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

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Introduction

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

Purpose of Corroboration

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

Modeling Tools

DSM2

25 DSM2 is a one-dimensional hydrodynamics, water quality and particle tracking simulation model used to
26 simulate hydrodynamics, water quality, and particle tracking in the Sacramento-San Joaquin Delta
27 (DWR, 2002). DSM2 represents the best available planning model for Delta tidal hydraulics and salinity
28 modeling. It is appropriate for describing the existing conditions in the Delta, as well as performing
29 simulations for the assessment of incremental environmental impacts caused by facilities and
30 operations. The DSM2 model has three separate components: HYDRO, QUAL, and PTM. HYDRO
31 simulates one-dimensional hydrodynamics including flows, velocities, depth, and water surface
32 elevations. The HYDRO module is a one-dimensional, implicit, unsteady, open channel flow model that
33 DWR developed from FOURPT, a four-point finite difference model originally developed by the USGS in
34 Reston, Virginia. HYDRO provides the flow input for QUAL and PTM. The QUAL module is a one-
35 dimensional water quality transport model that DWR adapted from the Branched Lagrangian Transport
36 Model originally developed by the USGS in Reston, Virginia. QUAL simulates fate and transport of

1   conservative and non-conservative water quality constituents by solving the one-dimensional advection-
2   dispersion equation in which non-conservative constituent relationships are considered to be governed,
3   in general, by first order rates. Tidal boundary (stage in feet) is applied at Martinez. Flow boundaries are
4   specified at Sacramento, Vernalis, Yolo bypass and East side streams. Other boundaries include gates
5   and other control structures, diversions, exports and Delta Island Consumptive Use (DICU). QUAL uses
6   EC boundary specified at Martinez and other boundary inflow locations mentioned above.

RMA Bay-Delta Model

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

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

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

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

UnTRIM-3D

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

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

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

10   The UnTRIM San Francisco Bay-Delta model (UnTRIM Bay-Delta model) is a three-dimensional
11   hydrodynamic model of San Francisco Bay and the Sacramento-San Joaquin Delta, which has been
12   developed using the UnTRIM hydrodynamic model (MacWilliams et al., 2007; MacWilliams et al., 2008;
13   MacWilliams et al., 2009). The UnTRIM Bay-Delta model extends from the Pacific Ocean through the
14   entire Sacramento-San Joaquin Delta (Figure 2-1). The UnTRIM Bay-Delta model takes advantage of the
15   grid flexibility allowed in an unstructured mesh by gradually varying grid cell sizes, beginning with large
16   grid cells in the Pacific Ocean and gradually transitioning to finer grid resolution in the smaller channels
17   of the Sacramento-San Joaquin Delta. The model calibration and validation results (MacWilliams et al.,
18   2008; MacWilliams et al. 2009) demonstrate that the UnTRIM Bay-Delta model is accurately predicting
19   flow, stage, and salinity in San Francisco Bay and the Sacramento-San Joaquin Delta under a wide range
20   of hydrologic conditions and is suitable for evaluating the potential salinity impacts resulting from sea
21   level rise.

22

1 BDCP Corroboration Scenarios

2 The evaluation of the BDCP Alternatives is performed at three phases in time – Near Term (NT)
3 represents the point in time after 10 years from permitting, Early Long Term (ELT) represents the point
4 in time after 15 years from permitting and Late Long Term (LLT) represents the point in time at the of
5 the permitting period of 60 years. The restoration acreages increase with each phase. NT includes
6 14,000 ac, ELT includes 25,000 ac and LLT includes 65,000 ac of restoration. In the evaluation of ELT and
7 LLT phases of the BDCP Alternatives, sea level rise was assumed to be inherent. ELT assumes 15cm and
8 LLT assumes 45cm rise in the mean sea level.

9 Restoration Opportunity Areas

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

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

19 Corroboration Scenarios

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

24 Scenarios with Restoration

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

28 *14,000 acre Restoration*

29 This scenario represents the proposed restoration changes in the Delta at the NT phase. The total
30 acreage goal of restoration for this scenario is 14,000 acres. The modeled scenario consists of 6,750
31 acres in the Cache Slough ROA, 6,450 acres in the Suisun Marsh, 2,310 acres in the West Delta ROA, and
32 2,900 acres in the Mokelumne – Cosumnes ROA. This scenario does not include any restoration in the
33 East and the South Delta ROAs.

34 *25,000 acre Restoration*

35 This scenario represents the proposed restoration changes in the Delta at the ELT phase. The total
36 acreage goal of restoration under this scenario is 25,000 acres. The modeled scenario consists of 12,900
37 acres in the Cache Slough ROA, 8,130 acres in the Suisun Marsh, 3,990 acres in the West Delta ROA, and
38 2,900 acres in the Mokelumne – Cosumnes ROA. The areas identified for the NT phases are included in
39 this scenario. This scenario also does not include any restoration in the East and the South Delta ROAs.

40 *65,000 acre Restoration*

41 This scenario represents the proposed restoration changes in the Delta at the LLT phase. The total
42 acreage goal of restoration under this scenario is 65,000 acres. The modeled scenario consists of 20,340

1 acres in the Cache Slough ROA, 14,390 acres in the Suisun Marsh, 4,240 acres in the West Delta ROA,
2 and 3,290 acres in the Mokelumne – Cosumnes ROA, 2,160 acres in the East Delta ROA and 22,480 acres
3 in the South Delta ROA. The areas included in the NT and ELT phases are included in this scenario.

4 **Scenarios with Sea Level Rise**

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

8 *15 cm Sea Level Rise*

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

11 *45 cm Sea Level Rise*

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

14 **Scenarios with Restoration and Sea Level Rise**

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

18 *25,000 acre Restoration with 15 cm Sea Level Rise*

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

22 *65,000 acre Restoration with 45 cm Sea Level Rise*

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

26

1 Corroboration Methodology

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

8 Corroboration Baseline

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

15 Physical Changes in DSM2

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

20 Representation of Restoration Areas in DSM2

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

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

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

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

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

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

Boundary Conditions

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

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

Information from Higher Dimensional Models

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

Simulation Period for Corroboration

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

Parameters Adjusted for Corroboration

40 In DSM2, the reservoir entrance and exit coefficients and the coefficients for the weir at the channel
41 entrance, were fine tuned to match the instantaneous flows at each breach location from RMA model.
42 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

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

Simulation Period for Corroboration of Restoration Scenarios

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

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

Parameters Adjusted for the Corroboration of Restoration Scenarios

16 Modifications to the reservoir coefficients and channel weir coefficients matched the change in the tidal
17 prism for most regions of delta between the two models. However, for regions near Threemile slough
18 and Sevenmile slough these changes were not enough to match the increase in tidal range observed in
19 the RMA simulations. Hence, the channel roughness in these channels was adjusted to match the
20 incremental change in the tidal and net flows in these channels observed in the RMA simulations. Table
21 8 shows the comparison of channel roughness values for the modified channels between the three
22 scenarios and the baseline. The changes to roughness may be justified for couple of reasons. The DSM2
23 grid has been modified significantly from existing conditions in the NT, ELT and LLT scenarios near the
24 Threemile and Sevenmile Slough channels. There are significant differences in the NT, ELT and LLT grids.
25 Minor changes in the stage in the San Joaquin and Sacramento River channels result in significant
26 variation in both the tidal and net flows through Threemile Slough. Since the roughness is the main
27 calibration parameter available in the DSM2 model, it was modified to match the incremental change in
28 the tidal and net flows observed in the RMA results, taking past calibration efforts as a precedent.

Corroboration Results for the Restoration Scenarios

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

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

1 shows comparison of incremental change in flows at San Joaquin River at Jersey Point and San Andreas
2 for Late Long-term Scenario.

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

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

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

25

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.

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

11

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.

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

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

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

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

20

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.

1   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

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1   Table 2: Summary of Parameters used in DSM2 for the Reservoirs and Channels Representing all ROAs
2   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

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4

1   Table 3: Summary of Parameters used in DSM2 for the Reservoirs and Channels Representing all ROAs
2   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

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1   Table 4: Summary of Parameters used in DSM2 for the Reservoirs and Channels Representing all ROAs
2   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		

1   Table 6: DSM2 channel cross-sections in Western Delta that are modified for the NT, ELT and LLT
2   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

3

4

1   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

2

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

DSM2 Channel	Channel Roughness (Manning's n)			
	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

3

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

DSM2 Channel	Channel Dispersion Factors		
	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

6

7

1 Table 10: Summary of Parameters used in DSM2 for the Reservoirs and Channels Representing all ROAs
2 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

3

4

1   Table 11: Summary of Parameters used in DSM2 for the Reservoirs and Channels Representing all ROAs
2   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

1

2

1
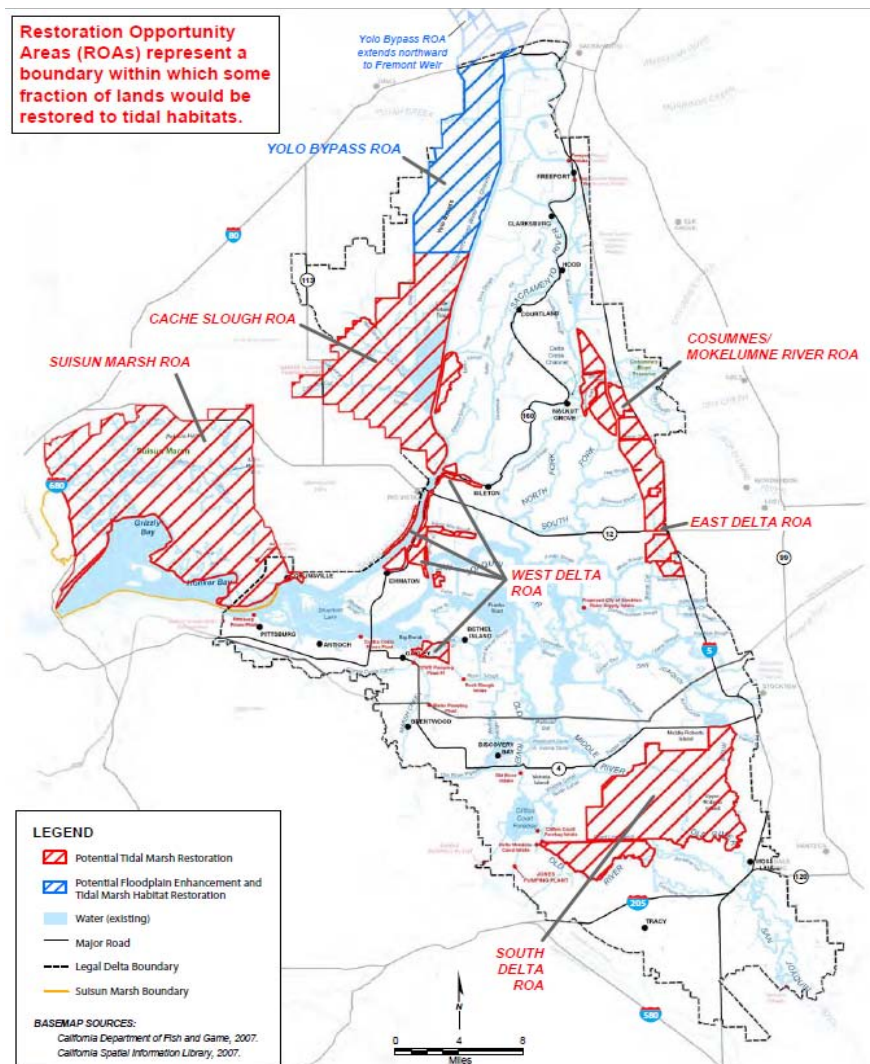
2   Figure 1: Bay Delta Conservation Plan Restoration Opportunity Areas
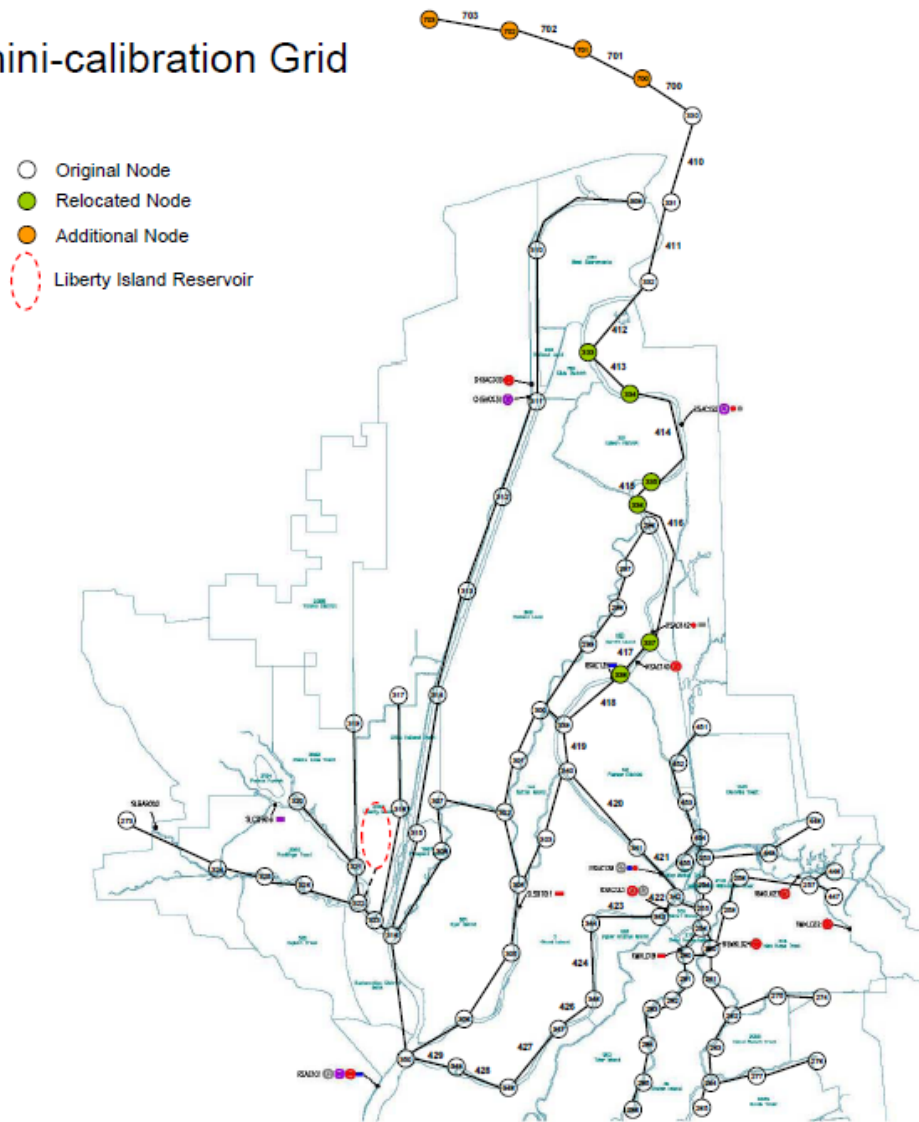
1
2 Figure 2: 2009 calibrated DSM2 Grid Schematic (only modified portion of the delta is shown) used as
3 baseline model for tidal marsh corroboration

1

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

4

5 Figure 4: DSM2 Grid Modifications for Incorporating NT Tidal Marsh Restoration Proposed in the
6 Mokelumne – Cosumnes Region
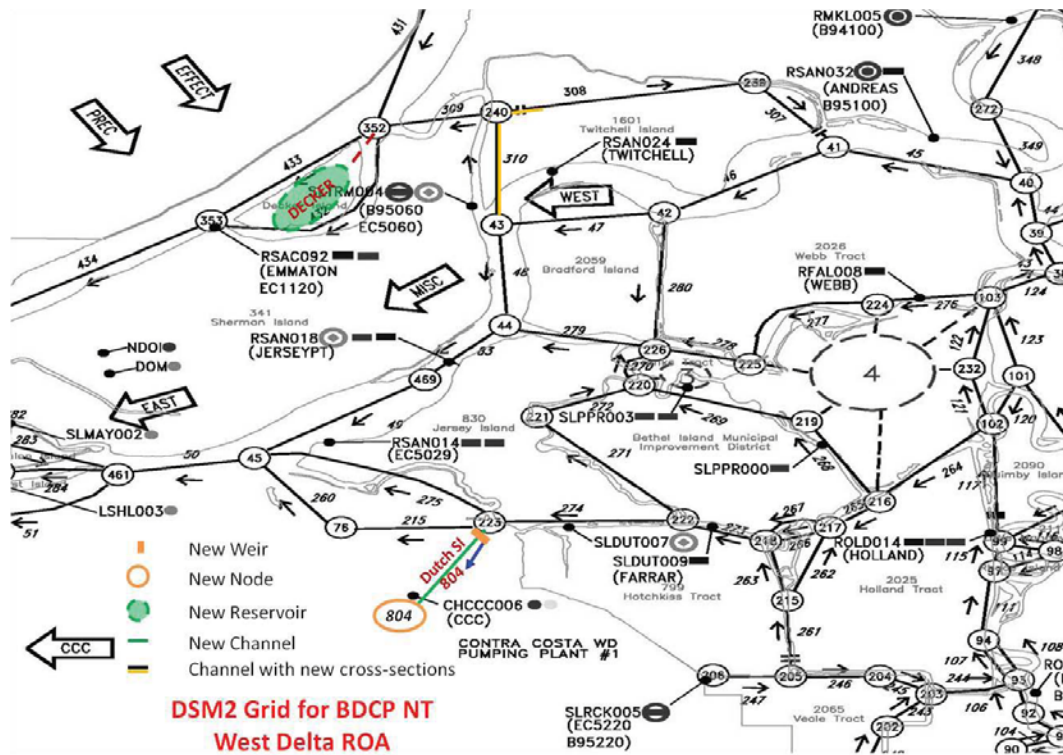
Figure 5: DSM2 Grid Modifications for Incorporating NT Tidal Marsh Restoration Proposed in the West Delta Region
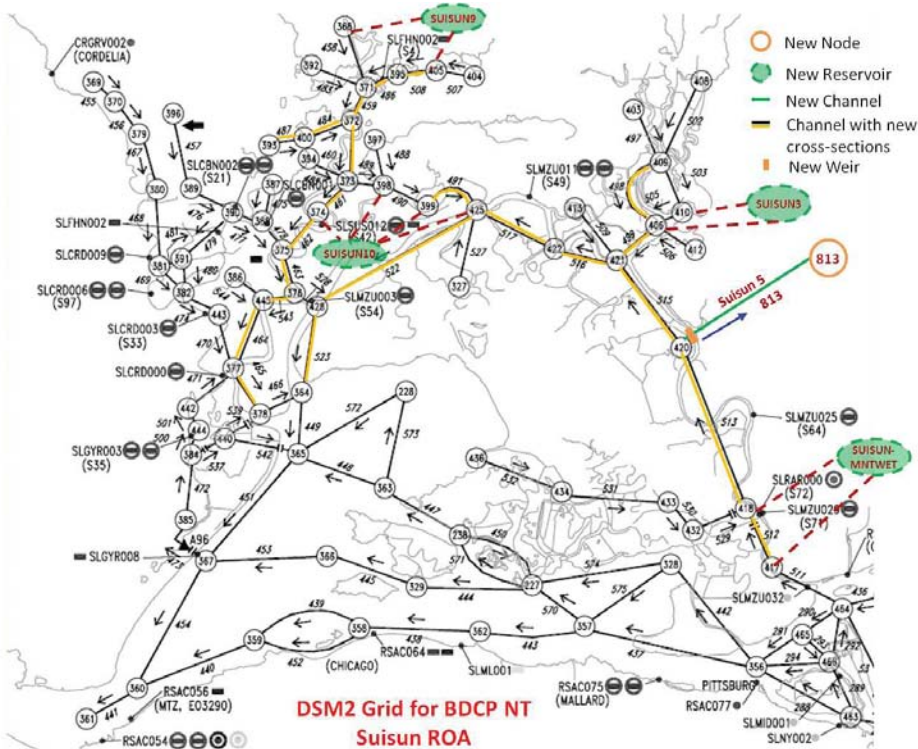
Figure 6: DSM2 Grid Modifications for Incorporating NT Tidal Marsh Restoration Proposed in the Suisun Marsh Region
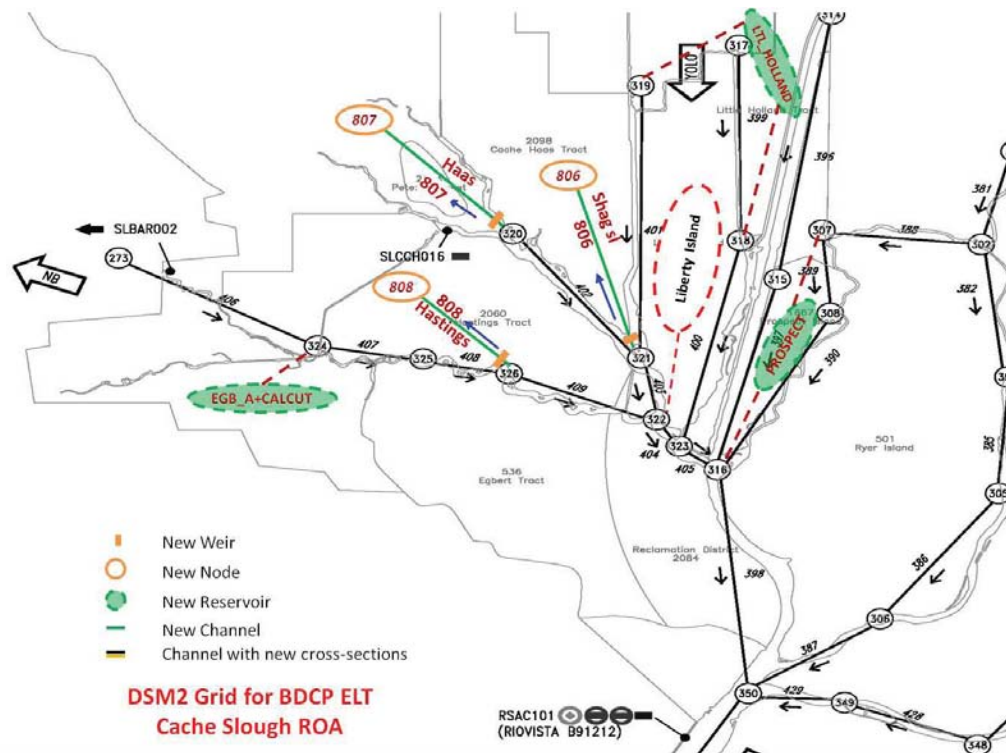
Figure 7: DSM2 Grid Modifications for Incorporating ELT Tidal Marsh Restoration Proposed in the Cache Slough Region
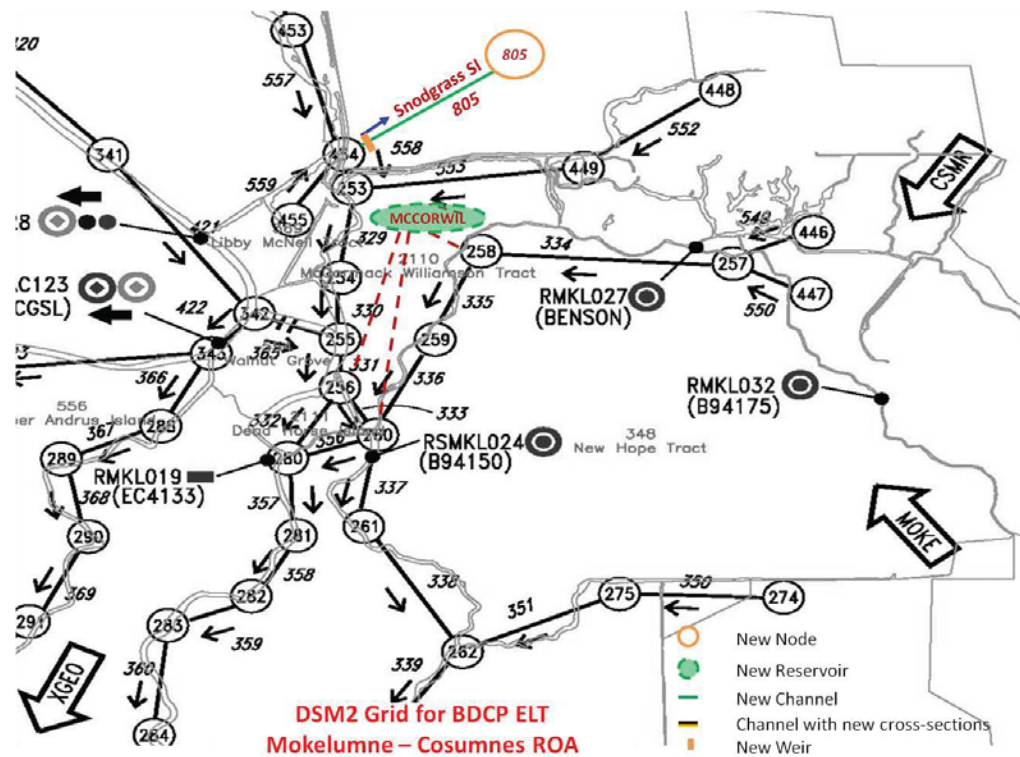
Figure 8: DSM2 Grid Modifications for Incorporating ELT Tidal Marsh Restoration Proposed in the Mokelumne – Cosumnes Region
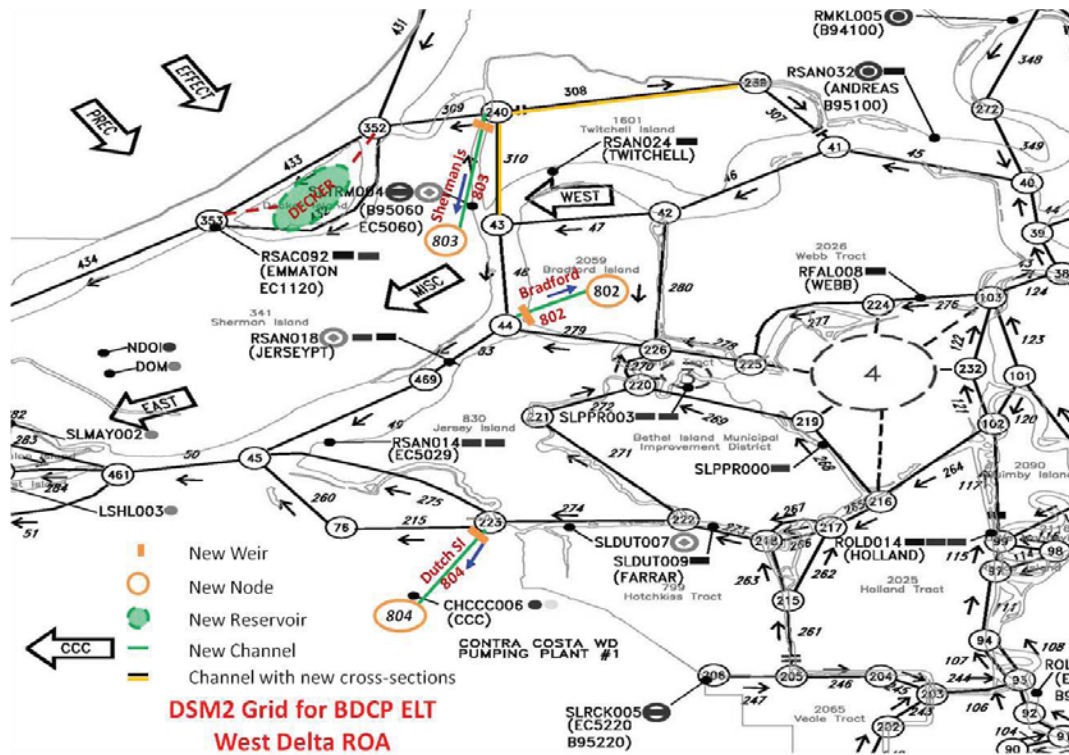
Figure 9: DSM2 Grid Modifications for Incorporating ELT Tidal Marsh Restoration Proposed in the West Delta Region
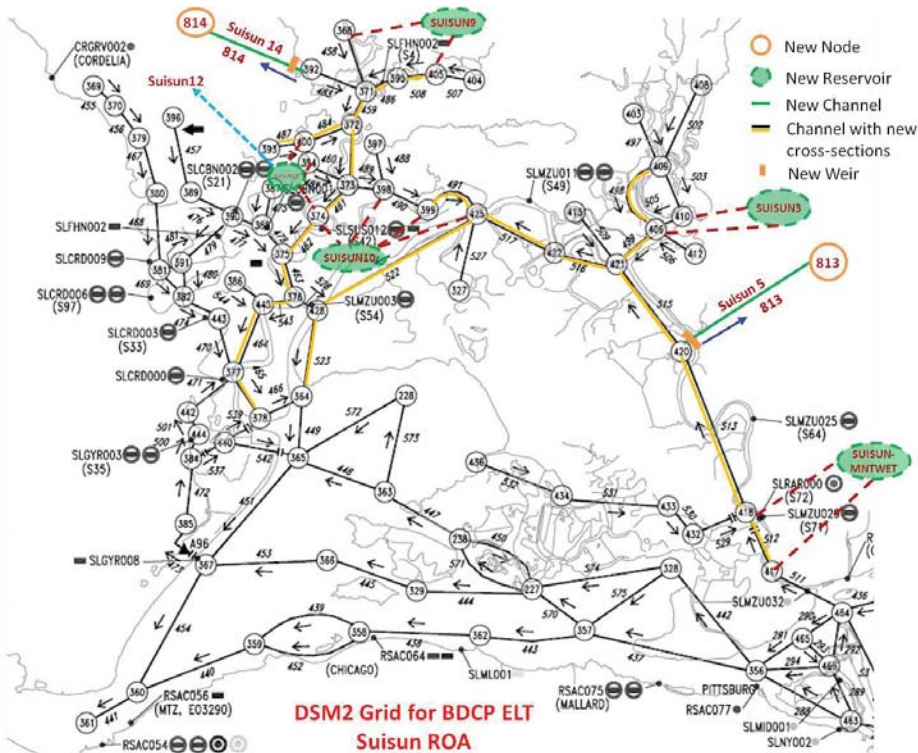
Figure 10: DSM2 Grid Modifications for Incorporating ELT Tidal Marsh Restoration Proposed in the Suisun Marsh Region

1
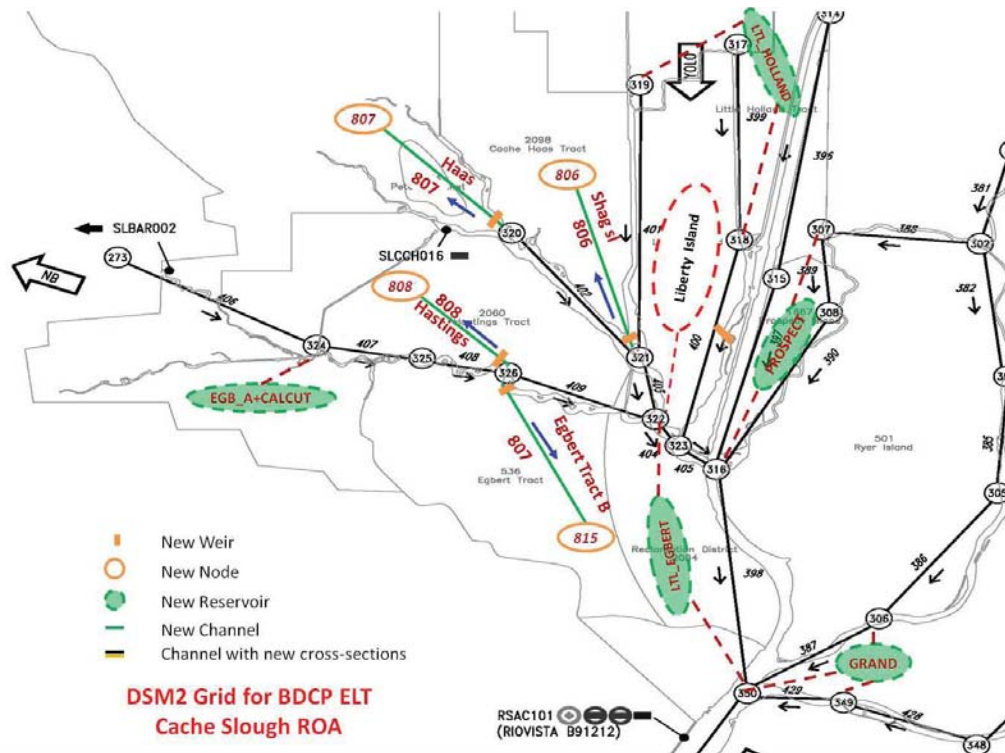
2   Figure 11: DSM2 Grid Modifications for Incorporating LLT Tidal Marsh Restoration Proposed in the Cache
3   Slough Region

4

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

Figure 13: DSM2 Grid Modifications for Incorporating LLT Tidal Marsh Restoration Proposed in the West Delta Region
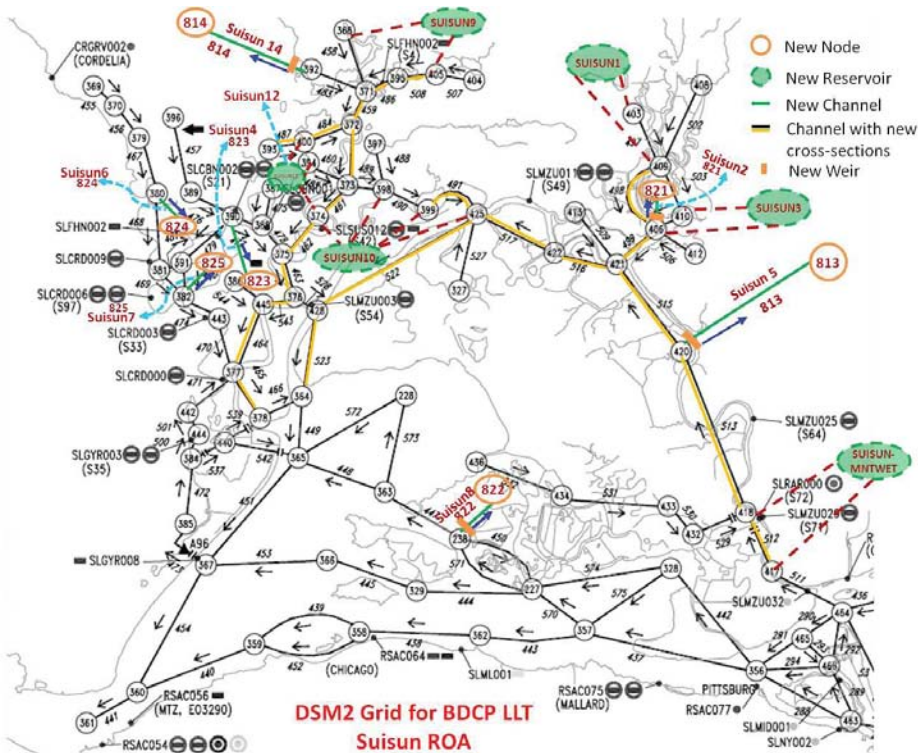
Figure 14: DSM2 Grid Modifications for Incorporating LLT Tidal Marsh Restoration Proposed in the Suisun Marsh Region
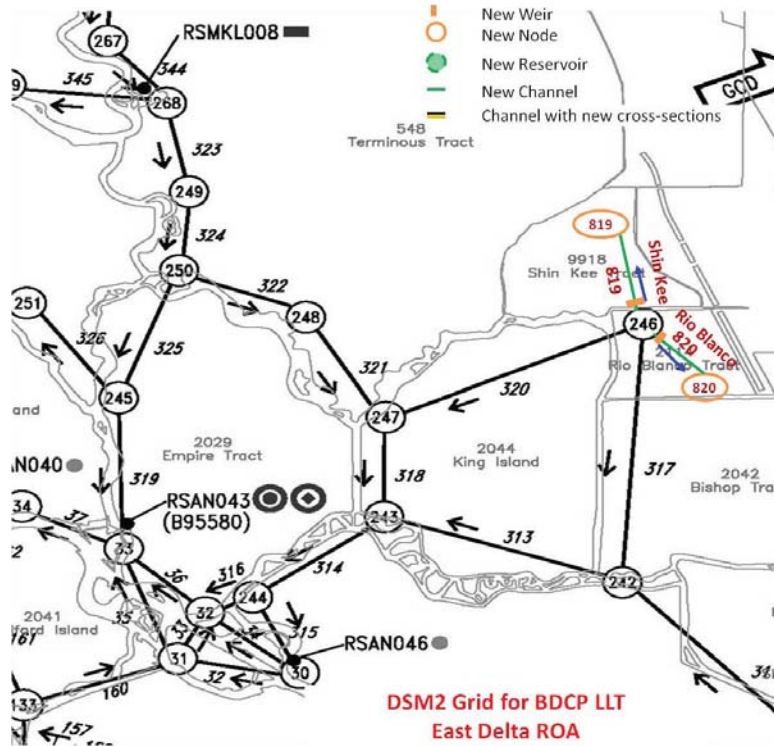
Figure 15: DSM2 Grid Modifications for Incorporating LLT Tidal Marsh Restoration Proposed in the East Delta Region
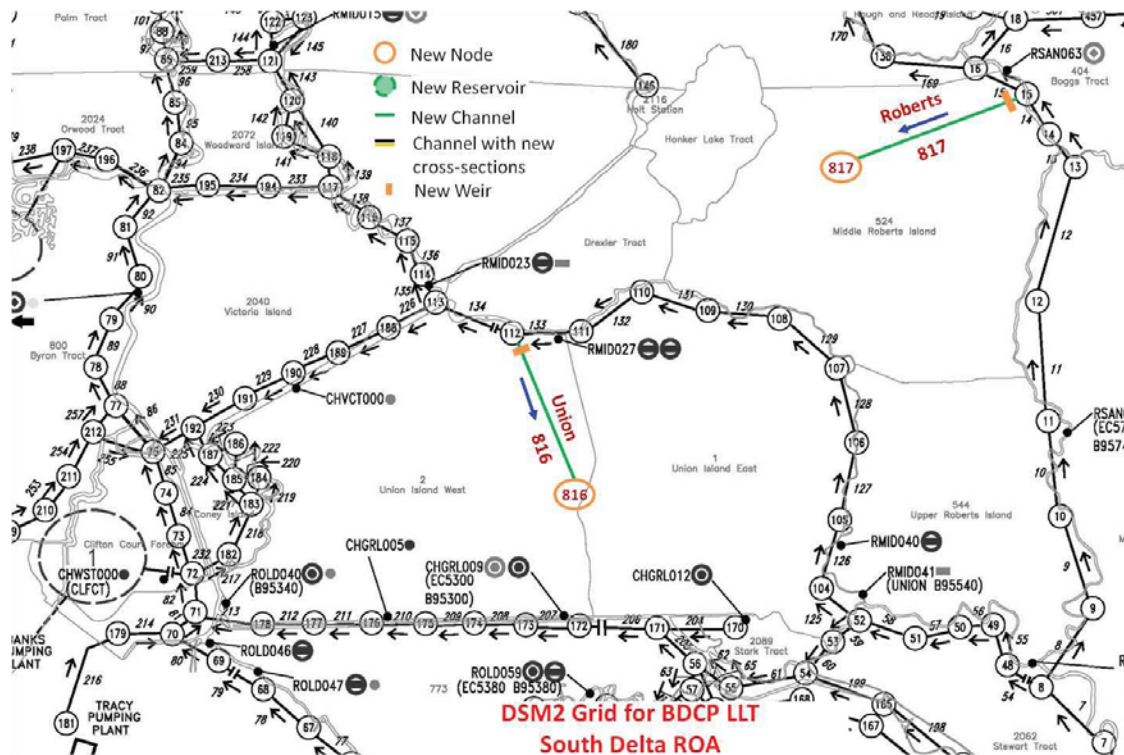
Figure 16: DSM2 Grid Modifications for Incorporating LLT Tidal Marsh Restoration Proposed in the South Delta Region
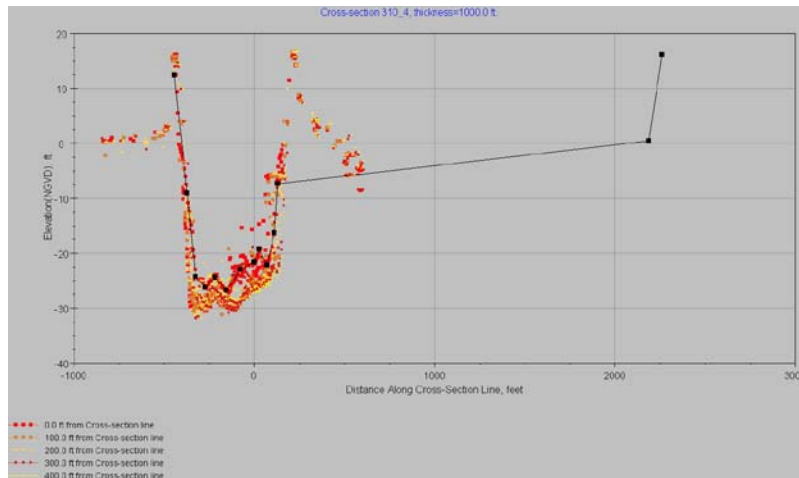
Figure 17: Modified DSM2 channel cross-section in West Delta (Threemile Slough channel 310) to represent levee setback proposed on Twitchell Island in RMA model.
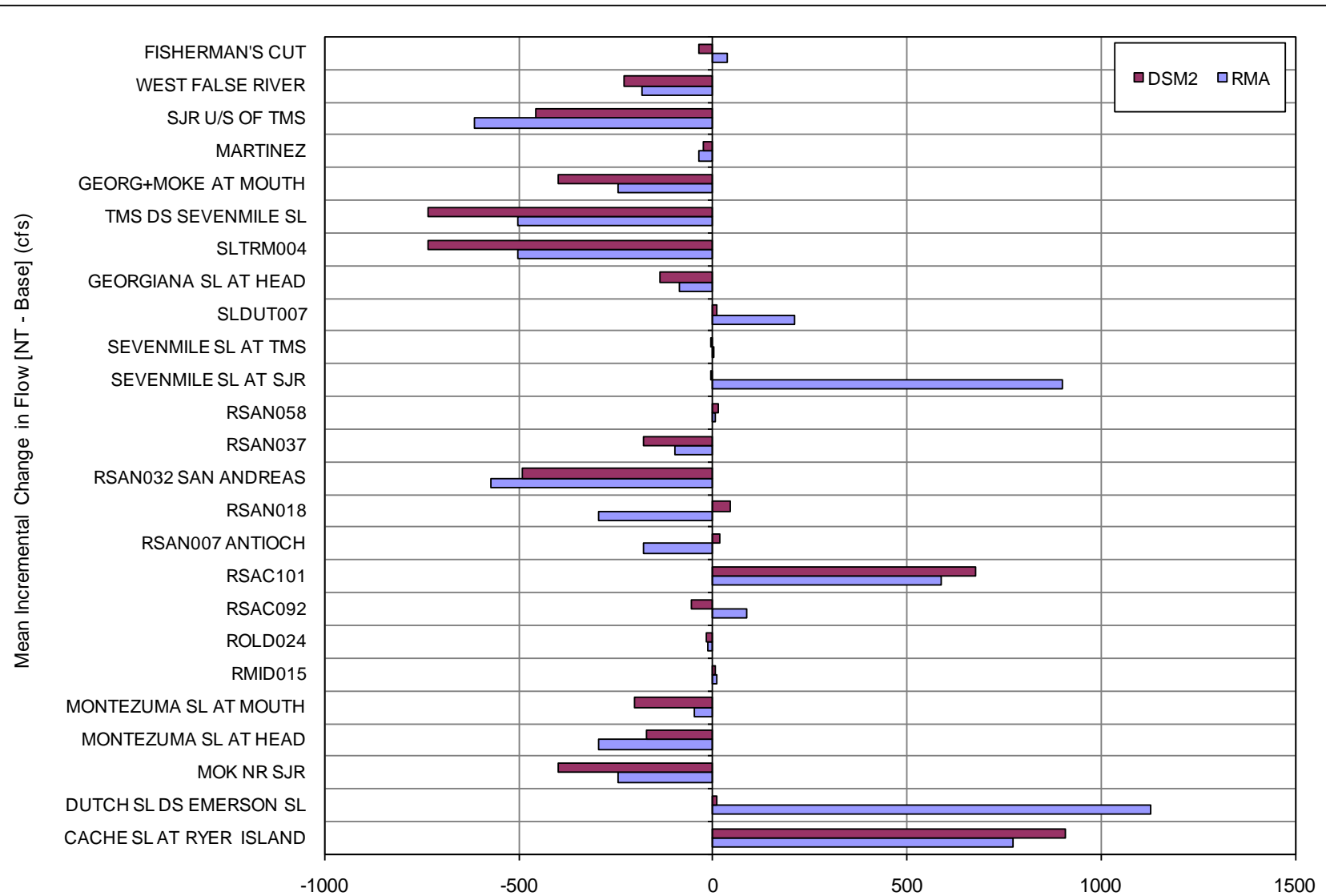
Figure 18: Comparison of average incremental change in tidally averaged flow in Near-Term scenario from the baseline between DSM2 and RMA
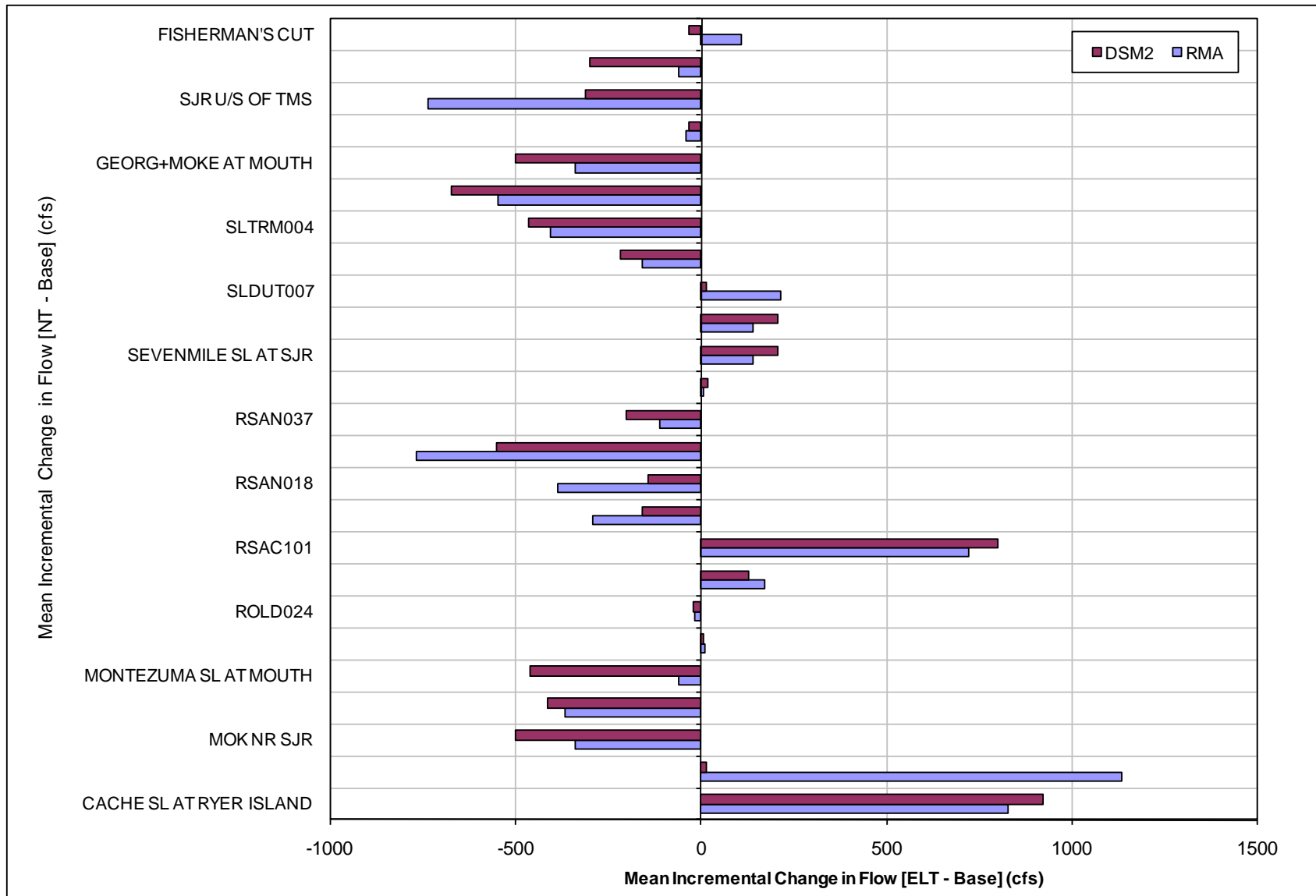
Figure 19: Comparison of average incremental change in tidally averaged flow in Early Long-Term scenario from the baseline between DSM2 and RMA
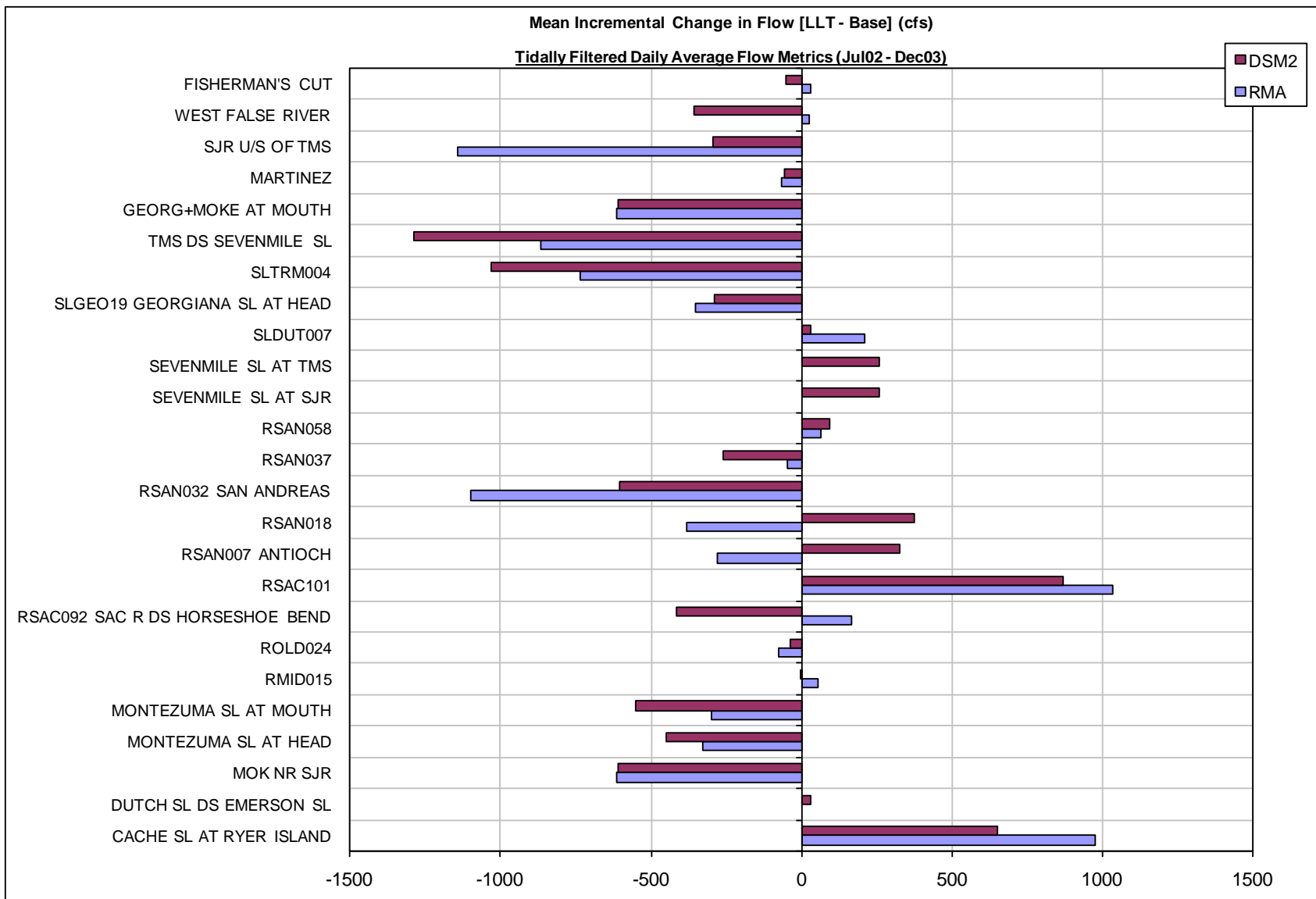
Figure 20: Comparison of average incremental change in tidally averaged flow in Late Long-Term scenario from the baseline between DSM2 and RMA
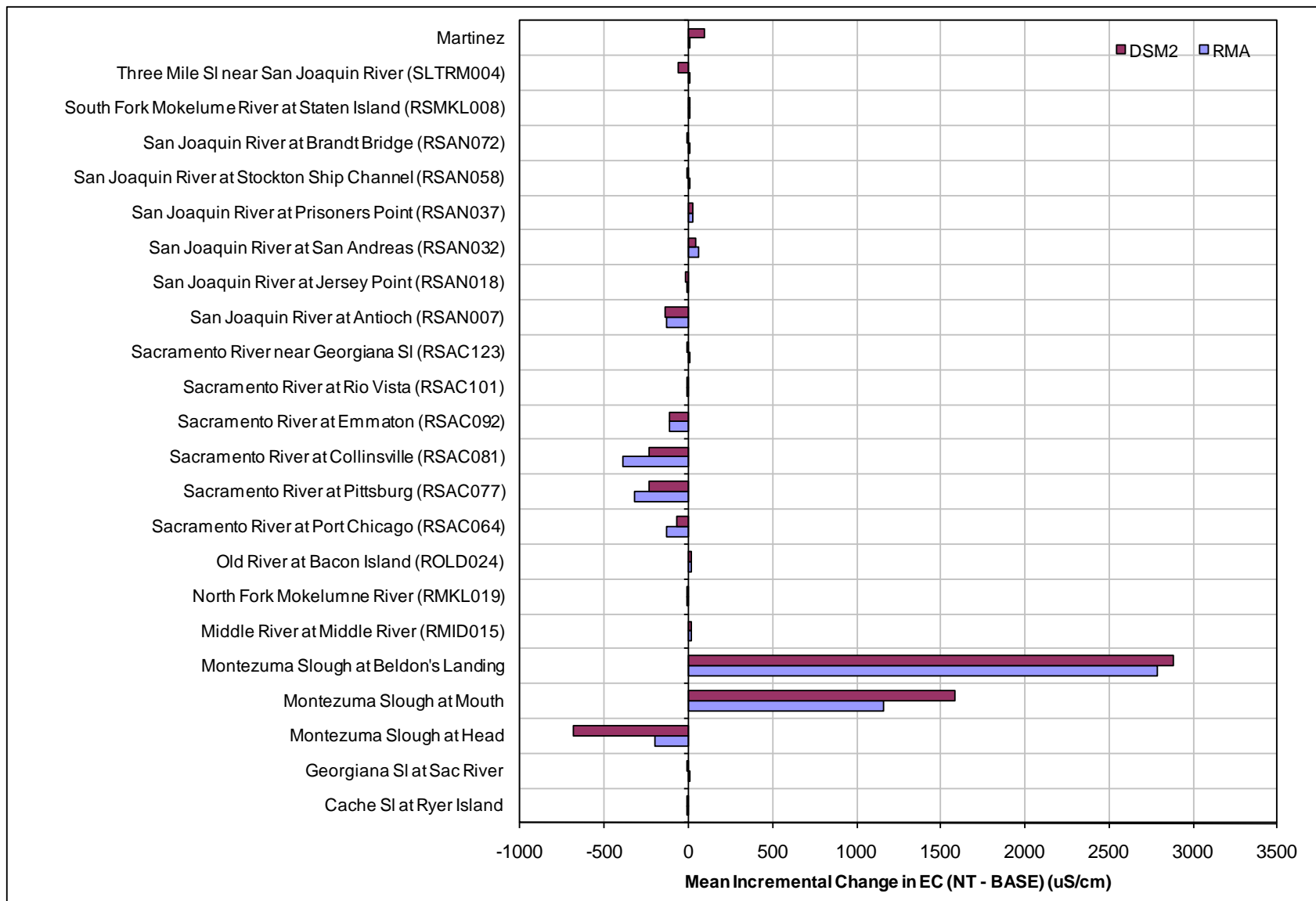
Figure 21: Comparison of average incremental change in tidally averaged EC in Near-Term scenario from the baseline between DSM2 and RMA
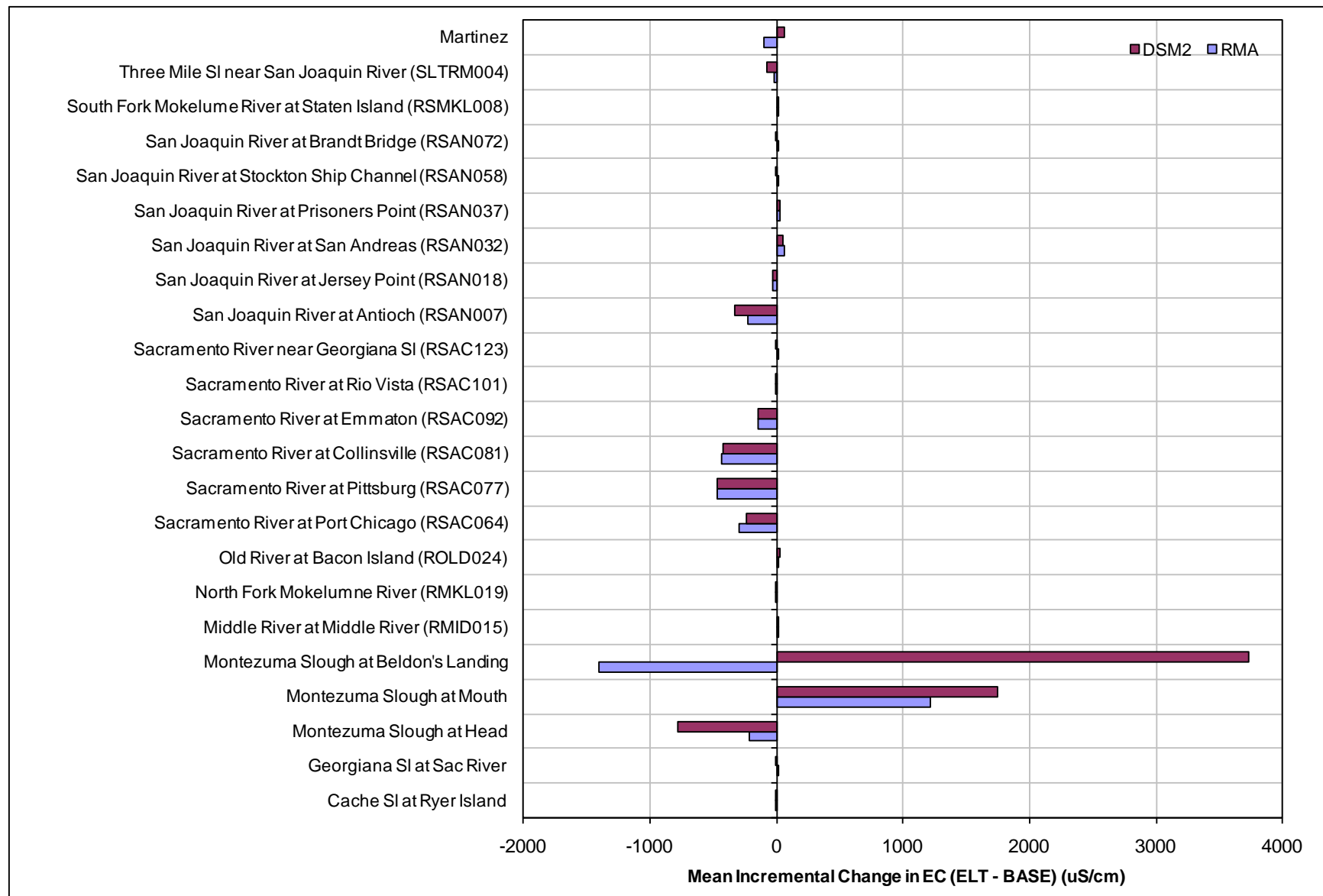
Figure 22: Comparison of average incremental change in tidally averaged EC in Early Long-Term scenario from the baseline between DSM2 and RMA
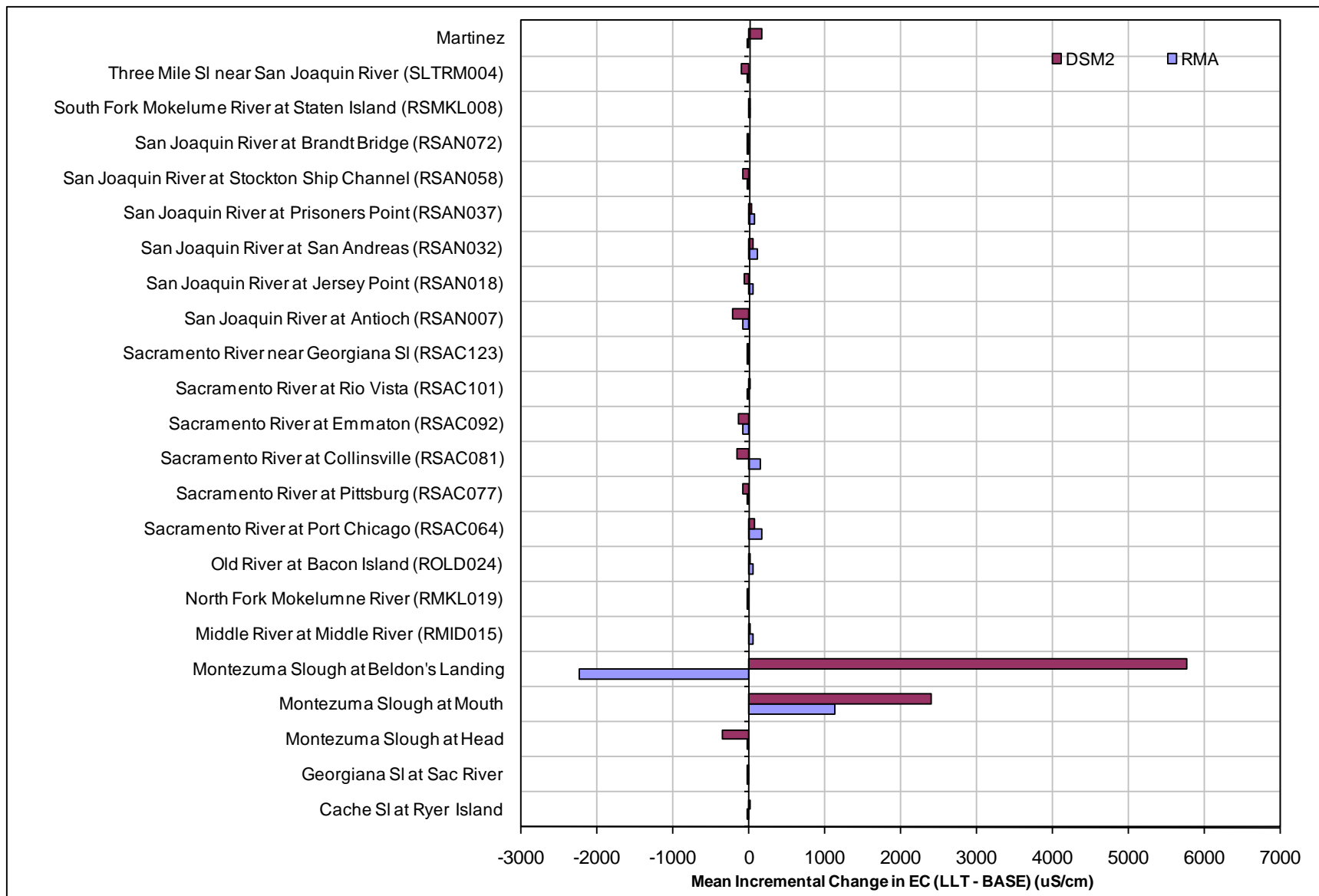
Figure 23: Comparison of average incremental change in tidally averaged EC in Late Long-Term scenario from the baseline between DSM2 and RMA
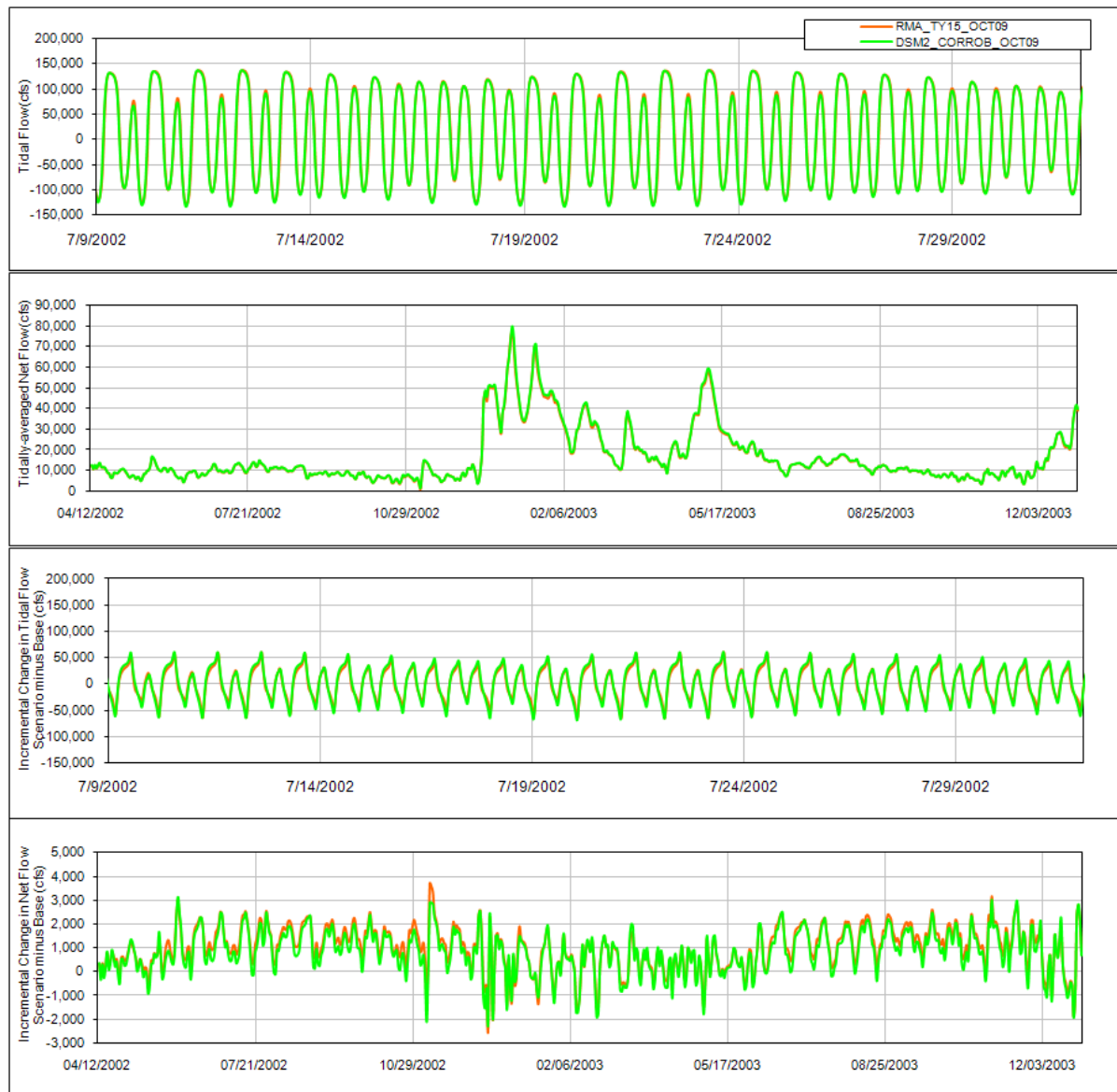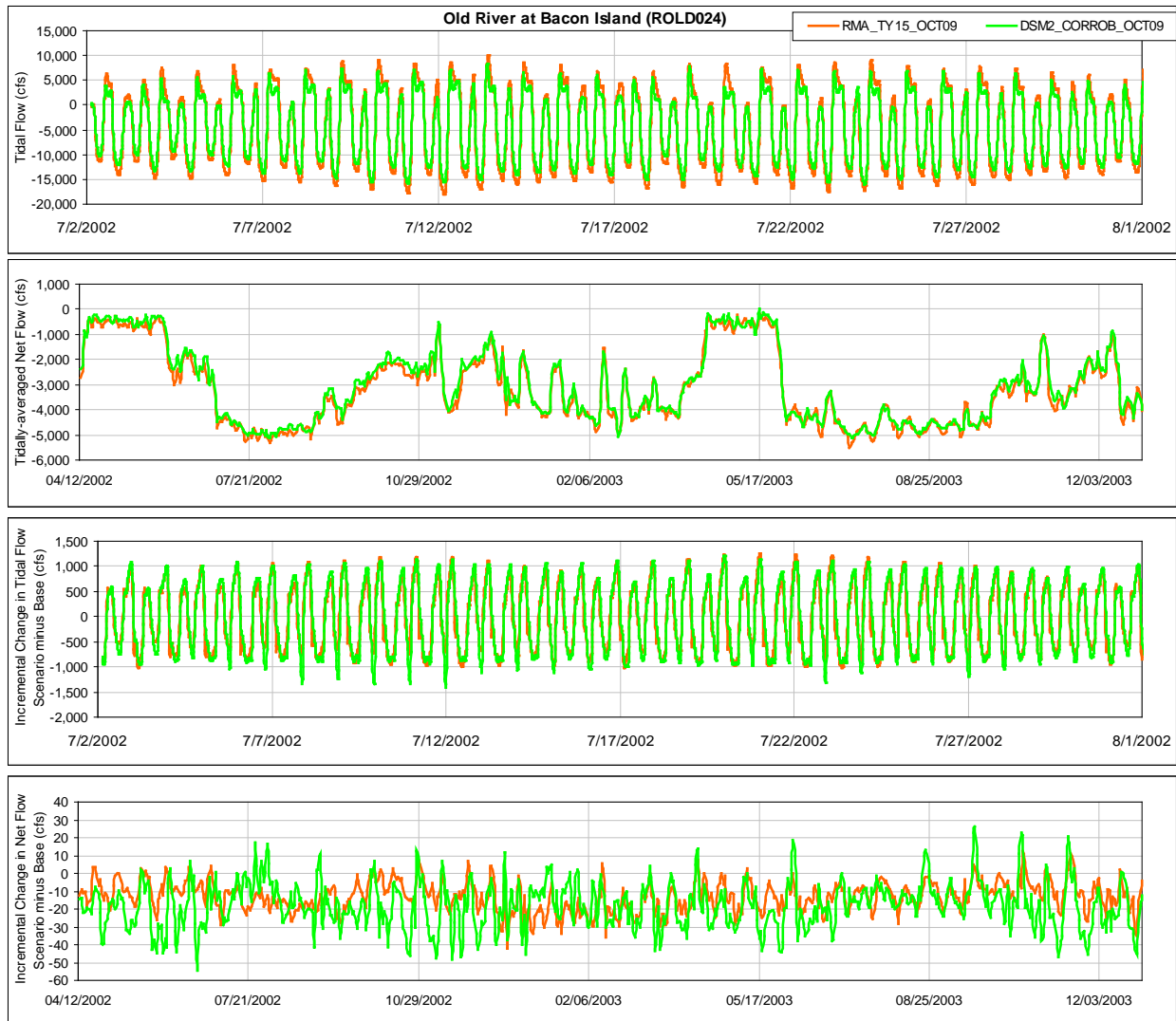
1
2 Figure 24: Comparison of Tidal Flow, Tidally-Averaged Daily Flow, Incremental Change in Tidal Flow and
3 the Incremental Change in the Daily Flow between the Late Long-term Scenario and the Current
4 Conditions Scenario from RMA Model and DSM2 Model for Sacramento River at Rio Vista Location
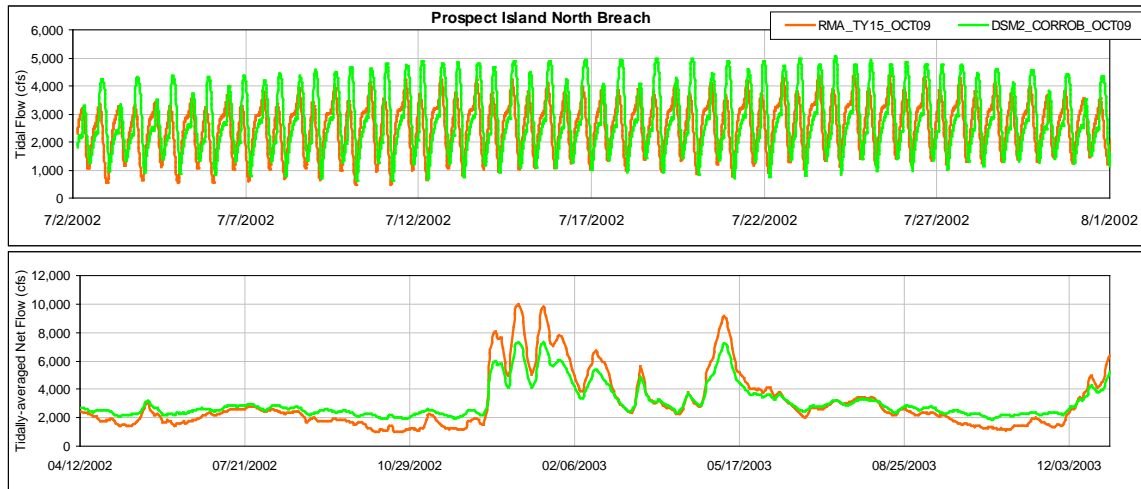5
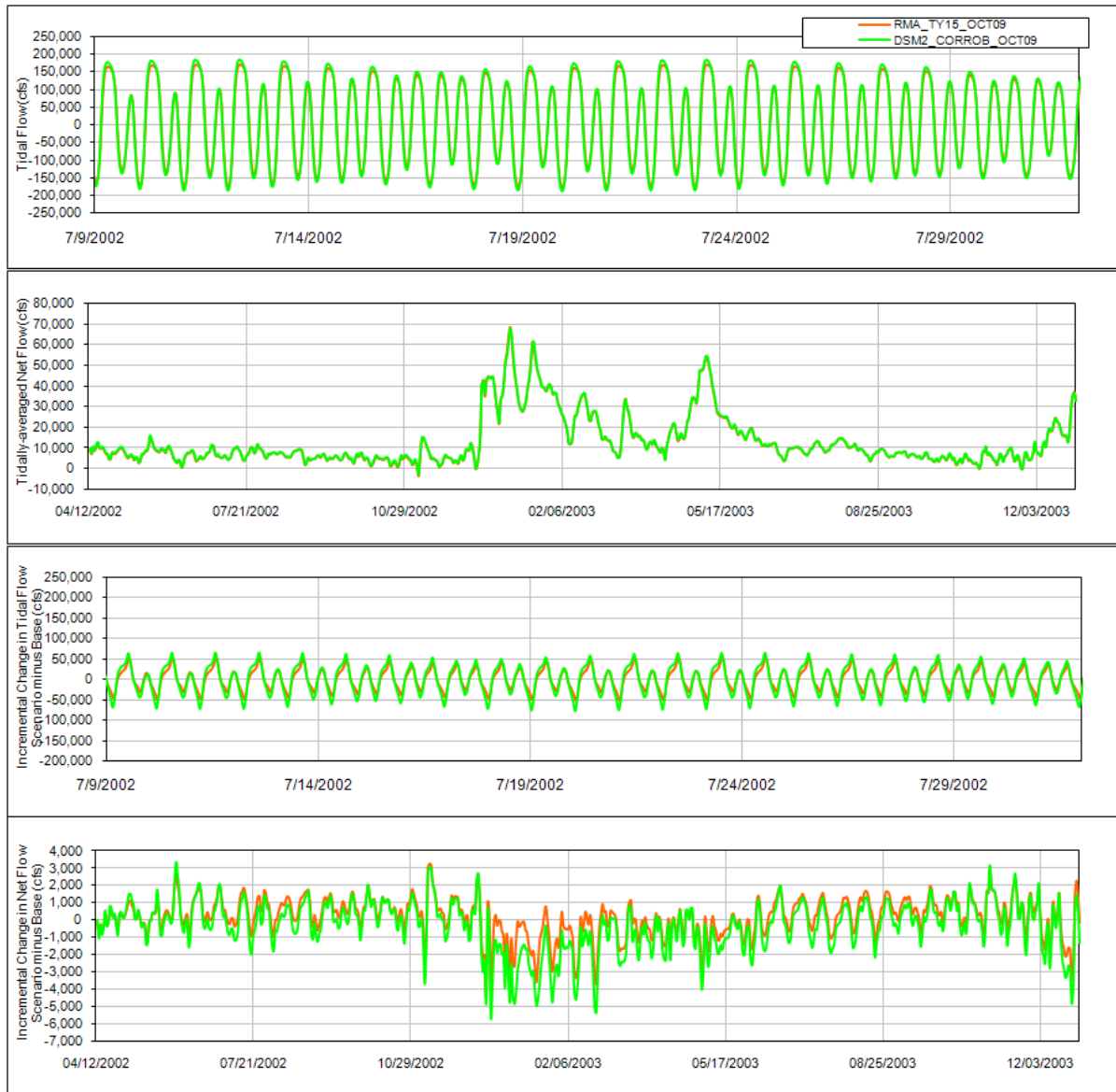
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2 Figure 25: Comparison of Tidal Flow, Tidally-Averaged Daily Flow, Incremental Change in Tidal Flow and
3 the Incremental Change in the Daily Flow between the Late Long-term Scenario and the Current
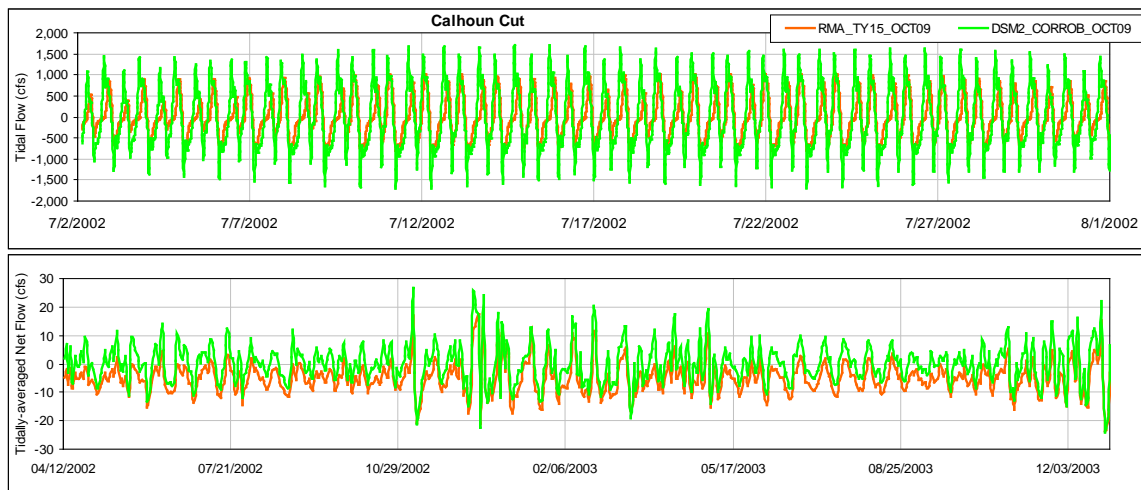4 Conditions Scenario from RMA Model and DSM2 Model for Sacramento River at Emmaton Location

5
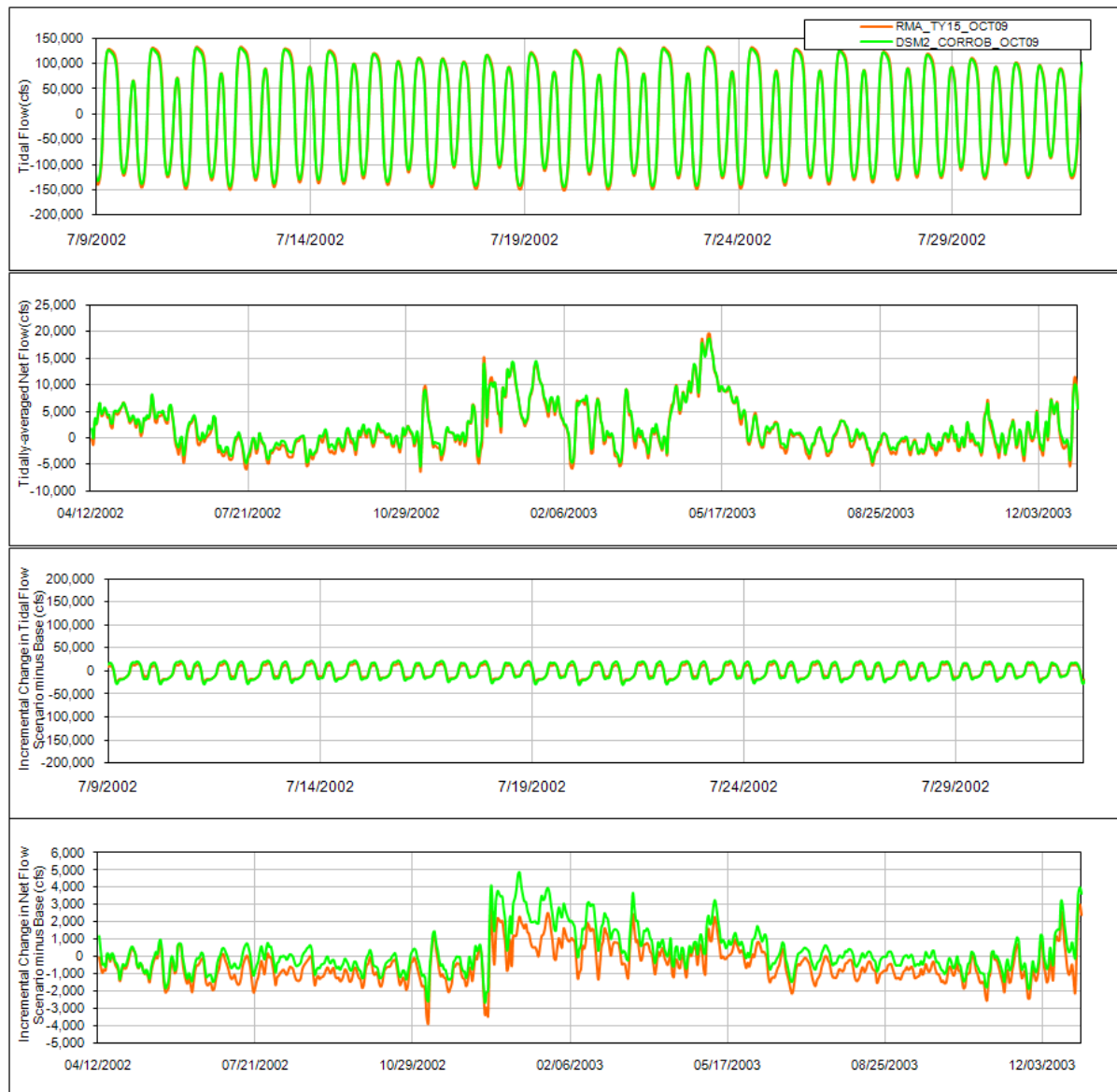
Figure 26: Comparison of Tidal Flow, Tidally-Averaged Daily Flow, Incremental Change in Tidal Flow and the Incremental Change in the Daily Flow between the Late Long-term Scenario and the Current Conditions Scenario from RMA Model and DSM2 Model for San Joaquin River at Jersey Point Location
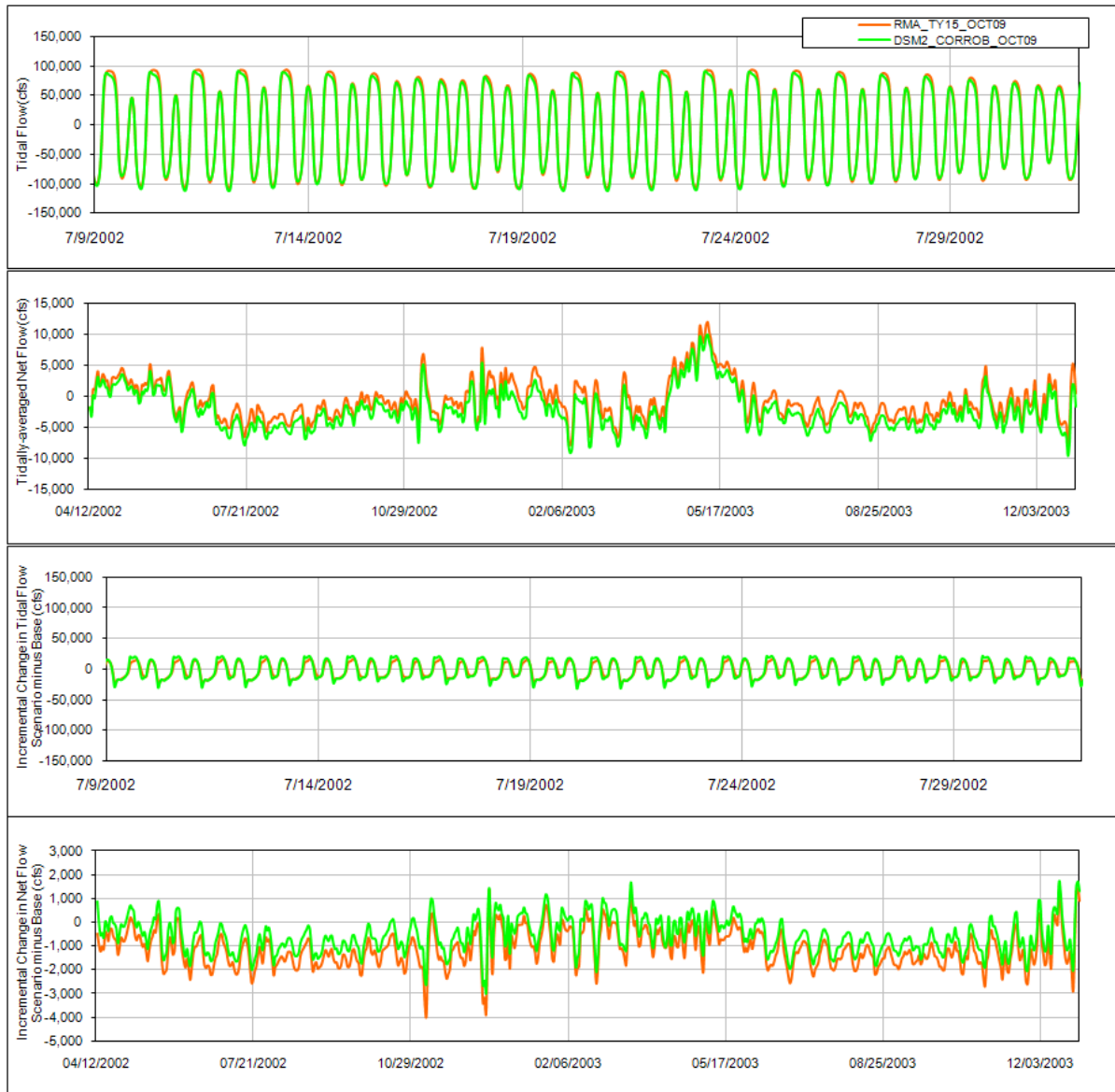
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2   Figure 27: Comparison of Tidal Flow, Tidally-Averaged Daily Flow, Incremental Change in Tidal Flow and
3   the Incremental Change in the Daily Flow between the Late Long-term Scenario and the Current
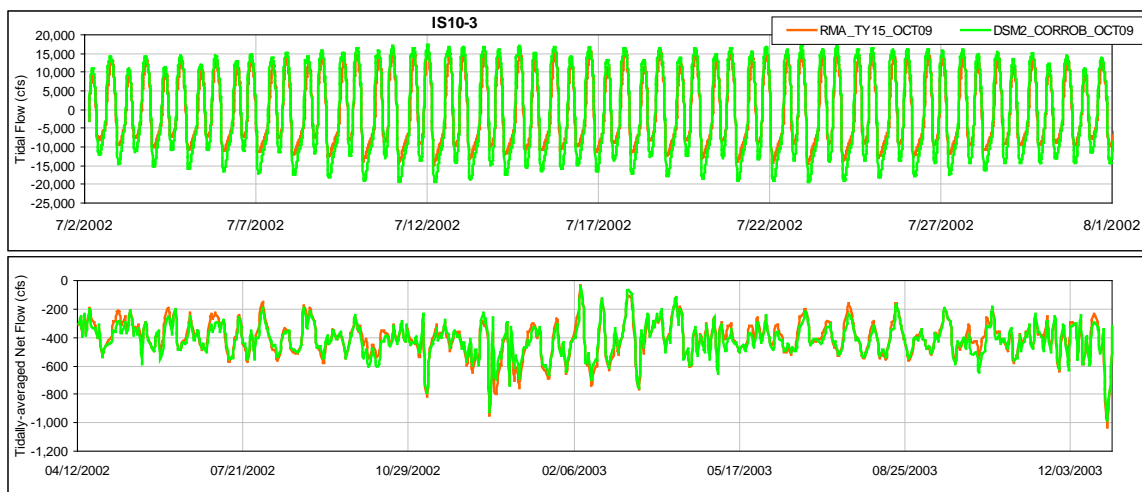4   Conditions Scenario from RMA Model and DSM2 Model for San Joaquin River at San Andreas Location
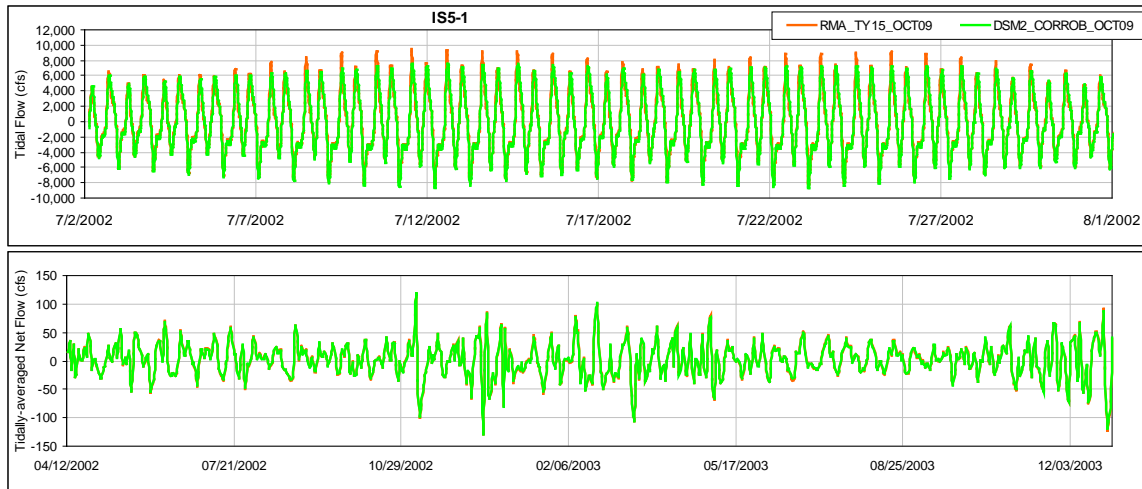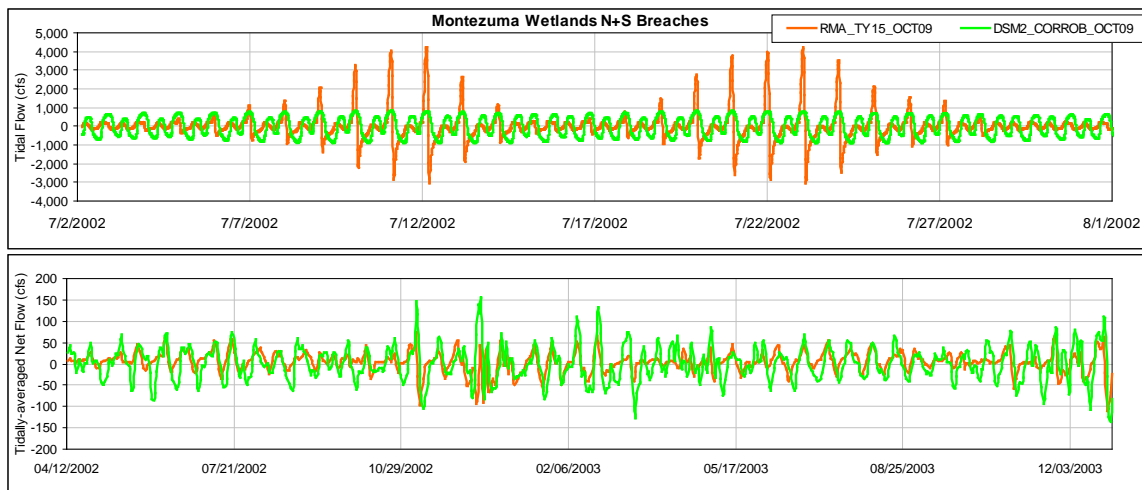5
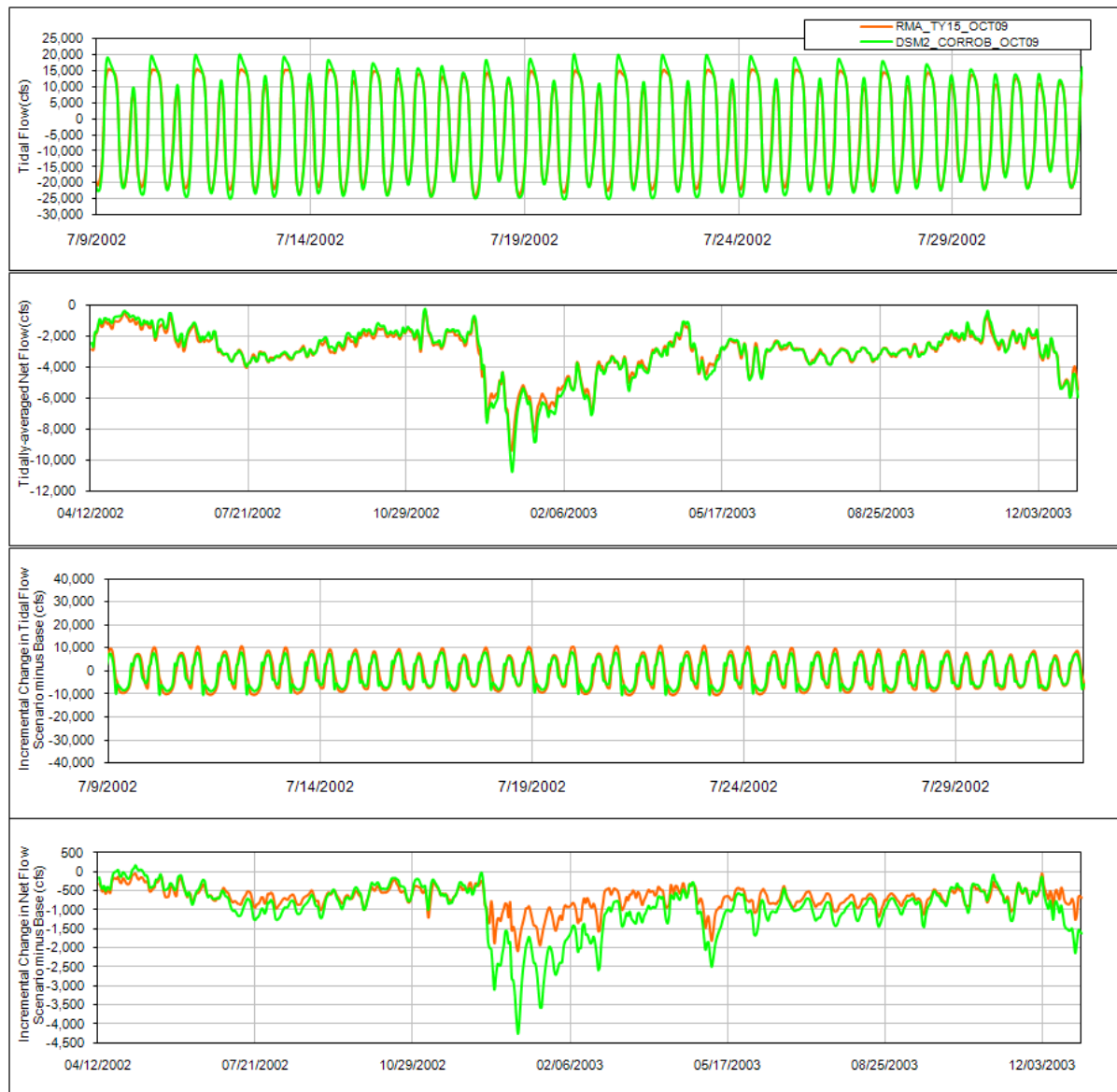
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2   Figure 28: Comparison of Tidal Flow, Tidally-Averaged Daily Flow, Incremental Change in Tidal Flow and
3   the Incremental Change in the Daily Flow between the Late Long-term Scenario and the Current
4   Conditions Scenario from RMA Model and DSM2 Model for Three Mile Slough at San Joaquin River
5   Location
6
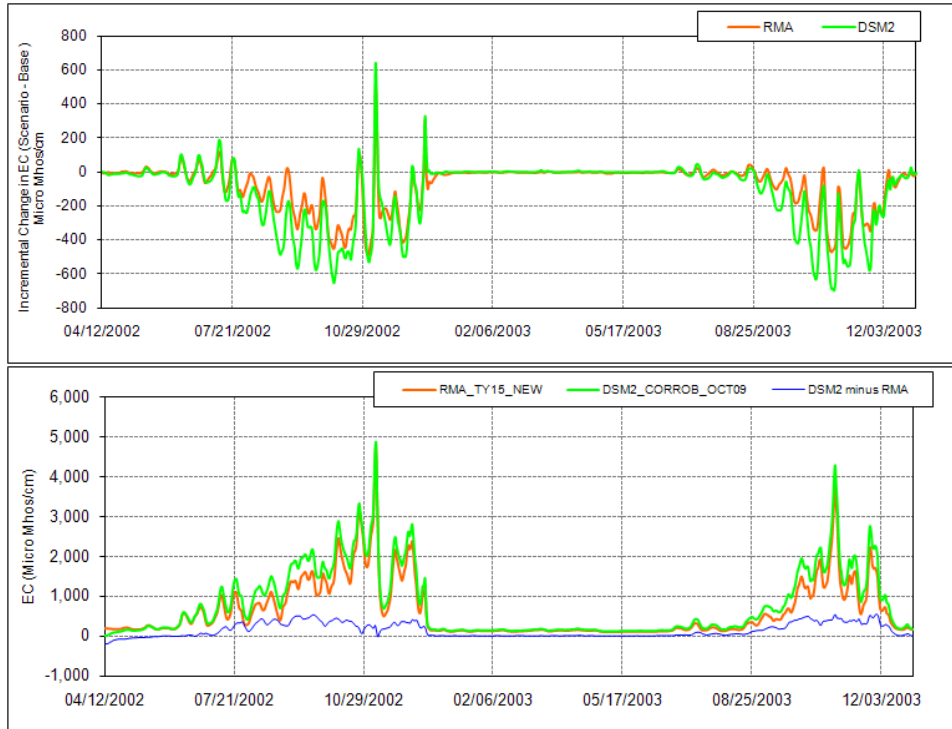
Figure 29: Comparison of Tidally-Averaged Daily EC and the Incremental Change in the Daily EC between the Late Long-term Scenario and the Current Conditions Scenario from RMA Model and DSM2 Model for Sacramento River at Emmaton Location
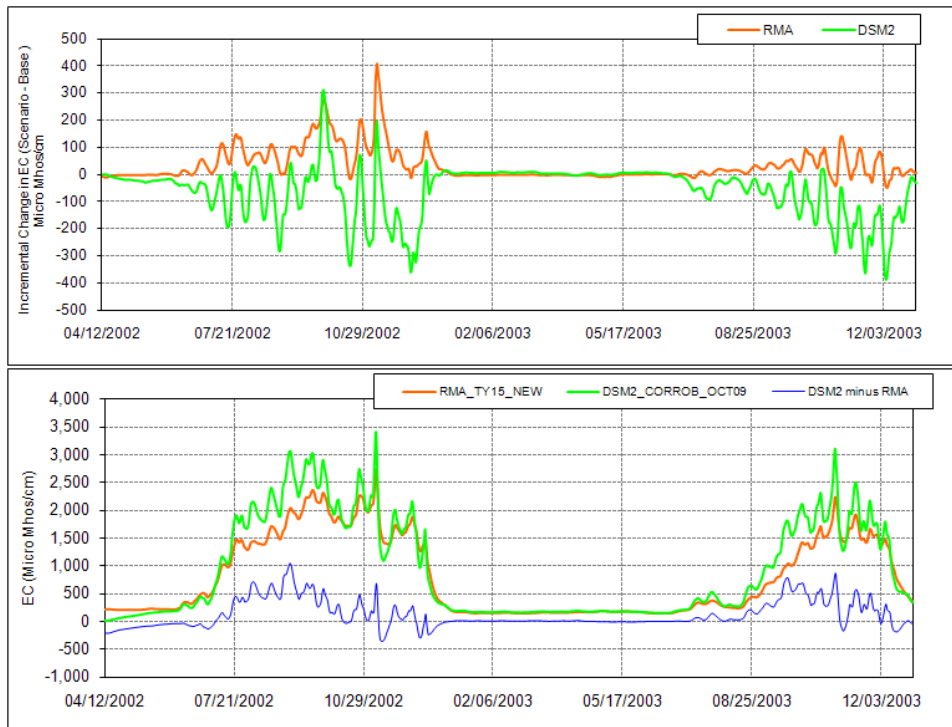
Figure 30: Comparison of Tidally-Averaged Daily EC and the Incremental Change in the Daily EC between the Late Long-term Scenario and the Current Conditions Scenario from RMA Model and DSM2 Model for San Joaquin River at Jersey Point Location
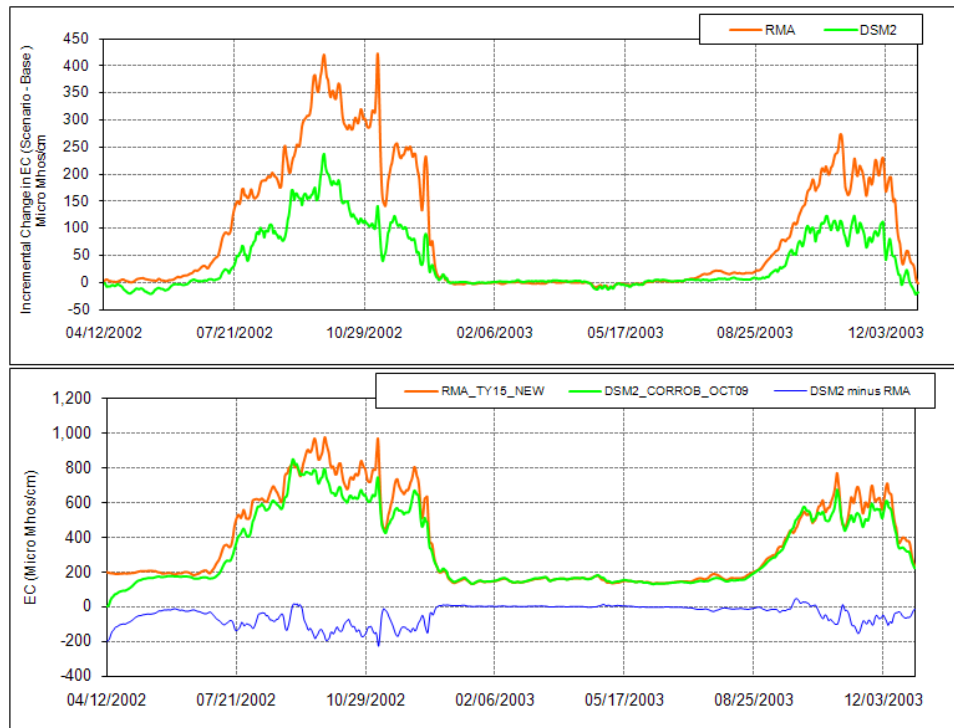
Figure 31: Comparison of Tidally-Averaged Daily EC and the Incremental Change in the Daily EC between the Late Long-term Scenario and the Current Conditions Scenario from RMA Model and DSM2 Model for San Joaquin River at San Andreas Location
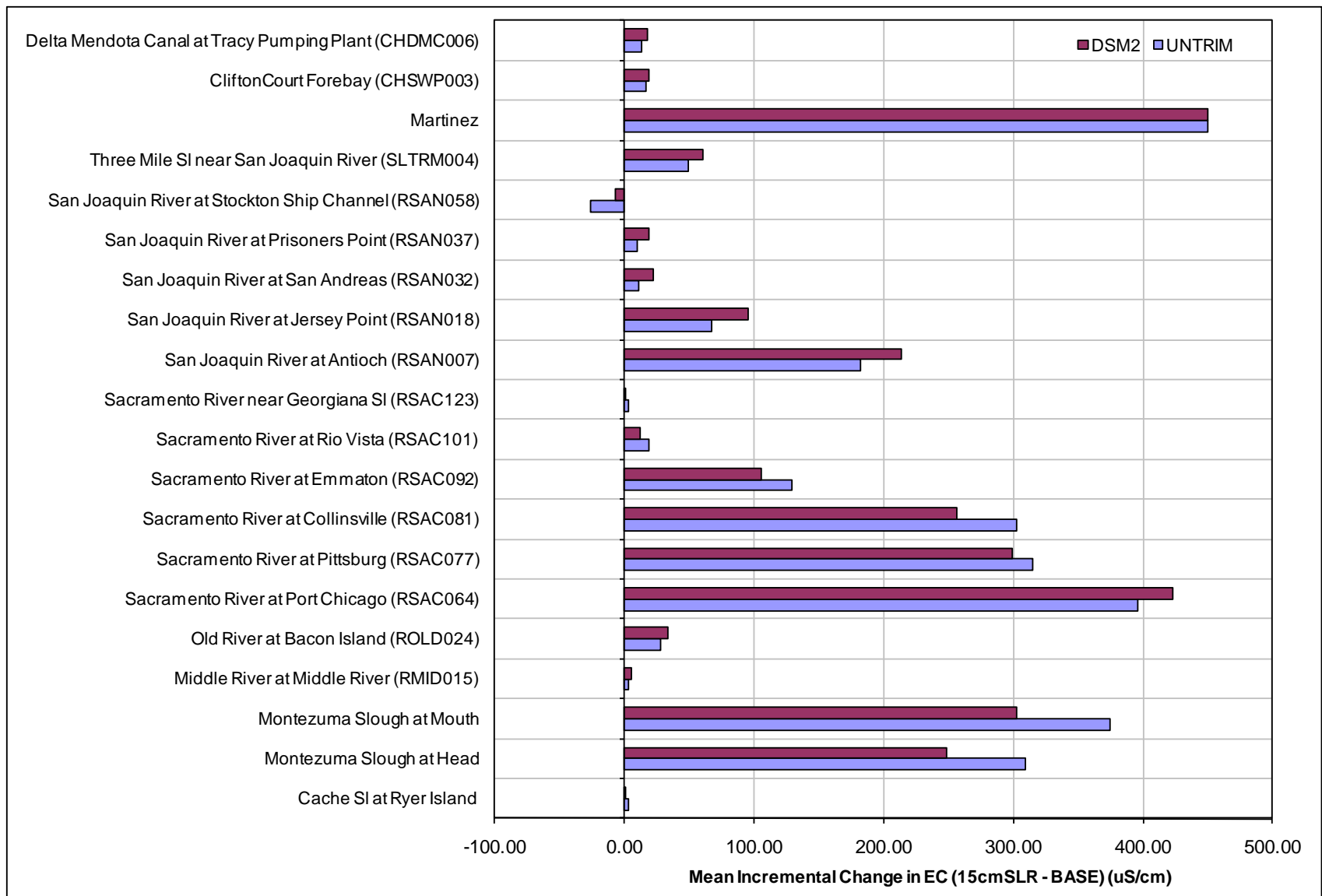
Figure 32: Comparison of average incremental change in tidally averaged EC in 15cm SLR scenario from the baseline between DSM2 and UNTRIM
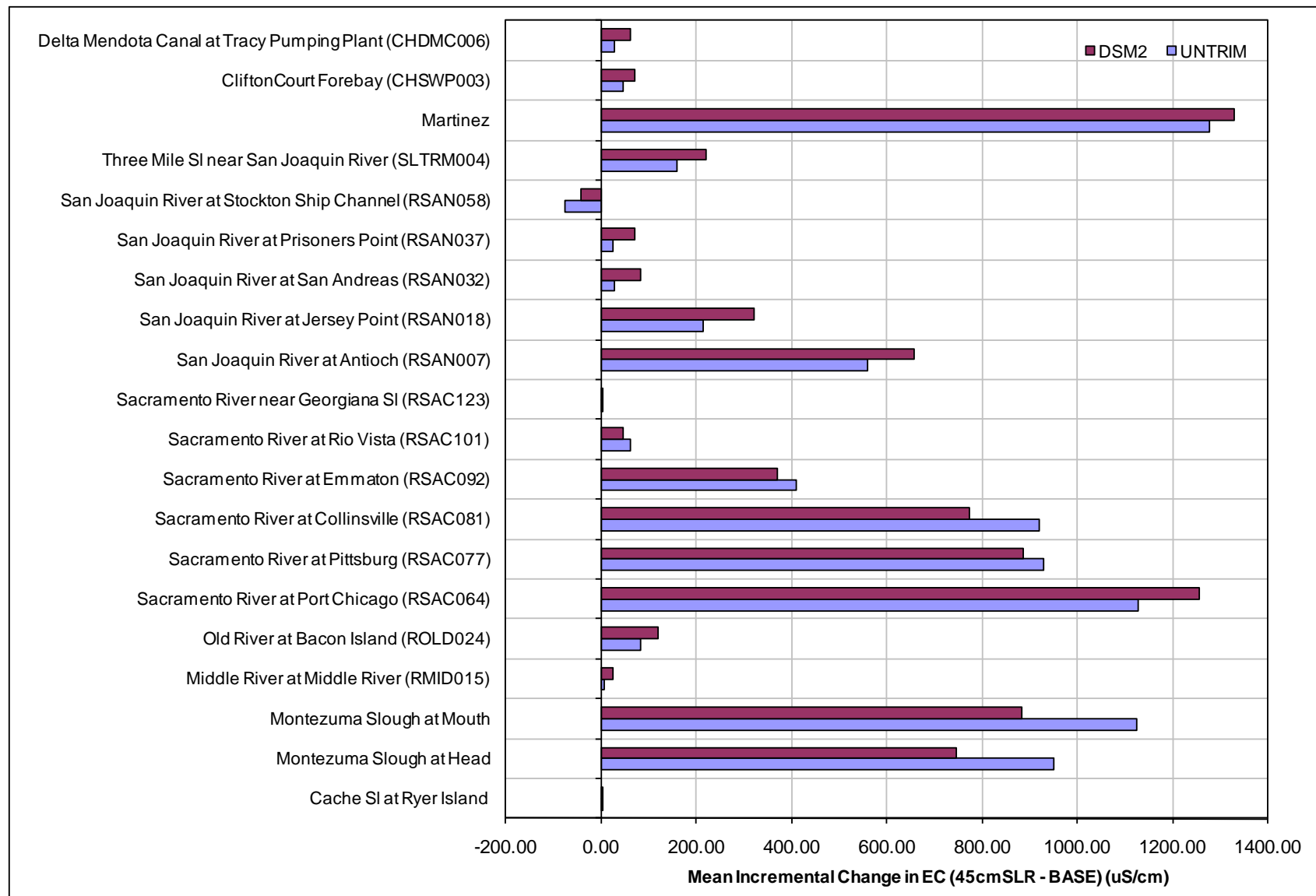
Figure 33: Comparison of average incremental change in tidally averaged EC in 45cm SLR scenario from the baseline between DSM2 and UNTRIM
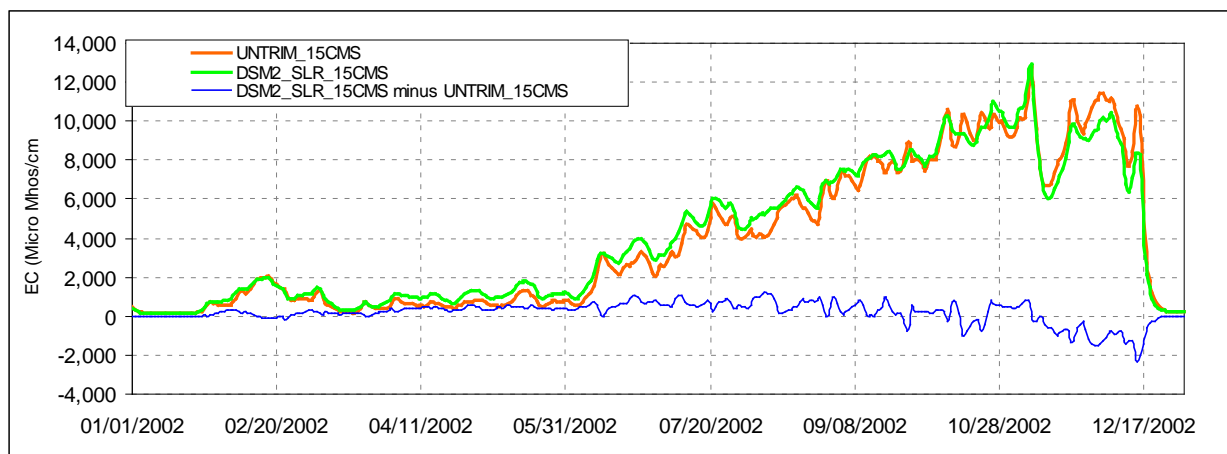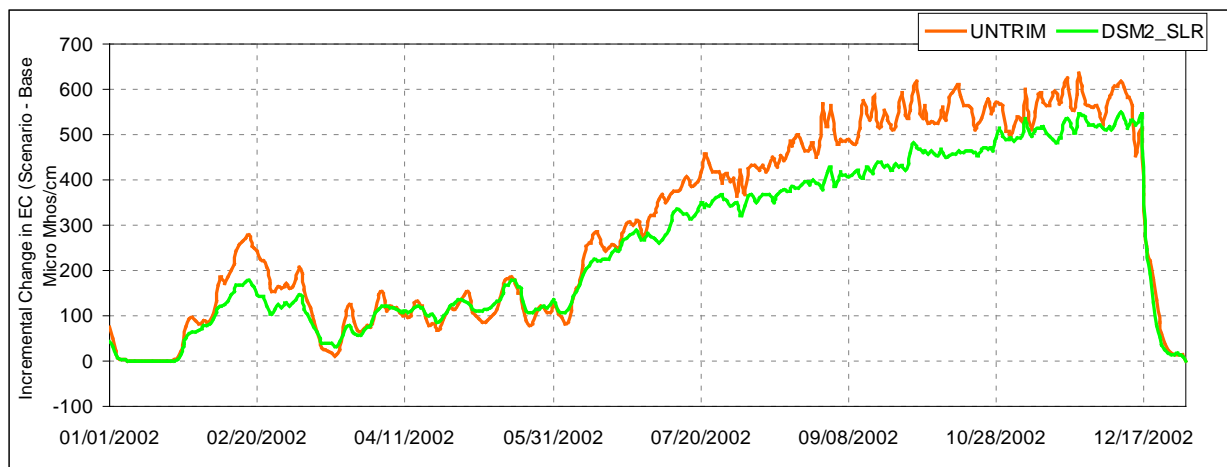
Figure 34: Comparison of Tidally-Averaged Daily EC and the Incremental Change in the Daily EC between the 15 cm Sea Level Rise and the Current Conditions Scenario from UnTRIM Model and DSM2 Model for Sacramento River at Collinsville Location
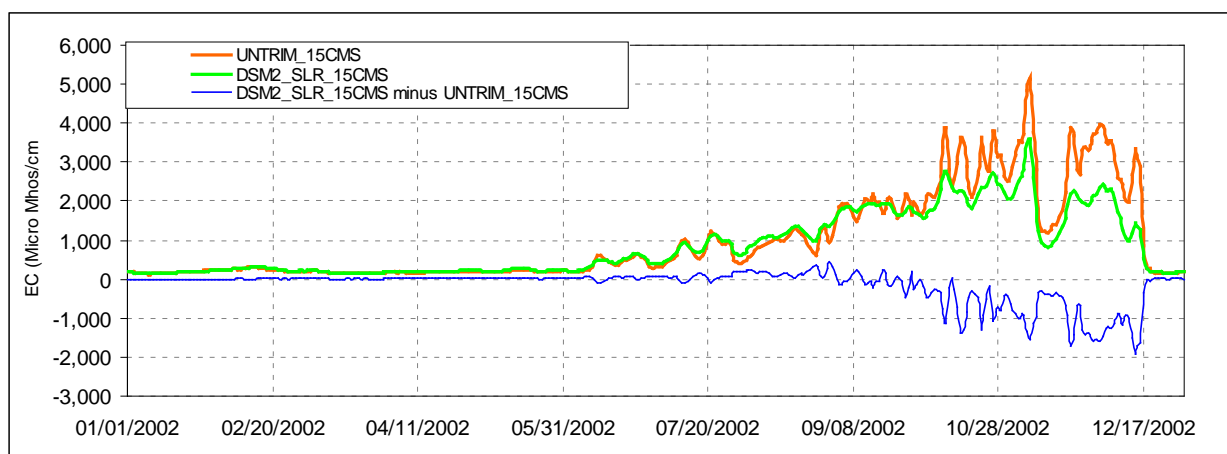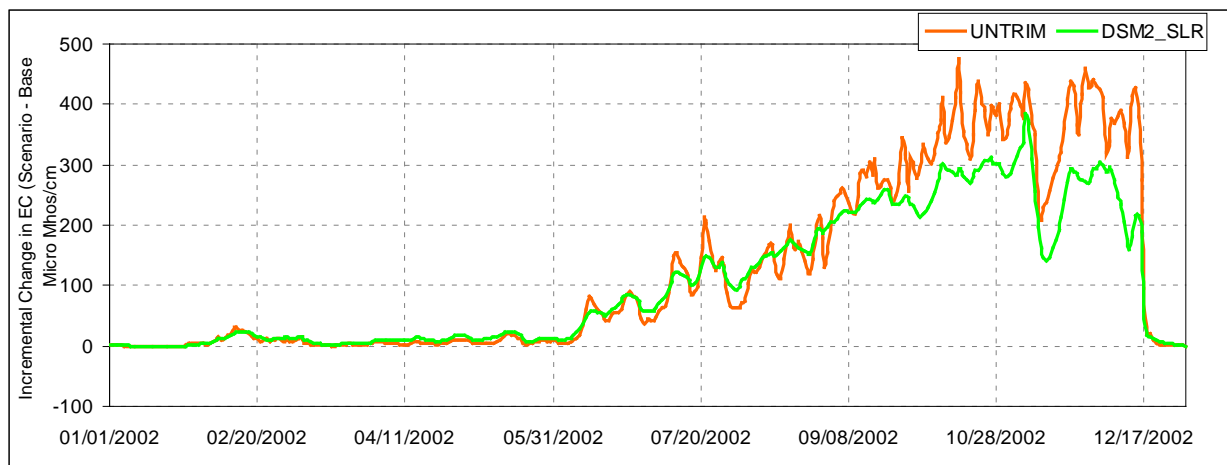
Figure 35: Comparison of Tidally-Averaged Daily EC and the Incremental Change in the Daily EC between the 15 cm Sea Level Rise and the Current Conditions Scenario from UnTRIM Model and DSM2 Model for Sacramento River at Emmaton Location
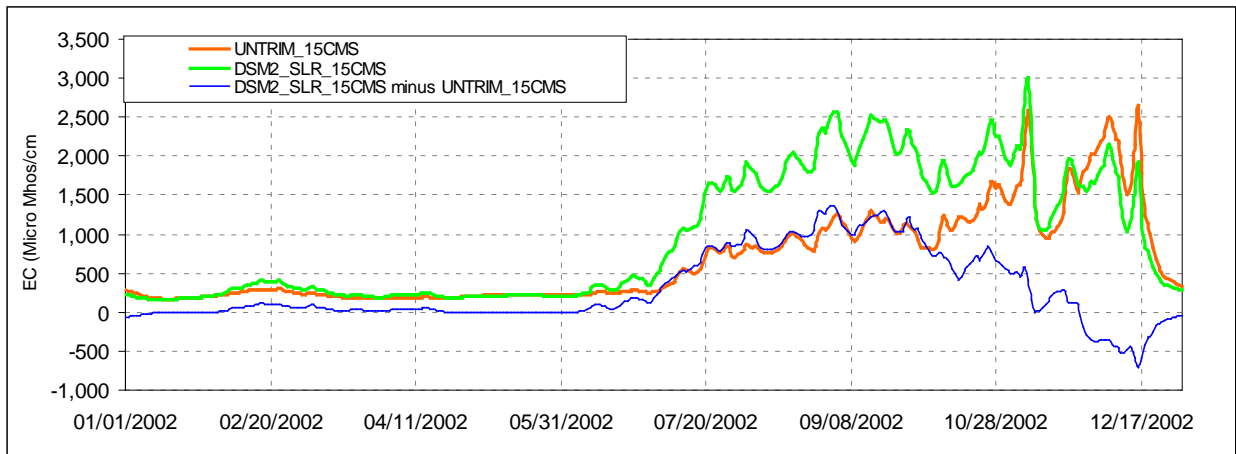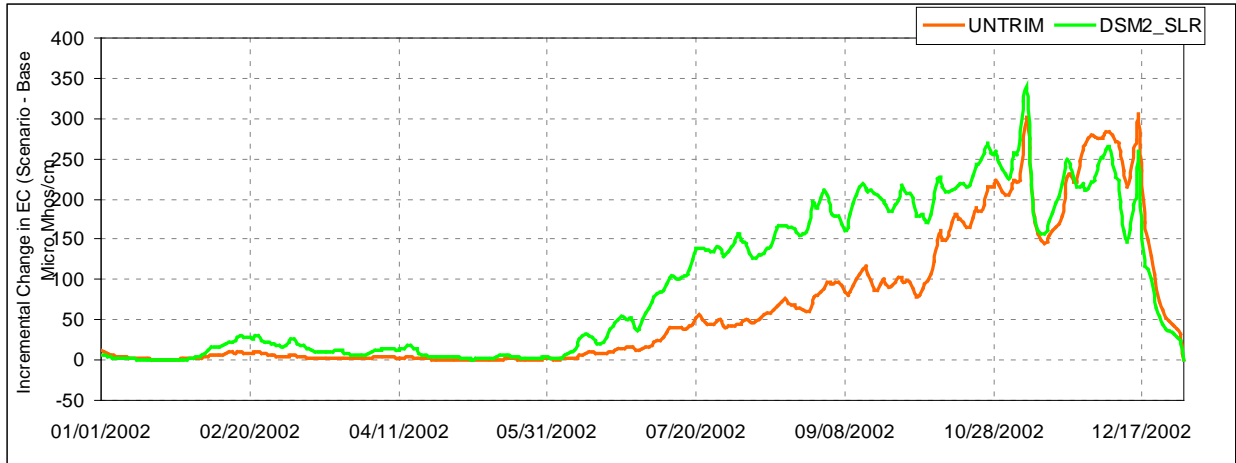
Figure 36: Comparison of Tidally-Averaged Daily EC and the Incremental Change in the Daily EC between the 15 cm Sea Level Rise and the Current Conditions Scenario from UnTRIM Model and DSM2 Model for San Joaquin River at Jersey Point Location
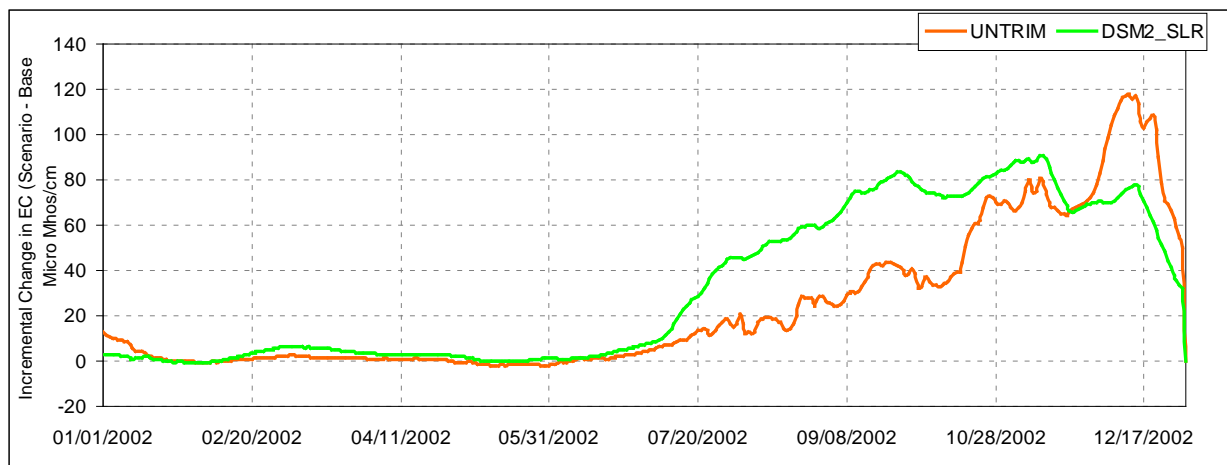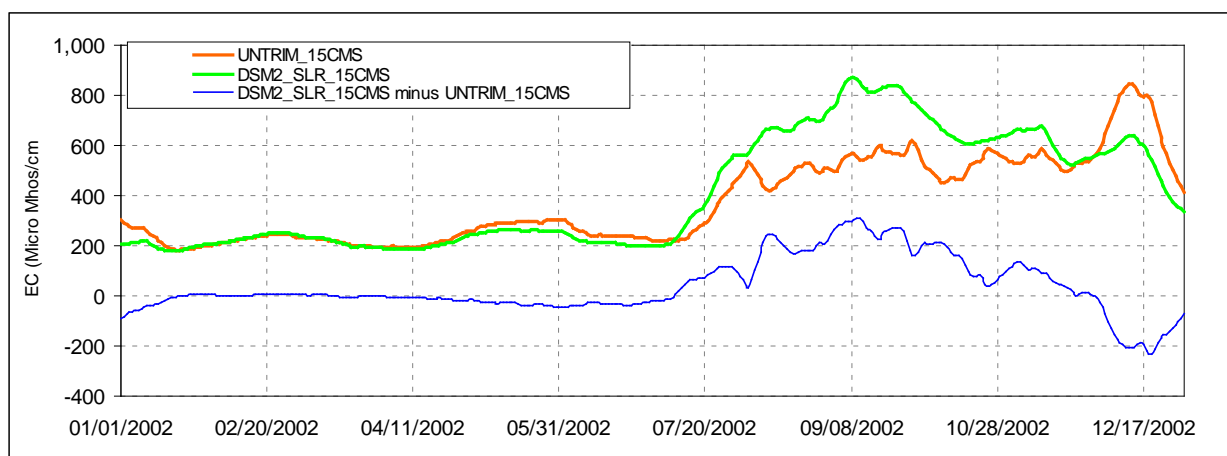
Figure 37: Comparison of Tidally-Averaged Daily EC and the Incremental Change in the Daily EC between the 15 cm Sea Level Rise and the Current Conditions Scenario from UnTRIM Model and DSM2 Model for Old River at Rock Slough Location
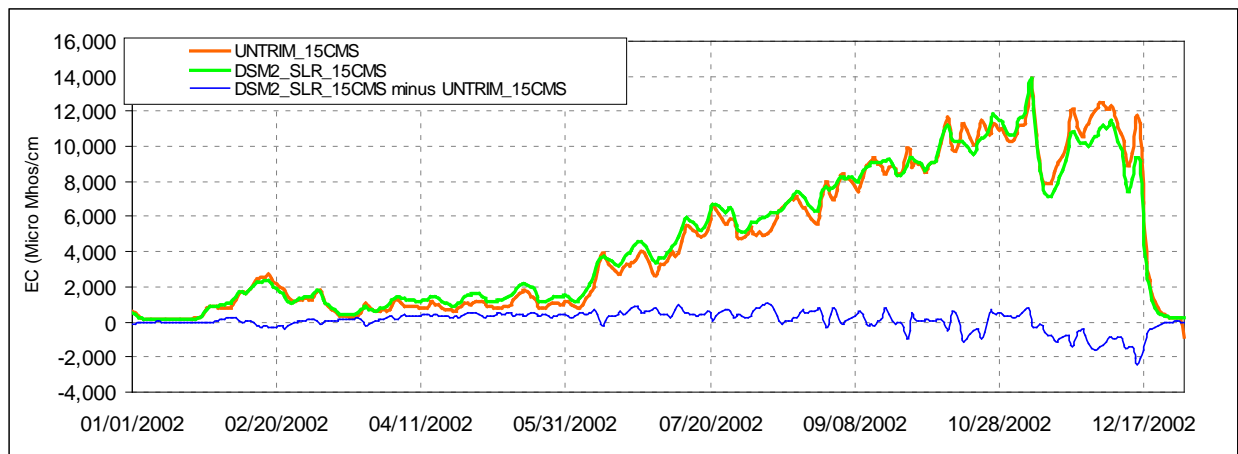
Figure 38: Comparison of Tidally-Averaged Daily EC and the Incremental Change in the Daily EC between the 45 cm Sea Level Rise and the Current Conditions Scenario from UnTRIM Model and DSM2 Model for Sacramento River at Collinsville Location
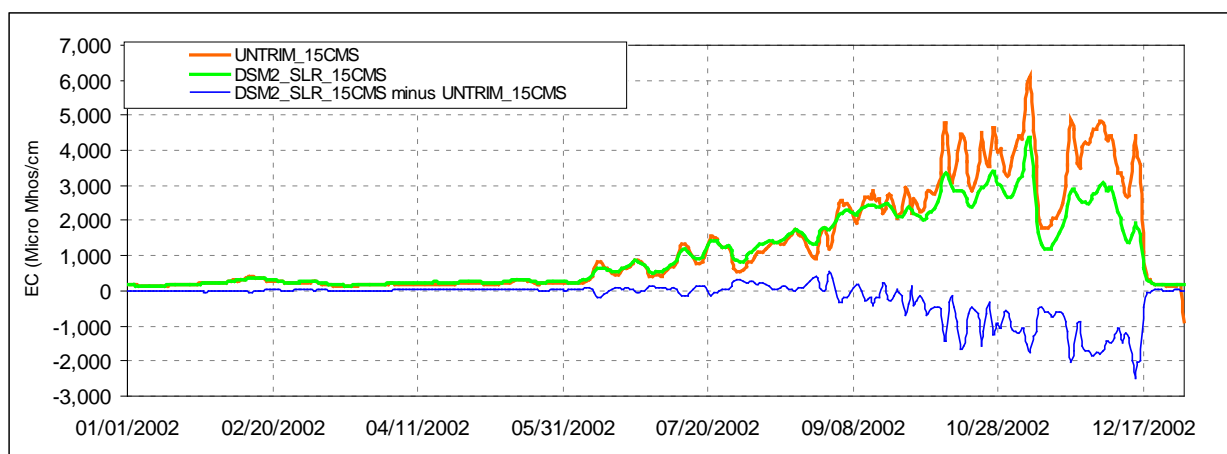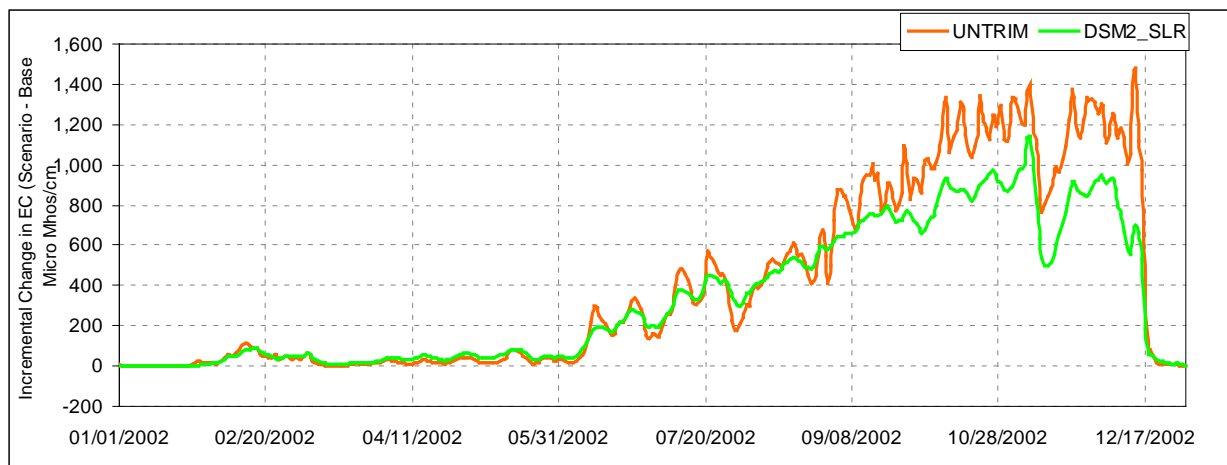
Figure 39: Comparison of Tidally-Averaged Daily EC and the Incremental Change in the Daily EC between the 45 cm Sea Level Rise and the Current Conditions Scenario from UnTRIM Model and DSM2 Model for Sacramento River at Emmaton Location
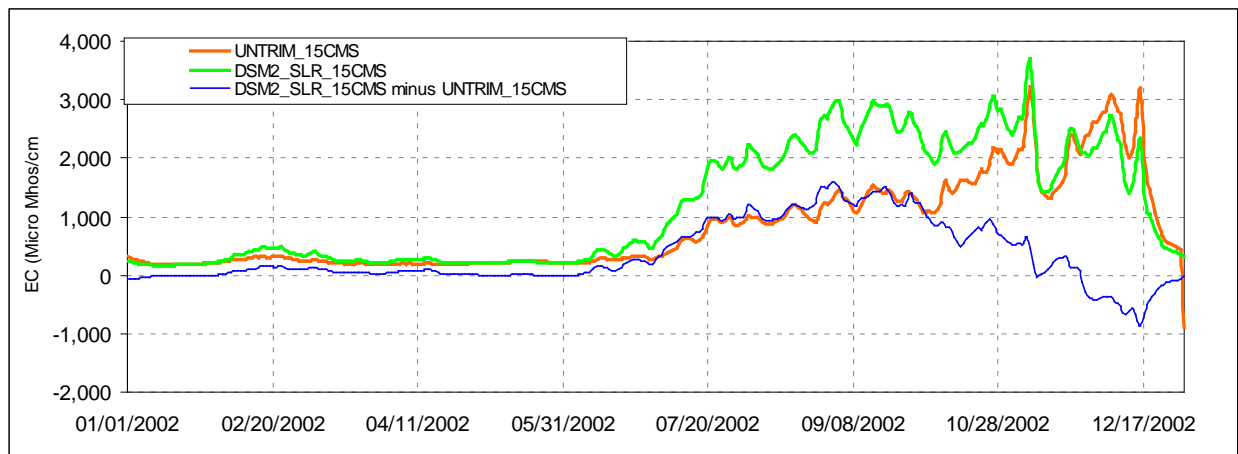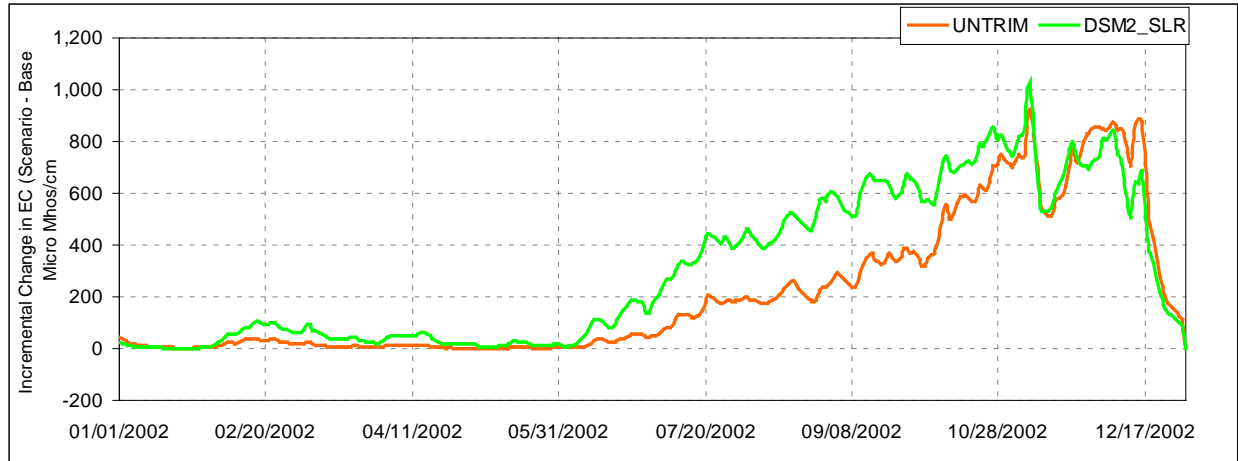
Figure 40: Comparison of Tidally-Averaged Daily EC and the Incremental Change in the Daily EC between the 45 cm Sea Level Rise and the Current Conditions Scenario from UnTRIM Model and DSM2 Model for San Joaquin River at Jersey Point Location
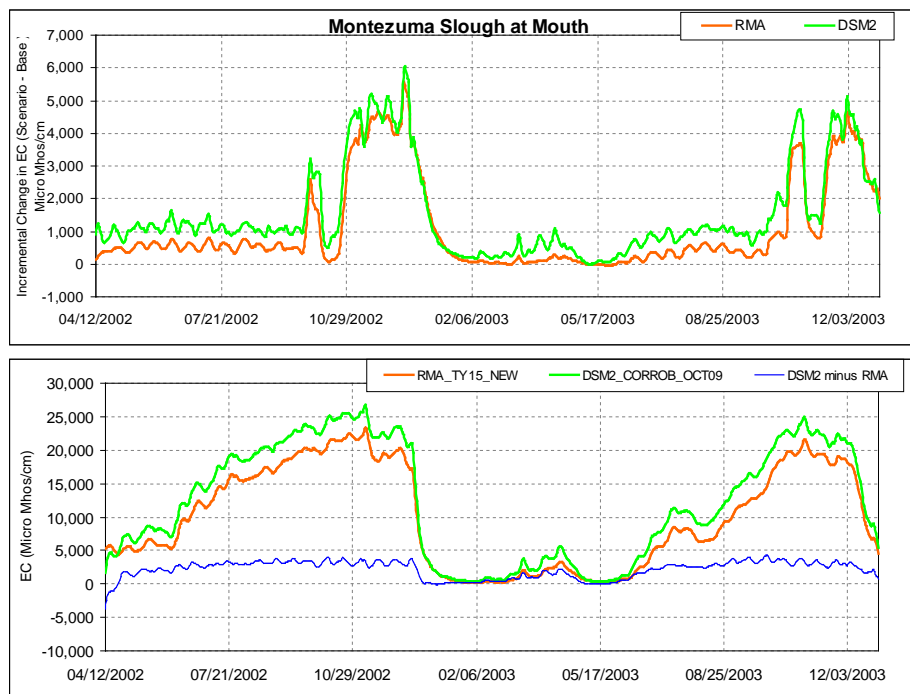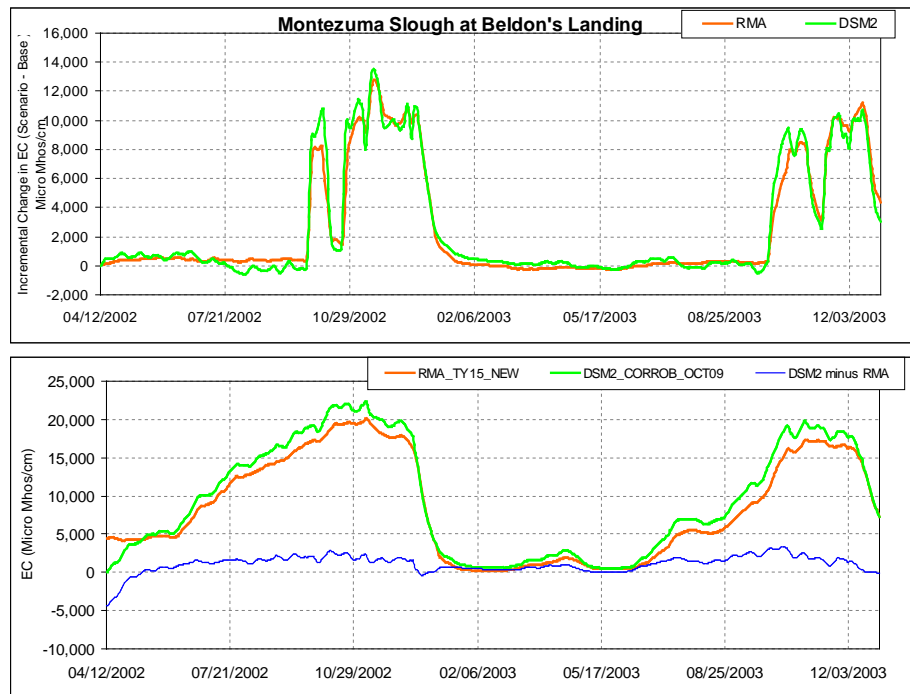
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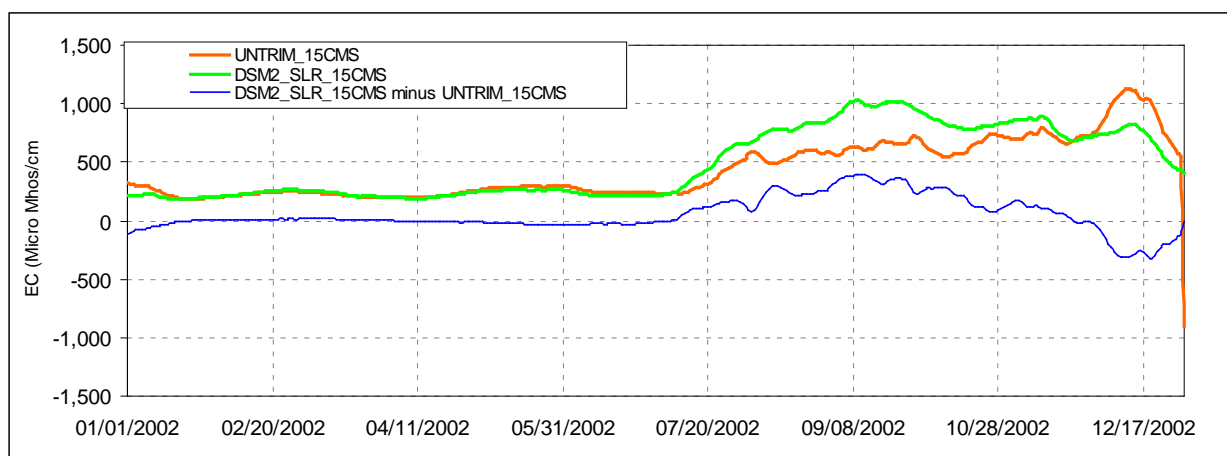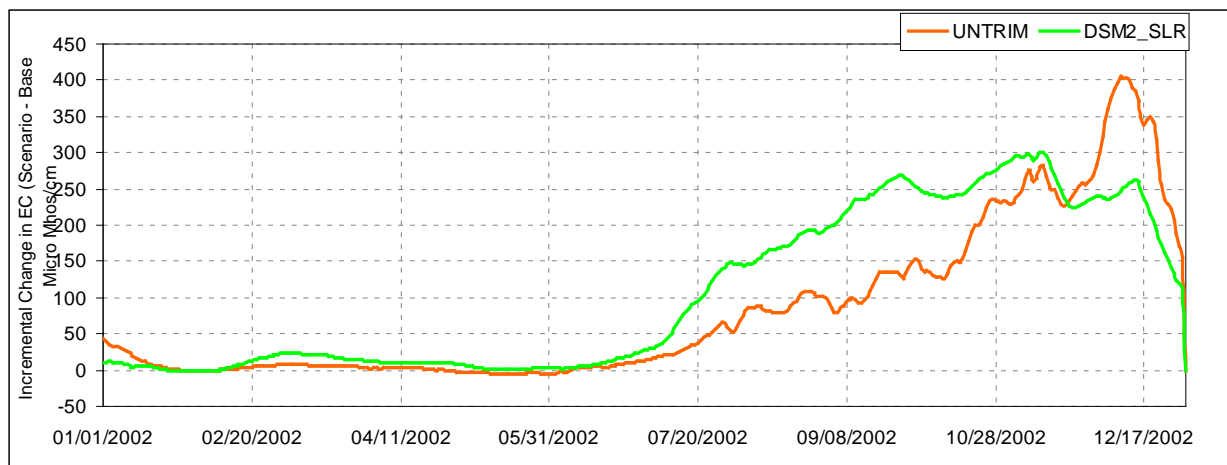
Figure 41: Comparison of Tidally-Averaged Daily EC and the Incremental Change in the Daily EC between the 45 cm Sea Level Rise and the Current Conditions Scenario from UnTRIM Model and DSM2 Model for Old River at Rock Slough Location

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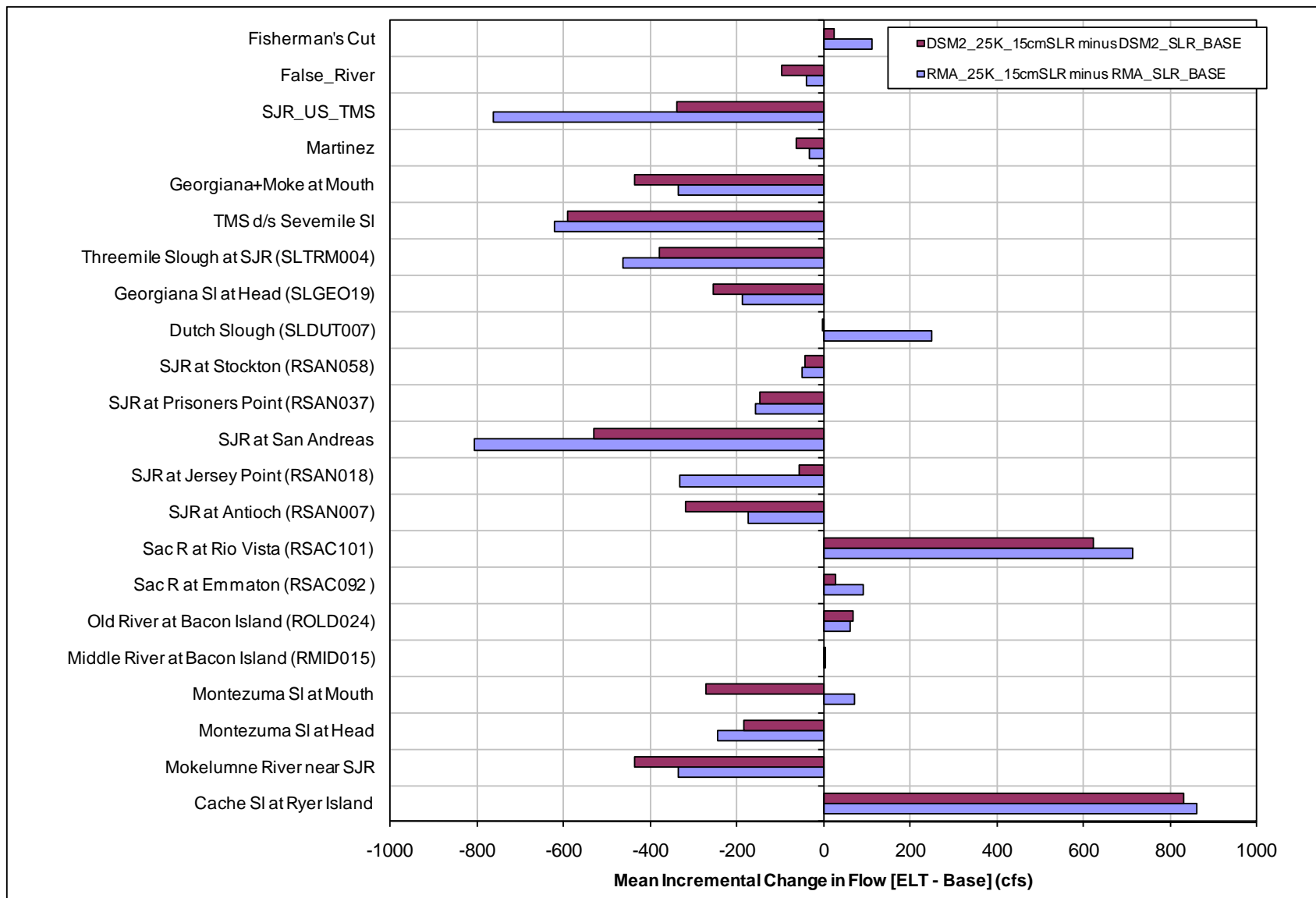
Figure 42: Comparison of average incremental change in tidally averaged flow in Integrated Early Long-Term scenario from the baseline between DSM2 and RMA

Figure 43: Comparison of average tidally averaged breach flows in Integrated Early Long-Term scenario from the baseline between DSM2 and RMA
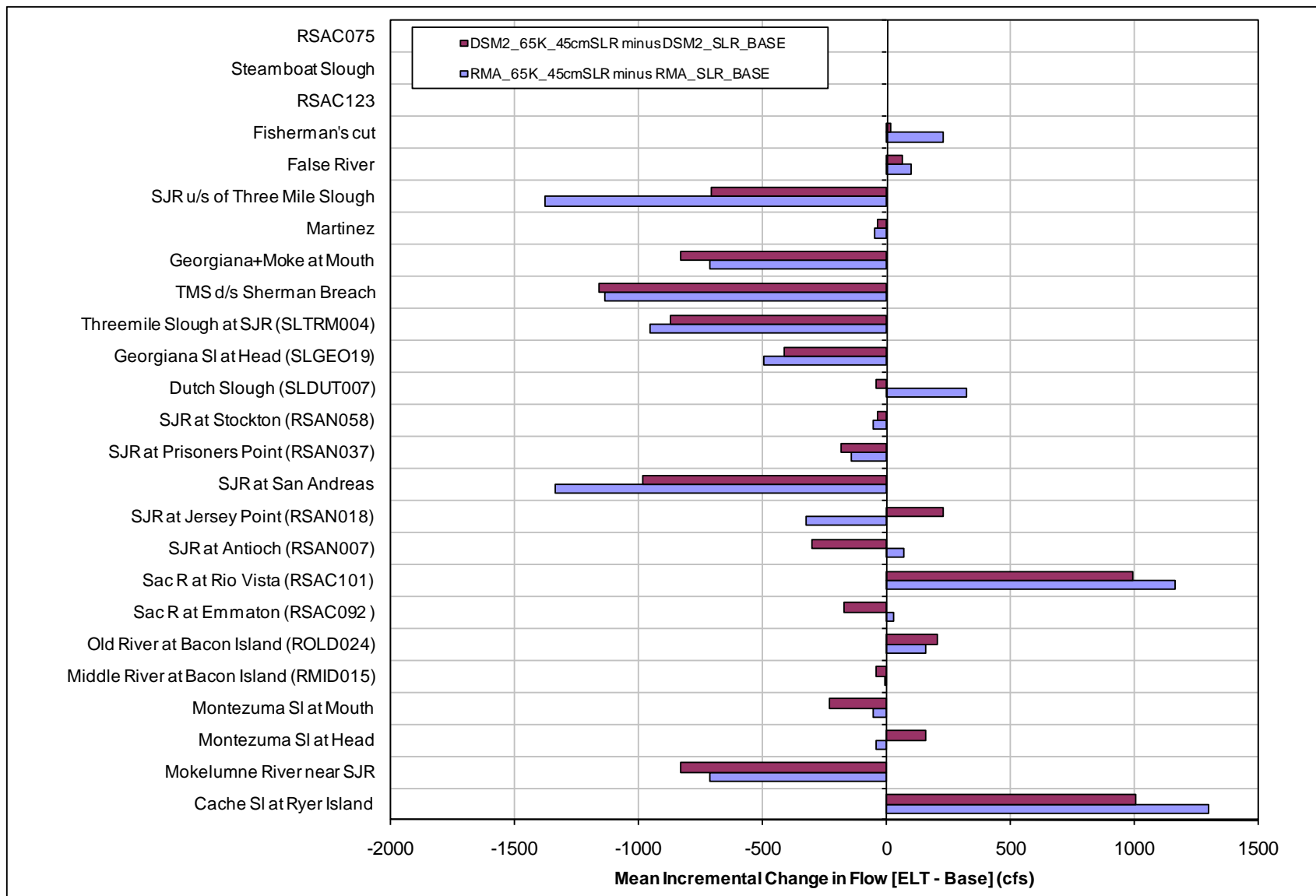
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2 Figure 44: Comparison of average incremental change in tidally averaged flow in Integrated Late Long-Term scenario from the baseline between
3 DSM2 and RMA
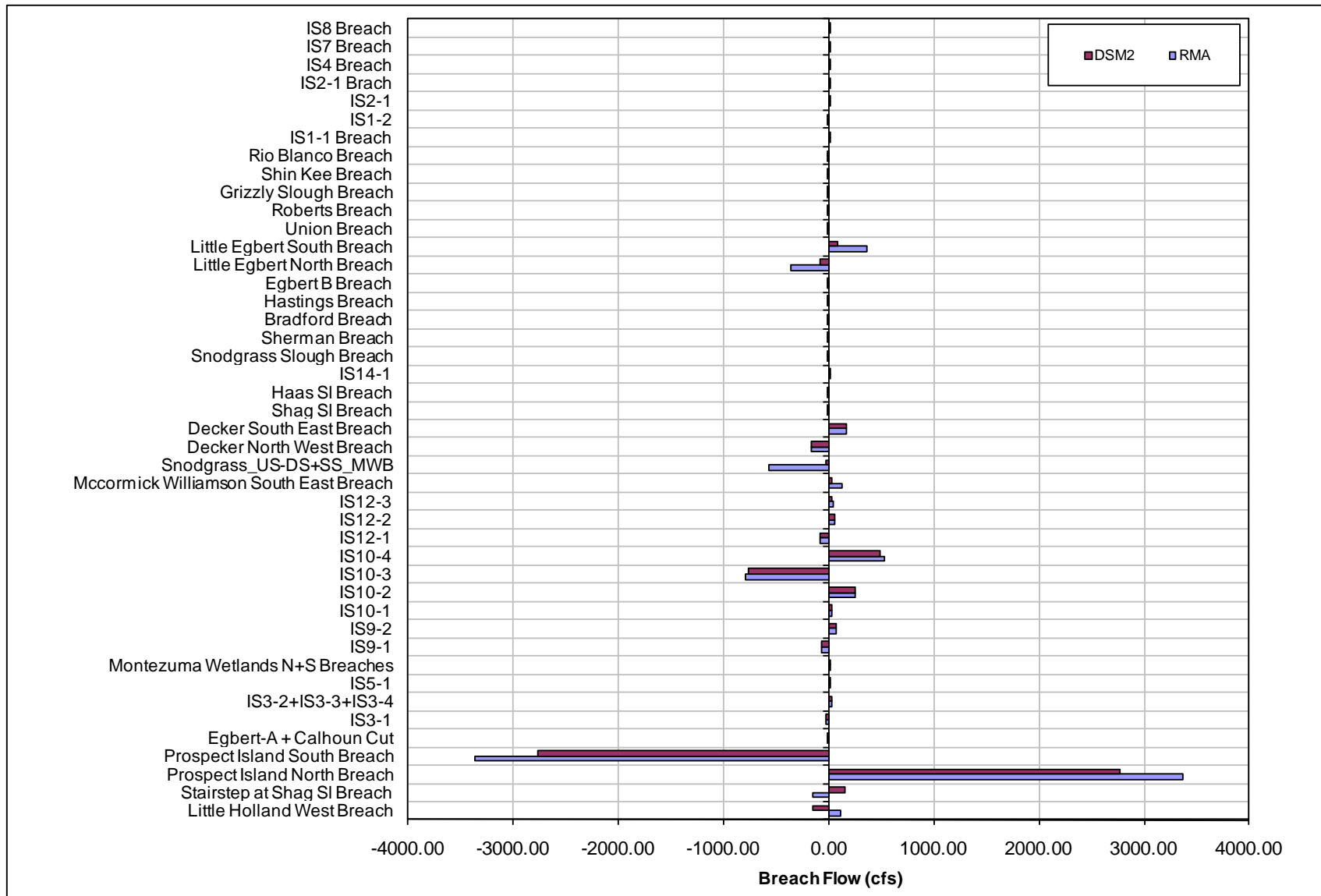
Figure 45: Comparison of average tidally averaged breach flows in Integrated Late Long-Term scenario from the baseline between DSM2 and RMA
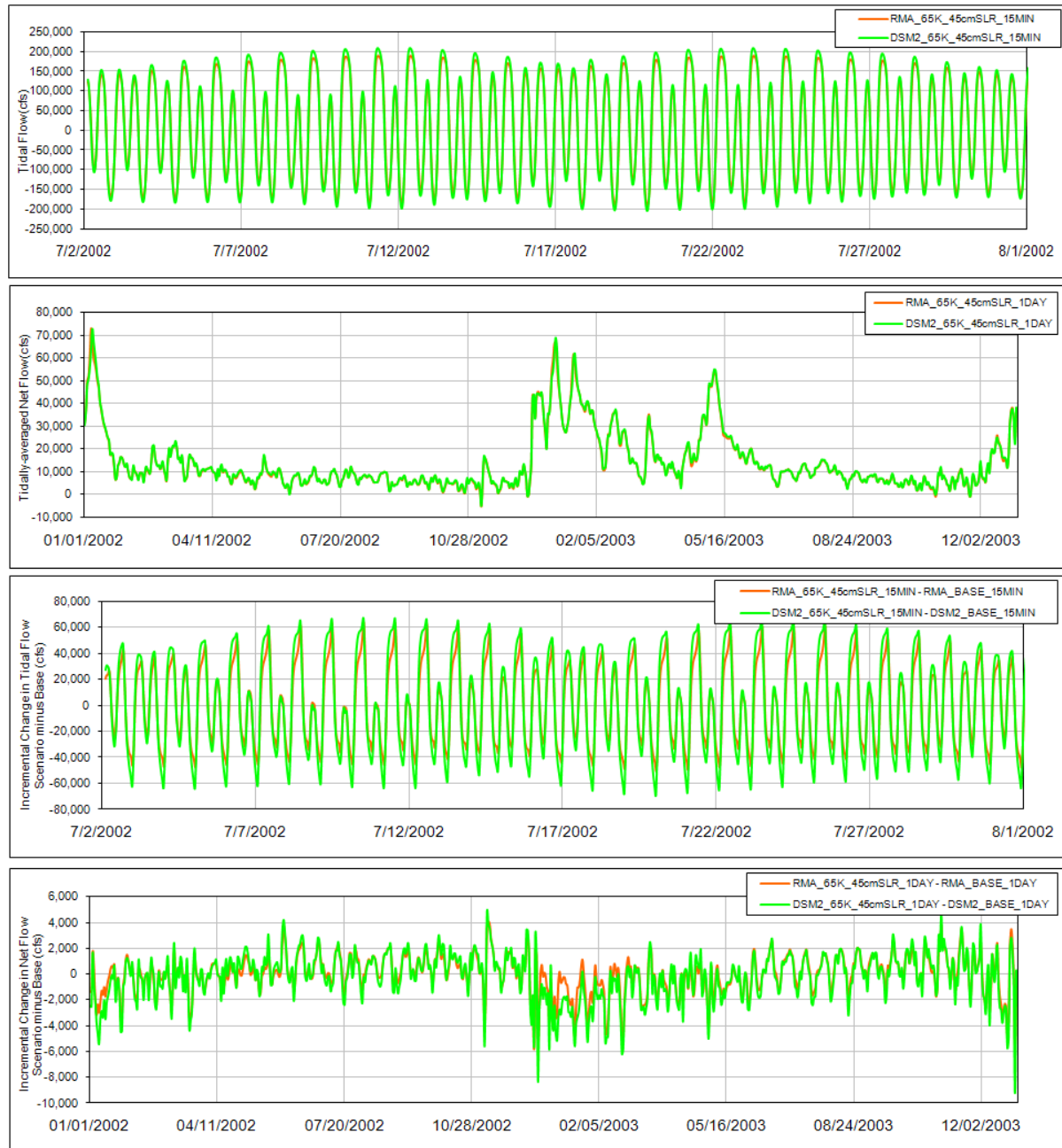
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2 Figure 46: Comparison of Tidal Flow, Tidally-Averaged Daily Flow, Incremental Change in Tidal Flow
3 and the Incremental Change in the Daily Flow between the Integrated Late Long-term Scenario and
4 the Current Conditions Scenario from RMA Model and DSM2 Model for Sacramento River at
5 Emmaton Location

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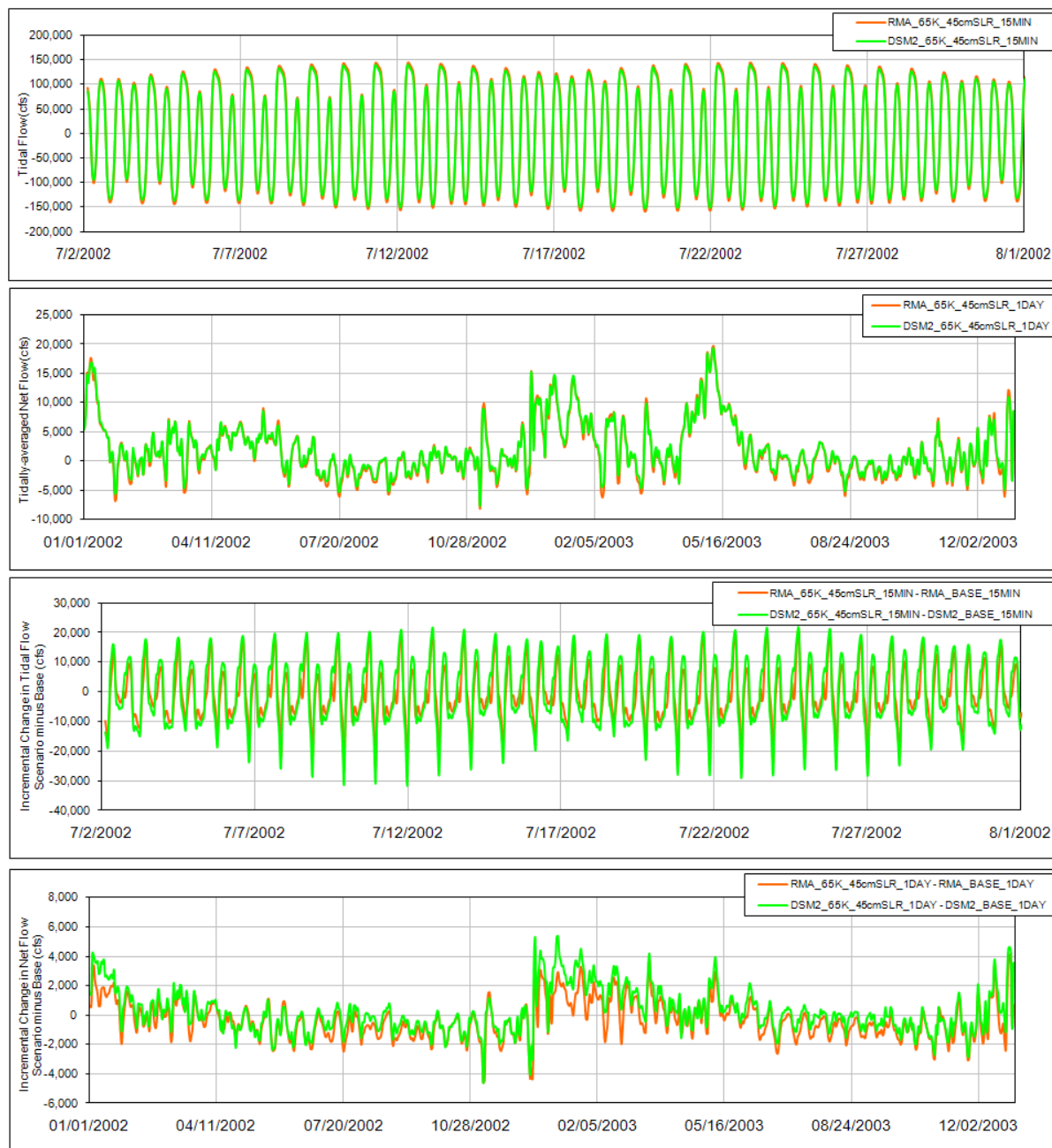
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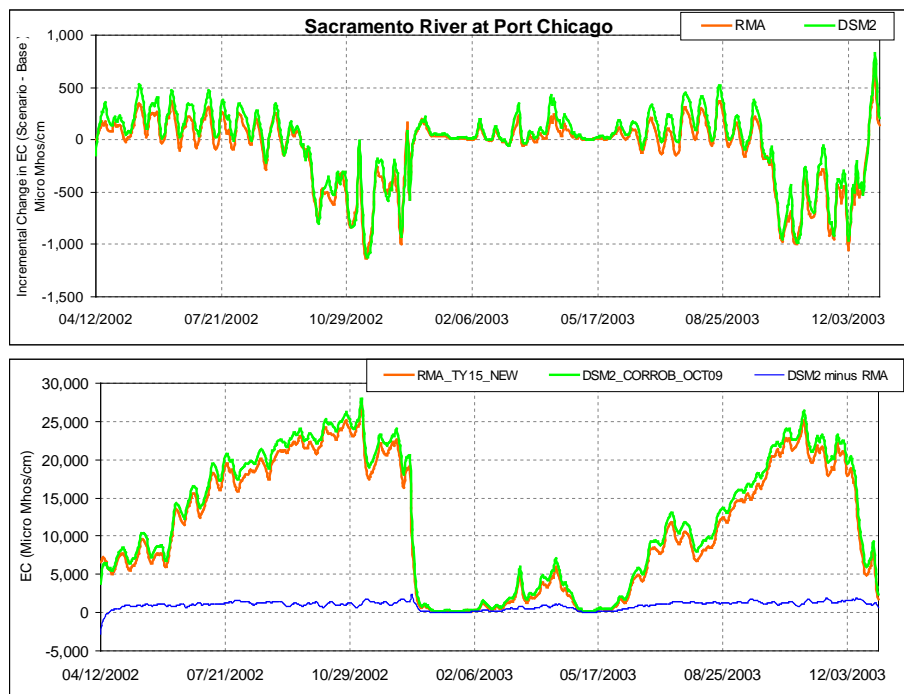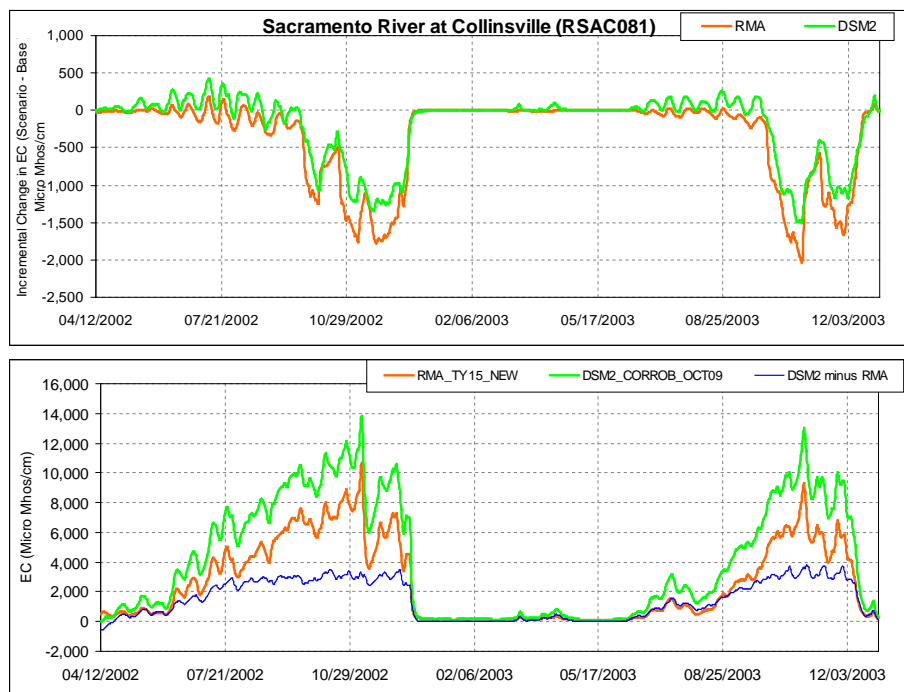2   Figure 47: Comparison of Tidal Flow, Tidally-Averaged Daily Flow, Incremental Change in Tidal Flow
3   and the Incremental Change in the Daily Flow between the Integrated Late Long-term Scenario and
4   the Current Conditions Scenario from RMA Model and DSM2 Model for San Joaquin River at Jersey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

1
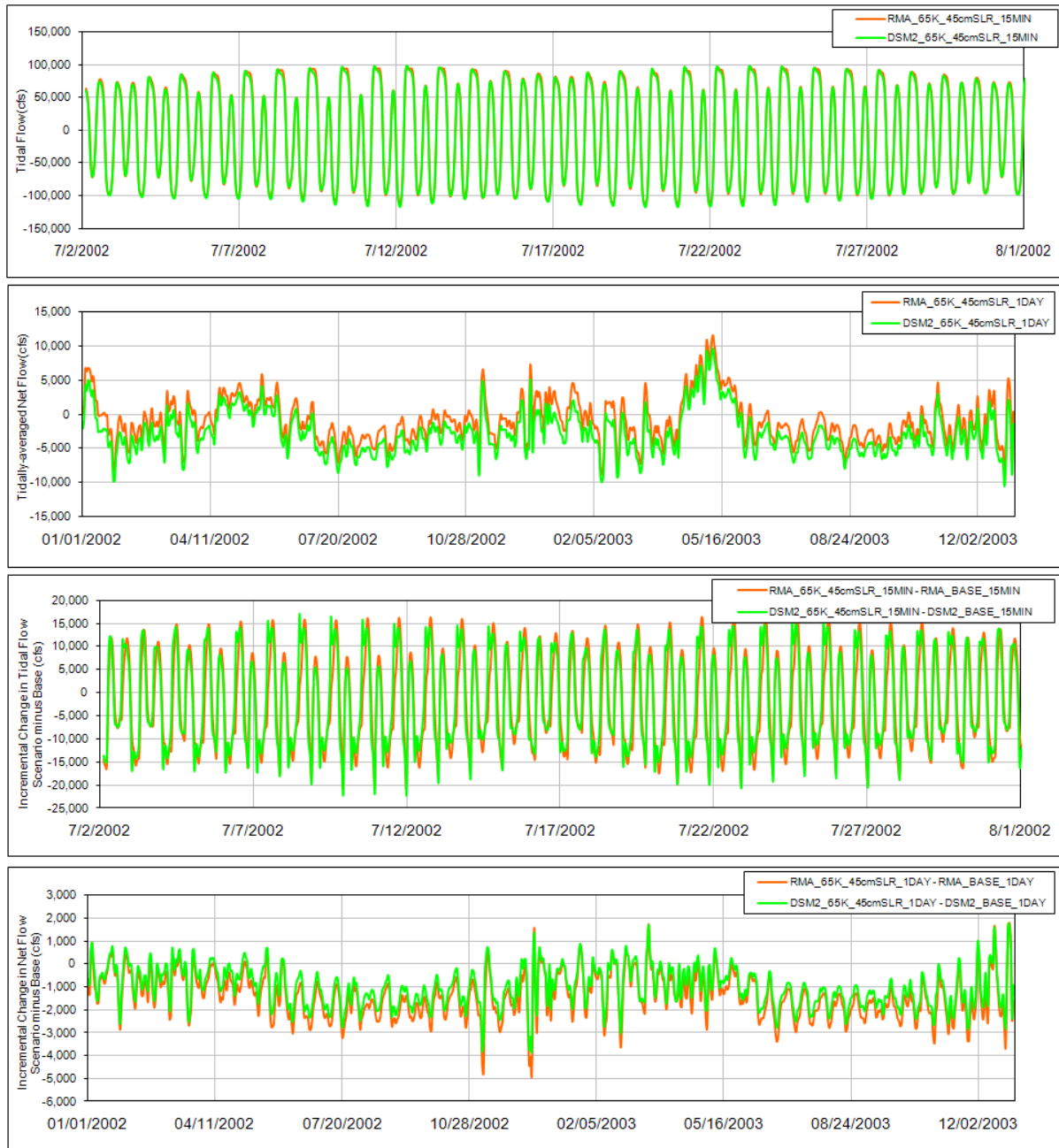
2 Figure 48: Comparison of Tidal Flow, Tidally-Averaged Daily Flow, Incremental Change in Tidal Flow
3 and the Incremental Change in the Daily Flow between the Integrated Late Long-term Scenario and
4 the Current Conditions Scenario from RMA Model and DSM2 Model for San Joaquin River at San
5 Andreas Location

6
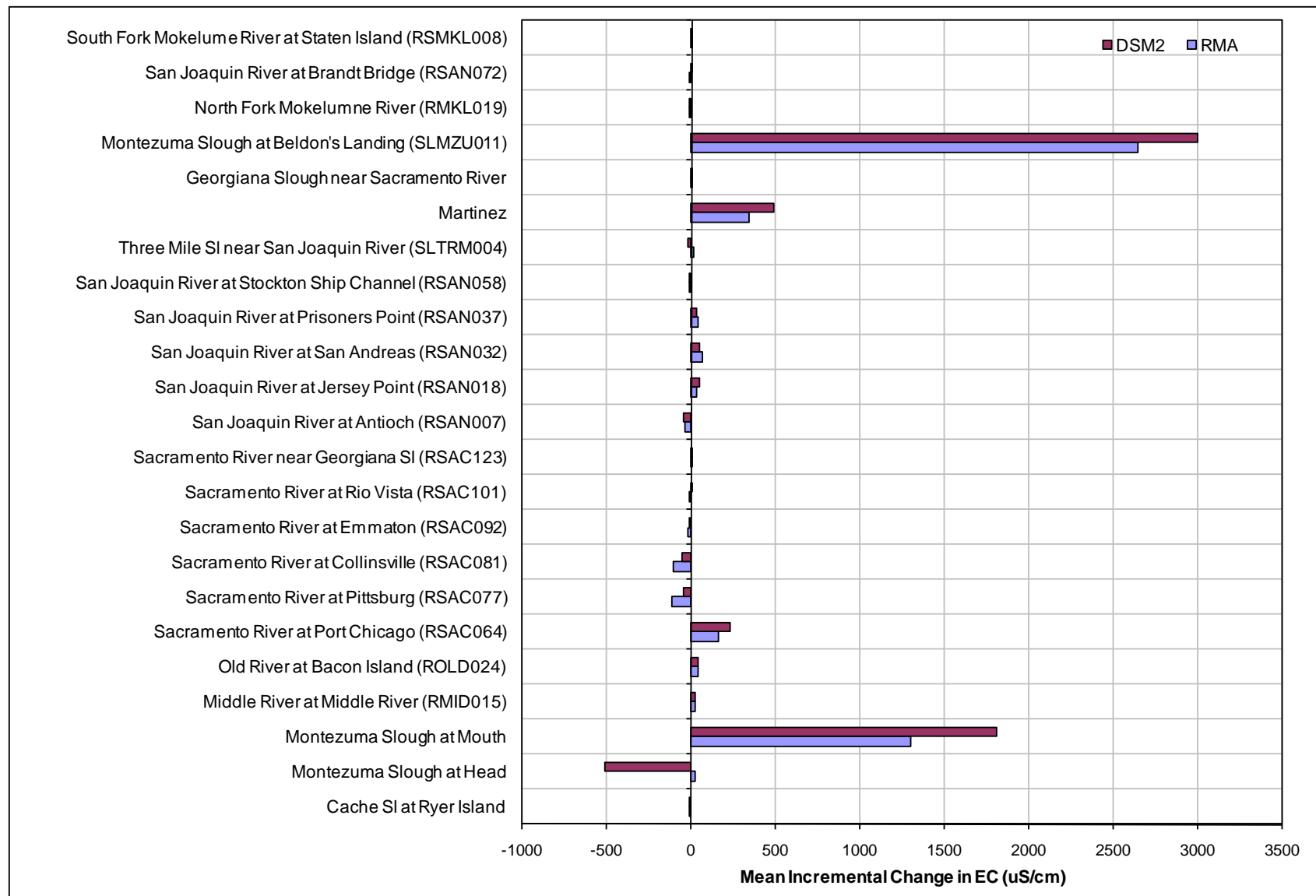
Figure 49: Comparison of average incremental change in tidally averaged EC in Integrated Early Long-Term scenario from the baseline between DSM2 and RMA
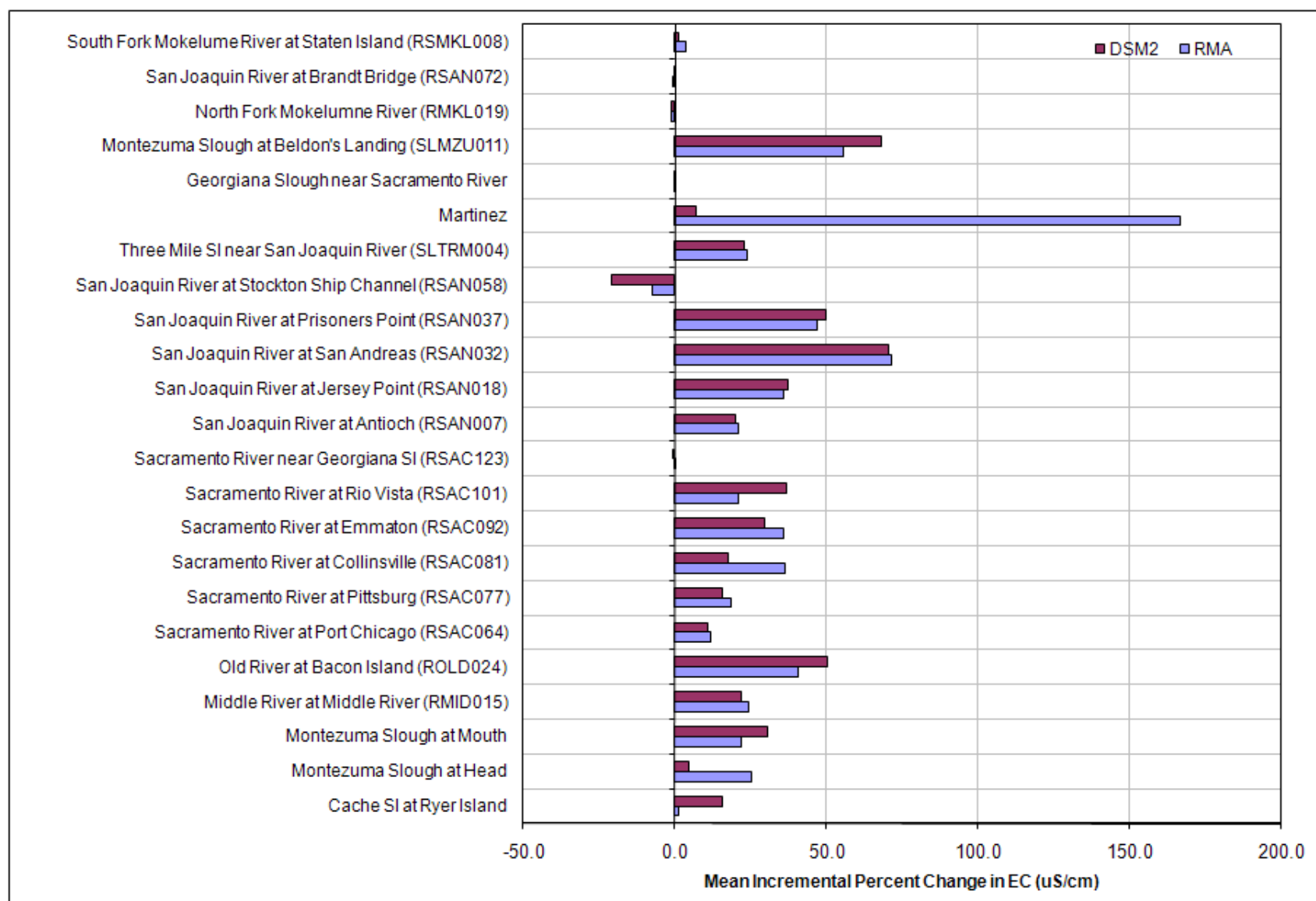
Figure 50: Comparison of average incremental change in tidally averaged EC in Integrated Late Long-Term scenario from the baseline between DSM2 and RMA
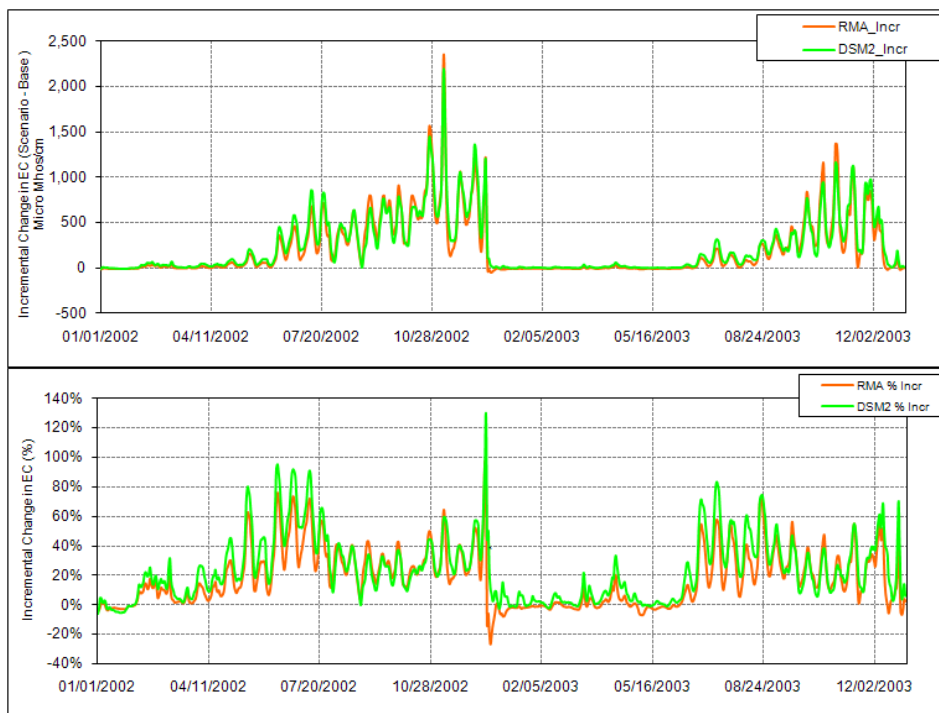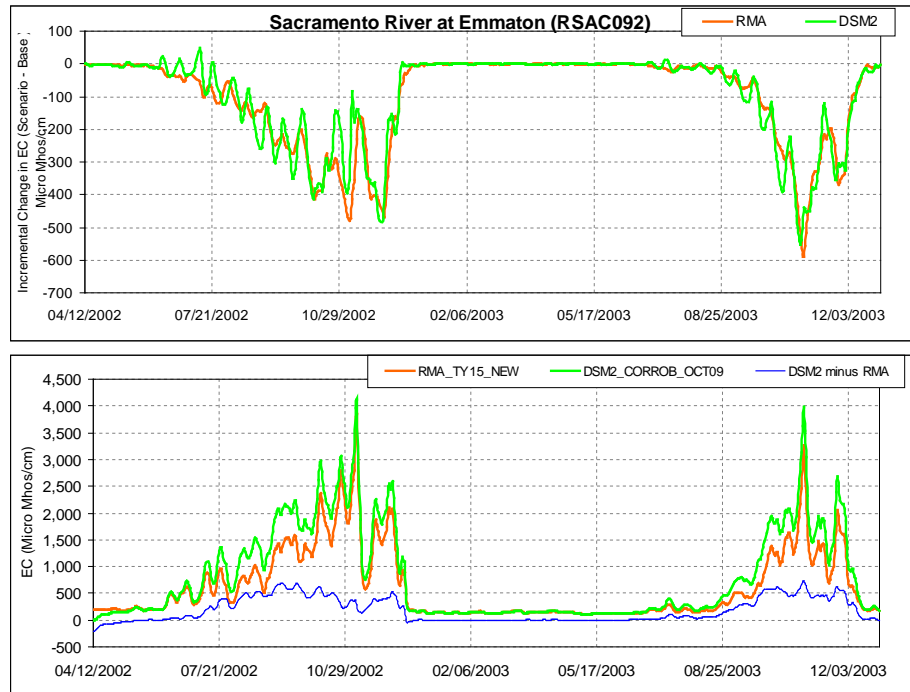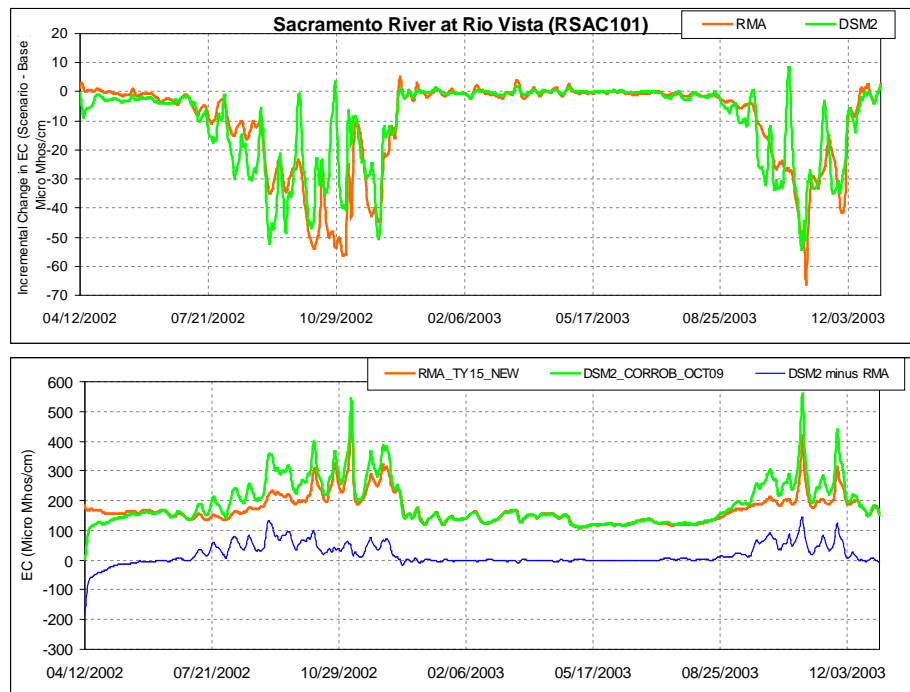
1

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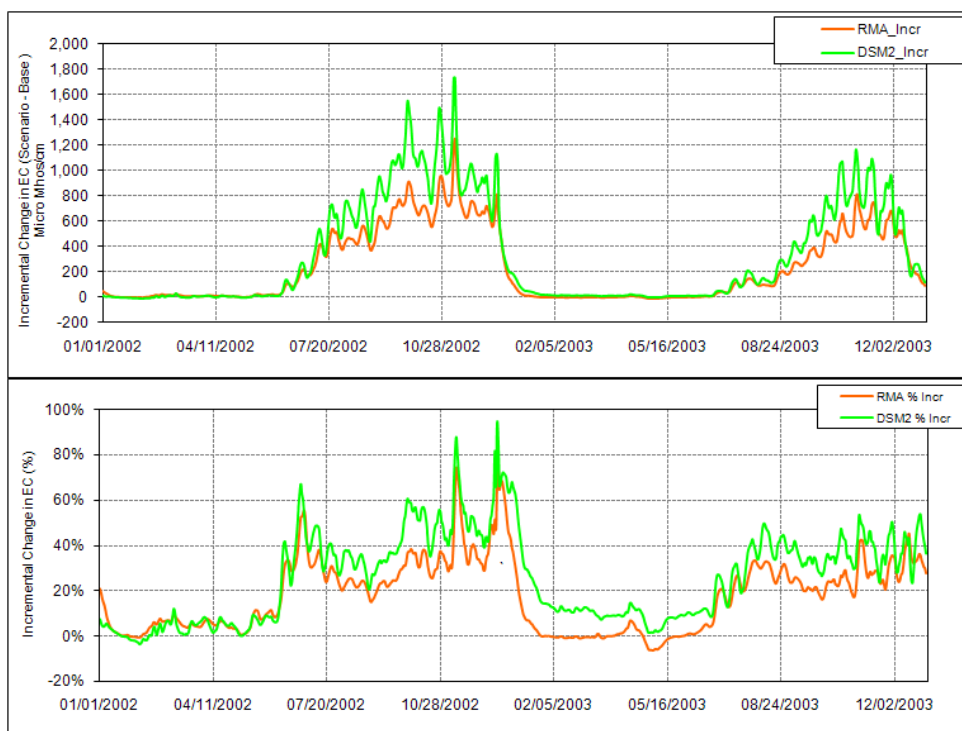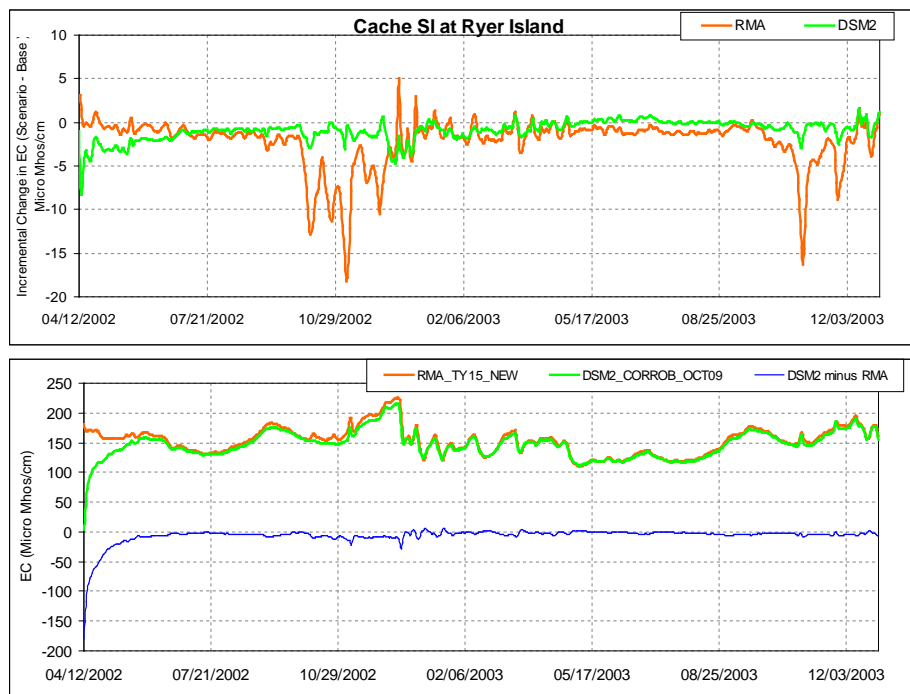

5

6 Figure 52: Comparison of Tidally-Averaged Daily EC and the Incremental Change in the Daily EC
7 between the Integrated Late Long-term Scenario and the Current Conditions Scenario from RMA
8 Model and DSM2 Model for San Joaquin River at Jersey Point Location
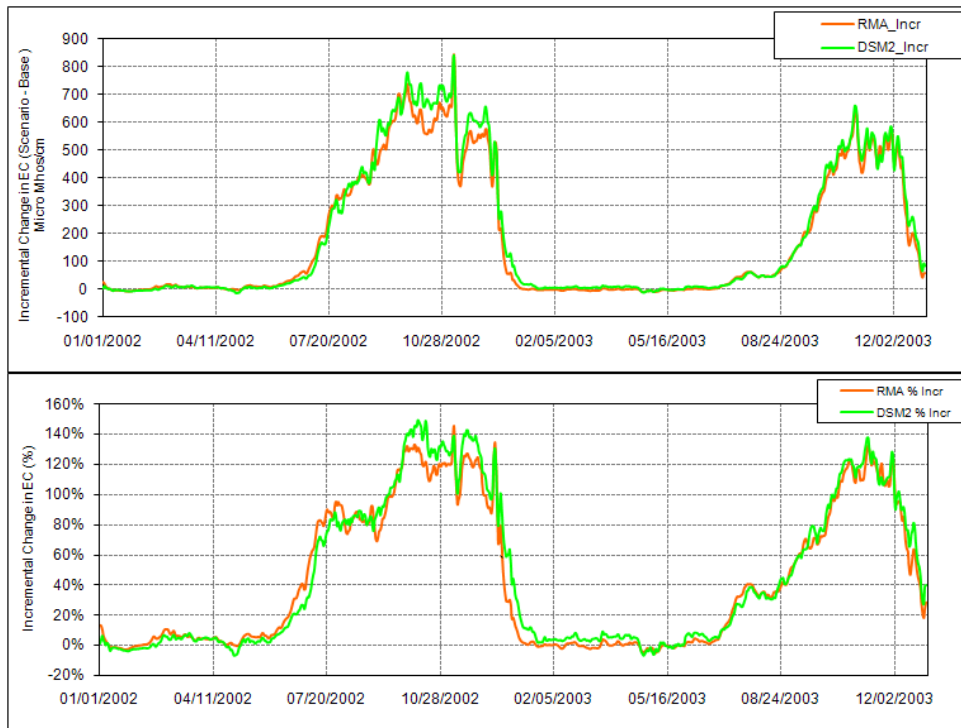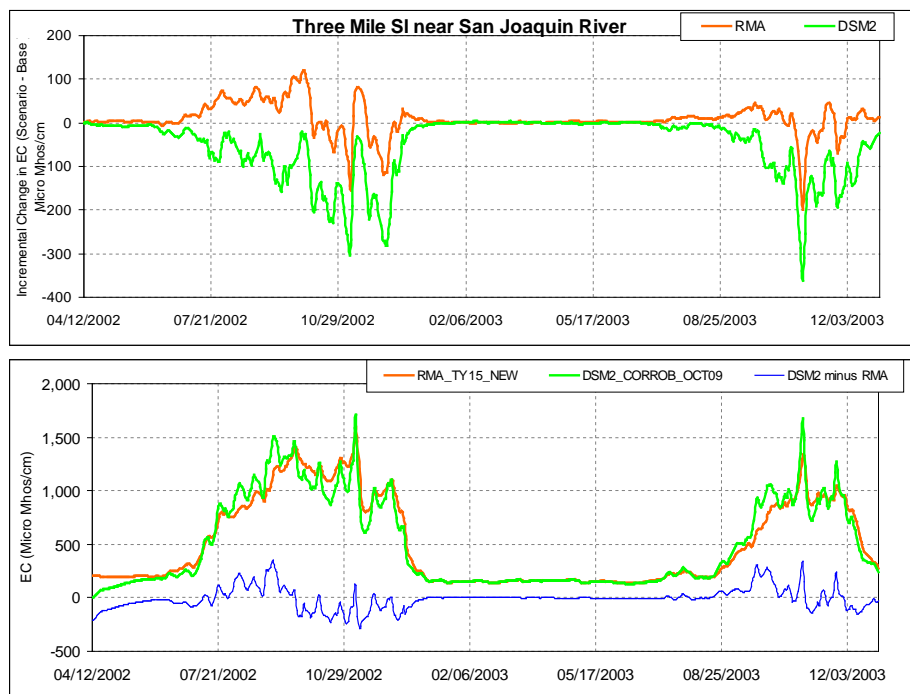
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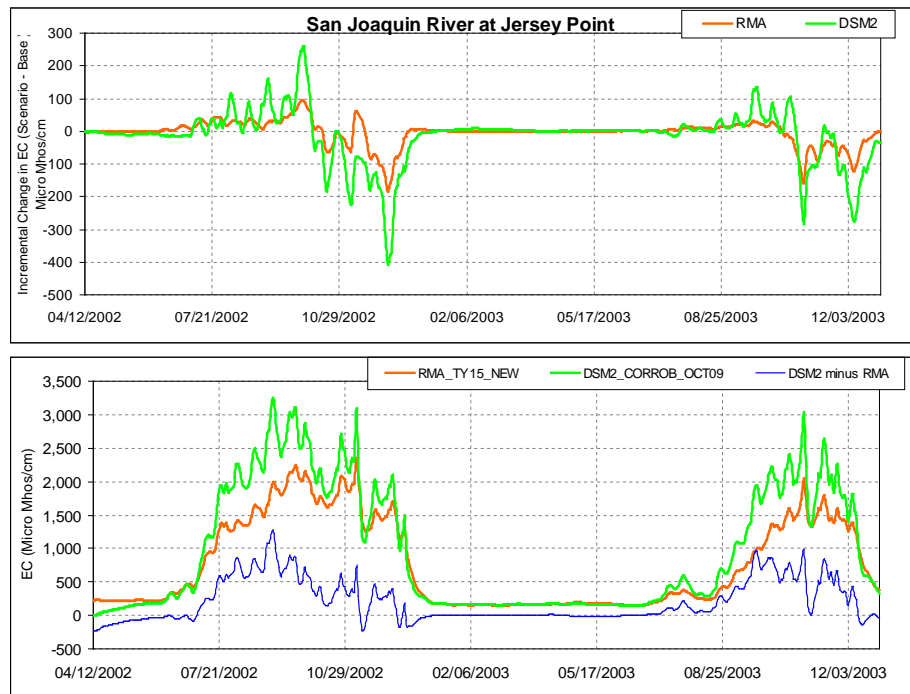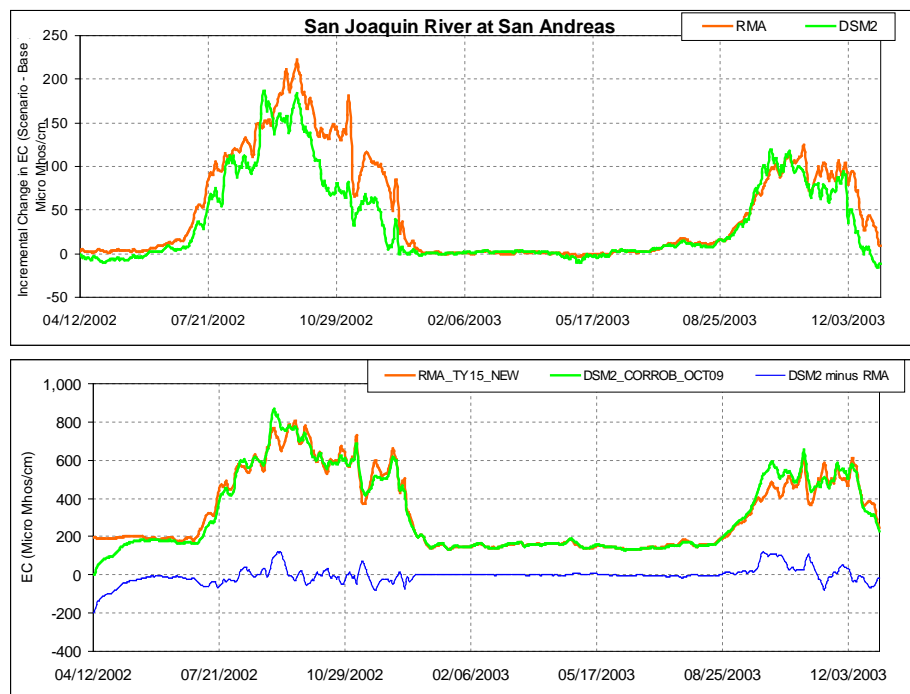2 Figure 53: Comparison of Tidally-Averaged Daily EC and the Incremental Change in the Daily EC
3 between the Integrated Late Long-term Scenario and the Current Conditions Scenario from RMA
4 Model and DSM2 Model for San Joaquin River at San Andreas Location

5

Attachment 1: Detailed Corroboration Results

1 Near-Term 14,000ac Restoration Corroboration

2 Hydrodynamics Results

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

6
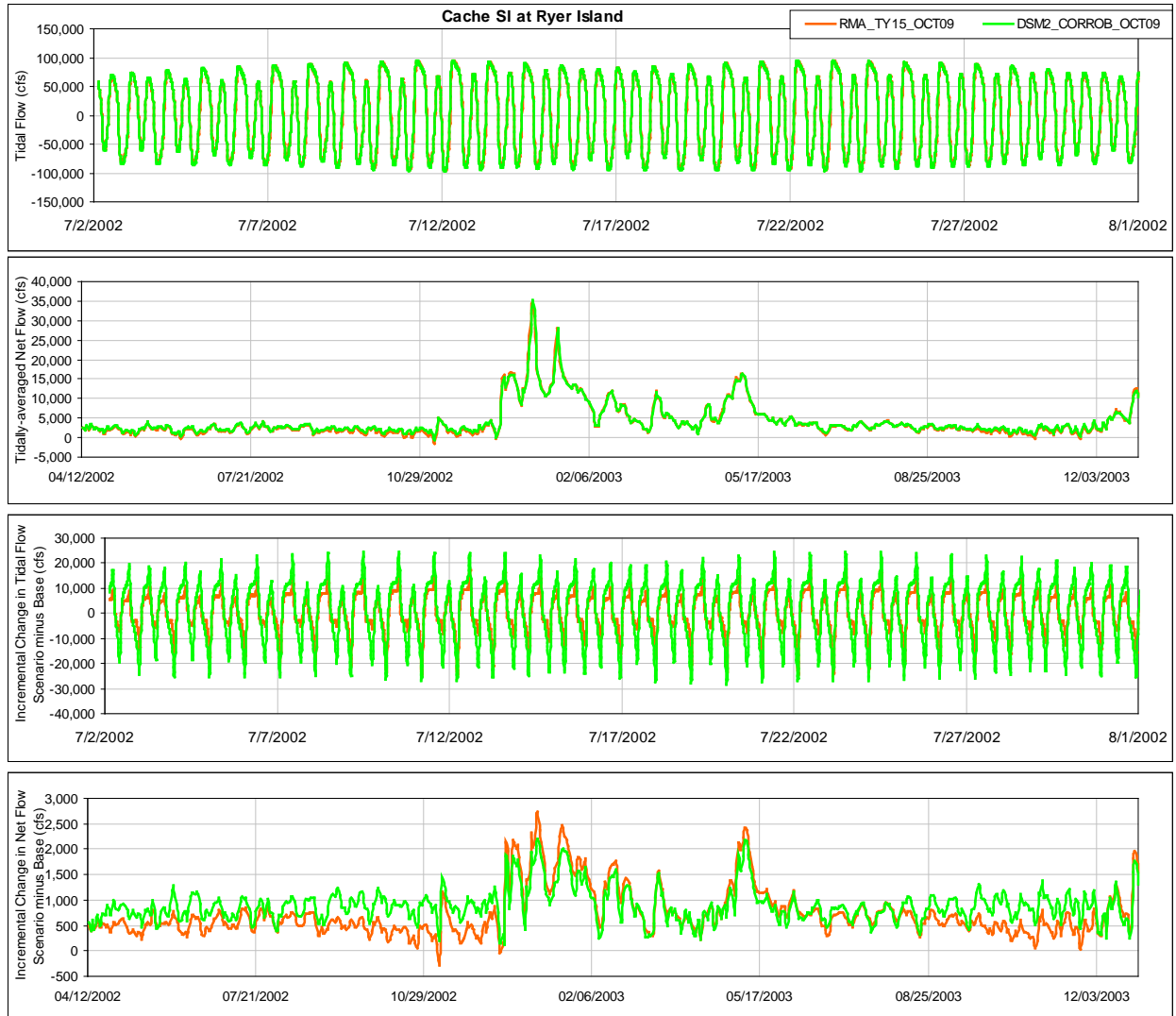
1 Figure 1-2. Comparison of Tidal Flow, Tidally-Averaged Daily Flow, Incremental Change in Tidal Flow
2 and the Incremental Change in the Daily Flow between the Near-Term Scenario and the Current
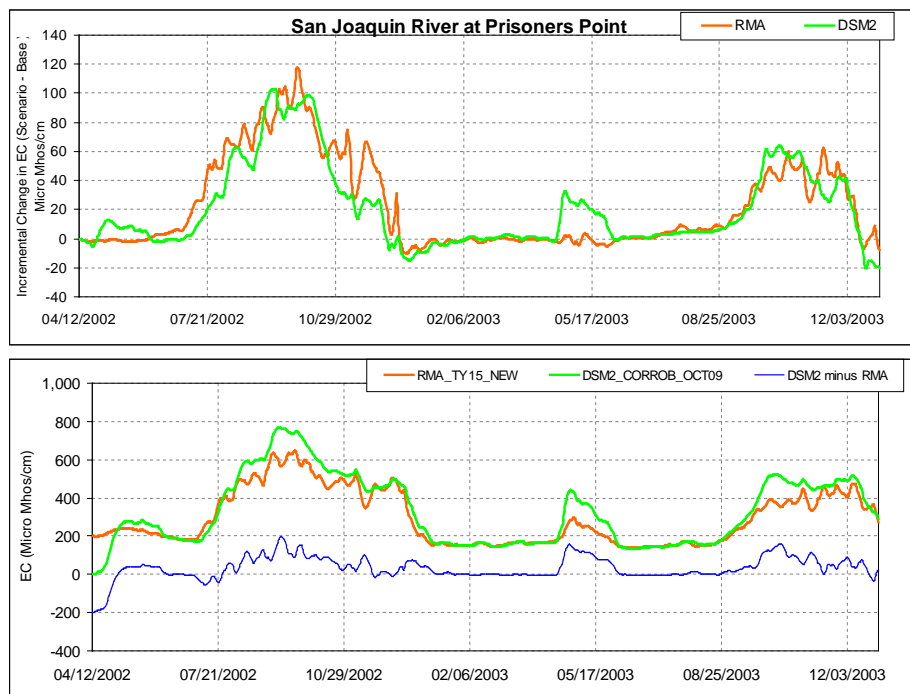3 Conditions Scenario from RMA Model and DSM2 Model for Sacramento River at Rio Vista Location

4
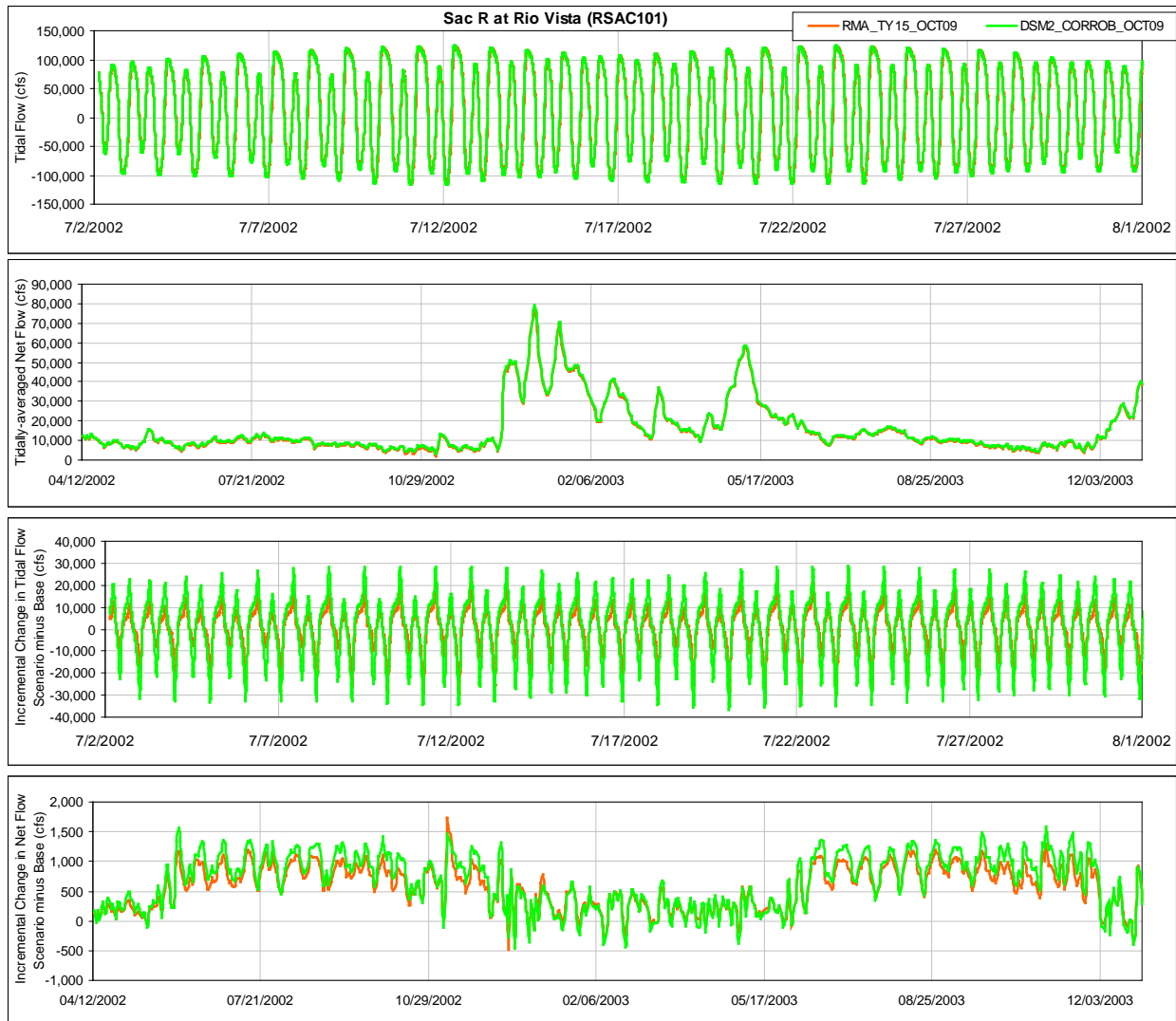
1 Figure 1-3. Comparison of Tidal Flow, Tidally-Averaged Daily Flow, Incremental Change in Tidal Flow
2 and the Incremental Change in the Daily Flow between the Near-Term Scenario and the Current
3 Conditions Scenario from RMA Model and DSM2 Model for Georgiana SI at Head Location
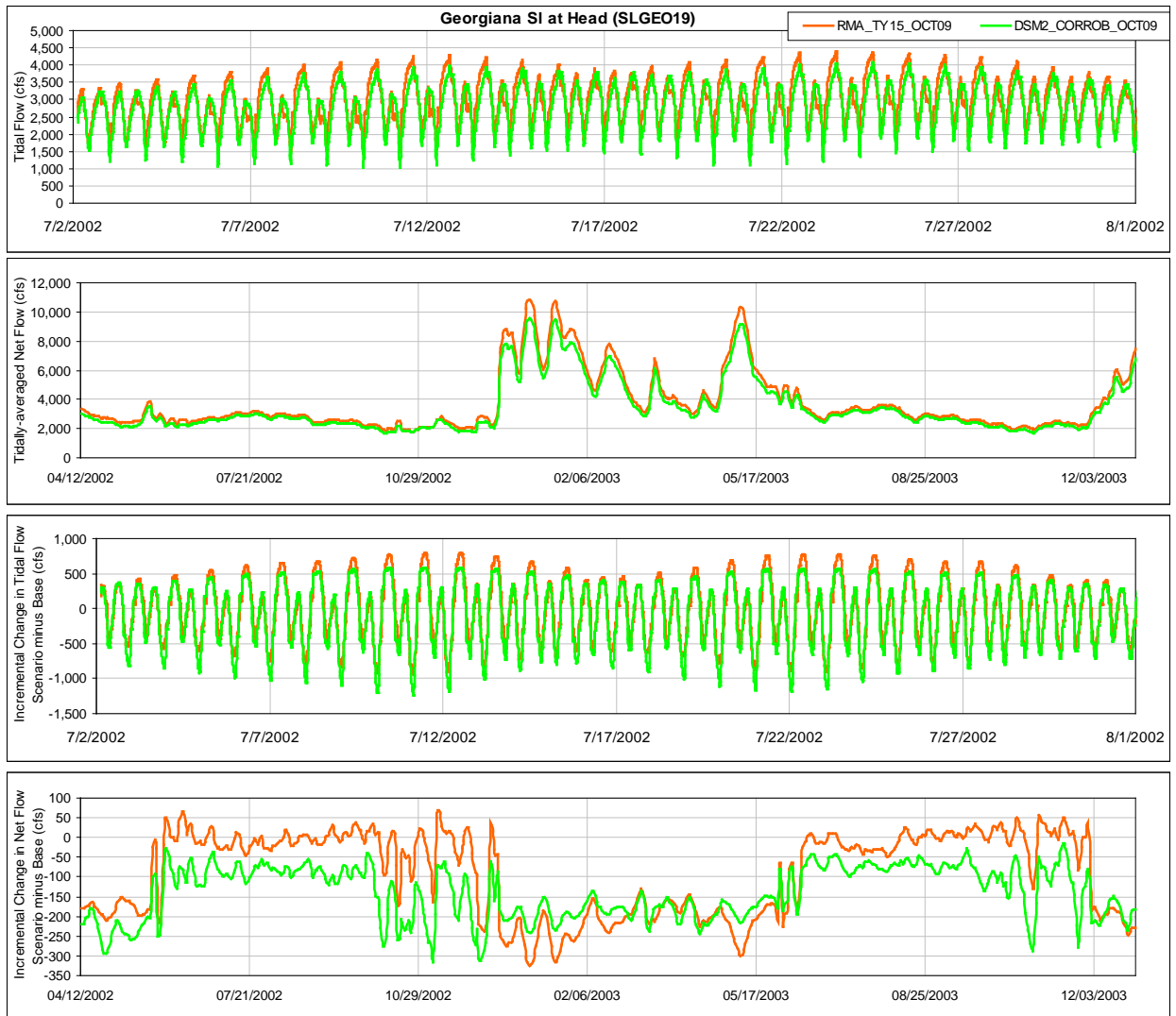
4

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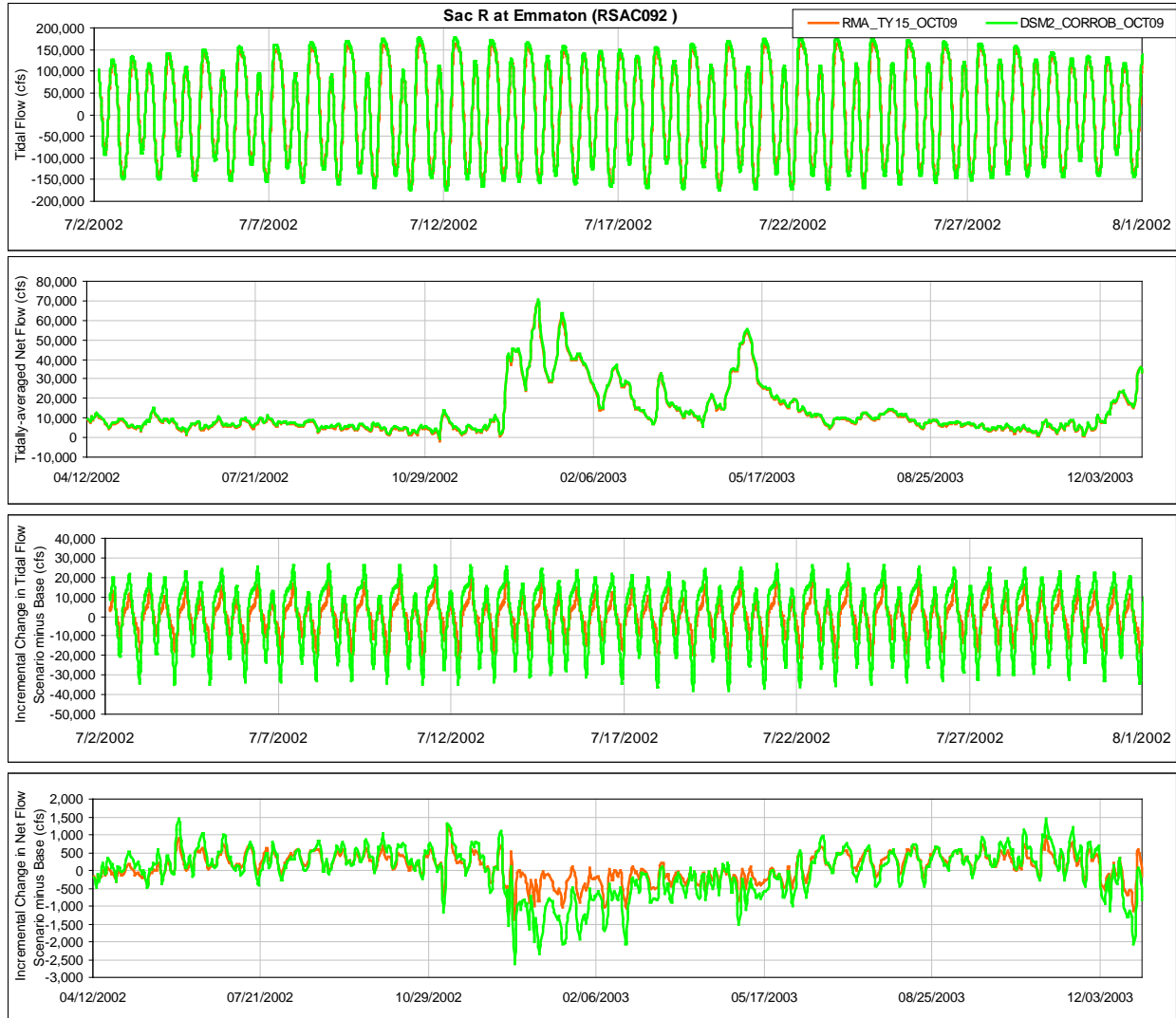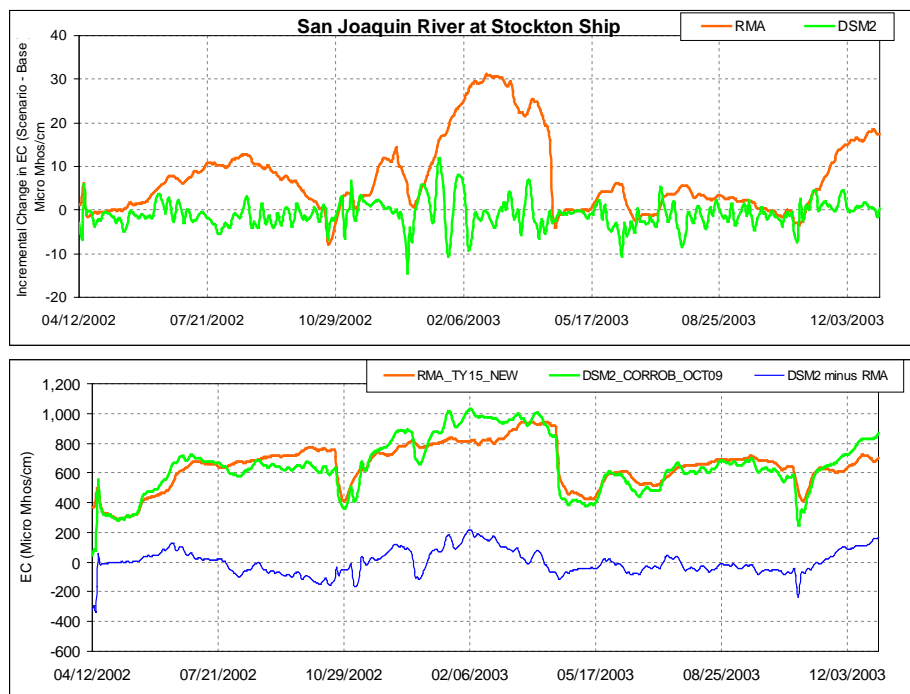

4

1 Figure 1-5. Comparison of Tidal Flow, Tidally-Averaged Daily Flow, Incremental Change in Tidal Flow
2 and the Incremental Change in the Daily Flow between the Near-Term Scenario and the Current
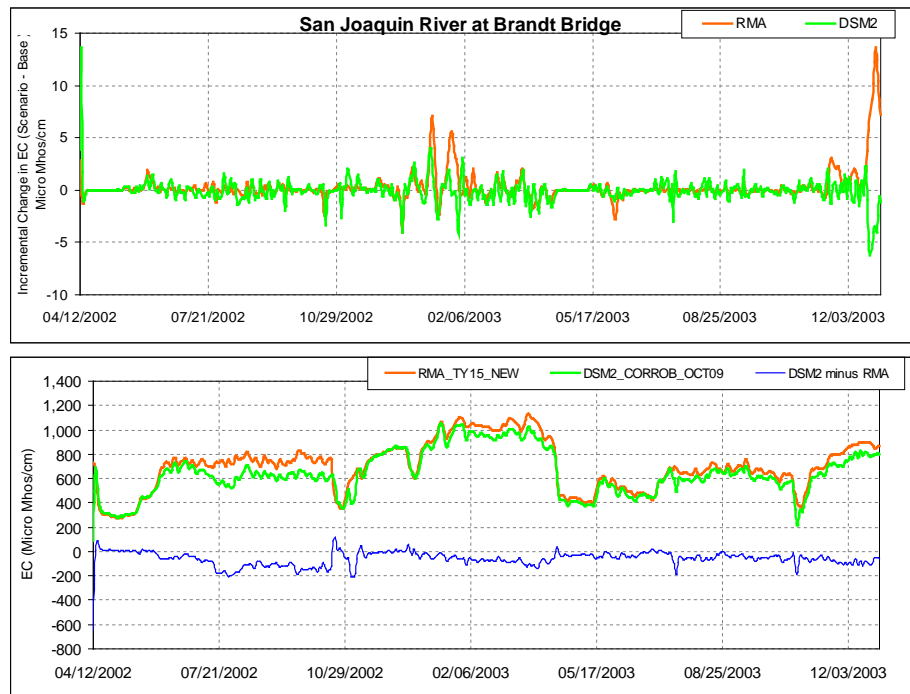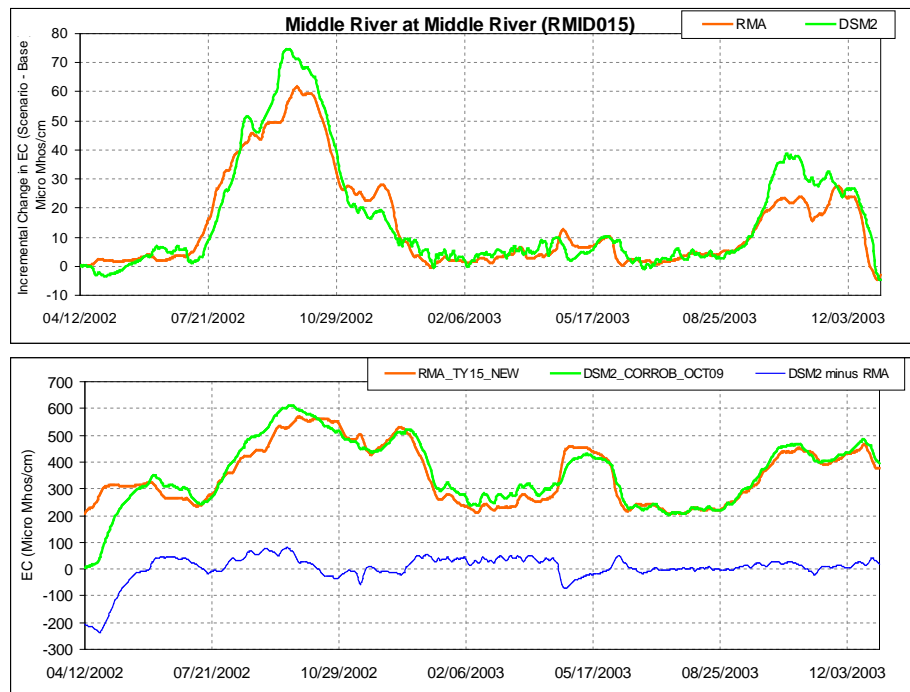3 Conditions Scenario from RMA Model and DSM2 Model for Montezuma SI at Head Location
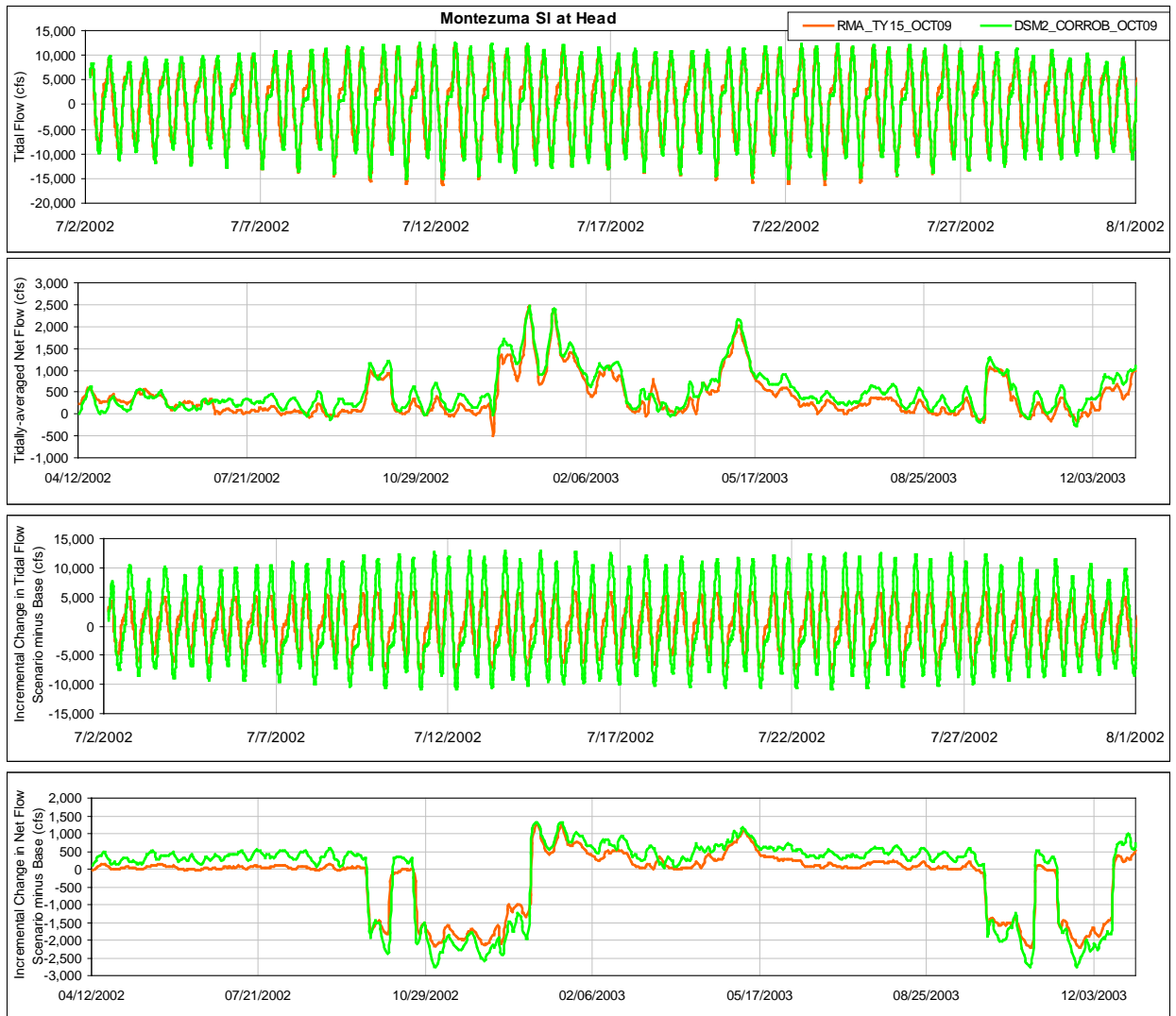
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1 Figure 1-6. Comparison of Tidal Flow, Tidally-Averaged Daily Flow, Incremental Change in Tidal Flow
2 and the Incremental Change in the Daily Flow between the Near-Term Scenario and the Current
3 Conditions Scenario from RMA Model and DSM2 Model for Montezuma SI at Mouth Location
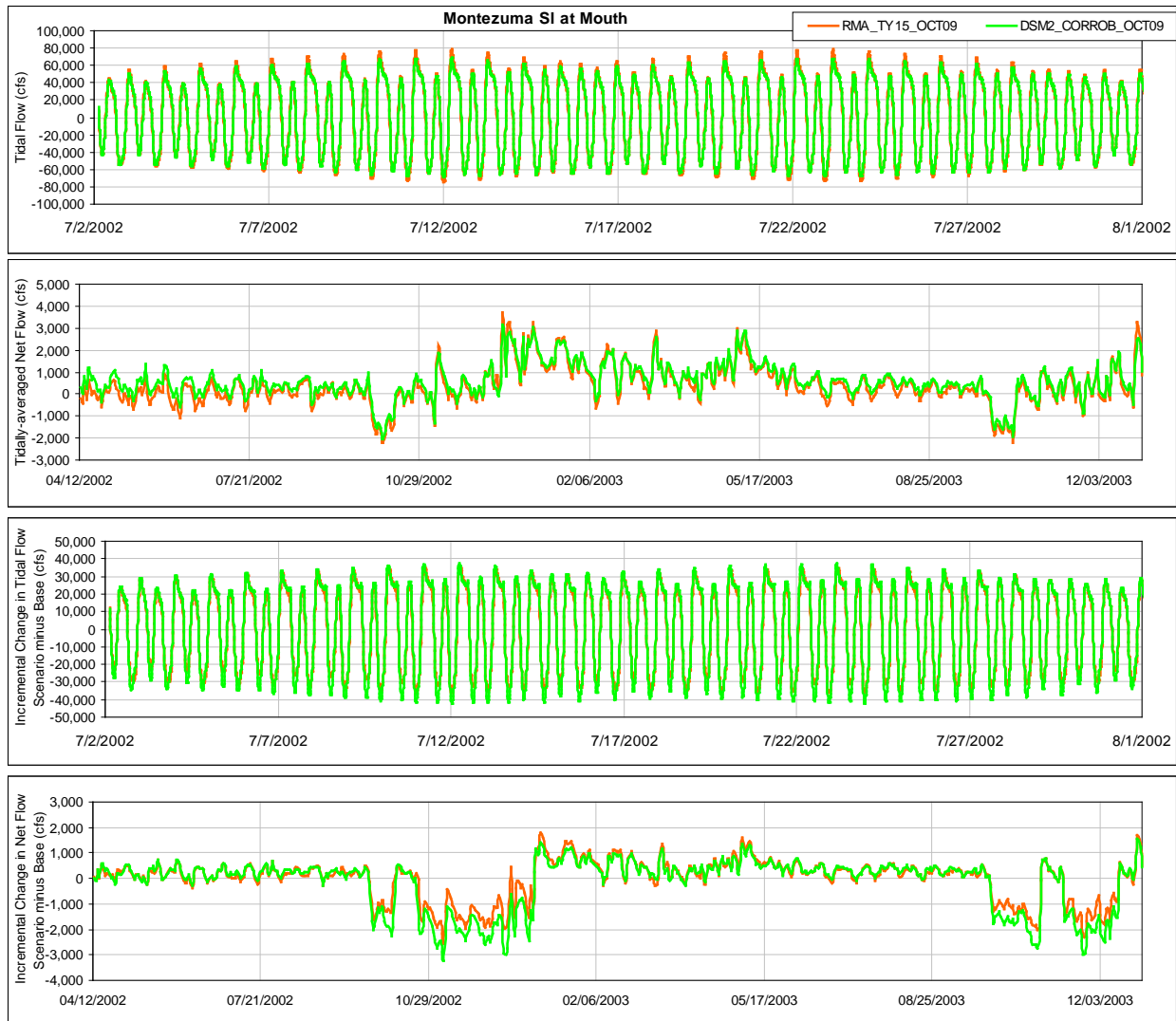
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1 Figure 1-7. Comparison of Tidal Flow, Tidally-Averaged Daily Flow, Incremental Change in Tidal Flow
2 and the Incremental Change in the Daily Flow between the Near-Term Scenario and the Current
3 Conditions Scenario from RMA Model and DSM2 Model for Threemile Sl at San Joaquin River
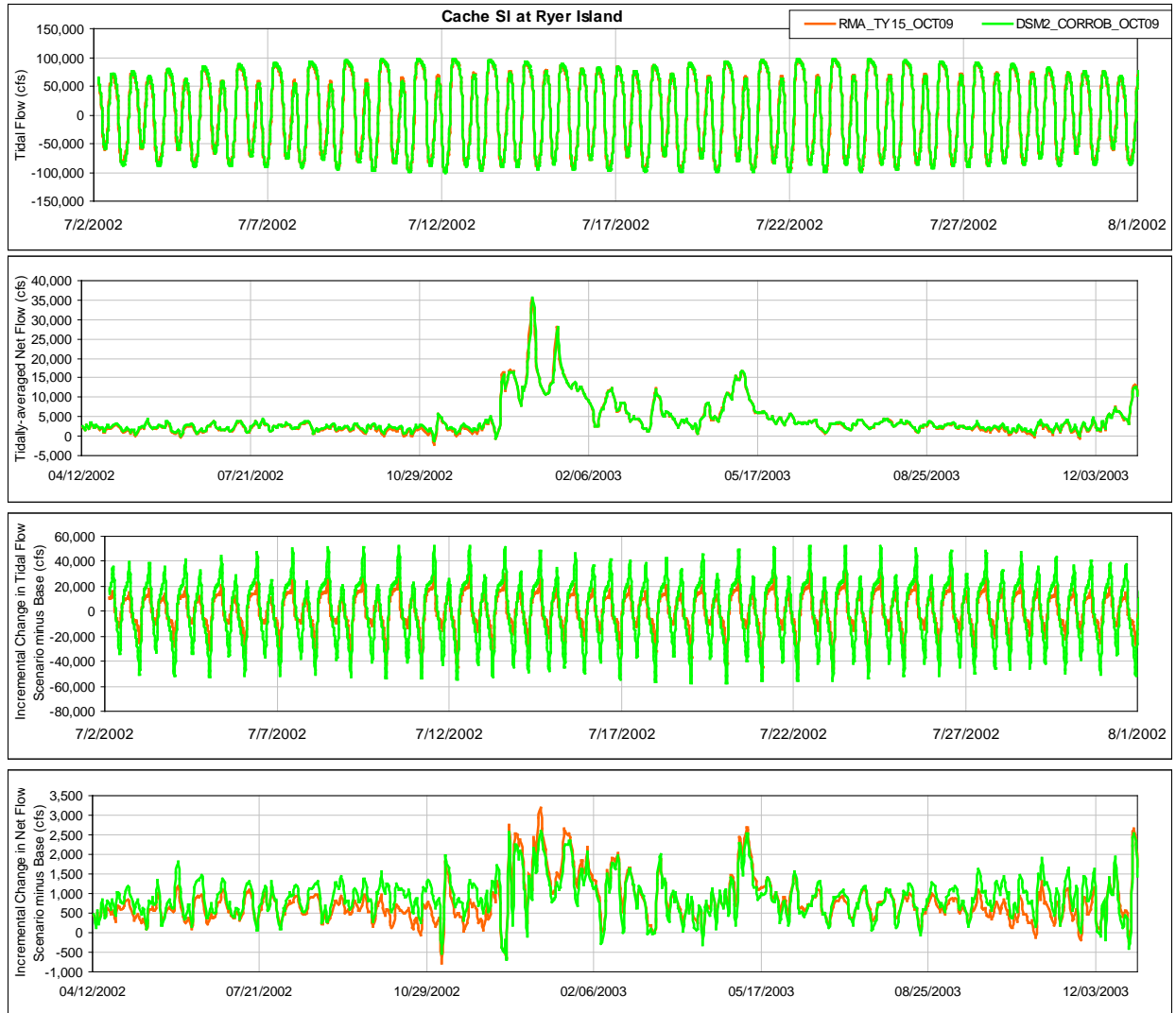4 Location
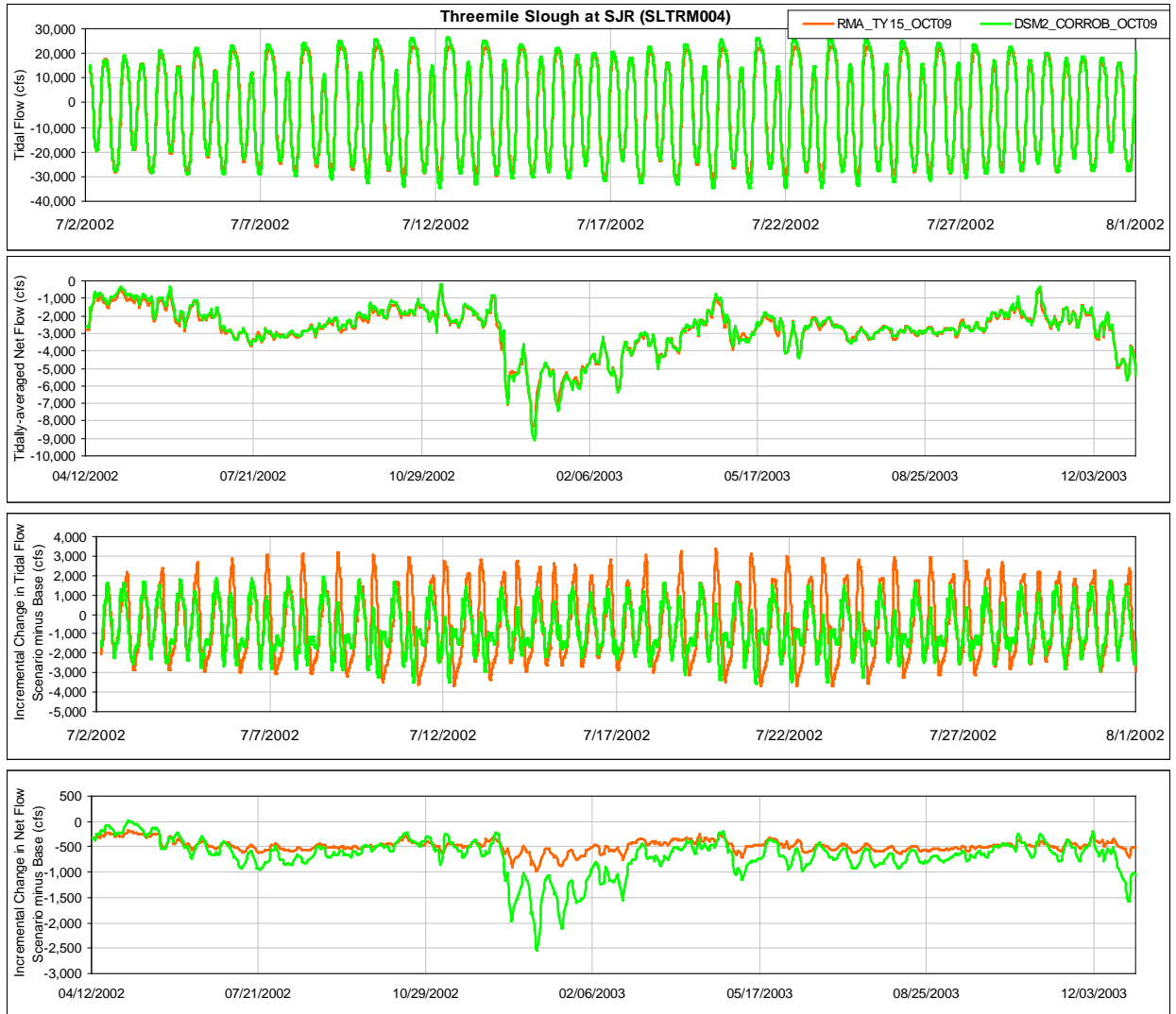
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1 **Figure 1-8. Comparison of Tidal Flow, Tidally-Averaged Daily Flow, Incremental Change in Tidal Flow**
2 **and the Incremental Change in the Daily Flow between the Near-Term Scenario and the Current**
3 **Conditions Scenario from RMA Model and DSM2 Model for San Joaquin River at Jersey Point**
4 **Location**
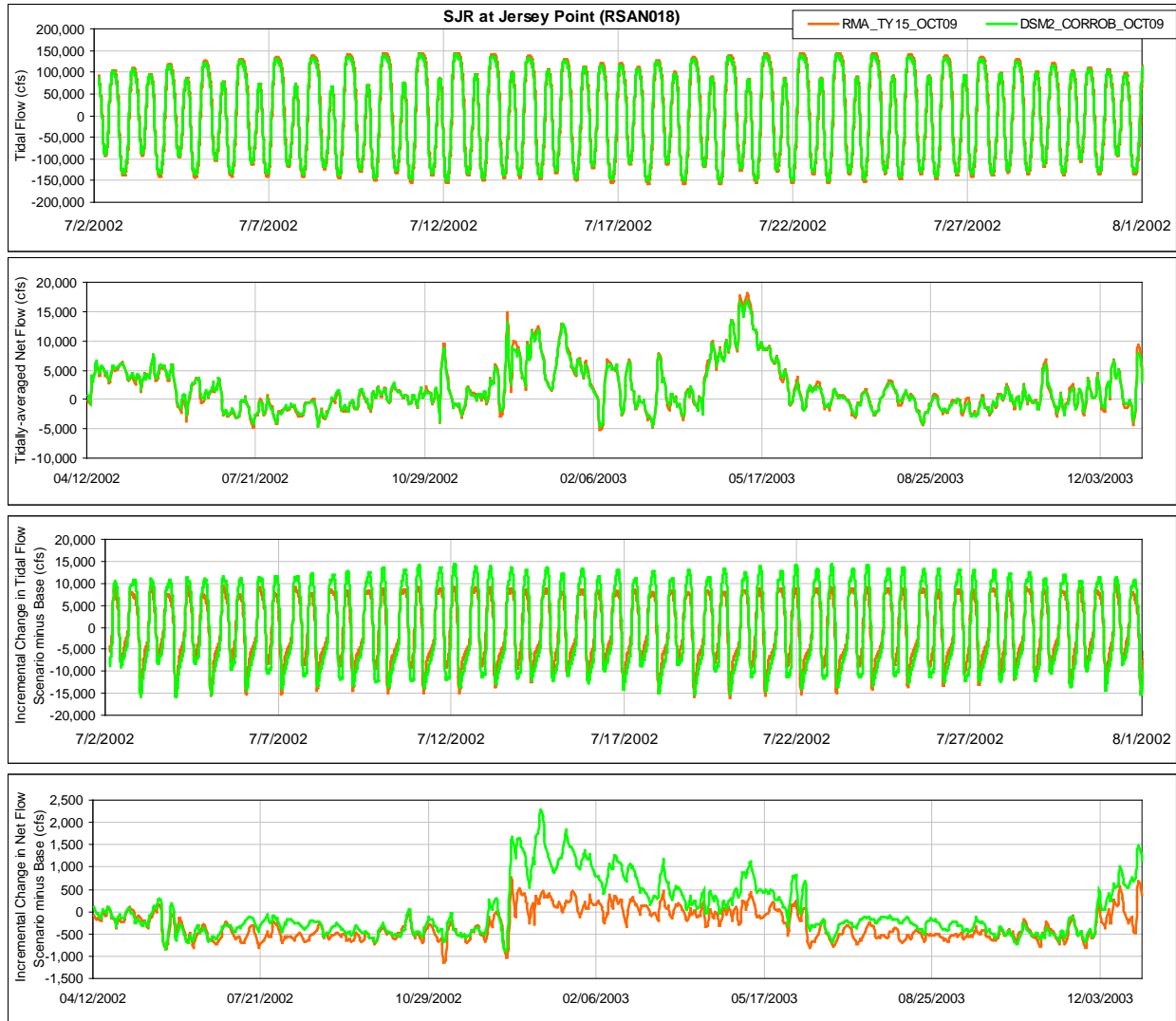
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1   Figure 1-9. Comparison of Tidal Flow, Tidally-Averaged Daily Flow, Incremental Change in Tidal Flow
2   and the Incremental Change in the Daily Flow between the Near-Term Scenario and the Current
3   Conditions Scenario from RMA Model and DSM2 Model for San Joaquin River at San Andreas
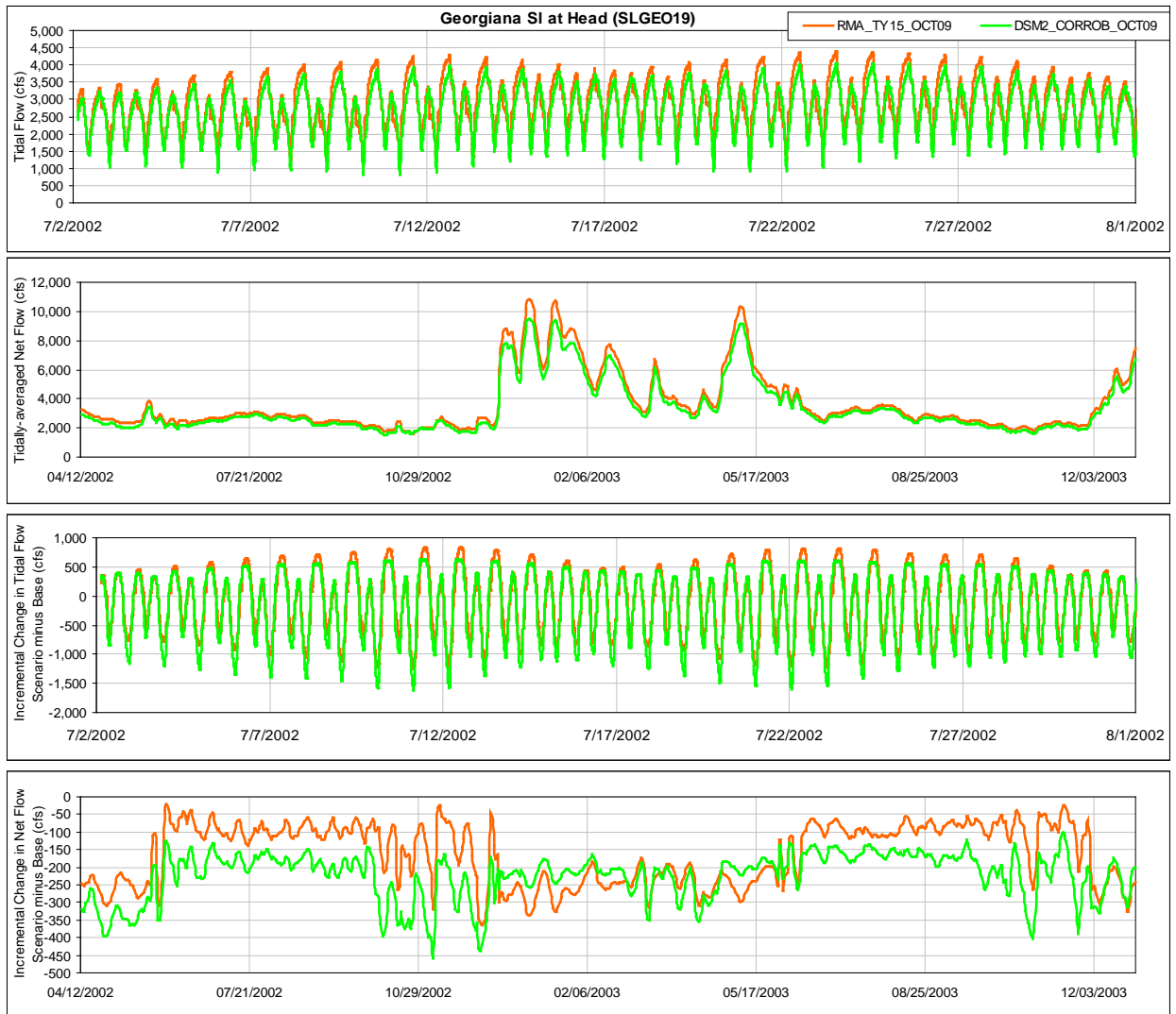4   Location
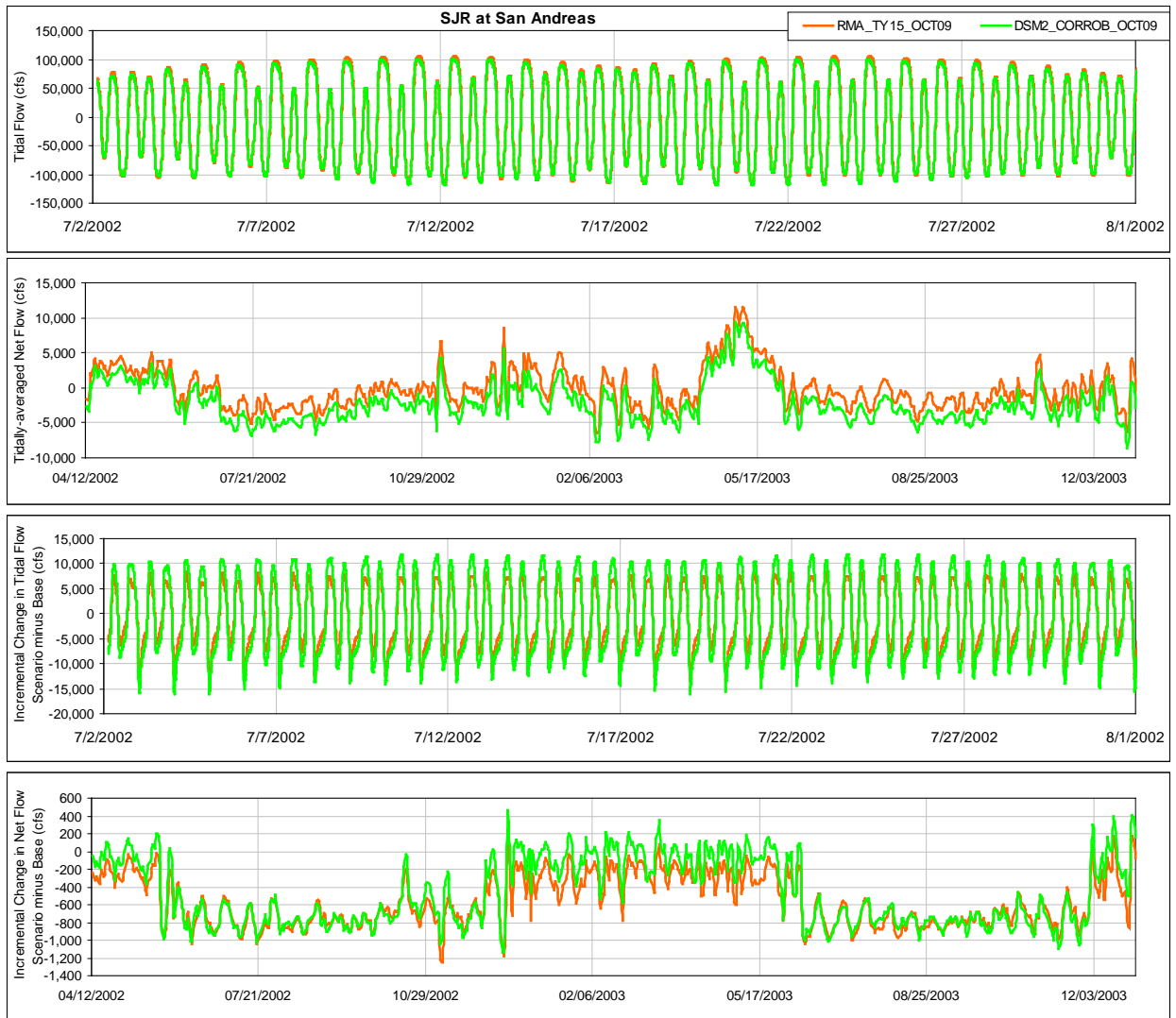
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1 **Figure 1-10. Comparison of Tidal Flow, Tidally-Averaged Daily Flow, Incremental Change in Tidal**
2 **Flow and the Incremental Change in the Daily Flow between the Near-Term Scenario and the**
3 **Current Conditions Scenario from RMA Model and DSM2 Model for San Joaquin River at Prisoners**
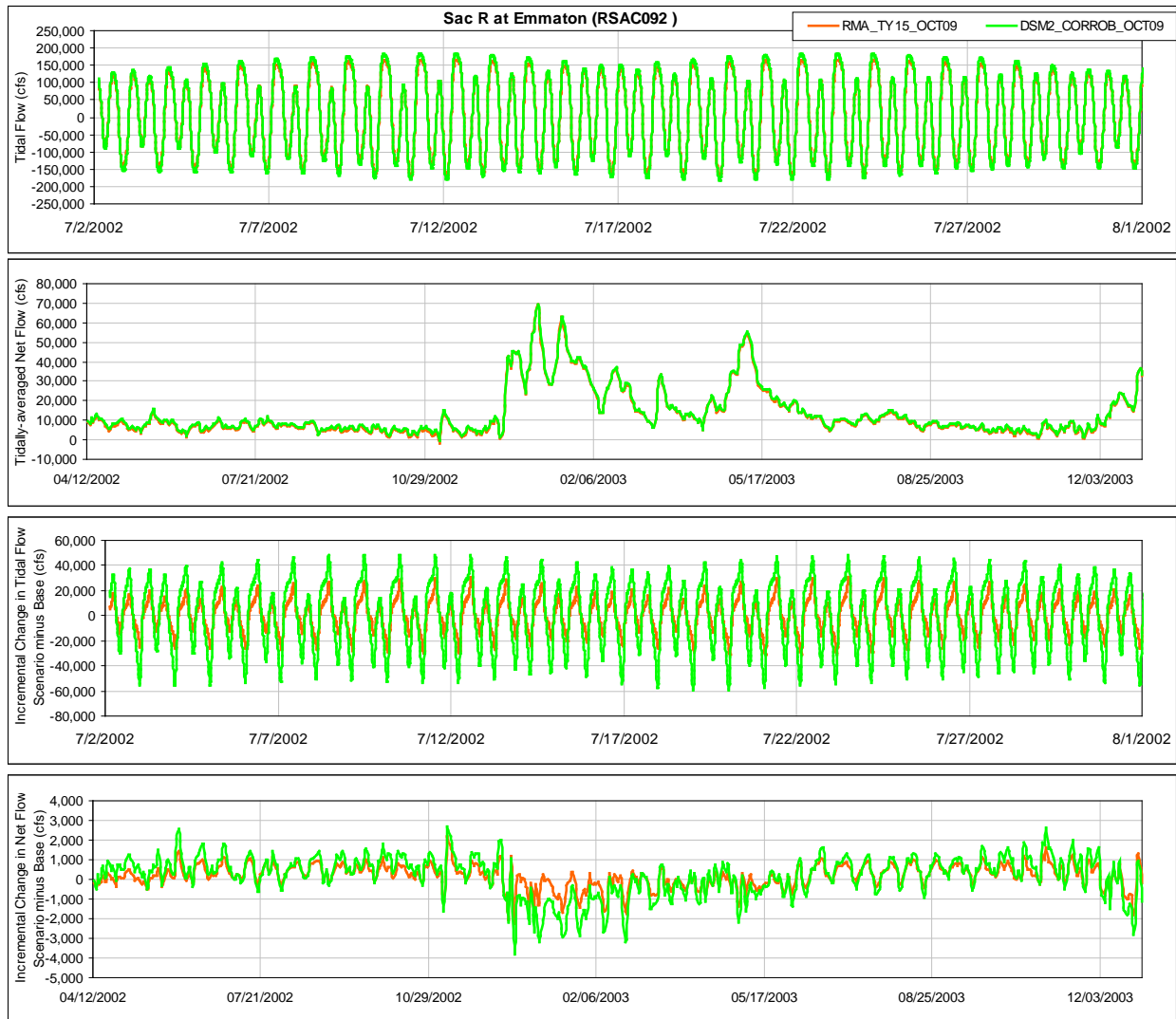4 **Point Location**

5

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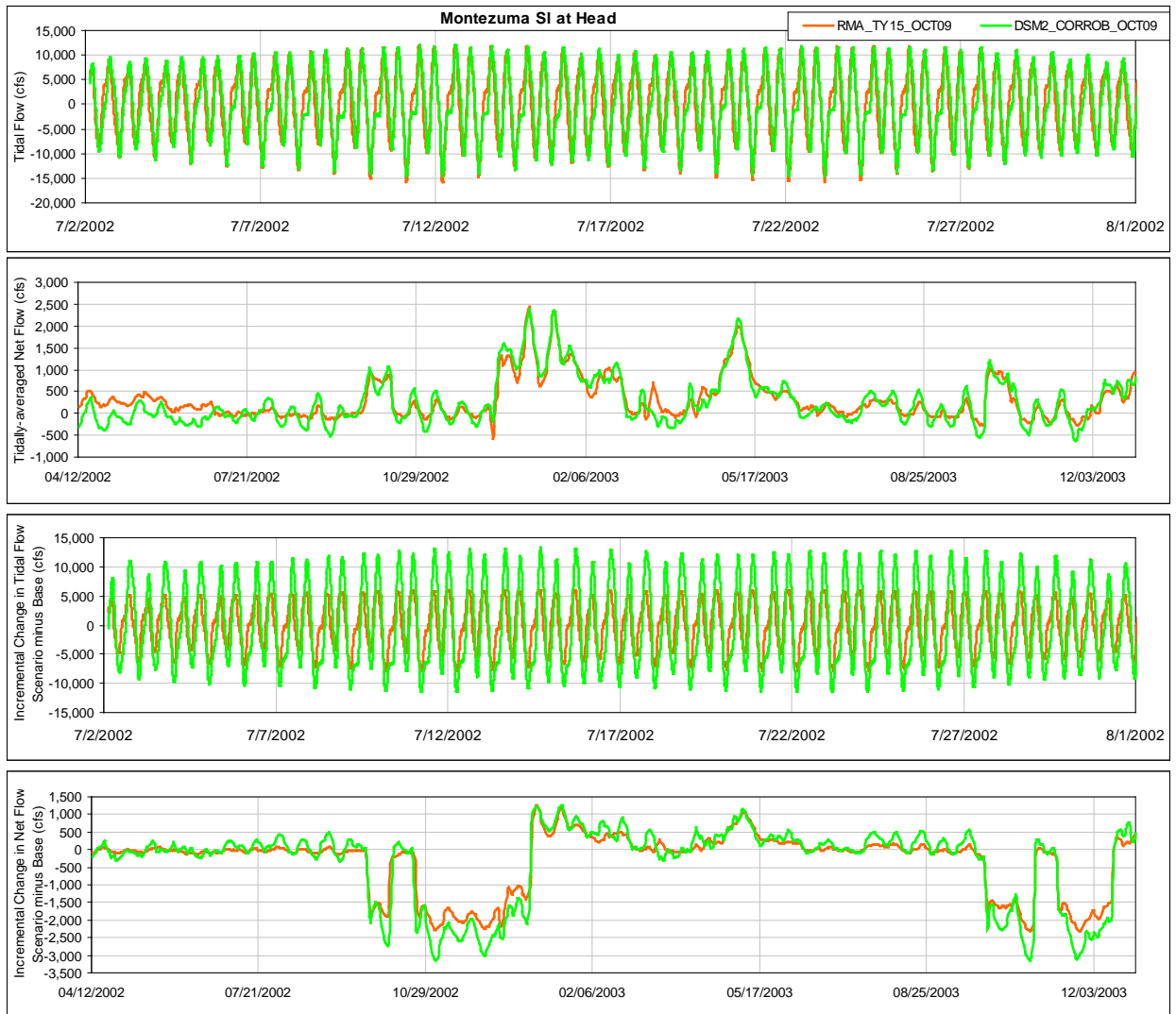

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1   Figure 1-12. Comparison of Tidal Flow, Tidally-Averaged Daily Flow, Incremental Change in Tidal
2   Flow and the Incremental Change in the Daily Flow between the Near-Term Scenario and the
3   Current Conditions Scenario from RMA Model and DSM2 Model for Mokelumne River near San
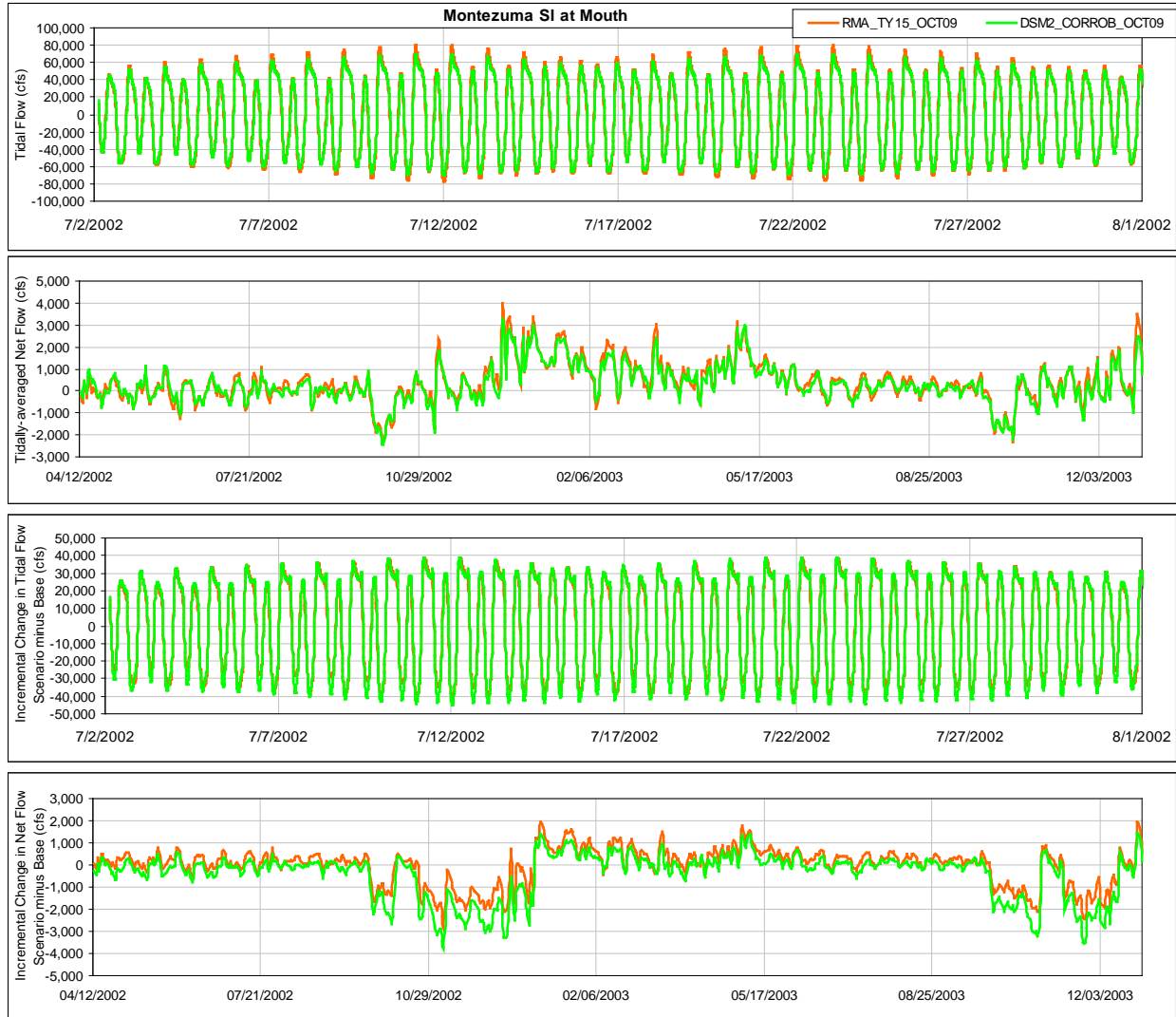4   Joaquin River Location
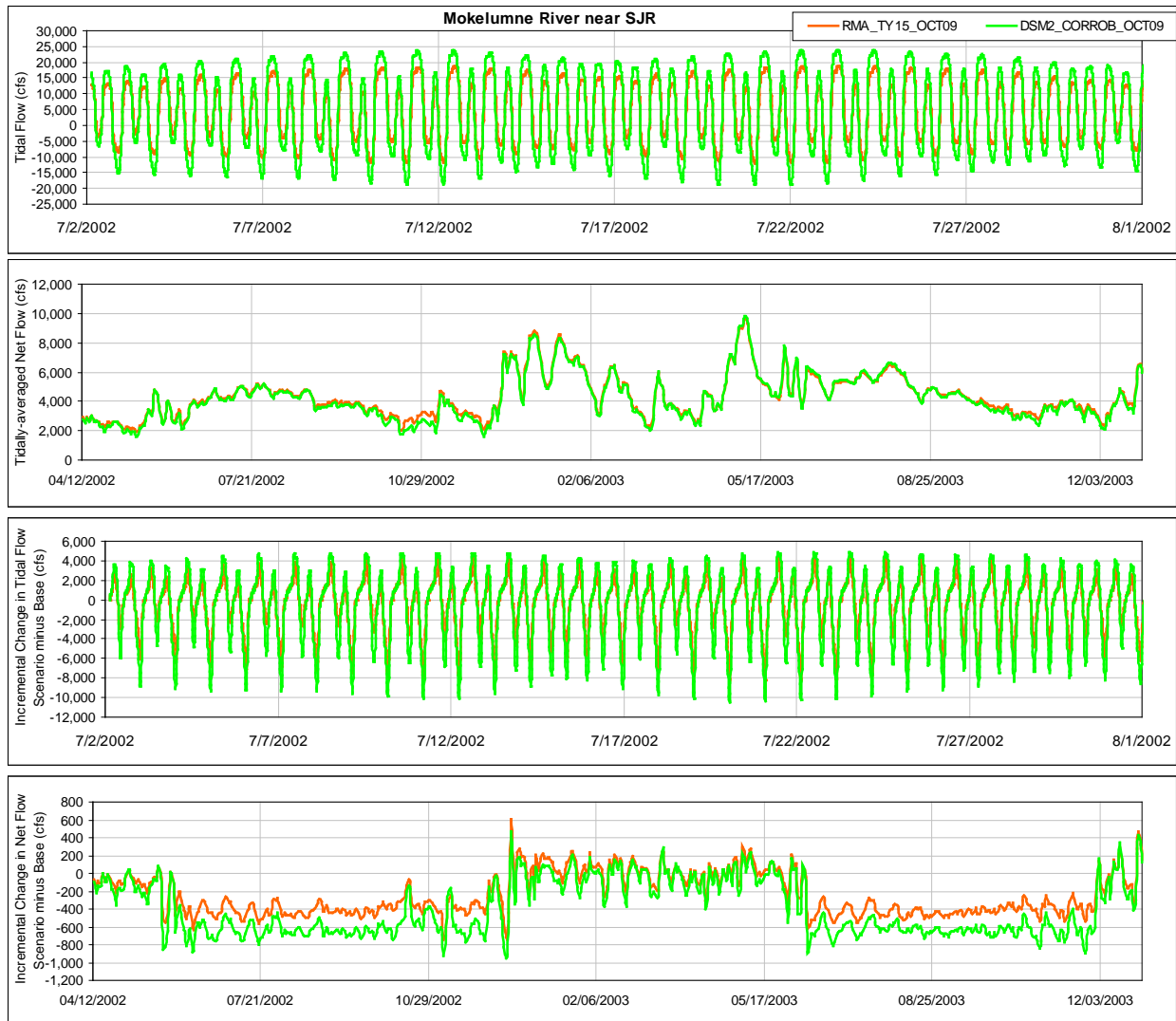
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1 Figure 1-13. Comparison of Tidal Flow, Tidally-Averaged Daily Flow, Incremental Change in Tidal
2 Flow and the Incremental Change in the Daily Flow between the Near-Term Scenario and the
3 Current Conditions Scenario from RMA Model and DSM2 Model for Middle River at Bacon Island
4 Location

5

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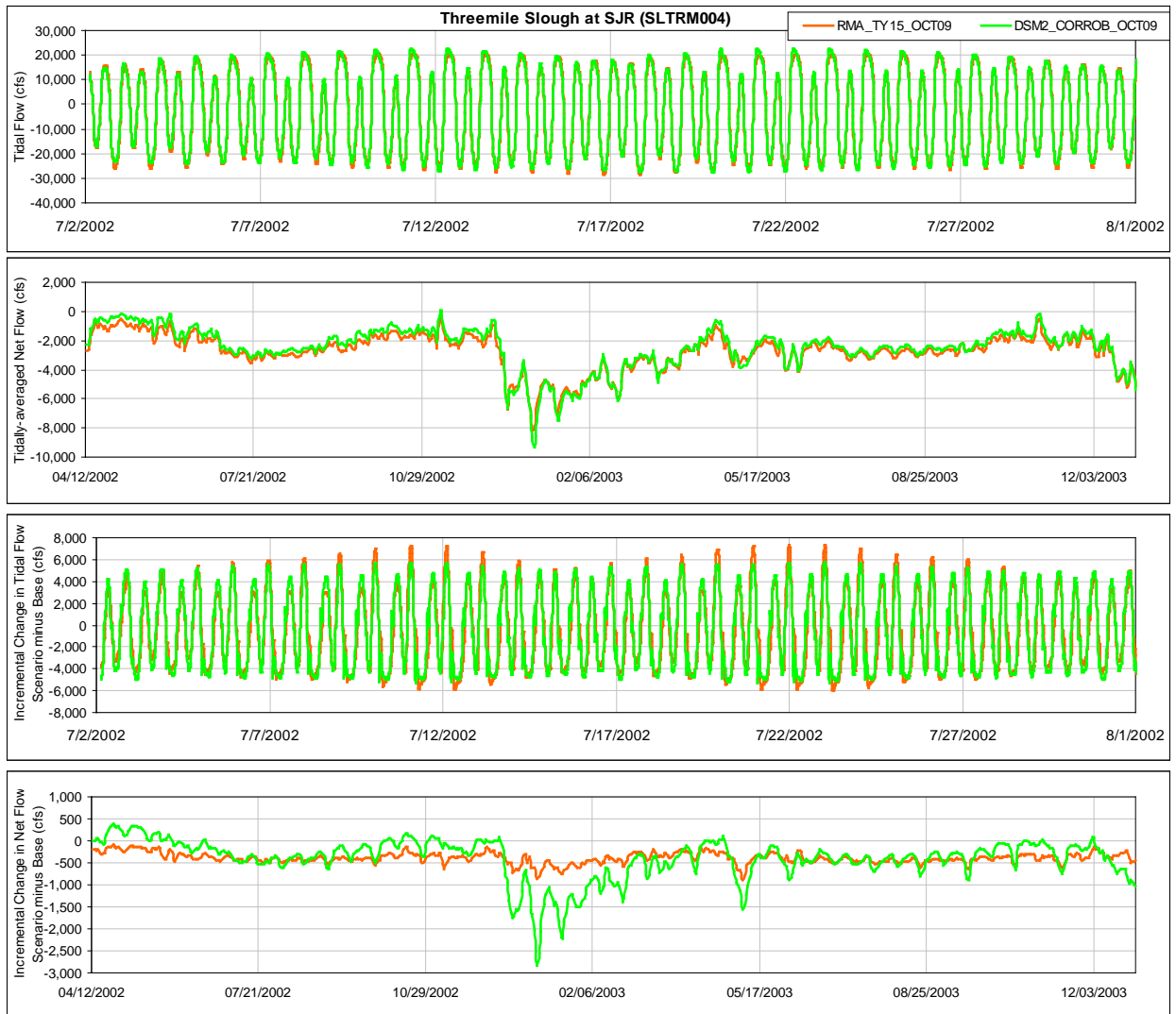4 Location

5

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

5

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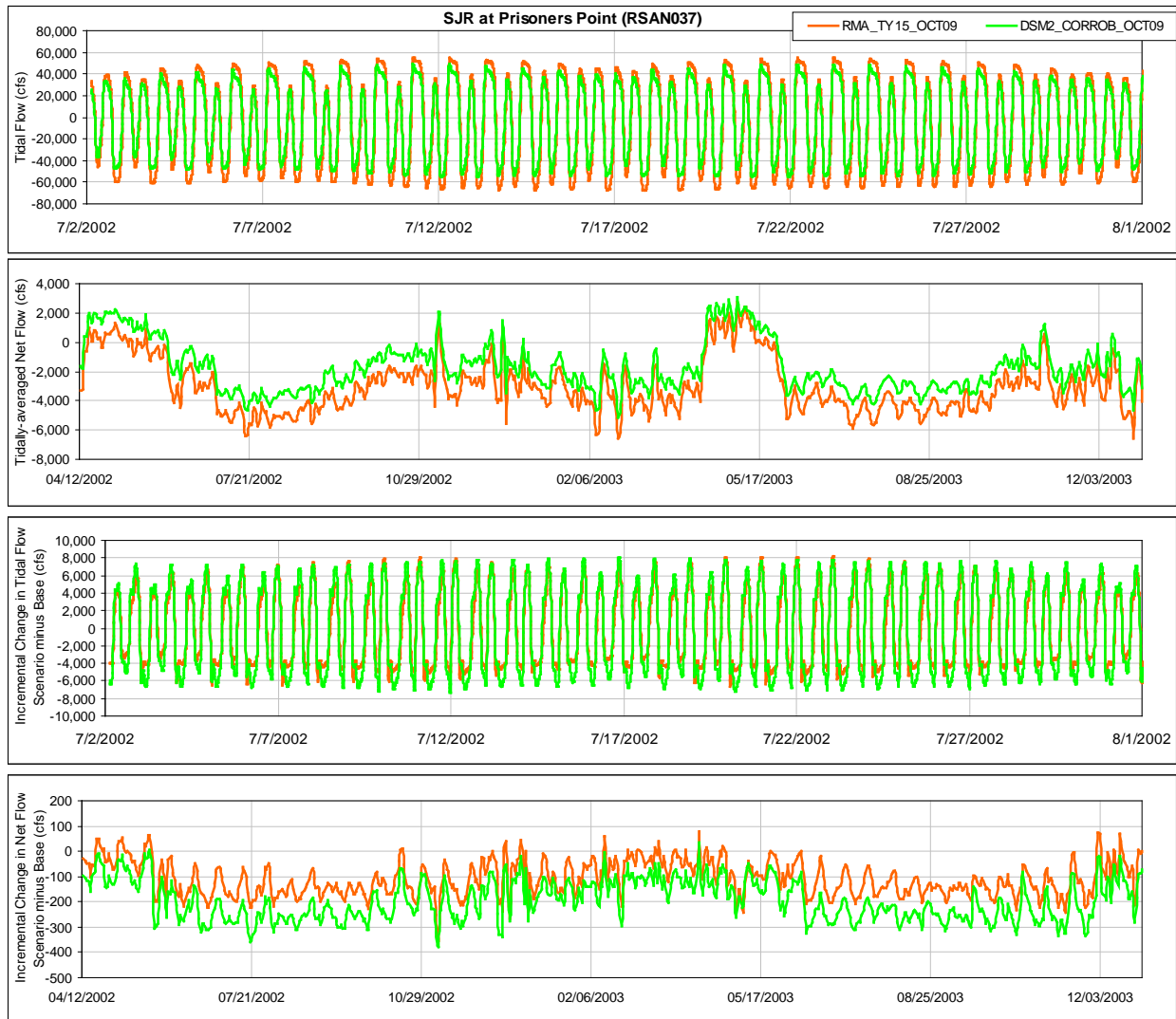9 SI Region

10

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

5

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

10

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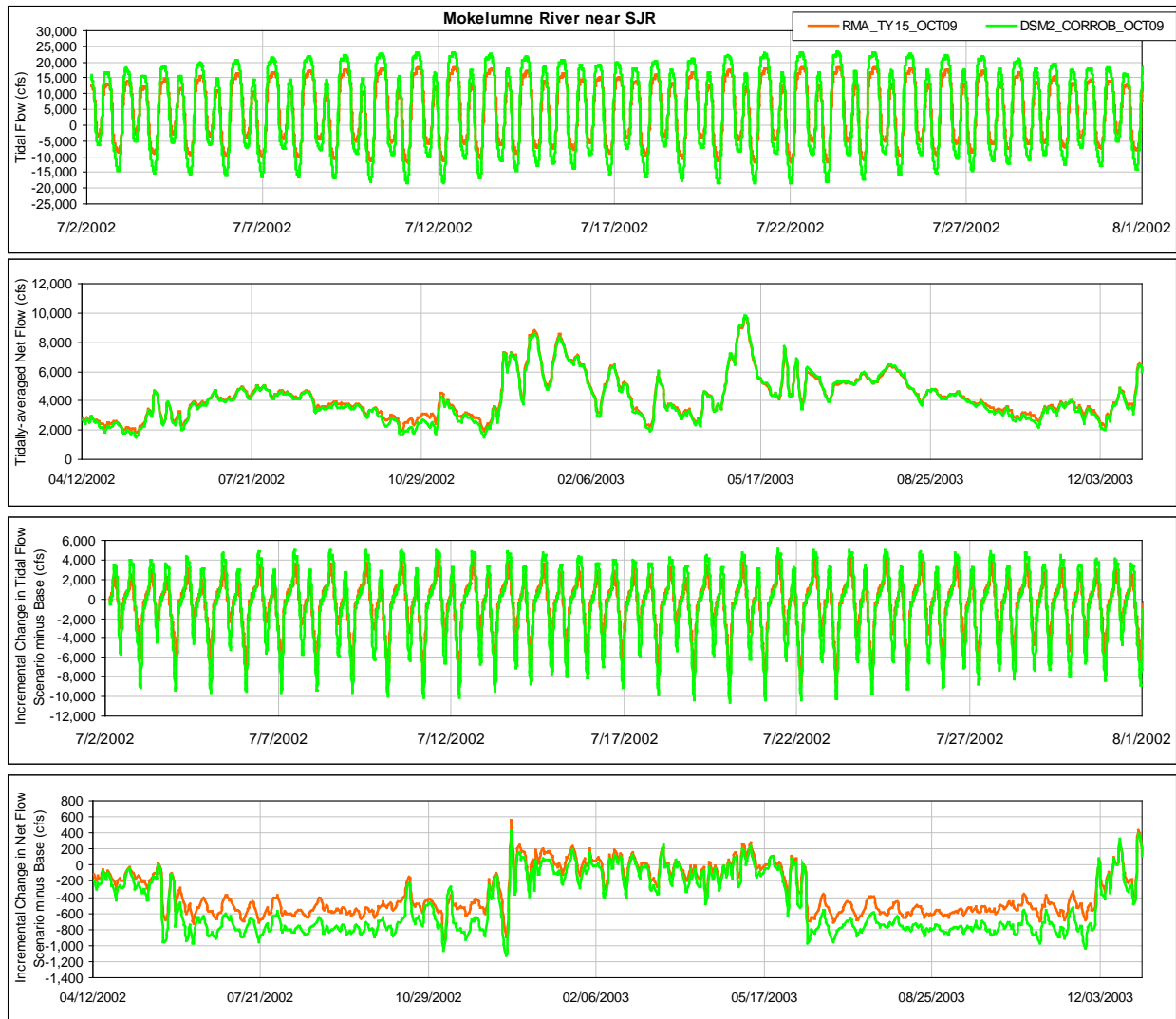4 **Marsh Region**

5

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

10

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

5

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

10
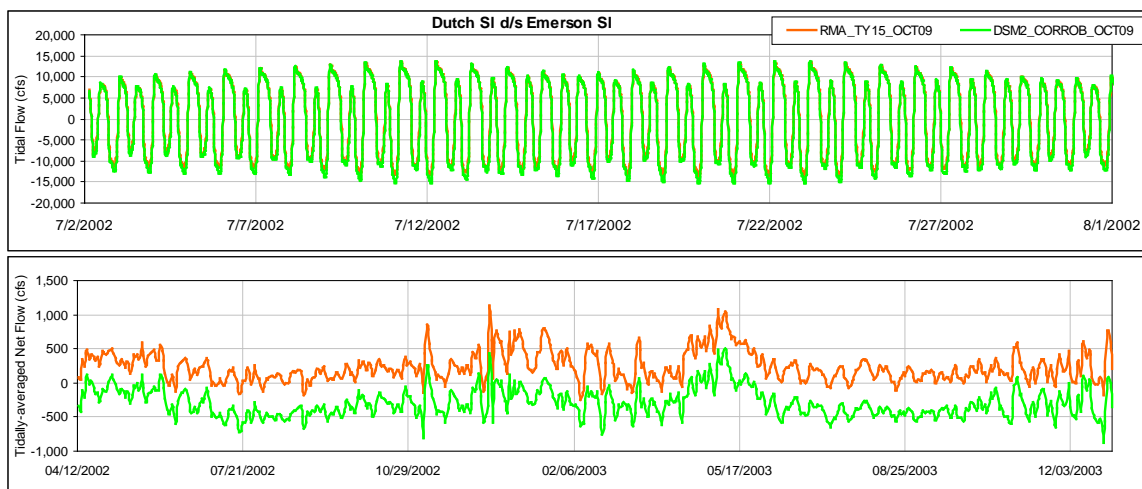
1 **Figure 1-23. Comparison of Tidal Flow, Tidally-Averaged Daily Flow, Incremental Change in Tidal**
2 **Flow and the Incremental Change in the Daily Flow between the Near-Term Scenario and the**
3 **Current Conditions Scenario from RMA Model and DSM2 Model for Snodgrass SI Breach under East**
4 **Delta Region**
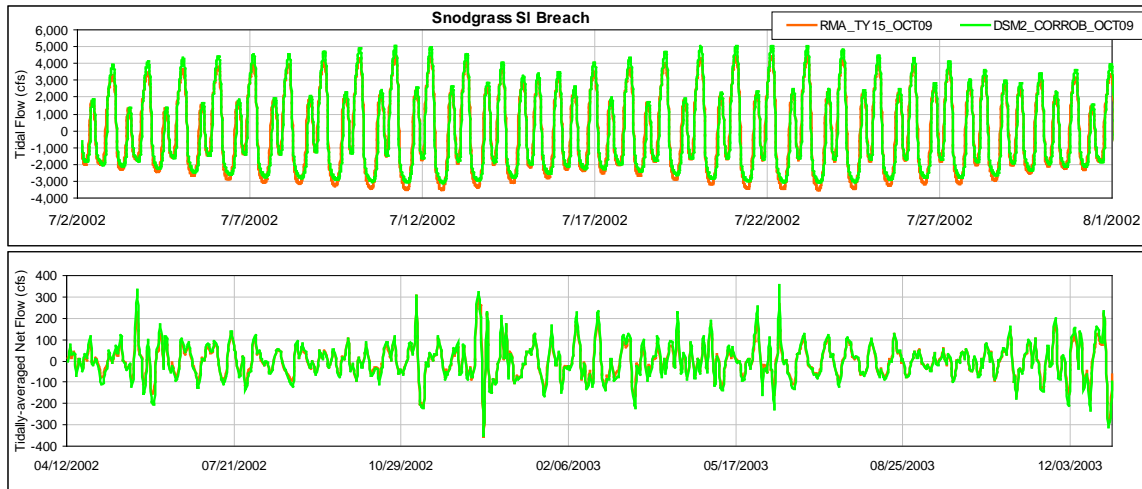
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6 **Figure 1-24. Comparison of Tidal Flow, Tidally-Averaged Daily Flow, Incremental Change in Tidal**
7 **Flow and the Incremental Change in the Daily Flow between the Near-Term Scenario and the**
8 **Current Conditions Scenario from RMA Model and DSM2 Model for channel d/s of Snodgrass SI**
9 **Breach under East Delta Region**

10
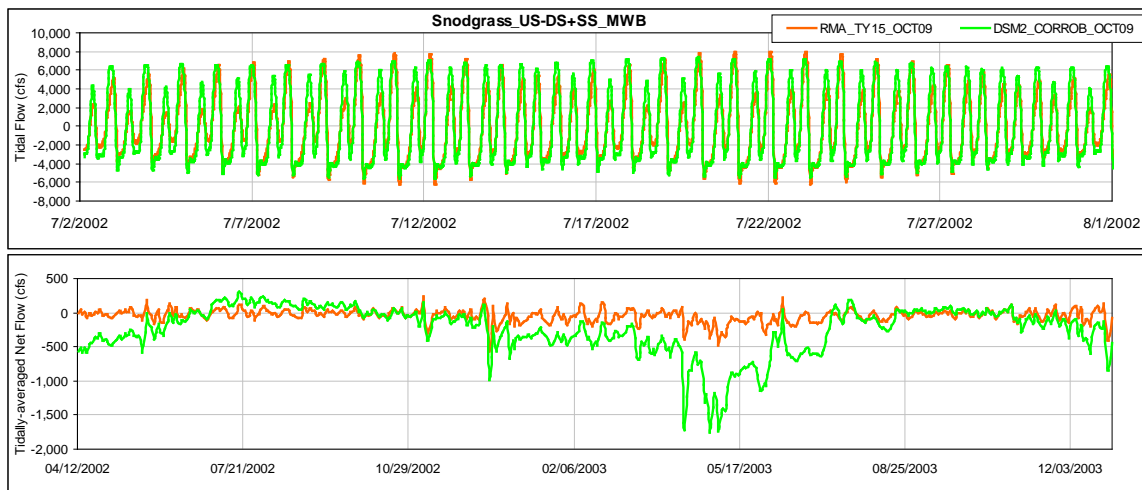
1 Near-Term 14,000ac Restoration Corroboration

2 Salinity Results

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

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

4

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

8

9
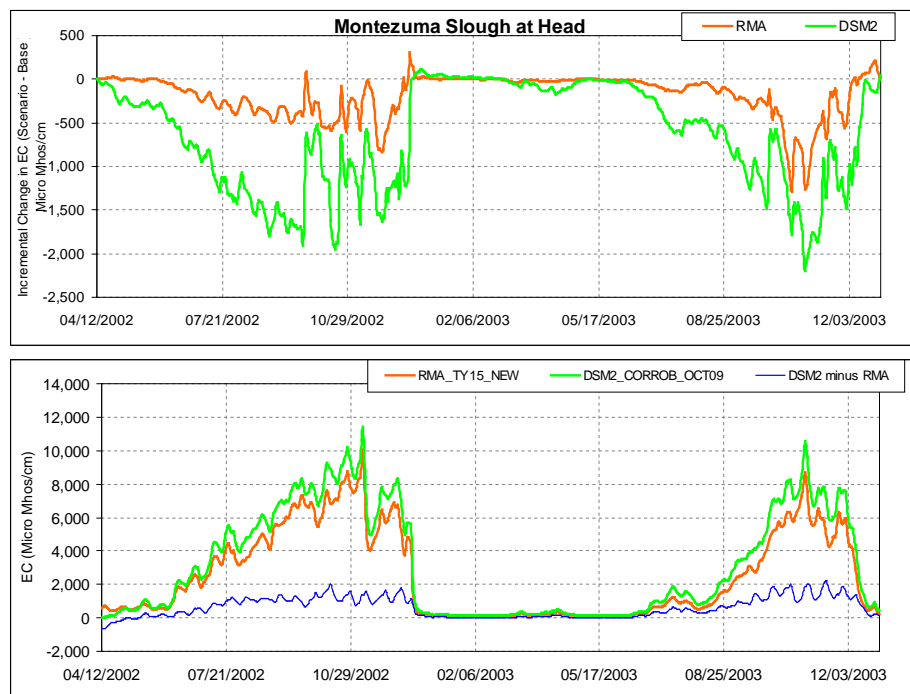
1 **Figure 1-28. Comparison of Tidally-Averaged Daily EC and the Incremental Change in the Daily EC**
2 **between the Near-term Scenario and the Current Conditions Scenario from RMA Model and DSM2**
3 **Model for Sacramento River at Port Chicago Location**

4

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

8

9

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

4

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

8

9

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

4

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

8

9

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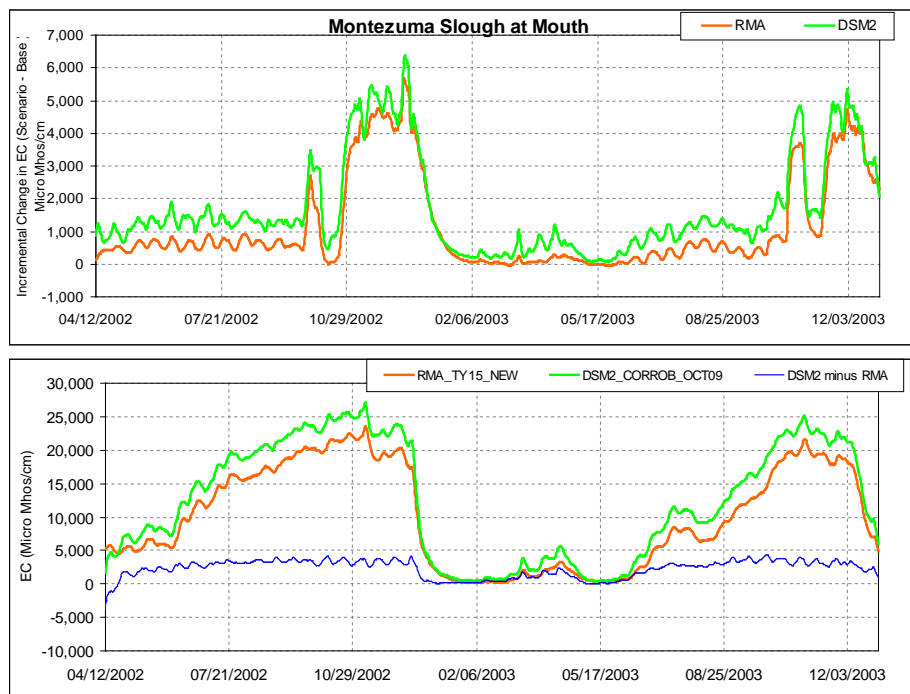

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5 **Figure 1-35. Comparison of Tidally-Averaged Daily EC and the Incremental Change in the Daily EC**
6 **between the Near-term Scenario and the Current Conditions Scenario from RMA Model and DSM2**
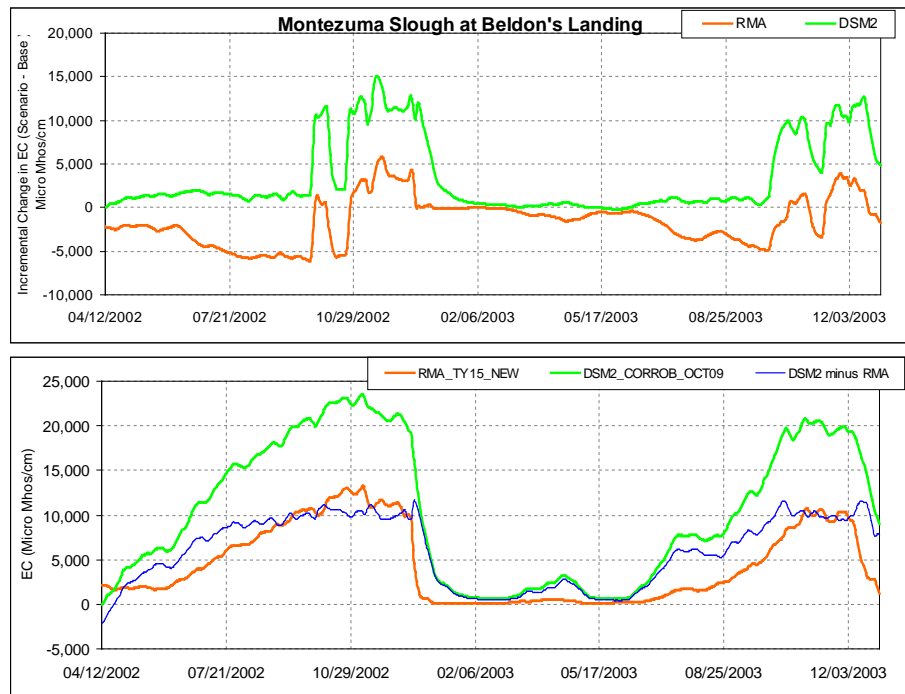7 **Model for San Joaquin River at San Andreas Location**

8

9

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

4

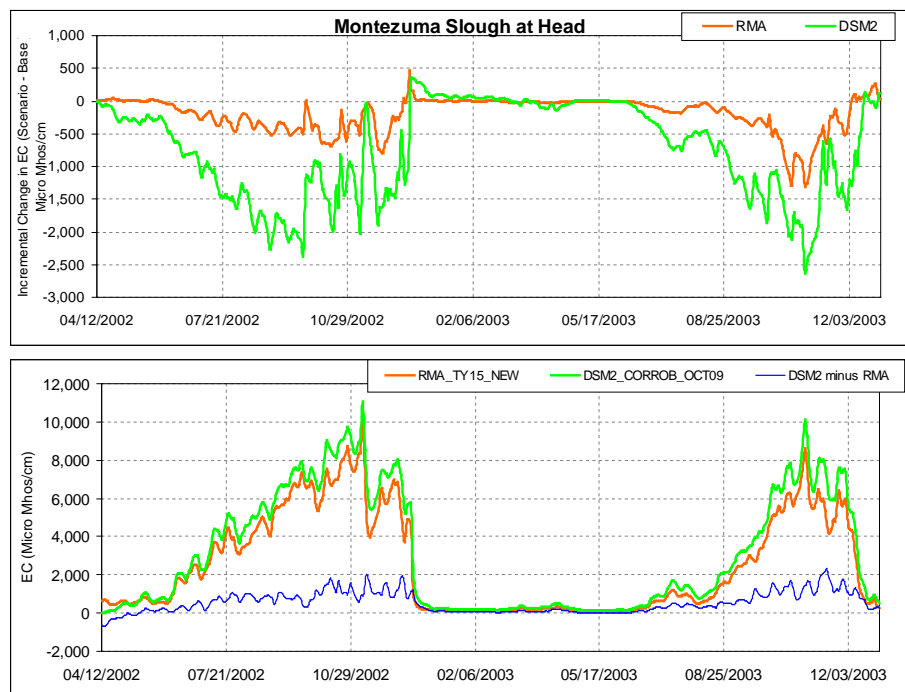5 Figure 1-37. Comparison of Tidally-Averaged Daily EC and the Incremental Change in the Daily EC
6 between the Near-term Scenario and the Current Conditions Scenario from RMA Model and DSM2
7 Model for San Joaquin River at Stockton Location

8

9

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

4

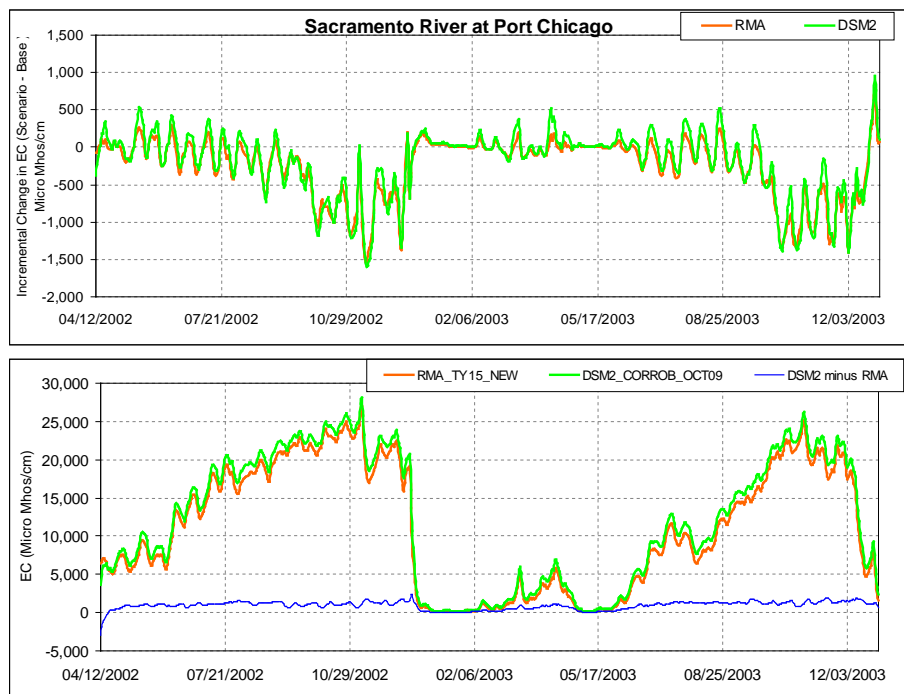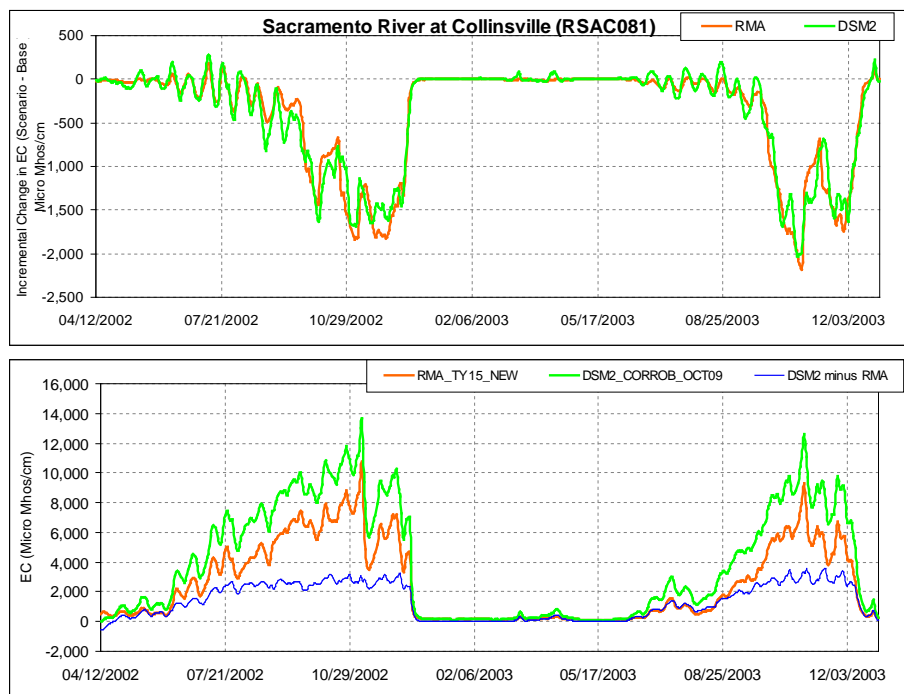5 Figure 1-40. Comparison of Tidally-Averaged Daily EC and the Incremental Change in the Daily EC
6 between the Near-term Scenario and the Current Conditions Scenario from RMA Model and DSM2
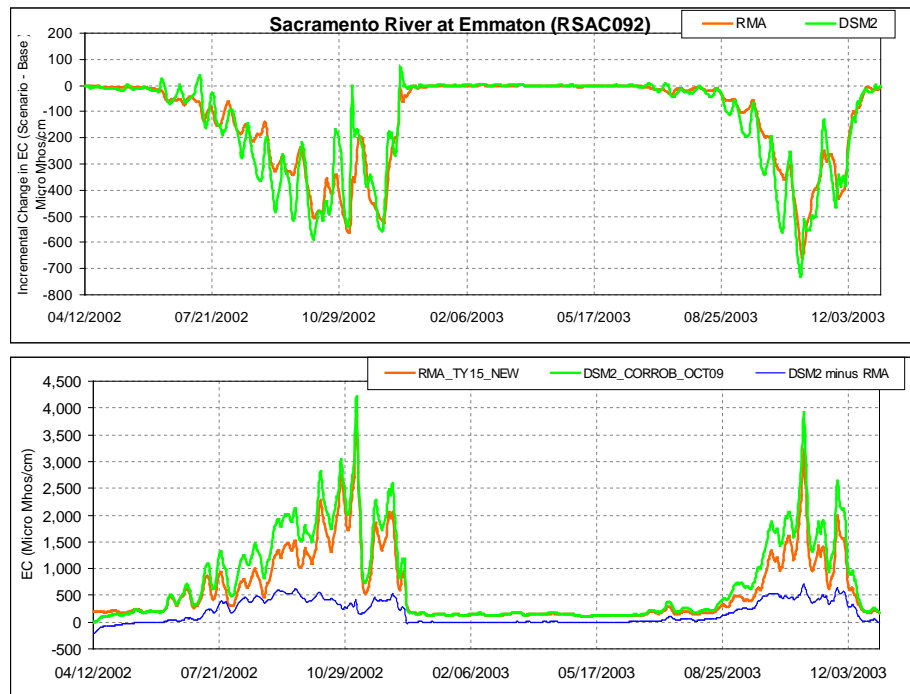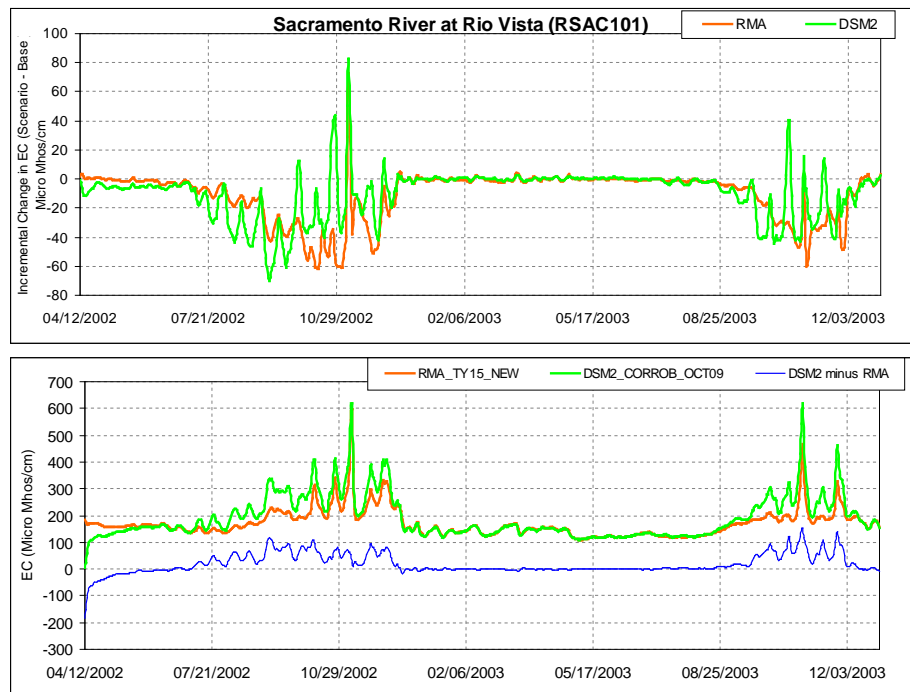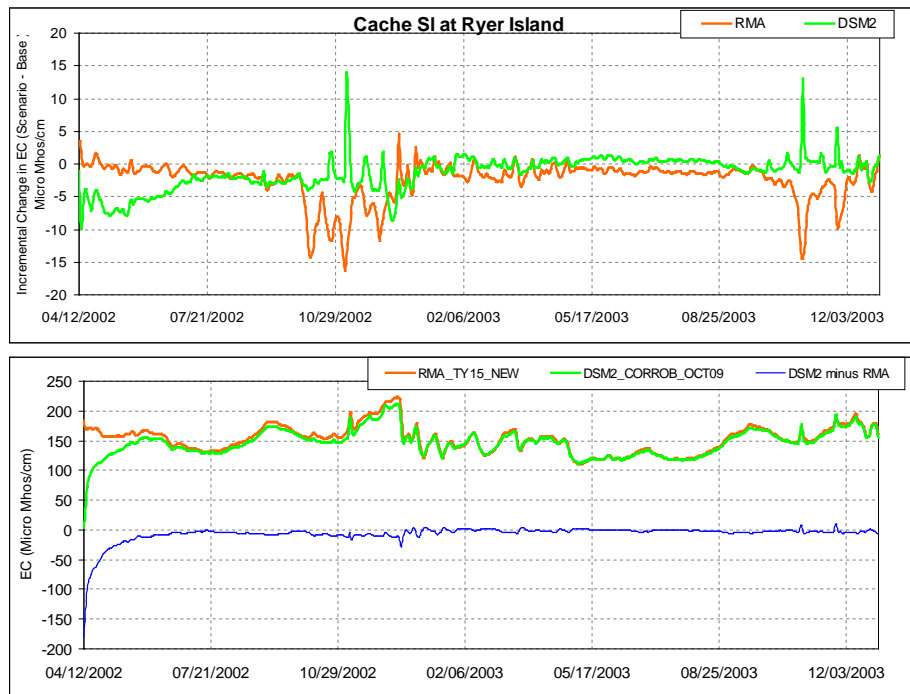7 Model for Middle River at Middle River Location

8

9

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

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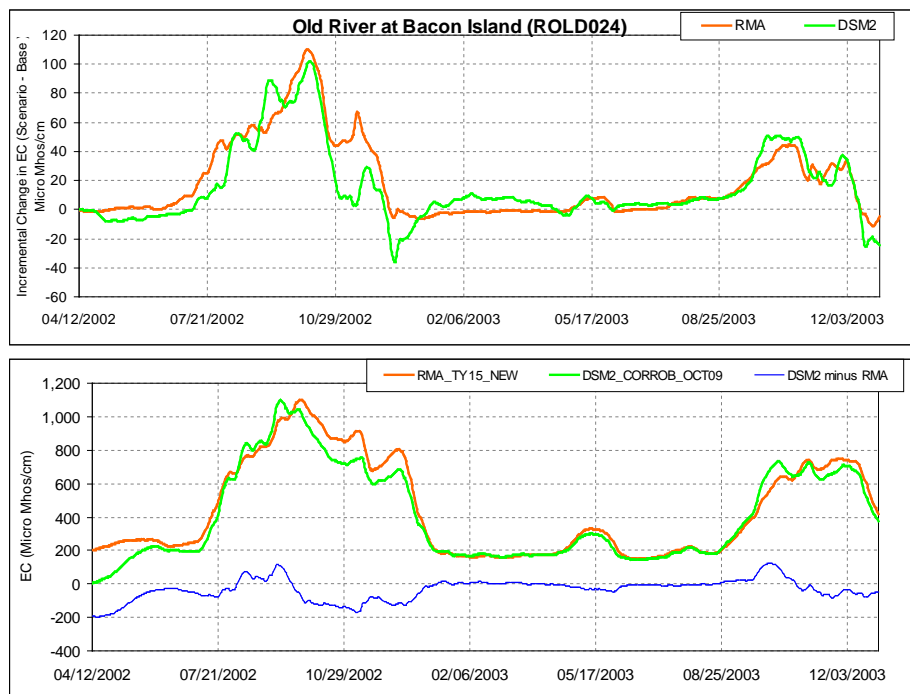
1 Early Long-Term 25,000ac Restoration Corroboration

2 Hydrodynamics Results

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

6

1   **Figure 1-43. 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 Rio Vista**
4   **Location**
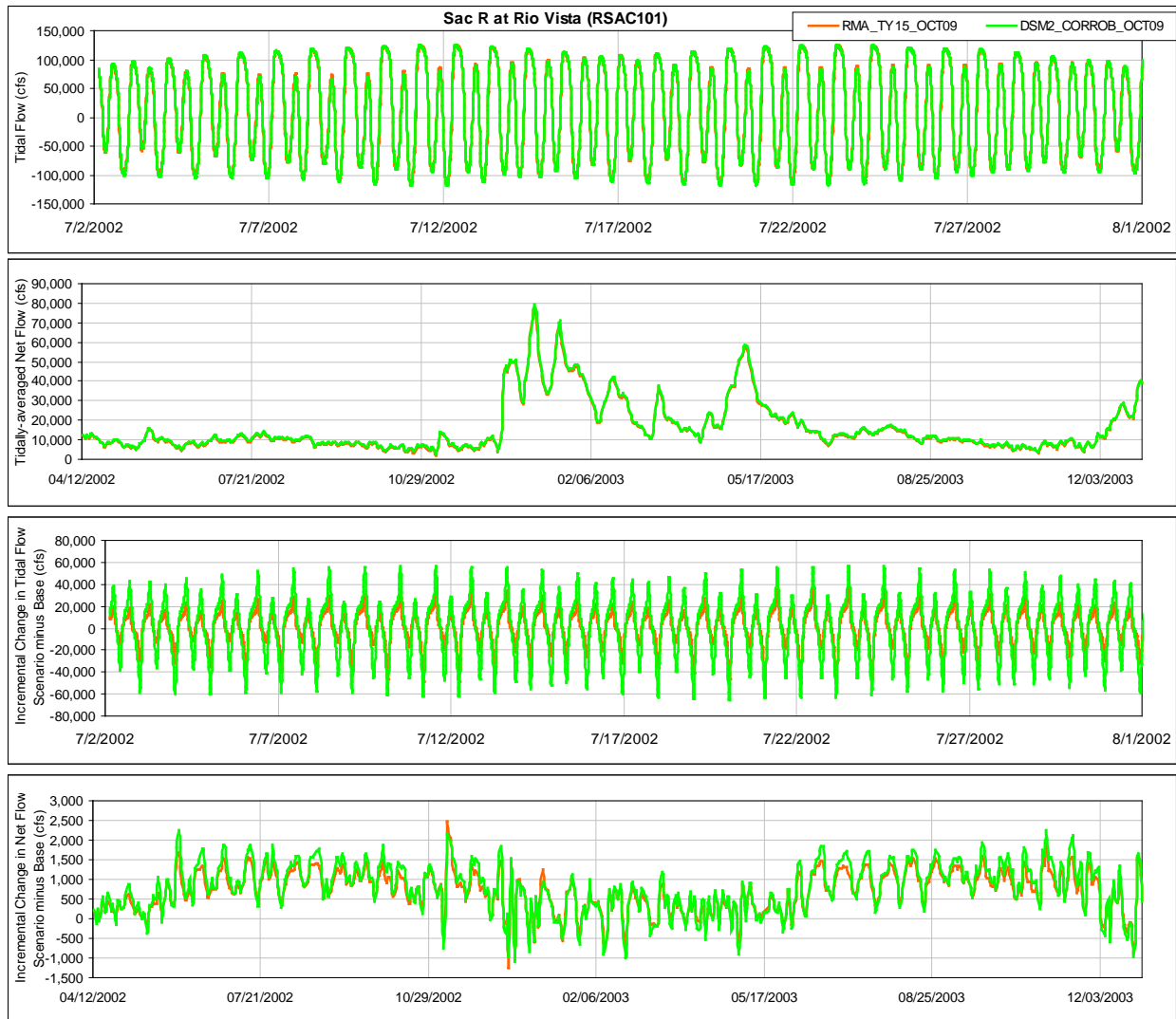
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1 Figure 1-44. Comparison of Tidal Flow, Tidally-Averaged Daily Flow, Incremental Change in Tidal
2 Flow and the Incremental Change in the Daily Flow between the Early Long-term Scenario and the
3 Current Conditions Scenario from RMA Model and DSM2 Model for Georgiana SI at Head Location

4

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**

5

1 Figure 1-46. 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
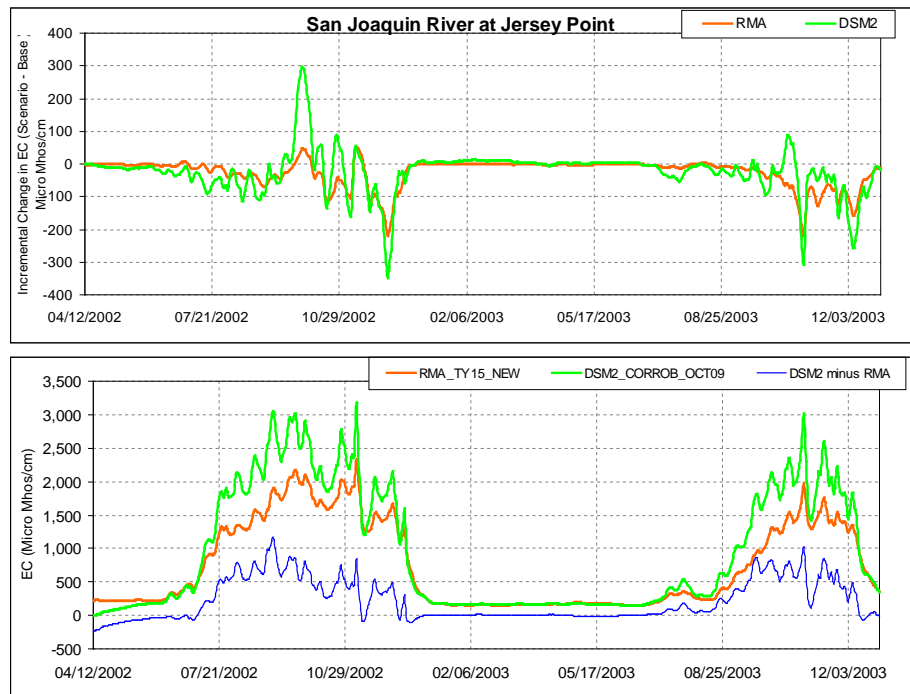3 Current Conditions Scenario from RMA Model and DSM2 Model for Montezuma SI at Head Location

4

1 **Figure 1-47. 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**
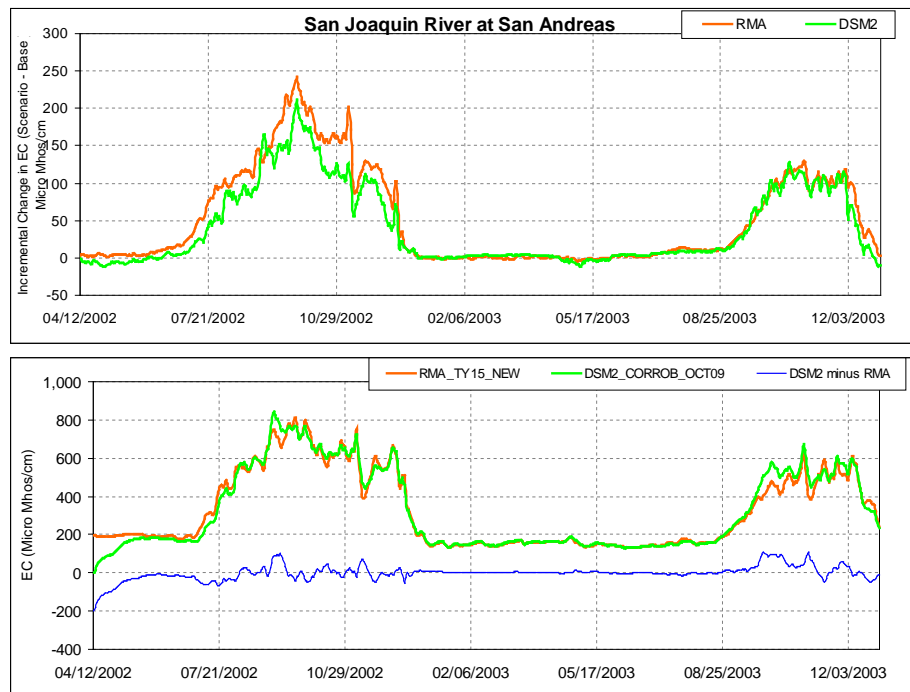3 **Current Conditions Scenario from RMA Model and DSM2 Model for Montezuma Sl at Mouth Location**

4

1   Figure 1-48. 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 Threemile Sl at San Joaquin
4   River Location

5

1 Figure 1-49. 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 San Joaquin River at Jersey
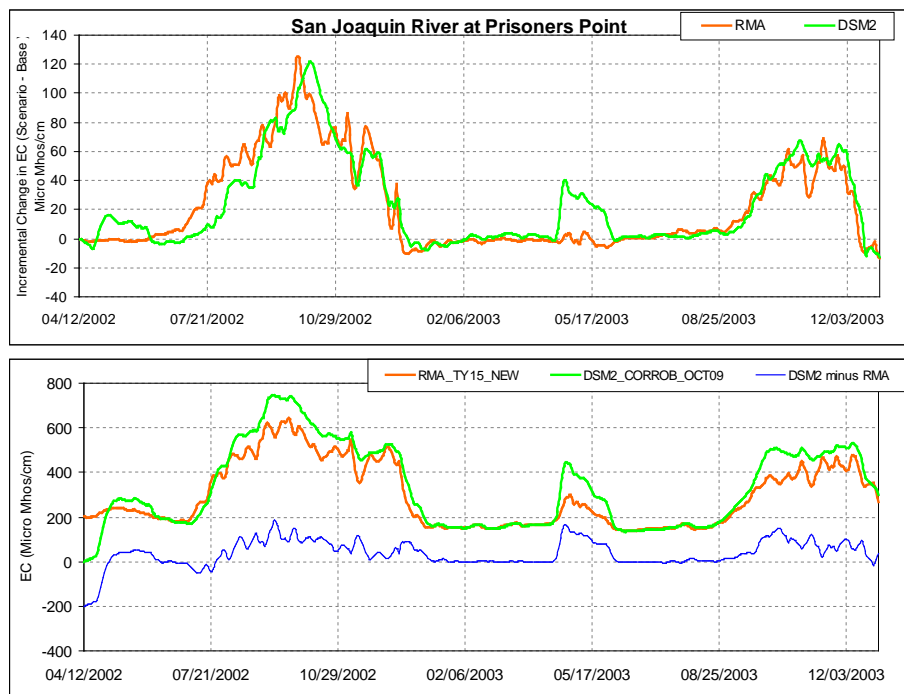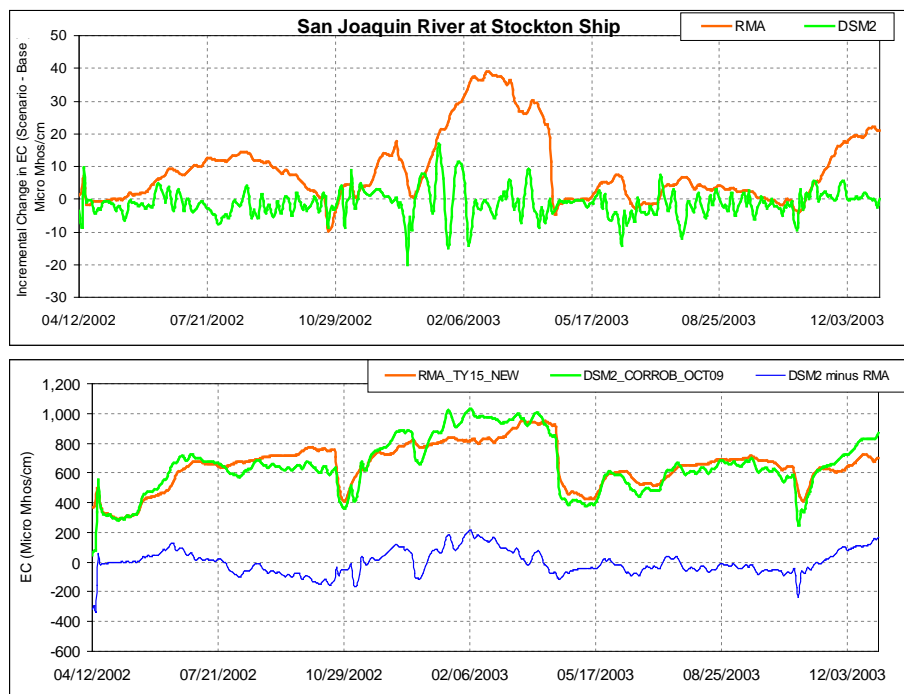4 Point Location

5

1 Figure 1-50. 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 San Joaquin River at San
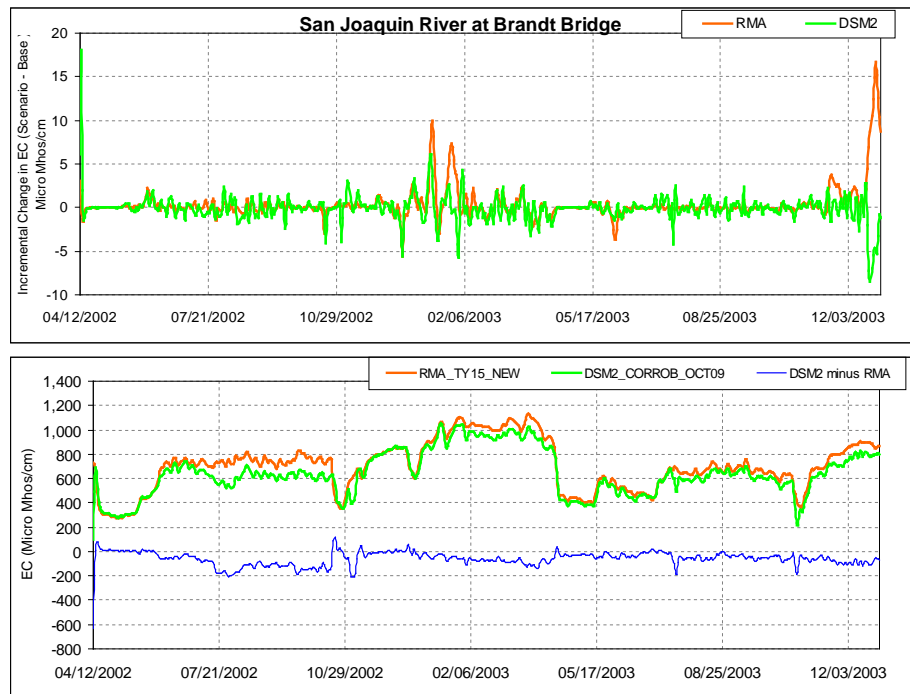4 Andreas Location

5

1 Figure 1-51. 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
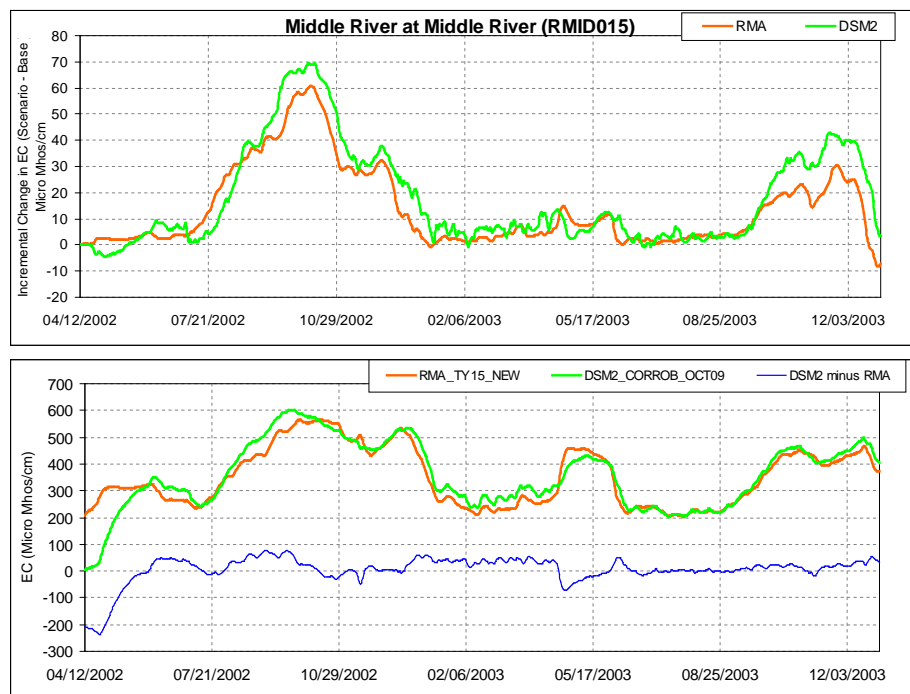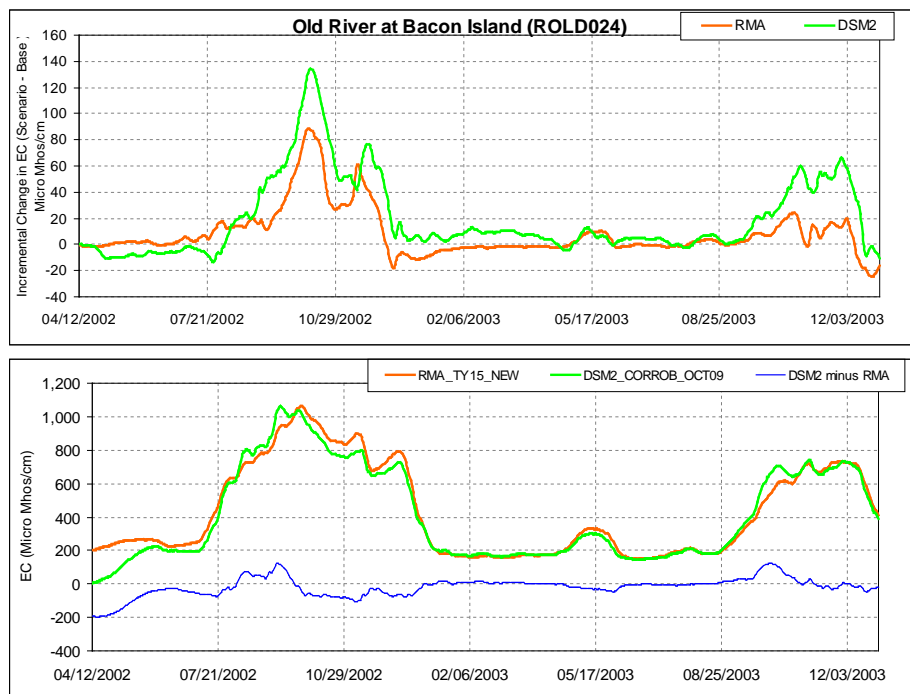3 Current Conditions Scenario from RMA Model and DSM2 Model for San Joaquin River at Prisoners
4 Point Location

5

1 Figure 1-52. 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 San Joaquin River at Stockton
4 Location

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1 **Figure 1-53. 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 Mokelumne River near San**
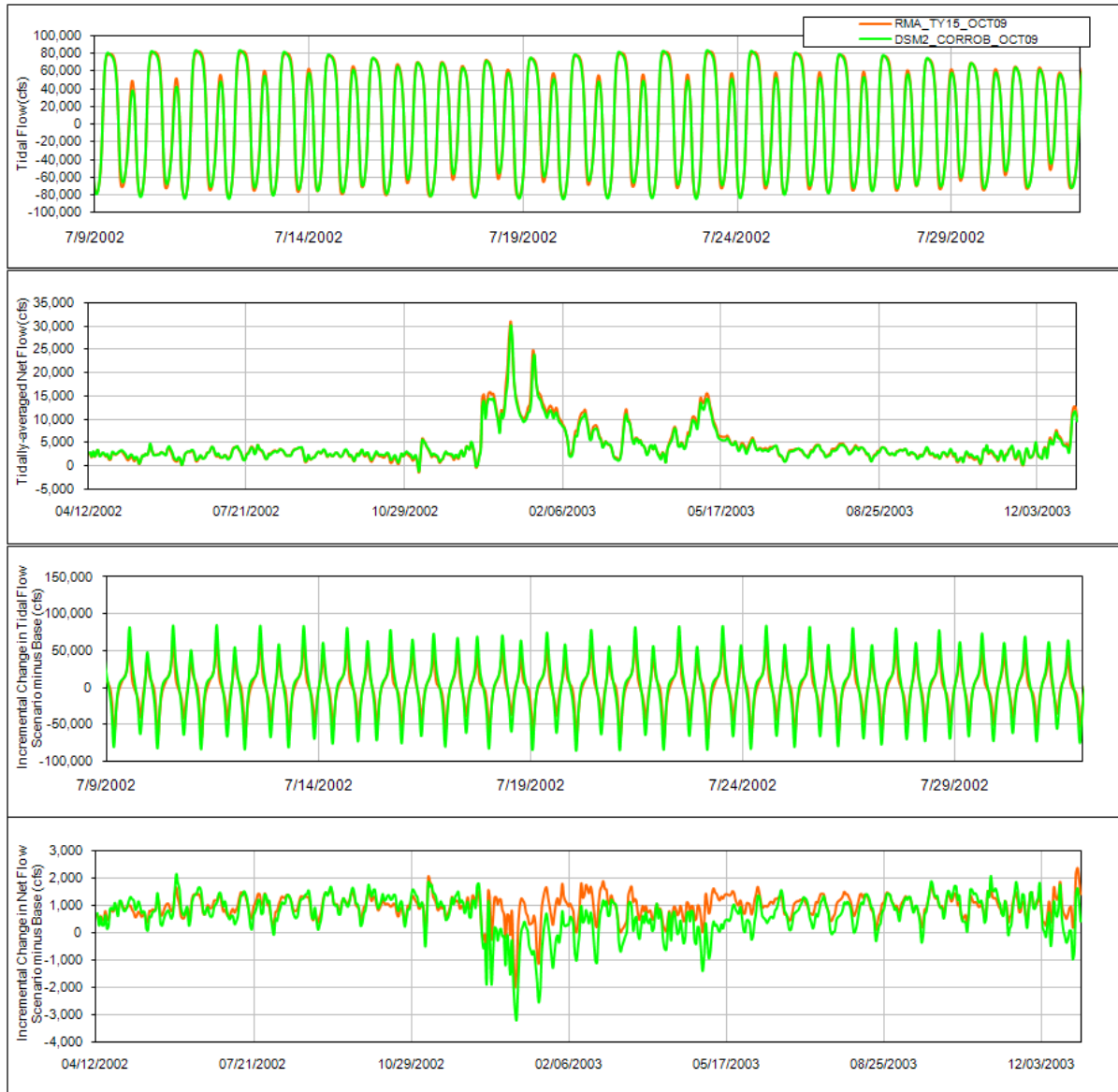4 **Joaquin River Location**

5

1 Figure 1-54. 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 Middle River at Bacon Island
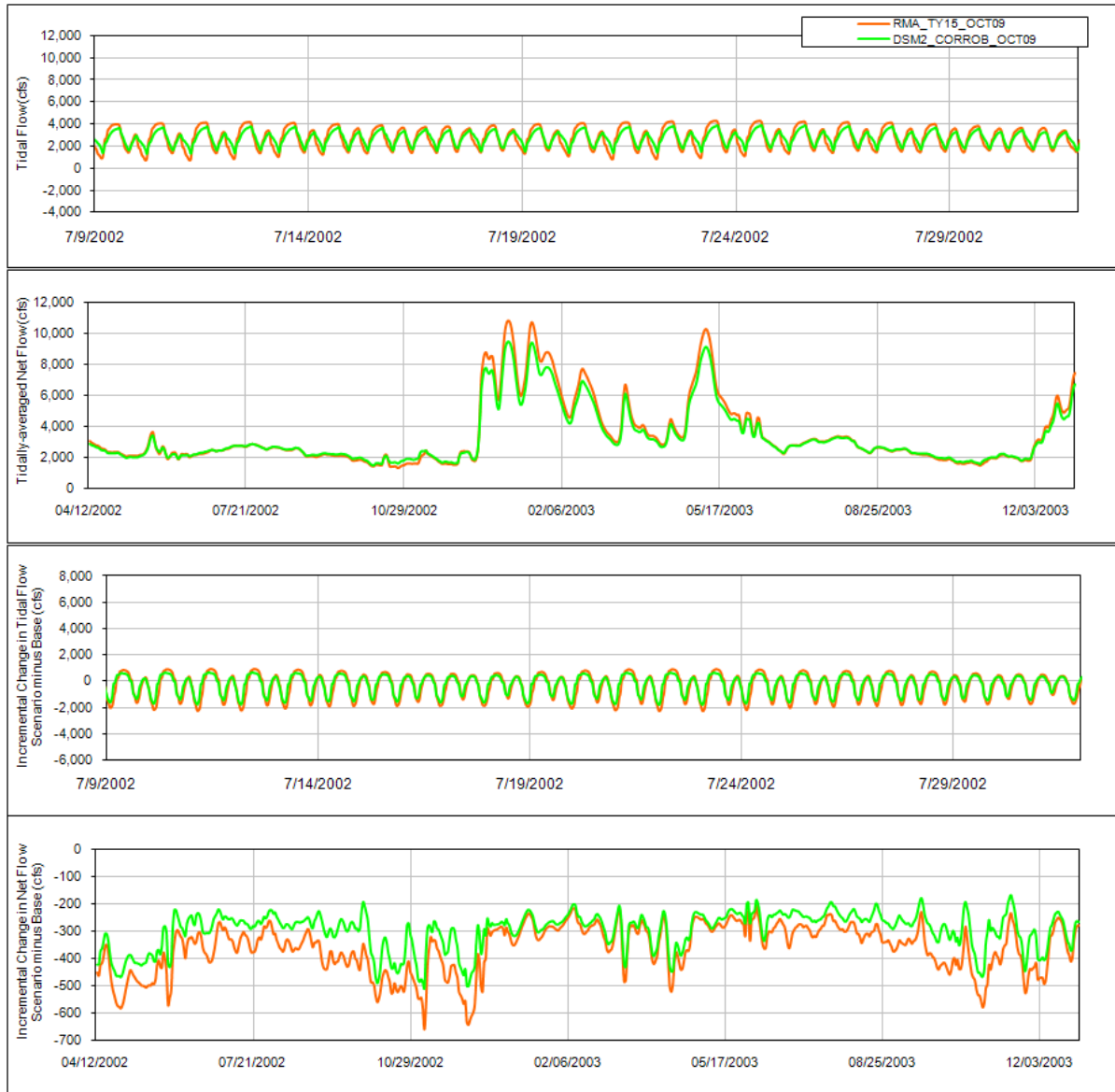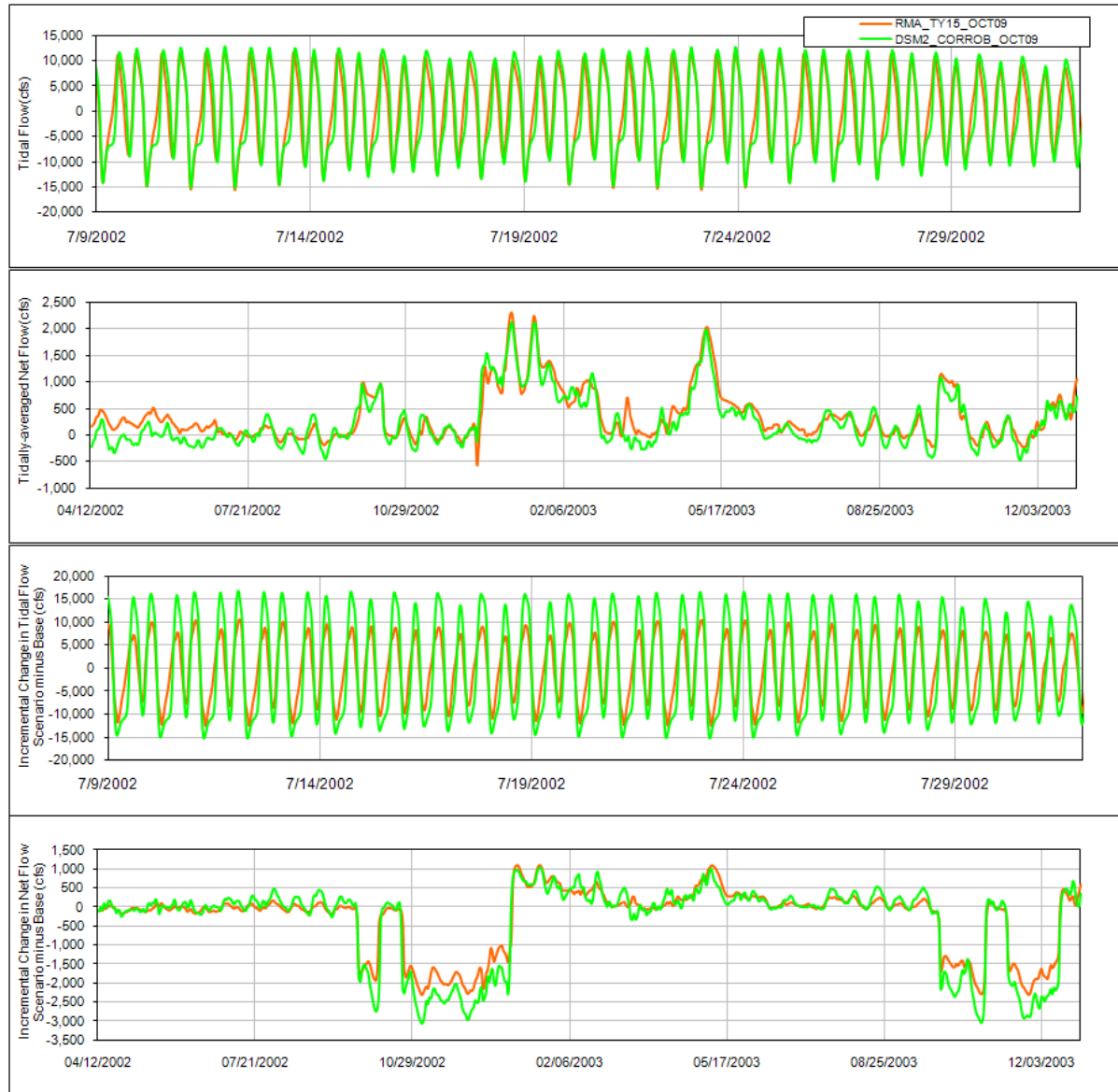4 Location

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1 **Figure 1-55. 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 Old River at Bacon Island**
4 **Location**

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1 **Figure 1-56. Comparison of Tidal Flow, Tidally-Averaged Daily Flow between the Early Long-Term**
2 **Scenario and the Current Conditions Scenario from RMA Model and DSM2 Model for Prospect Island**
3 **North Breach under Cache SI Region**
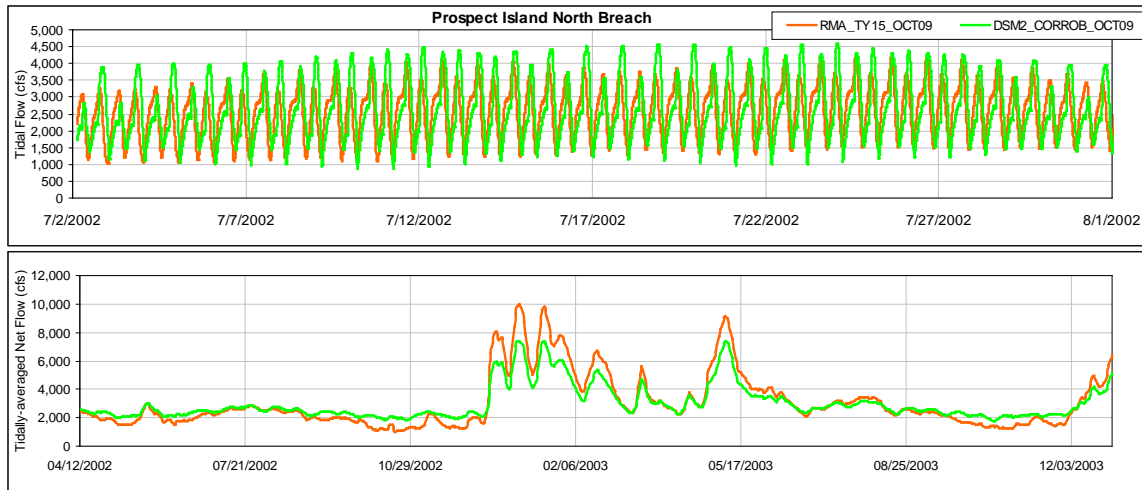
4

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

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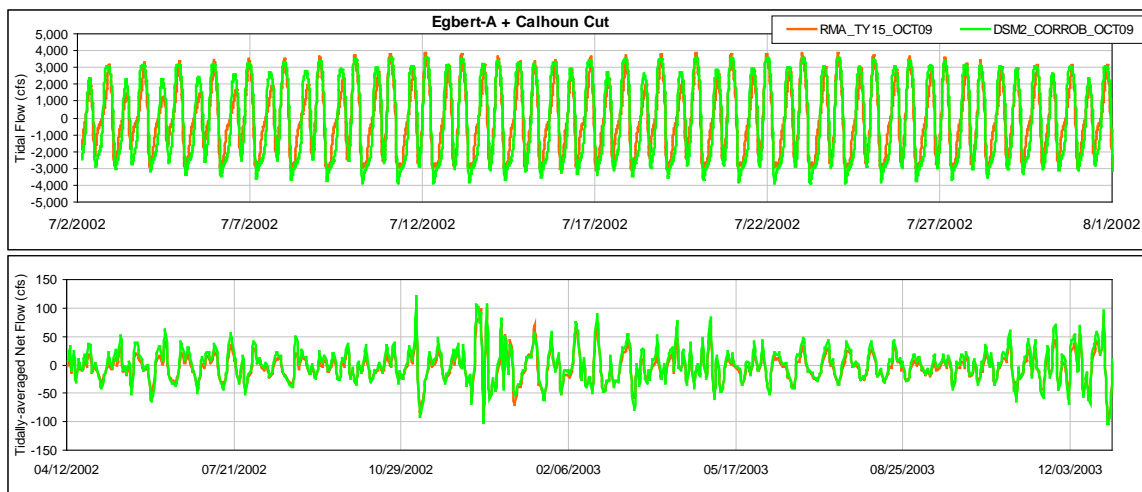
1   **Figure 1-58. Comparison of Tidal Flow, Tidally-Averaged Daily Flow between the Early Long-Term**
2   **Scenario and the Current Conditions Scenario from RMA Model and DSM2 Model for Shag Sl Breach**
3   **under Cache Sl Region**

4
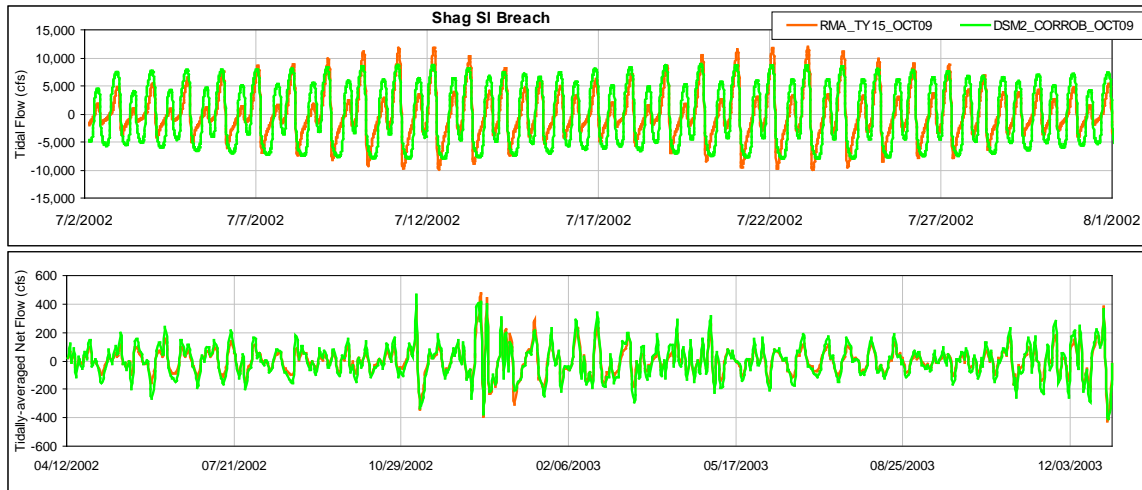
5   **Figure 1-59. Comparison of Tidal Flow, Tidally-Averaged Daily Flow between the Early Long-Term**
6   **Scenario and the Current Conditions Scenario from RMA Model and DSM2 Model for Island 10**
7   **Breach 3 under Suisun Marsh Region**

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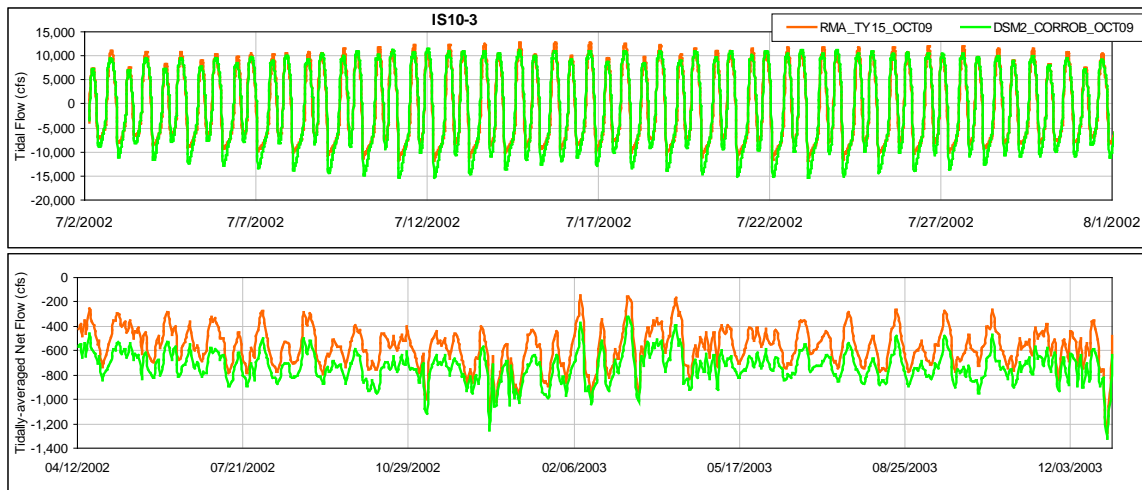
1 **Figure 1-60. Comparison of Tidal Flow, Tidally-Averaged Daily Flow between the Early Long-Term**
2 **Scenario and the Current Conditions Scenario from RMA Model and DSM2 Model for Island 5 Breach**
3 **1 under Suisun Marsh Region**
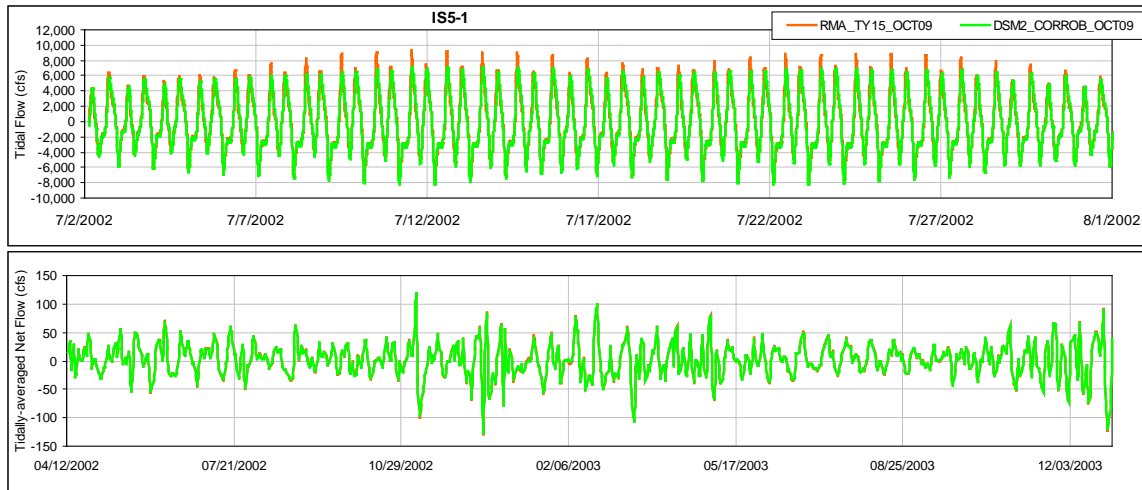
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5 **Figure 1-61. Comparison of Tidal Flow, Tidally-Averaged Daily Flow between the Early Long-Term**
6 **Scenario and the Current Conditions Scenario from RMA Model and DSM2 Model for Montezuma**
7 **Wetlands breaches under Suisun Marsh Region**

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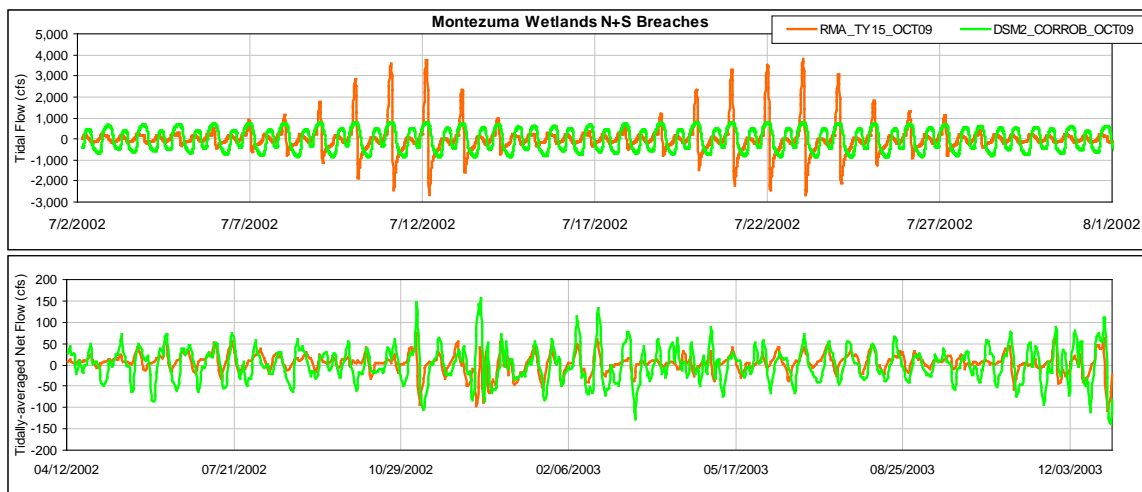
1   **Figure 1-62. Comparison of Tidal Flow, Tidally-Averaged Daily Flow between the Early Long-Term**
2   **Scenario and the Current Conditions Scenario from RMA Model and DSM2 Model for Decker Island**
3   **North West Breach under West Delta Region**

4

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

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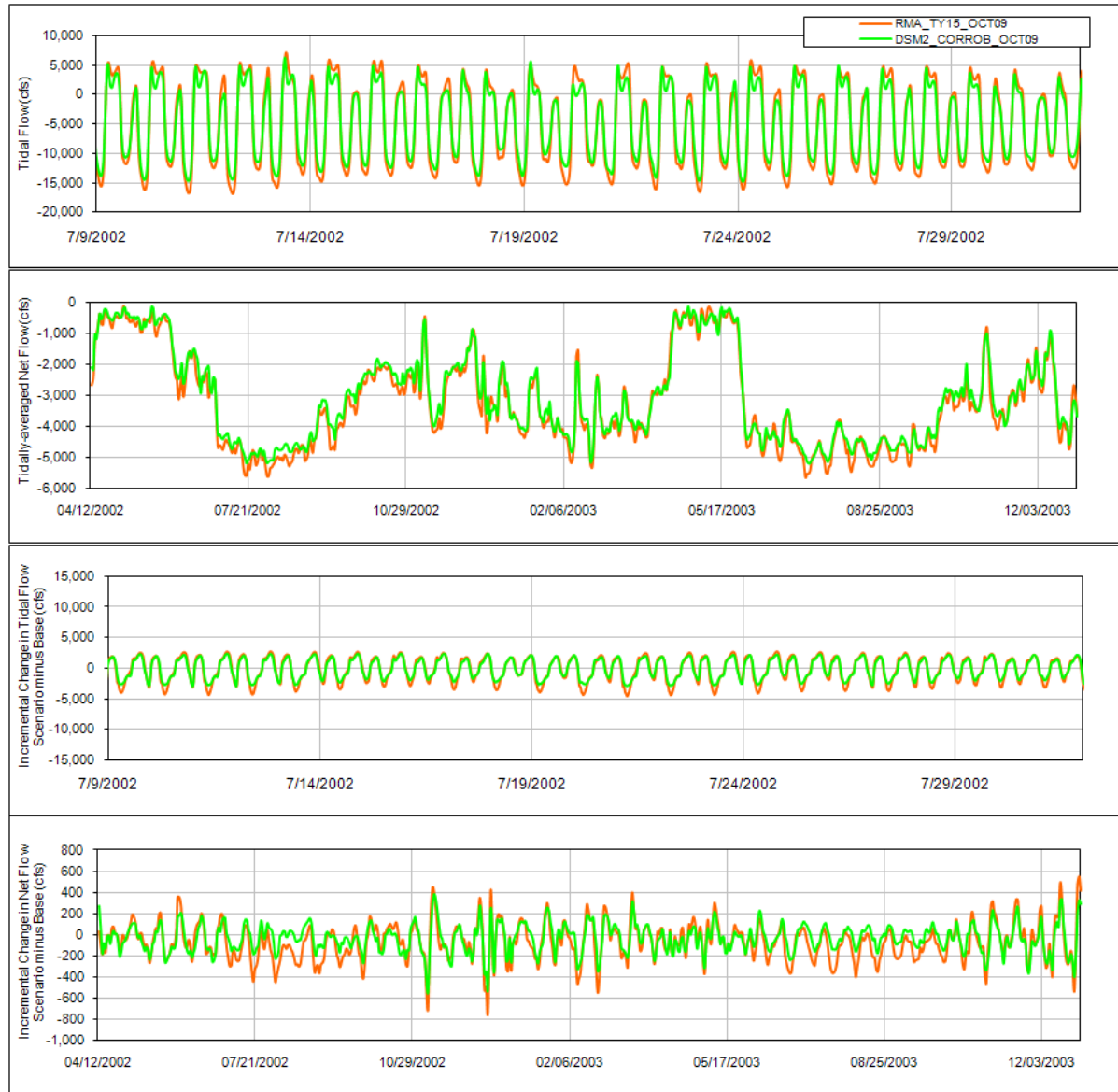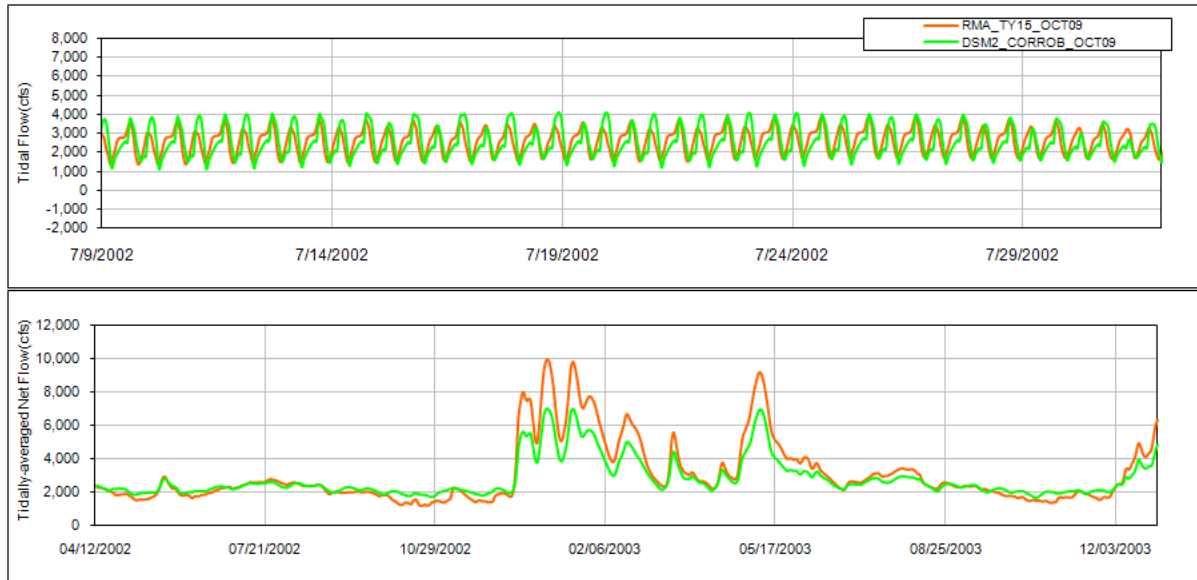3 **Breach under East Delta Region**

4
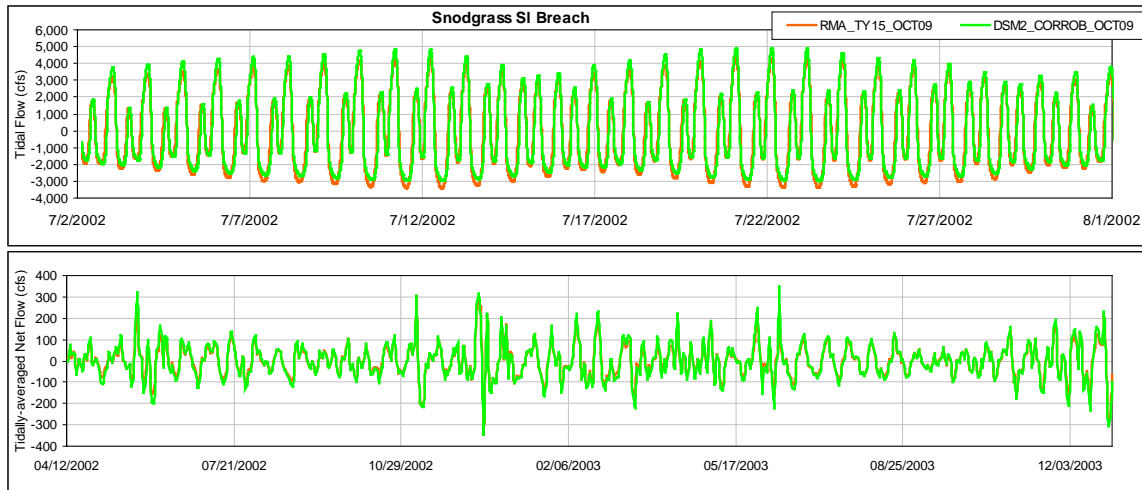
5 **Figure 1-65. Comparison of Tidal Flow, Tidally-Averaged Daily Flow between the Early Long-Term**
6 **Scenario and the Current Conditions Scenario from RMA Model and DSM2 Model for channel d/s of**
7 **Snodgrass SI Breach under East Delta Region**

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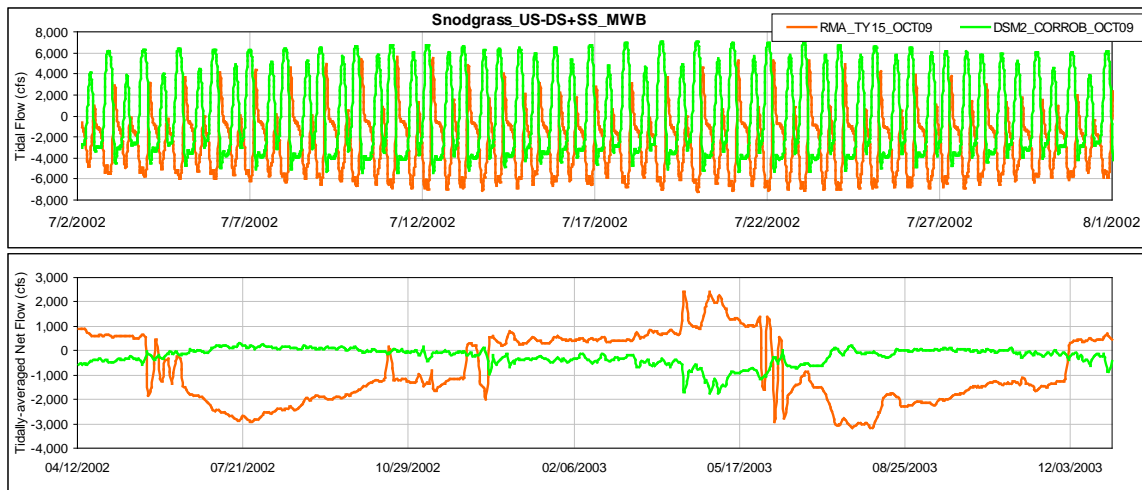
1 Early Long-Term 25,000ac Restoration Corroboration

2 Salinity Results

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

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

4

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

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

4

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

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

4

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

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

4

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

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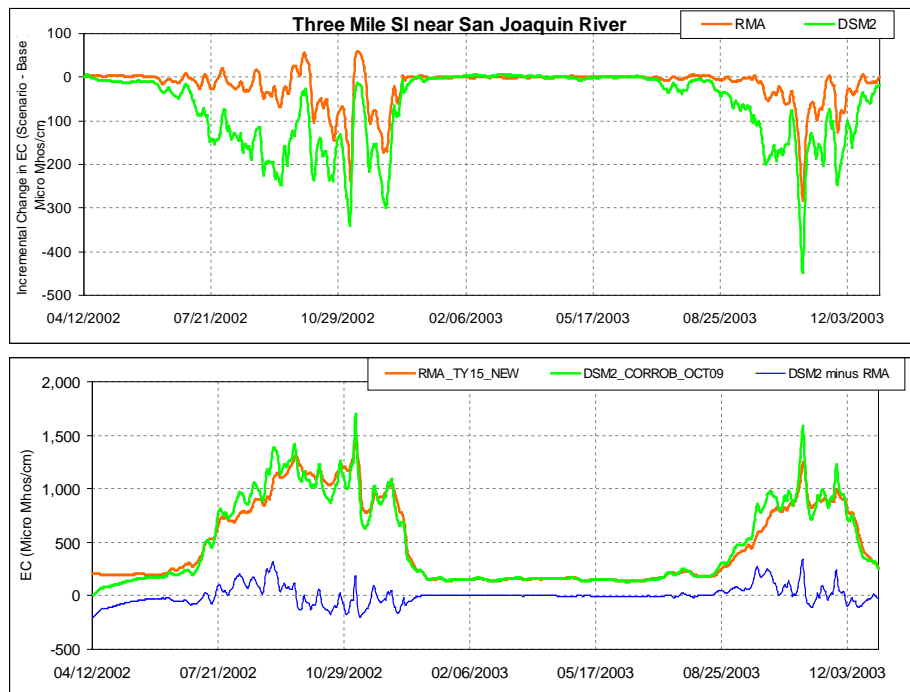
1 Figure 1-75. Comparison of Tidally-Averaged Daily EC and the Incremental Change in the Daily EC
2 between the Early Long-term Scenario and the Current Conditions Scenario from RMA Model and
3 DSM2 Model for San Joaquin River at Jersey Point Location

4

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

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

4

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

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

4

5 **Figure 1-80. Comparison of Tidally-Averaged Daily EC and the Incremental Change in the Daily EC**
6 **between the Early Long-term Scenario and the Current Conditions Scenario from RMA Model and**
7 **DSM2 Model for Middle River at Middle River Location**
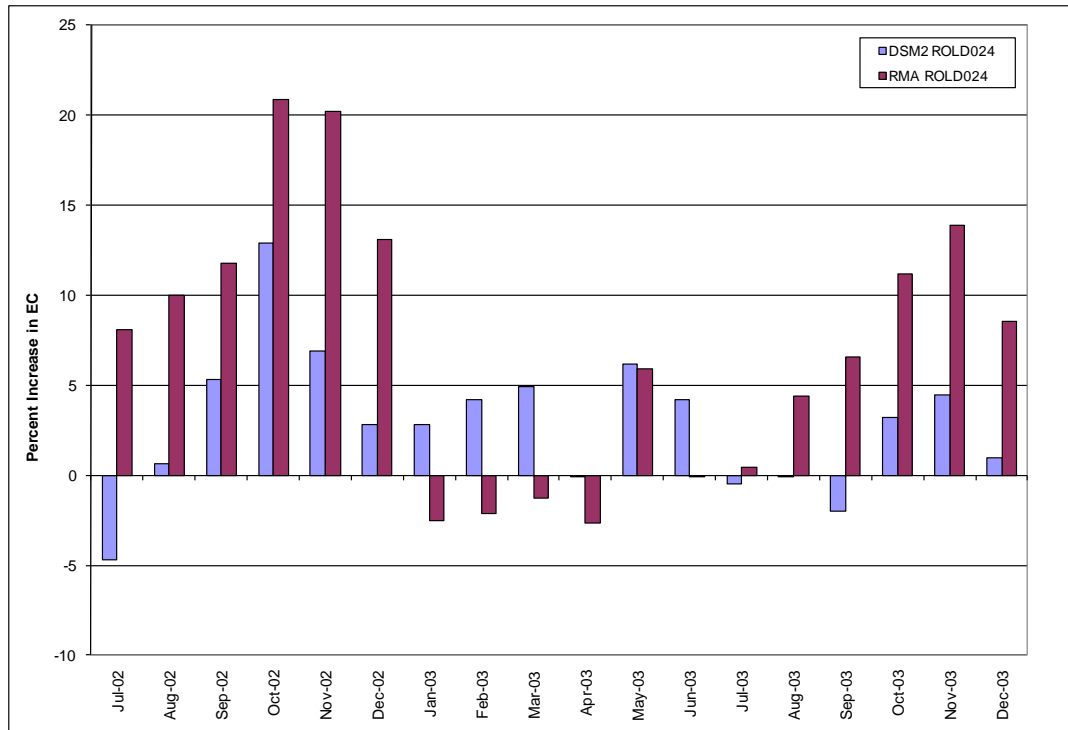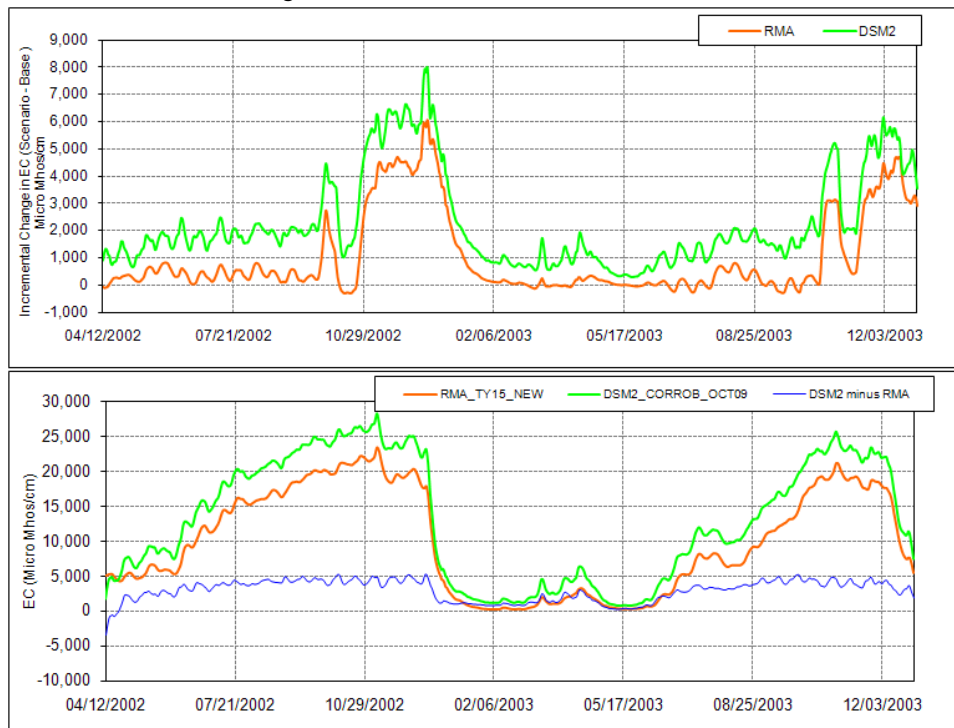
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1 **Figure 1-81. Comparison of Tidally-Averaged Daily EC and the Incremental Change in the Daily EC**
2 **between the Early Long-term Scenario and the Current Conditions Scenario from RMA Model and**
3 **DSM2 Model for Old River at Bacon Island Location**

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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

1 Figure 1-83. Comparison of Tidal Flow, Tidally-Averaged Daily Flow, Incremental Change in Tidal
2 Flow and the Incremental Change in the Daily Flow between the Late Long-term Scenario and the
3 Current Conditions Scenario from RMA Model and DSM2 Model for Georgiana Slough at Head
4 Location
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1 Figure 1-84. Comparison of Tidal Flow, Tidally-Averaged Daily Flow, Incremental Change in Tidal
2 Flow and the Incremental Change in the Daily Flow between the Late Long-term Scenario and the
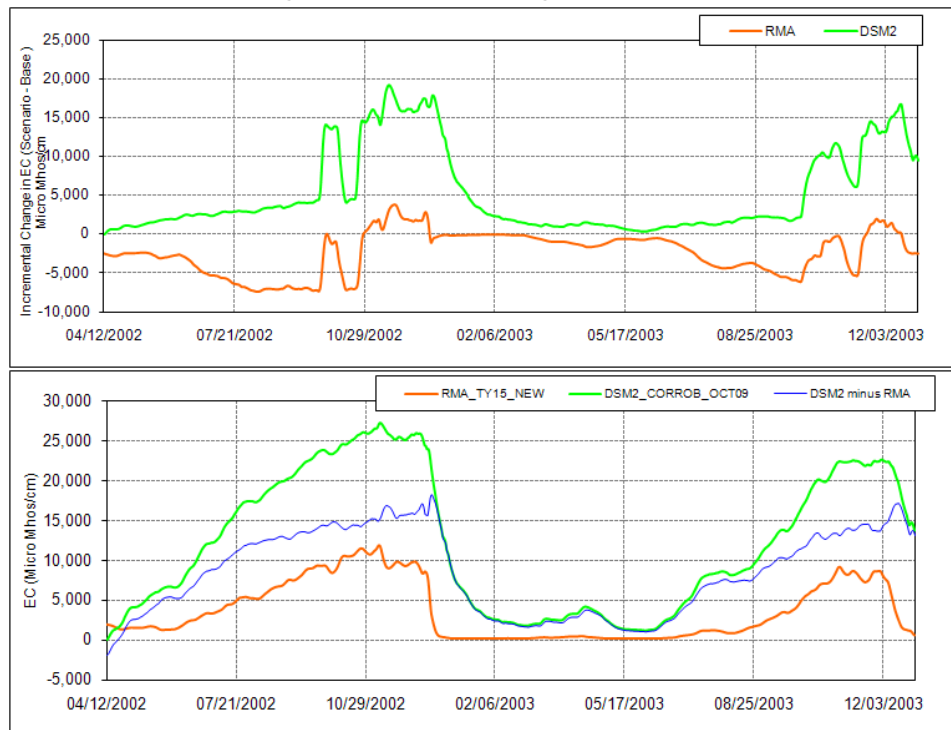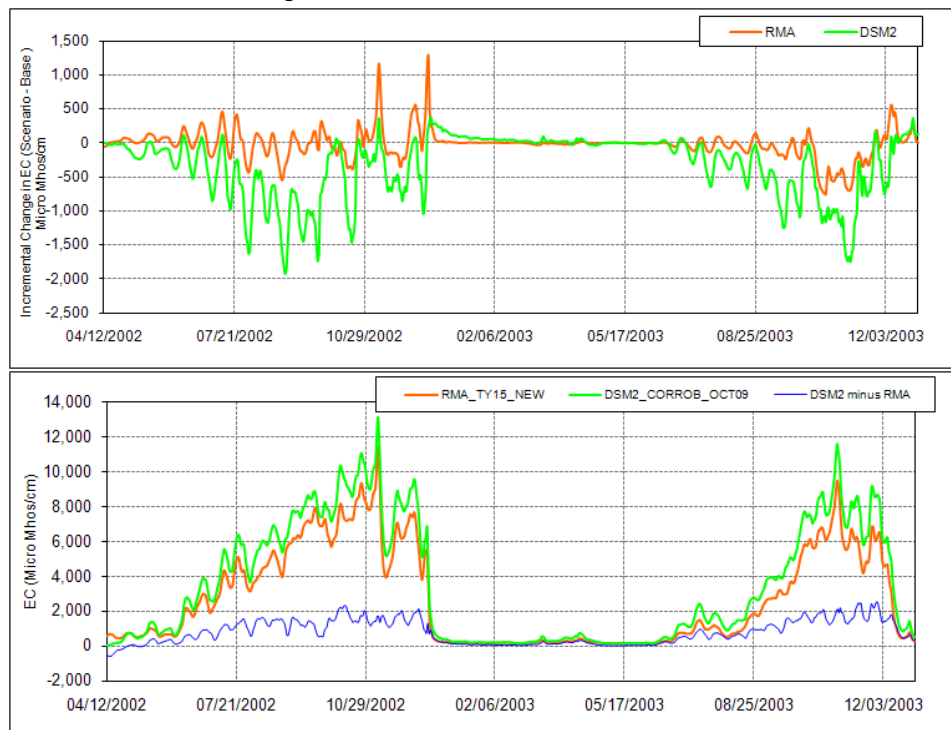3 Current Conditions Scenario from RMA Model and DSM2 Model for Montezuma Slough at Head
4 Location
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1 Figure 1-85. Comparison of Tidal Flow, Tidally-Averaged Daily Flow, Incremental Change in Tidal
2 Flow and the Incremental Change in the Daily Flow between the Late Long-term Scenario and the
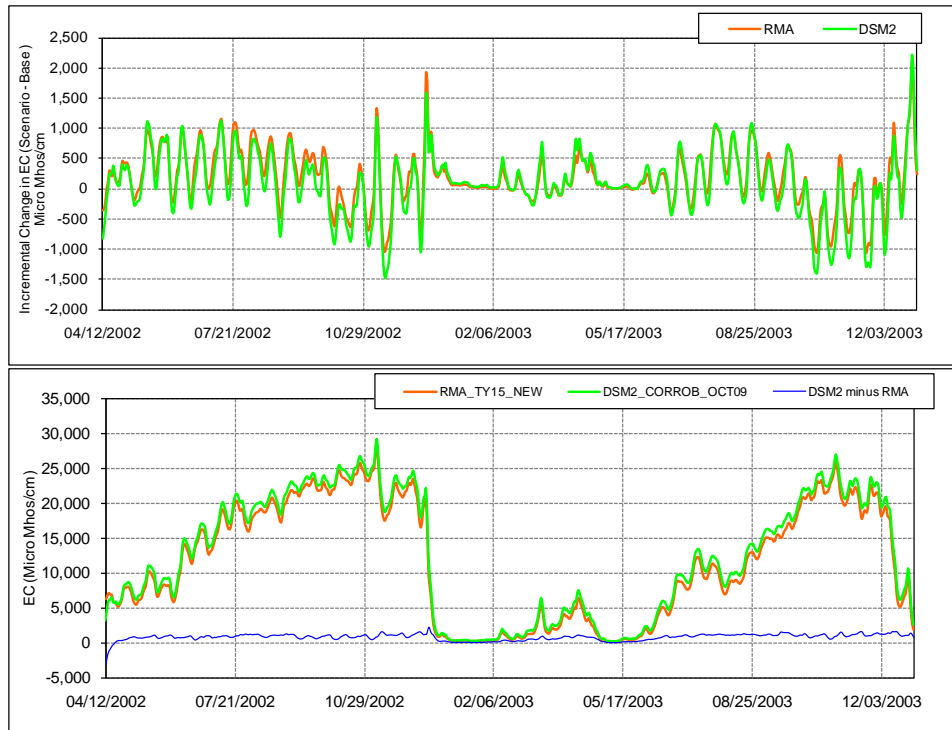3 Current Conditions Scenario from RMA Model and DSM2 Model for Montezuma Slough at Mouth
4 Location
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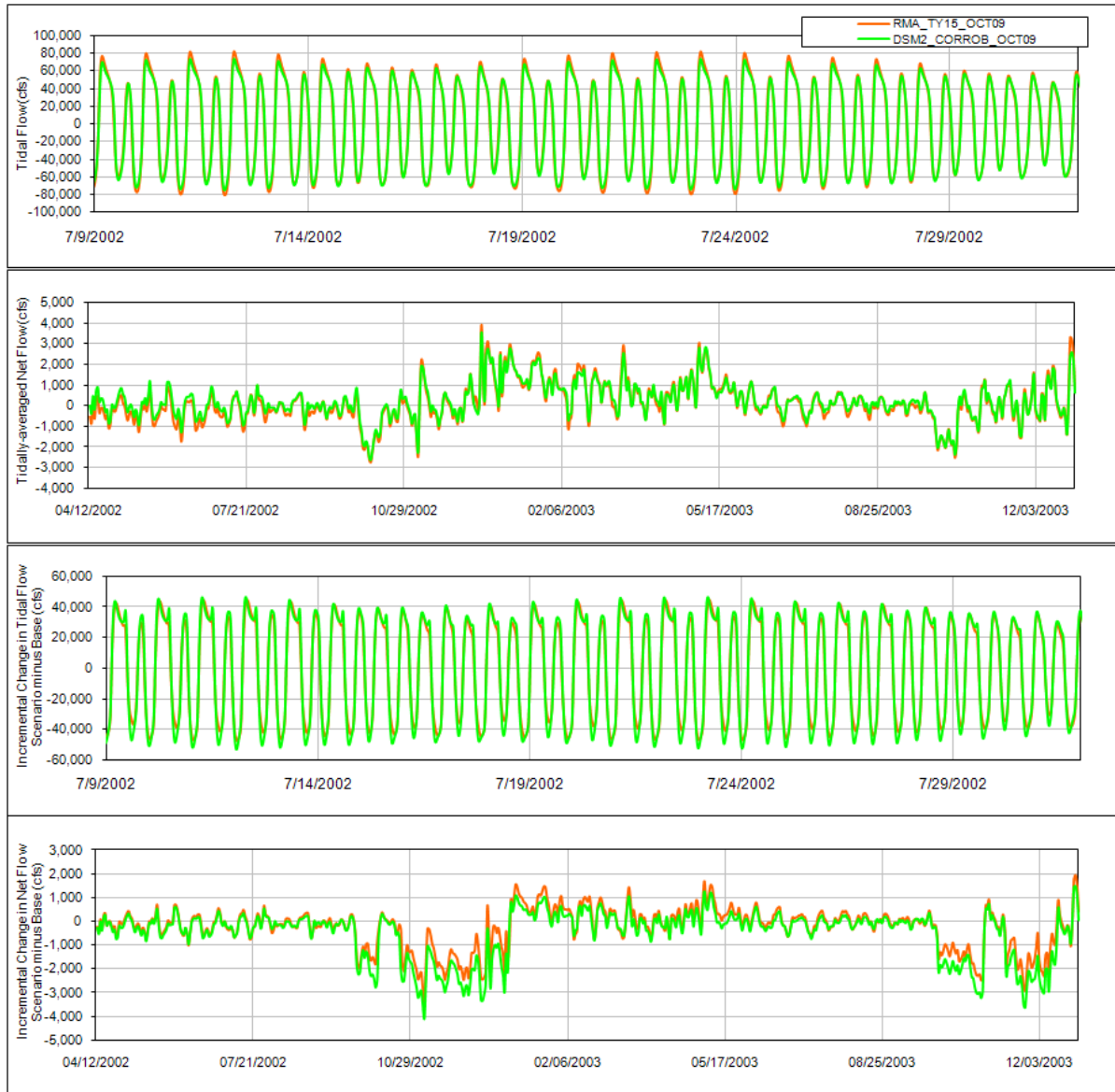
1 Figure 1-86. Comparison of Tidal Flow, Tidally-Averaged Daily Flow, Incremental Change in Tidal
2 Flow and the Incremental Change in the Daily Flow between the Late Long-term Scenario and the
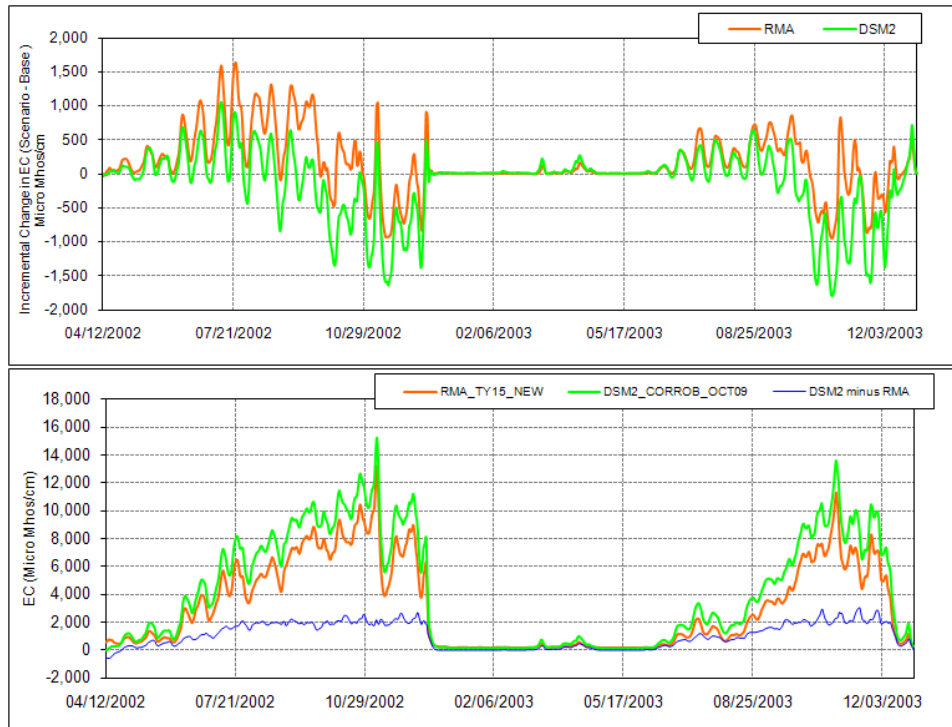3 Current Conditions Scenario from RMA Model and DSM2 Model for San Joaquin River at Prisoners
4 Point Location
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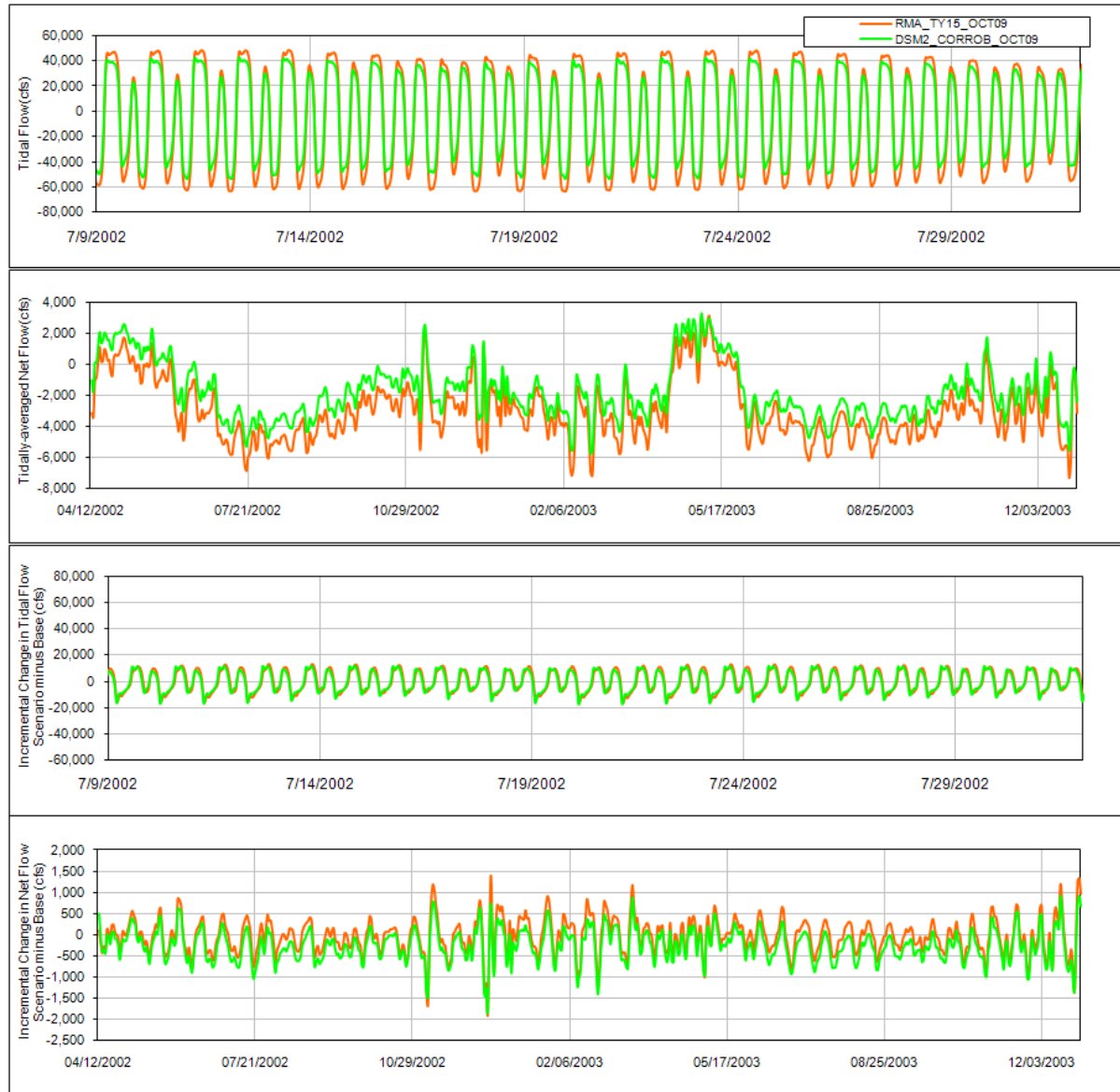
1 Figure 1-87. Comparison of Tidal Flow, Tidally-Averaged Daily Flow, Incremental Change in Tidal
2 Flow and the Incremental Change in the Daily Flow between the Late Long-term Scenario and the
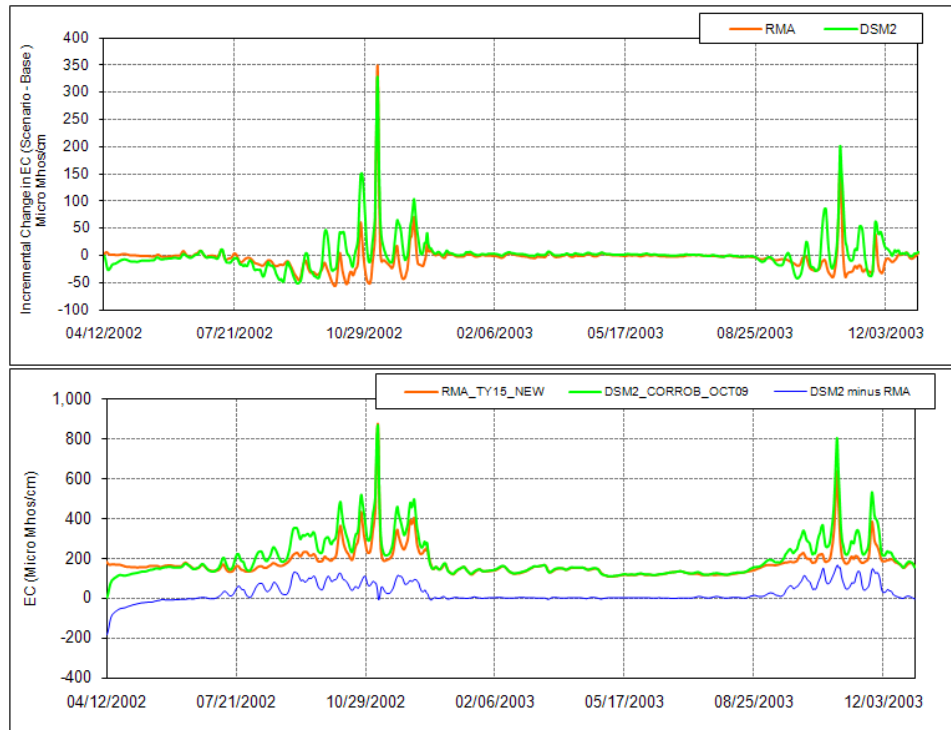3 Current Conditions Scenario from RMA Model and DSM2 Model for San Joaquin River at Stockton
4 Location
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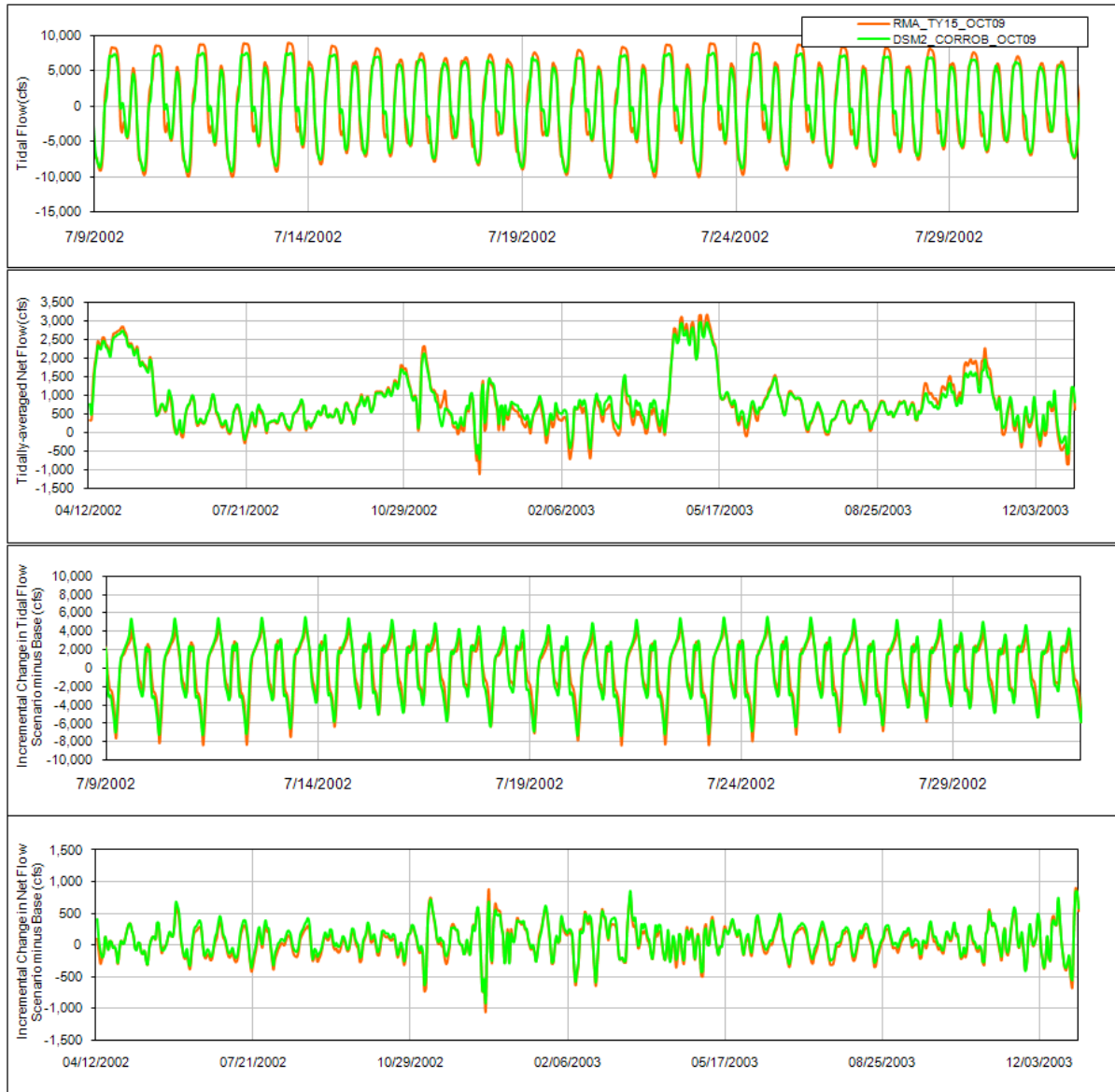
1 Figure 1-88. Comparison of Tidal Flow, Tidally-Averaged Daily Flow, Incremental Change in Tidal
2 Flow and the Incremental Change in the Daily Flow between the Late Long-term Scenario and the
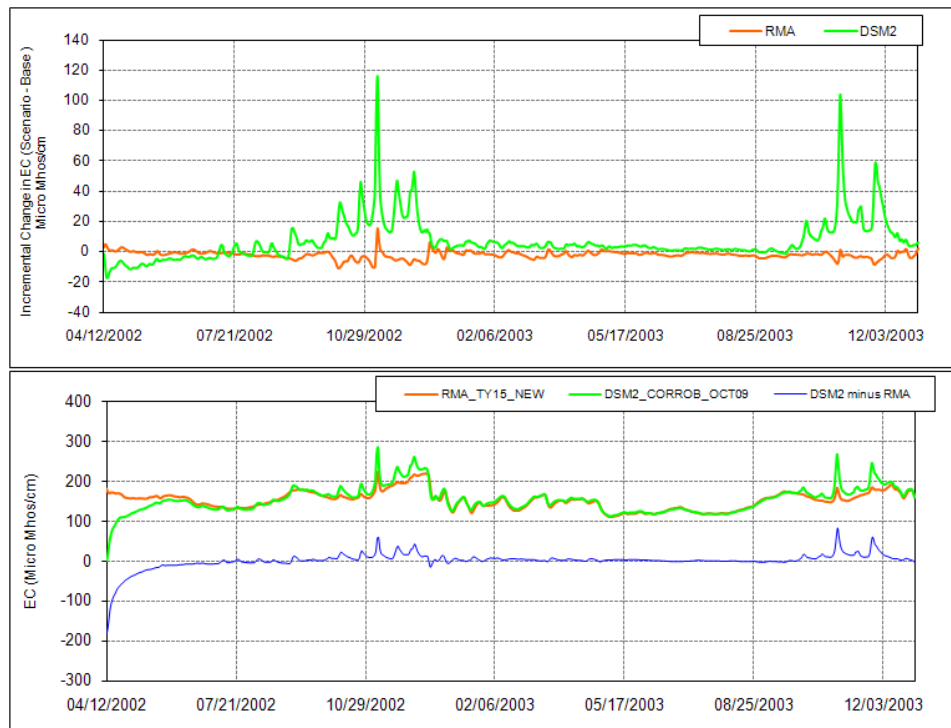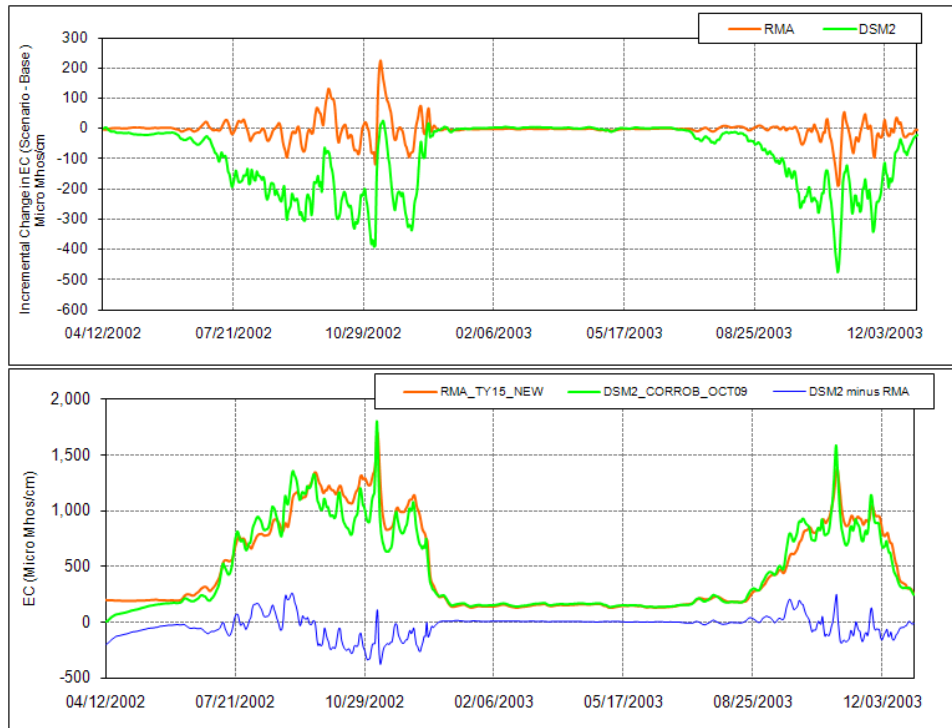3 Current Conditions Scenario from RMA Model and DSM2 Model for Mokelumne River near San
4 Joaquin River Location
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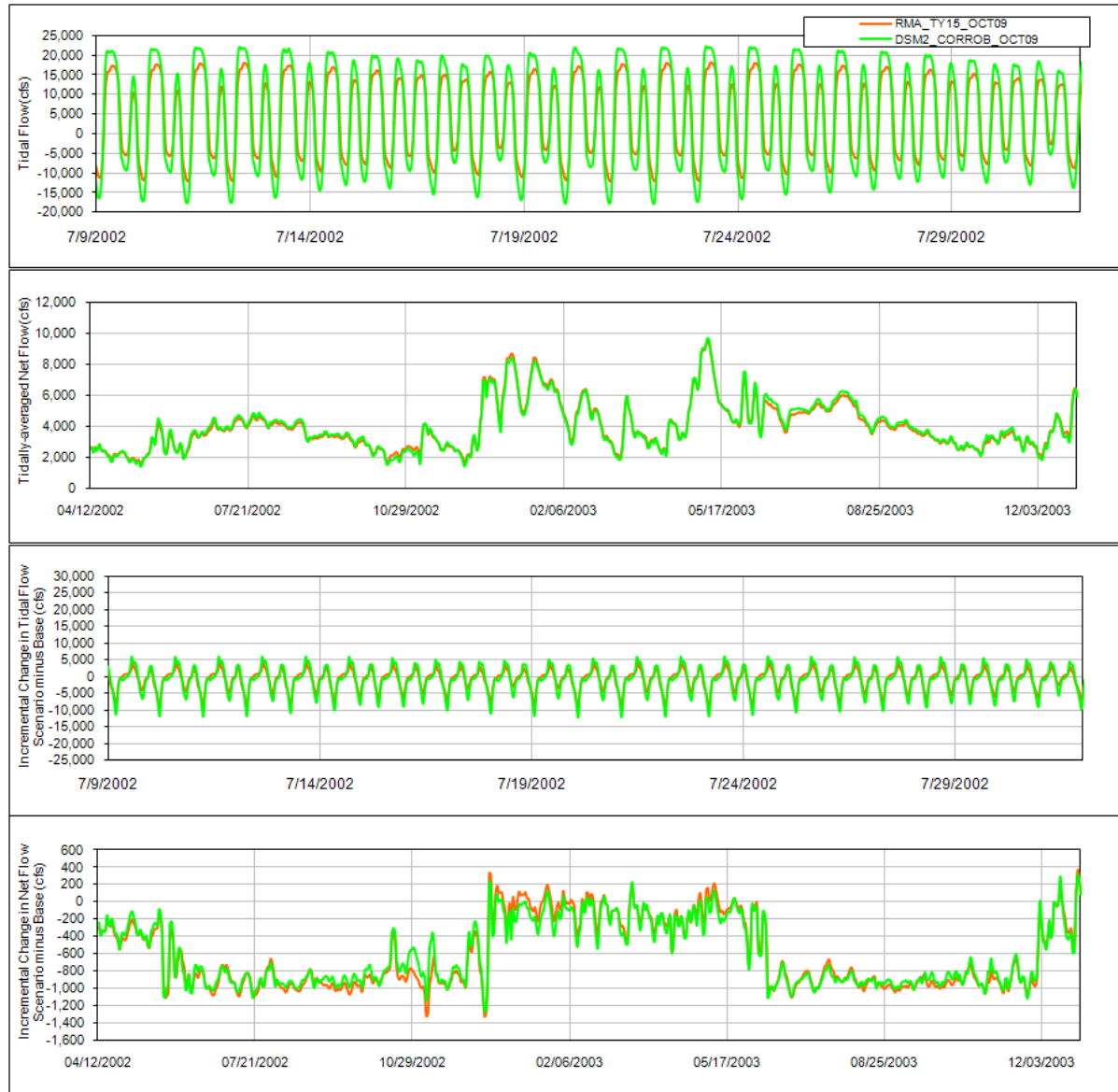
1   Figure 1-89. Comparison of Tidal Flow, Tidally-Averaged Daily Flow, Incremental Change in Tidal
2   Flow and the Incremental Change in the Daily Flow between the Late Long-term Scenario and the
3   Current Conditions Scenario from RMA Model and DSM2 Model for Middle River at Bacon Island
4   Location
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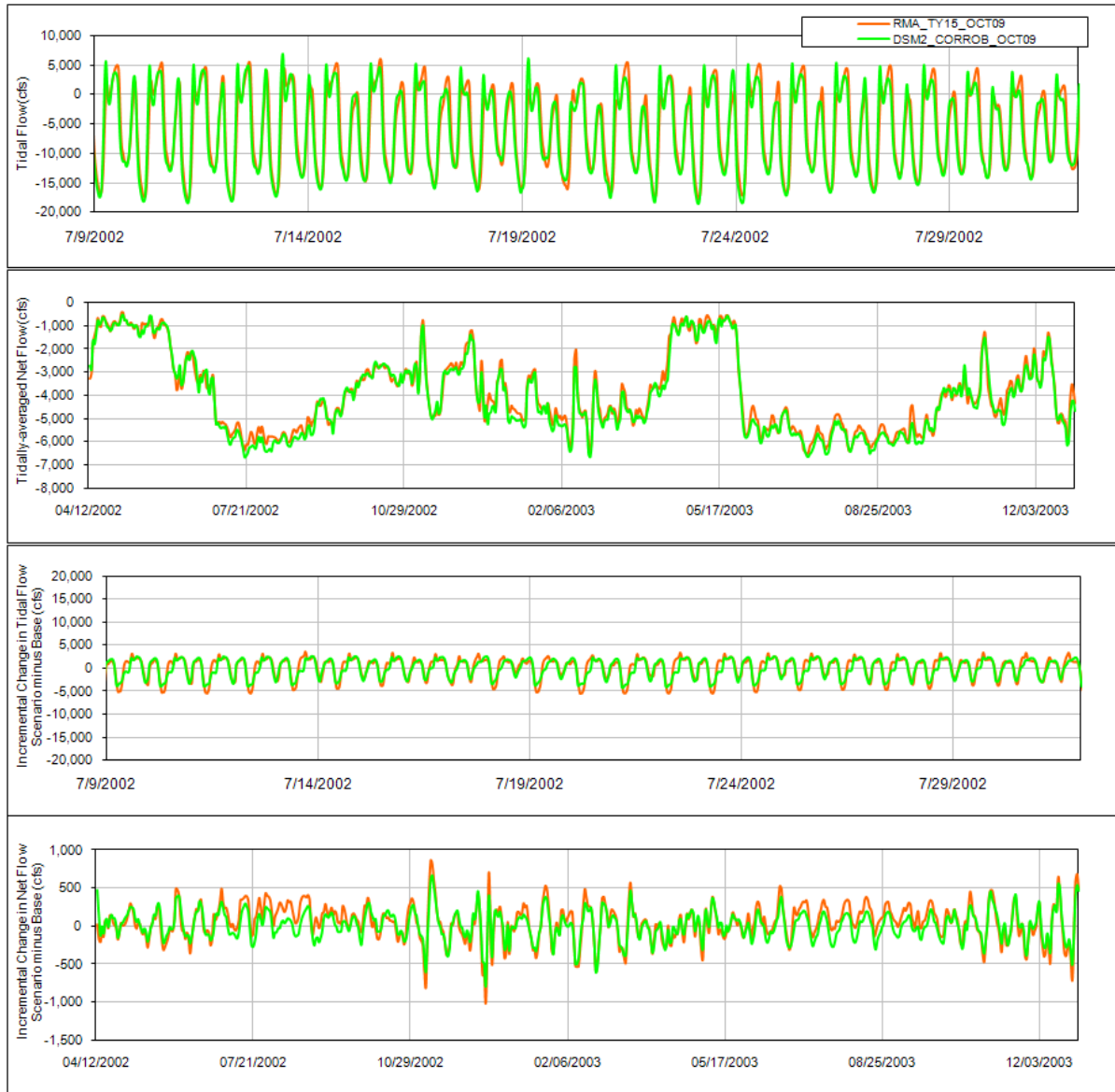
1 Figure 1-90. Comparison of Tidal Flow, Tidally-Averaged Daily Flow, Incremental Change in Tidal
2 Flow and the Incremental Change in the Daily Flow between the Late Long-term Scenario and the
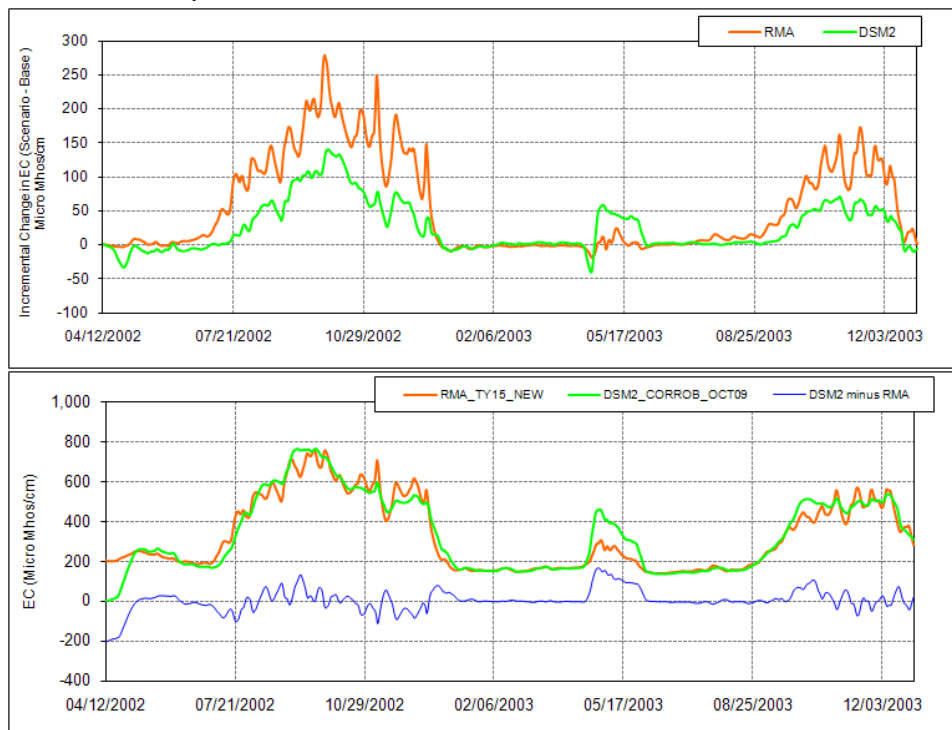3 Current Conditions Scenario from RMA Model and DSM2 Model for Middle River at Bacon Island
4 Location
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1   Figure 1-91. Comparison of Tidal Flow and Tidally-Averaged Daily Flow between the Late Long-Term
2   Scenario and the Current Conditions Scenario from RMA Model and DSM2 Model for Prospect Island
3   North Breach under Cache SI Region

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

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1 Figure 1-93. Comparison of Tidal Flow and Tidally-Averaged Daily Flow between the Late Long-Term
2 Scenario and the Current Conditions Scenario from RMA Model and DSM2 Model for Shag Slough
3 Breach under Cache Sl Region
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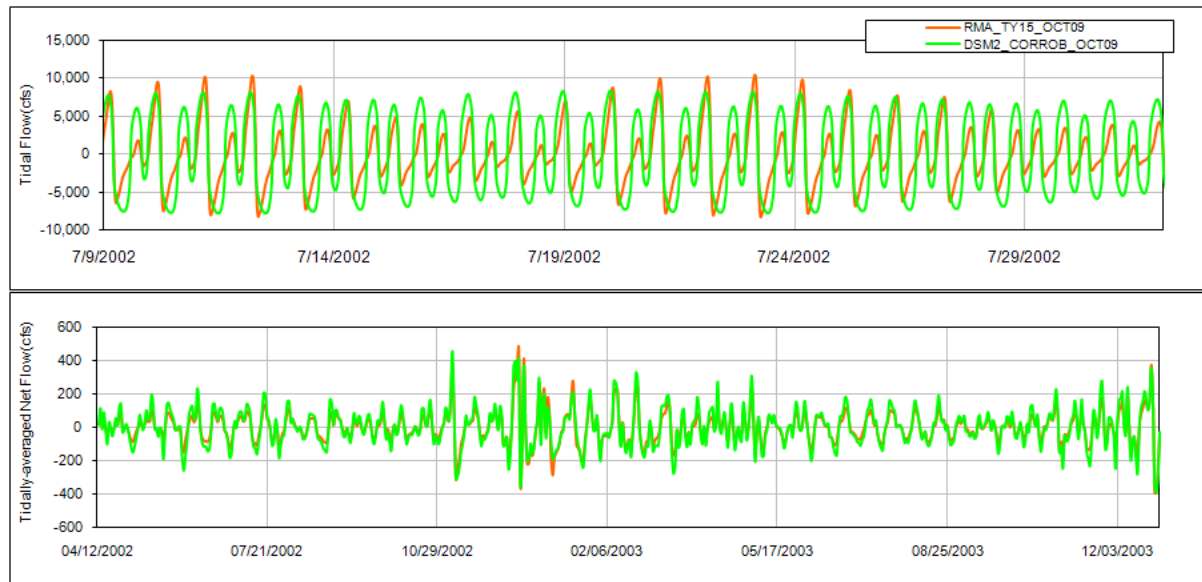
7 Figure 1-94. Comparison of Tidal Flow and Tidally-Averaged Daily Flow between the Late Long-Term
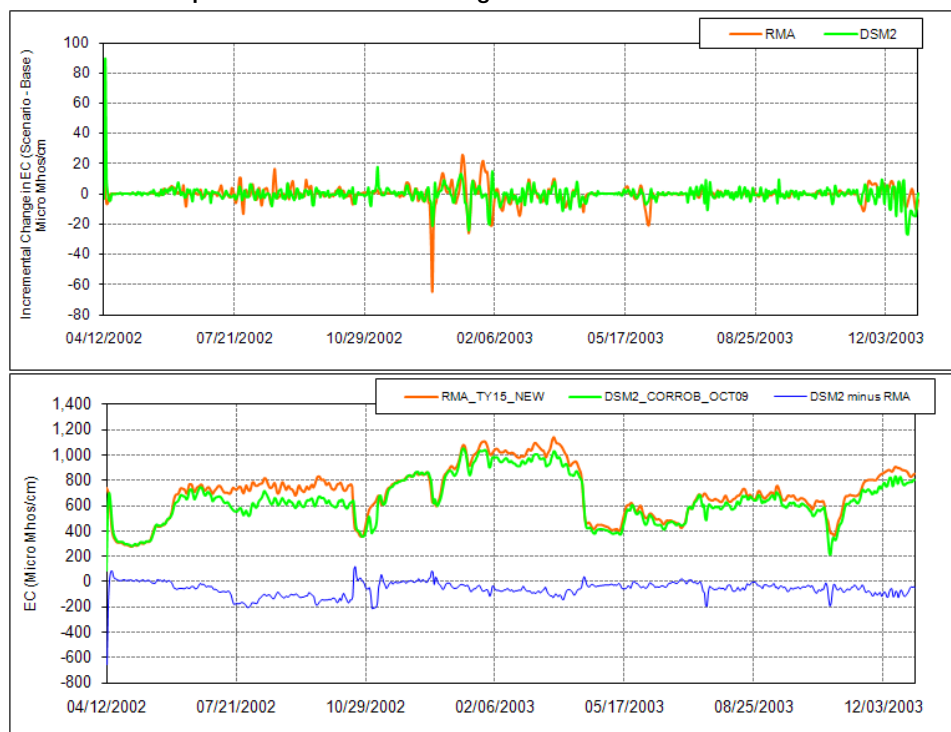8 Scenario and the Current Conditions Scenario from RMA Model and DSM2 Model for Suisun Island
9 10 Breach 3 under Suisun Marsh
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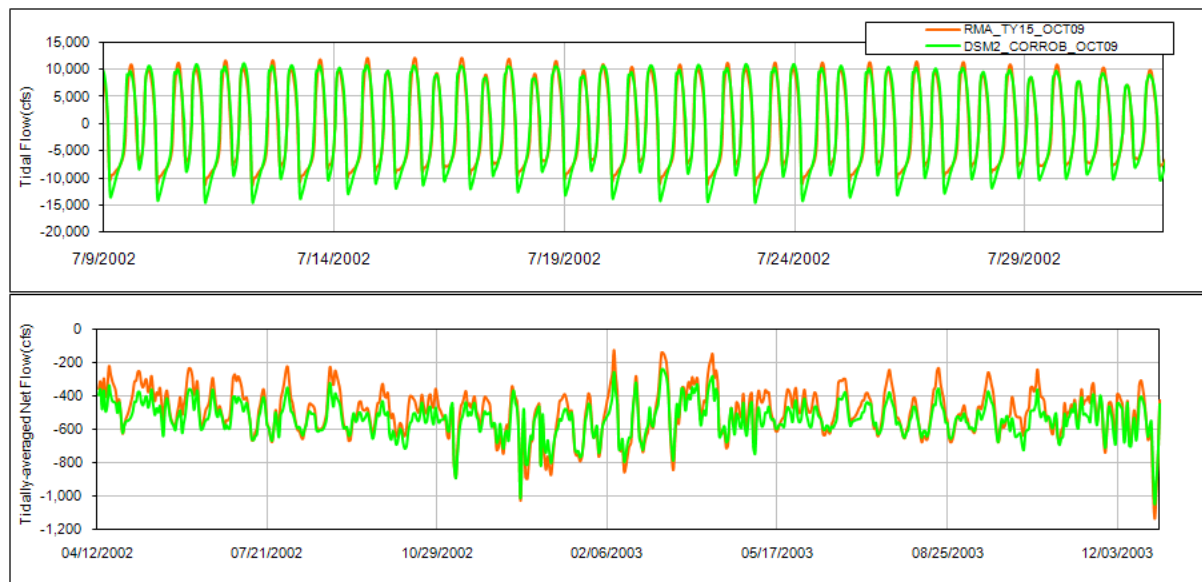
1 Figure 1-95. Comparison of Tidal Flow and Tidally-Averaged Daily Flow between the Late Long-Term
2 Scenario and the Current Conditions Scenario from RMA Model and DSM2 Model for Suisun Island 5
3 Breach 1 under Suisun Marsh
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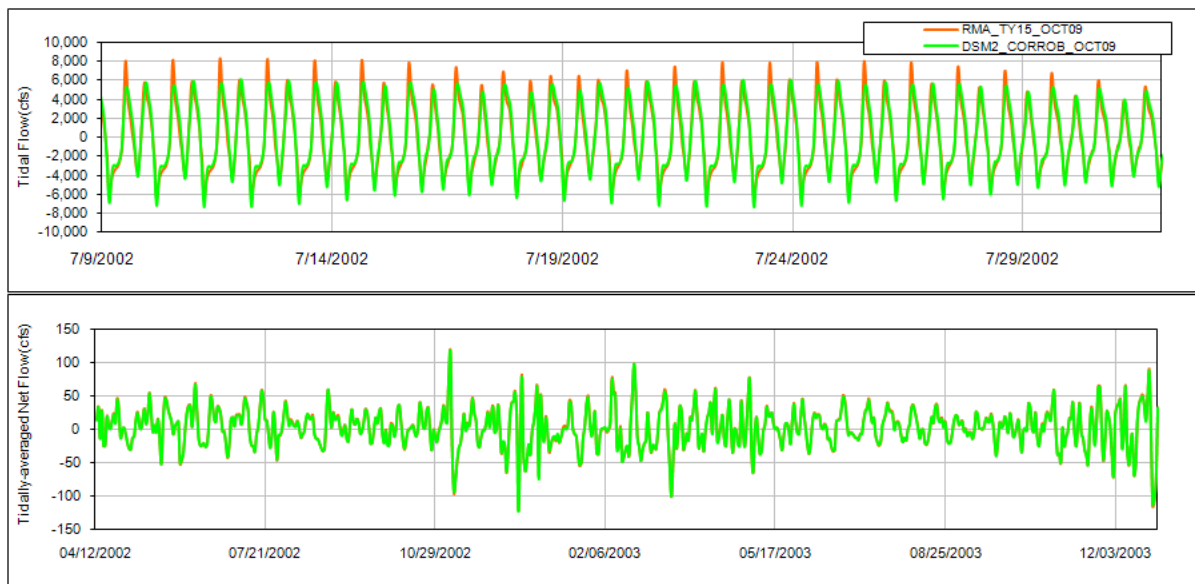
7 Figure 1-96. Comparison of Tidal Flow and Tidally-Averaged Daily Flow between the Late Long-Term
8 Scenario and the Current Conditions Scenario from RMA Model and DSM2 Model for Montezuma
9 Wetlands Breach under Suisun Marsh
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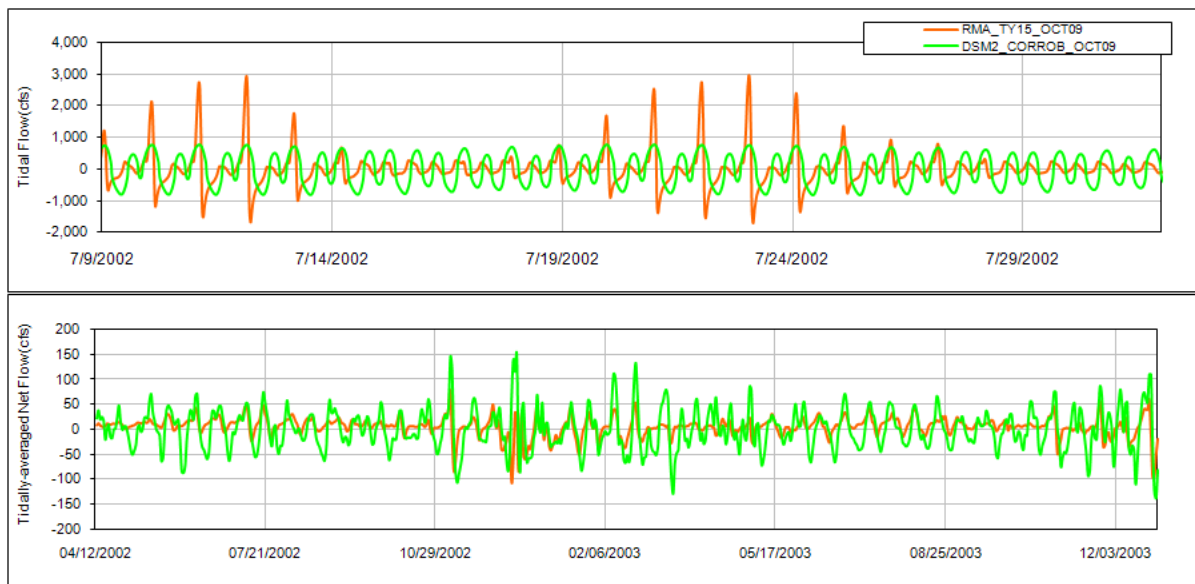
1   Figure 1-97. Comparison of Tidal Flow and Tidally-Averaged Daily Flow between the Late Long-Term
2   Scenario and the Current Conditions Scenario from RMA Model and DSM2 Model for Decker Island
3   North West Breach under Western Delta Region.
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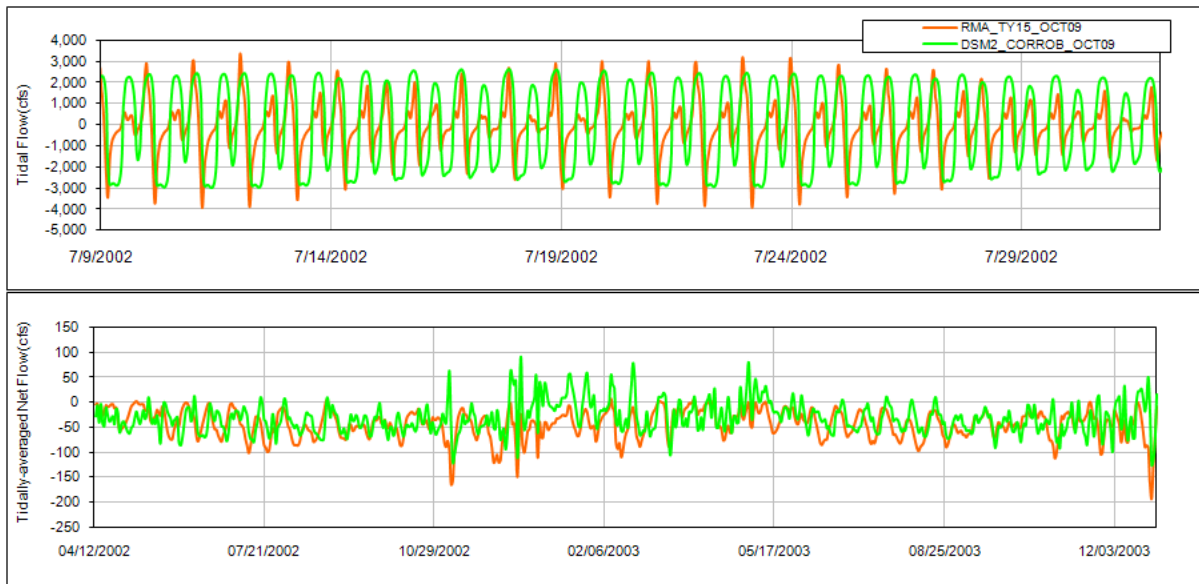
7   Figure 1-98. Comparison of Tidal Flow and Tidally-Averaged Daily Flow between the Late Long-Term
8   Scenario and the Current Conditions Scenario from RMA Model and DSM2 Model for Dutch Slough
9   d/s of Emerson Slough under Western Delta Region.
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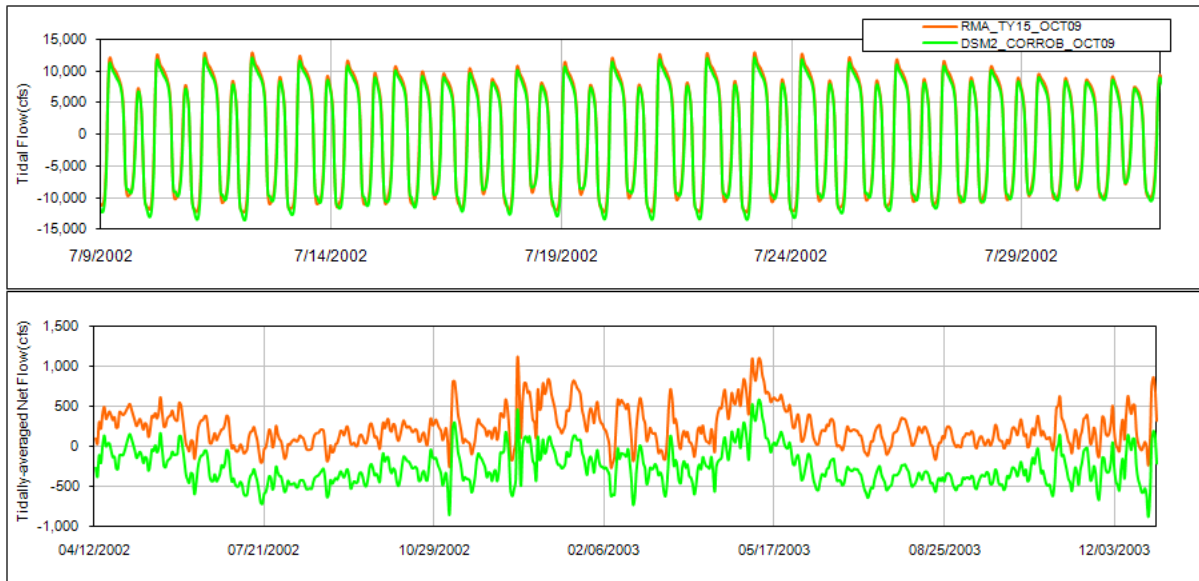
1 Figure 1-100. Comparison of Tidal Flow and Tidally-Averaged Daily Flow between the Late Long-
2 Term Scenario and the Current Conditions Scenario from RMA Model and DSM2 Model for
3 Snodgrass Slough Breach under Eastern Delta Region.
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Late Long-Term 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.
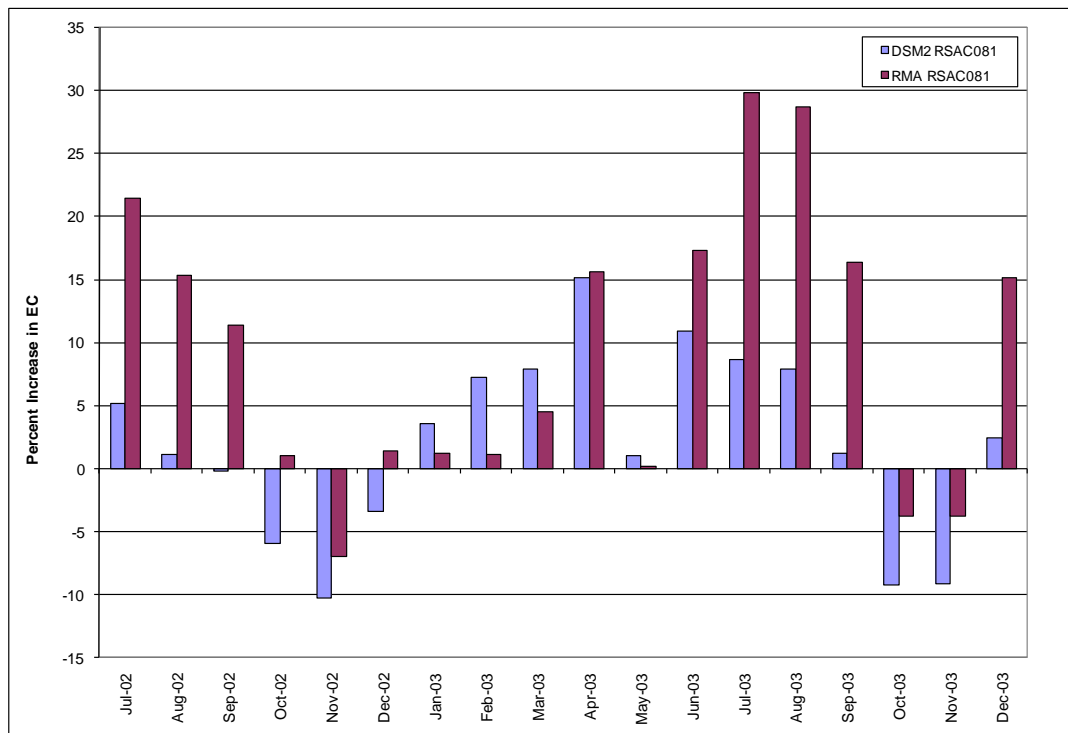
1 Figure 1-102. Comparison of Monthly averaged percentage incremental change in EC between the
2 Late Long-Term Scenario and the Current Conditions Scenario from RMA Model and DSM2 Model for
3 Sacramento River at Emmaton.

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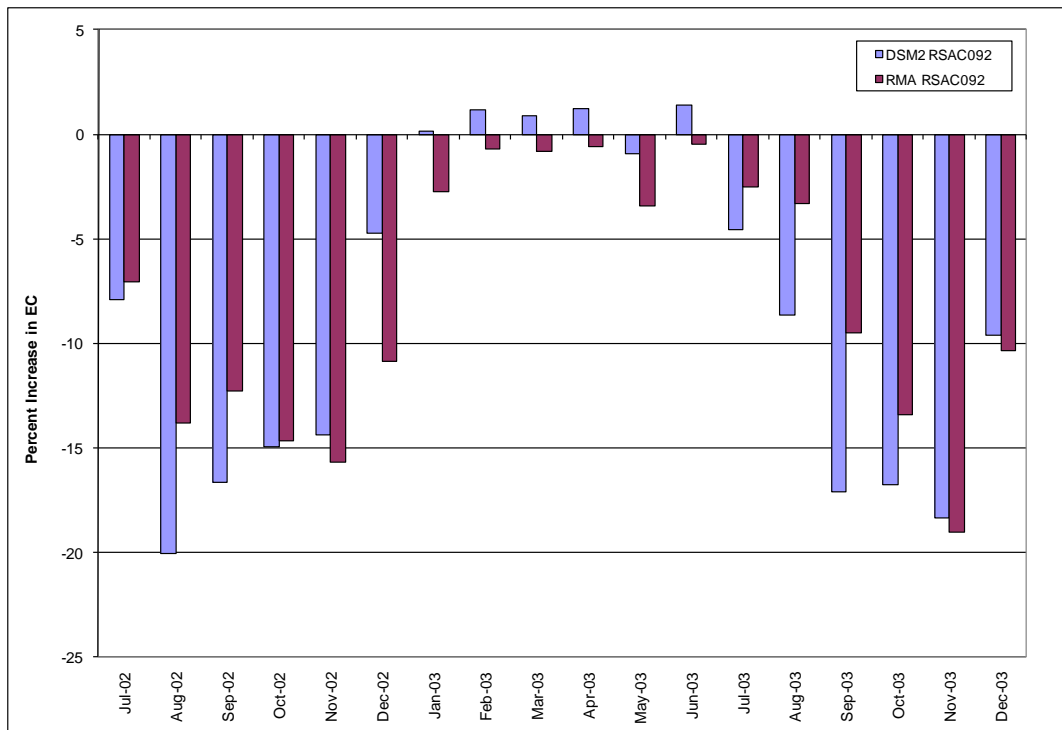
5 Figure 1-103. Comparison of Monthly averaged percentage incremental change in EC between the
6 Late Long-Term Scenario and the Current Conditions Scenario from RMA Model and DSM2 Model for
7 San Joaquin River at Jersey Point.

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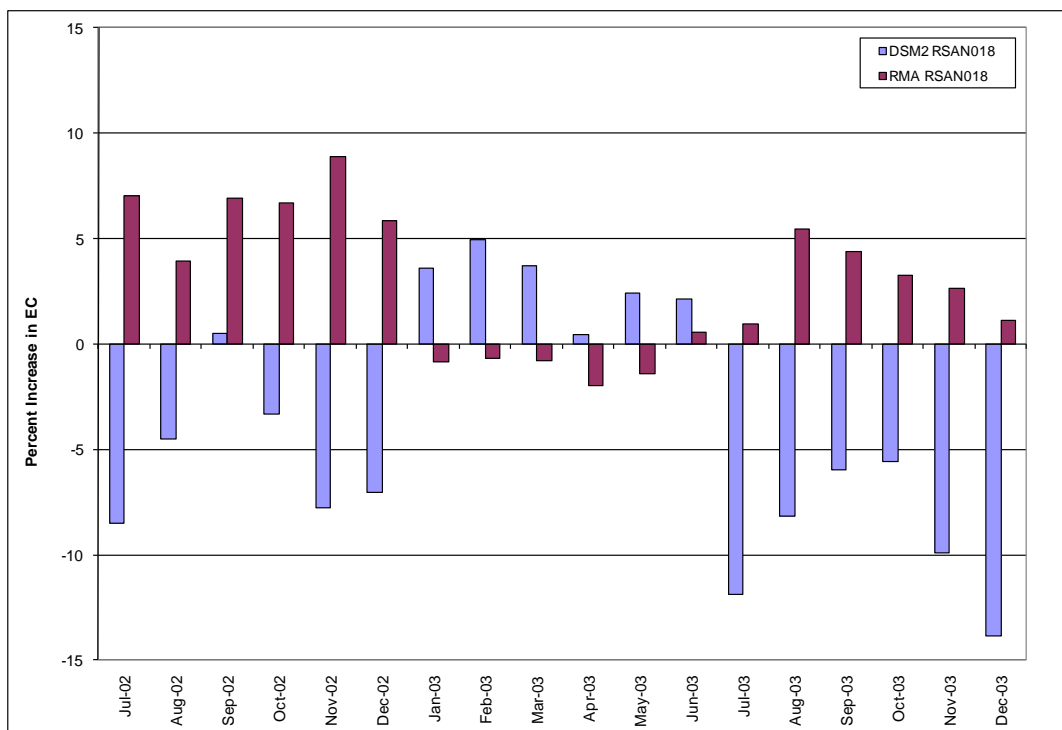
1 Figure 1-104. Comparison of Monthly averaged percentage incremental change in EC between the
2 Late Long-Term Scenario and the Current Conditions Scenario from RMA Model and DSM2 Model for
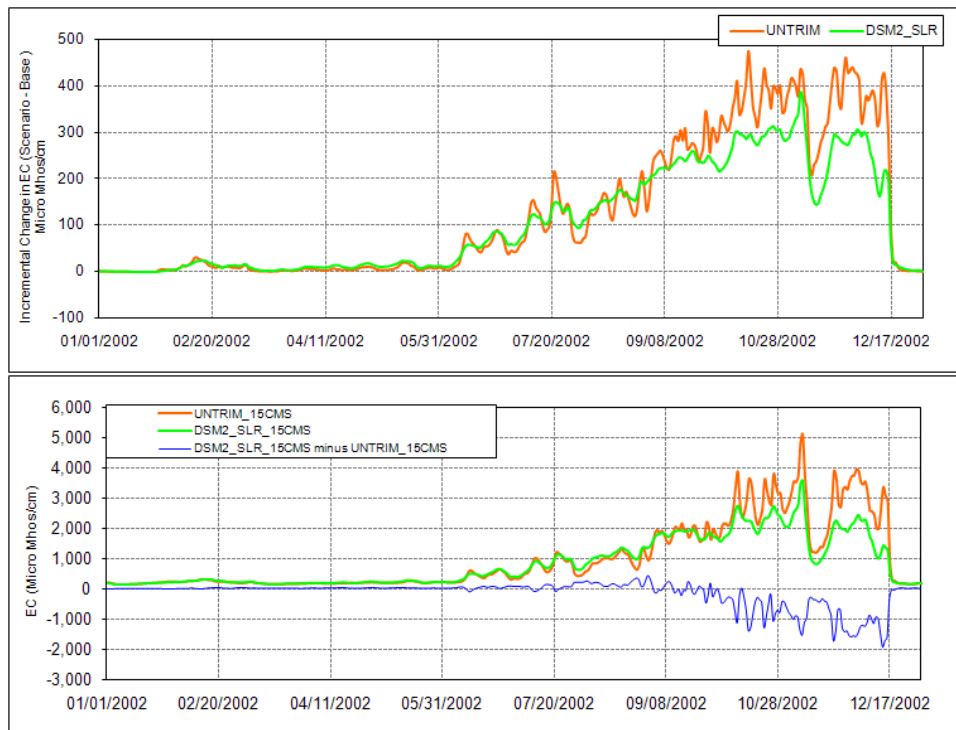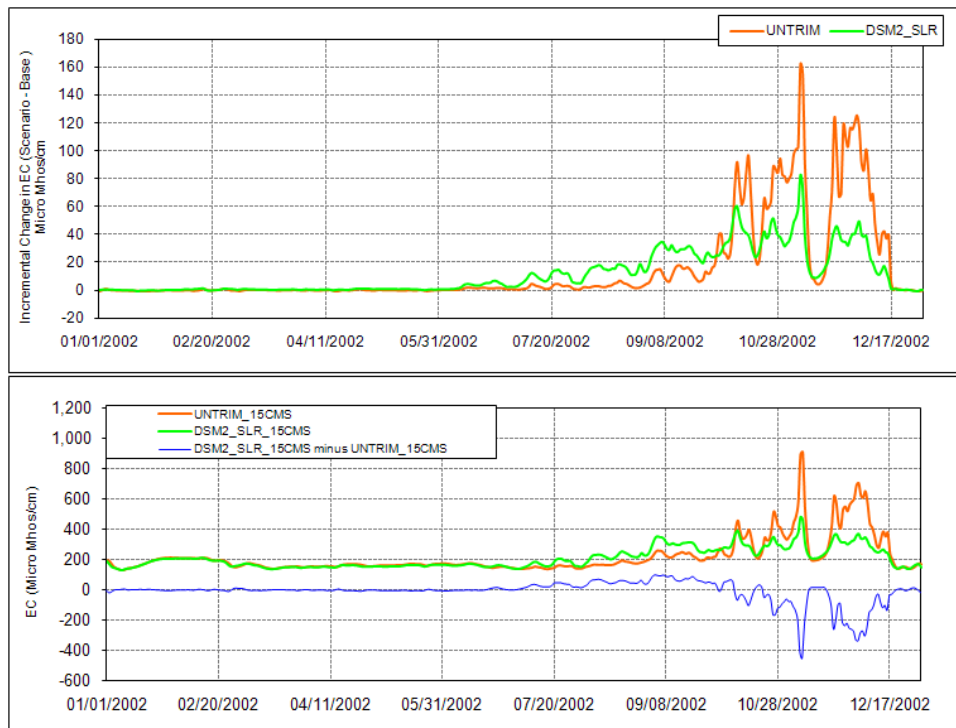3 Old River at Rock Slough.

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5

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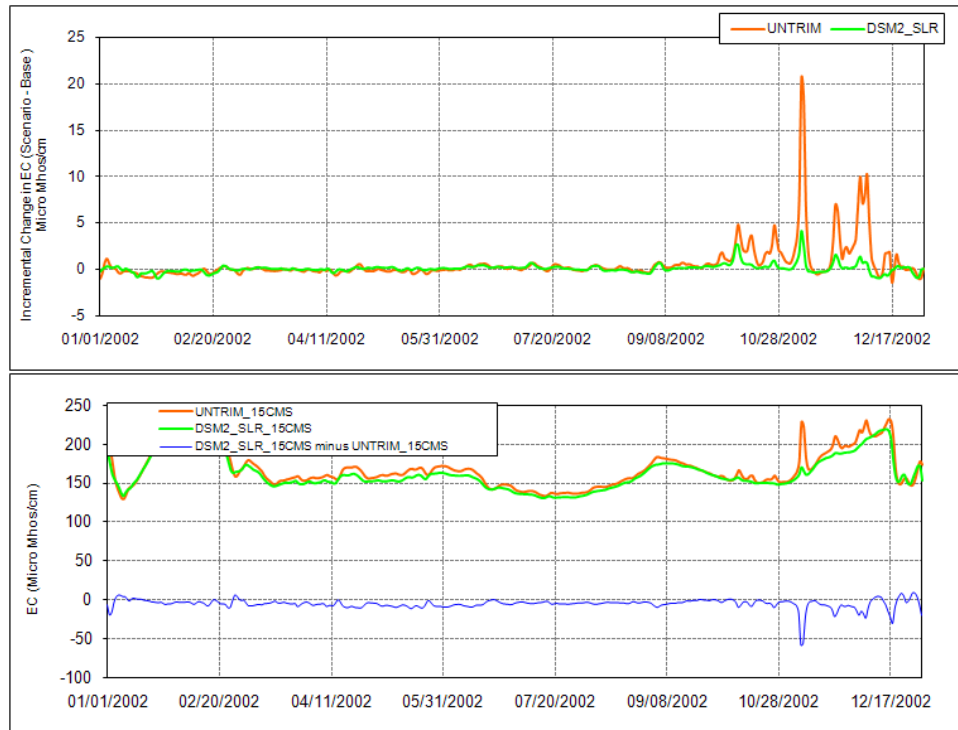8 DSM2 Model for Montezuma Slough at Mouth Location.

9

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

4

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

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

4

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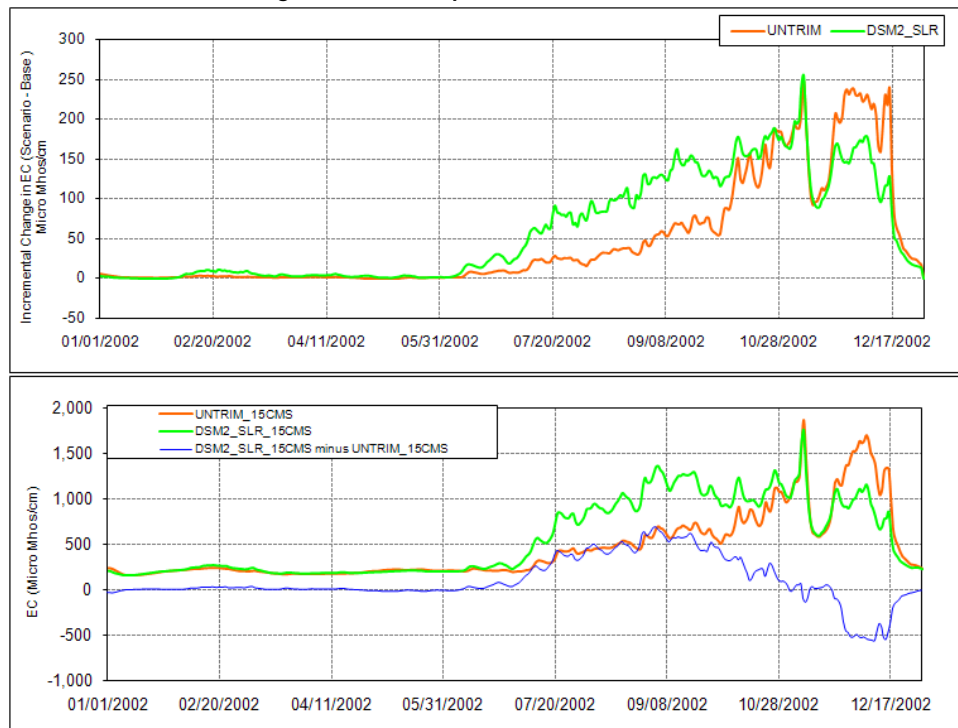7 DSM2 Model for Sacramento River at Collinsville Location.

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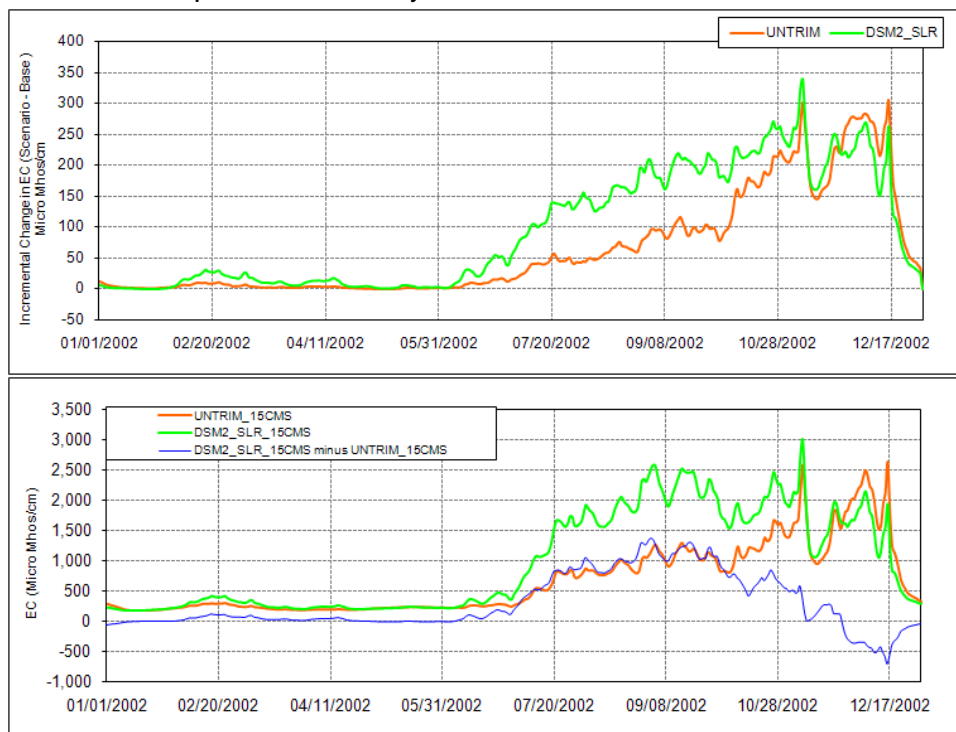3 DSM2 Model for Sacramento River at Rio Vista Location.

4

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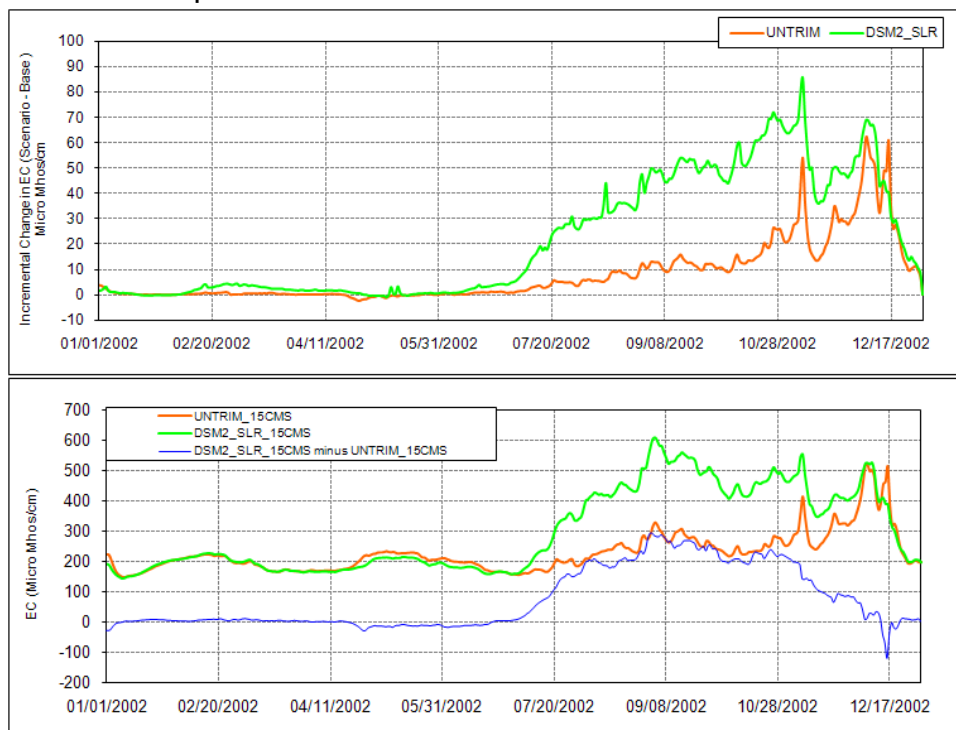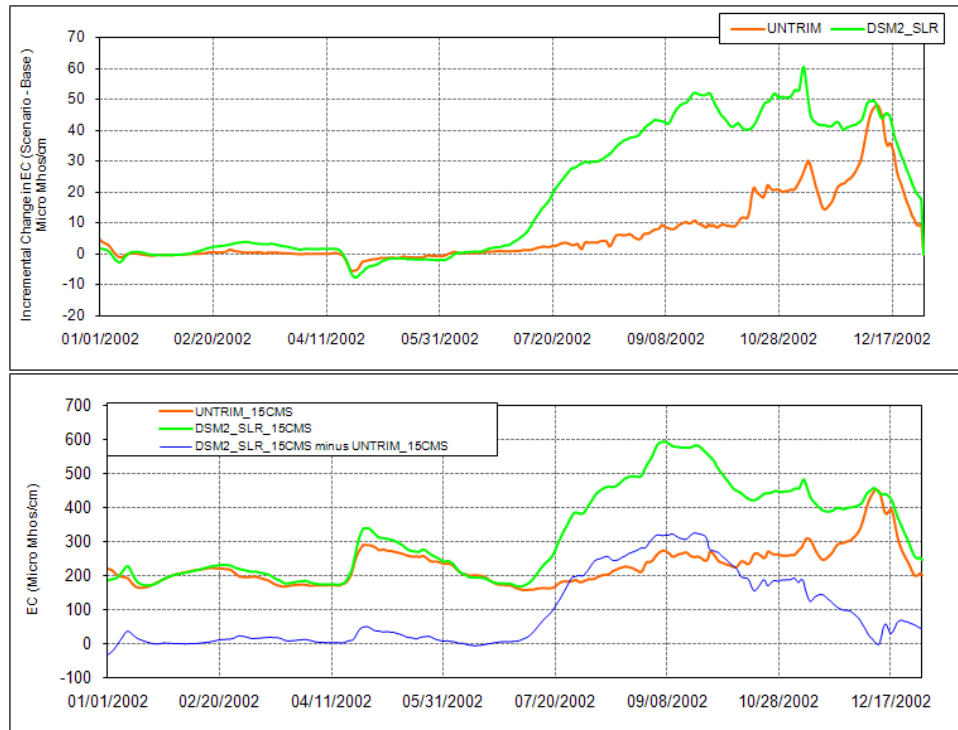7 DSM2 Model for Cache Slough at Ryer Island Location.

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

4

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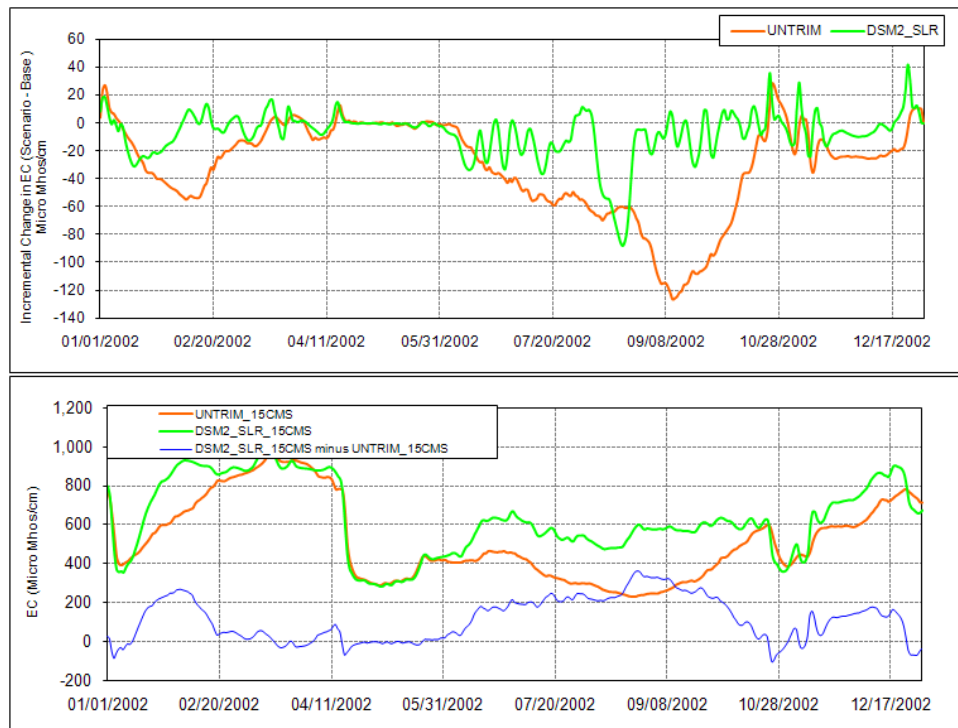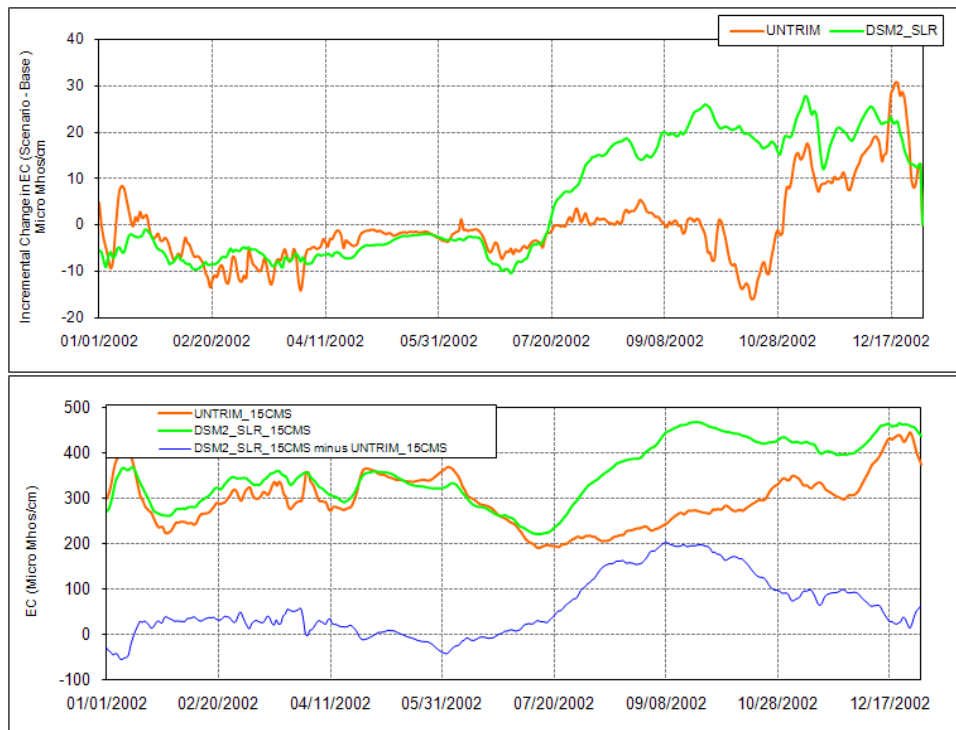7 DSM2 Model for San Joaquin River at Prisoners Point Location.

8

149

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

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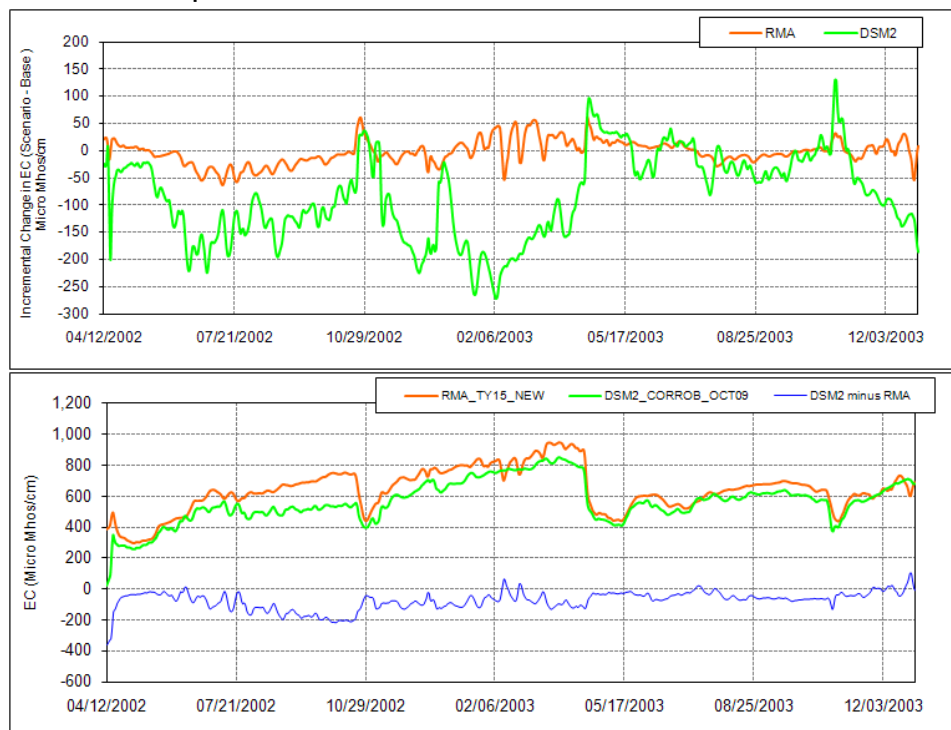
5   Figure 1-113. Comparison of Tidally-Averaged Daily EC and the Incremental Change in the Daily EC
6   between the Late Long-term Scenario and the Current Conditions Scenario from RMA Model and
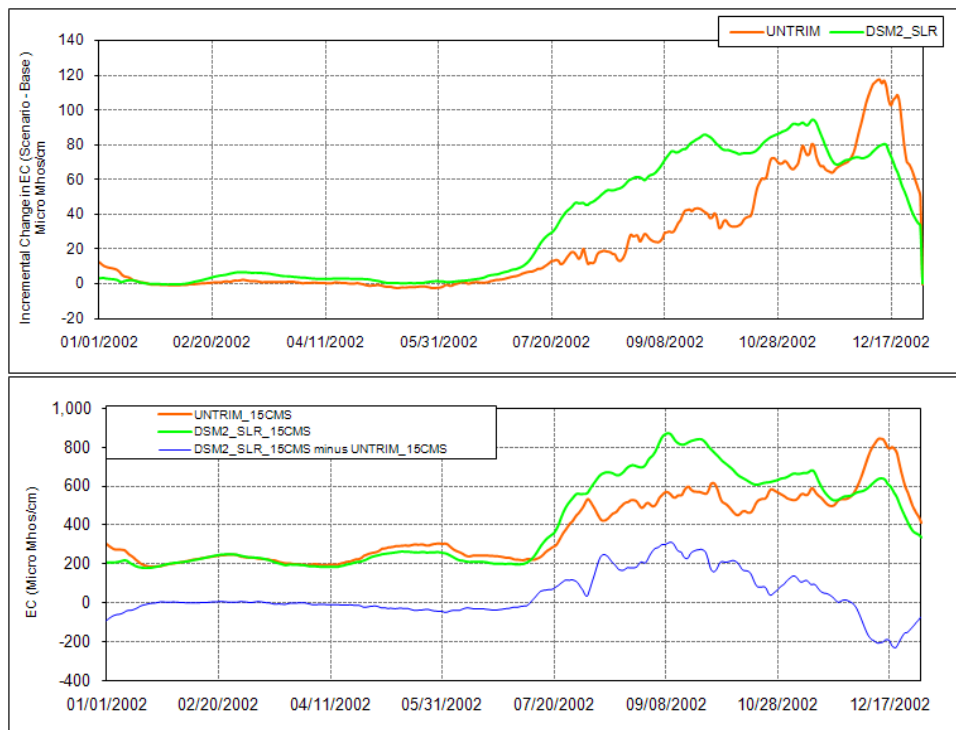7   DSM2 Model for San Joaquin River at Brandt Bridge Location.

8

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

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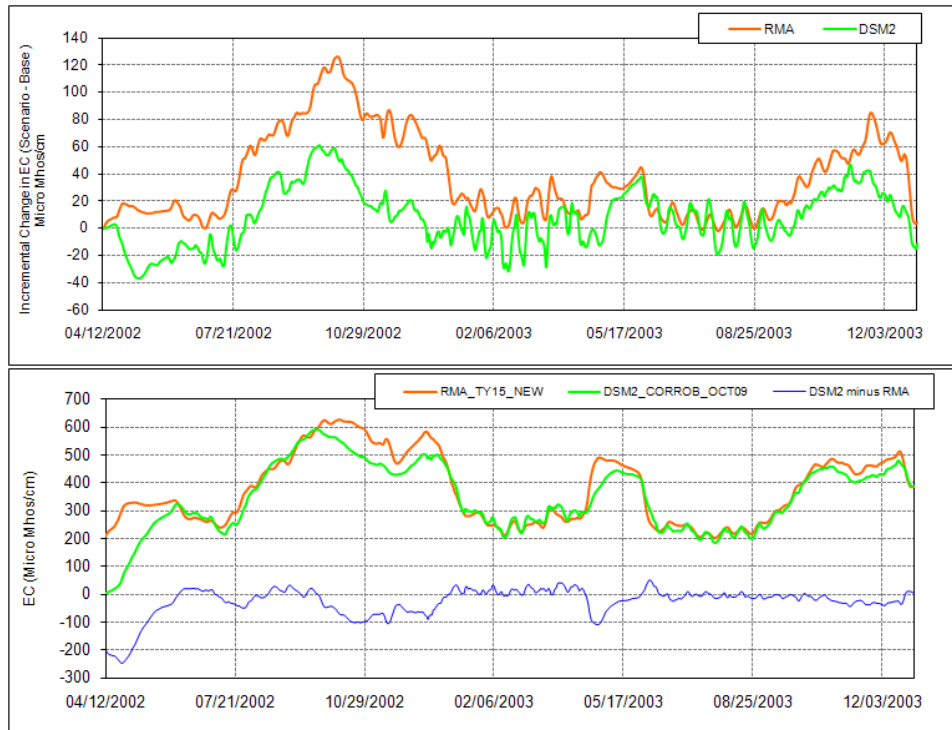
5 Figure 1-115. Comparison of Tidally-Averaged Daily EC and the Incremental Change in the Daily EC
6 between the Late Long-term Scenario and the Current Conditions Scenario from RMA Model and
7 DSM2 Model for Old River at Bacon Island Location.

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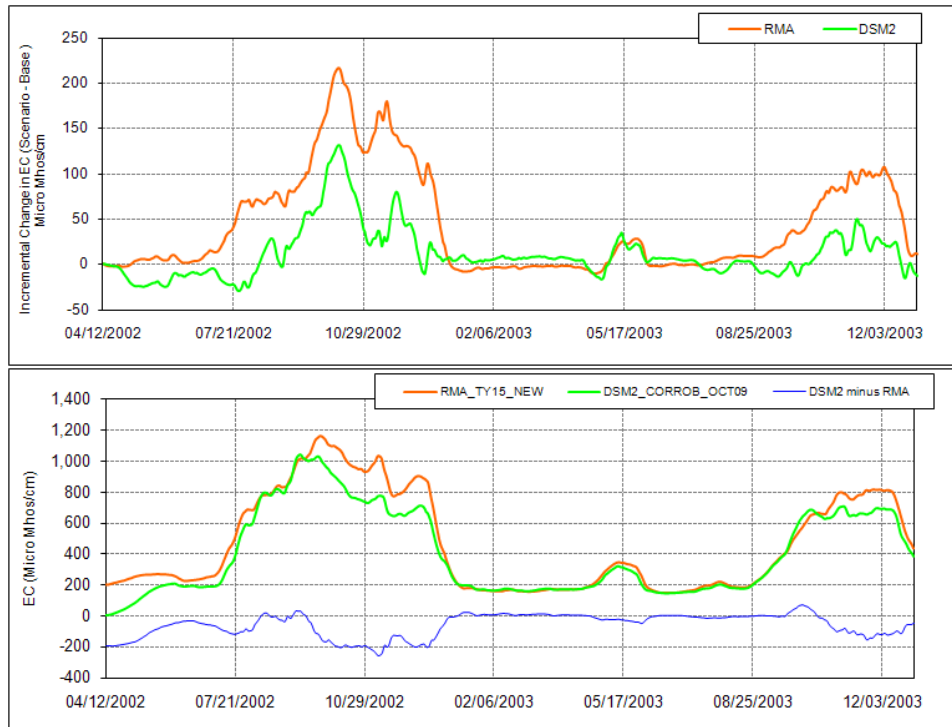
1   Early Long-Term 15cm Sea Level Rise Corroboration

2   Salinity Results

1

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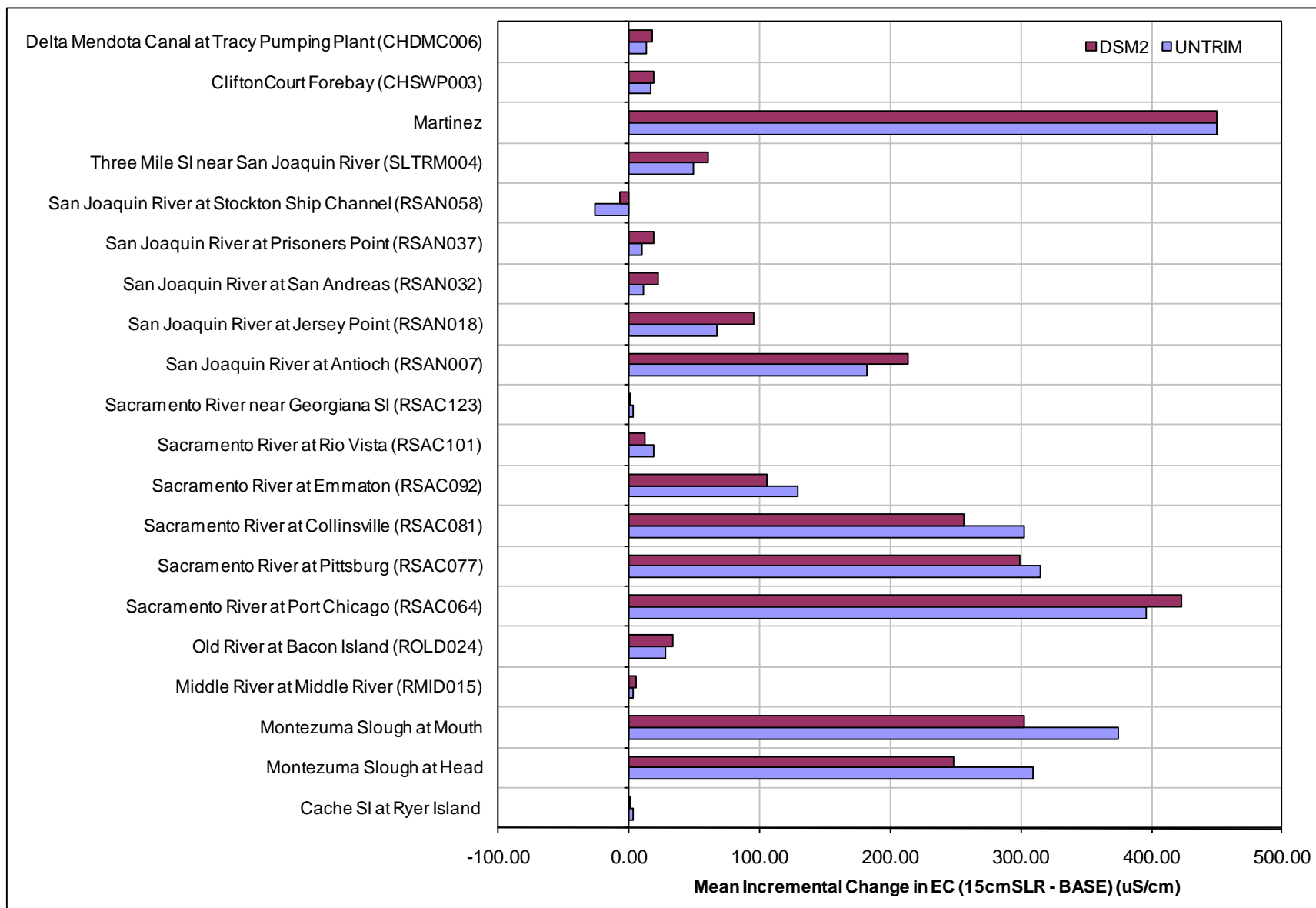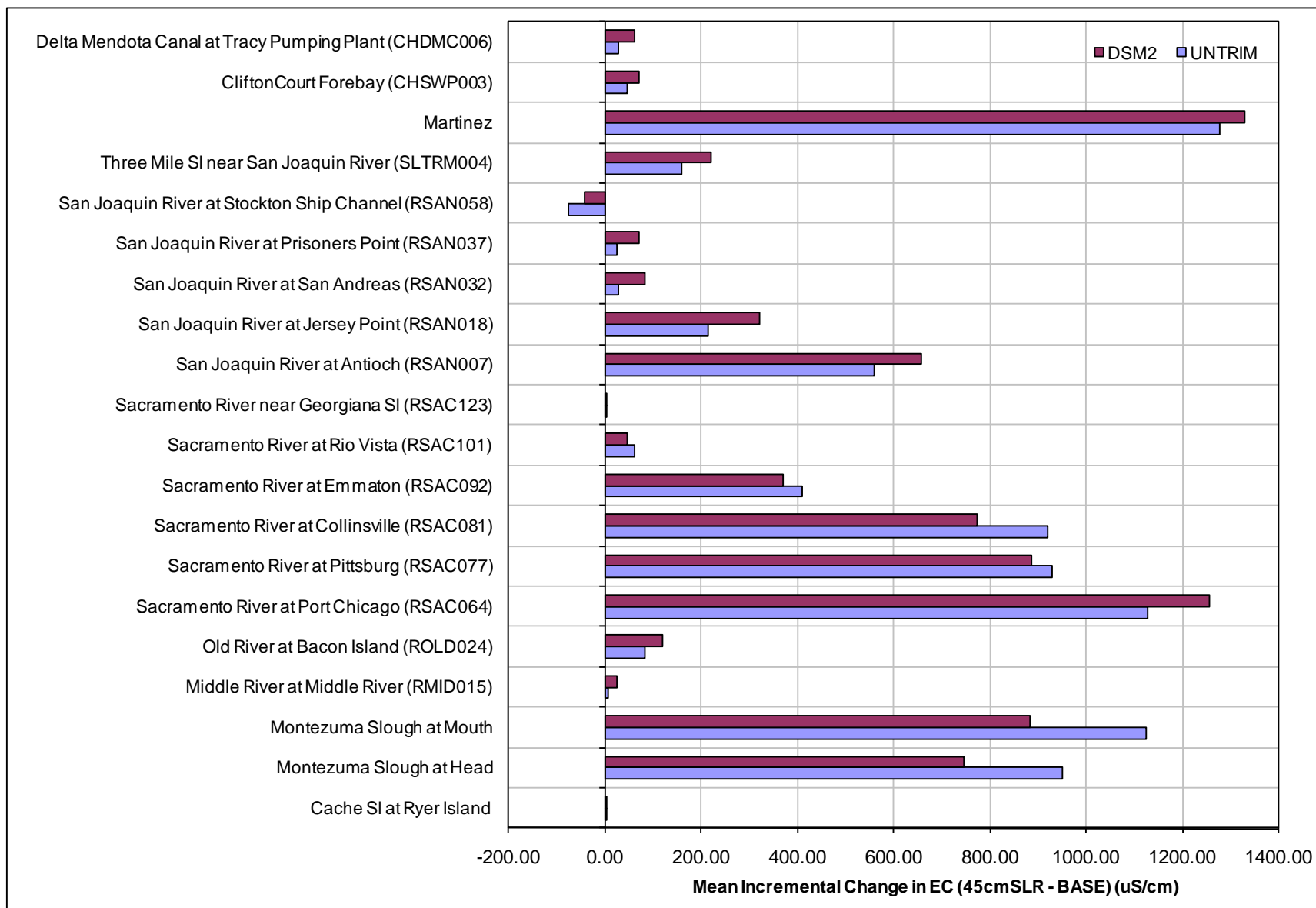

2

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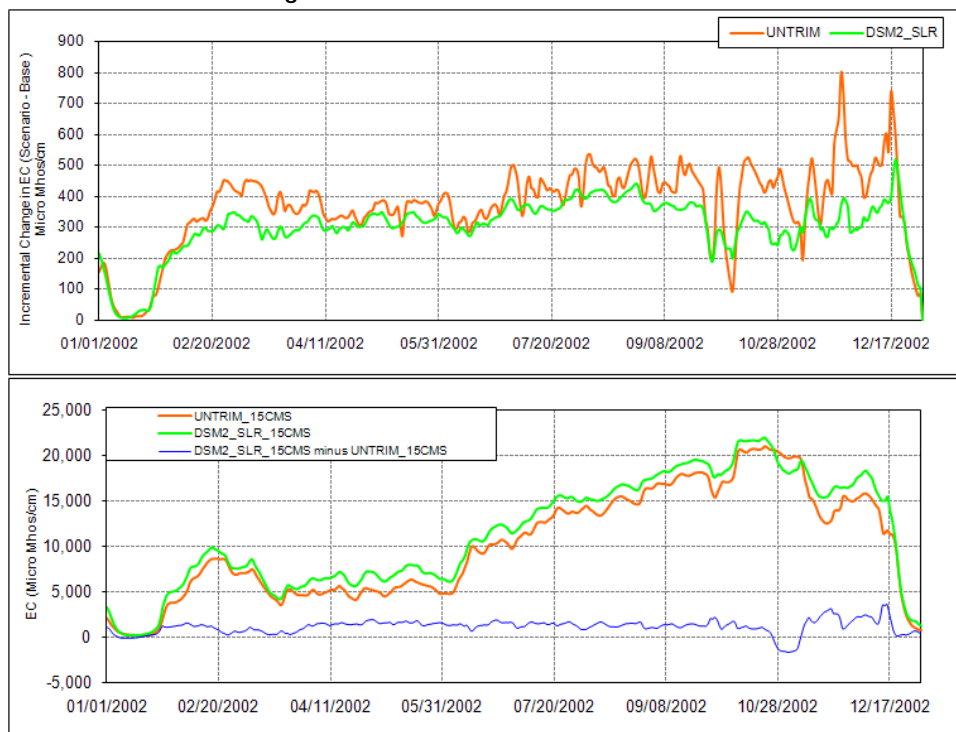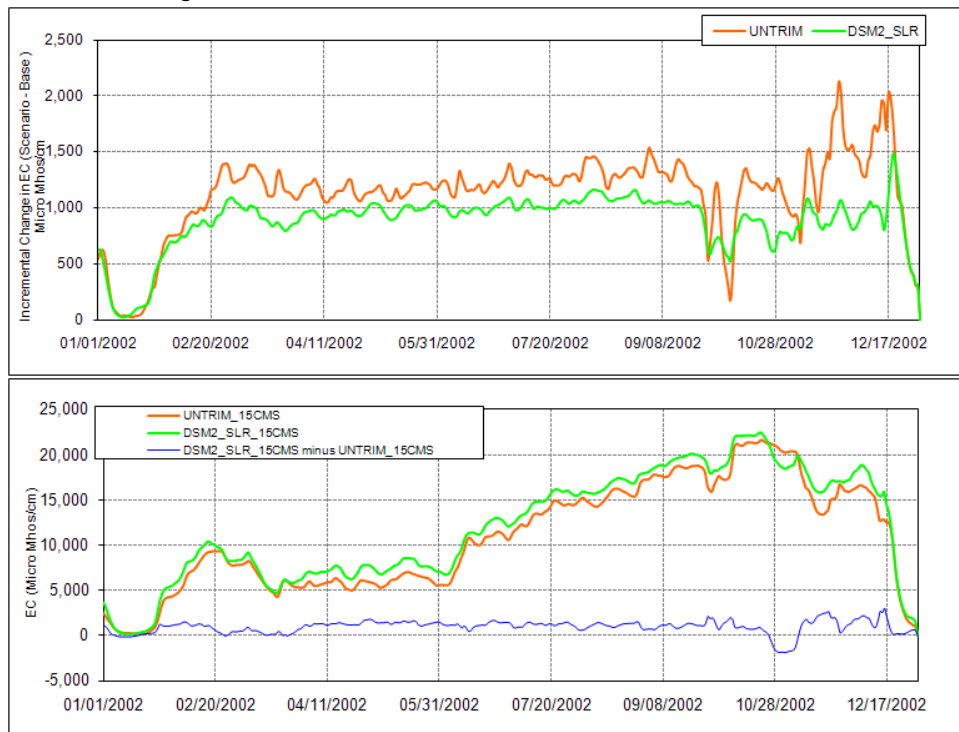

4

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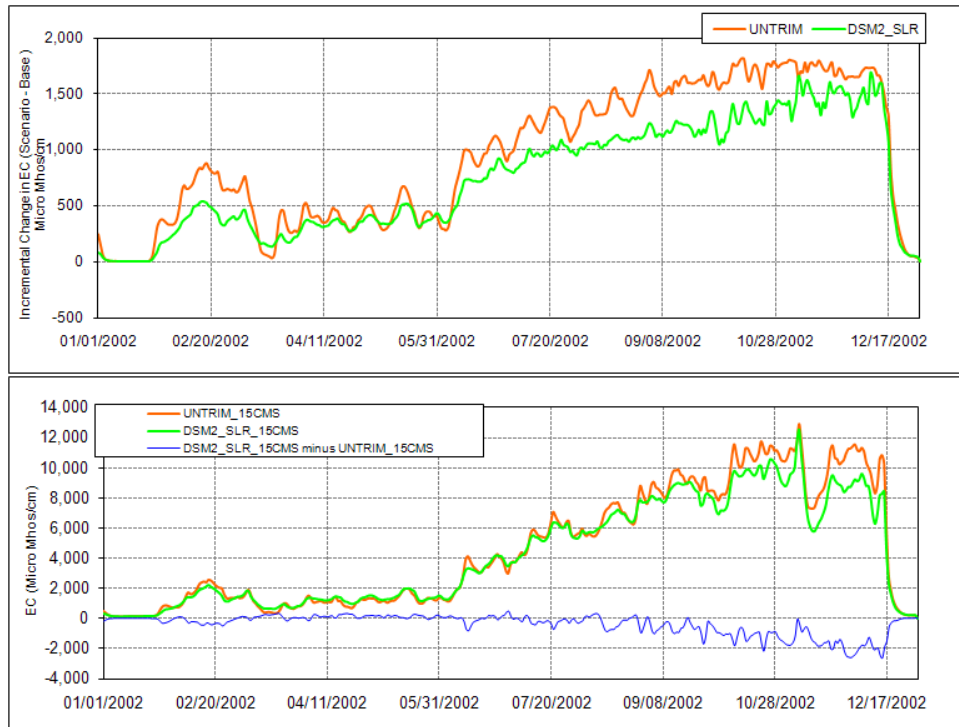7 **DSM2 Model for Montezuma Slough at Head Location.**

8
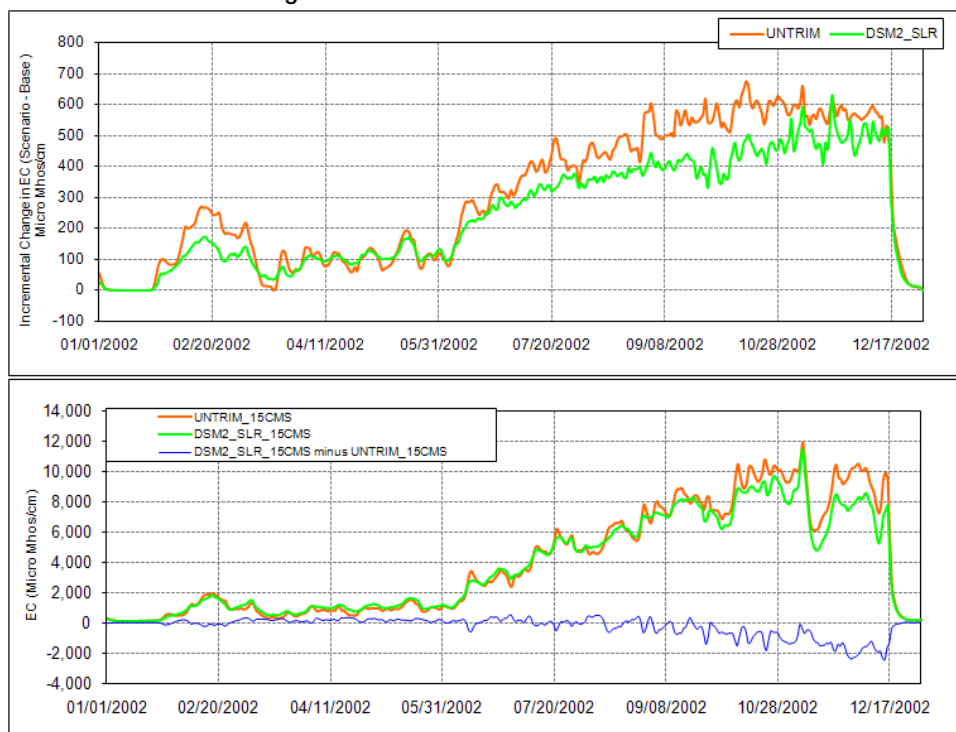
1 Figure 1-119. Comparison of Tidally-Averaged Daily EC and the Incremental Change in the Daily EC
2 between the 15cm SLR Scenario and the Current Conditions Scenario from UNTRIM Model and
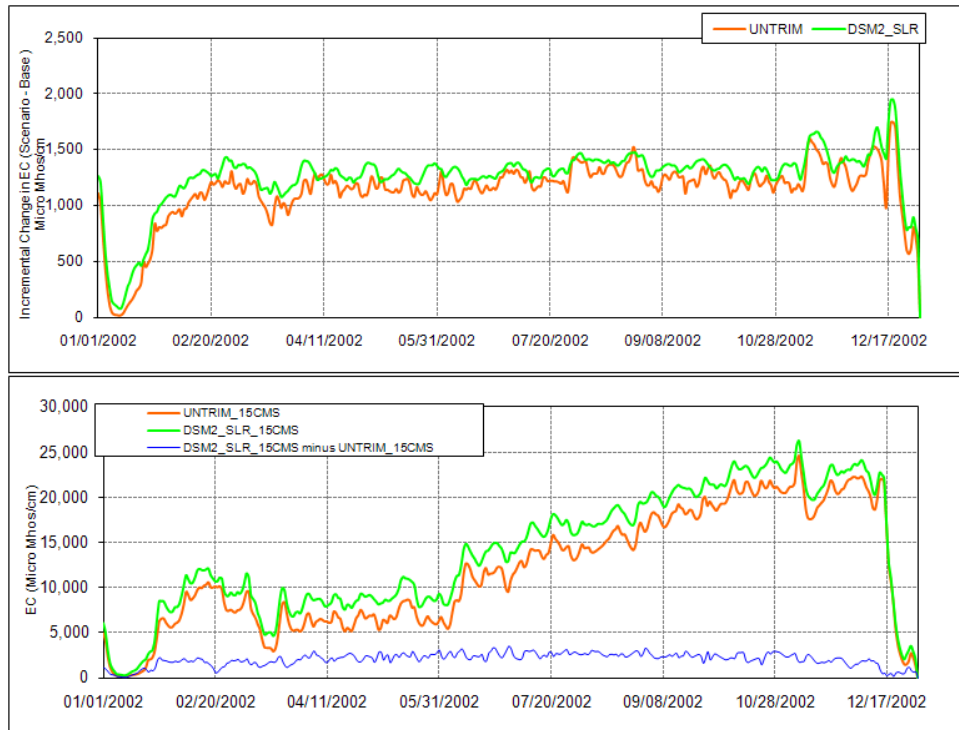3 DSM2 Model for Sacramento River at Port Chicago Location.
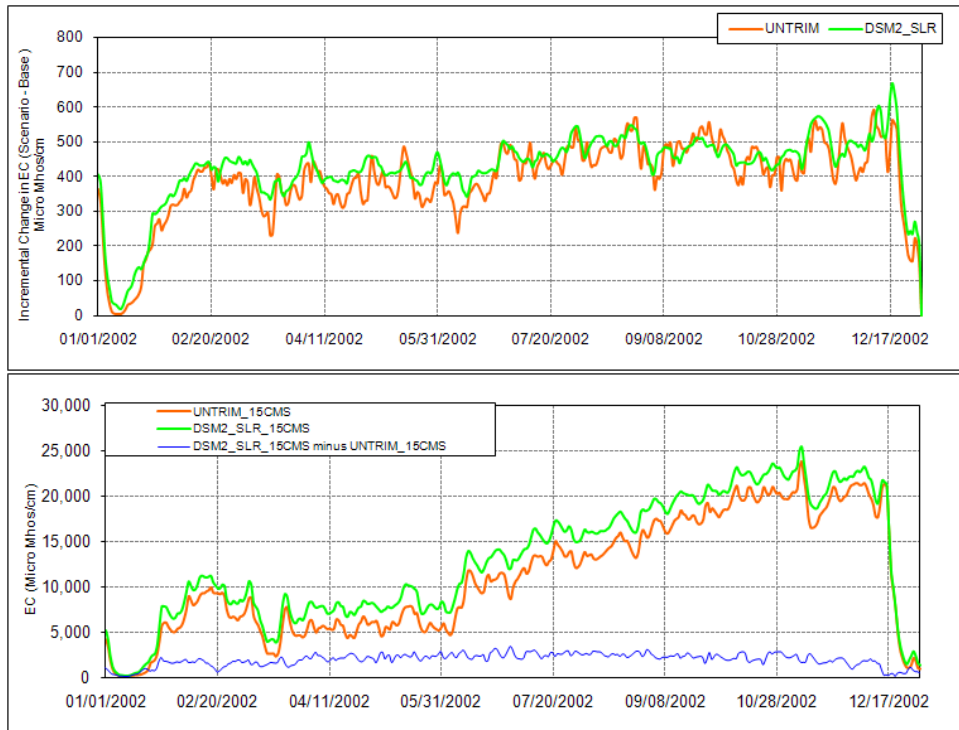
4

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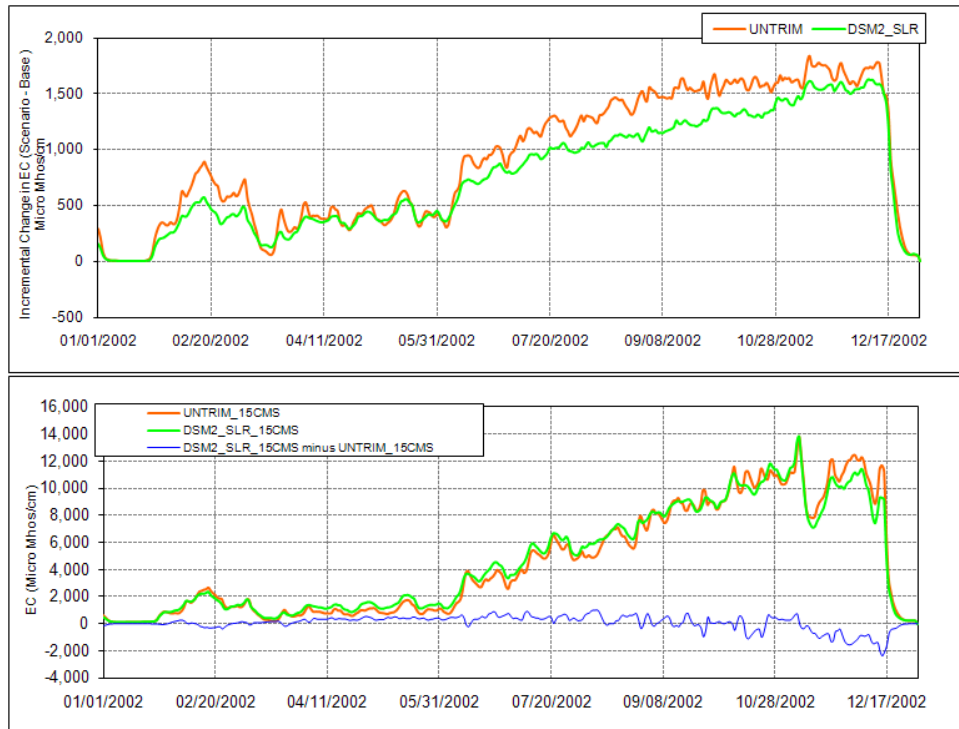7 DSM2 Model for Sacramento River at Collinsville Location.

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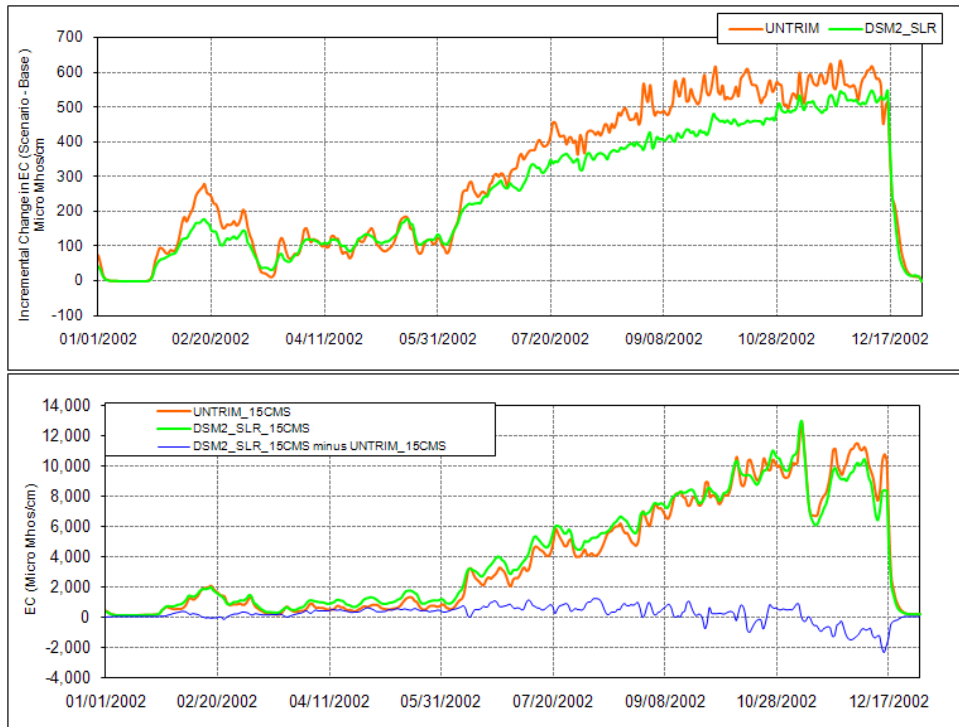
1 Figure 1-121. Comparison of Tidally-Averaged Daily EC and the Incremental Change in the Daily EC
2 between the 15cm SLR Scenario and the Current Conditions Scenario from UNTRIM Model and
3 DSM2 Model for Sacramento River at Emmaton Location.

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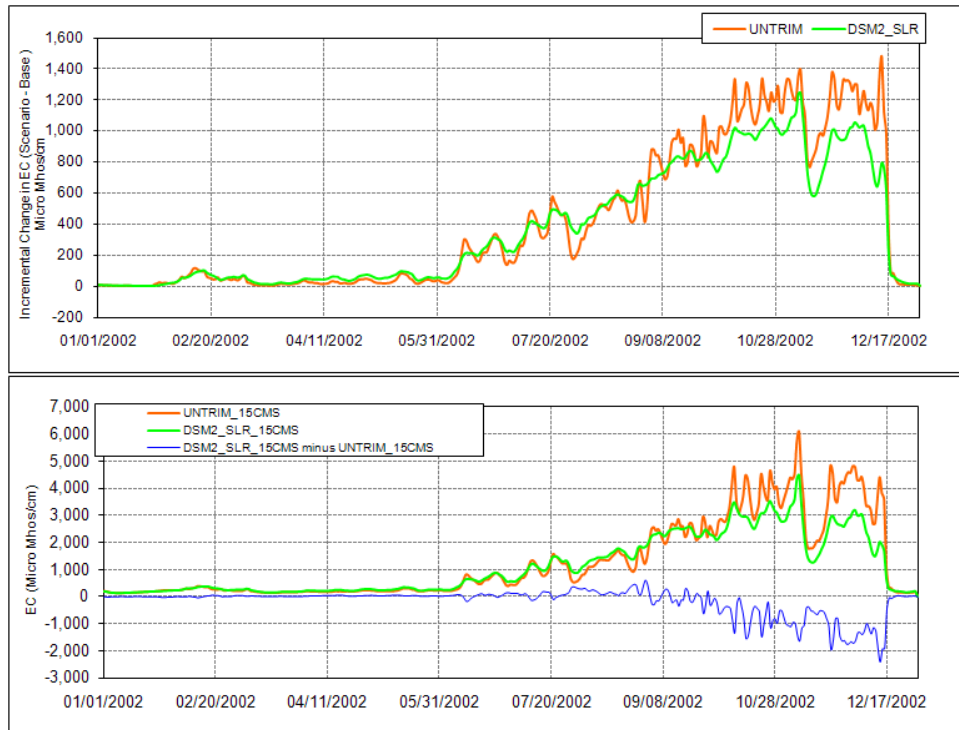8 DSM2 Model for Sacramento River at Rio Vista Location.

9

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

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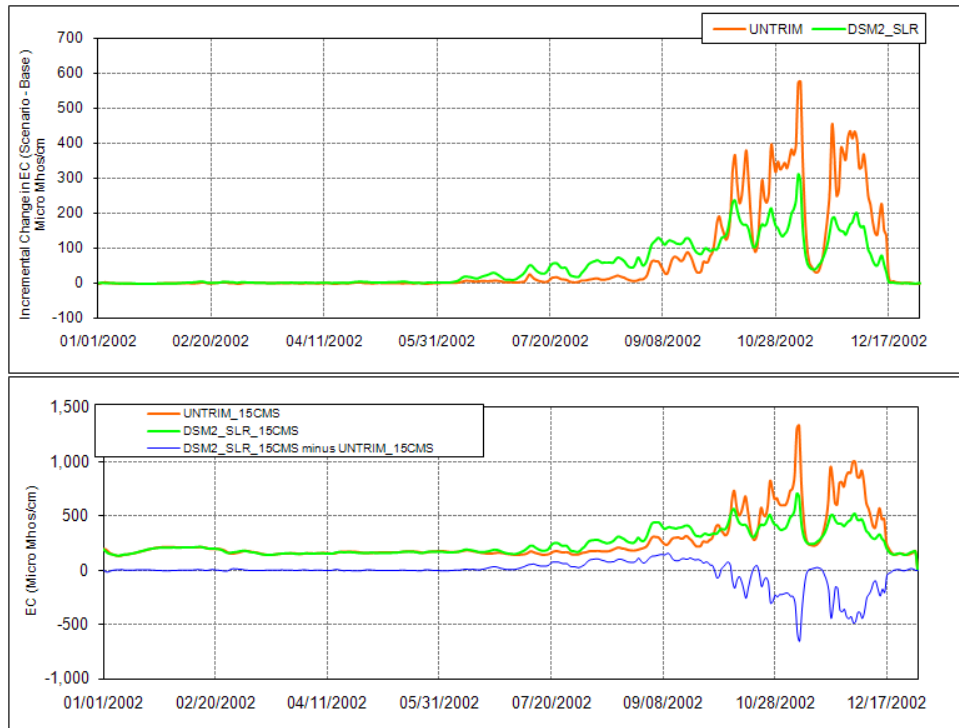8 DSM2 Model for Three Mile Slough at San Joaquin River Location.

9

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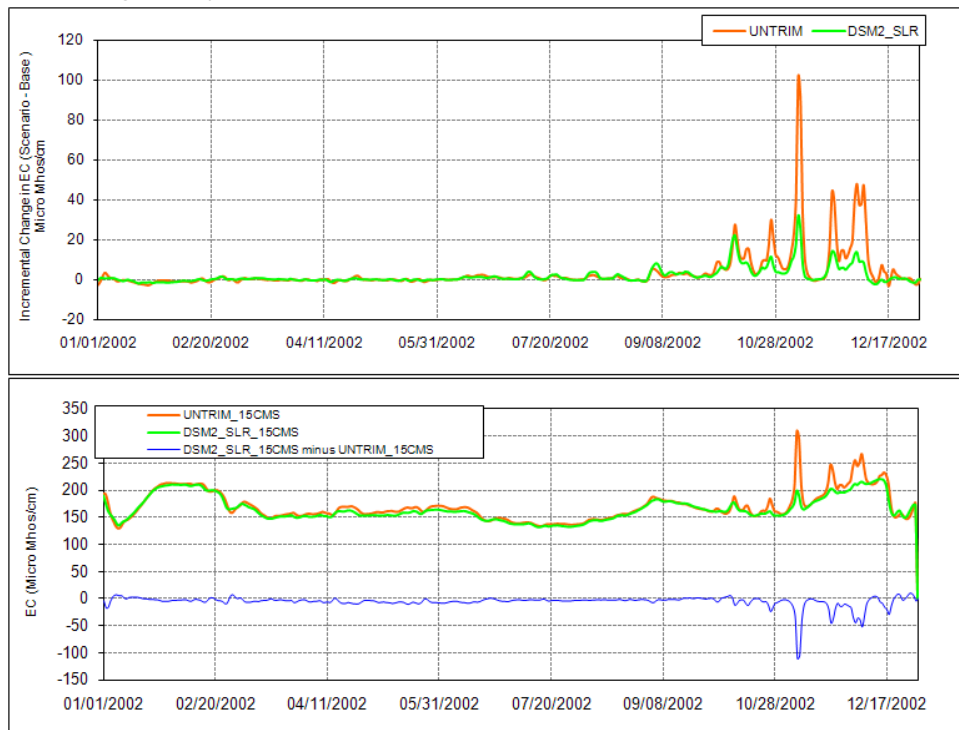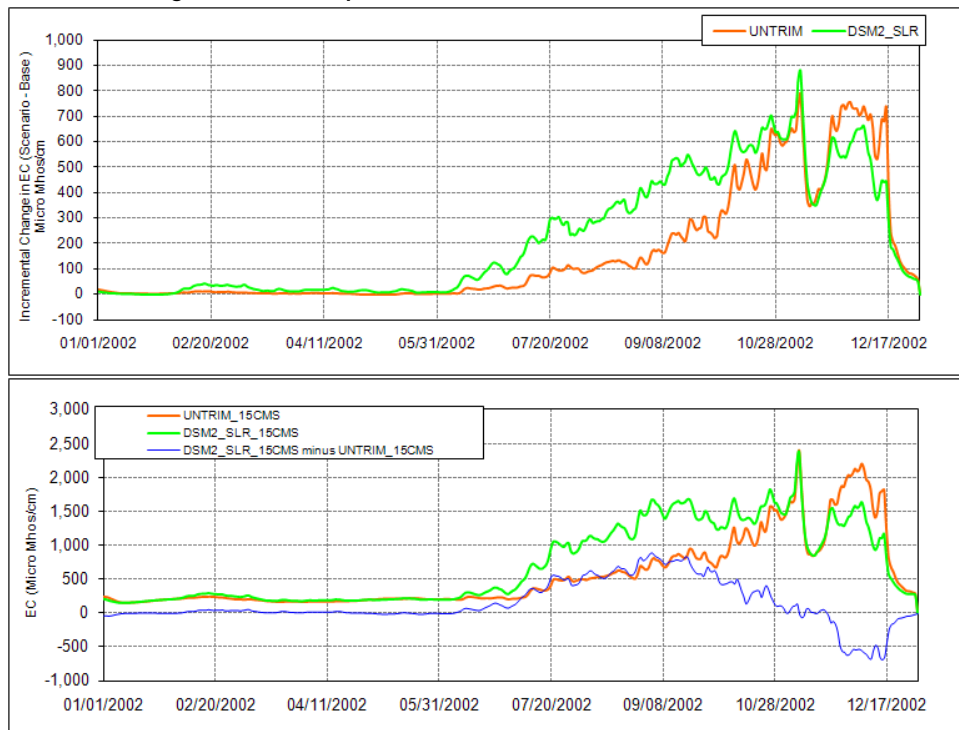

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6   Figure 1-126. Comparison of Tidally-Averaged Daily EC and the Incremental Change in the Daily EC
7   between the 15cm SLR Scenario and the Current Conditions Scenario from UNTRIM Model and
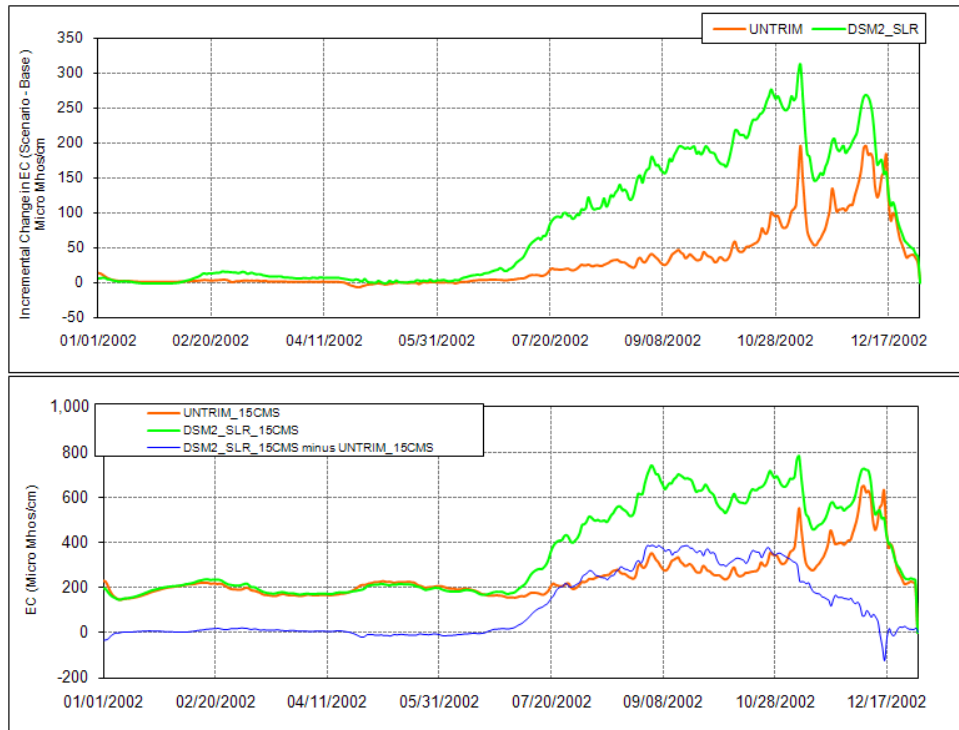8   DSM2 Model for San Joaquin River at San Andreas Location.

9

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

4

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

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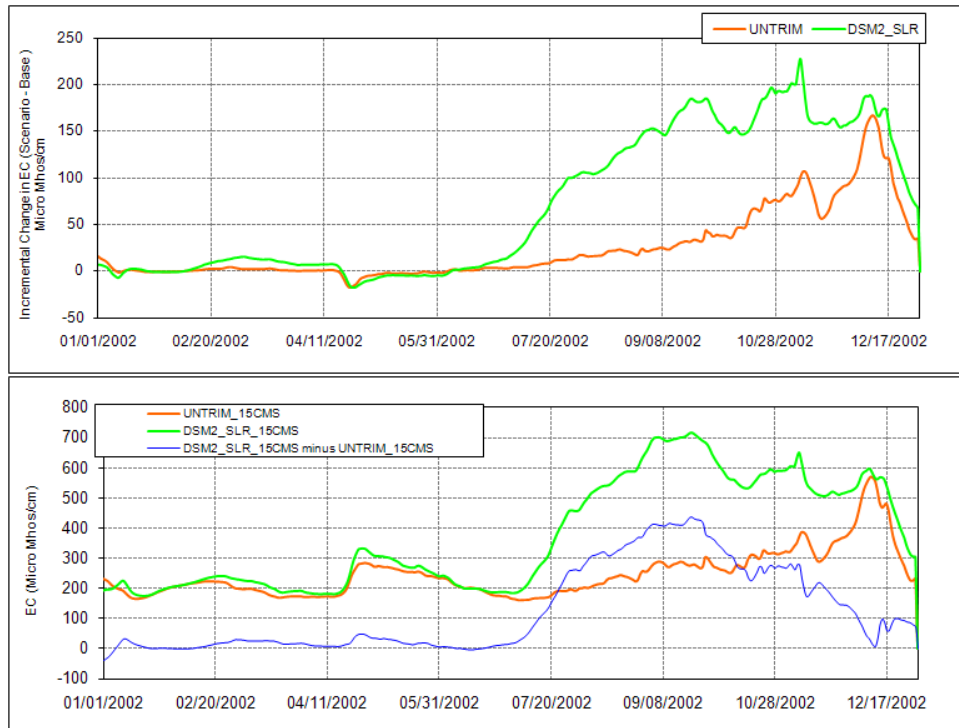3 DSM2 Model for Middle River at Middle River Location.

4

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

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1 Late Long-Term 45cm Sea Level Rise Corroboration

2 Salinity Results

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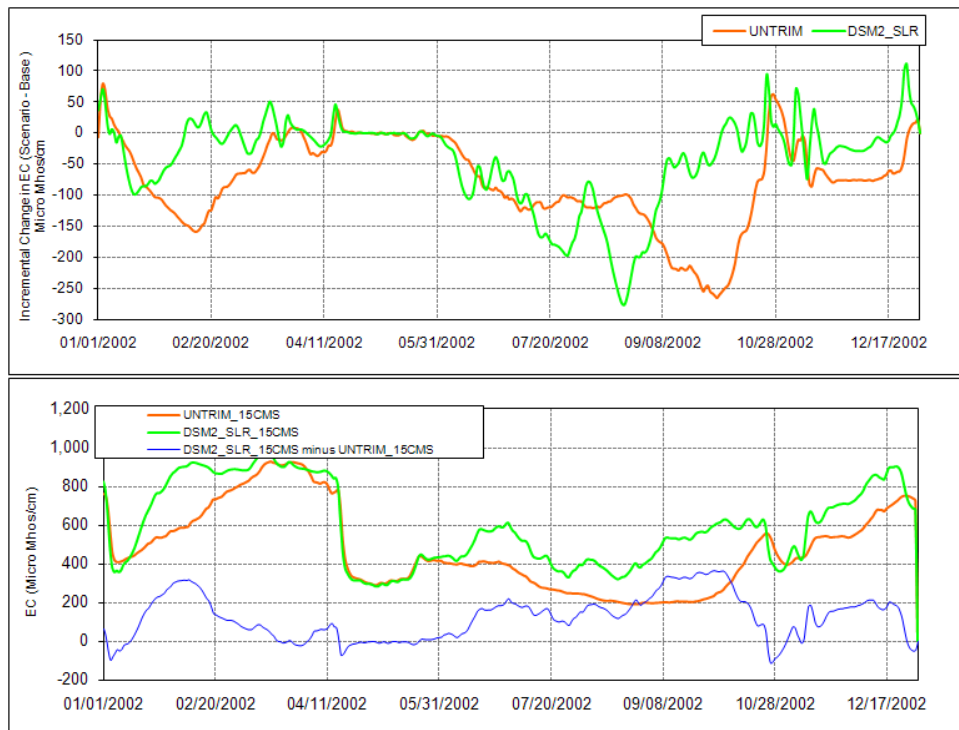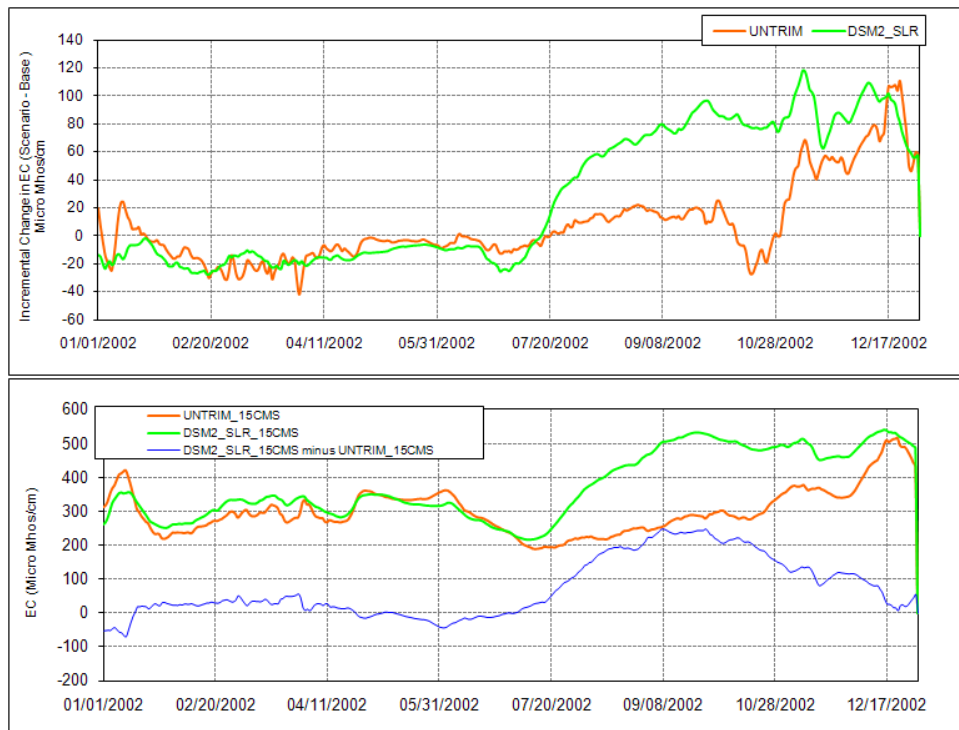

2

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

4

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

8

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

4

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

8

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

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

9

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

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

9

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

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

9

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

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

9

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

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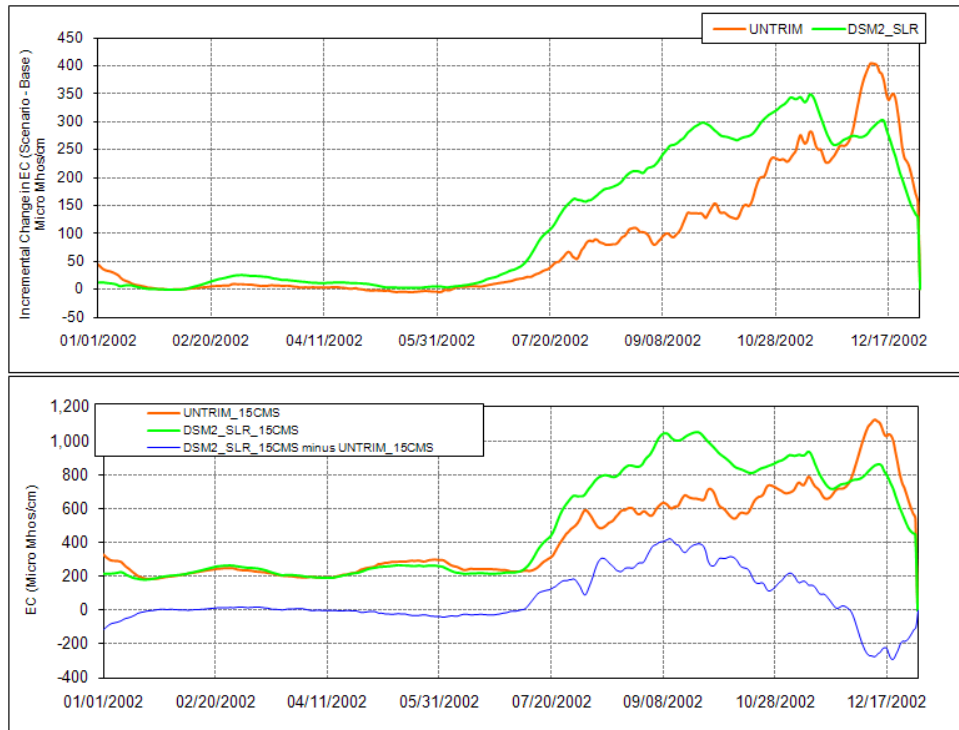
Early Long-Term Integrated 25,000ac Restoration and 15cm Sea Level Rise Corroboration
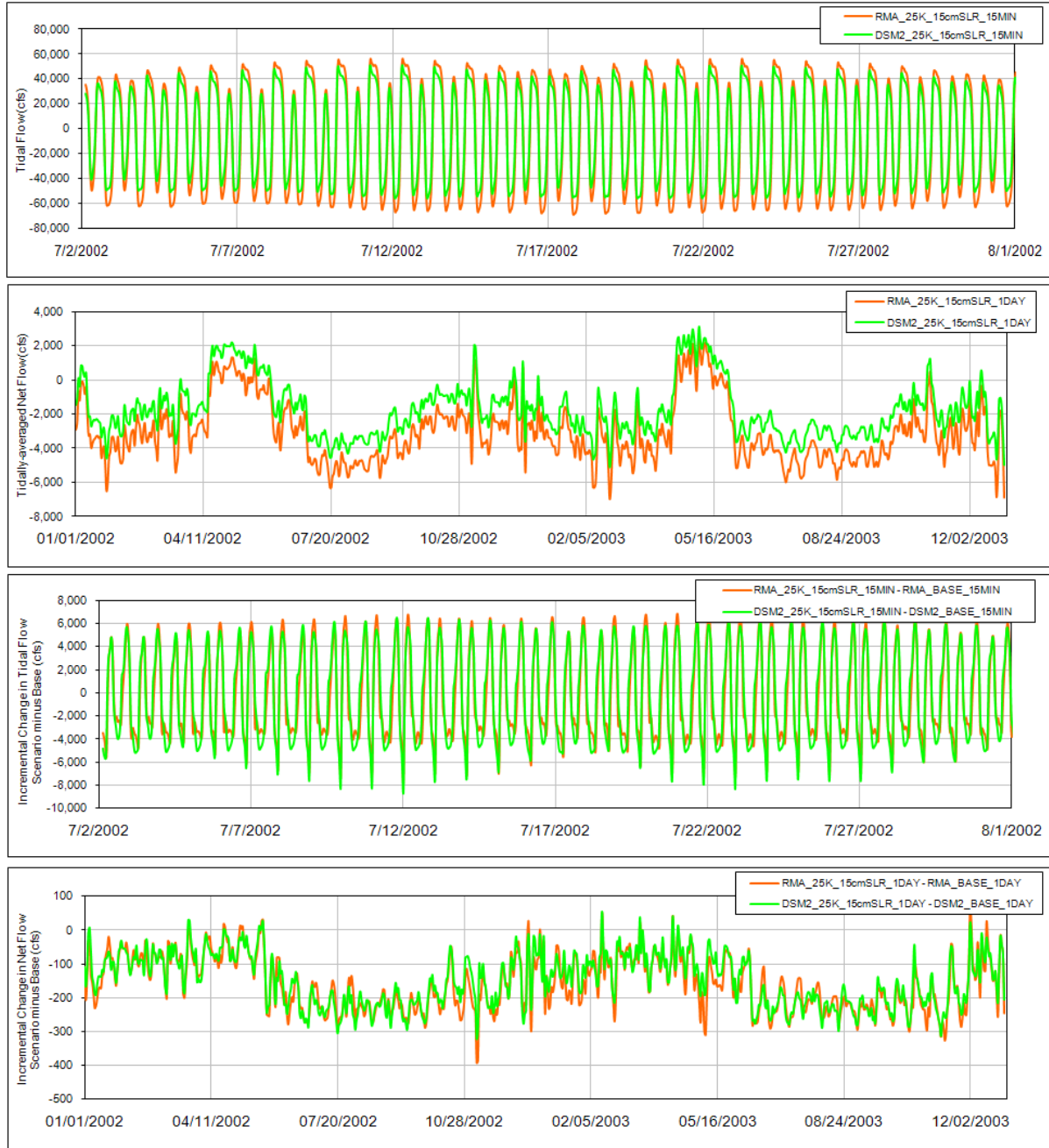
Hydrodynamics Results

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.
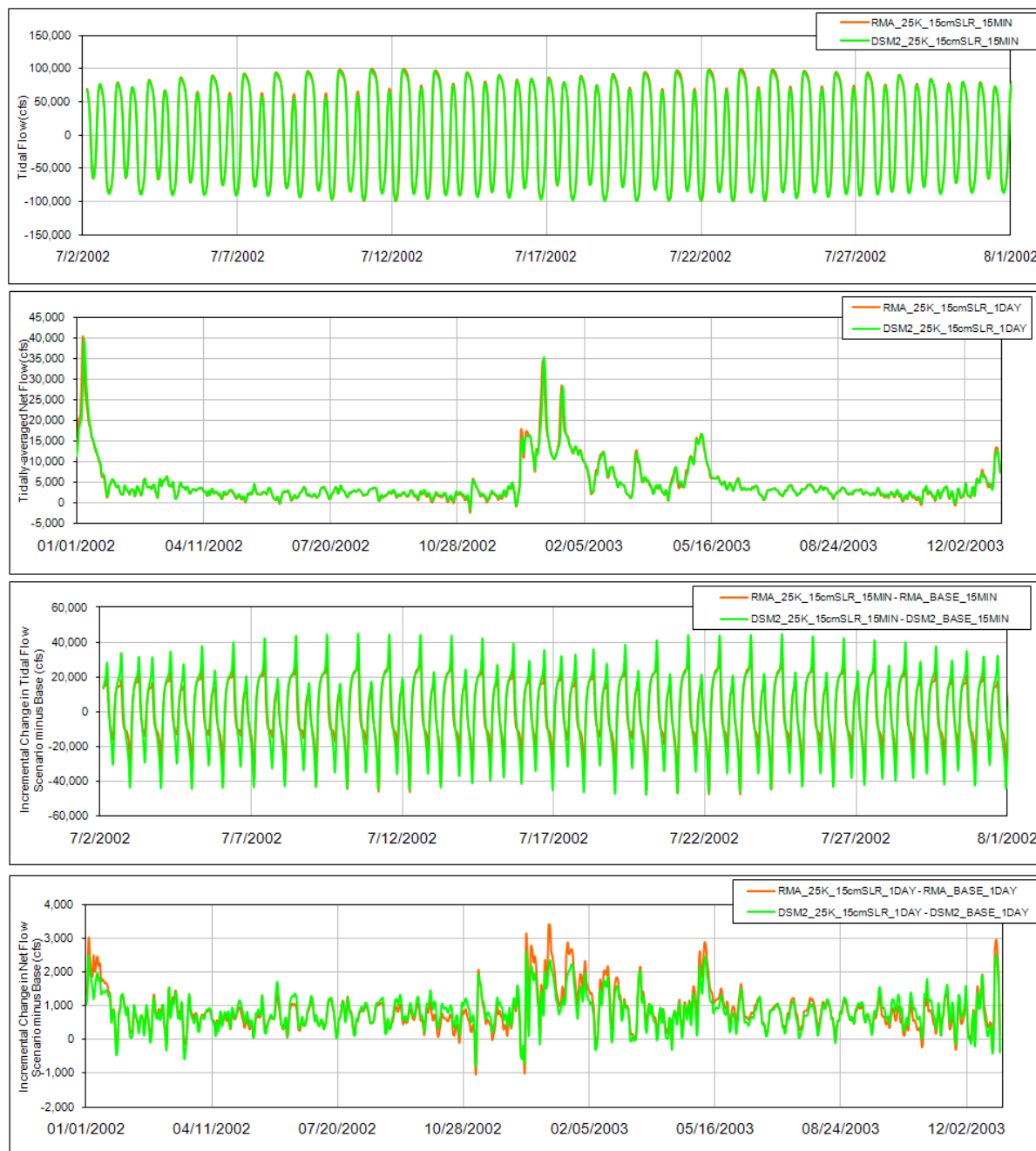
1 Figure 1-146. Comparison of Tidal Flow, Tidally-Averaged Daily Flow, Incremental Change in Tidal Flow
2 and the Incremental Change in the Daily Flow between the Integrated Early Long-term Scenario and the
3 Current Conditions Scenario from RMA Model and DSM2 Model for Sacramento River at Rio Vista
4 Location.
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1 Figure 1-147. Comparison of Tidal Flow, Tidally-Averaged Daily Flow, Incremental Change in Tidal Flow
2 and the Incremental Change in the Daily Flow between the Integrated Early Long-term Scenario and the
3 Current Conditions Scenario from RMA Model and DSM2 Model for Georgiana Slough at Head Location.
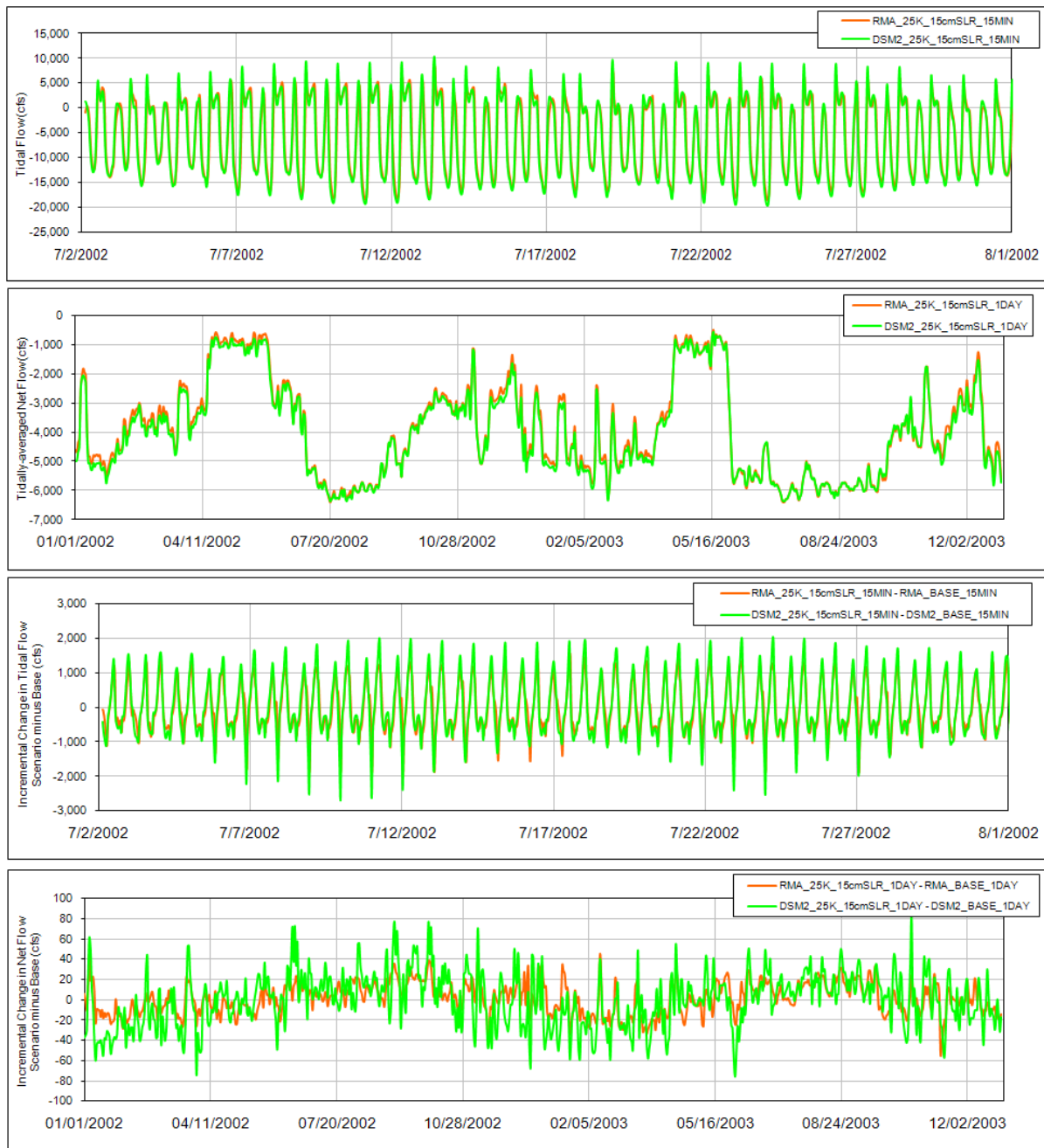4

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1 Figure 1-148. Comparison of Tidal Flow, Tidally-Averaged Daily Flow, Incremental Change in Tidal Flow
2 and the Incremental Change in the Daily Flow between the Integrated 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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1　Figure 1-149. Comparison of Tidal Flow, Tidally-Averaged Daily Flow, Incremental Change in Tidal Flow
2　and the Incremental Change in the Daily Flow between the Integrated Early Long-term Scenario and the
3　Current Conditions Scenario from RMA Model and DSM2 Model for Montezuma Slough at Head Location.

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

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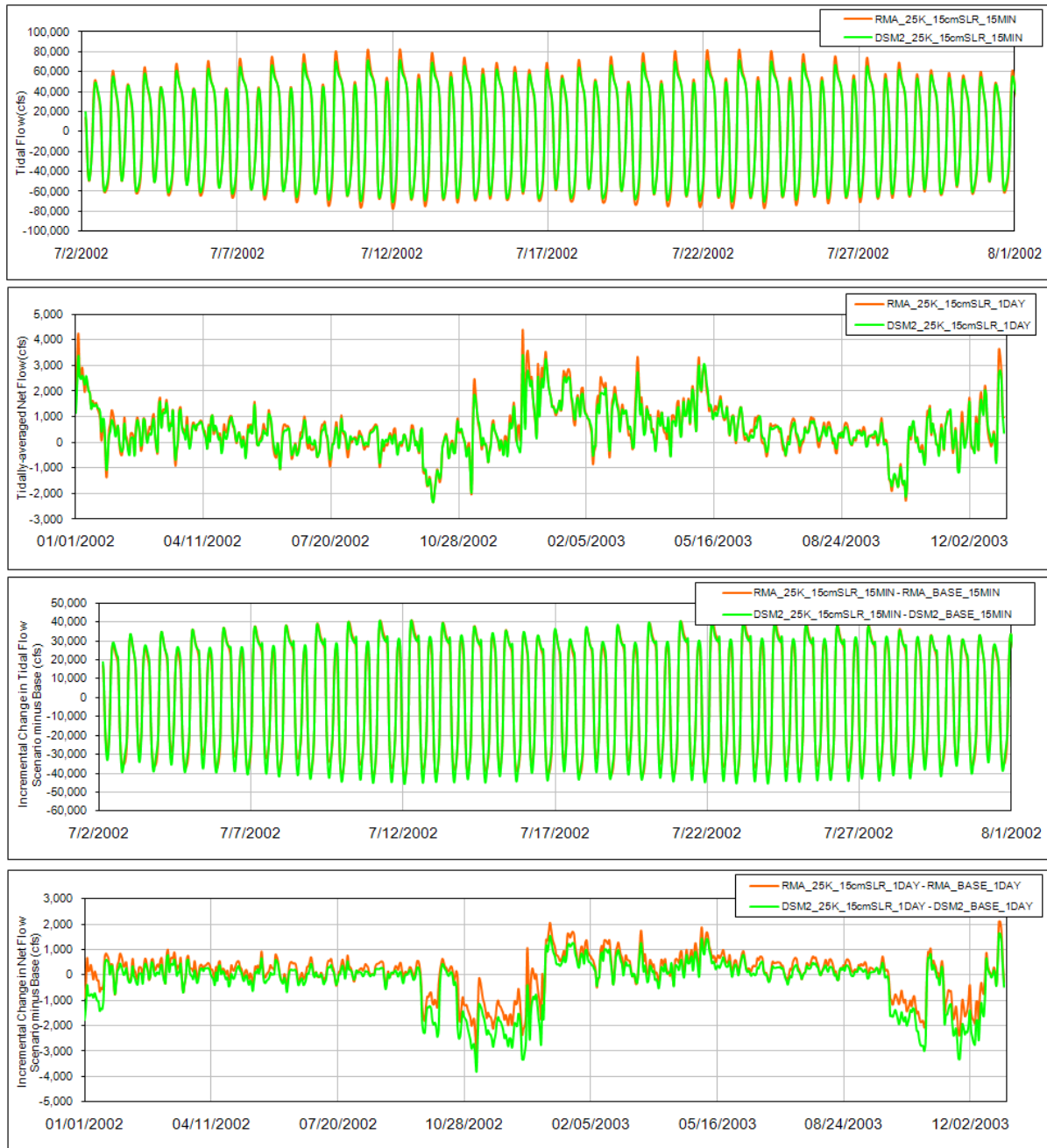
1　Figure 1-151. Comparison of Tidal Flow, Tidally-Averaged Daily Flow, Incremental Change in Tidal Flow
2　and the Incremental Change in the Daily Flow between the Integrated Early Long-term Scenario and the
3　Current Conditions Scenario from RMA Model and DSM2 Model for Three Mile Slough at San Joaquin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

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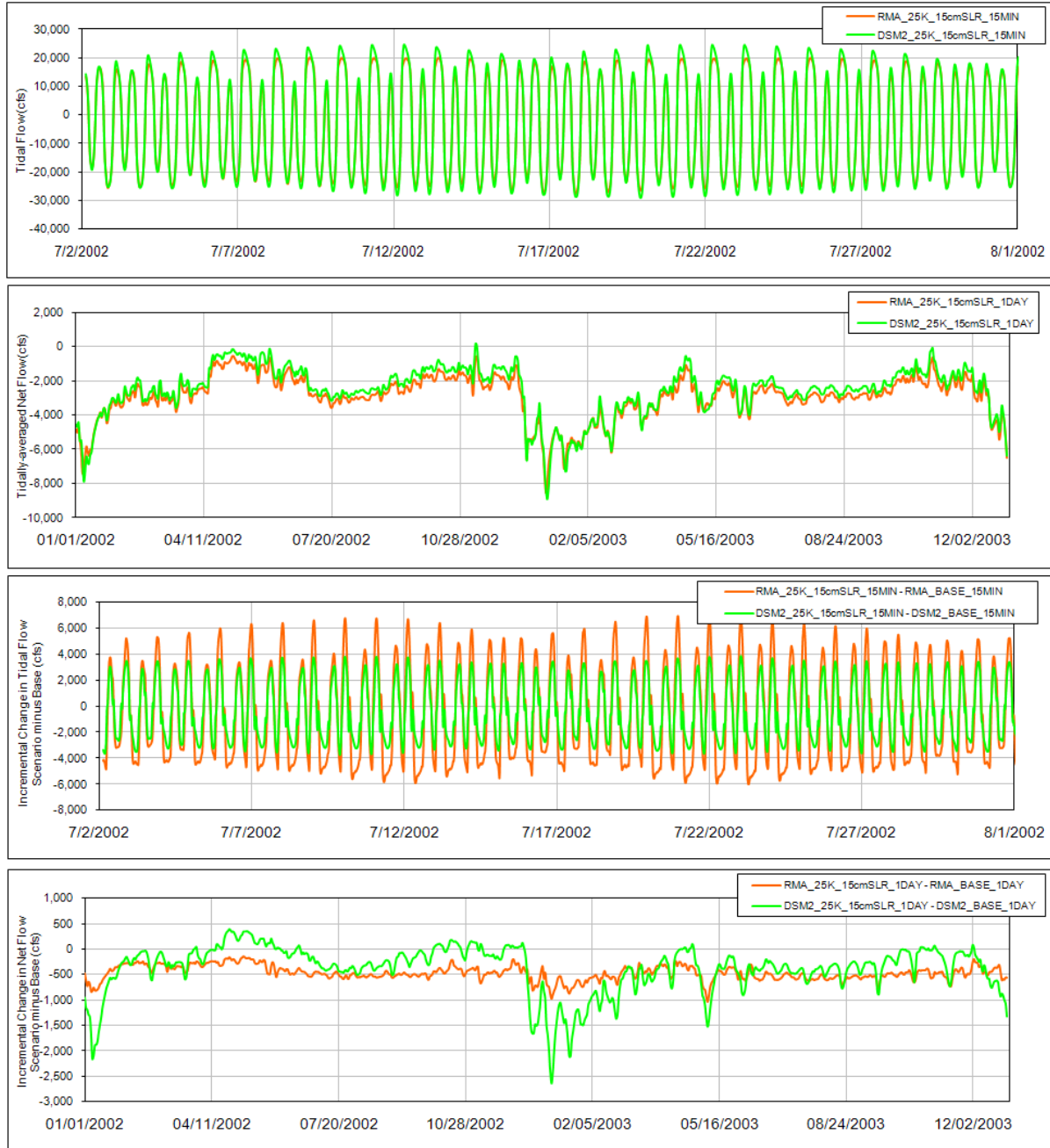
1   Figure 1-152. Comparison of Tidal Flow, Tidally-Averaged Daily Flow, Incremental Change in Tidal Flow
2   and the Incremental Change in the Daily Flow between the Integrated Early Long-term Scenario and the
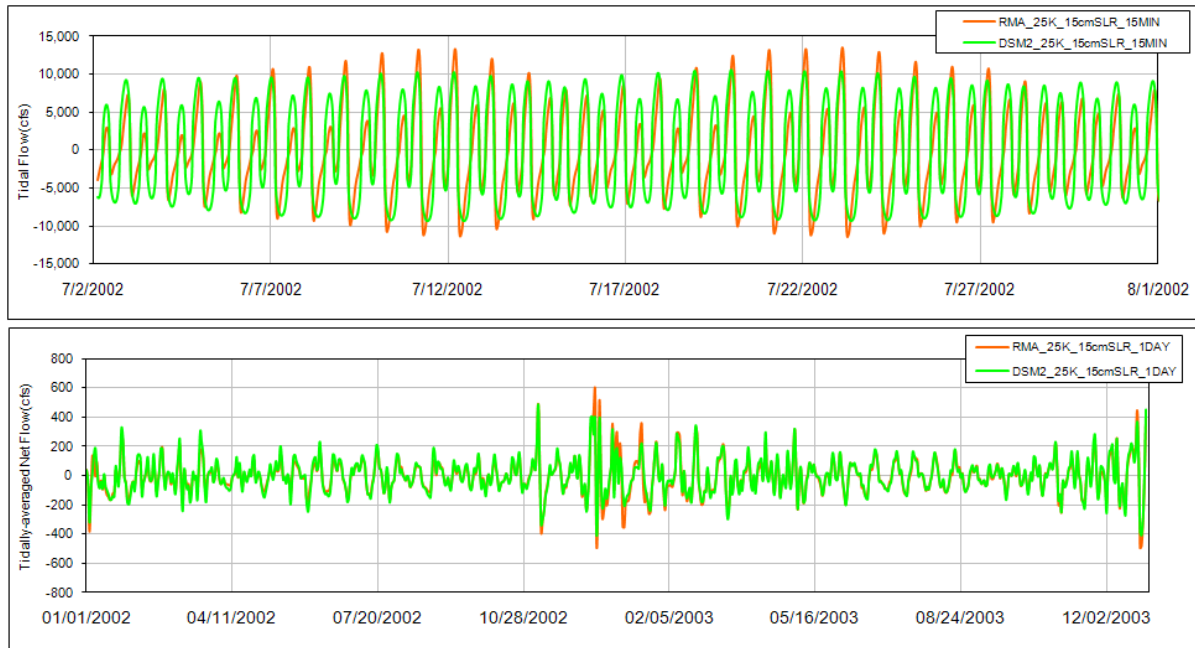3   Current Conditions Scenario from RMA Model and DSM2 Model for San Joaquin River at Jersey Point
4   Location.

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

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

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1 Figure 1-155. Comparison of Tidal Flow, Tidally-Averaged Daily Flow, Incremental Change in Tidal Flow
2 and the Incremental Change in the Daily Flow between the Integrated Early Long-term Scenario and the
3 Current Conditions Scenario from RMA Model and DSM2 Model for San Joaquin River at Stockton
4 Location.
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1 Figure 1-156. Comparison of Tidal Flow, Tidally-Averaged Daily Flow, Incremental Change in Tidal Flow
2 and the Incremental Change in the Daily Flow between the Integrated Early Long-term Scenario and the
3 Current Conditions Scenario from RMA Model and DSM2 Model for Mokelumne River near San Joaquin
4 River Location.
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1 Figure 1-157. Comparison of Tidal Flow, Tidally-Averaged Daily Flow, Incremental Change in Tidal Flow
2 and the Incremental Change in the Daily Flow between the Integrated Early Long-term Scenario and the
3 Current Conditions Scenario from RMA Model and DSM2 Model for Middle River at Bacon Island
4 Location.
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1   Figure 1-158. Comparison of Tidal Flow, Tidally-Averaged Daily Flow, Incremental Change in Tidal Flow
2   and the Incremental Change in the Daily Flow between the Integrated Early Long-term Scenario and the
3   Current Conditions Scenario from RMA Model and DSM2 Model for Old River at Bacon Island Location.
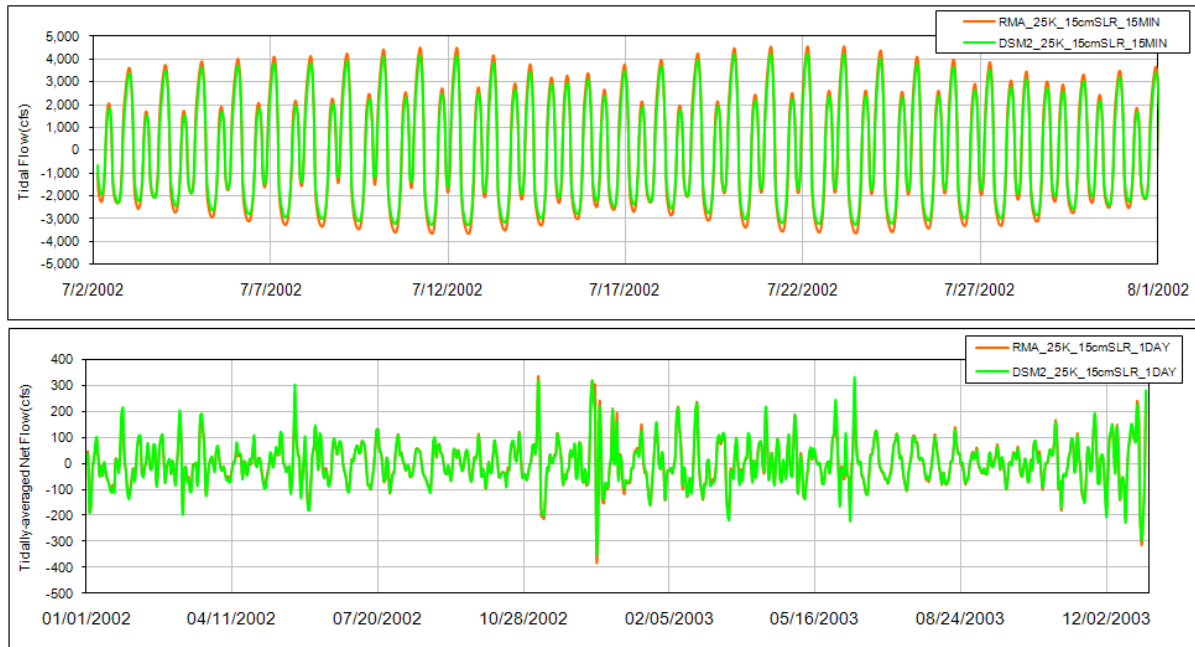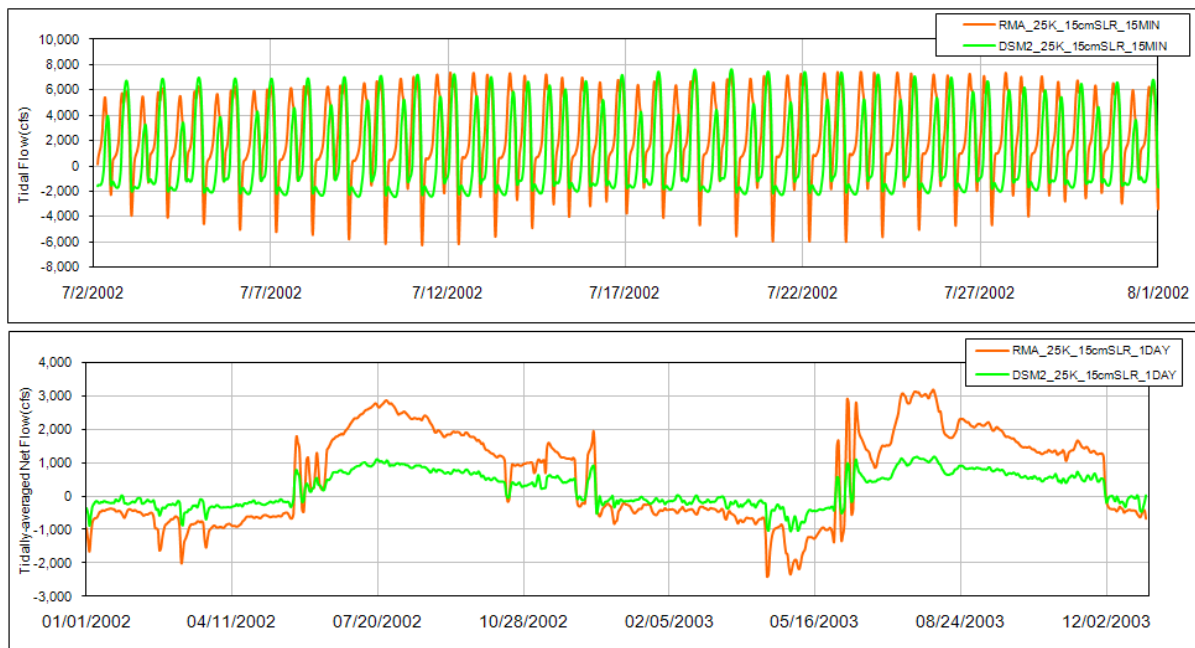4

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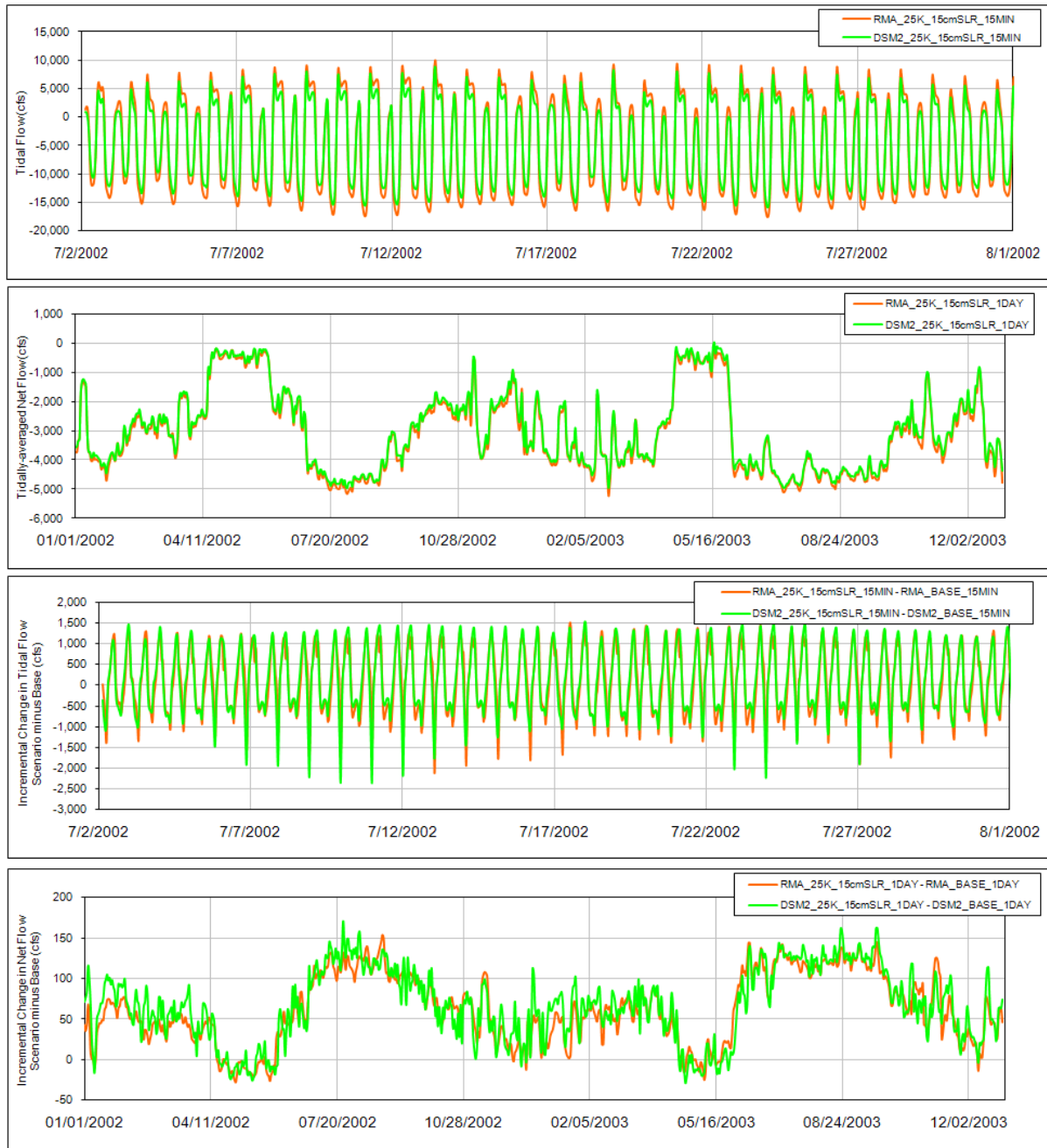
Figure 1-159. Comparison of Tidal Flow and Tidally-Averaged Daily Flow between the Integrated Early Long-term Scenario and the Current Conditions Scenario from RMA Model and DSM2 Model for Prospect Island North breach under Cache Region.
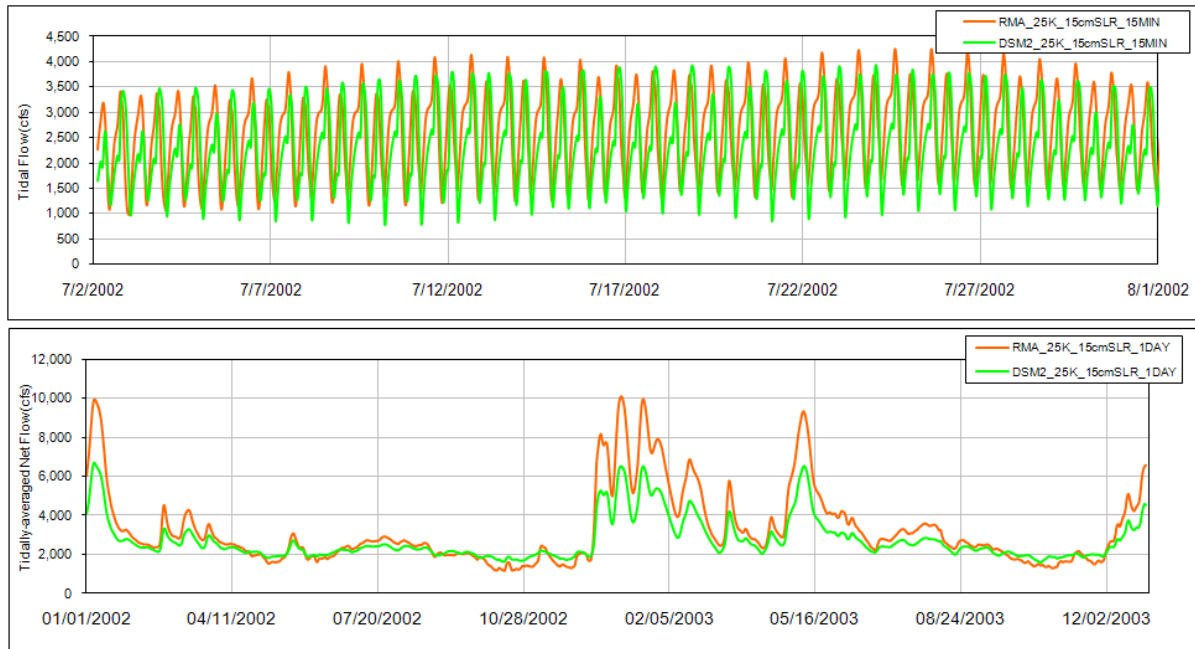
Figure 1-160. Comparison of Tidal Flow and Tidally-Averaged Daily Flow between the Integrated Early Long-term Scenario and the Current Conditions Scenario from RMA Model and DSM2 Model for Egbert A and Calhoun cut breaches under Cache Region.
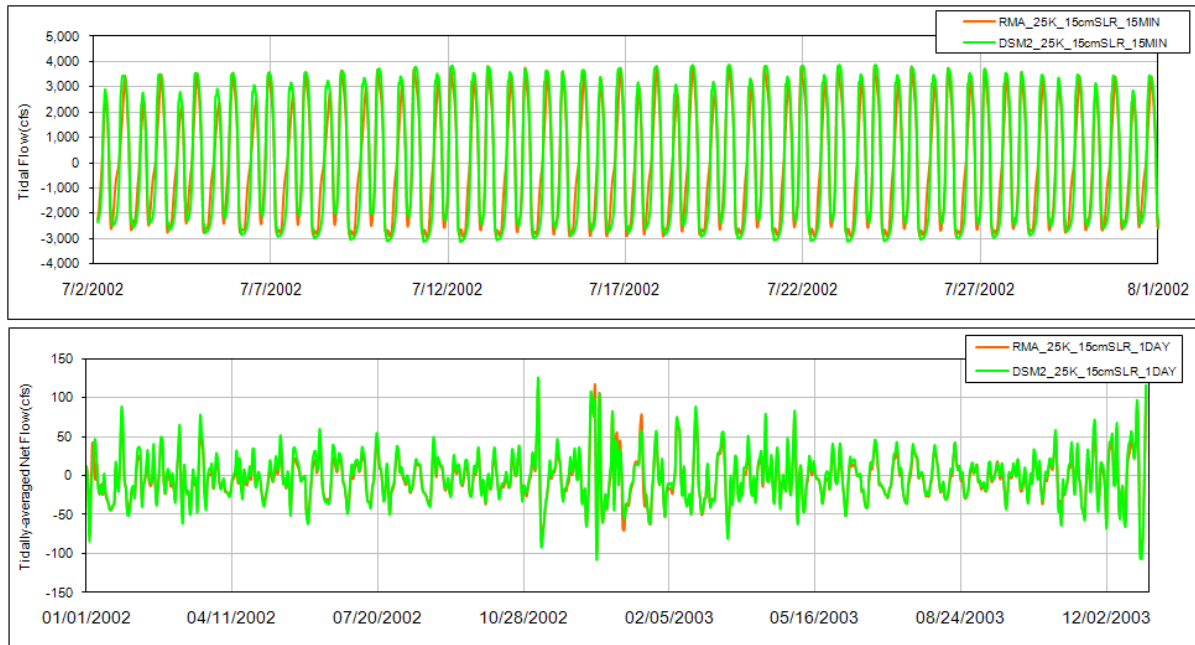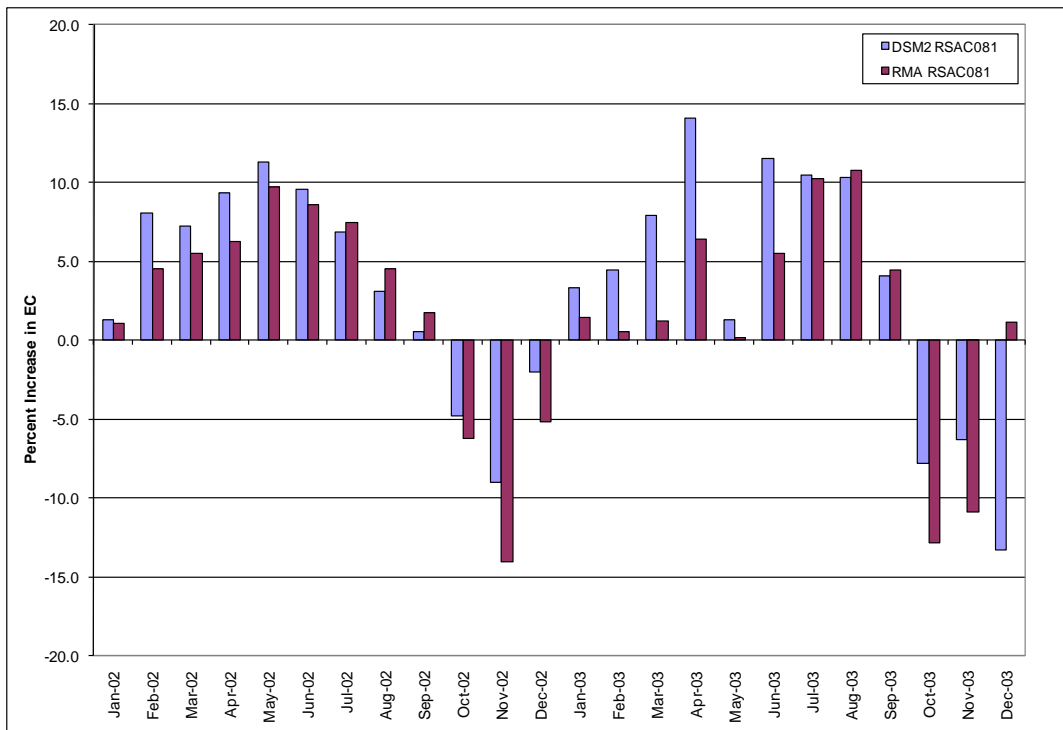
1 **Figure 1-161. Comparison of Tidal Flow and Tidally-Averaged Daily Flow between the Integrated Early**
2 **Long-term Scenario and the Current Conditions Scenario from RMA Model and DSM2 Model for Shag**
3 **Slough breach under Cache Region.**

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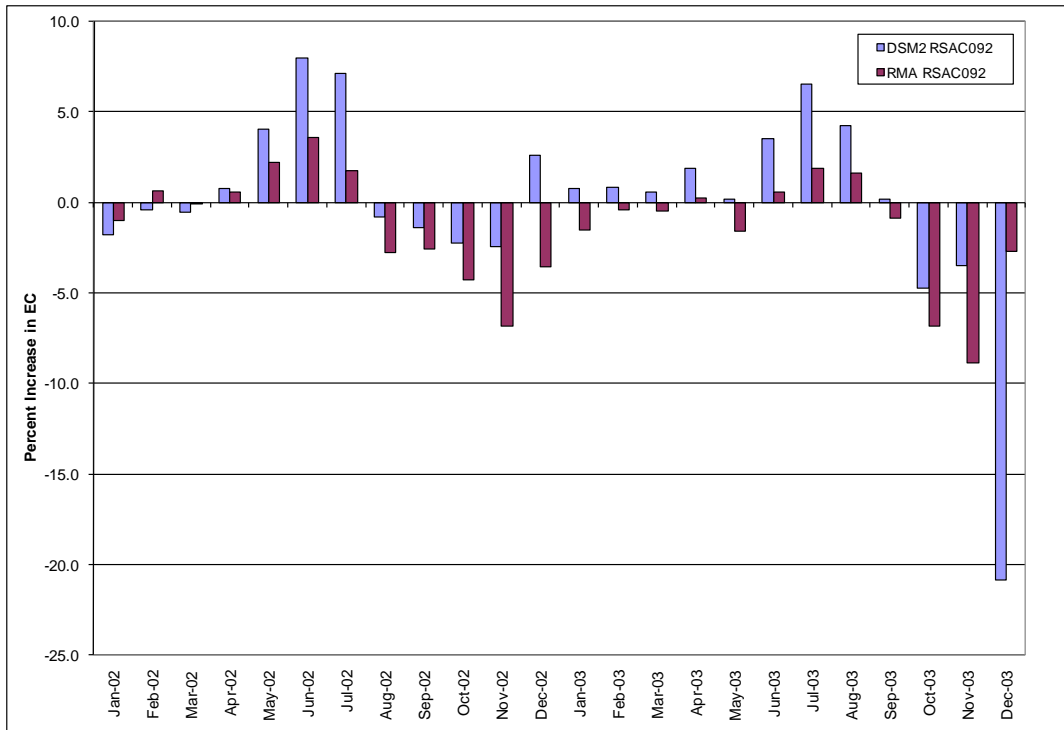7 **Long-term Scenario and the Current Conditions Scenario from RMA Model and DSM2 Model for Suisun**
8 **Island 10 breach 3 under Suisun Marsh Region.**

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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.
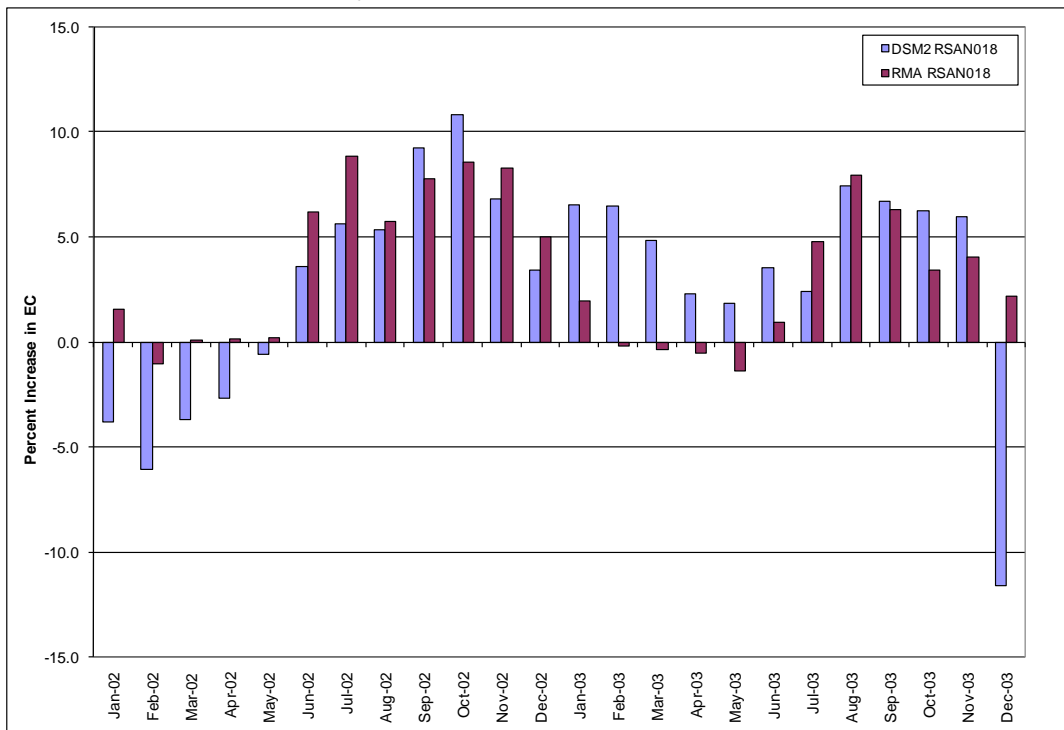
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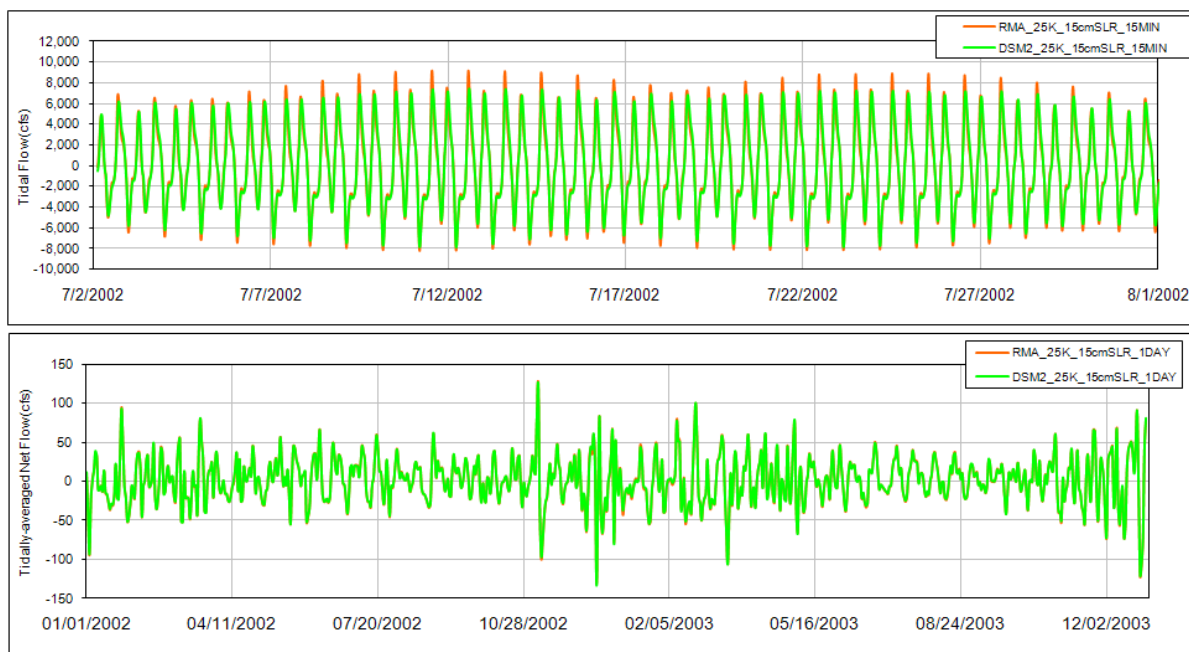
Figure 1-164. Comparison of Tidal Flow and Tidally-Averaged Daily Flow between the Integrated Early Long-term Scenario and the Current Conditions Scenario from RMA Model and DSM2 Model for Montezuma Wetlands North and South breaches under Cache Region.
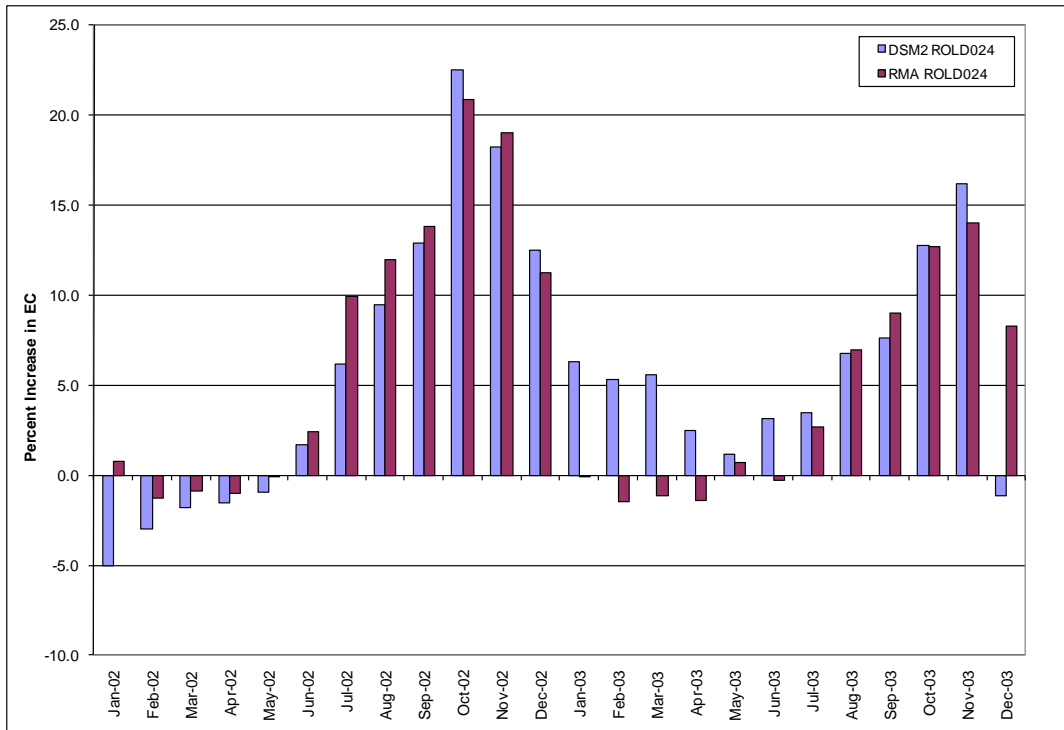
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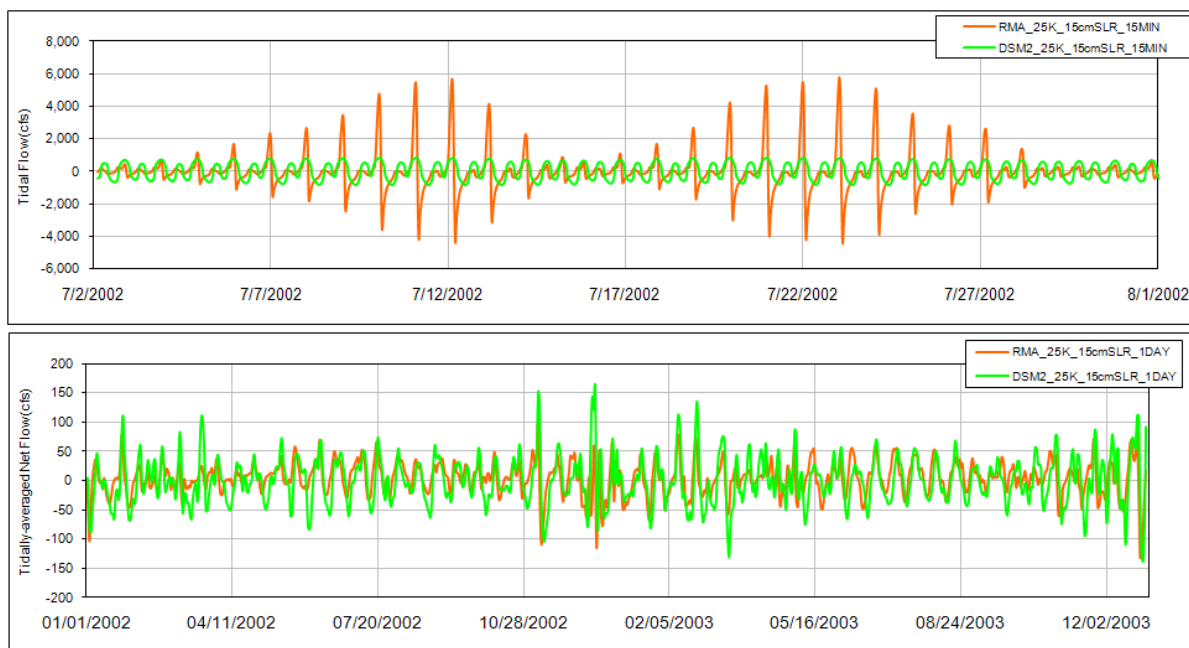
Figure 1-165. Comparison of Tidal Flow and Tidally-Averaged Daily Flow between the Integrated Early Long-term Scenario and the Current Conditions Scenario from RMA Model and DSM2 Model for Decker Island North-west breach under Cache Region.
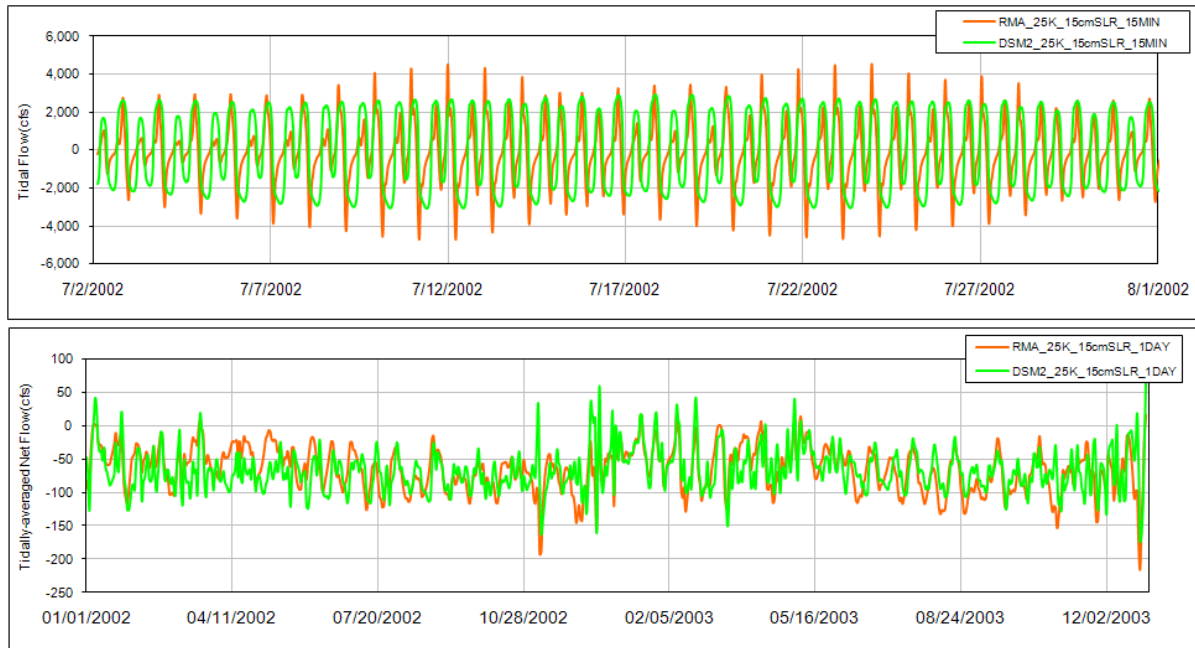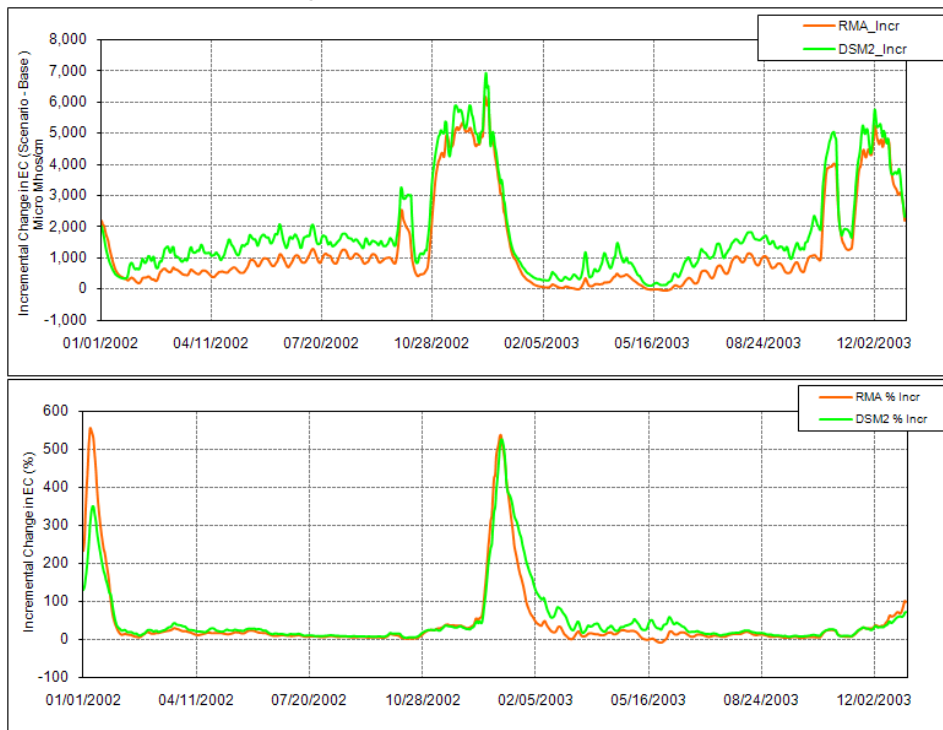

Figure 1-166. Comparison of Tidal Flow and Tidally-Averaged Daily Flow between the Integrated Early Long-term Scenario and the Current Conditions Scenario from RMA Model and DSM2 Model for Dutch Slough d/s of Emerson Slough under Western Delta Region.

1　Figure 1-167. Comparison of Tidal Flow and Tidally-Averaged Daily Flow between the Integrated Early
2　Long-term Scenario and the Current Conditions Scenario from RMA Model and DSM2 Model for
3　Snodgrass Slough breach under Mokelumne/Cosumnes Region.
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6　Figure 1-168. Comparison of Tidal Flow and Tidally-Averaged Daily Flow between the Integrated Early
7　Long-term Scenario and the Current Conditions Scenario from RMA Model and DSM2 Model for
8　Snodgrass Slough south and McCormick Williamson Tract breaches under Eastern Delta Region.
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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.

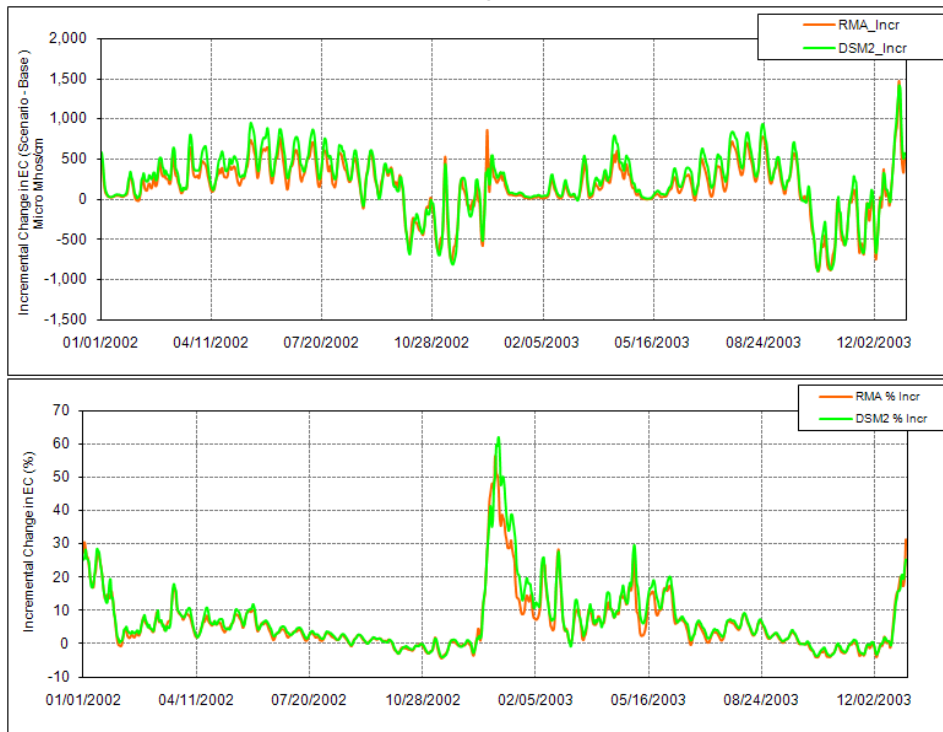1 Figure 1-170. Comparison of Monthly averaged percentage incremental change in EC between the
2 Integrated Early Long-Term Scenario and the Current Conditions Scenario from RMA Model and DSM2
3 Model for Sacramento River at Emmaton.

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

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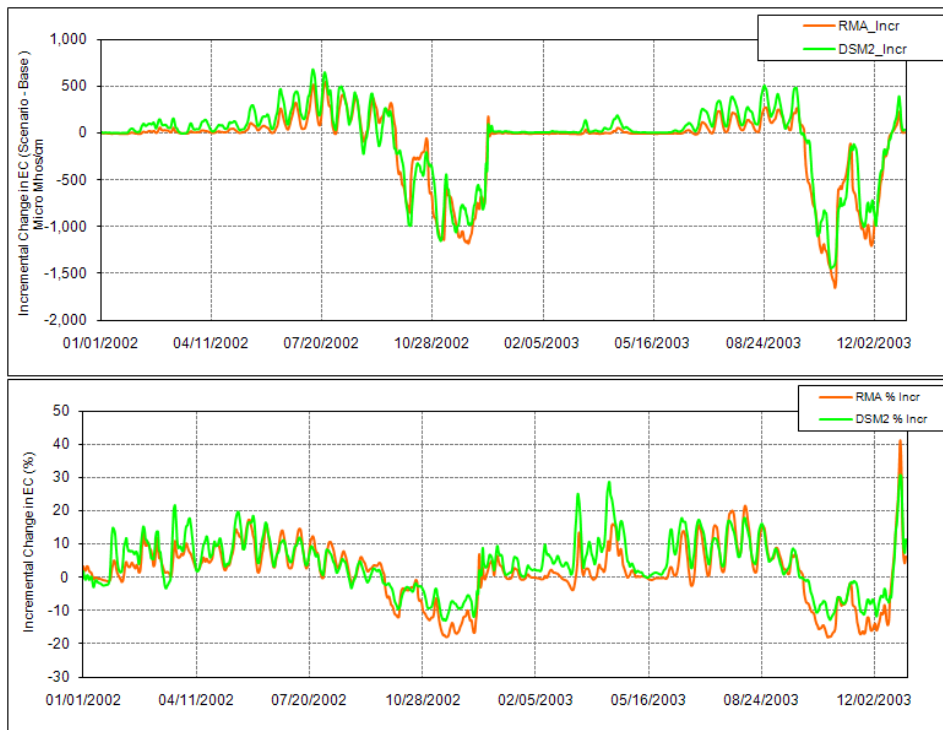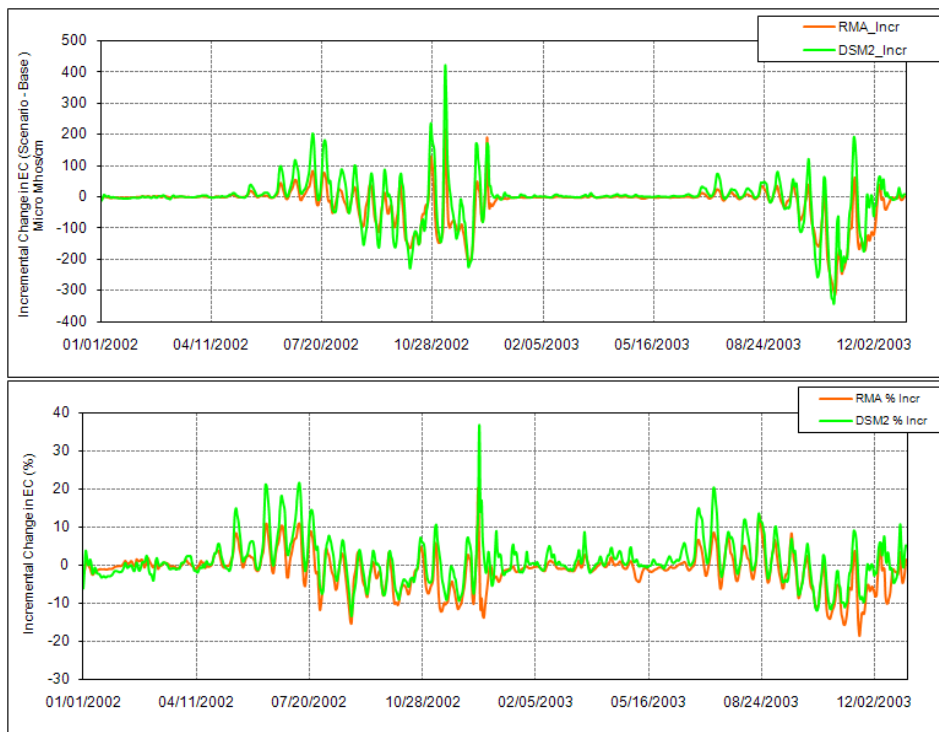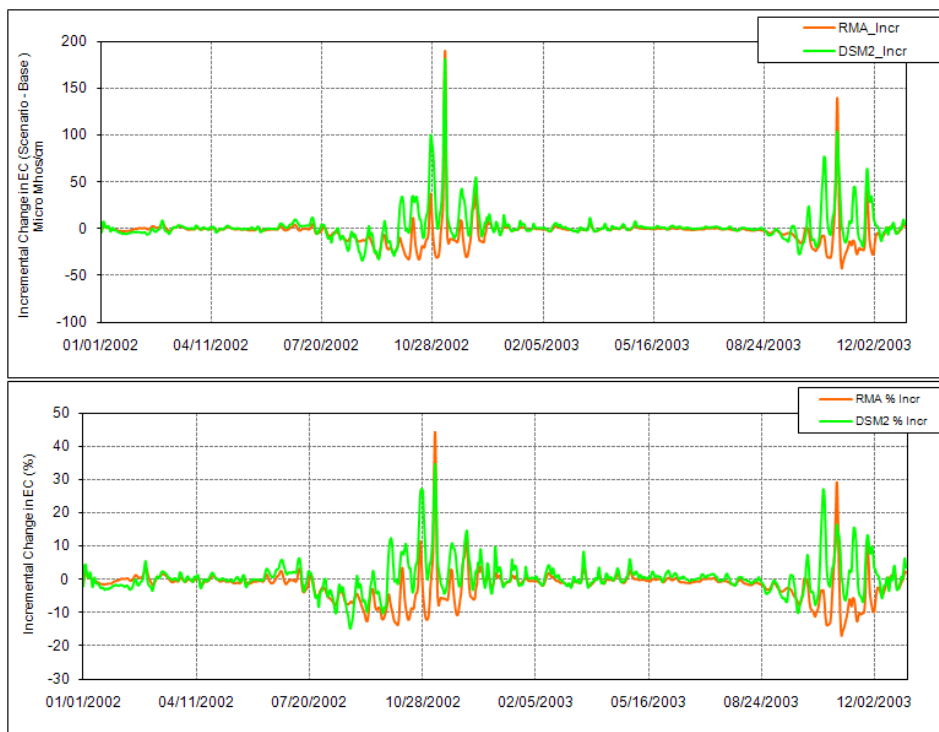3 Model for Old River at Rock Slough.

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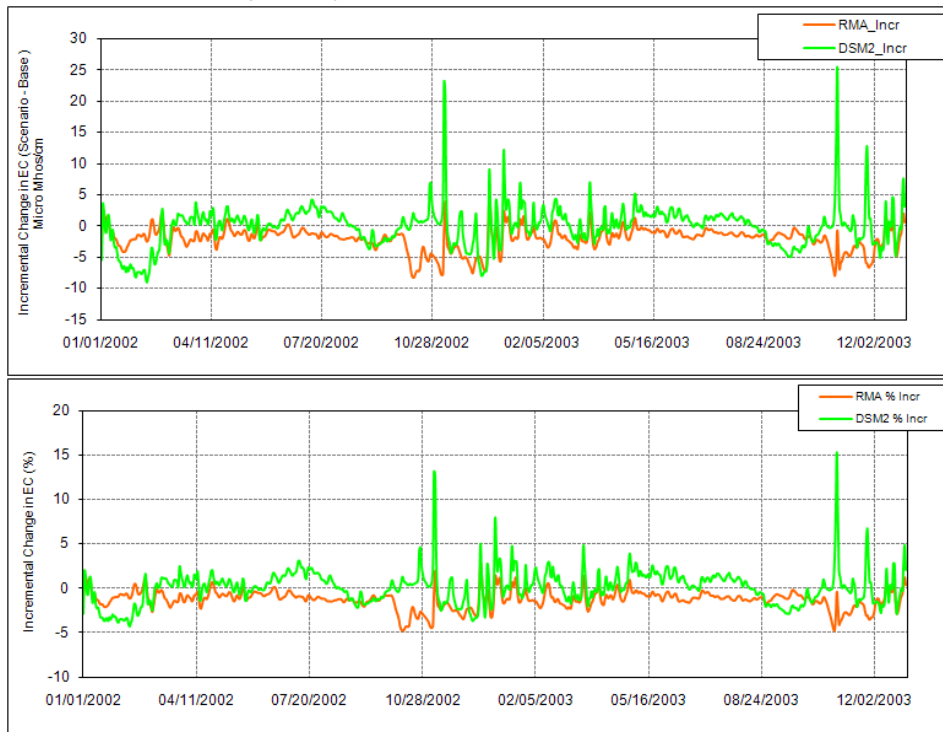7 and DSM2 Model for Montezuma Slough at Mouth Location.

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

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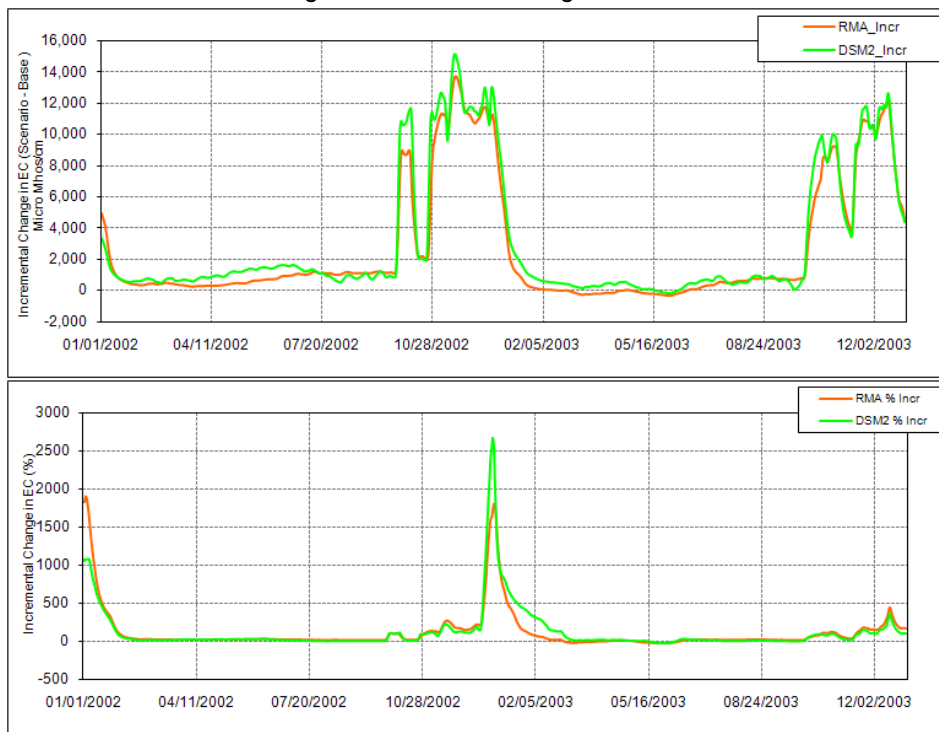
5   Figure 1-175. Comparison of Tidally-Averaged Daily EC and the Incremental Change in the Daily EC
6   between the Integrated Early Long-Term Scenario and the Current Conditions Scenario from RMA Model
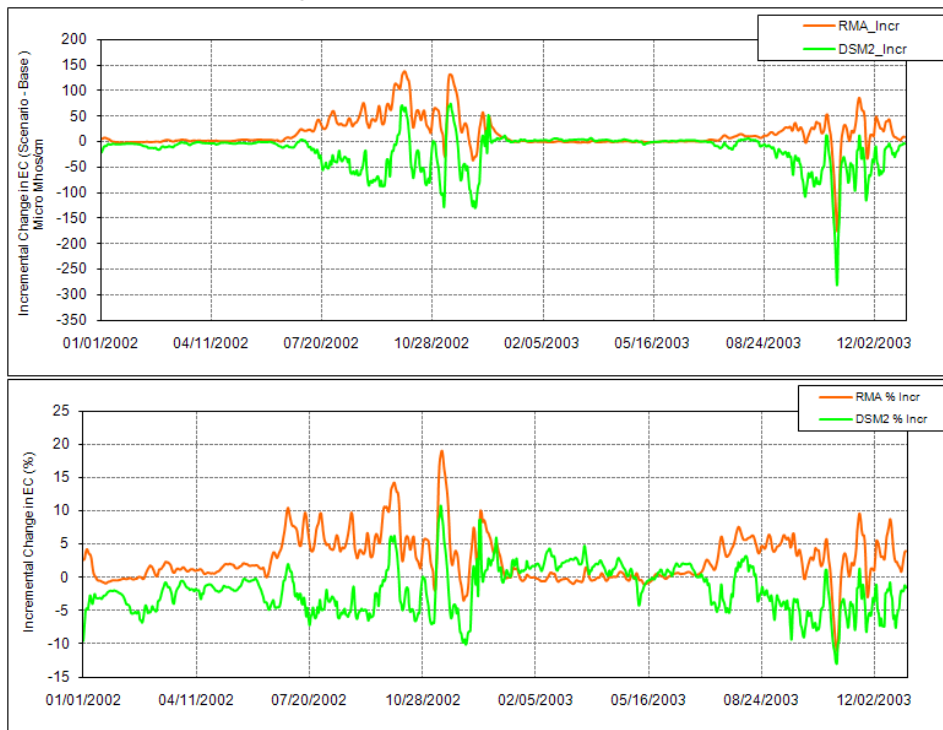7   and DSM2 Model for Montezuma Slough at Head Location.

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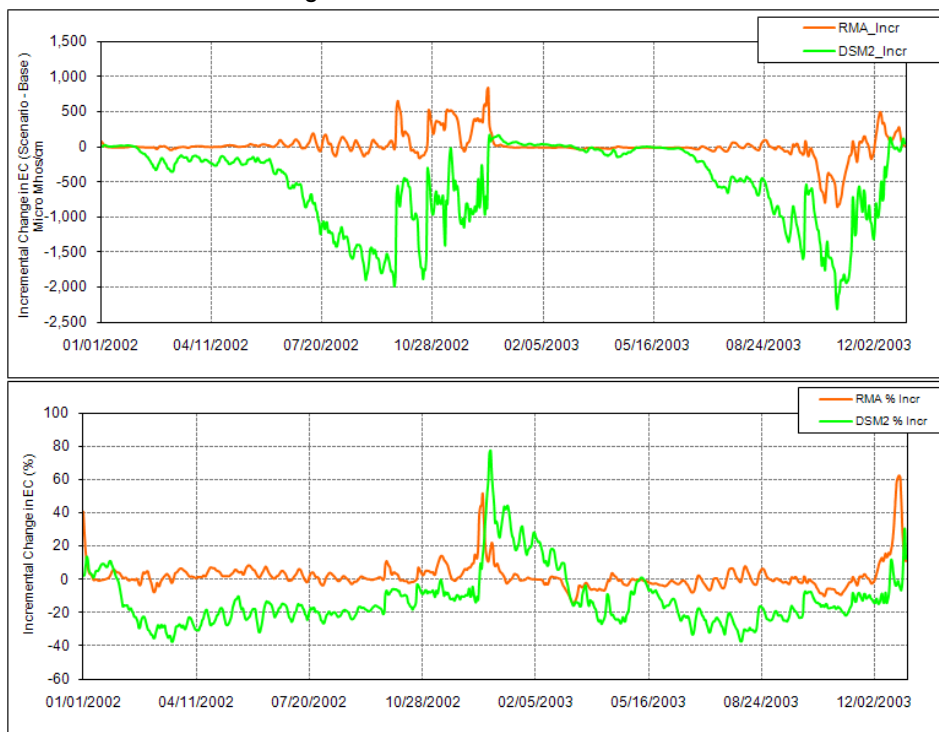
1 Figure 1-176. Comparison of Tidally-Averaged Daily EC and the Incremental Change in the Daily EC
2 between the Integrated Early Long-Term Scenario and the Current Conditions Scenario from RMA Model
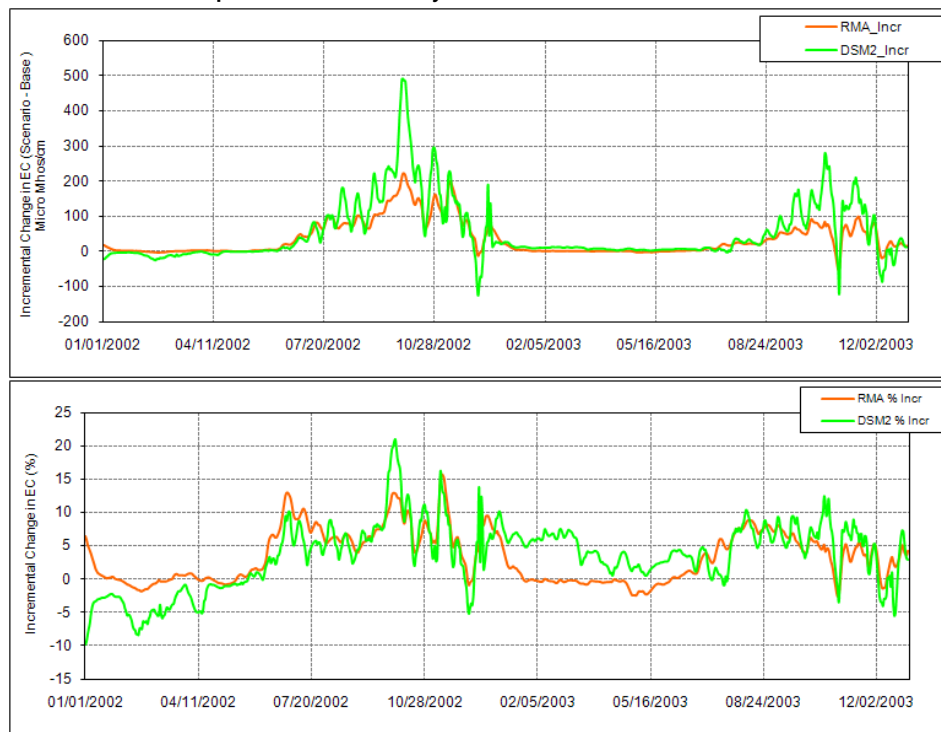3 and DSM2 Model for Sacramento River at Port Chicago Location.

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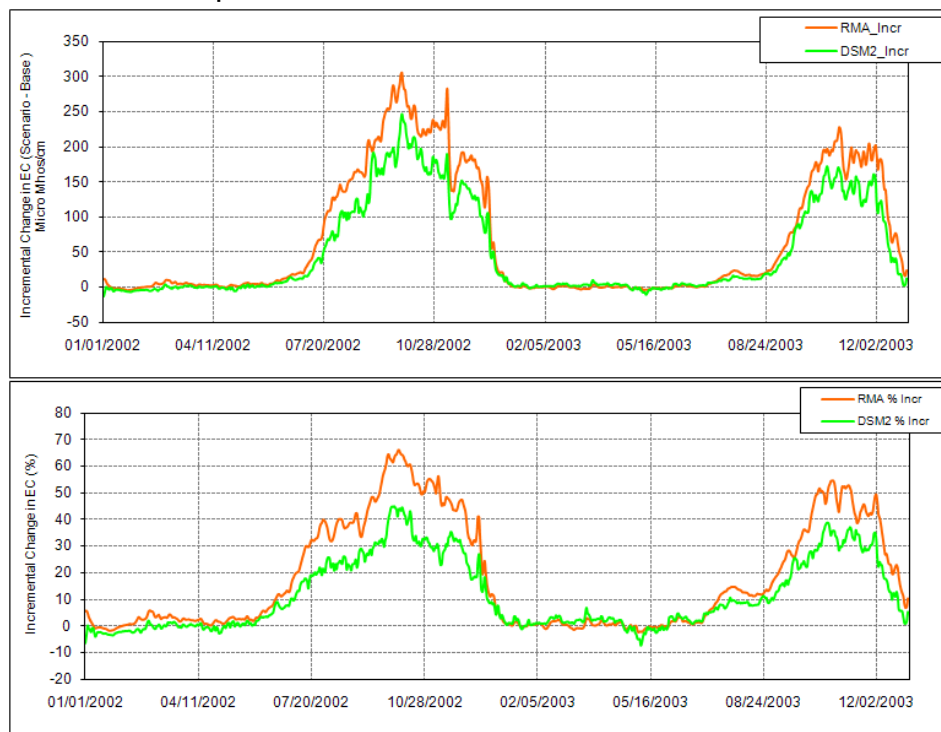7 and DSM2 Model for Sacramento River at Collinsville Location.

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

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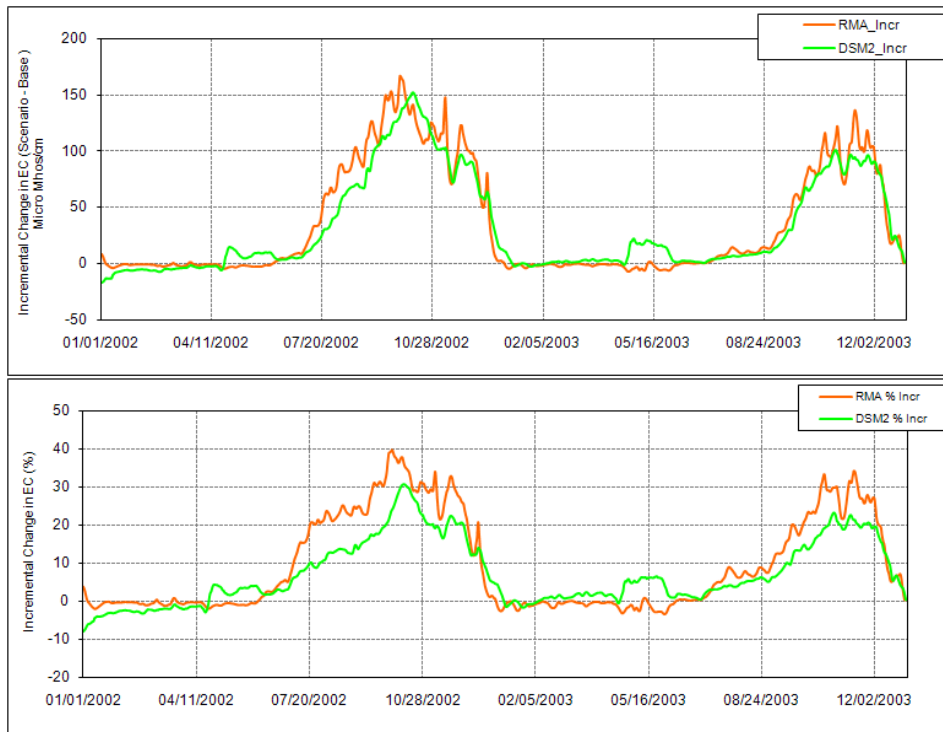

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1 Figure 1-180. Comparison of Tidally-Averaged Daily EC and the Incremental Change in the Daily EC
2 between the Integrated Early Long-Term Scenario and the Current Conditions Scenario from RMA Model
3 and DSM2 Model for Cache Slough at Ryer Island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

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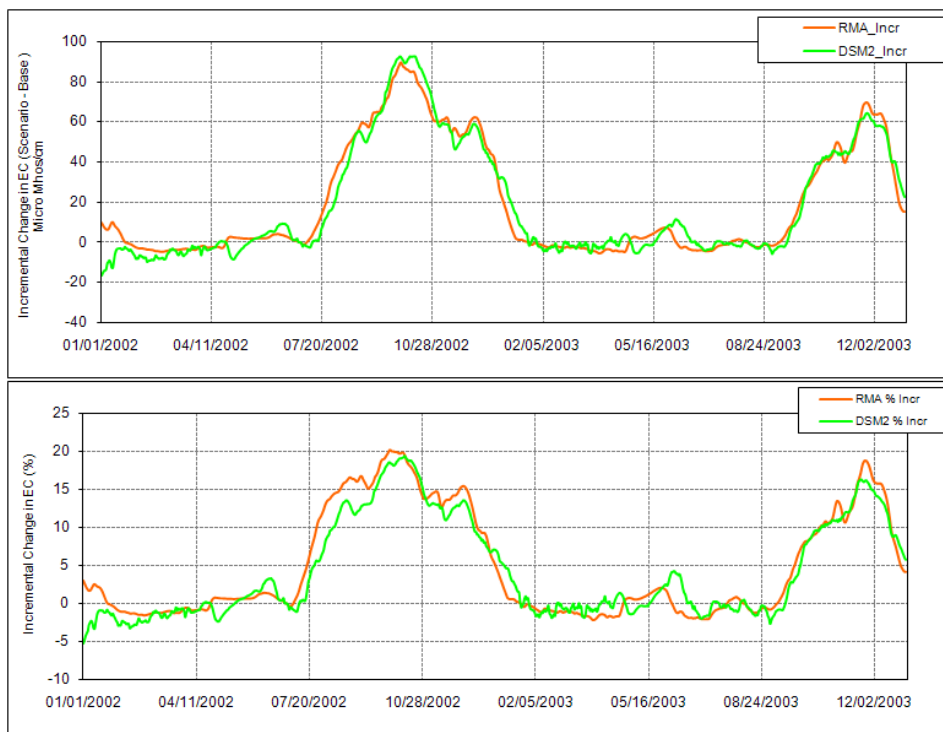

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1   Figure 1-182. Comparison of Tidally-Averaged Daily EC and the Incremental Change in the Daily EC
2   between the Integrated Early Long-Term Scenario and the Current Conditions Scenario from RMA Model
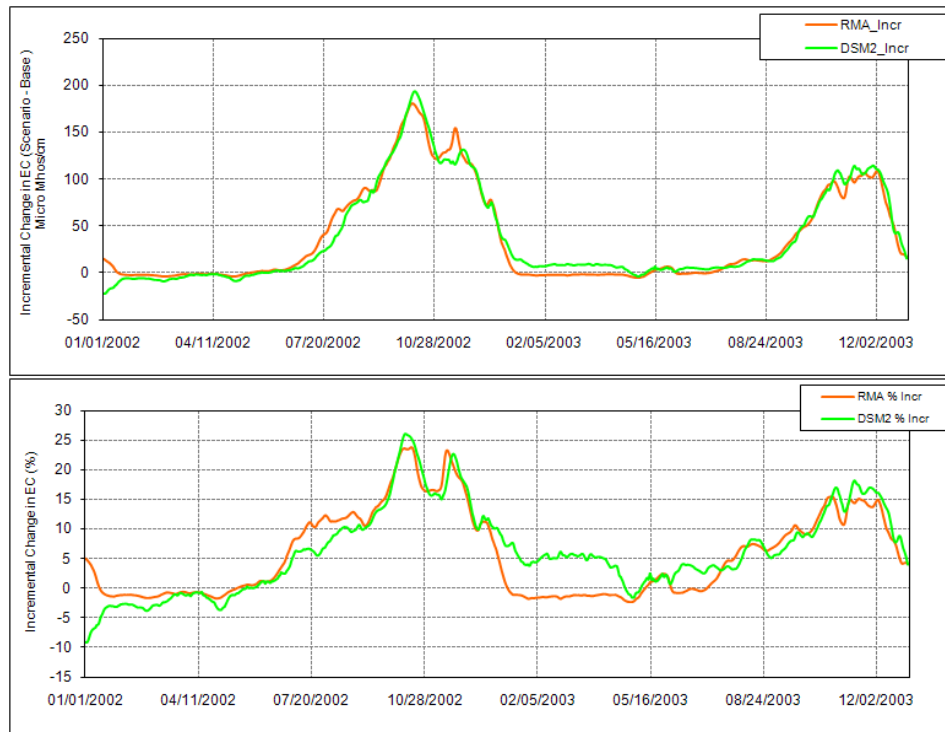3   and DSM2 Model for San Joaquin River at Jersey Point Location.

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

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

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

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

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

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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.

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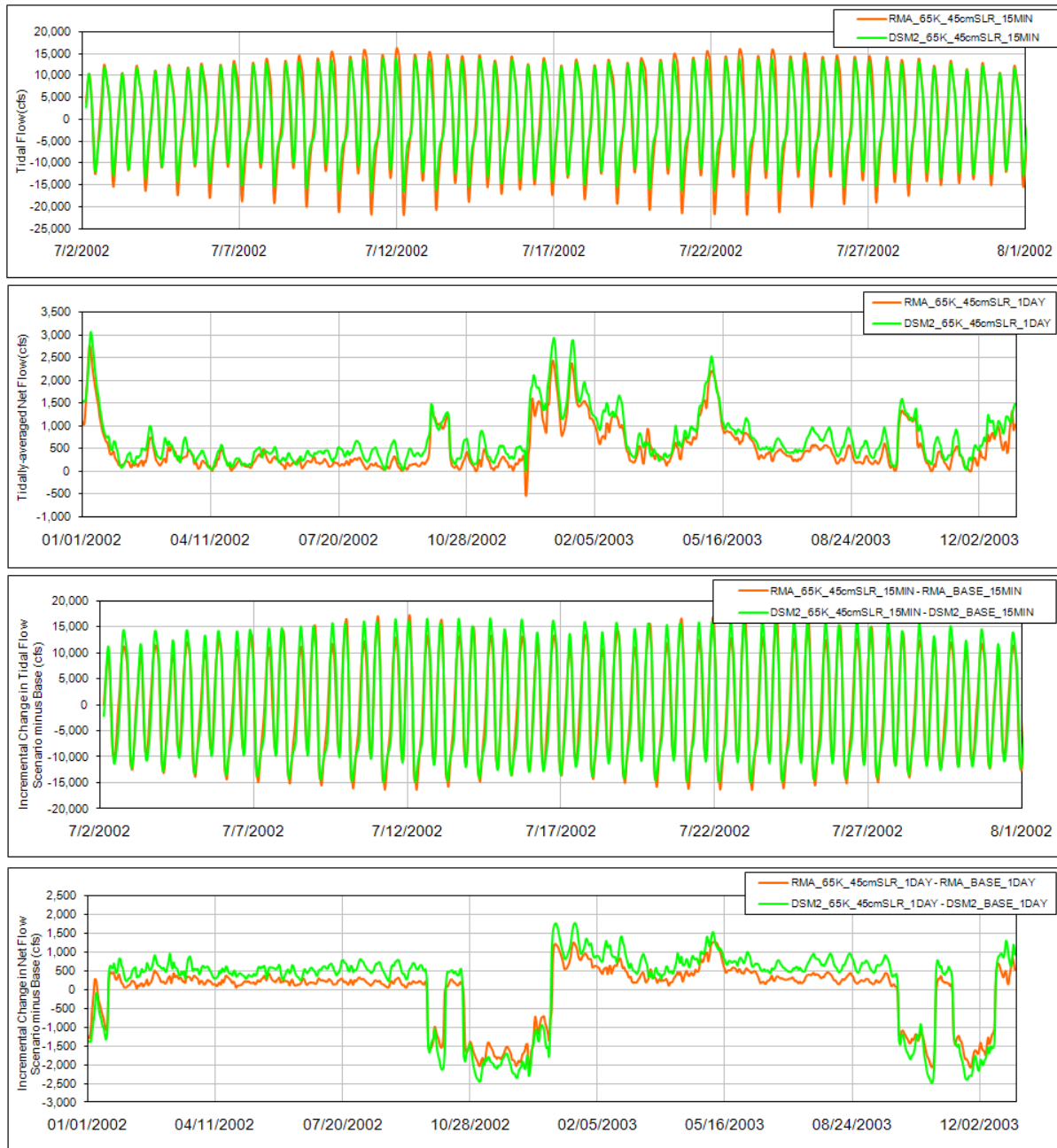
Hydrodynamics Results

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.
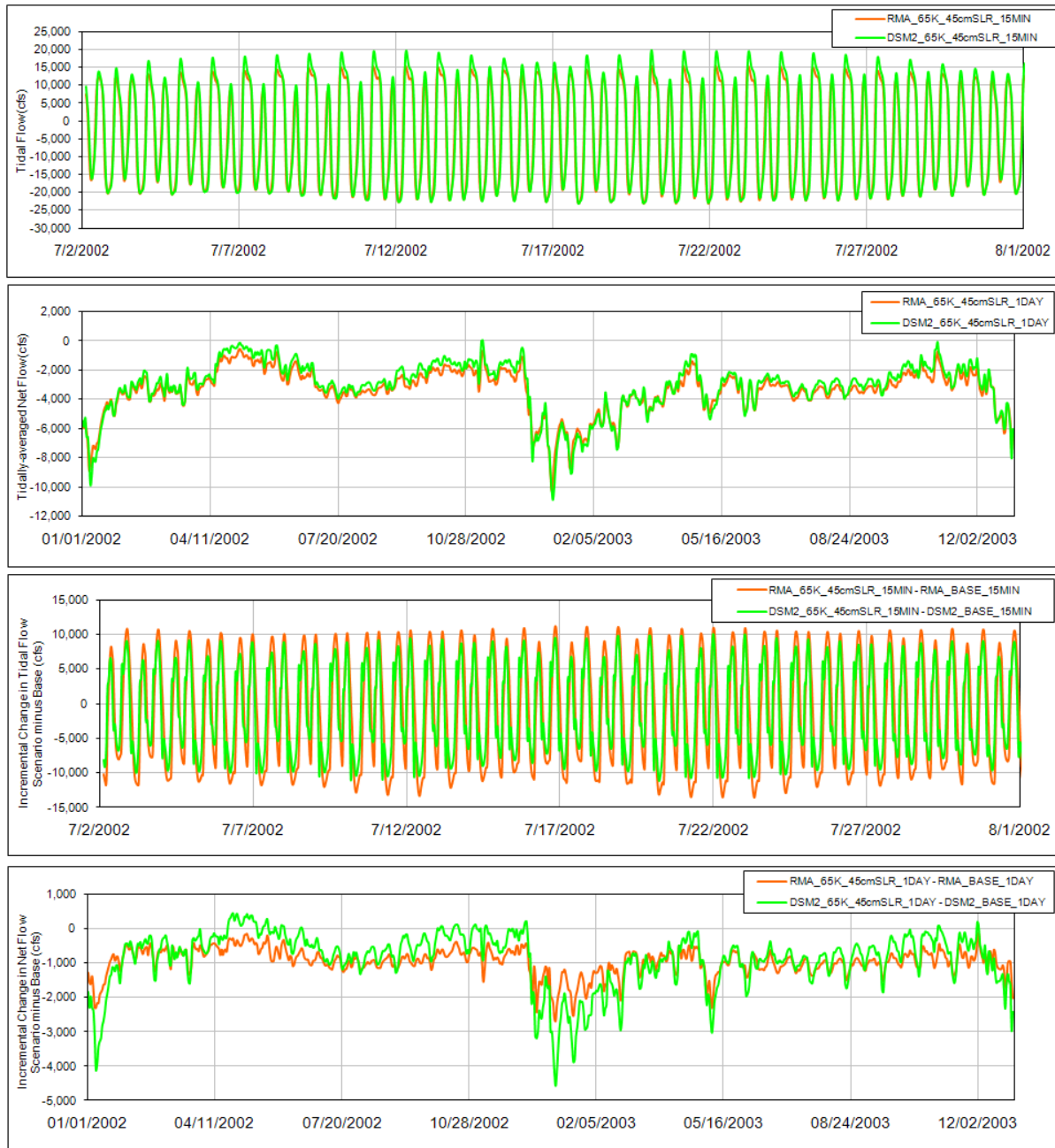
1   Figure 1-190. Comparison of Tidal Flow, Tidally-Averaged Daily Flow, Incremental Change in Tidal Flow
2   and the Incremental Change in the Daily Flow between the Integrated Late Long-term Scenario and the
3   Current Conditions Scenario from RMA Model and DSM2 Model for Sacramento River at Rio Vista
4   Location.
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1 Figure 1-191. Comparison of Tidal Flow, Tidally-Averaged Daily Flow, Incremental Change in Tidal Flow
2 and the Incremental Change in the Daily Flow between the Integrated Late Long-term Scenario and the
3 Current Conditions Scenario from RMA Model and DSM2 Model for Georgiana Slough at Head Location.
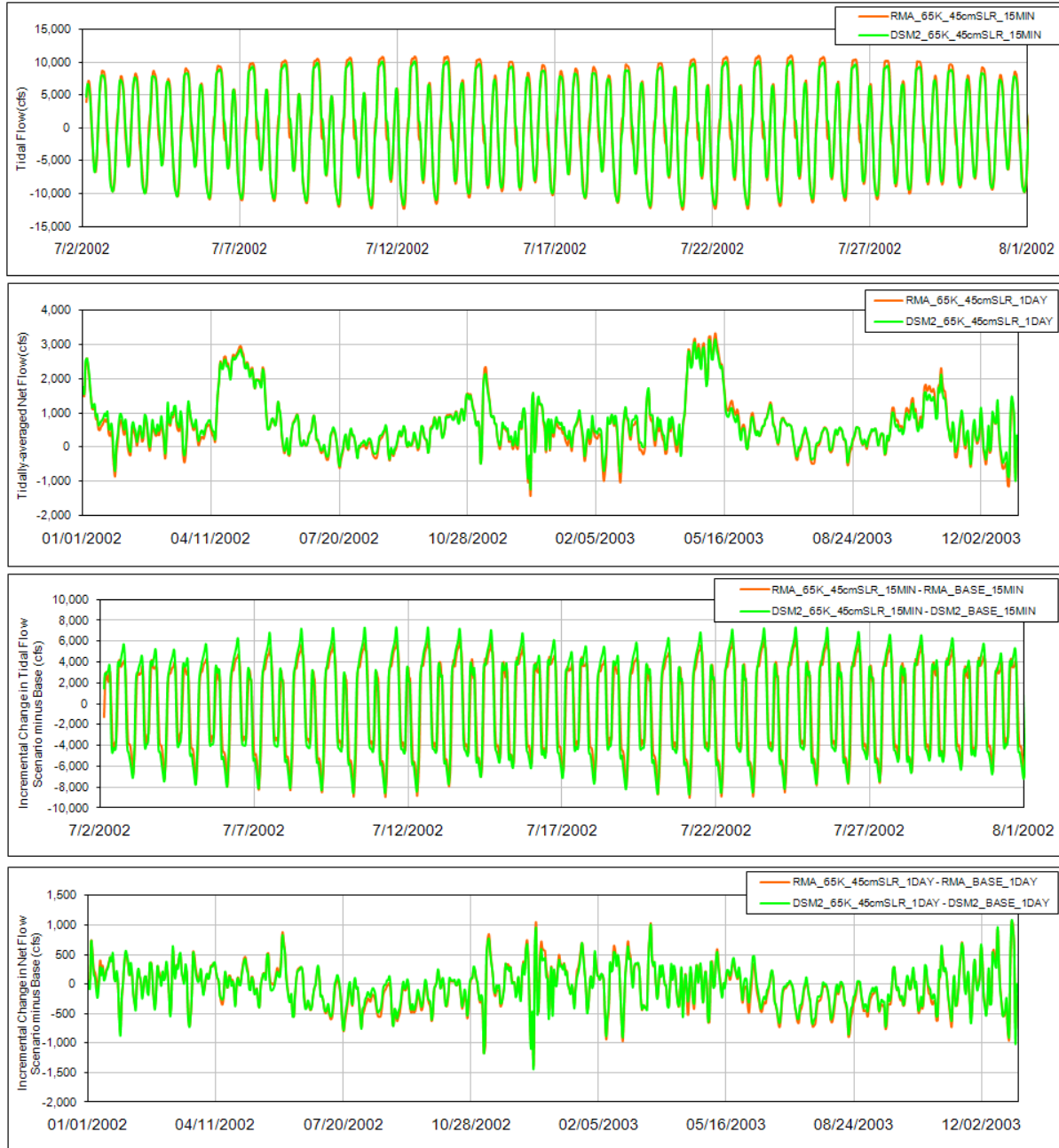4

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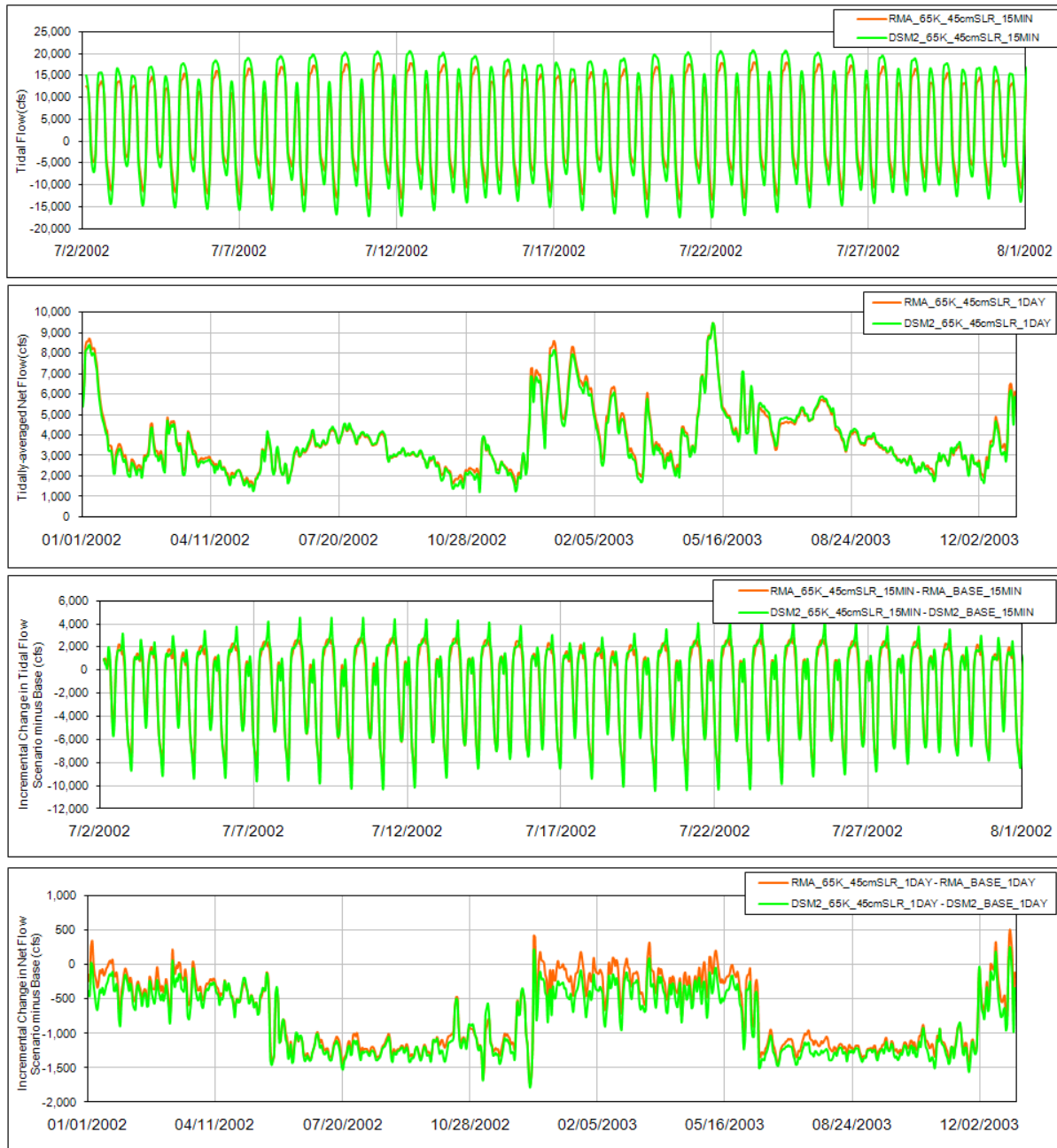
1 Figure 1-192. Comparison of Tidal Flow, Tidally-Averaged Daily Flow, Incremental Change in Tidal Flow
2 and the Incremental Change in the Daily Flow between the Integrated Late Long-term Scenario and the
3 Current Conditions Scenario from RMA Model and DSM2 Model for Montezuma Slough at Head Location.

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1   Figure 1-193. Comparison of Tidal Flow, Tidally-Averaged Daily Flow, Incremental Change in Tidal Flow
2   and the Incremental Change in the Daily Flow between the Integrated Late Long-term Scenario and the
3   Current Conditions Scenario from RMA Model and DSM2 Model for Montezuma Slough at Mouth
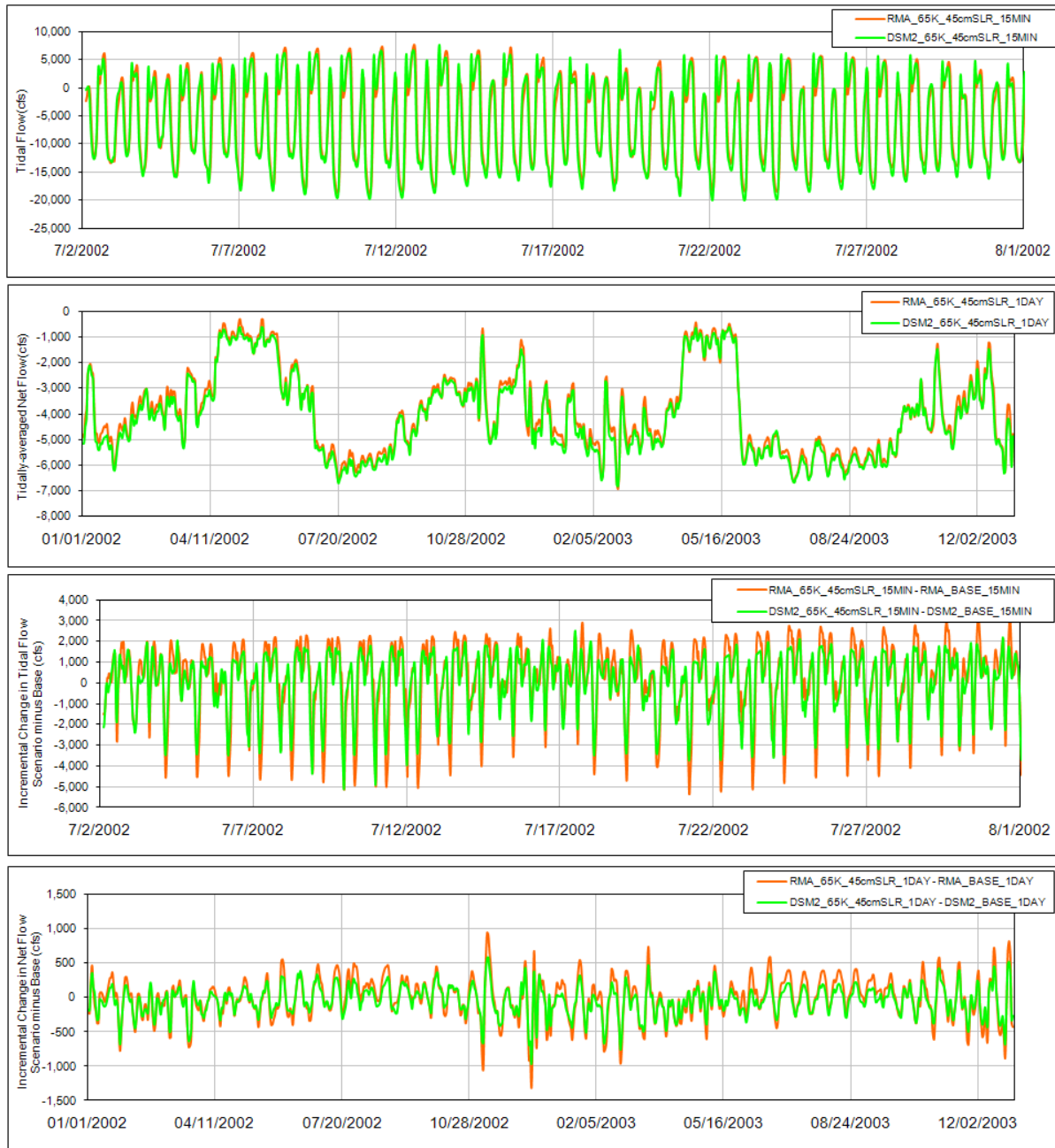4   Location.
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1 Figure 1-194. Comparison of Tidal Flow, Tidally-Averaged Daily Flow, Incremental Change in Tidal Flow
2 and the Incremental Change in the Daily Flow between the Integrated Late Long-term Scenario and the
3 Current Conditions Scenario from RMA Model and DSM2 Model for Three Mile Slough at San Joaquin
4 River Location.

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

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

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1 Figure 1-197. Comparison of Tidal Flow, Tidally-Averaged Daily Flow, Incremental Change in Tidal Flow
2 and the Incremental Change in the Daily Flow between the Integrated Late Long-term Scenario and the
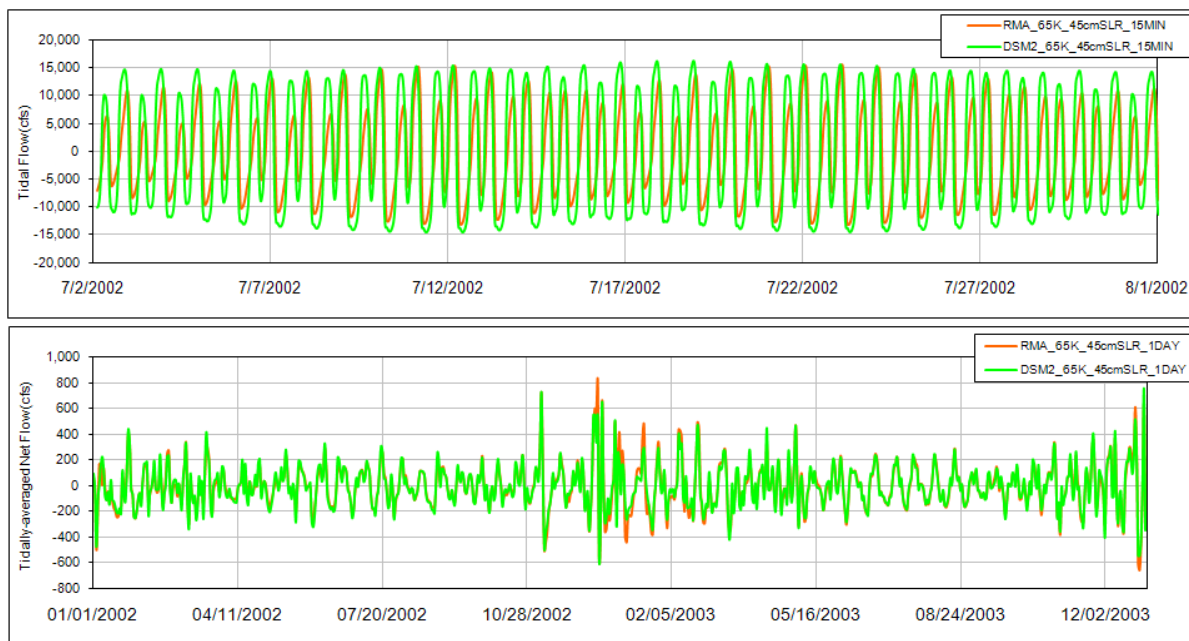3 Current Conditions Scenario from RMA Model and DSM2 Model for Mokelumne River near San Joaquin
4 River Location.
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1 **Figure 1-198. Comparison of Tidal Flow, Tidally-Averaged Daily Flow, Incremental Change in Tidal Flow**
2 **and the Incremental Change in the Daily Flow between the Integrated Late Long-term Scenario and the**
3 **Current Conditions Scenario from RMA Model and DSM2 Model for Middle River at Bacon Island**
4 **Location.**
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1 Figure 1-199. Comparison of Tidal Flow, Tidally-Averaged Daily Flow, Incremental Change in Tidal Flow
2 and the Incremental Change in the Daily Flow between the Integrated Late Long-term Scenario and the
3 Current Conditions Scenario from RMA Model and DSM2 Model for Old River at Bacon Island Location.
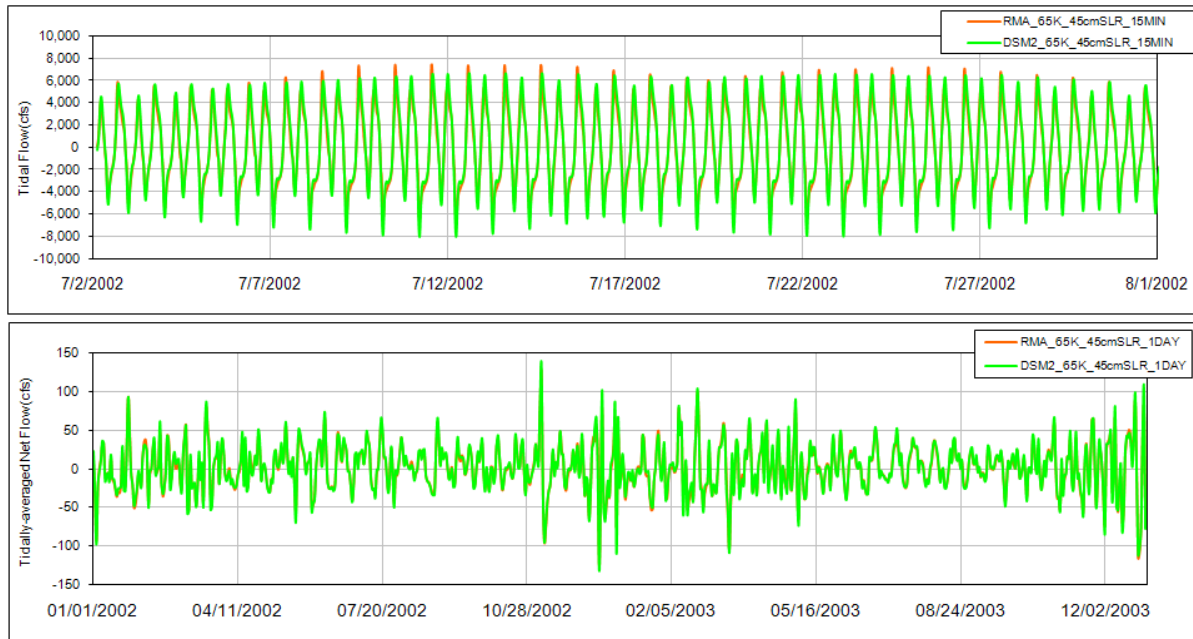
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1 Figure 1-200. Comparison of Tidal Flow and Tidally-Averaged Daily Flow between the Integrated Late
2 Long-term Scenario and the Current Conditions Scenario from RMA Model and DSM2 Model for Prospect
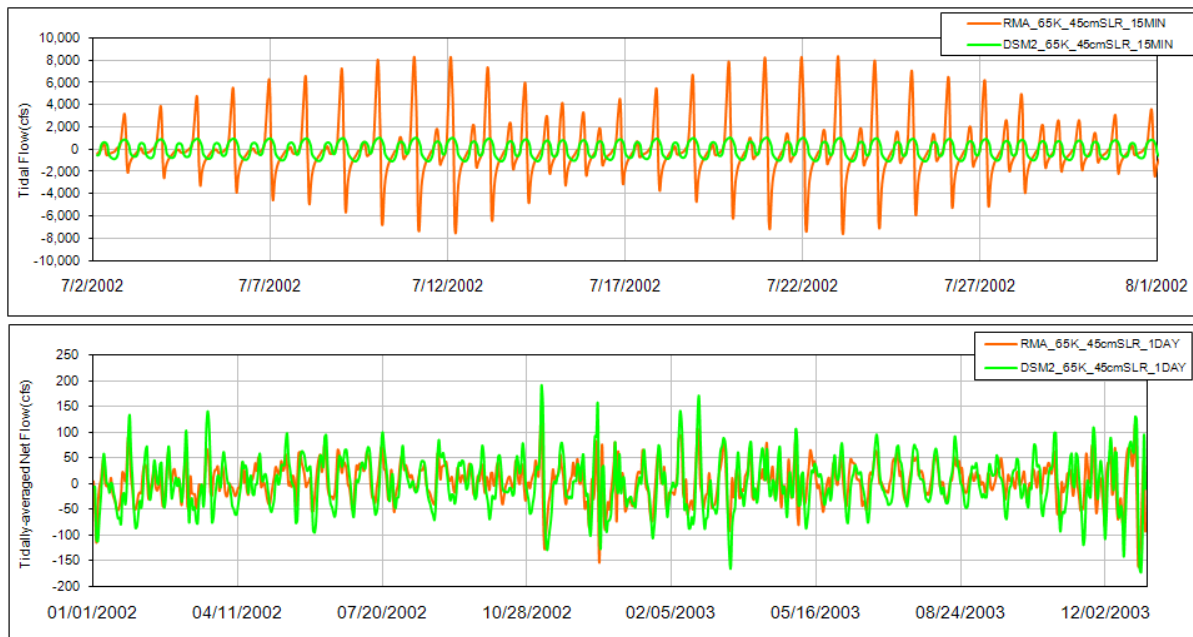3 Slough North Breach under Cache Region.

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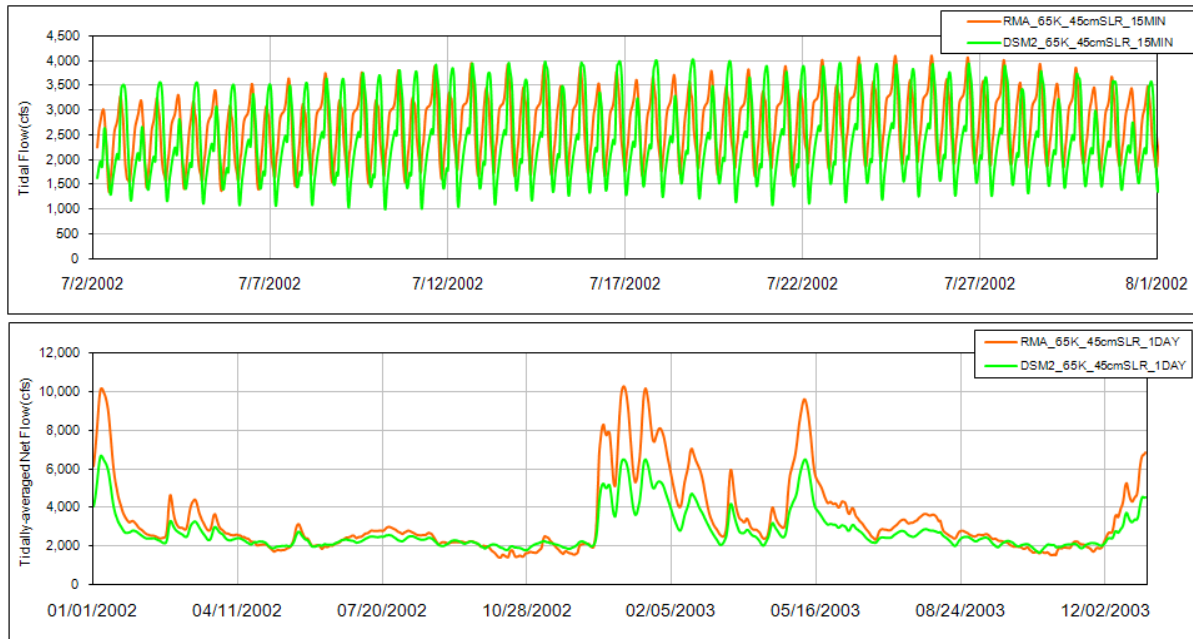
6 Figure 1-201. Comparison of Tidal Flow and Tidally-Averaged Daily Flow between the Integrated Late
7 Long-term Scenario and the Current Conditions Scenario from RMA Model and DSM2 Model for Egbert A
8 and Calhoun Cut Breaches under Cache Region.
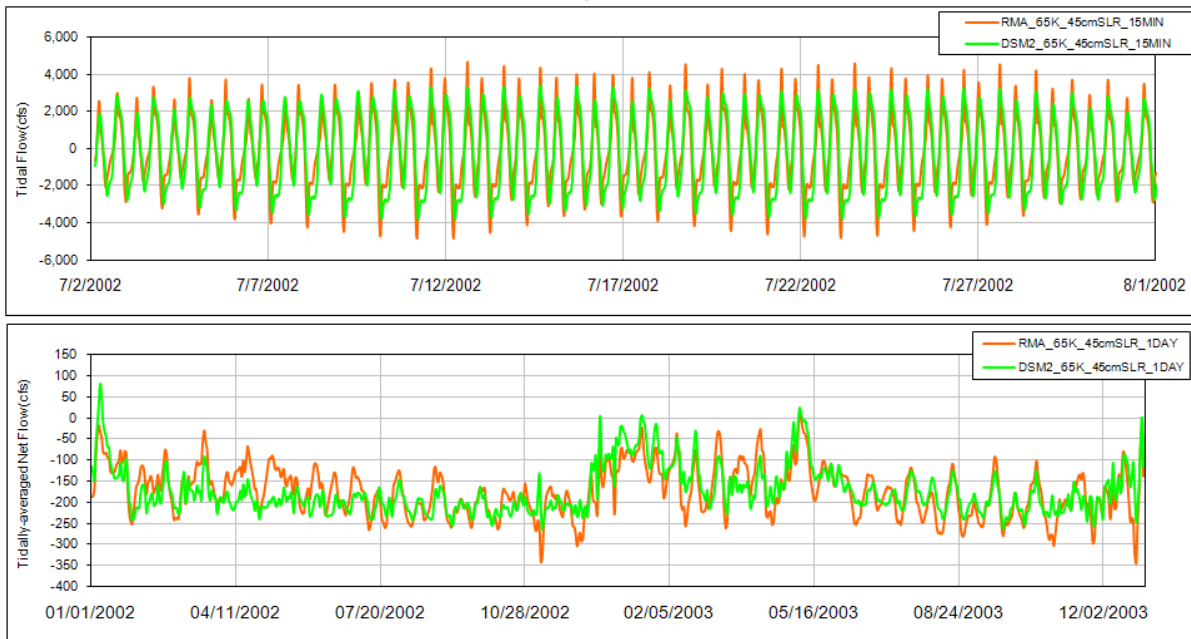
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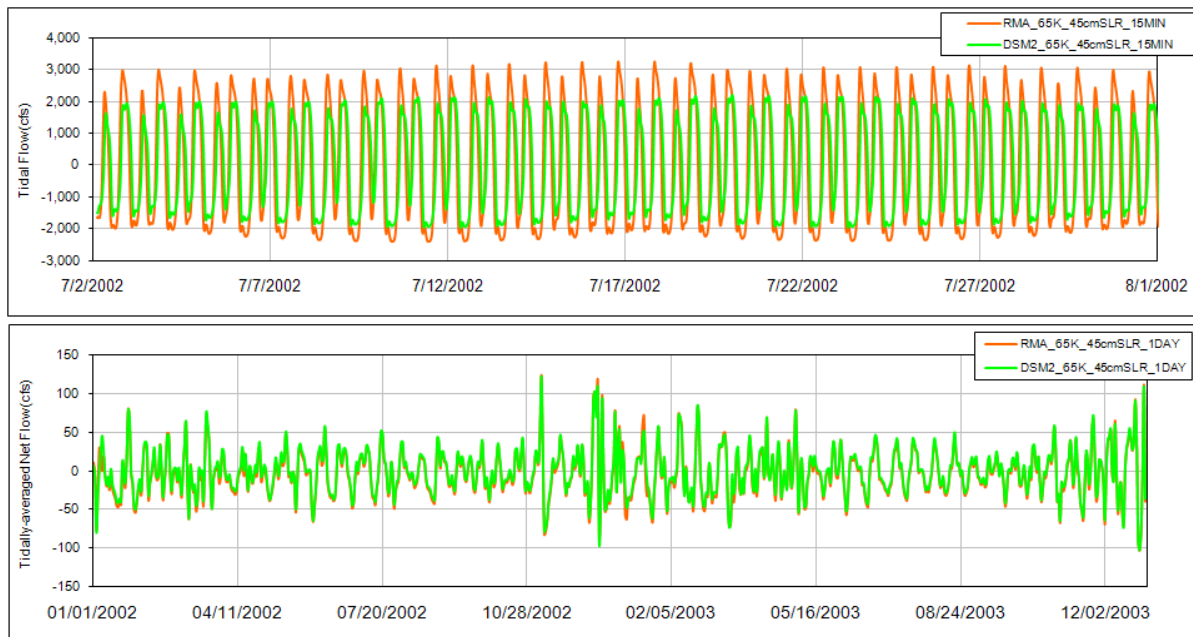
1   **Figure 1-202. Comparison of Tidal Flow and Tidally-Averaged Daily Flow between the Integrated Late**
2   **Long-term Scenario and the Current Conditions Scenario from RMA Model and DSM2 Model for Shag**
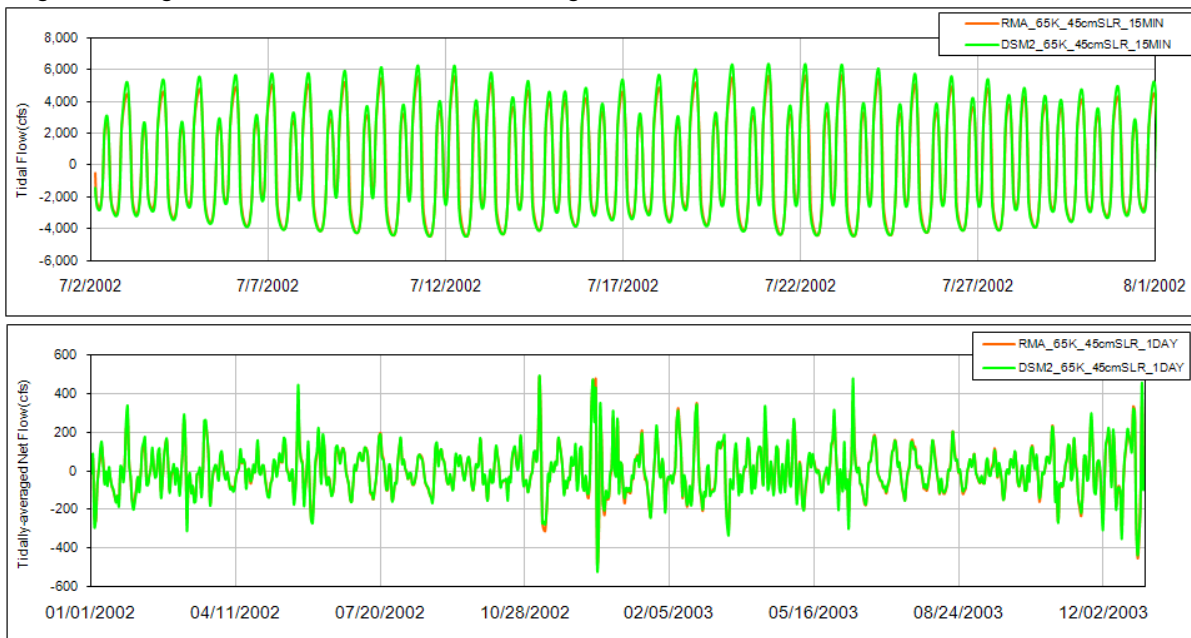3   **Slough Breach under Cache Region.**

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

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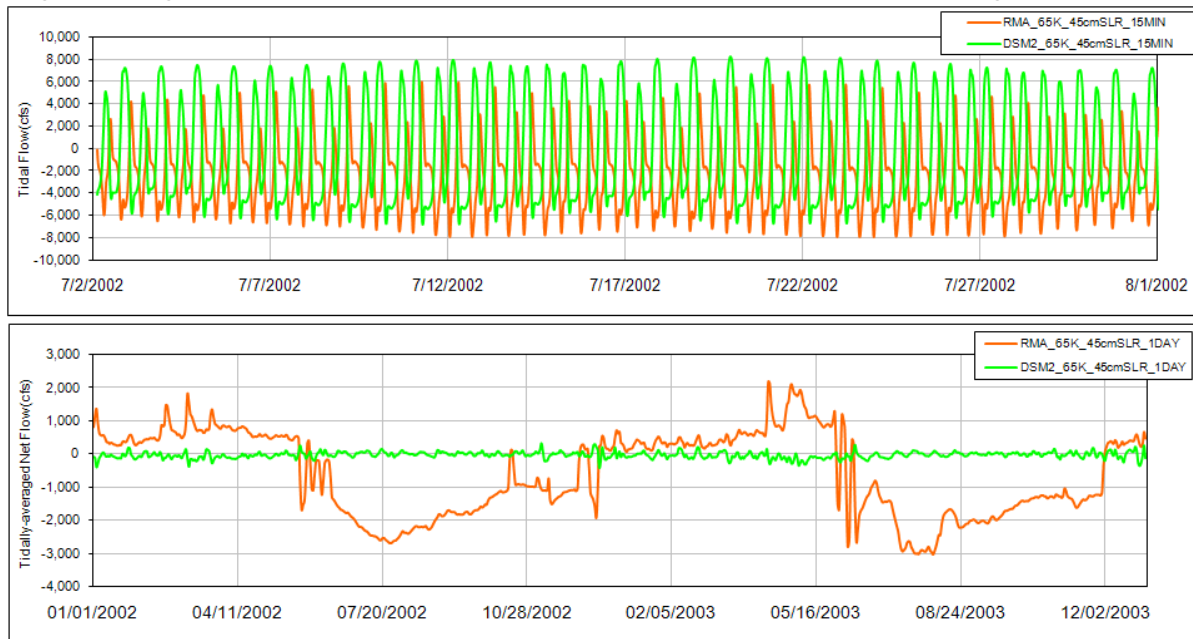3   **Island 5 Breach 1 under Suisun Marsh Region.**

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

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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.

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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.
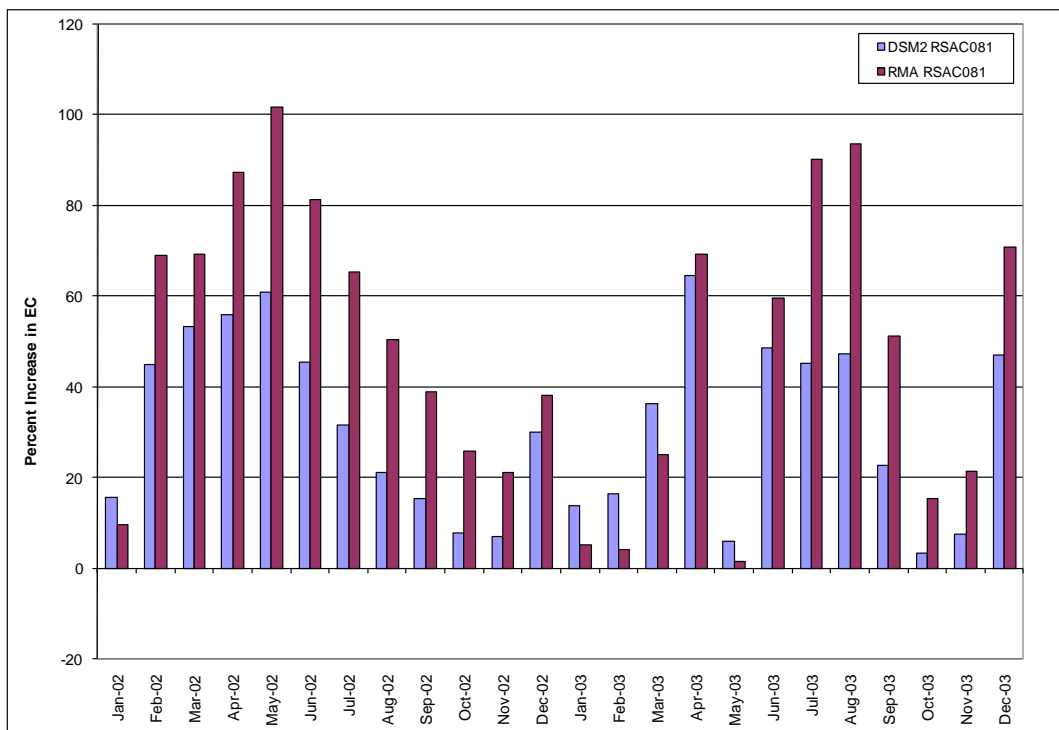

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1   **Figure 1-208. Comparison of Tidal Flow and Tidally-Averaged Daily Flow between the Integrated Late**
2   **Long-term Scenario and the Current Conditions Scenario from RMA Model and DSM2 Model for**
3   **Snodgrass Slough and McCormick Williamson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

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5   **Figure 1-209. Comparison of Tidal Flow and Tidally-Averaged Daily Flow between the Integrated Late**
6   **Long-term Scenario and the Current Conditions Scenario from RMA Model and DSM2 Model for Suisun**
7   **Island 6 Breach under Suisun Marsh Region.**
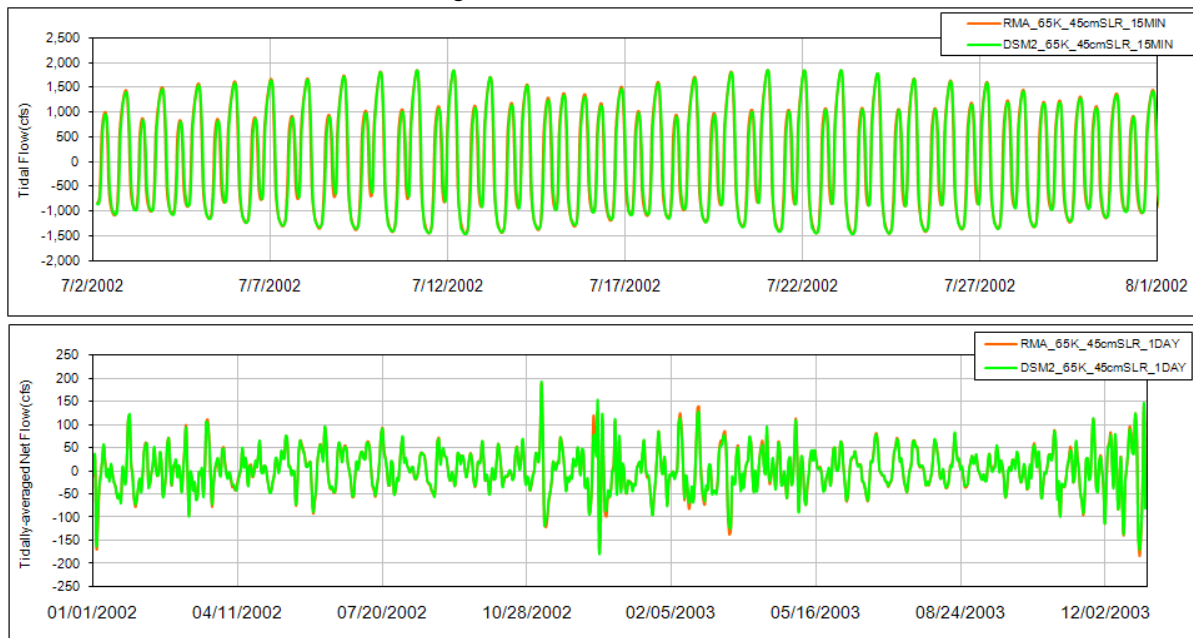
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Late Long-Term Integrated 65,000ac Restoration and 45cm Sea Level Rise Corroboration
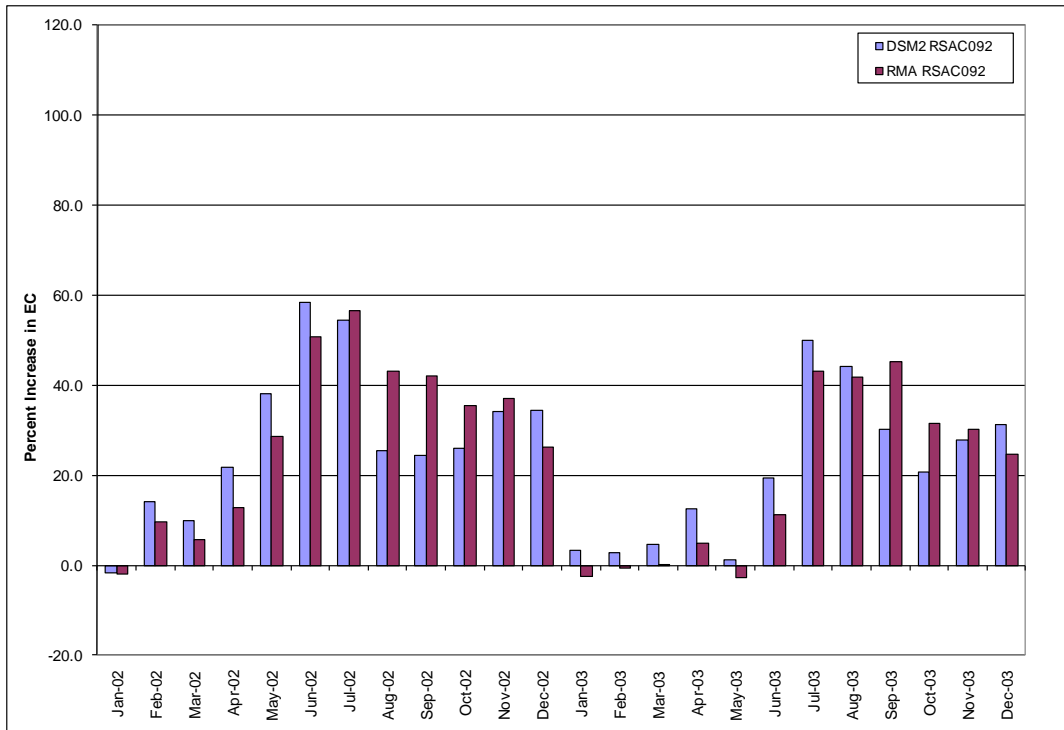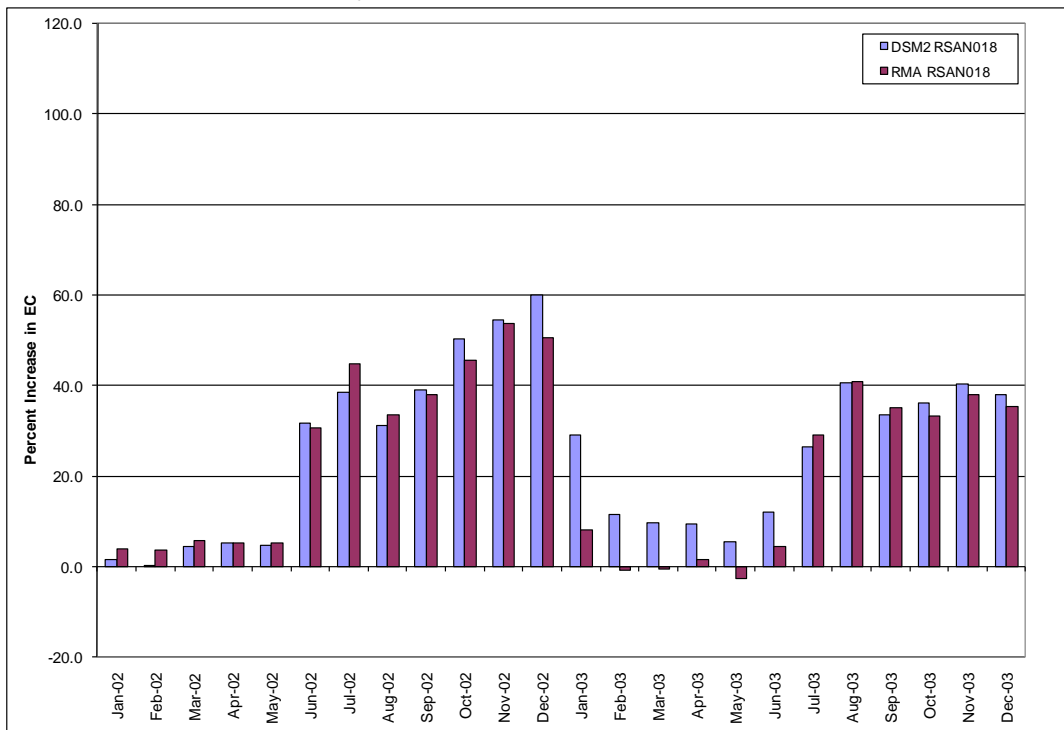
Salinity Results

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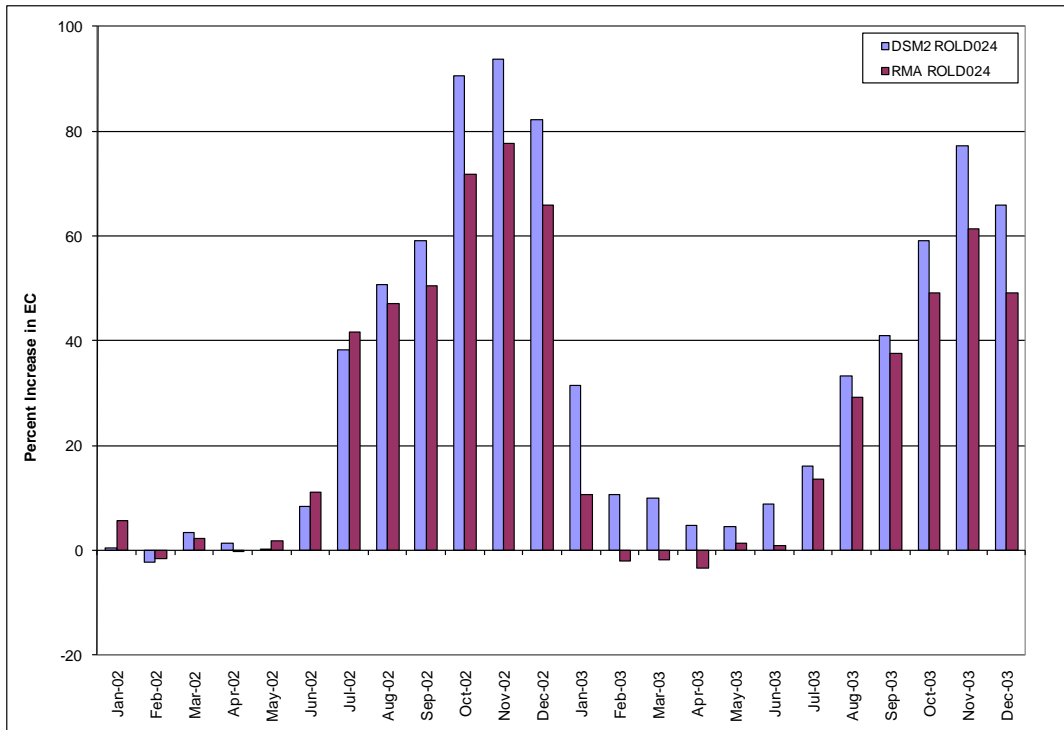
1 Figure 1-211. Comparison of Monthly averaged percentage incremental change in EC between the
2 Integrated Late Long-Term Scenario and the Current Conditions Scenario from RMA Model and DSM2
3 Model for Sacramento River at Emmaton.

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

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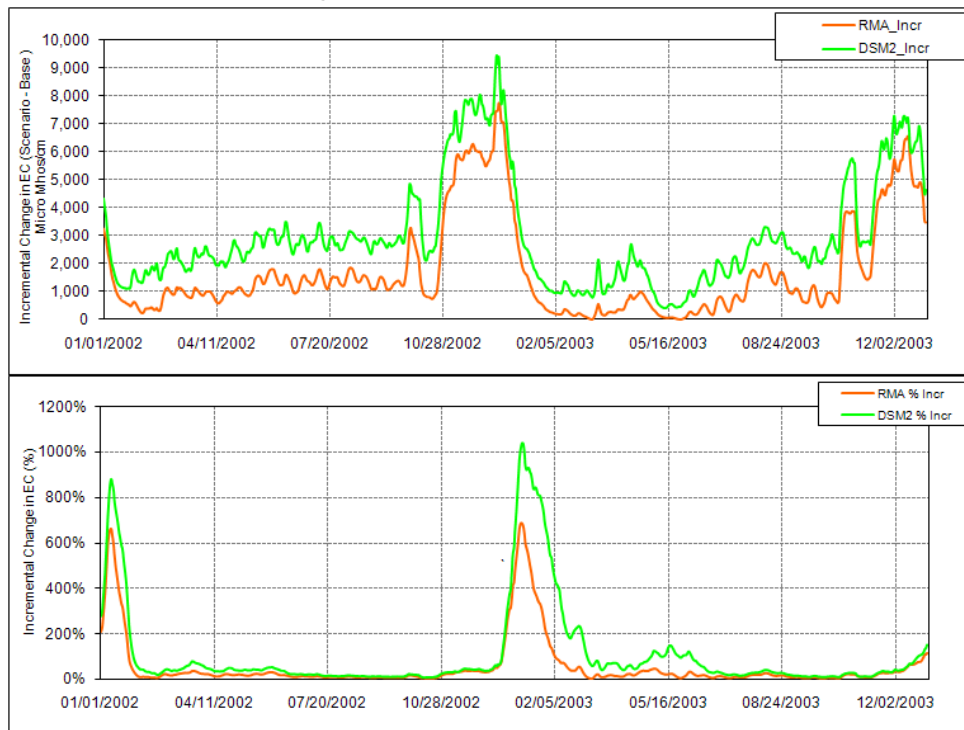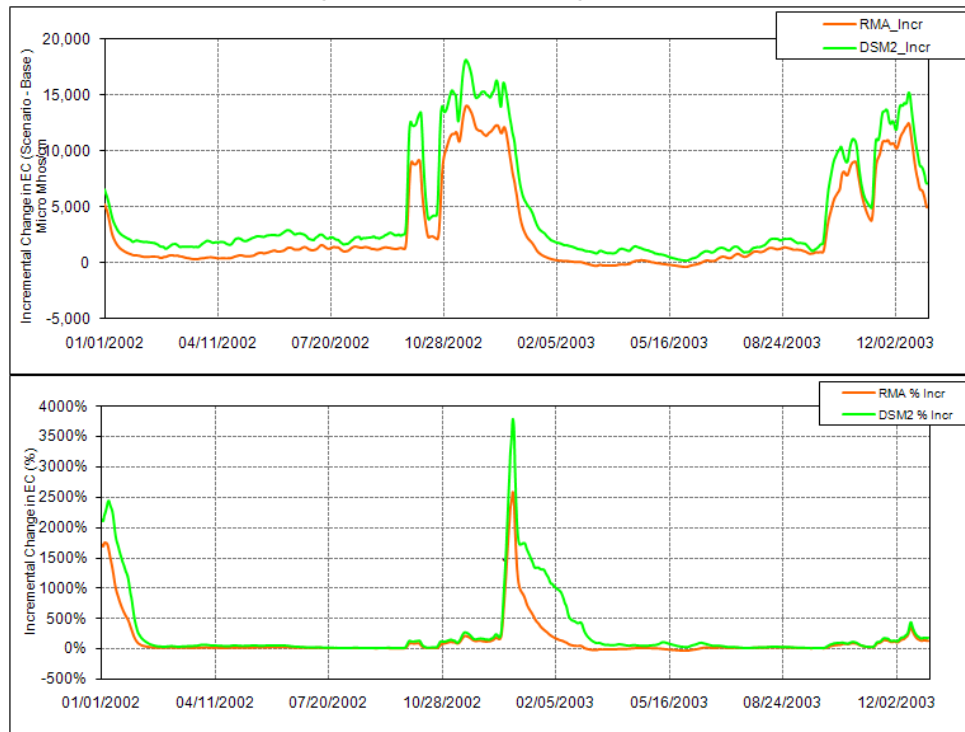3 Model for Old River at Rock Slough.

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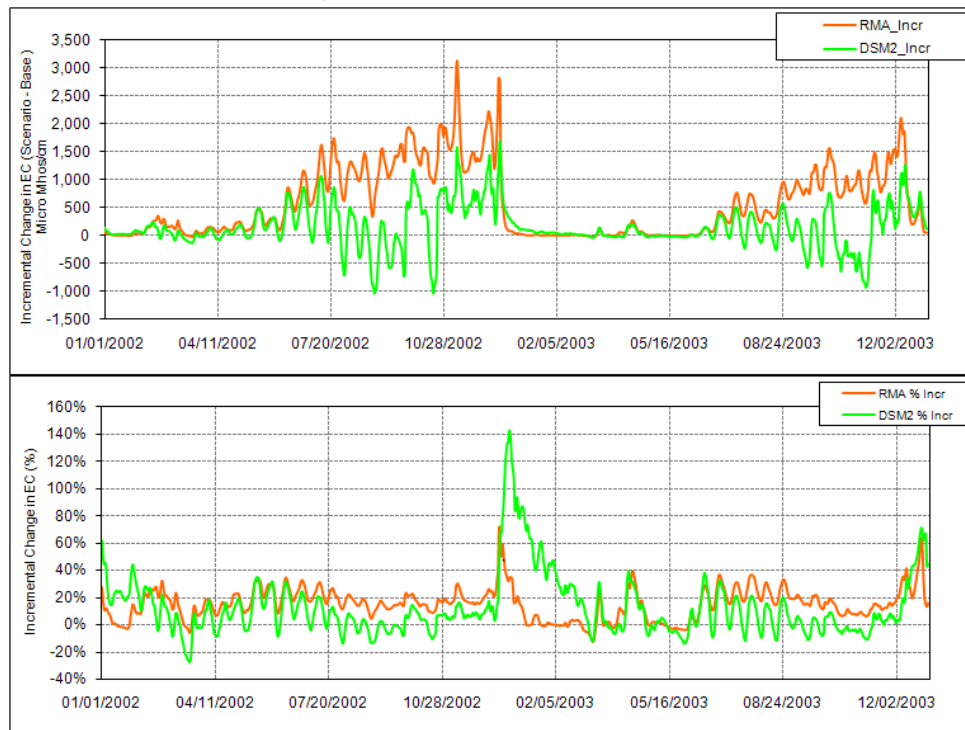7 and DSM2 Model for Montezuma Slough at Mouth Location.

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

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

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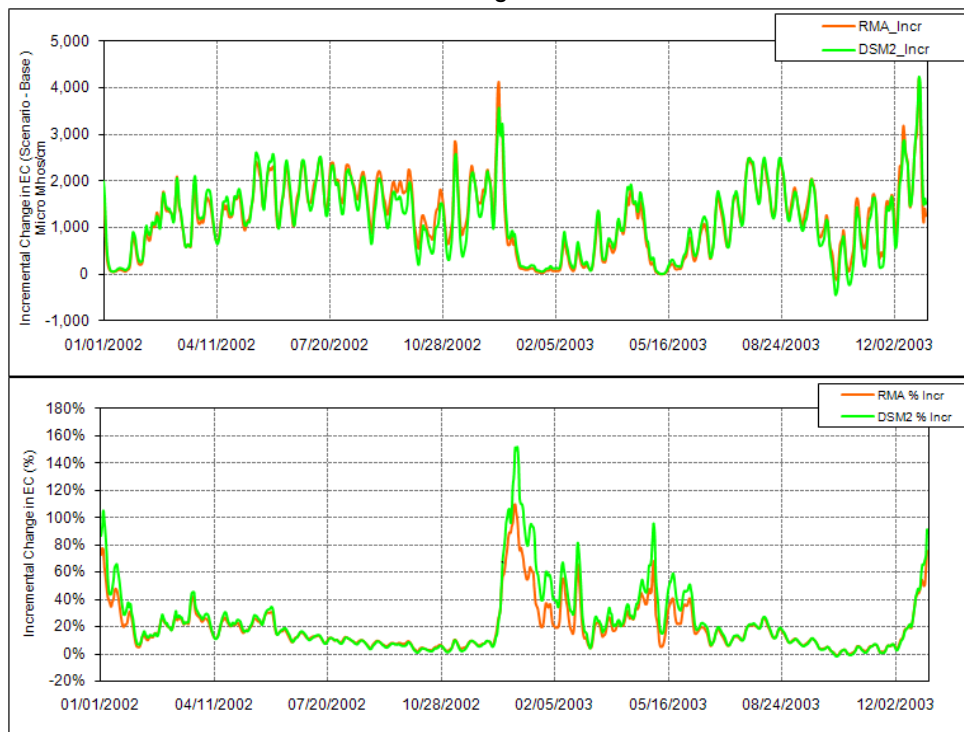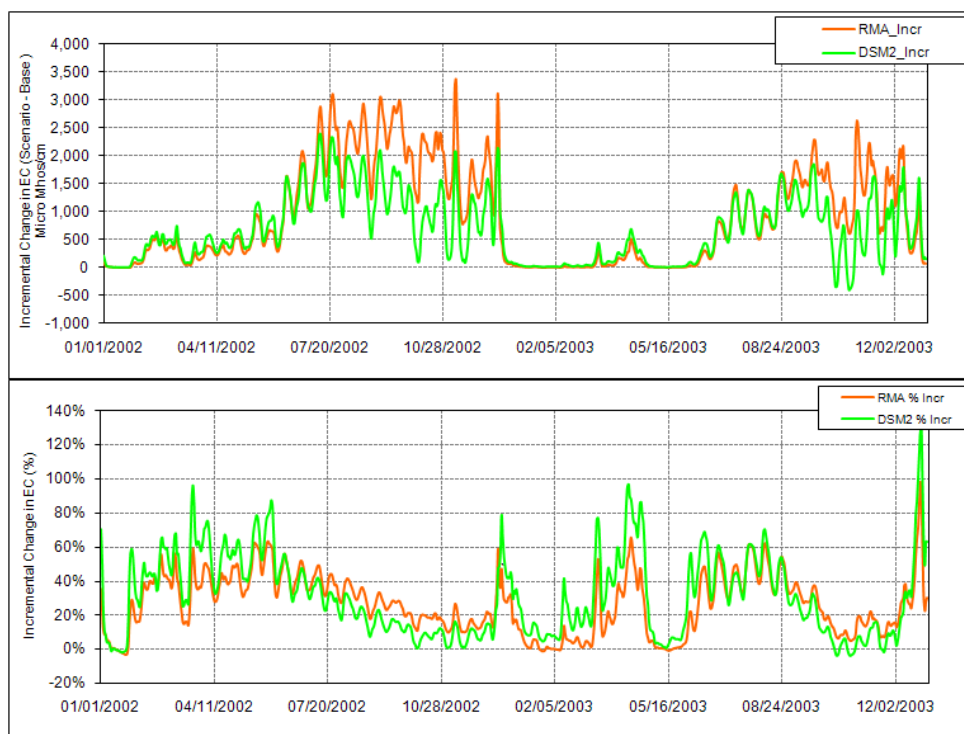3 and DSM2 Model for Sacramento River at Port Chicago Location.

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

8

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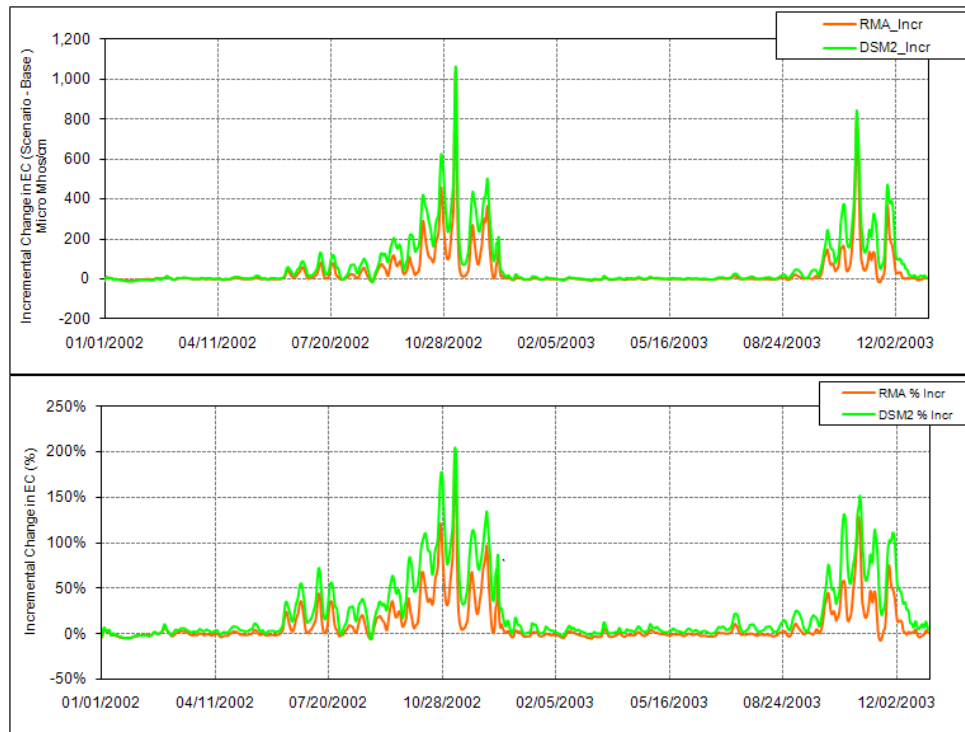3 and DSM2 Model for Sacramento River at Rio Vista Location.

4

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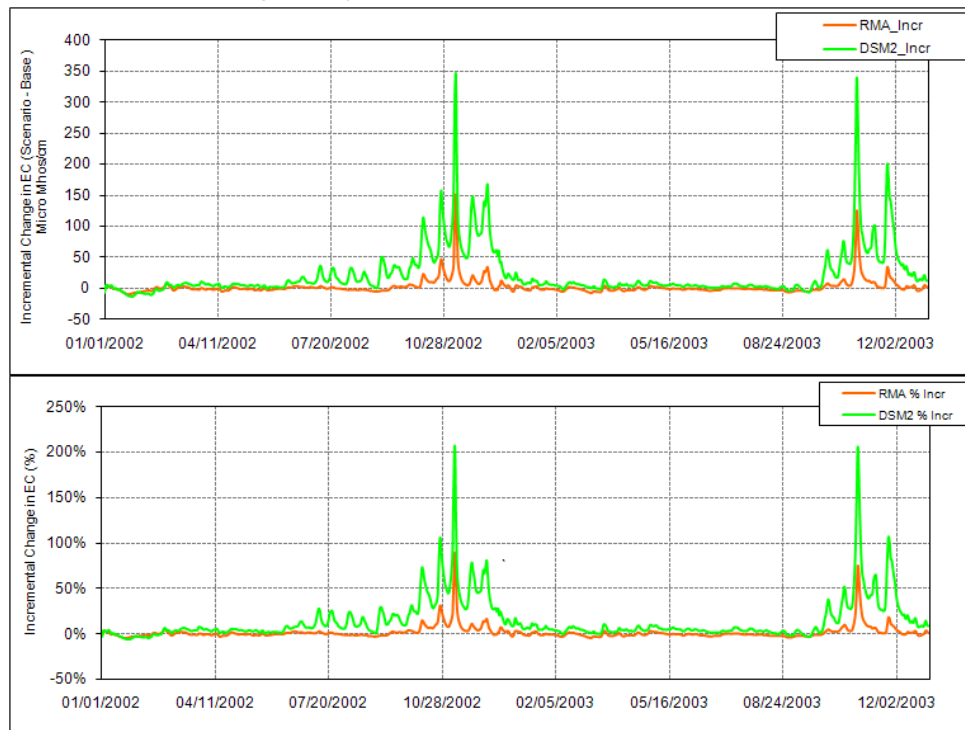7 and DSM2 Model for Cache Slough at Ryer Island Location.

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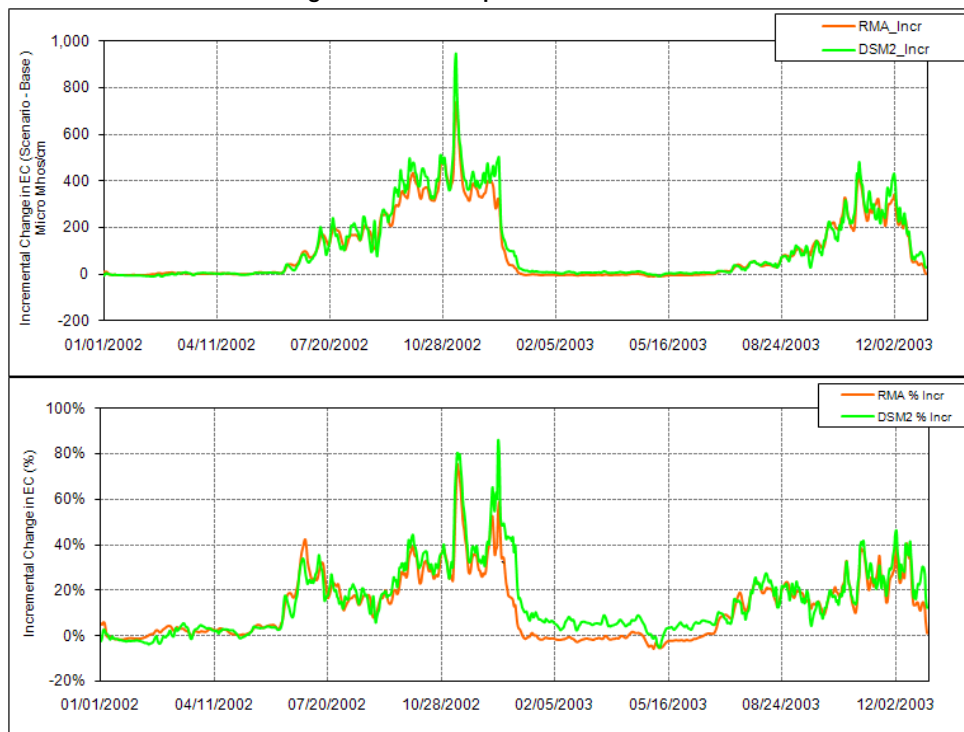3　and DSM2 Model for Three Mile Slough at San Joaquin River Location.

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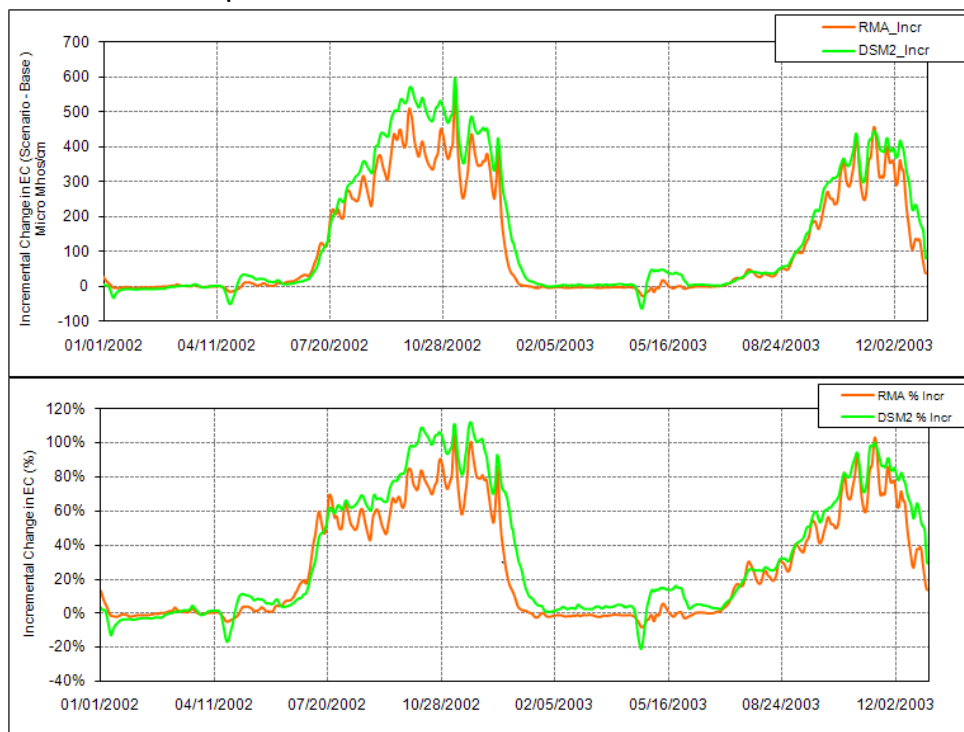7　and DSM2 Model for San Joaquin River at Prisoners Point Location.

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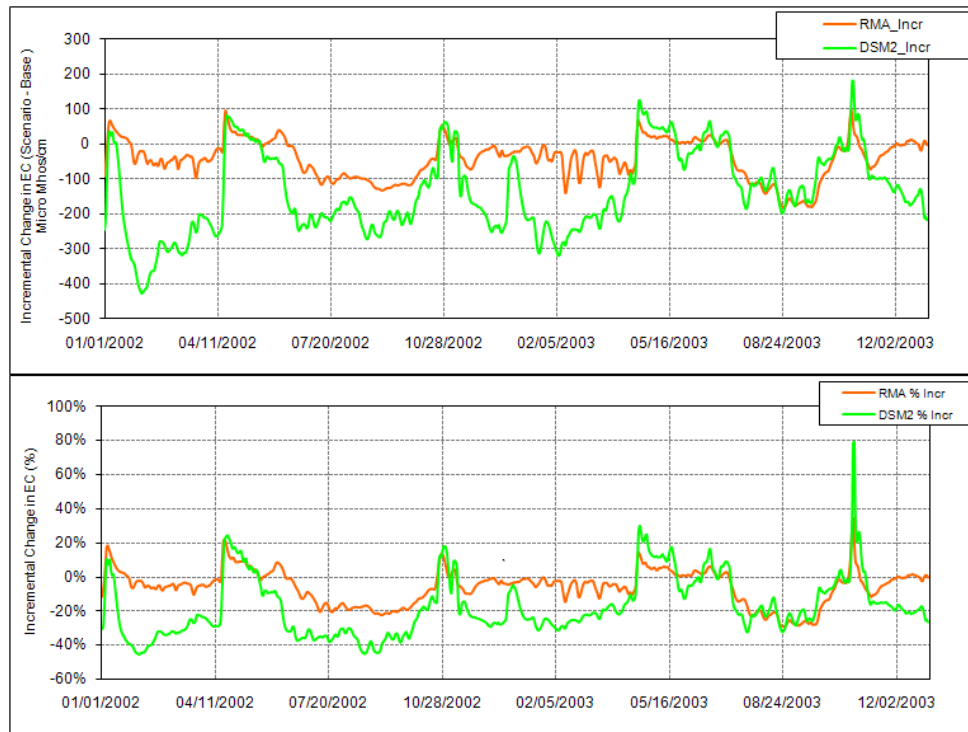3 **and DSM2 Model for San Joaquin River at Stockton Location.**

4

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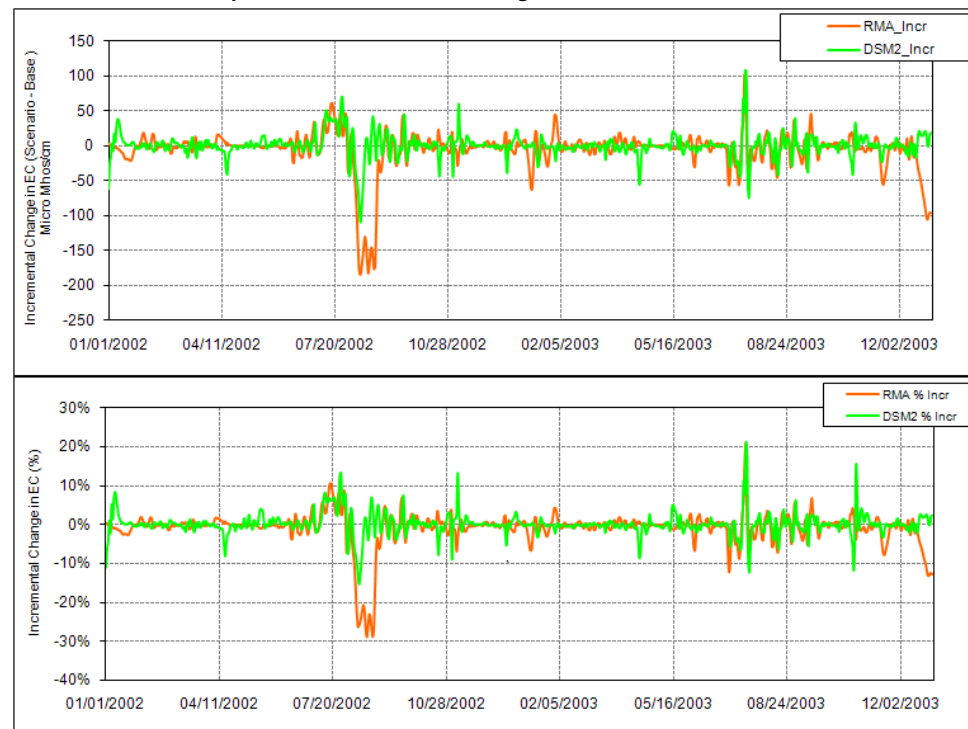

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Figure 1-225. Comparison of Tidally-Averaged Daily EC and the Incremental Change in the Daily EC between the Integrated Late Long-Term Scenario and the Current Conditions Scenario from RMA Model and DSM2 Model for Middle River at Middle River Location.
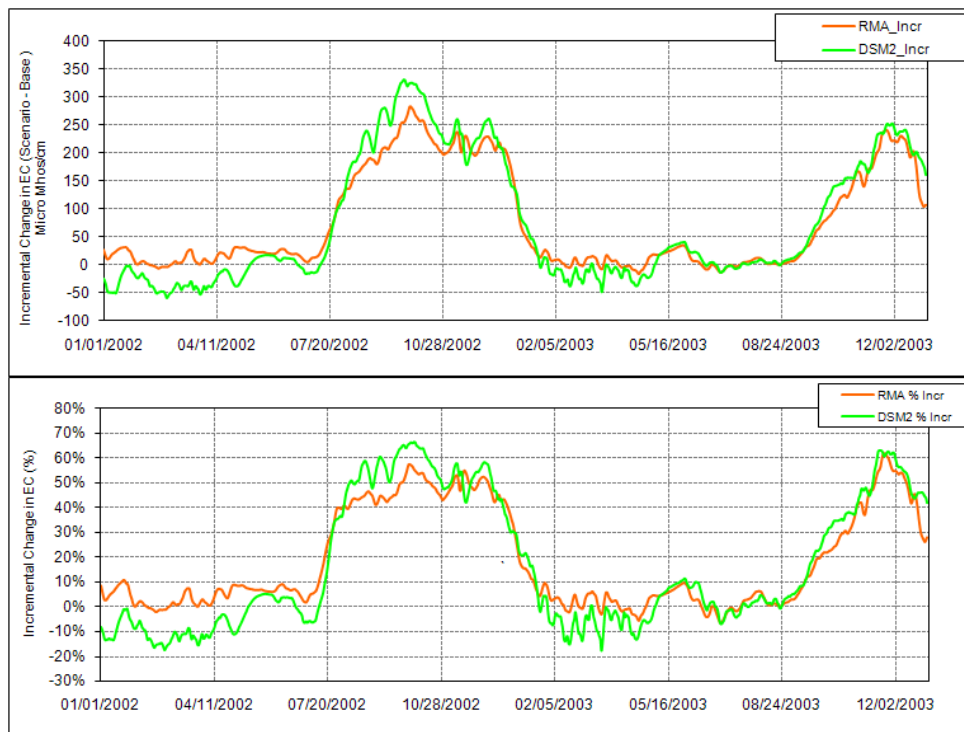

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Figure 1-226. Comparison of Tidally-Averaged Daily EC and the Incremental Change in the Daily EC between the Integrated Late Long-Term Scenario and the Current Conditions Scenario from RMA Model and DSM2 Model for Old River at Bacon Island Location.

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