# Attachment 4

# DSM2 Corroboration for Modeling Tidal Marsh Restoration and Sea Level Rise Effects in the Sacramento-San Joaquin Delta

TECHNICAL MEMORANDUM

# DSM2 CORROBORATION FOR MODELING TIDAL MARSH RESTORATION AND SEA LEVEL RISE EFFECTS IN THE SACRAMENTO-SAN JOAQUIN DELTA


SAIC

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## Introduction

Tidal marsh restoration in the Delta is one of the core elements of the Bay Delta Conservation Plan (BDCP) conservation strategy. In the analysis of the BDCP Proposed Project the restoration areas and sea level rise are integral part of the physical modeling to capture the effects. In the process of preparing Delta Simulation Model (DSM2) for evaluating the BDCP alternatives, the simulation of tidal marsh and sea level rise in DSM2 are corroborated using the modeling results from higher dimensional models of the California Bay-Delta. This memorandum provides a brief description of the purpose, methodology and the results of this process.

## Purpose of Corroboration

BDCP alternatives evaluation requires long-term analysis of hydrodynamics and water quality in the Delta resulting from the proposed physical and operational changes. DSM2 is an appropriate model for this type of analysis. It has been successfully used in analyzing several projects in the Delta. However, DSM2 has a limited ability to simulate two-dimensional features such as tidal marshes and three-dimensional processes such as gravitational circulation which is known to increase with sea level rise in the estuaries. Therefore, it is imperative that DSM2 be recalibrated or corroborated based on a dataset that accurately represents the conditions in the Delta under restoration and sea level rise. Since the proposed conditions are hypothetical, the best available approach to estimate the Delta hydrodynamics would be to simulate higher dimensional models which can resolve the two- and three-dimensional processes well. These models would generate the data sets needed to corroborate or recalibrate DSM2 under the proposed conditions so that it can simulate the hydrodynamics and salinity transport with reasonable accuracy.

## Modeling Tools

### DSM2

DSM2 is a one-dimensional hydrodynamics, water quality and particle tracking simulation model used to simulate hydrodynamics, water quality, and particle tracking in the Sacramento-San Joaquin Delta (DWR, 2002). DSM2 represents the best available planning model for Delta tidal hydraulics and salinity modeling. It is appropriate for describing the existing conditions in the Delta, as well as performing simulations for the assessment of incremental environmental impacts caused by facilities and operations. The DSM2 model has three separate components: HYDRO, QUAL, and PTM. HYDRO simulates one-dimensional hydrodynamics including flows, velocities, depth, and water surface elevations. The HYDRO module is a one-dimensional, implicit, unsteady, open channel flow model that DWR developed from FOURPT, a four-point finite difference model originally developed by the USGS in Reston, Virginia. HYDRO provides the flow input for QUAL and PTM. The QUAL module is a one-dimensional water quality transport model that DWR adapted from the Branched Lagrangian Transport Model originally developed by the USGS in Reston, Virginia. QUAL simulates fate and transport of conservative and non-conservative water quality constituents by solving the one-dimensional advection-dispersion equation in which non-conservative constituent relationships are considered to be governed, in general, by first order rates. Tidal boundary (stage in feet) is applied at Martinez. Flow boundaries are specified at Sacramento, Vernalis, Yolo bypass and East side streams. Other boundaries include gates and other control structures, diversions, exports and Delta Island Consumptive Use (DICU). QUAL uses EC boundary specified at Martinez and other boundary inflow locations mentioned above.

### RMA Bay-Delta Model

Tidal marsh restoration is one of the important physical changes to the Delta, proposed under the BDCP. It is necessary to modify the current DSM2 grid to include these new open water areas. However, since DSM2 is a one-dimensional model, it has limited capability of simulating hydrodynamics and water quality in two dimensional features such as open water areas or reservoirs. Therefore, results from two-dimensional RMA model were used to corroborate and fine tune the tidal marsh implementation in the DSM2 model.

RMA Bay-Delta Model, a two-dimensional hydrodynamics and water quality model was used to simulate tidal marsh restoration effects with and without sea level rise on hydrodynamics and salinity transport under the historic operations. The results from the RMA model were used to corroborate DSM2 so that it can simulate the effect of tidal marsh restoration with and without sea level rise accurately.

RMA Bay Delta Model, developed and refined by RMA, is a numerical model of the San Francisco Bay and Sacramento-San Joaquin Delta system (Bay-Delta model) utilizing the RMA finite element models for surface waters. RMA2 (King, 1990) is a generalized free surface hydrodynamic model that is used to compute two-dimensional depth-averaged velocity and water surface elevation. RMA11 (King, 1998) is a generalized two-dimensional depth-averaged water quality model that computes a temporal and spatial description of conservative and non-conservative water quality parameters. RMA11 uses the results from RMA2 for its description of the flow field. The model extends from the Golden Gate to the confluence of the American and Sacramento Rivers and to Vernalis on the San Joaquin River. The current version of RMA's Bay-Delta model has been developed and continually refined during numerous studies over the past decade. One of the most important additions has been the capability to accurately represent wetting and drying in shallow estuaries.

The model uses a depth-averaged approximation in the western Delta and Suisun Bay where significant vertical gradients in salinity are often present. Vertical gradients in salinity may lead to three dimensional circulation patterns that will not be represented by a two-dimensional depth-averaged model. Instead, the three dimensional processes are approximated by two-dimensional mixing parameters.

### UnTRIM-3D

Sea level rise is known to alter the transport processes in the estuaries. Processes such as the gravitational circulation are affected by the resulting changes in the density gradients under the sea level rise. DSM2 does not explicitly simulate these transport processes unlike the other higher order models, such as UnTRIM-3D. Therefore, results from the UnTRIM-3D were used to corroborate and fine tune the transport processes in DSM2 under the sea level rise conditions.

UnTRIM Bay-Delta Model, a three-dimensional hydrodynamics and water quality model was used to simulate the sea level rise effects on hydrodynamics and salinity transport under the historical operations in the Delta. The results from the UnTRIM model were used to corroborate RMA and DSM2 models so that they simulate the effect of sea level rise accurately.

A complete description of the UnTRIM Bay-Delta model can be found in MacWilliams et al. (2009). The UnTRIM model solves the three-dimensional Navier-Stokes equations on an unstructured grid in the horizontal plane. The boundaries between vertical layers are at fixed elevations, and cell heights can be varied vertically to provide increased resolution near the surface or other vertical locations. Volume conservation is satisfied by a volume integration of the incompressible continuity equation, and the free-surface is calculated by integrating the continuity equation over the depth, and using a kinematic condition at the free-surface as described in Casulli (1990). The numerical method allows full wetting and drying of cells in the vertical and horizontal directions. The governing equations are discretized using a finite difference – finite volume algorithm.

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, which has been developed using the UnTRIM hydrodynamic model (MacWilliams et al., 2007; MacWilliams et al., 2008; MacWilliams et al., 2009). The UnTRIM Bay-Delta model extends from the Pacific Ocean through the entire Sacramento-San Joaquin Delta (Figure 2-1). 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. The model calibration and validation results (MacWilliams et al., 2008; MacWilliams et al. 2009) demonstrate that the UnTRIM Bay-Delta model is accurately predicting flow, stage, and salinity in San Francisco Bay and the Sacramento-San Joaquin Delta under a wide range of hydrologic conditions and is suitable for evaluating the potential salinity impacts resulting from sea level rise.

# BDCP Corroboration Scenarios

The evaluation of the BDCP Alternatives is performed at three phases in time – Near Term (NT) represents the point in time after 10 years from permitting, Early Long Term (ELT) represents the point in time after 15 years from permitting and Late Long Term (LLT) represents the point in time at the of the permitting period of 60 years. The restoration acreages increase with each phase. NT includes 14,000 ac, ELT includes 25,000 ac and LLT includes 65,000 ac of restoration. In the evaluation of ELT and LLT phases of the BDCP Alternatives, sea level rise was assumed to be inherent. ELT assumes 15cm and LLT assumes 45cm rise in the mean sea level.

## Restoration Opportunity Areas

SAIC identified several areas in the Delta that could be potentially restored as tidal marshes. These areas are referred to as Restoration Opportunity Areas (ROAs). ROAs were identified in Cache Slough region, Suisun Marsh, West Delta, Mokelumne – Cosumnes region, East Delta and South Delta as shown in the Figure 1.

In addition to the restoration acreage goals assigned to each time phase, minimum restoration area goals were established for each ROA at each time phase. Using this ROA information and the restoration acreage goals, RMA with the help of the two-dimensional hydrodynamic modeling identified the footprints of the specific areas for restoration at three phases in time. Details of how the specific areas were identified are described by RMA in previous section.

## Corroboration Scenarios

The scenarios for which DSM2 was corroborated using the results from either RMA or UnTRIM model are described below. In general, three types of corroboration runs were performed – scenarios that included restoration, scenarios that included sea level rise and scenarios that included both restoration and sea level rise.

### Scenarios with Restoration

DSM2 was corroborated for three restoration scenarios, representing the restoration acreages proposed at NT, ELT and LLT time phases. RMA model results were used to corroborate DSM2 model for these restoration scenarios.

#### *14,000 acre Restoration*

This scenario represents the proposed restoration changes in the Delta at the NT phase. The total acreage goal of restoration for this scenario is 14,000 acres. The modeled scenario consists of 6,750 acres in the Cache Slough ROA, 6,450 acres in the Suisun Marsh, 2,310 acres in the West Delta ROA, and 2,900 acres in the Mokelumne – Cosumnes ROA. This scenario does not include any restoration in the East and the South Delta ROAs.

#### *25,000 acre Restoration*

This scenario represents the proposed restoration changes in the Delta at the ELT phase. The total acreage goal of restoration under this scenario is 25,000 acres. The modeled scenario consists of 12,900 acres in the Cache Slough ROA, 8,130 acres in the Suisun Marsh, 3,990 acres in the West Delta ROA, and 2,900 acres in the Mokelumne – Cosumnes ROA. The areas identified for the NT phases are included in this scenario. This scenario also does not include any restoration in the East and the South Delta ROAs.

#### *65,000 acre Restoration*

This scenario represents the proposed restoration changes in the Delta at the LLT phase. The total acreage goal of restoration under this scenario is 65,000 acres. The modeled scenario consists of 20,340 acres in the Cache Slough ROA, 14,390 acres in the Suisun Marsh, 4,240 acres in the West Delta ROA, and 3,290 acres in the Mokelumne – Cosumnes ROA, 2,160 acres in the East Delta ROA and 22,480 acres in the South Delta ROA. The areas included in the NT and ELT phases are included in this scenario.

### Scenarios with Sea Level Rise

DSM2 was corroborated for two sea level rise scenarios, representing the assumed sea level change at ELT and LLT time phases. UnTRIM model results were used to corroborate DSM2 and RMA models for these scenarios.

#### *15 cm Sea Level Rise*

This scenario represents the assumed sea level rise at the ELT phase. It assumes 15 cm increase in the mean sea level without any change in the amplitude at the ocean end.

#### *45 cm Sea Level Rise*

This scenario represents the assumed sea level rise at the LLT phase. It assumes 45 cm increase in the mean sea level without any change in the amplitude at the ocean end.

### Scenarios with Restoration and Sea Level Rise

DSM2 was corroborated for two integrated restoration and sea level rise scenarios, representing the proposed restoration and assumed sea level rise at ELT and LLT time phases. RMA model results were used to corroborate DSM2 for these scenarios.

#### *25,000 acre Restoration with 15 cm Sea Level Rise*

This scenario represents the proposed restoration changes and sea level rise in the Delta at the ELT phase. The restoration areas in each ROA under this scenario are consistent with the areas mentioned for the “25,000 acre Restoration” scenario.

#### *65,000 acre Restoration with 45 cm Sea Level Rise*

This scenario represents the proposed restoration changes and sea level rise in the Delta at the LLT phase. The restoration areas in each ROA under this scenario are consistent with the areas mentioned for the “65,000 acre Restoration” scenario.

# Corroboration Methodology

Maintaining consistent grid and boundary conditions between the higher dimensional model and DSM2 model for each scenario is critical for successful corroboration. The methodology includes building the physical changes into the DSM2grid and ensuring the boundary conditions for stage, inflow, diversion and gate operations are consistent between DSM2 and the higher dimensional model. Once ensuring the consistency between the two model setups, the results from the higher dimensional model are used to fine tune the DSM2 results.

## Corroboration Baseline

DSM2 model from the 2009 mini-calibration is used as the baseline in the corroboration process. The historical boundary conditions are updated to be same as that of RMA's baseline model. DSM2 stage and EC boundary at Martinez are set equal to the output at Martinez from RMA's baseline (full-bay uncoupled) model or the UnTRIM baseline model. Suisun marsh island flow and EC boundaries are added to the calibration setup to be consistent with RMA's boundary conditions. Figure 2 shows the north Delta portion of the DSM2 grid used for the corroboration baseline.

## Physical Changes in DSM2

The first step in the corroboration process is to implement the physical changes such as the new restoration areas and any channel cross-section modifications into the DSM2 grid consistent with the implementation in the RMA model. This section describes how the physical changes have been implemented in DSM2.

### Representation of Restoration Areas in DSM2

In DSM2, an open water area such as the proposed ROAs is represented by a reservoir or a wide channel with a weir at the entrance. A reservoir in DSM2 is a simple vertical walled cylinder with a constant wetted surface area. The flow in and out of the reservoir is computed using the orifice equation, which depends on an entrance or an exit coefficient and the stage gradient between the reservoir and the adjoining channel. The entrance and exit coefficients for the reservoir account for the cross-sectional area of the inlet and the inlet losses. These coefficients are constant in DSM2. In reality, the wetted surface area and the cross-sectional area of the inlet change with varying water surface elevation. The surface area of the reservoir is set equal to the surface area of the marsh corresponding to the mean water level in the channel to which the reservoir is connected to. This assumption allows for approximately the right amount of flow exchanged over the tidal day with appropriate coefficients specified at the connections with channels. The bottom elevation of all the reservoirs was assumed to be -10.1 ft instead of using a representative elevation based on the existing land elevations. If the existing elevations were used, part of the marsh area could be wet under certain tidal conditions and dry under others. DSM2 does not allow dry channels or reservoirs in the model. Therefore, in order to simulate the right amount of tidal exchange, the bottom elevation of the reservoirs in DSM2 needed to be lower than the lowest water level that can occur in the channel it is connected with. The downside of this assumption is that the volume of the water in the reservoir could potentially be higher than what in reality should be. This could potentially cause increased dilution of the salinity in the ROAs.

A wide rectangular channel with a weir at the entrance was also used to represent the ROAs in DSM2. ROAs with single breach location were modeled as wide channels instead of a reservoir. The length of the channel was assumed to be 25,000 ft and the width was estimated based on the surface area of the ROA. The bottom elevation of the channel corresponds to the bottom elevation of the breach in the RMA model. The width and the crest elevation of the weirs are set equal to the modeled width and the bottom elevation of the breach in RMA model.

Both reservoir and wide channel representations of ROAs in DSM2 arrive at similar results. As part of the corroboration, the reservoir entrance and exit coefficients and the weir coefficients were adjusted to match the breach flows simulated in the RMA model both on a tidal scale and a net basis.

The changes specific to each corroboration scenario are described in the following sections.

**Modifications to the Channel Cross-Sections in DSM2**

Some of the restoration areas proposed in the West Delta ROA includes levee setback. Such changes are simulated by modifying channel cross-sections in DSM2 consistent with the implementation in the higher dimensional model. The changes specific to each corroboration scenario are described in the following sections.

## Boundary Conditions

In order to achieve DSM2 results consistent with the higher dimensional model, the number of differences between the two models in terms of the grid, bathymetry and boundary conditions have to be minimized. Therefore, in addition to modifying the DSM2 grid for the physical changes, such as inclusion of ROA's and modification of channel cross-sections, the historical flow and EC boundaries at all the rim stations and in-Delta locations were set equal to those used in the higher dimensional model. Further, the stage and EC boundary conditions at Martinez used in the DSM2 model were set equal to the simulated outputs at Martinez from higher dimensional model used in the corroboration process.

For maintaining consistency in the boundary conditions, additional flow and EC boundary conditions for the Suisun Marsh area were included in DSM2. They are comprised of tributary creek inflows to Montezuma Slough, Suisun Slough and Nurse Slough, and tidal marsh flows and drains from local managed wetlands. All the inflow boundary conditions for the Suisun Marsh area are associated with EC boundary conditions. Table 1 summarizes the list of boundary conditions used in the historical DSM2 model representing the corroboration baseline simulation.

## Information from Higher Dimensional Models

Based on the results of RMA simulations, information related to the grid modifications such as the wetted surface areas of individual tidal marsh corresponding to the Mean Sea Level (MSL), breach locations, breach widths, bottom elevation of the breaches and changes to channel cross-sections were provided. The boundary conditions used in the RMA model were provided for use in the DSM2 model including simulated Martinez stage, Delta inflows, DICU, local flows and diversions in Suisun Marsh region, net precipitation (precipitation – evaporation) and the average wetted area in the Suisun Marsh region, inflow salinities and Martinez EC. In the corroboration scenarios, correlations capturing the changes in stage and EC at Martinez were provided from the RMA and UnTRIM models. In addition, to verify the DSM2 results, timeseries of breach flows at all the proposed breach locations, timeseries of tidal flows at key channel locations and timeseries of EC at key channel locations in the Delta were provided based on the RMA and UnTRIM results.

## Simulation Period for Corroboration

In general the corroboration was performed over a portion of the water years 2002 and 2003. The simulation period specific for each corroboration run is described in the following sections.

## Parameters Adjusted for Corroboration

In DSM2, the reservoir entrance and exit coefficients and the coefficients for the weir at the channel entrance, were fine tuned to match the instantaneous flows at each breach location from RMA model. The overall change in the tidal prism resulting from the new ROAs is measured by the instantaneous tidal flows and the tidally-averaged net flows at a few key channel locations downstream of each ROA. The coefficients in DSM2 were further refined until the incremental change in flows at these critical locations are matched in both the models.

When modifications to the reservoir coefficients and channel weir coefficients in DSM2 were not enough to match the change in the tidal range observed in the RMA simulations, the channel roughness was slightly adjusted in the channels with modified cross-sections. Since the roughness is the main calibration parameter available in the DSM2 model, it was modified to match the incremental change in the tidal and net flows observed in the RMA results, taking past calibration efforts as a precedent.

## Corroboration Metrics

During the process of corroboration, changes to the DSM2 parameters were made based on computed statistics such that the incremental changes predicted by DSM2 between the baseline and corroboration scenario were similar to those predicted by higher dimensional model. The metrics used to assess the quality of flow corroboration included incremental change of instantaneous flows in the corroboration model from baseline model at key locations, incremental change of tidally averaged daily flows in the corroboration model from baseline model at key locations, instantaneous flows and tidally averaged net daily flows at key channel locations in the Delta and at breaches. The metrics used to assess the quality of EC corroboration included incremental change of tidally-averaged daily EC from the current conditions model to the corroboration model at key locations in the Delta and the tidally averaged daily EC at key locations in the Delta.

- Incremental change of instantaneous flows from baseline model at key locations
- Incremental change of tidally averaged daily flows from baseline model at key locations
- Instantaneous flows at key locations and ROA breach locations
- Tidally averaged daily flows at key locations and ROA breach locations
- Tidally averaged daily EC at key locations
- Incremental change of tidally averaged daily EC at key locations

# Corroboration of Scenarios with Restoration

This section describes the specifics related to the corroboration of DSM2 for the three scenarios with restoration – 14,000 ac (NT), 25,000 ac (ELT) and 65,000 ac (LLT). RMA model was used in this corroboration process.

## Representation of Restoration Areas in DSM2

DSM2 grid was modified to incorporate the proposed tidal marsh restoration areas based on the information from RMA model. Figures 3 to 16 illustrate the changes made to the DSM2 grid to incorporate tidal marsh restoration proposed at NT, ELT and LLT phase in various ROAs. The restoration areas were either represented by a reservoir feature in or by a wide channel with a weir at the entrance in DSM2. The surface area of the reservoir or the channel was set equal to the corresponding area provided by RMA. The bottom elevation in the reservoirs was set to an arbitrary number such that reservoir does not dry out during the lower low tide, which DSM2 cannot simulate. The bottom elevation of the channel was set to the bottom elevation of the breach. The reservoirs and channels were connected to the appropriate nodes in the existing grid consistent with the breach location information provided by RMA. The parameters used in DSM2 to represent the ROAs for NT, ELT and LLT restoration scenarios are summarized in Tables 2, 3 and 4, respectively.

## Modifications to the Channel Cross-Sections in DSM2

RMA proposed the use of wider channels in the Suisun March area for Near-term, Early Long-term and Late Long-term scenarios under the assumption that the fringe marsh inside the currently leveed channels would naturally erode away when the additional marsh acreage is reconnected to tidal flows. The cross-sections used in these channels were trapezoidal cross-sections with a side slope of 3H: 1V and with a varying bottom width along the channels. Based on the aerial maps provided by RMA showing the cross-section's bottom elevation and bottom width, DSM2 cross-sections were evaluated and modified for the channels in Montezuma Slough, Suisun Slough and Nurse Slough. Table 5 shows the list of DSM2 channels and the cross-sections locations in the Suisun Marsh area that are modified in the NT, ELT and LLT scenarios compared to the Baseline model.

Levee setback on the Twitchell Island in the West Delta as part of the three ROA scenarios was represented by modifying the channel cross-sections on portions of Sevenmile Slough and Threemile Slough. The cross-section was modified such that the extended levee bottom elevation is set as the elevation of one of the banks in the channel and the extent of levee is set equal to the bank width. To avoid instability issues in DSM2 caused by having a gradually varied slope in the channel cross-section, side slopes were made slightly steeper while maintaining the same volume as in RMA model. Figure 17 shows an example of modified cross-section on Threemile Slough (Channel 310). Table 6 shows the DSM2 channel cross-sections modified for each restoration scenario.

## Boundary Conditions

The boundary conditions were consistent with the baseline model except for some in the Suisun Marsh. In the RMA model, boundary conditions for precipitation and evaporation were applied aerially on Suisun Marsh areas. Since it is a two-dimensional model, the aerial boundaries for each wetted cell were computed based on the precipitation and evaporation rates observed at Suisun Valley gage collected by California Irrigation Management Information System (CIMIS). To translate these boundary conditions to the DSM2 model, the net precipitation minus evaporation rates were multiplied by the surface area of the ROA to generate timeseries of inflow or outflow. These timeseries were used as boundary flows into the ROAs. Table 7 summarizes the list of boundary conditions that are used in the DSM2 model for all the restoration scenarios in the corroboration process. As noted some of the boundary flows in the

Suisun Marsh from the baseline model are not included in the restoration scenarios since those flows were estimates of runoff from the areas that were leveed in the baseline. In the restoration cases these areas are part of the restoration and the runoff is estimated from the net precipitation computation. Therefore, to avoid double counting of the runoff, some of the boundary flows assumed in the baseline are turned off in the restoration cases. The stage and EC boundary conditions at Martinez used in the DSM2 model were set equal to the simulated outputs at Martinez from the RMA models of the restoration scenarios.

### Simulation Period for Corroboration of Restoration Scenarios

The proposed footprints of the tidal marsh areas for NT, ELT and LLT phases of the BDCP have been modeled in RMA initially under the historic operations from April 2002 to Dec 2003 period.

The period of corroboration was from July 2002 through December 2003, although the simulations were initiated in April 2002. For this period, the RMA model was run with the full physical footprint of the proposed ROAs under the NT, ELT and LLT scenarios. The flow and EC results from the RMA model were used to corroborate DSM2 with full physical changes and boundary condition changes incorporated.

### Parameters Adjusted for the Corroboration of Restoration Scenarios

Modifications to the reservoir coefficients and channel weir coefficients matched the change in the tidal prism for most regions of delta between the two models. However, for regions near Threemile slough and Sevenmile slough these changes were not enough to match the increase in tidal range observed in the RMA simulations. Hence, the channel roughness in these channels was adjusted to match the incremental change in the tidal and net flows in these channels observed in the RMA simulations. Table 8 shows the comparison of channel roughness values for the modified channels between the three scenarios and the baseline. The changes to roughness may be justified for couple of reasons. The DSM2 grid has been modified significantly from existing conditions in the NT, ELT and LLT scenarios near the Threemile and Sevenmile Slough channels. There are significant differences in the NT, ELT and LLT grids. Minor changes in the stage in the San Joaquin and Sacramento River channels result in significant variation in both the tidal and net flows through Threemile Slough. Since the roughness is the main calibration parameter available in the DSM2 model, it was modified to match the incremental change in the tidal and net flows observed in the RMA results, taking past calibration efforts as a precedent.

### Corroboration Results for the Restoration Scenarios

The restoration corroboration scenarios included all the proposed ROAs in the Cache Slough, Suisun Marsh, West Delta, Mokelumne/Cosumnes, South Delta and East Delta regions of the Delta. The results from the final DSM2 HYDRO and QUAL corroboration runs are compared to the RMA outputs in this report. Figures 18, 19 and 20 compare the average incremental change in flow between RMA and DSM2 models at various locations in the Delta for NT, ELT and LLT simulations respectively. The incremental change was computed from their respective baseline simulations. Similarly, Figures 21, 22 and 23 compare the average incremental change in EC between RMA and DSM2 models at various locations in the Delta for NT, ELT and LLT simulations respectively.

Detailed incremental flow and EC plots for individual locations are provided in the Attachment 1 of this report. Model results demonstrate a similar behavior for the three BDCP Scenarios. For the Sacramento River flow upstream of the confluence corroboration yielded in a very good match between the RMA and DSM2, both on the incremental change in tidal flow and the incremental change in tidally-averaged flows. Figure 24 and 25 shows comparison of incremental change in flows at Sacramento River at Rio Vista and Emmaton for Late Long-term Scenario. San Joaquin River flows upstream of the confluence show good agreement between the two models, except at Prisoners Point location. Figure 26 and 27 shows comparison of incremental change in flows at San Joaquin River at Jersey Point and San Andreas for Late Long-term Scenario.

South Delta flows show a good agreement. In Montezuma Slough, there are slight differences between the two models. The incremental change in tidally averaged flow at the mouth of Montezuma Slough near Grizzly Bay is higher for DSM2. The incremental change in tidally averaged flows in Threemile Slough and Dutch Slough are different between the two models. Incremental changes in tidally average flow are lower for Threemile Slough, suggesting slight under prediction of DSM2 flows towards Sacramento River compared to RMA. Figure 28 shows the comparison of incremental change in flows at Three Mile Slough at San Joaquin River for Late Long-term Scenario. Overall, the differences in predicted changes between DSM2 and RMA associated with the addition of the ROAs are considered to be within acceptable limits for the purpose of this analysis.

Comparison of breach and channel flow results show that Cache Slough region and Suisun Marsh region except Montezuma Wetlands have good match between RMA and DSM2 models. East and West Delta regions results show slight differences at the breach locations.

The ROA scenarios from both the models show EC increasing throughout the Delta, in general. However, the magnitude of increase is not same at some of the locations in Suisun Marsh between the two models. For Late Long-Term scenario, incremental change in EC is lower for most of the locations. Figures 29, 30 and 31 show the comparison of incremental change in EC for Sacramento River at Emmaton, San Joaquin River at Jersey Point and San Joaquin River at San Andreas Landing for Late Long-Term scenario. In Suisun region DSM2 shows lower increment in salinity than RMA under the restoration scenarios. In Sacramento River, both the models agree well in terms of the incremental change in the EC. In San Joaquin River and South Delta locations, the trends between the two models are the same and the tidally averaged EC values are approximately the same. However, DSM2 shows slightly higher increment in the salinity in these locations under the restoration scenarios compared to RMA.

# Corroboration of Scenarios with Sea Level Rise

This section describes the specifics related to the corroboration of DSM2 for the two scenarios with sea level rise – 15 cm and 45 cm. UnTRIM model was used in this corroboration process. In this corroboration process, the DSM2 baseline model stayed the same, except the stage and EC boundary conditions at Martinez were from the UnTRIM baseline outputs.

For the sea level rise corroboration, there were no physical changes to the baseline grid. Once again, for the baseline and the two sea level rise corroboration runs, the boundary conditions and the model setup were ensured to be consistent between DSM2 and UnTRIM models.

## Boundary Conditions

The boundary conditions were consistent with the baseline model. The stage and EC boundary conditions at Martinez used in the DSM2 model were set equal to the simulated outputs at Martinez from the corresponding UnTRIM model. Table 1 summarizes the list of boundary conditions that are used in the DSM2 model for the sea level rise corroboration runs.

## Simulation Period for Sea Level Rise Corroboration Scenarios

The UnTRIM runs were simulated from October 2001 to Dec 2002 period. The period of corroboration was from January 2002 through December 2002, although the simulations were initiated in October 2001. For this period, the UnTRIM model was run with the assumed changes in the mean sea level at the ocean boundary under the 15 cm and 45 cm scenarios. The flow and EC results from the UnTRIM model were used to corroborate DSM2 with full boundary condition changes incorporated. During the process of corroboration, changes to the DSM2 parameters were made based on computed statistics such that the incremental changes predicted by DSM2 between the baseline and sea level rise scenarios were similar to those predicted by UnTRIM.

## Parameters Adjusted for the Corroboration

The consistency in the boundary conditions between the two models ensured that DSM2 HYDRO runs for the sea level rise scenarios resulted in a good match with UnTRIM in terms of the incremental changes in the flow without any changes to the model parameters. Based on the initial QUAL results, dispersion factors were modified for a few channels between Sherman Lake and Rio Vista on the Sacramento River in DSM2 to match the incremental change in salinity in the UnTRIM results. Since DSM2 does not capture the increased gravitational circulation caused by the sea level rise as in UnTRIM, increasing the dispersion factors in DSM2 compensates for the higher tidal dispersion caused by the sea level rise. Table 9 shows the DSM2 channels with the modified dispersion factors for sea level rise scenarios along with the values under the baseline.

## Corroboration Results

The DSM2 results from the final sea level rise corroboration runs were compared with the UnTRIM results. Figure 32 and 33 compare the average incremental change in tidally-averaged EC at several key locations in the Delta for 15 cm and 45 cm sea level rise scenarios simulated in DSM2 and UnTRIM models. The results show that DSM2 matches UnTRIM reasonably well in terms of the direction and magnitude of the average change at most locations.

Figures 34, 35, 36 and 37 show the timeseries of incremental change in EC between DSM2 and UnTRIM at Collinsville, Emmaton, Jersey Point and Old River at Rock Slough locations for the 15 cm sea level rise scenario. In general, the incremental change in DSM2 matches well with UnTRIM. Even though the incremental change in EC from DSM2 is slightly lower at Collinsville, it matches well at Emmaton. At Jersey Point and Old River at Rock Slough DSM2 shows higher incremental change than UnTRIM.

Comparing the DSM2 and UnTRIM baseline models with the observed data it was found that UnTRIM was under-predicting the salinity in the central and south Delta. It was found that UnTRIM salinity result at Jersey Point was about 20% below the observed values and DSM2 was about 20% higher than the observed values. South Delta salinities simulated in DSM2 matched well with the observed data. For this reason, the UnTRIM results in this region of the Delta were mainly used to capture the trends and not necessarily to match the magnitude of the change while corroborating DSM2 sea level rise scenarios. Figures 38, 39, 40, and 41 show the timeseries comparison of incremental change in EC at Collinsville, Emmaton, Jersey Point and Rock Slough locations, respectively for the 45 cm sea level rise scenario. Again, the conclusions are similar to the 15 cm case, incremental changes in the west delta match well between the two models.

# Corroboration of Scenarios with Restoration and Sea Level Rise

This section describes the specifics related to the corroboration of DSM2 for the two scenarios with both restoration and sea level rise at ELT (25,000 ac and 15 cm) and LLT (65,000 ac and 45 cm) phases. RMA model was used in this corroboration process. In this corroboration process, the DSM2 baseline model stayed the same, except the stage and EC boundary conditions at Martinez were from the RMA baseline outputs.

## Representation of Restoration Areas in DSM2

The restoration areas and the foot prints are consistent with those described in “Restoration Only” scenarios. Changes in DSM2 grid with respect to the restoration areas and breach locations are consistent with the Figures 7 to 16. The parameters used in DSM2 to represent the ROAs for the ELT and LLT restoration and sea level rise scenarios are summarized in Tables 10 and 11, respectively.

## Modifications to the Channel Cross-Sections in DSM2

The channel modifications in the Suisun Marsh channels, Threemile Slough and Seven Mile Slough are consistent with the changes described for “Restoration Only” scenarios.

## Boundary Conditions

Boundary conditions for the scenarios with both restoration and sea level rise are exactly same as the scenarios with restoration. All the boundaries listed in Table 7 are used for the integrated scenarios as well. The stage and EC boundary conditions at Martinez used in the DSM2 model were set equal to the simulated outputs at Martinez from the corresponding RMA model runs.

## Simulation Period for the Restoration and Sea Level Rise Corroboration

Consistent with restoration scenarios, the period of corroboration in the restoration and sea level rise scenarios was from July 2002 through December 2003, although the simulations were initiated in April 2002. For this period, the RMA model was run with the full physical footprint of the proposed ROAs under the NT, ELT and LLT scenarios along with the increased mean sea level at the Golden Gate boundary. The flow and EC results from the RMA model were used to corroborate DSM2 with full physical and boundary condition changes incorporated. During the process of corroboration, changes to the DSM2 parameters were made based on computed statistics such that the incremental changes predicted by DSM2 between the baseline and ROA scenarios were similar to those predicted by RMA.

## Parameters Adjusted for the Restoration and Sea Level Rise Corroboration

Modifications to the reservoir coefficients and channel weir coefficients matched the change in the tidal prism for most regions of delta between the two models. Incorporating the previously identified roughness changes in Threemile and Sevenmile Sloughs, shown in Table 8, ensured a good match in tidal prism in these channels.

For salinity, incorporating the dispersion changes identified in the sea level rise corroboration simulations, shown in Table 9, ensured a good match in the incremental change in EC.

## Integrated Restoration and Sea Level Rise Corroboration Results

Integrated restoration and sea level rise corroboration includes proposed ROAs with the Sea Level Rise (SLR) for the ELT and LLT scenarios. ELT scenario is the combination of 25,000 acre ROAs with 15 cm SLR and LLT scenario is the combination of 65,000 acres ROAs and 45 cm SLR. DSM2 integrated restoration and SLR results are compared with RMA results.

Figures 42 and 43 show the comparison of mean incremental change in flows at key channel locations in the delta and at breach locations of ROAs, respectively for integrated ELT scenario. Similarly, Figures 44 and 45 show the comparison of mean incremental change in flows for integrated LLT scenario.

The summary results demonstrate slightly higher incremental change in DSM2 simulated flows in Sacramento River, San Joaquin River and Central Delta and slightly lower incremental change in flows for Suisun Marsh and Georgiana Slough. DSM2 breach flows show good agreement with RMA breach flows. Figures 46, 47 and 48 show the comparison of change in incremental flows at Sacramento River at Emmaton, San Joaquin River at Jersey Point and San Andreas for Late Long-term Scenario. The figures show the same effect as summary plots with slightly higher incremental change in flow. DSM2 breach flows are similar to the RMA breach flows.

Figure 49 and 50 show the comparison of mean incremental change in EC at key locations for ELT and LLT scenarios. From the figures it is observed that there is a slight increase in EC for most locations for ELT and LLT scenarios in DSM2. Figures 51, 52 and 53 show the timeseries of incremental change in EC as a percentage for Sacramento River at Emmaton, San Joaquin River at Jersey Point and San Andreas for Late Long-term Scenario. Emmaton and Jersey Point show increase in EC where as San Andreas has a slight decrease in EC for LLT scenario.

Overall the results show that the DSM2 model with consistent physical changes and boundary conditions is capable of simulating the similar incremental changes in flows and salinity at most Delta locations as in the RMA model.

# Limitations

- Accurate representation of RMA's tidal marsh areas, bottom elevations, breach locations, breach widths, cross-sections, and boundary conditions in DSM2 is critical to the agreement of corroboration results.
- DSM2 is a one dimensional model and has inherent limitations in simulating the hydrodynamics related to the open water areas. Since a reservoir surface area is constant in DSM2, it impacts the stage in the reservoir and thereby impacting the flow exchange with the adjoining channel. Due to the inability to change the cross-sectional area of the reservoir inlets with changing water surface elevation, the final entrance and exit coefficients were fine tuned to match a median flow range. This causes errors in the flow exchange at breaches during the extreme spring and neap tides.
- Using an arbitrary bottom elevation value for the reservoirs representing the proposed marsh areas to get around the wetting-drying limitation of DSM2 may increase the dilution of salinity in the reservoirs.

Table 1: Summary of DSM2 Boundary Conditions for the Corroboration Baseline

| Boundary Location | DSM2 Node/ Reservoir | Boundary Type |
|---|---|---|
| Calaveras | 21 | flow/EC |
| Cosumnes | 446 | flow/EC |
| Mokelumne | 447 | flow/EC |
| North Bay | 273 | Diversion |
| Yolo | 316 | flow/EC |
| Sacramento | 330 | flow/EC |
| Vernalis | 17 | flow/EC |
| Martinez | 361 | Stage/EC |
| CVP | 181 | Diversion |
| Green Valley Creek | 369 | flow/EC |
| Suisun Creek | 396 | flow/EC |
| Ledgewood Creek | 392 | flow/EC |
| Laurel Creek | 368 | flow/EC |
| Fairfield WWTP | 400 | flow/EC |
| Roaring River Duck Club | 418 | flow/EC |
| Morrow Island Duck Club | 384 | Diversion |
| Montezuma Sl West Duck Club | 428 | flow/EC |
| Montezuma Sl East Duck Club | 420 | flow/EC |
| Montezuma Sl Middle Duck Club | 422 | flow/EC |
| Nurse Sl Duck Club | 406 | flow/EC |
| Suisun Sl Duck Club | 375 | flow/EC |
| Boynton Sl Tidal Marsh | 400 | Precipitation/EC |
| Peytonia Sl Tidal Marsh | 371 | Precipitation/EC |
| Hill Sl Tidal Marsh | 395 | Precipitation/EC |
| First Mallard Sl Tidal Marsh | 373 | Precipitation/EC |
| Cutoff Sl Tidal Marsh | 399 | Precipitation/EC |
| Beldons Landing Tidal Marsh | 425 | Precipitation/EC |

Table 2: Summary of Parameters used in DSM2 for the Reservoirs and Channels Representing all ROAs for Near-Term Restoration Scenario

| ROA | Region | Mean Wetted Surface Area (acres) | Storage Type | DSM2 Reservoir/Weir Coefficient | | Breach Location (DSM2 Node) |
|---|---|---|---|---|---|---|
| | | | | Entrance | Exit | |
| Prospect | Cache Slough | 1,180 | Reservoir | 800 | 2000 | 316 |
| Prospect | Cache Slough | 1,180 | Reservoir | 1300 | 1500 | 307 |
| Little Holland | Cache Slough | 7 | Reservoir | 250 | 550 | 319 |
| Little Holland | Cache Slough | 7 | Reservoir | 2000 | 500 | 318 |
| CalhounCut | Cache Slough | 110 | Reservoir | 1100 | 1100 | 324 |
| Shag | Cache Slough | 1,910 | Channel+Weir | 0.05 | 0.05 | 321 |
| 3 | Suisun Marsh | 760 | Reservoir | 90 | 80 | 410 |
| 3 | Suisun Marsh | 760 | Reservoir | 900 | 700 | 406 |
| 9 | Suisun Marsh | 680 | Reservoir | 3300 | 1000 | 405 |
| 9 | Suisun Marsh | 680 | Reservoir | 1450 | 1200 | 368 |
| 10 | Suisun Marsh | 2,410 | Reservoir | 550 | 350 | 399 |
| 10 | Suisun Marsh | 2,410 | Reservoir | 1175 | 1075 | 425 |
| 10 | Suisun Marsh | 2,410 | Reservoir | 5000 | 6000 | 374 |
| 10 | Suisun Marsh | 2,410 | Reservoir | 6500 | 650 | 398 |
| Montz Wet | Suisun Marsh | 35 | Reservoir | 30 | 35 | 417 |
| Montz Wet | Suisun Marsh | 35 | Reservoir | 30 | 35 | 418 |
| 5 | Suisun Marsh | 500 | Channel+Weir | 0.6 | 1 | 420 |
| Decker | West Delta | 570 | Reservoir | 350 | 700 | 352 |
| Dutch Sl | West Delta | 780 | Channel+Weir | 0.4 | 0.4 | 223 |
| Mccorwil | East Delta | 1,180 | Reservoir | 1200 | 1100 | 256 |
| Mccorwil | East Delta | 1,180 | Reservoir | 1100 | 1000 | 258 |
| Mccorwil | East Delta | 1,180 | Reservoir | 800 | 700 | 260 |
| Snodgrass | East Delta | 1,240 | Channel+Weir | 0.18 | 0.07 | 454 |

Table 3: Summary of Parameters used in DSM2 for the Reservoirs and Channels Representing all ROAs for Early Long-term Restoration Scenario

| ROA | Region | Mean Wetted Surface Area (acres) | Storage Type | DSM2 Reservoir/Weir Coefficient | | Breach Location (DSM2 Node) |
|---|---|---|---|---|---|---|
| | | | | Entrance | Exit | |
| Prospect | Cache Slough | 1,180 | Reservoir | 800 | 2000 | 316 |
| Prospect | Cache Slough | 1,180 | Reservoir | 1400 | 1500 | 307 |
| Little Holland | Cache Slough | 7 | Reservoir | 250 | 550 | 319 |
| Little Holland | Cache Slough | 7 | Reservoir | 2000 | 500 | 318 |
| Egb_A+Calcut | Cache Slough | 480 | Reservoir | 1200 | 1100 | 324 |
| Shag | Cache Slough | 1,850 | Channel+Weir | 0.05 | 0.05 | 321 |
| Haas | Cache Slough | 20 | Channel+Weir | 0.03 | 0.03 | 320 |
| Hastings | Cache Slough | 2,760 | Channel+Weir | 0.18 | 0.13 | 326 |
| 3 | Suisun Marsh | 760 | Reservoir | 90 | 80 | 410 |
| 3 | Suisun Marsh | 760 | Reservoir | 900 | 700 | 406 |
| Montz Wet | Suisun Marsh | 35 | Reservoir | 30 | 35 | 417 |
| Montz Wet | Suisun Marsh | 35 | Reservoir | 30 | 35 | 418 |
| 9 | Suisun Marsh | 680 | Reservoir | 3000 | 1000 | 405 |
| 9 | Suisun Marsh | 680 | Reservoir | 1350 | 1200 | 368 |
| 10 | Suisun Marsh | 2,410 | Reservoir | 550 | 350 | 399 |
| 10 | Suisun Marsh | 2,410 | Reservoir | 1225 | 1075 | 425 |
| 10 | Suisun Marsh | 2,410 | Reservoir | 3500 | 6000 | 374 |
| 10 | Suisun Marsh | 2,410 | Reservoir | 5000 | 400 | 398 |
| 12 | Suisun Marsh | 1,460 | Reservoir | 2400 | 2250 | 374 |
| 12 | Suisun Marsh | 1,460 | Reservoir | 250 | 160 | 394 |
| 12 | Suisun Marsh | 1,460 | Reservoir | 750 | 712.5 | 400 |
| 5 | Suisun Marsh | 500 | Channel+Weir | 0.6 | 1 | 420 |
| 14 | Suisun Marsh | 10 | Channel+Weir | 0.01 | 0.02 | 392 |
| Decker | West Delta | 600 | Reservoir | 450 | 700 | 352 |
| Decker | West Delta | 600 | Reservoir | 105 | 80 | 353 |
| Dutch Sl | West Delta | 780 | Channel+Weir | 0.4 | 0.4 | 223 |
| Sherman | West Delta | 940 | Channel+Weir | 0.04 | 0.05 | 240 |
| Bradford | West Delta | 250 | Channel+Weir | 0.01 | 0.01 | 44 |
| Mccorwil | East Delta | 1,180 | Reservoir | 1200 | 1100 | 256 |
| Mccorwil | East Delta | 1,180 | Reservoir | 1100 | 1000 | 258 |
| Mccorwil | East Delta | 1,180 | Reservoir | 800 | 700 | 260 |
| Snodgrass | East Delta | 1,230 | Channel+Weir | 0.18 | 0.07 | 454 |

Table 4: Summary of Parameters used in DSM2 for the Reservoirs and Channels Representing all ROAs for Late Long-term Restoration Scenario

| ROA | Region | Mean Wetted Surface Area (acres) | Storage Type | DSM2 Reservoir/Weir Coefficient | | Breach Location (DSM2 Node) |
|---|---|---|---|---|---|---|
| | | | | Entrance | Exit | |
| Prospect | Cache Slough | 1,180 | Reservoir | 800 | 2000 | 316 |
| Prospect | Cache Slough | 1,180 | Reservoir | 1200 | 1500 | 307 |
| Little Holland | Cache Slough | 7 | Reservoir | 250 | 550 | 319 |
| Little Holland | Cache Slough | 7 | Reservoir | 800 | 800 | 318 |
| Egb_A+Calcut | Cache Slough | 480 | Reservoir | 1200 | 1100 | 324 |
| Little Egbert | Cache Slough | 2,430 | Reservoir | 8000 | 9000 | 322 |
| Little Egbert | Cache Slough | 2,430 | Reservoir | 7000 | 6500 | 350 |
| Shag | Cache Slough | 1,840 | Channel+Weir | 0.032 | 0.032 | 321 |
| Haas | Cache Slough | 20 | Channel+Weir | 0.01 | 0.01 | 320 |
| Hastings | Cache Slough | 2,660 | Channel+Weir | 0.1 | 0.1 | 326 |
| Egb Tract B | Cache Slough | 3,260 | Channel+Weir | 0.6 | 0.9 | 326 |
| 1 | Suisun Marsh | 1,140 | Reservoir | 60 | 80 | 403 |
| 1 | Suisun Marsh | 1,140 | Reservoir | 1500 | 1400 | 409 |
| 3 | Suisun Marsh | 760 | Reservoir | 82 | 72 | 410 |
| 3 | Suisun Marsh | 760 | Reservoir | 900 | 700 | 406 |
| 9 | Suisun Marsh | 680 | Reservoir | 3000 | 1000 | 405 |
| 9 | Suisun Marsh | 680 | Reservoir | 1350 | 1200 | 368 |
| 10 | Suisun Marsh | 2,410 | Reservoir | 550 | 400 | 399 |
| 10 | Suisun Marsh | 2,410 | Reservoir | 1175 | 1025 | 425 |
| 10 | Suisun Marsh | 2,410 | Reservoir | 3750 | 5500 | 374 |
| 10 | Suisun Marsh | 2,410 | Reservoir | 3300 | 500 | 398 |
| 12 | Suisun Marsh | 1,450 | Reservoir | 2600 | 2250 | 374 |
| 12 | Suisun Marsh | 1,450 | Reservoir | 300 | 200 | 394 |
| 12 | Suisun Marsh | 1,450 | Reservoir | 750 | 712.5 | 400 |
| Montz Wet | Suisun Marsh | 35 | Reservoir | 30 | 35 | 417 |
| Montz Wet | Suisun Marsh | 35 | Reservoir | 30 | 35 | 418 |
| 2 | Suisun Marsh | 440 | Channel+Weir | 0.06 | 0.04 | 406 |
| 4 | Suisun Marsh | 530 | Channel+Weir | 0.04 | 0.04 | 390 |
| 5 | Suisun Marsh | 500 | Channel+Weir | 0.6 | 1 | 420 |
| 6 | Suisun Marsh | 670 | Channel+Weir | 0.032 | 0.032 | 380 |
| 7 | Suisun Marsh | 500 | Channel+Weir | 0.051 | 0.071 | 382 |
| 8 | Suisun Marsh | 2,700 | Channel+Weir | 0.5 | 0.5 | 238 |
| 14 | Suisun Marsh | 10 | Channel+Weir | 0.01 | 0.02 | 392 |
| Decker | West Delta | 600 | Reservoir | 350 | 550 | 352 |
| Decker | West Delta | 600 | Reservoir | 105 | 105 | 353 |
| Grand | West Delta | 250 | Reservoir | 1000 | 750 | 306 |
| Grand | West Delta | 250 | Reservoir | 1000 | 750 | 350 |
| Grand | West Delta | 250 | Reservoir | 1000 | 750 | 349 |
| Dutch Sl | West Delta | 780 | Channel+Weir | 0.4 | 0.4 | 223 |
| Sherman | West Delta | 940 | Channel+Weir | 0.009 | 0.009 | 240 |
| Bradford | West Delta | 250 | Channel+Weir | 0.01 | 0.01 | 44 |

| ROA | Region | Mean Wetted Surface Area (acres) | Storage Type | DSM2 Reservoir/Weir Coefficient | | Breach Location (DSM2 Node) |
|---|---|---|---|---|---|---|
| | | | | Entrance | Exit | |
| Mccorwil | East Delta | 1,180 | Reservoir | 1200 | 1100 | 256 |
| Mccorwil | East Delta | 1,180 | Reservoir | 55 | 45 | 258 |
| Mccorwil | East Delta | 1,180 | Reservoir | 800 | 700 | 260 |
| Snodgrass | East Delta | 1,220 | Channel+Weir | 0.025 | 0.09 | 454 |
| Grizzly South | East Delta | 5 | Channel+Weir | 0.05 | 0.05 | 446 |
| Shine Kee | East Delta | 560 | Channel+Weir | 0.03 | 0.02 | 246 |
| Rio Blanco | East Delta | 420 | Channel+Weir | 0.012 | 0.012 | 246 |
| Union | South Delta | 6,090 | Channel+Weir | 0.5 | 0.5 | 112 |
| Roberts | South Delta | 5,000 | Channel+Weir | 0.015 | 0.01 | 15 |

Table 5: Summary of DSM2 channels in Suisun Marsh that are modified for the NT, ELT and LLT Scenarios (with and without SLR).

| DSM2 Channel Number | Cross-section Location | DSM2 Channel Number | Cross-section Location | DSM2 Channel Number | Cross-section Location |
|---|---|---|---|---|---|
| 459 | 0.380 | 491 | 0.247 | 515 | 0.004 |
| 460 | 0.131 | | 0.659 | | 0.277 |
| | 0.563 | 498 | 0.113 | | 0.282 |
| 461 | 0.273 | | 0.239 | | 0.406 |
| | 0.497 | | 0.419 | | 0.417 |
| | 0.848 | | 0.731 | | 0.888 |
| 462 | 0.486 | | 0.909 | | 0.899 |
| | 0.929 | 499 | 0.172 | 516 | 0.102 |
| 463 | 0.393 | | 0.393 | | 0.463 |
| | 0.753 | | 0.900 | | 0.789 |
| 464 | 0.207 | 508 | 0.361 | 517 | 0.192 |
| | 0.453 | | 0.866 | | 0.435 |
| | 0.779 | 512 | 0.000 | | 0.695 |
| 484 | 0.016 | | 1.000 | 522 | 0.058 |
| | 0.236 | 513 | 0.091 | | 0.184 |
| 486 | 0.043 | | 0.198 | | 0.407 |
| | 0.202 | | 0.322 | | 0.597 |
| | 0.322 | | 0.424 | | 0.788 |
| | 0.486 | | 0.600 | | |
| 487 | 0.189 | | 0.759 | 543 | 0.361 |
| | 0.999 | | 0.882 | | |

Table 6: DSM2 channel cross-sections in Western Delta that are modified for the NT, ELT and LLT Scenarios (with and without SLR)

| DSM2 Channel Number | Cross-section Location | Near-term | Early Long-Term | Late Long-Term |
|---|---|---|---|---|
| 307 | 0.000 | x | x | x |
| | 0.100 | x | x | x |
| 308 | 0.051 | x | x | x |
| | 0.140 | x | n/a | n/a |
| | 0.170 | x | n/a | n/a |
| | 0.200 | x | n/a | n/a |
| | 0.980 | x | x | x |
| 310 | 0.154 | x | x | x |
| | 0.235 | x | x | x |
| | 0.330 | x | x | x |
| | 0.413 | x | x | x |
| | 0.496 | x | x | x |
| | 0.591 | x | x | x |
| | 0.682 | x | x | x |
| | 0.775 | x | x | x |
| | 0.875 | x | x | x |

Table 7: Summary of DSM2 Boundary conditions for the Restoration Corroboration Scenarios

| Boundary Location | DSM2 Node/ Reservoir | Boundary Type | Restoration Scenario | | | |
|---|---|---|---|---|---|---|
| | | | Base -Line | 14,000 ac (NT) | 25,000 ac (ELT) | 65,000 ac (LLT) |
| Calaveras | 21 | flow/EC | x | x | x | x |
| Cosumnes | 446 | flow/EC | x | x | x | x |
| Mokelumne | 447 | flow/EC | x | x | x | x |
| North Bay | 273 | Diversion | x | x | x | x |
| Yolo | 316 | flow/EC | x | x | x | x |
| Sacramento | 330 | flow/EC | x | x | x | x |
| Vernalis | 17 | flow/EC | x | x | x | x |
| Martinez | 361 | Stage/EC | x | x | x | x |
| CVP | 181 | Diversion | x | x | x | x |
| Green Valley Creek | 369 | flow/EC | x | x | x | x |
| Suisun Creek | 396 | flow/EC | x | x | x | x |
| Ledgewood Creek | 392 | flow/EC | x | x | x | x |
| Laurel Creek | 368 | flow/EC | x | x | x | x |
| Fairfield WWTP | 400 | flow/EC | x | x | x | x |
| Roaring River Duck Club | 418 | flow/EC | x | x | x | x |
| Morrow Island Duck Club | 384 | Diversion | x | x | x | x |
| Montezuma Sl West Duck Club | 428 | flow/EC | x | x | x | x |
| Montezuma Sl East Duck Club | 420 | flow/EC | x | x | x | x |
| Montezuma Sl Middle Duck Club | 422 | flow/EC | x | x | x | x |
| Nurse Sl Duck Club | 406 | flow/EC | x | x | x | x |
| Suisun Sl Duck Club | 375 | flow/EC | x | x | x | x |
| Boynton Sl Tidal Marsh | 400 | Precipitation/EC | x | x | x | x |
| Peytonia Sl Tidal Marsh | 371 | Precipitation/EC | x | x | n/a | n/a |
| Hill Sl Tidal Marsh | 395 | Precipitation/EC | x | n/a | n/a | n/a |
| First Mallard Sl Tidal Marsh | 373 | Precipitation/EC | x | n/a | n/a | n/a |
| Cutoff Sl Tidal Marsh | 399 | Precipitation/EC | x | n/a | n/a | n/a |
| Beldons Landing Tidal Marsh | 425 | Precipitation/EC | x | n/a | n/a | n/a |
| Suisun ROA (Suisun14) | 814 | Precip minus Evap | n/a | n/a | x | x |
| Suisun ROA (Suisun5) | 813 | Precip minus Evap | n/a | x | x | x |
| Suisun ROA (Suisun2) | 821 | Precip minus Evap | n/a | n/a | n/a | x |
| Suisun ROA (Suisun8) | 822 | Precip minus Evap | n/a | n/a | n/a | x |
| Suisun ROA (Suisun4) | 823 | Precip minus Evap | n/a | n/a | n/a | x |
| Suisun ROA (Suisun6) | 824 | Precip minus Evap | n/a | n/a | n/a | x |
| Suisun ROA (Suisun7) | 825 | Precip minus Evap | n/a | n/a | n/a | x |
| Suisun ROA (Suisun10) | Suisun10 | Precip minus Evap | n/a | x | x | x |
| Suisun ROA (Suisun12) | Suisun12 | Precip minus Evap | n/a | n/a | x | x |
| Suisun ROA (Suisun3) | Suisun3 | Precip minus Evap | n/a | x | x | x |
| Suisun ROA (Suisun9) | Suisun9 | Precip minus Evap | n/a | x | x | x |
| Montezuma Wetland | Suisun-mntwet | Precip minus Evap | n/a | x | x | x |
| Suisun ROA (Suisun1) | Suisun1 | Precip minus Evap | n/a | n/a | n/a | x |

Table 8: DSM2 Channel Roughness Changes to the Existing Channels for the Tidal Marsh Restoration Corroboration

| | Channel Roughness (Manning's n) | | | |
|---|---|---|---|---|
| **DSM2 Channel** | **Baseline** | **Near Term** | **Early Long Term** | **Late Long Term** |
| 307 | 0.033 | 0.028 | 0.028 | 0.028 |
| 308 | 0.033 | 0.028 | 0.028 | 0.028 |
| 309 | 0.033 | 0.024 | 0.022 | 0.022 |
| 310 | 0.033 | 0.024 | 0.022 | 0.022 |

Table 9: Modified DSM2 Channel Dispersion Factors to Compensate for the Increased Tidal Dispersion under Sea Level Rise Scenarios

| | Channel Dispersion Factors | | |
|---|---|---|---|
| **DSM2 Channel** | **Baseline** | **15cm Sea Level Rise (Early Long Term)** | **45cm Sea Level Rise (Late Long Term)** |
| 431 | 0.05 | 0.08 | 0.08 |
| 432 | 0.20 | 0.20 | 0.30 |
| 433 | 0.20 | 0.25 | 0.30 |
| 434 | 0.50 | 0.55 | 0.65 |

Table 10: Summary of Parameters used in DSM2 for the Reservoirs and Channels Representing all ROAs for Early Long-term Integrated Restoration and Sea Level Rise Scenario

| ROA | Region | Mean Wetted Surface Area (acres) | Storage Type | DSM2 Reservoir/Weir Coefficient | | Breach Location (DSM2 Node) |
|---|---|---|---|---|---|---|
| | | | | Entrance | Exit | |
| Prospect | Cache Slough | 1,180 | Reservoir | 1000 | 2000 | 316 |
| Prospect | Cache Slough | 1,180 | Reservoir | 1000 | 600 | 307 |
| Little Holland | Cache Slough | 7 | Reservoir | 250 | 550 | 319 |
| Little Holland | Cache Slough | 7 | Reservoir | 1000 | 500 | 318 |
| Egb_A+Calcut | Cache Slough | 480 | Reservoir | 800 | 500 | 324 |
| Shag | Cache Slough | 1,850 | Channel+Weir | 0.06 | 0.06 | 321 |
| Haas | Cache Slough | 20 | Channel+Weir | 0.1 | 0.1 | 320 |
| Hastings | Cache Slough | 2,760 | Channel+Weir | 0.08 | 0.08 | 326 |
| 3 | Suisun Marsh | 760 | Reservoir | 80 | 70 | 410 |
| 3 | Suisun Marsh | 760 | Reservoir | 1100 | 950 | 406 |
| Montz Wet | Suisun Marsh | 930 | Reservoir | 30 | 35 | 417 |
| Montz Wet | Suisun Marsh | 930 | Reservoir | 30 | 35 | 418 |
| 9 | Suisun Marsh | 700 | Reservoir | 400 | 400 | 405 |
| 9 | Suisun Marsh | 700 | Reservoir | 1000 | 1000 | 368 |
| 10 | Suisun Marsh | 2,420 | Reservoir | 475 | 350 | 399 |
| 10 | Suisun Marsh | 2,420 | Reservoir | 1250 | 1100 | 425 |
| 10 | Suisun Marsh | 2,420 | Reservoir | 2000 | 2500 | 374 |
| 10 | Suisun Marsh | 2,420 | Reservoir | 2000 | 400 | 398 |
| 12 | Suisun Marsh | 1,460 | Reservoir | 2000 | 2000 | 374 |
| 12 | Suisun Marsh | 1,460 | Reservoir | 180 | 200 | 394 |
| 12 | Suisun Marsh | 1,460 | Reservoir | 250 | 250 | 400 |
| 5 | Suisun Marsh | 500 | Channel+Weir | 0.6 | 0.6 | 420 |
| 14 | Suisun Marsh | 200 | Channel+Weir | 0.035 | 0.035 | 392 |
| Decker | West Delta | 600 | Reservoir | 400 | 400 | 352 |
| Decker | West Delta | 600 | Reservoir | 130 | 90 | 353 |
| Dutch Sl | West Delta | 780 | Channel+Weir | 0.4 | 0.4 | 223 |
| Sherman | West Delta | 940 | Channel+Weir | 0.025 | 0.025 | 240 |
| Bradford | West Delta | 250 | Channel+Weir | 0.01 | 0.009 | 44 |
| Mccorwil | East Delta | 1,180 | Reservoir | 600 | 300 | 256 |
| Mccorwil | East Delta | 1,180 | Reservoir | 40 | 15 | 258 |
| Mccorwil | East Delta | 1,180 | Reservoir | 400 | 200 | 260 |
| Snodgrass | East Delta | 1,230 | Channel+Weir | 0.18 | 0.07 | 454 |

Table 11: Summary of Parameters used in DSM2 for the Reservoirs and Channels Representing all ROAs for Late Long-term Integrated Restoration and Sea Level Rise Scenario

| ROA | Region | Mean Wetted Surface Area (acres) | Storage Type | DSM2 Reservoir/Weir Coefficient | | Breach Location (DSM2 Node) |
|---|---|---|---|---|---|---|
| | | | | Entrance | Exit | |
| Prospect | Cache Slough | 1,180 | Reservoir | 800 | 2000 | 316 |
| Prospect | Cache Slough | 1,180 | Reservoir | 1100 | 1100 | 307 |
| Little Holland | Cache Slough | 7 | Reservoir | 250 | 550 | 319 |
| Little Holland | Cache Slough | 7 | Reservoir | 800 | 800 | 318 |
| Egb_A+Calcut | Cache Slough | 480 | Reservoir | 1800 | 1100 | 324 |
| Little Egbert | Cache Slough | 2,430 | Reservoir | 8000 | 10000 | 322 |
| Little Egbert | Cache Slough | 2,430 | Reservoir | 6900 | 6300 | 350 |
| Shag | Cache Slough | 1,840 | Channel+Weir | 0.08 | 0.08 | 321 |
| Haas | Cache Slough | 20 | Channel+Weir | 1 | 1 | 320 |
| Hastings | Cache Slough | 2,660 | Channel+Weir | 0.5 | 0.5 | 326 |
| Egb Tract B | Cache Slough | 3,260 | Channel+Weir | 0.6 | 0.9 | 326 |
| 1 | Suisun Marsh | 1,140 | Reservoir | 80 | 80 | 403 |
| 1 | Suisun Marsh | 1,140 | Reservoir | 1500 | 1500 | 409 |
| 3 | Suisun Marsh | 760 | Reservoir | 75 | 67 | 410 |
| 3 | Suisun Marsh | 760 | Reservoir | 1100 | 850 | 406 |
| 9 | Suisun Marsh | 680 | Reservoir | 340 | 400 | 405 |
| 9 | Suisun Marsh | 680 | Reservoir | 1250 | 1300 | 371 |
| 10 | Suisun Marsh | 2,410 | Reservoir | 775 | 490 | 399 |
| 10 | Suisun Marsh | 2,410 | Reservoir | 1600 | 1450 | 425 |
| 10 | Suisun Marsh | 2,410 | Reservoir | 3000 | 6200 | 374 |
| 10 | Suisun Marsh | 2,410 | Reservoir | 3000 | 120 | 398 |
| 12 | Suisun Marsh | 1,450 | Reservoir | 2900 | 2300 | 374 |
| 12 | Suisun Marsh | 1,450 | Reservoir | 650 | 850 | 394 |
| 12 | Suisun Marsh | 1,450 | Reservoir | 1000 | 510 | 400 |
| Montz Wet | Suisun Marsh | 35 | Reservoir | 40 | 45 | 417 |
| Montz Wet | Suisun Marsh | 35 | Reservoir | 40 | 45 | 418 |
| 2 | Suisun Marsh | 440 | Channel+Weir | 0.06 | 0.04 | 406 |
| 4 | Suisun Marsh | 530 | Channel+Weir | 0.06 | 0.06 | 390 |
| 5 | Suisun Marsh | 500 | Channel+Weir | 0.6 | 1 | 420 |
| 6 | Suisun Marsh | 670 | Channel+Weir | 0.08 | 0.08 | 380 |
| 7 | Suisun Marsh | 500 | Channel+Weir | 0.06 | 0.075 | 382 |
| 8 | Suisun Marsh | 2,700 | Channel+Weir | 0.5 | 0.5 | 238 |
| 14 | Suisun Marsh | 10 | Channel+Weir | 0.05 | 0.05 | 392 |
| Decker | West Delta | 600 | Reservoir | 900 | 900 | 352 |
| Decker | West Delta | 600 | Reservoir | 320 | 160 | 353 |
| Grand | West Delta | 250 | Reservoir | 1000 | 750 | 306 |
| Grand | West Delta | 250 | Reservoir | 1000 | 750 | 350 |
| Grand | West Delta | 250 | Reservoir | 1000 | 750 | 349 |
| Dutch Sl | West Delta | 780 | Channel+Weir | 0.4 | 0.4 | 223 |
| Sherman | West Delta | 940 | Channel+Weir | 0.1 | 0.1 | 240 |
| Bradford | West Delta | 250 | Channel+Weir | 0.02 | 0.02 | 44 |

| ROA | Region | Mean Wetted Surface Area (acres) | Storage Type | DSM2 Reservoir/Weir Coefficient | | Breach Location (DSM2 Node) |
|---|---|---|---|---|---|---|
| | | | | Entrance | Exit | |
| Mccorwil | East Delta | 1,180 | Reservoir | 1400 | 1300 | 256 |
| Mccorwil | East Delta | 1,180 | Reservoir | 55 | 45 | 258 |
| Mccorwil | East Delta | 1,180 | Reservoir | 1200 | 900 | 260 |
| Snodgrass | East Delta | 1,220 | Channel+Weir | 0.16 | 0.24 | 454 |
| Grizzly South | East Delta | 5 | Channel+Weir | 1 | 1 | 446 |
| Shine Kee | East Delta | 560 | Channel+Weir | 0.03 | 0.02 | 246 |
| Rio Blanco | East Delta | 420 | Channel+Weir | 0.017 | 0.015 | 246 |
| Union | South Delta | 6,090 | Channel+Weir | 1 | 1 | 112 |
| Roberts | South Delta | 5,000 | Channel+Weir | 0.022 | 0.02 | 15 |

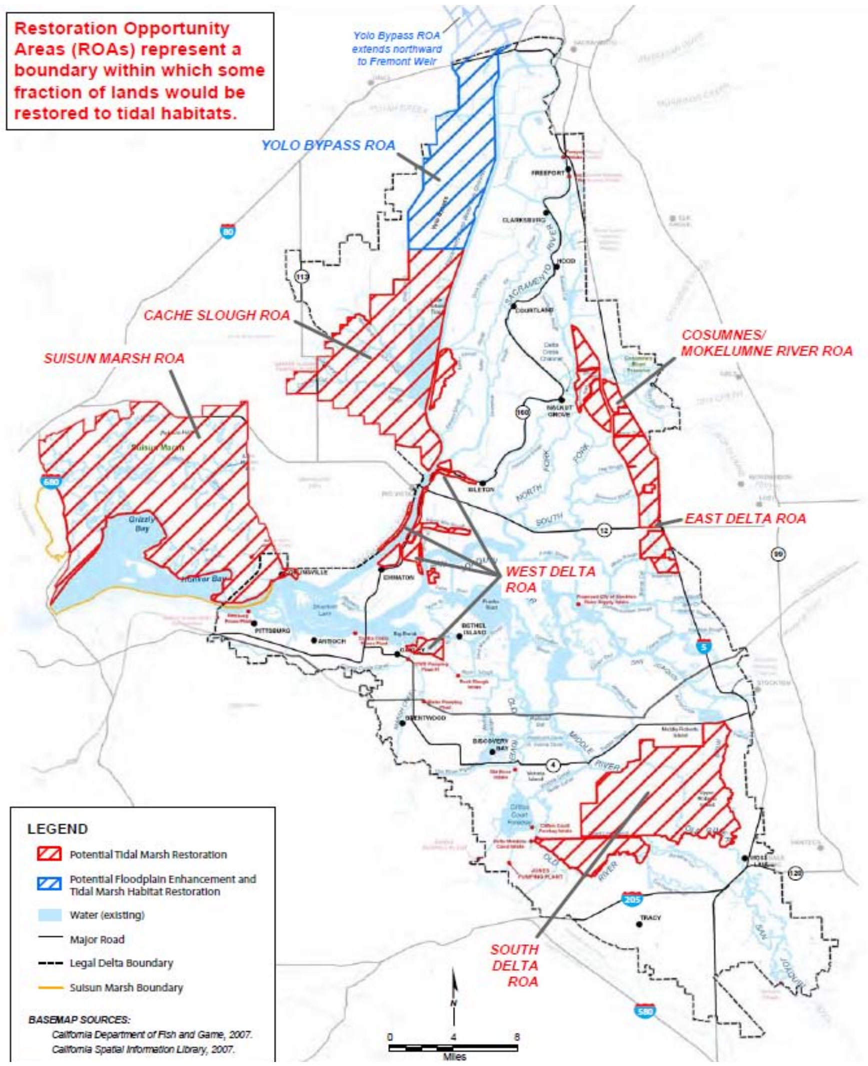



Figure 1: Bay Delta Conservation Plan Restoration Opportunity Areas

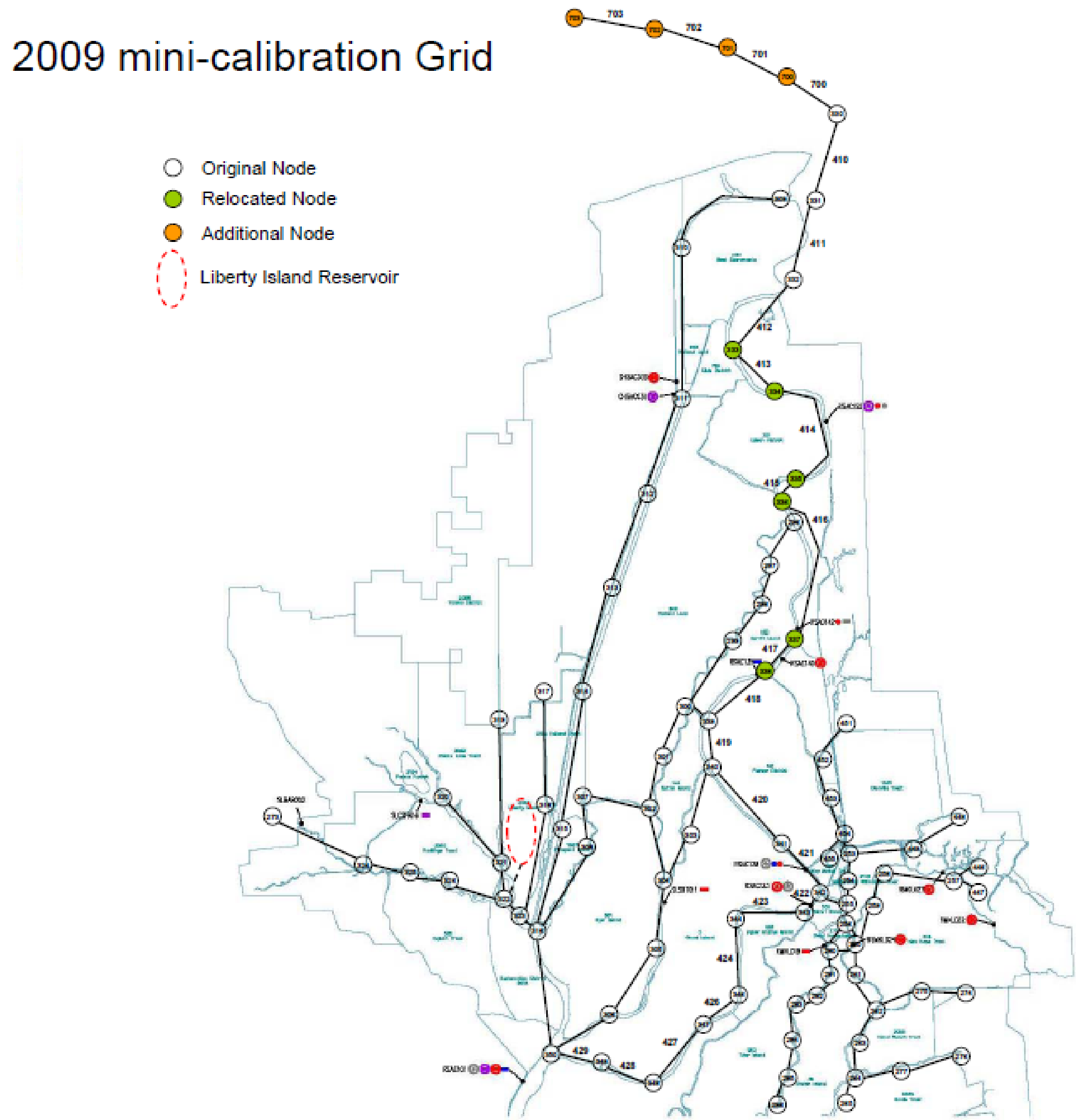



Figure 2: 2009 calibrated DSM2 Grid Schematic (only modified portion of the delta is shown) used as baseline model for tidal marsh corroboration

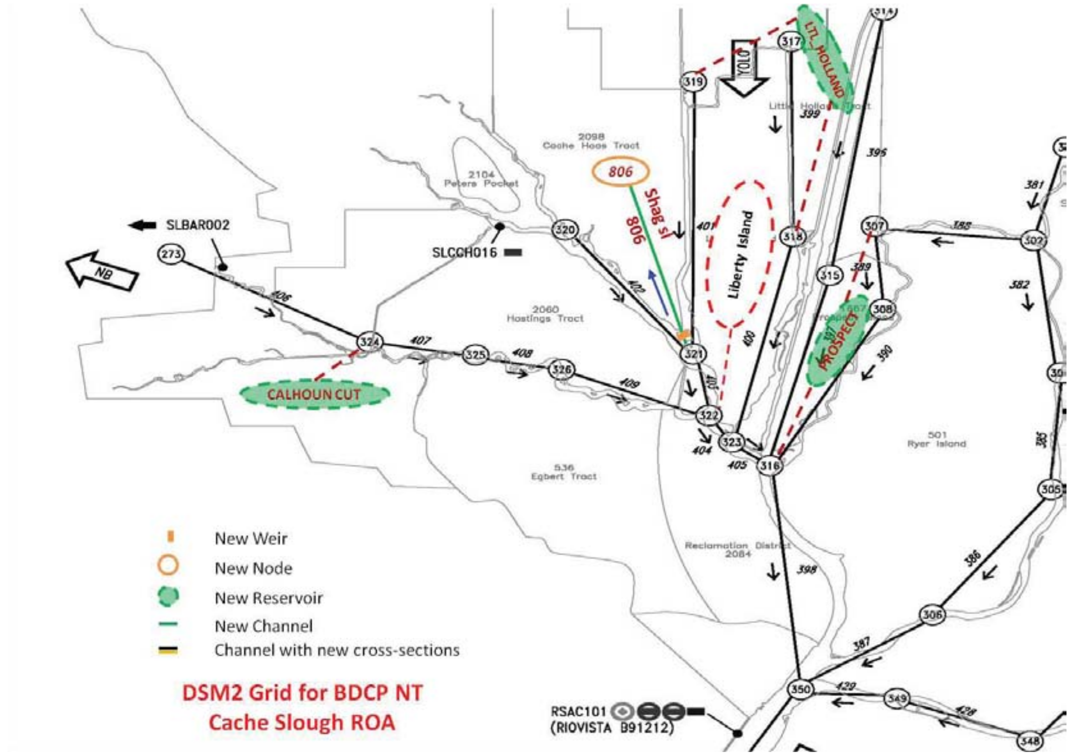



Figure 3: DSM2 Grid Modifications for Incorporating NT Tidal Marsh Restoration Proposed in the Cache Slough Region

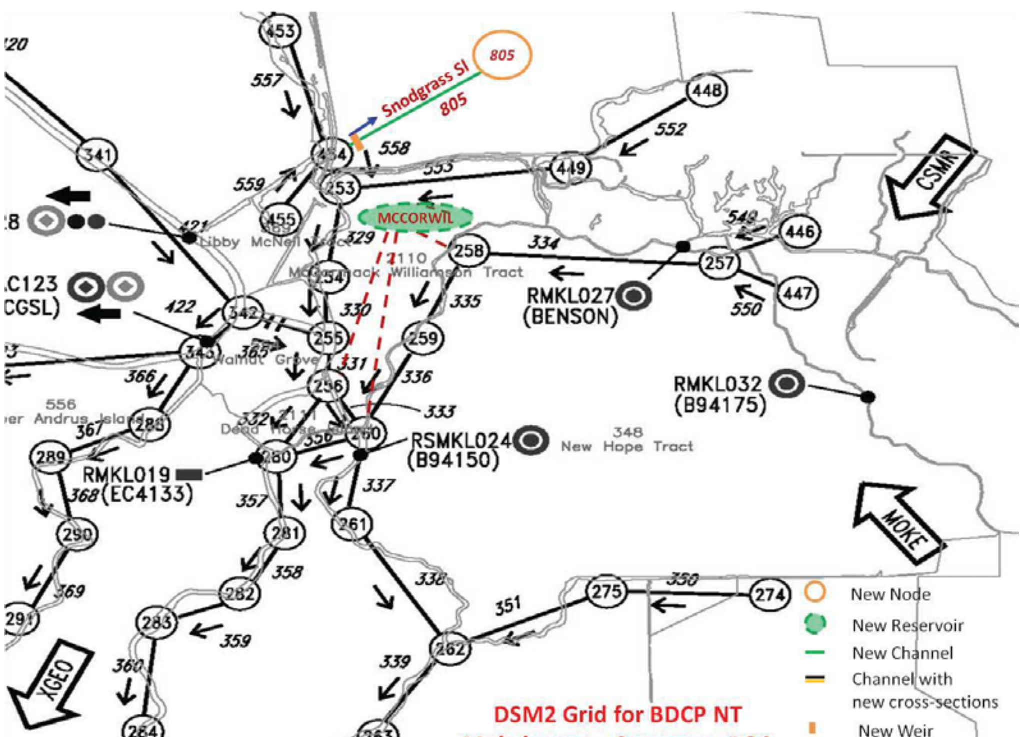



Figure 4: DSM2 Grid Modifications for Incorporating NT Tidal Marsh Restoration Proposed in the Mokelumne – Cosumnes Region

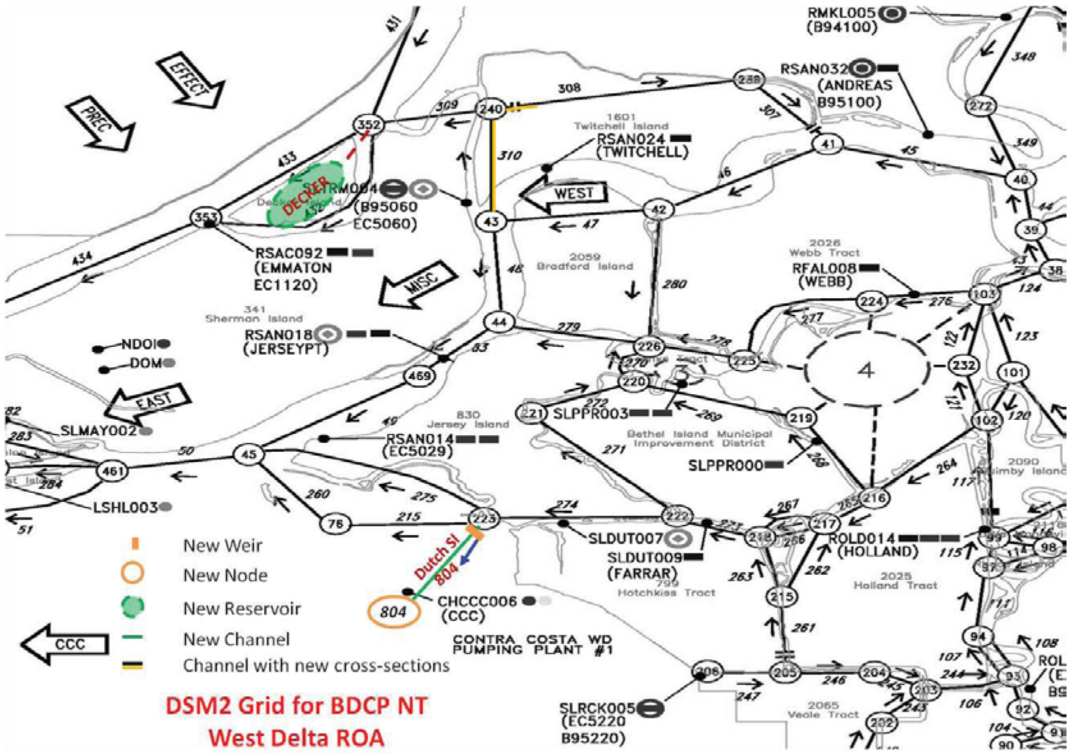



Figure 5: DSM2 Grid Modifications for Incorporating NT Tidal Marsh Restoration Proposed in the West Delta Region

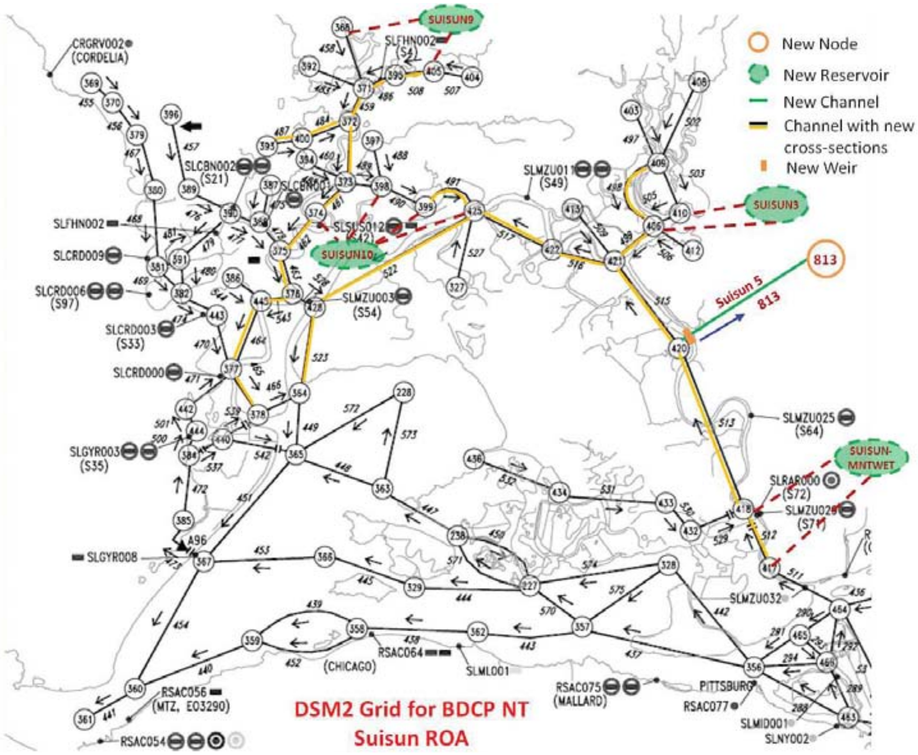



Figure 6: DSM2 Grid Modifications for Incorporating NT Tidal Marsh Restoration Proposed in the Suisun Marsh Region

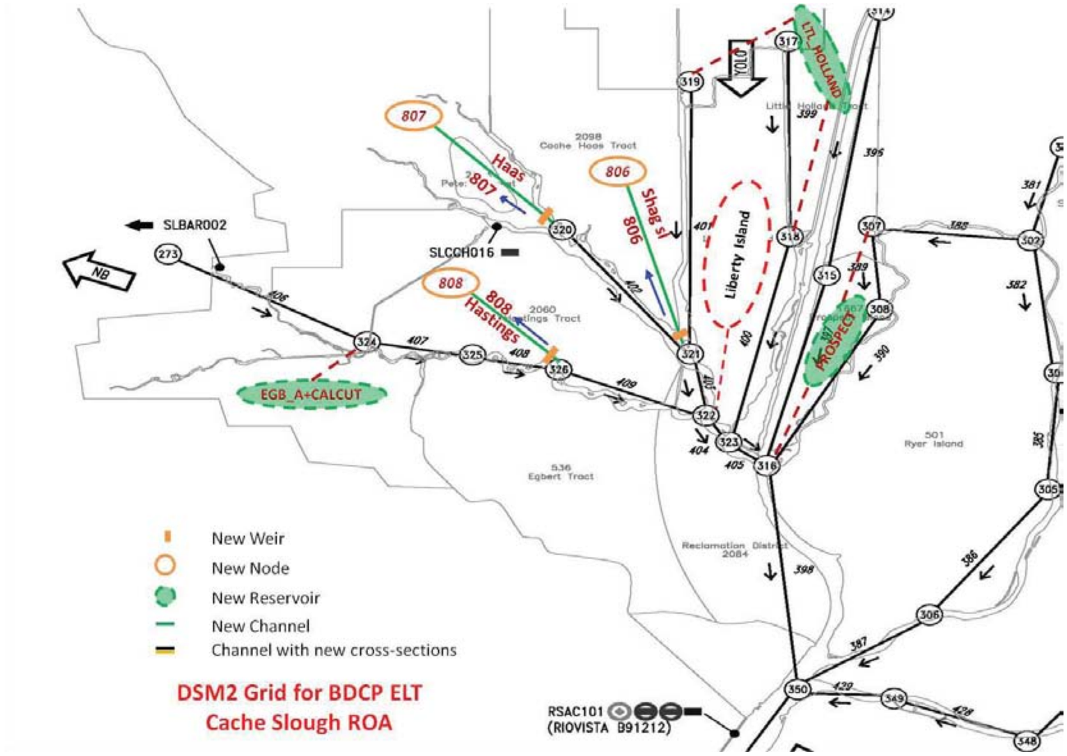



Figure 7: DSM2 Grid Modifications for Incorporating ELT Tidal Marsh Restoration Proposed in the Cache Slough Region

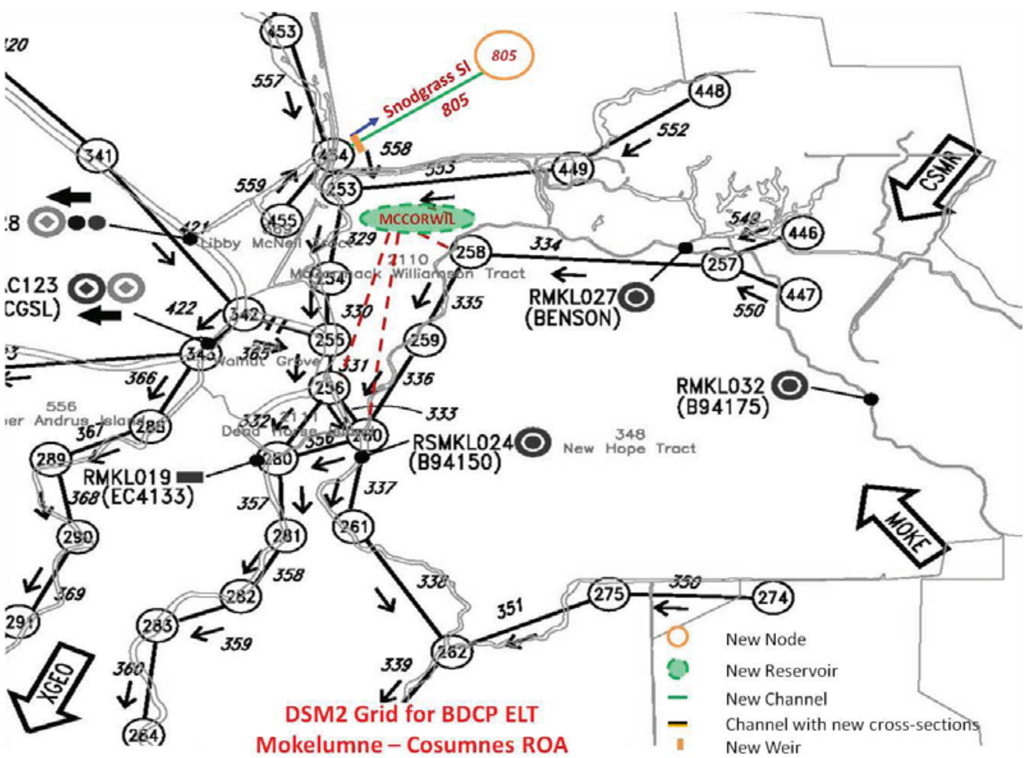



Figure 8: DSM2 Grid Modifications for Incorporating ELT Tidal Marsh Restoration Proposed in the Mokelumne – Cosumnes Region

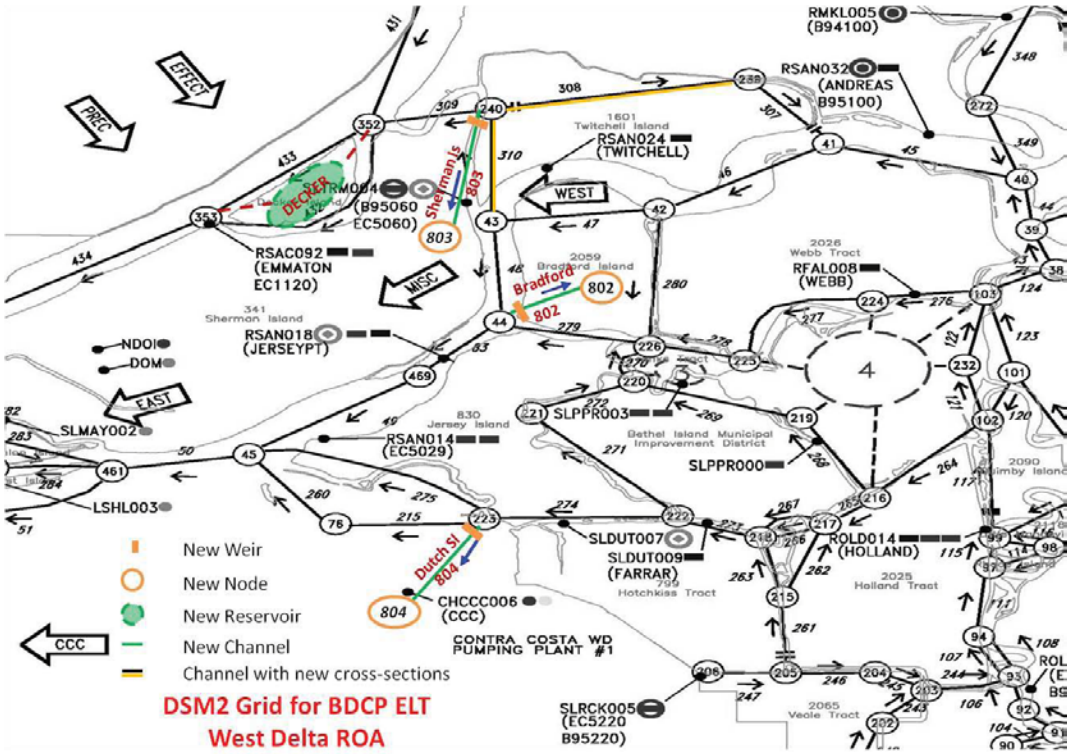



Figure 9: DSM2 Grid Modifications for Incorporating ELT Tidal Marsh Restoration Proposed in the West Delta Region

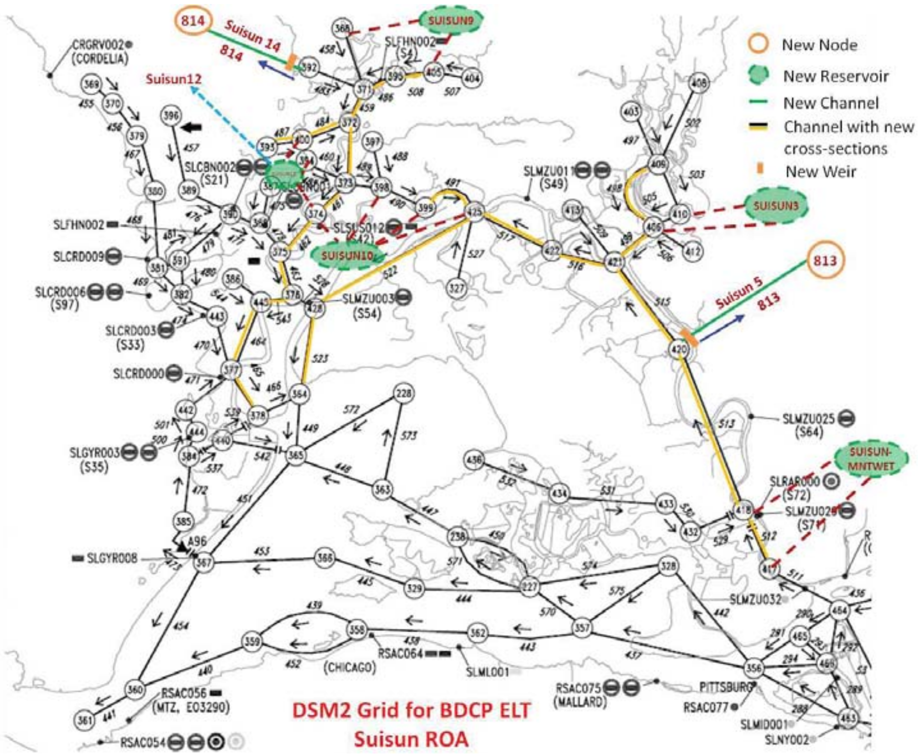



Figure 10: DSM2 Grid Modifications for Incorporating ELT Tidal Marsh Restoration Proposed in the Suisun Marsh Region

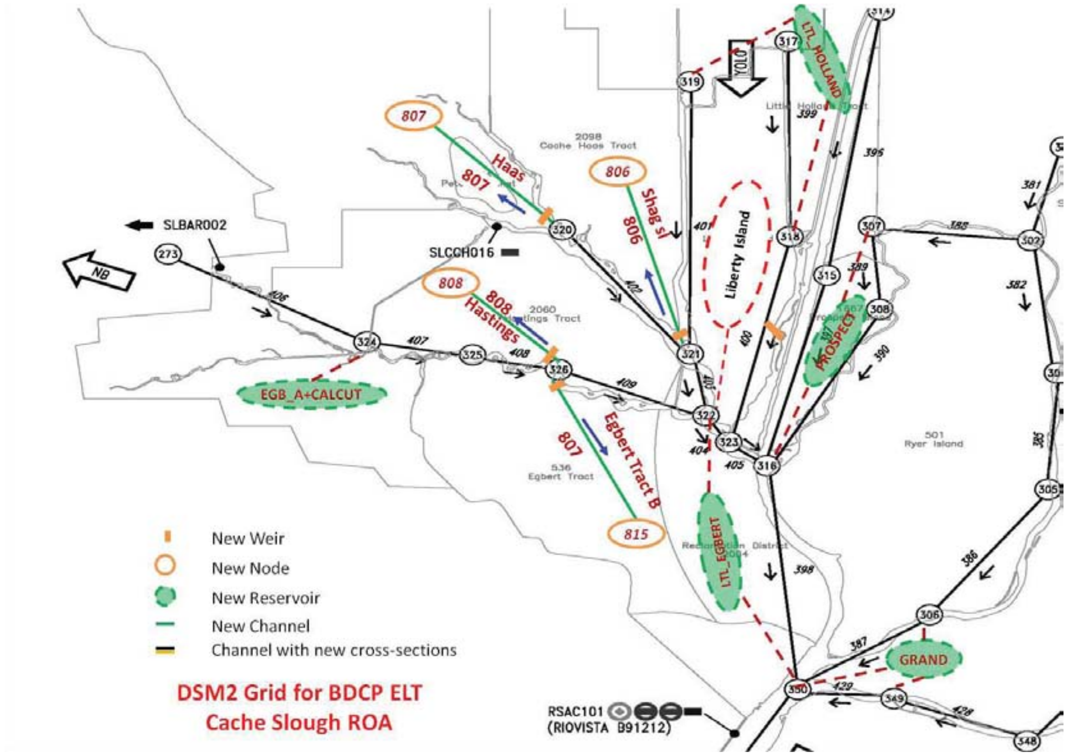



Figure 11: DSM2 Grid Modifications for Incorporating LLT Tidal Marsh Restoration Proposed in the Cache Slough Region

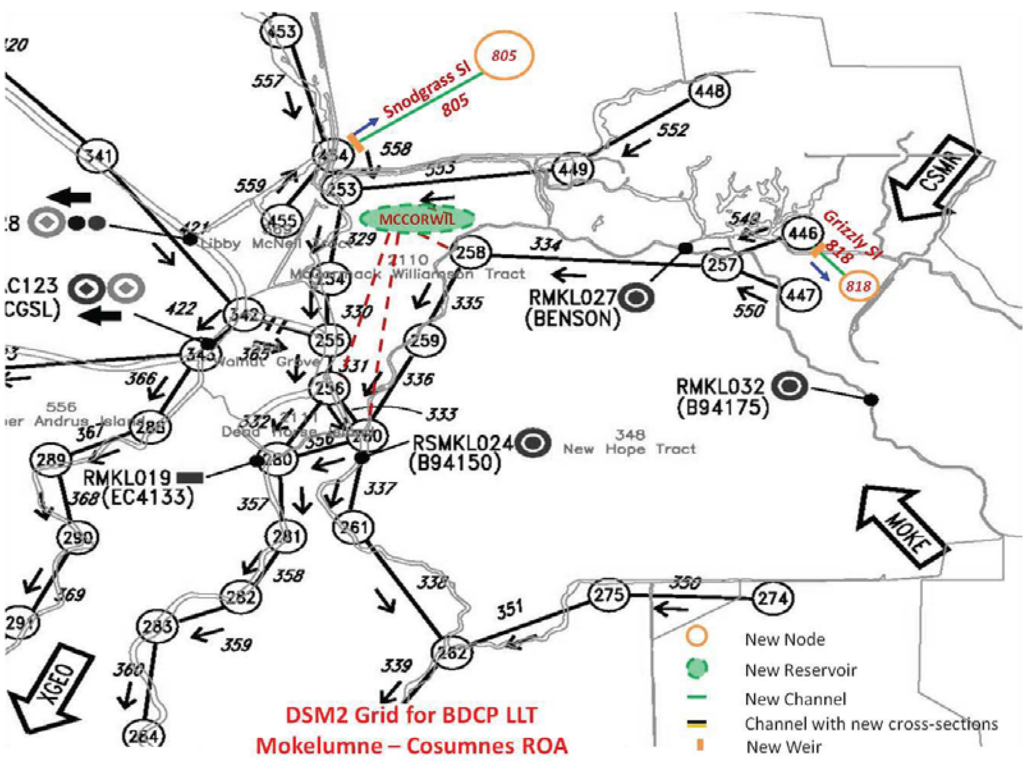



Figure 12: DSM2 Grid Modifications for Incorporating LLT Tidal Marsh Restoration Proposed in the Mokelumne – Cosumnes Region

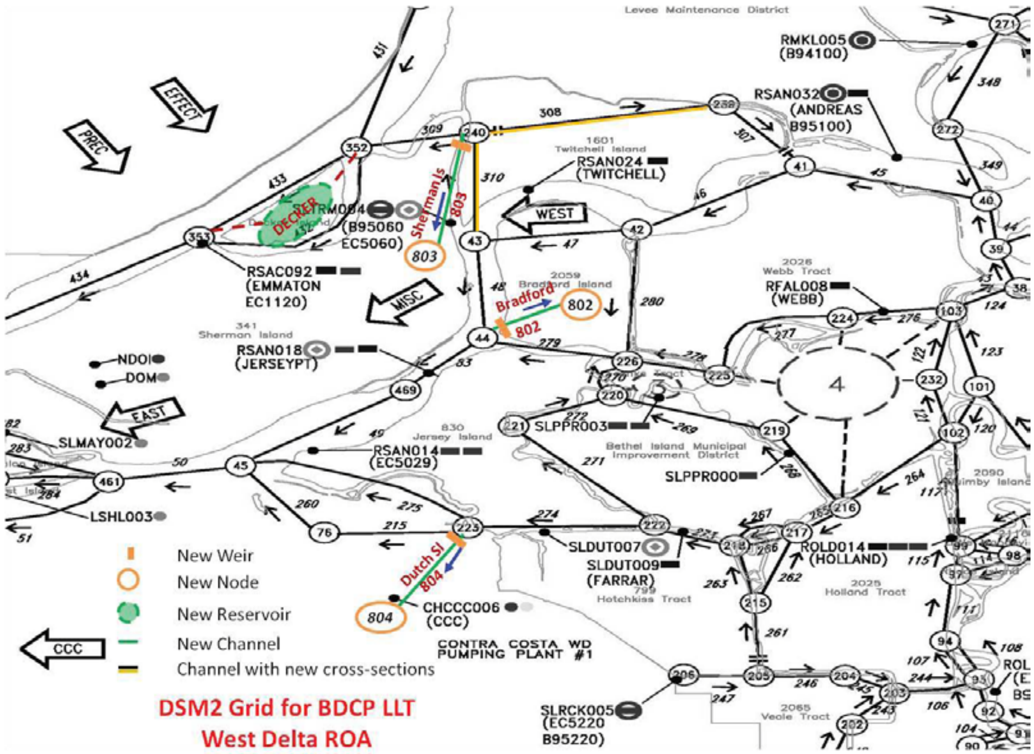



Figure 13: DSM2 Grid Modifications for Incorporating LLT Tidal Marsh Restoration Proposed in the West Delta Region

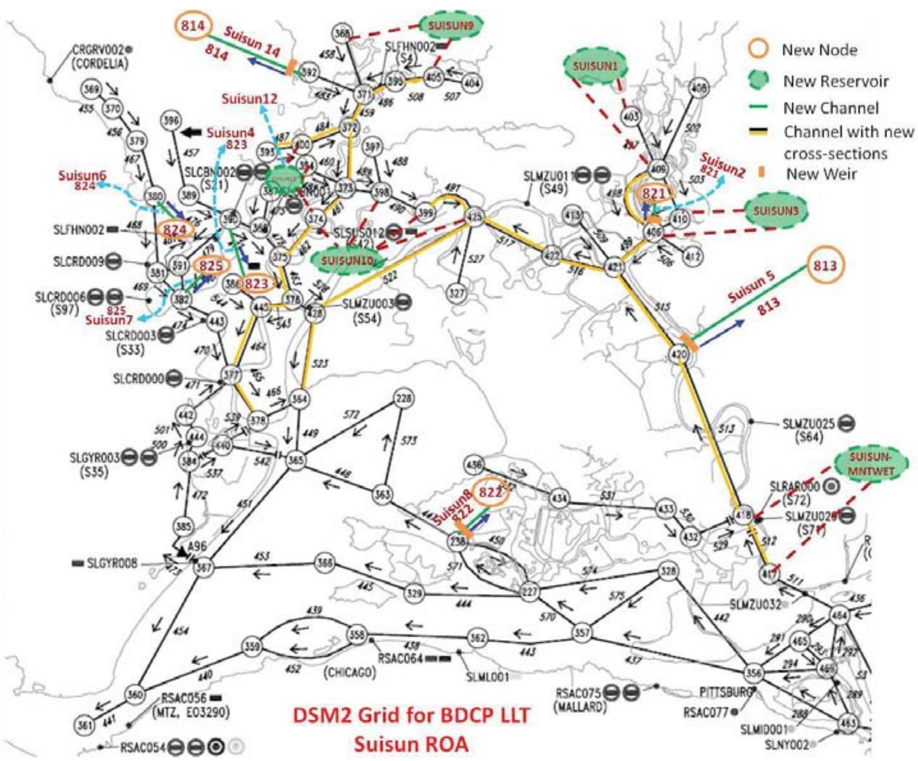



Figure 14: DSM2 Grid Modifications for Incorporating LLT Tidal Marsh Restoration Proposed in the Suisun Marsh Region

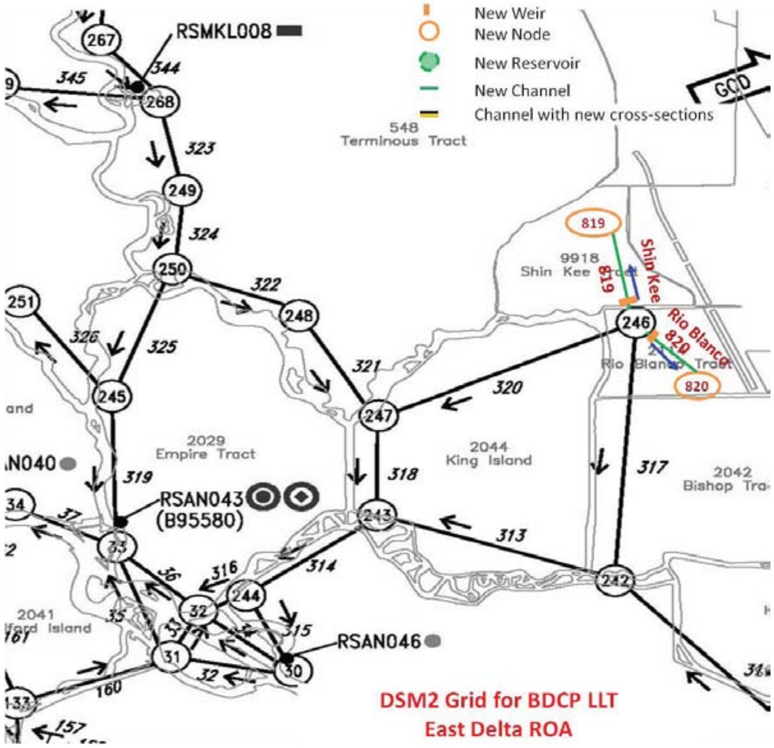



Figure 15: DSM2 Grid Modifications for Incorporating LLT Tidal Marsh Restoration Proposed in the East Delta Region

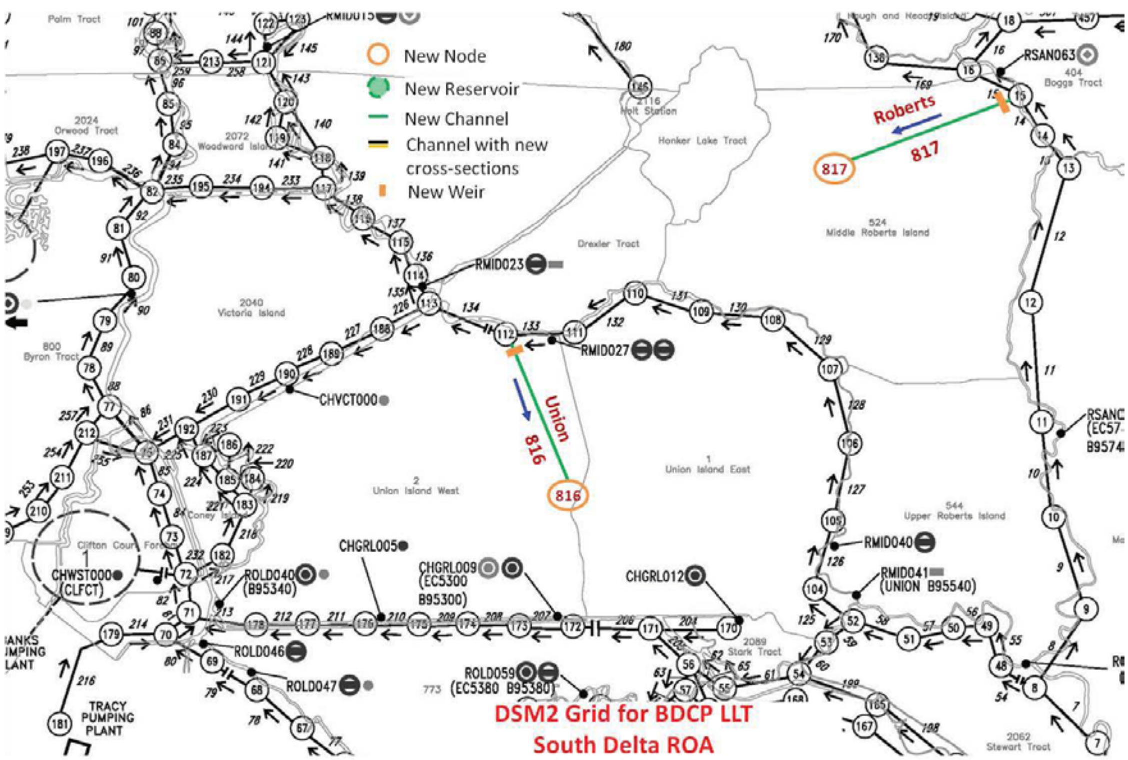



Figure 16: DSM2 Grid Modifications for Incorporating LLT Tidal Marsh Restoration Proposed in the South Delta Region

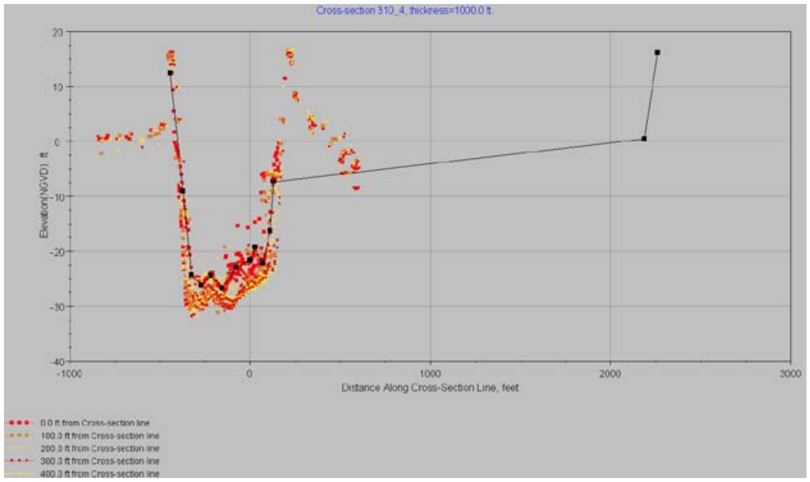



Figure 17: Modified DSM2 channel cross-section in West Delta (Threemile Slough channel 310) to represent levee setback proposed on Twitchell Island in RMA model.

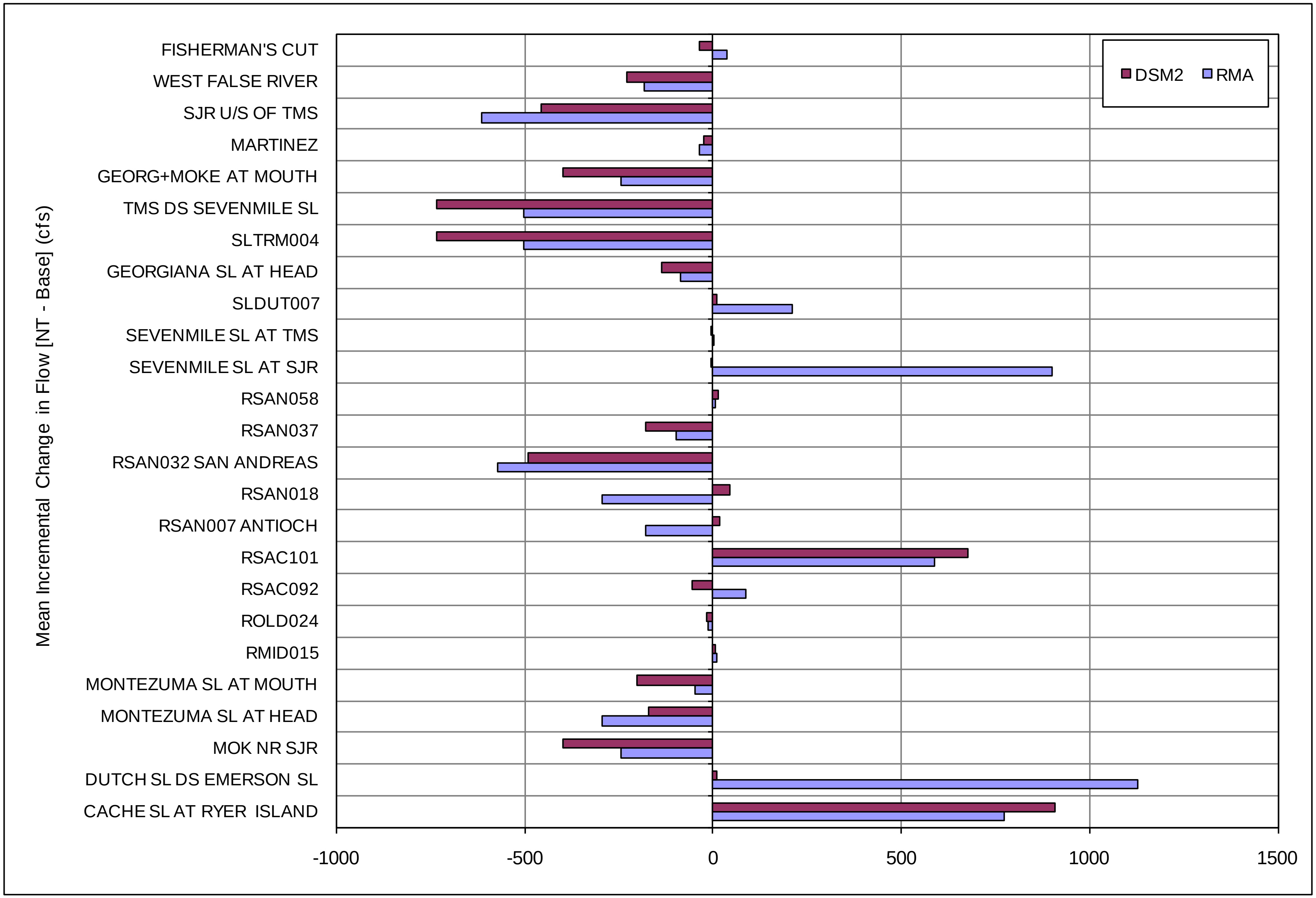



Figure 18: Comparison of average incremental change in tidally averaged flow in Near-Term scenario from the baseline between DSM2 and RMA

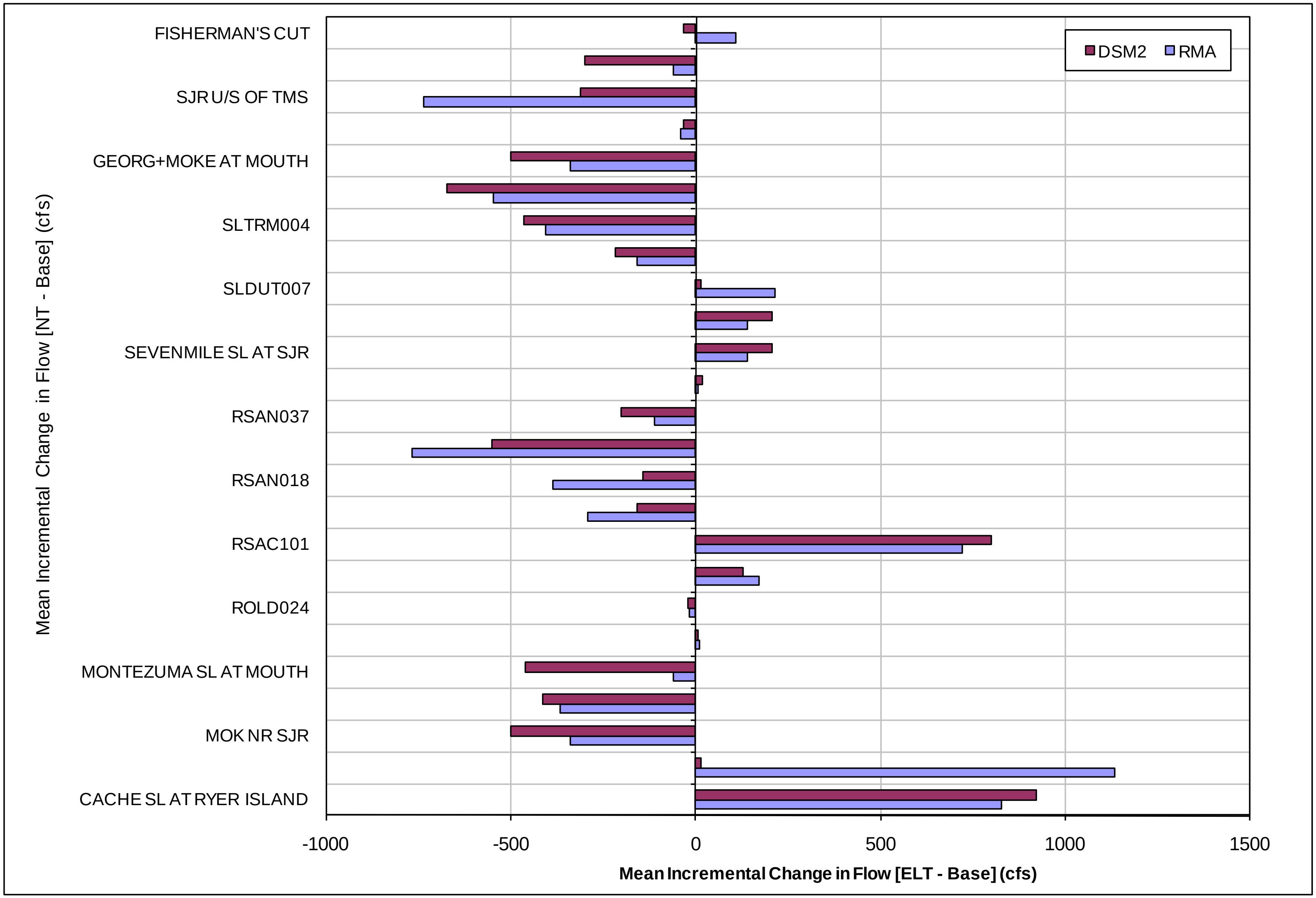



Figure 19: Comparison of average incremental change in tidally averaged flow in Early Long-Term scenario from the baseline between DSM2 and RMA

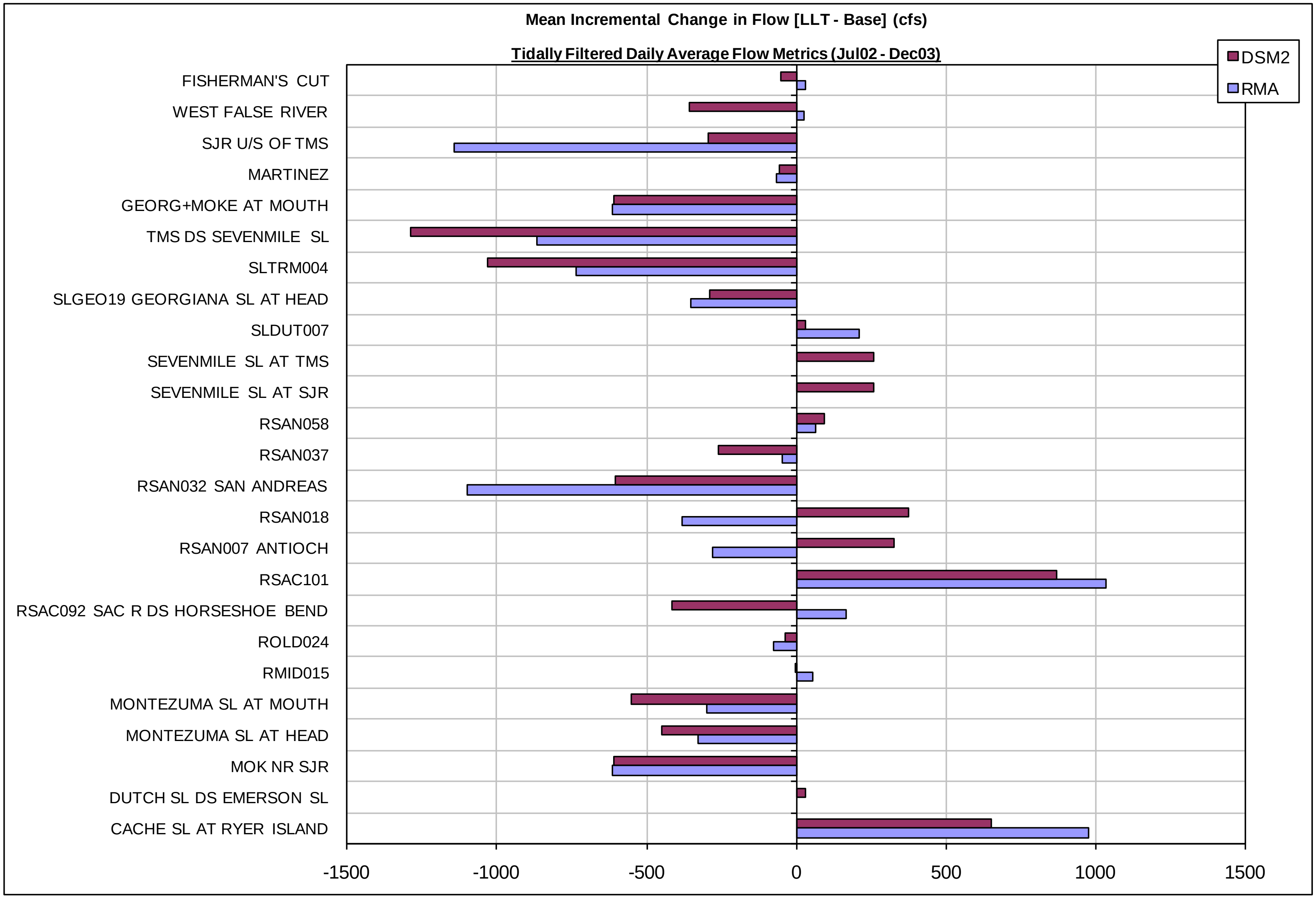



Figure 20: Comparison of average incremental change in tidally averaged flow in Late Long-Term scenario from the baseline between DSM2 and RMA

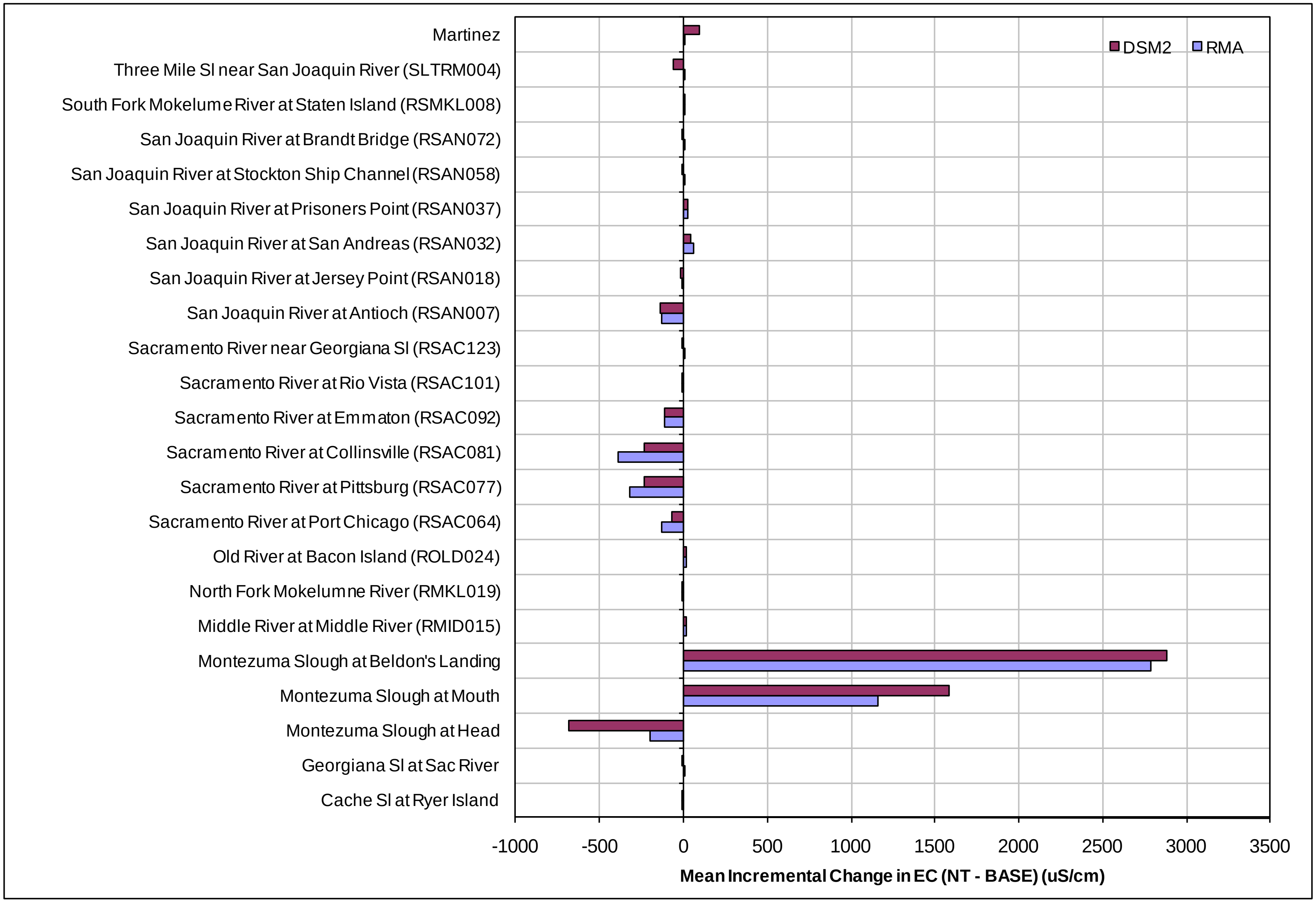



Figure 21: Comparison of average incremental change in tidally averaged EC in Near-Term scenario from the baseline between DSM2 and RMA

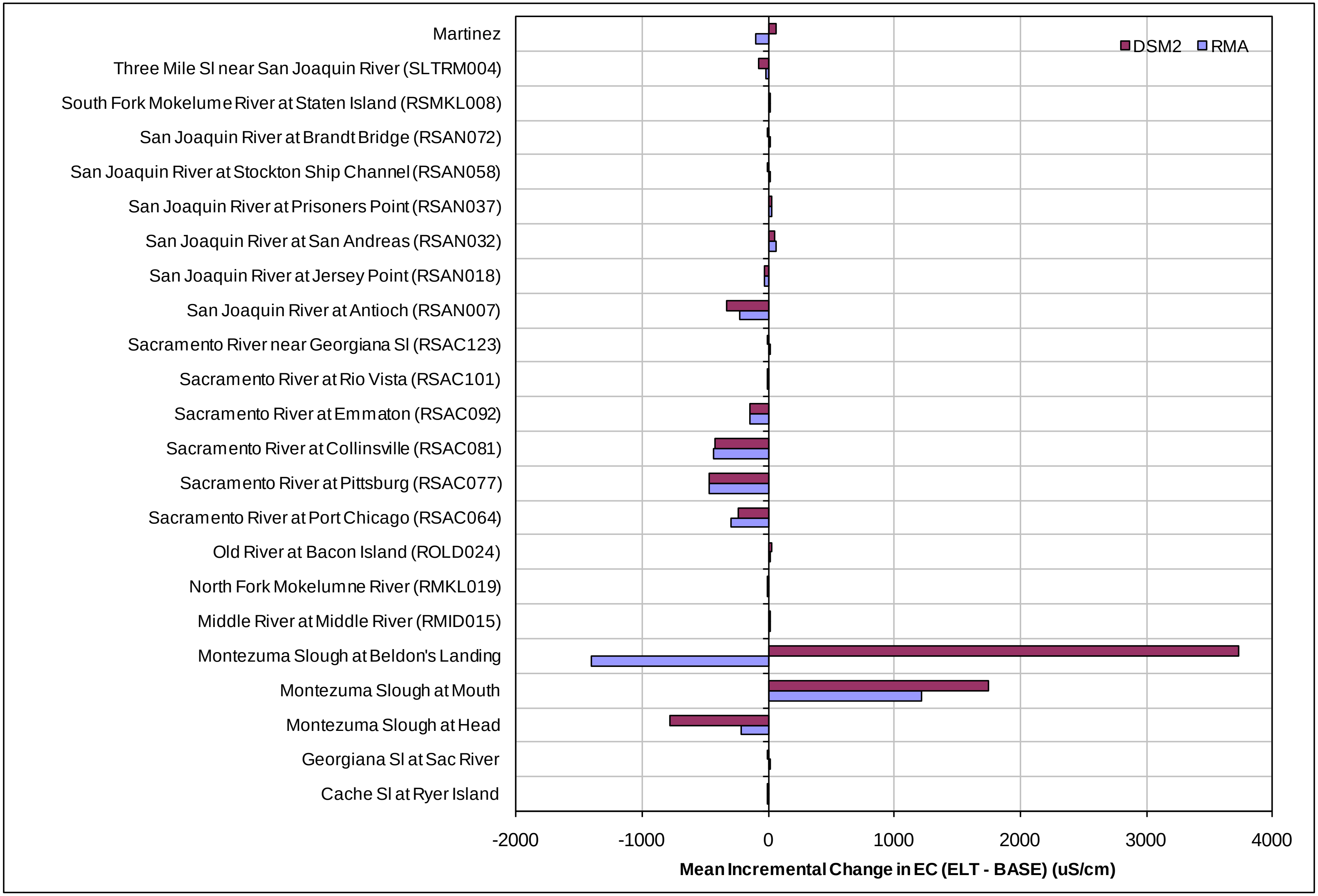
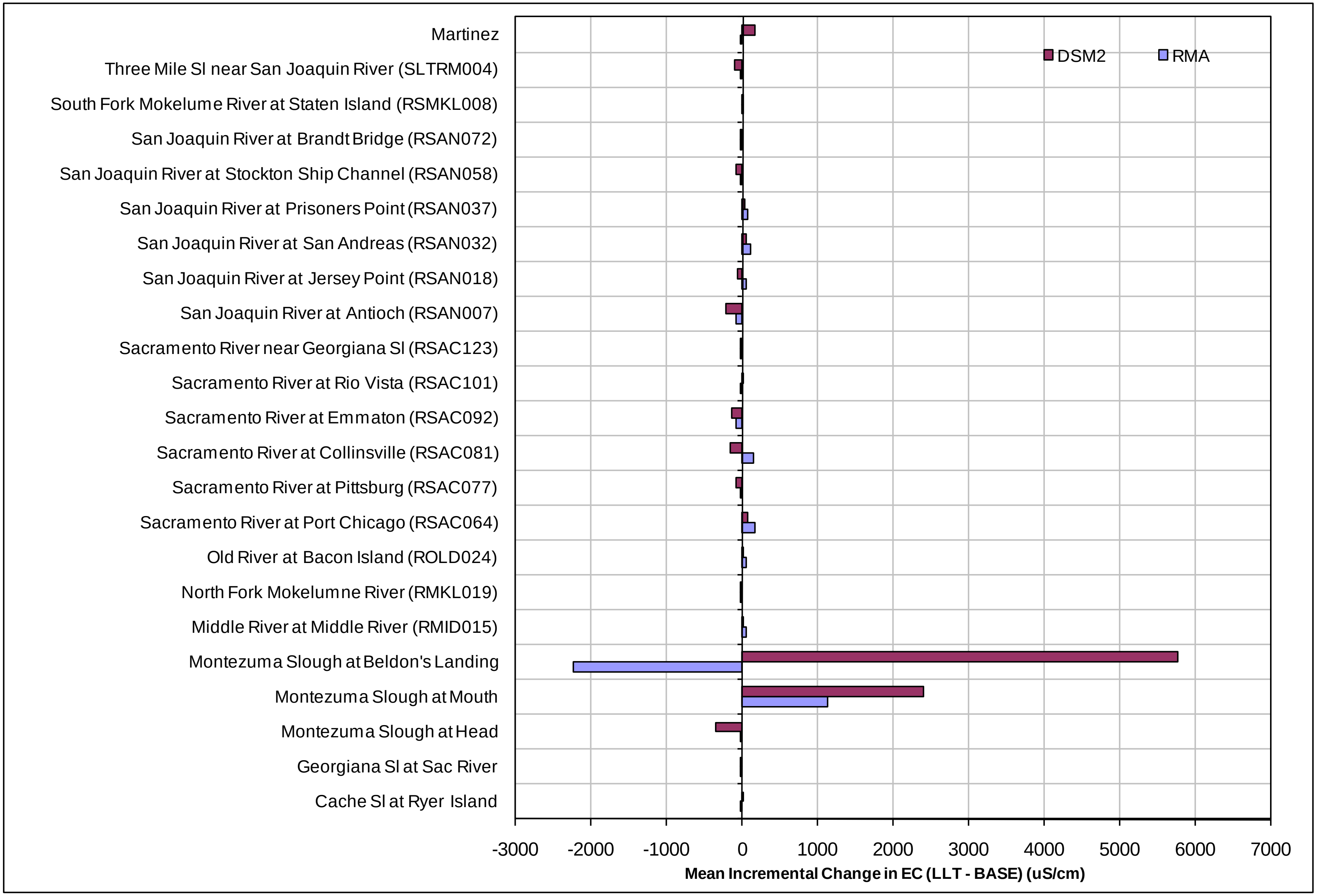



Figure 22: Comparison of average incremental change in tidally averaged EC in Early Long-Term scenario from the baseline between DSM2 and RMA




1
2 Figure 23: Comparison of average incremental change in tidally averaged EC in Late Long-Term scenario from the baseline between DSM2 and
3 RMA

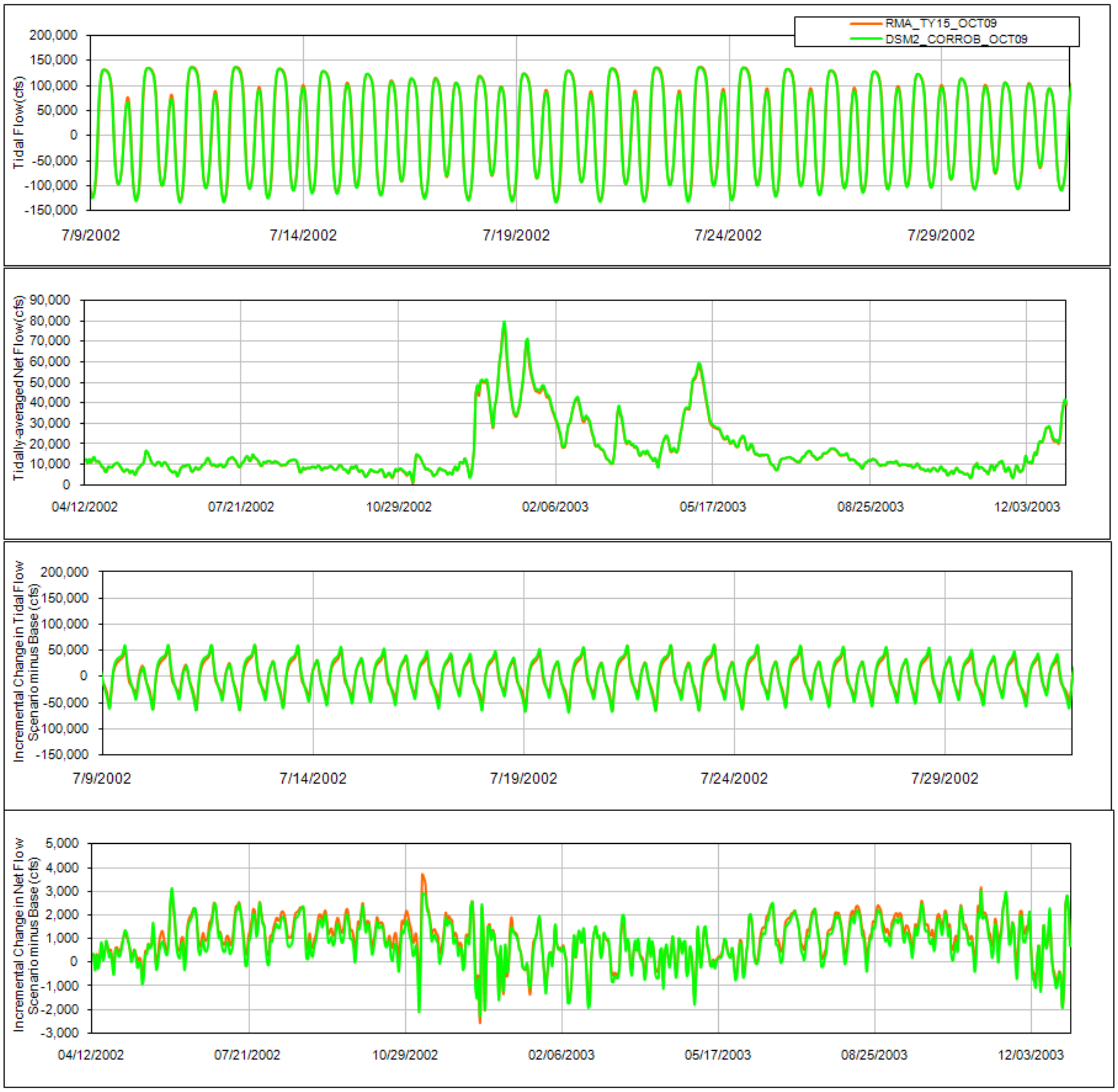



Figure 24: Comparison of Tidal Flow, Tidally-Averaged Daily Flow, Incremental Change in Tidal Flow and the Incremental Change in the Daily Flow between the Late Long-term Scenario and the Current Conditions Scenario from RMA Model and DSM2 Model for Sacramento River at Rio Vista Location

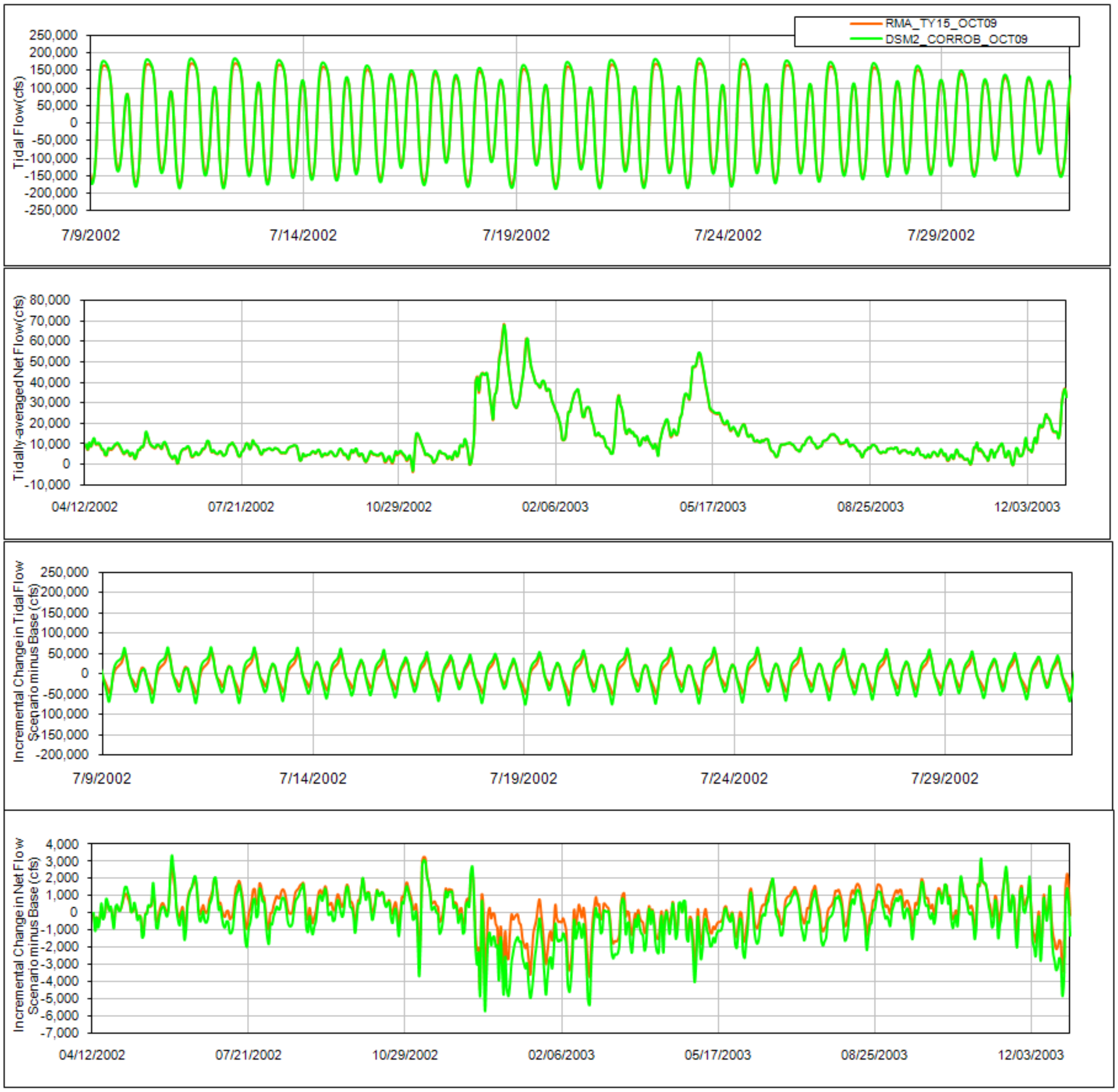



Figure 25: Comparison of Tidal Flow, Tidally-Averaged Daily Flow, Incremental Change in Tidal Flow and the Incremental Change in the Daily Flow between the Late Long-term Scenario and the Current Conditions Scenario from RMA Model and DSM2 Model for Sacramento River at Emmaton Location

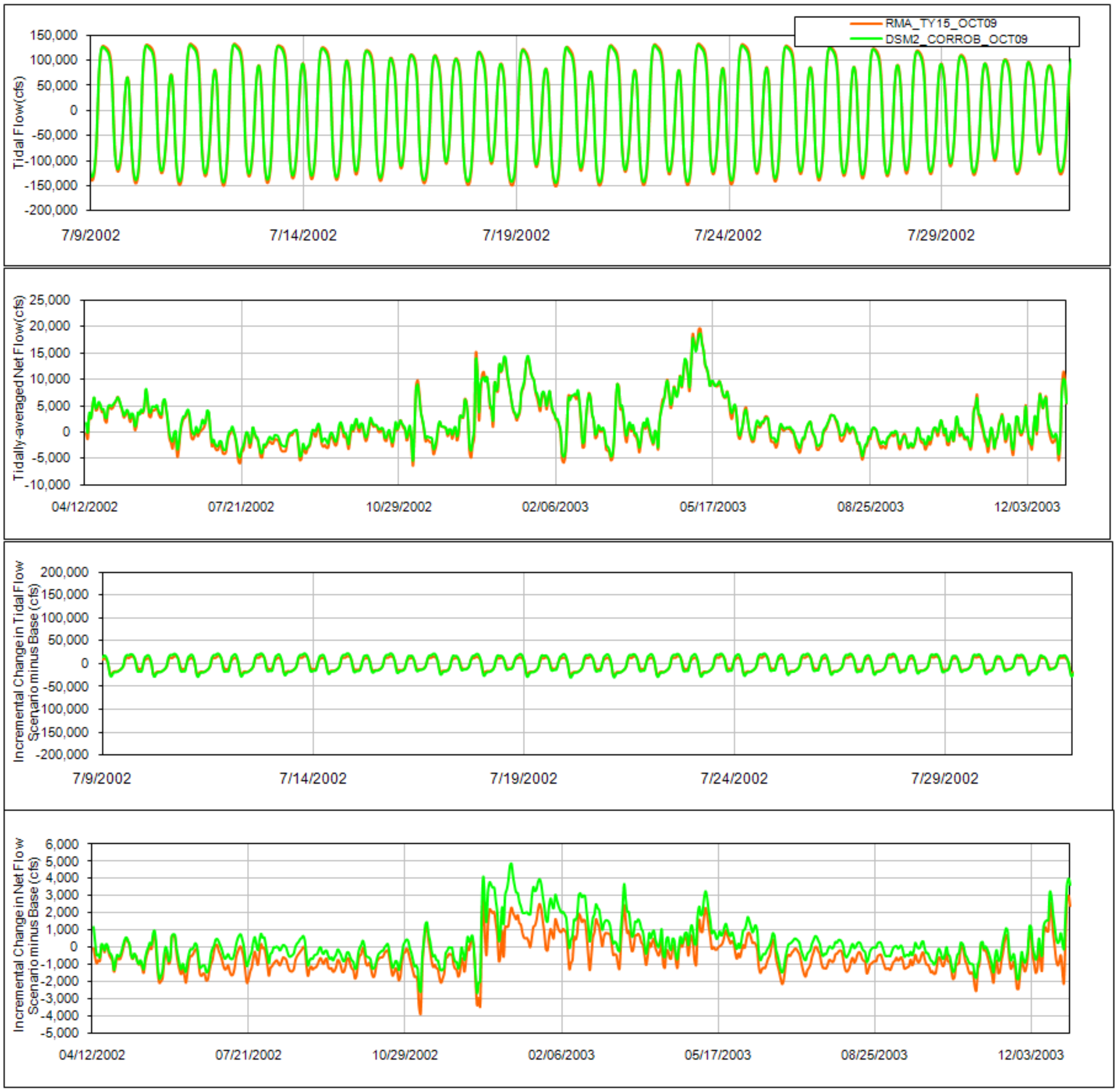



Figure 26: Comparison of Tidal Flow, Tidally-Averaged Daily Flow, Incremental Change in Tidal Flow and the Incremental Change in the Daily Flow between the Late Long-term Scenario and the Current Conditions Scenario from RMA Model and DSM2 Model for San Joaquin River at Jersey Point Location

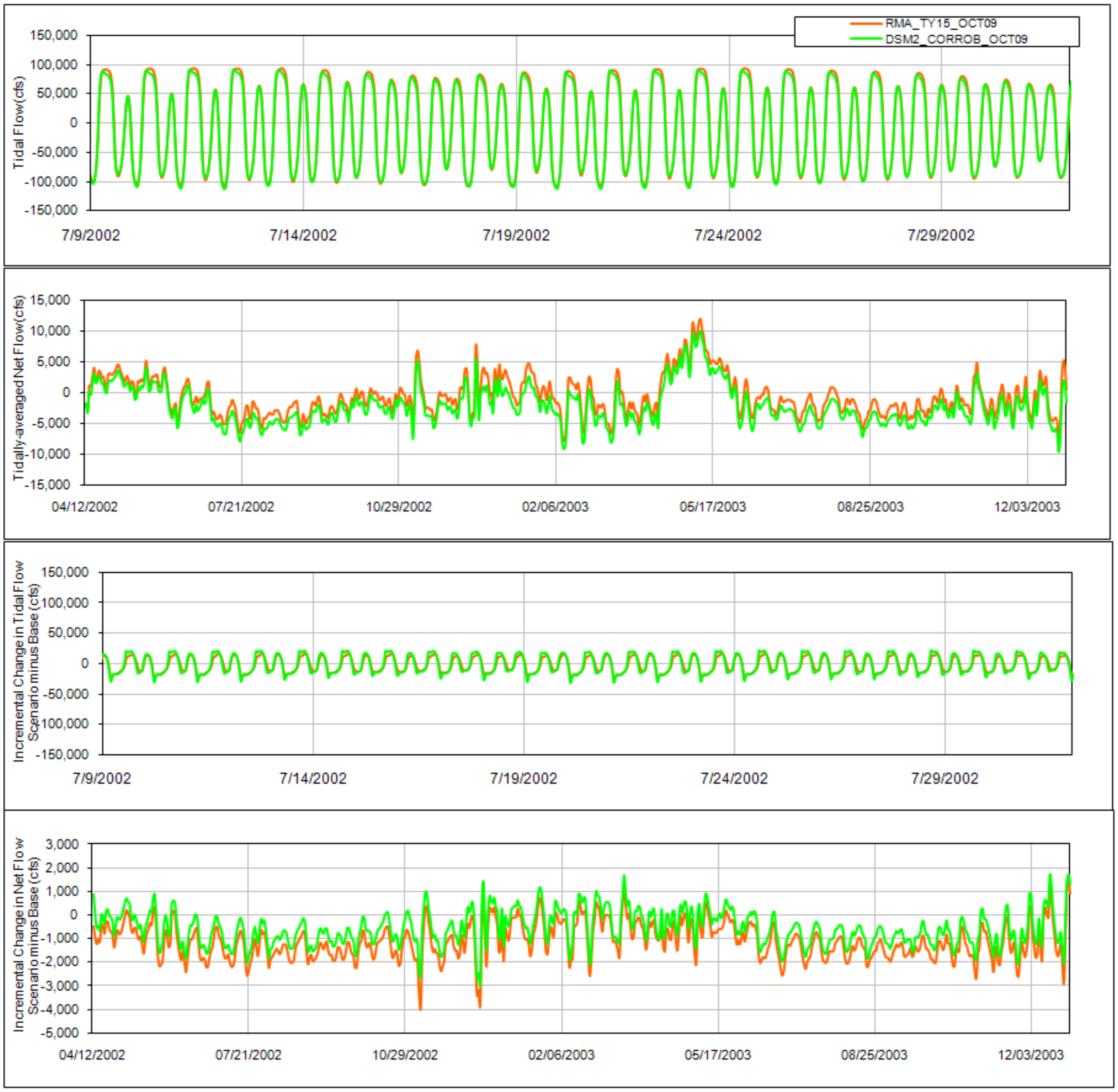



Figure 27: Comparison of Tidal Flow, Tidally-Averaged Daily Flow, Incremental Change in Tidal Flow and the Incremental Change in the Daily Flow between the Late Long-term Scenario and the Current Conditions Scenario from RMA Model and DSM2 Model for San Joaquin River at San Andreas Location

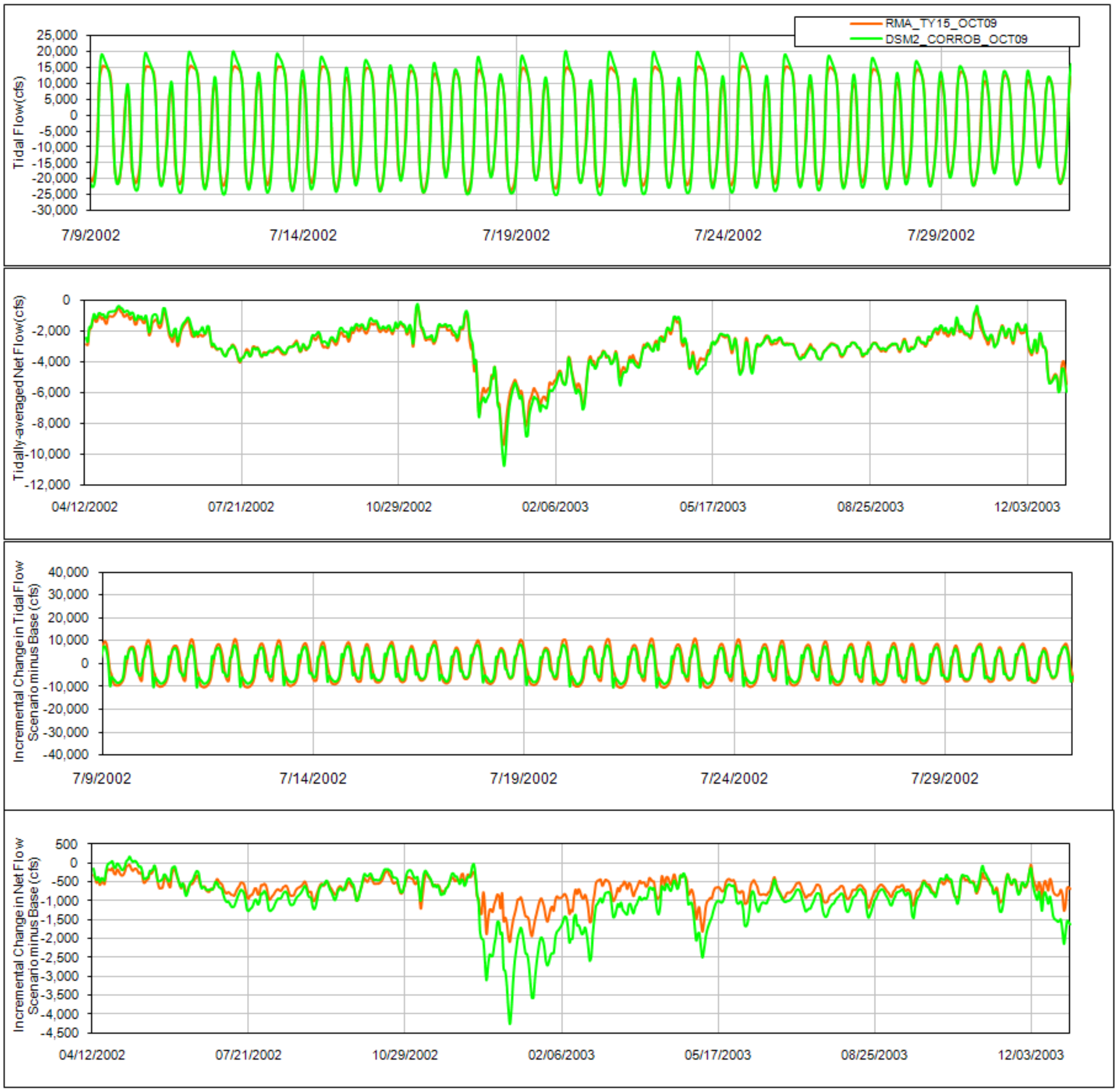



Figure 28: Comparison of Tidal Flow, Tidally-Averaged Daily Flow, Incremental Change in Tidal Flow and the Incremental Change in the Daily Flow between the Late Long-term Scenario and the Current Conditions Scenario from RMA Model and DSM2 Model for Three Mile Slough at San Joaquin River Location

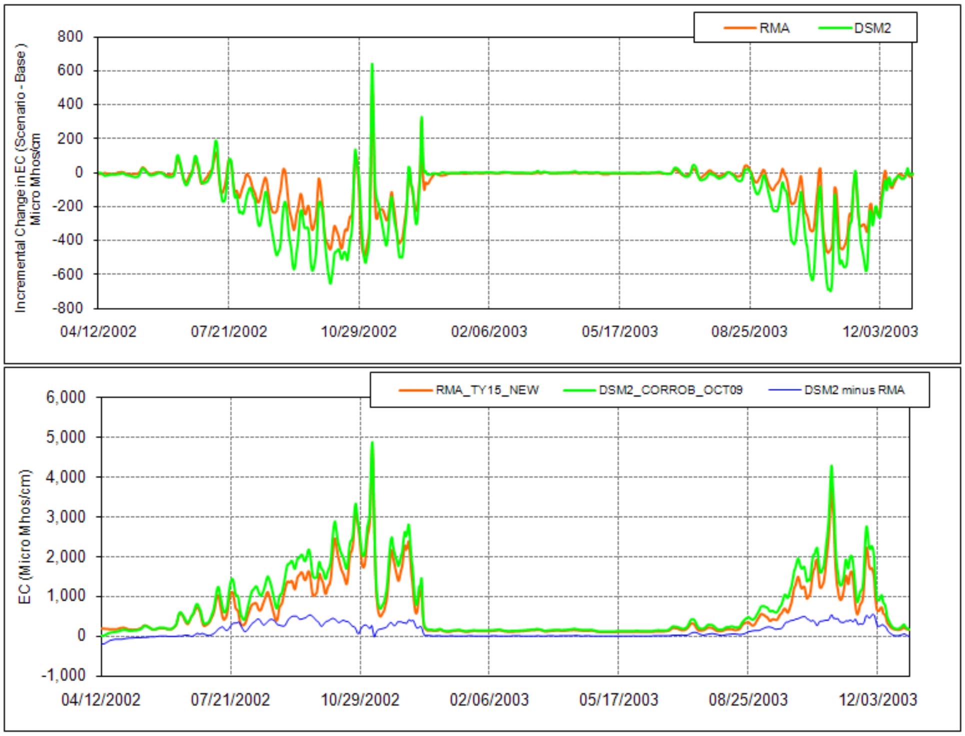



Figure 29: Comparison of Tidally-Averaged Daily EC and the Incremental Change in the Daily EC between the Late Long-term Scenario and the Current Conditions Scenario from RMA Model and DSM2 Model for Sacramento River at Emmaton Location

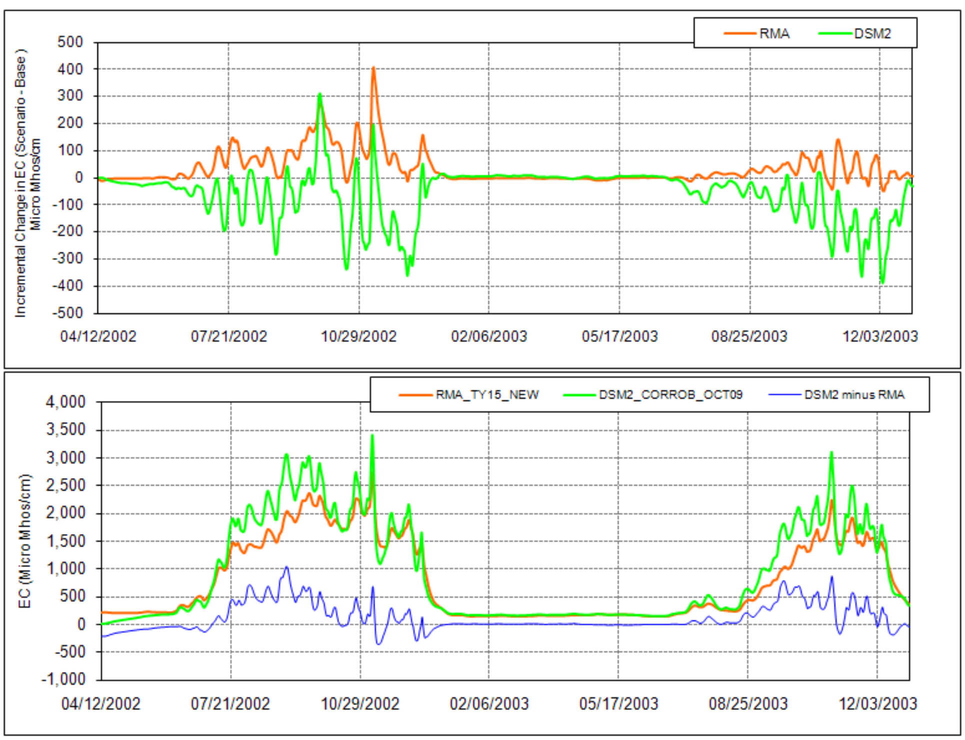



Figure 30: Comparison of Tidally-Averaged Daily EC and the Incremental Change in the Daily EC between the Late Long-term Scenario and the Current Conditions Scenario from RMA Model and DSM2 Model for San Joaquin River at Jersey Point Location

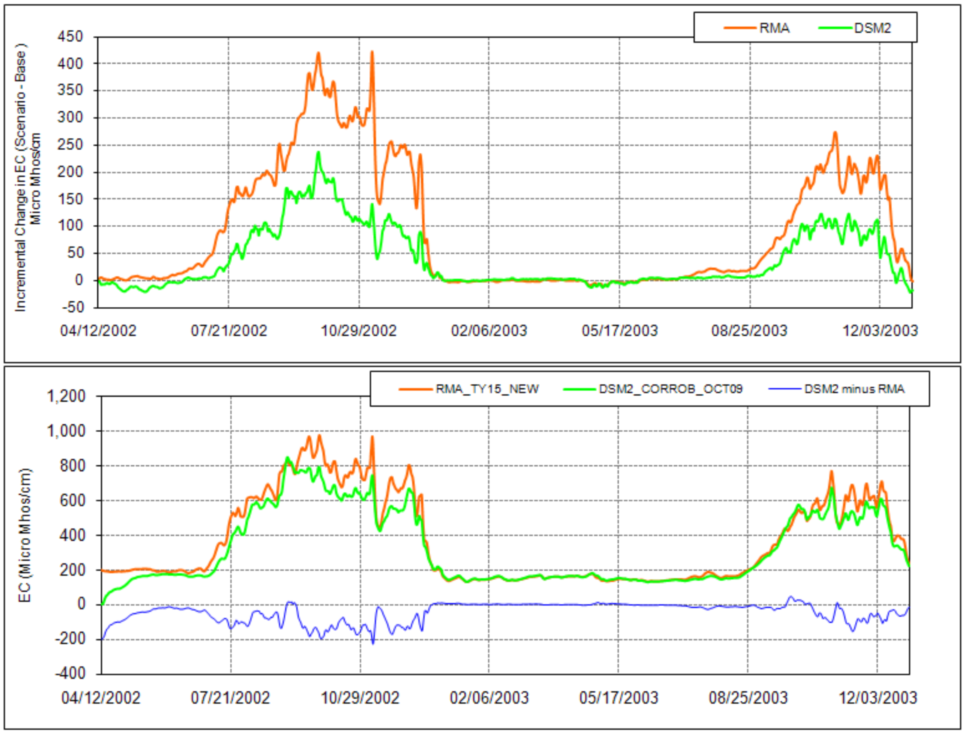
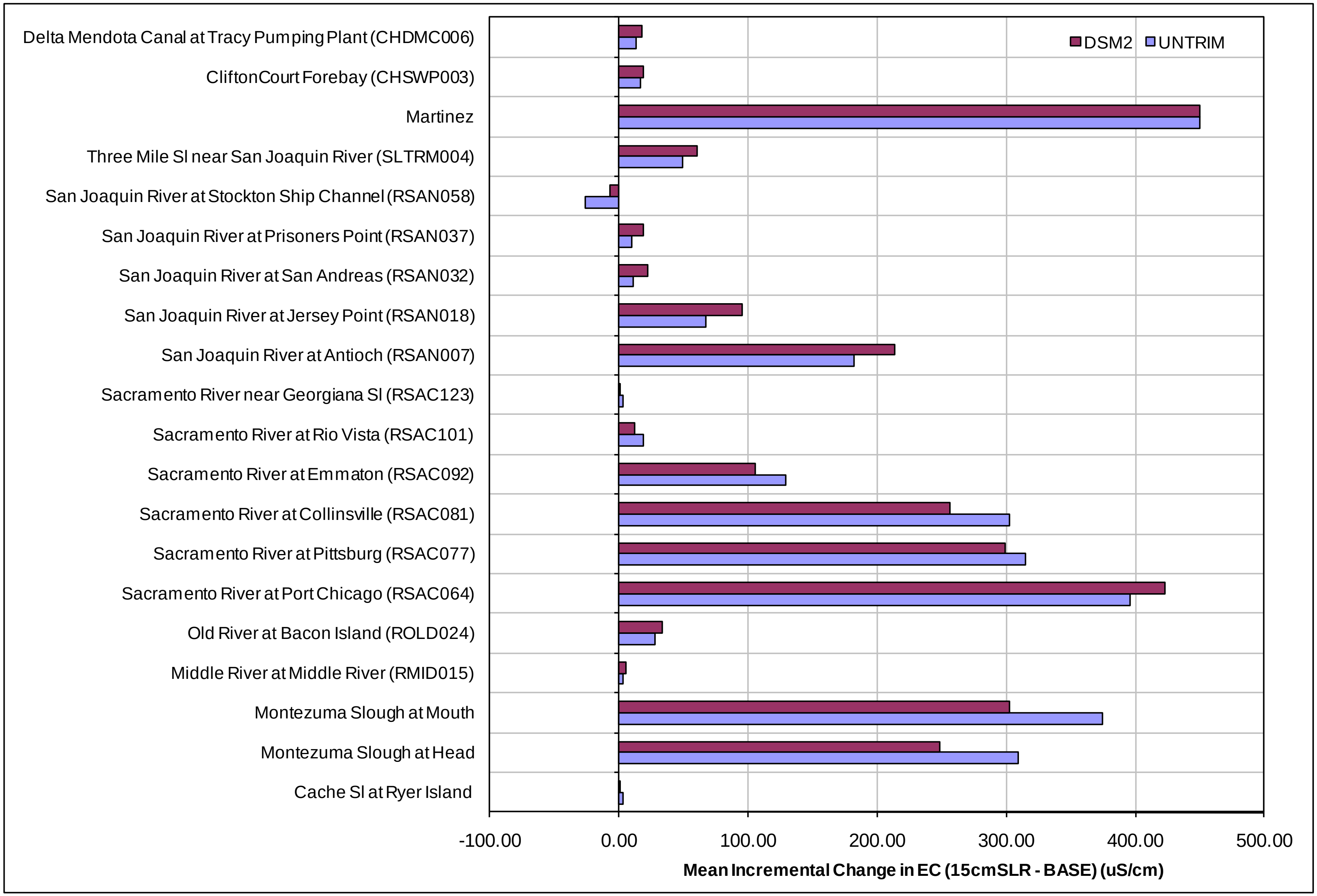



Figure 31: Comparison of Tidally-Averaged Daily EC and the Incremental Change in the Daily EC between the Late Long-term Scenario and the Current Conditions Scenario from RMA Model and DSM2 Model for San Joaquin River at San Andreas Location

1 


2 Figure 32: Comparison of average incremental change in tidally averaged EC in 15cm SLR scenario from the baseline between DSM2 and UNTRIM

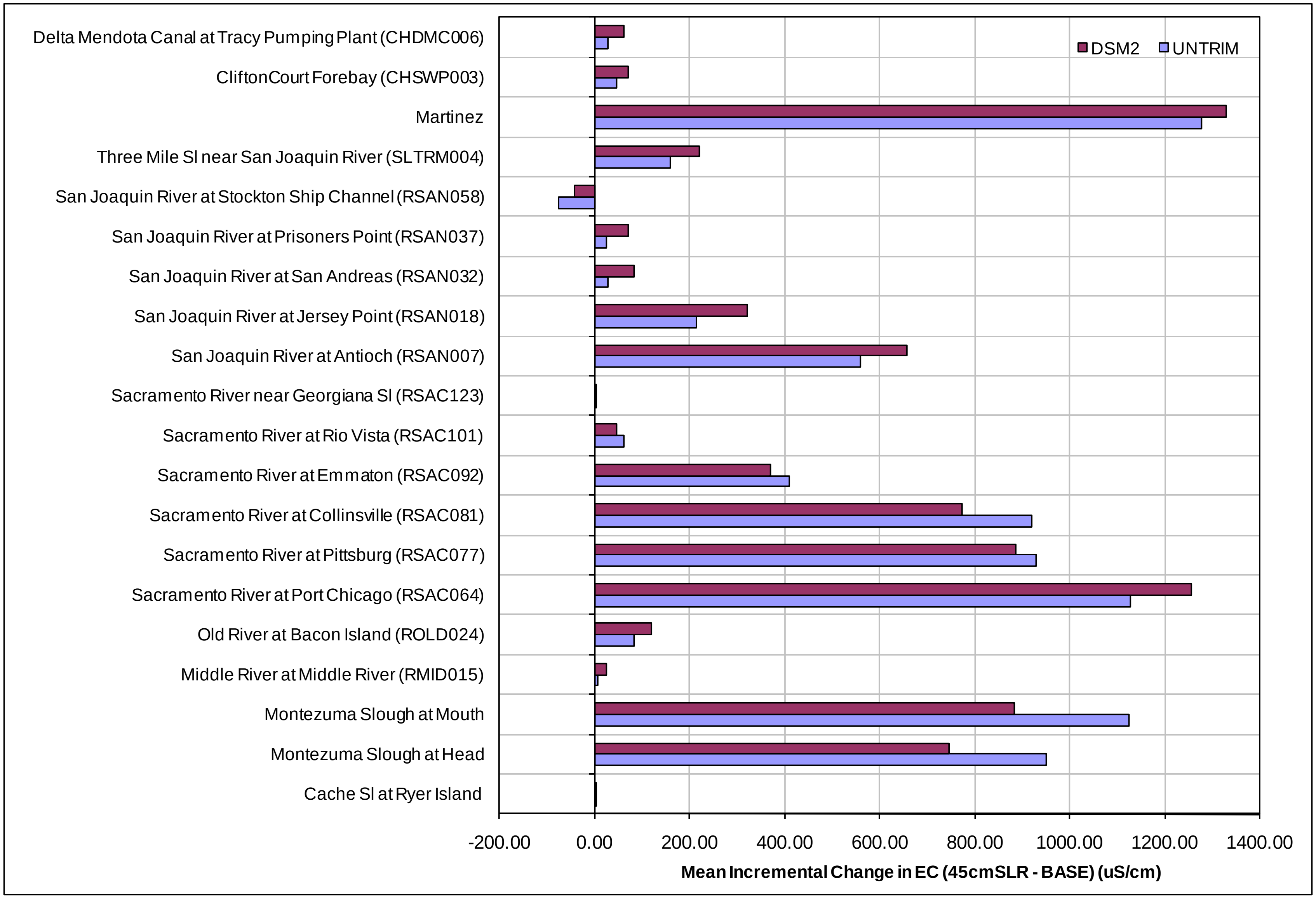
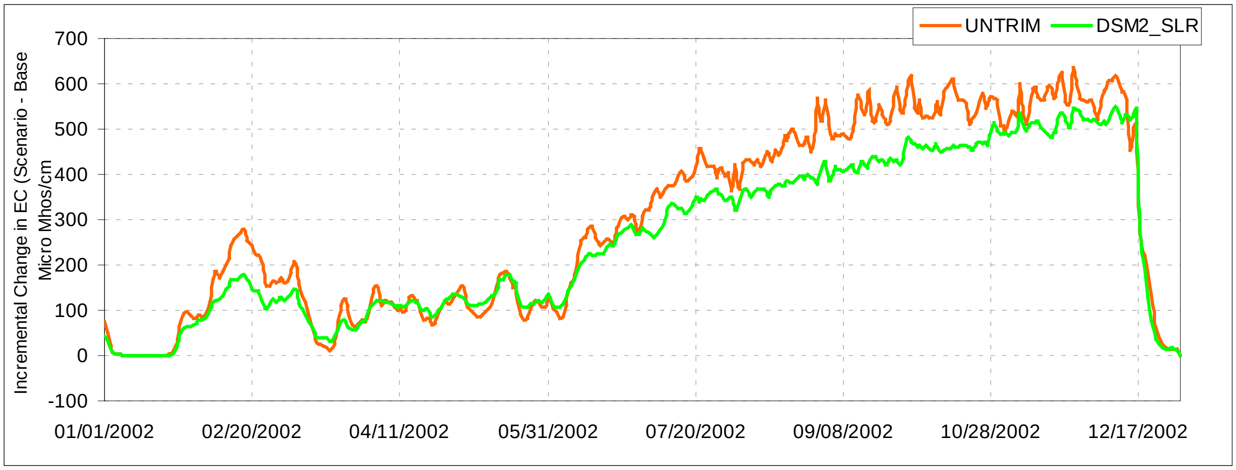



Figure 33: Comparison of average incremental change in tidally averaged EC in 45cm SLR scenario from the baseline between DSM2 and UNTRIM



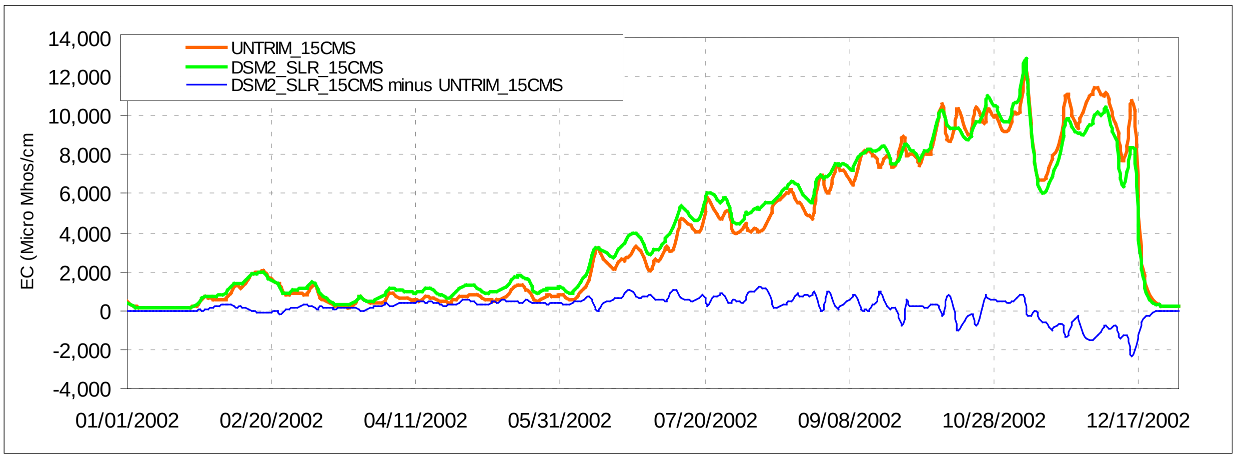
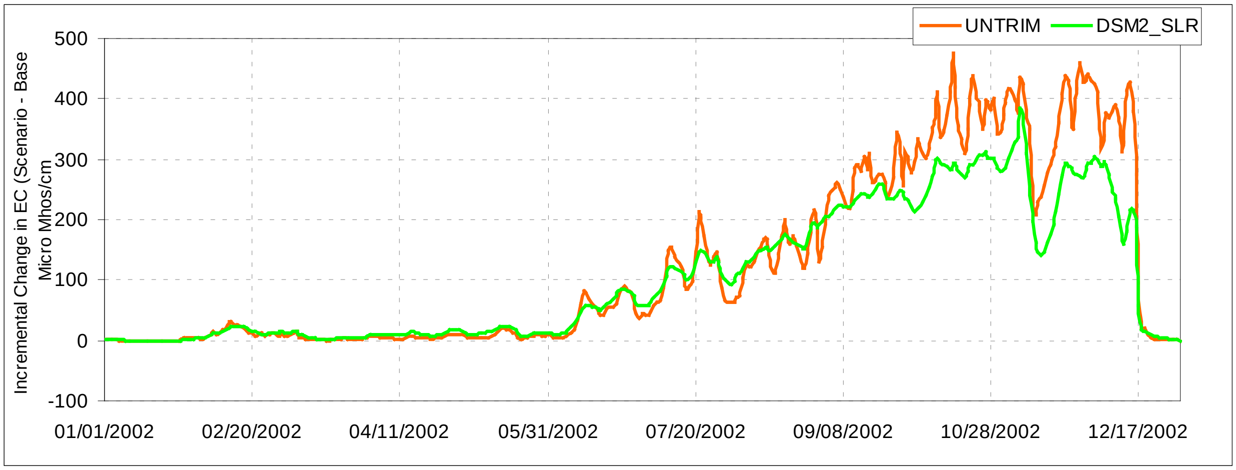




Figure 34: Comparison of Tidally-Averaged Daily EC and the Incremental Change in the Daily EC between the 15 cm Sea Level Rise and the Current Conditions Scenario from UnTRIM Model and DSM2 Model for Sacramento River at Collinsville Location



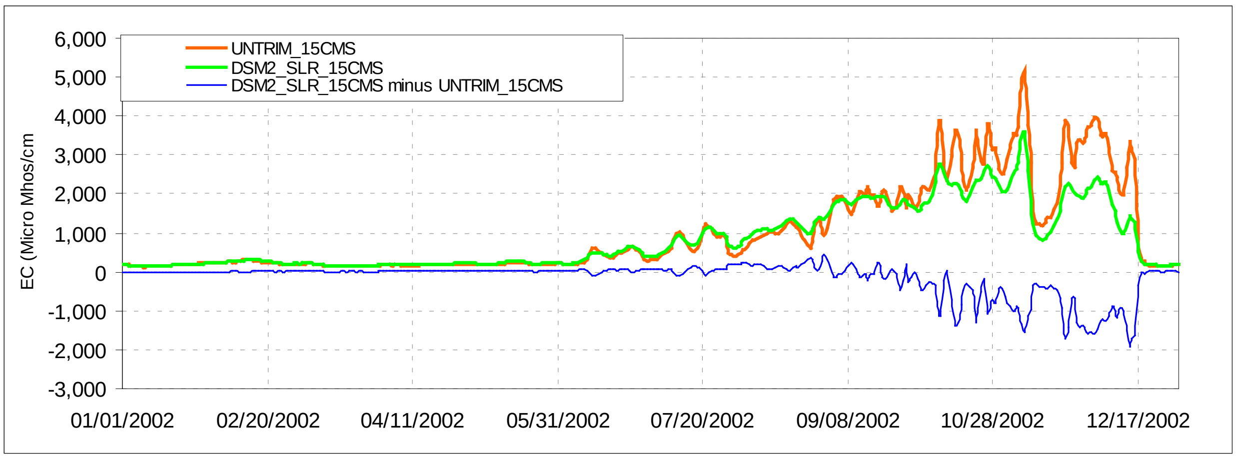
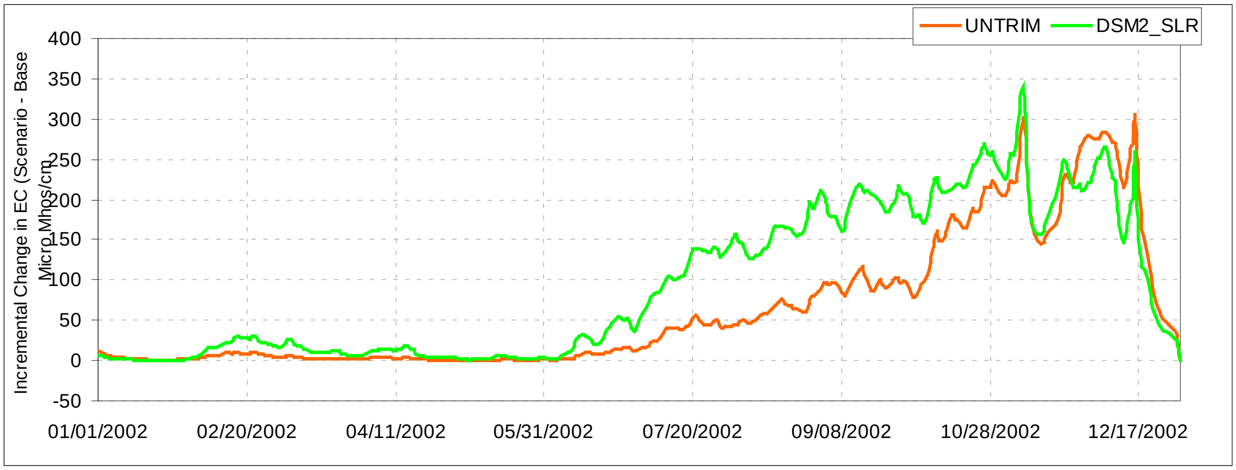




Figure 35: Comparison of Tidally-Averaged Daily EC and the Incremental Change in the Daily EC between the 15 cm Sea Level Rise and the Current Conditions Scenario from UnTRIM Model and DSM2 Model for Sacramento River at Emmaton Location



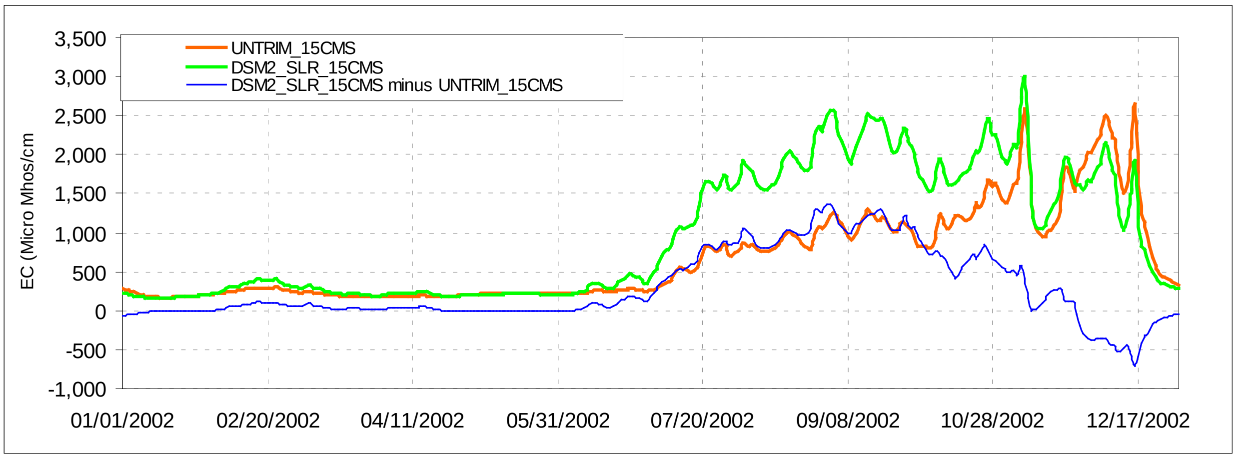
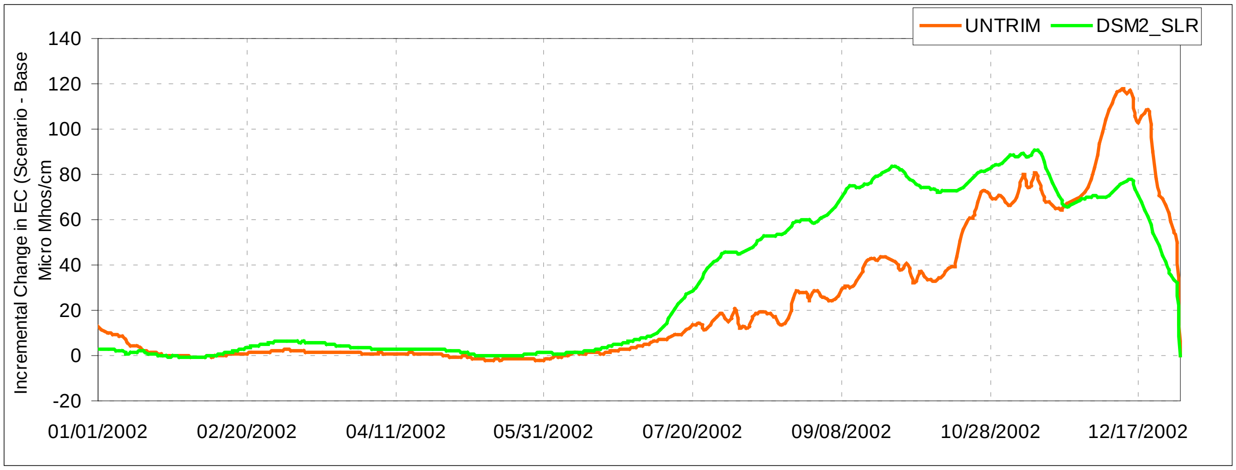




Figure 36: Comparison of Tidally-Averaged Daily EC and the Incremental Change in the Daily EC between the 15 cm Sea Level Rise and the Current Conditions Scenario from UnTRIM Model and DSM2 Model for San Joaquin River at Jersey Point Location



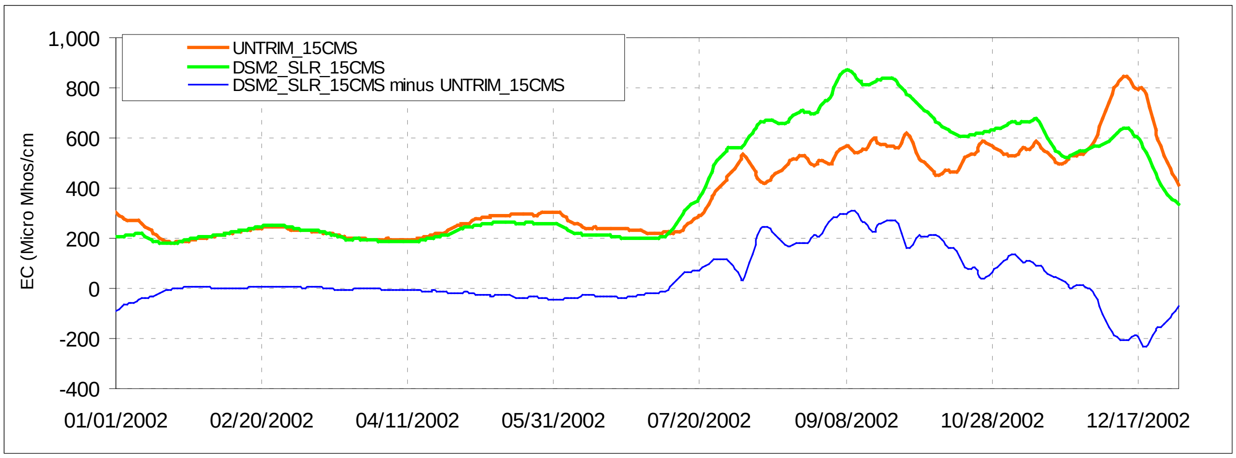




Figure 37: Comparison of Tidally-Averaged Daily EC and the Incremental Change in the Daily EC between the 15 cm Sea Level Rise and the Current Conditions Scenario from UnTRIM Model and DSM2 Model for Old River at Rock Slough Location

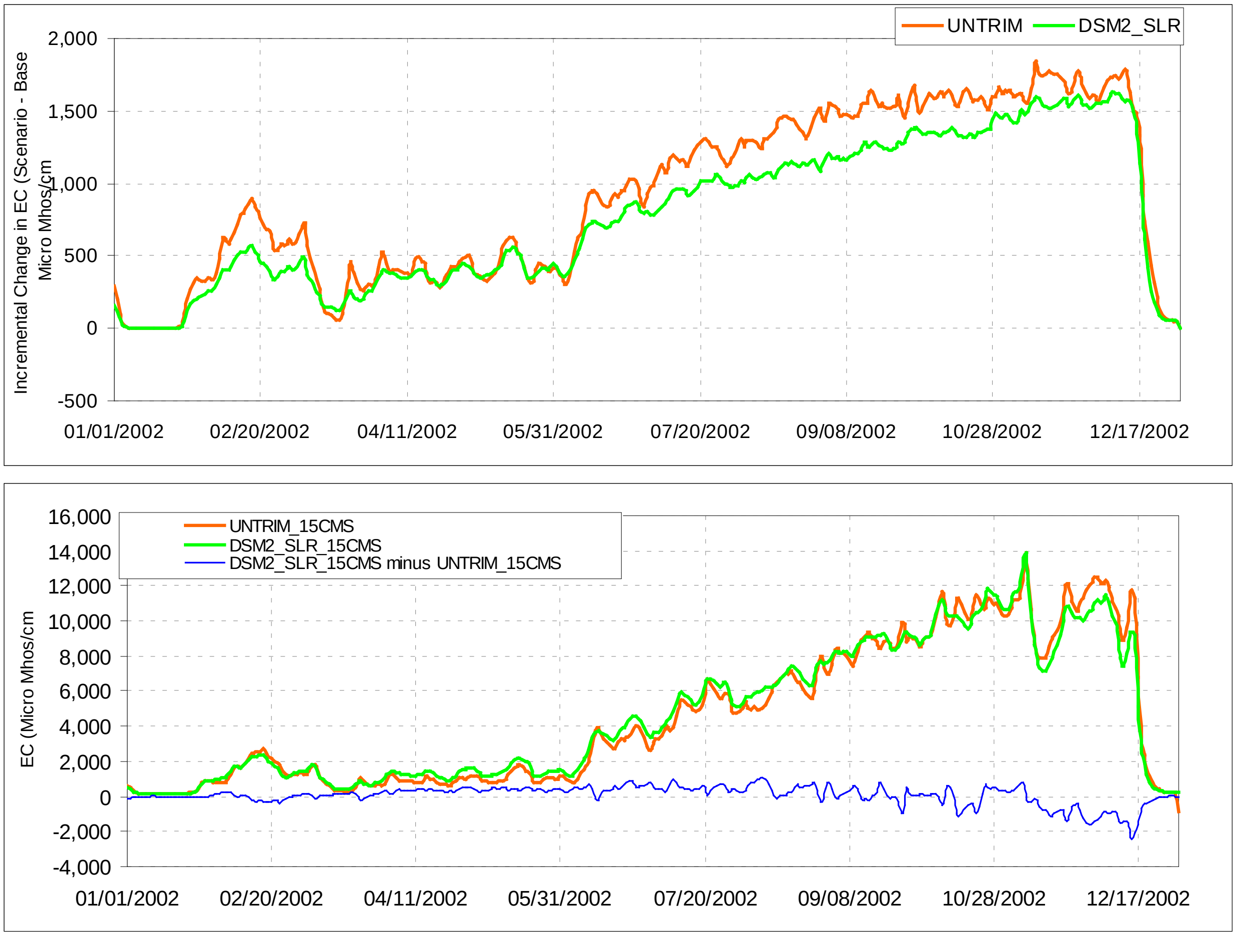
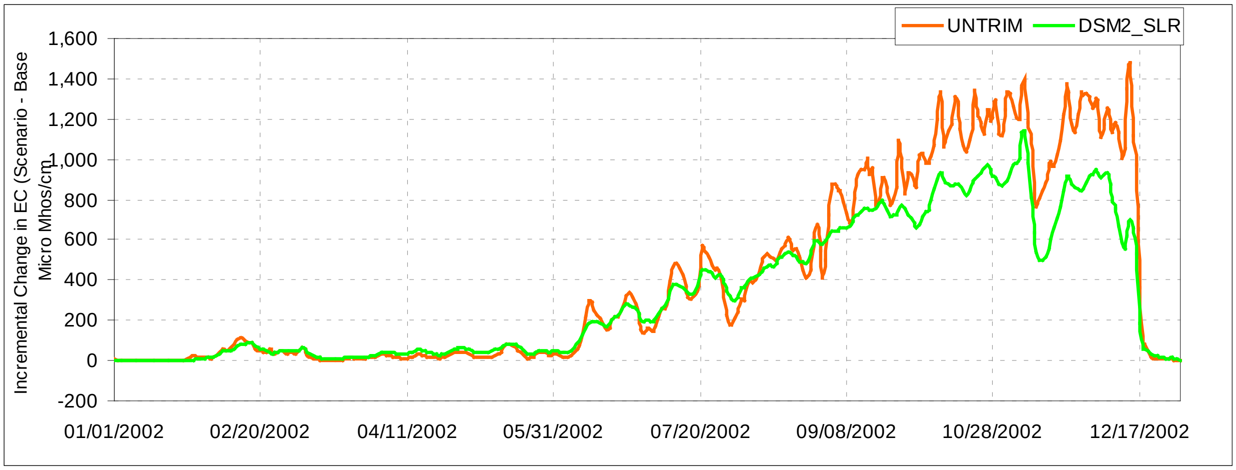



Figure 38: Comparison of Tidally-Averaged Daily EC and the Incremental Change in the Daily EC between the 45 cm Sea Level Rise and the Current Conditions Scenario from UnTRIM Model and DSM2 Model for Sacramento River at Collinsville Location



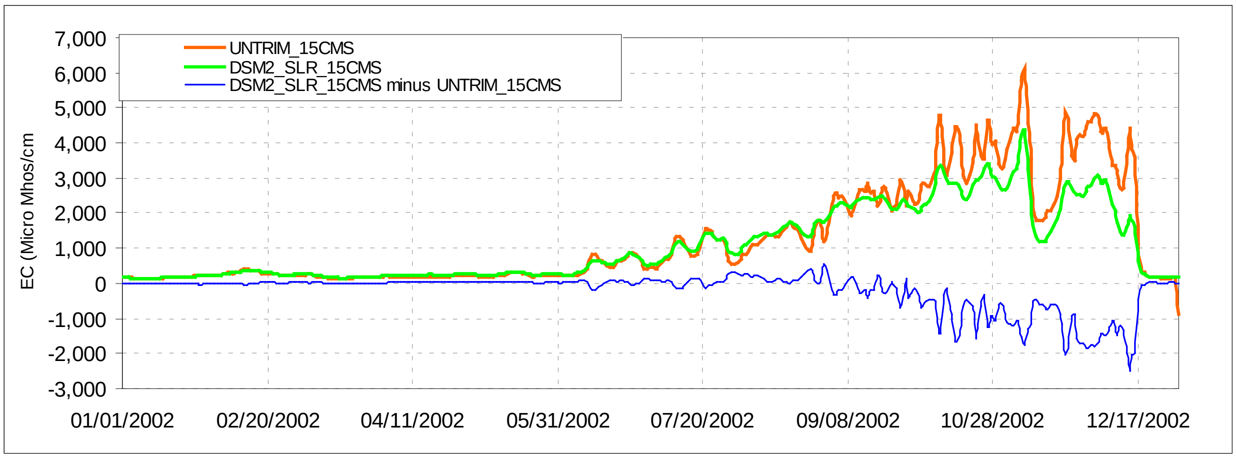
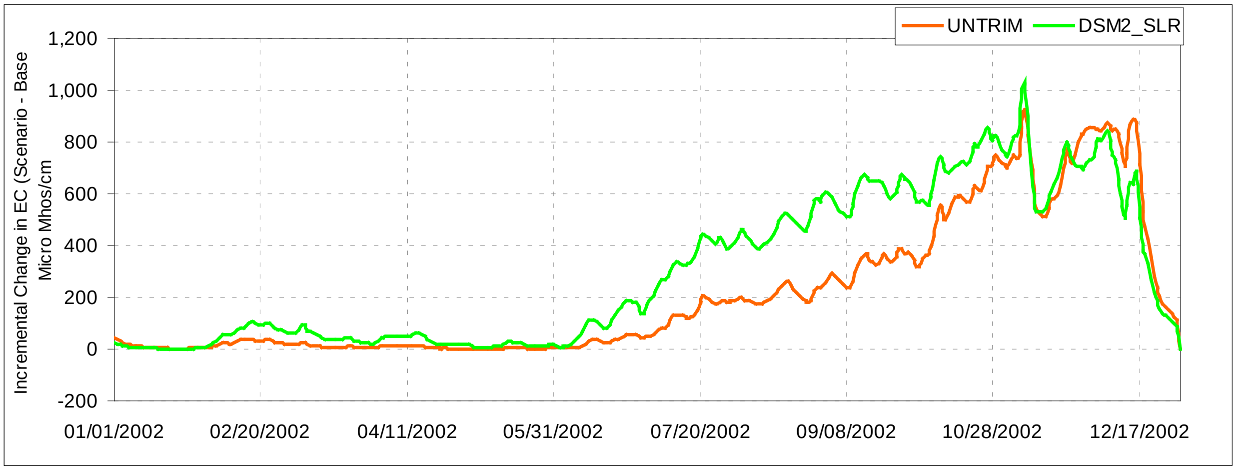




Figure 39: Comparison of Tidally-Averaged Daily EC and the Incremental Change in the Daily EC between the 45 cm Sea Level Rise and the Current Conditions Scenario from UnTRIM Model and DSM2 Model for Sacramento River at Emmaton Location



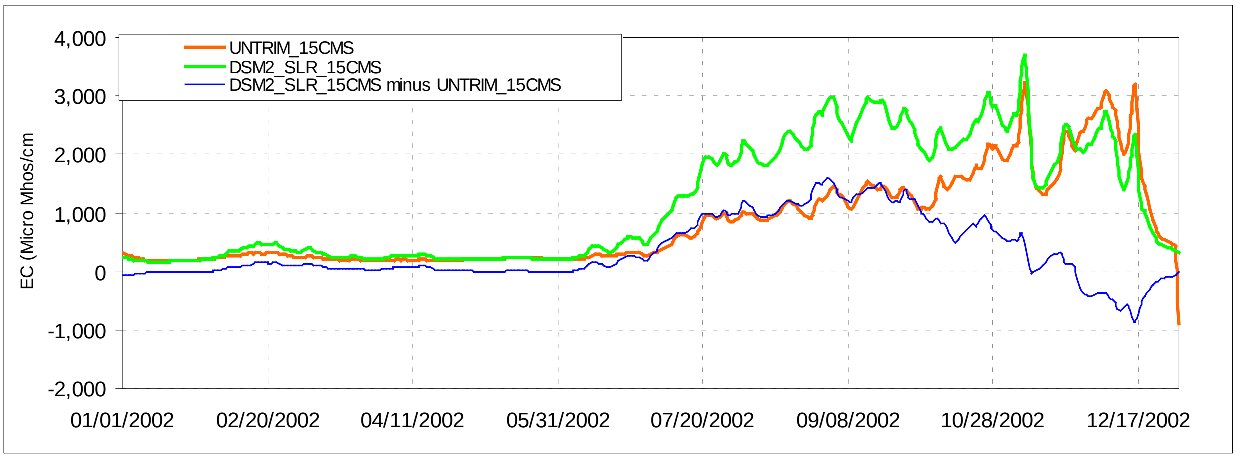
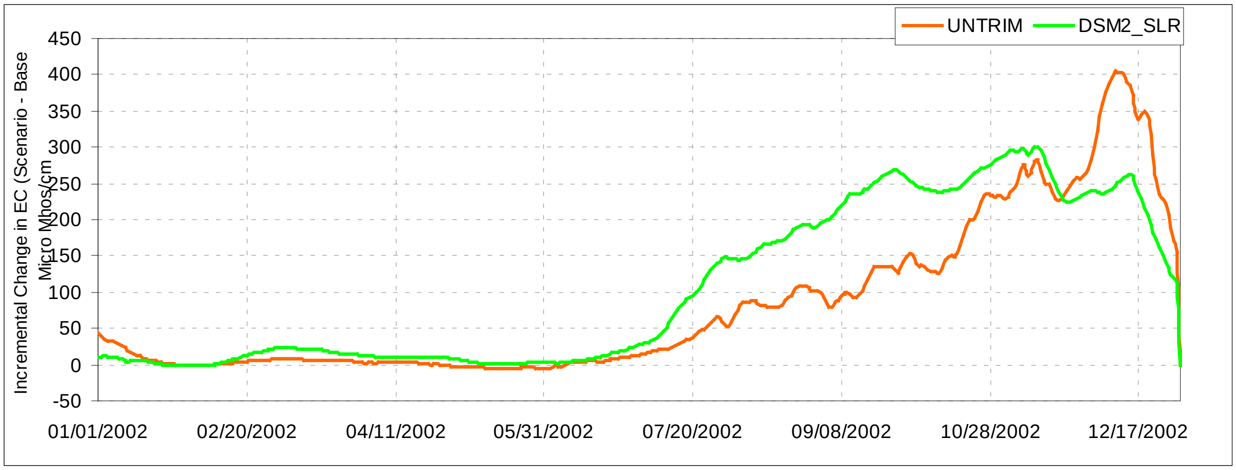




Figure 40: Comparison of Tidally-Averaged Daily EC and the Incremental Change in the Daily EC between the 45 cm Sea Level Rise and the Current Conditions Scenario from UnTRIM Model and DSM2 Model for San Joaquin River at Jersey Point Location



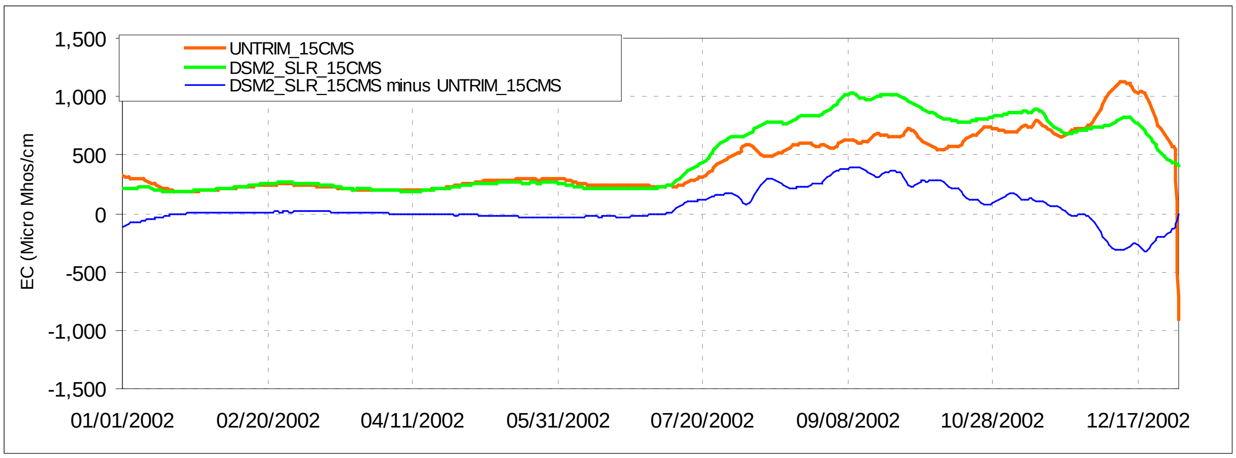




Figure 41: Comparison of Tidally-Averaged Daily EC and the Incremental Change in the Daily EC between the 45 cm Sea Level Rise and the Current Conditions Scenario from UnTRIM Model and DSM2 Model for Old River at Rock Slough Location

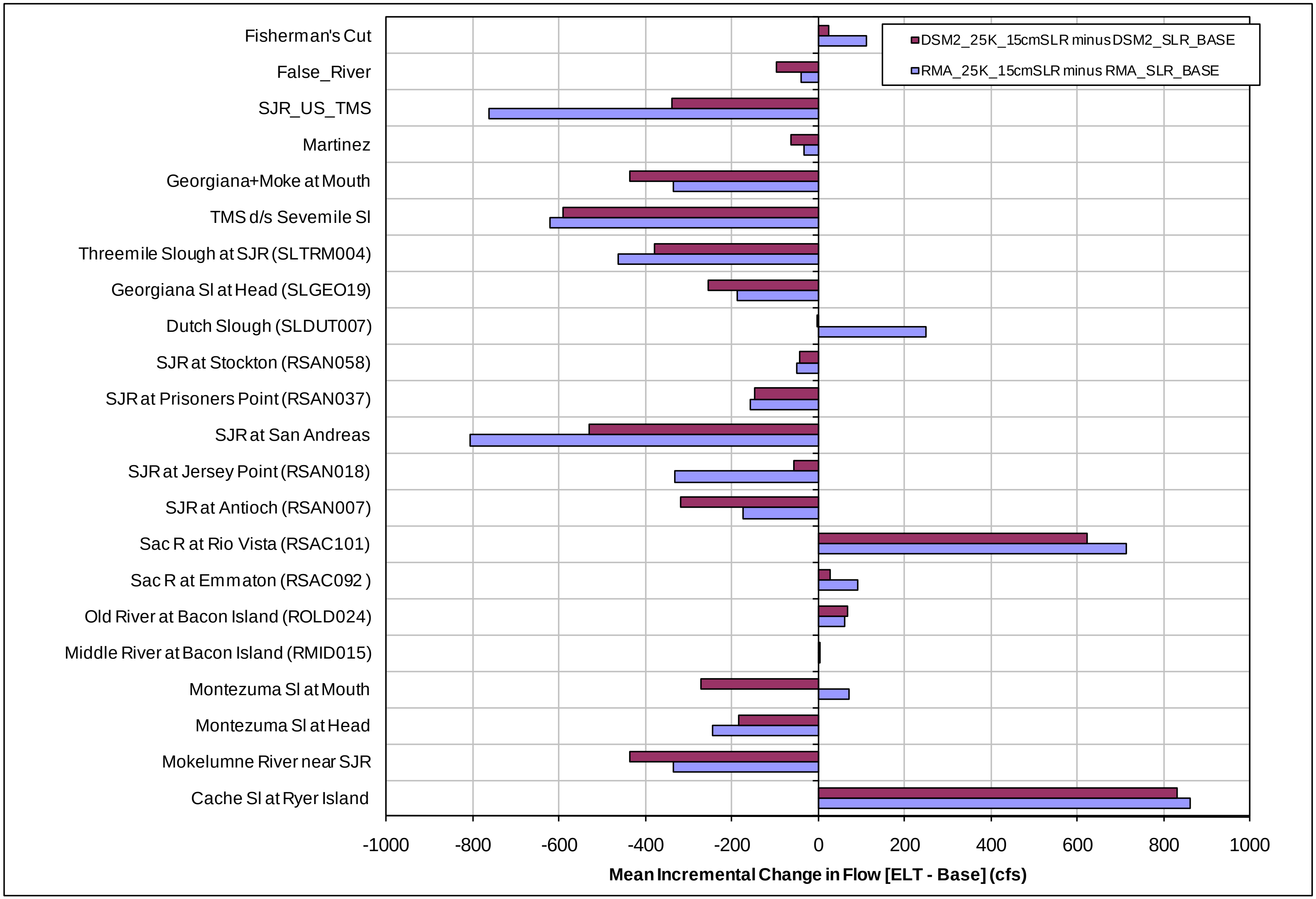



Figure 42: Comparison of average incremental change in tidally averaged flow in Integrated Early Long-Term scenario from the baseline between DSM2 and RMA

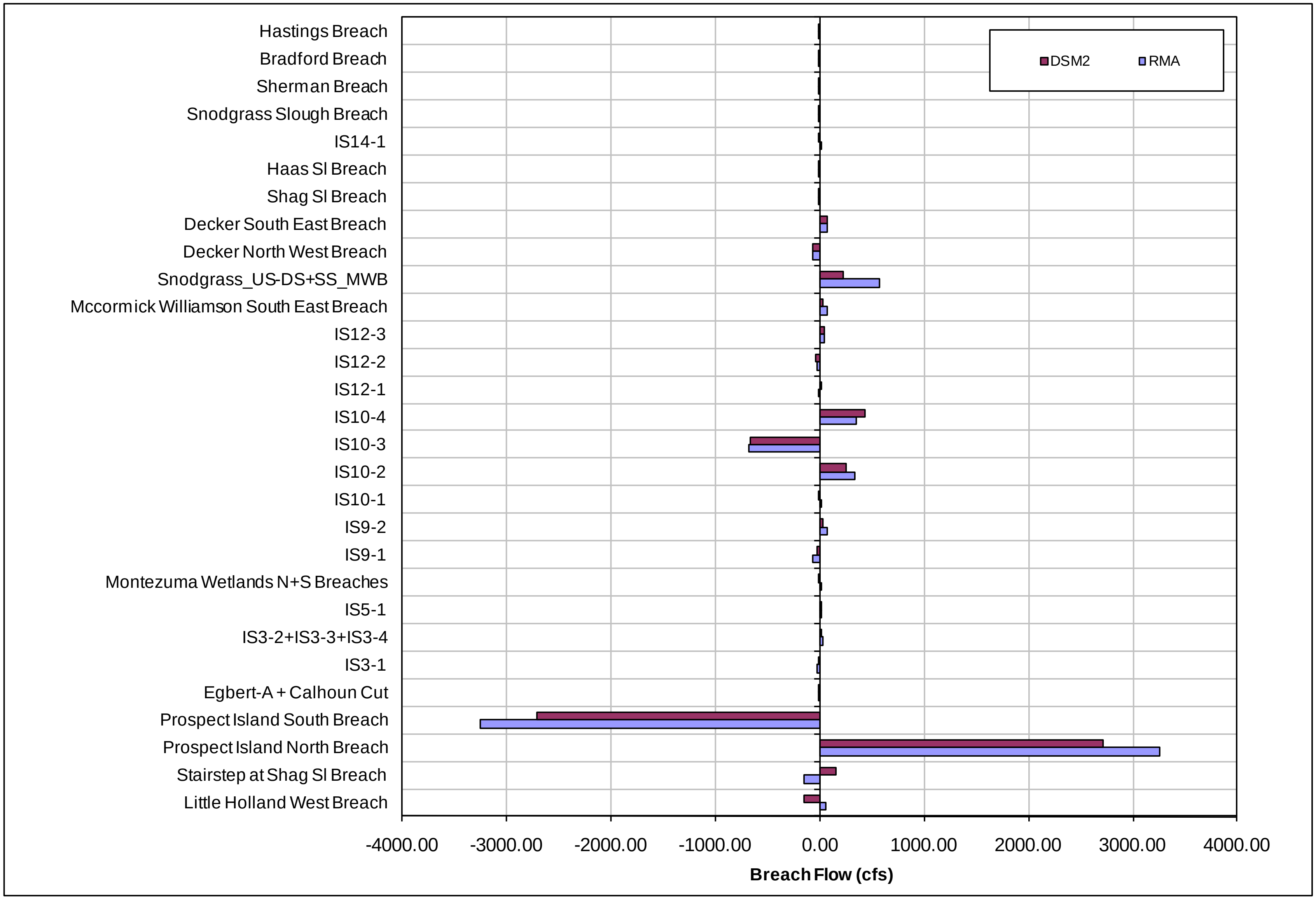



Figure 43: Comparison of average tidally averaged breach flows in Integrated Early Long-Term scenario from the baseline between DSM2 and RMA

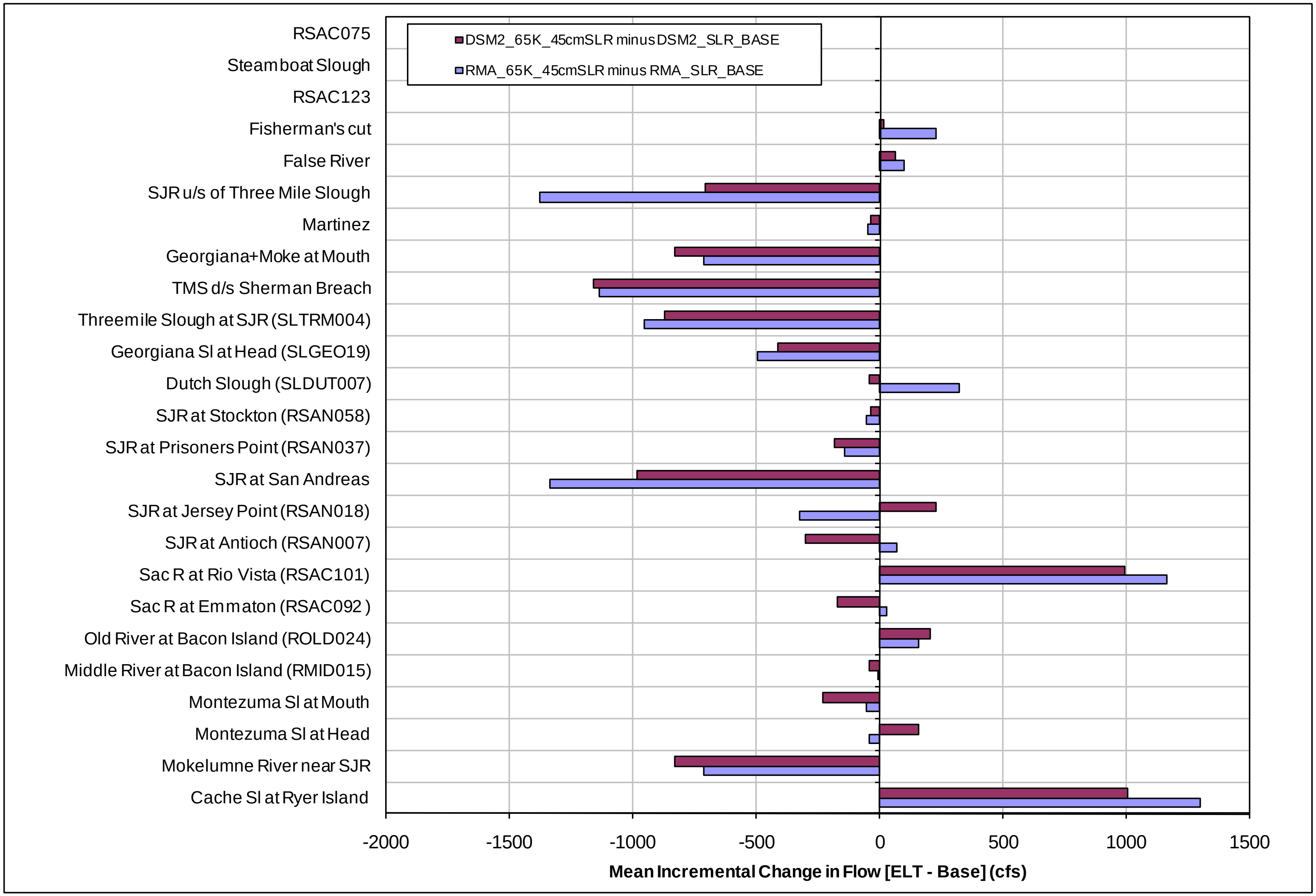



Figure 44: Comparison of average incremental change in tidally averaged flow in Integrated Late Long-Term scenario from the baseline between DSM2 and RMA

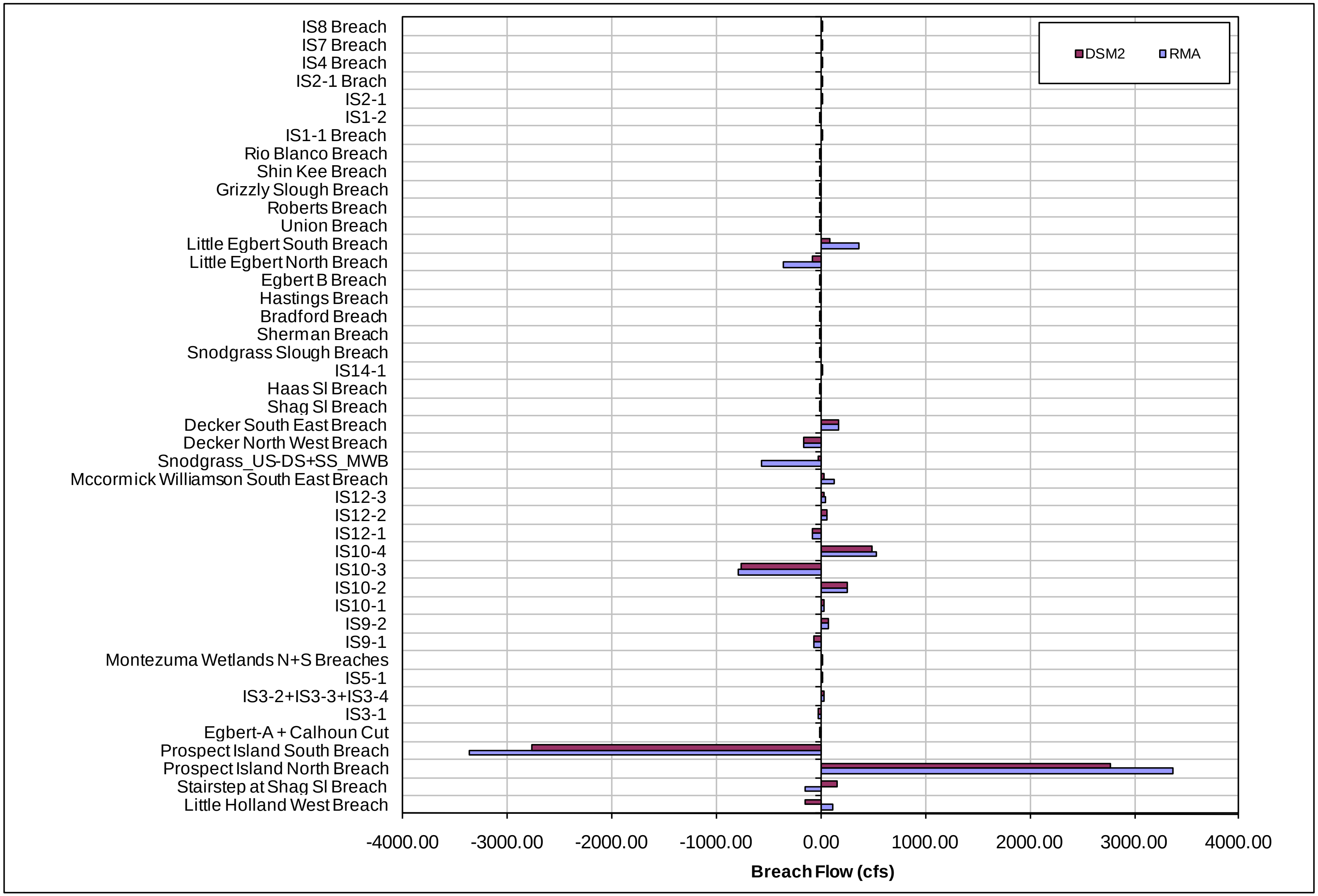



Figure 45: Comparison of average tidally averaged breach flows in Integrated Late Long-Term scenario from the baseline between DSM2 and RMA

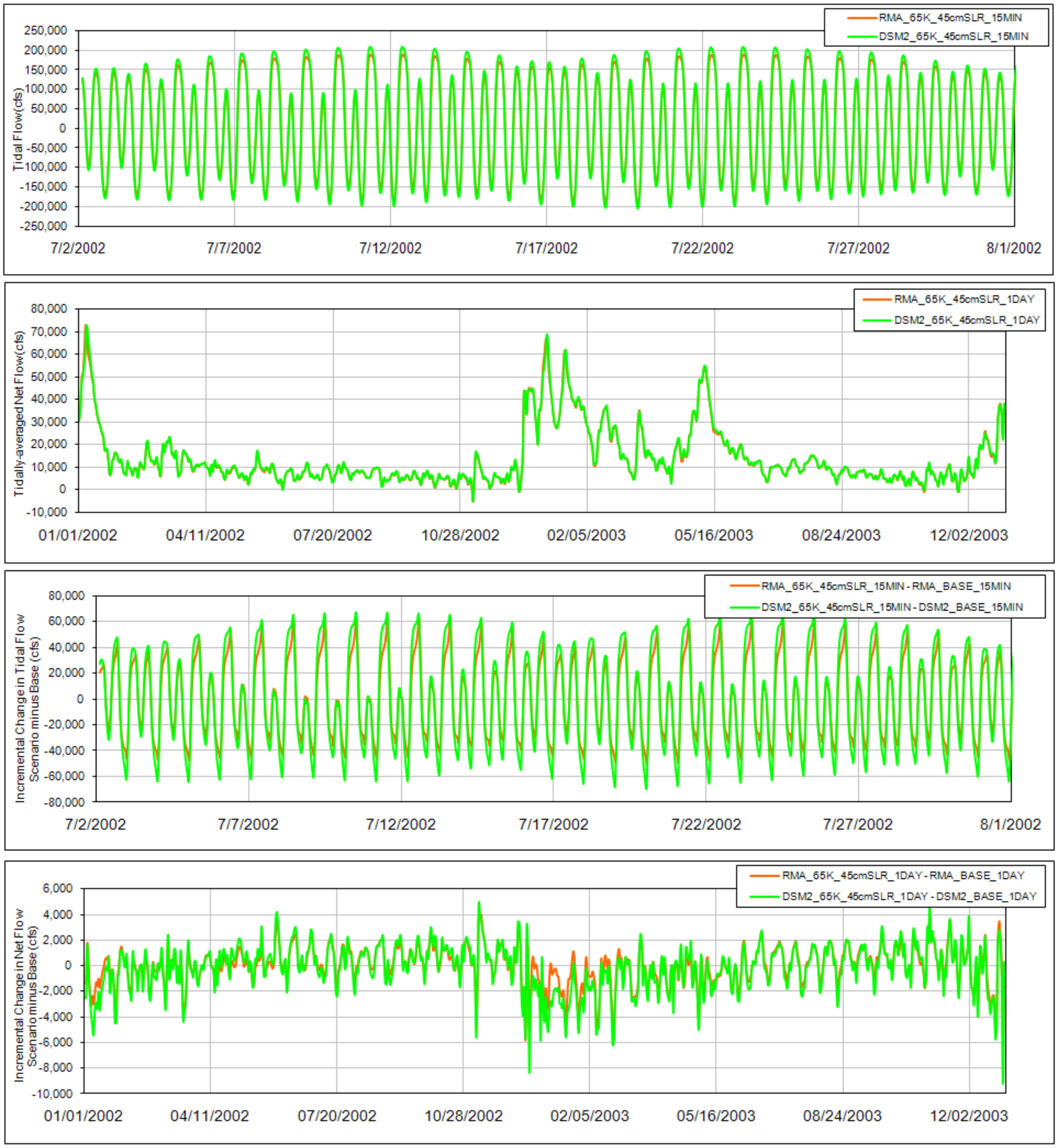



Figure 46: Comparison of Tidal Flow, Tidally-Averaged Daily Flow, Incremental Change in Tidal Flow and the Incremental Change in the Daily Flow between the Integrated Late Long-term Scenario and the Current Conditions Scenario from RMA Model and DSM2 Model for Sacramento River at Emmaton Location

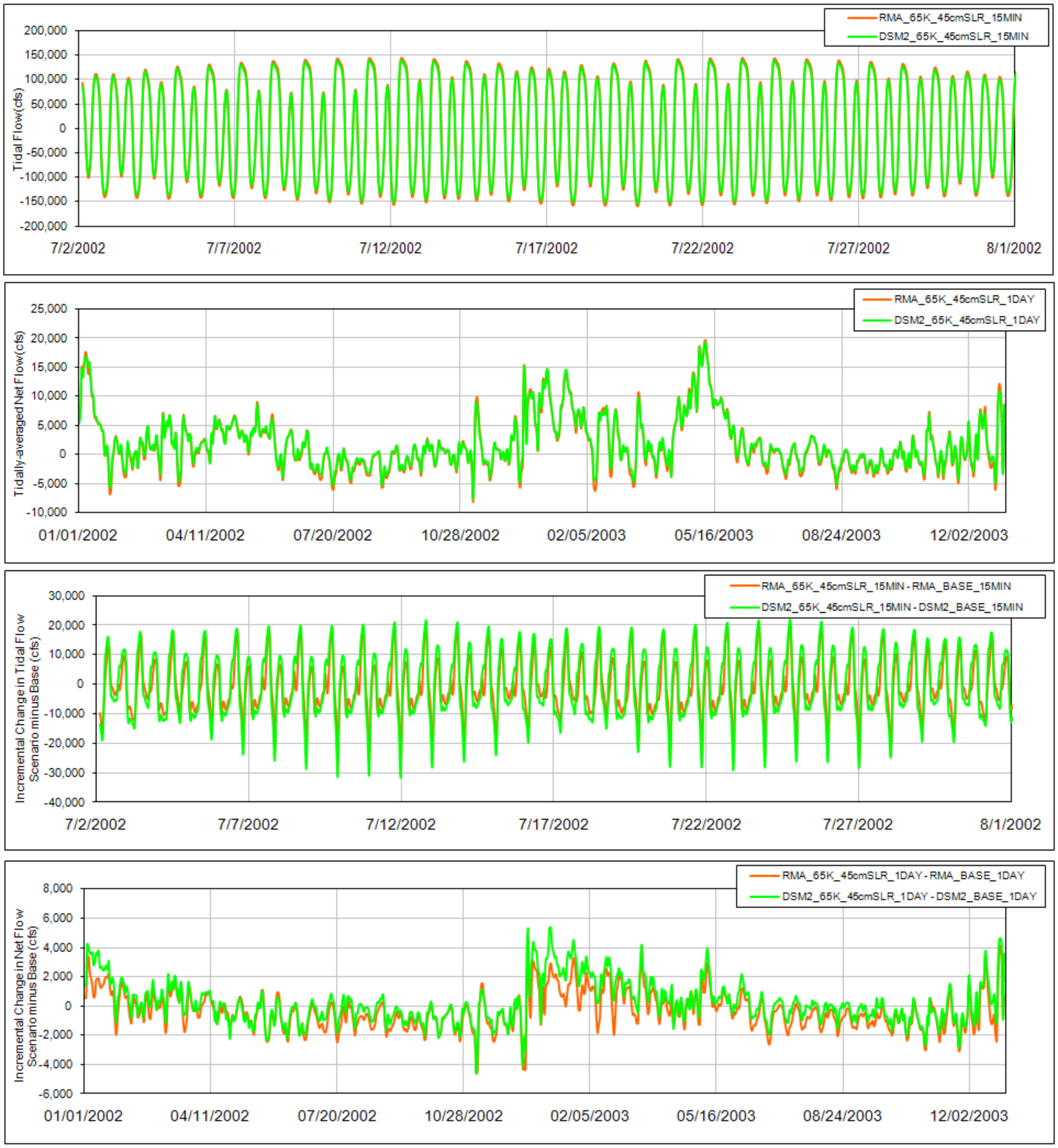



Figure 47: Comparison of Tidal Flow, Tidally-Averaged Daily Flow, Incremental Change in Tidal Flow and the Incremental Change in the Daily Flow between the Integrated Late Long-term Scenario and the Current Conditions Scenario from RMA Model and DSM2 Model for San Joaquin River at Jersey Point Location

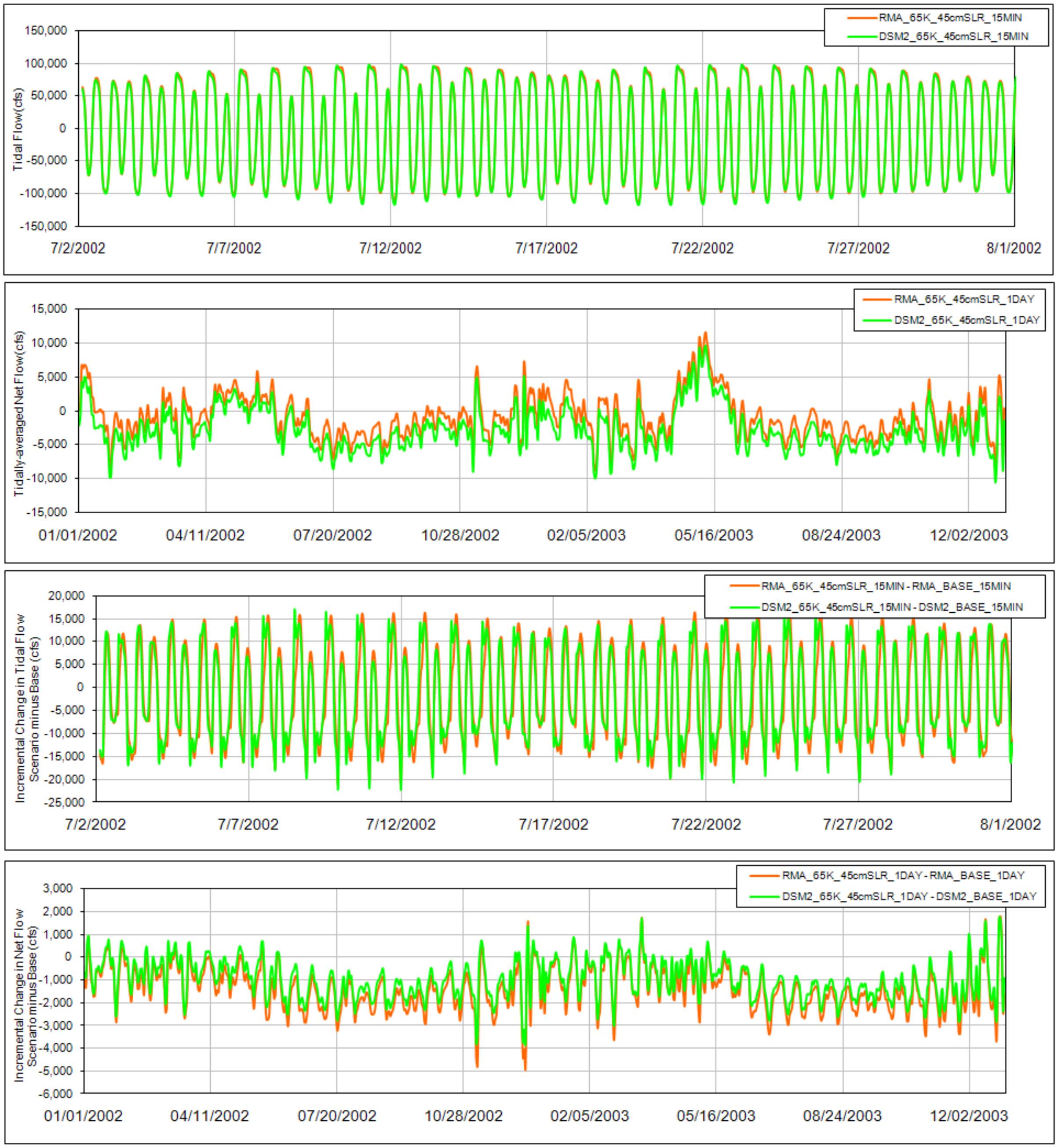



Figure 48: Comparison of Tidal Flow, Tidally-Averaged Daily Flow, Incremental Change in Tidal Flow and the Incremental Change in the Daily Flow between the Integrated Late Long-term Scenario and the Current Conditions Scenario from RMA Model and DSM2 Model for San Joaquin River at San Andreas Location

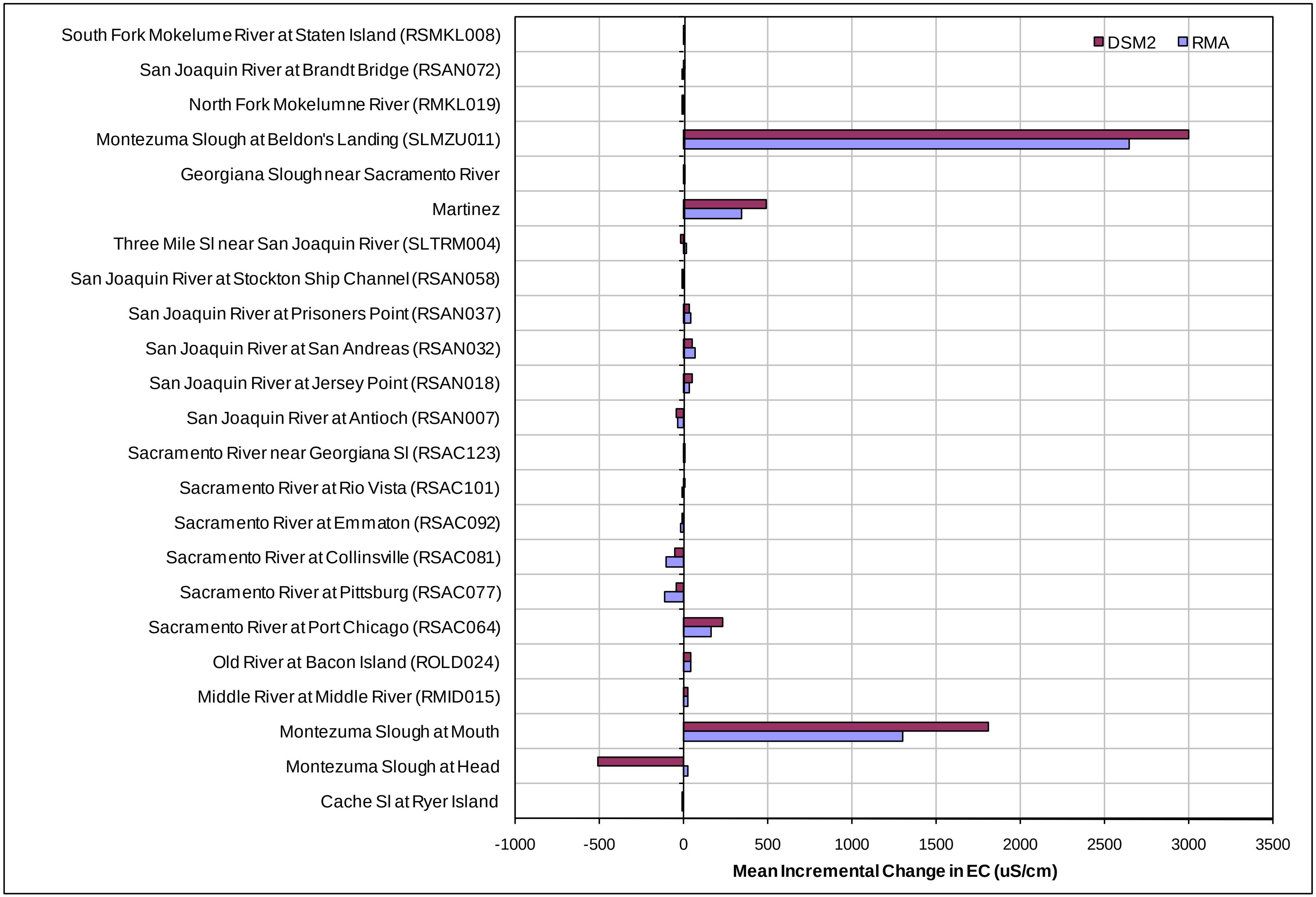



Figure 49: Comparison of average incremental change in tidally averaged EC in Integrated Early Long-Term scenario from the baseline between DSM2 and RMA

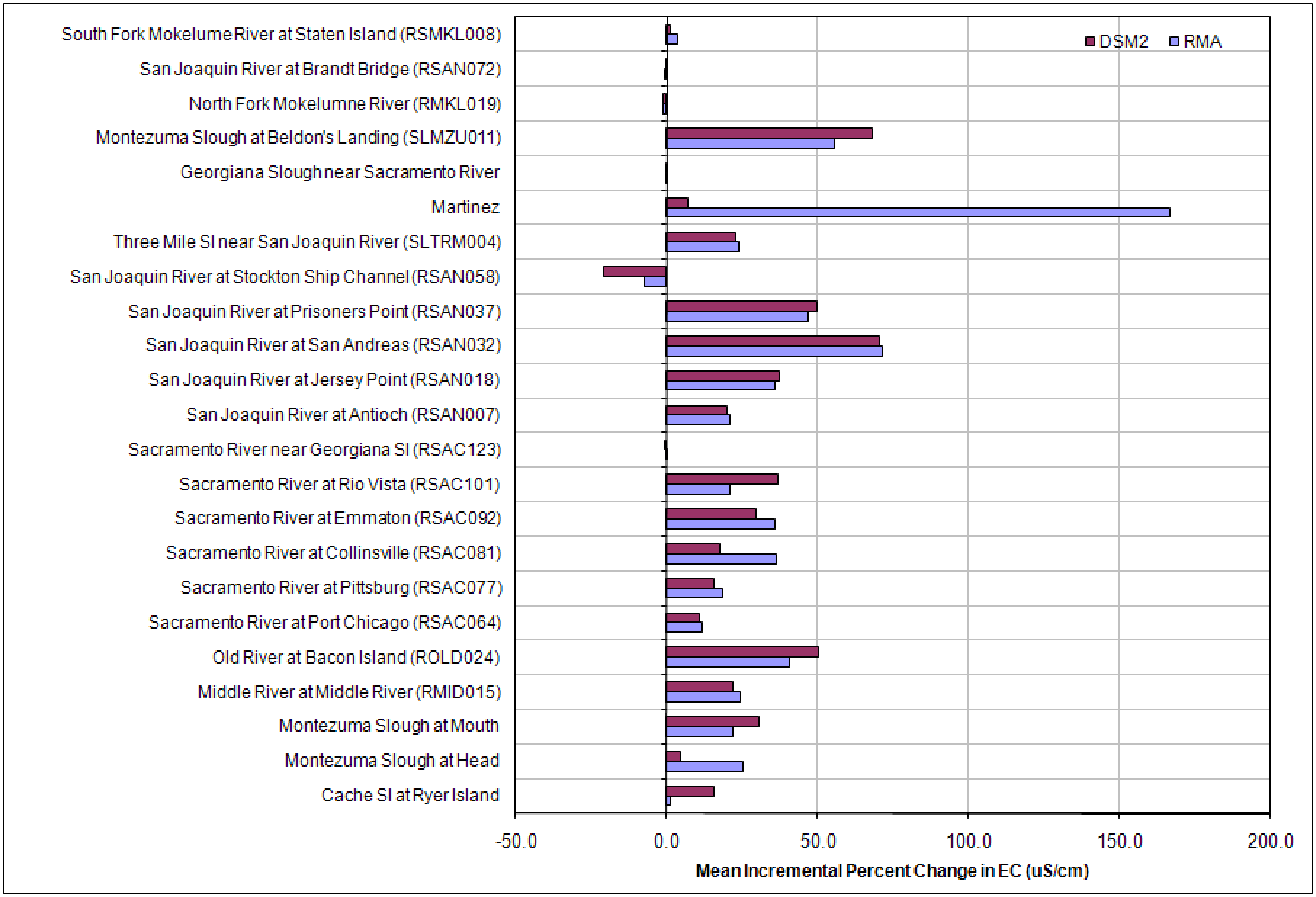



Figure 50: Comparison of average incremental change in tidally averaged EC in Integrated Late Long-Term scenario from the baseline between DSM2 and RMA

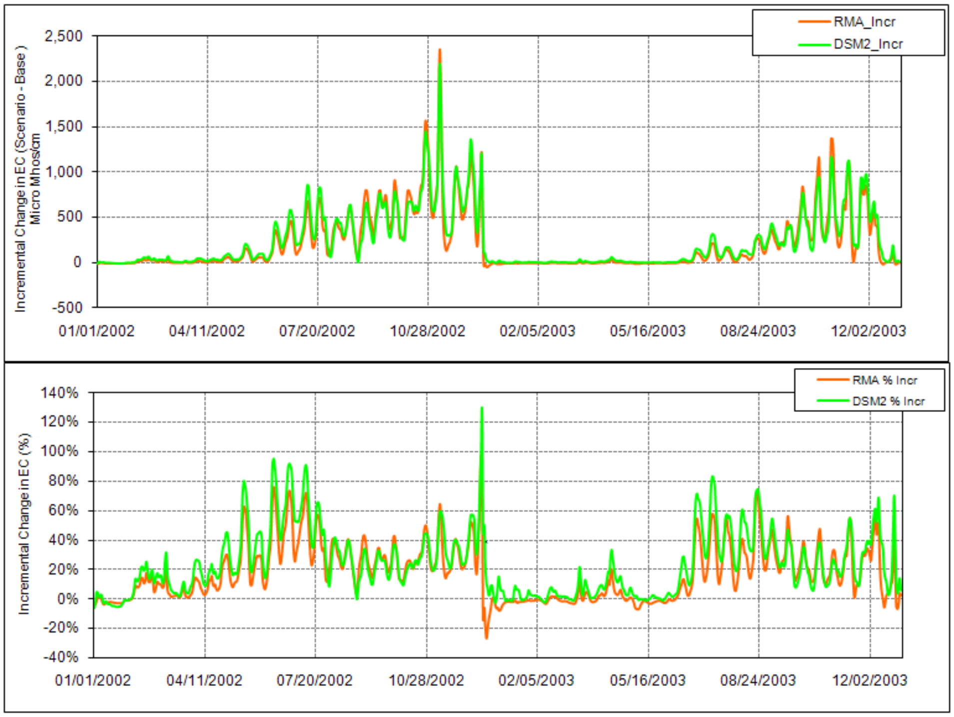



Figure 51: Comparison of Tidally-Averaged Daily EC and the Incremental Change in the Daily EC between the Integrated Late Long-term Scenario and the Current Conditions Scenario from RMA Model and DSM2 Model for Sacramento River at Emmaton Location

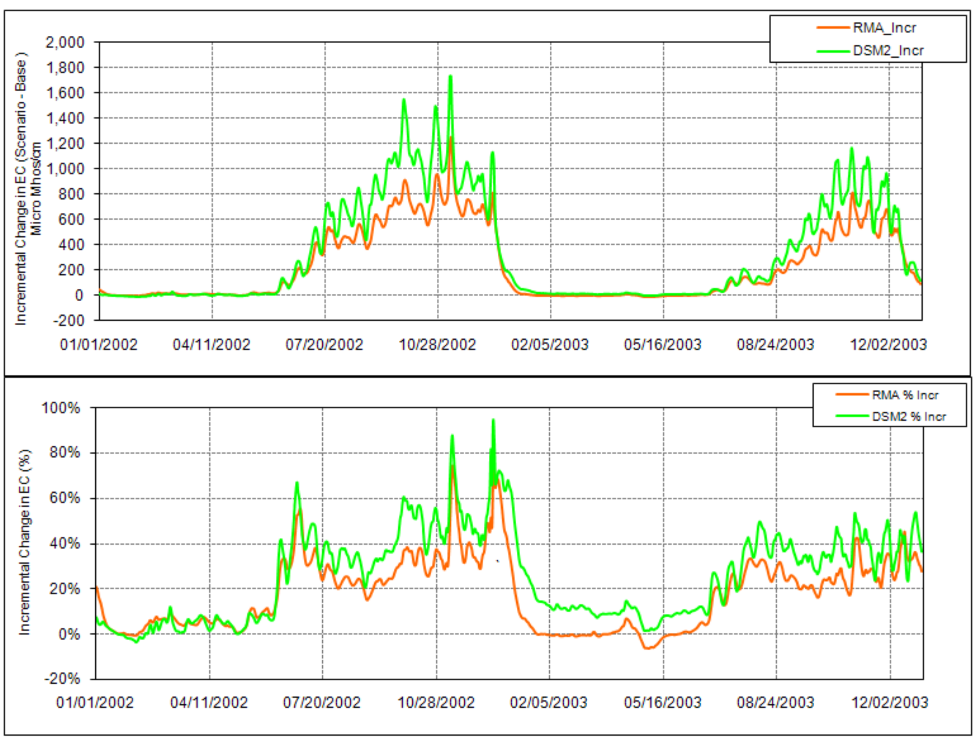



Figure 52: Comparison of Tidally-Averaged Daily EC and the Incremental Change in the Daily EC between the Integrated Late Long-term Scenario and the Current Conditions Scenario from RMA Model and DSM2 Model for San Joaquin River at Jersey Point Location

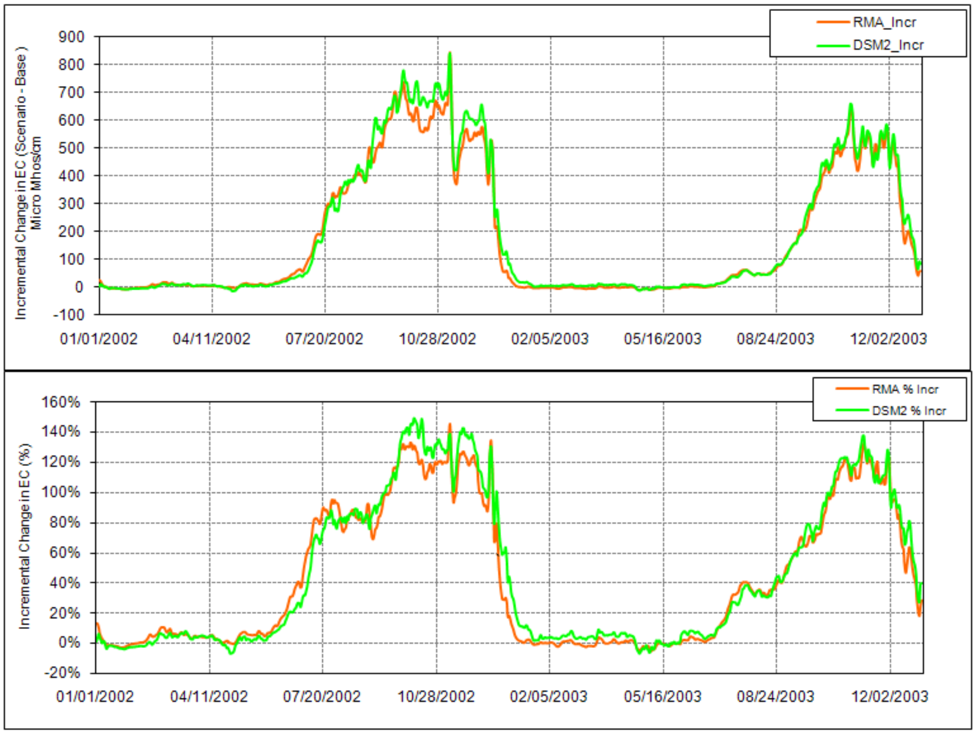



Figure 53: Comparison of Tidally-Averaged Daily EC and the Incremental Change in the Daily EC between the Integrated Late Long-term Scenario and the Current Conditions Scenario from RMA Model and DSM2 Model for San Joaquin River at San Andreas Location

# Attachment 1: Detailed Corroboration Results

# Near-Term 14,000ac Restoration Corroboration

## Hydrodynamics Results

**Figure 1-1. Comparison of Tidal Flow, Tidally-Averaged Daily Flow, Incremental Change in Tidal Flow and the Incremental Change in the Daily Flow between the Near-term Scenario and the Current Conditions Scenario from RMA Model and DSM2 Model for Cache Slough at Ryer Location**

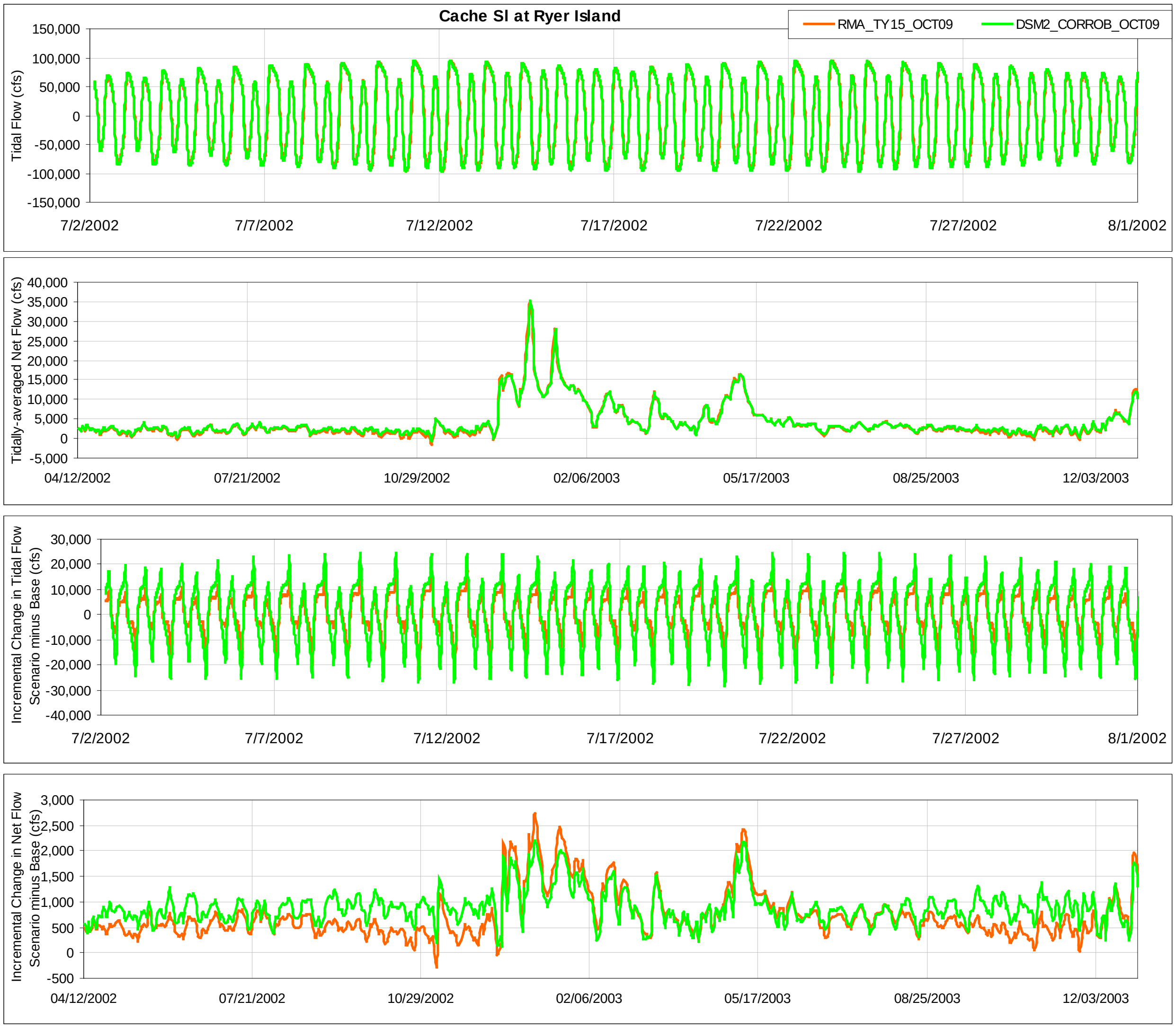


**Figure 1-2. Comparison of Tidal Flow, Tidally-Averaged Daily Flow, Incremental Change in Tidal Flow and the Incremental Change in the Daily Flow between the Near-Term Scenario and the Current Conditions Scenario from RMA Model and DSM2 Model for Sacramento River at Rio Vista Location**

**Figure 1-3. Comparison of Tidal Flow, Tidally-Averaged Daily Flow, Incremental Change in Tidal Flow and the Incremental Change in the Daily Flow between the Near-Term Scenario and the Current Conditions Scenario from RMA Model and DSM2 Model for Georgiana Sl at Head Location**

**Figure 1-4. Comparison of Tidal Flow, Tidally-Averaged Daily Flow, Incremental Change in Tidal Flow and the Incremental Change in the Daily Flow between the Near-Term Scenario and the Current Conditions Scenario from RMA Model and DSM2 Model for Sacramento River at Emmaton Location**

**Figure 1-5. Comparison of Tidal Flow, Tidally-Averaged Daily Flow, Incremental Change in Tidal Flow and the Incremental Change in the Daily Flow between the Near-Term Scenario and the Current Conditions Scenario from RMA Model and DSM2 Model for Montezuma Sl at Head Location**

**Figure 1-6. Comparison of Tidal Flow, Tidally-Averaged Daily Flow, Incremental Change in Tidal Flow and the Incremental Change in the Daily Flow between the Near-Term Scenario and the Current Conditions Scenario from RMA Model and DSM2 Model for Montezuma Sl at Mouth Location**

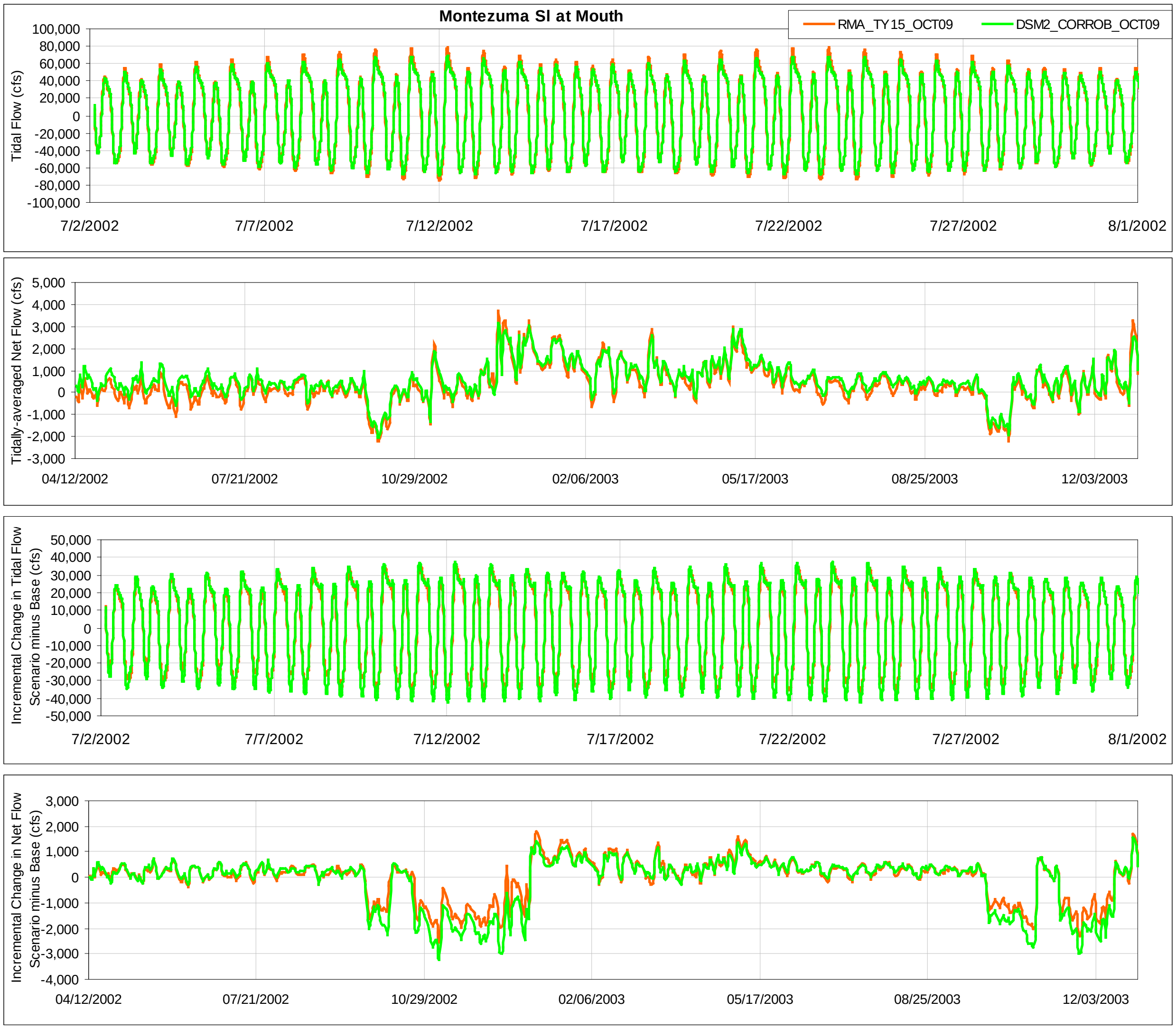


**Figure 1-7. Comparison of Tidal Flow, Tidally-Averaged Daily Flow, Incremental Change in Tidal Flow and the Incremental Change in the Daily Flow between the Near-Term Scenario and the Current Conditions Scenario from RMA Model and DSM2 Model for Threemile Sl at San Joaquin River Location**

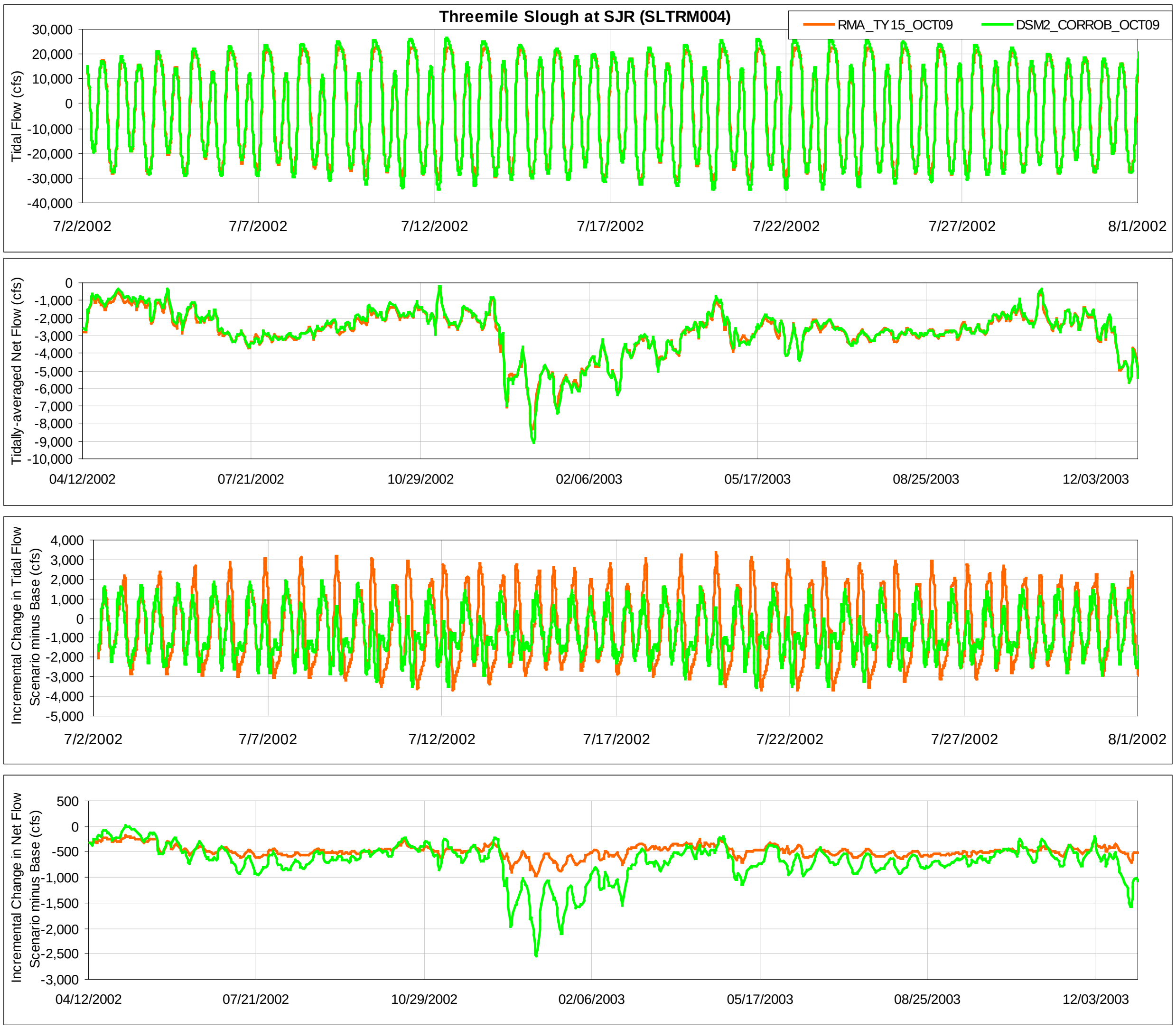


**Figure 1-8. Comparison of Tidal Flow, Tidally-Averaged Daily Flow, Incremental Change in Tidal Flow and the Incremental Change in the Daily Flow between the Near-Term Scenario and the Current Conditions Scenario from RMA Model and DSM2 Model for San Joaquin River at Jersey Point Location**

**Figure 1-9. Comparison of Tidal Flow, Tidally-Averaged Daily Flow, Incremental Change in Tidal Flow and the Incremental Change in the Daily Flow between the Near-Term Scenario and the Current Conditions Scenario from RMA Model and DSM2 Model for San Joaquin River at San Andreas Location**

**Figure 1-10. Comparison of Tidal Flow, Tidally-Averaged Daily Flow, Incremental Change in Tidal Flow and the Incremental Change in the Daily Flow between the Near-Term Scenario and the Current Conditions Scenario from RMA Model and DSM2 Model for San Joaquin River at Prisoners Point Location**

**Figure 1-11. Comparison of Tidal Flow, Tidally-Averaged Daily Flow, Incremental Change in Tidal Flow and the Incremental Change in the Daily Flow between the Near-Term Scenario and the Current Conditions Scenario from RMA Model and DSM2 Model for San Joaquin River at Stockton Location**

**Figure 1-12. Comparison of Tidal Flow, Tidally-Averaged Daily Flow, Incremental Change in Tidal Flow and the Incremental Change in the Daily Flow between the Near-Term Scenario and the Current Conditions Scenario from RMA Model and DSM2 Model for Mokelumne River near San Joaquin River Location**

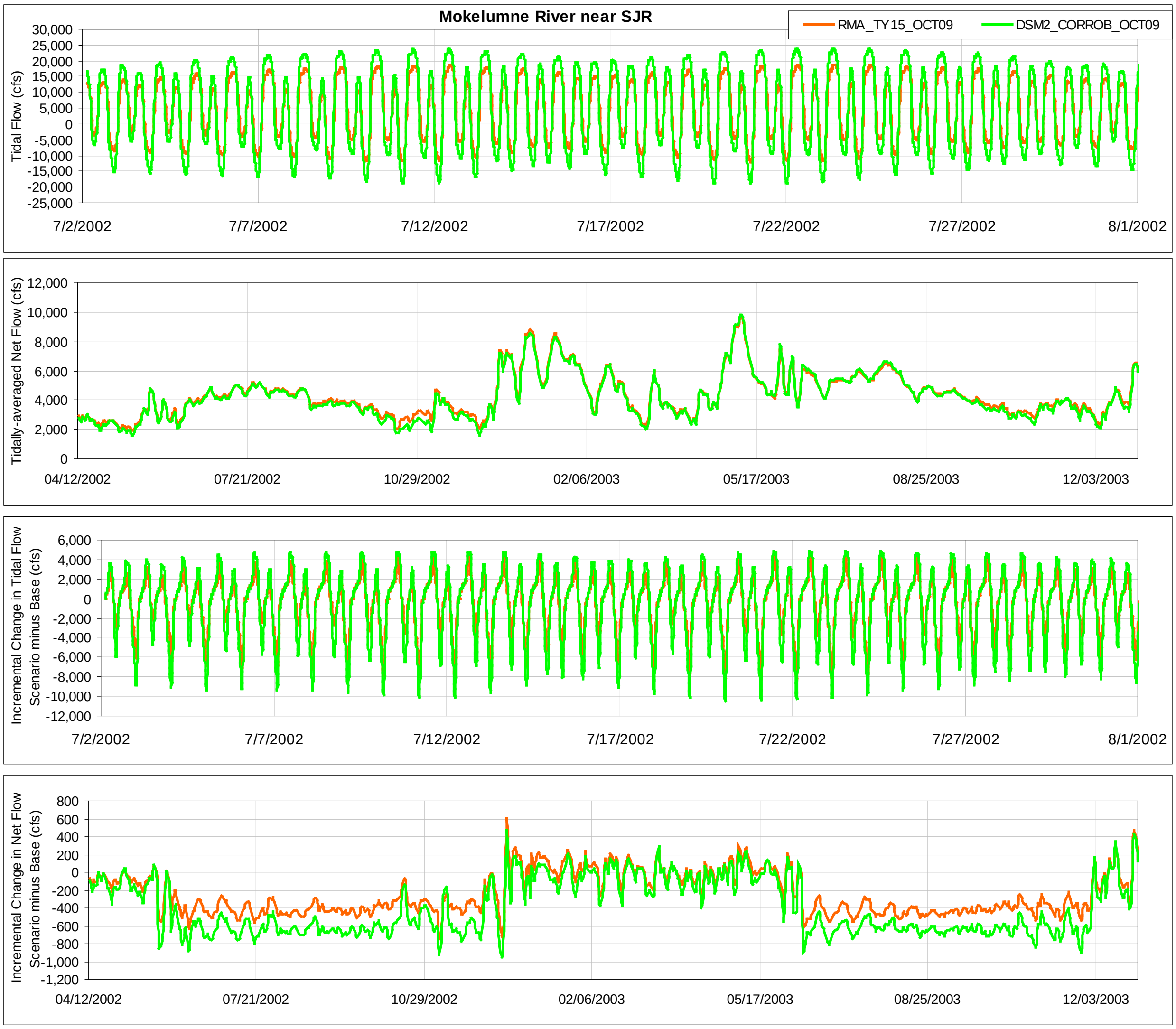


**Figure 1-13. Comparison of Tidal Flow, Tidally-Averaged Daily Flow, Incremental Change in Tidal Flow and the Incremental Change in the Daily Flow between the Near-Term Scenario and the Current Conditions Scenario from RMA Model and DSM2 Model for Middle River at Bacon Island Location**

**Figure 1-14. Comparison of Tidal Flow, Tidally-Averaged Daily Flow, Incremental Change in Tidal Flow and the Incremental Change in the Daily Flow between the Near-Term Scenario and the Current Conditions Scenario from RMA Model and DSM2 Model for Old River at Bacon Island Location**

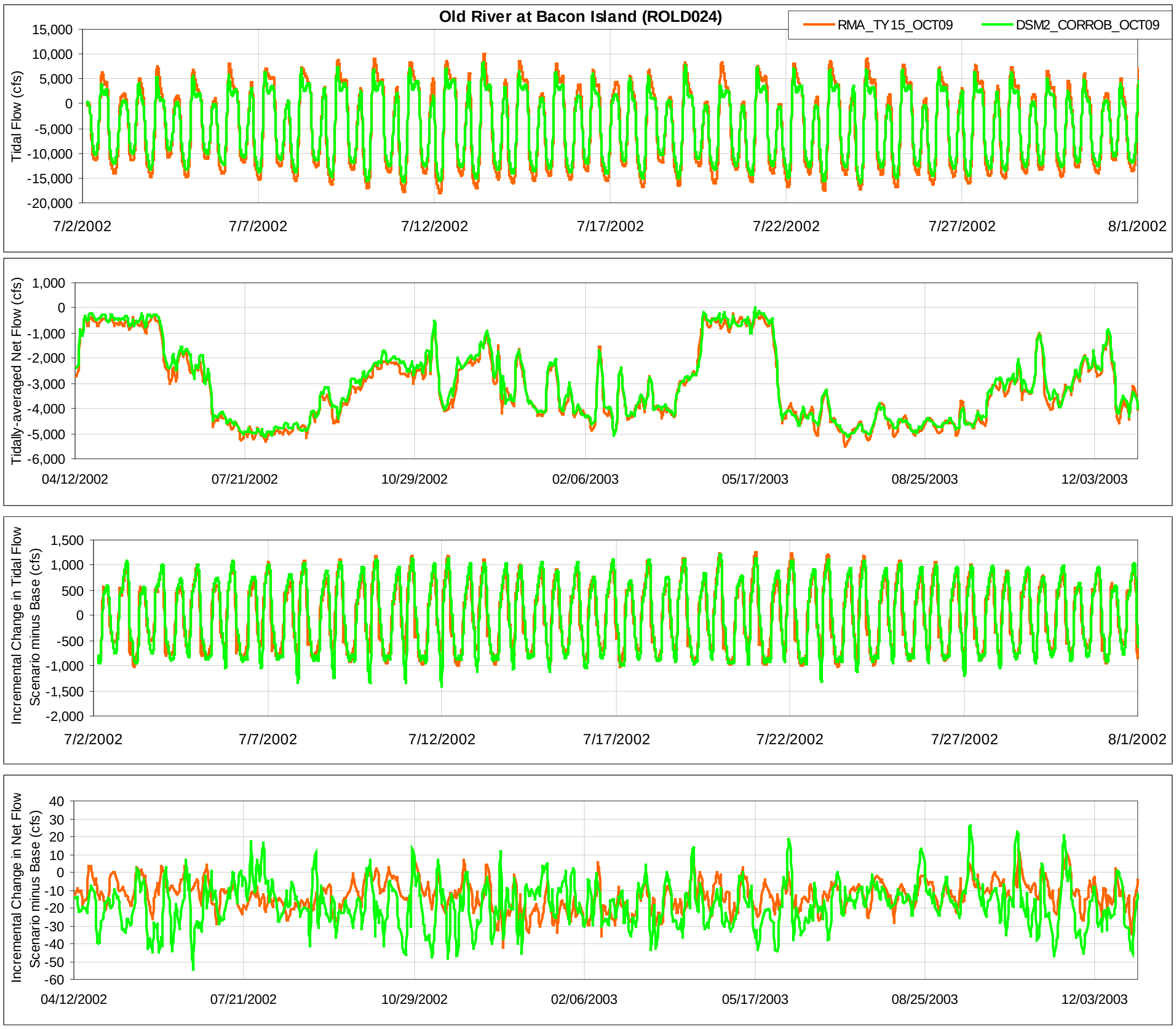


**Figure 1-15. Comparison of Tidal Flow, Tidally-Averaged Daily Flow, Incremental Change in Tidal Flow and the Incremental Change in the Daily Flow between the Near-Term Scenario and the Current Conditions Scenario from RMA Model and DSM2 Model for Prospect Island North Breach under Cache SI Region**

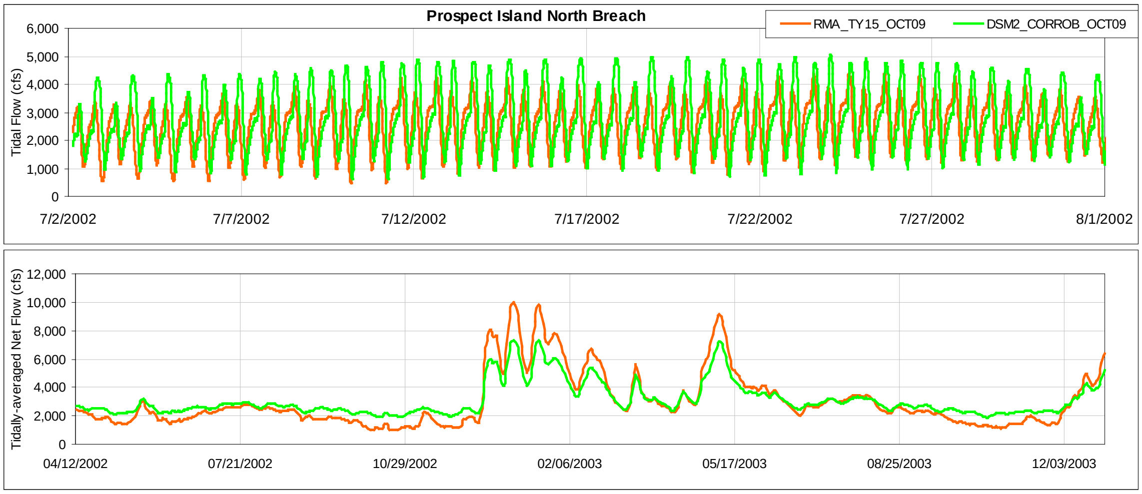



**Figure 1-16. Comparison of Tidal Flow, Tidally-Averaged Daily Flow, Incremental Change in Tidal Flow and the Incremental Change in the Daily Flow between the Near-Term Scenario and the Current Conditions Scenario from RMA Model and DSM2 Model for Calhoun Cut Breach under Cache SI Region**

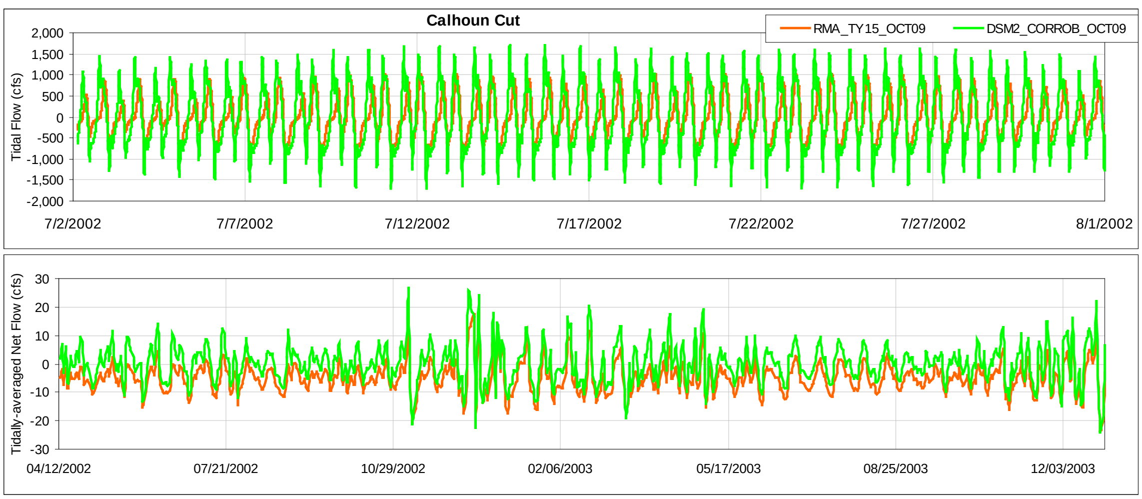


**Figure 1-17. Comparison of Tidal Flow, Tidally-Averaged Daily Flow, Incremental Change in Tidal Flow and the Incremental Change in the Daily Flow between the Near-Term Scenario and the Current Conditions Scenario from RMA Model and DSM2 Model for Shag Sl Breach under Cache Sl Region**

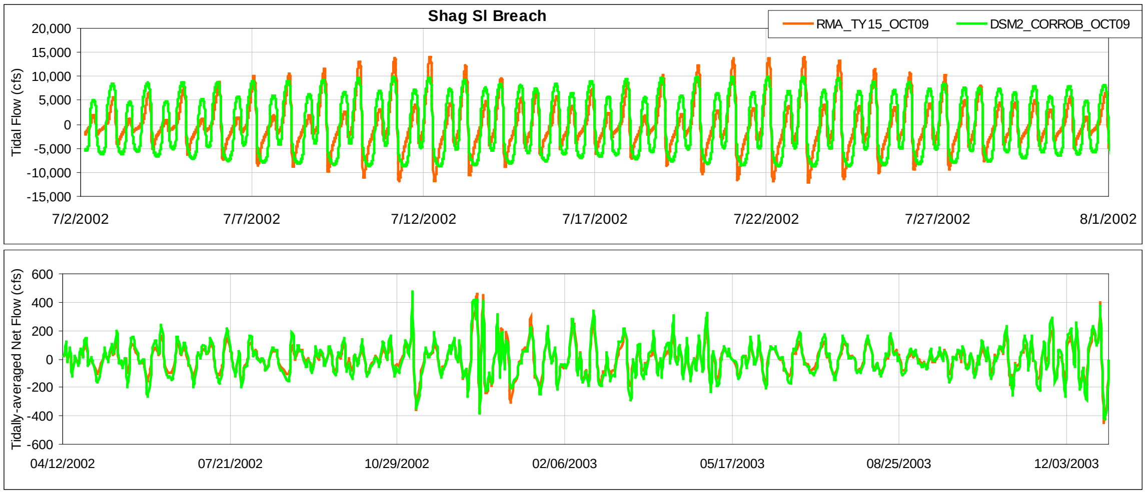



**Figure 1-18. Comparison of Tidal Flow, Tidally-Averaged Daily Flow, Incremental Change in Tidal Flow and the Incremental Change in the Daily Flow between the Near-Term Scenario and the Current Conditions Scenario from RMA Model and DSM2 Model for Island 10 Breach 3 under Suisun Marsh Region**

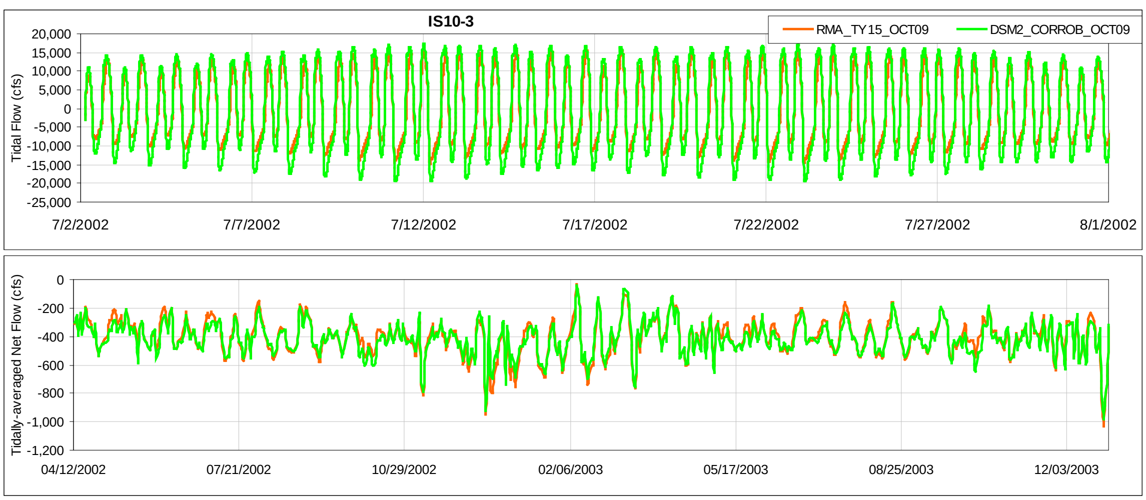


**Figure 1-19. Comparison of Tidal Flow, Tidally-Averaged Daily Flow, Incremental Change in Tidal Flow and the Incremental Change in the Daily Flow between the Near-Term Scenario and the Current Conditions Scenario from RMA Model and DSM2 Model for Island 5 Breach 1 under Suisun Marsh Region**

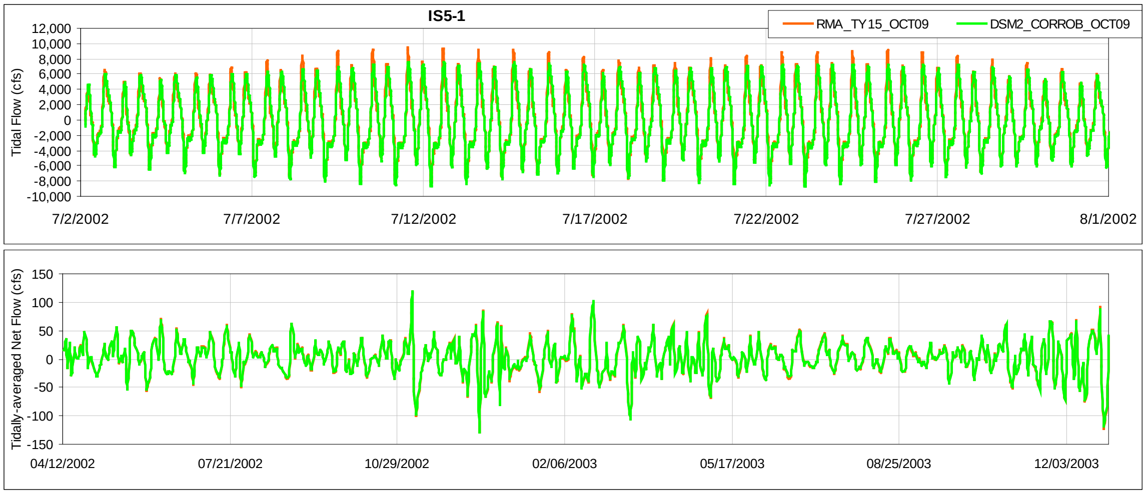



**Figure 1-20. Comparison of Tidal Flow, Tidally-Averaged Daily Flow, Incremental Change in Tidal Flow and the Incremental Change in the Daily Flow between the Near-Term Scenario and the Current Conditions Scenario from RMA Model and DSM2 Model for Montezuma Wetlands breaches under Suisun Marsh Region**

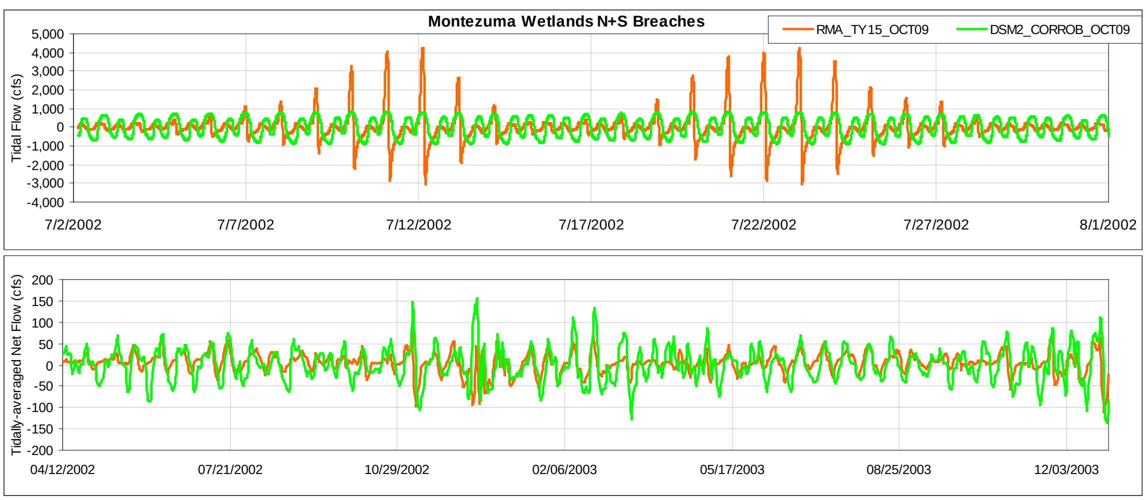


**Figure 1-21. Comparison of Tidal Flow, Tidally-Averaged Daily Flow, Incremental Change in Tidal Flow and the Incremental Change in the Daily Flow between the Near-Term Scenario and the Current Conditions Scenario from RMA Model and DSM2 Model for Decker Island North West Breach under West Delta Region**

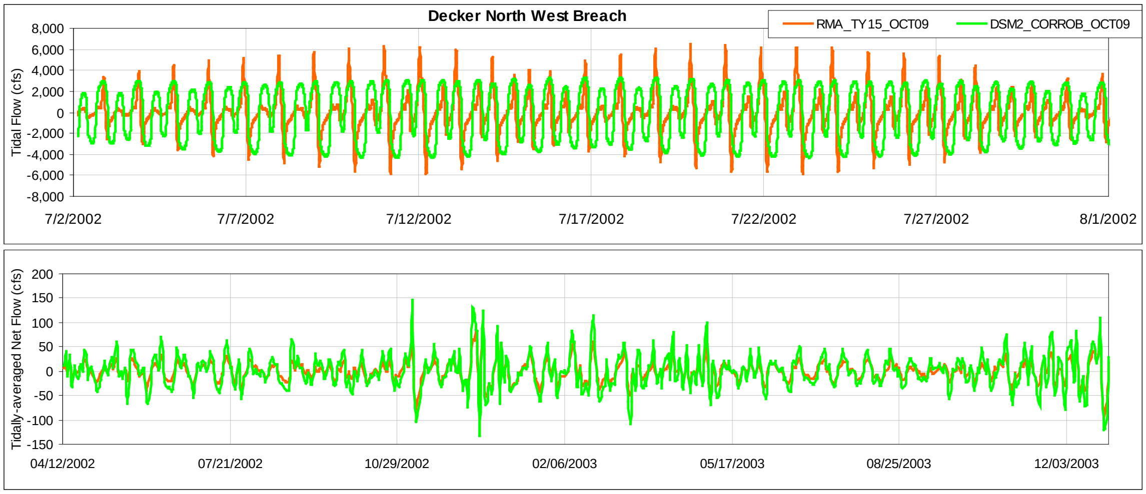



**Figure 1-22. Comparison of Tidal Flow, Tidally-Averaged Daily Flow, Incremental Change in Tidal Flow and the Incremental Change in the Daily Flow between the Near-Term Scenario and the Current Conditions Scenario from RMA Model and DSM2 Model for Dutch Sl d/s of Emerson Sl under West Delta Region**

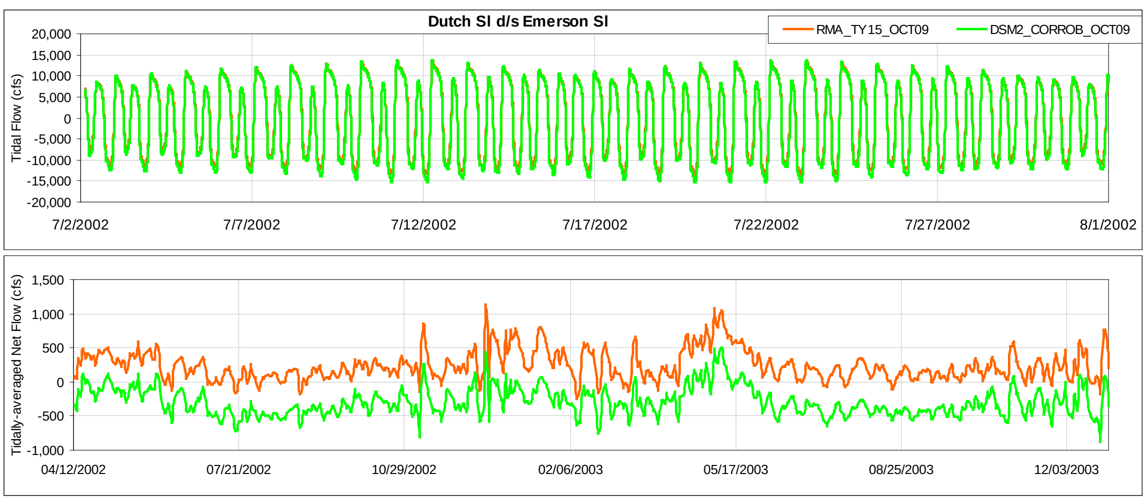


**Figure 1-23. Comparison of Tidal Flow, Tidally-Averaged Daily Flow, Incremental Change in Tidal Flow and the Incremental Change in the Daily Flow between the Near-Term Scenario and the Current Conditions Scenario from RMA Model and DSM2 Model for Snodgrass Sl Breach under East Delta Region**

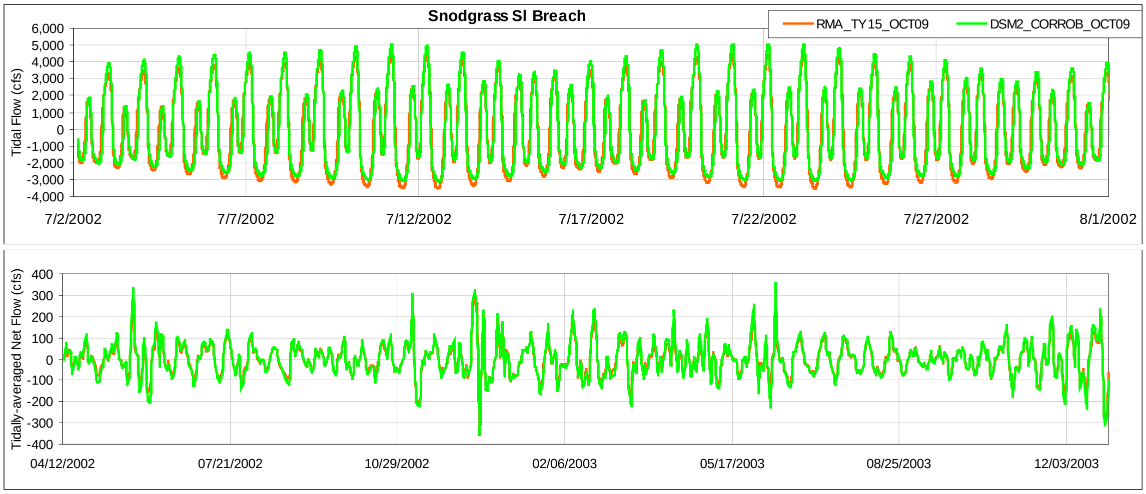
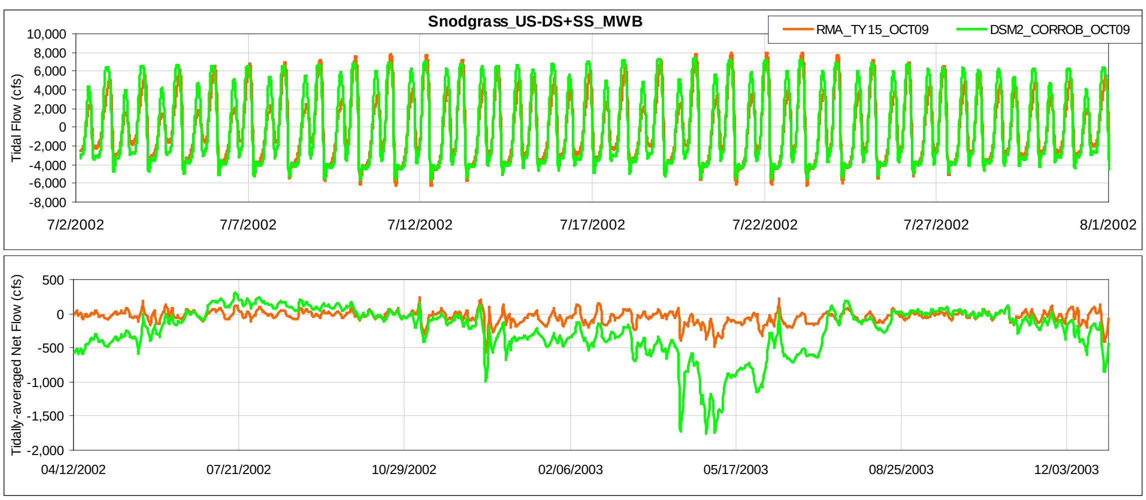



**Figure 1-24. Comparison of Tidal Flow, Tidally-Averaged Daily Flow, Incremental Change in Tidal Flow and the Incremental Change in the Daily Flow between the Near-Term Scenario and the Current Conditions Scenario from RMA Model and DSM2 Model for channel d/s of Snodgrass Sl Breach under East Delta Region**



# Near-Term 14,000ac Restoration Corroboration

## Salinity Results

**Figure 1-25. Comparison of Tidally-Averaged Daily EC and the Incremental Change in the Daily EC between the Near-term Scenario and the Current Conditions Scenario from RMA Model and DSM2 Model for Montezuma Sl at Mouth Location**

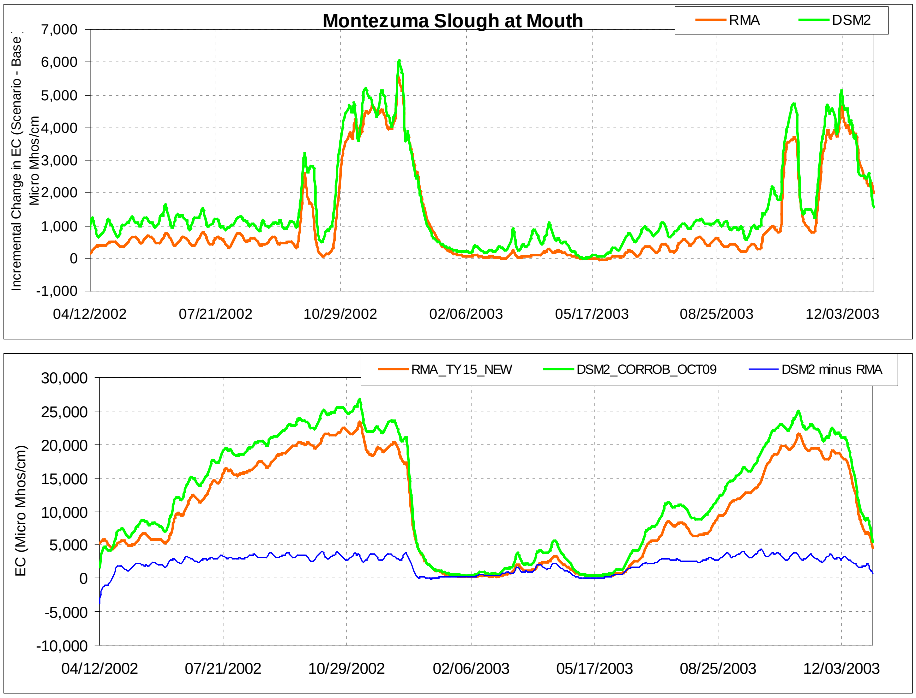


**Figure 1-26. Comparison of Tidally-Averaged Daily EC and the Incremental Change in the Daily EC between the Near-term Scenario and the Current Conditions Scenario from RMA Model and DSM2 Model for Montezuma Sl at Beldon's Landing Location**

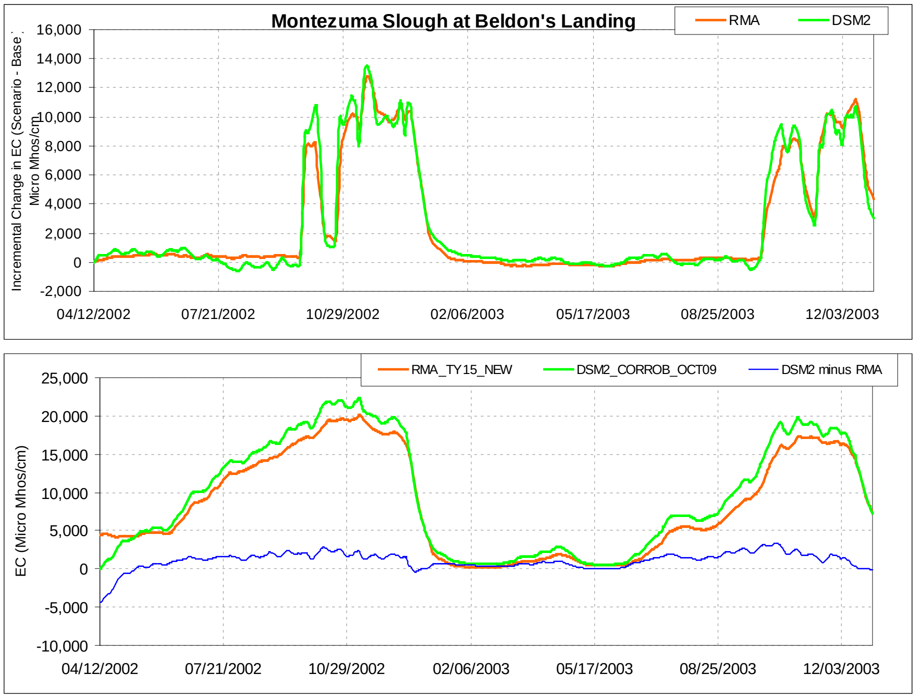



**Figure 1-27. Comparison of Tidally-Averaged Daily EC and the Incremental Change in the Daily EC between the Near-term Scenario and the Current Conditions Scenario from RMA Model and DSM2 Model for Montezuma Sl at Head Location**

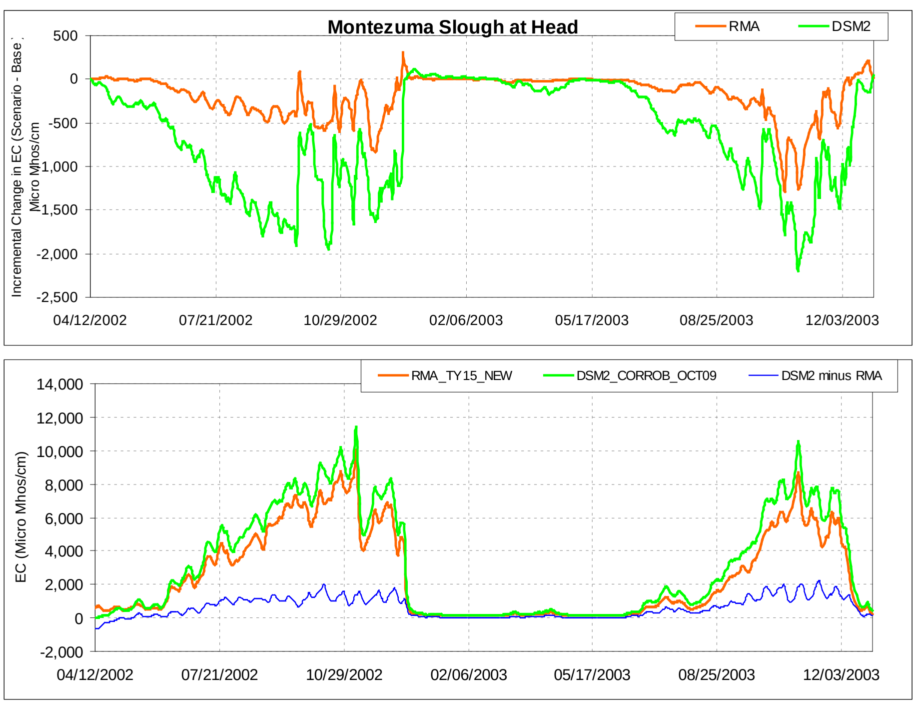


**Figure 1-28. Comparison of Tidally-Averaged Daily EC and the Incremental Change in the Daily EC between the Near-term Scenario and the Current Conditions Scenario from RMA Model and DSM2 Model for Sacramento River at Port Chicago Location**

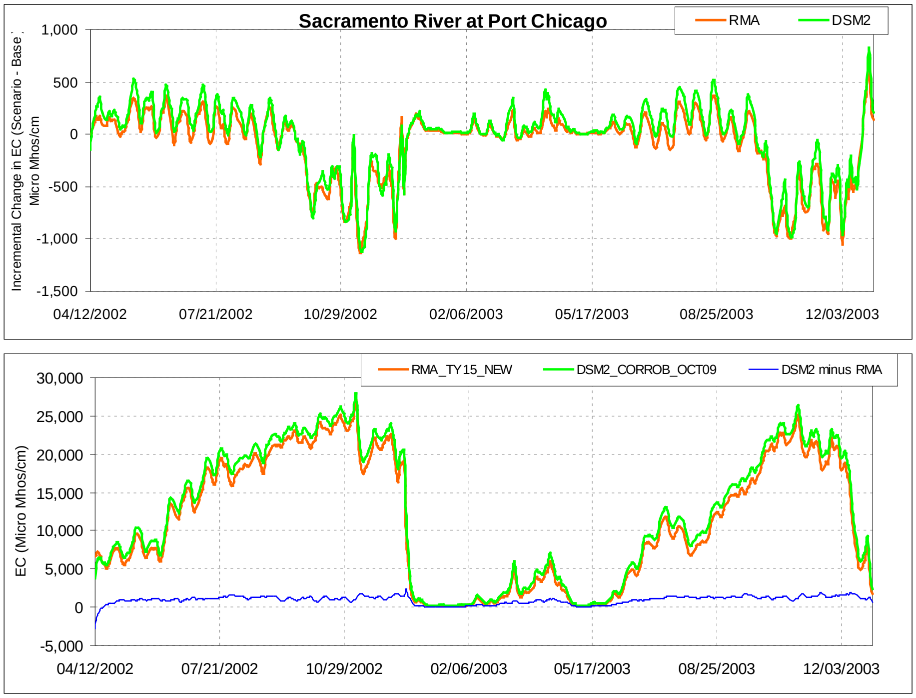



**Figure 1-29. Comparison of Tidally-Averaged Daily EC and the Incremental Change in the Daily EC between the Near-term Scenario and the Current Conditions Scenario from RMA Model and DSM2 Model for Sacramento River at Collinsville Location**

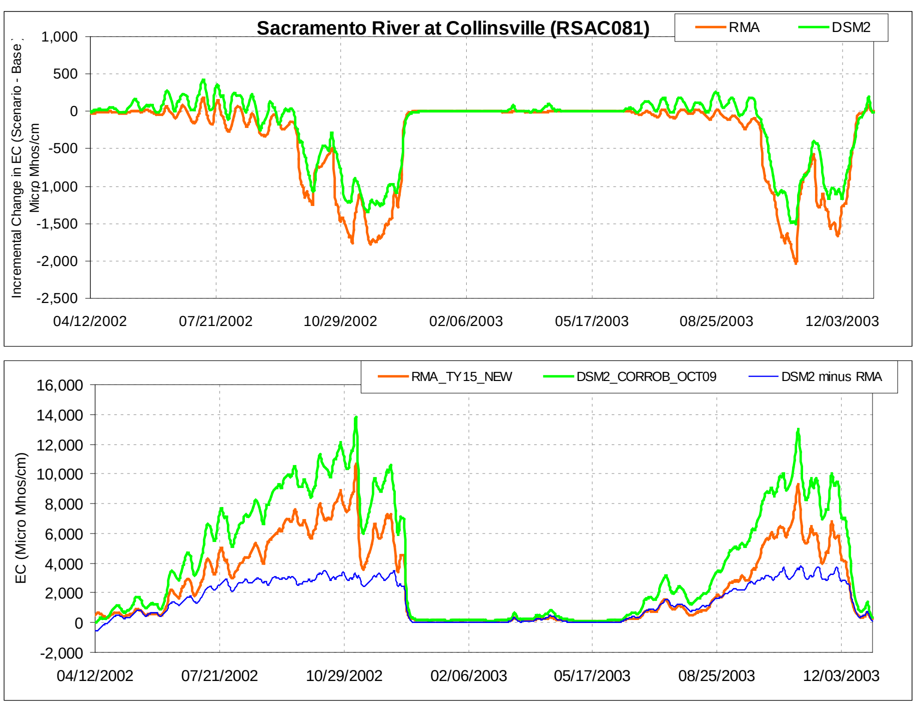


**Figure 1-30. Comparison of Tidally-Averaged Daily EC and the Incremental Change in the Daily EC between the Near-term Scenario and the Current Conditions Scenario from RMA Model and DSM2 Model for Sacramento River at Emmaton Location**

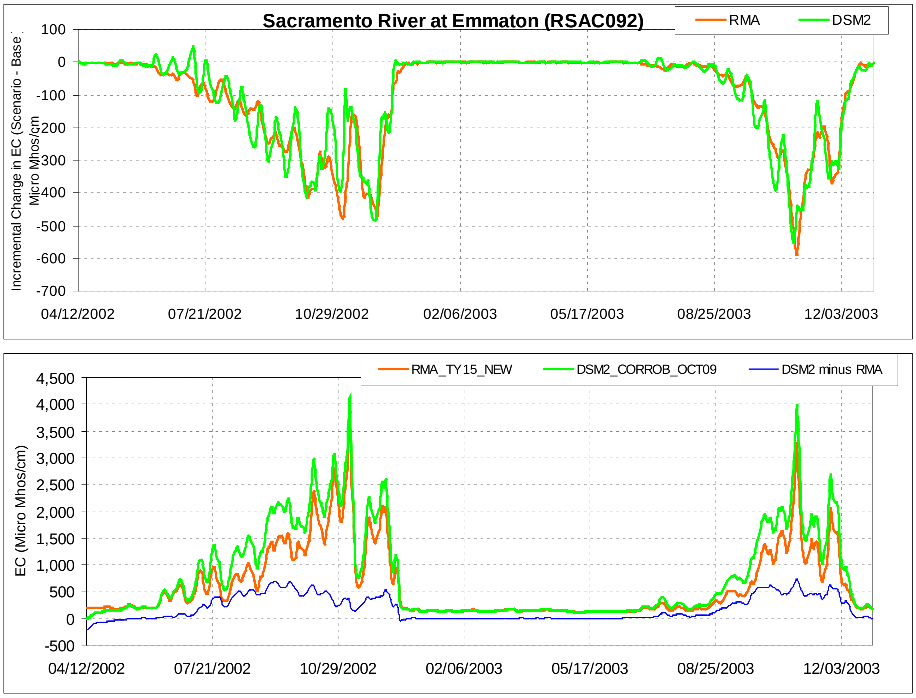



**Figure 1-31. Comparison of Tidally-Averaged Daily EC and the Incremental Change in the Daily EC between the Near-term Scenario and the Current Conditions Scenario from RMA Model and DSM2 Model for Sacramento River at Rio Vista Location**

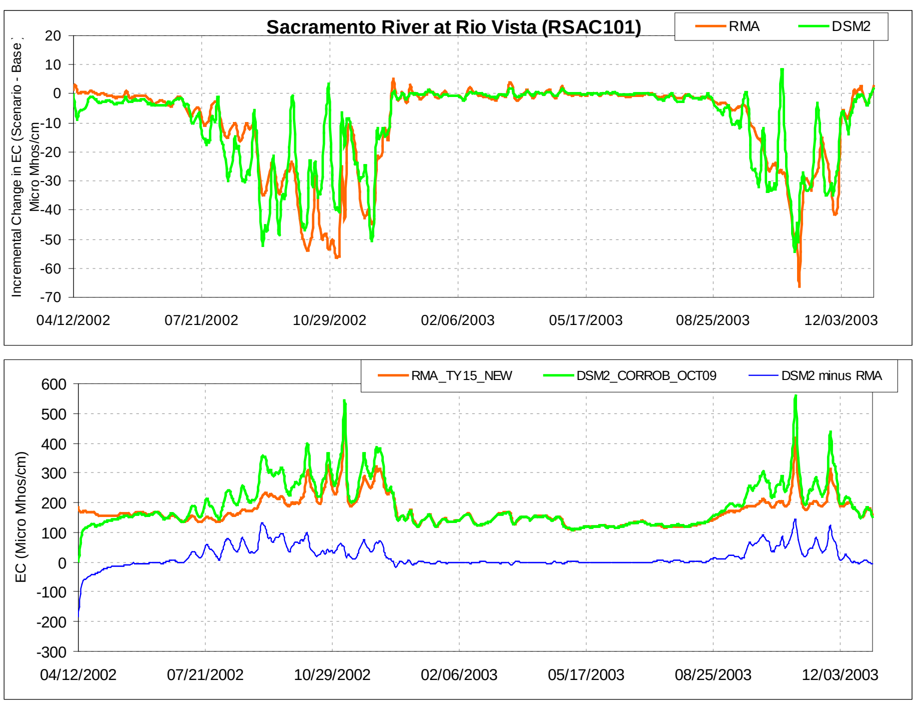


**Figure 1-32. Comparison of Tidally-Averaged Daily EC and the Incremental Change in the Daily EC between the Near-term Scenario and the Current Conditions Scenario from RMA Model and DSM2 Model for Cache sl at Ryer Island Location**

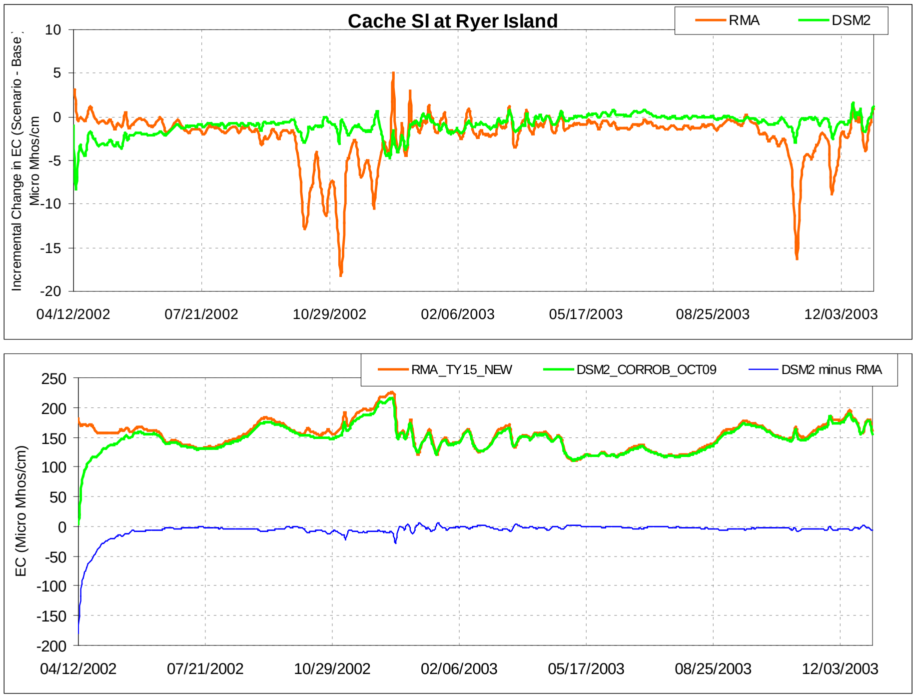



**Figure 1-33. Comparison of Tidally-Averaged Daily EC and the Incremental Change in the Daily EC between the Near-term Scenario and the Current Conditions Scenario from RMA Model and DSM2 Model for Threemile Sl near San Joaquin River Location**

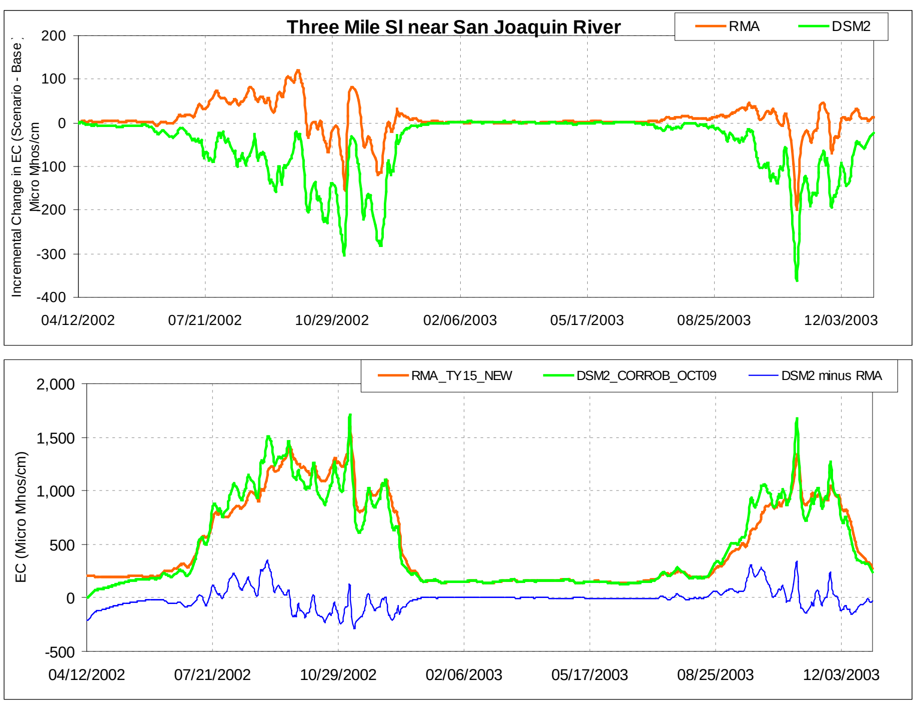


**Figure 1-34. Comparison of Tidally-Averaged Daily EC and the Incremental Change in the Daily EC between the Near-term Scenario and the Current Conditions Scenario from RMA Model and DSM2 Model for San Joaquin River at Jersey Point Location**

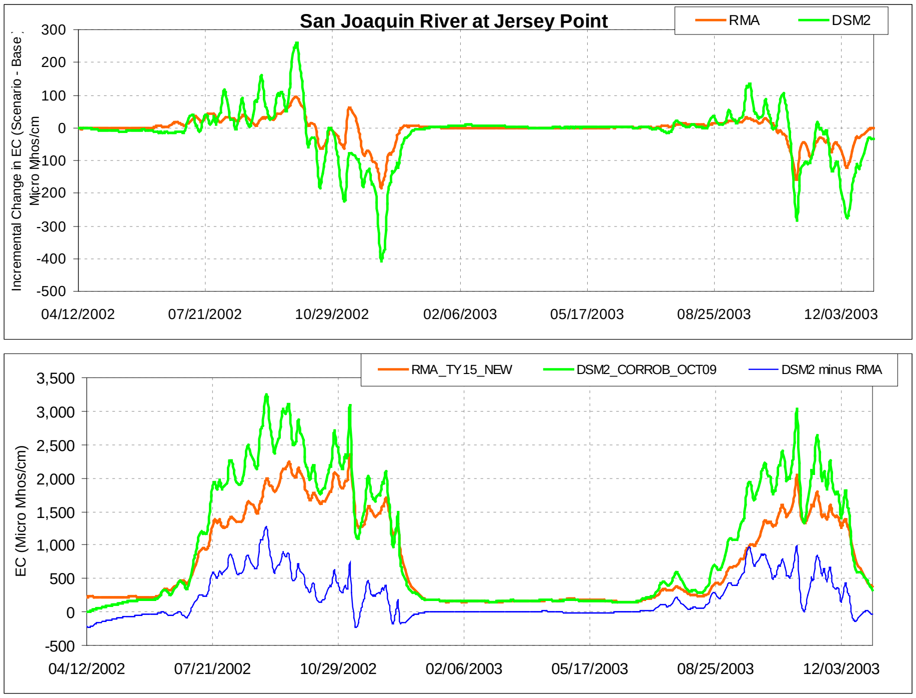



**Figure 1-35. Comparison of Tidally-Averaged Daily EC and the Incremental Change in the Daily EC between the Near-term Scenario and the Current Conditions Scenario from RMA Model and DSM2 Model for San Joaquin River at San Andreas Location**

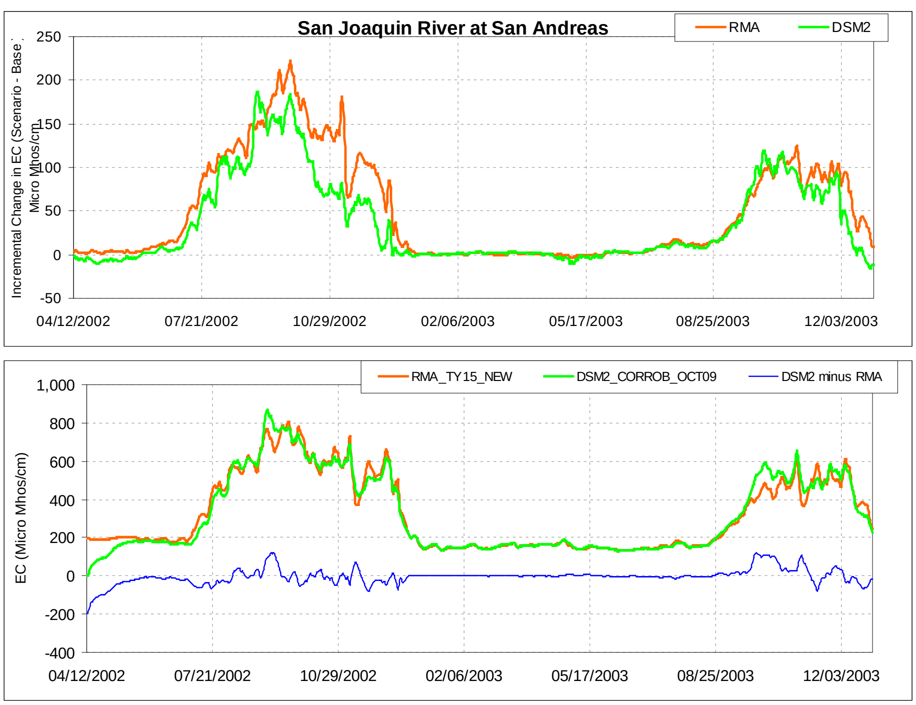


**Figure 1-36. Comparison of Tidally-Averaged Daily EC and the Incremental Change in the Daily EC between the Near-term Scenario and the Current Conditions Scenario from RMA Model and DSM2 Model for San Joaquin River at Prisoners Point Location**

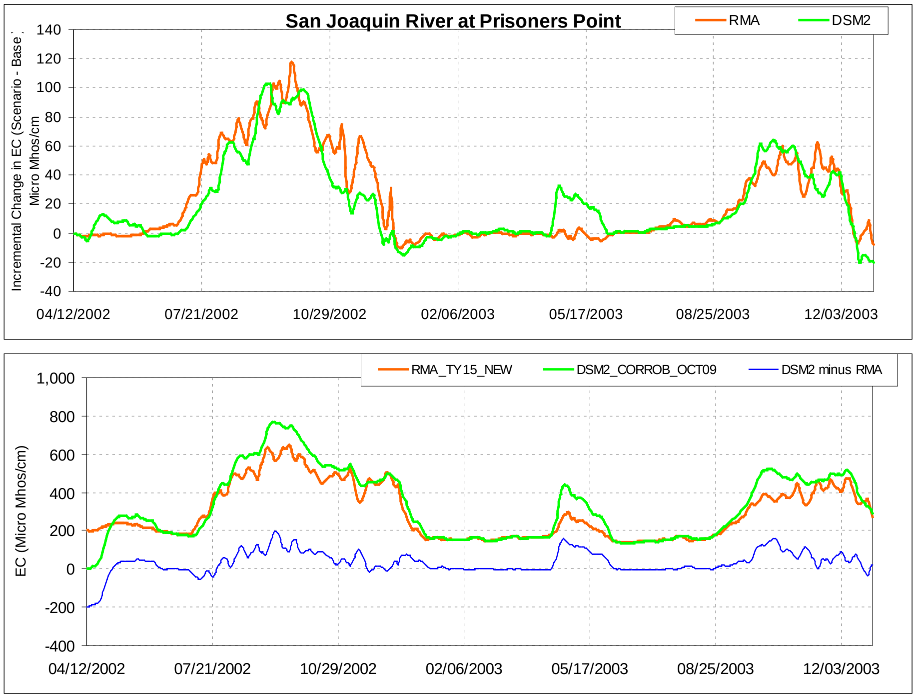



**Figure 1-37. Comparison of Tidally-Averaged Daily EC and the Incremental Change in the Daily EC between the Near-term Scenario and the Current Conditions Scenario from RMA Model and DSM2 Model for San Joaquin River at Stockton Location**

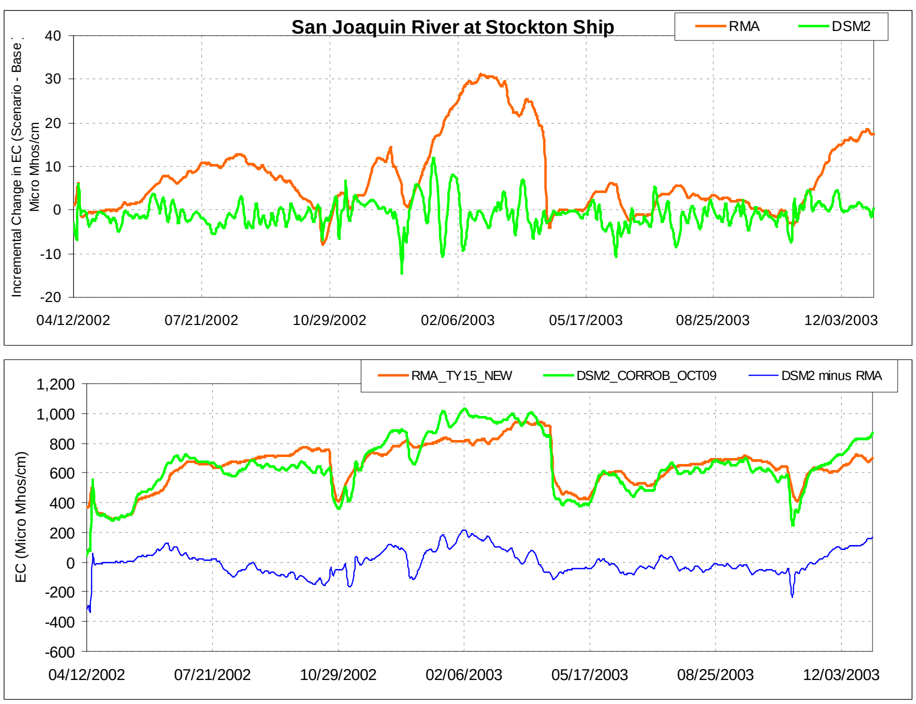


**Figure 1-38. Comparison of Tidally-Averaged Daily EC and the Incremental Change in the Daily EC between the Near-term Scenario and the Current Conditions Scenario from RMA Model and DSM2 Model for San Joaquin River at Brand Bridge Location**

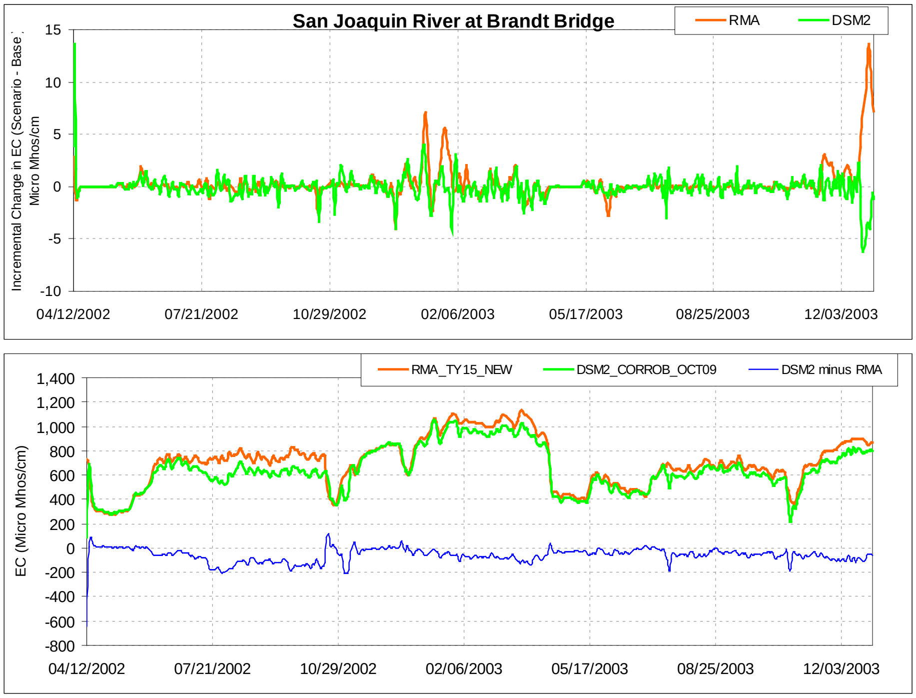



**Figure 1-40. Comparison of Tidally-Averaged Daily EC and the Incremental Change in the Daily EC between the Near-term Scenario and the Current Conditions Scenario from RMA Model and DSM2 Model for Middle River at Middle River Location**

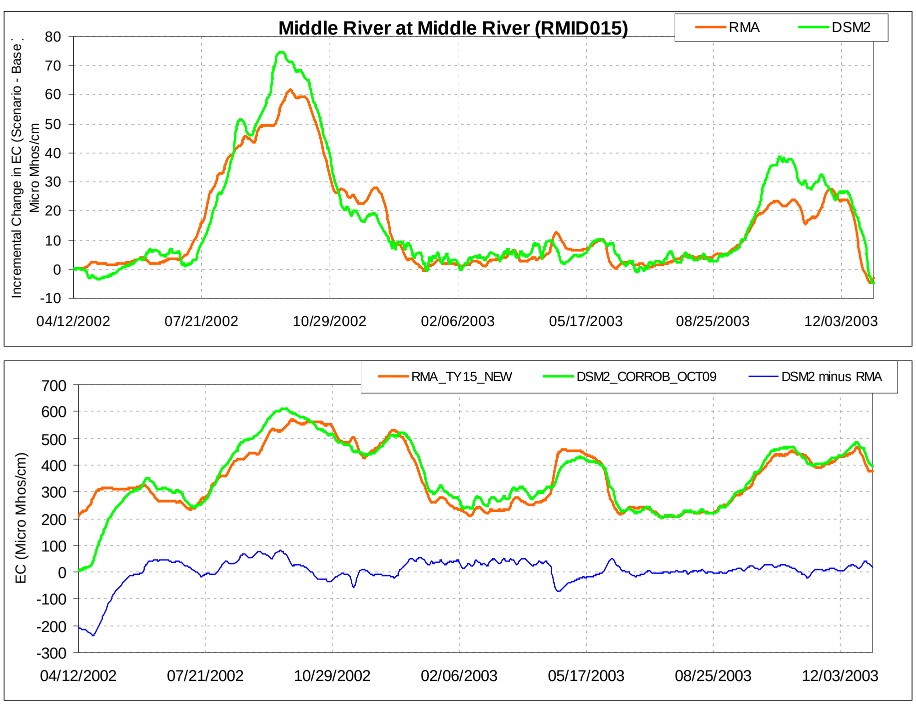
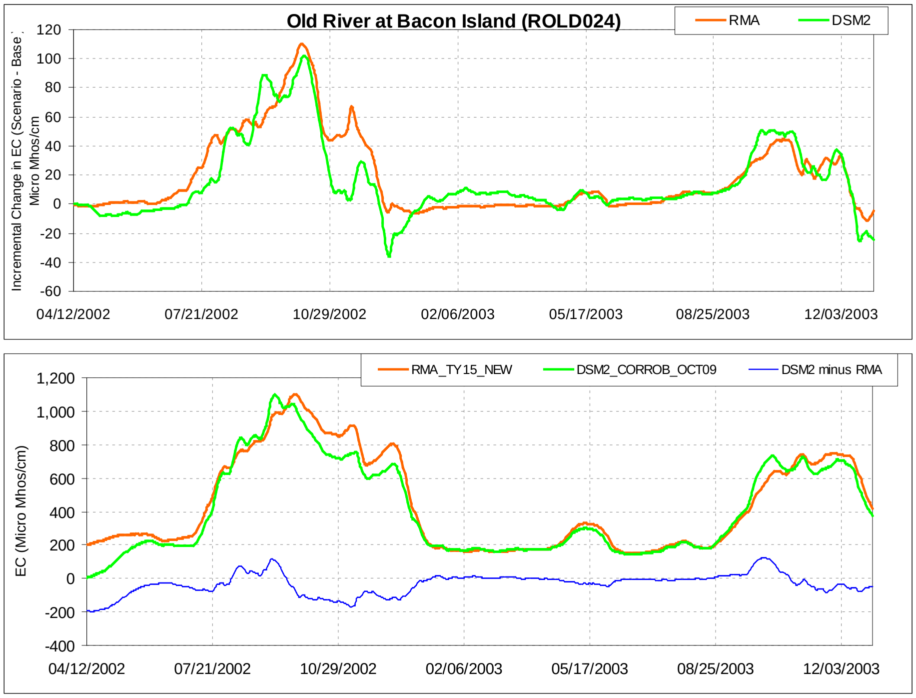


**Figure 1-41. Comparison of Tidally-Averaged Daily EC and the Incremental Change in the Daily EC between the Near-term Scenario and the Current Conditions Scenario from RMA Model and DSM2 Model for Old River at Bacon Island Location**



# Early Long-Term 25,000ac Restoration Corroboration

## Hydrodynamics Results

**Figure 1-42. Comparison of Tidal Flow, Tidally-Averaged Daily Flow, Incremental Change in Tidal Flow and the Incremental Change in the Daily Flow between the Early Long-term Scenario and the Current Conditions Scenario from RMA Model and DSM2 Model for Cache Slough at Ryer Location**

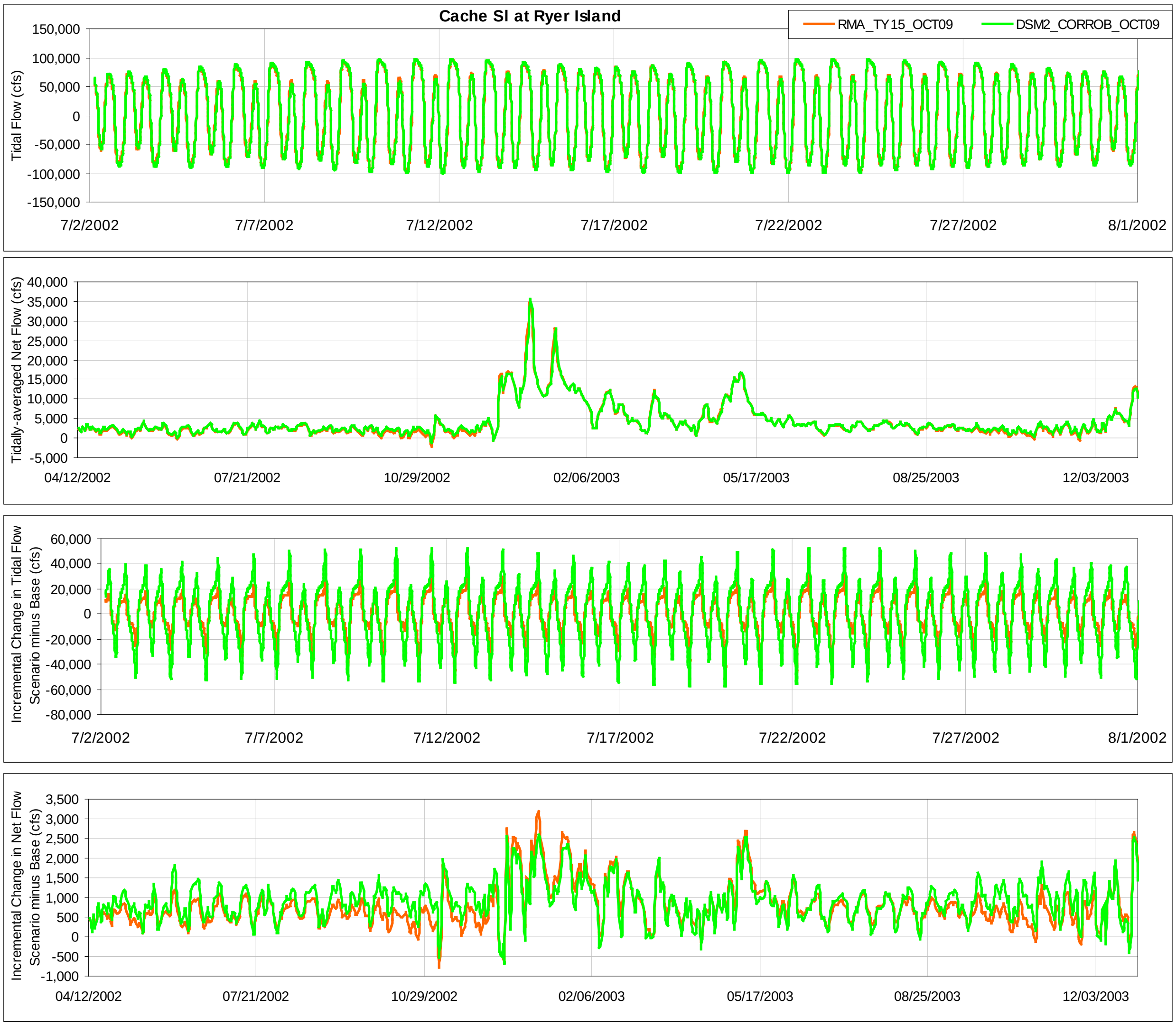


**Figure 1-43. Comparison of Tidal Flow, Tidally-Averaged Daily Flow, Incremental Change in Tidal Flow and the Incremental Change in the Daily Flow between the Early Long-term Scenario and the Current Conditions Scenario from RMA Model and DSM2 Model for Sacramento River at Rio Vista Location**

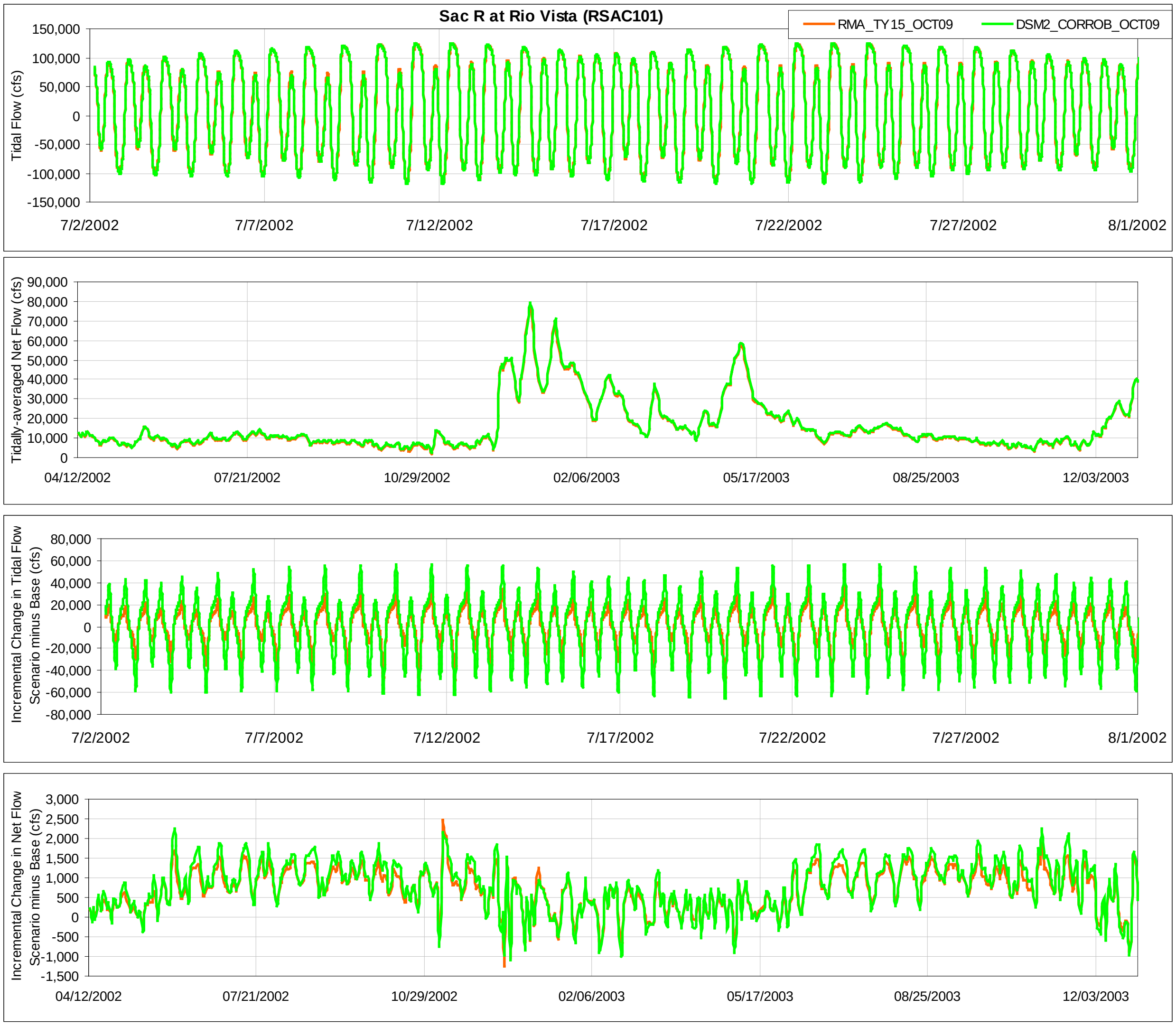
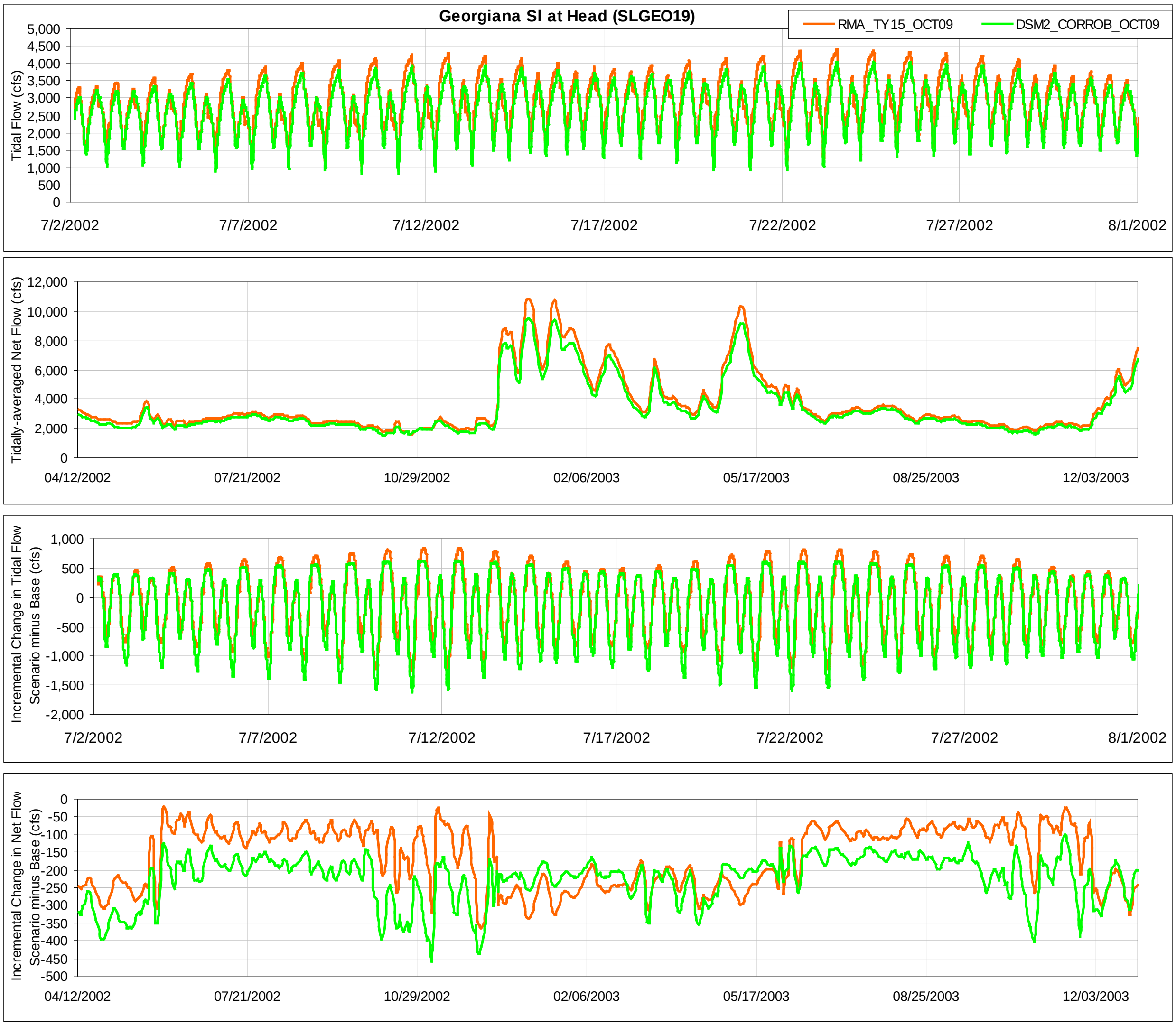


**Figure 1-44. Comparison of Tidal Flow, Tidally-Averaged Daily Flow, Incremental Change in Tidal Flow and the Incremental Change in the Daily Flow between the Early Long-term Scenario and the Current Conditions Scenario from RMA Model and DSM2 Model for Georgiana Sl at Head Location**



1 Figure 1-45. Comparison of Tidal Flow, Tidally-Averaged Daily Flow, Incremental Change in Tidal
2 Flow and the Incremental Change in the Daily Flow between the Early Long-term Scenario and the
3 Current Conditions Scenario from RMA Model and DSM2 Model for Sacramento River at Emmaton
4 Location

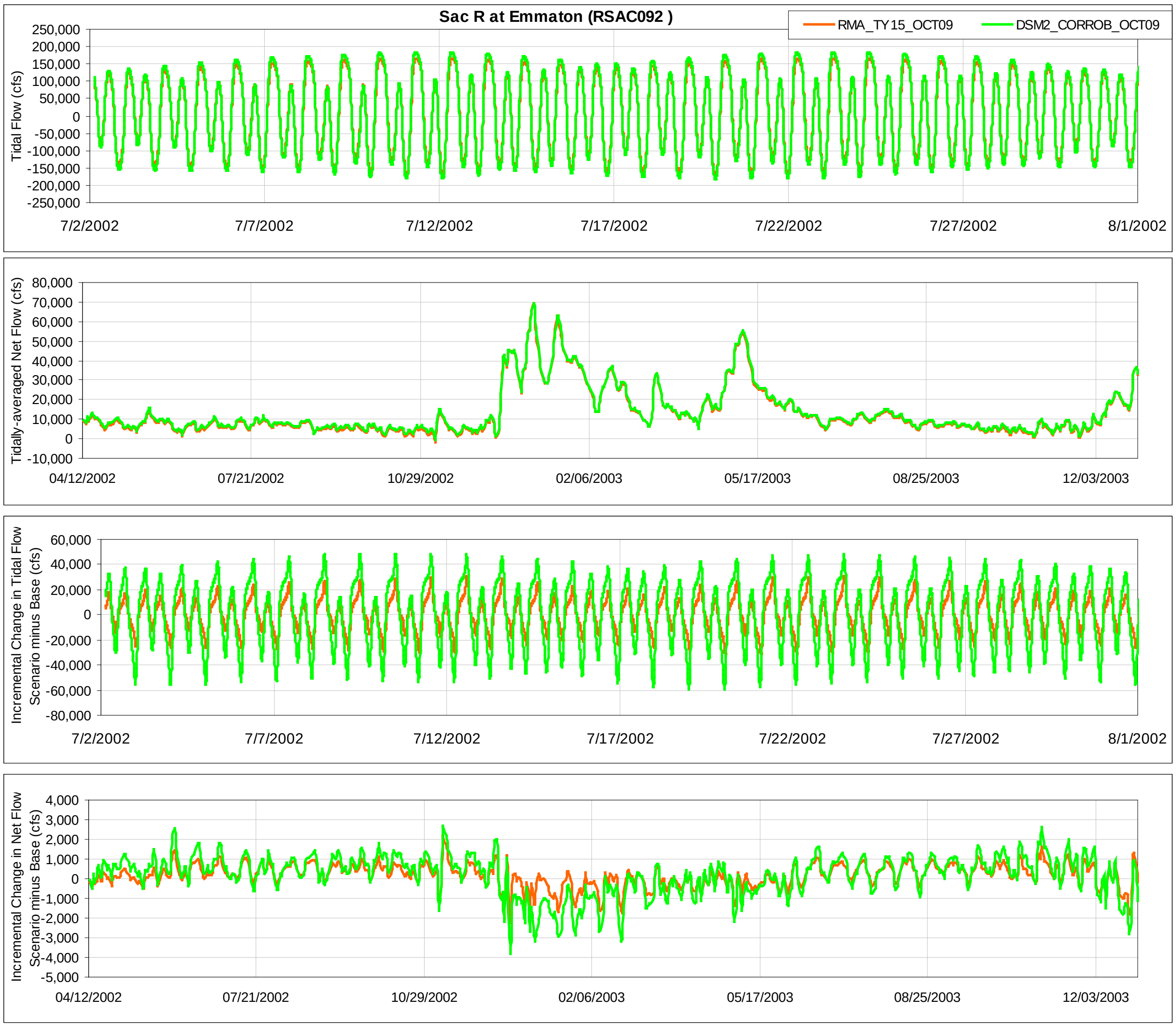



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**Figure 1-46. Comparison of Tidal Flow, Tidally-Averaged Daily Flow, Incremental Change in Tidal Flow and the Incremental Change in the Daily Flow between the Early Long-term Scenario and the Current Conditions Scenario from RMA Model and DSM2 Model for Montezuma Sl at Head Location**

**Figure 1-47. Comparison of Tidal Flow, Tidally-Averaged Daily Flow, Incremental Change in Tidal Flow and the Incremental Change in the Daily Flow between the Early Long-term Scenario and the Current Conditions Scenario from RMA Model and DSM2 Model for Montezuma Sl at Mouth Location**

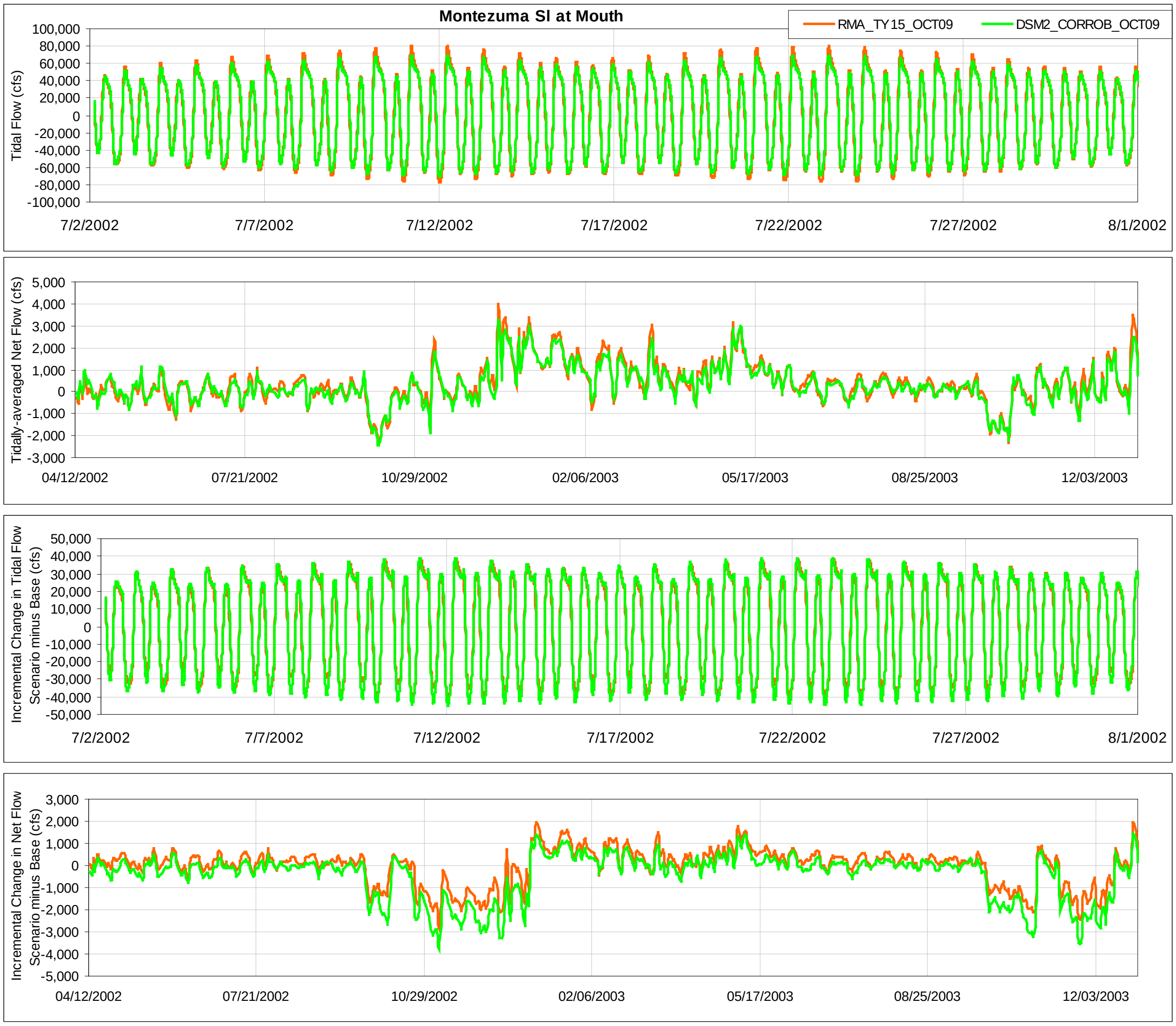


**Figure 1-48. Comparison of Tidal Flow, Tidally-Averaged Daily Flow, Incremental Change in Tidal Flow and the Incremental Change in the Daily Flow between the Early Long-term Scenario and the Current Conditions Scenario from RMA Model and DSM2 Model for Threemile Sl at San Joaquin River Location**

**Figure 1-49. Comparison of Tidal Flow, Tidally-Averaged Daily Flow, Incremental Change in Tidal Flow and the Incremental Change in the Daily Flow between the Early Long-term Scenario and the Current Conditions Scenario from RMA Model and DSM2 Model for San Joaquin River at Jersey Point Location**

**Figure 1-50. Comparison of Tidal Flow, Tidally-Averaged Daily Flow, Incremental Change in Tidal Flow and the Incremental Change in the Daily Flow between the Early Long-term Scenario and the Current Conditions Scenario from RMA Model and DSM2 Model for San Joaquin River at San Andreas Location**

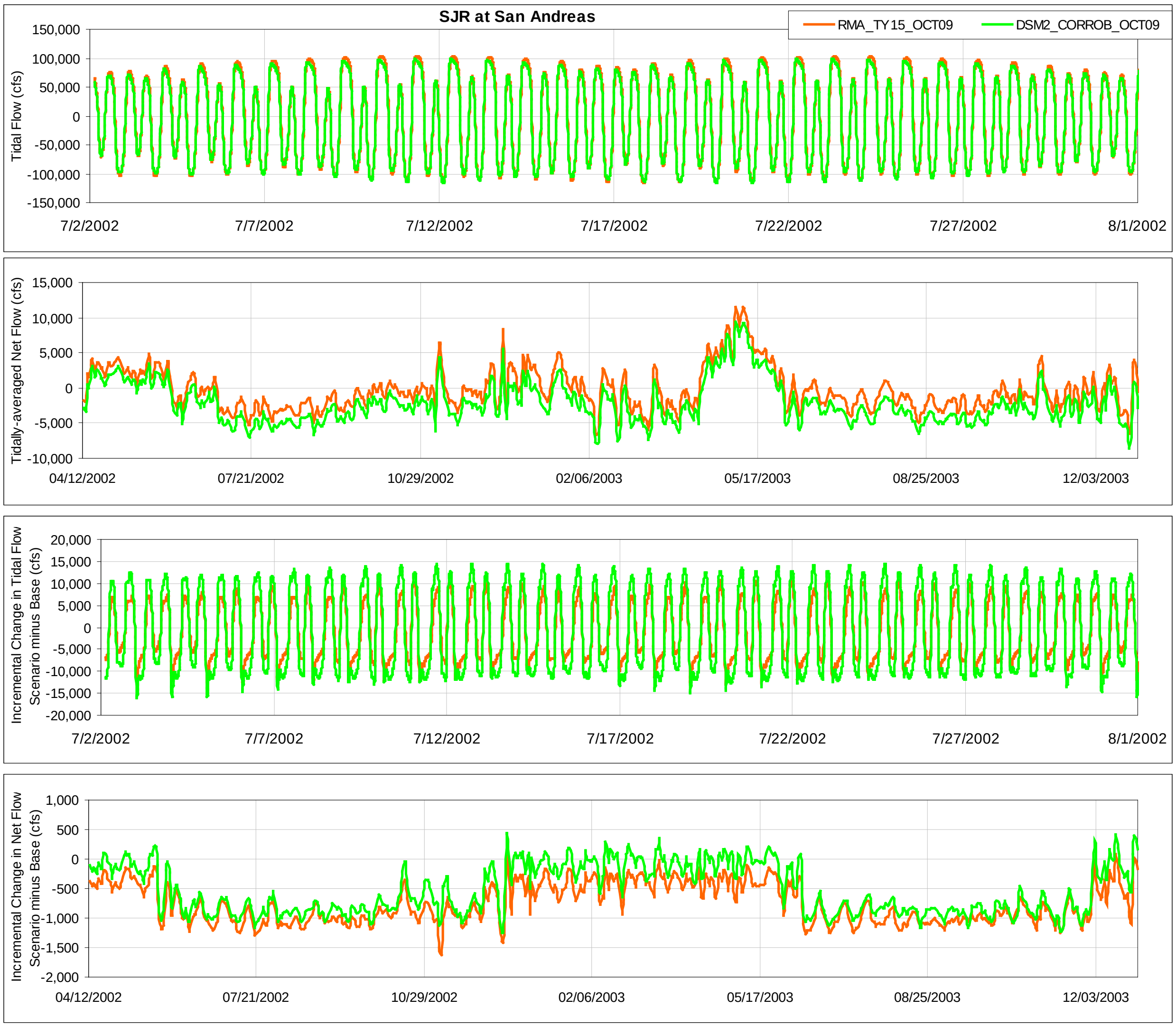


**Figure 1-51. Comparison of Tidal Flow, Tidally-Averaged Daily Flow, Incremental Change in Tidal Flow and the Incremental Change in the Daily Flow between the Early Long-term Scenario and the Current Conditions Scenario from RMA Model and DSM2 Model for San Joaquin River at Prisoners Point Location**

**Figure 1-52. Comparison of Tidal Flow, Tidally-Averaged Daily Flow, Incremental Change in Tidal Flow and the Incremental Change in the Daily Flow between the Early Long-term Scenario and the Current Conditions Scenario from RMA Model and DSM2 Model for San Joaquin River at Stockton Location**

**Figure 1-53. Comparison of Tidal Flow, Tidally-Averaged Daily Flow, Incremental Change in Tidal Flow and the Incremental Change in the Daily Flow between the Early Long-term Scenario and the Current Conditions Scenario from RMA Model and DSM2 Model for Mokelumne River near San Joaquin River Location**

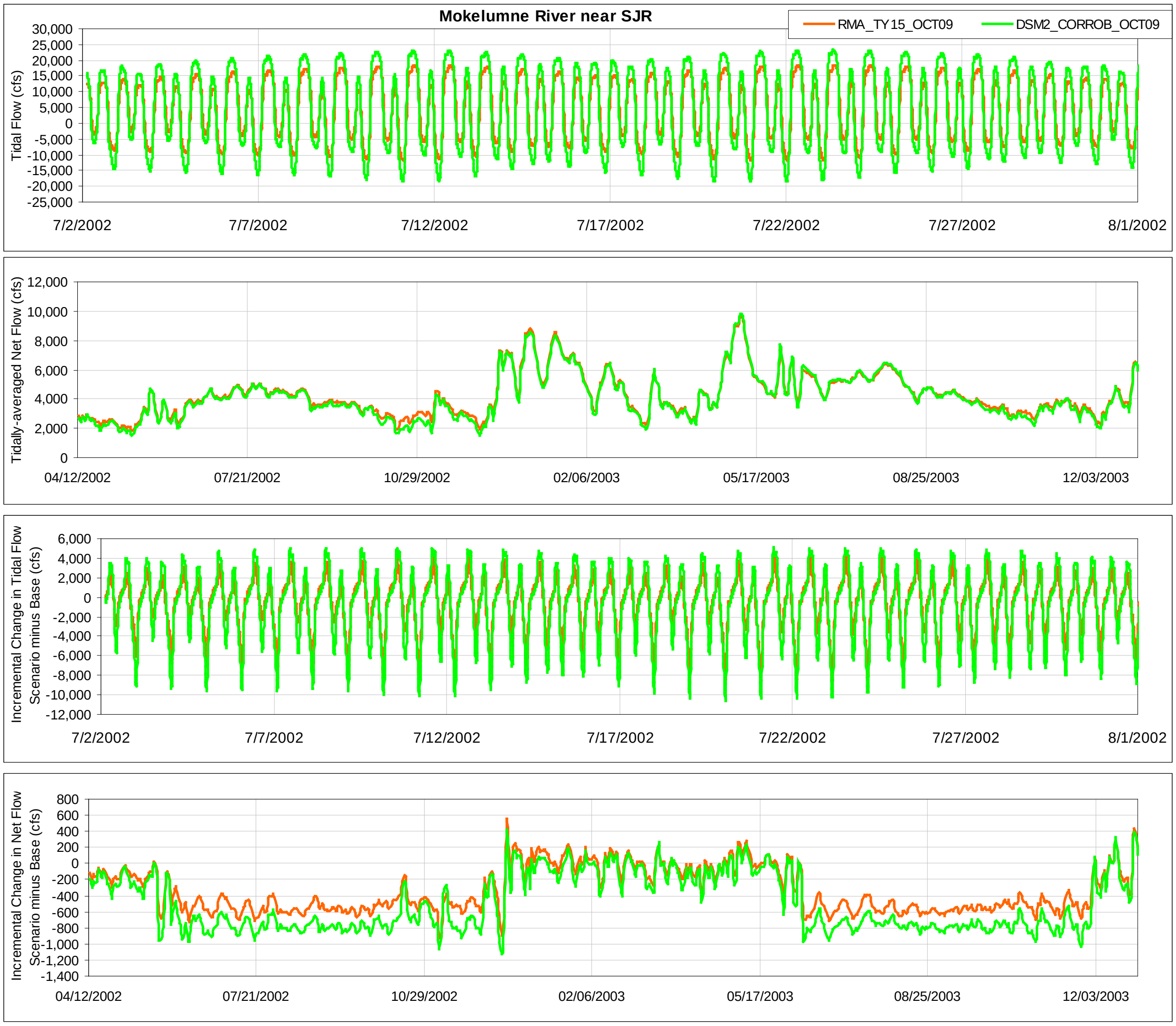


**Figure 1-54. Comparison of Tidal Flow, Tidally-Averaged Daily Flow, Incremental Change in Tidal Flow and the Incremental Change in the Daily Flow between the Early Long-term Scenario and the Current Conditions Scenario from RMA Model and DSM2 Model for Middle River at Bacon Island Location**

**Figure 1-55. Comparison of Tidal Flow, Tidally-Averaged Daily Flow, Incremental Change in Tidal Flow and the Incremental Change in the Daily Flow between the Early Long-term Scenario and the Current Conditions Scenario from RMA Model and DSM2 Model for Old River at Bacon Island Location**

**Figure 1-56. Comparison of Tidal Flow, Tidally-Averaged Daily Flow between the Early Long-Term Scenario and the Current Conditions Scenario from RMA Model and DSM2 Model for Prospect Island North Breach under Cache SI Region**

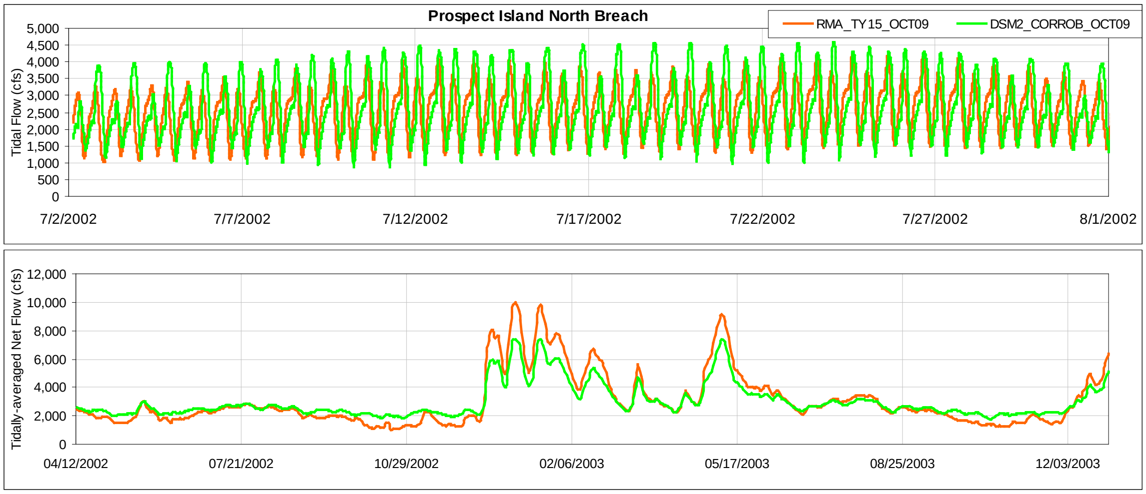



**Figure 1-57. Comparison of Tidal Flow, Tidally-Averaged Daily Flow between the Early Long-Term Scenario and the Current Conditions Scenario from RMA Model and DSM2 Model for d/s of Egbert A and Calhoun Cut breaches under Cache SI Region**

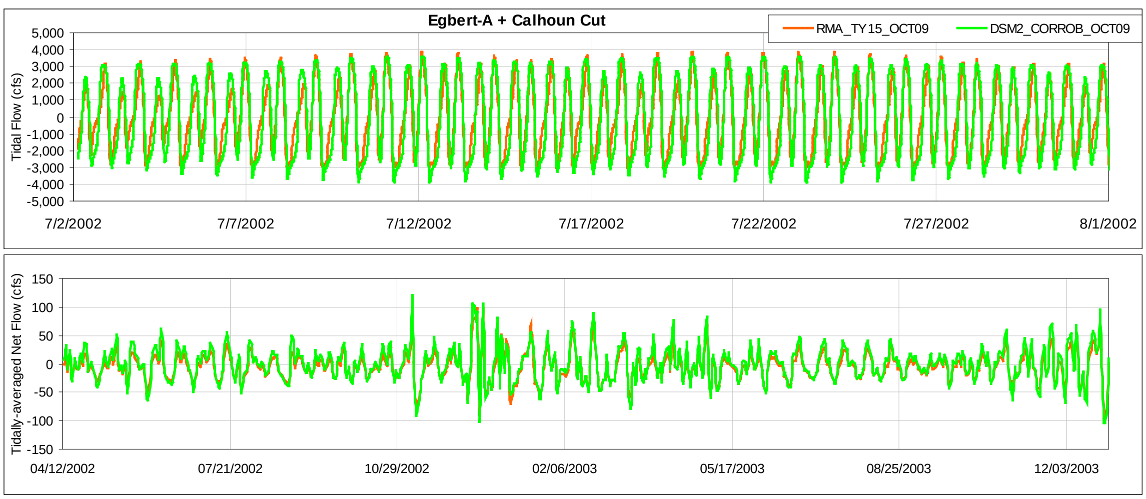


**Figure 1-58. Comparison of Tidal Flow, Tidally-Averaged Daily Flow between the Early Long-Term Scenario and the Current Conditions Scenario from RMA Model and DSM2 Model for Shag Sl Breach under Cache Sl Region**

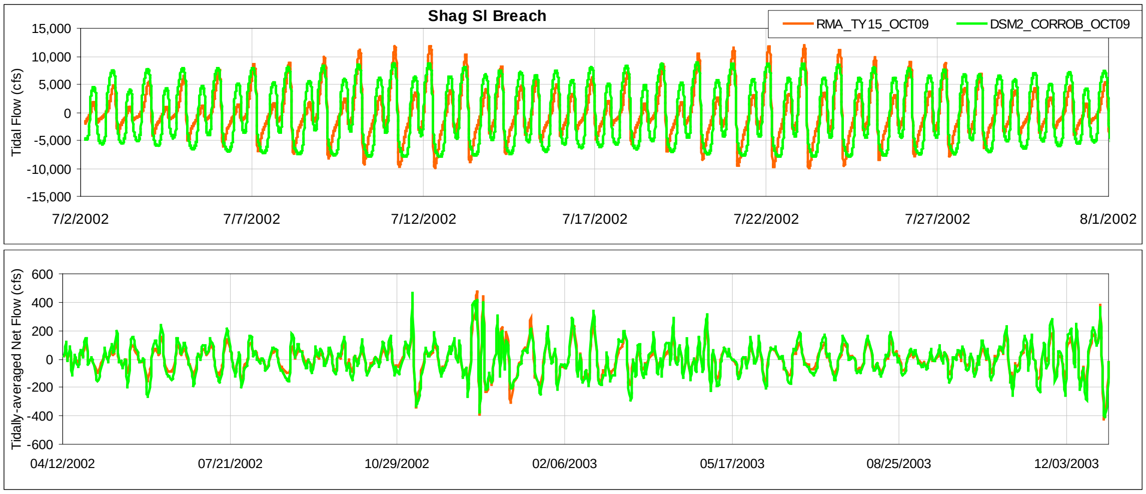



**Figure 1-59. Comparison of Tidal Flow, Tidally-Averaged Daily Flow between the Early Long-Term Scenario and the Current Conditions Scenario from RMA Model and DSM2 Model for Island 10 Breach 3 under Suisun Marsh Region**

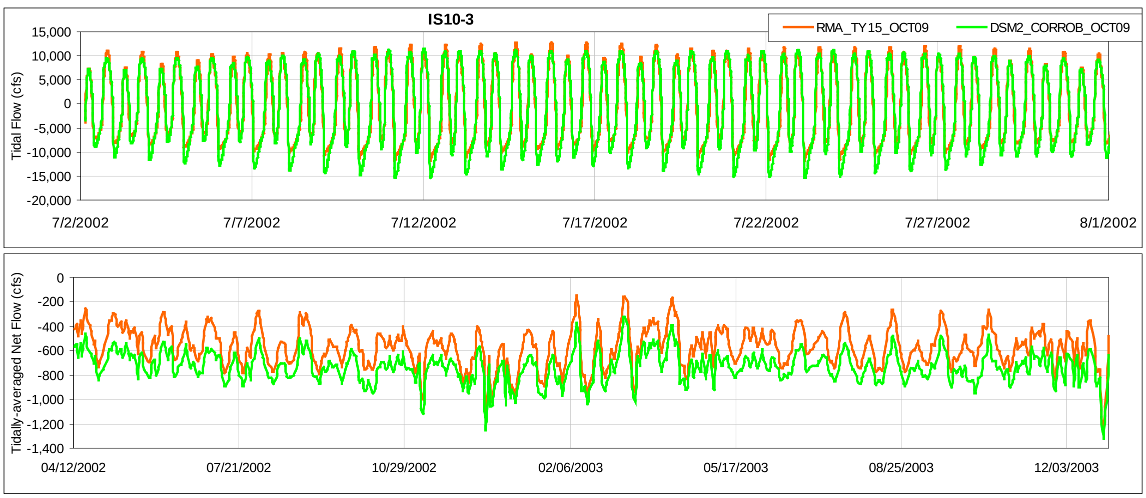


**Figure 1-60. Comparison of Tidal Flow, Tidally-Averaged Daily Flow between the Early Long-Term Scenario and the Current Conditions Scenario from RMA Model and DSM2 Model for Island 5 Breach 1 under Suisun Marsh Region**

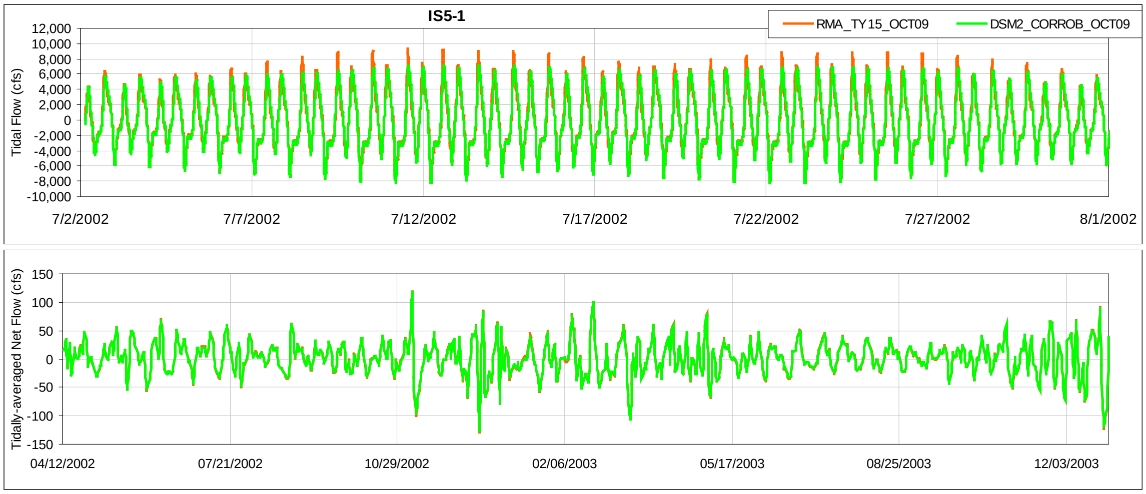



**Figure 1-61. Comparison of Tidal Flow, Tidally-Averaged Daily Flow between the Early Long-Term Scenario and the Current Conditions Scenario from RMA Model and DSM2 Model for Montezuma Wetlands breaches under Suisun Marsh Region**

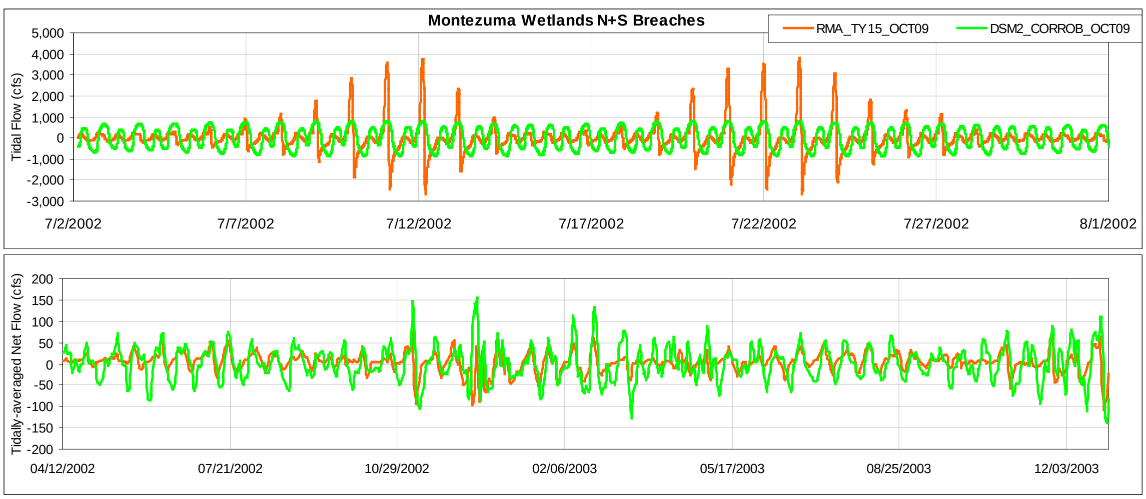


**Figure 1-62. Comparison of Tidal Flow, Tidally-Averaged Daily Flow between the Early Long-Term Scenario and the Current Conditions Scenario from RMA Model and DSM2 Model for Decker Island North West Breach under West Delta Region**

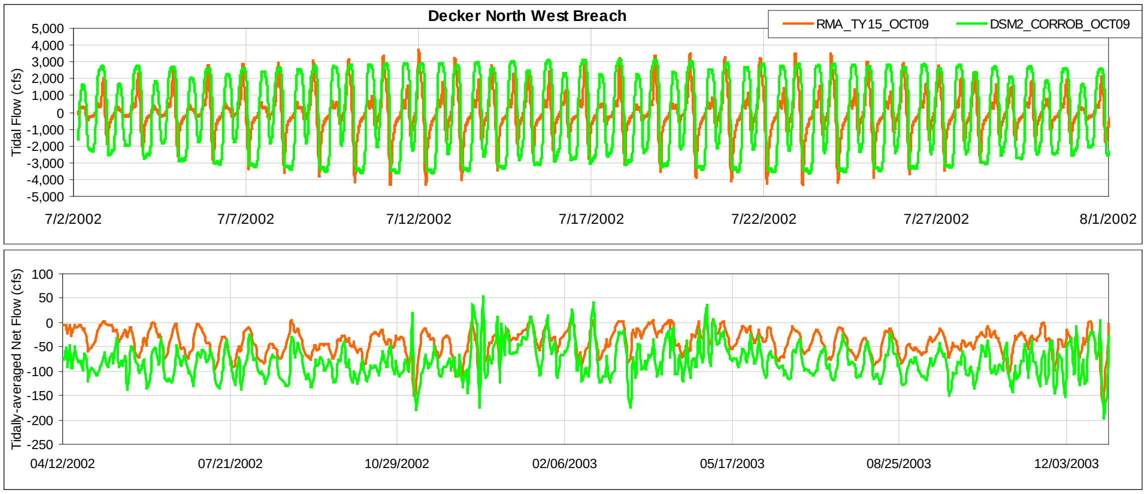



**Figure 1-63. Comparison of Tidal Flow, Tidally-Averaged Daily Flow between the Early Long-Term Scenario and the Current Conditions Scenario from RMA Model and DSM2 Model for Dutch Sl d/s Emerson Sl under West Delta Region**

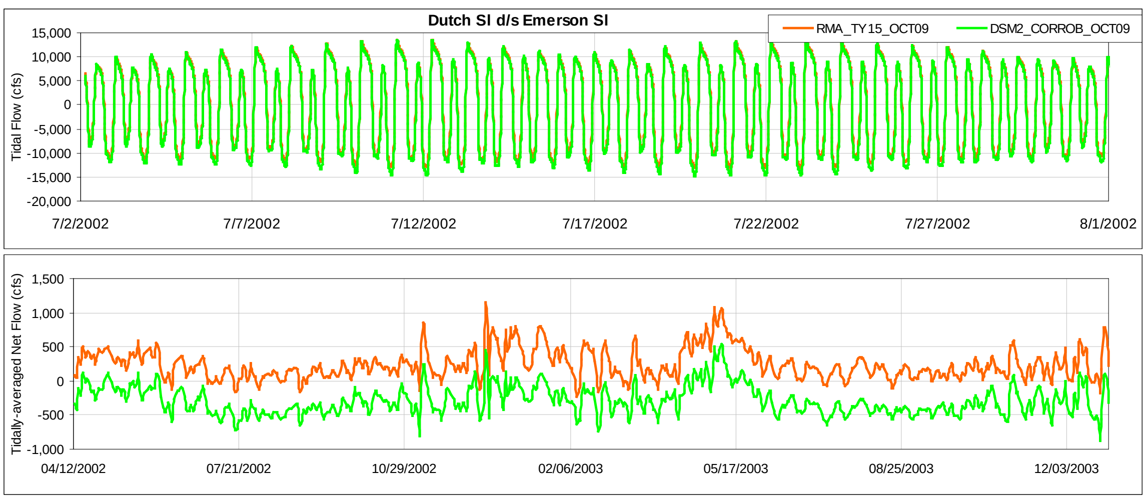


**Figure 1-64. Comparison of Tidal Flow, Tidally-Averaged Daily Flow between the Early Long-Term Scenario and the Current Conditions Scenario from RMA Model and DSM2 Model for Snodgrass Sl Breach under East Delta Region**

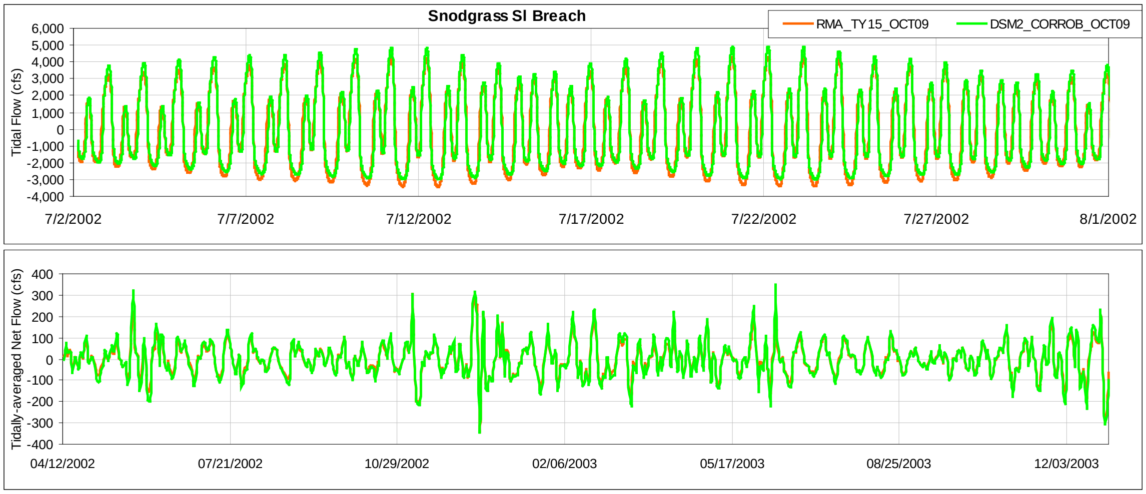
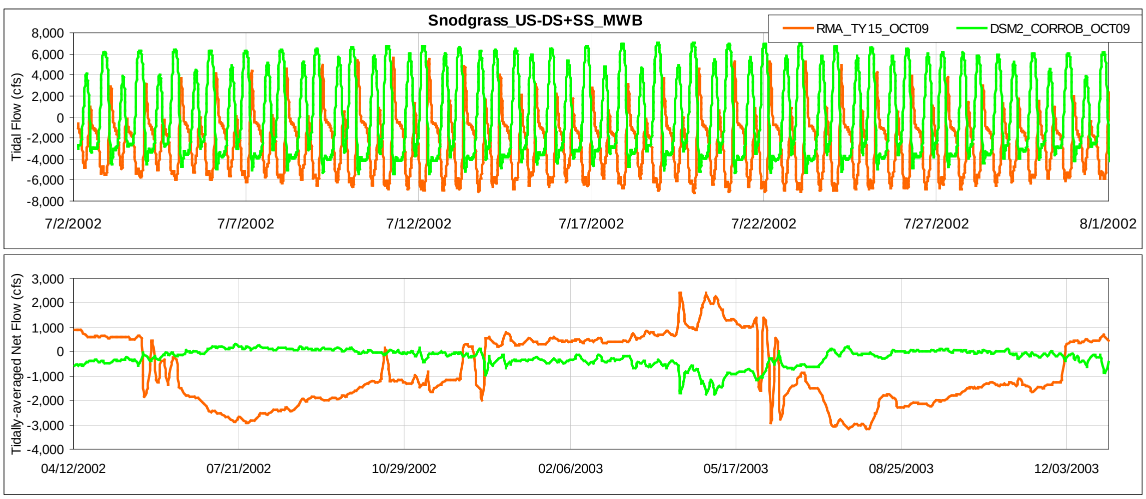



**Figure 1-65. Comparison of Tidal Flow, Tidally-Averaged Daily Flow between the Early Long-Term Scenario and the Current Conditions Scenario from RMA Model and DSM2 Model for channel d/s of Snodgrass Sl Breach under East Delta Region**



# Early Long-Term 25,000ac Restoration Corroboration

## Salinity Results

**Figure 1-66. Comparison of Tidally-Averaged Daily EC and the Incremental Change in the Daily EC between the Early Long-term Scenario and the Current Conditions Scenario from RMA Model and DSM2 Model for Montezuma Sl at Mouth Location**

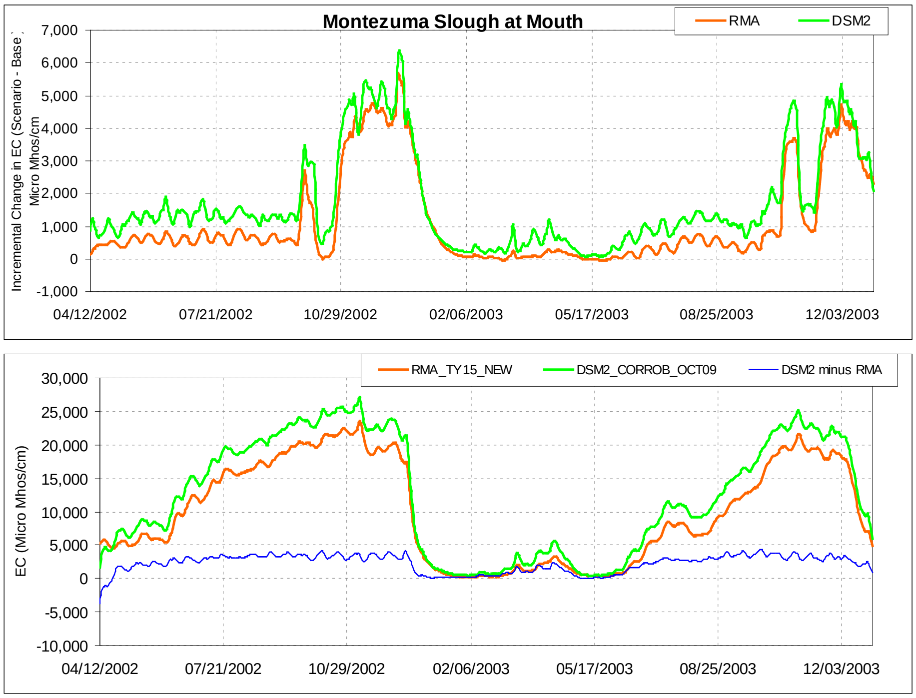


**Figure 1-67. Comparison of Tidally-Averaged Daily EC and the Incremental Change in the Daily EC between the Early Long-term Scenario and the Current Conditions Scenario from RMA Model and DSM2 Model for Montezuma Sl at Beldon's Landing Location**

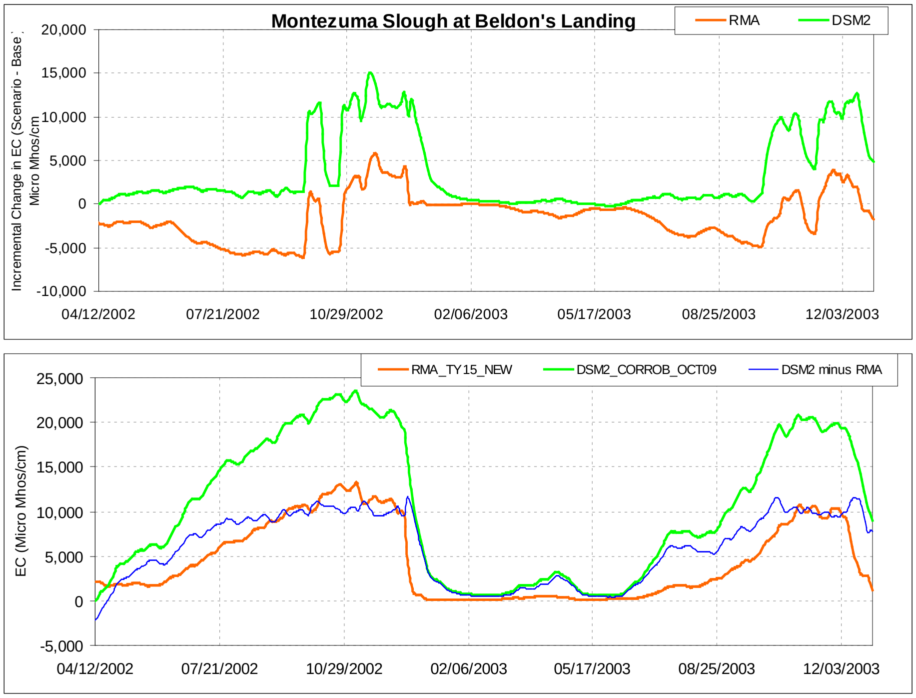



**Figure 1-68. Comparison of Tidally-Averaged Daily EC and the Incremental Change in the Daily EC between the Early Long-term Scenario and the Current Conditions Scenario from RMA Model and DSM2 Model for Montezuma Sl at Head Location**

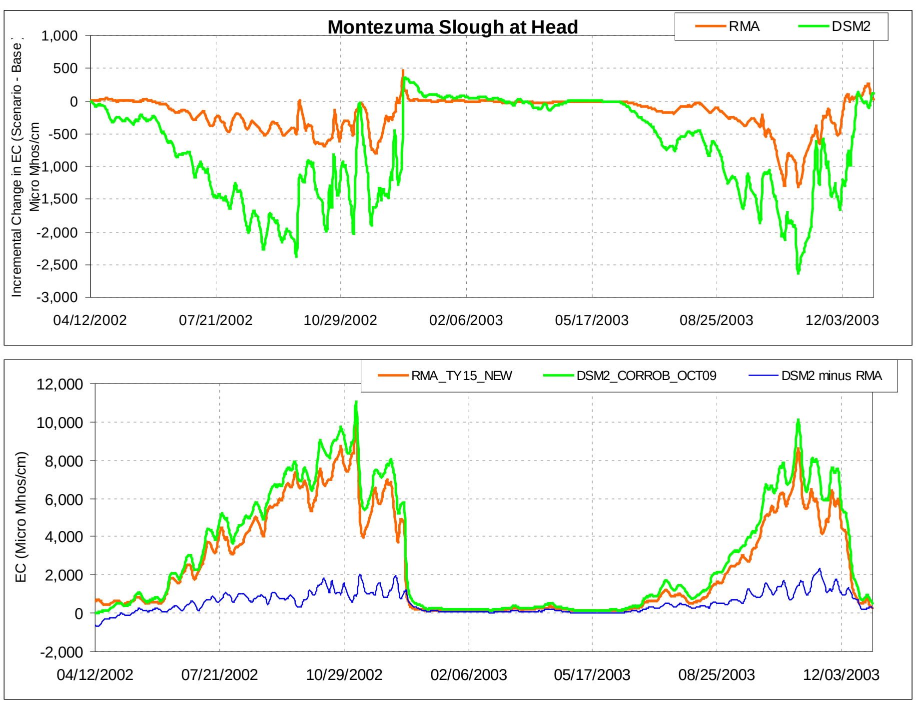


**Figure 1-69. Comparison of Tidally-Averaged Daily EC and the Incremental Change in the Daily EC between the Early Long-term Scenario and the Current Conditions Scenario from RMA Model and DSM2 Model for Sacramento River at Port Chicago Location**

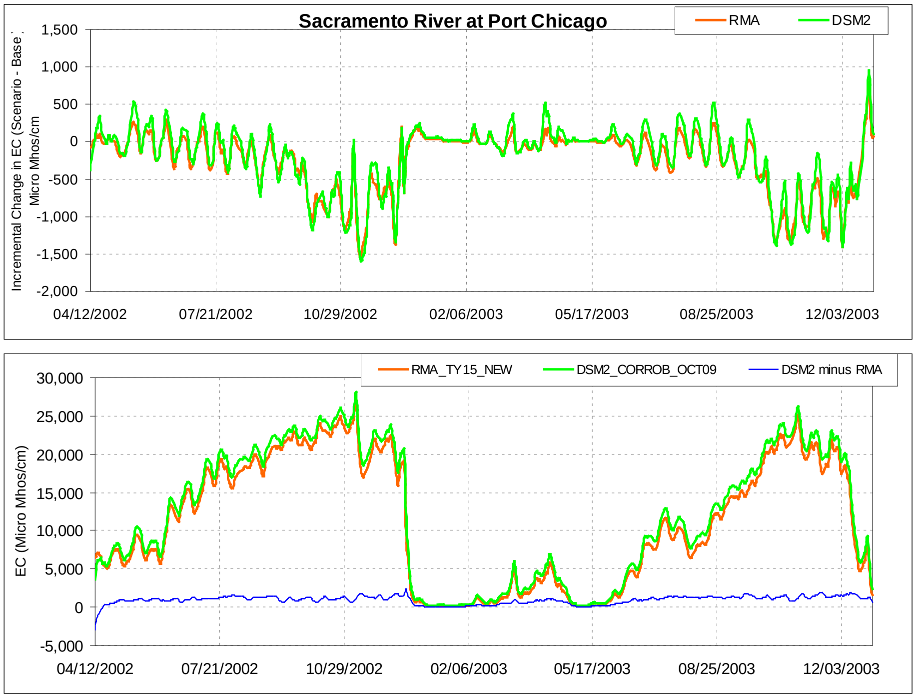



**Figure 1-70. Comparison of Tidally-Averaged Daily EC and the Incremental Change in the Daily EC between the Early Long-term Scenario and the Current Conditions Scenario from RMA Model and DSM2 Model for Sacramento River at Collinsville Location**

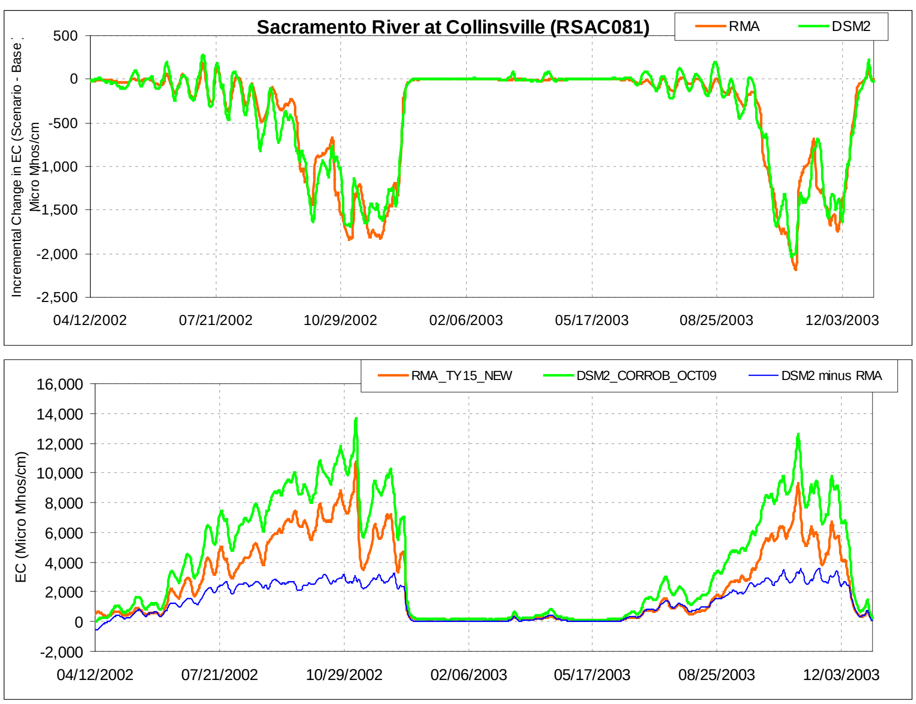


**Figure 1-71. Comparison of Tidally-Averaged Daily EC and the Incremental Change in the Daily EC between the Early Long-term Scenario and the Current Conditions Scenario from RMA Model and DSM2 Model for Sacramento River at Emmaton Location**

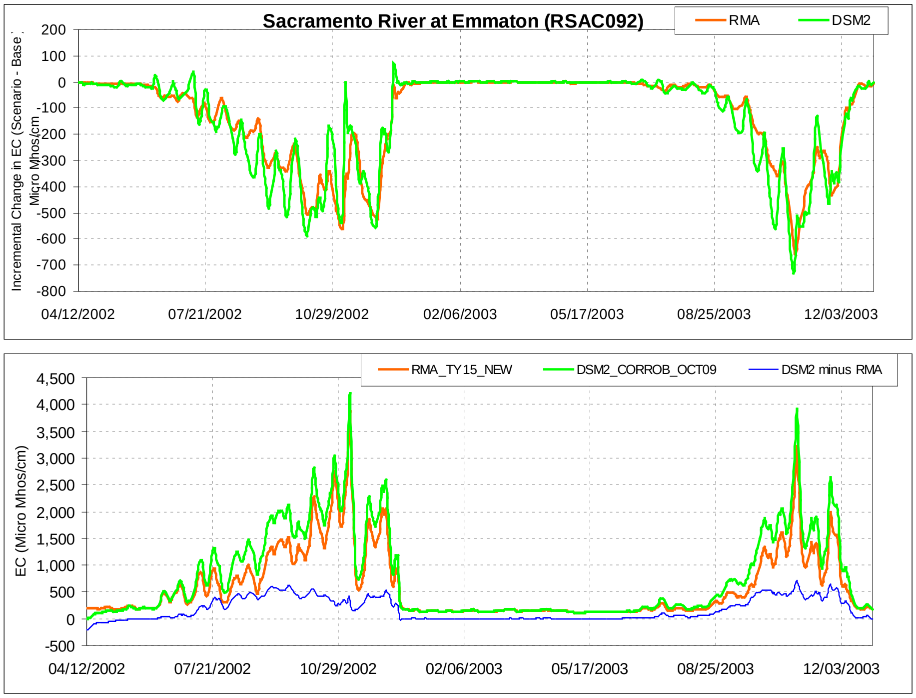



**Figure 1-72. Comparison of Tidally-Averaged Daily EC and the Incremental Change in the Daily EC between the Early Long-term Scenario and the Current Conditions Scenario from RMA Model and DSM2 Model for Sacramento River at Rio Vista Location**

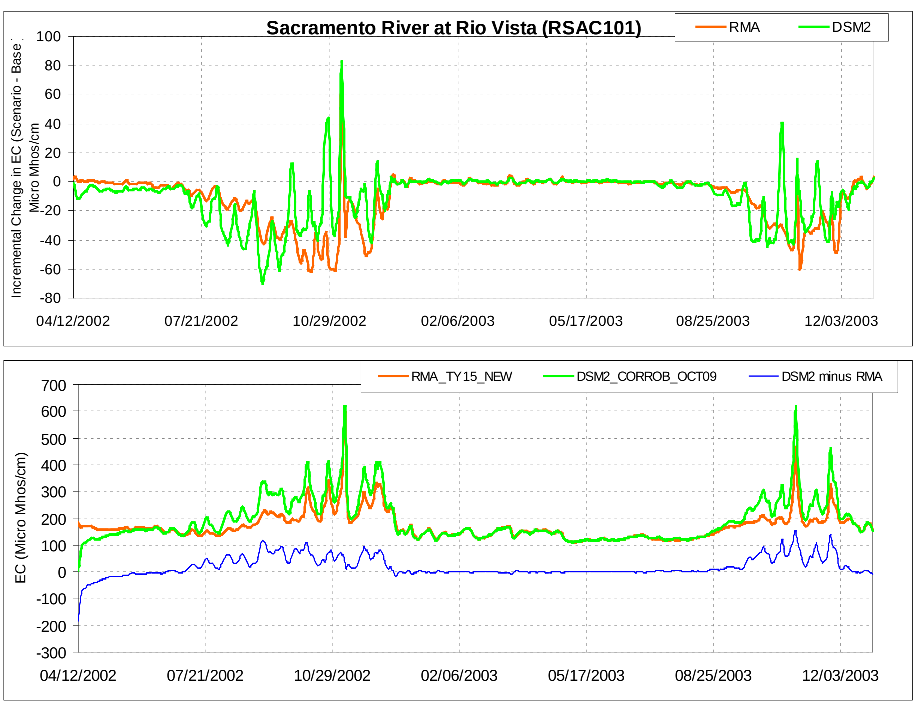


**Figure 1-73. Comparison of Tidally-Averaged Daily EC and the Incremental Change in the Daily EC between the Early Long-term Scenario and the Current Conditions Scenario from RMA Model and DSM2 Model for Cache Sl at Ryer Island Location**

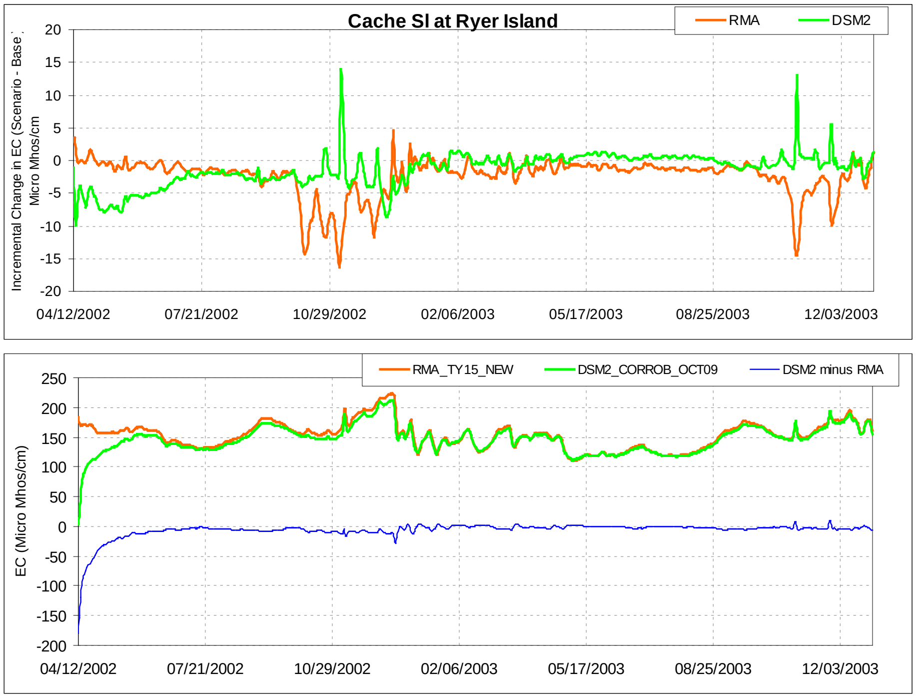



**Figure 1-74. Comparison of Tidally-Averaged Daily EC and the Incremental Change in the Daily EC between the Early Long-term Scenario and the Current Conditions Scenario from RMA Model and DSM2 Model for Three Mile Sl near San Joaquin River Location**

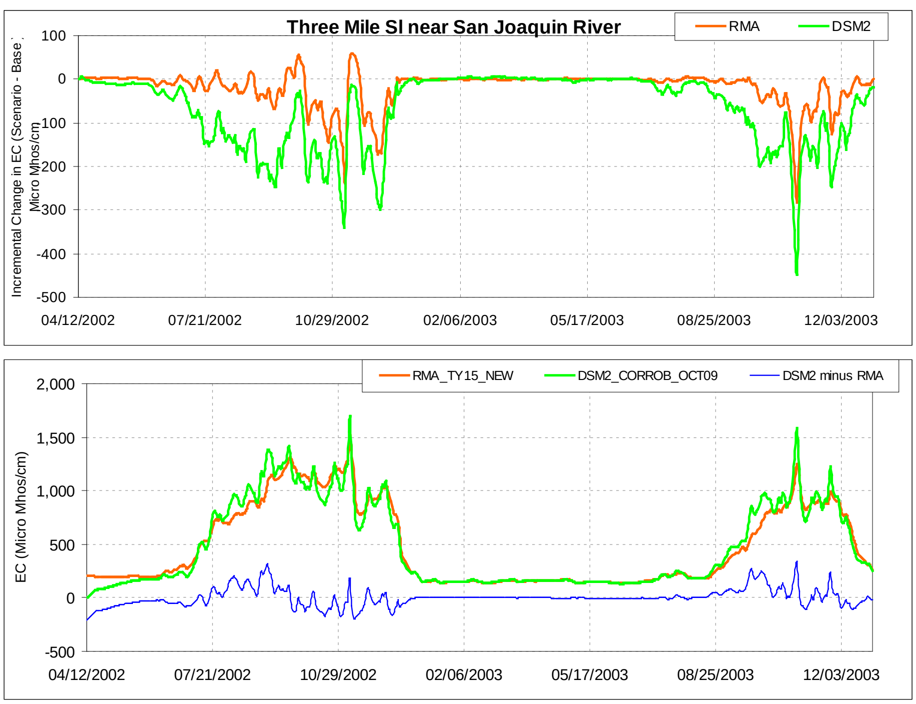


**Figure 1-75. Comparison of Tidally-Averaged Daily EC and the Incremental Change in the Daily EC between the Early Long-term Scenario and the Current Conditions Scenario from RMA Model and DSM2 Model for San Joaquin River at Jersey Point Location**

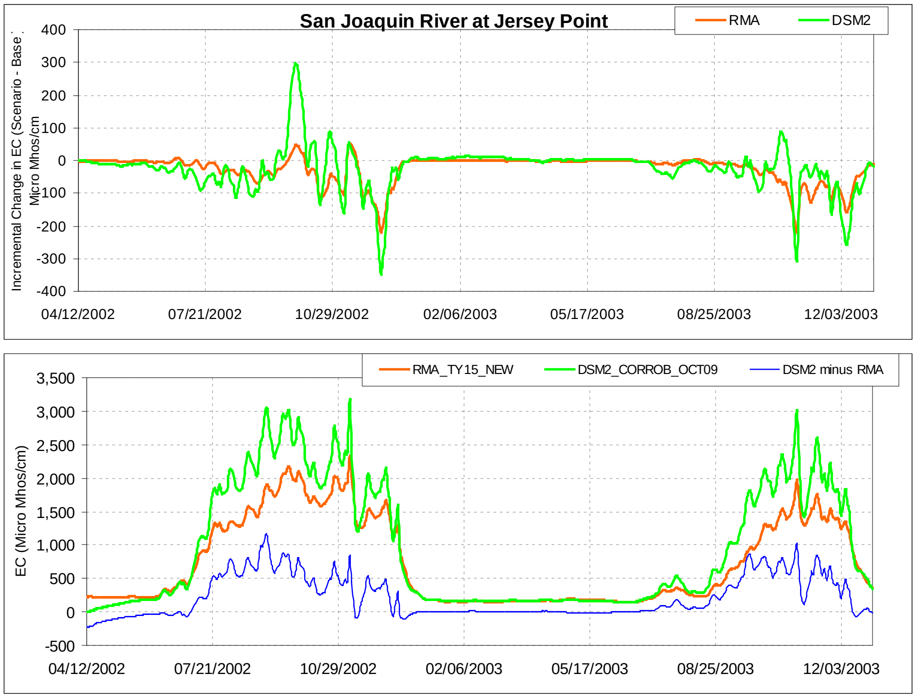



**Figure 1-76. Comparison of Tidally-Averaged Daily EC and the Incremental Change in the Daily EC between the Early Long-term Scenario and the Current Conditions Scenario from RMA Model and DSM2 Model for San Joaquin River at San Andreas Location**

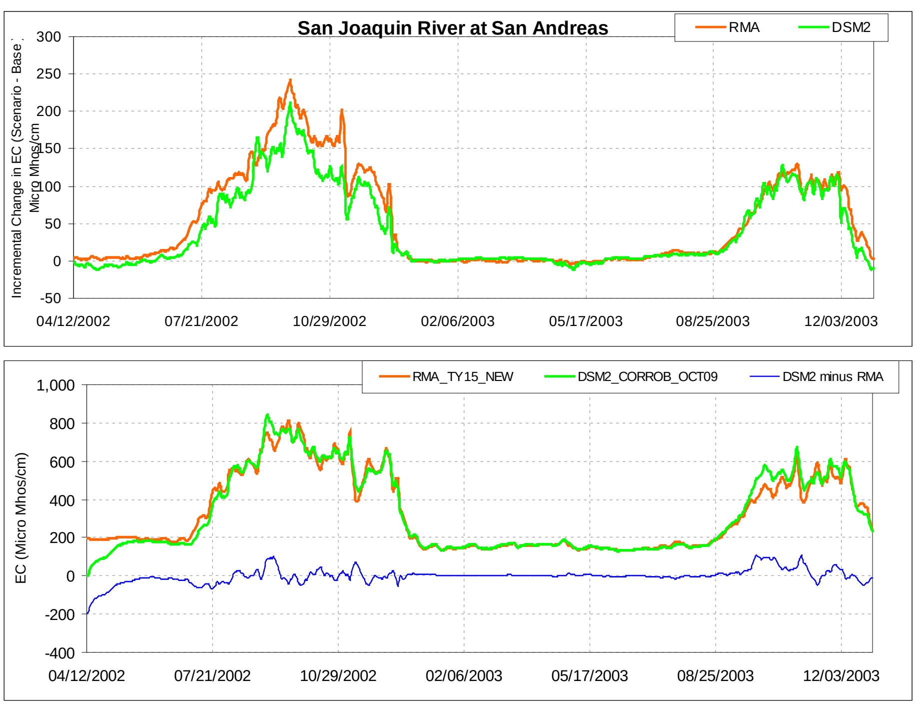


**Figure 1-77. Comparison of Tidally-Averaged Daily EC and the Incremental Change in the Daily EC between the Early Long-term Scenario and the Current Conditions Scenario from RMA Model and DSM2 Model for San Joaquin River at Prisoners Point Location**

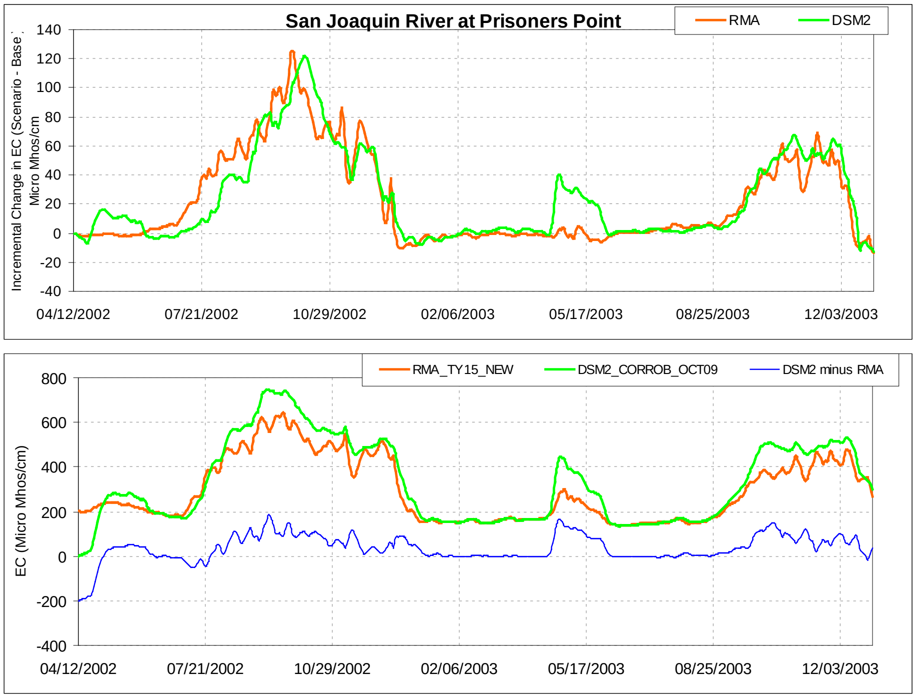



**Figure 1-78. Comparison of Tidally-Averaged Daily EC and the Incremental Change in the Daily EC between the Early Long-term Scenario and the Current Conditions Scenario from RMA Model and DSM2 Model for San Joaquin River at Stockton Location**

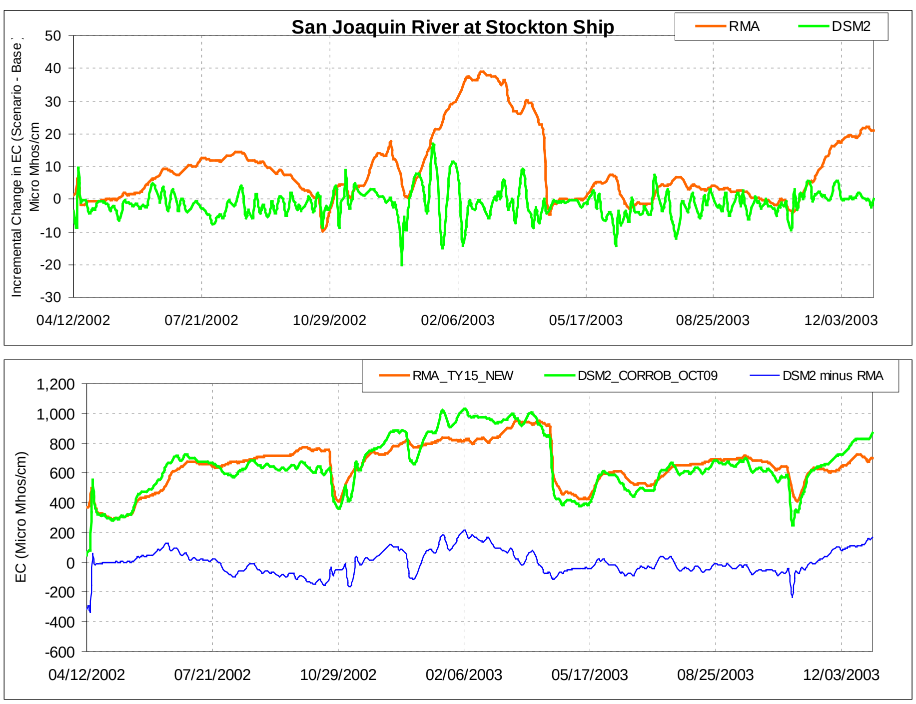


**Figure 1-79. Comparison of Tidally-Averaged Daily EC and the Incremental Change in the Daily EC between the Early Long-term Scenario and the Current Conditions Scenario from RMA Model and DSM2 Model for San Joaquin River at Brandt Bridge Location**

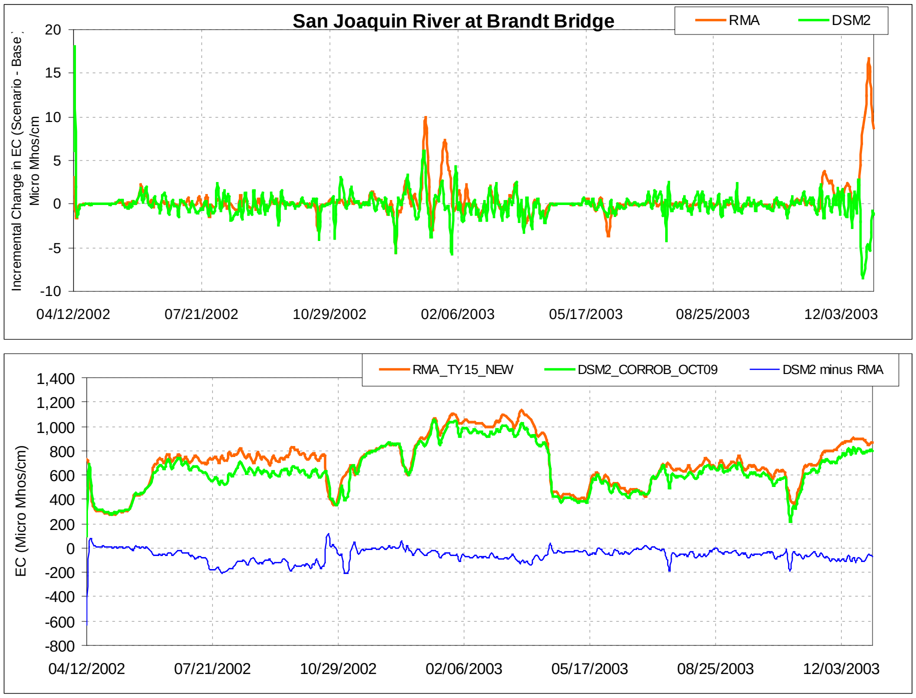



**Figure 1-80. Comparison of Tidally-Averaged Daily EC and the Incremental Change in the Daily EC between the Early Long-term Scenario and the Current Conditions Scenario from RMA Model and DSM2 Model for Middle River at Middle River Location**

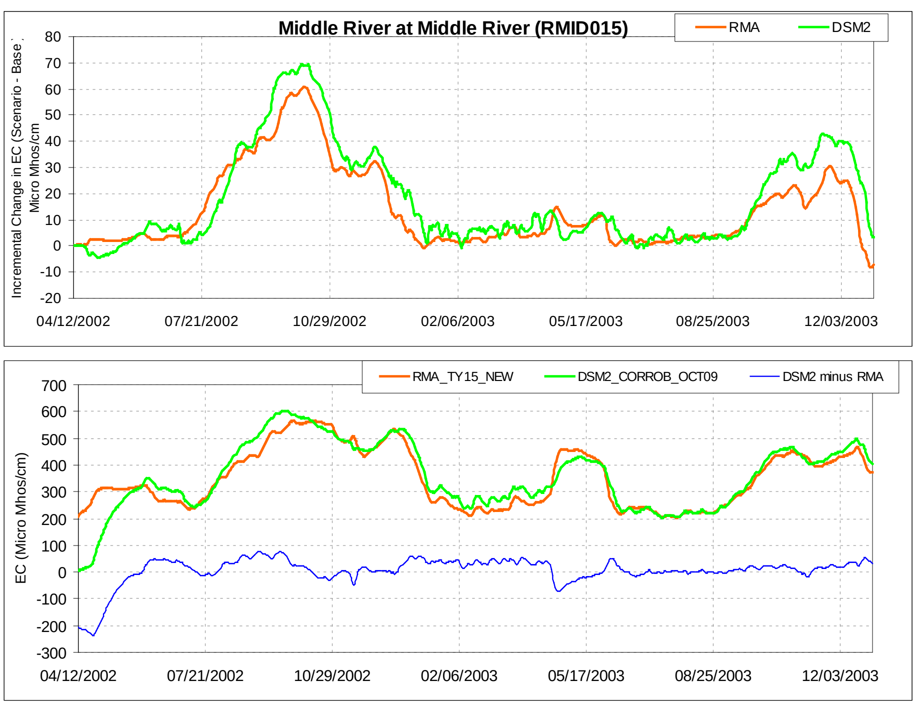
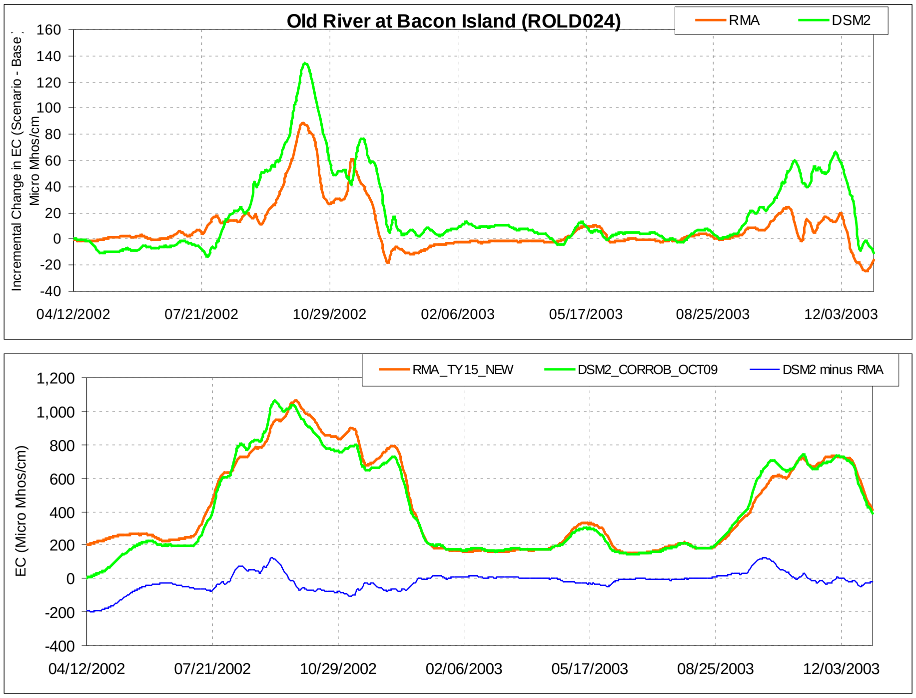


**Figure 1-81. Comparison of Tidally-Averaged Daily EC and the Incremental Change in the Daily EC between the Early Long-term Scenario and the Current Conditions Scenario from RMA Model and DSM2 Model for Old River at Bacon Island Location**



# Late Long-Term 65,000ac Restoration Corroboration

## Hydrodynamics Results

**Figure 1-82. Comparison of Tidal Flow, Tidally-Averaged Daily Flow, Incremental Change in Tidal Flow and the Incremental Change in the Daily Flow between the Late Long-term Scenario and the Current Conditions Scenario from RMA Model and DSM2 Model for Cache Slough at Ryer Location**

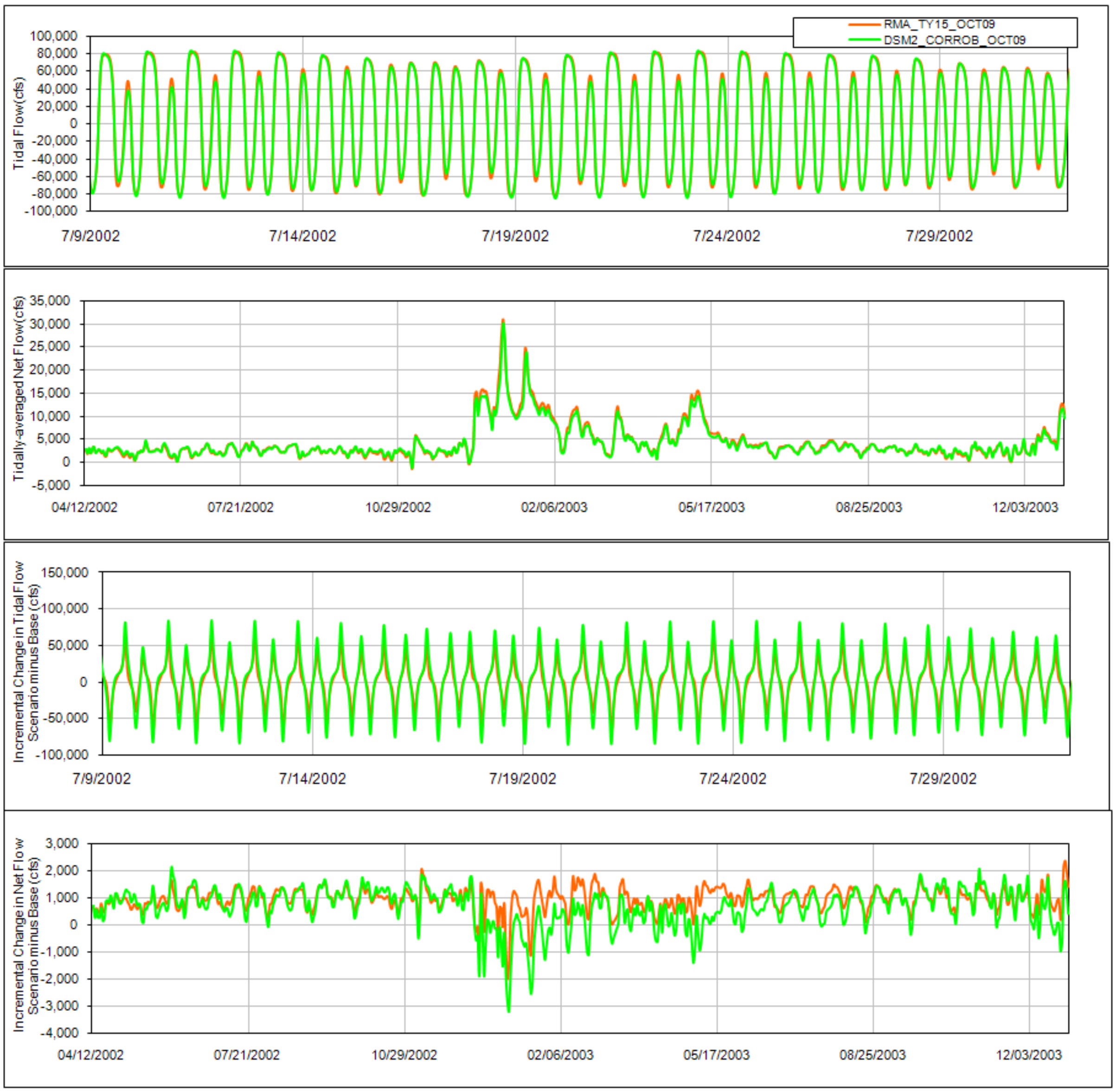


**Figure 1-83. Comparison of Tidal Flow, Tidally-Averaged Daily Flow, Incremental Change in Tidal Flow and the Incremental Change in the Daily Flow between the Late Long-term Scenario and the Current Conditions Scenario from RMA Model and DSM2 Model for Georgiana Slough at Head Location**

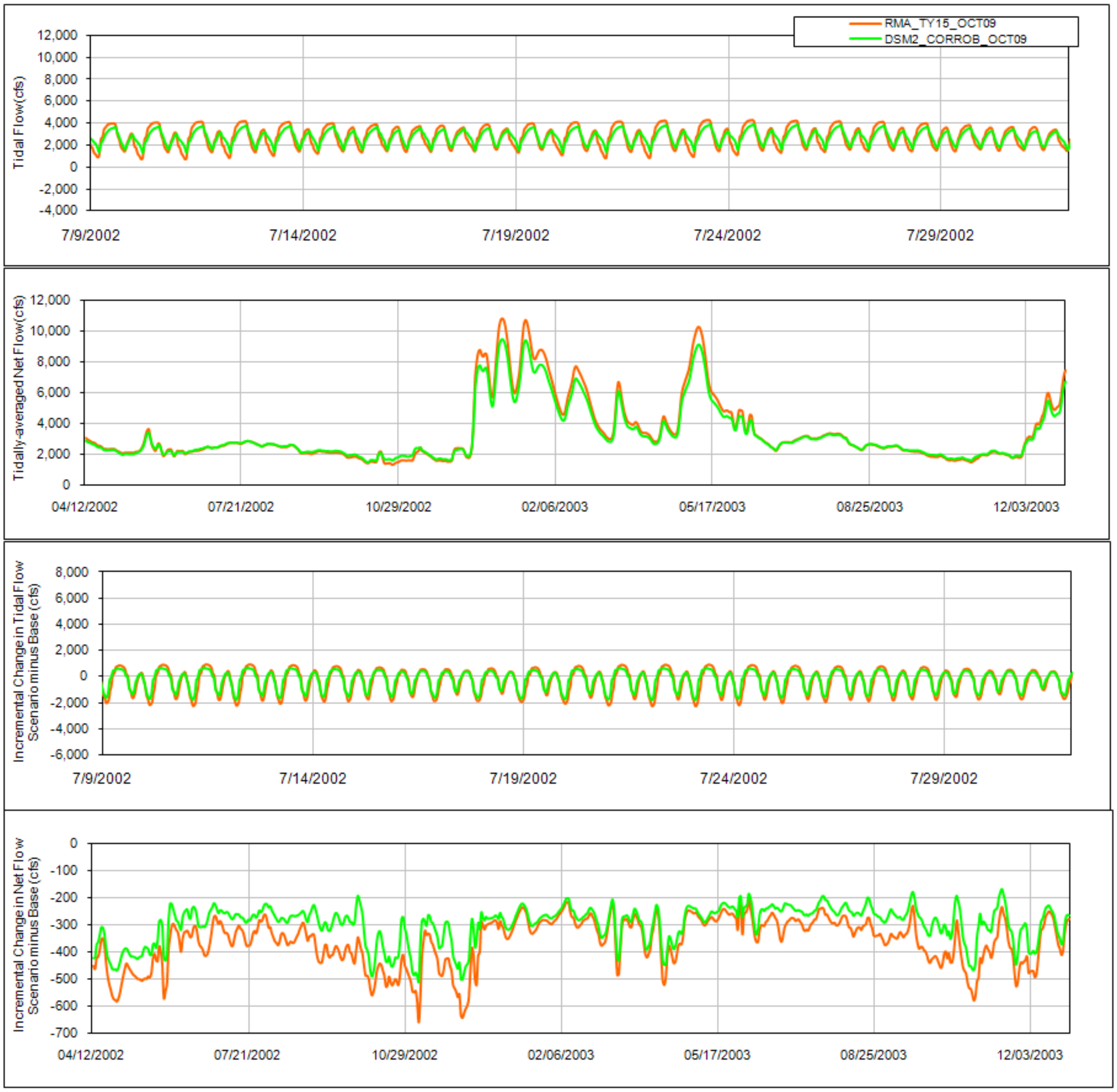


**Figure 1-84. Comparison of Tidal Flow, Tidally-Averaged Daily Flow, Incremental Change in Tidal Flow and the Incremental Change in the Daily Flow between the Late Long-term Scenario and the Current Conditions Scenario from RMA Model and DSM2 Model for Montezuma Slough at Head Location**

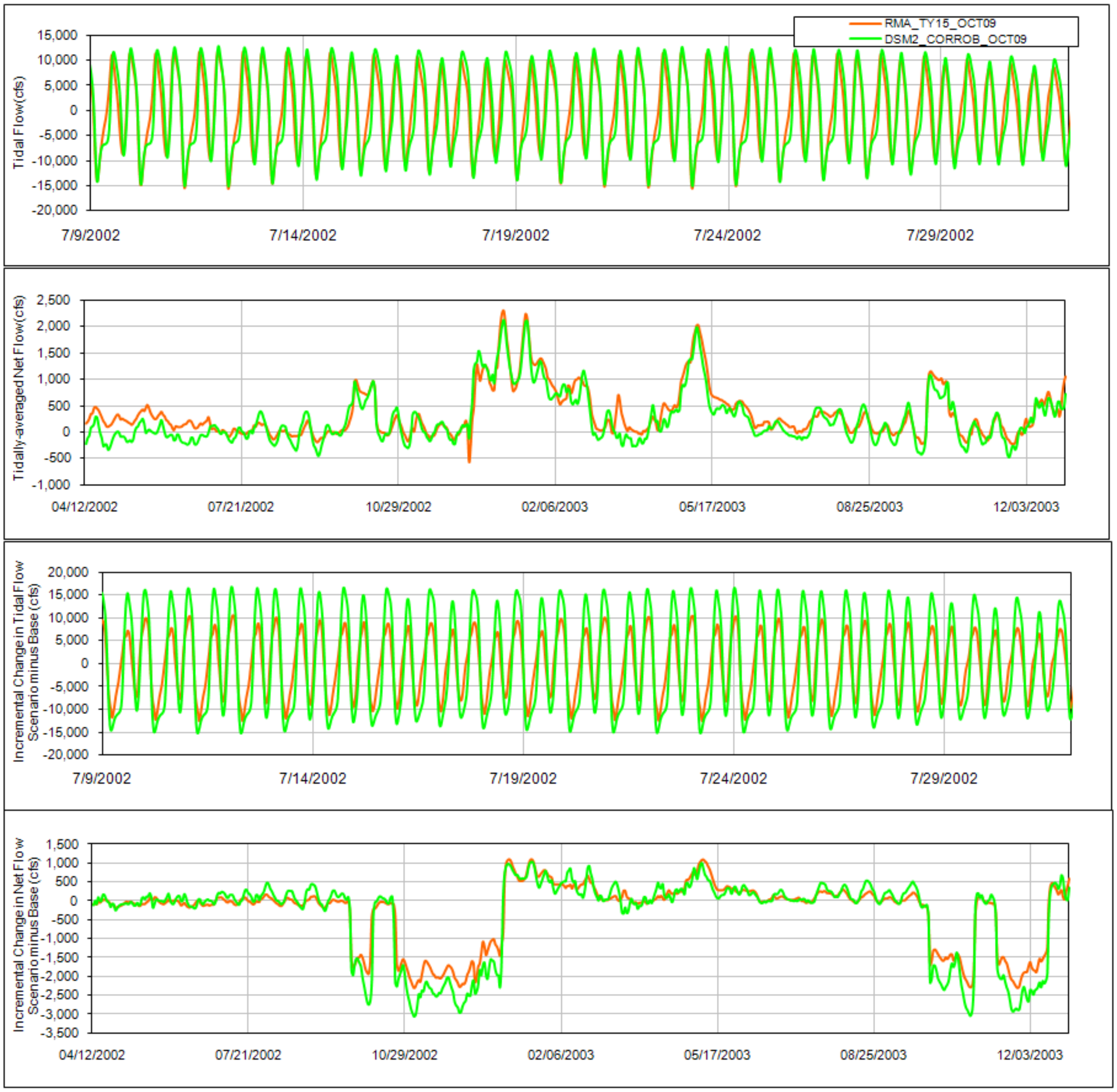


**Figure 1-85. Comparison of Tidal Flow, Tidally-Averaged Daily Flow, Incremental Change in Tidal Flow and the Incremental Change in the Daily Flow between the Late Long-term Scenario and the Current Conditions Scenario from RMA Model and DSM2 Model for Montezuma Slough at Mouth Location**

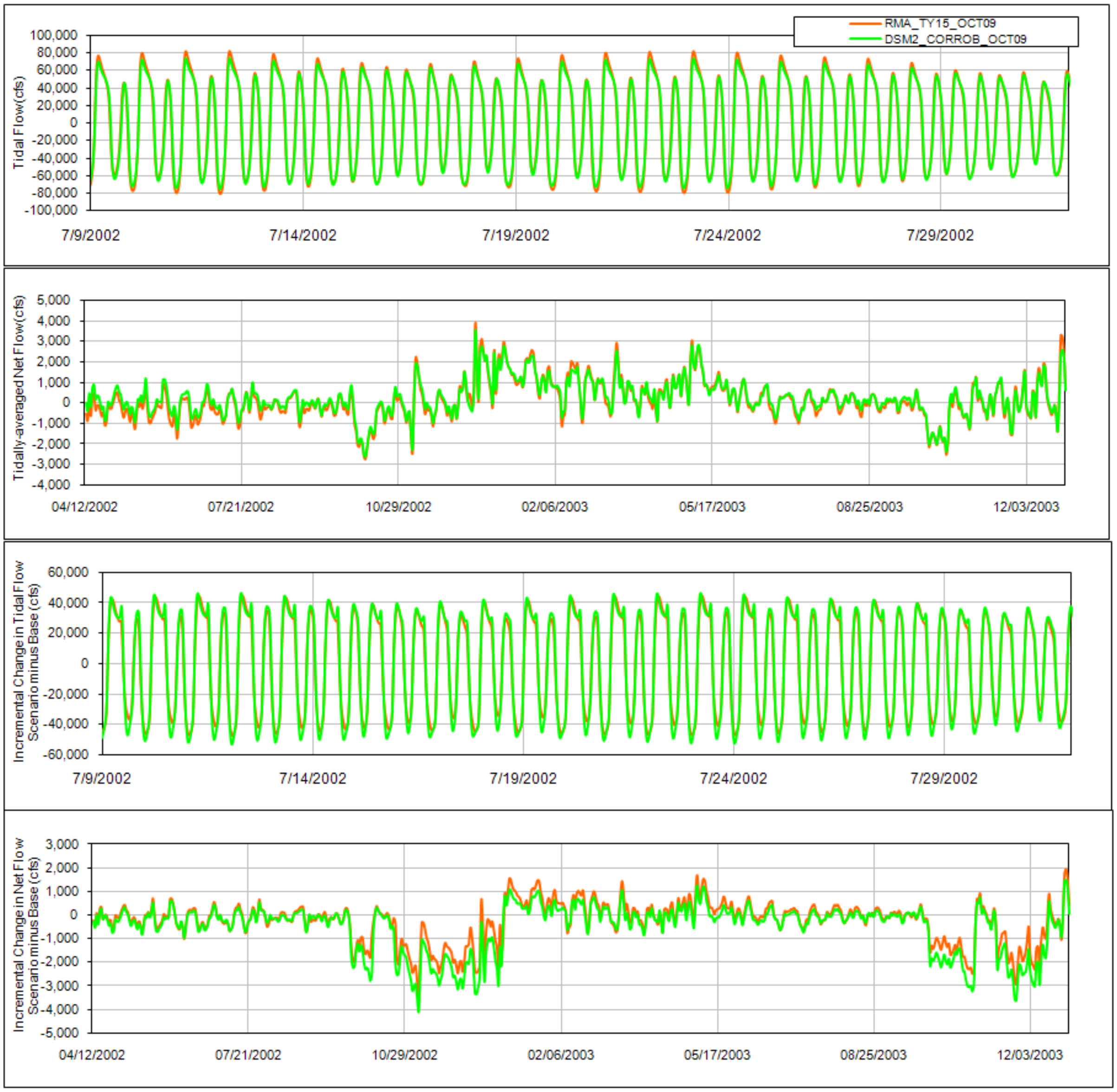


**Figure 1-86. Comparison of Tidal Flow, Tidally-Averaged Daily Flow, Incremental Change in Tidal Flow and the Incremental Change in the Daily Flow between the Late Long-term Scenario and the Current Conditions Scenario from RMA Model and DSM2 Model for San Joaquin River at Prisoners Point Location**

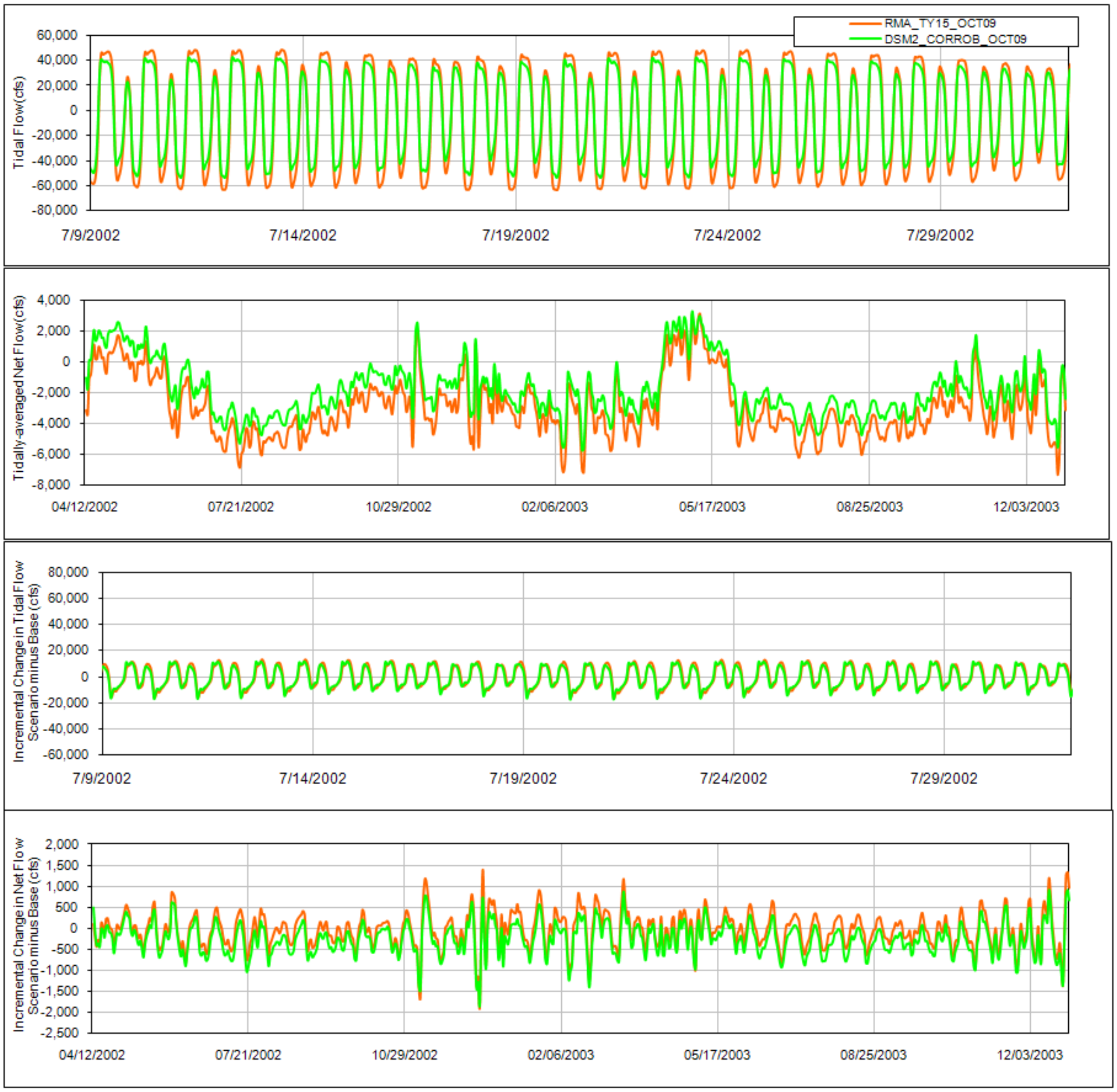


**Figure 1-87. Comparison of Tidal Flow, Tidally-Averaged Daily Flow, Incremental Change in Tidal Flow and the Incremental Change in the Daily Flow between the Late Long-term Scenario and the Current Conditions Scenario from RMA Model and DSM2 Model for San Joaquin River at Stockton Location**

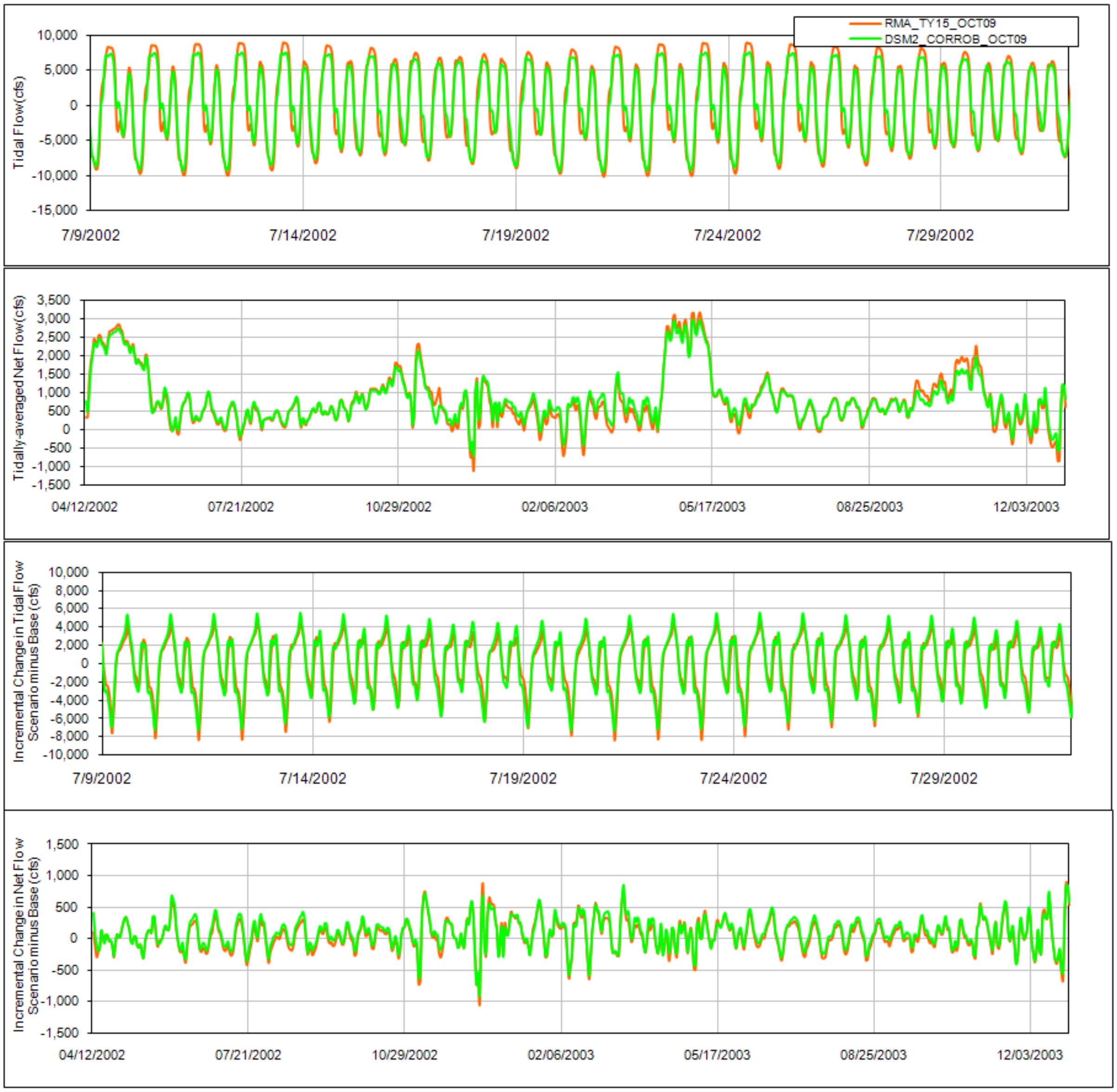


**Figure 1-88. Comparison of Tidal Flow, Tidally-Averaged Daily Flow, Incremental Change in Tidal Flow and the Incremental Change in the Daily Flow between the Late Long-term Scenario and the Current Conditions Scenario from RMA Model and DSM2 Model for Mokelumne River near San Joaquin River Location**

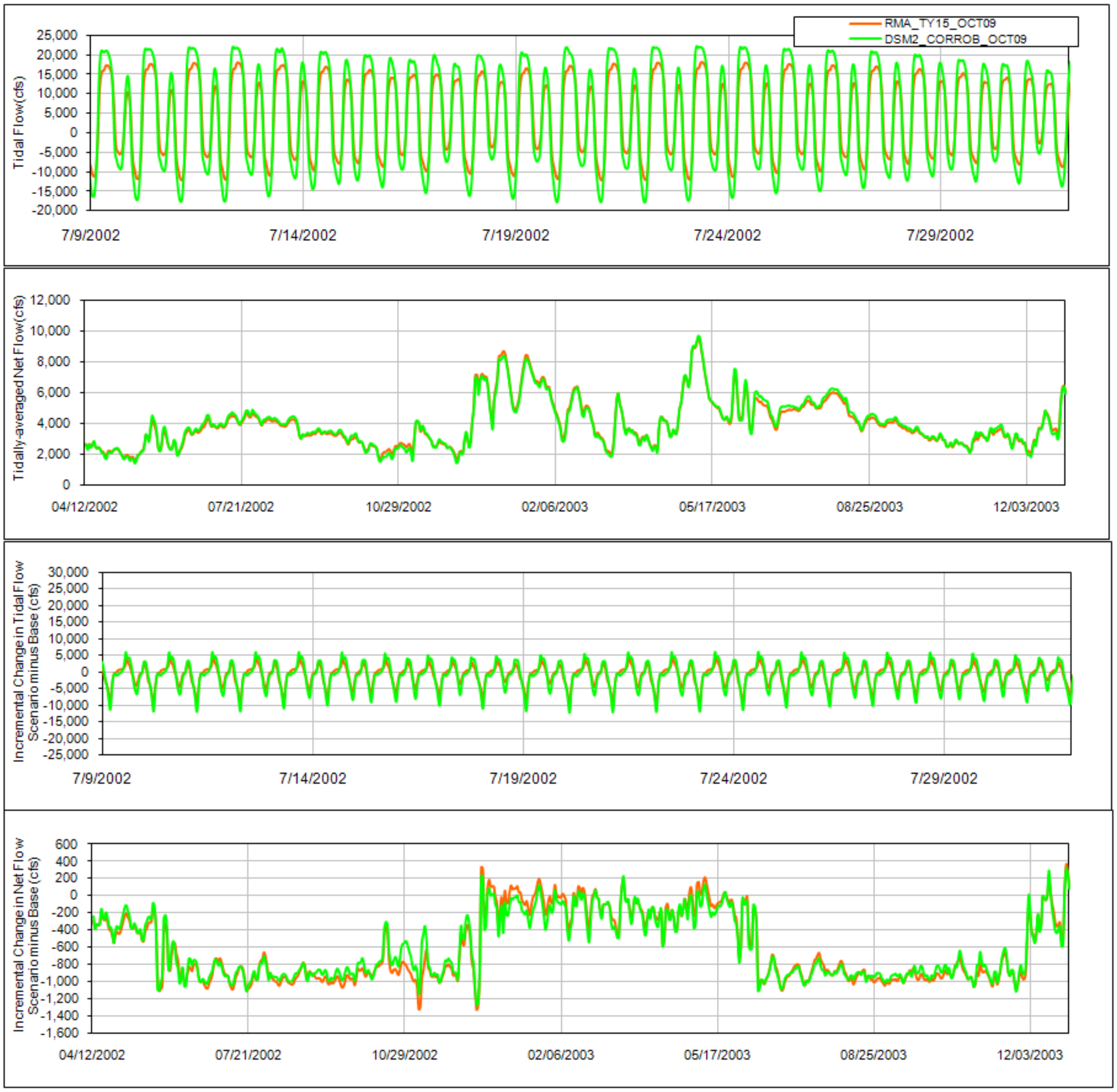


**Figure 1-89. Comparison of Tidal Flow, Tidally-Averaged Daily Flow, Incremental Change in Tidal Flow and the Incremental Change in the Daily Flow between the Late Long-term Scenario and the Current Conditions Scenario from RMA Model and DSM2 Model for Middle River at Bacon Island Location**

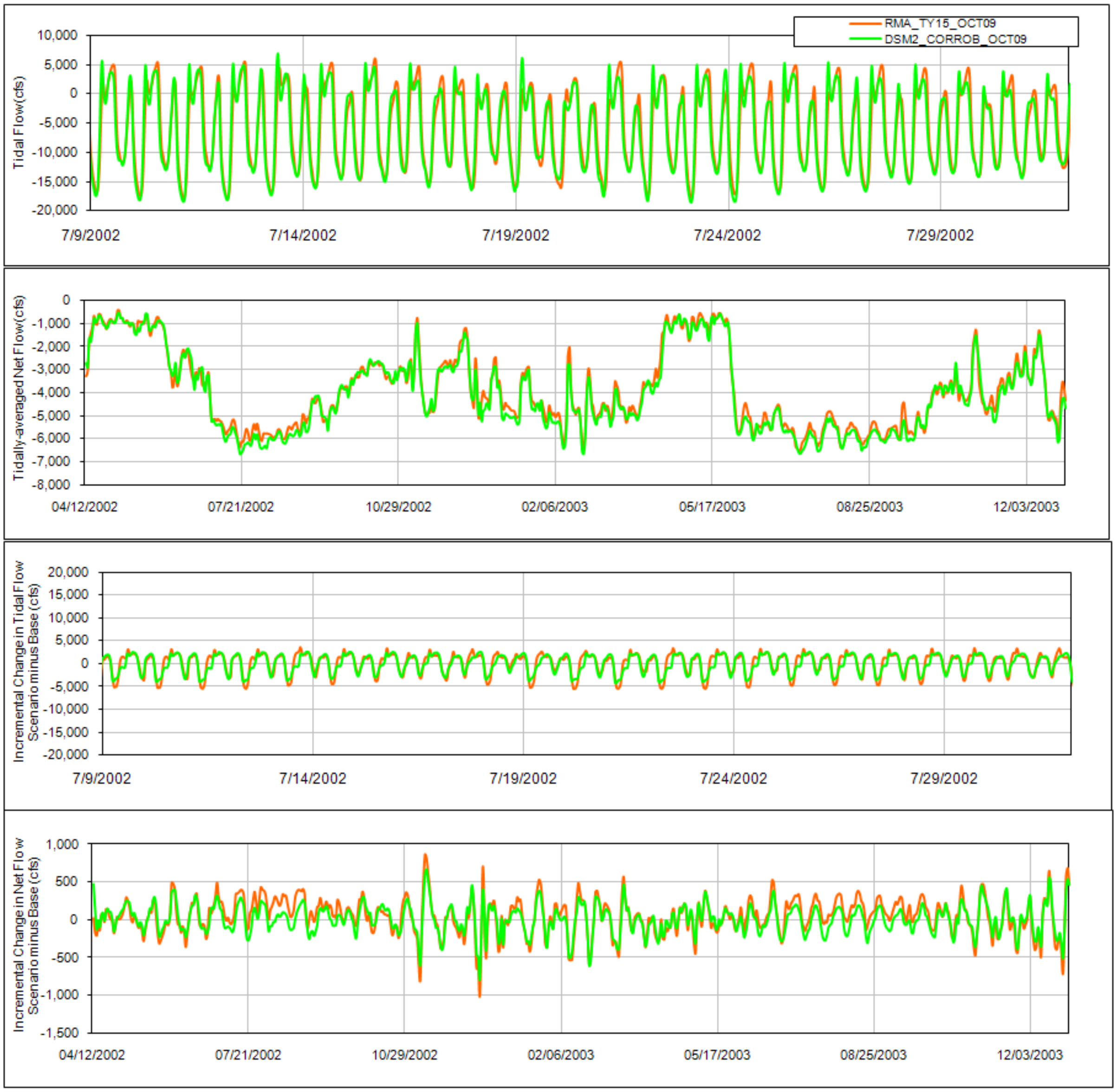


**Figure 1-90. Comparison of Tidal Flow, Tidally-Averaged Daily Flow, Incremental Change in Tidal Flow and the Incremental Change in the Daily Flow between the Late Long-term Scenario and the Current Conditions Scenario from RMA Model and DSM2 Model for Middle River at Bacon Island Location**

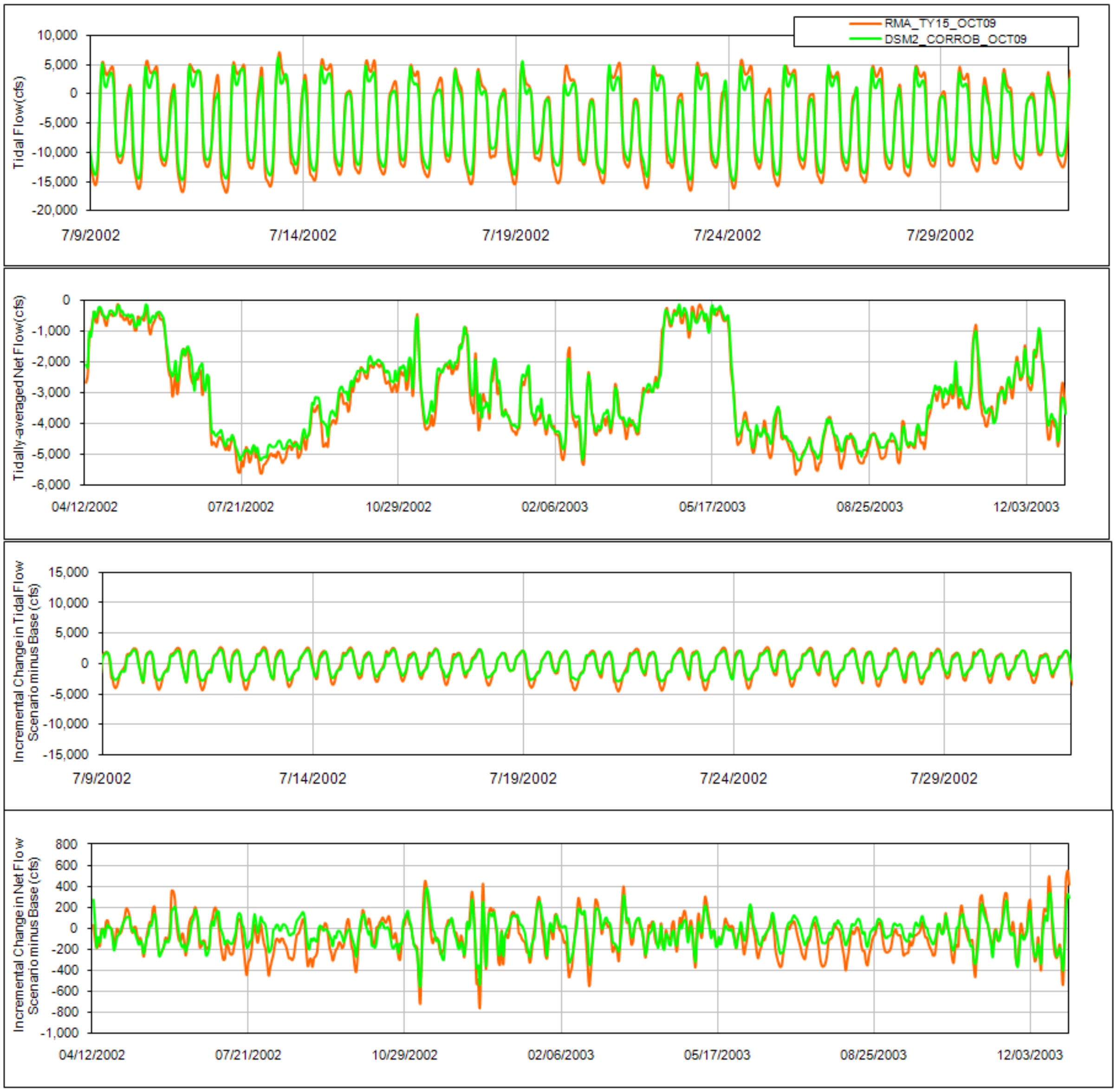


**Figure 1-91. Comparison of Tidal Flow and Tidally-Averaged Daily Flow between the Late Long-Term Scenario and the Current Conditions Scenario from RMA Model and DSM2 Model for Prospect Island North Breach under Cache SI Region**

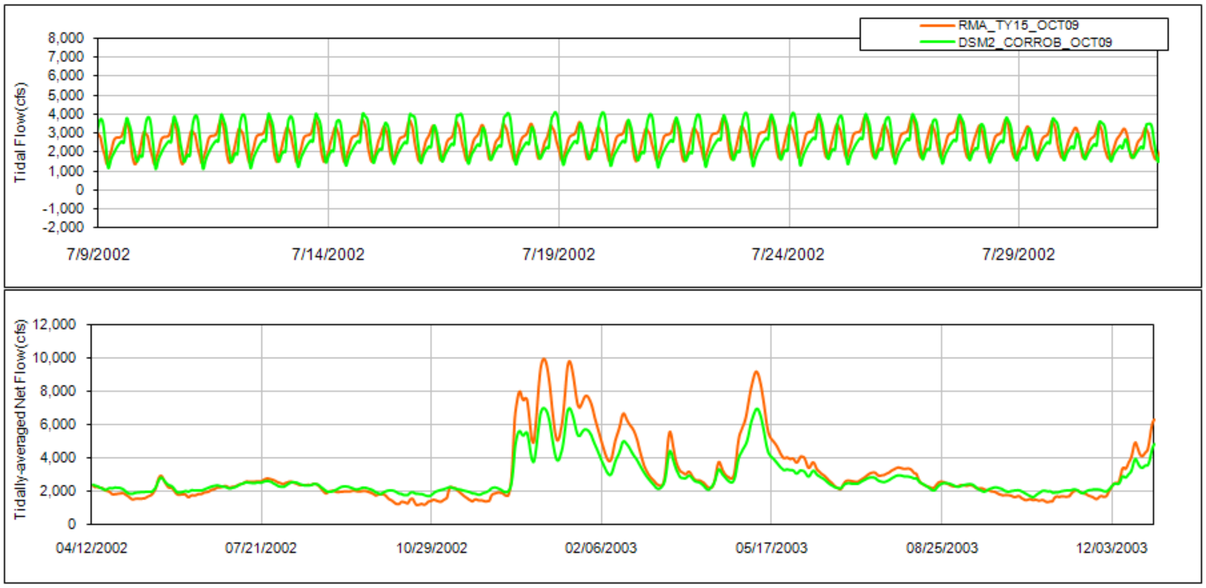



**Figure 1-92. Comparison of Tidal Flow and Tidally-Averaged Daily Flow between the Late Long-Term Scenario and the Current Conditions Scenario from RMA Model and DSM2 Model for Egbert A and Calhoun Cut Breaches under Cache SI Region**

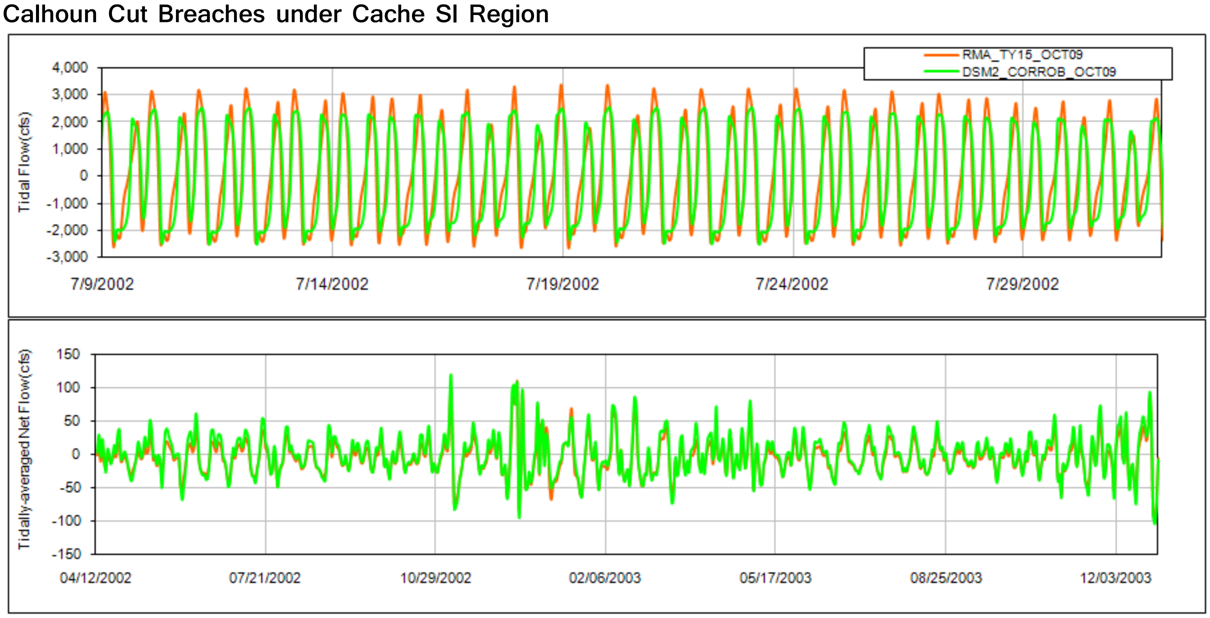


**Figure 1-93. Comparison of Tidal Flow and Tidally-Averaged Daily Flow between the Late Long-Term Scenario and the Current Conditions Scenario from RMA Model and DSM2 Model for Shag Slough Breach under Cache Sl Region**

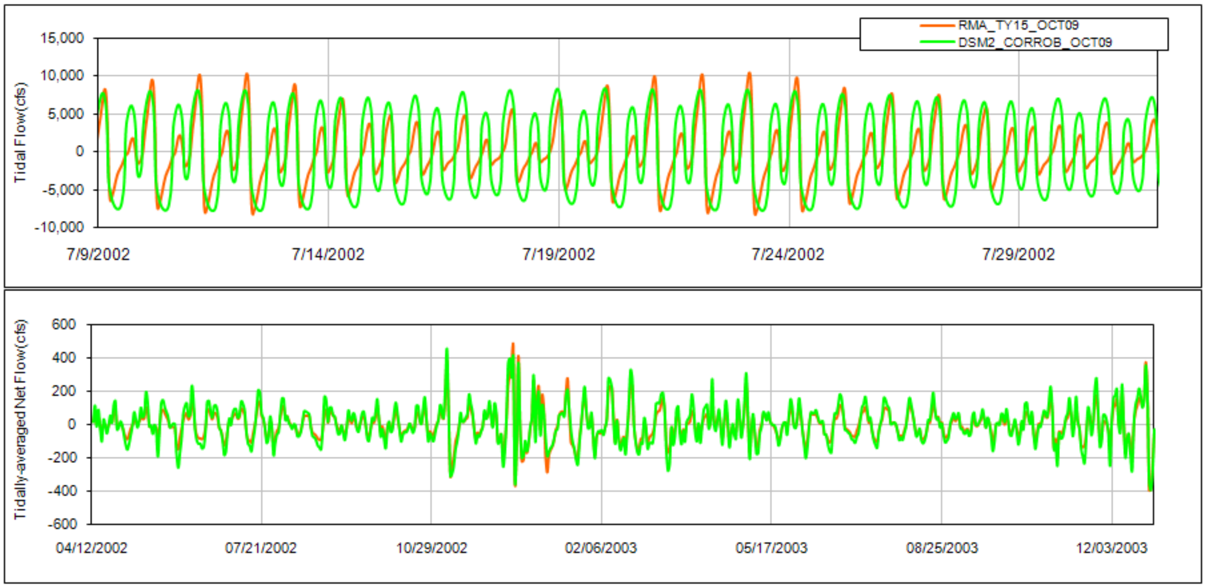



**Figure 1-94. Comparison of Tidal Flow and Tidally-Averaged Daily Flow between the Late Long-Term Scenario and the Current Conditions Scenario from RMA Model and DSM2 Model for Suisun Island 10 Breach 3 under Suisun Marsh**

**Figure 1-95. Comparison of Tidal Flow and Tidally-Averaged Daily Flow between the Late Long-Term Scenario and the Current Conditions Scenario from RMA Model and DSM2 Model for Suisun Island 5 Breach 1 under Suisun Marsh**

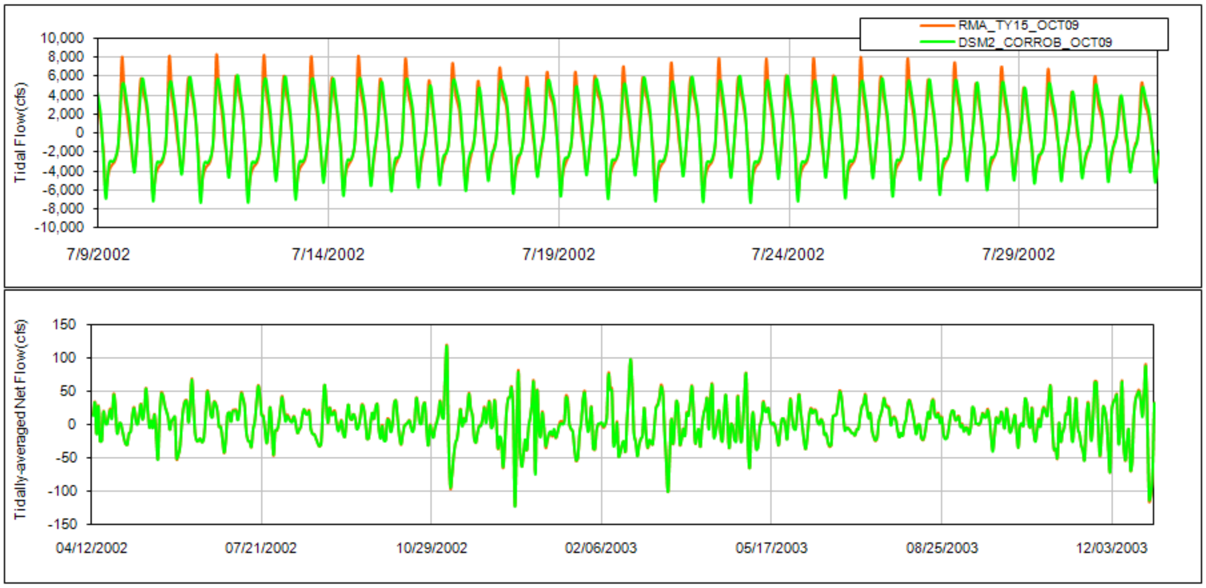



**Figure 1-96. Comparison of Tidal Flow and Tidally-Averaged Daily Flow between the Late Long-Term Scenario and the Current Conditions Scenario from RMA Model and DSM2 Model for Montezuma Wetlands Breach under Suisun Marsh**

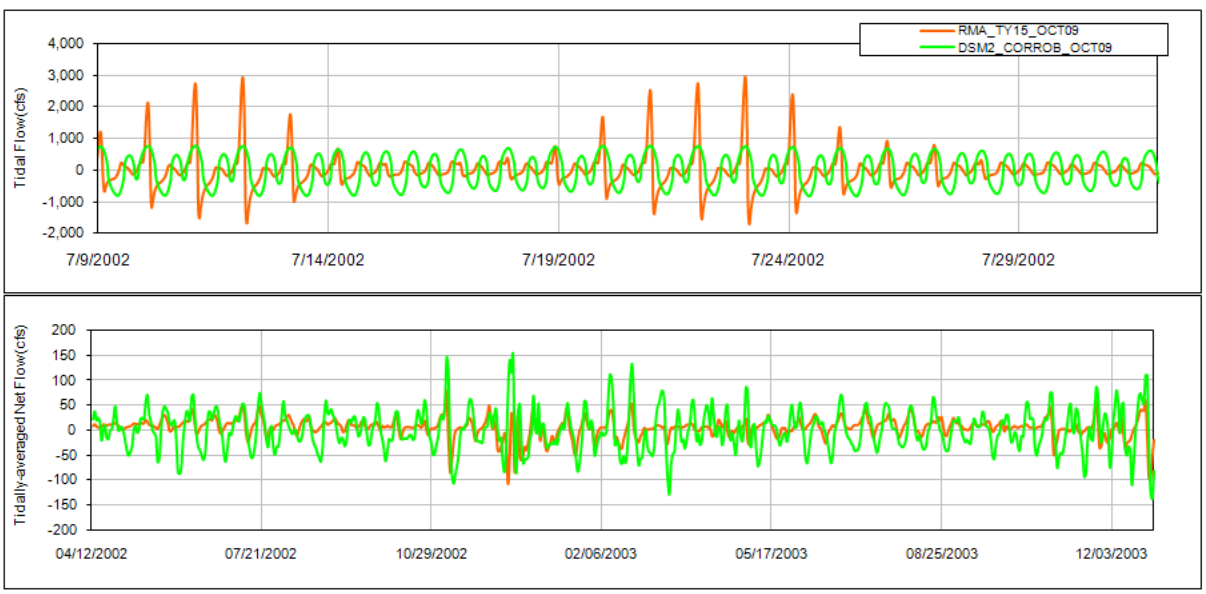


**Figure 1-97. Comparison of Tidal Flow and Tidally-Averaged Daily Flow between the Late Long-Term Scenario and the Current Conditions Scenario from RMA Model and DSM2 Model for Decker Island North West Breach under Western Delta Region.**


**Figure 1-98. Comparison of Tidal Flow and Tidally-Averaged Daily Flow between the Late Long-Term Scenario and the Current Conditions Scenario from RMA Model and DSM2 Model for Dutch Slough d/s of Emerson Slough under Western Delta Region.**

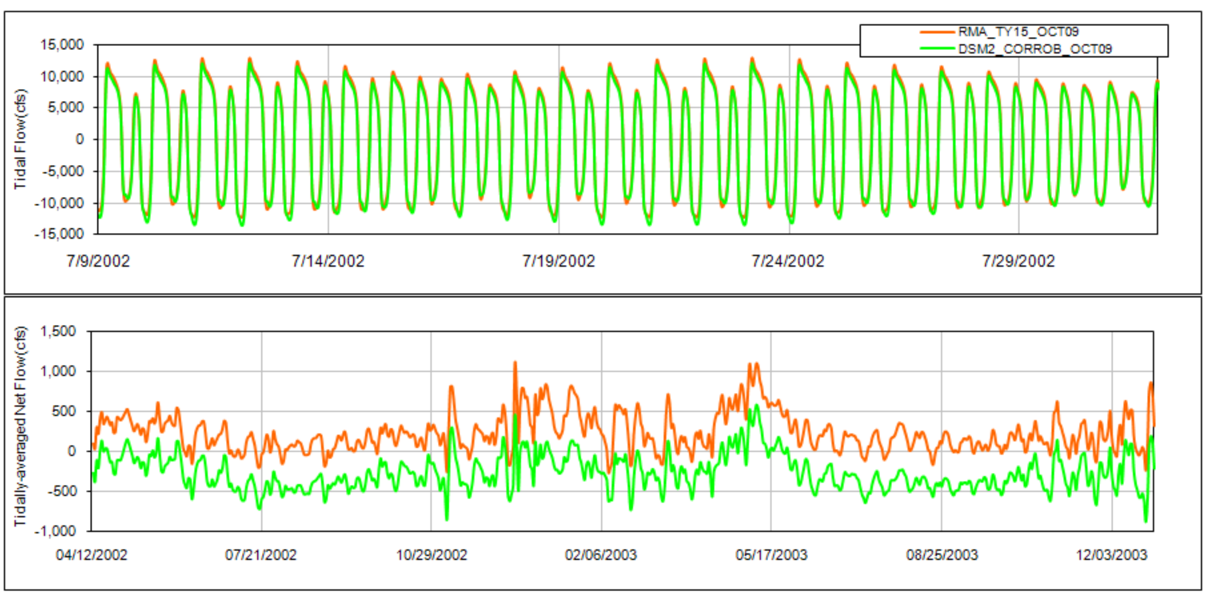
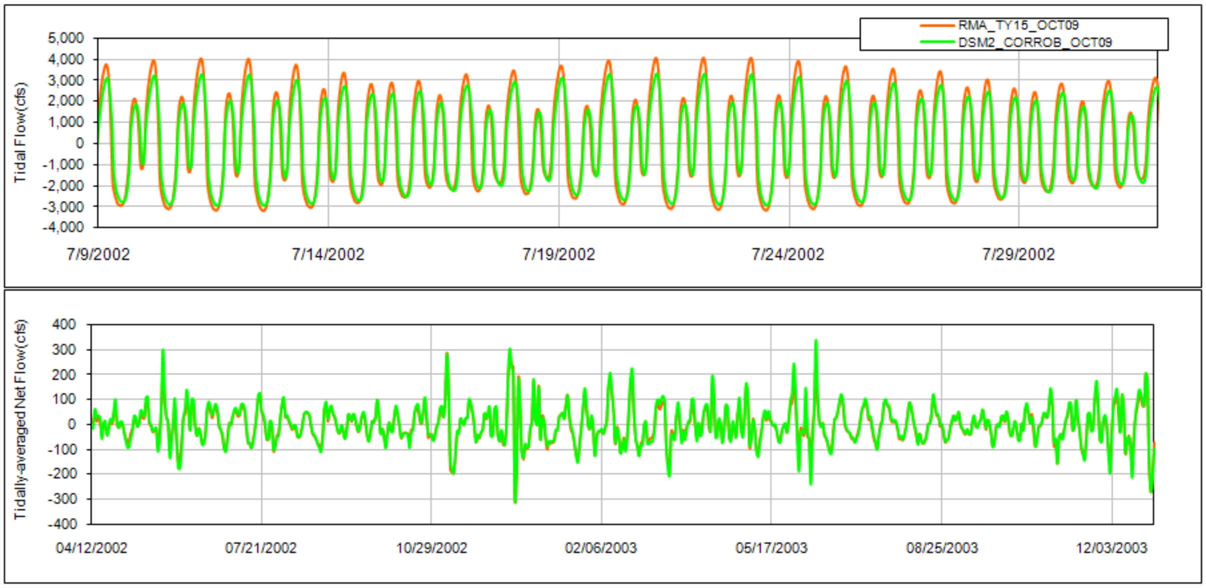


**Figure 1-100. Comparison of Tidal Flow and Tidally-Averaged Daily Flow between the Late Long-Term Scenario and the Current Conditions Scenario from RMA Model and DSM2 Model for Snodgrass Slough Breach under Eastern Delta Region.**



# Late Long-Term 65,000ac Restoration Corroboration

## Salinity Results

**Figure 1-101. Comparison of Monthly averaged percentage incremental change in EC between the Late Long-Term Scenario and the Current Conditions Scenario from RMA Model and DSM2 Model for Sacramento River at Collinsville.**

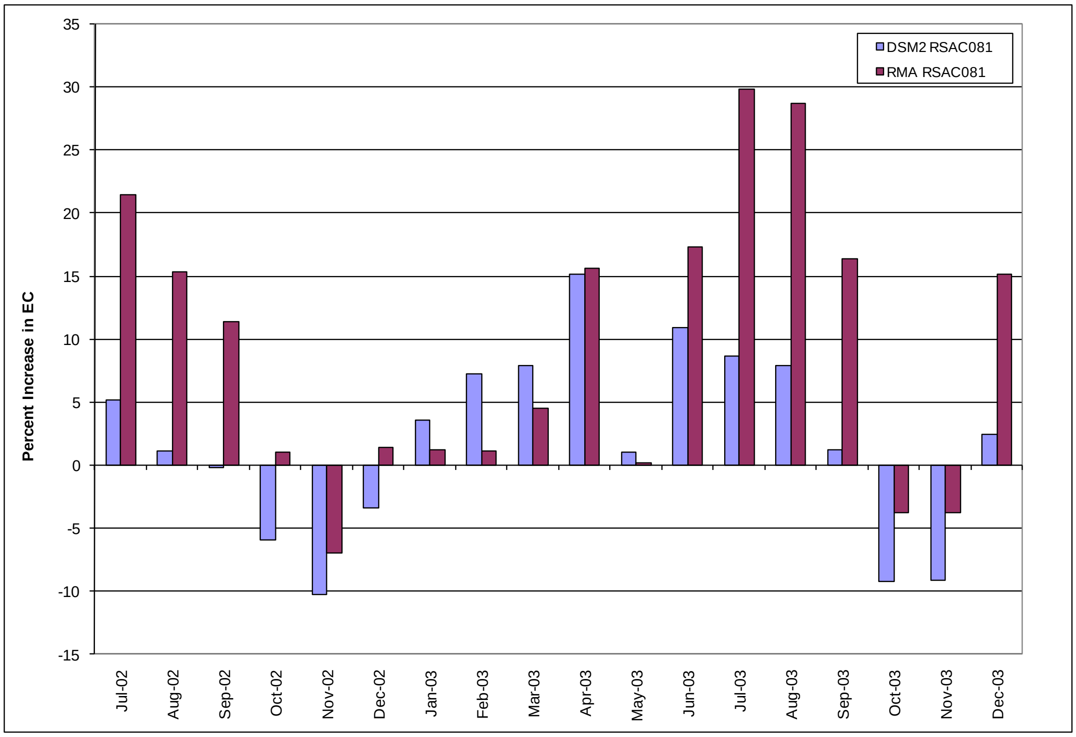


**Figure 1-102. Comparison of Monthly averaged percentage incremental change in EC between the Late Long-Term Scenario and the Current Conditions Scenario from RMA Model and DSM2 Model for Sacramento River at Emmaton.**

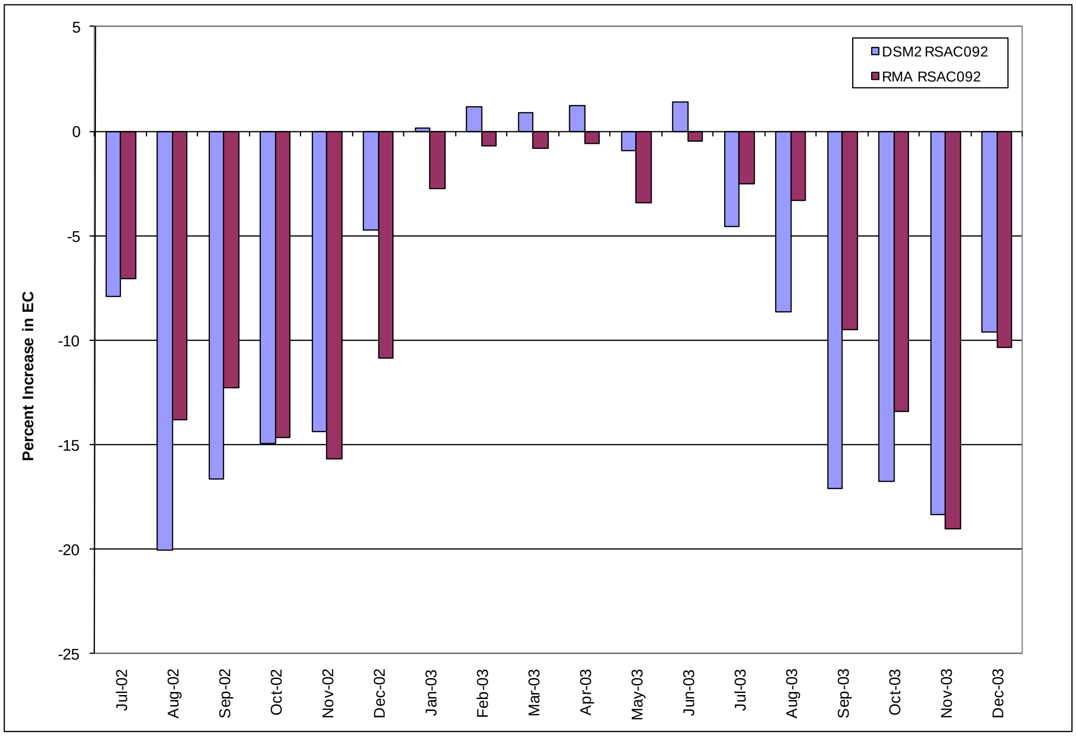



**Figure 1-103. Comparison of Monthly averaged percentage incremental change in EC between the Late Long-Term Scenario and the Current Conditions Scenario from RMA Model and DSM2 Model for San Joaquin River at Jersey Point.**

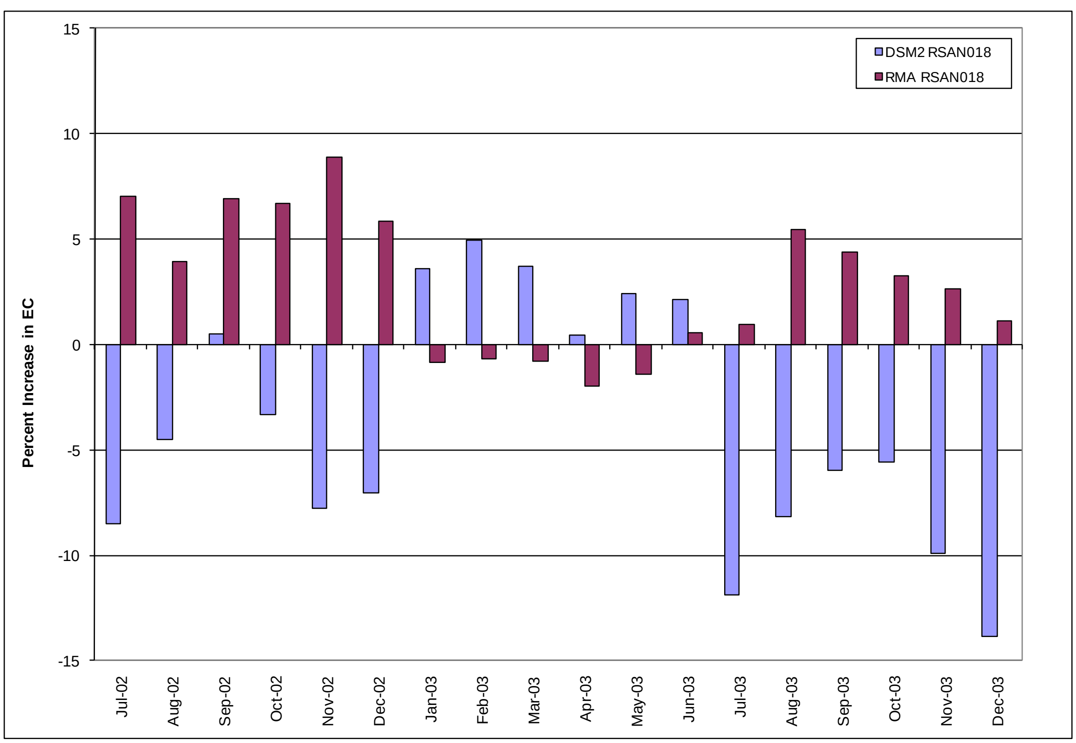


**Figure 1-104. Comparison of Monthly averaged percentage incremental change in EC between the Late Long-Term Scenario and the Current Conditions Scenario from RMA Model and DSM2 Model for Old River at Rock Slough.**

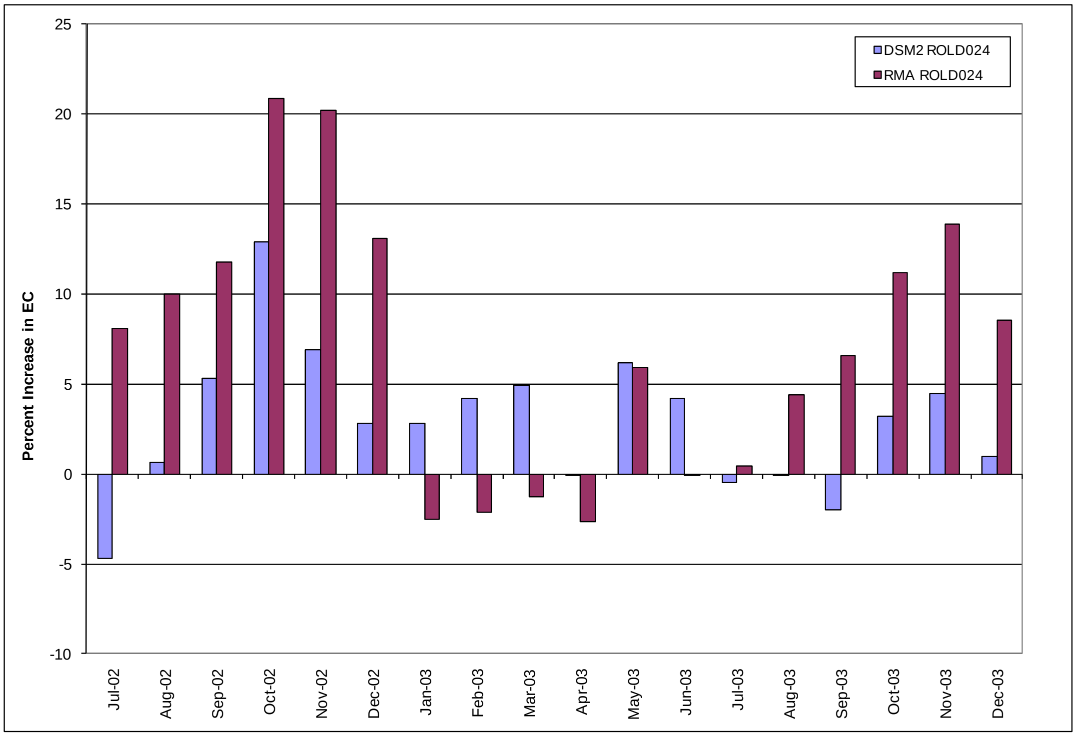



**Figure 1-105. Comparison of Tidally-Averaged Daily EC and the Incremental Change in the Daily EC between the Late Long-term Scenario and the Current Conditions Scenario from RMA Model and DSM2 Model for Montezuma Slough at Mouth Location.**

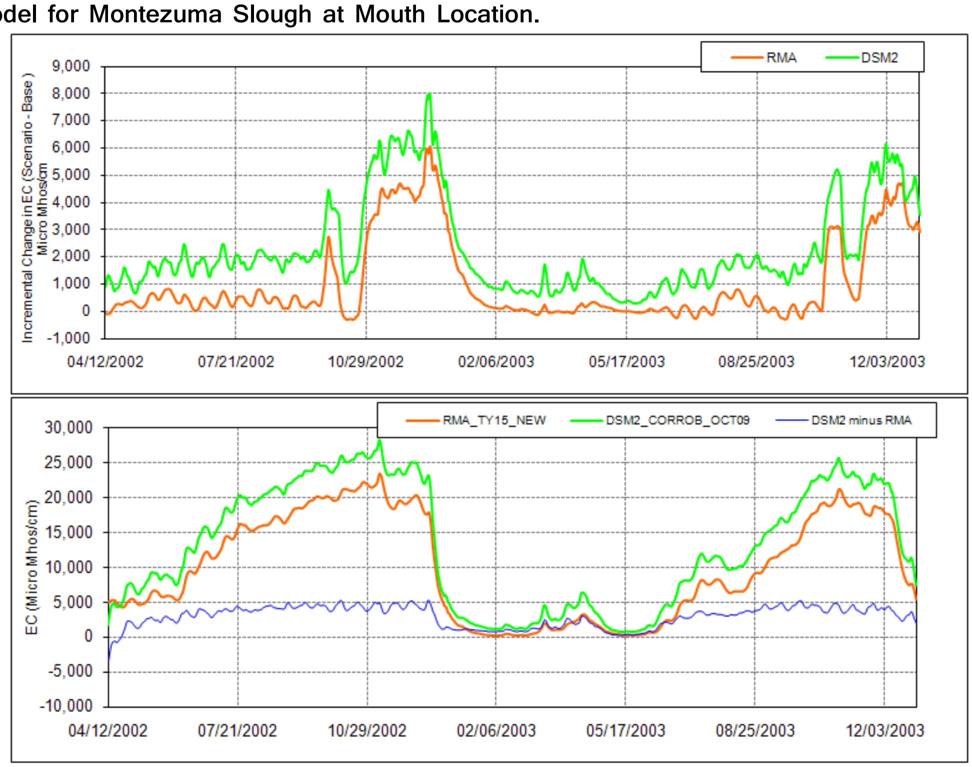


**Figure 1-106. Comparison of Tidally-Averaged Daily EC and the Incremental Change in the Daily EC between the Late Long-term Scenario and the Current Conditions Scenario from RMA Model and DSM2 Model for Montezuma Slough at Beldon's Landing Location.**

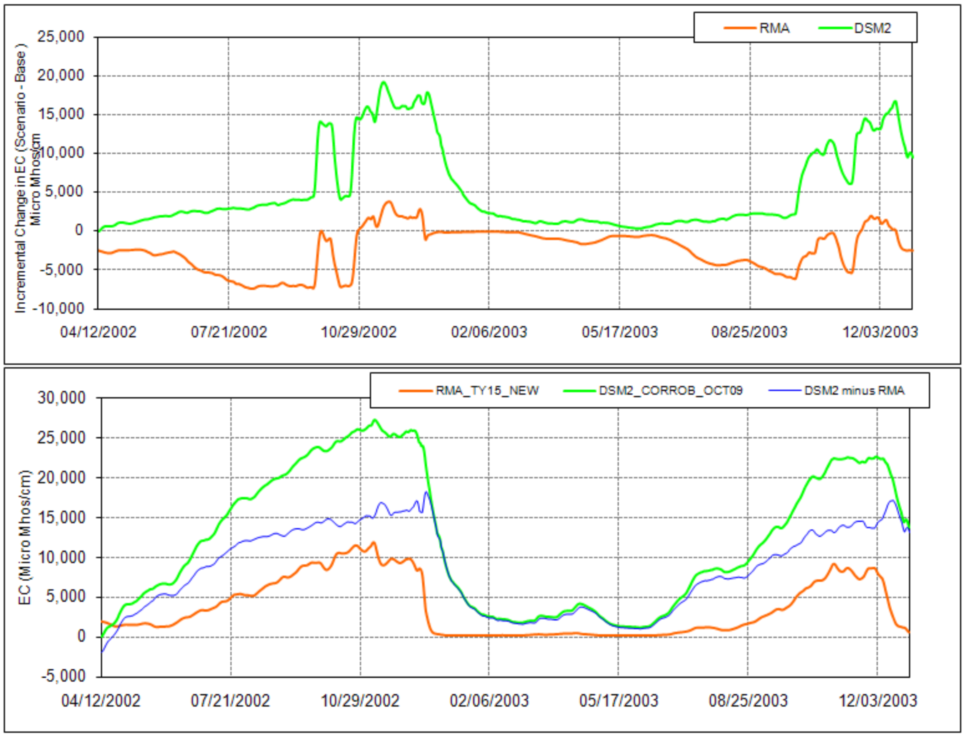



**Figure 1-107. Comparison of Tidally-Averaged Daily EC and the Incremental Change in the Daily EC between the Late Long-term Scenario and the Current Conditions Scenario from RMA Model and DSM2 Model for Montezuma Slough at Head Location.**

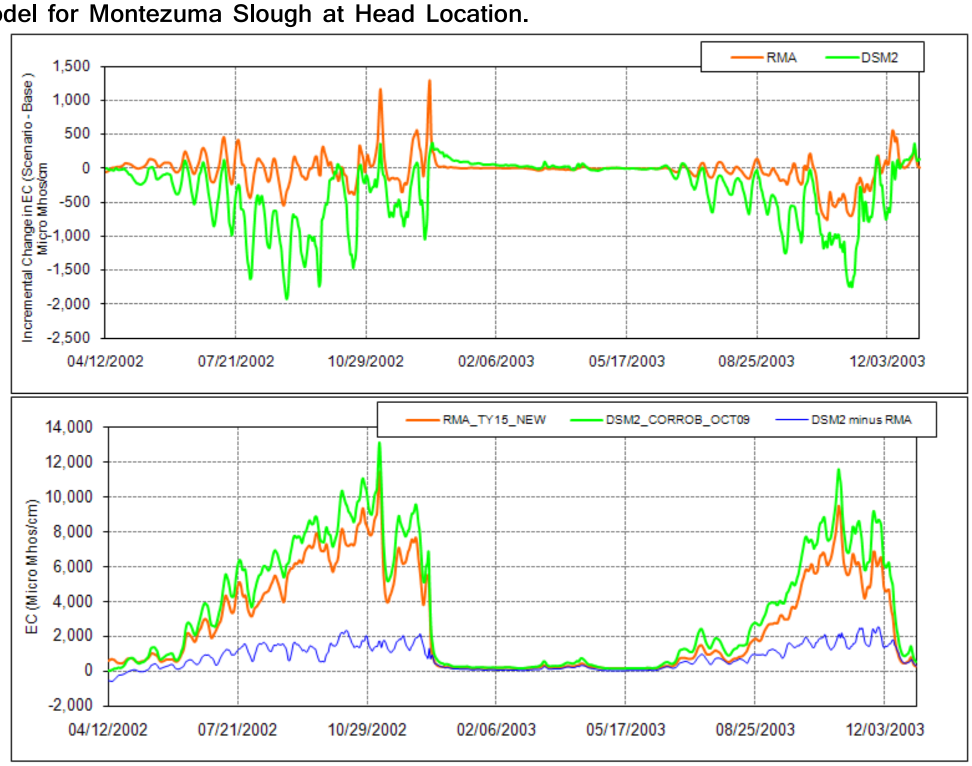


**Figure 1-106. Comparison of Tidally-Averaged Daily EC and the Incremental Change in the Daily EC between the Late Long-term Scenario and the Current Conditions Scenario from RMA Model and DSM2 Model for Sacramento River at Port Chicago Location.**

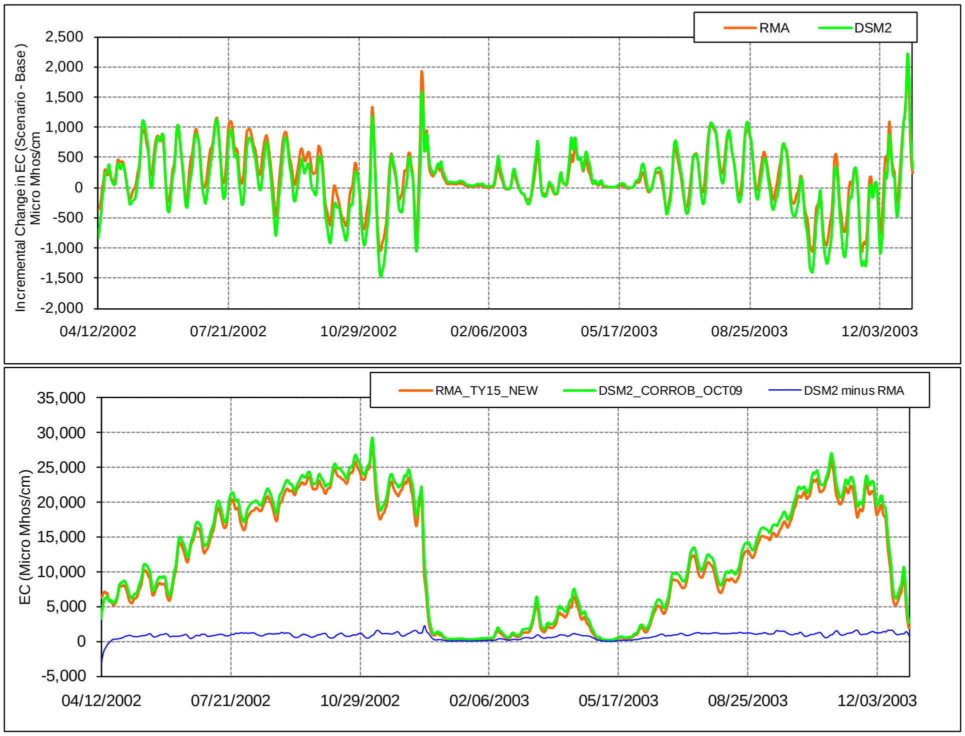



**Figure 1-107. Comparison of Tidally-Averaged Daily EC and the Incremental Change in the Daily EC between the Late Long-term Scenario and the Current Conditions Scenario from RMA Model and DSM2 Model for Sacramento River at Collinsville Location.**

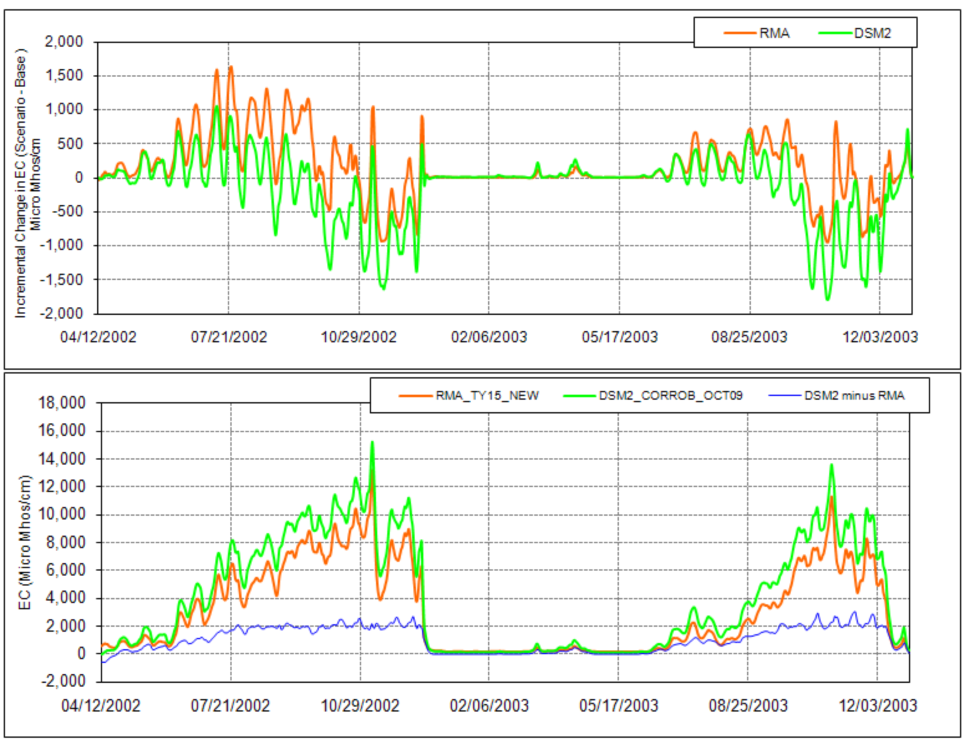


Figure 1-108. Comparison of Tidally-Averaged Daily EC and the Incremental Change in the Daily EC between the Late Long-term Scenario and the Current Conditions Scenario from RMA Model and DSM2 Model for Sacramento River at Rio Vista Location.

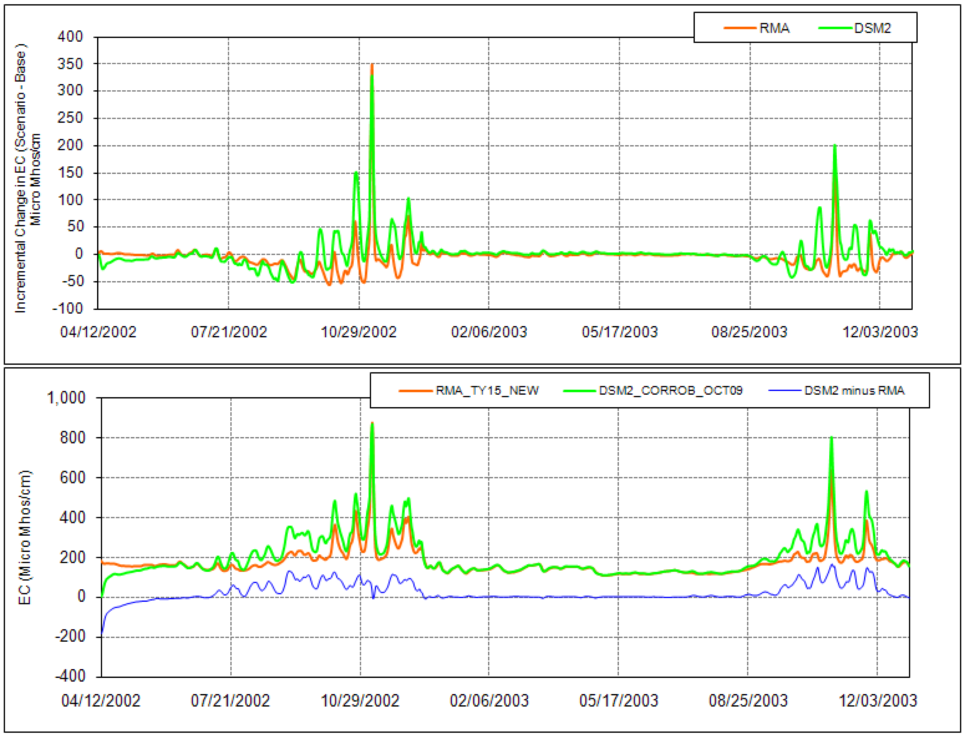



Figure 1-109. Comparison of Tidally-Averaged Daily EC and the Incremental Change in the Daily EC between the Late Long-term Scenario and the Current Conditions Scenario from RMA Model and DSM2 Model for Cache Slough at Ryer Island Location.

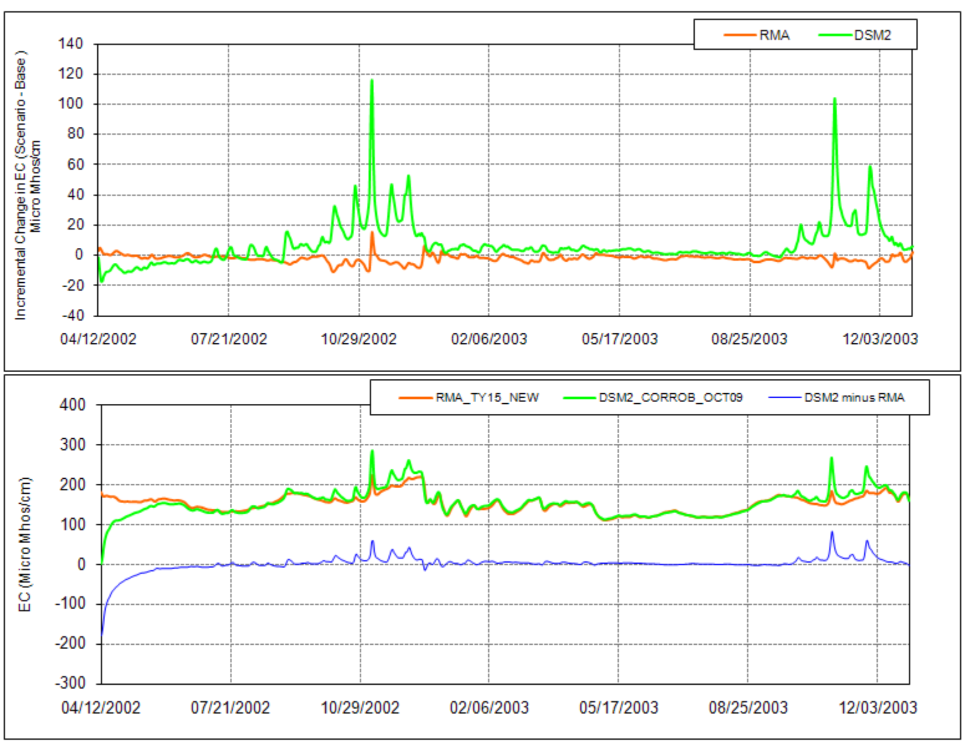


**Figure 1-110. Comparison of Tidally-Averaged Daily EC and the Incremental Change in the Daily EC between the Late Long-term Scenario and the Current Conditions Scenario from RMA Model and DSM2 Model for Three Mile Slough at San Joaquin River Location.**

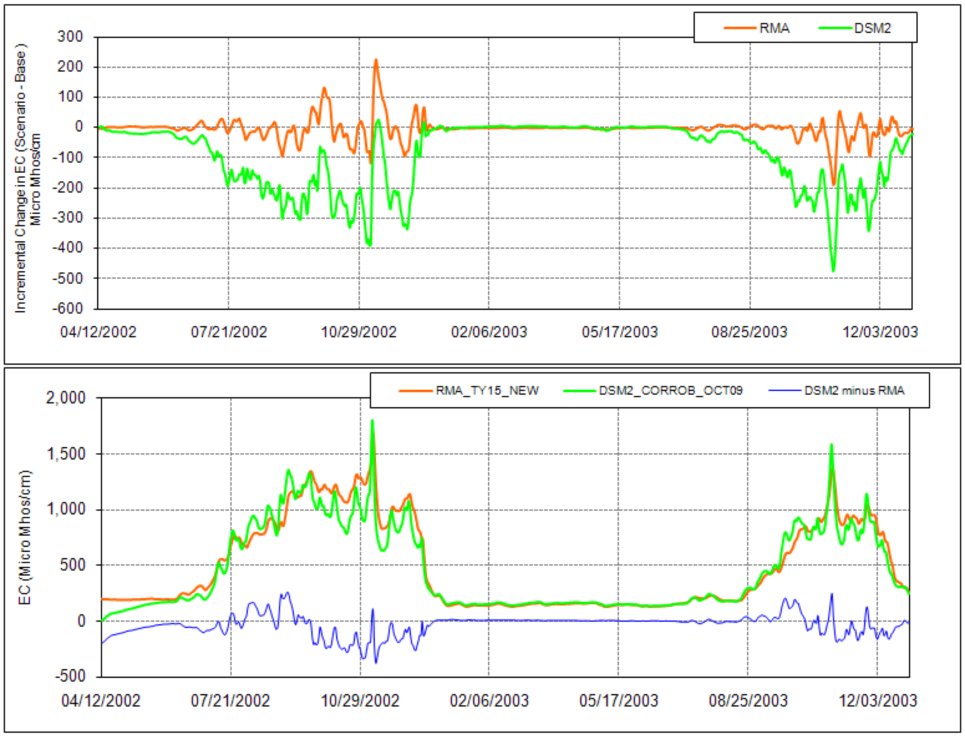



**Figure 1-111. Comparison of Tidally-Averaged Daily EC and the Incremental Change in the Daily EC between the Late Long-term Scenario and the Current Conditions Scenario from RMA Model and DSM2 Model for San Joaquin River at Prisoners Point Location.**

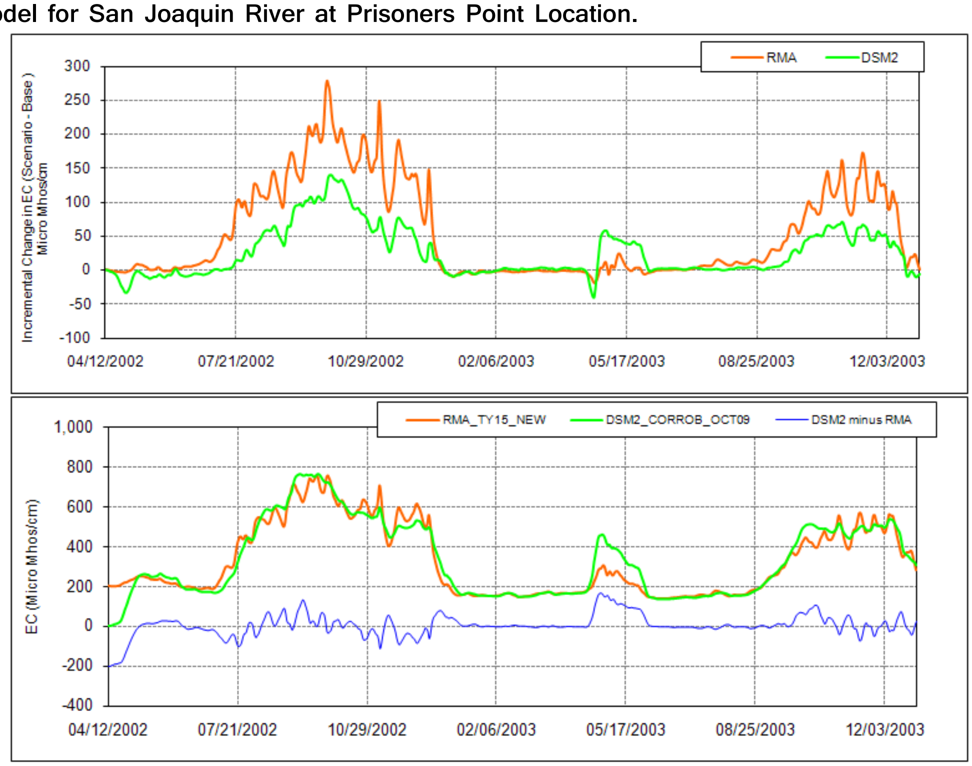


**Figure 1-112. Comparison of Tidally-Averaged Daily EC and the Incremental Change in the Daily EC between the Late Long-term Scenario and the Current Conditions Scenario from RMA Model and DSM2 Model for San Joaquin River at Stockton Location.**

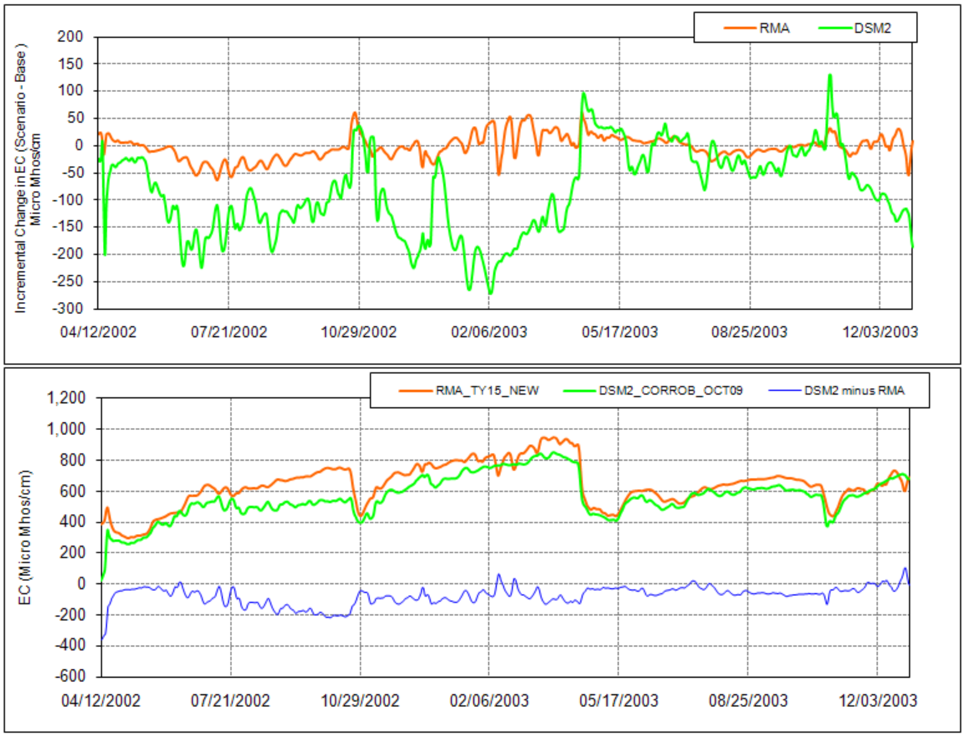



**Figure 1-113. Comparison of Tidally-Averaged Daily EC and the Incremental Change in the Daily EC between the Late Long-term Scenario and the Current Conditions Scenario from RMA Model and DSM2 Model for San Joaquin River at Brandt Bridge Location.**

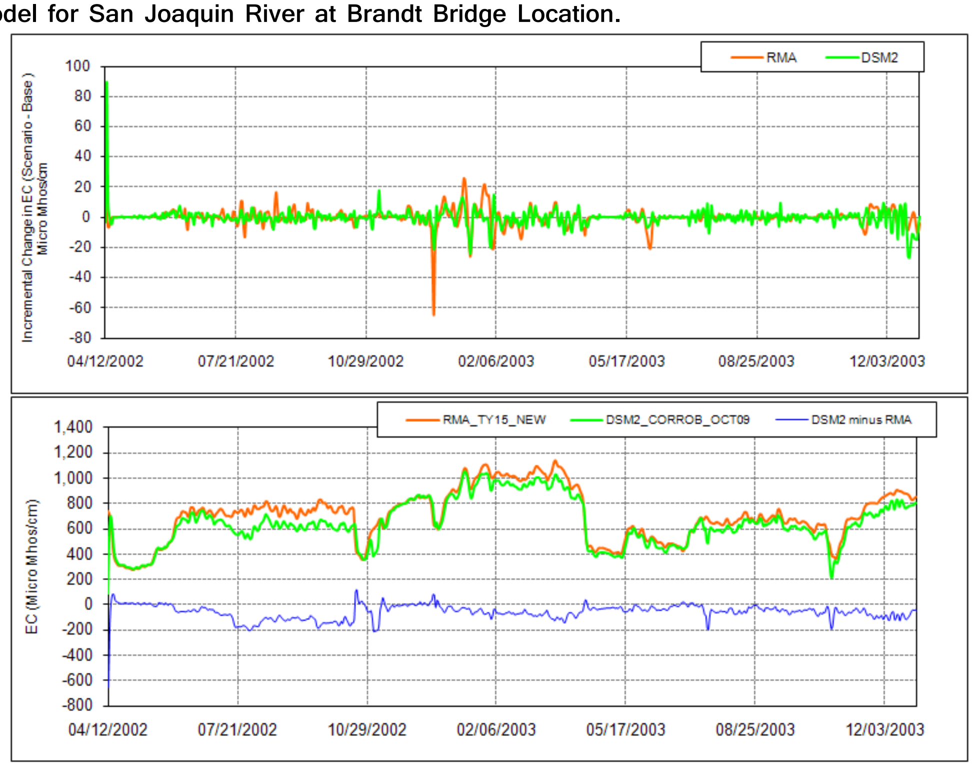


**Figure 1-114. Comparison of Tidally-Averaged Daily EC and the Incremental Change in the Daily EC between the Late Long-term Scenario and the Current Conditions Scenario from RMA Model and DSM2 Model for Middle River at Middle River Location.**

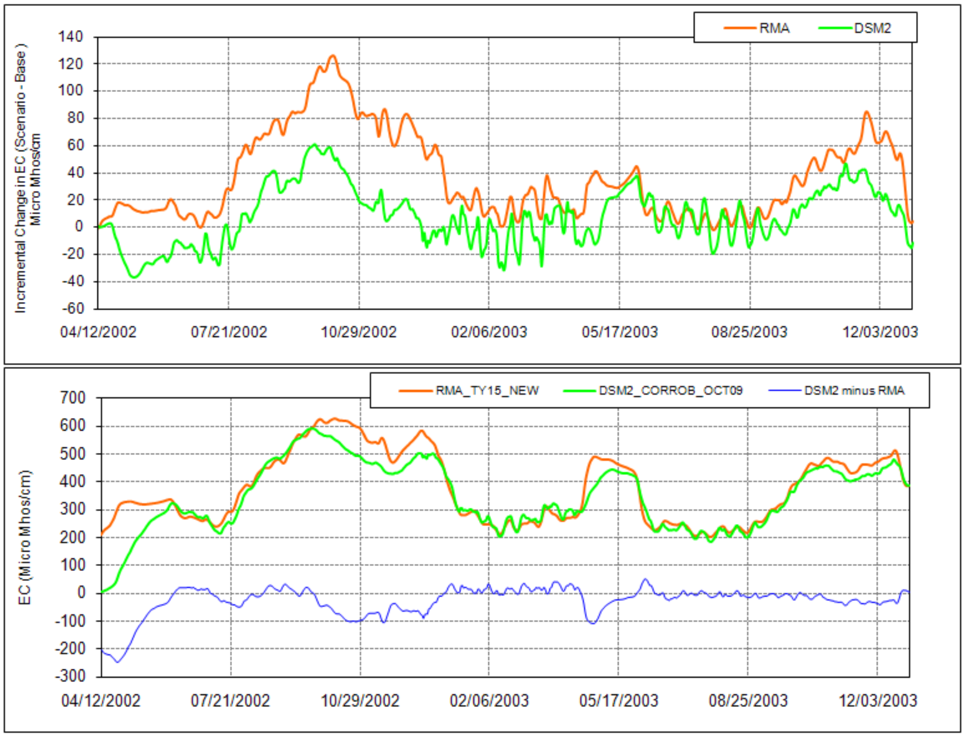
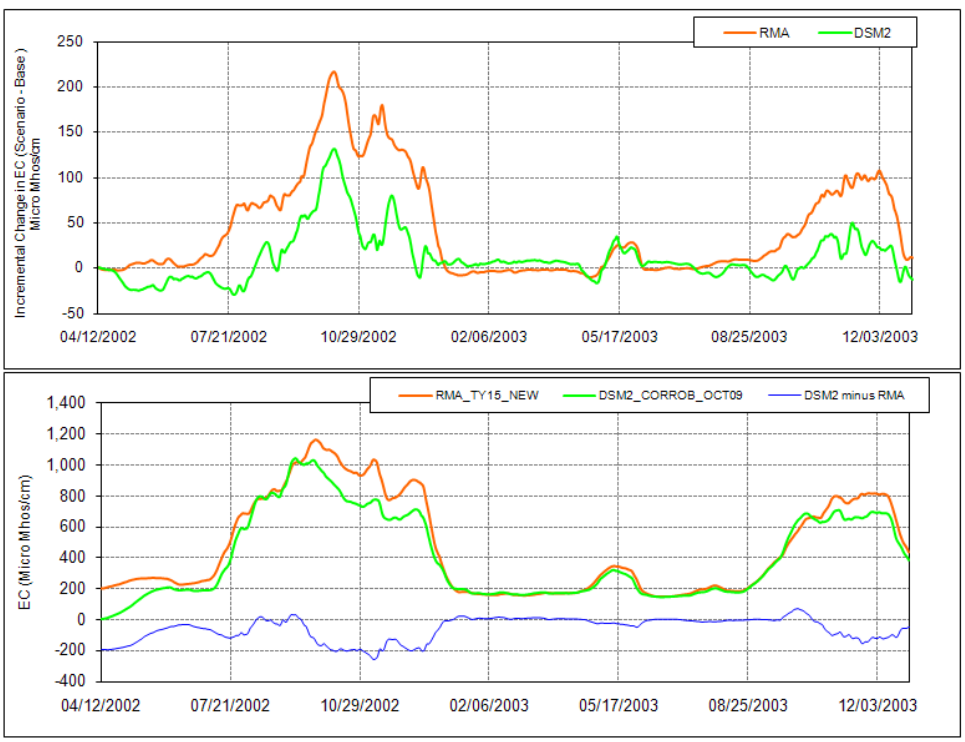



**Figure 1-115. Comparison of Tidally-Averaged Daily EC and the Incremental Change in the Daily EC between the Late Long-term Scenario and the Current Conditions Scenario from RMA Model and DSM2 Model for Old River at Bacon Island Location.**



# Early Long-Term 15cm Sea Level Rise Corroboration

## Salinity Results

**Figure 116. Comparison of average incremental change in tidally averaged EC in 15cm SLR scenario from the baseline between DSM2 and UNTRIM**

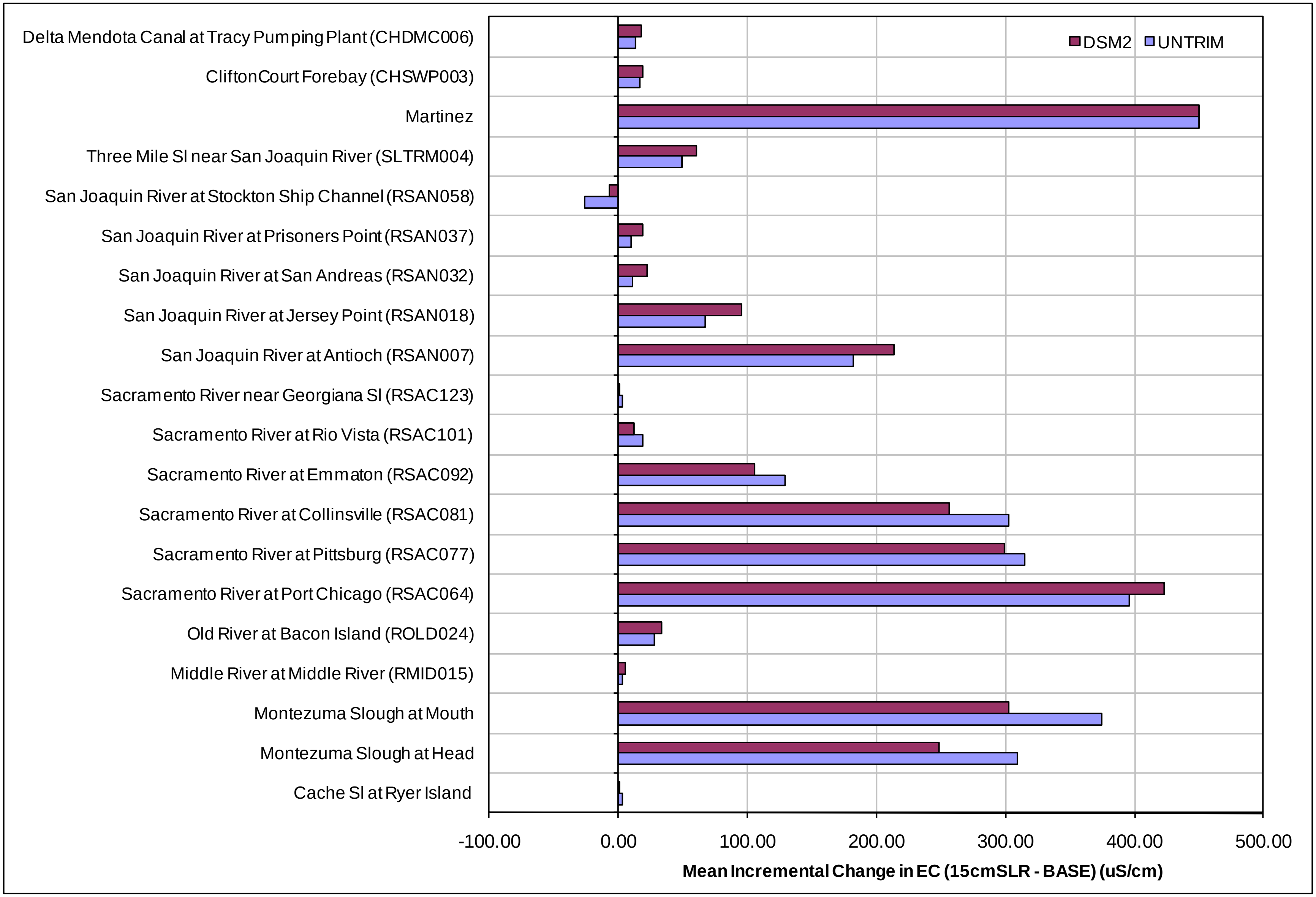


**Figure 1-117. Comparison of Tidally-Averaged Daily EC and the Incremental Change in the Daily EC between the 15cm SLR Scenario and the Current Conditions Scenario from UNTRIM Model and DSM2 Model for Montezuma Slough at Mouth Location.**

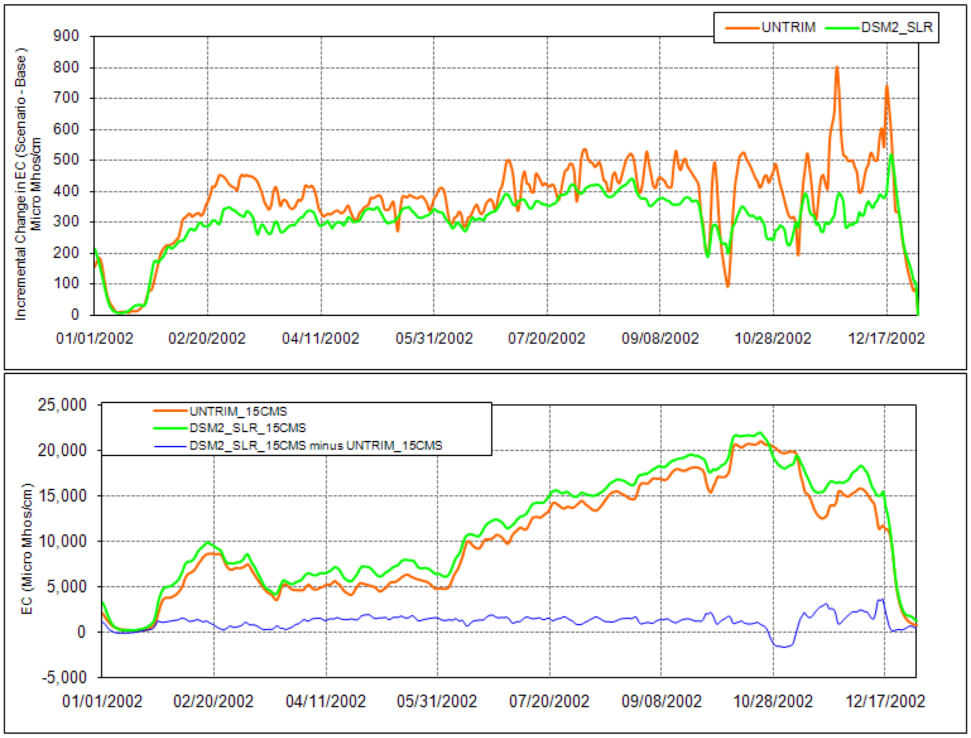



**Figure 1-118. Comparison of Tidally-Averaged Daily EC and the Incremental Change in the Daily EC between the 15cm SLR Scenario and the Current Conditions Scenario from UNTRIM Model and DSM2 Model for Montezuma Slough at Head Location.**

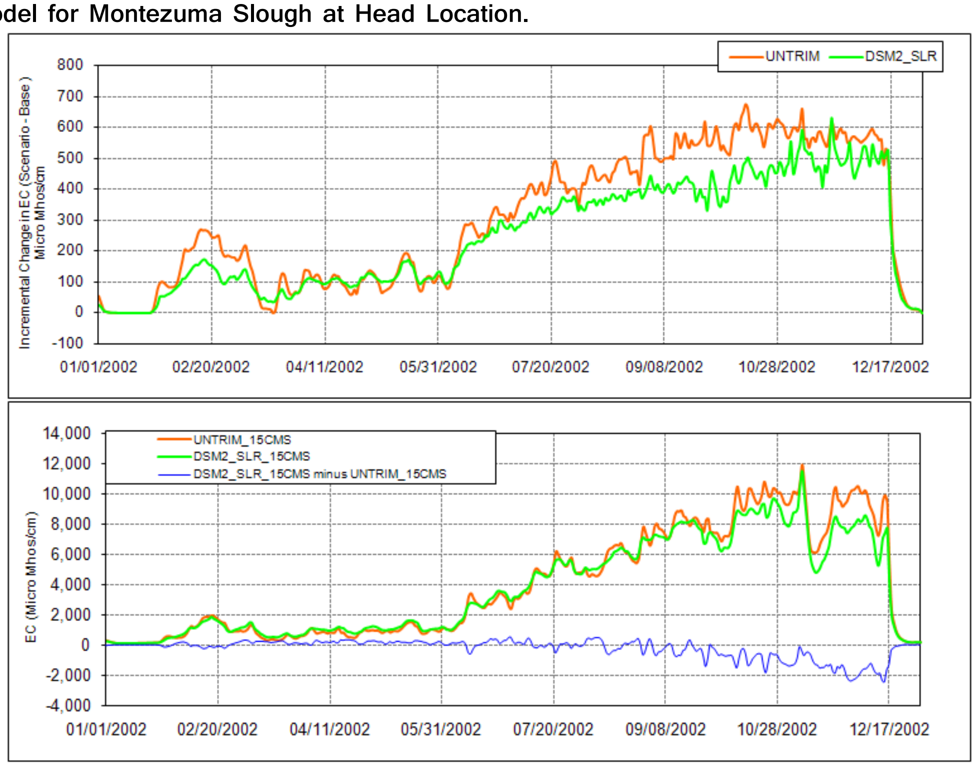


**Figure 1-119. Comparison of Tidally-Averaged Daily EC and the Incremental Change in the Daily EC between the 15cm SLR Scenario and the Current Conditions Scenario from UNTRIM Model and DSM2 Model for Sacramento River at Port Chicago Location.**

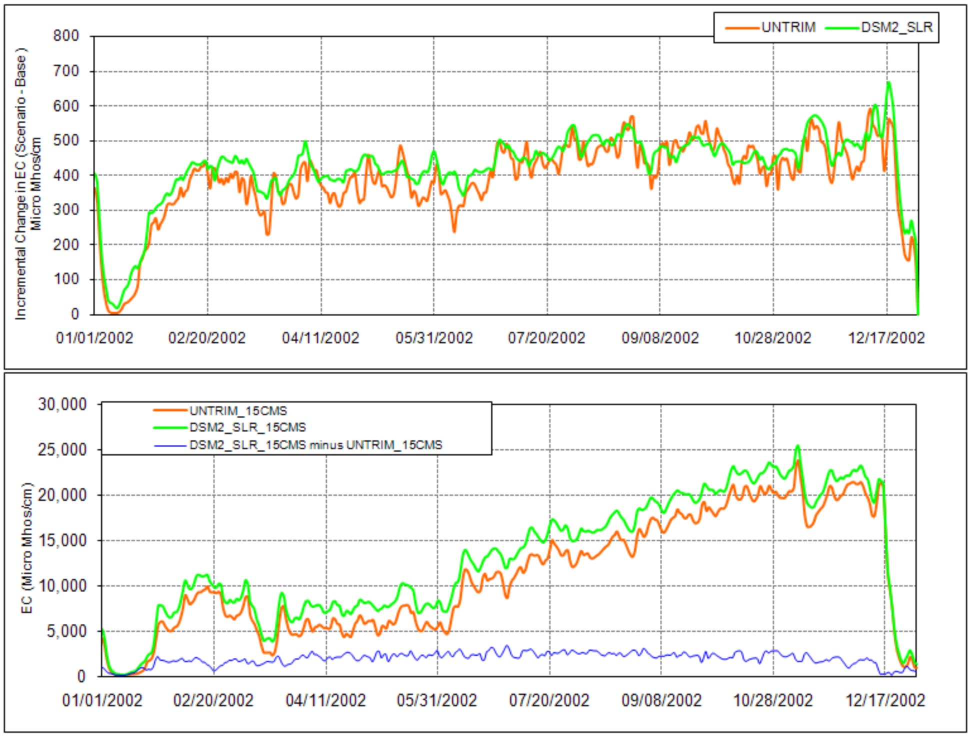



**Figure 1-120. Comparison of Tidally-Averaged Daily EC and the Incremental Change in the Daily EC between the 15cm SLR Scenario and the Current Conditions Scenario from UNTRIM Model and DSM2 Model for Sacramento River at Collinsville Location.**

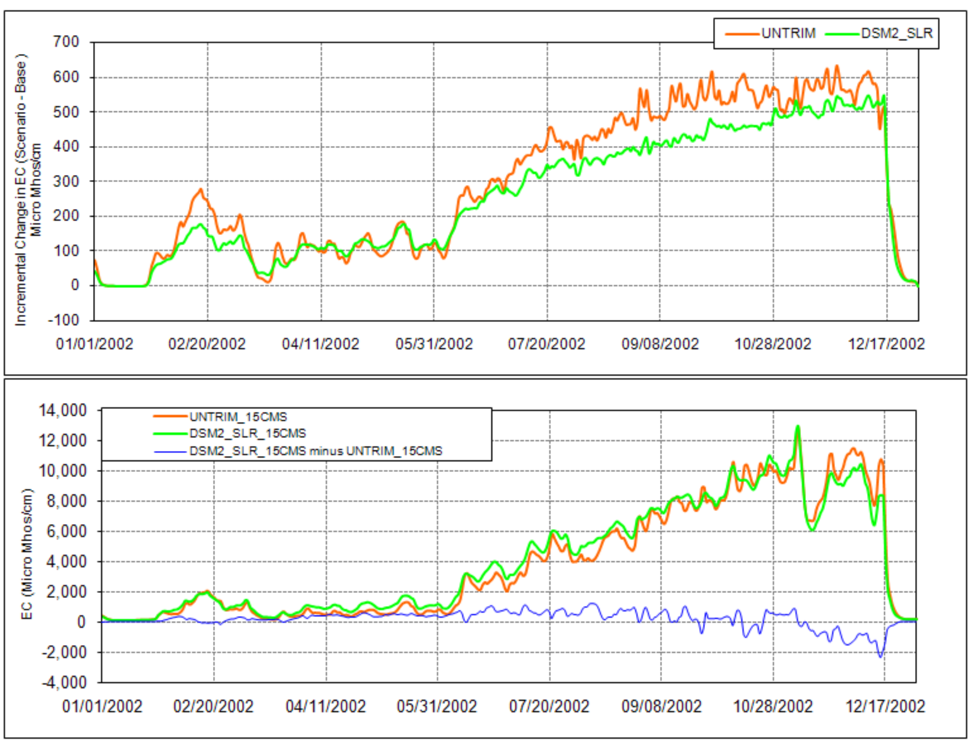


**Figure 1-121. Comparison of Tidally-Averaged Daily EC and the Incremental Change in the Daily EC between the 15cm SLR Scenario and the Current Conditions Scenario from UNTRIM Model and DSM2 Model for Sacramento River at Emmaton Location.**

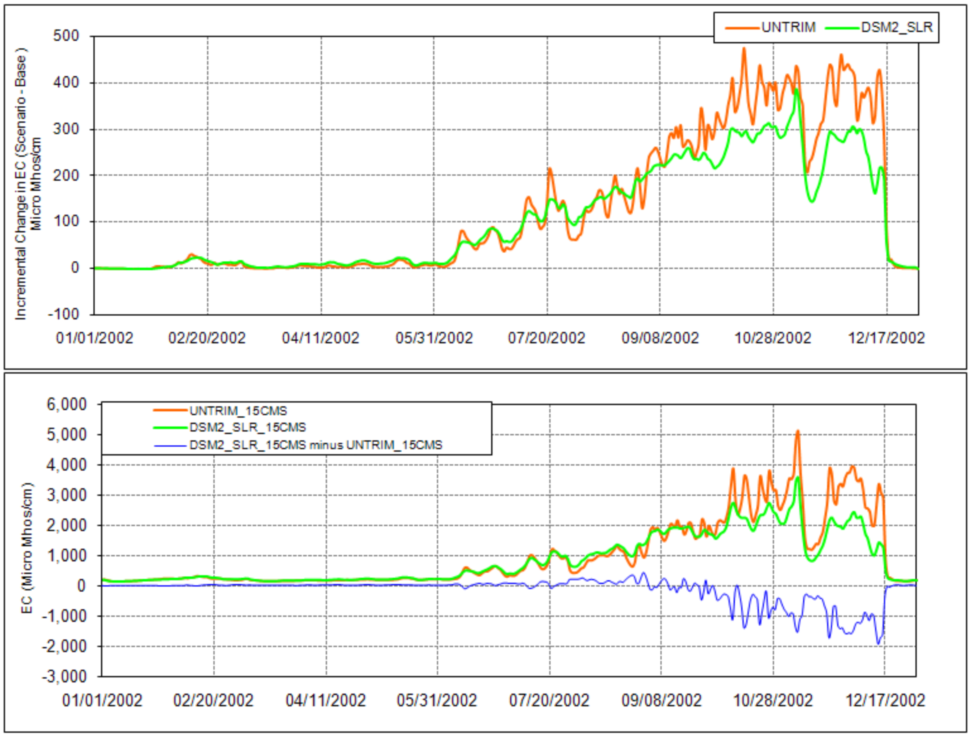



**Figure 1-122. Comparison of Tidally-Averaged Daily EC and the Incremental Change in the Daily EC between the 15cm SLR Scenario and the Current Conditions Scenario from UNTRIM Model and DSM2 Model for Sacramento River at Rio Vista Location.**

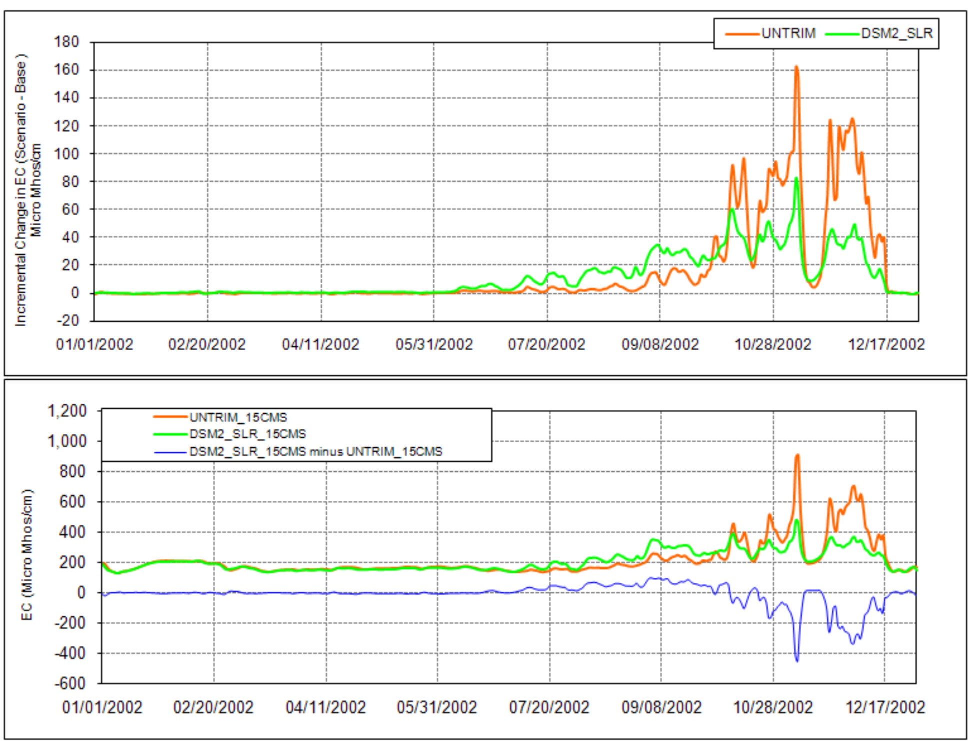


**Figure 1-123. Comparison of Tidally-Averaged Daily EC and the Incremental Change in the Daily EC between the 15cm SLR Scenario and the Current Conditions Scenario from UNTRIM Model and DSM2 Model for Cache Slough at Ryer Island Location.**

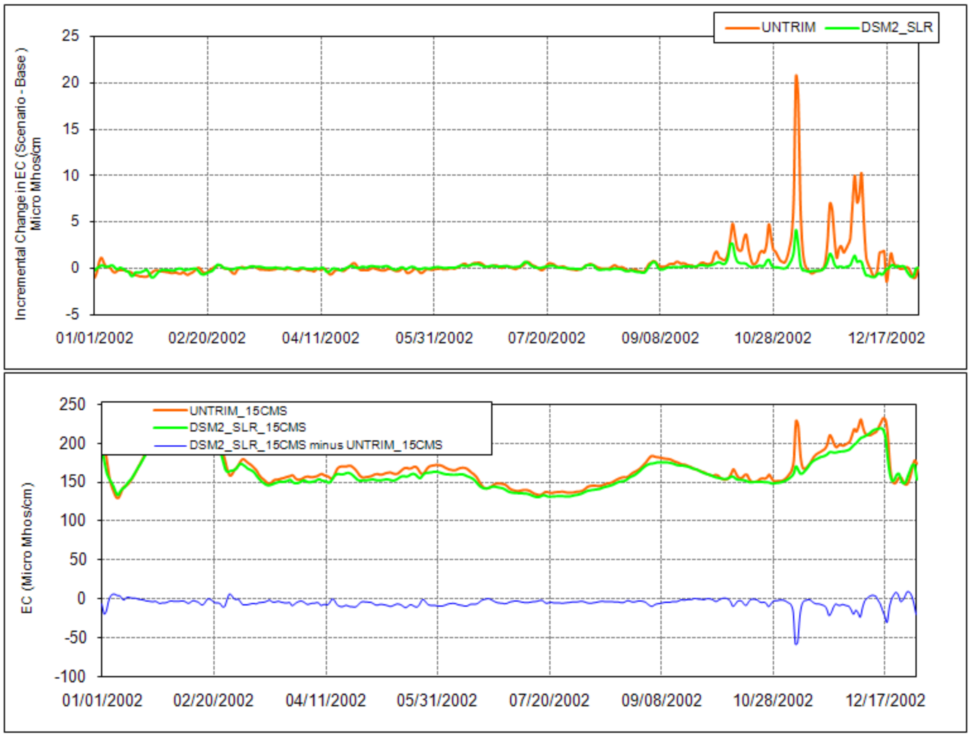



**Figure 1-124. Comparison of Tidally-Averaged Daily EC and the Incremental Change in the Daily EC between the 15cm SLR Scenario and the Current Conditions Scenario from UNTRIM Model and DSM2 Model for Three Mile Slough at San Joaquin River Location.**

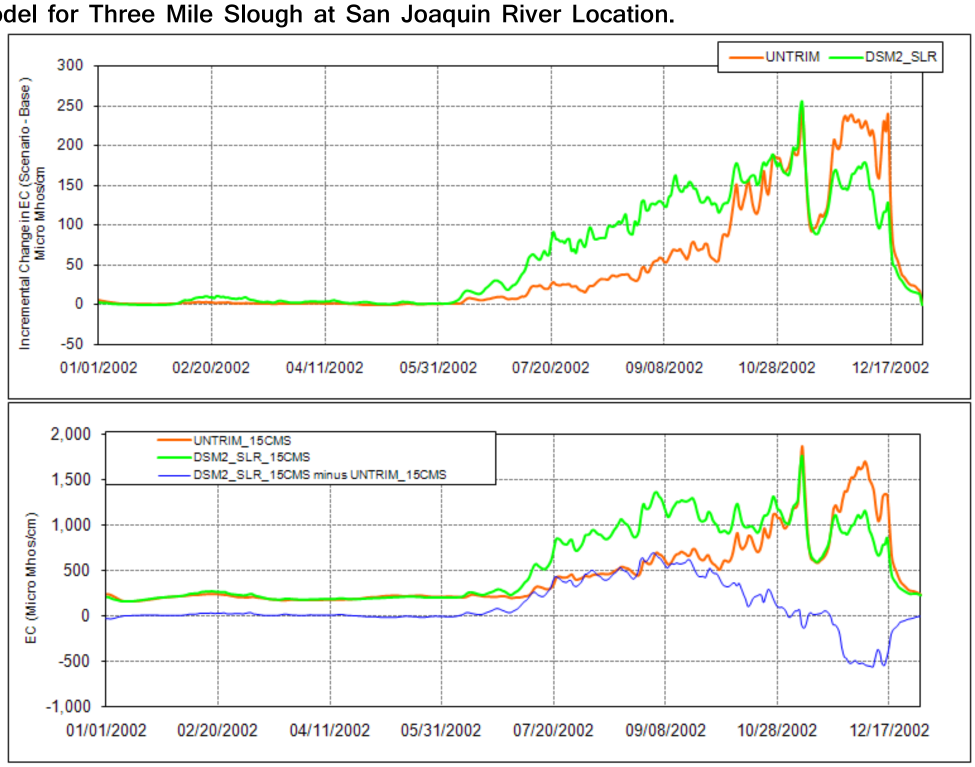


**Figure 1-125. Comparison of Tidally-Averaged Daily EC and the Incremental Change in the Daily EC between the 15cm SLR Scenario and the Current Conditions Scenario from UNTRIM Model and DSM2 Model for San Joaquin River at Jersey Point Location.**

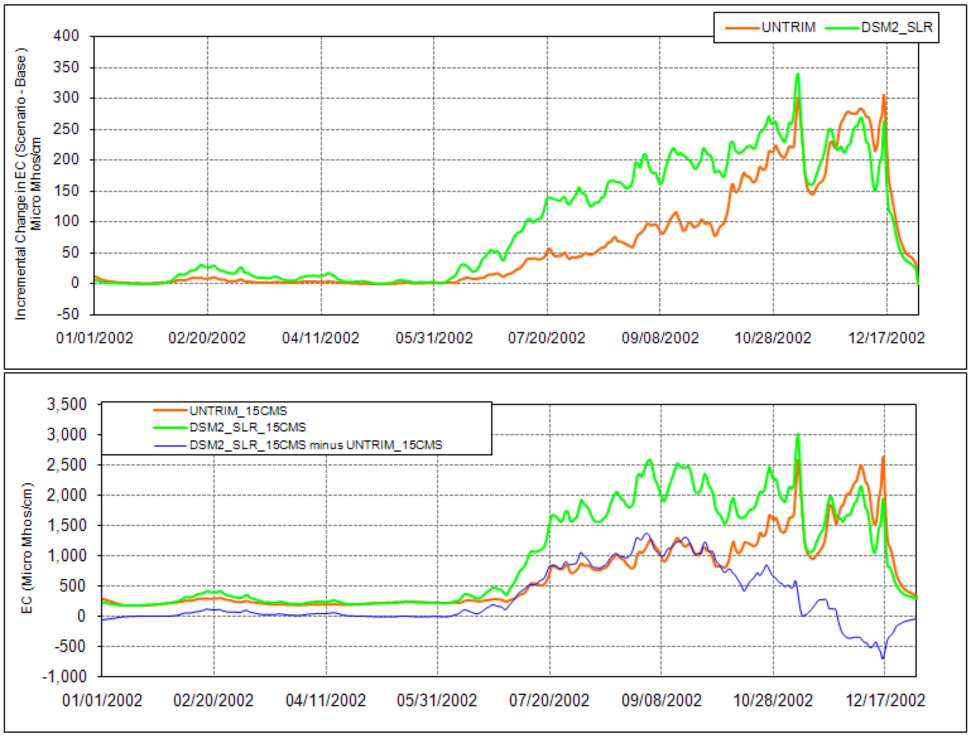



**Figure 1-126. Comparison of Tidally-Averaged Daily EC and the Incremental Change in the Daily EC between the 15cm SLR Scenario and the Current Conditions Scenario from UNTRIM Model and DSM2 Model for San Joaquin River at San Andreas Location.**

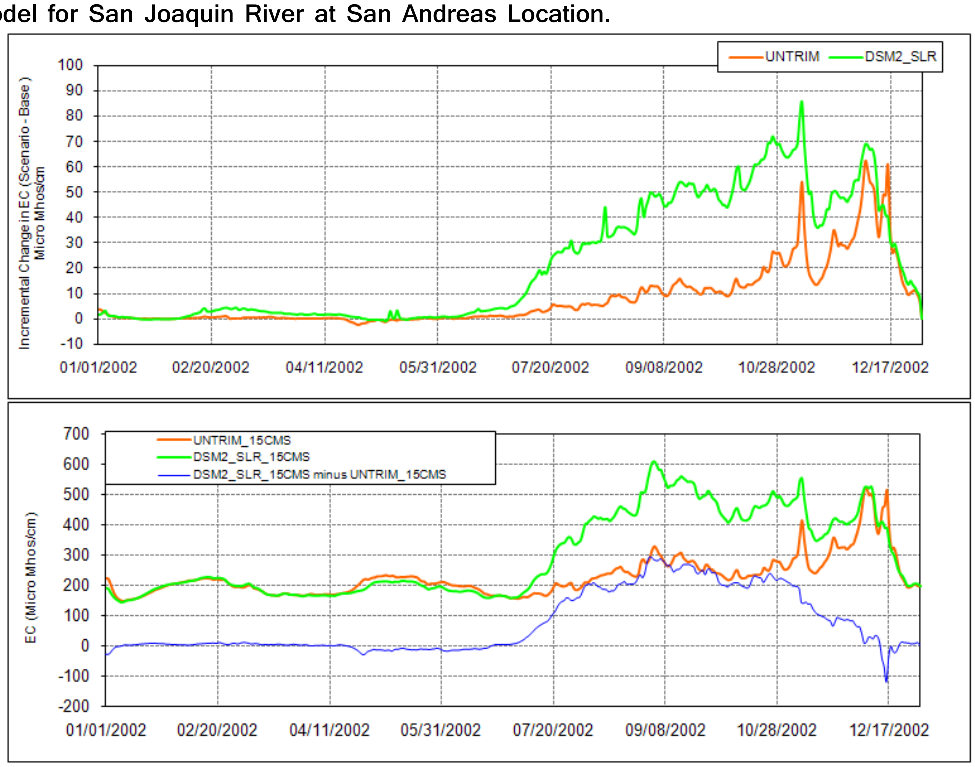


**Figure 1-127. Comparison of Tidally-Averaged Daily EC and the Incremental Change in the Daily EC between the 15cm SLR Scenario and the Current Conditions Scenario from UNTRIM Model and DSM2 Model for San Joaquin River at Prisoners Point Location.**

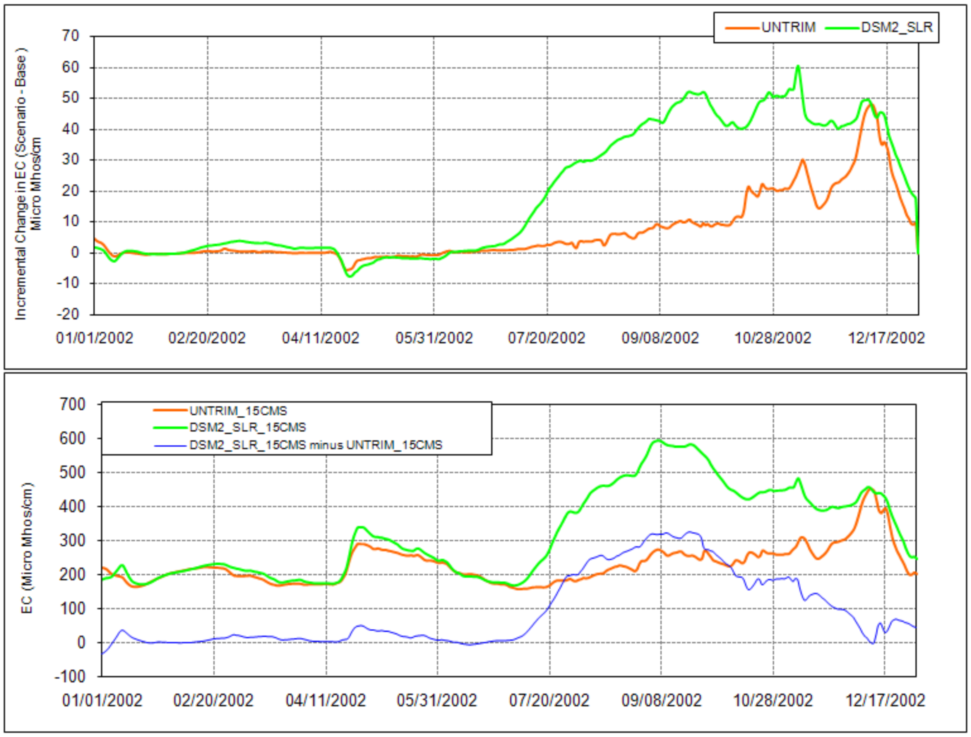



**Figure 1-128. Comparison of Tidally-Averaged Daily EC and the Incremental Change in the Daily EC between the 15cm SLR Scenario and the Current Conditions Scenario from UNTRIM Model and DSM2 Model for San Joaquin River at Stockton Location.**

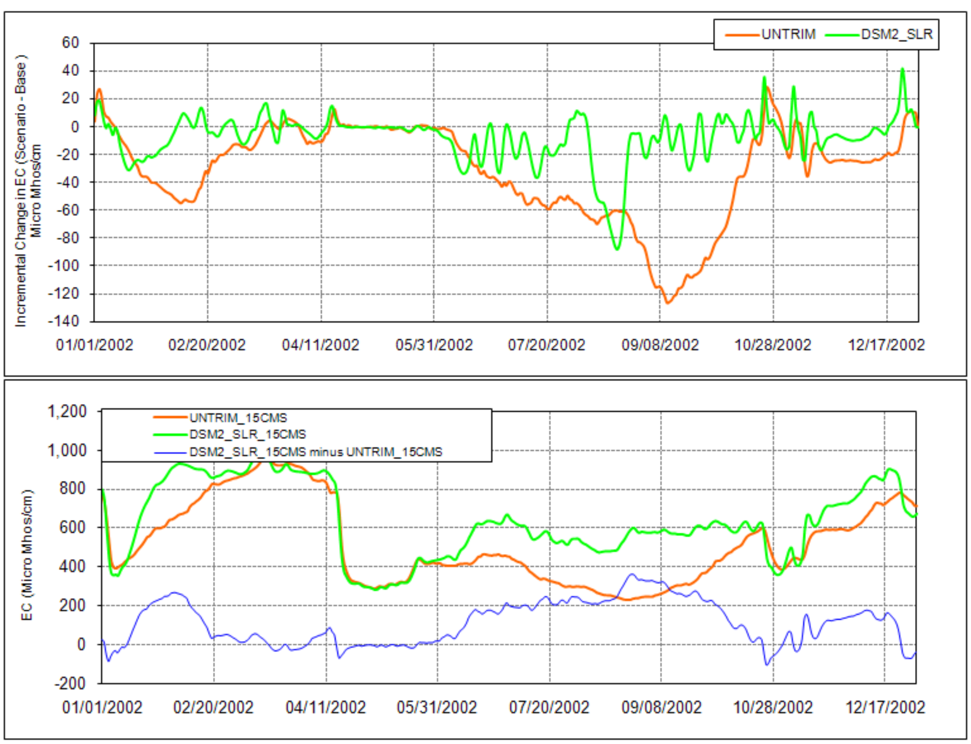


**Figure 1-129. Comparison of Tidally-Averaged Daily EC and the Incremental Change in the Daily EC between the 15cm SLR Scenario and the Current Conditions Scenario from UNTRIM Model and DSM2 Model for Middle River at Middle River Location.**

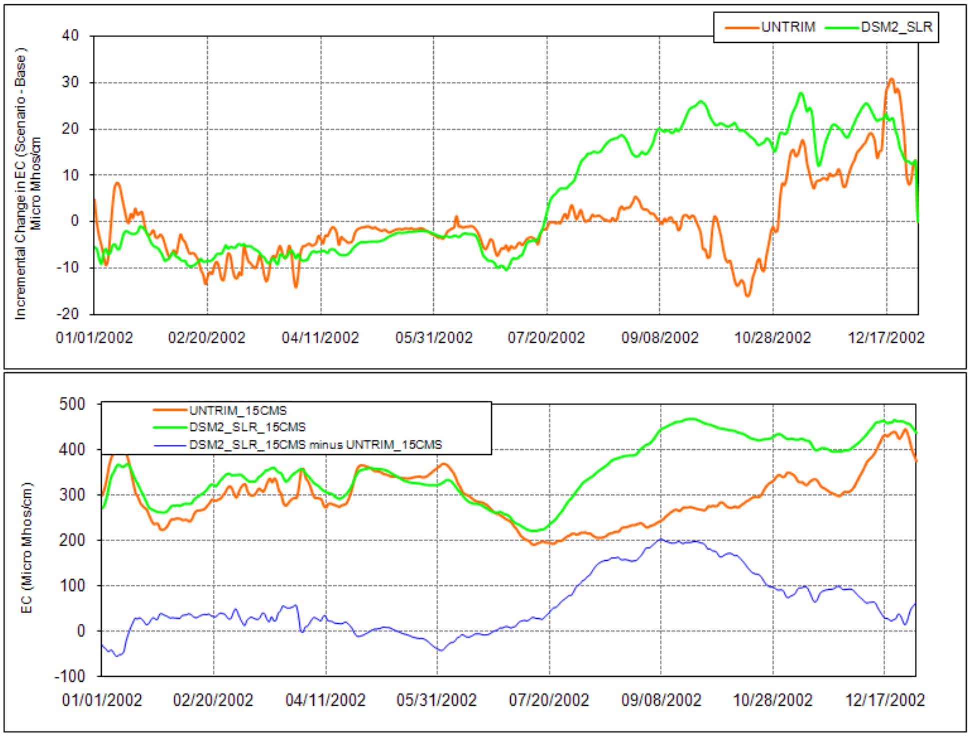
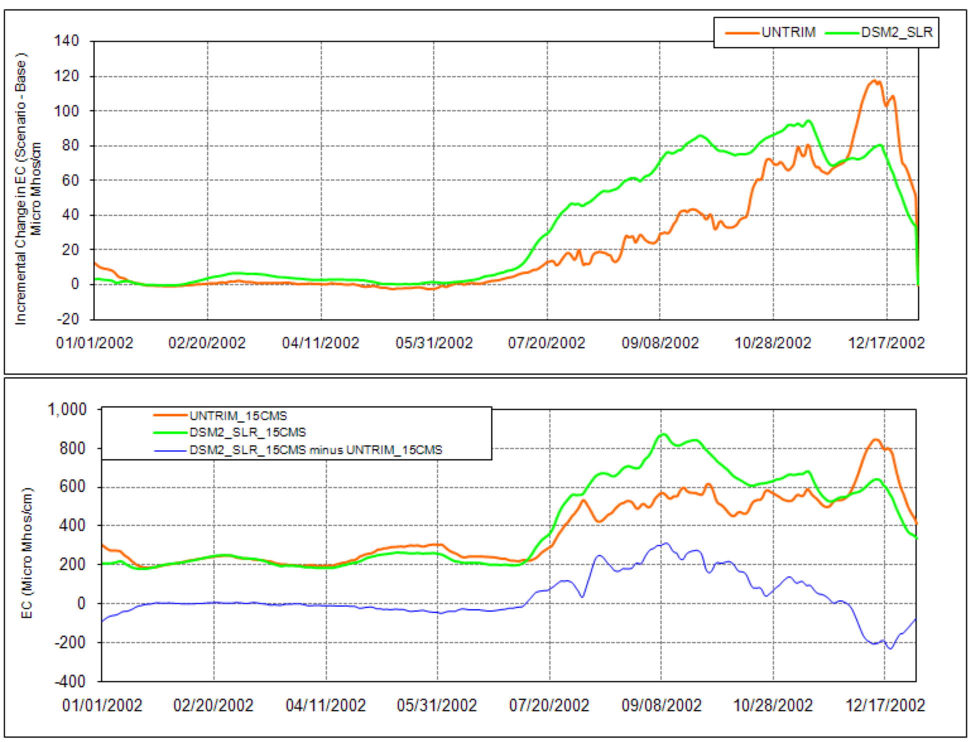



**Figure 1-130. Comparison of Tidally-Averaged Daily EC and the Incremental Change in the Daily EC between the 15cm SLR Scenario and the Current Conditions Scenario from UNTRIM Model and DSM2 Model for Old River at Bacon Island Location.**



# Late Long-Term 45cm Sea Level Rise Corroboration

## Salinity Results

**Figure 131. Comparison of average incremental change in tidally averaged EC in 45cm SLR scenario from the baseline between DSM2 and UNTRIM**

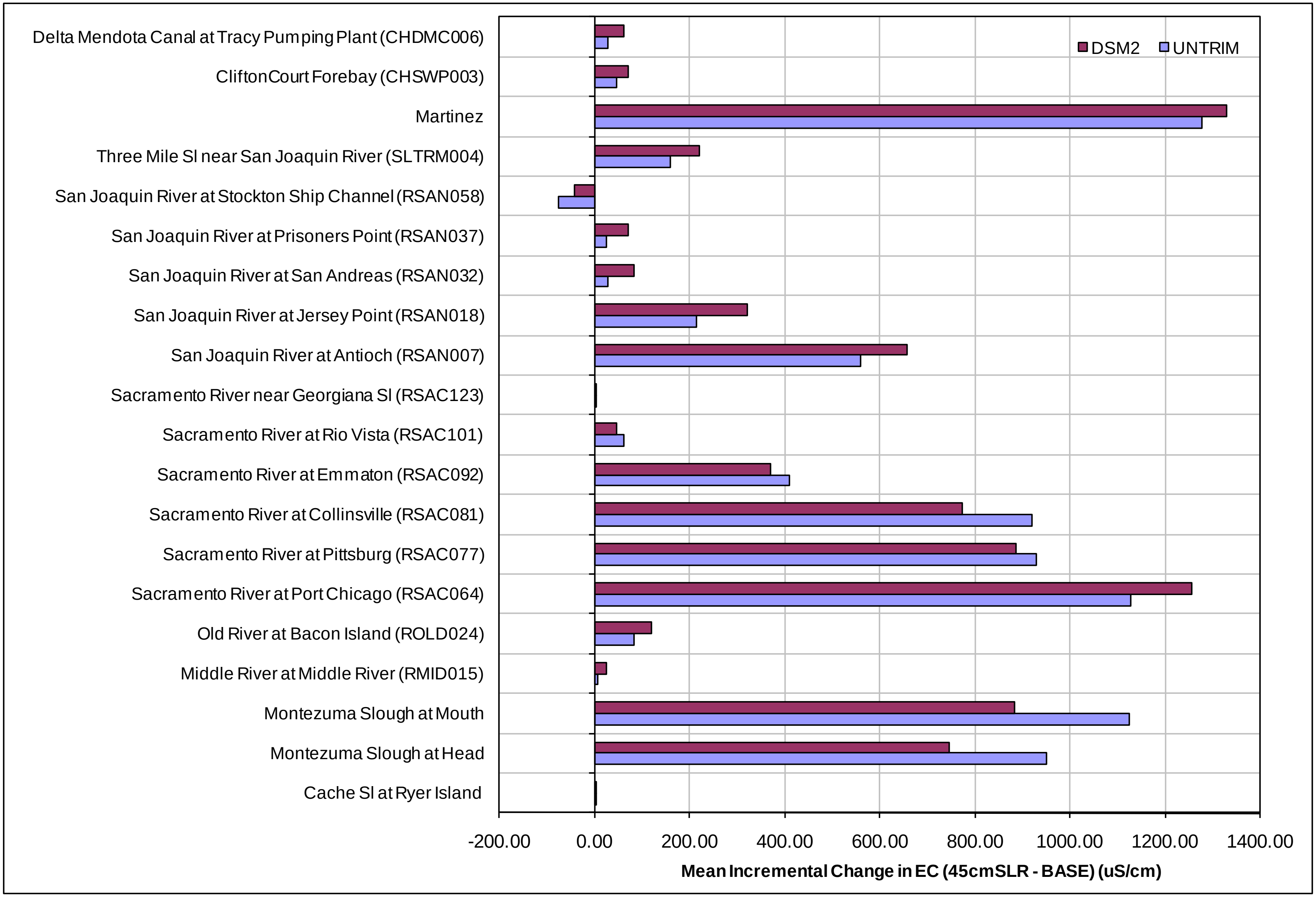


**Figure 1-132. Comparison of Tidally-Averaged Daily EC and the Incremental Change in the Daily EC between the 45cm SLR Scenario and the Current Conditions Scenario from UNTRIM Model and DSM2 Model for Montezuma Slough at Mouth Location.**

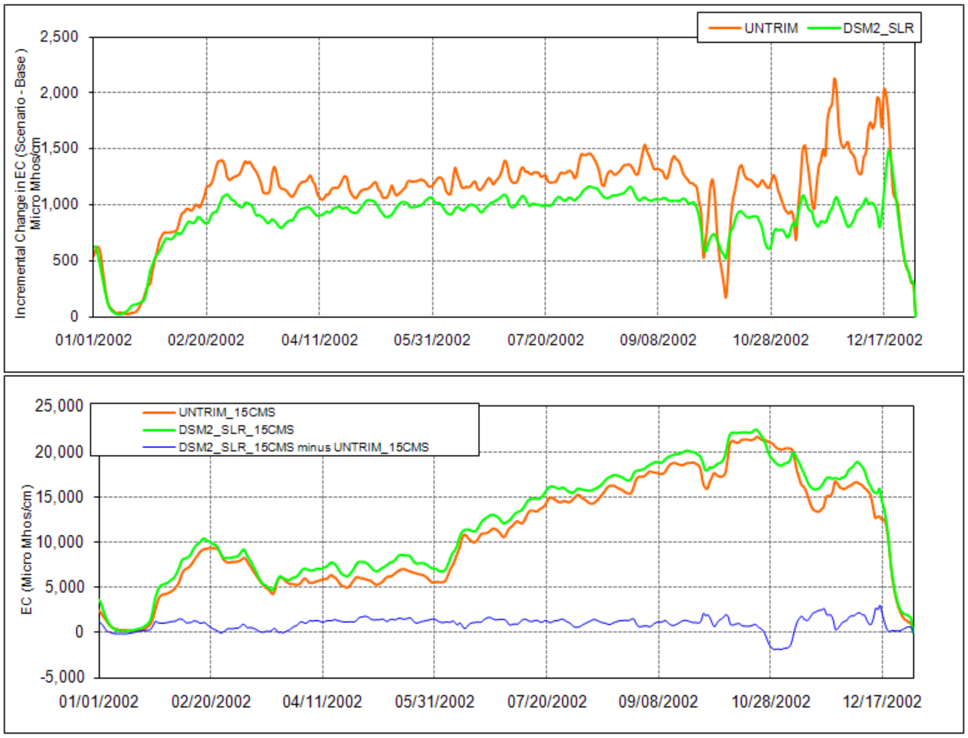



**Figure 1-133. Comparison of Tidally-Averaged Daily EC and the Incremental Change in the Daily EC between the 45cm SLR Scenario and the Current Conditions Scenario from UNTRIM Model and DSM2 Model for Montezuma Slough at Head Location.**

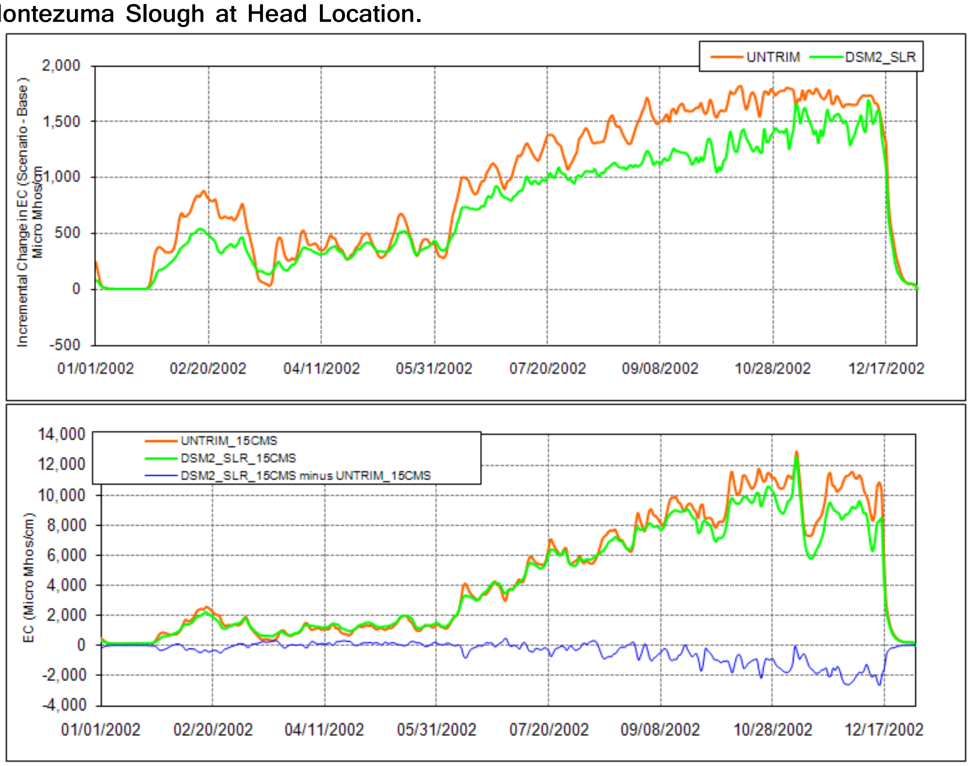


**Figure 1-134. Comparison of Tidally-Averaged Daily EC and the Incremental Change in the Daily EC between the 45cm SLR Scenario and the Current Conditions Scenario from UNTRIM Model and DSM2 Model for Sacramento River at Port Chicago Location.**

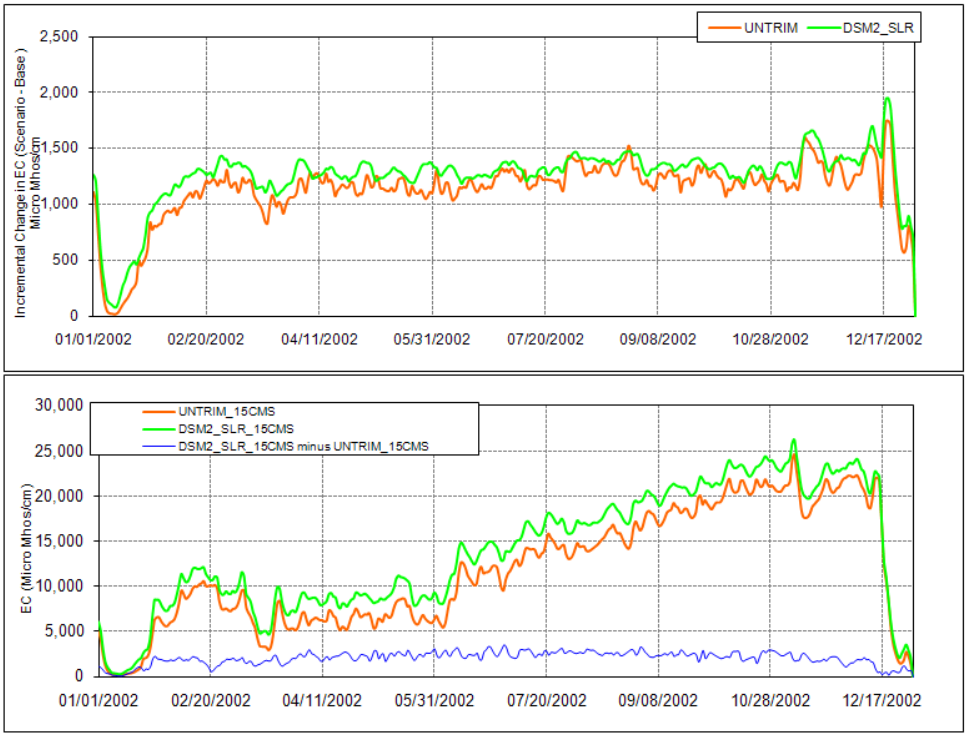



**Figure 1-135. Comparison of Tidally-Averaged Daily EC and the Incremental Change in the Daily EC between the 45cm SLR Scenario and the Current Conditions Scenario from UNTRIM Model and DSM2 Model for Sacramento River at Collinsville Location.**

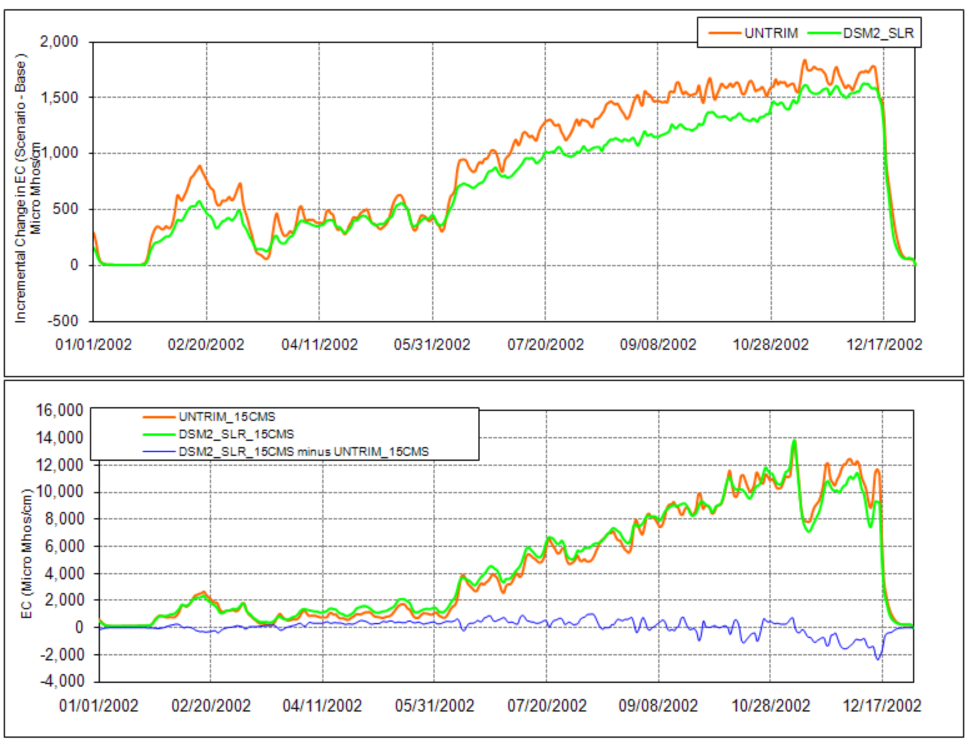


**Figure 1-136. Comparison of Tidally-Averaged Daily EC and the Incremental Change in the Daily EC between the 45cm SLR Scenario and the Current Conditions Scenario from UNTRIM Model and DSM2 Model for Sacramento River at Emmaton Location.**

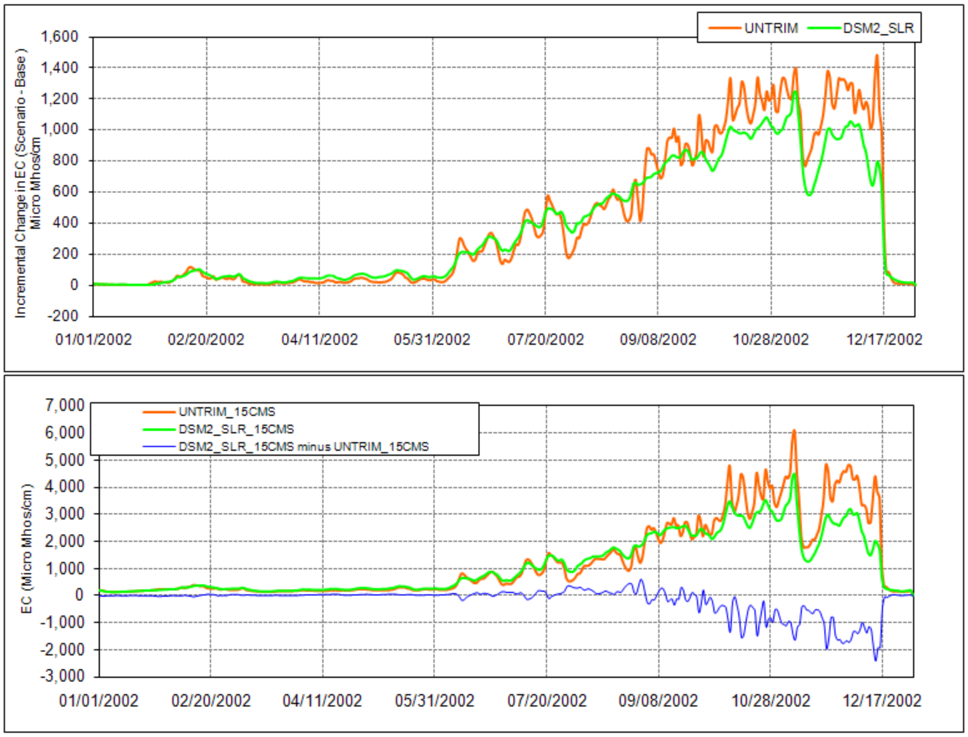



**Figure 1-137. Comparison of Tidally-Averaged Daily EC and the Incremental Change in the Daily EC between the 45cm SLR Scenario and the Current Conditions Scenario from UNTRIM Model and DSM2 Model for Sacramento River at Rio Vista Location.**

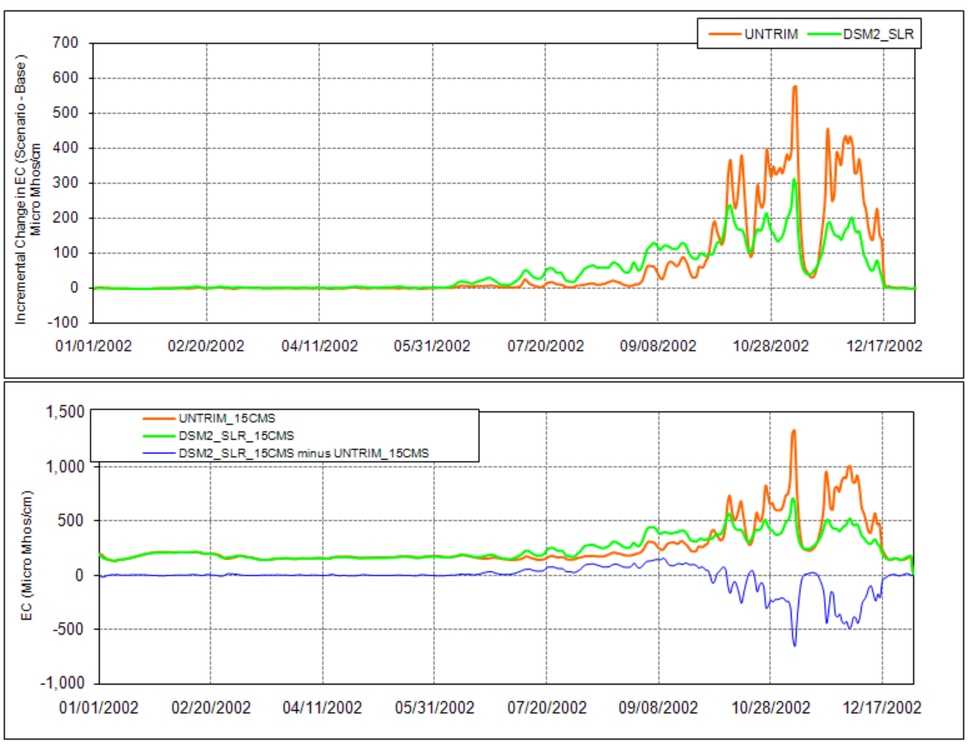


**Figure 1-138. Comparison of Tidally-Averaged Daily EC and the Incremental Change in the Daily EC between the 45cm SLR Scenario and the Current Conditions Scenario from UNTRIM Model and DSM2 Model for Cache Slough at Ryer Location.**

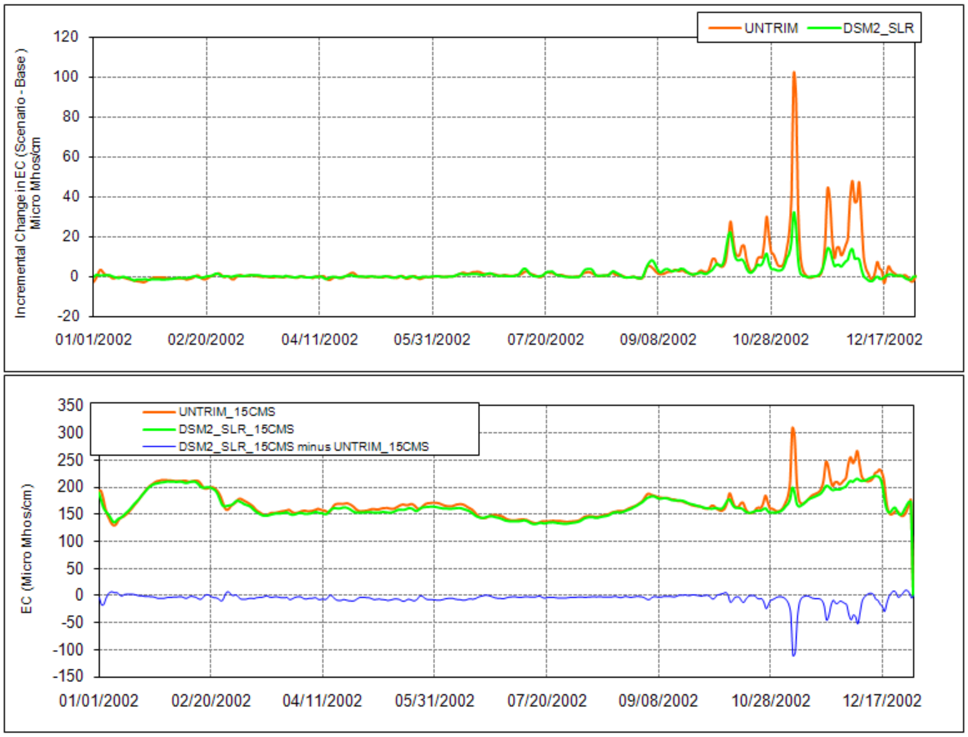



**Figure 1-139. Comparison of Tidally-Averaged Daily EC and the Incremental Change in the Daily EC between the 45cm SLR Scenario and the Current Conditions Scenario from UNTRIM Model and DSM2 Model for Three Mile Slough at San Joaquin River Location.**

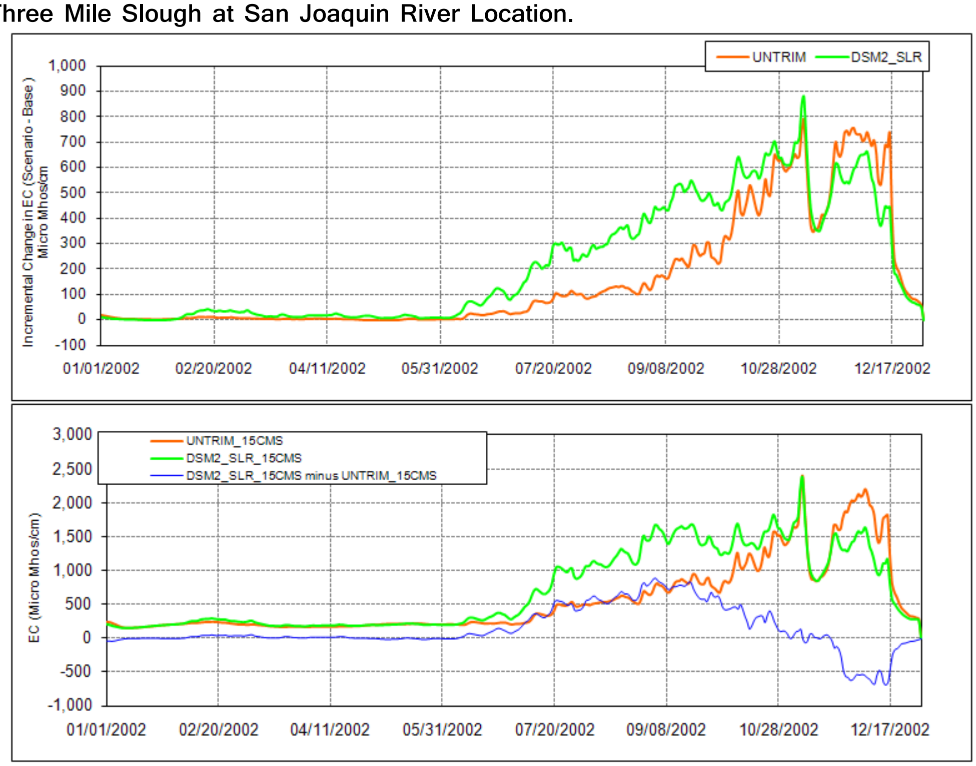


**Figure 1-140. Comparison of Tidally-Averaged Daily EC and the Incremental Change in the Daily EC between the 45cm SLR Scenario and the Current Conditions Scenario from UNTRIM Model and DSM2 Model for San Joaquin River at San Andreas Location.**

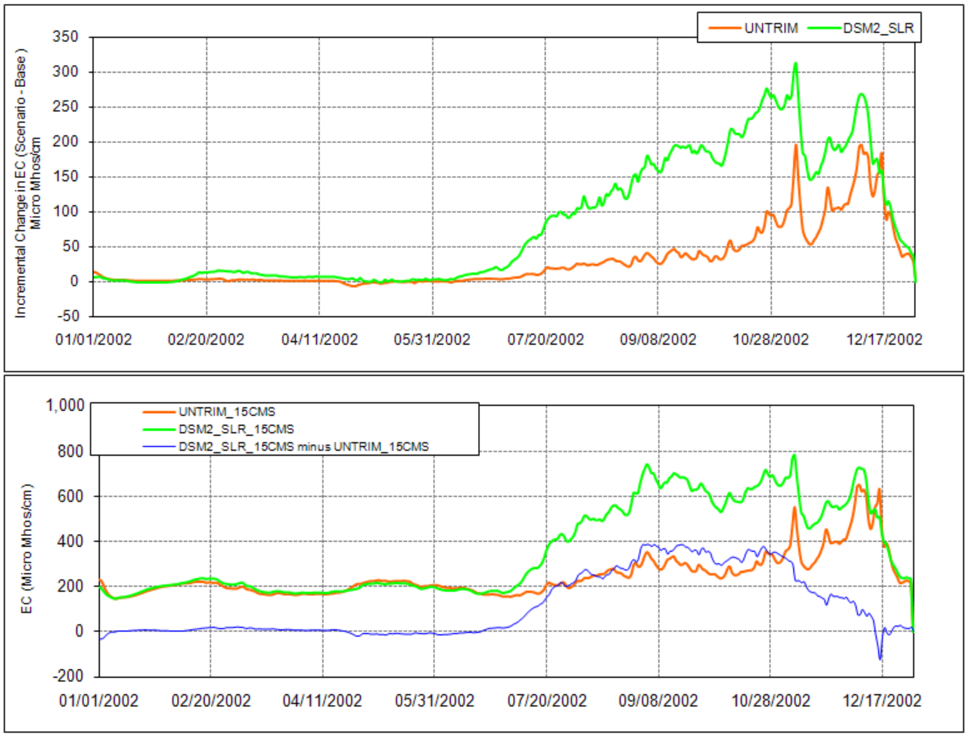



**Figure 1-141. Comparison of Tidally-Averaged Daily EC and the Incremental Change in the Daily EC between the 45cm SLR Scenario and the Current Conditions Scenario from UNTRIM Model and DSM2 Model for San Joaquin River at Prisoner's Point Location.**

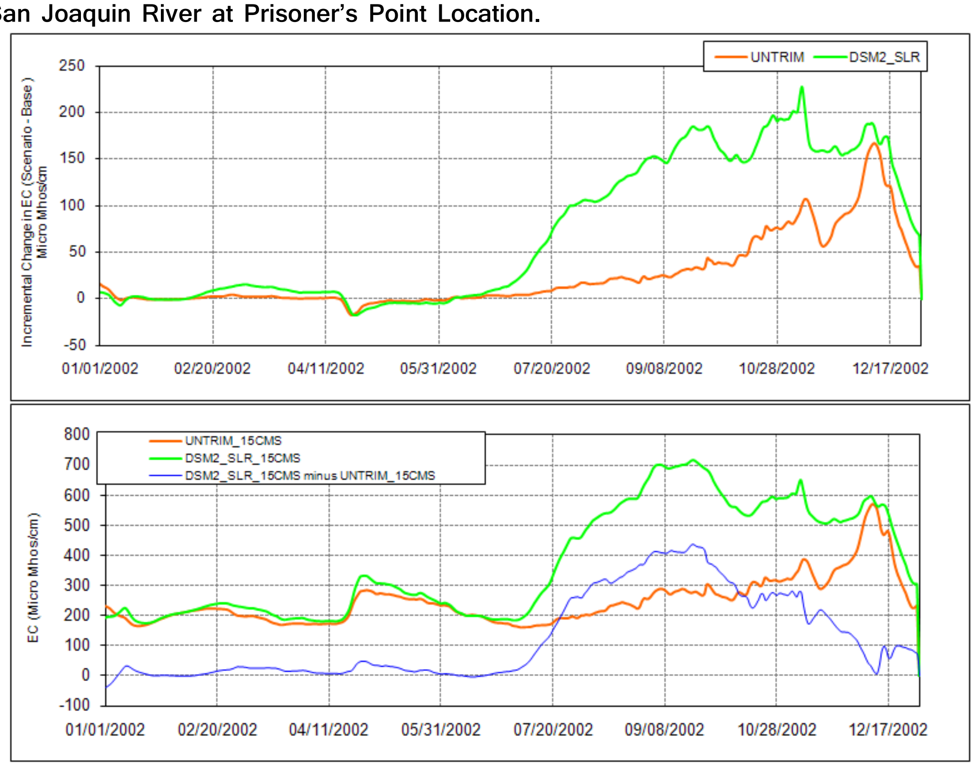


**Figure 1-142. Comparison of Tidally-Averaged Daily EC and the Incremental Change in the Daily EC between the 45cm SLR Scenario and the Current Conditions Scenario from UNTRIM Model and DSM2 Model for San Joaquin River at Stockton Location.**

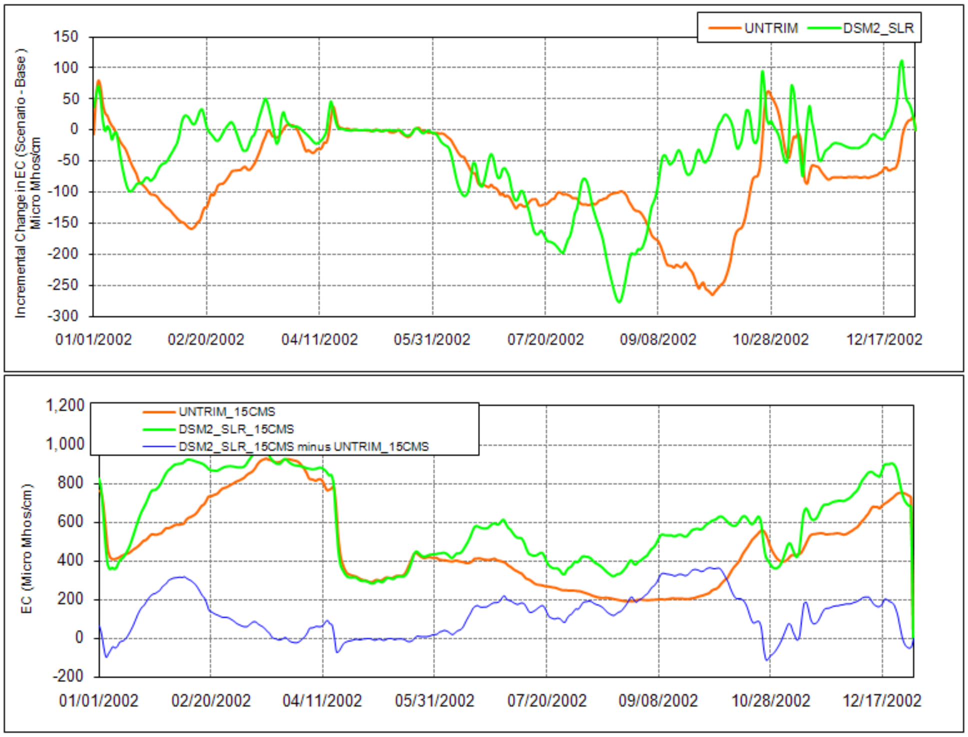



**Figure 1-143. Comparison of Tidally-Averaged Daily EC and the Incremental Change in the Daily EC between the 45cm SLR Scenario and the Current Conditions Scenario from UNTRIM Model and DSM2 Model for Middle River at Middle River Location.**

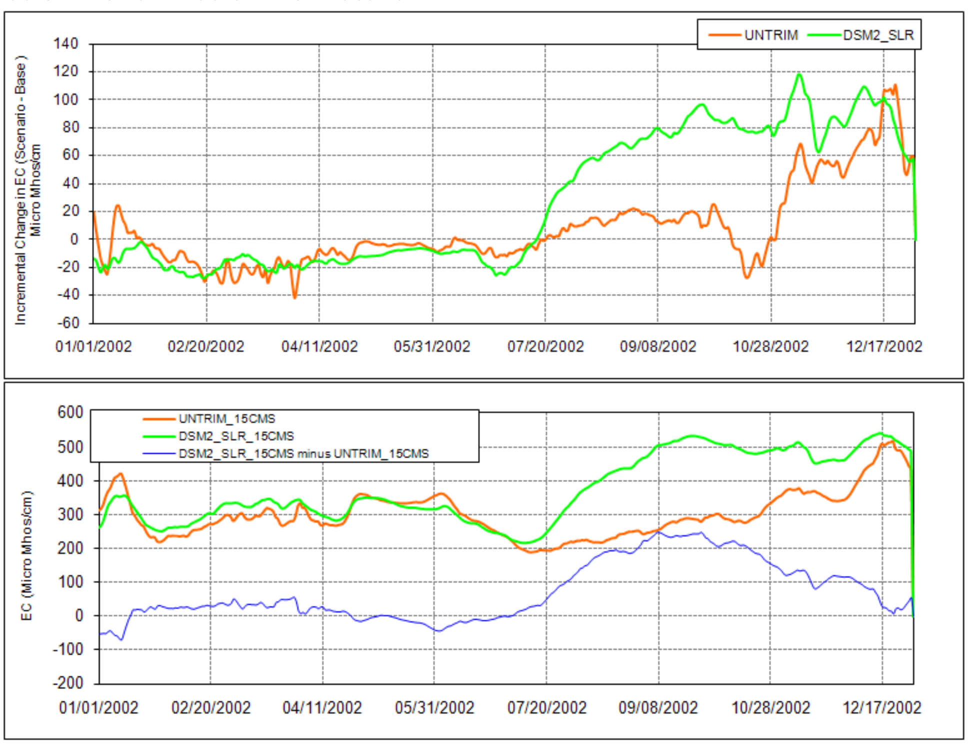
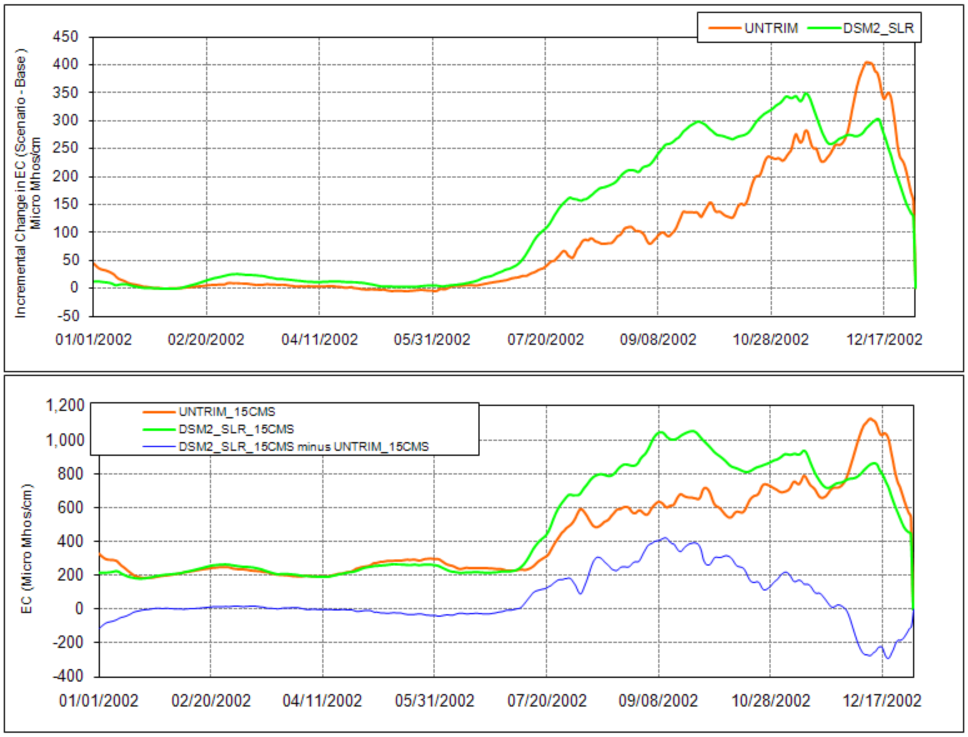


**Figure 1-144. Comparison of Tidally-Averaged Daily EC and the Incremental Change in the Daily EC between the 45cm SLR Scenario and the Current Conditions Scenario from UNTRIM Model and DSM2 Model for Old River at Bacon Island Location.**



# Early Long-Term Integrated 25,000ac Restoration and 15cm Sea Level Rise Corroboration

## Hydrodynamics Results

**Figure 1-145. Comparison of Tidal Flow, Tidally-Averaged Daily Flow, Incremental Change in Tidal Flow and the Incremental Change in the Daily Flow between the Integrated Early Long-term Scenario and the Current Conditions Scenario from RMA Model and DSM2 Model for Cache Slough at Ryer Island Location.**

**Figure 1-146. Comparison of Tidal Flow, Tidally-Averaged Daily Flow, Incremental Change in Tidal Flow and the Incremental Change in the Daily Flow between the Integrated Early Long-term Scenario and the Current Conditions Scenario from RMA Model and DSM2 Model for Sacramento River at Rio Vista Location.**

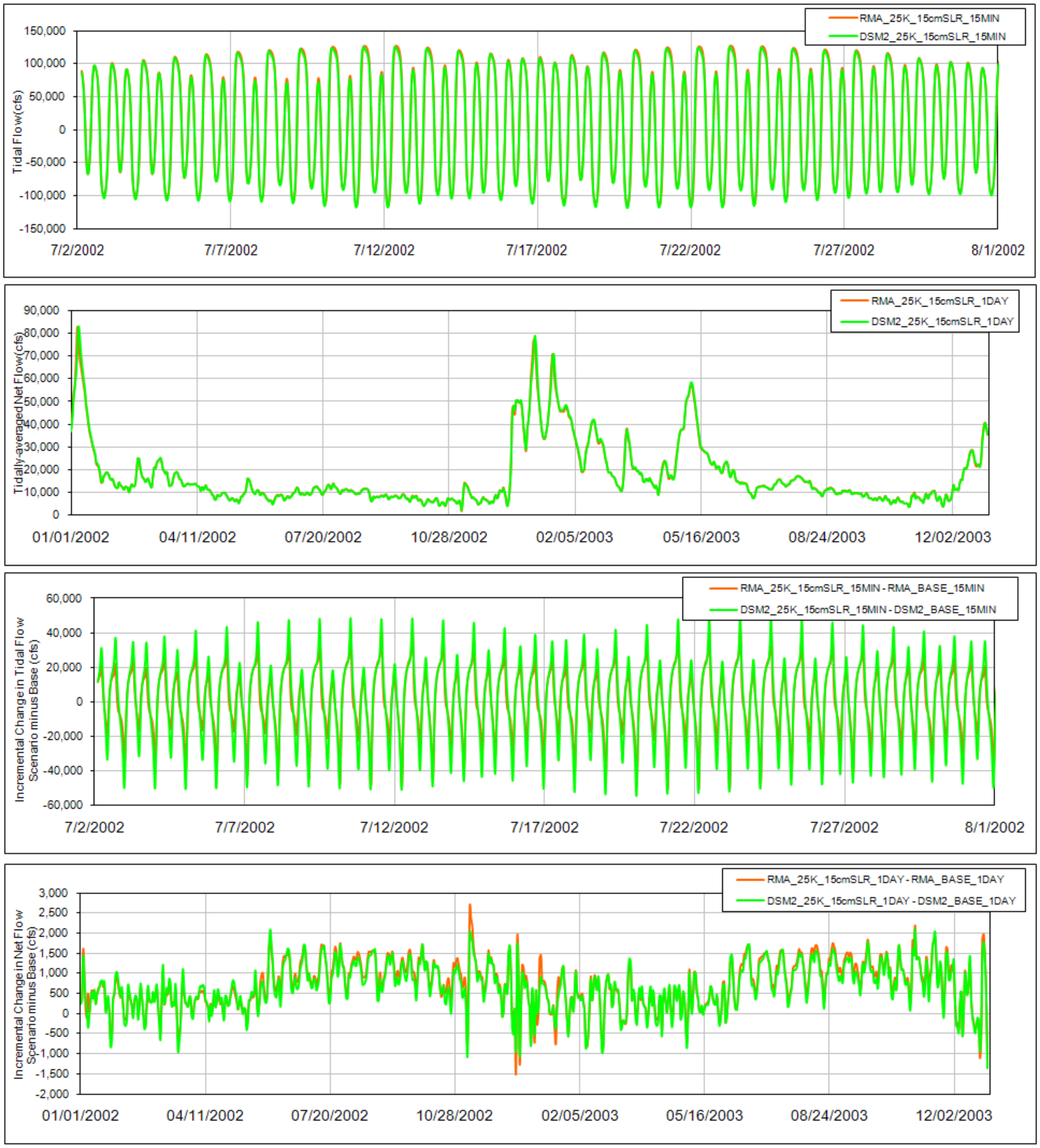


**Figure 1-147. Comparison of Tidal Flow, Tidally-Averaged Daily Flow, Incremental Change in Tidal Flow and the Incremental Change in the Daily Flow between the Integrated Early Long-term Scenario and the Current Conditions Scenario from RMA Model and DSM2 Model for Georgiana Slough at Head Location.**

**Figure 1-148. Comparison of Tidal Flow, Tidally-Averaged Daily Flow, Incremental Change in Tidal Flow and the Incremental Change in the Daily Flow between the Integrated Early Long-term Scenario and the Current Conditions Scenario from RMA Model and DSM2 Model for Sacramento River at Emmaton Location.**

**Figure 1-149. Comparison of Tidal Flow, Tidally-Averaged Daily Flow, Incremental Change in Tidal Flow and the Incremental Change in the Daily Flow between the Integrated Early Long-term Scenario and the Current Conditions Scenario from RMA Model and DSM2 Model for Montezuma Slough at Head Location.**

**Figure 1-150. Comparison of Tidal Flow, Tidally-Averaged Daily Flow, Incremental Change in Tidal Flow and the Incremental Change in the Daily Flow between the Integrated Early Long-term Scenario and the Current Conditions Scenario from RMA Model and DSM2 Model for Montezuma Slough at Mouth Location.**

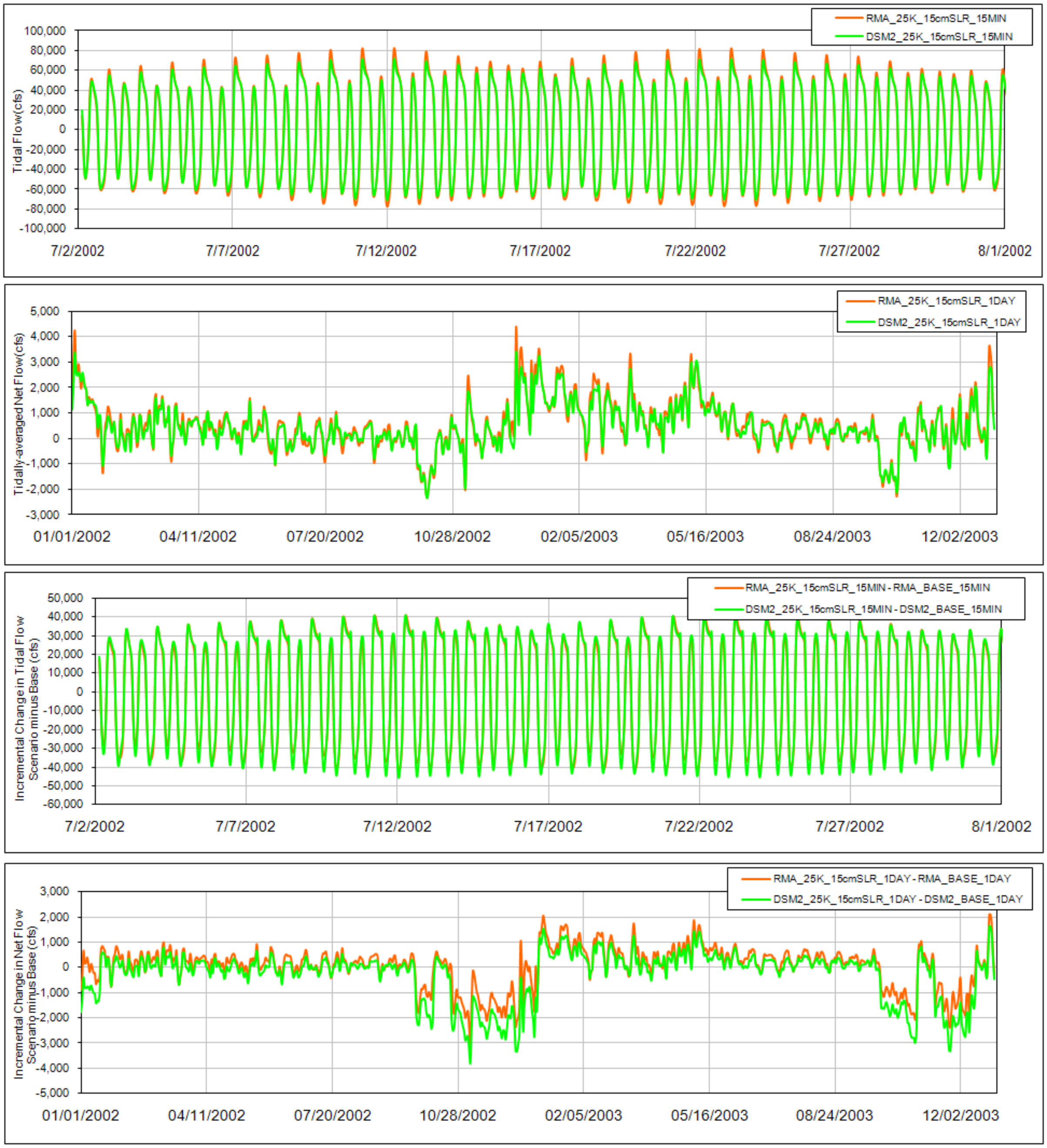


**Figure 1-151. Comparison of Tidal Flow, Tidally-Averaged Daily Flow, Incremental Change in Tidal Flow and the Incremental Change in the Daily Flow between the Integrated Early Long-term Scenario and the Current Conditions Scenario from RMA Model and DSM2 Model for Three Mile Slough at San Joaquin River Location.**

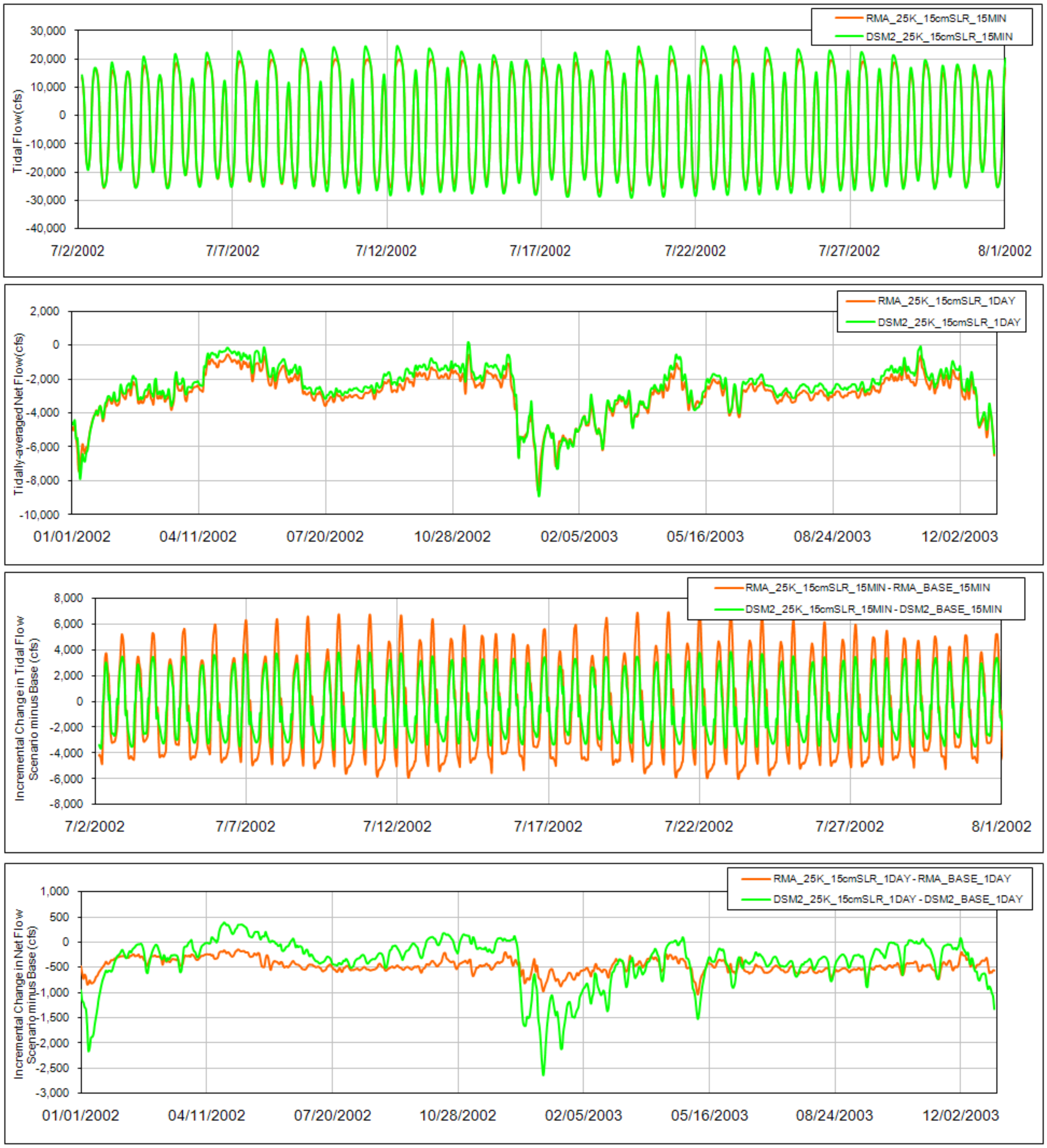


**Figure 1-152. Comparison of Tidal Flow, Tidally-Averaged Daily Flow, Incremental Change in Tidal Flow and the Incremental Change in the Daily Flow between the Integrated Early Long-term Scenario and the Current Conditions Scenario from RMA Model and DSM2 Model for San Joaquin River at Jersey Point Location.**

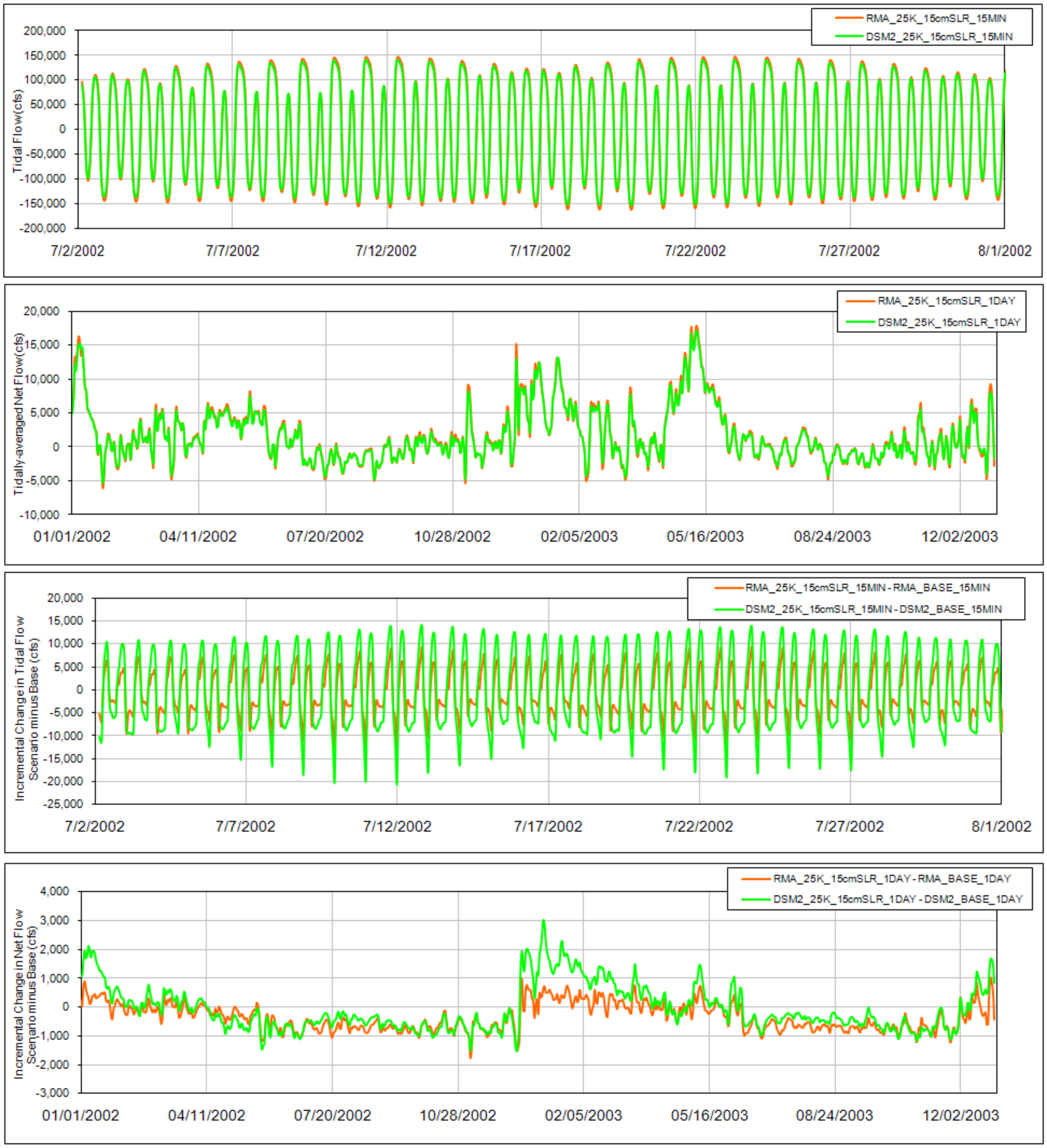


**Figure 1-153. Comparison of Tidal Flow, Tidally-Averaged Daily Flow, Incremental Change in Tidal Flow and the Incremental Change in the Daily Flow between the Integrated Early Long-term Scenario and the Current Conditions Scenario from RMA Model and DSM2 Model for San Joaquin River at San Andreas Location.**

**Figure 1-154. Comparison of Tidal Flow, Tidally-Averaged Daily Flow, Incremental Change in Tidal Flow and the Incremental Change in the Daily Flow between the Integrated Early Long-term Scenario and the Current Conditions Scenario from RMA Model and DSM2 Model for San Joaquin River at Prisoners Point Location.**

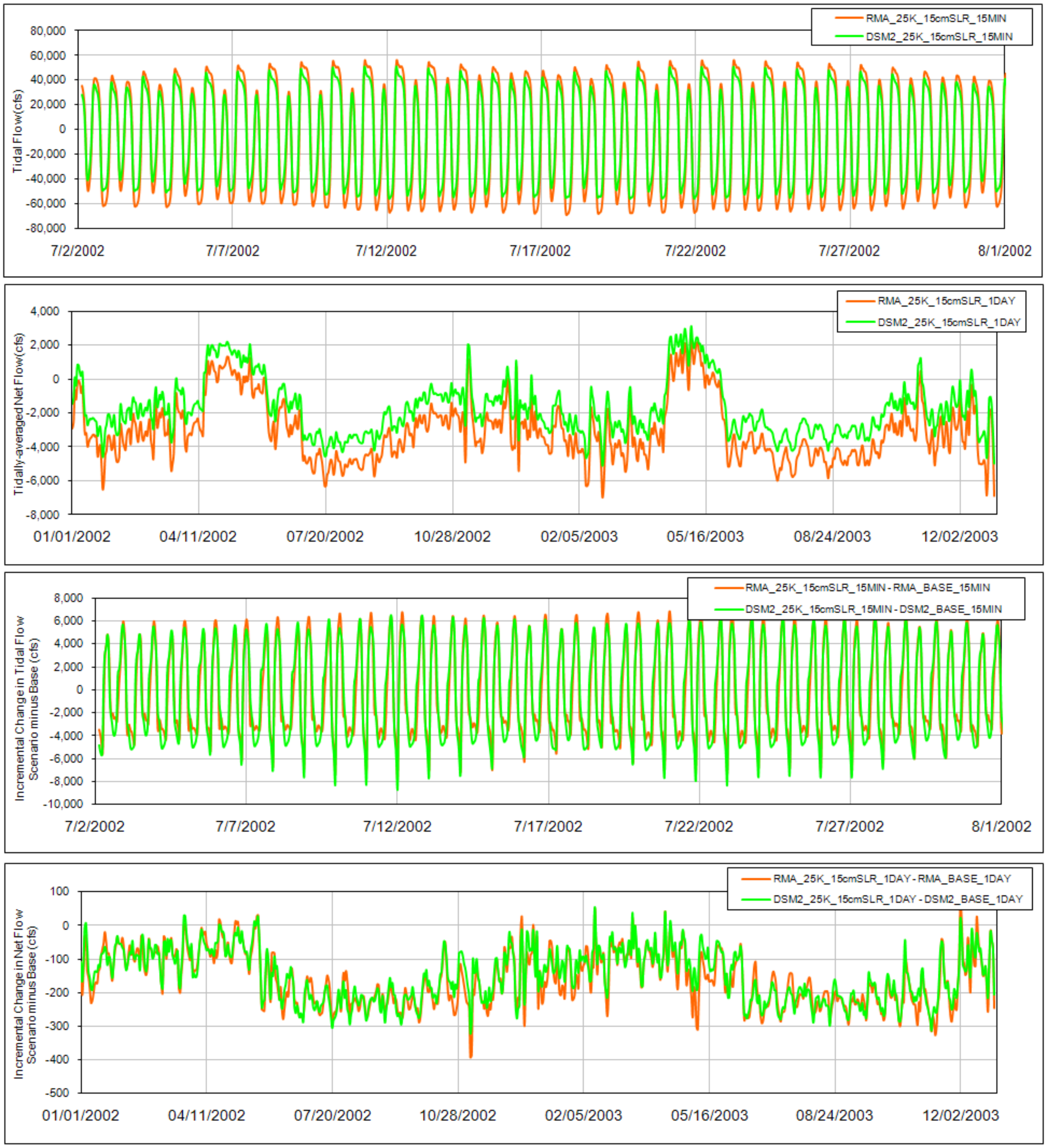


**Figure 1-155. Comparison of Tidal Flow, Tidally-Averaged Daily Flow, Incremental Change in Tidal Flow and the Incremental Change in the Daily Flow between the Integrated Early Long-term Scenario and the Current Conditions Scenario from RMA Model and DSM2 Model for San Joaquin River at Stockton Location.**

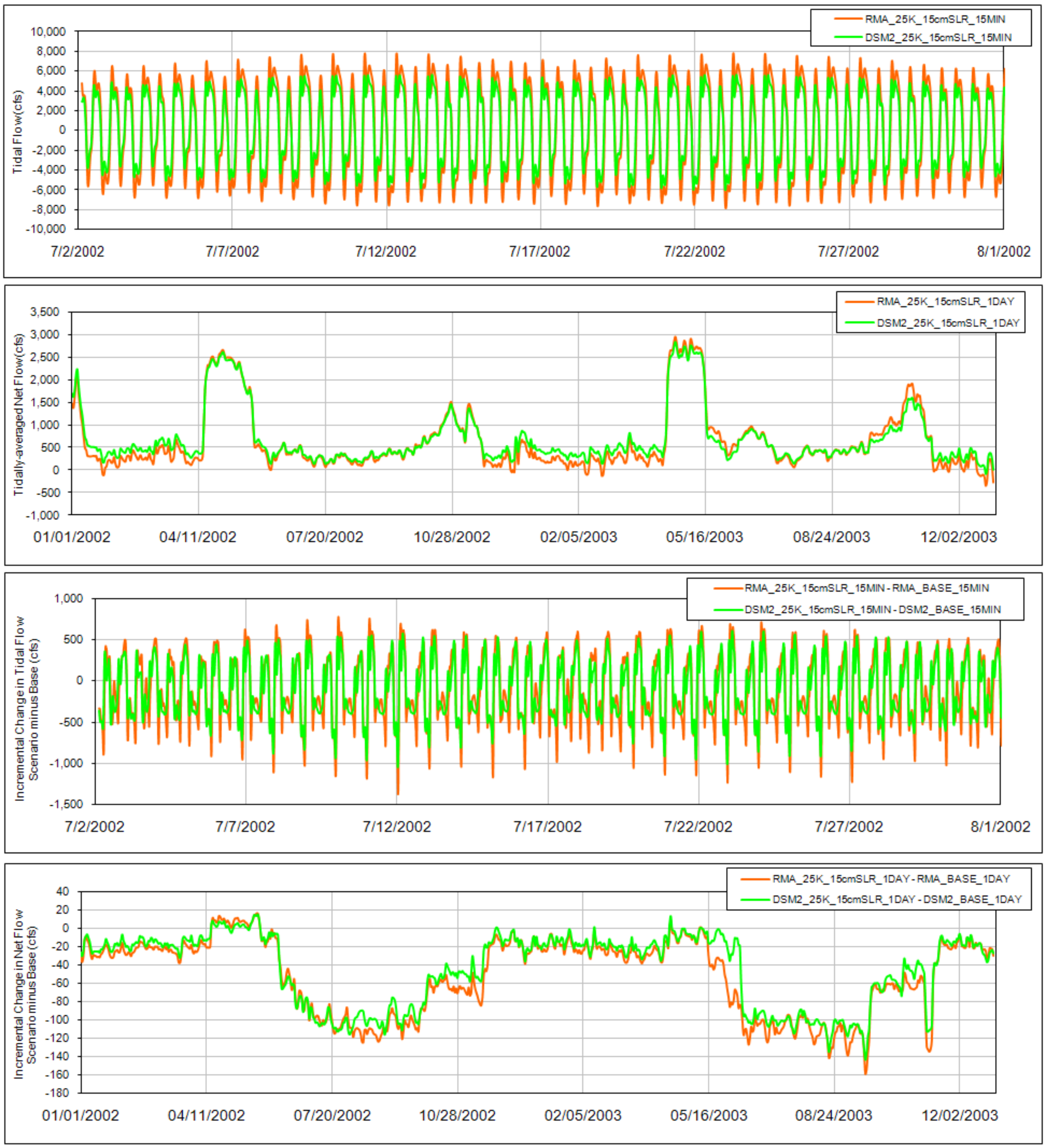


**Figure 1-156. Comparison of Tidal Flow, Tidally-Averaged Daily Flow, Incremental Change in Tidal Flow and the Incremental Change in the Daily Flow between the Integrated Early Long-term Scenario and the Current Conditions Scenario from RMA Model and DSM2 Model for Mokelumne River near San Joaquin River Location.**

**Figure 1-157. Comparison of Tidal Flow, Tidally-Averaged Daily Flow, Incremental Change in Tidal Flow and the Incremental Change in the Daily Flow between the Integrated Early Long-term Scenario and the Current Conditions Scenario from RMA Model and DSM2 Model for Middle River at Bacon Island Location.**

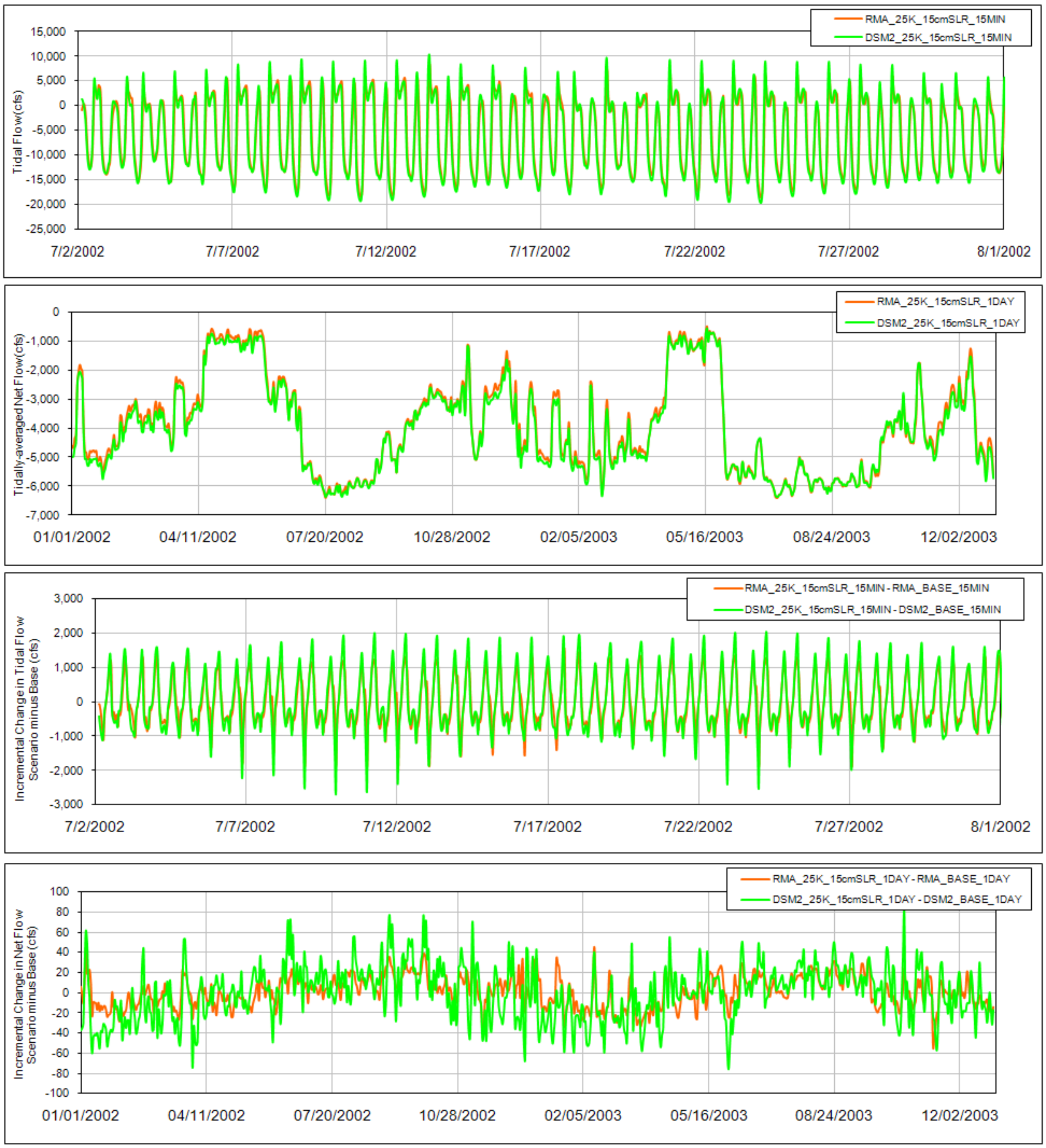


**Figure 1-158. Comparison of Tidal Flow, Tidally-Averaged Daily Flow, Incremental Change in Tidal Flow and the Incremental Change in the Daily Flow between the Integrated Early Long-term Scenario and the Current Conditions Scenario from RMA Model and DSM2 Model for Old River at Bacon Island Location.**

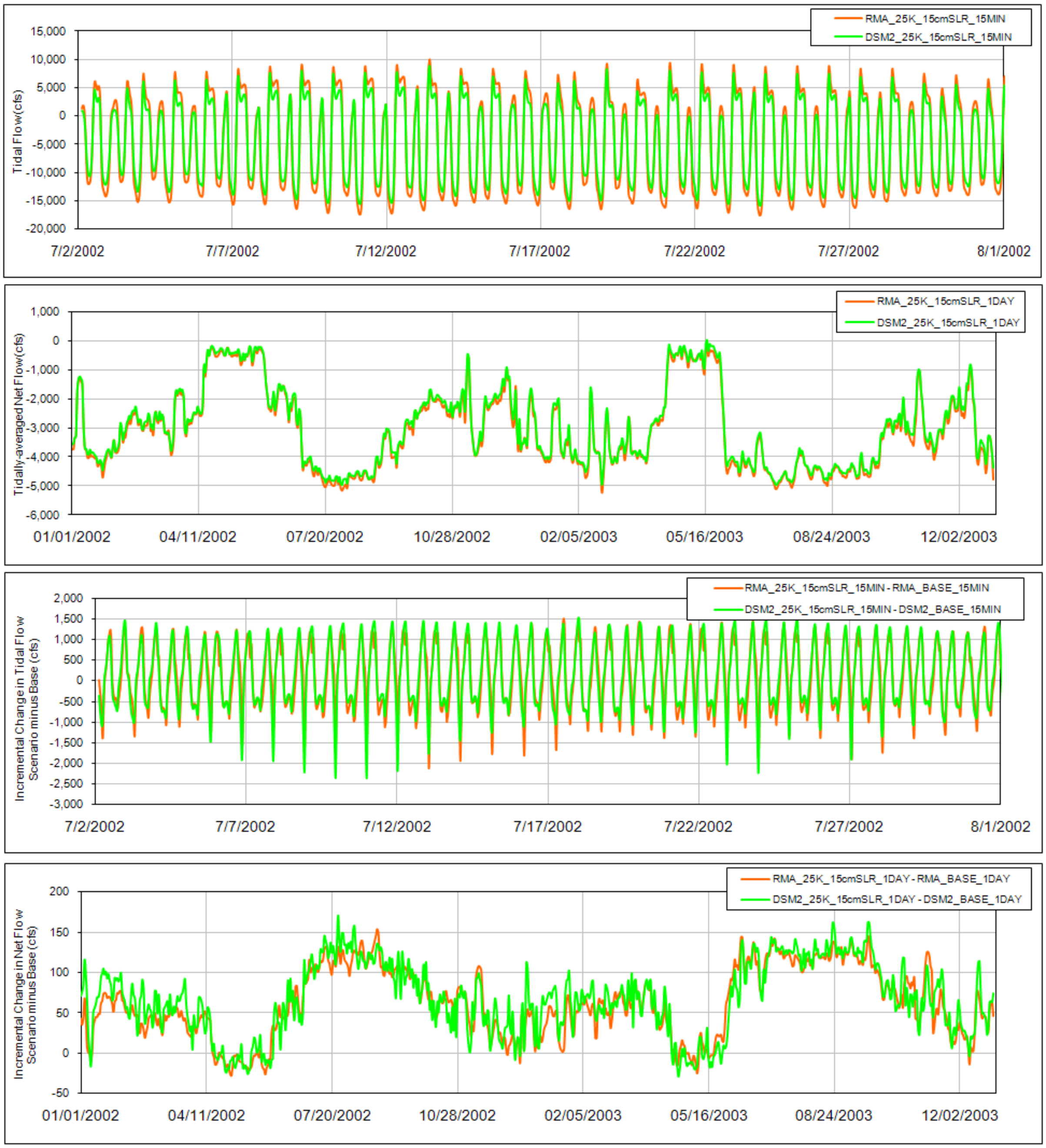


**Figure 1-159. Comparison of Tidal Flow and Tidally-Averaged Daily Flow between the Integrated Early Long-term Scenario and the Current Conditions Scenario from RMA Model and DSM2 Model for Prospect Island North breach under Cache Region.**

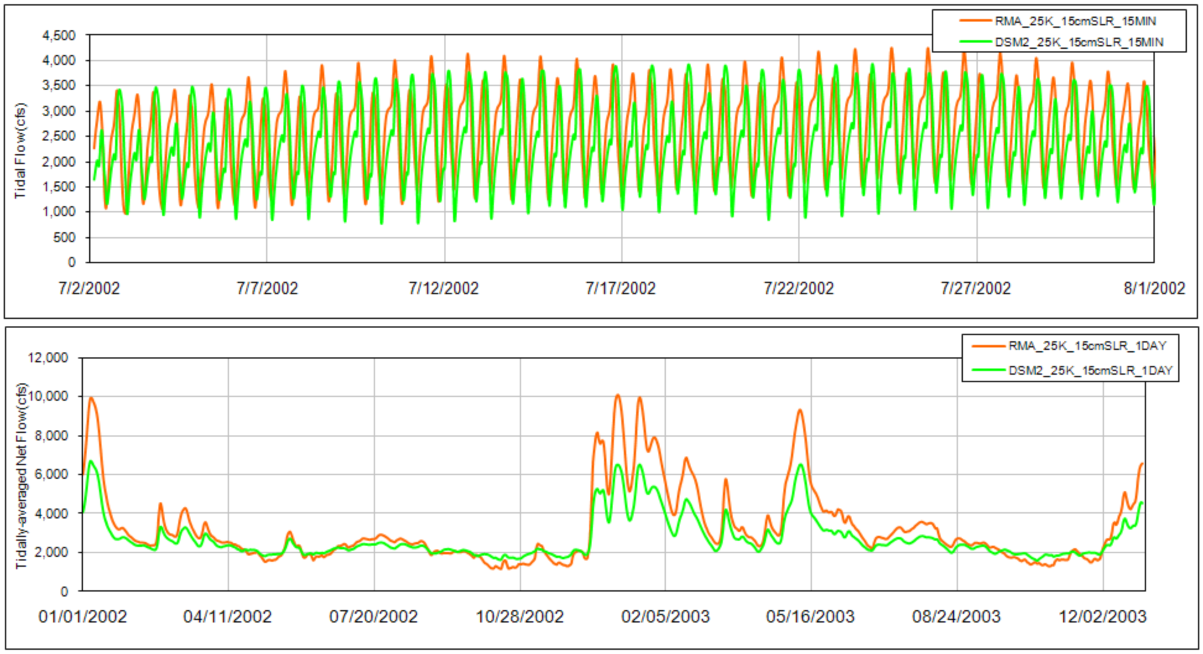



**Figure 1-160. Comparison of Tidal Flow and Tidally-Averaged Daily Flow between the Integrated Early Long-term Scenario and the Current Conditions Scenario from RMA Model and DSM2 Model for Egbert A and Calhoun cut breaches under Cache Region.**

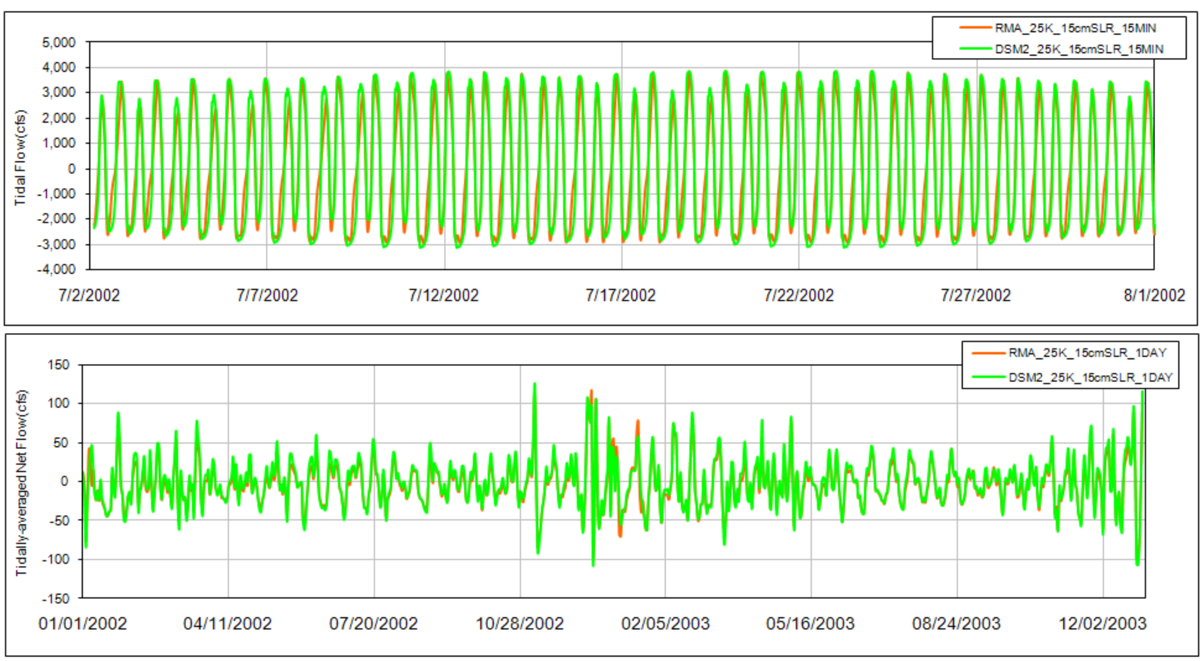


**Figure 1-161. Comparison of Tidal Flow and Tidally-Averaged Daily Flow between the Integrated Early Long-term Scenario and the Current Conditions Scenario from RMA Model and DSM2 Model for Shag Slough breach under Cache Region.**

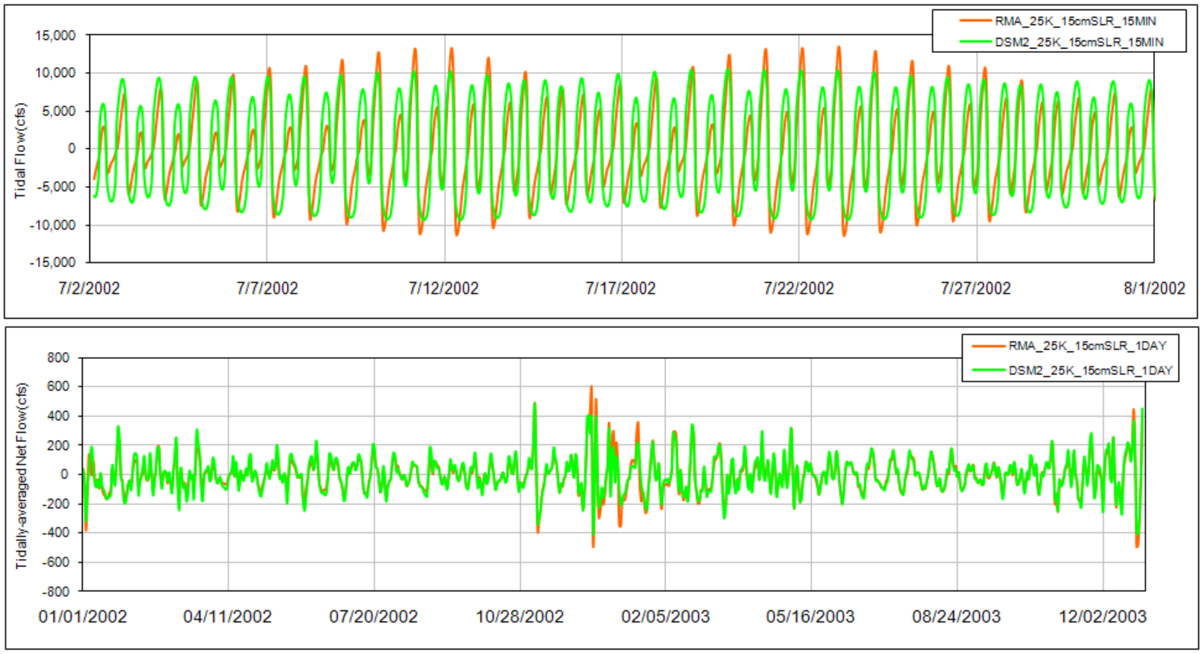



**Figure 1-162. Comparison of Tidal Flow and Tidally-Averaged Daily Flow between the Integrated Early Long-term Scenario and the Current Conditions Scenario from RMA Model and DSM2 Model for Suisun Island 10 breach 3 under Suisun Marsh Region.**

**Figure 1-163. Comparison of Tidal Flow and Tidally-Averaged Daily Flow between the Integrated Early Long-term Scenario and the Current Conditions Scenario from RMA Model and DSM2 Model for Suisun Island 5 breach 1 under Suisun Marsh Region.**

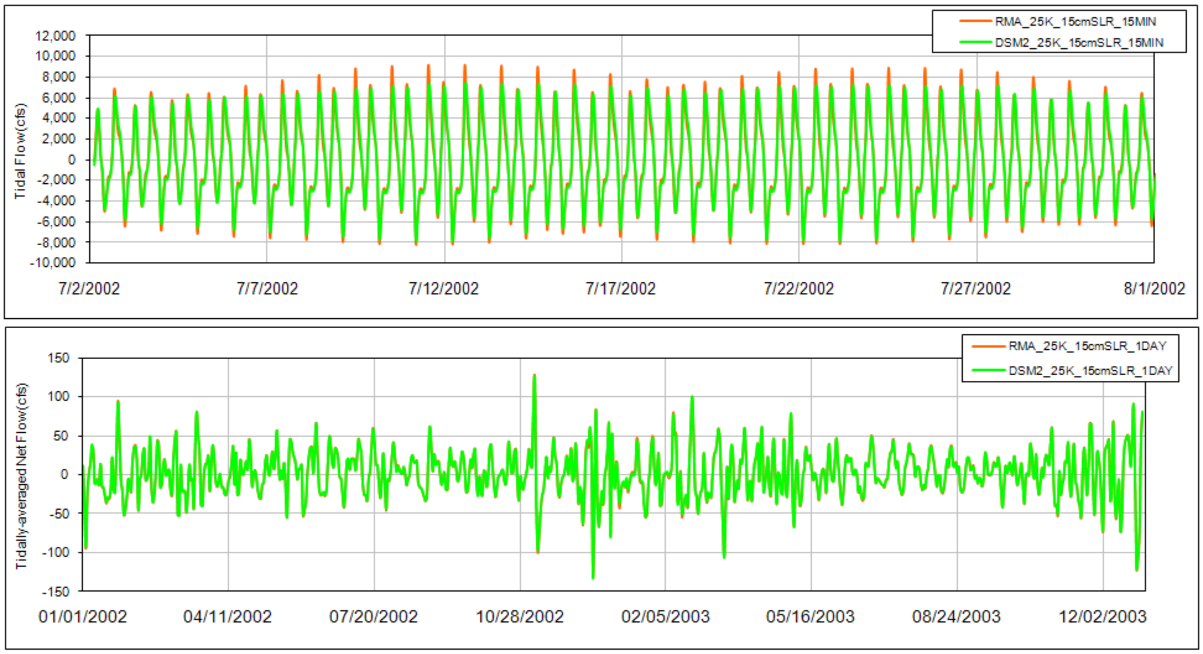



**Figure 1-164. Comparison of Tidal Flow and Tidally-Averaged Daily Flow between the Integrated Early Long-term Scenario and the Current Conditions Scenario from RMA Model and DSM2 Model for Montezuma Wetlands North and South breaches under Cache Region.**

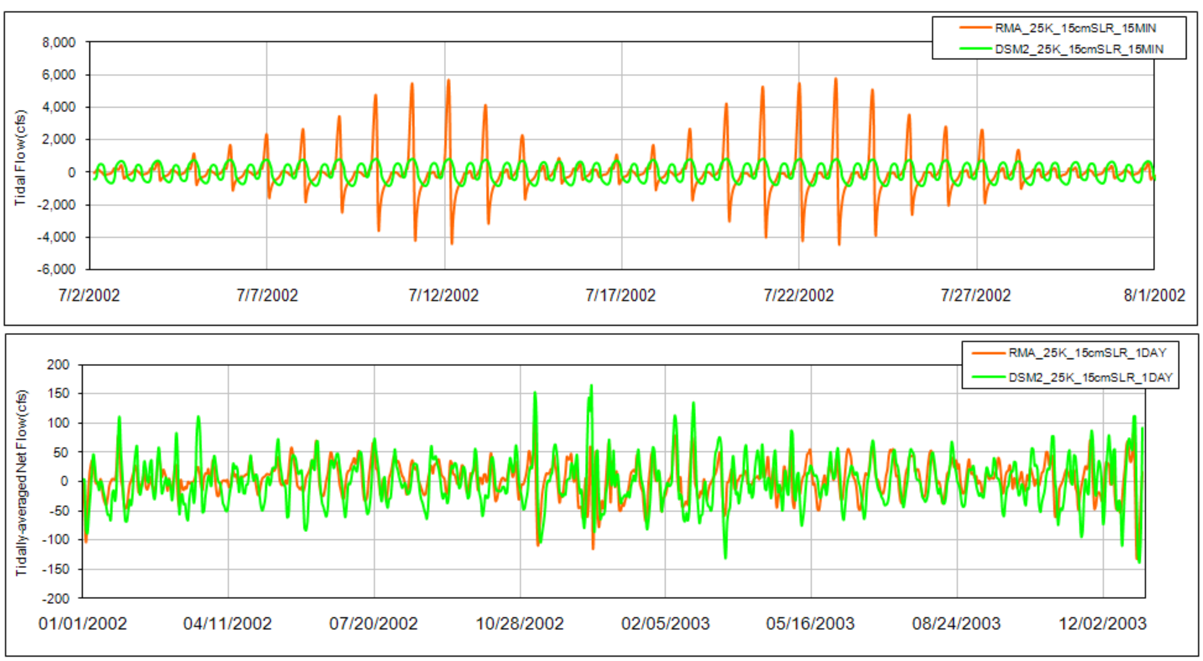


**Figure 1-165. Comparison of Tidal Flow and Tidally-Averaged Daily Flow between the Integrated Early Long-term Scenario and the Current Conditions Scenario from RMA Model and DSM2 Model for Decker Island North-west breach under Cache Region.**

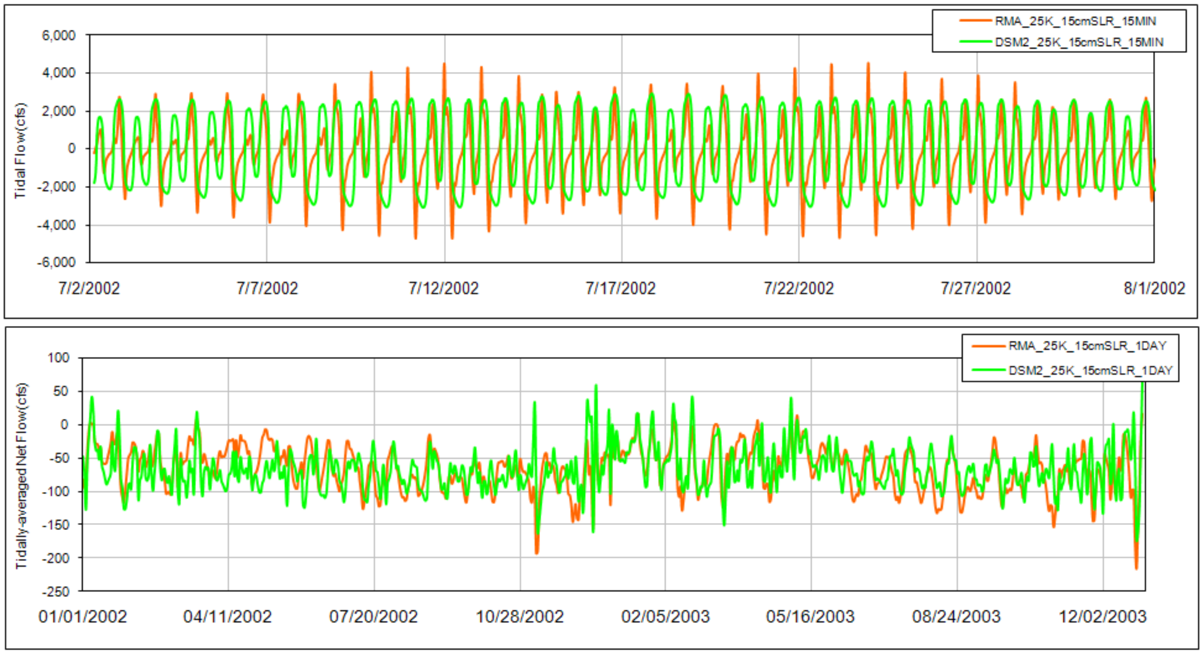



**Figure 1-166. Comparison of Tidal Flow and Tidally-Averaged Daily Flow between the Integrated Early Long-term Scenario and the Current Conditions Scenario from RMA Model and DSM2 Model for Dutch Slough d/s of Emerson Slough under Western Delta Region.**

**Figure 1-167. Comparison of Tidal Flow and Tidally-Averaged Daily Flow between the Integrated Early Long-term Scenario and the Current Conditions Scenario from RMA Model and DSM2 Model for Snodgrass Slough breach under Mokelumne/Cosumnes Region.**

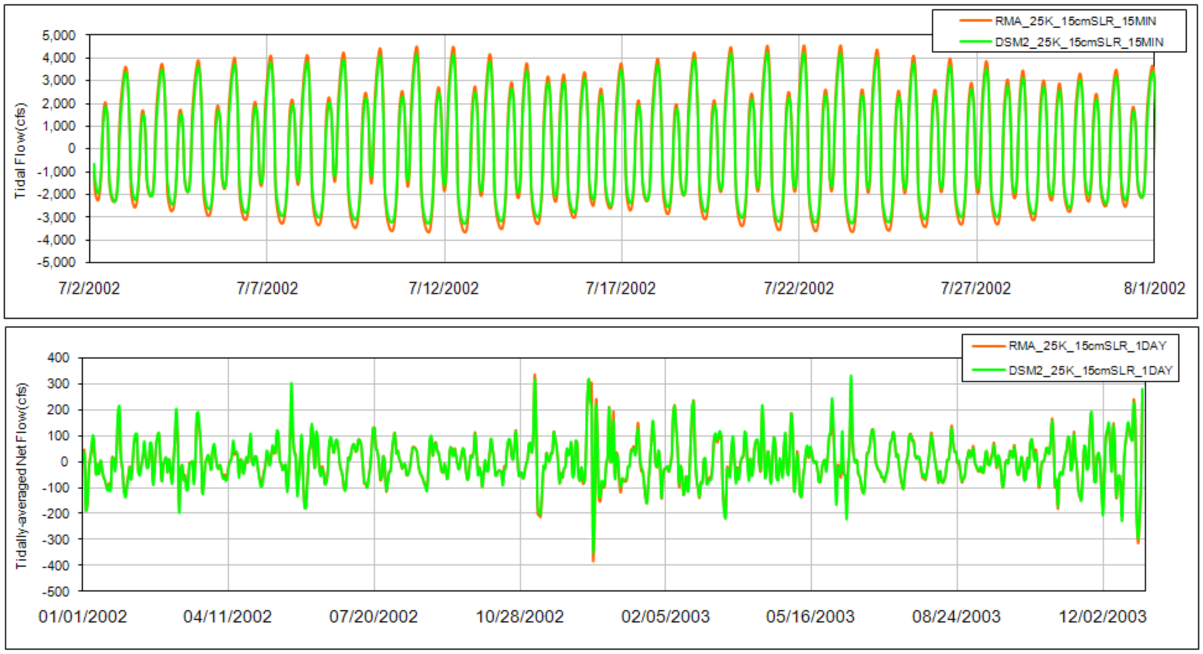
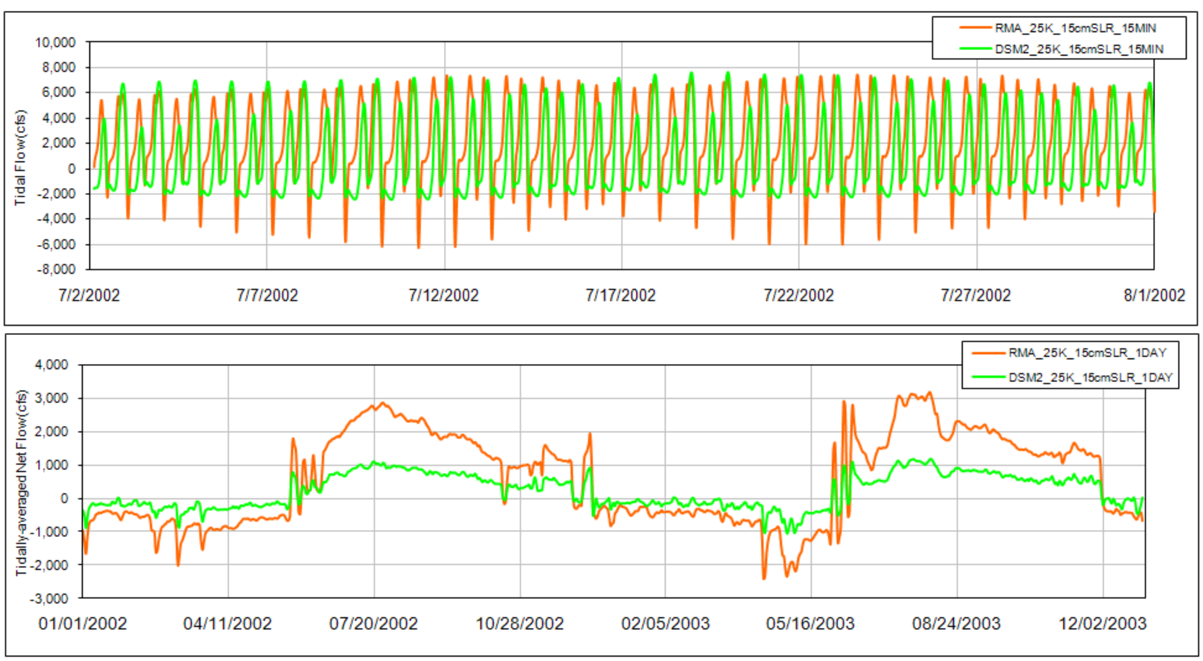



**Figure 1-168. Comparison of Tidal Flow and Tidally-Averaged Daily Flow between the Integrated Early Long-term Scenario and the Current Conditions Scenario from RMA Model and DSM2 Model for Snodgrass Slough south and McCormick Williamson Tract breaches under Eastern Delta Region.**



# Early Long-Term Integrated 25,000ac Restoration and 15cm Sea Level Rise Corroboration

## Salinity Results

**Figure 1-169. Comparison of Monthly averaged percentage incremental change in EC between the Integrated Early Long-Term Scenario and the Current Conditions Scenario from RMA Model and DSM2 Model for Sacramento River at Collinsville.**

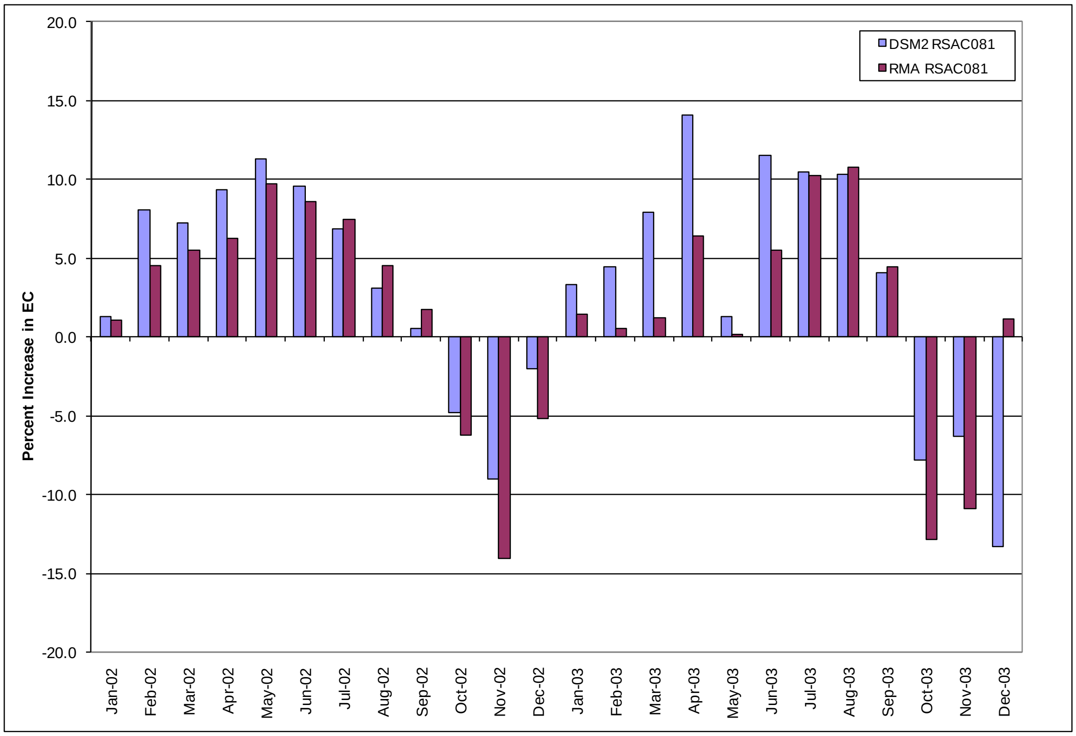


**Figure 1-170. Comparison of Monthly averaged percentage incremental change in EC between the Integrated Early Long-Term Scenario and the Current Conditions Scenario from RMA Model and DSM2 Model for Sacramento River at Emmaton.**

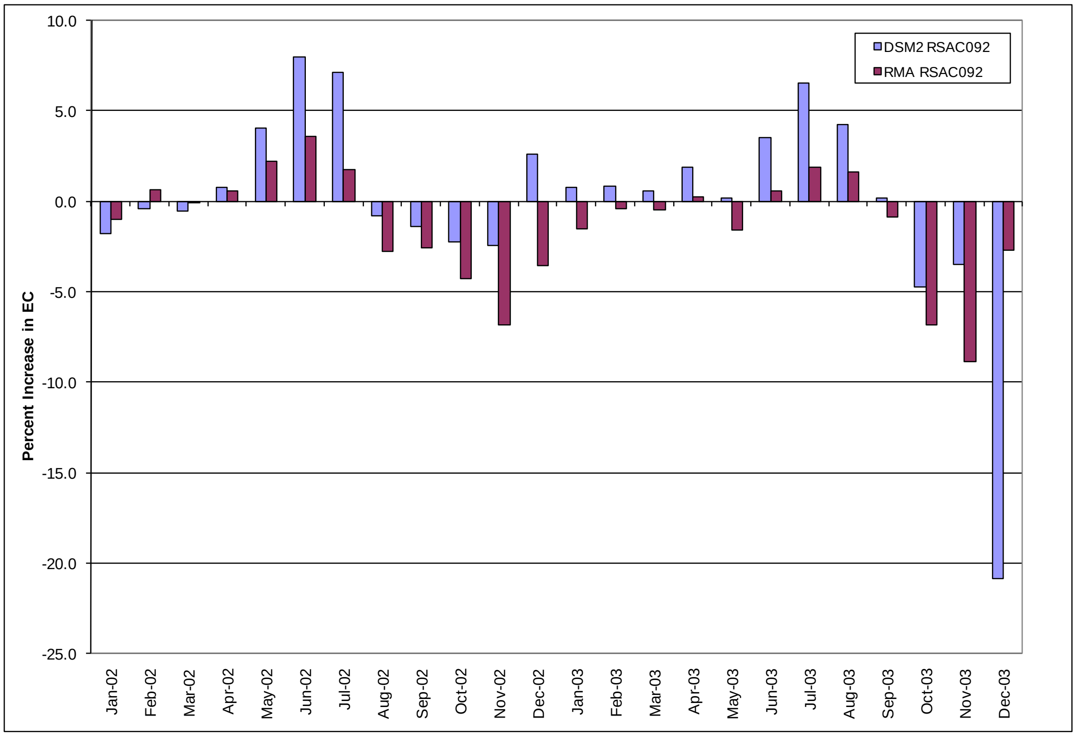



**Figure 1-171. Comparison of Monthly averaged percentage incremental change in EC between the Integrated Early Long-Term Scenario and the Current Conditions Scenario from RMA Model and DSM2 Model for San Joaquin River at Jersey Point.**

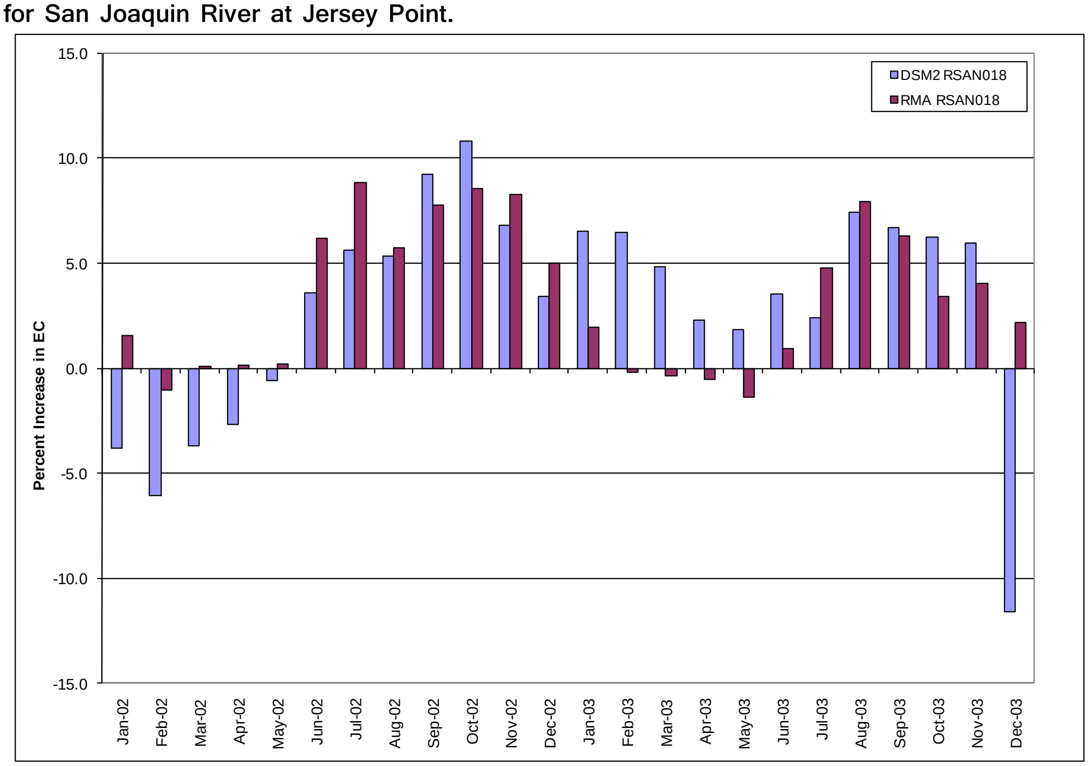


**Figure 1-172. Comparison of Monthly averaged percentage incremental change in EC between the Integrated Early Long-Term Scenario and the Current Conditions Scenario from RMA Model and DSM2 Model for Old River at Rock Slough.**

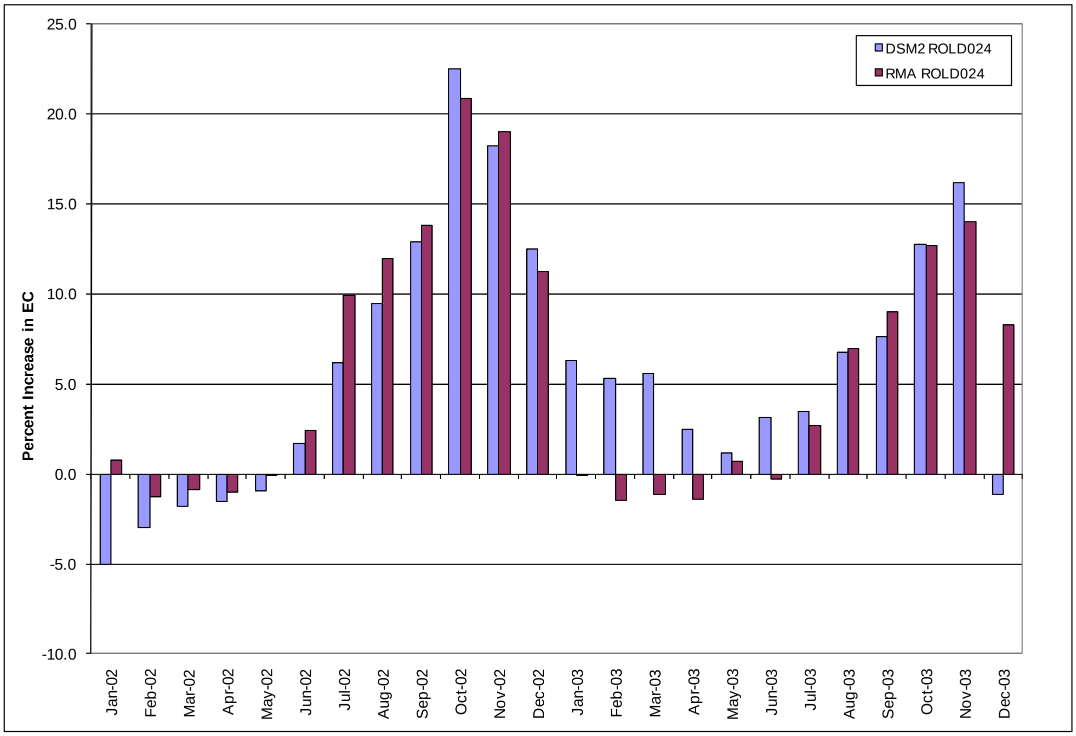



**Figure 1-173. Comparison of Tidally-Averaged Daily EC and the Incremental Change in the Daily EC between the Integrated Early Long-Term Scenario and the Current Conditions Scenario from RMA Model and DSM2 Model for Montezuma Slough at Mouth Location.**

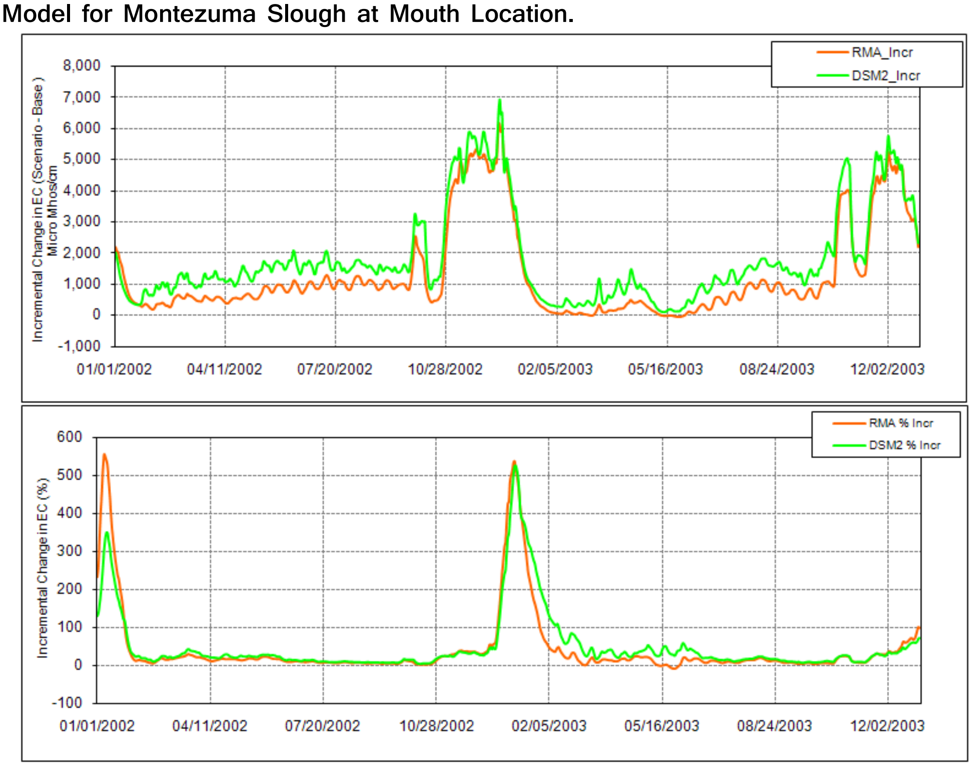


Figure 1-174. Comparison of Tidally-Averaged Daily EC and the Incremental Change in the Daily EC between the Integrated Early Long-Term Scenario and the Current Conditions Scenario from RMA Model and DSM2 Model for Montezuma Slough at Beldon's Landing Location.

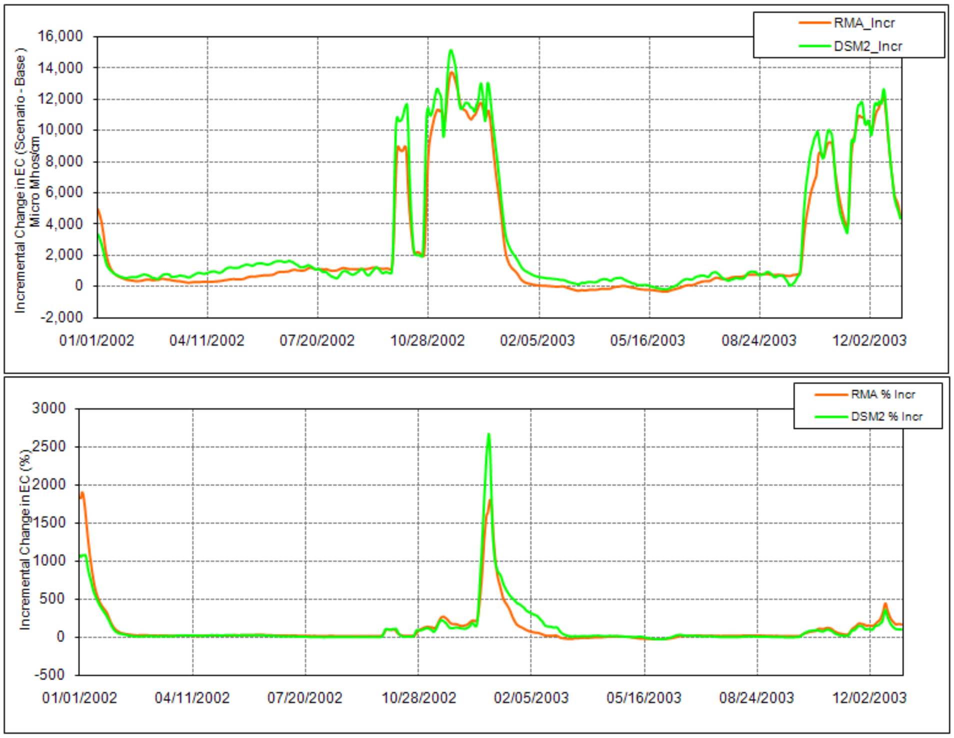



Figure 1-175. Comparison of Tidally-Averaged Daily EC and the Incremental Change in the Daily EC between the Integrated Early Long-Term Scenario and the Current Conditions Scenario from RMA Model and DSM2 Model for Montezuma Slough at Head Location.

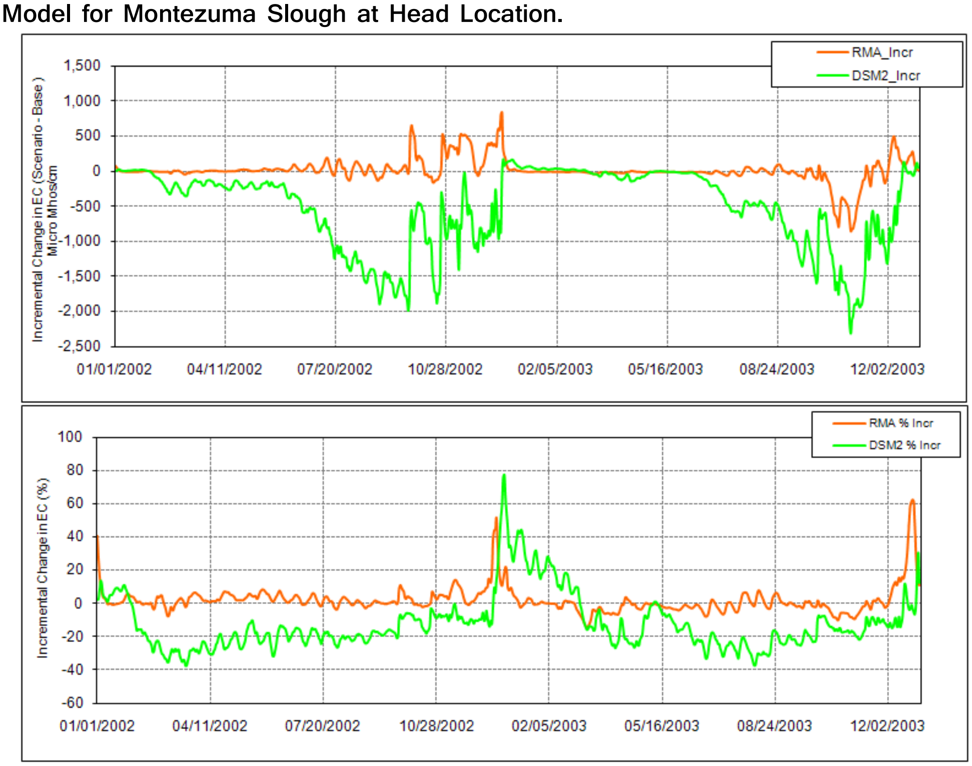


**Figure 1-176. Comparison of Tidally-Averaged Daily EC and the Incremental Change in the Daily EC between the Integrated Early Long-Term Scenario and the Current Conditions Scenario from RMA Model and DSM2 Model for Sacramento River at Port Chicago Location.**

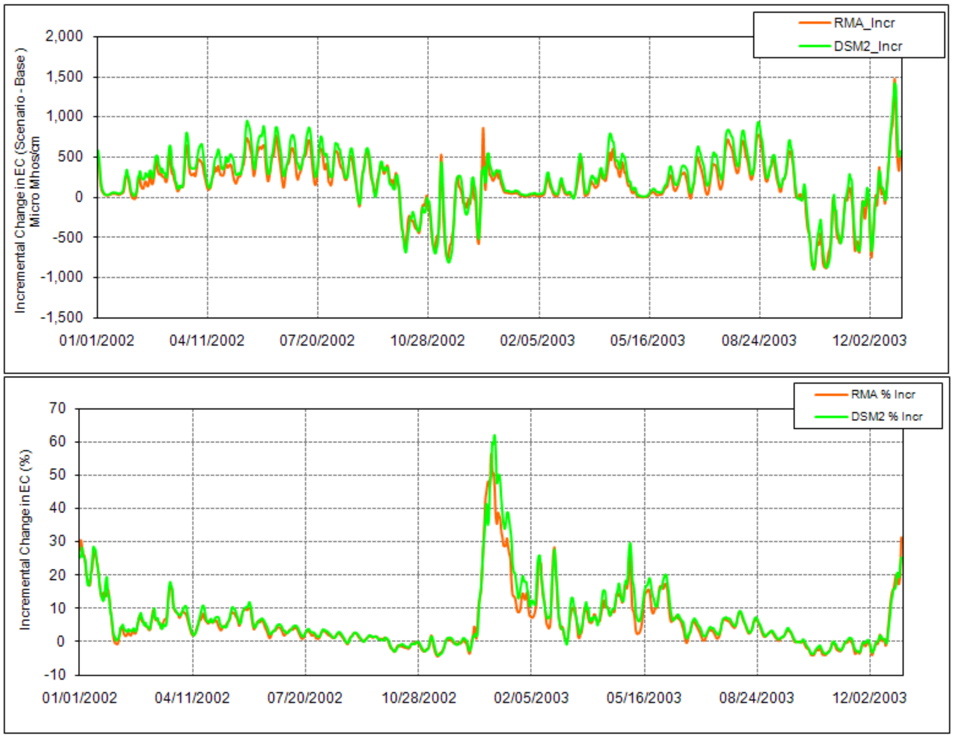



**Figure 1-177. Comparison of Tidally-Averaged Daily EC and the Incremental Change in the Daily EC between the Integrated Early Long-Term Scenario and the Current Conditions Scenario from RMA Model and DSM2 Model for Sacramento River at Collinsville Location.**

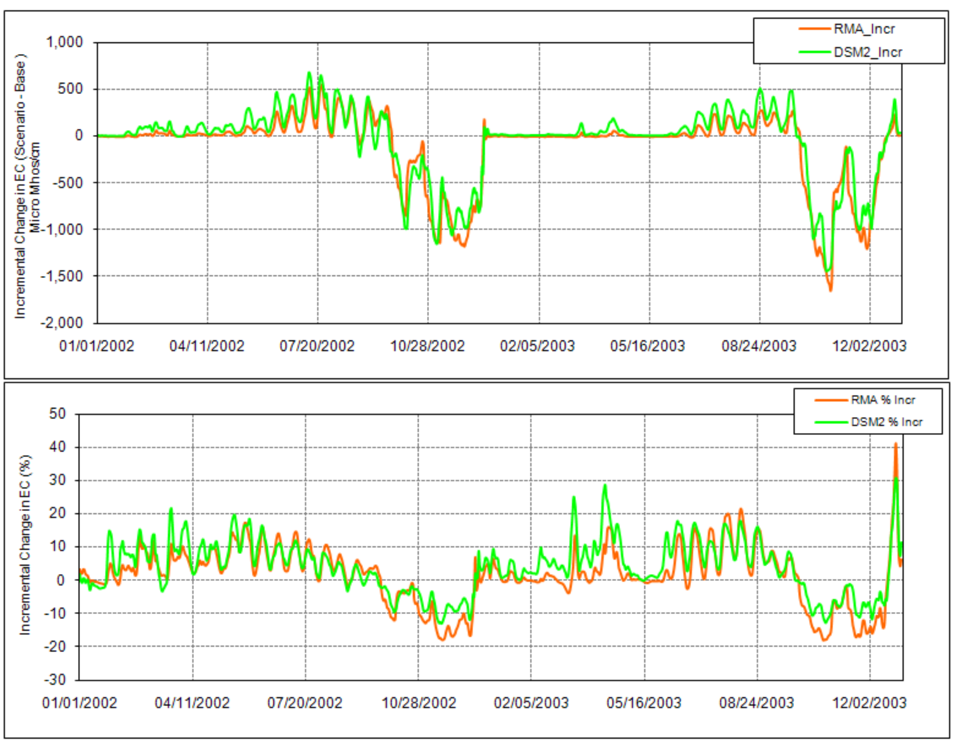


**Figure 1-178. Comparison of Tidally-Averaged Daily EC and the Incremental Change in the Daily EC between the Integrated Early Long-Term Scenario and the Current Conditions Scenario from RMA Model and DSM2 Model for Sacramento River at Emmaton Location.**

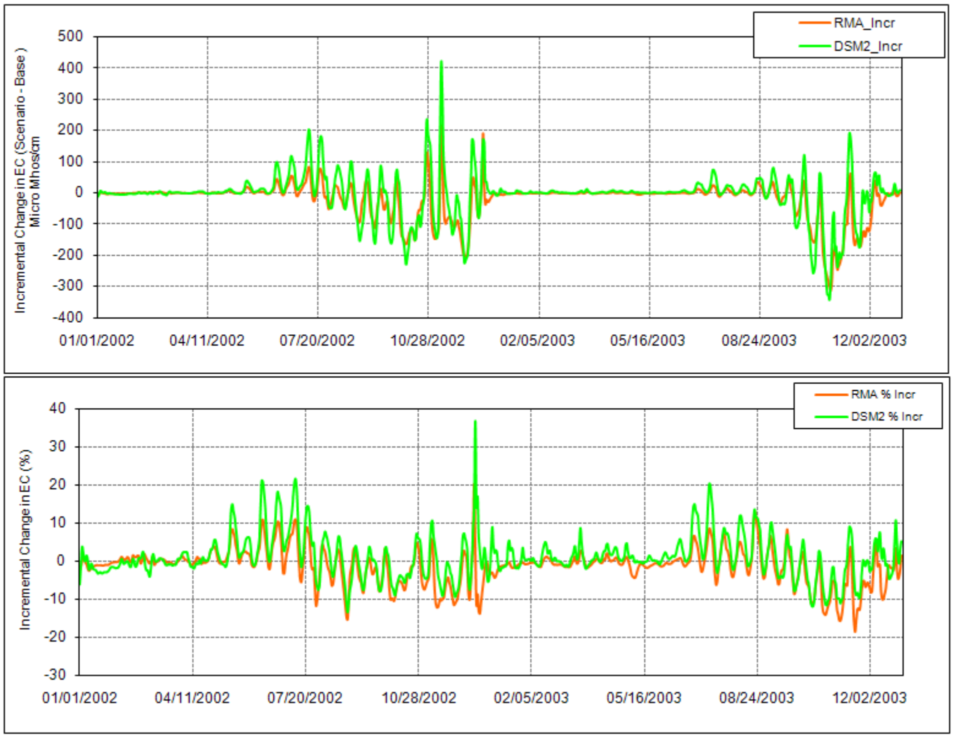



**Figure 1-179. Comparison of Tidally-Averaged Daily EC and the Incremental Change in the Daily EC between the Integrated Early Long-Term Scenario and the Current Conditions Scenario from RMA Model and DSM2 Model for Sacramento River at Rio Vista Location.**

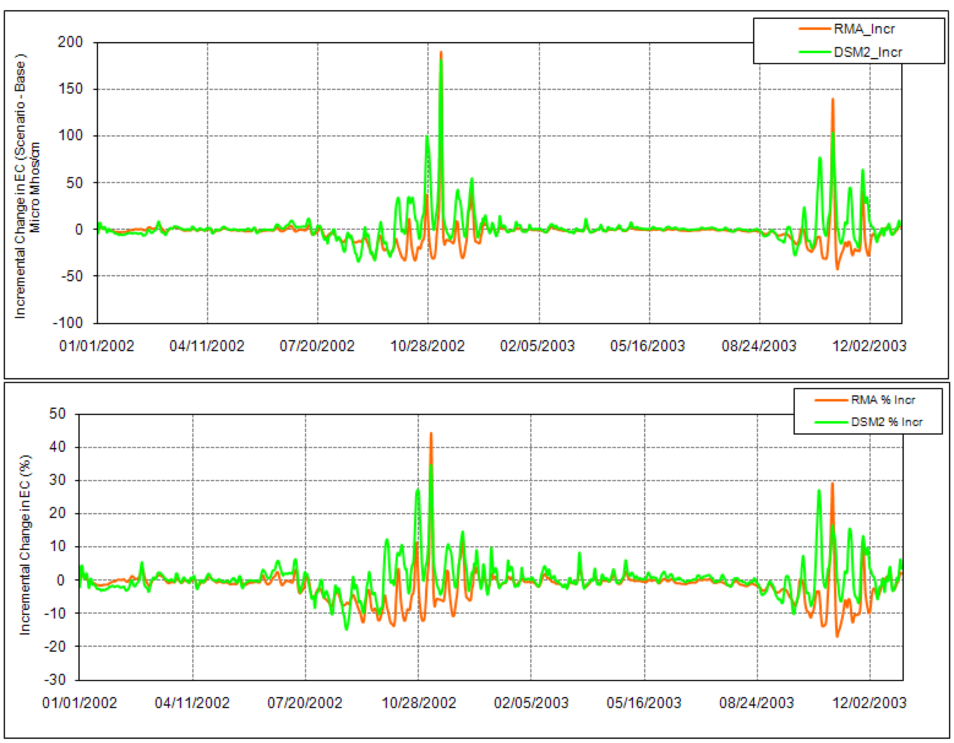


**Figure 1-180. Comparison of Tidally-Averaged Daily EC and the Incremental Change in the Daily EC between the Integrated Early Long-Term Scenario and the Current Conditions Scenario from RMA Model and DSM2 Model for Cache Slough at Ryer Island Location.**

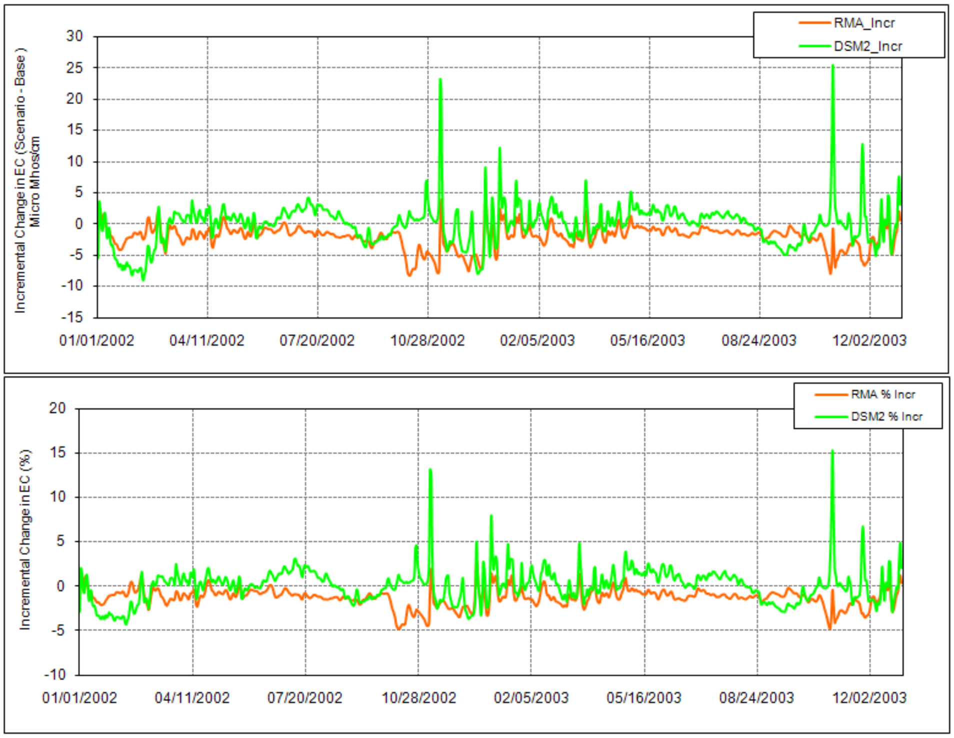



**Figure 1-181. Comparison of Tidally-Averaged Daily EC and the Incremental Change in the Daily EC between the Integrated Early Long-Term Scenario and the Current Conditions Scenario from RMA Model and DSM2 Model for Three Mile Slough at San Joaquin River Location.**

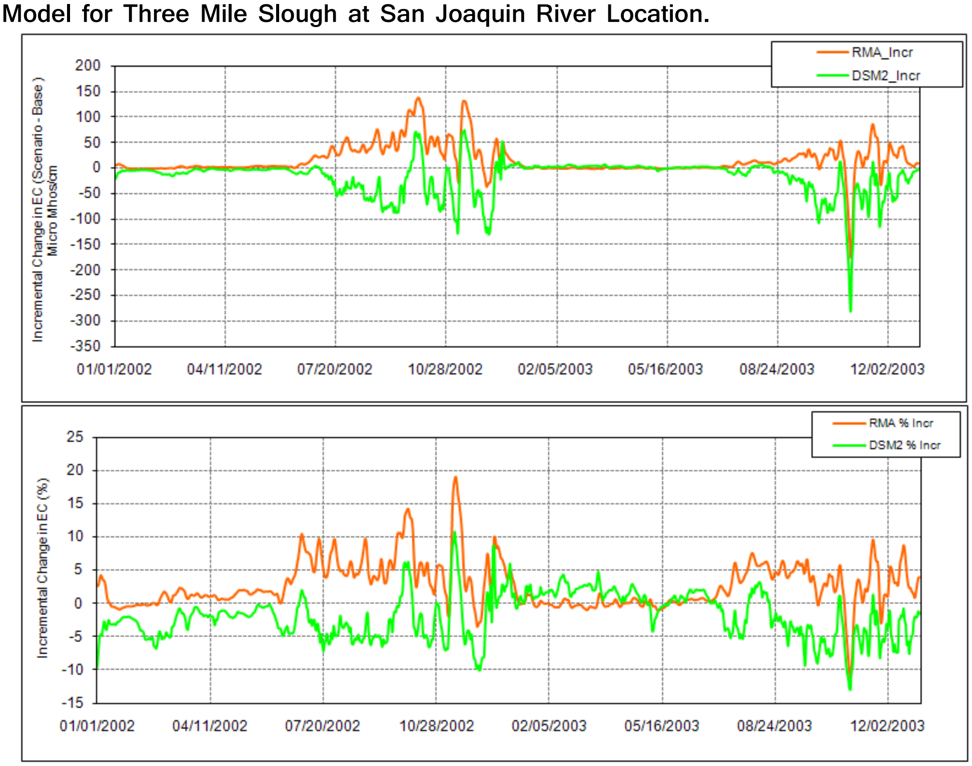


**Figure 1-182. Comparison of Tidally-Averaged Daily EC and the Incremental Change in the Daily EC between the Integrated Early Long-Term Scenario and the Current Conditions Scenario from RMA Model and DSM2 Model for San Joaquin River at Jersey Point Location.**

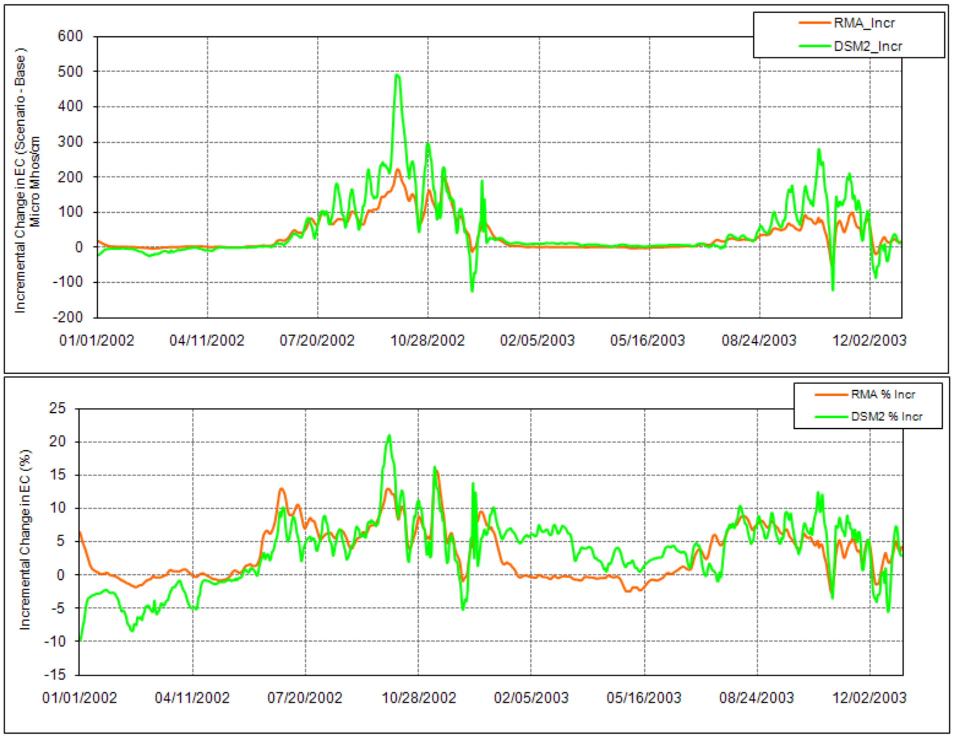



**Figure 1-183. Comparison of Tidally-Averaged Daily EC and the Incremental Change in the Daily EC between the Integrated Early Long-Term Scenario and the Current Conditions Scenario from RMA Model and DSM2 Model for San Joaquin River at San Andreas Location.**

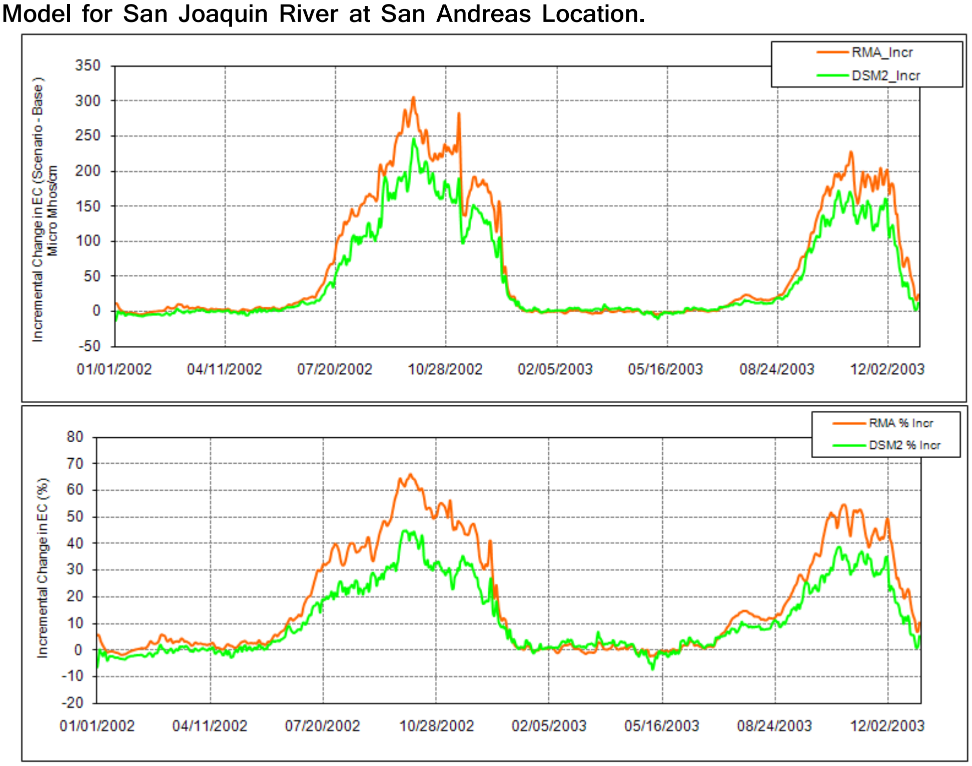


**Figure 1-184. Comparison of Tidally-Averaged Daily EC and the Incremental Change in the Daily EC between the Integrated Early Long-Term Scenario and the Current Conditions Scenario from RMA Model and DSM2 Model for San Joaquin River at Prisoners Point Location.**

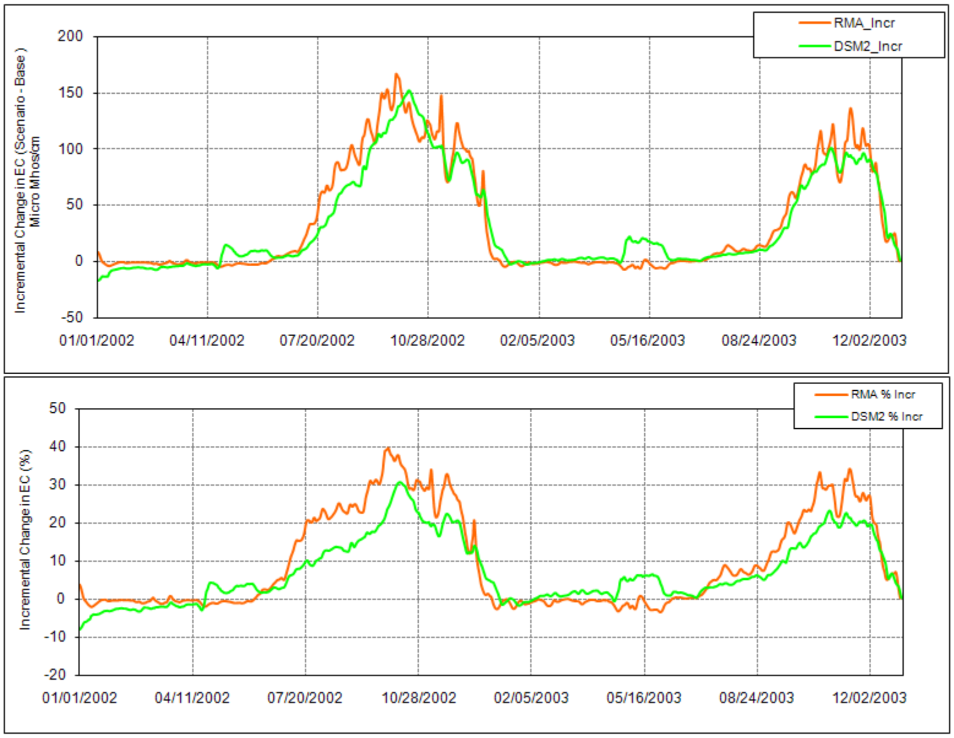



**Figure 1-185. Comparison of Tidally-Averaged Daily EC and the Incremental Change in the Daily EC between the Integrated Early Long-Term Scenario and the Current Conditions Scenario from RMA Model and DSM2 Model for San Joaquin River at Stockton Location.**

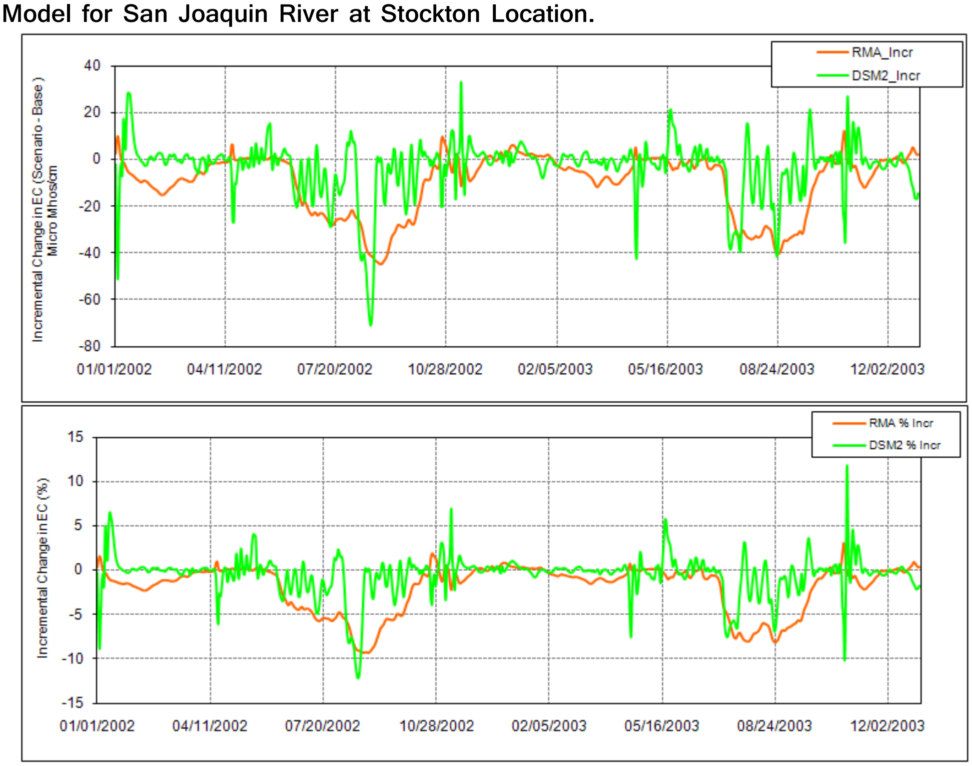


**Figure 1-186. Comparison of Tidally-Averaged Daily EC and the Incremental Change in the Daily EC between the Integrated Early Long-Term Scenario and the Current Conditions Scenario from RMA Model and DSM2 Model for San Joaquin River at Brandt Bridge Location.**


**Figure 1-187. Comparison of Tidally-Averaged Daily EC and the Incremental Change in the Daily EC between the Integrated Early Long-Term Scenario and the Current Conditions Scenario from RMA Model and DSM2 Model for Middle River at Middle River Location.**

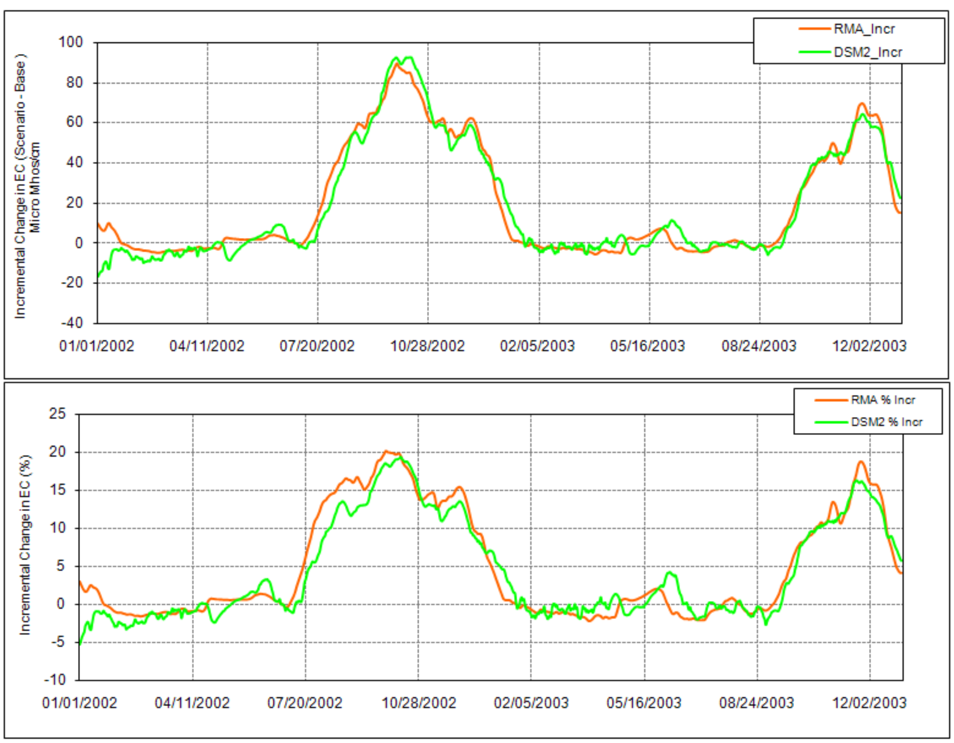
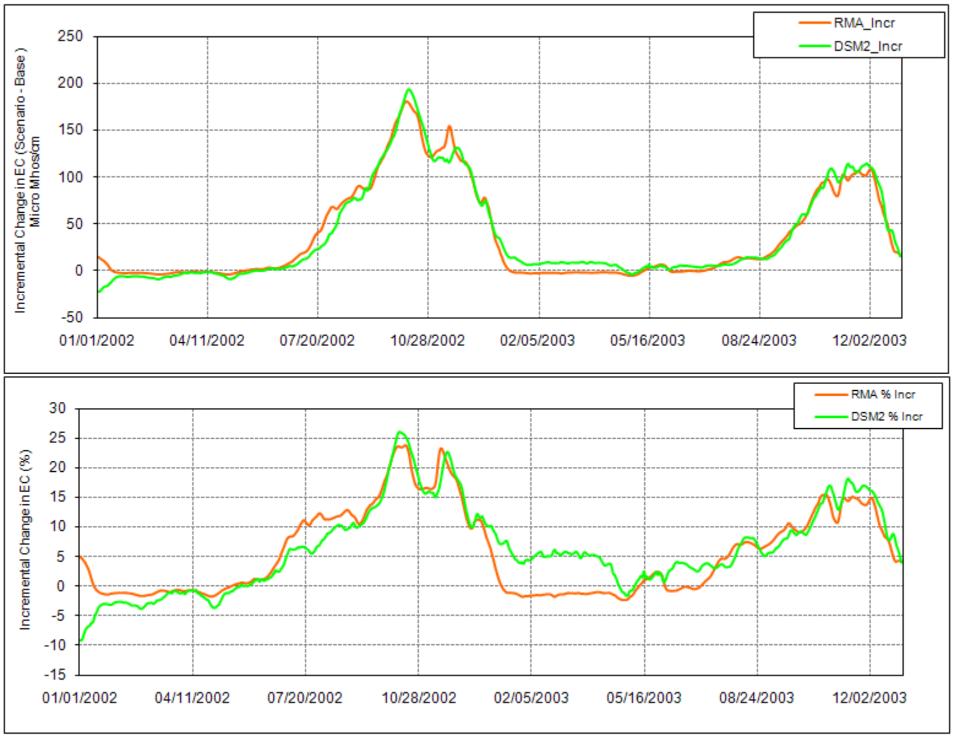


**Figure 1-188. Comparison of Tidally-Averaged Daily EC and the Incremental Change in the Daily EC between the Integrated Early Long-Term Scenario and the Current Conditions Scenario from RMA Model and DSM2 Model for Old River at Bacon Island Location.**



# Late Long-Term Integrated 65,000ac Restoration and 45cm Sea Level Rise Corroboration

## Hydrodynamics Results

**Figure 1-189. Comparison of Tidal Flow, Tidally-Averaged Daily Flow, Incremental Change in Tidal Flow and the Incremental Change in the Daily Flow between the Integrated Late Long-term Scenario and the Current Conditions Scenario from RMA Model and DSM2 Model for Cache at Ryer Island Location.**

**Figure 1-190. Comparison of Tidal Flow, Tidally-Averaged Daily Flow, Incremental Change in Tidal Flow and the Incremental Change in the Daily Flow between the Integrated Late Long-term Scenario and the Current Conditions Scenario from RMA Model and DSM2 Model for Sacramento River at Rio Vista Location.**

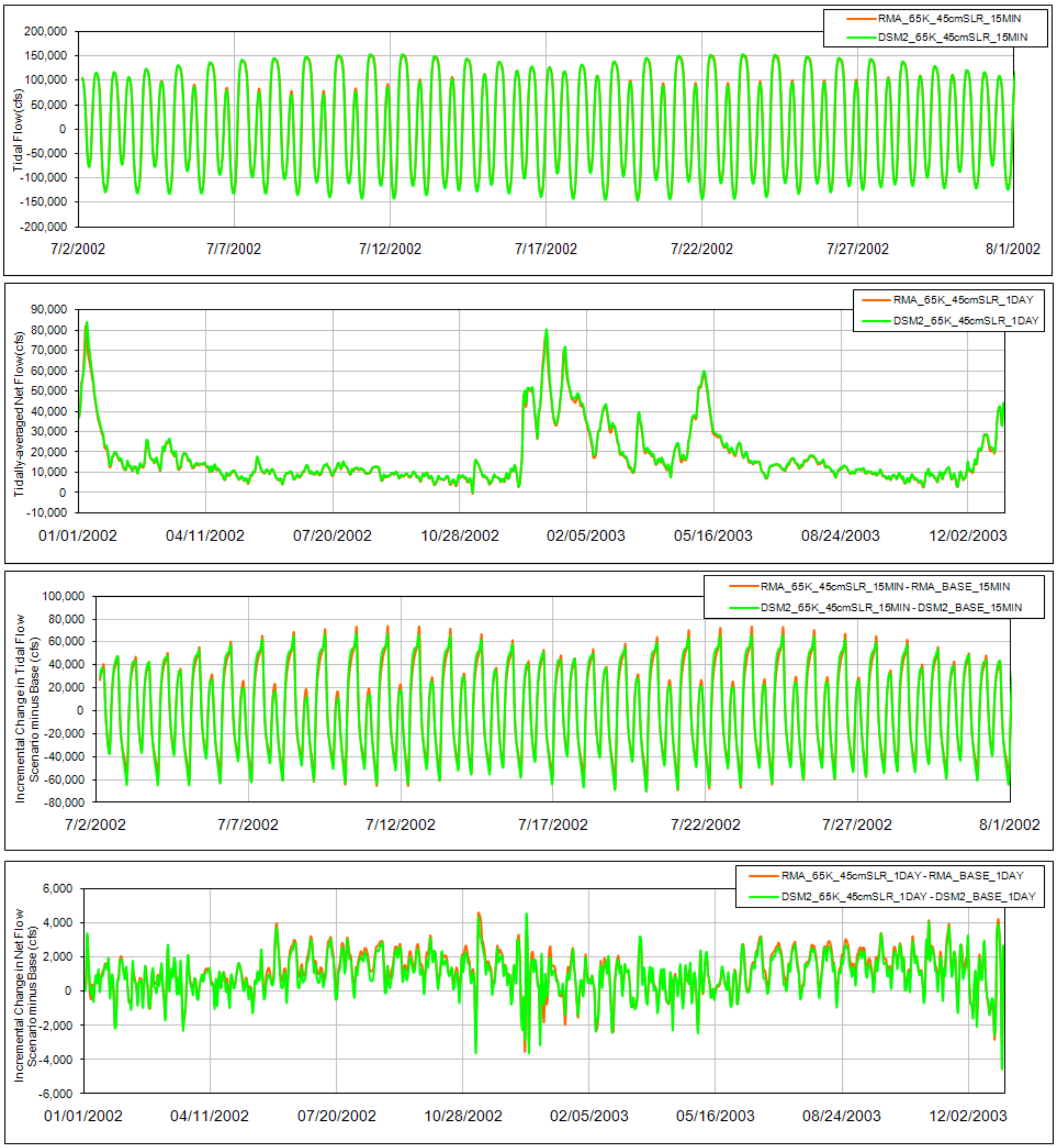


**Figure 1-191. Comparison of Tidal Flow, Tidally-Averaged Daily Flow, Incremental Change in Tidal Flow and the Incremental Change in the Daily Flow between the Integrated Late Long-term Scenario and the Current Conditions Scenario from RMA Model and DSM2 Model for Georgiana Slough at Head Location.**

**Figure 1-192. Comparison of Tidal Flow, Tidally-Averaged Daily Flow, Incremental Change in Tidal Flow and the Incremental Change in the Daily Flow between the Integrated Late Long-term Scenario and the Current Conditions Scenario from RMA Model and DSM2 Model for Montezuma Slough at Head Location.**

**Figure 1-193. Comparison of Tidal Flow, Tidally-Averaged Daily Flow, Incremental Change in Tidal Flow and the Incremental Change in the Daily Flow between the Integrated Late Long-term Scenario and the Current Conditions Scenario from RMA Model and DSM2 Model for Montezuma Slough at Mouth Location.**

**Figure 1-194. Comparison of Tidal Flow, Tidally-Averaged Daily Flow, Incremental Change in Tidal Flow and the Incremental Change in the Daily Flow between the Integrated Late Long-term Scenario and the Current Conditions Scenario from RMA Model and DSM2 Model for Three Mile Slough at San Joaquin River Location.**

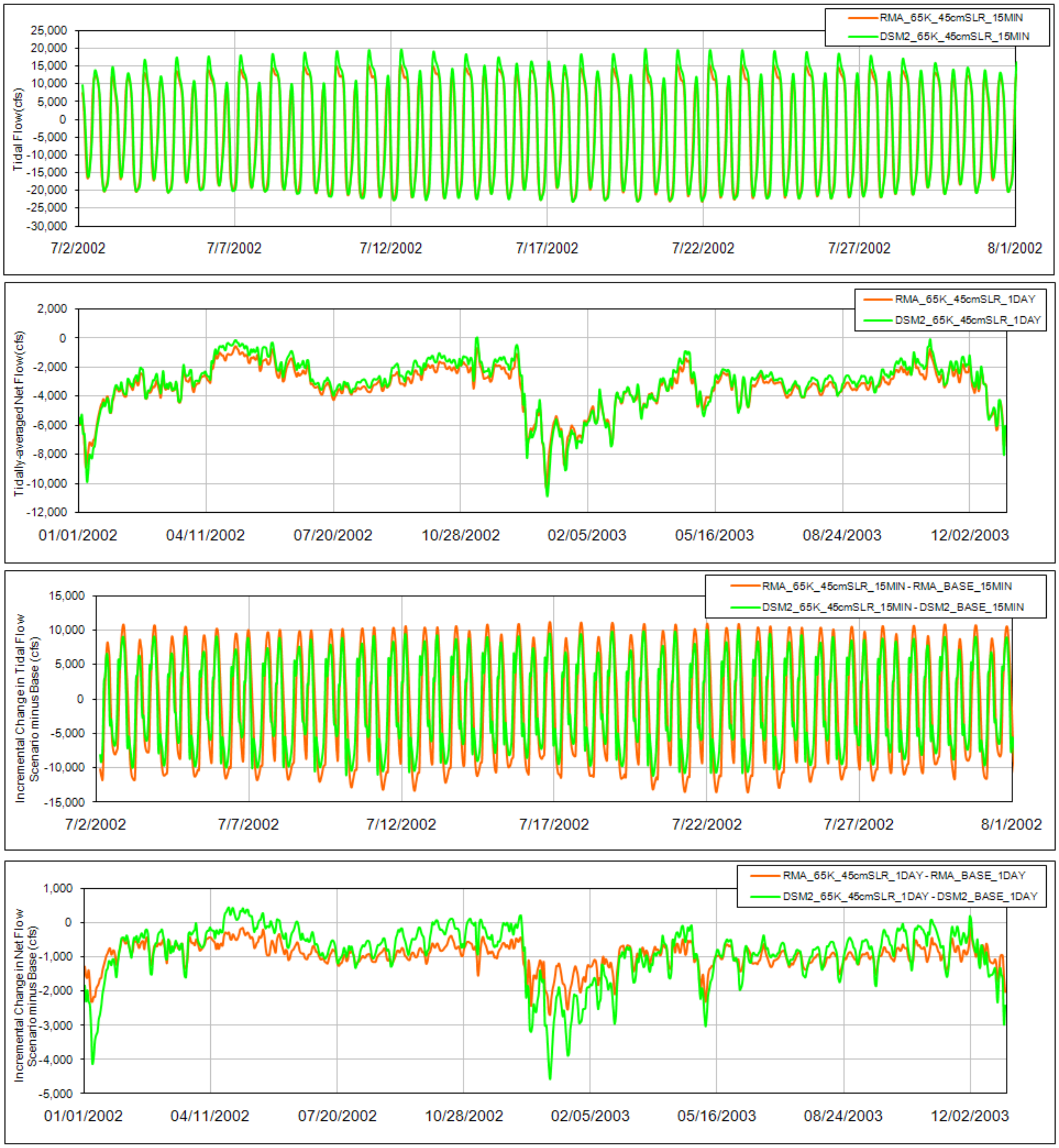


**Figure 1-195. Comparison of Tidal Flow, Tidally-Averaged Daily Flow, Incremental Change in Tidal Flow and the Incremental Change in the Daily Flow between the Integrated Late Long-term Scenario and the Current Conditions Scenario from RMA Model and DSM2 Model for San Joaquin River at Prisoners Point Location.**

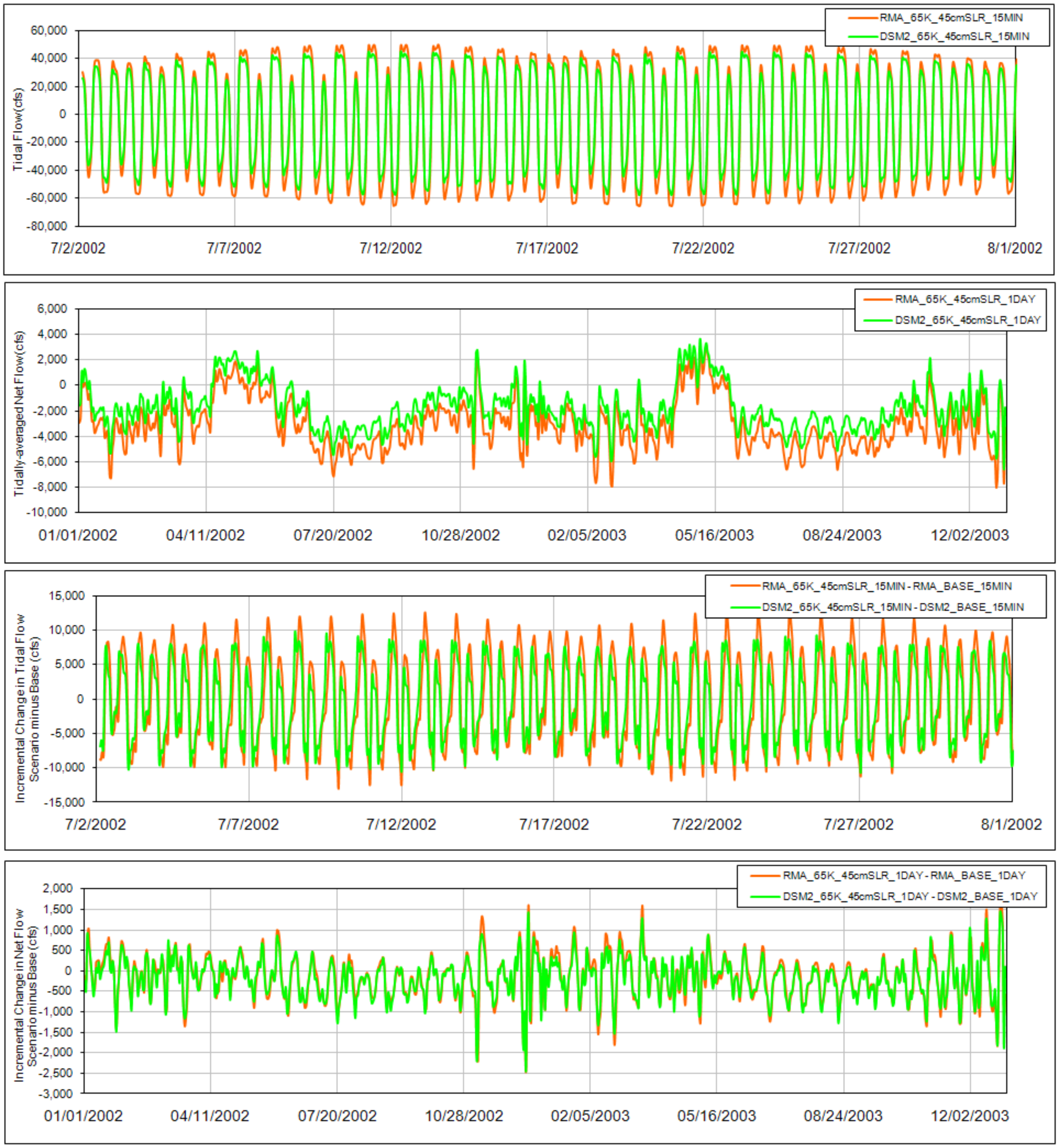


**Figure 1-196. Comparison of Tidal Flow, Tidally-Averaged Daily Flow, Incremental Change in Tidal Flow and the Incremental Change in the Daily Flow between the Integrated Late Long-term Scenario and the Current Conditions Scenario from RMA Model and DSM2 Model for San Joaquin River at Stockton Location.**

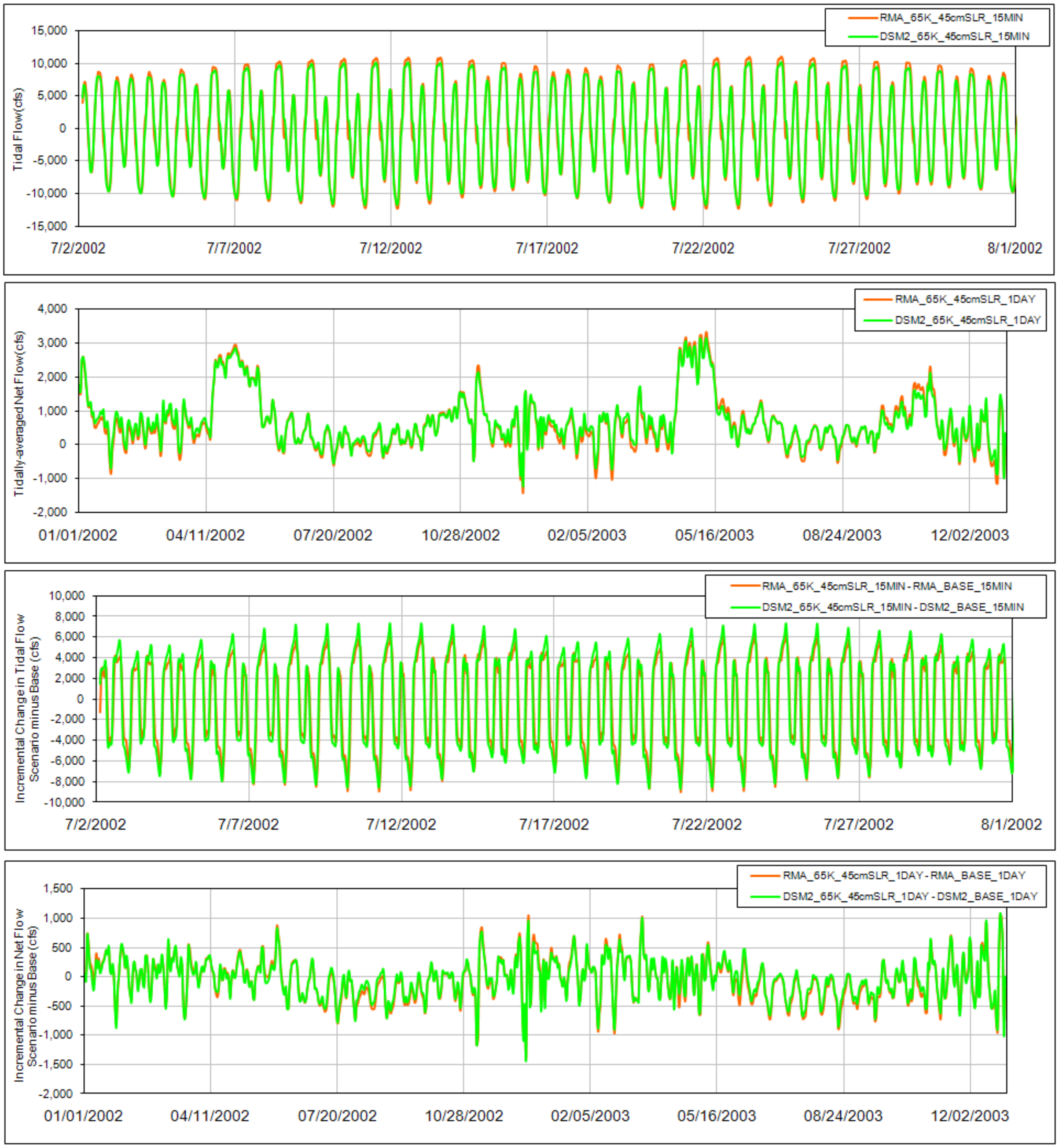


**Figure 1-197. Comparison of Tidal Flow, Tidally-Averaged Daily Flow, Incremental Change in Tidal Flow and the Incremental Change in the Daily Flow between the Integrated Late Long-term Scenario and the Current Conditions Scenario from RMA Model and DSM2 Model for Mokelumne River near San Joaquin River Location.**

**Figure 1-198. Comparison of Tidal Flow, Tidally-Averaged Daily Flow, Incremental Change in Tidal Flow and the Incremental Change in the Daily Flow between the Integrated Late Long-term Scenario and the Current Conditions Scenario from RMA Model and DSM2 Model for Middle River at Bacon Island Location.**

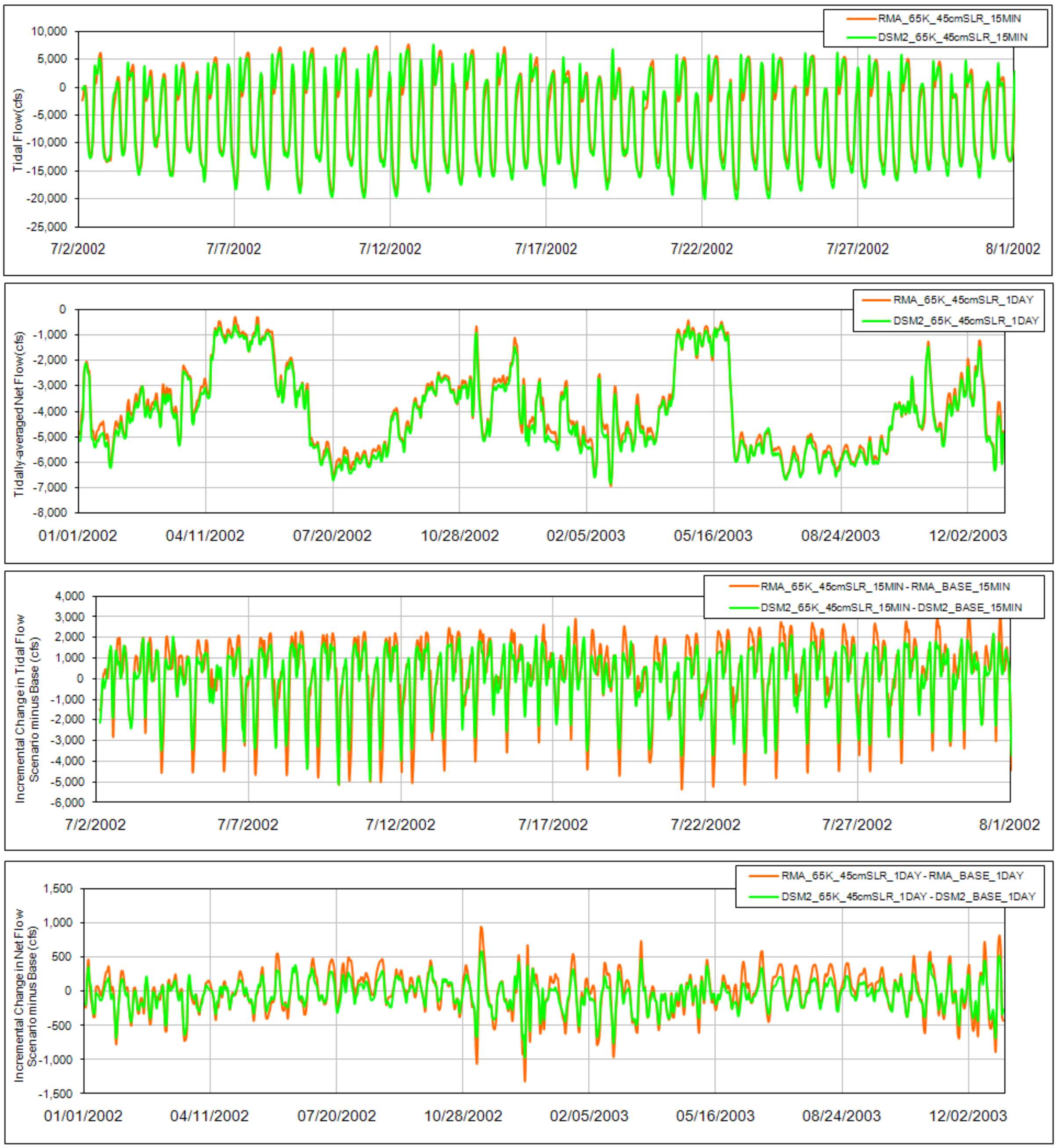


**Figure 1-199. Comparison of Tidal Flow, Tidally-Averaged Daily Flow, Incremental Change in Tidal Flow and the Incremental Change in the Daily Flow between the Integrated Late Long-term Scenario and the Current Conditions Scenario from RMA Model and DSM2 Model for Old River at Bacon Island Location.**

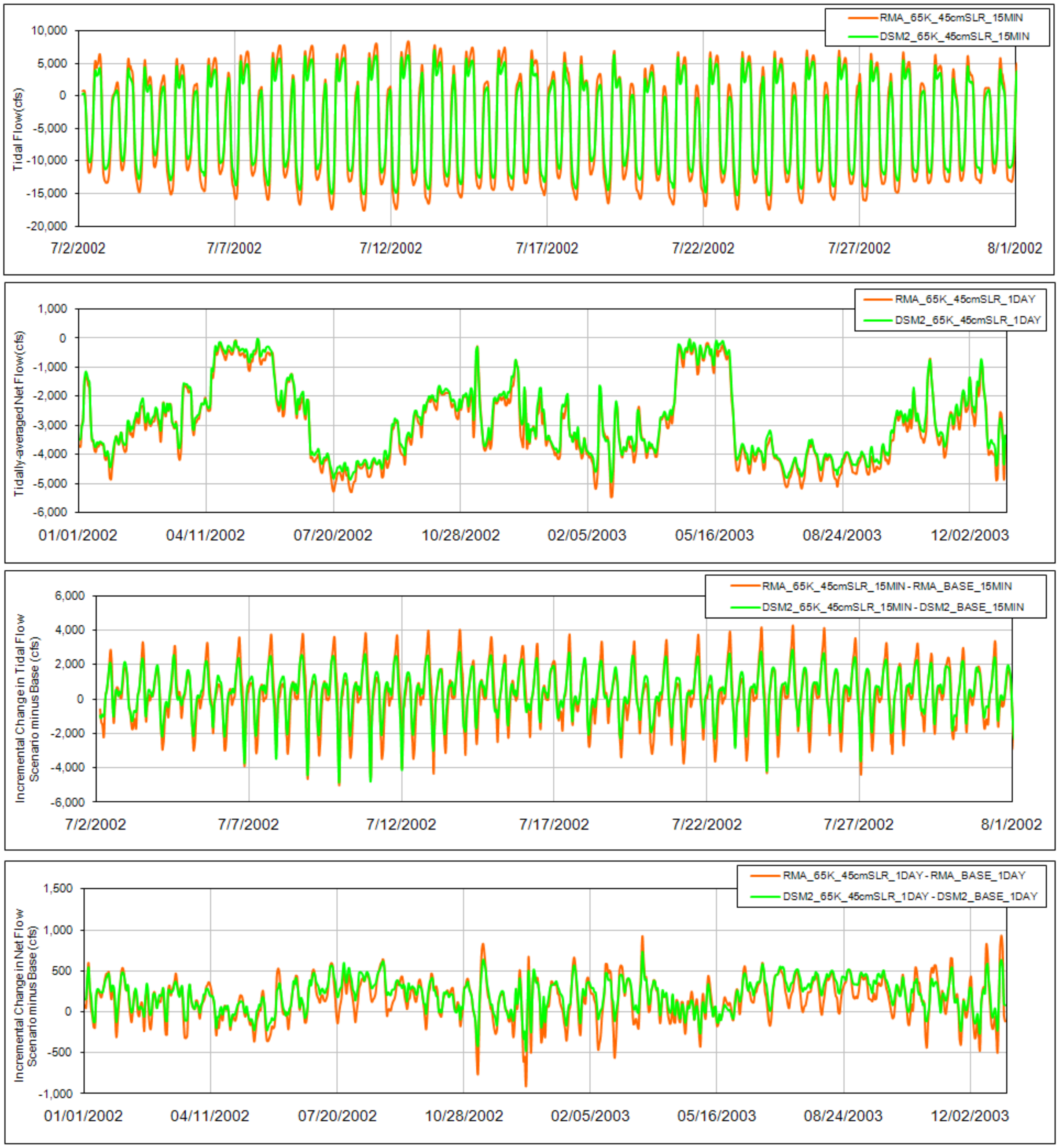


**Figure 1-200. Comparison of Tidal Flow and Tidally-Averaged Daily Flow between the Integrated Late Long-term Scenario and the Current Conditions Scenario from RMA Model and DSM2 Model for Prospect Slough North Breach under Cache Region.**

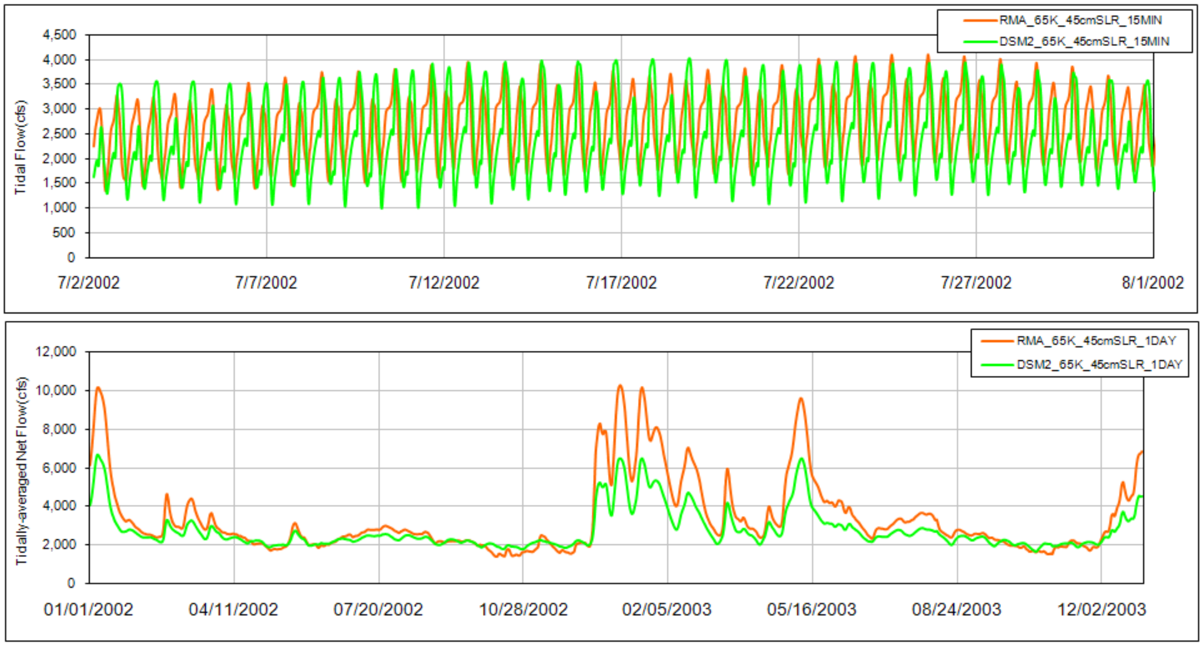



**Figure 1-201. Comparison of Tidal Flow and Tidally-Averaged Daily Flow between the Integrated Late Long-term Scenario and the Current Conditions Scenario from RMA Model and DSM2 Model for Egbert A and Calhoun Cut Breaches under Cache Region.**

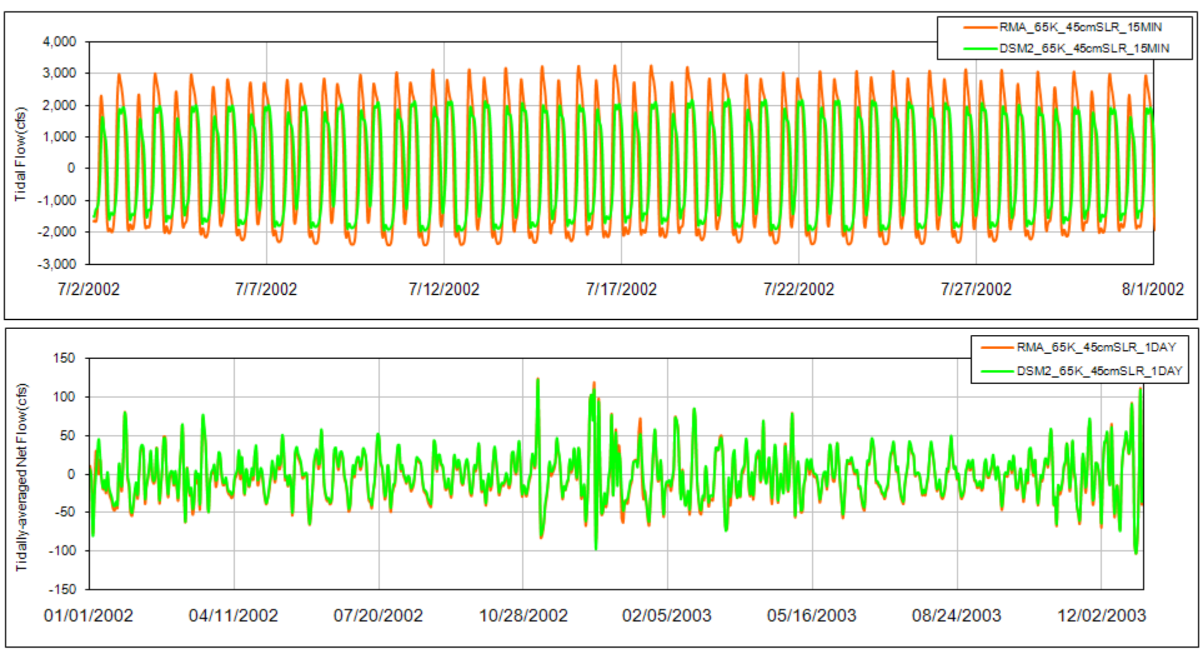


**Figure 1-202. Comparison of Tidal Flow and Tidally-Averaged Daily Flow between the Integrated Late Long-term Scenario and the Current Conditions Scenario from RMA Model and DSM2 Model for Shag Slough Breach under Cache Region.**

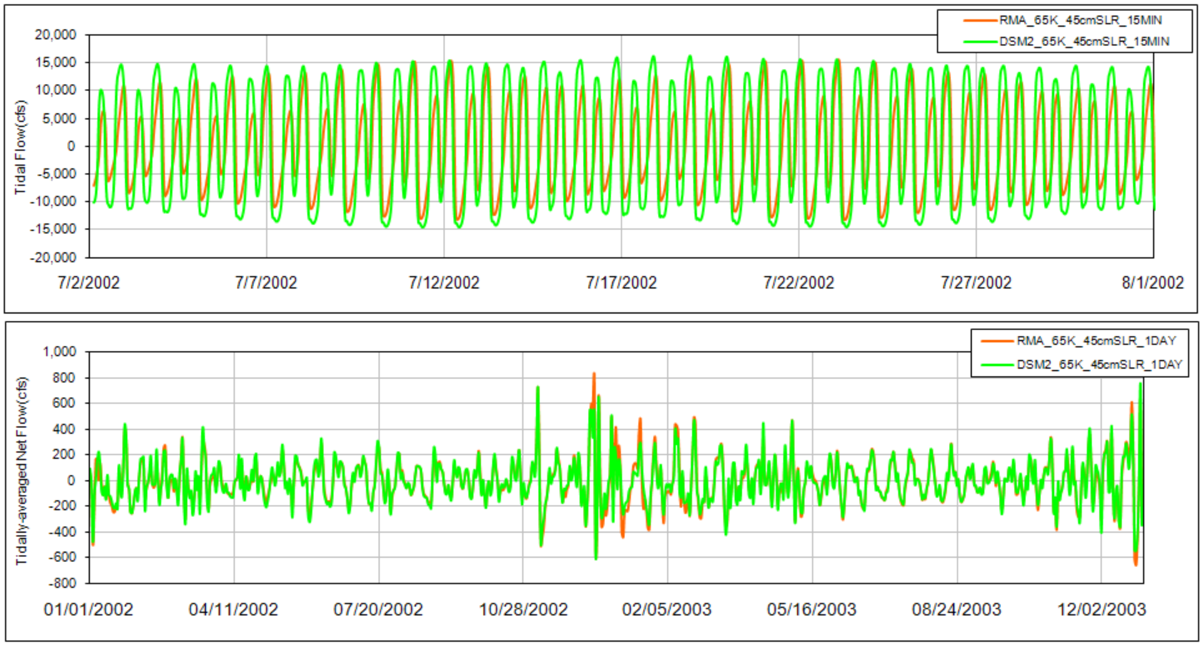



**Figure 1-203. Comparison of Tidal Flow and Tidally-Averaged Daily Flow between the Integrated Late Long-term Scenario and the Current Conditions Scenario from RMA Model and DSM2 Model for Suisun Island 10 Breach 3 under Suisun Marsh Region.**

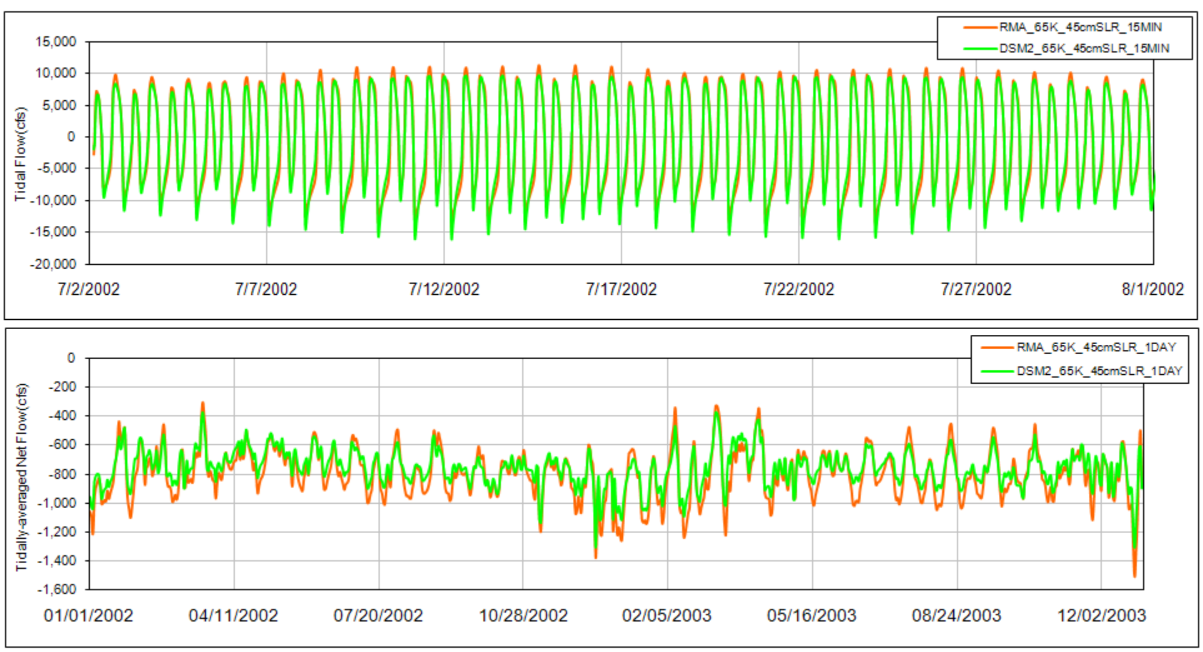


**Figure 1-204. Comparison of Tidal Flow and Tidally-Averaged Daily Flow between the Integrated Late Long-term Scenario and the Current Conditions Scenario from RMA Model and DSM2 Model for Suisun Island 5 Breach 1 under Suisun Marsh Region.**

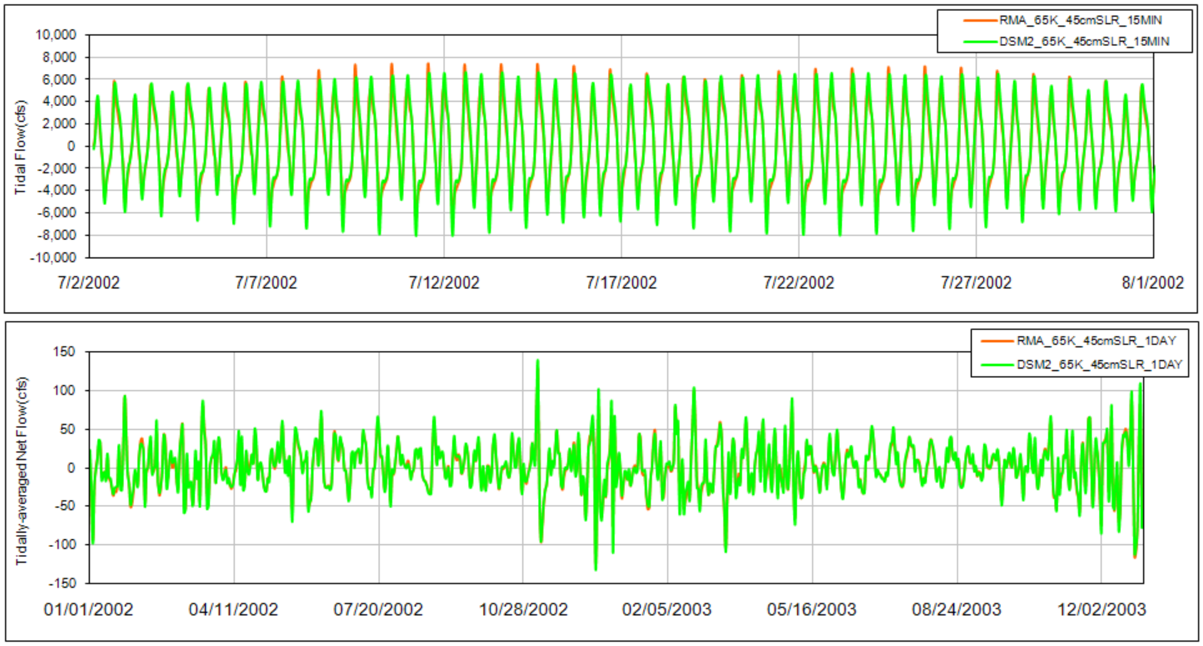



**Figure 1-205. Comparison of Tidal Flow and Tidally-Averaged Daily Flow between the Integrated Late Long-term Scenario and the Current Conditions Scenario from RMA Model and DSM2 Model for Montezuma Wetlands North and South Breaches under Suisun Marsh Region.**

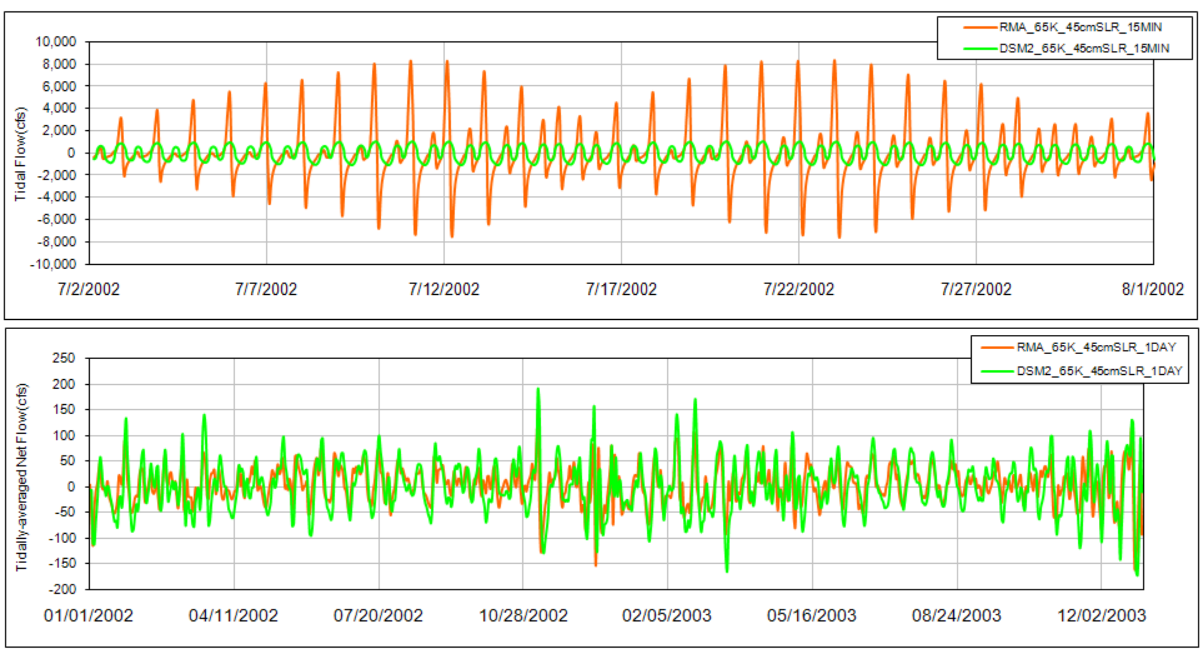


**Figure 1-206. Comparison of Tidal Flow and Tidally-Averaged Daily Flow between the Integrated Late Long-term Scenario and the Current Conditions Scenario from RMA Model and DSM2 Model for Decker Island North-West Breach under Western Delta Region.**

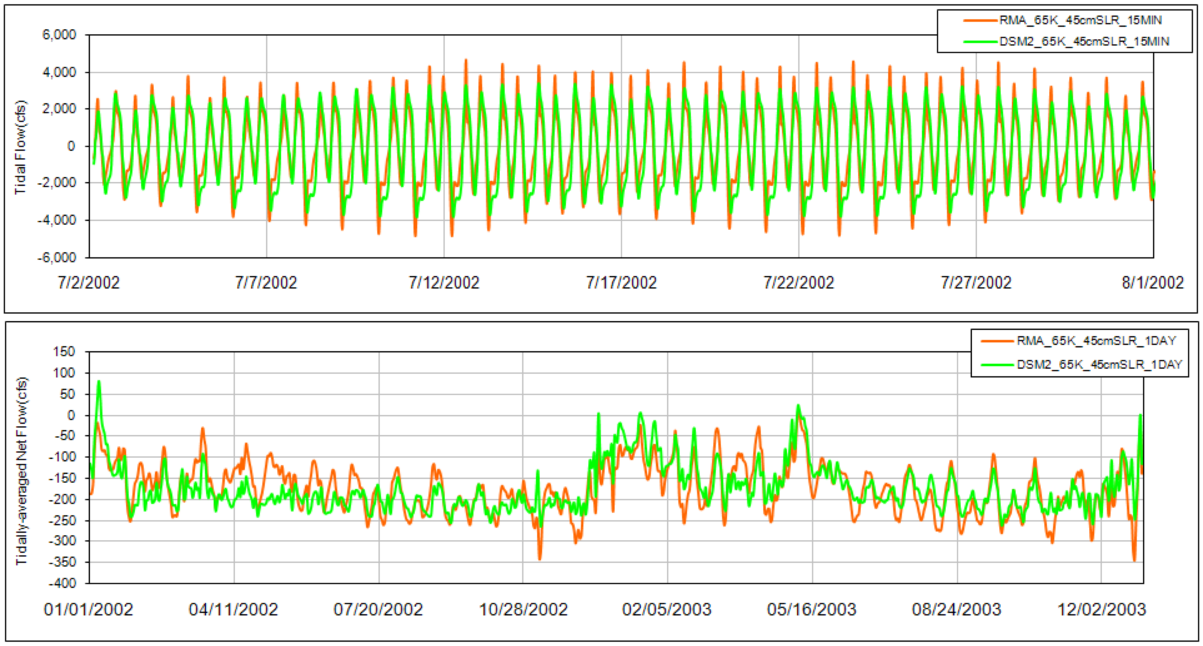



**Figure 1-207. Comparison of Tidal Flow and Tidally-Averaged Daily Flow between the Integrated Late Long-term Scenario and the Current Conditions Scenario from RMA Model and DSM2 Model for Snodgrass Slough Breach under Eastern Delta Region.**

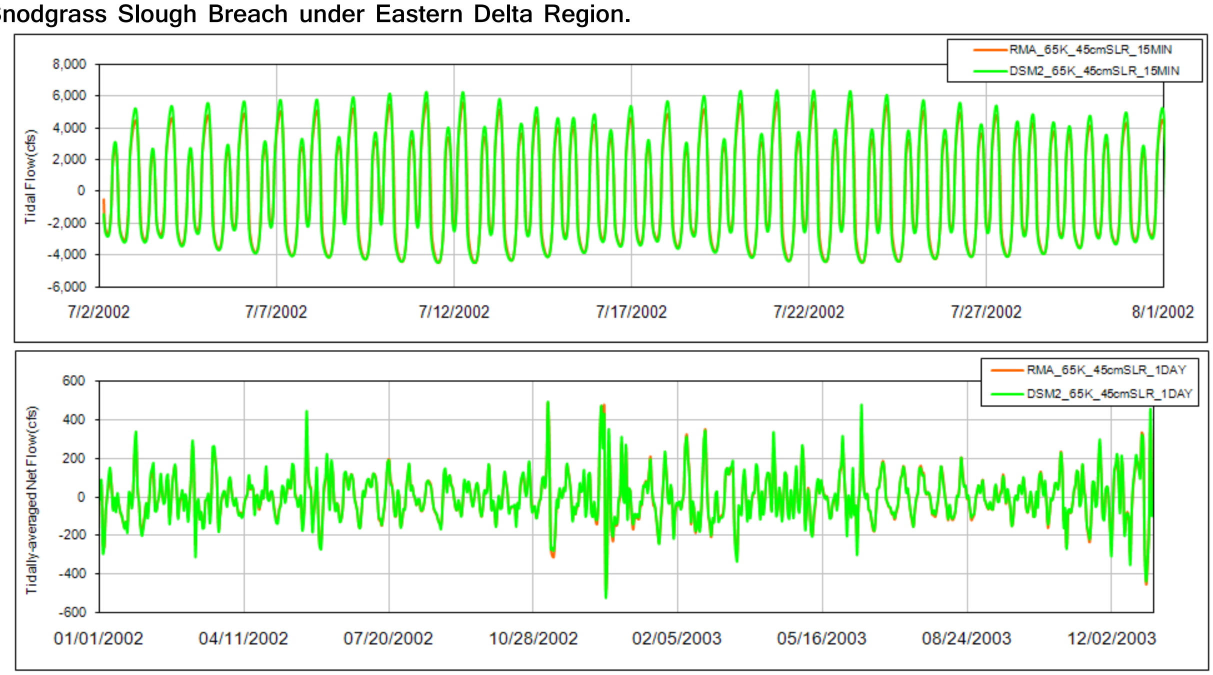


**Figure 1-208. Comparison of Tidal Flow and Tidally-Averaged Daily Flow between the Integrated Late Long-term Scenario and the Current Conditions Scenario from RMA Model and DSM2 Model for Snodgrass Slough and McCormick Williamson Tract Breaches under Eastern Delta Region.**

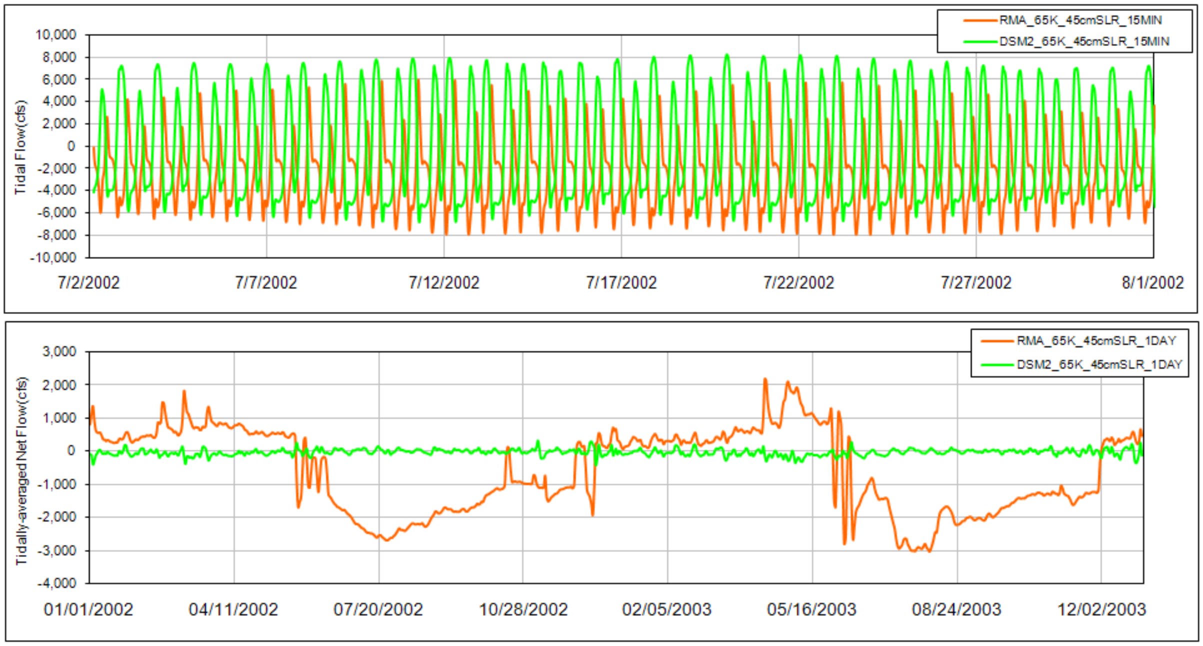
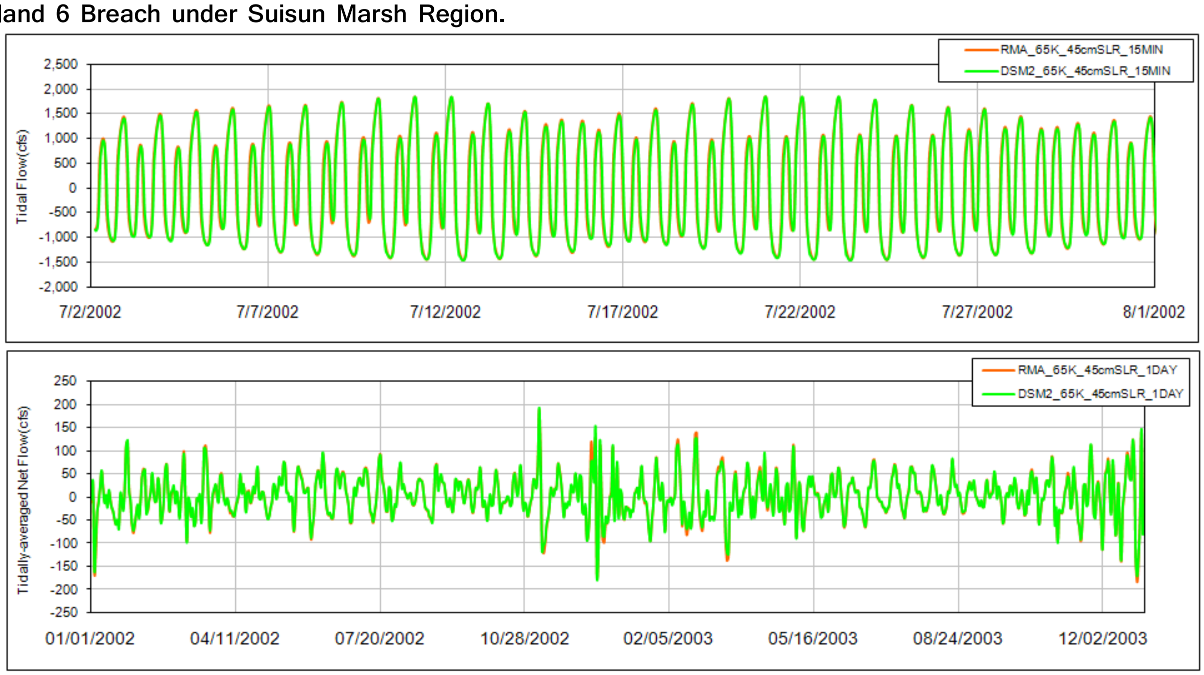



**Figure 1-209. Comparison of Tidal Flow and Tidally-Averaged Daily Flow between the Integrated Late Long-term Scenario and the Current Conditions Scenario from RMA Model and DSM2 Model for Suisun Island 6 Breach under Suisun Marsh Region.**



# Late Long-Term Integrated 65,000ac Restoration and 45cm Sea Level Rise Corroboration

## Salinity Results

**Figure 1-210. Comparison of Monthly averaged percentage incremental change in EC between the Integrated Late Long-Term Scenario and the Current Conditions Scenario from RMA Model and DSM2 Model for Sacramento River at Collinsville.**

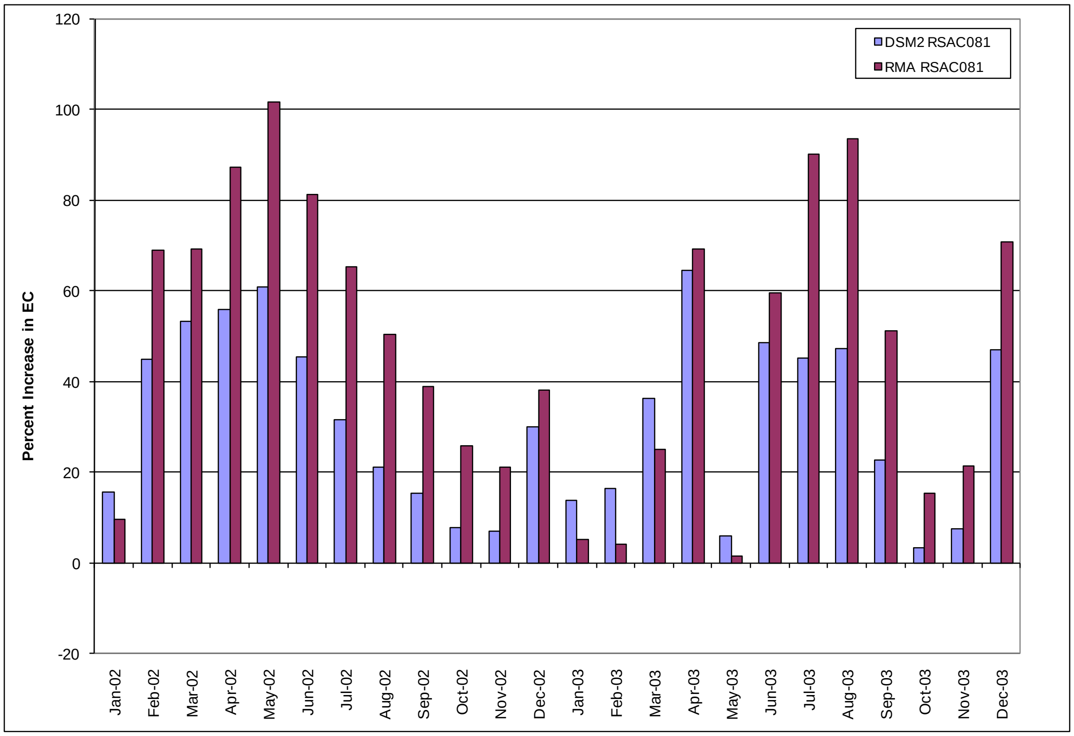


**Figure 1-211. Comparison of Monthly averaged percentage incremental change in EC between the Integrated Late Long-Term Scenario and the Current Conditions Scenario from RMA Model and DSM2 Model for Sacramento River at Emmaton.**

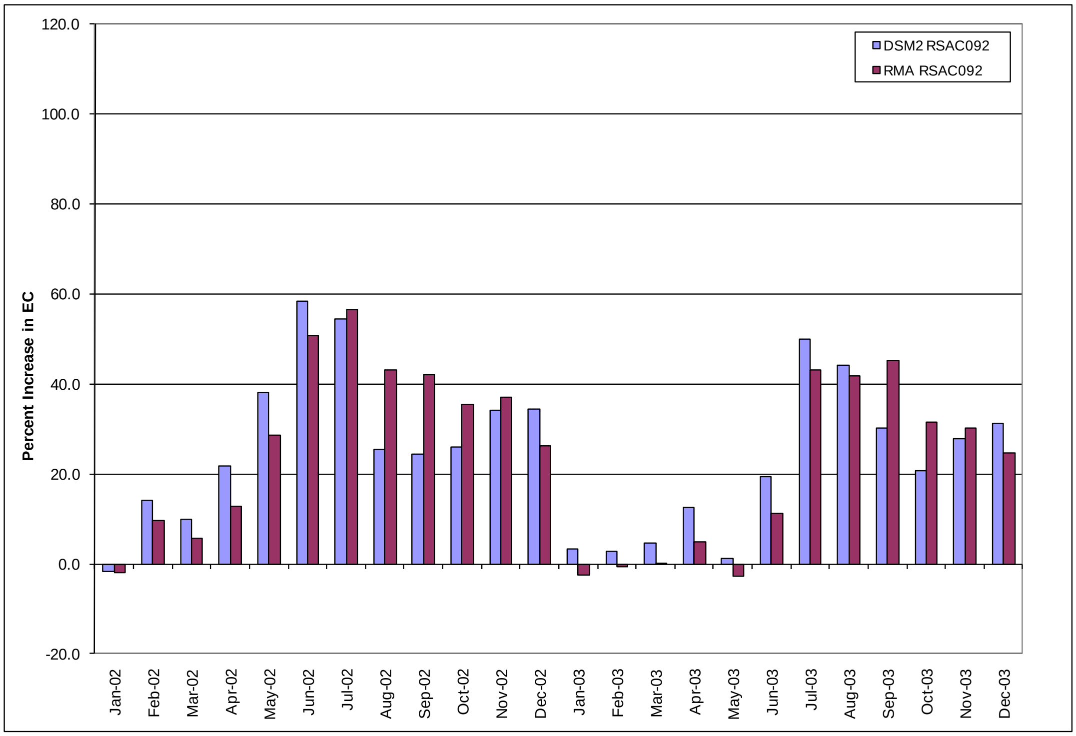



**Figure 1-212. Comparison of Monthly averaged percentage incremental change in EC between the Integrated Late Long-Term Scenario and the Current Conditions Scenario from RMA Model and DSM2 Model for San Joaquin River at Jersey Point.**

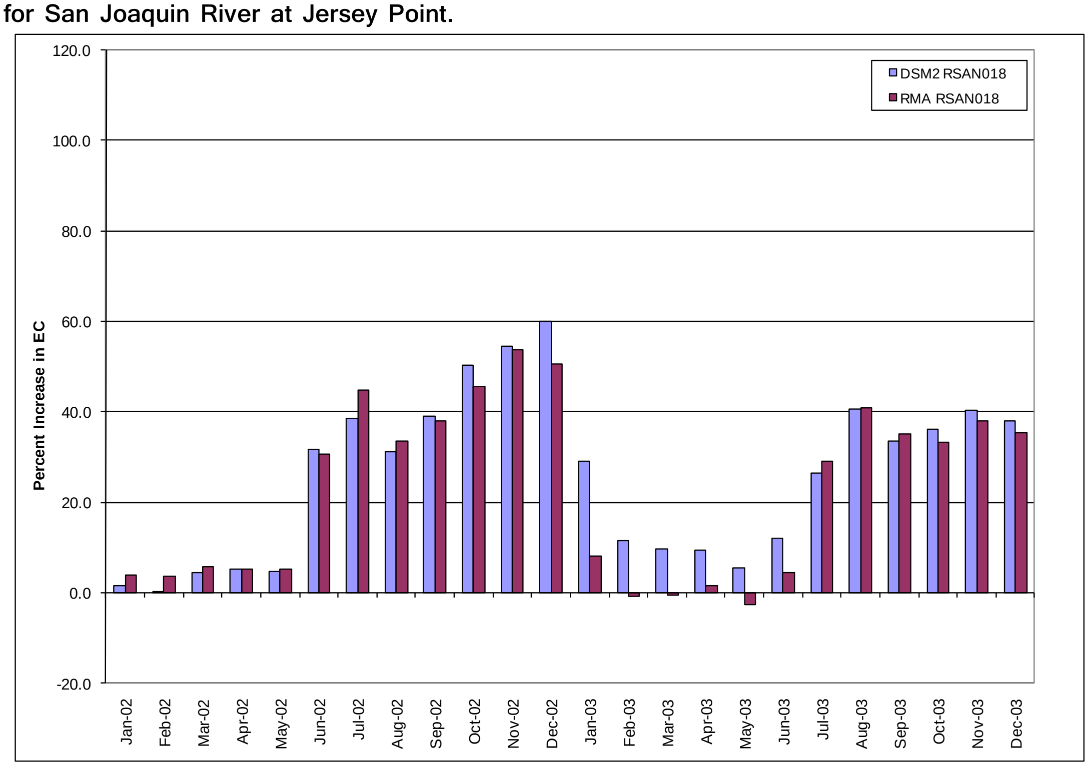


**Figure 1-213. Comparison of Monthly averaged percentage incremental change in EC between the Integrated Late Long-Term Scenario and the Current Conditions Scenario from RMA Model and DSM2 Model for Old River at Rock Slough.**

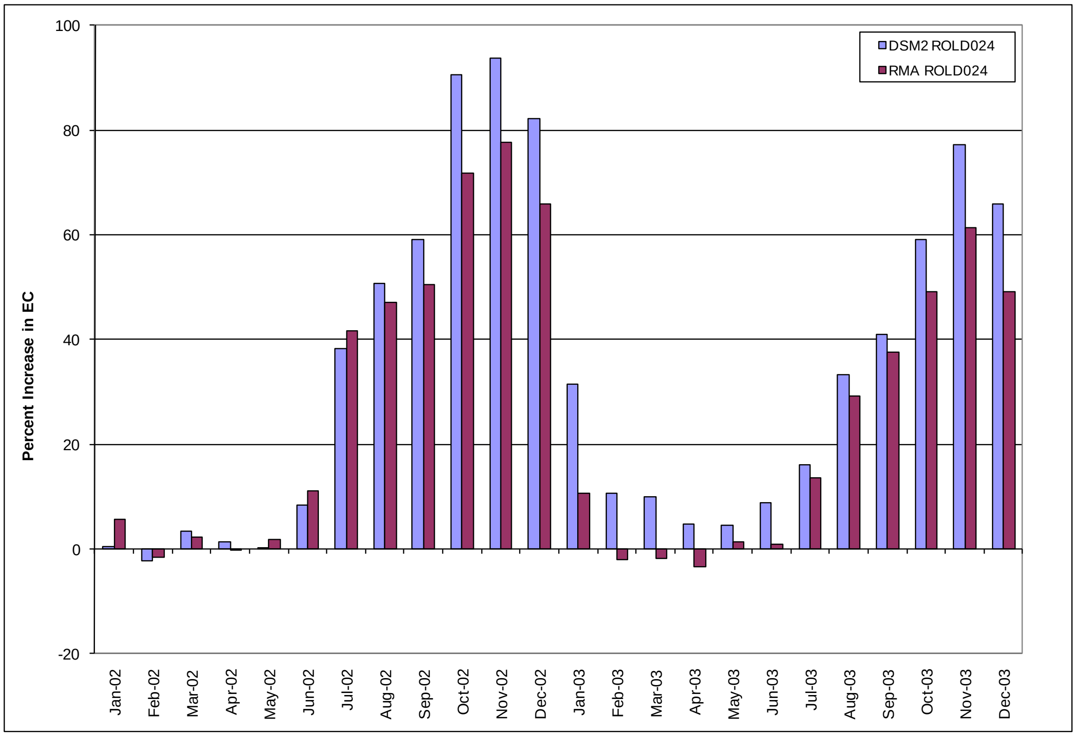



**Figure 1-214. Comparison of Tidally-Averaged Daily EC and the Incremental Change in the Daily EC between the Integrated Late Long-Term Scenario and the Current Conditions Scenario from RMA Model and DSM2 Model for Montezuma Slough at Mouth Location.**

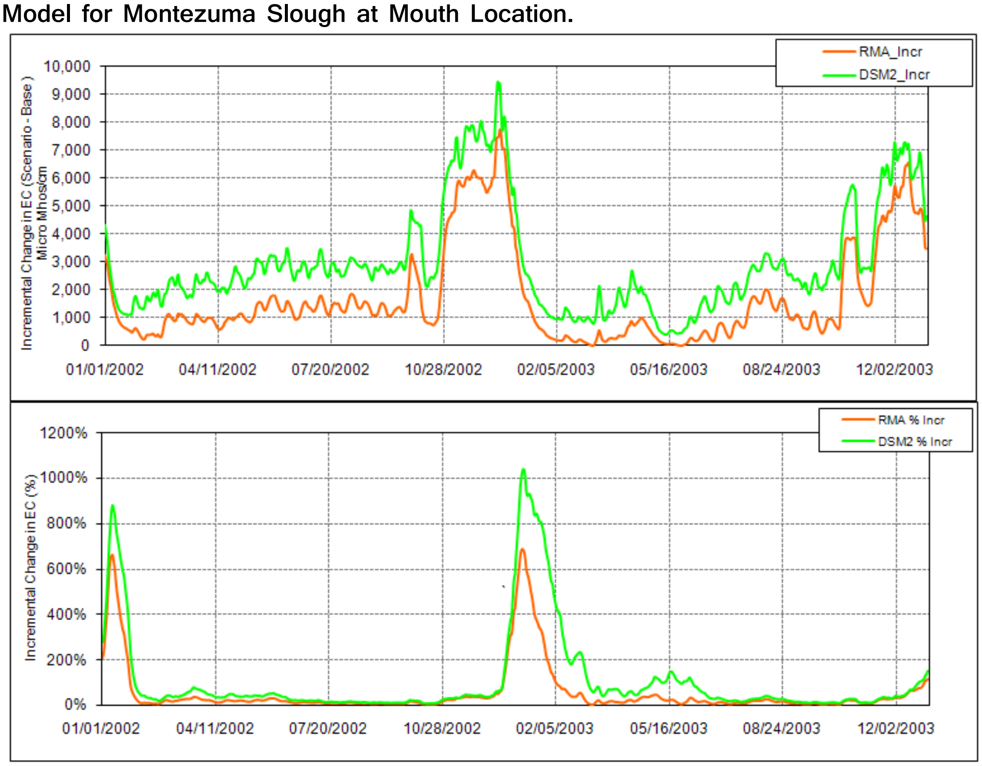


**Figure 1-215. Comparison of Tidally-Averaged Daily EC and the Incremental Change in the Daily EC between the Integrated Late Long-Term Scenario and the Current Conditions Scenario from RMA Model and DSM2 Model for Montezuma Slough at Beldon's Landing Location.**

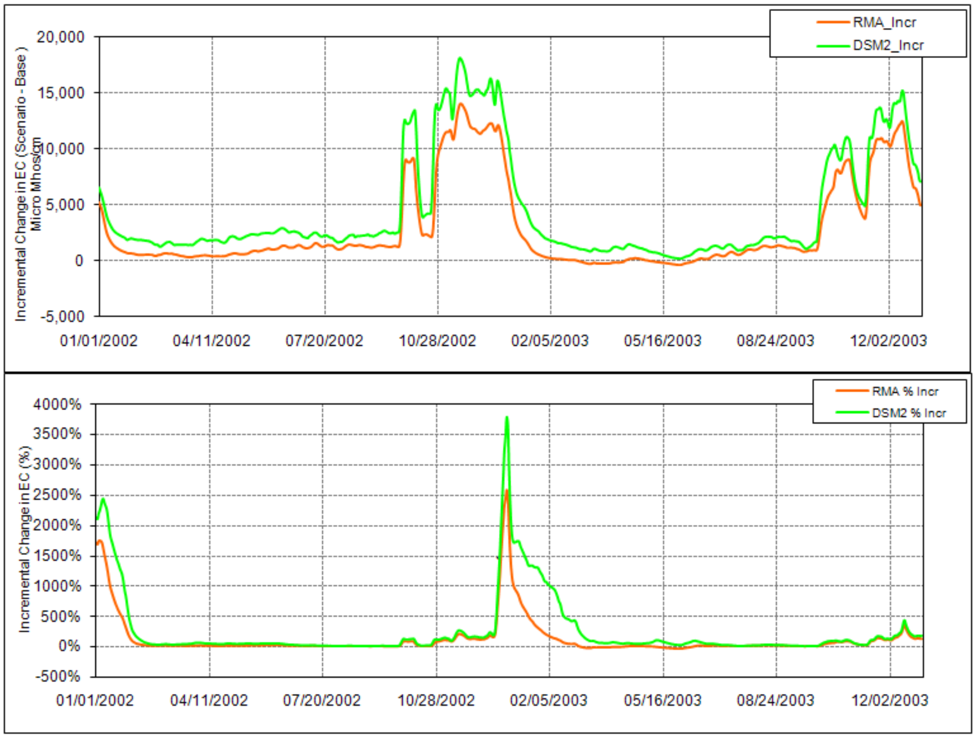



**Figure 1-216. Comparison of Tidally-Averaged Daily EC and the Incremental Change in the Daily EC between the Integrated Late Long-Term Scenario and the Current Conditions Scenario from RMA Model and DSM2 Model for Montezuma Slough at Head Location.**

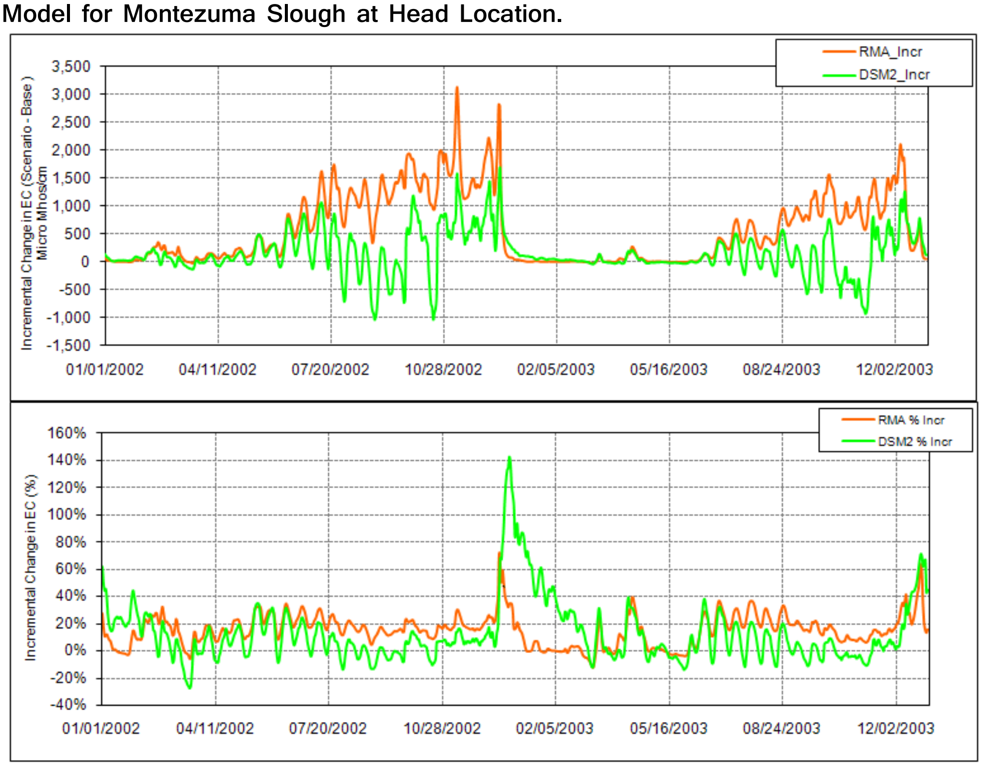


**Figure 1-217. Comparison of Tidally-Averaged Daily EC and the Incremental Change in the Daily EC between the Integrated Late Long-Term Scenario and the Current Conditions Scenario from RMA Model and DSM2 Model for Sacramento River at Port Chicago Location.**

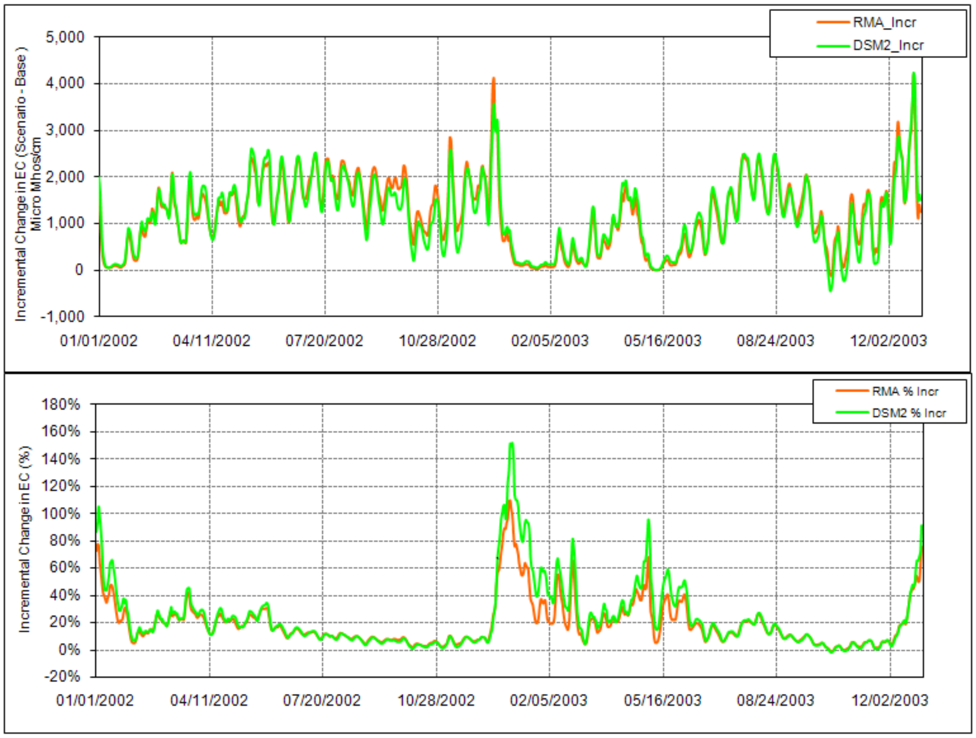



**Figure 1-218. Comparison of Tidally-Averaged Daily EC and the Incremental Change in the Daily EC between the Integrated Late Long-Term Scenario and the Current Conditions Scenario from RMA Model and DSM2 Model for Sacramento River at Collinsville Location.**

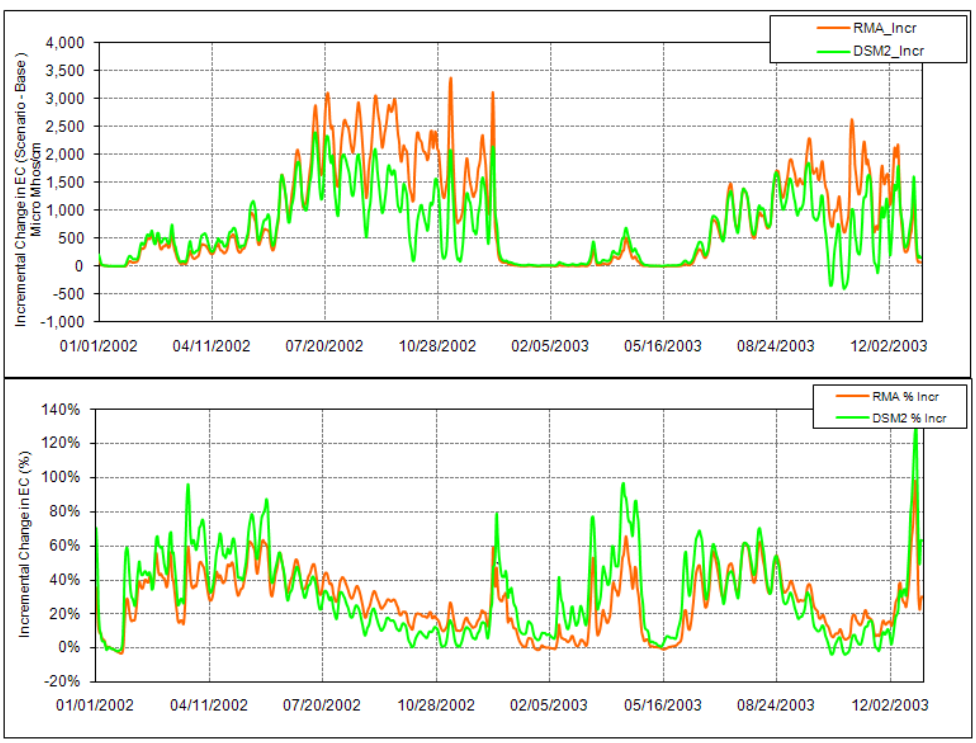


Figure 1-219. Comparison of Tidally-Averaged Daily EC and the Incremental Change in the Daily EC between the Integrated Late Long-Term Scenario and the Current Conditions Scenario from RMA Model and DSM2 Model for Sacramento River at Rio Vista Location.

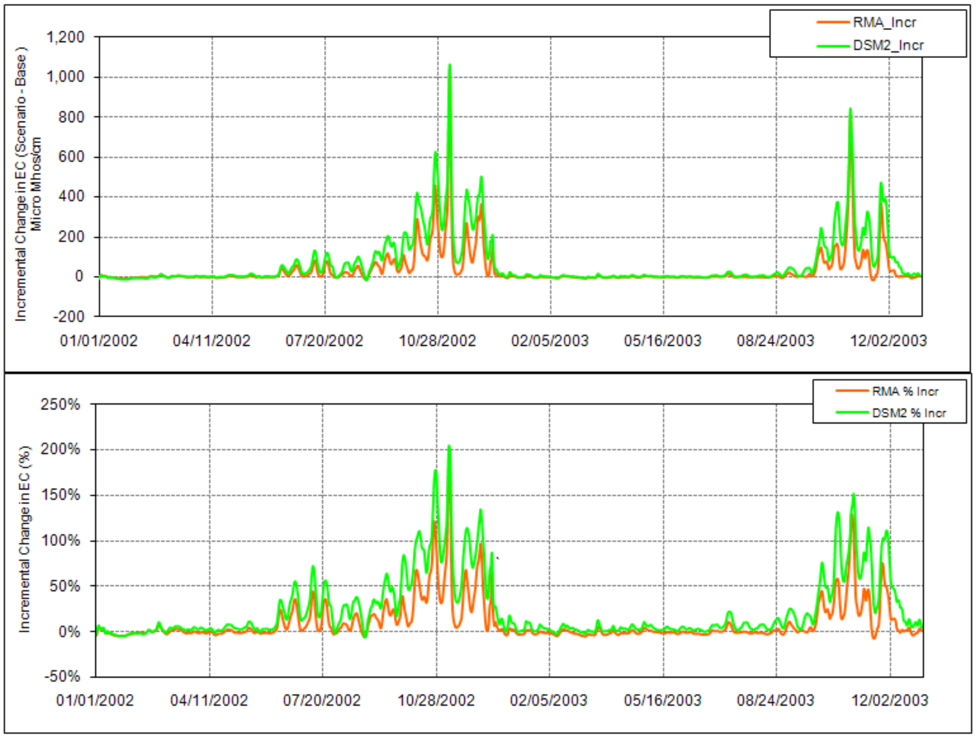



Figure 1-220. Comparison of Tidally-Averaged Daily EC and the Incremental Change in the Daily EC between the Integrated Late Long-Term Scenario and the Current Conditions Scenario from RMA Model and DSM2 Model for Cache Slough at Ryer Island Location.

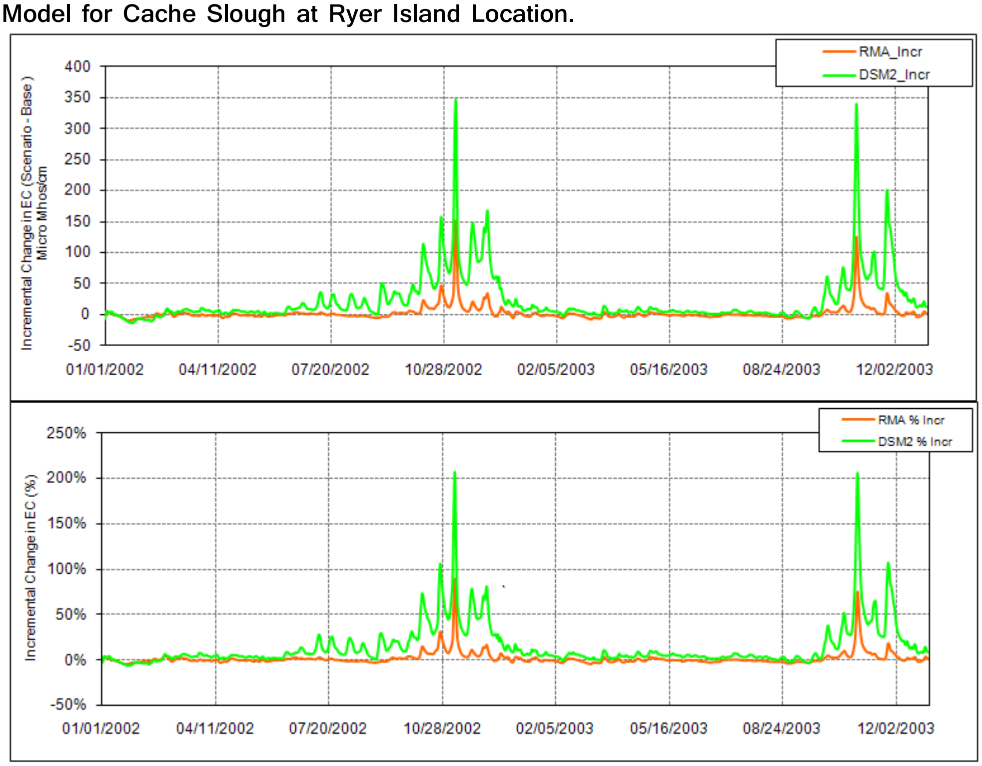


**Figure 1-221. Comparison of Tidally-Averaged Daily EC and the Incremental Change in the Daily EC between the Integrated Late Long-Term Scenario and the Current Conditions Scenario from RMA Model and DSM2 Model for Three Mile Slough at San Joaquin River Location.**

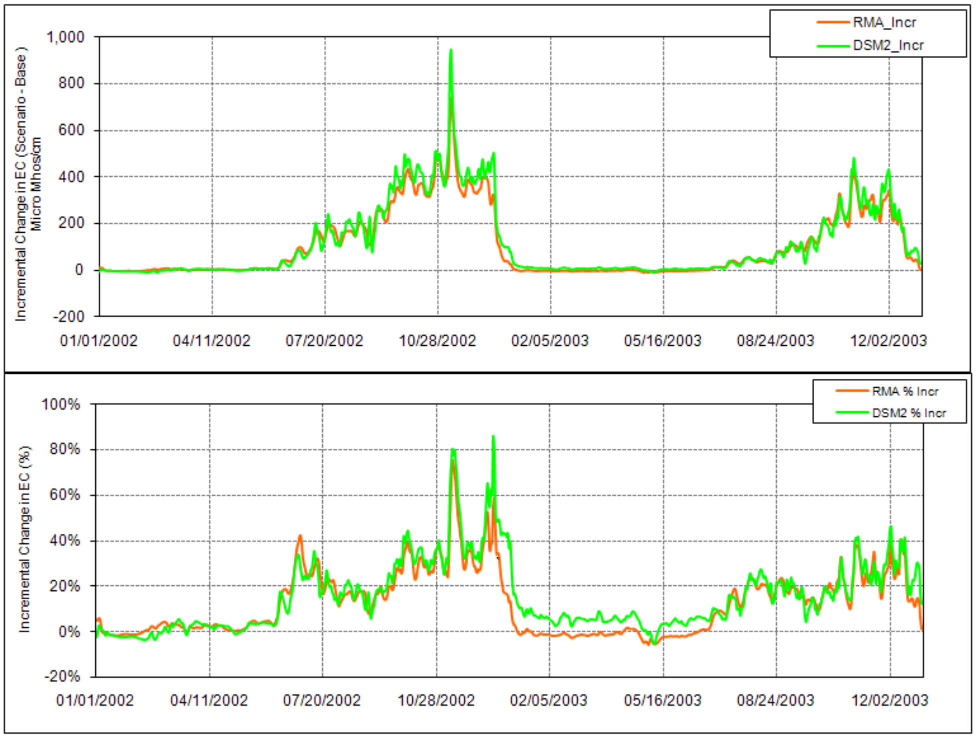



**Figure 1-222. Comparison of Tidally-Averaged Daily EC and the Incremental Change in the Daily EC between the Integrated Late Long-Term Scenario and the Current Conditions Scenario from RMA Model and DSM2 Model for San Joaquin River at Prisoners Point Location.**

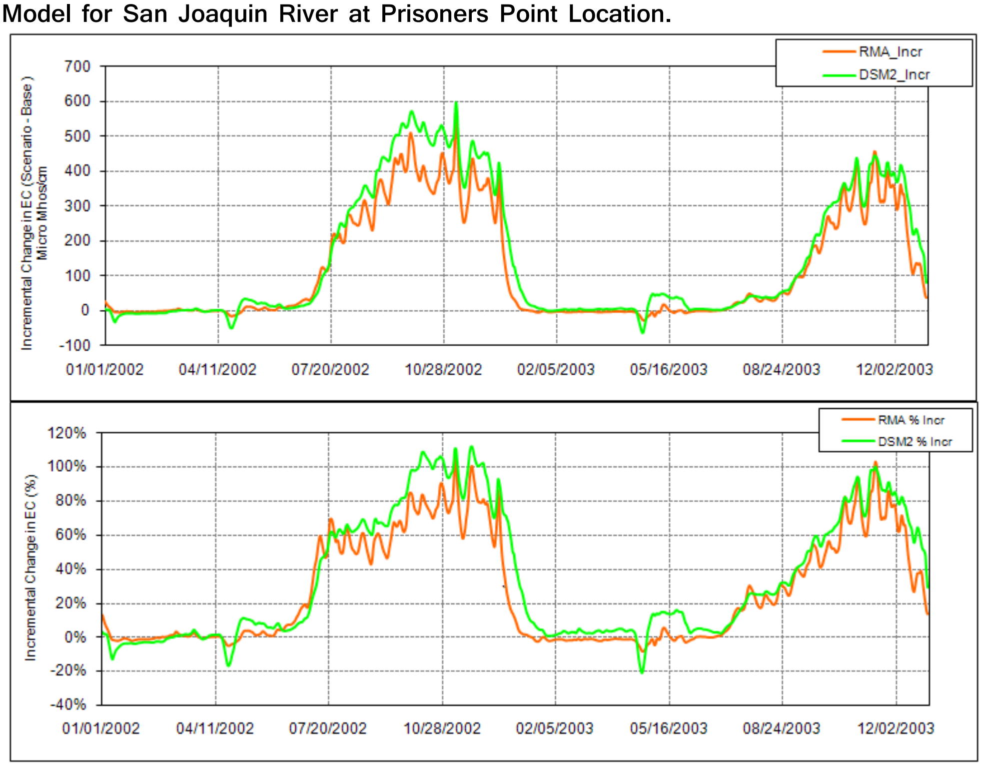


**Figure 1-223. Comparison of Tidally-Averaged Daily EC and the Incremental Change in the Daily EC between the Integrated Late Long-Term Scenario and the Current Conditions Scenario from RMA Model and DSM2 Model for San Joaquin River at Stockton Location.**

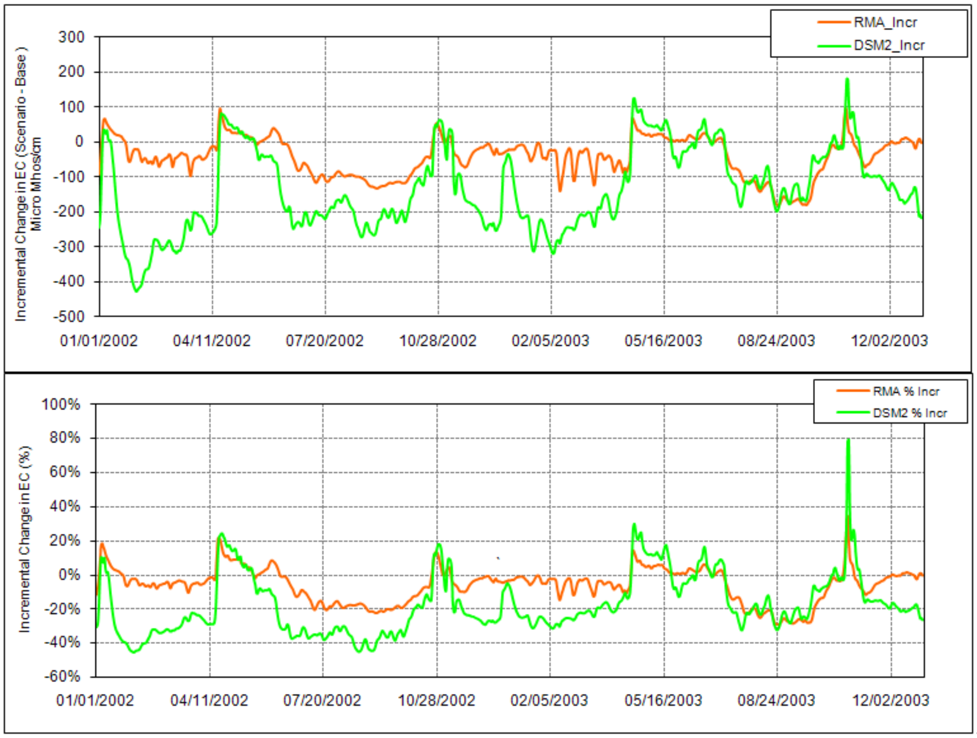



**Figure 1-224. Comparison of Tidally-Averaged Daily EC and the Incremental Change in the Daily EC between the Integrated Late Long-Term Scenario and the Current Conditions Scenario from RMA Model and DSM2 Model for San Joaquin River at Brandt Bridge Location.**

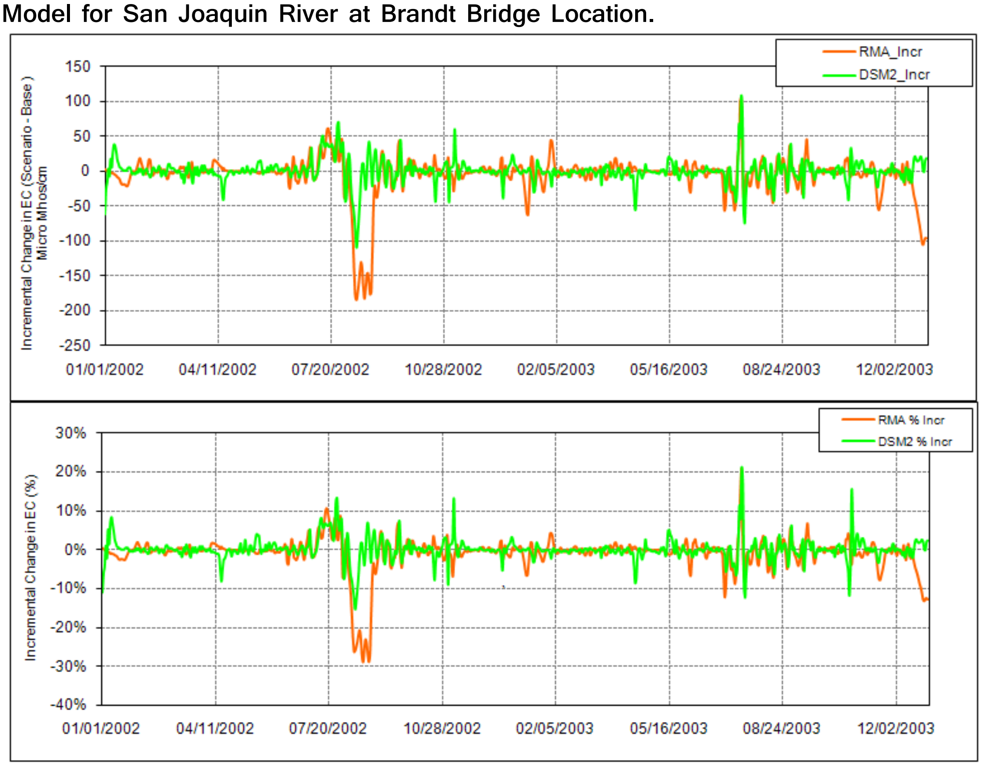


**Figure 1-225. Comparison of Tidally-Averaged Daily EC and the Incremental Change in the Daily EC between the Integrated Late Long-Term Scenario and the Current Conditions Scenario from RMA Model and DSM2 Model for Middle River at Middle River Location.**

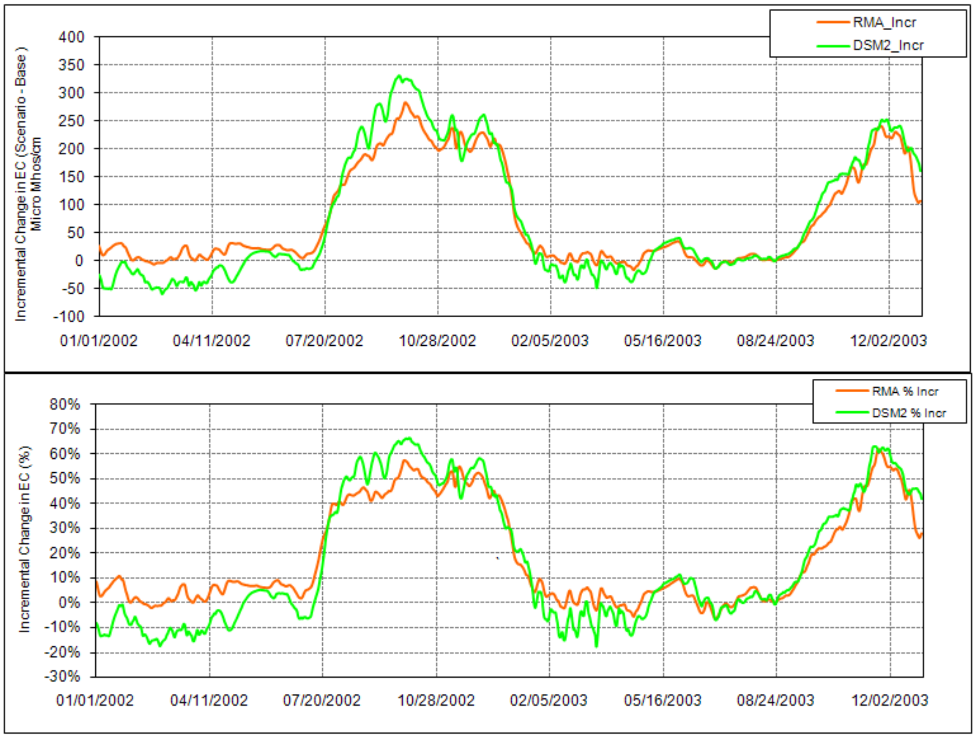



**Figure 1-226. Comparison of Tidally-Averaged Daily EC and the Incremental Change in the Daily EC between the Integrated Late Long-Term Scenario and the Current Conditions Scenario from RMA Model and DSM2 Model for Old River at Bacon Island Location.**