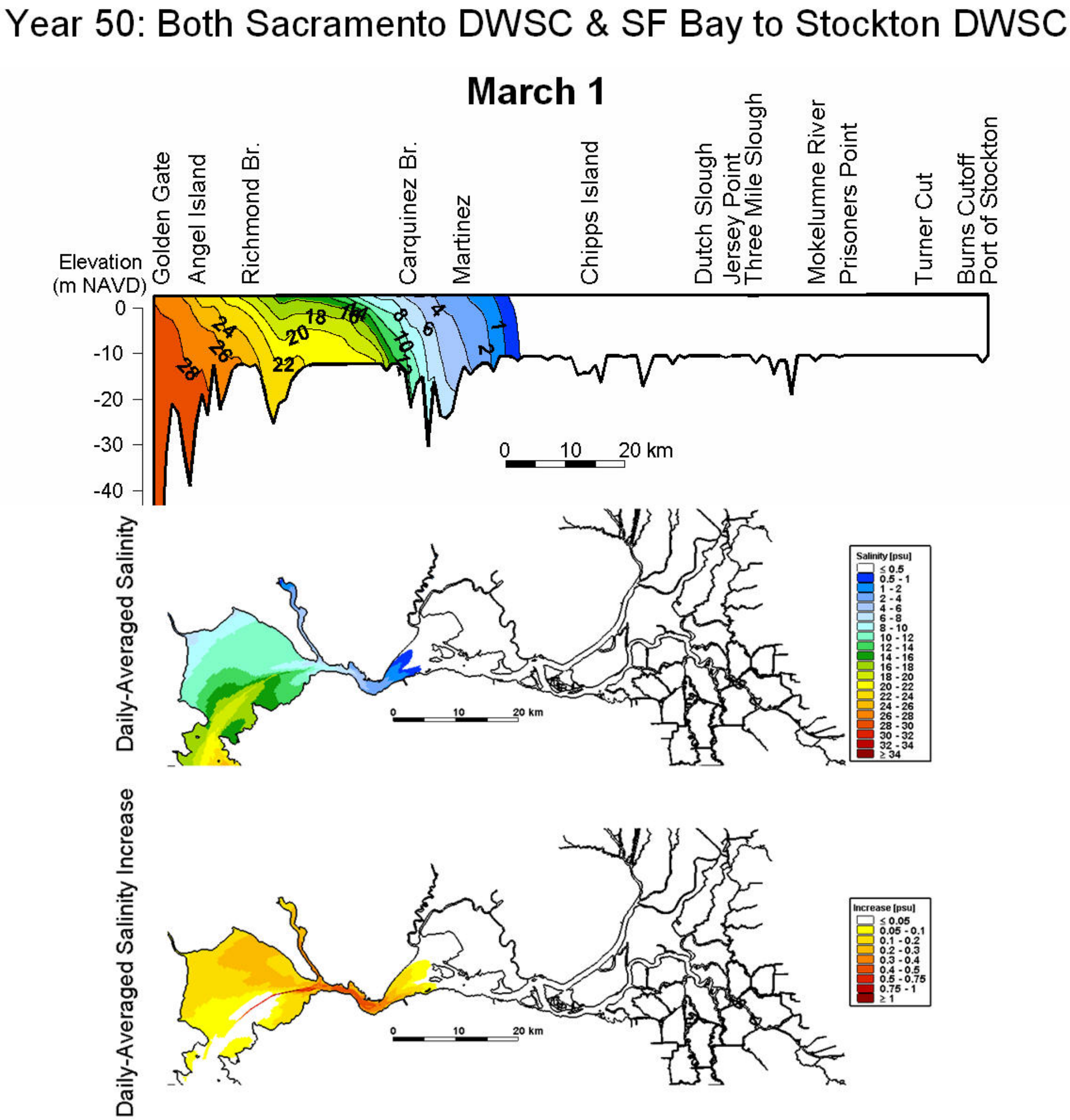


Figure 5.4-39 Predicted daily-averaged salinity profile along the axis of San Francisco Bay from the Golden Gate to the Port of Stockton on March 1 for the Year 50 Both DWSC Deepening scenario (top); predicted depth-averaged daily-averaged salinity on March 1 for the Year 50 Both DWSC Deepening scenario (middle); predicted increase in depth-averaged daily-averaged salinity on March 1 relative to the Year 50 Baseline scenario for the Year 50 Both DWSC Deepening scenario.

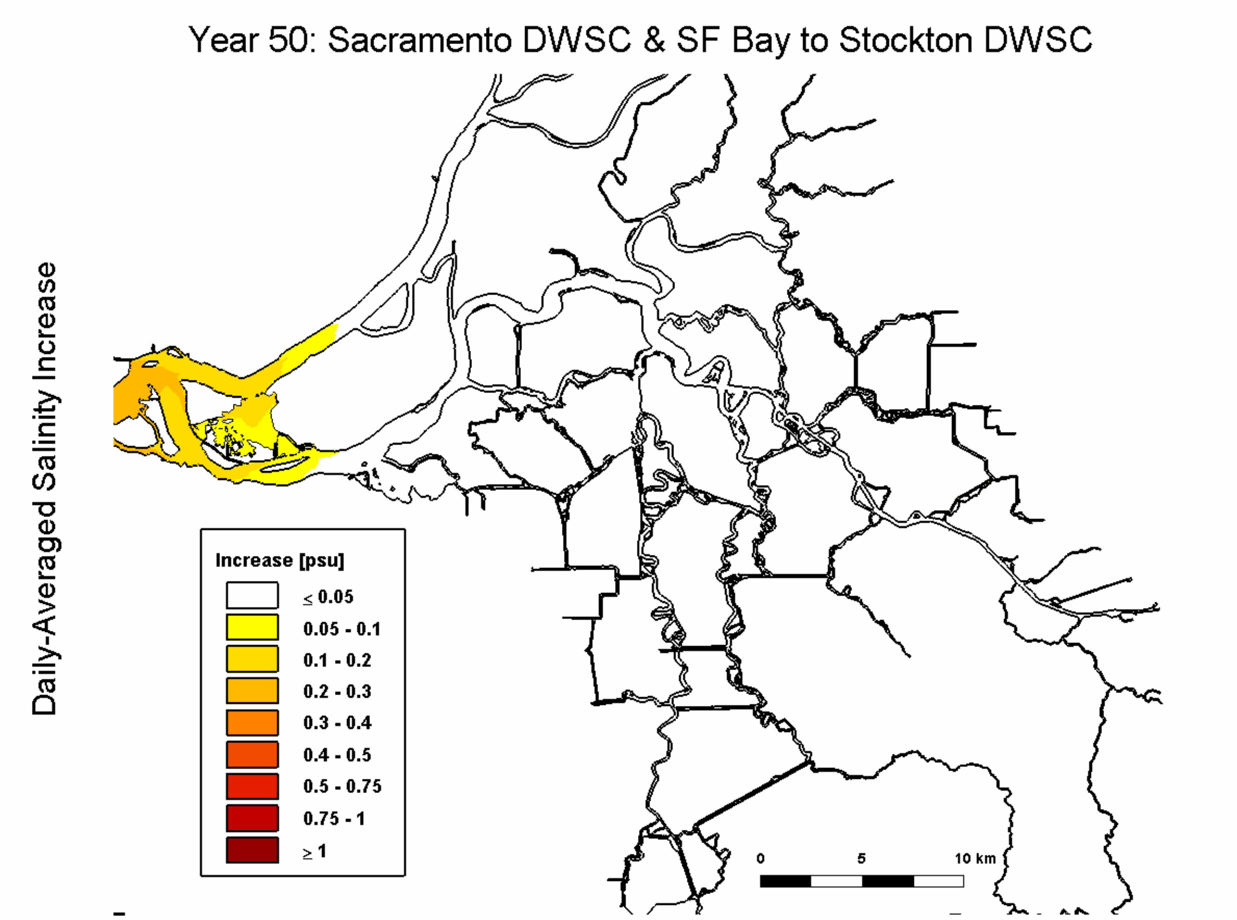


Figure 5.4-40 Predicted depth-averaged daily-averaged salinity increase in the Sacramento-San Joaquin Delta on April 1 for the Year 50 Both DWSC Deepening scenario relative to the Year 50 Baseline scenario.

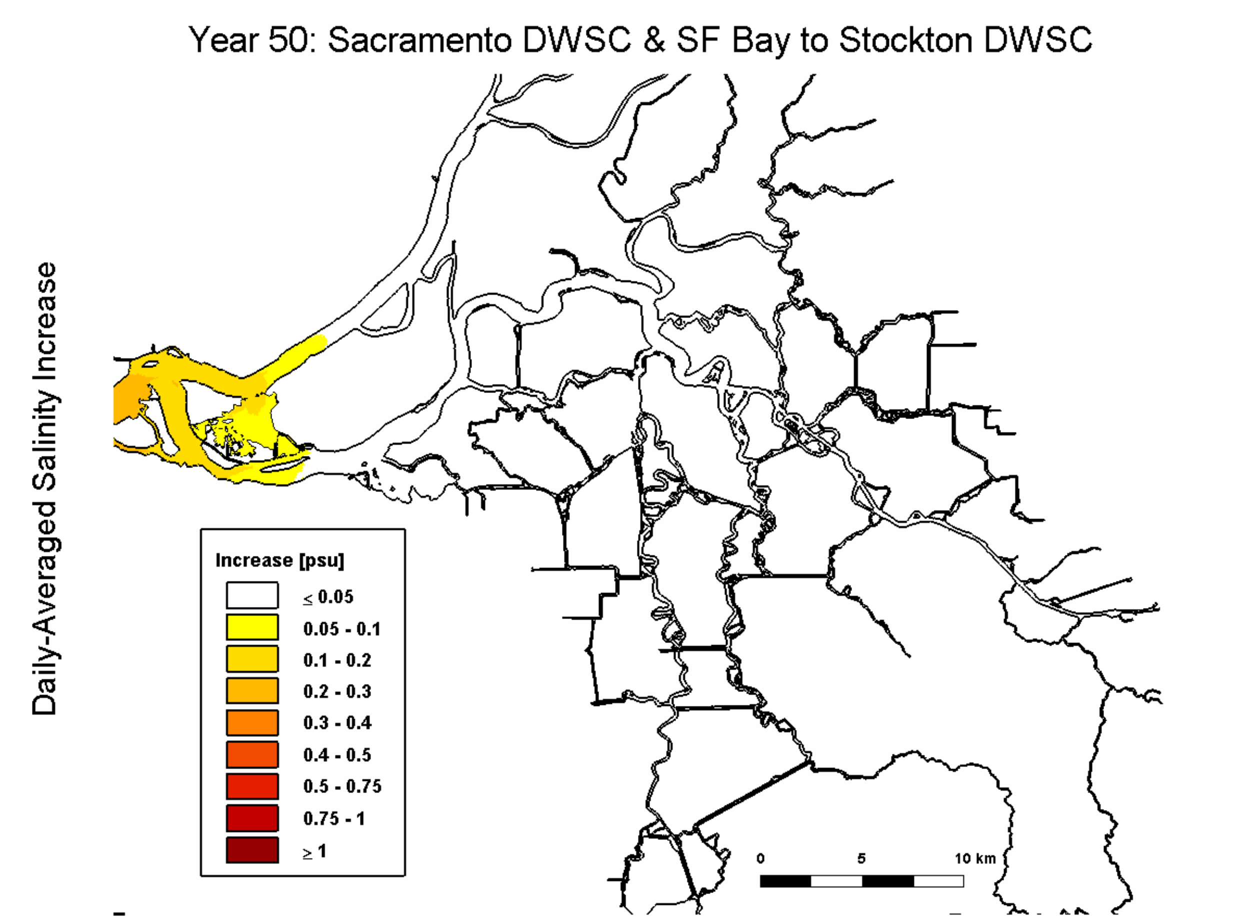


Figure 5.4-41 Predicted depth-averaged daily-averaged salinity increase in the Sacramento-San Joaquin Delta on May 1 for the Year 50 Both DWSC Deepening scenario relative to the Year 50 Baseline scenario.

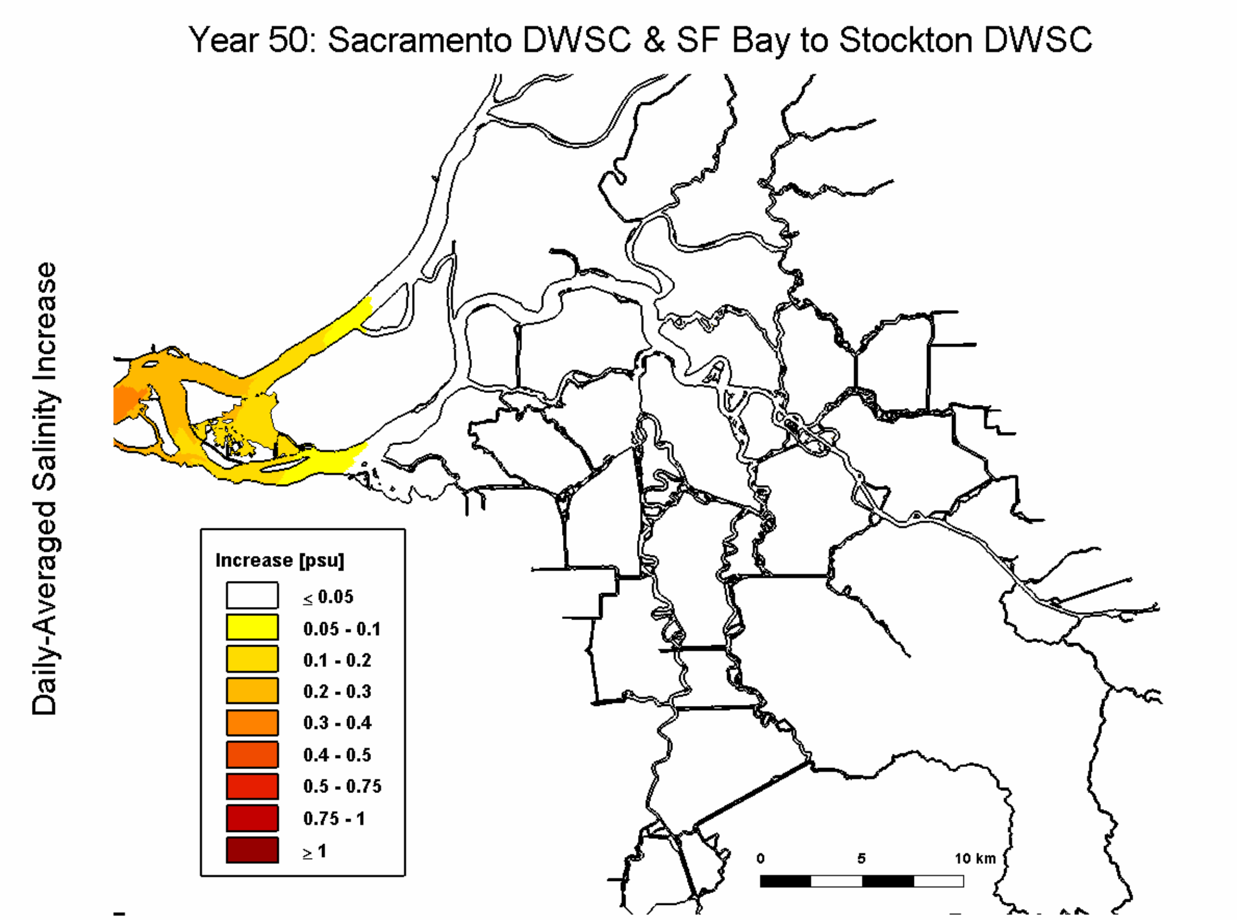


Figure 5.4-42 Predicted depth-averaged daily-averaged salinity increase in the Sacramento-San Joaquin Delta on June 1 for the Year 50 Both DWSC Deepening scenario relative to the Year 50 Baseline scenario.

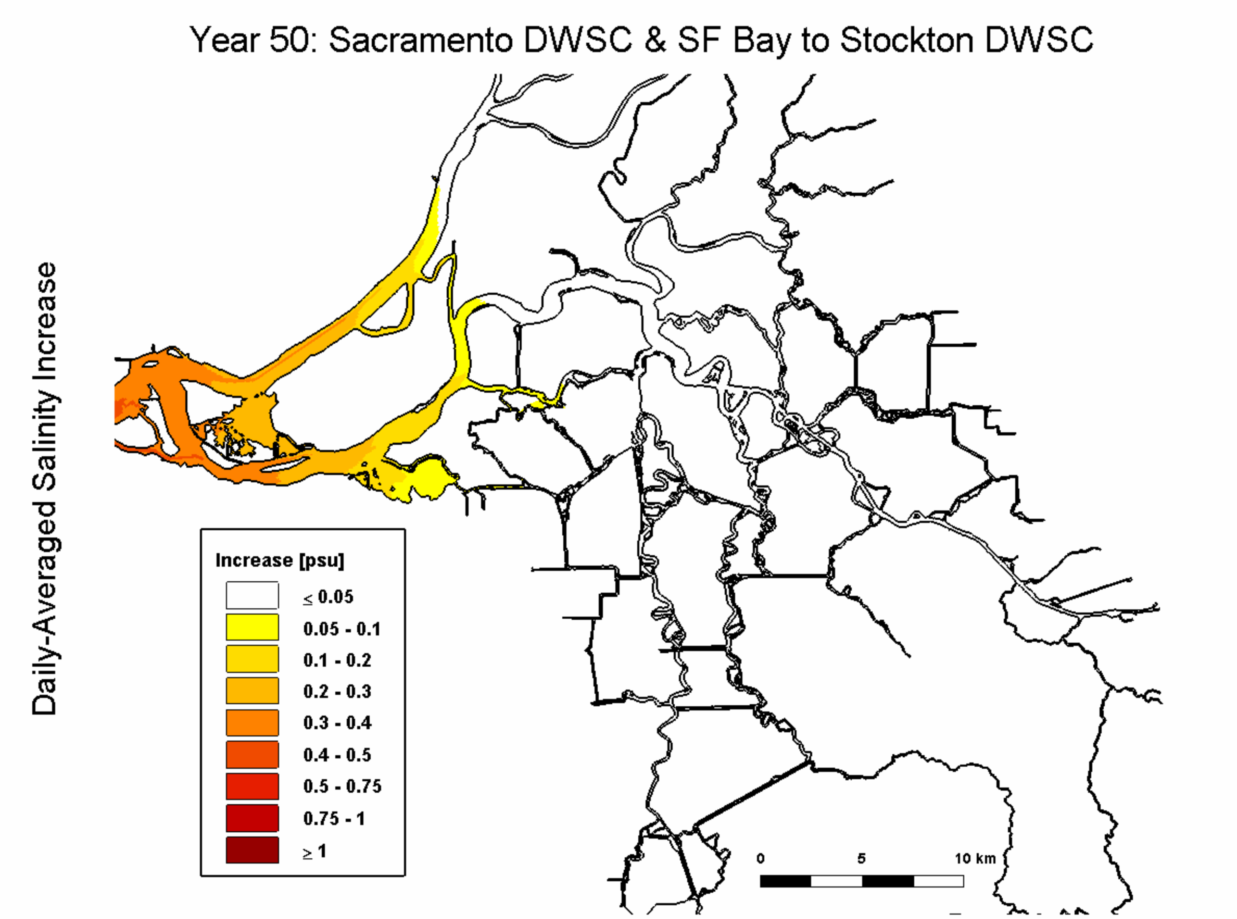


Figure 5.4-43 Predicted depth-averaged daily-averaged salinity increase in the Sacramento-San Joaquin Delta on July 1 for the Year 50 Both DWSC Deepening scenario relative to the Year 50 Baseline scenario.

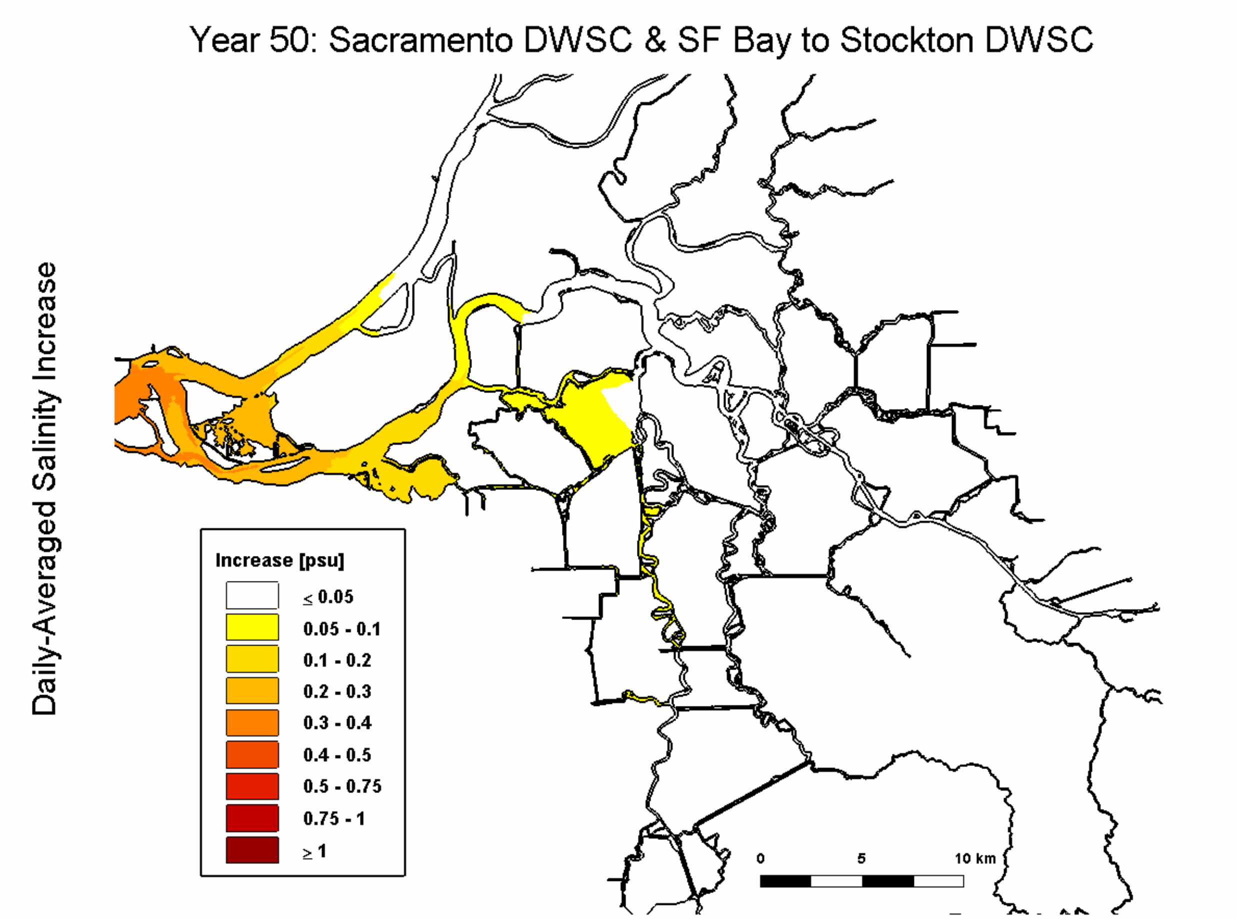


Figure 5.4-44 Predicted depth-averaged daily-averaged salinity increase in the Sacramento-San Joaquin Delta on August 1 for the Year 50 Both DWSC Deepening scenario relative to the Year 50 Baseline scenario.

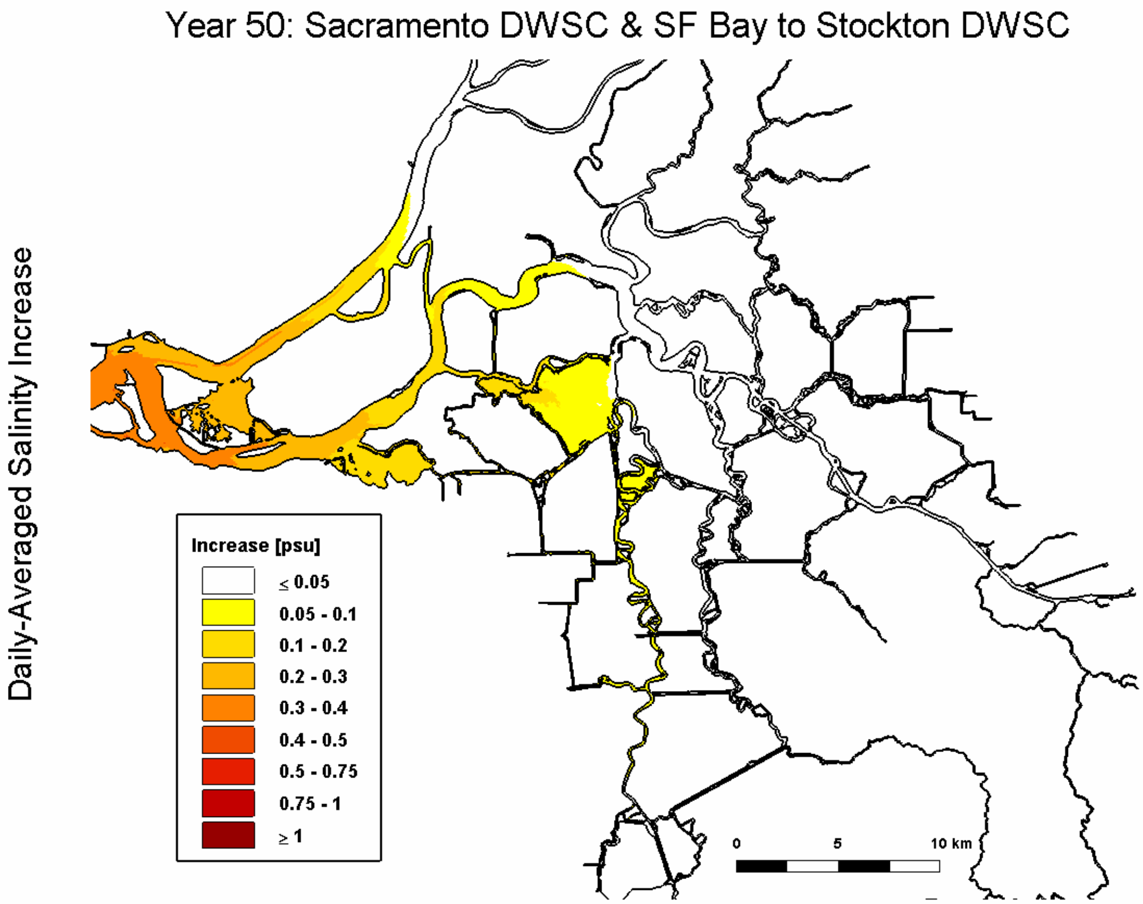


Figure 5.4-45 Predicted depth-averaged daily-averaged salinity increase in the Sacramento-San Joaquin Delta on September 1 for the Year 50 Both DWSC Deepening scenario relative to the Year 50 Baseline scenario.

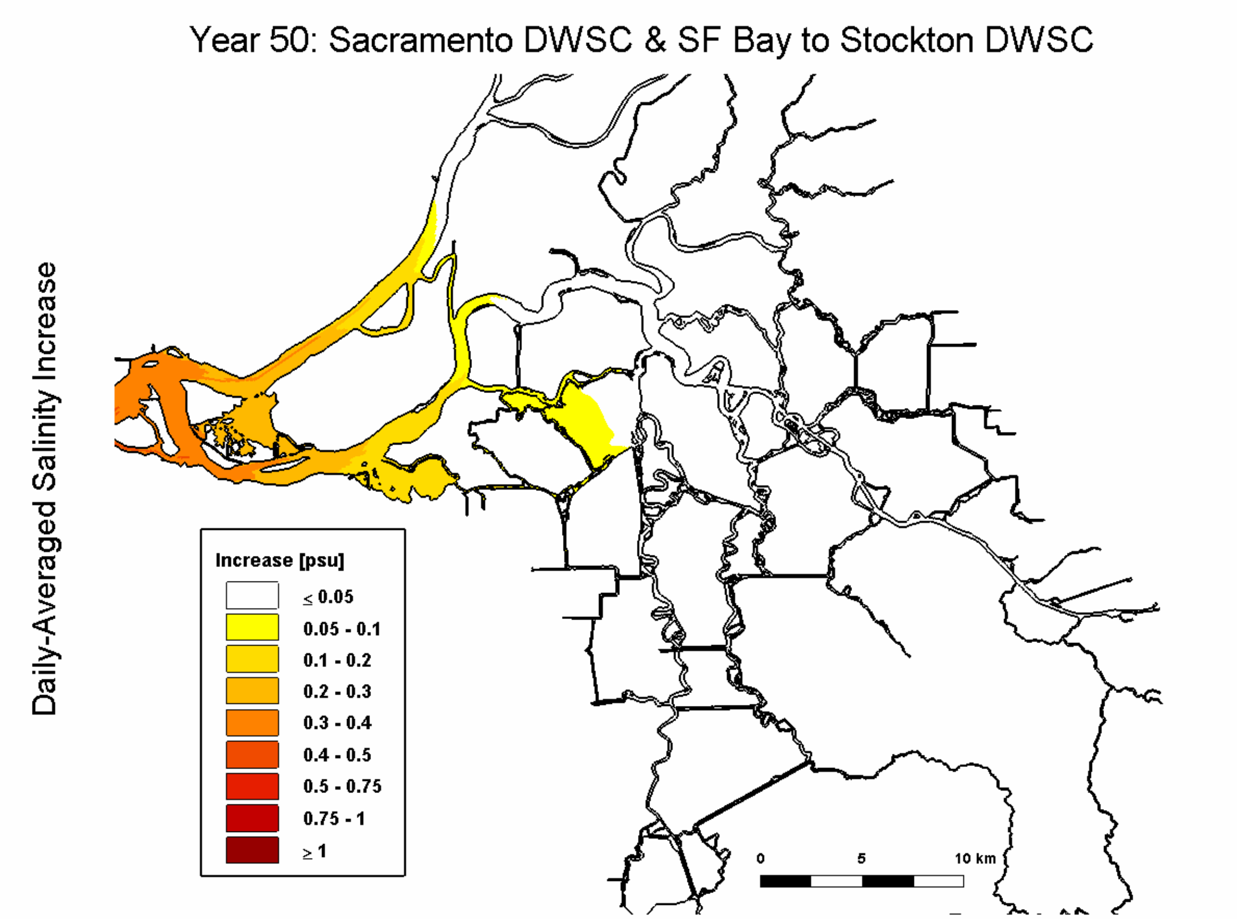


Figure 5.4-46 Predicted depth-averaged daily-averaged salinity increase in the Sacramento-San Joaquin Delta on October 1 for the Year 50 Both DWSC Deepening scenario relative to the Year 50 Baseline scenario.

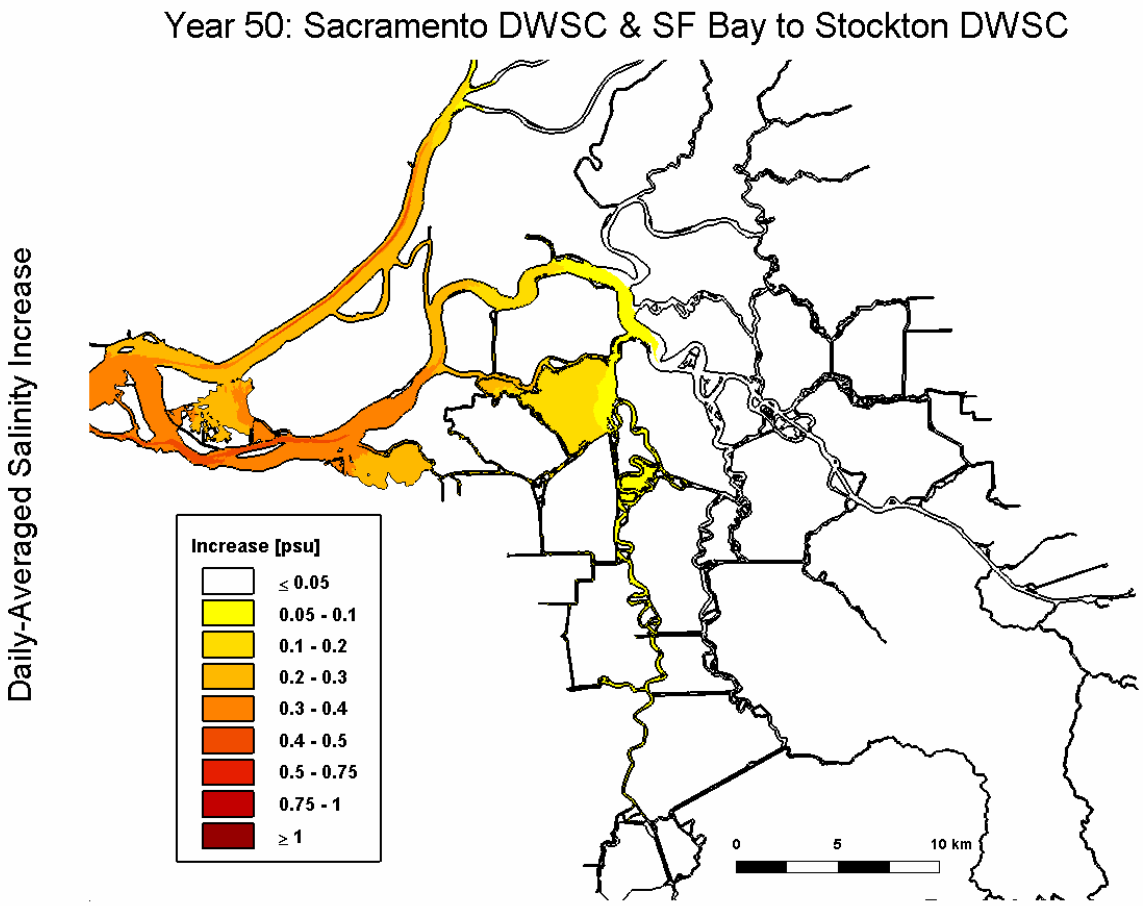


Figure 5.4-47 Predicted depth-averaged daily-averaged salinity increase in the Sacramento-San Joaquin Delta on October 24, the day of maximum predicted X2, for the Year 50 Both DWSC Deepening scenario relative to the Year 50 Baseline scenario.

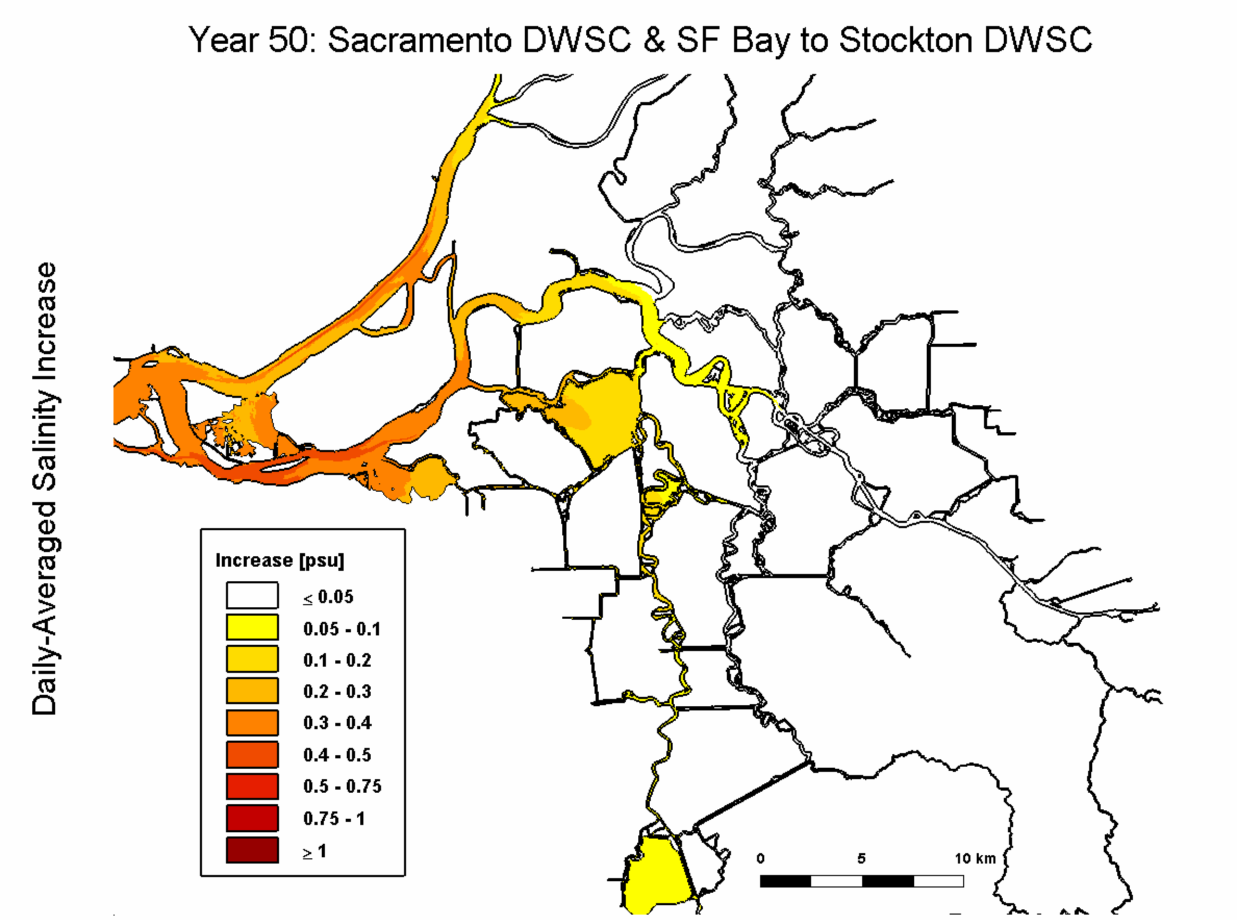


Figure 5.4-48 Predicted depth-averaged daily-averaged salinity increase in the Sacramento-San Joaquin Delta on November 1 for the Year 50 Both DWSC Deepening scenario relative to the Year 50 Baseline scenario.

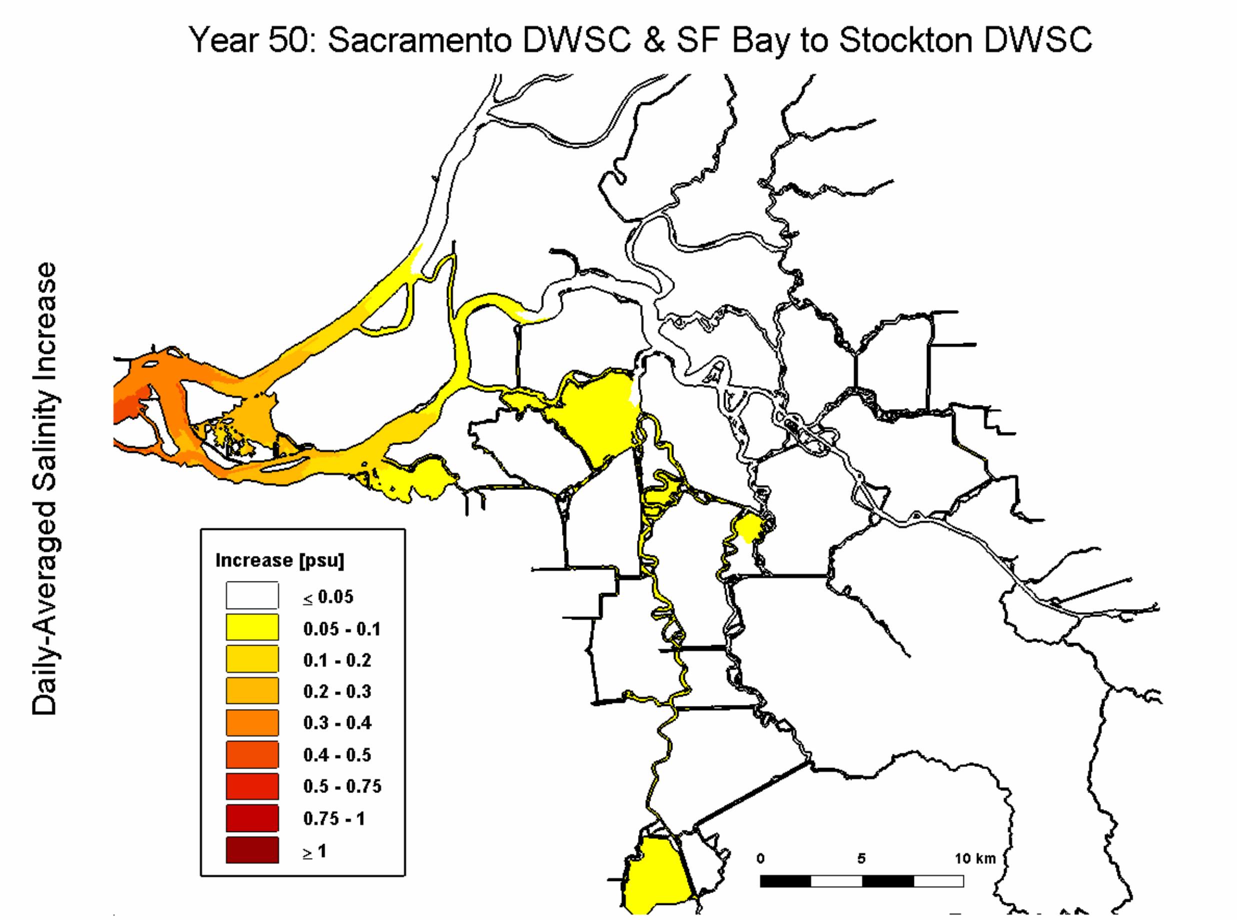


Figure 5.4-49 Predicted depth-averaged daily-averaged salinity increase in the Sacramento-San Joaquin Delta on December 1 for the Year 50 Both DWSC Deepening scenario relative to the Year 50 Baseline scenario.

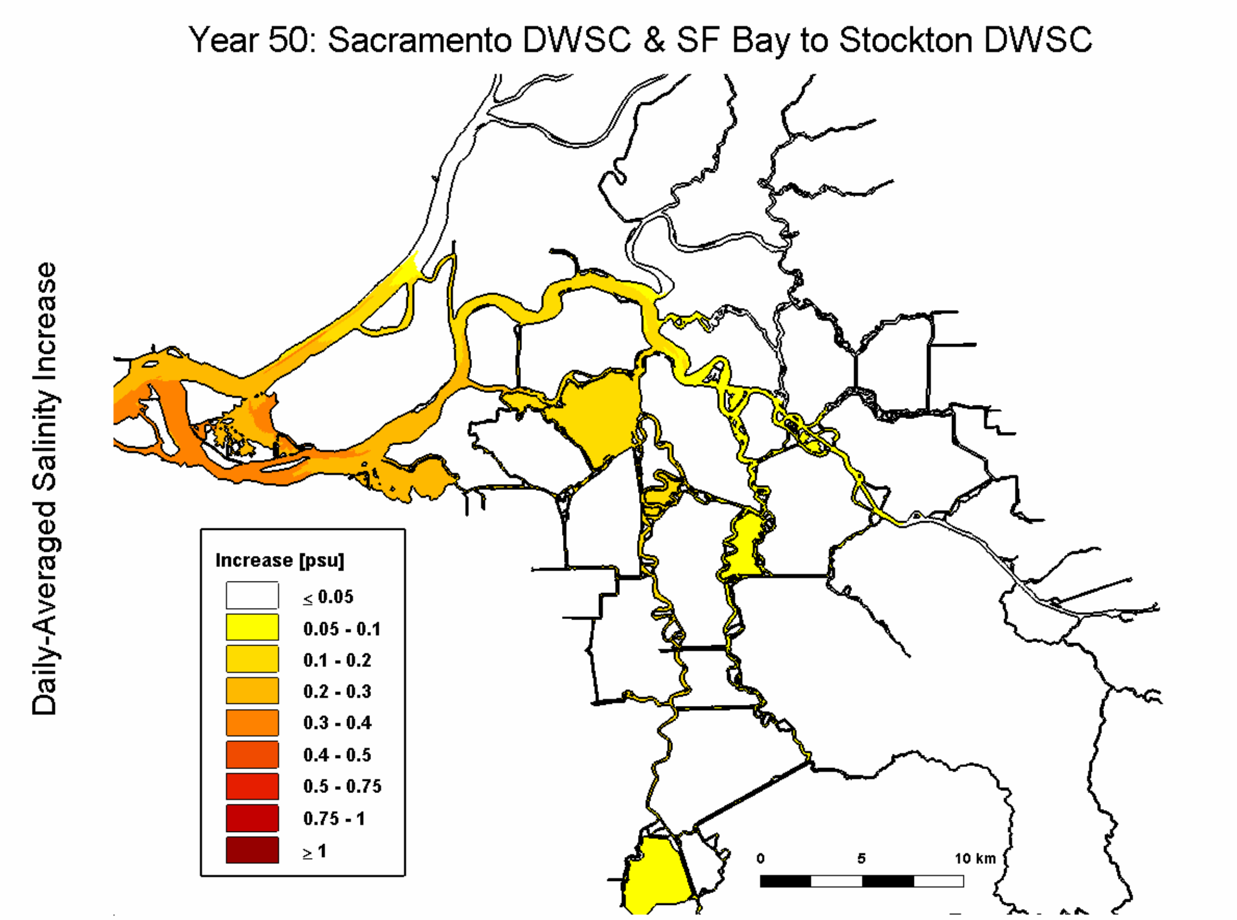


Figure 5.4-50 Predicted depth-averaged daily-averaged salinity increase in the Sacramento-San Joaquin Delta on January 1 for the Year 50 Both DWSC Deepening scenario relative to the Year 50 Baseline scenario.

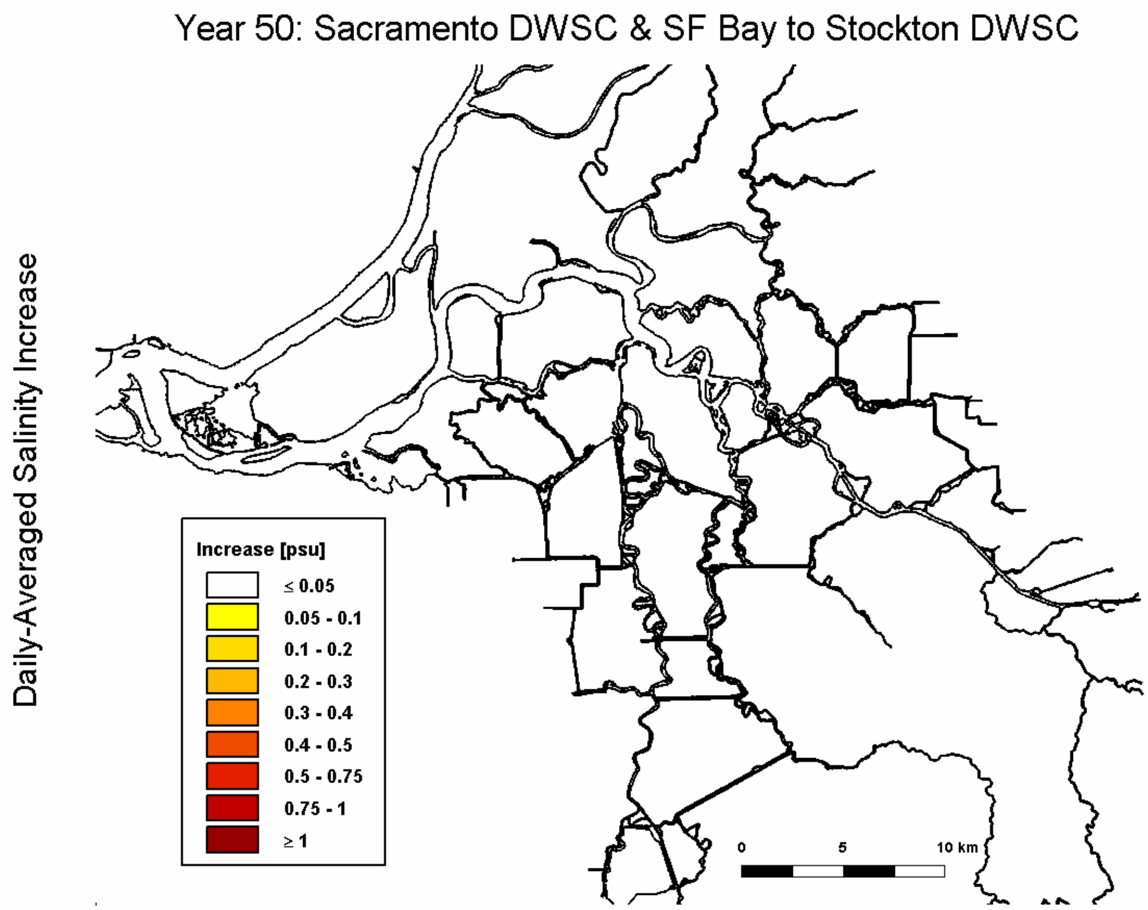


Figure 5.4-51 Predicted depth-averaged daily-averaged salinity increase in the Sacramento-San Joaquin Delta on February 1 for the Year 50 Both DWSC Deepening scenario relative to the Year 50 Baseline scenario.

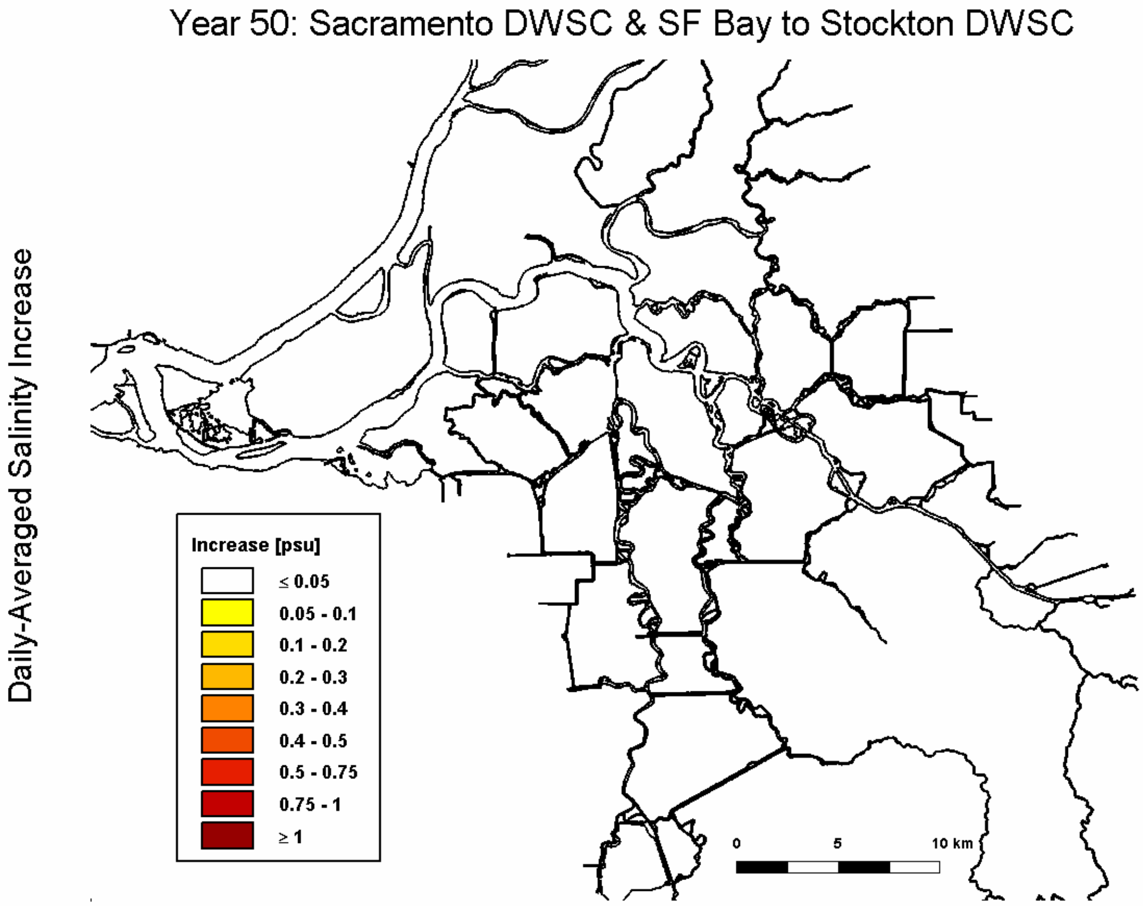


Figure 5.4-52 Predicted depth-averaged daily-averaged salinity increase in the Sacramento-San Joaquin Delta on March 1 for the Year 50 Both DWSC Deepening scenario relative to the Year 50 Baseline scenario.

5.5 Salinity Time Series Comparisons

Salinity time series provide information about potential salinity impacts over time at a fixed location. Salinity time series comparisons were made the twenty-seven continuous salinity monitoring stations in San Francisco Bay and the Sacramento-San Joaquin Delta, shown on Figure 3.3-5. Comparisons for the Year 50 simulation period between predicted salinity for the Year 50 Baseline scenario and the Year 50 Sacramento DWSC Only Deepening scenario are shown in Section 5.5.1. Comparisons for the Year 50 simulation period between predicted salinity for the Year 50 Baseline scenario, the Year 50 Sacramento DWSC Only Deepening scenario, and the Year 50 Both DWSC Deepening scenario are shown in Section 5.5.2.

5.5.1 Year 50 Sacramento DWSC Only Deepening

For each salinity comparison figure included in this section, the top plot shows the tidal time-scale variability over a 15-day period for the Year 50 Baseline scenario and the Year 50 Sacramento DWSC Only Deepening scenario. The middle plot shows daily-averaged salinity during the full simulation year for each scenario. The bottom plot shows the predicted increase in daily-averaged salinity for the Year 50 Sacramento DWSC Only Deepening scenario relative to the Year 50 Baseline scenario. In cases where the predicted salinity is identical between scenarios, some lines are not fully visible. Since the lines are plotted in the order listed on the legend, for periods where the predicted salinity for the Year 50 Baseline scenario is not fully visible, the predicted salinity for the Year 50 Baseline scenario is identical to the visible line for the Year 50 Sacramento DWSC Only Deepening scenario.

Figure 5.5-1 shows the predicted salinity at the Richmond-San Rafael Bridge Lower Sensor for the Year 50 Baseline scenario and the Year 50 Sacramento DWSC Only Deepening scenario. During the second half of November (top panel of Figure 5.5-1), the predicted salinity for both scenarios is nearly identical. Similarly, the daily-averaged salinity is nearly identical between the two scenarios over the entire simulation year. The predicted salinity increase for the Year 50 Sacramento DWSC Only Deepening scenario is almost exactly zero during the whole year indicating no predicted salinity increase at the Richmond-San Rafael Bridge Lower Sensor resulting from the Year 50 Sacramento DWSC Only Deepening scenario. The predicted salinity for the Year 50 Sacramento DWSC Only Deepening scenario shows some very small transient salinity differences during the high flow periods, but these should not be considered to represent a significant impact.

Figure 5.5-2 shows the predicted salinity at the Carquinez Bridge Lower Sensor for the Year 50 Baseline scenario and the Year 50 Sacramento DWSC Only Deepening scenario. During the second half of November (top panel of Figure 5.5-2), the predicted salinity for the Year 50 Baseline scenario and the Year 50 Sacramento DWSC Only Deepening scenario are nearly identical. Similarly, the predicted daily-averaged salinity for the Year 50 Sacramento DWSC Only Deepening scenario is nearly identical to the predicted daily-averaged salinity under the Year 50 Baseline scenario. The predicted salinity increase for the Year 50 Sacramento DWSC Only Deepening scenario is very close to zero during the whole year except for very small differences during January and February during high flows, indicating almost no predicted salinity impact at the Carquinez Bridge Lower Sensor resulting from the Year 50 Sacramento DWSC Only Deepening scenario.

Figure 5.5-3 shows the predicted salinity at the Sacramento River at the Martinez Surface Sensor for the Year 50 Baseline scenario and the Year 50 Sacramento DWSC Only Deepening scenario. During the second half of November (top panel of Figure 5.5-3), the predicted salinity for the Year 50 Baseline scenario and the Year 50 Sacramento DWSC Only Deepening scenario are nearly identical. Similarly, the predicted daily-averaged salinity for the Year 50 Sacramento DWSC Only Deepening scenario is nearly identical to the predicted daily-averaged salinity under the Year 50 Baseline scenario. The predicted salinity increase for the Year 50 Sacramento DWSC Only Deepening scenario is very close to zero during the whole year, indicating no predicted salinity increase at the Martinez Surface Sensor resulting from the Year 50 Sacramento DWSC Only Deepening scenario.

Figure 5.5-4 shows the predicted salinity at the Benicia Bridge Lower Sensor for the Year 50 Baseline scenario and the Year 50 Sacramento DWSC Only Deepening scenario. During the second half of November (top panel of Figure 5.5-4), the predicted salinity for the Year 50 Baseline scenario and the Year 50 Sacramento DWSC Only Deepening scenario are nearly identical. Similarly, the predicted daily-averaged salinity for the Year 50 Sacramento DWSC Only Deepening scenario is nearly identical to the predicted daily-averaged salinity for the Year 50 Baseline scenario. The predicted salinity increase for the Year 50 Sacramento DWSC Only Deepening scenario is very close to zero during the whole year, indicating no predicted salinity increase at the Benicia Bridge Lower Sensor resulting from the Year 50 Sacramento DWSC Only Deepening scenario.

Figure 5.5-5 shows the predicted salinity at the Sacramento River near Mallard Island Surface Sensor for the Year 50 Baseline scenario and the Year 50 Sacramento DWSC Only Deepening scenario. During the second half of November (top panel of Figure 5.5-5), the predicted salinity for the Year 50 Baseline scenario and the Year 50 Sacramento DWSC Only Deepening scenario are nearly identical. Similarly, the predicted daily-averaged salinity for the Year 50 Sacramento DWSC Only Deepening scenario is nearly identical to the predicted daily-averaged salinity for the Year 50 Baseline scenario. The predicted salinity increase for the Year 50 Sacramento DWSC Only Deepening scenario is very close to zero during the whole year, indicating no predicted salinity increase at the Sacramento River near Mallard Island Surface Sensor resulting from the Year 50 Sacramento DWSC Only Deepening scenario.

Figure 5.5-6 shows the predicted salinity at the Sacramento River at Emmaton Surface Sensor for the Year 50 Baseline scenario and the Year 50 Sacramento DWSC Only Deepening scenario. During the second half of November (top panel of Figure 5.5-6), the predicted salinity for the Year 50 Sacramento DWSC Only Deepening scenario is very slightly higher than the predicted salinity for the Year 50 Baseline scenario. The predicted salinity for the Year 50 Sacramento DWSC Only Deepening scenario is nearly identical to the predicted salinity for the Year 50 Baseline scenario, except during July through December when the predicted salinity for the Year 50 Sacramento DWSC Only Deepening scenario is up to 0.08 psu higher than the Year 50 Baseline salinity.

Figure 5.5-7 shows the predicted salinity at the Sacramento River at Rio Vista for the Year 50 Baseline scenario and the Year 50 Sacramento DWSC Only Deepening scenario. The predicted salinity for the Year 50 Sacramento DWSC Only Deepening scenario is nearly identical to the predicted salinity for the Year 50 Baseline scenario, except during October and November when the predicted salinity for the Year 50 Sacramento DWSC Only Deepening scenario is up to 0.11 psu higher than the Year 50 Baseline salinity.

Figure 5.5-8 shows the predicted salinity at the Port of Sacramento for the Year 50 Baseline scenario and the Year 50 Sacramento DWSC Only Deepening scenario. The predicted salinity for the Year 50 Sacramento DWSC Only Deepening scenario is nearly identical the predicted salinity for the Year 50 Baseline scenario throughout the year, with no predicted salinity increases resulting from the Year 50 Sacramento DWSC Only Deepening scenario.

Figure 5.5-9 shows the predicted salinity at the San Joaquin River at Antioch for the Year 50 Baseline scenario and the Year 50 Sacramento DWSC Only Deepening scenario. During the second half of November (top panel of Figure 5.5-9), the predicted salinity for the Year 50 Baseline scenario and the Year 50 Sacramento DWSC Only Deepening scenario are nearly identical. Similarly, the predicted daily-averaged salinity for the Year 50 Sacramento DWSC Only Deepening scenario is nearly identical to the predicted daily-averaged salinity for the Year 50 Baseline scenario. The predicted salinity increase for the Year 50 Sacramento DWSC Only Deepening scenario is very close to zero during the whole year, with a maximum predicted salinity increase of 0.06 psu during November.

Figure 5.5-10 shows the predicted salinity at the San Joaquin River at Jersey Point for the Year 50 Baseline scenario and the Year 50 Sacramento DWSC Only Deepening scenario. The predicted salinity for both scenarios is nearly identical from April through September and from January through March. From October through December, the predicted salinity for the Year 50 Sacramento DWSC Only Deepening scenario is slightly higher than the predicted salinity for the Year 50 Baseline scenario, with predicted salinity increases of up to 0.07 psu.

Figure 5.5-11 shows the predicted salinity at the San Joaquin River at San Andreas Landing for the Year 50 Baseline scenario and the Year 50 Sacramento DWSC Only Deepening scenario. The predicted salinity for both scenarios is nearly identical from April through September and from January through March. During October, the predicted salinity for the Year 50 Sacramento DWSC Only Deepening scenario is slightly higher than the predicted salinity for the Year 50 Baseline scenario, with predicted salinity increases of up to 0.02 psu.

Figure 5.5-12 shows the predicted salinity at the San Joaquin River before Prisoners Point for the Year 50 Baseline scenario and the Year 50 Sacramento DWSC Only Deepening scenario. The predicted salinity for both scenarios is nearly identical from April through September and from January through March. During November and December, the predicted salinity for the Year 50 Sacramento DWSC Only Deepening scenario is slightly higher than the predicted salinity for the Year 50 Baseline scenario, with predicted salinity increases of up to 0.01 psu.

Figure 5.5-13 shows the predicted salinity at the Stockton Ship Channel at Burns Cutoff for the Year 50 Baseline scenario and the Year 50 Sacramento DWSC Only Deepening scenario. The predicted salinity for the Year 50 Sacramento DWSC Only Deepening scenario is nearly identical the predicted salinity for the Year 50 Baseline scenario throughout the year, with no predicted salinity increases resulting from the Year 50 Sacramento DWSC Only Deepening scenario.

Figure 5.5-14 shows the predicted salinity at the South Fork Mokelumne River at Staten Island for the Year 50 Baseline scenario and the Year 50 Sacramento DWSC Only Deepening scenario. The predicted salinity for both scenarios is nearly identical throughout the year, with no predicted salinity increases resulting from the Year 50 Sacramento DWSC Only Deepening scenario.

Figure 5.5-15 shows the predicted salinity at Dutch Slough at Jersey Island for the Year 50 Baseline scenario and the Year 50 Sacramento DWSC Only Deepening scenario. The predicted salinity for both scenarios is nearly identical from April through September and from January through March. During November and December, the predicted salinity for the Year 50 Sacramento DWSC Only Deepening scenario is slightly higher than the predicted salinity for the Year 50 Baseline scenario, with predicted salinity increases of up to 0.05 psu.

Figure 5.5-16 shows the predicted salinity at Old River and Holland Cut at Mandeville Island for the Year 50 Baseline scenario and the Year 50 Sacramento DWSC Only Deepening scenario. During the second half of November (top panel of Figure 5.5-16), the predicted salinity for the Year 50 Sacramento DWSC Only Deepening scenario is typically 0.03 psu higher than the predicted salinity for the Year 50 Baseline scenario throughout the tidal cycle. The predicted daily-averaged salinity for both scenarios is nearly identical from April through September and from January through March. During late October, the predicted salinity for the Year 50 Sacramento DWSC Only Deepening scenario is slightly higher than the predicted salinity for the Year 50 Baseline scenario, with predicted salinity increases of up to 0.04 psu.

Figure 5.5-17 shows the predicted salinity at Old River at Bacon Island for the Year 50 Baseline scenario and the Year 50 Sacramento DWSC Only Deepening scenario. During the second half of November (top panel of Figure 5.5-17), the predicted salinity for the Year 50 Sacramento DWSC Only Deepening scenario is typically 0.03 psu higher than the predicted salinity for the Year 50 Baseline scenario throughout the tidal cycle. The predicted daily-averaged salinity for both scenarios is nearly identical from April through September and from January through March. During November, the predicted salinity for the Year 50 Sacramento DWSC Only Deepening scenario is slightly higher than the predicted salinity for the Year 50 Baseline scenario, with predicted salinity increases of up to 0.04 psu.

Figure 5.5-18 shows the predicted salinity at Middle River at Borden Highway for the Year 50 Baseline scenario and the Year 50 Sacramento DWSC Only Deepening scenario. During the second half of November (top panel of Figure 5.5-18), the predicted salinity for the Year 50 Sacramento DWSC Only Deepening scenario is typically 0.01 psu higher than the predicted salinity for the Year 50 Baseline scenario throughout the tidal cycle. The predicted daily-averaged salinity for both scenarios is nearly identical from April through October and from December through March. During November, the predicted salinity for the Year 50 Sacramento

DWSC Only Deepening scenario is slightly higher than the predicted salinity for the Year 50 Baseline scenario, with predicted salinity increases of up to 0.01 psu.

Figure 5.5-19 shows the predicted salinity at Middle River at Tracy Boulevard for the Year 50 Baseline scenario and the Year 50 Sacramento DWSC Only Deepening scenario. During the second half of November (top panel of Figure 5.5-19), the predicted salinity for the Year 50 Sacramento DWSC Only Deepening scenario is nearly identical to the predicted salinity for the Year 50 Baseline scenario throughout the tidal cycle. The predicted daily-averaged salinity for both scenarios is nearly identical throughout the year. Predicted salinity increases resulting from the Year 50 Sacramento DWSC Only Deepening scenario never exceed 0.01 psu.

Figure 5.5-20 shows the predicted salinity at Victoria Canal near Byron for the Year 50 Baseline scenario and the Year 50 Sacramento DWSC Only Deepening scenario. During the second half of November (top panel of Figure 5.5-20), the predicted salinity for the Year 50 Sacramento DWSC Only Deepening scenario is typically 0.01 psu higher than the predicted salinity for the Year 50 Baseline scenario throughout the tidal cycle. The predicted daily-averaged salinity for both scenarios is nearly identical from April through October and from November through March. During November, the predicted salinity for the Year 50 Sacramento DWSC Only Deepening scenario is slightly higher than the predicted salinity for the Year 50 Baseline scenario, with predicted salinity increases of up to 0.01 psu.

Figure 5.5-21 shows the predicted salinity at the Clifton Court Forebay Radial Gates for the Year 50 Baseline scenario and the Year 50 Sacramento DWSC Only Deepening scenario. During the second half of November (top panel of Figure 5.5-21), the predicted salinity for the Year 50 Sacramento DWSC Only Deepening scenario is up to 0.02 psu higher than the predicted salinity for the Year 50 Baseline scenario throughout the tidal cycle. The predicted daily-averaged salinity for both scenarios is nearly identical from April through October and from January through March. From November through January, the predicted salinity for the Year 50 Sacramento DWSC Only Deepening scenario is slightly higher than the predicted salinity for the Year 50 Baseline scenario, with predicted salinity increases of up to 0.02 psu.

Figure 5.5-22 shows the predicted salinity at Old River near Delta-Mendota Canal (Downstream of Barrier) for the Year 50 Baseline scenario and the Year 50 Sacramento DWSC Only Deepening scenario. During the second half of November, the predicted salinity for the Year 50 Sacramento DWSC Only Deepening scenario is nearly identical to the predicted salinity for the Year 50 Baseline scenario throughout the tidal cycle. The predicted daily-averaged salinity for both scenarios is nearly identical throughout the year. Predicted salinity increases resulting from the Year 50 Sacramento DWSC Only Deepening scenario never exceed 0.01 psu.

Figure 5.5-23 shows the predicted salinity at Old River at Tracy Boulevard for the Year 50 Baseline scenario and the Year 50 Sacramento DWSC Only Deepening scenario. The predicted salinity for both scenarios is nearly identical throughout the year, and no salinity increases are predicted for the Year 50 Sacramento DWSC Only Deepening scenario.

Figure 5.5-24 shows the predicted salinity at Grant Line Canal at Tracy Boulevard for the Year 50 Baseline scenario and the Year 50 Sacramento DWSC Only Deepening scenario. The predicted salinity for both scenarios is nearly identical throughout the year, and no salinity increases are predicted for the Year 50 Sacramento DWSC Only Deepening scenario.

Figure 5.5-25 shows the predicted salinity at Middle River near Old River for the Year 50 Baseline scenario and the Year 50 Sacramento DWSC Only Deepening scenario. The predicted salinity for both scenarios is nearly identical throughout the year, and no salinity increases are predicted for the Year 50 Sacramento DWSC Only Deepening scenario.

Figure 5.5-26 shows the predicted salinity at San Joaquin River at Brandt Bridge for the Year 50 Baseline scenario and the Year 50 Sacramento DWSC Only Deepening scenario. The predicted salinity for both scenarios is nearly identical throughout the year, and no salinity increases are predicted for the Year 50 Sacramento DWSC Only Deepening scenario.

Figure 5.5-27 shows the predicted salinity at San Joaquin River at Mossdale for the Year 50 Baseline scenario and the Year 50 Sacramento DWSC Only Deepening scenario. The predicted salinity for both scenarios is nearly identical throughout the year, and no salinity increases are predicted for the Year 50 Sacramento DWSC Only Deepening scenario.

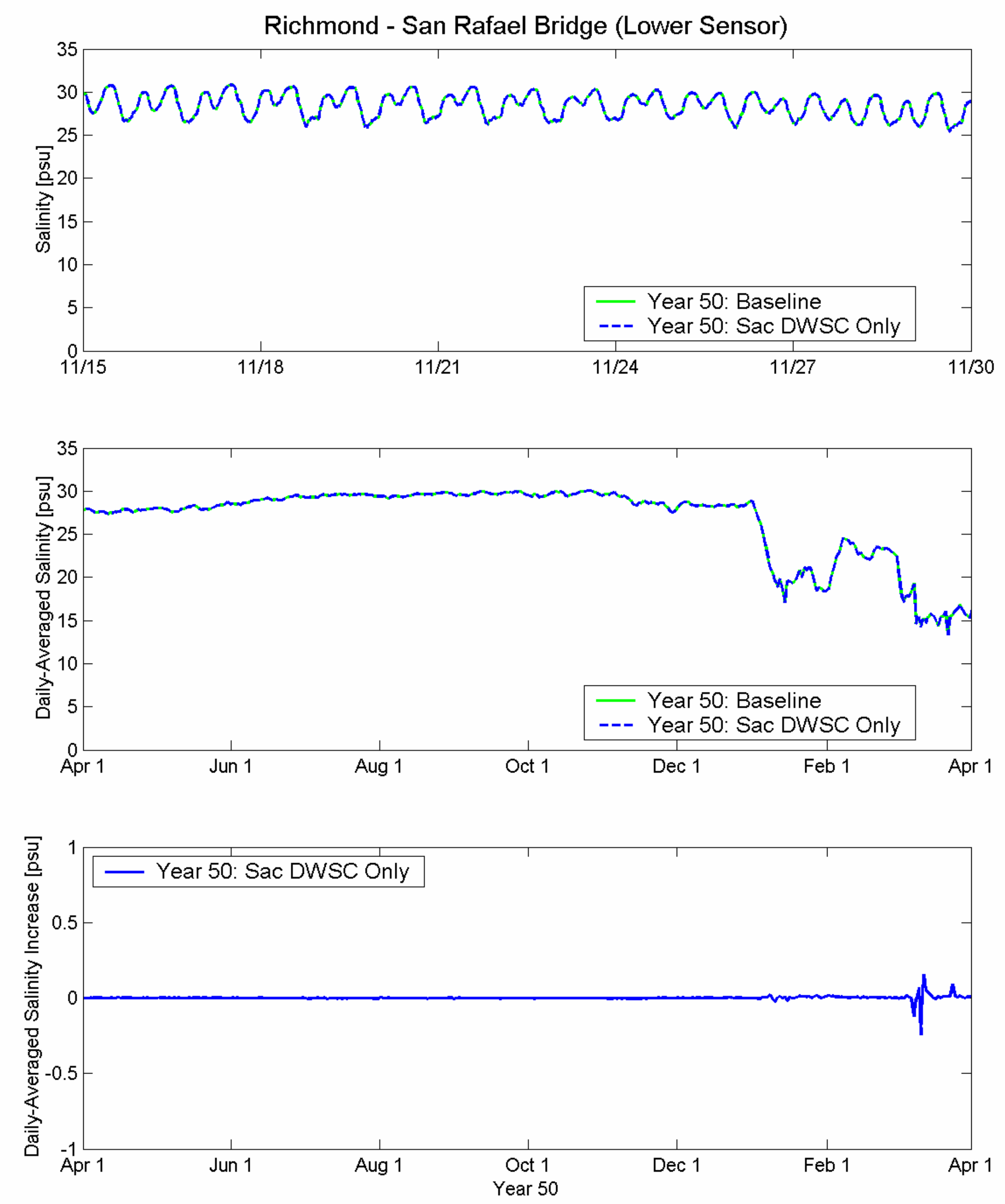


Figure 5.5-1 Predicted salinity at Richmond-San Rafael Bridge Lower Sensor for the Year 50 Baseline scenario and the Year 50 Sacramento DWSC Only Deepening scenario: tidal time-scale variability over a 15-day period (top); daily-averaged salinity for the Year 50 simulation period (middle); predicted increase in daily-averaged salinity for the Year 50 Sacramento DWSC Only Deepening scenario relative to the Year 50 Baseline scenario (bottom).

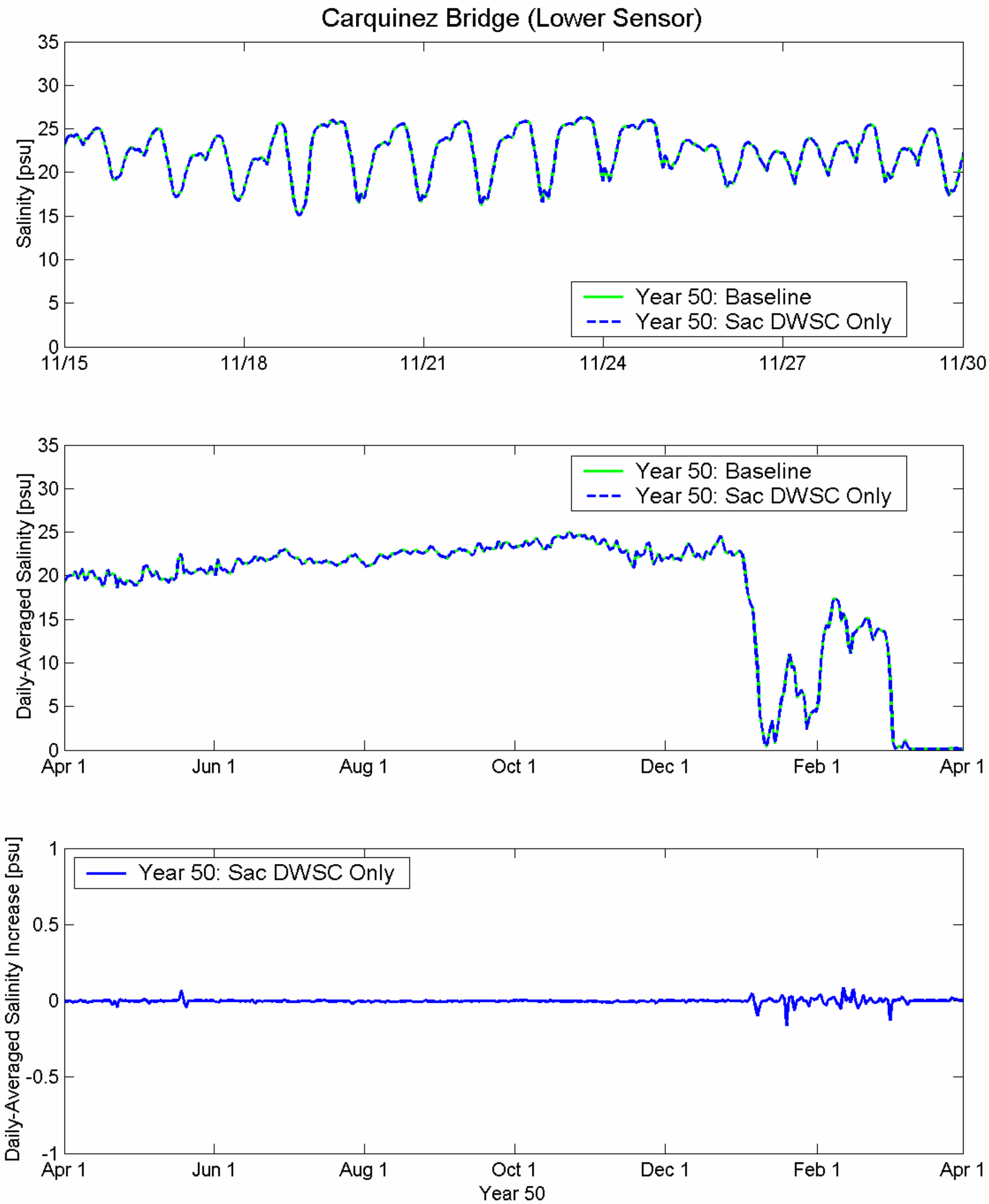


Figure 5.5-2 Predicted salinity at Carquinez Bridge Lower Sensor for the Year 50 Baseline scenario and the Year 50 Sacramento DWSC Only Deepening scenario: tidal time-scale variability over a 15-day period (top); daily-averaged salinity for the Year 50 simulation period (middle); predicted increase in daily-averaged salinity for the Year 50 Sacramento DWSC Only Deepening scenario relative to the Year 50 Baseline scenario (bottom).

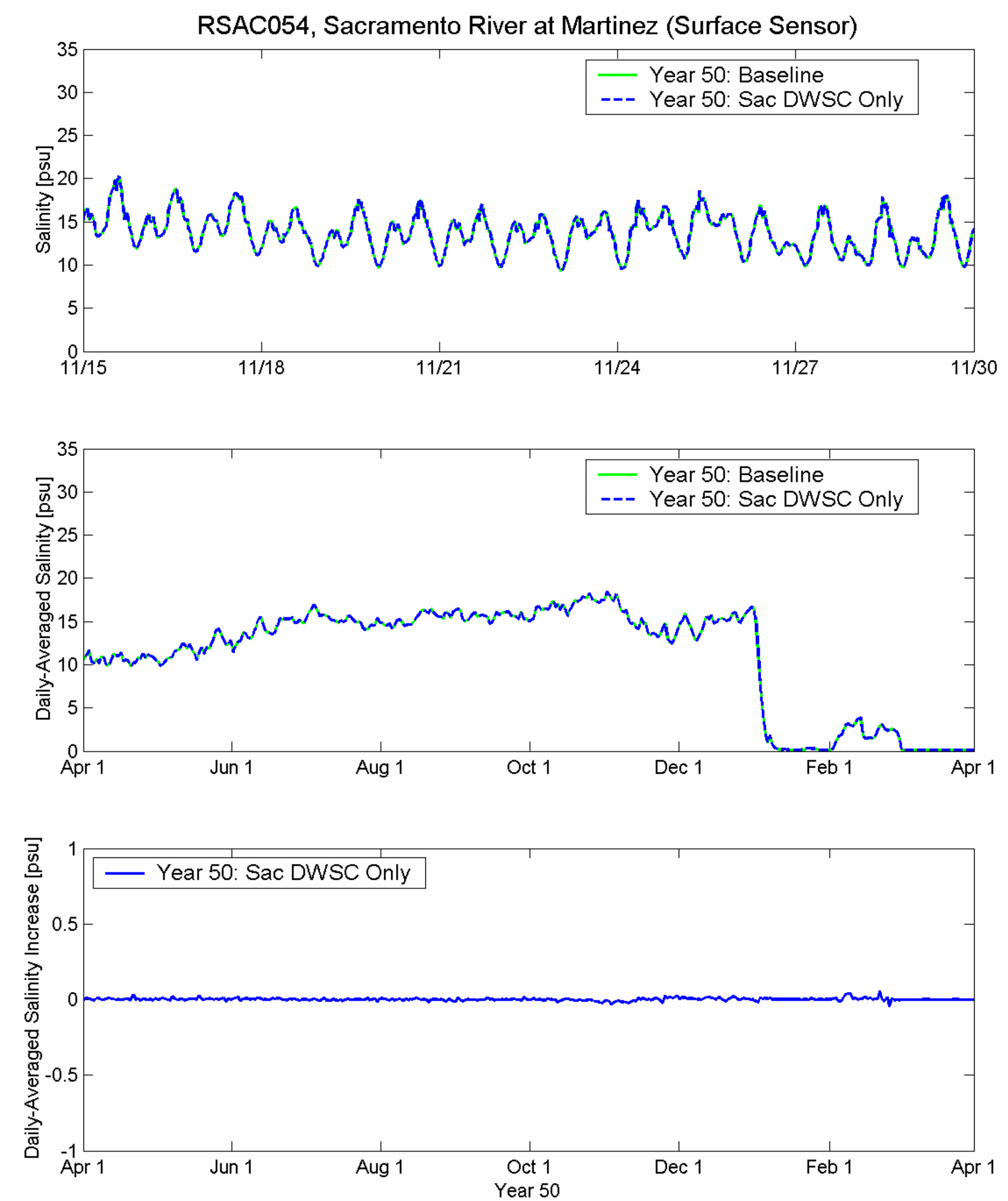


Figure 5.5-3 Predicted salinity at Sacramento River at Martinez (RSAC054) for the Year 50 Baseline scenario and the Year 50 Sacramento DWSC Only Deepening scenario: tidal time-scale variability over a 15-day period (top); daily-averaged salinity for the Year 50 simulation period (middle); predicted increase in daily-averaged salinity for the Year 50 Sacramento DWSC Only Deepening scenario relative to the Year 50 Baseline scenario (bottom).

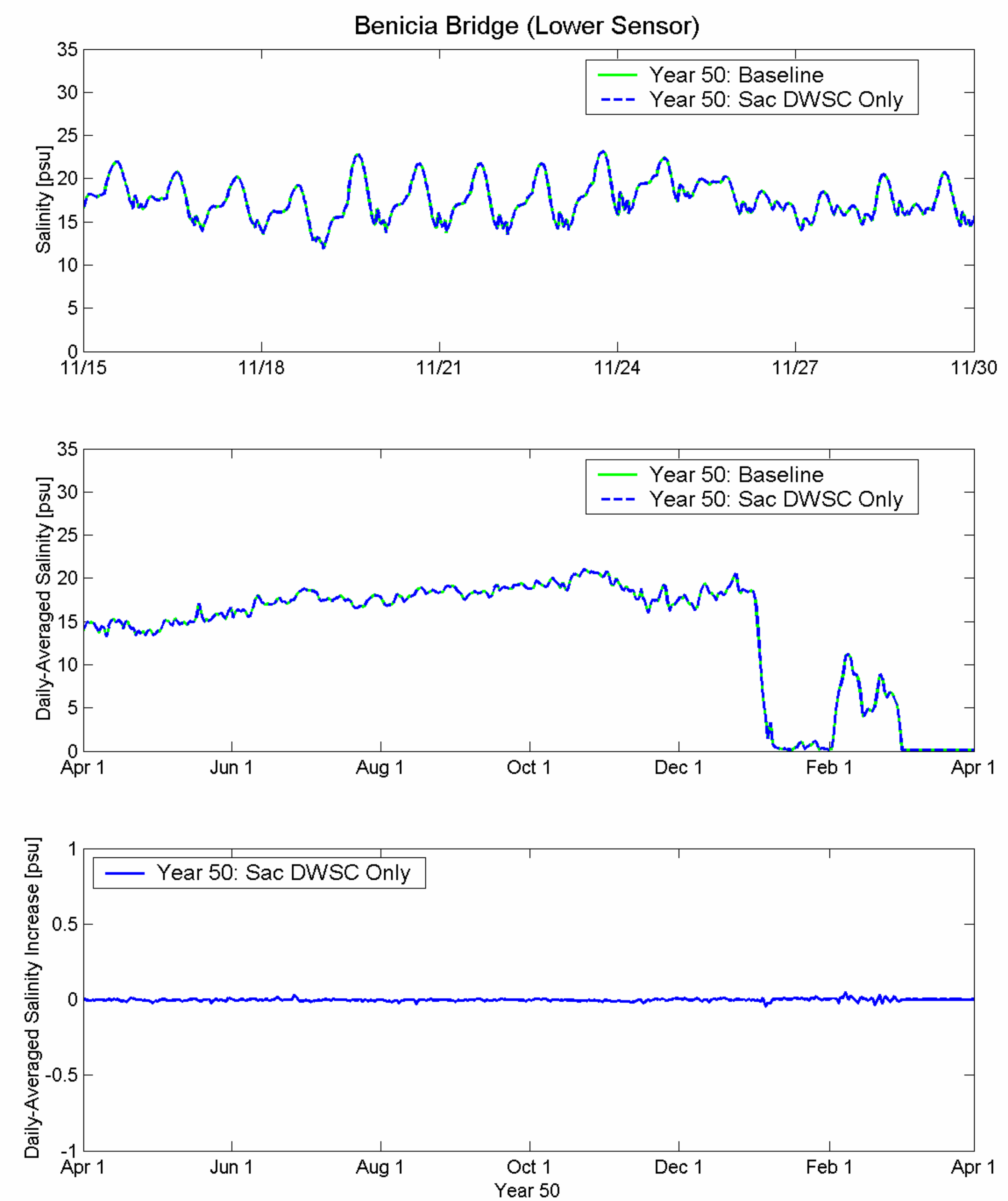


Figure 5.5-4 Predicted salinity at Benicia Bridge Lower Sensor for the Year 50 Baseline scenario and the Year 50 Sacramento DWSC Only Deepening scenario: tidal time-scale variability over a 15-day period (top); daily-averaged salinity for the Year 50 simulation period (middle); predicted increase in daily-averaged salinity for the Year 50 Sacramento DWSC Only Deepening scenario relative to the Year 50 Baseline scenario (bottom).

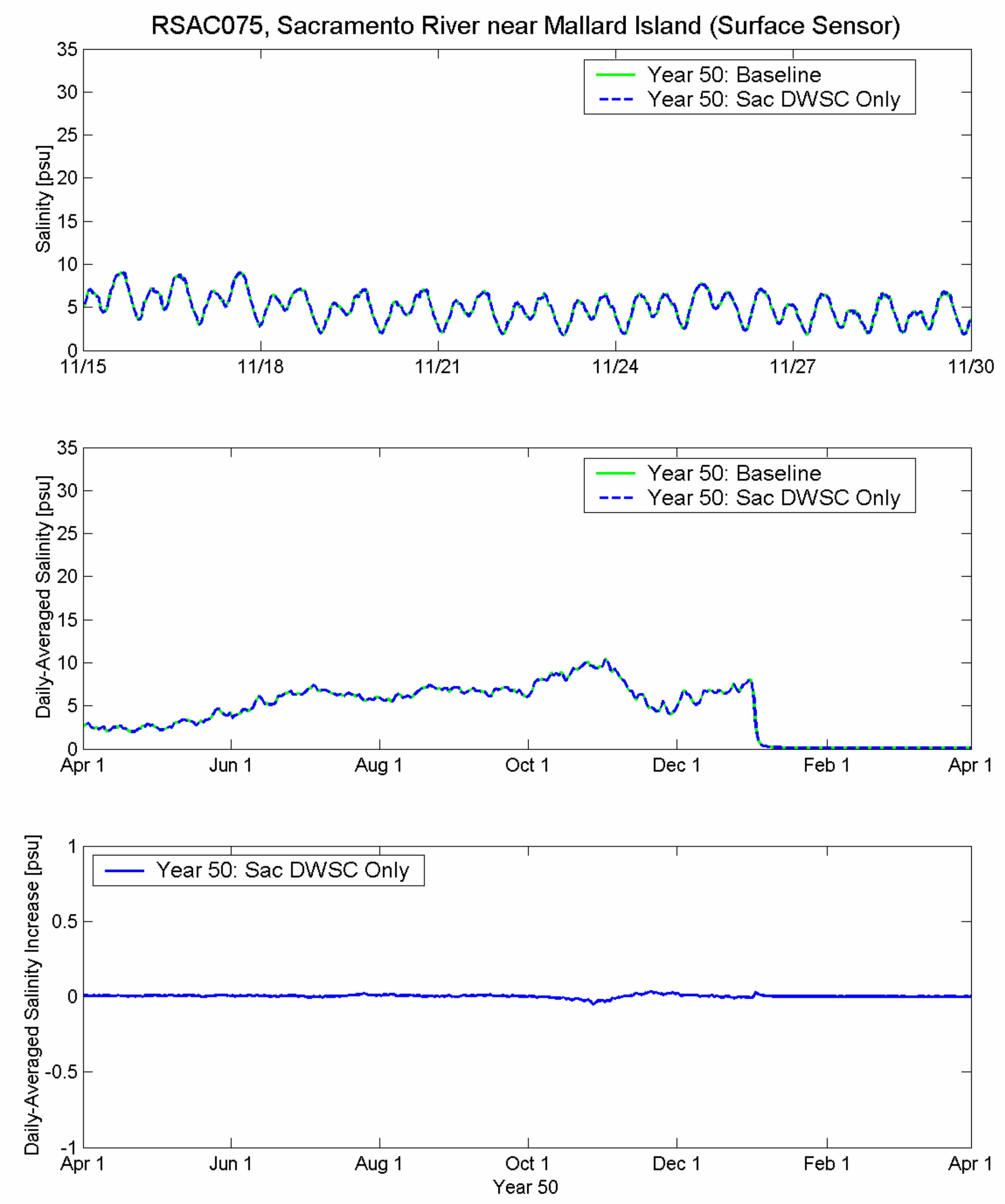


Figure 5.5-5 Predicted salinity at the Sacramento River near Mallard Island (RSAC075) Surface Sensor for the Year 50 Baseline scenario and the Year 50 Sacramento DWSC Only Deepening scenario: tidal time-scale variability over a 15-day period (top); daily-averaged salinity for the Year 50 simulation period (middle); predicted increase in daily-averaged salinity for the Year 50 Sacramento DWSC Only Deepening scenario relative to the Year 50 Baseline scenario (bottom).

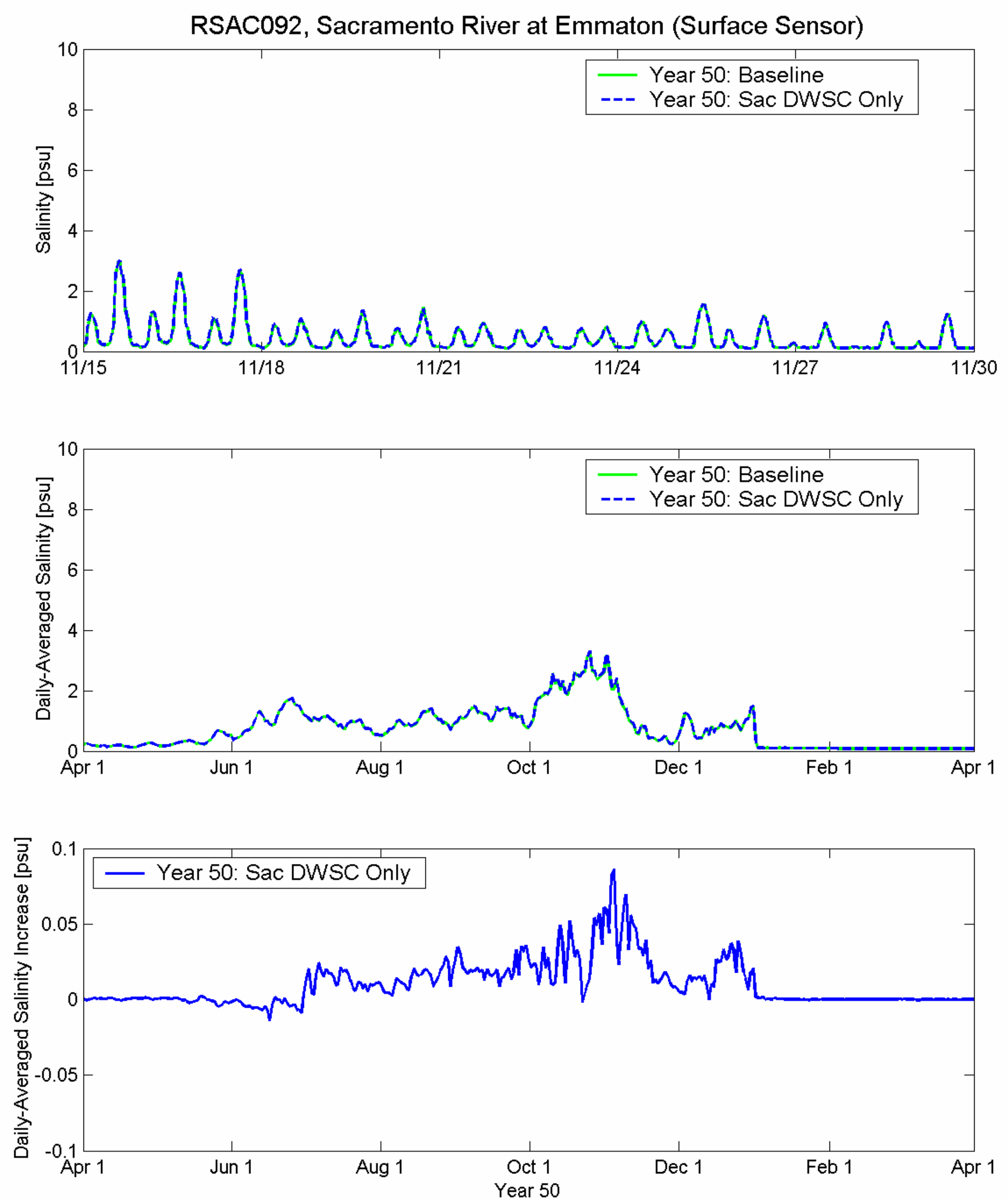


Figure 5.5-6 Predicted salinity at the Sacramento River at Emmaton (RSAC092) Surface Sensor for the Year 50 Baseline scenario and the Year 50 Sacramento DWSC Only Deepening scenario: tidal time-scale variability over a 15-day period (top); daily-averaged salinity for the Year 50 simulation period (middle); predicted increase in daily-averaged salinity for the Year 50 Sacramento DWSC Only Deepening scenario relative to the Year 50 Baseline scenario (bottom).

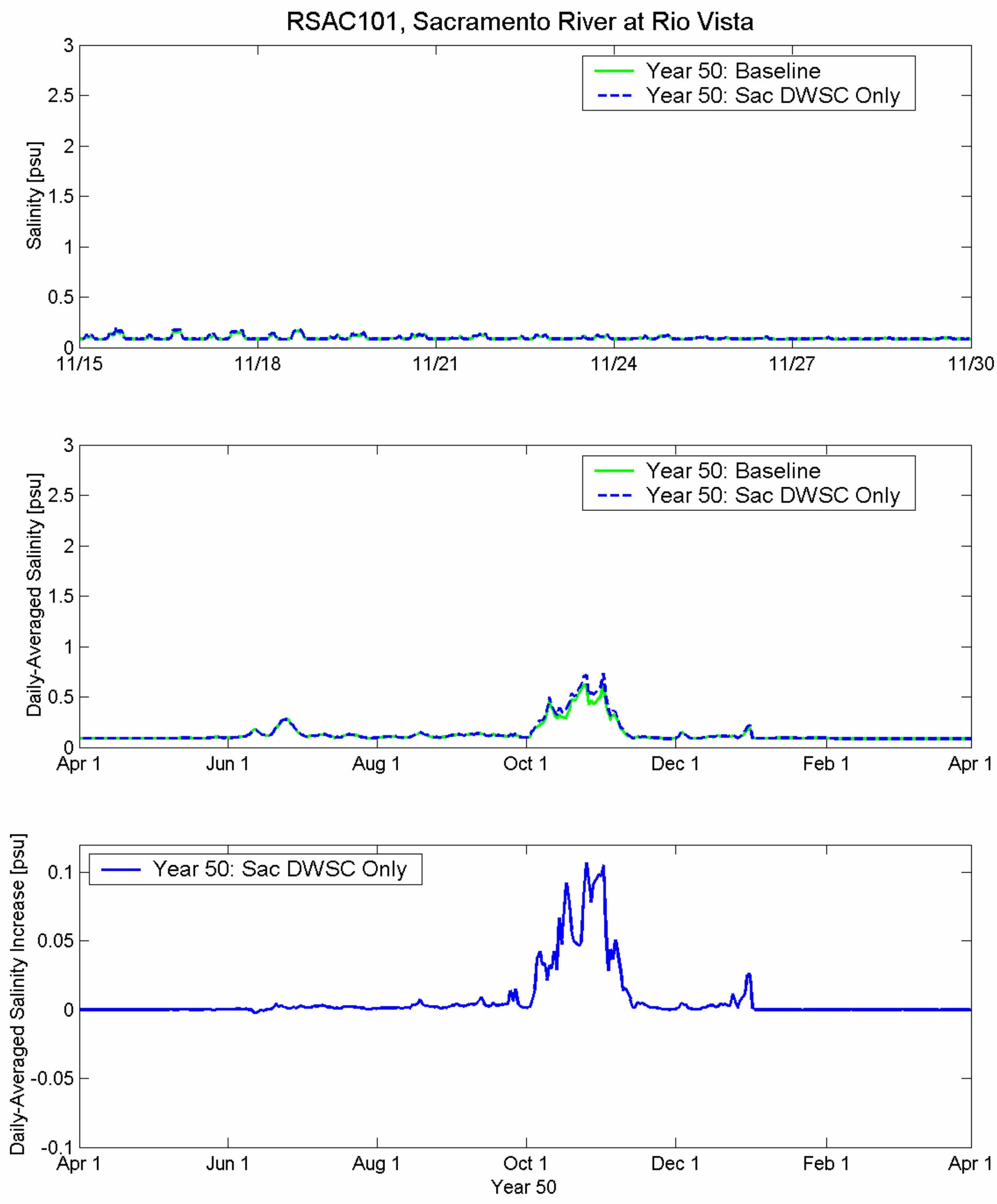


Figure 5.5-7 Predicted salinity at Sacramento River at Rio Vista (RSAC101) for the Year 50 Baseline scenario and the Year 50 Sacramento DWSC Only Deepening scenario: tidal time-scale variability over a 15-day period (top); daily-averaged salinity for the Year 50 simulation period (middle); predicted increase in daily-averaged salinity for the Year 50 Sacramento DWSC Only Deepening scenario relative to the Year 50 Baseline scenario (bottom).

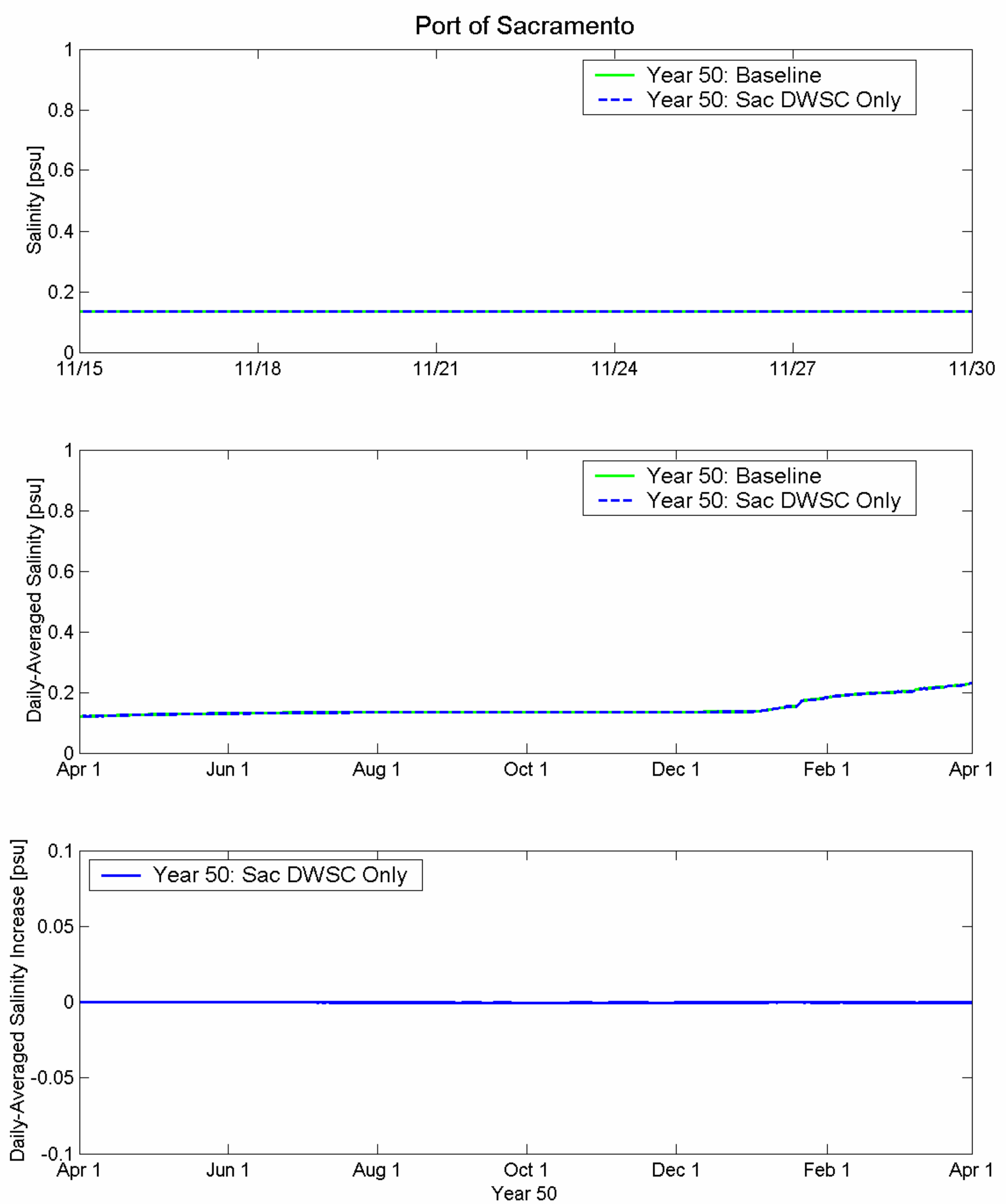


Figure 5.5-8 Predicted salinity at the Port of Sacramento for the Year 50 Baseline scenario and the Year 50 Sacramento DWSC Only Deepening scenario: tidal time-scale variability over a 15-day period (top); daily-averaged salinity for the Year 50 simulation period (middle); predicted increase in daily-averaged salinity for the Year 50 Sacramento DWSC Only Deepening scenario relative to the Year 50 Baseline scenario (bottom).

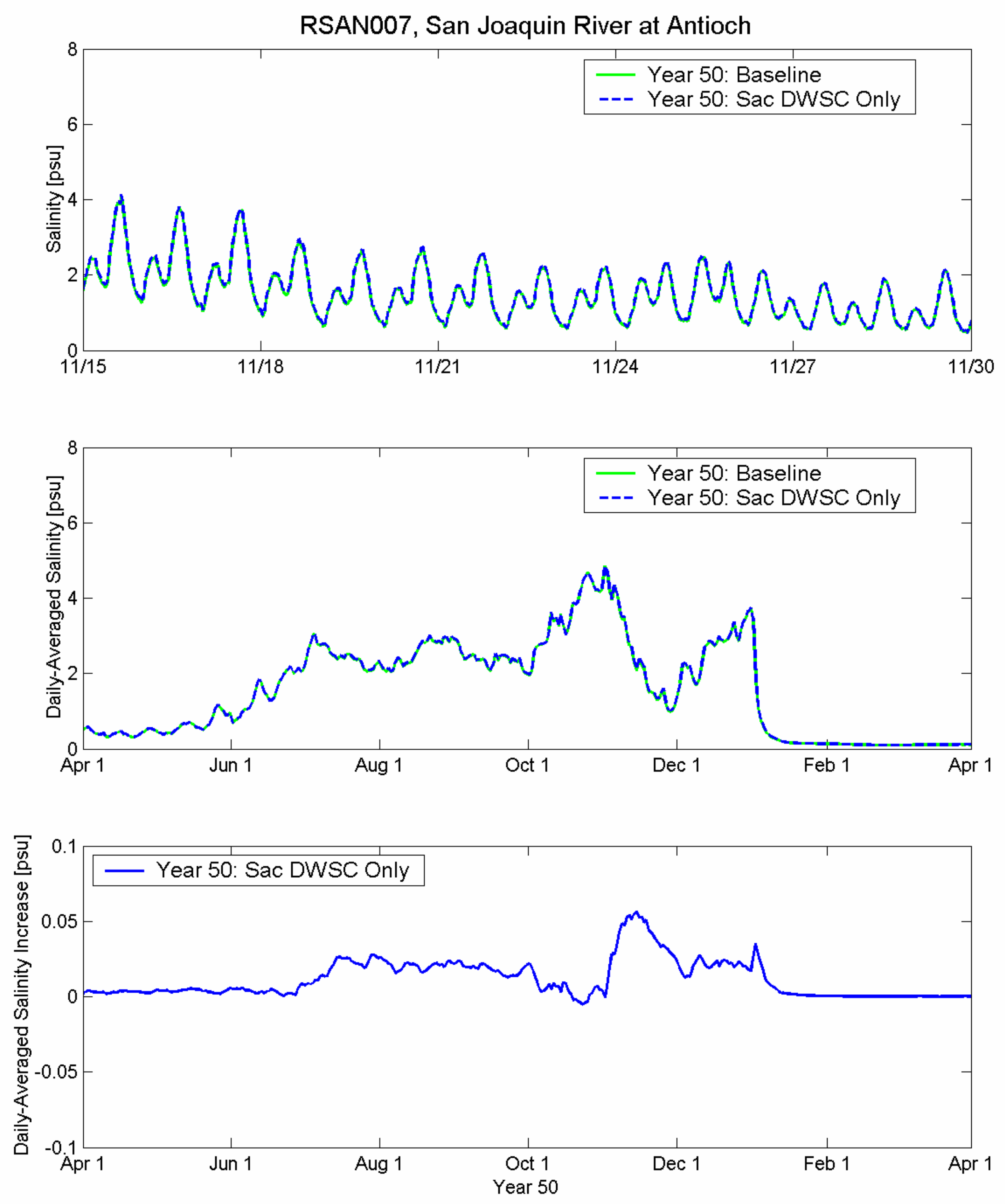


Figure 5.5-9 Predicted salinity at San Joaquin River at Antioch (RSAN007) for the Year 50 Baseline scenario and the Year 50 Sacramento DWSC Only Deepening scenario: tidal time-scale variability over a 15-day period (top); daily-averaged salinity for the Year 50 simulation period (middle); predicted increase in daily-averaged salinity for the Year 50 Sacramento DWSC Only Deepening scenario relative to the Year 50 Baseline scenario (bottom).

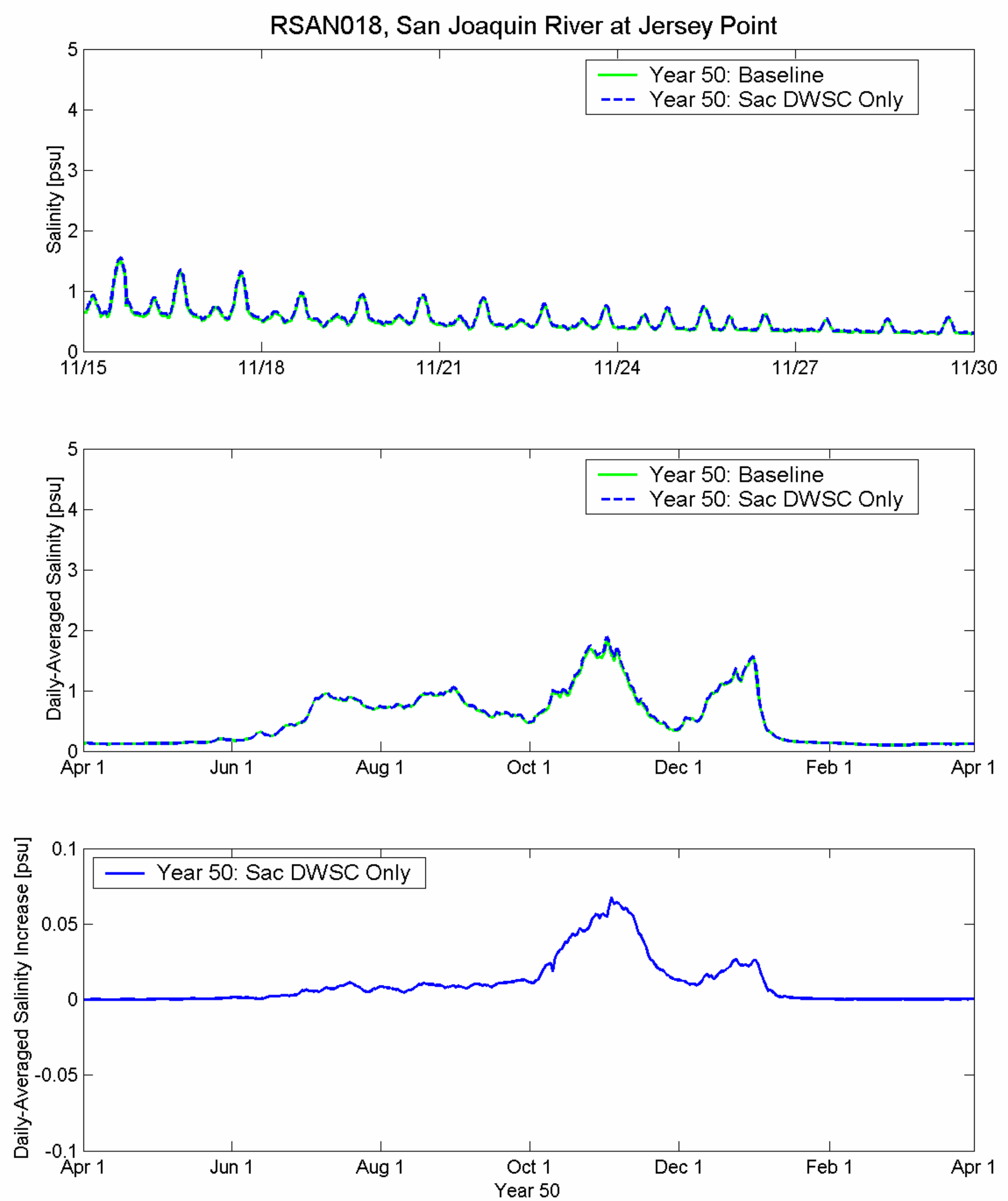


Figure 5.5-10 Predicted salinity at San Joaquin River at Jersey Point (RSAN018) for the Year 50 Baseline scenario and the Year 50 Sacramento DWSC Only Deepening scenario: tidal time-scale variability over a 15-day period (top); daily-averaged salinity for the Year 50 simulation period (middle); predicted increase in daily-averaged salinity for the Year 50 Sacramento DWSC Only Deepening scenario relative to the Year 50 Baseline scenario (bottom).

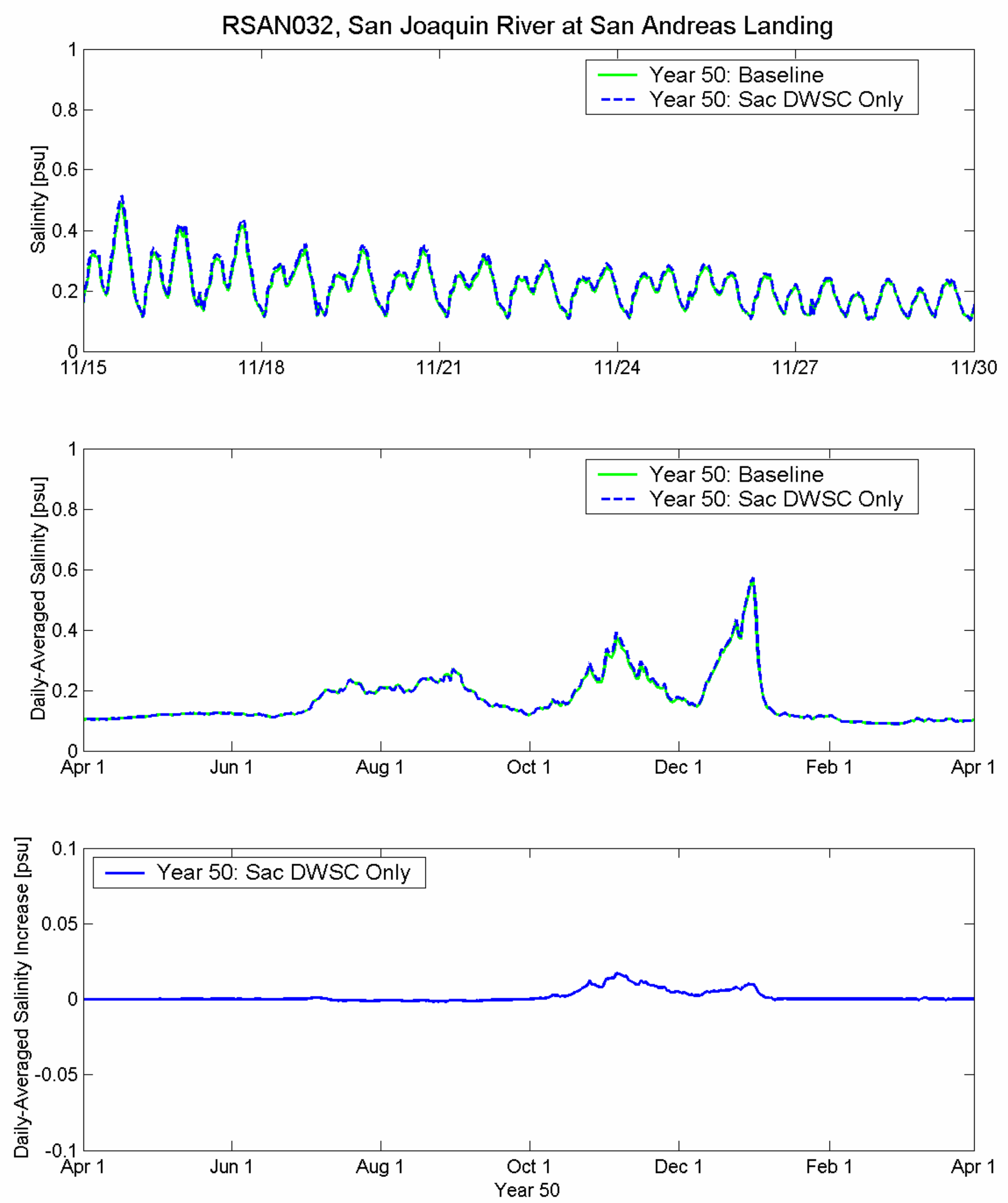


Figure 5.5-11 Predicted salinity at San Joaquin River at San Andreas Landing (RSAN032) for the Year 50 Baseline scenario and the Year 50 Sacramento DWSC Only Deepening scenario: tidal time-scale variability over a 15-day period (top); daily-averaged salinity for the Year 50 simulation period (middle); predicted increase in daily-averaged salinity for the Year 50 Sacramento DWSC Only Deepening scenario relative to the Year 50 Baseline scenario (bottom).

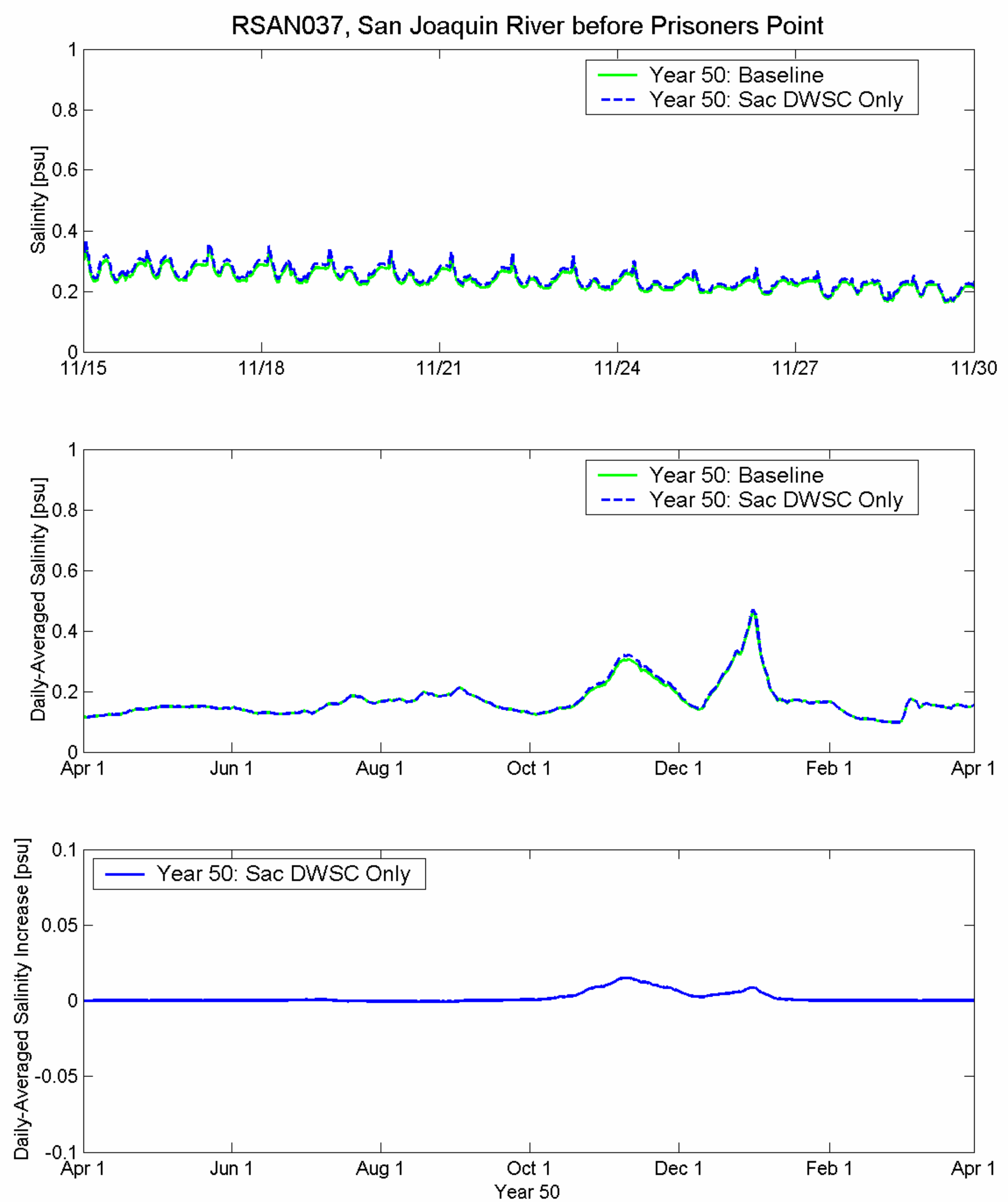


Figure 5.5-12 Predicted salinity at San Joaquin River before Prisoners Point (RSAN037) for the Year 50 Baseline scenario and the Year 50 Sacramento DWSC Only Deepening scenario: tidal time-scale variability over a 15-day period (top); daily-averaged salinity for the Year 50 simulation period (middle); predicted increase in daily-averaged salinity for the Year 50 Sacramento DWSC Only Deepening scenario relative to the Year 50 Baseline scenario (bottom).

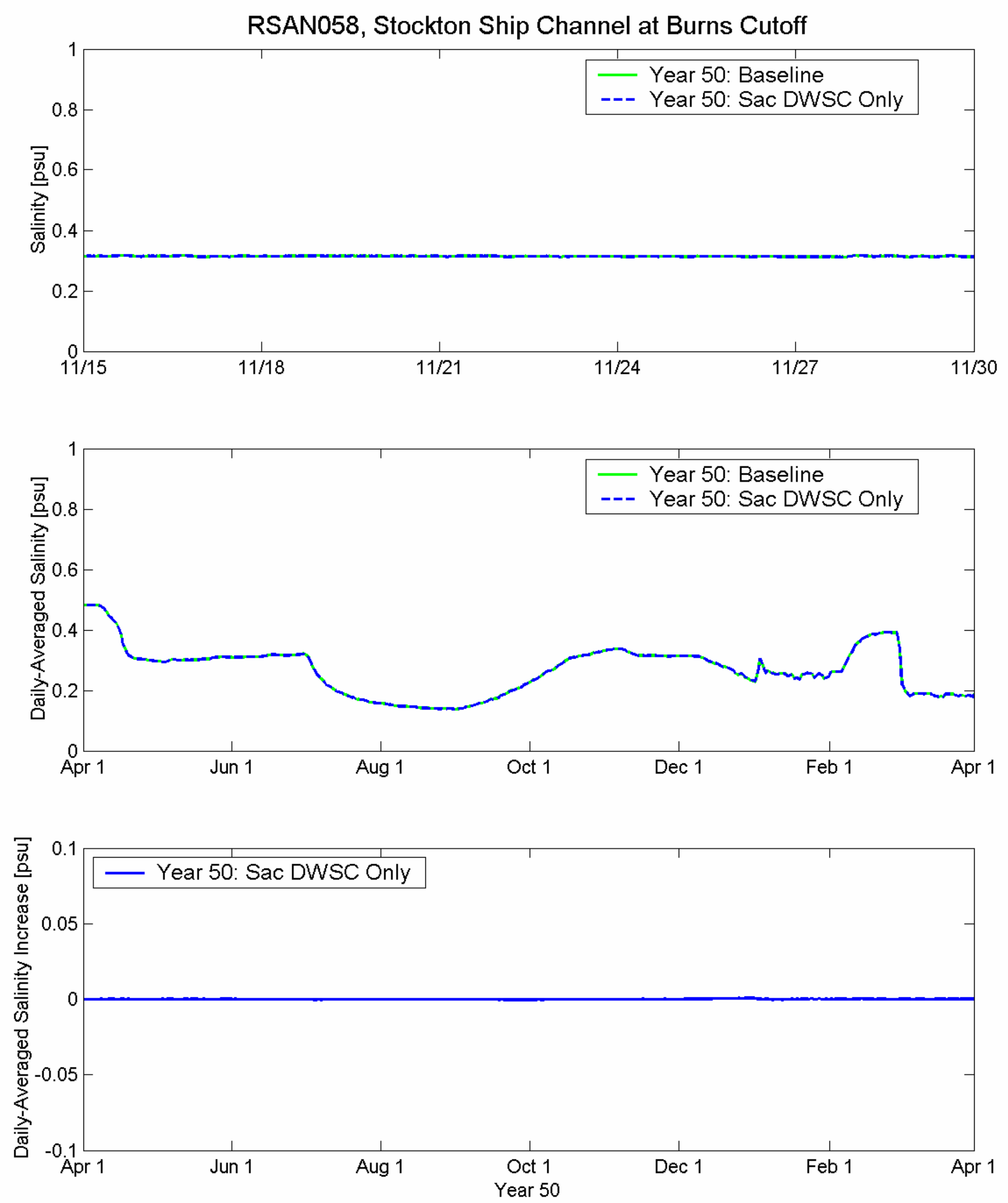


Figure 5.5-13 Predicted salinity at Stockton Ship Channel at Burns Cutoff (RSAN058) for the Year 50 Baseline scenario and the Year 50 Sacramento DWSC Only Deepening scenario: tidal time-scale variability over a 15-day period (top); daily-averaged salinity for the Year 50 simulation period (middle); predicted increase in daily-averaged salinity for the Year 50 Sacramento DWSC Only Deepening scenario relative to the Year 50 Baseline scenario (bottom).

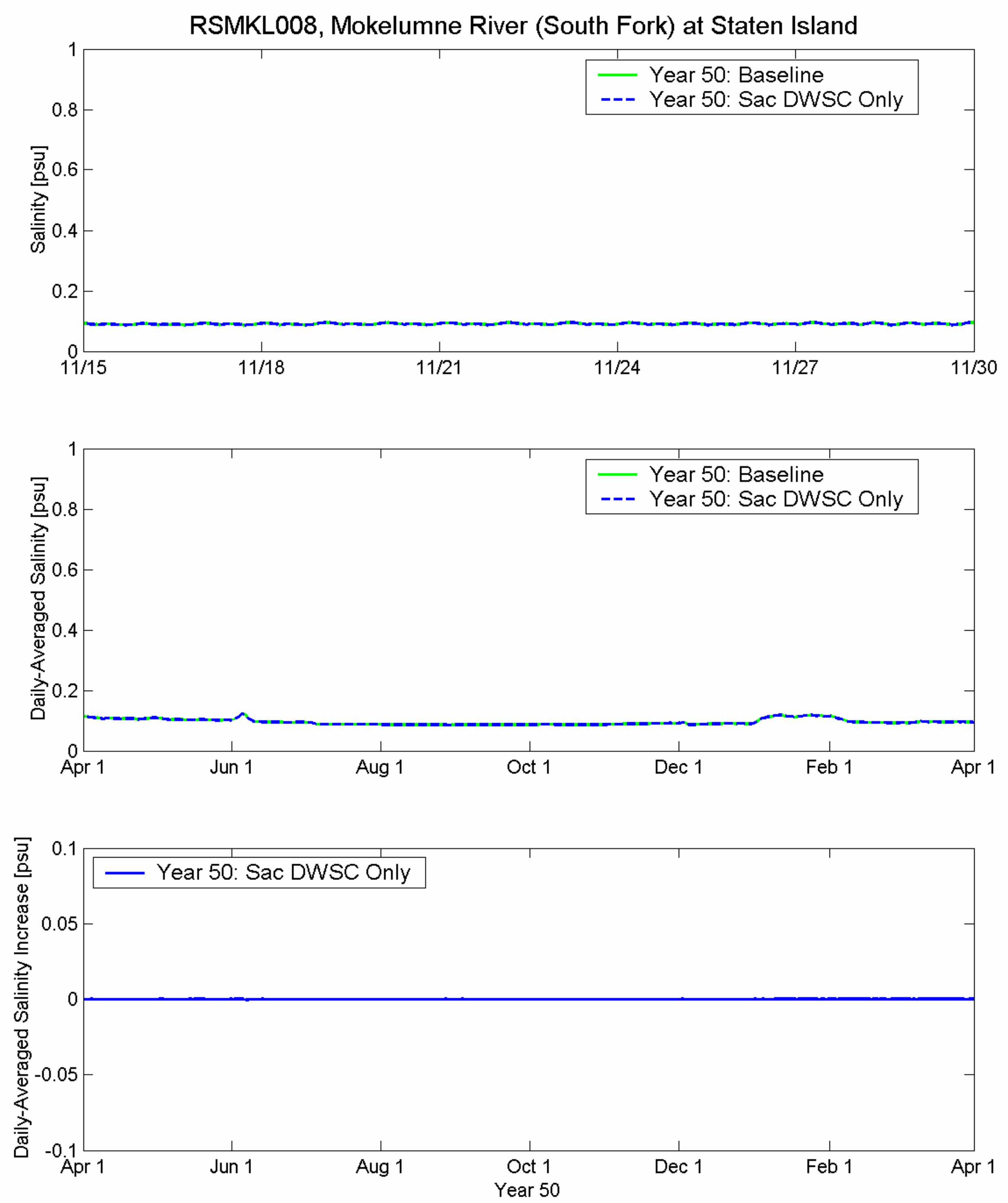


Figure 5.5-14 Predicted salinity at South Fork Mokelumne River at Staten Island (RSMKL008) for the Year 50 Baseline scenario and the Year 50 Sacramento DWSC Only Deepening scenario: tidal time-scale variability over a 15-day period (top); daily-averaged salinity for the Year 50 simulation period (middle); predicted increase in daily-averaged salinity for the Year 50 Sacramento DWSC Only Deepening scenario relative to the Year 50 Baseline scenario (bottom).

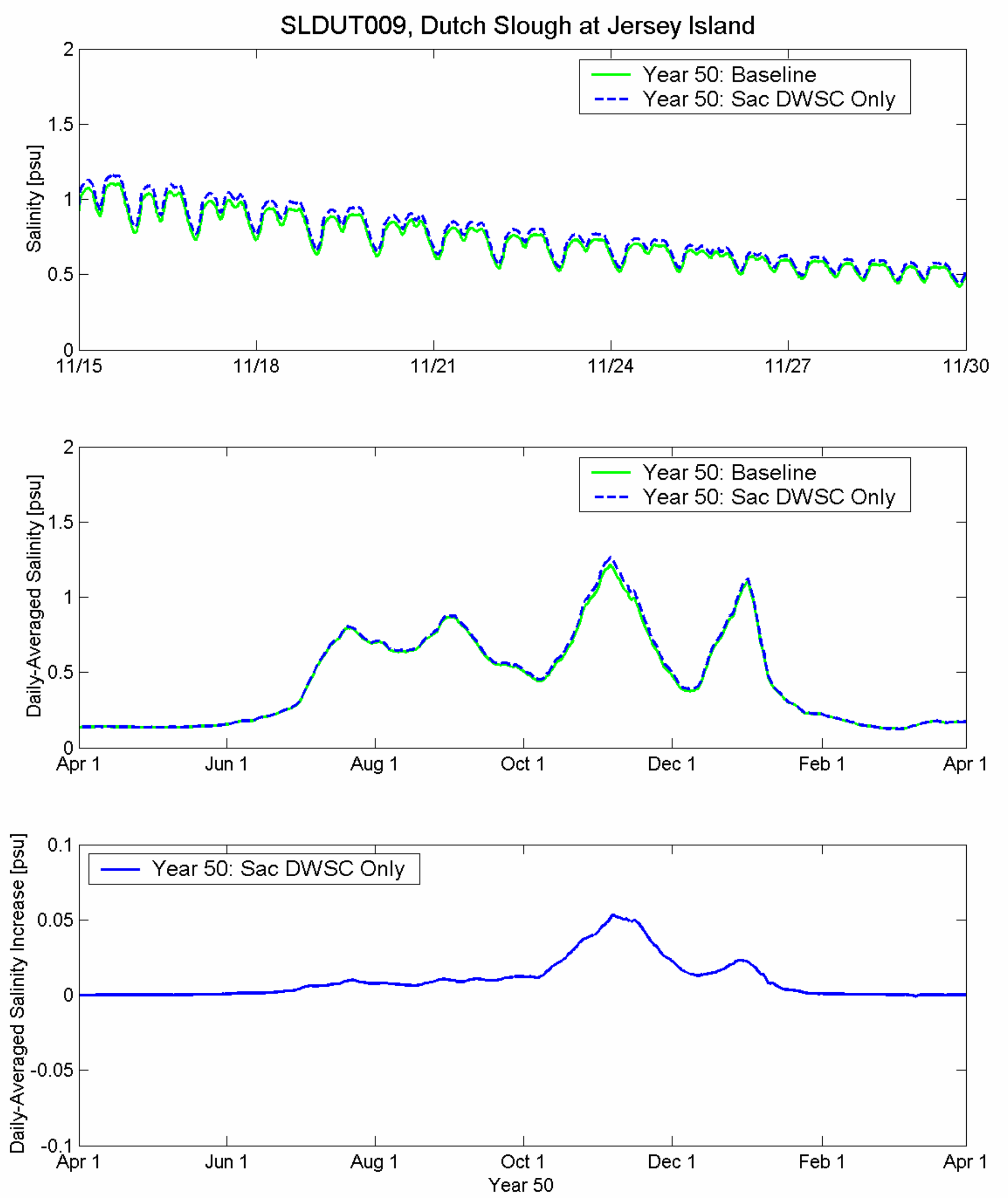


Figure 5.5-15 Predicted salinity at Dutch Slough at Jersey Island (SLDUT009) for the Year 50 Baseline scenario and the Year 50 Sacramento DWSC Only Deepening scenario: tidal time-scale variability over a 15-day period (top); daily-averaged salinity for the Year 50 simulation period (middle); predicted increase in daily-averaged salinity for the Year 50 Sacramento DWSC Only Deepening scenario relative to the Year 50 Baseline scenario (bottom).

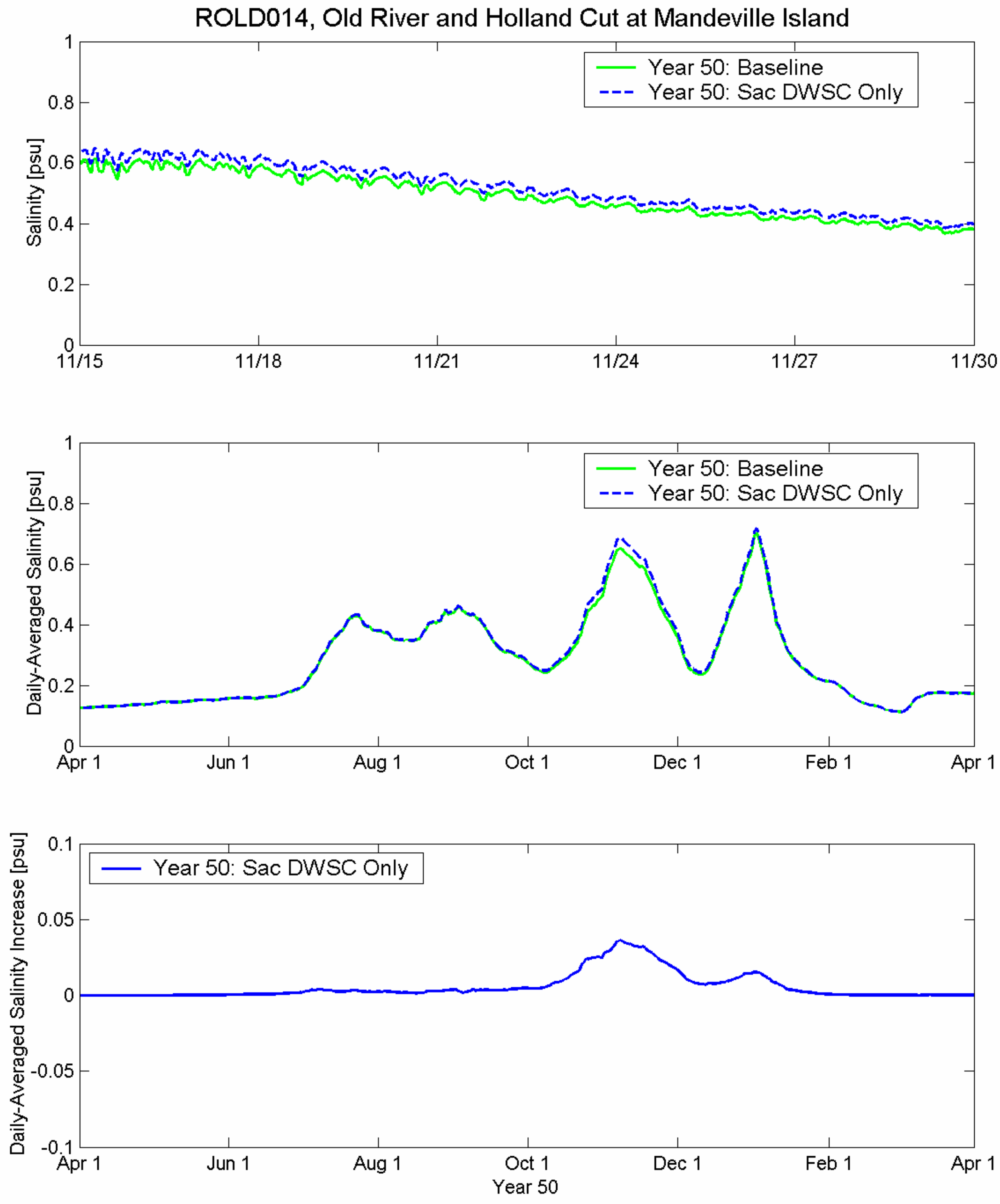


Figure 5.5-16 Predicted salinity at Old River and Holland Cut at Mandeville Island (ROLD014) for the Year 50 Baseline scenario and the Year 50 Sacramento DWSC Only Deepening scenario: tidal time-scale variability over a 15-day period (top); daily-averaged salinity for the Year 50 simulation period (middle); predicted increase in daily-averaged salinity for the Year 50 Sacramento DWSC Only Deepening scenario relative to the Year 50 Baseline scenario (bottom).

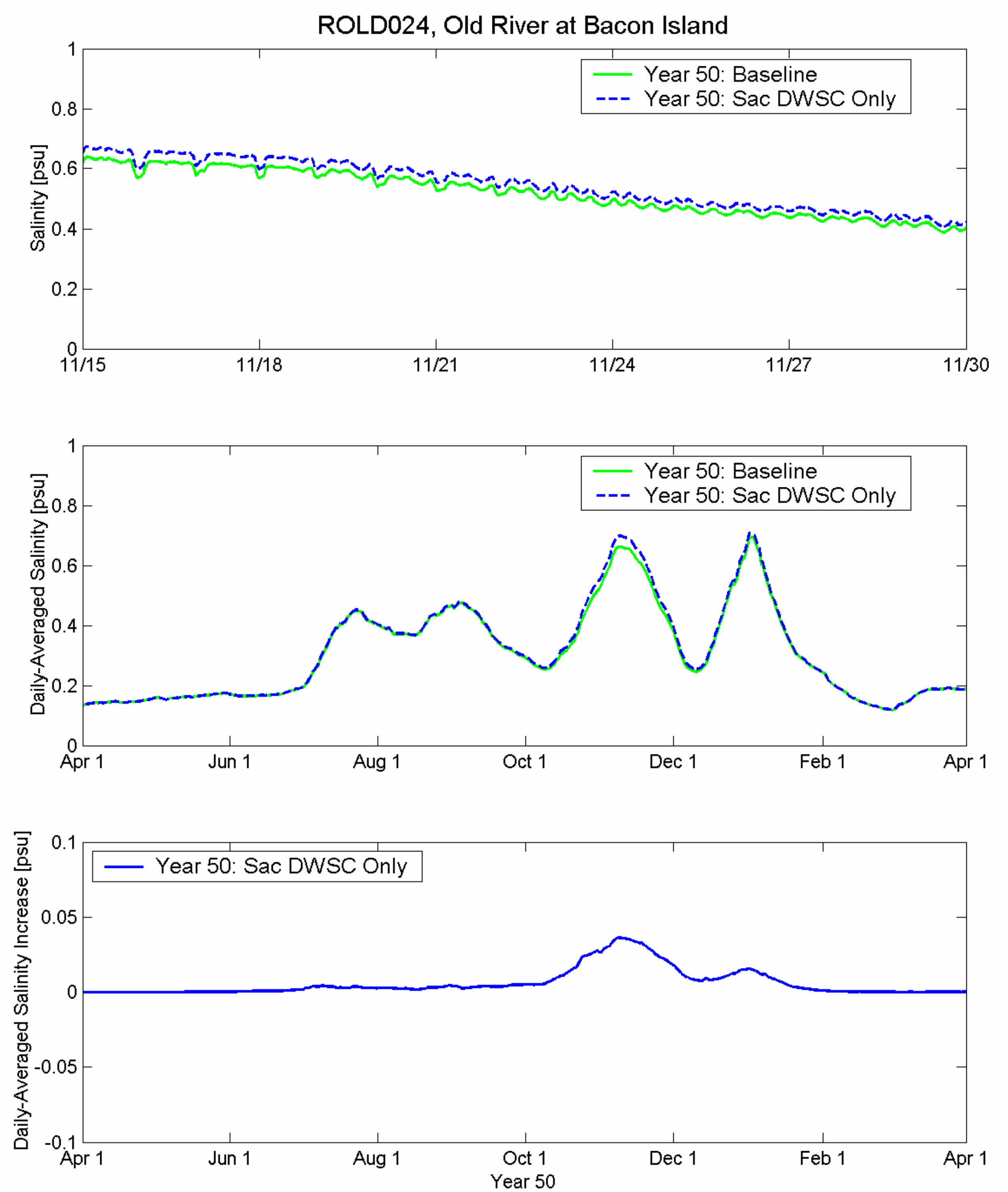


Figure 5.5-17 Predicted salinity at Old River at Bacon Island (ROLD024) for the Year 50 Baseline scenario and the Year 50 Sacramento DWSC Only Deepening scenario: tidal time-scale variability over a 15-day period (top); daily-averaged salinity for the Year 50 simulation period (middle); predicted increase in daily-averaged salinity for the Year 50 Sacramento DWSC Only Deepening scenario relative to the Year 50 Baseline scenario (bottom).

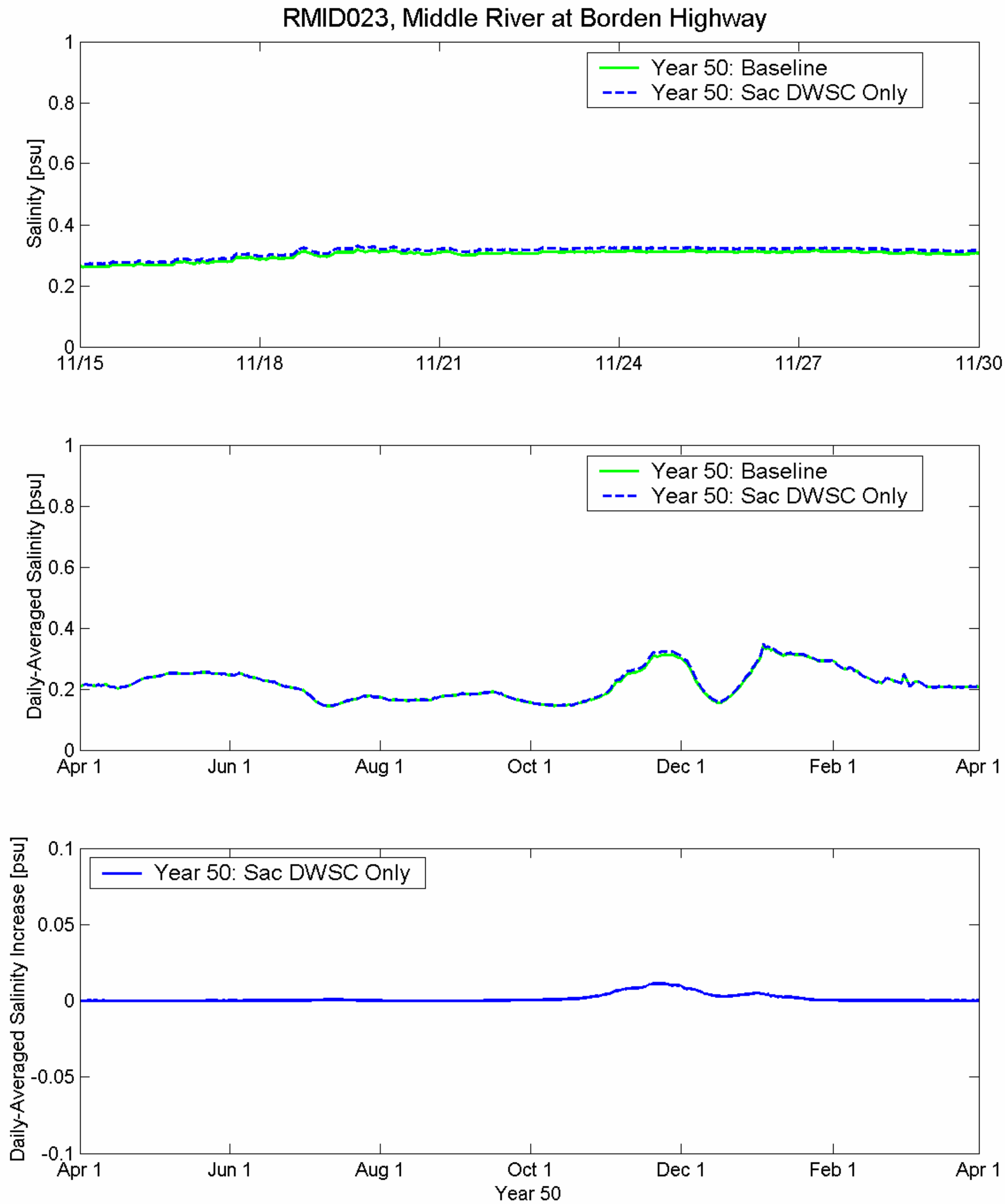


Figure 5.5-18 Predicted salinity at Middle River at Borden Highway (RMID023) for the Year 50 Baseline scenario and the Year 50 Sacramento DWSC Only Deepening scenario: tidal time-scale variability over a 15-day period (top); daily-averaged salinity for the Year 50 simulation period (middle); predicted increase in daily-averaged salinity for the Year 50 Sacramento DWSC Only Deepening scenario relative to the Year 50 Baseline scenario (bottom).

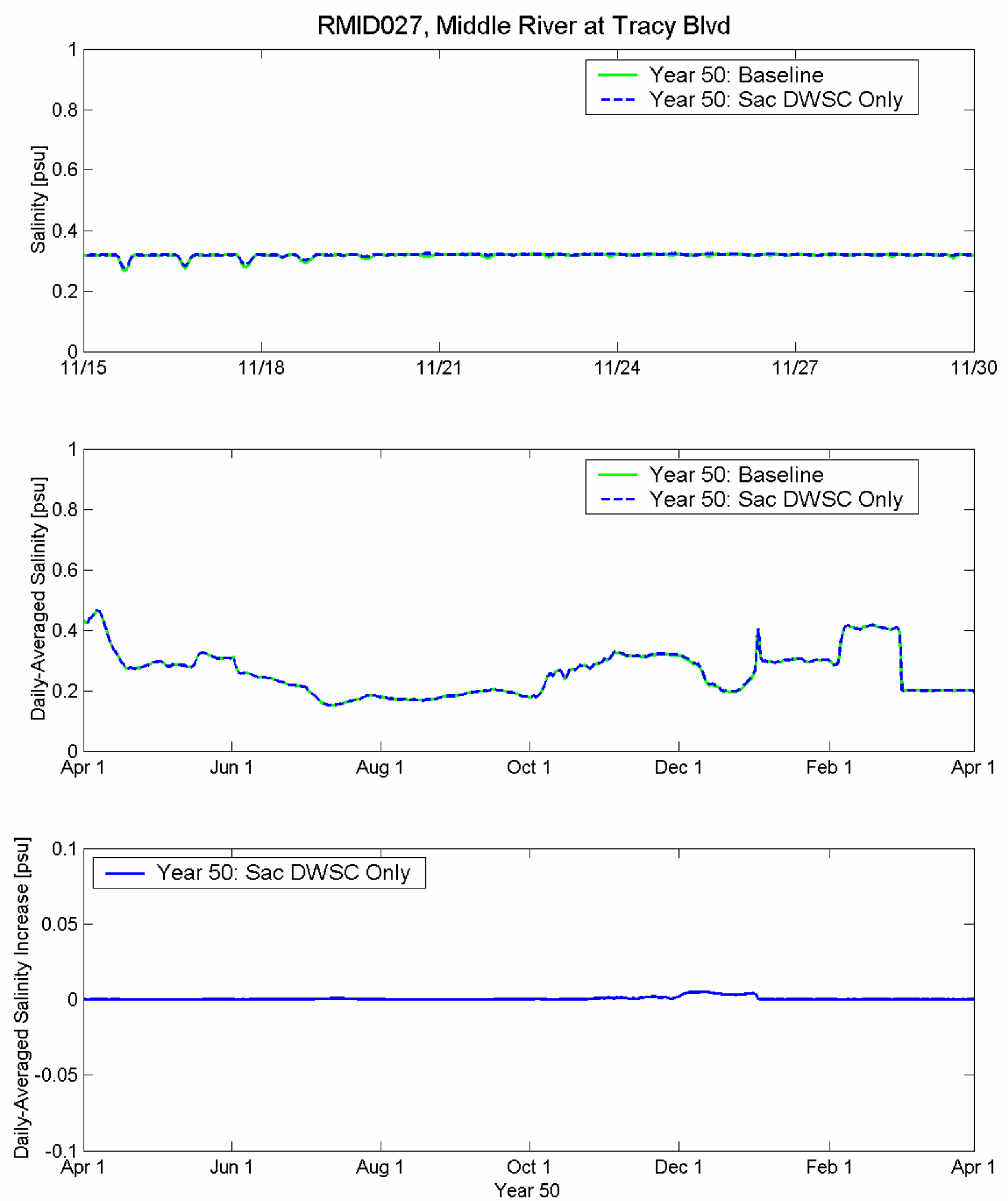


Figure 5.5-19 Predicted salinity at Middle River at Tracy Boulevard (RMID027) for the Year 50 Baseline scenario and the Year 50 Sacramento DWSC Only Deepening scenario: tidal time-scale variability over a 15-day period (top); daily-averaged salinity for the Year 50 simulation period (middle); predicted increase in daily-averaged salinity for the Year 50 Sacramento DWSC Only Deepening scenario relative to the Year 50 Baseline scenario (bottom).

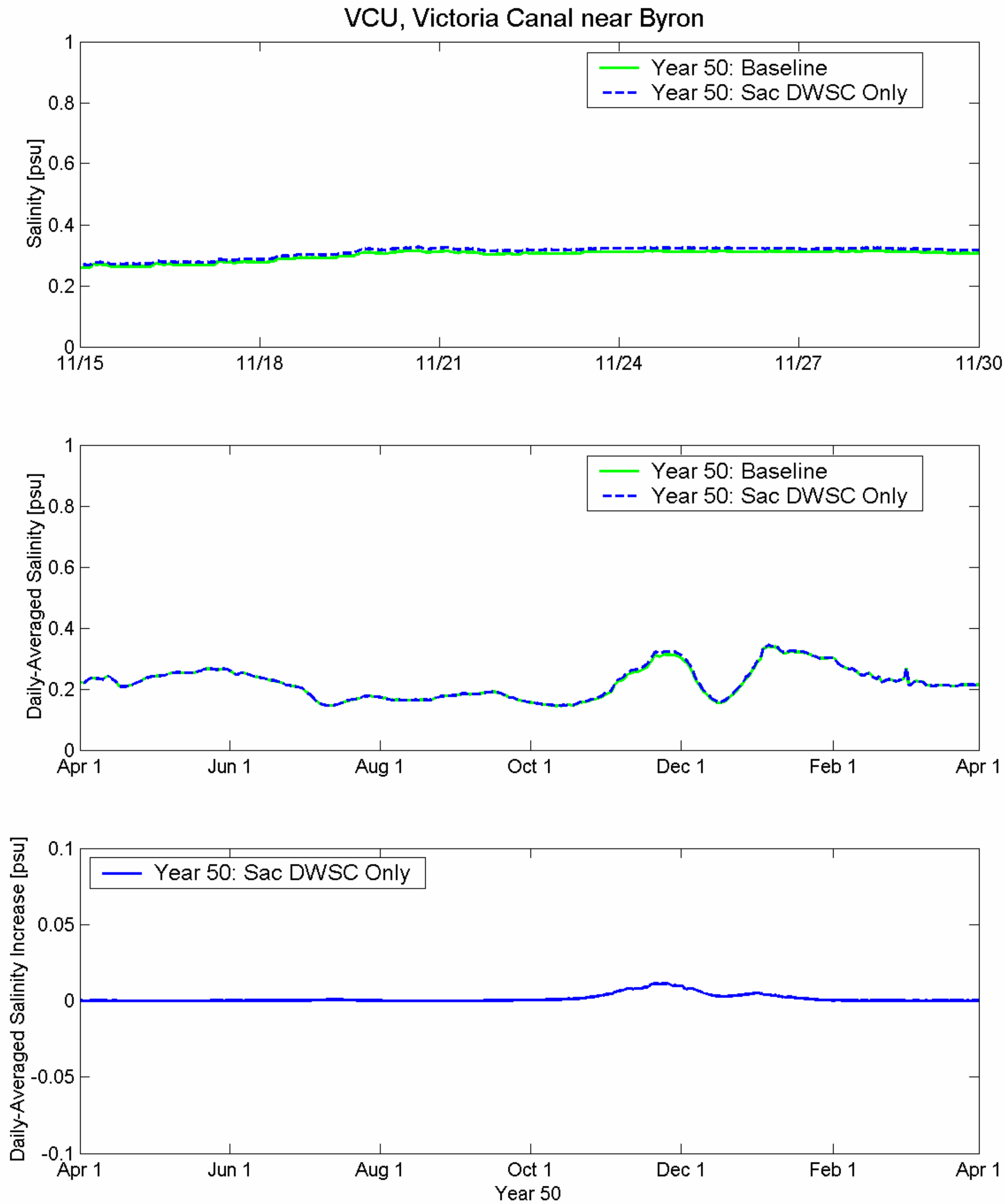


Figure 5.5-20 Predicted salinity at Victoria Canal near Byron (VCU) for the Year 50 Baseline scenario and the Year 50 Sacramento DWSC Only Deepening scenario: tidal time-scale variability over a 15-day period (top); daily-averaged salinity for the Year 50 simulation period (middle); predicted increase in daily-averaged salinity for the Year 50 Sacramento DWSC Only Deepening scenario relative to the Year 50 Baseline scenario (bottom).

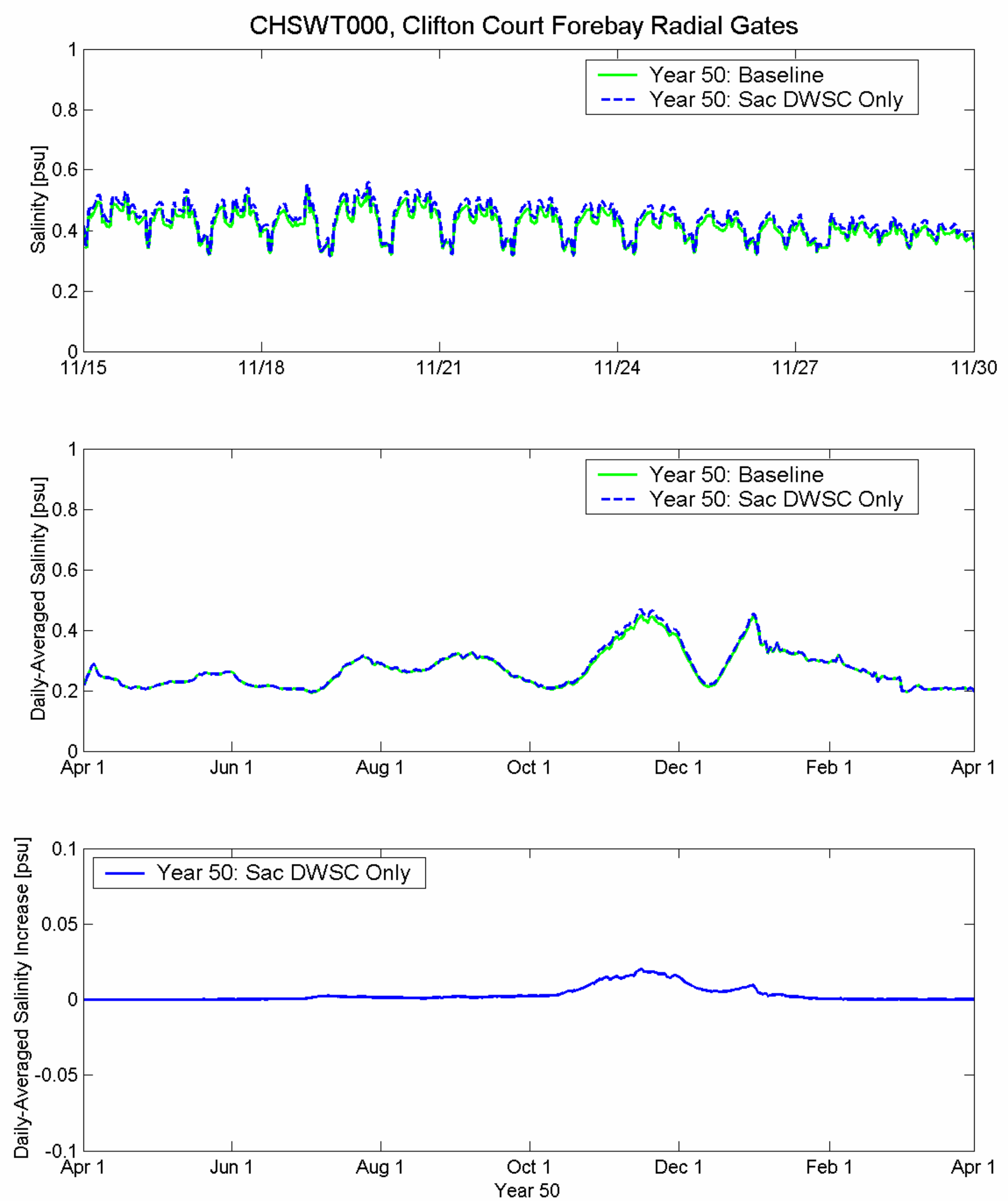


Figure 5.5-21 Predicted salinity at Clifton Court Forebay Radial Gates (CHWST000) for the Year 50 Baseline scenario and the Year 50 Sacramento DWSC Only Deepening scenario: tidal time-scale variability over a 15-day period (top); daily-averaged salinity for the Year 50 simulation period (middle); predicted increase in daily-averaged salinity for the Year 50 Sacramento DWSC Only Deepening scenario relative to the Year 50 Baseline scenario (bottom).

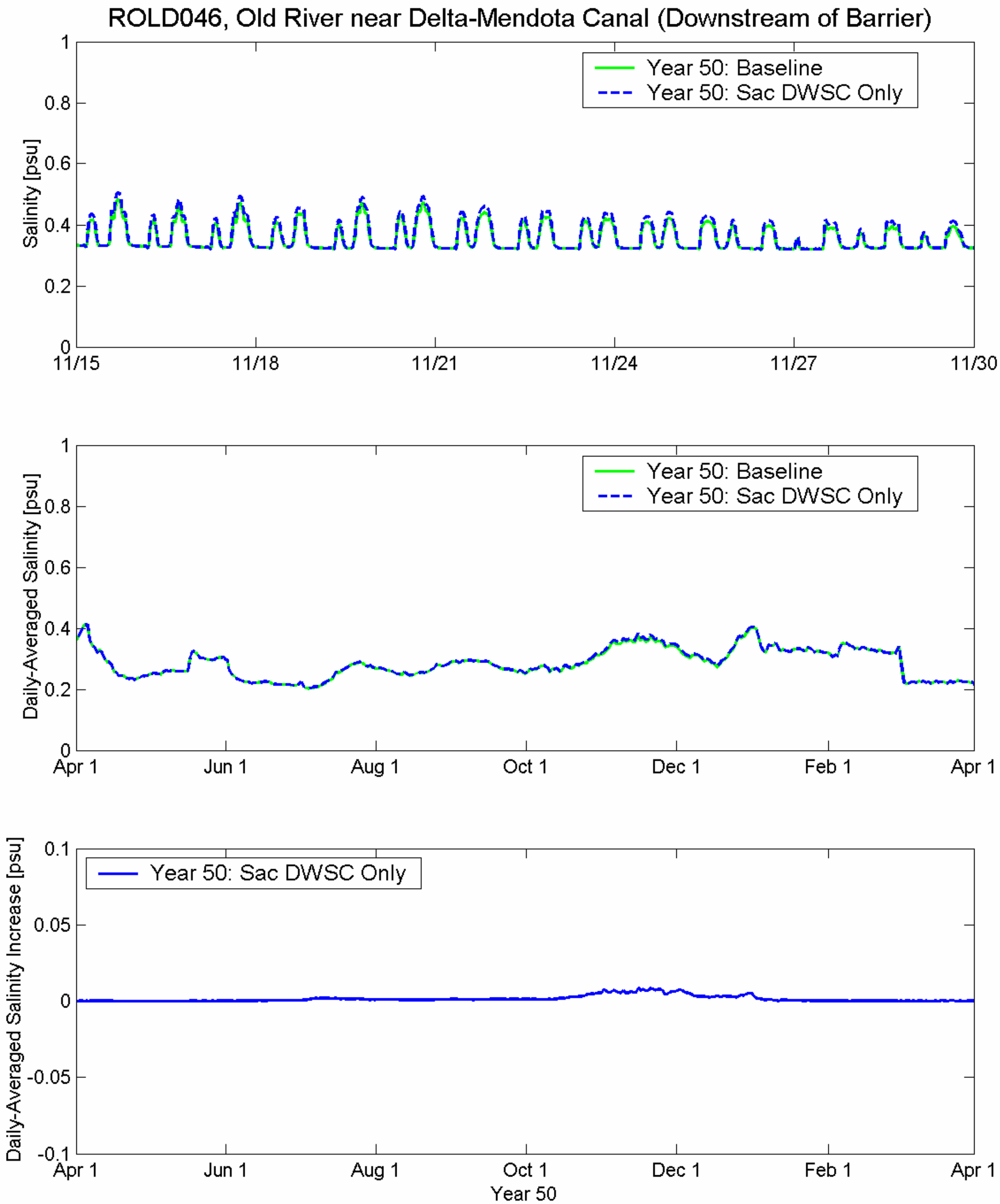


Figure 5.5-22 Predicted salinity at Old River near Delta-Mendota Canal Downstream of Barrier (ROLD046) for the Year 50 Baseline scenario and the Year 50 Sacramento DWSC Only Deepening scenario: tidal time-scale variability over a 15-day period (top); daily-averaged salinity for the Year 50 simulation period (middle); predicted increase in daily-averaged salinity for the Year 50 Sacramento DWSC Only Deepening scenario relative to the Year 50 Baseline scenario (bottom).

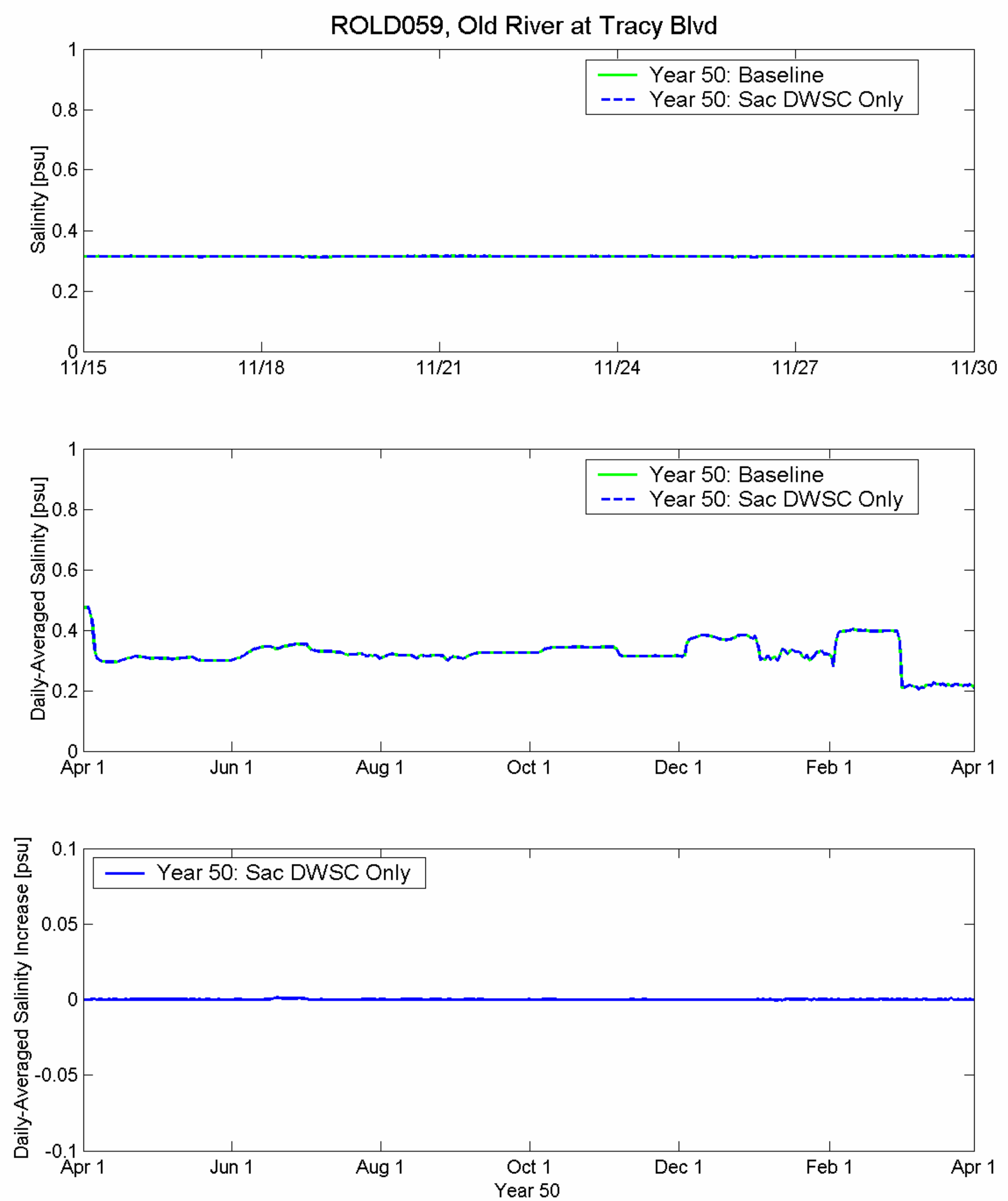


Figure 5.5-23 Predicted salinity at Old River at Tracy Boulevard (ROLD059) for the Year 50 Baseline scenario and the Year 50 Sacramento DWSC Only Deepening scenario: tidal time-scale variability over a 15-day period (top); daily-averaged salinity for the Year 50 simulation period (middle); predicted increase in daily-averaged salinity for the Year 50 Sacramento DWSC Only Deepening scenario relative to the Year 50 Baseline scenario (bottom).

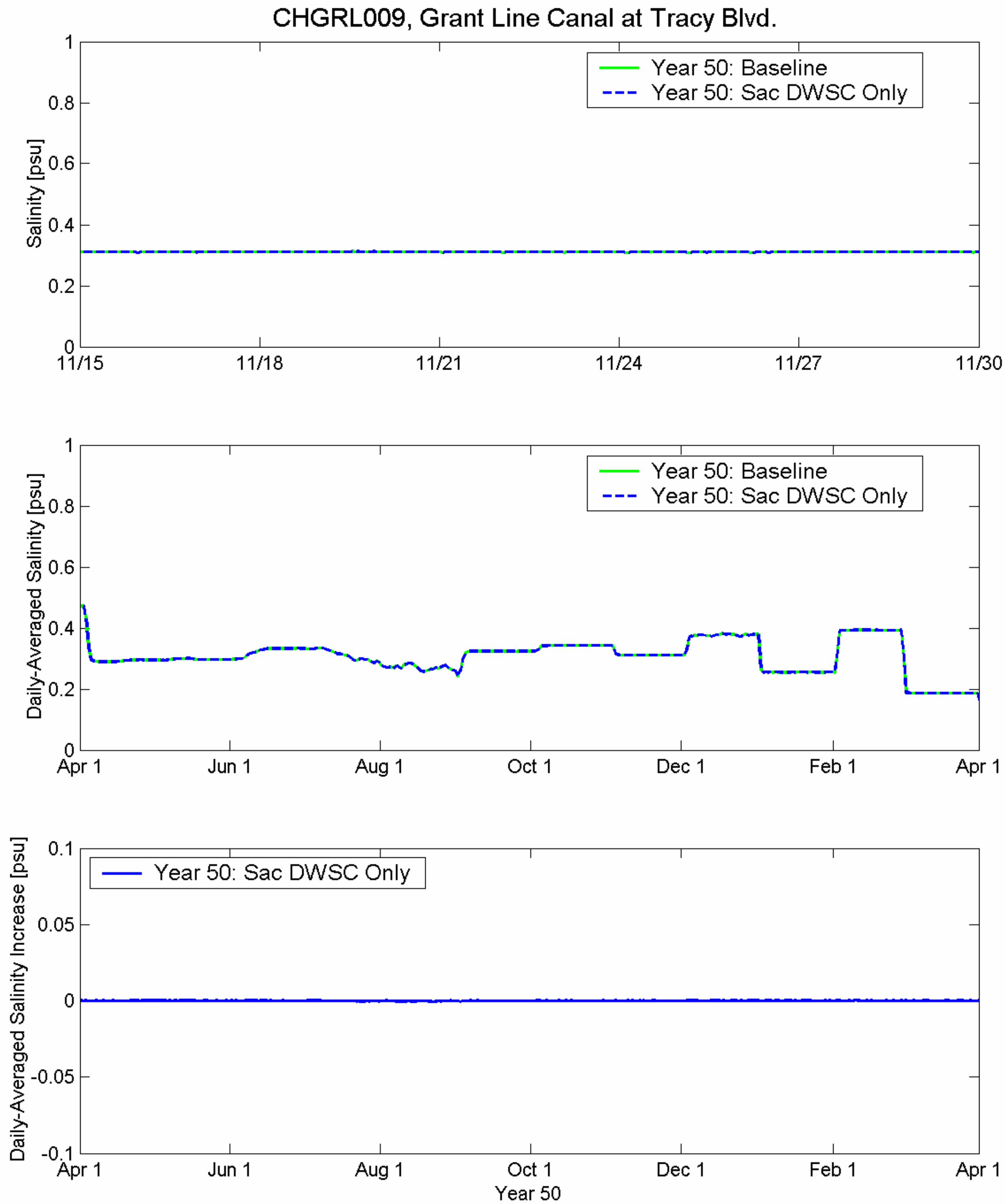


Figure 5.5-24 Predicted salinity at Grant Line Canal at Tracy Boulevard (CHGRL009) for the Year 50 Baseline scenario and the Year 50 Sacramento DWSC Only Deepening scenario: tidal time-scale variability over a 15-day period (top); daily-averaged salinity for the Year 50 simulation period (middle); predicted increase in daily-averaged salinity for the Year 50 Sacramento DWSC Only Deepening scenario relative to the Year 50 Baseline scenario (bottom).

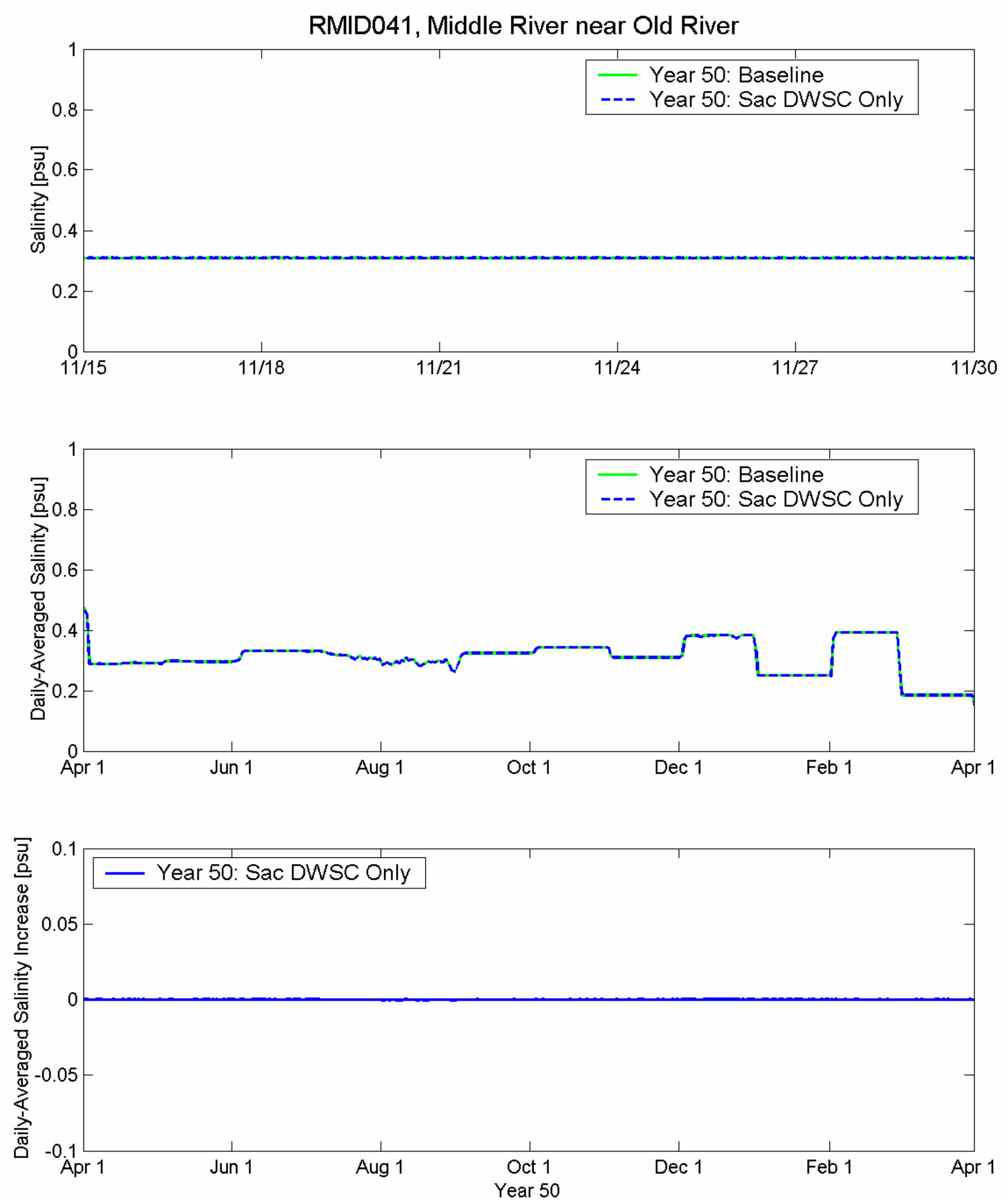


Figure 5.5-25 Predicted salinity at Middle River near Old River (RMID041) for the Year 50 Baseline scenario and the Year 50 Sacramento DWSC Only Deepening scenario: tidal time-scale variability over a 15-day period (top); daily-averaged salinity for the Year 50 simulation period (middle); predicted increase in daily-averaged salinity for the Year 50 Sacramento DWSC Only Deepening scenario relative to the Year 50 Baseline scenario (bottom).

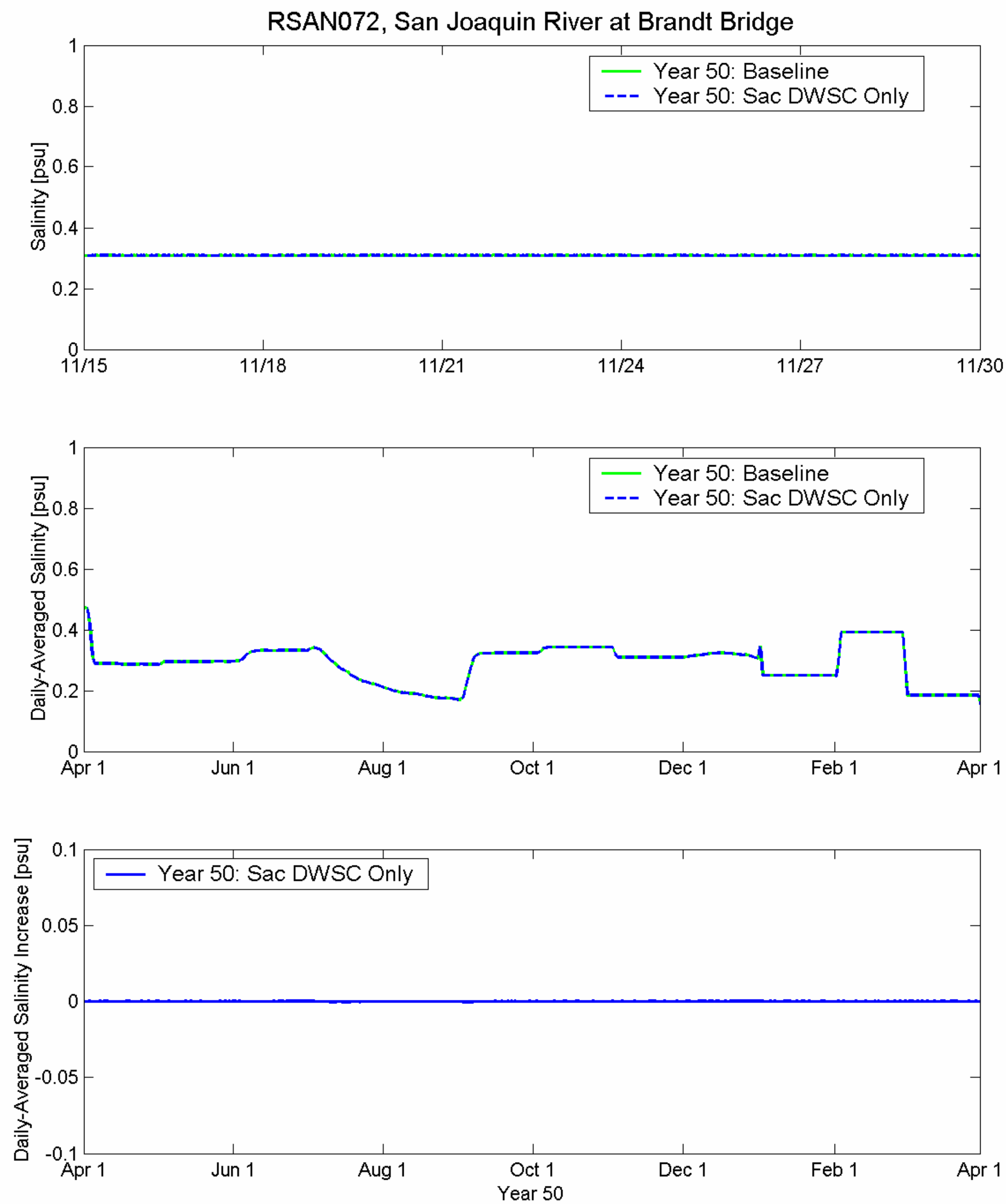


Figure 5.5-26 Predicted salinity at San Joaquin River at Brandt Bridge (RSAN072) for the Year 50 Baseline scenario and the Year 50 Sacramento DWSC Only Deepening scenario: tidal time-scale variability over a 15-day period (top); daily-averaged salinity for the Year 50 simulation period (middle); predicted increase in daily-averaged salinity for the Year 50 Sacramento DWSC Only Deepening scenario relative to the Year 50 Baseline scenario (bottom).

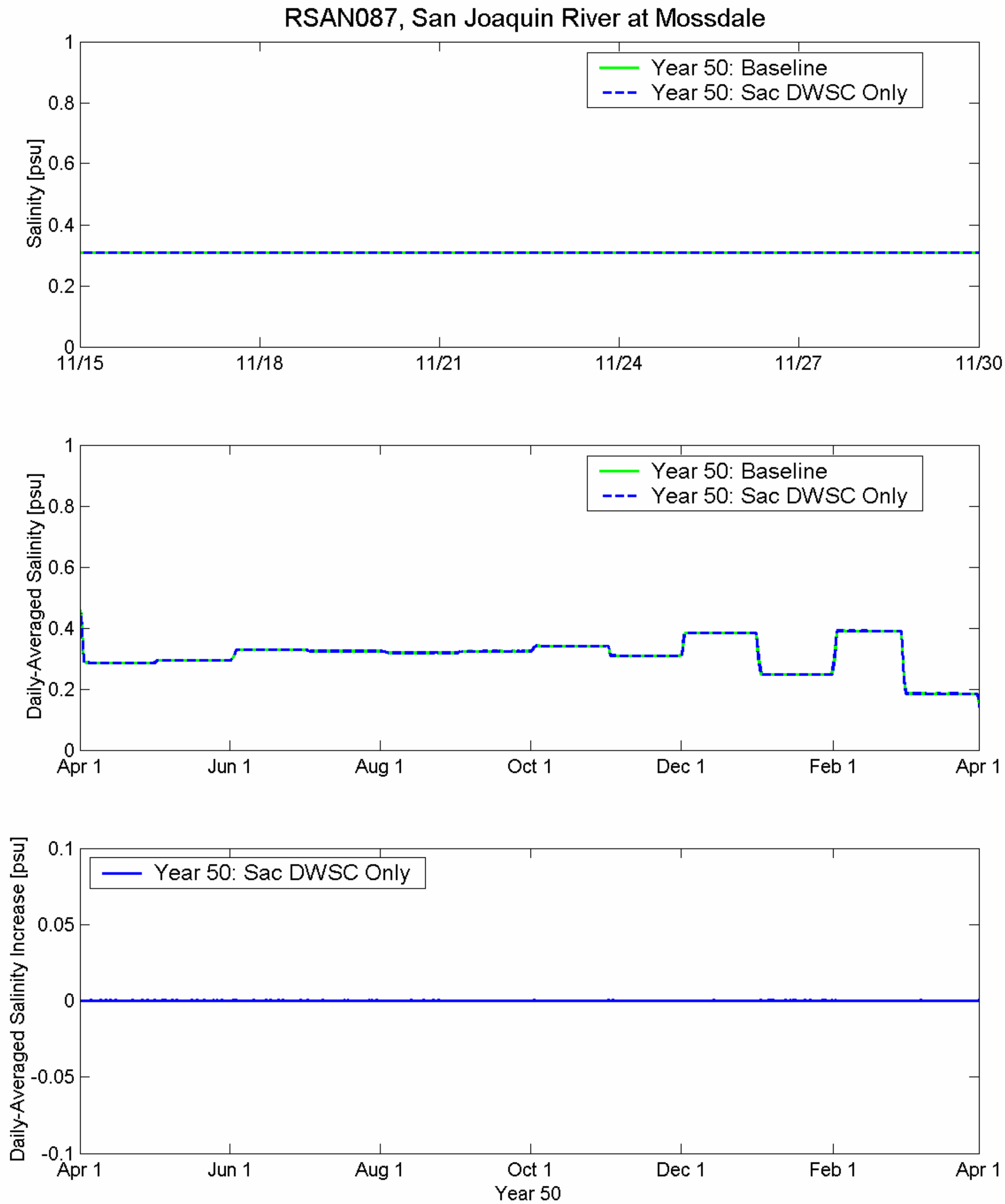


Figure 5.5-27 Predicted salinity at San Joaquin River at Mossdale (RSAN087) for the Year 50 Baseline scenario and the Year 50 Sacramento DWSC Only Deepening scenario: tidal time-scale variability over a 15-day period (top); daily-averaged salinity for the Year 50 simulation period (middle); predicted increase in daily-averaged salinity for the Year 50 Sacramento DWSC Only Deepening scenario relative to the Year 50 Baseline scenario (bottom).

5.5.2 Year 50 Both Sacramento DWSC & SF Bay to Stockton DWSC Deepening

For each salinity comparison figure included in this section, the top plot shows the tidal time-scale variability over a 15-day period for the Year 50 Baseline scenario, the Year 50 Sacramento DWSC Only Deepening scenario, and the Year 50 Both DWSC Deepening scenario. The middle plot shows daily-averaged salinity during the full simulation year for each scenario. The bottom plot shows the predicted increase in daily-averaged salinity for the Year 50 Sacramento DWSC Only Deepening scenario and the Year 50 Both DWSC Deepening scenario relative to the Year 50 Baseline scenario. In cases where the predicted salinity is identical between scenarios, some lines are not fully visible. Since the lines are plotted in the order listed on the legend, for periods where the predicted salinity for the Year 50 Baseline scenario or the Year 50 Sacramento DWSC Only Deepening scenario are not fully visible, the predicted salinity for these scenarios is identical to the visible line(s).

Figure 5.5-28 shows the predicted salinity at the Richmond-San Rafael Bridge Lower Sensor for the Year 50 Baseline scenario, the Year 50 Sacramento DWSC Only Deepening scenario, and the Year 50 Both DWSC Deepening scenario. During the second half of November (top panel of Figure 5.5-28), the predicted salinity for all three scenarios is nearly identical. Similarly, the daily-averaged salinity is nearly identical between the three scenarios over the entire simulation year. The predicted salinity increase for the Year 50 Sacramento DWSC Only Deepening scenario is almost exactly zero during the whole year indicating no predicted salinity increase at the Richmond-San Rafael Bridge Lower Sensor resulting from the Year 50 Sacramento DWSC Only Deepening scenario. The predicted salinity for the Year 50 Both DWSC Deepening scenario shows some very small salinity differences during the high flow periods, however, overall the salinity comparison at the Richmond-San Rafael Bridge Lower Sensor shows no significant predicted salinity impact resulting from either DWSC deepening scenario for Year 50 conditions.

Figure 5.5-29 shows the predicted salinity at the Carquinez Bridge Lower Sensor for the Year 50 Baseline scenario, the Year 50 Sacramento DWSC Only Deepening scenario, and the Year 50 Both DWSC Deepening scenario. During the second half of November (top panel of Figure 5.5-29), the predicted salinity for the Year 50 Baseline scenario and the Year 50 Sacramento DWSC Only Deepening scenario are nearly identical, with a slightly higher predicted salinity for the Year 50 Both DWSC Deepening scenario. Similarly, the predicted daily-averaged salinity for the Year 50 Sacramento DWSC Only Deepening scenario is nearly identical to the predicted daily-averaged salinity under the Year 50 Baseline scenario, while the predicted daily-averaged salinity for the Year 50 Both DWSC Deepening scenario is slightly higher than for the Year 50 Baseline scenario. The predicted salinity increase for the Year 50 Sacramento DWSC Only Deepening scenario is very close to zero during the whole year except for very small differences during January and February during high flows, indicating almost no predicted salinity impact at the Carquinez Bridge Lower Sensor resulting from the Year 50 Sacramento DWSC Only Deepening scenario. The predicted salinity for the Year 50 Both DWSC Deepening scenario is typically 0.4 to 0.6 psu higher than the predicted salinity for the Year 50 Baseline scenario, with predicted salinity increases between January and March of up to 1.5 psu during high flows (see Figure 3.3-2).

Figure 5.5-30 shows the predicted salinity at the Sacramento River at Martinez Surface Sensor for the Year 50 Baseline scenario, the Year 50 Sacramento DWSC Only Deepening scenario, and the Year 50 Both DWSC Deepening scenario. During the second half of November (top panel of Figure 5.5-30), the predicted salinity for the Year 50 Baseline scenario and the Year 50 Sacramento DWSC Only Deepening scenario are nearly identical, with a slightly higher predicted salinity for the Year 50 Both DWSC Deepening scenario. Similarly, the predicted daily-averaged salinity for the Year 50 Sacramento DWSC Only Deepening scenario is nearly identical to the predicted daily-averaged salinity under the Year 50 Baseline scenario, while the predicted daily-averaged salinity for the Year 50 Both DWSC Deepening scenario is slightly higher than for the Year 50 Baseline scenario. The predicted salinity increase for the Year 50 Sacramento DWSC Only Deepening scenario is very close to zero during the whole year, indicating no predicted salinity increase at the Martinez Surface Sensor resulting from the Year 50 Sacramento DWSC Only Deepening scenario. The predicted salinity for the Year 50 Both DWSC Deepening scenario is typically 0.4 to 0.5 psu higher than the predicted salinity for the Year 50 Baseline scenario throughout the year, except during January and March when high flows push the 0.50 psu isohaline as far west as Martinez.

Figure 5.5-31 shows the predicted salinity at the Benicia Bridge Lower Sensor for the Year 50 Baseline scenario, the Year 50 Sacramento DWSC Only Deepening scenario, and the Year 50 Both DWSC Deepening scenario. During the second half of November (top panel of Figure 5.5-31), the predicted salinity for the Year 50 Baseline scenario and the Year 50 Sacramento DWSC Only Deepening scenario are nearly identical, with a slightly higher predicted salinity for the Year 50 Both DWSC Deepening scenario. Similarly, the predicted daily-averaged salinity for the Year 50 Sacramento DWSC Only Deepening scenario is nearly identical to the predicted daily-averaged salinity for the Year 50 Baseline scenario, while the predicted daily-averaged salinity for the Year 50 Both DWSC Deepening scenario is slightly higher than for the Year 50 Baseline scenario. The predicted salinity increase for the Year 50 Sacramento DWSC Only Deepening scenario is very close to zero during the whole year, indicating no predicted salinity increase at the Benicia Bridge Lower Sensor resulting from the Year 50 Sacramento DWSC Only Deepening scenario. The predicted salinity for the Year 50 Both DWSC Deepening scenario is typically 0.4 to 0.5 psu higher than the predicted salinity for the Year 50 Baseline scenario through the year, with maximum predicted salinity increases at the beginning of the January high flows and during February.

Figure 5.5-32 shows the predicted salinity at the Sacramento River near Mallard Island Surface Sensor for the Year 50 Baseline scenario, the Year 50 Sacramento DWSC Only Deepening scenario, and the Year 50 Both DWSC Deepening scenario. During the second half of November (top panel of Figure 5.5-32), the predicted salinity for the Year 50 Baseline scenario and the Year 50 Sacramento DWSC Only Deepening scenario are nearly identical, with a slightly higher predicted salinity for the Year 50 Both DWSC Deepening scenario. Similarly, the predicted daily-averaged salinity for the Year 50 Sacramento DWSC Only Deepening scenario is nearly identical to the predicted daily-averaged salinity for the Year 50 Baseline scenario, while the predicted daily-averaged salinity for the Year 50 Both DWSC Deepening scenario is slightly higher than the predicted daily-averaged salinity for the Year 50 Baseline scenario. The predicted salinity increase for the Year 50 Sacramento DWSC Only Deepening scenario is very close to zero during the whole year, indicating no predicted salinity increase at the Sacramento River near Mallard Island Surface Sensor resulting from the Year 50 Sacramento DWSC Only Deepening scenario. The predicted salinity for the Year 50 Both DWSC Deepening scenario is typically 0.30 to 0.40 psu higher than the predicted salinity for the Year 50 Baseline scenario from April through December, with no increase predicted during the high flow period from January through March when salinity gradients are pushed west of Mallard Island.

Figure 5.5-33 shows the predicted salinity at the Sacramento River at Emmaton Surface Sensor for the Year 50 Baseline scenario, the Year 50 Sacramento DWSC Only Deepening scenario, and the Year 50 Both DWSC Deepening scenario. During the second half of November (top panel of Figure 5.5-33), the predicted salinity for the Year 50 Sacramento DWSC Only Deepening scenario and the Year 50 Both DWSC Deepening scenario are slightly higher than the predicted salinity for the Year 50 Baseline scenario. The predicted salinity for the Year 50 Sacramento DWSC Only Deepening scenario is nearly identical to the predicted salinity for the Year 50 Baseline scenario, except during July through December when the predicted salinity for the Year 50 Sacramento DWSC Only Deepening scenario is up to 0.08 psu higher than the Year 50 Baseline salinity. The predicted salinity for the Year 50 Both DWSC Deepening scenario shows increases of up to 0.27 psu during late fall conditions, and is nearly identical to the Year 50 Baseline scenario salinity during spring conditions when high flows result in very low salinities in the western Delta.

Figure 5.5-34 shows the predicted salinity at the Sacramento River at Rio Vista for the Year 50 Baseline scenario, the Year 50 Sacramento DWSC Only Deepening scenario, and the Year 50 Both DWSC Deepening scenario. The predicted salinity for the Year 50 Sacramento DWSC Only Deepening scenario is nearly identical to the predicted salinity for the Year 50 Baseline scenario, except during October and November when the predicted salinity for the Year 50 Sacramento DWSC Only Deepening scenario is up to 0.11 psu higher than the Year 50 Baseline salinity. The predicted salinity for the Year 50 Both DWSC Deepening scenario is slightly higher than the Year 50 Baseline salinity from June through September; during October and November the predicted salinity for the Year 50 Both DWSC Deepening scenario is up to 0.21 psu higher than the Year 50 Baseline salinity.

Figure 5.5-35 shows the predicted salinity at the Port of Sacramento for the Year 50 Baseline scenario, the Year 50 Sacramento DWSC Only Deepening scenario, and the Year 50 Both DWSC Deepening scenario. The predicted salinity for all three scenarios is nearly identical throughout the year, and no salinity increases are predicted for either the Year 50 Sacramento DWSC Only Deepening scenario or the Year 50 Both DWSC Deepening scenario.

Figure 5.5-36 shows the predicted salinity at the San Joaquin River at Antioch for the Year 50 Baseline scenario, the Year 50 Sacramento DWSC Only Deepening scenario, and the Year 50 Both DWSC Deepening scenario. During the second half of November (top panel of Figure 5.5-36), the predicted salinity for the Year 50 Baseline scenario and the Year 50 Sacramento DWSC Only Deepening scenario are nearly identical, with a slightly higher predicted salinity for the Year 50 Both DWSC Deepening scenario. Similarly, the predicted daily-averaged salinity for the Year 50 Sacramento DWSC Only Deepening scenario is nearly identical to the predicted daily-averaged salinity for the Year 50 Baseline scenario, while the predicted daily-averaged salinity for the Year 50 Both DWSC Deepening scenario is slightly higher than for the predicted daily-averaged salinity for the Year 50 Baseline scenario. The predicted salinity increase for the Year 50 Sacramento DWSC Only Deepening scenario is very close to zero during the whole year, with a maximum predicted salinity increase of 0.06 psu during November. The predicted salinity for the Year 50 Both DWSC Deepening scenario is higher than the predicted salinity for the Year 50 Baseline scenario from April through January, with the largest predicted salinity increases of up to 0.40 psu during late fall.

Figure 5.5-37 shows the predicted salinity at the San Joaquin River at Jersey Point for the Year 50 Baseline scenario, the Year 50 Sacramento DWSC Only Deepening scenario, and the Year 50 Both DWSC Deepening scenario. The predicted salinity for all three scenarios is nearly identical from April through May and from January through March. From October through December, the predicted salinity for the Year 50 Sacramento DWSC Only Deepening scenario is slightly higher than the predicted salinity for the Year 50 Baseline scenario, with predicted salinity increases of up to 0.07 psu. Salinity increases of up to 0.33 psu are predicted during late October for the Year 50 Both DWSC Deepening scenario.

Figure 5.5-38 shows the predicted salinity at the San Joaquin River at San Andreas Landing for the Year 50 Baseline scenario, the Year 50 Sacramento DWSC Only Deepening scenario, and the Year 50 Both DWSC Deepening scenario. The predicted salinity for all three scenarios is nearly identical from April through June and from January through March. During October, the predicted salinity for the Year 50 Sacramento DWSC Only Deepening scenario is slightly higher than the predicted salinity for the Year 50 Baseline scenario, with predicted salinity increases of up to 0.02 psu. Salinity increases of up to 0.10 psu are predicted during October and December for the Year 50 Both DWSC Deepening scenario.

Figure 5.5-39 shows the predicted salinity at the San Joaquin River before Prisoners Point for the Year 50 Baseline scenario, the Year 50 Sacramento DWSC Only Deepening scenario, and the Year 50 Both DWSC Deepening scenario. The predicted salinity for all three scenarios is nearly identical from April through June and from February through March. During November and December, the predicted salinity for the Year 50 Sacramento DWSC Only Deepening scenario is slightly higher than the predicted salinity for the Year 50 Baseline scenario, with predicted salinity increases of up to 0.01 psu. Salinity increases of up to 0.09 psu are predicted during November and December for the Year 50 Both DWSC Deepening scenario.

Figure 5.5-40 shows the predicted salinity at the Stockton Ship Channel at Burns Cutoff for the Year 50 Baseline scenario, the Year 50 Sacramento DWSC Only Deepening scenario, and the Year 50 Both DWSC Deepening scenario. The predicted salinity for the Year 50 Sacramento DWSC Only Deepening scenario is nearly identical the predicted salinity for the Year 50 Baseline scenario throughout the year, with no predicted salinity increases resulting from the Year 50 Sacramento DWSC Only Deepening scenario. The predicted salinity for the Year 50 Both DWSC Deepening scenario is nearly identical the predicted salinity for the Year 50 Baseline scenario throughout the year, however some salinity increases and decreases of up to 0.03 psu are predicted. For the Year 50 Both DWSC Deepening scenario, salinity decreases are predicted during several periods, particularly during periods when salinity of Delta inflows on the Calaveras River or San Joaquin River are increasing. Salinity decreases occur because the increased volume of the Stockton DWSC under the deepening scenario results in a longer time required for the salinity in the DWSC to reach the concentration of the inflow salinities due to a larger volume within the DWSC which dilutes inflow salinity during the periods of increasing inflow salinity.

Figure 5.5-41 shows the predicted salinity at the South Fork Mokelumne River at Staten Island for the Year 50 Baseline scenario, the Year 50 Sacramento DWSC Only Deepening scenario, and the Year 50 Both DWSC Deepening scenario. The predicted salinity for all three scenarios is nearly identical throughout the year, and no salinity increases are predicted for either the Year 50 Sacramento DWSC Only Deepening scenario or the Year 50 Both DWSC Deepening scenario.

Figure 5.5-42 shows the predicted salinity at Dutch Slough at Jersey Island for the Year 50 Baseline scenario, the Year 50 Sacramento DWSC Only Deepening scenario, and the Year 50 Both DWSC Deepening scenario. The predicted salinity for all three scenarios is nearly identical from April through June and from February through March. During December and January, the predicted salinity for the Year 50 Sacramento DWSC Only Deepening scenario is slightly higher than the predicted salinity for the Year 50 Baseline scenario, with predicted salinity increases of up to 0.05 psu. Salinity increases of up to 0.22 psu during October and 0.20 psu during December are predicted for the Year 50 Both DWSC Deepening scenario.

Figure 5.5-43 shows the predicted salinity at Old River and Holland Cut at Mandeville Island for the Year 50 Baseline scenario, the Year 50 Sacramento DWSC Only Deepening scenario, and the Year 50 Both DWSC Deepening scenario. During the second half of November (top panel of Figure 5.5-43), the predicted salinity for the Year 50 Sacramento DWSC Only Deepening scenario is typically 0.03 psu higher than the predicted salinity for the Year 50 Baseline scenario throughout the tidal cycle, and the predicted salinity for the Year 50 Both DWSC Deepening scenario is typically 0.12 psu higher than the predicted salinity for the Year 50 Baseline scenario throughout the tidal cycle. The predicted daily-averaged salinity for all three scenarios is nearly identical from April through June and from February through March. During late October, the predicted salinity for the Year 50 Sacramento DWSC Only Deepening scenario is slightly higher than the predicted salinity for the Year 50 Baseline scenario, with predicted salinity increases of up to 0.04 psu. Salinity increases of up to 0.13 psu are predicted during October and December for the Year 50 Both DWSC Deepening scenario.

Figure 5.5-44 shows the predicted salinity at Old River at Bacon Island for the Year 50 Baseline scenario, the Year 50 Sacramento DWSC Only Deepening scenario, and the Year 50 Both DWSC Deepening scenario. During the second half of November (top panel of Figure 5.5-44), the predicted salinity for the Year 50 Sacramento DWSC Only Deepening scenario is typically 0.03 psu higher than the predicted salinity for the Year 50 Baseline scenario throughout the tidal cycle, and the predicted salinity for the Year 50 Both DWSC Deepening scenario is typically 0.13 psu higher than the predicted salinity for the Year 50 Baseline scenario throughout the tidal cycle. The predicted daily-averaged salinity for all three scenarios is nearly identical from April through June and from February through March. During November, the predicted salinity for the Year 50 Sacramento DWSC Only Deepening scenario is slightly higher than the predicted salinity for the Year 50 Baseline scenario, with predicted salinity increases of up to 0.04 psu.

Salinity increases of up to 0.13 psu are predicted during November and December for the Year 50 Both DWSC Deepening scenario.

Figure 5.5-45 shows the predicted salinity at Middle River at Borden Highway for the Year 50 Baseline scenario, the Year 50 Sacramento DWSC Only Deepening scenario, and the Year 50 Both DWSC Deepening scenario. During the second half of November (top panel of Figure 5.5-45), the predicted salinity for the Year 50 Sacramento DWSC Only Deepening scenario is typically 0.01 psu higher than the predicted salinity for the Year 50 Baseline scenario throughout the tidal cycle, and the predicted salinity for the Year 50 Both DWSC Deepening scenario is typically 0.05 psu higher than the predicted salinity for the Year 50 Baseline scenario throughout the tidal cycle. The predicted daily-averaged salinity for all three scenarios is nearly identical from April through June and from February through March. During November, the predicted salinity for the Year 50 Sacramento DWSC Only Deepening scenario is slightly higher than the predicted salinity for the Year 50 Baseline scenario, with predicted salinity increases of up to 0.01 psu. Salinity increases of up to 0.06 psu are predicted during late November and late December for the Year 50 Both DWSC Deepening scenario. Similar to the Stockton Ship Channel at Burns Cutoff comparison (Figure 5.5-40), salinity decreases under the Year 50 Both DWSC Deepening scenario are predicted during some periods when salinity is increasing.

Figure 5.5-46 shows the predicted salinity at Middle River at Tracy Boulevard for the Year 50 Baseline scenario, the Year 50 Sacramento DWSC Only Deepening scenario, and the Year 50 Both DWSC Deepening scenario. During the second half of November (top panel of Figure 5.5-46), the predicted salinity for the Year 50 Sacramento DWSC Only Deepening scenario is nearly identical to the predicted salinity for the Year 50 Baseline scenario throughout the tidal cycle; the predicted salinity for the Year 50 Both DWSC Deepening scenario is up to 0.06 psu higher than the predicted salinity for the Year 50 Baseline scenario during some portions of the tidal cycle. The predicted daily-averaged salinity for all three scenarios is nearly identical from April through June and from January through March. During December, the predicted salinity for the Year 50 Sacramento DWSC Only Deepening scenario is slightly higher than the predicted salinity for the Year 50 Baseline scenario, with predicted salinity increases of up to 0.005 psu. Salinity increases of up to 0.05 psu are predicted during late December for the Year 50 Both DWSC Deepening scenario.

Figure 5.5-47 shows the predicted salinity at Victoria Canal near Byron for the Year 50 Baseline scenario, the Year 50 Sacramento DWSC Only Deepening scenario, and the Year 50 Both DWSC Deepening scenario. During the second half of November (top panel of Figure 5.5-47), the predicted salinity for the Year 50 Sacramento DWSC Only Deepening scenario is typically 0.01 psu higher than the predicted salinity for the Year 50 Baseline scenario throughout the tidal cycle; the predicted salinity for the Year 50 Both DWSC Deepening scenario is typically 0.05 psu higher than the predicted salinity for the Year 50 Baseline scenario throughout the tidal cycle. The predicted daily-averaged salinity for all three scenarios is nearly identical from April through June and from February through March. During November, the predicted salinity for the Year 50 Sacramento DWSC Only Deepening scenario is slightly higher than the predicted salinity for the Year 50 Baseline scenario, with predicted salinity increases of up to 0.01 psu. Salinity increases of up to 0.06 psu are predicted during November and late December for the Year 50 Both DWSC Deepening scenario.

Figure 5.5-48 shows the predicted salinity at the Clifton Court Forebay Radial Gates for the Year 50 Baseline scenario, the Year 50 Sacramento DWSC Only Deepening scenario, and the Year 50 Both DWSC Deepening scenario. During the second half of November (top panel of Figure 5.5-48), the predicted salinity for the Year 50 Sacramento DWSC Only Deepening scenario is up to 0.02 psu higher than the predicted salinity for the Year 50 Baseline scenario throughout the tidal cycle; the predicted salinity for the Year 50 Both DWSC Deepening scenario is typically 0.08 psu higher than the predicted salinity for the Year 50 Baseline scenario throughout the tidal cycle. The predicted daily-averaged salinity for all three scenarios is nearly identical from April through June and from February through March. From November through January, the predicted salinity for the Year 50 Sacramento DWSC Only Deepening scenario is slightly higher than the predicted salinity for the Year 50 Baseline scenario, with predicted salinity increases of up to 0.02 psu. Salinity increases of up to 0.08 psu are predicted during November and late December for the Year 50 Both DWSC Deepening scenario.

Figure 5.5-49 shows the predicted salinity at Old River near Delta-Mendota Canal (Downstream of Barrier) for the Year 50 Baseline scenario, the Year 50 Sacramento DWSC Only Deepening scenario, and the Year 50 Both DWSC Deepening scenario. During the second half of November, the predicted salinity for the Year 50 Sacramento DWSC Only Deepening scenario is nearly identical to the predicted salinity for the Year 50 Baseline scenario throughout the tidal cycle; the predicted salinity for the Year 50 Both DWSC Deepening scenario is up to 0.10 psu higher than the Year 50 Baseline scenario during high salinity periods and nearly identical to the Year 50 Baseline scenario during low salinity periods of the tidal cycle. The predicted daily-averaged salinity for all three scenarios is nearly identical from April through June and from February through March. From November through January, the predicted salinity for the Year 50 Sacramento DWSC Only Deepening scenario is slightly higher than the predicted salinity for the Year 50 Baseline scenario, with predicted salinity increases of up to 0.008 psu. Salinity increases are predicted during July through December for the Year 50 Both DWSC Deepening scenario with predicted salinity increases of up to 0.05 psu.

Figure 5.5-50 shows the predicted salinity at Old River at Tracy Boulevard for the Year 50 Baseline scenario, the Year 50 Sacramento DWSC Only Deepening scenario, and the Year 50 Both DWSC Deepening scenario. The predicted salinity for all three scenarios is nearly identical throughout the year, and no salinity increases are predicted for either the Year 50 Sacramento DWSC Only Deepening scenario or the Year 50 Both DWSC Deepening scenario.

Figure 5.5-51 shows the predicted salinity at Grant Line Canal at Tracy Boulevard for the Year 50 Baseline scenario, the Year 50 Sacramento DWSC Only Deepening scenario, and the Year 50 Both DWSC Deepening scenario. The predicted salinity for all three scenarios is nearly identical throughout the year, and no salinity increases are predicted for either the Year 50 Sacramento DWSC Only Deepening scenario or the Year 50 Both DWSC Deepening scenario.

Figure 5.5-52 shows the predicted salinity at Middle River near Old River for the Year 50 Baseline scenario, the Year 50 Sacramento DWSC Only Deepening scenario, and the Year 50 Both DWSC Deepening scenario. The predicted salinity for all three scenarios is nearly identical throughout the year, and no salinity increases are predicted for either the Year 50 Sacramento DWSC Only Deepening scenario or the Year 50 Both DWSC Deepening scenario.

Figure 5.5-53 shows the predicted salinity at San Joaquin River at Brandt Bridge for the Year 50 Baseline scenario, the Year 50 Sacramento DWSC Only Deepening scenario, and the Year 50 Both DWSC Deepening scenario. The predicted salinity for all three scenarios is nearly identical throughout the year, and no salinity increases are predicted for either the Year 50 Sacramento DWSC Only Deepening scenario or the Year 50 Both DWSC Deepening scenario.

Figure 5.5-54 shows the predicted salinity at San Joaquin River at Mossdale for the Year 50 Baseline scenario, the Year 50 Sacramento DWSC Only Deepening scenario, and the Year 50 Both DWSC Deepening scenario. The predicted salinity for all three scenarios is nearly identical throughout the year, and no salinity increases are predicted for either the Year 50 Sacramento DWSC Only Deepening scenario or the Year 50 Both DWSC Deepening scenario.

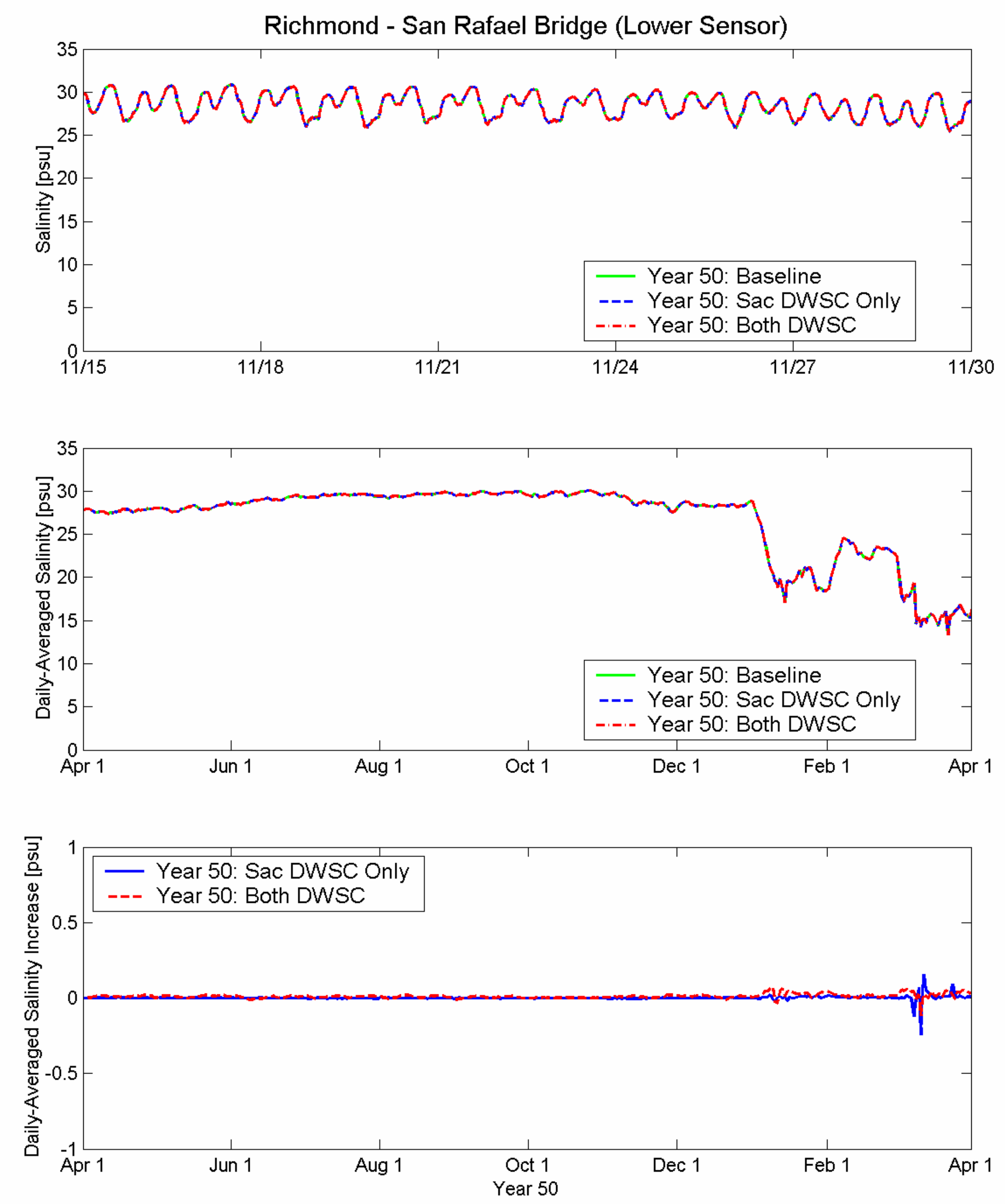


Figure 5.5-28 Predicted salinity at Richmond-San Rafael Bridge Lower Sensor for the Year 50 Baseline scenario, the Year 50 Sacramento DWSC Only Deepening scenario, and the Year 50 Both DWSC Deepening scenario: tidal time-scale variability over a 15-day period (top); daily-averaged salinity for the Year 50 simulation period (middle); predicted increase in daily-averaged salinity for the Year 50 Sacramento DWSC Only Deepening scenario and the Year 50 Both DWSC Deepening scenario relative to the Year 50 Baseline scenario (bottom).

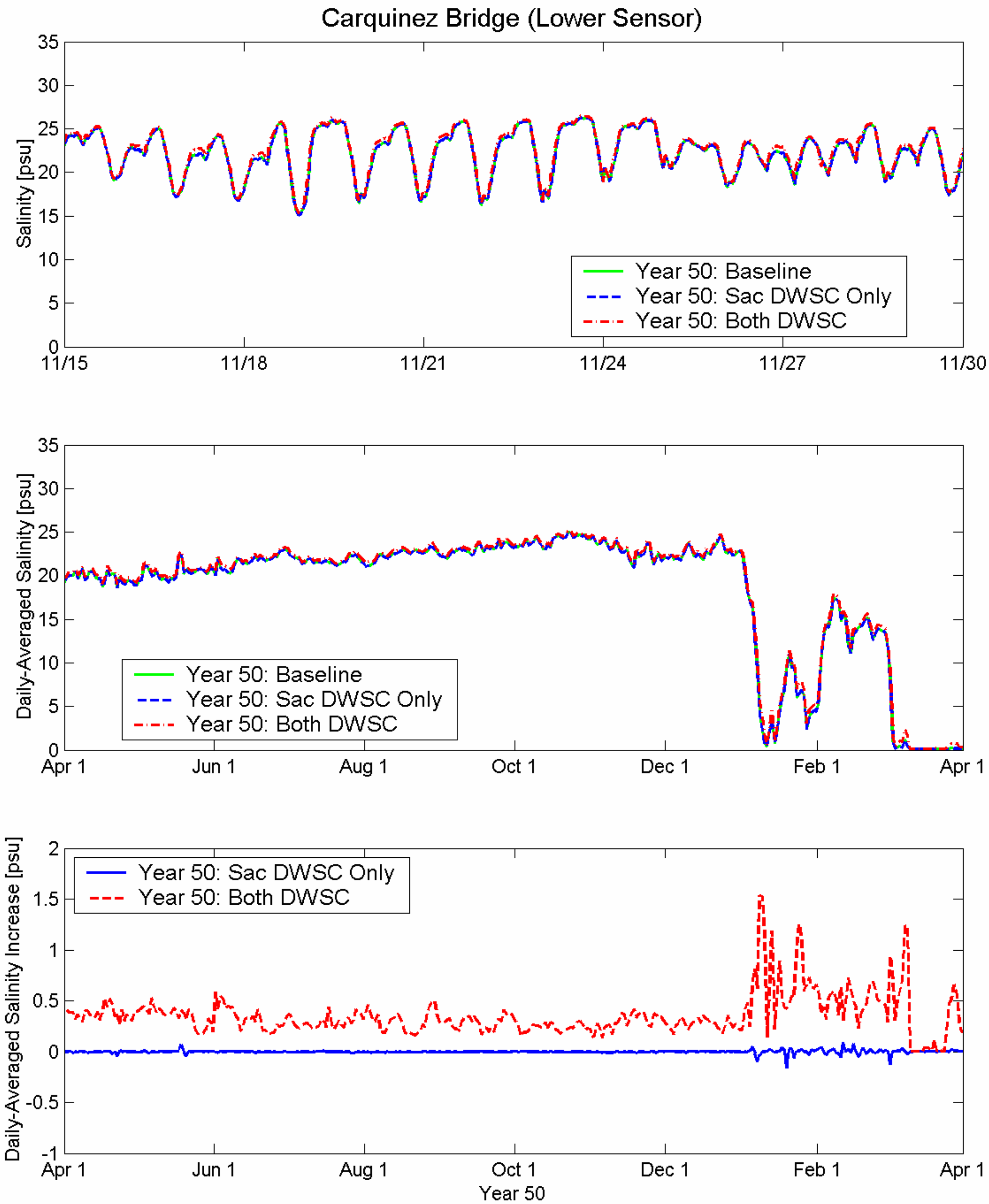


Figure 5.5-29 Predicted salinity at Carquinez Bridge Lower Sensor for the Year 50 Baseline scenario, the Year 50 Sacramento DWSC Only Deepening scenario, and the Year 50 Both DWSC Deepening scenario: tidal time-scale variability over a 15-day period (top); daily-averaged salinity for the Year 50 simulation period (middle); predicted increase in daily-averaged salinity for the Year 50 Sacramento DWSC Only Deepening scenario and the Year 50 Both DWSC Deepening scenario relative to the Year 50 Baseline scenario (bottom).

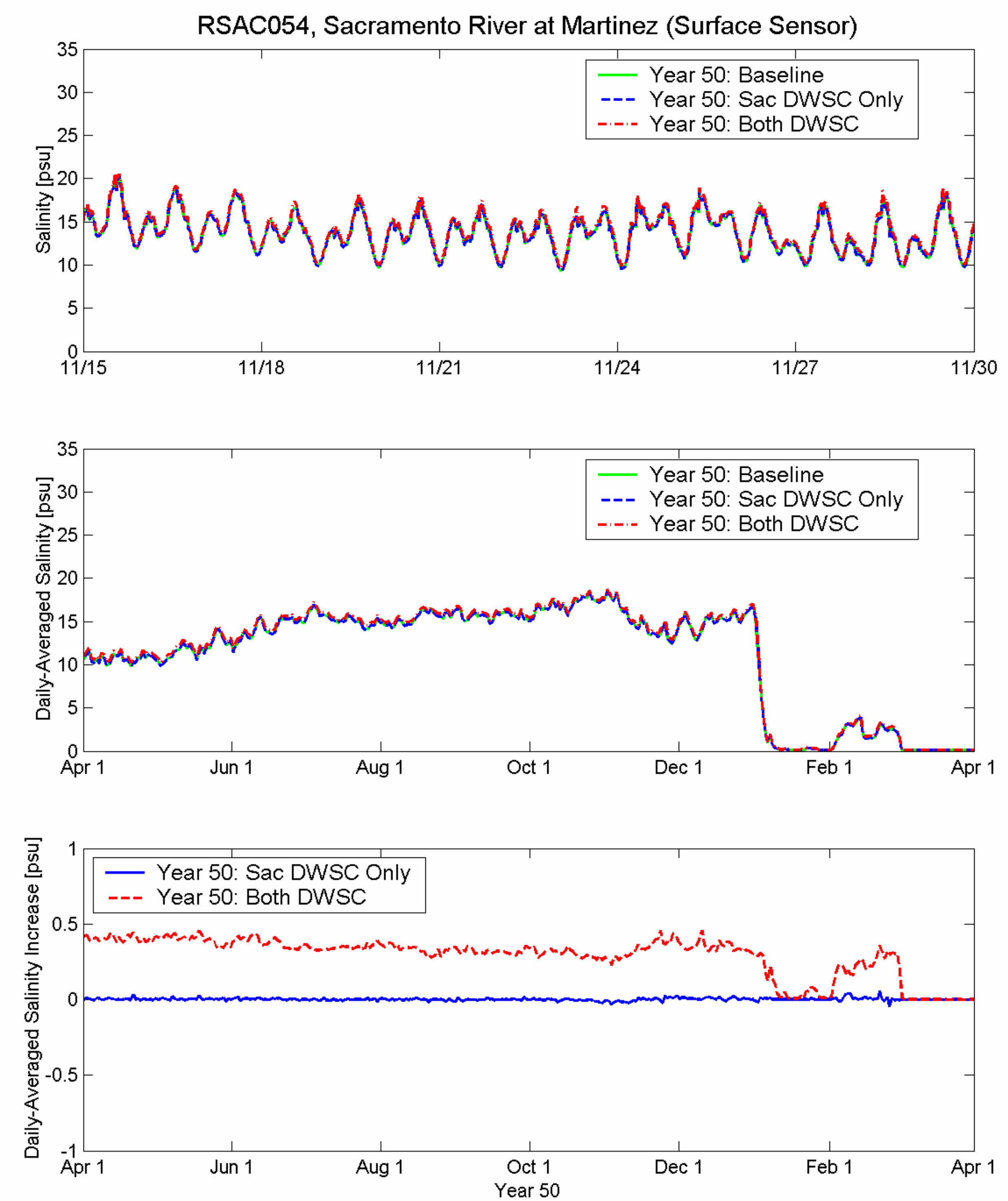


Figure 5.5-30 Predicted salinity at Sacramento River at Martinez (RSAC054) for the Year 50 Baseline scenario, the Year 50 Sacramento DWSC Only Deepening scenario, and the Year 50 Both DWSC Deepening scenario: tidal time-scale variability over a 15-day period (top); daily-averaged salinity for the Year 50 simulation period (middle); predicted increase in daily-averaged salinity for the Year 50 Sacramento DWSC Only Deepening scenario and the Year 50 Both DWSC Deepening scenario relative to the Year 50 Baseline scenario (bottom).

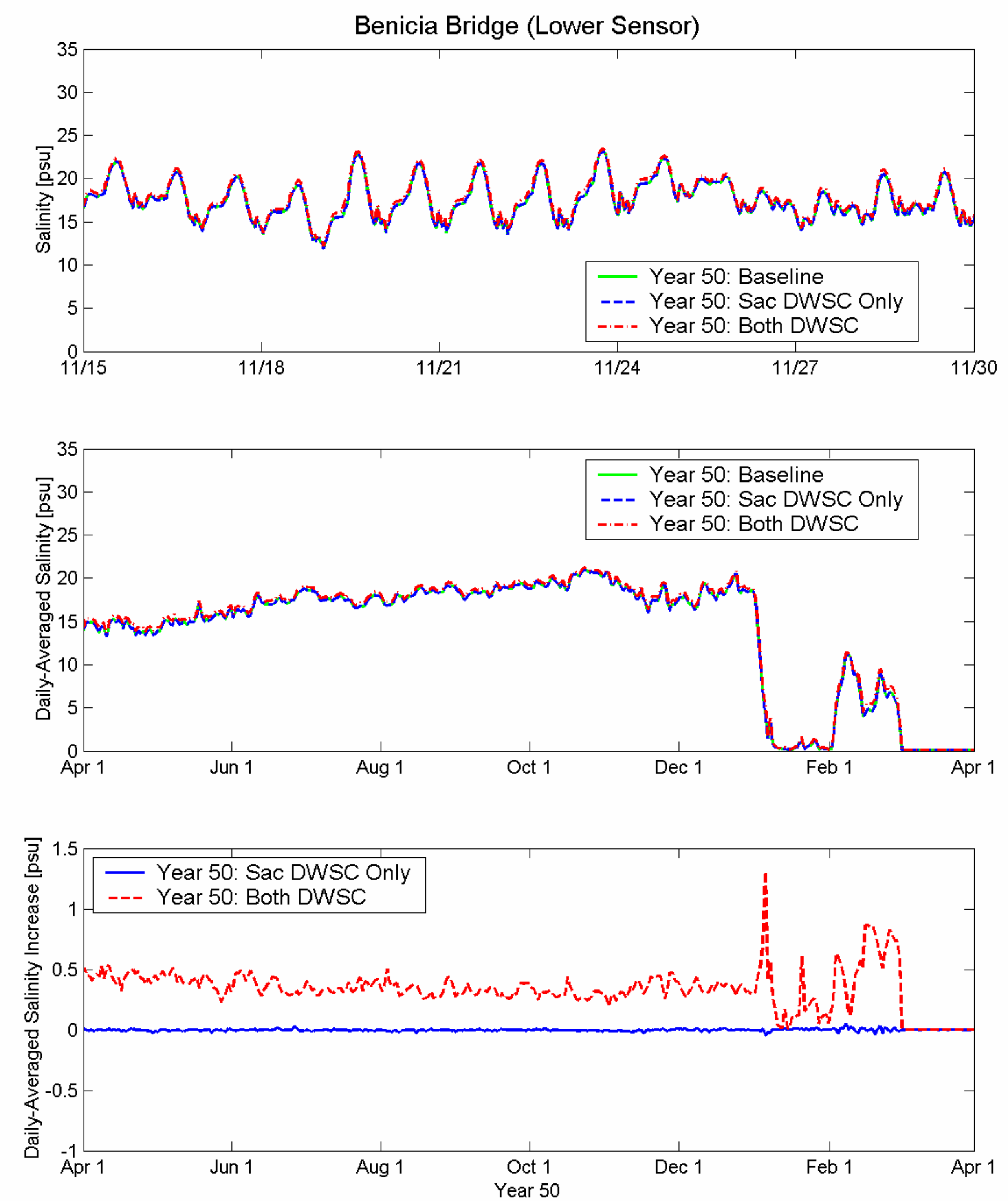


Figure 5.5-31 Predicted salinity at Benicia Bridge Lower Sensor for the Year 50 Baseline scenario, the Year 50 Sacramento DWSC Only Deepening scenario, and the Year 50 Both DWSC Deepening scenario: tidal time-scale variability over a 15-day period (top); daily-averaged salinity for the Year 50 simulation period (middle); predicted increase in daily-averaged salinity for the Year 50 Sacramento DWSC Only Deepening scenario and the Year 50 Both DWSC Deepening scenario relative to the Year 50 Baseline scenario (bottom).

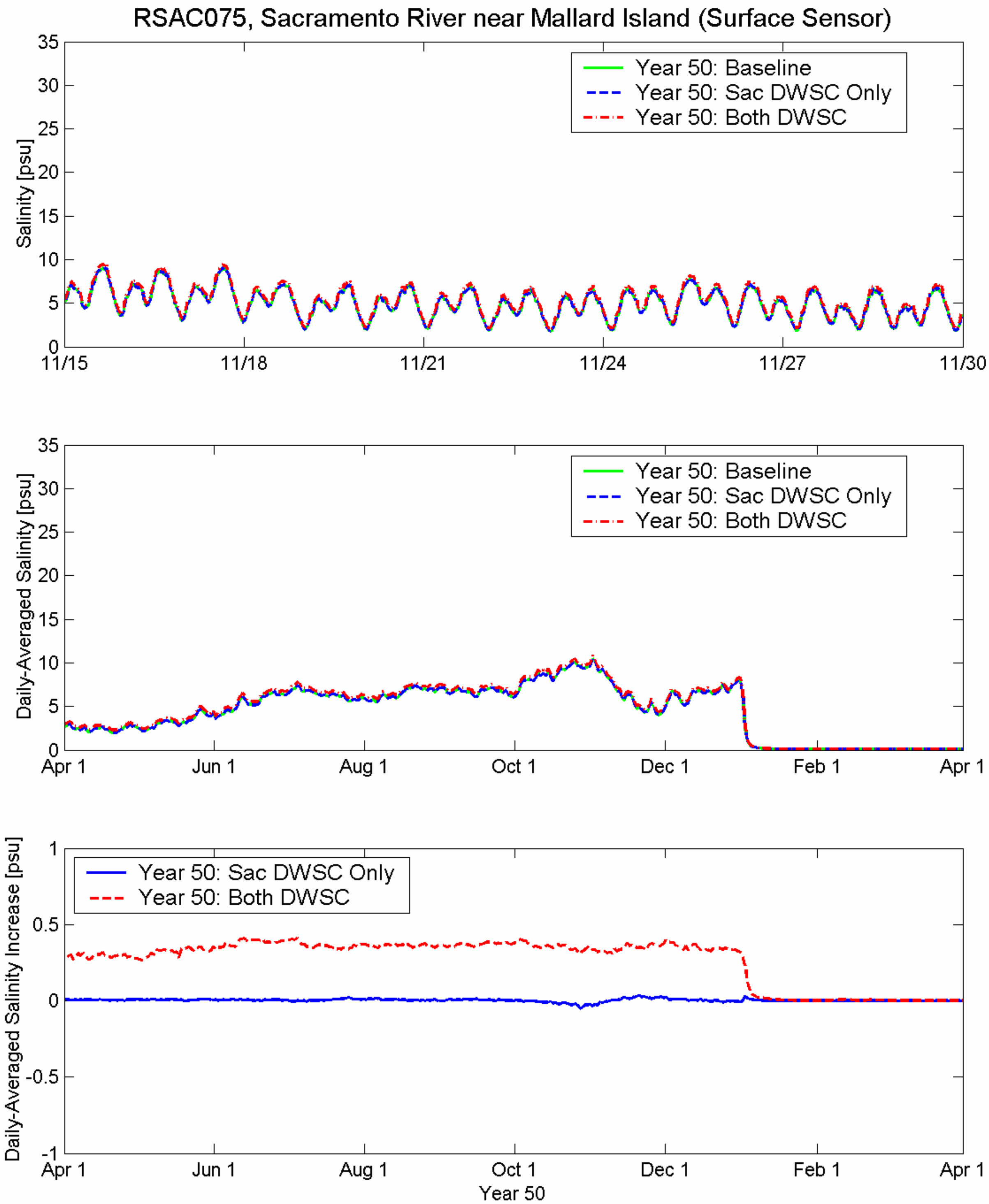


Figure 5.5-32 Predicted salinity at Sacramento River near Mallard Island (RSAC075) for the Year 50 Baseline scenario, the Year 50 Sacramento DWSC Only Deepening scenario, and the Year 50 Both DWSC Deepening scenario: tidal time-scale variability over a 15-day period (top); daily-averaged salinity for the Year 50 simulation period (middle); predicted increase in daily-averaged salinity for the Year 50 Sacramento DWSC Only Deepening scenario and the Year 50 Both DWSC Deepening scenario relative to the Year 50 Baseline scenario (bottom).

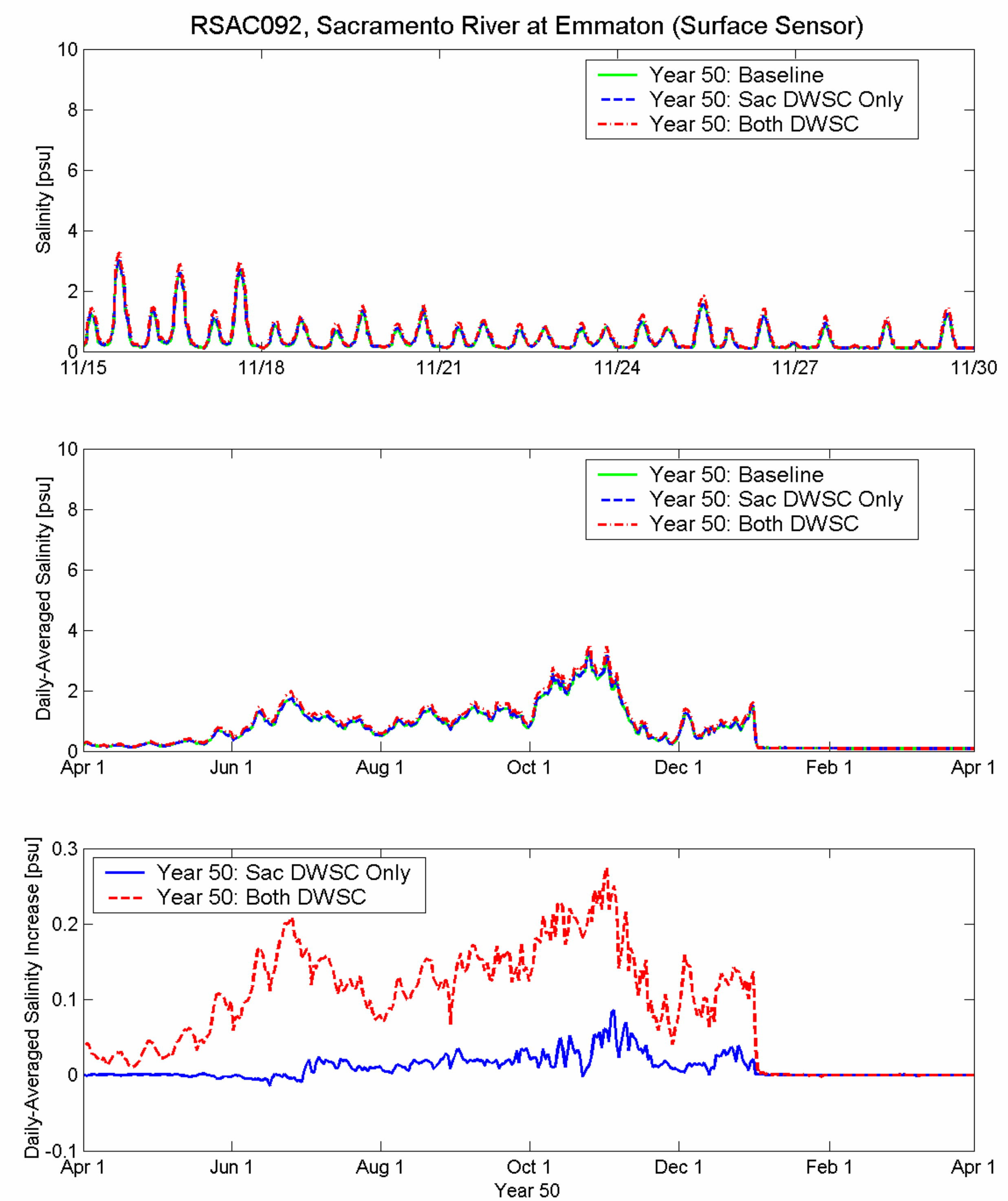


Figure 5.5-33 Predicted salinity at the Sacramento River at Emmaton (RSAC092) Surface Sensor for the Year 50 Baseline scenario, the Year 50 Sacramento DWSC Only Deepening scenario, and the Year 50 Both DWSC Deepening scenario: tidal time-scale variability over a 15-day period (top); daily-averaged salinity for the Year 50 simulation period (middle); predicted increase in daily-averaged salinity for the Year 50 Sacramento DWSC Only Deepening scenario

and the Year 50 Both DWSC Deepening scenario relative to the Year 50 Baseline scenario (bottom).

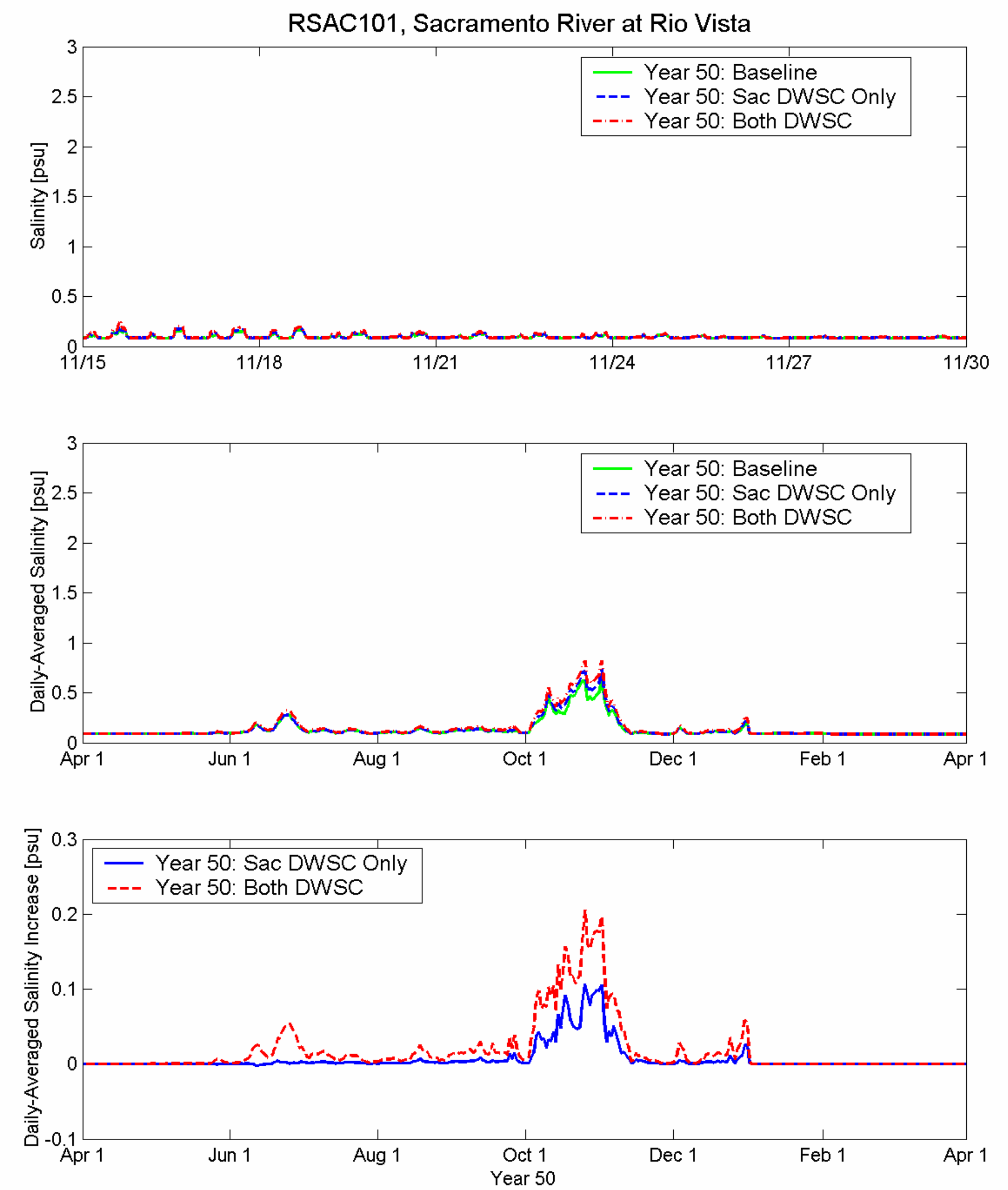


Figure 5.5-34 Predicted salinity at Sacramento River at Rio Vista (RSAC101) for the Year 50 Baseline scenario, the Year 50 Sacramento DWSC Only Deepening scenario, and the Year 50 Both DWSC Deepening scenario: tidal time-scale variability over a 15-day period (top); daily-averaged salinity for the Year 50 simulation period (middle); predicted increase in daily-

averaged salinity for the Year 50 Sacramento DWSC Only Deepening scenario and the Year 50 Both DWSC Deepening scenario relative to the Year 50 Baseline scenario (bottom).

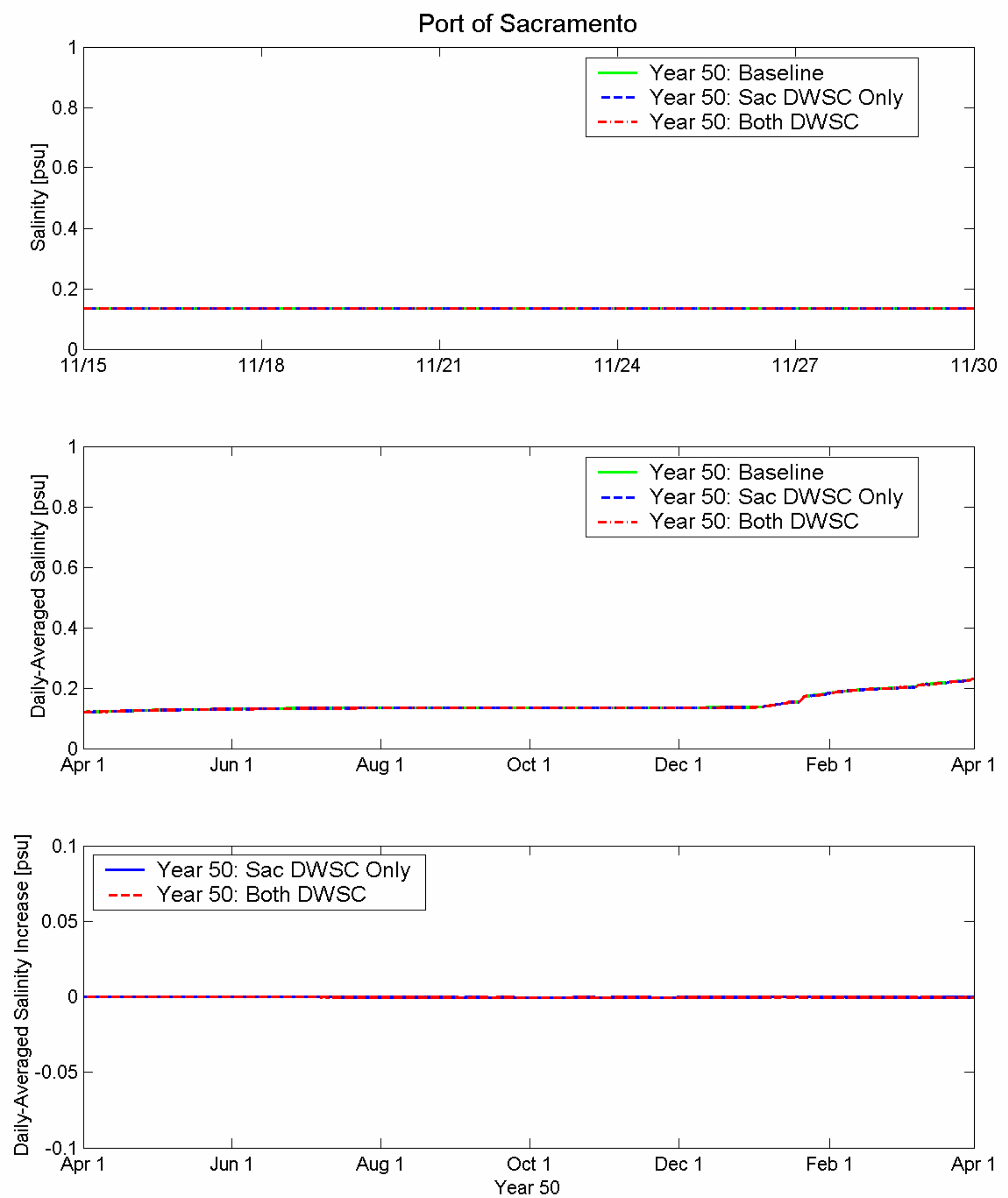


Figure 5.5-35 Predicted salinity at the Port of Sacramento for the Year 50 Baseline scenario, the Year 50 Sacramento DWSC Only Deepening scenario, and the Year 50 Both DWSC Deepening scenario: tidal time-scale variability over a 15-day period (top); daily-averaged salinity for the Year 50 simulation period (middle); predicted increase in daily-averaged salinity for the Year 50

Sacramento DWSC Only Deepening scenario and the Year 50 Both DWSC Deepening scenario relative to the Year 50 Baseline scenario (bottom).

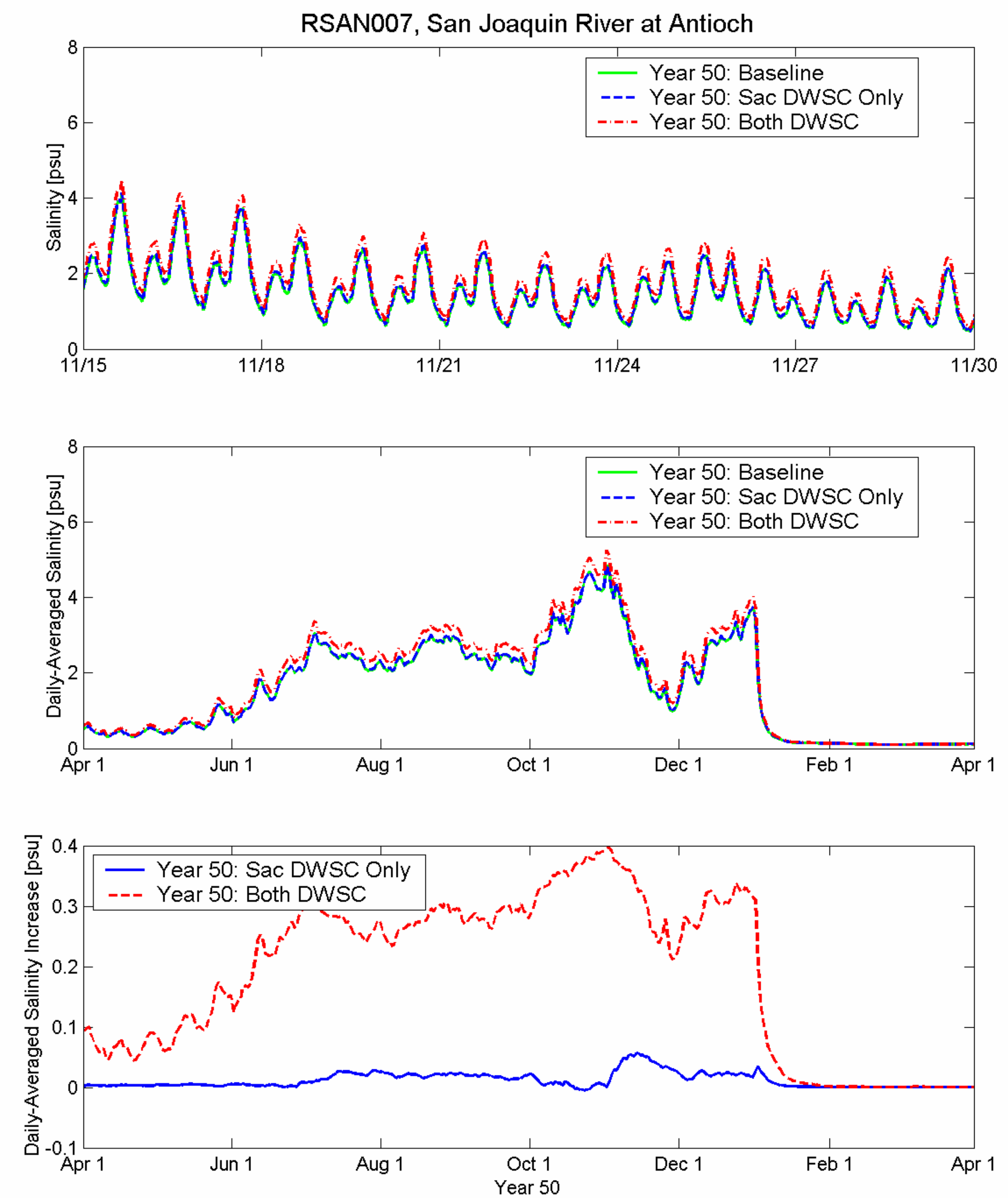


Figure 5.5-36 Predicted salinity at San Joaquin River at Antioch (RSAN007) for the Year 50 Baseline scenario, the Year 50 Sacramento DWSC Only Deepening scenario, and the Year 50 Both DWSC Deepening scenario: tidal time-scale variability over a 15-day period (top); daily-averaged salinity for the Year 50 simulation period (middle); predicted increase in daily-

averaged salinity for the Year 50 Sacramento DWSC Only Deepening scenario and the Year 50 Both DWSC Deepening scenario relative to the Year 50 Baseline scenario (bottom).

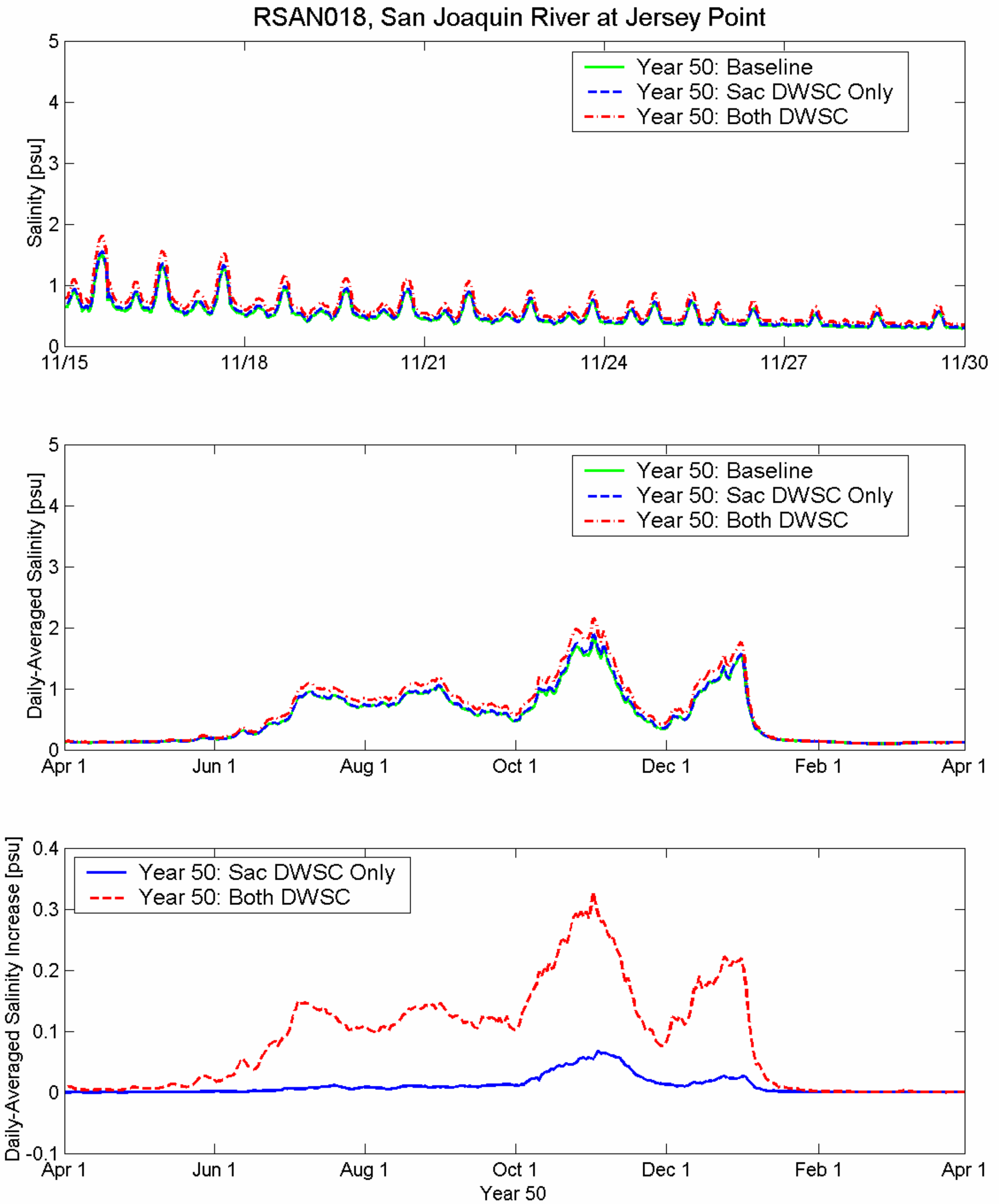


Figure 5.5-37 Predicted salinity at San Joaquin River at Jersey Point (RSAN018) for the Year 50 Baseline scenario, the Year 50 Sacramento DWSC Only Deepening scenario, and the Year 50 Both DWSC Deepening scenario: tidal time-scale variability over a 15-day period (top); daily-averaged salinity for the Year 50 simulation period (middle); predicted increase in daily-

averaged salinity for the Year 50 Sacramento DWSC Only Deepening scenario and the Year 50 Both DWSC Deepening scenario relative to the Year 50 Baseline scenario (bottom).

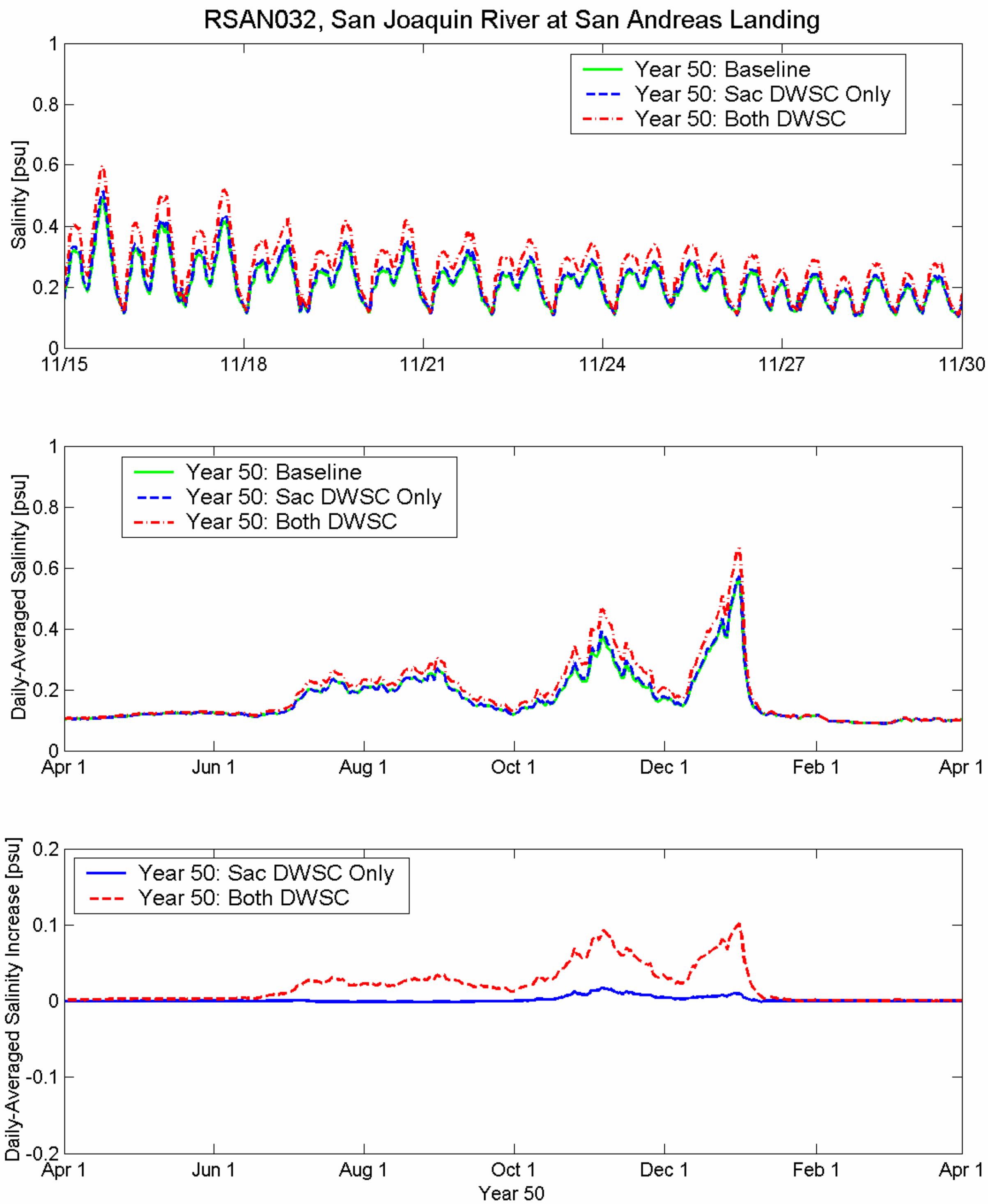


Figure 5.5-38 Predicted salinity at San Joaquin River at San Andreas Landing (RSAN032) for the Year 50 Baseline scenario, the Year 50 Sacramento DWSC Only Deepening scenario, and the Year 50 Both DWSC Deepening scenario: tidal time-scale variability over a 15-day period (top); daily-averaged salinity for the Year 50 simulation period (middle); predicted increase in

daily-averaged salinity for the Year 50 Sacramento DWSC Only Deepening scenario and the Year 50 Both DWSC Deepening scenario relative to the Year 50 Baseline scenario (bottom).

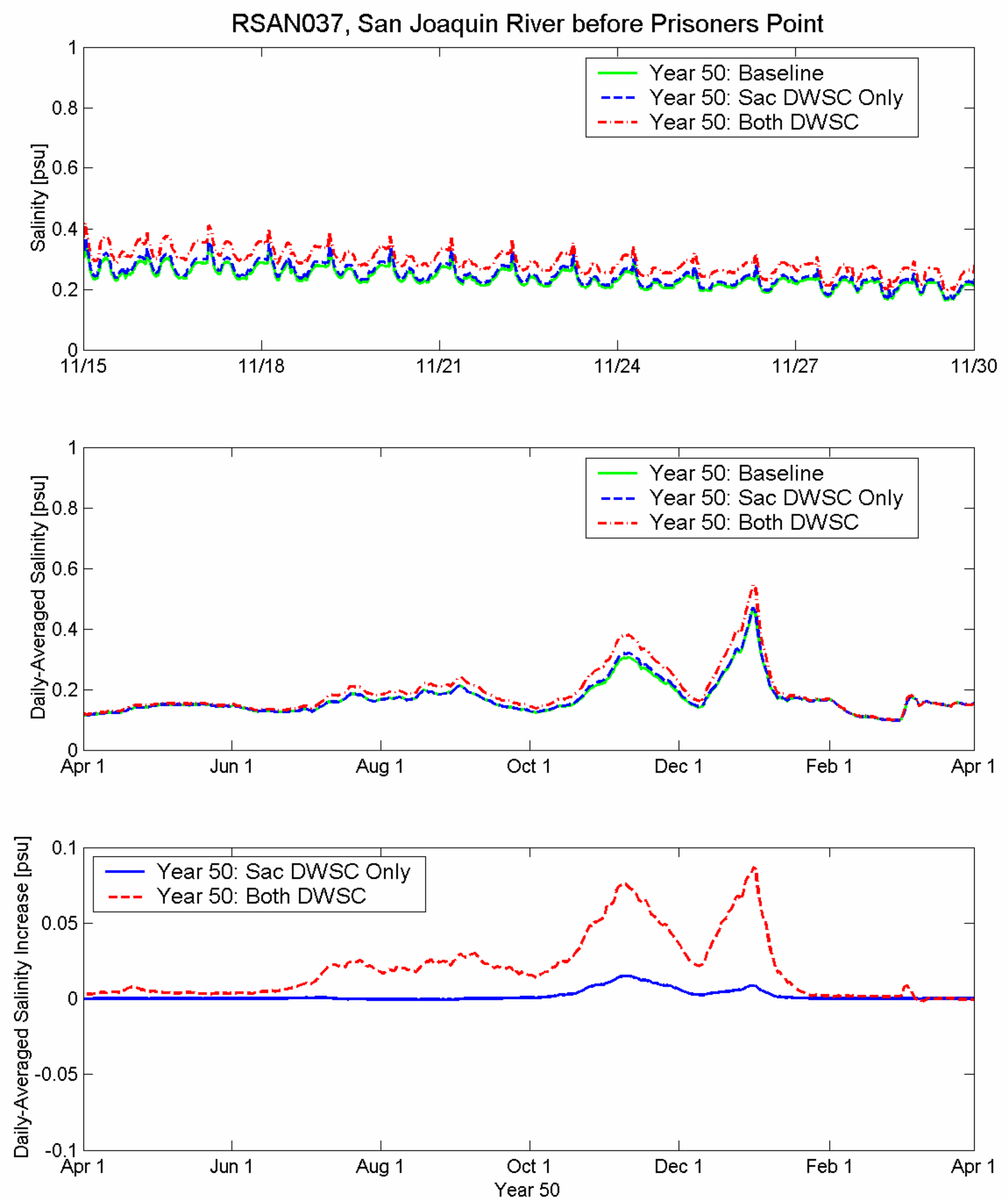


Figure 5.5-39 Predicted salinity at San Joaquin River before Prisoners Point (RSAN037) for the Year 50 Baseline scenario, the Year 50 Sacramento DWSC Only Deepening scenario, and the Year 50 Both DWSC Deepening scenario: tidal time-scale variability over a 15-day period (top); daily-averaged salinity for the Year 50 simulation period (middle); predicted increase in daily-

averaged salinity for the Year 50 Sacramento DWSC Only Deepening scenario and the Year 50 Both DWSC Deepening scenario relative to the Year 50 Baseline scenario (bottom).

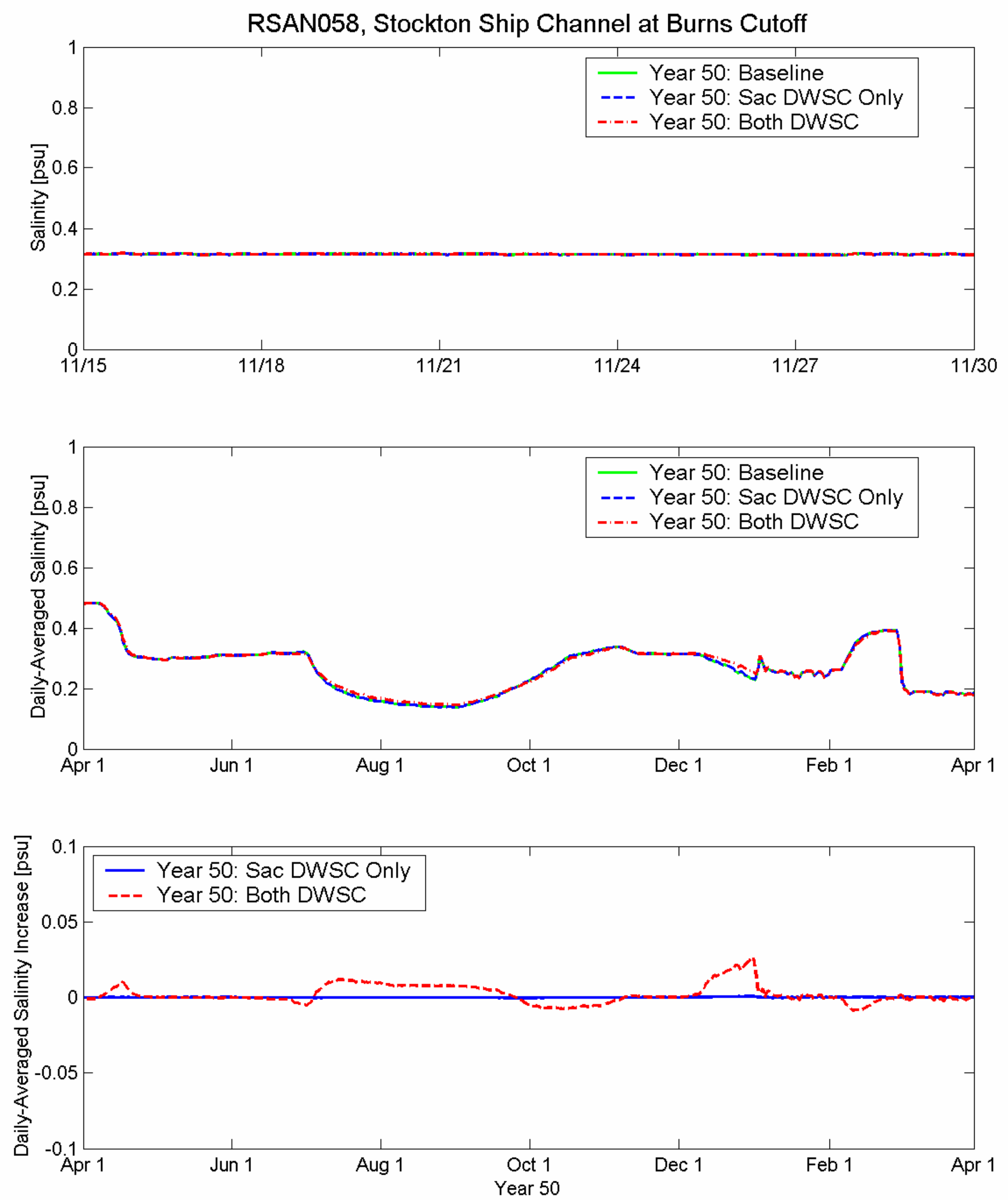


Figure 5.5-40 Predicted salinity at Stockton Ship Channel at Burns Cutoff (RSAN058) for the Year 50 Baseline scenario, the Year 50 Sacramento DWSC Only Deepening scenario, and the Year 50 Both DWSC Deepening scenario: tidal time-scale variability over a 15-day period (top); daily-averaged salinity for the Year 50 simulation period (middle); predicted increase in daily-

averaged salinity for the Year 50 Sacramento DWSC Only Deepening scenario and the Year 50 Both DWSC Deepening scenario relative to the Year 50 Baseline scenario (bottom).

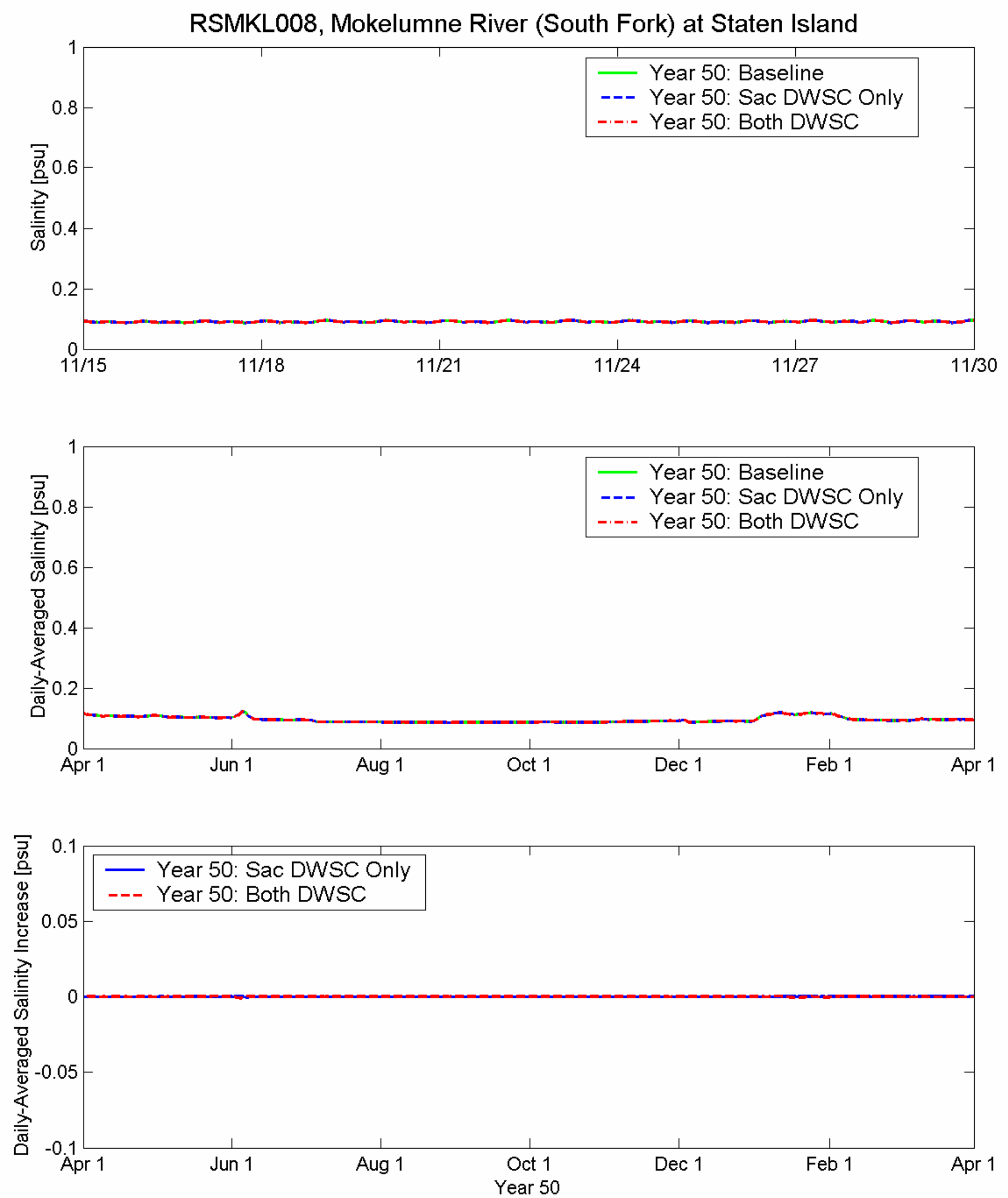


Figure 5.5-41 Predicted salinity at South Fork Mokelumne River at Staten Island (RSMKL008) for the Year 50 Baseline scenario, the Year 50 Sacramento DWSC Only Deepening scenario, and the Year 50 Both DWSC Deepening scenario: tidal time-scale variability over a 15-day period (top); daily-averaged salinity for the Year 50 simulation period (middle); predicted increase in

daily-averaged salinity for the Year 50 Sacramento DWSC Only Deepening scenario and the Year 50 Both DWSC Deepening scenario relative to the Year 50 Baseline scenario (bottom).

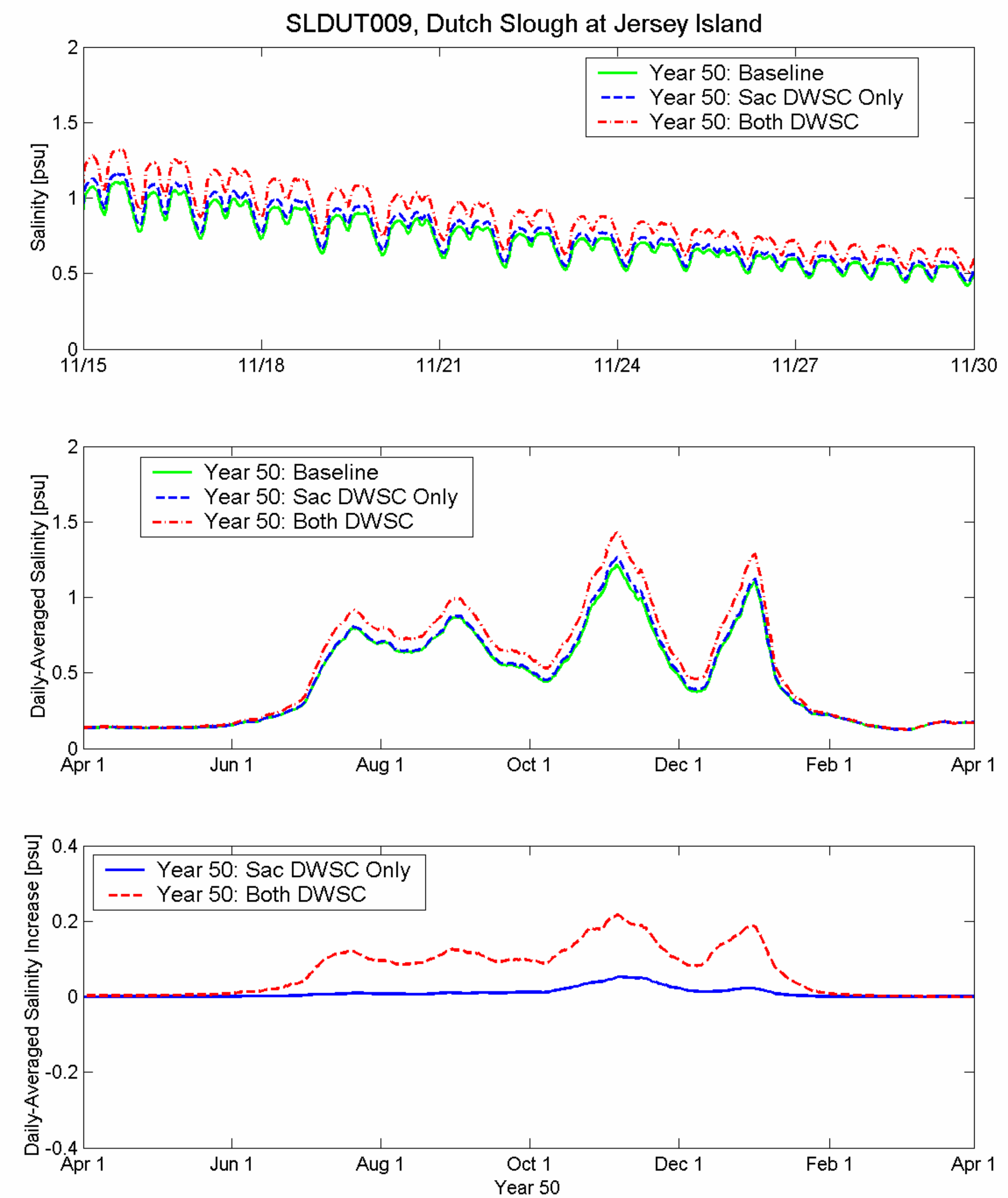


Figure 5.5-42 Predicted salinity at Dutch Slough at Jersey Island (SLDUT009) for the Year 50 Baseline scenario, the Year 50 Sacramento DWSC Only Deepening scenario, and the Year 50 Both DWSC Deepening scenario: tidal time-scale variability over a 15-day period (top); daily-averaged salinity for the Year 50 simulation period (middle); predicted increase in daily-

averaged salinity for the Year 50 Sacramento DWSC Only Deepening scenario and the Year 50 Both DWSC Deepening scenario relative to the Year 50 Baseline scenario (bottom).

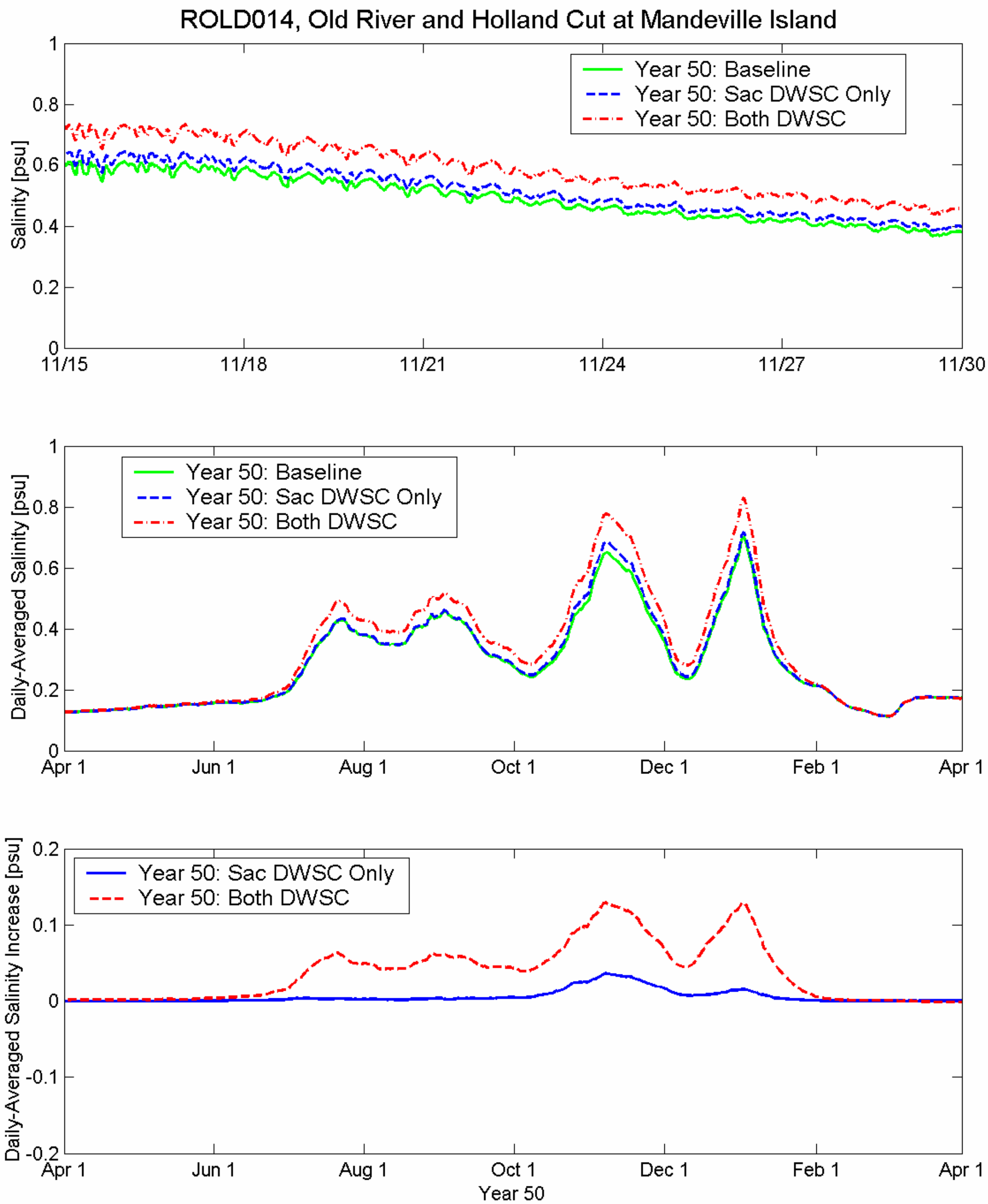


Figure 5.5-43 Predicted salinity at Old River and Holland Cut at Mandeville Island (ROLD014) for the Year 50 Baseline scenario, the Year 50 Sacramento DWSC Only Deepening scenario, and the Year 50 Both DWSC Deepening scenario: tidal time-scale variability over a 15-day period (top); daily-averaged salinity for the Year 50 simulation period (middle); predicted increase in

daily-averaged salinity for the Year 50 Sacramento DWSC Only Deepening scenario and the Year 50 Both DWSC Deepening scenario relative to the Year 50 Baseline scenario (bottom).

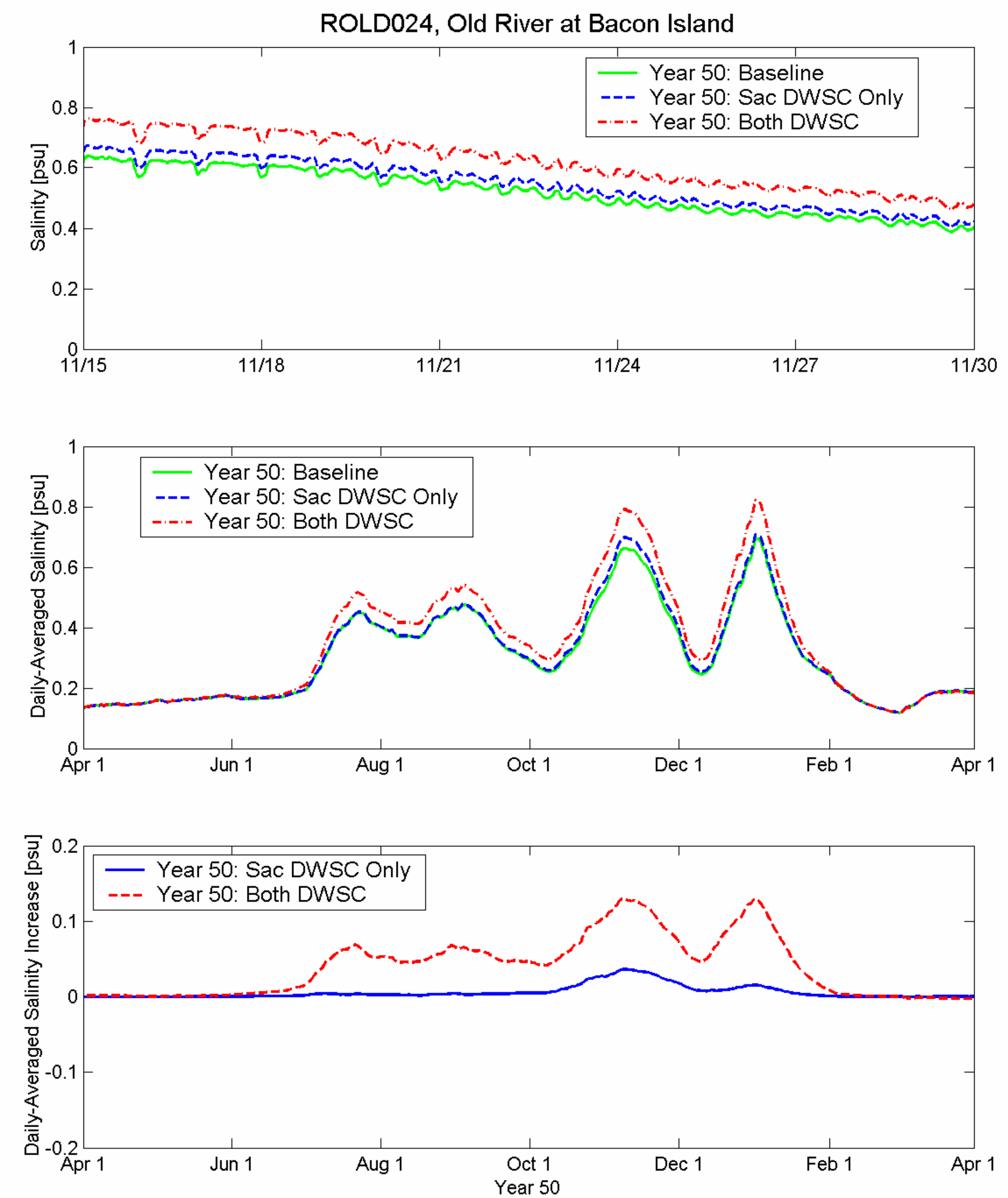


Figure 5.5-44 Predicted salinity at Old River at Bacon Island (ROLD024) for the Year 50 Baseline scenario, the Year 50 Sacramento DWSC Only Deepening scenario, and the Year 50 Both DWSC Deepening scenario: tidal time-scale variability over a 15-day period (top); daily-averaged salinity for the Year 50 simulation period (middle); predicted increase in daily-

averaged salinity for the Year 50 Sacramento DWSC Only Deepening scenario and the Year 50 Both DWSC Deepening scenario relative to the Year 50 Baseline scenario (bottom).

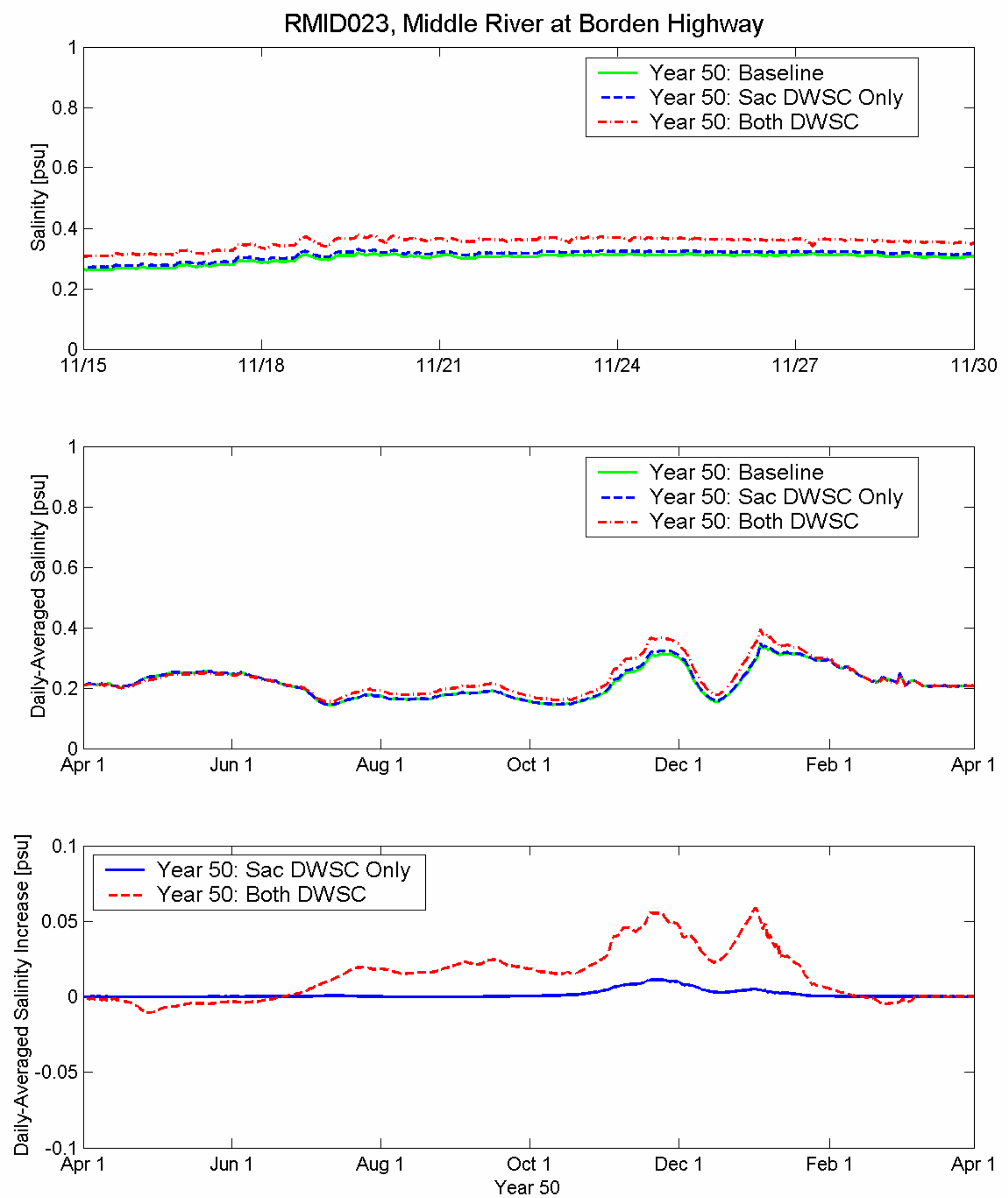


Figure 5.5-45 Predicted salinity at Middle River at Borden Highway (RMID023) for the Year 50 Baseline scenario, the Year 50 Sacramento DWSC Only Deepening scenario, and the Year 50 Both DWSC Deepening scenario: tidal time-scale variability over a 15-day period (top); daily-averaged salinity for the Year 50 simulation period (middle); predicted increase in daily-

averaged salinity for the Year 50 Sacramento DWSC Only Deepening scenario and the Year 50 Both DWSC Deepening scenario relative to the Year 50 Baseline scenario (bottom).

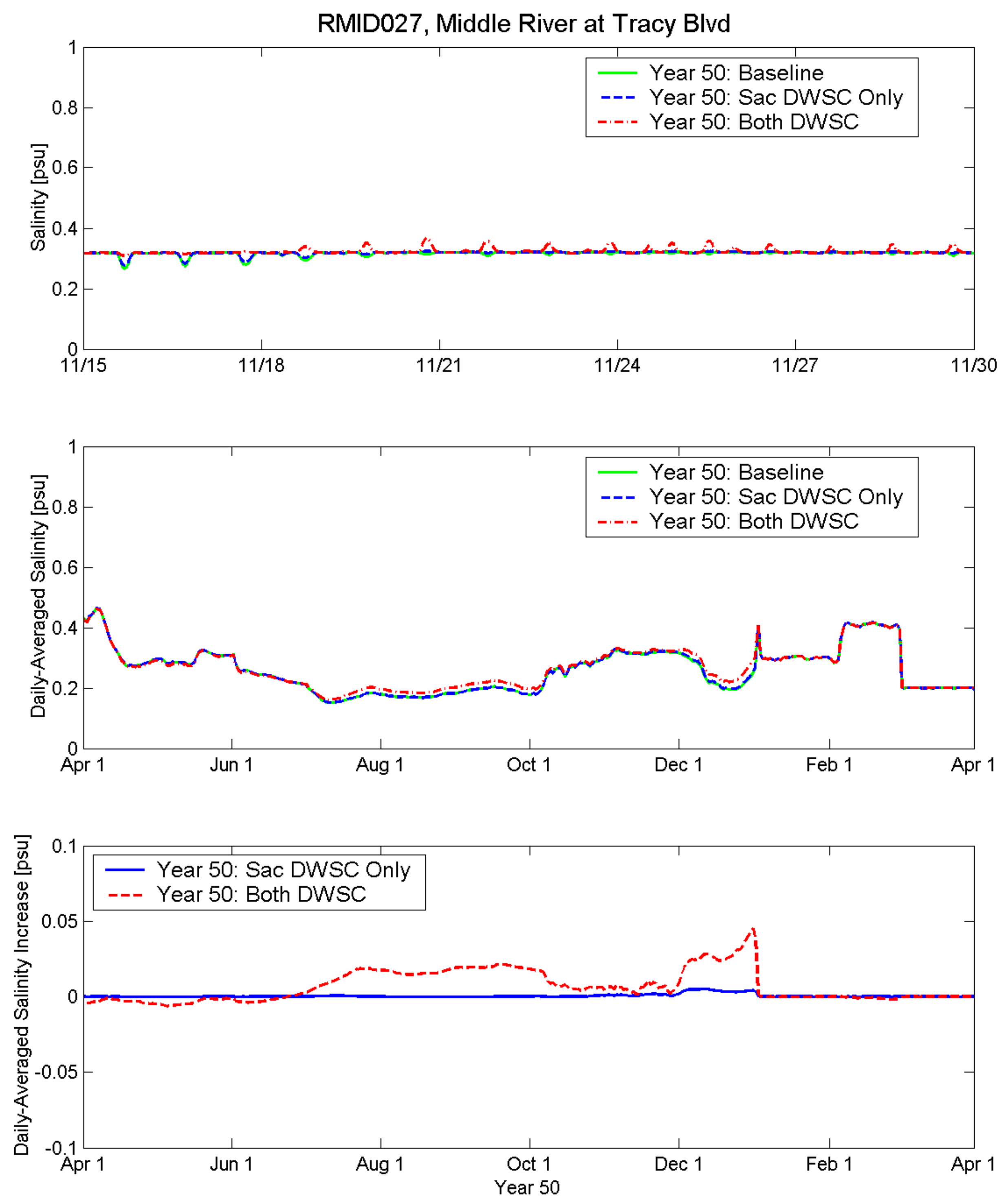


Figure 5.5-46 Predicted salinity at Middle River at Tracy Boulevard (RMID027) for the Year 50 Baseline scenario, the Year 50 Sacramento DWSC Only Deepening scenario, and the Year 50 Both DWSC Deepening scenario: tidal time-scale variability over a 15-day period (top); daily-averaged salinity for the Year 50 simulation period (middle); predicted increase in daily-

averaged salinity for the Year 50 Sacramento DWSC Only Deepening scenario and the Year 50 Both DWSC Deepening scenario relative to the Year 50 Baseline scenario (bottom).

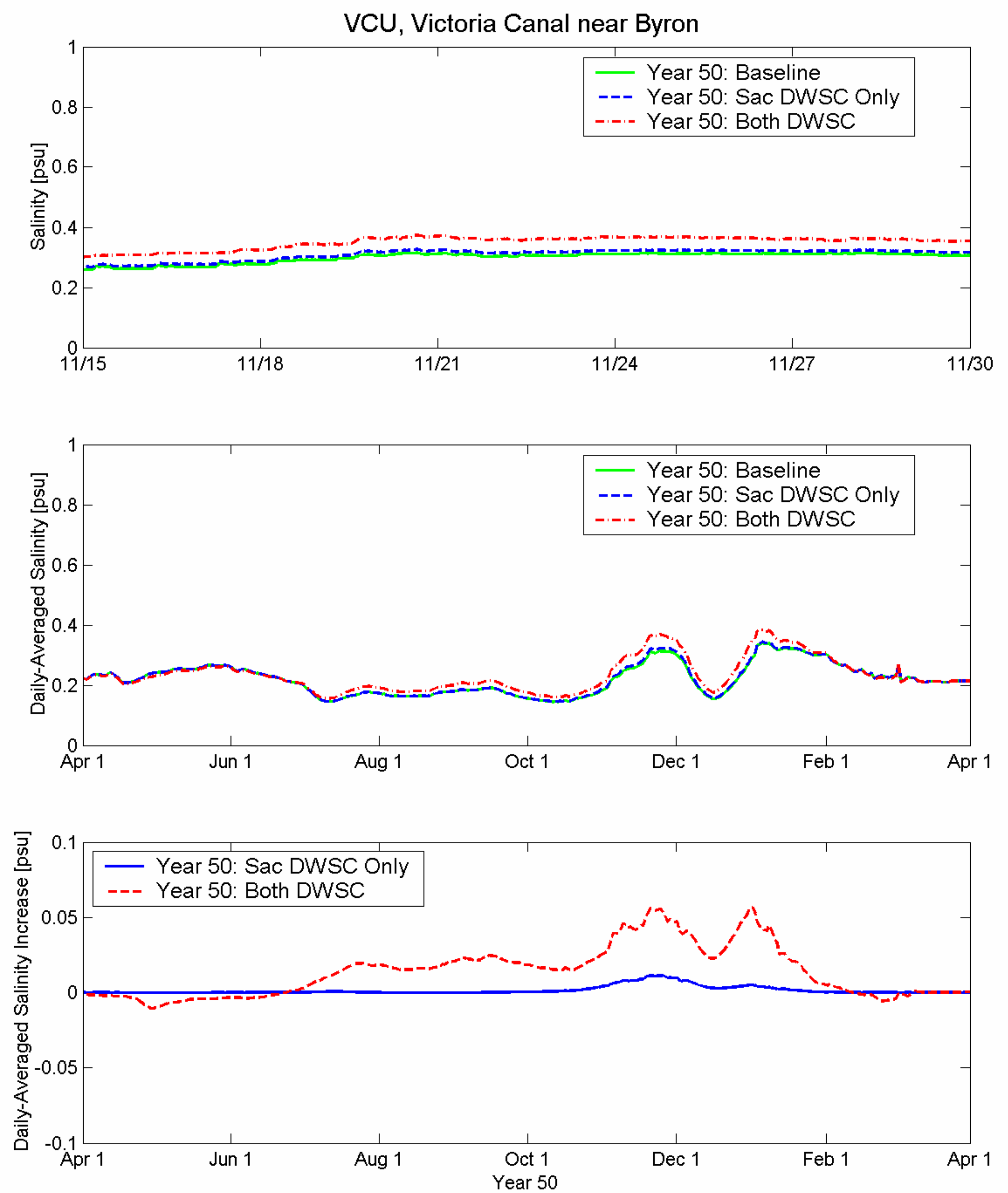


Figure 5.5-47 Predicted salinity at Victoria Canal near Byron (VCU) for the Year 50 Baseline scenario, the Year 50 Sacramento DWSC Only Deepening scenario, and the Year 50 Both DWSC Deepening scenario: tidal time-scale variability over a 15-day period (top); daily-averaged salinity for the Year 50 simulation period (middle); predicted increase in daily-

averaged salinity for the Year 50 Sacramento DWSC Only Deepening scenario and the Year 50 Both DWSC Deepening scenario relative to the Year 50 Baseline scenario (bottom).

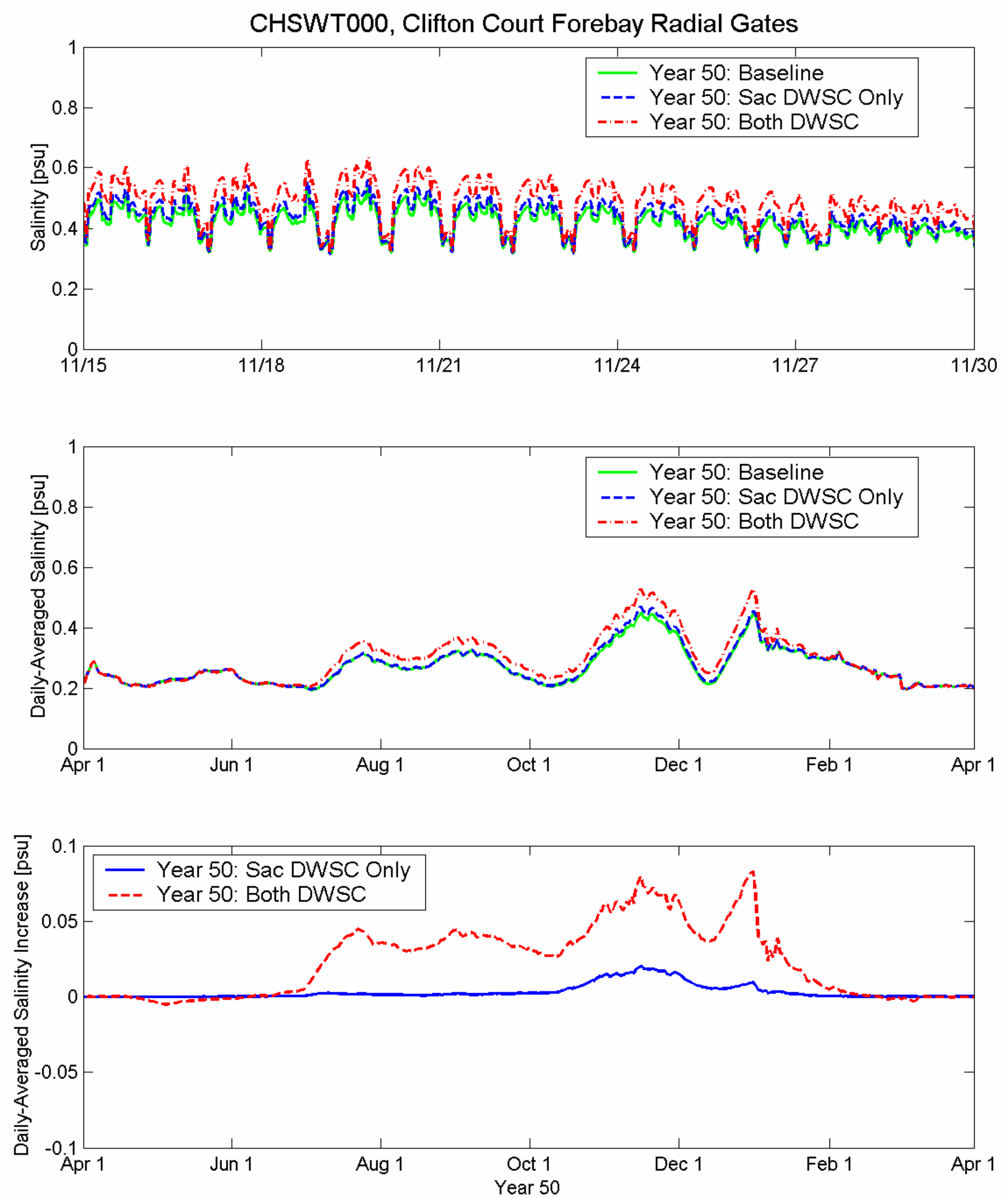


Figure 5.5-48 Predicted salinity at Clifton Court Forebay Radial Gates (CHWST000) for the Year 50 Baseline scenario, the Year 50 Sacramento DWSC Only Deepening scenario, and the Year 50 Both DWSC Deepening scenario: tidal time-scale variability over a 15-day period (top); daily-averaged salinity for the Year 50 simulation period (middle); predicted increase in daily-

averaged salinity for the Year 50 Sacramento DWSC Only Deepening scenario and the Year 50 Both DWSC Deepening scenario relative to the Year 50 Baseline scenario (bottom).

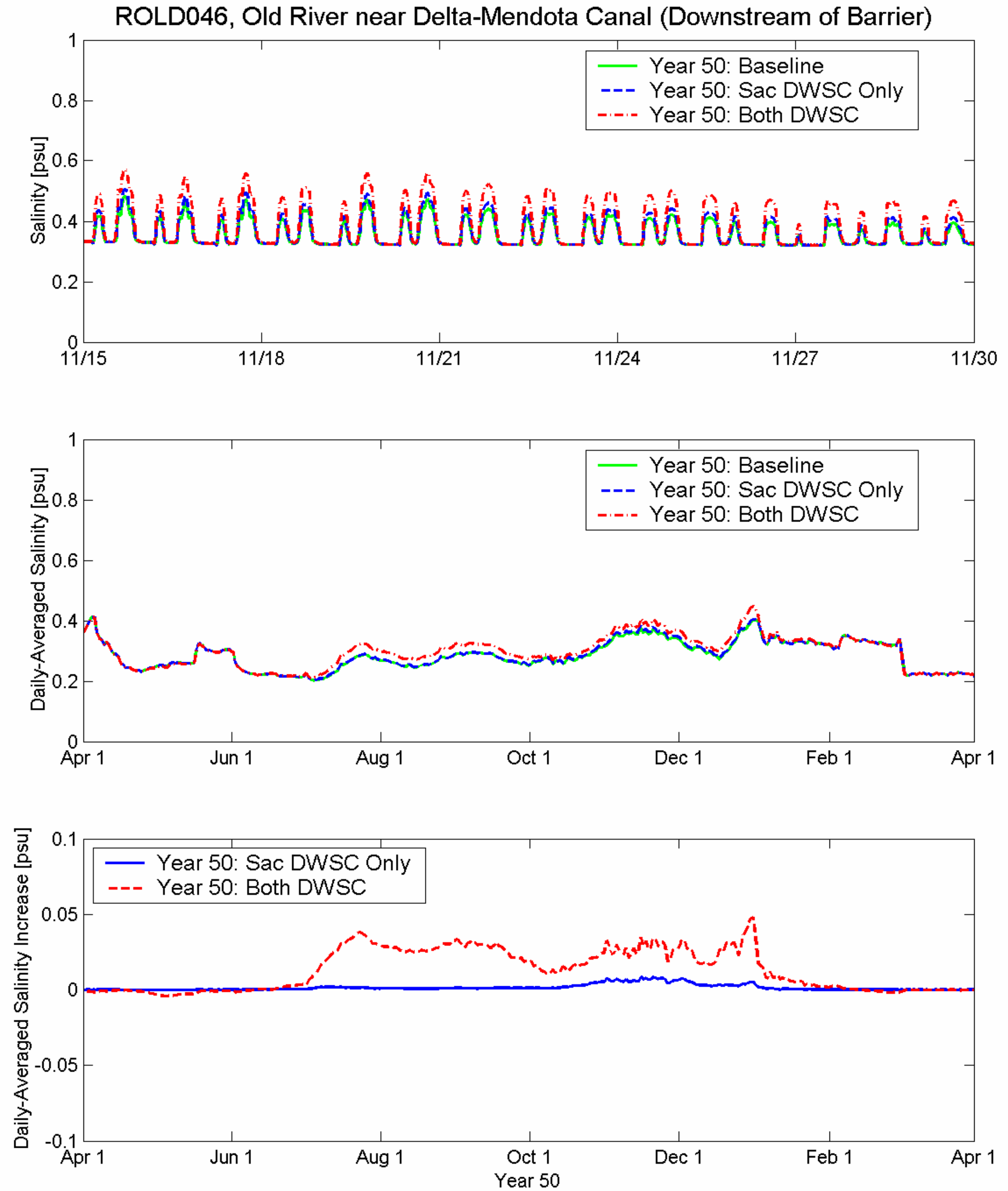


Figure 5.5-49 Predicted salinity at Old River near Delta-Mendota Canal Downstream of Barrier (ROLD046) for the Year 50 Baseline scenario, the Year 50 Sacramento DWSC Only Deepening scenario, and the Year 50 Both DWSC Deepening scenario: tidal time-scale variability over a 15-day period (top); daily-averaged salinity for the Year 50 simulation period (middle); predicted increase in daily-averaged salinity for the Year 50 Sacramento DWSC Only Deepening scenario

and the Year 50 Both DWSC Deepening scenario relative to the Year 50 Baseline scenario (bottom).

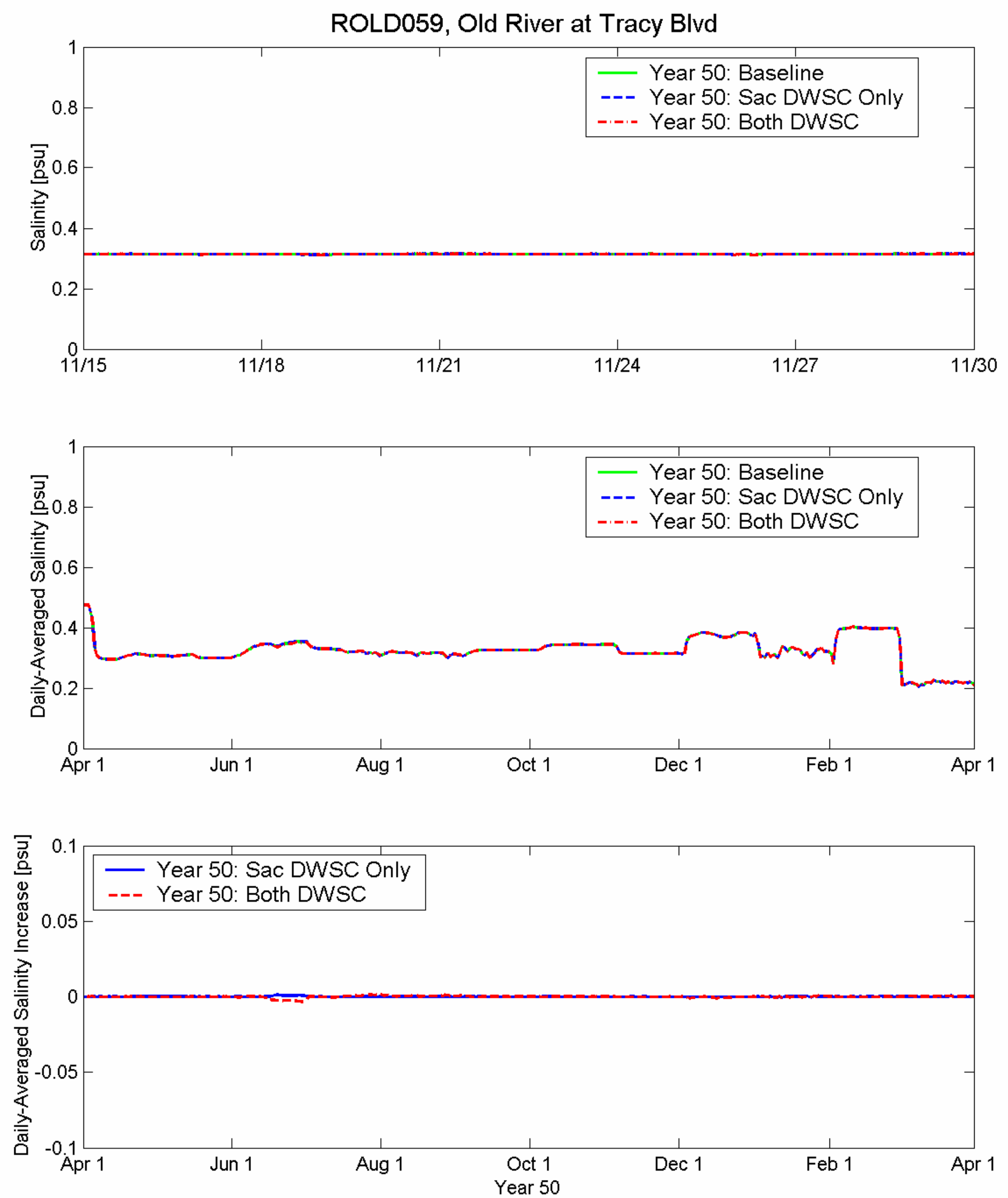


Figure 5.5-50 Predicted salinity at Old River at Tracy Boulevard (ROLD059) for the Year 50 Baseline scenario, the Year 50 Sacramento DWSC Only Deepening scenario, and the Year 50 Both DWSC Deepening scenario: tidal time-scale variability over a 15-day period (top); daily-averaged salinity for the Year 50 simulation period (middle); predicted increase in daily-

averaged salinity for the Year 50 Sacramento DWSC Only Deepening scenario and the Year 50 Both DWSC Deepening scenario relative to the Year 50 Baseline scenario (bottom).

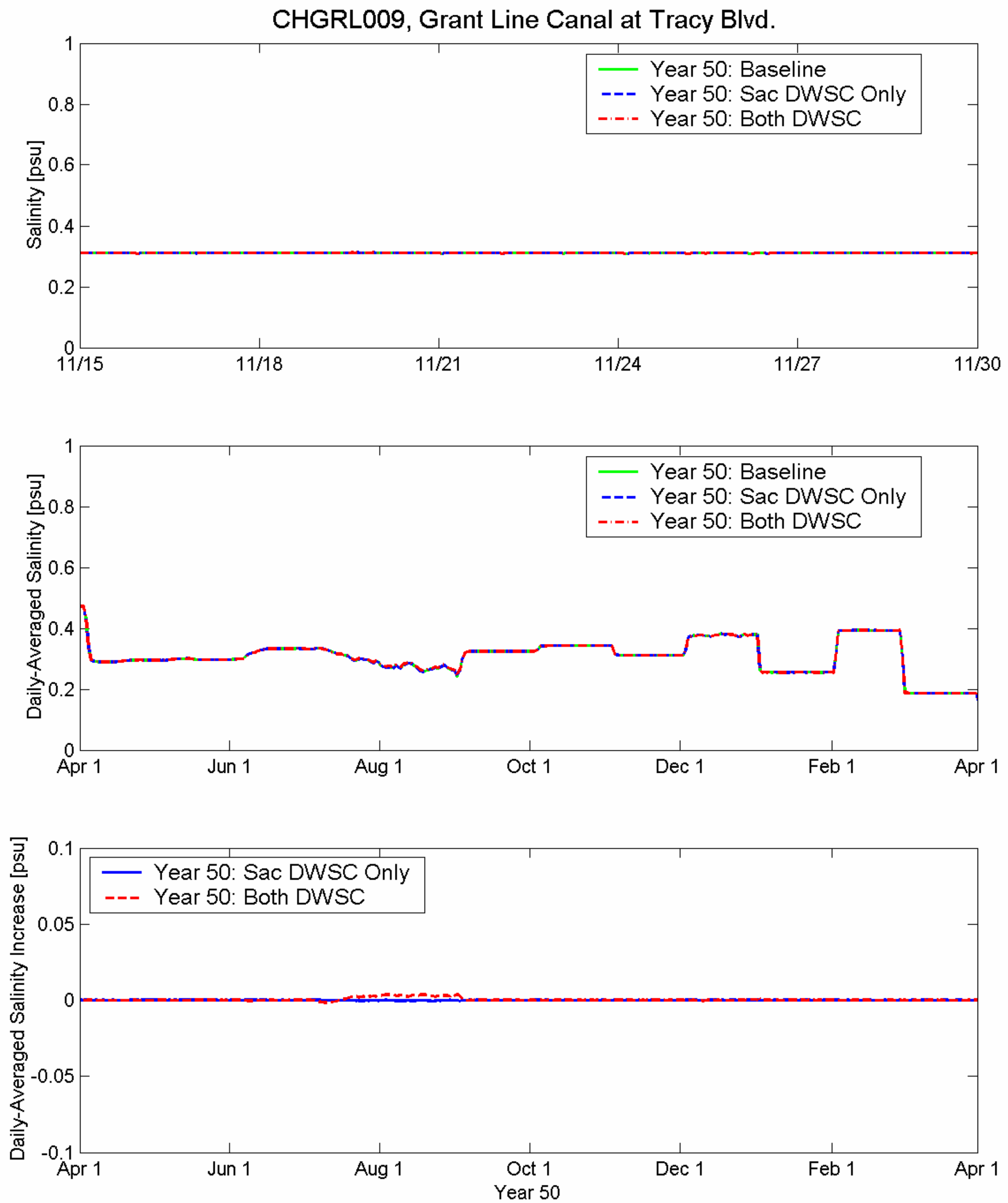


Figure 5.5-51 Predicted salinity at Grant Line Canal at Tracy Boulevard (CHGRL009) for the Year 50 Baseline scenario, the Year 50 Sacramento DWSC Only Deepening scenario, and the Year 50 Both DWSC Deepening scenario: tidal time-scale variability over a 15-day period (top); daily-averaged salinity for the Year 50 simulation period (middle); predicted increase in daily-

averaged salinity for the Year 50 Sacramento DWSC Only Deepening scenario and the Year 50 Both DWSC Deepening scenario relative to the Year 50 Baseline scenario (bottom).

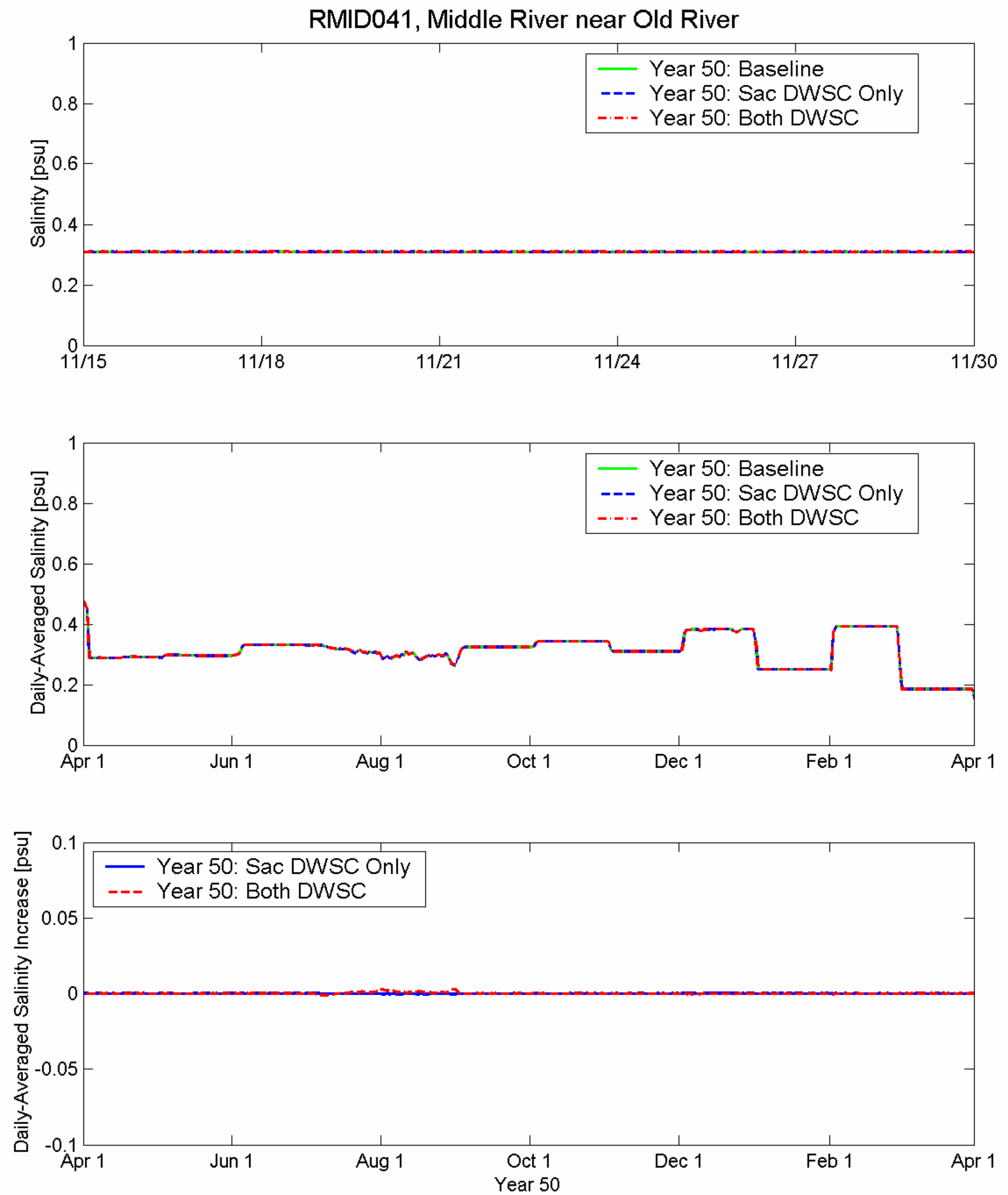


Figure 5.5-52 Predicted salinity at Middle River near Old River (RMID041) for the Year 50 Baseline scenario, the Year 50 Sacramento DWSC Only Deepening scenario, and the Year 50 Both DWSC Deepening scenario: tidal time-scale variability over a 15-day period (top); daily-averaged salinity for the Year 50 simulation period (middle); predicted increase in daily-

averaged salinity for the Year 50 Sacramento DWSC Only Deepening scenario and the Year 50 Both DWSC Deepening scenario relative to the Year 50 Baseline scenario (bottom).

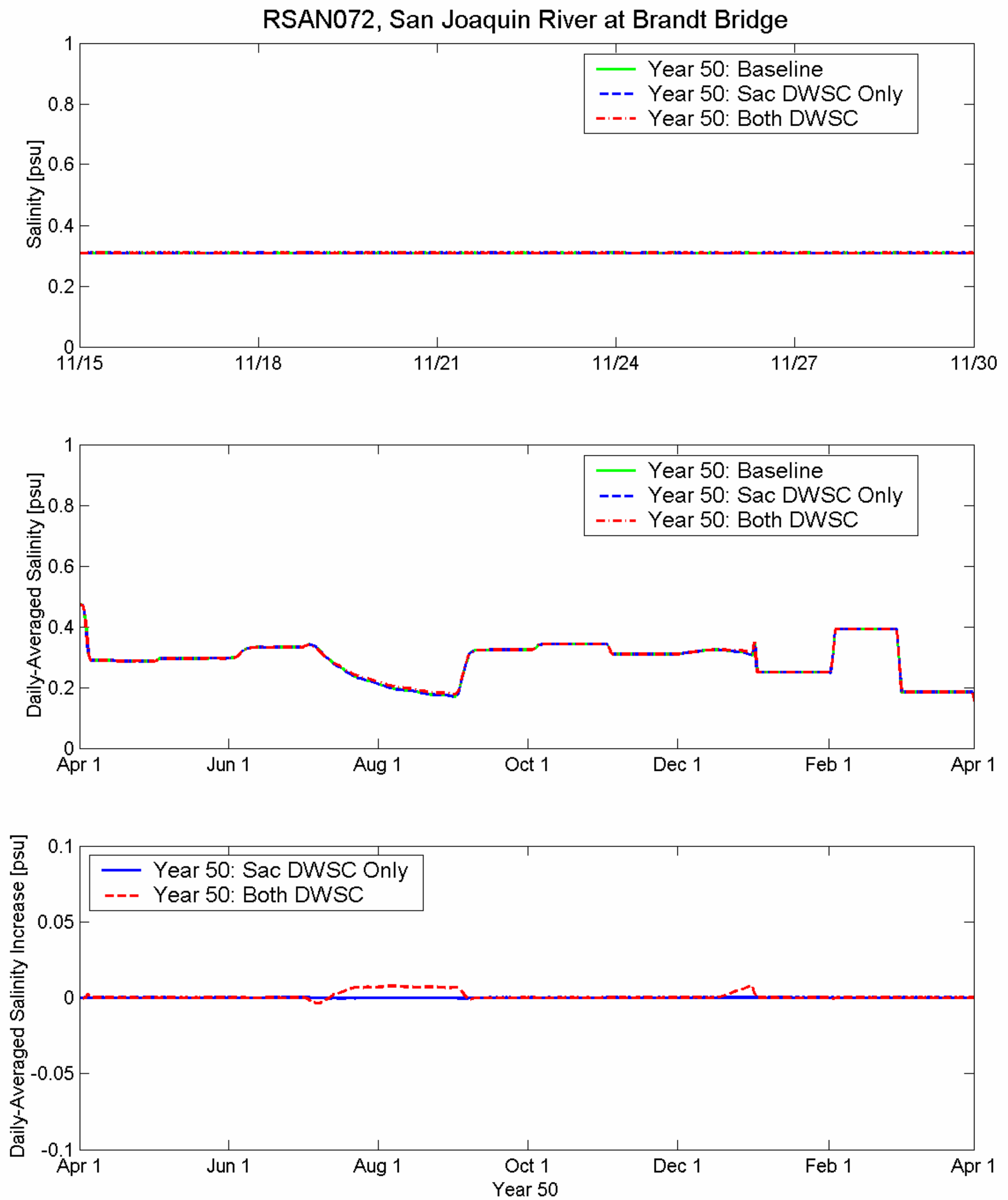


Figure 5.5-53 Predicted salinity at San Joaquin River at Brandt Bridge (RSAN072) for the Year 50 Baseline scenario, the Year 50 Sacramento DWSC Only Deepening scenario, and the Year 50 Both DWSC Deepening scenario: tidal time-scale variability over a 15-day period (top); daily-averaged salinity for the Year 50 simulation period (middle); predicted increase in daily-

averaged salinity for the Year 50 Sacramento DWSC Only Deepening scenario and the Year 50 Both DWSC Deepening scenario relative to the Year 50 Baseline scenario (bottom).

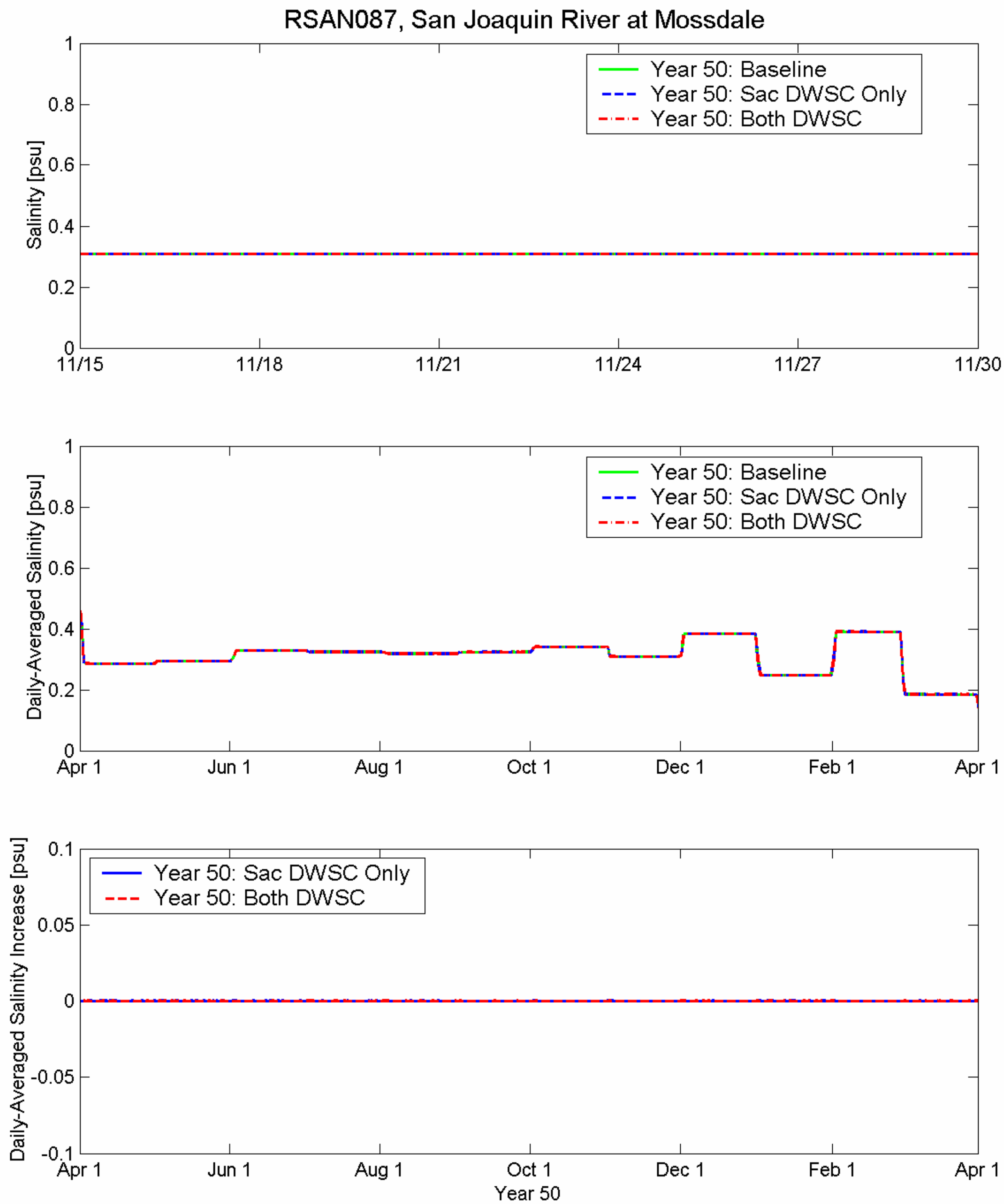


Figure 5.5-54 Predicted salinity at San Joaquin River at Mossdale (RSAN087) for the Year 50 Baseline scenario, the Year 50 Sacramento DWSC Only Deepening scenario, and the Year 50 Both DWSC Deepening scenario: tidal time-scale variability over a 15-day period (top); daily-averaged salinity for the Year 50 simulation period (middle); predicted increase in daily-

averaged salinity for the Year 50 Sacramento DWSC Only Deepening scenario and the Year 50 Both DWSC Deepening scenario relative to the Year 50 Baseline scenario (bottom).

5.6 Impact of Year 50 Sacramento DWSC Only Deepening on D-1641 Water Quality Objectives

Section 3.4 presents the water quality objectives for municipal and industrial, agricultural, and fish and wildlife beneficial uses stipulated by D-1641. The performance of the Year 50 Baseline scenario and the Year 50 Sacramento DWSC Only Deepening scenario simulations in meeting these water quality objectives is presented in this section.

5.6.1 Water Quality Objectives for Municipal and Industrial Beneficial Use

The D-1641 water quality objectives for municipal and industrial beneficial uses, shown in Table 3-1, are based on concentration of Cl^- at water export locations, shown on Figure 3.4-1. The first set of standards stipulate the number of days that daily mean salinity must be less than 150 mg/l either at Contra Costa Canal at Pumping Plant #1, or at the Antioch Water Works intake. The minimum number of days that this objective should be met ranges from 155 days for a "critical" water year to 240 days for a "wet" water year.

Water year 1994 (from October 1, 1993 through September 30, 1994) was classified as a "critical" year, the lowest flow classification, on both the Sacramento River and San Joaquin River. Water Year 1995 (from October 1, 1994 through September 30, 1995) was classified as a "wet" year, the highest flow classification, on both the Sacramento River and the San Joaquin River (DWR, 2009b). As a result, the Year 50 simulation year spans part of a "critical" year and part of a "wet" water year on the Sacramento River.

Figure 5.6-1 shows the number of days that the maximum mean daily concentration of Cl^- is less than 150 mg/l at CHCCC06 and RSAN007. To meet the "critical year" water quality objective, the number of days that mean daily concentration of Cl^- is less than 150 mg/l should exceed 155 days at either CHCCC06 or RSAN007. At CHCCC06, the mean daily concentration of Cl^- is less than 150 mg/l for 174 days under the Year 50 Baseline scenario and 170 days for the Year 50 Sacramento DWSC Only Deepening scenario (a decrease of 4 days relative to the Year 50 Baseline scenario). At RSAN007, the mean daily concentration of Cl^- is less than 150 mg/l for 88 days under the Year 50 Baseline scenario and 87 days for the Year 50 Sacramento DWSC Only Deepening scenario (a decrease of 1 day relative to the Year 50 Baseline scenario). Since this standard stipulates that daily mean salinity must be less than 150 mg/l for at least 155 days either at Contra Costa Canal at Pumping Plant #1, or at the Antioch Water Works intake, this standard is met for both the Year 50 Baseline scenario and the Year 50 Sacramento DWSC Only Deepening scenario since this water quality standard is met at CHCCC06 under both scenarios.

The second set of D-1641 water quality objectives for municipal and industrial beneficial use stipulate a maximum allowable concentration of Cl^- at the municipal water intakes. The D-1641 standards stipulate this objective for Contra Costa Canal at Pumping Plant #1, West Canal at mouth of Clifton Court Forebay, Delta-Mendota Canal at Tracy Pumping Plant, Barker Slough at North Bay Aqueduct Intake, and Cache Slough at City of Vallejo Intake (Table 3-3). For the purposes of this study, this standard is also evaluated at the CCWD intake on Old River (ROLD304), and at the CCWD alternative intake point (AIP) on Victoria Canal.

Figure 5.6-2 shows the predicted mean daily chloride concentration at the Contra Costa Rock Slough Export for the Year 50 Baseline scenario and the Year 50 Sacramento DWSC Only Deepening scenario. Increases in chloride concentration under the Year 50 Sacramento DWSC Only Deepening scenario are predicted from October through December. Under the Year 50 Baseline scenario the water quality objective of 250 mg/l Cl^- is exceeded for 11 days in November, 9 days in December, and 17 days in January. Under the Year 50 Sacramento DWSC Only Deepening scenario, the water quality objective of 250 mg/l Cl^- is exceeded for 13 days during November (an increase of 2 days), 11 days during December (an increase of 2 days), and 17 days during January (no change relative to Year 50 Baseline). Thus the Year 50 Sacramento DWSC Only Deepening scenario results in a total increase of 4 days that the water quality objective of 250 mg/l Cl^- is exceeded at the Contra Costa Rock Slough Export, relative to the Year 50 Baseline scenario.

Figure 5.6-3 shows the predicted mean daily chloride concentration at West Canal at mouth of Clifton Court Forebay for the Year 50 Baseline scenario and the Year 50 Sacramento DWSC Only Deepening scenario. Increases in chloride concentration under the Year 50 Sacramento DWSC Only Deepening scenario are predicted between November and January. The water quality objective of maximum mean daily concentration of 250 mg/l Cl^- is not exceeded at West Canal at mouth of Clifton Court Forebay under either the Year 50 Baseline or the Year 50 Sacramento DWSC Only Deepening scenario.

Figure 5.6-4 shows the predicted mean daily chloride concentration at the Delta-Mendota Canal at Tracy Pumping Plant for the Year 50 Baseline scenario and the Year 50 Sacramento DWSC Only Deepening scenario. Increases in chloride concentration under the Year 50 Sacramento DWSC Only Deepening scenario are predicted between November and December. The water quality objective of maximum mean daily concentration of 250 mg/l Cl^- is not exceeded at Delta-Mendota Canal at Tracy Pumping Plant under either the Year 50 Baseline or the Year 50 Sacramento DWSC Only Deepening scenario.

Figure 5.6-5 shows the predicted mean daily chloride concentration in Barker Slough at North Bay Aqueduct Intake for the Year 50 Baseline scenario and the Year 50 Sacramento DWSC Only Deepening scenario. The predicted mean daily chloride concentration is nearly identical for both scenarios, indicating that there is no predicted effect on chloride concentration in Barker Slough at the North Bay Aqueduct Intake resulting from the Year 50 Sacramento DWSC Only Deepening scenario. The water quality objective of maximum mean daily concentration of 250 mg/l Cl^- is not exceeded under either the Year 50 Baseline or the Year 50 Sacramento DWSC Only Deepening scenario.

Figure 5.6-6 shows the predicted mean daily chloride concentration in Cache Slough at City of Vallejo Intake for the Year 50 Baseline scenario and the Year 50 Sacramento DWSC Only Deepening scenario. The predicted mean daily chloride concentration is nearly identical for both scenarios, indicating that there is no predicted effect on chloride concentration in Cache Slough at City of Vallejo Intake resulting from the Year 50 Sacramento DWSC Only Deepening scenario. The water quality objective of maximum mean daily concentration of 250 mg/l Cl^- is not exceeded under either the Year 50 Baseline or the Year 50 Sacramento DWSC Only Deepening scenario.

Figure 5.6-7 shows the predicted mean daily chloride concentration at the Contra Costa Old River Export for the Year 50 Baseline scenario and the Year 50 Sacramento DWSC Only Deepening scenario. Increases in chloride concentration under the Year 50 Sacramento DWSC Only Deepening scenario are predicted from October through January. Under the Year 50 Baseline scenario the water quality objective of 250 mg/l Cl^- is exceeded for 2 days during November, 2 days during December, and 4 days during January. Under the Year 50 Sacramento DWSC Only Deepening scenario, the water quality objective of 250 mg/l Cl^- is exceeded for 9 days during November (an increase of 7 days), 2 days during December (no change relative to Year 50 Baseline) and 5 days during January (an increase of 1 day). Thus the Year 50 Sacramento DWSC Only Deepening scenario results in a total increase of 8 days that the water quality objective of 250 mg/l Cl^- is exceeded at the Contra Costa Old River Export, relative to the Year 50 Baseline scenario.

Figure 5.6-8 shows the predicted mean daily chloride concentration at the Contra Costa Victoria Canal Alternative Intake Point for the Year 50 Baseline scenario and the Year 50 Sacramento DWSC Only Deepening scenario. Increases in chloride concentration under the Year 50 Sacramento DWSC Only Deepening scenario are predicted between November and December. The water quality objective of maximum mean daily concentration of 250 mg/l Cl^- is not exceeded at the Contra Costa Victoria Canal Alternative Intake Point under either the Year 50 Baseline or the Year 50 Sacramento DWSC Only Deepening scenario.

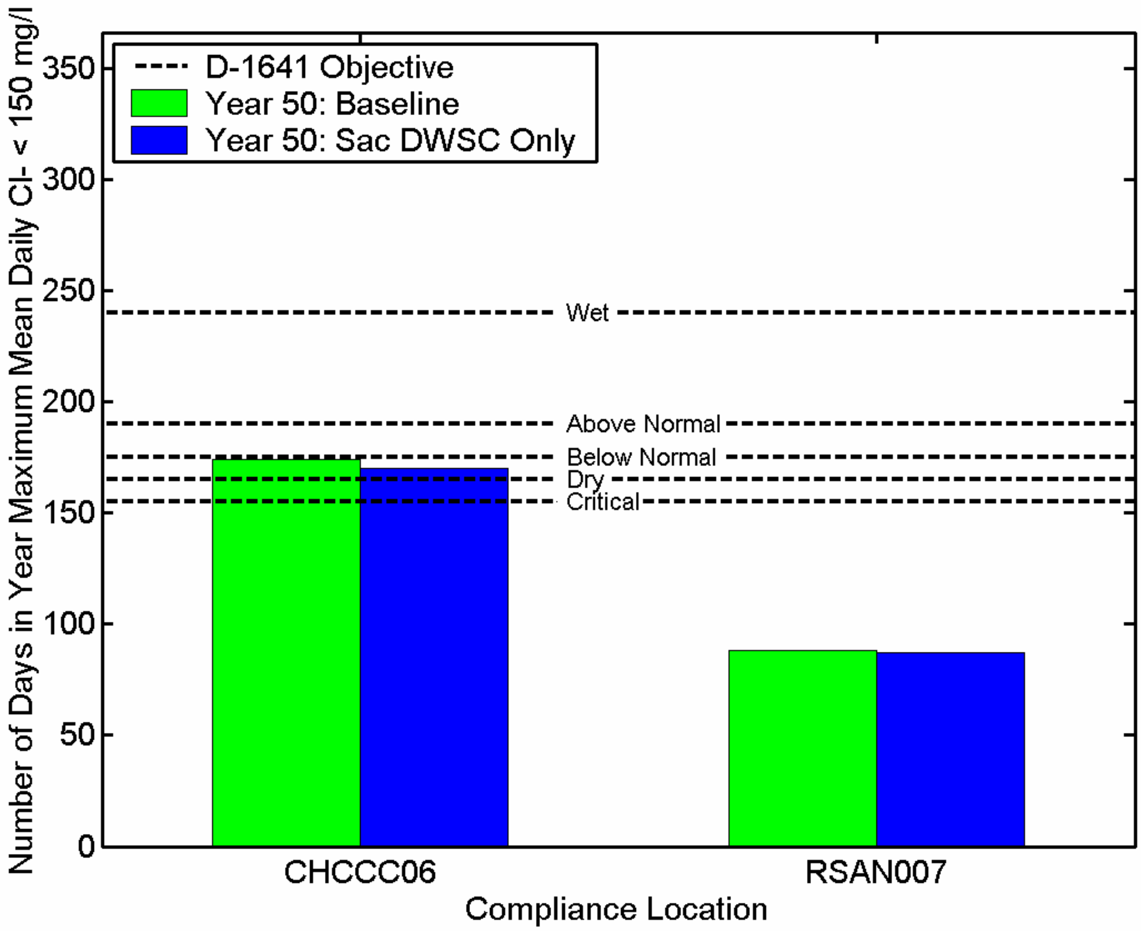


Figure 5.6-1 Number of days during the Year 50 simulation period that predicted mean daily concentration of Cl^- is less than 150 mg/l at Contra Costa Canal at Pumping Plant #1 (CHCCC06) and the Antioch Water Works intake (RSAN007) for the Year 50 Baseline scenario and the Year 50 Sacramento DWSC Only Deepening scenario.

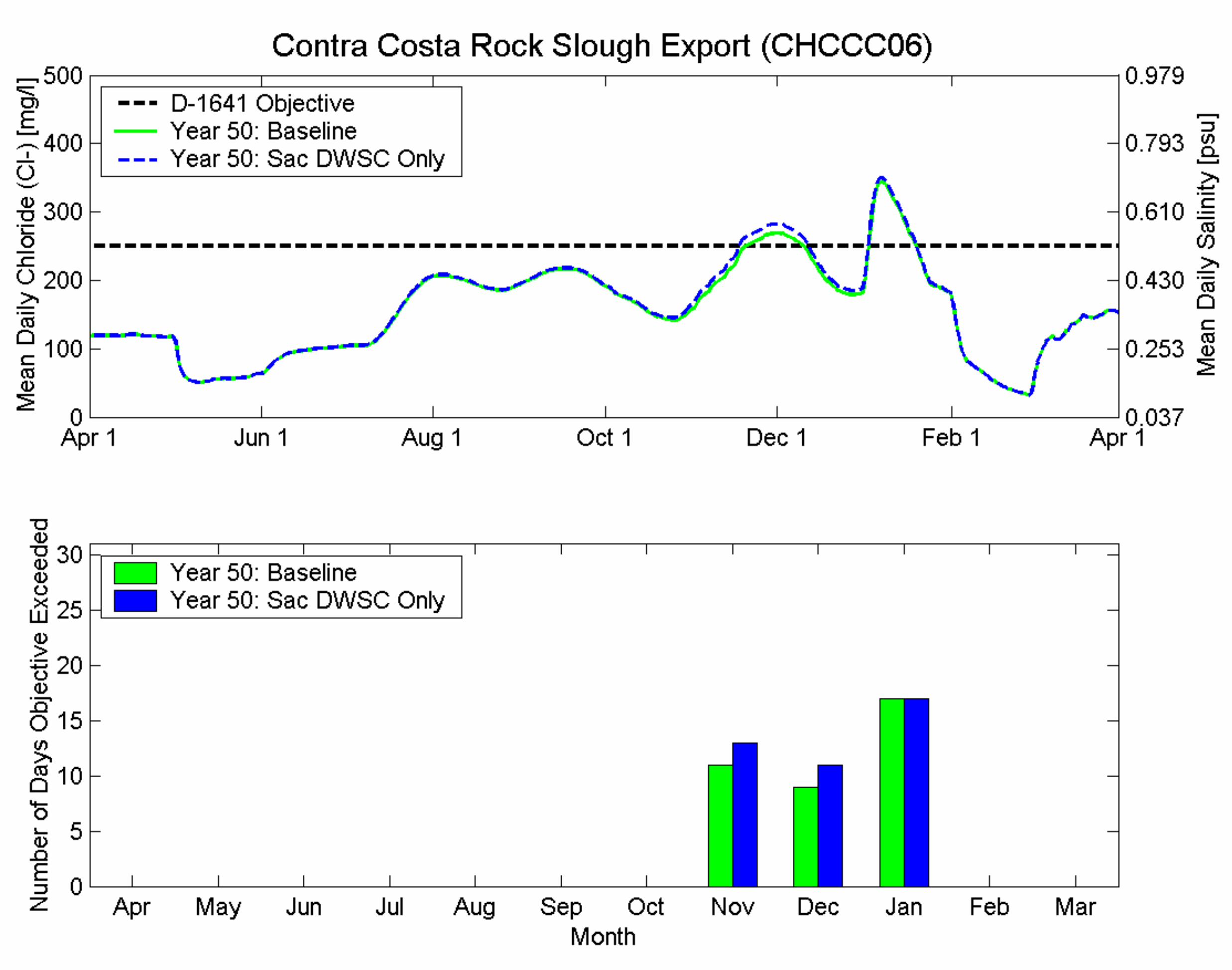


Figure 5.6-2 Predicted mean daily Cl^- concentration at Contra Costa Rock Slough Export (CHCCC06) for the Year 50 Baseline scenario and the Year 50 Sacramento DWSC Only Deepening scenario (top); number of days each month that predicted mean daily concentration of Cl^- at CHCCC06 exceeds 250 mg/l Cl^- for each scenario during the Year 50 simulation period (bottom).

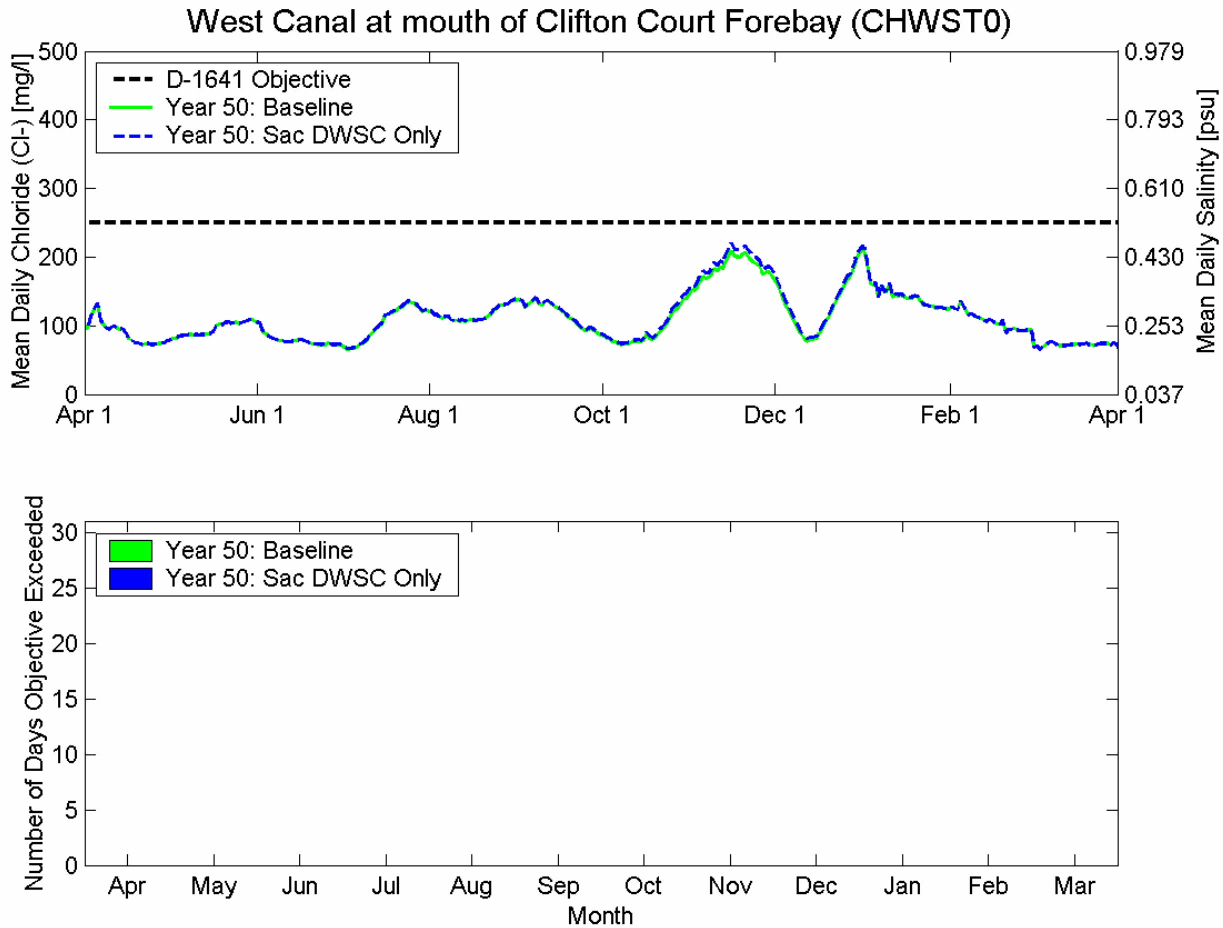


Figure 5.6-3 Predicted mean daily Cl^- concentration at West Canal at mouth of Clifton Court Forebay (CHWST0) for the Year 50 Baseline scenario and the Year 50 Sacramento DWSC Only Deepening scenario (top); number of days each month that predicted mean daily concentration of Cl^- at CHWST0 exceeds 250 mg/l Cl^- for each scenario during the Year 50 simulation period (bottom).

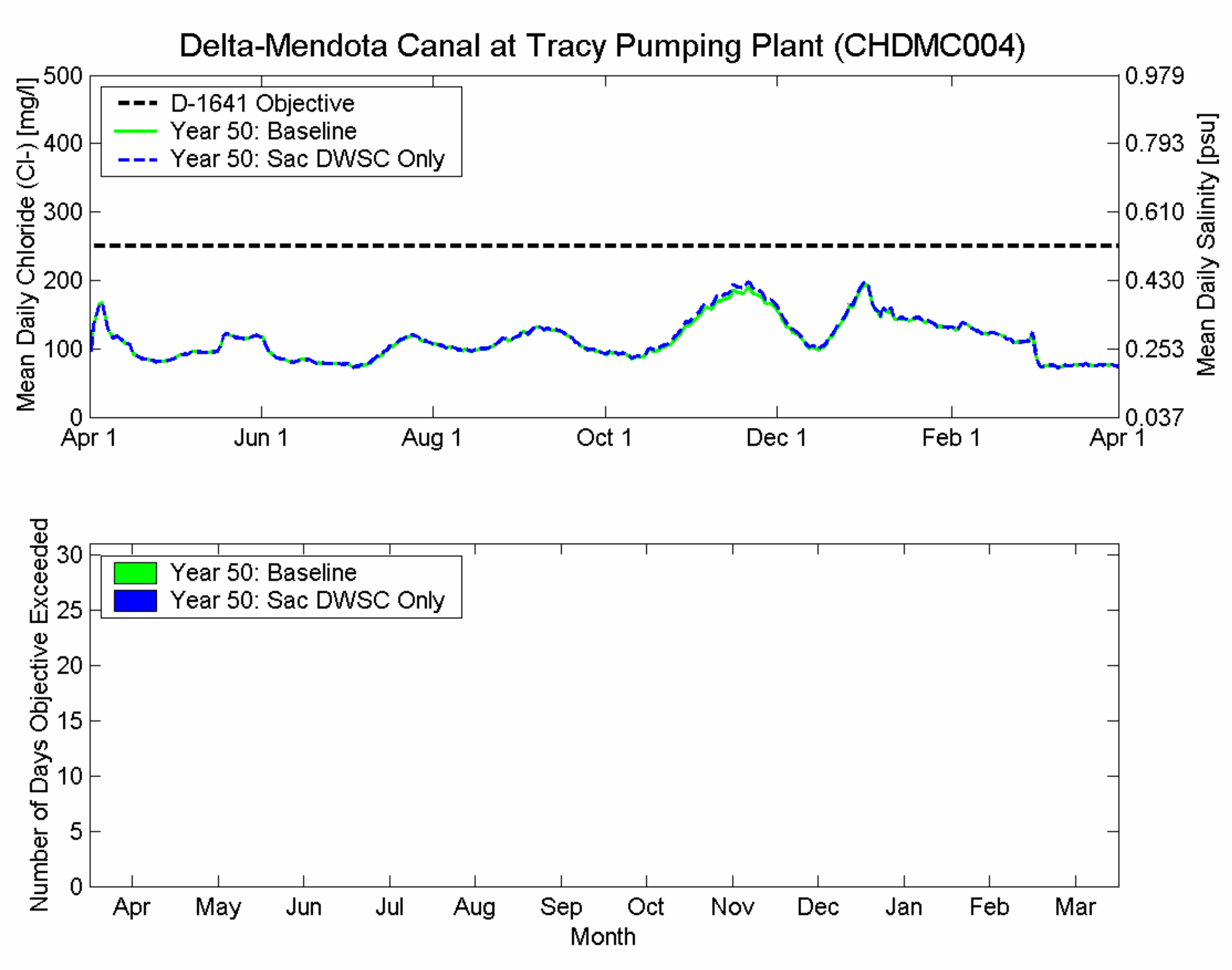


Figure 5.6-4 Predicted mean daily Cl^- concentration at Delta-Mendota Canal at Tracy Pumping Plant (CHDMC004) for the Year 50 Baseline scenario and the Year 50 Sacramento DWSC Only Deepening scenario (top); number of days each month that predicted mean daily concentration of Cl^- at CHDMC004 exceeds 250 mg/l Cl^- for each scenario during the Year 50 simulation period (bottom).

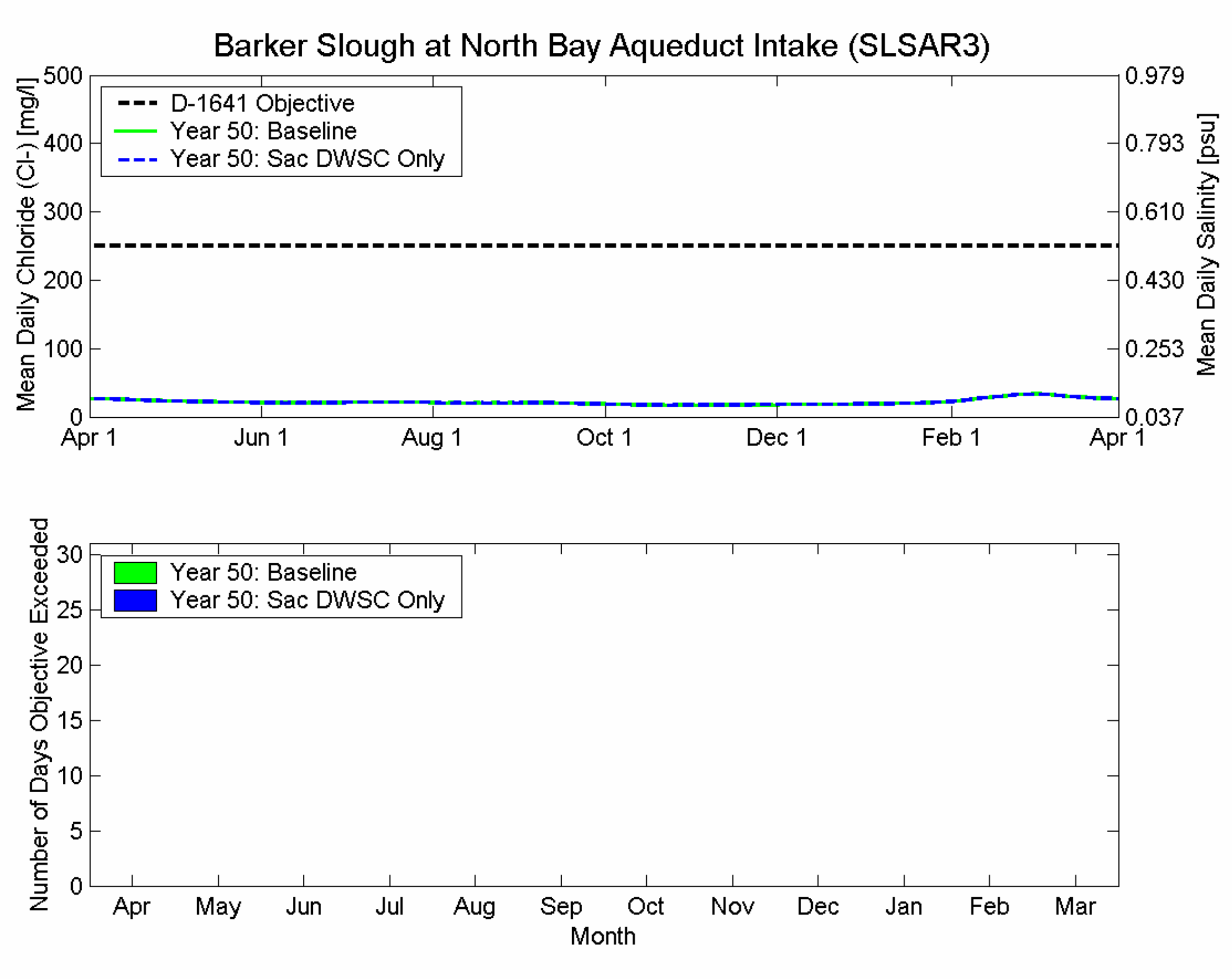


Figure 5.6-5 Predicted mean daily Cl^- concentration at Barker Slough at North Bay Aqueduct Intake (SLSAR3) for the Year 50 Baseline scenario and the Year 50 Sacramento DWSC Only Deepening scenario (top); number of days each month that predicted mean daily concentration of Cl^- at SLSAR3 exceeds 250 mg/l Cl^- for each scenario during the Year 50 simulation period (bottom).

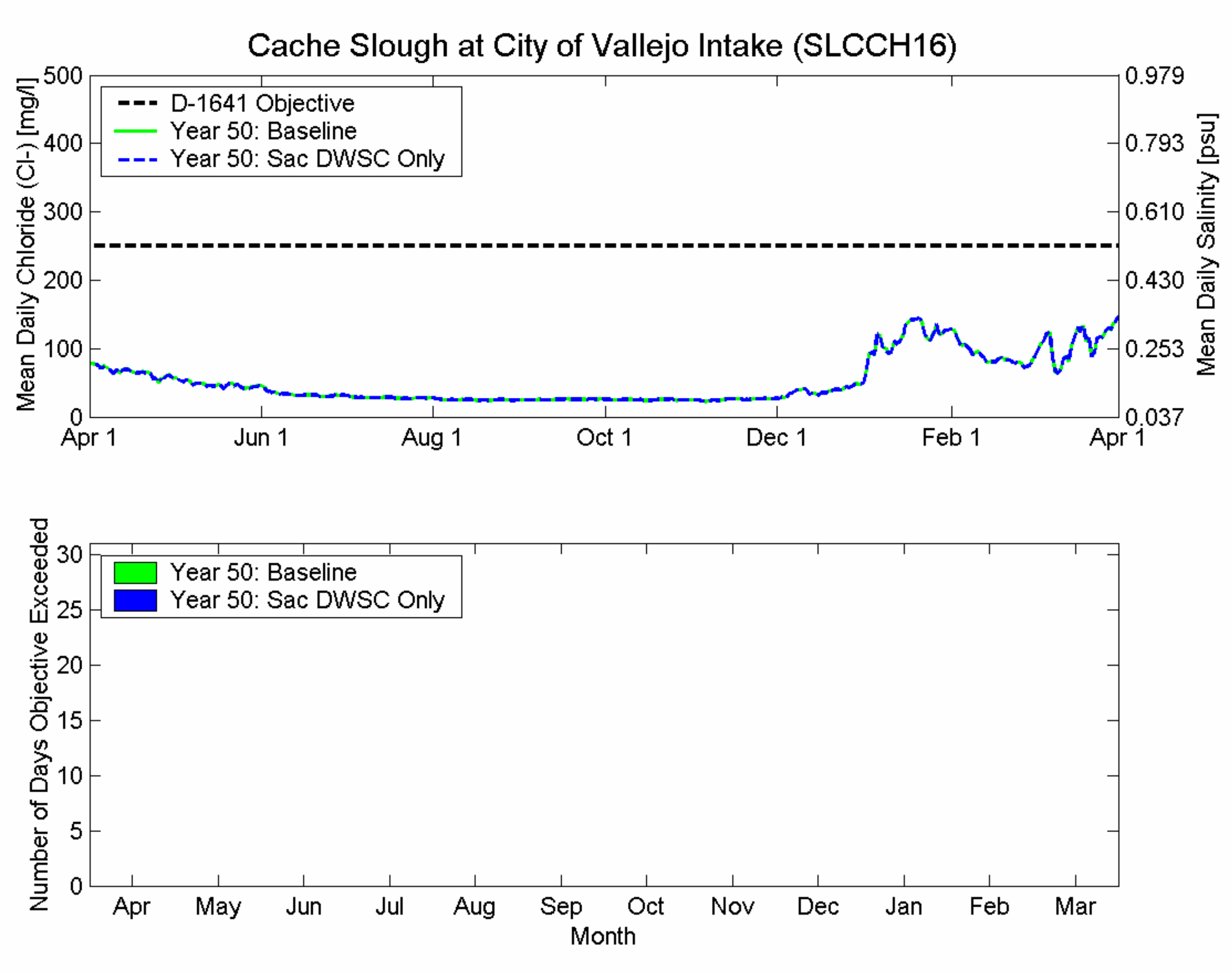


Figure 5.6-6 Predicted mean daily Cl^- concentration at Cache Slough at City of Vallejo Intake (SLCCH16) for the Year 50 Baseline scenario and the Year 50 Sacramento DWSC Only Deepening scenario (top); number of days each month that predicted mean daily concentration of Cl^- at SLCCH16 exceeds 250 mg/l Cl^- for each scenario during the Year 50 simulation period (bottom).

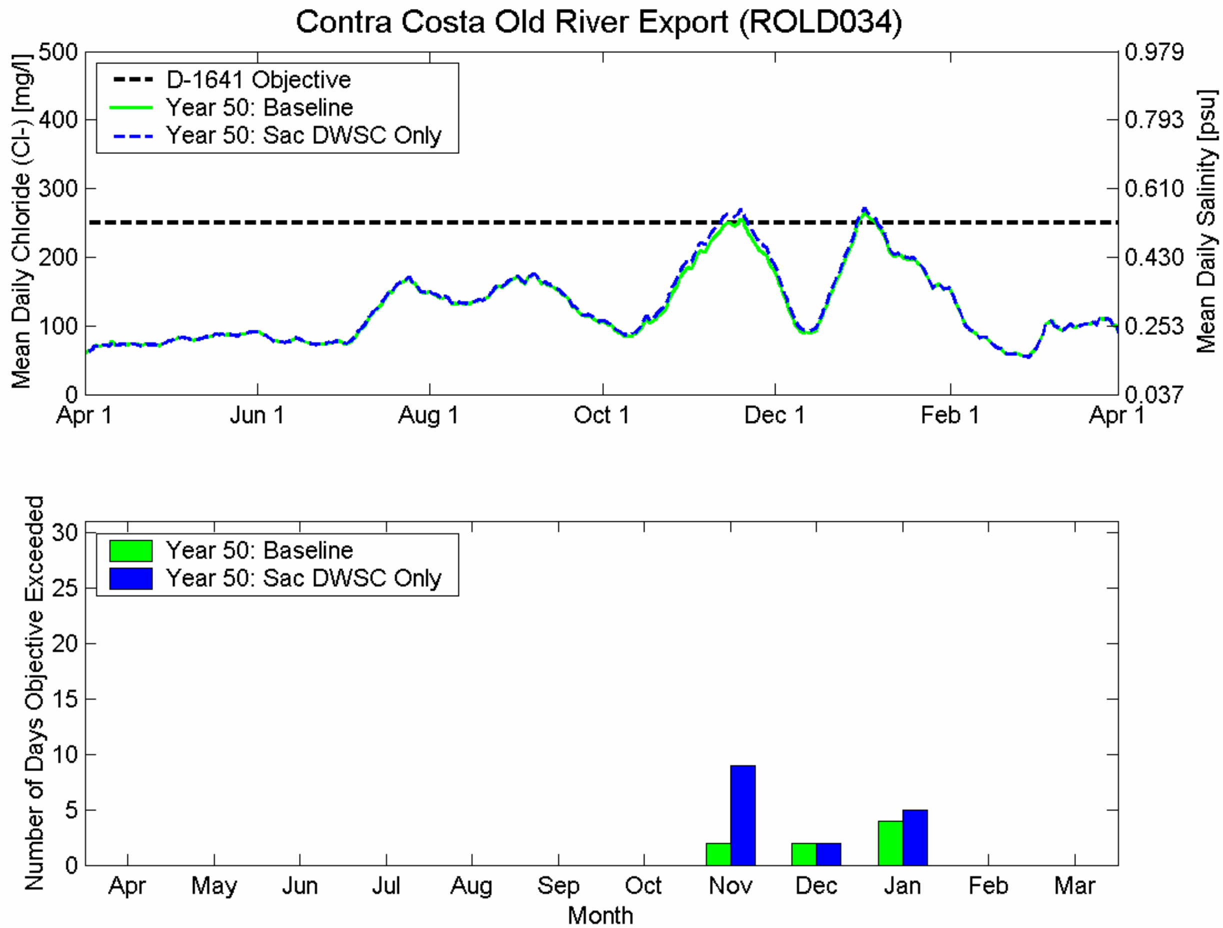


Figure 5.6-7 Predicted mean daily Cl^- concentration at Contra Costa Old River Export (ROLD034) for the Year 50 Baseline scenario and the Year 50 Sacramento DWSC Only Deepening scenario (top); number of days each month that predicted mean daily concentration of Cl^- at ROLD034 exceeds 250 mg/l Cl^- for each scenario during the Year 50 simulation period (bottom).

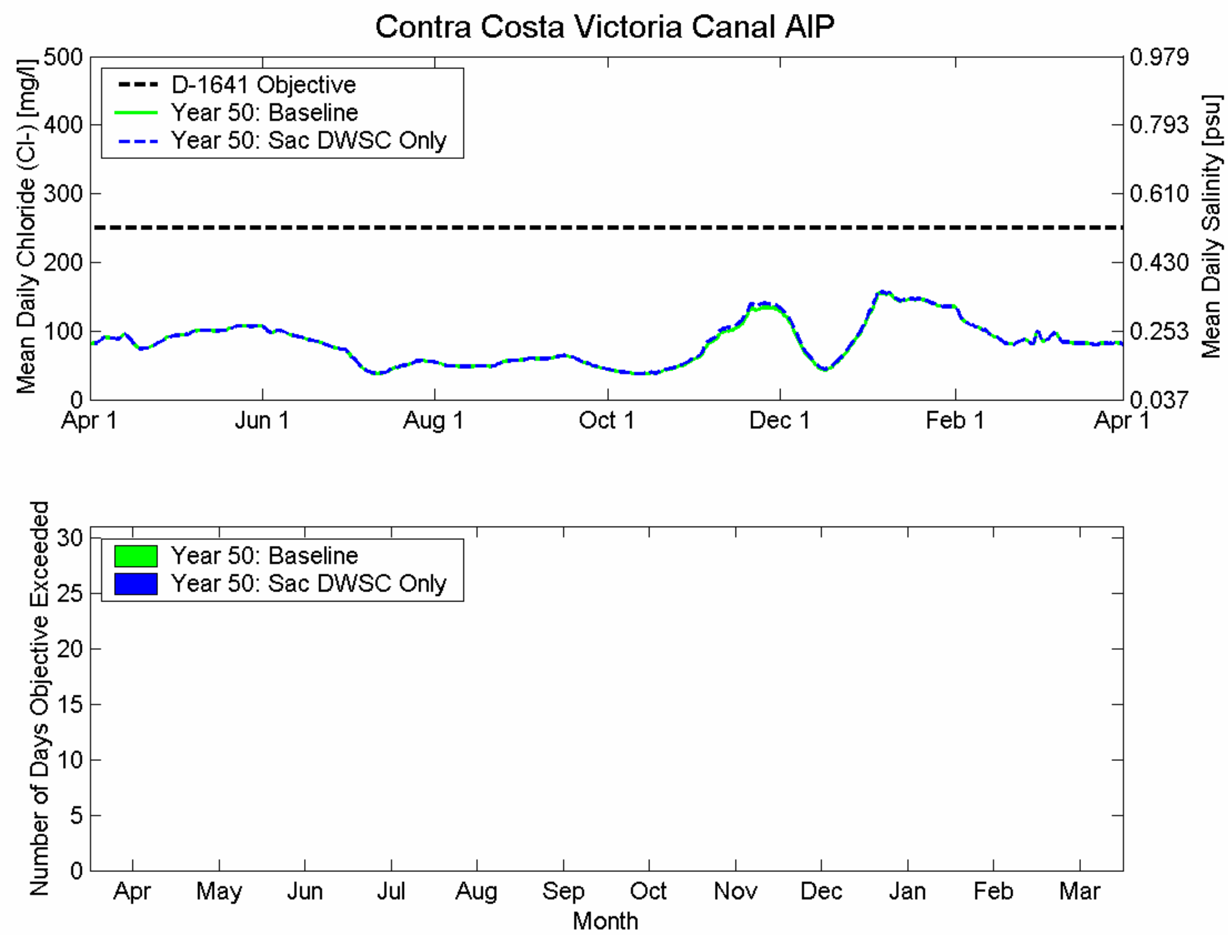


Figure 5.6-8 Predicted mean daily Cl^- concentration at Contra Costa Victoria Canal Alternative Intake Point for the Year 50 Baseline scenario and the Year 50 Sacramento DWSC Only Deepening scenario (top); number of days each month that predicted mean daily concentration of Cl^- at Contra Costa Victoria Canal Alternative Intake Point exceeds 250 mg/l Cl^- for each scenario during the Year 50 simulation period (bottom).

5.6.2 Water Quality Objectives for Agricultural Beneficial Use

The D-1641 water quality objectives for agricultural beneficial uses, shown in Table 3-2, are based on either maximum 14-day running average EC, maximum 30-day running average EC, or maximum monthly average of mean daily EC at the stations shown on Figure 3.4-2. The western Delta and interior Delta water quality objectives for agricultural beneficial use depend on water year type on the Sacramento River and apply only from April 1 to August 15, while the southern Delta and export area water quality objectives for agricultural beneficial use apply uniformly across all water year types during the whole year.

Water year 1994 (from October 1, 1993 through September 30, 1994) was classified as a "critical" year, the lowest flow classification, on both the Sacramento River and San Joaquin River. Water Year 1995 (from October 1, 1994 through September 30, 1995) was classified as a "wet" year, the highest flow classification, on both the Sacramento River and the San Joaquin River (DWR, 2009b). Since the April 1 through August 15 period falls within water year 1994, the "critical" year water quality objectives shown in Table 3-2 are applied for the western Delta and interior Delta stations.

Figure 5.6-9 shows the predicted 14-day running average EC on the Sacramento River at Emmaton for the Year 50 Baseline scenario and the Year 50 Sacramento DWSC Only Deepening scenario. Small increases in 14-day running average EC under the Year 50 Sacramento DWSC Only Deepening scenario are predicted between November and December. The water quality objectives for agricultural beneficial use apply from April 1 through August 15. The water quality objective of maximum 14-day running average EC on the Sacramento River at Emmaton is not exceeded for any days under the Year 50 Baseline scenario or the Year 50 Sacramento DWSC Only Deepening scenario.

Figure 5.6-10 shows the predicted 14-day running average EC on the San Joaquin River at Jersey Point for the Year 50 Baseline scenario and the Year 50 Sacramento DWSC Only Deepening scenario. Small increases in 14-day running average EC under the Year 50 Sacramento DWSC Only Deepening scenario are predicted between November and December. The water quality objectives for agricultural beneficial use apply from April 1 through August 15. The water quality objective of maximum 14-day running average EC on the San Joaquin River at Jersey Point is not exceeded under the Year 50 Baseline scenario or the Year 50 Sacramento DWSC Only Deepening scenario.

Figure 5.6-11 shows the predicted 14-day running average EC on the South Fork Mokelumne River at Terminous for the Year 50 Baseline scenario and the Year 50 Sacramento DWSC Only Deepening scenario. The predicted 14-day running average EC is nearly identical for both scenarios indicating that there is no predicted effect on EC on the South Fork Mokelumne River at Terminous resulting from the Year 50 Sacramento DWSC Only Deepening scenario. The water quality objectives for agricultural beneficial use apply from April 1 through August 15. The water quality objective of maximum 14-day running average EC on the South Fork Mokelumne River at Terminous is not exceeded under the Year 50 Baseline scenario or the Year 50 Sacramento DWSC Only Deepening scenario.

Figure 5.6-12 shows the predicted 14-day running average EC on the San Joaquin River at San Andreas Landing for the Year 50 Baseline scenario and the Year 50 Sacramento DWSC Only Deepening scenario. Small increases in 14-day running average EC under the Year 50 Sacramento DWSC Only Deepening scenario are predicted between November and December. The water quality objectives for agricultural beneficial use apply from April 1 through August 15. The water quality objective of maximum 14-day running average EC on the San Joaquin River at San Andreas Landing is not exceeded under the Year 50 Baseline scenario or the Year 50 Sacramento DWSC Only Deepening scenario.

Figure 5.6-13 shows the predicted 30-day running average EC on the San Joaquin River at Airport Way Bridge, Vernalis for the Year 50 Baseline scenario and the Year 50 Sacramento DWSC Only Deepening scenario. The predicted 30-day running average EC is identical for both scenarios indicating that there is no predicted effect on EC on the San Joaquin River at Vernalis resulting from the Year 50 Sacramento DWSC Only Deepening scenario. The water quality objectives for agricultural beneficial use apply all year. The water quality objective of maximum 30-day running average EC on the San Joaquin River at Vernalis is exceeded for 20 days during April both scenarios. Since the predicted EC at Vernalis is almost entirely dependent on the specified inflow concentration on the San Joaquin River which is provided as part of the CALSIM II output, the compliance with this objective is dependent on the inflow concentration which is not impacted by the deepening scenario.

Figure 5.6-14 shows the predicted 30-day running average EC on the San Joaquin River at Brandt Bridge for the Year 50 Baseline scenario and the Year 50 Sacramento DWSC Only Deepening scenario. The predicted 30-day running average EC is nearly identical for both scenarios indicating that there is no predicted effect on EC on the San Joaquin River at Brandt Bridge resulting from the Year 50 Sacramento DWSC Only Deepening scenario. The water quality objectives for agricultural beneficial use apply all year. The water quality objective of maximum 30-day running average EC on the San Joaquin River at Brandt Bridge is exceeded for 24 days during April for both the Year 50 Baseline scenario and the Year 50 Sacramento DWSC Only Deepening scenario. Since the predicted EC at Brandt Bridge is largely dependent on the specified inflow concentration on the San Joaquin River at Vernalis, and the compliance with this objective is not impacted by the deepening scenario.

Figure 5.6-15 shows the predicted 30-day running average EC on Old River near Middle River for the Year 50 Baseline scenario and the Year 50 Sacramento DWSC Only Deepening scenario. The predicted 30-day running average EC is identical for both scenarios indicating that there is no predicted effect on EC on Old River near Middle River resulting from the Year 50 Sacramento DWSC Only Deepening scenario. The water quality objectives for agricultural beneficial use apply all year. The water quality objective of maximum 30-day running average EC on Old River near Middle River is exceeded for 23 days during April for both the Year 50 Baseline scenario and the Year 50 Sacramento DWSC Only Deepening scenario. The compliance with this water quality objective is not impacted by the deepening scenario.

Figure 5.6-16 shows the predicted 30-day running average EC on Old River at Tracy Road Bridge for the Year 50 Baseline scenario and the Year 50 Sacramento DWSC Only Deepening scenario. The predicted 30-day running average EC is nearly identical for both scenarios indicating only a very small effect on EC on Old River at Tracy Road Bridge resulting from the Year 50 Sacramento DWSC Only Deepening scenario. The water quality objectives for agricultural beneficial use apply all year. The water quality objective of maximum 30-day running average EC on Old River at Tracy Road Bridge is exceeded for 27 days during April for both scenarios. Compliance with this objective during April is largely dependent on the inflow concentration at Vernalis which is not impacted by either of the deepening scenarios. During July, the water quality objective is exceeded for 12 days under the Year 50 Baseline scenario and 13 days under the Year 50 Sacramento DWSC Only Deepening scenario (an increase of 1 day). Despite this 1 day difference in compliance during July, the absolute difference in 30-day running average EC between the Year 50 Baseline scenario and the Year 50 Sacramento DWSC Only Deepening scenario during July is extremely small as seen on Figure 5.6-16.

The D-1641 water quality objectives for agricultural beneficial uses at the export areas stipulate that the monthly average of mean daily EC not exceed 1.0 mmhos/cm. Figure 5.6-17 and Figure 5.6-18 show the predicted monthly average of mean daily EC for the two export areas shown in Table 3-2 which have water quality objectives for agricultural beneficial uses.

Figure 5.6-17 shows the predicted monthly average of mean daily EC at West Canal at mouth of Clifton Court Forebay for the Year 50 Baseline scenario and the Year 50 Sacramento DWSC Only Deepening scenario. The Year 50 Sacramento DWSC Only Deepening scenario has a very small effect on monthly average EC West Canal at mouth of Clifton Court Forebay except during November through January when slightly larger EC values associated with the Year 50 Sacramento DWSC Only Deepening scenario are predicted. Under both the Year 50 Baseline Scenario and the Year 50 Sacramento DWSC Only Deepening scenario, the water quality objective is met at West Canal at mouth of Clifton Court Forebay for all months except January. In January, the predicted monthly average of mean daily EC is 1.08 mmhos/cm for the Year 50 Baseline scenario and 1.09 mmhos/cm for the Year 50 Sacramento DWSC Only Deepening scenario (an increase of 0.01 mmhos/cm).

Figure 5.6-18 shows the predicted monthly average of mean daily EC at the Delta-Mendota Canal at Tracy Pumping Plant for the Year 50 Baseline scenario and the Year 50 Sacramento DWSC Only Deepening scenario. The Year 50 Sacramento DWSC Only Deepening scenario has an extremely small effect on monthly average EC at the Delta-Mendota Canal at Tracy Pumping Plant except during November and December when slightly larger EC increases associated with the Year 50 Sacramento DWSC Only Deepening scenario are predicted. Under both scenarios, the water quality objective is met at the Delta-Mendota Canal at Tracy Pumping Plant during all months during the simulation period.

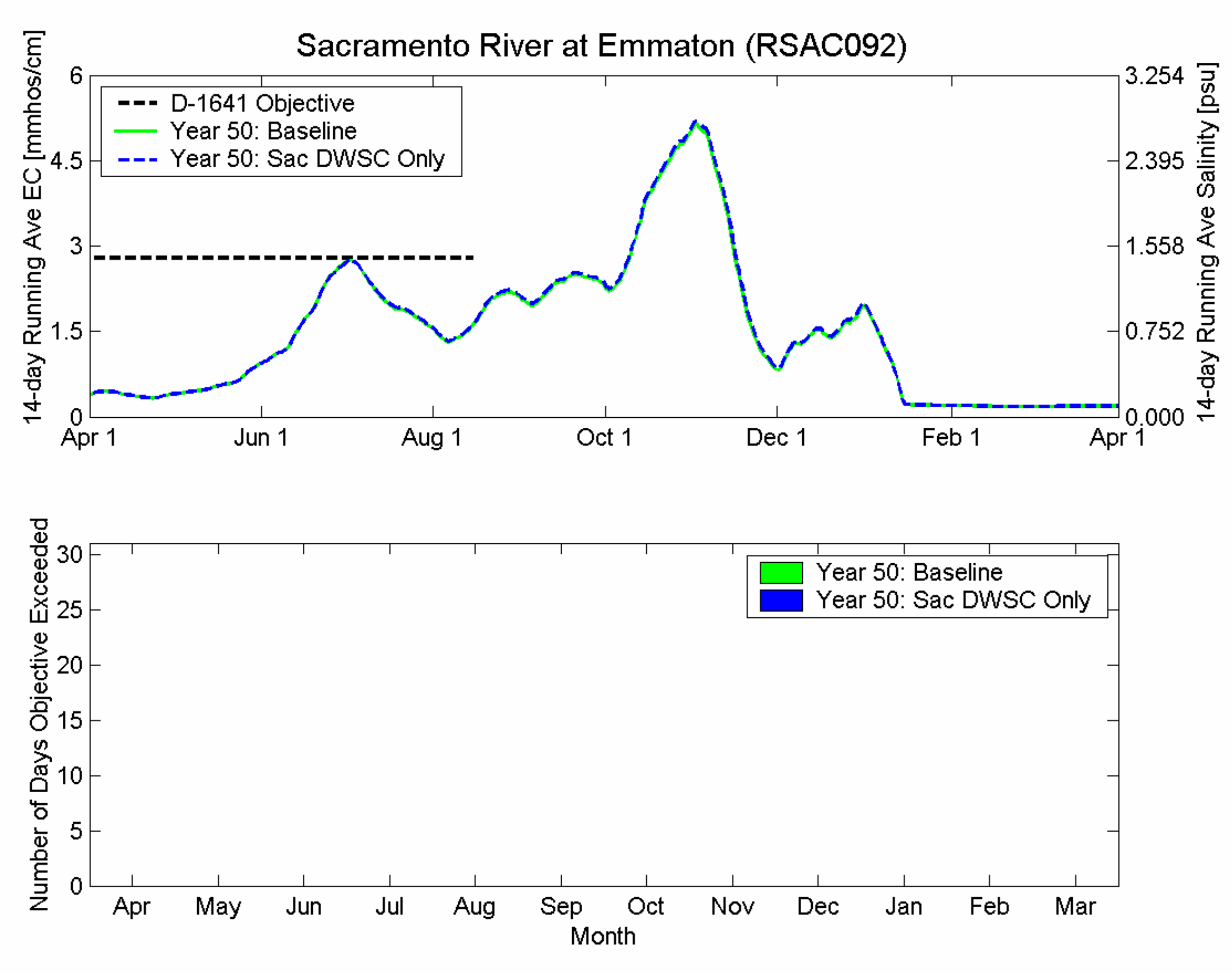


Figure 5.6-9 Predicted 14-day running average EC at Sacramento River at Emmaton (RSAC092) for the Year 50 Baseline scenario and the Year 50 Sacramento DWSC Only Deepening scenario (top); number of days each month that predicted 14-day running average EC at RSAC092 exceeds D-1641 water quality objectives for each scenario during the Year 50 simulation period (bottom).

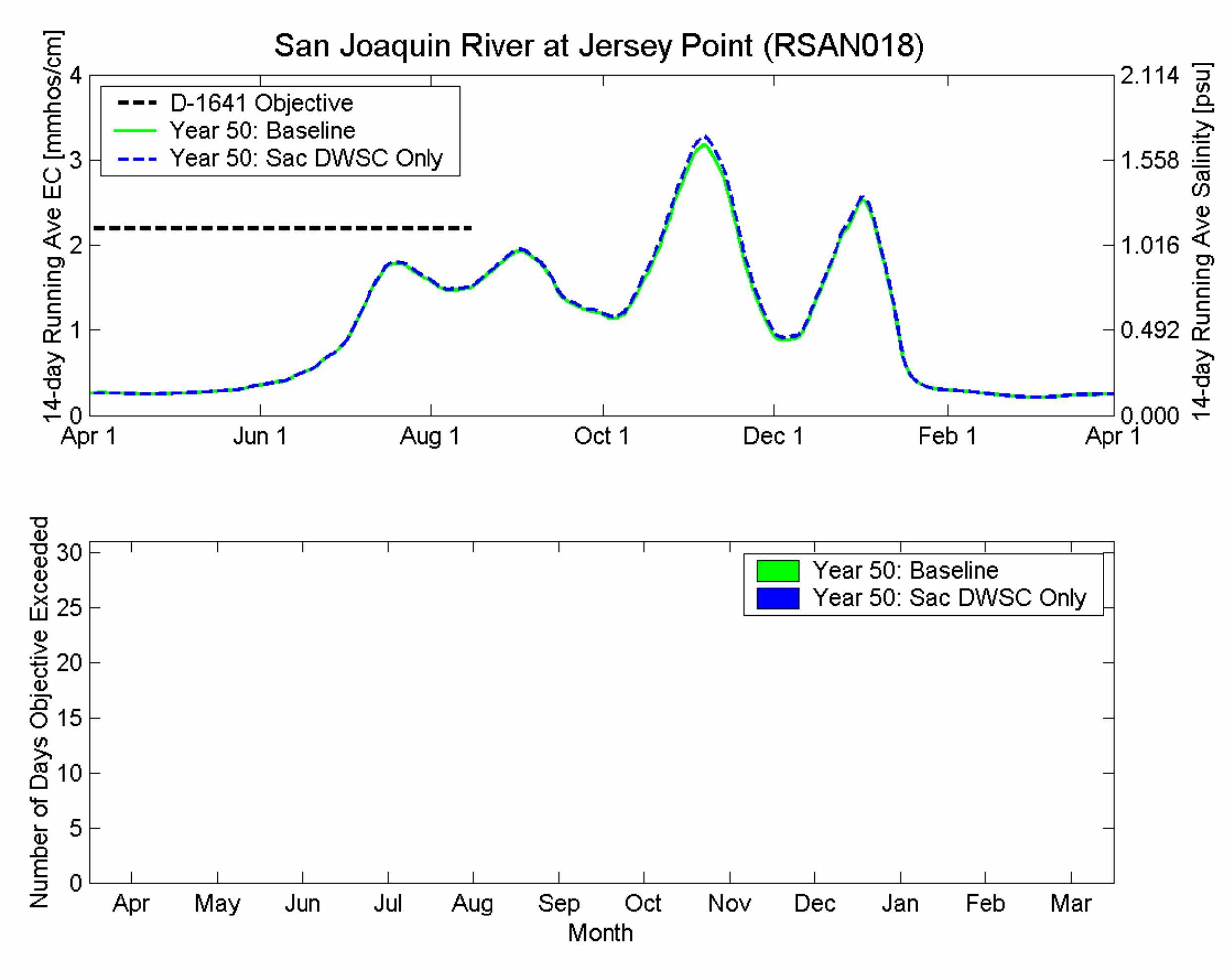


Figure 5.6-10 Predicted 14-day running average EC at San Joaquin River at Jersey Point (RSAN018) for the Year 50 Baseline scenario and the Year 50 Sacramento DWSC Only Deepening scenario (top); number of days each month that predicted 14-day running average EC at RSAN018 exceeds D-1641 water quality objectives for each scenario during the Year 50 simulation period (bottom).

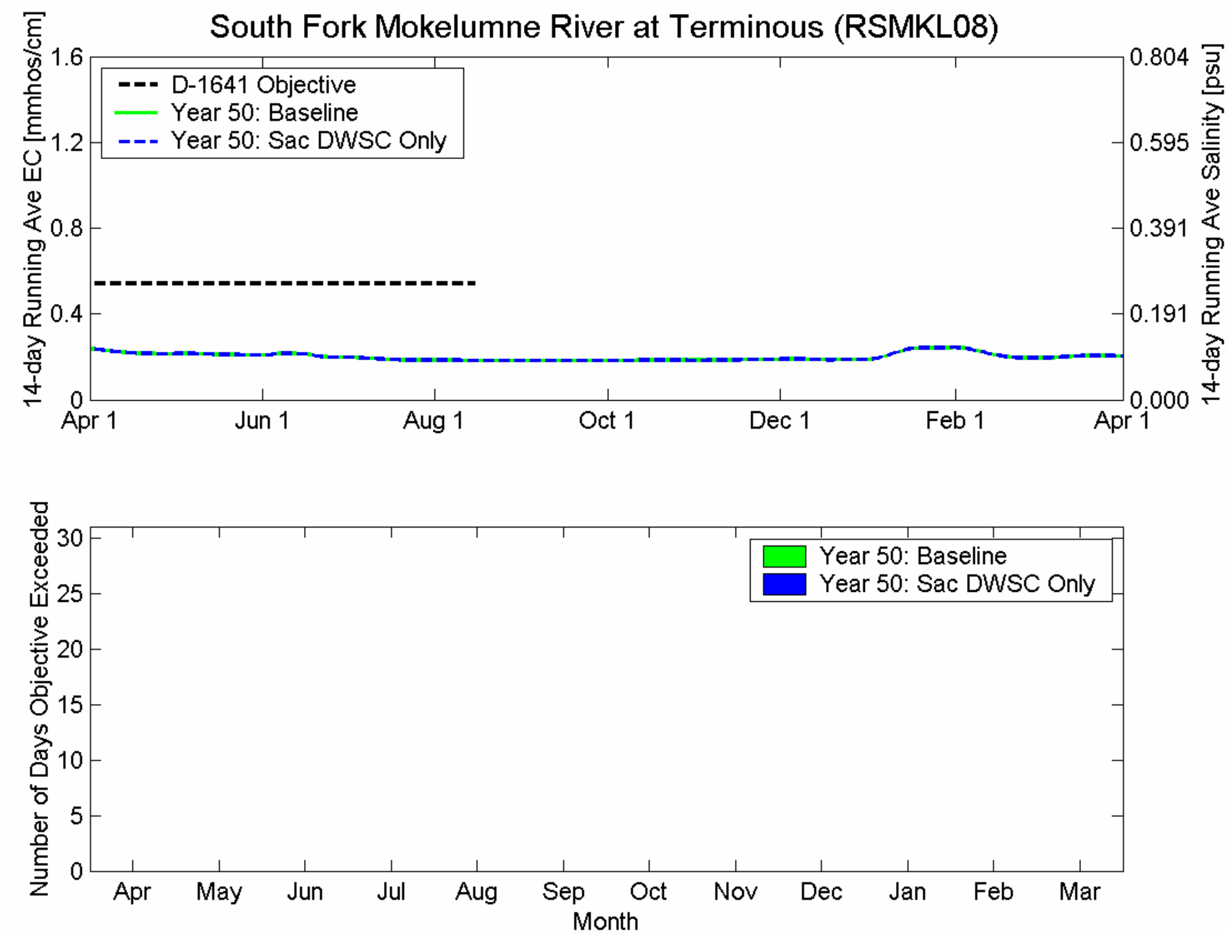


Figure 5.6-11 Predicted 14-day running average EC at South Fork Mokelumne River at Terminous (RSMKL08) for the Year 50 Baseline scenario and the Year 50 Sacramento DWSC Only Deepening scenario (top); number of days each month that predicted 14-day running average EC at RSMKL08 exceeds D-1641 water quality objectives for each scenario during the Year 50 simulation period (bottom).

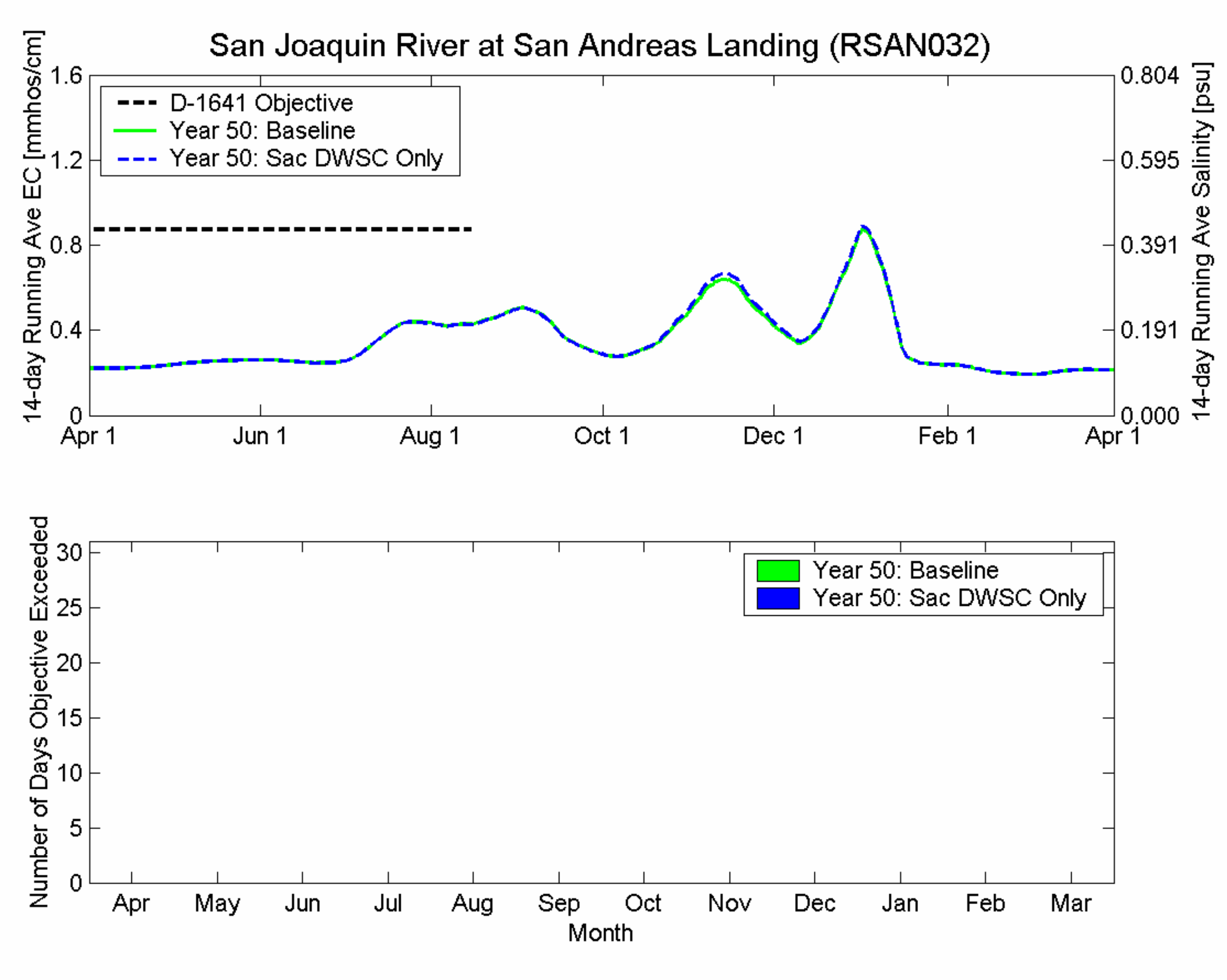


Figure 5.6-12 Predicted 14-day running average EC at San Joaquin River at San Andreas Landing (RSAN032) for the Year 50 Baseline scenario and the Year 50 Sacramento DWSC Only Deepening scenario (top); number of days each month that predicted 14-day running average EC at RSAN032 exceeds D-1641 water quality objectives for each scenario during the Year 50 simulation period (bottom).

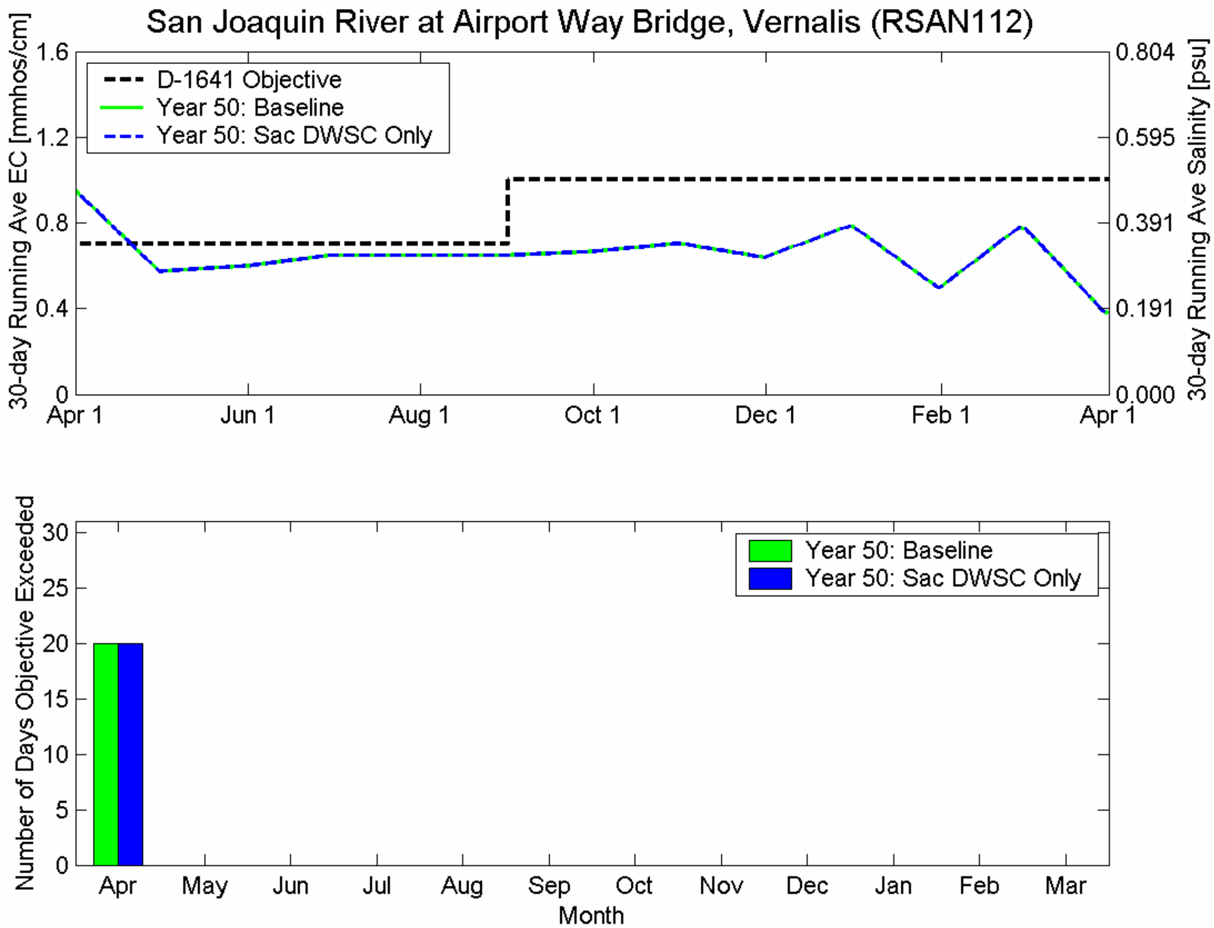


Figure 5.6-13 Predicted 30-day running average EC at San Joaquin River at Airport Way Bridge, Vernalis (RSAN112) for the Year 50 Baseline scenario and the Year 50 Sacramento DWSC Only Deepening scenario (top); number of days each month that predicted 14-day running average EC at RSAN112 exceeds D-1641 water quality objectives for each scenario during the Year 50 simulation period (bottom).

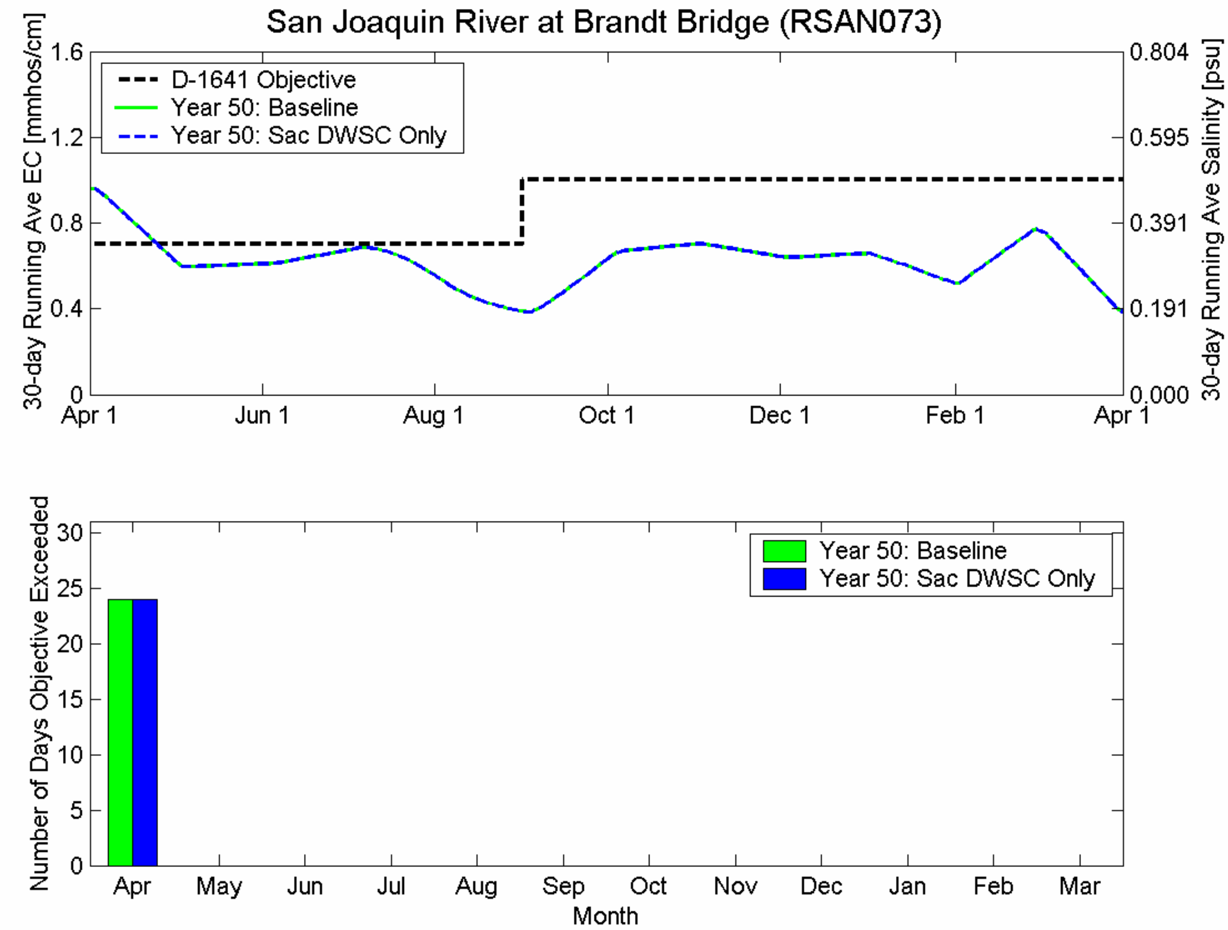
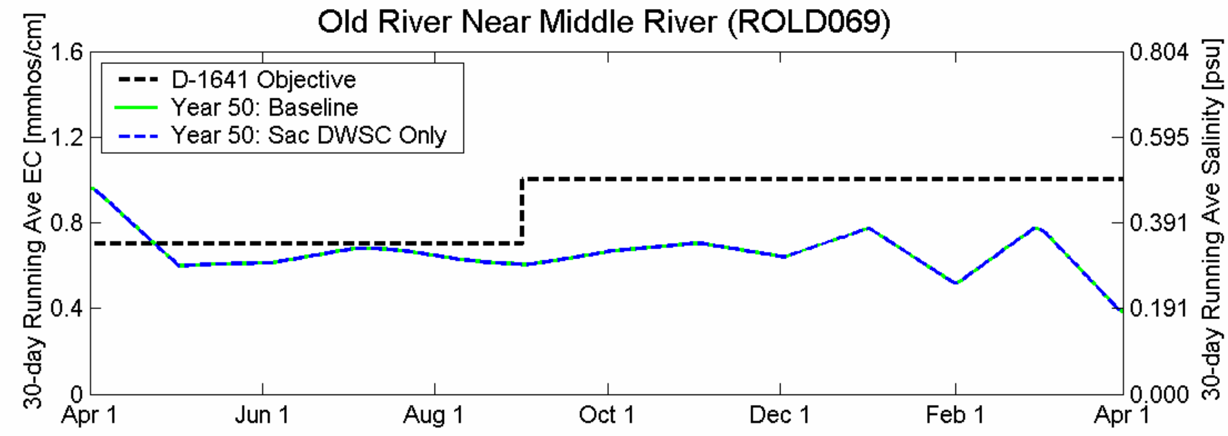


Figure 5.6-14 Predicted 30-day running average EC at San Joaquin River at Brandt Bridge (RSAN073) for the Year 50 Baseline scenario and the Year 50 Sacramento DWSC Only Deepening scenario (top); number of days each month that predicted 14-day running average EC at RSAN073 exceeds D-1641 water quality objectives for each scenario during the Year 50 simulation period (bottom).



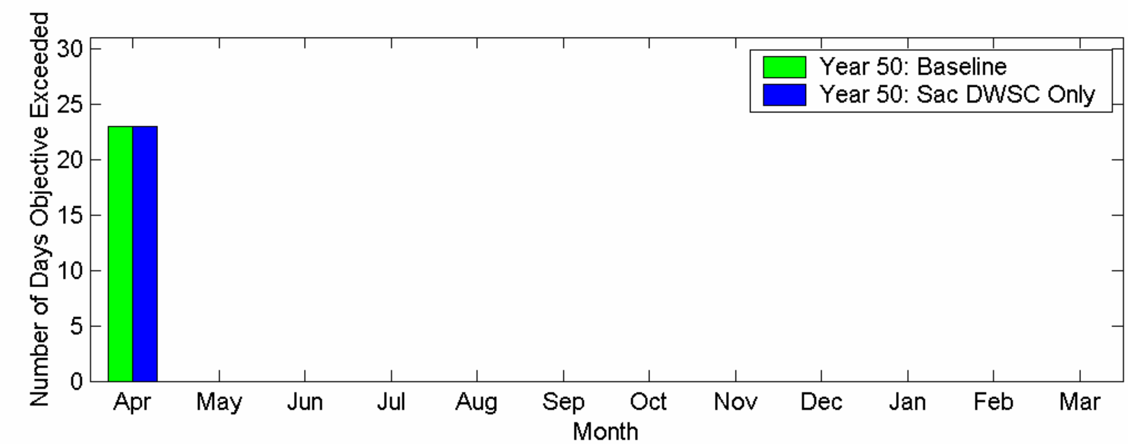


Figure 5.6-15 Predicted 30-day running average EC at Old River Near Middle River (ROLD069) for the Year 50 Baseline scenario and the Year 50 Sacramento DWSC Only Deepening scenario (top); number of days each month that predicted 14-day running average EC at ROLD069 exceeds D-1641 water quality objectives for each scenario during the Year 50 simulation period (bottom).

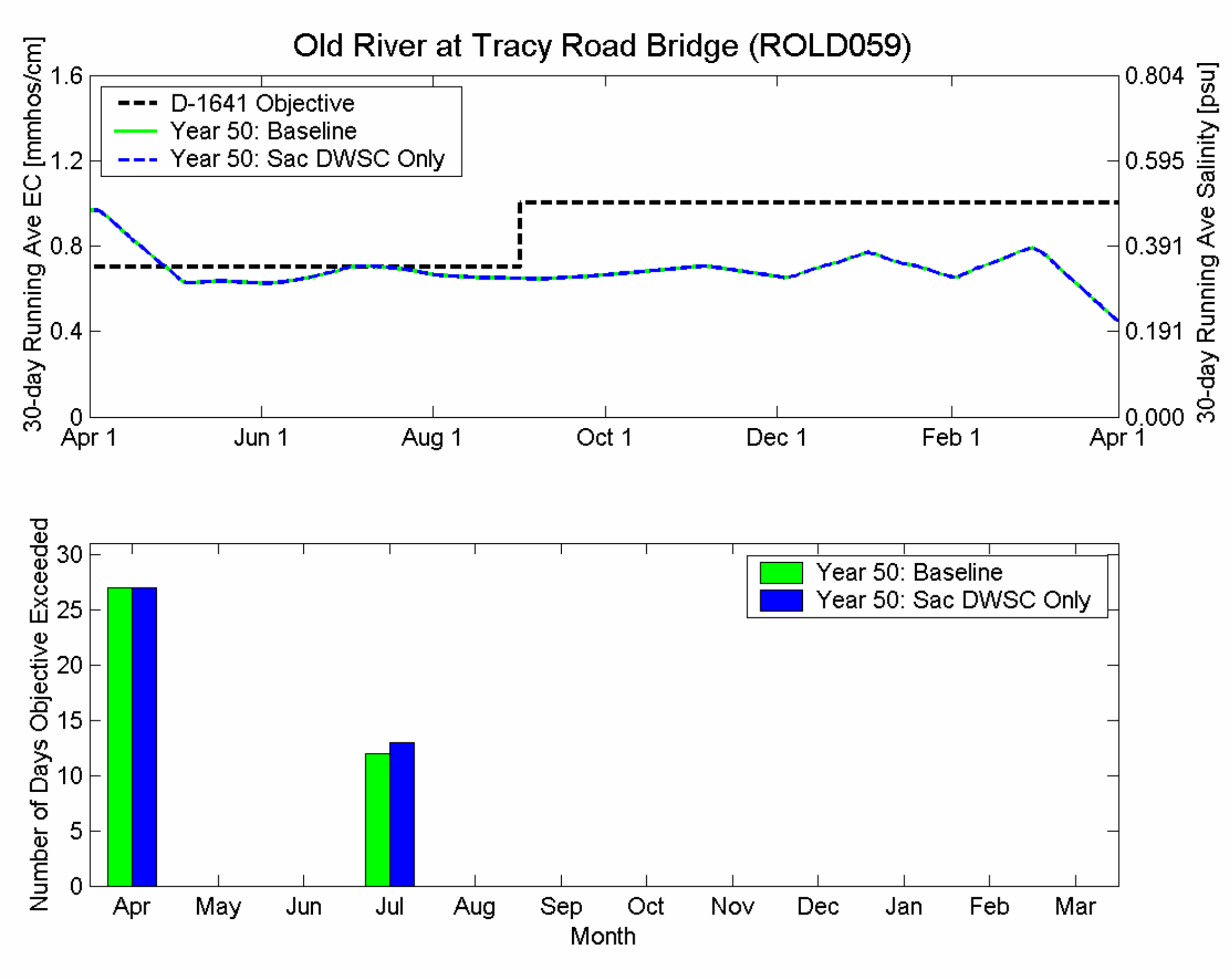


Figure 5.6-16 Predicted 30-day running average EC at Old River at Tracy Road Bridge (ROLD059) for the Year 50 Baseline scenario and the Year 50 Sacramento DWSC Only Deepening scenario (top); number of days each month that predicted 14-day running average EC at ROLD059 exceeds D-1641 water quality objectives for each scenario during the Year 50 simulation period (bottom).

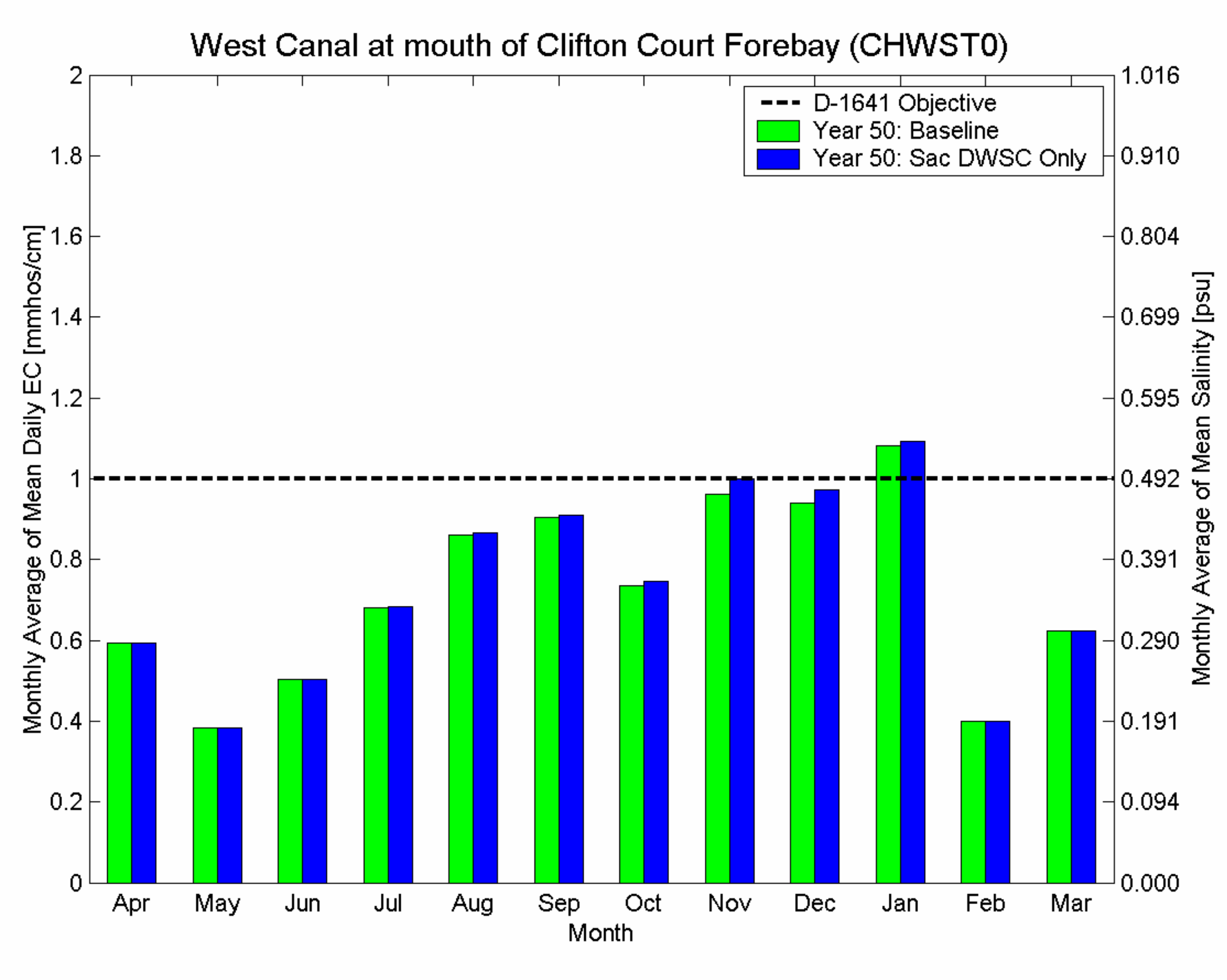


Figure 5.6-17 Predicted monthly average of mean daily EC at West Canal at mouth of Clifton Court Forebay (CHWST0) for the Year 50 Baseline scenario and the Year 50 Sacramento DWSC Only Deepening scenario, shown relative to the D-1641 water quality objectives for agricultural beneficial uses.

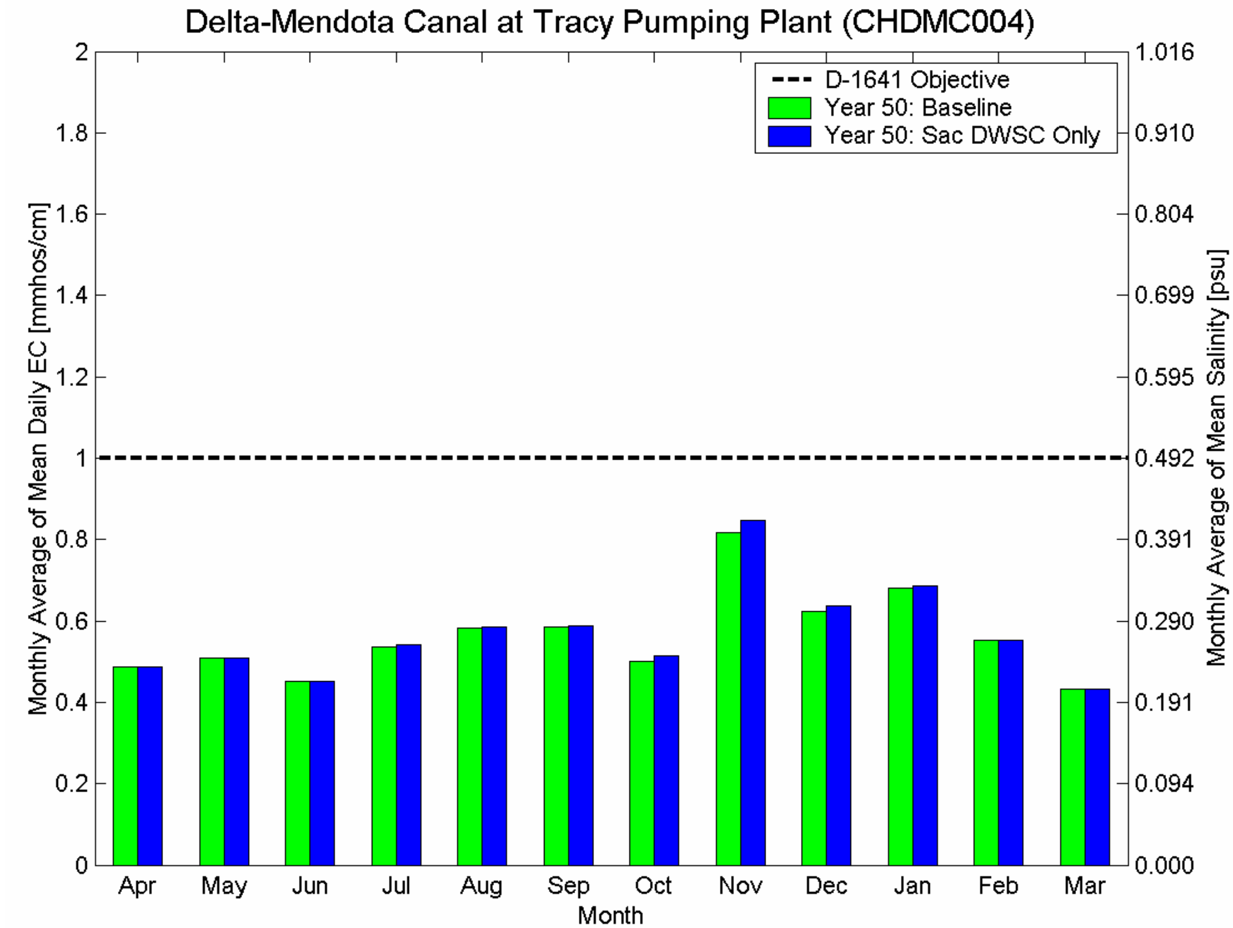


Figure 5.6-18 Predicted monthly average of mean daily EC at Delta-Mendota Canal at Tracy Pumping Plant (CHDMC004) for the Year 50 Baseline scenario and the Year 50 Sacramento DWSC Only Deepening scenario, shown relative to the D-1641 water quality objectives for agricultural beneficial uses.

5.6.3 Water Quality Objectives for Fish and Wildlife Beneficial Uses

The D-1641 water quality objectives for fish and wildlife beneficial uses, shown in Table 3-3, are based on the maximum 14-day running average EC at two stations on the San Joaquin River, and on the monthly average of both daily high tide EC values at three stations in eastern Suisun Marsh and two stations in western Suisun Marsh (shown on Figure 3.4-3).

On the San Joaquin River, the water quality objectives for fish and wildlife beneficial uses stipulate that the 14-day running average of mean daily EC on the San Joaquin River "at and between Jersey Point and Prisoners Point" is less than 0.44 mmhos/cm during the months of April and May for all water year types except "critical" years. Although April and May 1994 fall within a "critical" water year, which means that this standard does not apply for this simulation, the impact of the proposed DWSC deepening scenarios on this water quality objective is shown in Figures 5.6-19 and 5.6-20 for reference.

Figure 5.6-19 shows the predicted 14-day running average EC on the San Joaquin River at Jersey Point for the Year 50 Baseline scenario and the Year 50 Sacramento DWSC Only Deepening scenario. No increases in 14-day running average EC are predicted under the Year 50 Sacramento DWSC Only Deepening scenario during April or May. The water quality objective of maximum 14-day running average EC on the San Joaquin River at Jersey Point is not exceeded under either the Year 50 Baseline scenario or the Year 50 Sacramento DWSC Only Deepening scenario during the two months that the objectives would apply for water year types that are not "critical."

Figure 5.6-20 shows the predicted 14-day running average EC on the San Joaquin River at Prisoners Point for the Year 50 Baseline scenario and the Year 50 Sacramento DWSC Only Deepening scenario. No increases in 14-day running average EC are predicted under either the Year 50 Sacramento DWSC Only Deepening scenario during April or May. The water quality objective of maximum 14-day running average EC on the San Joaquin River at Prisoners Point is not exceeded under either the Year 50 Baseline scenario or the Year 50 Sacramento DWSC Only Deepening scenario during the two months that the objectives would apply for water year types that are not "critical."

The eastern Suisun Marsh and western Suisun Marsh water quality objectives for fish and wildlife beneficial uses are based on the monthly average of both daily high tide EC values. The water quality objectives apply from October through May for all water year types, as shown in Table 3-3.

Figure 5.6-21 shows the predicted monthly average of both daily high tide EC values on the Sacramento River at Collinsville for the Year 50 Baseline scenario and the Year 50 Sacramento DWSC Only Deepening scenario. For the Year 50 Sacramento DWSC Only Deepening scenario, minimal to no increase in monthly average of both daily high tide EC values is predicted during all months. The water quality objectives for fish and wildlife beneficial uses on the Sacramento River at Collinsville are met for all months under the Year 50 Baseline scenario and the Year 50 Sacramento DWSC Only Deepening scenario.

Figure 5.6-22 shows the predicted monthly average of both daily high tide EC values on Montezuma Slough at National Steel for the Year 50 Baseline scenario and the Year 50 Sacramento DWSC Only Deepening scenario. For the Year 50 Sacramento DWSC Only Deepening scenario, minimal to no increase in monthly average of both daily high tide EC values is predicted during all months. The water quality objectives for fish and wildlife beneficial uses on Montezuma Slough at National Steel are exceeded during November, January, and February under both the Year 50 Baseline scenario and the Year 50 Sacramento DWSC Only Deepening scenario, but are met during all other months.

Figure 5.6-23 shows the predicted monthly average of both daily high tide EC values on Montezuma Slough near Beldon Landing for the Year 50 Baseline scenario and the Year 50 Sacramento DWSC Only Deepening scenario. For the Year 50 Sacramento DWSC Only Deepening scenario, minimal to no increase in monthly average of both daily high tide EC values is predicted during all months. The water quality objectives for fish and wildlife beneficial uses on Montezuma Slough near Beldon Landing are exceeded during November under both the Year 50 Baseline scenario and the Year 50 Sacramento DWSC Only Deepening scenario, but are met during all other months.

Figure 5.6-24 shows the predicted monthly average of both daily high tide EC values on Chadbourne Slough at Sunrise Duck Club for the Year 50 Baseline scenario and the Year 50 Sacramento DWSC Only Deepening scenario. For the Year 50 Sacramento DWSC Only Deepening scenario, minimal to no increase in monthly average of both daily high tide EC values is predicted during all months. The water quality objectives for fish and wildlife beneficial uses on Chadbourne Slough at Sunrise Duck Club are exceeded during April, November, December, January, February, and March under both the Year 50 Baseline scenario and the Year 50 Sacramento DWSC Only Deepening scenario.

Figure 5.6-25 shows the predicted monthly average of both daily high tide EC values on Suisun Slough, 300 feet south of Volanti Slough for the Year 50 Baseline scenario and the Year 50 Sacramento DWSC Only Deepening scenario. For the Year 50 Sacramento DWSC Only Deepening scenario, minimal to no increase in monthly average of both daily high tide EC values is predicted during all months. The water quality objectives for fish and wildlife beneficial uses on Suisun Slough, 300 feet south of Volanti Slough are exceeded during November, December, January, February, and March under both the Year 50 Baseline scenario and the Year 50 Sacramento DWSC Only Deepening scenario.

The evaluation of water quality objectives in eastern Suisun Marsh and western Suisun Marsh demonstrates that the deepening of the Sacramento DWSC Only is unlikely to have any impact on EC in these regions during Year 50. This is consistent with the salinity maps for the Year 50 Sacramento DWSC Only Deepening scenario discussed in Section 5.4 (Figures 5.4-1 though 5.4-13), which showed that no salinity increases greater than 0.05 psu are predicted in Suisun Marsh under the Year 50 Sacramento DWSC Only Deepening scenario.

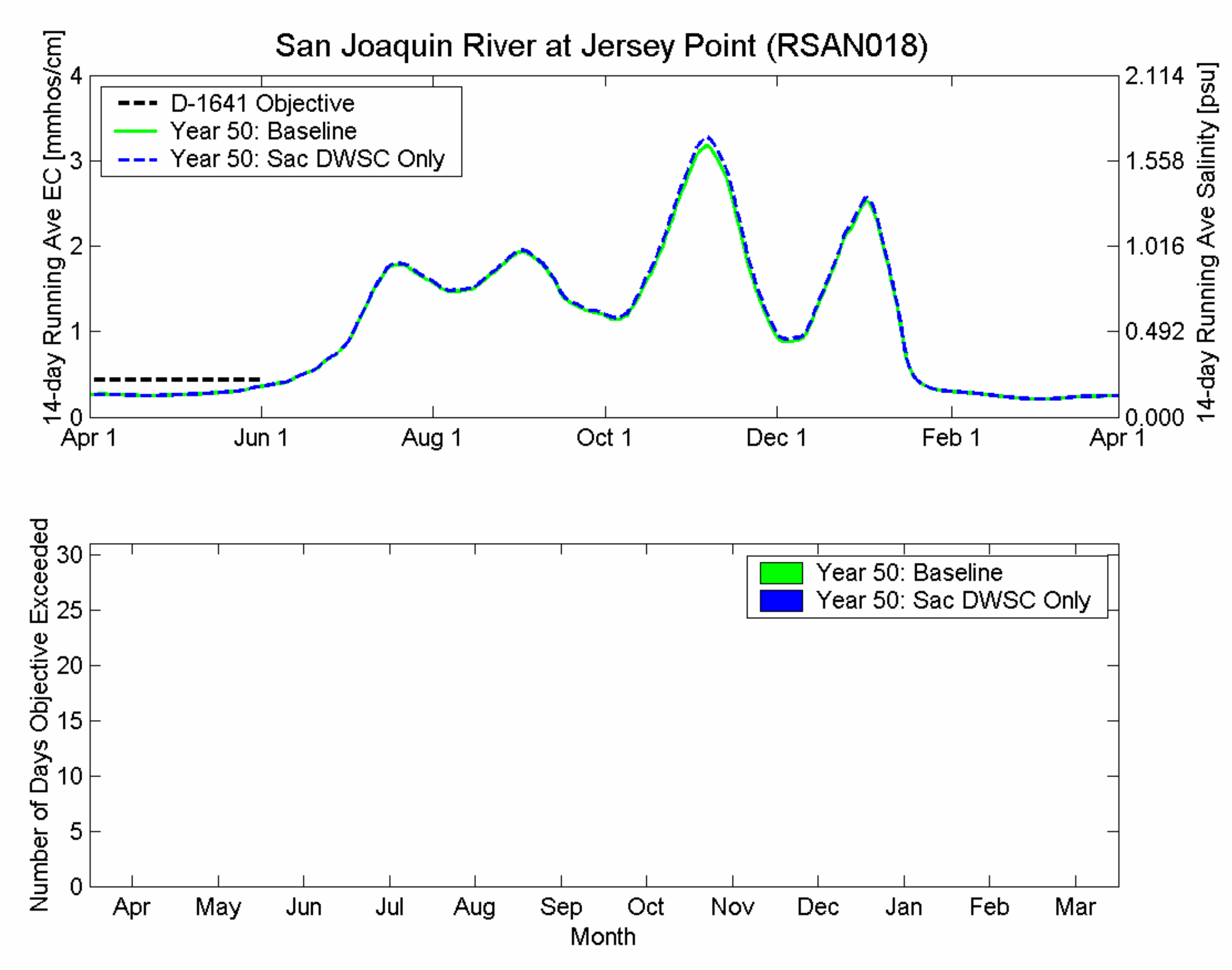


Figure 5.6-19 Predicted 14-day running average EC at San Joaquin River at Jersey Point (RSAN018) for the Year 50 Baseline scenario and the Year 50 Sacramento DWSC Only Deepening scenario (top); number of days each month that predicted 14-day running average EC at RSAN018 exceeds D-1641 water quality objectives for each scenario during the Year 50 simulation period (bottom).

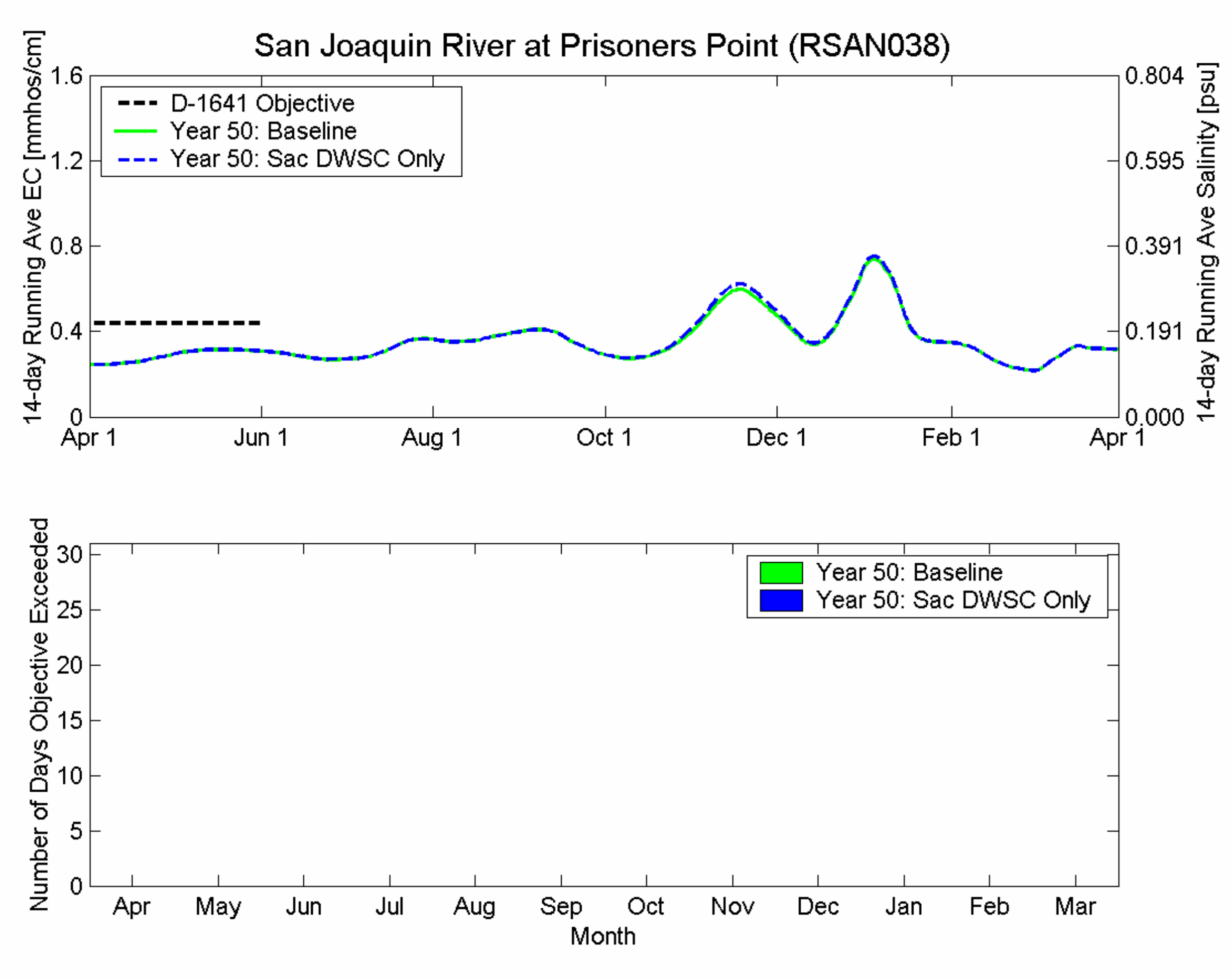


Figure 5.6-20 Predicted 14-day running average EC at San Joaquin River at Prisoners Point (RSAN038) for the Year 50 Baseline scenario and the Year 50 Sacramento DWSC Only Deepening scenario (top); number of days each month that predicted 14-day running average EC at RSAN038 exceeds D-1641 water quality objectives for each scenario during the Year 50 simulation period (bottom).

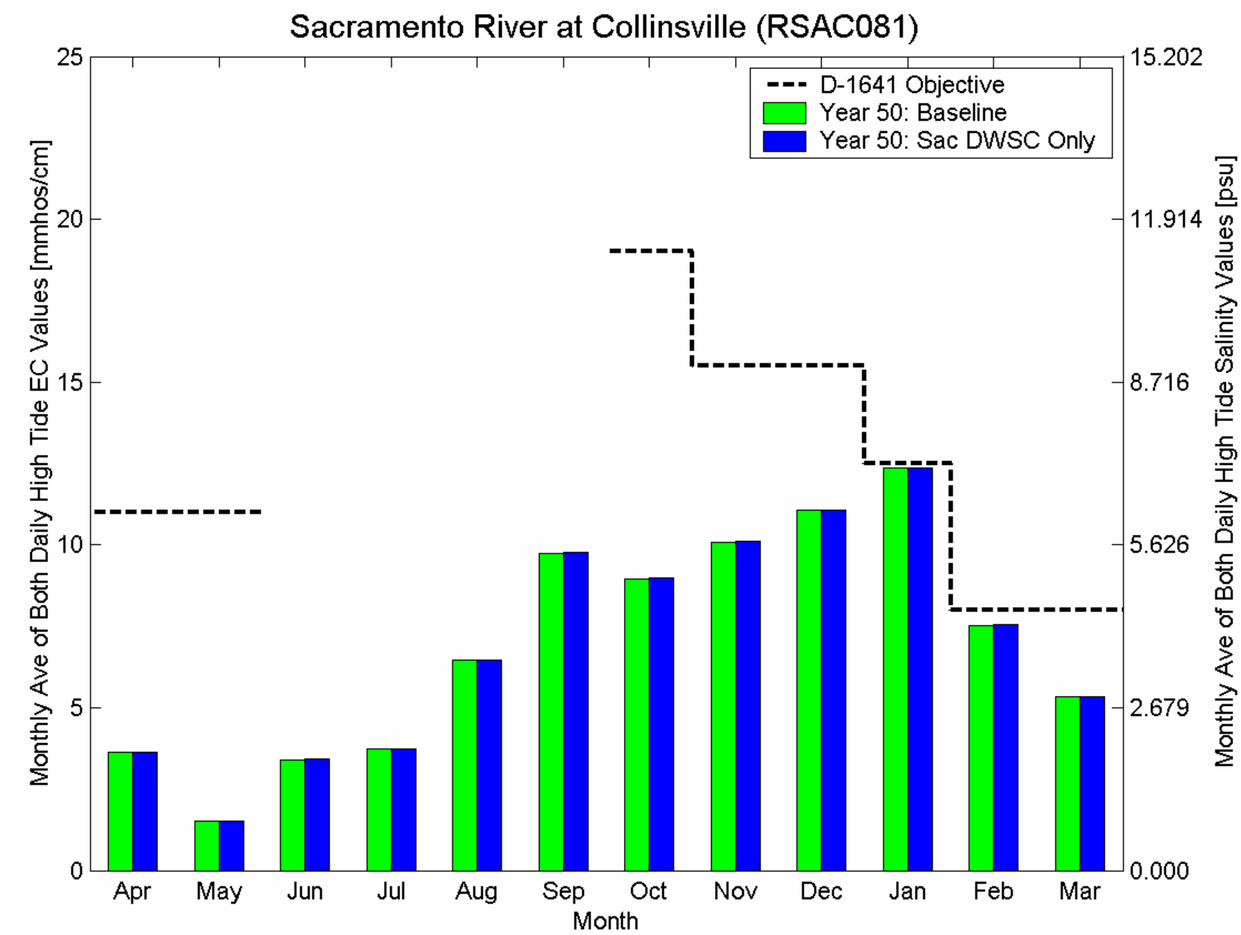


Figure 5.6-21 Predicted monthly average of both daily high tide EC values at Sacramento River at Collinsville (RSAC081) for the Year 50 Baseline scenario and the Year 50 Sacramento DWSC Only Deepening scenario, shown relative to the D-1641 water quality objectives for fish and wildlife beneficial uses.

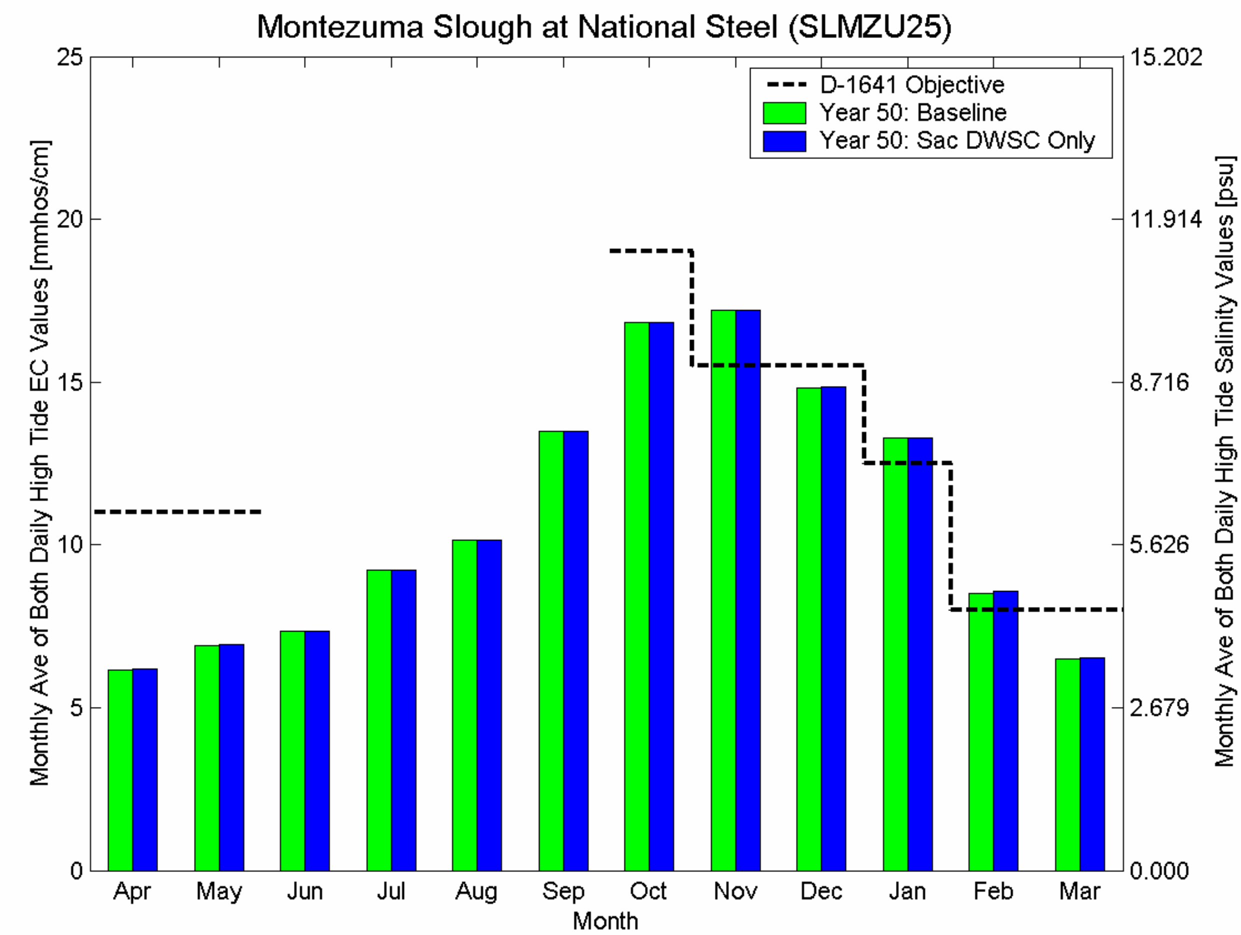


Figure 5.6-22 Predicted monthly average of both daily high tide EC values at Montezuma Slough at National Steel (SLMZU25) for the Year 50 Baseline scenario and the Year 50 Sacramento DWSC Only Deepening scenario, shown relative to the D-1641 water quality objectives for fish and wildlife beneficial uses.

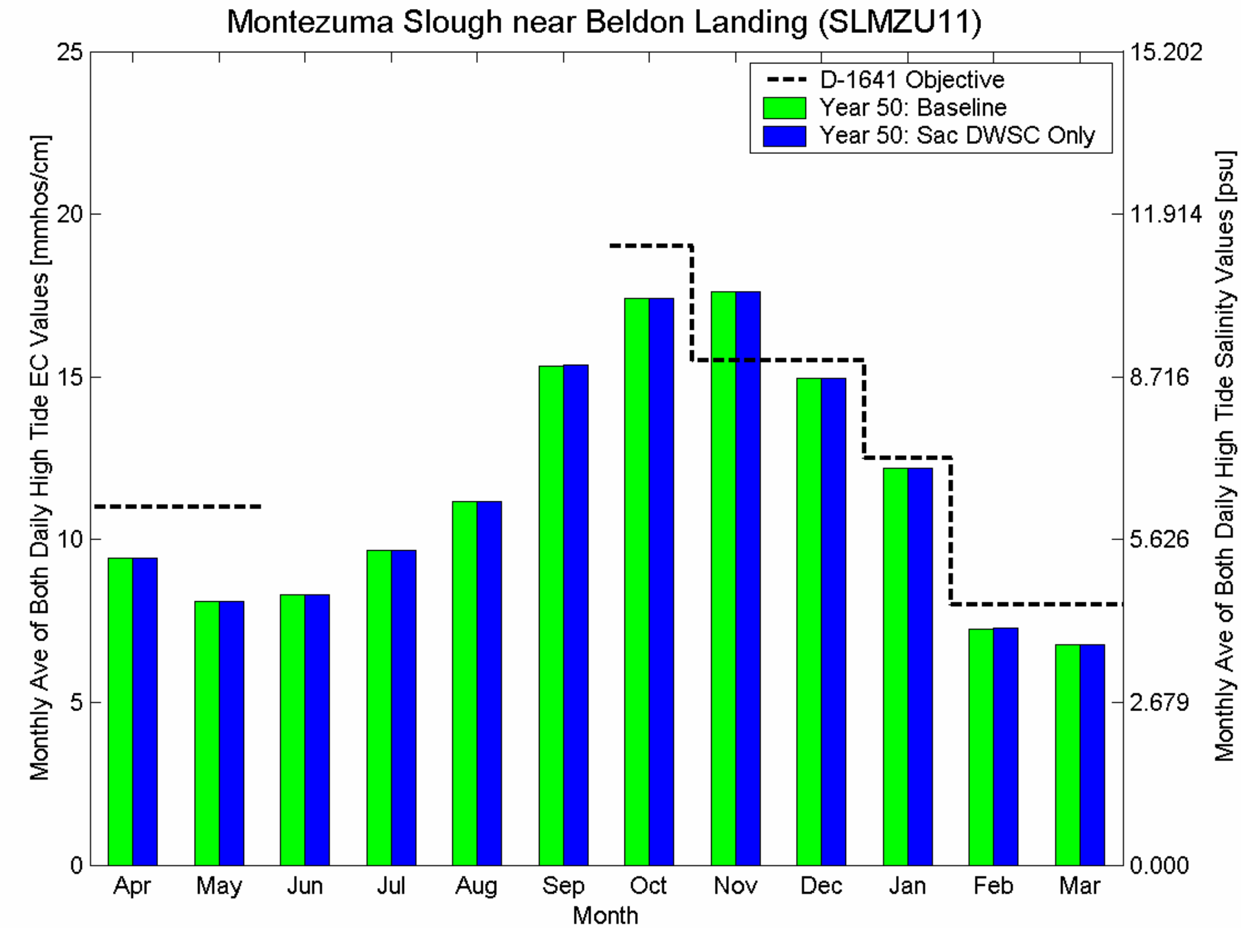


Figure 5.6-23 Predicted monthly average of both daily high tide EC values at Montezuma Slough near Beldon Landing (SLMZU11) for the Year 50 Baseline scenario and the Year 50 Sacramento DWSC Only Deepening scenario, shown relative to the D-1641 water quality objectives for fish and wildlife beneficial uses.

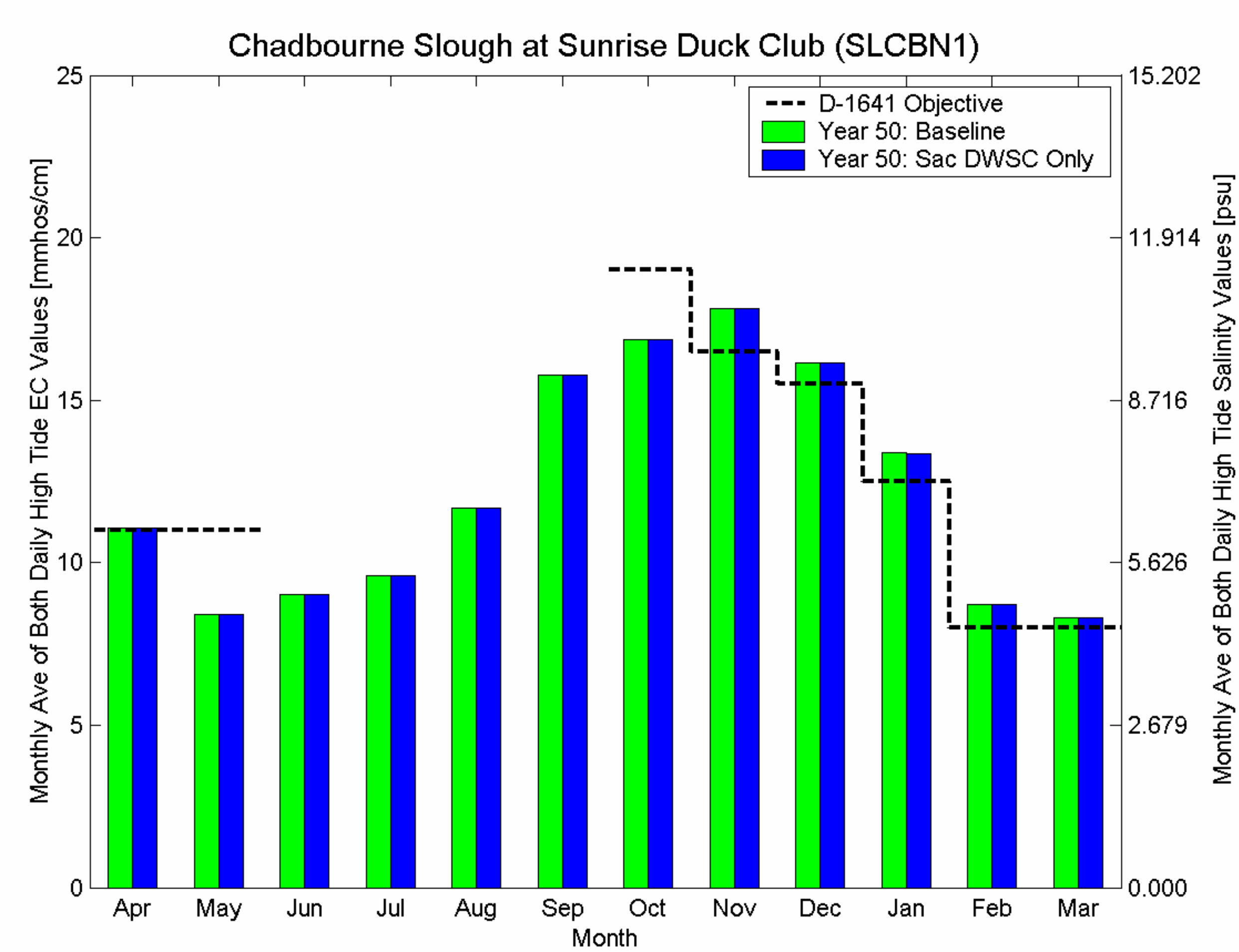


Figure 5.6-24 Predicted monthly average of both daily high tide EC values at Chadbourne Slough at Sunrise Duck Club (SLCBN1) for the Year 50 Baseline scenario and the Year 50 Sacramento DWSC Only Deepening scenario, shown relative to the D-1641 water quality objectives for fish and wildlife beneficial uses.

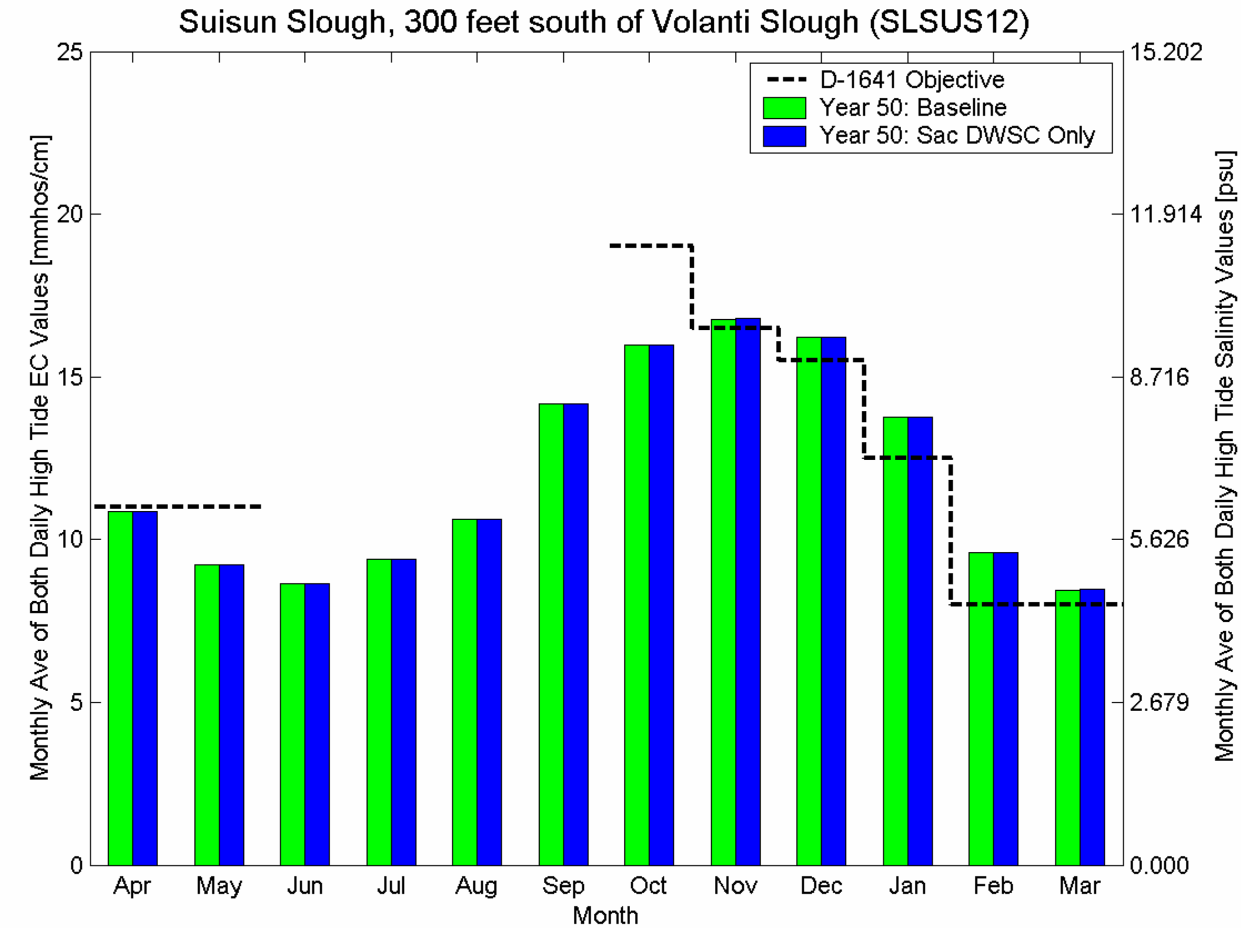


Figure 5.6-25 Predicted monthly average of both daily high tide EC values at Suisun Slough, 300 feet south of Volanti Slough (SLSUS12) for the Year 50 Baseline scenario and the Year 50 Sacramento DWSC Only Deepening scenario, shown relative to the D-1641 water quality objectives for fish and wildlife beneficial uses.

5.7 Impact of Year 50 Both Sacramento DWSC & SF Bay to Stockton DWSC Deepening on D-1641 Water Quality Objectives

Section 3.4 presents the water quality objectives for municipal and industrial, agricultural, and fish and wildlife beneficial uses stipulated by D-1641. The performance of the Year 50 Baseline scenario, the Year 50 Sacramento DWSC Only Deepening scenario, and the Year 50 Both DWSC Deepening scenario simulations in meeting these water quality objectives is presented in this section.

5.7.1 Water Quality Objectives for Municipal and Industrial Beneficial Use

The D-1641 water quality objectives for municipal and industrial beneficial uses, shown in Table 3-1, are based on concentration of Cl^- at water export locations, shown on Figure 3.4-1. The first set of standards stipulate the number of days that daily mean salinity must be less than 150 mg/l either at Contra Costa Canal at Pumping Plant #1, or at the Antioch Water Works intake. The minimum number of days that this objective should be met ranges from 155 days for a “critical” water year to 240 days for a “wet” water year.

Water year 1994 (from October 1, 1993 through September 30, 1994) was classified as a “critical” year, the lowest flow classification, on both the Sacramento River and San Joaquin River. Water Year 1995 (from October 1, 1994 through September 30, 1995) was classified as a “wet” year, the highest flow classification, on both the Sacramento River and the San Joaquin River (DWR, 2009b). As a result, the Year 50 simulation year spans part of a “critical” year and part of a “wet” water year on the Sacramento River.

Figure 5.7-1 shows the number of days that the maximum mean daily concentration of Cl^- is less than 150 mg/l at CHCCC06 and RSAN007. To meet the “critical year” water quality objective, the number of days that mean daily concentration of Cl^- is less than 150 mg/l should exceed 155 days at either CHCCC06 or RSAN007. At CHCCC06, the mean daily concentration of Cl^- is less than 150 mg/l for 174 days under the Year 50 Baseline scenario, 170 days for the Year 50 Sacramento DWSC Only Deepening scenario (a decrease of 4 days relative to the Year 50 Baseline scenario), and 159 days for the Year 50 Both DWSC Deepening scenario (a decrease of 15 days relative to the Year 50 Baseline scenario). At RSAN007, the mean daily concentration of Cl^- is less than 150 mg/l for 88 days under the Year 50 Baseline scenario, 87 days for the Year 50 Sacramento DWSC Only Deepening scenario (a decrease of 1 day relative to the Year 50 Baseline scenario), and 81 days for the Year 50 Both DWSC Deepening scenario (a decrease of 7 days relative to the Year 50 Baseline scenario). Since this standard stipulates that daily mean salinity must be less than 150 mg/l for at least 155 days either at Contra Costa Canal at Pumping Plant #1, or at the Antioch Water Works intake, this standard is met for the Year 50 Baseline scenario, the Year 50 Sacramento DWSC Only deepening scenario, and the Year 50 Both DWSC Deepening scenario, since this water quality standard is met at CHCCC06 under all three scenarios.

The second set of D-1641 water quality objectives for municipal and industrial beneficial use stipulate a maximum allowable concentration of Cl^- at the municipal water intakes. The D-1641 standards stipulate this objective for Contra Costa Canal at Pumping Plant #1, West Canal at mouth of Clifton Court Forebay, Delta-Mendota Canal at Tracy Pumping Plant, Barker Slough at North Bay Aqueduct Intake, and Cache Slough at City of Vallejo Intake (Table 3-3). For the purposes of this study, this standard is also evaluated at the CCWD intake on Old River (ROLD304), and at the CCWD alternative intake point (AIP) on Victoria Canal.

Figure 5.7-2 shows the predicted mean daily chloride concentration at the Contra Costa Rock Slough Export for the Year 50 Baseline scenario, the Year 50 Sacramento DWSC Only Deepening scenario, and the Year 50 Both DWSC Deepening scenario. Increases in chloride concentration under the Year 50 Sacramento DWSC Only Deepening scenario are predicted from October through December, and increases in chloride concentration under the Year 50 Both DWSC Deepening scenario are predicted between July and January. Under the Year 50 Baseline scenario the water quality objective of 250 mg/l Cl^- is exceeded for 11 days in November, 9 days in December, and 17 days in January. Under the Year 50 Sacramento DWSC Only Deepening scenario, the water quality objective of 250 mg/l Cl^- is exceeded for 13 days during November (an increase of 2 days), 11 days during December (an increase of 2 days), and 17 days during January (no change relative to Year 50 Baseline). Under the Year 50 Both DWSC Deepening scenario, the water quality objective of 250 mg/l Cl^- is exceeded for 19 days during November (an increase of 8 days), 14 days during December (an increase of 5 days), and 19 days during January (an increase of 2 days).

Figure 5.7-3 shows the predicted mean daily chloride concentration at West Canal at mouth of Clifton Court Forebay for the Year 50 Baseline scenario, the Year 50 Sacramento DWSC Only Deepening scenario, and the Year 50 Both DWSC Deepening scenario. Increases in chloride concentration under the Year 50 Sacramento DWSC Only Deepening scenario are predicted between November and January, and increases in chloride concentration under the Year 50 Both DWSC Deepening scenario are predicted between July and February. The water quality objective of maximum mean daily concentration of 250 mg/l Cl^- is not exceeded at West Canal at mouth of Clifton Court Forebay under either the Year 50 Baseline or the Year 50 Sacramento DWSC Only Deepening scenario. Under the Year 50 Both DWSC Deepening scenario, the water quality objective of 250 mg/l Cl^- is exceeded for 1 day during November (an increase of 1 day relative to Year 50 Baseline) and 1 day during December (an increase of 1 day relative to Year 50 Baseline).

Figure 5.7-4 shows the predicted mean daily chloride concentration at the Delta-Mendota Canal at Tracy Pumping Plant for the Year 50 Baseline scenario, the Year 50 Sacramento DWSC Only Deepening scenario, and the Year 50 Both DWSC Deepening scenario. Increases in chloride concentration under the Year 50 Sacramento DWSC Only Deepening scenario are predicted between November and December, and increases in chloride concentration under the Year 50 Both DWSC Deepening scenario are predicted between July and February. Despite these predicted increases in chloride concentration, the water quality objective of maximum mean daily concentration of 250 mg/l Cl^- is not exceeded at the Delta-Mendota Canal at Tracy Pumping Plant under any of the Year 50 scenarios.

Figure 5.7-5 shows the predicted mean daily chloride concentration in Barker Slough at North Bay Aqueduct Intake for the Year 50 Baseline scenario, the Year 50 Sacramento DWSC Only

Deepening scenario, and the Year 50 Both DWSC Deepening scenario. The predicted mean daily chloride concentration is nearly identical for all three scenarios indicating that there is no predicted effect on chloride concentration in Barker Slough at the North Bay Aqueduct Intake resulting from the proposed project scenarios. The water quality objective of maximum mean daily concentration of 250 mg/l Cl^- is not exceeded under any of the scenarios.

Figure 5.7-6 shows the predicted mean daily chloride concentration in Cache Slough at City of Vallejo Intake for the Year 50 Baseline scenario, the Year 50 Sacramento DWSC Only Deepening scenario, and the Year 50 Both DWSC Deepening scenario. The predicted mean daily chloride concentration is nearly identical for all three scenarios indicating that there is no predicted effect on chloride concentration in Cache Slough at City of Vallejo Intake resulting from the proposed project scenarios. The water quality objective of maximum mean daily concentration of 250 mg/l Cl^- is not exceeded under any of the scenarios.

Figure 5.7-7 shows the predicted mean daily chloride concentration at the Contra Costa Old River Export for the Year 50 Baseline scenario, the Year 50 Sacramento DWSC Only Deepening scenario, and the Year 50 Both DWSC Deepening scenario. Increases in chloride concentration under the Year 50 Sacramento DWSC Only Deepening scenario are predicted from October through January, and increases in chloride concentration under the Year 50 Both DWSC Deepening scenario are predicted between July and February. Under the Year 50 Baseline scenario the water quality objective of 250 mg/l Cl^- is exceeded for 2 days during November, 2 days during December, and 4 days during January. Under the Year 50 Sacramento DWSC Only Deepening scenario, the water quality objective of 250 mg/l Cl^- is exceeded for 9 days during November (an increase of 7 days), 2 days during December (no change relative to Year 50 Baseline) and 5 days during January (an increase of 1 day). Under the Year 50 Both DWSC Deepening scenario, the water quality objective of 250 mg/l Cl^- is exceeded for 22 days during November (an increase of 20 days), 5 days during December (an increase of 3 days) and 9 days during January (an increase of 5 days).

Figure 5.7-8 shows the predicted mean daily chloride concentration at the Contra Costa Victoria Canal Alternative Intake Point for the Year 50 Baseline scenario, the Year 50 Sacramento DWSC Only Deepening scenario, and the Year 50 Both DWSC Deepening scenario. Increases in chloride concentration under the Year 50 Sacramento DWSC Only Deepening scenario are predicted between November and December, and increases in chloride concentration under the Year 50 Both DWSC Deepening scenario are predicted between July and February. Although noticeable increases in concentration of Cl^- are predicted for the Year 50 Both DWSC Deepening scenario, the water quality objective of maximum mean daily concentration of 250 mg/l Cl^- is not exceeded under any of the Year 50 scenarios.

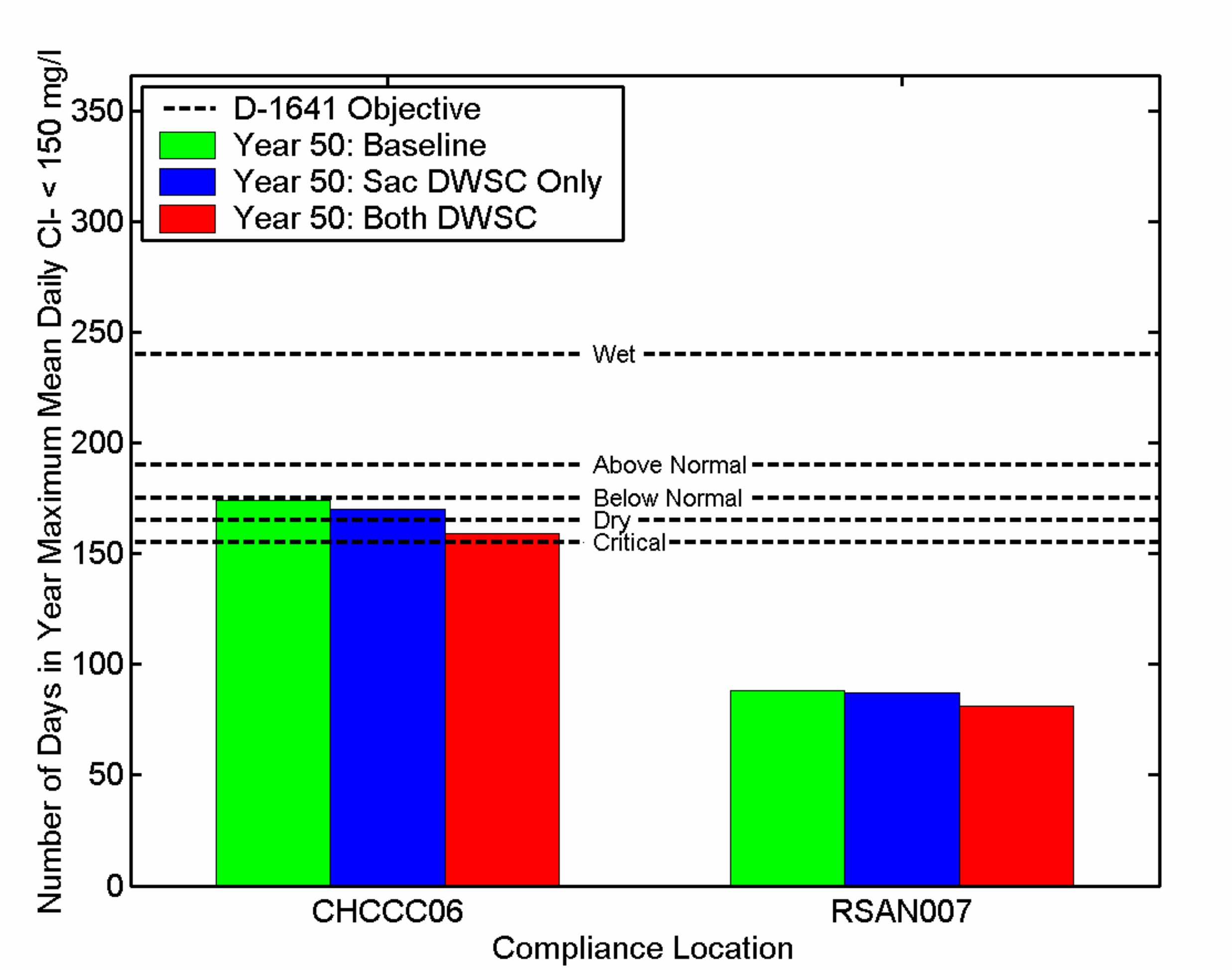


Figure 5.7-1 Number of days during the Year 50 simulation period that predicted mean daily concentration of Cl^- is less than 150 mg/l at Contra Costa Canal at Pumping Plant #1 (CHCCC06) and the Antioch Water Works intake (RSAN007) for the Year 50 Baseline scenario, the Year 50 Sacramento DWSC Only Deepening scenario, and the Year 50 Both DWSC Deepening scenario.

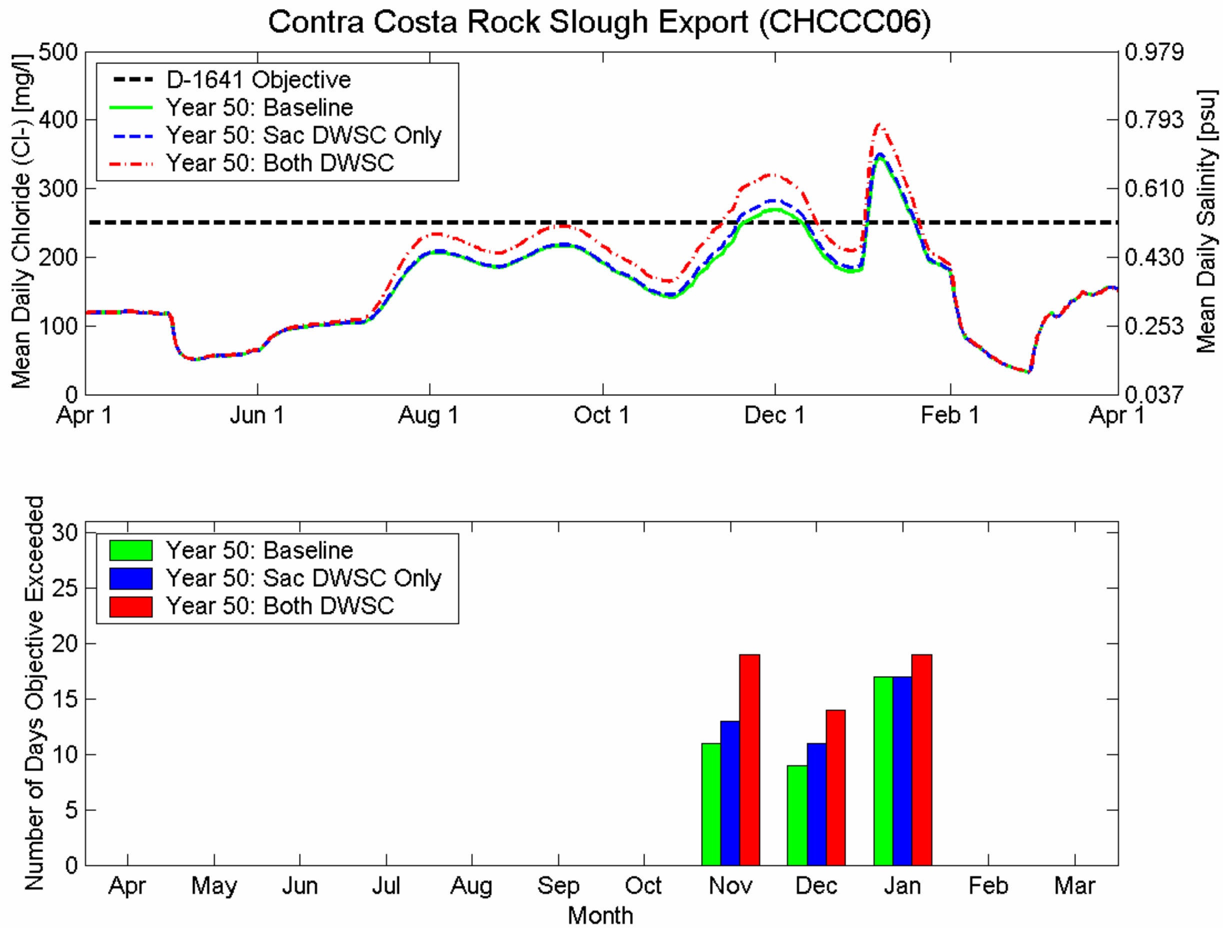


Figure 5.7-2 Predicted mean daily Cl^- concentration at Contra Costa Rock Slough Export (CHCCC06) for the Year 50 Baseline scenario, the Year 50 Sacramento DWSC Only Deepening scenario, and the Year 50 Both DWSC Deepening scenario (top); number of days each month that predicted mean daily concentration of Cl^- at CHCCC06 exceeds 250 mg/l Cl^- for each scenario during the Year 50 simulation period (bottom).

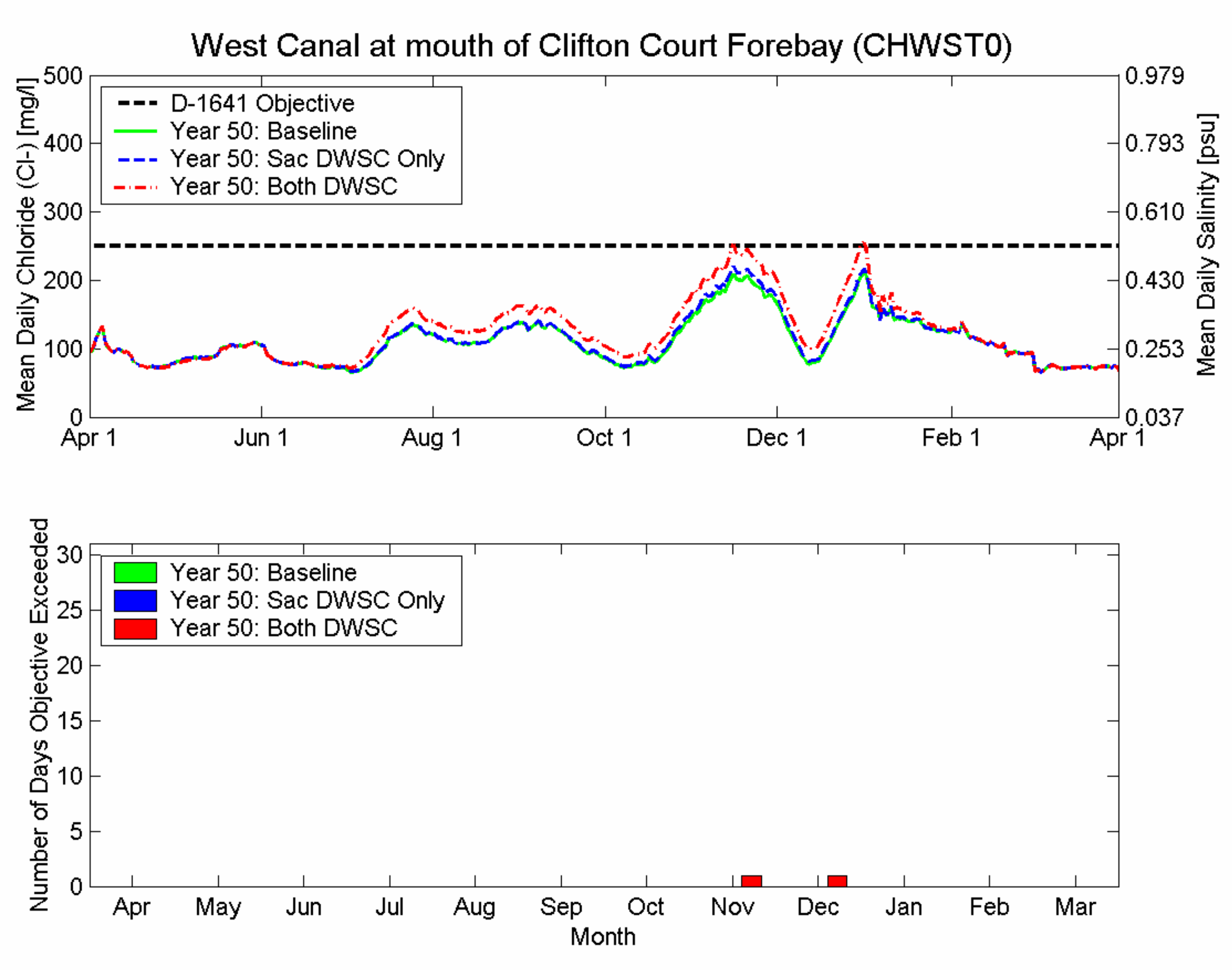


Figure 5.7-3 Predicted mean daily Cl^- concentration at West Canal at mouth of Clifton Court Forebay (CHWST0) for the Year 50 Baseline scenario, the Year 50 Sacramento DWSC Only Deepening scenario, and the Year 50 Both DWSC Deepening scenario (top); number of days each month that predicted mean daily concentration of Cl^- at CHWST0 exceeds 250 mg/l Cl^- for each scenario during the Year 50 simulation period (bottom).

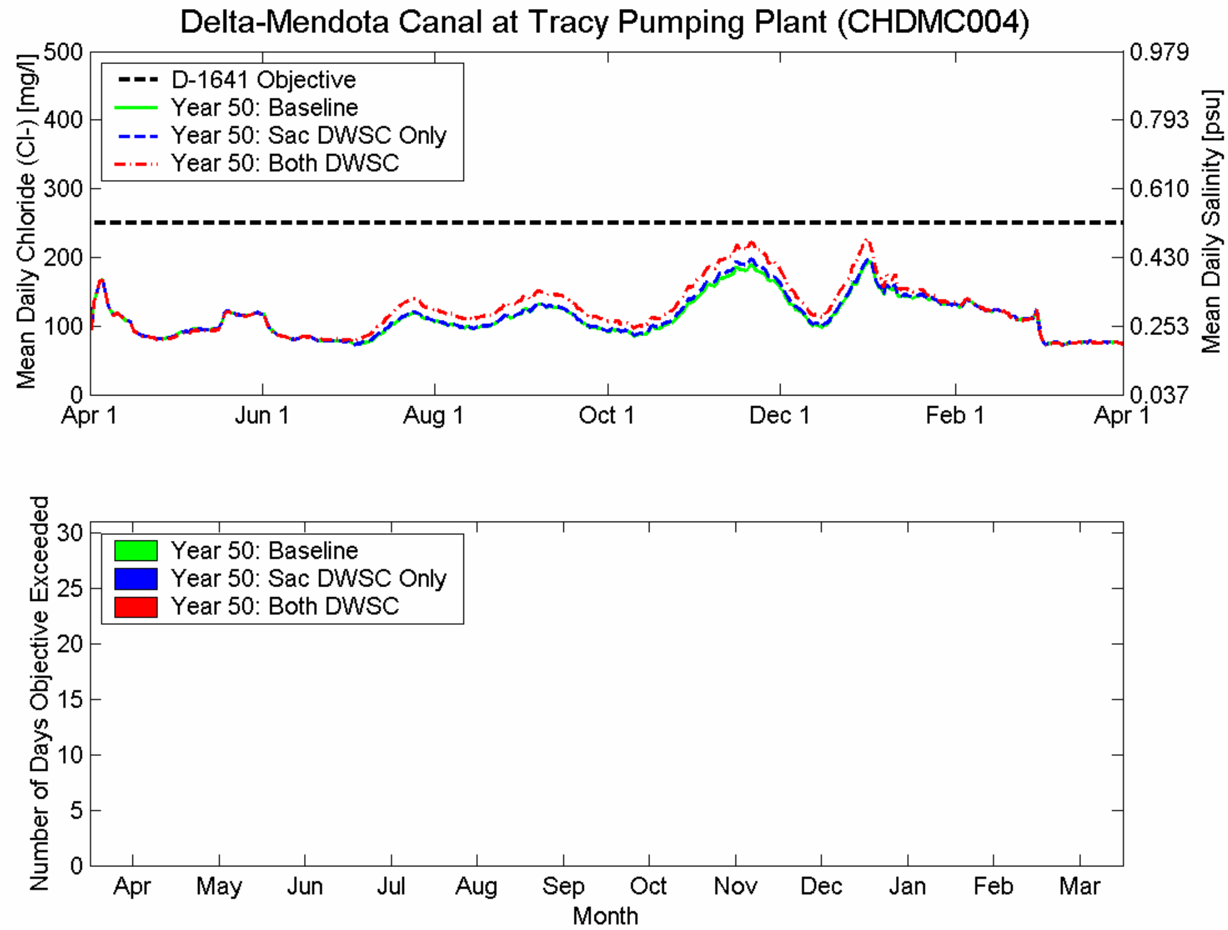


Figure 5.7-4 Predicted mean daily Cl^- concentration at Delta-Mendota Canal at Tracy Pumping Plant (CHDMC004) for the Year 50 Baseline scenario, the Year 50 Sacramento DWSC Only Deepening scenario, and the Year 50 Both DWSC Deepening scenario (top); number of days each month that predicted mean daily concentration of Cl^- at CHDMC004 exceeds 250 mg/l Cl^- for each scenario during the Year 50 simulation period (bottom).

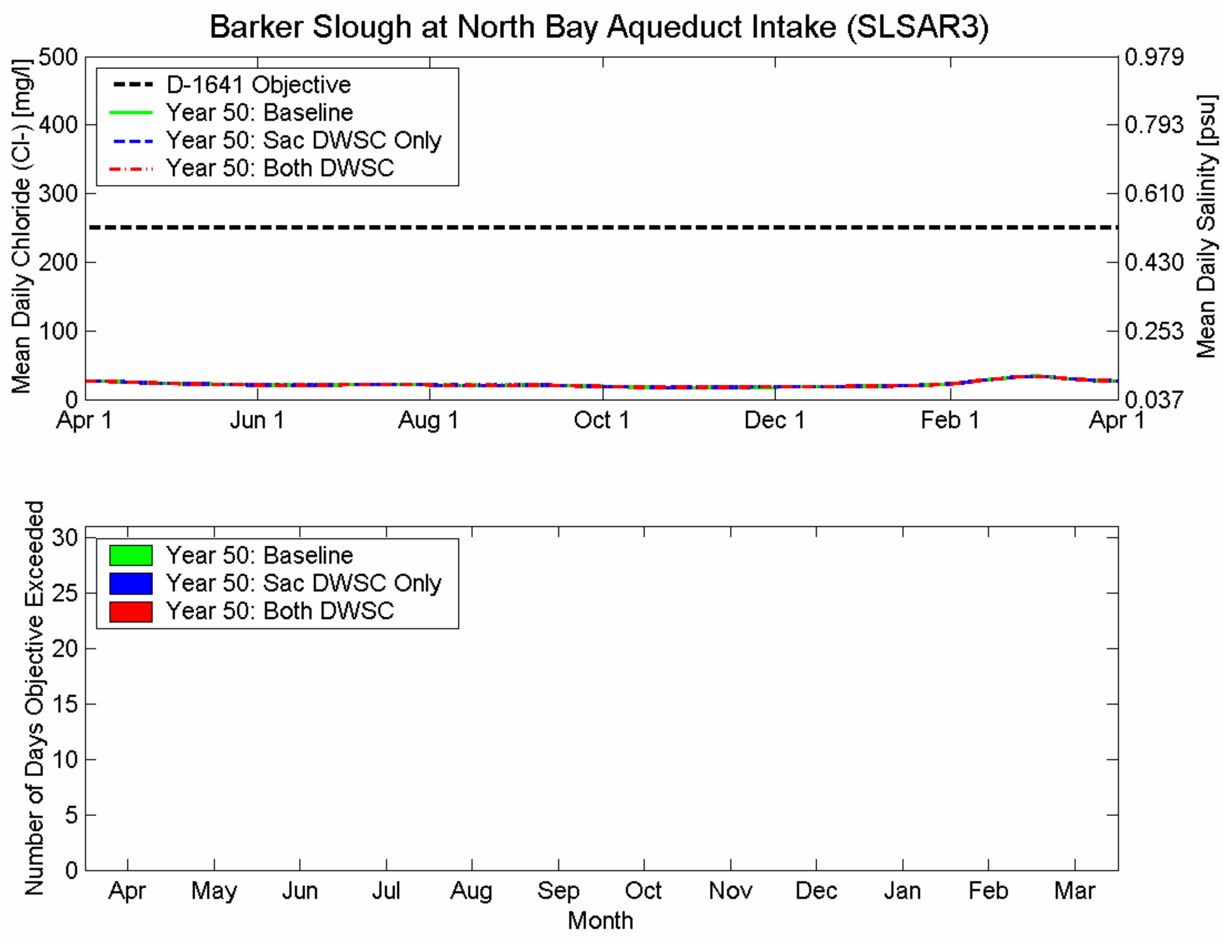


Figure 5.7-5 Predicted mean daily Cl^- concentration at Barker Slough at North Bay Aqueduct Intake (SLSAR3) for the Year 50 Baseline scenario, the Year 50 Sacramento DWSC Only Deepening scenario, and the Year 50 Both DWSC Deepening scenario (top); number of days each month that predicted mean daily concentration of Cl^- at SLSAR3 exceeds 250 mg/l Cl^- for each scenario during the Year 50 simulation period (bottom).

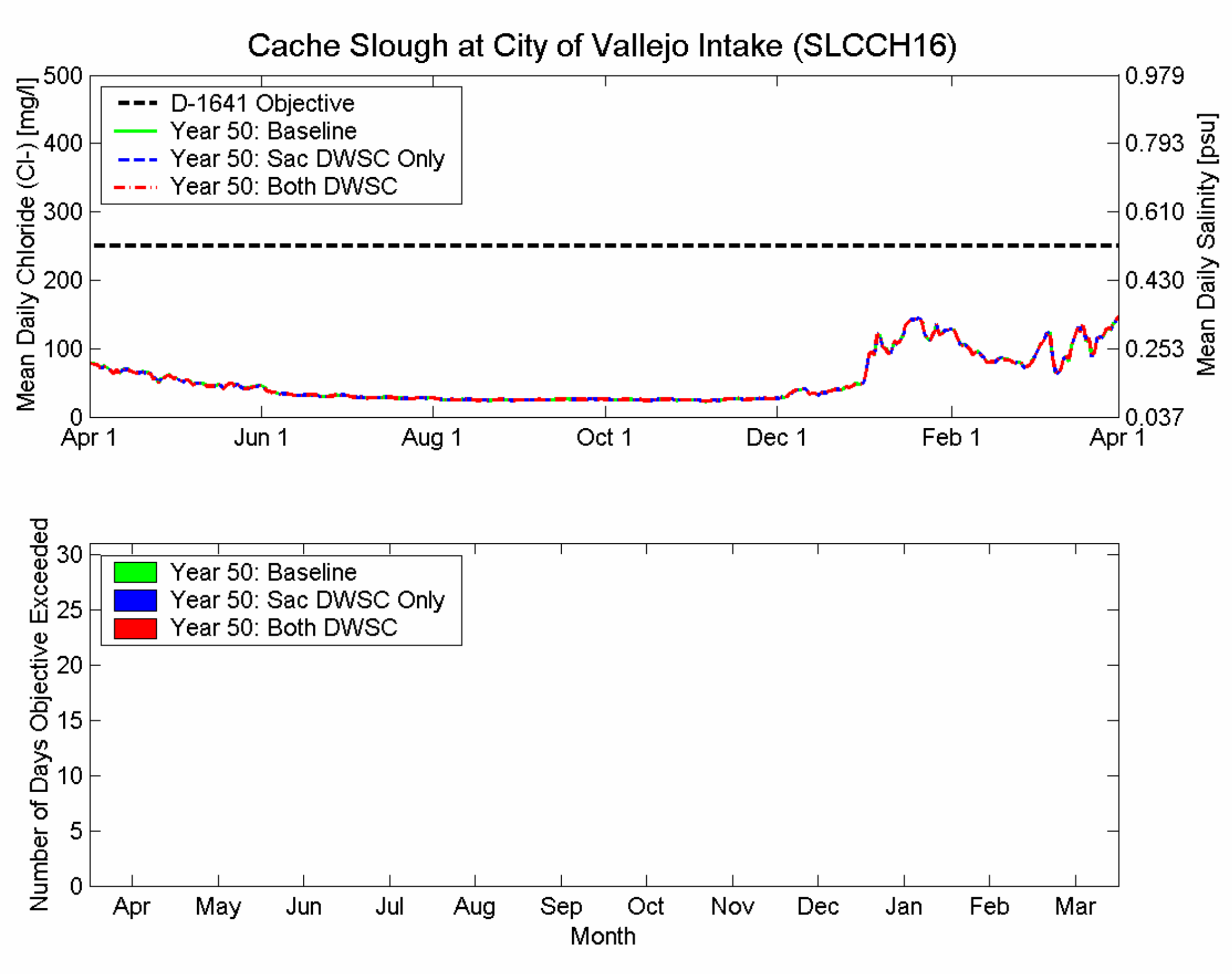
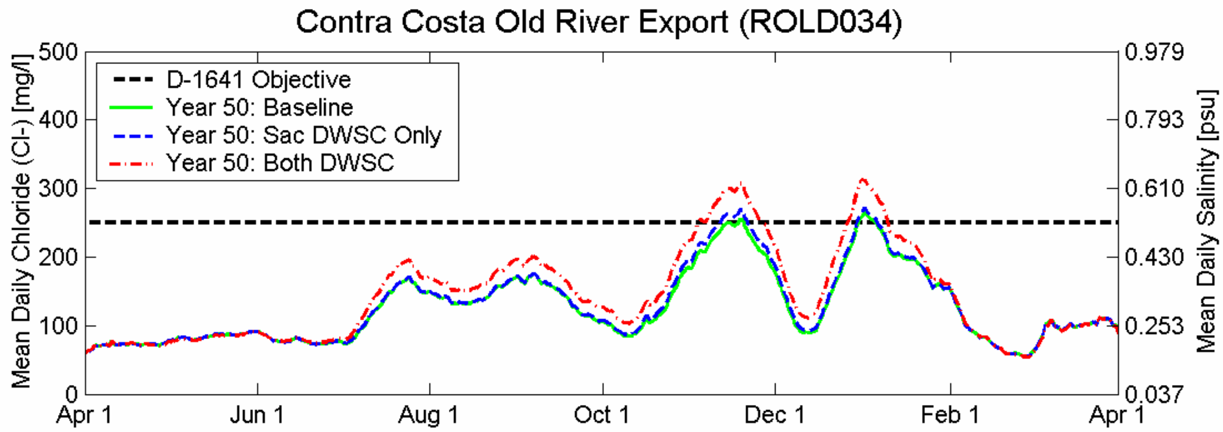


Figure 5.7-6 Predicted mean daily Cl^- concentration at Cache Slough at City of Vallejo Intake (SLCCH16) for the Year 50 Baseline scenario, the Year 50 Sacramento DWSC Only Deepening scenario, and the Year 50 Both DWSC Deepening scenario (top); number of days each month that predicted mean daily concentration of Cl^- at SLCCH16 exceeds 250 mg/l Cl^- for each scenario during the Year 50 simulation period (bottom).



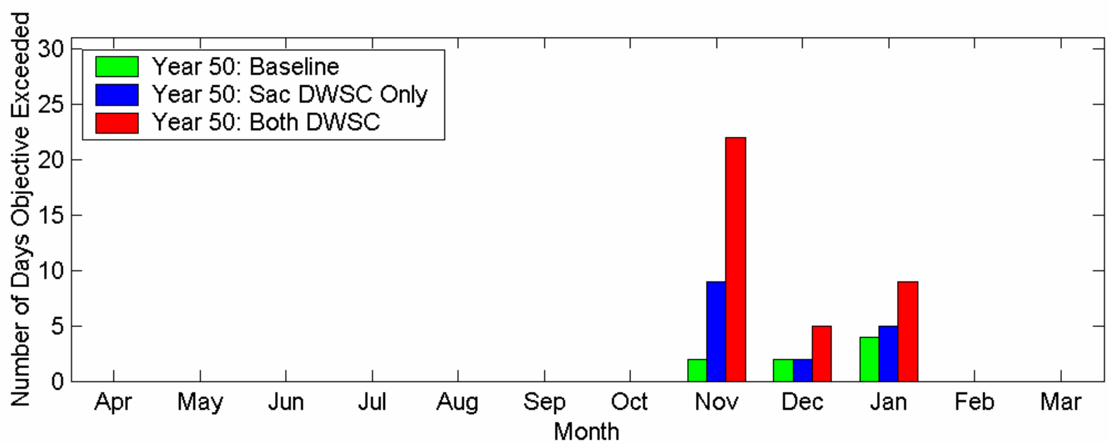


Figure 5.7-7 Predicted mean daily Cl^- concentration at Contra Costa Old River Export (ROLD034) for the Year 50 Baseline scenario, the Year 50 Sacramento DWSC Only Deepening scenario, and the Year 50 Both DWSC Deepening scenario (top); number of days each month that predicted mean daily concentration of Cl^- at ROLD034 exceeds 250 mg/l Cl^- for each scenario during the Year 50 simulation period (bottom).

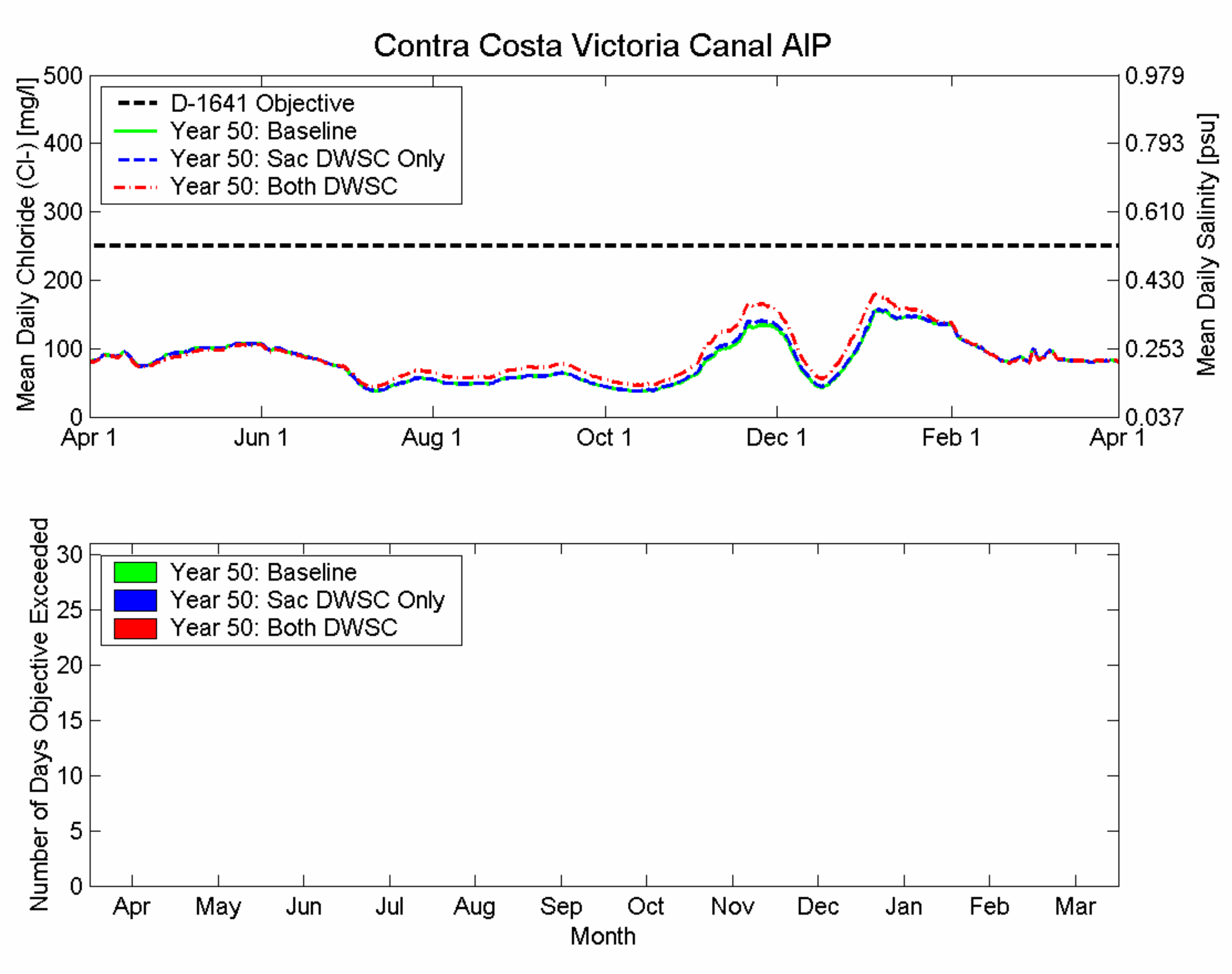


Figure 5.7-8 Predicted mean daily Cl^- concentration at Contra Costa Victoria Canal Alternative Intake Point for the Year 50 Baseline scenario, the Year 50 Sacramento DWSC Only Deepening scenario, and the Year 50 Both DWSC Deepening scenario (top); number of days each month that predicted mean daily concentration of Cl^- at Contra Costa Victoria Canal Alternative Intake Point exceeds 250 mg/l Cl^- for each scenario during the Year 50 simulation period (bottom).

5.7.2 Water Quality Objectives for Agricultural Beneficial Use

The D-1641 water quality objectives for agricultural beneficial uses, shown in Table 3-2, are based on either maximum 14-day running average EC, maximum 30-day running average EC, or maximum monthly average of mean daily EC at the stations shown on Figure 3.4-2. The western Delta and interior Delta water quality objectives for agricultural beneficial use depend on water year type on the Sacramento River and apply only from April 1 to August 15, while the southern Delta and export area water quality objectives for agricultural beneficial use apply uniformly across all water year types during the whole year.

Water year 1994 (from October 1, 1993 through September 30, 1994) was classified as a “critical” year, the lowest flow classification, on both the Sacramento River and San Joaquin River. Water Year 1995 (from October 1, 1994 through September 30, 1995) was classified as a “wet” year, the highest flow classification, on both the Sacramento River and the San Joaquin River (DWR, 2009b). Since the April 1 through August 15 period falls within water year 1994, the “critical” year water quality objectives shown in Table 3-2 are applied for the western Delta and interior Delta stations.

Figure 5.7-9 shows the predicted 14-day running average EC on the Sacramento River at Emmaton for the Year 50 Baseline scenario, the Year 50 Sacramento DWSC Only Deepening scenario, and the Year 50 Both DWSC Deepening scenario. Small increases in 14-day running average EC under the Year 50 Sacramento DWSC Only Deepening scenario are predicted between November and December, and increases in 14-day running average EC under the Year 50 Both DWSC Deepening scenario are predicted from April through mid-January. The water quality objectives for agricultural beneficial use apply from April 1 through August 15. The water quality objective of maximum 14-day running average EC on the Sacramento River at Emmaton is not exceeded for any days under the Year 50 Baseline scenario or the Year 50 Sacramento DWSC Only Deepening scenario. Under the Year 50 Both DWSC Deepening scenario, the water quality objective of maximum 14-day running average EC on the Sacramento River at Emmaton is exceeded for 6 days during June (an increase of 6 days), and 7 days during July (an increase of 7 days).

Figure 5.7-10 shows the predicted 14-day running average EC on the San Joaquin River at Jersey Point for the Year 50 Baseline scenario, the Year 50 Sacramento DWSC Only Deepening scenario, and the Year 50 Both DWSC Deepening scenario. Small increases in 14-day running average EC under the Year 50 Sacramento DWSC Only Deepening scenario are predicted between November and December, and increases in 14-day running average EC under the Year 50 Both DWSC Deepening scenario are predicted between June and February. The water quality objectives for agricultural beneficial use apply from April 1 through August 15. The water quality objective of maximum 14-day running average EC on the San Joaquin River at Jersey Point is not exceeded under any of the scenarios during this period.

Figure 5.7-11 shows the predicted 14-day running average EC on the South Fork Mokelumne River at Terminous for the Year 50 Baseline scenario, the Year 50 Sacramento DWSC Only Deepening scenario, and the Year 50 Both DWSC Deepening scenario. The predicted 14-day running average EC is nearly identical for all three scenarios indicating that there is no predicted effect on EC on the South Fork Mokelumne River at Terminous resulting from the proposed project scenarios. The water quality objectives for agricultural beneficial use apply from April 1 through August 15. The water quality objective of maximum 14-day running average EC on the South Fork Mokelumne River at Terminous is not exceeded under any of the scenarios during this period.

Figure 5.7-12 shows the predicted 14-day running average EC on the San Joaquin River at San Andreas Landing for the Year 50 Baseline scenario, the Year 50 Sacramento DWSC Only Deepening scenario, and the Year 50 Both DWSC Deepening scenario. Small increases in 14-day running average EC under the Year 50 Sacramento DWSC Only Deepening scenario are predicted between November and December, and increases in 14-day running average EC under the Year 50 Both DWSC Deepening scenario are predicted between July and February. The water quality objectives for agricultural beneficial use apply from April 1 through August 15. The water quality objective of maximum 14-day running average EC on the San Joaquin River at San Andreas Landing is not exceeded under any of the scenarios during this period.

Figure 5.7-13 shows the predicted 30-day running average EC on the San Joaquin River at Airport Way Bridge, Vernalis for the Year 50 Baseline scenario, the Year 50 Sacramento DWSC Only Deepening scenario, and the Year 50 Both DWSC Deepening scenario. The predicted 30-day running average EC is identical for all three scenarios indicating that there is no predicted effect on EC on the San Joaquin River at Vernalis resulting from the proposed project scenarios. The water quality objectives for agricultural beneficial use apply all year. The water quality objective of maximum 30-day running average EC on the San Joaquin River at Vernalis is exceeded for 20 days during April for all three scenarios. Since the predicted EC at Vernalis is almost entirely dependent on the specified inflow concentration on the San Joaquin River which is provided as part of the CALSIM II output, the compliance with this objective is dependent on the inflow concentration which is not impacted by either of the deepening scenarios.

Figure 5.7-14 shows the predicted 30-day running average EC on the San Joaquin River at Brandt Bridge for the Year 50 Baseline scenario, the Year 50 Sacramento DWSC Only Deepening scenario, and the Year 50 Both DWSC Deepening scenario. The predicted 30-day running average EC is nearly identical for all three scenarios indicating that there is no predicted effect on EC on the San Joaquin River at Brandt Bridge resulting from the proposed project scenarios. The water quality objectives for agricultural beneficial use apply all year. The water quality objective of maximum 30-day running average EC on the San Joaquin River at Brandt Bridge is exceeded for 24 days during April for all three scenarios. Since the predicted EC at Brandt Bridge is largely dependent on the specified inflow concentration on the San Joaquin River at Vernalis, and the compliance with this objective is not impacted by either of the deepening scenarios.

Figure 5.7-15 shows the predicted 30-day running average EC on Old River near Middle River for the Year 50 Baseline scenario, the Year 50 Sacramento DWSC Only Deepening scenario, and the Year 50 Both DWSC Deepening scenario. The predicted 30-day running average EC is identical for all three scenarios indicating that there is no predicted effect on EC on Old River near Middle River resulting from the proposed project scenarios. The water quality objectives for agricultural beneficial use apply all year. The water quality objective of maximum 30-day running average EC on Old River near Middle River is exceeded for 23 days during April for all three scenarios. The compliance with this water quality objective is not impacted by either of the deepening scenarios.

Figure 5.7-16 shows the predicted 30-day running average EC on Old River at Tracy Road Bridge for the Year 50 Baseline scenario, the Year 50 Sacramento DWSC Only Deepening scenario, and the Year 50 Both DWSC Deepening scenario. The predicted 30-day running average EC is nearly identical for all three scenarios indicating only a very small effect on EC on Old River at Tracy Road Bridge resulting from the proposed project scenarios. The water quality objectives for agricultural beneficial use apply all year. The water quality objective of maximum 30-day running average EC on Old River at Tracy Road Bridge is exceeded for 27 days during April for all three scenarios. Compliance with this objective during April is largely dependent on the inflow concentration at Vernalis which is not impacted by either of the deepening scenarios. During July, the water quality objective is exceeded for 12 days under the Year 50 Baseline scenario, 13 days under the Year 50 Sacramento DWSC Only Deepening scenario (an increase of 1 day), and 8 days under the Year 50 Both DWSC Deepening scenario (a decrease of 4 days). Despite these difference in July, the absolute difference in 30-day running average EC between the three scenarios during July is extremely small as seen on Figure 5.7-16.

The D-1641 water quality objectives for agricultural beneficial uses at the export areas stipulate that the monthly average of mean daily EC not exceed 1.0 mmhos/cm. Figure 5.7-17 and Figure 5.7-18 show the predicted monthly average of mean daily EC for the two export areas shown in Table 3-2 which have water quality objectives for agricultural beneficial uses.

Figure 5.7-17 shows the predicted monthly average of mean daily EC at West Canal at mouth of Clifton Court Forebay for the Year 50 Baseline scenario, the Year 50 Sacramento DWSC Only Deepening scenario, and the Year 50 Both DWSC Deepening scenario. The Year 50 Sacramento DWSC Only Deepening scenario has a very small effect on monthly average EC West Canal at mouth of Clifton Court Forebay except during November through January when slightly larger EC increases associated with the Year 50 Sacramento DWSC Only Deepening scenario are predicted. The Year 50 Both DWSC Deepening scenario has a small effect on monthly average EC from April through June, with larger increases predicted from July through January. In both the Year 50 Baseline Scenario and the Year 50 Sacramento DWSC Only Deepening scenario, the water quality objective is met at West Canal at mouth of Clifton Court Forebay for all months except January. Under the Year 50 Both DWSC Deepening scenario, the water quality objective is not met in November, December, or January. The predicted monthly average of mean daily EC for the Year 50 Both DWSC Deepening scenario is 1.12 mmhos/cm in November and 1.07 mmhos/cm in December. In January, the predicted monthly average of mean daily EC is 1.08 mmhos/cm for the Year 50 Baseline scenario, 1.09 mmhos/cm for the Year 50 Sacramento DWSC Only Deepening scenario (an increase of 0.01 mmhos/cm), and 1.18 mmhos/cm for the Year 50 Both DWSC Deepening scenario (an increase of 0.17 mmhos/cm).

Figure 5.7-18 shows the predicted monthly average of mean daily EC at the Delta-Mendota Canal at Tracy Pumping Plant for the Year 50 Baseline scenario, the Year 50 Sacramento DWSC Only Deepening scenario, and the Year 50 Both DWSC Deepening scenario. The Year 50

Sacramento DWSC Only Deepening scenario has an extremely small effect on monthly average EC at the Delta-Mendota Canal at Tracy Pumping Plant except during November and December when slightly larger EC increases associated with the Year 50 Sacramento DWSC Only Deepening scenario are predicted. The Year 50 Both DWSC Deepening scenario has an extremely small effect on monthly average EC from April through June, with larger EC increases predicted from July through January. In all three scenarios, the water quality objective is met at the Delta-Mendota Canal at Tracy Pumping Plant during all months during the simulation period.

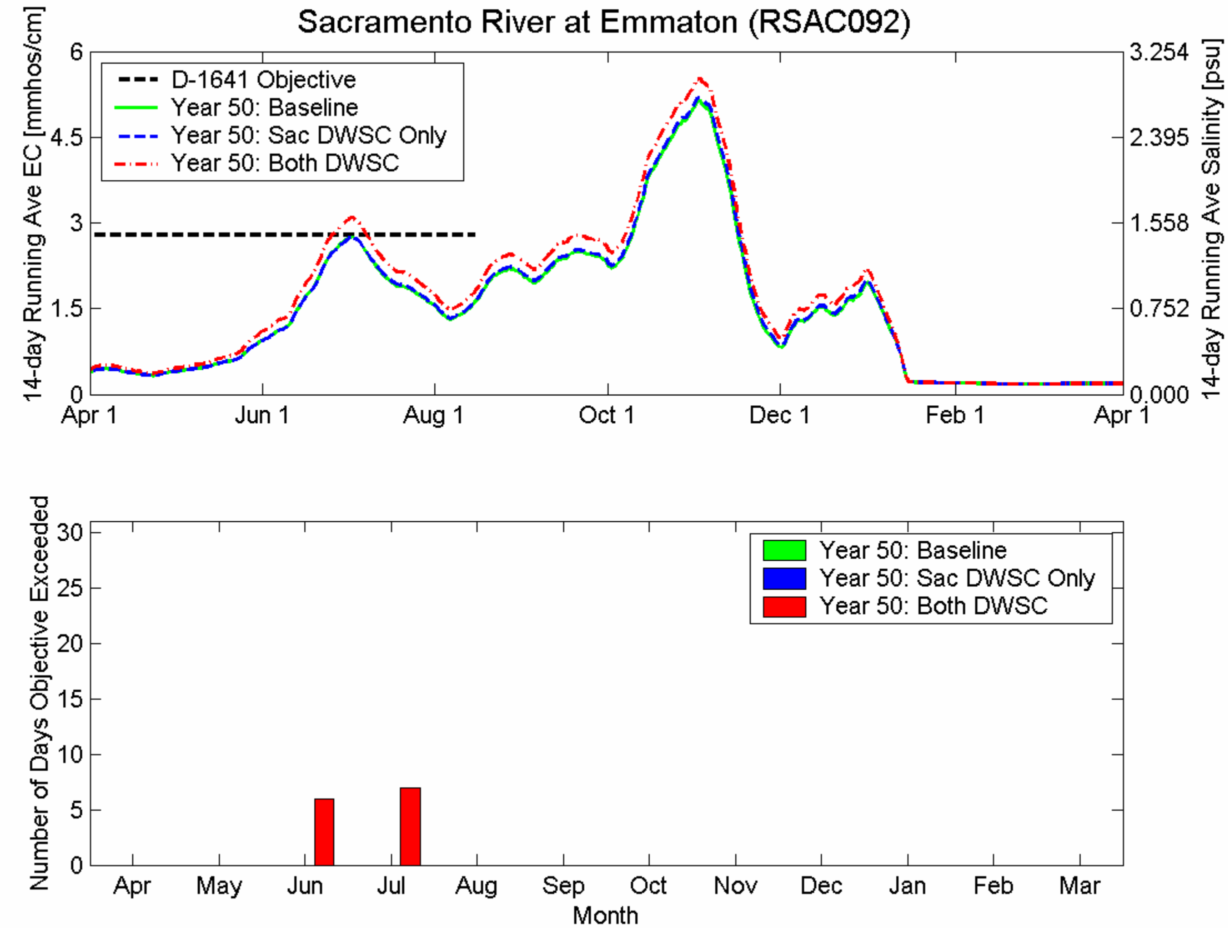


Figure 5.7-9 Predicted 14-day running average EC at Sacramento River at Emmaton (RSAC092) for the Year 50 Baseline scenario, the Year 50 Sacramento DWSC Only Deepening scenario, and the Year 50 Both DWSC Deepening scenario (top); number of days each month that predicted 14-day running average EC at RSAC092 exceeds D-1641 water quality objectives for each scenario during the Year 50 simulation period (bottom).

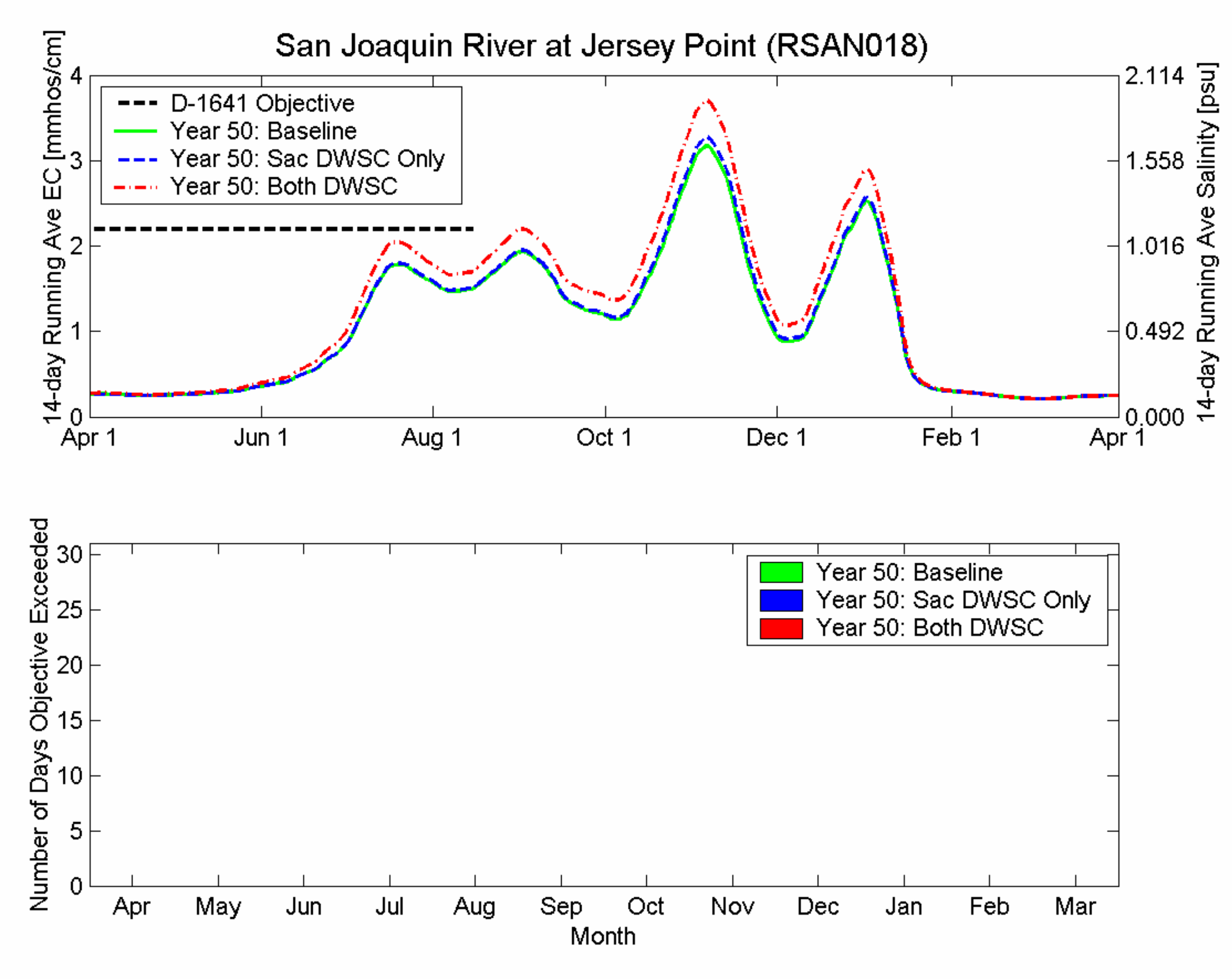


Figure 5.7-10 Predicted 14-day running average EC at San Joaquin River at Jersey Point (RSAN018) for the Year 50 Baseline scenario, the Year 50 Sacramento DWSC Only Deepening scenario, and the Year 50 Both DWSC Deepening scenario (top); number of days each month that predicted 14-day running average EC at RSAN018 exceeds D-1641 water quality objectives for each scenario during the Year 50 simulation period (bottom).

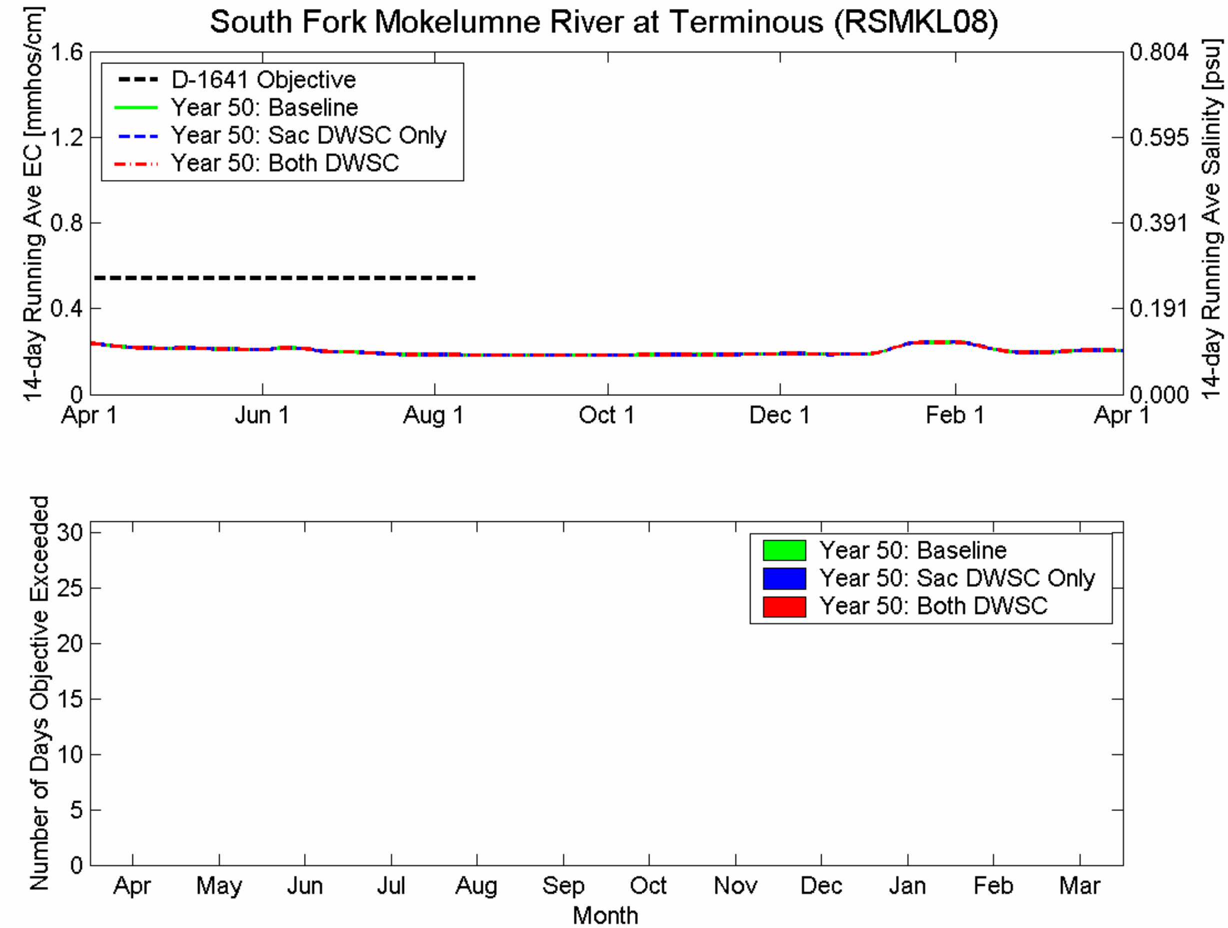
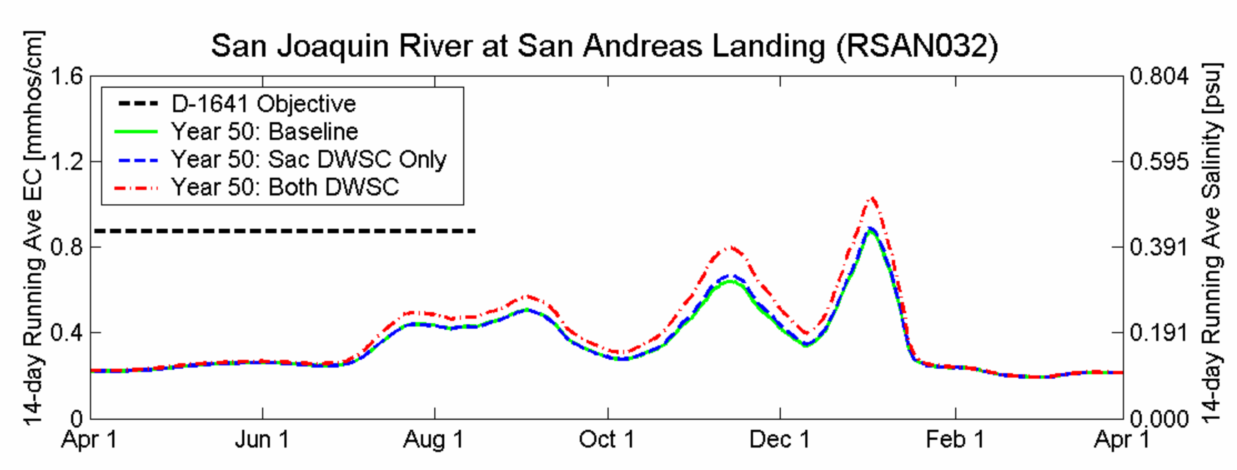


Figure 5.7-11 Predicted 14-day running average EC at South Fork Mokelumne River at Terminous (RSMKL08) for the Year 50 Baseline scenario, the Year 50 Sacramento DWSC Only Deepening scenario, and the Year 50 Both DWSC Deepening scenario (top); number of days each month that predicted 14-day running average EC at RSMKL08 exceeds D-1641 water quality objectives for each scenario during the Year 50 simulation period (bottom).



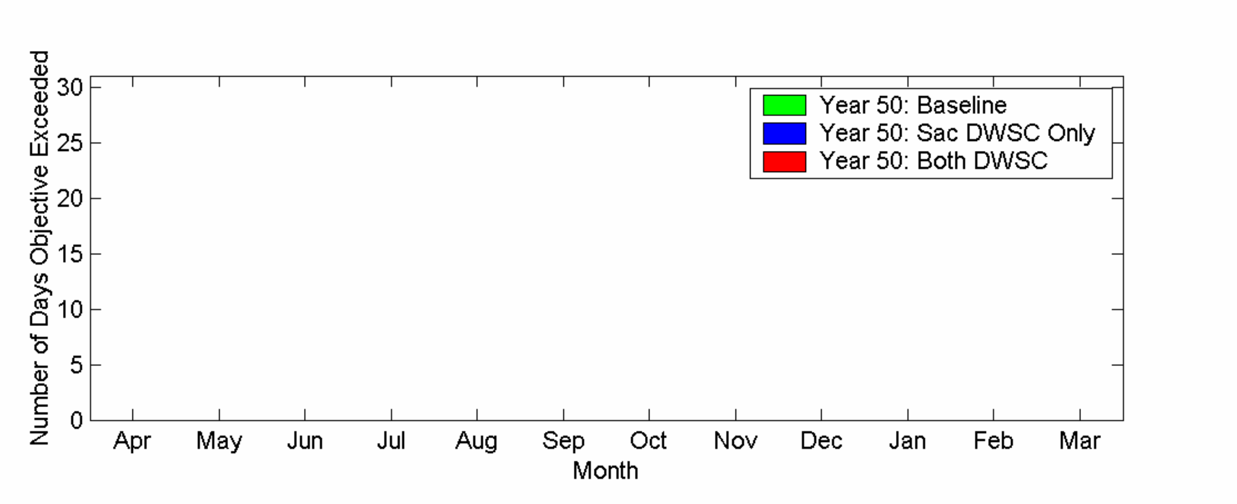


Figure 5.7-12 Predicted 14-day running average EC at San Joaquin River at San Andreas Landing (RSAN032) for the Year 50 Baseline scenario, the Year 50 Sacramento DWSC Only Deepening scenario, and the Year 50 Both DWSC Deepening scenario (top); number of days each month that predicted 14-day running average EC at RSAN032 exceeds D-1641 water quality objectives for each scenario during the Year 50 simulation period (bottom).

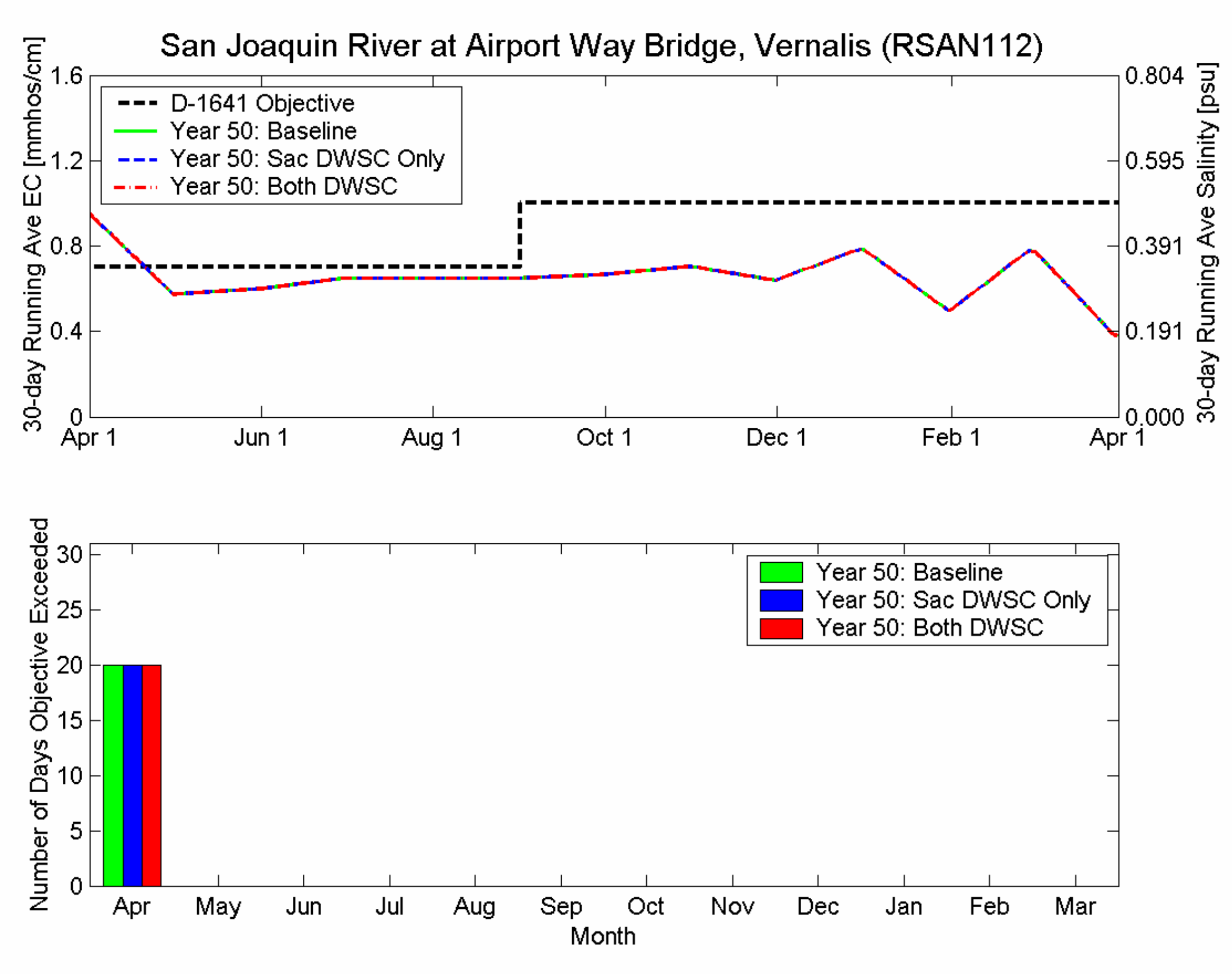
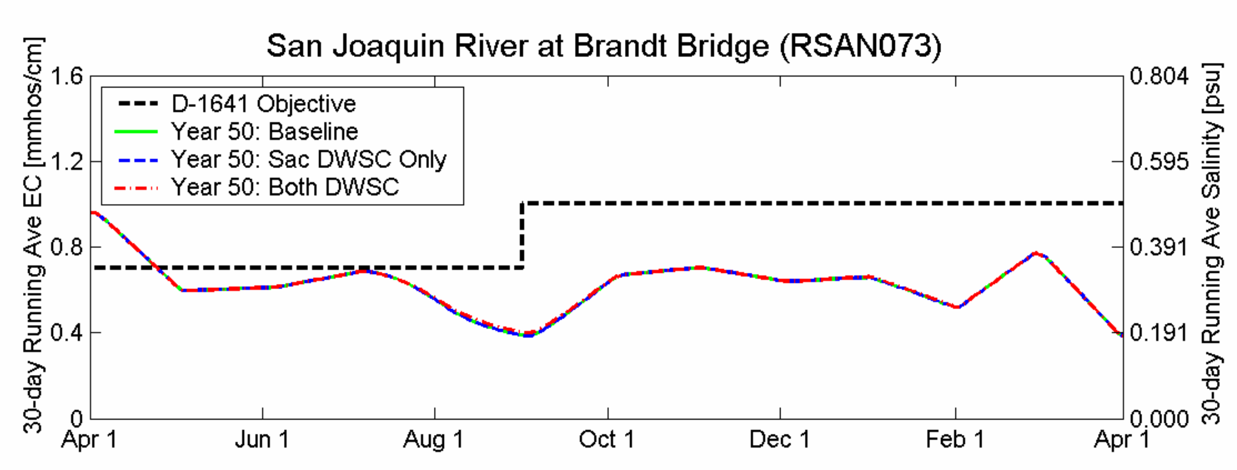


Figure 5.7-13 Predicted 30-day running average EC at San Joaquin River at Airport Way Bridge, Vernalis (RSAN112) for the Year 50 Baseline scenario, the Year 50 Sacramento DWSC Only Deepening scenario, and the Year 50 Both DWSC Deepening scenario (top); number of days each month that predicted 14-day running average EC at RSAN112 exceeds D-1641 water quality objectives for each scenario during the Year 50 simulation period (bottom).



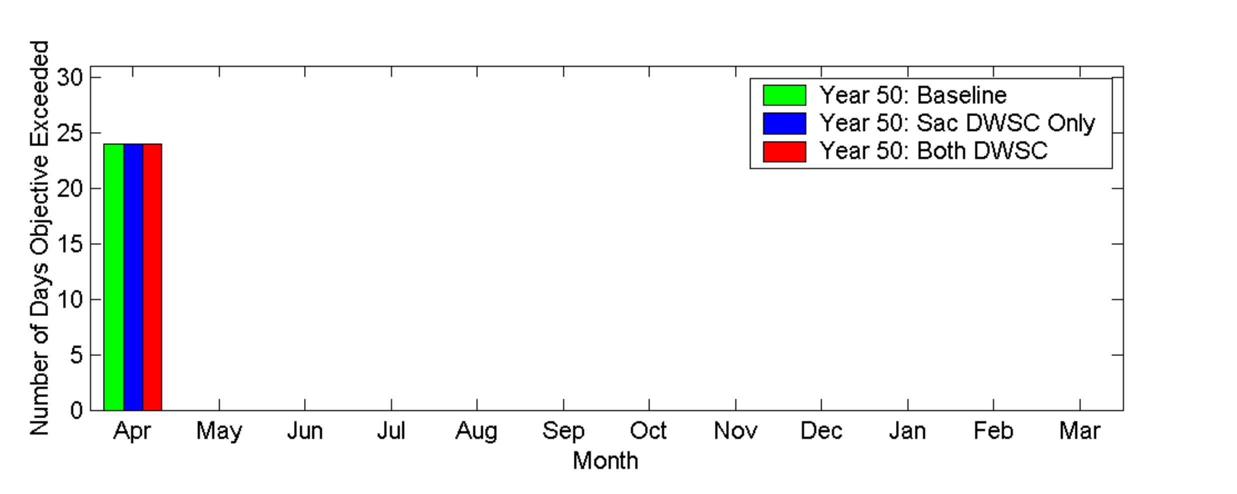


Figure 5.7-14 Predicted 30-day running average EC at San Joaquin River at Brandt Bridge (RSAN073) for the Year 50 Baseline scenario, the Year 50 Sacramento DWSC Only Deepening scenario, and the Year 50 Both DWSC Deepening scenario (top); number of days each month that predicted 14-day running average EC at RSAN073 exceeds D-1641 water quality objectives for each scenario during the Year 50 simulation period (bottom).

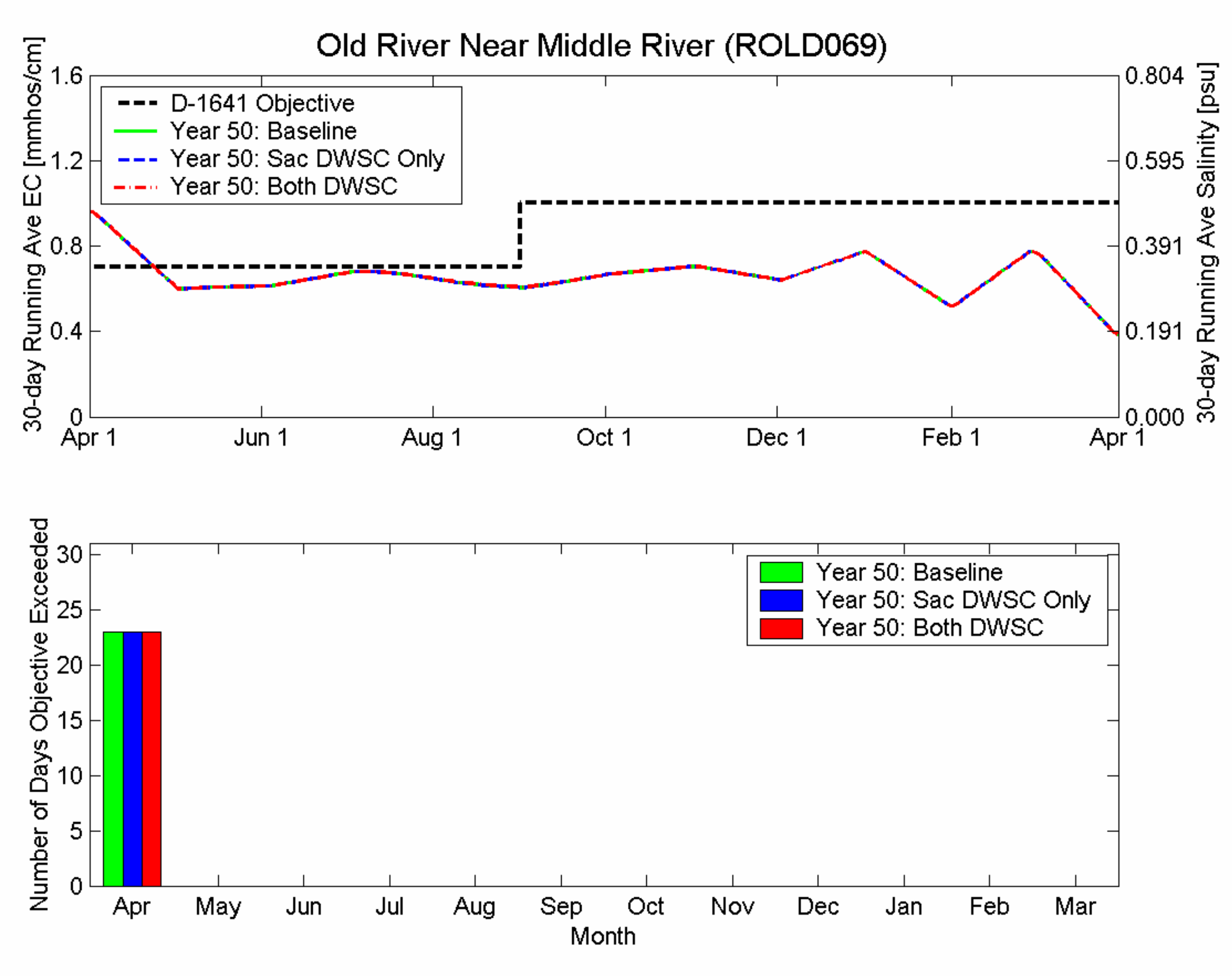


Figure 5.7-15 Predicted 30-day running average EC at Old River Near Middle River (ROLD069) for the Year 50 Baseline scenario, the Year 50 Sacramento DWSC Only Deepening scenario, and the Year 50 Both DWSC Deepening scenario (top); number of days each month that predicted 14-day running average EC at ROLD069 exceeds D-1641 water quality objectives for each scenario during the Year 50 simulation period (bottom).

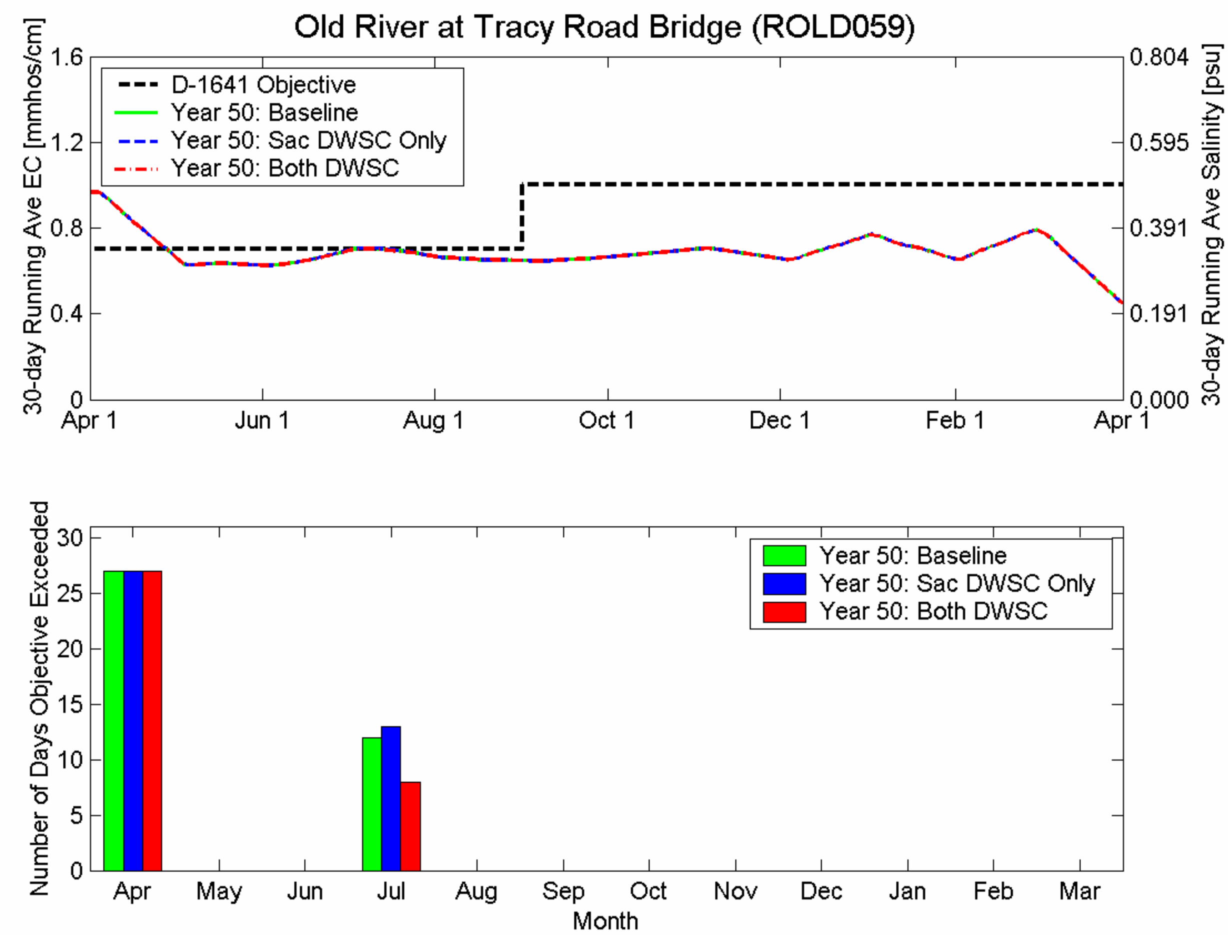


Figure 5.7-16 Predicted 30-day running average EC at Old River at Tracy Road Bridge (ROLD059) for the Year 50 Baseline scenario, the Year 50 Sacramento DWSC Only Deepening scenario, and the Year 50 Both DWSC Deepening scenario (top); number of days each month that predicted 14-day running average EC at ROLD059 exceeds D-1641 water quality objectives for each scenario during the Year 50 simulation period (bottom).

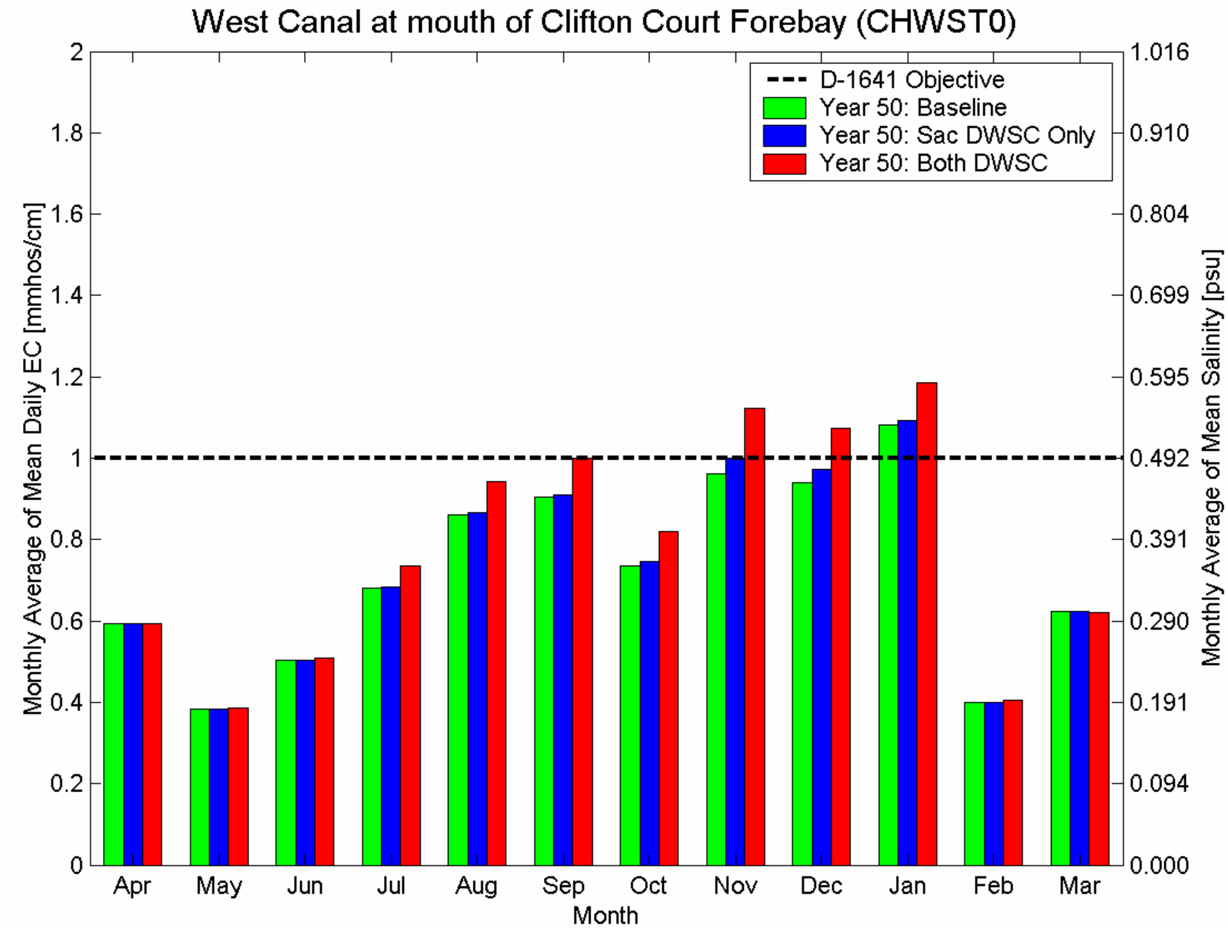


Figure 5.7-17 Predicted monthly average of mean daily EC at West Canal at mouth of Clifton Court Forebay (CHWST0) for the Year 50 Baseline scenario, the Year 50 Sacramento DWSC Only Deepening scenario, and the Year 50 Both DWSC Deepening scenario, shown relative to the D-1641 water quality objectives for agricultural beneficial uses.

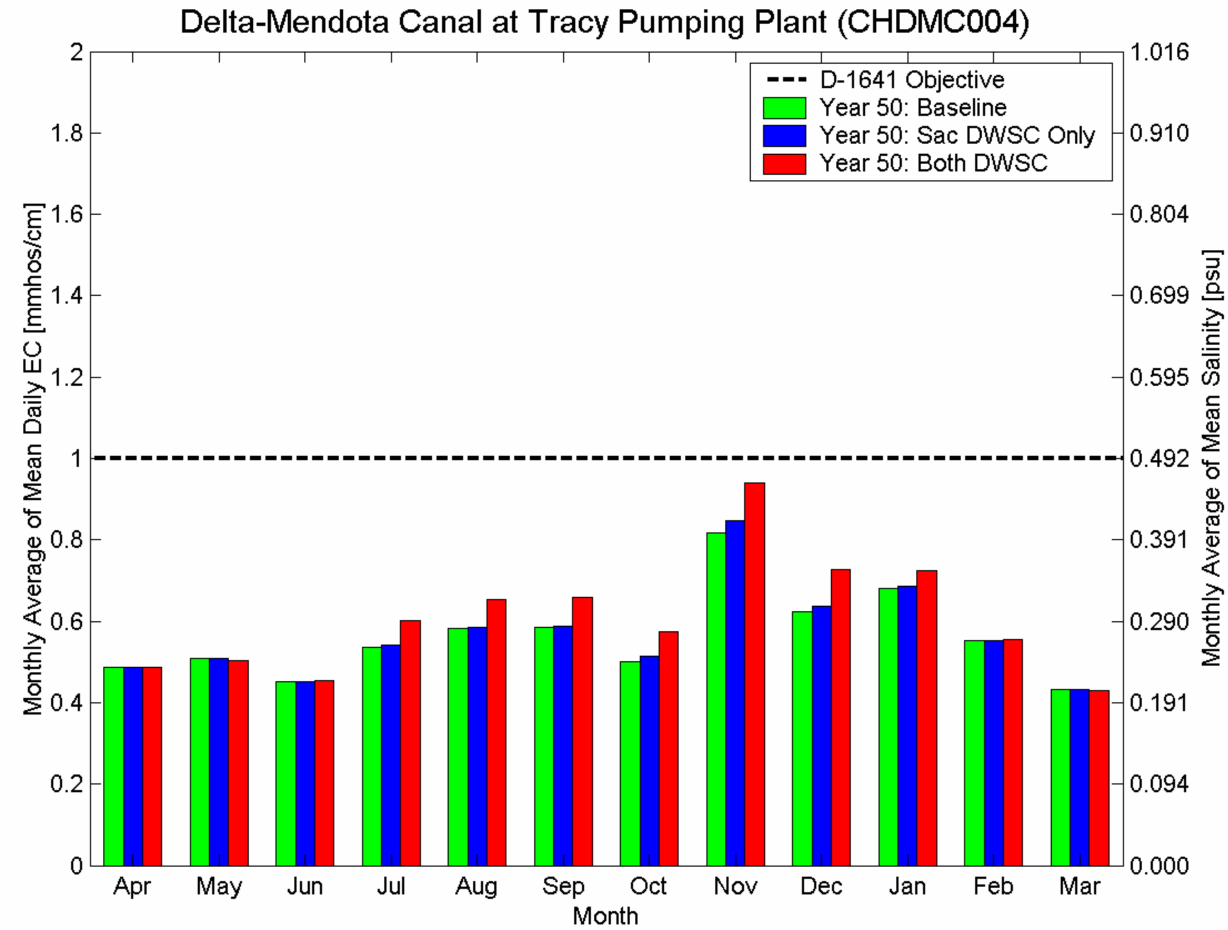


Figure 5.7-18 Predicted monthly average of mean daily EC at Delta-Mendota Canal at Tracy Pumping Plant (CHDMC004) for the Year 50 Baseline scenario, the Year 50 Sacramento DWSC Only Deepening scenario, and the Year 50 Both DWSC Deepening scenario, shown relative to the D-1641 water quality objectives for agricultural beneficial uses.

5.7.3 Water Quality Objectives for Fish and Wildlife Beneficial Uses

The D-1641 water quality objectives for fish and wildlife beneficial uses, shown in Table 3-3, are based on the maximum 14-day running average EC at two stations on the San Joaquin River, and on the monthly average of both daily high tide EC values at three stations in eastern Suisun Marsh and two stations in western Suisun Marsh (shown on Figure 3.4-3).

On the San Joaquin River, the water quality objectives for fish and wildlife beneficial uses stipulate that the 14-day running average of mean daily EC on the San Joaquin River "at and between Jersey Point and Prisoners Point" is less than 0.44 mmhos/cm during the months of April and May for all water year types except "critical" years. Although April and May 1994 fall within a "critical" water year, which means that this standard does not apply for this simulation, the impact of the proposed DWSC deepening scenarios on this water quality objective is shown in Figures 5.7-19 and 5.7-20 for reference.

Figure 5.7-19 shows the predicted 14-day running average EC on the San Joaquin River at Jersey Point for the Year 50 Baseline scenario, the Year 50 Sacramento DWSC Only Deepening scenario, and the Year 50 Both DWSC Deepening scenario. No increases in 14-day running average EC are predicted under either the Year 50 Sacramento DWSC Only Deepening scenario or the Year 50 Both DWSC Deepening scenario during April or May. The water quality objective of maximum 14-day running average EC on the San Joaquin River at Jersey Point is not exceeded under any of the scenarios during the two months that the objectives would apply for water year types that are not "critical."

Figure 5.7-20 shows the predicted 14-day running average EC on the San Joaquin River at Prisoners Point for the Year 50 Baseline scenario, the Year 50 Sacramento DWSC Only Deepening scenario, and the Year 50 Both DWSC Deepening scenario. No increases in 14-day running average EC are predicted under either the Year 50 Sacramento DWSC Only Deepening scenario or the Year 50 Both DWSC Deepening scenario during April or May. The water quality objective of maximum 14-day running average EC on the San Joaquin River at Prisoners Point is not exceeded under any of the scenarios during the two months that the objectives would apply for water year types that are not "critical."

The eastern Suisun Marsh and western Suisun Marsh water quality objectives for fish and wildlife beneficial uses are based on the monthly average of both daily high tide EC values. The water quality objectives apply from October through May for all water year types, as shown in Table 3-3.

Figure 5.7-21 shows the predicted monthly average of both daily high tide EC values on the Sacramento River at Collinsville for the Year 50 Baseline scenario, the Year 50 Sacramento DWSC Only Deepening scenario, and the Year 50 Both DWSC Deepening scenario. For the Year 50 Sacramento DWSC Only Deepening scenario, minimal to no increase in monthly average of both daily high tide EC values is predicted during all months. For the Year 50 Both DWSC Deepening scenario, predicted increases in monthly average of both daily high tide EC values are typically on the order of 0.5 mmhos/cm. The water quality objectives for fish and wildlife beneficial uses on the Sacramento River at Collinsville are met for all months under the Year 50 Baseline scenario and the Year 50 Sacramento DWSC Only Deepening scenario. Under the Year 50 Both DWSC Deepening scenario, the water quality objectives for fish and wildlife beneficial uses on the Sacramento River at Collinsville are not met during January or February.

Figure 5.7-22 shows the predicted monthly average of both daily high tide EC values on Montezuma Slough at National Steel for the Year 50 Baseline scenario, the Year 50 Sacramento DWSC Only Deepening scenario, and the Year 50 Both DWSC Deepening scenario. For the Year 50 Sacramento DWSC Only Deepening scenario, minimal to no increase in monthly average of both daily high tide EC values is predicted during all months. For the Year 50 Both DWSC Deepening scenario, predicted increases in monthly average of both daily high tide EC values are typically on the order of 0.5 mmhos/cm. The water quality objectives for fish and wildlife beneficial uses on Montezuma Slough at National Steel are exceeded during November, January, and February under all three scenarios, but are met during all other months.

Figure 5.7-23 shows the predicted monthly average of both daily high tide EC values on Montezuma Slough near Beldon Landing for the Year 50 Baseline scenario, the Year 50 Sacramento DWSC Only Deepening scenario, and the Year 50 Both DWSC Deepening scenario. For the Year 50 Sacramento DWSC Only Deepening scenario, minimal to no increase in monthly average of both daily high tide EC values is predicted during all months. For the Year 50 Both DWSC Deepening scenario, predicted increases in monthly average of both daily high tide EC values are typically on the order of 0.5 mmhos/cm. The water quality objectives for fish and wildlife beneficial uses on Montezuma Slough near Beldon Landing are exceeded during November for all three scenarios. Under the Year 50 Both DWSC Deepening scenario, the water quality objectives for fish and wildlife beneficial uses on Montezuma Slough near Beldon Landing are also exceeded during December and January.

Figure 5.7-24 shows the predicted monthly average of both daily high tide EC values on Chadbourne Slough at Sunrise Duck Club for the Year 50 Baseline scenario, the Year 50 Sacramento DWSC Only Deepening scenario, and the Year 50 Both DWSC Deepening scenario. For the Year 50 Sacramento DWSC Only Deepening scenario, minimal to no increase in monthly average of both daily high tide EC values is predicted during all months. For the Year 50 Both DWSC Deepening scenario, predicted increases in monthly average of both daily high tide EC values are typically on the order of 0.5 mmhos/cm. The water quality objectives for fish and wildlife beneficial uses on Chadbourne Slough at Sunrise Duck Club are exceeded during April, November, December, January, February, and March under all three scenarios.

Figure 5.7-25 shows the predicted monthly average of both daily high tide EC values on Suisun Slough, 300 feet south of Volanti Slough for the Year 50 Baseline scenario, the Year 50 Sacramento DWSC Only Deepening scenario, and the Year 50 Both DWSC Deepening scenario. For the Year 50 Sacramento DWSC Only Deepening scenario, minimal to no increase in monthly average of both daily high tide EC values is predicted during all months. For the Year 50 Both DWSC Deepening scenario, predicted increases in monthly average of both daily high tide EC values are typically on the order of 0.5 mmhos/cm. The water quality objectives for fish and wildlife beneficial uses on Suisun Slough, 300 feet south of Volanti Slough are exceeded during November, December, January, February, and March under all three scenarios.

The evaluation of water quality objectives in eastern Suisun Marsh and western Suisun Marsh demonstrates that the deepening of the Sacramento DWSC Only is unlikely to have any impact on EC in these regions during Year 50. This is consistent with the salinity maps for the Year 50 Sacramento DWSC Only Deepening scenario discussed in Section 5.4 (Figures 5.4-1 though 5.4-13), which showed that no salinity increases greater than 0.05 psu are predicted in Suisun Marsh under the Year 50 Sacramento DWSC Only Deepening scenario. However, the corresponding maps for the Year 50 Both DWSC Deepening scenario in Section 5.4 (Figures 5.4-27 through 5.4-37) showed a predicted salinity increase on the order of 0.2-0.5 psu during most of the year in Suisun Bay and Suisun Marsh, indicating that increased salt intrusion resulting from the Year 50 Both DWSC Deepening scenario is likely to have a more significant impact on EC in Suisun Marsh throughout the year.

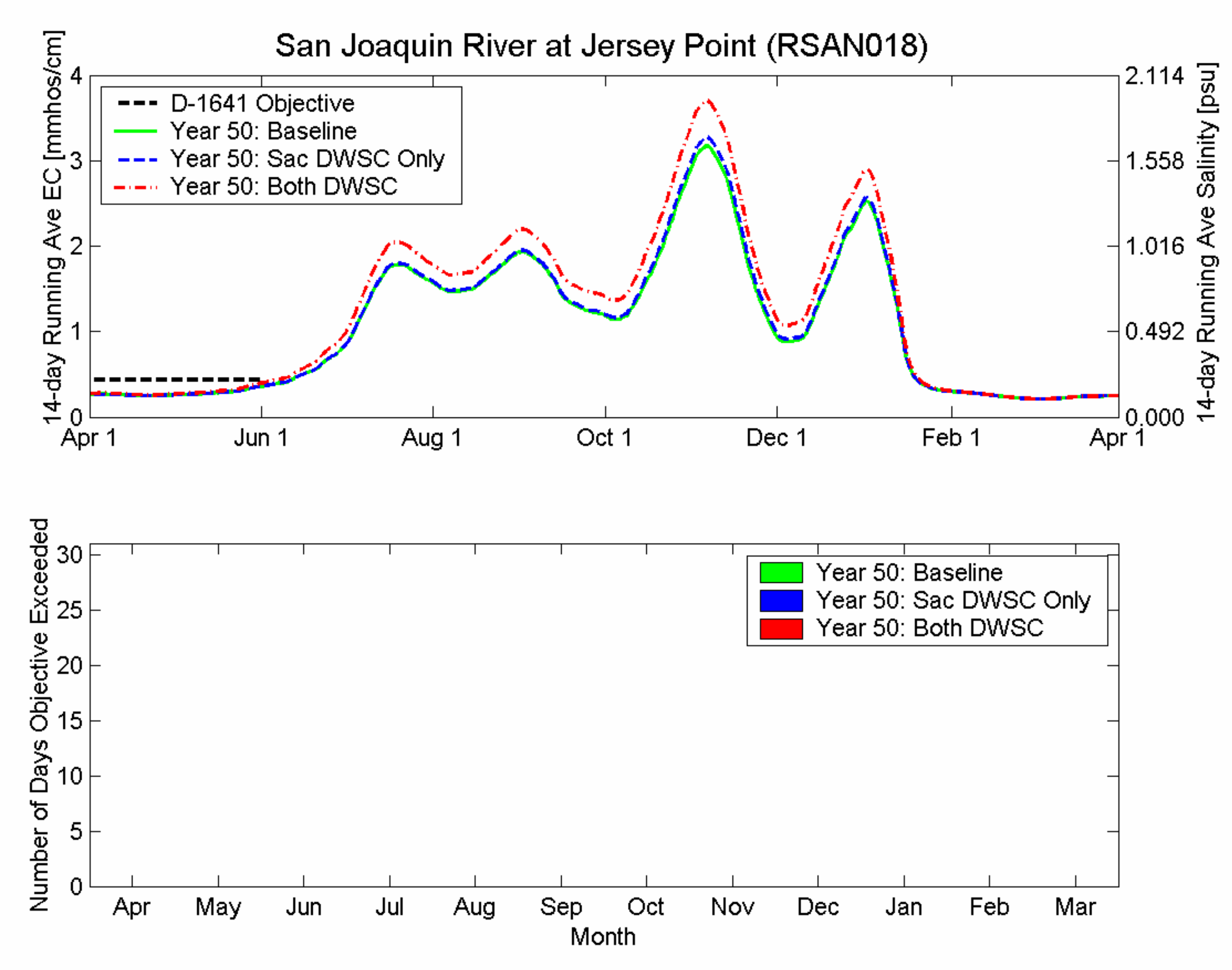


Figure 5.7-19 Predicted 14-day running average EC at San Joaquin River at Jersey Point (RSAN018) for the Year 50 Baseline scenario, the Year 50 Sacramento DWSC Only Deepening scenario, and the Year 50 Both DWSC Deepening scenario (top); number of days each month that predicted 14-day running average EC at RSAN018 exceeds D-1641 water quality objectives for each scenario during the Year 50 simulation period (bottom).

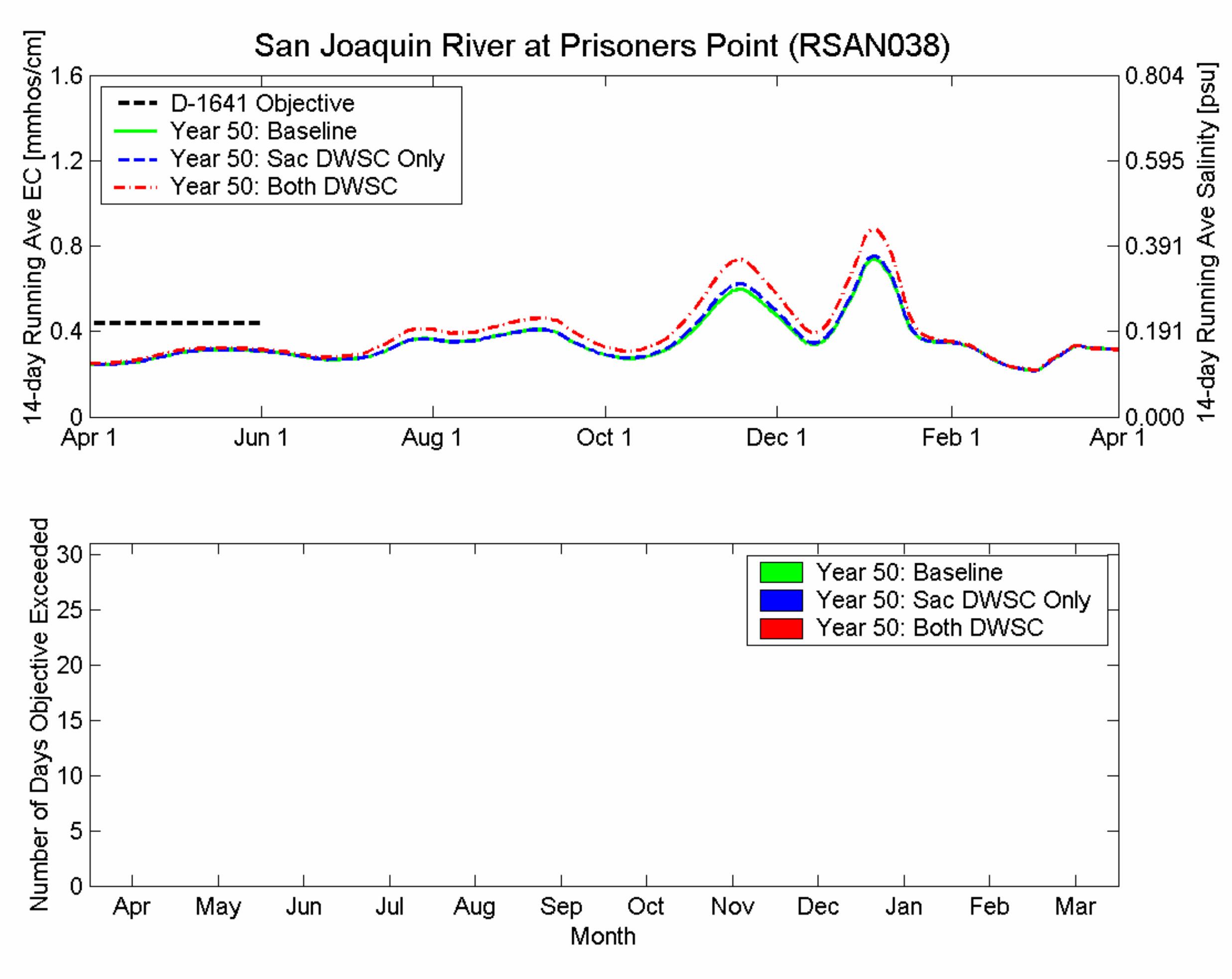


Figure 5.7-20 Predicted 14-day running average EC at San Joaquin River at Prisoners Point (RSAN038) for the Year 50 Baseline scenario, the Year 50 Sacramento DWSC Only Deepening scenario, and the Year 50 Both DWSC Deepening scenario (top); number of days each month that predicted 14-day running average EC at RSAN038 exceeds D-1641 water quality objectives for each scenario during the Year 50 simulation period (bottom).

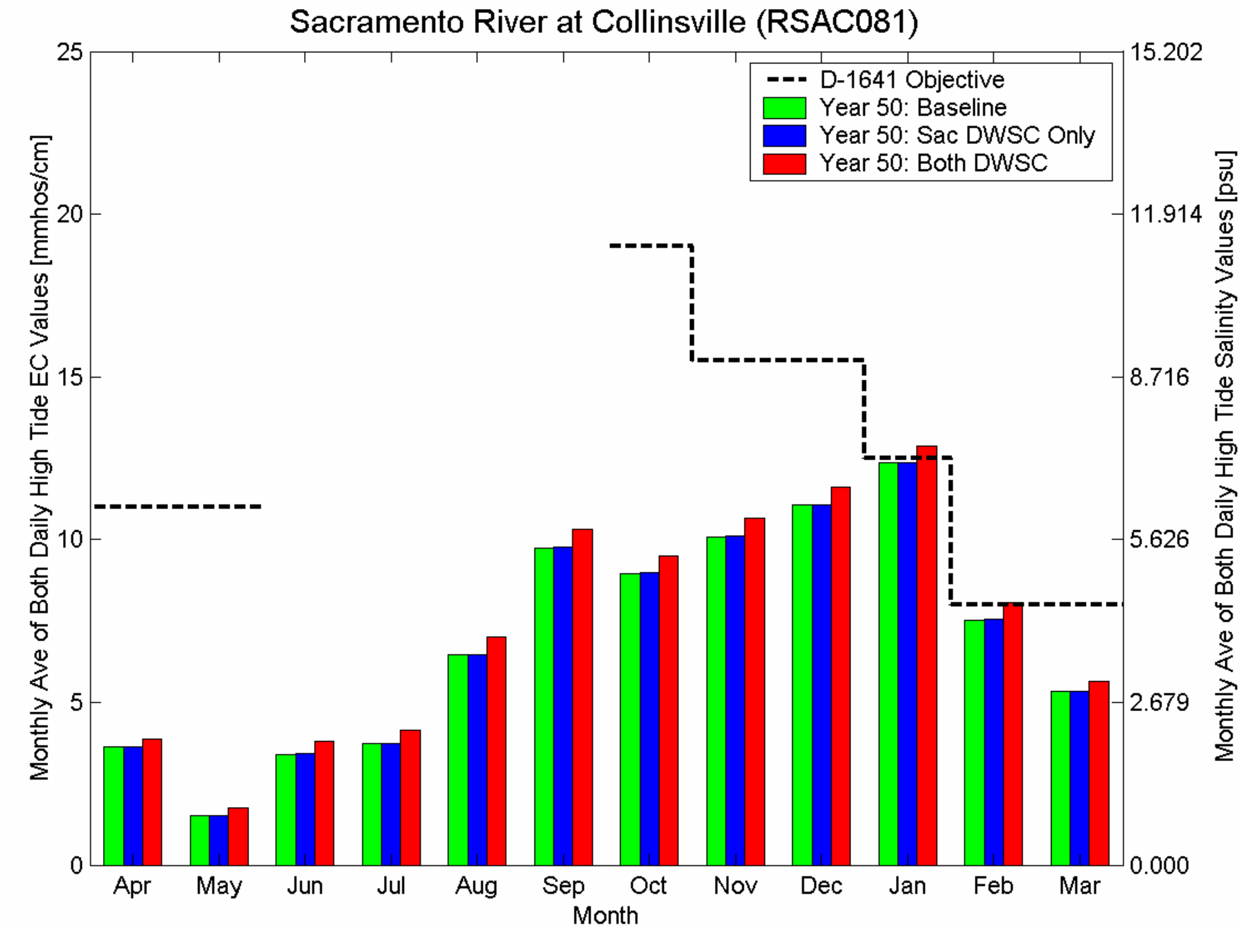


Figure 5.7-21 Predicted monthly average of both daily high tide EC values at Sacramento River at Collinsville (RSAC081) for the Year 50 Baseline scenario, the Year 50 Sacramento DWSC Only Deepening scenario, and the Year 50 Both DWSC Deepening scenario, shown relative to the D-1641 water quality objectives for fish and wildlife beneficial uses.

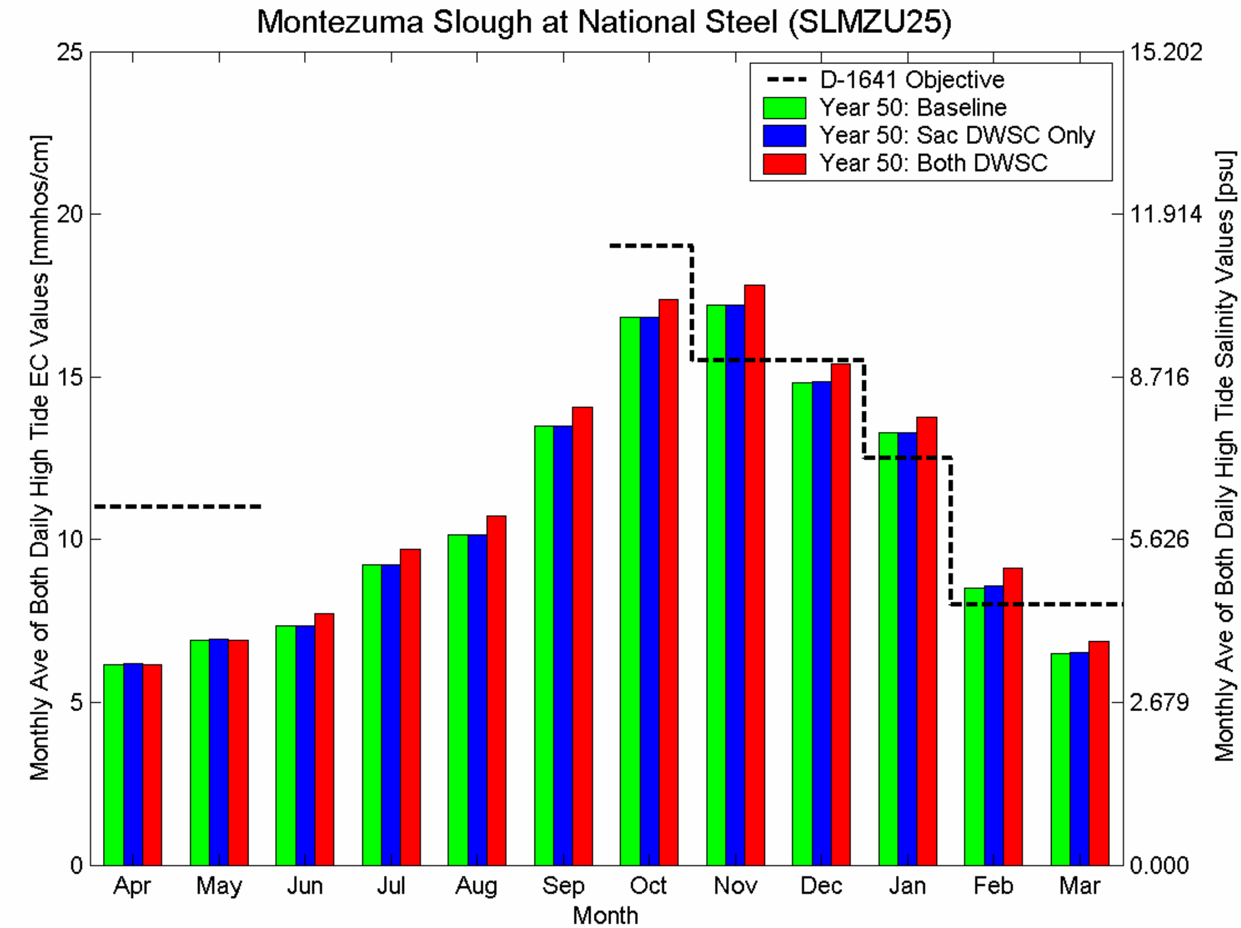


Figure 5.7-22 Predicted monthly average of both daily high tide EC values at Montezuma Slough at National Steel (SLMZU25) for the Year 50 Baseline scenario, the Year 50 Sacramento DWSC Only Deepening scenario, and the Year 50 Both DWSC Deepening scenario, shown relative to the D-1641 water quality objectives for fish and wildlife beneficial uses.

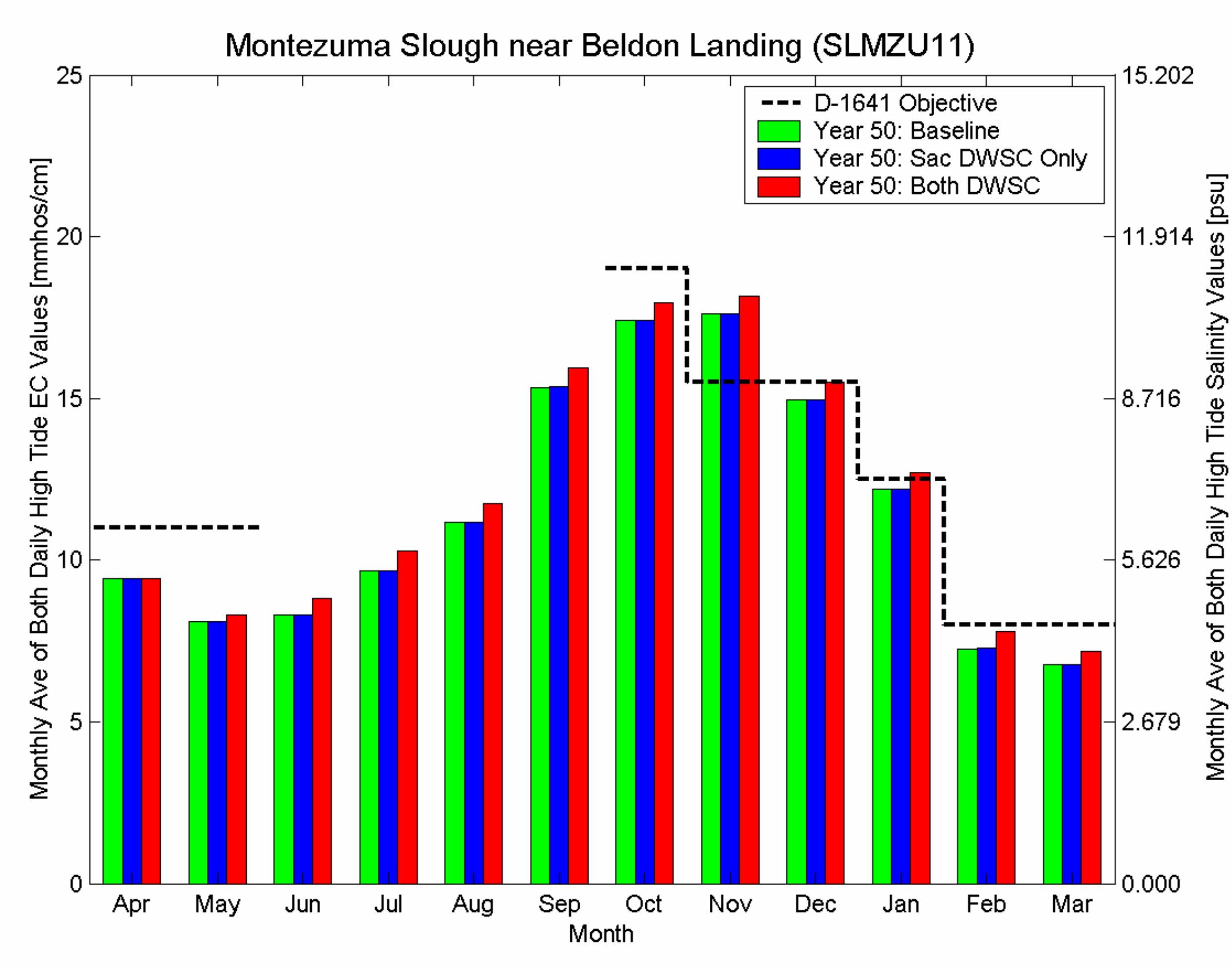


Figure 5.7-23 Predicted monthly average of both daily high tide EC values at Montezuma Slough near Beldon Landing (SLMZU11) for the Year 50 Baseline scenario, the Year 50 Sacramento DWSC Only Deepening scenario, and the Year 50 Both DWSC Deepening scenario, shown relative to the D-1641 water quality objectives for fish and wildlife beneficial uses.

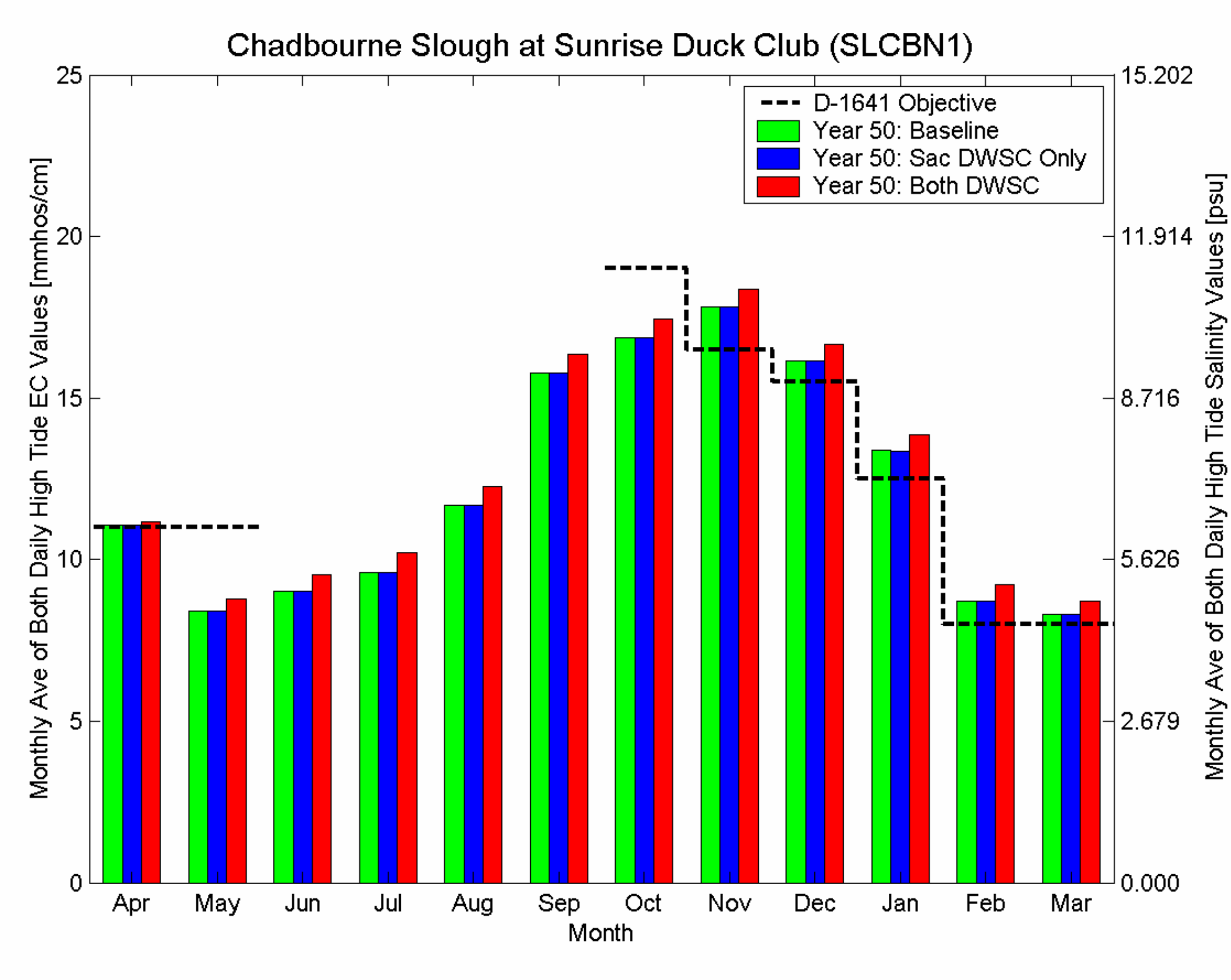


Figure 5.7-24 Predicted monthly average of both daily high tide EC values at Chadbourne Slough at Sunrise Duck Club (SLCBN1) for the Year 50 Baseline scenario, the Year 50 Sacramento DWSC Only Deepening scenario, and the Year 50 Both DWSC Deepening scenario, shown relative to the D-1641 water quality objectives for fish and wildlife beneficial uses.

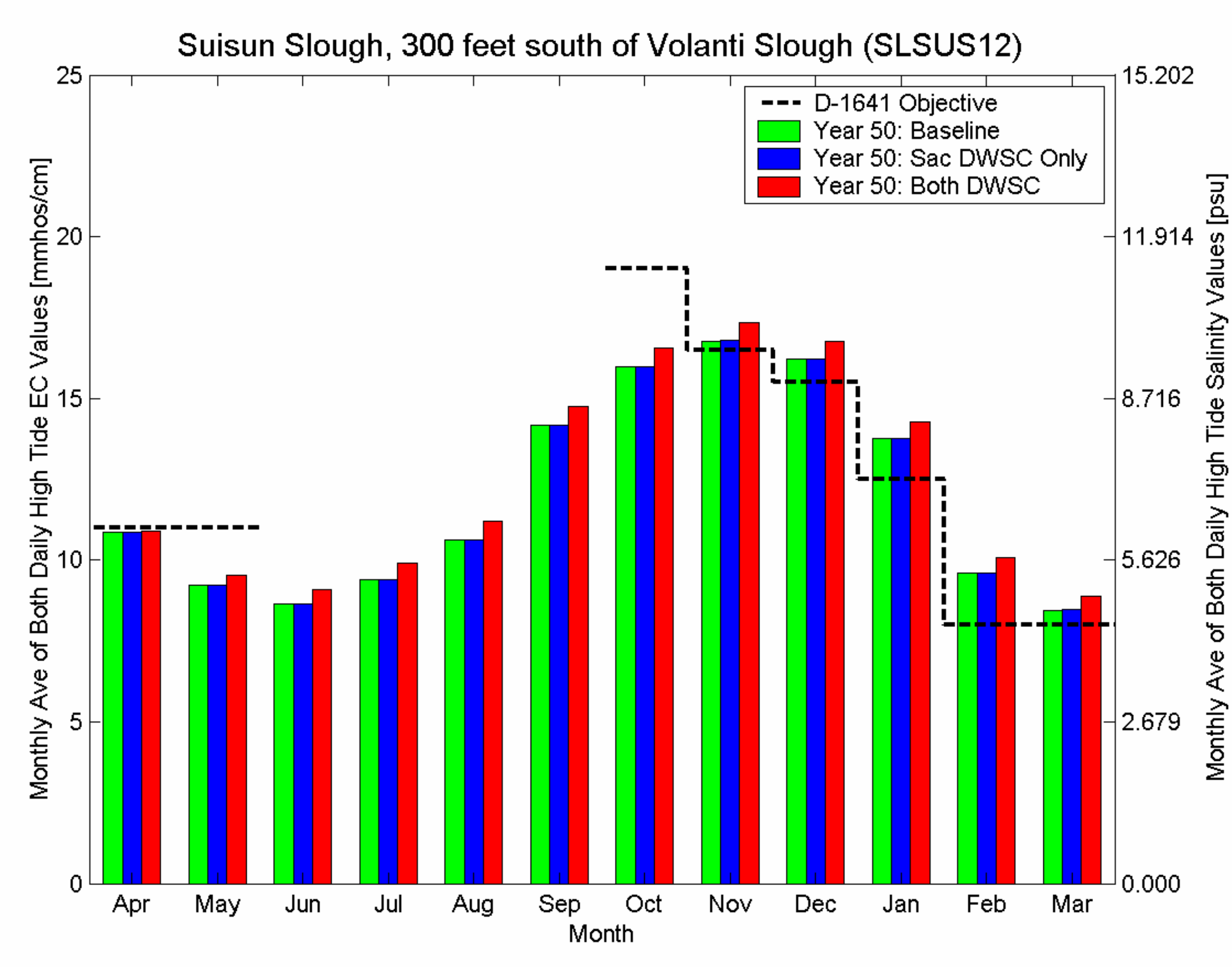


Figure 5.7-25 Predicted monthly average of both daily high tide EC values at Suisun Slough, 300 feet south of Volanti Slough (SLSUS12) for the Year 50 Baseline scenario, the Year 50 Sacramento DWSC Only Deepening scenario, and the Year 50 Both DWSC Deepening scenario, shown relative to the D-1641 water quality objectives for fish and wildlife beneficial uses.

5.8 Discussion of DWSC Deepening Alternatives under Year 50 Conditions

The Year 50 simulation period represents an estimate of possible conditions that may exist 50 years after the projected start of project construction for each of the deepening projects. The Year 50 simulation incorporates the expected bathymetric, hydrologic, and operating conditions in years 2061 and 2062 for the Sacramento DWSC and the San Francisco Bay to Stockton DWSC, respectively.

5.8.1 Discussion of Year 50 Sacramento DWSC Only Deepening Scenario

The Year 50 Sacramento DWSC Only Deepening scenario was compared to the Year 50 Baseline scenario to evaluate the potential impacts of the proposed deepening of the Sacramento DWSC under Year 50 conditions. Predicted water surface elevation, flow, and salinity under the Year 50 Sacramento DWSC Only Deepening scenario were compared to the corresponding model predictions under the Year 50 Baseline scenario.

Time series comparisons of stage (Section 5.1.1) show that during most of the year the deepening of the Sacramento DWSC does not have a noticeable impact on stage in the San Francisco Bay or the Sacramento-San Joaquin Delta. During high flows, a slight decrease in daily-averaged stage of less than 0.03 m is predicted along the Sacramento DWSC. This decrease in stage is likely the result of increased conveyance capacity along the Sacramento DWSC resulting from the channel deepening. Time series comparisons of flow (Section 5.2.1) show that during most of the year the deepening of the Sacramento DWSC does not have a significant effect on tidal flows in San Francisco Bay or the Sacramento-San Joaquin Delta. The deepening of the Sacramento DWSC results in a very small increase in the tidal prism along the Sacramento DWSC, however these changes to tidal prism are evident only along the Sacramento River and Cache Slough.

Time series comparisons of salinity (Section 5.5.1) show that during spring and winter periods, the deepening of the Sacramento DWSC does not have a significant effect on salinity in San Francisco Bay or the Sacramento-San Joaquin Delta. Depth-averaged daily-averaged salinity maps (Section 5.4.1) show that the predicted salinity increase in the entire Sacramento-San Joaquin Delta is less than 0.05 psu from April 1 through June 1 and from February 1 through March 1 for the Year 50 Sacramento DWSC Only Deepening scenario. From July to January, salinity increases of up to 0.11 psu are predicted along the Sacramento River between Emmaton and Rio Vista. These salinity increases result in a maximum increase in X2 (Section 5.3.1) measured along the Sacramento transect of 1.94 km during the Year 50 Sacramento DWSC Only Deepening scenario. The deepening of the Sacramento DWSC has a much smaller impact on salinity along the San Joaquin River with predicted salinity increases of up to 0.06 psu at Antioch and 0.07 psu at Jersey Point. This salinity increase results in a maximum increase in X2 measured along the San Joaquin River transect of 1.22 km during the Year 50 Sacramento DWSC Only Deepening scenario. The maximum change in average X2 during the Year 50 Sacramento DWSC Only Deepening scenario is 1.05 km. A change of average X2 of 1.0 km or more is predicted on only 1 day during the Year 50 Sacramento DWSC Only Deepening scenario. The deepening of the Sacramento DWSC does not have an impact on salinity during periods when X2 is less than 75 km.

Evaluation of the impact of the Year 50 Sacramento DWSC Only Deepening scenario on the compliance with the D-1641 water quality objectives (Section 5.6) indicates a small increase in the number of days the water quality objectives for municipal and industrial beneficial uses are not met at the Contra Costa Rock Slough Export and at the Contra Costa Old River Export. No change in the number of days the water quality objectives for municipal and industrial beneficial uses are met is predicted at West Canal at the mouth of Clifton Court Forebay, the Delta-Mendota Canal at the Tracy Pumping Plant, Barker Slough at the North Bay Aqueduct Intake, Cache Slough at the City of Vallejo Intake, or at the Contra Costa Victoria Canal AIP. No changes to the compliance with the water quality objectives for agricultural beneficial uses are predicted under the Year 50 Sacramento DWSC Only Deepening scenario except at West Canal at the mouth of Clifton Court Forebay and at Old River at Tracy Road Bridge. No changes to the compliance with the water quality objectives for Fish and Wildlife beneficial uses are predicted under the Year 50 Sacramento DWSC Only Deepening scenario.

5.8.2 Discussion of Year 50 Both DWSC Deepening Scenario

The Year 50 Both DWSC Deepening scenario was compared to the Year 50 Baseline scenario and the Year 50 Sacramento DWSC Only Deepening scenario to evaluate the potential impacts of the proposed deepening of Both DWSC under Year 50 conditions. Predicted water surface elevation, flow, and salinity under the Year 50 Both DWSC Deepening scenario were compared to the corresponding model predictions under the Year 50 Baseline scenario and the Year 50 Sacramento DWSC Only Deepening scenario.

Time series comparisons of stage (Section 5.1.2) show that during most of the year the deepening of Both DWSC does not have a noticeable impact on stage in the San Francisco Bay or the Sacramento-San Joaquin Delta. During high flows, a slight decrease in daily-averaged stage of less than 0.03 m is predicted along both the Sacramento DWSC and the San Francisco Bay to Stockton DWSC within the Delta. This decrease in stage is likely the result of increased conveyance capacity along both the Sacramento DWSC and the San Francisco Bay to Stockton DWSC resulting from the channel deepening. Time series comparisons of flow (Section 5.2.2) show that the channel deepening associated with the Year 50 Both DWSC Deepening scenario results in a small increase in tidal prism of the Delta. Peak tidal flows at Chipps Island under the Year 50 Both DWSC Deepening scenario are about 1.5% greater than under the Year 50 Baseline scenario indicating a slight increase in tidal prism of the Delta under the Year 50 Both DWSC Deepening scenario. A similar percentage increase in tidal prism is predicted along the San Joaquin River past Prisoners Point, and a smaller increase in tidal prism is predicted along the Sacramento River.

Depth-averaged daily-averaged salinity maps (Section 5.4.2) show that salinity increases are predicted in San Pablo Bay and Suisun Bay throughout the year. During high flows, the predicted salinity increase in the entire Sacramento-San Joaquin Delta is less than 0.05 psu from February 1 through March 1 for the Year 50 Both DWSC Deepening scenario, but salinity increases are predicted in the Sacramento-San Joaquin Delta throughout most of the year. Time series comparisons of salinity (Section 5.5.2) show predicted salinity increases of between 0.5 psu and 1.0 psu from Carquinez Straight through western Suisun Bay throughout the year. Salinity increases of up to 0.27 psu are predicted on the Sacramento River at Emmaton and salinity increases of up to 0.33 psu are predicted on the San Joaquin River at Jersey Point.

Since the San Francisco Bay to Stockton DWSC deepening affects the West Richmond Channel, the Pinole Shoal Channel though San Pablo Bay and the Stockton DWSC through Suisun Bay, salinity gradients are present in deepened reaches throughout the year. This results in an increase in salt intrusion and a resulting increase in X2 (Section 5.3.2) throughout the year under the Year 50 Both DWSC Deepening scenario. Throughout most of the Year 50 simulation period, the predicted X2 for the Year 50 Both DWSC Deepening scenario is approximately 1 km to 2 km greater than for the Year 50 Baseline scenario along both the Sacramento and the San Joaquin transects, indicating increased salt intrusion throughout the simulation period. The maximum change in average X2 during the Year 50 Both DWSC Deepening scenario is 4.40 km. A change of average X2 of 2.0 km or more is predicted on 31 days under the Year 50 Both DWSC Deepening scenario and a change of average X2 of 1.0 km or more is predicted on 293 days under the Year 50 Both DWSC Deepening scenario.

Evaluation of the impact of the Year 50 Both DWSC Deepening scenario on the compliance with the D-1641 water quality objectives (Section 5.7) indicates an increase in the number of days the water quality objectives for municipal and industrial beneficial uses are not met at the Contra Costa Rock Slough Export, West Canal at the mouth of Clifton Court Forebay, and at the Contra Costa Old River Export. No change in the number of days the water quality objectives for municipal and industrial beneficial uses are met is predicted at Barker Slough at the North Bay Aqueduct Intake, Cache Slough at the City of Vallejo Intake, the Delta-Mendota Canal at the Tracy Pumping Plant, or at the Contra Costa Victoria Canal AIP. No changes to the compliance with the water quality objectives for agricultural beneficial uses are predicted under the Year 50 Both DWSC Deepening scenario except at the Sacramento River at Emmaton and at West Canal at the mouth of Clifton Court Forebay. Due to predicted salinity increases on the order of 0.2 to 0.5 psu during most of the year in Suisun Bay and Suisun Marsh, increased salt intrusion resulting from the Year 50 Both DWSC Deepening scenario results in a decline in compliance with the water quality objectives for fish and wildlife beneficial uses in eastern Suisun Marsh and western Suisun Marsh.

6. Evaluation of Alternatives under Future Conditions with Potential Project (Year 50 with Potential Project)

This section presents an evaluation of the potential impacts resulting from the proposed channel deepening scenarios, discussed in Section 2, under future with Potential Project (PP) conditions, as described in Section 3.2.3. The Year 50 with Potential Project conditions differ from the Year 50 conditions only in the geographic distribution of the Delta exports. Under the Year 50 with Potential Project conditions, an isolated conveyance facility is added along the Sacramento River near Freeport and some of the South Delta exports are shifted to this "Potential Project" facility under the operating constraints described in Section 3.2.3. The future year conditions are defined based on the expected bathymetric, hydrologic, and operating conditions in years 2061 and 2062 for the Sacramento DWSC and the San Francisco Bay to Stockton DWSC, respectively. The future year conditions simulation represents the Year 50 with Potential Project conditions, which are an estimate of possible conditions that may exist fifty years following the time that a deepening project is completed, assuming that an isolated conveyance facility is constructed as described in Section 3.2.3. Potential hydrodynamic, salinity and water quality impacts of the deepening scenarios under future with potential project conditions are evaluated based on the metrics described in Section 3.3 and 3.4. Under the Year 50 with Potential Project future conditions only the Baseline scenario and the Both DWSC Deepening Scenario is simulated. The Sacramento DWSC Only Deepening scenario is not simulated under Year 50 with Potential Project conditions.

6.1 Evaluation of Impact on Water Levels

Water level time series provide information about potential impacts on water levels (stage) over time at a fixed location. Water level time series comparisons were made at eleven continuous stage monitoring stations in San Francisco Bay and the Sacramento-San Joaquin Delta, shown on Figure 3.3-1. Comparisons for the Year 50 with Potential Project simulation period between predicted water levels for the Year 50 with Potential Project Baseline scenario and the Year 50 with Potential Project Both DWSC Deepening scenario are shown in Section 6.1.1.

6.1.1 Year 50 with Potential Project Both Sacramento DWSC & SF Bay to Stockton DWSC Deepening

For each water level comparison figure included in this section, the top plot shows the tidal time-scale water level variability over a 15-day period for the Year 50 with Potential Project Baseline scenario and the Year 50 with Potential Project Both DWSC Deepening scenario. The middle plot shows daily-averaged stage during the full simulation year for each scenario. The bottom plot shows the predicted change in daily-averaged stage for the Year 50 with Potential Project Both DWSC Deepening scenario relative to the Year 50 with Potential Project Baseline scenario. In cases where the predicted stage is identical between scenarios, some lines are not fully visible. Since the lines are plotted in the order listed on the legend, for periods where the predicted stage for the Year 50 with Potential Project Baseline scenario is not fully visible, the predicted stage for the Year 50 with Potential Project Baseline scenario is identical to the visible line for the Year 50 with Potential Project Both DWSC Deepening scenario.

Figure 6.1-1 shows the predicted stage at Sacramento River at Martinez (RSAC054) for the Year 50 with Potential Project Baseline scenario and the Year 50 with Potential Project Both DWSC Deepening scenario. During the second half of November (top panel of Figure 6.1-1), the predicted stage for both scenarios is identical. Similarly, the daily-averaged stage is nearly identical between both scenarios over the entire simulation year. No change in stage relative to the Year 50 with Potential Project Baseline scenario is predicted at Martinez for the Year 50 with Potential Project Both DWSC Deepening scenario.

Figure 6.1-2 shows the predicted stage at Sacramento River at Collinsville (RSAC081) for the Year 50 with Potential Project Baseline scenario and the Year 50 with Potential Project Both DWSC Deepening scenario. During the second half of November (top panel of Figure 6.1-2), the predicted stage for both scenarios is identical. Similarly, the daily-averaged stage is nearly identical between both scenarios over the entire simulation year. No change in stage relative to the Year 50 with Potential Project Baseline scenario is predicted under the Year 50 with Potential Project Both DWSC Deepening scenario.

Figure 6.1-3 shows the predicted stage at Sacramento River at Rio Vista (RIO) for the Year 50 with Potential Project Baseline scenario and the Year 50 with Potential Project Both DWSC Deepening scenario. During the second half of November (top panel of Figure 6.1-3), the predicted stage for both scenarios is identical. Similarly, the daily-averaged stage is nearly identical between both scenarios over the entire simulation year. A slight decrease in daily-averaged stage of less than 0.01 m is predicted under the Year 50 with Potential Project Both DWSC Deepening scenario during the high flow period between January and March. This decrease in stage is likely the result of the increased conveyance along the Sacramento River resulting from the deepening of the Sacramento DSWC in this reach.

Figure 6.1-4 shows the predicted stage at Cache Slough at Ryer Island (CCH) for the Year 50 with Potential Project Baseline scenario and the Year 50 with Potential Project Both DWSC Deepening scenario. During the second half of November (top panel of Figure 6.1-4), the predicted stage for both scenarios is identical. Similarly, the daily-averaged stage is nearly identical between both scenarios over the entire simulation year. A slight decrease in daily-averaged stage of less than 0.04 m is predicted under the Year 50 with Potential Project Both DWSC Deepening scenario during the high flow period between January and March. This decrease in stage is likely the result of the increased conveyance in Cache Slough resulting from the deepening of the Sacramento DSWC in this reach.

Figure 6.1-5 shows the predicted stage at the Sacramento DWSC (USGS Station 11455335) for the Year 50 with Potential Project Baseline scenario and the Year 50 with Potential Project Both DWSC Deepening scenario. During the second half of November (top panel of Figure 6.1-5), the predicted stage for both scenarios is identical. Similarly, the daily-averaged stage is nearly identical between both scenarios over the entire simulation year. A slight decrease in daily-averaged stage of less than 0.03 m is predicted under the Year 50 with Potential Project Both DWSC Deepening scenario during the high flow period between January and March. This decrease in stage is likely the result of the increased conveyance in Cache Slough which results in a decrease in stage in Cache Slough, and a corresponding decrease in stage in the man-made portion of the Sacramento DSWC.

Figure 6.1-6 shows the predicted stage at the Port of Sacramento for the Year 50 with Potential Project Baseline scenario and the Year 50 with Potential Project Both DWSC Deepening scenario. During the second half of November (top panel of Figure 6.1-6), the predicted stage for both scenarios is identical. Similarly, the daily-averaged stage is nearly identical between both scenarios over the entire simulation year. A slight decrease in daily-averaged stage of less than 0.025 m is predicted under the Year 50 with Potential Project Both DWSC Deepening scenario during the high flow period between January and March. This decrease in stage at the Port of Sacramento is likely the result of the increased conveyance in Cache Slough which results in a decrease in stage in Cache Slough, and a corresponding decrease in stage in the man-made portion of the Sacramento DSWC.

Figure 6.1-7 shows the predicted stage at Sacramento River South of Georgiana Slough (WGB) for the Year 50 with Potential Project Baseline scenario and the Year 50 with Potential Project Both DWSC Deepening scenario. During the second half of November (top panel of Figure 6.1-7), the predicted stage for both scenarios is identical. A slight decrease in daily-averaged stage of less than 0.01 m is predicted under the Year 50 with Potential Project Both DWSC Deepening scenario during the high flow period between January and March.

Figure 6.1-8 shows the predicted stage at San Joaquin River at Jersey Point (JPT) for the Year 50 with Potential Project Baseline scenario and the Year 50 with Potential Project Both DWSC Deepening scenario. During the second half of November (top panel of Figure 6.1-8), the predicted stage for both scenarios is identical. A slight decrease in daily-averaged stage of less than 0.01 m is predicted under the Year 50 with Potential Project Both DWSC Deepening scenario during the high flow period between January and March.

Figure 6.1-9 shows the predicted stage at San Joaquin River at Prisoners Point (PRI) for the Year 50 with Potential Project Baseline scenario and the Year 50 with Potential Project Both DWSC Deepening scenario. During the second half of November (top panel of Figure 6.1-9), the predicted stage for both scenarios is identical. A slight decrease in daily-averaged stage of less than 0.01 m is predicted under the Year 50 with Potential Project Both DWSC Deepening scenario during the high flow period between January and March.

Figure 6.1-10 shows the predicted stage at Stockton Ship Channel at Burns Cutoff (RSAN058) for the Year 50 with Potential Project Baseline scenario and the Year 50 with Potential Project Both DWSC Deepening scenario. During the second half of November (top panel of Figure 6.1-10), the predicted stage for both scenarios is identical. A slight decrease in daily-averaged stage of less than 0.015 m is predicted under the Year 50 with Potential Project Both DWSC Deepening scenario during the high flow period between January and March.

Figure 6.1-11 shows the predicted stage at Middle River at Middle River (MID) for the Year 50 with Potential Project Baseline scenario and the Year 50 with Potential Project Both DWSC Deepening scenario. During the second half of November (top panel of Figure 6.1-11), the predicted stage for both scenarios is identical. Similarly, the daily-averaged stage is nearly identical between both scenarios over the entire simulation year. A slight decrease in daily-averaged stage of less than 0.01 m is predicted under the Year 50 with Potential Project Both DWSC Deepening scenario during the high flow period between January and March.

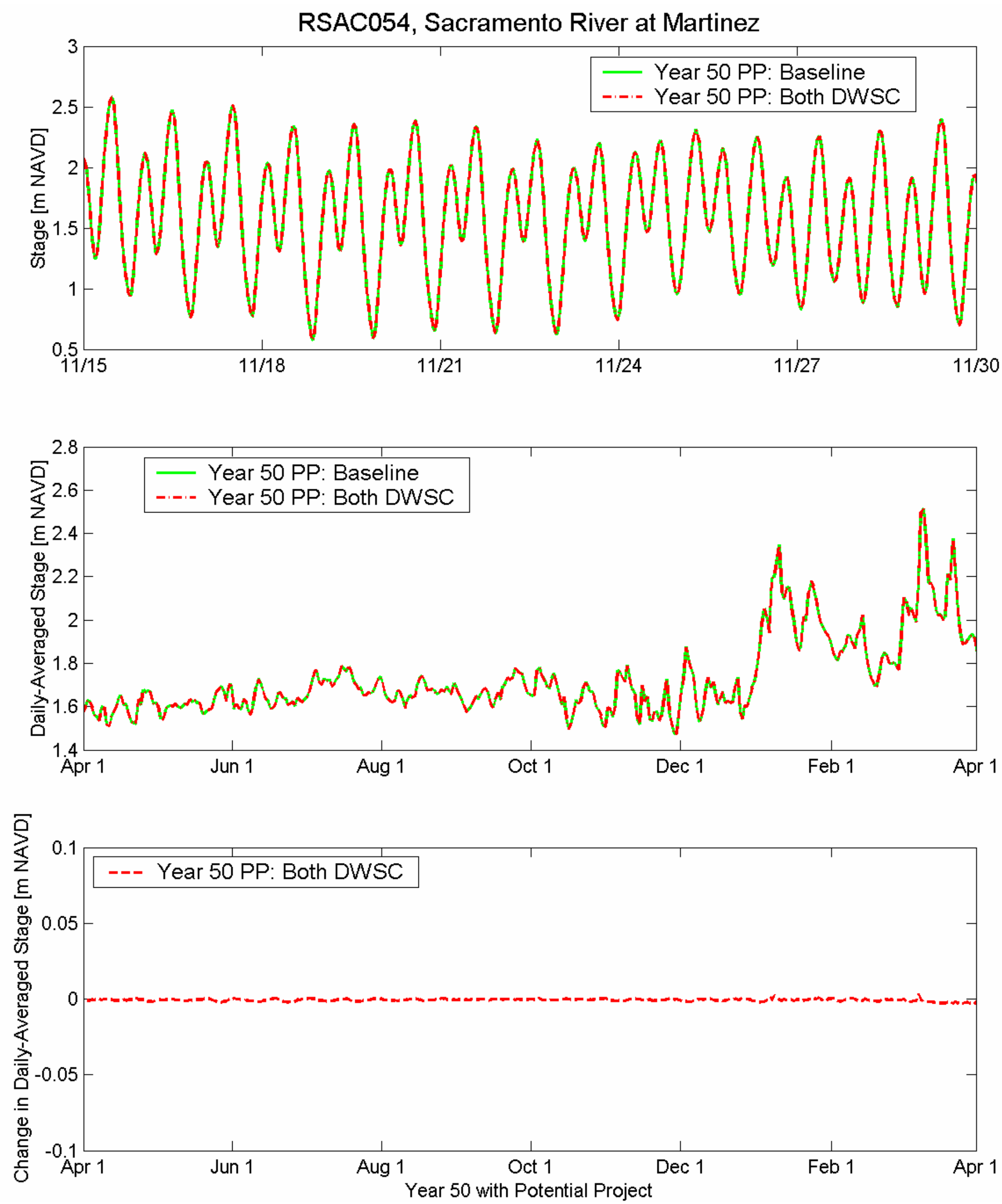


Figure 6.1-1 Predicted stage at Sacramento River at Martinez (RSAC054) for the Year 50 with Potential Project Baseline scenario and the Year 50 with Potential Project Both DWSC Deepening scenario: tidal time-scale variability over a 15-day period (top); daily-averaged stage for the Year 50 with Potential Project simulation period (middle); predicted increase in daily-averaged stage for the Year 50 with Potential Project Both DWSC Deepening scenario relative to the Year 50 with Potential Project Baseline scenario (bottom).

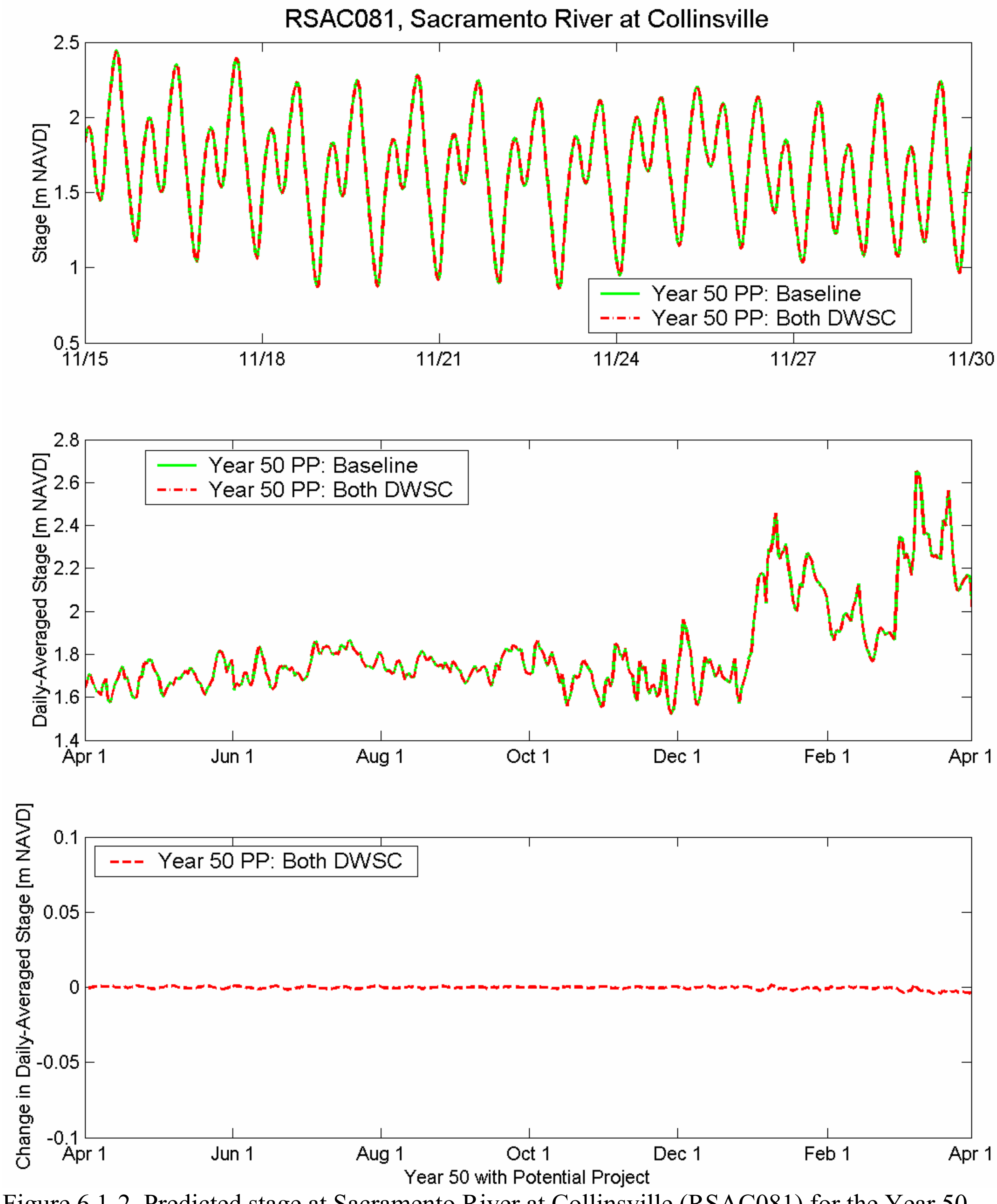


Figure 6.1-2 Predicted stage at Sacramento River at Collinsville (RSAC081) for the Year 50 with Potential Project Baseline scenario and the Year 50 with Potential Project Both DWSC Deepening scenario: tidal time-scale variability over a 15-day period (top); daily-averaged stage for the Year 50 with Potential Project simulation period (middle); predicted increase in daily-averaged stage for the Year 50 with Potential Project Both DWSC Deepening scenario relative to the Year 50 with Potential Project Baseline scenario (bottom).

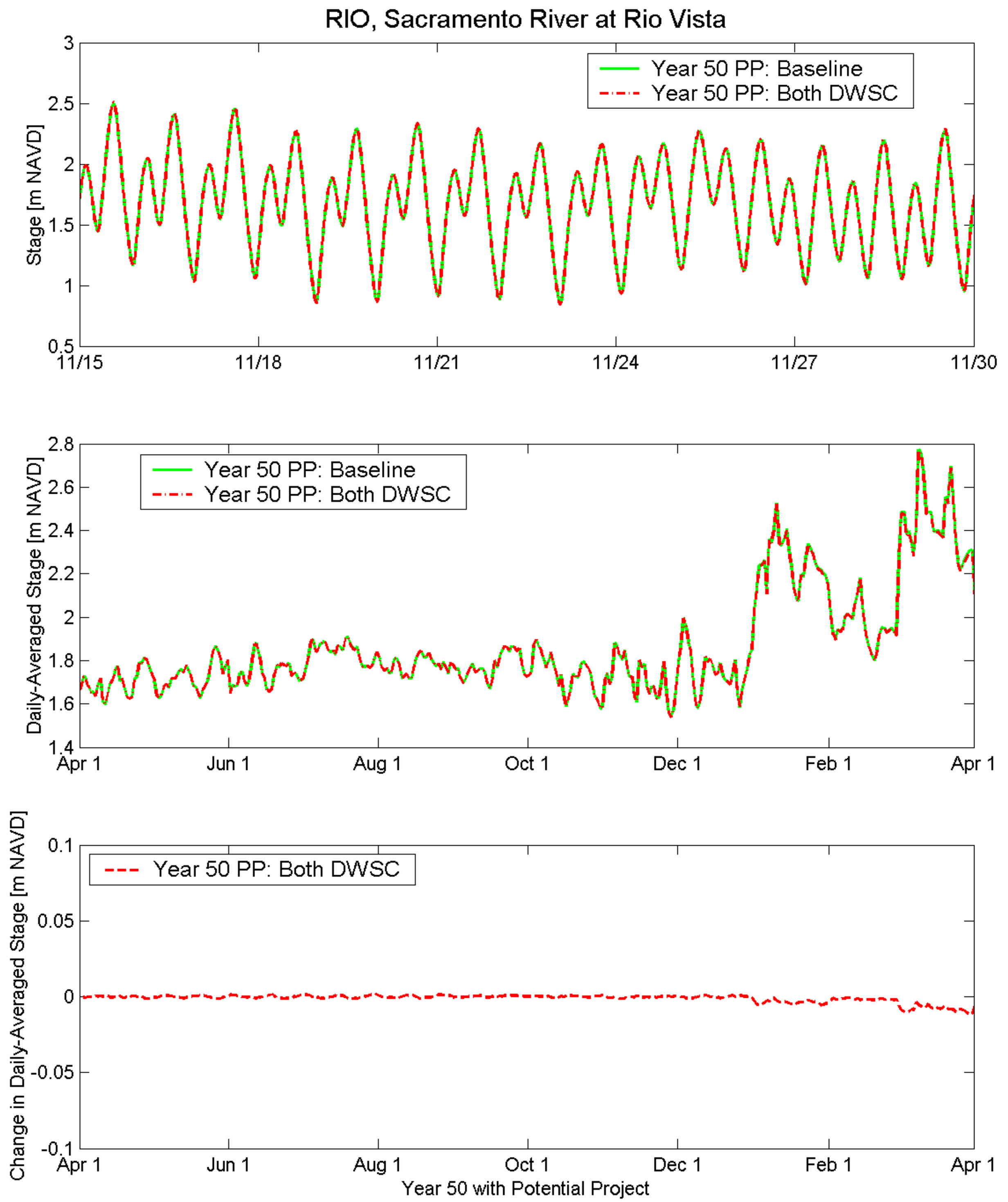


Figure 6.1-3 Predicted stage at Sacramento River at Rio Vista (RIO) for the Year 50 with Potential Project Baseline scenario and the Year 50 with Potential Project Both DWSC Deepening scenario: tidal time-scale variability over a 15-day period (top); daily-averaged stage for the Year 50 with Potential Project simulation period (middle); predicted increase in daily-averaged stage for the Year 50 with Potential Project Both DWSC Deepening scenario relative to the Year 50 with Potential Project Baseline scenario (bottom).

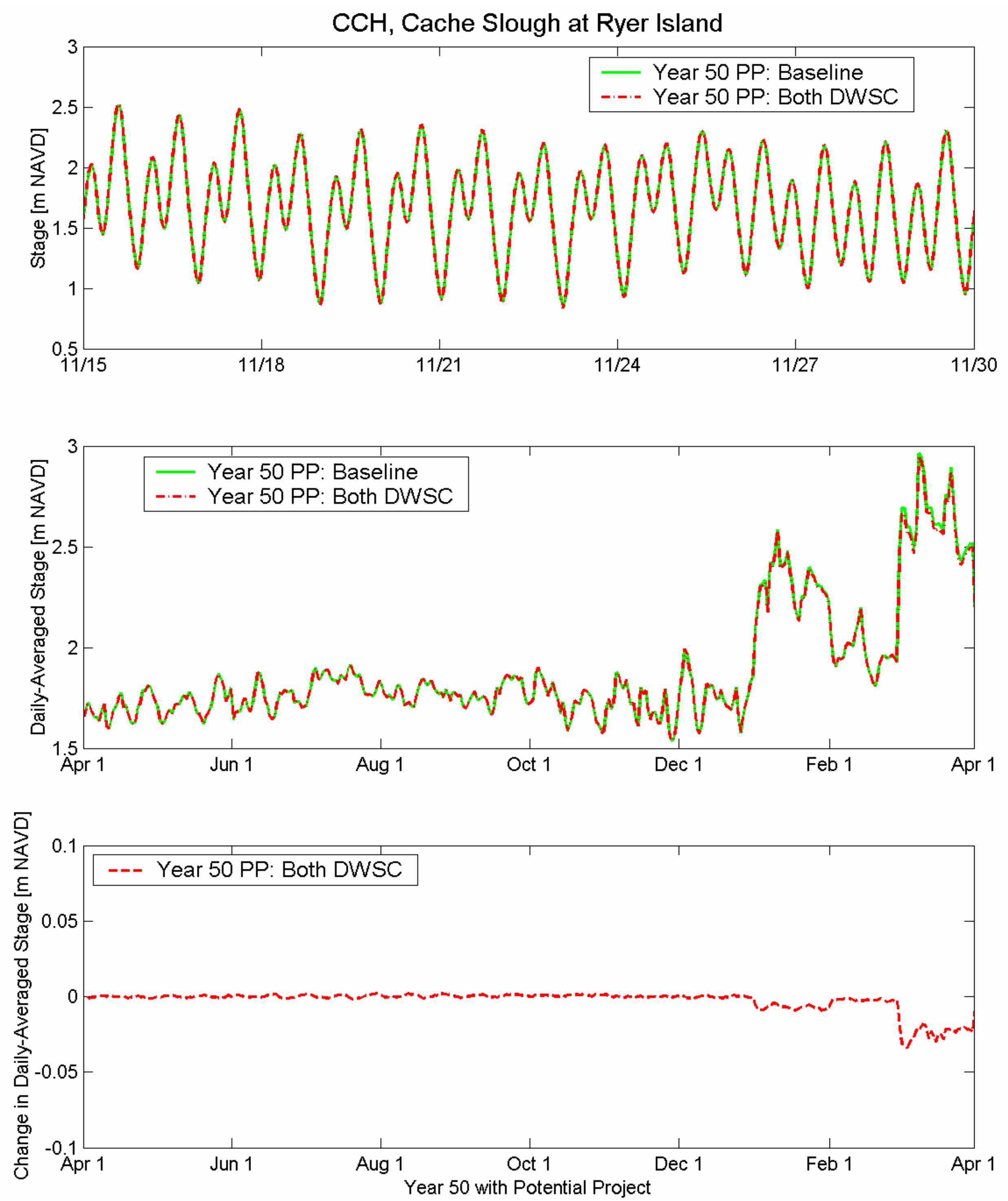


Figure 6.1-4 Predicted stage at Cache Slough at Ryer Island (CCH) for the Year 50 with Potential Project Baseline scenario and the Year 50 with Potential Project Both DWSC Deepening scenario: tidal time-scale variability over a 15-day period (top); daily-averaged stage for the Year 50 with Potential Project simulation period (middle); predicted increase in daily-averaged stage for the Year 50 with Potential Project Both DWSC Deepening scenario relative to the Year 50 with Potential Project Baseline scenario (bottom).

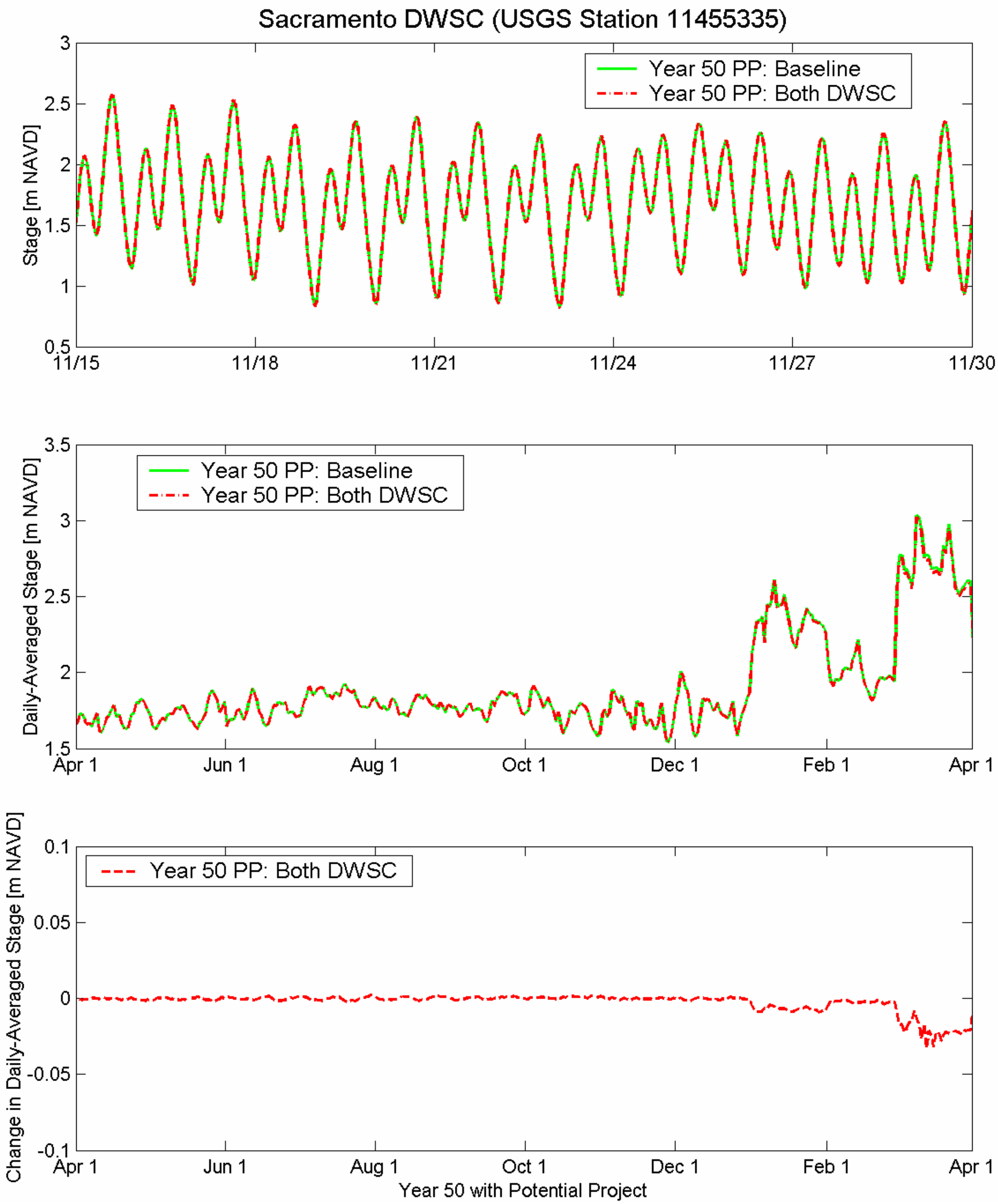


Figure 6.1-5 Predicted stage at Sacramento DWSC (USGS Station 11455335) for the Year 50 with Potential Project Baseline scenario and the Year 50 with Potential Project Both DWSC Deepening scenario: tidal time-scale variability over a 15-day period (top); daily-averaged stage for the Year 50 with Potential Project simulation period (middle); predicted increase in daily-averaged stage for the Year 50 with Potential Project Both DWSC Deepening scenario relative to the Year 50 with Potential Project Baseline scenario (bottom).

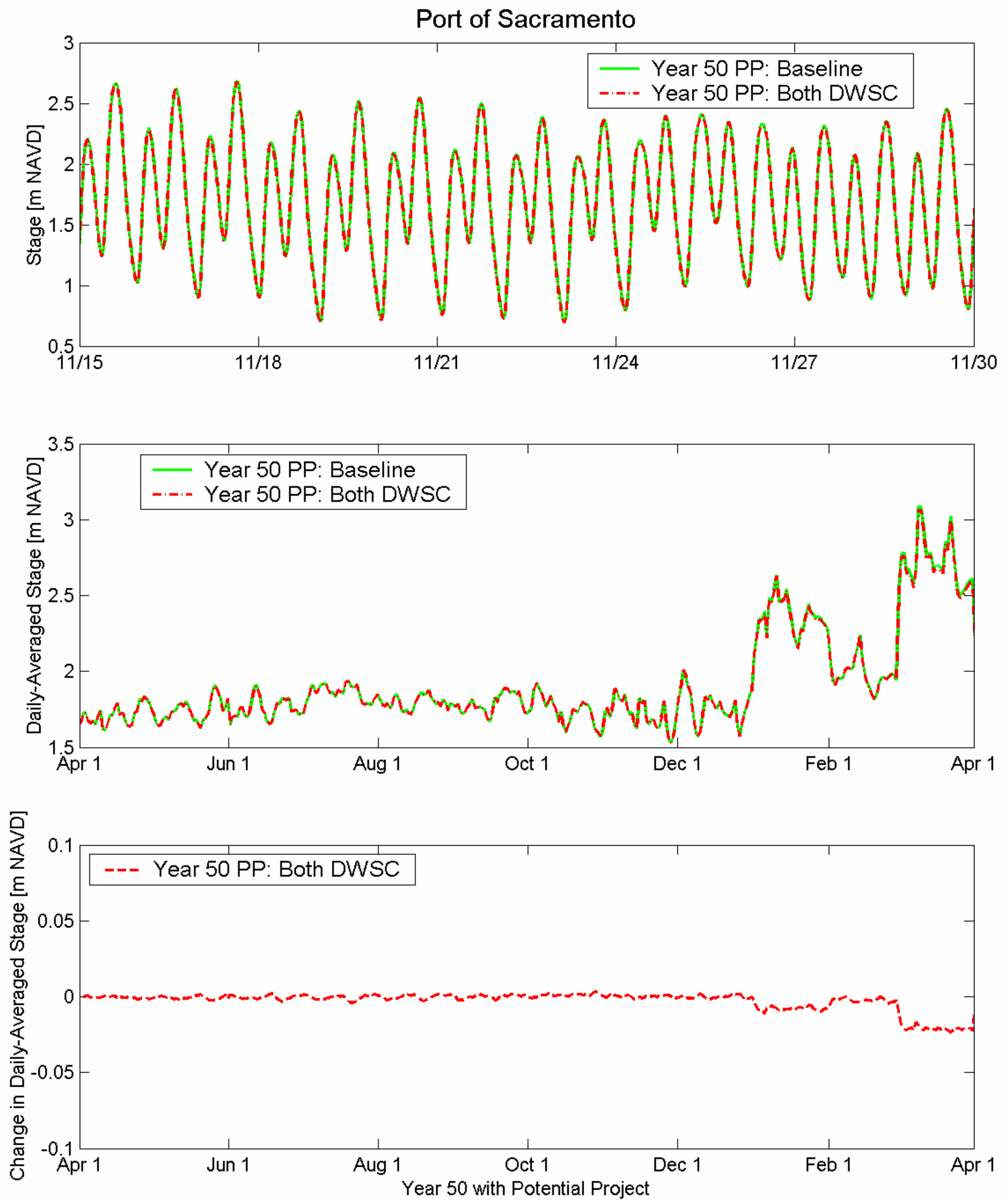


Figure 6.1-6 Predicted stage at the Port of Sacramento for the Year 50 with Potential Project Baseline scenario and the Year 50 with Potential Project Both DWSC Deepening scenario: tidal time-scale variability over a 15-day period (top); daily-averaged stage for the Year 50 with Potential Project simulation period (middle); predicted increase in daily-averaged stage for the Year 50 with Potential Project Both DWSC Deepening scenario relative to the Year 50 with Potential Project Baseline scenario (bottom).

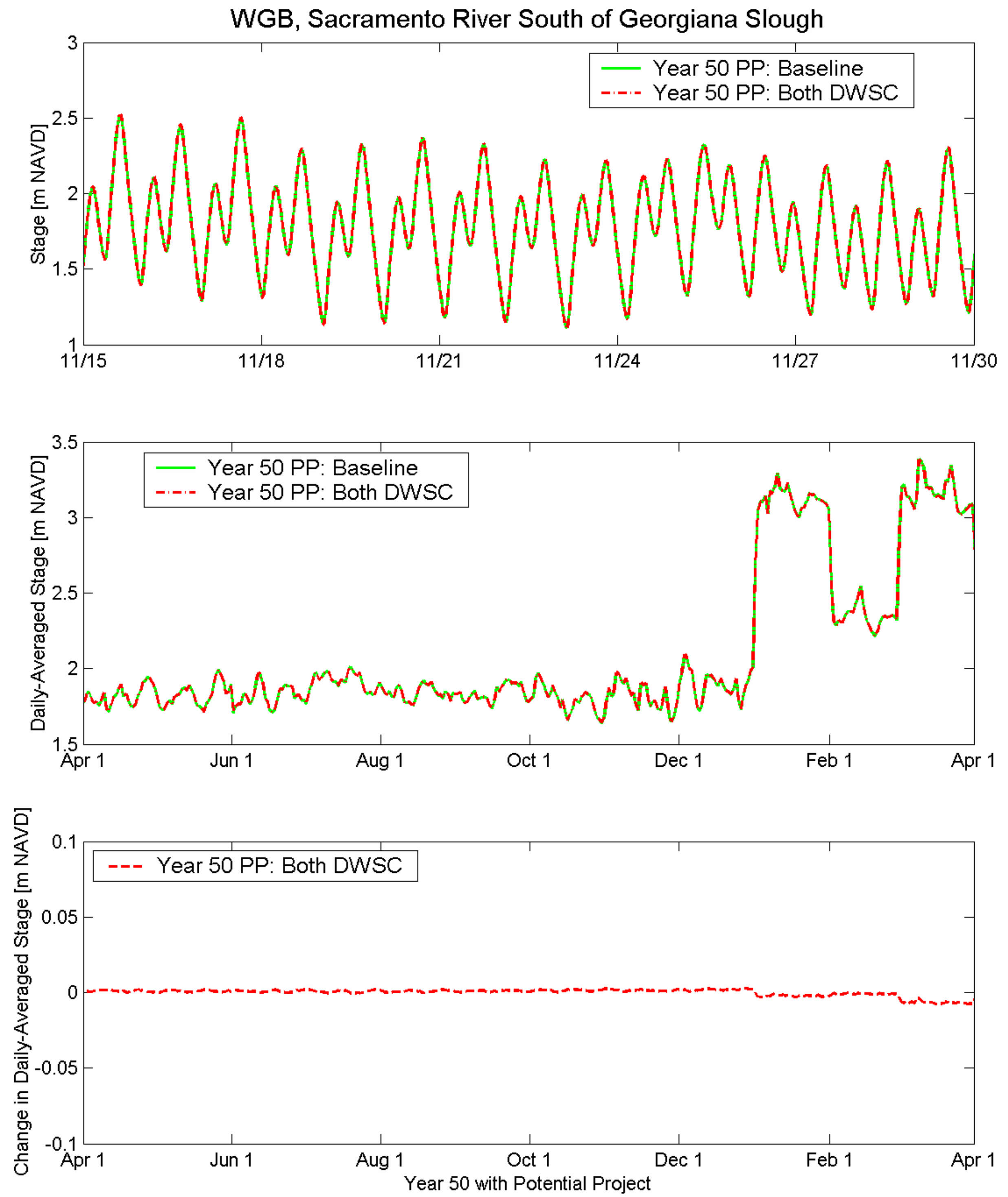


Figure 6.1-7 Predicted stage at Sacramento River South of Georgiana Slough (WGB) for the Year 50 with Potential Project Baseline scenario and the Year 50 with Potential Project Both DWSC Deepening scenario: tidal time-scale variability over a 15-day period (top); daily-averaged stage for the Year 50 with Potential Project simulation period (middle); predicted increase in daily-averaged stage for the Year 50 with Potential Project Both DWSC Deepening scenario relative to the Year 50 with Potential Project Baseline scenario (bottom).

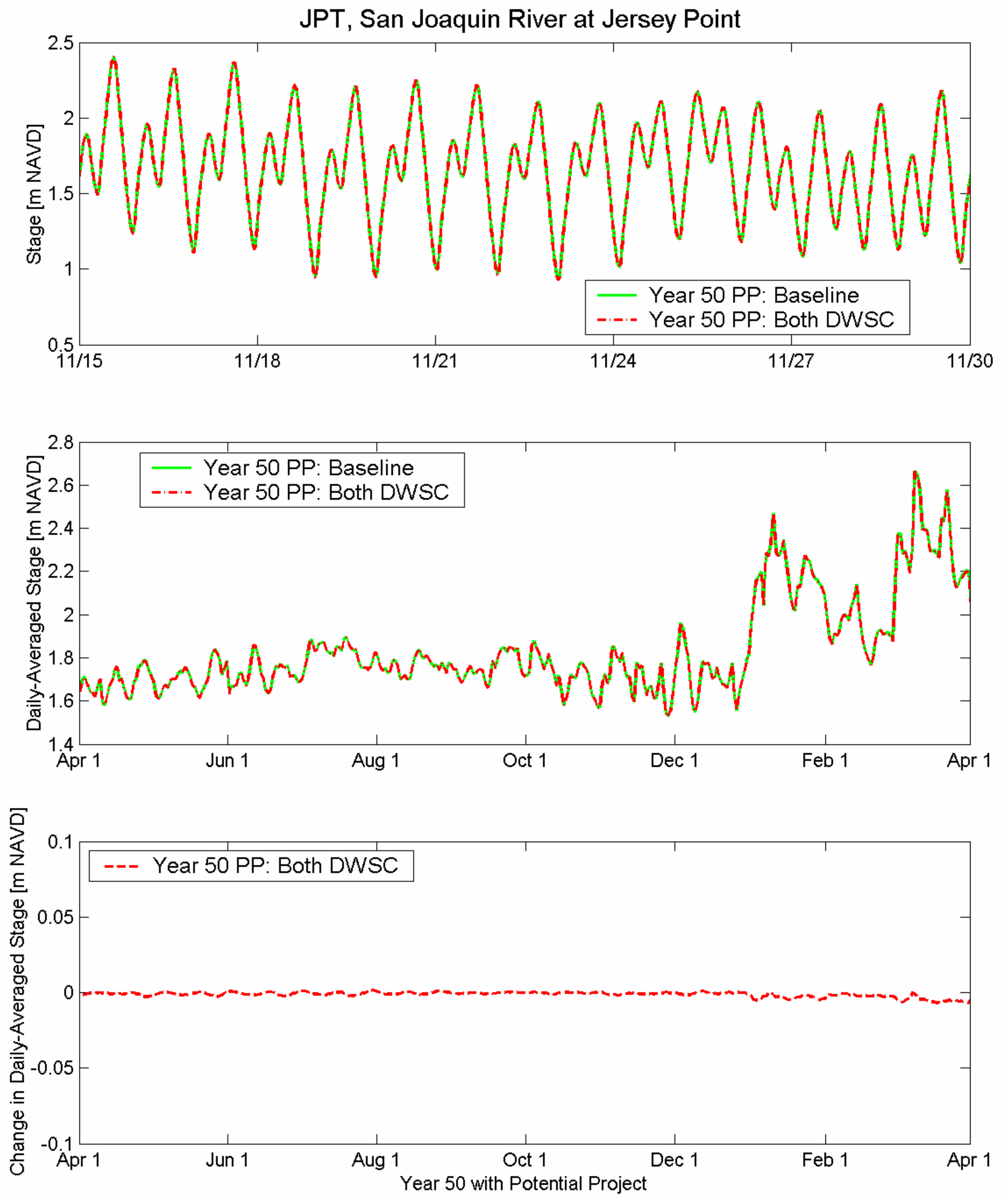


Figure 6.1-8 Predicted stage at San Joaquin River at Jersey Point (JPT) for the Year 50 with Potential Project Baseline scenario and the Year 50 with Potential Project Both DWSC Deepening scenario: tidal time-scale variability over a 15-day period (top); daily-averaged stage for the Year 50 with Potential Project simulation period (middle); predicted increase in daily-averaged stage for the Year 50 with Potential Project Both DWSC Deepening scenario relative to the Year 50 with Potential Project Baseline scenario (bottom).

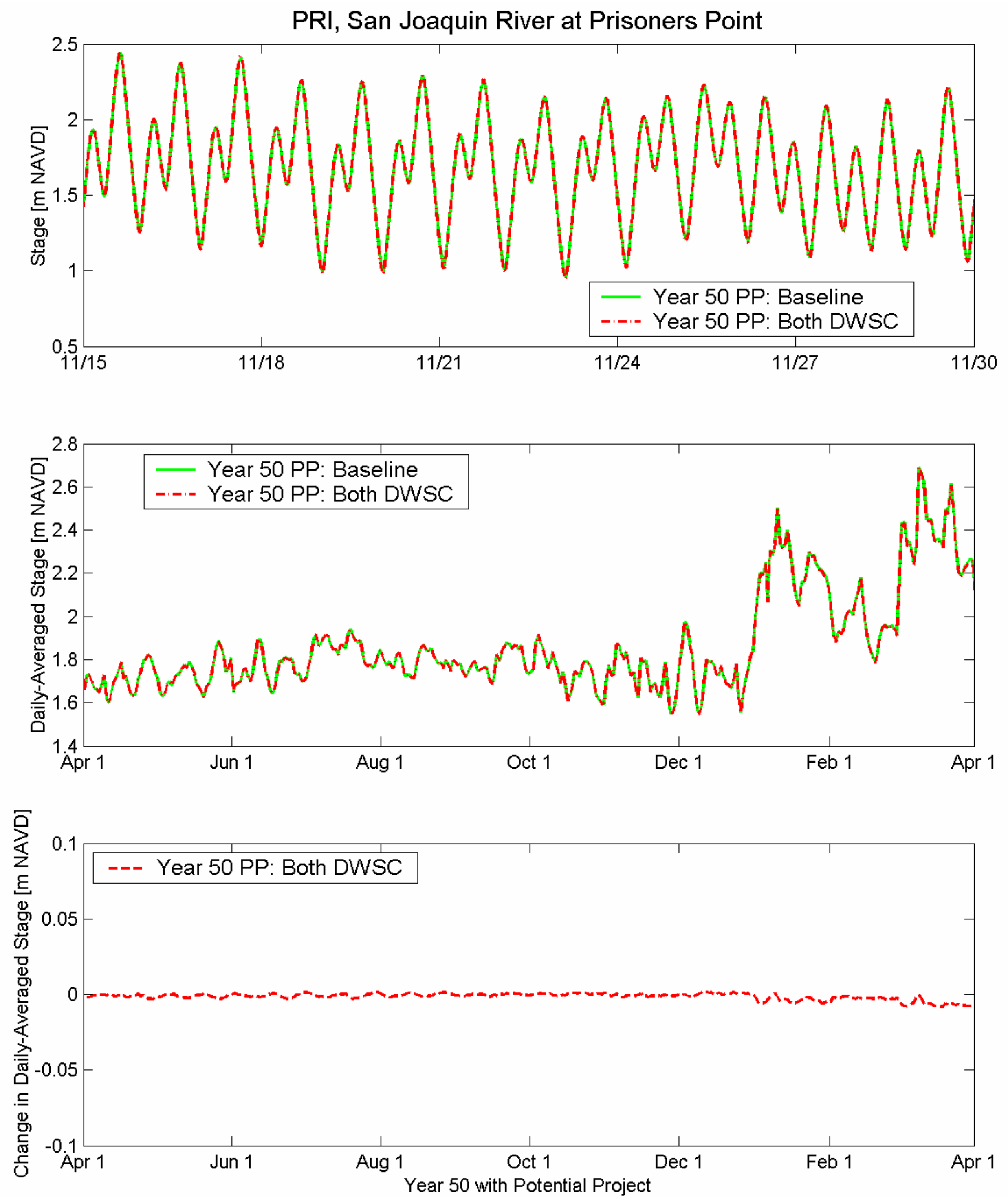


Figure 6.1-9 Predicted stage at San Joaquin River at Prisoners Point (PRI) for the Year 50 with Potential Project Baseline scenario and the Year 50 with Potential Project Both DWSC Deepening scenario: tidal time-scale variability over a 15-day period (top); daily-averaged stage for the Year 50 with Potential Project simulation period (middle); predicted increase in daily-averaged stage for the Year 50 with Potential Project Both DWSC Deepening scenario relative to the Year 50 with Potential Project Baseline scenario (bottom).

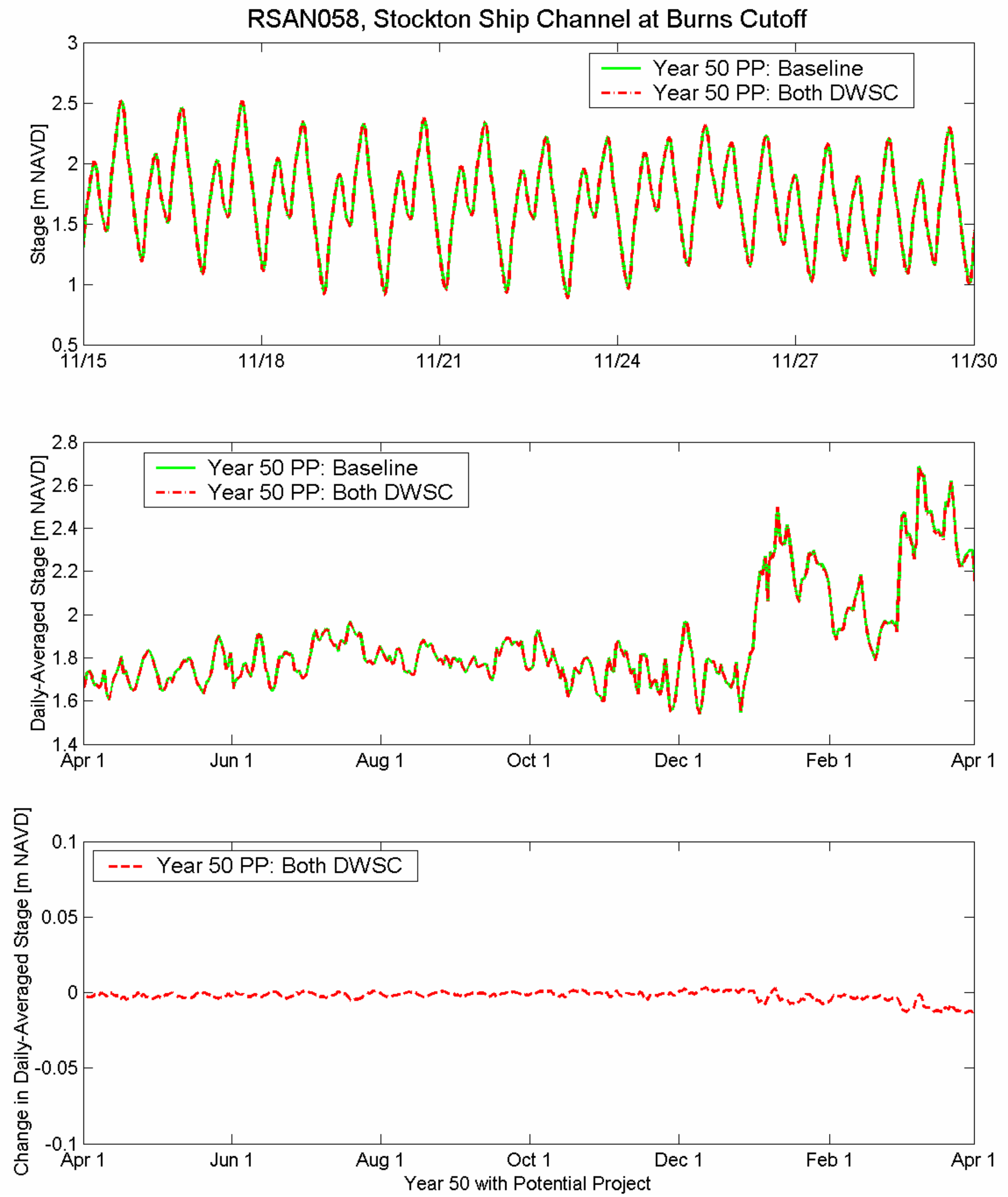


Figure 6.1-10 Predicted stage at Stockton Ship Channel at Burns Cutoff (RSAN058) for the Year 50 with Potential Project Baseline scenario and the Year 50 with Potential Project Both DWSC Deepening scenario: tidal time-scale variability over a 15-day period (top); daily-averaged stage for the Year 50 with Potential Project simulation period (middle); predicted increase in daily-averaged stage for the Year 50 with Potential Project Both DWSC Deepening scenario relative to the Year 50 with Potential Project Baseline scenario (bottom).

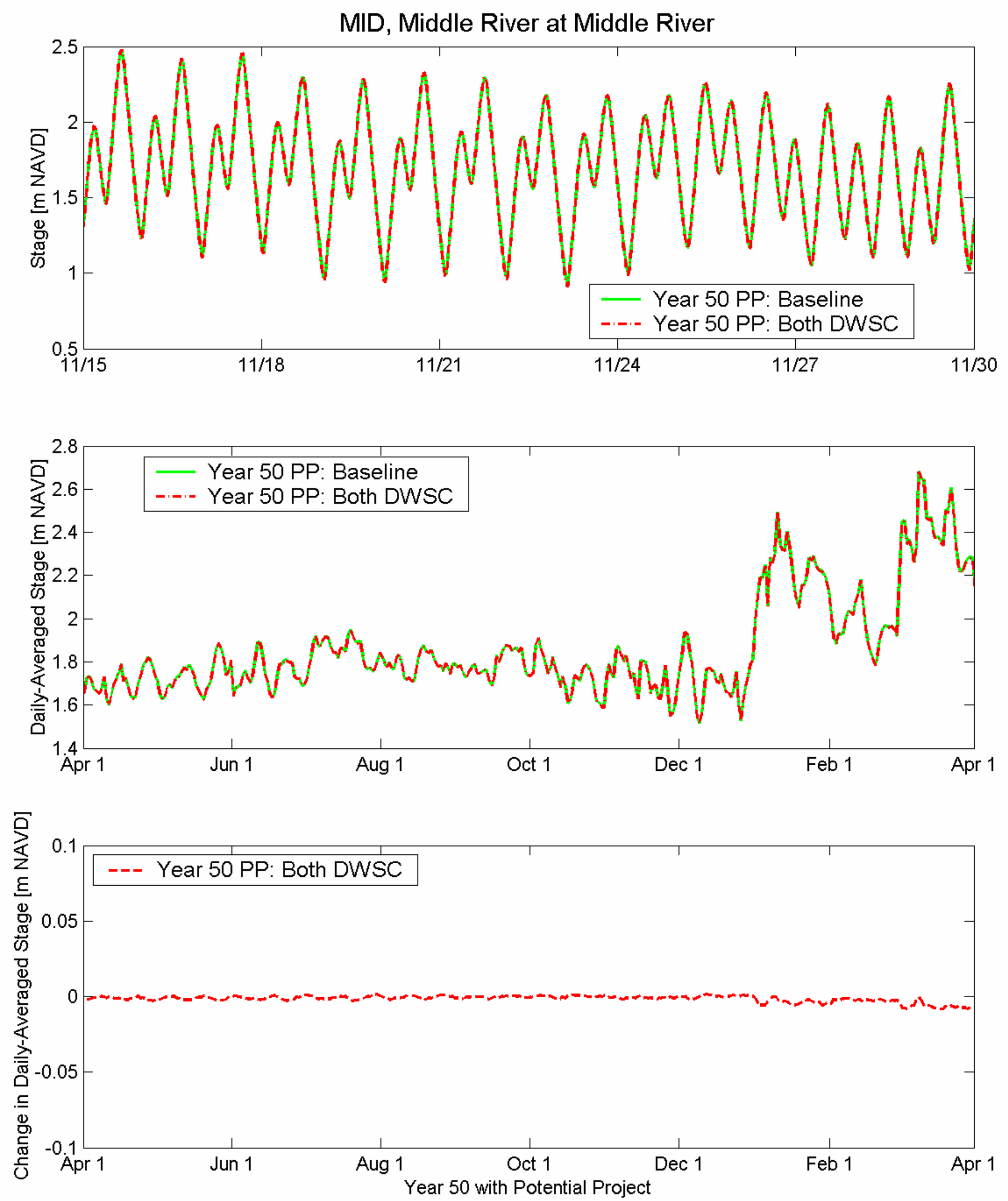


Figure 6.1-11 Predicted stage at Middle River at Middle River (MID) for the Year 50 with Potential Project Baseline scenario and the Year 50 with Potential Project Both DWSC Deepening scenario: tidal time-scale variability over a 15-day period (top); daily-averaged stage for the Year 50 with Potential Project simulation period (middle); predicted increase in daily-averaged stage for the Year 50 with Potential Project Both DWSC Deepening scenario relative to the Year 50 with Potential Project Baseline scenario (bottom).

6.2 Evaluation of Impact on Tidal Flows

Flow time series provide information about potential impacts on tidal flows over time at a fixed location. Flow time series comparisons were made at nineteen continuous flow monitoring stations in San Francisco Bay and the Sacramento-San Joaquin Delta, shown on Figure 3.3-2. Comparisons for the Year 50 with Potential Project simulation period between predicted flows for the Year 50 with Potential Project Baseline scenario and the Year 50 with Potential Project Both DWSC Deepening scenario are shown in Section 6.2.1.

<u>6.2.1 Year 50 with Potential Project Both Sacramento DWSC & SF Bay to Stockton DWSC Deepening</u>

For each flow comparison figure included in this section, the top plot shows the tidal time-scale flow variability over a 15-day period for the Year 50 with Potential Project Baseline scenario and the Year 50 with Potential Project Both DWSC Deepening scenario. The middle plot shows daily-averaged flow during the full simulation year for each scenario. The bottom plot shows the predicted change in daily-averaged flow for the Year 50 with Potential Project Both DWSC Deepening scenario relative to the Year 50 with Potential Project Baseline scenario. In cases where the predicted flow is identical between scenarios, some lines are not fully visible. Since the lines are plotted for in the order listed on the legend, for periods where the predicted flow for the Year 50 with Potential Project Baseline scenario is not fully visible, the predicted flow for the Year 50 with Potential Project Baseline scenario is identical to the visible line for the Year 50 with Potential Project Both DWSC Deepening scenario.

Figure 6.2-1 shows the predicted flow at Chipps Island for the Year 50 with Potential Project Baseline scenario and the Year 50 with Potential Project Both DWSC Deepening scenario. During the second half of November (top panel of Figure 6.2-1), the predicted flow for both scenarios is similar, however the peak tidal flows under the Year 50 with Potential Project Both DWSC Deepening scenario are about 1.5% greater than under the Year 50 with Potential Project Baseline scenario indicating a slight increase in tidal prism of the Delta under the Year 50 with Potential Project Both DWSC Deepening scenario. The daily-averaged flow is nearly identical between both scenarios over the entire simulation year. The change in daily-averaged flow plot (lower panel of Figure 6.2-1) shows some small differences in daily-averaged flow between the Year 50 with Potential Project Baseline scenario and the Year 50 with Potential Project Both DWSC Deepening scenario. These differences are very small relative to the daily-averaged flow magnitude, and are likely the result of small phase differences in tidal propagation and a slight increase in tidal prism resulting under the Year 50 with Potential Project Both DWSC Deepening scenario.

Figure 6.2-2 shows the predicted flow at Sacramento River at Rio Vista (RIO) for the Year 50 with Potential Project Baseline scenario and the Year 50 with Potential Project Both DWSC Deepening scenario. During the second half of November (top panel of Figure 6.2-2), the predicted flow for both scenarios is identical. Similarly, the daily-averaged flow is nearly identical between both scenarios over the entire simulation year. The change in daily-averaged flow plot (lower panel of Figure 6.2-2) shows some small differences in daily-averaged flow between the Year 50 with Potential Project Baseline scenario and the Year 50 with Potential Project Both DWSC Deepening scenario. These differences are very small relative to the daily-averaged flow magnitude, and are likely the result of small phase differences in tidal propagation and a slight increase in tidal prism resulting under the Year 50 with Potential Project Both DWSC Deepening scenario.

Figure 6.2-3 shows the predicted flow at Cache Slough at Ryer Island (CCH) for the Year 50 with Potential Project Baseline scenario and the Year 50 with Potential Project Both DWSC Deepening scenario. During the second half of November (top panel of Figure 6.2-3), the predicted flow for both scenarios is identical. Similarly, the daily-averaged flow is nearly identical between both scenarios over the entire simulation year. The change in daily-averaged flow plot (lower panel of Figure 6.2-3) shows some small differences in daily-averaged flow between the Year 50 with Potential Project Baseline scenario and the Year 50 with Potential Project Both DWSC Deepening scenario. These differences are very small relative to the daily-averaged flow magnitude, and are likely the result of small phase differences in tidal propagation and a slight increase in tidal prism resulting under the Year 50 with Potential Project Both DWSC Deepening scenario.

Figure 6.2-4 shows the predicted flow at the Sacramento DWSC (USGS Station 11455335) for the Year 50 with Potential Project Baseline scenario and the Year 50 with Potential Project Both DWSC Deepening scenario. During the second half of November (top panel of Figure 6.2-4), the predicted flow for both scenarios is identical. Similarly, the daily-averaged flow is nearly identical between both scenarios over the entire simulation year. The change in daily-averaged flow plot (lower panel of Figure 6.2-4) shows some small differences in daily-averaged flow between the Year 50 with Potential Project Baseline scenario and the Year 50 with Potential Project Both DWSC Deepening scenario. These differences are small relative to the daily-averaged flow magnitude, and are likely the result of small phase differences in tidal propagation and a slight increase in tidal prism resulting under the Year 50 with Potential Project Both DWSC Deepening scenario.

Figure 6.2-5 shows the predicted flow at Miner Slough at Highway 84 Bridge (MIN) for the Year 50 with Potential Project Baseline scenario and the Year 50 with Potential Project Both DWSC Deepening scenario. During the second half of November (top panel of Figure 6.2-5), the predicted flow for both scenarios is identical. Similarly, the daily-averaged flow is nearly identical between both scenarios over the entire simulation year. The change in daily-averaged flow plot (lower panel of Figure 6.2-5) shows a slight reduction in daily-averaged flow in Miner Slough during most of the year in the Year 50 with Potential Project Both DWSC Deepening scenario relative to the Year 50 with Potential Project Baseline scenario.

Figure 6.2-6 shows the predicted flow at Steamboat Slough between Sacramento River and Sutter Slough (STM) for the Year 50 with Potential Project Baseline scenario and the Year 50 with Potential Project Both DWSC Deepening scenario. During the second half of November (top panel of Figure 6.2-6), the predicted flow for both scenarios is identical. Similarly, the daily-averaged flow is nearly identical between both scenarios over the entire simulation year. No significant change in daily-averaged flow relative to the Year 50 with Potential Project

Baseline scenario is predicted for the Year 50 with Potential Project Both DWSC Deepening scenario.

Figure 6.2-7 shows the predicted flow at Sutter Slough at Courtland (SUT) for the Year 50 with Potential Project Baseline scenario and the Year 50 with Potential Project Both DWSC Deepening scenario. During the second half of November (top panel of Figure 6.2-7), the predicted flow for both scenarios is identical. Similarly, the daily-averaged flow is nearly identical between both scenarios over the entire simulation year. The change in daily-averaged flow plot (lower panel of Figure 6.2-7) shows a slight reduction in daily-averaged flow in Sutter Slough during most of the year under the Year 50 with Potential Project Both DWSC Deepening scenario.

Figure 6.2-8 shows the predicted flow at Sacramento River South of Georgiana Slough (WGB) for the Year 50 with Potential Project Baseline scenario and the Year 50 with Potential Project Both DWSC Deepening scenario. During the second half of November (top panel of Figure 6.2-8), the predicted flow for both scenarios is identical. Similarly, the daily-averaged flow is nearly identical between both scenarios over the entire simulation year. The change in daily-averaged flow plot (lower panel of Figure 6.2-8) shows a slight increase in daily-averaged flow in the Sacramento River South of Georgiana Slough during most of the year under the Year 50 with Potential Project Both DWSC Deepening scenario. The flow increase in the Sacramento River at Georgiana Slough is similar in magnitude to the flow decrease predicted in Sutter Slough and Miner Slough suggesting that the deepening of the Sacramento DWSC is resulting in slightly less flow into Sutter Slough and a corresponding higher flow remaining in the Sacramento River.

Figure 6.2-9 shows the predicted flow at Georgiana Slough near the Sacramento River (GEO) for the Year 50 with Potential Project Baseline scenario and the Year 50 with Potential Project Both DWSC Deepening scenario. During the second half of November (top panel of Figure 6.2-9), the predicted flow for both scenarios is identical. Similarly, the daily-averaged flow is nearly identical between both scenarios over the entire simulation year. No significant change in daily-averaged flow relative to the Year 50 with Potential Project Baseline scenario is predicted under the Year 50 with Potential Project Both DWSC Deepening scenario.

Figure 6.2-10 shows the predicted flow at the Delta Cross Channel (DCC) for the Year 50 with Potential Project Baseline scenario and the Year 50 with Potential Project Both DWSC Deepening scenario. During the second half of November (top panel of Figure 6.2-10), the predicted flow for both scenarios is identical. Similarly, the daily-averaged flow is nearly identical between both scenarios over the entire simulation year. The change in daily-averaged flow plot (lower panel of Figure 6.2-10) shows no significant change in daily-averaged flow through the Delta Cross Channel during periods when the Delta Cross Channel is open under the Year 50 with Potential Project Both DWSC Deepening scenario.

Figure 6.2-11 shows the predicted flow at San Joaquin River at Jersey Point (JPT) for the Year 50 with Potential Project Baseline scenario and the Year 50 with Potential Project Both DWSC Deepening scenario. During the second half of November (top panel of Figure 6.2-11), the predicted flow for both scenarios is similar, however the peak tidal flows under the Year 50 with Potential Project Both DWSC Deepening scenario are about 2% greater than under the Year 50 with Potential Project Baseline scenario. The daily-averaged flow is nearly identical between both scenarios over the entire simulation year. The change in daily-averaged flow plot (lower panel of Figure 6.2-11) shows some small differences in daily-averaged flow between the Year 50 with Potential Project Baseline scenario and the Year 50 with Potential Project Both DWSC Deepening scenario. Under the Year 50 with Potential Project Both DWSC Deepening scenario, a decrease in net flow is predicted during the high flow periods during March.

Figure 6.2-12 shows the predicted flow at Threemile Slough at San Joaquin River (TMN) for the Year 50 with Potential Project Baseline scenario and the Year 50 with Potential Project Both DWSC Deepening scenario. During the second half of November (top panel of Figure 6.2-12), the predicted flow for both scenarios is identical. Similarly, the daily-averaged flow is nearly identical between both scenarios over the entire simulation year. The change in daily-averaged flow plot (lower panel of Figure 6.2-12) shows some small differences in daily-averaged flow between the Year 50 with Potential Project Baseline scenario and the Year 50 with Potential Project Both DWSC Deepening scenario. Under the Year 50 with Potential Project Both DWSC Deepening scenario, an increase in net flow indicates less flow is flowing south through Threemile Slough during the high flow period during March (resulting in the decrease in daily-averaged flow predicted at Jersey Point during this period).

Figure 6.2-13 shows the predicted flow at False River (FAL) for the Year 50 with Potential Project Baseline scenario and the Year 50 with Potential Project Both DWSC Deepening scenario. During the second half of November (top panel of Figure 6.2-13), the predicted flow for both scenarios is identical. Similarly, the daily-averaged flow is nearly identical between both scenarios over the entire simulation year. The change in daily-averaged flow plot (lower panel of Figure 6.2-13) shows a slight reduction in daily-averaged flow in False River during most of the year under the Year 50 with Potential Project Both DWSC Deepening scenario.

Figure 6.2-14 shows the predicted flow at San Joaquin River at Prisoners Point (PRI) for the Year 50 with Potential Project Baseline scenario and the Year 50 with Potential Project Both DWSC Deepening scenario. During the second half of November (top panel of Figure 6.2-14), the predicted flow for both scenarios is similar, however the peak tidal flows under the Year 50 with Potential Project Both DWSC Deepening scenario are about 5% greater than under the Year 50 with Potential Project Baseline scenario. The daily-averaged flow is nearly identical between both scenarios over the entire simulation year.

Figure 6.2-15 shows the predicted flow at San Joaquin River at Stockton (STK) for the Year 50 with Potential Project Baseline scenario and the Year 50 with Potential Project Both DWSC Deepening scenario. During the second half of November (top panel of Figure 6.2-15), the predicted flow for both scenarios is identical. Similarly, the daily-averaged flow is nearly identical between both scenarios over the entire simulation year. No significant change in daily-averaged flow relative to the Year 50 with Potential Project Baseline scenario is predicted for the Year 50 with Potential Project Both DWSC Deepening.

Figure 6.2-16 shows the predicted flow at Middle River at Middle River (MID) for the Year 50 with Potential Project Baseline scenario and the Year 50 with Potential Project Both DWSC Deepening scenario. During the second half of November (top panel of Figure 6.2-16), the predicted flow for both scenarios is identical. Similarly, the daily-averaged flow is nearly identical between both scenarios over the entire simulation year. No significant change in daily-averaged flow relative to the Year 50 with Potential Project Baseline scenario is predicted for the Year 50 with Potential Project Both DWSC Deepening scenario.

Figure 6.2-17 shows the predicted flow at Old River at Bacon Island (OLD) for the Year 50 with Potential Project Baseline scenario and the Year 50 with Potential Project Both DWSC Deepening scenario. During the second half of November (top panel of Figure 6.2-17), the predicted flow for both scenarios is identical. Similarly, the daily-averaged flow is nearly identical between both scenarios over the entire simulation year. No significant change in daily-averaged flow relative to the Year 50 with Potential Project Baseline scenario is predicted for the Year 50 with Potential Project Both DWSC Deepening scenario.

Figure 6.2-18 shows the predicted flow at Old River near Byron (ORF) for the Year 50 with Potential Project Baseline scenario and the Year 50 with Potential Project Both DWSC Deepening scenario. During the second half of November (top panel of Figure 6.2-18), the predicted flow for both scenarios is identical. Similarly, the daily-averaged flow is nearly identical between both scenarios over the entire simulation year. No significant change in daily-averaged flow relative to the Year 50 with Potential Project Baseline scenario is predicted for the Year 50 with Potential Project Both DWSC Deepening scenario.

Figure 6.2-19 shows the predicted flow at Victoria Canal near Byron (VIC) for the Year 50 with Potential Project Baseline scenario and the Year 50 with Potential Project Both DWSC Deepening scenario. During the second half of November (top panel of Figure 6.2-19), the predicted flow for both scenarios is identical. Similarly, the daily-averaged flow is nearly identical between both scenarios over the entire simulation year. No significant change in daily-averaged flow relative to the Year 50 with Potential Project Baseline scenario is predicted for the Year 50 with Potential Project Both DWSC Deepening scenario.

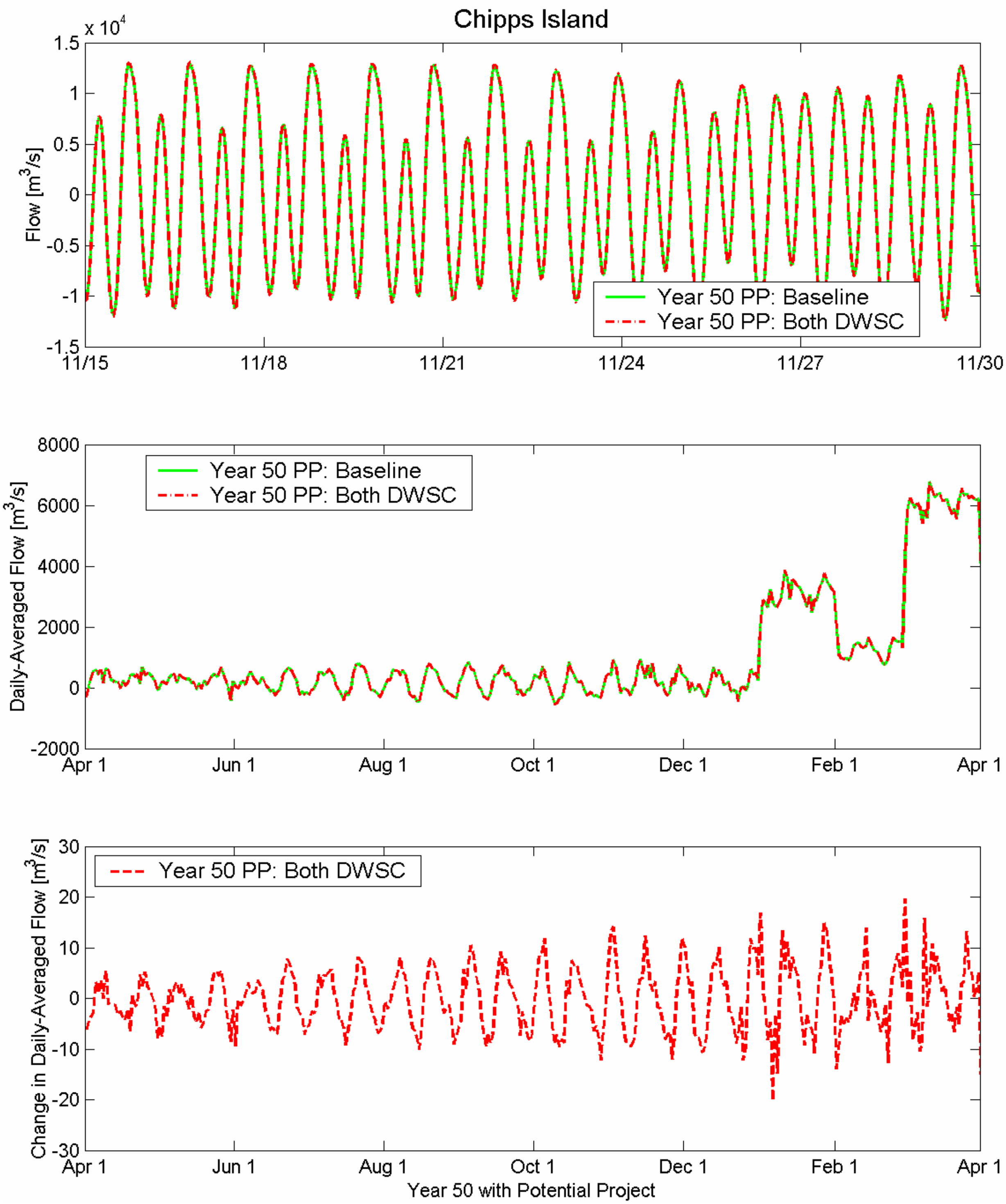


Figure 6.2-1 Predicted flow at Chipps Island for the Year 50 with Potential Project Baseline scenario and the Year 50 with Potential Project Both DWSC Deepening scenario: tidal time-scale variability over a 15-day period (top); daily-averaged flow for the Year 50 with Potential Project simulation period (middle); predicted increase in daily-averaged flow for the Year 50 with Potential Project Both DWSC Deepening scenario relative to the Year 50 with Potential Project Baseline scenario (bottom).

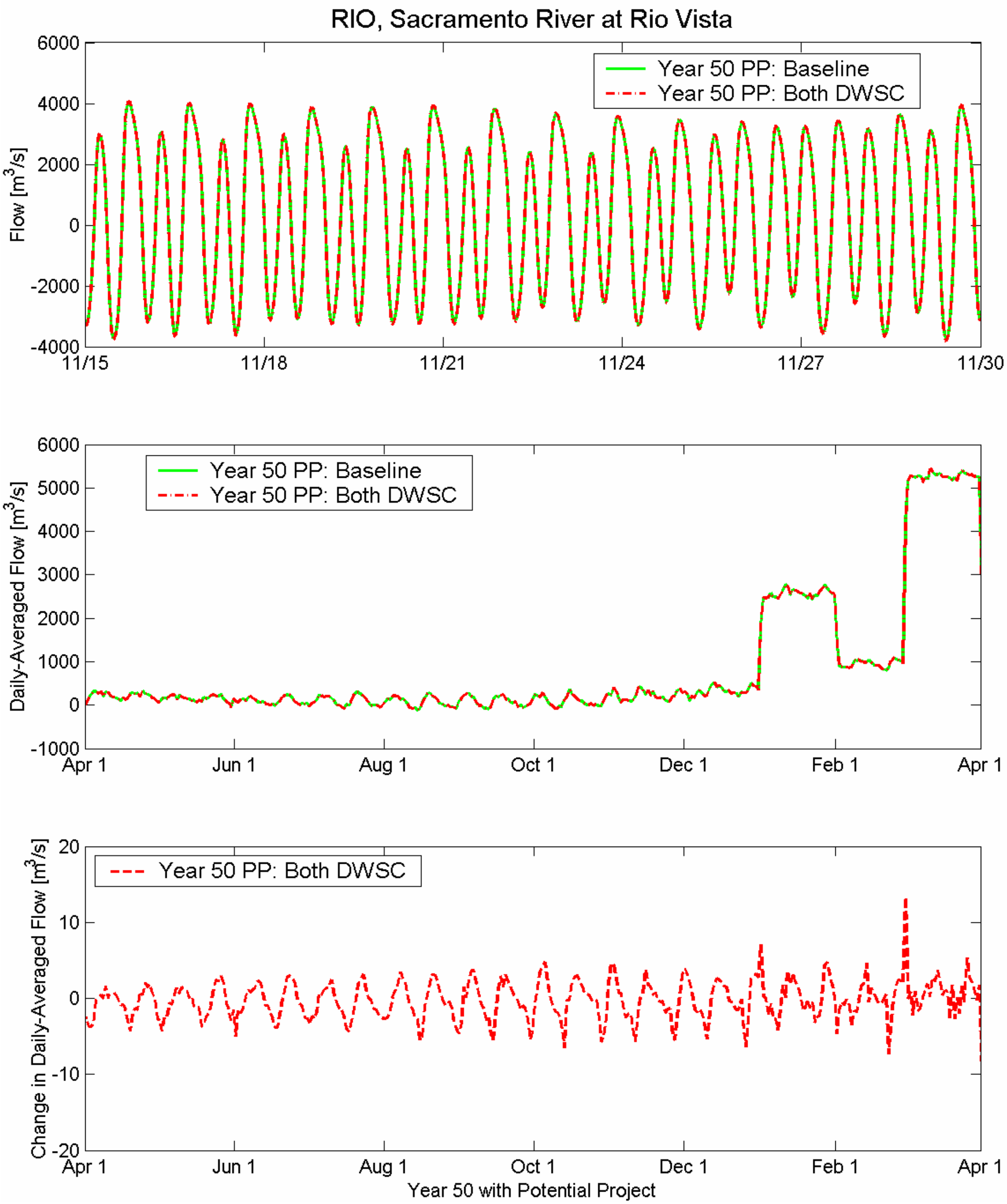


Figure 6.2-2 Predicted flow at Sacramento River at Rio Vista (RIO) for the Year 50 with Potential Project Baseline scenario and the Year 50 with Potential Project Both DWSC Deepening scenario: tidal time-scale variability over a 15-day period (top); daily-averaged flow for the Year 50 with Potential Project simulation period (middle); predicted increase in daily-averaged flow for the Year 50 with Potential Project Both DWSC Deepening scenario relative to the Year 50 with Potential Project Baseline scenario (bottom).

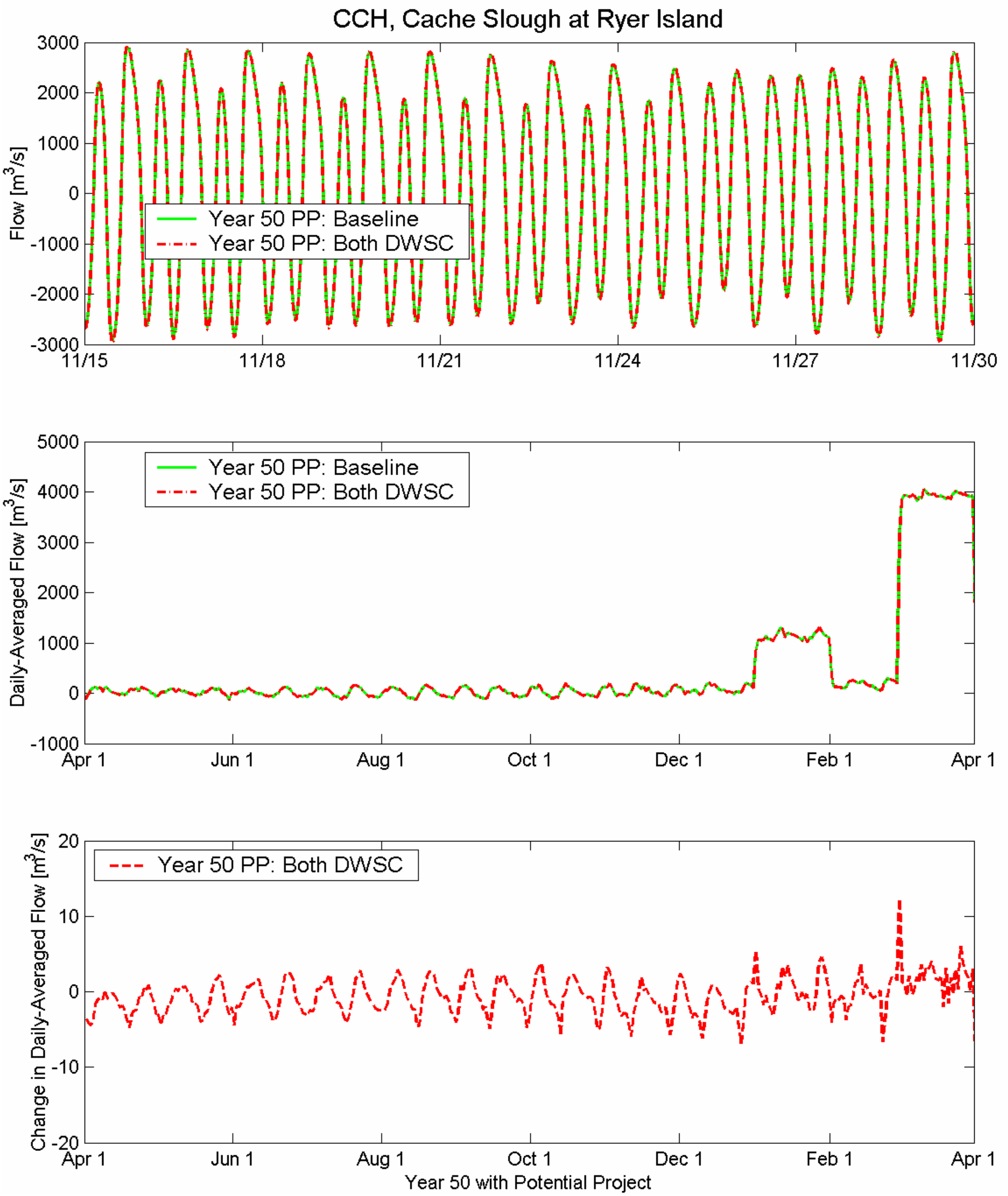


Figure 6.2-3 Predicted flow at Cache Slough at Ryer Island (CCH) for the Year 50 with Potential Project Baseline scenario and the Year 50 with Potential Project Both DWSC Deepening scenario: tidal time-scale variability over a 15-day period (top); daily-averaged flow for the Year 50 with Potential Project simulation period (middle); predicted increase in daily-averaged flow for the Year 50 with Potential Project Both DWSC Deepening scenario relative to the Year 50 with Potential Project Baseline scenario (bottom).

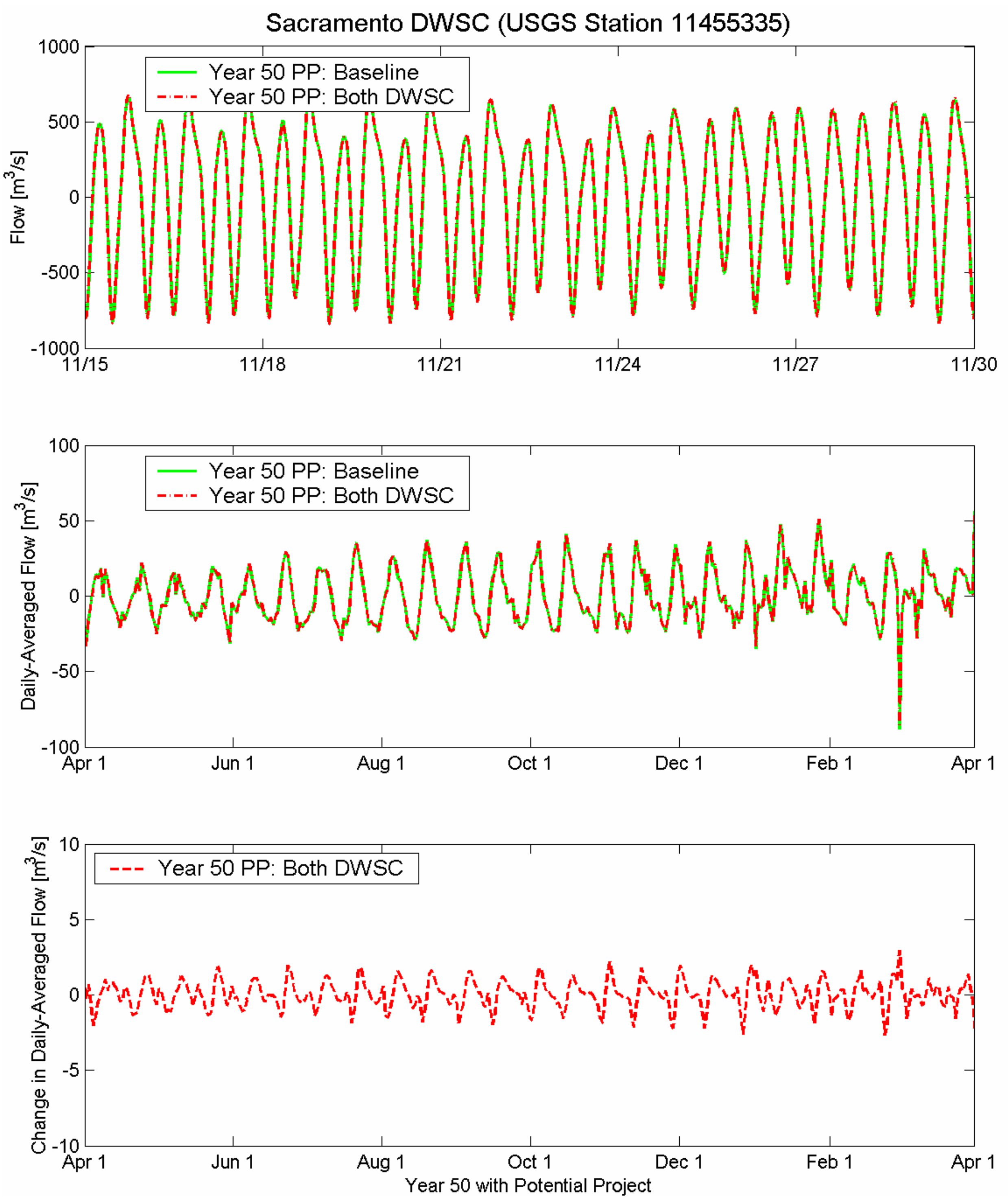


Figure 6.2-4 Predicted flow at Sacramento DWSC (USGS Station 11455335) for the Year 50 with Potential Project Baseline scenario and the Year 50 with Potential Project Both DWSC Deepening scenario: tidal time-scale variability over a 15-day period (top); daily-averaged flow for the Year 50 with Potential Project simulation period (middle); predicted increase in daily-averaged flow for the Year 50 with Potential Project Both DWSC Deepening scenario relative to the Year 50 with Potential Project Baseline scenario (bottom).

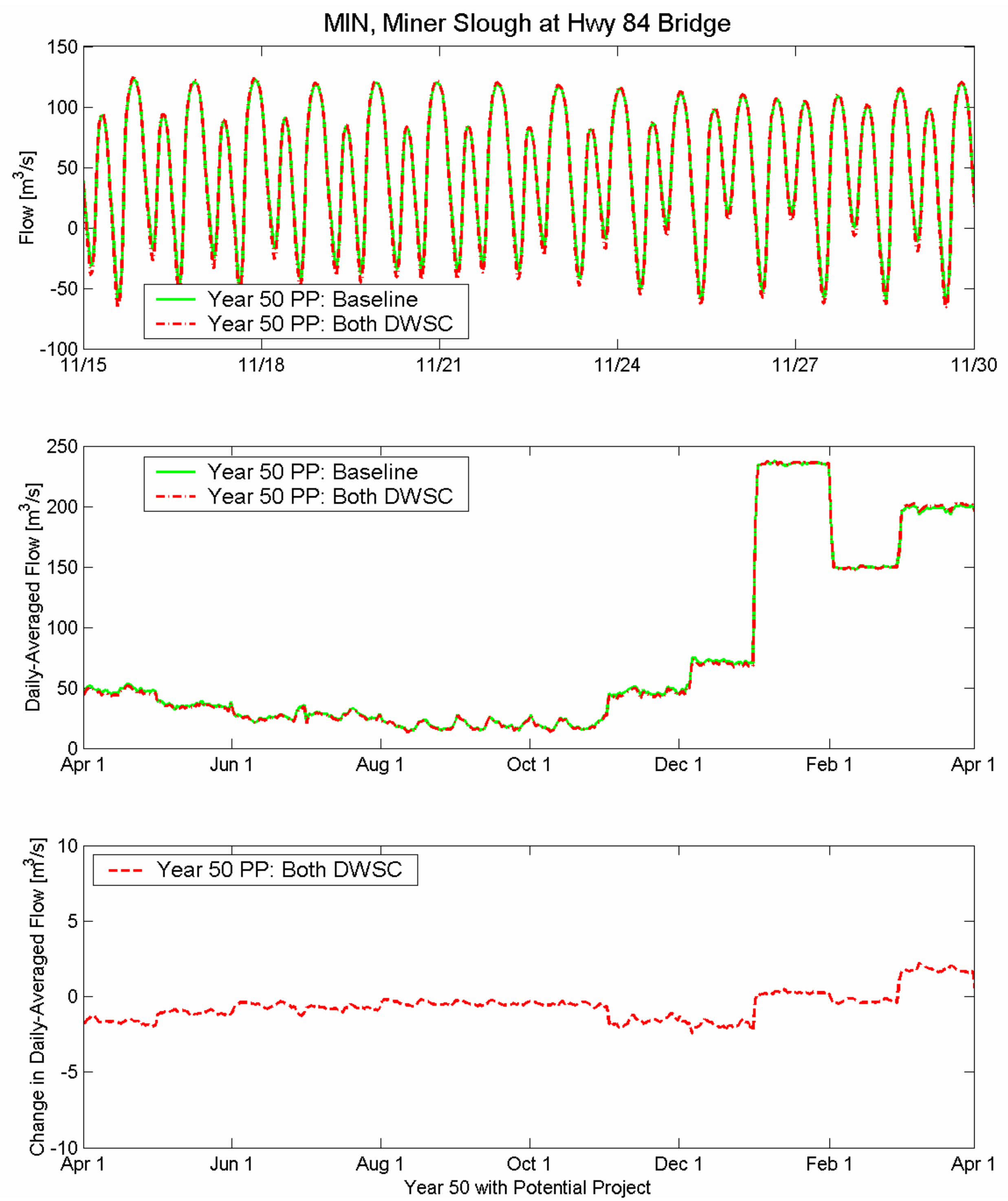


Figure 6.2-5 Predicted flow at Miner Slough at Highway 84 Bridge (MIN) for the Year 50 with Potential Project Baseline scenario and the Year 50 with Potential Project Both DWSC Deepening scenario: tidal time-scale variability over a 15-day period (top); daily-averaged flow for the Year 50 with Potential Project simulation period (middle); predicted increase in daily-averaged flow for the Year 50 with Potential Project Both DWSC Deepening scenario relative to the Year 50 with Potential Project Baseline scenario (bottom).

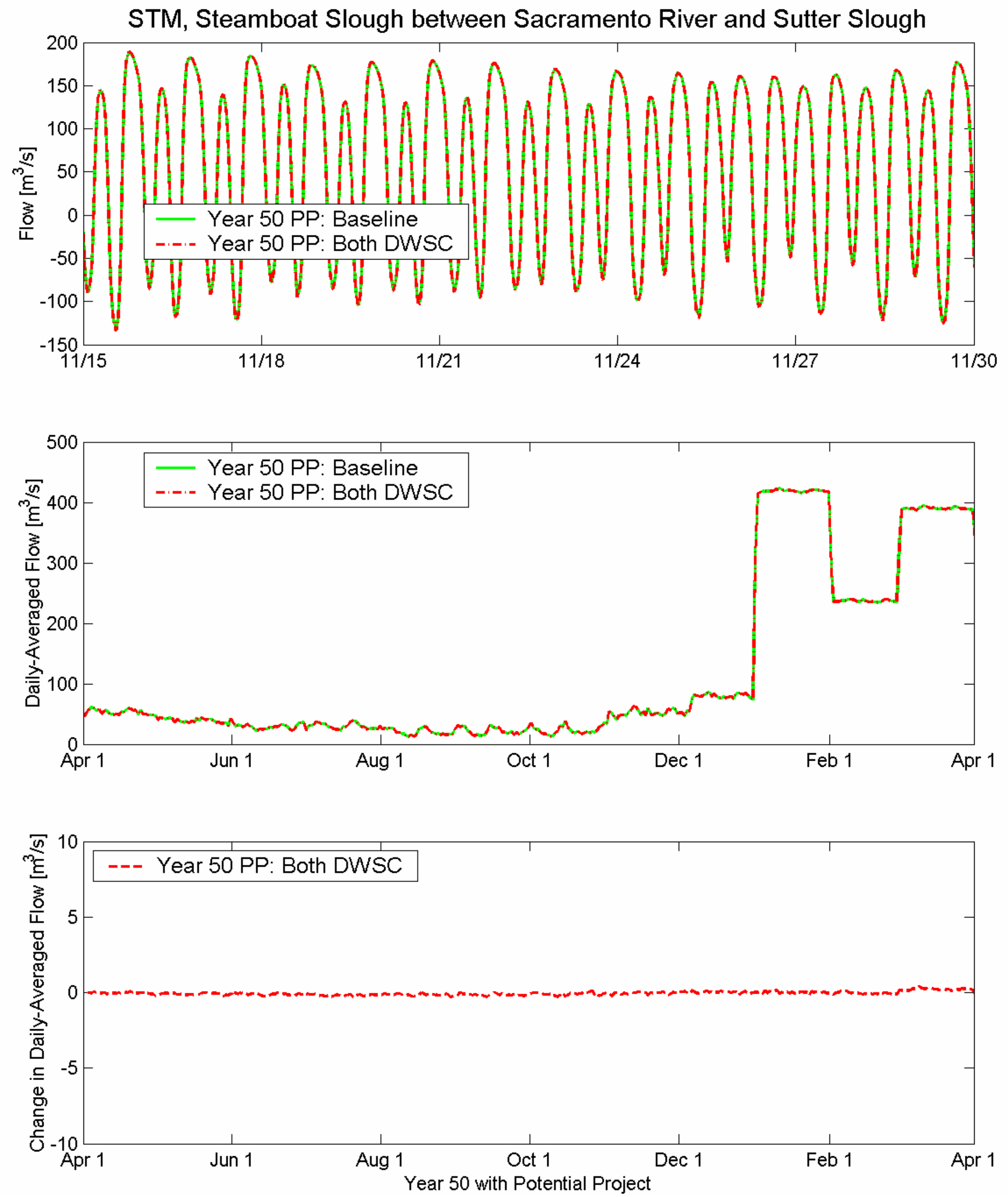


Figure 6.2-6 Predicted flow at Steamboat Slough between Sacramento River and Sutter Slough (STM) for the Year 50 with Potential Project Baseline scenario and the Year 50 with Potential Project Both DWSC Deepening scenario: tidal time-scale variability over a 15-day period (top); daily-averaged flow for the Year 50 with Potential Project simulation period (middle); predicted increase in daily-averaged flow for the Year 50 with Potential Project Both DWSC Deepening scenario relative to the Year 50 with Potential Project Baseline scenario (bottom).

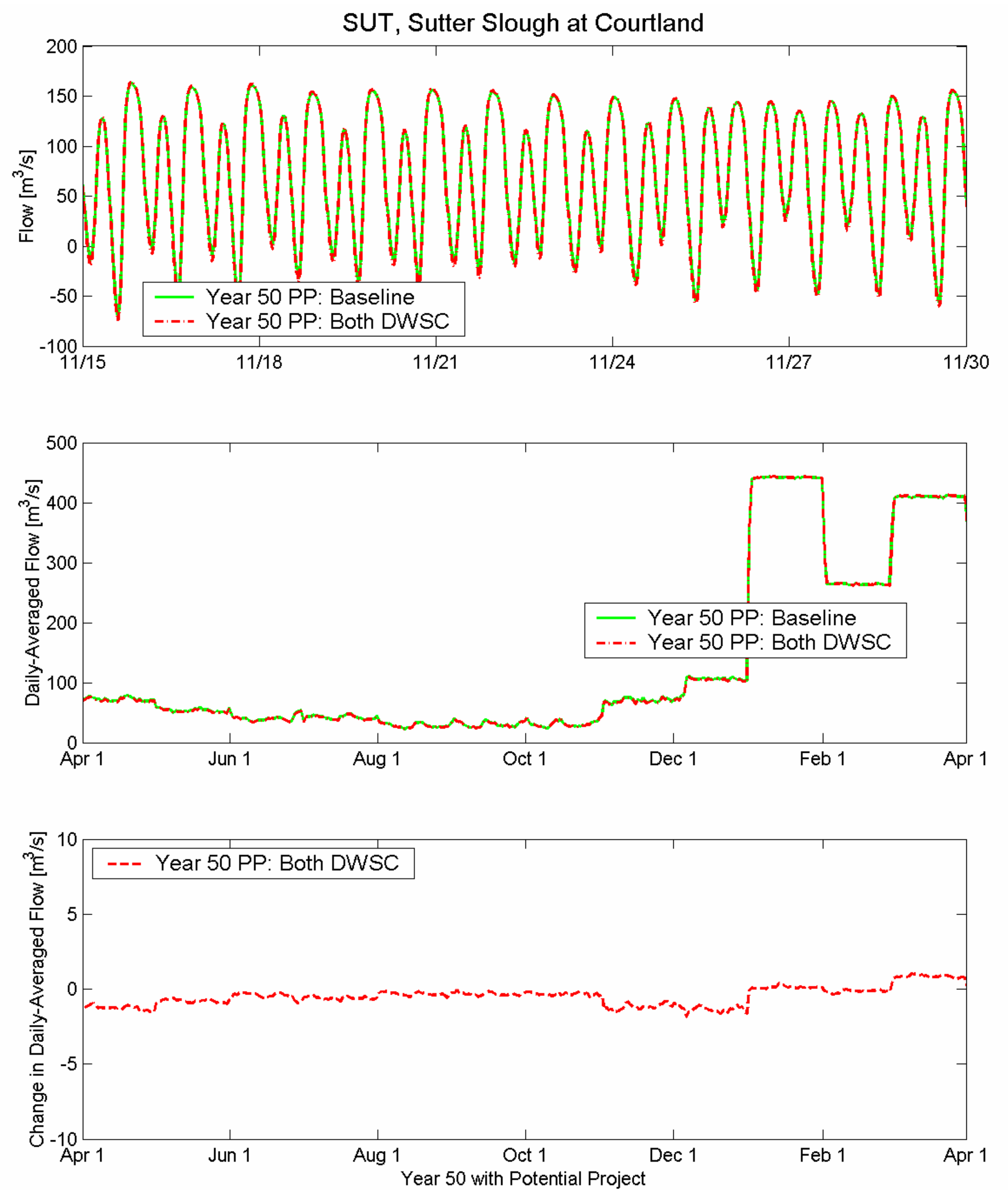


Figure 6.2-7 Predicted flow at Sutter Slough at Courtland (SUT) for the Year 50 with Potential Project Baseline scenario and the Year 50 with Potential Project Both DWSC Deepening scenario: tidal time-scale variability over a 15-day period (top); daily-averaged flow for the Year 50 with Potential Project simulation period (middle); predicted increase in daily-averaged flow for the Year 50 with Potential Project Both DWSC Deepening scenario relative to the Year 50 with Potential Project Baseline scenario (bottom).

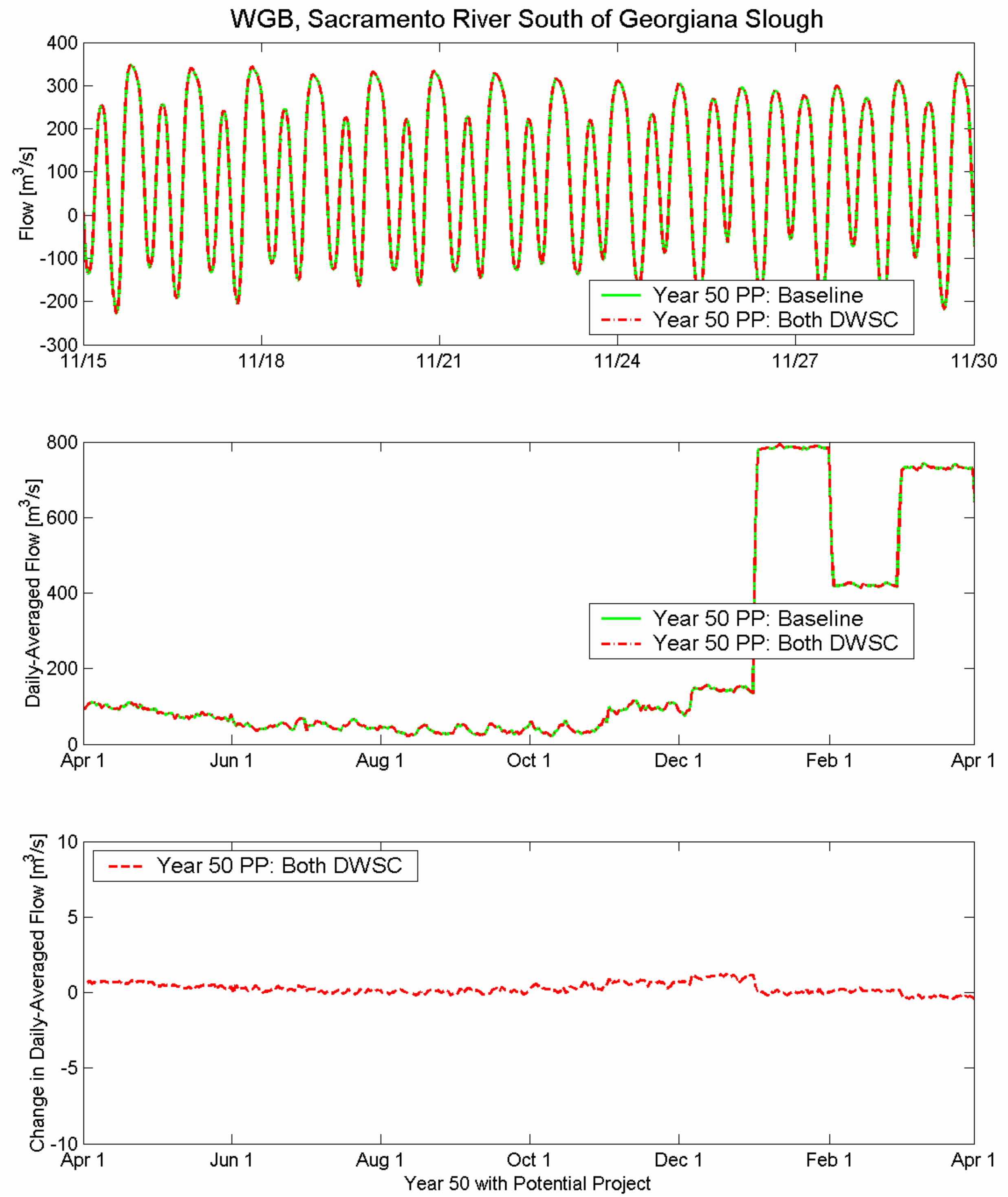


Figure 6.2-8 Predicted flow at Sacramento River South of Georgiana Slough (WGB) for the Year 50 with Potential Project Baseline scenario and the Year 50 with Potential Project Both DWSC Deepening scenario: tidal time-scale variability over a 15-day period (top); daily-averaged flow for the Year 50 with Potential Project simulation period (middle); predicted increase in daily-averaged flow for the Year 50 with Potential Project Both DWSC Deepening scenario relative to the Year 50 with Potential Project Baseline scenario (bottom).

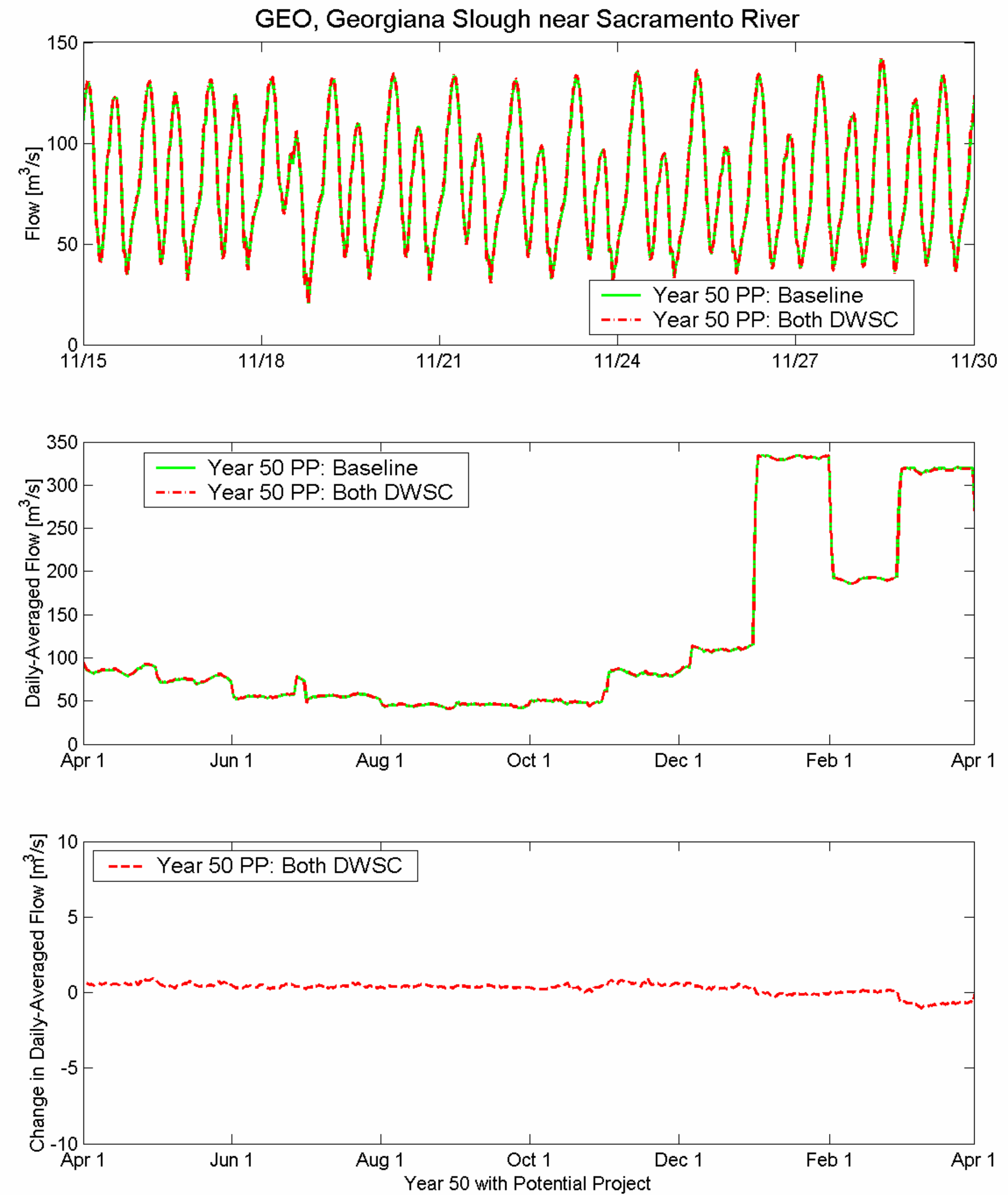


Figure 6.2-9 Predicted flow at Georgiana Slough near Sacramento River (GEO) for the Year 50 with Potential Project Baseline scenario and the Year 50 with Potential Project Both DWSC Deepening scenario: tidal time-scale variability over a 15-day period (top); daily-averaged flow for the Year 50 with Potential Project simulation period (middle); predicted increase in daily-averaged flow for the Year 50 with Potential Project Both DWSC Deepening scenario relative to the Year 50 with Potential Project Baseline scenario (bottom).

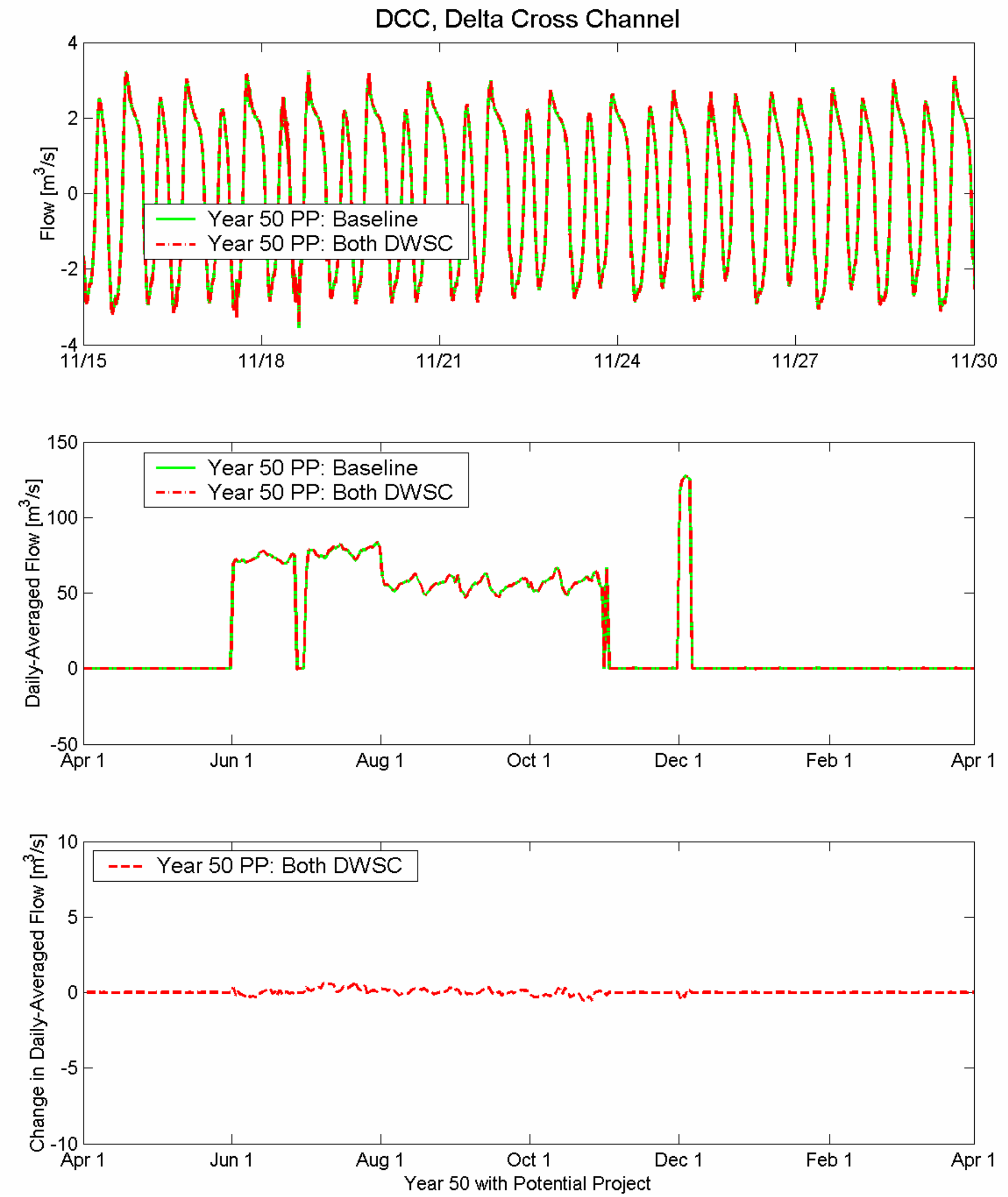


Figure 6.2-10 Predicted flow at the Delta Cross Channel (DCC) for the Year 50 with Potential Project Baseline scenario and the Year 50 with Potential Project Both DWSC Deepening scenario: tidal time-scale variability over a 15-day period (top); daily-averaged flow for the Year 50 with Potential Project simulation period (middle); predicted increase in daily-averaged flow for the Year 50 with Potential Project Both DWSC Deepening scenario relative to the Year 50 with Potential Project Baseline scenario (bottom).

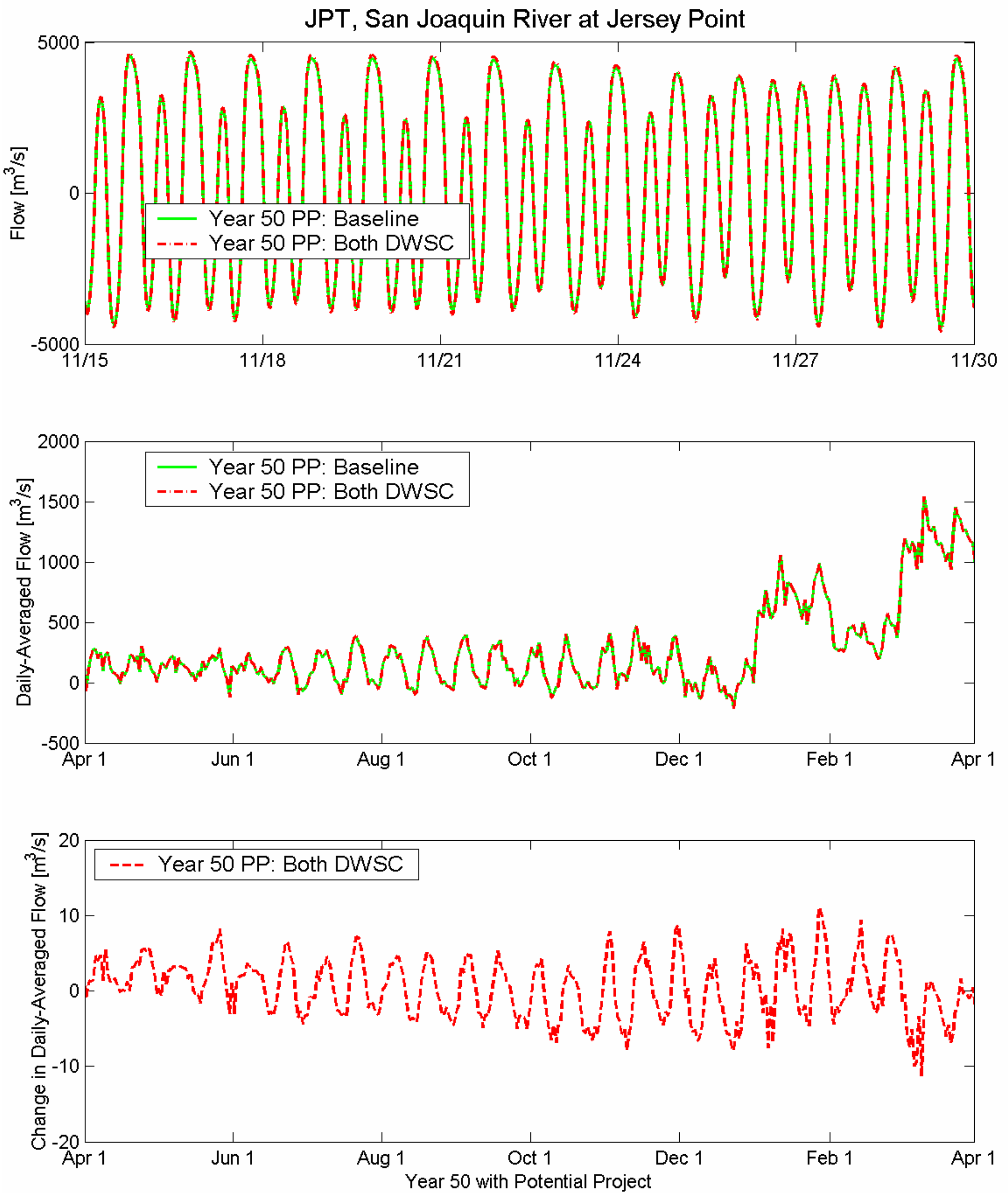


Figure 6.2-11 Predicted flow at San Joaquin River at Jersey Point (JPT) for the Year 50 with Potential Project Baseline scenario and the Year 50 with Potential Project Both DWSC Deepening scenario: tidal time-scale variability over a 15-day period (top); daily-averaged flow for the Year 50 with Potential Project simulation period (middle); predicted increase in daily-averaged flow for the Year 50 with Potential Project Both DWSC Deepening scenario relative to the Year 50 with Potential Project Baseline scenario (bottom).

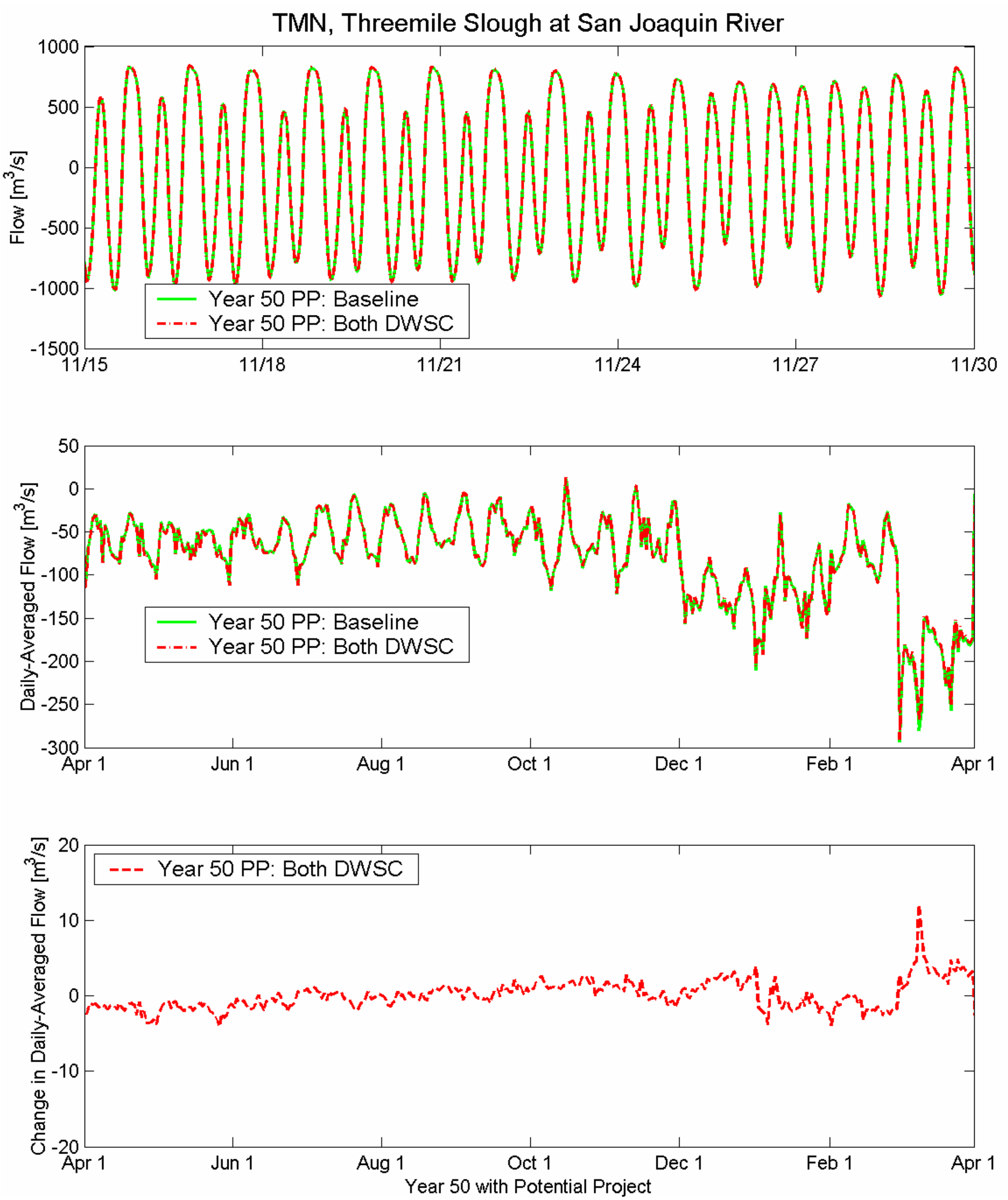


Figure 6.2-12 Predicted flow at Threemile Slough at San Joaquin River (TMN) for the Year 50 with Potential Project Baseline scenario and the Year 50 with Potential Project Both DWSC Deepening scenario: tidal time-scale variability over a 15-day period (top); daily-averaged flow for the Year 50 with Potential Project simulation period (middle); predicted increase in daily-averaged flow for the Year 50 with Potential Project Both DWSC Deepening scenario relative to the Year 50 with Potential Project Baseline scenario (bottom).

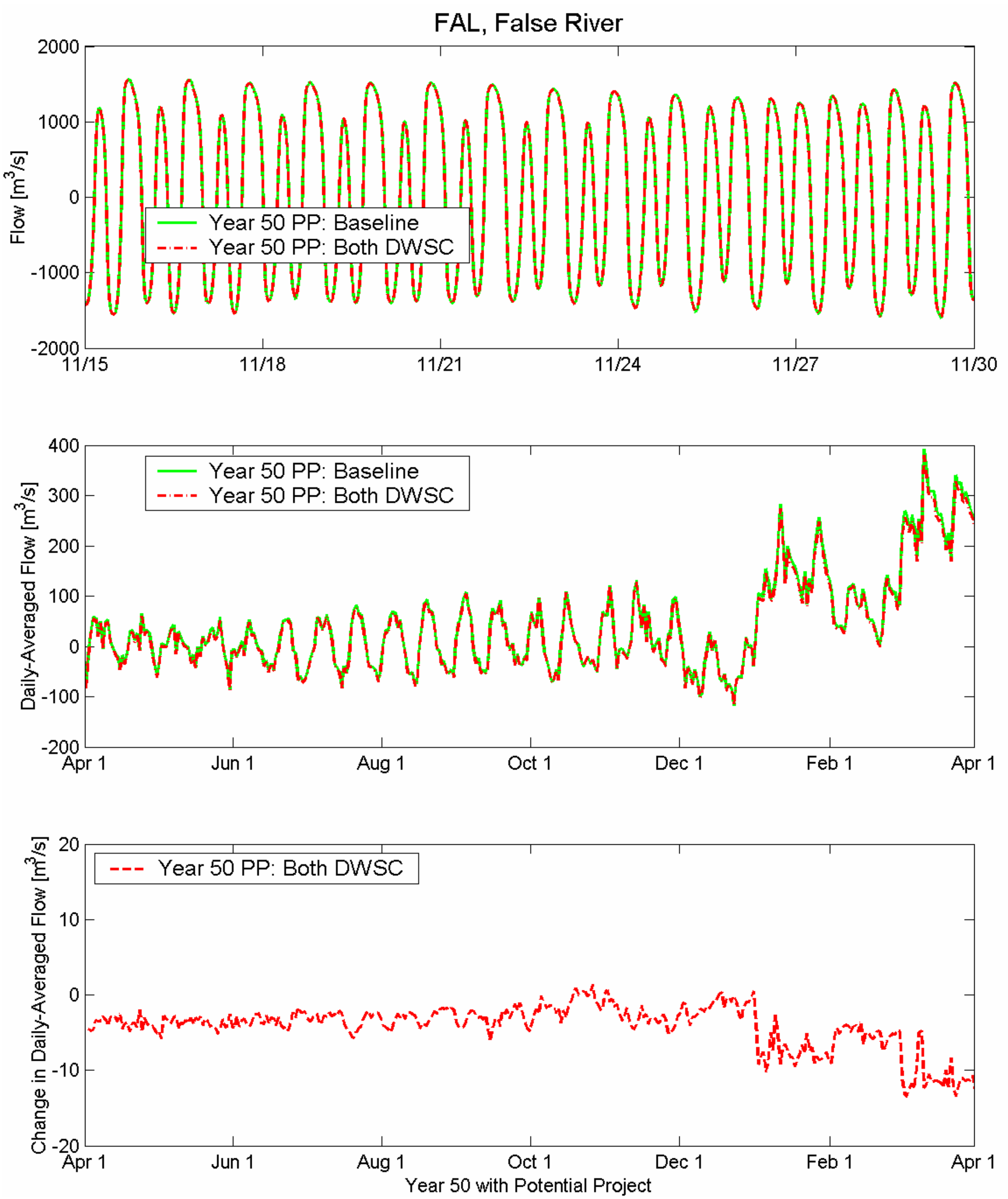


Figure 6.2-13 Predicted flow at False River (FAL) for the Year 50 with Potential Project Baseline scenario and the Year 50 with Potential Project Both DWSC Deepening scenario: tidal time-scale variability over a 15-day period (top); daily-averaged flow for the Year 50 with Potential Project simulation period (middle); predicted increase in daily-averaged flow for the Year 50 with Potential Project Both DWSC Deepening scenario relative to the Year 50 with Potential Project Baseline scenario (bottom).

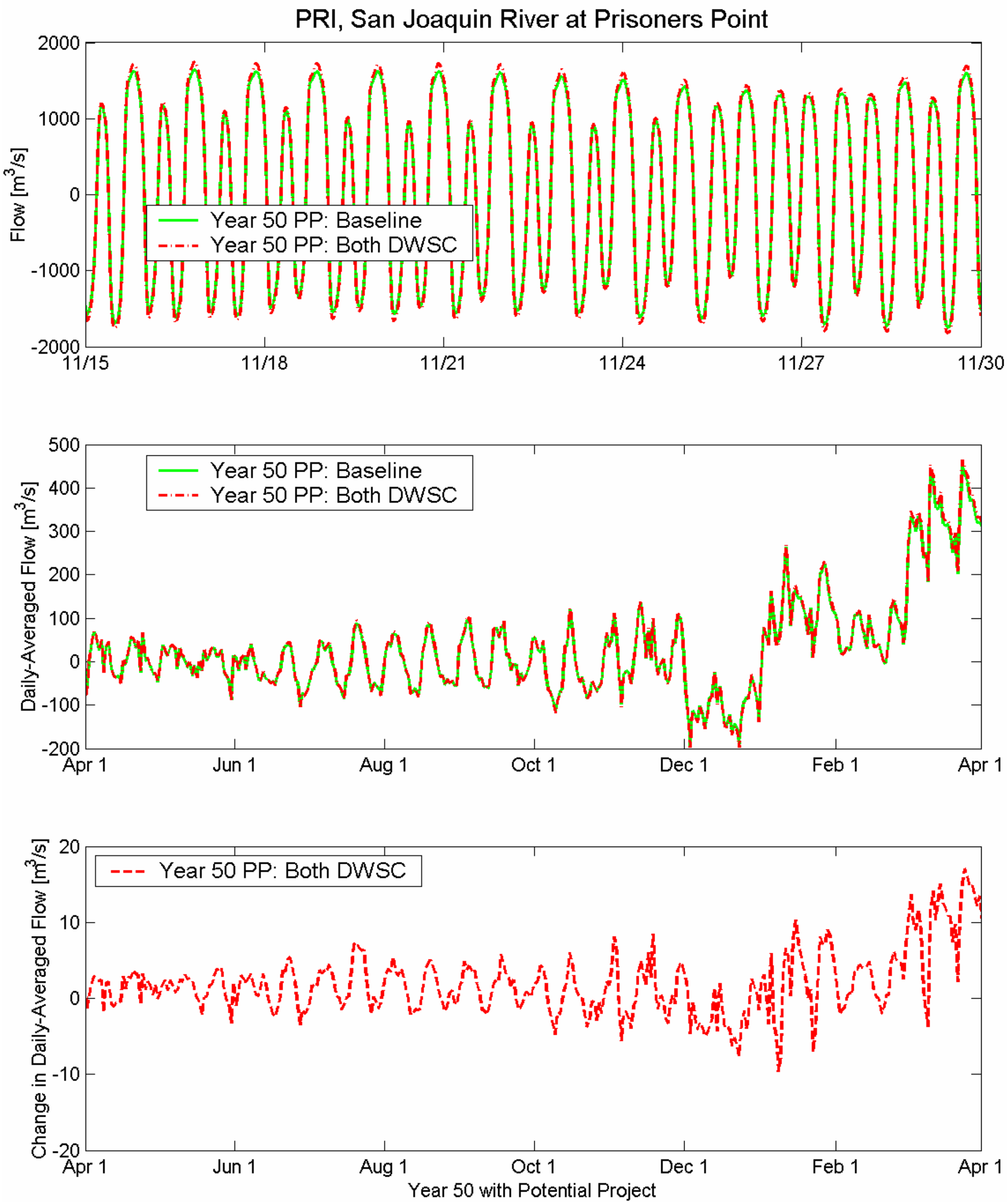


Figure 6.2-14 Predicted flow at San Joaquin River at Prisoners Point (PRI) for the Year 50 with Potential Project Baseline scenario and the Year 50 with Potential Project Both DWSC Deepening scenario: tidal time-scale variability over a 15-day period (top); daily-averaged flow for the Year 50 with Potential Project simulation period (middle); predicted increase in daily-averaged flow for the Year 50 with Potential Project Both DWSC Deepening scenario relative to the Year 50 with Potential Project Baseline scenario (bottom).

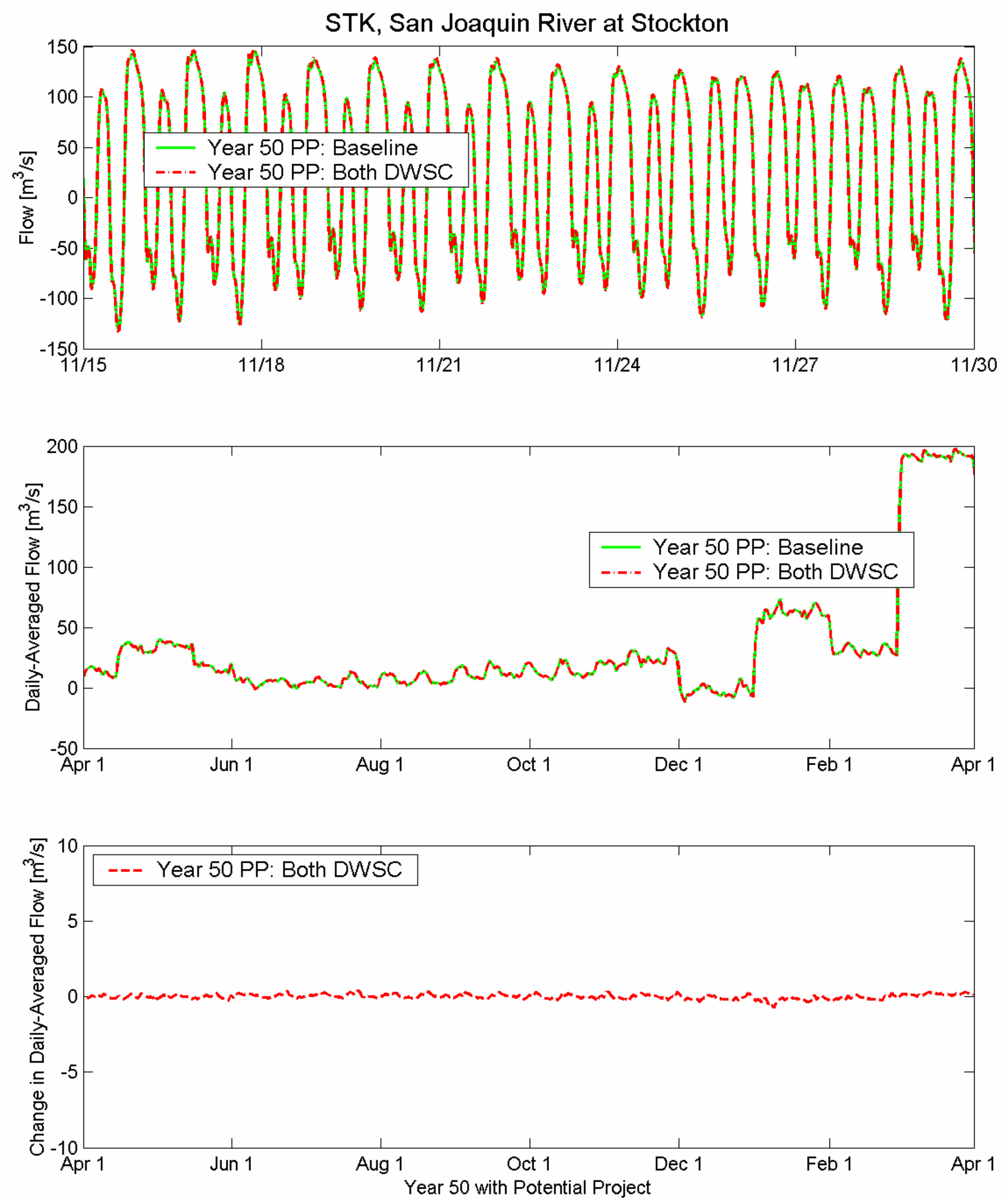


Figure 6.2-15 Predicted flow at San Joaquin River at Stockton (STK) for the Year 50 with Potential Project Baseline scenario and the Year 50 with Potential Project Both DWSC Deepening scenario: tidal time-scale variability over a 15-day period (top); daily-averaged flow for the Year 50 with Potential Project simulation period (middle); predicted increase in daily-averaged flow for the Year 50 with Potential Project Both DWSC Deepening scenario relative to the Year 50 with Potential Project Baseline scenario (bottom).

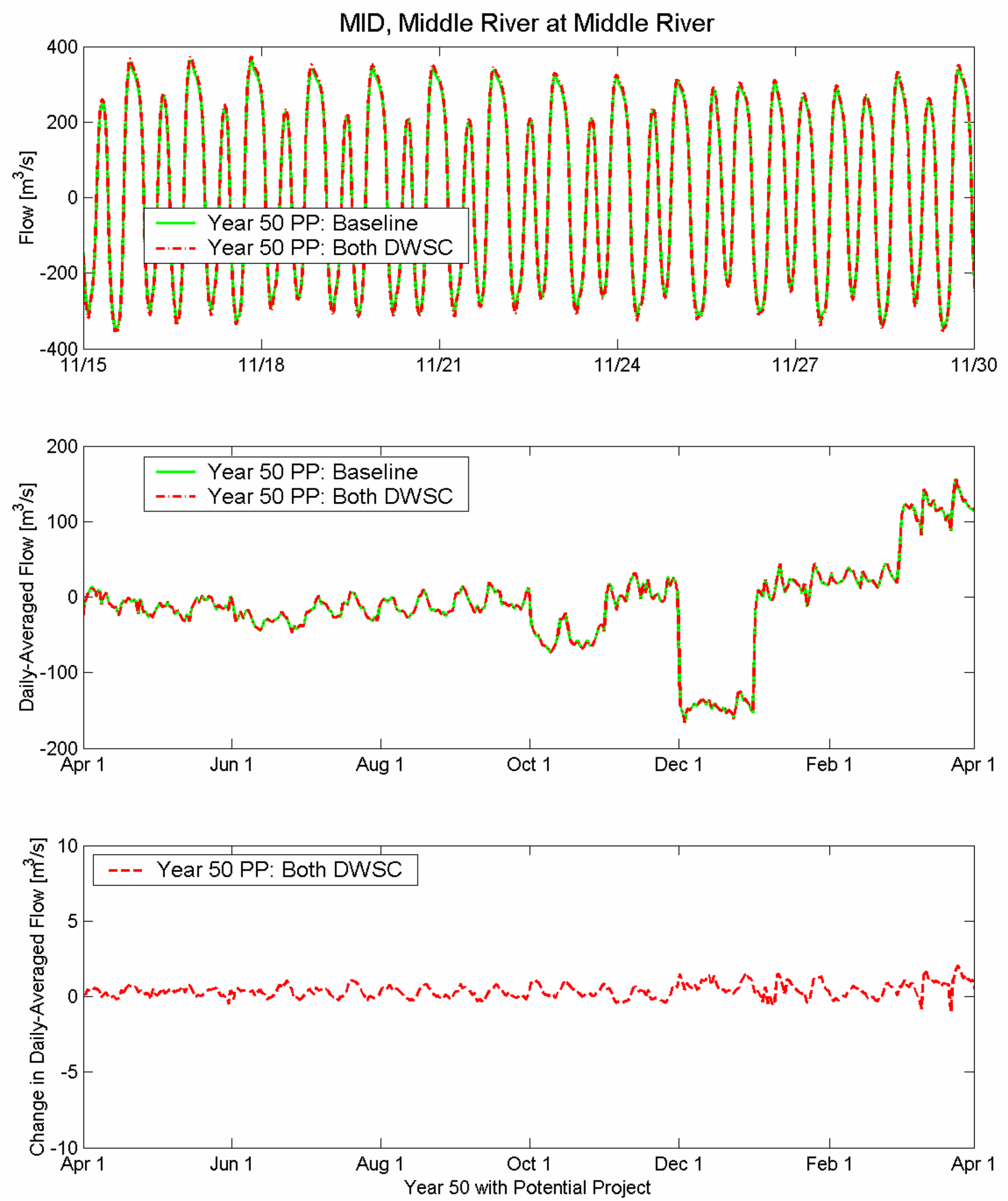


Figure 6.2-16 Predicted flow at Middle River at Middle River (MID) for the Year 50 with Potential Project Baseline scenario and the Year 50 with Potential Project Both DWSC Deepening scenario: tidal time-scale variability over a 15-day period (top); daily-averaged flow for the Year 50 with Potential Project simulation period (middle); predicted increase in daily-averaged flow for the Year 50 with Potential Project Both DWSC Deepening scenario relative to the Year 50 with Potential Project Baseline scenario (bottom).

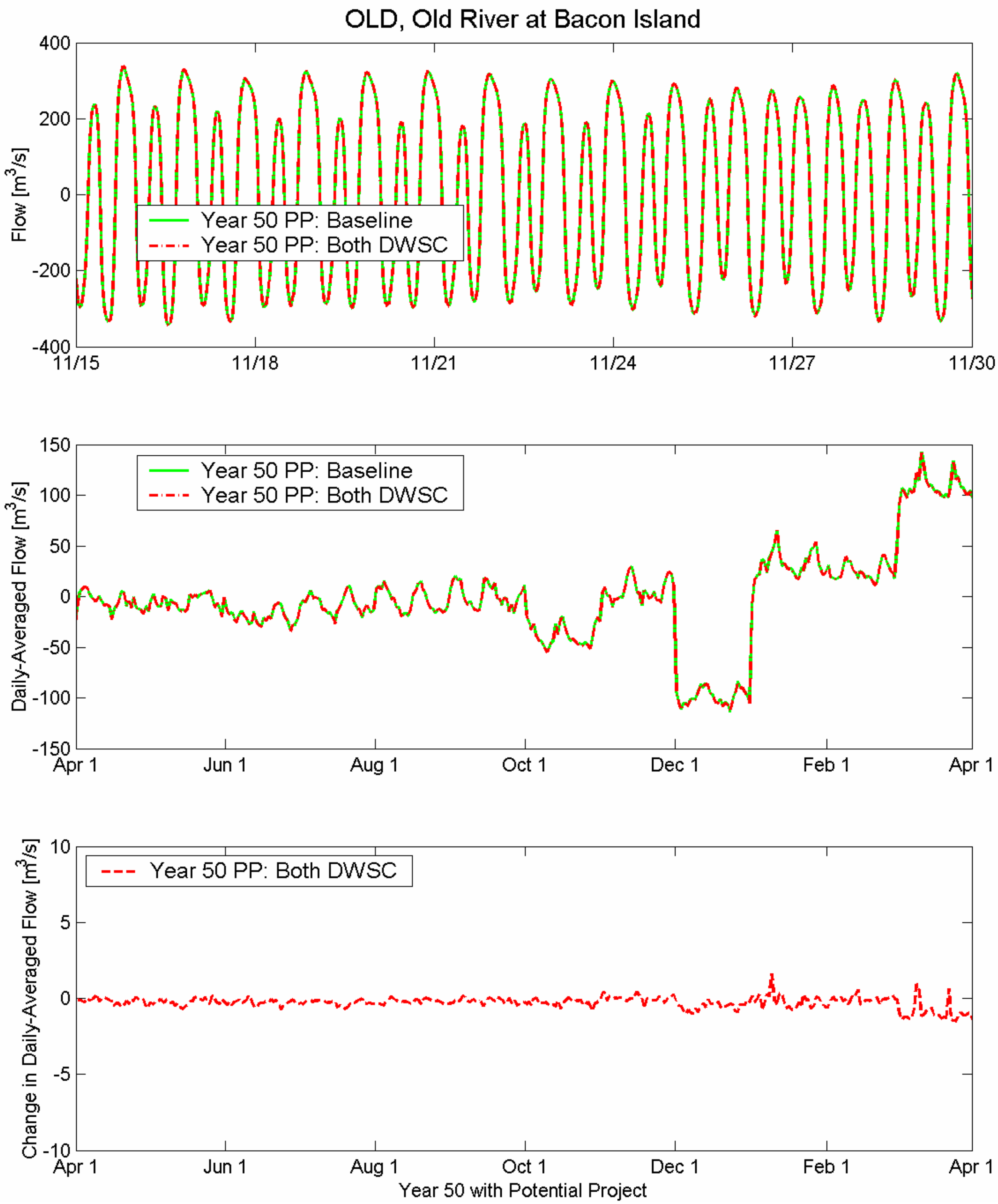


Figure 6.2-17 Predicted flow at Old River at Bacon Island (OLD) for the Year 50 with Potential Project Baseline scenario and the Year 50 with Potential Project Both DWSC Deepening scenario: tidal time-scale variability over a 15-day period (top); daily-averaged flow for the Year 50 with Potential Project simulation period (middle); predicted increase in daily-averaged flow for the Year 50 with Potential Project Both DWSC Deepening scenario relative to the Year 50 with Potential Project Baseline scenario (bottom).

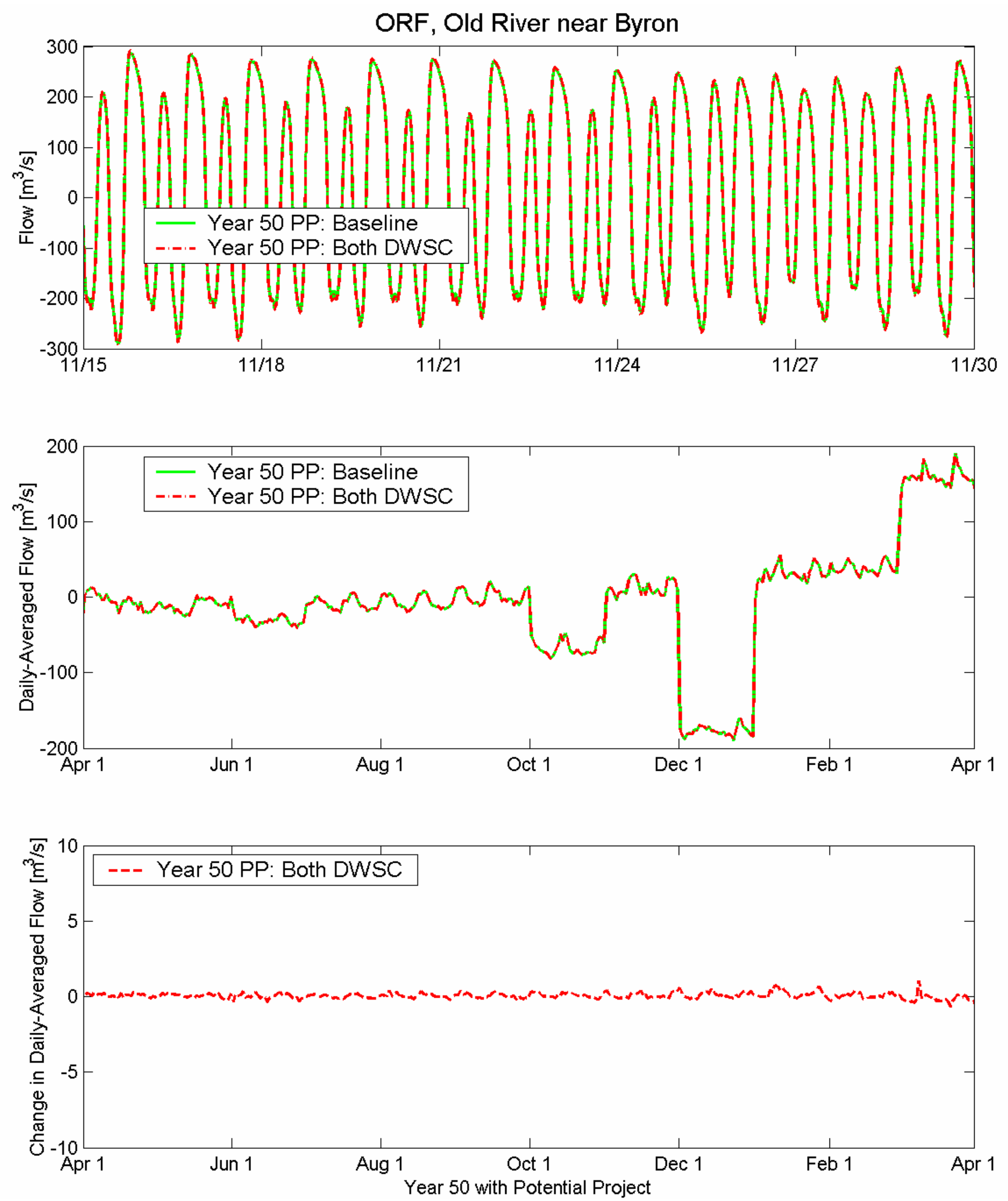


Figure 6.2-18 Predicted flow at Old River near Byron (ORF) for the Year 50 with Potential Project Baseline scenario and the Year 50 with Potential Project Both DWSC Deepening scenario: tidal time-scale variability over a 15-day period (top); daily-averaged flow for the Year 50 with Potential Project simulation period (middle); predicted increase in daily-averaged flow for the Year 50 with Potential Project Both DWSC Deepening scenario relative to the Year 50 with Potential Project Baseline scenario (bottom).

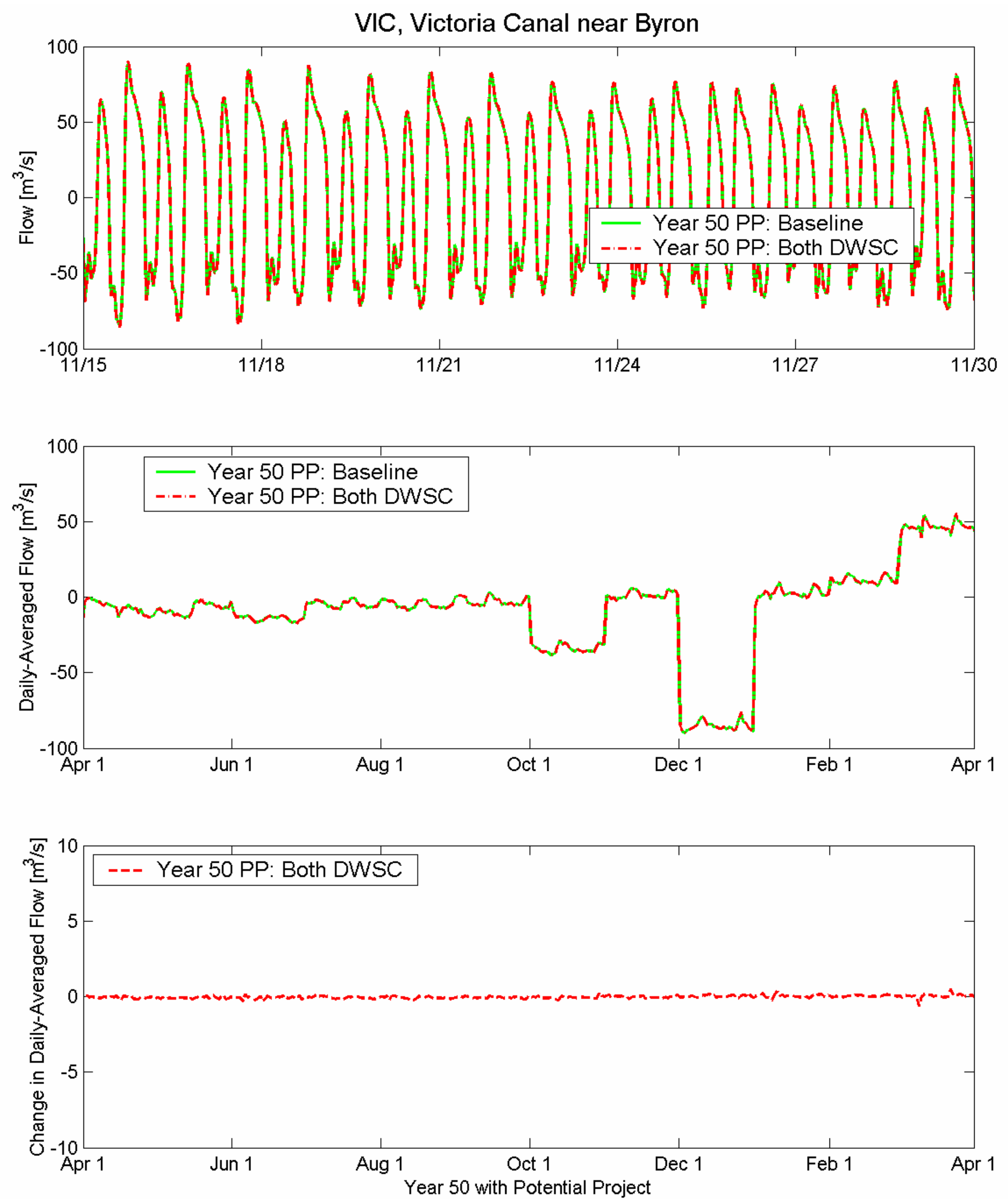


Figure 6.2-19 Predicted flow at Victoria Canal near Byron (VIC) for the Year 50 with Potential Project Baseline scenario and the Year 50 with Potential Project Both DWSC Deepening scenario: tidal time-scale variability over a 15-day period (top); daily-averaged flow for the Year 50 with Potential Project simulation period (middle); predicted increase in daily-averaged flow for the Year 50 with Potential Project Both DWSC Deepening scenario relative to the Year 50 with Potential Project Baseline scenario (bottom).

6.3 Evaluation of Salinity Impacts on X2

For each Year 50 with Potential Project scenario simulation, the daily-averaged salinity along the transects shown on Figure 3.3-4 were used to compute the predicted X2, measured from the Golden Gate, along both the Sacramento and San Joaquin River transects. The "average X2" was also computed by averaging the computed X2 distance measured along the two transects, as described in Section 3.3.3.

6.3.1 Year 50 with Potential Project Both Sacramento DWSC & SF Bay to Stockton DWSC Deepening

Figure 6.3-1 shows the predicted daily-averaged salinity profile along the axis of San Francisco Bay from the Golden Gate to the Port of Sacramento on October 24, the day of maximum predicted X2, for the Year 50 with Potential Project Baseline scenario and the Year 50 with Potential Project Both DWSC Deepening scenario. The vertical red line indicates the position of the Sacramento transect X2 for the Year 50 with Potential Project Baseline scenario. On October 24 the predicted X2 measured along the Sacramento transect is 97.5 km for the Year 50 with Potential Project Baseline scenario, and 99.1 km for the Year 50 with Potential Project Both DWSC Deepening scenario (an increase of 1.6 km).

Figure 6.3-2 shows the predicted daily-averaged salinity profile along the axis of San Francisco Bay from the Golden Gate to the Port of Stockton on October 24, the day of maximum predicted X2, for the Year 50 with Potential Project Baseline scenario and the Year 50 with Potential Project Both DWSC Deepening scenario. The vertical red line indicates the position of the San Joaquin transect X2 for the Year 50 with Potential Project Baseline scenario. On October 24 the predicted X2 measured along the San Joaquin transect is 94.0 km for the Year 50 with Potential Project Baseline scenario, and 95.7 km for the Year 50 with Potential Project Both DWSC Deepening scenario (an increase of 1.7 km).

On October 24, the predicted combined "average X2" is 95.7 km for the Year 50 with Potential project Baseline scenario and 97.4 km for the Year 50 with Potential Project Both DWSC Deepening scenario (an increase of 1.7 km).

Figure 6.3-3 shows the predicted X2 measured from the Golden Gate to the Port of Sacramento during the Year 50 with Potential Project simulation period for the Year 50 with Potential Project Baseline scenario and the Year 50 with Potential Project Both DWSC Deepening scenario.

Figure 6.3-4 shows the predicted X2 measured from the Golden Gate to the Port of Stockton during the Year 50 with Potential Project simulation period for the Year 50 with Potential Project Baseline scenario and the Year 50 with Potential Project Both DWSC Deepening scenario.

Figure 6.3-5 shows the predicted "average X2" measured from the Golden Gate during the Year 50 with Potential Project simulation period for the Year 50 with Potential Project Baseline scenario and the Year 50 with Potential Project Both DWSC Deepening scenario.

Predicted X2 measured along both the Sacramento transect (Figure 6.3-3) and the San Joaquin transect (6.3-4) for the Year 50 with Potential Project Both DWSC Deepening scenario is greater than the predicted X2 for the Year 50 with Potential Project Baseline scenario throughout the simulation period. Since the San Francisco Bay to Stockton DWSC deepening affects the West Richmond Channel, the Pinole Shoal Channel though San Pablo Bay and the Stockton DWSC through Suisun Bay, salinity gradients are present in deepened reaches throughout the year. Throughout most of the Year 50 with Potential Project simulation period, the predicted X2 for the Year 50 with Potential Project Both DWSC Deepening scenario is approximately 1 km to 2 km greater than for the Year 50 with Potential Project Baseline scenario along both the Sacramento and the San Joaquin transects, indicating increased salt intrusion throughout the simulation period. Because the Year 50 Both DWSC Deepening scenario has a similar impact on salt intrusion on the Sacramento transect and the San Joaquin transect, the computed change in "average X2" (Figure 6.3-5) shows a similar increase in X2 to that predicted along the Sacramento transect (Figure 6.3-3) and the San Joaquin transect (Figure 6.3-4).

Figure 6.3-6 shows the cumulative number of days during the year that the change in predicted X2 measured along the Sacramento transect for the Year 50 with Potential Project Both DWSC Deepening scenario exceeds the corresponding Sacramento transect X2 predicted under the Year 50 with Potential Project Baseline Scenario by a specific distance. The maximum change in X2 measured along the Sacramento transect during the Year 50 with Potential Project Both DWSC Deepening scenario is 4.55 km. A change in X2 measured along the Sacramento transect of 2.0 km or more is predicted on 25 days for the Year 50 with Potential Project Both DWSC Deepening scenario. A change in X2 measured along the Sacramento transect of 1.0 km or more is predicted on 302 days. The median predicted change in X2 measured along the Sacramento transect under the Year 50 with Potential Project Both DWSC Deepening scenario is 1.19 km. For 182 days during the year under the Year 50 with Potential Project Both DWSC Deepening scenario, the predicted change in X2 measured along the Sacramento transect is more than 1.19 km, whereas for 182 days the predicted change in X2 measured along the Sacramento transect under the Year 50 with Potential Project Both DWSC Deepening scenario is less than 1.19 km.

Figure 6.3-7 shows the cumulative number of days during the year that the change in predicted X2 measured along the San Joaquin transect for the Year 50 with Potential Project Both DWSC Deepening scenario exceeds the corresponding San Joaquin transect X2 predicted under the Year 50 with Potential Project Baseline Scenario by a specific distance. The maximum change in X2 measured along the San Joaquin transect during the Year 50 with Potential Project Both DWSC Deepening scenario is 5.07 km. A change in X2 measured along the San Joaquin transect of 2.0 km or more is predicted on 24 days for the Year 50 with Potential Project Both DWSC Deepening scenario. A change in X2 measured along the San Joaquin transect of 1.0 km or more is predicted on 239 days for the Year 50 with Potential Project Both DWSC Deepening scenario. The median predicted change in X2 measured along the San Joaquin transect under the Year 50 with Potential Project Both DWSC Deepening scenario is 1.11 km. For 182 days during the year under the Year 50 with Potential Project Both DWSC Deepening scenario, the predicted change in X2 measured along the San Joaquin transect is more than 1.11 km, whereas for 182 days the predicted change in X2 measured along the San Joaquin transect under the Year 50 with Potential Project Both DWSC Deepening scenario is less than 1.11 km.

Figure 6.3-8 shows the cumulative number of days during the year that the change in predicted average X2 for the Year 50 with Potential Project Both DWSC Deepening scenario exceeds the corresponding average X2 predicted under the Year 50 with Potential Project Baseline Scenario by a specific distance. The maximum change in average X2 during the Year 50 with Potential Project Both DWSC Deepening scenario is 4.55 km. A change of average X2 of 2.0 km or more is predicted on 22 days for the Year 50 with Potential Project Both DWSC Deepening scenario. A change of average X2 of 1.0 km or more is predicted on 282 days for the Year 50 with Potential Project Both DWSC Deepening scenario. The median predicted change in average X2 under the Year 50 with Potential Project Both DWSC Deepening scenario is 1.15 km. For 182 days during the year under the Year 50 with Potential Project Both DWSC Deepening scenario, the predicted change in average X2 is more than 1.15 km, whereas for 182 days the predicted change in average X2 under the Year 50 with Potential Project Both DWSC Deepening scenario is less than 1.15 km.

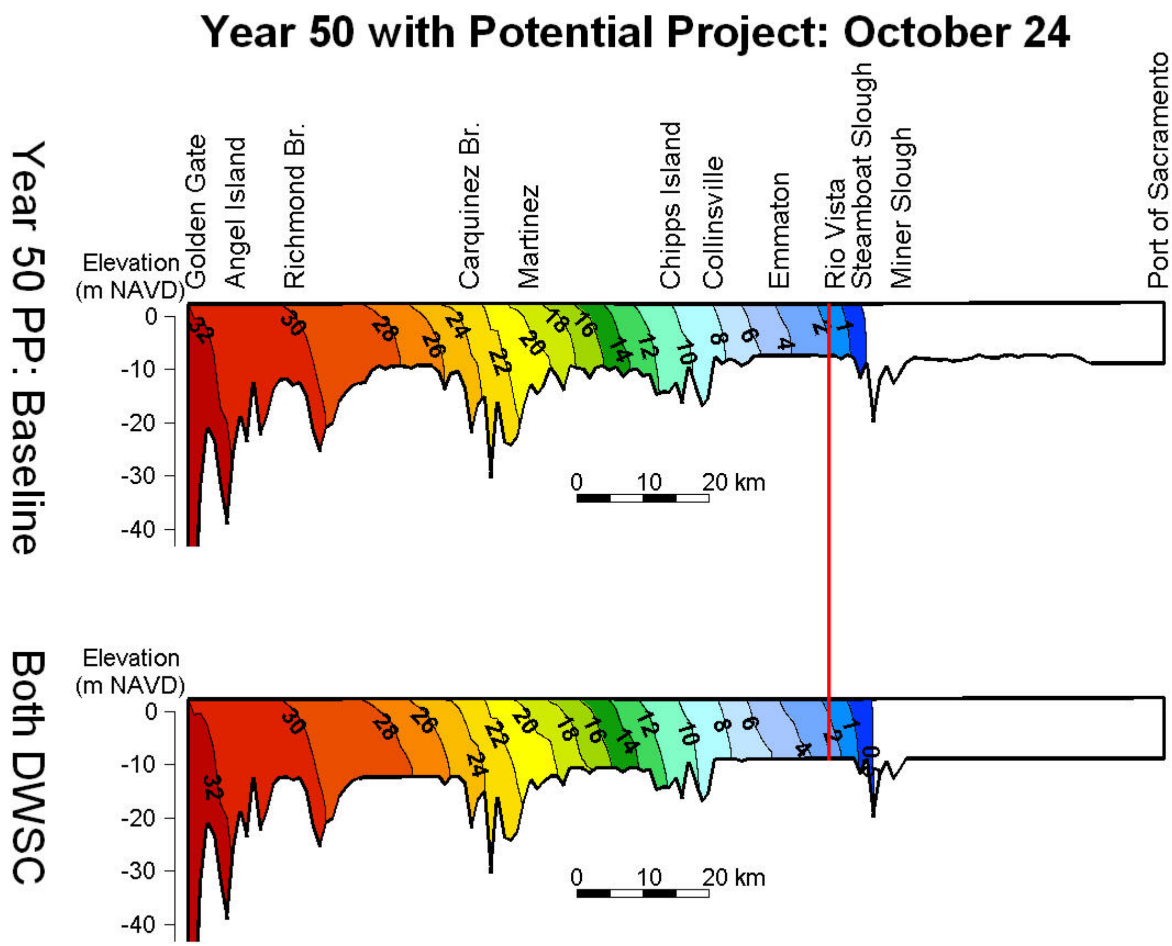


Figure 6.3-1 Predicted daily-averaged salinity profile along the axis of San Francisco Bay from the Golden Gate to the Port of Sacramento on October 24, the day of maximum predicted X2, for the Year 50 with Potential Project Baseline scenario (top) and the Year 50 with Potential Project Both DWSC Deepening scenario (bottom). The vertical red line indicates X2 for the Year 50 with Potential Project Baseline scenario.

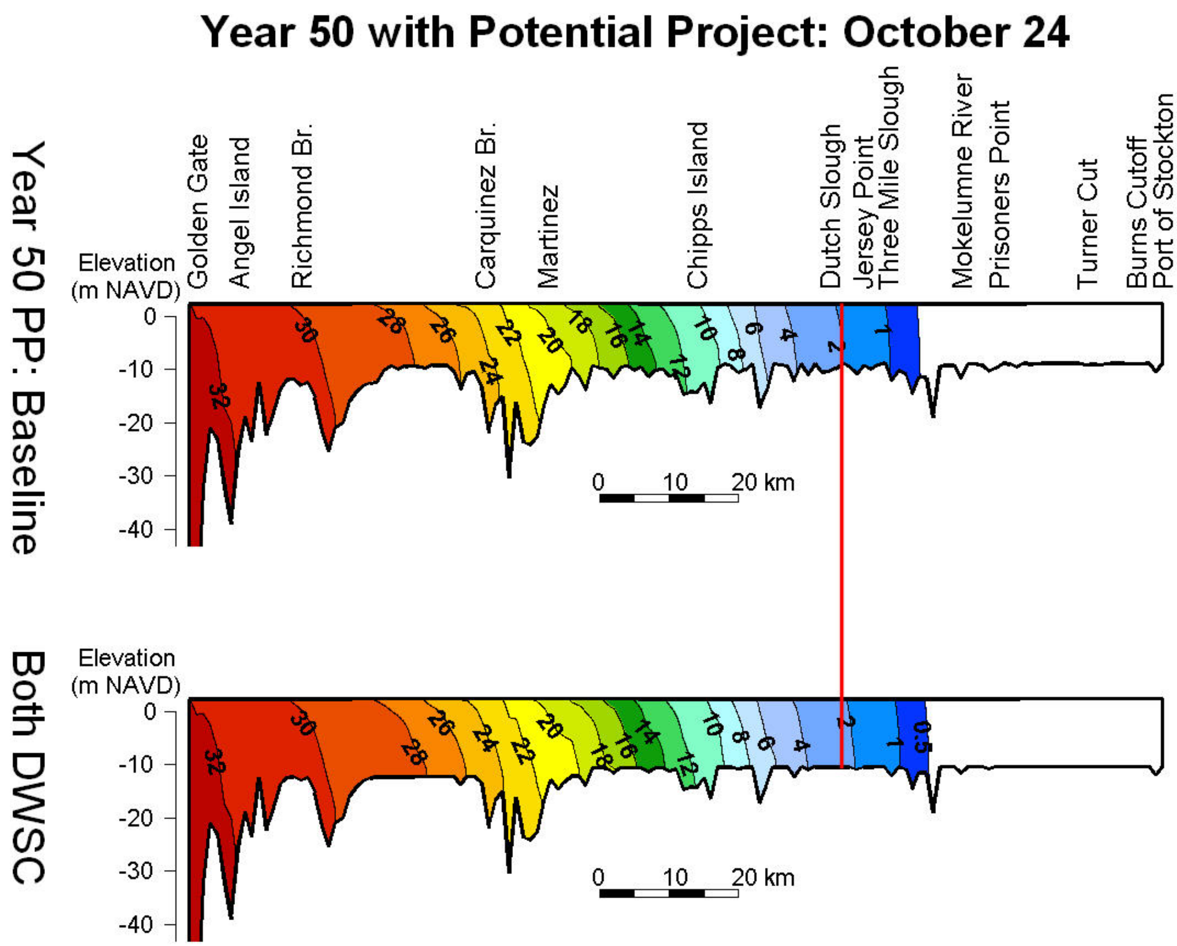


Figure 6.3-2 Predicted daily-averaged salinity profile along the axis of San Francisco Bay from the Golden Gate to the Port of Stockton on October 24, the day of maximum predicted X2, for the Year 50 with Potential Project Baseline scenario (top) and the Year 50 with Potential Project Both DWSC Deepening scenario (bottom). The vertical red line indicates X2 for the Year 50 with Potential Project Baseline scenario.

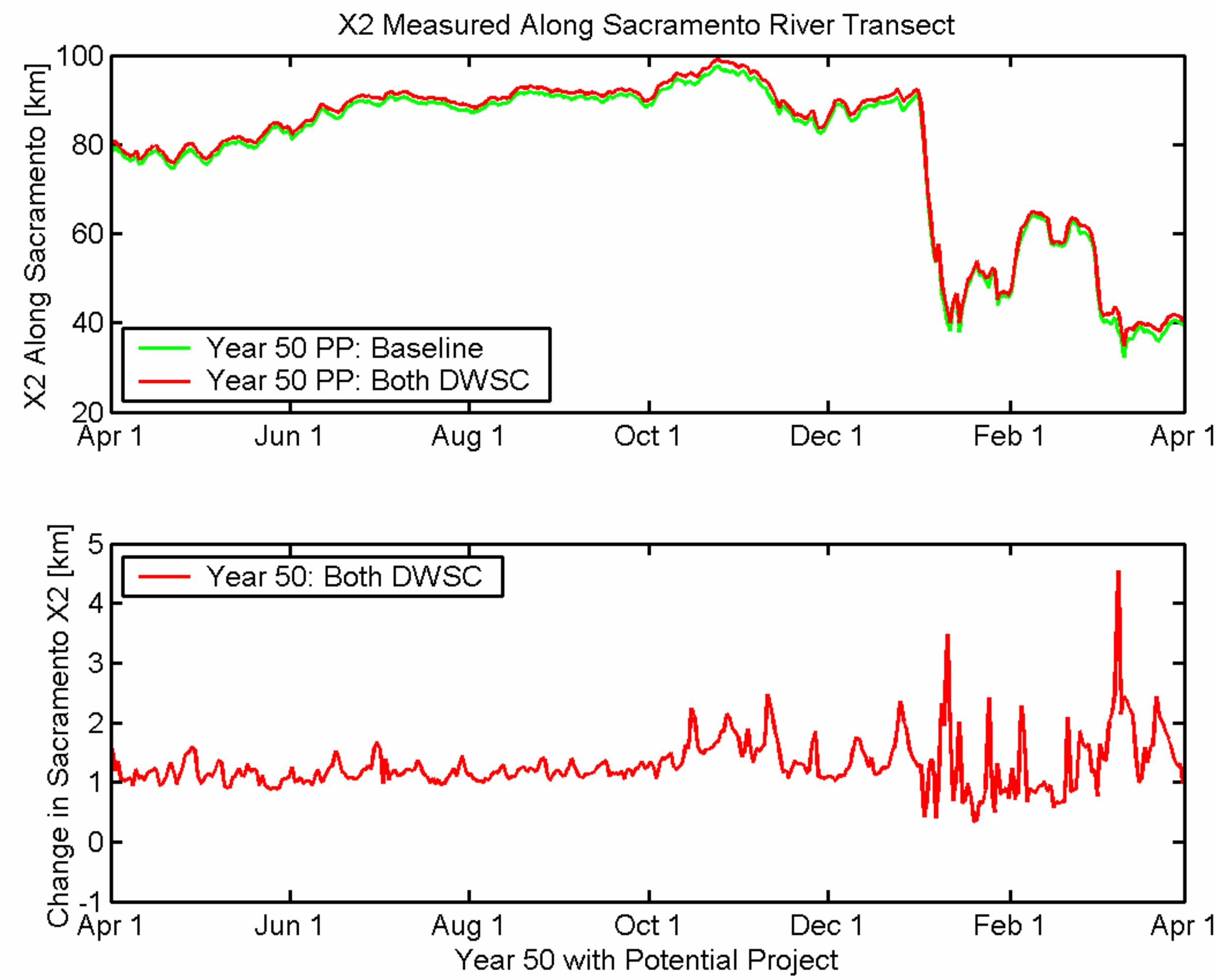


Figure 6.3-3 Predicted X2 measured from the Golden Gate to the Port of Sacramento along the Sacramento transect on Figure 3.3-4 for the Year 50 with Potential Project Baseline scenario and the Year 50 with Potential Project Both DWSC Deepening scenario (top); Predicted change in X2 measured along the Sacramento transect relative to the Year 50 with Potential Project Baseline scenario for the Year 50 with Potential Project Both DWSC Deepening scenario (bottom).

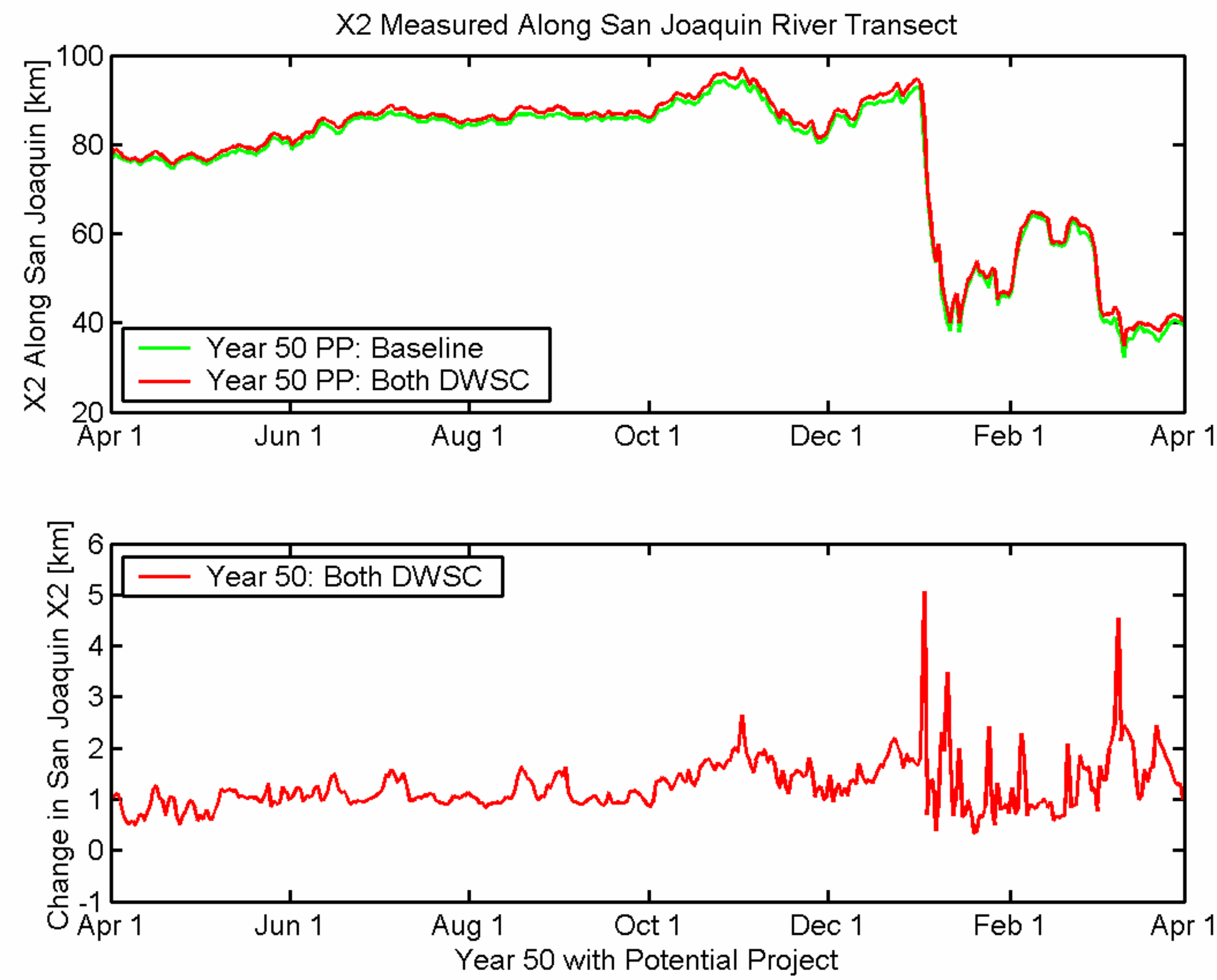


Figure 6.3-4 Predicted X2 measured from the Golden Gate to the Port of Stockton along the San Joaquin transect on Figure 3.3-4 for the Year 50 with Potential Project Baseline scenario and the Year 50 with Potential Project Both DWSC Deepening scenario (top); Predicted change in X2 measured along the San Joaquin transect relative to the Year 50 with Potential Project Baseline scenario for the Year 50 with Potential Project Both DWSC Deepening scenario (bottom).

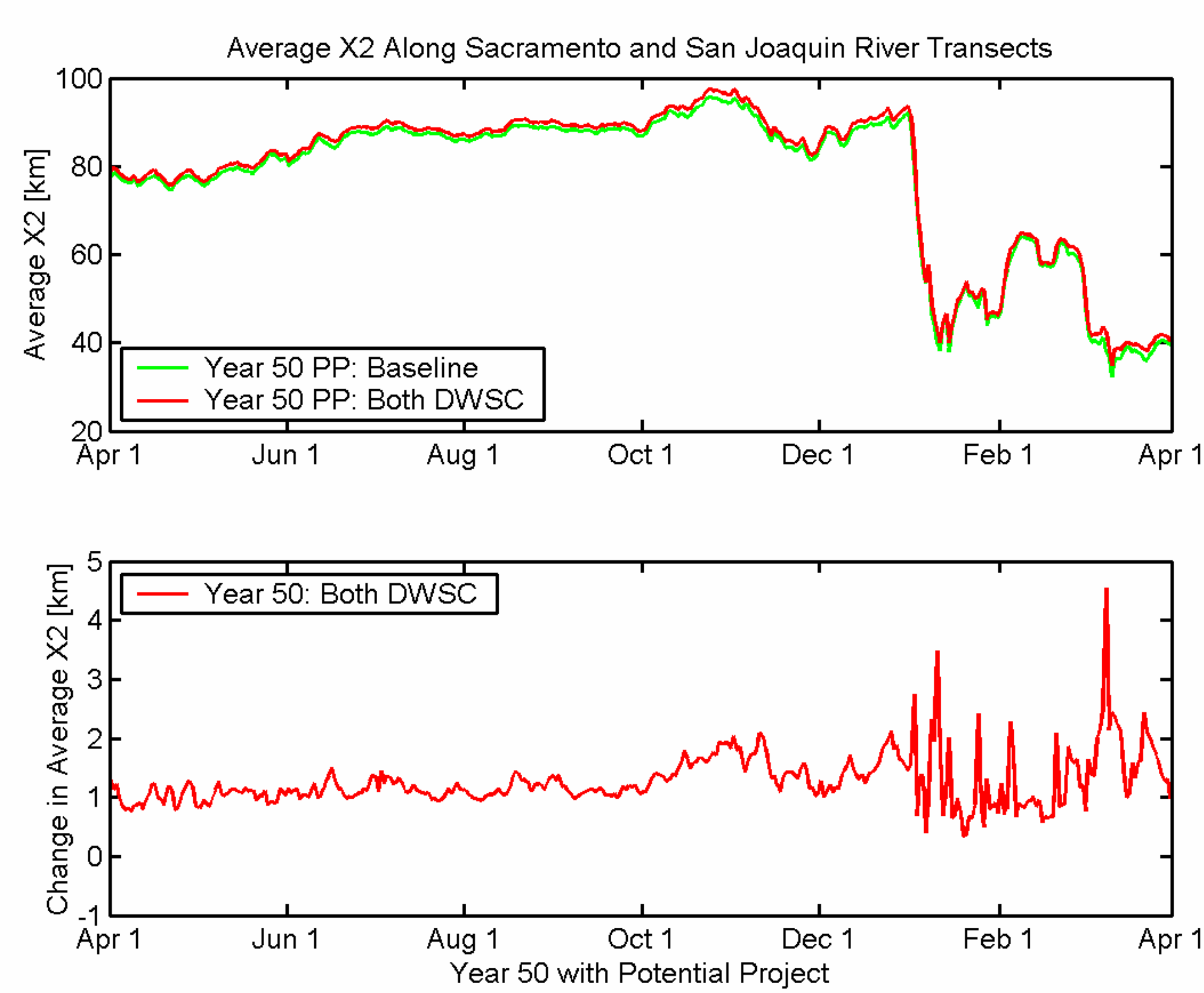


Figure 6.3-5 Predicted "average X2" for the Year 50 with Potential Project Baseline scenario and the Year 50 with Potential Project Both DWSC Deepening scenario (top); Predicted change in "average X2" relative to the Year 50 with Potential Project Baseline scenario for the Year 50 with Potential Project Both DWSC Deepening scenario (bottom).

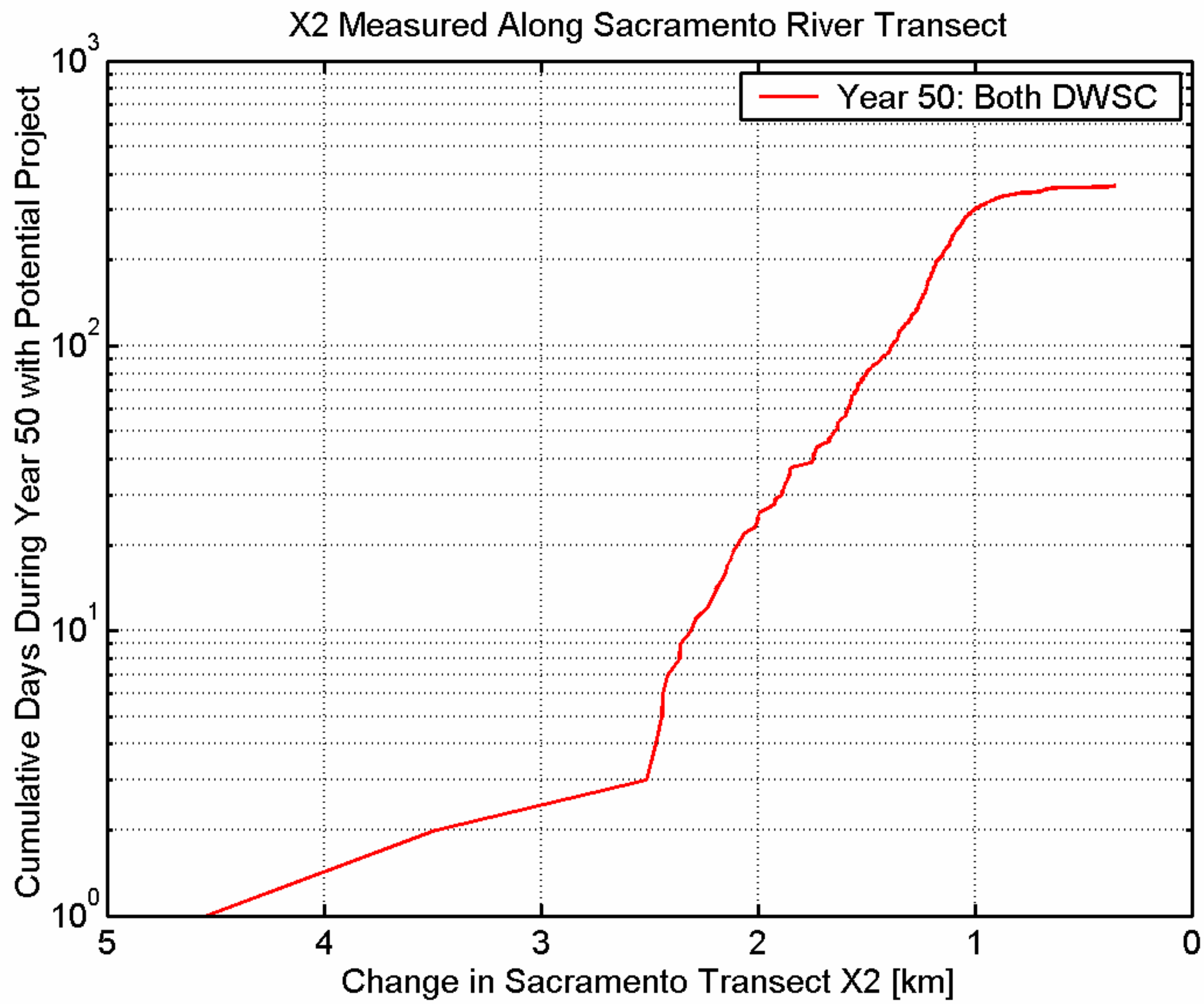


Figure 6.3-6 Cumulative number of days during the year that the change in predicted X2 measured along the Sacramento transect for the Year 50 with Potential Project Both DWSC Deepening scenario exceeds the corresponding Sacramento transect X2 predicted under the Year 50 with Potential Project Baseline Scenario by a specific distance.

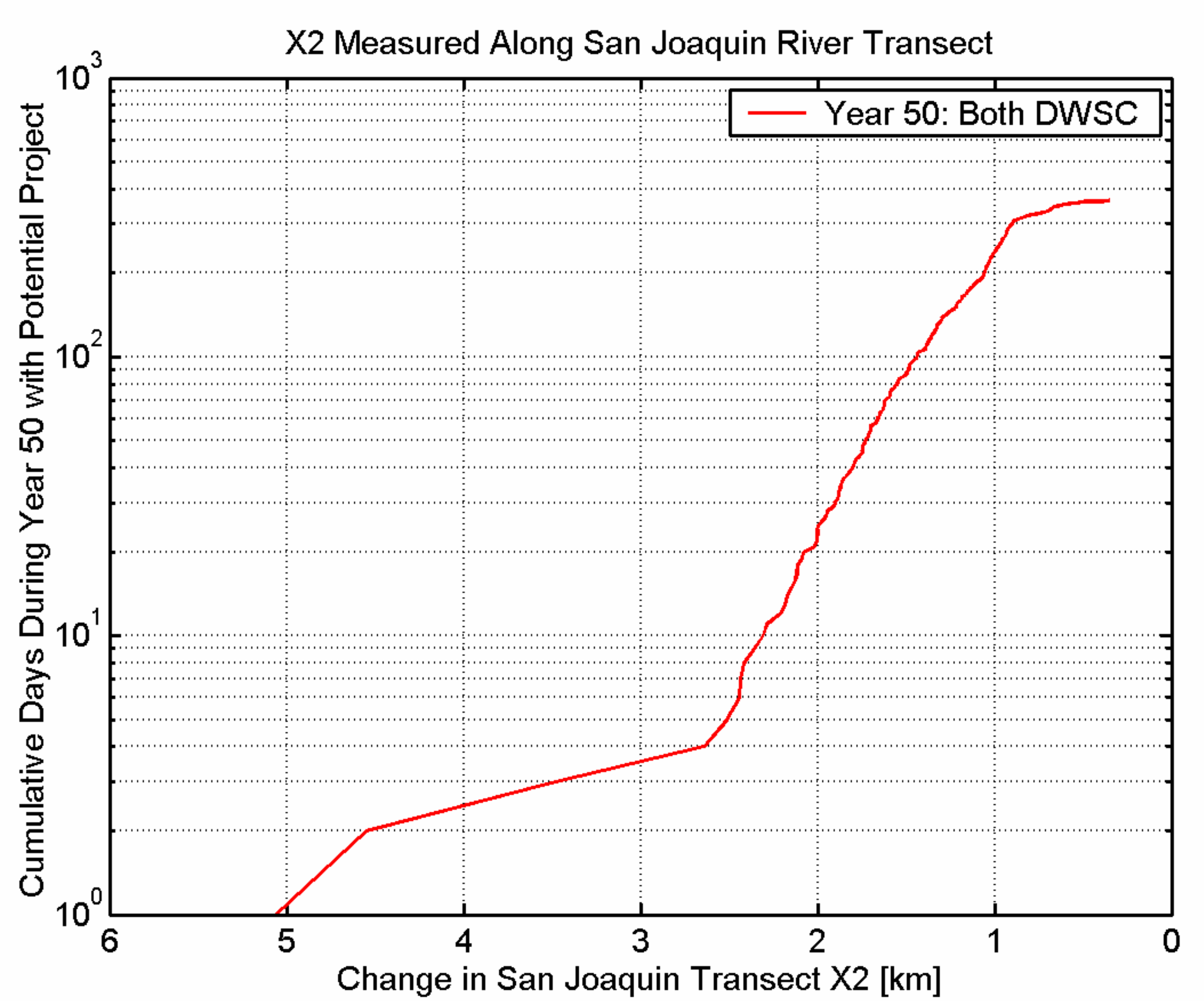


Figure 6.3-7 Cumulative number of days during the year that the change in predicted X2 measured along the San Joaquin transect for the Year 50 with Potential Project Both DWSC Deepening scenario exceeds the corresponding San Joaquin transect X2 predicted under the Year 50 with Potential Project Baseline Scenario by a specific distance.

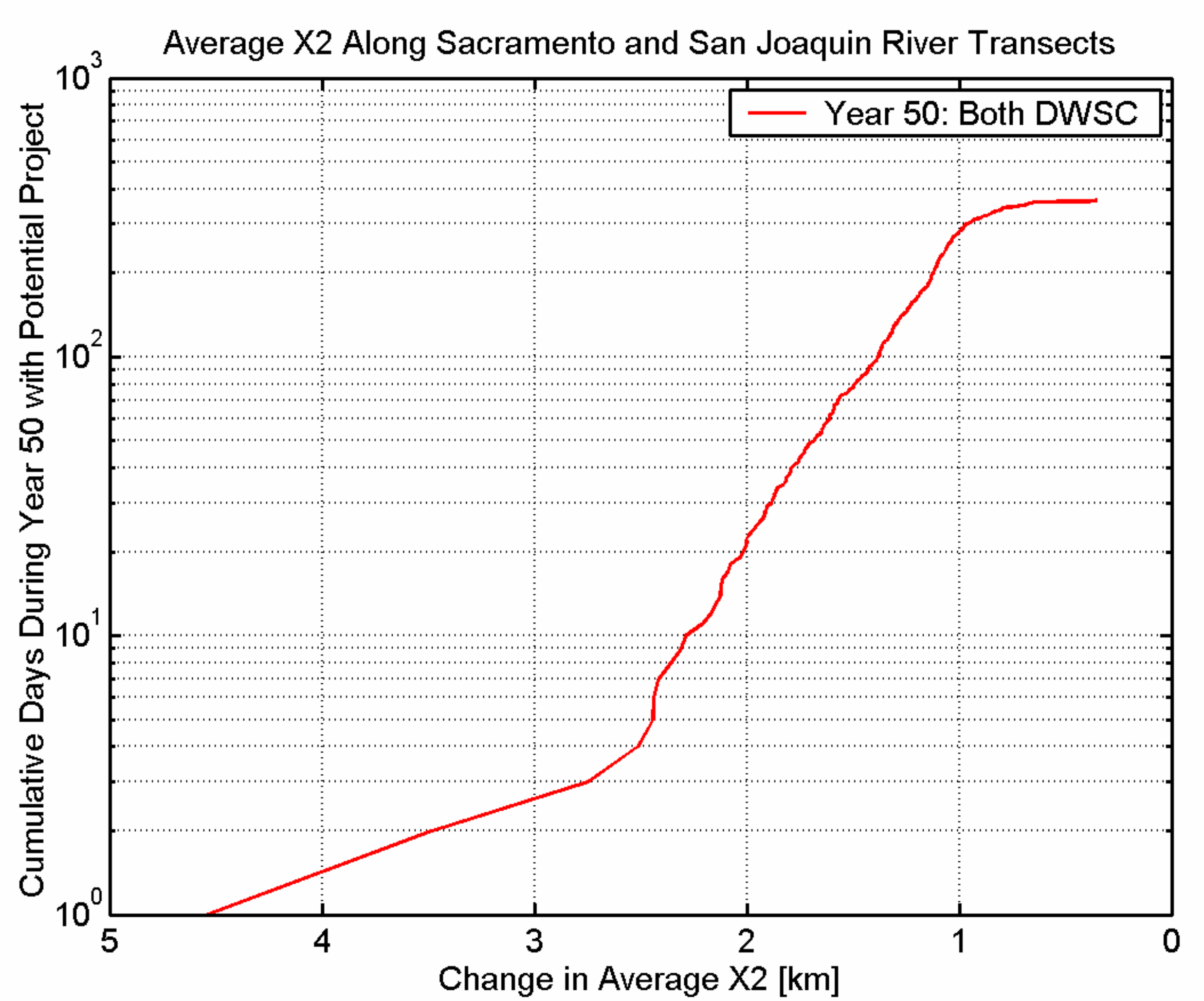


Figure 6.3-8 Cumulative number of days during the year that the change in predicted average X2 for the Year 50 with Potential Project Both DWSC Deepening scenario exceeds the corresponding average X2 predicted under the Year 50 with Potential Project Baseline Scenario by a specific distance.

6.4 Depth-Averaged Daily-Average Salinity Maps

Depth-averaged daily-averaged salinity maps were computed for the first day of each month, and for October 24, the day of maximum X2 for the Baseline scenario and the Both DWSC Deepening scenario during Year 50 with Potential Project simulation period. On each of these days, the daily-averaged depth-averaged salinity for the Year 50 with Potential Project Both DWSC Deepening scenario was compared to the depth-averaged daily-averaged salinity for the Year 50 with Potential Project Baseline scenario to compute the salinity increase. Each figure also shows the vertical salinity profile along the axis of San Francisco Bay to provide a reference for the longitudinal position of salinity gradients and the location and strength of salinity stratification in San Francisco Bay. Depth-averaged daily-averaged salinity comparisons for the Year 50 with Potential Project Both DWSC Deepening scenario are presented in the following section.

6.4.1 Year 50 with Potential Project Both Sacramento DWSC & SF Bay to Stockton DWSC Deepening

Figure 6.4-1 shows the predicted daily-averaged salinity profile along the axis of San Francisco Bay from the Golden Gate to the Port of Sacramento, depth-averaged daily-averaged salinity map, and predicted salinity increase relative to the Year 50 with Potential Project Baseline scenario for the Year 50 with Potential Project Both DWSC Deepening scenario at the beginning of the analysis period for the Year 50 with Potential Project simulation on April 1. On April 1, X2 is between Chipps Island and Collinsville, and the 0.5 psu salinity isohaline is between Collinsville and Emmaton. Predicted salinity increases on April 1 for the Year 50 with Potential Project Both DWSC Deepening scenario are evident in San Pablo Bay, Suisun Bay, and into the western Delta. The largest salinity increases are evident within the Pinole Shoal Channel in San Pablo Bay and through Carquinez Strait, where predicted salinity increases range from 0.5 psu to 1.0 psu. The strong stratification evident west of the Carquinez Bridge suggests that strong gravitational circulation is occurring in this region. The deepening of the Pinole DWSC results in increased salt intrusion through San Pablo Bay. Salinity increases of between 0.3 and 0.50 psu are evident in much of Suisun Bay, with the largest salinity increases predicted in and near the Stockton DWSC.

During late spring and early summer conditions on May 1 (Figure 6.4-2) and June 1 (Figure 6.4-3) depth-averaged daily-averaged salinity increases are predicted in San Pablo Bay and Suisun Bay resulting from the Year 50 with Potential Project Both DWSC Deepening scenario. Salinity increases of between 0.05 and 0.2 psu are predicted in much of San Pablo Bay and salinity increases of between 0.3 and 0.5 psu are predicted in much of Suisun Bay.

On July 1 (Figure 6.4-4), the 0.5 psu isohaline is near Jersey Point and the 1 psu isohaline is near Dutch Slough. Salinity increases in San Pablo Bay and Suisun Bay on July 1 are similar to the salinity increases predicted during May and June, however larger salinity increases are predicted in the western Delta (see Figure 6.4-17).

On August 1 (Figure 6.4-5) salinity increases of between 0.05 and 0.3 psu are predicted in eastern San Pablo Bay, and salinity increases of between 0.3 and 0.5 psu are predicted in most of Suisun Bay. Predicted salinity increases of at least 0.05 psu extend up the Sacramento River past Emmaton, along the San Joaquin River upstream to False River (see Figure 6.4-18).

On September 1 (Figure 6.4-6), salinity increases of between 0.05 and 0.3 psu are predicted in eastern of San Pablo Bay, and salinity increases of between 0.3 and 0.5 psu are predicted in most of Suisun Bay. Predicted salinity increases of 0.05 psu extend up the Sacramento River past Emmaton, and along the San Joaquin River past Threemile Slough. Salinity increases between 0.05 and 0.1 psu are predicted in False River, Little Franks Tract and Dutch Slough (see Figure 6.4-19).

During September, Delta outflow is somewhat higher (167 m^3/s) than during August (122 m^3/s), and exports during September are significantly lower than during August (see Figure 3.3-2). As a result, by October 1 (Figure 6.4-7), predicted salinity increases in False River and Little Franks Tract are significantly less than on September 1 (see Figure 6.4-20).

As seen in Figure 3.2-3, Delta outflow during October in the Year 50 with Potential Project simulation is at an annual low of 86 m^3/s, compared to 167 m^3/s in September and 334 m^3/s in November. As a result, significant salt intrusion occurs during October leading to an annual maximum X2 for all scenarios on October 24. On October 24 (Figure 6.4-8), the day of maximum predicted X2 during the Year 50 with Potential Project simulation period, salinity increases of between 0.1 and 0.2 psu are predicted in most of Franks Tract and salinity increases of between 0.05 and 0.1 psu extend down Old River to the southern end of Bacon Island (see Figure 6.4-21).

On November 1 (Figure 6.4-9), predicted salinity increases are similar to those on October 24, with larger predicted salinity increases seen in the western part of Franks Tract and salinity increases of between 0.05 and 0.10 psu extending down Old River to Victoria Canal (see Figure 6.4-22). During November, Delta outflow increases significantly to 334 m^3/s (from 86 m^3/s during October), due largely to lower exports during November (see Figure 3.2-3). As a result, much of the salt that intruded into the western Delta during October has been flushed out of the Delta by December 1 (Figure 6.4-10). However salinity increases of between 0.05 and 0.10 psu are still predicted in some parts of Franks Tract and Little Mandeville Island (see Figure 6.4-23).

During December net Delta outflow decreases to 182 m^3/s resulting in additional salt intrusion during December. On January 1 (Figure 6.4-11), predicted salinity increases of between 0.2 and 0.3 psu are evident in Franks Tract and along Old River. Predicted salinity increases of between 0.05 and 0.1 psu extend down Old River and into Clifton Court Forebay, and extend up the San Joaquin River almost to Turner Cut (see Figure 6.4-24).

Large Delta outflows during January (Figure 3.2-3) flush most of the salt out of the Delta and Suisun Bay, with the 0.5 psu isohaline near Martinez on February 1 (Figure 6.4-12). No salinity increases greater than 0.05 psu are predicted east of Martinez resulting from the Year 50 with Potential Project Both DWSC Deepening scenario on February 1 (Figure 6.4-12) or on March 1 (Figure 6.4-13).

Figure 6.4-14 through Figure 6.4-26 show the predicted increase in salinity in the Sacramento-San Joaquin Delta for the first day of each month and on October 24, the day of maximum predicted X2 for the Year 50 with Potential Project Both DWSC Deepening scenario during the Year 50 with Potential Project simulation period. These figures allow for closer inspection of salinity increases within the Delta on each of the days on which salinity profiles and maps are shown in Figures 6.4-1 through 6.4-13.

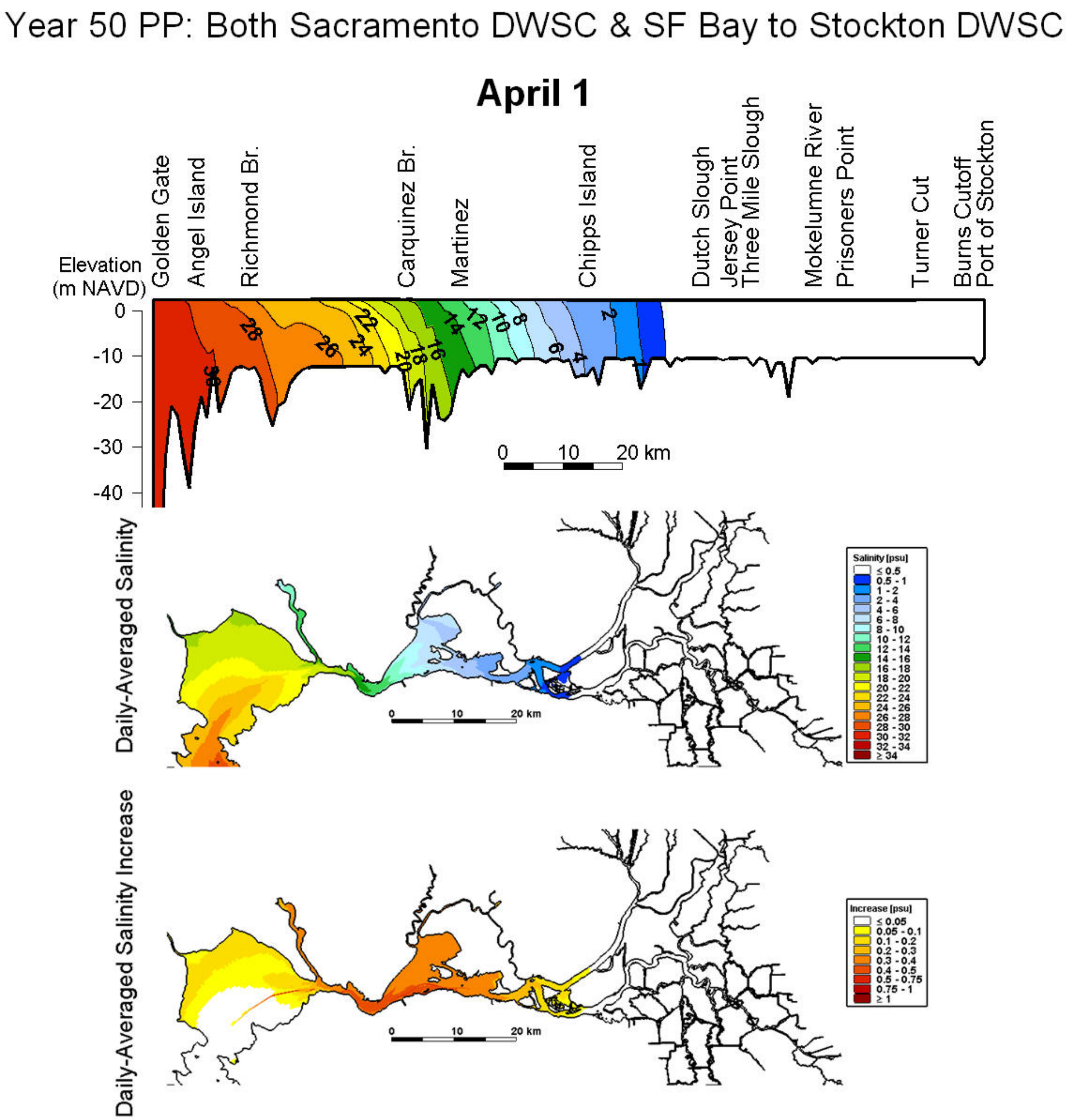


Figure 6.4-1 Predicted daily-averaged salinity profile along the axis of San Francisco Bay from the Golden Gate to the Port of Stockton on April 1 for the Year 50 with Potential Project Both DWSC Deepening scenario (top); predicted depth-averaged daily-averaged salinity on April 1 for the Year 50 with Potential Project Both DWSC Deepening scenario (middle); predicted increase in depth-averaged daily-averaged salinity on April 1 relative to the Year 50 with Potential Project Baseline scenario for the Year 50 with Potential Project Both DWSC Deepening scenario.

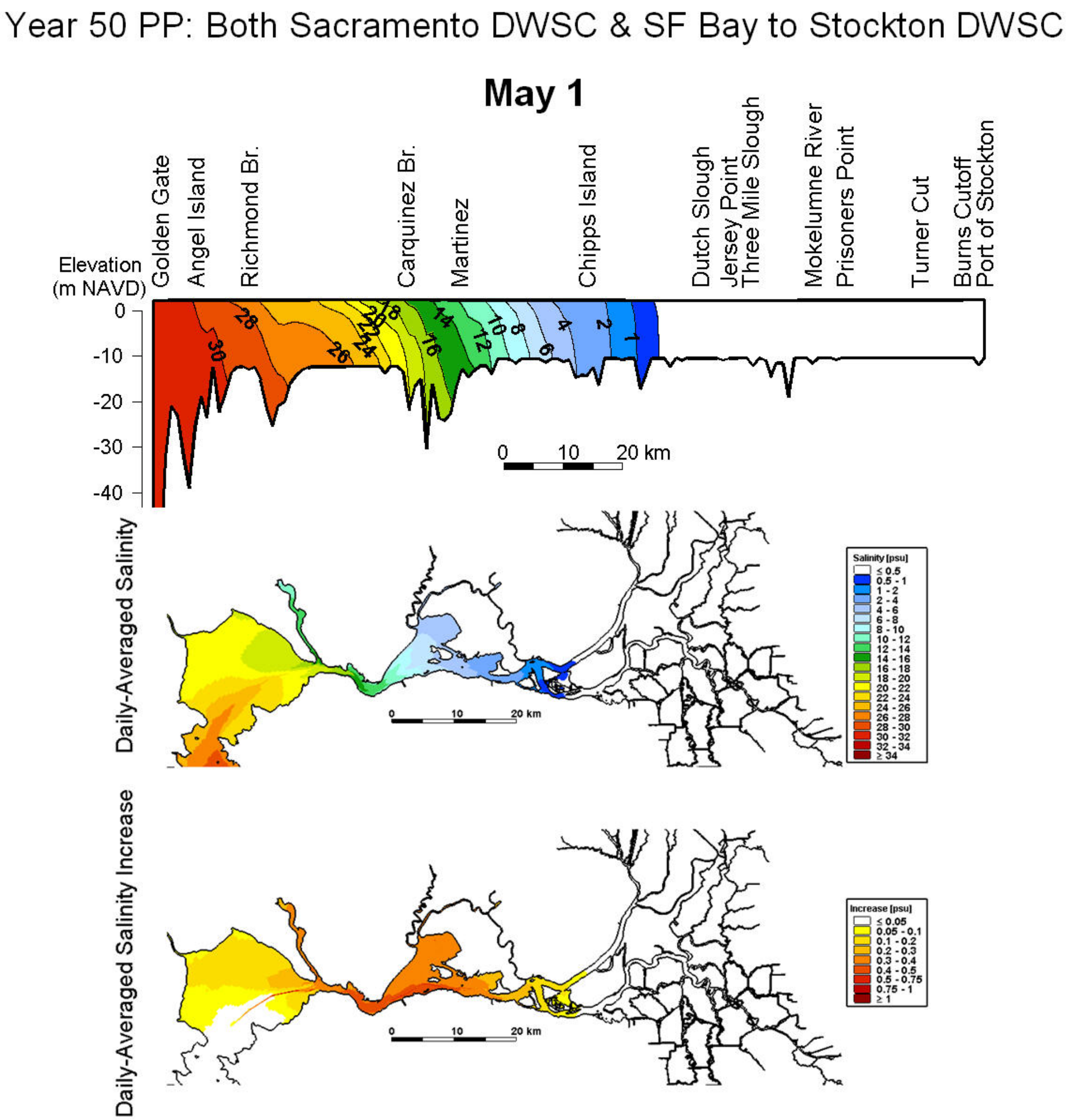


Figure 6.4-2 Predicted daily-averaged salinity profile along the axis of San Francisco Bay from the Golden Gate to the Port of Stockton on May 1 for the Year 50 with Potential Project Both DWSC Deepening scenario (top); predicted depth-averaged daily-averaged salinity on May 1 for the Year 50 with Potential Project Both DWSC Deepening scenario (middle); predicted increase in depth-averaged daily-averaged salinity on May 1 relative to the Year 50 with Potential Project Baseline scenario for the Year 50 with Potential Project Both DWSC Deepening scenario.

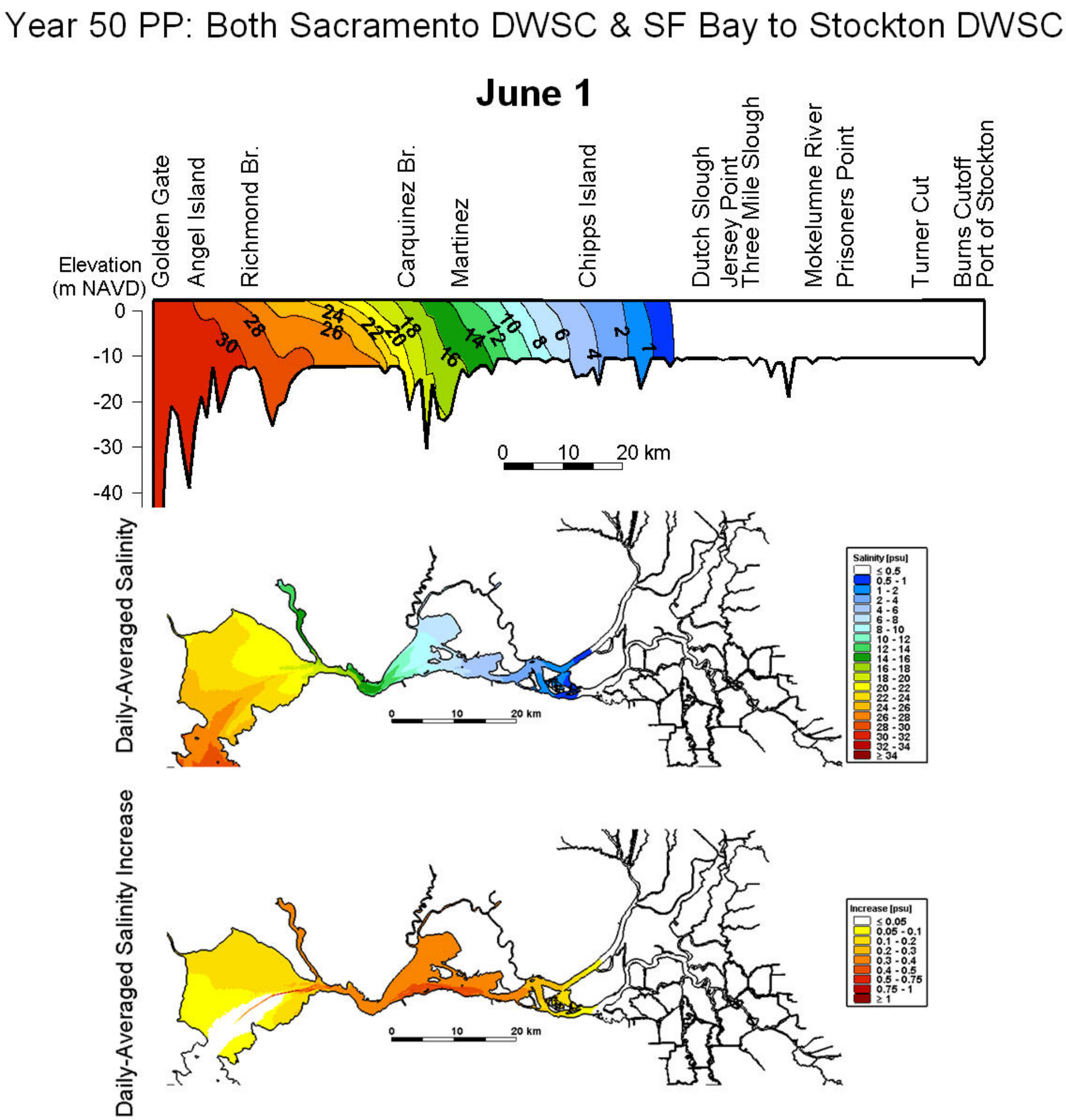


Figure 6.4-3 Predicted daily-averaged salinity profile along the axis of San Francisco Bay from the Golden Gate to the Port of Stockton on June 1 for the Year 50 with Potential Project Both DWSC Deepening scenario (top); predicted depth-averaged daily-averaged salinity on June 1 for the Year 50 with Potential Project Both DWSC Deepening scenario (middle); predicted increase in depth-averaged daily-averaged salinity on June 1 relative to the Year 50 with Potential Project Baseline scenario for the Year 50 with Potential Project Both DWSC Deepening scenario.

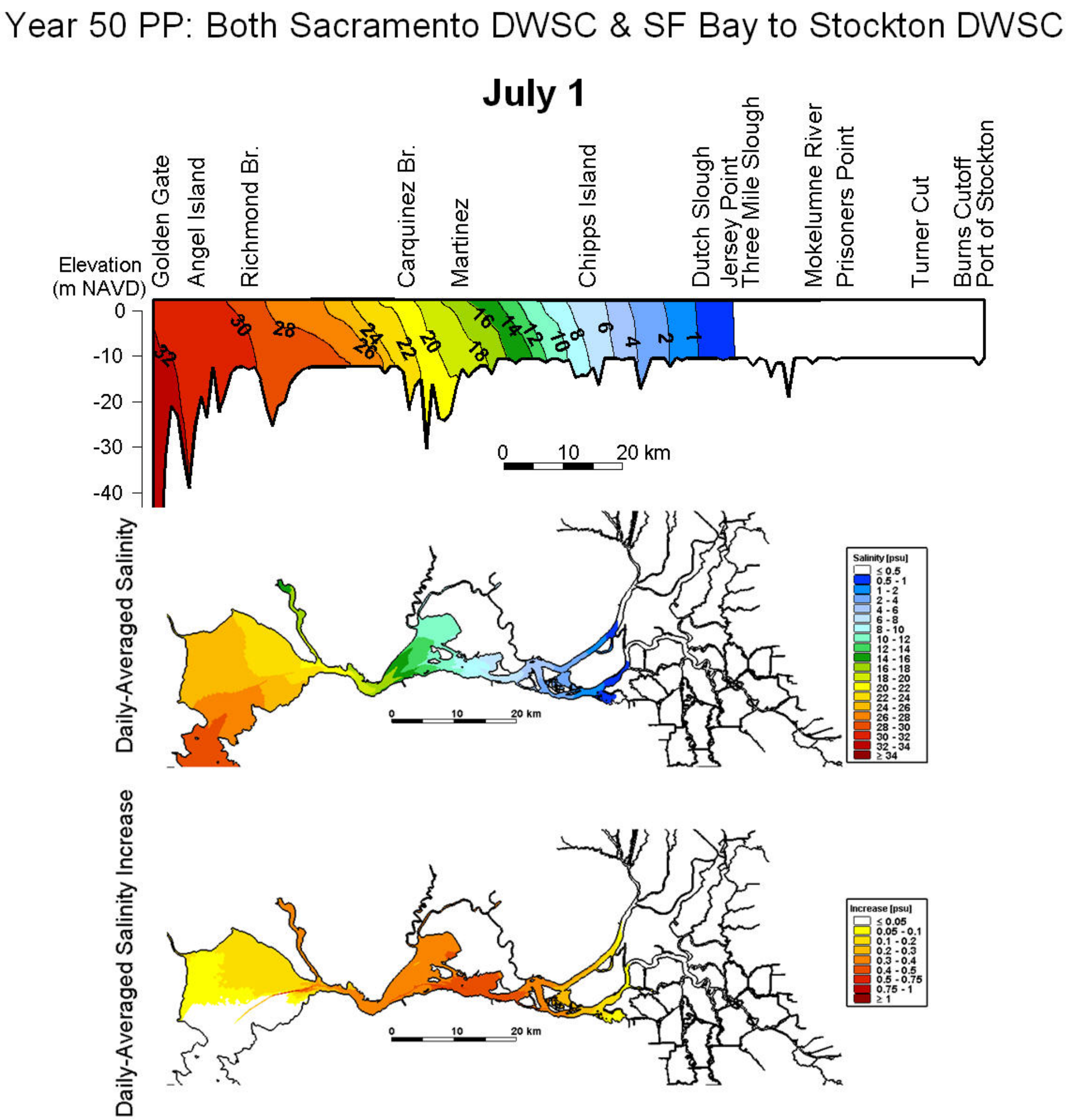


Figure 6.4-4 Predicted daily-averaged salinity profile along the axis of San Francisco Bay from the Golden Gate to the Port of Stockton on July 1 for the Year 50 with Potential Project Both DWSC Deepening scenario (top); predicted depth-averaged daily-averaged salinity on July 1 for the Year 50 with Potential Project Both DWSC Deepening scenario (middle); predicted increase in depth-averaged daily-averaged salinity on July 1 relative to the Year 50 with Potential Project Baseline scenario for the Year 50 with Potential Project Both DWSC Deepening scenario.

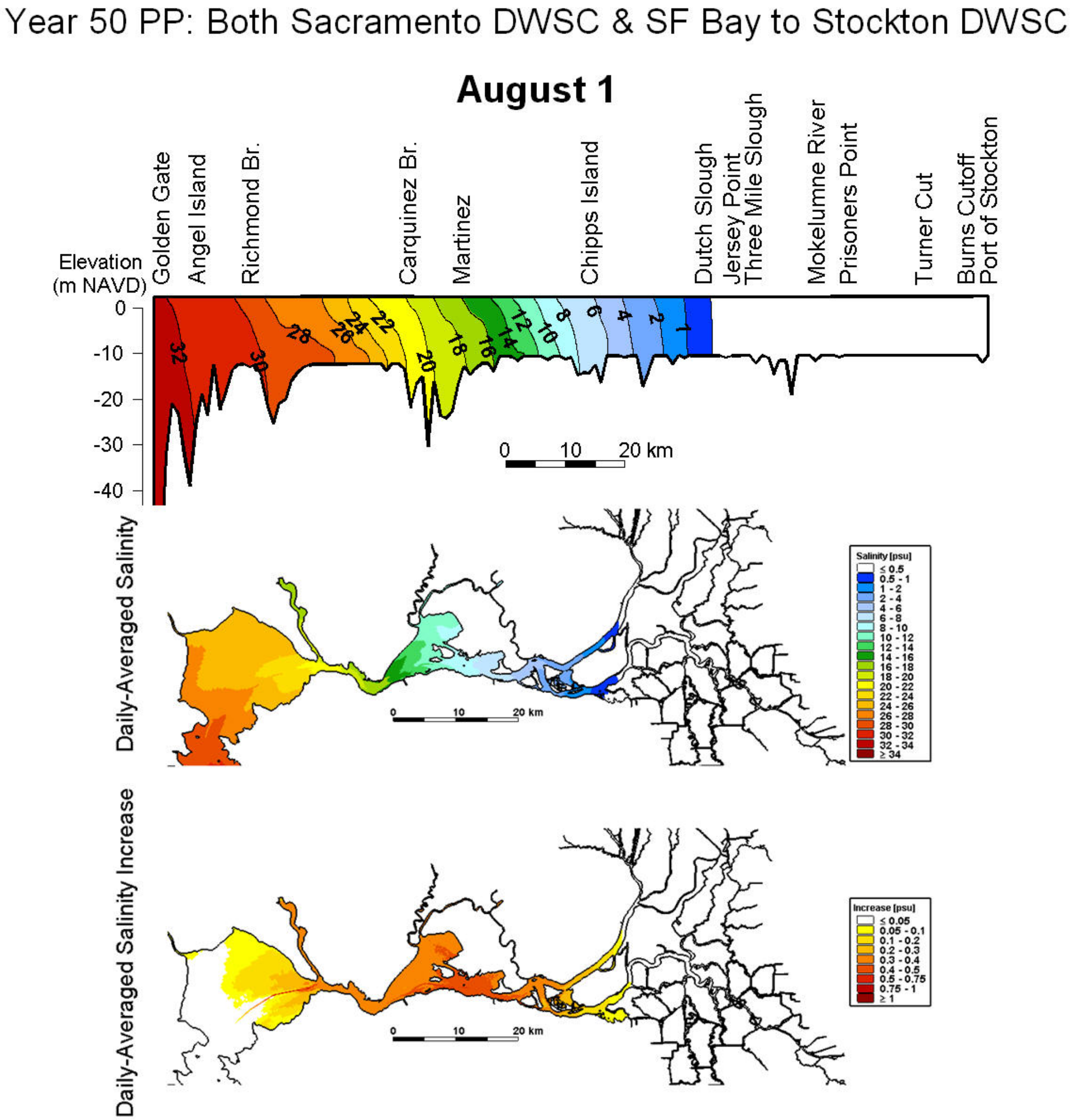


Figure 6.4-5 Predicted daily-averaged salinity profile along the axis of San Francisco Bay from the Golden Gate to the Port of Stockton on August 1 for the Year 50 with Potential Project Both DWSC Deepening scenario (top); predicted depth-averaged daily-averaged salinity on August 1 for the Year 50 with Potential Project Both DWSC Deepening scenario (middle); predicted increase in depth-averaged daily-averaged salinity on August 1 relative to the Year 50 with Potential Project Baseline scenario for the Year 50 with Potential Project Both DWSC Deepening scenario.

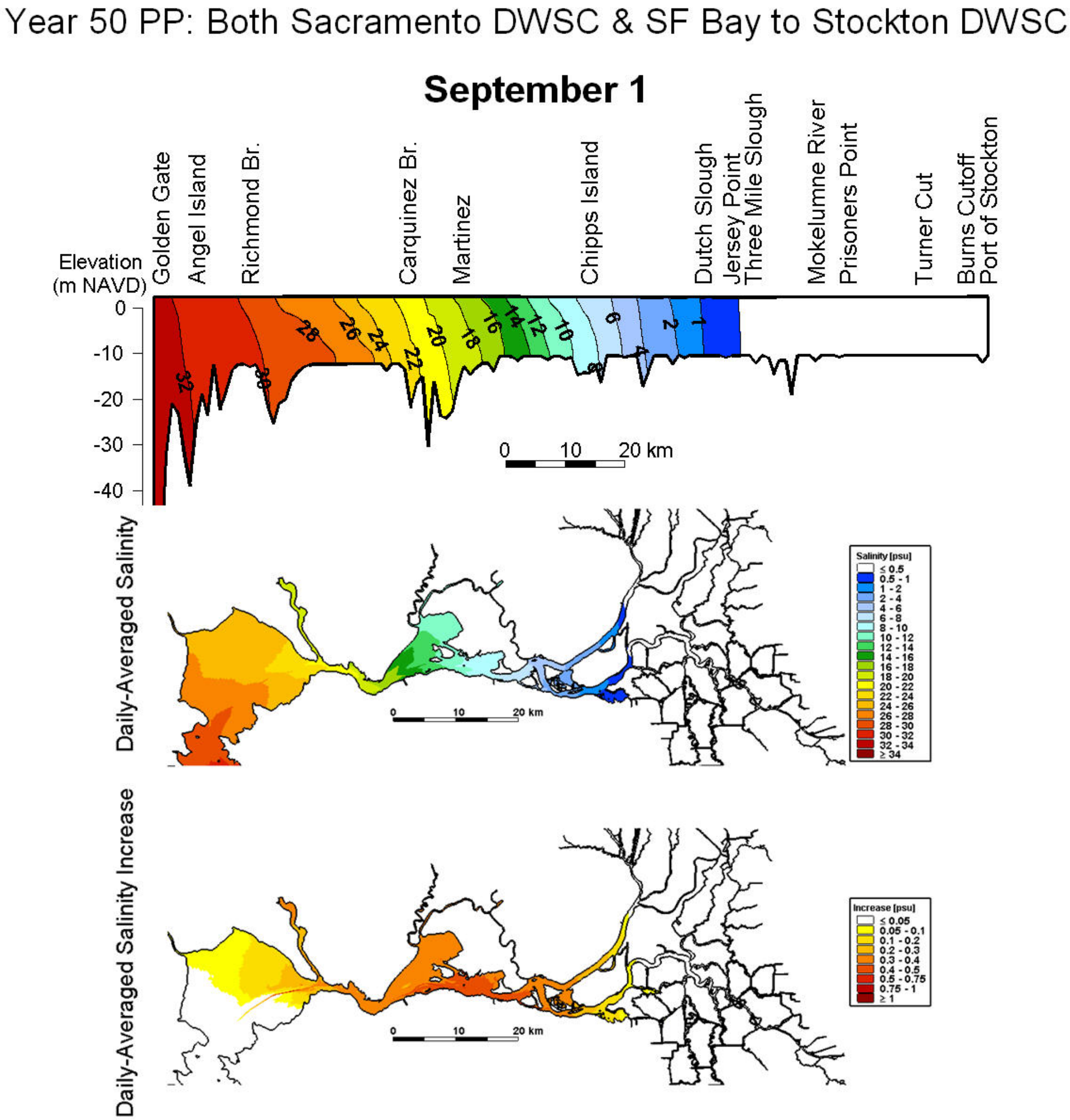


Figure 6.4-6 Predicted daily-averaged salinity profile along the axis of San Francisco Bay from the Golden Gate to the Port of Stockton on September 1 for the Year 50 with Potential Project Both DWSC Deepening scenario (top); predicted depth-averaged daily-averaged salinity on September 1 for the Year 50 with Potential Project Both DWSC Deepening scenario (middle); predicted increase in depth-averaged daily-averaged salinity on September 1 relative to the Year 50 with Potential Project Baseline scenario for the Year 50 with Potential Project Both DWSC Deepening scenario.

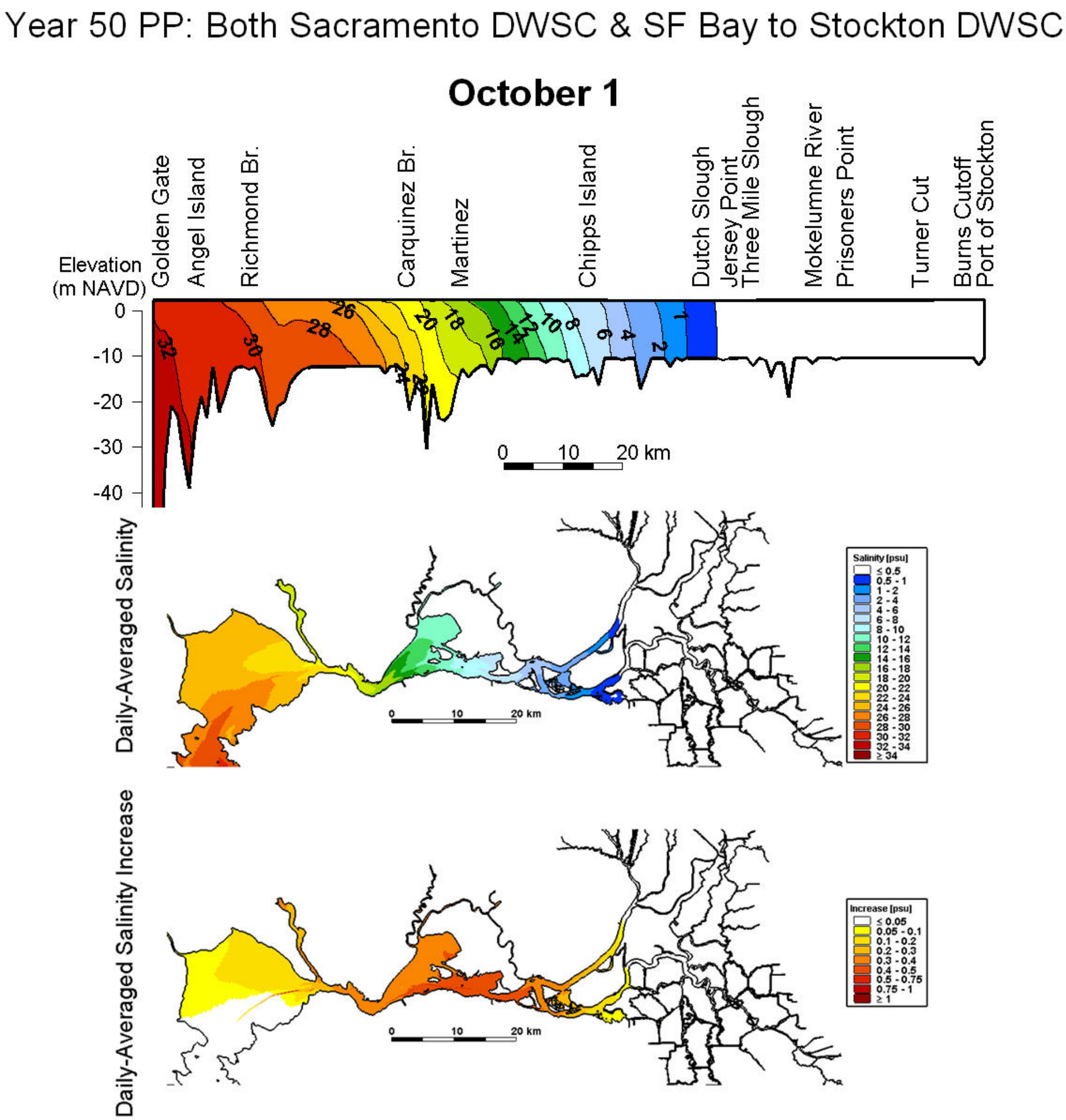


Figure 6.4-7 Predicted daily-averaged salinity profile along the axis of San Francisco Bay from the Golden Gate to the Port of Stockton on October 1 for the Year 50 with Potential Project Both DWSC Deepening scenario (top); predicted depth-averaged daily-averaged salinity on October 1 for the Year 50 with Potential Project Both DWSC Deepening scenario (middle); predicted increase in depth-averaged daily-averaged salinity on October 1 relative to the Year 50 with Potential Project Baseline scenario for the Year 50 with Potential Project Both DWSC Deepening scenario.

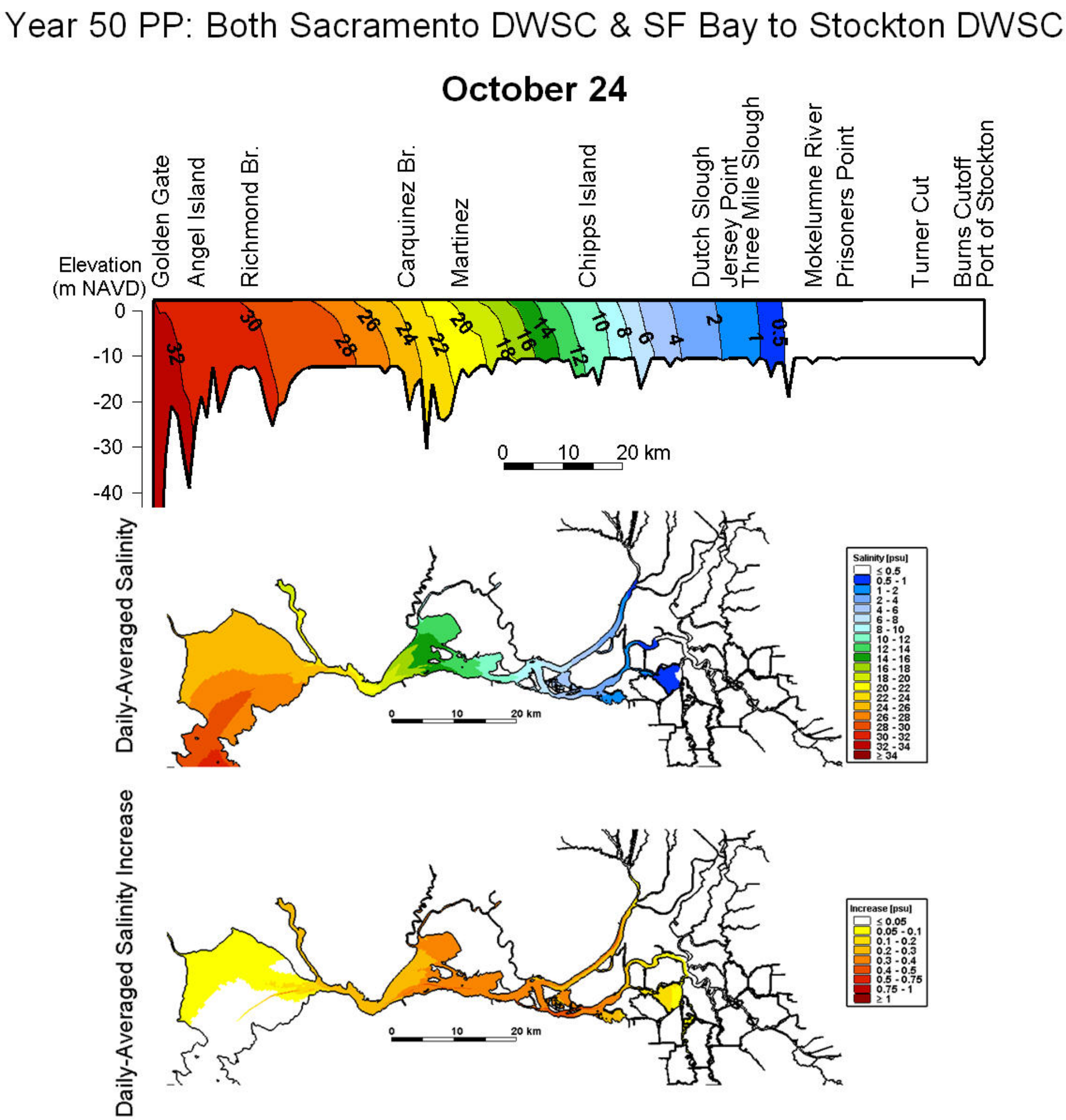


Figure 6.4-8 Predicted daily-averaged salinity profile along the axis of San Francisco Bay from the Golden Gate to the Port of Stockton on October 24, the day of maximum predicted X2, for the Year 50 with Potential Project Both DWSC Deepening scenario (top); predicted depth-averaged daily-averaged salinity on October 24 for the Year 50 with Potential Project Both DWSC Deepening scenario (middle); predicted increase in depth-averaged daily-averaged salinity on October 24 relative to the Year 50 with Potential Project Baseline scenario for the Year 50 with Potential Project Both DWSC Deepening scenario.

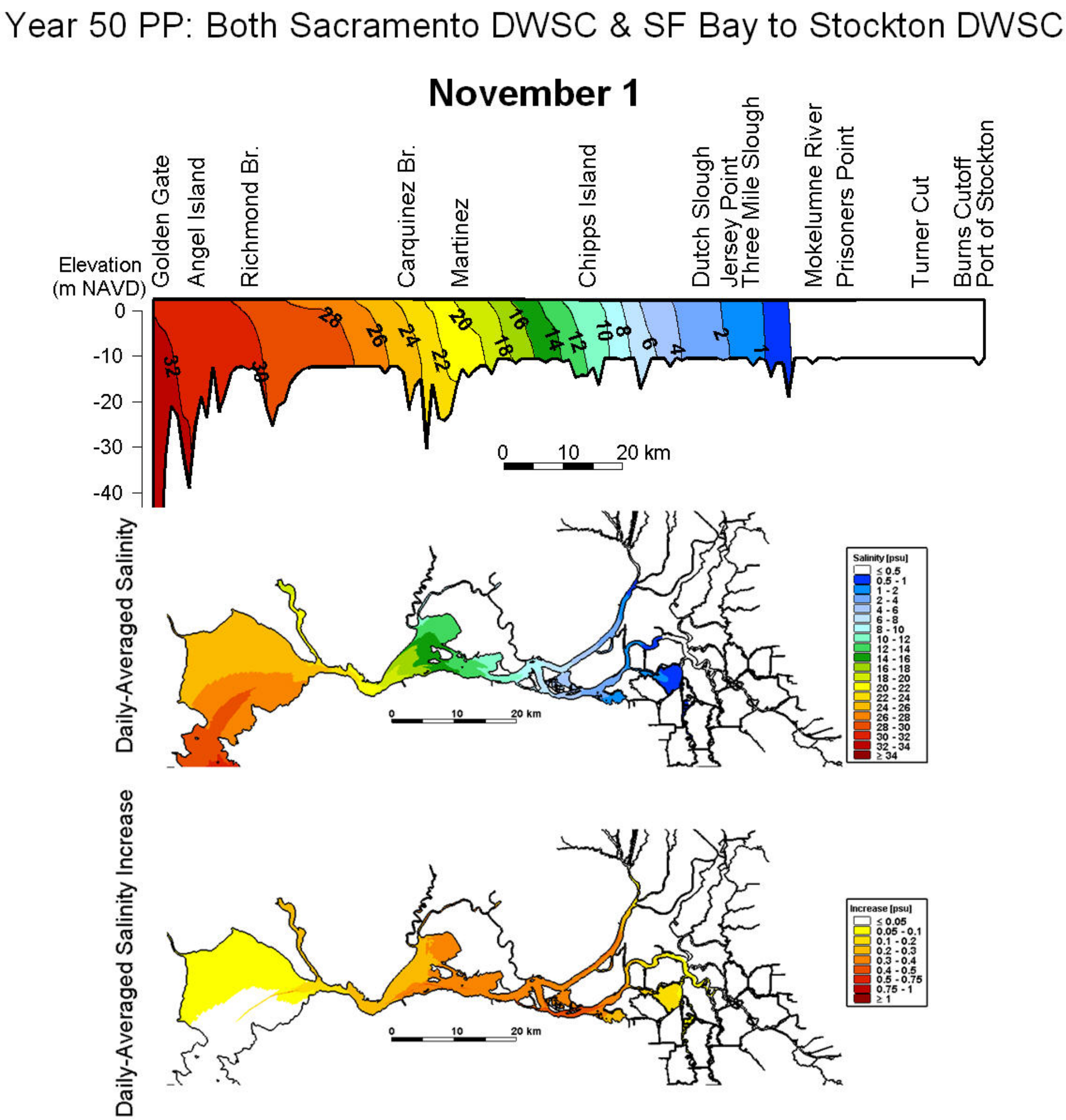


Figure 6.4-9 Predicted daily-averaged salinity profile along the axis of San Francisco Bay from the Golden Gate to the Port of Stockton on November 1 for the Year 50 with Potential Project Both DWSC Deepening scenario (top); predicted depth-averaged daily-averaged salinity on November 1 for the Year 50 with Potential Project Both DWSC Deepening scenario (middle); predicted increase in depth-averaged daily-averaged salinity on November 1 relative to the Year 50 with Potential Project Baseline scenario for the Year 50 with Potential Project Both DWSC Deepening scenario.

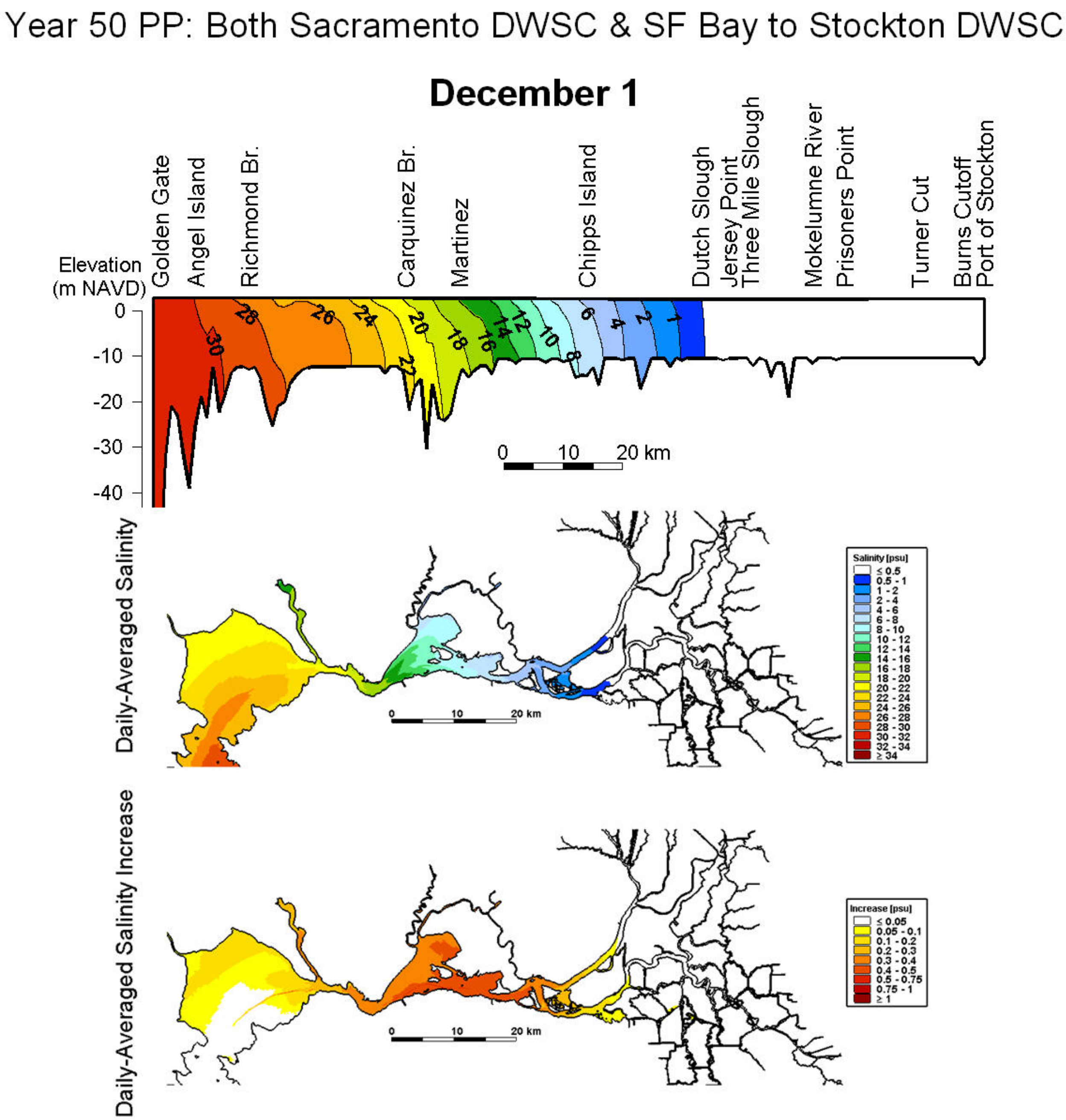


Figure 6.4-10 Predicted daily-averaged salinity profile along the axis of San Francisco Bay from the Golden Gate to the Port of Stockton on December 1 for the Year 50 with Potential Project Both DWSC Deepening scenario (top); predicted depth-averaged daily-averaged salinity on December 1 for the Year 50 with Potential Project Both DWSC Deepening scenario (middle); predicted increase in depth-averaged daily-averaged salinity on December 1 relative to the Year 50 with Potential Project Baseline scenario for the Year 50 with Potential Project Both DWSC Deepening scenario.

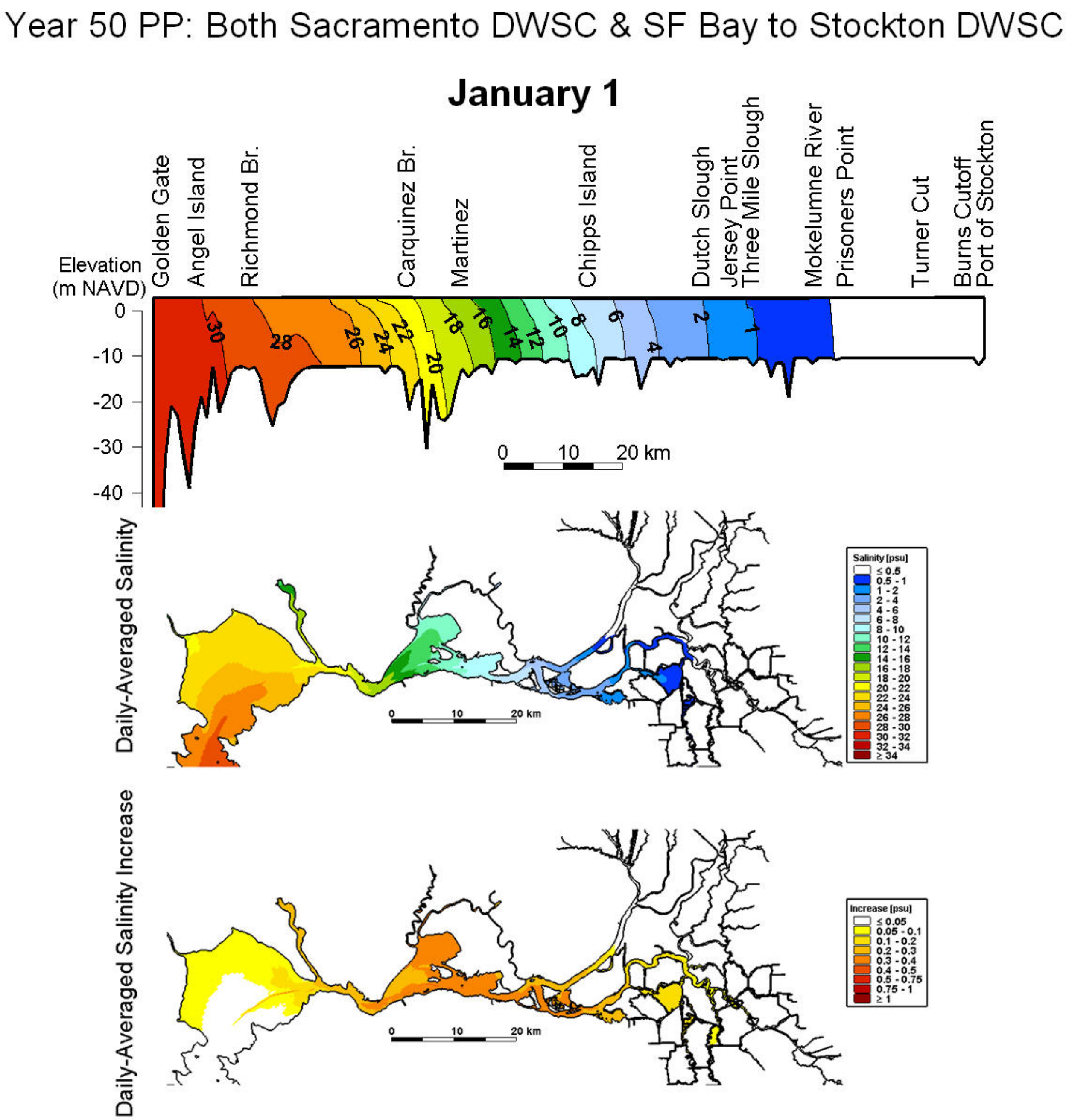


Figure 6.4-11 Predicted daily-averaged salinity profile along the axis of San Francisco Bay from the Golden Gate to the Port of Stockton on January 1 for the Year 50 with Potential Project Both DWSC Deepening scenario (top); predicted depth-averaged daily-averaged salinity on January 1 for the Year 50 with Potential Project Both DWSC Deepening scenario (middle); predicted increase in depth-averaged daily-averaged salinity on January 1 relative to the Year 50 with Potential Project Baseline scenario for the Year 50 with Potential Project Both DWSC Deepening scenario.

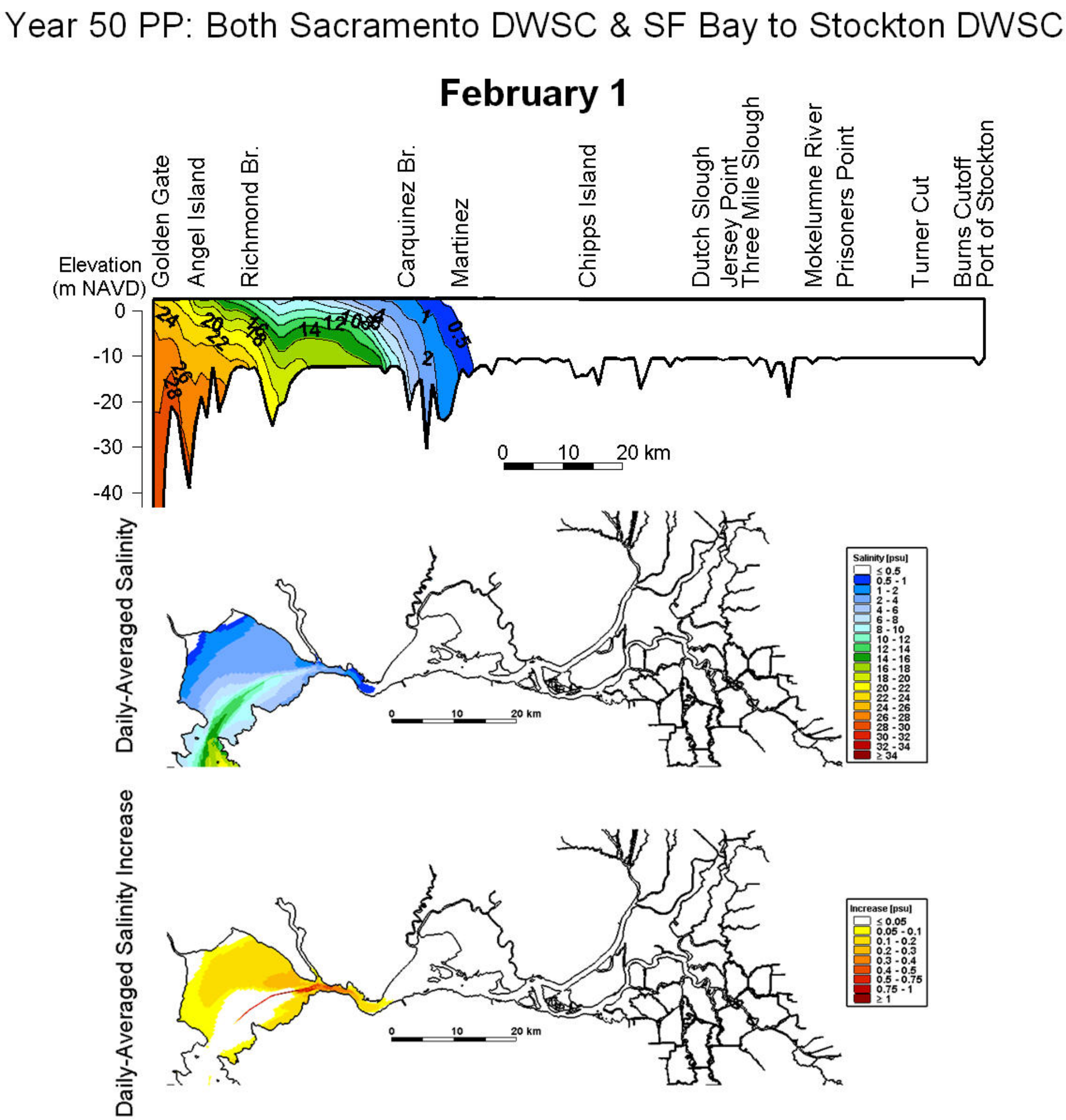


Figure 6.4-12 Predicted daily-averaged salinity profile along the axis of San Francisco Bay from the Golden Gate to the Port of Stockton on February 1 for the Year 50 with Potential Project Both DWSC Deepening scenario (top); predicted depth-averaged daily-averaged salinity on February 1 for the Year 50 with Potential Project Both DWSC Deepening scenario (middle); predicted increase in depth-averaged daily-averaged salinity on February 1 relative to the Year 50 with Potential Project Baseline scenario for the Year 50 with Potential Project Both DWSC Deepening scenario.

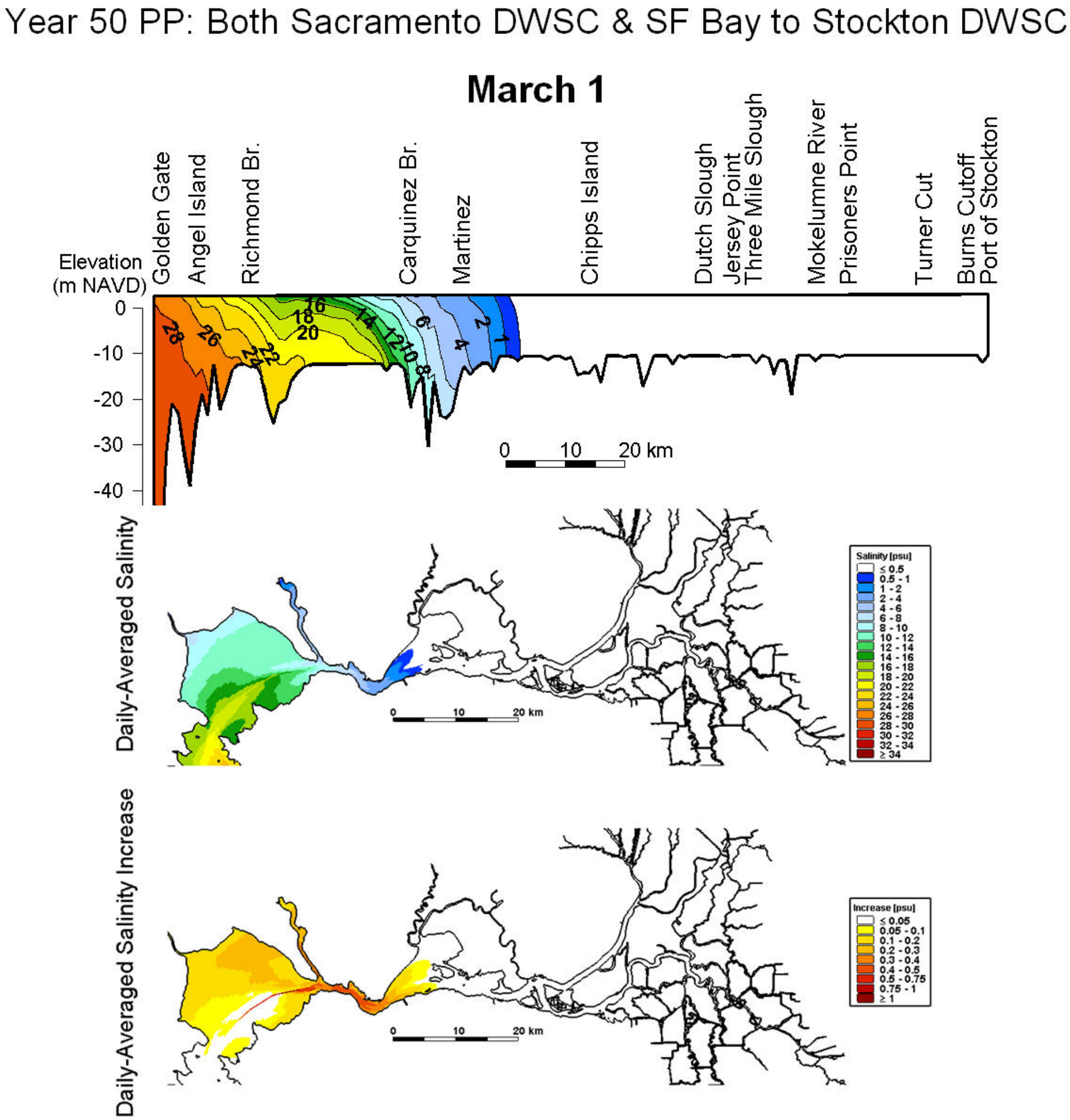


Figure 6.4-13 Predicted daily-averaged salinity profile along the axis of San Francisco Bay from the Golden Gate to the Port of Stockton on March 1 for the Year 50 with Potential Project Both DWSC Deepening scenario (top); predicted depth-averaged daily-averaged salinity on March 1 for the Year 50 with Potential Project Both DWSC Deepening scenario (middle); predicted increase in depth-averaged daily-averaged salinity on March 1 relative to the Year 50 with Potential Project Baseline scenario for the Year 50 with Potential Project Both DWSC Deepening scenario.

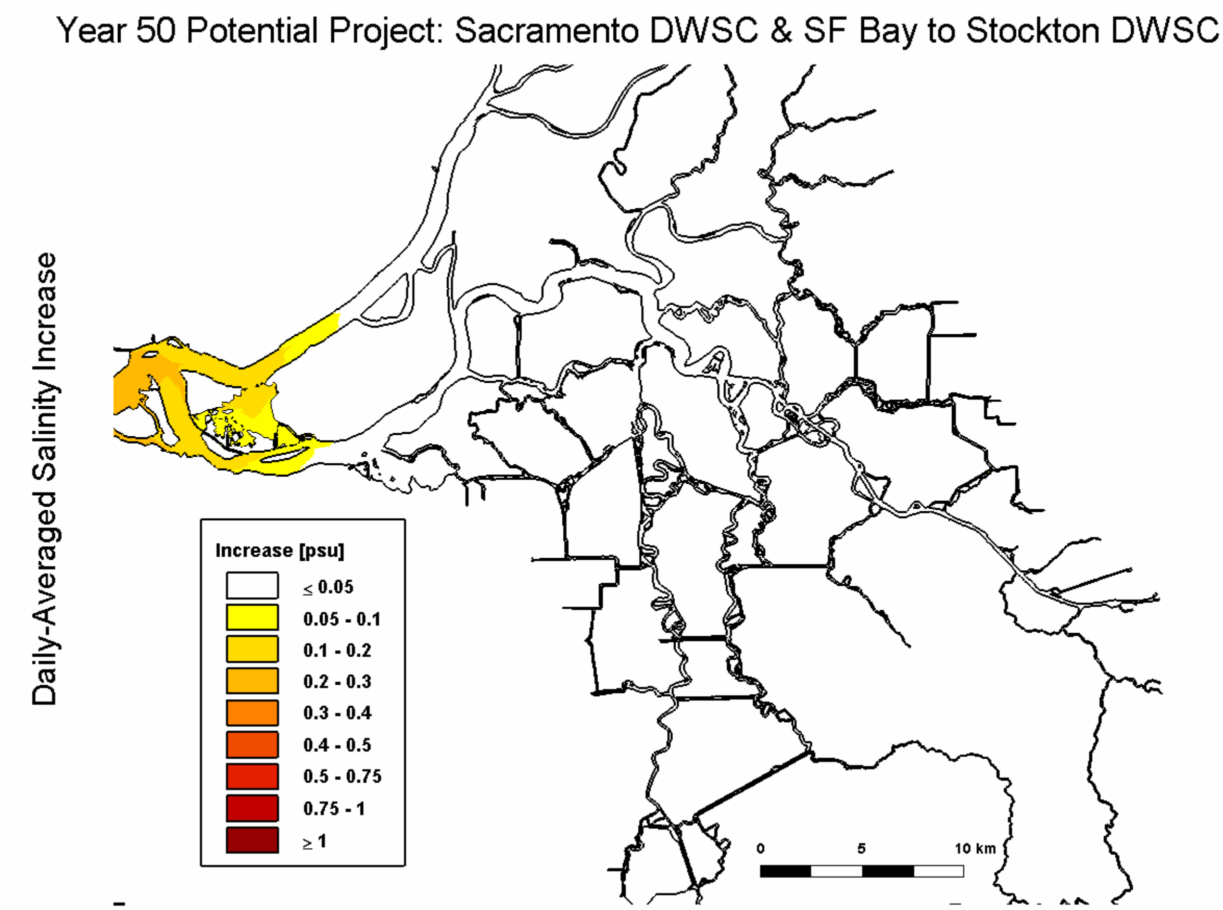


Figure 6.4-14 Predicted depth-averaged daily-averaged salinity increase in the Sacramento-San Joaquin Delta on April 1 for the Year 50 with Potential Project Both DWSC Deepening scenario relative to the Year 50 with Potential Project Baseline scenario.

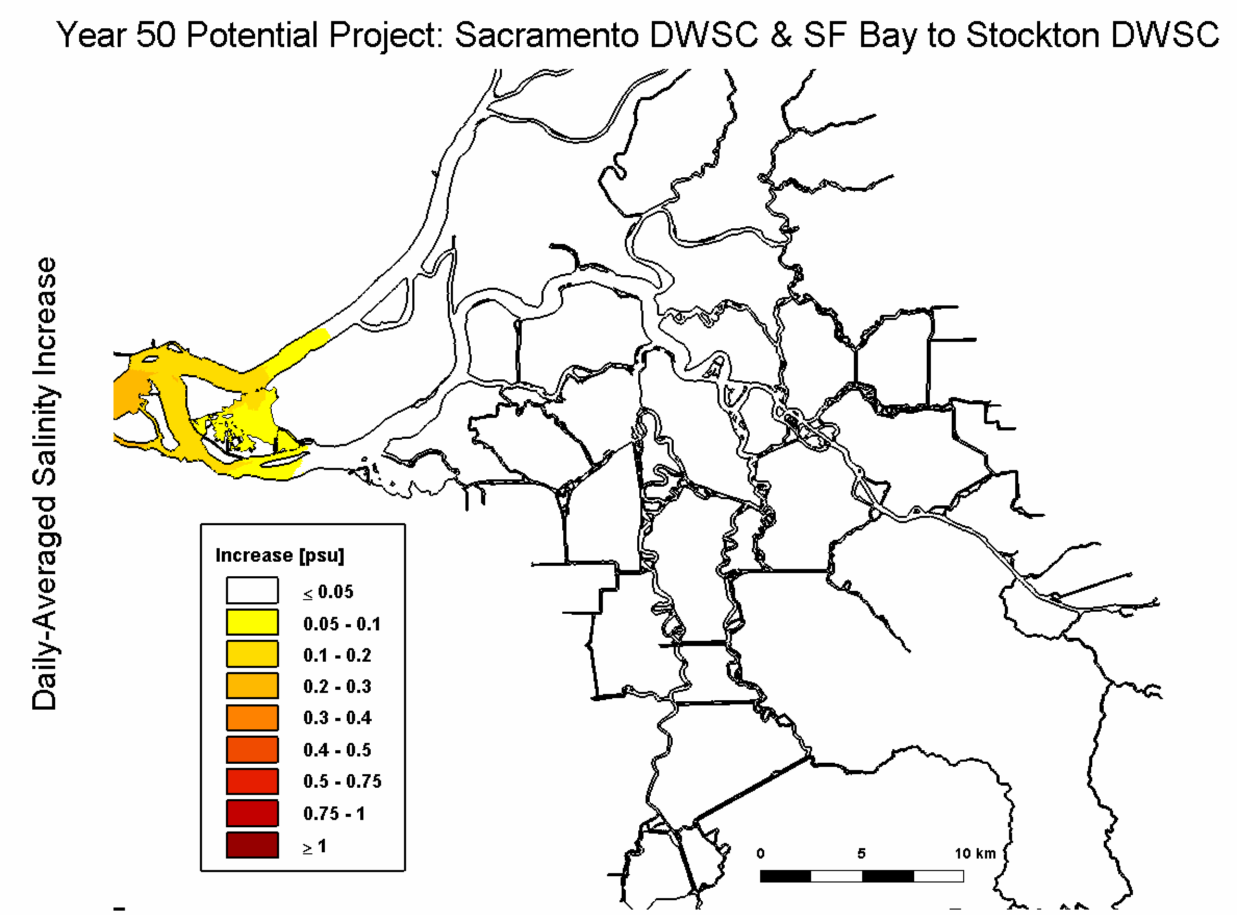


Figure 6.4-15 Predicted depth-averaged daily-averaged salinity increase in the Sacramento-San Joaquin Delta on May 1 for the Year 50 with Potential Project Both DWSC Deepening scenario relative to the Year 50 with Potential Project Baseline scenario.

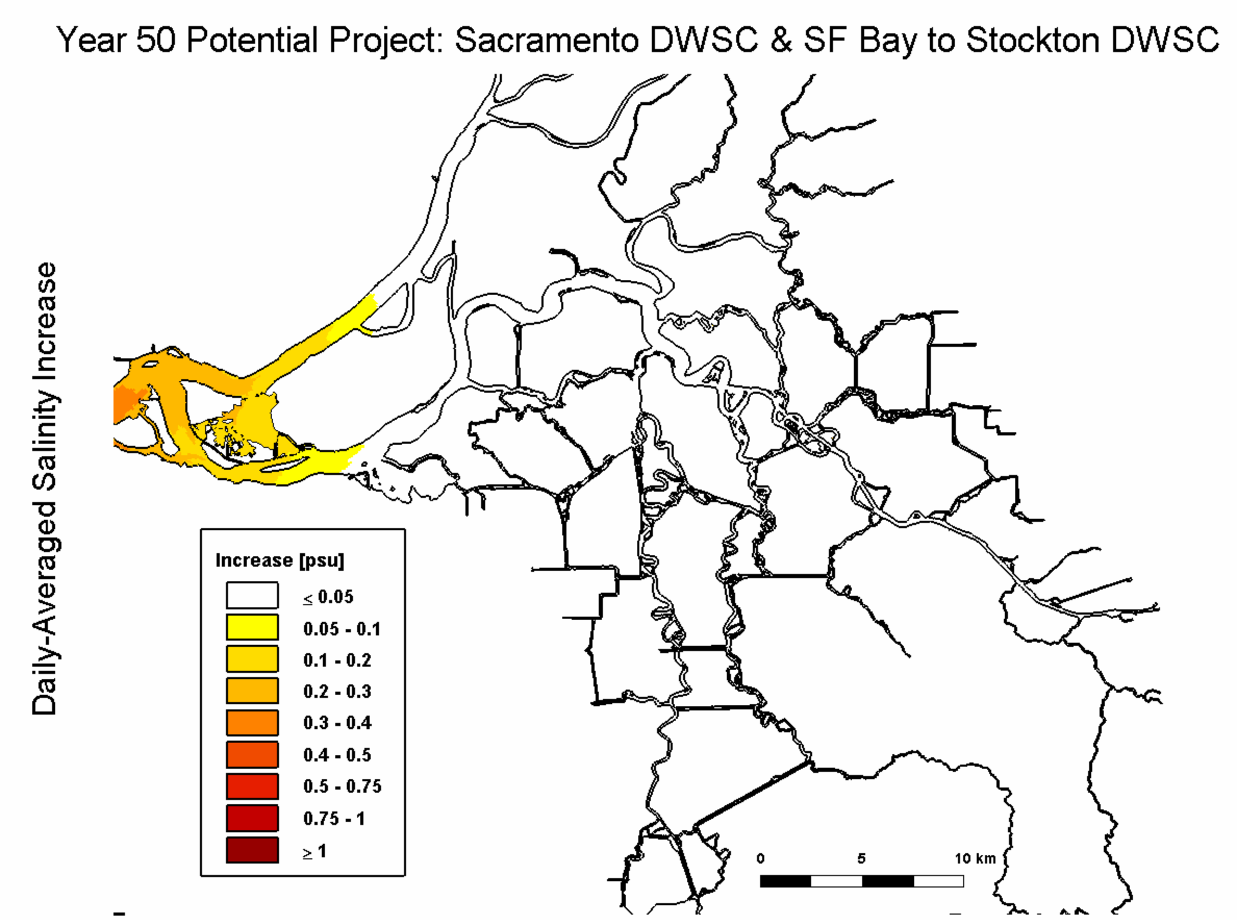


Figure 6.4-16 Predicted depth-averaged daily-averaged salinity increase in the Sacramento-San Joaquin Delta on June 1 for the Year 50 with Potential Project Both DWSC Deepening scenario relative to the Year 50 with Potential Project Baseline scenario.

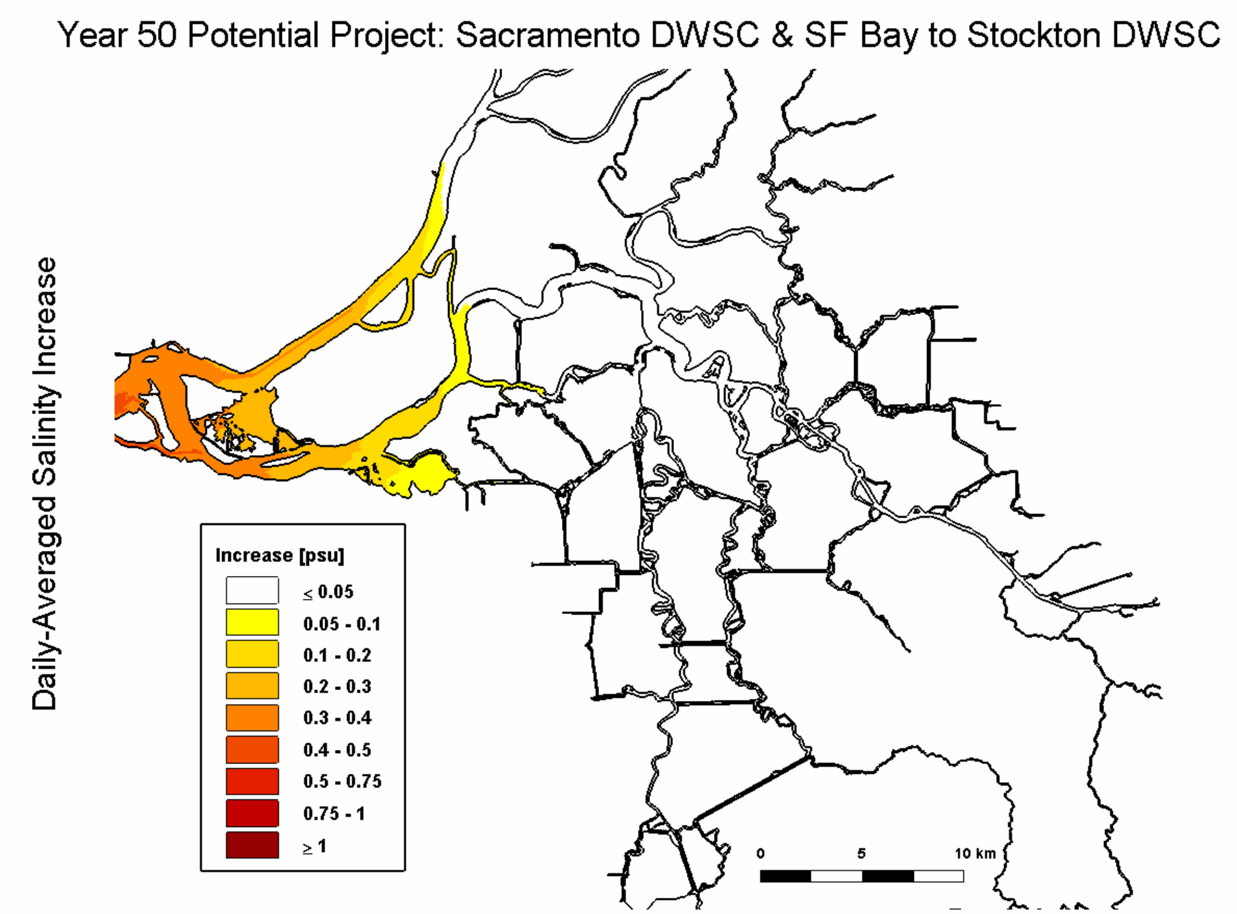


Figure 6.4-17 Predicted depth-averaged daily-averaged salinity increase in the Sacramento-San Joaquin Delta on July 1 for the Year 50 with Potential Project Both DWSC Deepening scenario relative to the Year 50 with Potential Project Baseline scenario.

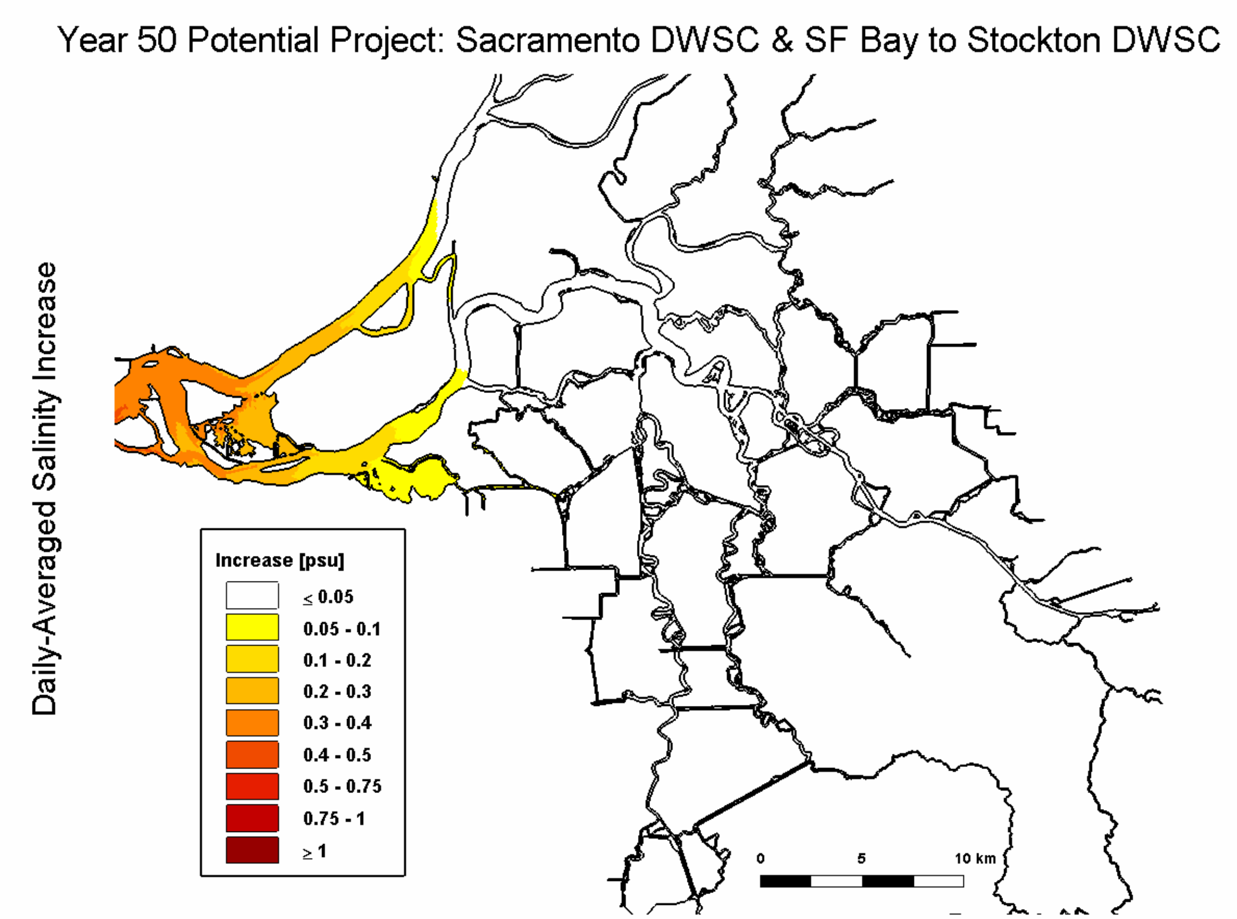


Figure 6.4-18 Predicted depth-averaged daily-averaged salinity increase in the Sacramento-San Joaquin Delta on August 1 for the Year 50 with Potential Project Both DWSC Deepening scenario relative to the Year 50 with Potential Project Baseline scenario.

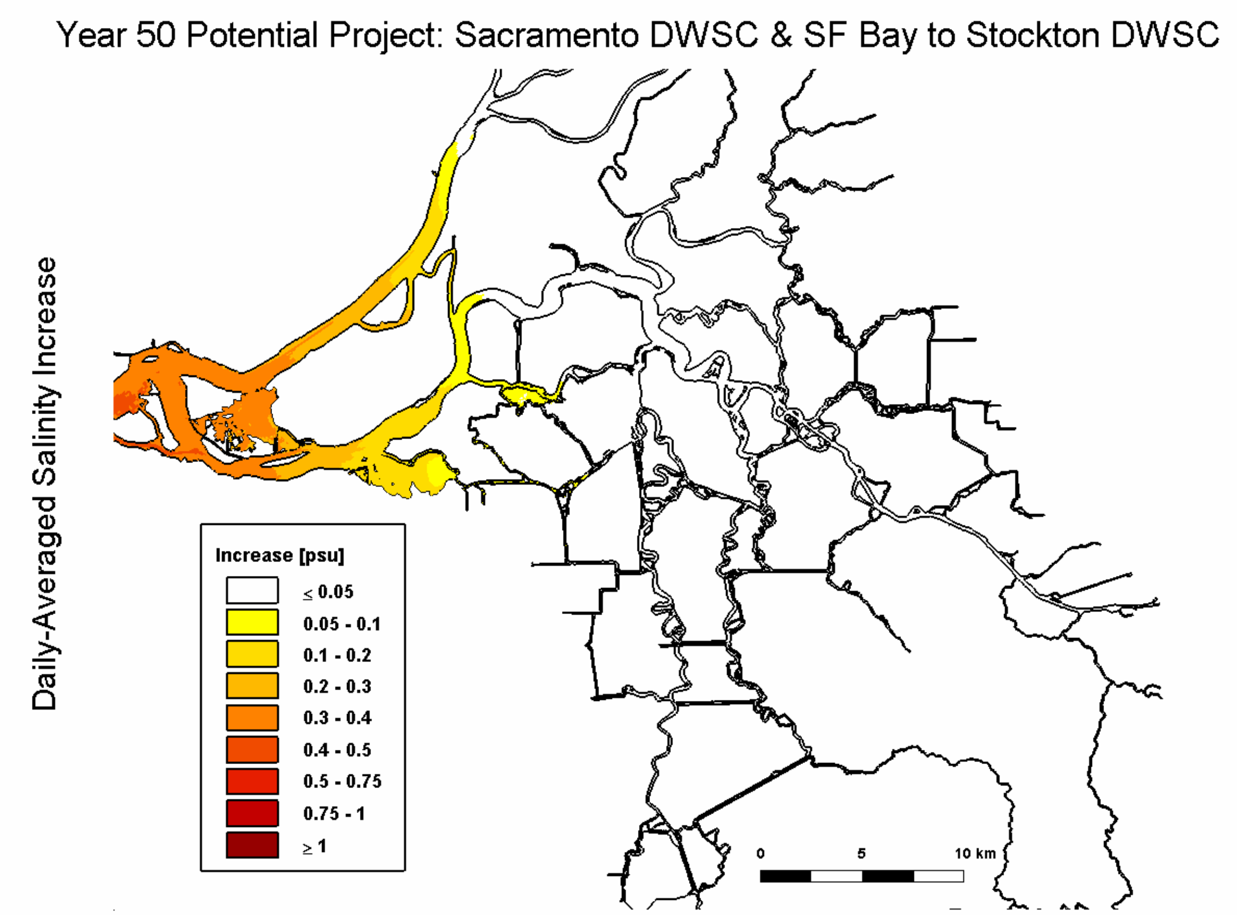


Figure 6.4-19 Predicted depth-averaged daily-averaged salinity increase in the Sacramento-San Joaquin Delta on September 1 for the Year 50 with Potential Project Both DWSC Deepening scenario relative to the Year 50 with Potential Project Baseline scenario.

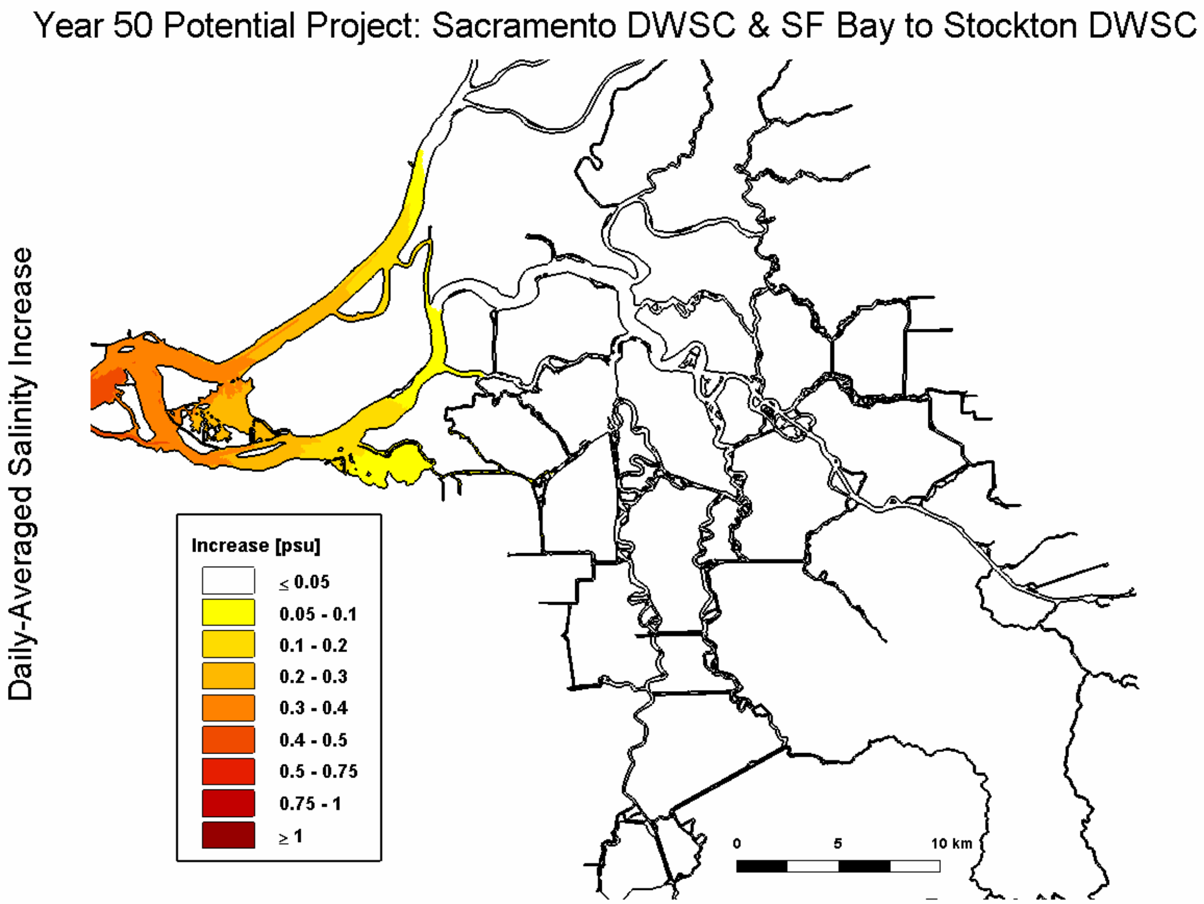


Figure 6.4-20 Predicted depth-averaged daily-averaged salinity increase in the Sacramento-San Joaquin Delta on October 1 for the Year 50 with Potential Project Both DWSC Deepening scenario relative to the Year 50 with Potential Project Baseline scenario.

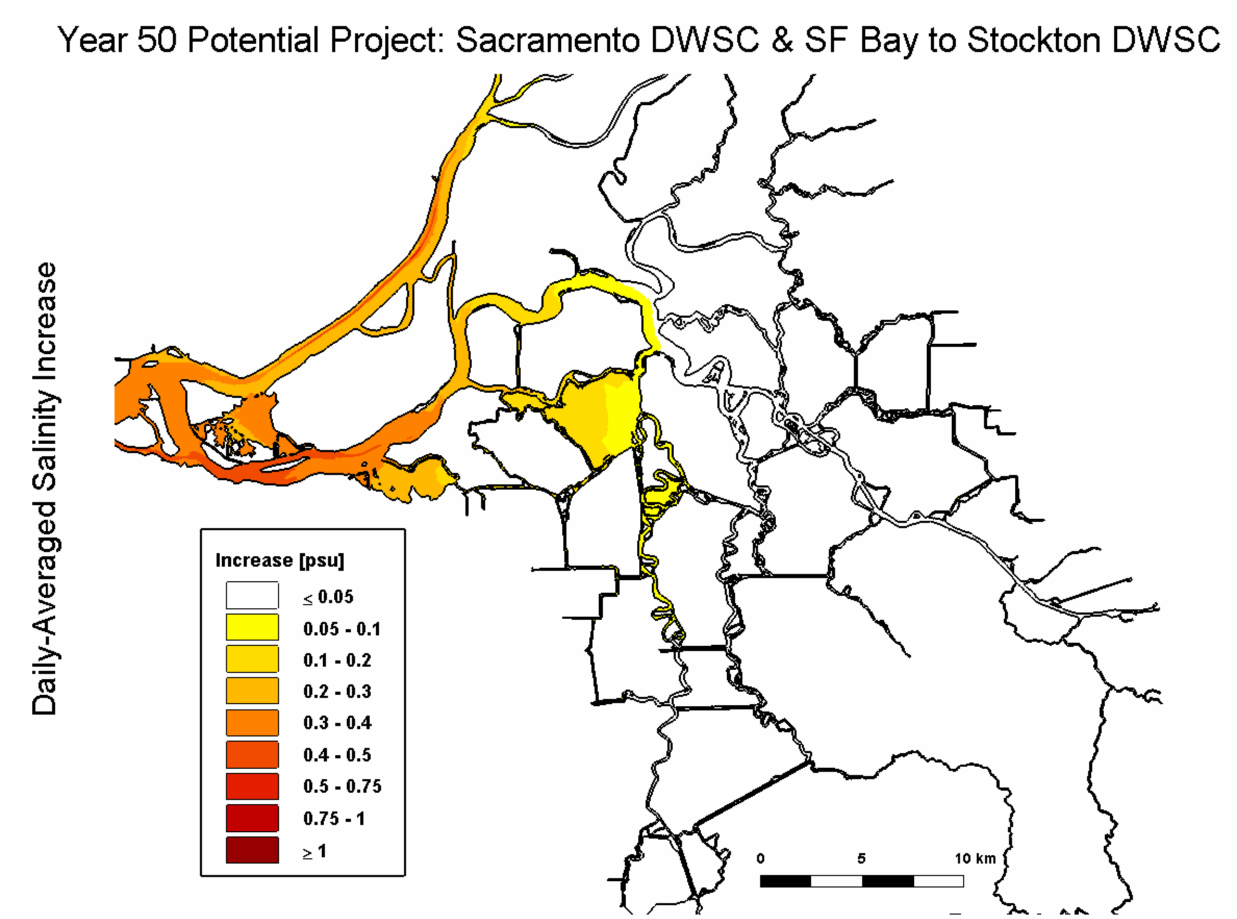


Figure 6.4-21 Predicted depth-averaged daily-averaged salinity increase in the Sacramento-San Joaquin Delta on October 24, the day of maximum predicted X2, for the Year 50 with Potential Project Both DWSC Deepening scenario relative to the Year 50 with Potential Project Baseline scenario.

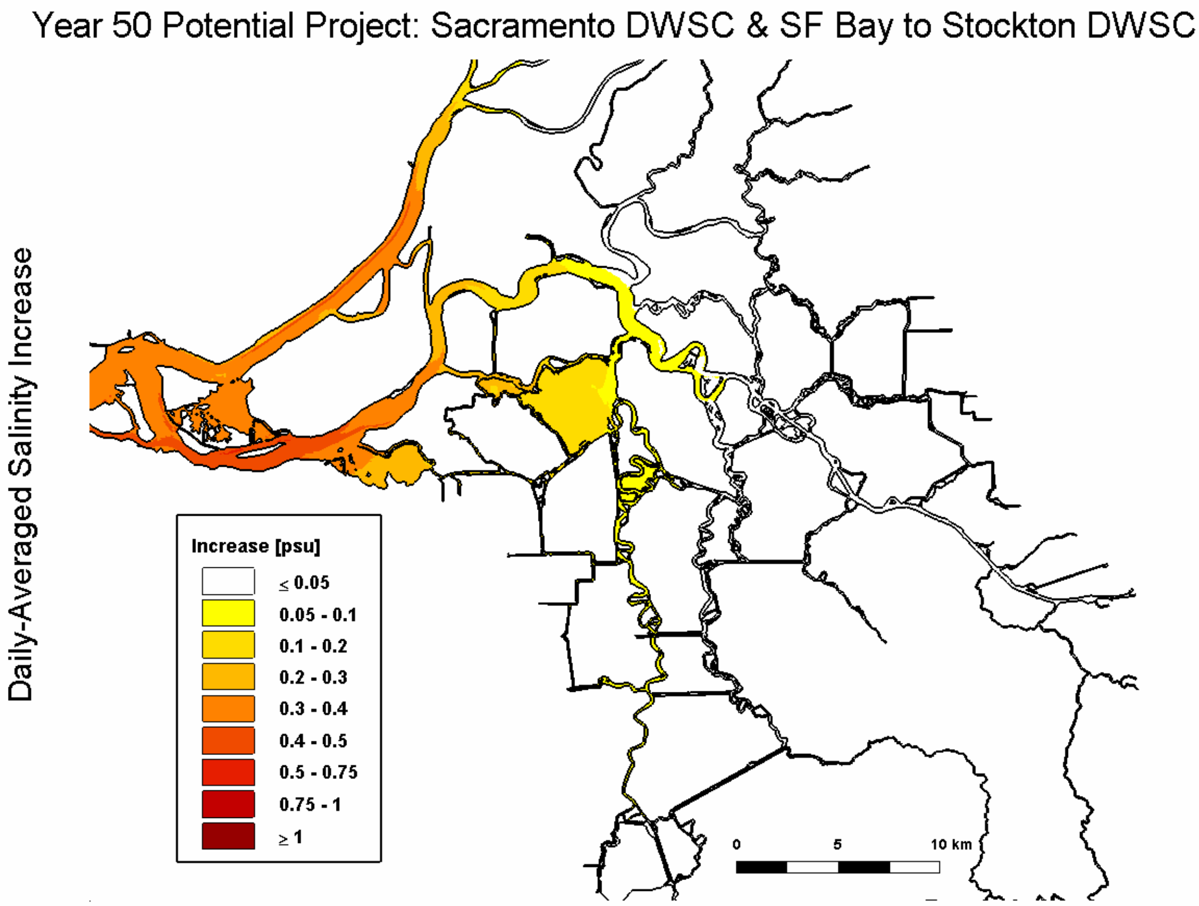


Figure 6.4-22 Predicted depth-averaged daily-averaged salinity increase in the Sacramento-San Joaquin Delta on November 1 for the Year 50 with Potential Project Both DWSC Deepening scenario relative to the Year 50 with Potential Project Baseline scenario.

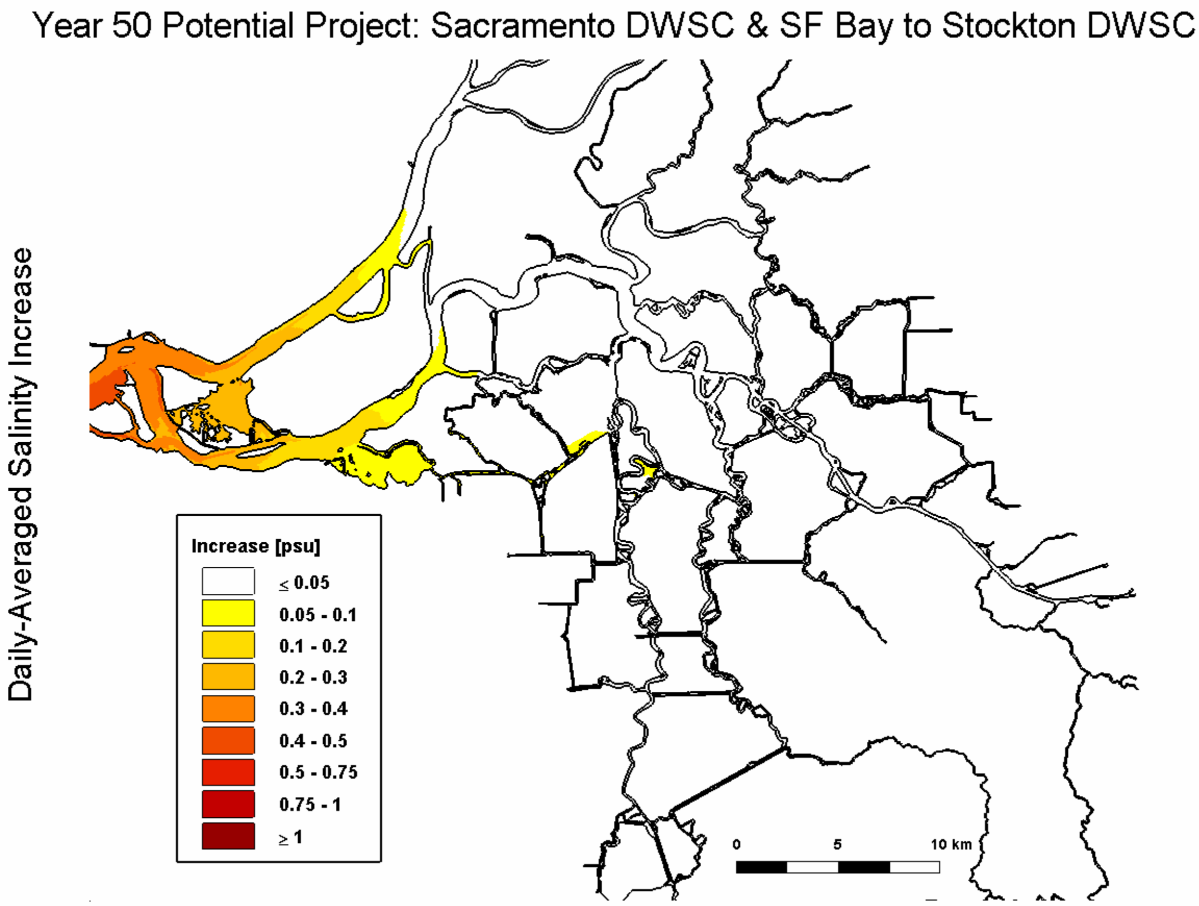


Figure 6.4-23 Predicted depth-averaged daily-averaged salinity increase in the Sacramento-San Joaquin Delta on December 1 for the Year 50 with Potential Project Both DWSC Deepening scenario relative to the Year 50 with Potential Project Baseline scenario.

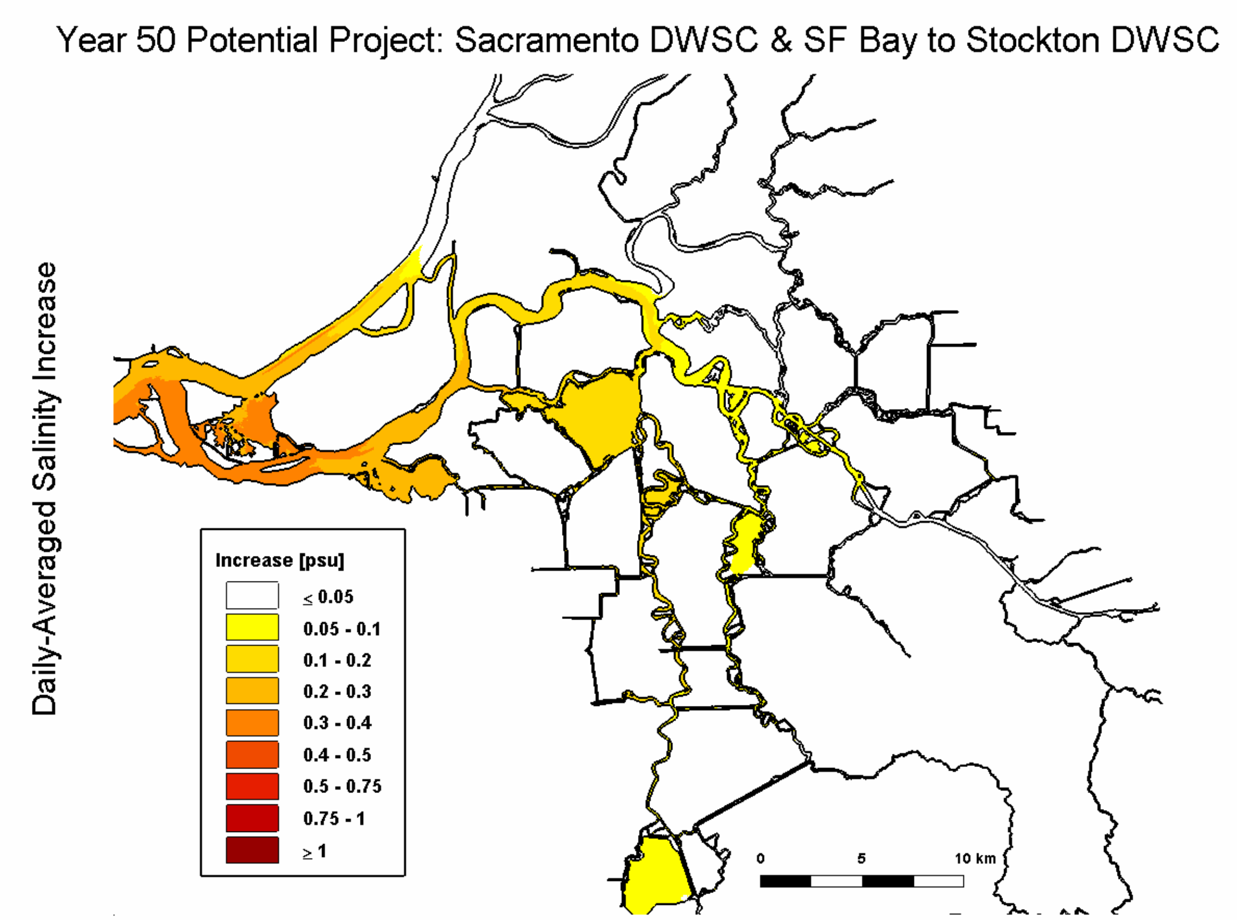


Figure 6.4-24 Predicted depth-averaged daily-averaged salinity increase in the Sacramento-San Joaquin Delta on January 1 for the Year 50 with Potential Project Both DWSC Deepening scenario relative to the Year 50 with Potential Project Baseline scenario.

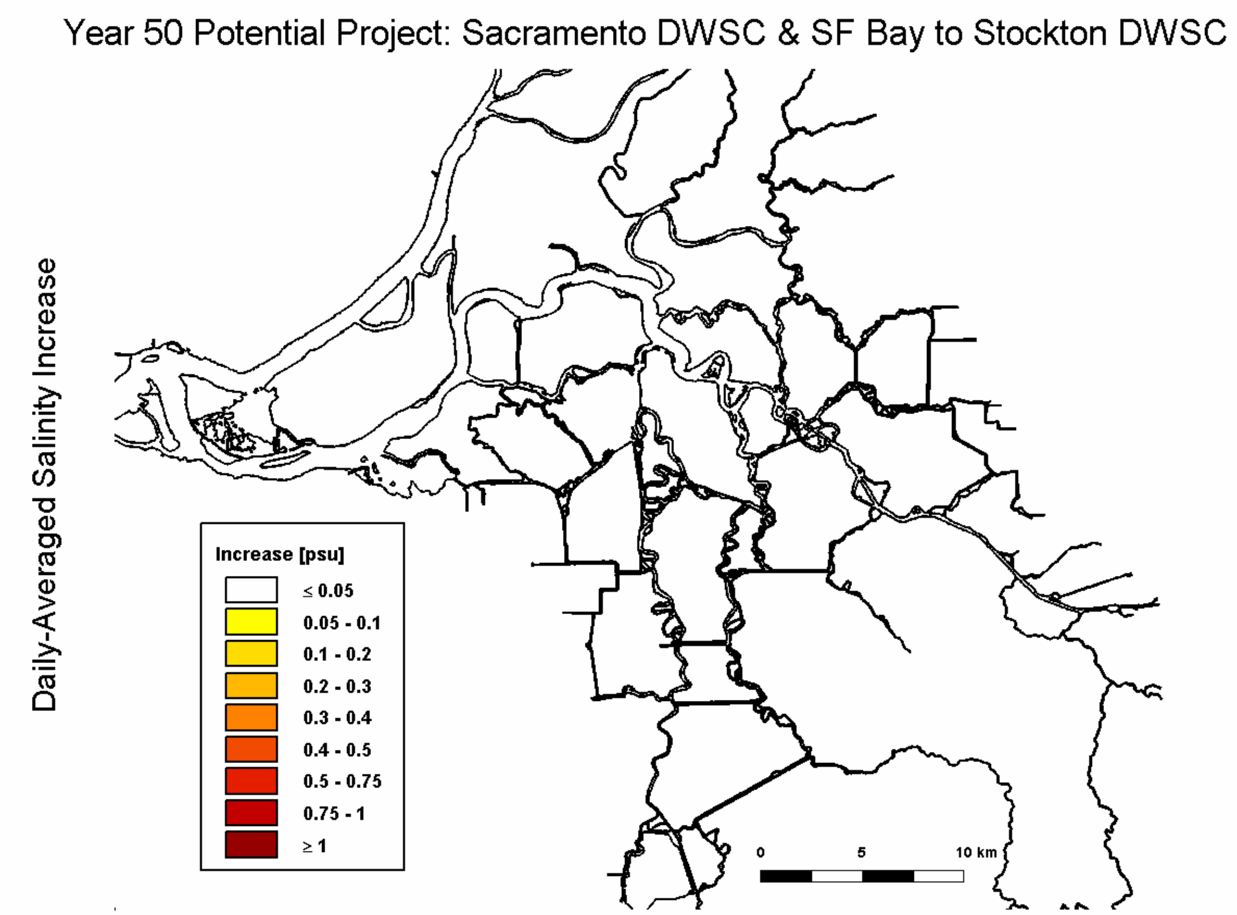


Figure 6.4-25 Predicted depth-averaged daily-averaged salinity increase in the Sacramento-San Joaquin Delta on February 1 for the Year 50 with Potential Project Both DWSC Deepening scenario relative to the Year 50 with Potential Project Baseline scenario.

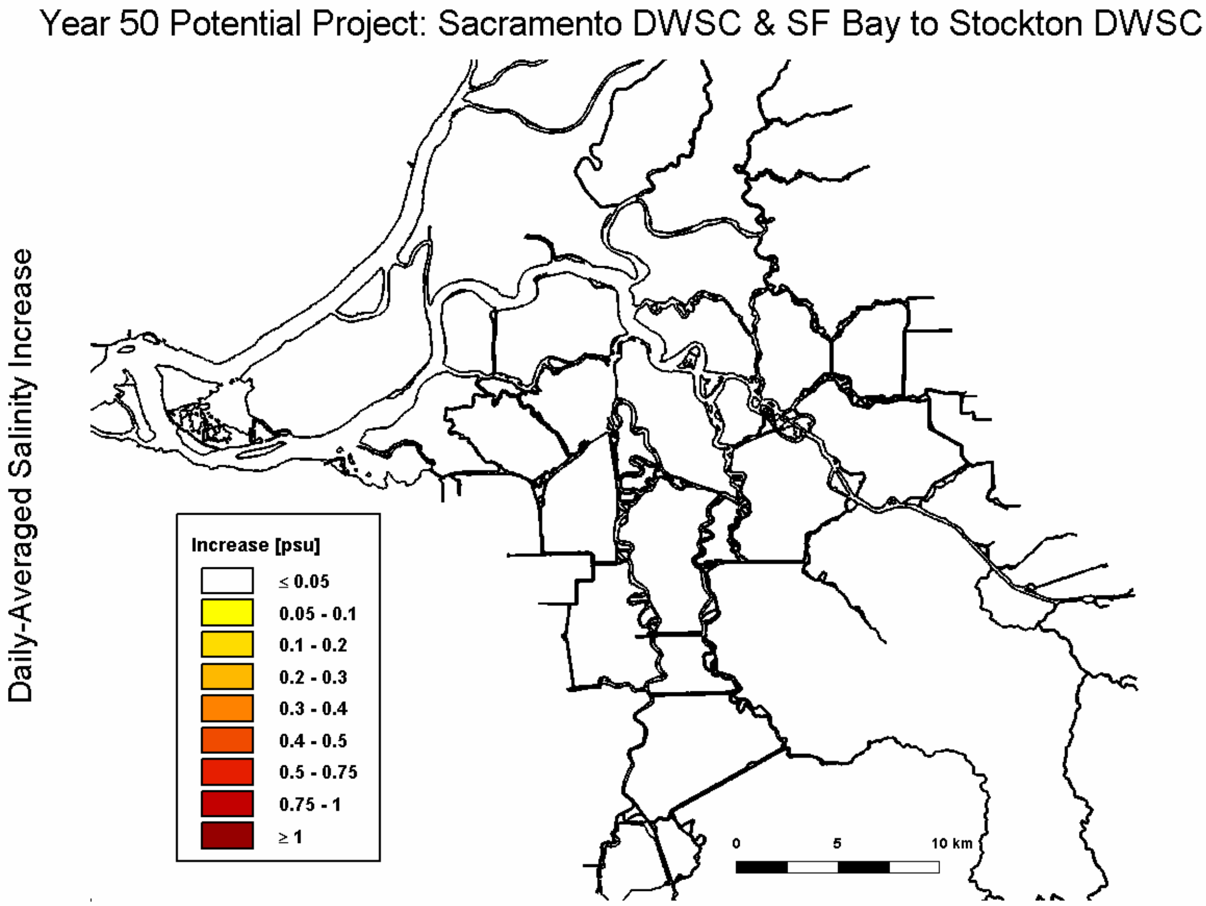


Figure 6.4-26 Predicted depth-averaged daily-averaged salinity increase in the Sacramento-San Joaquin Delta on March 1 for the Year 50 with Potential Project Both DWSC Deepening scenario relative to the Year 50 with Potential Project Baseline scenario.

6.5 Salinity Time Series Comparisons

Salinity time series provide information about potential salinity impacts over time at a fixed location. Salinity time series comparisons were made the twenty-seven continuous salinity monitoring stations in San Francisco Bay and the Sacramento-San Joaquin Delta, shown on Figure 3.3-5. Comparisons for the Year 50 with Potential Project simulation period between predicted salinity for the Year 50 with Potential Project Baseline scenario and the Year 50 with Potential Project Both DWSC Deepening scenario are shown in Section 6.5.1.

6.5.1 Year 50 with Potential Project Both Sacramento DWSC & SF Bay to Stockton DWSC Deepening

For each salinity comparison figure included in this section, the top plot shows the tidal time-scale variability over a 15-day period for the Year 50 with Potential Project Baseline scenario and the Year 50 with Potential Project Both DWSC Deepening scenario. The middle plot shows daily-averaged salinity during the full simulation year for each scenario. The bottom plot shows the predicted increase in daily-averaged salinity for the Year 50 with Potential Project Both DWSC Deepening scenario relative to the Year 50 with Potential Project Baseline scenario. In cases where the predicted salinity is identical between scenarios, some lines are not fully visible. Since the lines are plotted in the order listed on the legend, for periods where the predicted salinity for the Year 50 with Potential Project Baseline scenario is not fully visible, the predicted salinity for the Year 50 with Potential Project Baseline scenario is identical to the visible line for the Year 50 with Potential Project Both DWSC Deepening scenario.

Figure 6.5-1 shows the predicted salinity at the Richmond-San Rafael Bridge Lower Sensor for the Year 50 with Potential Project Baseline scenario and the Year 50 with Potential Project Both DWSC Deepening scenario. During the second half of November (top panel of Figure 6.5-1), the predicted salinity for both scenarios is nearly identical. Similarly, the daily-averaged salinity is nearly identical between the two scenarios over the entire simulation year. The predicted salinity increase for the Year 50 with Potential Project Both DWSC Deepening scenario is almost exactly zero during the whole year indicating no predicted salinity increase at the Richmond-San Rafael Bridge Lower Sensor resulting from the Year 50 with Potential Project Both DWSC Deepening scenario. The predicted salinity for the Year 50 with Potential Project Both DWSC Deepening scenario shows some very small transient salinity differences during the high flow periods, but these should not be considered to represent a significant impact.

Figure 6.5-2 shows the predicted salinity at the Carquinez Bridge Lower Sensor for the Year 50 with Potential Project Baseline scenario and the Year 50 with Potential Project Both DWSC Deepening scenario. During the second half of November (top panel of Figure 6.5-2), the predicted salinity for the Year 50 with Potential Project Both DWSC Deepening scenario is slightly higher than the predicted salinity for the Year 50 with Potential Project Baseline scenario. Similarly, the predicted daily-averaged salinity for the Year 50 with Potential Project Both DWSC Deepening scenario is slightly higher than for the Year 50 with Potential Project Baseline scenario. The predicted salinity for the Year 50 with Potential Project Both DWSC Deepening scenario is typically 0.4 to 0.6 psu higher than the predicted salinity for the Year 50 with potential Project Baseline scenario, with predicted salinity increases between January and March of up to 1.5 psu during high flows (see Figure 3.3-3).

Figure 6.5-3 shows the predicted salinity at the Sacramento River at the Martinez Surface Sensor for the Year 50 with Potential Project Baseline scenario and the Year 50 with Potential Project Both DWSC Deepening scenario. During the second half of November (top panel of Figure 6.5-3), the predicted salinity for the Year 50 with Potential Project Both DWSC Deepening scenario is slightly higher than the predicted salinity for the Year 50 with Potential Project Baseline scenario. Similarly, the predicted daily-averaged salinity for the Year 50 with Potential Project Both DWSC Deepening scenario is slightly higher than for the Year 50 with Potential Project Baseline scenario. The predicted salinity for the Year 50 with Potential Project Both DWSC Deepening scenario is typically 0.4 to 0.5 psu higher than the predicted salinity for the Year 50 with Potential Project Baseline scenario throughout the year, except during January and March when high flows push the 0.50 psu isohaline as far west as Martinez.

Figure 6.5-4 shows the predicted salinity at the Benicia Bridge Lower Sensor for the Year 50 with Potential Project Baseline scenario and the Year 50 with Potential Project Both DWSC Deepening scenario. During the second half of November (top panel of Figure 6.5-4), the predicted salinity for the Year 50 with Potential Project Both DWSC Deepening scenario is slightly higher than the predicted salinity for the Year 50 with Potential Project Baseline scenario. Similarly, the predicted daily-averaged salinity for the Year 50 with Potential Project Both DWSC Deepening scenario is slightly higher than for the Year 50 with Potential Project Baseline scenario. The predicted salinity for the Year 50 with Potential Project Both DWSC Deepening scenario is typically 0.4 to 0.5 psu higher than the predicted salinity for the Year 50 with Potential Project Baseline scenario through the year, with maximum predicted salinity increases at the beginning of the January high flows and during February.

Figure 6.5-5 shows the predicted salinity at the Sacramento River near Mallard Island Surface Sensor for the Year 50 with Potential Project Baseline scenario and the Year 50 with Potential Project Both DWSC Deepening scenario. During the second half of November (top panel of Figure 6.5-5), the predicted salinity for the Year 50 with Potential Project Both DWSC Deepening scenario is slightly higher than the predicted salinity for the Year 50 with Potential Project Baseline scenario. Similarly, the predicted daily-averaged salinity for the Year 50 with Potential Project Both DWSC Deepening scenario is slightly higher than for the Year 50 with Potential Project Baseline scenario. The predicted salinity for the Year 50 with Potential Project Both DWSC Deepening scenario is typically 0.30 to 0.40 psu higher than the predicted salinity for the Year 50 with Potential Project Baseline scenario from April through December, with no increase predicted during the high flow period from January through March when salinity gradients are pushed west of Mallard Island.

Figure 6.5-6 shows the predicted salinity at the Sacramento River at Emmaton Surface Sensor for the Year 50 with Potential Project Baseline scenario and the Year 50 with Potential Project Both DWSC Deepening scenario. During the second half of November (top panel of Figure 6.5-6), the predicted salinity for the Year 50 with Potential Project Both DWSC Deepening scenario is slightly higher than the predicted salinity for the Year 50 with Potential Project Baseline scenario. Similarly, the predicted daily-averaged salinity for the Year 50 with Potential Project

Both DWSC Deepening scenario is slightly higher than for the Year 50 with Potential Project Baseline scenario. The predicted salinity for the Year 50 with Potential Project Both DWSC Deepening scenario shows increases of up to 0.30 psu during late fall conditions, and is nearly identical to the Year 50 with Potential Project Baseline scenario salinity during spring conditions when high flows result in very low salinities in the western Delta.

Figure 6.5-7 shows the predicted salinity at the Sacramento River at Rio Vista for the Year 50 with Potential Project Baseline scenario and the Year 50 with Potential Project Both DWSC Deepening scenario. The predicted salinity for the Year 50 with Potential Project Both DWSC Deepening scenario is higher than the Year 50 with Potential Project Baseline salinity from June through December; during October and November the predicted salinity for the Year 50 with Potential Project Both DWSC Deepening scenario is up to 0.25 psu higher than the Year 50 with Potential Project Baseline salinity.

Figure 6.5-8 shows the predicted salinity at the Port of Sacramento for the Year 50 with Potential Project Baseline scenario and the Year 50 with Potential Project Both DWSC Deepening scenario. The predicted salinity for the Year 50 with Potential Project Both DWSC Deepening scenario is nearly identical the predicted salinity for the Year 50 with Potential Project Baseline scenario throughout the year, with no predicted salinity increases resulting from the Year 50 with Potential Project Both DWSC Deepening scenario.

Figure 6.5-9 shows the predicted salinity at the San Joaquin River at Antioch for the Year 50 with Potential Project Baseline scenario and the Year 50 with Potential Project Both DWSC Deepening scenario. During the second half of November (top panel of Figure 6.5-9), the predicted salinity for the Year 50 with Potential Project Both DWSC Deepening scenario is slightly higher than the predicted salinity for the Year 50 with Potential Project Baseline scenario. Similarly, the predicted daily-averaged salinity for the Year 50 with Potential Project Both DWSC Deepening scenario is slightly higher than for the Year 50 with Potential Project Baseline scenario. The predicted salinity for the Year 50 with Potential Project Both DWSC Deepening scenario is higher than the predicted salinity for the Year 50 with Potential Project Baseline scenario from April through January, with the largest predicted salinity increases of up to 0.42 psu during late fall.

Figure 6.5-10 shows the predicted salinity at the San Joaquin River at Jersey Point for the Year 50 with Potential Project Baseline scenario and the Year 50 with Potential Project Both DWSC Deepening scenario. The predicted salinity for both scenarios is nearly identical from April through May and from January through March. From October through December, the predicted salinity for the Year 50 with Potential Project Both DWSC Deepening scenario is higher than the predicted salinity for the Year 50 with Potential Project Baseline scenario. Salinity increases of up to 0.31 psu are predicted during late October for the Year 50 with Potential Project Both DWSC Deepening scenario.

Figure 6.5-11 shows the predicted salinity at the San Joaquin River at San Andreas Landing for the Year 50 with Potential Project Baseline scenario and the Year 50 with Potential Project Both DWSC Deepening scenario. The predicted salinity for both scenarios is nearly identical from April through June and from January through March. Salinity increases of up to 0.7 psu during

October and up to 0.10 psu during December are predicted for the Year 50 with Potential Project Both DWSC Deepening scenario.

Figure 6.5-12 shows the predicted salinity at the San Joaquin River before Prisoners Point for the Year 50 with Potential Project Baseline scenario and the Year 50 with Potential Project Both DWSC Deepening scenario. The predicted salinity for both scenarios is nearly identical from April through June and from February through March. From October through December, the predicted salinity for the Year 50 with Potential Project Both DWSC Deepening scenario is higher than the predicted salinity for the Year 50 with Potential Project Baseline scenario, with predicted salinity increases of up to 0.08 psu.

Figure 6.5-13 shows the predicted salinity at the Stockton Ship Channel at Burns Cutoff for the Year 50 with Potential Project Baseline scenario and the Year 50 with Potential Project Both DWSC Deepening scenario. The predicted salinity for the Year 50 with Potential Project Both DWSC Deepening scenario is nearly identical the predicted salinity for the Year 50 with Potential Project Baseline scenario throughout the year, however some salinity increases and decreases of up to 0.01 psu are predicted. For the Year 50 with Potential project Both DWSC Deepening scenario, salinity decreases are predicted during several periods, particularly during periods when salinity of Delta inflows on the Calaveras River or San Joaquin River are increasing. Salinity decreases occur because the increased volume of the Stockton DWSC under the deepening scenario results in a longer time required for the salinity in the DWSC to reach the concentration of the inflow salinities due to a larger volume within the DWSC which dilutes inflow salinity during the periods of increasing inflow salinity.

Figure 6.5-14 shows the predicted salinity at the South Fork Mokelumne River at Staten Island for the Year 50 with Potential Project Baseline scenario and the Year 50 with Potential Project Both DWSC Deepening scenario. The predicted salinity for both scenarios is nearly identical throughout the year, with no predicted salinity increases resulting from the Year 50 with Potential Project Both DWSC Deepening scenario.

Figure 6.5-15 shows the predicted salinity at Dutch Slough at Jersey Island for the Year 50 with Potential Project Baseline scenario and the Year 50 with Potential Project Both DWSC Deepening scenario. The predicted salinity for both scenarios is nearly identical from April through June and from February through March. From October through December, the predicted salinity for the Year 50 with Potential Project Both DWSC Deepening scenario is higher than the predicted salinity for the Year 50 with Potential Project Baseline scenario, with predicted salinity increases of up to 0.19 psu.

Figure 6.5-16 shows the predicted salinity at Old River and Holland Cut at Mandeville Island for the Year 50 with Potential Project Baseline scenario and the Year 50 with Potential Project Both DWSC Deepening scenario. During the second half of November (top panel of Figure 6.5-16), the predicted salinity for the Year 50 with Potential Project Both DWSC Deepening scenario is typically 0.07 psu higher than the predicted salinity for the Year 50 with Potential Project Baseline scenario throughout the tidal cycle. The predicted daily-averaged salinity for both scenarios is nearly identical from April through June and from January through March. From October through December, the predicted salinity for the Year 50 with Potential Project Both

DWSC Deepening scenario is higher than the predicted salinity for the Year 50 with Potential Project Baseline scenario, with predicted salinity increases of up to 0.12 psu.

Figure 6.5-17 shows the predicted salinity at Old River at Bacon Island for the Year 50 with Potential Project Baseline scenario and the Year 50 with Potential Project Both DWSC Deepening scenario. During the second half of November (top panel of Figure 6.5-17), the predicted salinity for the Year 50 with Potential Project Both DWSC Deepening scenario is typically 0.06 psu higher than the predicted salinity for the Year 50 with Potential Project Baseline scenario throughout the tidal cycle. The predicted daily-averaged salinity for both scenarios is nearly identical from April through June and from February through March. From October through December, the predicted salinity for the Year 50 with Potential Project Both DWSC Deepening scenario is higher than the predicted salinity for the Year 50 with Potential Project Baseline scenario, with predicted salinity increases of up to 0.12 psu.

Figure 6.5-18 shows the predicted salinity at Middle River at Borden Highway for the Year 50 with Potential Project Baseline scenario and the Year 50 with Potential Project Both DWSC Deepening scenario. During the second half of November (top panel of Figure 6.5-18), the predicted salinity for the Year 50 with Potential Project Both DWSC Deepening scenario is typically 0.02 psu higher than the predicted salinity for the Year 50 with Potential Project Baseline scenario throughout the tidal cycle. The predicted daily-averaged salinity for both scenarios is nearly identical from April through June and from January through March. From August through December the predicted salinity for the Year 50 with Potential Project Both DWSC Deepening scenario is higher than the predicted salinity for the Year 50 with Potential Project Baseline scenario, with predicted salinity increases of up to 0.05 psu.

Figure 6.5-19 shows the predicted salinity at Middle River at Tracy Boulevard for the Year 50 with Potential Project Baseline scenario and the Year 50 with Potential Project Both DWSC Deepening scenario. During the second half of November (top panel of Figure 6.5-19), the predicted salinity for the Year 50 with Potential Project Both DWSC Deepening scenario is nearly identical to the predicted salinity for the Year 50 with Potential Project Baseline scenario throughout the tidal cycle. The predicted daily-averaged salinity for both scenarios is nearly identical throughout most of the year. Predicted salinity increases resulting from the Year 50 with Potential Project Both DWSC Deepening scenario do not exceed 0.01 psu, except during December when salinity increases of up to 0.03 psu are predicted.

Figure 6.5-20 shows the predicted salinity at Victoria Canal near Byron for the Year 50 with Potential Project Baseline scenario and the Year 50 with Potential Project Both DWSC Deepening scenario. During the second half of November (top panel of Figure 6.5-20), the predicted salinity for the Year 50 with Potential Project Both DWSC Deepening scenario is typically 0.03 psu higher than the predicted salinity for the Year 50 with Potential Project Baseline scenario throughout the tidal cycle. The predicted daily-averaged salinity for both scenarios is nearly identical from April through July and from January through March. From August through December, the predicted salinity for the Year 50 with Potential Project Both DWSC Deepening scenario is slightly higher than the predicted salinity for the Year 50 with Potential Project Baseline scenario, with predicted salinity increases of up to 0.05 psu.

Figure 6.5-21 shows the predicted salinity at the Clifton Court Forebay Radial Gates for the Year 50 with Potential Project Baseline scenario and the Year 50 with Potential Project Both DWSC Deepening scenario. During the second half of November (top panel of Figure 6.5-21), the predicted salinity for the Year 50 with Potential Project Both DWSC Deepening scenario is 0.04 psu higher than the predicted salinity for the Year 50 with Potential Project Baseline scenario throughout the tidal cycle. The predicted daily-averaged salinity for both scenarios is nearly identical from April through October and from January through March. From November through January, the predicted salinity for the Year 50 with Potential Project Both DWSC Deepening scenario is slightly higher than the predicted salinity for the Year 50 with Potential Project Baseline scenario, with predicted salinity increases of up to 0.07 psu.

Figure 6.5-22 shows the predicted salinity at Old River near Delta-Mendota Canal (Downstream of Barrier) for the Year 50 with Potential Project Baseline scenario and the Year 50 with Potential Project Both DWSC Deepening scenario. During the second half of November, the predicted salinity for the Year 50 with Potential Project Both DWSC Deepening scenario is nearly identical to the predicted salinity for the Year 50 with Potential Project Baseline scenario throughout the tidal cycle. During October and December, the predicted salinity for the Year 50 with Potential Project Both DWSC Deepening scenario is slightly higher than the predicted salinity for the Year 50 with Potential Project Baseline scenario, with predicted salinity increases of up to 0.05 psu.

Figure 6.5-23 shows the predicted salinity at Old River at Tracy Boulevard for the Year 50 with Potential Project Baseline scenario and the Year 50 with Potential Project Both DWSC Deepening scenario. The predicted salinity for both scenarios is nearly identical throughout the year, and no salinity increases are predicted for the Year 50 with Potential Project Both DWSC Deepening scenario.

Figure 6.5-24 shows the predicted salinity at Grant Line Canal at Tracy Boulevard for the Year 50 with Potential Project Baseline scenario and the Year 50 with Potential Project Both DWSC Deepening scenario. The predicted salinity for both scenarios is nearly identical throughout the year, and no salinity increases are predicted for the Year 50 with Potential Project Both DWSC Deepening scenario.

Figure 6.5-25 shows the predicted salinity at Middle River near Old River for the Year 50 with Potential Project Baseline scenario and the Year 50 with Potential Project Both DWSC Deepening scenario. The predicted salinity for both scenarios is nearly identical throughout the year, and no salinity increases are predicted for the Year 50 with Potential Project Both DWSC Deepening scenario.

Figure 6.5-26 shows the predicted salinity at San Joaquin River at Brandt Bridge for the Year 50 with Potential Project Baseline scenario and the Year 50 with Potential Project Both DWSC Deepening scenario. The predicted salinity for both scenarios is nearly identical throughout the year, and no salinity increases are predicted for the Year 50 with Potential Project Both DWSC Deepening scenario.

Figure 6.5-27 shows the predicted salinity at San Joaquin River at Mossdale for the Year 50 with Potential Project Baseline scenario and the Year 50 with Potential Project Both DWSC Deepening scenario. The predicted salinity for both scenarios is nearly identical throughout the year, and no salinity increases are predicted for the Year 50 with Potential Project Both DWSC Deepening scenario.

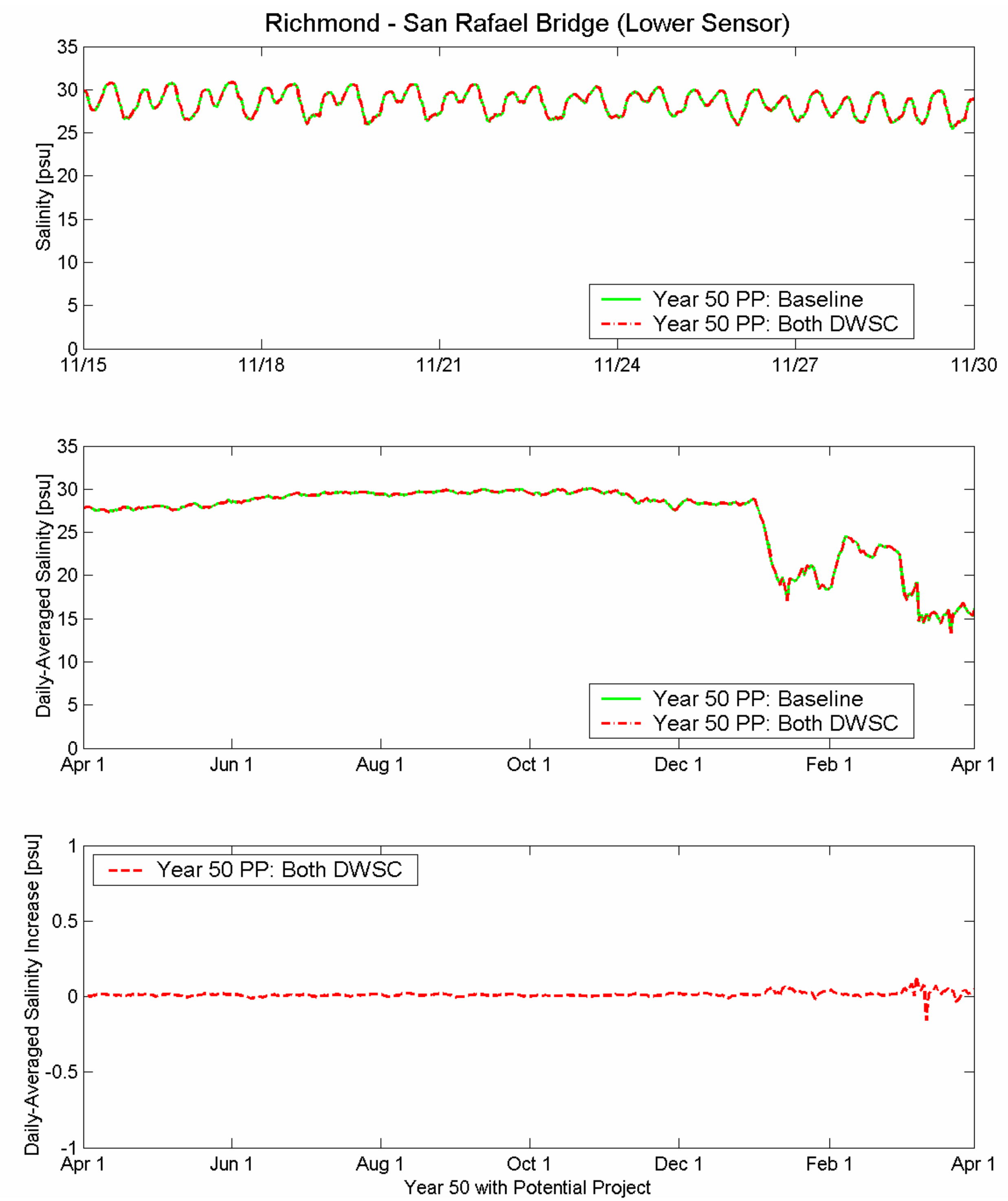


Figure 6.5-1 Predicted salinity at Richmond-San Rafael Bridge Lower Sensor for the Year 50 with Potential Project Baseline scenario and the Year 50 with Potential Project Both DWSC Deepening scenario: tidal time-scale variability over a 15-day period (top); daily-averaged salinity for the Year 50 with Potential Project simulation period (middle); predicted increase in daily-averaged salinity for the Year 50 with Potential Project Both DWSC Deepening scenario relative to the Year 50 with Potential Project Baseline scenario (bottom).

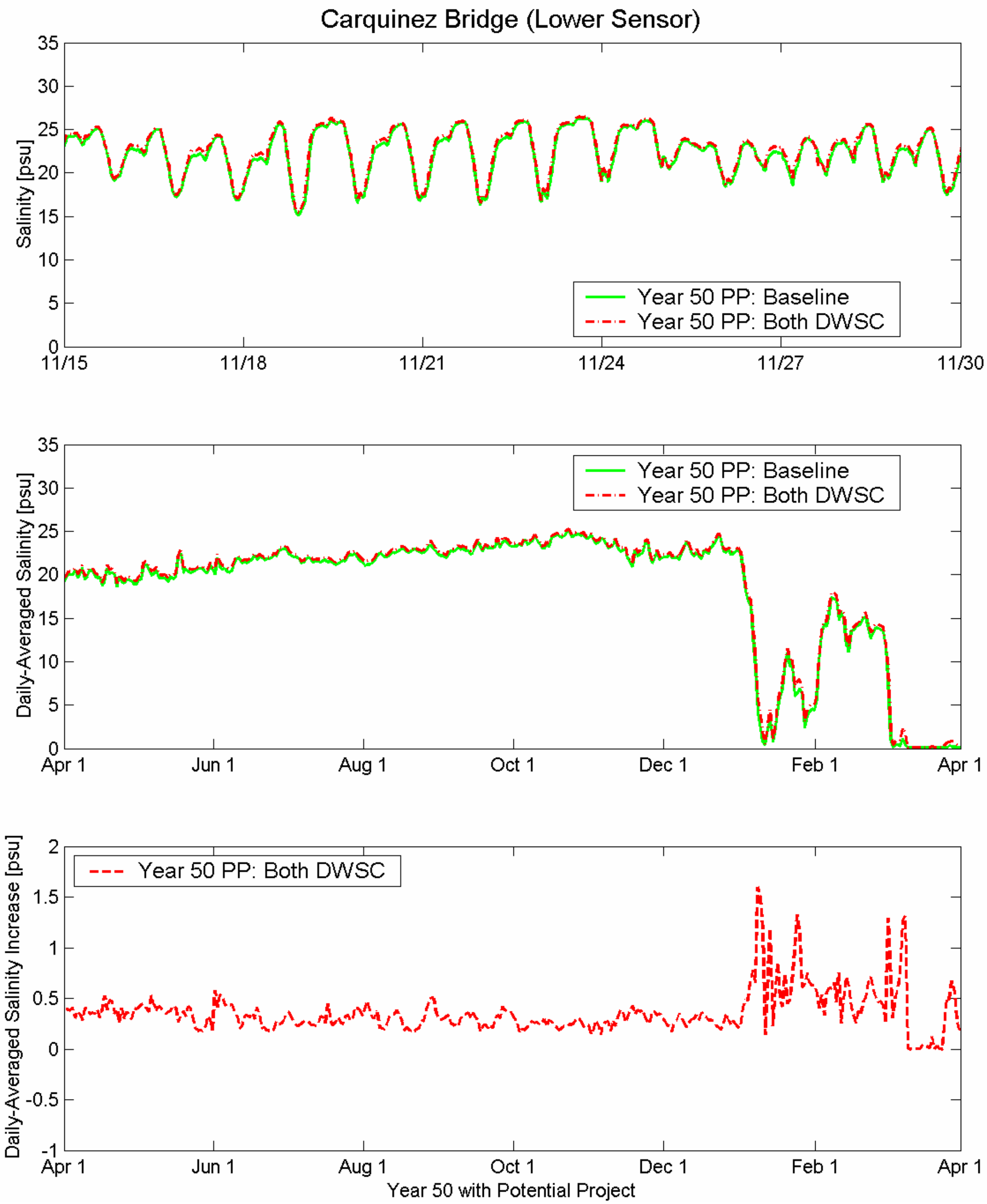


Figure 6.5-2 Predicted salinity at Carquinez Bridge Lower Sensor for the Year 50 with Potential Project Baseline scenario and the Year 50 with Potential Project Both DWSC Deepening scenario: tidal time-scale variability over a 15-day period (top); daily-averaged salinity for the Year 50 with Potential Project simulation period (middle); predicted increase in daily-averaged salinity for the Year 50 with Potential Project Both DWSC Deepening scenario relative to the Year 50 with Potential Project Baseline scenario (bottom).

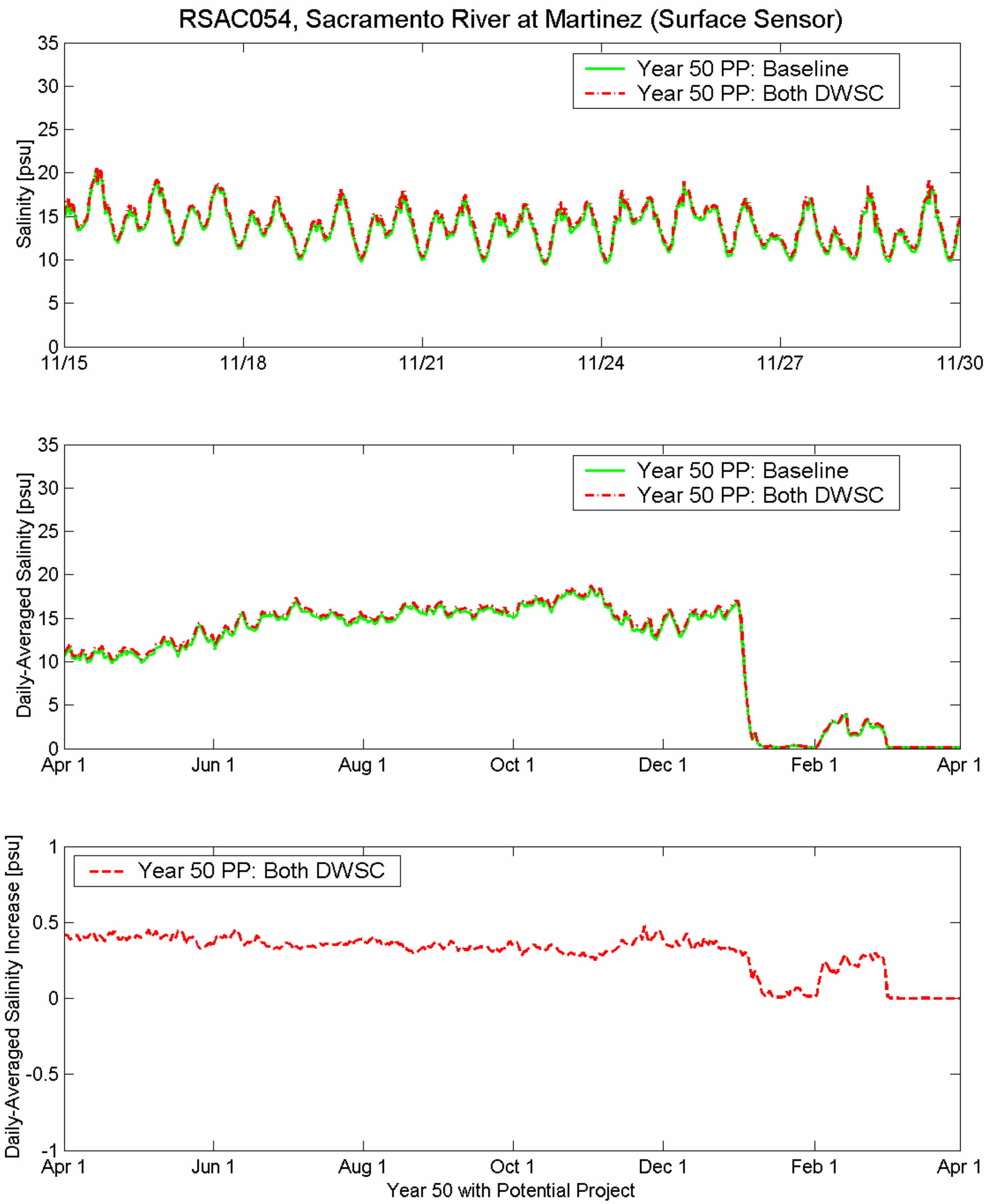


Figure 6.5-3 Predicted salinity at Sacramento River at Martinez (RSAC054) for the Year 50 with Potential Project Baseline scenario and the Year 50 with Potential Project Both DWSC Deepening scenario: tidal time-scale variability over a 15-day period (top); daily-averaged salinity for the Year 50 with Potential Project simulation period (middle); predicted increase in daily-averaged salinity for the Year 50 with Potential Project Both DWSC Deepening scenario relative to the Year 50 with Potential Project Baseline scenario (bottom).

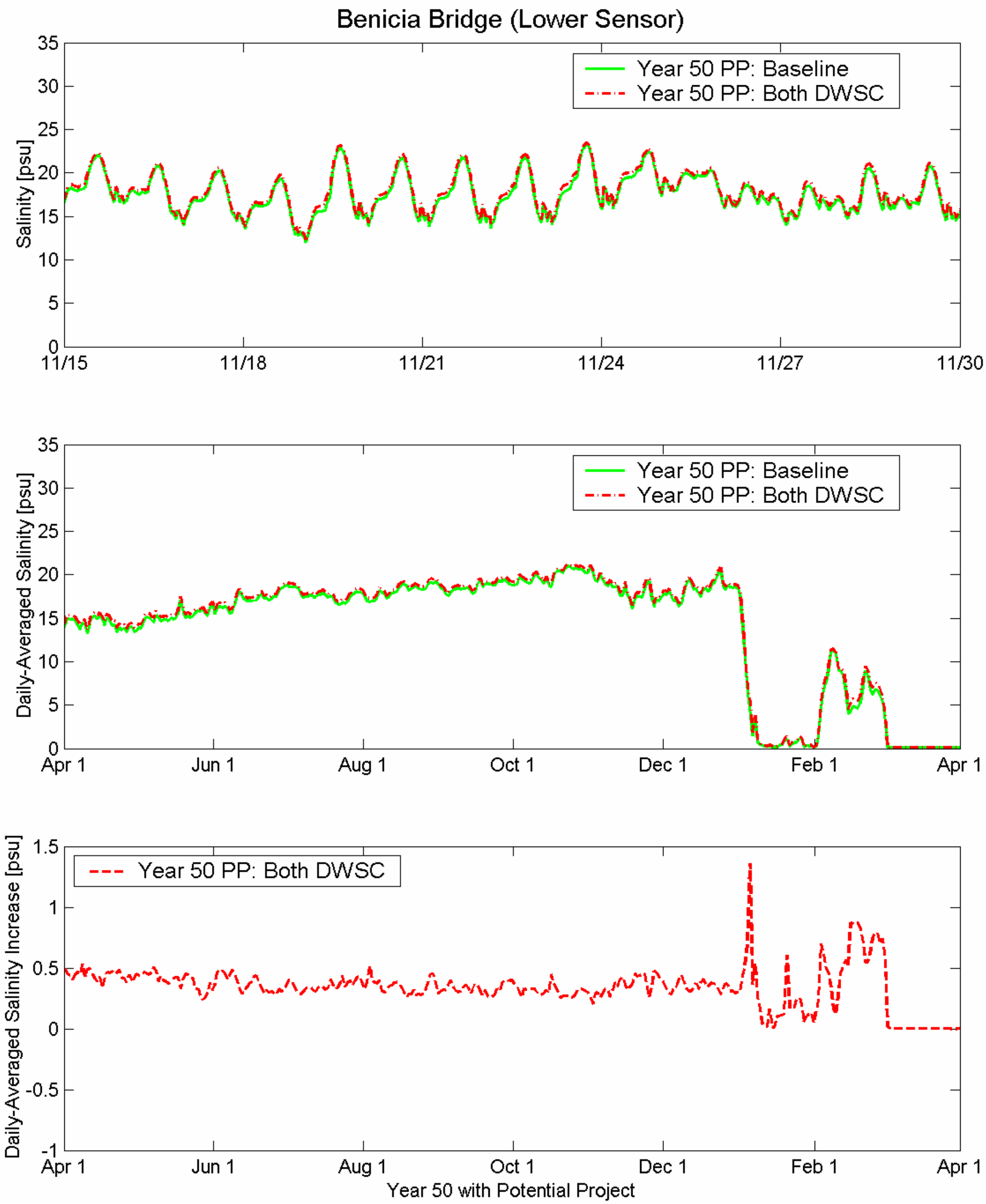


Figure 6.5-4 Predicted salinity at Benicia Bridge Lower Sensor for the Year 50 with Potential Project Baseline scenario and the Year 50 with Potential Project Both DWSC Deepening scenario: tidal time-scale variability over a 15-day period (top); daily-averaged salinity for the Year 50 with Potential Project simulation period (middle); predicted increase in daily-averaged salinity for the Year 50 with Potential Project Both DWSC Deepening scenario relative to the Year 50 with Potential Project Baseline scenario (bottom).

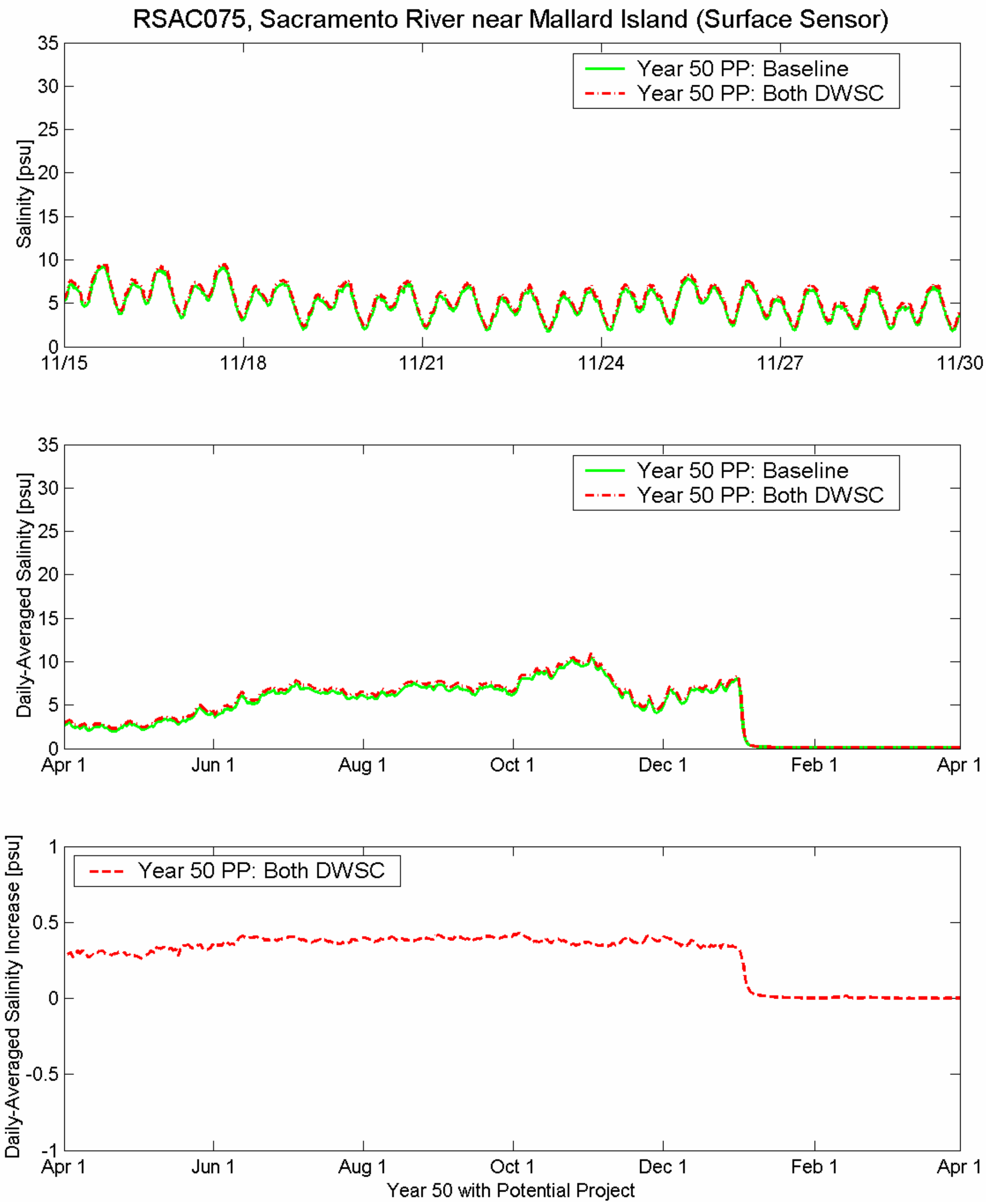


Figure 6.5-5 Predicted salinity at the Sacramento River near Mallard Island (RSAC075) Surface Sensor for the Year 50 with Potential Project Baseline scenario and the Year 50 with Potential Project Both DWSC Deepening scenario: tidal time-scale variability over a 15-day period (top); daily-averaged salinity for the Year 50 with Potential Project simulation period (middle); predicted increase in daily-averaged salinity for the Year 50 with Potential Project Both DWSC Deepening scenario relative to the Year 50 with Potential Project Baseline scenario (bottom).

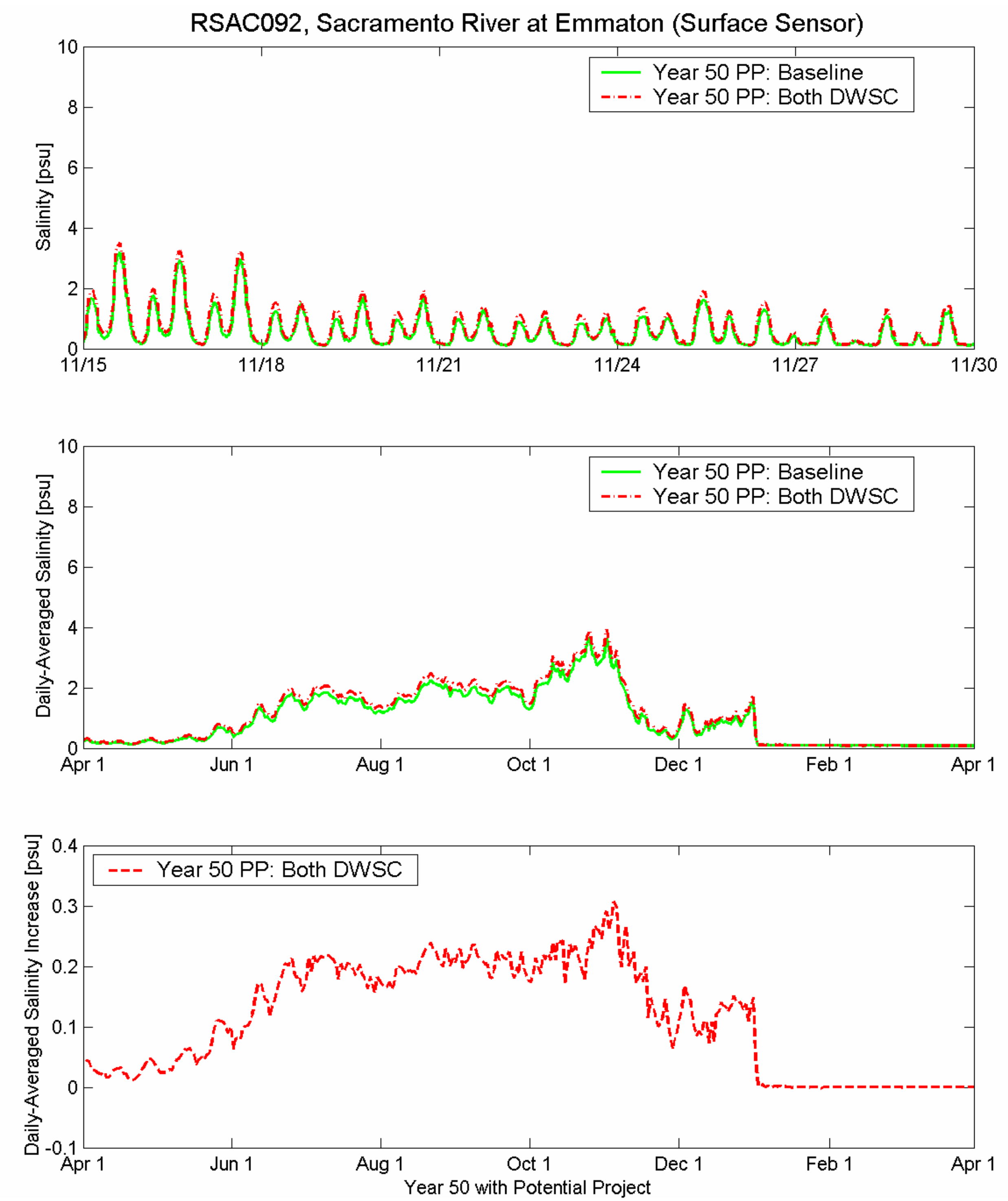


Figure 6.5-6 Predicted salinity at the Sacramento River at Emmaton (RSAC092) Surface Sensor for the Year 50 with Potential Project Baseline scenario and the Year 50 with Potential Project Both DWSC Deepening scenario: tidal time-scale variability over a 15-day period (top); daily-averaged salinity for the Year 50 with Potential Project simulation period (middle); predicted increase in daily-averaged salinity for the Year 50 with Potential Project Both DWSC Deepening scenario relative to the Year 50 with Potential Project Baseline scenario (bottom).

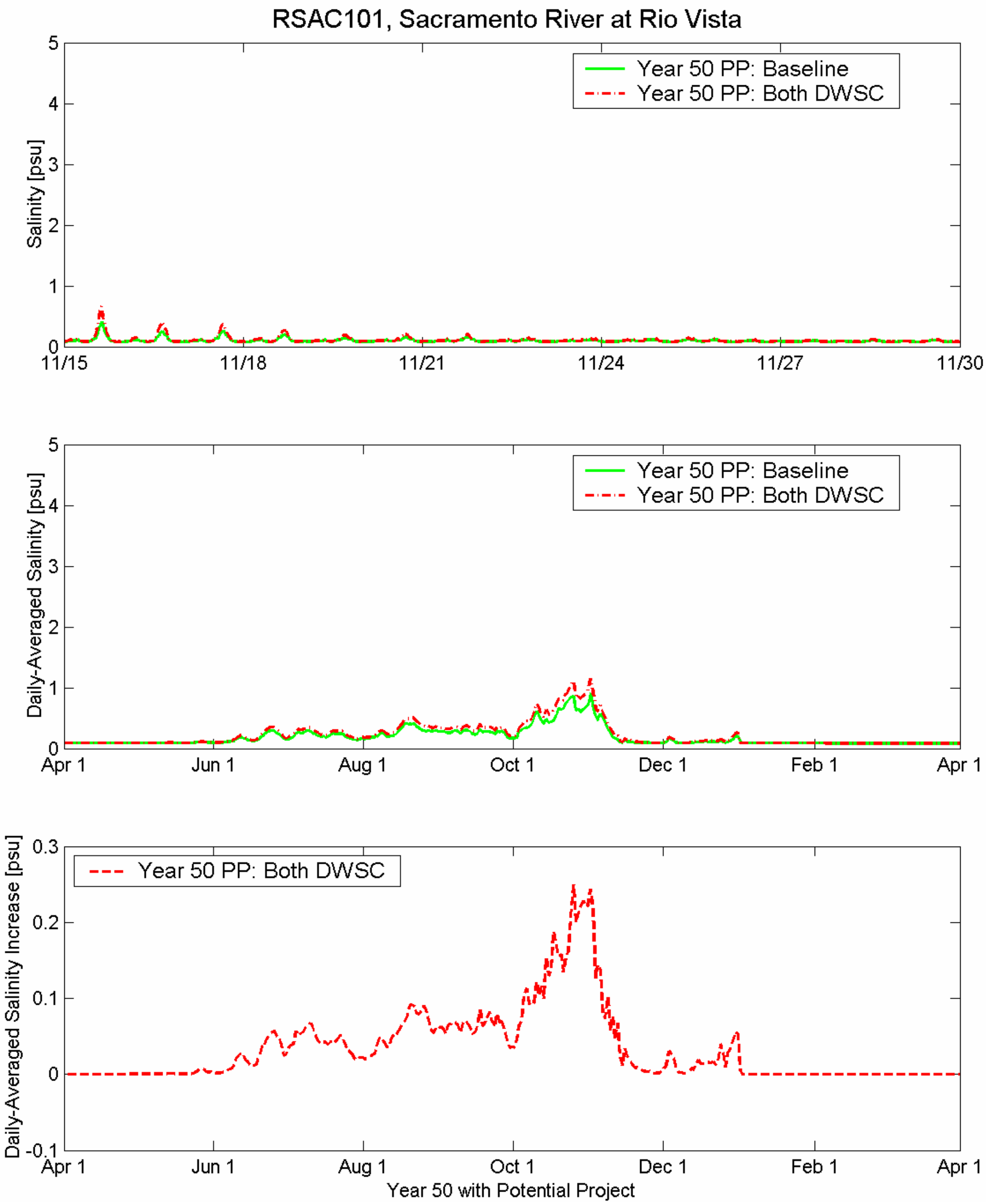


Figure 6.5-7 Predicted salinity at Sacramento River at Rio Vista (RSAC101) for the Year 50 with Potential Project Baseline scenario and the Year 50 with Potential Project Both DWSC Deepening scenario: tidal time-scale variability over a 15-day period (top); daily-averaged salinity for the Year 50 with Potential Project simulation period (middle); predicted increase in daily-averaged salinity for the Year 50 with Potential Project Both DWSC Deepening scenario relative to the Year 50 with Potential Project Baseline scenario (bottom).

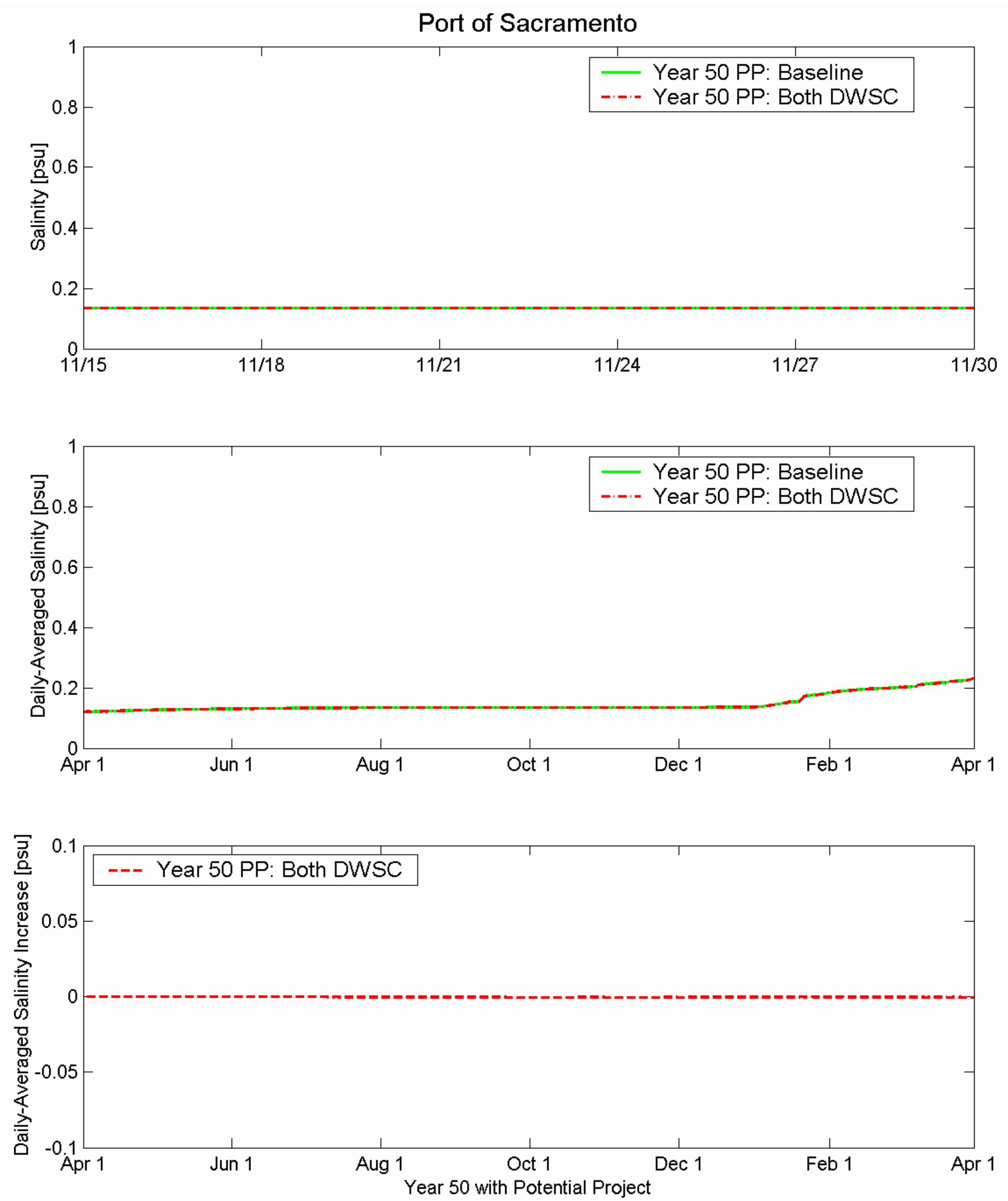


Figure 6.5-8 Predicted salinity at the Port of Sacramento for the Year 50 with Potential Project Baseline scenario and the Year 50 with Potential Project Both DWSC Deepening scenario: tidal time-scale variability over a 15-day period (top); daily-averaged salinity for the Year 50 with Potential Project simulation period (middle); predicted increase in daily-averaged salinity for the Year 50 with Potential Project Both DWSC Deepening scenario relative to the Year 50 with Potential Project Baseline scenario (bottom).

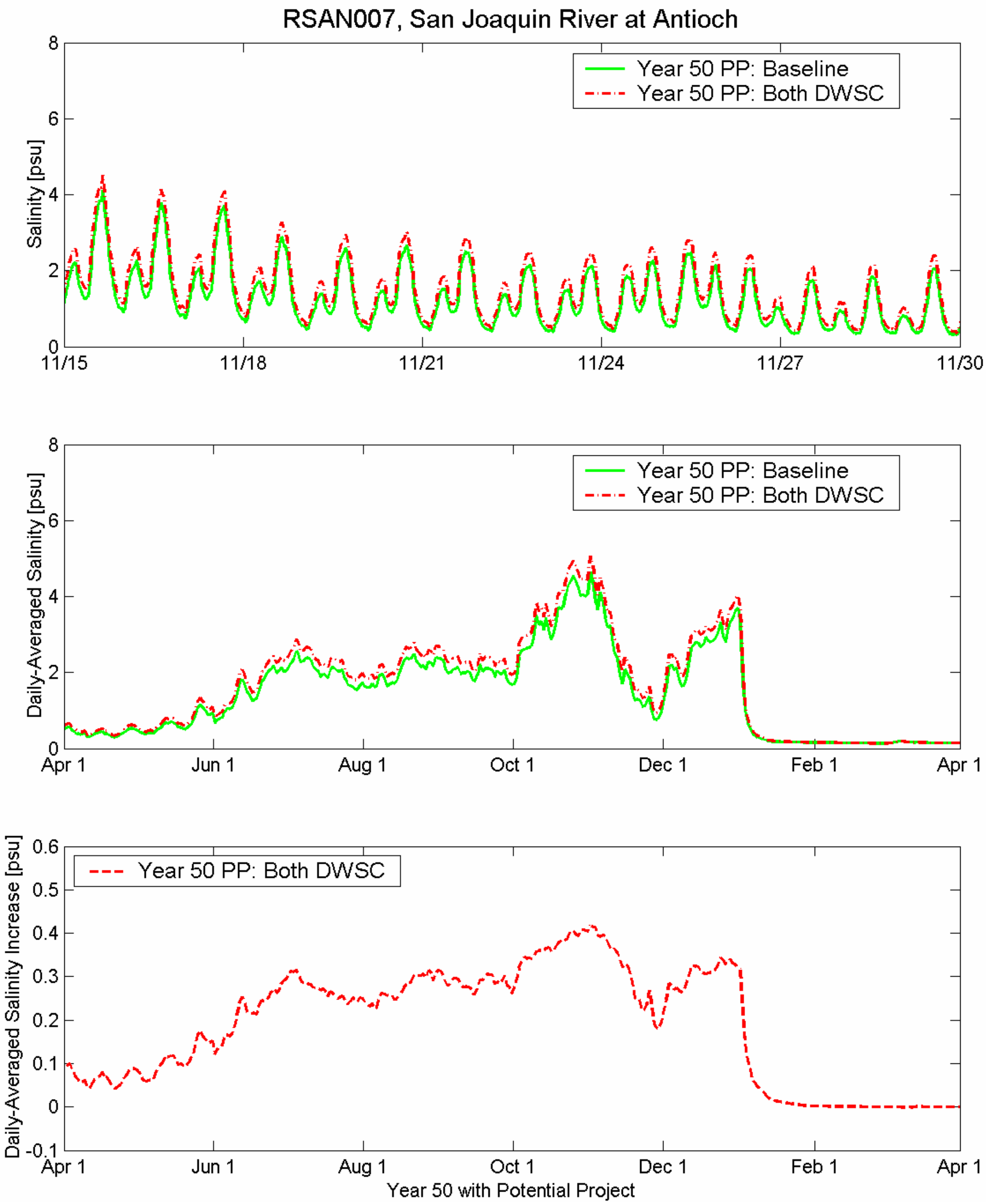


Figure 6.5-9 Predicted salinity at San Joaquin River at Antioch (RSAN007) for the Year 50 with Potential Project Baseline scenario and the Year 50 with Potential Project Both DWSC Deepening scenario: tidal time-scale variability over a 15-day period (top); daily-averaged salinity for the Year 50 with Potential Project simulation period (middle); predicted increase in daily-averaged salinity for the Year 50 with Potential Project Both DWSC Deepening scenario relative to the Year 50 with Potential Project Baseline scenario (bottom).

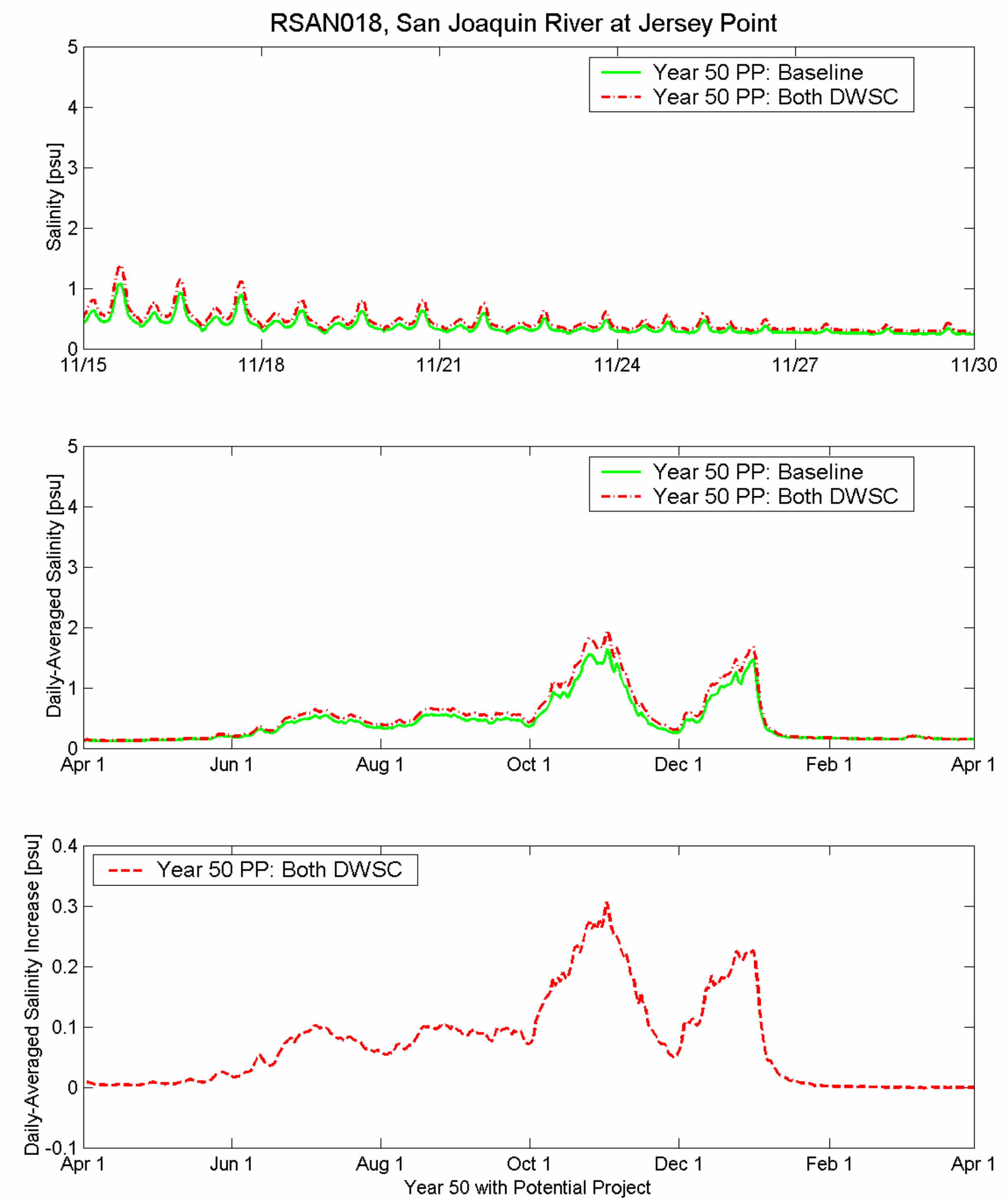


Figure 6.5-10 Predicted salinity at San Joaquin River at Jersey Point (RSAN018) for the Year 50 with Potential Project Baseline scenario and the Year 50 with Potential Project Both DWSC Deepening scenario: tidal time-scale variability over a 15-day period (top); daily-averaged salinity for the Year 50 with Potential Project simulation period (middle); predicted increase in daily-averaged salinity for the Year 50 with Potential Project Both DWSC Deepening scenario relative to the Year 50 with Potential Project Baseline scenario (bottom).

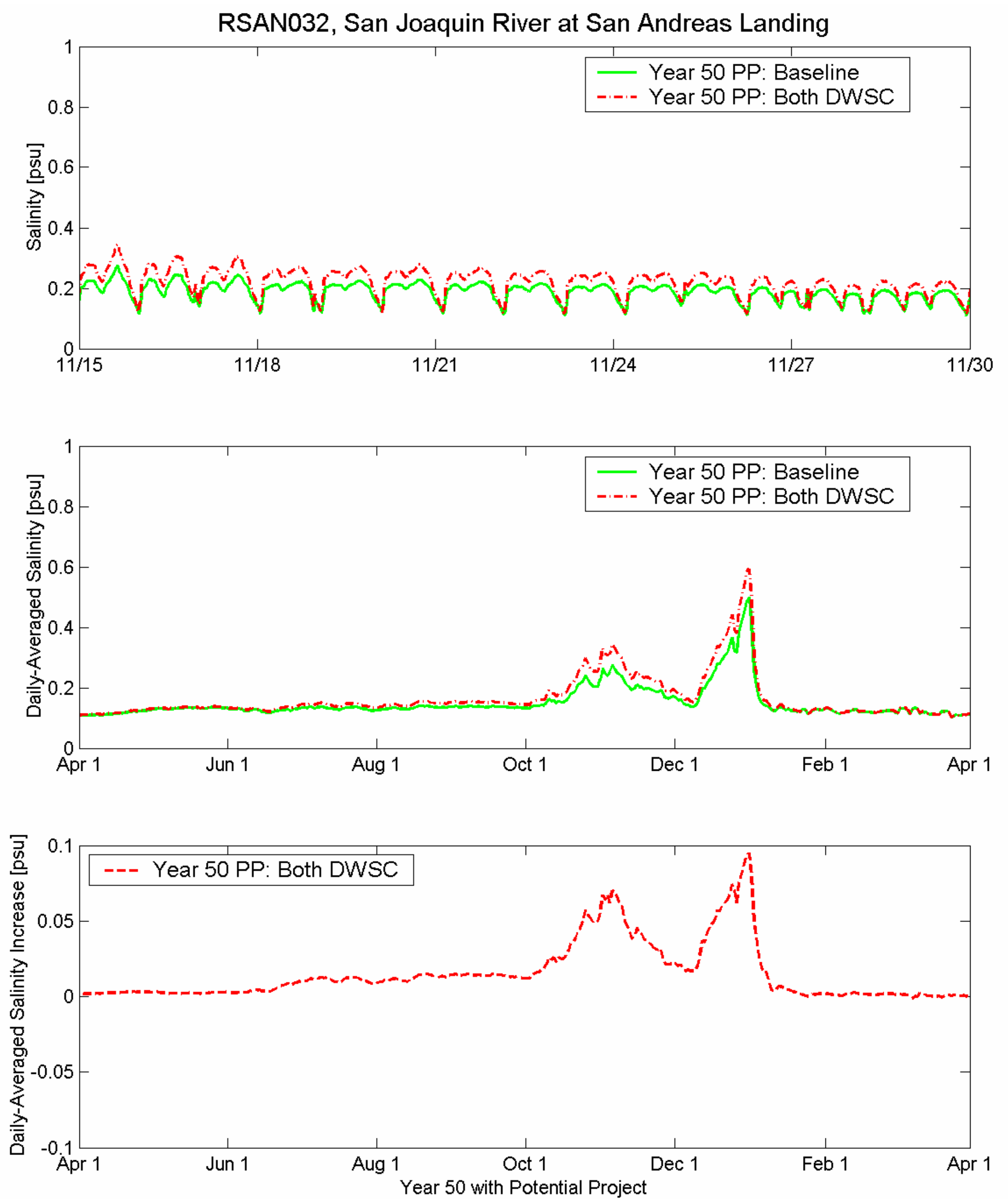


Figure 6.5-11 Predicted salinity at San Joaquin River at San Andreas Landing (RSAN032) for the Year 50 with Potential Project Baseline scenario and the Year 50 with Potential Project Both DWSC Deepening scenario: tidal time-scale variability over a 15-day period (top); daily-averaged salinity for the Year 50 with Potential Project simulation period (middle); predicted increase in daily-averaged salinity for the Year 50 with Potential Project Both DWSC Deepening scenario relative to the Year 50 with Potential Project Baseline scenario (bottom).

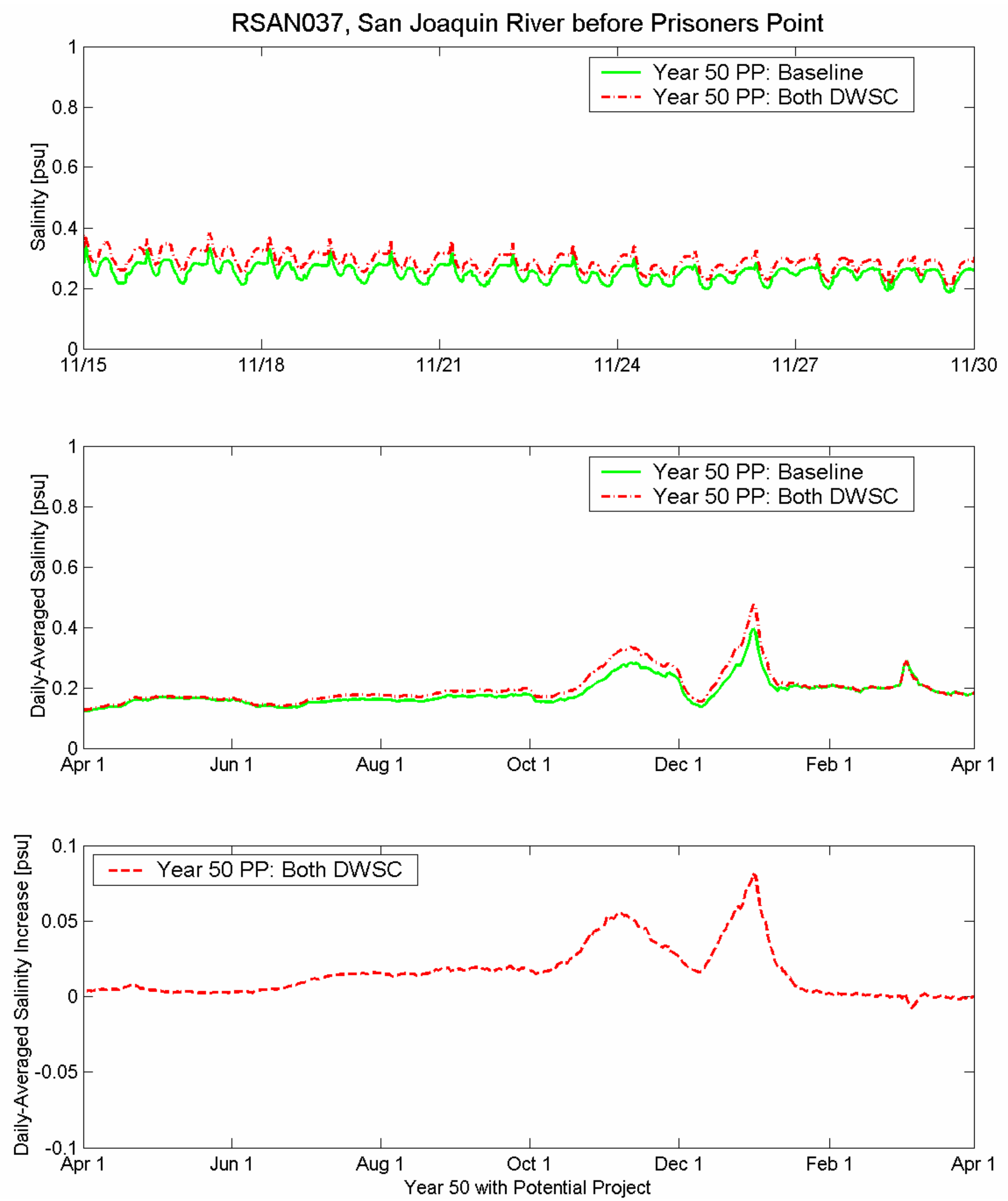


Figure 6.5-12 Predicted salinity at San Joaquin River before Prisoners Point (RSAN037) for the Year 50 with Potential Project Baseline scenario and the Year 50 with Potential Project Both DWSC Deepening scenario: tidal time-scale variability over a 15-day period (top); daily-averaged salinity for the Year 50 with Potential Project simulation period (middle); predicted increase in daily-averaged salinity for the Year 50 with Potential Project Both DWSC Deepening scenario relative to the Year 50 with Potential Project Baseline scenario (bottom).

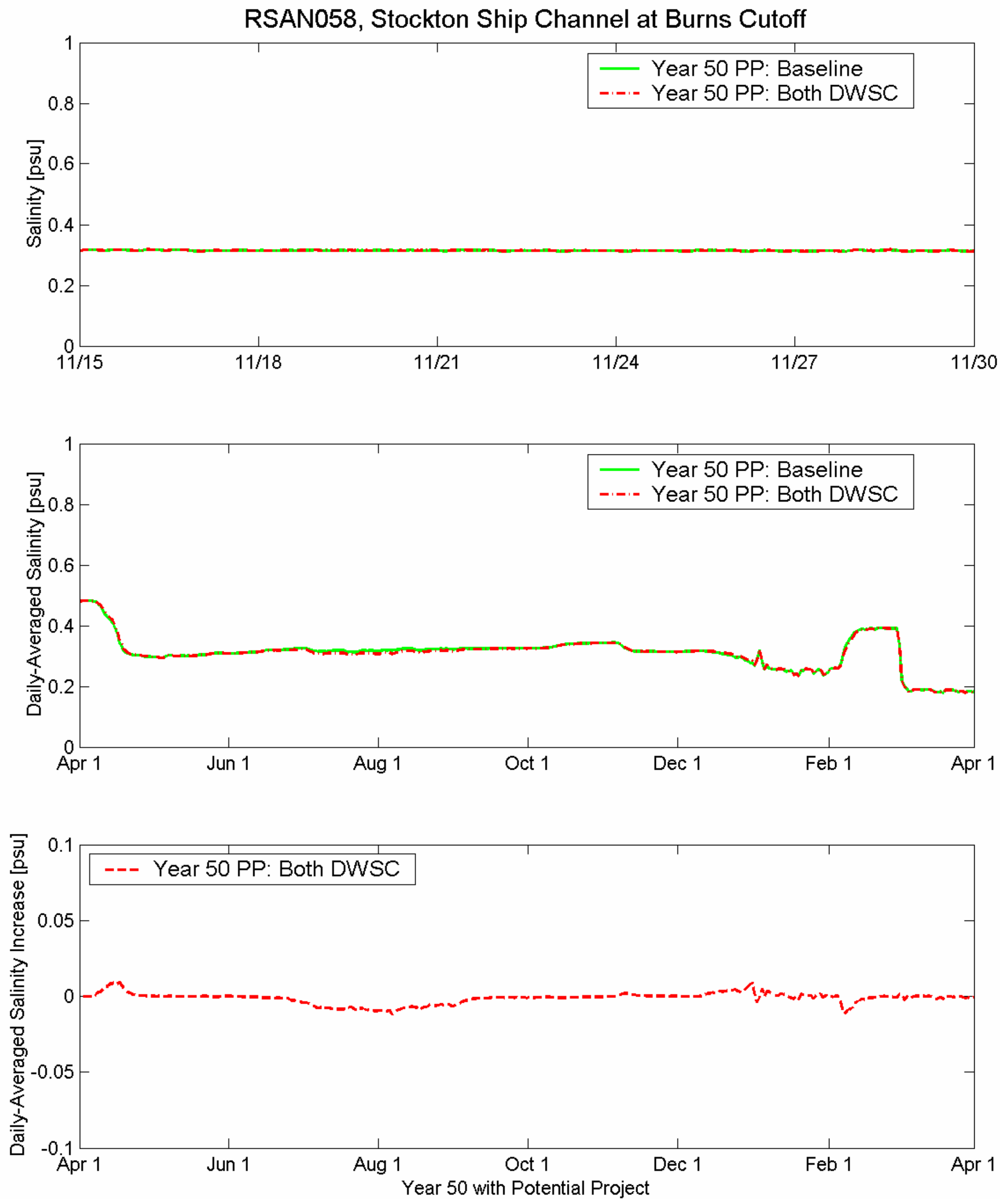


Figure 6.5-13 Predicted salinity at Stockton Ship Channel at Burns Cutoff (RSAN058) for the Year 50 with Potential Project Baseline scenario and the Year 50 with Potential Project Both DWSC Deepening scenario: tidal time-scale variability over a 15-day period (top); daily-averaged salinity for the Year 50 with Potential Project simulation period (middle); predicted increase in daily-averaged salinity for the Year 50 with Potential Project Both DWSC Deepening scenario relative to the Year 50 with Potential Project Baseline scenario (bottom).

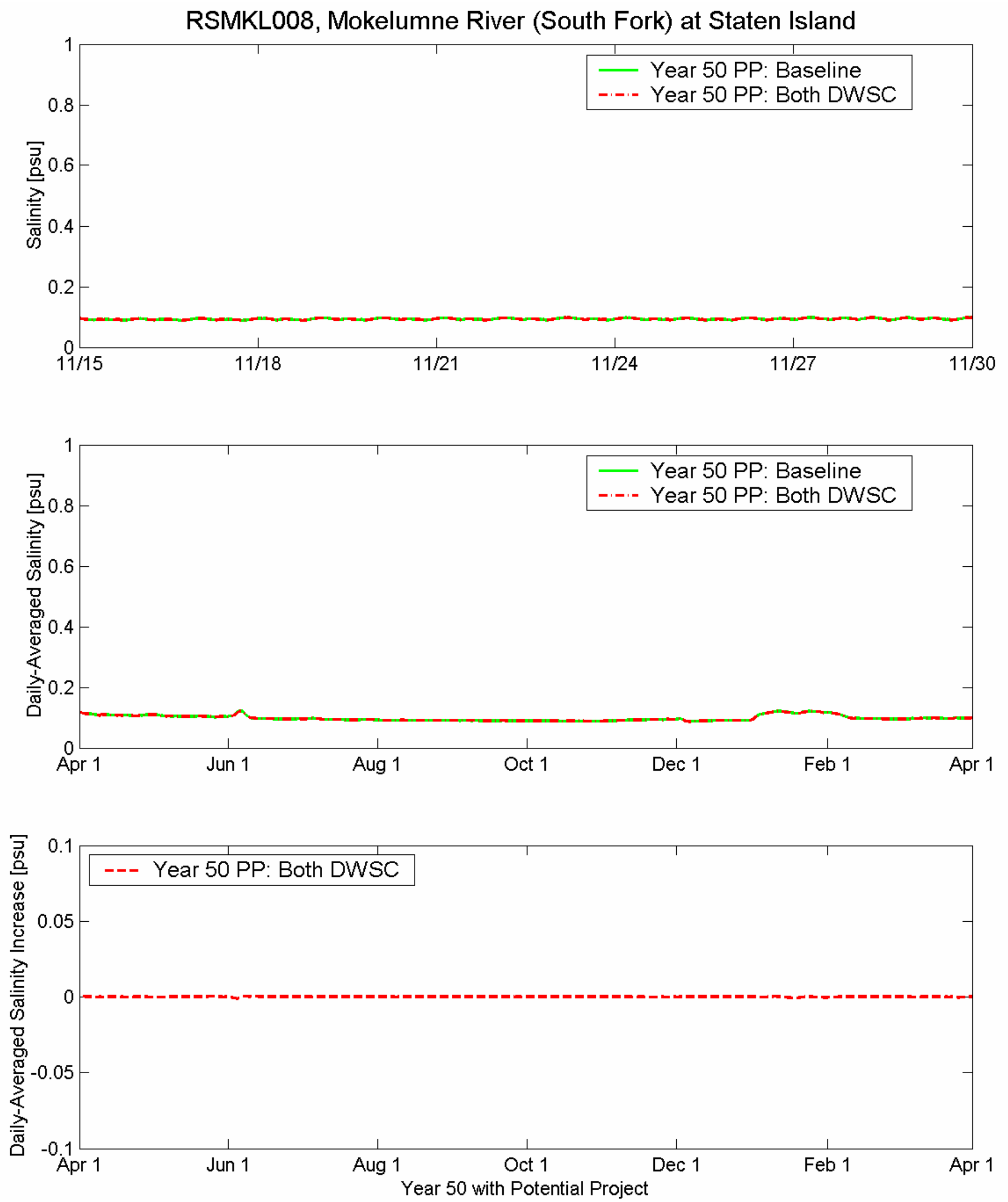


Figure 6.5-14 Predicted salinity at South Fork Mokelumne River at Staten Island (RSMKL008) for the Year 50 with Potential Project Baseline scenario and the Year 50 with Potential Project Both DWSC Deepening scenario: tidal time-scale variability over a 15-day period (top); daily-averaged salinity for the Year 50 with Potential Project simulation period (middle); predicted increase in daily-averaged salinity for the Year 50 with Potential Project Both DWSC Deepening scenario relative to the Year 50 with Potential Project Baseline scenario (bottom).

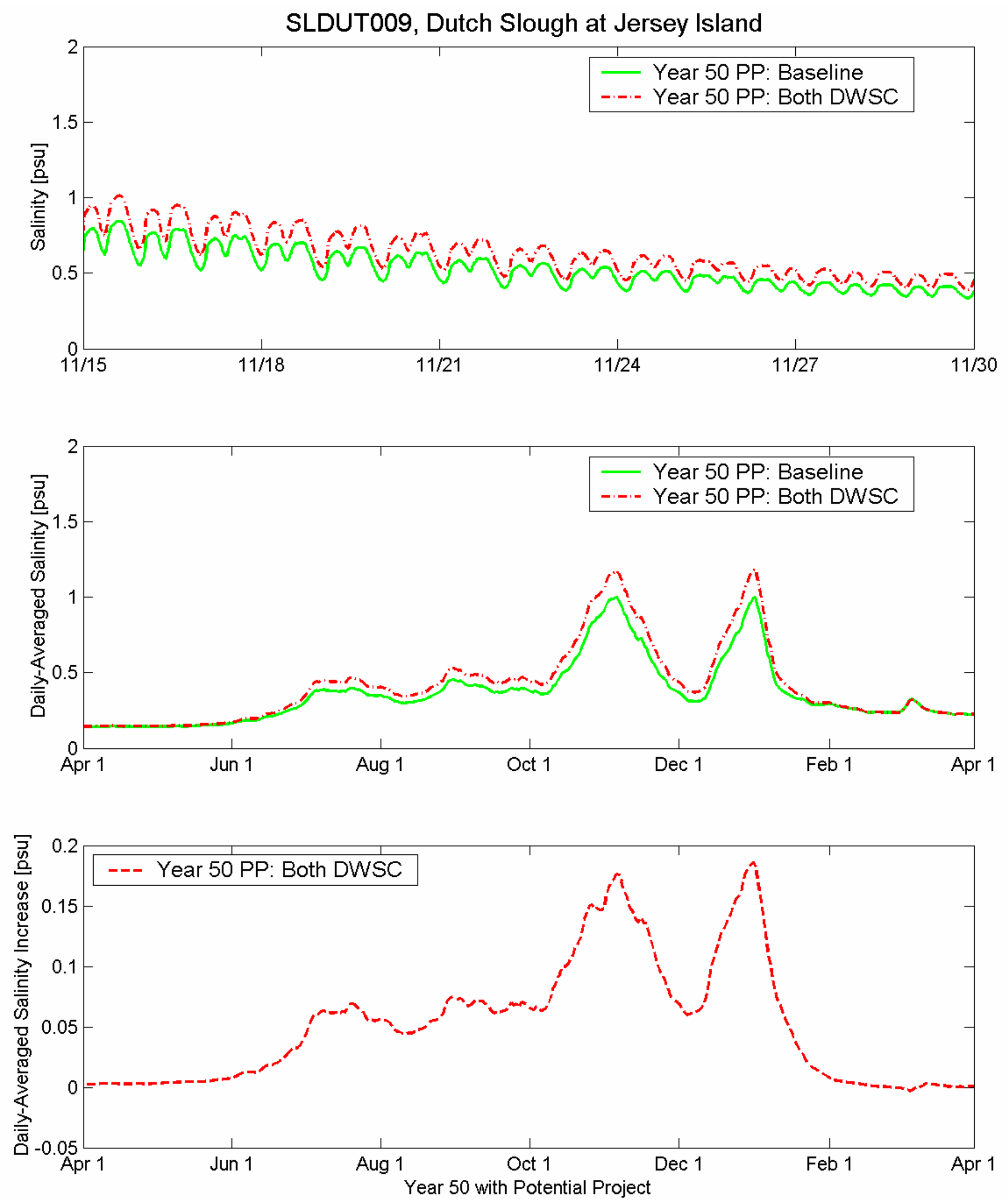


Figure 6.5-15 Predicted salinity at Dutch Slough at Jersey Island (SLDUT009) for the Year 50 with Potential Project Baseline scenario and the Year 50 with Potential Project Both DWSC Deepening scenario: tidal time-scale variability over a 15-day period (top); daily-averaged salinity for the Year 50 with Potential Project simulation period (middle); predicted increase in daily-averaged salinity for the Year 50 with Potential Project Both DWSC Deepening scenario relative to the Year 50 with Potential Project Baseline scenario (bottom).

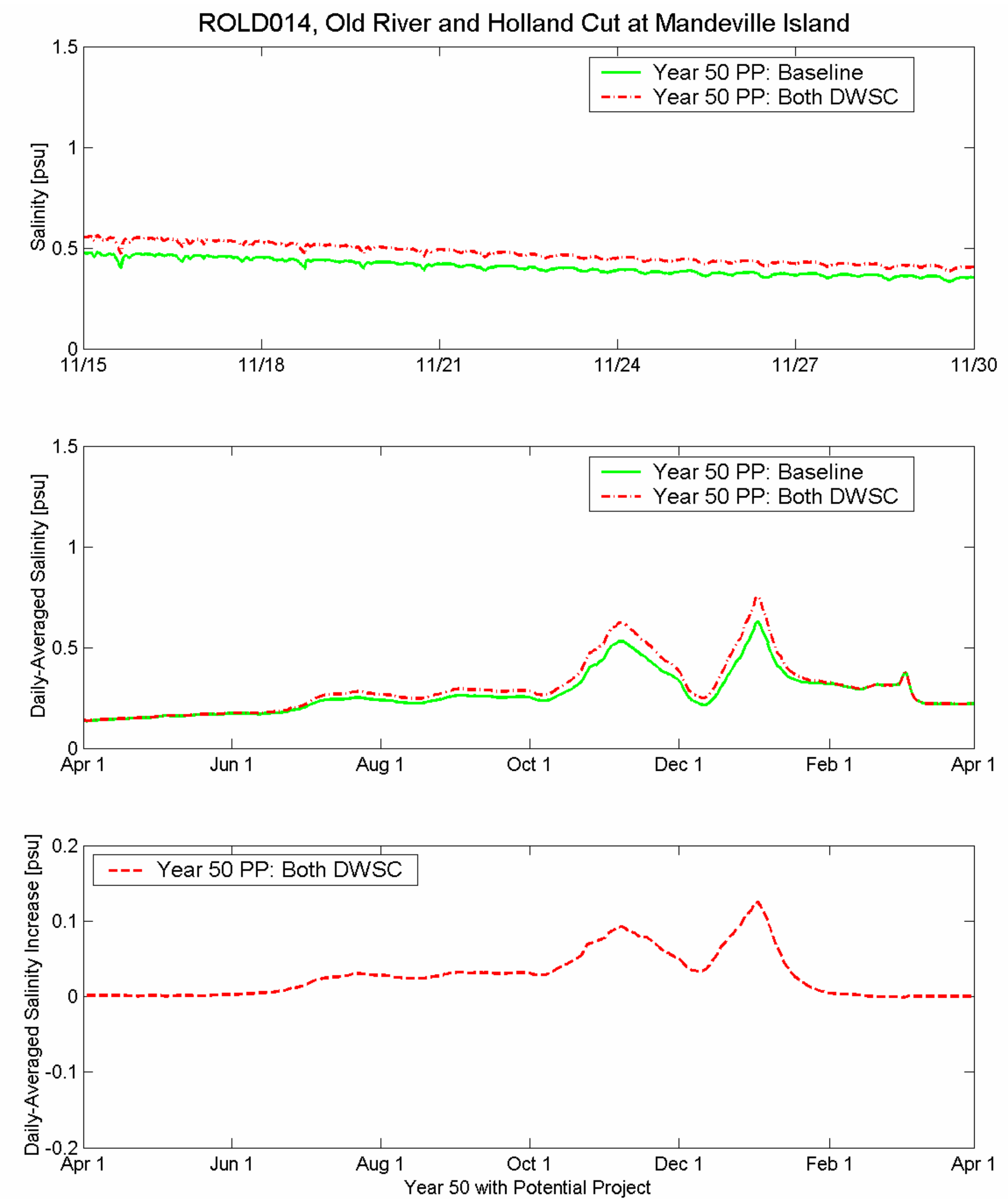


Figure 6.5-16 Predicted salinity at Old River and Holland Cut at Mandeville Island (ROLD014) for the Year 50 with Potential Project Baseline scenario and the Year 50 with Potential Project Both DWSC Deepening scenario: tidal time-scale variability over a 15-day period (top); daily-averaged salinity for the Year 50 with Potential Project simulation period (middle); predicted increase in daily-averaged salinity for the Year 50 with Potential Project Both DWSC Deepening scenario relative to the Year 50 with Potential Project Baseline scenario (bottom).

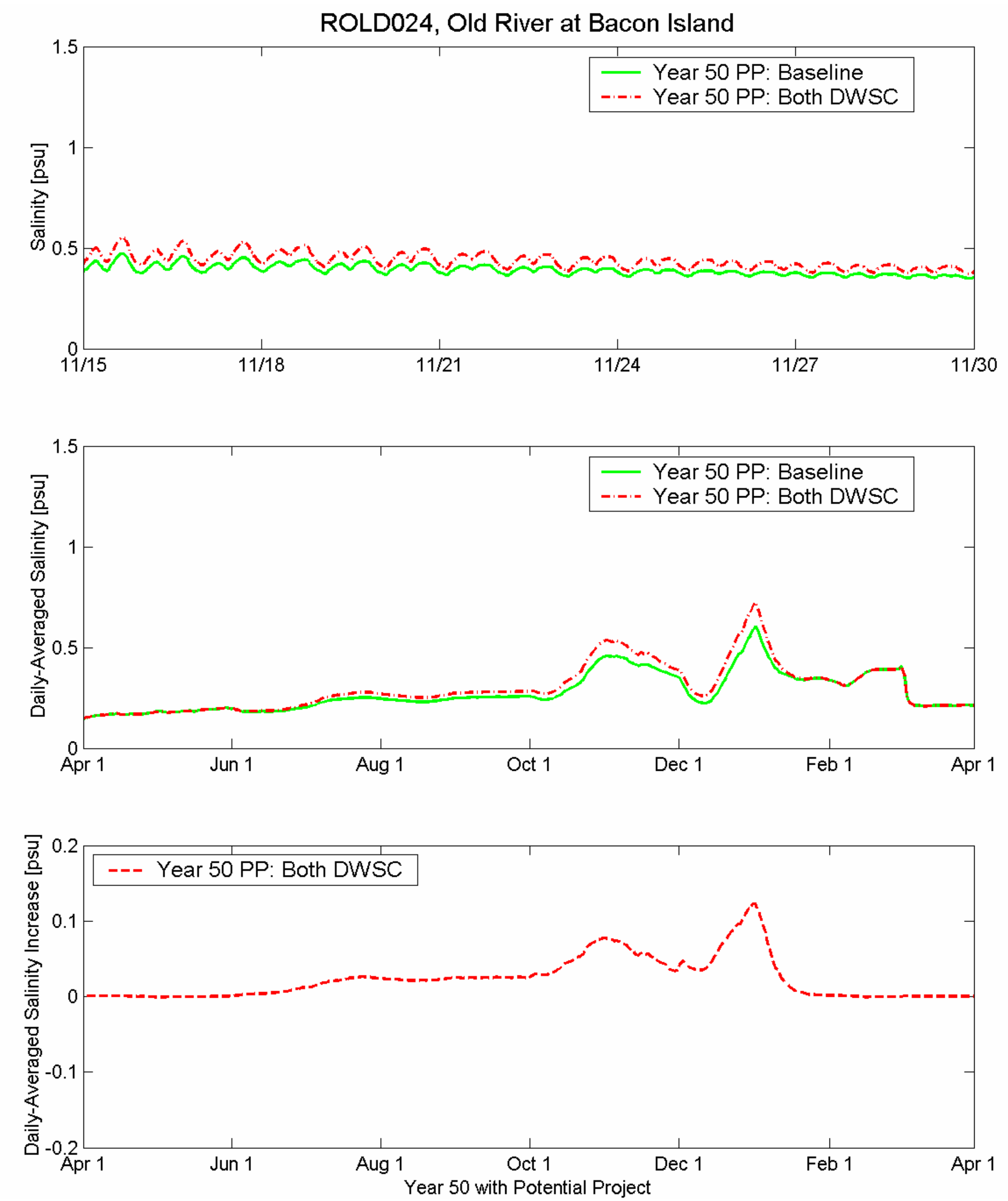


Figure 6.5-17 Predicted salinity at Old River at Bacon Island (ROLD024) for the Year 50 with Potential Project Baseline scenario and the Year 50 with Potential Project Both DWSC Deepening scenario: tidal time-scale variability over a 15-day period (top); daily-averaged salinity for the Year 50 with Potential Project simulation period (middle); predicted increase in daily-averaged salinity for the Year 50 with Potential Project Both DWSC Deepening scenario relative to the Year 50 with Potential Project Baseline scenario (bottom).

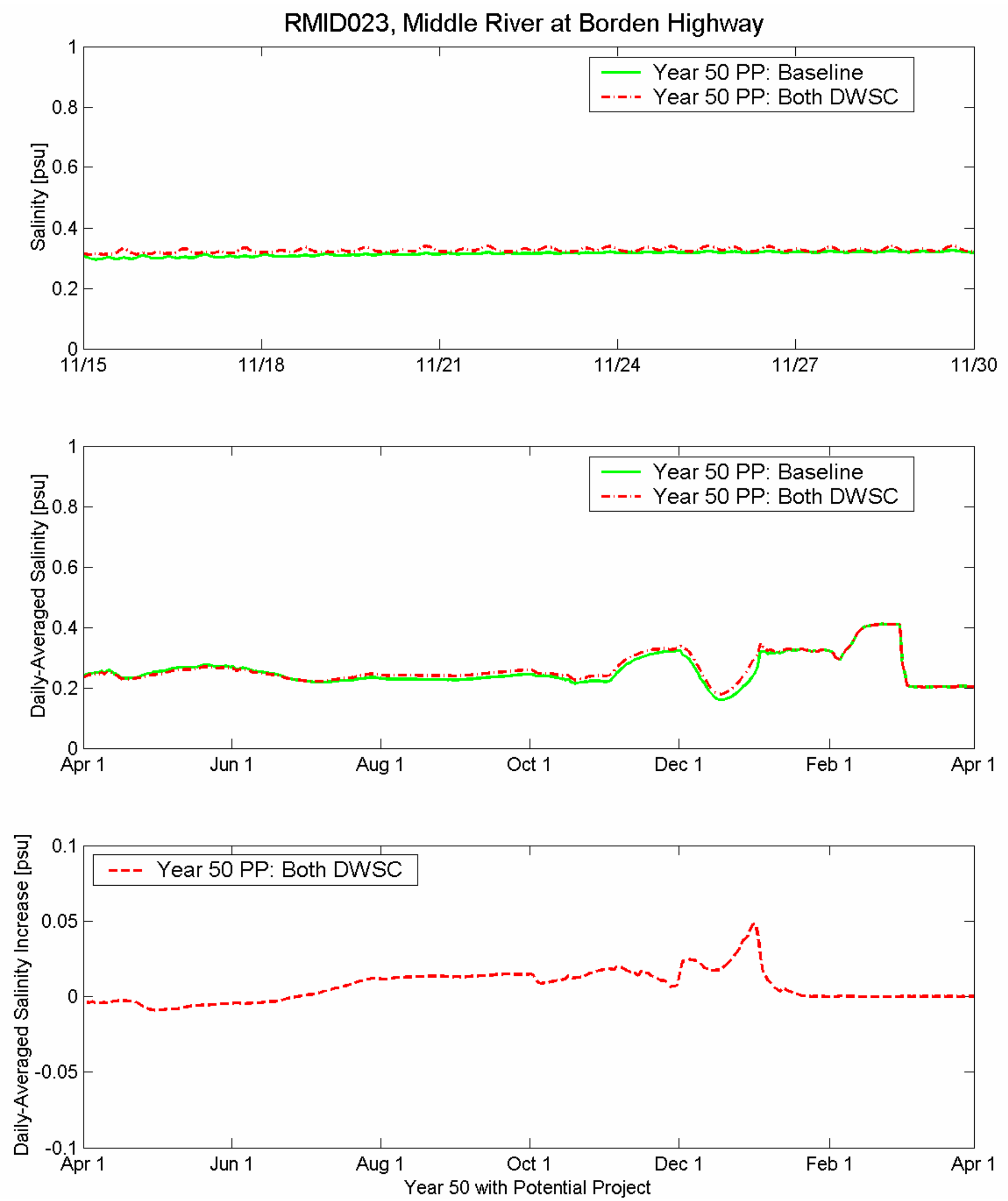


Figure 6.5-18 Predicted salinity at Middle River at Borden Highway (RMID023) for the Year 50 with Potential Project Baseline scenario and the Year 50 with Potential Project Both DWSC Deepening scenario: tidal time-scale variability over a 15-day period (top); daily-averaged salinity for the Year 50 with Potential Project simulation period (middle); predicted increase in daily-averaged salinity for the Year 50 with Potential Project Both DWSC Deepening scenario relative to the Year 50 with Potential Project Baseline scenario (bottom).

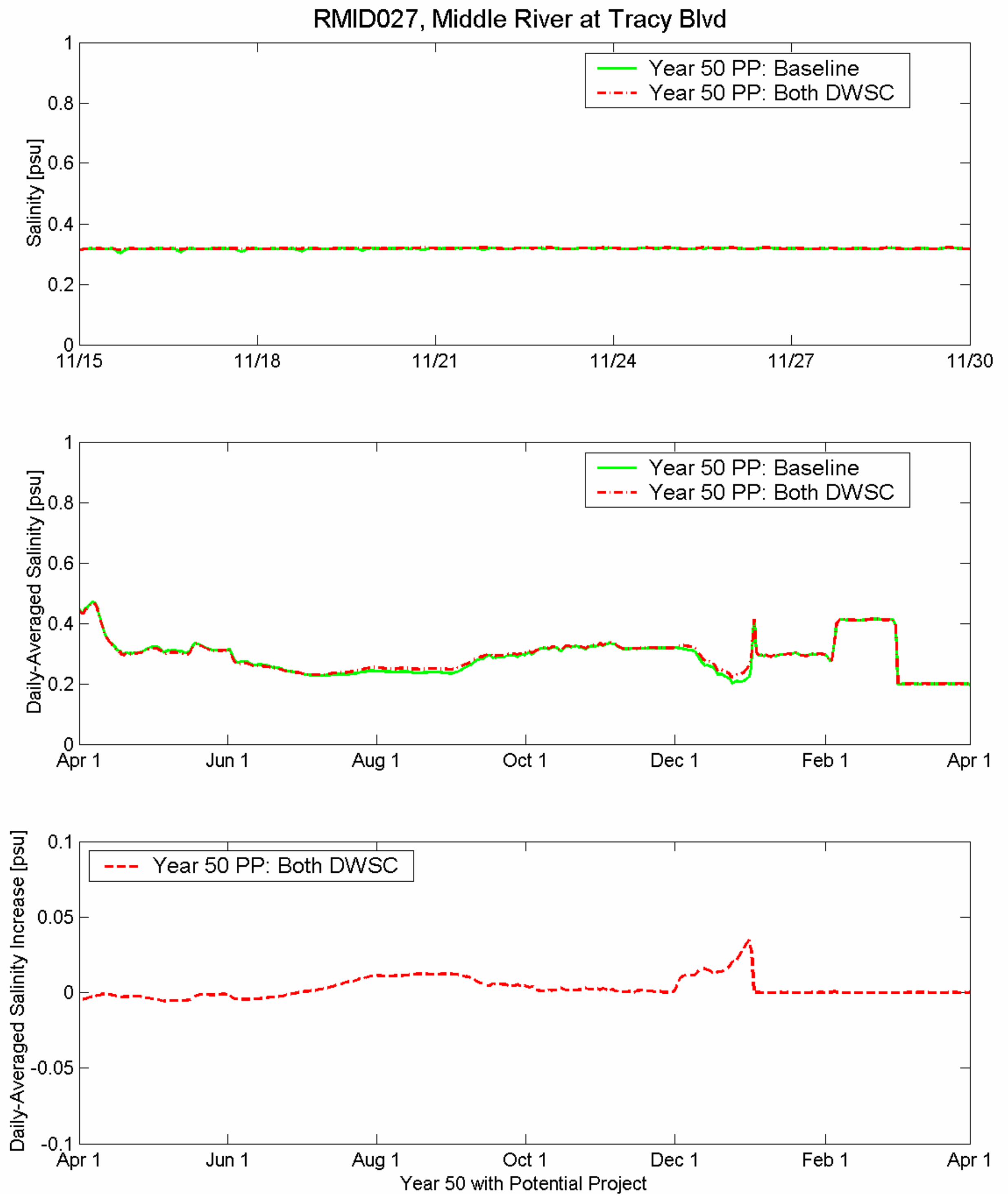


Figure 6.5-19 Predicted salinity at Middle River at Tracy Boulevard (RMID027) for the Year 50 with Potential Project Baseline scenario and the Year 50 with Potential Project Both DWSC Deepening scenario: tidal time-scale variability over a 15-day period (top); daily-averaged salinity for the Year 50 with Potential Project simulation period (middle); predicted increase in daily-averaged salinity for the Year 50 with Potential Project Both DWSC Deepening scenario relative to the Year 50 with Potential Project Baseline scenario (bottom).

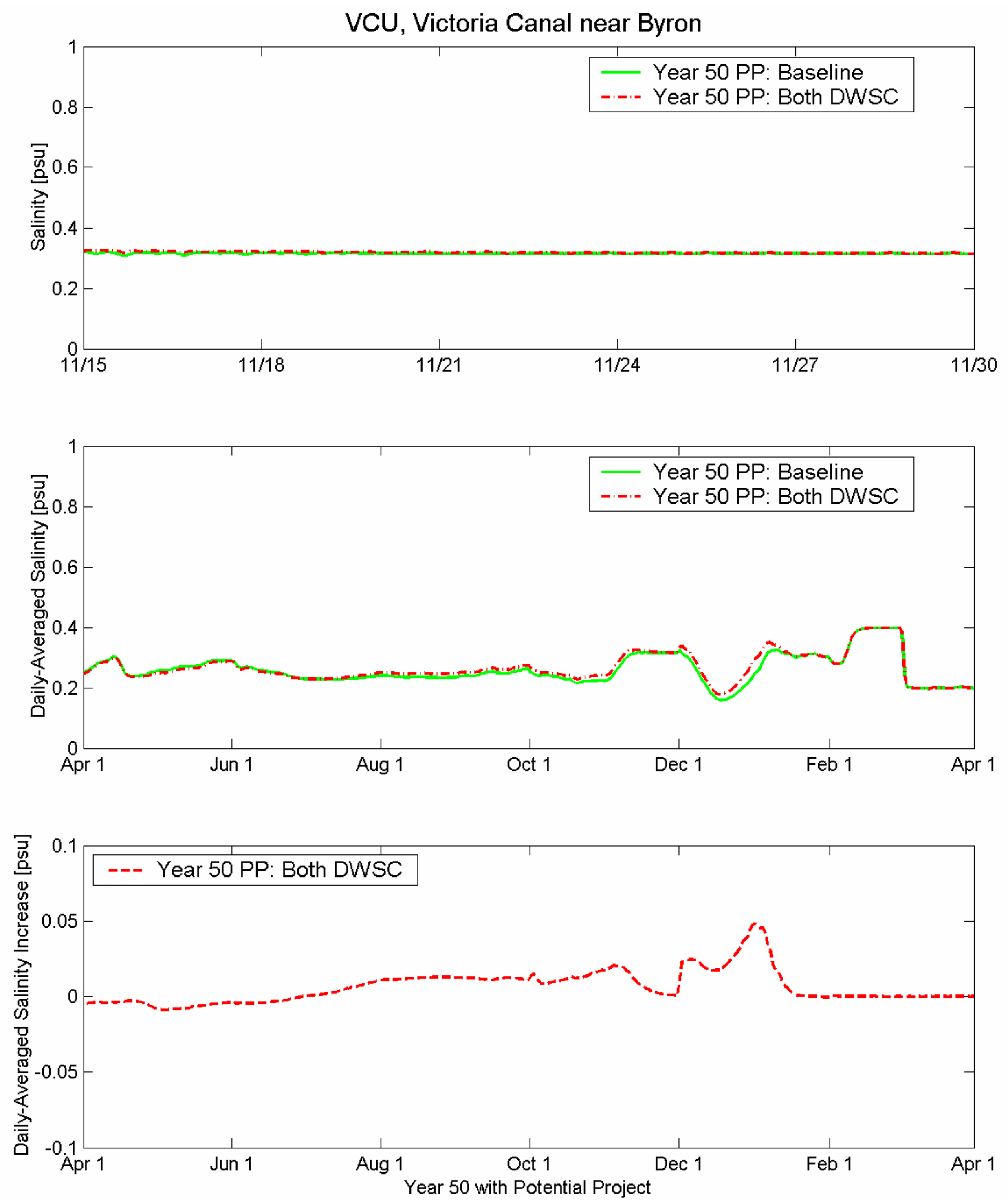


Figure 6.5-20 Predicted salinity at Victoria Canal near Byron (VCU) for the Year 50 with Potential Project Baseline scenario and the Year 50 with Potential Project Both DWSC Deepening scenario: tidal time-scale variability over a 15-day period (top); daily-averaged salinity for the Year 50 with Potential Project simulation period (middle); predicted increase in daily-averaged salinity for the Year 50 with Potential Project Both DWSC Deepening scenario relative to the Year 50 with Potential Project Baseline scenario (bottom).

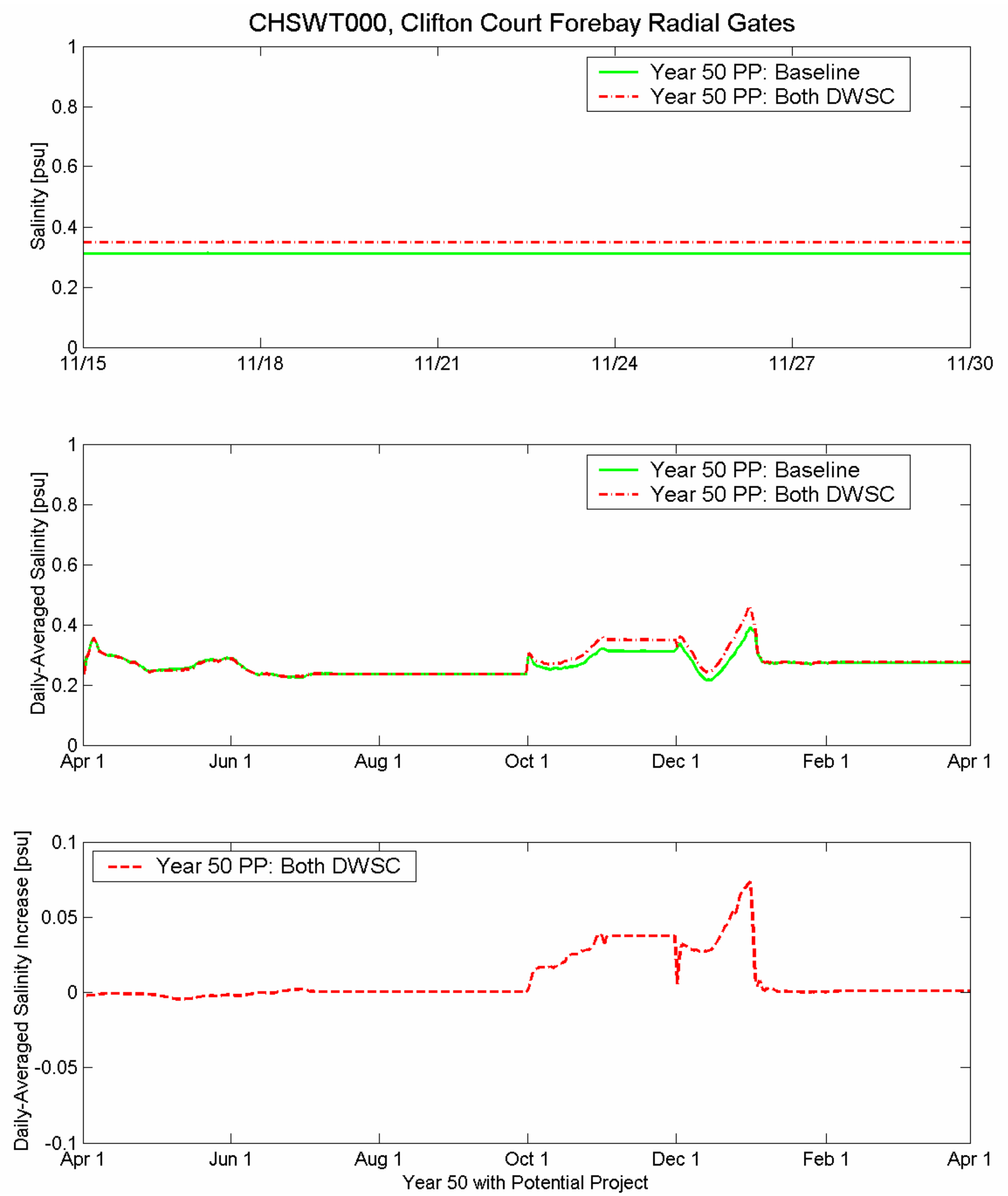


Figure 6.5-21 Predicted salinity at Clifton Court Forebay Radial Gates (CHWST000) for the Year 50 with Potential Project Baseline scenario and the Year 50 with Potential Project Both DWSC Deepening scenario: tidal time-scale variability over a 15-day period (top); daily-averaged salinity for the Year 50 with Potential Project simulation period (middle); predicted increase in daily-averaged salinity for the Year 50 with Potential Project Both DWSC Deepening scenario relative to the Year 50 with Potential Project Baseline scenario (bottom).

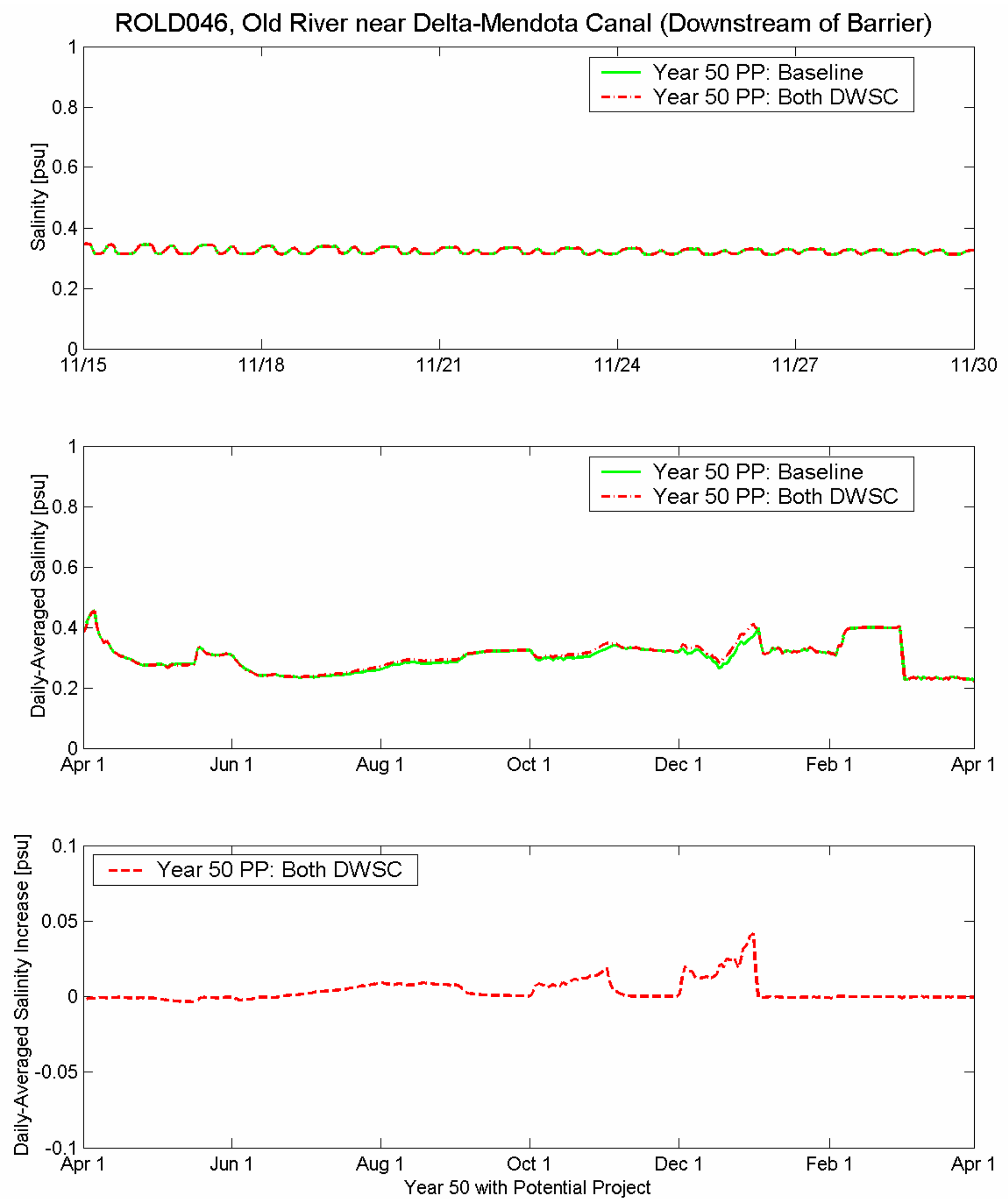


Figure 6.5-22 Predicted salinity at Old River near Delta-Mendota Canal Downstream of Barrier (ROLD046) for the Year 50 with Potential Project Baseline scenario and the Year 50 with Potential Project Both DWSC Deepening scenario: tidal time-scale variability over a 15-day period (top); daily-averaged salinity for the Year 50 with Potential Project simulation period (middle); predicted increase in daily-averaged salinity for the Year 50 with Potential Project Both DWSC Deepening scenario relative to the Year 50 with Potential Project Baseline scenario (bottom).

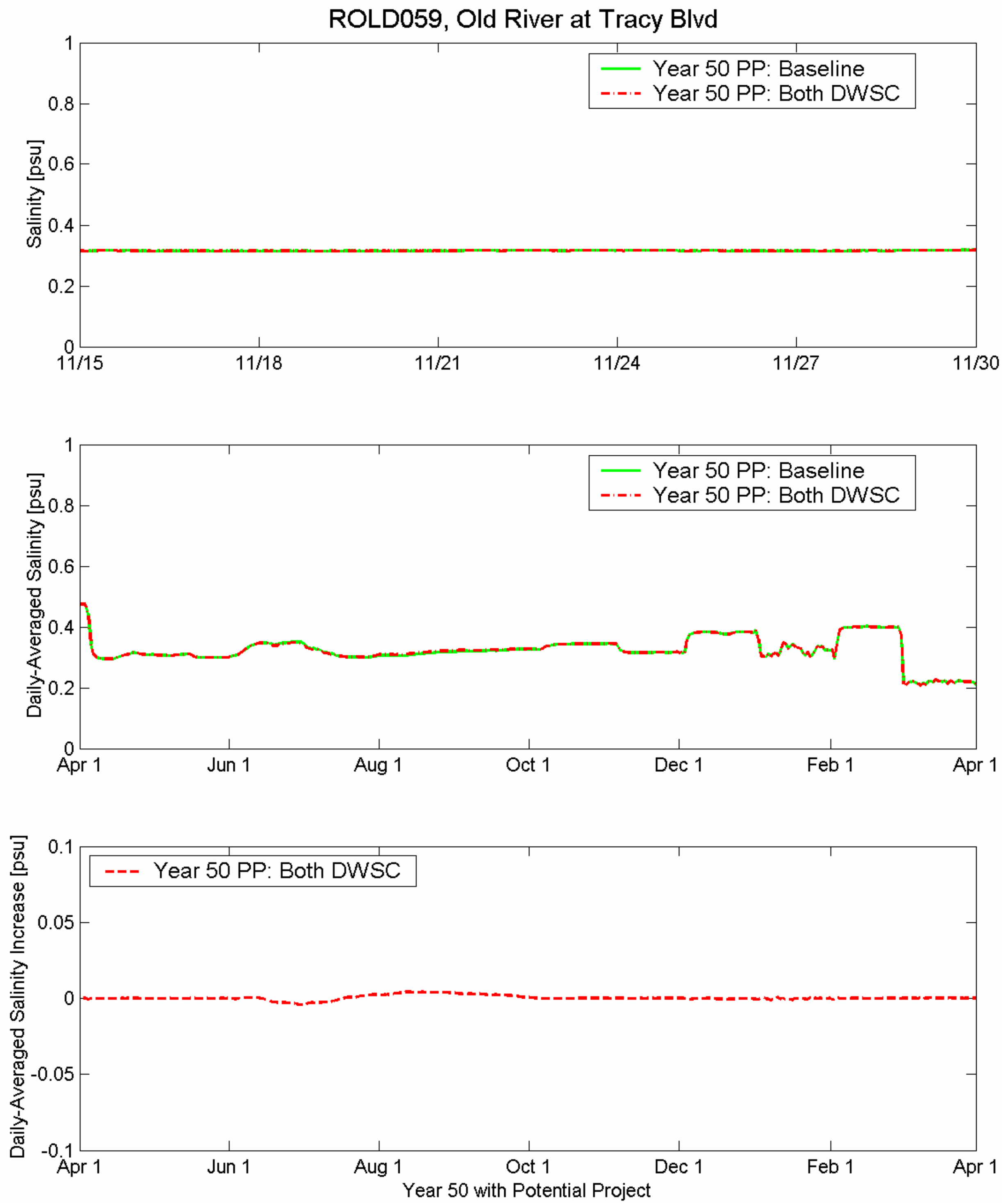


Figure 6.5-23 Predicted salinity at Old River at Tracy Boulevard (ROLD059) for the Year 50 with Potential Project Baseline scenario and the Year 50 with Potential Project Both DWSC Deepening scenario: tidal time-scale variability over a 15-day period (top); daily-averaged salinity for the Year 50 with Potential Project simulation period (middle); predicted increase in daily-averaged salinity for the Year 50 with Potential Project Both DWSC Deepening scenario relative to the Year 50 with Potential Project Baseline scenario (bottom).

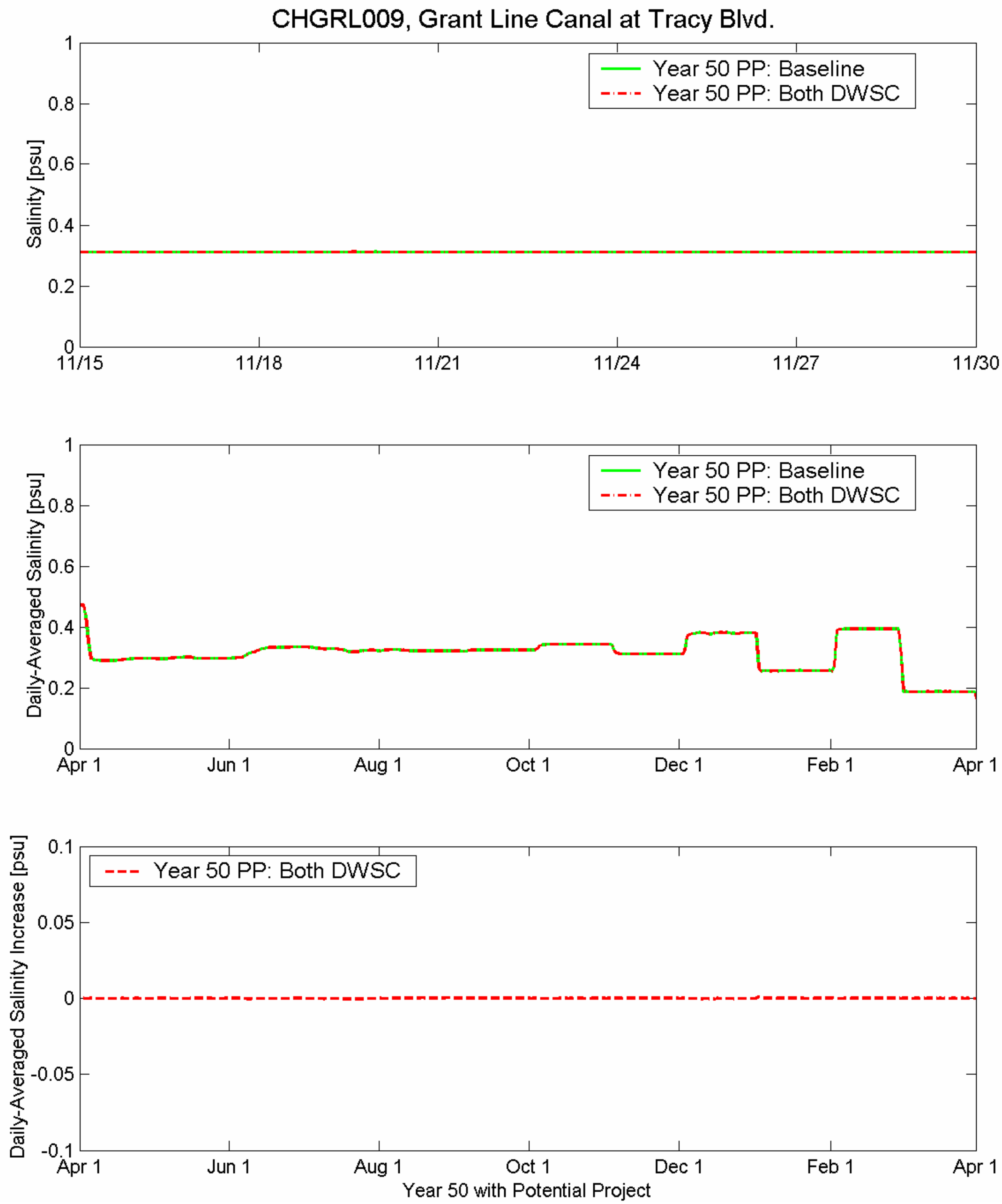


Figure 6.5-24 Predicted salinity at Grant Line Canal at Tracy Boulevard (CHGRL009) for the Year 50 with Potential Project Baseline scenario and the Year 50 with Potential Project Both DWSC Deepening scenario: tidal time-scale variability over a 15-day period (top); daily-averaged salinity for the Year 50 with Potential Project simulation period (middle); predicted increase in daily-averaged salinity for the Year 50 with Potential Project Both DWSC Deepening scenario relative to the Year 50 with Potential Project Baseline scenario (bottom).

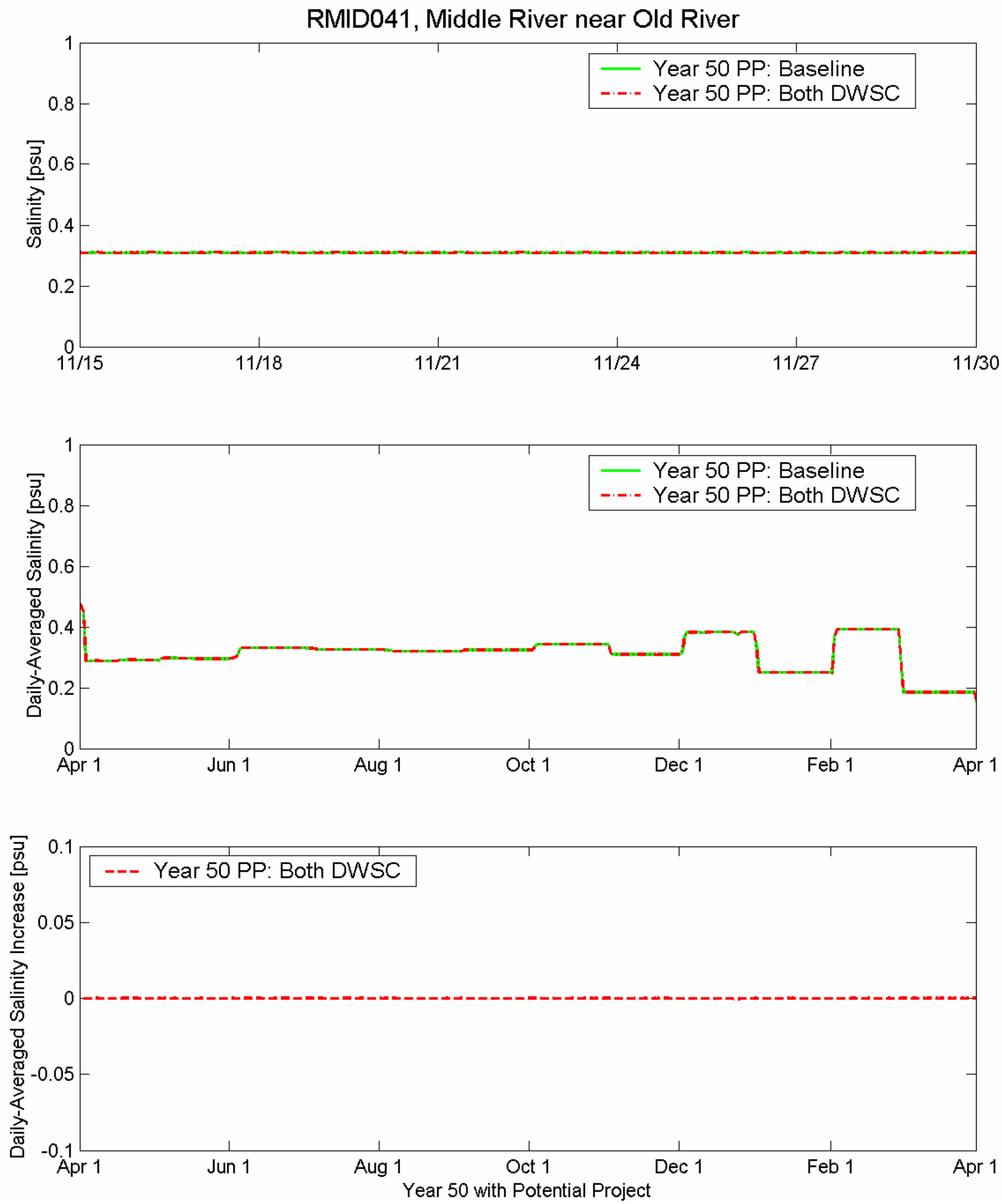


Figure 6.5-25 Predicted salinity at Middle River near Old River (RMID041) for the Year 50 with Potential Project Baseline scenario and the Year 50 with Potential Project Both DWSC Deepening scenario: tidal time-scale variability over a 15-day period (top); daily-averaged salinity for the Year 50 with Potential Project simulation period (middle); predicted increase in daily-averaged salinity for the Year 50 with Potential Project Both DWSC Deepening scenario relative to the Year 50 with Potential Project Baseline scenario (bottom).

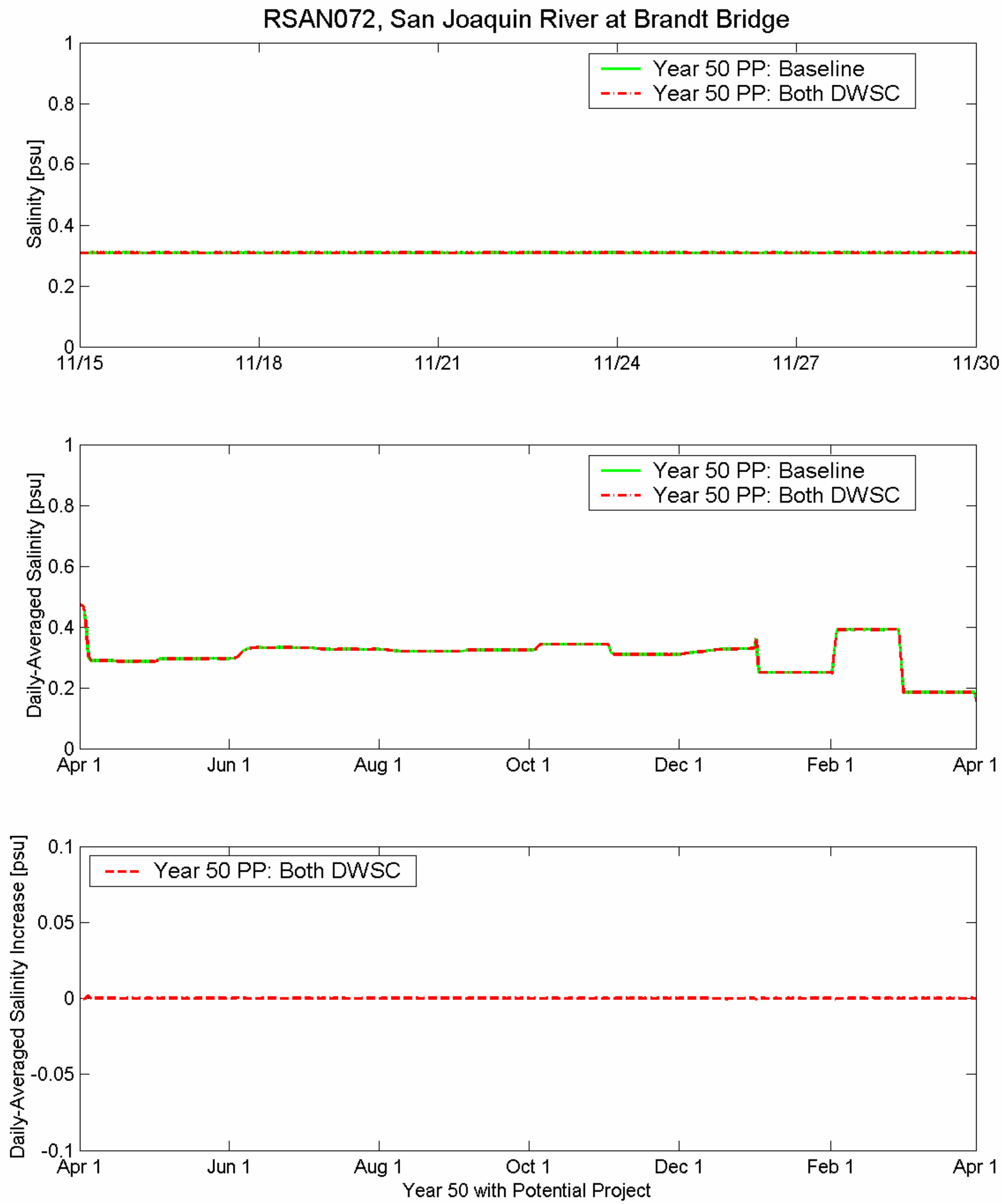


Figure 6.5-26 Predicted salinity at San Joaquin River at Brandt Bridge (RSAN072) for the Year 50 with Potential Project Baseline scenario and the Year 50 with Potential Project Both DWSC Deepening scenario: tidal time-scale variability over a 15-day period (top); daily-averaged salinity for the Year 50 with Potential Project simulation period (middle); predicted increase in daily-averaged salinity for the Year 50 with Potential Project Both DWSC Deepening scenario relative to the Year 50 with Potential Project Baseline scenario (bottom).

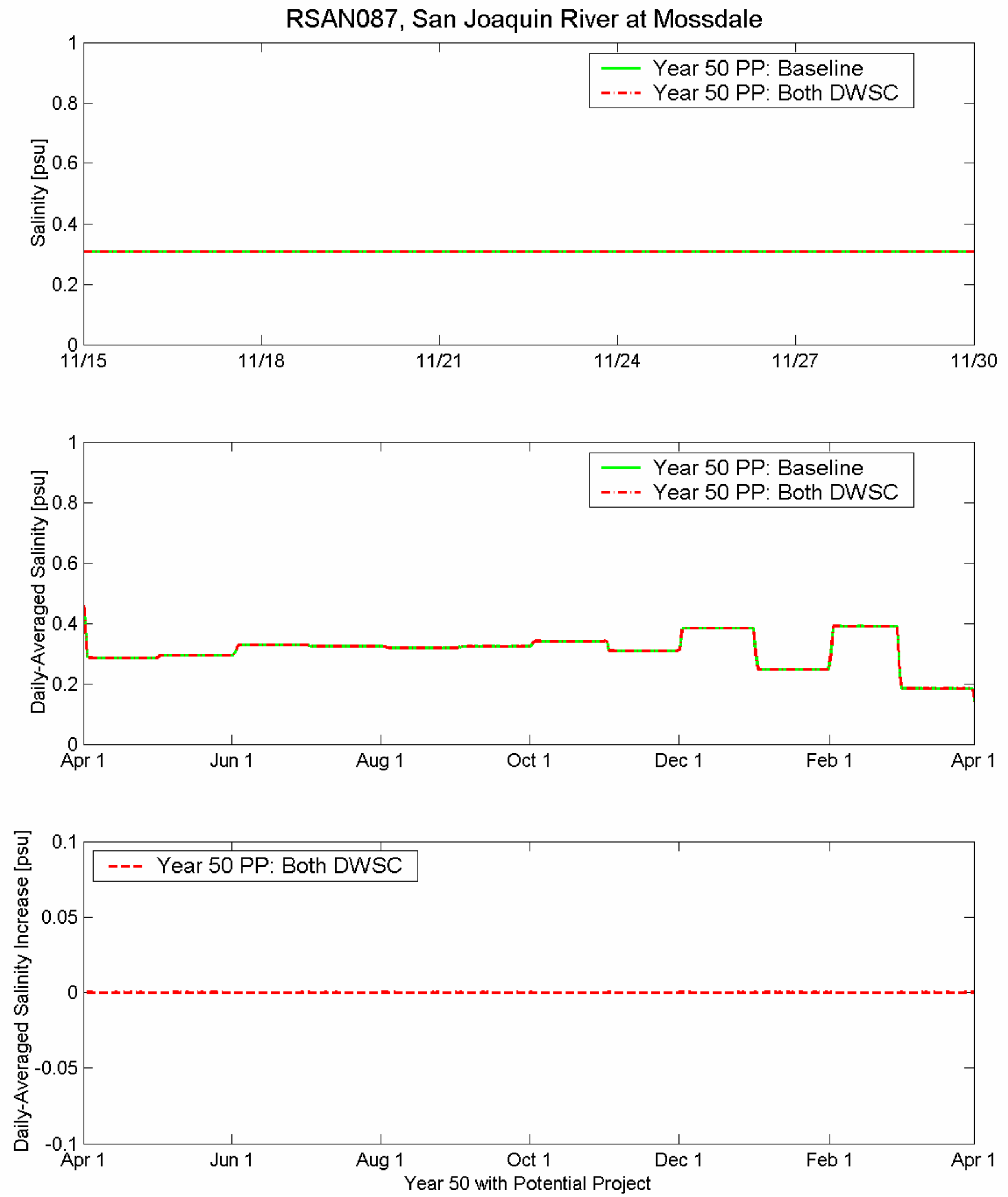


Figure 6.5-27 Predicted salinity at San Joaquin River at Mossdale (RSAN087) for the Year 50 with Potential Project Baseline scenario and the Year 50 with Potential Project Both DWSC Deepening scenario: tidal time-scale variability over a 15-day period (top); daily-averaged salinity for the Year 50 with Potential Project simulation period (middle); predicted increase in daily-averaged salinity for the Year 50 with Potential Project Both DWSC Deepening scenario relative to the Year 50 with Potential Project Baseline scenario (bottom).

6.6 Year 50 with Potential Project Impact of Both Sacramento DWSC & SF Bay to Stockton DWSC Deepening on D-1641 Water Quality Objectives

Section 3.4 presents the water quality objectives for municipal and industrial, agricultural, and fish and wildlife beneficial uses stipulated by D-1641. The performance of the Year 50 with Potential Project Baseline scenario and the Year 50 with Potential Project Both DWSC Deepening scenario simulations in meeting these water quality objectives is presented in this section.

6.6.1 Water Quality Objectives for Municipal and Industrial Beneficial Use

The D-1641 water quality objectives for municipal and industrial beneficial uses, shown in Table 3-1, are based on concentration of Cl^- at water export locations, shown on Figure 3.4-1. The first set of standards stipulate the number of days that daily mean salinity must be less than 150 mg/l either at Contra Costa Canal at Pumping Plant #1, or at the Antioch Water Works intake. The minimum number of days that this objective should be met ranges from 155 days for a "critical" water year to 240 days for a "wet" water year.

Water year 1994 (from October 1, 1993 through September 30, 1994) was classified as a "critical" year, the lowest flow classification, on both the Sacramento River and San Joaquin River. Water Year 1995 (from October 1, 1994 through September 30, 1995) was classified as a "wet" year, the highest flow classification, on both the Sacramento River and the San Joaquin River (DWR, 2009b). As a result, the Year 50 with Potential Project simulation year spans part of a "critical" year and part of a "wet" water year on the Sacramento River.

Figure 6.6-1 shows the number of days that the maximum mean daily concentration of Cl^- is less than 150 mg/l at CHCCC06 and RSAN007. To meet the "critical year" water quality objective, the number of days that mean daily concentration of Cl^- is less than 150 mg/l should exceed 155 days at either CHCCC06 or RSAN007. At CHCCC06, the mean daily concentration of Cl^- is less than 150 mg/l for 216 days under the Year 50 with Potential Project Baseline scenario and 211 days for the Year 50 with Potential Project Both DWSC Deepening scenario (a decrease of 5 days relative to the Year 50 with Potential Project Baseline scenario). At RSAN007, the mean daily concentration of Cl^- is less than 150 mg/l for 91 days under the Year 50 with Potential Project Baseline scenario and 83 days for the Year 50 with Potential Project Both DWSC Deepening scenario (a decrease of 8 days relative to the Year 50 with Potential Project Baseline scenario). Since this standard stipulates that daily mean salinity must be less than 150 mg/l for at least 155 days either at Contra Costa Canal at Pumping Plant #1, or at the Antioch Water Works intake, this standard is met for both the Year 50 with Potential Project Baseline scenario and the Year 50 with Potential Project Both DWSC Deepening scenario since this water quality standard is met at CHCCC06 under both scenarios.

The second set of D-1641 water quality objectives for municipal and industrial beneficial use stipulate a maximum allowable concentration of Cl^- at the municipal water intakes. The D-1641 standards stipulate this objective for Contra Costa Canal at Pumping Plant #1, West Canal at mouth of Clifton Court Forebay, Delta-Mendota Canal at Tracy Pumping Plant, Barker Slough at

North Bay Aqueduct Intake, and Cache Slough at City of Vallejo Intake (Table 3-3). For the purposes of this study, this standard is also evaluated at the CCWD intake on Old River (ROLD304), and at the CCWD alternative intake point (AIP) on Victoria Canal.

Figure 6.6-2 shows the predicted mean daily chloride concentration at the Contra Costa Rock Slough Export for the Year 50 with Potential Project Baseline scenario and the Year 50 with Potential Project Both DWSC Deepening scenario. Increases in chloride concentration under the Year 50 with Potential Project Both DWSC Deepening scenario are predicted from July through January. Under the Year 50 with Potential Project Baseline scenario the water quality objective of 250 mg/l Cl^- is exceeded for 13 days in January and 2 days in January. Under the Year 50 with Potential Project Both DWSC Deepening scenario, the water quality objective of 250 mg/l Cl^- is exceeded for 17 days during January (an increase of 4 days) and 2 days during March (no change relative to Year 50 with Potential Project Baseline). Thus the Year 50 with Potential Project Both DWSC Deepening scenario results in a total increase of 4 days that the water quality objective of 250 mg/l Cl^- is exceeded at the Contra Costa Rock Slough Export, relative to the Year 50 with Potential Project Baseline scenario.

Figure 6.6-3 shows the predicted mean daily chloride concentration at West Canal at mouth of Clifton Court Forebay for the Year 50 with Potential Project Baseline scenario and the Year 50 with Potential Project Both DWSC Deepening scenario. Increases in chloride concentration under the Year 50 with Potential Project Both DWSC Deepening scenario are predicted from October through January. The water quality objective of maximum mean daily concentration of 250 mg/l Cl^- is not exceeded at West Canal at mouth of Clifton Court Forebay under either the Year 50 with Potential Project Baseline or the Year 50 with Potential Project Both DWSC Deepening scenario.

Figure 6.6-4 shows the predicted mean daily chloride concentration at the Delta-Mendota Canal at Tracy Pumping Plant for the Year 50 with Potential Project Baseline scenario and the Year 50 with Potential Project Both DWSC Deepening scenario. Increases in chloride concentration under the Year 50 with Potential Project Both DWSC Deepening scenario are predicted from October through January. The water quality objective of maximum mean daily concentration of 250 mg/l Cl^- is not exceeded at Delta-Mendota Canal at Tracy Pumping Plant under either the Year 50 with Potential Project Baseline or the Year 50 with Potential Project Both DWSC Deepening scenario.

Figure 6.6-5 shows the predicted mean daily chloride concentration in Barker Slough at North Bay Aqueduct Intake for the Year 50 with Potential Project Baseline scenario and the Year 50 with Potential Project Both DWSC Deepening scenario. The predicted mean daily chloride concentration is nearly identical for both scenarios, indicating that there is no predicted effect on chloride concentration in Barker Slough at the North Bay Aqueduct Intake resulting from the Year 50 with Potential Project Both DWSC Deepening scenario. The water quality objective of maximum mean daily concentration of 250 mg/l Cl^- is not exceeded under either the Year 50 with Potential Project Baseline or the Year 50 with Potential Project Both DWSC Deepening scenario.

Figure 6.6-6 shows the predicted mean daily chloride concentration in Cache Slough at City of Vallejo Intake for the Year 50 with Potential Project Baseline scenario and the Year 50 with Potential Project Both DWSC Deepening scenario. The predicted mean daily chloride concentration is nearly identical for both scenarios, indicating that there is no predicted effect on chloride concentration in Cache Slough at City of Vallejo Intake resulting from the Year 50 with Potential Project Both DWSC Deepening scenario. The water quality objective of maximum mean daily concentration of 250 mg/l Cl^- is not exceeded under either the Year 50 with Potential Project Baseline or the Year 50 with Potential Project Both DWSC Deepening scenario.

Figure 6.6-7 shows the predicted mean daily chloride concentration at the Contra Costa Old River Export for the Year 50 with Potential Project Baseline scenario and the Year 50 with Potential Project Both DWSC Deepening scenario. Increases in chloride concentration under the Year 50 with Potential Project Both DWSC Deepening scenario are predicted from October through January. Under the Year 50 with Potential Project Baseline scenario the water quality objective of 250 mg/l Cl^- is not exceeded on any days during the Year 50 with Potential project simulation period. Under the Year 50 with Potential Project Both DWSC Deepening scenario, the water quality objective of 250 mg/l Cl^- is exceeded for 3 days during December (an increase of 3 days) and 1 day during January (an increase of 1 day). Thus the Year 50 with Potential Project Both DWSC Deepening scenario results in a total increase of 4 days that the water quality objective of 250 mg/l Cl^- is exceeded at the Contra Costa Old River Export, relative to the Year 50 with Potential Project Baseline scenario.

Figure 6.6-8 shows the predicted mean daily chloride concentration at the Contra Costa Victoria Canal Alternative Intake Point for the Year 50 with Potential Project Baseline scenario and the Year 50 with Potential Project Both DWSC Deepening scenario. Increases in chloride concentration under the Year 50 with Potential Project Both DWSC Deepening scenario are predicted from August through December. The water quality objective of maximum mean daily concentration of 250 mg/l Cl^- is not exceeded at the Contra Costa Victoria Canal Alternative Intake Point under either the Year 50 with Potential Project Baseline or the Year 50 with Potential Project Both DWSC Deepening scenario.

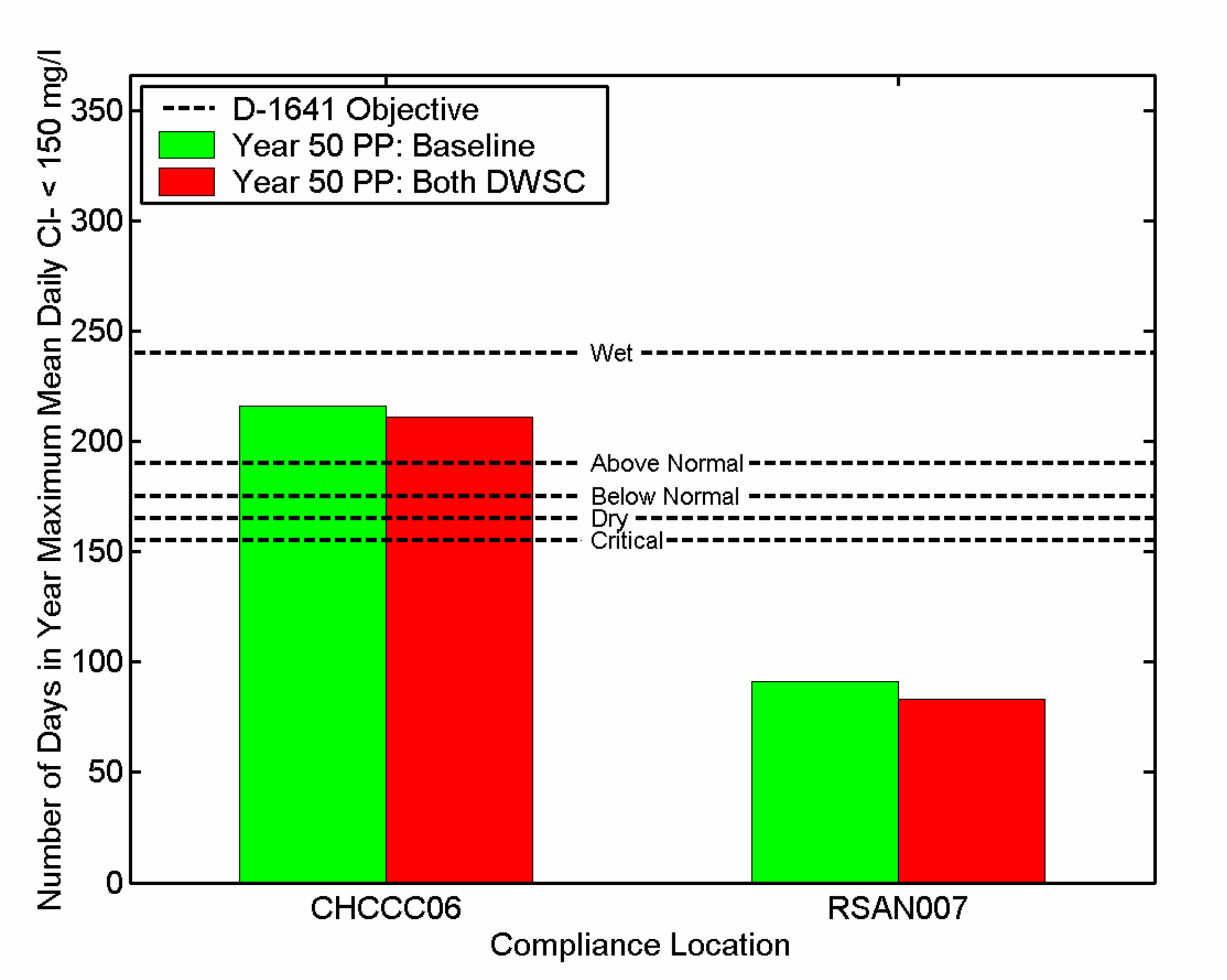


Figure 6.6-1 Number of days during the Year 50 with Potential Project simulation period that predicted mean daily concentration of Cl^- is less than 150 mg/l at Contra Costa Canal at Pumping Plant #1 (CHCCC06) and the Antioch Water Works intake (RSAN007) for the Year 50 with Potential Project Baseline scenario and the Year 50 with Potential Project Both DWSC Deepening scenario.

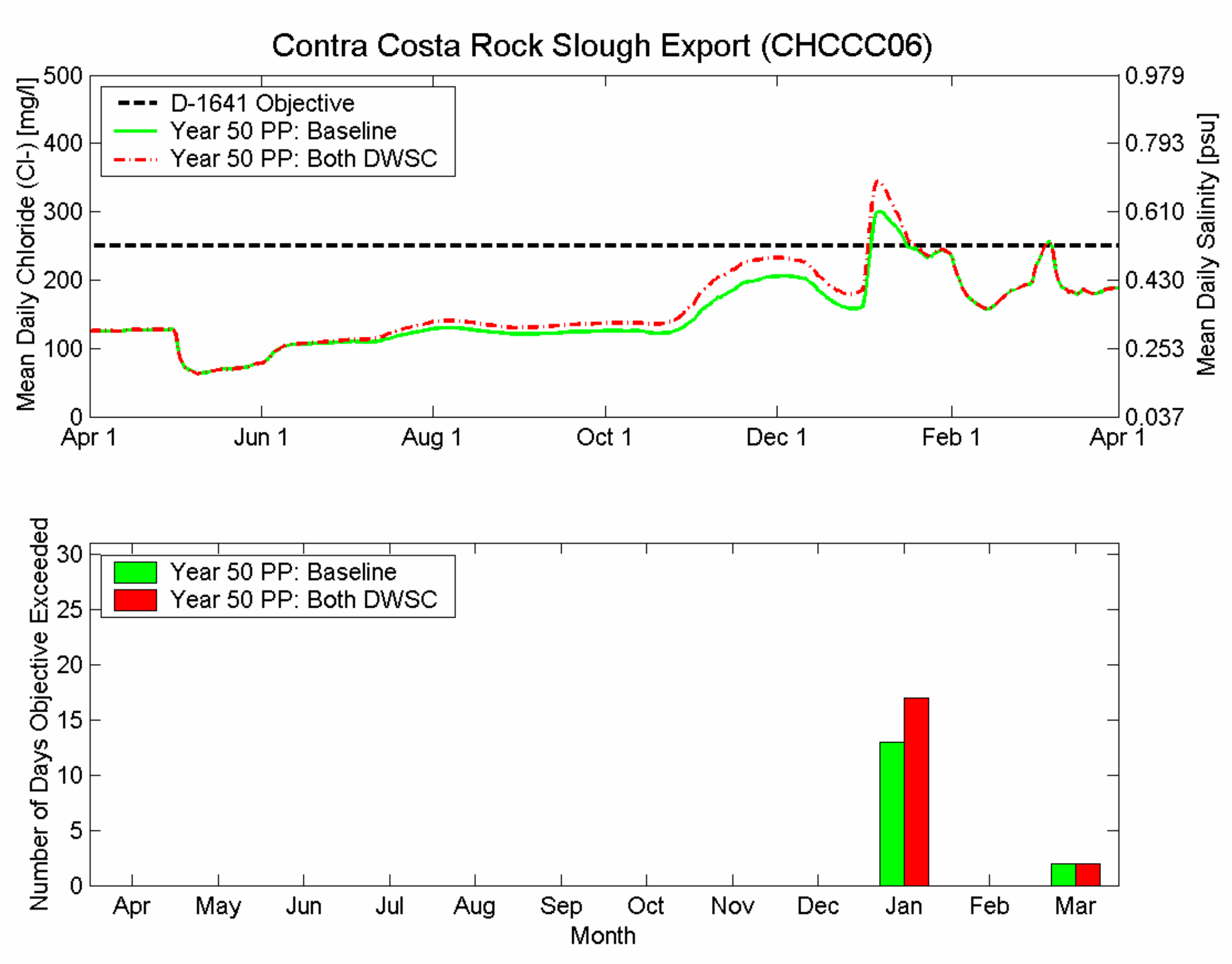


Figure 6.6-2 Predicted mean daily Cl^- concentration at Contra Costa Rock Slough Export (CHCCC06) for the Year 50 with Potential Project Baseline scenario and the Year 50 with Potential Project Both DWSC Deepening scenario (top); number of days each month that predicted mean daily concentration of Cl^- at CHCCC06 exceeds 250 mg/l Cl^- for each scenario during the Year 50 with Potential Project simulation period (bottom).

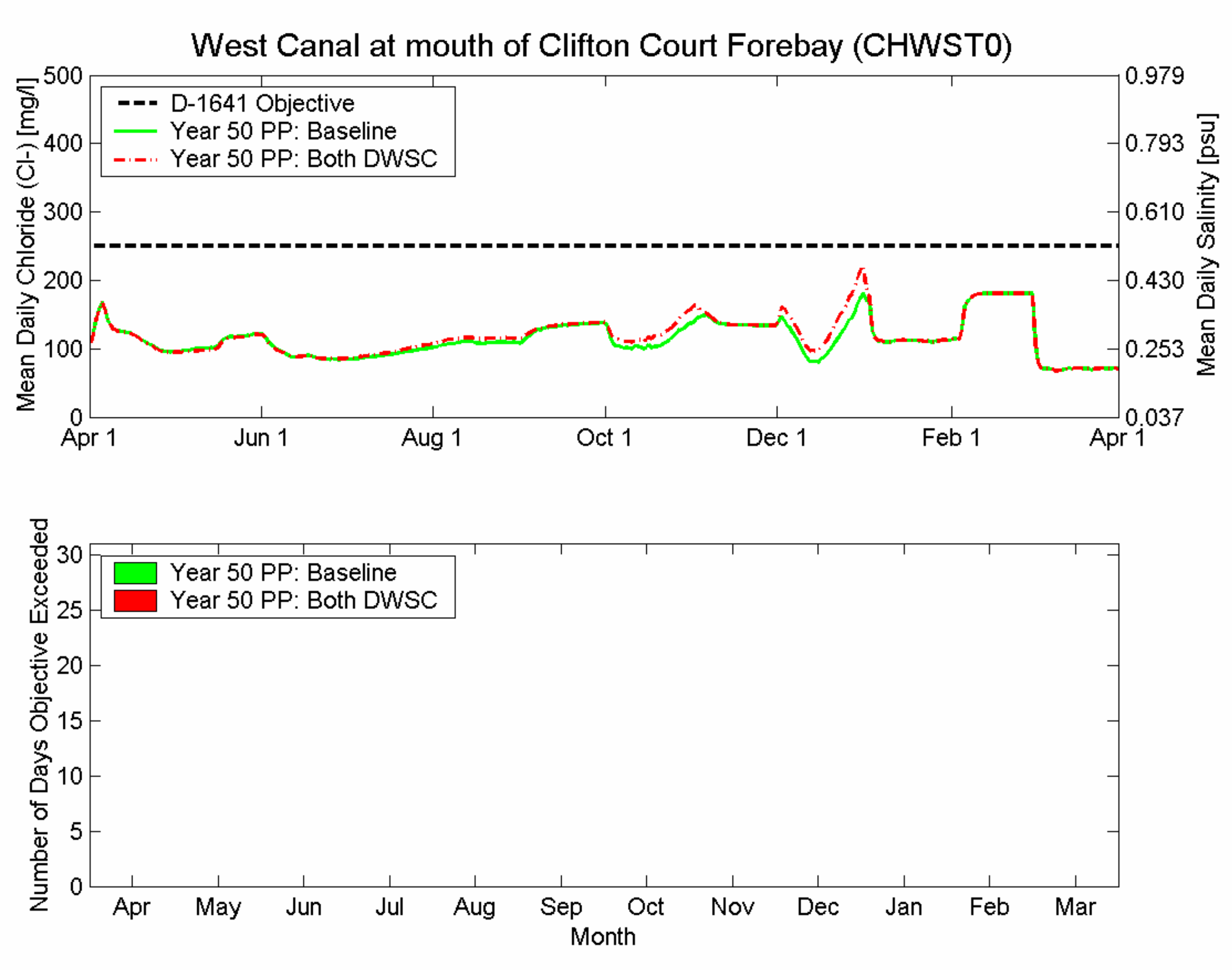


Figure 6.6-3 Predicted mean daily Cl^- concentration at West Canal at mouth of Clifton Court Forebay (CHWST0) for the Year 50 with Potential Project Baseline scenario and the Year 50 with Potential Project Both DWSC Deepening scenario (top); number of days each month that predicted mean daily concentration of Cl^- at CHWST0 exceeds 250 mg/l Cl^- for each scenario during the Year 50 with Potential Project simulation period (bottom).

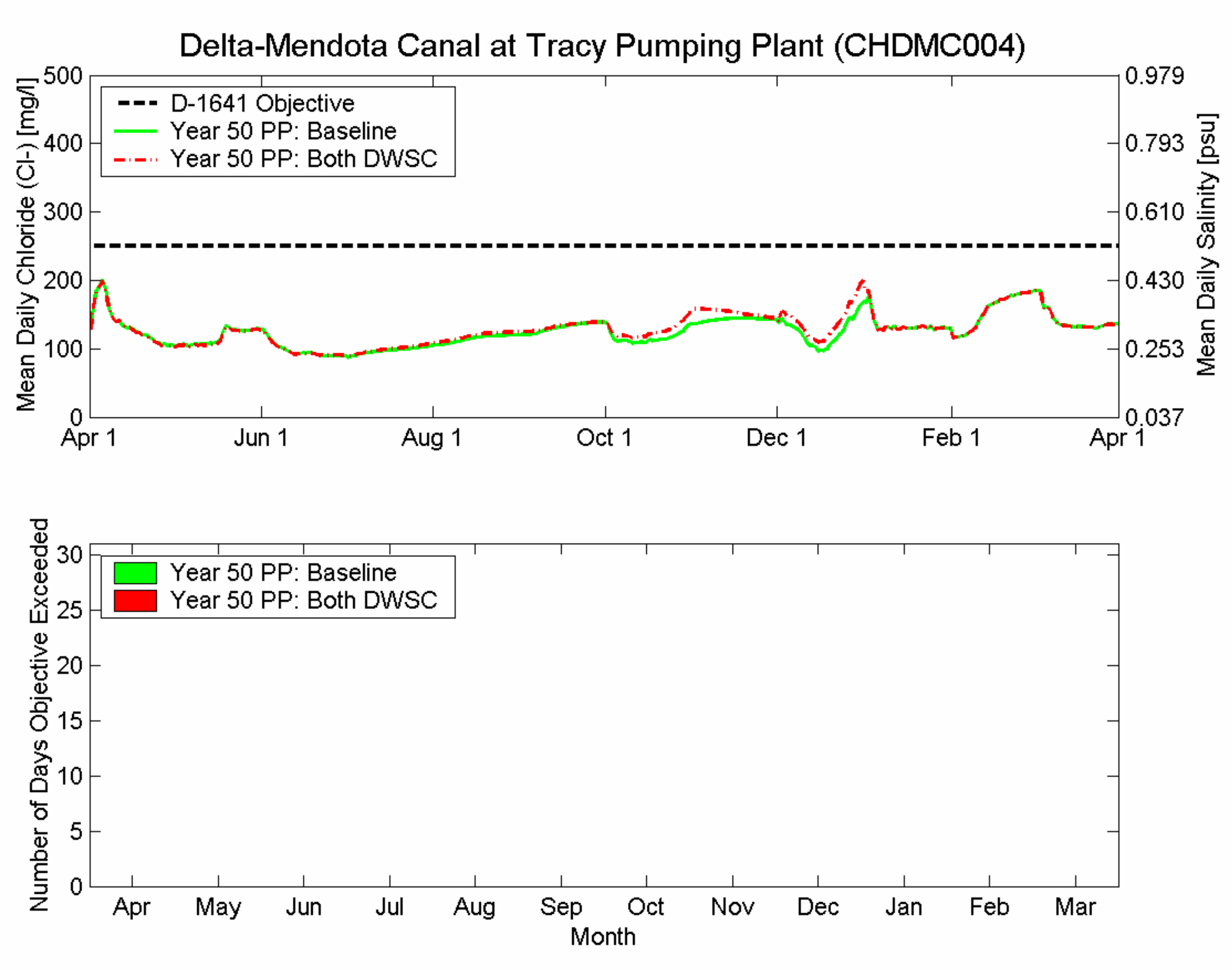


Figure 6.6-4 Predicted mean daily Cl^- concentration at Delta-Mendota Canal at Tracy Pumping Plant (CHDMC004) for the Year 50 with Potential Project Baseline scenario and the Year 50 with Potential Project Both DWSC Deepening scenario (top); number of days each month that predicted mean daily concentration of Cl^- at CHDMC004 exceeds 250 mg/l Cl^- for each scenario during the Year 50 with Potential Project simulation period (bottom).

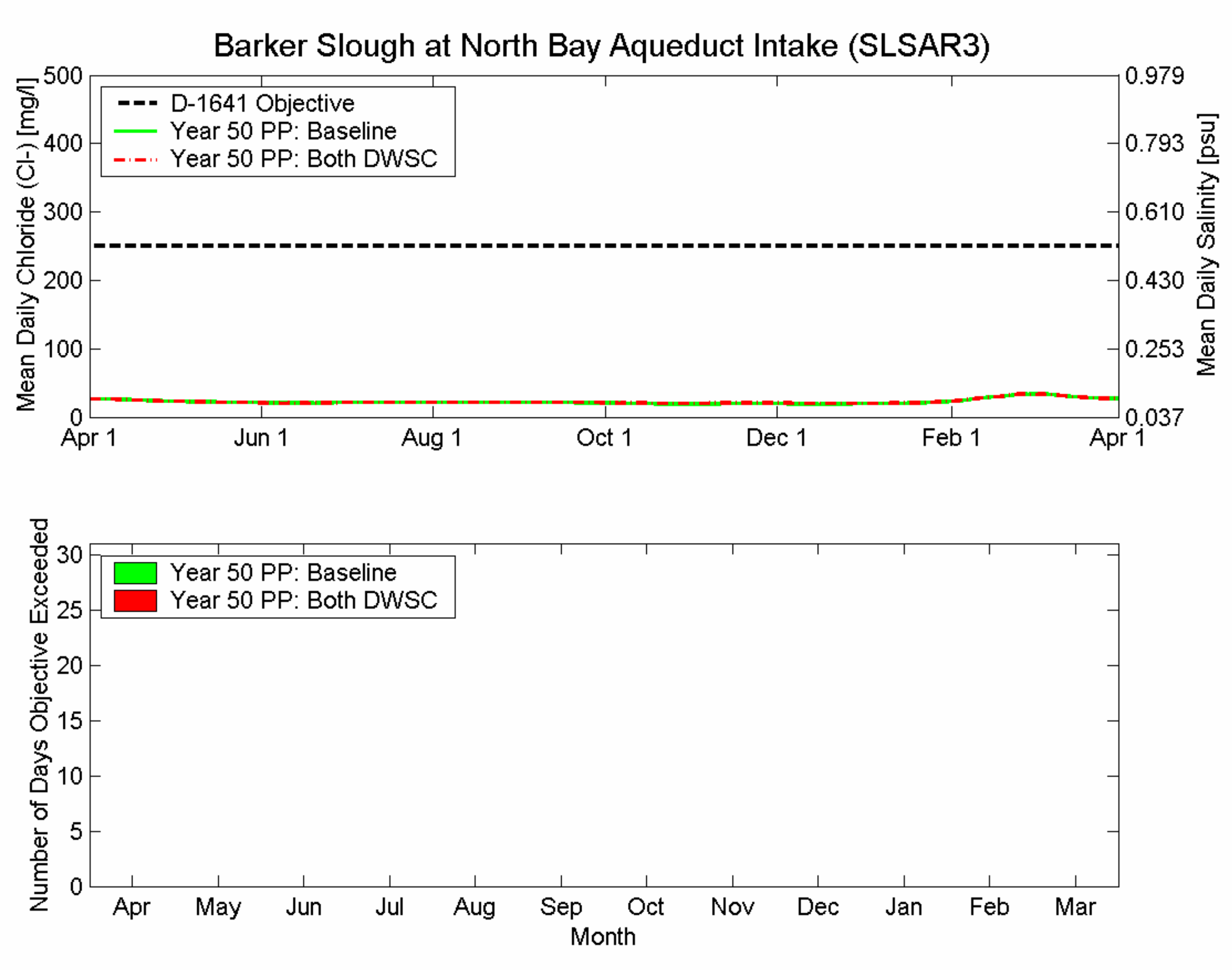


Figure 6.6-5 Predicted mean daily Cl^- concentration at Barker Slough at North Bay Aqueduct Intake (SLSAR3) for the Year 50 with Potential Project Baseline scenario and the Year 50 with Potential Project Both DWSC Deepening scenario (top); number of days each month that predicted mean daily concentration of Cl^- at SLSAR3 exceeds 250 mg/l Cl^- for each scenario during the Year 50 with Potential Project simulation period (bottom).

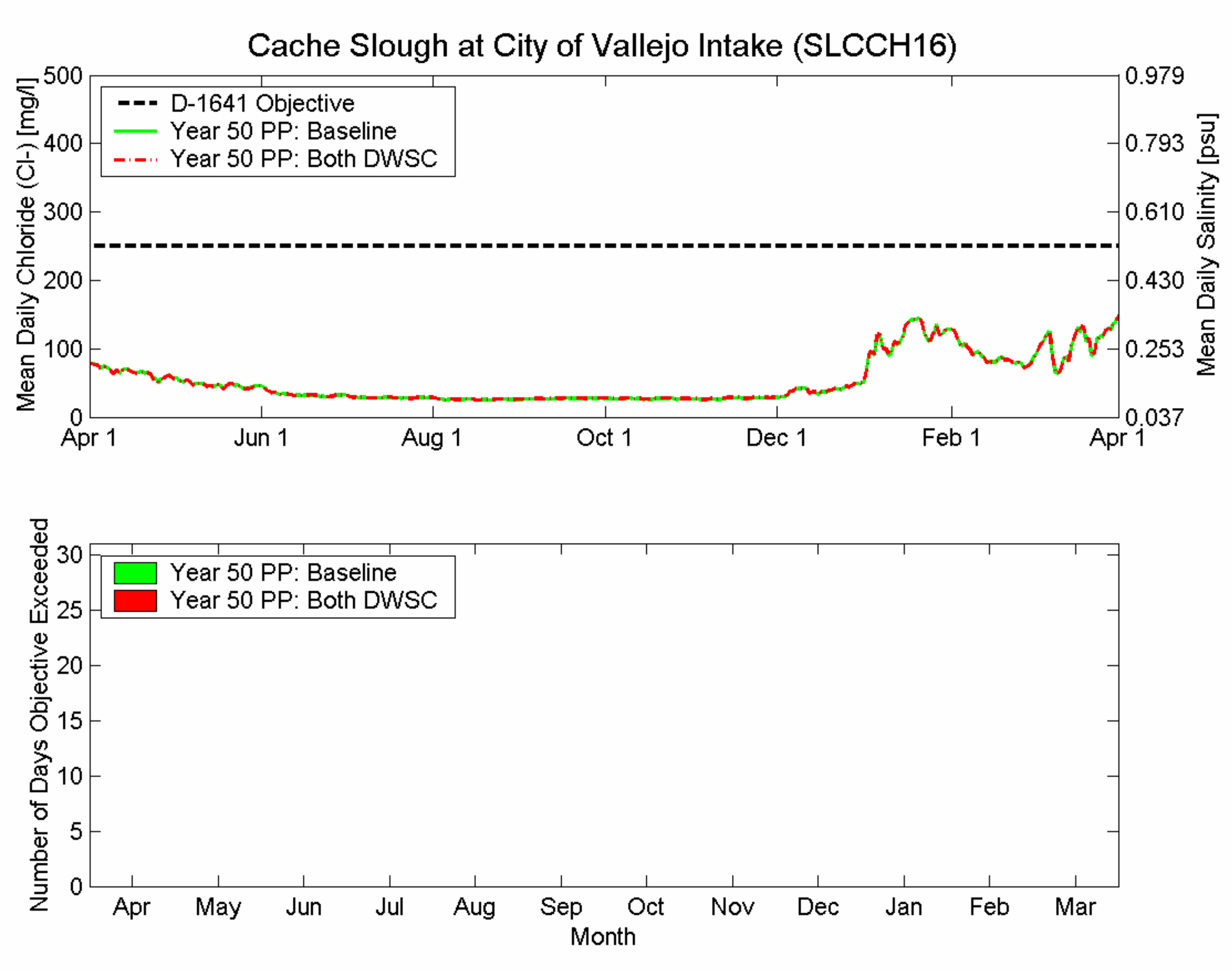


Figure 6.6-6 Predicted mean daily Cl^- concentration at Cache Slough at City of Vallejo Intake (SLCCH16) for the Year 50 with Potential Project Baseline scenario and the Year 50 with Potential Project Both DWSC Deepening scenario (top); number of days each month that predicted mean daily concentration of Cl^- at SLCCH16 exceeds 250 mg/l Cl^- for each scenario during the Year 50 with Potential Project simulation period (bottom).

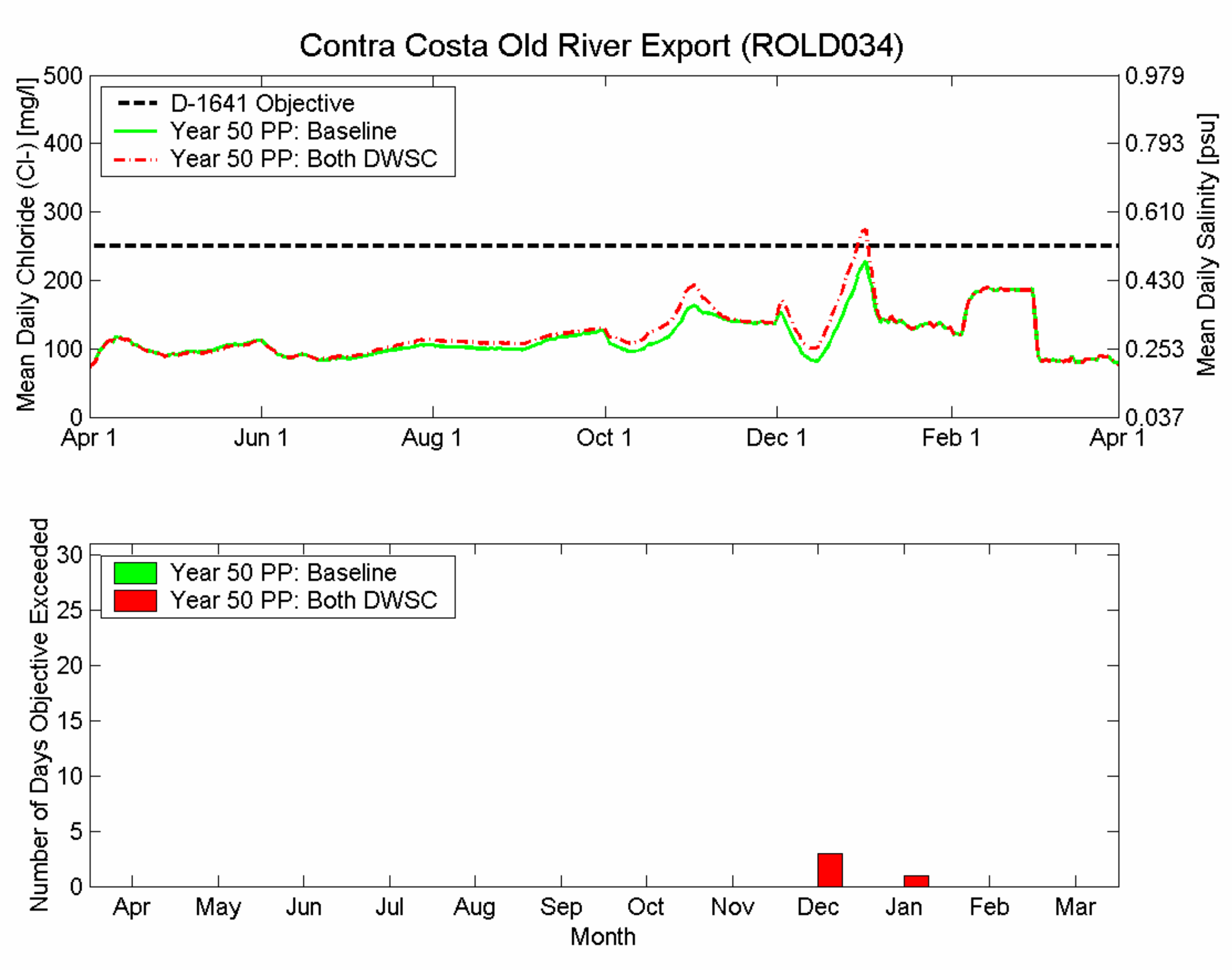


Figure 6.6-7 Predicted mean daily Cl^- concentration at Contra Costa Old River Export (ROLD034) for the Year 50 with Potential Project Baseline scenario and the Year 50 with Potential Project Both DWSC Deepening scenario (top); number of days each month that predicted mean daily concentration of Cl^- at ROLD034 exceeds 250 mg/l Cl^- for each scenario during the Year 50 with Potential Project simulation period (bottom).

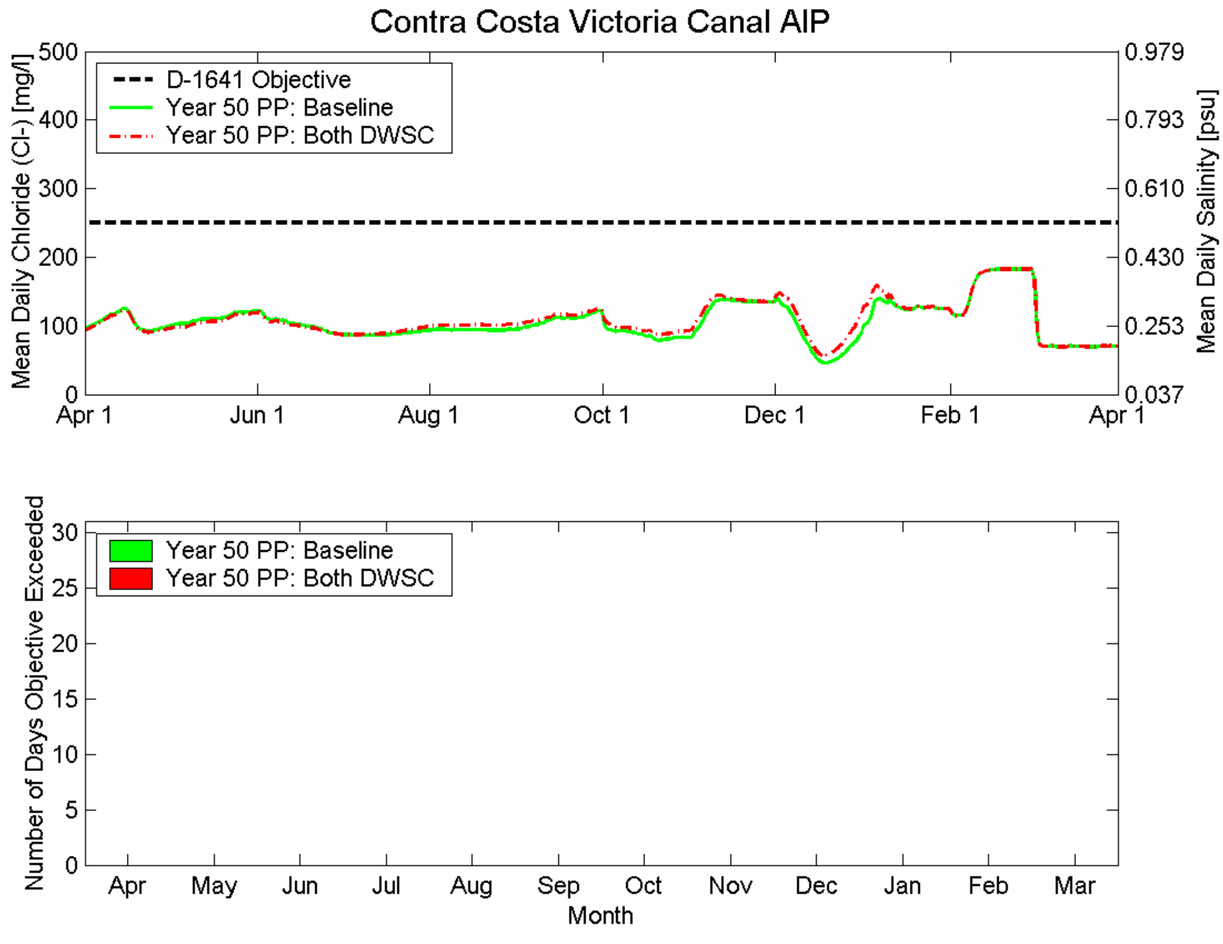


Figure 6.6-8 Predicted mean daily Cl^- concentration at Contra Costa Victoria Canal Alternative Intake Point for the Year 50 with Potential Project Baseline scenario and the Year 50 with Potential Project Both DWSC Deepening scenario (top); number of days each month that predicted mean daily concentration of Cl^- at Contra Costa Victoria Canal Alternative Intake Point exceeds 250 mg/l Cl^- for each scenario during the Year 50 with Potential Project simulation period (bottom).

6.6.2 Water Quality Objectives for Agricultural Beneficial Use

The D-1641 water quality objectives for agricultural beneficial uses, shown in Table 3-2, are based on either maximum 14-day running average EC, maximum 30-day running average EC, or maximum monthly average of mean daily EC at the stations shown on Figure 3.4-2. The western Delta and interior Delta water quality objectives for agricultural beneficial use depend on water year type on the Sacramento River and apply only from April 1 to August 15, while the southern Delta and export area water quality objectives for agricultural beneficial use apply uniformly across all water year types during the whole year.

Water year 1994 (from October 1, 1993 through September 30, 1994) was classified as a "critical" year, the lowest flow classification, on both the Sacramento River and San Joaquin River. Water Year 1995 (from October 1, 1994 through September 30, 1995) was classified as a "wet" year, the highest flow classification, on both the Sacramento River and the San Joaquin River (DWR, 2009b). Since the April 1 through August 15 period falls within water year 1994, the "critical" year water quality objectives shown in Table 3-2 are applied for the western Delta and interior Delta stations.

Figure 6.6-9 shows the predicted 14-day running average EC on the Sacramento River at Emmaton for the Year 50 with Potential Project Baseline scenario and the Year 50 with Potential Project Both DWSC Deepening scenario. Increases in 14-day running average EC under the Year 50 with Potential Project Both DWSC Deepening scenario are predicted from June through January. The water quality objectives for agricultural beneficial use apply from April 1 through August 15. Under the Year 50 with Potential Project Baseline scenario the water quality objective of maximum 14-day running average EC on the Sacramento River at Emmaton is exceeded for 30 days in July. Under the Year 50 with Potential Project Both DWSC Deepening scenario, the water quality objective of maximum 14-day running average EC on the Sacramento River at Emmaton is exceeded for 6 days during June (an increase of 6 days relative to Year 50 with Potential Project Baseline), 31 days during July (an increase of 1 day relative to Year 50 with Potential Project Baseline), and 14 days during August (an increase of 14 days relative to Year 50 with Potential Project Baseline).

Figure 6.6-10 shows the predicted 14-day running average EC on the San Joaquin River at Jersey Point for the Year 50 with Potential Project Baseline scenario and the Year 50 with Potential Project Both DWSC Deepening scenario. Increases in 14-day running average EC under the Year 50 with Potential Project Both DWSC Deepening scenario are predicted from June through January. The water quality objectives for agricultural beneficial use apply from April 1 through August 15. The water quality objective of maximum 14-day running average EC on the San Joaquin River at Jersey Point is not exceeded under the Year 50 with Potential Project Baseline scenario or the Year 50 with Potential Project Both DWSC Deepening scenario.

Figure 6.6-11 shows the predicted 14-day running average EC on the South Fork Mokelumne River at Terminous for the Year 50 with Potential Project Baseline scenario and the Year 50 with Potential Project Both DWSC Deepening scenario. The predicted 14-day running average EC is nearly identical for both scenarios indicating that there is no predicted effect on EC on the South

Fork Mokelumne River at Terminous resulting from the Year 50 with Potential Project Both DWSC Deepening scenario. The water quality objectives for agricultural beneficial use apply from April 1 through August 15. The water quality objective of maximum 14-day running average EC on the South Fork Mokelumne River at Terminous is not exceeded under the Year 50 with Potential Project Baseline scenario or the Year 50 with Potential Project Both DWSC Deepening scenario.

Figure 6.6-12 shows the predicted 14-day running average EC on the San Joaquin River at San Andreas Landing for the Year 50 with Potential Project Baseline scenario and the Year 50 with Potential Project Both DWSC Deepening scenario. Increases in 14-day running average EC under the Year 50 with Potential Project Both DWSC Deepening scenario are predicted from July through January. The water quality objectives for agricultural beneficial use apply from April 1 through August 15. The water quality objective of maximum 14-day running average EC on the San Joaquin River at San Andreas Landing is not exceeded under the Year 50 with Potential Project Baseline scenario or the Year 50 with Potential Project Both DWSC Deepening scenario.

Figure 6.6-13 shows the predicted 30-day running average EC on the San Joaquin River at Airport Way Bridge, Vernalis for the Year 50 with Potential Project Baseline scenario and the Year 50 with Potential Project Both DWSC Deepening scenario. The predicted 30-day running average EC is identical for both scenarios indicating that there is no predicted effect on EC on the San Joaquin River at Vernalis resulting from the Year 50 with Potential Project Both DWSC Deepening scenario. The water quality objectives for agricultural beneficial use apply all year. The water quality objective of maximum 30-day running average EC on the San Joaquin River at Vernalis is exceeded for 20 days during April both scenarios. Since the predicted EC at Vernalis is almost entirely dependent on the specified inflow concentration on the San Joaquin River which is provided as part of the CALSIM II output, the compliance with this objective is dependent on the inflow concentration which is not impacted by the deepening scenario.

Figure 6.6-14 shows the predicted 30-day running average EC on the San Joaquin River at Brandt Bridge for the Year 50 with Potential Project Baseline scenario and the Year 50 with Potential Project Both DWSC Deepening scenario. The predicted 30-day running average EC is nearly identical for both scenarios indicating that there is no predicted effect on EC on the San Joaquin River at Brandt Bridge resulting from the Year 50 with Potential Project Both DWSC Deepening scenario. The water quality objectives for agricultural beneficial use apply all year. The water quality objective of maximum 30-day running average EC on the San Joaquin River at Brandt Bridge is exceeded for 24 days during April for both the Year 50 with Potential Project Baseline scenario and the Year 50 with Potential Project Both DWSC Deepening scenario. Since the predicted EC at Brandt Bridge is largely dependent on the specified inflow concentration on the San Joaquin River at Vernalis, and the compliance with this objective is not impacted by the deepening scenario.

Figure 6.6-15 shows the predicted 30-day running average EC on Old River near Middle River for the Year 50 with Potential Project Baseline scenario and the Year 50 with Potential Project Both DWSC Deepening scenario. The predicted 30-day running average EC is identical for both scenarios indicating that there is no predicted effect on EC on Old River near Middle River resulting from the Year 50 with Potential Project Both DWSC Deepening scenario. The water quality objectives for agricultural beneficial use apply all year. The water quality objective of maximum 30-day running average EC on Old River near Middle River is exceeded for 23 days during April for both the Year 50 with Potential Project Baseline scenario and the Year 50 with Potential Project Both DWSC Deepening scenario. The compliance with this water quality objective is not impacted by the deepening scenario.

Figure 6.6-16 shows the predicted 30-day running average EC on Old River at Tracy Road Bridge for the Year 50 with Potential Project Baseline scenario and the Year 50 with Potential Project Both DWSC Deepening scenario. The predicted 30-day running average EC is nearly identical for both scenarios indicating only a very small effect on EC on Old River at Tracy Road Bridge resulting from the Year 50 with Potential Project Both DWSC Deepening scenario. The water quality objectives for agricultural beneficial use apply all year. The water quality objective of maximum 30-day running average EC on Old River at Tracy Road Bridge is exceeded for 27 days during April for both scenarios. Compliance with this objective during April is largely dependent on the inflow concentration at Vernalis which is not impacted by the deepening scenario. During July, the water quality objective is exceeded for 8 days under the Year 50 with Potential Project Baseline scenario and 0 days under the Year 50 with Potential Project Both DWSC Deepening scenario (a decrease of 8 days). Despite this 8 day difference in compliance during July, the absolute difference in 30-day running average EC between the Year 50 with Potential Project Baseline scenario and the Year 50 with Potential Project Both DWSC Deepening scenario during July is extremely small, as seen on Figure 6.6-16.

The D-1641 water quality objectives for agricultural beneficial uses at the export areas stipulate that the monthly average of mean daily EC not exceed 1.0 mmhos/cm. Figure 6.6-17 and Figure 6.6-18 show the predicted monthly average of mean daily EC for the two export areas shown in Table 3-2 which have water quality objectives for agricultural beneficial uses.

Figure 6.6-17 shows the predicted monthly average of mean daily EC at West Canal at mouth of Clifton Court Forebay for the Year 50 with Potential Project Baseline scenario and the Year 50 with Potential Project Both DWSC Deepening scenario. The Year 50 with Potential Project Both DWSC Deepening scenario has a small effect on monthly average EC from April through June, with larger increases predicted from July through January. Under both the Year 50 with Potential Project Baseline Scenario and the Year 50 with Potential Project Both DWSC Deepening scenario, the water quality objective is met at West Canal at mouth of Clifton Court Forebay for all months except January. In January, the predicted monthly average of mean daily EC is 1.07 mmhos/cm for the Year 50 with Potential Project Baseline scenario and 1.13 mmhos/cm for the Year 50 with Potential Project Both DWSC Deepening scenario (an increase of 0.06 mmhos/cm).

Figure 6.6-18 shows the predicted monthly average of mean daily EC at the Delta-Mendota Canal at Tracy Pumping Plant for the Year 50 with Potential Project Baseline scenario and the Year 50 with Potential Project Both DWSC Deepening scenario. The Year 50 with Potential Project Both DWSC Deepening has an extremely small effect on monthly average EC at the Delta-Mendota Canal at Tracy Pumping Plant from April through June and From January through March, with larger EC increases predicted from July through December. Under both scenarios, the water quality objective is met at the Delta-Mendota Canal at Tracy Pumping Plant during all months during the simulation period.

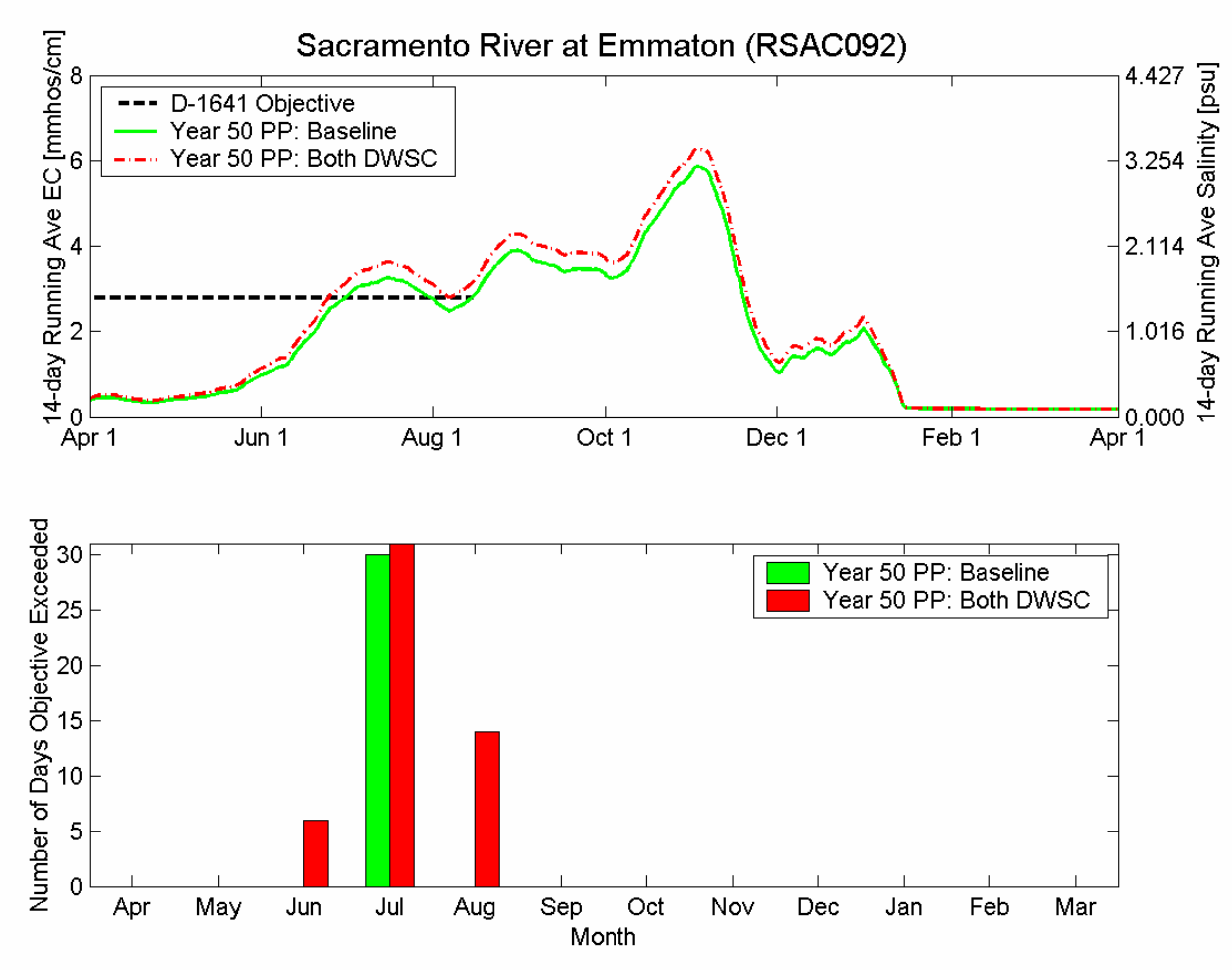
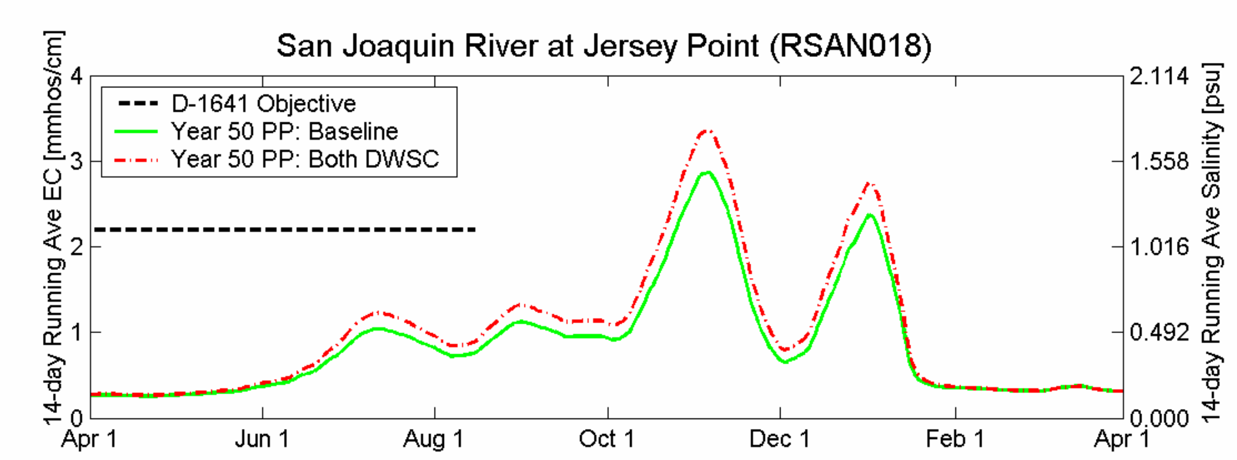


Figure 6.6-9 Predicted 14-day running average EC at Sacramento River at Emmaton (RSAC092) for the Year 50 with Potential Project Baseline scenario and the Year 50 with Potential Project Both DWSC Deepening scenario (top); number of days each month that predicted 14-day running average EC at RSAC092 exceeds D-1641 water quality objectives for each scenario during the Year 50 with Potential Project simulation period (bottom).



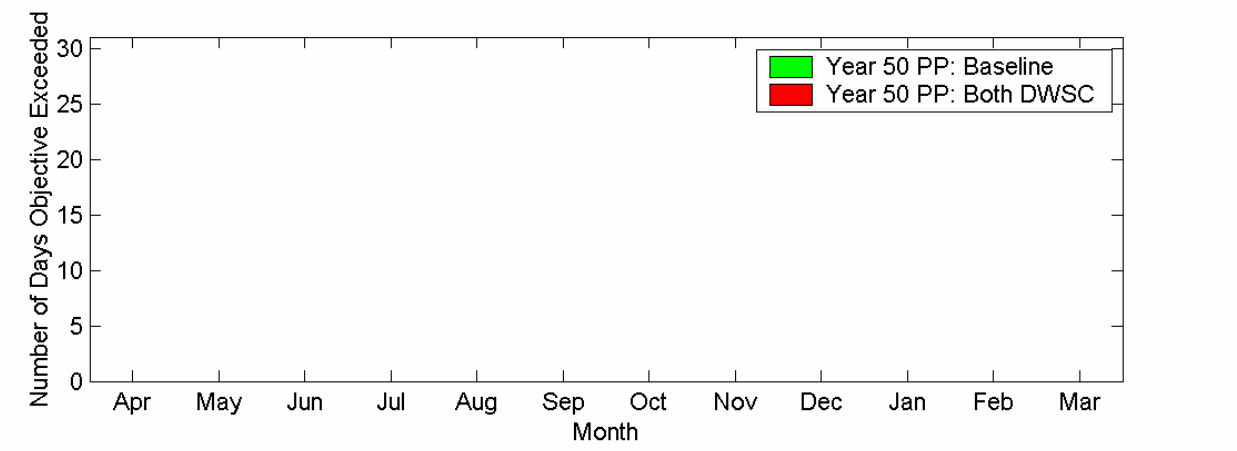


Figure 6.6-10 Predicted 14-day running average EC at San Joaquin River at Jersey Point (RSAN018) for the Year 50 with Potential Project Baseline scenario and the Year 50 with Potential Project Both DWSC Deepening scenario (top); number of days each month that predicted 14-day running average EC at RSAN018 exceeds D-1641 water quality objectives for each scenario during the Year 50 with Potential Project simulation period (bottom).

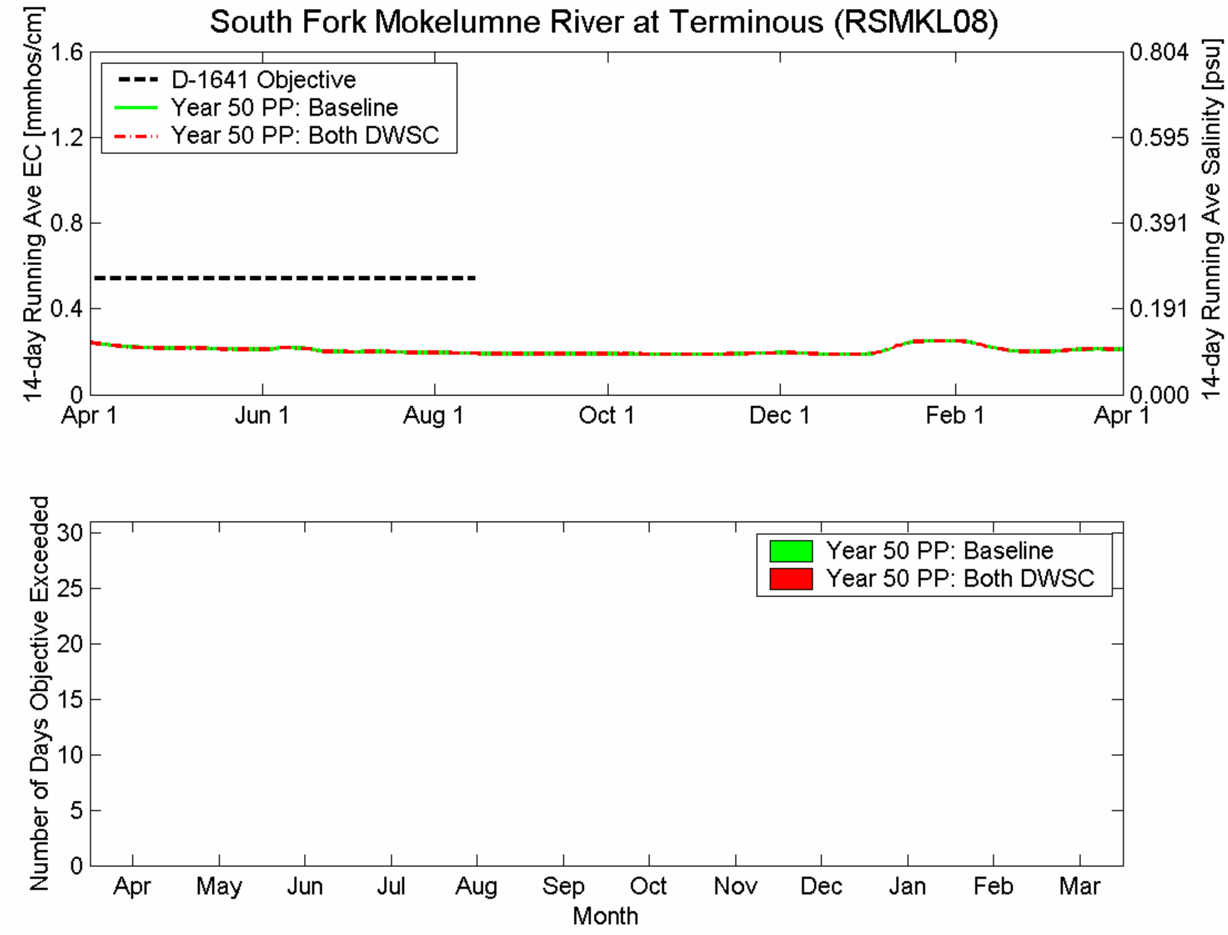


Figure 6.6-11 Predicted 14-day running average EC at South Fork Mokelumne River at Terminous (RSMKL08) for the Year 50 with Potential Project Baseline scenario and the Year 50 with Potential Project Both DWSC Deepening scenario (top); number of days each month that predicted 14-day running average EC at RSMKL08 exceeds D-1641 water quality objectives for each scenario during the Year 50 with Potential Project simulation period (bottom).

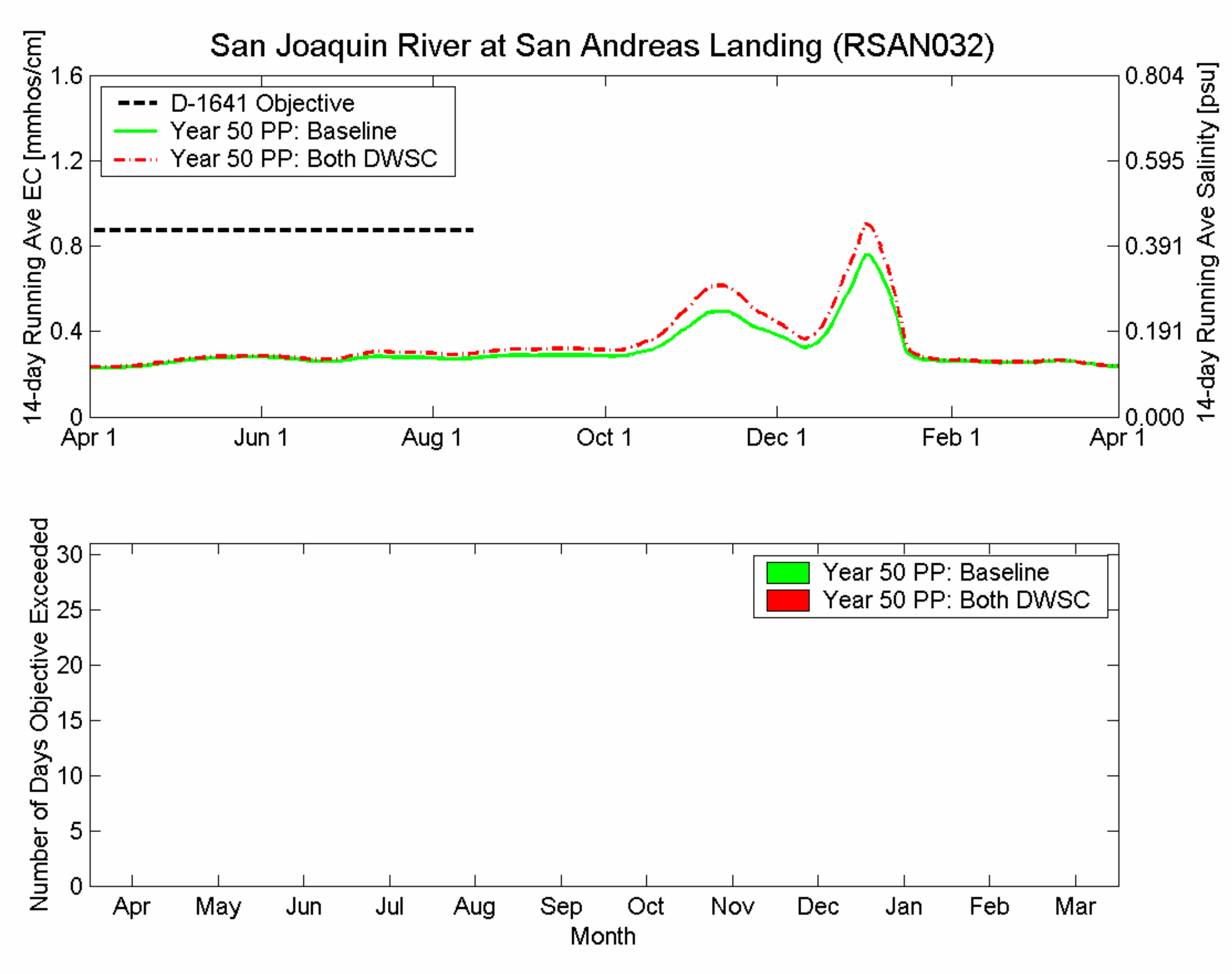
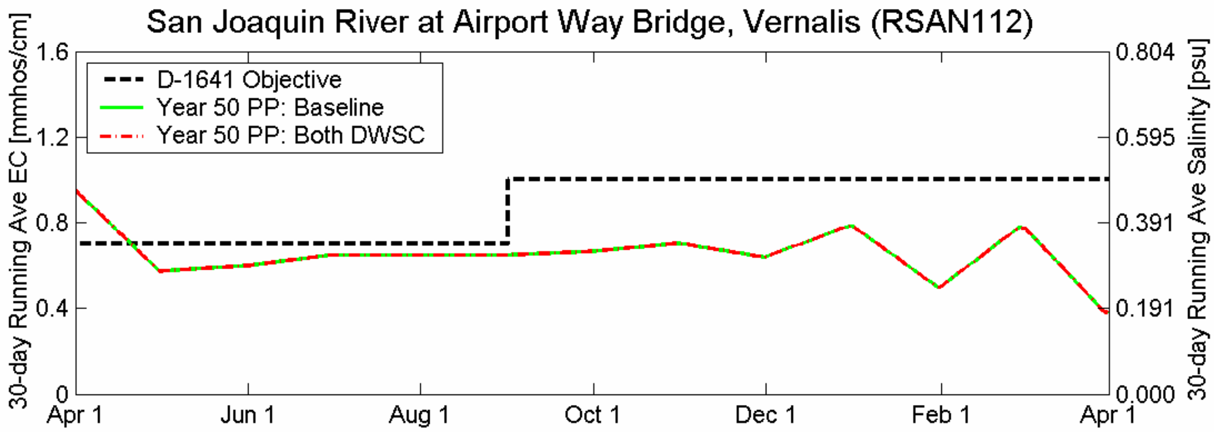


Figure 6.6-12 Predicted 14-day running average EC at San Joaquin River at San Andreas Landing (RSAN032) for the Year 50 with Potential Project Baseline scenario and the Year 50 with Potential Project Both DWSC Deepening scenario (top); number of days each month that predicted 14-day running average EC at RSAN032 exceeds D-1641 water quality objectives for each scenario during the Year 50 with Potential Project simulation period (bottom).



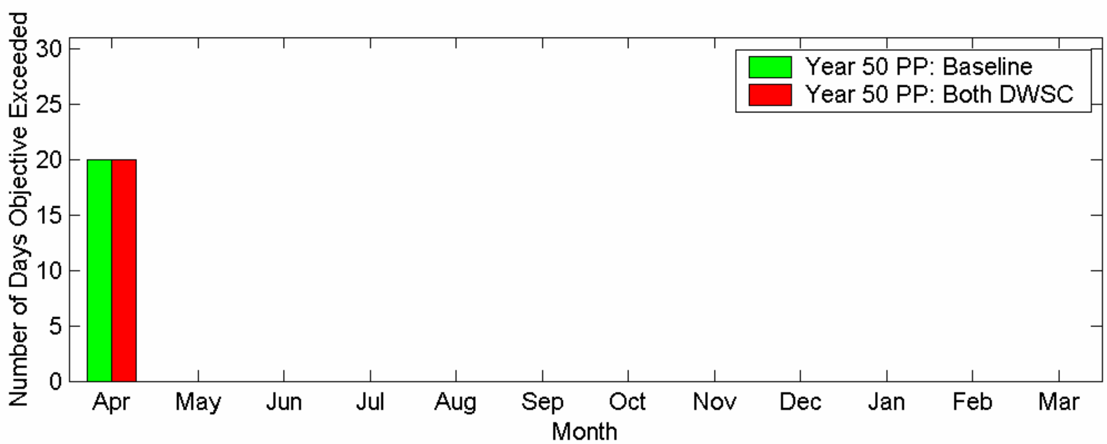
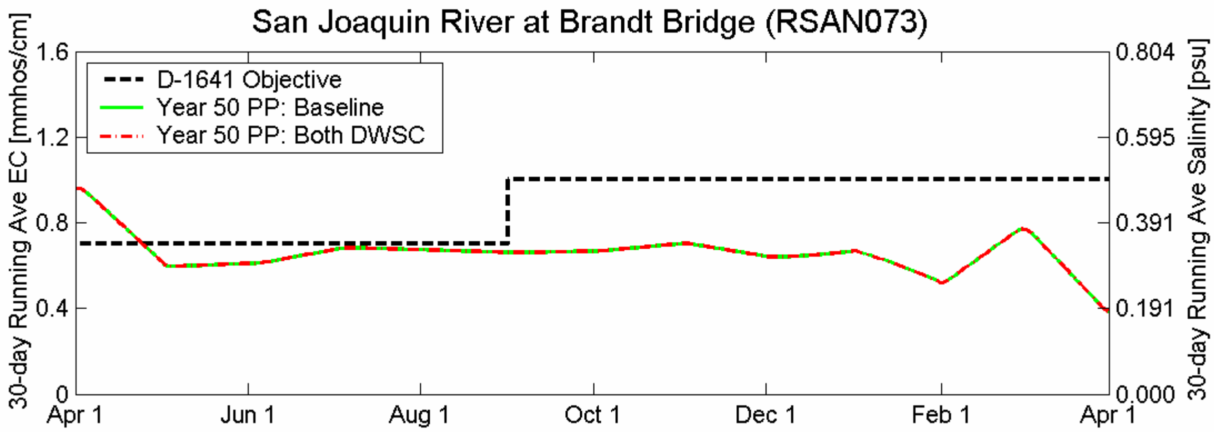


Figure 6.6-13 Predicted 30-day running average EC at San Joaquin River at Airport Way Bridge, Vernalis (RSAN112) for the Year 50 with Potential Project Baseline scenario and the Year 50 with Potential Project Both DWSC Deepening scenario (top); number of days each month that predicted 14-day running average EC at RSAN112 exceeds D-1641 water quality objectives for each scenario during the Year 50 with Potential Project simulation period (bottom).



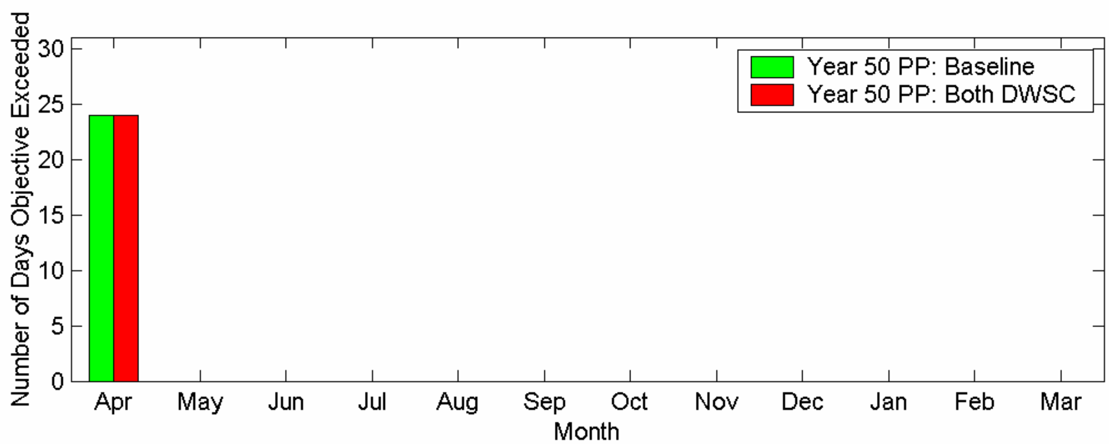


Figure 6.6-14 Predicted 30-day running average EC at San Joaquin River at Brandt Bridge (RSAN073) for the Year 50 with Potential Project Baseline scenario and the Year 50 with Potential Project Both DWSC Deepening scenario (top); number of days each month that predicted 14-day running average EC at RSAN073 exceeds D-1641 water quality objectives for each scenario during the Year 50 with Potential Project simulation period (bottom).

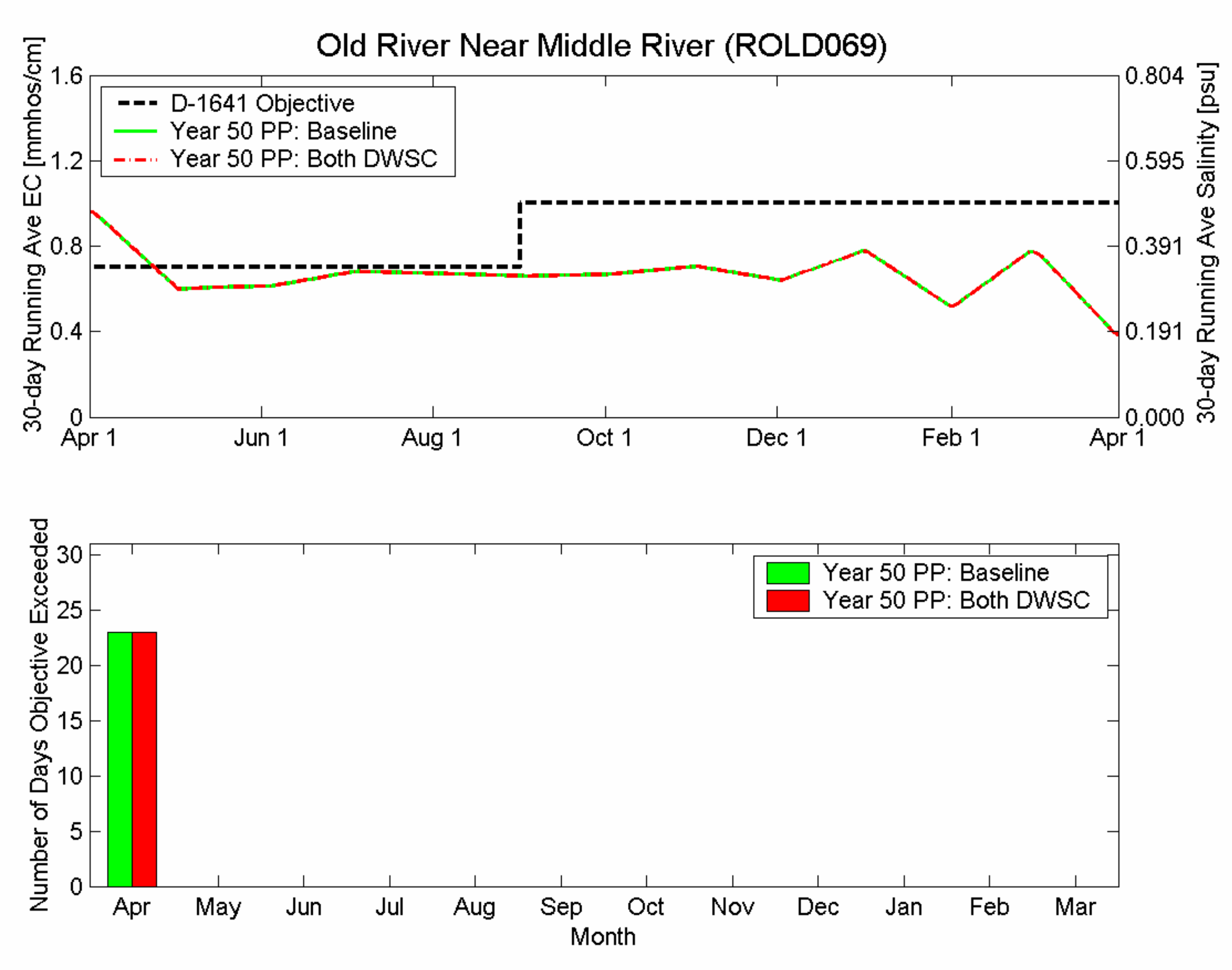
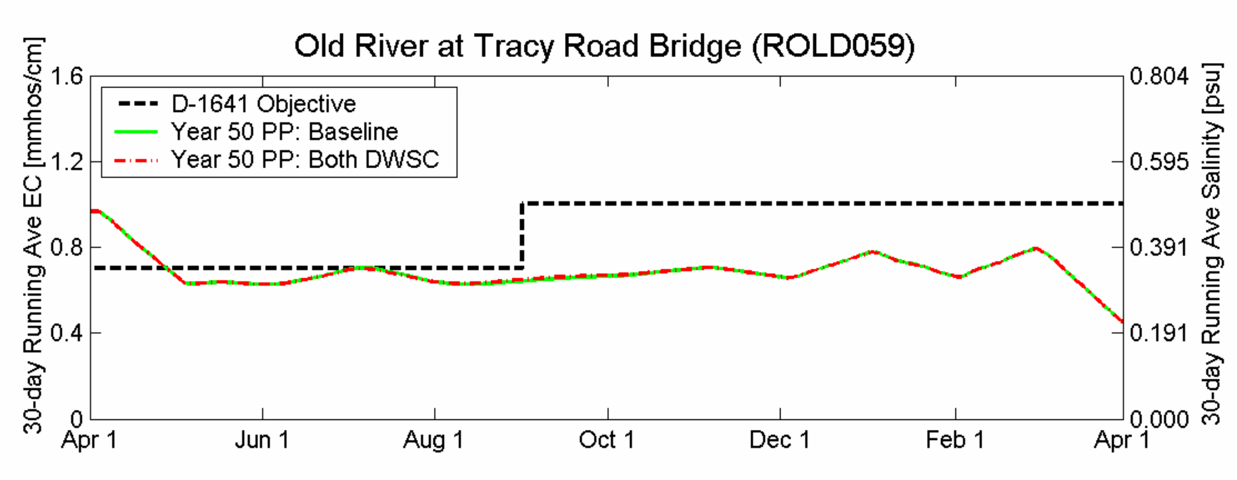


Figure 6.6-15 Predicted 30-day running average EC at Old River Near Middle River (ROLD069) for the Year 50 with Potential Project Baseline scenario and the Year 50 with Potential Project Both DWSC Deepening scenario (top); number of days each month that predicted 14-day running average EC at ROLD069 exceeds D-1641 water quality objectives for each scenario during the Year 50 with Potential Project simulation period (bottom).



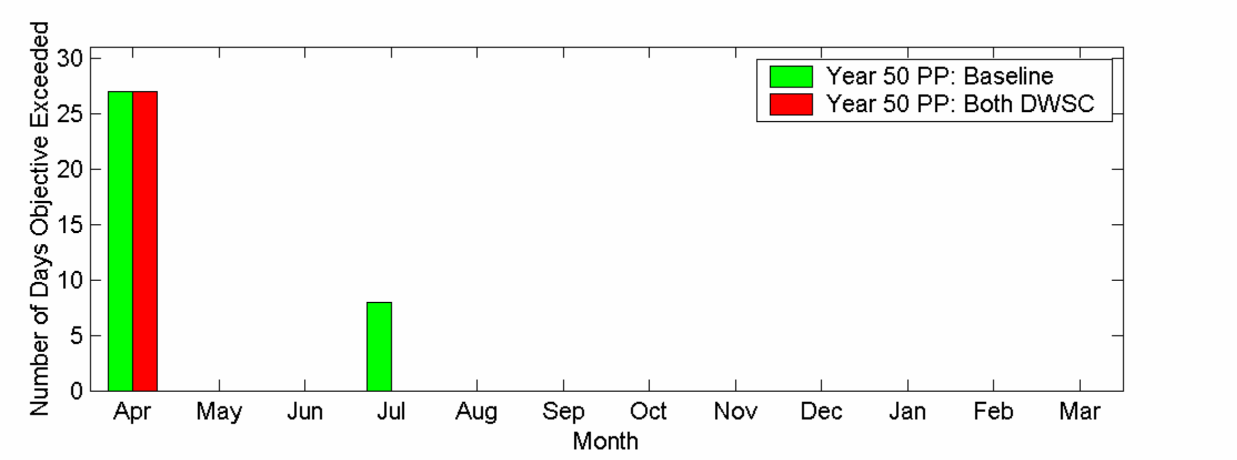


Figure 6.6-16 Predicted 30-day running average EC at Old River at Tracy Road Bridge (ROLD059) for the Year 50 with Potential Project Baseline scenario and the Year 50 with Potential Project Both DWSC Deepening scenario (top); number of days each month that predicted 14-day running average EC at ROLD059 exceeds D-1641 water quality objectives for each scenario during the Year 50 with Potential Project simulation period (bottom).

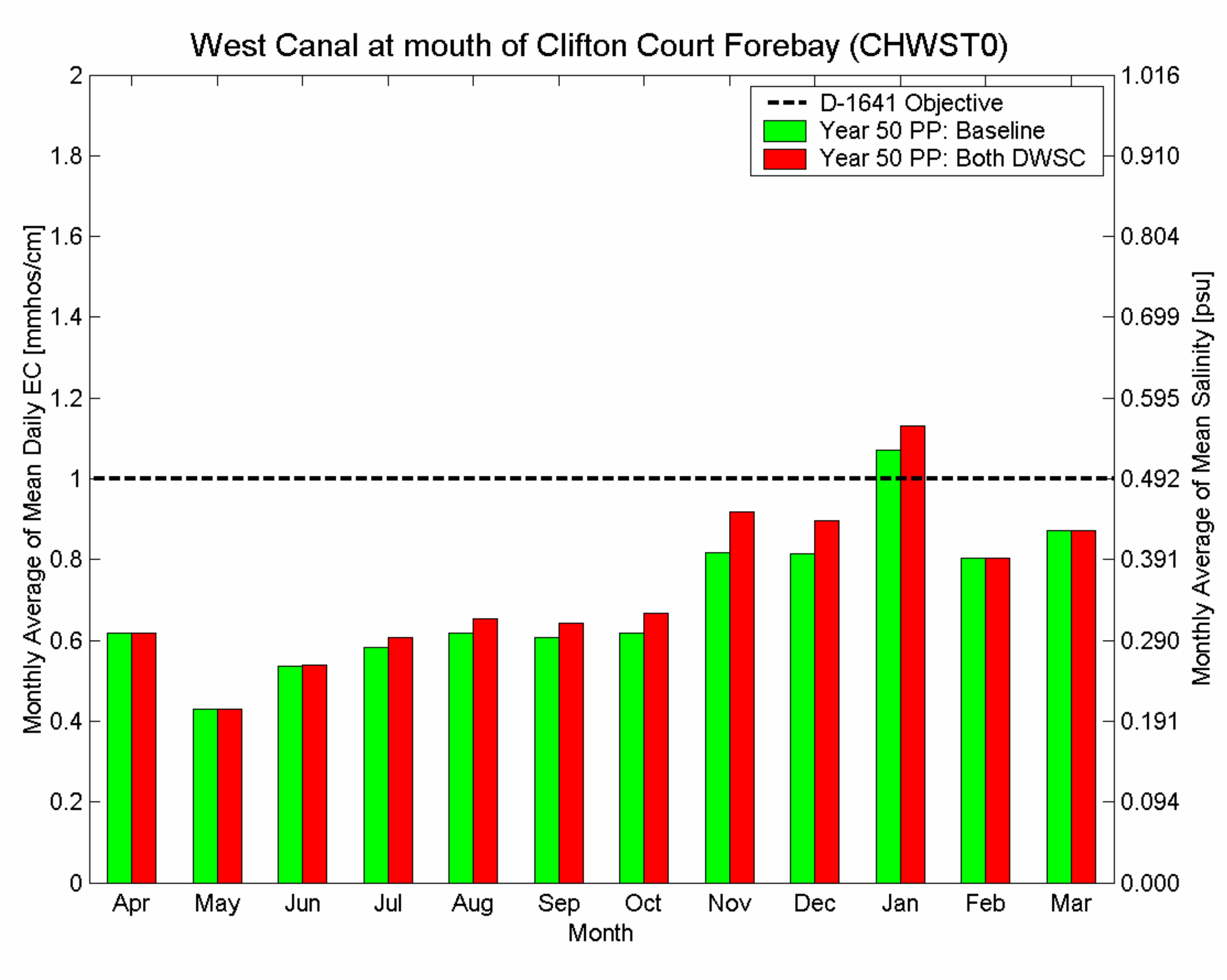


Figure 6.6-17 Predicted monthly average of mean daily EC at West Canal at mouth of Clifton Court Forebay (CHWST0) for the Year 50 with Potential Project Baseline scenario and the Year 50 with Potential Project Both DWSC Deepening scenario, shown relative to the D-1641 water quality objectives for agricultural beneficial uses.

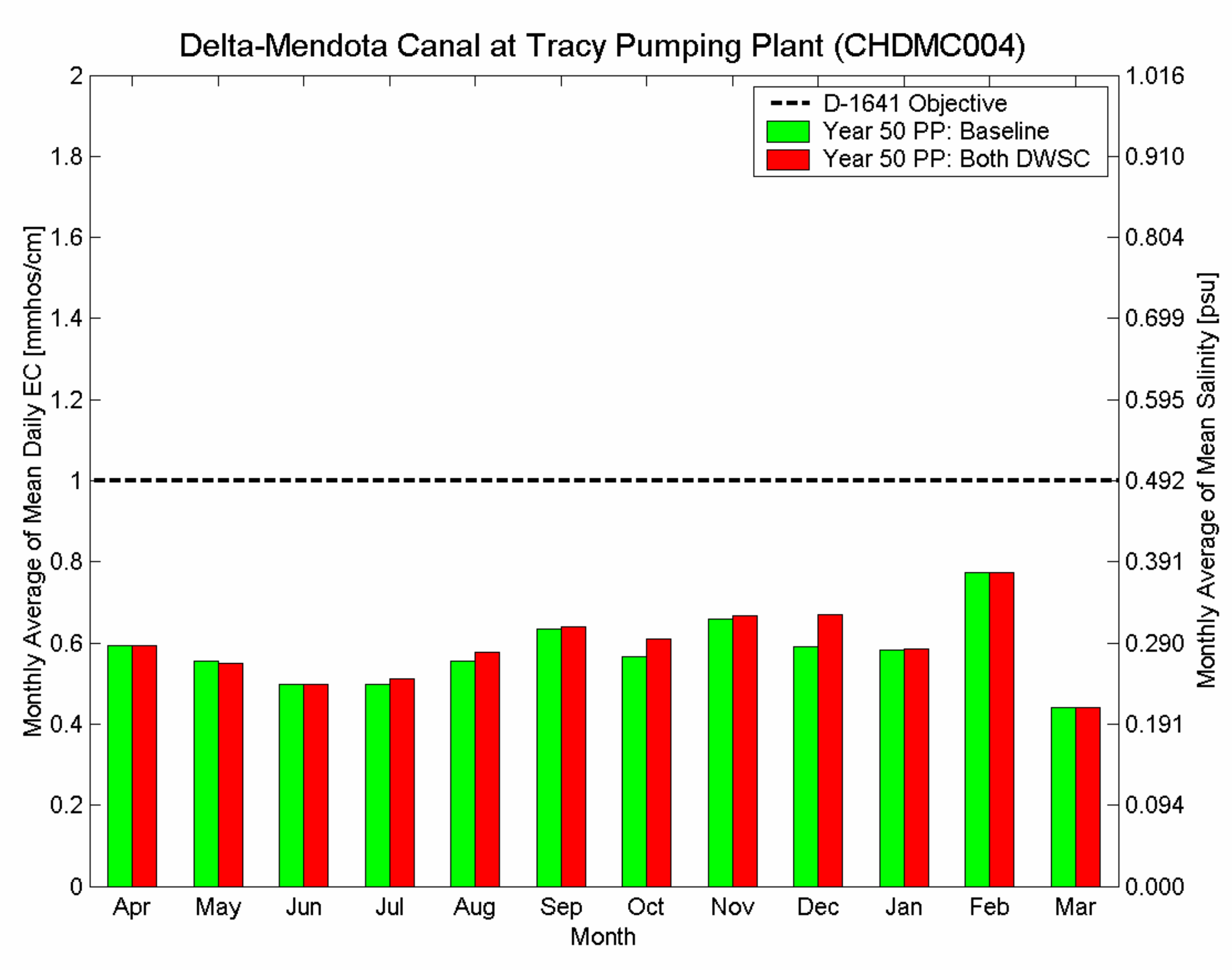


Figure 6.6-18 Predicted monthly average of mean daily EC at Delta-Mendota Canal at Tracy Pumping Plant (CHDMC004) for the Year 50 with Potential Project Baseline scenario and the Year 50 with Potential Project Both DWSC Deepening scenario, shown relative to the D-1641 water quality objectives for agricultural beneficial uses.

6.6.3 Water Quality Objectives for Fish and Wildlife Beneficial Uses

The D-1641 water quality objectives for fish and wildlife beneficial uses, shown in Table 3-3, are based on the maximum 14-day running average EC at two stations on the San Joaquin River, and on the monthly average of both daily high tide EC values at three stations in eastern Suisun Marsh and two stations in western Suisun Marsh (shown on Figure 3.4-3).

On the San Joaquin River, the water quality objectives for fish and wildlife beneficial uses stipulate that the 14-day running average of mean daily EC on the San Joaquin River “at and between Jersey Point and Prisoners Point” is less than 0.44 mmhos/cm during the months of April and May for all water year types except “critical” years. Although April and May 1994 fall within a “critical” water year, which means that this standard does not apply for this simulation, the impact of the proposed DWSC deepening scenarios on this water quality objective is shown in Figures 6.6-19 and 6.6-20 for reference.

Figure 6.6-19 shows the predicted 14-day running average EC on the San Joaquin River at Jersey Point for the Year 50 with Potential Project Baseline scenario and the Year 50 with Potential Project Both DWSC Deepening scenario. No increases in 14-day running average EC are predicted under the Year 50 with Potential Project Both DWSC Deepening scenario during April or May. The water quality objective of maximum 14-day running average EC on the San Joaquin River at Jersey Point is not exceeded under either the Year 50 with Potential Project Baseline scenario or the Year 50 with Potential Project Both DWSC Deepening scenario during the two months that the objectives would apply for water year types that are not “critical.”

Figure 6.6-20 shows the predicted 14-day running average EC on the San Joaquin River at Prisoners Point for the Year 50 with Potential Project Baseline scenario and the Year 50 with Potential Project Both DWSC Deepening scenario. No increases in 14-day running average EC are predicted under either the Year 50 with Potential Project Both DWSC Deepening scenario during April or May. The water quality objective of maximum 14-day running average EC on the San Joaquin River at Prisoners Point is not exceeded under either the Year 50 with Potential Project Baseline scenario or the Year 50 with Potential Project Both DWSC Deepening scenario during the two months that the objectives would apply for water year types that are not “critical.”

The eastern Suisun Marsh and western Suisun Marsh water quality objectives for fish and wildlife beneficial uses are based on the monthly average of both daily high tide EC values. The water quality objectives apply from October through May for all water year types, as shown in Table 3-3.

Figure 6.6-21 shows the predicted monthly average of both daily high tide EC values on the Sacramento River at Collinsville for the Year 50 with Potential Project Baseline scenario and the Year 50 with Potential Project Both DWSC Deepening scenario. For the Year 50 with Potential Project Both DWSC Deepening scenario, predicted increases in monthly average of both daily high tide EC values are typically on the order of 0.5 mmhos/cm. The water quality objectives for fish and wildlife beneficial uses on the Sacramento River at Collinsville are exceeded during

January under both the Year 50 with Potential Project Baseline scenario and the Year 50 with Potential Project Both DWSC Deepening scenario, but are met during all other months.

Figure 6.6-22 shows the predicted monthly average of both daily high tide EC values on Montezuma Slough at National Steel for the Year 50 with Potential Project Baseline scenario and the Year 50 with Potential Project Both DWSC Deepening scenario. For the Year 50 with Potential Project Both DWSC Deepening scenario, predicted increases in monthly average of both daily high tide EC values are typically on the order of 0.5 mmhos/cm. The water quality objectives for fish and wildlife beneficial uses on Montezuma Slough at National Steel are exceeded during November, January, and February under both the Year 50 with Potential Project Baseline scenario and the Year 50 with Potential Project Both DWSC Deepening scenario, but are met during all other months.

Figure 6.6-23 shows the predicted monthly average of both daily high tide EC values on Montezuma Slough near Beldon Landing for the Year 50 with Potential Project Baseline scenario and the Year 50 with Potential Project Both DWSC Deepening scenario. For the Year 50 with Potential Project Both DWSC Deepening scenario, predicted increases in monthly average of both daily high tide EC values are typically on the order of 0.5 mmhos/cm. The water quality objectives for fish and wildlife beneficial uses on Montezuma Slough near Beldon Landing are exceeded during November under both the Year 50 with Potential Project Baseline scenario, but are met during all other months. Under the Year 50 with Potential Project Both DWSC Deepening scenario the water quality objectives for fish and wildlife beneficial uses on Montezuma Slough near Beldon Landing are exceeded during November, December, and January.

Figure 6.6-24 shows the predicted monthly average of both daily high tide EC values on Chadbourne Slough at Sunrise Duck Club for the Year 50 with Potential Project Baseline scenario and the Year 50 with Potential Project Both DWSC Deepening scenario. For the Year 50 with Potential Project Both DWSC Deepening scenario, predicted increases in monthly average of both daily high tide EC values are typically on the order of 0.5 mmhos/cm. The water quality objectives for fish and wildlife beneficial uses on Chadbourne Slough at Sunrise Duck Club are exceeded during April, November, December, January, February, and March under both the Year 50 with Potential Project Baseline scenario and the Year 50 with Potential Project Both DWSC Deepening scenario.

Figure 6.6-25 shows the predicted monthly average of both daily high tide EC values on Suisun Slough, 300 feet south of Volanti Slough for the Year 50 with Potential Project Baseline scenario and the Year 50 with Potential Project Both DWSC Deepening scenario. For the Year 50 with Potential Project Both DWSC Deepening scenario, predicted increases in monthly average of both daily high tide EC values are typically on the order of 0.5 mmhos/cm. The water quality objectives for fish and wildlife beneficial uses on Suisun Slough, 300 feet south of Volanti Slough are exceeded during November, December, January, February, and March under both the Year 50 with Potential Project Baseline scenario and the Year 50 with Potential Project Both DWSC Deepening scenario.

The evaluation of water quality objectives in eastern Suisun Marsh and western Suisun Marsh demonstrates that the Year 50 with Potential Project Both DWSC scenario results in a predicted salinity increase on the order of 0.2-0.5 psu during most of the year in Suisun Bay and Suisun Marsh. This is consistent with the salinity maps for the Year 50 with Potential Project Both DWSC Deepening scenario discussed in Section 6.4 (Figures 6.4-1 though 6.4-13). These results indicate that increased salt intrusion resulting from the Year 50 Both DWSC Deepening scenario is likely to have an impact on EC in Suisun Marsh throughout the year.

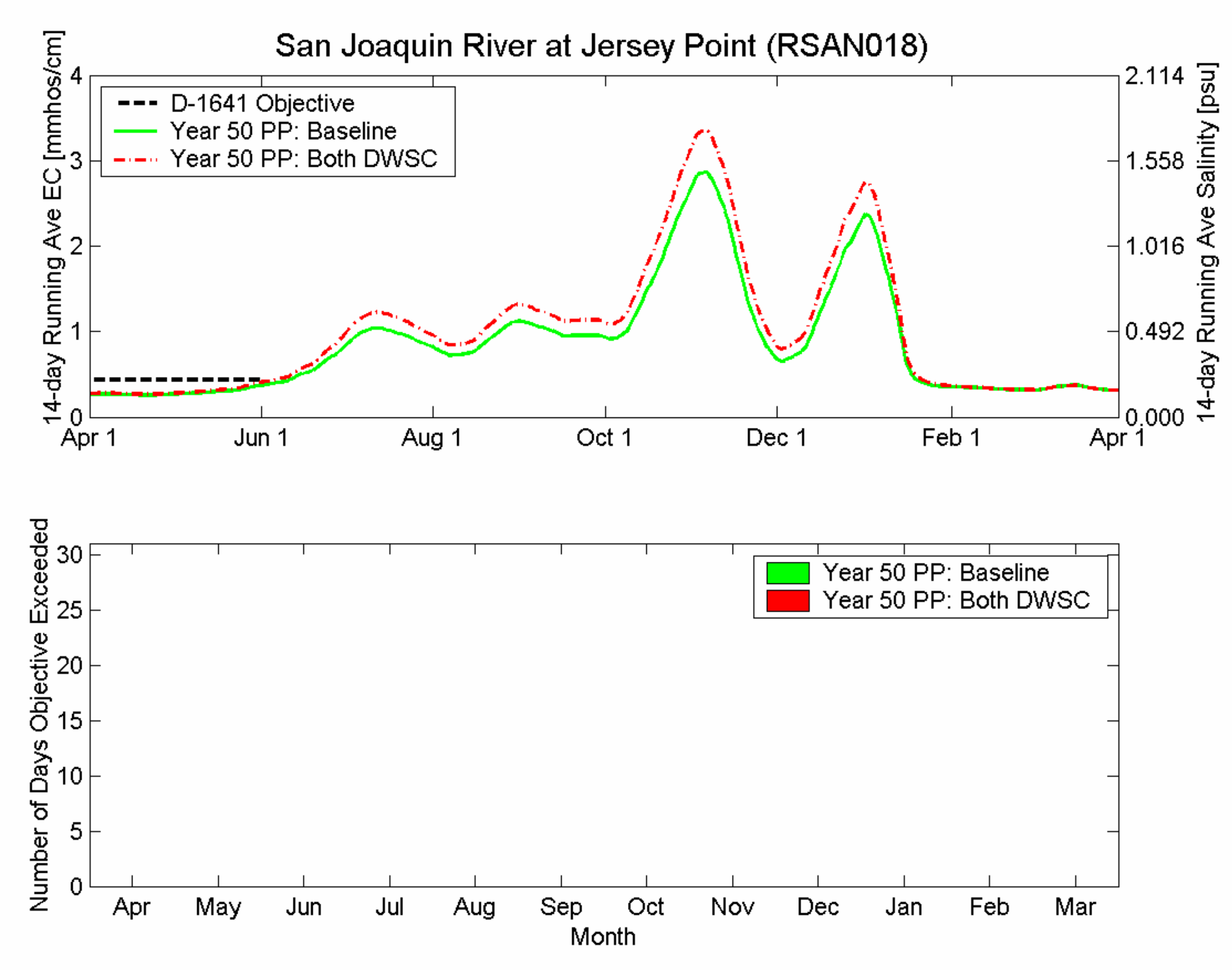


Figure 6.6-19 Predicted 14-day running average EC at San Joaquin River at Jersey Point (RSAN018) for the Year 50 with Potential Project Baseline scenario and the Year 50 with Potential Project Both DWSC Deepening scenario (top); number of days each month that predicted 14-day running average EC at RSAN018 exceeds D-1641 water quality objectives for each scenario during the Year 50 with Potential Project simulation period (bottom).

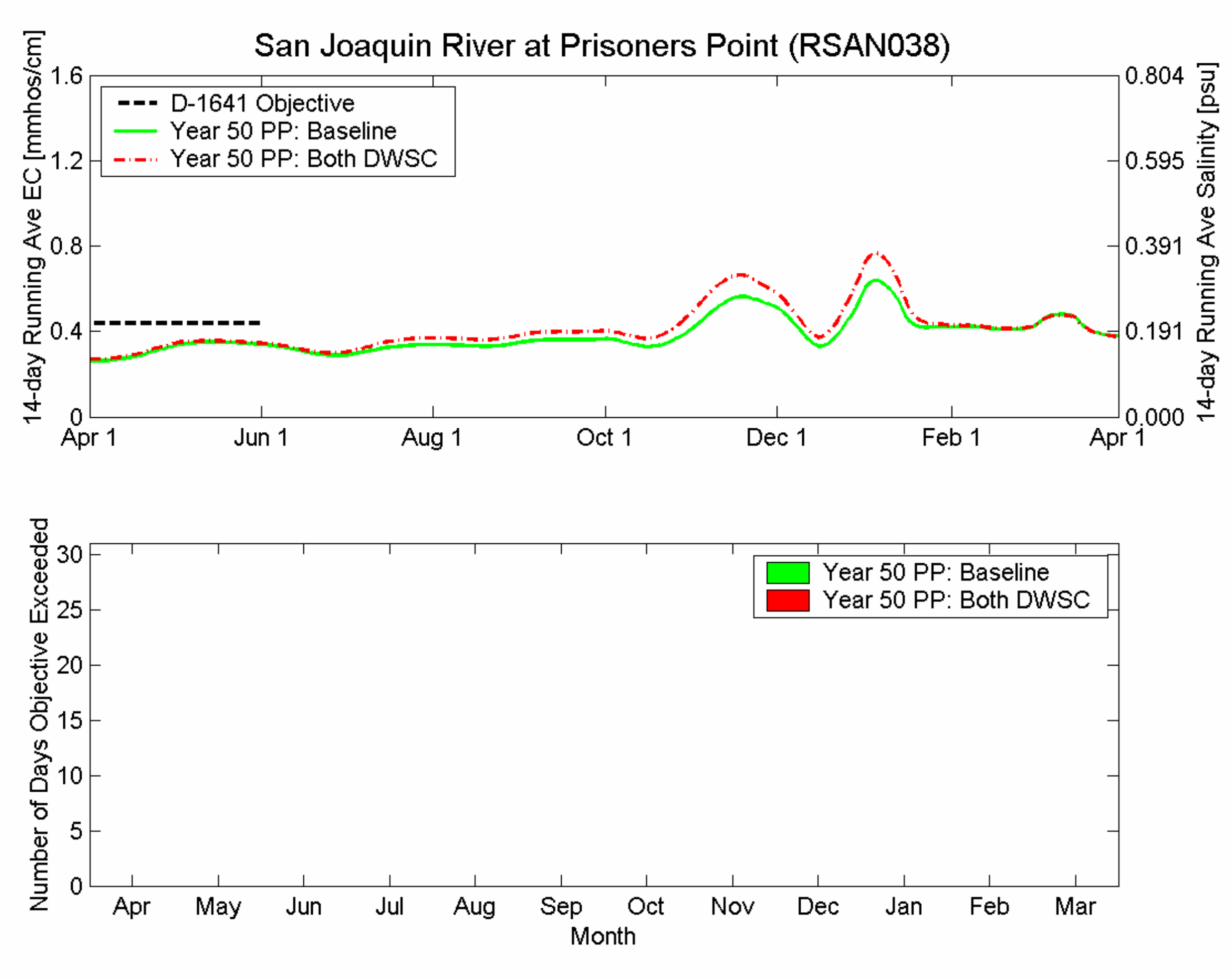


Figure 6.6-20 Predicted 14-day running average EC at San Joaquin River at Prisoners Point (RSAN038) for the Year 50 with Potential Project Baseline scenario and the Year 50 with Potential Project Both DWSC Deepening scenario (top); number of days each month that predicted 14-day running average EC at RSAN038 exceeds D-1641 water quality objectives for each scenario during the Year 50 with Potential Project simulation period (bottom).

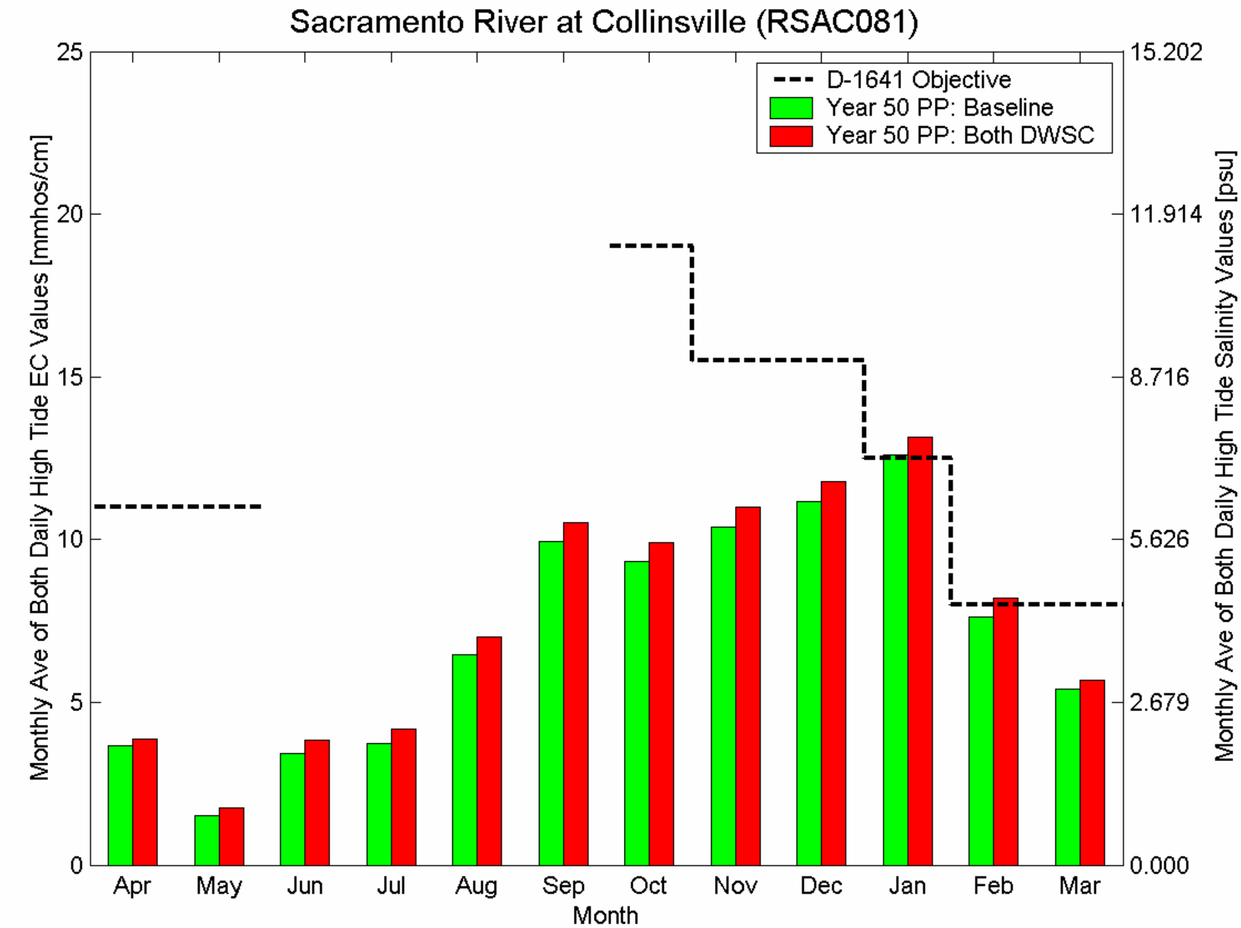


Figure 6.6-21 Predicted monthly average of both daily high tide EC values at Sacramento River at Collinsville (RSAC081) for the Year 50 with Potential Project Baseline scenario and the Year 50 with Potential Project Both DWSC Deepening scenario, shown relative to the D-1641 water quality objectives for fish and wildlife beneficial uses.

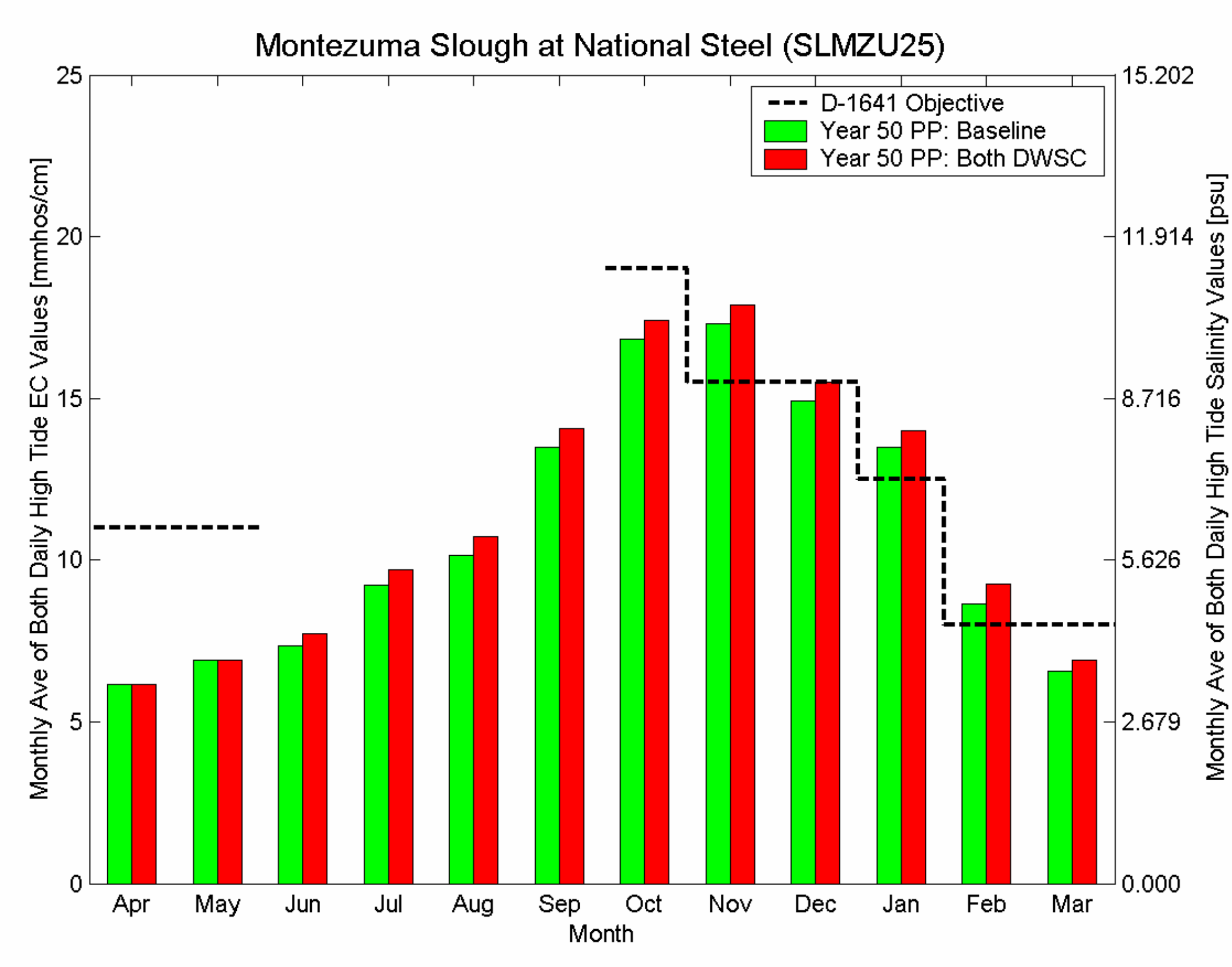


Figure 6.6-22 Predicted monthly average of both daily high tide EC values at Montezuma Slough at National Steel (SLMZU25) for the Year 50 with Potential Project Baseline scenario and the Year 50 with Potential Project Both DWSC Deepening scenario, shown relative to the D-1641 water quality objectives for fish and wildlife beneficial uses.

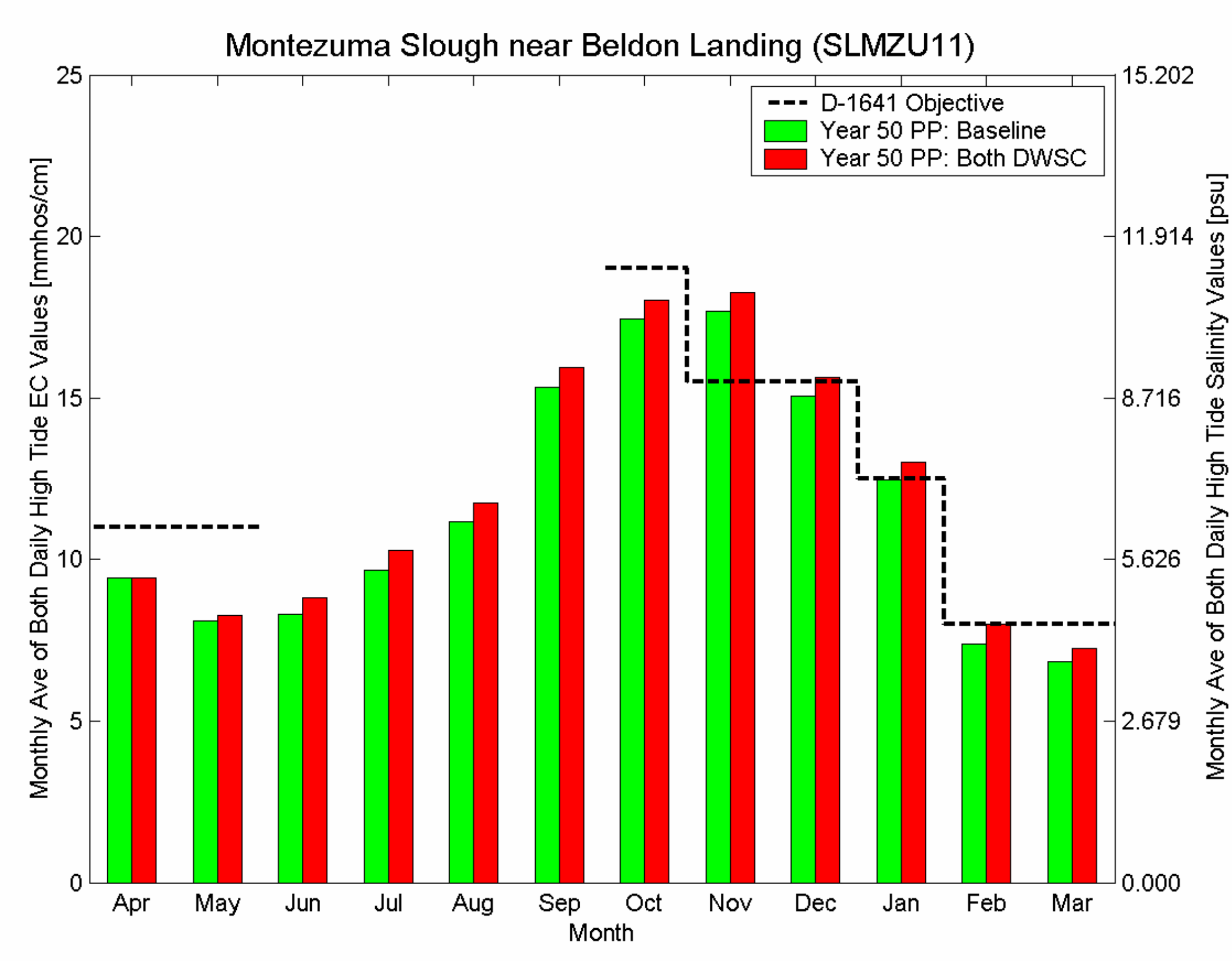


Figure 6.6-23 Predicted monthly average of both daily high tide EC values at Montezuma Slough near Beldon Landing (SLMZU11) for the Year 50 with Potential Project Baseline scenario and the Year 50 with Potential Project Both DWSC Deepening scenario, shown relative to the D-1641 water quality objectives for fish and wildlife beneficial uses.

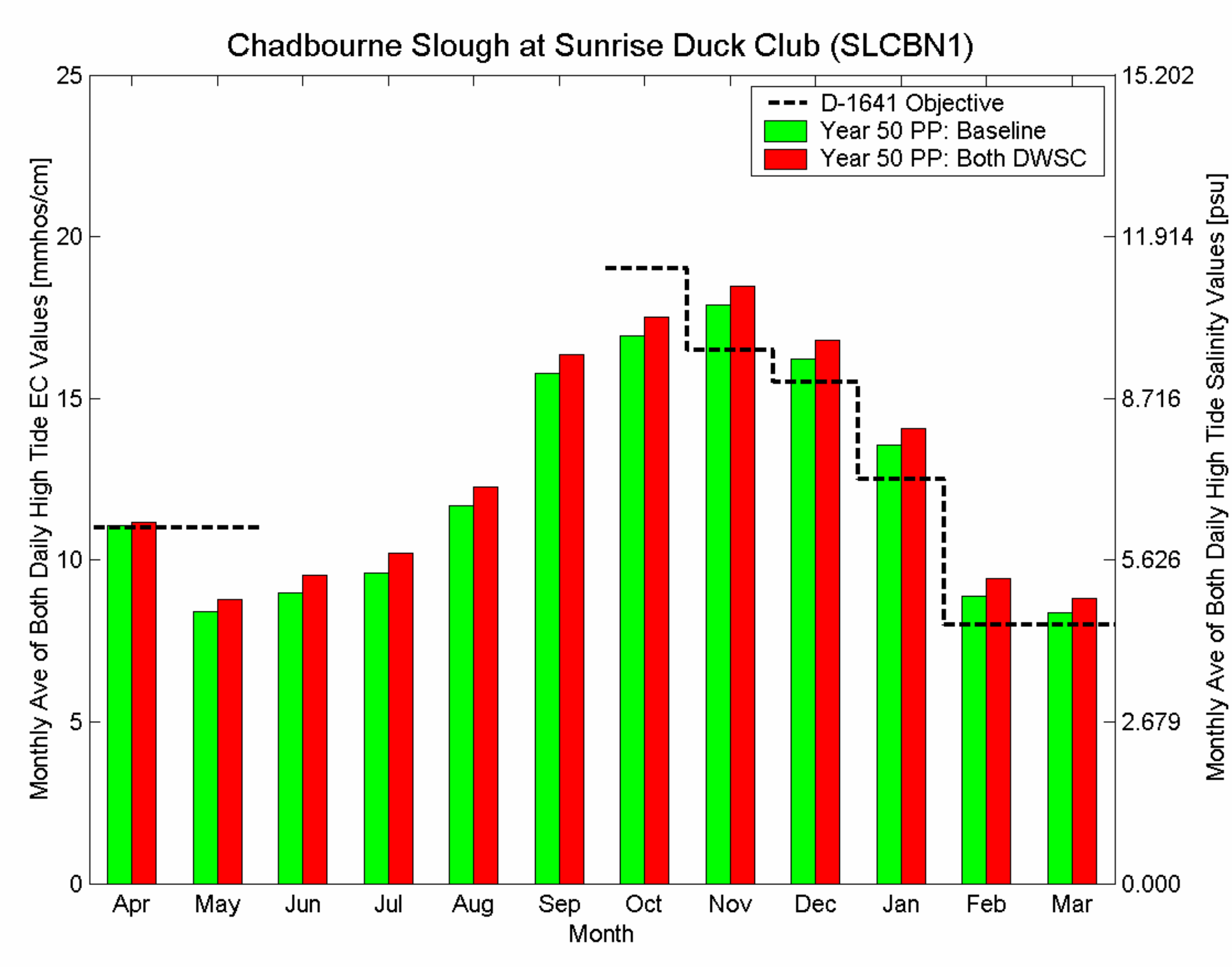


Figure 6.6-24 Predicted monthly average of both daily high tide EC values at Chadbourne Slough at Sunrise Duck Club (SLCBN1) for the Year 50 with Potential Project Baseline scenario and the Year 50 with Potential Project Both DWSC Deepening scenario, shown relative to the D-1641 water quality objectives for fish and wildlife beneficial uses.

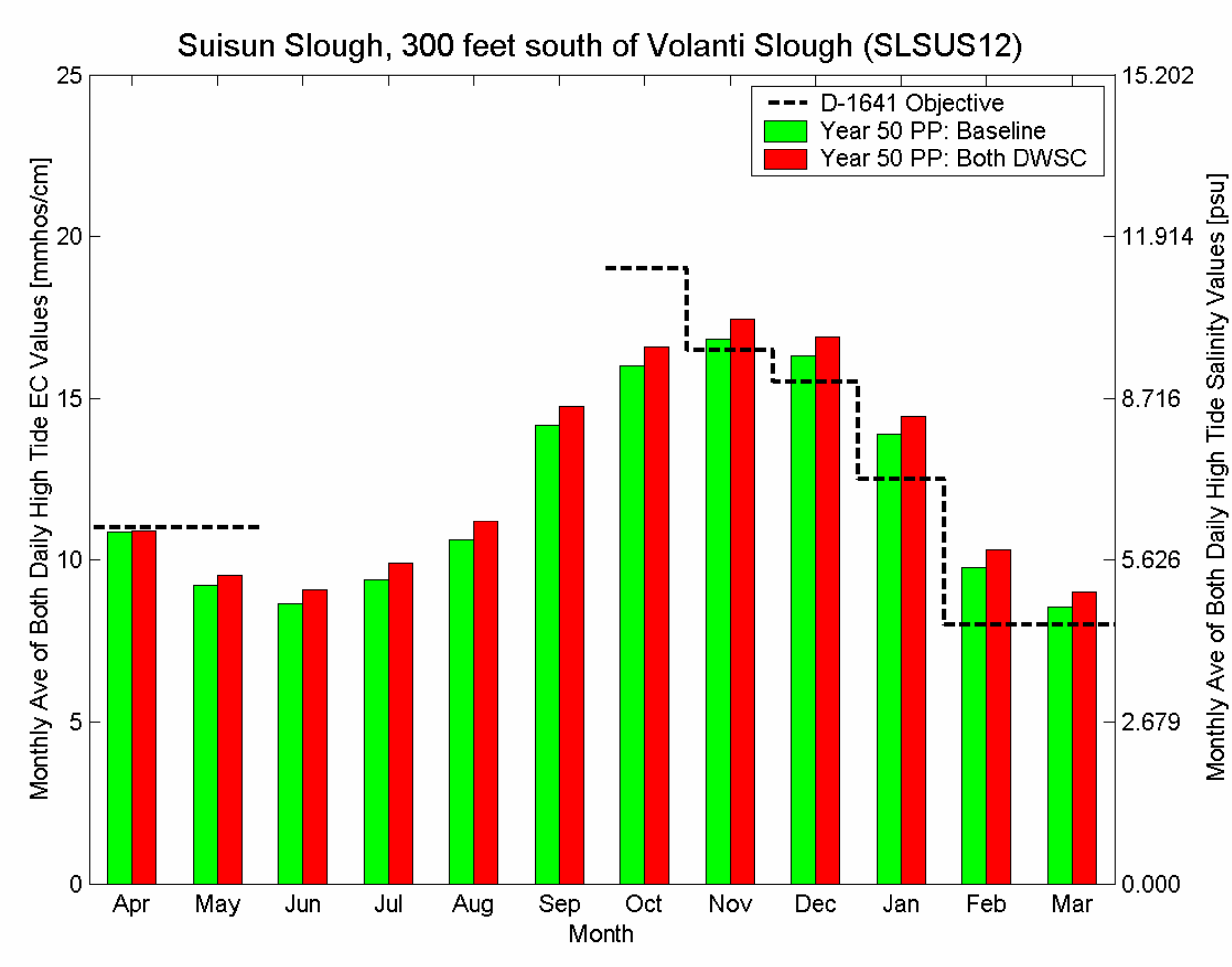


Figure 6.6-25 Predicted monthly average of both daily high tide EC values at Suisun Slough, 300 feet south of Volanti Slough (SLSUS12) for the Year 50 with Potential Project Baseline scenario and the Year 50 with Potential Project Both DWSC Deepening scenario, shown relative to the D-1641 water quality objectives for fish and wildlife beneficial uses.

6.7 Discussion of DWSC Deepening Alternatives under Year 50 with Potential Project Conditions

The Year 50 with Potential Project simulation period represents an estimate of possible conditions that may exist 50 years after the projected start of project construction for each of the deepening projects under future conditions that also include the construction of a “Potential Project” consisting of an isolated conveyance facility. The Year 50 with Potential Project conditions differ from the Year 50 conditions only in the geographic distribution of the Delta exports. Under the Year 50 with Potential Project conditions, an isolated conveyance facility is added along the Sacramento River near Freeport and some of the South Delta exports are shifted to this “Potential Project” facility under the operating constraints described in Section 3.2.3. The Year 50 with Potential Project simulation incorporates the expected bathymetric, hydrologic, and operating conditions with an isolated conveyance facility in years 2061 and 2062 for the Sacramento DWSC and the San Francisco Bay to Stockton DWSC, respectively.

6.7.1 Discussion of Year 50 with Potential Project Both DWSC Deepening Scenario

The Year 50 with Potential Project Both DWSC Deepening scenario was compared to the Year 50 with Potential Project Baseline scenario to evaluate the potential impacts of the proposed deepening of Both DWSC under Year 50 with Potential Project conditions. Predicted water surface elevation, flow, and salinity under the Year 50 with Potential Project Both DWSC Deepening scenario were compared to the corresponding model predictions under the Year 50 with Potential Project Baseline scenario.

Time series comparisons of stage (Section 6.1.1) show that during most of the year the deepening associated with the Year 50 with Potential Project Both DWSC Deepening scenario does not have a noticeable impact on stage in the San Francisco Bay or the Sacramento-San Joaquin Delta. During high flows, a slight decrease in daily-averaged stage of less than 0.04 m is predicted along both the Sacramento DWSC and the San Francisco Bay to Stockton DWSC within the Delta. This decrease in stage is likely the result of increased conveyance capacity along both the Sacramento DWSC and the San Francisco Bay to Stockton DWSC resulting from the channel deepening. Time series comparisons of flow (Section 6.2.1) show that the channel deepening associated with the Year 50 with Potential Project Both DWSC Deepening scenario results in a small increase in tidal prism of the Delta. Peak tidal flows at Chipps Island under the Year 50 with Potential Project Both DWSC Deepening scenario are about 1.5% greater than under the Year 50 with Potential Project Baseline scenario indicating a slight increase in tidal prism of the Delta under the Year 50 with Potential Project Both DWSC Deepening scenario. A similar percentage increase in tidal prism is predicted along the San Joaquin River past Prisoners Point, and a smaller increase in tidal prism is predicted along the Sacramento River.

Depth-averaged daily-averaged salinity maps (Section 6.4.1) show that salinity increases are predicted in San Pablo Bay and Suisun Bay throughout the year. During high flows, the predicted salinity increase in the entire Sacramento-San Joaquin Delta is less than 0.05 psu from February 1 through March 1 for the Year 50 with Potential Project Both DWSC Deepening scenario, but salinity increases are predicted in the Sacramento-San Joaquin Delta throughout most of the year. Time series comparisons of salinity (Section 6.5.1) show predicted salinity increases of between 0.5 psu and 1.0 psu from Carquinez Straight through western Suisun Bay throughout the year. Salinity increases of up to 0.30 psu are predicted on the Sacramento River at Emmaton and salinity increases of up to 0.31 psu are predicted on the San Joaquin River at Jersey Point.

Since the San Francisco Bay to Stockton DWSC deepening affects the West Richmond Channel, the Pinole Shoal Channel though San Pablo Bay and the Stockton DWSC through Suisun Bay, salinity gradients are present in deepened reaches throughout the year. This results in an increase in salt intrusion and a resulting increase in X2 (Section 6.3.1) throughout the year under the Year 50 with Potential Project Both DWSC Deepening scenario. Throughout most of the Year 50 with Potential Project simulation period, the predicted X2 for the Year 50 with Potential Project Both DWSC Deepening scenario is approximately 1 km to 2 km greater than for the Year 50 with Potential Project Baseline scenario along both the Sacramento and the San Joaquin transects, indicating increased salt intrusion throughout the simulation period. The maximum change in average X2 during the Year 50 with Potential Project Both DWSC Deepening scenario is 4.55 km. A change of average X2 of 2.0 km or more is predicted on 22 days under the Year 50 with Potential Project Both DWSC Deepening scenario and a change of average X2 of 1.0 km or more is predicted on 282 days under the Year 50 with Potential Project Both DWSC Deepening scenario.

Evaluation of the impact of the Year 50 with Potential Project Both DWSC Deepening scenario on the compliance with the D-1641 water quality objectives (Section 6.6) indicates an increase in the number of days the water quality objectives for municipal and industrial beneficial uses are not met at the Contra Costa Rock Slough Export and at the Contra Costa Old River Export. No change in the number of days the water quality objectives for municipal and industrial beneficial uses are met is predicted at West Canal at the mouth of Clifton Court Forebay, the Delta-Mendota Canal at the Tracy Pumping Plant, Barker Slough at the North Bay Aqueduct Intake, Cache Slough at the City of Vallejo Intake, or at the Contra Costa Victoria Canal AIP. No changes to the compliance with the water quality objectives for agricultural beneficial uses are predicted under the Year 50 with Potential Project Both DWSC Deepening scenario except at the Sacramento River at Emmaton and at West Canal at the mouth of Clifton Court Forebay. Due to predicted salinity increases on the order of 0.2 to 0.5 psu during most of the year in Suisun Bay and Suisun Marsh, increased salt intrusion resulting from the Year 50 with Potential Project Both DWSC Deepening scenario results in a decline in compliance with the water quality objectives for fish and wildlife beneficial uses in eastern Suisun Marsh and western Suisun Marsh.

7. Analysis of Potential Effects of DWSC Deepening on Bed Shear Stress and Storm Surge Propagation

This section provides additional analysis of the potential effects of the DWSC deepening scenarios on bed shear stress and storm surge. The predicted changes to bed shear stress resulting from the proposed DWSC deepening scenarios are evaluated for the Year 0 scenario simulations in Section 7.1. The predicted changes to storm surge propagation resulting from the proposed DWSC deepening scenarios are evaluated using historic boundary conditions spanning from December 2007 to January 2008 in Section 7.2.

7.1 Analysis of Potential Effects of DWSC Deepening on Bed Shear Stress

7.1.1 Analysis Approach for Evaluation of Impact of DWSC Deepening on Bed Shear Stress

Evaluation of changes in predicted bed shear stress can be used to infer the potential for increased erosion or deposition under the proposed DWSC deepening scenarios. However, this type of analysis does not provide a quantitative measure of erosion or deposition or a quantitative assessment of the potential effects of the proposed DWSC deepening scenarios on the dredging required to maintain the proposed DWSC depths under the proposed DWSC deepening scenarios. For the purpose of this analysis the Year 0 Baseline Scenario, the Year 0 Sacramento DWSC Only Deepening scenario, and the Year 0 Both DWSC Deepening scenario were analyzed. The shear stress analysis was not conducted under Year 50 or Year 50 with Potential Project conditions.

Predicted shear stress maps are evaluated in each of the five reaches of the Sacramento DWSC identified on Figure 7.1-4 and within Reaches 2 through 6 of the SF Bay to Stockton DWSC identified on Figure 7.1-5. Shear stress comparisons are not made in Reach 1 of the San Francisco Bay to Stockton DWSC because no deepening of Reach 1 is proposed under any of the DWSC deepening scenarios.

Maps of predicted bed shear stress were plotted for one day during spring tide during June, and for one day during spring tide during the high flows in March. During June, the maps of predicted shear stress were evaluated during spring tide on June 23, the day with the largest observed tidal range at Fort Point, as shown in Figure 7.1-1. During March, when Delta outflow is the highest during the simulation period (see Figure 3.2-1 and Figure 3.2-1), the maps of predicted shear stress were evaluated on March 21, the day with the largest observed tidal range at Fort Point during March, as shown in Figure 7.1-2

The shear stress maps are generated using the near-bed velocity predicted in the UnTRIM simulations. Within each grid cell the bed shear stress is calculated as

$$\tau = \rho C_d {u_b}^2$$

where ρ is the density of water, C_d is the drag coefficient, and u_b is the predicted velocity 1 m above the bed. The coefficient of drag applied was 0.0025 at 1 meter above the bed, as used in MacWilliams and Cheng (2008). The spatial distribution of the drag coefficient can depend on local sediment properties, however only limited data are available in the project area to estimate the drag coefficient. For the shear stress analysis presented in this report, a typical value of 0.0025 was assumed for the coefficient of drag. This value is consistent with the sediment transport analysis conducted as part of the ATF Technical Study (Sea Engineering, Inc., 2008).

During spring tide during June, maps of predicted shear stress were compared at peak flood and peak ebb within each of the reaches of the Sacramento DWSC and the San Francisco Bay to Stockton DWSC described in Section 3.3.3. During the high flow period, maps of predicted shear stress were compared during peak ebb tide in each reach.

At each of these times the predicted bed shear for each of the deepening scenarios was compared to the predicted bed shear stress for the Year 0 Baseline scenario to compute the predicted change in bed shear stress associated with the DWSC channel deepening. Predicted bed shear stress comparisons for the Year Sacramento DWSC Only Deepening scenario are presented in Section 7.1.2. Predicted bed shear stress comparisons for the Year Both DWSC Deepening scenario are presented in Section 7.1.3.

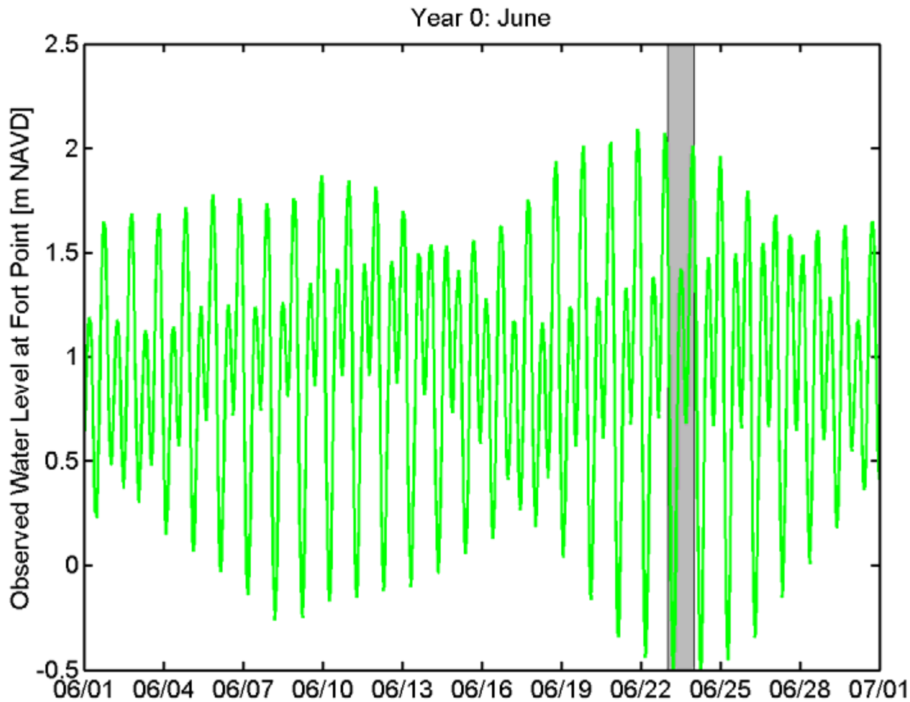


Figure 7.1-1 Observed water level at Fort Point during June 1994. The grey shaded bar shows the day selected for the spring tide shear stress analysis, June 23.

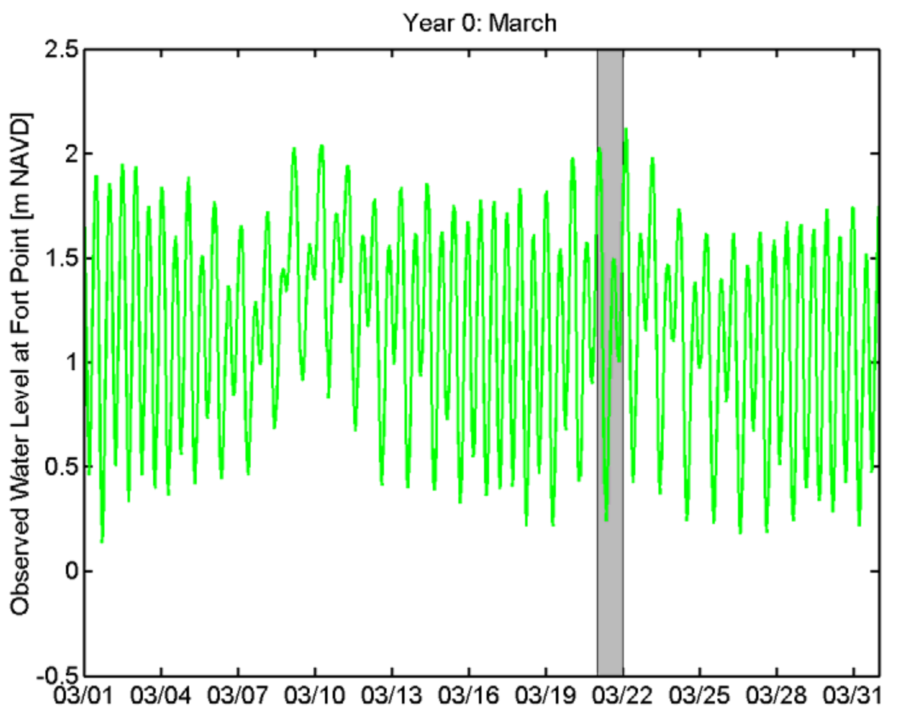


Figure 7.1-2 Observed water level at Fort Point during March 1995. The grey shaded bar shows the day selected for the spring tide shear stress analysis, March 21.

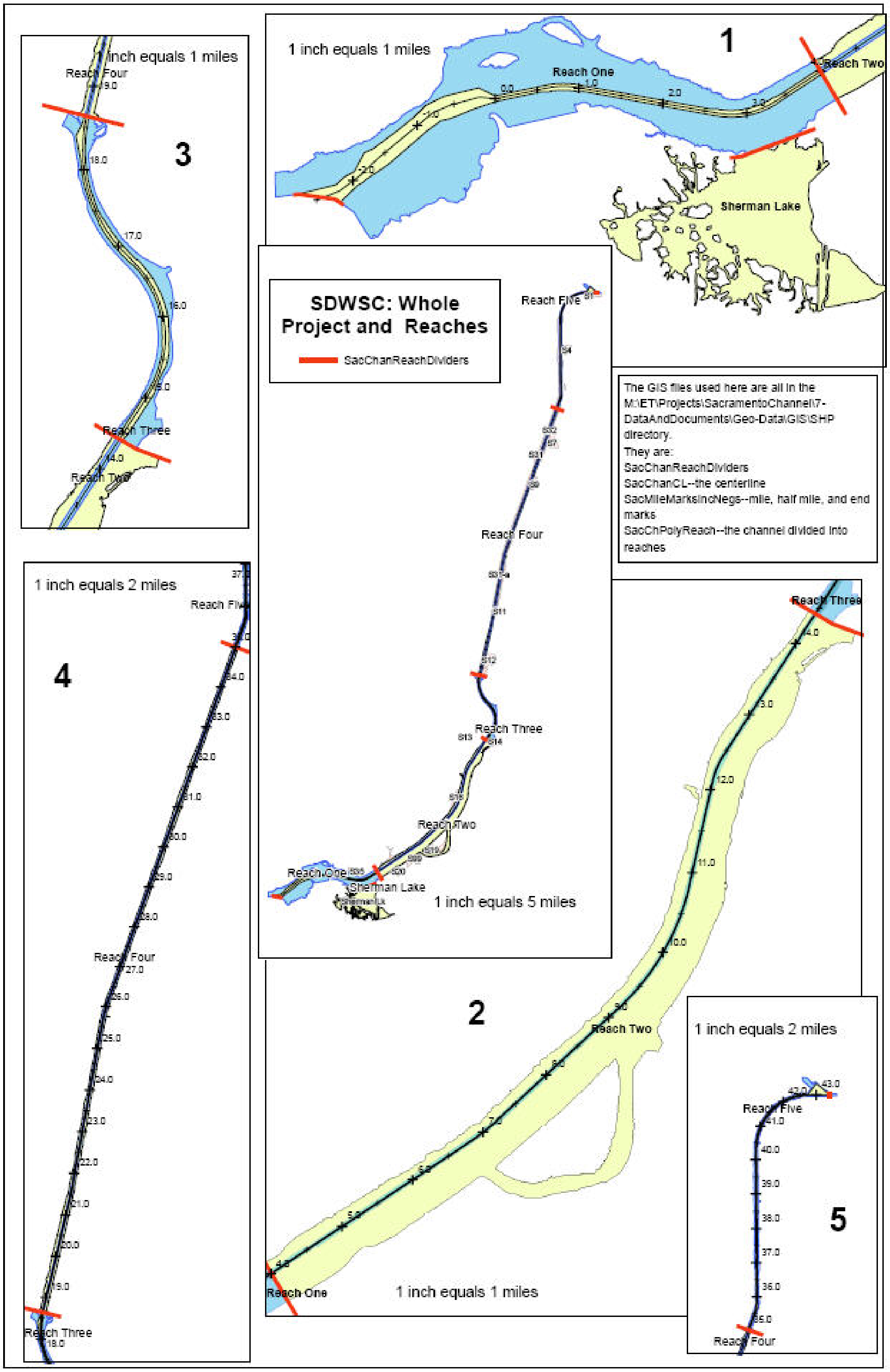


Figure 7.1-3 Location of Sacramento DWSC Project reaches where impacts of proposed DWSC deepening scenarios on bed shear stress are evaluated.

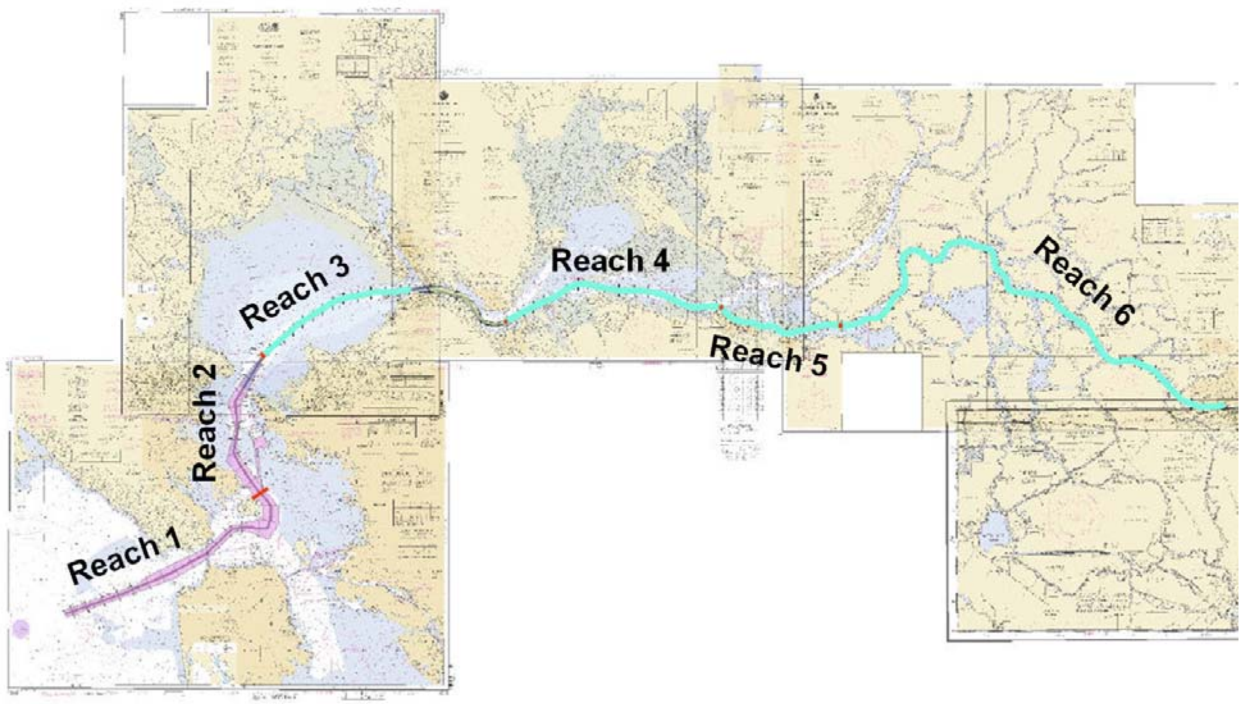


Figure 7.1-4 Location of San Francisco Bay to Stockton DWSC Project reaches where impacts of proposed DWSC deepening scenarios on bed shear stress are evaluated.

7.1.2 Year 0 Sacramento DWSC Only Deepening Scenario Shear Stress Analysis

Figure 7.1-5 shows the predicted stage and channel velocity magnitude for the Year 0 Baseline scenario on June 23 during spring tide within each of the five reaches of the Sacramento DWSC shown on Figure 7.1-3. June 23 was selected for this analysis because the largest tidal range during June occurs on this day (see Figure 7.1-1). The lower panel shows the time of peak ebb tide in each of the five reaches, as well as the time of peak flood tide following peak ebb. San Francisco Bay is ebb dominant, which means that the highest velocities typically occur on ebb tide, as seen in Reaches 1 through 3. In Sacramento DWSC Reaches 4 and 5, which are both within the man-made portion of the Sacramento DWSC, the peak ebb velocities are larger than the peak ebb velocities. Predicted shear stress comparisons are made during peak ebb tide and peak flood tide in each of the five reaches.

Figure 7.1-6 shows the predicted stage and channel velocity magnitude for the Year 0 Baseline scenario on March 21 during spring tide within each of the five reaches of the Sacramento DWSC shown on Figure 7.1-3. March 21 was selected for this analysis because the largest Delta outflows during the Year 0 simulation period occur during March (see Figure 3.2-1), and March 21 has the largest tidal range during March (see Figure 7.1-2). Predicted shear stress comparisons are made during peak ebb in each of the five reaches. Peak flood tide comparisons are not made because the flood tide currents are very small due to the large Delta outflows; the current direction does not reverse during flood tide in Reaches 1 and 2 of the Sacramento DWSC.

Figure 7.1-7 shows the predicted bed shear stress and the predicted change in bed shear stress under the Sacramento DWSC Only Deepening scenario relative to the Year 0 Baseline scenario for Reach 1 of the Sacramento DWSC during peak ebb tide on June 23. Bed shear stress within the DWSC is predicted to decrease by between 0.05 and 0.3 N/m^2 in some regions of the Sacramento DWSC during peak ebb tide. This predicted bed shear stress decrease appears to correspond with increased stratification in the Year 0 Sacramento DWSC deepening scenario relative to the Year 0 Baseline scenario. During the subsequent peak flood tide (Figure 7.1-8), the predicted bed shear stress tends to be lower than during ebb tide, and relatively smaller shear stress differences are predicted under the Sacramento DWSC Only Deepening scenario. Some small increases and decreases are predicted along the Sacramento DWSC, but a predominant trend in the change is not evident during flood tide. The reason that the pattern of decreased predicted bed shear stresses noted on ebb tides do not persist on flood tides is probably because flood tides are less stratified than ebb tides. During peak ebb tide during high flows on March 21 (Figure 7.1-9) the predicted bed shear stress in Reach 1 of the Sacramento DWSC are higher than during spring tides in June. During peak ebb tide during high flows, the predicted shear stress within the Sacramento DWSC tends to be higher under the Sacramento DWSC only deepening scenario than under Baseline conditions, and predicted shear stress on the shoals along the southwestern edges of the Sacramento DWSC tend to be lower. This pattern suggests that the predicted flow through the DWSC increases due to the deepening while the flow through the shoals decreases.

Figure 7.1-10 shows the predicted bed shear stress and the predicted change in bed shear stress under the Sacramento DWSC Only Deepening scenario relative to the Year 0 Baseline scenario for Reach 2 of the Sacramento DWSC during peak ebb tide on June 23. Similar to Reach 1, the bed shear stress within the DWSC is predicted to decrease by between 0.05 and 0.3 N/m^2 in some regions of the Sacramento DWSC during peak ebb tide. During the subsequent peak flood tide (Figure 7.1-11), the predicted bed shear stress tends to be lower than during ebb tide, and relatively smaller shear stress differences are predicted under the Sacramento DWSC Only Deepening scenario. Some small increases and decreases are predicted along the Sacramento DWSC, but a predominant trend in the change is not evident during flood tide. During peak ebb tide during high flows on March 21 (Figure 7.1-12) the predicted bed shear stress in Reach 2 of the Sacramento DWSC are higher than during spring tides in June. During peak ebb tide and high flows, the predicted shear stress within the Sacramento DWSC in Reach 2 tends to be higher under the Sacramento DWSC only deepening scenario than under Baseline conditions, and predicted shear stress along the southwestern edges of the Sacramento DWSC tend to be lower. These results are similar to those predicted in Reach 1 of the Sacramento DWSC.

Figure 7.1-13 shows the predicted bed shear stress and the predicted change in bed shear stress under the Sacramento DWSC Only Deepening scenario relative to the Year 0 Baseline scenario for Reach 3 of the Sacramento DWSC during peak ebb tide on June 23. Some small decreases in shear stress are predicted in the Sacramento DWSC near the junction of the Sacramento River and Cache Slough, but in most regions only small differences in shear stress are predicted in Reach 3 during ebb tide. During the subsequent peak flood tide (Figure 7.1-14), the predicted bed shear stress tends to be lower than during ebb tide, and relatively smaller shear stress differences are predicted under the Sacramento DWSC Only Deepening scenario. Near the middle of the reach along Cache Slough bed shear stress is predicted to increase by between 0.05 and 0.10 N/m^2, with relatively small differences predicted in the rest of Reach 3 during peak flood tide. During peak ebb tide during high flows on March 21 (Figure 7.1-15) the predicted bed shear stress in Reach 3 of the Sacramento DWSC shows some difference near the junction of Cache Slough and the Sacramento River, with slightly higher shear stress predicted in this region of the DWSC and lower shear stresses predicted along the DWSC margin.

Figure 7.1-16 shows the predicted bed shear stress and the predicted change in bed shear stress under the Sacramento DWSC Only Deepening scenario relative to the Year 0 Baseline scenario for Reach 4 of the Sacramento DWSC during peak ebb tide on June 23. Reach 4 of the Sacramento DWSC is within the man-made portion of the Sacramento DWSC. In this reach the channel velocities tend to be much lower than in Reaches 1 through 3 (see Figure 7.1-5 and Figure 7.1-6), and as a result predicted bed shear stress is very small even during peak ebb. Predicted shear stress differences resulting from the Sacramento DWSC Only Deepening scenario are less than 0.05 N/m^2 during peak ebb. Similarly, during the subsequent peak flood tide (Figure 7.1-17) the predicted bed shear stress within Reach 4 is very low and the predicted shear stress differences resulting from the Sacramento DWSC Only Deepening scenario are less than 0.05 N/m^2 during peak flood. During peak ebb tide during high flows on March 21 (Figure 7.1-18) the predicted channel velocity within Reach 4 is relatively low (Figure 7.1-6). Predicted shear stress differences resulting from the Sacramento DWSC Only Deepening scenario are less than 0.05 N/m^2 during peak ebb during high flows.

Figure 7.1-19 shows the predicted bed shear stress and the predicted change in bed shear stress under the Sacramento DWSC Only Deepening scenario relative to the Year 0 Baseline scenario for Reach 5 of the Sacramento DWSC during peak ebb tide on June 23. Reach 5 of the Sacramento DWSC is within the man-made portion of the Sacramento DWSC, and because this reach has already been deepened to 35 ft MLLW, no additional deepening of this reach is proposed under the Sacramento DWSC Only Deepening scenario. The predicted shear stress differences in Reach 5 resulting from the Sacramento DWSC Only Deepening scenario are less than 0.05 N/m^2 during peak ebb (Figure 7.1-19), peak flood (Figure 7.1-20) and peak ebb during high flows (Figure 7.1-21).

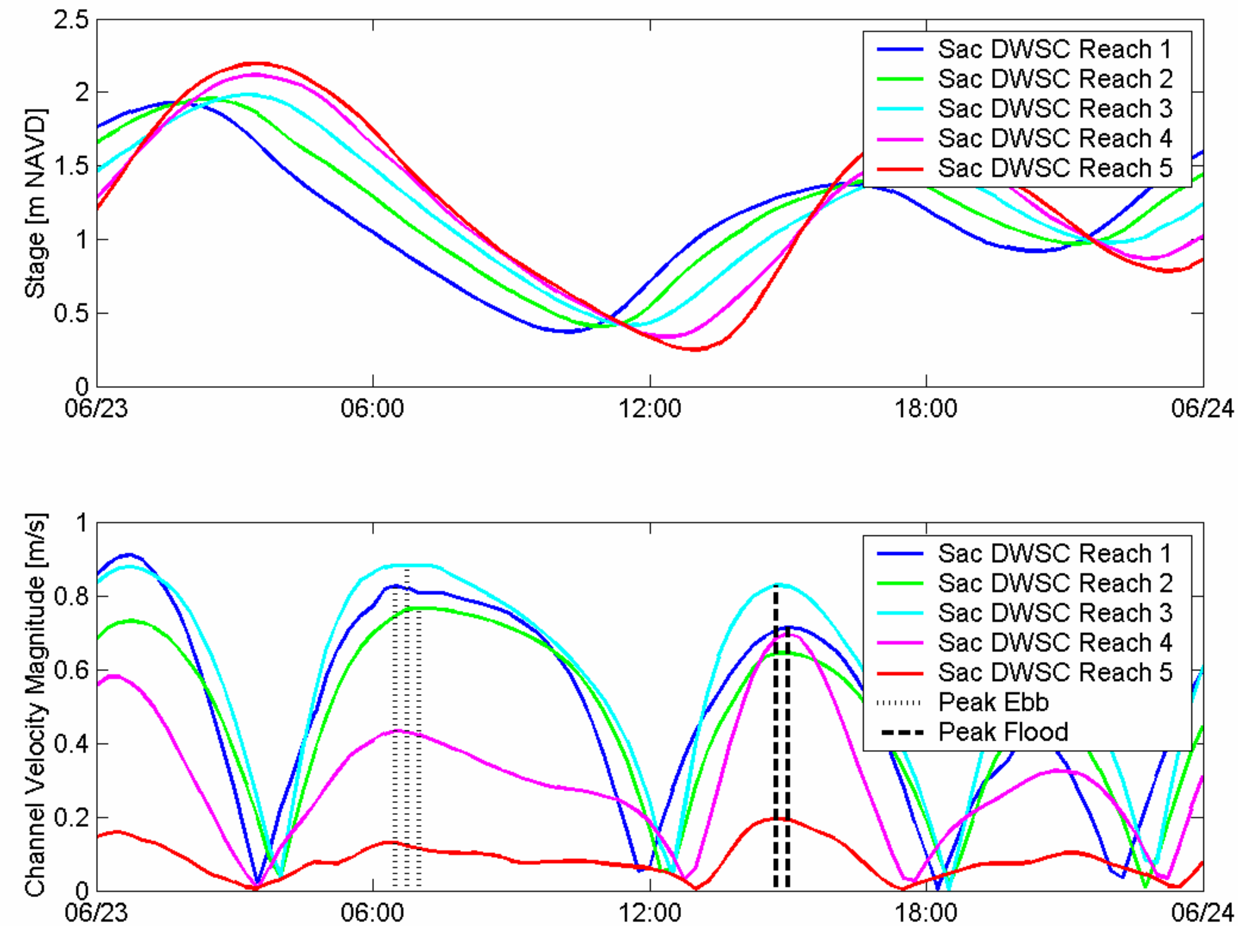


Figure 7.1-5 Predicted stage (top) and channel velocity magnitude (bottom) within five reaches of the Sacramento DWSC during spring tide on June 23 during the Year 0 simulation period. The times of peak ebb and peak flood tidal velocities within each reach are shown on the bottom panel.

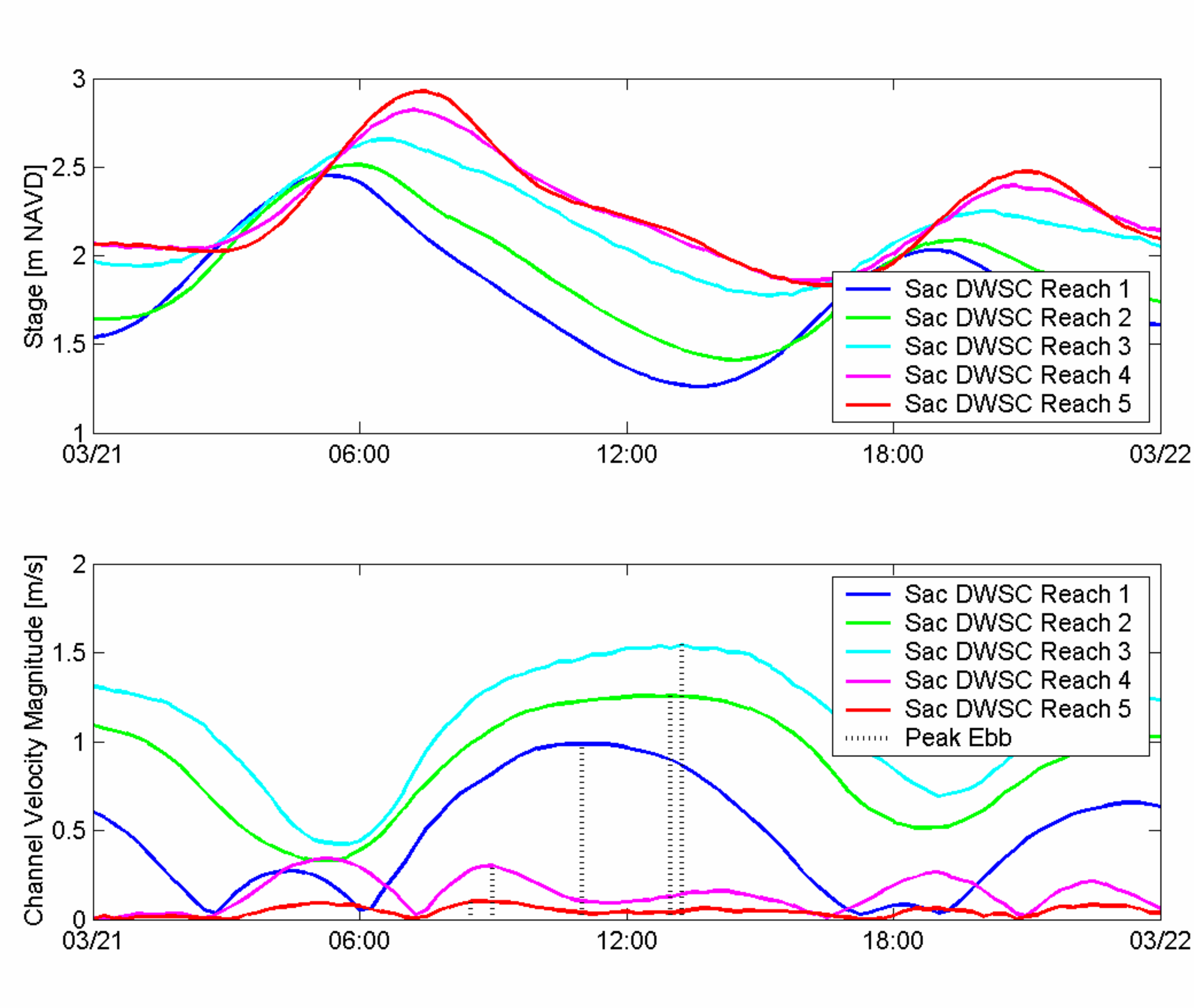


Figure 7.1-6 Predicted stage (top) and channel velocity magnitude (bottom) within five reaches of the Sacramento DWSC during spring tide on March 21 during the highest Delta outflows during Year 0 simulation period. The times of peak ebb tidal velocities within each reach are shown on the bottom panel.

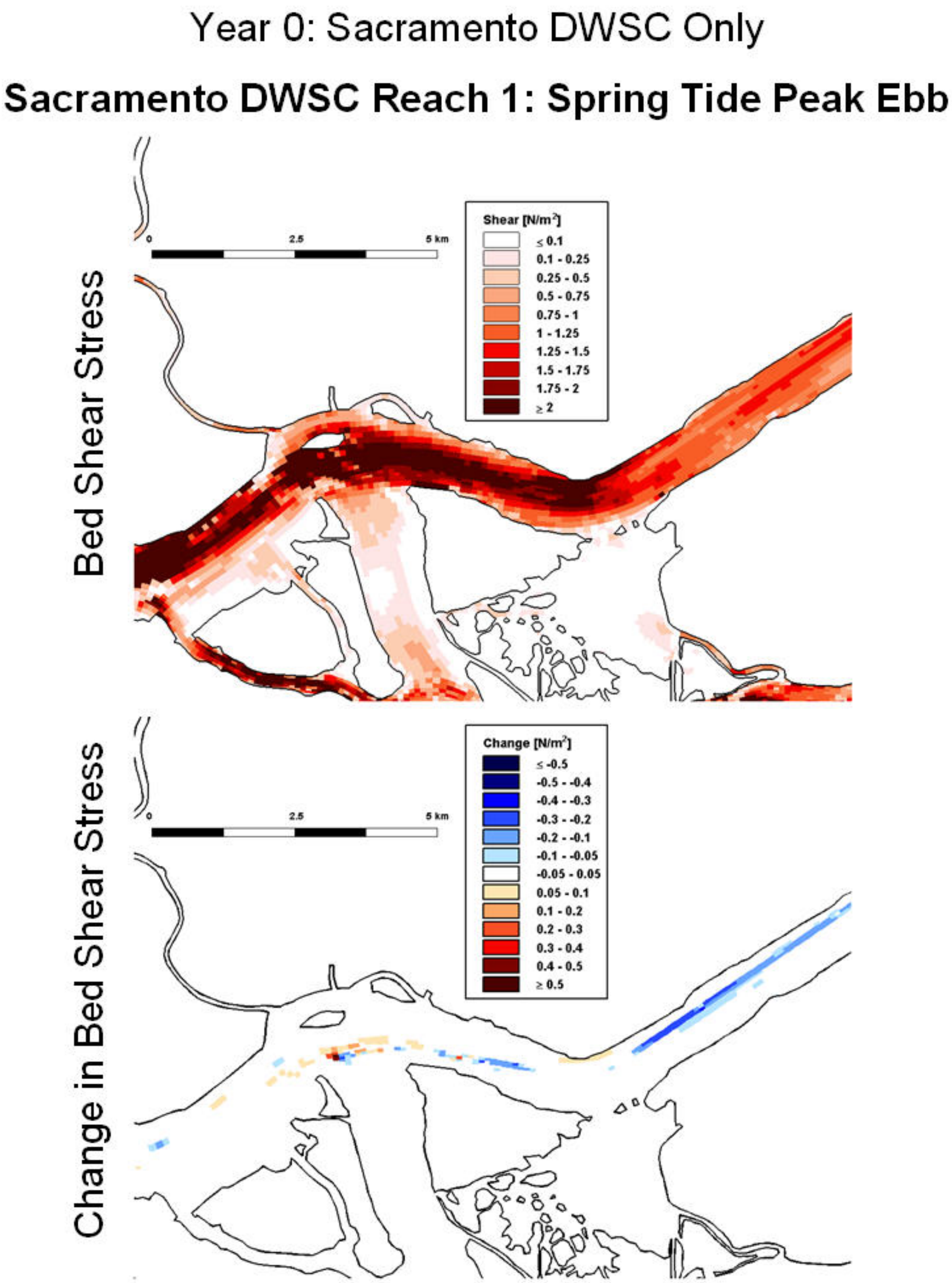


Figure 7.1-7 Predicted bed shear stress in Sacramento DWSC Reach 1 during peak ebb currents on June 23 during spring tide for the Year 0 Sacramento DWSC Only Deepening scenario (top); predicted change in bed shear stress in Sacramento DWSC Reach 1 during peak ebb on June 23 for the Year 0 Sacramento DWSC Only Deepening scenario relative to the Year 0 Baseline scenario (bottom).

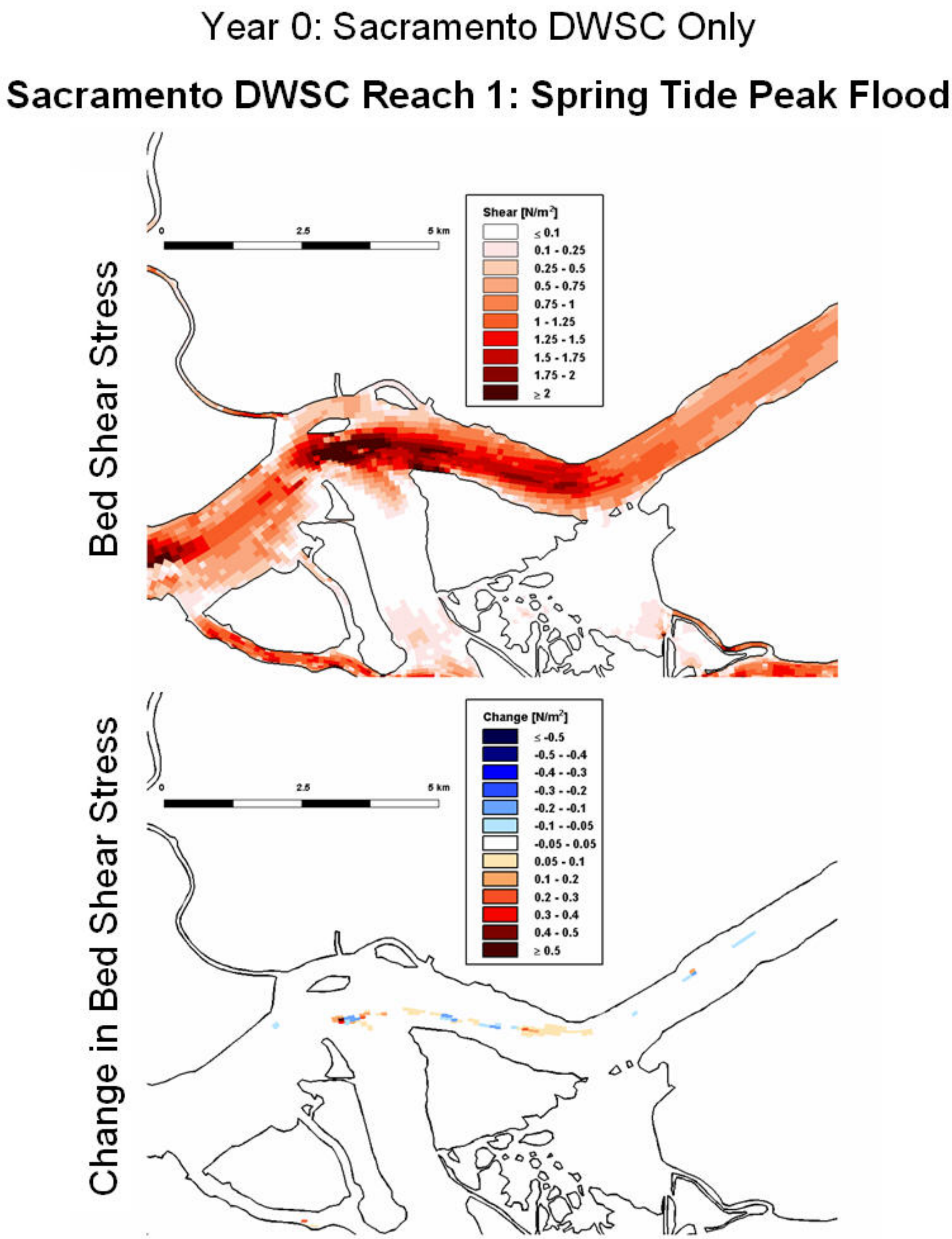


Figure 7.1-8 Predicted bed shear stress in Sacramento DWSC Reach 1 during peak flood currents on June 23 during spring tide for the Year 0 Sacramento DWSC Only Deepening scenario (top); predicted change in bed shear stress in Sacramento DWSC Reach 1 during peak flood on June 23 for the Year 0 Sacramento DWSC Only Deepening scenario relative to the Year 0 Baseline scenario (bottom).

Year 0: Sacramento DWSC Only

Sacramento DWSC Reach 1: High Flow at Peak Ebb

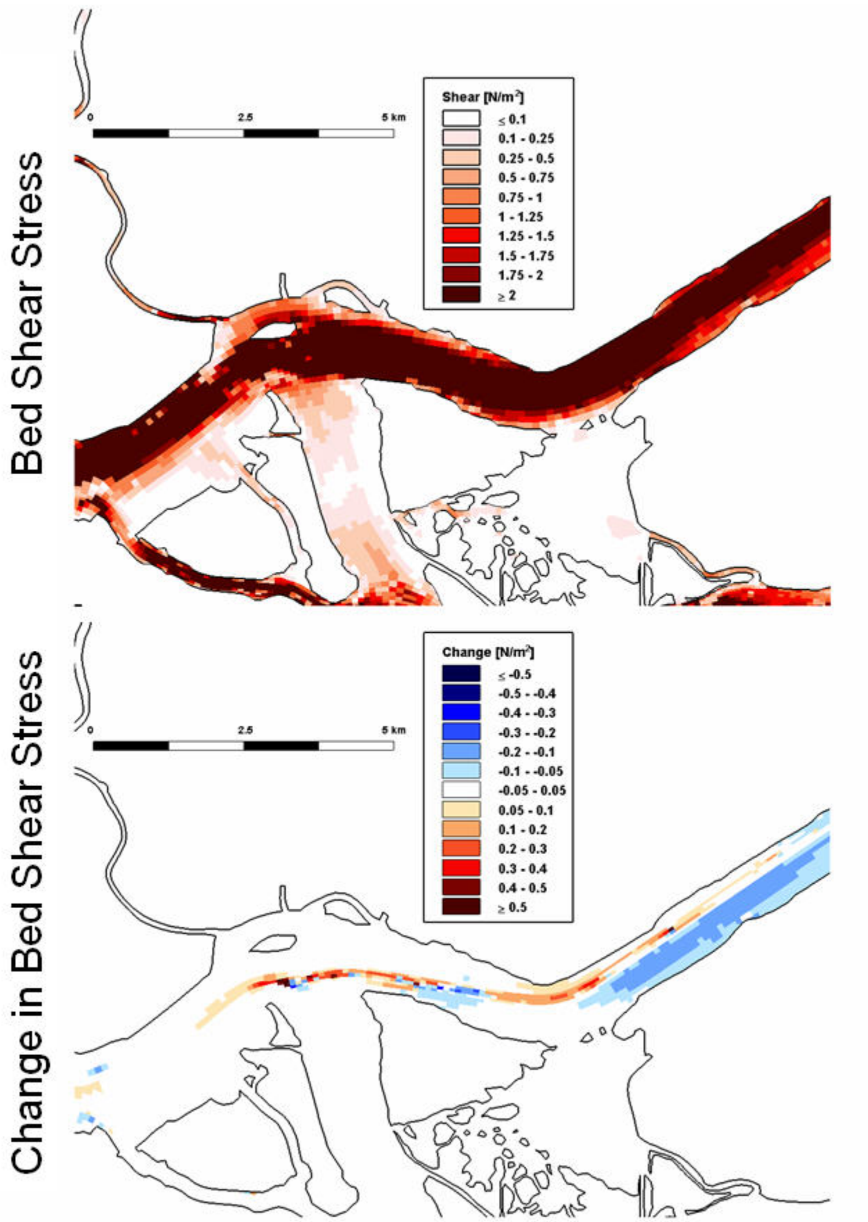


Figure 7.1-9 Predicted bed shear stress in Sacramento DWSC Reach 1 during peak ebb currents on March 21 during spring tide and a period of high Delta outflows for the Year 0 Sacramento DWSC Only Deepening scenario (top); predicted change in bed shear stress in Sacramento DWSC Reach 1 during peak ebb on March 21 for the Year 0 Sacramento DWSC Only Deepening scenario relative to the Year 0 Baseline scenario (bottom).

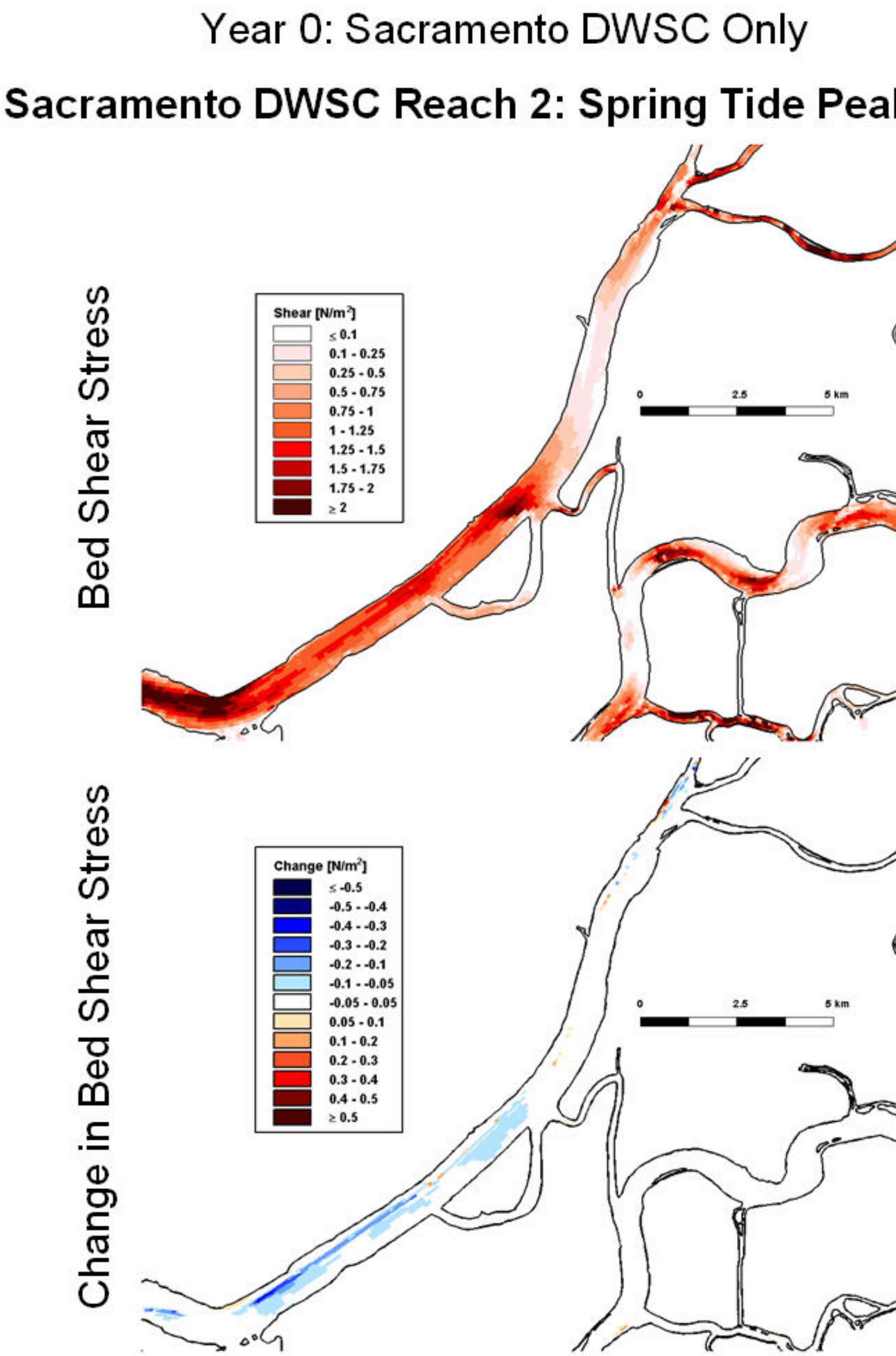


Figure 7.1-10 Predicted bed shear stress in Sacramento DWSC Reach 2 during peak ebb currents on June 23 during spring tide for the Year 0 Sacramento DWSC Only Deepening scenario (top); predicted change in bed shear stress in Sacramento DWSC Reach 2 during peak ebb on June 23 for the Year 0 Sacramento DWSC Only Deepening scenario relative to the Year 0 Baseline scenario (bottom).

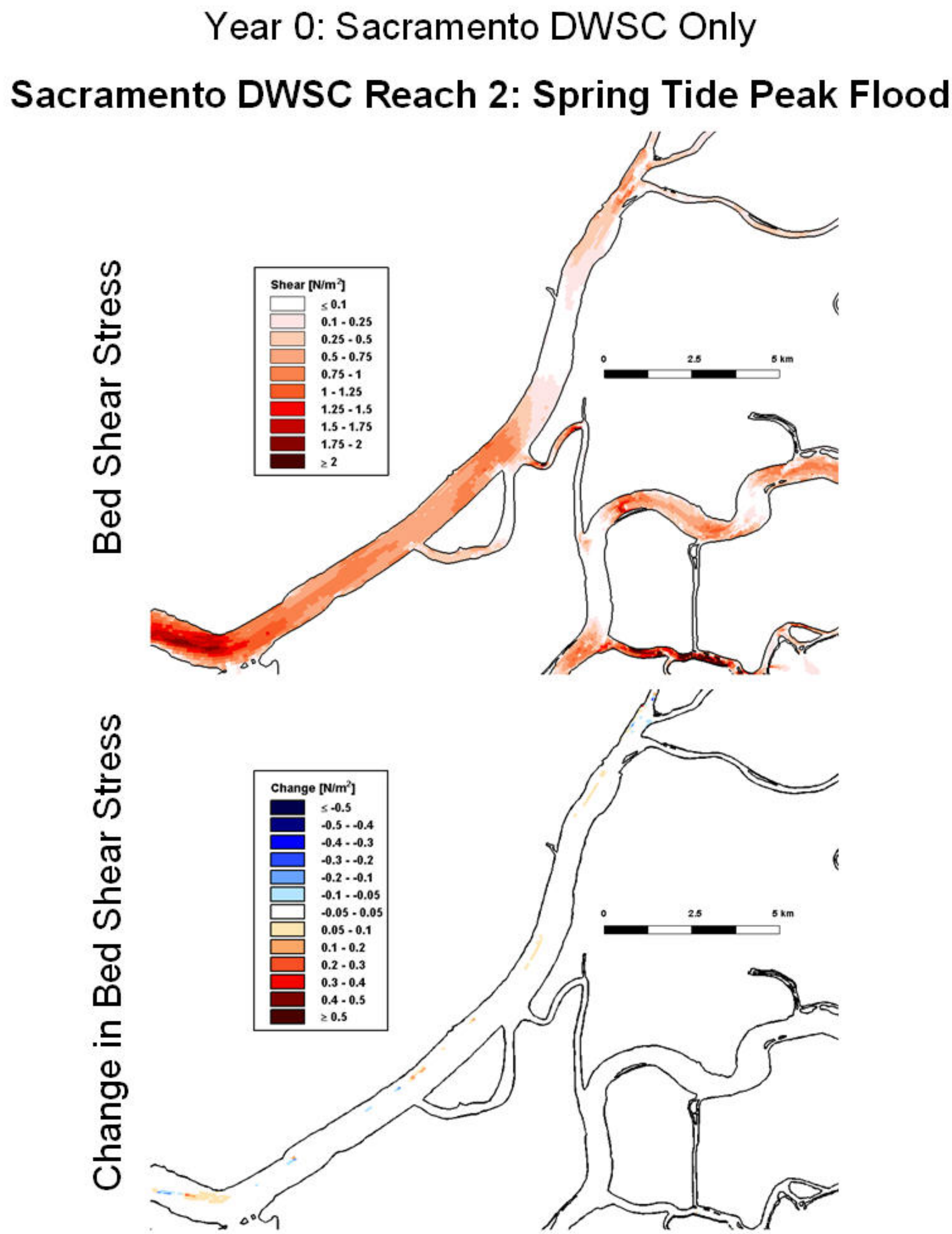


Figure 7.1-11 Predicted bed shear stress in Sacramento DWSC Reach 2 during peak flood currents on June 23 during spring tide for the Year 0 Sacramento DWSC Only Deepening scenario (top); predicted change in bed shear stress in Sacramento DWSC Reach 2 during peak flood on June 23 for the Year 0 Sacramento DWSC Only Deepening scenario relative to the Year 0 Baseline scenario (bottom).

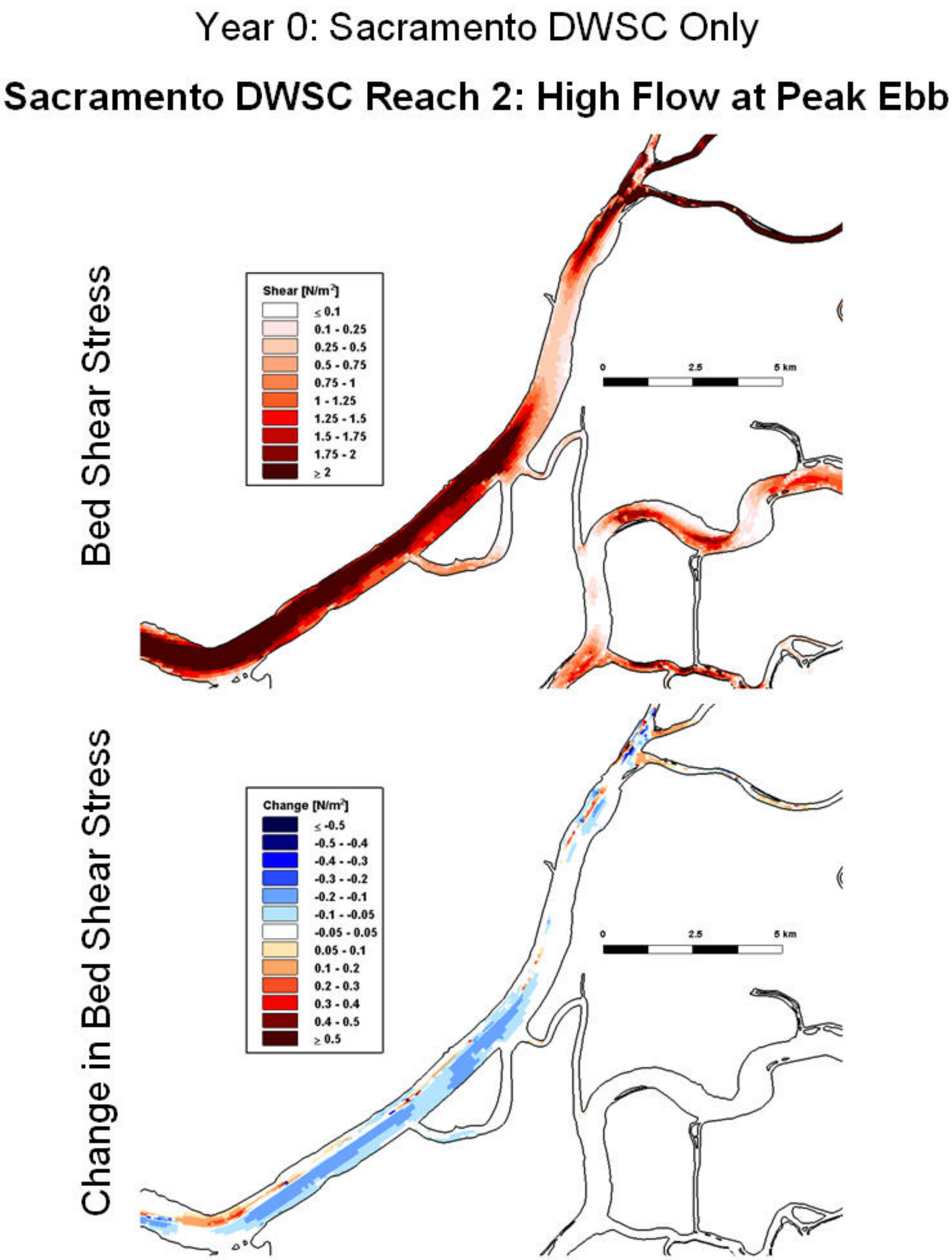


Figure 7.1-12 Predicted bed shear stress in Sacramento DWSC Reach 2 during peak ebb currents on March 21 during spring tide and a period of high Delta outflows for the Year 0 Sacramento DWSC Only Deepening scenario (top); predicted change in bed shear stress in Sacramento DWSC Reach 2 during peak ebb on March 21 for the Year 0 Sacramento DWSC Only Deepening scenario relative to the Year 0 Baseline scenario (bottom).

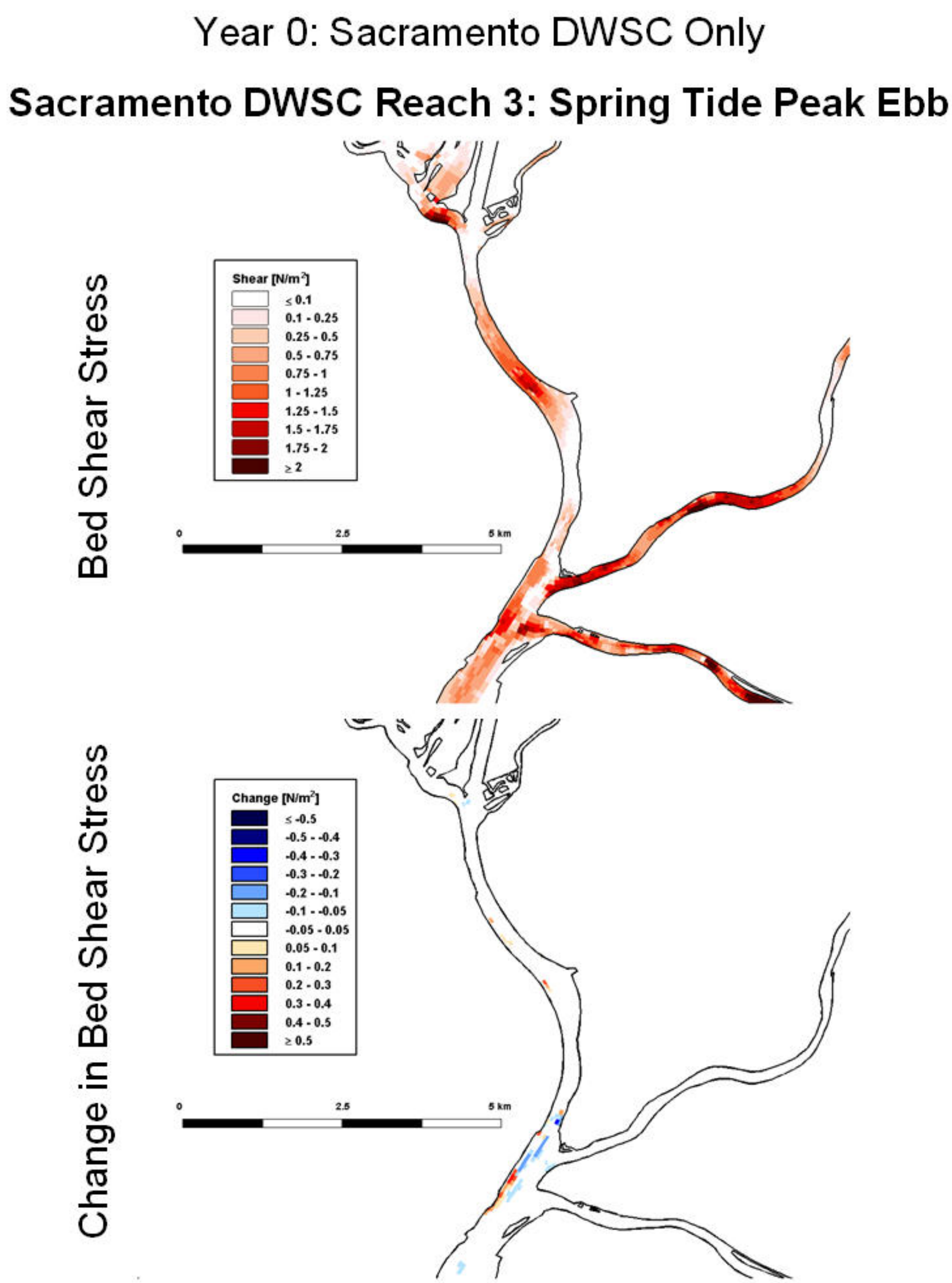


Figure 7.1-13 Predicted bed shear stress in Sacramento DWSC Reach 3 during peak ebb currents on June 23 during spring tide for the Year 0 Sacramento DWSC Only Deepening scenario (top); predicted change in bed shear stress in Sacramento DWSC Reach 3 during peak ebb on June 23 for the Year 0 Sacramento DWSC Only Deepening scenario relative to the Year 0 Baseline scenario (bottom).

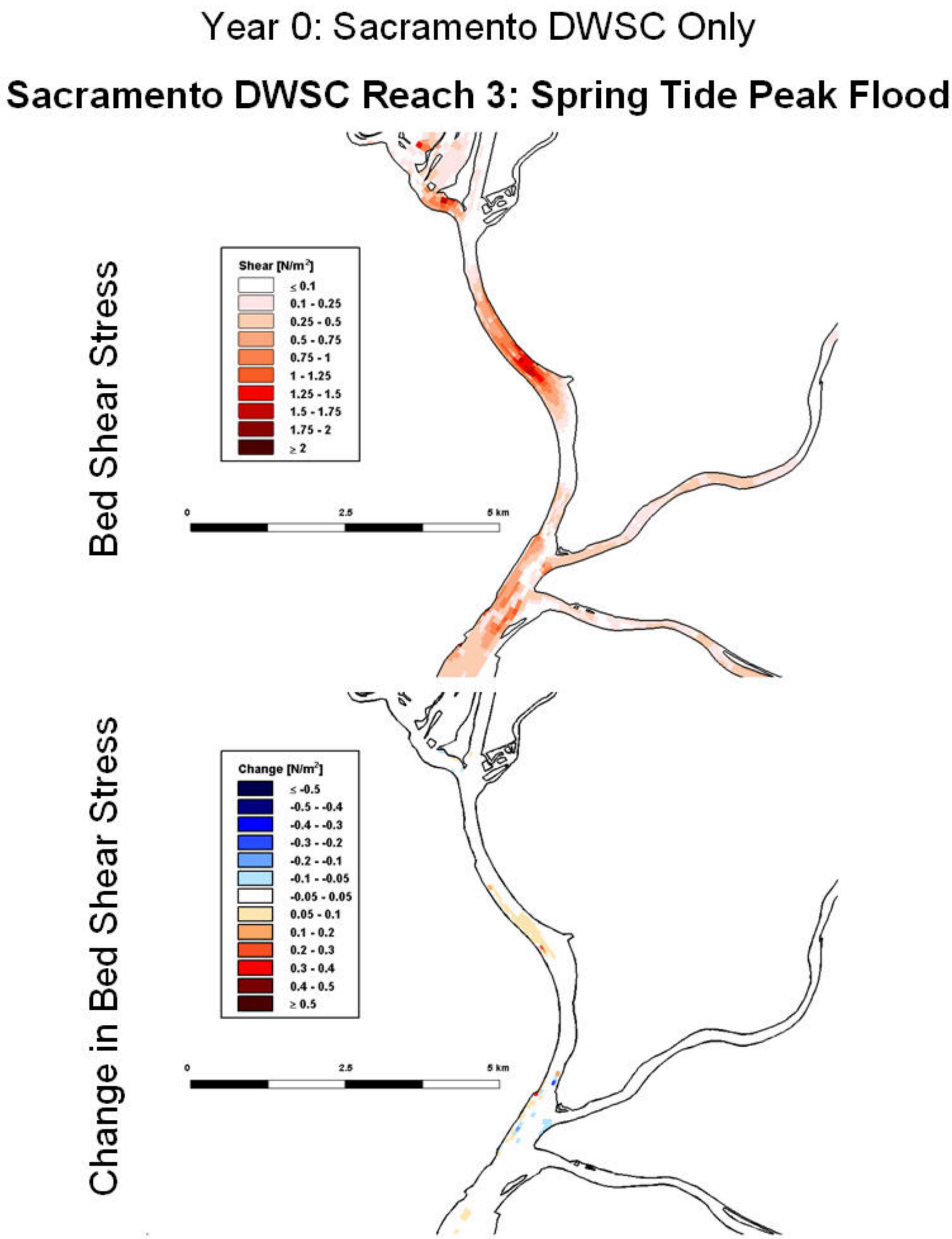


Figure 7.1-14 Predicted bed shear stress in Sacramento DWSC Reach 3 during peak flood currents on June 23 during spring tide for the Year 0 Sacramento DWSC Only Deepening scenario (top); predicted change in bed shear stress in Sacramento DWSC Reach 3 during peak flood on June 23 for the Year 0 Sacramento DWSC Only Deepening scenario relative to the Year 0 Baseline scenario (bottom).

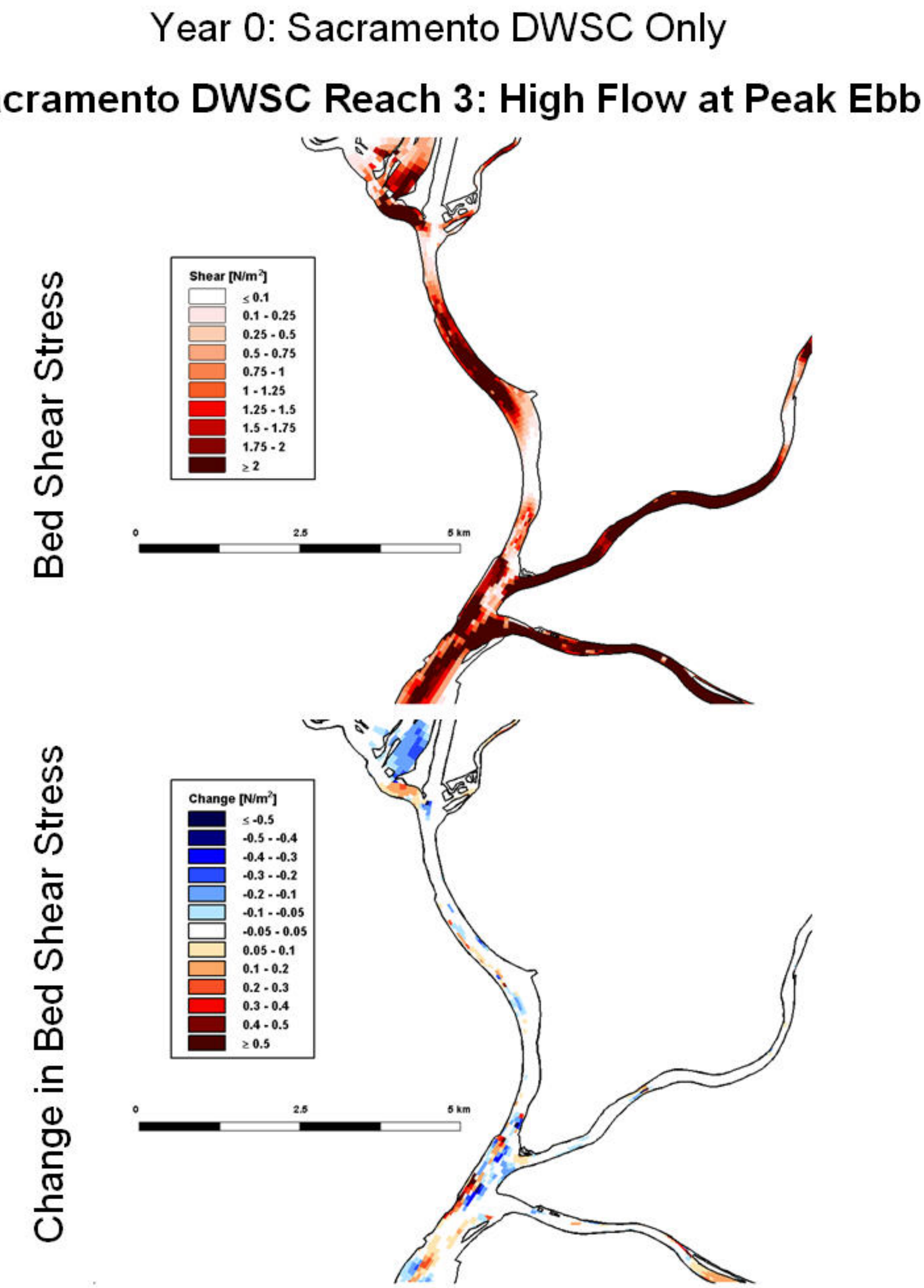


Figure 7.1-15 Predicted bed shear stress in Sacramento DWSC Reach 3 during peak ebb currents on March 21 during spring tide and a period of high Delta outflows for the Year 0 Sacramento DWSC Only Deepening scenario (top); predicted change in bed shear stress in Sacramento DWSC Reach 3 during peak ebb on March 21 for the Year 0 Sacramento DWSC Only Deepening scenario relative to the Year 0 Baseline scenario (bottom).

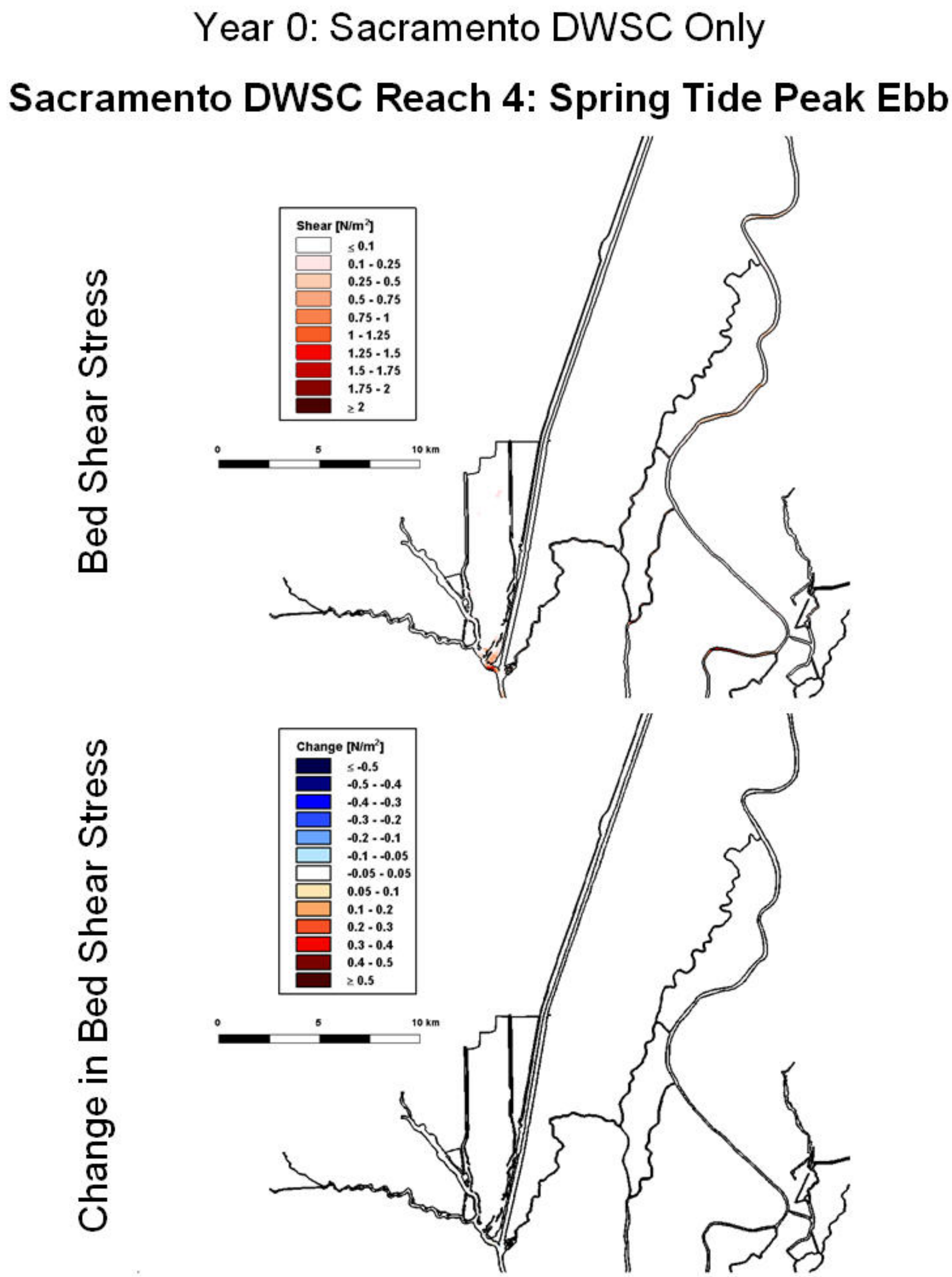


Figure 7.1-16 Predicted bed shear stress in Sacramento DWSC Reach 4 during peak ebb currents on June 23 during spring tide for the Year 0 Sacramento DWSC Only Deepening scenario (top); predicted change in bed shear stress in Sacramento DWSC Reach 4 during peak ebb on June 23 for the Year 0 Sacramento DWSC Only Deepening scenario relative to the Year 0 Baseline scenario (bottom).

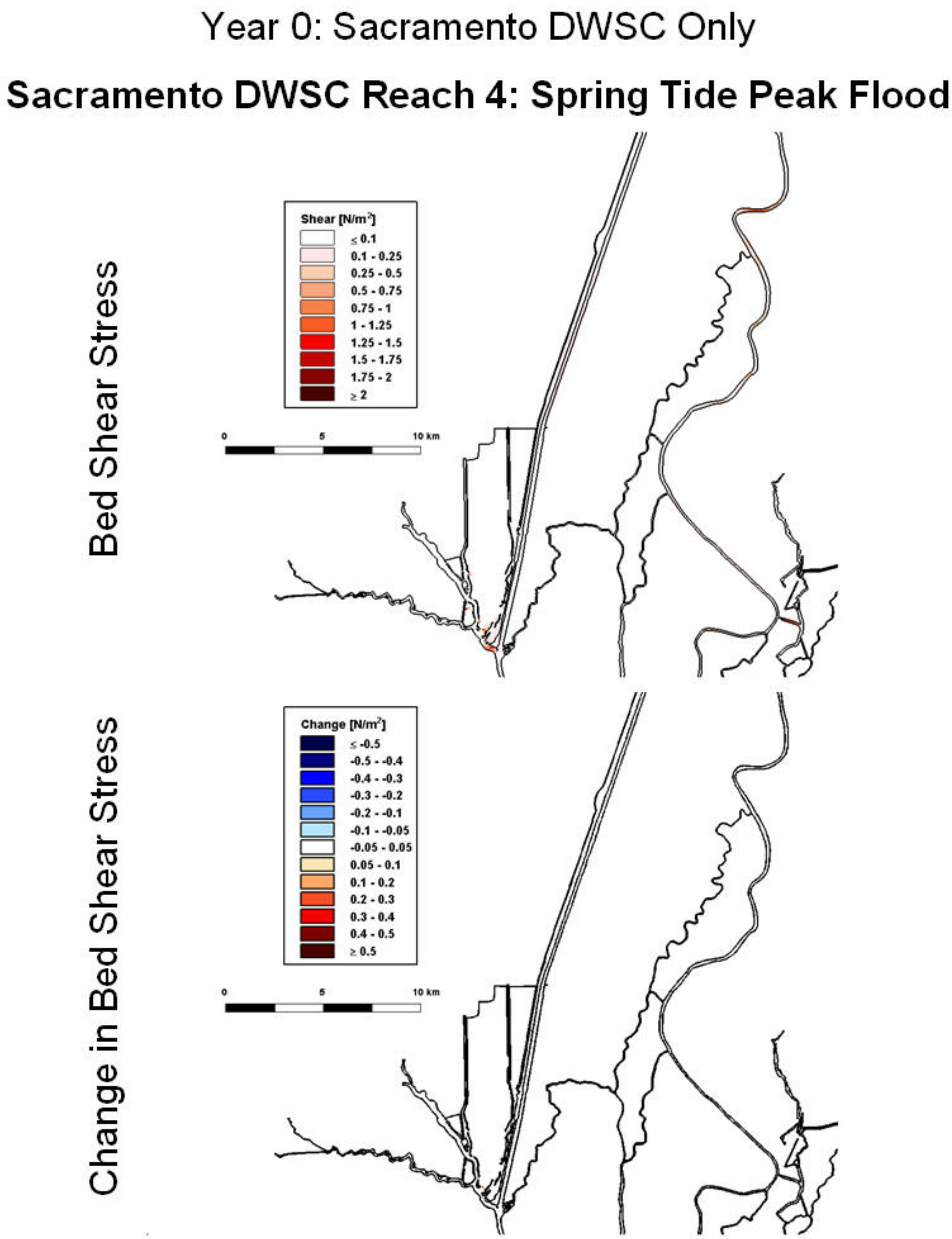


Figure 7.1-17 Predicted bed shear stress in Sacramento DWSC Reach 4 during peak flood currents on June 23 during spring tide for the Year 0 Sacramento DWSC Only Deepening scenario (top); predicted change in bed shear stress in Sacramento DWSC Reach 4 during peak flood on June 23 for the Year 0 Sacramento DWSC Only Deepening scenario relative to the Year 0 Baseline scenario (bottom).

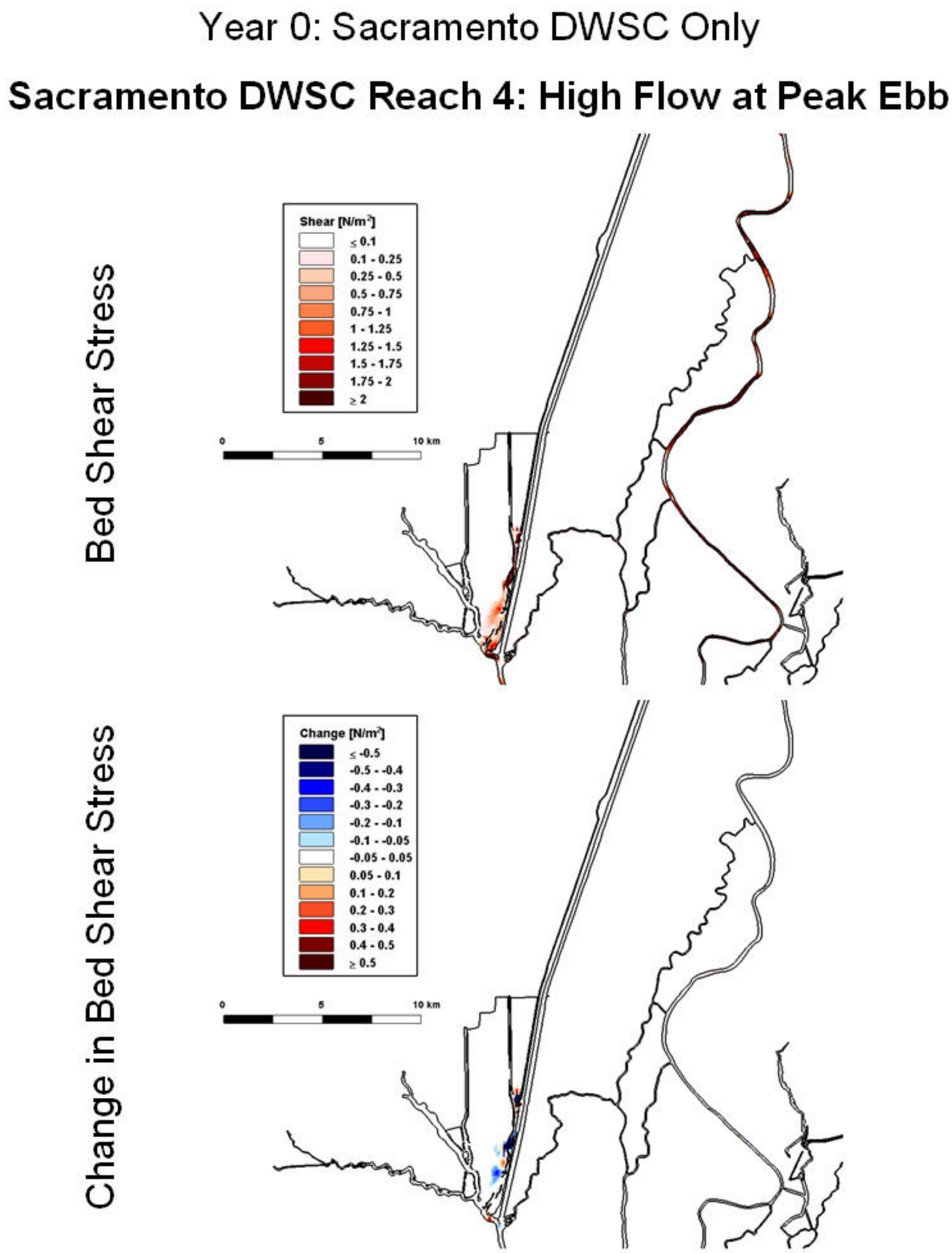


Figure 7.1-18 Predicted bed shear stress in Sacramento DWSC Reach 4 during peak ebb currents on March 21 during spring tide and a period of high Delta outflows for the Year 0 Sacramento DWSC Only Deepening scenario (top); predicted change in bed shear stress in Sacramento DWSC Reach 4 during peak ebb on March 21 for the Year 0 Sacramento DWSC Only Deepening scenario relative to the Year 0 Baseline scenario (bottom).

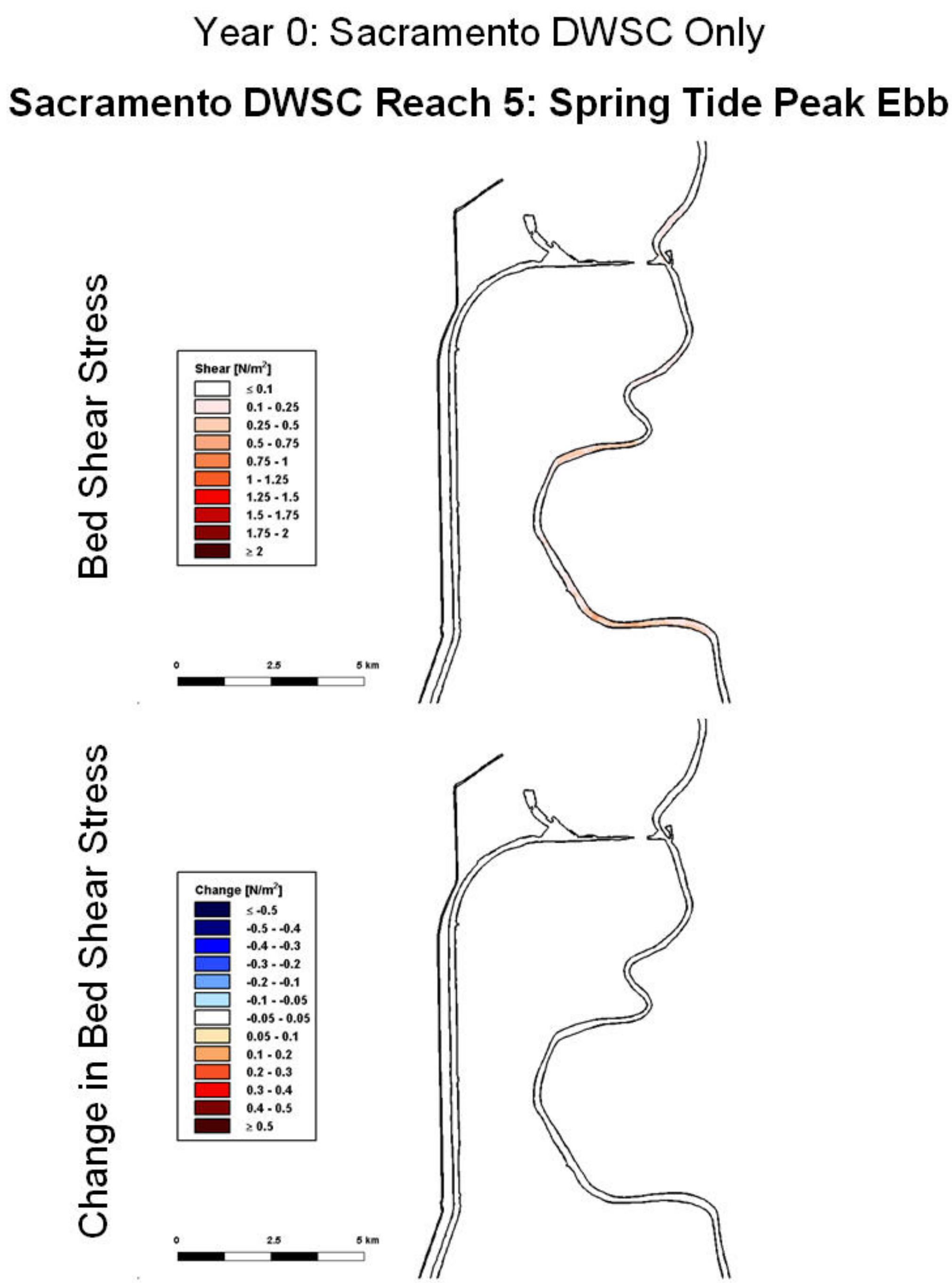


Figure 7.1-19 Predicted bed shear stress in Sacramento DWSC Reach 5 during peak ebb currents on June 23 during spring tide for the Year 0 Sacramento DWSC Only Deepening scenario (top); predicted change in bed shear stress in Sacramento DWSC Reach 5 during peak ebb on June 23 for the Year 0 Sacramento DWSC Only Deepening scenario relative to the Year 0 Baseline scenario (bottom).

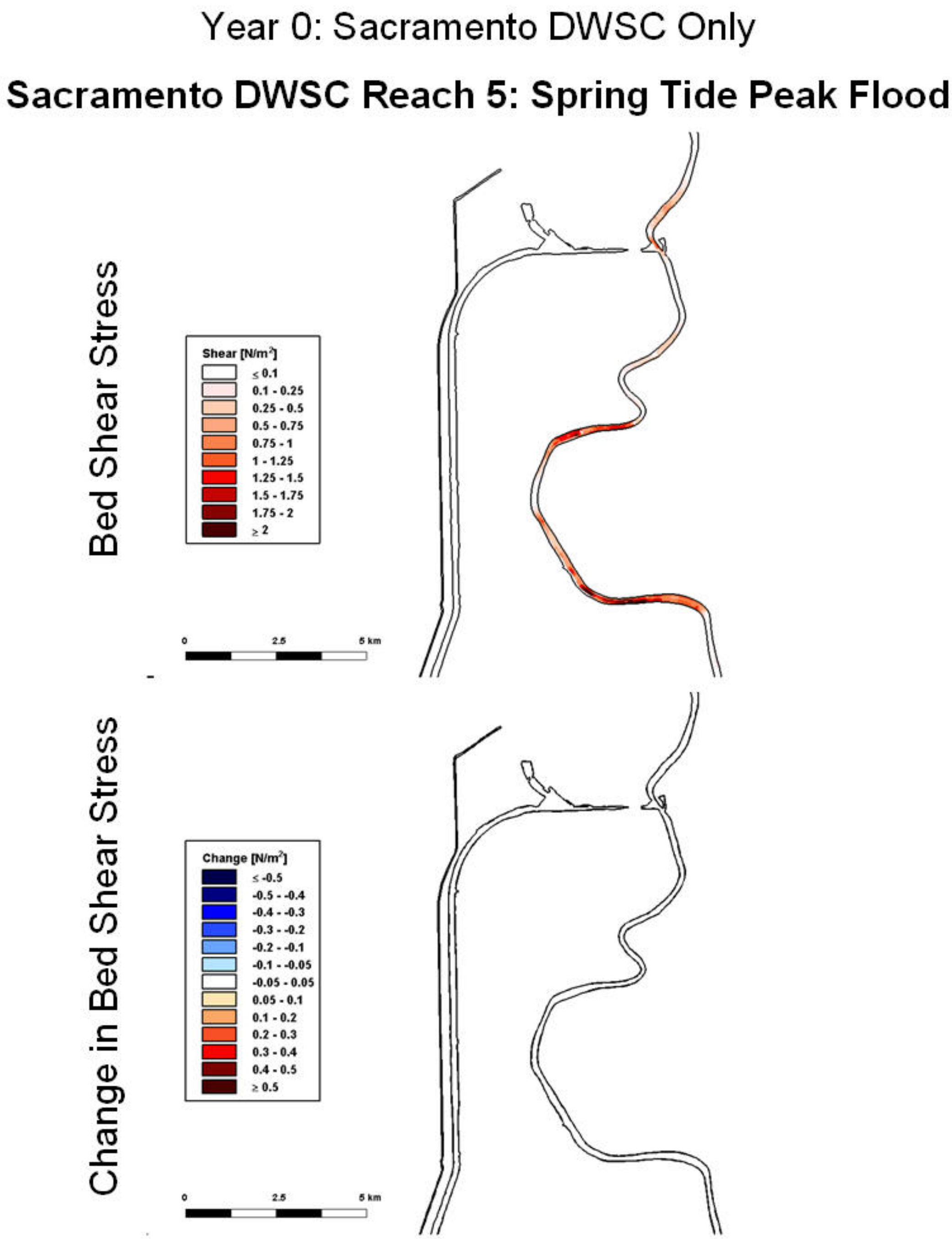


Figure 7.1-20 Predicted bed shear stress in Sacramento DWSC Reach 5 during peak flood currents on June 23 during spring tide for the Year 0 Sacramento DWSC Only Deepening scenario (top); predicted change in bed shear stress in Sacramento DWSC Reach 5 during peak flood on June 23 for the Year 0 Sacramento DWSC Only Deepening scenario relative to the Year 0 Baseline scenario (bottom).

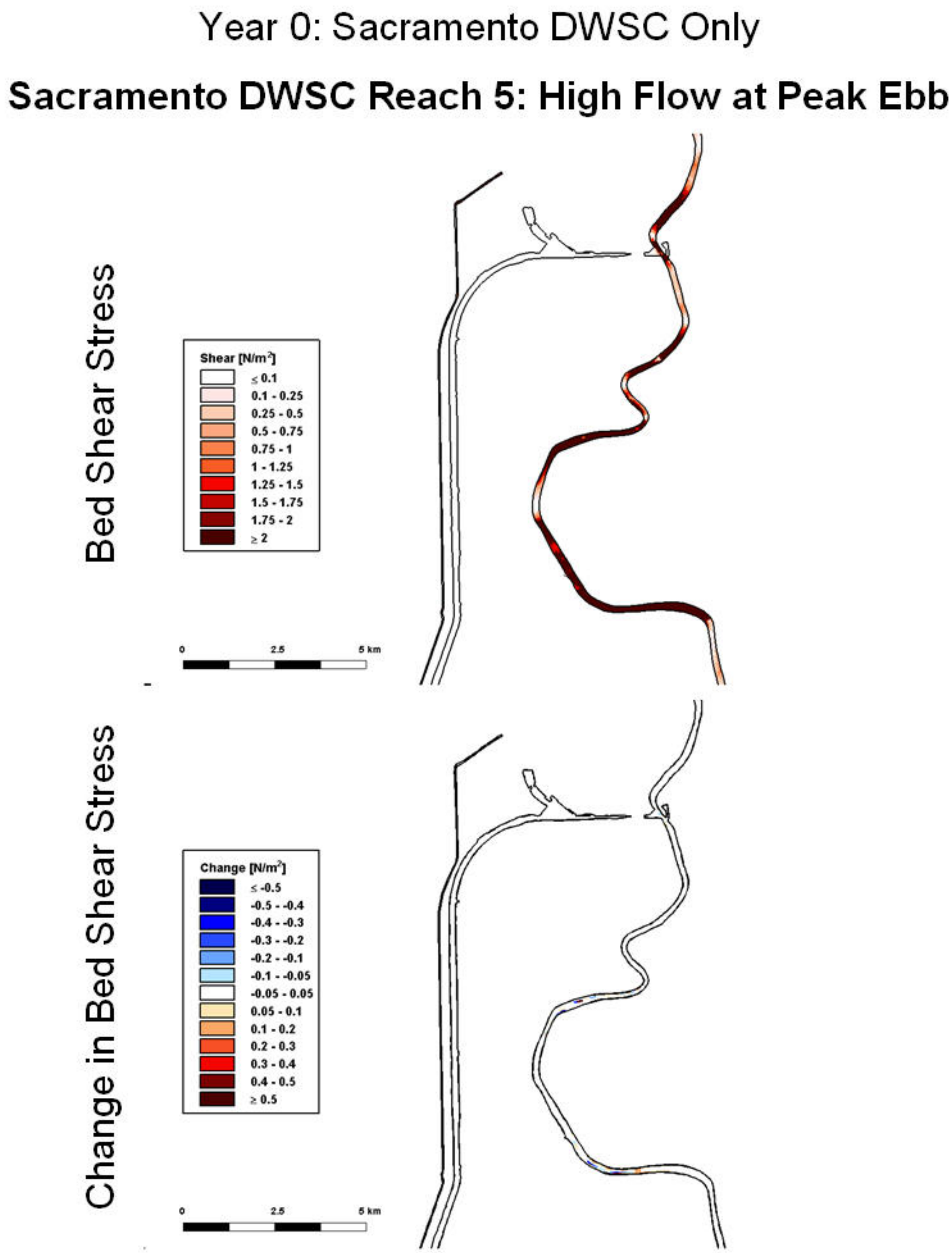


Figure 7.1-21 Predicted bed shear stress in Sacramento DWSC Reach 5 during peak ebb currents on March 21 during spring tide and a period of high Delta outflows for the Year 0 Sacramento DWSC Only Deepening scenario (top); predicted change in bed shear stress in Sacramento DWSC Reach 5 during peak ebb on March 21 for the Year 0 Sacramento DWSC Only Deepening scenario relative to the Year 0 Baseline scenario (bottom).

7.1.3 Year 0 Both Sacramento DWSC & SF Bay to Stockton DWSC Deepening Scenario Shear Stress Analysis

Figure 7.1-22 shows the predicted stage and channel velocity magnitude for the Year 0 Baseline scenario on June 23 during spring tide within Reaches 2 through 6 of the SF Bay to Stockton DWSC shown on Figure 7.1-4. Shear stress comparisons are not made in Reach 1 of the San Francisco Bay to Stockton DWSC because no deepening of Reach 1 is proposed under any of the DWSC deepening scenarios. June 23 was selected for this analysis because the largest tidal range during June occurs on this day (see Figure 7.1-1). The lower panel shows the time of peak ebb tide in each of the five reaches, as well as the time of peak flood tide following peak ebb. San Francisco Bay is ebb dominant, which means that the highest velocities occur on ebb tide in each of the 5 reaches shown. Predicted shear stress comparisons are made during peak ebb tide and peak flood tide in each of the five reaches.

Figure 7.1-23 shows the predicted stage and channel velocity magnitude for the Year 0 Baseline scenario on March 21 during spring tide within Reaches 2 through 6 of the SF Bay to Stockton DWSC shown on Figure 7.1-4. March 21 was selected for this analysis because the largest Delta outflows during the Year 0 simulation period occur during March (see Figure 3.2-1), and March 21 has the largest tidal range during March (see Figure 7.1-2). Predicted shear stress comparisons are made during peak ebb in each of the five reaches. Peak flood tide comparisons are not made because the flood tide currents are very small due to the large Delta outflows and are similar to the peak flood velocities during the summer spring tide analyzed (Figure 7.1-22).

Figure 7.1-24 shows the predicted bed shear stress and the predicted change in bed shear stress under the Both DWSC Deepening scenario relative to the Year 0 Baseline scenario for Reach 2 of the SF Bay to Stockton DWSC during peak ebb tide on June 23. Reach 2 of the SF Bay to Stockton DWSC encompasses the West Richmond Channel. The predicted change in bed shear stress in this reach is very small during peak ebb tide on June 23 (Figure 7.1-24), peak flood tide on June 23 (Figure 7.1-25), and during peak ebb tide during high flows on March 21 (Figure 7.1-26). These results suggest that the proposed deepening of the West Richmond channel is likely to have only a small effect on bed shear stress in this reach.

Figure 7.1-27 shows the predicted bed shear stress and the predicted change in bed shear stress under the Both DWSC Deepening scenario relative to the Year 0 Baseline scenario for Reach 3 of the SF Bay to Stockton DWSC during peak ebb tide on June 23. Reach 3 of the SF Bay to Stockton DWSC encompasses the Pinole Shoal Channel. During peak ebb tide, the bed shear stress within the Pinole Shoal Channel is predicted to decrease in some regions, an increase in some regions. Lower shear stresses are also predicted along the margins of the Pinole Shoal channel through San Pablo Bay. During the subsequent flood tide (Figure 7.1-28), significant increases in bed shear stress are predicted within the Pinole Shoal Channel under the Both DWSC Deepening scenario. During peak ebb tide during high flows on March 21 (Figure 7.1-29), the predicted bed shear stress in Reach 3 of the SF Bay to Stockton DWSC shows some complexity with relatively low shear stress predicted in some portions of the eastern reach of the Pinole Shoal Channel. The low shear stress regions correspond to the location of a sharply stratified salt wedge (see salinity profile for March 1 on Figure 4.5-39). The location of the salt wedge is shifted further landward for the Year 0 Both DWSC Deepening scenario relative to the Year 0 Baseline scenario resulting in a spatial shift in the low predicted bed shear stress region among scenarios. This spatial shift in stratification and shear stress results in the large differences in predicted shear stress over much of the Pinole Shoal Channel seen in Figure 7.1-29. During this period increases in shear stress are predicted in the western portion of the Pinole Shoal Channel and decreases in shear stress are predicted near the eastern end of the Pinole Shoal channel.

Figure 7.1-30 shows the predicted bed shear stress and the predicted change in bed shear stress under the Both DWSC Deepening scenario relative to the Year 0 Baseline scenario for Reach 4 of the SF Bay to Stockton DWSC during peak ebb tide on June 23. Reach 4 of the SF Bay to Stockton DWSC encompasses the portion of the SF Bay to Stockton DWSC through Suisun Bay. During peak ebb tide, the bed shear stress within the SF Bay to Stockton DWSC is predicted to decrease in the center portion of Suisun Bay, and increase along the margins of the DWSC throughout Suisun Bay. During the subsequent peak flood tide (Figure 7.1-31) the predicted bed shear stress tends to be lower than during ebb tide, and relatively smaller shear stress differences are predicted under the Both DWSC Deepening scenario. In general, the predicted shear stress along Reach 4 of the SF Bay to Stockton DWSC increases under the Both DWSC Deepening scenario during peak flood tide. During peak ebb tide during high flows on March 21 (Figure 7.1-32), the predicted bed shear stress in Reach 4 of the SF Bay to Stockton DWSC is significantly higher than during peak ebb or peak flood tide on June 23. The predicted shear stress along Reach 4 of the SF Bay to Stockton DWSC increases under the Both DWSC Deepening scenario during peak ebb tide and high flows, though some small regions of the channel are predicted to experience lower bed shear stress. Tidal prism landward of Suisun Bay is predicted to increase slightly for the Year 0 Both DWSC Deepening scenario relative to the Year 0 Baseline scenario. It appears that much of the increased tidal prism flows through the deeper parts of the channel, including the DWSC, resulting in increased predicted shear stress. These results suggest that the deepening of the SF Bay to Stockton DWSC leads to a decreased potential for deposition and an increased potential for erosion through much of Reach 4.

Figure 7.1-33 shows the predicted bed shear stress and the predicted change in bed shear stress under the Both DWSC Deepening scenario relative to the Year 0 Baseline scenario for Reach 5 of the SF Bay to Stockton DWSC during peak ebb tide on June 23. Reach 5 of the SF Bay to Stockton DWSC encompasses the portion of the SF Bay to Stockton DWSC between Pittsburgh and Antioch through New York Slough. During peak ebb tide, the bed shear stress within the SF Bay to Stockton DWSC is predicted to increase throughout this reach. During the subsequent peak flood tide (Figure 7.1-34), the predicted bed shear stress tends to be lower than during ebb tide, and relatively smaller shear stress differences are predicted under the Both DWSC Deepening scenario. Small increases in bed shear stress are predicted along most of Reach 5 of the SF Bay to Stockton DWSC increases under the Both DWSC Deepening scenario during peak flood tide. During peak ebb tide during high flows on March 21 (Figure 7.1-35) the predicted bed shear stress in Reach 5 of the SF Bay to Stockton DWSC is significantly higher than during peak ebb or peak flood tide on June 23. The bed shear stress along most of Reach 5 of the SF Bay to Stockton DWSC is predicted to increase under the Both DWSC Deepening scenario during peak ebb tide and high flows. Similar to Reach 4, these results suggest that, in general, the deepening of the SF Bay to Stockton DWSC through this reach leads increased flow through the DWSC and New York Slough and an increased potential for erosion through much of this reach.

Figure 7.1-36 shows the predicted bed shear stress and the predicted change in bed shear stress under the Both DWSC Deepening scenario relative to the Year 0 Baseline scenario for Reach 6 of the SF Bay to Stockton DWSC during peak ebb tide on June 23. Reach 6 of the SF Bay to Stockton DWSC encompasses the portion of the SF Bay to Stockton DWSC between Antioch and the Port of Stockton. During peak ebb tide, some increases in bed shear stress within the SF Bay to Stockton DWSC are predicted in this reach, particularly between Antioch and False River, between Threemile Slough and San Andreas Landing, and between Prisoners Point and Venice Cut. During the subsequent peak flood tide (Figure 7.1-37), the predicted bed shear stress tends to be lower than during ebb tide, and relatively smaller shear stress differences are predicted under the Both DWSC Deepening scenario. During peak flood, small increases in bed shear stress are predicted along the same regions where shear stress increases were predicted during peak ebb. During peak ebb tide during high flows on March 21 (Figure 7.1-38) the predicted bed shear stress in Reach 6 is also predicted to increase in similar regions. Similar to Reaches 4 and 5, these results suggest that, in general, the deepening of the SF Bay to Stockton DWSC through this reach leads to increased flow through the San Joaquin River and along the SF Bay to Stockton DWSC and an increased potential for erosion through some portions of this reach.

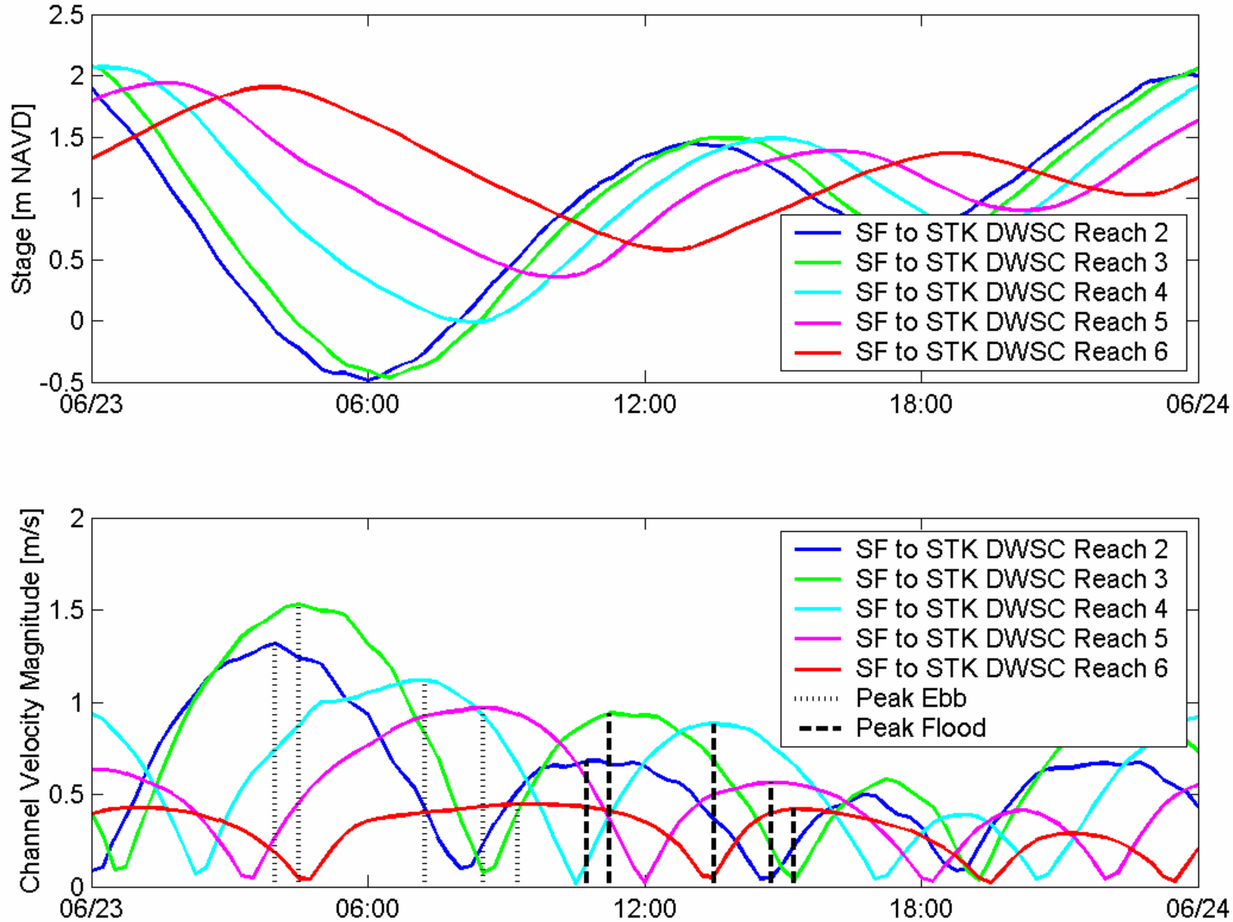


Figure 7.1-22 Predicted stage (top) and channel velocity magnitude (bottom) within Reaches 2 through 6 of the SF Bay to Stockton DWSC during spring tide on June 23 during the Year 0 simulation period. The times of peak ebb and peak flood tidal velocities within each reach are shown on the bottom panel.

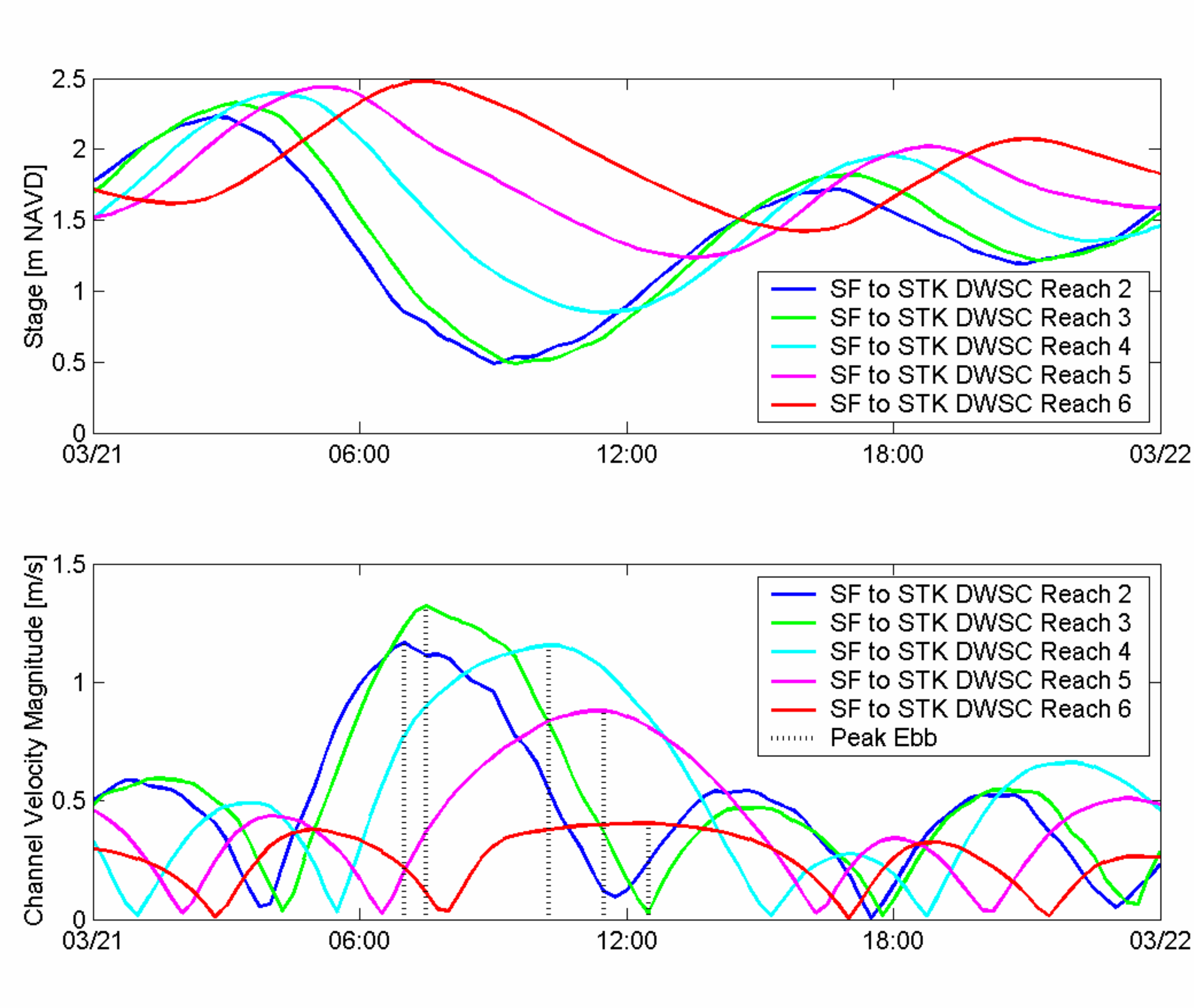


Figure 7.1-23 Predicted stage (top) and channel velocity magnitude (bottom) within Reaches 2 through 6 of the SF Bay to Stockton DWSC during spring tide on March 21 during the highest Delta outflows during Year 0 simulation period. The times of peak ebb tidal velocities within each reach are shown on the bottom panel.

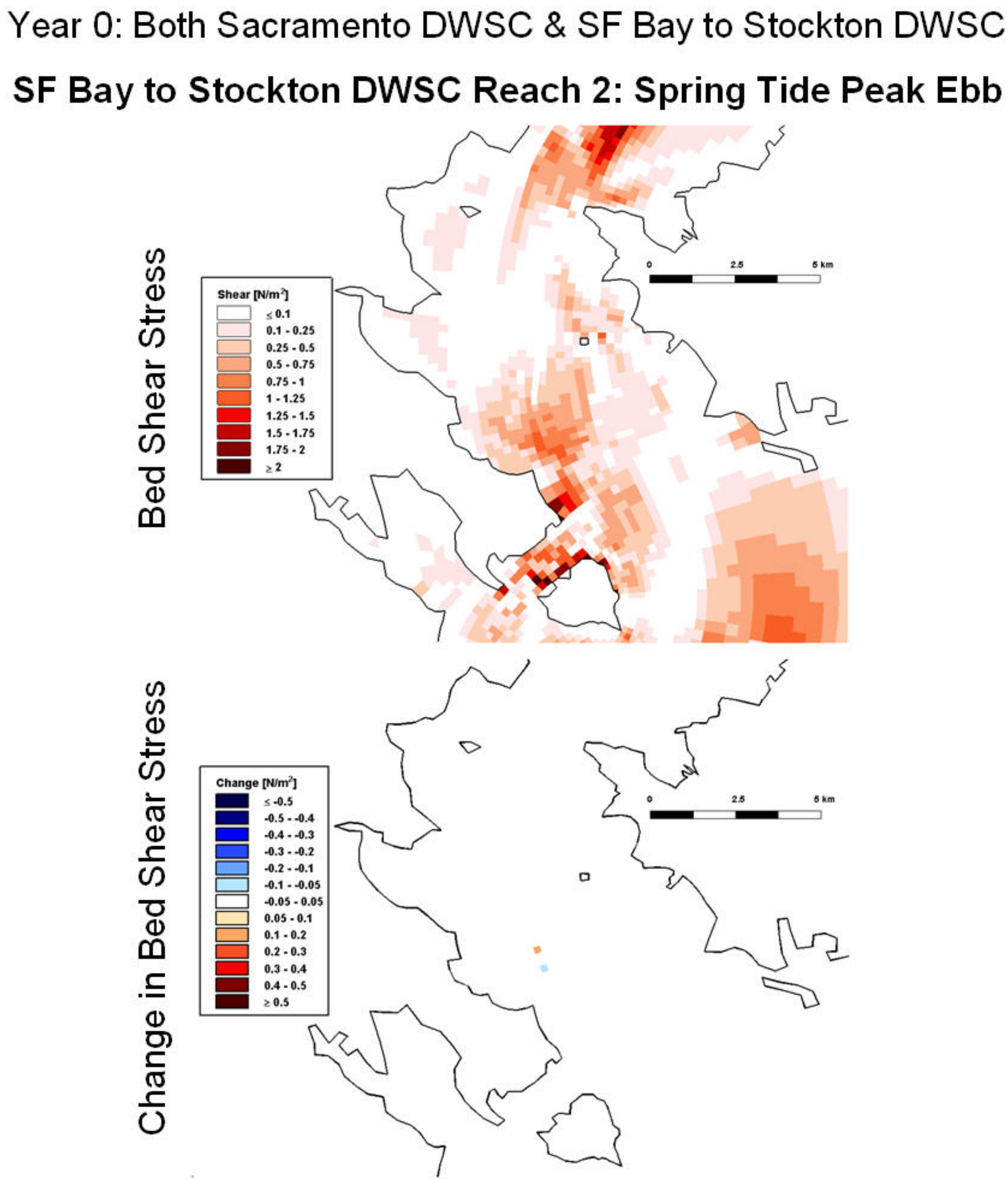


Figure 7.1-24 Predicted bed shear stress in SF Bay to Stockton DWSC Reach 2 during peak ebb currents on June 23 during spring tide for the Year 0 Both DWSC Deepening scenario (top); predicted change in bed shear stress in SF Bay to Stockton DWSC Reach 2 during peak ebb on June 23 for the Year 0 Both DWSC Deepening scenario relative to the Year 0 Baseline scenario (bottom).

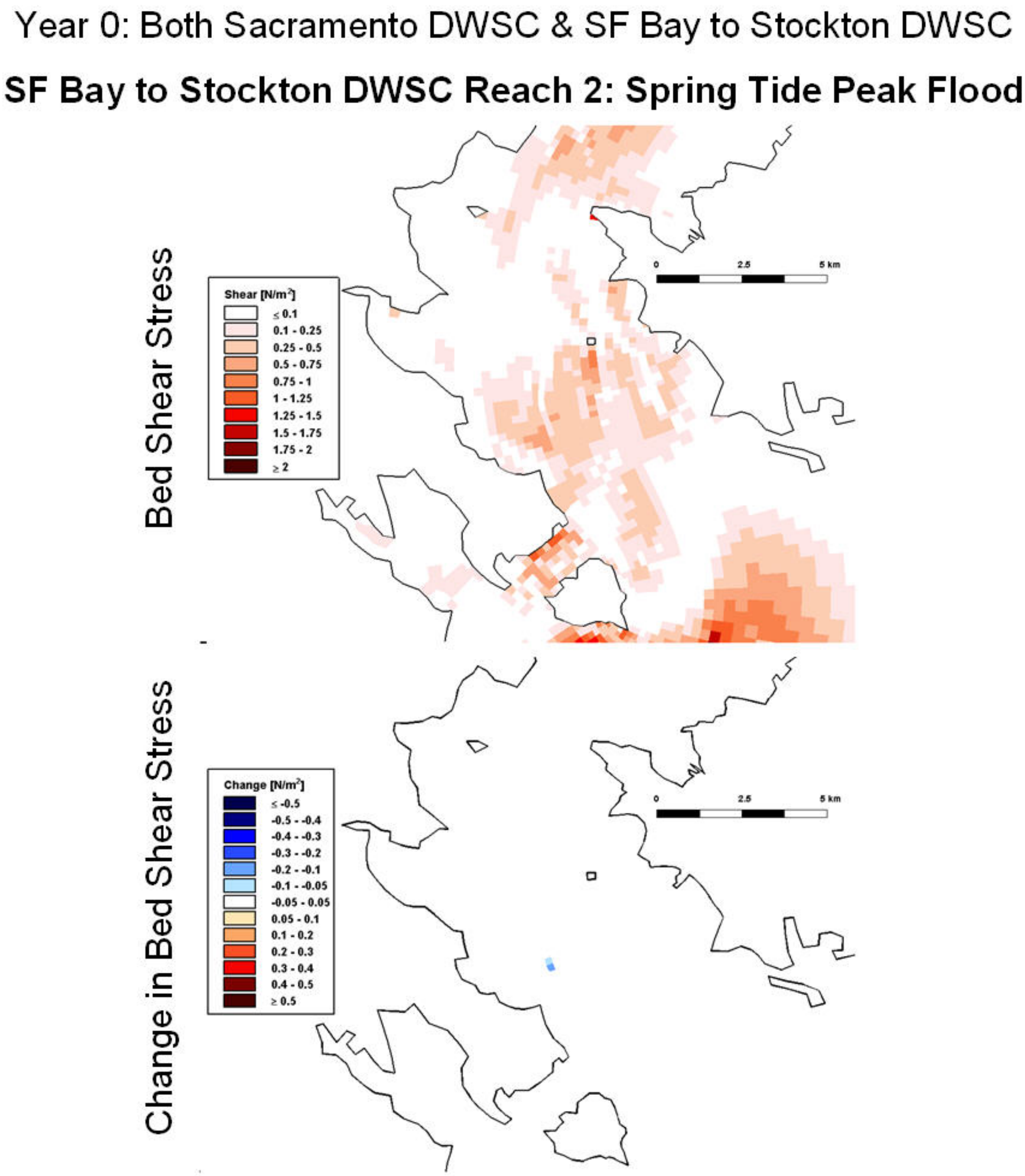


Figure 7.1-25 Predicted bed shear stress in SF Bay to Stockton DWSC Reach 2 during peak flood currents on June 23 during spring tide for the Year 0 Both DWSC Deepening scenario (top); predicted change in bed shear stress in SF Bay to Stockton DWSC Reach 2 during peak flood on June 23 for the Year 0 Both DWSC Deepening scenario relative to the Year 0 Baseline scenario (bottom).

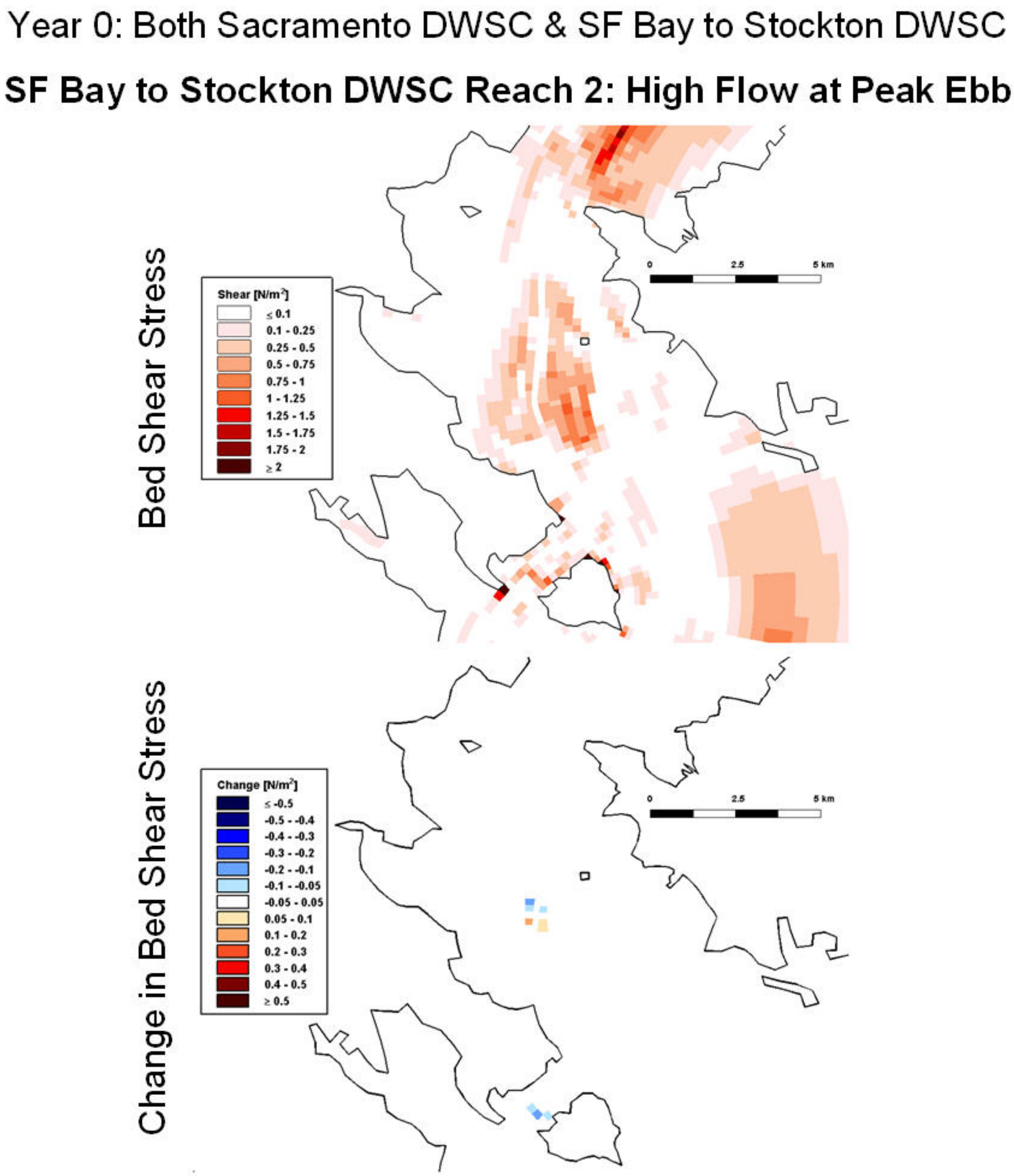


Figure 7.1-26 Predicted bed shear stress in SF Bay to Stockton DWSC Reach 2 during peak ebb currents on March 21 during spring tide and a period of high Delta outflows for the Year 0 Both DWSC Deepening scenario (top); predicted change in bed shear stress in SF Bay to Stockton DWSC Reach 2 during peak ebb on March 21 for the Year 0 Both DWSC Deepening scenario relative to the Year 0 Baseline scenario (bottom).

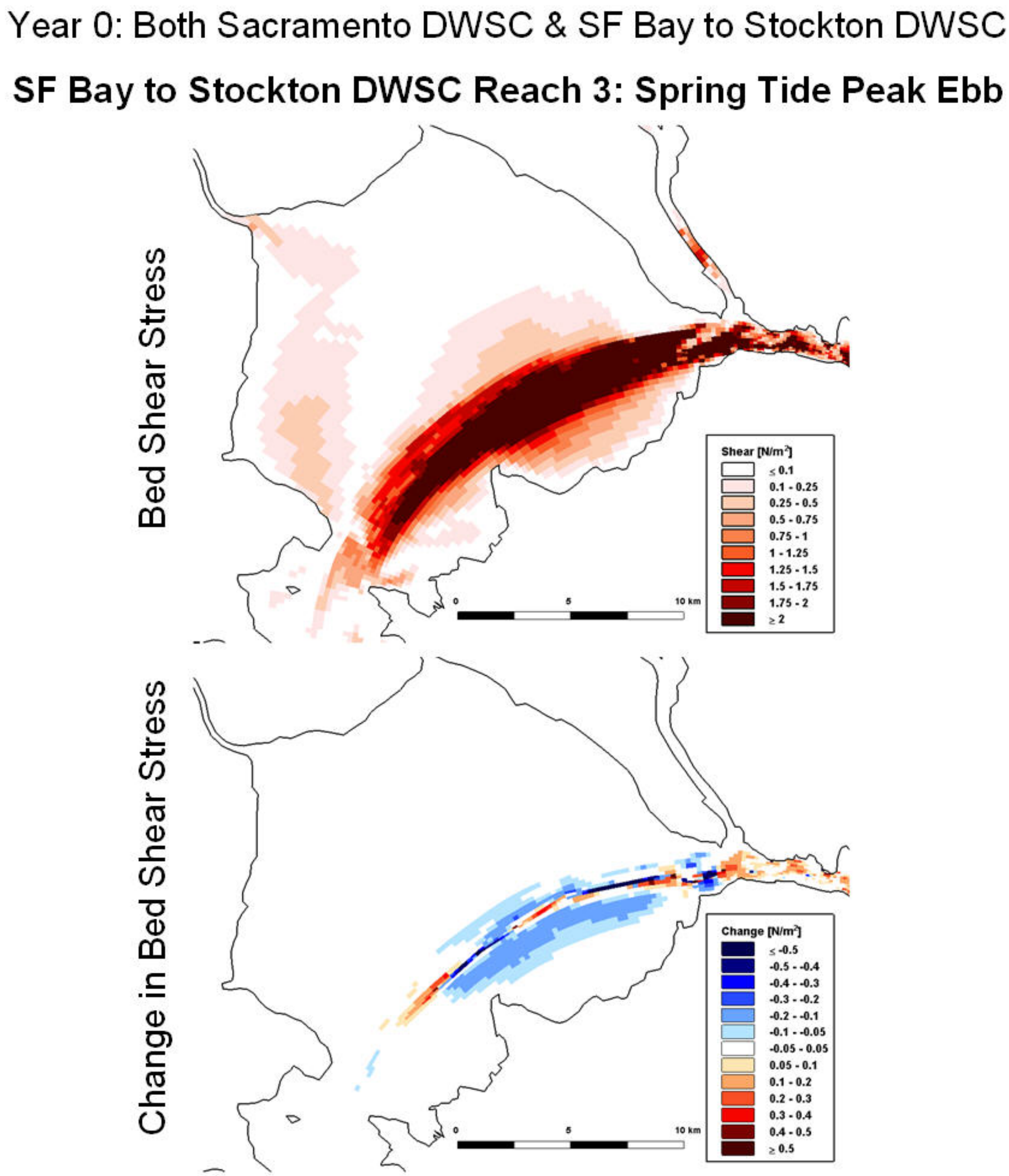


Figure 7.1-27 Predicted bed shear stress in SF Bay to Stockton DWSC Reach 3 during peak ebb currents on June 23 during spring tide for the Year 0 Both DWSC Deepening scenario (top); predicted change in bed shear stress in SF Bay to Stockton DWSC Reach 3 during peak ebb on June 23 for the Year 0 Both DWSC Deepening scenario relative to the Year 0 Baseline scenario (bottom).

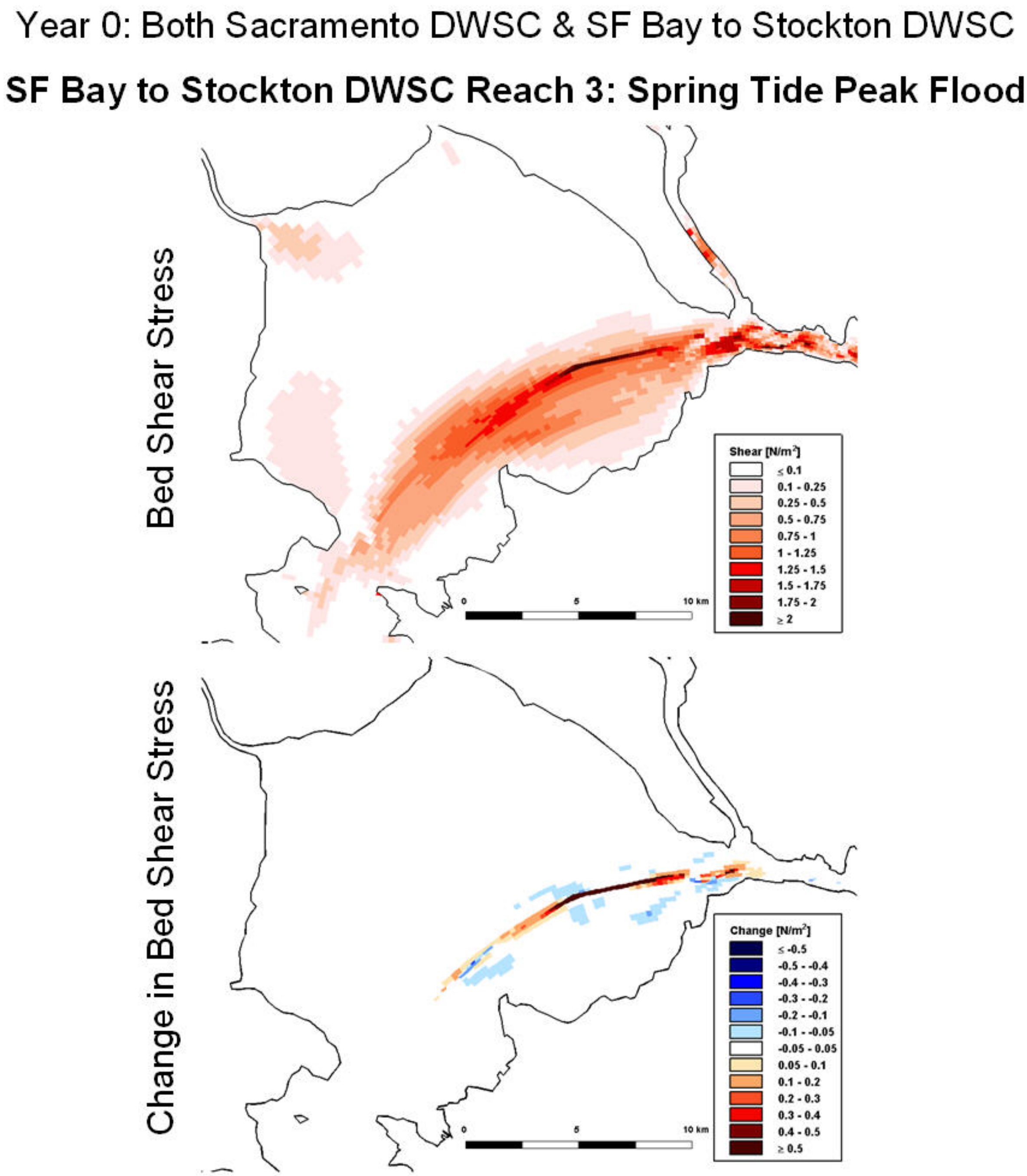


Figure 7.1-28 Predicted bed shear stress in SF Bay to Stockton DWSC Reach 3 during peak flood currents on June 23 during spring tide for the Year 0 Both DWSC Deepening scenario (top); predicted change in bed shear stress in SF Bay to Stockton DWSC Reach 3 during peak flood on June 23 for the Year 0 Both DWSC Deepening scenario relative to the Year 0 Baseline scenario (bottom).

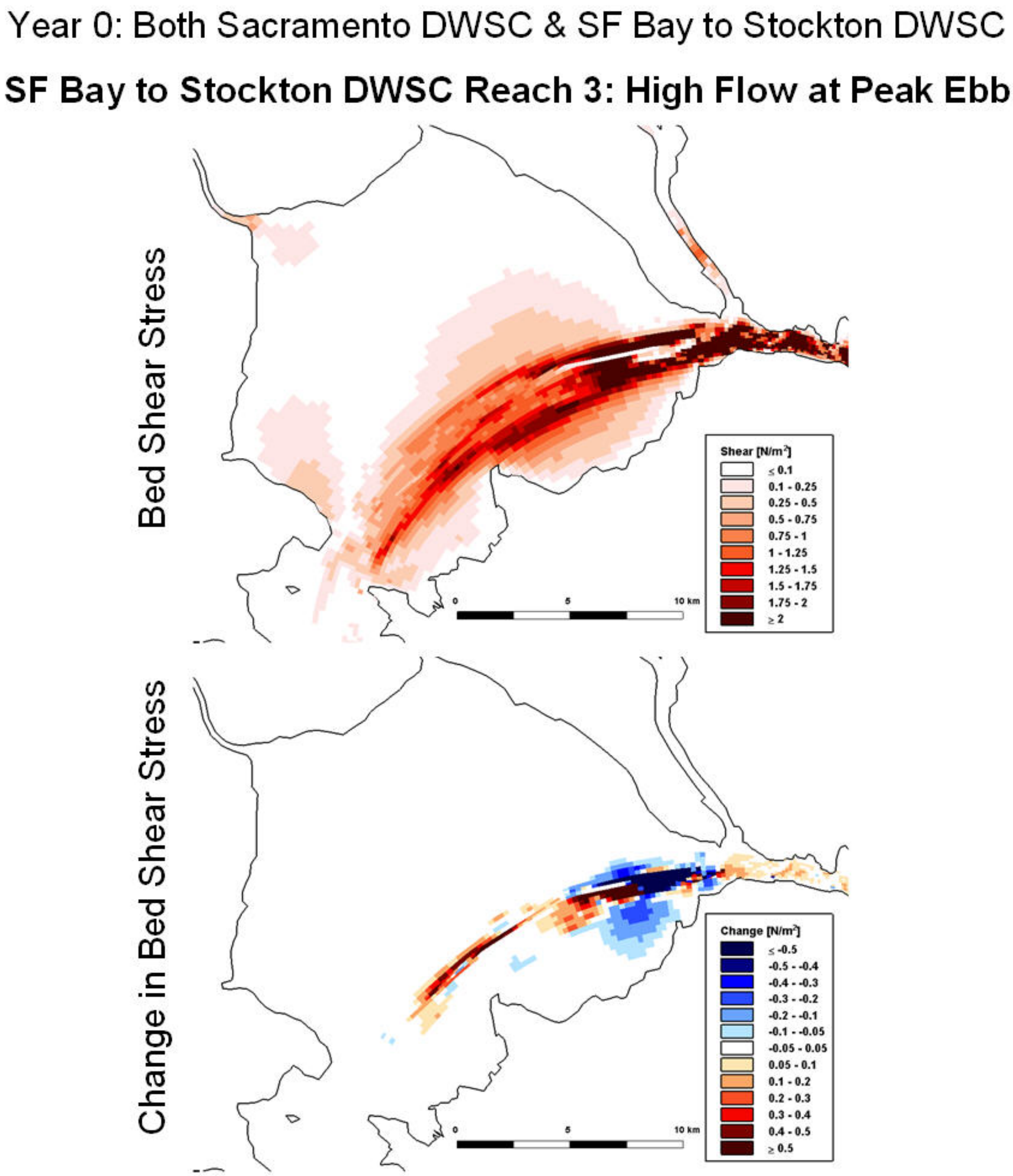


Figure 7.1-29 Predicted bed shear stress in SF Bay to Stockton DWSC Reach 3 during peak ebb currents on March 21 during spring tide and a period of high Delta outflows for the Year 0 Both DWSC Deepening scenario (top); predicted change in bed shear stress in SF Bay to Stockton DWSC Reach 3 during peak ebb on March 21 for the Year 0 Both DWSC Deepening scenario relative to the Year 0 Baseline scenario (bottom).

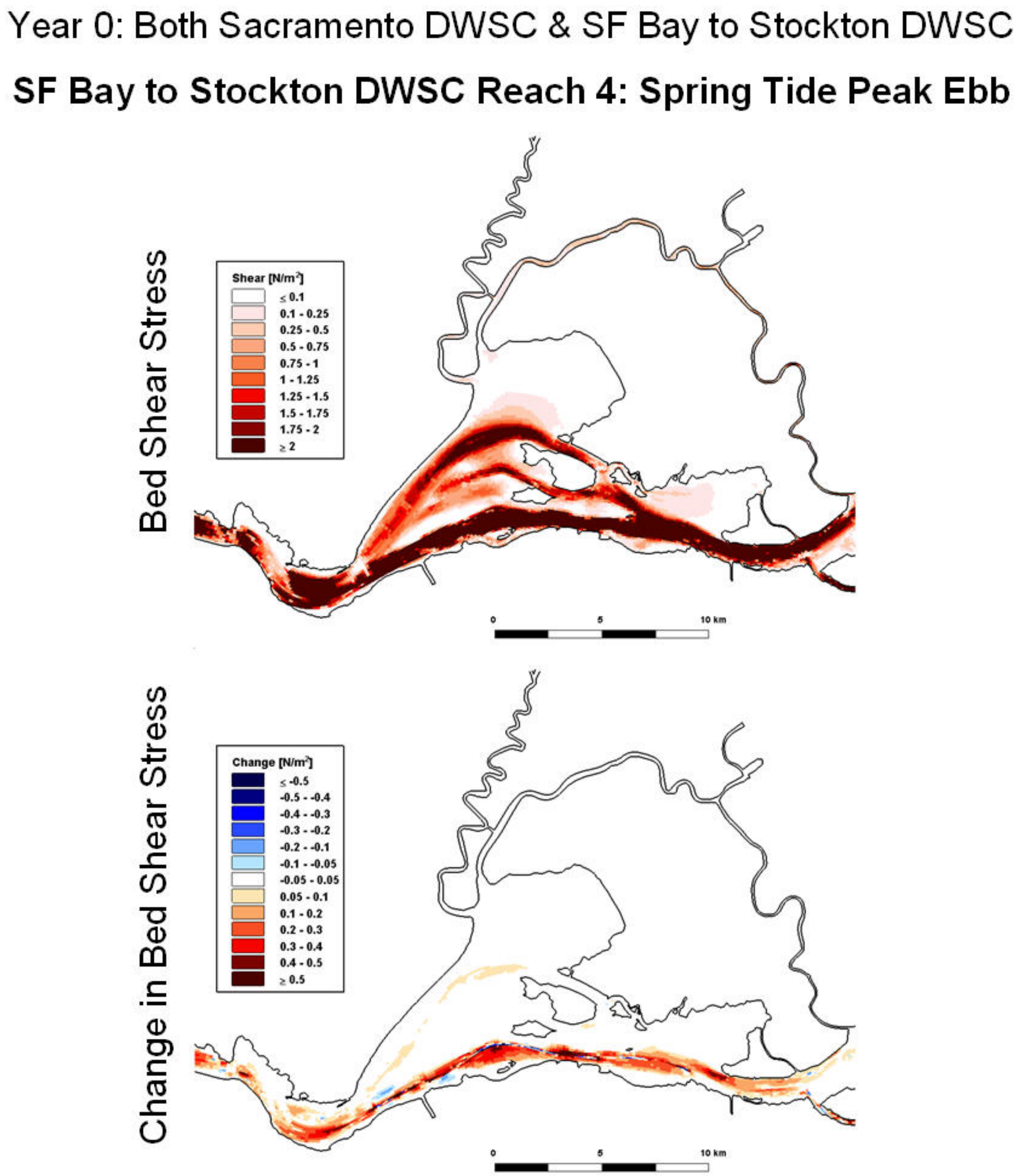


Figure 7.1-30 Predicted bed shear stress in SF Bay to Stockton DWSC Reach 4 during peak ebb currents on June 23 during spring tide for the Year 0 Both DWSC Deepening scenario (top); predicted change in bed shear stress in SF Bay to Stockton DWSC Reach 4 during peak ebb on June 23 for the Year 0 Both DWSC Deepening scenario relative to the Year 0 Baseline scenario (bottom).

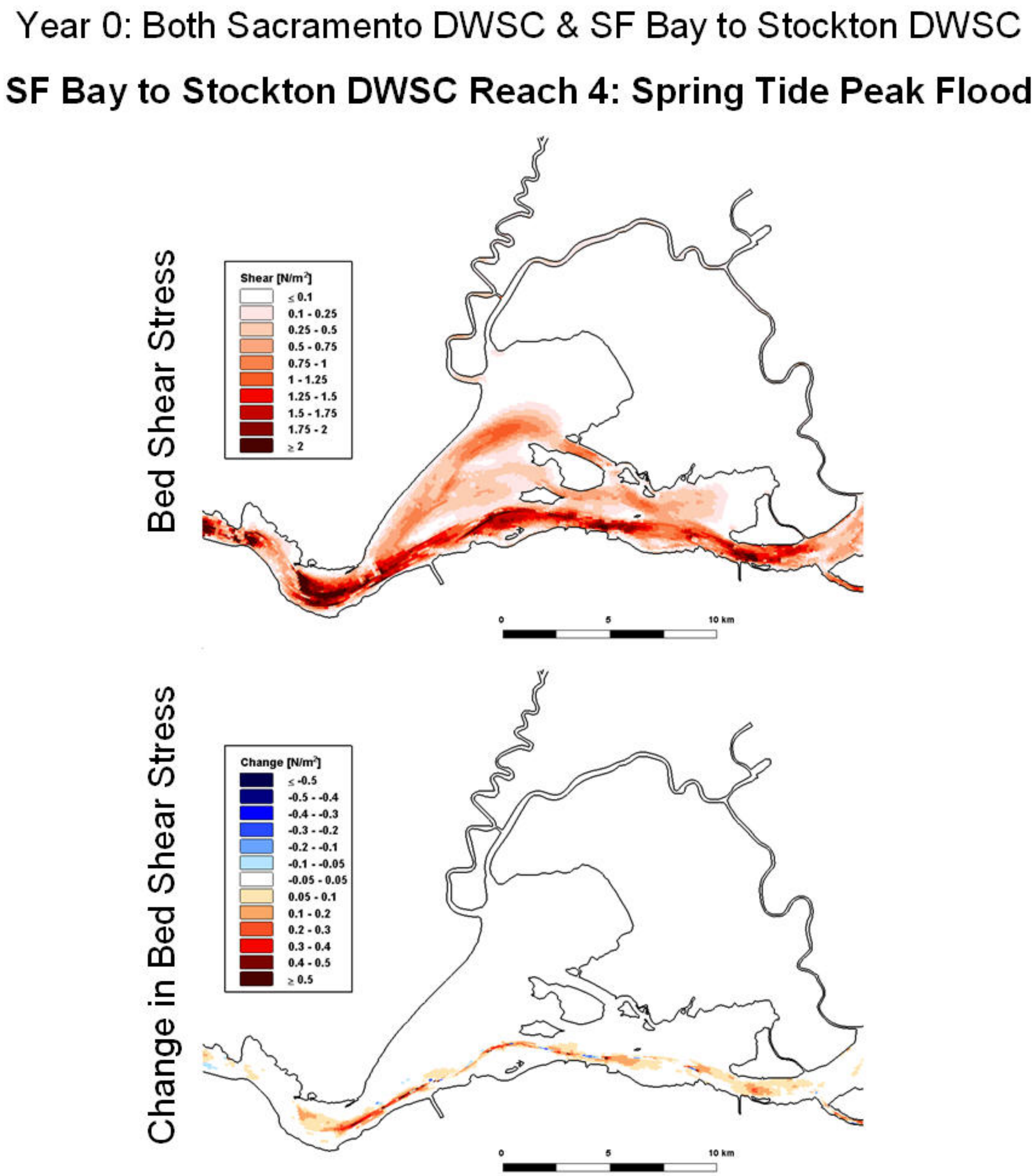


Figure 7.1-31 Predicted bed shear stress in SF Bay to Stockton DWSC Reach 4 during peak flood currents on June 23 during spring tide for the Year 0 Both DWSC Deepening scenario (top); predicted change in bed shear stress in SF Bay to Stockton DWSC Reach 4 during peak flood on June 23 for the Year 0 Both DWSC Deepening scenario relative to the Year 0 Baseline scenario (bottom).

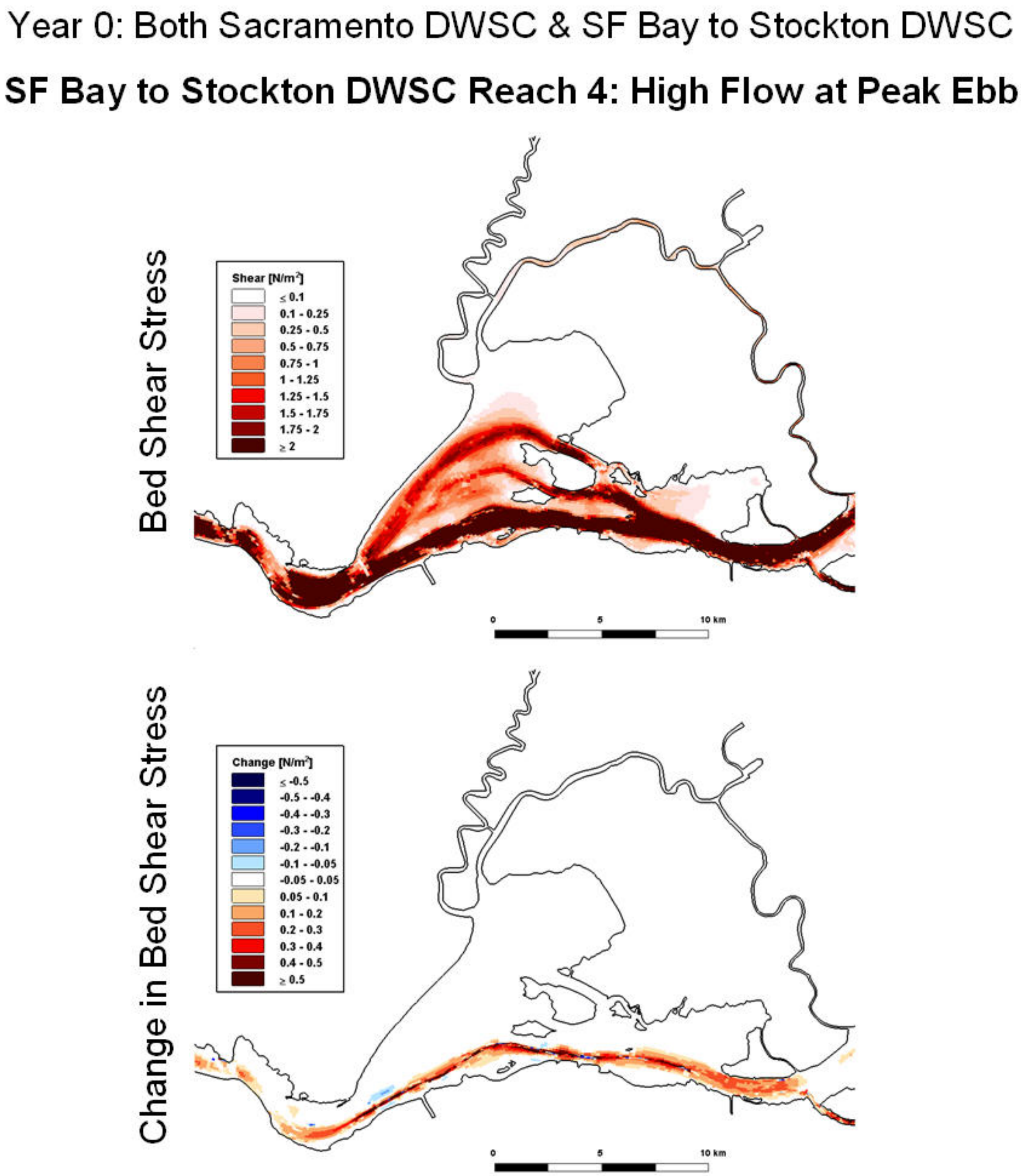


Figure 7.1-32 Predicted bed shear stress in SF Bay to Stockton DWSC Reach 4 during peak ebb currents on March 21 during spring tide and a period of high Delta outflows for the Year 0 Both DWSC Deepening scenario (top); predicted change in bed shear stress in SF Bay to Stockton DWSC Reach 4 during peak ebb on March 21 for the Year 0 Both DWSC Deepening scenario relative to the Year 0 Baseline scenario (bottom).

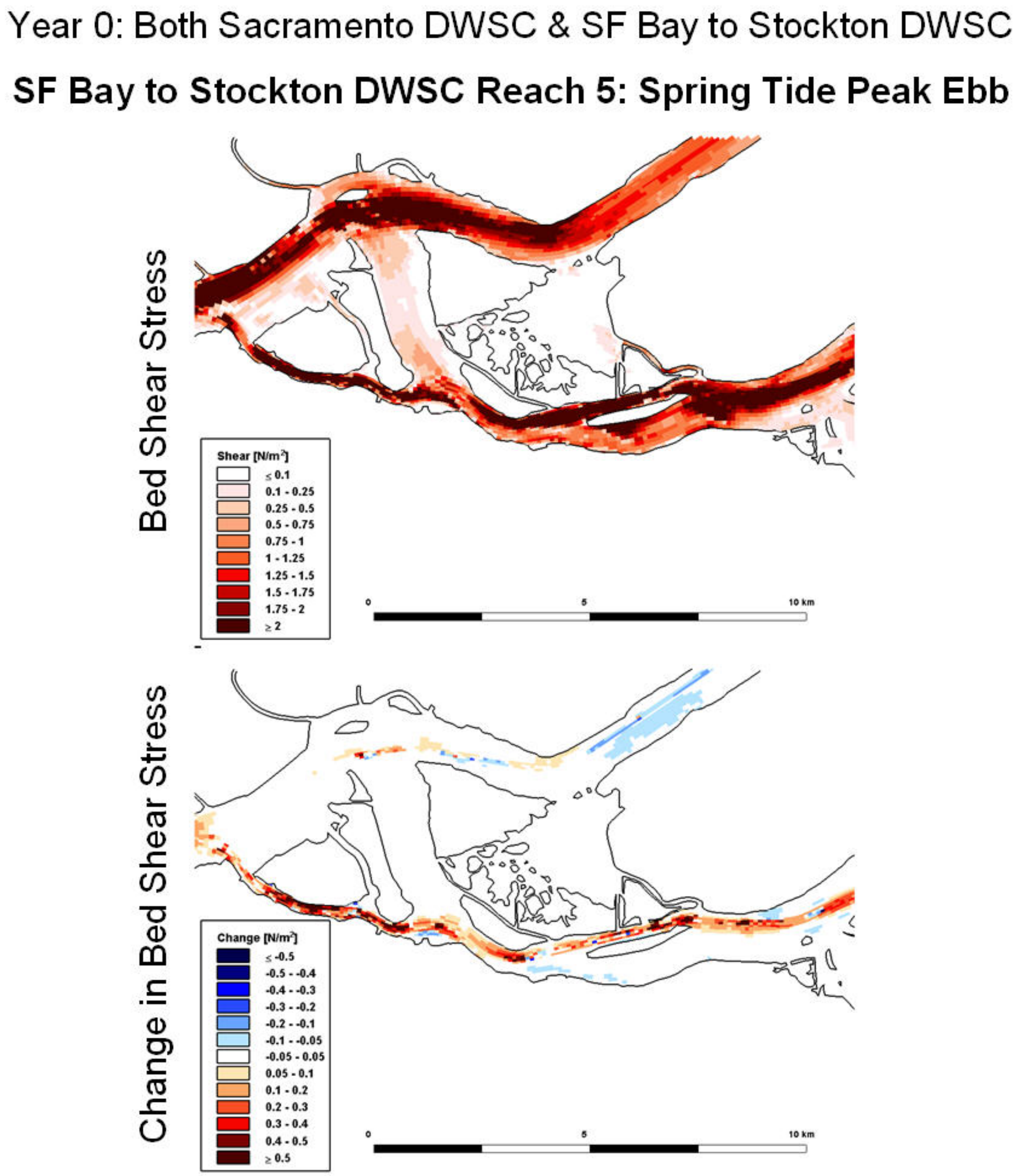


Figure 7.1-33 Predicted bed shear stress in SF Bay to Stockton DWSC Reach 5 during peak ebb currents on June 23 during spring tide for the Year 0 Both DWSC Deepening scenario (top); predicted change in bed shear stress in SF Bay to Stockton DWSC Reach 5 during peak ebb on June 23 for the Year 0 Both DWSC Deepening scenario relative to the Year 0 Baseline scenario (bottom).

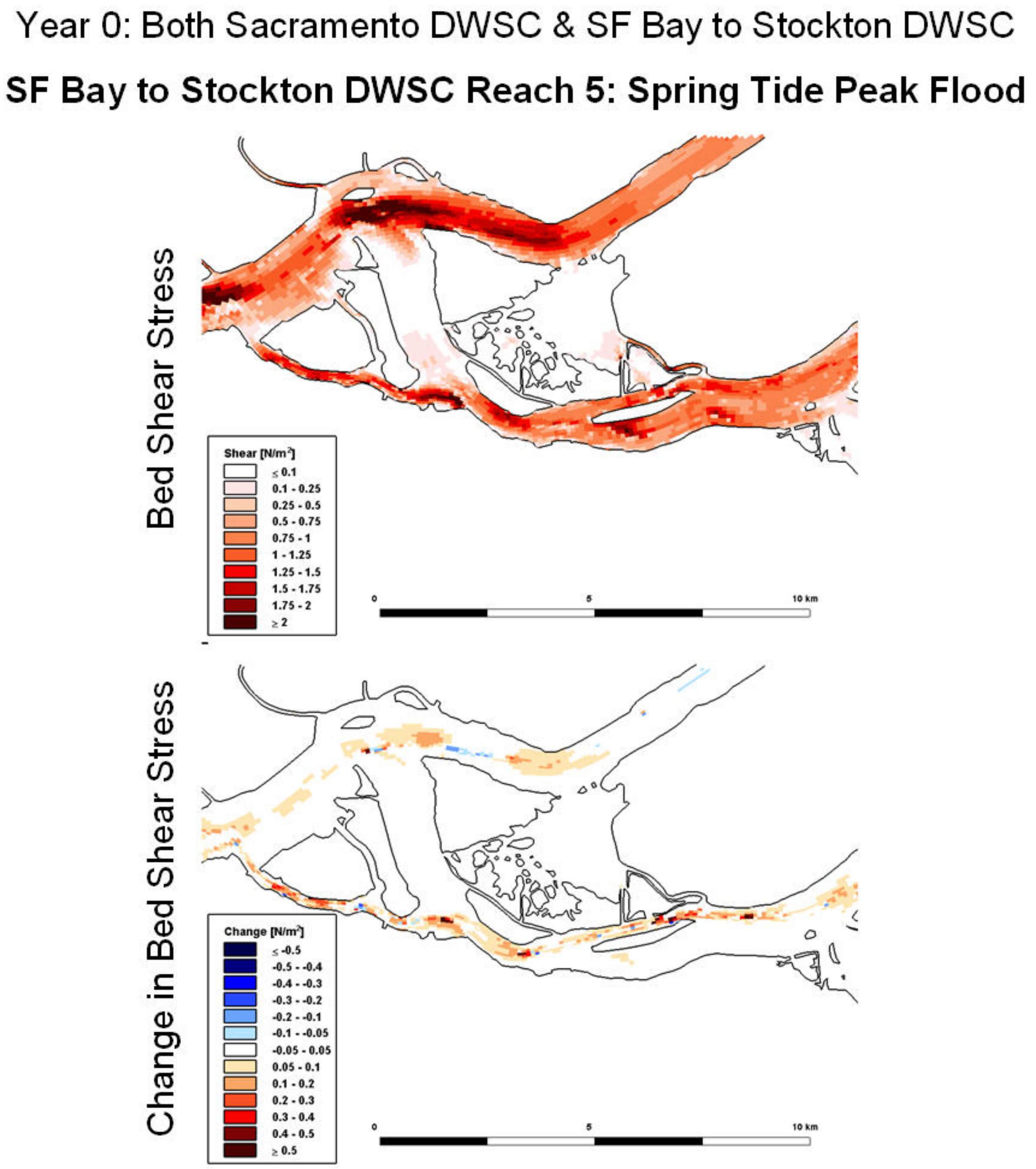


Figure 7.1-34 Predicted bed shear stress in SF Bay to Stockton DWSC Reach 5 during peak flood currents on June 23 during spring tide for the Year 0 Both DWSC Deepening scenario (top); predicted change in bed shear stress in SF Bay to Stockton DWSC Reach 5 during peak flood on June 23 for the Year 0 Both DWSC Deepening scenario relative to the Year 0 Baseline scenario (bottom).

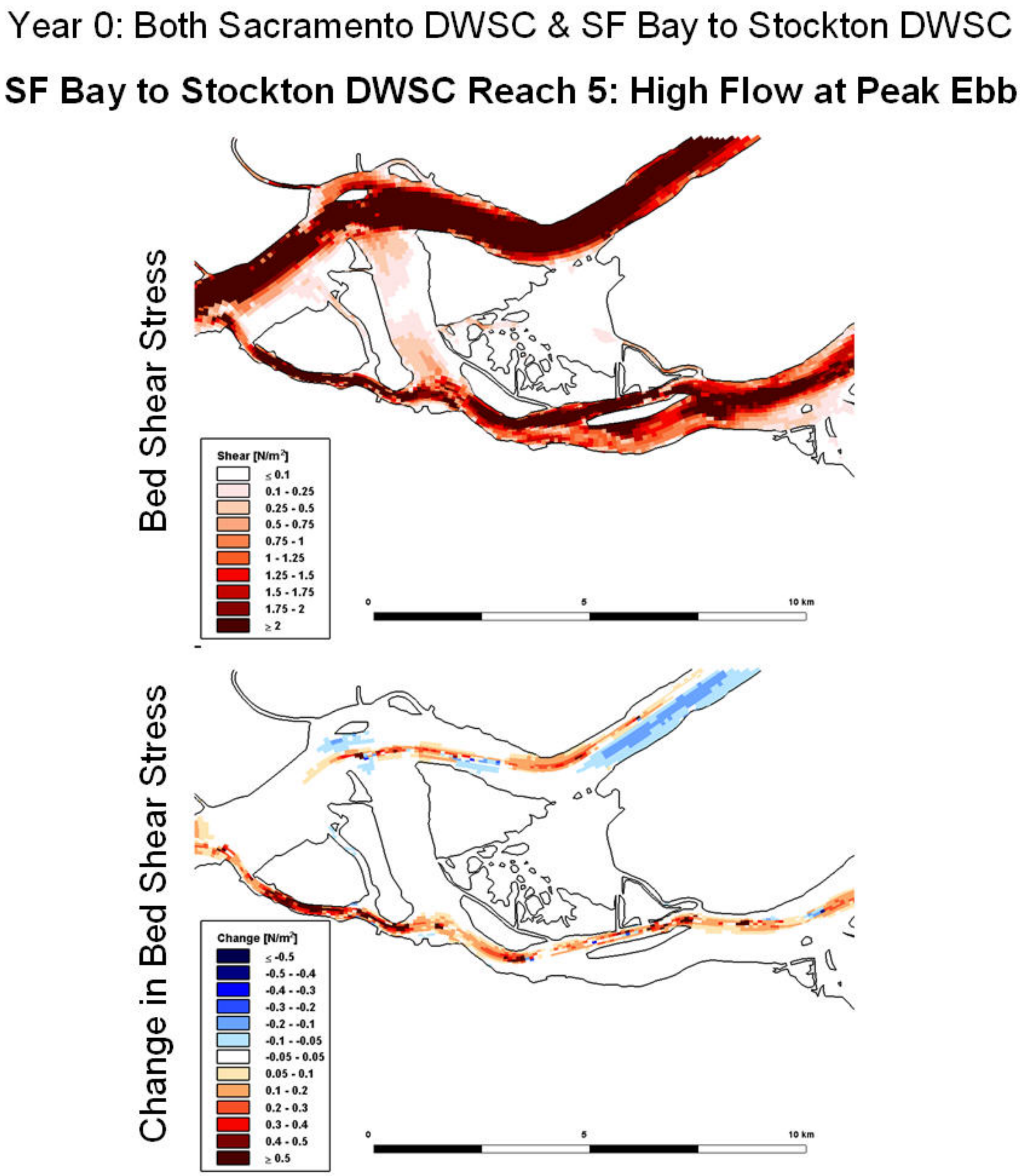


Figure 7.1-35 Predicted bed shear stress in SF Bay to Stockton DWSC Reach 5 during peak ebb currents on March 21 during spring tide and a period of high Delta outflows for the Year 0 Both DWSC Deepening scenario (top); predicted change in bed shear stress in SF Bay to Stockton DWSC Reach 5 during peak ebb on March 21 for the Year 0 Both DWSC Deepening scenario relative to the Year 0 Baseline scenario (bottom).

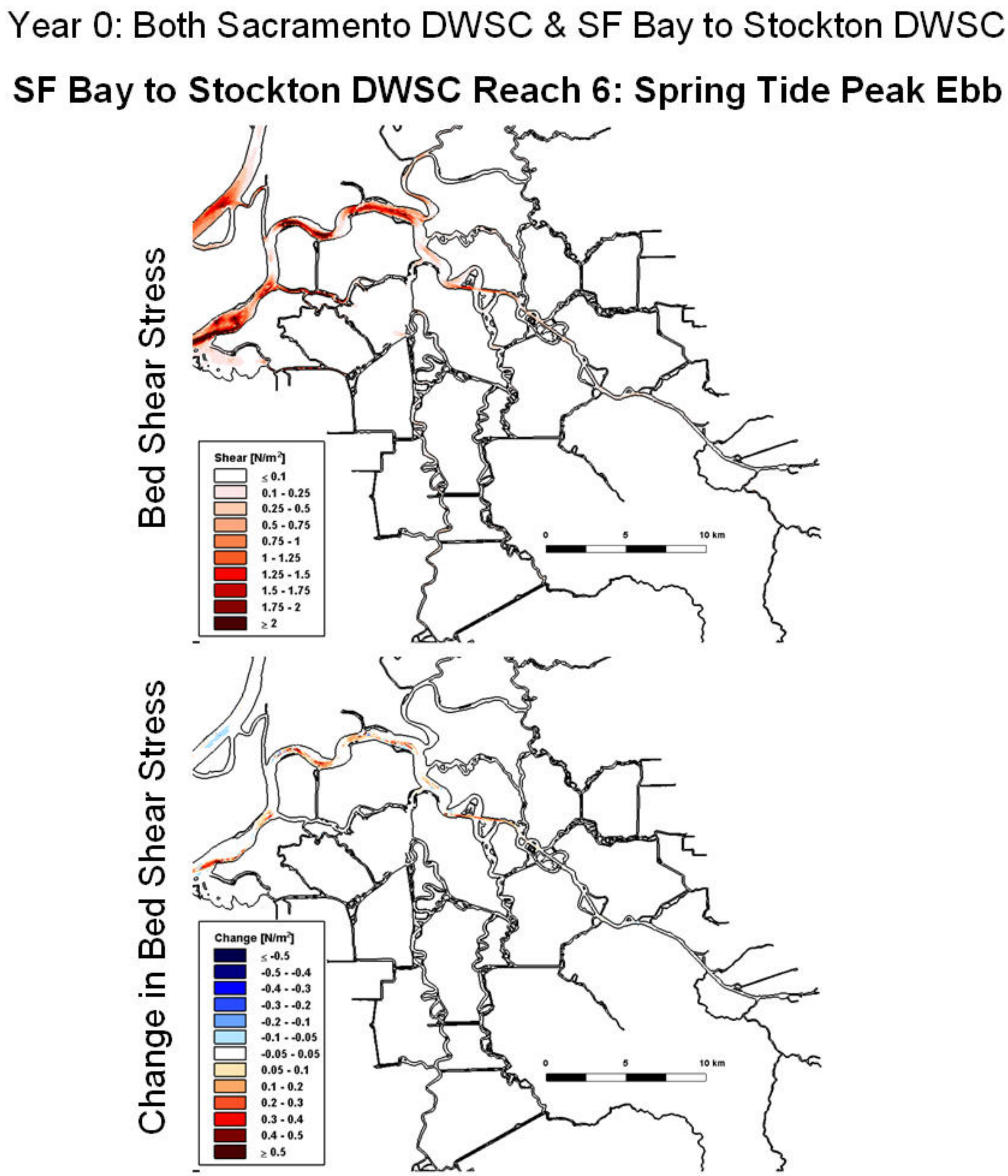


Figure 7.1-36 Predicted bed shear stress in SF Bay to Stockton DWSC Reach 6 during peak ebb currents on June 23 during spring tide for the Year 0 Both DWSC Deepening scenario (top); predicted change in bed shear stress in SF Bay to Stockton DWSC Reach 6 during peak ebb on June 23 for the Year 0 Both DWSC Deepening scenario relative to the Year 0 Baseline scenario (bottom).

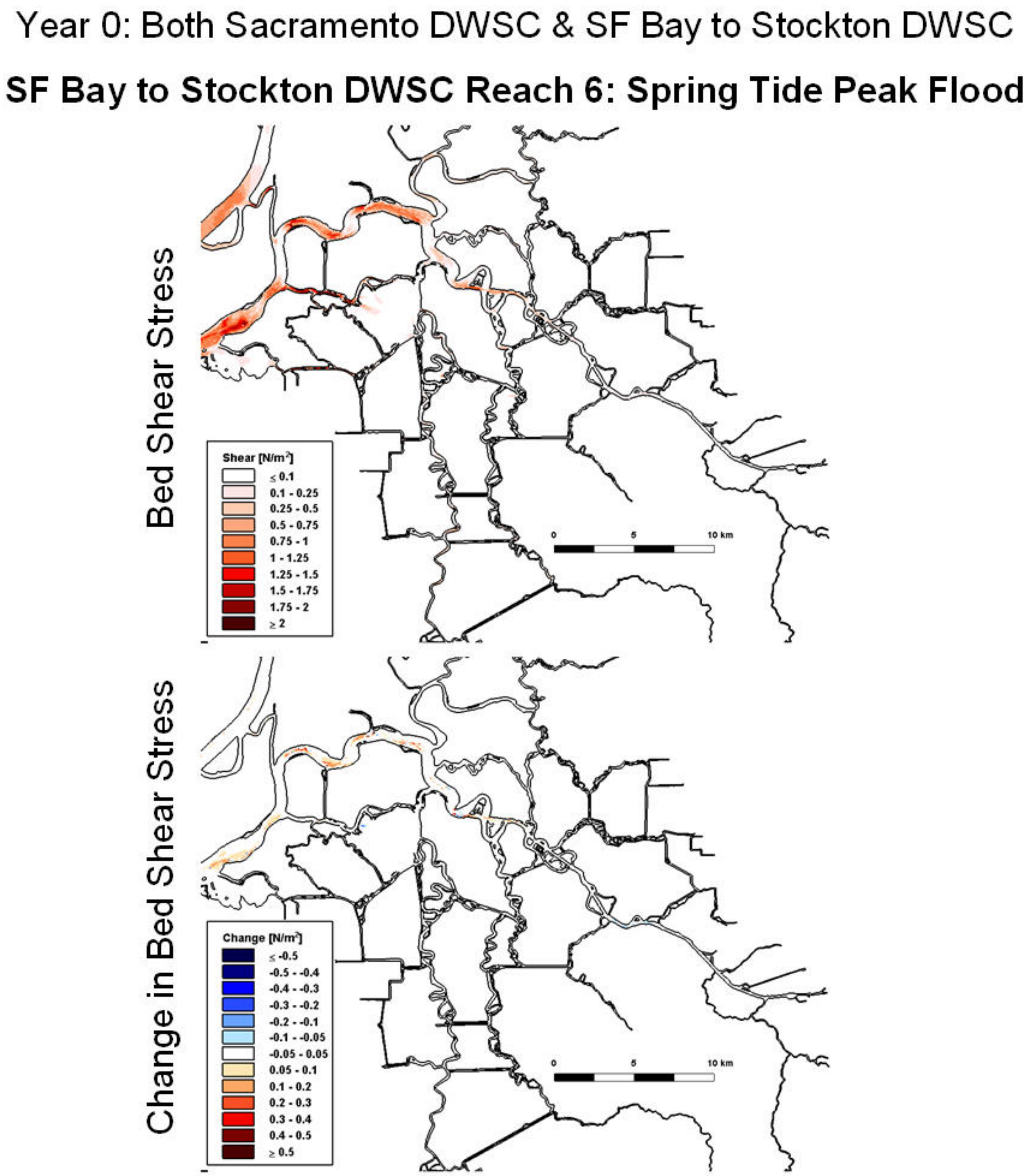


Figure 7.1-37 Predicted bed shear stress in SF Bay to Stockton DWSC Reach 6 during peak flood currents on June 23 during spring tide for the Year 0 Both DWSC Deepening scenario (top); predicted change in bed shear stress in SF Bay to Stockton DWSC Reach 6 during peak flood on June 23 for the Year 0 Both DWSC Deepening scenario relative to the Year 0 Baseline scenario (bottom).

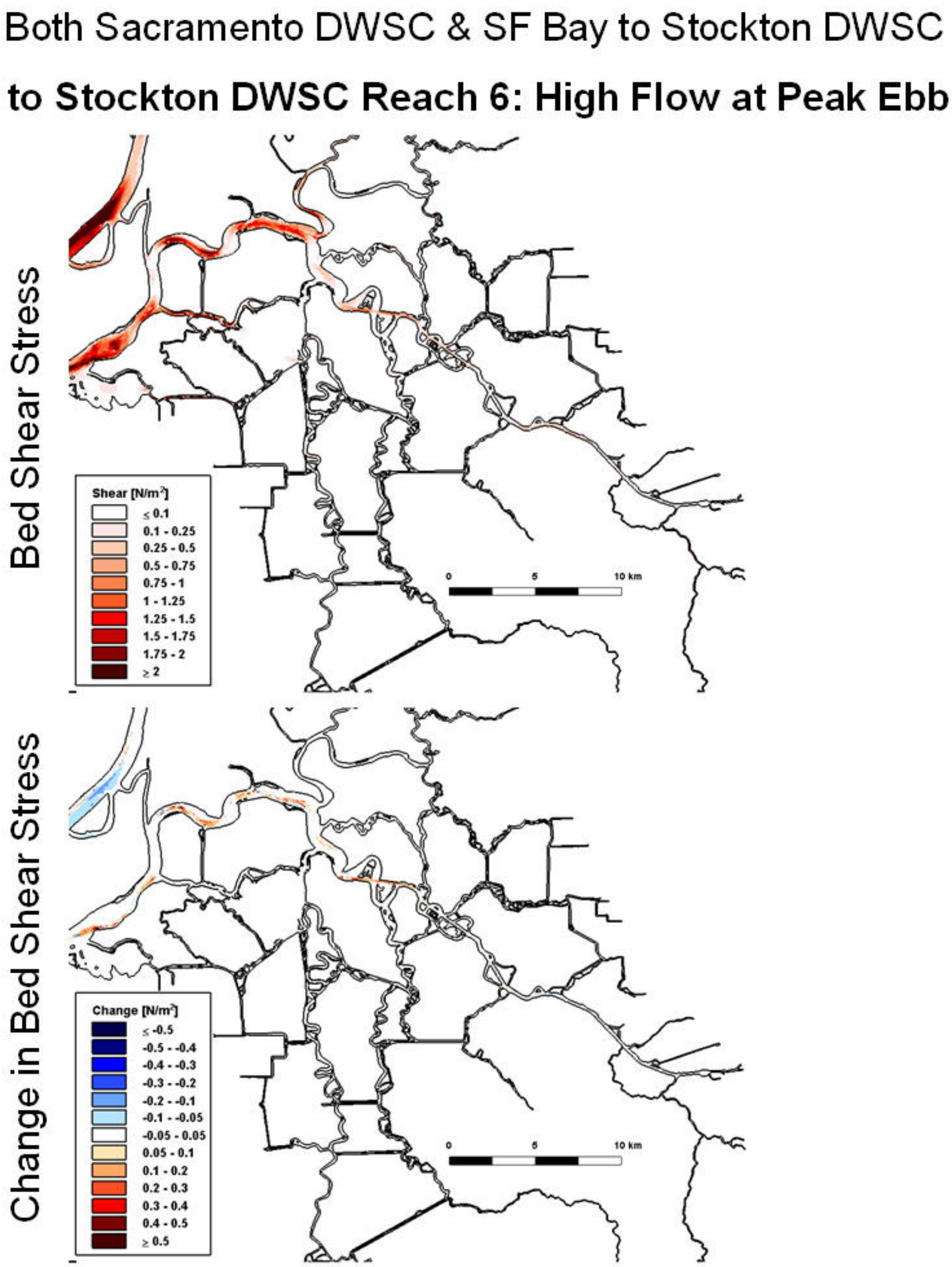


Figure 7.1-38 Predicted bed shear stress in SF Bay to Stockton DWSC Reach 6 during peak ebb currents on March 21 during spring tide and a period of high Delta outflows for the Year 0 Both DWSC Deepening scenario (top); predicted change in bed shear stress in SF Bay to Stockton DWSC Reach 6 during peak ebb on March 21 for the Year 0 Both DWSC Deepening scenario relative to the Year 0 Baseline scenario (bottom).

7.2 Analysis of Potential Effects of DWSC Deepening on Storm Surge

The predicted changes to storm surge propagation resulting from the proposed DWSC deepening scenarios are evaluated using historic boundary conditions spanning from December 2007 to January 2008. This period was selected for analysis because a large storm surge event in San Francisco Bay occurred on January 4, 2008.

7.2.1 Analysis Approach for Evaluation of Impact of DWSC Deepening on Storm Surge

The potential effects of the DWSC deepening on storm surge propagation in San Francisco Bay was evaluated by simulation a large storm surge event which occurred on January 4, 2008 under each of the DWSC scenarios.

A series of storm systems moved through the San Francisco Bay area beginning January 3, 2008 and ending January 6, 2008. The strongest storm made landfall on January 4, 2008 and was one of the strongest storms in the San Francisco Bay Area in the last ten years (National Weather Service, 2008). This storm resulted in peak observed hourly average wind speeds of 14.3 m/s (32 mph) at Mission Bay in San Francisco. The National Weather Service reported peak wind gusts of 70 mph at the Golden Gate Bridge and 58 mph at Mission Bay (National Weather Service, 2008) on January 4, 2008. Additionally a record wave height of 10 m was observed at the Monterey Bay Buoy (National Weather Service, 2008), and approximately 0.5 meters of storm surge is evident in the water levels observed at the NOAA Fort Point station (9414290) during this period.

The UnTRIM Bay-Delta Model calibration conducted for this study (MacWilliams et al., 2009) used a calibration period spanning from April 1, 2007 through April 1, 2008 which includes this storm surge event. Figure 7.2-1 shows the observed and predicted stage at Fort Point during the from the 2007-2008 model calibration simulation. As seen in this figure, the UnTRIM Bay-Delta model accurately predicts water levels at Fort Point during the storm surge event on January 4, 2008.

In order to evaluate the impact of the DWSC deepening scenarios on the propagation of this storm surge into San Francisco Bay, the identical boundary conditions used in the 2007-2008 calibration period (see MacWilliams et al., 2009) were used to simulate this storm surge event under the Baseline scenario, the Sacramento DWSC Only Deepening scenario and the Both DWSC Deepening scenario.

The effect of the DWSC deepening scenarios on storm surge was analyzed using the same approached used to evaluate the impact of the DWSC deepening on water levels described in Section 3.3.1. Water level time series comparisons were made at 10 stage monitoring stations in San Francisco Bay and the Sacramento-San Joaquin Delta, shown on Figure 7.2-2. For each comparison, three separate plots are shown. The top plot shows the tidal time-scale variability of stage over a 7-day period for the Baseline scenario, the Sacramento DWSC Only Deepening scenario, and the Both DWSC Deepening scenario. The middle plot shows daily-averaged stage during a five week analysis period for each scenario. The bottom plot shows the predicted change in daily-averaged stage for the Sacramento DWSC Only Deepening scenario and Both DWSC Deepening scenario relative to the corresponding Baseline scenario. The figures provide a quantitative measure of potential impacts of the proposed DWSC deepening projects on the propagation of the January 4, 2008 storm surge.

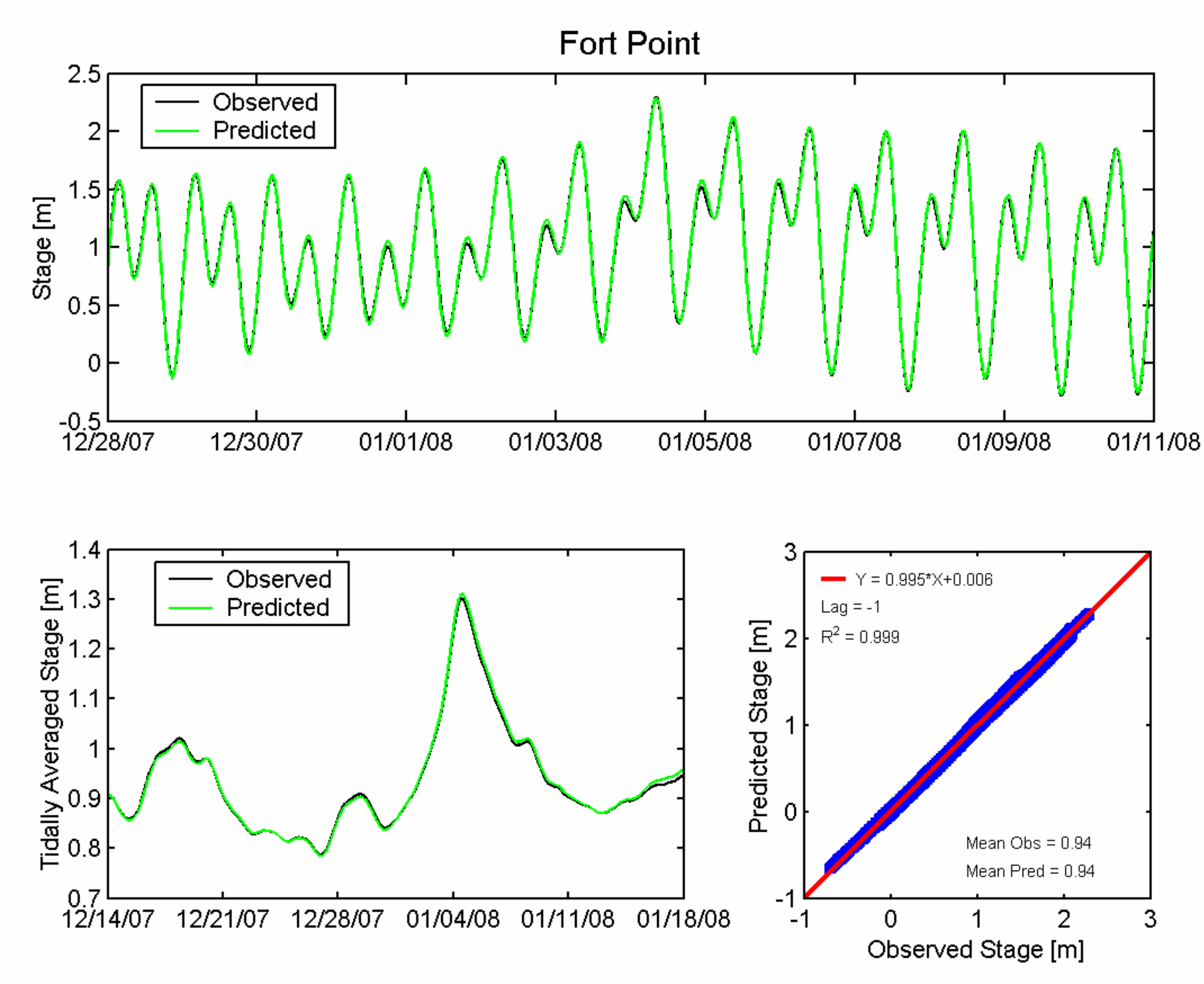


Figure 7.2-1 Observed and predicted stage at San Francisco Fort Point NOAA station (9414290) during the 2007-2008 simulation period.

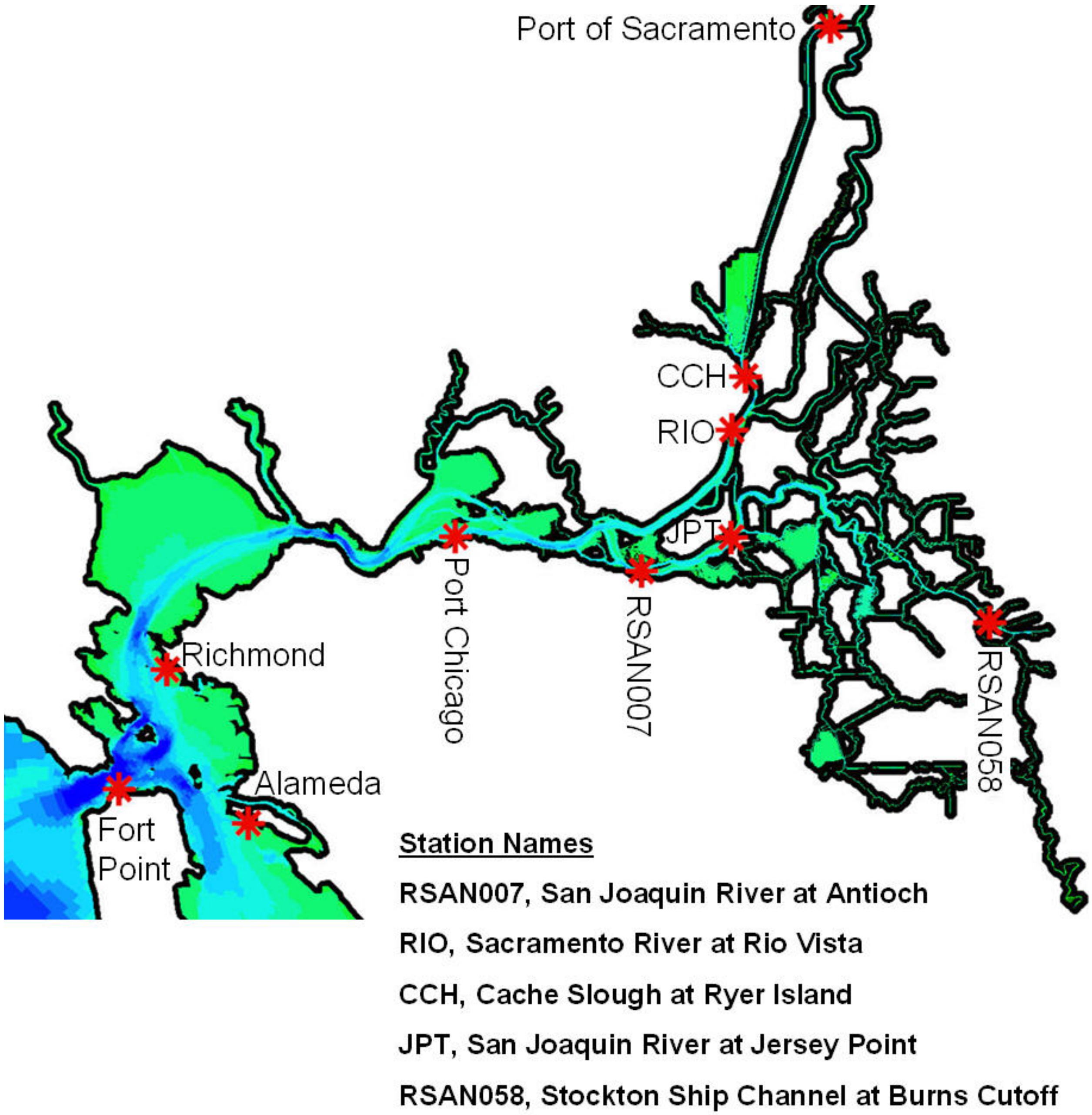


Figure 7.2-2 Location of continuous monitoring stations in San Francisco Bay and the Sacramento-San Joaquin Delta where water level time series comparisons are made to evaluate potential storm surge impacts resulting from the proposed DWSC deepening scenarios.

7.2.1 Analysis of Impact of DWSC Deepening of Storm Surge during 2007-2008

Figure 7.2-3 shows the predicted stage at San Francisco Fort Point NOAA station (9414290) for the Baseline scenario, the Sacramento DWSC Only Deepening scenario, and the Both DWSC Deepening scenario under 2007-2008 historic conditions. As seen on the tidally-averaged stage plot (center panel of Figure 7.2-3) a storm surge of almost 0.5 m is evident on June 4 under the Baseline scenario, the Sacramento DWSC Only Deepening scenario and the Both DWSC Deepening scenario. The storm surge is also evident at the center of the top panel of Figure 7.2-3. Relative to the Baseline scenario, no significant change in stage at Fort Point is predicted during this storm surge event under the Sacramento DWSC Only Deepening scenario or the Both DWSC Deepening scenario. A similar result is evident at the NOAA stations at Alameda (Figure 7.2-4), Richmond (Figure 7.2-5) and Port Chicago (Figure 7.2-6).

The storm surge propagates up the Sacramento River to Rio Vista (Figure 7.2-7), into Cache Slough (Figure 7.2-8) and up the Sacramento DWSC as far as the Port of Sacramento (Figure 7.2-9). Relative to the Baseline scenario, no significant change in stage at these stations along the Sacramento DWSC is predicted during this storm surge event under the Sacramento DWSC Only Deepening scenario or the Both DWSC Deepening scenario. This suggests that deepening the Sacramento DWSC is not expected to have a significant impact on storm surge propagation into the Sacramento-San Joaquin Delta.

The storm surge propagates up the San Joaquin River to Antioch (Figure 7.2-10), Jersey Point (Figure 7.2-11) and up the San Joaquin River as far as the Stockton Chip Channel at Burns Cutoff (Figure 7.2-12). At the Stockton Ship Channel at Burns Cutoff the peak stage on January 4 under the Both DWSC Deepening scenario is about 1.5 cm higher than under the Baseline scenario and the daily averaged stage is about 0.07 cm higher than under the Baseline scenario. This suggests that the deepening of Both DWSC is expected to have only a minimal impact on storm surge propagation into the Sacramento-San Joaquin Delta.

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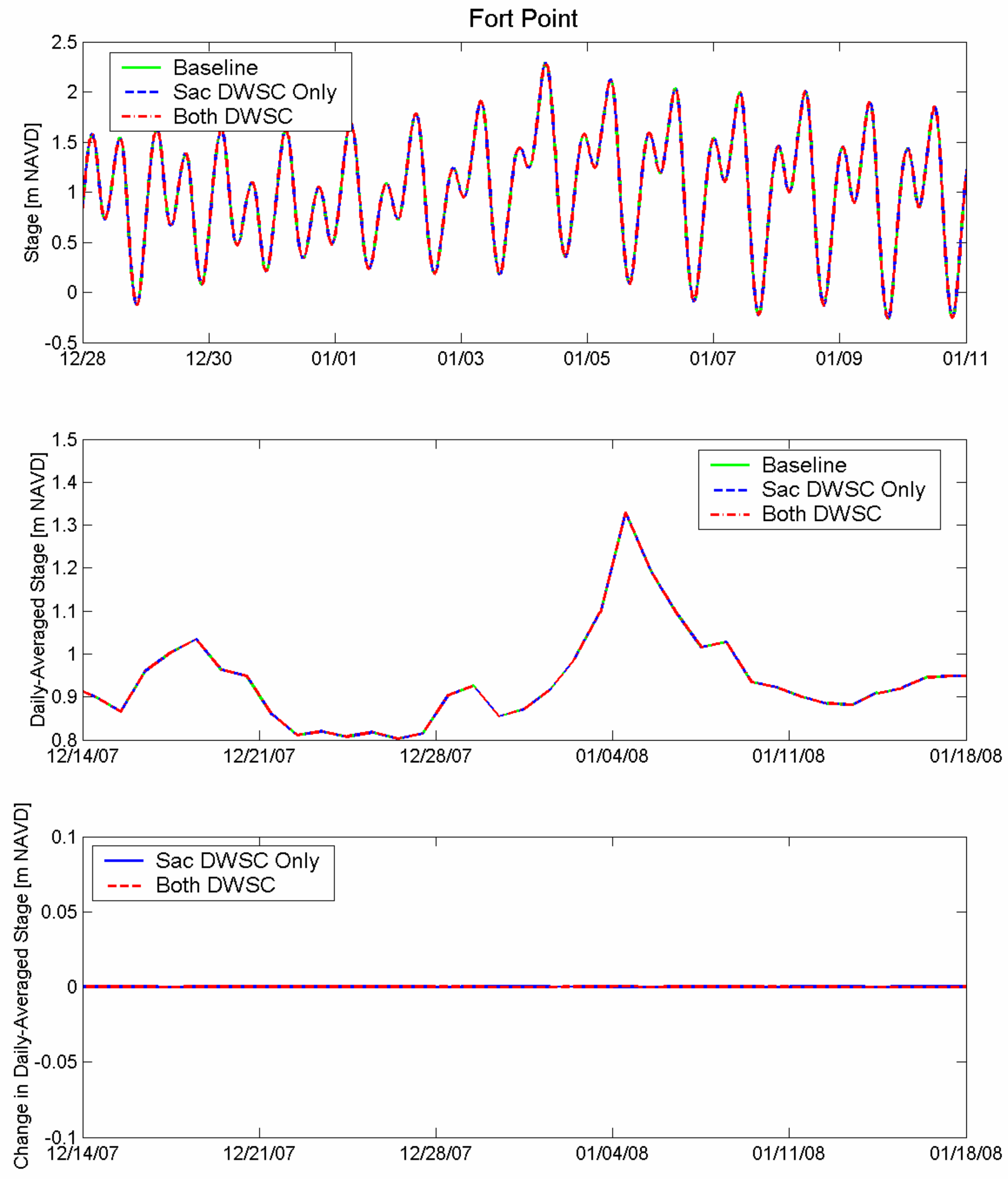

Figure 7.2-3 Predicted stage at San Francisco Fort Point NOAA station (9414290) for the Baseline scenario, the Sacramento DWSC Only Deepening scenario, and the Both DWSC Deepening scenario under 2007-2008 historic conditions: tidal time-scale variability over a 7-day period (top); daily-averaged stage for five week analysis period (middle); predicted change in daily-averaged stage for the Sacramento DWSC Only Deepening scenario and the Both DWSC Deepening scenario relative to the Baseline scenario (bottom).

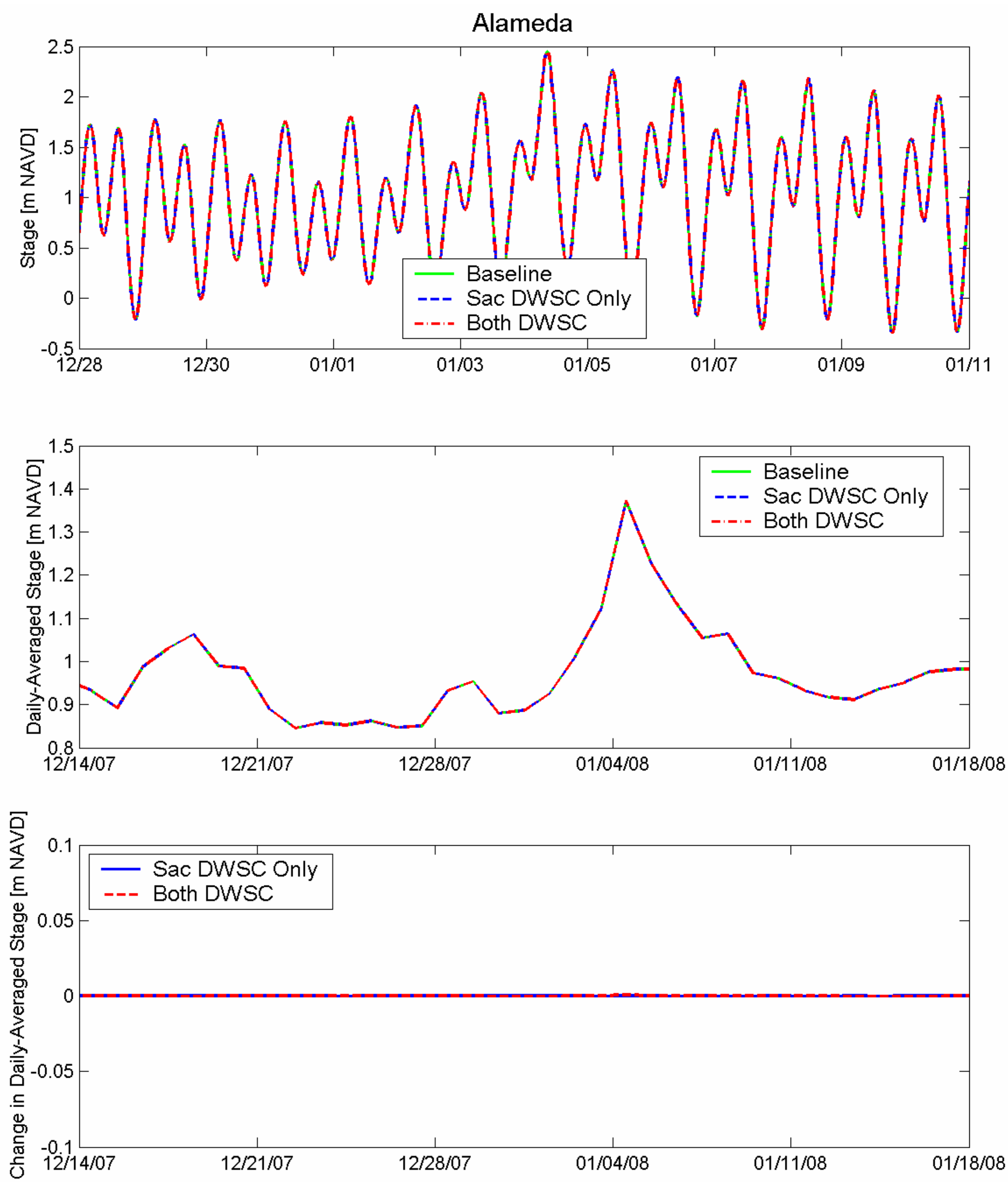

Figure 7.2-4 Predicted stage at Alameda NOAA station (9414750) for the Baseline scenario, the Sacramento DWSC Only Deepening scenario, and the Both DWSC Deepening scenario under 2007-2008 historic conditions: tidal time-scale variability over a 7-day period (top); daily-averaged stage for five week analysis period (middle); predicted change in daily-averaged stage for the Sacramento DWSC Only Deepening scenario and the Both DWSC Deepening scenario relative to the Baseline scenario (bottom).

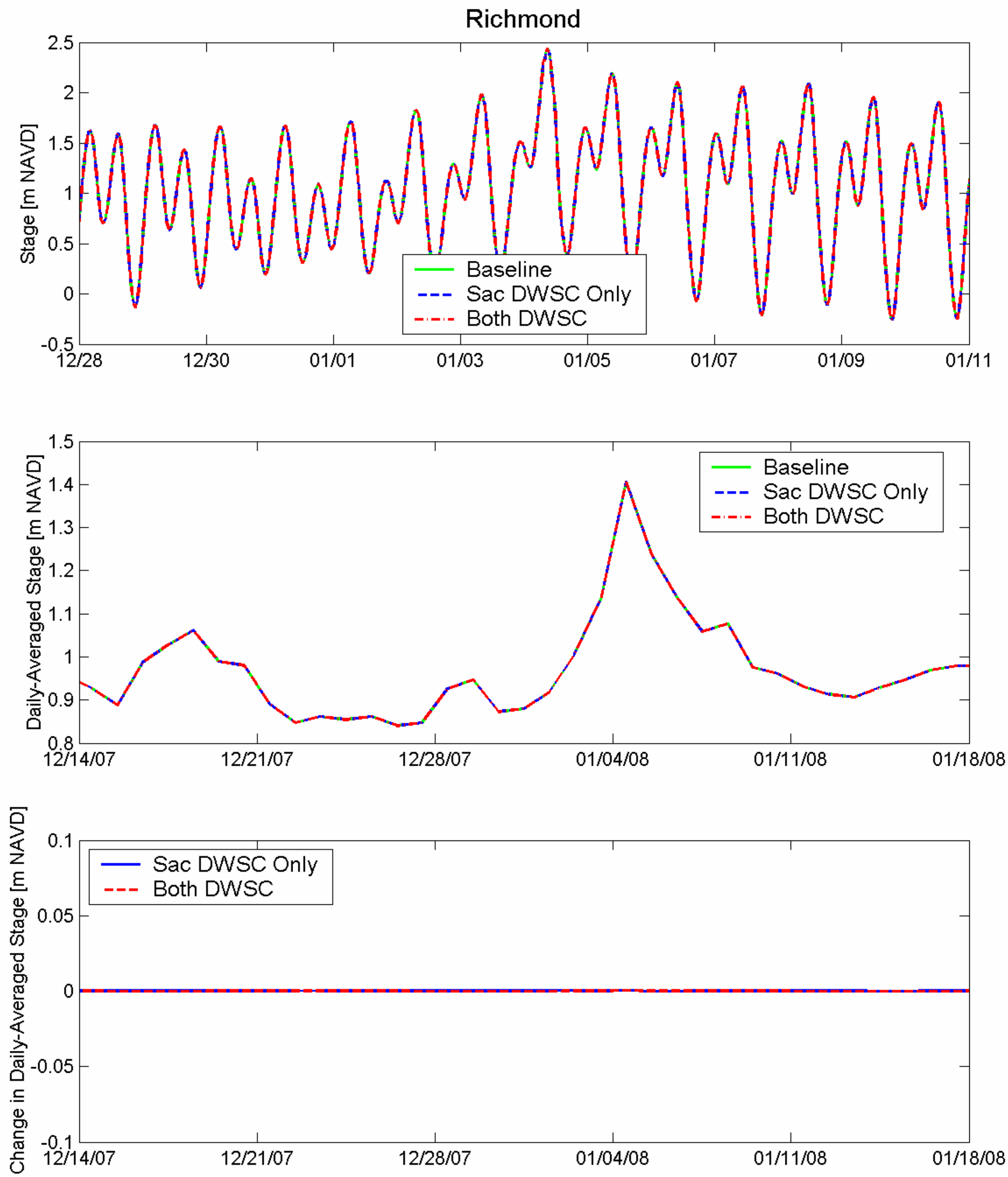

Figure 7.2-5 Predicted stage at Richmond NOAA station (9414863) for the Baseline scenario, the Sacramento DWSC Only Deepening scenario, and the Both DWSC Deepening scenario under 2007-2008 historic conditions: tidal time-scale variability over a 7-day period (top); daily-averaged stage for five week analysis period (middle); predicted change in daily-averaged stage for the Sacramento DWSC Only Deepening scenario and the Both DWSC Deepening scenario relative to the Baseline scenario (bottom).

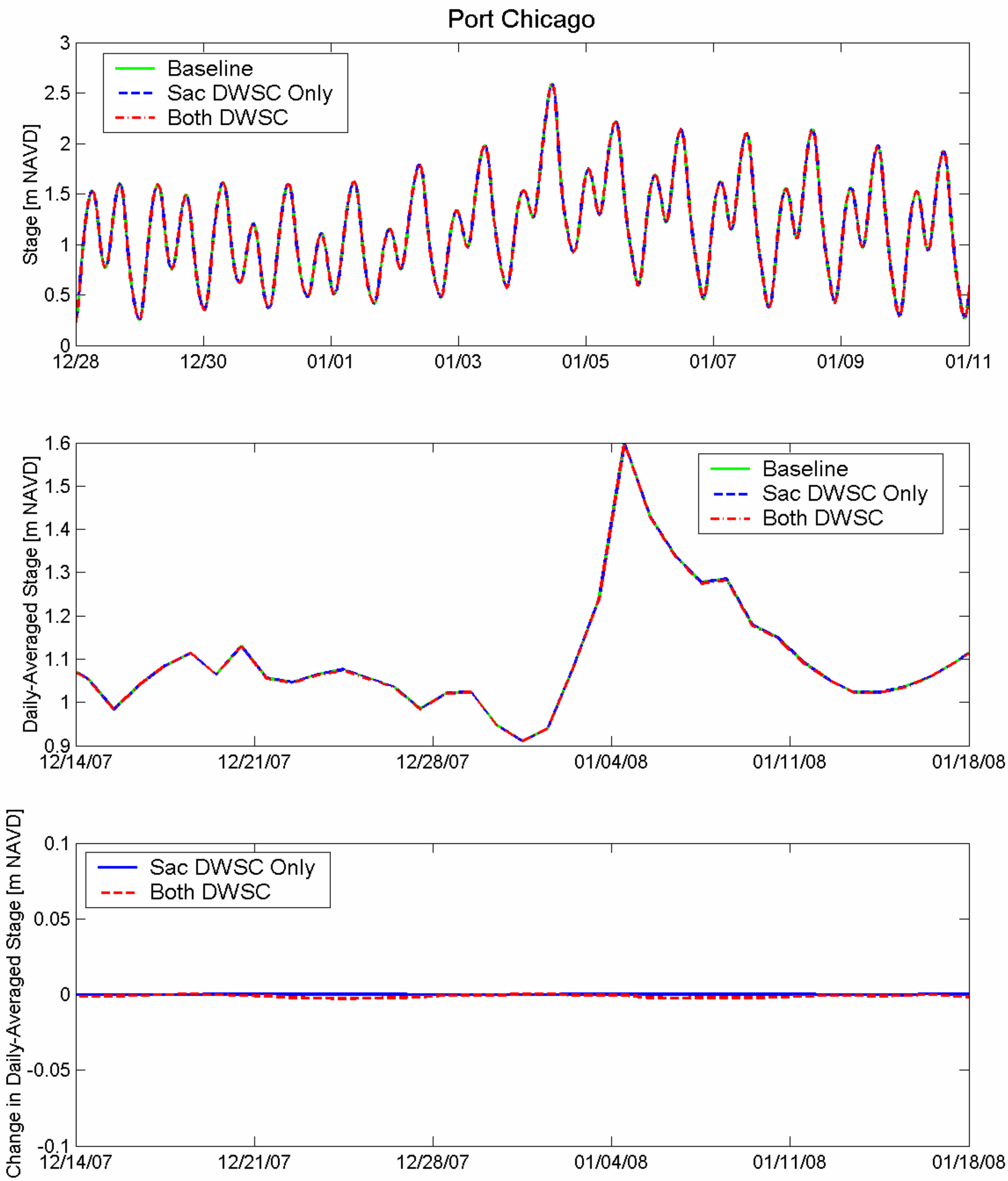

Figure 7.2-6 Predicted stage at Port Chicago NOAA station (9415144) for the Baseline scenario, the Sacramento DWSC Only Deepening scenario, and the Both DWSC Deepening scenario under 2007-2008 historic conditions: tidal time-scale variability over a 7-day period (top); daily-averaged stage for five week analysis period (middle); predicted change in daily-averaged stage for the Sacramento DWSC Only Deepening scenario and the Both DWSC Deepening scenario relative to the Baseline scenario (bottom).

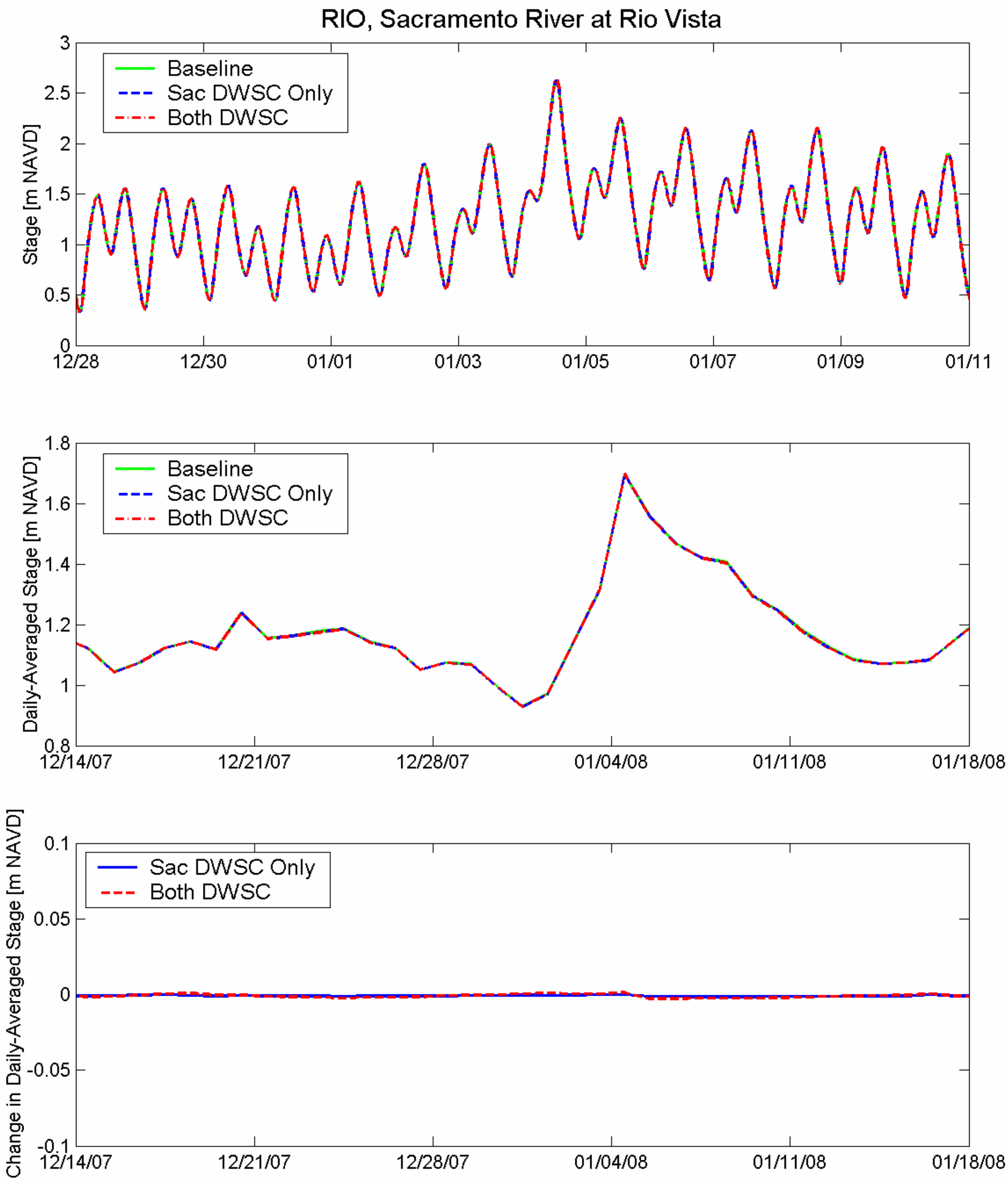

Figure 7.2-7 Predicted stage at Rio Vista (RIO) for the Baseline scenario, the Sacramento DWSC Only Deepening scenario, and the Both DWSC Deepening scenario under 2007-2008 historic conditions: tidal time-scale variability over a 7-day period (top); daily-averaged stage for five week analysis period (middle); predicted change in daily-averaged stage for the Sacramento DWSC Only Deepening scenario and the Both DWSC Deepening scenario relative to the Baseline scenario (bottom).

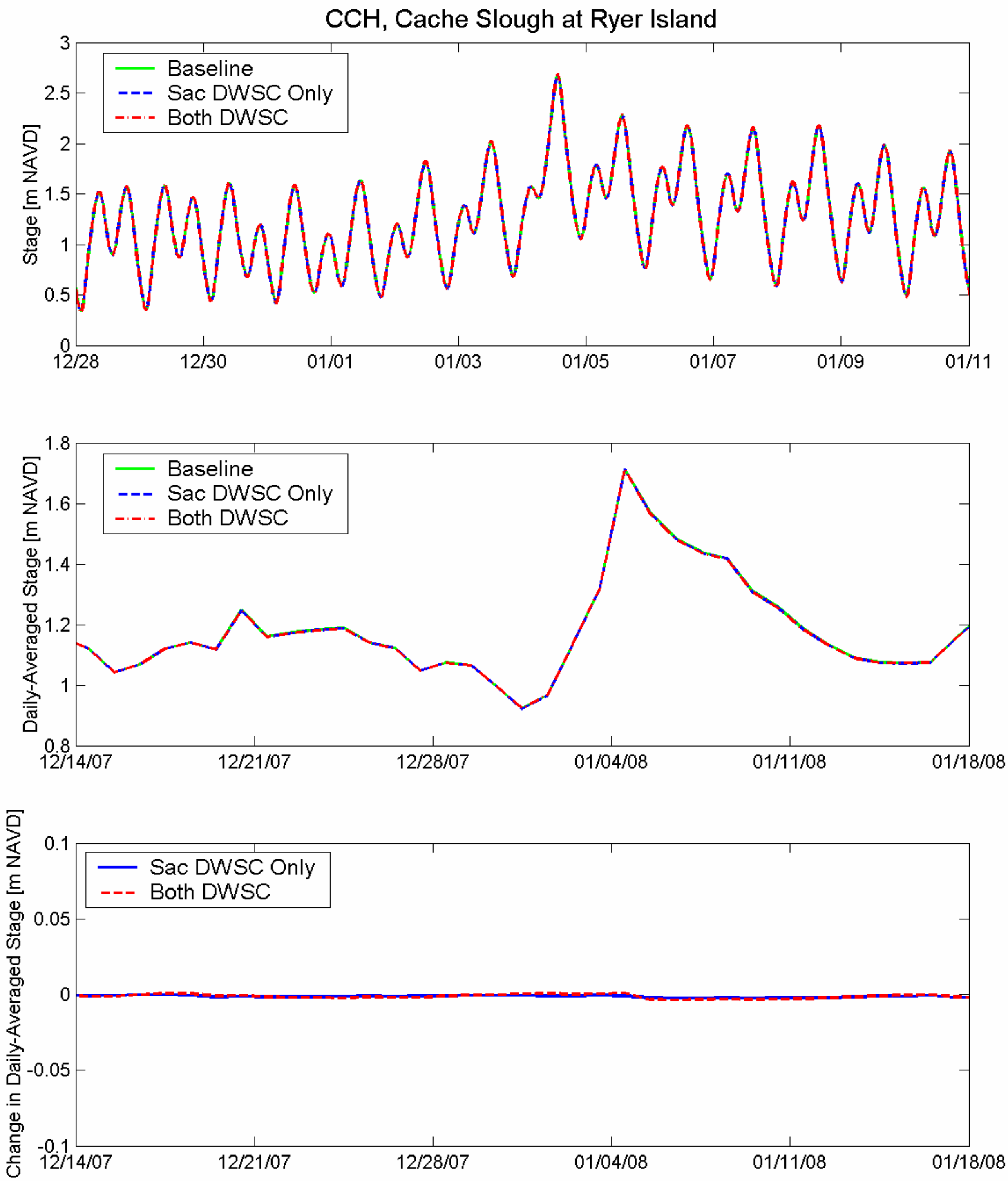

Figure 7.2-8 Predicted stage at Cache Slough at Ryer Island (CCH) for the Baseline scenario, the Sacramento DWSC Only Deepening scenario, and the Both DWSC Deepening scenario under 2007-2008 historic conditions: tidal time-scale variability over a 7-day period (top); daily-averaged stage for five week analysis period (middle); predicted change in daily-averaged stage for the Sacramento DWSC Only Deepening scenario and the Both DWSC Deepening scenario relative to the Baseline scenario (bottom).

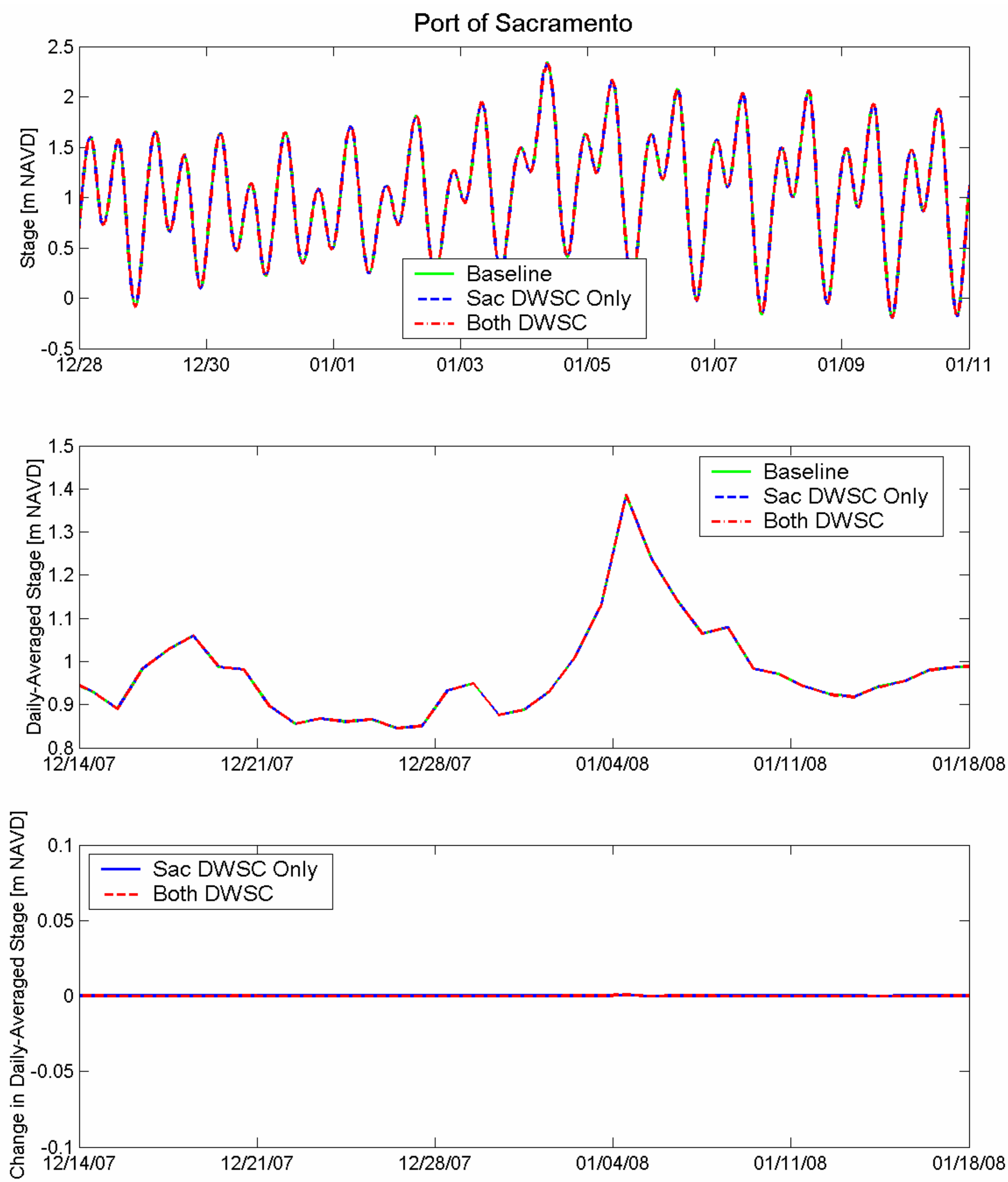

Figure 7.2-9 Predicted stage at the Port of Sacramento for the Baseline scenario, the Sacramento DWSC Only Deepening scenario, and the Both DWSC Deepening scenario under 2007-2008 historic conditions: tidal time-scale variability over a 7-day period (top); daily-averaged stage for five week analysis period (middle); predicted change in daily-averaged stage for the Sacramento DWSC Only Deepening scenario and the Both DWSC Deepening scenario relative to the Baseline scenario (bottom).

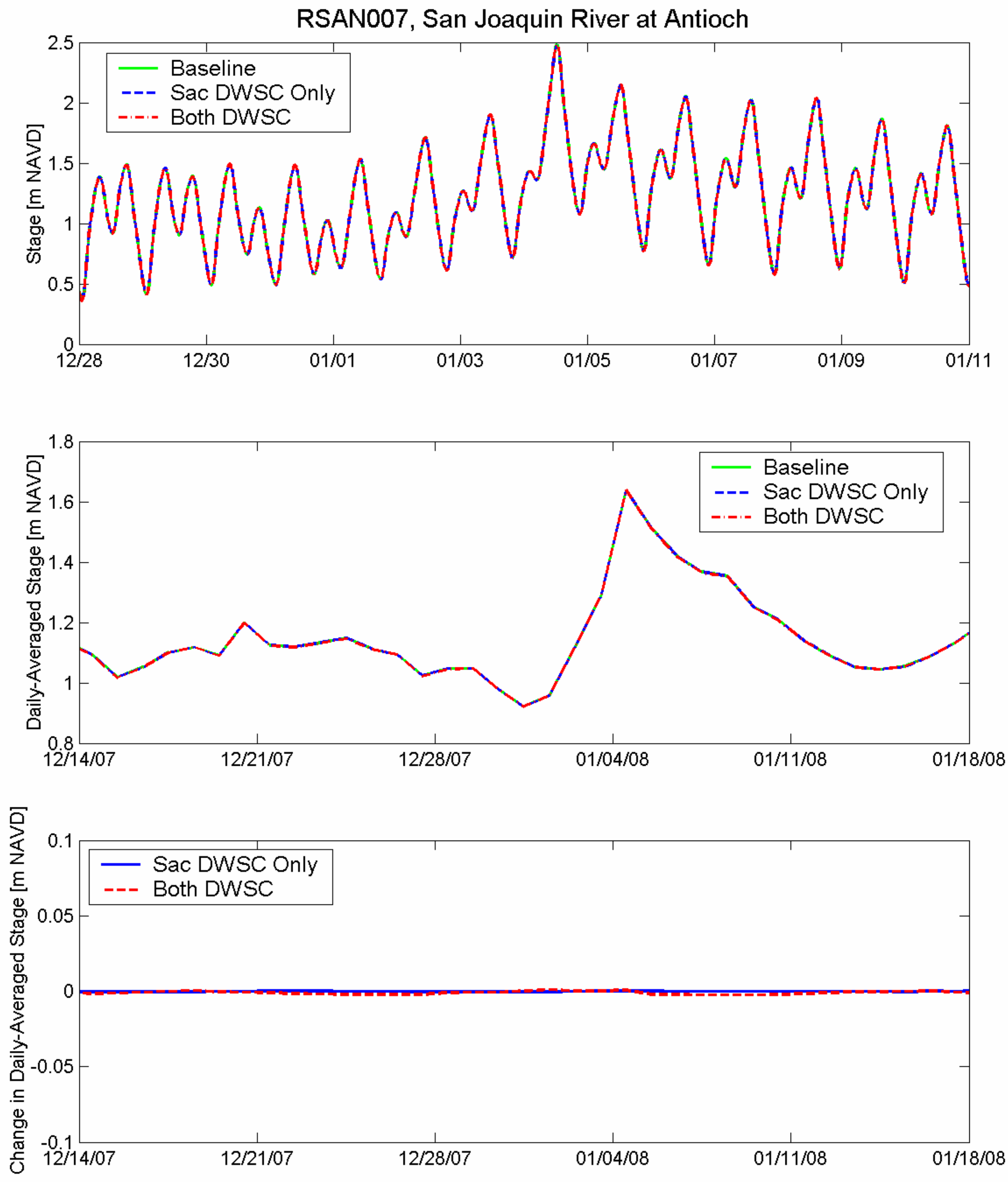

Figure 7.2-10 Predicted stage at San Joaquin River at Antioch station (RSAN007) for the Baseline scenario, the Sacramento DWSC Only Deepening scenario, and the Both DWSC Deepening scenario under 2007-2008 historic conditions: tidal time-scale variability over a 7-day period (top); daily-averaged stage for five week analysis period (middle); predicted change in daily-averaged stage for the Sacramento DWSC Only Deepening scenario and the Both DWSC Deepening scenario relative to the Baseline scenario (bottom).

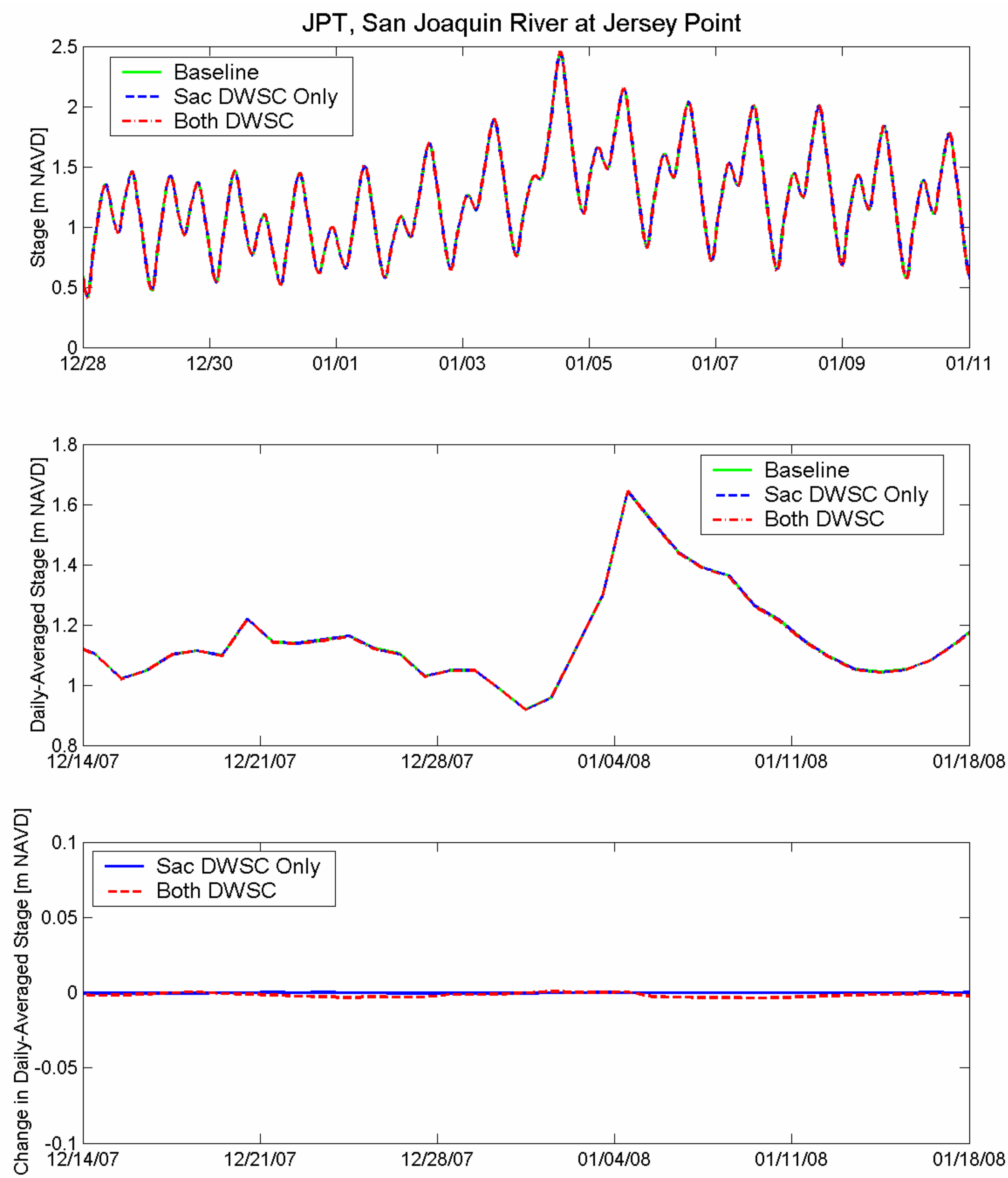

Figure 7.2-11 Predicted stage at Jan Joaquin River at Jersey Point (JPT) for the Baseline scenario, the Sacramento DWSC Only Deepening scenario, and the Both DWSC Deepening scenario under 2007-2008 historic conditions: tidal time-scale variability over a 7-day period (top); daily-averaged stage for five week analysis period (middle); predicted change in daily-averaged stage for the Sacramento DWSC Only Deepening scenario and the Both DWSC Deepening scenario relative to the Baseline scenario (bottom).

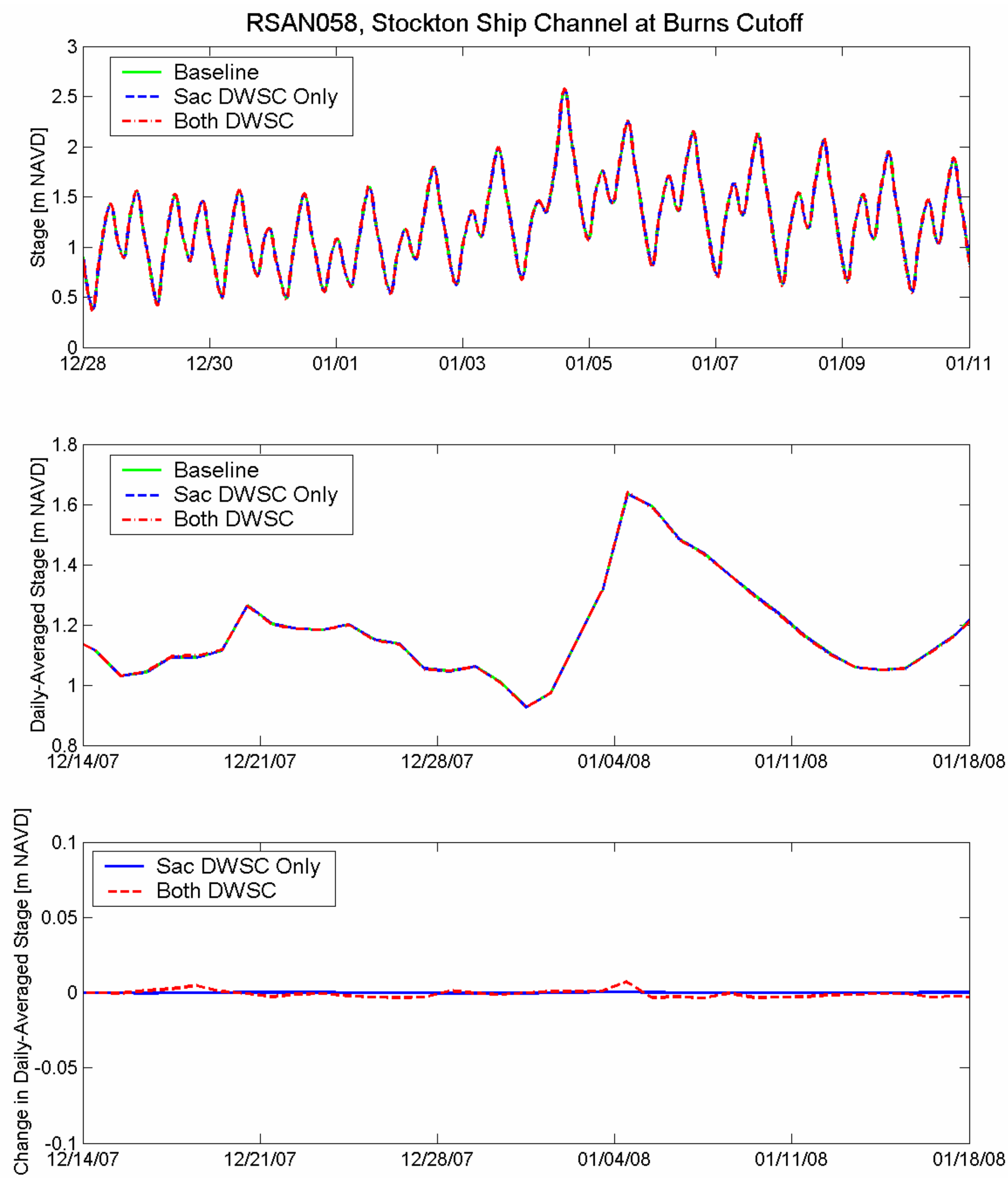

Figure 7.2-12 Predicted stage at Stockton Chip Channel at Burns Cutoff (RSAN058) for the Baseline scenario, the Sacramento DWSC Only Deepening scenario, and the Both DWSC Deepening scenario under 2007-2008 historic conditions: tidal time-scale variability over a 7-day period (top); daily-averaged stage for five week analysis period (middle); predicted change in daily-averaged stage for the Sacramento DWSC Only Deepening scenario and the Both DWSC Deepening scenario relative to the Baseline scenario (bottom).

8. Summary and Conclusions

This report presents the results of a detailed analysis of the potential hydrodynamic and salinity impacts that may result from the deepening of the Sacramento DWSC and San Francisco Bay to Stockton DWSC. The potential hydrodynamic and salinity impacts resulting from the proposed deepening projects were evaluated under base year conditions and under future conditions scenarios, which include both the effects of sea level rise and potential changes to Delta operations.

The UnTRIM San Francisco Bay-Delta model (UnTRIM Bay-Delta model) is a three-dimensional hydrodynamic model of San Francisco Bay and the Sacramento-San Joaquin Delta. The UnTRIM Bay-Delta model used for this project builds on previous applications (e.g., MacWilliams et al., 2007; MacWilliams et al., 2008), and was further refined to increase the model grid resolution within the Deep Water Ship Channels and incorporate the most recent ship channel bathymetric survey data into the model grid. The calibration and validation of the UnTRIM Bay-Delta model for this project is documented in a separate report (MacWilliams et al., 2009). The UnTRIM Bay-Delta model was applied to simulate salt intrusion under the currently maintained Baseline DWSC configuration and under project alternatives that entail the deepening of the Sacramento DWSC and the San Francisco Bay to Stockton DWSC.

Three different DWSC configurations were modeled. The Baseline DWSC conditions represent the “currently maintained” conditions for both the Sacramento DWSC and the San Francisco Bay to Stockton DWSC as described in Section 2.1. The Sacramento DWSC Only Deepening scenario incorporates the proposed deepening of the Sacramento DWSC with no changes to the San Francisco Bay to Stockton DWSC as described in Section 2.2. The Both DWSC Deepening scenario incorporates both the proposed deepening of the Sacramento DWSC and the proposed deepening of the San Francisco Bay to Stockton DWSC channels as described in Section 2.3.

For each of the three DWSC configurations, a one year simulation period was analyzed under base year (Year 0) and future year (Year 50) conditions. An additional future conditions simulation was made that considers the impact of the proposed deepening scenarios under modified Delta operations (Year 50 with Potential Project). The boundary conditions and assumptions used to develop the Year 0, Year 50, and Year 50 with Potential Project simulations are described in Section 3.2.

For each simulation period the model predictions were analyzed to allow for comparison of the effects of the proposed DWSC deepening scenarios on hydrodynamics and salinity in San Francisco Bay and the Sacramento-San Joaquin Delta. Comparisons were made between predicted stage, flow, and salinity at an extensive set of monitoring stations. The impact of the proposed projects on the compliance with the D-1641 water quality standards was evaluated. Comparison of depth-averaged daily-averaged salinity maps were used to identify the spatial extent of salinity impacts during each simulation period. For each scenario, X2 was calculated and the predicted impacts to X2 for each scenario were evaluated. Lastly, the potential impacts of the proposed DWSC on bed shear stress (Section 7.1) and storm surge (Section 7.2) were analyzed.

A detailed discussion of the Year 0 Sacramento DWSC Only Deepening Scenario and the Year 0 Both DWSC Deepening scenario results are presented in Section 4.8. A detailed discussion of the Year 50 Sacramento DWSC Only Deepening Scenario and the Year 50 Both DWSC Deepening scenario results are presented in Section 5.8. A detailed discussion of the Year 50 with Potential Project Both DWSC Deepening scenario results are presented in Section 6.7.

The effects of channel deepening were qualitatively similar for the Year 0 conditions, Year 50 conditions and Year 50 with Potential Project conditions. Deepening of the Sacramento DWSC resulted in only small effects of water levels and flows, primarily a small decrease in predicted stage along the Sacramento DWSC during high flow periods. Deepening of both the Sacramento DWSC and the San Francisco Bay to Stockton DWSC also resulted in slightly decreased predicted stage during high flows and, in addition, a small increase in the predicted tidal prism of the Delta.

The predicted salinity effects varied between the two different deepening scenarios. Deepening the Sacramento DWSC only resulted primarily in localized changes in predicted salinity in the Sacramento River during fall, while deepening both the Sacramento DWSC and the San Francisco Bay to Stockton DWSC resulted in substantial increases in salinity throughout much of San Francisco Bay and the western and central Delta, particularly during the dry summer and fall period. More widely distributed and persistent predicted salinity increases associated with the Both DWSC Deepening scenarios relative to the Sacramento DWSC Only Deepening scenarios most likely occur because deepening in the San Francisco Bay reaches of the San Francisco Bay to Stockton DWSC results in more gravitational circulation throughout the year. In contrast, deepening of the Sacramento DWSC only appears to have substantial effects on predicted salinity when salt intrudes into the Sacramento DWSC during fall conditions.

Effects on compliance with water quality objectives were estimated using the same Delta inflows and operations for the deepening scenarios as the relevant baseline scenario. The predicted effects on compliance with water quality objectives were small for the Sacramento DWSC Deepening scenarios. However, substantial effects on compliance with water quality objectives were predicted for the Both DWS Deepening scenarios.

The effects of the deepening scenarios on bed shear stresses were generally small. The Both DWSC Deepening scenarios showed larger effects of deepening that the Sacramento DWSC Only Deepening scenarios. The changes in predicted bed shear stresses were attributed primarily to changes in tidal prism and lateral distribution of velocity. In addition, localized changes in predicted stratification resulted in changes in vertical velocity profiles and, therefore, changes in predicted bed shear stresses. The effects of deepening scenarios on predicted storm surge were minimal.

The analysis presented in this document constitutes a comprehensive analysis of the potential effects of the deepening of the Sacramento DWSC and the San Francisco Bay to Stockton DWSC on hydrodynamics and salinity in San Francisco Bay and the Sacramento-San Joaquin Delta.

Acknowledgments

The authors would like to acknowledge Frank Wu (USACE) for management and technical oversight through the USACE San Francisco District. The UnTRIM code was developed by Professor Vincenzo Casulli (University of Trento, Italy). Bathymetric data for the DWSC were prepared and provided by Towill, Inc. Additional data and information was provided by Tara Smith (DWR), Brett Kawakami (CCWD), Deanna Sereno (CCWD), Chandra Chilmakuri (CH2M HILL), and Armin Munevar (CH2M HILL).

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