

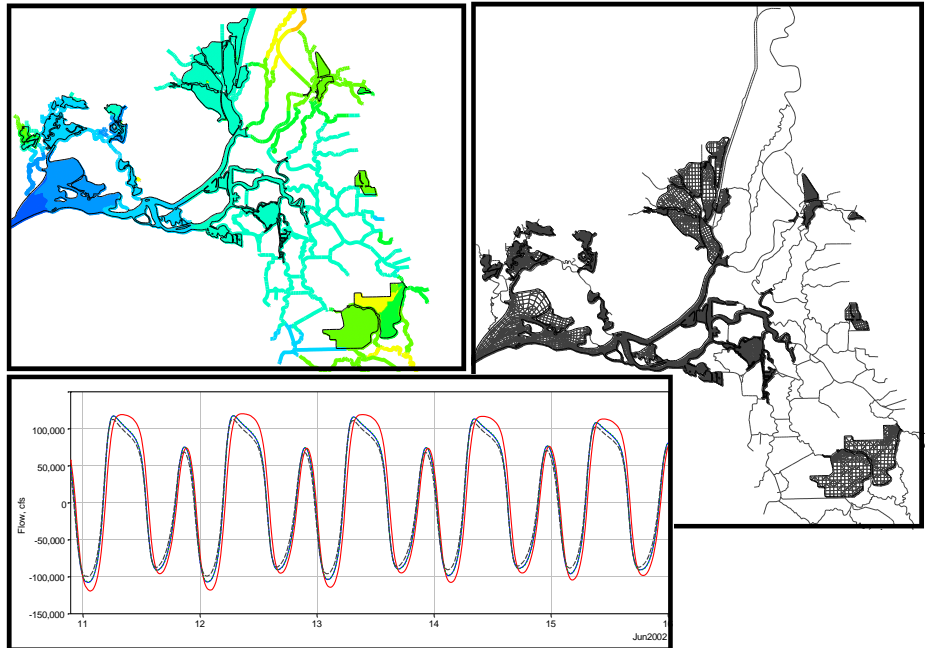
Bay-Delta Conservation Plan EIR/EIS Appendix 5A
Section D: Additional Modeling Information

Attachment 5

Tidal Marsh Restoration Sensitivity Analysis

NUMERICAL MODELING IN SUPPORT OF BAY DELTA CONSERVATION PLAN TIDAL MARSH ASSUMPTIONS SENSITIVITY ANALYSIS

JULY 2012



Prepared For:
ICF International
630 K Street, Suite 400
Sacramento, CA 94952
Contact:
Jennifer Pierre
Project Manager, Effects Analysis
707-280-9673

Prepared By:
Resource Management Associates
4171 Suisun Valley Road, Suite J
Fairfield, CA 94534
Contact:
John DeGeorge
707-864-2950

Executive Summary

Restoration of tidal marsh has been proposed for various regions of the Delta to improve habitat diversity and food availability for covered species. Assessments of tidal marsh effects on flows, stage, velocity and EC were performed for areas throughout the Delta. Early Long-term (ELT) and Late Long-term (LLT) BDCP restoration cases were simulated to represent two points in time with two different total areas of restoration. Restoration Opportunity Areas (ROAs) include Suisun Marsh, Cache Slough, West Delta, Mokelumne-Cosumnes, East Delta and South Delta.

Under the current phase of the project, analyses were conducted to assess the sensitivity of physical parameters to tidal marsh habitat restoration hypothetical assumptions used in the initial effects analysis.

With the ELT and LLT simulations as base cases, three types of sensitivity analyses were conducted: sensitivity to tidal marsh area, to conveyance and to breach location. Two to three individual analyses are performed for each. The set of sensitivity simulations is as follows:

- *Tidal marsh area*
 - *ELT – Maximize Suisun ROA (shift restoration acreage from Cache to Suisun ROA)*
 - *LLT – No South Delta ROA (remove South Delta ROA)*
- *Conveyance*
 - *LLT – Middle River Conveyance (increase conveyance capacity in Middle River)*
 - *LLT – Suisun Scour (scour in main channels, incised channels in ROAs)*
- *Breach location*
 - *ELT – Prospect Island Breach (remove one of two Prospect Island breaches)*
 - *LLT – Little Egbert Breach (remove one of two Little Egbert Tract breaches)*
 - *LLT – Sherman Breach (move Sherman breach from Threemile Slough to San Joaquin River)*

Among the most important hydrodynamic impacts was the transfer of net flow between the Sacramento River and the Delta Cross Channel / Georgiana Slough. Breach removal in the LLT – Little Egbert Breach case had the greatest impact on Georgiana Slough flows, while breach removal in the ELT – Prospect Breach case had the greatest impact on DCC flows. In each case, the combined DCC plus Georgiana Slough flows are increased by 2% above their respective base restoration case due to breach removal.

All sensitivity scenarios with changes in Suisun marsh or the south Delta had a 5% or greater impact on average flows at both ends of Montezuma Slough, relative to the base restoration cases. Montezuma Slough flows are sensitive to conditions within Suisun Marsh, and to a lesser degree to conditions in the south Delta.

Restoration diminishes tidal range throughout the system. Sensitivity analyses show that increases in channel conveyance, certain changes to breach configurations and moving or removing certain restoration areas can all impact tidal range. Geometry modifications in Suisun primarily impact Suisun Marsh and south Delta tidal range. Geometry changes in the south Delta have localized tidal range impacts. Breach removal in the ELT – Prospect Breach case only affected tidal range in the north Delta, while the impacts of LLT – Little Egbert Breach removal were more far reaching.

The distribution of salinity in the Delta is a function of the overall flow balance, net flow distribution, and dispersive mixing associated with tidal flows.

None of the scenarios has large EC impacts north of Rio Vista. LLT – Suisun Scour and ELT – Max Suisun result in the largest EC increases overall, while LLT – Little Egbert results in the largest decreases overall.

Changes in freshwater coming down Georgiana Slough and Mokelumne River impact EC in the San Joaquin River around San Andreas Landing and on down into the South Delta. The LLT – Little Egbert case increases Georgiana Slough and Mokelumne River flows above LLT, resulting in EC decreases of up to 7% below LLT in the south Delta.

Suisun Marsh restoration has the greatest impact on EC in the central and south Delta. Shifting restoration area from Cache Slough to Suisun Marsh increased EC in these areas and increased X2. Increasing conveyance in Suisun Marsh amplified the impact of Suisun Marsh restoration on central and south Delta EC and resulted in the highest X2 and highest EC at the exports of any scenario.

Most of the sensitivity cases impact July 2002 X2 by 0.3 km or less, relative to the base restoration cases. The LLT – Suisun Scour case increases X2 by 0.7 km relative to LLT and the ELT – Max Suisun case increases it by a full kilometer, bringing it closer to LLT X2.

BDCP –Tidal Marsh Assumptions Sensitivity Analysis

| | | |
|-------|--|-----|
| 1 | Introduction..... | 1 |
| 1.1 | Background | 1 |
| 1.2 | RMA Bay-Delta Model..... | 1 |
| 1.3 | Objectives..... | 1 |
| 2 | Model Configuration..... | 2 |
| 2.1 | Base Model..... | 2 |
| 2.2 | ELT and LLT | 4 |
| 2.3 | Sensitivity Cases | 8 |
| 2.3.1 | ELT – Maximize Suisun ROA..... | 8 |
| 2.3.2 | LLT – No South Delta ROA..... | 11 |
| 2.3.3 | LLT – Middle River Conveyance | 13 |
| 2.3.4 | LLT - Suisun Scour..... | 15 |
| 2.3.5 | ELT – Prospect Breach | 17 |
| 2.3.6 | LLT – Little Egbert Breach..... | 19 |
| 2.3.7 | LLT – Sherman Breach..... | 21 |
| 3 | Boundary Conditions | 23 |
| 3.1.1 | Tidal boundary | 23 |
| 3.1.2 | Flows, exports, precipitation, evaporation, DICU | 23 |
| 3.1.3 | Electrical Conductivity (EC)..... | 25 |
| 3.1.4 | Gate and barrier operations | 25 |
| 3.1.5 | Precipitation and evaporation by element type | 25 |
| 4 | Hydrodynamic Impacts..... | 33 |
| 4.1 | Description of Analysis Types | 33 |
| 4.1.1 | Net Flows | 33 |
| 4.1.2 | Tidal Prism..... | 35 |
| 4.1.3 | Stage and Tidal Range | 35 |
| 4.1.4 | Bed Shear | 36 |
| 4.2 | Sensitivity Cases | 37 |
| 4.2.1 | ELT - Maximize Suisun ROA | 37 |
| 4.2.2 | LLT - No South Delta ROA..... | 58 |
| 4.2.3 | LLT – Middle River Conveyance | 79 |
| 4.2.4 | LLT – Suisun Scour | 101 |
| 4.2.5 | ELT – Prospect Breach | 121 |
| 4.2.6 | LLT – Little Egbert Breach..... | 140 |
| 4.2.7 | LLT – Sherman Breach..... | 160 |
| 4.3 | Hydrodynamics Summary..... | 177 |
| 5 | Electrical Conductivity (EC)..... | 182 |
| 5.1 | ELT – Maximize Suisun | 184 |
| 5.1.1 | Tidally averaged EC time series | 187 |
| 5.1.2 | Spatial Plots of EC Change..... | 196 |
| 5.1.3 | X2 Time Series | 200 |
| 5.2 | LLT – No South Delta ROA | 201 |
| 5.2.1 | Tidally averaged EC time series | 204 |
| 5.2.2 | Spatial Plots of EC Change..... | 215 |
| 5.2.3 | X2 Time Series | 218 |

| | | |
|-------|--|-----|
| 5.3 | LLT – Middle River Conveyance | 219 |
| 5.3.1 | Tidally averaged EC time series | 222 |
| 5.3.2 | Spatial Plots of EC Change..... | 233 |
| 5.3.3 | X2 Time Series | 237 |
| 5.4 | LLT – Suisun Scour | 238 |
| 5.4.1 | Tidally averaged EC time series | 241 |
| 5.4.2 | Spatial Plots of EC Change..... | 251 |
| 5.4.3 | X2 Time Series | 254 |
| 5.5 | ELT – Prospect Breach | 255 |
| 5.5.1 | Tidally averaged EC time series | 258 |
| 5.5.2 | Spatial Plots of EC Change..... | 268 |
| 5.5.3 | X2 Time Series | 272 |
| 5.6 | LLT – Little Egbert Breach..... | 273 |
| 5.6.1 | Tidally averaged EC time series | 276 |
| 5.6.2 | Spatial Plots of EC Change..... | 286 |
| 5.6.3 | X2 Time Series | 290 |
| 5.7 | LLT – Sherman Breach..... | 291 |
| 5.7.1 | Tidally averaged EC time series | 294 |
| 5.7.2 | Spatial Plots of EC Change..... | 302 |
| 5.7.3 | X2 Time Series | 305 |
| 5.8 | EC Summary | 306 |
| 6 | References..... | 309 |
| 7 | Appendix..... | 311 |
| 7.1 | Spatial Plots of EC Change from base | 311 |
| 7.1.1 | ELT – Maximize Suisun ROA..... | 311 |
| 7.1.2 | LLT – No South Delta ROA..... | 315 |
| 7.1.3 | LLT – Middle River Conveyance..... | 319 |
| 7.1.4 | LLT – Suisun Scour | 323 |
| 7.1.5 | ELT – Prospect Breach | 327 |
| 7.1.6 | LLT – Little Egbert Breach..... | 331 |
| 7.1.7 | LLT – Sherman Breach..... | 335 |
| 7.2 | Summary tables of change in monthly average EC | 338 |

List of Tables

| | |
|---|-----|
| Table 2-1 Summary of Early Long-Term ROA acreages. | 5 |
| Table 2-2 Summary of Late Long-Term ROA acreages. | 5 |
| Table 3-1 Summary of monthly DICU flows ($\text{ft}^3 \text{sec}^{-1}$) for the simulation period. Negative values indicate Delta withdrawal. | 30 |
| Table 3-2 EC boundary conditions. | 31 |
| Table 4-1 Direction of ebb (positive) flow for analysis locations. | 33 |
| Table 4-2 Summary of 3-month Average flow (Jul – Sep 2002) for Base – No SMSCG, ELT, ELT - Max Suisun and LLT simulations. | 39 |
| Table 4-3 Summary of Apr – Dec 2002 Average Tidal Prism for Base – No SMSCG, ELT, ELT - Max Suisun and LLT simulations, and percent change from Base – No SMSCG. | 41 |
| Table 4-4 Summary of Apr – Dec 2002 Average Tidal Range for Base – No SMSCG, ELT, ELT - Max Suisun and LLT simulations. | 44 |
| Table 4-5 Summary of 3-month Average flow (Jul – Sep 2002) for Base - No MRB, LLT, LLT – No South simulations. | 60 |
| Table 4-6 Summary of Apr – Dec 2002 Average Tidal Prism for Base - No MRB, LLT and LLT – No South simulations, and percent change from Base- No MRB. | 62 |
| Table 4-7 Summary of Apr – Dec 2002 Average Tidal Range for Base - No MRB, LLT and LLT – No South simulations. | 65 |
| Table 4-8 Summary of 3-month Average flow (Jul – Sep 2002) for Base - No MRB, LLT, LLT – Middle River simulations. | 83 |
| Table 4-9 Summary of Apr – Dec 2002 Average Tidal Prism for Base - No MRB, LLT and LLT – Middle River simulations, and percent change from Base - No MRB. | 85 |
| Table 4-10 Summary of Apr – Dec 2002 Average Tidal Range for Base - No MRB, LLT and LLT – Middle River simulations. | 88 |
| Table 4-11 Summary of 3-month Average flow (Jul – Sep 2002) for Base - No MRB, LLT, LLT – Suisun Scour simulations. | 102 |
| Table 4-12 Summary of Apr – Dec 2002 Average Tidal Prism for Base - No MRB, LLT and LLT – Suisun Scour simulations, and percent change from Base - No MRB. | 104 |
| Table 4-13 Summary of Apr – Dec 2002 Average Tidal Range for Base - No MRB, LLT and LLT – Suisun Scour simulations. | 107 |
| Table 4-14 Summary of 3-month Average flow (Jul – Sep 2002) for Base - No SMSCG, ELT, ELT – Prospect Breach simulations. | 122 |
| Table 4-15 Summary of Apr – Dec 2002 Average Tidal Prism for Base - No SMSCG, ELT and ELT – Prospect Breach simulations, and percent change from Base - SMSCG. | 124 |
| Table 4-16 Summary of Apr – Dec 2002 Average Tidal Range for Base – No SMSCG, ELT and ELT – Prospect Breach simulations. | 127 |
| Table 4-17 Summary of 3-month Average flow (Jul – Sep 2002) for Base - No MRB, LLT, LLT – Little Egbert Breach simulations. | 141 |
| Table 4-18 Summary of Apr – Dec 2002 Average Tidal Prism for Base - No MRB, LLT and LLT – Little Egbert Breach simulations, and percent change from Base- No MRB. | 143 |
| Table 4-19 Summary of Apr – Dec 2002 Average Tidal Range for Base - No MRB, LLT and LLT – Little Egbert Breach simulations. | 146 |
| Table 4-20 Summary of 3-month Average flow (Jul – Sep 2002) for Base - No MRB, LLT, LLT – Sherman Breach simulations. | 161 |

| | |
|--|-----|
| Table 4-21 Summary of Apr – Dec 2002 Average Tidal Prism for Base - No MRB, LLT and LLT – Sherman Breach simulations, and percent change from Base- No MRB. | 163 |
| Table 4-22 Summary of Apr – Dec 2002 Average Tidal Range for Base - No MRB, LLT and LLT – Sherman Breach simulations. | 166 |
| Table 4-23 Summary of percent change from base restoration case for average flow, average tidal prism and average tidal range. | 180 |
| Table 5-1 Summary of July - December 2002 monthly average EC for Base - No SMSCG, ELT and ELT - Max Suisun. | 185 |
| Table 5-2 Summary of July - December 2002 percent change in monthly average EC for ELT and ELT – Max Suisun relative to Base - No SMSCG. | 186 |
| Table 5-3 Summary of July - December 2002 monthly average EC for Base - No MRB, LLT and LLT – No South. | 202 |
| Table 5-4 Summary of July - December 2002 percent change in monthly average EC for LLT and LLT – No South relative to Base - No MRB. | 203 |
| Table 5-5 Summary of July - December 2002 monthly average EC for Base - No MRB, LLT and LLT – Middle River. | 220 |
| Table 5-6 Summary of July - December 2002 percent change in monthly average EC for LLT and LLT – Middle River relative to Base - No MRB. | 221 |
| Table 5-7 Summary of July - December 2002 monthly average EC for Base - No MRB, LLT and LLT – Suisun Scour. | 239 |
| Table 5-8 Summary of July - December 2002 percent change in monthly average EC for LLT and LLT – Suisun Scour relative to Base - No MRB. | 240 |
| Table 5-9 Summary of July - December 2002 monthly average EC for Base - No SMSCG, ELT and ELT – Prospect Breach. | 256 |
| Table 5-10 Summary of July - December 2002 percent change in monthly average EC for ELT and ELT – Prospect Breach relative to Base - No SMSCG. | 257 |
| Table 5-11 Summary of July - December 2002 monthly average EC for Base - No MRB, LLT and LLT – Little Egbert Breach. | 274 |
| Table 5-12 Summary of July - December 2002 percent change in monthly average EC for LLT and LLT – Little Egbert relative to Base - No MRB. | 275 |
| Table 5-13 Summary of July - December 2002 monthly average EC for Base - No MRB, LLT and LLT – Sherman Breach. | 292 |
| Table 5-14 Summary of July - December 2002 percent change in monthly average EC for LLT and LLT – Sherman Breach relative to Base - No MRB. | 293 |
| Table 5-15 Summary of July and August 2002 change in monthly average EC relative to base restoration case for ELT - Max Suisun, ELT - Prospect Breach and LLT - Middle River (values for September through December are tabulated in the Appendix). Darker red indicates largest increases and darkest blue indicates largest decreases. | 307 |
| Table 5-16 Average X2 values for July. | 308 |
| Table 7-1 Summary of September and October 2002 change in monthly average EC relative to base restoration case for ELT - Max Suisun, ELT - Prospect Breach and LLT - Middle River. Darker red indicates largest increases and darkest blue indicates largest decreases. | 339 |
| Table 7-2 Summary of November and December 2002 change in monthly average EC relative to base restoration case for ELT - Max Suisun, ELT - Prospect Breach and LLT - Middle River. Darker red indicates largest increases and darkest blue indicates largest decrease | 340 |

Table of Figures

| | |
|---|----|
| Figure 2-1 Model grid showing inflow and export locations, DICU and flow control structures.. | 3 |
| Figure 2-2 RMA Early Long-Term model finite element mesh. | 6 |
| Figure 2-3 RMA Late Long-Term ROA model finite element mesh. | 7 |
| Figure 2-4 Comparison of Suisun Marsh ROA geometry for the ELT and ELT – Max Suisun scenarios..... | 9 |
| Figure 2-5 Comparison of Cache ROA geometry for the ELT and ELT – Max Suisun scenarios. | 10 |
| Figure 2-6 Comparison of South Delta ROA geometry for the LLT and LLT – No South scenarios..... | 12 |
| Figure 2-7 Comparison of Middle River channel geometry for the LLT and LLT - Middle River scenarios..... | 14 |
| Figure 2-8 Comparison of Suisun Marsh ROA geometry for the LLT and LLT – Suisun Scour scenarios..... | 16 |
| Figure 2-9 Comparison of Prospect Island geometry for the ELT and ELT – Prospect Breach scenarios..... | 18 |
| Figure 2-10 Comparison of Little Egbert Tract geometry for the LLT and LLT – Little Egbert Breach scenarios. | 20 |
| Figure 2-11 Comparison of Sherman Island geometry for the LLT and LLT – Sherman Breach scenarios..... | 22 |
| Figure 3-1 Inflow/export locations in Suisun Marsh. | 26 |
| Figure 3-2 Net Delta outflow and major boundary flows for the April – December 2002simulation period. | 27 |
| Figure 3-3 Minor boundary flows for the April - December 2002 simulation period. | 28 |
| Figure 3-4 Suisun Marsh local creek and WWTP flows for the 2002-2003 simulation period. . | 28 |
| Figure 3-5 Historical exports used in the model for the April – December 2002 simulation period. Note that daily averaged SWP exports are plotted, however the model uses 15-minute inputs..... | 29 |
| Figure 3-6 Daily EC time series used as boundary conditions for the Sacramento River and Yolo Bypass and for the San Joaquin River for the April – December 2002 simulation period..... | 32 |
| Figure 4-1 Flow, tidal prism and tidal range analysis locations. | 34 |
| Figure 4-2 Stage time series plot locations. | 36 |
| Figure 4-3 Average flows (Jul - Sep 2002) for Base – No SMSCG, ELT, ELT - Max Suisun and LLT simulations..... | 40 |
| Figure 4-4 Average tidal prism (Apr - Dec 2002) for Base – No SMSCG, ELT, ELT - Max Suisun and LLT simulations. | 42 |
| Figure 4-5 Average percent change from Base – No SMSCG tidal prism (Apr - Dec 2002) for ELT, ELT - Max Suisun and LLT simulations..... | 43 |
| Figure 4-6 Average tidal range (Apr - Dec 2002) for Base – No SMSCG, ELT, ELT - Max Suisun and LLT simulations. | 45 |
| Figure 4-7 Profiles of July 2002 MHHW, MSL and MLLW along the Sacramento River for the Base – No SMSCG (Base), ELT and ELT - Max Suisun simulations. | 46 |
| Figure 4-8 Profiles of July 2002 MHHW, MSL and MLLW along the San Joaquin River for the Base – No SMSCG (Base), ELT and ELT - Max Suisun simulations. | 47 |
| Figure 4-9 Profiles of July 2002 MHHW, MSL and MLLW along the Middle River for the Base – No SMSCG (Base), ELT and ELT - Max Suisun simulations. | 48 |

| | |
|--|----|
| Figure 4-10 Profiles of July 2002 MHHW, MSL and MLLW along Montezuma Slough for the Base – No SMSCG (Base), ELT and ELT - Max Suisun simulations. | 49 |
| Figure 4-11 Stage in Sutter Slough near Sacramento R. for Base - No SMSCG (Base), ELT, LLT and LLT - Max Suisun scenarios..... | 50 |
| Figure 4-12 Stage in Steamboat Slough for Base - No SMSCG (Base), ELT, LLT and LLT - Max Suisun scenarios. | 51 |
| Figure 4-13 Stage in Cache Slough at Ryer Island for Base - No SMSCG (Base), ELT, LLT and LLT - Max Suisun scenarios..... | 51 |
| Figure 4-14 Stage at RSAC128 for Base - No SMSCG (Base), ELT, LLT and LLT - Max Suisun scenarios..... | 52 |
| Figure 4-15 Stage in Delta Cross Channel for Base - No SMSCG (Base), ELT, LLT and LLT - Max Suisun scenarios. | 52 |
| Figure 4-16 Stage in Georgiana Slough at head for Base - No SMSCG (Base), ELT, LLT and LLT - Max Suisun scenarios..... | 53 |
| Figure 4-17 Stage at Rio Vista for Base - No SMSCG (Base), ELT, LLT and LLT - Max Suisun scenarios..... | 53 |
| Figure 4-18 Stage at Jersey Point for Base - No SMSCG (Base), ELT, LLT and LLT - Max Suisun scenarios..... | 54 |
| Figure 4-19 Stage at ROLD034 for Base - No SMSCG (Base), ELT, LLT and LLT - Max Suisun scenarios..... | 54 |
| Figure 4-20 Stage at RMID023 for Base - No SMSCG (Base), ELT, LLT and LLT - Max Suisun scenarios..... | 55 |
| Figure 4-21 Stage at Chipps Island for Base - No SMSCG (Base), ELT, LLT and LLT - Max Suisun scenarios..... | 55 |
| Figure 4-22 Stage in Montezuma Slough at Head for Base - No SMSCG (Base), ELT, LLT and LLT - Max Suisun scenarios..... | 56 |
| Figure 4-23 Stage in Montezuma Slough at Beldon’s Landing (S-49) for Base - No SMSCG (Base), ELT, LLT and LLT - Max Suisun scenarios..... | 56 |
| Figure 4-24 Stage in Boynton Slough at S-40 for Base - No SMSCG (Base), ELT, LLT and LLT - Max Suisun scenarios. | 57 |
| Figure 4-25 Stage in Montezuma Slough at mouth for Base - No SMSCG (Base), ELT, LLT and LLT - Max Suisun scenarios..... | 57 |
| Figure 4-26 Average flows (Jul - Sep 2002) for Base - No MRB, LLT and LLT – No South simulations..... | 61 |
| Figure 4-27 Average tidal prism (Apr - Dec 2002) for Base - No MRB, LLT and LLT – No South simulations..... | 63 |
| Figure 4-28 Average percent change from Base - No MRB tidal prism (Apr - Dec 2002) for LLT and LLT – No South simulations..... | 64 |
| Figure 4-29 Average tidal range (Apr - Dec 2002) for Base - No MRB, LLT and LLT – No South simulations..... | 66 |
| Figure 4-30 Profiles of July 2002 MHHW, MSL and MLLW along the Sacramento River for the Base - No MRB, LLT and LLT - No South simulations. | 67 |
| Figure 4-31 Profiles of July 2002 MHHW, MSL and MLLW along the San Joaquin River for the Base - No MRB, LLT and LLT - No South simulations. | 68 |
| Figure 4-32 Profiles of July 2002 MHHW, MSL and MLLW along the Middle River for the Base - No MRB, LLT and LLT - No South simulations. | 69 |

| | |
|---|----|
| Figure 4-33 Profiles of July 2002 MHHW, MSL and MLLW along Montezuma Slough for the Base - No MRB, LLT and LLT - No South simulations. | 70 |
| Figure 4-34 Stage in Sutter Slough for Base - No MRB, LLT and LLT - No South scenarios. . | 71 |
| Figure 4-35 Stage in Steamboat Slough for Base - No MRB, LLT and LLT - No South scenarios..... | 71 |
| Figure 4-36 Stage at RSAC128 for Base - No MRB, LLT and LLT - No South scenarios. | 72 |
| Figure 4-37 Stage in Delta Cross Channel for Base - No MRB, LLT and LLT - No South scenarios..... | 72 |
| Figure 4-38 Stage in Georgiana Slough at head for Base - No MRB, LLT and LLT - No South scenarios..... | 73 |
| Figure 4-39 Stage in Threemile Slough for Base - No MRB, LLT and LLT - No South scenarios. | 73 |
| Figure 4-40 Stage at Jersey Point for Base - No MRB, LLT and LLT - No South scenarios. | 74 |
| Figure 4-41 Stage at ROLD024 for Base - No MRB, LLT and LLT - No South scenarios..... | 74 |
| Figure 4-42 Stage at ROLD034 Base – No MRB, LLT and LLT - No South scenarios..... | 75 |
| Figure 4-43 Stage RMID023 for Base - No MRB, LLT and LLT - No South scenarios..... | 75 |
| Figure 4-44 Stage at RMID027 for Base - No MRB, LLT and LLT - No South scenarios. | 76 |
| Figure 4-45 Stage in Grantline Canal for Base - No MRB, LLT and LLT - No South scenarios. | 76 |
| Figure 4-46 Stage at ROLD059 for Base - No MRB, LLT and LLT - No South scenarios..... | 77 |
| Figure 4-47 Comparison of Middle River bed shear for the LLT and LLT- No South simulations at times of peak bed shear during July 2002..... | 78 |
| Figure 4-48 Flows in Middle River at RMID015 and through the Union Island breach for the LLT and LLT - Middle River cases..... | 81 |
| Figure 4-49 Comparison of stage at RMID015 and RMID023 for LLT and LLT - Middle River. | 82 |
| Figure 4-50 Average flows (Jul - Sep 2002) for Base - No MRB, LLT and LLT – Middle River simulations..... | 84 |
| Figure 4-51 Average tidal prism (Apr - Dec 2002) for Base - No MRB, LLT and LLT – Middle River simulations. | 86 |
| Figure 4-52 Average percent change from Base - No MRB tidal prism (Apr - Dec 2002) for LLT and LLT – Middle River simulations..... | 87 |
| Figure 4-53 Average tidal range (Apr - Dec 2002) for Base - No MRB, LLT and LLT – Middle River simulations. | 89 |
| Figure 4-54 Profiles of July 2002 MHHW, MSL and MLLW along the Sacramento River for the Base - No MRB, LLT and LLT - Middle River simulations..... | 90 |
| Figure 4-55 Profiles of July 2002 MHHW, MSL and MLLW along the San Joaquin River for the Base - No MRB, LLT and LLT - Middle River simulations..... | 91 |
| Figure 4-56 Profiles of July 2002 MHHW, MSL and MLLW along the Middle River for the Base - No MRB, LLT and LLT - Middle River simulations..... | 92 |
| Figure 4-57 Profiles of July 2002 MHHW, MSL and MLLW along Montezuma Slough for the Base - No MRB, LLT and LLT - Middle River simulations..... | 93 |
| Figure 4-58 Stage in Sutter Slough for Base - No MRB, LLT and LLT - Middle River scenarios. | 94 |
| Figure 4-59 Stage in Steamboat Slough for Base - No MRB, LLT and LLT - Middle River scenarios..... | 94 |

| | |
|--|-----|
| Figure 4-60 Stage at RSAC128 for Base - No MRB, LLT and LLT - Middle River scenarios.. | 95 |
| Figure 4-61 Stage at Delta Cross Channel for Base - No MRB, LLT and LLT - Middle River scenarios..... | 95 |
| Figure 4-62 Stage at Georgiana Slough for Base - No MRB, LLT and LLT - Middle River scenarios..... | 96 |
| Figure 4-63 Stage at Jersey Point for Base - No MRB, LLT and LLT - Middle River scenarios..... | 96 |
| Figure 4-64 Stage at ROLD024 for Base - No MRB, LLT and LLT - Middle River scenarios. | 97 |
| Figure 4-65 Stage at ROLD034 Base, LLT and LLT - Middle River scenarios. | 97 |
| Figure 4-66 Stage RMID023 for Base - No MRB, LLT and LLT - Middle River scenarios..... | 98 |
| Figure 4-67 Stage at RMID027 for Base - No MRB, LLT and LLT - Middle River scenarios.. | 98 |
| Figure 4-68 Stage in Grantline Canal for Base - No MRB, LLT and LLT - Middle River scenarios..... | 99 |
| Figure 4-69 Stage at ROLD059 for Base - No MRB, LLT and LLT - Middle River scenarios. | 99 |
| Figure 4-70 Comparison of Middle River bed shear for the LLT and LLT- Middle River simulations at times of peak bed shear during July 2002. | 100 |
| Figure 4-71 Average flows (Jul - Sep 2002) for Base - No MRB, LLT and LLT – Suisun Scour simulations..... | 103 |
| Figure 4-72 Average tidal prism (Apr - Dec 2002) for Base - No MRB, LLT and LLT –Suisun Scour simulations..... | 105 |
| Figure 4-73 Average percent change from Base - No MRB tidal prism (Apr - Dec 2002) for LLT and LLT – Suisun Scour simulations..... | 106 |
| Figure 4-74 Average tidal range (Apr - Dec 2002) for Base - No MRB, LLT and LLT –Suisun Scour simulations..... | 108 |
| Figure 4-75 Profiles of July 2002 MHHW, MSL and MLLW along the Sacramento River for the Base - No MRB, LLT and LLT - Suisun Scour simulations. | 109 |
| Figure 4-76 Profiles of July 2002 MHHW, MSL and MLLW along the San Joaquin River for the Base - No MRB, LLT and LLT - Suisun Scour simulations. | 110 |
| Figure 4-77 Profiles of July 2002 MHHW, MSL and MLLW along the Middle River for the Base - No MRB, LLT and LLT - Suisun Scour simulations. | 111 |
| Figure 4-78 Profiles of July 2002 MHHW, MSL and MLLW along Montezuma Slough for the Base - No MRB, LLT and LLT - Suisun Scour simulations. | 112 |
| Figure 4-79 Stage in Sutter Slough for Base - No MRB, LLT and LLT - Suisun Scour scenarios..... | 113 |
| Figure 4-80 Stage in Steamboat Slough for Base - No MRB, LLT and LLT - Suisun Scour scenarios..... | 113 |
| Figure 4-81 Stage at RSAC128 for Base - No MRB, LLT and LLT - Suisun Scour scenarios. | 114 |
| Figure 4-82 Stage in Cache Slough at Ryer Island for Base - No MRB, LLT and LLT - Suisun Scour scenarios. | 114 |
| Figure 4-83 Stage in Delta Cross Channel for Base - No MRB, LLT and LLT - Suisun Scour scenarios..... | 115 |
| Figure 4-84 Stage in Georgiana Slough at head for Base - No MRB, LLT and LLT - Suisun Scour scenarios. | 115 |
| Figure 4-85 Stage at Rio Vista for Base - No MRB, LLT and LLT - Suisun Scour scenarios. | 116 |
| Figure 4-86 Stage at Jersey Point for Base - No MRB, LLT and LLT - Suisun Scour scenarios..... | 116 |

| | |
|---|-----|
| Figure 4-87 Stage at ROLD034 for Base - No MRB, LLT and LLT - Suisun Scour scenarios. | 117 |
| Figure 4-88 Stage at RMID023 for Base - No MRB, LLT and LLT - Suisun Scour scenarios. | 117 |
| Figure 4-89 Stage at Chipps Island for Base - No MRB, LLT and LLT - Suisun Scour scenarios. | 118 |
| Figure 4-90 Stage in Montezuma Slough at Head for Base - No MRB, LLT and LLT - Suisun Scour scenarios. | 118 |
| Figure 4-91 Stage in Montezuma Slough at Beldon’s Landing (S-49) for Base - No MRB, LLT and LLT - Suisun Scour scenarios. | 119 |
| Figure 4-92 Stage in Boynton Slough at S-40 for Base - No MRB, LLT and LLT - Suisun Scour scenarios. | 119 |
| Figure 4-93 Stage in Montezuma Slough at mouth for Base - No MRB, LLT and LLT - Suisun Scour scenarios. | 120 |
| Figure 4-94 Average flows (Jul - Sep 2002) for Base - No SMSCG, ELT and ELT – Prospect Breach simulations. | 123 |
| Figure 4-95 Average tidal prism (Apr - Dec 2002) for Base – No SMSCG, ELT and ELT – Prospect Breach simulations. | 125 |
| Figure 4-96 Average percent change from Base – No SMSCG tidal prism (Apr - Dec 2002) for ELT and ELT – Prospect Breach simulations. | 126 |
| Figure 4-97 Average tidal range (Apr - Dec 2002) for Base – No SMSCG, ELT and ELT – Prospect Breach simulations. | 128 |
| Figure 4-98 Profiles of July 2002 MHHW, MSL and MLLW along the Sacramento River for the Base - No SMSCG (Base), ELT and ELT - Prospect Breach simulations. | 129 |
| Figure 4-99 Profiles of July 2002 MHHW, MSL and MLLW along the San Joaquin River for the Base - No SMSCG (Base), ELT and ELT - Prospect Breach simulations. | 130 |
| Figure 4-100 Profiles of July 2002 MHHW, MSL and MLLW along the Middle River for the Base - No SMSCG (Base), ELT and ELT - Prospect Breach simulations. | 131 |
| Figure 4-101 Profiles of July 2002 MHHW, MSL and MLLW along Montezuma Slough for the Base - No SMSCG (Base), ELT and ELT - Prospect Breach simulations. | 132 |
| Figure 4-102 Stage at RSAC155 for Base - No SMSCG (Base), ELT and ELT - Prospect Breach scenarios. | 133 |
| Figure 4-103 Stage in Sutter Slough for Base - No SMSCG (Base), ELT and ELT - Prospect Breach scenarios. | 133 |
| Figure 4-104 Stage in Steamboat Slough for Base - No SMSCG (Base), ELT and ELT - Prospect Breach scenarios. | 134 |
| Figure 4-105 Stage at RSAC128 for Base - No SMSCG (Base), ELT and ELT - Prospect Breach scenarios. | 134 |
| Figure 4-106 Stage in Delta Cross Channel for Base - No SMSCG (Base), ELT and ELT - Prospect Breach scenarios. | 135 |
| Figure 4-107 Stage in Georgiana Slough at head for Base - No SMSCG (Base), ELT and ELT - Prospect Breach scenarios. | 135 |
| Figure 4-108 Stage in Sutter Slough near Sacramento R. for Base - No SMSCG (Base), ELT and ELT - Prospect Breach scenarios. | 136 |
| Figure 4-109 Stage in Steamboat Slough for Base - No SMSCG (Base), ELT and ELT - Prospect Breach scenarios. | 136 |
| Figure 4-110 Stage in Miner Slough for Base - No SMSCG (Base), ELT and ELT - Prospect Breach scenarios. | 137 |

| | |
|---|-----|
| Figure 4-111 Stage in Cache Slough at Ryer Island for Base - No SMSCG (Base), ELT and ELT - Prospect Breach scenarios..... | 137 |
| Figure 4-112 Stage in Sacramento River at RSAC101 for Base - No SMSCG (Base), ELT and ELT - Prospect Breach scenarios..... | 138 |
| Figure 4-113 Comparison of bed shear in the Prospect Island vicinity for the ELT and ELT-Prospect Island simulations at times of peak bed shear during July 2002..... | 139 |
| Figure 4-114 Average flows (Jul - Sep 2002) for Base - No MRB, LLT and LLT – Little Egbert Breach simulations..... | 142 |
| Figure 4-115 Average tidal prism (Apr - Dec 2002) for Base - No MRB, LLT and LLT – Little Egbert Breach simulations..... | 144 |
| Figure 4-116 Average percent change from Base - No MRB tidal prism (Apr - Dec 2002) for LLT and LLT – Little Egbert Breach simulations..... | 145 |
| Figure 4-117 Average tidal range (Apr - Dec 2002) for Base - No MRB, LLT and LLT – Little Egbert Breach simulations..... | 147 |
| Figure 4-118 Profiles of July 2002 MHHW, MSL and MLLW along the Sacramento River for the Base - No MRB, LLT and LLT - Little Egbert Breach simulations..... | 148 |
| Figure 4-119 Profiles of July 2002 MHHW, MSL and MLLW along the San Joaquin River for the Base - No MRB, LLT and LLT - Little Egbert Breach simulations..... | 149 |
| Figure 4-120 Profiles of July 2002 MHHW, MSL and MLLW along the Middle River for the Base - No MRB, LLT and LLT - Little Egbert Breach simulations..... | 150 |
| Figure 4-121 Profiles of July 2002 MHHW, MSL and MLLW along Montezuma Slough for the Base - No MRB, LLT and LLT - Little Egbert Breach simulations..... | 151 |
| Figure 4-122 Stage at Freeport for Base - No MRB, LLT and LLT - Little Egbert Breach scenarios..... | 152 |
| Figure 4-123 Stage in Sutter Slough for Base - No MRB, LLT and LLT - Little Egbert Breach scenarios..... | 152 |
| Figure 4-124 Stage in Steamboat Slough for Base - No MRB, LLT and LLT - Little Egbert Breach scenarios..... | 153 |
| Figure 4-125 Stage at RSAC128 for Base - No MRB, LLT and LLT - Little Egbert Breach scenarios..... | 153 |
| Figure 4-126 Stage at Delta Cross Channel for Base - No MRB, LLT and LLT - Little Egbert Breach scenarios..... | 154 |
| Figure 4-127 Stage in Georgiana Slough at head for Base - No MRB, LLT and LLT - Little Egbert Breach scenarios..... | 154 |
| Figure 4-128 Stage in Sutter Slough near Sacramento R. for Base - No MRB, LLT and LLT - Little Egbert Breach scenarios..... | 155 |
| Figure 4-129 Stage in Steamboat Slough for Base - No MRB, LLT and LLT - Little Egbert Breach scenarios..... | 155 |
| Figure 4-130 Stage in Miner Slough for Base - No MRB, LLT and LLT - Little Egbert Breach scenarios..... | 156 |
| Figure 4-131 Stage in Cache Slough at Ryer Island for Base - No MRB, LLT and LLT - Little Egbert Breach scenarios..... | 156 |
| Figure 4-132 Stage at Rio Vista for Base - No MRB, LLT and LLT - Little Egbert Breach scenarios..... | 157 |
| Figure 4-133 Stage at Jersey Point for Base - No MRB, LLT and LLT - Little Egbert Breach scenarios..... | 157 |

| | |
|--|-----|
| Figure 4-134 Stage in Old River at ROLD034 for Base - No MRB, LLT and LLT - Little Egbert Breach scenarios. | 158 |
| Figure 4-135 Stage in Middle River at RMID023 for Base - No MRB, LLT and LLT - Little Egbert Breach scenarios..... | 158 |
| Figure 4-136 Stage in Montezuma Slough at head for Base - No MRB, LLT and LLT - Little Egbert Breach scenarios..... | 159 |
| Figure 4-137 Stage in Montezuma Slough at mouth for Base - No MRB, LLT and LLT - Little Egbert Breach scenarios..... | 159 |
| Figure 4-138 Average flows (Jul - Sep 2002) for Base - No MRB, LLT and LLT – Sherman Breach simulations..... | 162 |
| Figure 4-139 Average tidal prism (Apr - Dec 2002) for Base - No MRB, LLT and LLT – Sherman Breach simulations..... | 164 |
| Figure 4-140 Average percent change from Base - No MRB tidal prism (Apr - Dec 2002) for LLT and LLT – Sherman Breach simulations..... | 165 |
| Figure 4-141 Average tidal range (Apr - Dec 2002) for Base - No MRB, LLT and LLT – Sherman Breach simulations..... | 167 |
| Figure 4-142 Profiles of July 2002 MHHW, MSL and MLLW along the Sacramento River for the Base - No MRB, LLT and LLT - Sherman Breach simulations..... | 168 |
| Figure 4-143 Profiles of July 2002 MHHW, MSL and MLLW along the San Joaquin River for the Base - No MRB, LLT and LLT - Sherman Breach simulations..... | 169 |
| Figure 4-144 Profiles of July 2002 MHHW, MSL and MLLW along the Middle River for the Base - No MRB, LLT and LLT - Sherman Breach simulations..... | 170 |
| Figure 4-145 Stage in Sutter Slough for Base - No MRB, LLT and LLT - No South scenarios..... | 171 |
| Figure 4-146 Stage in Steamboat Slough for Base - No MRB, LLT and LLT - No South scenarios..... | 171 |
| Figure 4-147 Stage at RSAC128 for Base - No MRB, LLT and LLT - No South scenarios.... | 172 |
| Figure 4-148 Stage at Rio Vista for Base - No MRB, LLT and LLT - No South scenarios.... | 172 |
| Figure 4-149 Stage at Emmaton for Base - No MRB, LLT and LLT - No South scenarios.... | 173 |
| Figure 4-150 Stage in Threemile Slough for Base - No MRB, LLT and LLT - No South scenarios..... | 173 |
| Figure 4-151 Stage at Jersey Point for Base - No MRB, LLT and LLT - No South scenarios. | 174 |
| Figure 4-152 Stage at ROLD024 for Base - No MRB, LLT and LLT - No South scenarios.... | 174 |
| Figure 4-153 Stage RMID023 for Base - No MRB, LLT and LLT - No South scenarios..... | 175 |
| Figure 4-154 Time series plot locations in the Delta..... | 176 |
| Figure 4-155 Tidally averaged flow in Middle River at RMID015 for LLT and LLT - No South..... | 181 |
| Figure 4-156 Stage and tidally averaged stage in Middle River at RMID015 for LLT - No South..... | 181 |
| Figure 5-1 EC time series plot locations..... | 183 |
| Figure 5-2 Tidally averaged EC at RSAC155 for Base – No SMSCG, ELT and ELT – Max Suisun..... | 187 |
| Figure 5-3 Tidally averaged EC in Sutter Slough for Base – No SMSCG, ELT and ELT – Max Suisun..... | 187 |
| Figure 5-4 Tidally averaged EC in Steamboat Slough for Base – No SMSCG, ELT and ELT – Max Suisun..... | 188 |

| | |
|---|-----|
| Figure 5-5 Tidally averaged EC at RSAC128 for Base – No SMSCG, ELT and ELT – Max Suisun..... | 188 |
| Figure 5-6 Tidally averaged EC at RSAC123 for Base – No SMSCG, ELT and ELT – Max Suisun..... | 189 |
| Figure 5-7 Tidally averaged EC in Cache Slough at Ryer for Base – No SMSCG, ELT and ELT – Max Suisun. | 189 |
| Figure 5-8 Tidally averaged EC at RSAC101 for Base – No SMSCG, ELT and ELT – Max Suisun..... | 190 |
| Figure 5-9 Tidally averaged EC at RSAC092 for Base – No SMSCG, ELT and ELT – Max Suisun..... | 190 |
| Figure 5-10 Tidally averaged EC at RSAC018 for Base – No SMSCG, ELT and ELT – Max Suisun..... | 191 |
| Figure 5-11 Tidally averaged EC at RSAC032 for Base – No SMSCG, ELT and ELT – Max Suisun..... | 191 |
| Figure 5-12 Tidally averaged EC at RSAN058 for Base – No SMSCG, ELT and ELT – Max Suisun..... | 192 |
| Figure 5-13 Tidally averaged EC at RMID015 for Base – No SMSCG, ELT and ELT – Max Suisun..... | 192 |
| Figure 5-14 Tidally averaged EC at ROLD024 for Base – No SMSCG, ELT and ELT – Max Suisun..... | 193 |
| Figure 5-15 Tidally averaged EC at SWP for Base – No SMSCG, ELT and ELT – Max Suisun. | 193 |
| Figure 5-16 Tidally averaged EC at CVP for Base – No SMSCG, ELT and ELT – Max Suisun. | 194 |
| Figure 5-17 Tidally averaged EC at RSAC075 for Base – No SMSCG, ELT and ELT – Max Suisun..... | 194 |
| Figure 5-18 Tidally averaged EC at Montezuma SL at Head for Base – No SMSCG, ELT and ELT – Max Suisun..... | 195 |
| Figure 5-19 Tidally averaged EC at Montezuma Slough at Beldon's for Base – No SMSCG, ELT and ELT – Max Suisun..... | 195 |
| Figure 5-20 Tidally averaged EC at Montezuma SL at Mouth for Base – No SMSCG, ELT and ELT – Max Suisun..... | 196 |
| Figure 5-21 Contour plots of ELT – Max Suisun change from ELT tidally averaged EC on September 24, 2002. | 197 |
| Figure 5-22 Contour plots of ELT – Max Suisun change from ELT tidally averaged EC in south Delta on September 24, 2002..... | 198 |
| Figure 5-23 Contour plots of ELT – Max Suisun change from ELT tidally averaged EC in Suisun Marsh on September 24, 2002. | 199 |
| Figure 5-24 Time series of X2 for Base - No SMSCG, ELT, ELT - Max Suisun and LLT. | 200 |
| Figure 5-25 Tidally averaged EC at RSAC155 for Base – No MRB, LLT and LLT – No South. | 204 |
| Figure 5-26 Tidally averaged EC in Sutter Slough for Base – No MRB, LLT and LLT – No South. | 204 |
| Figure 5-27 Tidally averaged EC in Steamboat Slough for Base – No MRB, LLT and LLT – No South. | 205 |

| | |
|--|-----|
| Figure 5-28 Tidally averaged EC at RSAC128 for Base – No MRB, LLT and LLT – No South. | 205 |
| Figure 5-29 Tidally averaged EC at RSAC123 for Base – No MRB, LLT and LLT – No South. | 206 |
| Figure 5-30 Tidally averaged EC in Cache Slough at Ryer for Base – No MRB, LLT and LLT – No South. | 206 |
| Figure 5-31 Tidally averaged EC at RSAC101 for Base – No MRB, LLT and LLT – No South. | 207 |
| Figure 5-32 Tidally averaged EC at RSAC092 for Base – No MRB, LLT and LLT – No South. | 207 |
| Figure 5-33 Tidally averaged EC at RSAN018 for Base – No MRB, LLT and LLT – No South. | 208 |
| Figure 5-34 Tidally averaged EC at RSAN032 for Base – No MRB, LLT and LLT – No South. | 208 |
| Figure 5-35 Tidally averaged EC at RSAN058 for Base – No MRB, LLT and LLT – No South. | 209 |
| Figure 5-36 Tidally averaged EC at RMID015 for Base – No MRB, LLT and LLT – No South. | 209 |
| Figure 5-37 Tidally averaged EC at RMID023 for Base – No MRB, LLT and LLT – No South. | 210 |
| Figure 5-38 Tidally averaged EC at RMID027 for Base – No MRB, LLT and LLT – No South. | 210 |
| Figure 5-39 Tidally averaged EC at ROLD024 for Base – No MRB, LLT and LLT – No South. | 211 |
| Figure 5-40 Tidally averaged EC at ROLD034 for Base – No MRB, LLT and LLT – No South. | 211 |
| Figure 5-41 Tidally averaged EC at SWP for Base – No MRB, LLT and LLT – No South. | 212 |
| Figure 5-42 Tidally averaged EC at CCWD for Base – No MRB, LLT and LLT – No South. | 212 |
| Figure 5-43 Tidally averaged EC at CVP for Base – No MRB, LLT and LLT – No South. | 213 |
| Figure 5-44 Tidally averaged EC at Montezuma Sl at Head for Base – No MRB, LLT and LLT – No South. | 213 |
| Figure 5-45 Tidally averaged EC at Montezuma Slough at Beldon’s for Base – No MRB, LLT and LLT – No South. | 214 |
| Figure 5-46 Tidally averaged EC at Montezuma Sl at Mouth for Base – No MRB, LLT and LLT – No South. | 214 |
| Figure 5-47 Contour plots of LLT – No South change from LLT tidally averaged EC on September 24, 2002. | 215 |
| Figure 5-48 Contour plots of LLT – No South change from LLT tidally averaged EC in south Delta on September 24, 2002. | 216 |
| Figure 5-49 Contour plots of LLT – No South change from LLT tidally averaged EC in Suisun Marsh on September 24, 2002. | 217 |
| Figure 5-50 Time series of X2 for Base - No MRB, LLT and LLT - No south. | 218 |
| Figure 5-51 Tidally averaged EC at RSAC155 for Base-No MRB, LLT and LLT-Middle River. | 222 |
| Figure 5-52 Tidally averaged EC in Sutter Slough for Base-No MRB, LLT and LLT-Middle River. | 222 |

| | |
|---|-----|
| Figure 5-53 Tidally averaged EC in Steamboat Slough for Base-No MRB, LLT and LLT-Middle River. | 223 |
| Figure 5-54 Tidally averaged EC at RSAC128 for Base-No MRB, LLT and LLT-Middle River. | 223 |
| Figure 5-55 Tidally averaged EC at RSAC123 for Base-No MRB, LLT and LLT-Middle River. | 224 |
| Figure 5-56 Tidally averaged EC at Cache Slough at Ryer for Base-No MRB, LLT and LLT-Middle River. | 224 |
| Figure 5-57 Tidally averaged EC at RSAC101 for Base-No MRB, LLT and LLT-Middle River. | 225 |
| Figure 5-58 Tidally averaged EC at RSAC092 for Base-No MRB, LLT and LLT-Middle River. | 225 |
| Figure 5-59 Tidally averaged EC at RSAN018 for Base-No MRB, LLT and LLT-Middle River. | 226 |
| Figure 5-60 Tidally averaged EC at RSAN032 for Base-No MRB, LLT and LLT-Middle River. | 226 |
| Figure 5-61 Tidally averaged EC at RSAN058 for Base-No MRB, LLT and LLT-Middle River. | 227 |
| Figure 5-62 Tidally averaged EC at RMID015 for Base-No MRB, LLT and LLT-Middle River. | 227 |
| Figure 5-63 Tidally averaged EC at RMID023 for Base-No MRB, LLT and LLT-Middle River. | 228 |
| Figure 5-64 Tidally averaged EC at RMID027 for Base-No MRB, LLT and LLT-Middle River. | 228 |
| Figure 5-65 Tidally averaged EC at ROLD024 for Base-No MRB, LLT and LLT-Middle River. | 229 |
| Figure 5-66 Tidally averaged EC at ROLD034 for Base-No MRB, LLT and LLT-Middle River. | 229 |
| Figure 5-67 Tidally averaged EC at SWP for Base-No MRB, LLT and LLT-Middle River... .. | 230 |
| Figure 5-68 Tidally averaged EC at CVP for Base-No MRB, LLT and LLT-Middle River. .. | 230 |
| Figure 5-69 Tidally averaged EC at CCWD for Base-No MRB, LLT and LLT-Middle River. | 231 |
| Figure 5-70 Tidally averaged EC at RSAC075 for Base-No MRB, LLT and LLT-Middle River. | 231 |
| Figure 5-71 Tidally averaged EC at Montezuma Sl at Head for Base-No MRB, LLT and LLT-Middle River. | 232 |
| Figure 5-72 Tidally averaged EC at Montezuma Slough at Beldon’s for Base-No MRB, LLT and LLT-Middle River. | 232 |
| Figure 5-73 Tidally averaged EC at Montezuma Sl at Mouth for Base-No MRB, LLT and LLT-Middle River. | 233 |
| Figure 5-74 Contour plots of LLT – Middle River change from LLT tidally averaged EC on September 24, 2002. | 234 |
| Figure 5-75 Contour plots of LLT – Middle River change from LLT tidally averaged EC in south Delta on September 24, 2002. | 235 |
| Figure 5-76 Contour plots of LLT – Middle River change from LLT tidally averaged EC in Suisun Marsh on September 24, 2002. | 236 |

| | |
|---|-----|
| Figure 5-77 Time series of X2 for Base - No MRB, LLT and LLT – Middle River..... | 237 |
| Figure 5-78 Tidally averaged EC at RSAC155 for Base-No MRB, LLT and LLT-Suisun Scour. | 241 |
| Figure 5-79 Tidally averaged EC in Sutter Slough for Base-No MRB, LLT and LLT-Suisun Scour. | 241 |
| Figure 5-80 Tidally averaged EC in Steamboat Slough for Base-No MRB, LLT and LLT-Suisun Scour. | 242 |
| Figure 5-81 Tidally averaged EC at RSAC128 for Base-No MRB, LLT and LLT-Suisun Scour. | 242 |
| Figure 5-82 Tidally averaged EC at RSAC123 for Base-No MRB, LLT and LLT-Suisun Scour. | 243 |
| Figure 5-83 Tidally averaged EC at Cache Slough at Ryer for Base-No MRB, LLT and LLT- Suisun Scour. | 243 |
| Figure 5-84 Tidally averaged EC at RSAC101 for Base-No MRB, LLT and LLT-Suisun Scour. | 244 |
| Figure 5-85 Tidally averaged EC at RSAC092 for Base-No MRB, LLT and LLT-Suisun Scour. | 244 |
| Figure 5-86 Tidally averaged EC at RSAN018 for Base-No MRB, LLT and LLT-Suisun Scour. | 245 |
| Figure 5-87 Tidally averaged EC at RSAN032 for Base-No MRB, LLT and LLT-Suisun Scour. | 245 |
| Figure 5-88 Tidally averaged EC at RSAN058 for Base-No MRB, LLT and LLT-Suisun Scour. | 246 |
| Figure 5-89 Tidally averaged EC at RMID015 for Base-No MRB, LLT and LLT-Suisun Scour. | 246 |
| Figure 5-90 Tidally averaged EC at ROLD024 for Base-No MRB, LLT and LLT-Suisun Scour. | 247 |
| Figure 5-91 Tidally averaged EC at SWP for Base-No MRB, LLT and LLT-Suisun Scour. ... | 247 |
| Figure 5-92 Tidally averaged EC at CVP for Base-No MRB, LLT and LLT-Suisun Scour. ... | 248 |
| Figure 5-93 Tidally averaged EC at CCWD for Base-No MRB, LLT and LLT-Suisun Scour. | 248 |
| Figure 5-94 Tidally averaged EC at RSAC075 for Base-No MRB, LLT and LLT-Suisun Scour. | 249 |
| Figure 5-95 Tidally averaged EC at Montezuma Sl at Head for Base-No MRB, LLT and LLT- Suisun Scour. | 249 |
| Figure 5-96 Tidally averaged EC at Montezuma Slough at Beldon’s for Base-No MRB, LLT and LLT-Suisun Scour. | 250 |
| Figure 5-97 Tidally averaged EC at Montezuma Sl at Mouth for Base-No MRB, LLT and LLT- Suisun Scour. | 250 |
| Figure 5-98 Contour plots of LLT – Suisun Scour change from LLT tidally averaged EC on September 24, 2002. | 251 |
| Figure 5-99 Contour plots of LLT – Suisun Scour change from LLT tidally averaged EC in south Delta on September 24, 2002. | 252 |
| Figure 5-100 Contour plots of LLT – Suisun Scour change from LLT tidally averaged EC in Suisun Marsh on September 24, 2002. | 253 |
| Figure 5-101 Time series of X2 for Base - No MRB, LLT and LLT – Suisun Scour..... | 254 |

| | |
|---|-----|
| Figure 5-102 Tidally averaged EC at RSAC155 for Base-No SMSCG, ELT and ELT-Prospect Breach. | 258 |
| Figure 5-103 Tidally averaged EC in Sutter Slough for Base-No SMSCG, ELT and ELT-Prospect Breach. | 258 |
| Figure 5-104 Tidally averaged EC in Steamboat Slough for Base-No SMSCG, ELT and ELT-Prospect Breach. | 259 |
| Figure 5-105 Tidally averaged EC at RSAC128 for Base-No SMSCG, ELT and ELT-Prospect Breach. | 259 |
| Figure 5-106 Tidally averaged EC at RSAC123 for Base-No SMSCG, ELT and ELT-Prospect Breach. | 260 |
| Figure 5-107 Tidally averaged EC at Cache Slough at Ryer for Base-No SMSCG, ELT and ELT-Prospect Breach. | 260 |
| Figure 5-108 Tidally averaged EC at RSAC101 for Base-No SMSCG, ELT and ELT-Prospect Breach. | 261 |
| Figure 5-109 Tidally averaged EC at RSAC092 for Base-No SMSCG, ELT and ELT-Prospect Breach. | 261 |
| Figure 5-110 Tidally averaged EC at RSAN018 for Base-No SMSCG, ELT and ELT-Prospect Breach. | 262 |
| Figure 5-111 Tidally averaged EC at RSAN032 for Base-No SMSCG, ELT and ELT-Prospect Breach. | 262 |
| Figure 5-112 Tidally averaged EC at RSAN058 for Base-No SMSCG, ELT and ELT-Prospect Breach. | 263 |
| Figure 5-113 Tidally averaged EC at RMID015 for Base-No SMSCG, ELT and ELT-Prospect Breach. | 263 |
| Figure 5-114 Tidally averaged EC at ROLD024 for Base-No SMSCG, ELT and ELT-Prospect Breach. | 264 |
| Figure 5-115 Tidally averaged EC at SWP for Base-No SMSCG, ELT and ELT-Prospect Breach. | 264 |
| Figure 5-116 Tidally averaged EC at CVP for Base-No SMSCG, ELT and ELT-Prospect Breach. | 265 |
| Figure 5-117 Tidally averaged EC at CCWD for Base-No SMSCG, ELT and ELT-Prospect Breach. | 265 |
| Figure 5-118 Tidally averaged EC at RSAC075 for Base-No SMSCG, ELT and ELT-Prospect Breach. | 266 |
| Figure 5-119 Tidally averaged EC at Montezuma Sl at Head for Base-No SMSCG, ELT and ELT-Prospect Breach. | 266 |
| Figure 5-120 Tidally averaged EC at Montezuma Slough at Beldon’s for Base-No SMSCG, ELT and ELT-Prospect Breach. | 267 |
| Figure 5-121 Tidally averaged EC at Montezuma Sl at Mouth for Base-No SMSCG, ELT and ELT-Prospect Breach. | 267 |
| Figure 5-122 Contour plots of ELT – Prospect Breach change from ELT tidally averaged EC on September 24, 2002. | 268 |
| Figure 5-123 Contour plots of ELT – Prospect Breach change from ELT tidally averaged EC in south Delta on September 24, 2002. | 269 |
| Figure 5-124 Contour plots of ELT – Prospect Breach change from ELT tidally averaged EC in Suisun Marsh on September 24, 2002. | 270 |

| | |
|--|-----|
| Figure 5-125 Contour plots of ELT – Prospect Breach change from ELT tidally averaged EC in the Cache Slough ROA on September 24, 2002..... | 271 |
| Figure 5-126 Time series of X2 for Base - No SMSCG, ELT and ELT - Prospect Breach..... | 272 |
| Figure 5-127 Tidally averaged EC at RSAC155 for Base-No MRB, LLT and LLT-Little Egbert Breach. | 276 |
| Figure 5-128 Tidally averaged EC in Sutter Slough for Base-No MRB, LLT and LLT-Little Egbert Breach..... | 276 |
| Figure 5-129 Tidally averaged EC in Steamboat Slough for Base-No MRB, LLT and LLT-Little Egbert Breach..... | 277 |
| Figure 5-130 Tidally averaged EC at RSAC128 for Base-No MRB, LLT and LLT-Little Egbert Breach. | 277 |
| Figure 5-131 Tidally averaged EC at RSAC123 for Base-No MRB, LLT and LLT-Little Egbert Breach. | 278 |
| Figure 5-132 Tidally averaged EC at Cache Slough at Ryer for Base-No MRB, LLT and LLT-Little Egbert Breach..... | 278 |
| Figure 5-133 Tidally averaged EC at RSAC101 for Base-No MRB, LLT and LLT-Little Egbert Breach. | 279 |
| Figure 5-134 Tidally averaged EC at RSAC092 for Base-No MRB, LLT and LLT-Little Egbert Breach. | 279 |
| Figure 5-135 Tidally averaged EC at RSAN018 for Base-No MRB, LLT and LLT-Little Egbert Breach. | 280 |
| Figure 5-136 Tidally averaged EC at RSAN032 for Base-No MRB, LLT and LLT-Little Egbert Breach. | 280 |
| Figure 5-137 Tidally averaged EC at RSAN058 for Base-No MRB, LLT and LLT-Little Egbert Breach. | 281 |
| Figure 5-138 Tidally averaged EC at RMID015 for Base-No MRB, LLT and LLT-Little Egbert Breach. | 281 |
| Figure 5-139 Tidally averaged EC at ROLD024 for Base-No MRB, LLT and LLT-Little Egbert Breach. | 282 |
| Figure 5-140 Tidally averaged EC at SWP for Base-No MRB, LLT and LLT-Little Egbert Breach. | 282 |
| Figure 5-141 Tidally averaged EC at CVP for Base-No MRB, LLT and LLT-Little Egbert Breach. | 283 |
| Figure 5-142 Tidally averaged EC at RSAC075 for Base-No MRB, LLT and LLT-Little Egbert Breach. | 283 |
| Figure 5-143 Tidally averaged EC at Montezuma Sl at Head for Base-No MRB, LLT and LLT-Little Egbert Breach..... | 284 |
| Figure 5-144 Tidally averaged EC at Montezuma Slough at Beldon’s for Base-No MRB, LLT and LLT-Little Egbert Breach. | 284 |
| Figure 5-145 Tidally averaged EC at Montezuma Sl at Mouth for Base-No MRB, LLT and LLT-Little Egbert Breach. | 285 |
| Figure 5-146 Contour plots of LLT – Little Egbert change from LLT tidally averaged EC on September 24, 2002. | 286 |
| Figure 5-147 Contour plots of LLT – Little Egbert change from LLT tidally averaged EC in south Delta on September 24, 2002. | 287 |

| | |
|--|-----|
| Figure 5-148 Contour plots of LLT – Little Egbert change from LLT tidally averaged EC in Suisun Marsh on September 24, 2002. | 288 |
| Figure 5-149 Contour plots of LLT – Little Egbert change from LLT tidally averaged EC in the Cache Slough ROA on September 24, 2002..... | 289 |
| Figure 5-150 Time series of X2 for Base - No MRB, LLT and LLT – Little Egbert Breach. .. | 290 |
| Figure 5-151 Tidally averaged EC at RSAC155 for Base-No MRB, LLT and LLT-Sherman Breach. | 294 |
| Figure 5-152 Tidally averaged EC in Sutter Slough for Base-No MRB, LLT and LLT-Sherman Breach. | 294 |
| Figure 5-153 Tidally averaged EC in Steamboat Slough for Base-No MRB, LLT and LLT-Sherman Breach. | 295 |
| Figure 5-154 Tidally averaged EC at RSAC128 for Base-No MRB, LLT and LLT-Sherman Breach. | 295 |
| Figure 5-155 Tidally averaged EC at RSAC123 for Base-No MRB, LLT and LLT-Sherman Breach. | 296 |
| Figure 5-156 Tidally averaged EC at Cache Slough at Ryer for Base-No MRB, LLT and LLT-Sherman Breach. | 296 |
| Figure 5-157 Tidally averaged EC at RSAC101 for Base-No MRB, LLT and LLT-Sherman Breach. | 297 |
| Figure 5-158 Tidally averaged EC at RSAC092 for Base-No MRB, LLT and LLT-Sherman Breach. | 297 |
| Figure 5-159 Tidally averaged EC at RSAN018 for Base-No MRB, LLT and LLT-Sherman Breach. | 298 |
| Figure 5-160 Tidally averaged EC at RMID015 for Base-No MRB, LLT and LLT-Sherman Breach. | 298 |
| Figure 5-161 Tidally averaged EC at ROLD024 for Base-No MRB, LLT and LLT-Sherman Breach. | 299 |
| Figure 5-162 Tidally averaged EC at SWP for Base-No MRB, LLT and LLT-Sherman Breach. | 299 |
| Figure 5-163 Tidally averaged EC at CVP for Base-No MRB, LLT and LLT-Sherman Breach. | 300 |
| Figure 5-164 Tidally averaged EC at RSAC075 for Base-No MRB, LLT and LLT-Sherman Breach. | 300 |
| Figure 5-165 Tidally averaged EC at Montezuma Sl at Head for Base-No MRB, LLT and LLT-Sherman Breach. | 301 |
| Figure 5-166 Tidally averaged EC at Montezuma Sl at Mouth for Base-No MRB, LLT and LLT-Sherman Breach. | 301 |
| Figure 5-167 Contour plots of LLT – Sherman Breach change from LLT tidally averaged EC on September 24, 2002. | 302 |
| Figure 5-168 Contour plots of LLT – Sherman Breach change from LLT tidally averaged EC in south Delta on September 24, 2002. | 303 |
| Figure 5-169 Contour plots of LLT – Sherman Breach change from LLT tidally averaged EC in Suisun Marsh on September 24, 2002. | 304 |
| Figure 5-170 Time series of X2 for Base - No MRB, LLT and LLT – Sherman Breach. | 305 |
| Figure 7-1 Contour plots of EC change from Base - No SMSCG on September 24, 2002, for the ELT and ELT – Max Suisun simulations. | 312 |

| | |
|--|-----|
| Figure 7-2 Contour plots of tidally averaged EC change from Base - No SMSCG in the south Delta on September 24, 2002, for the ELT and ELT – Max Suisun simulations. | 313 |
| Figure 7-3 Contour plots of EC change from Base - No SMSCG in Suisun Marsh on September 24, 2002, for the ELT and ELT – Max Suisun simulations. | 314 |
| Figure 7-4 Contour plots of EC change from Base - No MRB on September 24, 2002, for the LLT and LLT - No South simulations. | 316 |
| Figure 7-5 Contour plots of EC change from Base - No MRB in the south Delta on September 24, 2002, for the LLT and LLT - No South simulations. | 317 |
| Figure 7-6 Contour plots of EC change from Base - No MRB in Suisun Marsh on September 24, 2002, for the LLT and LLT - No South simulations. | 318 |
| Figure 7-7 Contour plots of EC change from Base - No MRB on September 24, 2002, for the LLT and LLT – Middle River simulations. | 320 |
| Figure 7-8 Contour plots of EC change from Base - No MRB in south Delta on September 24, 2002, for the LLT and LLT - Middle River simulations. | 321 |
| Figure 7-9 Contour plots of EC change from Base - No MRB in Suisun Marsh on September 24, 2002, for the LLT and LLT - Middle River simulations. | 322 |
| Figure 7-10 Contour plots of tidally averaged EC change from Base - No MRB on September 24, 2002, for the LLT and LLT – Suisun Scour simulations. | 324 |
| Figure 7-11 Contour plots of tidally averaged EC change from Base - No MRB in south Delta on September 24, 2002, for the LLT and LLT - Suisun Scour simulations. | 325 |
| Figure 7-12 Contour plots of tidally averaged EC change from Base - No MRB in Suisun Marsh on September 24, 2002, for the LLT and LLT - Suisun Scour simulations. | 326 |
| Figure 7-13 Contour plots of EC change from Base – No SMSCG on September 24, 2002, for the ELT and ELT – Prospect Breach simulations. | 328 |
| Figure 7-14 Contour plots of EC change from Base - No SMSCG in central and south Delta on September 24, 2002, for the ELT and ELT – Prospect Breach simulations. | 329 |
| Figure 7-15 Contour plots of EC change from Base - No SMSCG in Suisun Marsh on September 24, 2002, for the ELT and ELT – Prospect Breach simulations. | 330 |
| Figure 7-16 Contour plots of EC change from Base - No MRB on September 24, 2002, for the LLT and LLT – Little Egbert Breach simulations. | 332 |
| Figure 7-17 Contour plots of EC change from Base - No MRB in south Delta on September 24, 2002, for the LLT and LLT - Little Egbert Breach simulations. | 333 |
| Figure 7-18 Contour plots of EC change from Base - No MRB in Suisun Marsh on September 24, 2002, for the LLT and LLT - Little Egbert Breach simulations. | 334 |
| Figure 7-19 Contour plots of EC change from Base - No MRB on September 24, 2002, for the LLT and LLT – Sherman Breach simulations. | 336 |
| Figure 7-20 Contour plots of EC change from Base - No MRB in south Delta on September 24, 2002, for the LLT and LLT - Sherman Breach simulations. | 337 |
| Figure 7-21 Contour plots of EC change from Base - No MRB in Suisun Marsh on September 24, 2002, for the LLT and LLT - Sherman Breach simulations. | 338 |

1 Introduction

1.1 Background

Restoration of tidal marsh has been proposed for various regions of the Delta, denoted Restoration Opportunity Areas (ROAs), to improve habitat diversity and food availability for covered species. Assessments of tidal marsh effects on flows, stage, velocity and EC were performed for areas throughout the Delta under three time step scenarios in the tidal marsh restoration process: Near-term (NT) with 14,000 acres of restoration; Early Long-term (ELT) with 25,000 acres of restoration and Late Long-term (LLT) with 65,000 acres of restoration. Under the current phase of the project, sensitivity analyses were subsequently conducted to determine the sensitivity of tidal marsh habitat restoration hypothetical assumptions used in the effects analysis on physical parameters. Analyses were based on ELT and LLT scenarios. This progress report illustrates the RMA model sensitivity analysis for tidal marsh assumptions.

1.2 RMA Bay-Delta Model

RMA has developed and refined a numerical model of the San Francisco Bay and Sacramento-San Joaquin Delta system (Bay-Delta model) utilizing the RMA finite element models for surface waters. RMA2 (King, 1990) is a generalized free surface hydrodynamic model that is used to compute two-dimensional depth-averaged velocity and water surface elevation. RMA11 (King, 1998) is a generalized two-dimensional depth-averaged water quality model that computes a temporal and spatial description of conservative and non-conservative water quality parameters. RMA11 uses the results from RMA2 for its description of the flow field. As shown in Figure 2-1, the full model extends from the Golden Gate to the confluence of the American and Sacramento Rivers and to Vernalis on the San Joaquin River.

The current version of RMA's Bay-Delta model has been developed and continually refined during numerous studies over the past 14 years. One of the most important additions has been the capability to accurately represent wetting and drying in shallow estuaries. The most comprehensive calibration efforts in recent years were performed during studies for the City of Novato (RMA, 1997), the City of Palo Alto Regional Water Quality Control Plant (RMA, 1998), Central Contra Costa Sanitary District (RMA, 2000a), CALFED (RMA, 2000b), Flooded Islands Feasibility Study (RMA, 2005) and Numerical Modeling in Support of Suisun Marsh PEIR/EIS (RMA, 2008).

1.3 Objectives

The objective of this effort is to assess sensitivity of physical parameters to tidal marsh habitat restoration assumptions.

2 Model Configuration

The RMA Bay-Delta model can be used with the tidal boundary condition applied at the Golden Gate (full Bay-Delta network) or with the tidal boundary condition applied at Martinez (Delta-only network). The Delta-only network is used when the physical or operational alternatives under consideration do not impact the flow or water quality at Martinez. Because the large-scale tidal marsh restoration configuration considered for the BDCP can impact conditions at Martinez, the RMA full-Bay-Delta network is used.

2.1 Base Model

Figure 2-1 shows the entire network of the Bay-Delta model used for the Base case hydrodynamic and EC simulations in this study.

The model was developed from GIS data, USGS shapefiles and digital orthoquad (DOQ) images. Bottom elevations and the extent of mudflats were based on bathymetry data collected by NOAA, DWR, USACE and USGS. These data sets have been compiled by DWR and can be downloaded from DWR's Cross Section Development Program (CSDP) website at <http://baydeltaoffice.water.ca.gov/modeling/deltamodeling/models/csdp/csdp.cfm>.

Additional data were collected around Franks Tract by DWR and the USGS in 2004. USGS 10 m resolution Delta Bathymetry grids were obtained from the Access USGS website at <http://sfbay.wr.usgs.gov/sediment/sfbay/downloads.html>.

During a previous study (RMA, 2008) the finite element mesh was refined in the Suisun Marsh area. The length of the 1-D elements was reduced and additional channels were added. Overbank/fringe marsh was added as off-channel storage based on observed flow data (DWR, Suisun Marsh Branch, 2004), LIDAR elevation data and aerial photos.

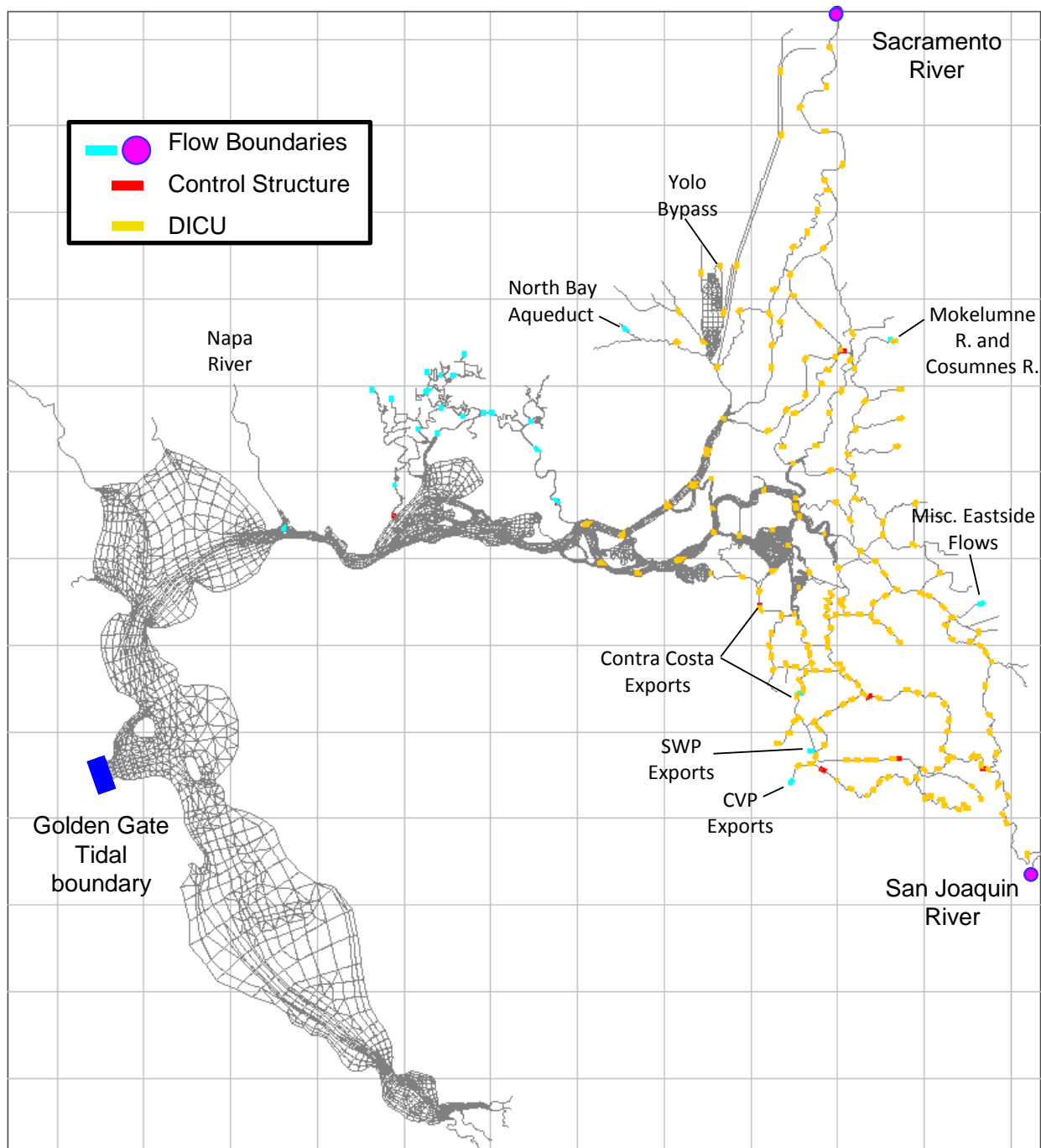


Figure 2-1 Model grid showing inflow and export locations, DICU and flow control structures.

2.2 ELT and LLT

During a previous phase of work, Early Long-term (ELT) and Late Long-term (LLT) BDCP restoration cases were simulated to represent two points in time with two different total areas of restoration. Areas of restoration include Suisun Marsh, Cache Slough, West Delta, Mokelumne-Cosumnes, East Delta and South Delta.

The restoration acreage goal for the Early Long-term (ELT) restorations scenario is 25,000 acres. The modeled ELT restoration scenario consists of 12,900 acres in the Cache Slough ROA, 8,130 acres in Suisun Marsh, 3,990 acres in the West Delta ROA, and 2,900 acres in the Mokelumne-Cosumnes ROA. A summary of the acreages, including areas at tidal datums, is provided in Table 2-1. A detail view of the ELT grid is shown in Figure 2-2. There is no restoration in the East Delta ROA or South Delta ROA for the ELT case.

The restoration acreage goal for the Late Long-term (LLT) restorations scenario is 65,000 acres. The modeled LLT restoration scenario consists of 20,330 acres in the Cache Slough ROA, 14,390 acres in Suisun Marsh, 4,240 acres in the West Delta ROA, 3,290 acres in the Mokelumne-Cosumnes ROA, 2,160 acres in the East Delta ROA and 22,480 acres in the South Delta ROA. A summary of the acreages, including areas at tidal datums, is provided in Table 2-2. A detail view of the LLT grid is shown in Figure 2-3. Note that there are approximately 2,000 acres of existing tidal marsh included in the Suisun Marsh ROA acreages, therefore the overall total acreage exceeds the goal for both cases.

Further details on the ELT and LLT simulations are provided in the RMA report *Numerical Modeling in Support of Bay Delta Conservation Plan, Technical Study #4 – Evaluation of Tidal Marsh Restoration Effects, Preliminary Results* (RMA, 2010).

Table 2-1 Summary of Early Long-Term ROA acreages.

| ROA | Area Above EHW (Ac) | Area MHHW to EHW (Ac) | Area MLLW to MHHW (Ac) | Area Below MLLW (Ac) | Total Area (Ac) | % Tidal Marsh (between MLLW and MHHW) |
|--------------------|---------------------|-----------------------|------------------------|----------------------|-----------------|---------------------------------------|
| Suisun Marsh | 159 | 289 | 3,495 | 4,190 | 8,133 | 43% |
| Cache Slough | 2,944 | 1,669 | 5,946 | 2,338 | 12,897 | 46% |
| West Delta | 284 | 38 | 2,743 | 927 | 3,992 | 69% |
| Mokelumne-Cosumnes | 3 | 83 | 846 | 1,972 | 2,904 | 29% |
| East Delta | - | - | - | - | - | - |
| South Delta | - | - | - | - | - | - |
| Total | 3,390 | 2,079 | 13,030 | 9,427 | 27,926 | 43% |

Table 2-2 Summary of Late Long-Term ROA acreages.

| ROA | Area Above EHW (Ac) | Area MHHW to EHW (Ac) | Area MLLW to MHHW (Ac) | Area Below MLLW (Ac) | Total Area (Ac) | % Tidal Marsh (between MLLW and MHHW) |
|--------------------|---------------------|-----------------------|------------------------|----------------------|-----------------|---------------------------------------|
| Suisun Marsh | 205 | 435 | 3,676 | 10,073 | 14,389 | 26% |
| Cache Slough | 4,080 | 1,955 | 6,878 | 7,421 | 20,334 | 34% |
| West Delta | 287 | 39 | 2,954 | 956 | 4,236 | 70% |
| Mokelumne-Cosumnes | 344 | 109 | 822 | 2,018 | 3,293 | 25% |
| East Delta | 792 | 221 | 240 | 910 | 2,163 | 70% |
| South Delta | 8,292 | 1,395 | 1,848 | 10,948 | 22,483 | 8% |
| Total | 14,000 | 4,154 | 16,418 | 32,326 | 66,898 | 25% |

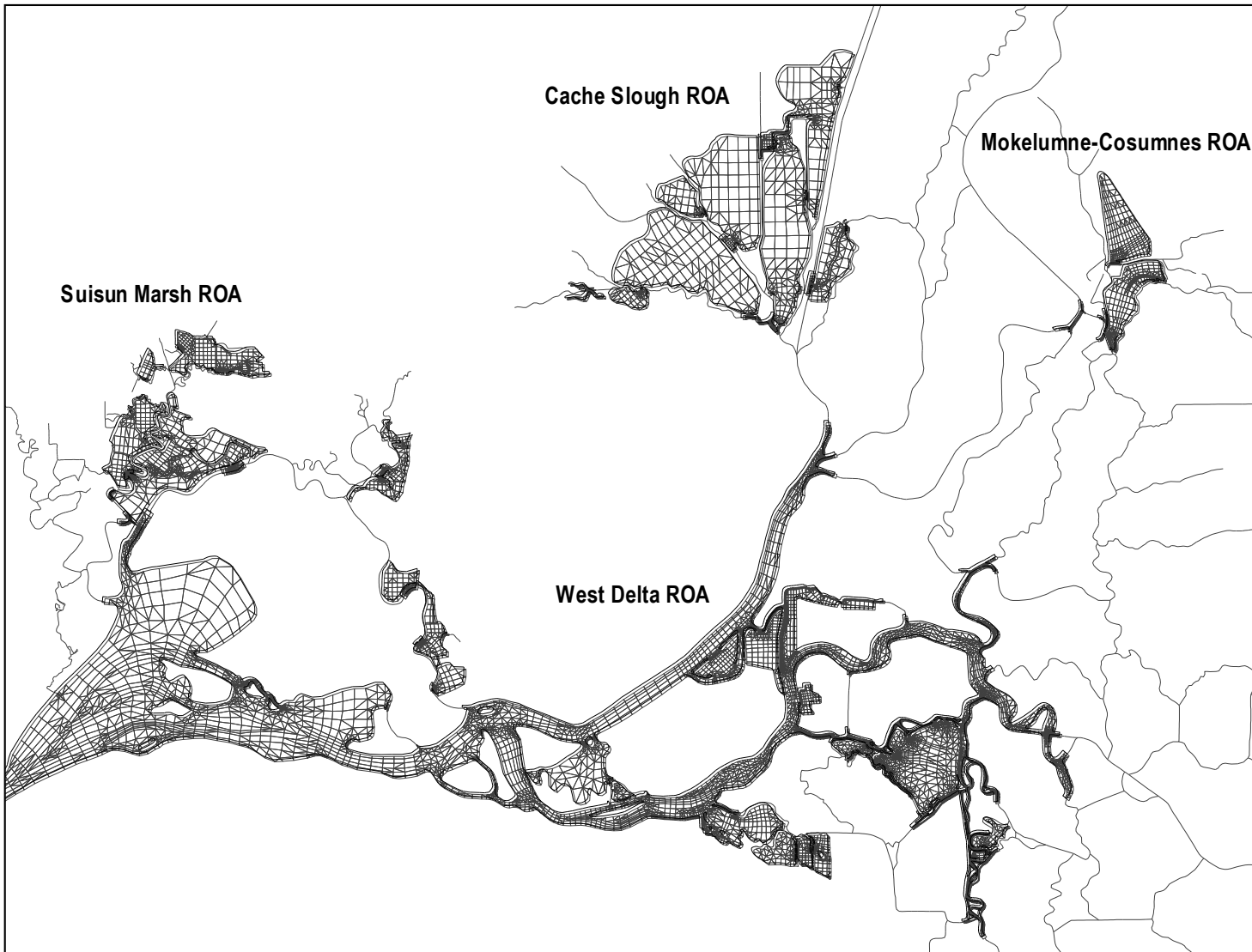


Figure 2-2 RMA Early Long-Term model finite element mesh.

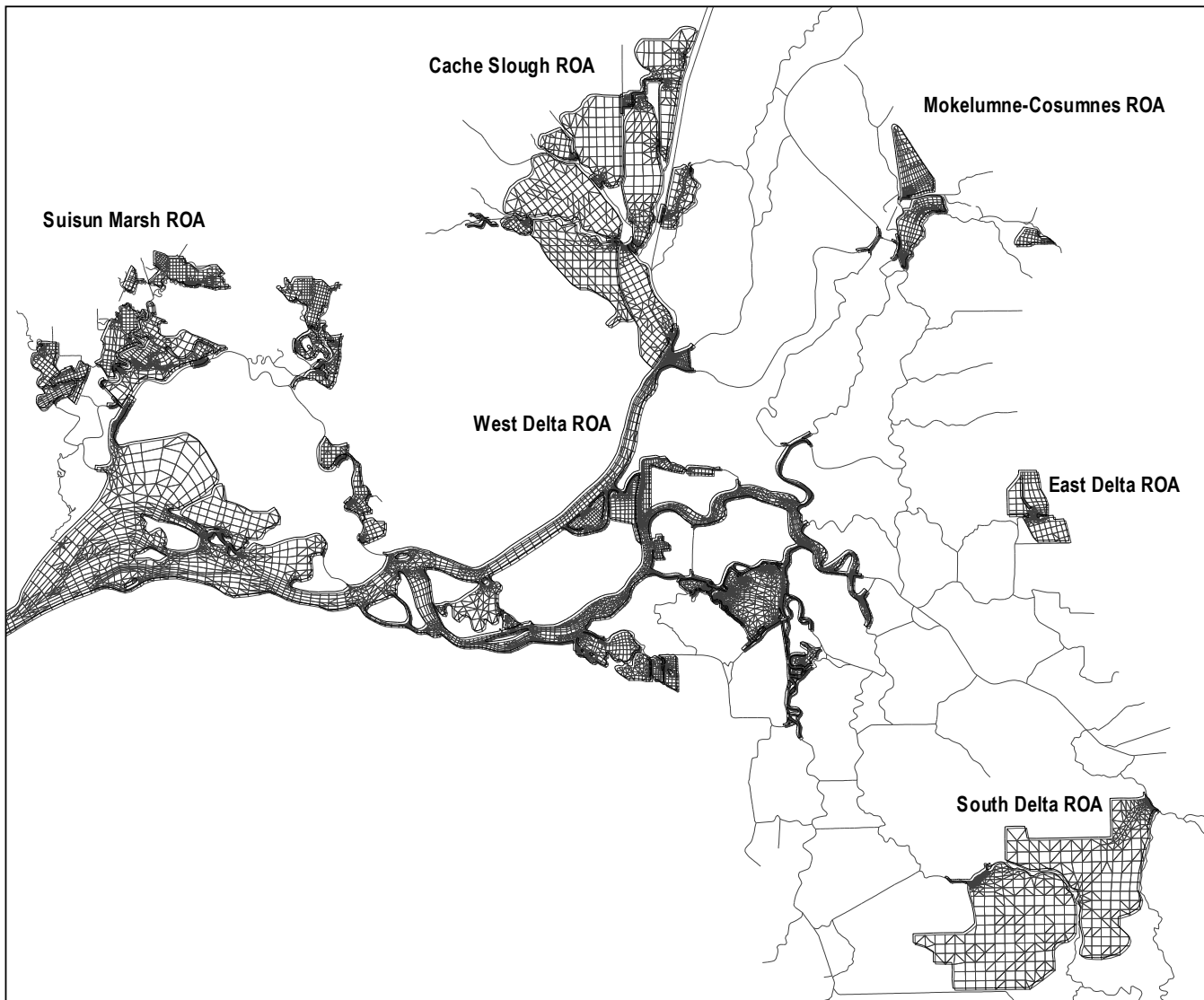


Figure 2-3 RMA Late Long-Term ROA model finite element mesh.

2.3 Sensitivity Cases

Three types of sensitivity analyses are addressed in this report: tidal marsh area, conveyance and breach location. Two to three individual analyses are performed for each. The set of sensitivity simulations is as follows:

- Tidal marsh area
 - ELT – Maximize Suisun ROA
 - LLT – No South Delta ROA
- Conveyance
 - LLT – Middle River Conveyance
 - LLT – Suisun Scour
- Breach location
 - ELT – Prospect Island Breach
 - LLT – Little Egbert Breach
 - LLT – Sherman Breach

Full descriptions of each simulation are provided below.

2.3.1 ELT – Maximize Suisun ROA

The total restored acreage for the ELT-Max Suisun sensitivity case is the same as that for the ELT case, approximately 25,000 ac, however the restoration within the Suisun Marsh ROA is the same as that for the LLT case, approximately 14,000 ac. To maintain the ELT acreage total, the Cache Slough ROA area is reduced. All other ROAs are the same as for the ELT case. Figure 2-4 and Figure 2-5 show comparisons of the Suisun Marsh and Cache ROA model grids for the ELT and ELT – Max Suisun scenarios.

The simulation uses ELT boundary conditions. The sensitivity analysis for the ELT – Max Suisun case relies on comparisons with the Base – No SMSCG and ELT simulations. The Base – No SMSCG simulation is a new base case that was run for the purpose of more meaningful comparisons in Montezuma Slough. The Suisun Marsh Salinity Control Gate (SMSCG) remains out for the entire simulation period, just as it does in the ELT case and all ELT based sensitivity simulations. This allows for analysis of the restoration and sensitivity impacts, without the bias of the differing gate operations. The Middle River barrier uses historic operations, as with the ELT case.

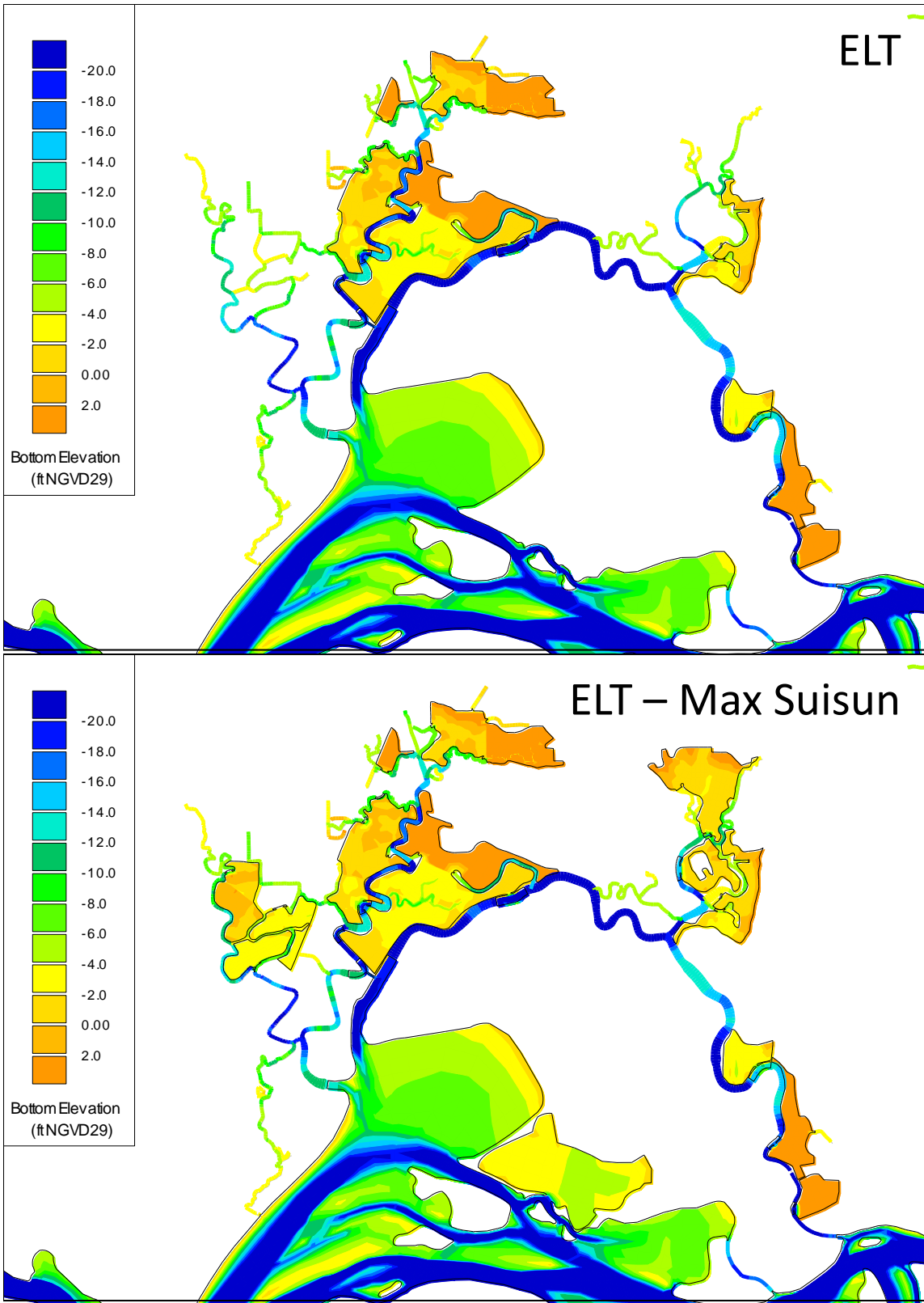


Figure 2-4 Comparison of Suisun Marsh ROA geometry for the ELT and ELT - Max Suisun scenarios.

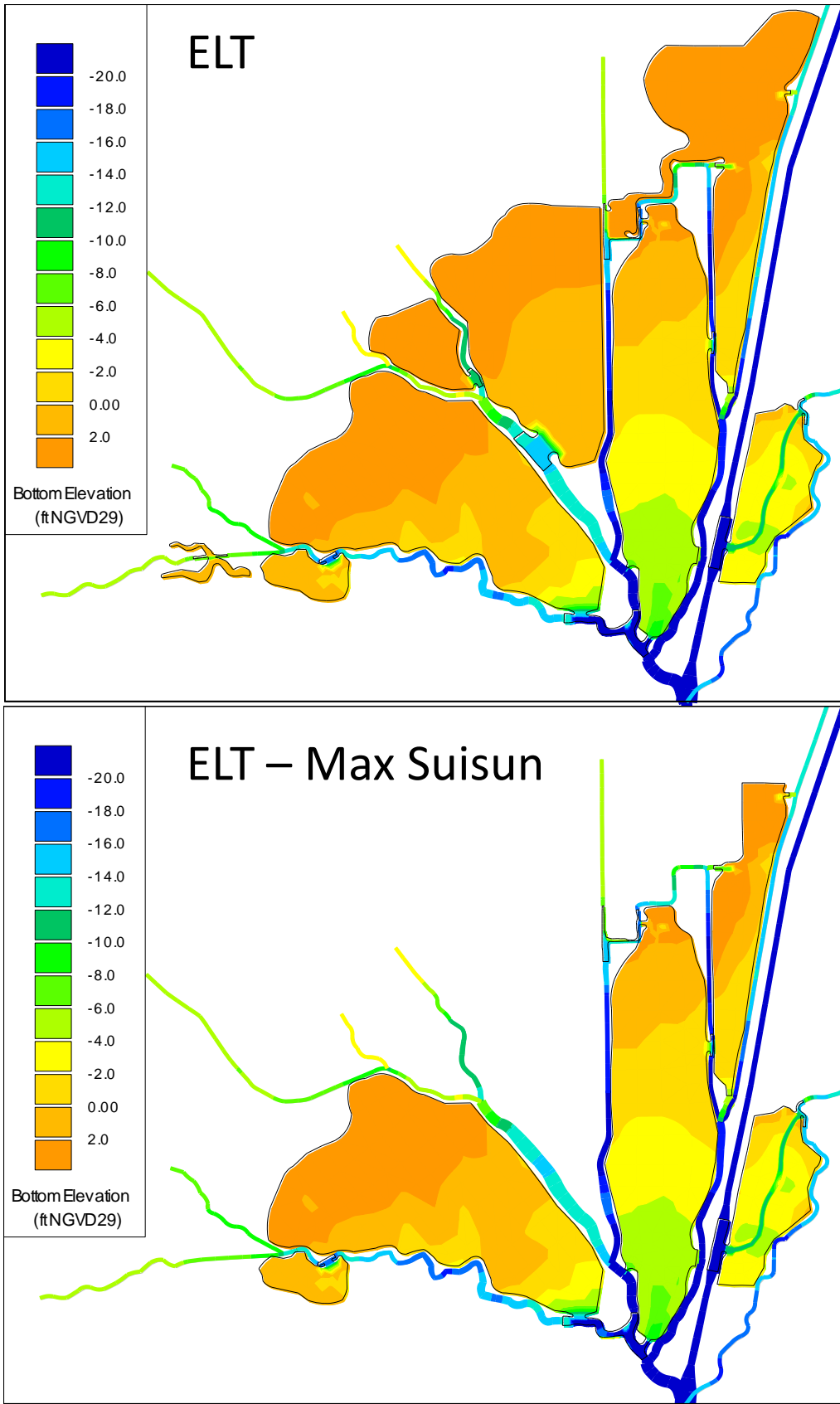


Figure 2-5 Comparison of Cache ROA geometry for the ELT and ELT – Max Suisun scenarios.

2.3.2 LLT – No South Delta ROA

The LLT – No South sensitivity case uses the LLT grid without the South Delta ROA. All other ROAs and the boundary conditions are the same as for the LLT case. A comparison of the LLT and LLT – No South model grids is shown in Figure 2-6.

The sensitivity analysis for the LLT – No South case relies on comparisons with the Base – No MRB and LLT simulations. The Base – No MRB simulation is a new base case that was run for the purpose of more meaningful comparisons in the south Delta. The Middle River Barrier (MRB) remains out for the entire simulation period, just as it does in the LLT case and all LLT based sensitivity simulations. This allows for analysis of the restoration and sensitivity impacts, without the bias of the differing gate operations. The Montezuma Slough salinity control gates are also open for the entire period, as with the LLT case.

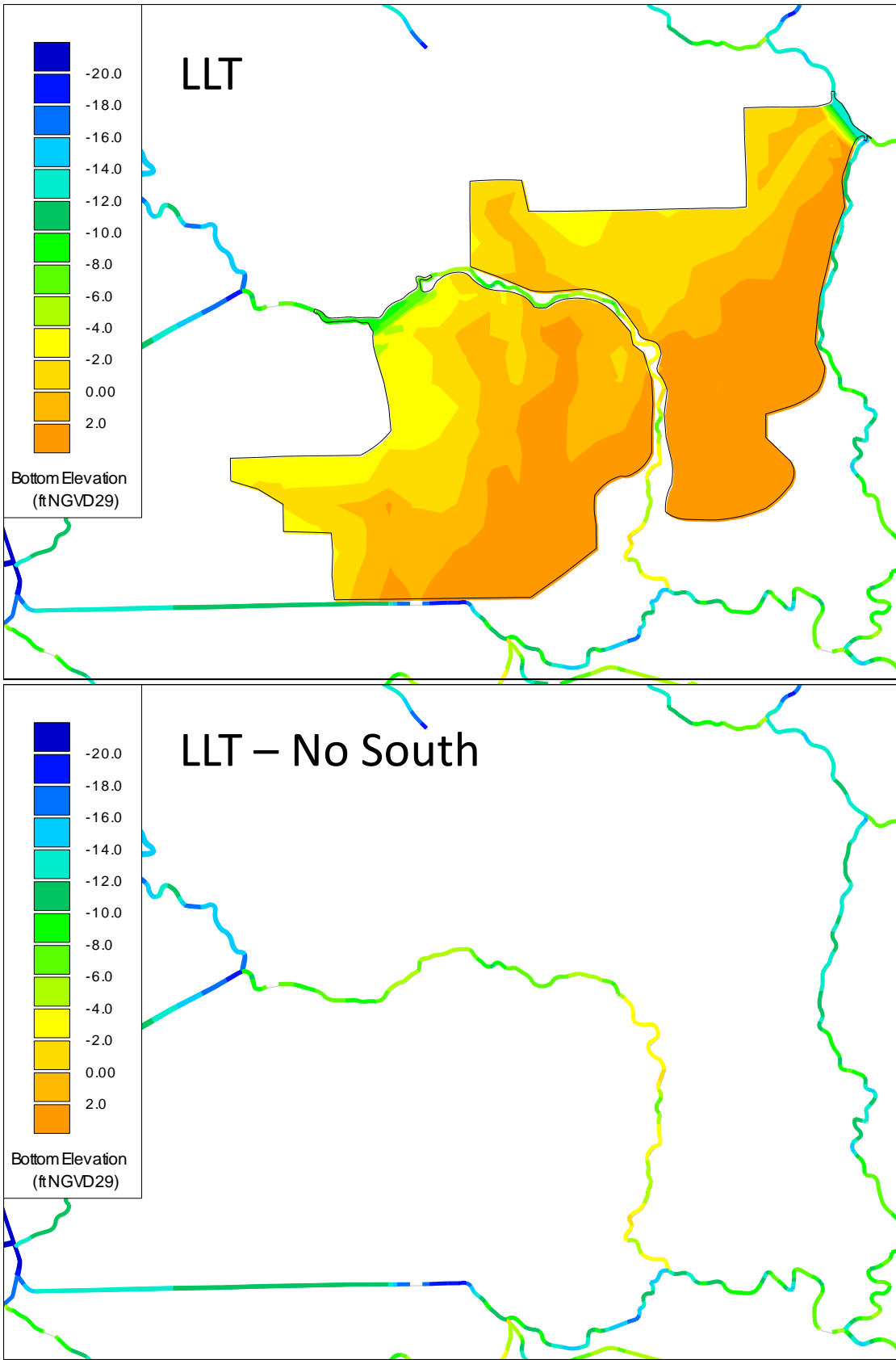


Figure 2-6 Comparison of South Delta ROA geometry for the LLT and LLT - No South scenarios.

2.3.3 LLT – Middle River Conveyance

The Middle River conveyance sensitivity run (LLT – Middle River) is the same as the LLT simulation with widened and deepened Middle River from Railroad Cut to the Union Island breach. The channel was widened based on an empirical hydraulic geometry relationship developed for San Francisco Bay (Williams et al., 2002). This relationship relates area at a cross-section to tidal prism at the cross-section. The sediment in the south Delta is likely to be mostly non-cohesive while San Francisco Bay sediment at the sites for which Williams et al. (2002) developed the empirical hydraulic relationship is mostly cohesive. Furthermore, due to management actions in the south Delta including the use of temporary barriers, it is not clear that an equilibrium geometry is present in Middle River near the restoration site. For this reason the Williams et al. (2002) relationship might not be accurate for the south Delta. However, the predicted equilibrium cross-sectional area at RMID027 was similar to the existing area, providing some evidence of the validity of the Williams et al. (2002) approach for the south Delta. The area for the LLT-Middle River conveyance sensitivity run was determined based on the predicted tidal prism at RMID023 and RMID027 for LLT. This is likely an underestimate of equilibrium cross-sectional area that would result from the south Delta ROAs because the increased cross-sectional area will lead to increased prism in suggesting that an iterative approach would be required to achieve a cross-sectional area that is consistent with the predicted tidal prism.

The final geometry changes for the LLT - Middle River scenario included widening and deepening the Middle River channel from Victoria Canal to the Union Island breach to achieve a 4X increase from base case cross-sectional area, and from Victoria Canal to Woodward Canal to achieve a 1.3X increase from base case area. The Middle River barrier is present but open in the LLT case, but removed completely for the LLT – Middle River case. A comparison of LLT and LLT – Middle River channel geometry is provided in Figure 2-7.

All ROAs and the boundary conditions are the same as for the LLT case.

The sensitivity analysis for the LLT – Middle River case relies on comparisons with the Base – No MRB and LLT simulations.

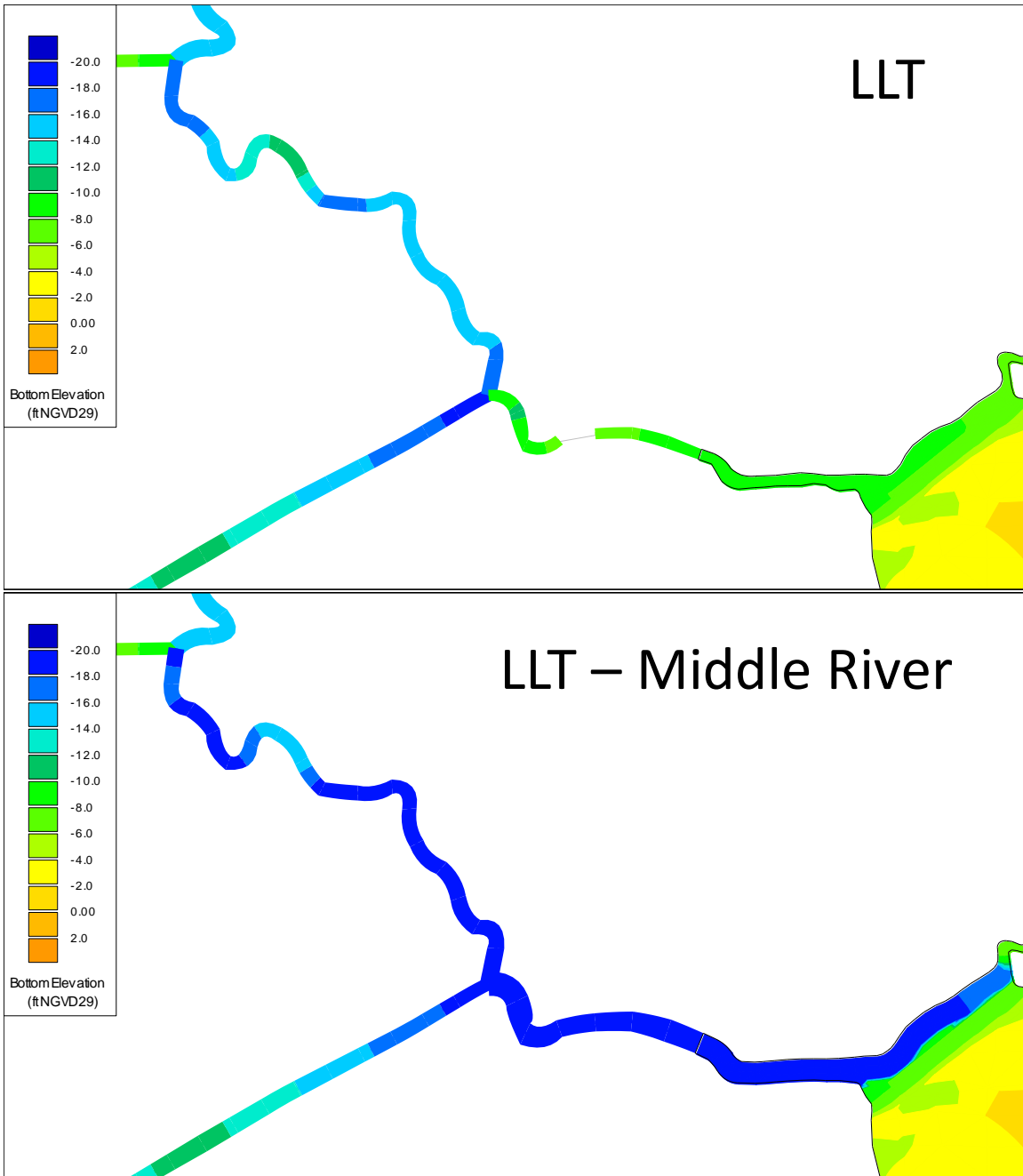


Figure 2-7 Comparison of Middle River channel geometry for the LLT and LLT - Middle River scenarios.

2.3.4 LLT - Suisun Scour

RMA collaborated with ESA PWA to conduct an analysis of channel scour and tidal marsh evolution in Suisun Marsh under the LLT conditions (ESA PWA, 2011). The simulations performed for that study are further analyzed here as a sensitivity case. The LLT grid was modified to reflect evolved tidal marsh and scoured channels as predicted by ESA PWA. This included deepening and widening most channels in the marsh, incised channels in the ROAs, and additional breaches in the ROAs for improved circulation. A comparison of the LLT and LLT – Suisun Scour model geometries is provided in Figure 2-8.

All other ROAs and all boundary conditions are the same as for the LLT case.

The sensitivity analysis for the LLT – Suisun Scour case relies on comparisons with the Base – No MRB and LLT simulations.

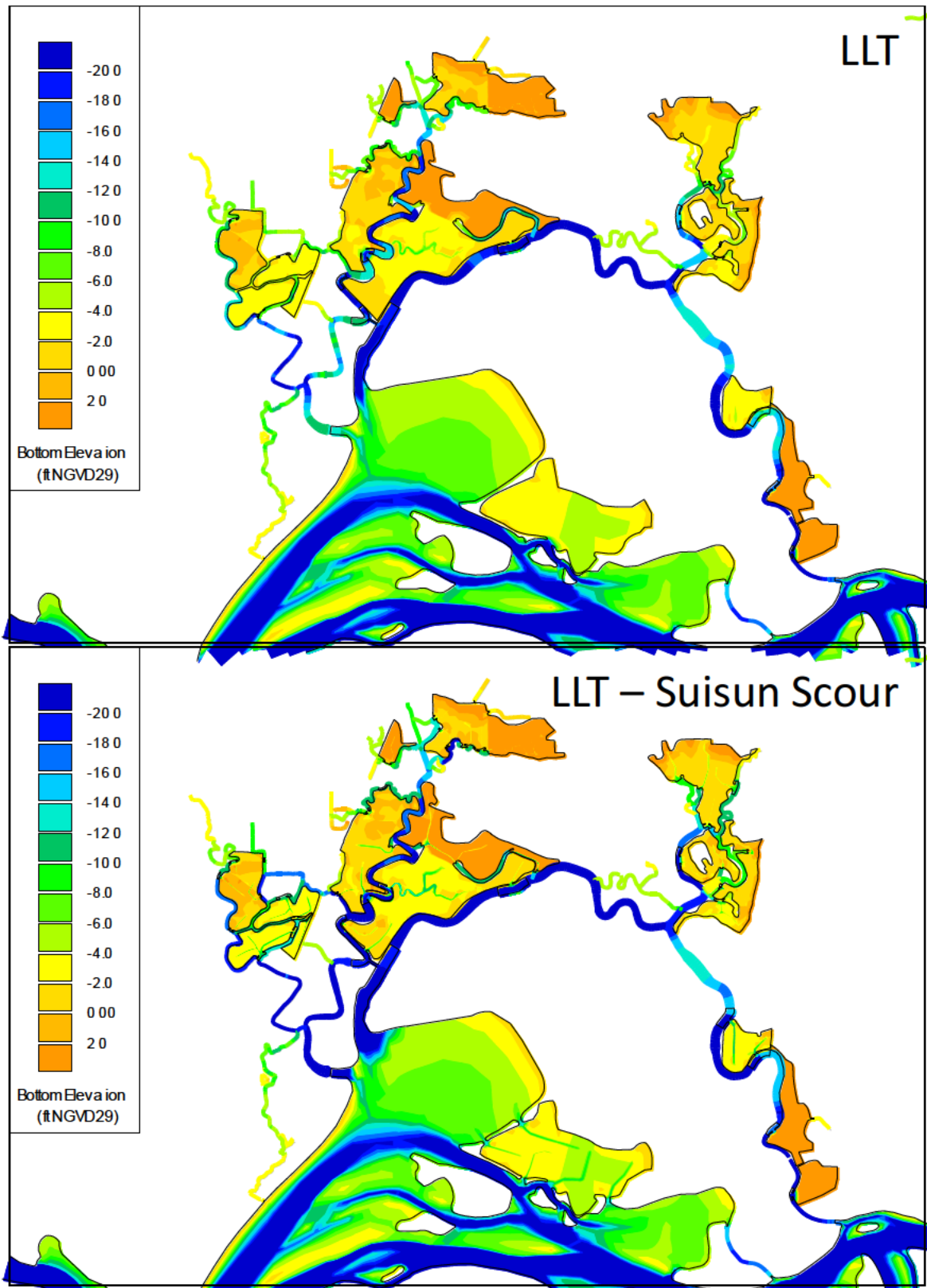


Figure 2-8 Comparison of Suisun Marsh ROA geometry for the LLT and LLT - Suisun Scour scenarios.

2.3.5 ELT – Prospect Breach

In both the ELT and LLT cases, restoration in the Cache Slough ROA includes Prospect Island with breaches on both Miner Slough and the Ship Channel. The flow through effect resulting from this configuration was thought to be impacting flows throughout the north Delta including Delta Cross Channel and Georgiana Slough flows. To discern the exact impact of the flow through Prospect Island, a sensitivity analysis was performed using the ELT configuration but with the Prospect Island breach on Miner Slough removed. The ELT and ELT – Prospect Breach model grids of Prospect Island are shown in Figure 2-9. All ROAs and boundary conditions are otherwise the same as for the ELT case.

The sensitivity analysis for the ELT – Prospect Island case relies on comparisons with the Base – No SMSCG and ELT simulations.

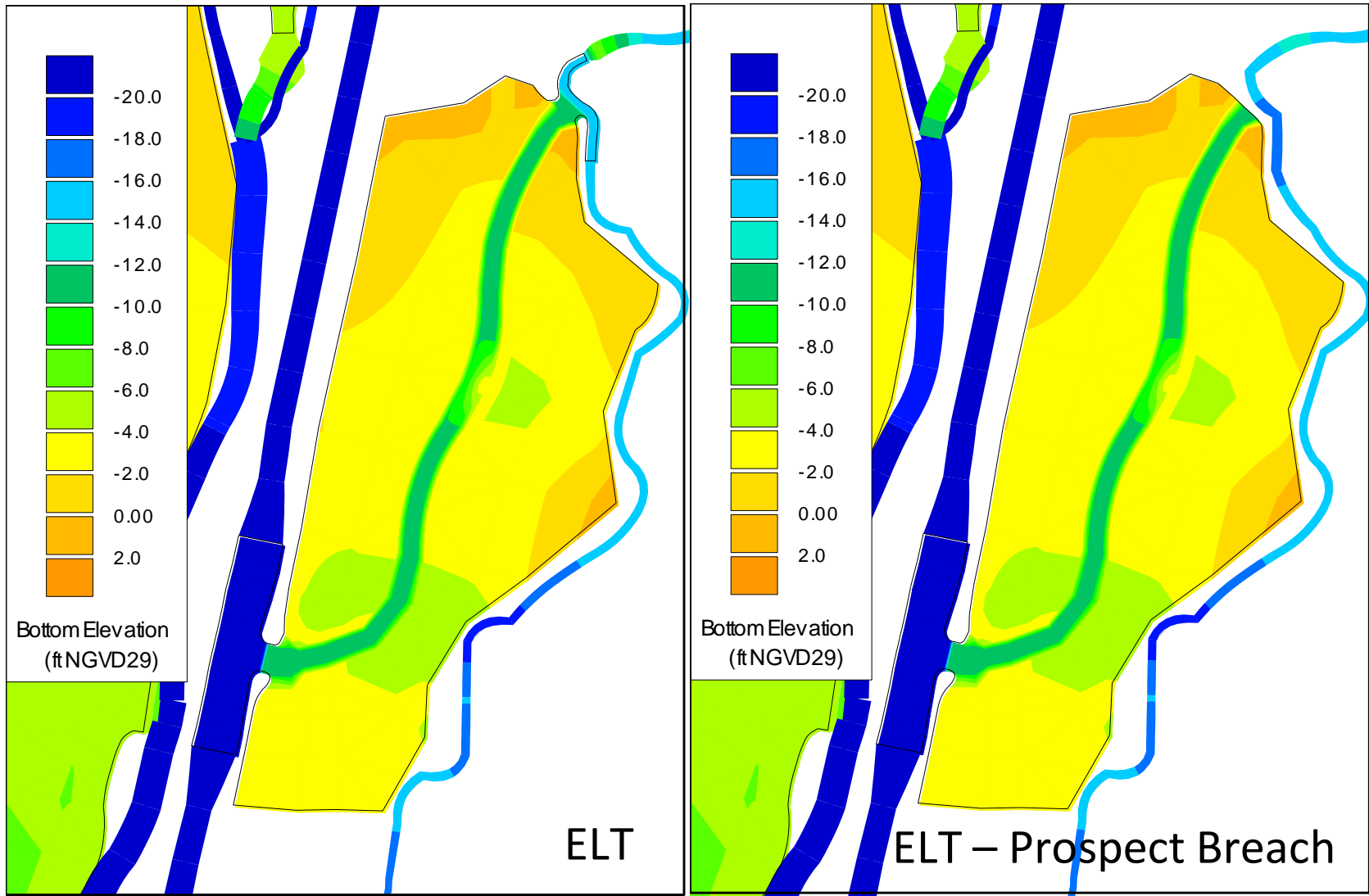


Figure 2-9 Comparison of Prospect Island geometry for the ELT and ELT – Prospect Breach scenarios.

2.3.6 LLT – Little Egbert Breach

For the LLT case, Little Egbert Island was breached on Cache Slough just upstream of Steamboat Slough, and on Lindsey Slough just above Cache Slough. This configuration was chosen to provide additional conveyance. For the LLT – Little Egbert Breach sensitivity case, the Cache Slough breach was removed, eliminating this potential conveyance. The LLT and LLT – Little Egbert Breach model grids of Little Egbert Island are shown in Figure 2-10. All ROAs and boundary conditions are otherwise the same as for the LLT case.

The sensitivity analysis for the LLT – Little Egbert Breach case relies on comparisons with the Base – No MRB and LLT simulations.

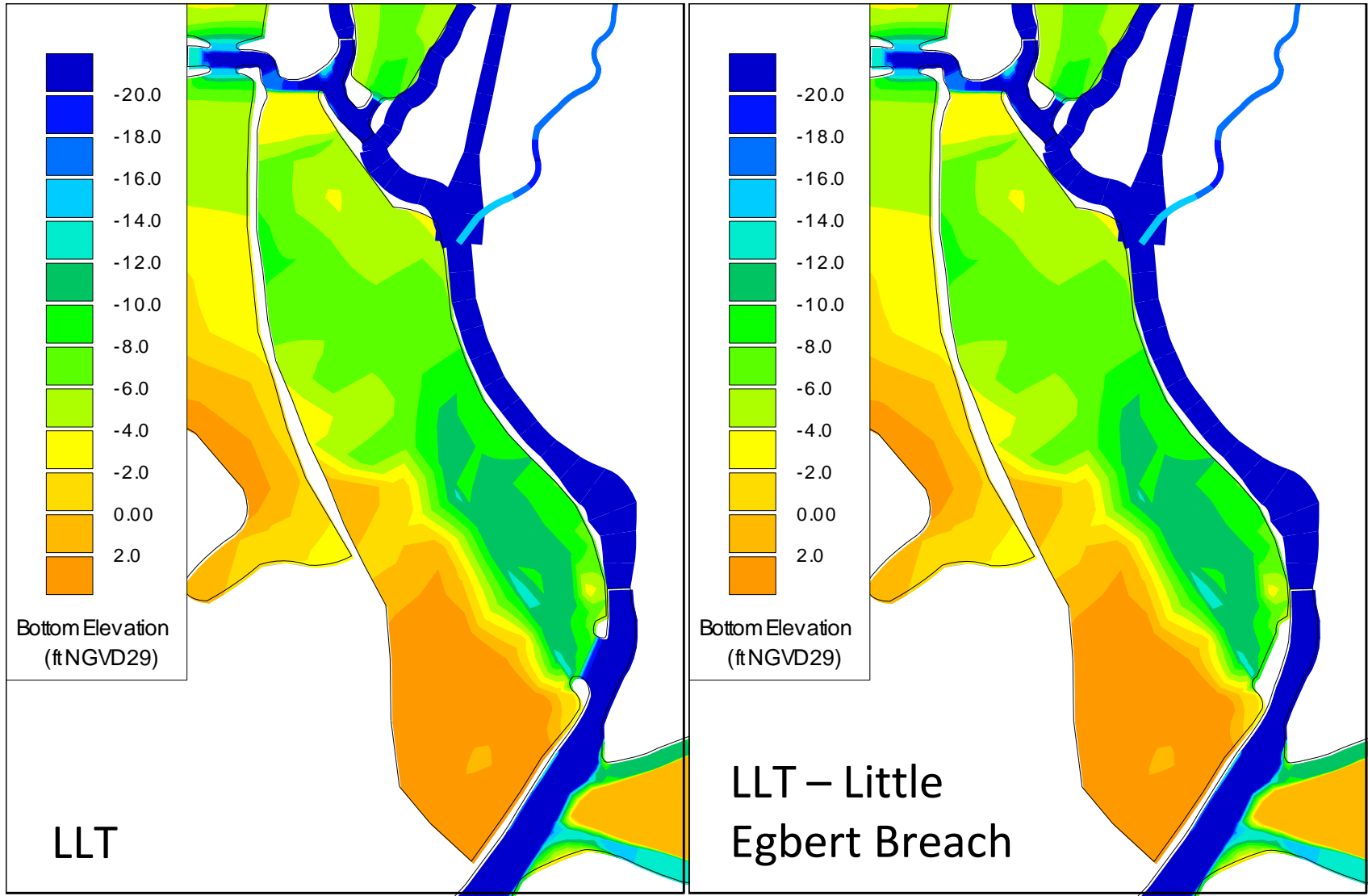


Figure 2-10 Comparison of Little Egbert Tract geometry for the LLT and LLT – Little Egbert Breach scenarios.

2.3.7 LLT – Sherman Breach

For a final breach location sensitivity case, the Sherman Island breach on Threemile Slough in the LLT case was moved to the San Joaquin River. The LLT and LLT – Sherman Breach model grids of Sherman Island are shown in Figure 2-11. All ROAs and boundary conditions are otherwise the same as for the LLT case.

The sensitivity analysis for the LLT – Sherman Breach case relies on comparisons with the Base – No MRB and LLT simulations.

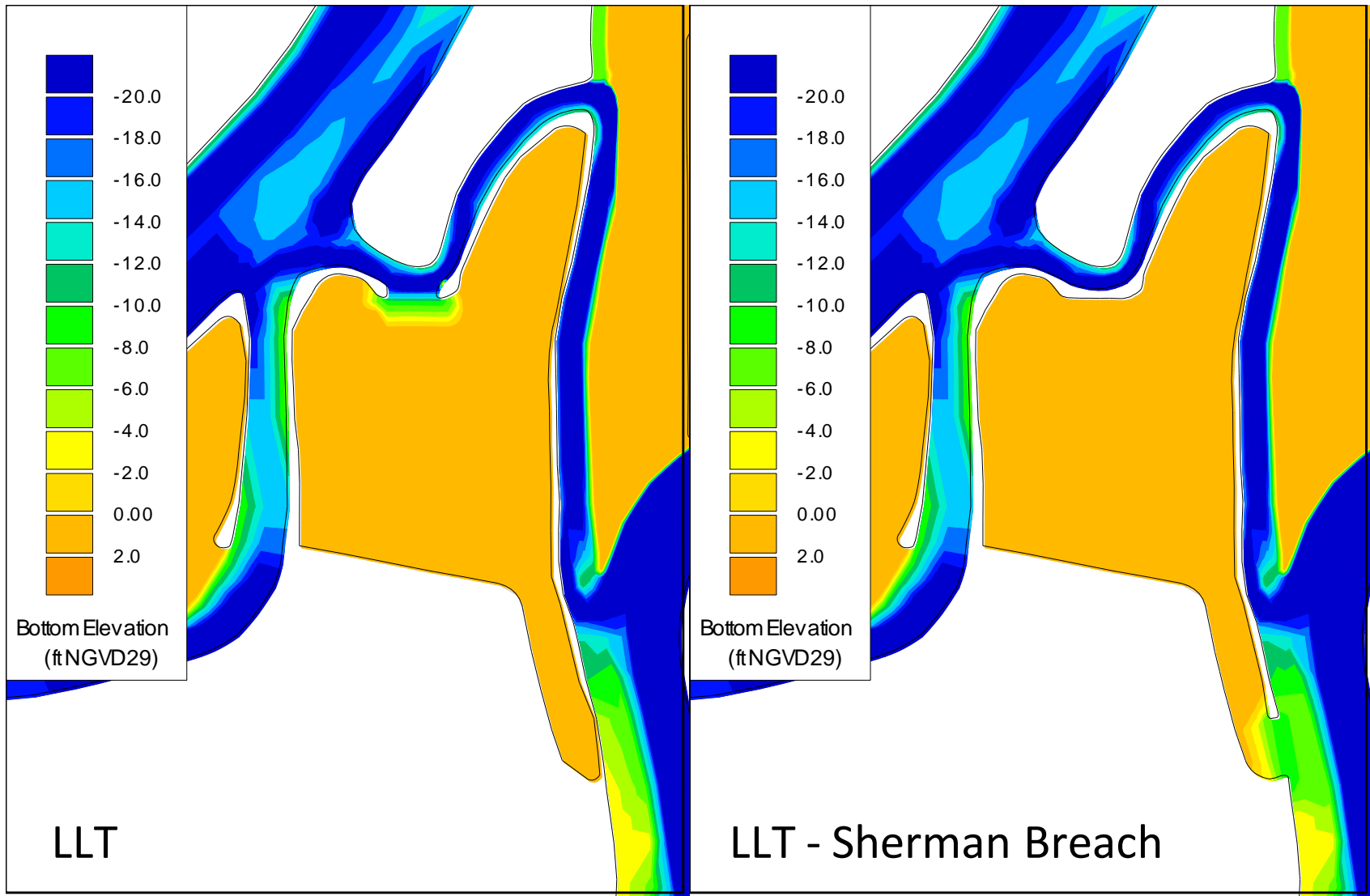


Figure 2-11 Comparison of Sherman Island geometry for the LLT and LLT – Sherman Breach scenarios.

3 Boundary Conditions

The simulation period for the Base Case and the restoration scenarios was from April 2002 through December 2002, a dry period in both the Sacramento and San Joaquin watersheds. Boundary conditions are specified for all inflow and outflow locations and for flow control structures. The locations of the model boundaries are shown in Figure 2-1.

3.1.1 Tidal boundary

The tidal boundary is set at the Golden Gate, the western boundary of the model, using observed data for the NOAA station at San Francisco. These data were smoothed using a 5 point moving average of the 6-minutes data, and shifted to NGVD + 0.1 m. The 0.1 m shift accounts for density effects between the tidal boundary and Suisun Marsh. The result at Martinez varies with Delta outflow, tidal and atmospheric conditions.

3.1.2 Flows, exports, precipitation, evaporation, DICU

Inflow locations in the model are shown in Figure 2-1. Suisun Marsh inflow locations are shown in Figure 3-1.

Time series of daily average inflow boundary conditions are plotted in Figure 3-2 to Figure 3-5 for the 2002-2003 simulation period (the longer period was used for the previous BDCP simulations). These flows are applied for the Sacramento River, Yolo Bypass, Napa River, San Joaquin River, Cosumnes River, Mokelumne River, and miscellaneous eastside flows which include Calaveras River and other minor flows. The model interpolates between the daily average flows at noon each day. Data from Dayflow (<http://www.iep.ca.gov/dayflow/index.html>) and the IEP database (<http://iep.water.ca.gov/dss/>) are used to set these boundary conditions.

Estimated Fairfield Wastewater Treatment Plant (WWTP) flows are plotted in Figure 3-3 (lower) for the 2002-2003 period. The reported average dry weather flow (ADWF) for the Fairfield WWTP is 13.2 – 14.8 mgd, with a peak wet weather capacity of 34.8 mgd. During dry periods, the WWTP flow in the model was set to 14 mgd. Daily precipitation data from the CIMIS station at Suisun Valley were used to estimate wet weather flows. Total wet weather flows were 14 mgd plus an additional flow of 3.8 mgd for each inch of the previous day's precipitation.

Flow data for Suisun Creek at Putah South Canal and Green Valley Creek at Green Valley Country Club are plotted in Figure 3-4 for the 2002-2003 period. Data were provided by Solano County Water Agency. Gaps in the Suisun Creek data were filled using flows estimated from Napa River flows scaled based on drainage area. This Suisun Creek data set was in turn scaled by drainage area for application to Ledgewood and Laurel Creeks.

Delta exports applied in the model include SWP, CVP, Contra Costa exports at Rock Slough and Old River intakes, and North Bay Aqueduct intake at Barker Slough. Exports are plotted for the 2002-2003 period in Figure 3-5. Dayflow and IEP database data are used to set daily average export flows for the CVP, North Bay Aqueduct and Contra Costa's exports.

Hourly SWP export flows for 2003 are computed using the Clifton Court gate ratings and inside and outside water levels. The flows are adjusted on a monthly basis so the total computed flow

matches the monthly SWP export. For 2002, when water levels inside and outside the gates were not available, SWP exports were defined using DSM2 node 72 flow, modified to remove erroneously large flows. Further details on Clifton Court Forebay gate operations can be found in (RMA, 2000), RMA's Flooded Islands Feasibility Study (RMA, 2005), and in (DWR, 2004a).

DICU flows incorporate channel depletions, infiltration, evaporation, and precipitation, as well as Delta island agricultural use (DWR, 1995). DICU values are applied on a monthly average basis and were derived from monthly DSM2 input values (DWR, 1995). Table 3-1 summarizes the total monthly diversions (incorporates agricultural use, evaporation and precipitation), drains (agricultural returns), seeps (channel depletions) and total flows used for DICU flows. Negative flows indicate net withdrawal from the system. These flows are distributed to multiple elements throughout the Delta using an in-house utility program. For the restoration cases, flooding new regions in the Delta may, in reality, change the net Delta consumptive use, possibly affecting net Delta outflow. However, for the sake of modeling DICU was applied the same for the Base and restoration simulations.

Duck club ponds are filled and drained seasonally to provide appropriate habitat and opportunity to attract migrating ducks. Flows had to be estimated to approximate diversion (filling) and return (draining) flows in the vicinity of the marsh. For modeling purposes, it was assumed that they filled at a constant rate (no tidal variation) from a depth of -1.0 ft to +1.0 ft over a 14 day period beginning October 1. The ponds were subsequently drained at a constant rate between March 1 and June 1. Flow rates were computed as the area to be filled multiplied by the depth of water (2.0 ft) divided by the time to fill or drain. No exchange between the modeled marsh flows and the duck club ponds occurred during the summer, from June 1 through October 1.

Evaporation and precipitation data were used to compute flows required to maintain ponds at a constant level from October 15 (following filling) through February. Flow volumes were based on areas for the following locations: Montezuma Slough (East, Middle and West), Suisun Slough, Nurse Slough, Morrow Island (fill only) and Roaring River. Locations of inflow/withdrawal in the Marsh are shown for the Base case mesh in Figure 3-1 – these locations are the same for the four scenarios, as applicable. For the restoration cases, some of the duck club ponds are restored and thus the duck club exchange flows are removed from the model. Those removed for each case are indicated in Figure 3-1.

Daily Suisun Valley CIMIS station precipitation data was used to compute additional inflows from tidal marsh areas during rainfall events. Areas of tidal marsh were estimated and multiplied by the daily precipitation data. Inflows from tidal marsh were input at Beldon's Landing, Boynton Slough, Cutoff Slough, First Mallard Slough, Hill Slough and Peytonia Slough. Locations are shown in Figure 3-1. As some of these areas were added into the grids for the restoration cases, they become subject to the precipitation and evaporation by element type (see Section 3.1.5) and so the inflows are removed from the model. Those removed for each case are indicated in Figure 3-1.

3.1.3 Electrical Conductivity (EC)

The western EC boundary condition at the Golden Gate is set at 50,000 $\mu\text{mhos cm}^{-1}$, the EC of seawater.

EC boundary conditions are set at all inflow boundaries. Table 3-2 gives the source of the EC boundary conditions. Figure 3-6 shows the EC time series boundary conditions at the major boundaries.

3.1.4 Gate and barrier operations

Historical Delta Cross Channel and south Delta barrier operations were included in the model for all cases with the exception of the Middle River barrier, which was kept open for the LLT simulation, associated sensitivity analysis simulations and Base – No MRB simulation.

Suisun Marsh salinity control gates (SMSCG) were kept open for all simulations analyzed in this report.

3.1.5 Precipitation and evaporation by element type

The ability to apply daily time series of precipitation and evaporation was added to the model for the Suisun Marsh simulations. In previous versions of the model, the monthly DICU inflows/outflows were the only evaporation and precipitation inputs, and these were applied to individual model elements only in the Delta. In Suisun Marsh, the impacts of evaporation and short time scale variations in precipitation were incorporated in selected areas of the grid by element type ID, and applied on a per-unit-area basis using daily time series of precipitation and evaporation data from the Suisun Valley CIMIS Station.

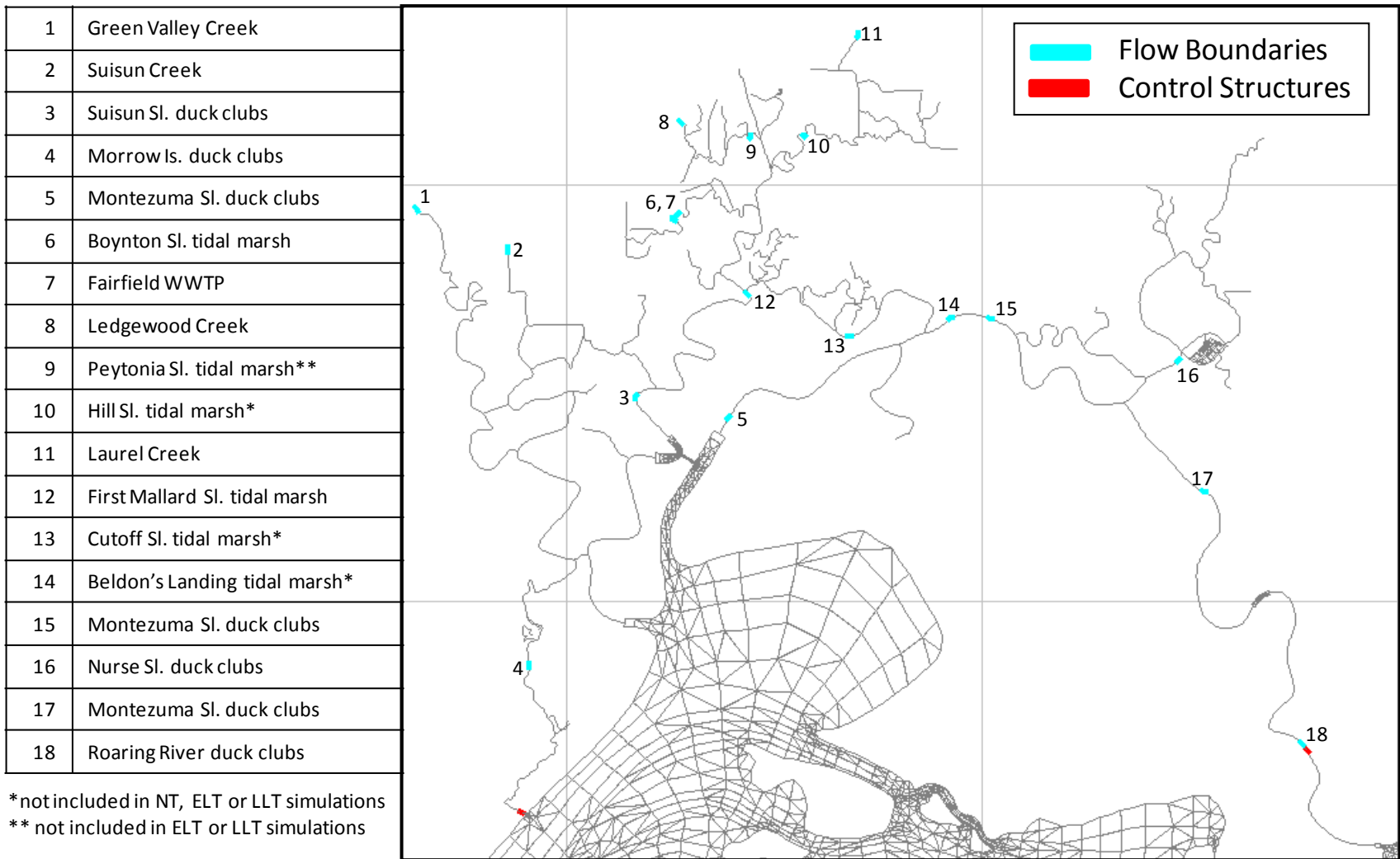


Figure 3-1 Inflow/export locations in Suisun Marsh.

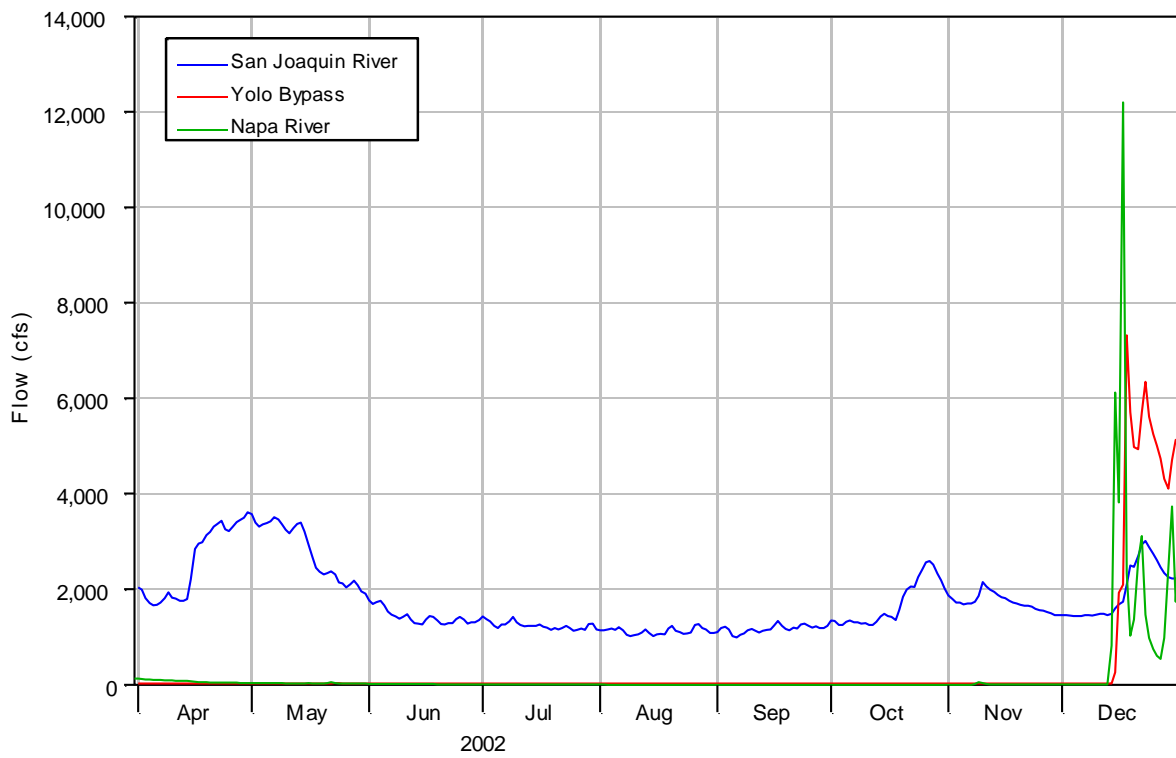
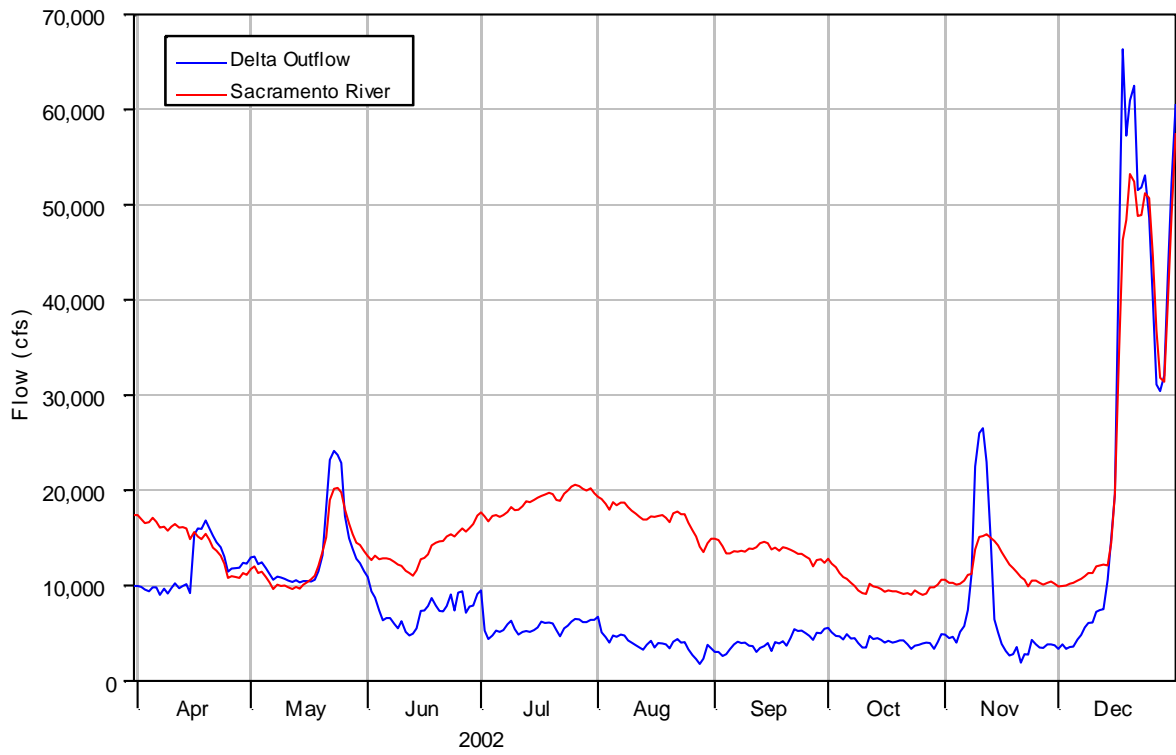


Figure 3-2 Net Delta outflow and major boundary flows for the April – December 2002 simulation period.

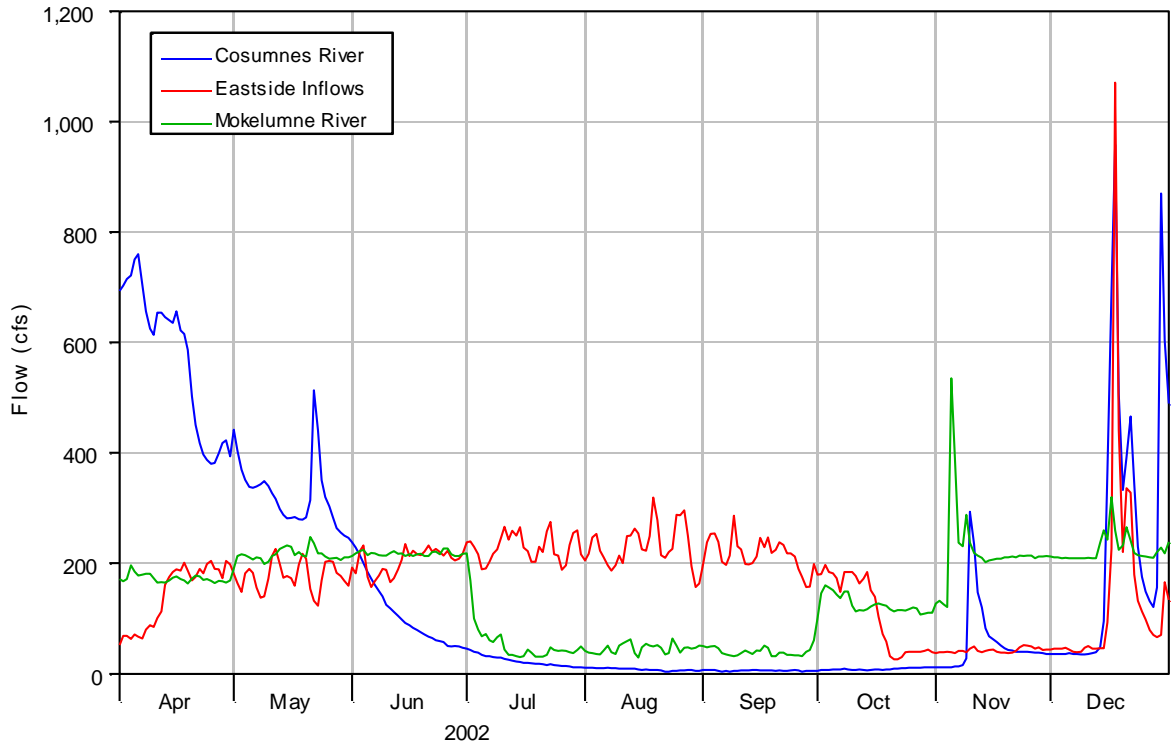


Figure 3-3 Minor boundary flows for the April - December 2002 simulation period.

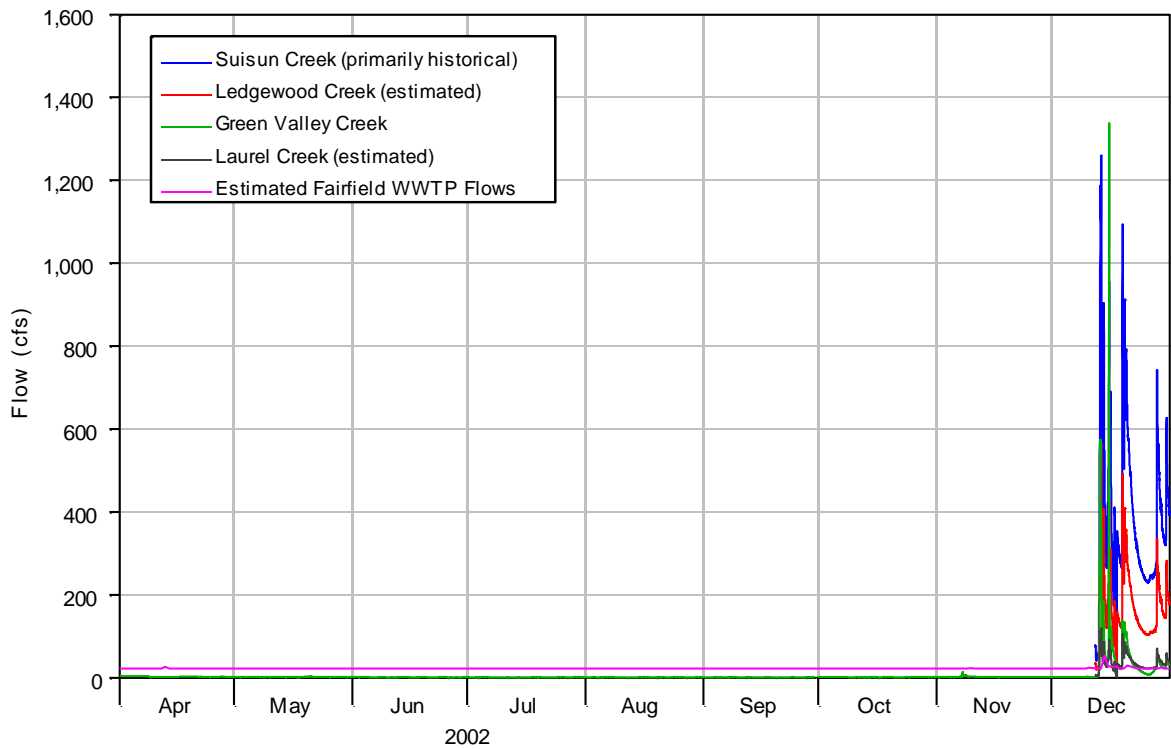


Figure 3-4 Suisun Marsh local creek and WWTP flows for the 2002-2003 simulation period.

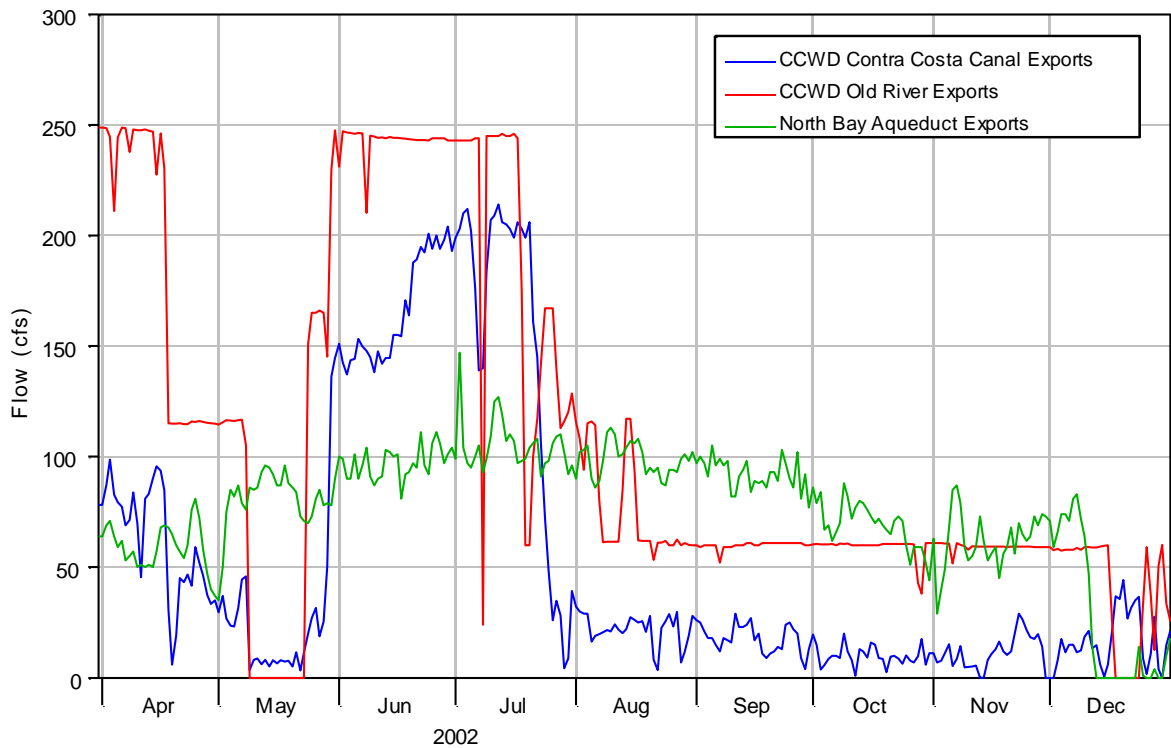
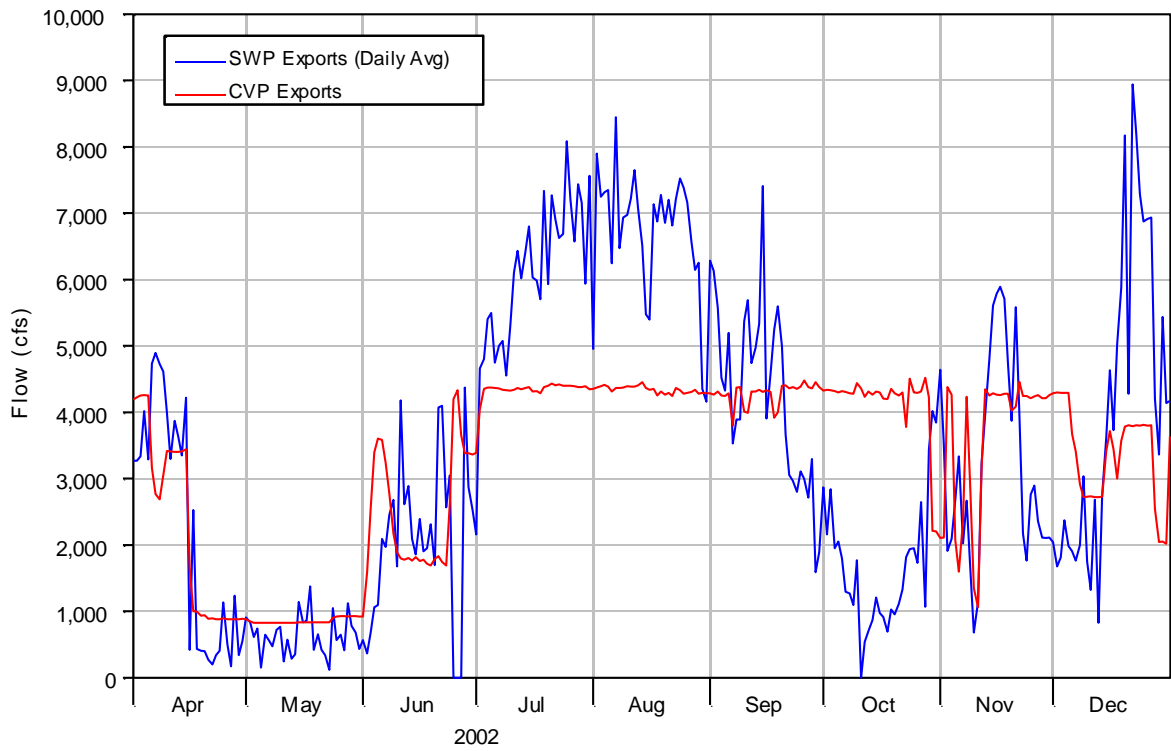


Figure 3-5 Historical exports used in the model for the April – December 2002 simulation period. Note that daily averaged SWP exports are plotted, however the model uses 15-minute inputs.

Table 3-1 Summary of monthly DICU flows ($\text{ft}^3 \text{sec}^{-1}$) for the simulation period. Negative values indicate Delta withdrawal.

| Month | Diversions | Drains | Seeps | Total |
|----------------|-------------------|---------------|--------------|--------------|
| April 2002 | -2109.9 | 1121.8 | -1006.4 | -1994.5 |
| May 2002 | -3978.0 | 1710.4 | -973.4 | -3241.0 |
| June 2002 | -4850.2 | 1995.6 | -1006.4 | -3860.9 |
| July 2002 | -4943.0 | 2011.0 | -973.4 | -3905.4 |
| August 2002 | -2659.8 | 1265.9 | -973.4 | -2367.3 |
| September 2002 | -1231.2 | 848.4 | -1006.2 | -1389.1 |
| October 2002 | -875.2 | 681.1 | -973.2 | -1167.4 |
| November 2002 | -268.9 | 576.2 | -1018.0 | -710.8 |
| December 2002 | -429.2 | 2318.5 | -633.9 | 1255.4 |

Table 3-2 EC boundary conditions.

| Boundary Location | Value ($\mu\text{mhos cm}^{-1}$) | Data Source |
|--|--|--|
| Golden Gate | 50,000 | Seawater EC |
| Sacramento River | Time Series | DWR DSM2 |
| Yolo Bypass | Sac. River Time Series | DWR DSM2 |
| San Joaquin River | Time Series | DWR DSM2 |
| DICU | Monthly Time Series | DWR's DICU model |
| Cosumnes River | 150 | Estimated |
| Mokelumne River | 150 | Estimated |
| Misc. Eastside Rivers | 750 | Estimated |
| Fairfield WWTP | 120 | Estimated |
| Napa River, Green Valley Creek, Suisun Creek, Ledge wood Creek, Laurel Creek | 120 | Estimated; Napa R. based on measured data |
| Duck Club Drains: Nurse Slough drain Suisun Slough drain Roaring River drain Montezuma Slough West Montezuma Slough Middle Montezuma Slough East | Estimated Using Source Time Series Data: | Beldon's Landing Observed EC Boynton Sl. Observed EC, shifted in time Roaring River Observed EC Hunter Cut Observed EC Beldon's Landing Observed EC National Steel Observed EC |
| Tidal Marsh – Boynton Slough Peytonia Slough Hill Slough First Mallard Slough Cutoff Slough Beldon's Landing | Estimated Using Source Time Series Data: | Boynton Sl. Observed EC, shifted in time Hill Slough Observed EC Hill Slough Observed EC Beldon's Landing Observed EC Beldon's Landing Observed EC Beldon's Landing Observed EC |

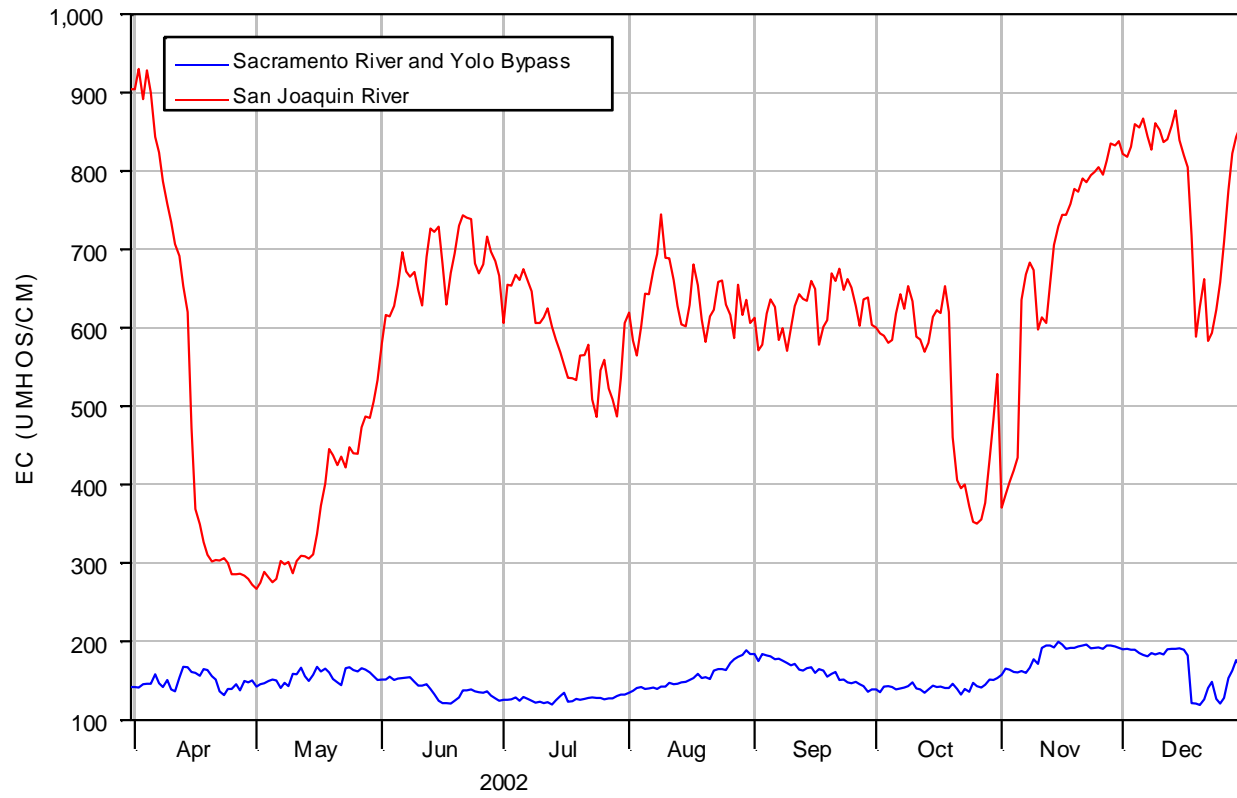


Figure 3-6 Daily EC time series used as boundary conditions for the Sacramento River and Yolo Bypass and for the San Joaquin River for the April – December 2002 simulation period.

4 Hydrodynamic Impacts

4.1 Description of Analysis Types

4.1.1 Net Flows

Net flows have been computed at several locations for each of the scenarios. Net flows were computed as the overall average of flows for the 3-month period of July 1 through September 20, 2002. Values are presented as bar charts plotted spatially. These plots illustrate how the flow distribution changes with the sensitivity scenarios.

The difference in average Delta water surface elevation between the beginning and end of the 3-month average period can slightly affect the net flow computation.

A map of flow locations is shown in Figure 4-1. Directions of ebb (positive) flow for each location are listed in Table 4-1.

Table 4-1 Direction of ebb (positive) flow for analysis locations.

| Location | Ebb (Positive) Direction |
|-----------------------|---------------------------------|
| Cache Sl at Ryer | southeast |
| DCC | east |
| False River | west |
| Martinez | west |
| Miner Slough | west |
| Mokelumne nr SJR | southeast |
| Montezuma Sl at Head | west |
| Montezuma Sl at Mouth | south |
| RMID015 | north |
| RMID027 | west |
| ROLD024 | north |
| ROLD034 | north |
| RSAC075 Chipps Island | west |
| RSAC092 Emmaton | southwest |
| RSAC101 Rio Vista | southwest |
| RSAC123 | west |
| RSAC128 | southeast |
| RSAN018 Jersey Pt | southwest |
| RSAN032 San Andreas | west |
| RSAN058 | northwest |
| SLDUT007 | west |
| SLGEO019 Georgiana Sl | southwest |
| SLTRM004 Threemile Sl | north |
| Steamboat Sl | south |
| Sutter Slough | south |
| Victoria Canal | northeast |

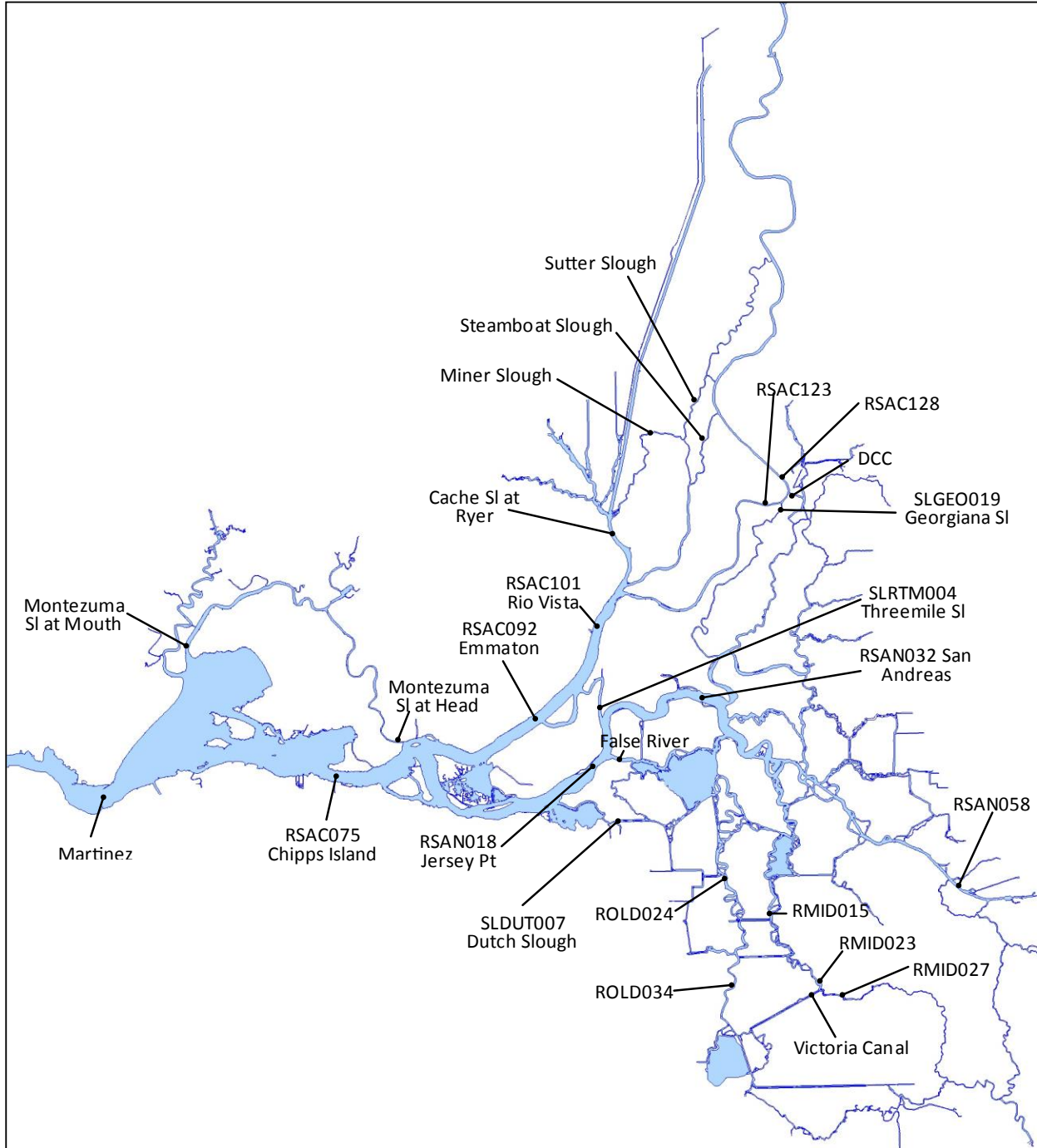


Figure 4-1 Flow, tidal prism and tidal range analysis locations.

4.1.2 Tidal Prism

Tidal prism has been computed at several locations for each of the sensitivity scenarios for the entire April – December 2002 simulation period, and compared with base case and ELT/LLT results. Percent change from base case tidal prism was also calculated. All values are presented as bar charts plotted spatially. These plots illustrate how the tidal flow distribution changes with the sensitivity scenarios. Values are also tabulated with additional locations included.

Tidal flow is computed by subtracting the mean flow $\langle Q \rangle$ from the instantaneous flow Q , giving Q'

$$Q' = Q - \langle Q \rangle$$

The tidal prism is then computed as the volume of tidal flow that passes a cross-section on a flood tide and the individual tidal prism values are averaged to calculate the average predicted tidal prism during the simulation period.

4.1.3 Stage and Tidal Range

“Tidal range” analysis in this report addresses, more specifically, mean diurnal tidal range, or the difference between average MHHW and MLLW. For simplicity, the term “tidal range” is used. Spatially referenced bar charts of tidal range are provided for comparison of relative changes between the base and sensitivity cases. These values are also tabulated, along with additional locations.

Profiles of July 2002 tidal datums (MHHW, MSL and MLLW) comparing the base and sensitivity scenarios are provided for the following.

- Martinez to the upstream Sacramento River boundary.
- Martinez to the upstream San Joaquin River boundary.
- Martinez to the upstream San Joaquin River boundary via Middle River.
- Montezuma Slough from mouth to head.

Inset maps for each plot show the profile locations.

RMA model tidal datum results shown in the profile plots were processed with the “RMA Tools” tidal analysis module developed by DWR (2004b). Mean Lower Low Water (MLLW), Mean Sea Level (MSL), Mean Higher High Water (MHHW) were computed for July 2002. The MLLW analysis provides a measure of changes in the Lower Low minimums averaged over the month. The MHHW analysis quantifies the changes in peak Higher High stage, averaged for the month.

Time series of 15-minute stage results are plotted at various locations for a three-day period in July 2002. A location map is provided in Figure 4-2. Each plot compares a sensitivity case with a base result and the relevant ELT or LLT result.

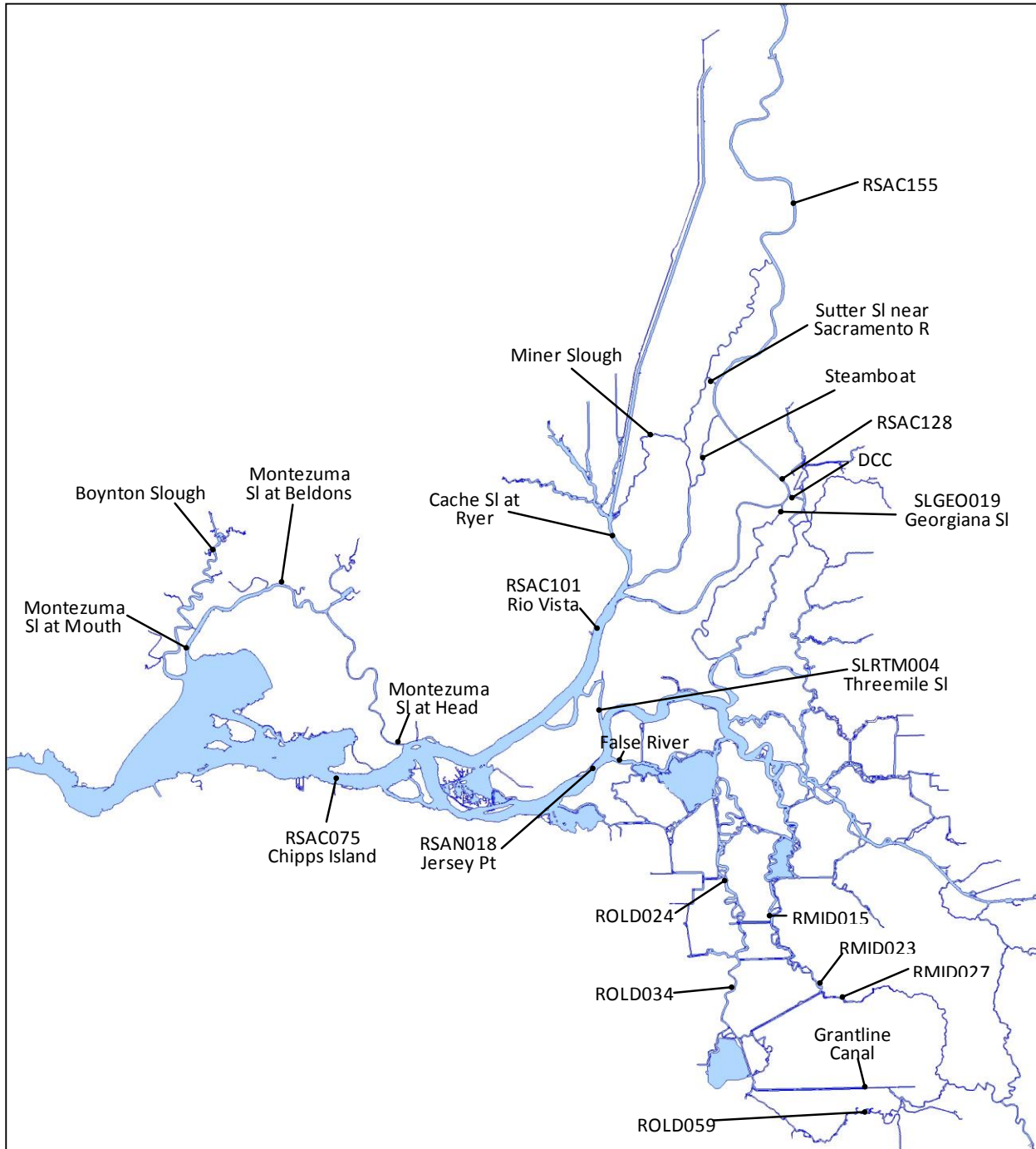


Figure 4-2 Stage time series plot locations.

4.1.4 Bed Shear

For each scenario, bed shear was calculated for the low flow month of July 2002 to help identify areas of scour potential. Spatial contour plots of bed shear for July 2002 are provided at times of peak bed shear for scenarios and locations where bed shear is high and/or it has changed significantly as a result of grid modifications for the sensitivity analyses.

Bed shear is computed using fluid shear velocity for a smooth bed.

4.2 Sensitivity Cases

4.2.1 ELT - Maximize Suisun ROA

The ELT – Max Suisun case is compared with both the ELT and LLT scenarios. The overall restoration acreage is the same as the ELT acreage, however the Suisun Marsh ROA acreage is the same as the LLT acreage.

Three-month average flows for the ELT-Max Suisun simulation are compared with base case, ELT and LLT flows in Table 4-2 and Figure 4-3. Shifting restoration area from the Cache Slough ROA to the Suisun Marsh ROA strongly affects 3-month average flows in Montezuma Slough. At Montezuma Slough at Mouth the flow changes from outflow (towards Suisun Bay) for ELT to inflow (into Montezuma Slough) for ELT – Max Suisun. This is partly caused by additional evaporation in the increased area of ROAs and by differences in spring-neap filling and draining between the scenarios. The 3-month average flow at this location is similar to the LLT, in which restoration acreage in the Suisun ROA is the same.

Flows elsewhere in the Bay-Delta generally change by 2% or less relative to ELT. ELT – Max Suisun outflow at Martinez falls between the ELT and LLT results. Evaporation in Suisun Marsh and spring-neap filling and draining throughout the Delta are, again, likely impacting the results. The overall evaporation is increased because evaporation terms were included in Suisun Marsh ROAs but not Cache Slough ROAs in the RMA Bay Delta model simulations. Additional changes relative to ELT included decreased flow through Miner and Sutter Sloughs, decreased flows in Cache Slough at Ryer, and decreased outflow from the Sacramento River at Emmaton. These changes are all 2% or less, and are reporting with the previous finding that averaged flows in the Sacramento River at Emmaton and Rio Vista increase with increased restoration area. These decreased outflows in the north Delta are roughly balanced by increased flow at RSAC128 and through the Delta Cross Channel. ELT – Max Suisun also has decreased inflow to the San Joaquin River at Jersey Point and decreased inflow to False River. The changes to flows in the south Delta and east Delta were typically small.

Tidal prism results are provided in Table 4-3, Figure 4-4 and Figure 4-5 as volume and percent change from the base case. Shifting restoration area from the Cache Slough ROA to the Suisun Marsh ROA increases tidal prism at Montezuma Slough at Mouth by 5%, relative to ELT. Relative to the LLT case, ELT – Max Suisun tidal prism in Montezuma Slough at mouth is only 1% lower. At the head of Montezuma Slough, ELT – Max Suisun tidal prism is reduced by 2% relative to ELT and by 4% relative to LLT. Thus tidal prism at the mouth seems more impacted by restoration area within Suisun Marsh, whereas tidal prism at the head of the slough is more impacted by upstream restoration area. Tidal prism at Martinez increased by 2%, relative to ELT. Tidal prism changes in the south Delta and east Delta were small. Tidal prism decreased in most of the Delta in ELT – Max Suisun relative to ELT. This was expected due to the increase in tidal prism and energy dissipation in Suisun Marsh. Tidal prism decreased by 3% in Cache Slough at Ryer, partially due to the decreased acreage of ROAs in the Cache Slough Complex for the ELT – Max Suisun case. Tidal prism increased in Miner Slough by 6% and in Sutter slough by 3%. Particularly significant tidal prism changes in Georgiana Slough were caused by changes in tidal phase for the ELT – Max Suisun case. Tidal prism decreased by 8% in

Georgiana Slough but decreased only 1% in the Delta Cross Channel and 2% at RSAC128. Tidal prism changes in the south Delta and east Delta were typically small.

Tidal range results are provided in Table 4-7 and Figure 4-6. Tidal range decreased by 4% at Montezuma Slough at Head and by 6% at Montezuma Slough at Mouth for ELT – Max Suisun relative to ELT. Tidal range increased by 0.5-1% at Cache Slough at Ryer and in Miner and Sutter Sloughs due to the reduced ROA acreage in the Cache Slough ROA. Throughout Suisun Bay and the west Delta, tidal range decreased by 2% to 4% for ELT – Max Suisun relative to ELT. In the south Delta and east Delta smaller decreases in tidal range were predicted to result from shifting restoration area from the Cache Slough ROA to the Suisun Marsh ROA. These results indicate, as noted in previous BDCP work, that increased restoration leads to decreased tidal range both locally and landward of the ROAs.

Profile plots of July 2002 MHHW, MSL and MLLW, in Figure 4-7 through Figure 4-10, show that the ELT – Max Suisun tidal range is similar to the LLT tidal range downstream of Chipps Island and in Montezuma Slough. The Suisun Marsh ROA acreage has the most important impact in this area. In the Sacramento River upstream of Rio Vista and in the upstream portion of San Joaquin River, the ELT – Max Suisun tidal range is similar to the ELT case. The overall restoration acreage has the most important impact in these areas.

For reference, time series plots of stage are provided for various locations in Figure 4-11 through Figure 4-25. A map of locations plotted is shown in Figure 4-2.

There are no new or resolved bed shear issues for this sensitivity case.

4.2.1.1 Net Flows

Table 4-2 Summary of 3-month Average flow (Jul – Sep 2002) for Base – No SMSCG, ELT, ELT - Max Suisun and LLT simulations.

| Location | 3-month Average Flow, Jul – Sep 2002 (cfs) | | | |
|-----------------------|--|-------|------------------|-------|
| | Base – No SMSCG | ELT | ELT – Max Suisun | LLT |
| Cache Sl at Ryer | 1535 | 2167 | 2132 | 2565 |
| DCC | 4609 | 3661 | 3686 | 3449 |
| False River | -1696 | -1837 | -1797 | -1806 |
| Martinez | 4423 | 4241 | 4148 | 4080 |
| Miner Slough | 2018 | 2681 | 2637 | 2667 |
| Mokelumne nr SJR | 4721 | 4157 | 4175 | 3781 |
| Montezuma Sl at Head | 12 | -10 | 38 | 13 |
| Montezuma Sl at Mouth | -71 | 85 | -172 | -191 |
| RMID015 | -5406 | -5384 | -5380 | -5265 |
| RMID027 | -58 | -58 | -59 | -45 |
| ROLD024 | -4402 | -4421 | -4430 | -4541 |
| ROLD034 | -6452 | -6443 | -6445 | -6603 |
| RSAC075 Chipps Island | 4504 | 4474 | 4422 | 4395 |
| RSAC092 Emmaton | 5873 | 6321 | 6296 | 6484 |
| RSAC101 Rio Vista | 8255 | 9273 | 9255 | 9712 |
| RSAC123 | 3607 | 3991 | 3992 | 4258 |
| RSAC128 | 10999 | 10338 | 10365 | 10137 |
| RSAN018 Jersey Pt | -1002 | -1695 | -1668 | -1914 |
| RSAN032 San Andreas | -1720 | -2750 | -2755 | -3216 |
| RSAN058 | 389 | 383 | 388 | 391 |
| SLDUT007 | -112 | 84 | 87 | 68 |
| SLGEO019 Georgiana Sl | 2762 | 2665 | 2666 | 2408 |
| SLTRM004 Threemile Sl | -2310 | -2732 | -2741 | -3012 |
| Steamboat Sl | 2280 | 2471 | 2471 | 2629 |
| Sutter Sl | 2965 | 3436 | 3408 | 3480 |

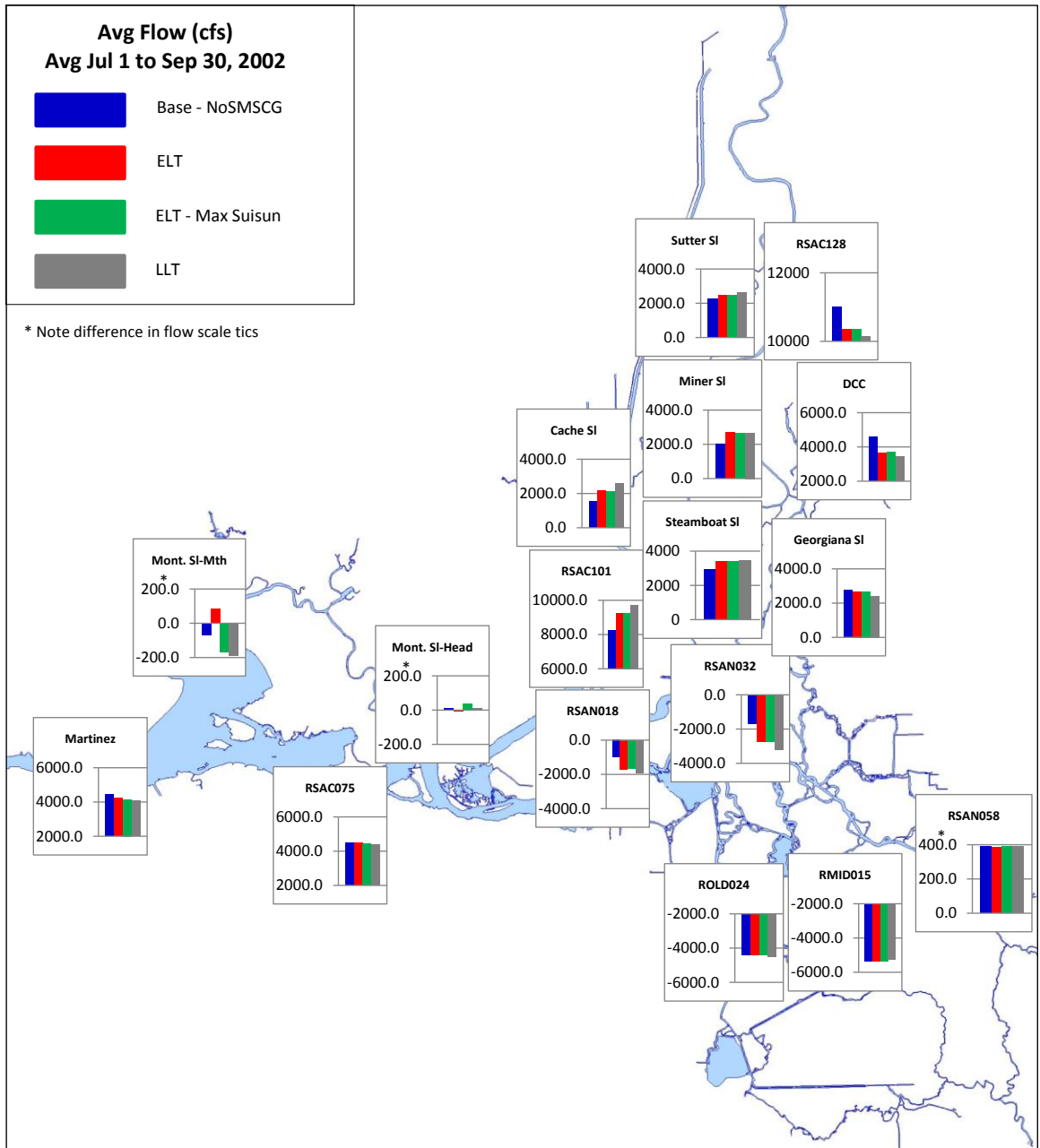


Figure 4-3 Average flows (Jul - Sep 2002) for Base – No SMSCG, ELT, ELT - Max Suisun and LLT simulations.

4.2.1.2 Tidal Prism

Table 4-3 Summary of Apr – Dec 2002 Average Tidal Prism for Base – No SMSCG, ELT, ELT - Max Suisun and LLT simulations, and percent change from Base – No SMSCG.

| Location | Base – No SMSCG | ELT | | ELT – Max Suisun | | LLT | |
|-----------------------|---------------------|---------------------|--------------------|---------------------|--------------------|---------------------|--------------------|
| | Tidal Prism (ac-ft) | Tidal Prism (ac-ft) | % Change from Base | Tidal Prism (ac-ft) | % Change from Base | Tidal Prism (ac-ft) | % Change from Base |
| Cache Sl at Ryer | 28,681 | 30,744 | 7% | 29,685 | 4% | 26,884 | -6% |
| DCC | 783 | 1,225 | 57% | 1,210 | 55% | 949 | 21% |
| False River | 18,890 | 17,565 | -7% | 17,137 | -9% | 16,508 | -13% |
| Martinez | 167,685 | 169,171 | 1% | 173,144 | 3% | 170,966 | 2% |
| Miner Slough | 618 | 578 | -6% | 611 | -1% | 455 | -26% |
| Mokelumne nr SJR | 4,613 | 4,509 | -2% | 4,410 | -4% | 4,490 | -3% |
| Montezuma Sl at Head | 2,054 | 3,221 | 87% | 3,148 | 82% | 3,283 | 90% |
| Montezuma Sl at Mouth | 10,987 | 21,983 | 95% | 22,981 | 104% | 23,108 | 105% |
| RMID015 | 4,021 | 3,704 | -8% | 3,623 | -10% | 3,333 | -17% |
| RMID027 | 243 | 231 | -5% | 228 | -6% | 1,784 | 634% |
| ROLD024 | 4,412 | 4,090 | -7% | 3,993 | -9% | 3,655 | -17% |
| ROLD034 | 2,289 | 2,107 | -8% | 2,074 | -9% | 1,960 | -14% |
| RSAC075 Chipps Island | 115,295 | 110,508 | -4% | 109,192 | -5% | 108,506 | -6% |
| RSAC092 Emmaton | 49,254 | 49,180 | 0% | 48,011 | -2% | 50,591 | 3% |
| RSAC101 Rio Vista | 36,156 | 36,783 | 2% | 35,715 | -1% | 40,582 | 12% |
| RSAC123 | 2,501 | 2,252 | -10% | 2,220 | -11% | 1,811 | -28% |
| RSAC128 | 1,605 | 1,130 | -30% | 1,103 | -31% | 1,175 | -27% |
| RSAN018 Jersey Pt | 50,165 | 46,935 | -6% | 45,670 | -9% | 44,549 | -11% |
| RSAN032 San Andreas | 37,894 | 35,019 | -7% | 34,045 | -10% | 32,450 | -14% |
| RSAN058 | 2,386 | 2,173 | -9% | 2,121 | -11% | 2,603 | 9% |
| SLDUT007 | 3,076 | 2,368 | -23% | 2,319 | -25% | 2,226 | -28% |
| SLGEO019 Georgiana Sl | 224 | 301 | 35% | 278 | 24% | 415 | 86% |
| SLTRM004 Threemile Sl | 9,431 | 7,921 | -16% | 7,714 | -18% | 6,526 | -31% |
| Steamboat Sl | 914 | 784 | -14% | 777 | -15% | 598 | -35% |
| Sutter Sl | 823 | 726 | -12% | 744 | -10% | 574 | -30% |

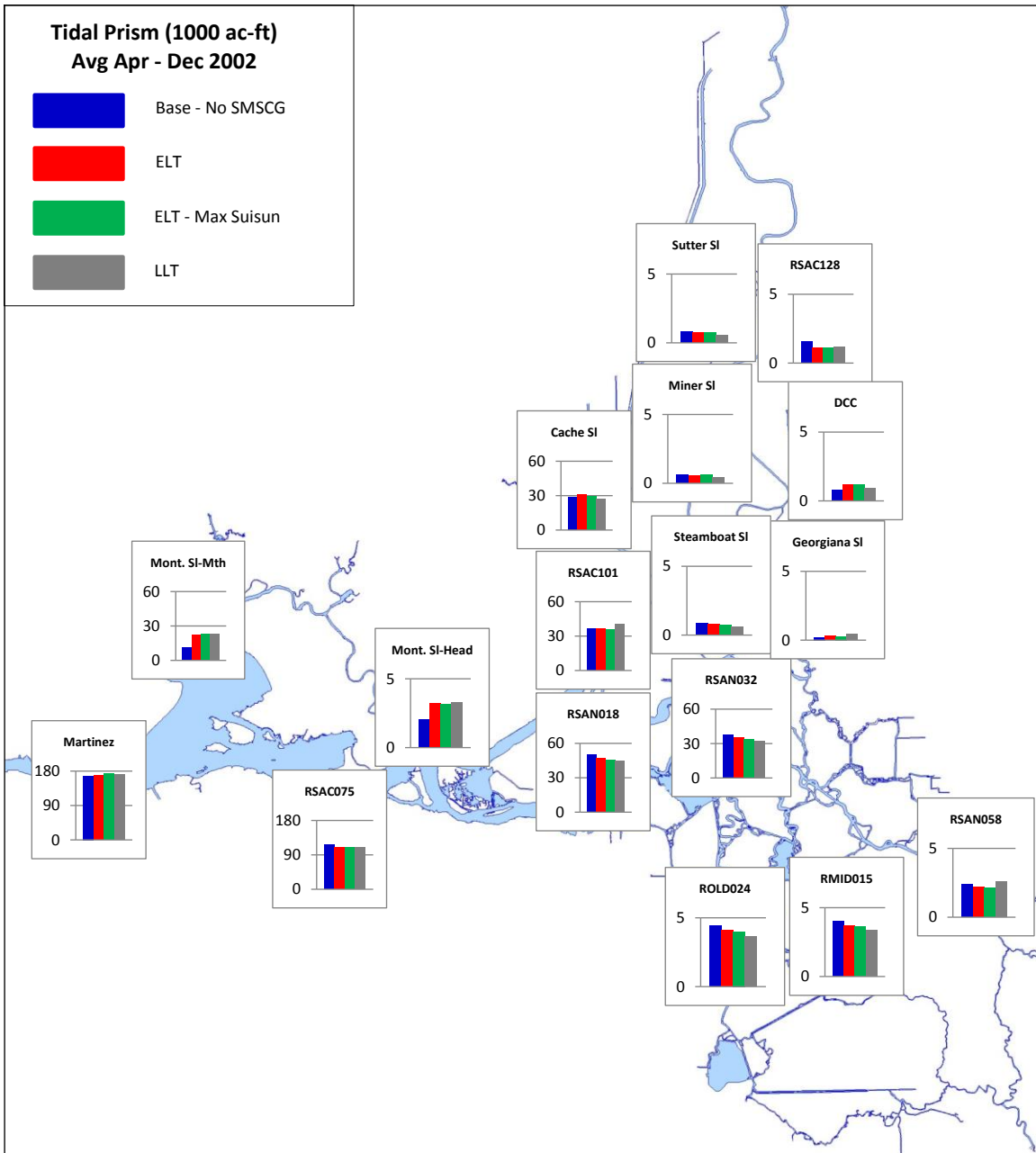


Figure 4-4 Average tidal prism (Apr - Dec 2002) for Base – No SMSCG, ELT, ELT - Max Suisun and LLT simulations.

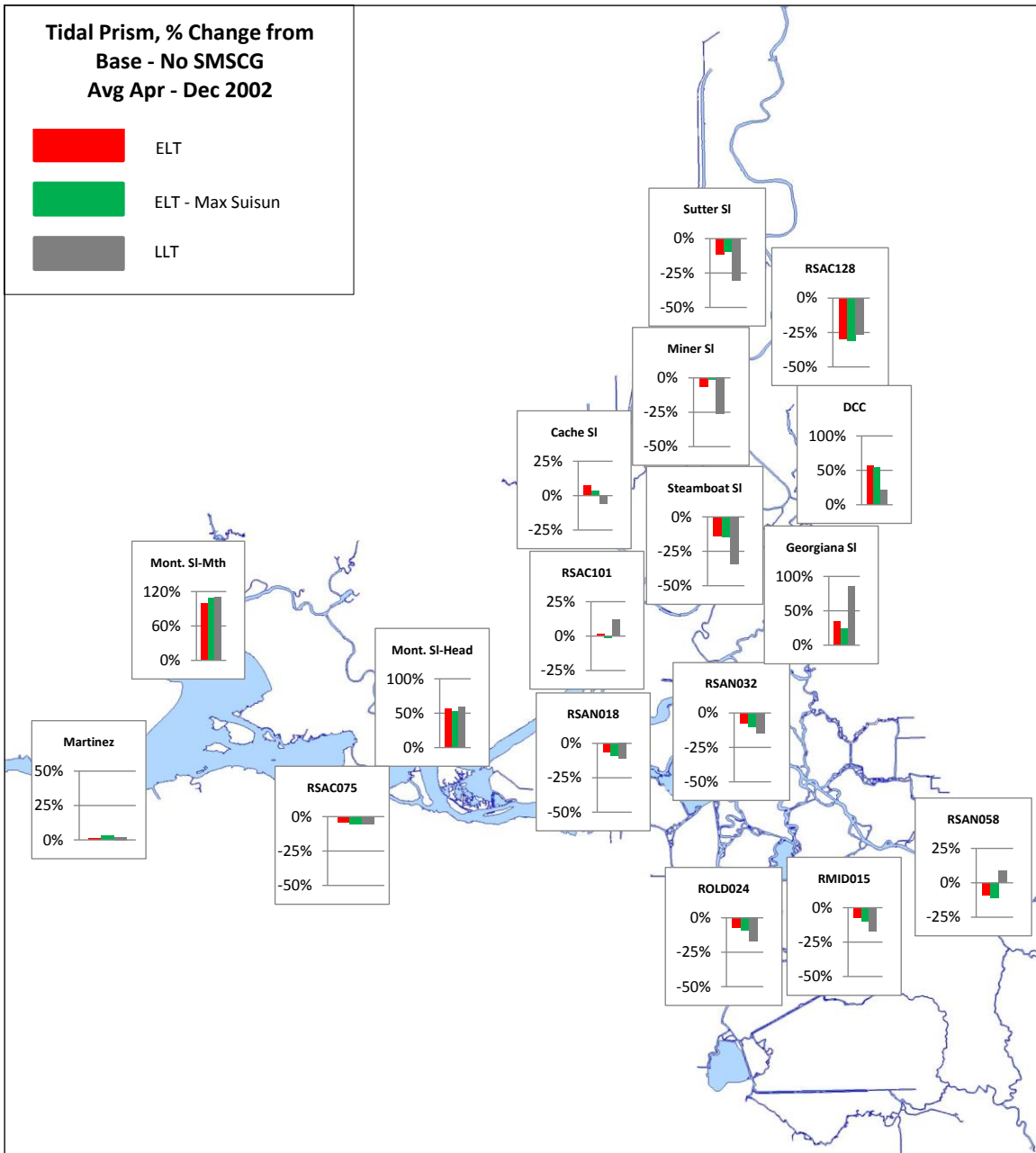


Figure 4-5 Average percent change from Base – No SMSCG tidal prism (Apr - Dec 2002) for ELT, ELT - Max Suisun and LLT simulations.

4.2.1.3 Tidal Range

Table 4-4 Summary of Apr – Dec 2002 Average Tidal Range for Base – No SMSCG, ELT, ELT - Max Suisun and LLT simulations.

| Location | Apr – Dec 2002 Average Tidal Range (ft) | | | |
|-----------------------|---|------|------------------|------|
| | Base – No SMSCG | ELT | ELT – Max Suisun | LLT |
| Cache Sl at Ryer | 3.95 | 3.21 | 3.24 | 2.75 |
| DCC | 2.92 | 2.31 | 2.3 | 2.11 |
| False River | 3.4 | 3.08 | 3.0 | 2.93 |
| Martinez | 5.47 | 5.24 | 5.1 | 5.14 |
| Miner Slough | 3.11 | 3.01 | 3.04 | 2.62 |
| Montezuma Sl at Head | 4.25 | 3.85 | 3.69 | 3.64 |
| Montezuma Sl at Mouth | 5.0 | 4.32 | 4.04 | 4.05 |
| RMID015 | 3.77 | 3.45 | 3.38 | 3.14 |
| RMID023 | 3.54 | 3.27 | 3.2 | 2.48 |
| ROLD024 | 3.56 | 3.27 | 3.2 | 3.02 |
| ROLD034 | 3.41 | 3.15 | 3.09 | 2.73 |
| RSAC075 Chipps Island | 4.42 | 4.04 | 3.87 | 3.85 |
| RSAC092 Emmaton | 3.93 | 3.52 | 3.42 | 3.23 |
| RSAC101 Rio Vista | 3.87 | 3.23 | 3.2 | 2.79 |
| RSAC123 | 2.95 | 2.34 | 2.33 | 2.14 |
| RSAC128 | 2.91 | 2.33 | 2.32 | 2.12 |
| RSAN018 Jersey Pt | 3.47 | 3.13 | 3.05 | 2.98 |
| RSAN032 San Andreas | 3.37 | 3.07 | 3.00 | 2.89 |
| RSAN058 | 4.06 | 3.69 | 3.61 | 3.25 |
| SLDUT007 Dutch Slough | 3.59 | 3.19 | 3.1 | 3.04 |
| SLGEO019 Georgiana Sl | 2.95 | 2.36 | 2.35 | 2.16 |
| SLTRM004 Threemile Sl | 3.45 | 3.09 | 3.02 | 2.9 |
| Steamboat Sl | 2.69 | 2.22 | 2.22 | 1.99 |
| Sutter Sl | 2.57 | 2.17 | 2.18 | 1.94 |
| Victoria Canal | 3.54 | 3.28 | 3.21 | 2.48 |

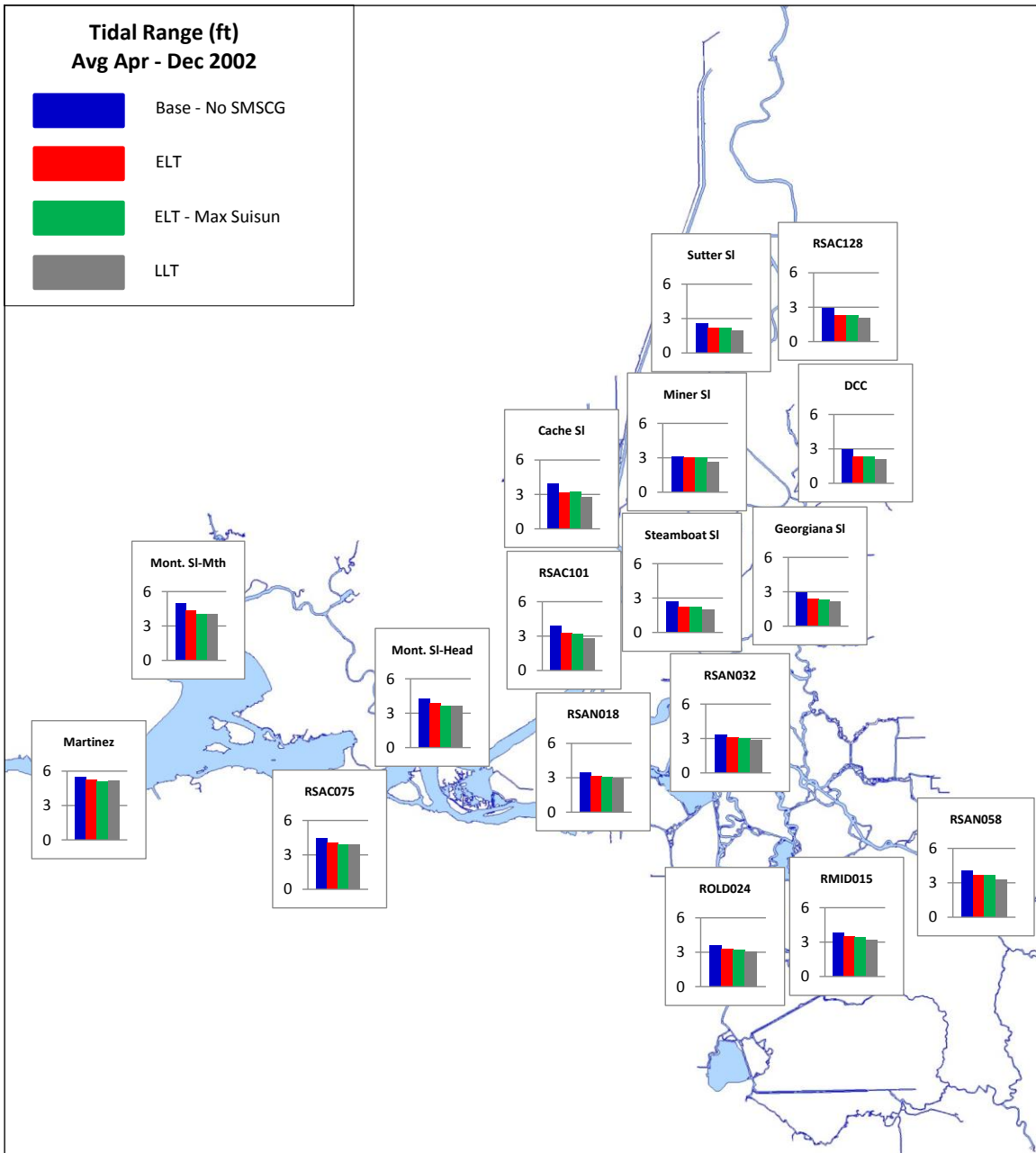


Figure 4-6 Average tidal range (Apr - Dec 2002) for Base – No SMSCG, ELT, ELT - Max Suisun and LLT simulations.

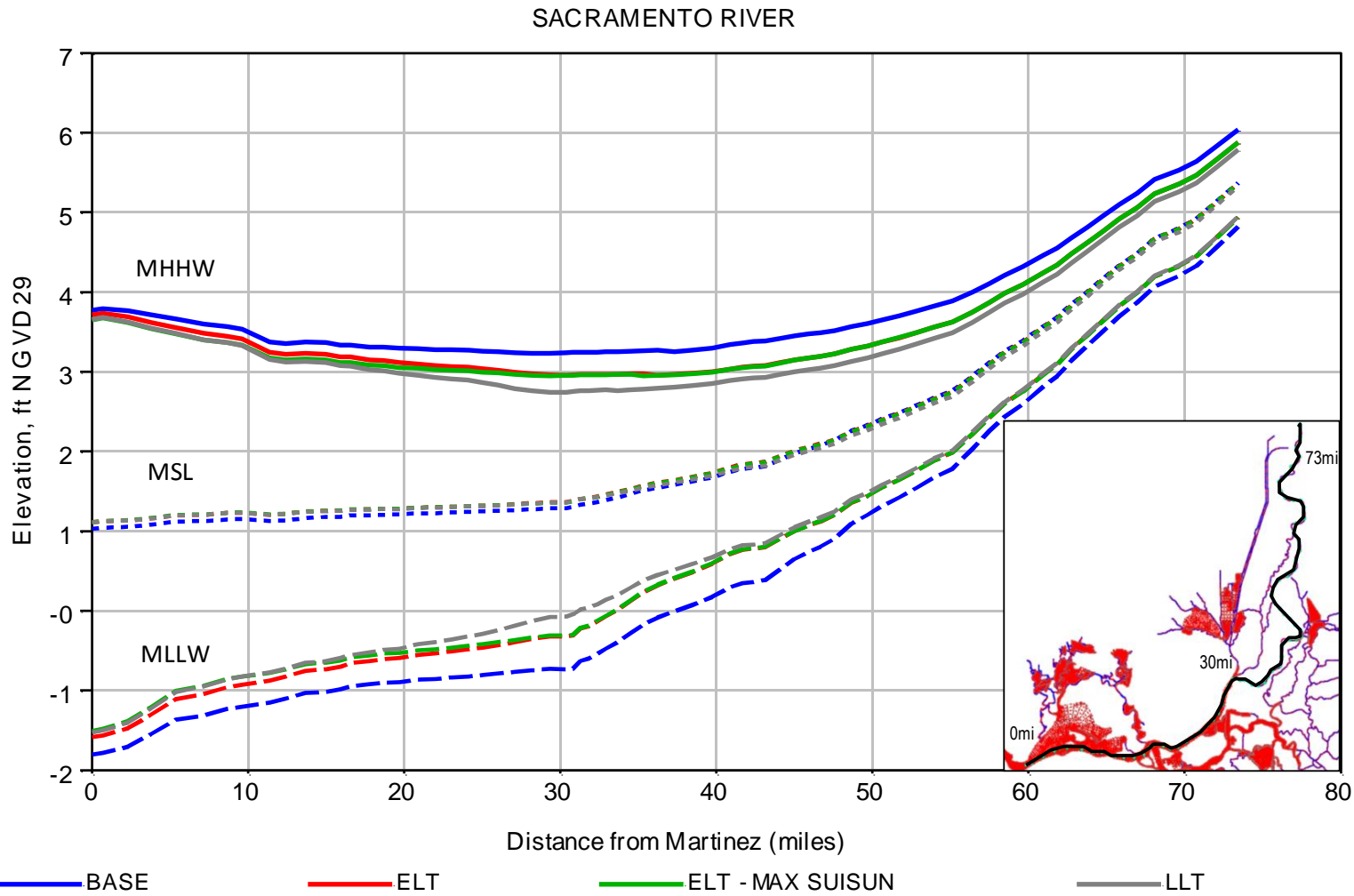


Figure 4-7 Profiles of July 2002 MHHW, MSL and MLLW along the Sacramento River for the Base – No SMSCG (Base), ELT and ELT - Max Suisun simulations.

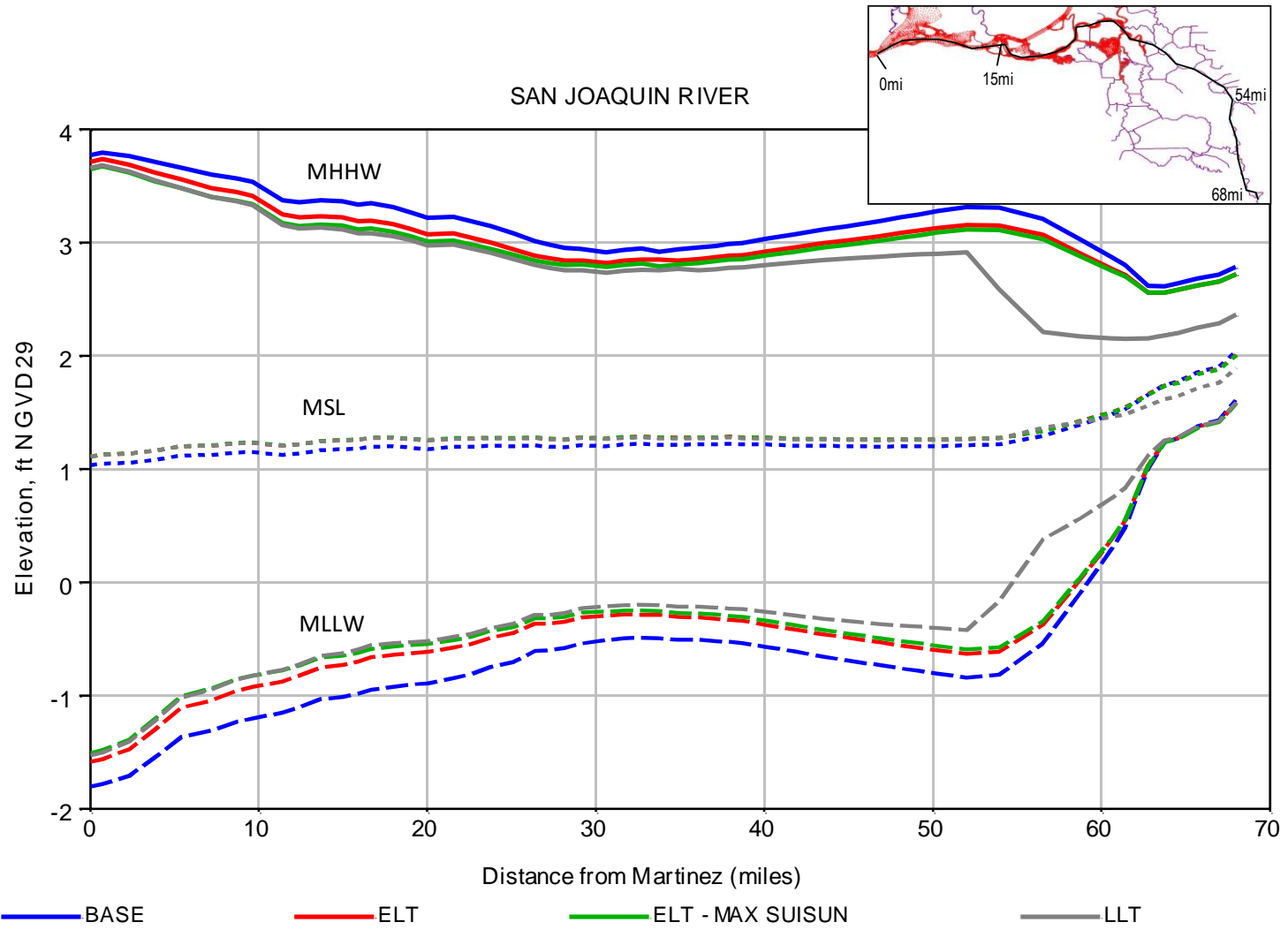


Figure 4-8 Profiles of July 2002 MHHW, MSL and MLLW along the San Joaquin River for the Base – No SMSCG (Base), ELT and ELT - Max Suisun simulations.

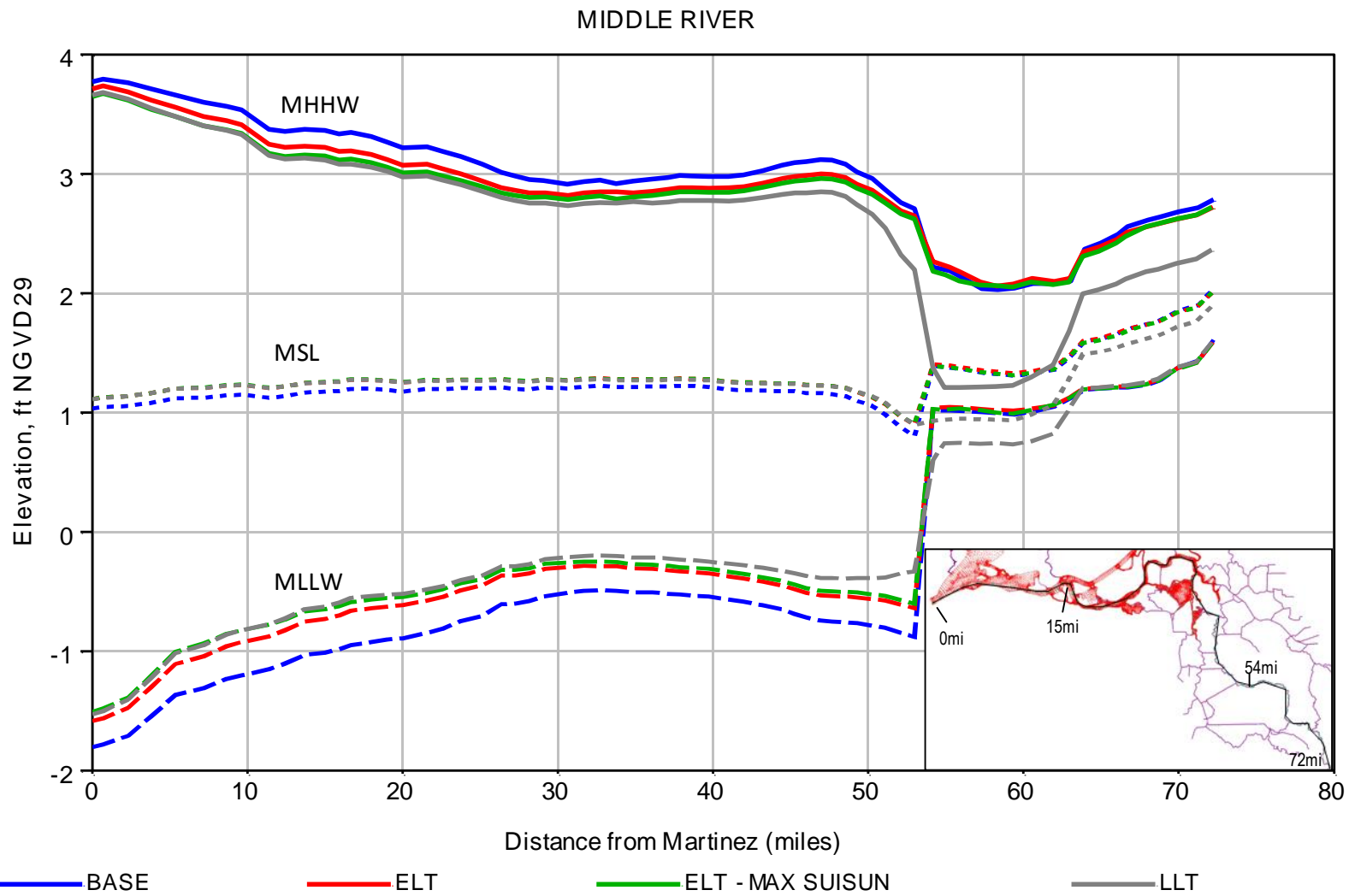


Figure 4-9 Profiles of July 2002 MHHW, MSL and MLLW along the Middle River for the Base – No SMSCG (Base), ELT and ELT - Max Suisun simulations.

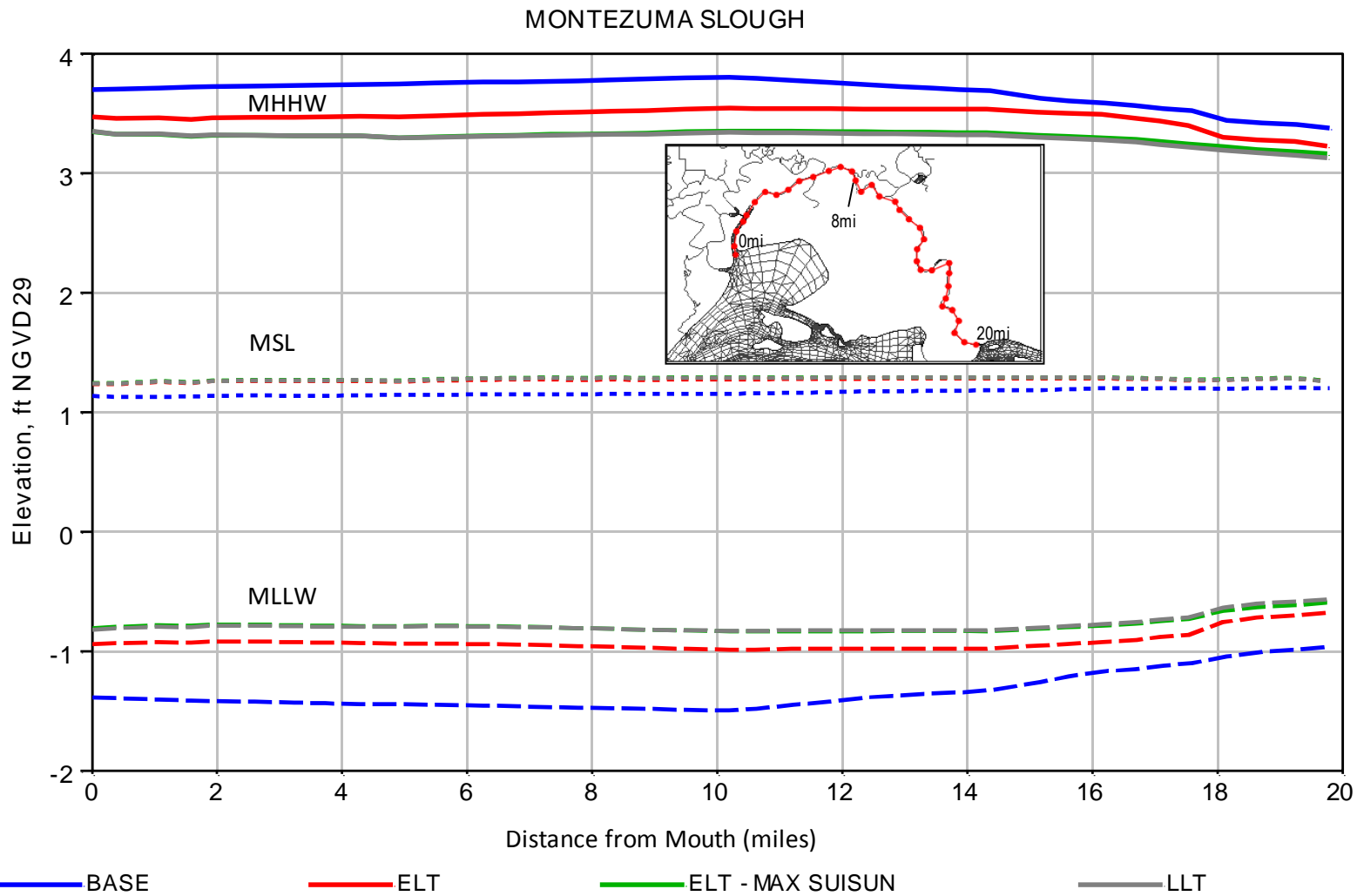


Figure 4-10 Profiles of July 2002 MHHW, MSL and MLLW along Montezuma Slough for the Base – No SMSCG (Base), ELT and ELT - Max Suisun simulations.

4.2.1.4 Stage Time Series Plots

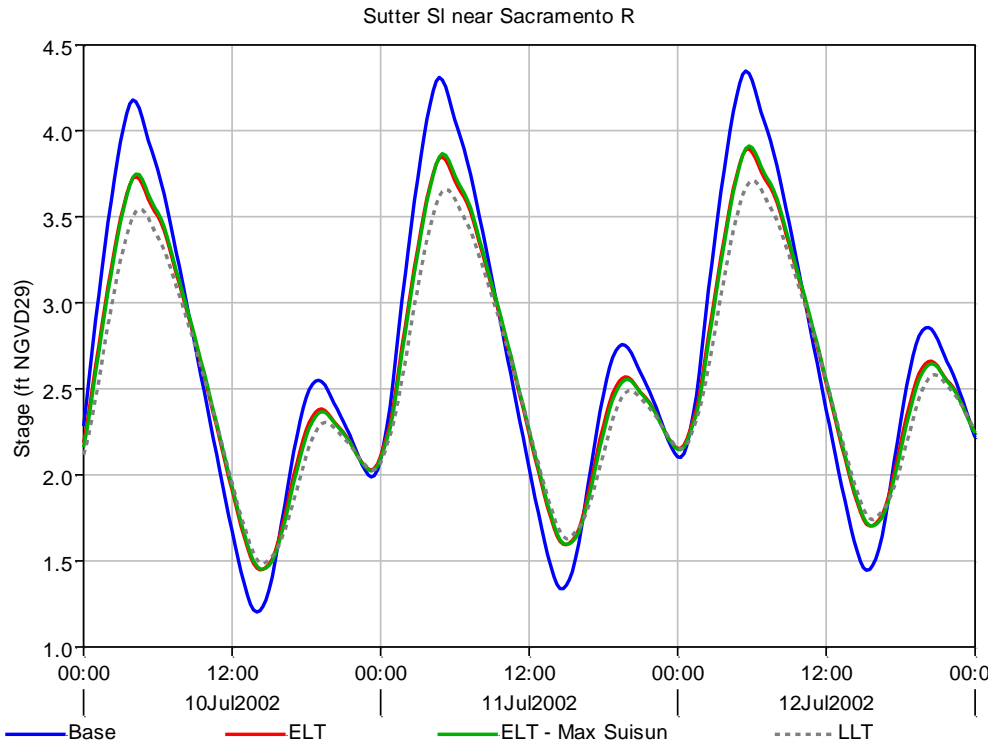


Figure 4-11 Stage in Sutter Slough near Sacramento R. for Base - No SMSCG (Base), ELT, LLT and LLT - Max Suisun scenarios.

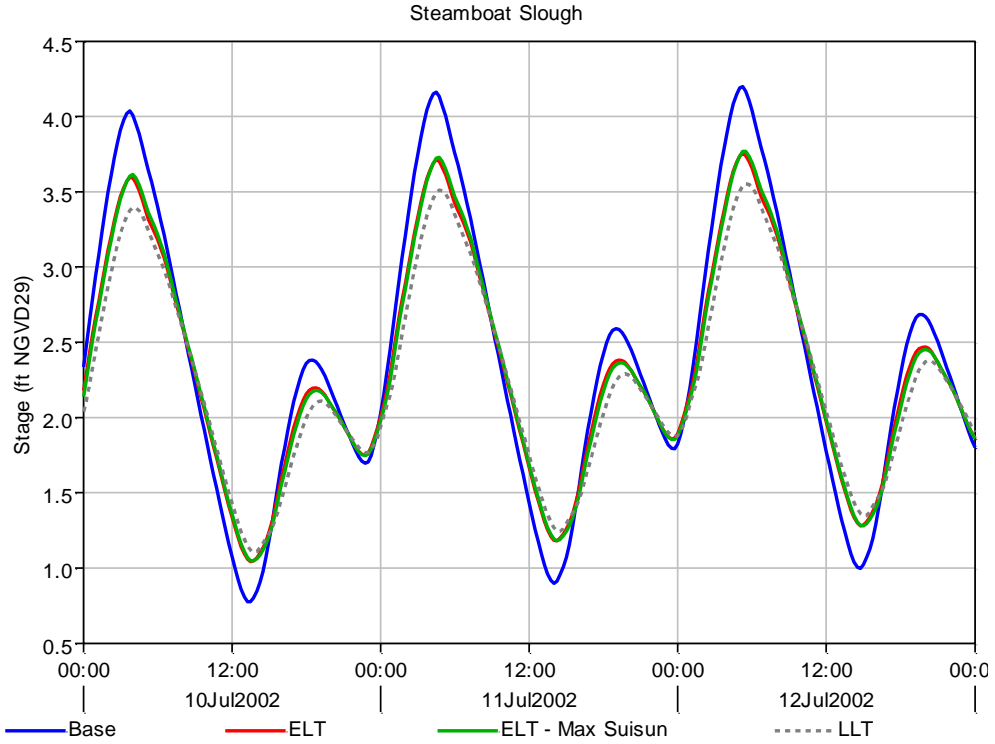


Figure 4-12 Stage in Steamboat Slough for Base - No SMSCG (Base), ELT, LLT and LLT - Max Suisun scenarios.

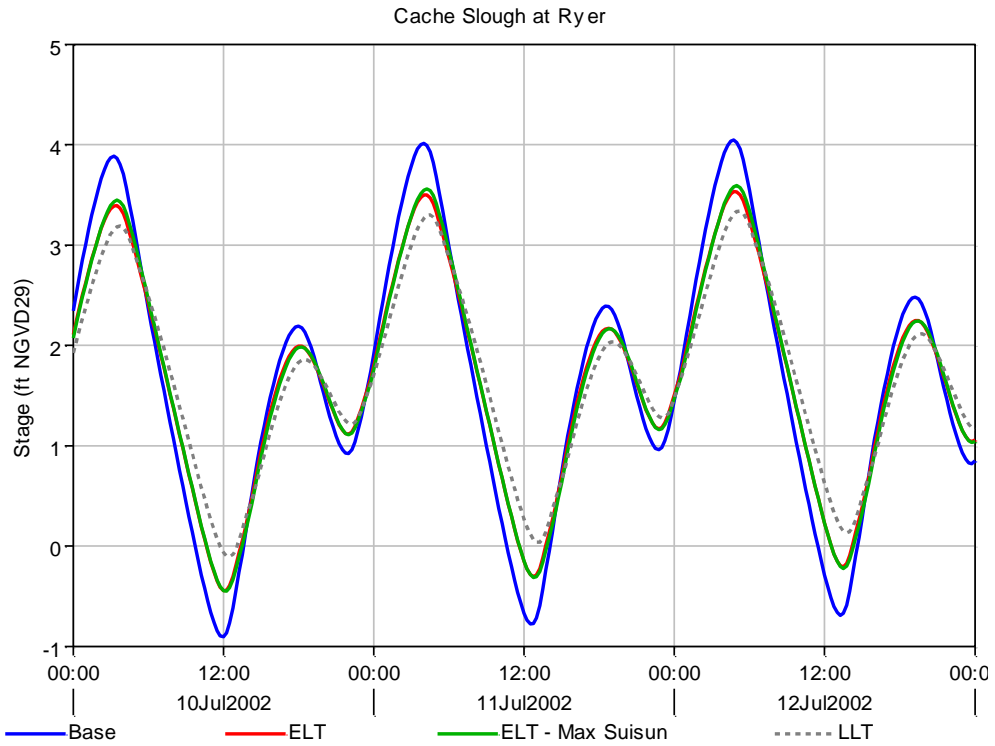


Figure 4-13 Stage in Cache Slough at Ryer Island for Base - No SMSCG (Base), ELT, LLT and LLT - Max Suisun scenarios.

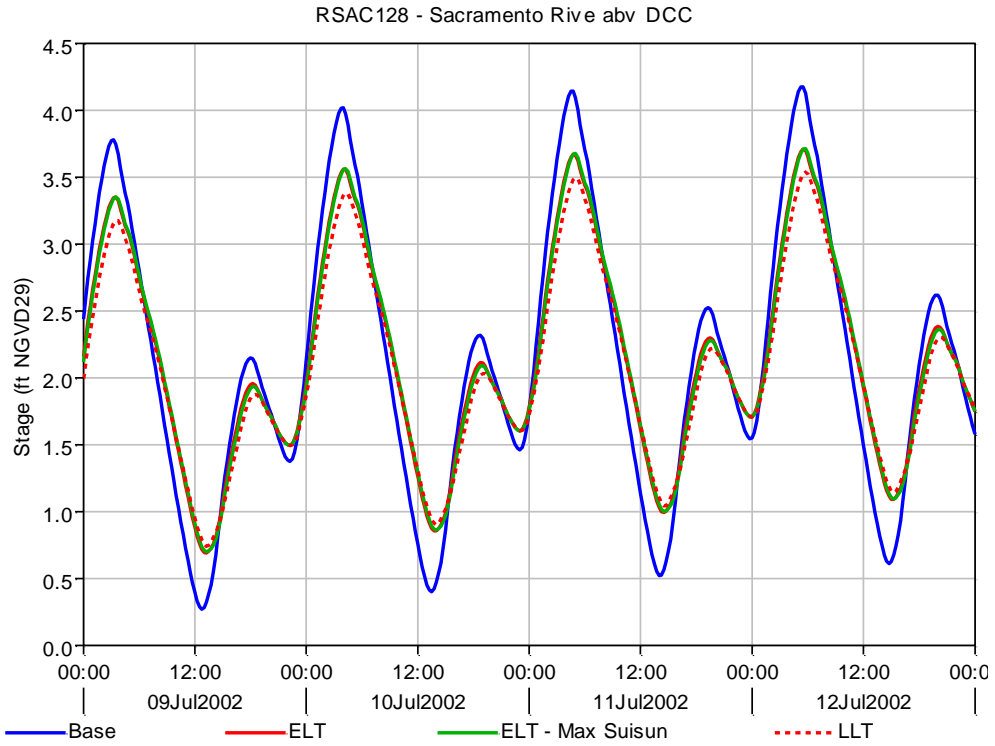


Figure 4-14 Stage at RSAC128 for Base - No SMSGC (Base), ELT, LLT and LLT - Max Suisun scenarios.

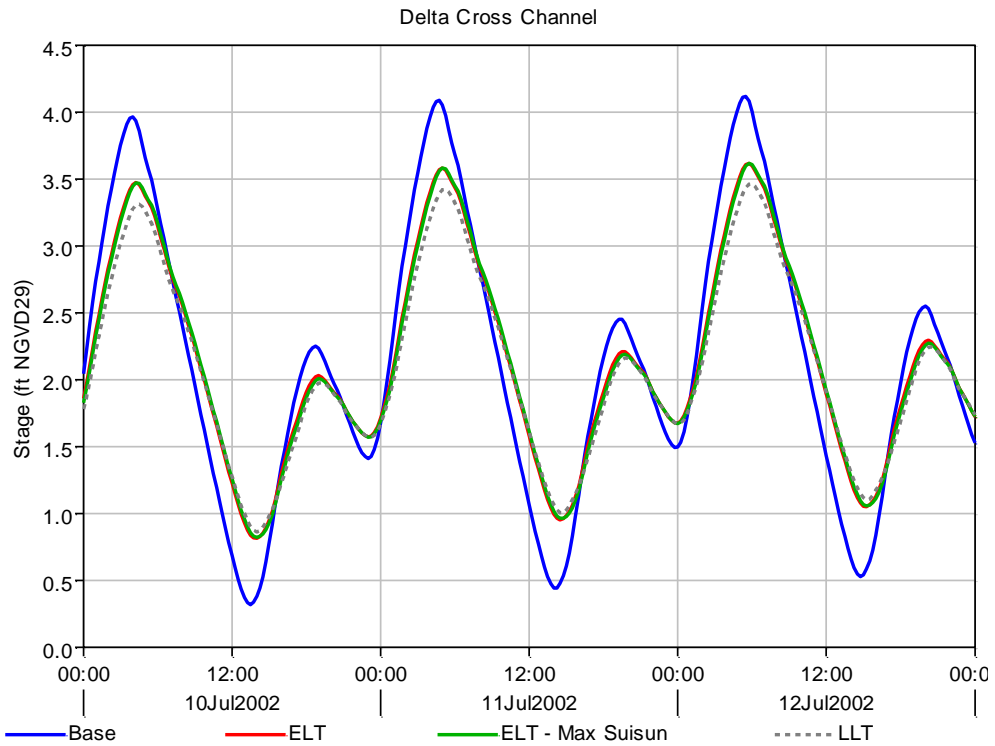


Figure 4-15 Stage in Delta Cross Channel for Base - No SMSGC (Base), ELT, LLT and LLT - Max Suisun scenarios.

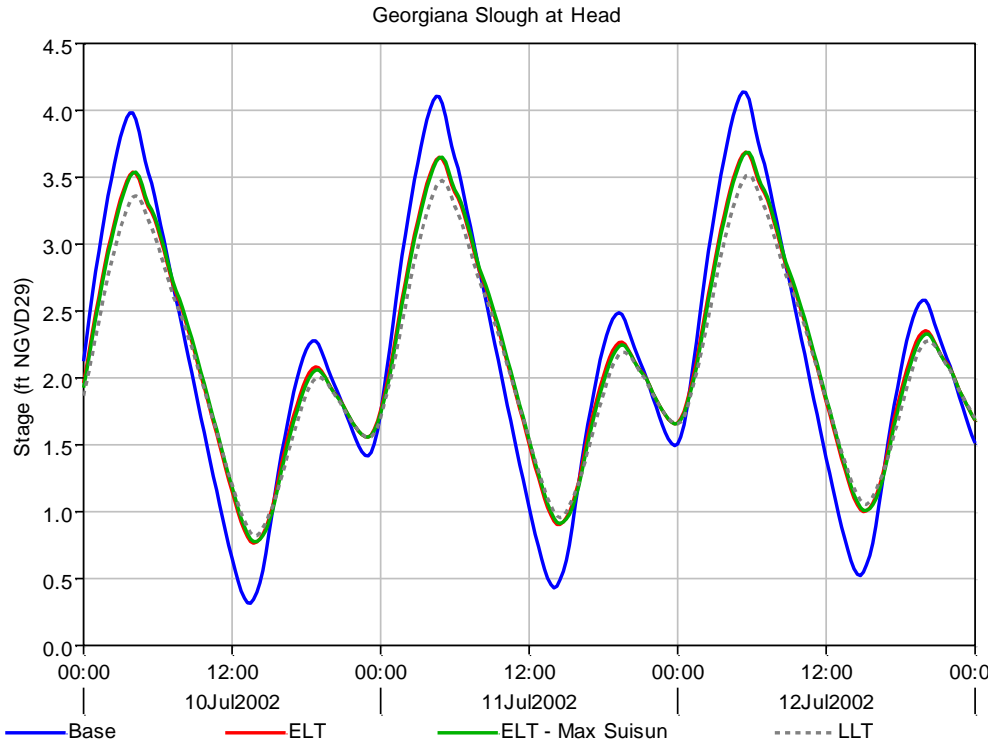


Figure 4-16 Stage in Georgiana Slough at head for Base - No SMSCG (Base), ELT, LLT and LLT - Max Suisun scenarios.

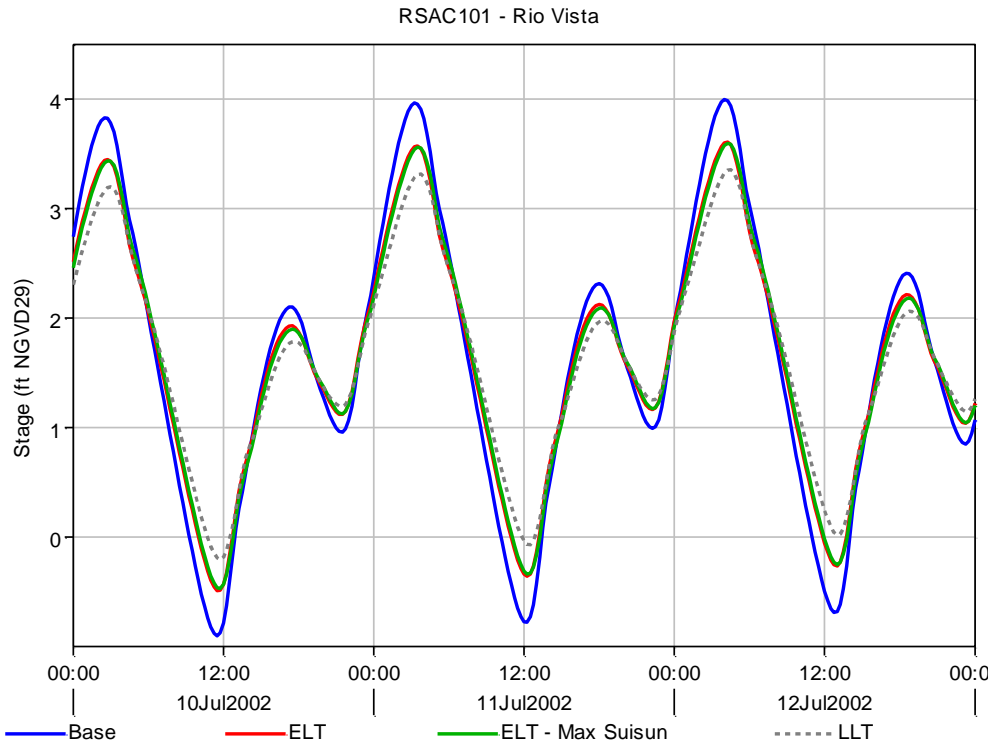


Figure 4-17 Stage at Rio Vista for Base - No SMSCG (Base), ELT, LLT and LLT - Max Suisun scenarios.

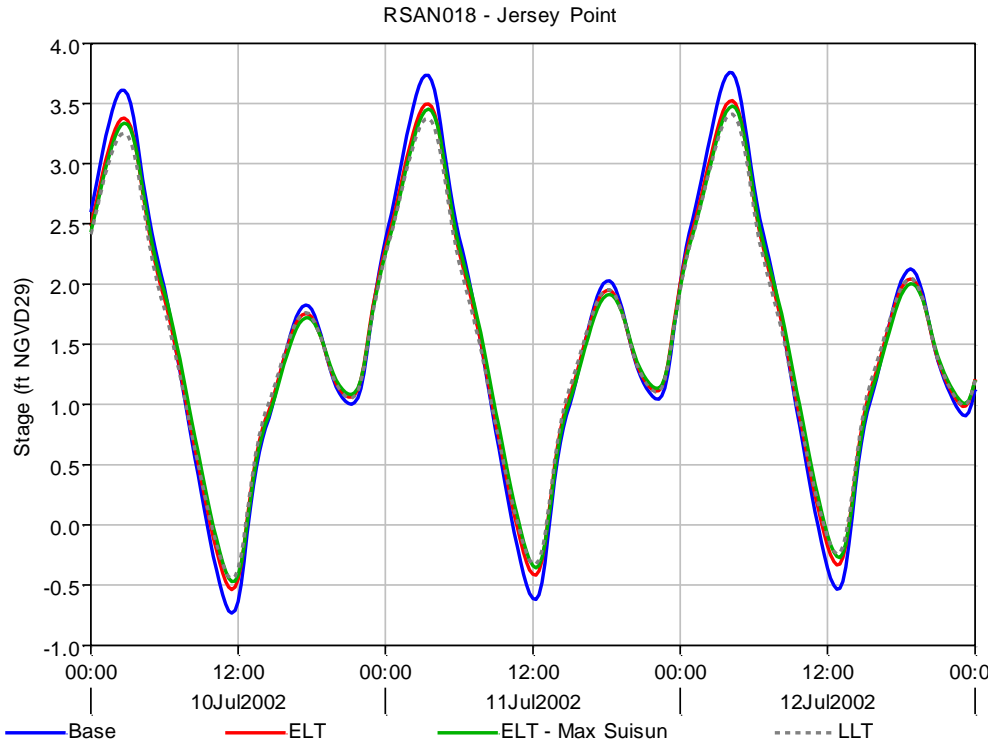


Figure 4-18 Stage at Jersey Point for Base - No SMSCG (Base), ELT, LLT and LLT - Max Suisun scenarios.

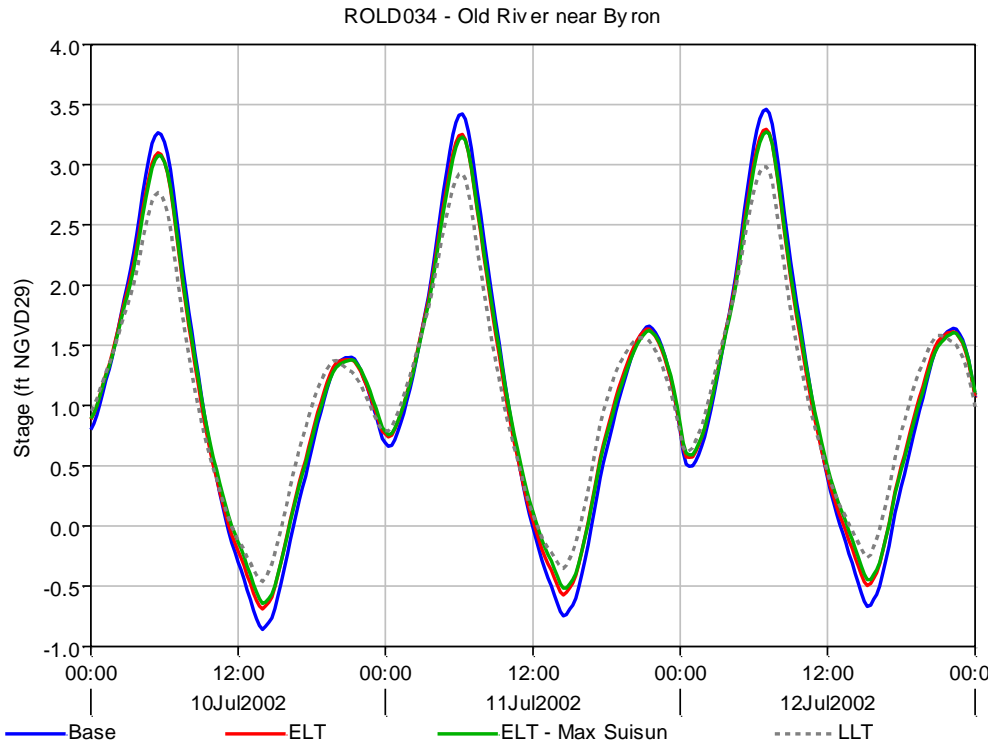


Figure 4-19 Stage at ROLD034 for Base - No SMSCG (Base), ELT, LLT and LLT - Max Suisun scenarios.

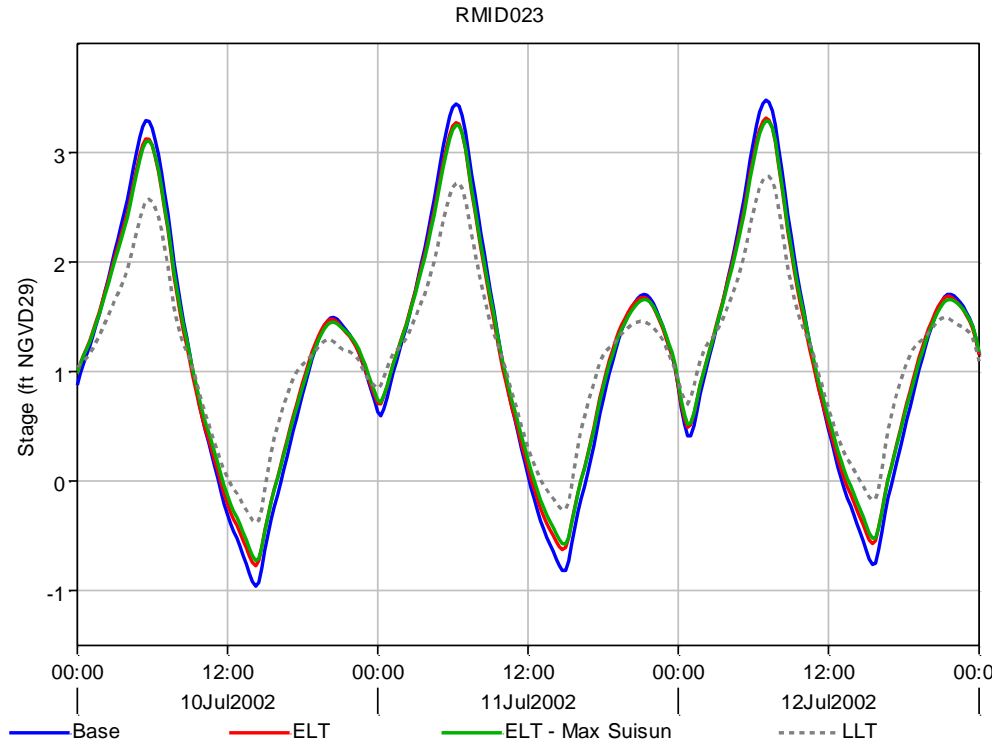


Figure 4-20 Stage at RMID023 for Base - No SMSCG (Base), ELT, LLT and LLT - Max Suisun scenarios.

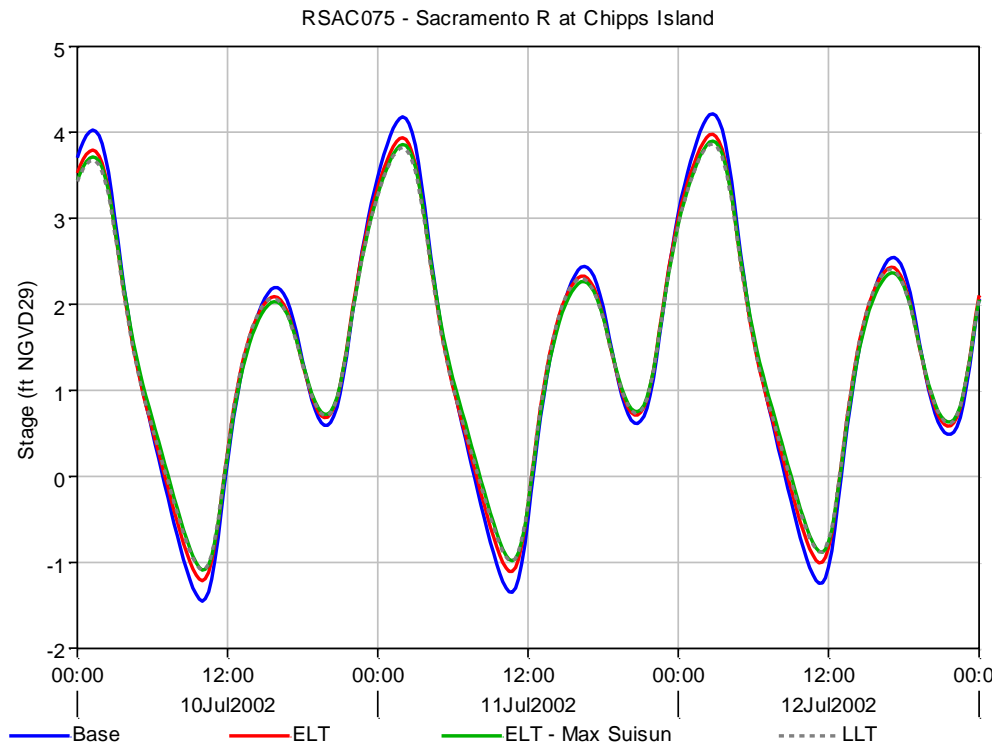


Figure 4-21 Stage at Chipps Island for Base - No SMSCG (Base), ELT, LLT and LLT - Max Suisun scenarios.

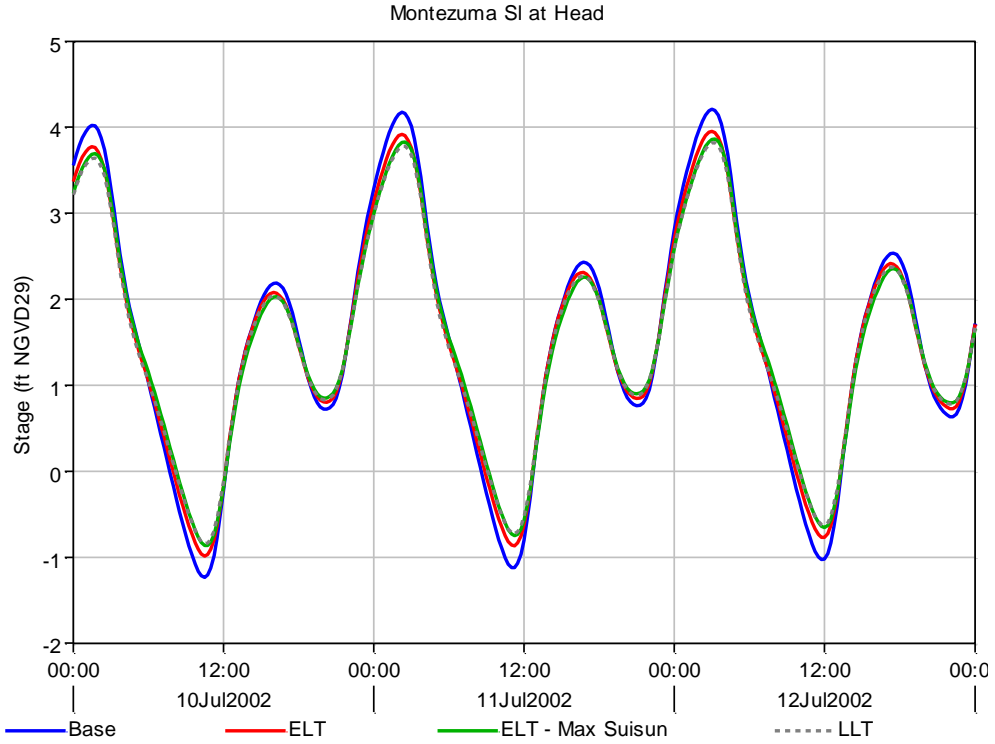


Figure 4-22 Stage in Montezuma Slough at Head for Base - No SMSCG (Base), ELT, LLT and LLT - Max Suisun scenarios.

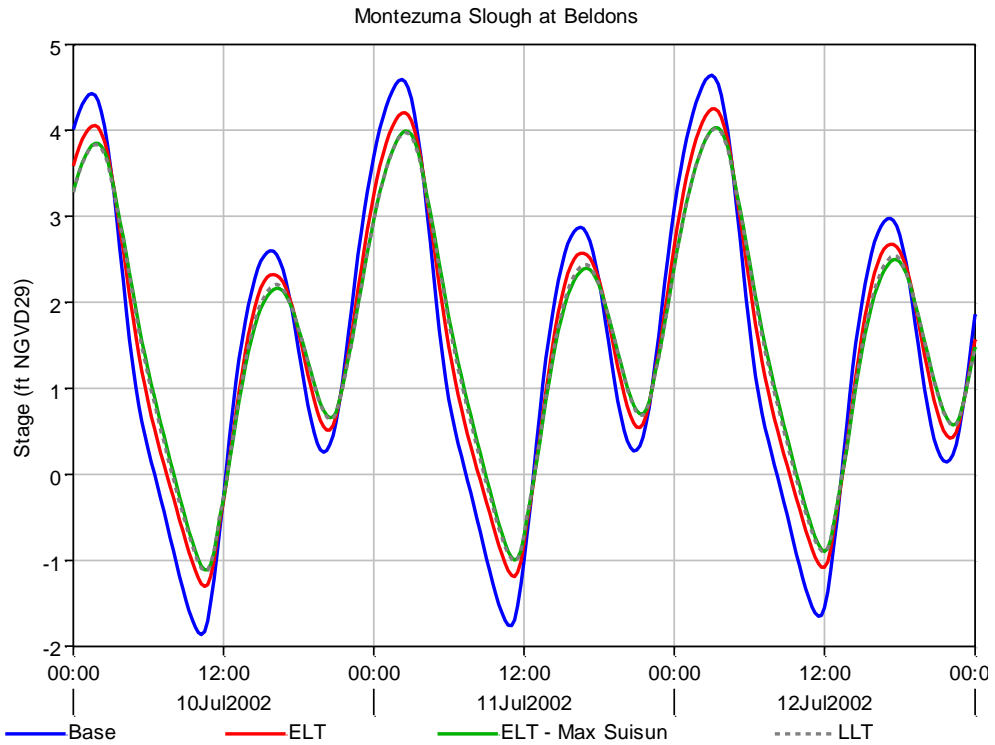


Figure 4-23 Stage in Montezuma Slough at Beldon's Landing (S-49) for Base - No SMSCG (Base), ELT, LLT and LLT - Max Suisun scenarios.

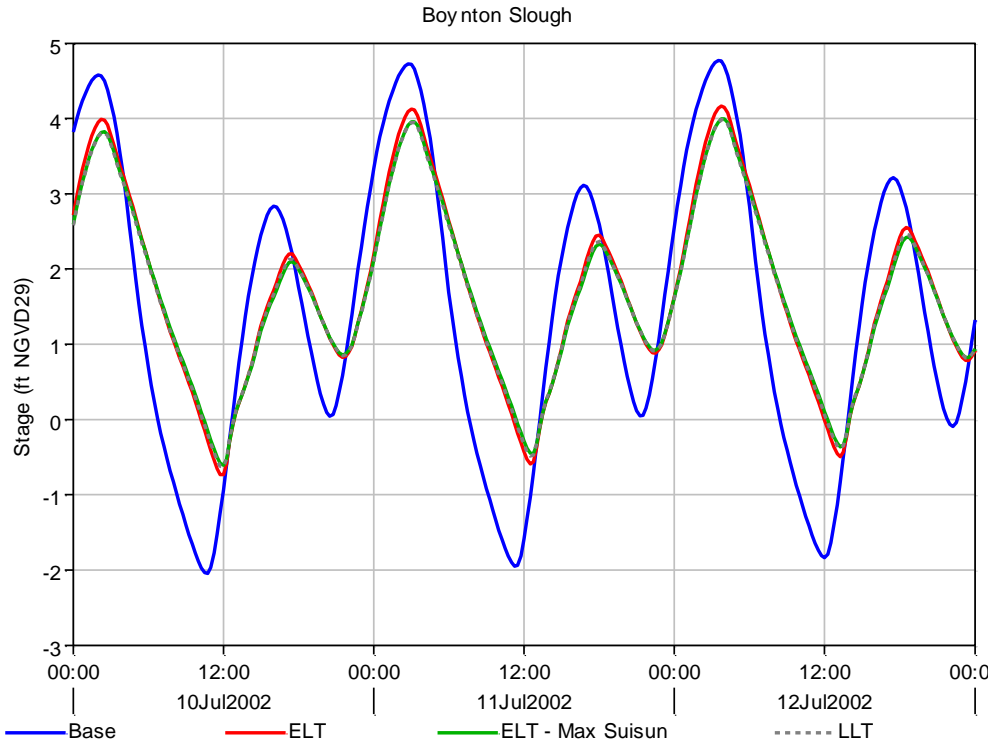


Figure 4-24 Stage in Boynton Slough at S-40 for Base - No SMSCG (Base), ELT, LLT and LLT - Max Suisun scenarios.

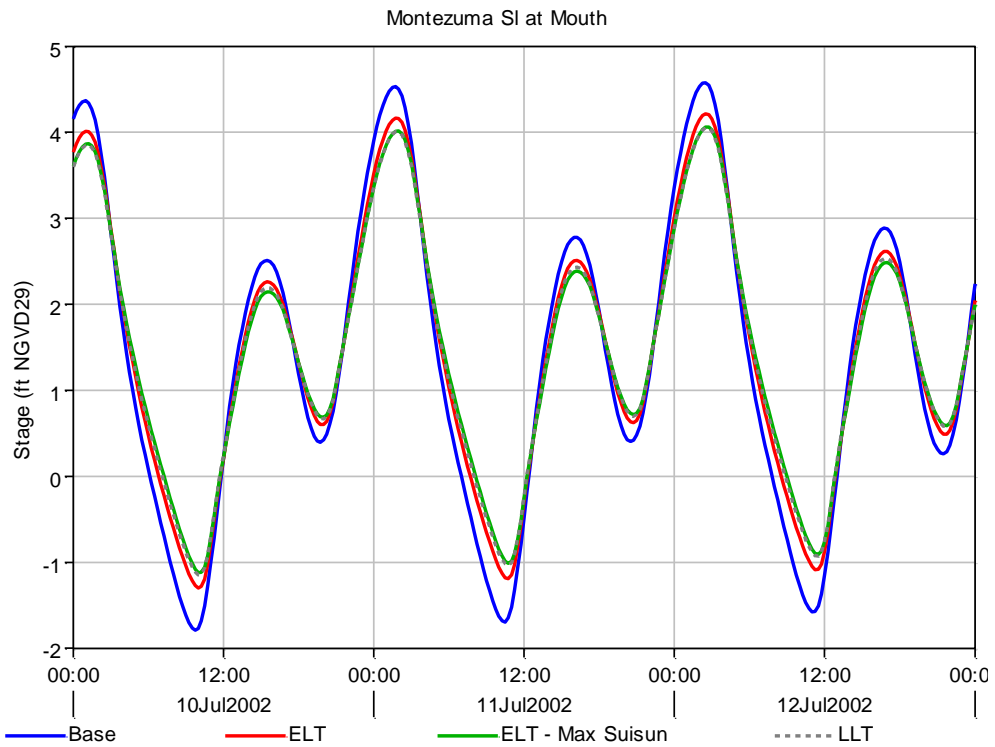


Figure 4-25 Stage in Montezuma Slough at mouth for Base - No SMSCG (Base), ELT, LLT and LLT - Max Suisun scenarios.

4.2.2 LLT - No South Delta ROA

Elimination of the South Delta ROA from the LLT case has varied impacts on net flows, as seen in Table 4-5 and Figure 4-26. Relative to LLT, reverse flows in Middle River are slightly increased at RMID015 and decreased at RMID027, with the balance of flow through Victoria Canal. Old River reverse flows are slightly decreased. Impacts on San Joaquin River flows are small at Jersey Point and San Andreas. Further upstream at RSAN058, the average flows are decreased by 23 cfs, or about 6%. In the north Delta, flow impacts are small. Flow through the DCC and Georgiana Slough is increased by less than 1%. In Montezuma Slough, there is a small increase in flow into the marsh from both the head and mouth of the slough. The increase at Montezuma Slough at Head is 92%, however the average flow is small and the increase is only 12 cfs. Small stage differences are responsible for these flow changes.

Tidal prism and percent change from base tidal prism is tabulated in Table 4-6 and plotted in Figure 4-27 and Figure 4-28. LLT - No South increases tidal prism in Old River and at RMID015 by 5-10% relative to LLT, bringing them closer to Base – No MRB. Victoria Canal tidal prism increases by 47% relative to LLT. At RMID027, there is very little tidal flow in the base case, but LLT restoration increases it by 277%. Without the South Delta ROA, tidal prism returns to near base condition. In the San Joaquin River, tidal prism increases by about 2% (about 700 ac-ft) relative to LLT at Jersey Point and San Andreas, and decreases by 21% (about 600 ac-ft) at RSAN058. Tidal prism changes at all locations in the Sacramento River, in Cache Slough, Montezuma Slough, and at Martinez are 1% or less, relative to LLT. Tidal prism in DCC increases by 3% relative to LLT, and decreases by 6% in Georgiana Slough.

As shown in Table 4-7 and Figure 4-29, without the South Delta LLT, tidal range is increased in Old and Middle River (particularly at RMID027 with an increase of 2.4 ft or 434% over LLT), Victoria Canal (0.6 ft or 23% increase over LLT), and in San Joaquin River at RSAN058 (0.2 ft or 6% increase over LLT). Most other locations show a 1% or smaller decrease in tidal range (0.04 ft or less) relative to LLT.

Profile plots of MHHW, MSL and MLLW, in Figure 4-30 through Figure 4-33, show that relative to LLT, the LLT – No South MHHW is higher and MLLW is lower in the south Delta in Middle River and San Joaquin River. Relative to LLT, MSL is slightly lower in Middle River upstream of Victoria Canal and slightly higher in the uppermost portion of San Joaquin River – in both cases returning closer to the base case MSL. Sacramento River and Montezuma Slough profiles show minimal difference between LLT and LLT – No South MHHW and MLLW, and virtually no change in MSL.

For reference, time series plots of stage are provided for various locations in Figure 4-37 through Figure 4-46. A map of locations plotted is shown in Figure 4-2.

Color contour plots of peak bed shear in Middle River during July 2002 are shown for LLT – No South in comparison with LLT in Figure 4-47. Without the south Delta ROA, the peak Middle River bed shear is reduced from about 1.3 N/m² to below 0.5 N/m². Bed

shear in the reach between Railroad Cut and Victoria Canal is increased relative to LLT, while the highest bed shear upstream of Victoria Canal is decreased.

4.2.2.1 Net Flows

Table 4-5 Summary of 3-month Average flow (Jul – Sep 2002) for Base - No MRB, LLT, LLT – No South simulations.

| Location | 3-month Average Flow, Jul – Sep 2002 (cfs) | | |
|-----------------------|--|-------|----------------|
| | Base – No MRB | LLT | LLT – No South |
| Cache Sl at Ryer | 1535 | 2565 | 2549 |
| DCC | 4609 | 3449 | 3467 |
| False River | -1696 | -1806 | -1808 |
| Martinez | 4422 | 4080 | 4104 |
| Miner Slough | 2018 | 2667 | 2664 |
| Mokelumne nr SJR | 4719 | 3781 | 3831 |
| Montezuma Sl at Head | 12 | 13 | 25 |
| Montezuma Sl at Mouth | -71 | -191 | -180 |
| RMID015 | -5351 | -5265 | -5319 |
| RMID027 | -25 | -45 | -29 |
| ROLD024 | -4425 | -4541 | -4465 |
| ROLD034 | -6493 | -6603 | -6489 |
| RSAC075 Chipps Island | 4503 | 4395 | 4411 |
| RSAC092 Emmaton | 5870 | 6484 | 6489 |
| RSAC101 Rio Vista | 8256 | 9712 | 9672 |
| RSAC123 | 3607 | 4258 | 4229 |
| RSAC128 | 10999 | 10137 | 10143 |
| RSAN018 Jersey Pt | -999 | -1914 | -1890 |
| RSAN032 San Andreas | -1716 | -3216 | -3160 |
| RSAN058 | 366 | 391 | 368 |
| SLDUT007 | -113 | 68 | 70 |
| SLGEO019 Georgiana Sl | 2762 | 2408 | 2426 |
| SLTRM004 Threemile Sl | -2313 | -3012 | -2974 |
| Steamboat Sl | 2280 | 2629 | 2625 |
| Sutter Sl | 2965 | 3480 | 3477 |
| Victoria Canal | -3580 | -3486 | -3584 |

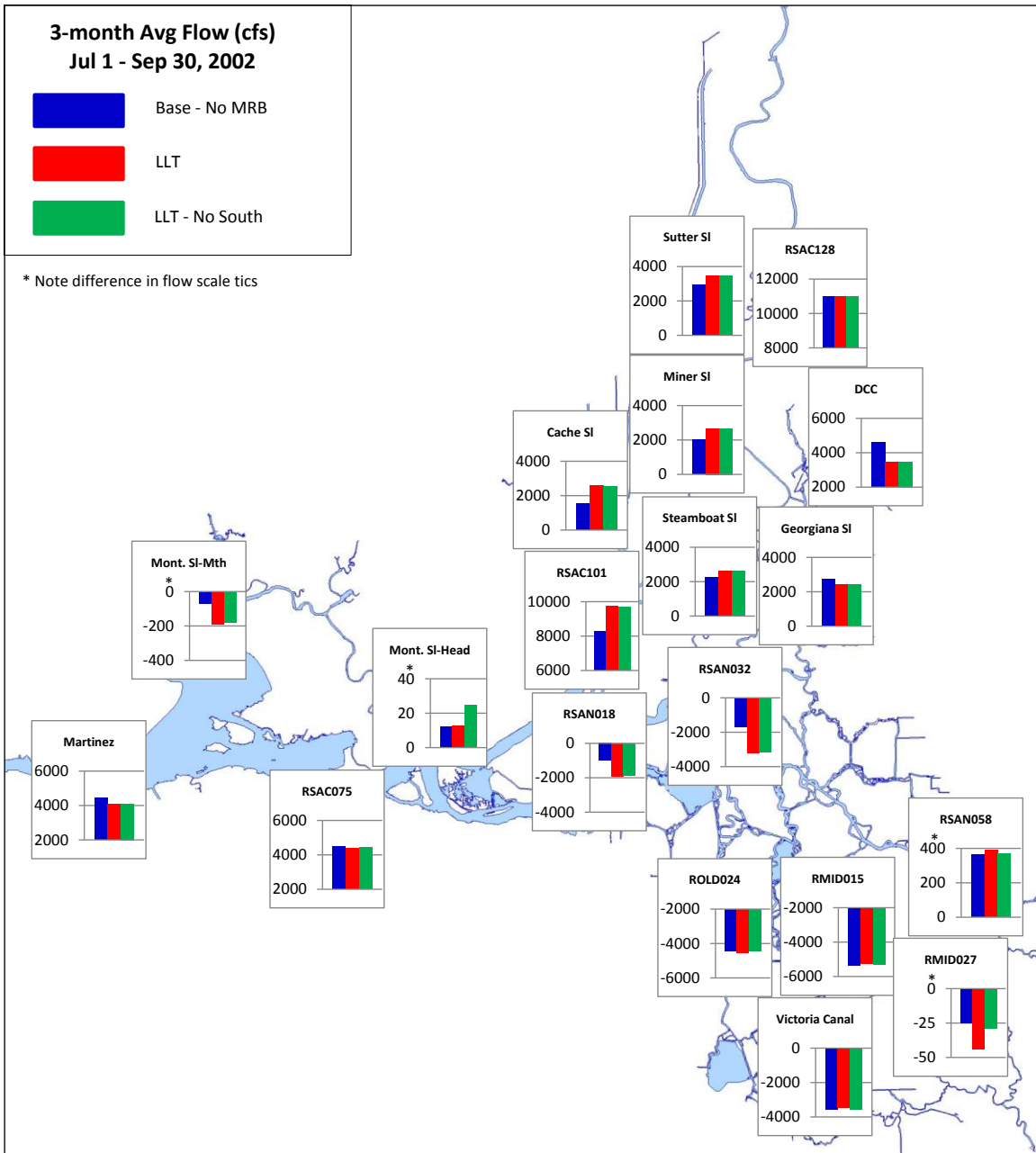


Figure 4-26 Average flows (Jul - Sep 2002) for Base - No MRB, LLT and LLT – No South simulations.

4.2.2.2 Tidal Prism

Table 4-6 Summary of Apr – Dec 2002 Average Tidal Prism for Base - No MRB, LLT and LLT – No South simulations, and percent change from Base-No MRB.

| Location | Base – No MRB | LLT | | LLT – No South | |
|-----------------------|---------------------|---------------------|--------------------|---------------------|--------------------|
| | Tidal Prism (ac-ft) | Tidal Prism (ac-ft) | % Change from Base | Tidal Prism (ac-ft) | % Change from Base |
| Cache Sl at Ryer | 28,697 | 26,884 | -6% | 26,717 | -7% |
| DCC | 782 | 949 | 21% | 977 | 25% |
| False River | 18,870 | 16,508 | -13% | 16,763 | -11% |
| Martinez | 167,717 | 170,966 | 2% | 170,658 | 2% |
| Miner Slough | 618 | 455 | -26% | 462 | -25% |
| Mokelumne nr SJR | 4,615 | 4,490 | -3% | 4,433 | -4% |
| Montezuma Sl at Head | 2,053 | 3,283 | 60% | 3,295 | 60% |
| Montezuma Sl at Mouth | 10,988 | 23,108 | 110% | 23,114 | 110% |
| RMID015 | 4,119 | 3,333 | -19% | 3,603 | -13% |
| RMID027 | 474 | 1,784 | 277% | 450 | -5% |
| ROLD024 | 4,427 | 3,655 | -17% | 3,923 | -11% |
| ROLD034 | 2,352 | 1,960 | -17% | 2,061 | -12% |
| RSAC075 Chipps Island | 115,263 | 108,506 | -6% | 108,789 | -6% |
| RSAC092 Emmaton | 49,256 | 50,591 | 3% | 50,612 | 3% |
| RSAC101 Rio Vista | 36,171 | 40,582 | 12% | 40,365 | 12% |
| RSAC123 | 2,499 | 1,811 | -28% | 1,834 | -27% |
| RSAC128 | 1,608 | 1,175 | -27% | 1,140 | -29% |
| RSAN018 Jersey Pt | 50,110 | 44,549 | -11% | 45,228 | -10% |
| RSAN032 San Andreas | 37,847 | 32,450 | -14% | 33,145 | -12% |
| RSAN058 | 2,385 | 2,603 | 9% | 2,044 | -14% |
| SLDUT007 | 3,073 | 2,226 | -28% | 2,283 | -26% |
| SLGEO019 Georgiana Sl | 222 | 415 | 87% | 389 | 75% |
| SLTRM004 Threemile Sl | 9,413 | 6,526 | -31% | 6,770 | -28% |
| Steamboat Sl | 913 | 598 | -35% | 603 | -34% |
| Sutter Sl | 823 | 574 | -30% | 580 | -30% |
| Victoria Canal | 1,337 | 786 | -41% | 1,152 | -14% |

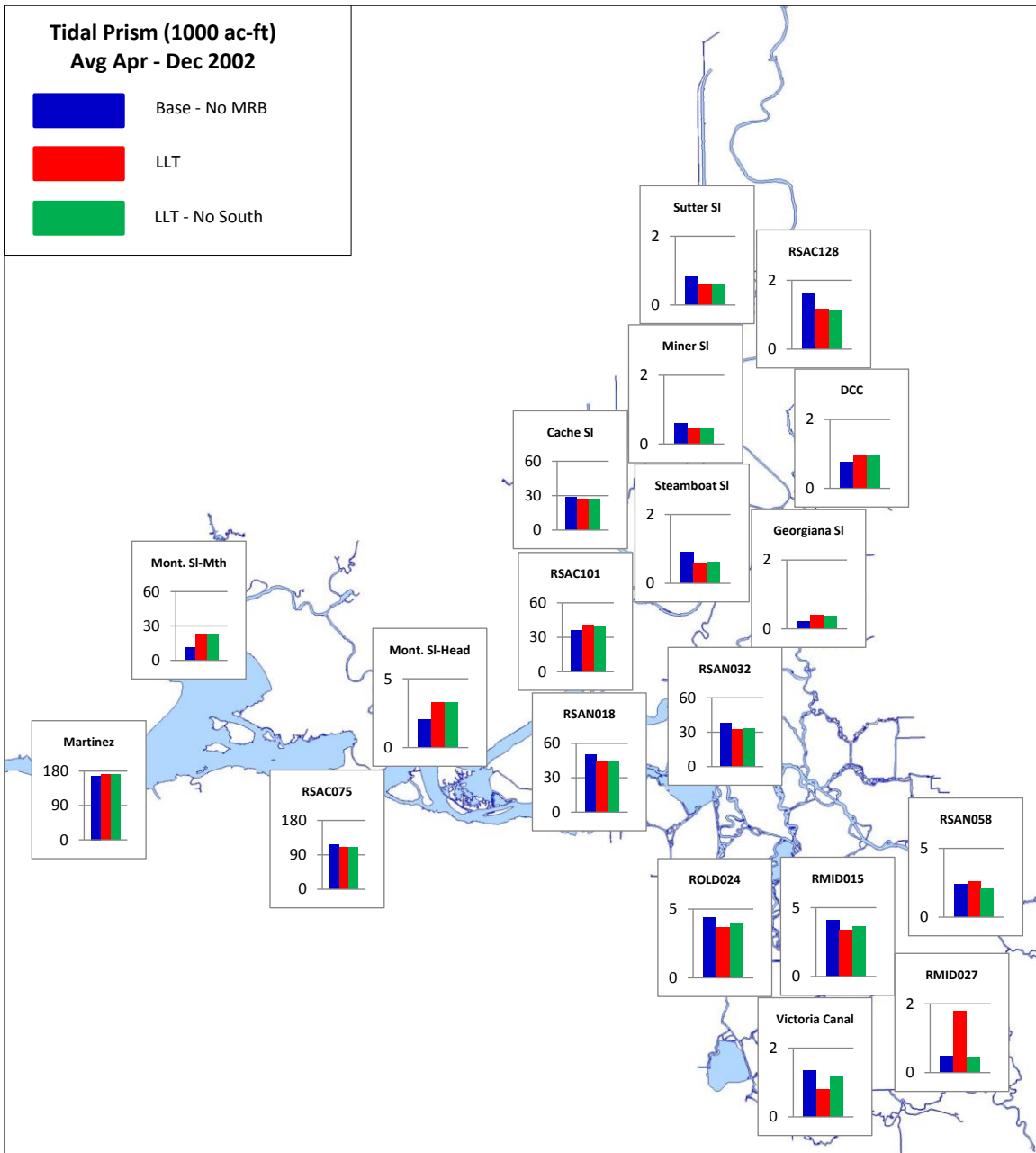


Figure 4-27 Average tidal prism (Apr - Dec 2002) for Base - No MRB, LLT and LLT – No South simulations.

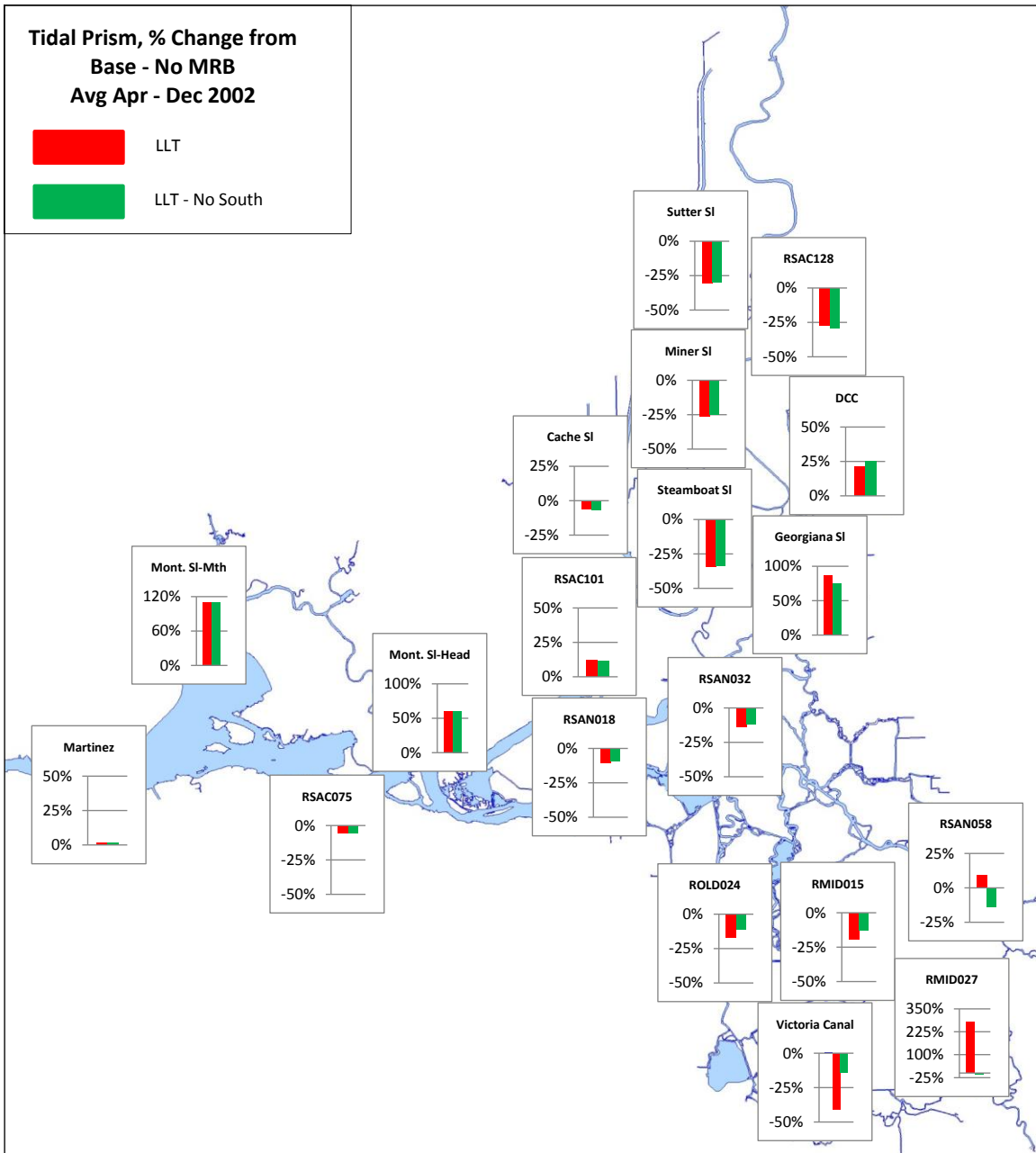


Figure 4-28 Average percent change from Base - No MRB tidal prism (Apr - Dec 2002) for LLT and LLT – No South simulations.

4.2.2.3 Tidal Range

Table 4-7 Summary of Apr – Dec 2002 Average Tidal Range for Base - No MRB, LLT and LLT – No South simulations.

| Location | Apr – Dec 2002 Average Tidal Range (ft) | | |
|-----------------------|---|------|----------------|
| | Base – No MRB | LLT | LLT – No South |
| Cache Sl at Ryer | 3.95 | 2.75 | 2.74 |
| DCC | 2.92 | 2.11 | 2.09 |
| False River | 3.4 | 2.93 | 2.9 |
| Martinez | 5.47 | 5.14 | 5.13 |
| Miner Slough | 3.12 | 2.62 | 2.6 |
| Montezuma Sl at Head | 4.25 | 3.64 | 3.6 |
| Montezuma Sl at Mouth | 5 | 4.05 | 4.05 |
| RMID015 | 3.76 | 3.14 | 3.23 |
| RMID023 | 3.49 | 2.48 | 3.04 |
| RMID027 | 3.33 | 0.56 | 2.99 |
| ROLD024 | 3.55 | 3.02 | 3.06 |
| ROLD034 | 3.36 | 2.73 | 2.96 |
| RSAC075 Chipps Island | 4.42 | 3.85 | 3.84 |
| RSAC092 Emmaton | 3.93 | 3.23 | 3.19 |
| RSAC101 Rio Vista | 3.86 | 2.79 | 2.76 |
| RSAC123 | 2.95 | 2.14 | 2.13 |
| RSAC128 | 2.91 | 2.12 | 2.11 |
| RSAN018 Jersey Pt | 3.47 | 2.98 | 2.95 |
| RSAN032 San Andreas | 3.37 | 2.89 | 2.88 |
| RSAN058 | 4.05 | 3.25 | 3.45 |
| SLDUT007 Dutch Slough | 3.59 | 3.04 | 3.01 |
| SLGEO019 Georgiana Sl | 2.95 | 2.16 | 2.16 |
| SLTRM004 Threemile Sl | 3.45 | 2.9 | 3 |
| Steamboat Slough | 2.69 | 1.99 | 1.98 |
| Sutter Slough | 2.57 | 1.94 | 1.91 |
| Victoria Canal | 3.48 | 2.48 | 3.05 |

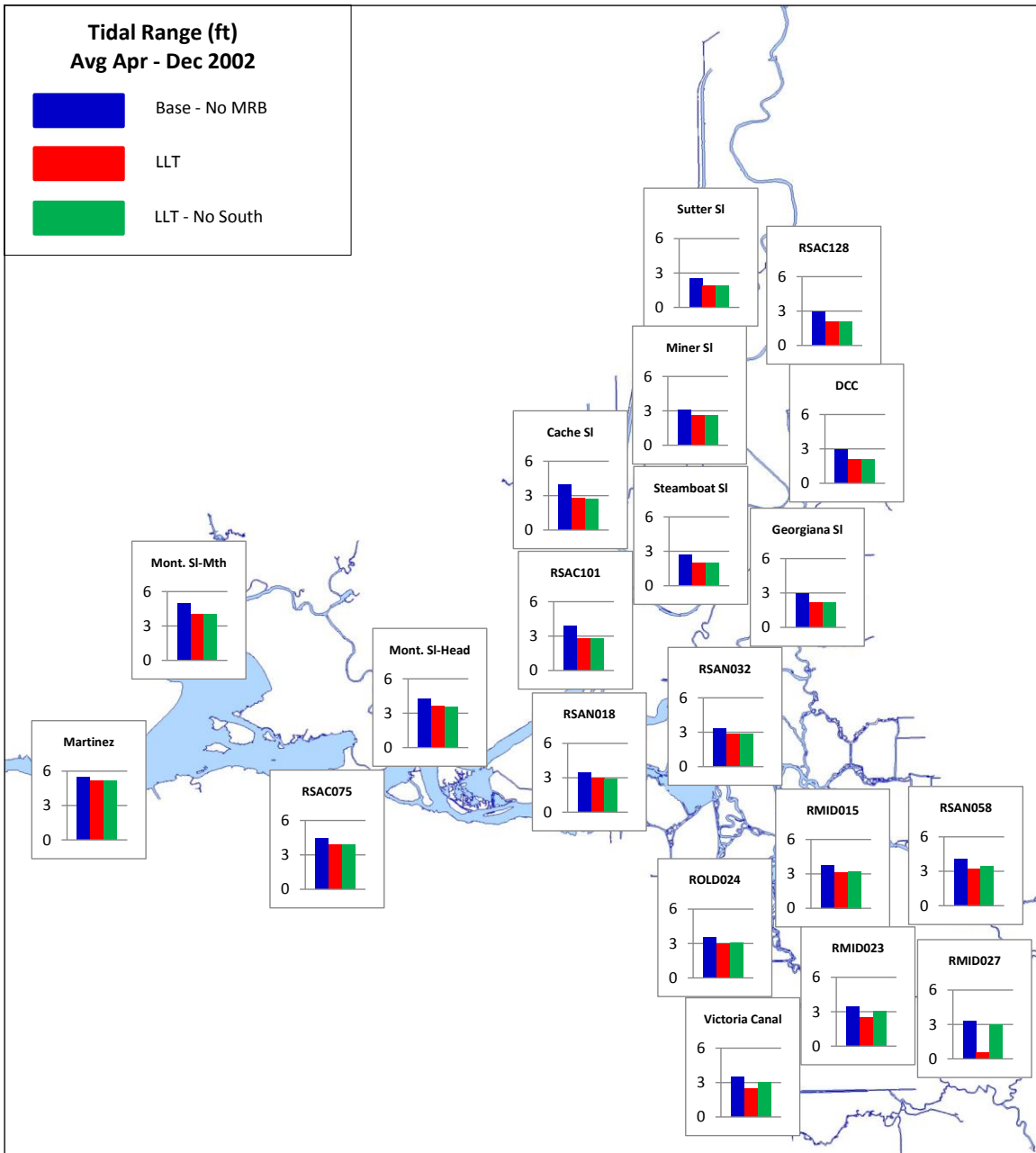


Figure 4-29 Average tidal range (Apr - Dec 2002) for Base - No MRB, LLT and LLT – No South simulations.

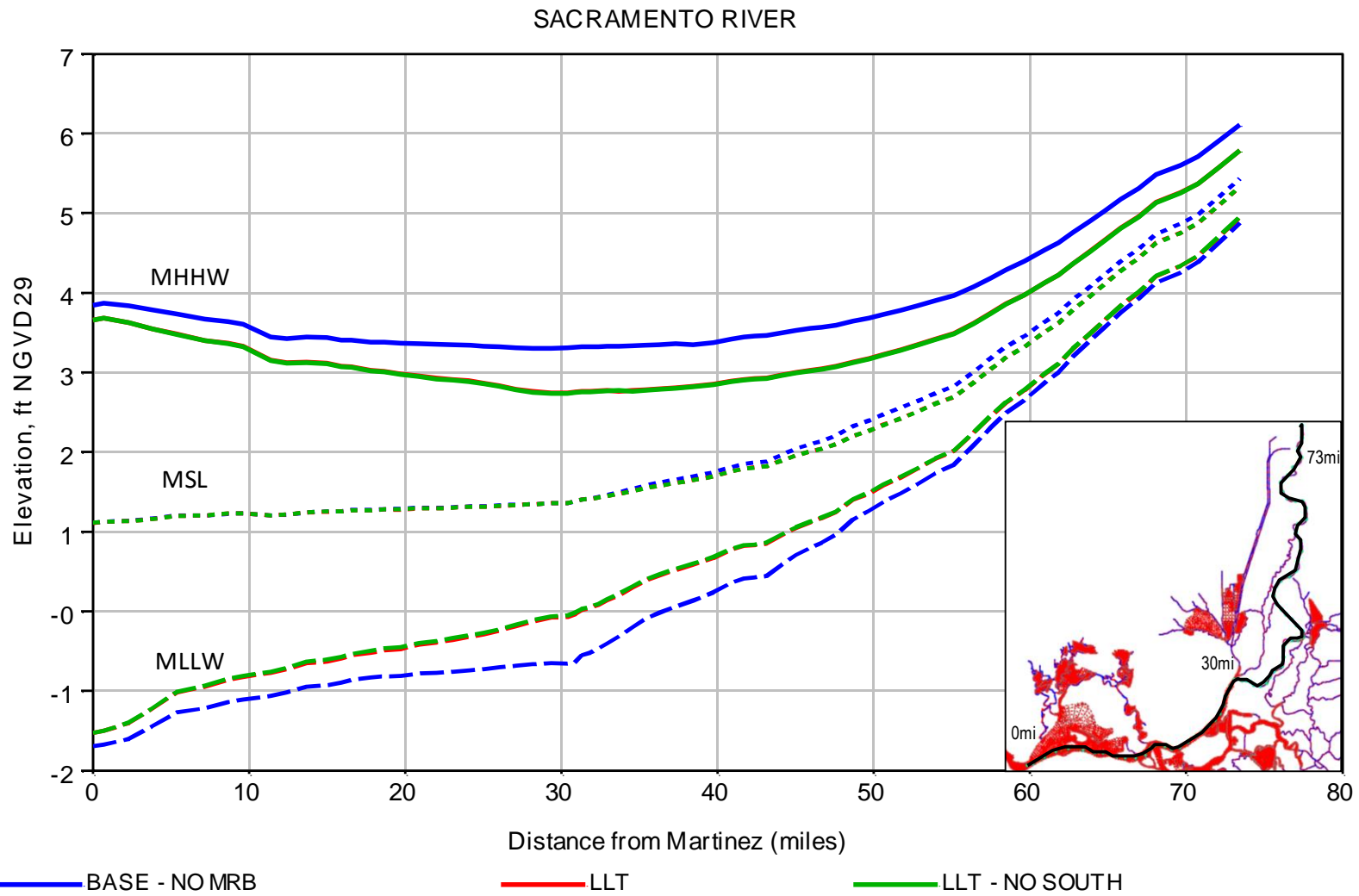


Figure 4-30 Profiles of July 2002 MHHW, MSL and MLLW along the Sacramento River for the Base - No MRB, LLT and LLT - No South simulations.

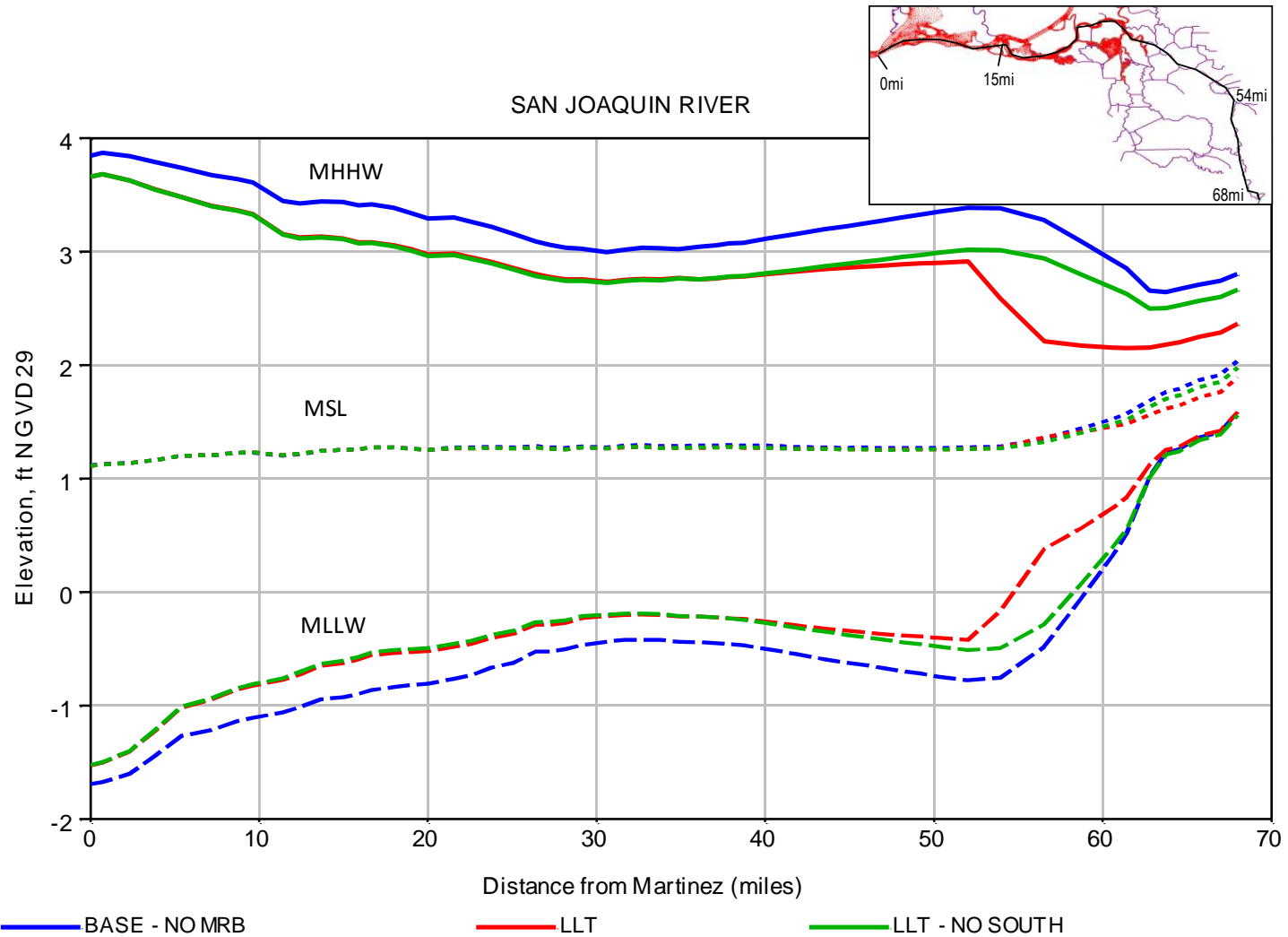


Figure 4-31 Profiles of July 2002 MHHW, MSL and MLLW along the San Joaquin River for the Base - No MRB, LLT and LLT - No South simulations.

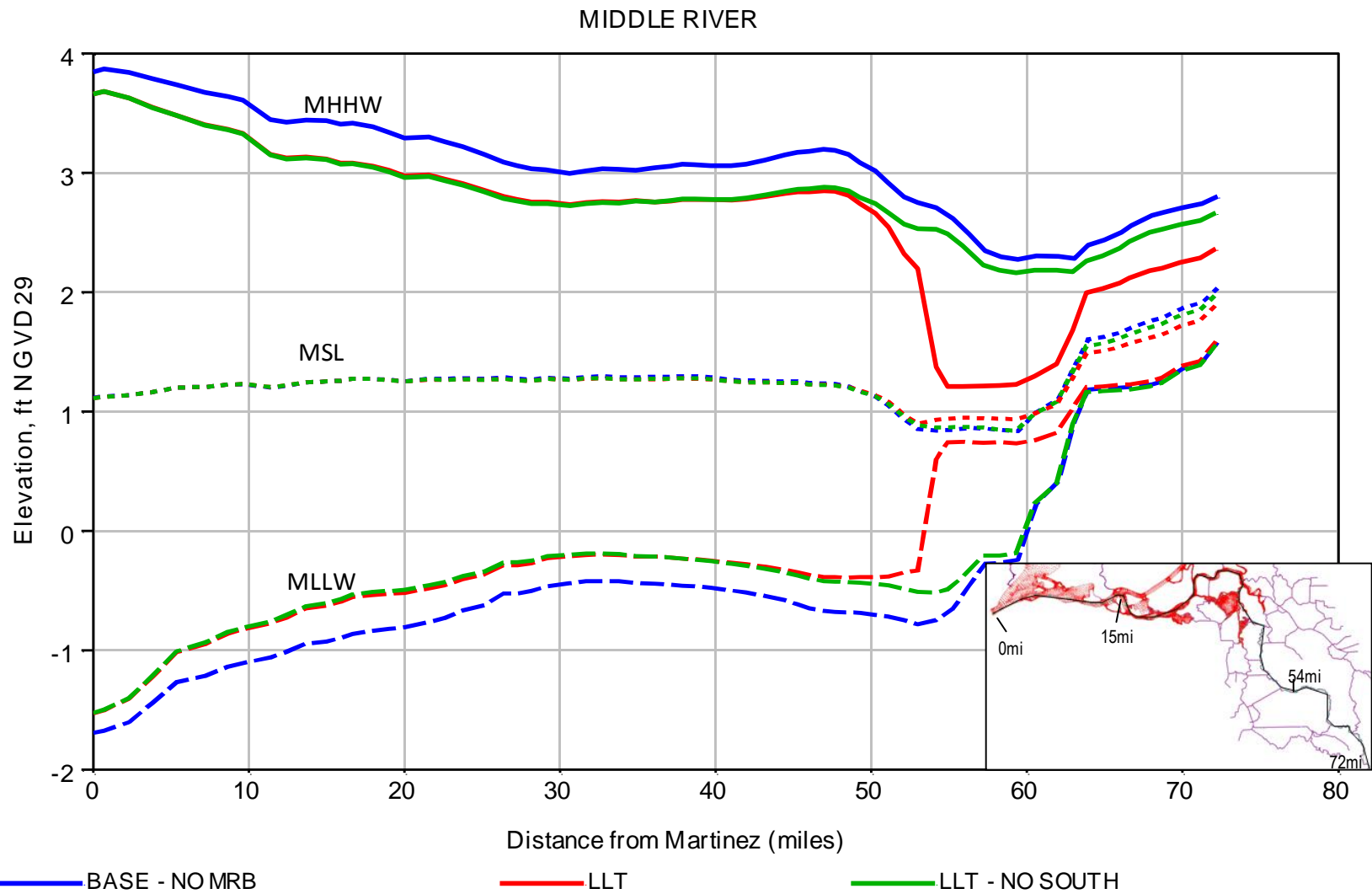


Figure 4-32 Profiles of July 2002 MHHW, MSL and MLLW along the Middle River for the Base - No MRB, LLT and LLT - No South simulations.

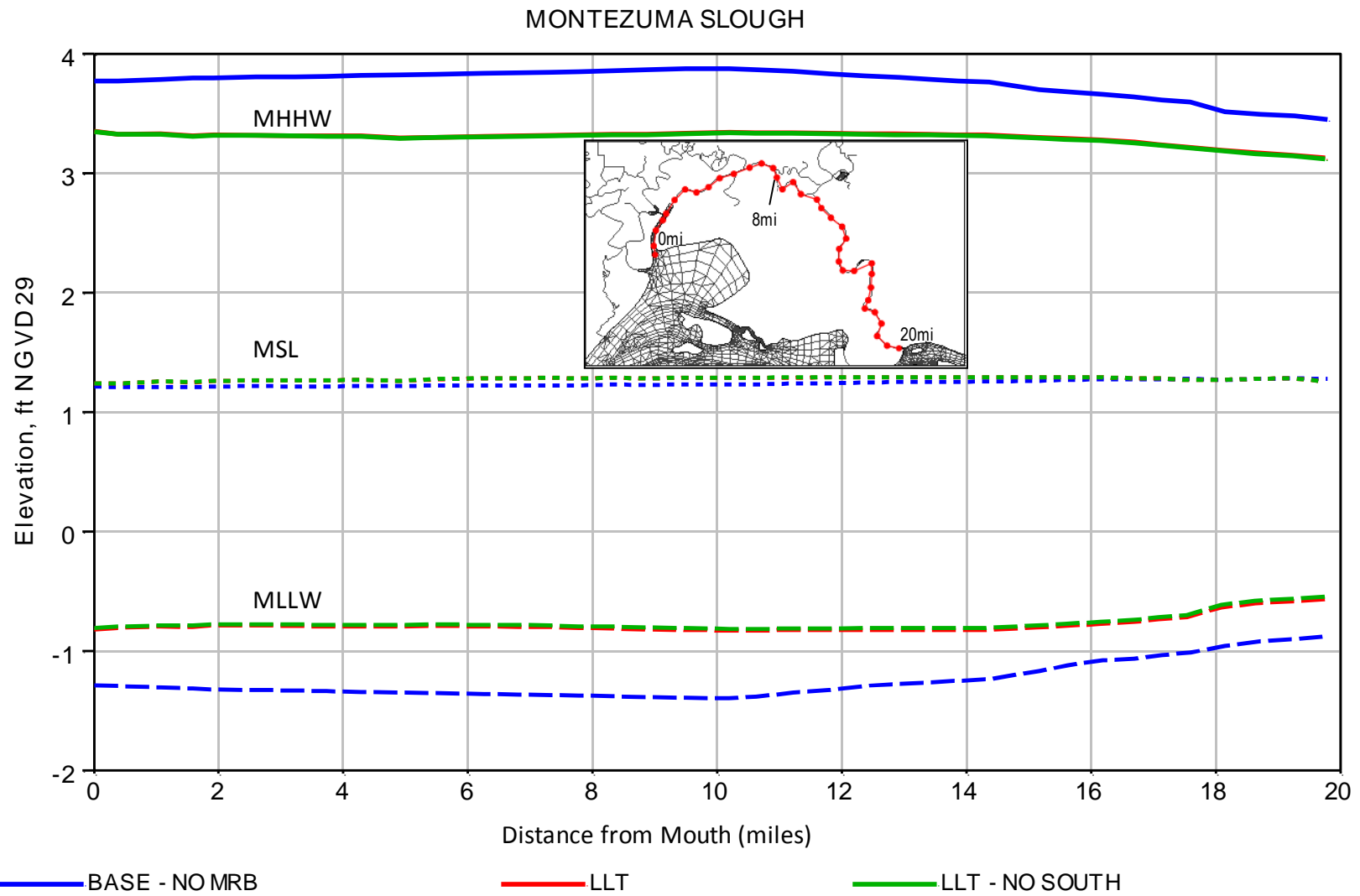


Figure 4-33 Profiles of July 2002 MHHW, MSL and MLLW along Montezuma Slough for the Base - No MRB, LLT and LLT - No South simulations.

4.2.2.4 Stage Time Series Plots

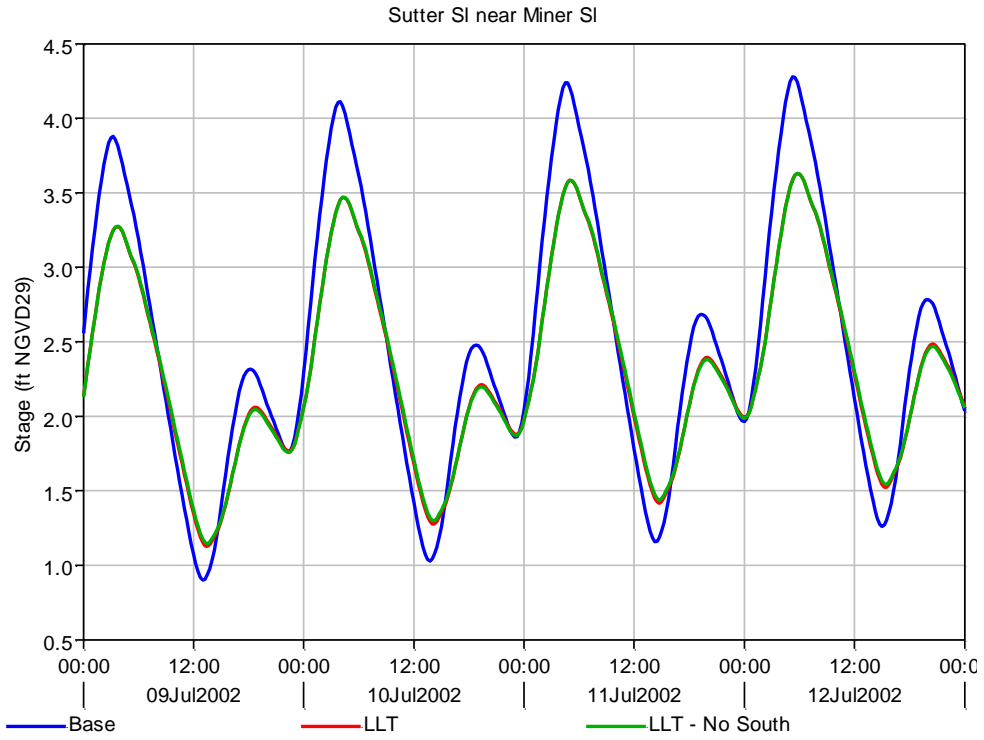


Figure 4-34 Stage in Sutter Slough for Base - No MRB, LLT and LLT - No South scenarios.

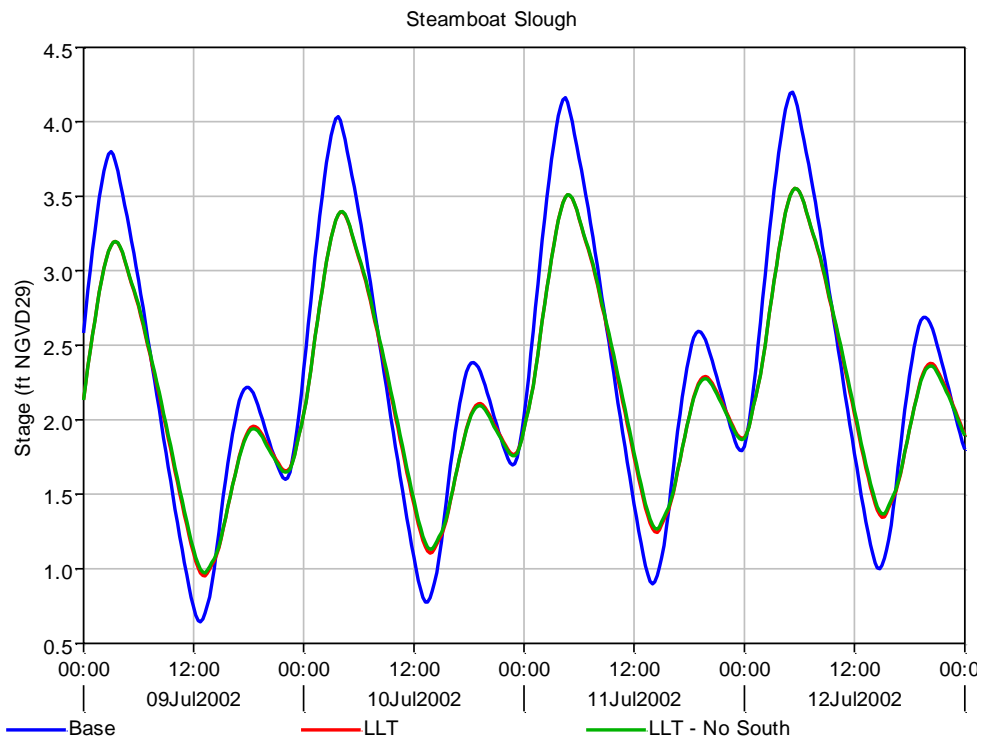


Figure 4-35 Stage in Steamboat Slough for Base - No MRB, LLT and LLT - No South scenarios.

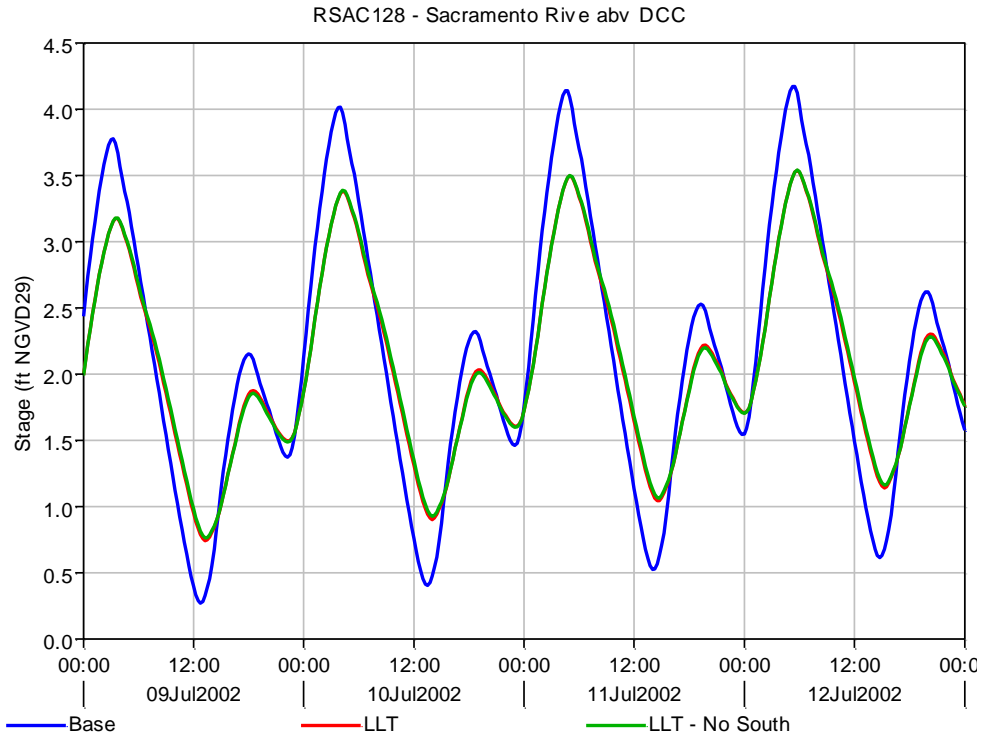


Figure 4-36 Stage at RSAC128 for Base - No MRB, LLT and LLT - No South scenarios.

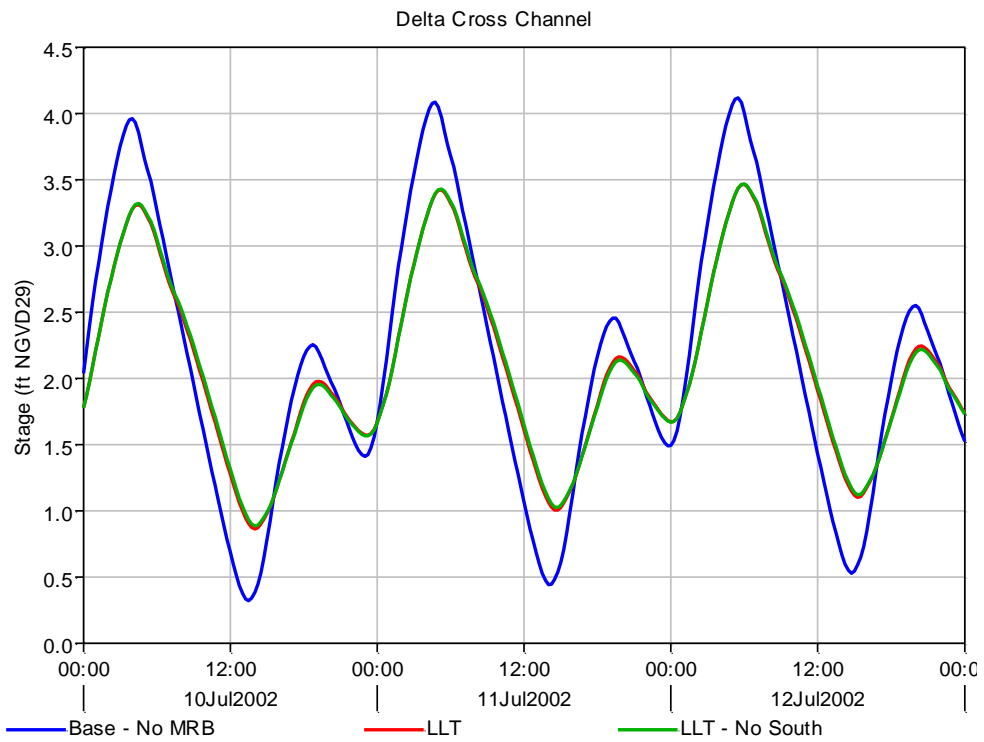


Figure 4-37 Stage in Delta Cross Channel for Base - No MRB, LLT and LLT - No South scenarios.

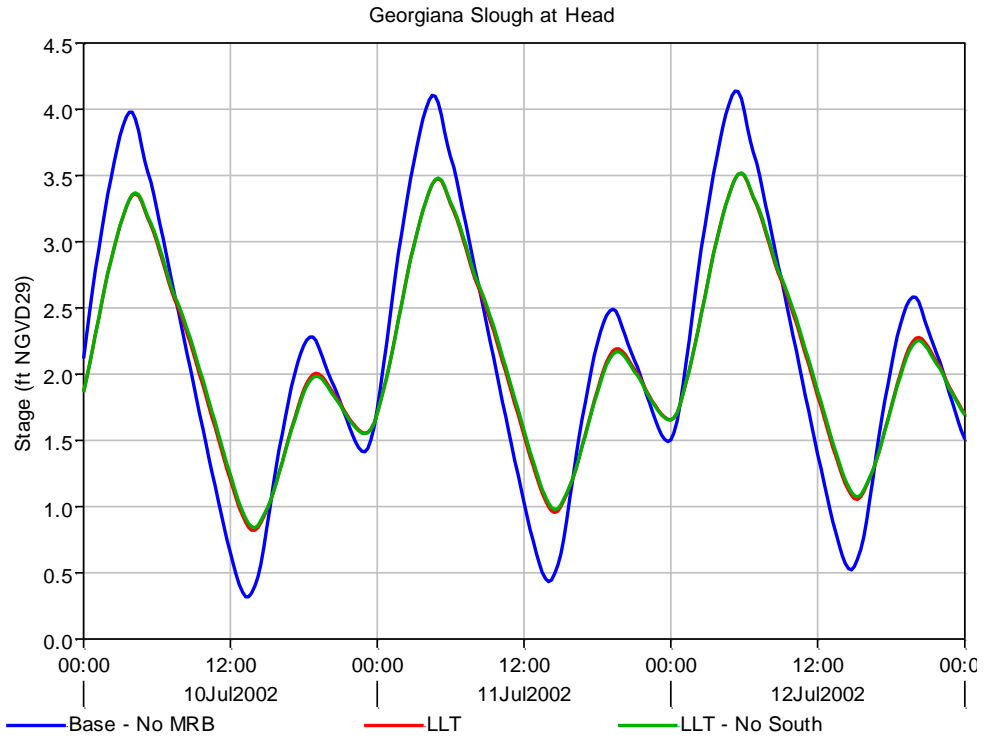


Figure 4-38 Stage in Georgiana Slough at head for Base - No MRB, LLT and LLT - No South scenarios.

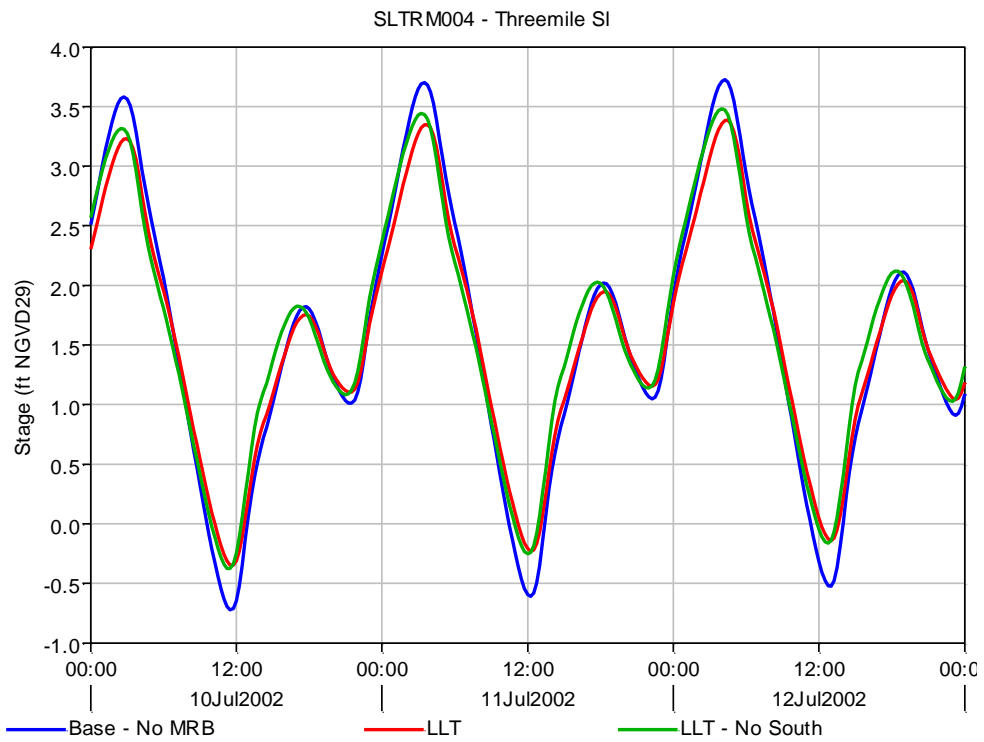


Figure 4-39 Stage in Threemile Slough for Base - No MRB, LLT and LLT - No South scenarios.

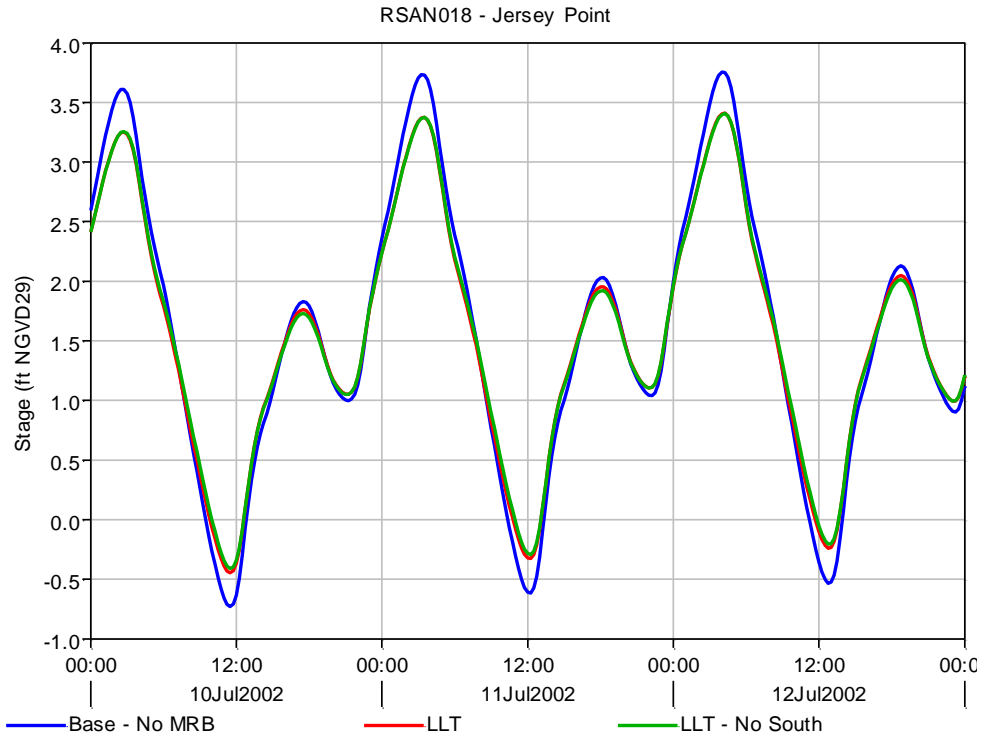


Figure 4-40 Stage at Jersey Point for Base - No MRB, LLT and LLT - No South scenarios.

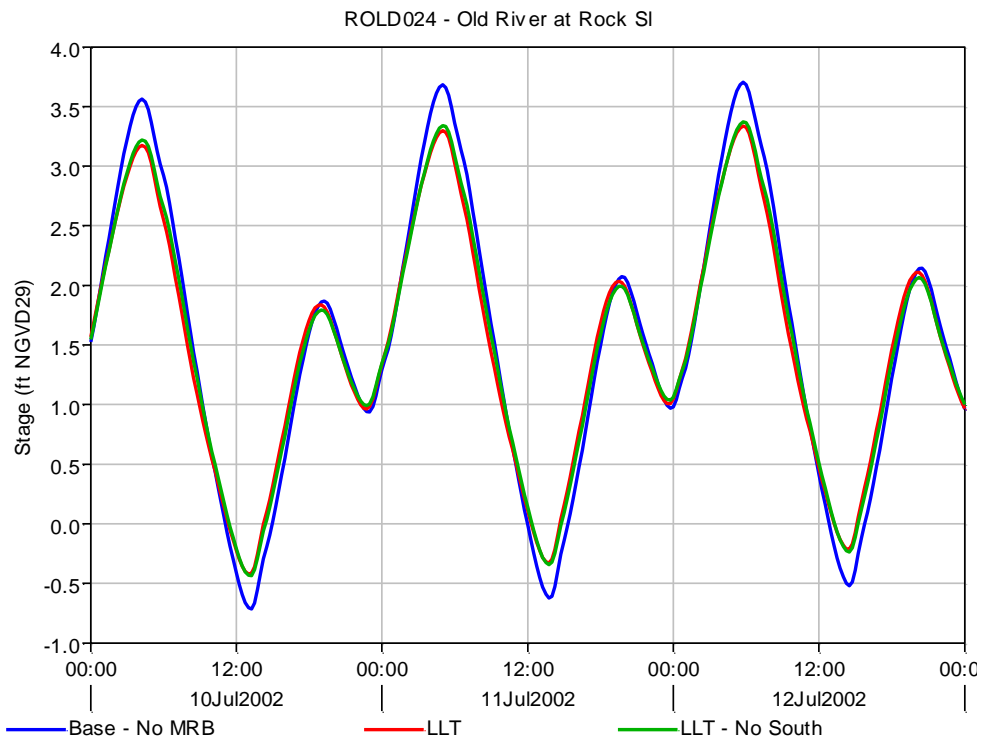


Figure 4-41 Stage at ROLD024 for Base - No MRB, LLT and LLT - No South scenarios.

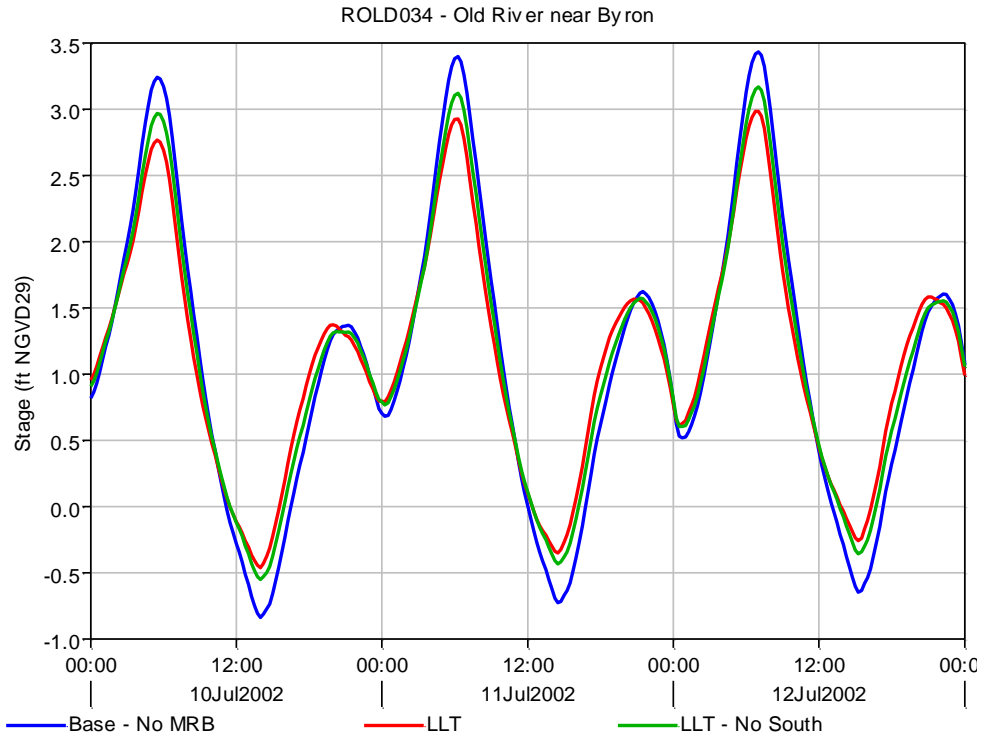


Figure 4-42 Stage at ROLD034 Base – No MRB, LLT and LLT - No South scenarios.

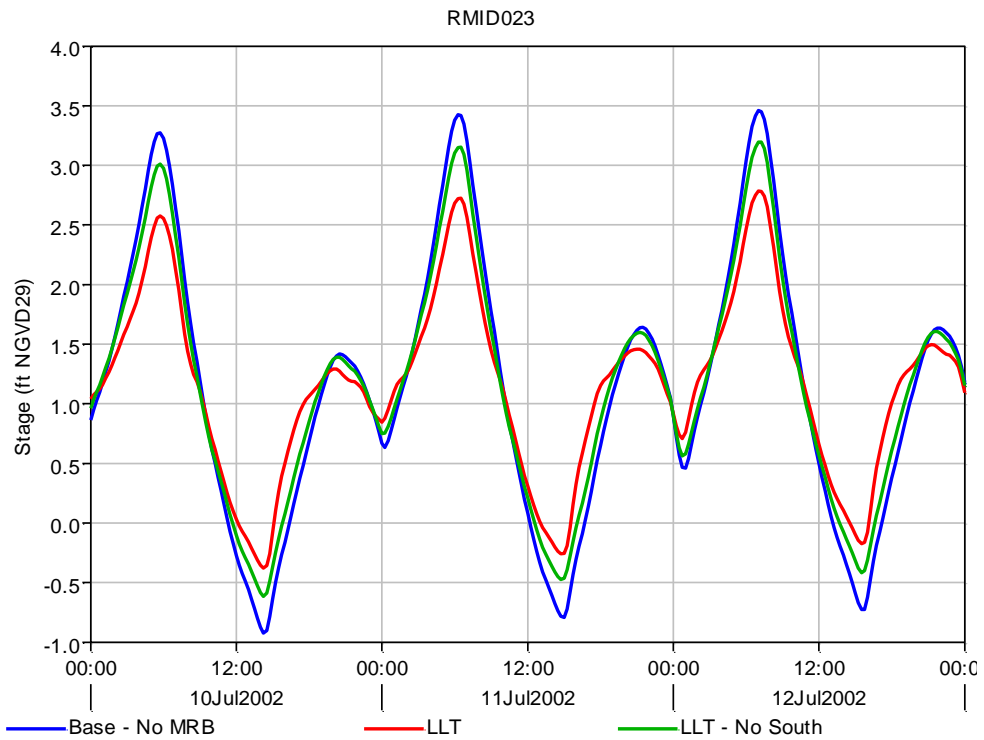


Figure 4-43 Stage RMID023 for Base - No MRB, LLT and LLT - No South scenarios.

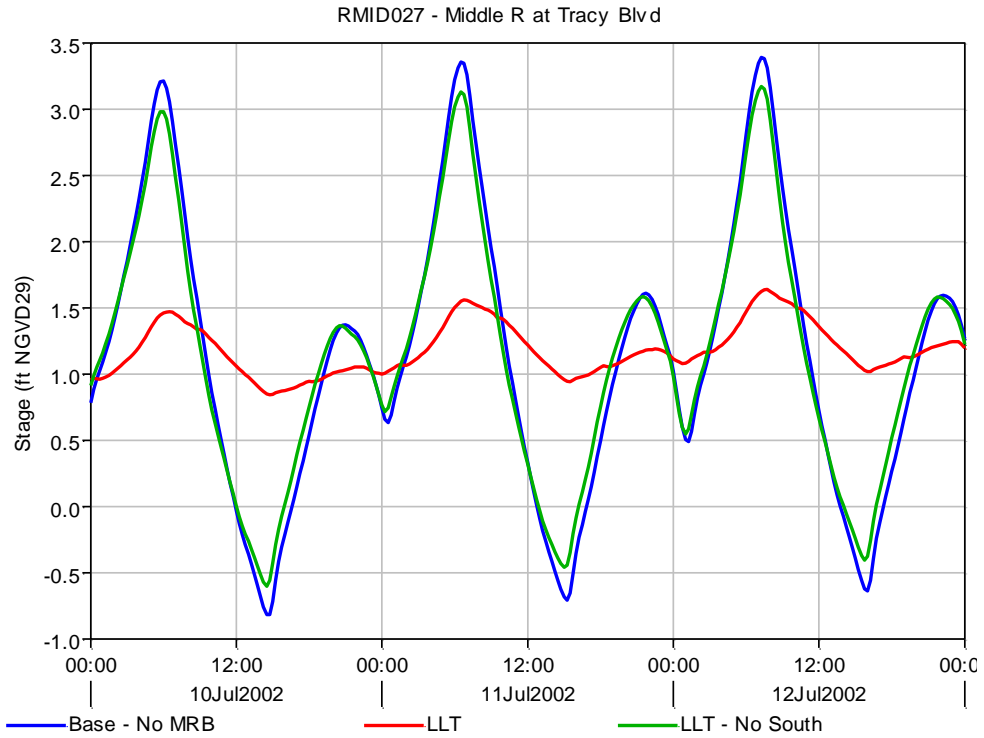


Figure 4-44 Stage at RMID027 for Base - No MRB, LLT and LLT - No South scenarios.

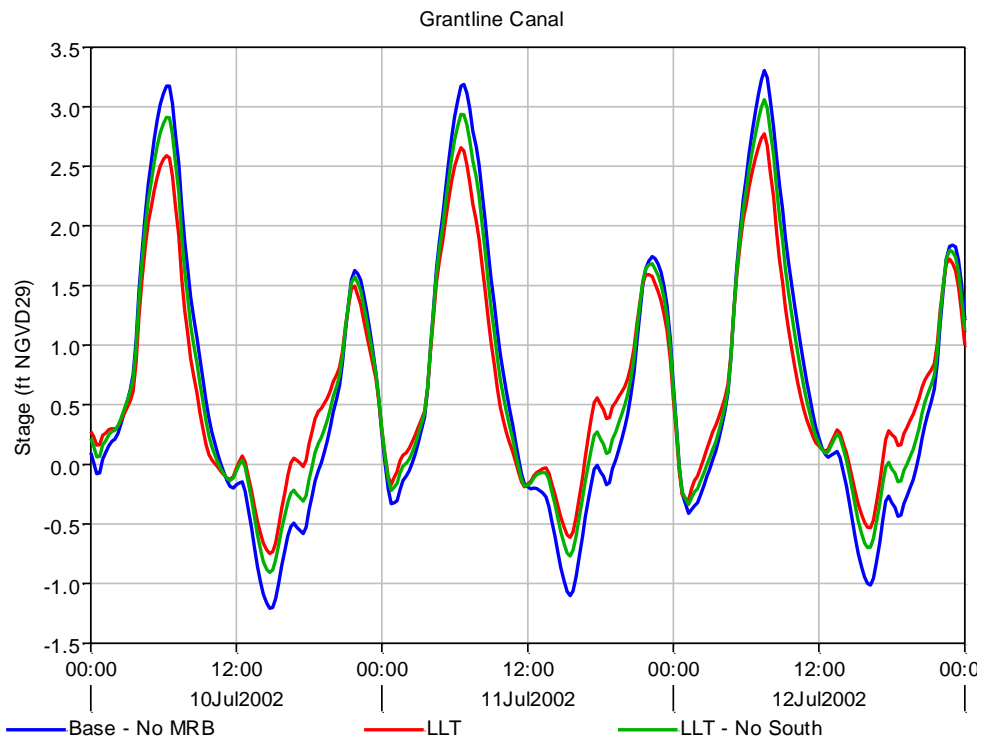


Figure 4-45 Stage in Grantline Canal for Base - No MRB, LLT and LLT - No South scenarios.

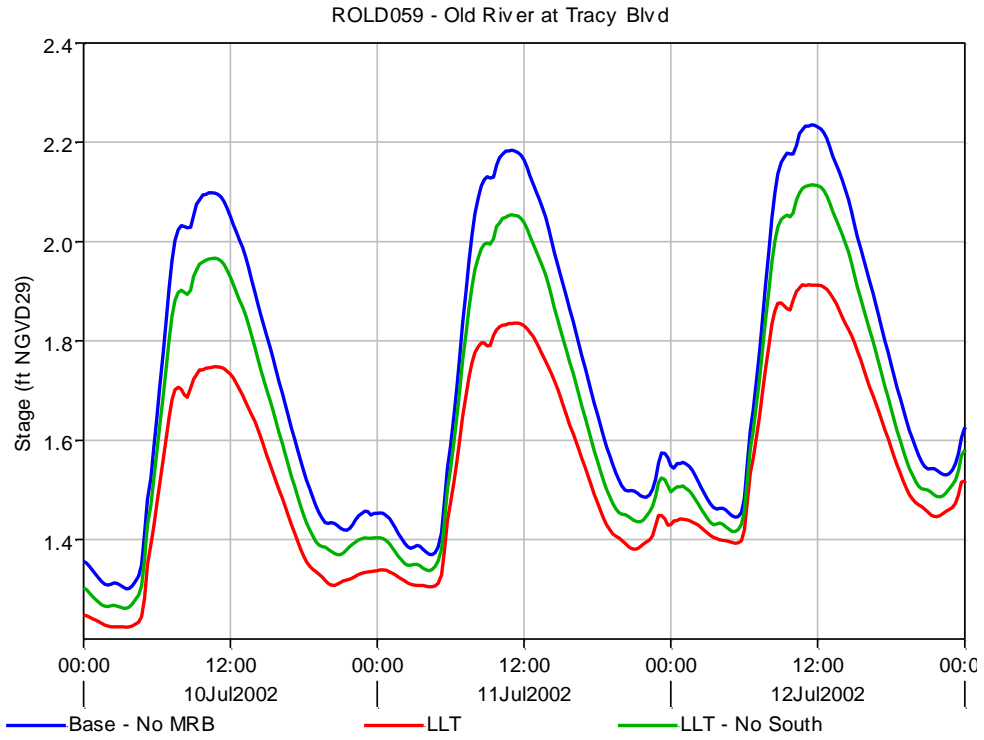


Figure 4-46 Stage at ROLD059 for Base - No MRB, LLT and LLT - No South scenarios.

4.2.2.5 Bed Shear

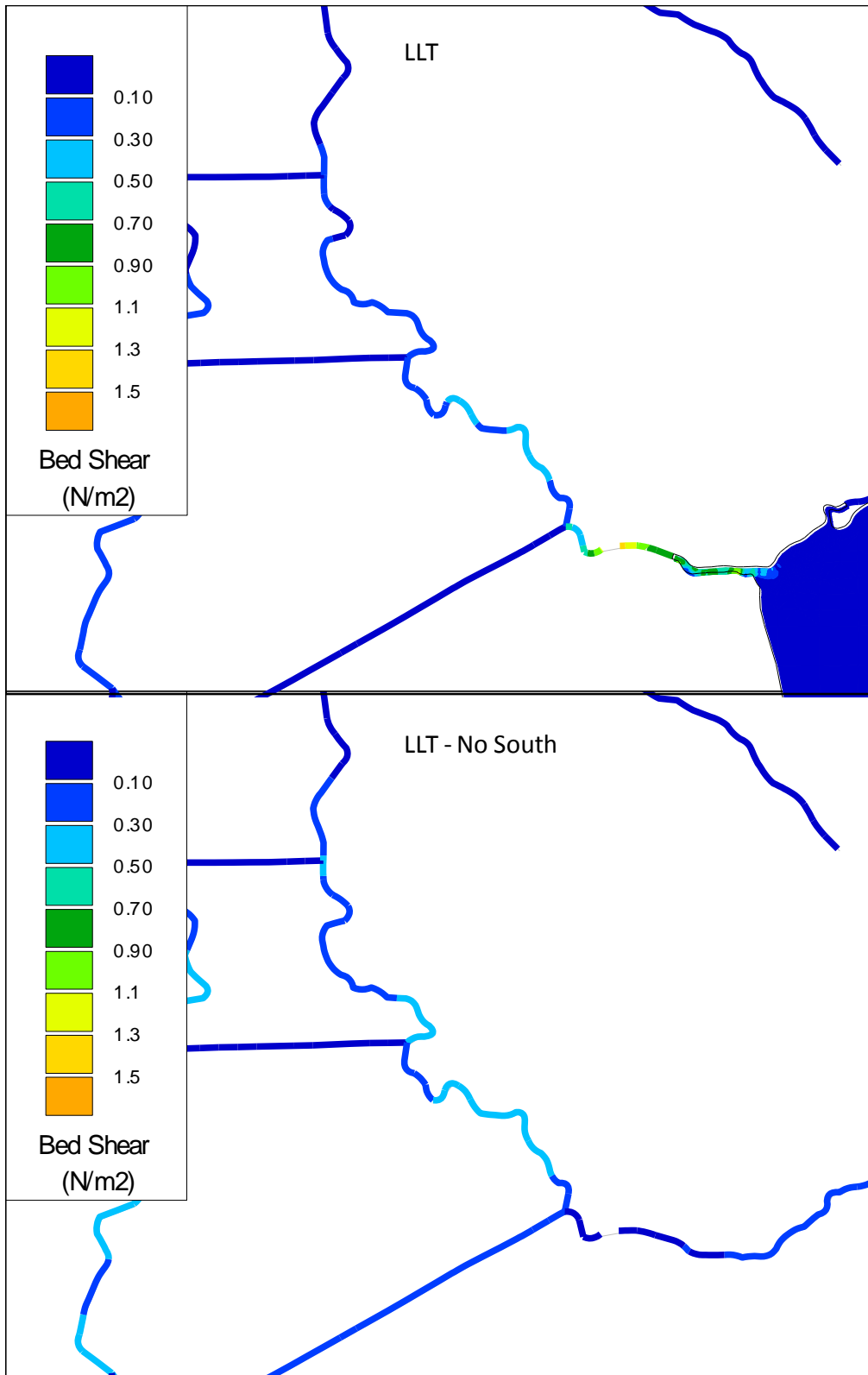


Figure 4-47 Comparison of Middle River bed shear for the LLT and LLT- No South simulations at times of peak bed shear during July 2002.

4.2.3 LLT – Middle River Conveyance

Three-month average flows for LLT-Middle River are compared with base case and LLT flows in Table 4-8 and Figure 4-50. The increased conveyance in Middle River shifts reverse flows from Middle River (456 cfs, or 9% decrease in reverse flows at RMID015) to Old River (339 cfs or 8% increase in reverse flows at ROLD024) in the reaches downstream of Victoria Canal. RMID027 reverse flows increase by 26 cfs (58%) relative to LLT, while Victoria Canal reverse flows decrease by 45 cfs (1%).

Plots of flows in Middle River at RMID015 and through the Union Island breach shown in Figure 4-48 illustrate that with the increased conveyance in Middle River, breach flows are more in phase with Middle River flows, resulting in the increased tidal flows in Middle River. With the increased tidal flow in Middle River, net flows shift to Old River for the LLT – Middle River case.

The increased tidal prism for the LLT - Middle River case means that the South Delta ROA contains more water volume at high water relative to the LLT case. Figure 4-49 shows the stage time series for RMID023 (Middle River at Victoria Canal) and RMID015. RMID023 is located just downstream of Victoria Canal. Upstream of the junction with Victoria Canal, the channel area decreases sharply in the LLT case, while the channel area remains larger for the LLT - Middle River case. The LLT - Middle River case (red line) suggests that low water is delayed at RMID023 because a larger volume is draining from the south Delta ROAs due to the increased tidal prism for the LLT - Middle River case relative to the LLT case.

At RSAN058, LLT – Middle River reduces average flow by 54 cfs (14%) relative to LLT. In the San Joaquin River at San Andreas and below, in the north Delta, along the Sacramento River and at Martinez, average flows change by 1% or less. Average flow in Montezuma Slough at head decreases from 13 cfs flowing into the marsh for LLT to 0 for LLT-Middle River (100% decrease). At the mouth of the slough, flow into the marsh increases by 10 cfs (5%).

Tidal prism and percent change from base tidal prism is tabulated in Table 4-9 and plotted in Figure 4-51 and Figure 4-52. LLT – Middle River increases tidal prism in Middle River at RMID015 by 30% and at RMID027 by 173% relative to LLT. In Old River, there is no change in tidal prism at ROLD024, but a 19% increase at ROLD034. Tidal prism in Victoria Canal increases by 17% relative to LLT. Tidal prism in San Joaquin River changes by 2% or less relative to LLT. In the Sacramento River, Cache Slough, Montezuma Slough and Martinez, tidal prism changes by 0 to 1%. Tidal Prism decreases by 2% in DCC and Miner Slough, and increases by 7% in Georgiana Slough.

Profile plots of July 2002 MHHW, MSL and MLLW, in Figure 4-54 through Figure 4-57, show that relative to LLT, the LLT – Middle River MHHW is lower in the San Joaquin River from about San Andreas to the upstream boundary. MLLW is higher from San Andreas to just upstream of Rough and Ready Island. In Middle River, LLT – Middle River MHHW is lower and MLLW is higher from San Joaquin River to just

upstream of Victoria Canal. Above this point, the MHHW is higher and the MLLW is lower. This could indicate that the “bottleneck” to filling and draining as moved from above Victoria Canal to below Victoria Canal. Relative to LLT, MSL is slightly lower in Middle River upstream of Victoria Canal and in the uppermost portion of San Joaquin River. Sacramento River and Montezuma Slough profiles show minimal difference between LLT and LLT – Middle River MLLW, and virtually no change in MHHW or MSL.

For reference, time series plots of stage are provided for various locations in Figure 4-61 through Figure 4-69. A map of locations plotted is shown in Figure 4-2.

Color contour plots of peak bed shear in Middle River during July 2002 are shown for LLT – Middle River in comparison with LLT. With increased conveyance capacity in Middle River, the peak overall Middle River bed shear is reduced from about 1.3 N/m^2 to below 0.7 N/m^2 . Bed shear in the reach between Railroad Cut and Victoria Canal is increased relative to LLT, while the highest bed shear upstream of Victoria Canal is decreased.

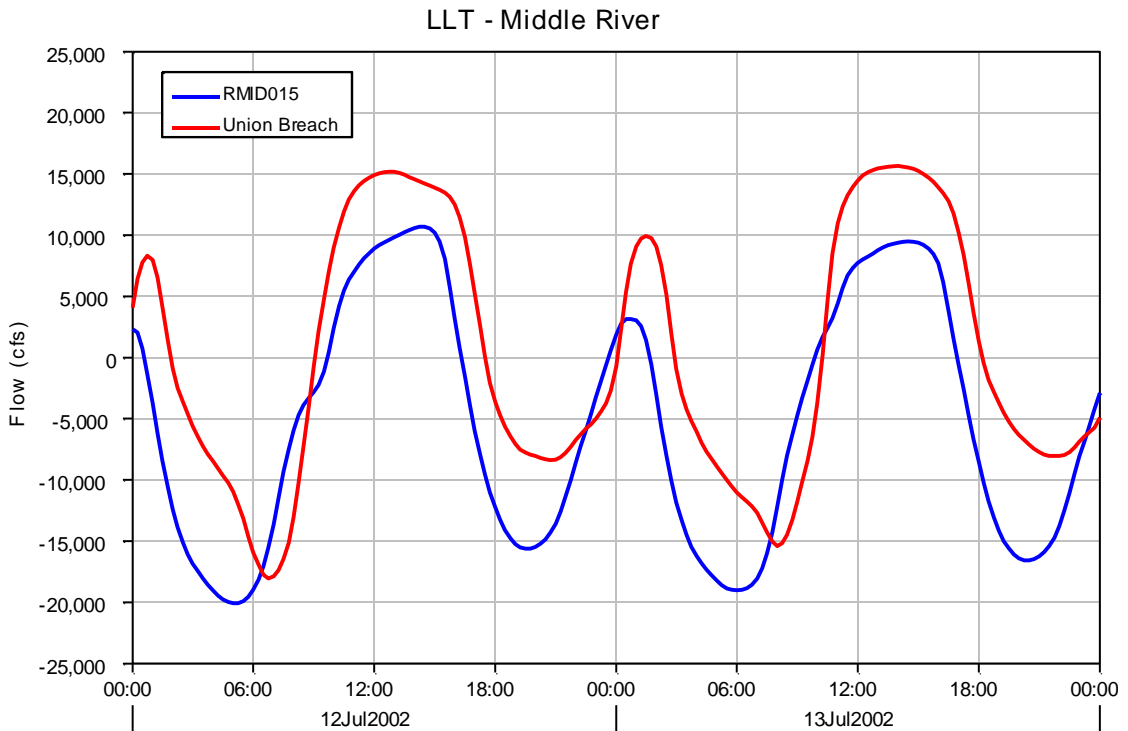
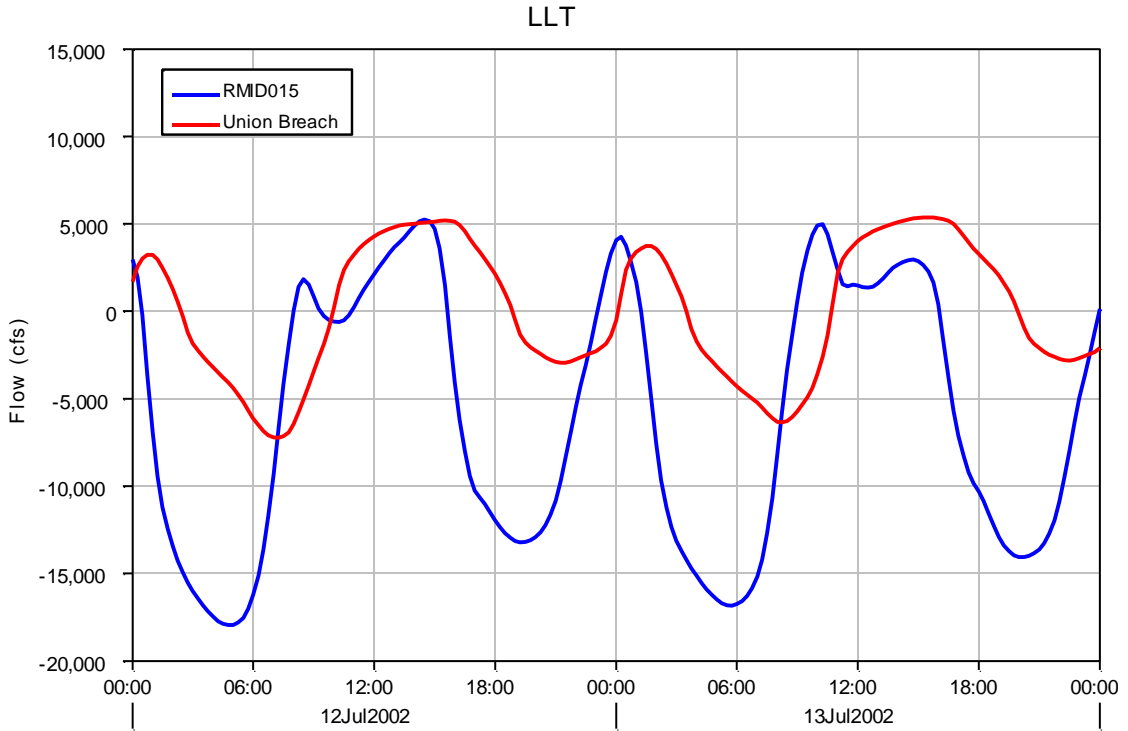


Figure 4-48 Flows in Middle River at RMD015 and through the Union Island breach for the LLT and LLT - Middle River cases.

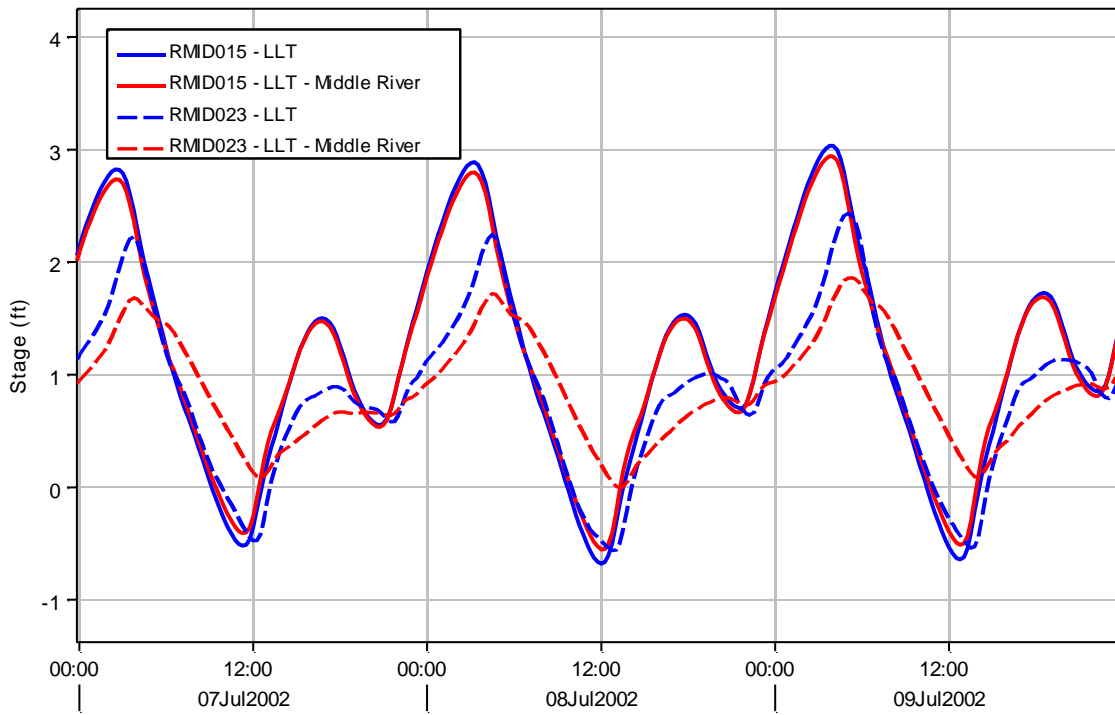


Figure 4-49 Comparison of stage at RMID015 and RMID023 for LLT and LLT - Middle River.

4.2.3.1 Net Flows

Table 4-8 Summary of 3-month Average flow (Jul – Sep 2002) for Base - No MRB, LLT, LLT – Middle River simulations.

| Location | 3-month Average Flow, Jul – Sep 2002 (cfs) | | |
|-----------------------|--|-------|--------------------|
| | Base – No MRB | LLT | LLT – Middle River |
| Cache Sl at Ryer | 1535 | 2565 | 2584 |
| DCC | 4609 | 3449 | 3435 |
| False River | -1696 | -1806 | -1821 |
| Martinez | 4422 | 4080 | 4080 |
| Miner Slough | 2018 | 2667 | 2671 |
| Mokelumne nr SJR | 4719 | 3781 | 3745 |
| Montezuma Sl at Head | 12 | 13 | 0 |
| Montezuma Sl at Mouth | -71 | -191 | -201 |
| RMID015 | -5351 | -5265 | -4809 |
| RMID027 | -25 | -45 | -71 |
| ROLD024 | -4425 | -4541 | -4880 |
| ROLD034 | -6493 | -6603 | -6579 |
| RSAC075 Chipps Island | 4503 | 4395 | 4403 |
| RSAC092 Emmaton | 5870 | 6484 | 6471 |
| RSAC101 Rio Vista | 8256 | 9712 | 9750 |
| RSAC123 | 3607 | 4258 | 4286 |
| RSAC128 | 10999 | 10137 | 10130 |
| RSAN018 Jersey Pt | -999 | -1914 | -1901 |
| RSAN032 San Andreas | -1716 | -3216 | -3204 |
| RSAN058 | 366 | 391 | 337 |
| SLDUT007 | -113 | 68 | 62 |
| SLGEO019 Georgiana Sl | 2762 | 2408 | 2388 |
| SLTRM004 Threemile Sl | -2313 | -3012 | -3058 |
| Steamboat Sl | 2280 | 2629 | 2634 |
| Sutter Sl | 2965 | 3480 | 3482 |
| Victoria Canal | -3580 | -3486 | -3441 |

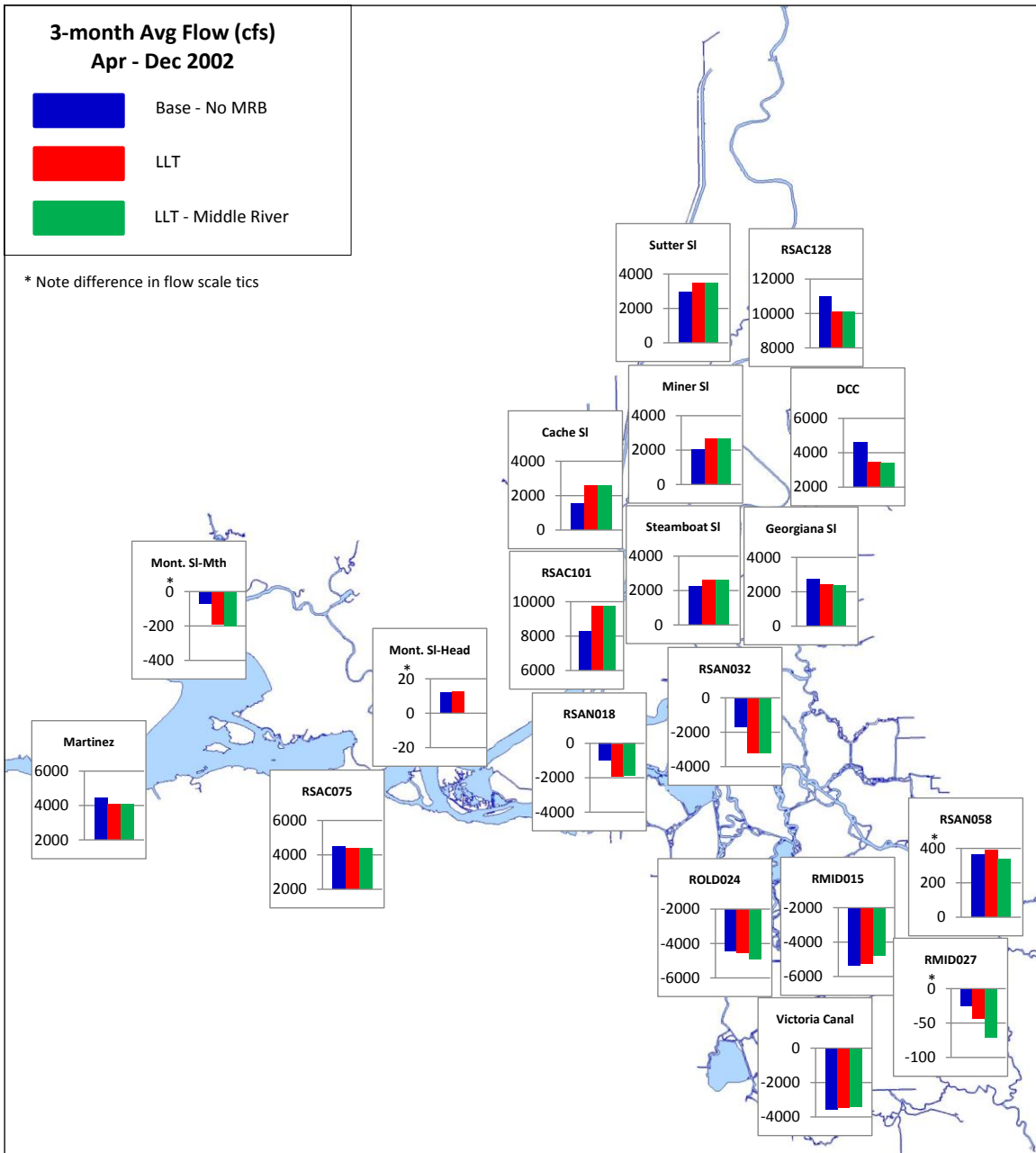


Figure 4-50 Average flows (Jul - Sep 2002) for Base - No MRB, LLT and LLT – Middle River simulations.

4.2.3.2 Tidal Prism

Table 4-9 Summary of Apr – Dec 2002 Average Tidal Prism for Base - No MRB, LLT and LLT – Middle River simulations, and percent change from Base - No MRB.

| Location | Base – No MRB | LLT | | LLT – Middle River | |
|-----------------------|---------------------|---------------------|--------------------|---------------------|--------------------|
| | Tidal Prism (ac-ft) | Tidal Prism (ac-ft) | % Change from Base | Tidal Prism (ac-ft) | % Change from Base |
| Cache Sl at Ryer | 28,697 | 26,884 | -6% | 27,080 | -6% |
| DCC | 782 | 949 | 21% | 928 | 19% |
| False River | 18,870 | 16,508 | -13% | 16,239 | -14% |
| Martinez | 167,717 | 170,966 | 2% | 171,263 | 2% |
| Miner Slough | 618 | 455 | -26% | 447 | -28% |
| Mokelumne nr SJR | 4,615 | 4,490 | -3% | 4,542 | -2% |
| Montezuma Sl at Head | 2,053 | 3,283 | 60% | 3,275 | 60% |
| Montezuma Sl at Mouth | 10,988 | 23,108 | 110% | 23,110 | 110% |
| RMID015 | 4,119 | 3,333 | -19% | 4,326 | 5% |
| RMID027 | 474 | 1,784 | 277% | 4,879 | 930% |
| ROLD024 | 4,427 | 3,655 | -17% | 3,660 | -17% |
| ROLD034 | 2,352 | 1,960 | -17% | 2,334 | -1% |
| RSAC075 Chipps Island | 115,263 | 108,506 | -6% | 108,113 | -6% |
| RSAC092 Emmaton | 49,256 | 50,591 | 3% | 50,578 | 3% |
| RSAC101 Rio Vista | 36,171 | 40,582 | 12% | 40,844 | 13% |
| RSAC123 | 2,499 | 1,811 | -28% | 1,787 | -29% |
| RSAN018 Jersey Pt | 50,110 | 44,549 | -11% | 43,854 | -12% |
| RSAN032 San Andreas | 37,847 | 32,450 | -14% | 31,763 | -16% |
| RSAN058 | 2,385 | 2,603 | 9% | 2,619 | 10% |
| SLDUT007 | 3,073 | 2,226 | -28% | 2,170 | -29% |
| SLGEO019 Georgiana Sl | 222 | 415 | 87% | 443 | 100% |
| SLTRM004 Threemile Sl | 9,413 | 6,526 | -31% | 6,266 | -33% |
| Victoria Canal | 1,337 | 786 | -41% | 920 | -31% |

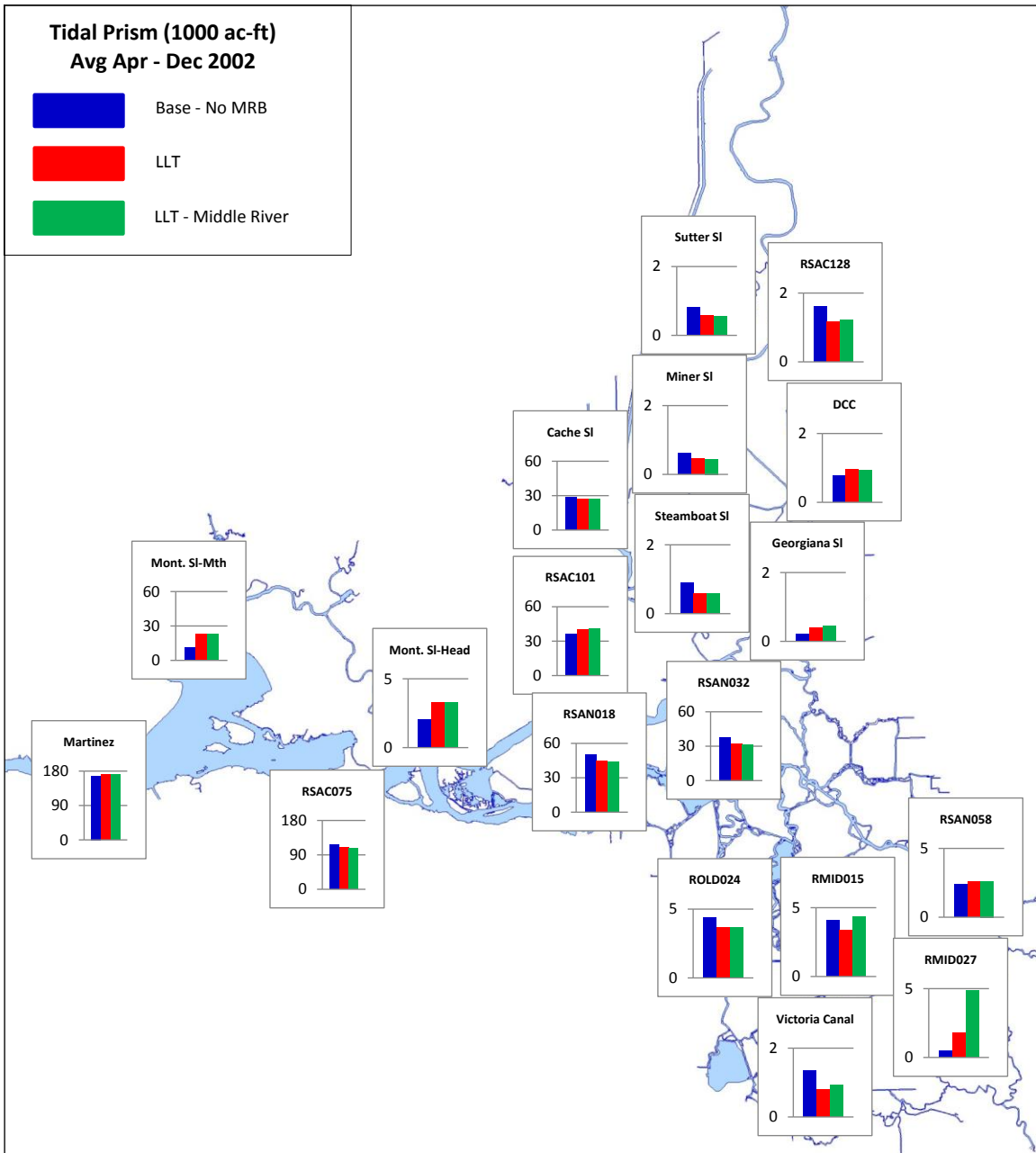


Figure 4-51 Average tidal prism (Apr - Dec 2002) for Base - No MRB, LLT and LLT – Middle River simulations.

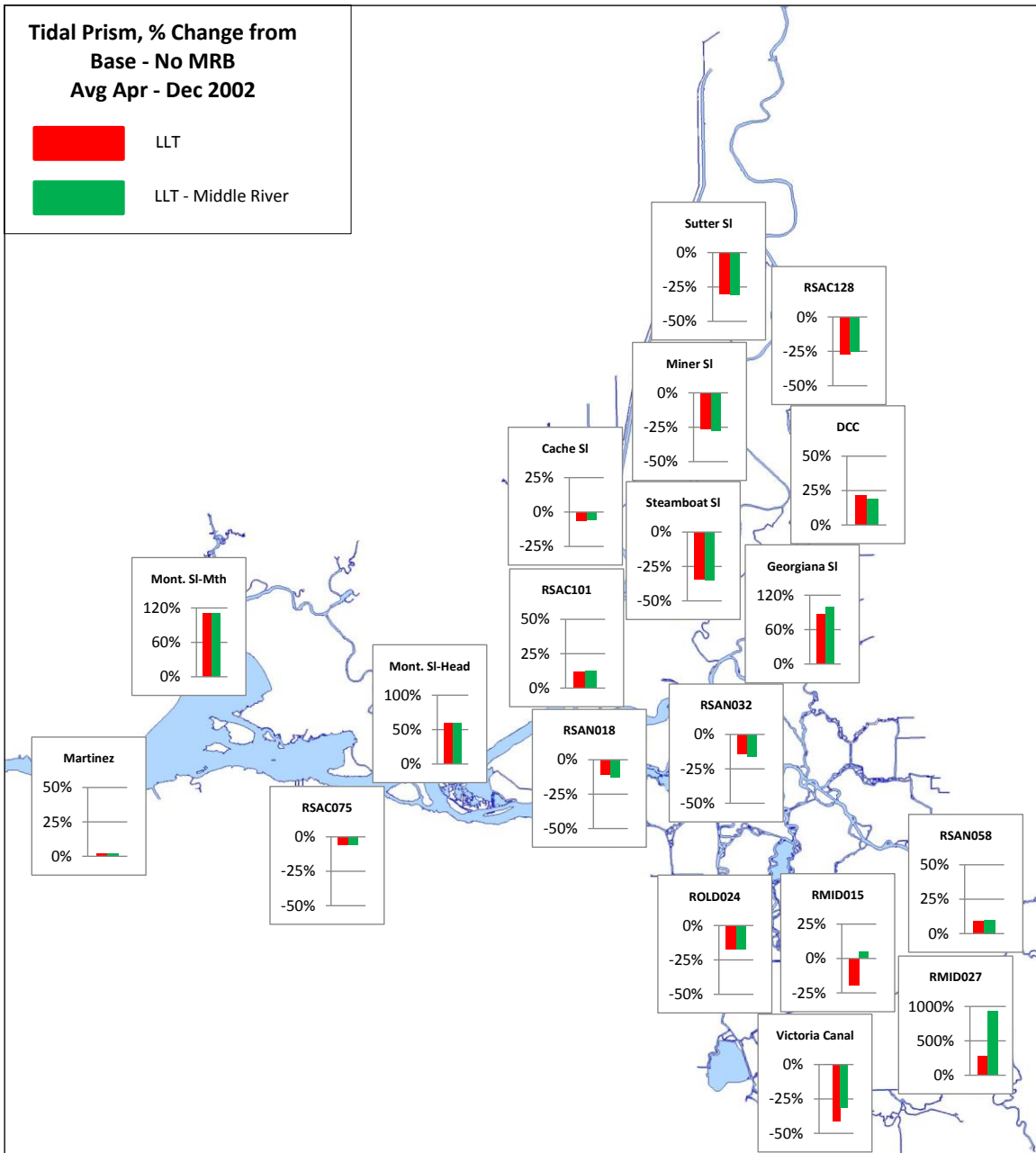


Figure 4-52 Average percent change from Base - No MRB tidal prism (Apr - Dec 2002) for LLT and LLT – Middle River simulations.

4.2.3.3 Tidal Range

Table 4-10 Summary of Apr – Dec 2002 Average Tidal Range for Base - No MRB, LLT and LLT – Middle River simulations.

| Location | Apr – Dec 2002 Average Tidal Range (ft) | | |
|-----------------------|---|------|--------------------|
| | Base – No MRB | LLT | LLT – Middle River |
| Cache Sl at Ryer | 3.95 | 2.75 | 2.76 |
| DCC | 2.92 | 2.11 | 2.11 |
| False River | 3.4 | 2.93 | 2.94 |
| Martinez | 5.47 | 5.14 | 5.14 |
| Miner Slough | 3.12 | 2.62 | 2.64 |
| Montezuma Sl at Head | 4.25 | 3.64 | 3.66 |
| Montezuma Sl at Mouth | 5.0 | 4.05 | 4.07 |
| RMID015 | 3.76 | 3.14 | 2.94 |
| RMID023 | 3.49 | 2.48 | 1.41 |
| RMID027 | 3.33 | 0.56 | 1.29 |
| ROLD024 | 3.55 | 3.02 | 2.86 |
| ROLD034 | 3.36 | 2.73 | 2.14 |
| RSAC075 Chipps Island | 4.42 | 3.85 | 3.87 |
| RSAC092 Emmaton | 3.93 | 3.23 | 3.25 |
| RSAC101 Rio Vista | 3.86 | 2.79 | 2.8 |
| RSAC123 | 2.95 | 2.14 | 2.14 |
| RSAC128 | 2.91 | 2.12 | 2.12 |
| RSAN018 Jersey Pt | 3.47 | 2.98 | 3.01 |
| RSAN032 San Andreas | 3.37 | 2.89 | 2.87 |
| RSAN058 | 4.05 | 3.25 | 3.18 |
| SLDUT007 Dutch Slough | 3.59 | 3.04 | 3.07 |
| SLGEO019 Georgiana Sl | 2.95 | 2.16 | 2.16 |
| SLTRM004 Threemile Sl | 3.45 | 2.9 | 2.9 |
| Steamboat Sl | 2.69 | 1.99 | 2.0 |
| Sutter Sl | 2.57 | 1.94 | 1.93 |
| Victoria Canal | 3.48 | 2.48 | 1.38 |

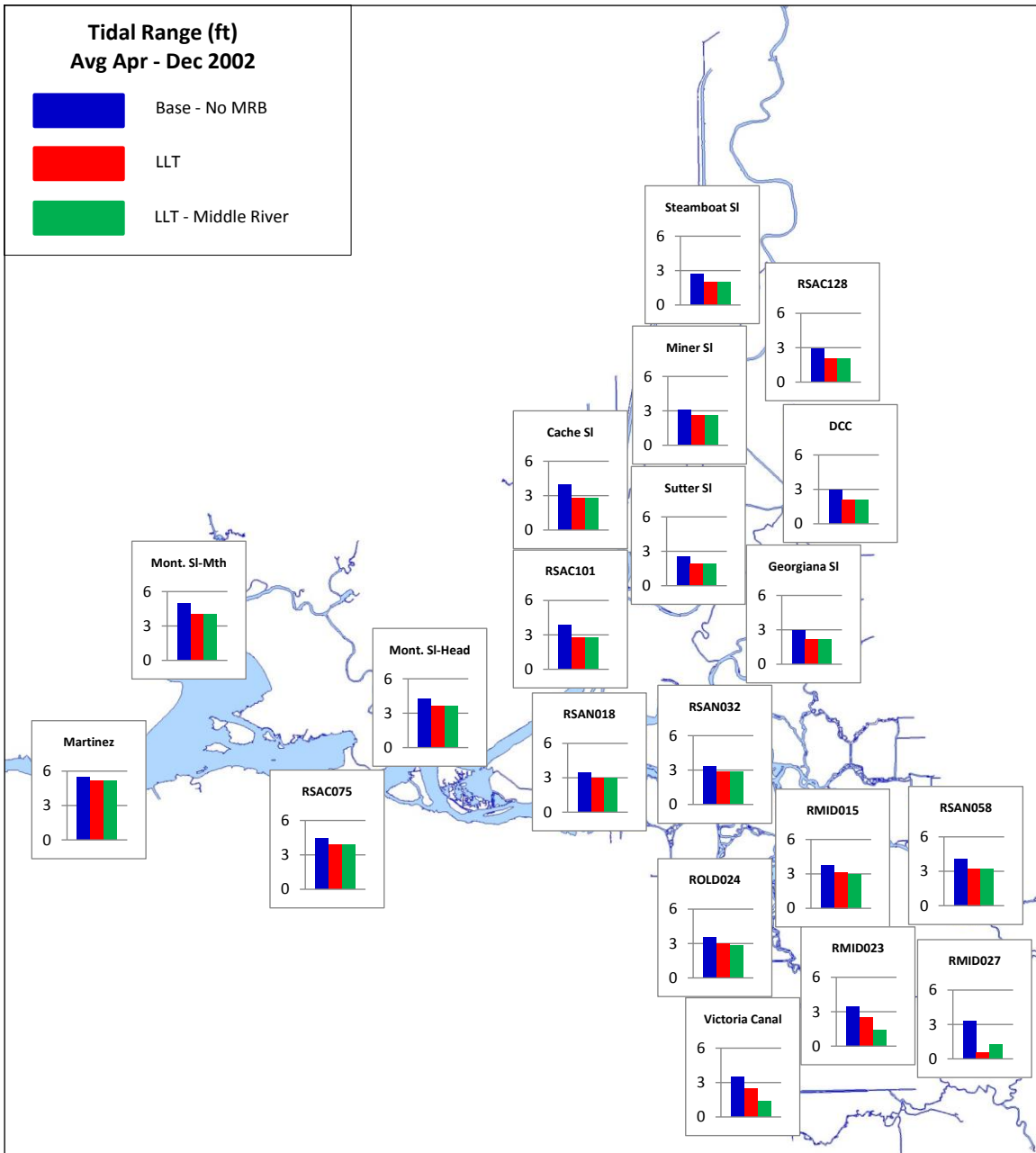


Figure 4-53 Average tidal range (Apr - Dec 2002) for Base - No MRB, LLT and LLT – Middle River simulations.

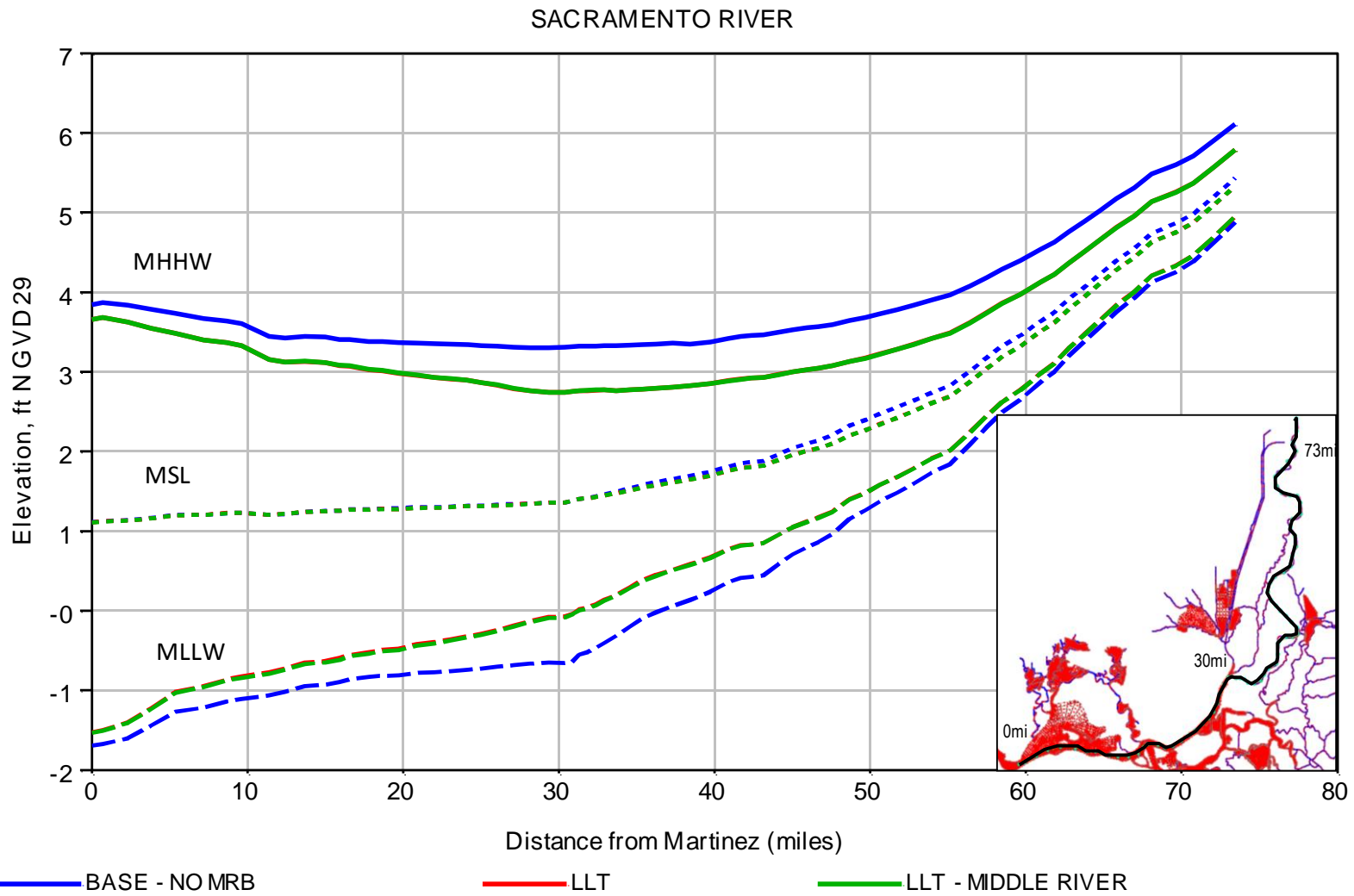


Figure 4-54 Profiles of July 2002 MHHW, MSL and MLLW along the Sacramento River for the Base - No MRB, LLT and LLT - Middle River simulations.

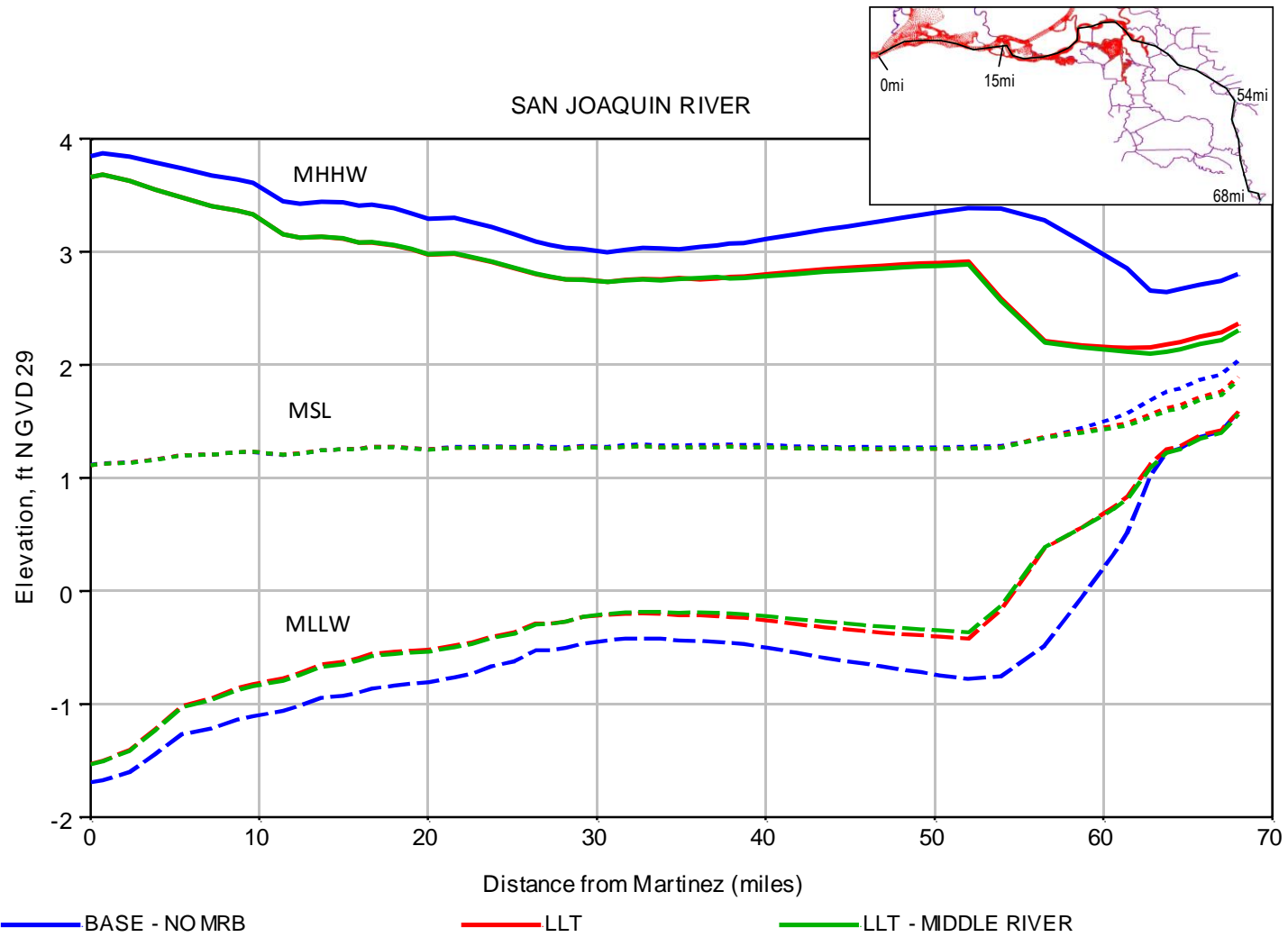


Figure 4-55 Profiles of July 2002 MHHW, MSL and MLLW along the San Joaquin River for the Base - No MRB, LLT and LLT - Middle River simulations.

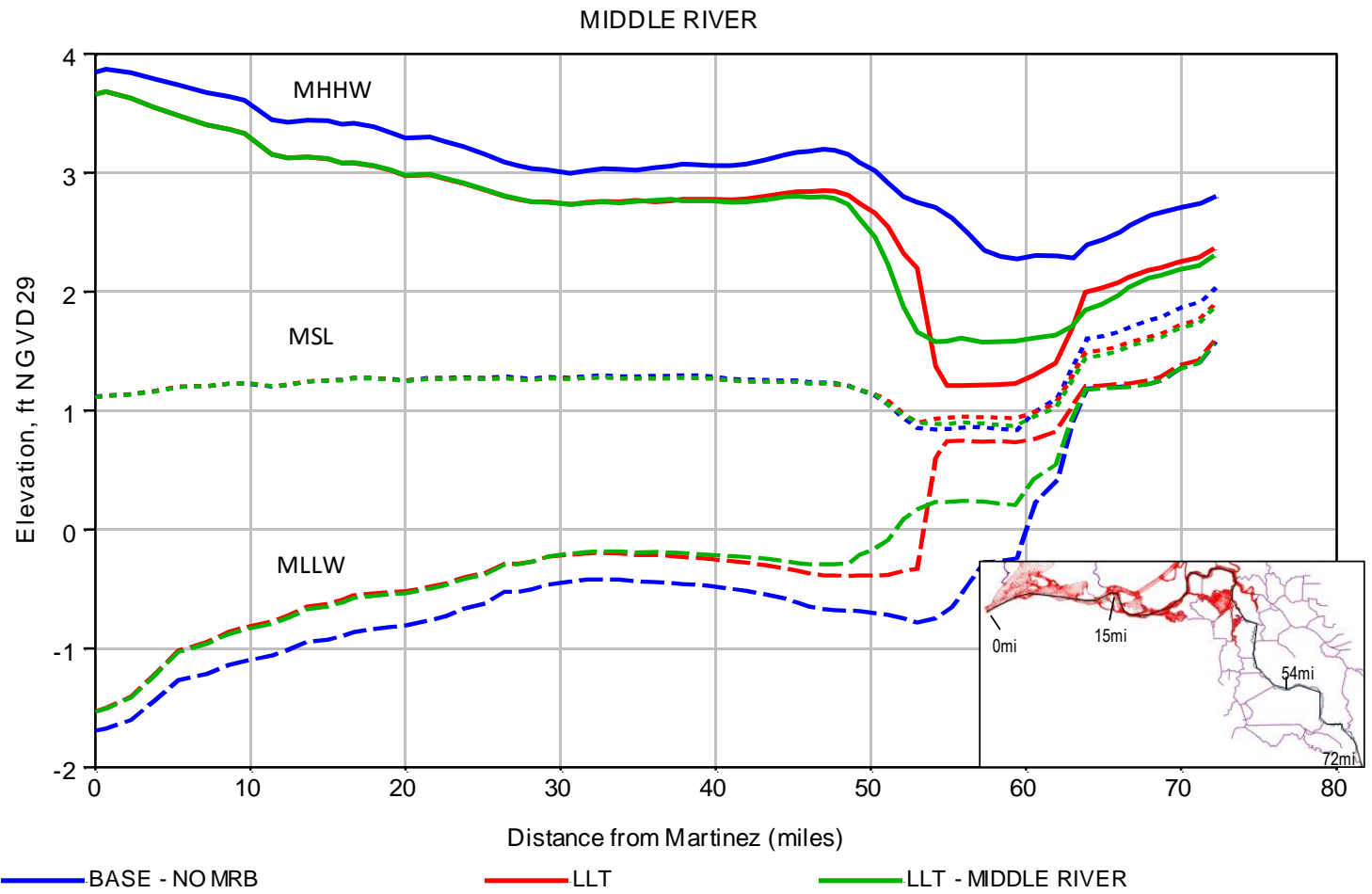


Figure 4-56 Profiles of July 2002 MHHW, MSL and MLLW along the Middle River for the Base - No MRB, LLT and LLT - Middle River simulations.

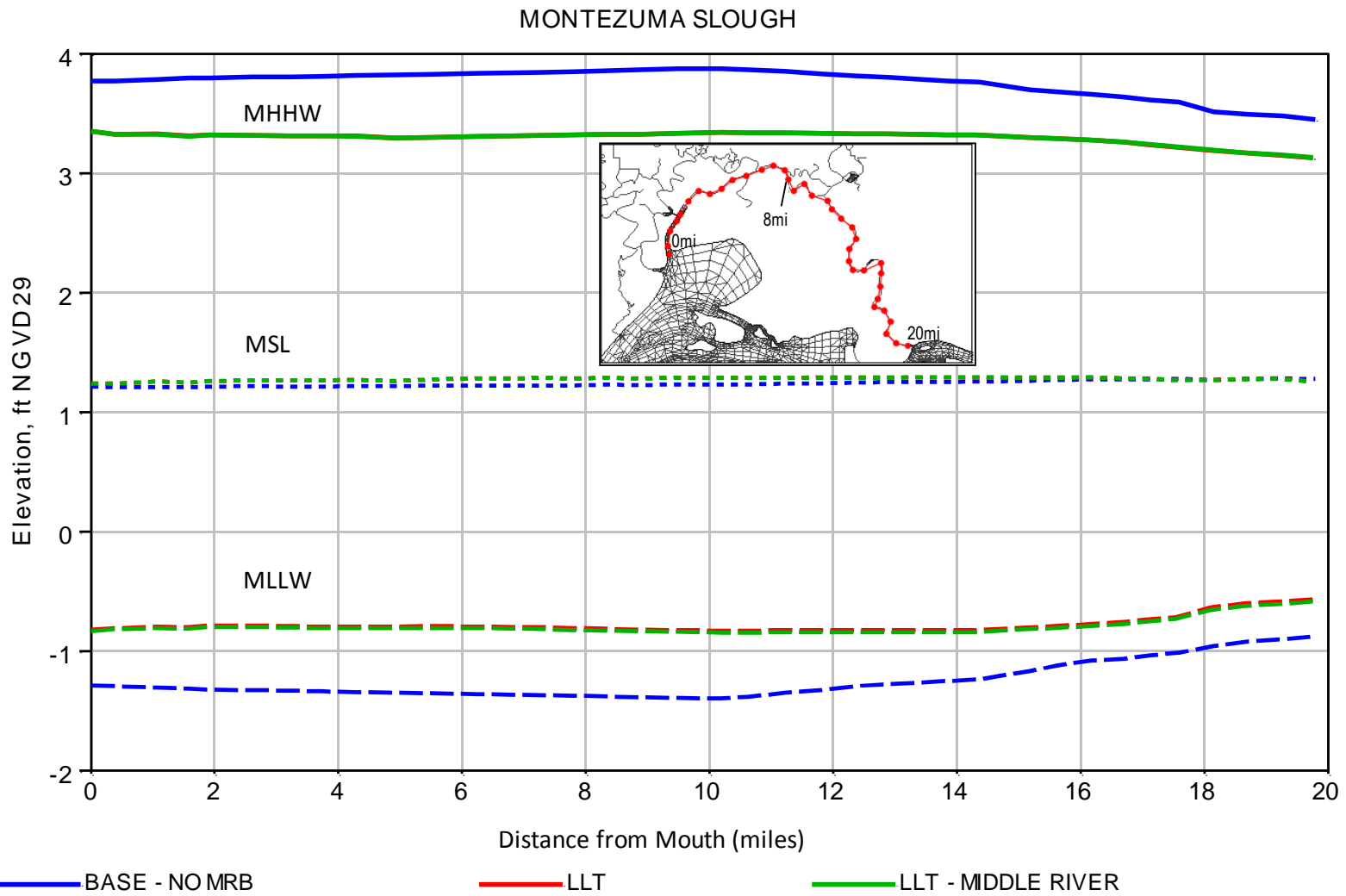


Figure 4-57 Profiles of July 2002 MHHW, MSL and MLLW along Montezuma Slough for the Base - No MRB, LLT and LLT - Middle River simulations.

4.2.3.4 Stage Time Series Plots

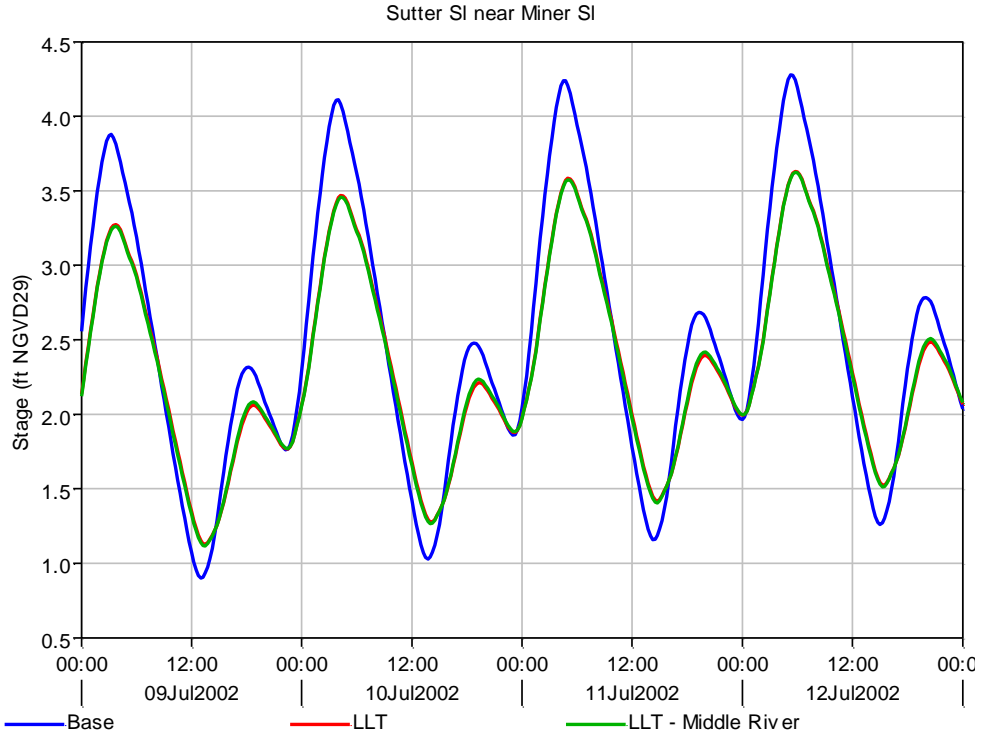


Figure 4-58 Stage in Sutter Slough for Base - No MRB, LLT and LLT - Middle River scenarios.

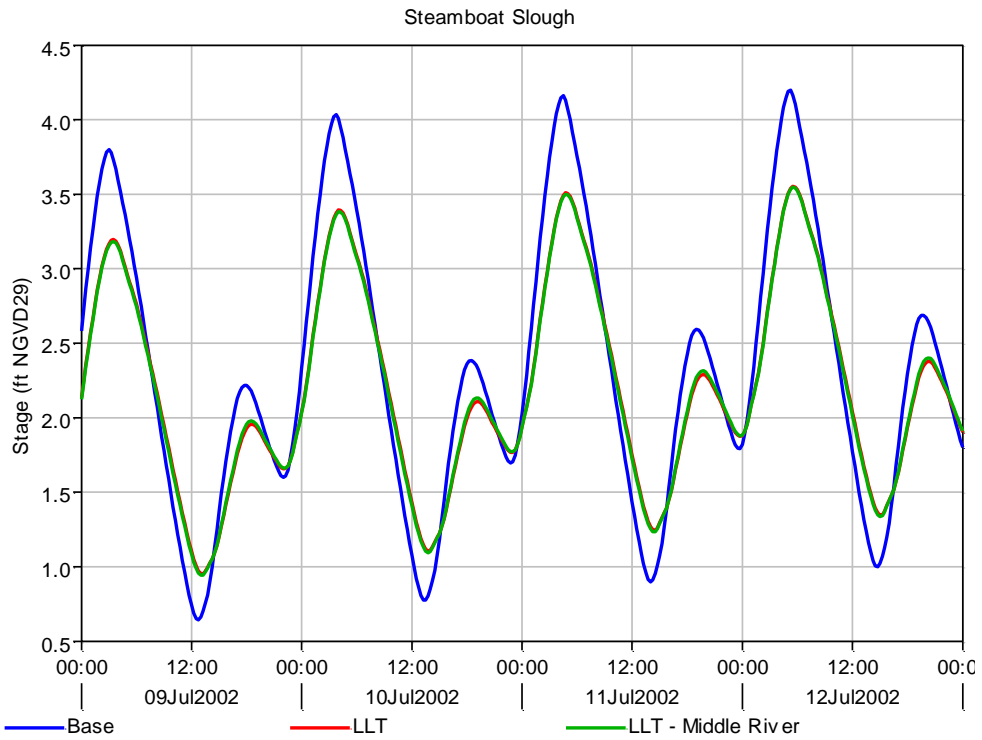


Figure 4-59 Stage in Steamboat Slough for Base - No MRB, LLT and LLT - Middle River scenarios.

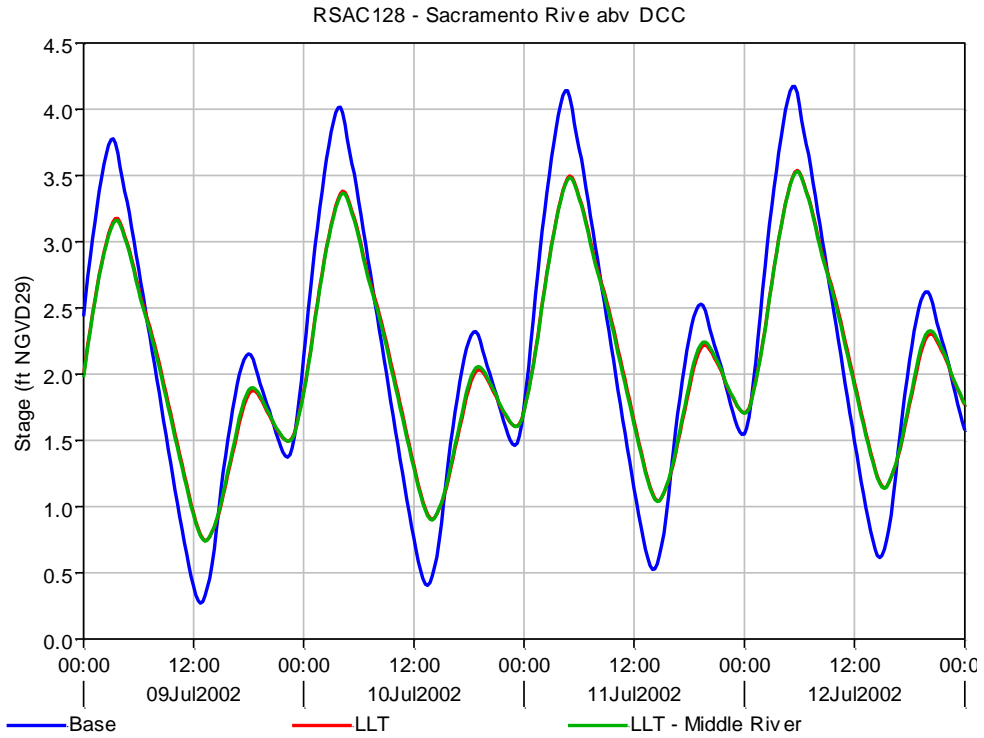


Figure 4-60 Stage at RSAC128 for Base - No MRB, LLT and LLT - Middle River scenarios.

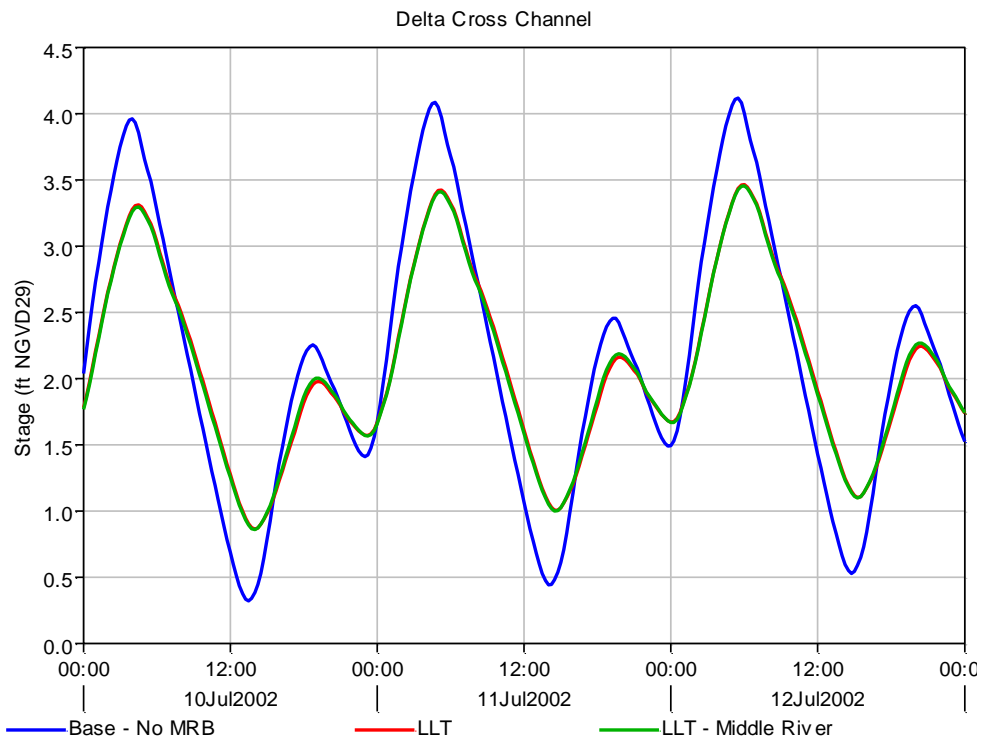


Figure 4-61 Stage at Delta Cross Channel for Base - No MRB, LLT and LLT - Middle River scenarios.

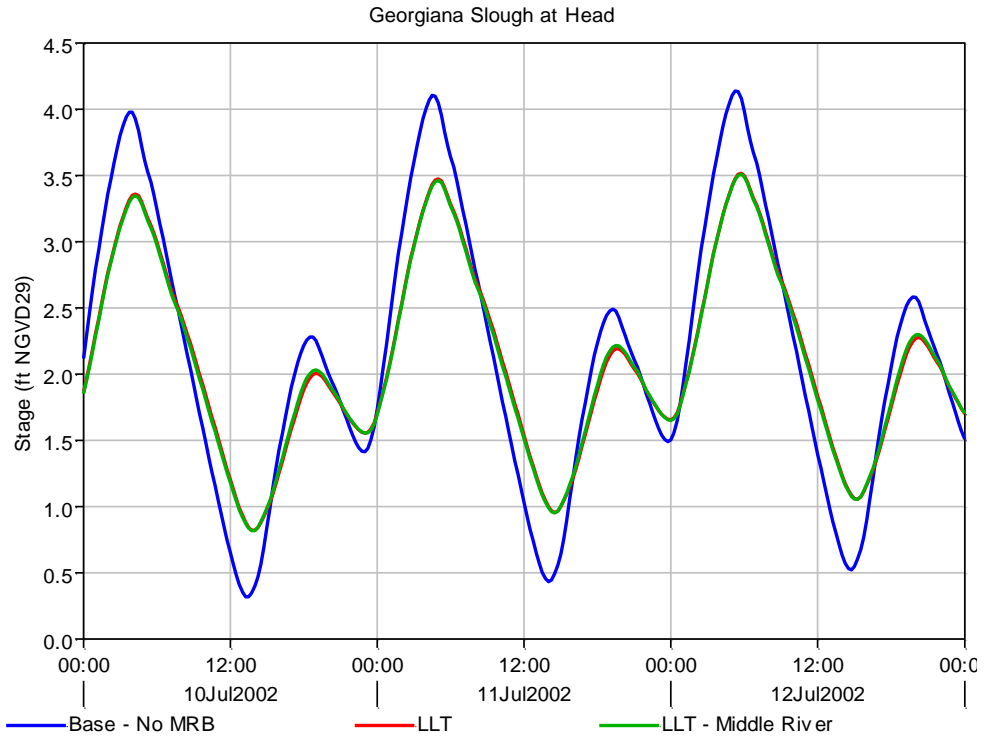


Figure 4-62 Stage at Georgiana Slough for Base - No MRB, LLT and LLT - Middle River scenarios.

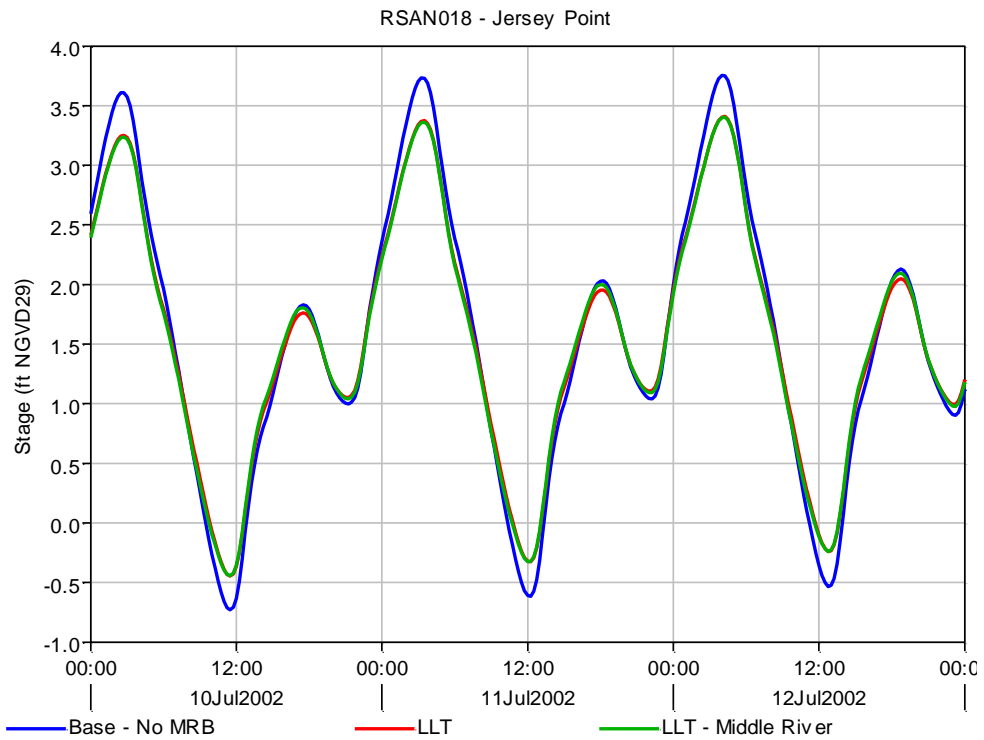


Figure 4-63 Stage at Jersey Point for Base - No MRB, LLT and LLT - Middle River scenarios.

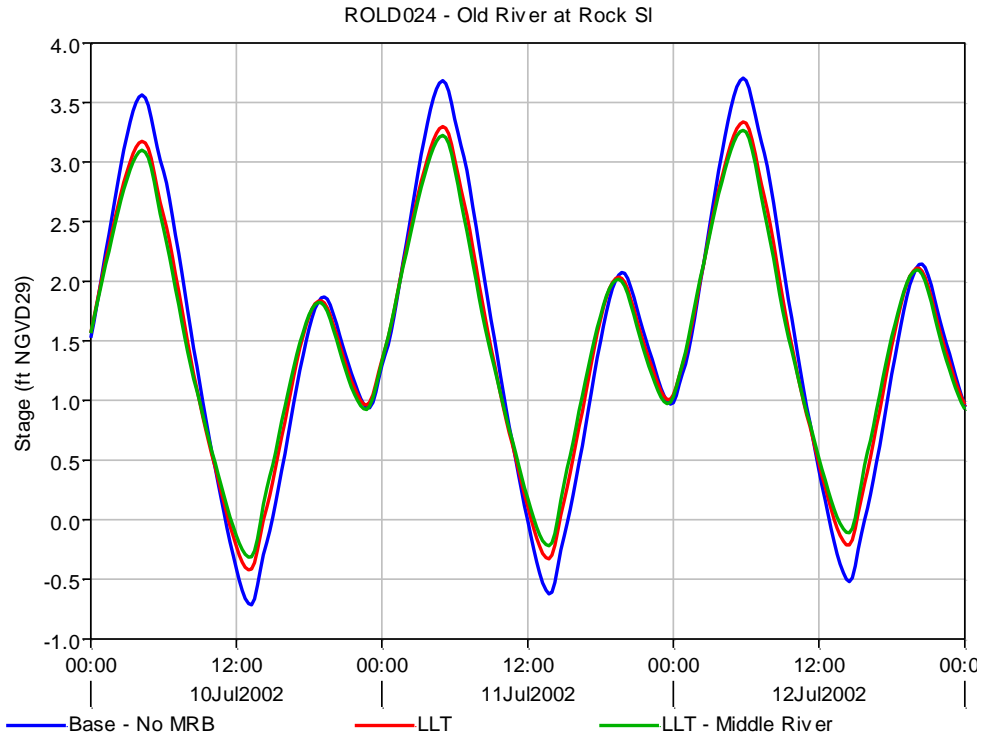


Figure 4-64 Stage at ROLD024 for Base - No MRB, LLT and LLT - Middle River scenarios.

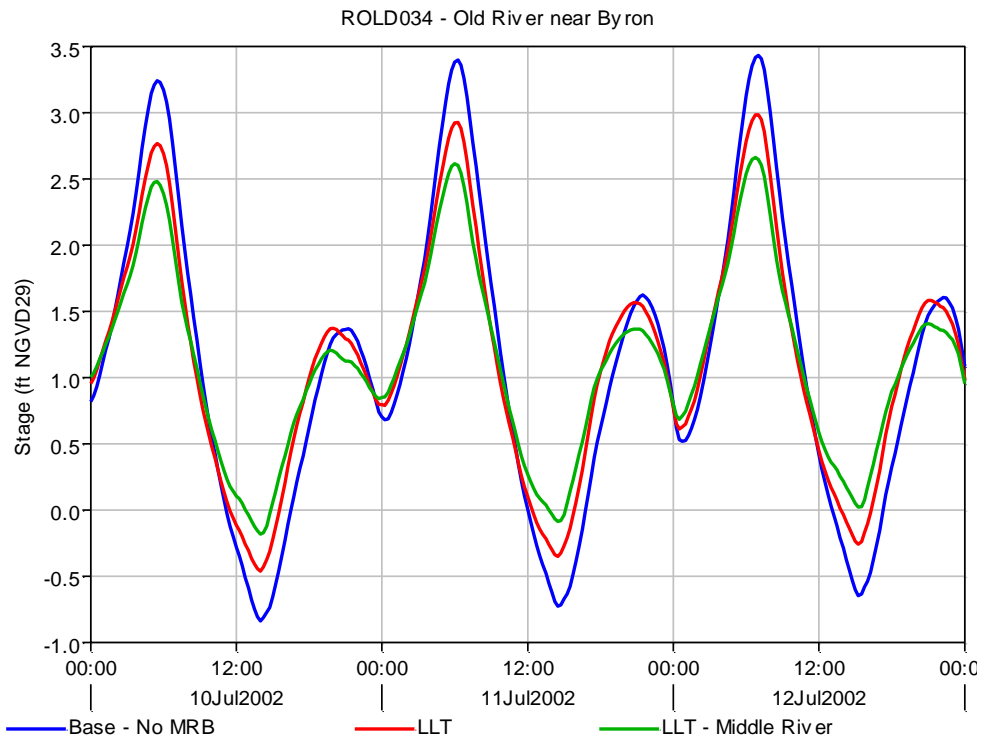


Figure 4-65 Stage at ROLD034 Base, LLT and LLT - Middle River scenarios.

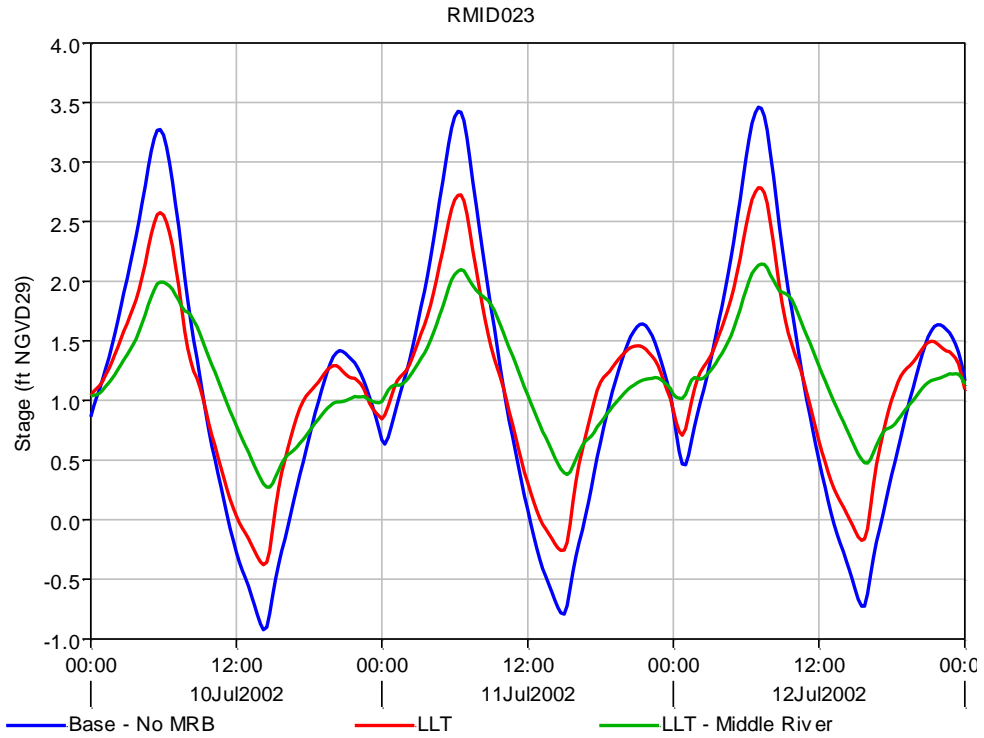


Figure 4-66 Stage RMID023 for Base - No MRB, LLT and LLT - Middle River scenarios.

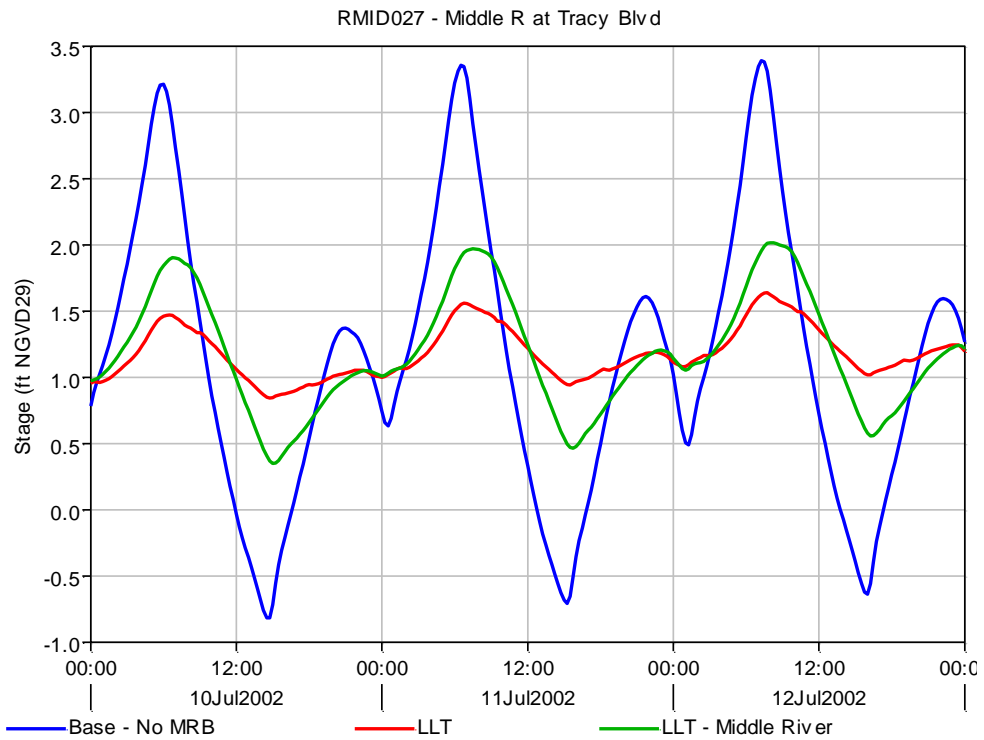


Figure 4-67 Stage at RMID027 for Base - No MRB, LLT and LLT - Middle River scenarios.

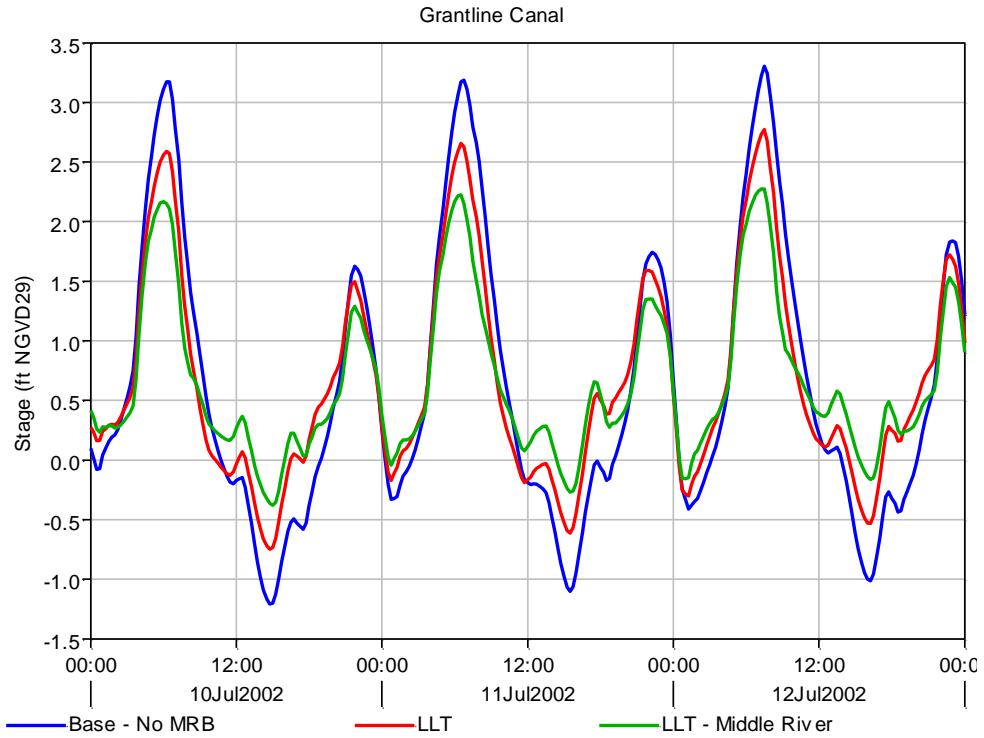


Figure 4-68 Stage in Grantline Canal for Base - No MRB, LLT and LLT - Middle River scenarios.

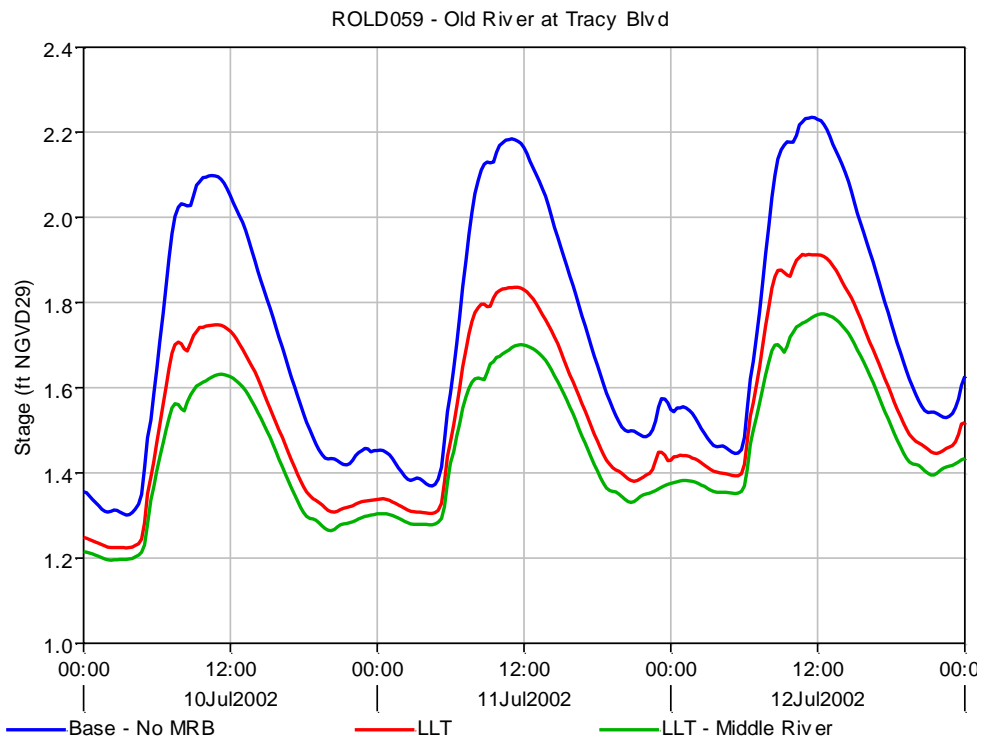


Figure 4-69 Stage at ROLD059 for Base - No MRB, LLT and LLT - Middle River scenarios.

4.2.3.5 Bed Shear

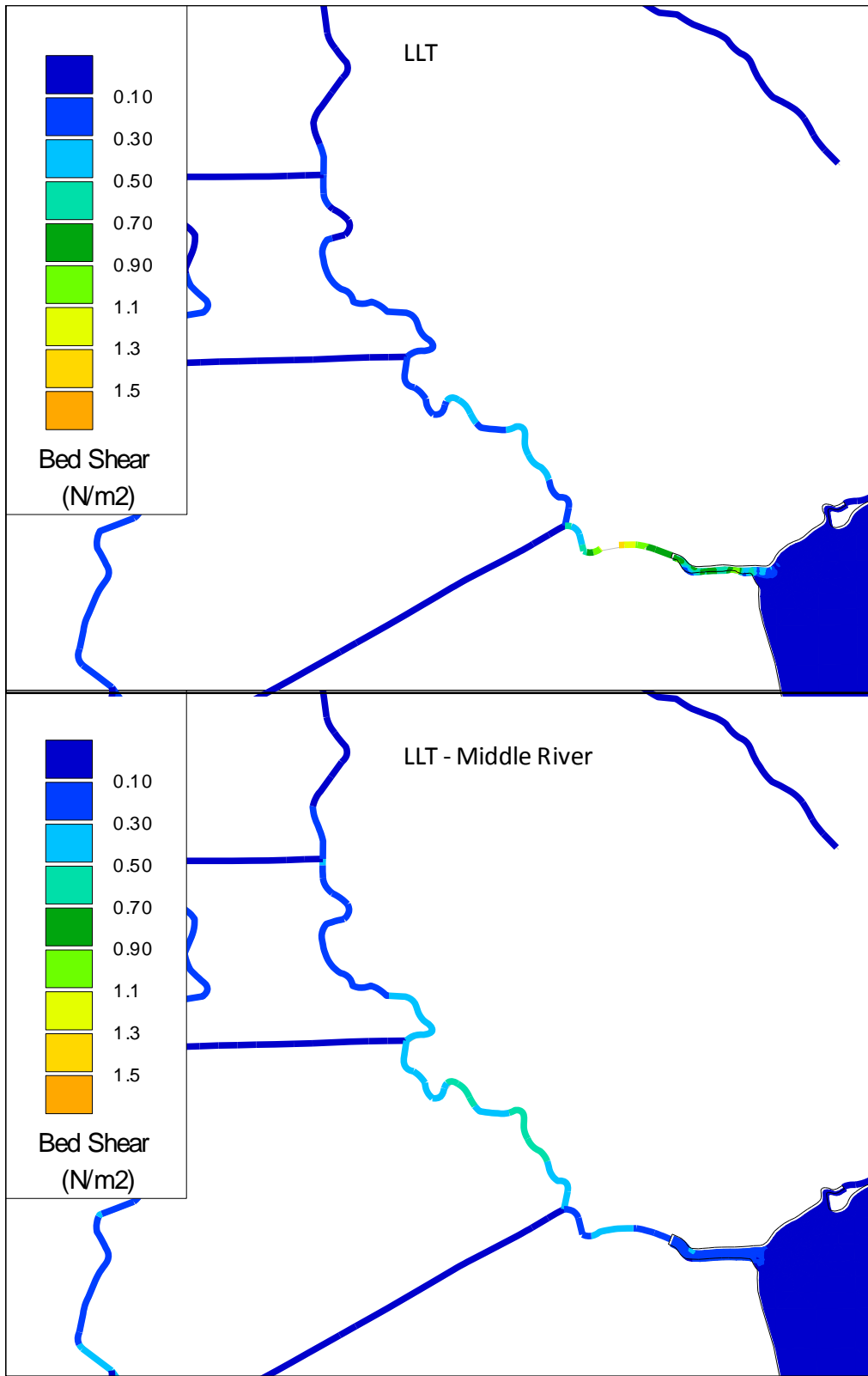


Figure 4-70 Comparison of Middle River bed shear for the LLT and LLT- Middle River simulations at times of peak bed shear during July 2002.

4.2.4 LLT – Suisun Scour

Three-day average flows for LLT – Suisun Scour are compared with base case and LLT flows in Table 4-11 and Figure 4-71. The grid modifications in LLT – Suisun Scour strongly impact flows in Montezuma Slough, resulting in a net east to west flow. Average flows at the head of the slough change from 13 cfs for LLT to 454 cfs (a 3400% increase). Average flows at the mouth of the slough reverse direction from 191 cfs into the marsh for LLT to 81 cfs out of the marsh, a 142% change. As a result, average flow at Chipps Island (RSAC075) decreases by 10% (455 cfs). Average flows elsewhere on the Sacramento River, in the north and south Delta and San Joaquin River change by 1% or less (generally less than 30 cfs) for LLT – Suisun Scour.

Tidal prism and percent change from base tidal prism is tabulated in Table 4-12 and plotted in Figure 4-72 and Figure 4-73. LLT – Suisun Scour increases tidal prism in Montezuma Slough by 37% at head and 26% at mouth, relative to LLT. At Martinez, tidal prism is increased by 4%. Decreases of 3% or less occur at most other locations.

RSAC128. Tidal prism changes in the south Delta and east Delta were typically small.

Tidal range results are provided in Table 4-13 and Figure 4-74. Tidal range decreased by 2% at Montezuma Slough at Head and increased by 1% at Montezuma Slough at Mouth for LLT – Suisun Scour relative to LLT. The increased conveyance within Suisun Marsh decreases tidal range throughout the Delta, with decreases of about 2% for LLT – Suisun Scour relative to LLT. The decrease was slightly smaller, about 1%, at DCC and Georgiana Slough, and slightly larger, about 3%, at Chipps Island and Martinez.

Profile plots of July 2002 MHHW, MSL and MLLW, in Figure 4-75 through Figure 4-78, show that the LLT – Suisun Scour tidal has larger impacts on MHHW and MLLW downstream in the Suisun Bay area and minimal impacts in the upstream ends of the Sacramento and San Joaquin Rivers. MSL is minimally impacted in Sacramento, San Joaquin and Middle Rivers. The largest tidal range impacts are seen in Suisun Marsh in the middle of Montezuma Slough.

For reference, time series plots of stage are provided for various locations in Figure 4-79 through Figure 4-93. A map of locations plotted is shown in Figure 4-2.

There are no new or resolved bed shear issues for this sensitivity case.

4.2.4.1 Net Flows

Table 4-11 Summary of 3-month Average flow (Jul – Sep 2002) for Base - No MRB, LLT, LLT – Suisun Scour simulations.

| Location | 3-month Average Flow, Jul – Sep 2002 (cfs) | | |
|-----------------------|--|-------|--------------------|
| | Base – No MRB | LLT | LLT – Suisun Scour |
| Cache Sl at Ryer | 1535 | 2565 | 2538 |
| DCC | 4609 | 3449 | 3438 |
| False River | -1696 | -1806 | -1797 |
| Martinez | 4422 | 4080 | 4067 |
| Miner Slough | 2018 | 2667 | 2659 |
| Mokelumne nr SJR | 4719 | 3781 | 3762 |
| Montezuma Sl at Head | 12 | 13 | 454 |
| Montezuma Sl at Mouth | -71 | -191 | 81 |
| RMID015 | -5351 | -5265 | -5260 |
| RMID027 | -25 | -45 | -45 |
| ROLD024 | -4425 | -4541 | -4541 |
| ROLD034 | -6493 | -6603 | -6595 |
| RSAC075 Chipps Island | 4503 | 4395 | 3940 |
| RSAC092 Emmaton | 5870 | 6484 | 6518 |
| RSAC101 Rio Vista | 8256 | 9712 | 9739 |
| RSAC123 | 3607 | 4258 | 4276 |
| RSAC128 | 10999 | 10137 | 10127 |
| RSAN018 Jersey Pt | -999 | -1914 | -1941 |
| RSAN032 San Andreas | -1716 | -3216 | -3237 |
| RSAN058 | 366 | 391 | 388 |
| SLDUT007 | -113 | 68 | 61 |
| SLGEO019 Georgiana Sl | 2762 | 2408 | 2392 |
| SLTRM004 Threemile Sl | -2313 | -3012 | -3008 |
| Steamboat Sl | 2280 | 2629 | 2639 |
| Sutter Sl | 2965 | 3480 | 3480 |

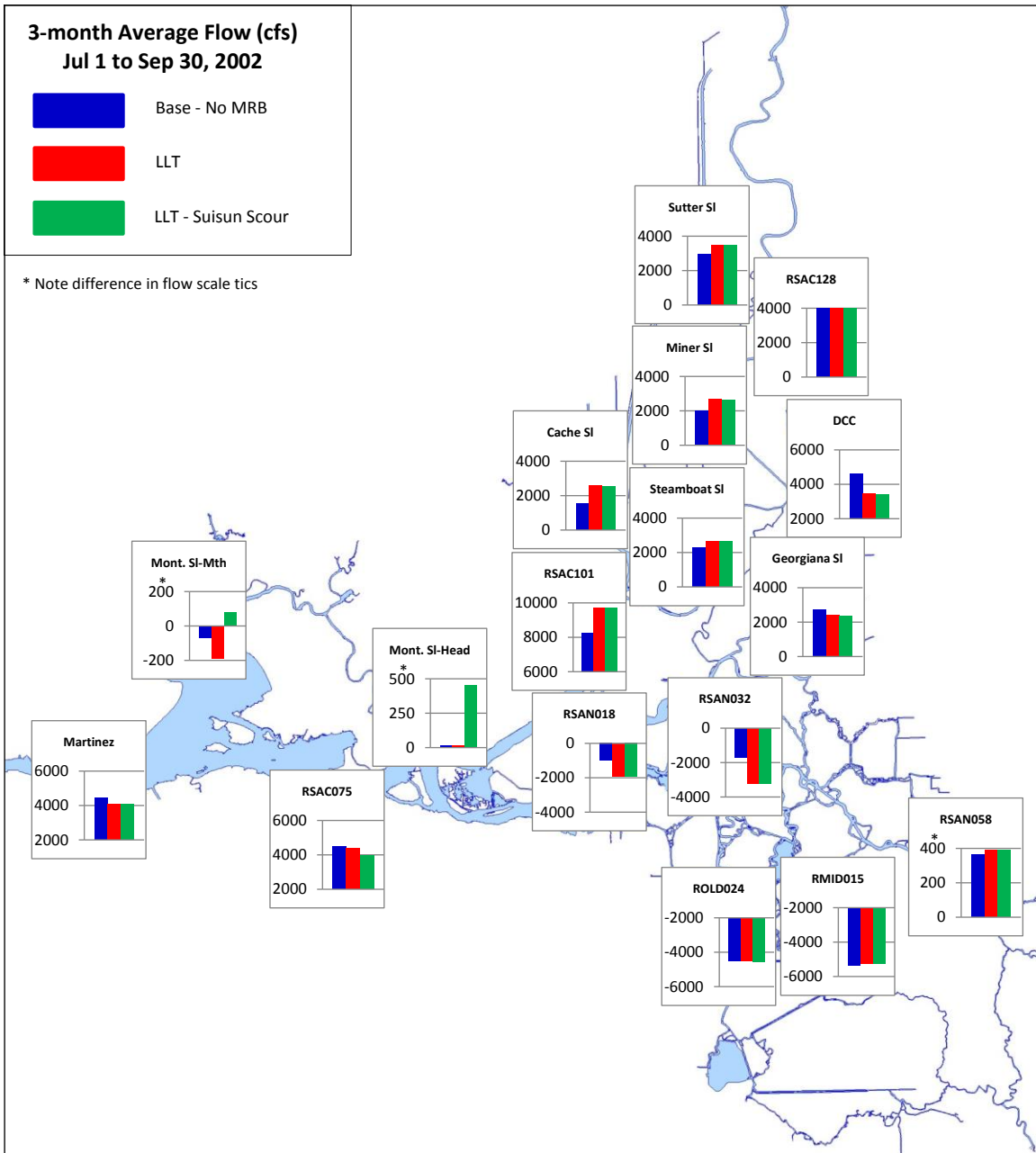


Figure 4-71 Average flows (Jul - Sep 2002) for Base - No MRB, LLT and LLT – Suisun Scour simulations.

4.2.4.2 Tidal Prism

Table 4-12 Summary of Apr – Dec 2002 Average Tidal Prism for Base - No MRB, LLT and LLT – Suisun Scour simulations, and percent change from Base - No MRB.

| Location | Base – No MRB | LLT | | LLT – Suisun Scour | |
|-----------------------|---------------------|---------------------|--------------------|---------------------|--------------------|
| | Tidal Prism (ac-ft) | Tidal Prism (ac-ft) | % Change from Base | Tidal Prism (ac-ft) | % Change from Base |
| Cache Sl at Ryer | 28,697 | 26,884 | -6% | 26,264 | -8% |
| DCC | 782 | 949 | 21% | 926 | 18% |
| False River | 18,870 | 16,508 | -13% | 16,122 | -15% |
| Martinez | 167,717 | 170,966 | 2% | 177,711 | 6% |
| Miner Slough | 618 | 455 | -26% | 450 | -27% |
| Mokelumne nr SJR | 4,615 | 4,490 | -3% | 4,401 | -5% |
| Montezuma Sl at Head | 2,053 | 3,283 | 60% | 4,502 | 119% |
| Montezuma Sl at Mouth | 10,988 | 23,108 | 110% | 29,077 | 165% |
| RMID015 | 4,119 | 3,333 | -19% | 3,272 | -21% |
| RMID027 | 474 | 1,784 | 277% | 1,769 | 273% |
| ROLD024 | 4,427 | 3,655 | -17% | 3,579 | -19% |
| ROLD034 | 2,352 | 1,960 | -17% | 1,947 | -17% |
| RSAC075 Chipps Island | 115,263 | 108,506 | -6% | 106,021 | -8% |
| RSAC092 Emmaton | 49,256 | 50,591 | 3% | 49,416 | 0% |
| RSAC101 Rio Vista | 36,171 | 40,582 | 12% | 39,693 | 10% |
| RSAC123 | 2,499 | 1,811 | -28% | 1,762 | -29% |
| RSAC128 | 1,608 | 1,175 | -27% | 1,154 | -28% |
| RSAN018 Jersey Pt | 50,110 | 44,549 | -11% | 43,472 | -13% |
| RSAN032 San Andreas | 37,847 | 32,450 | -14% | 31,620 | -16% |
| RSAN058 | 2,385 | 2,603 | 9% | 2,550 | 7% |
| SLDUT007 | 3,073 | 2,226 | -28% | 2,184 | -29% |
| SLGEO019 Georgiana Sl | 222 | 415 | 87% | 411 | 85% |
| SLTRM004 Threemile Sl | 9,413 | 6,526 | -31% | 6,345 | -33% |
| Steamboat Sl | 913 | 598 | -35% | 580 | -36% |
| Sutter Sl | 823 | 574 | -30% | 561 | -32% |

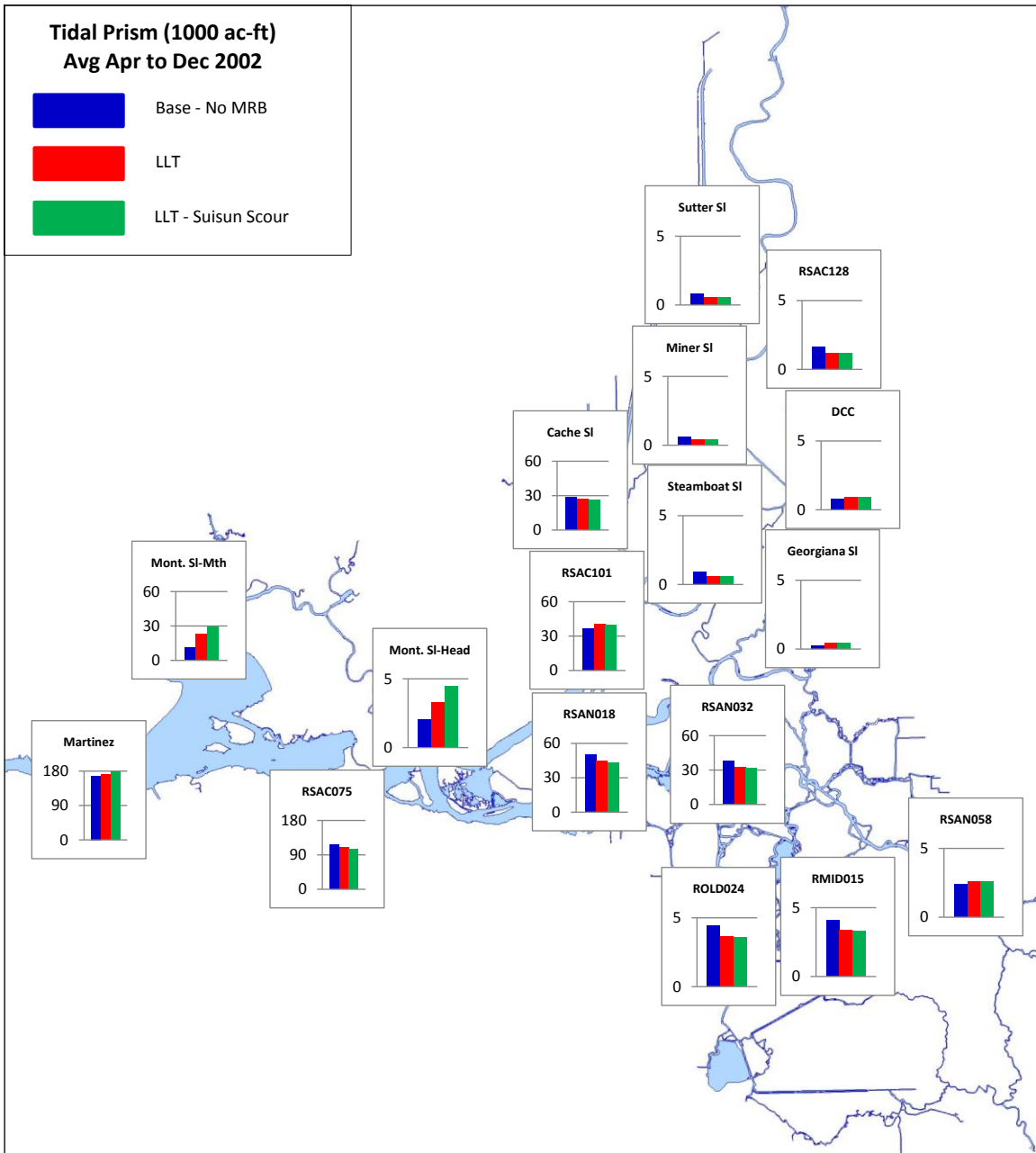


Figure 4-72 Average tidal prism (Apr - Dec 2002) for Base - No MRB, LLT and LLT - Suisun Scour simulations.

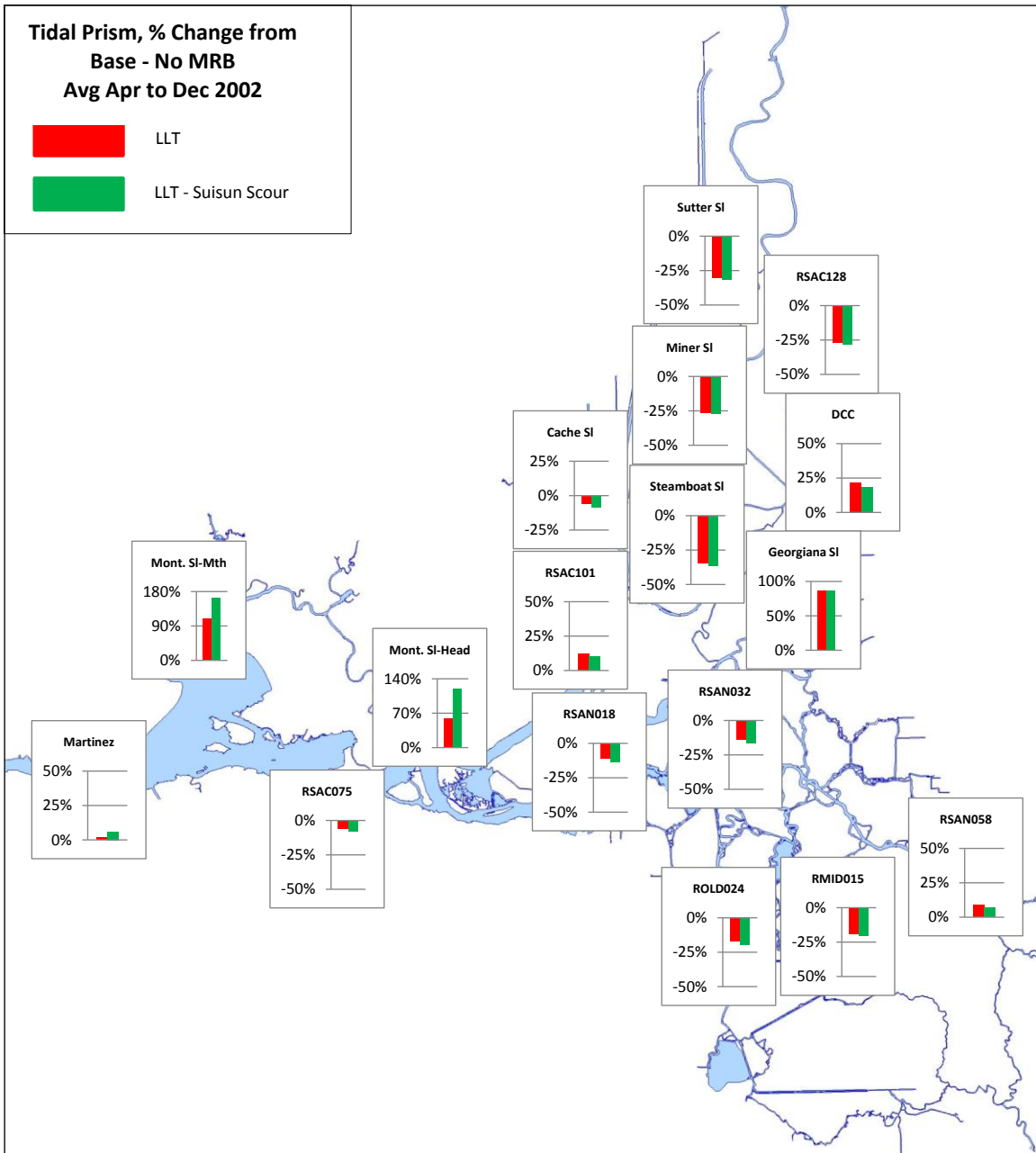


Figure 4-73 Average percent change from Base - No MRB tidal prism (Apr - Dec 2002) for LLT and LLT – Suisun Scour simulations.

4.2.4.3 Tidal Range

Table 4-13 Summary of Apr – Dec 2002 Average Tidal Range for Base - No MRB, LLT and LLT – Suisun Scour simulations.

| Location | Apr – Dec 2002 Average Tidal Range (ft) | | |
|-----------------------|---|------|--------------------|
| | Base – No MRB | LLT | LLT – Suisun Scour |
| Cache Sl at Ryer | 3.95 | 2.75 | 2.7 |
| DCC | 2.92 | 2.11 | 2.08 |
| False River | 3.4 | 2.93 | 2.87 |
| Martinez | 5.47 | 5.14 | 4.99 |
| Miner Slough | 3.12 | 2.62 | 2.58 |
| Montezuma Sl at Head | 4.25 | 3.64 | 3.58 |
| Montezuma Sl at Mouth | 5 | 4.05 | 4.09 |
| RMID015 | 3.76 | 3.14 | 3.08 |
| RMID023 | 3.49 | 2.48 | 2.45 |
| RMID027 | 3.33 | 0.56 | 0.48 |
| ROLD024 | 3.55 | 3.02 | 2.96 |
| ROLD034 | 3.36 | 2.73 | 2.68 |
| RSAC075 Chipps Island | 4.42 | 3.85 | 3.75 |
| RSAC092 Emmaton | 3.93 | 3.23 | 3.15 |
| RSAC101 Rio Vista | 3.86 | 2.79 | 2.73 |
| RSAC123 | 2.95 | 2.14 | 2.1 |
| RSAC128 | 2.91 | 2.12 | 2.08 |
| RSAN018 Jersey Pt | 3.47 | 2.98 | 2.91 |
| RSAN032 San Andreas | 3.37 | 2.89 | 2.83 |
| RSAN058 | 4.05 | 3.25 | 3.2 |
| SLDUT007 Dutch Slough | 3.59 | 3.04 | 2.98 |
| SLGEO019 Georgiana Sl | 2.95 | 2.16 | 2.13 |
| SLTRM004 Threemile Sl | 3.45 | 2.9 | 2.83 |
| Steamboat Sl | 2.69 | 1.99 | 1.96 |
| Sutter Sl | 2.57 | 1.94 | 1.9 |
| Victoria Canal | 3.48 | 2.48 | 2.43 |

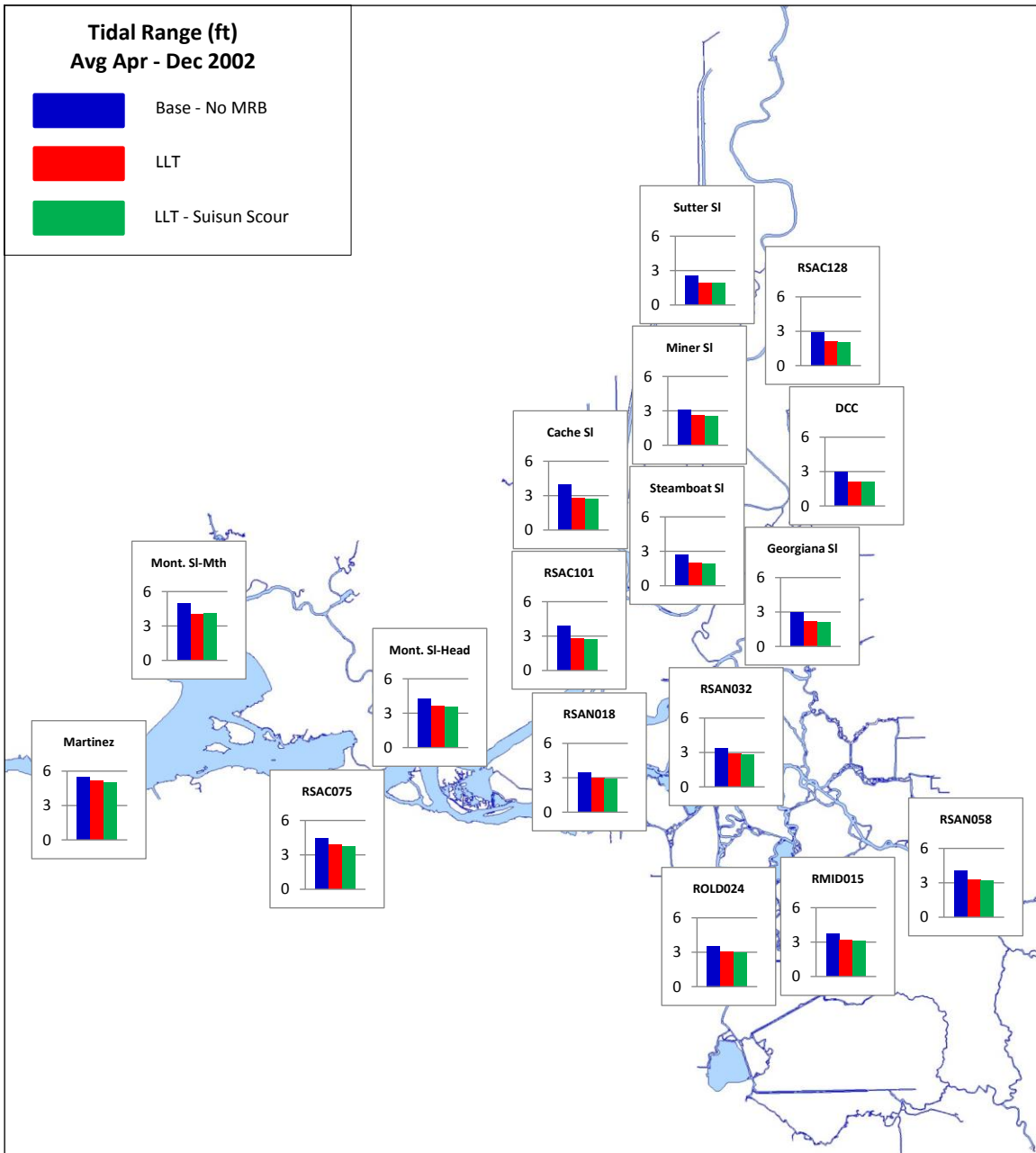


Figure 4-74 Average tidal range (Apr - Dec 2002) for Base - No MRB, LLT and LLT –Suisun Scour simulations.

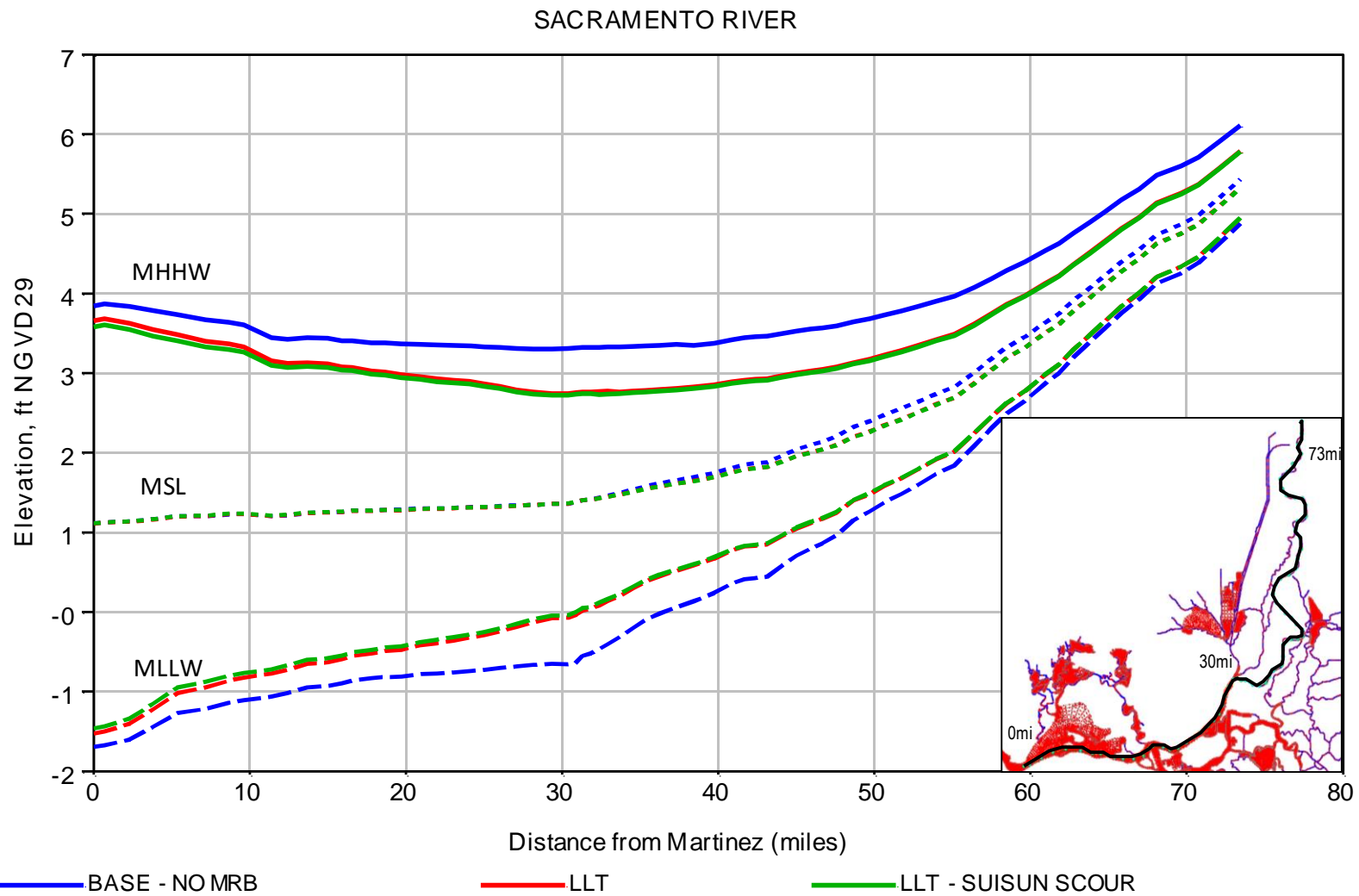


Figure 4-75 Profiles of July 2002 MHHW, MSL and MLLW along the Sacramento River for the Base - No MRB, LLT and LLT - Suisun Scour simulations.

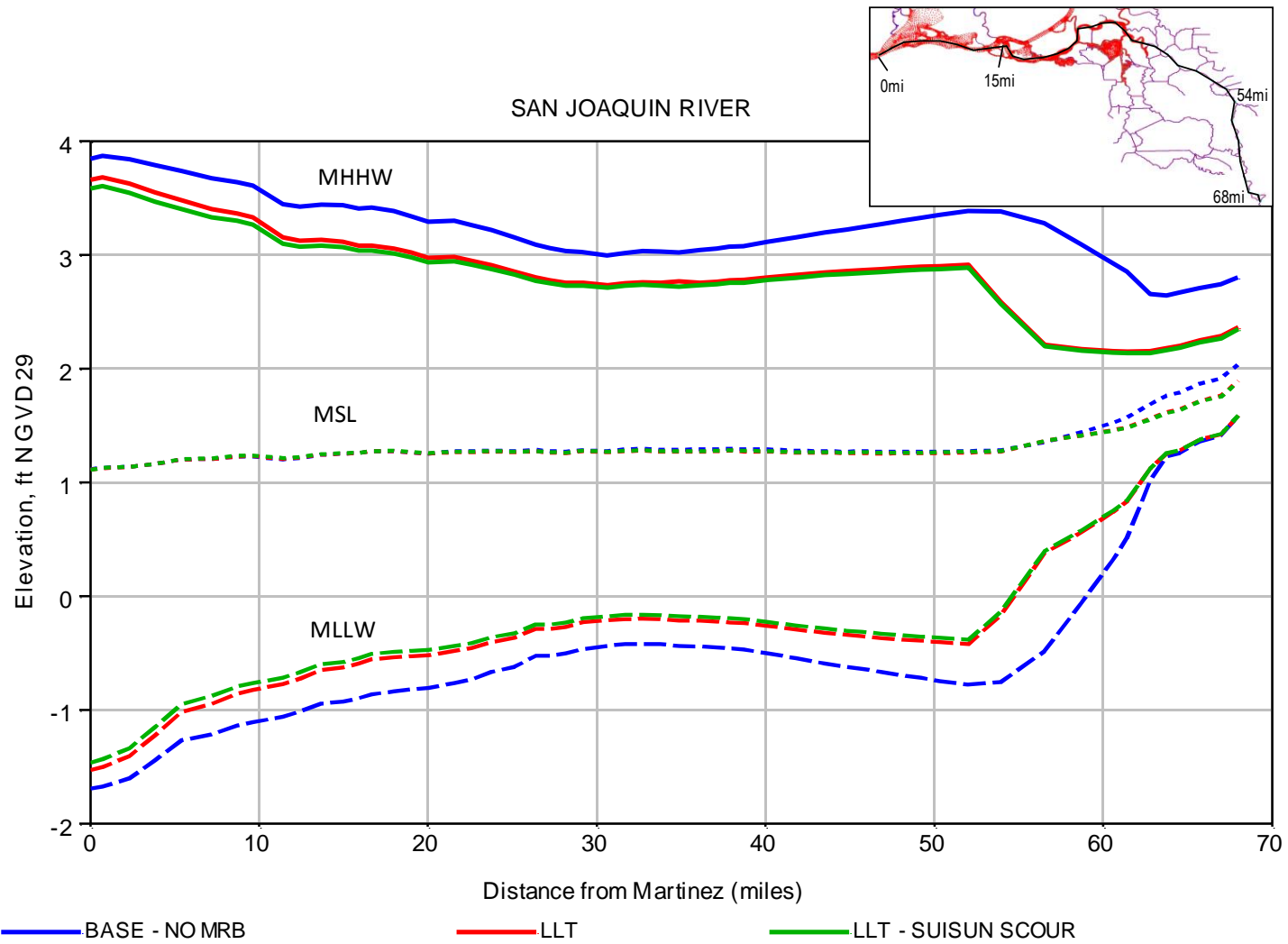


Figure 4-76 Profiles of July 2002 MHHW, MSL and MLLW along the San Joaquin River for the Base - No MRB, LLT and LLT - Suisun Scour simulations.

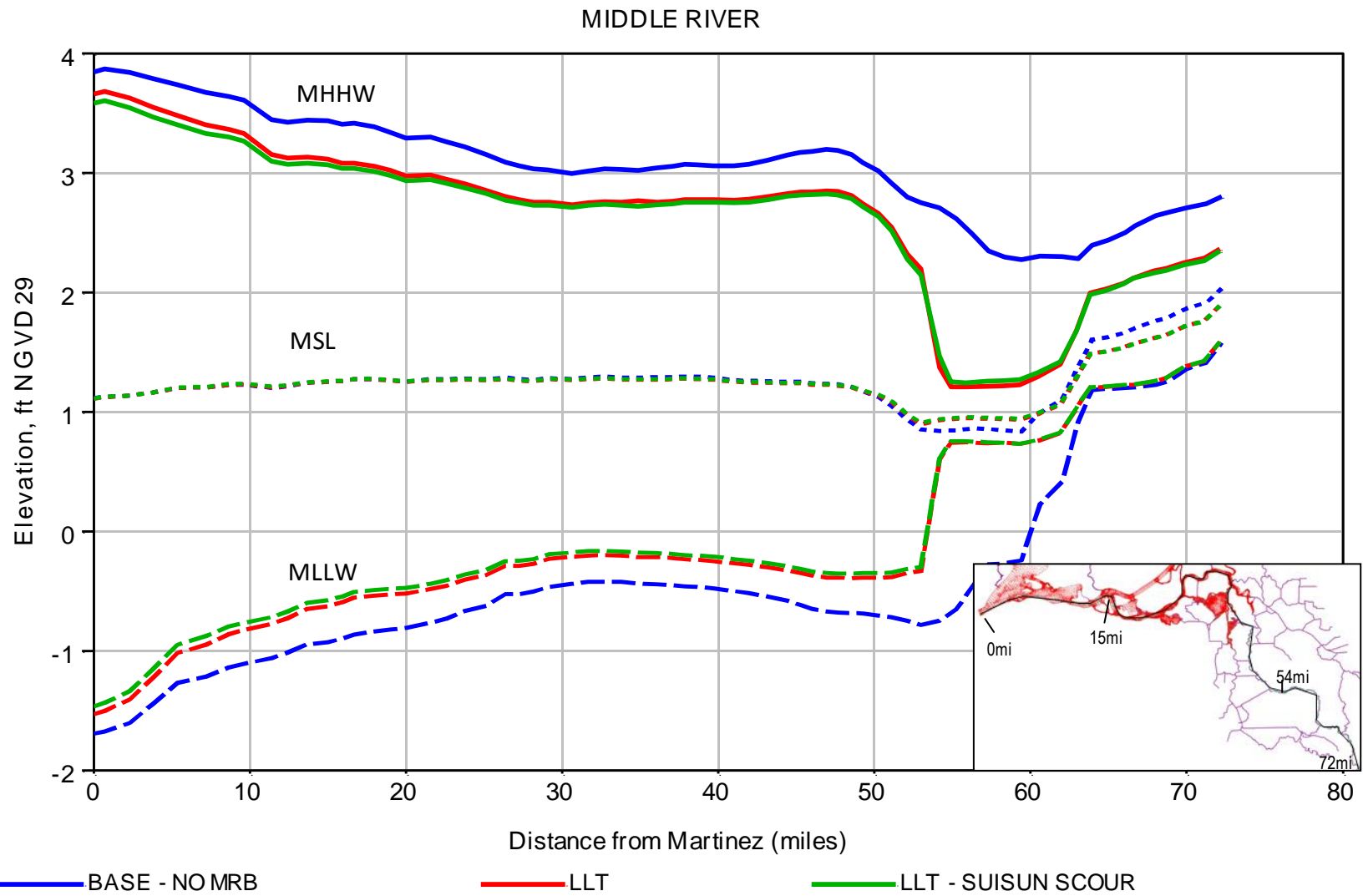


Figure 4-77 Profiles of July 2002 MHHW, MSL and MLLW along the Middle River for the Base - No MRB, LLT and LLT - Suisun Scour simulations.

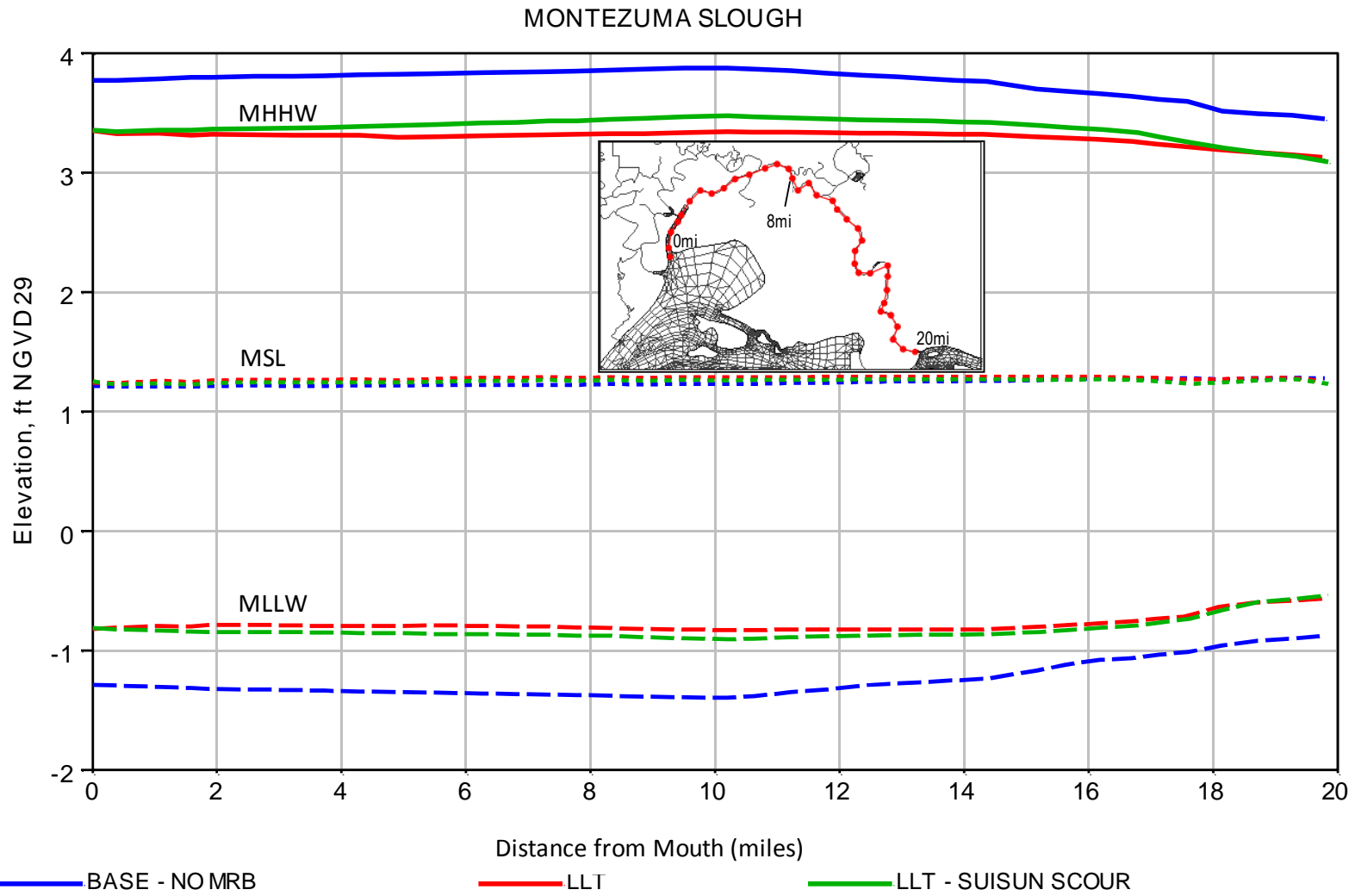


Figure 4-78 Profiles of July 2002 MHHW, MSL and MLLW along Montezuma Slough for the Base - No MRB, LLT and LLT - Suisun Scour simulations.

4.2.4.4 Stage Time Series Plots

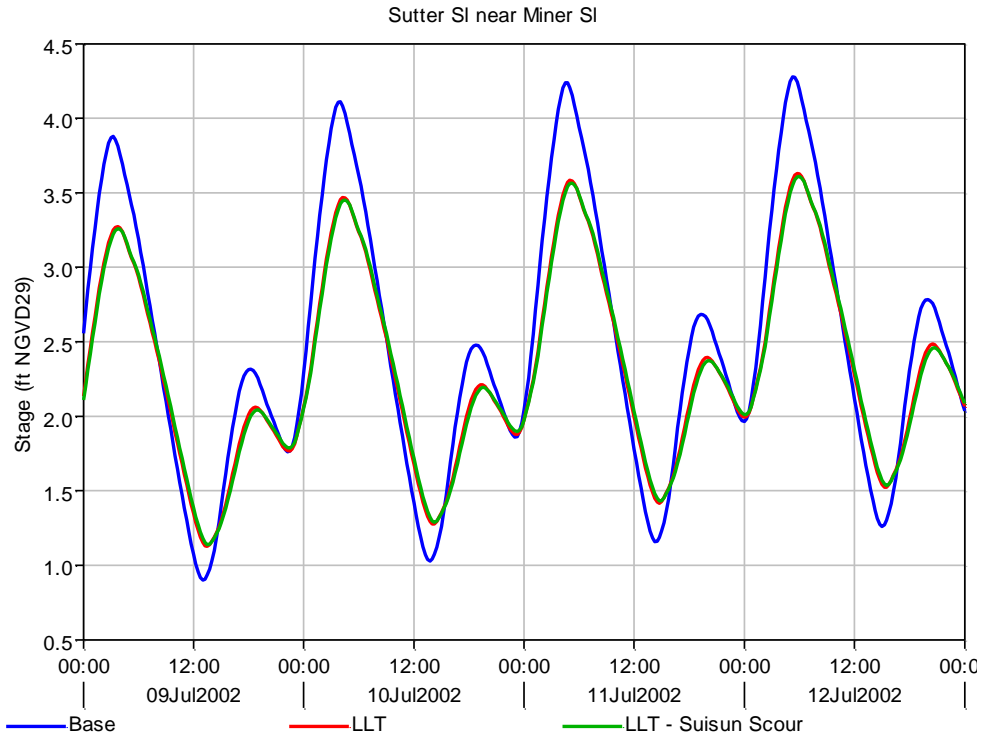


Figure 4-79 Stage in Sutter Slough for Base - No MRB, LLT and LLT - Suisun Scour scenarios.

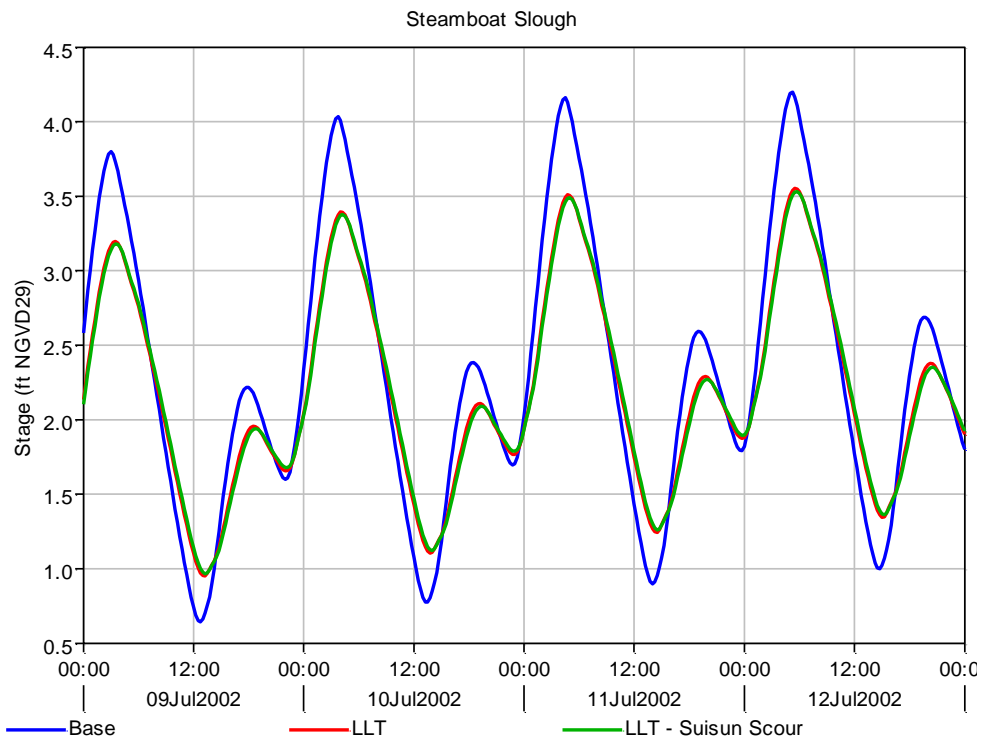


Figure 4-80 Stage in Steamboat Slough for Base - No MRB, LLT and LLT - Suisun Scour scenarios.

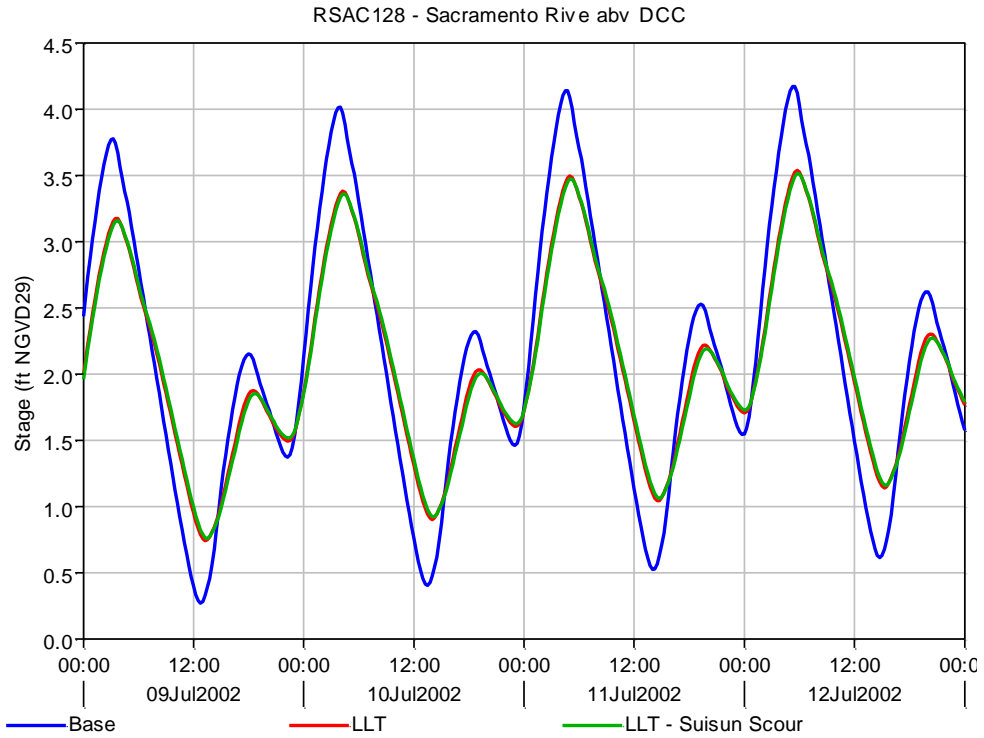


Figure 4-81 Stage at RSAC128 for Base - No MRB, LLT and LLT - Suisun Scour scenarios.

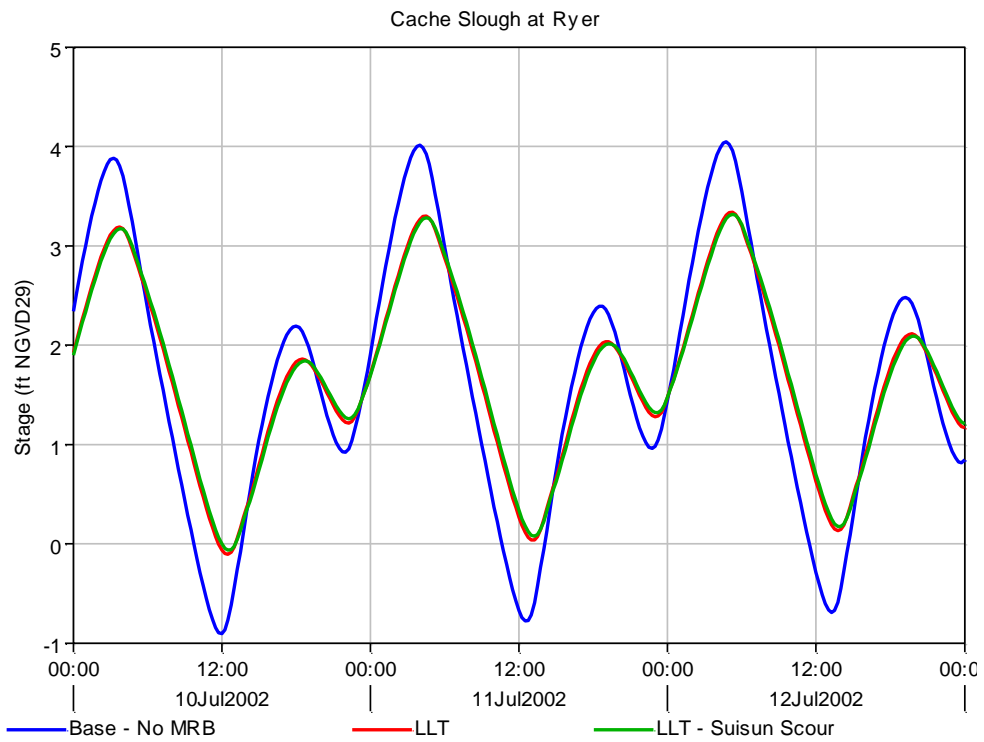


Figure 4-82 Stage in Cache Slough at Ryer Island for Base - No MRB, LLT and LLT - Suisun Scour scenarios.

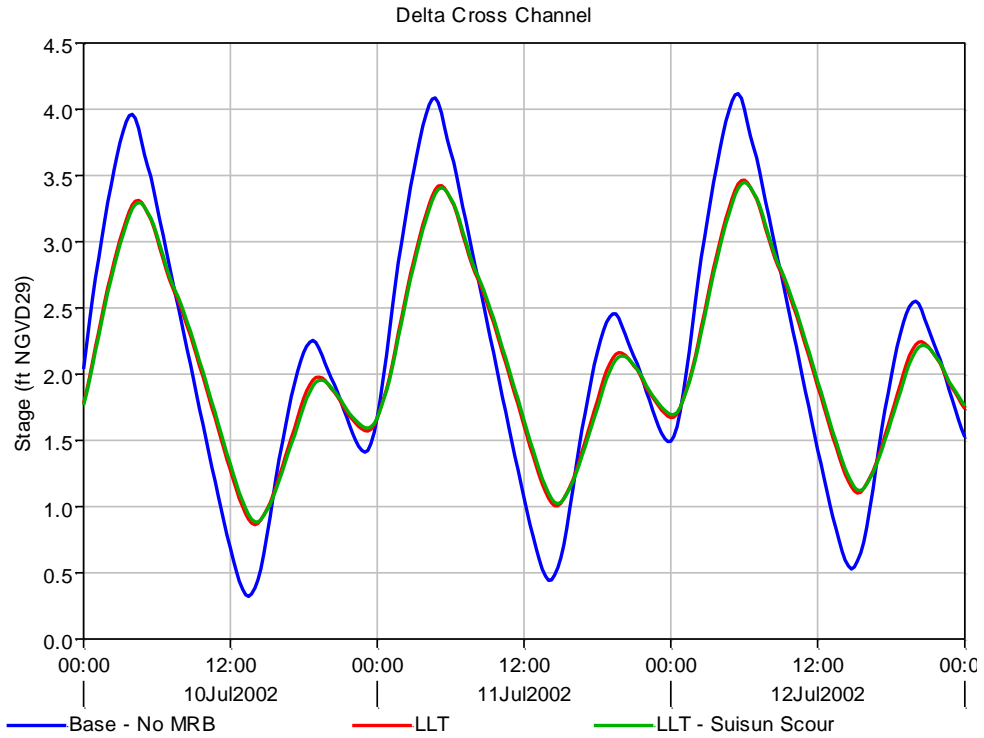


Figure 4-83 Stage in Delta Cross Channel for Base - No MRB, LLT and LLT - Suisun Scour scenarios.

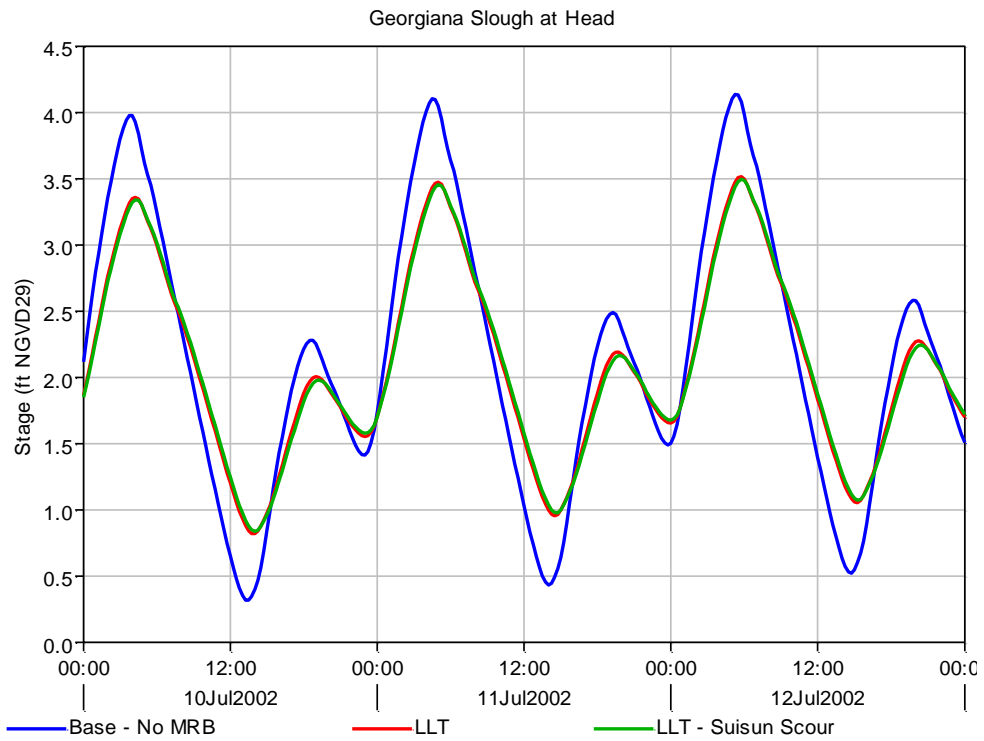


Figure 4-84 Stage in Georgiana Slough at head for Base - No MRB, LLT and LLT - Suisun Scour scenarios.

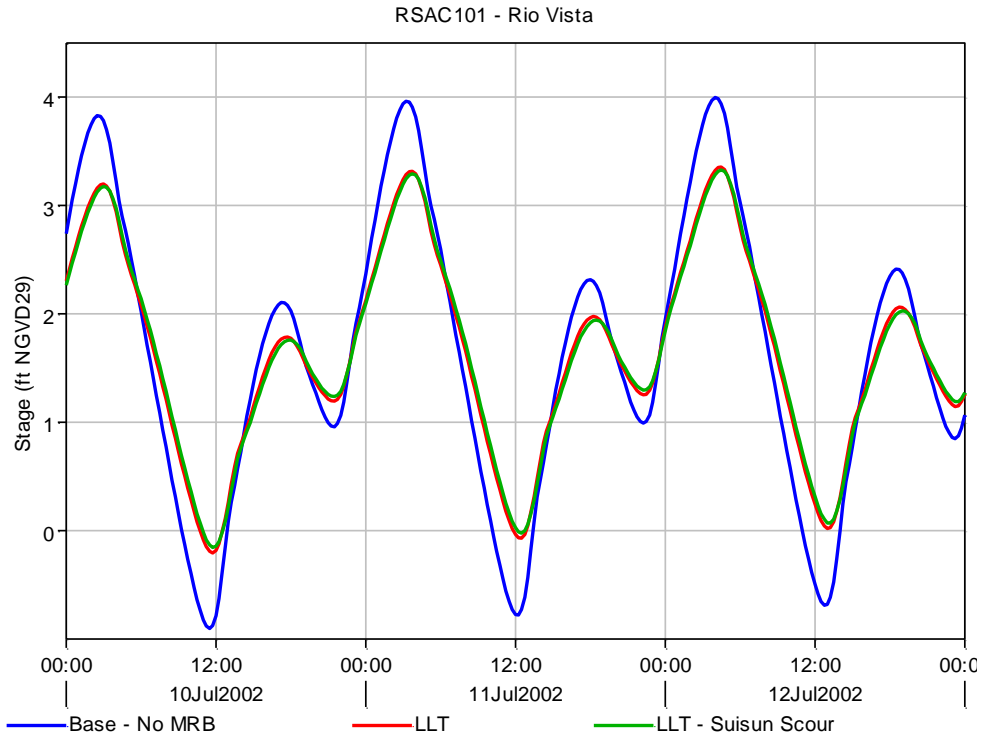


Figure 4-85 Stage at Rio Vista for Base - No MRB, LLT and LLT - Suisun Scour scenarios.

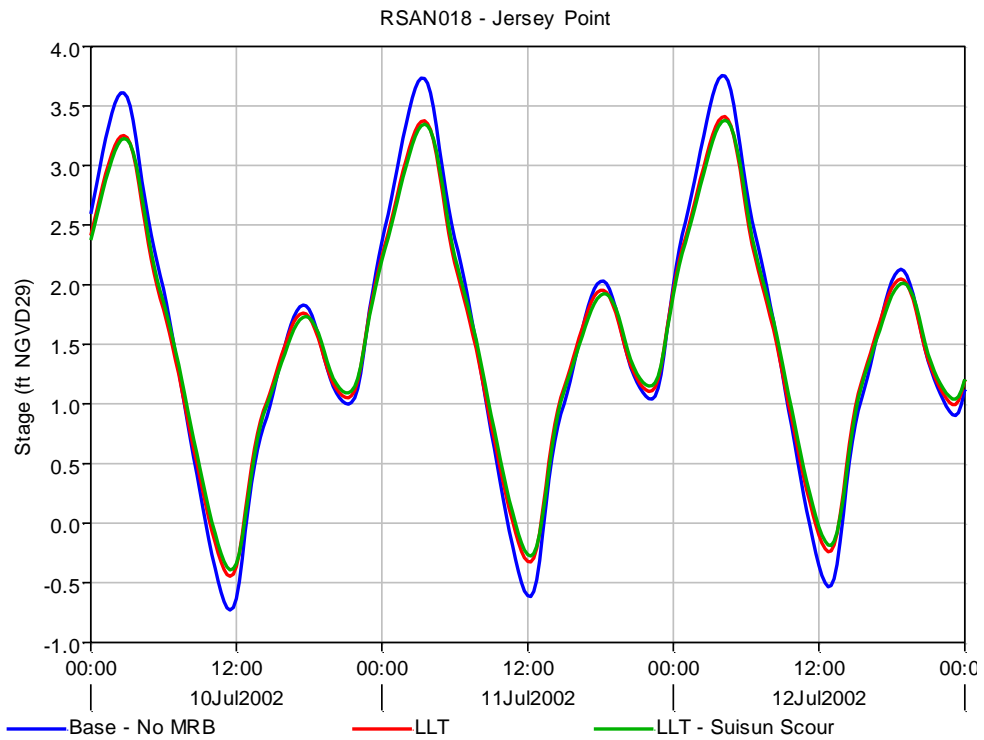


Figure 4-86 Stage at Jersey Point for Base - No MRB, LLT and LLT - Suisun Scour scenarios.

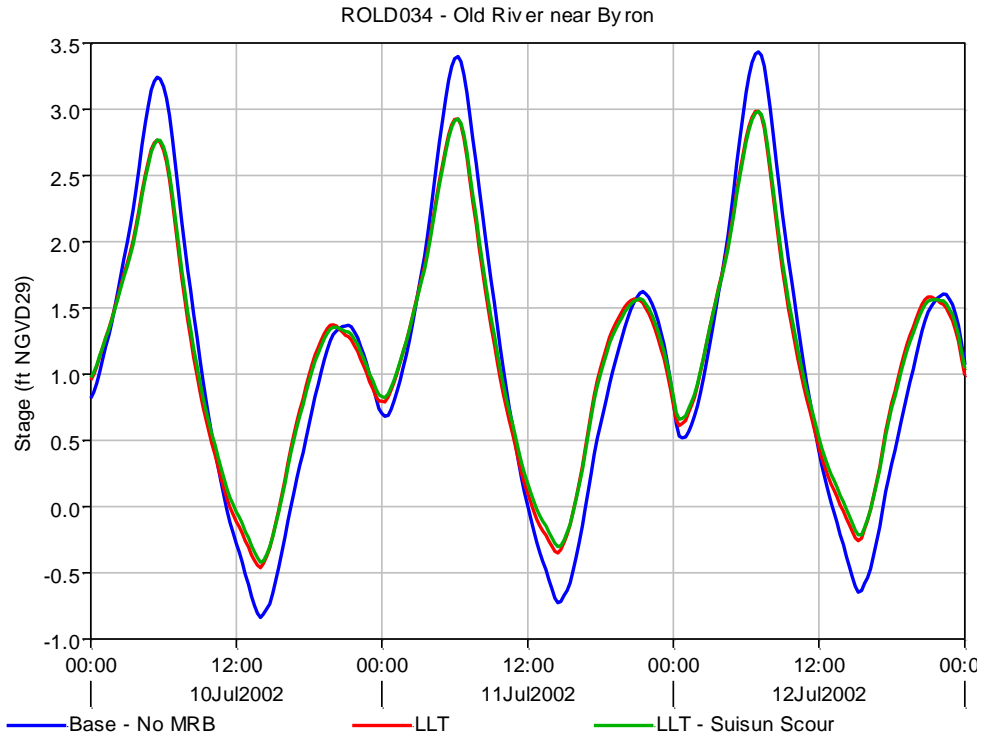


Figure 4-87 Stage at ROLD034 for Base - No MRB, LLT and LLT - Suisun Scour scenarios.

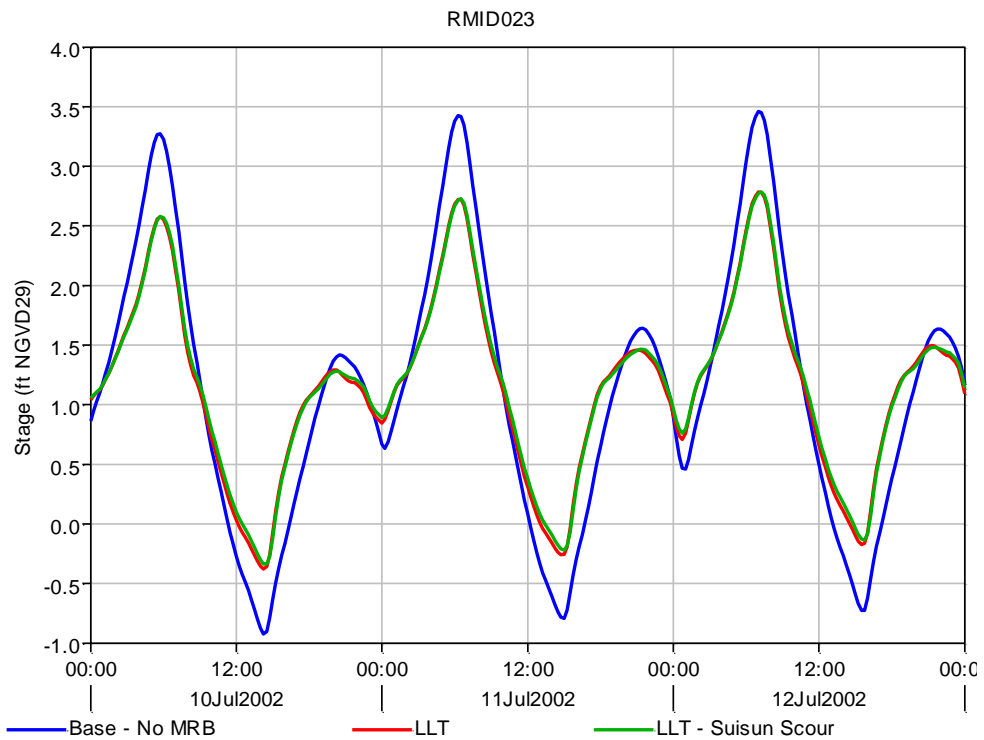


Figure 4-88 Stage at RMID023 for Base - No MRB, LLT and LLT - Suisun Scour scenarios.

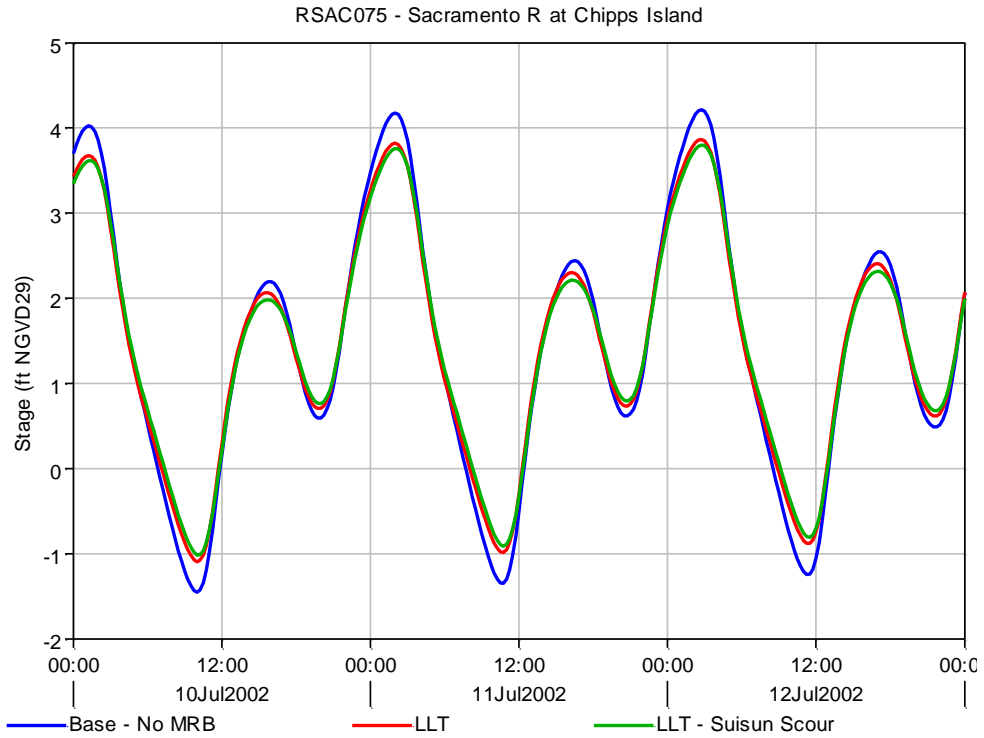


Figure 4-89 Stage at Chipps Island for Base - No MRB, LLT and LLT - Suisun Scour scenarios.

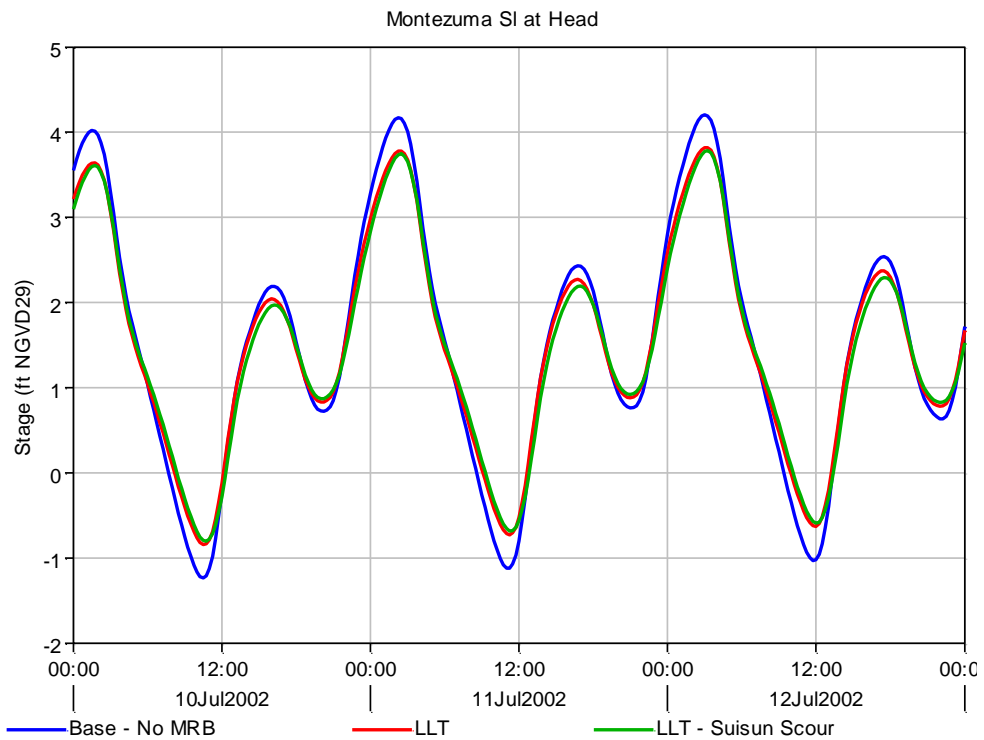


Figure 4-90 Stage in Montezuma Slough at Head for Base - No MRB, LLT and LLT - Suisun Scour scenarios.

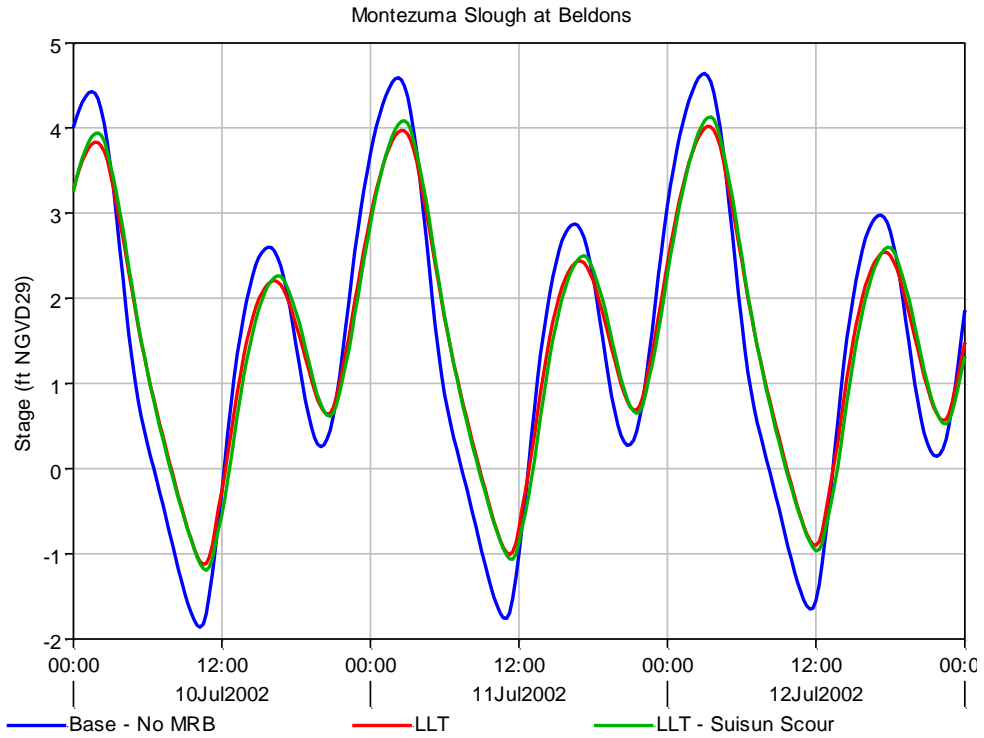


Figure 4-91 Stage in Montezuma Slough at Beldon’s Landing (S-49) for Base - No MRB, LLT and LLT - Suisun Scour scenarios.

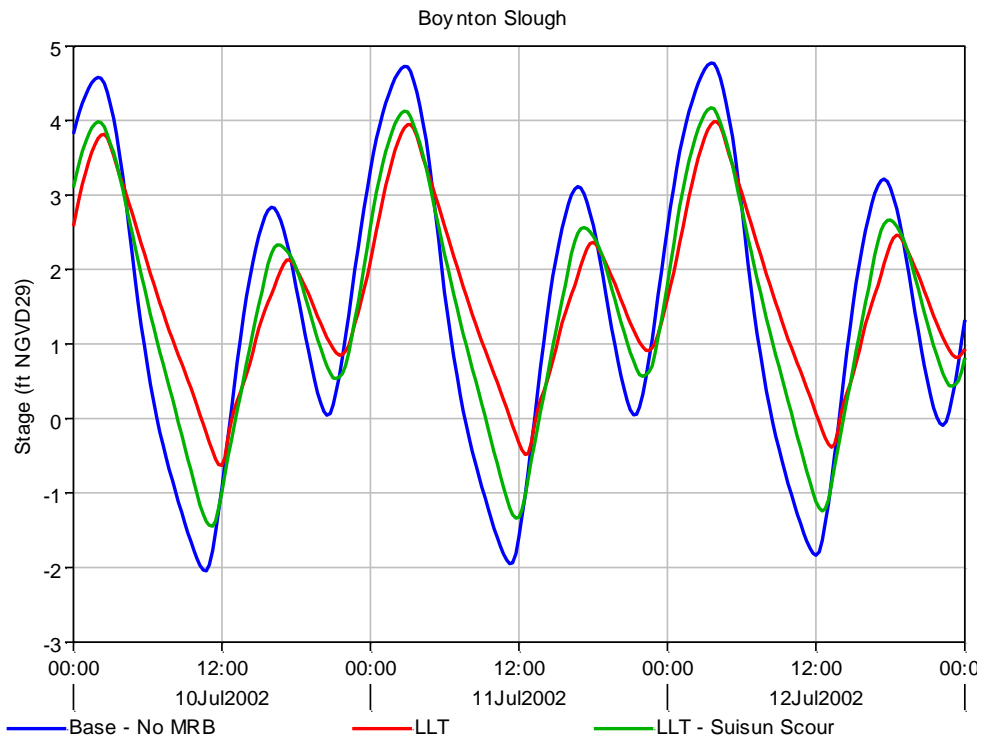


Figure 4-92 Stage in Boynton Slough at S-40 for Base - No MRB, LLT and LLT - Suisun Scour scenarios.

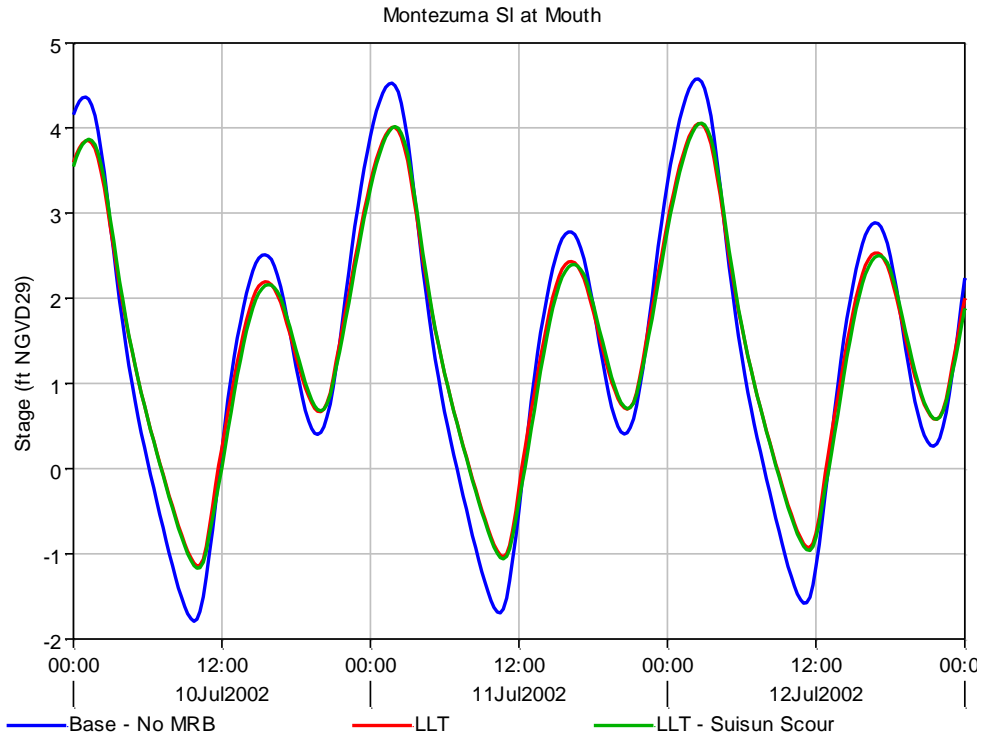


Figure 4-93 Stage in Montezuma Slough at mouth for Base - No MRB, LLT and LLT - Suisun Scour scenarios.

4.2.5 ELT – Prospect Breach

Three-month average flows for the ELT – Prospect Breach simulation are tabulated in Table 4-14 and plotted in Figure 4-94. Elimination of the Prospect Island breach on Miner Slough for the ELT – Prospect Breach case impacts flows in the north and central Delta. For the ELT case, the two breaches on Prospect Island provide additional conveyance through the island, increasing the net flow in Miner Slough. This results in decreased flows through the DCC and Georgiana Slough. By eliminating the breach on Miner Slough, the flow balance returns closer to the base case. Of all sensitivity cases, ELT – Prospect Breach has the greatest impact on DCC flows, increasing the three-month average flows by 87 cfs relative to ELT. In the Sacramento River above DCC (at RSAC128) flows are increased by 269 cfs and in Georgiana Slough, there is a 38 cfs increase. There are corresponding reductions in three-month average flows in Sutter Slough (-279 cfs), Miner Slough (-524 cfs) and lower Steamboat Slough (-257 cfs) and a small increase in upper Steamboat Slough above Miner Slough (12 cfs).

Relative to the base case, three-month average flows in Miner Slough are 33% greater for ELT, but only 7% greater than Base – No SMSCG for ELT – Prospect Breach. The DCC average flows are 21% below Base – No SMSCG for ELT and 19% lower for ELT – Prospect Breach and the Georgiana Slough flows change from 4% below Base – No SMSCG to 2% below Base – No SMSCG for ELT – Prospect Breach. Flows in the Sacramento River below Georgiana, at RSAC123 increase by 4% for the ELT – Prospect case relative to ELT. Flows in Cache Slough at Ryer are 41% greater than Base – No SMSCG for ELT and only 7% greater for ELT – Prospect Breach. Sacramento River flows at RSAC101 and below show a 1% reduction or less between ELT and ELT – Prospect Breach. On the San Joaquin River, San Andreas flows decline by 5% and Jersey Point flows decline by 4% with the eliminated breach. There is essentially no impact in Old and Middle River. ELT – Prospect Breach average flows out of Suisun Marsh in Montezuma Slough at head are increased by 10% relative to ELT and in Montezuma Slough at mouth flows are reduced by 2% relative to ELT.

ELT – Prospect Breach tidal prism results are shown in Table 4-15, Figure 4-95 and Figure 4-96. Tidal prism is impacted only in the north Delta. Elimination of the Miner Slough breach reduces tidal prism in Miner Slough by 22%, in Steamboat Slough by 3% and Sutter Slough by 12% relative to ELT. Tidal prism is reduced by 2% in DCC and increased by 3% at RSAC128 and Georgiana Slough, relative to ELT. Tidal prism changes due to the breach elimination are 0.1% or less throughout the rest of the system.

As shown in Table 4-16 and Figure 4-97, elimination of the Prospect Island breach on Miner Slough decreases tidal range in Miner Slough by 0.51 ft (17%) below ELT. Relative to ELT there is a 3% reduction in tidal range in Steamboat Slough, a 7% reduction in Sutter Slough, 2% reduction at RSAC128 and DCC and 1% reduction at Georgiana Slough and RSAC123. There is no change elsewhere in the system.

Profile plots of July 2002 MHHW, MSL and MLLW, in Figure 4-98 through Figure 4-101, show that relative to ELT, the ELT – Prospect Breach MLLW and MSL slightly

higher in the upper Sacramento River. There are no significant differences between ELT and ELT – Prospect Breach in the other profiles.

For reference, time series plots of stage are provided for various locations in Figure 4-102 through Figure 4-112. A map of locations plotted is shown in Figure 4-2.

Color contour plots of peak bed shear in in the Prospect Island vicinity during July 2002 are shown for ELT – Prospect Breach in comparison with ELT. For ELT – Prospect, there is a slight increase in bed shear in the Ship Channel and at the remaining Prospect Island breach to the Ship Channel, although bed shear remains relatively low.

4.2.5.1 Net Flows

Table 4-14 Summary of 3-month Average flow (Jul – Sep 2002) for Base - No SMSCG, ELT, ELT – Prospect Breach simulations.

| Location | 3-month Average Flow, Jul – Sep 2002 (cfs) | | |
|-----------------------|--|-------|-----------------------|
| | Base – No SMSCG | ELT | ELT – Prospect Breach |
| Cache Sl at Ryer | 1535 | 2167 | 1644 |
| DCC | 4609 | 3661 | 3748 |
| False River | -1696 | -1837 | -1810 |
| Martinez | 4423 | 4241 | 4241 |
| Miner Slough | 2018 | 2681 | 2157 |
| Mokelumne nr SJR | 4721 | 4157 | 4245 |
| Montezuma Sl at Head | 12 | -10 | -11 |
| Montezuma Sl at Mouth | -71 | 85 | 83 |
| RMID015 | -5406 | -5384 | -5389 |
| RMID027 | -58 | -58 | -58 |
| ROLD024 | -4402 | -4421 | -4423 |
| ROLD034 | -6452 | -6443 | -6446 |
| RSAC075 Chipps Island | 4504 | 4474 | 4476 |
| RSAC092 Emmaton | 5873 | 6321 | 6240 |
| RSAC101 Rio Vista | 8255 | 9273 | 9149 |
| RSAC123 | 3607 | 3991 | 4134 |
| RSAC128 | 10999 | 10338 | 10606 |
| RSAN018 Jersey Pt | -1002 | -1695 | -1618 |
| RSAN032 San Andreas | -1720 | -2750 | -2650 |
| RSAN058 | 389 | 383 | 389 |
| SLDUT007 | -112 | 84 | 88 |
| SLGEO019 Georgiana Sl | 2762 | 2665 | 2703 |
| SLTRM004 Threemile Sl | -2310 | -2732 | -2690 |
| Steamboat Sl | 2280 | 2471 | 2483 |
| Sutter Sl | 2965 | 3436 | 3157 |

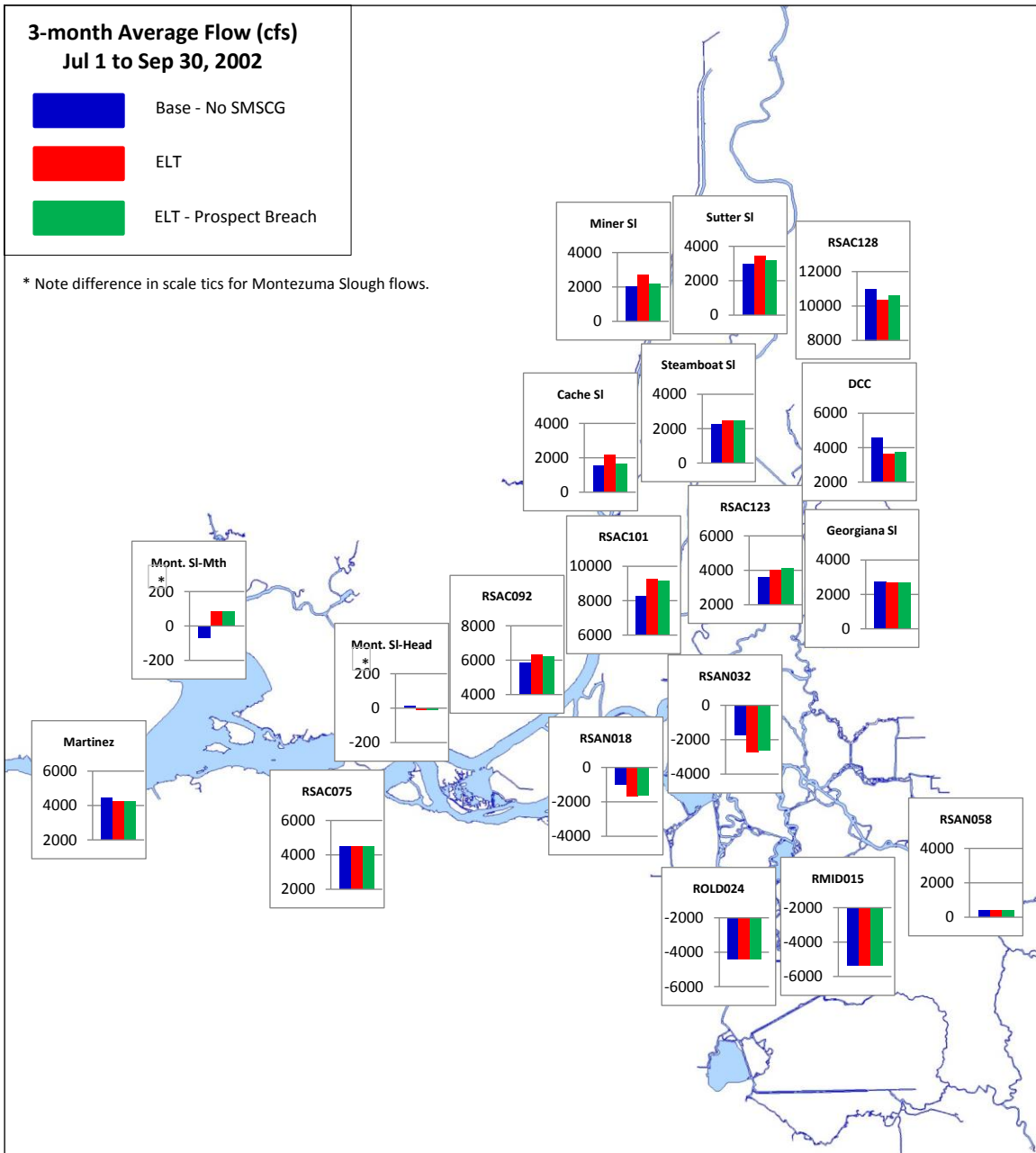


Figure 4-94 Average flows (Jul - Sep 2002) for Base - No SMSCG, ELT and ELT – Prospect Breach simulations.

4.2.5.2 Tidal Prism

Table 4-15 Summary of Apr – Dec 2002 Average Tidal Prism for Base - No SMSCG, ELT and ELT – Prospect Breach simulations, and percent change from Base - SMSCG.

| Location | Base – No SMSCG | ELT | | ELT – Prospect Breach | |
|-----------------------|---------------------|---------------------|--------------------|-----------------------|--------------------|
| | Tidal Prism (ac-ft) | Tidal Prism (ac-ft) | % Change from Base | Tidal Prism (ac-ft) | % Change from Base |
| Cache Sl at Ryer | 28,681 | 30,744 | 7% | 30,794 | 7% |
| DCC | 783 | 1,225 | 57% | 1,205 | 54% |
| False River | 18,890 | 17,565 | -7% | 17,565 | -7% |
| Martinez | 167,685 | 169,171 | 1% | 169,194 | 1% |
| Miner Slough | 618 | 578 | -6% | 450 | -27% |
| Mokelumne nr SJR | 4,613 | 4,509 | -2% | 4,496 | -2% |
| Montezuma Sl at Head | 2,054 | 3,221 | 87% | 3,219 | 87% |
| Montezuma Sl at Mouth | 10,987 | 21,983 | 95% | 21,983 | 95% |
| RMID015 | 4,021 | 3,704 | -8% | 3,704 | -8% |
| RMID027 | 243 | 231 | -5% | 231 | -5% |
| ROLD024 | 4,412 | 4,090 | -7% | 4,090 | -7% |
| ROLD034 | 2,289 | 2,107 | -8% | 2,105 | -8% |
| RSAC075 Chipps Island | 115,295 | 110,508 | -4% | 110,505 | -4% |
| RSAC092 Emmaton | 49,254 | 49,180 | 0% | 49,167 | 0% |
| RSAC101 Rio Vista | 36,156 | 36,783 | 2% | 36,765 | 2% |
| RSAC123 | 2,501 | 2,252 | -10% | 2,236 | -11% |
| RSAC128 | 1,605 | 1,130 | -30% | 1,159 | -28% |
| RSAN018 Jersey Pt | 50,165 | 46,935 | -6% | 46,929 | -6% |
| RSAN032 San Andreas | 37,894 | 35,019 | -7% | 35,015 | -8% |
| RSAN058 | 2,386 | 2,173 | -9% | 2,174 | -9% |
| SLDUT007 | 3,076 | 2,368 | -23% | 2,368 | -23% |
| SLGEO019 Georgiana Sl | 224 | 301 | 35% | 309 | 38% |
| SLTRM004 Threemile Sl | 9,431 | 7,921 | -16% | 7,924 | -16% |
| Steamboat Sl | 914 | 784 | -14% | 761 | -17% |
| Sutter Sl | 823 | 726 | -12% | 641 | -22% |

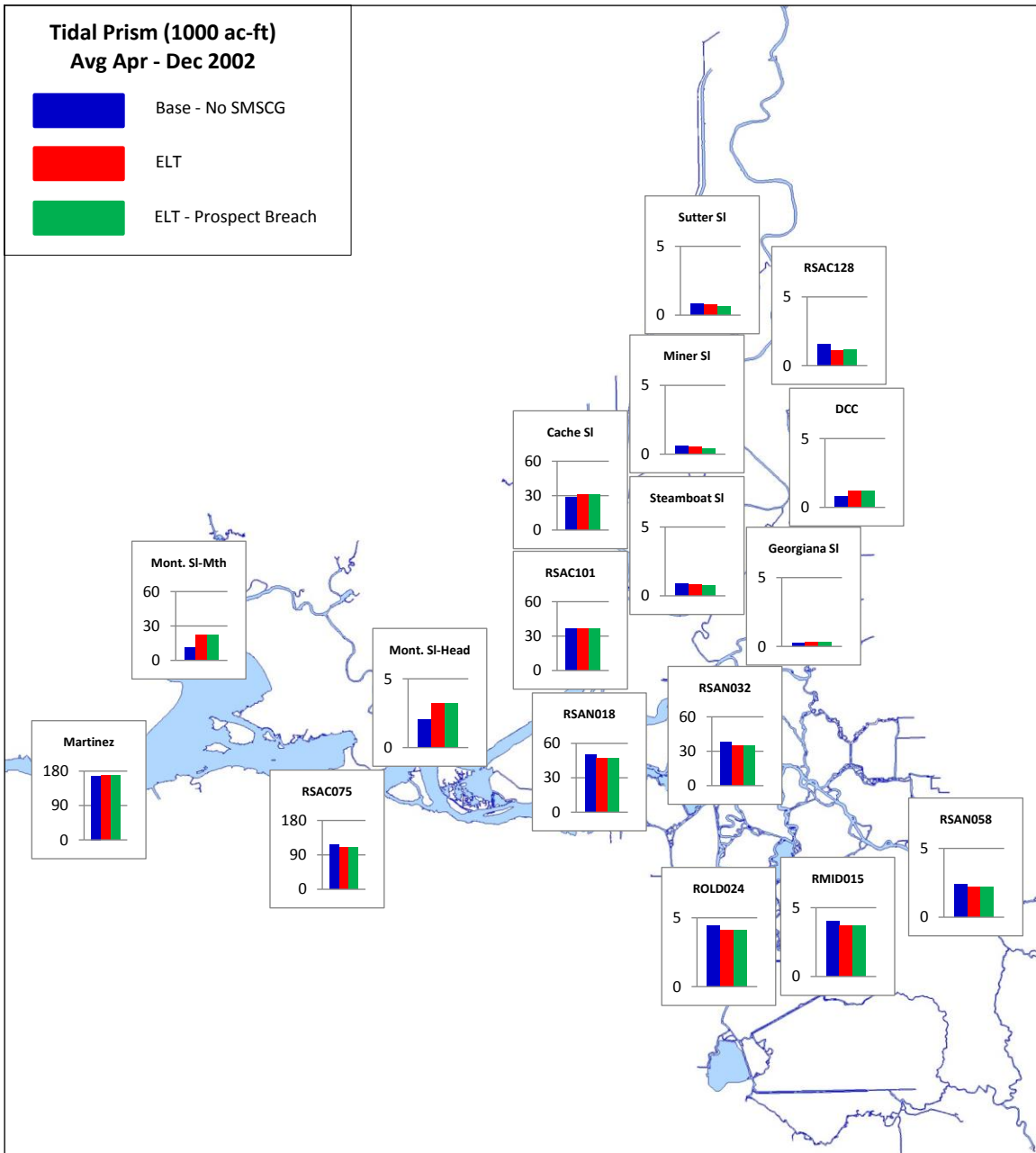


Figure 4-95 Average tidal prism (Apr - Dec 2002) for Base – No SMSCG, ELT and ELT – Prospect Breach simulations.

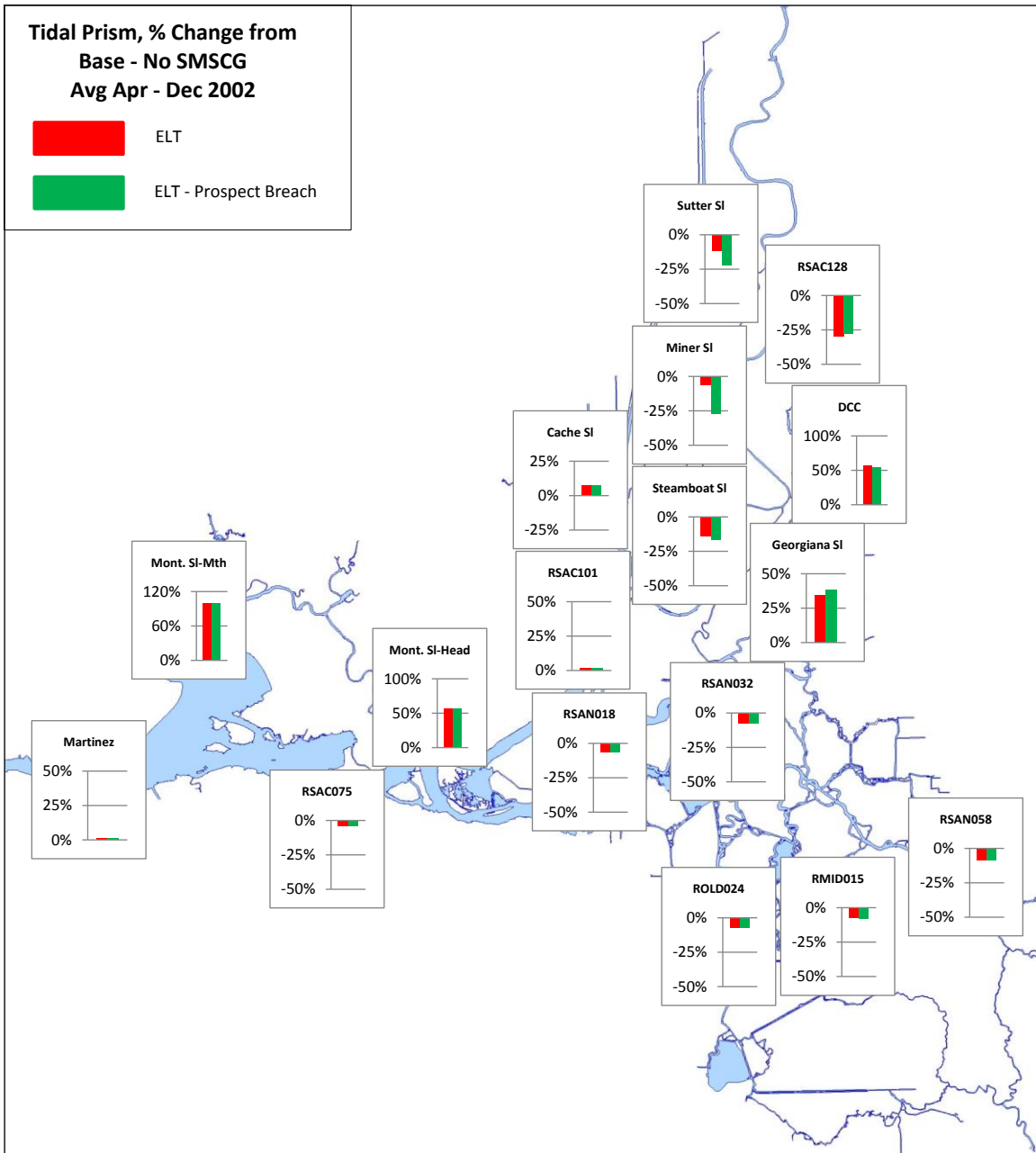


Figure 4-96 Average percent change from Base – No SMSCG tidal prism (Apr - Dec 2002) for ELT and ELT – Prospect Breach simulations.

4.2.5.3 Tidal Range

Table 4-16 Summary of Apr – Dec 2002 Average Tidal Range for Base – No SMSCG, ELT and ELT – Prospect Breach simulations.

| Location | Apr – Dec 2002 Average Tidal Range (ft) | | |
|-----------------------|---|------|-----------------------|
| | Base – No SMSCG | ELT | ELT – Prospect Breach |
| Cache Sl at Ryer | 3.95 | 3.21 | 3.21 |
| DCC | 2.92 | 2.31 | 2.27 |
| False River | 3.4 | 3.08 | 3.08 |
| Martinez | 5.47 | 5.24 | 5.24 |
| Miner Slough | 3.11 | 3.01 | 2.5 |
| Montezuma Sl at Head | 4.25 | 3.85 | 3.85 |
| Montezuma Sl at Mouth | 5 | 4.32 | 4.32 |
| RMID015 | 3.77 | 3.45 | 3.45 |
| RMID023 | 3.54 | 3.27 | 3.27 |
| ROLD024 | 3.56 | 3.27 | 3.27 |
| ROLD034 | 3.41 | 3.15 | 3.15 |
| RSAC075 Chipps Island | 4.42 | 4.04 | 4.04 |
| RSAC092 Emmaton | 3.93 | 3.52 | 3.53 |
| RSAC101 Rio Vista | 3.87 | 3.23 | 3.23 |
| RSAC123 | 2.95 | 2.34 | 2.32 |
| RSAC128 | 2.91 | 2.33 | 2.29 |
| RSAN018 Jersey Pt | 3.47 | 3.13 | 3.13 |
| RSAN032 San Andreas | 3.37 | 3.07 | 3.07 |
| RSAN058 | 4.06 | 3.69 | 3.69 |
| SLDUT007 Dutch Slough | 3.59 | 3.19 | 3.19 |
| SLGEO019 Georgiana Sl | 2.95 | 2.36 | 2.33 |
| SLTRM004 Threemile Sl | 3.45 | 3.09 | 3.09 |
| Steamboat Sl | 2.69 | 2.22 | 2.15 |
| Sutter Sl | 2.57 | 2.17 | 2.02 |
| Victoria Canal | 3.54 | 3.28 | 3.28 |

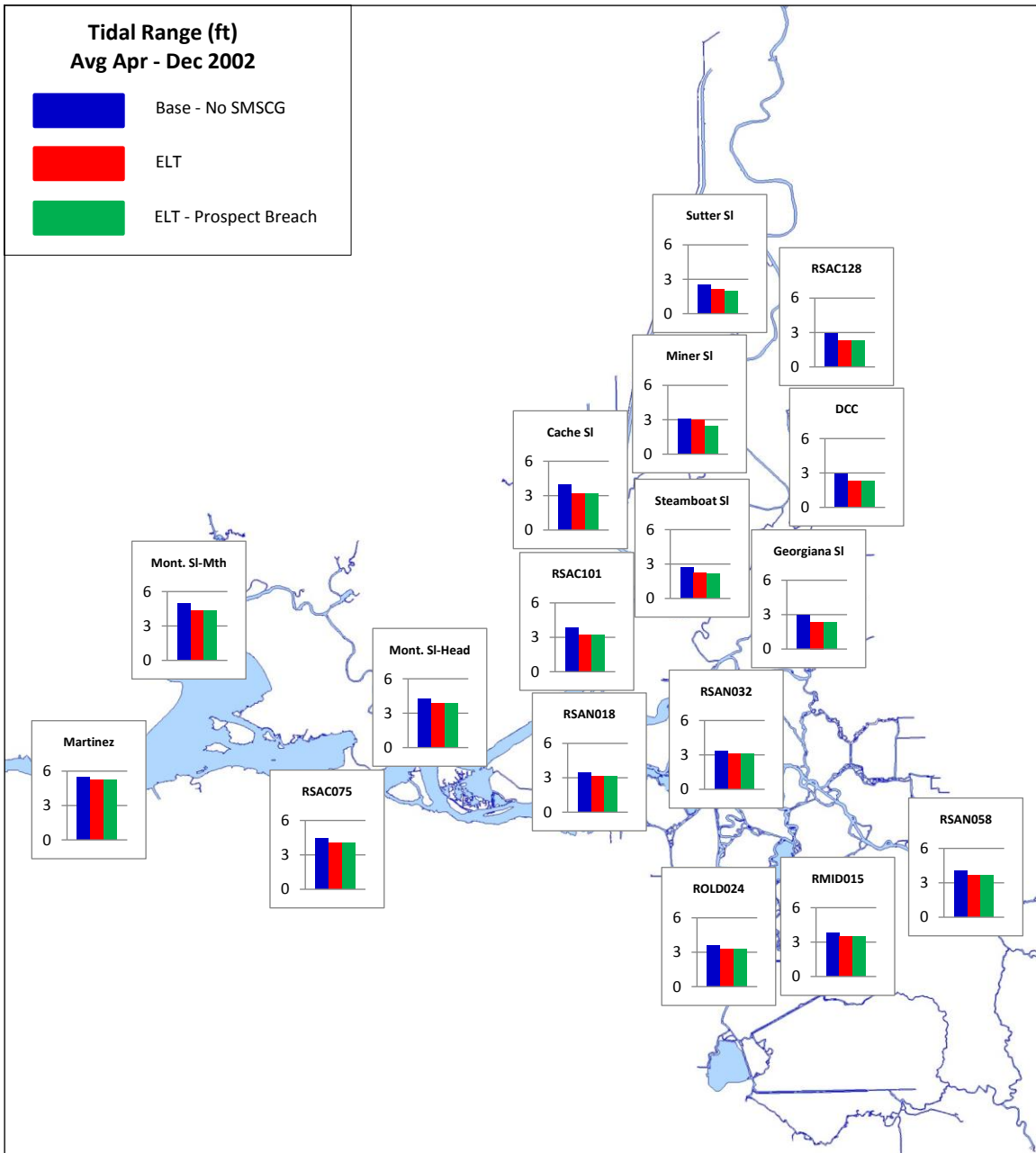


Figure 4-97 Average tidal range (Apr - Dec 2002) for Base – No SMSCG, ELT and ELT – Prospect Breach simulations.

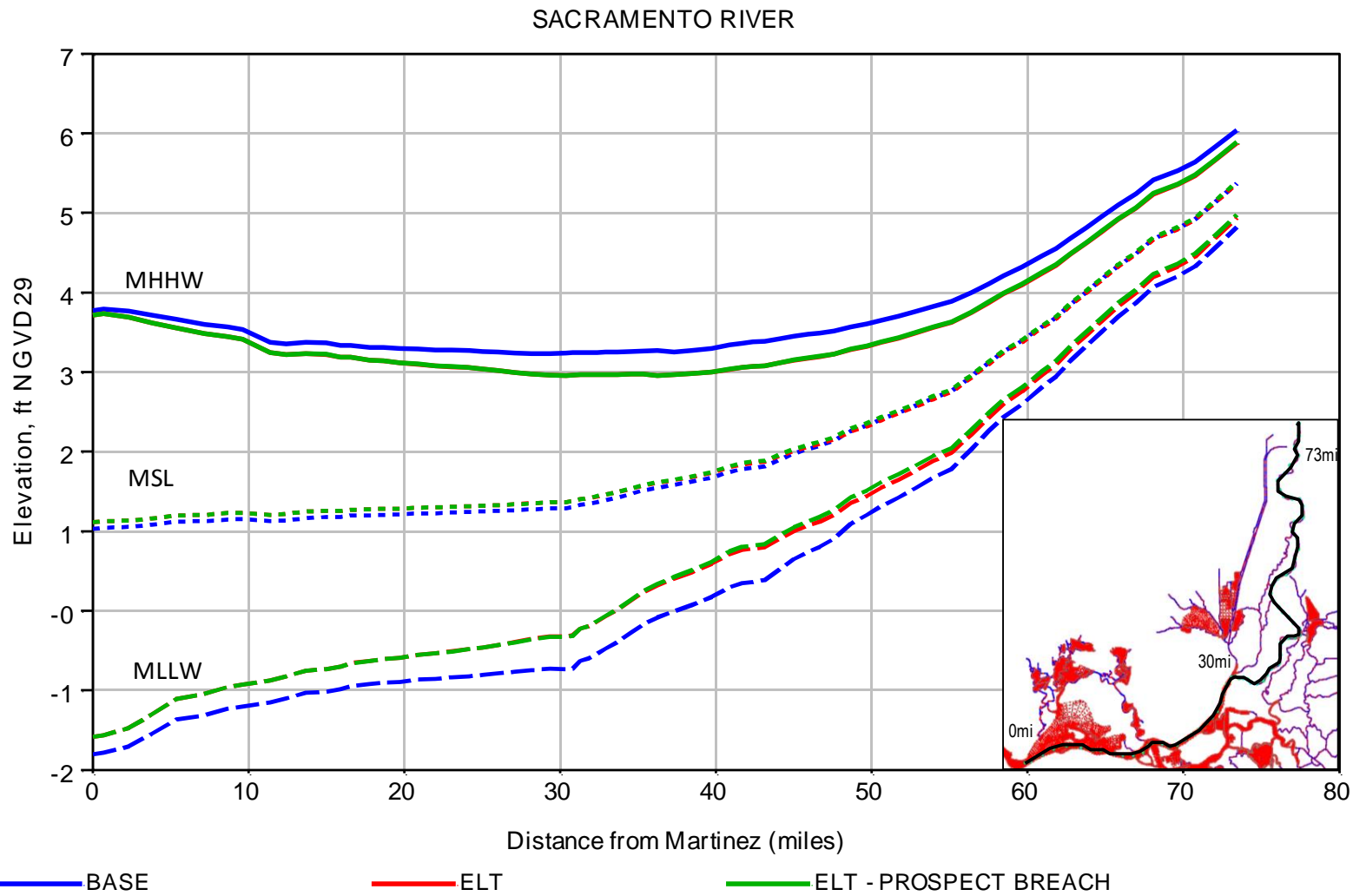


Figure 4-98 Profiles of July 2002 MHHW, MSL and MLLW along the Sacramento River for the Base - No SMSCG (Base), ELT and ELT - Prospect Breach simulations.

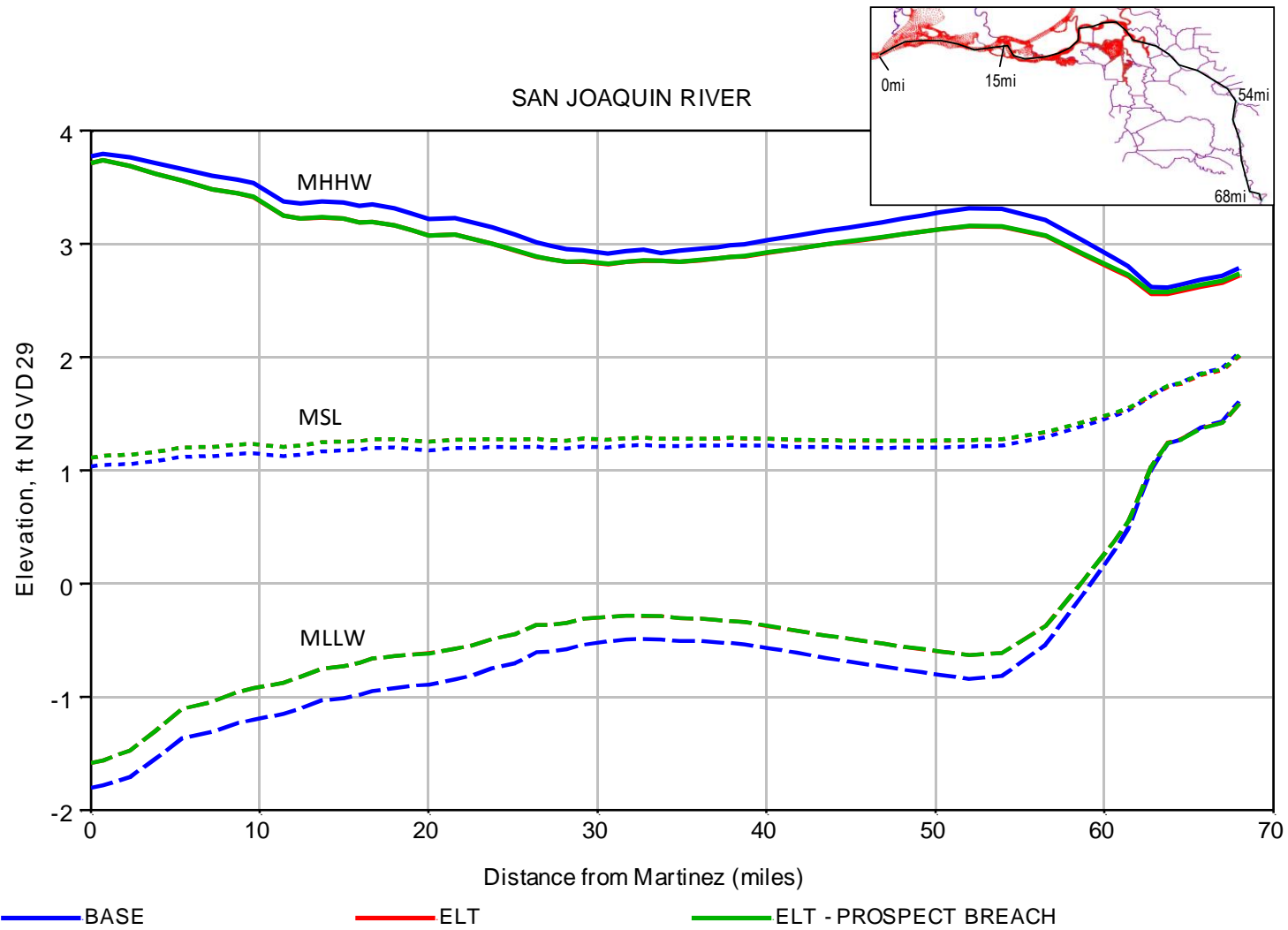


Figure 4-99 Profiles of July 2002 MHHW, MSL and MLLW along the San Joaquin River for the Base - No SMSCG (Base), ELT and ELT - Prospect Breach simulations.

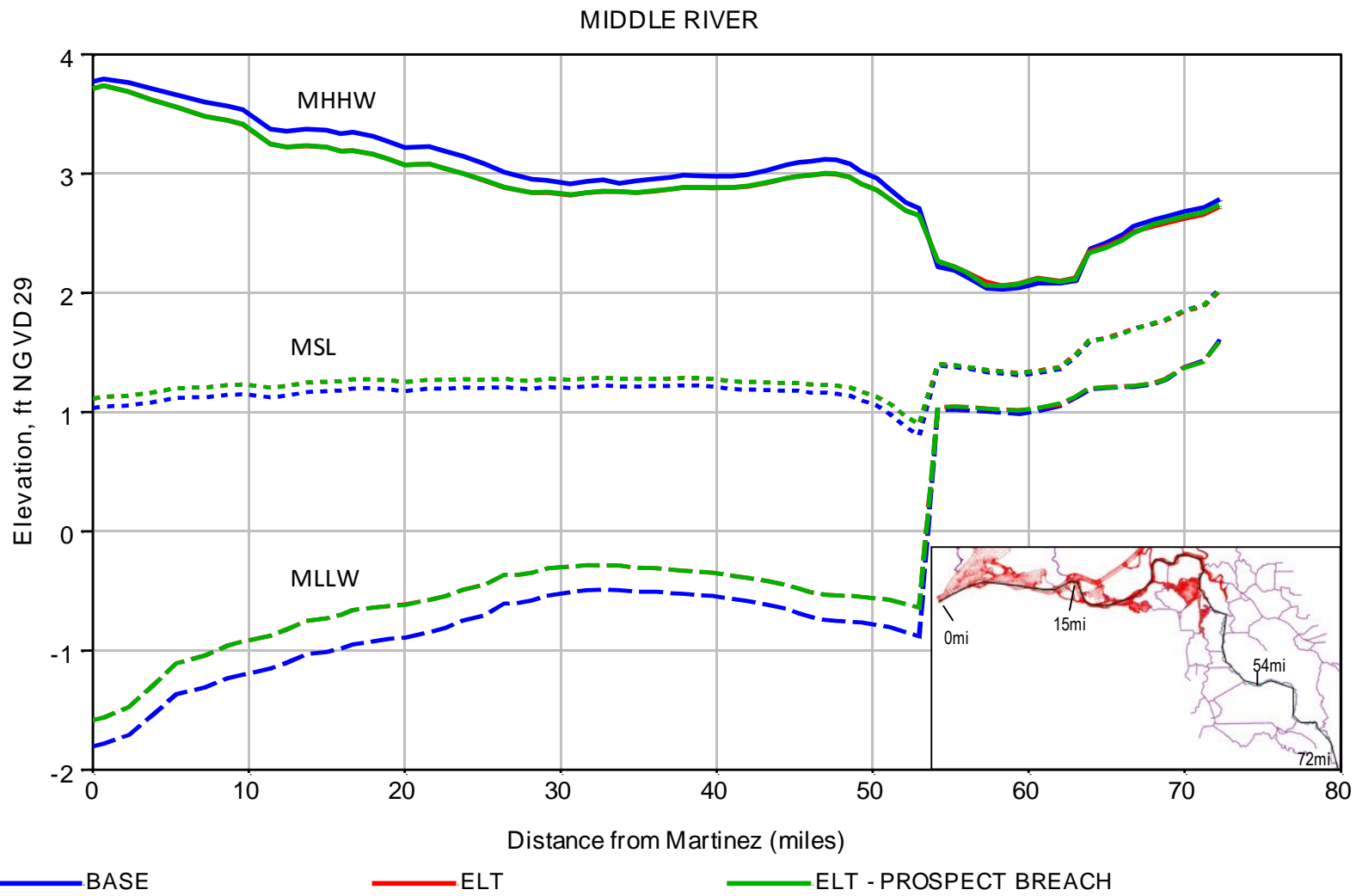


Figure 4-100 Profiles of July 2002 MHHW, MSL and MLLW along the Middle River for the Base - No SMSCG (Base), ELT and ELT - Prospect Breach simulations.

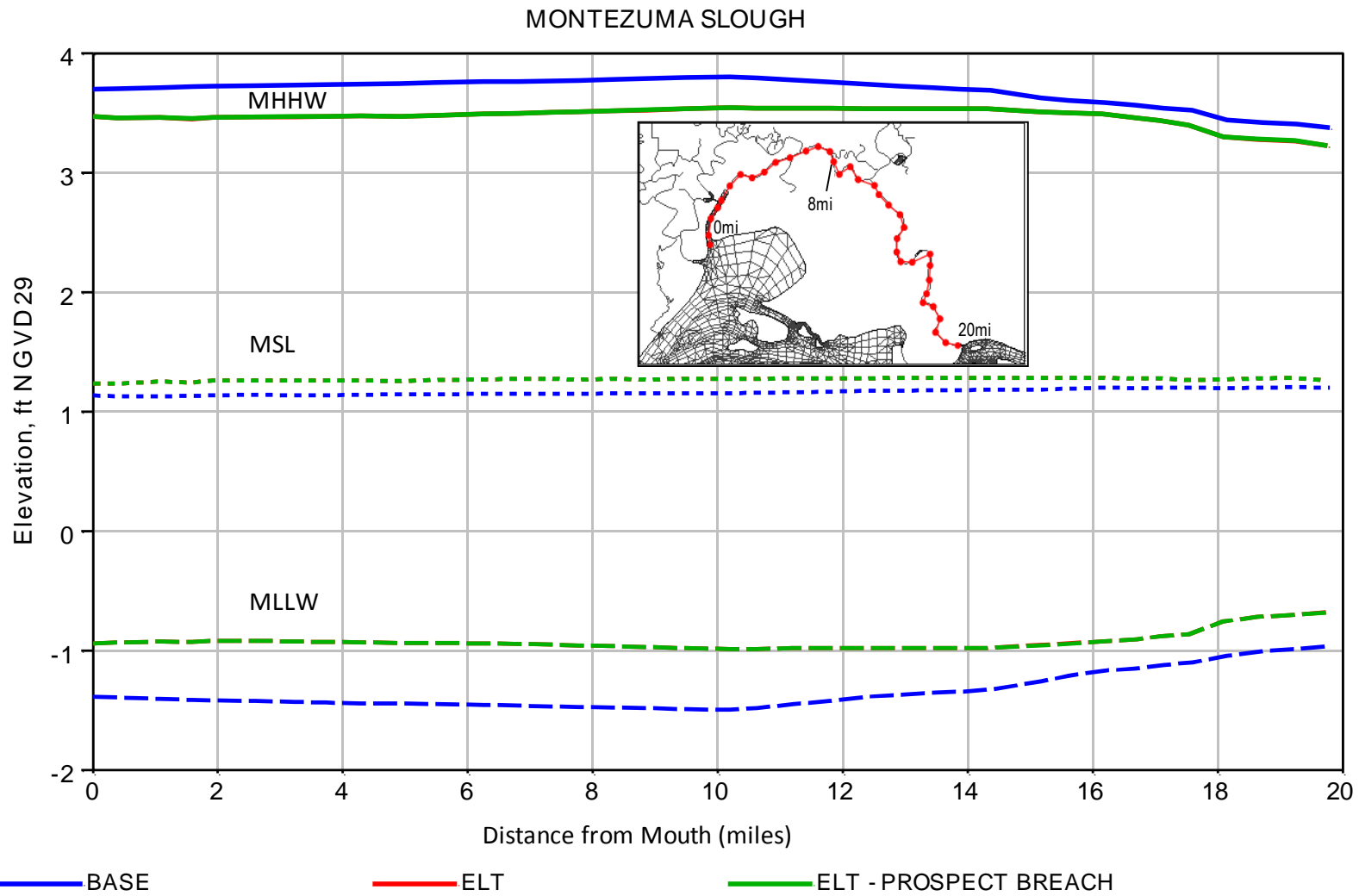


Figure 4-101 Profiles of July 2002 MHHW, MSL and MLLW along Montezuma Slough for the Base - No SMSCG (Base), ELT and ELT - Prospect Breach simulations.

4.2.5.4 Stage Time Series

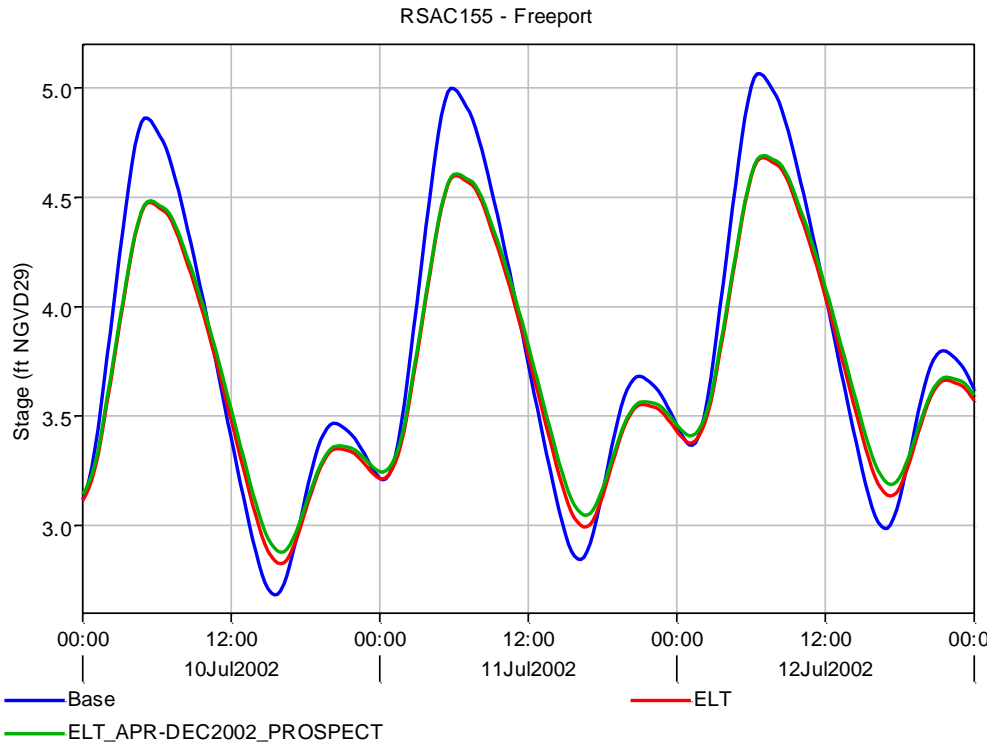


Figure 4-102 Stage at RSAC155 for Base - No SMSCG (Base), ELT and ELT - Prospect Breach scenarios.

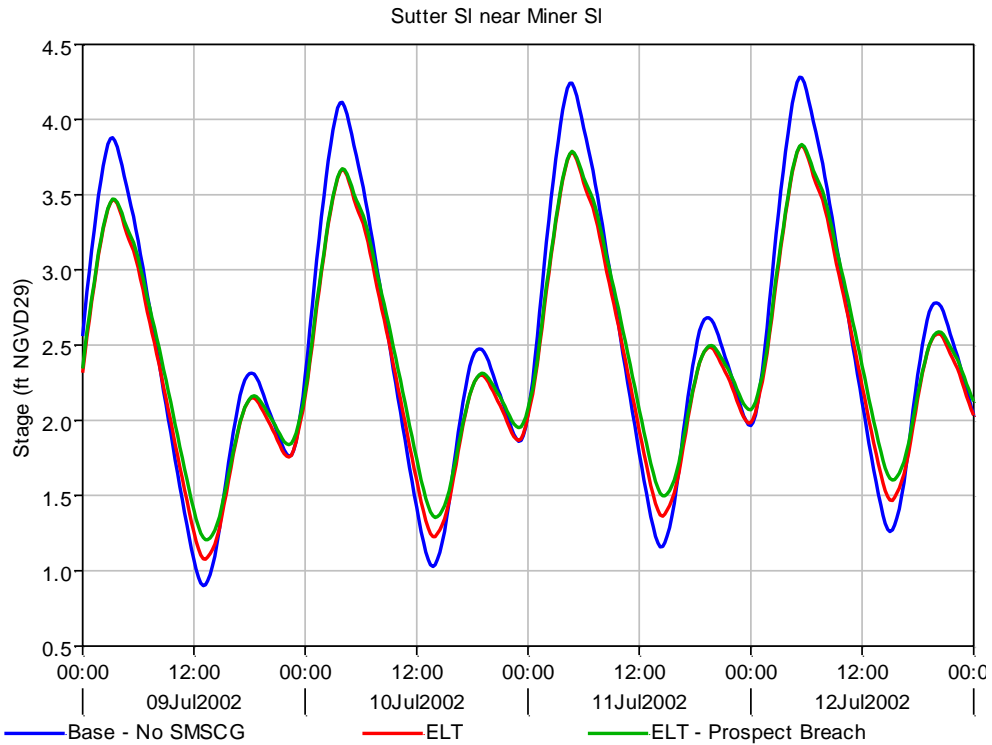


Figure 4-103 Stage in Sutter Slough for Base - No SMSCG (Base), ELT and ELT - Prospect Breach scenarios.

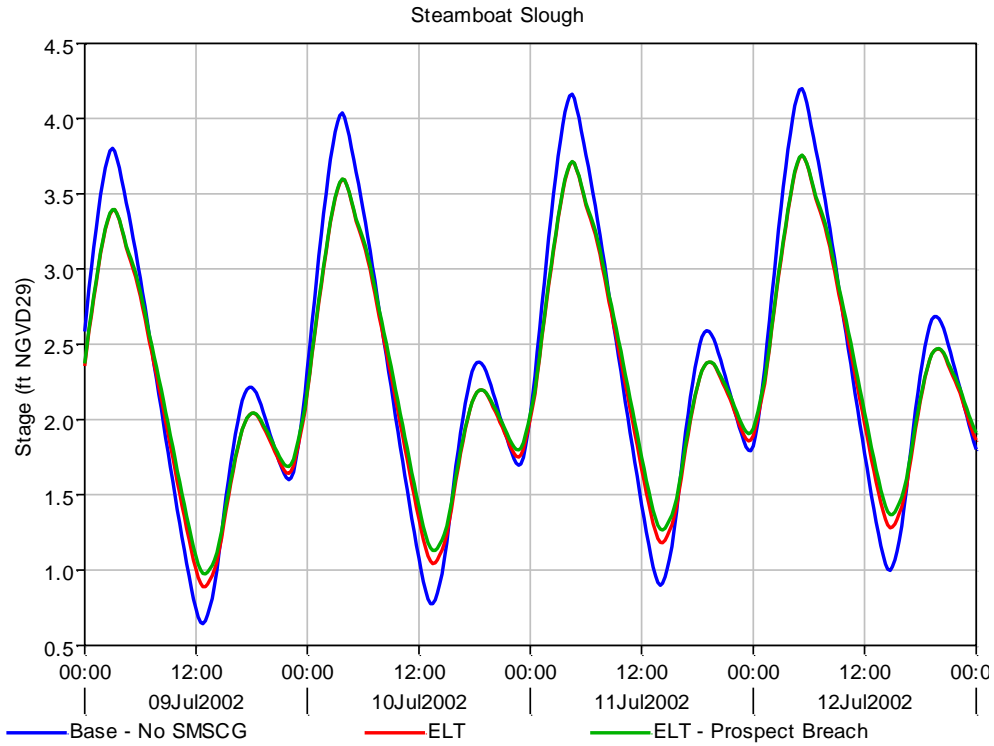


Figure 4-104 Stage in Steamboat Slough for Base - No SMSCG (Base), ELT and ELT - Prospect Breach scenarios.

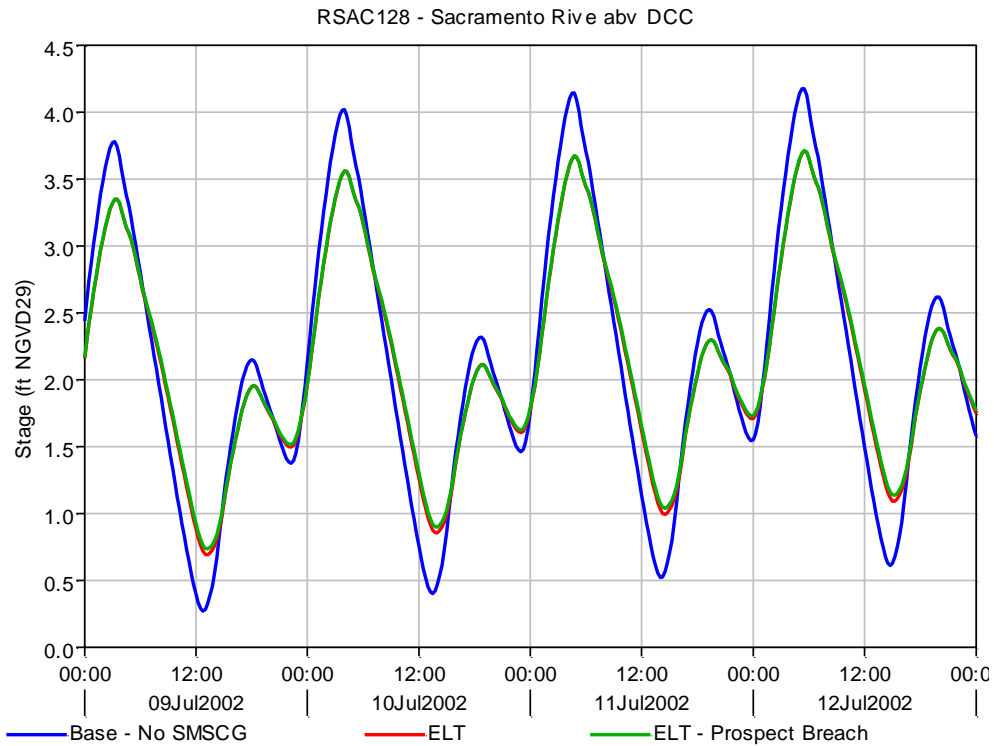


Figure 4-105 Stage at RSAC128 for Base - No SMSCG (Base), ELT and ELT - Prospect Breach scenarios.

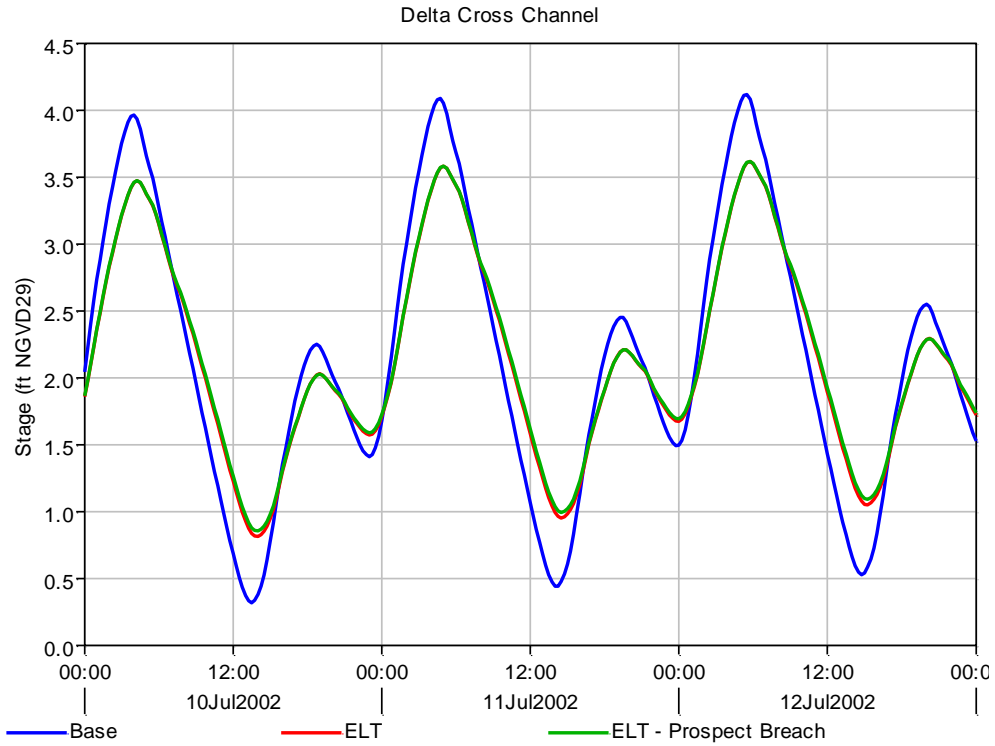


Figure 4-106 Stage in Delta Cross Channel for Base - No SMSCG (Base), ELT and ELT - Prospect Breach scenarios.

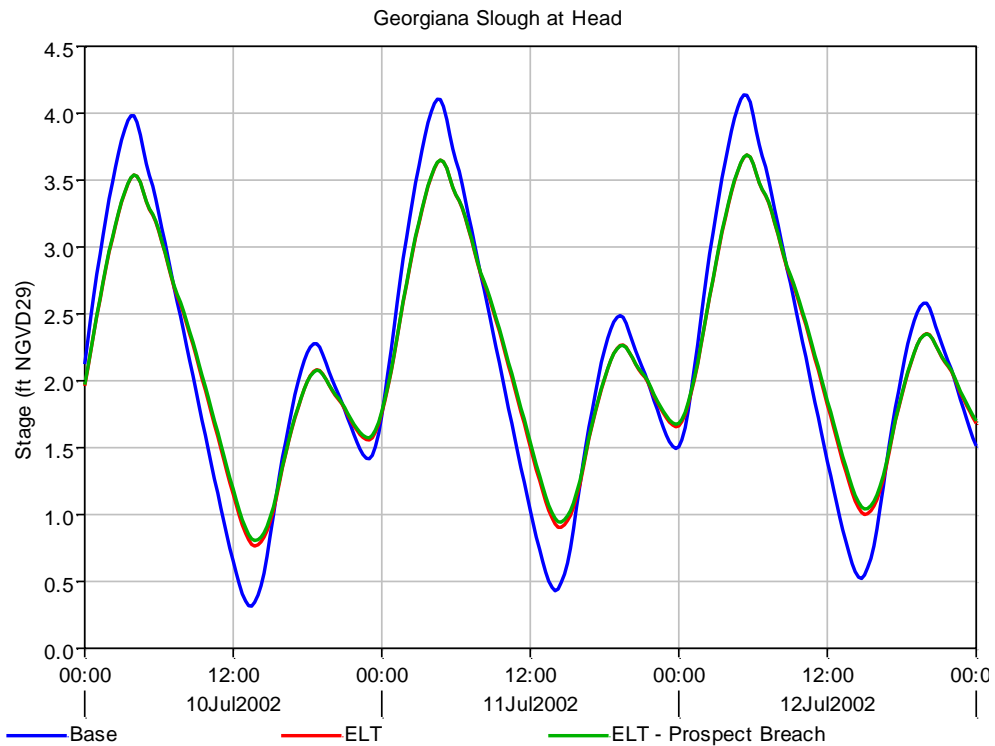


Figure 4-107 Stage in Georgiana Slough at head for Base - No SMSCG (Base), ELT and ELT - Prospect Breach scenarios.

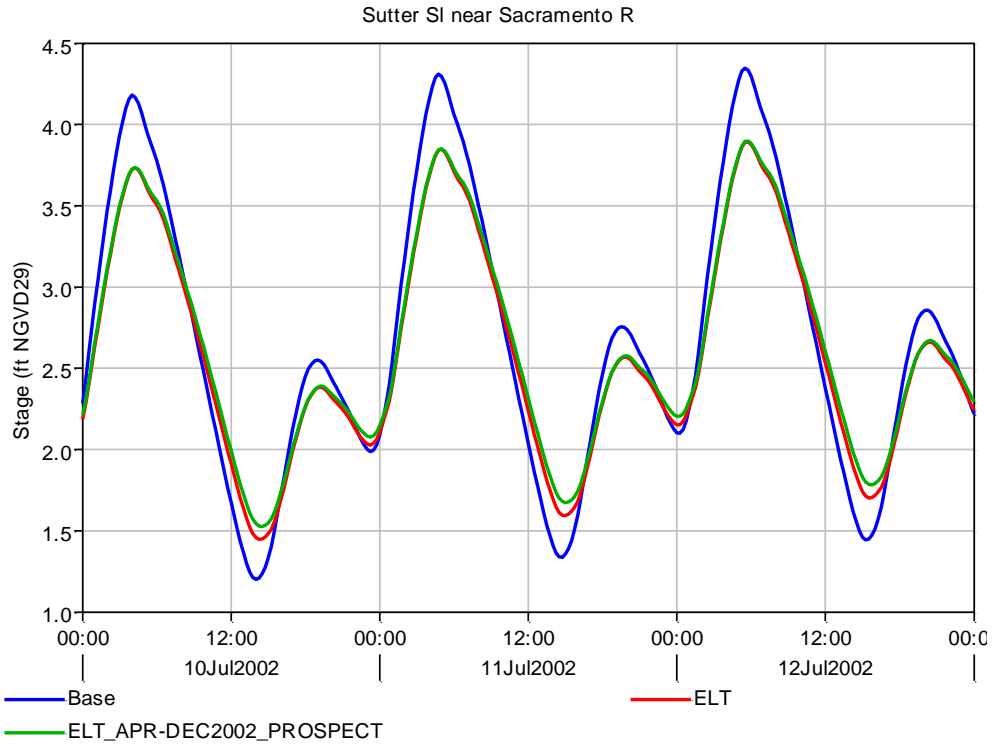


Figure 4-108 Stage in Sutter Slough near Sacramento R. for Base - No SMSCG (Base), ELT and ELT - Prospect Breach scenarios.

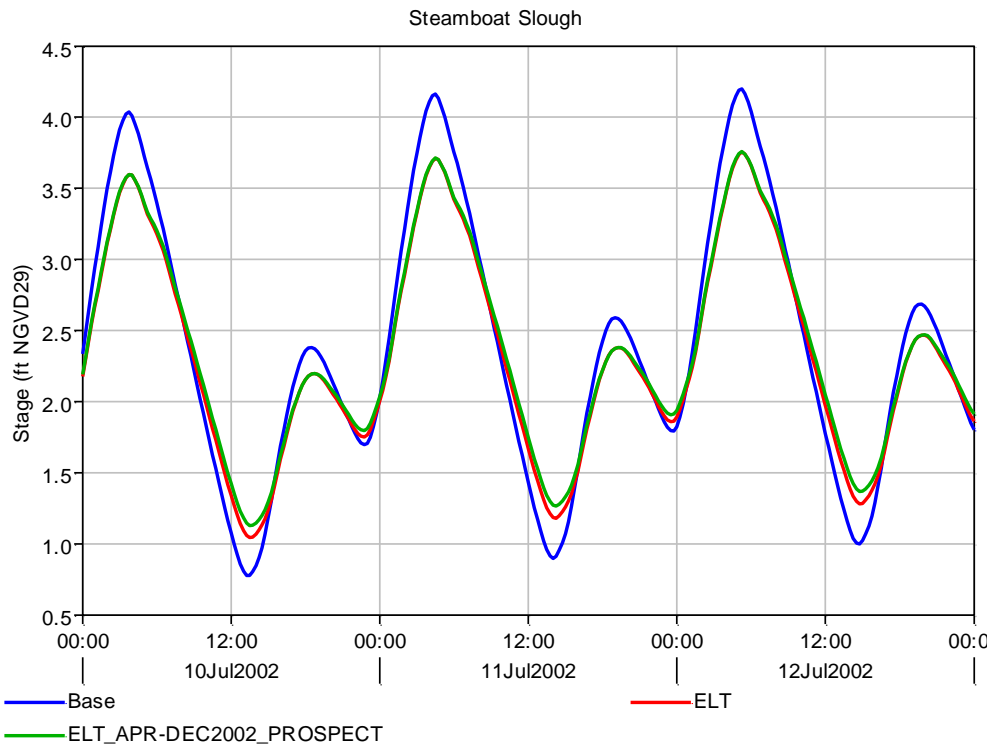


Figure 4-109 Stage in Steamboat Slough for Base - No SMSCG (Base), ELT and ELT - Prospect Breach scenarios.

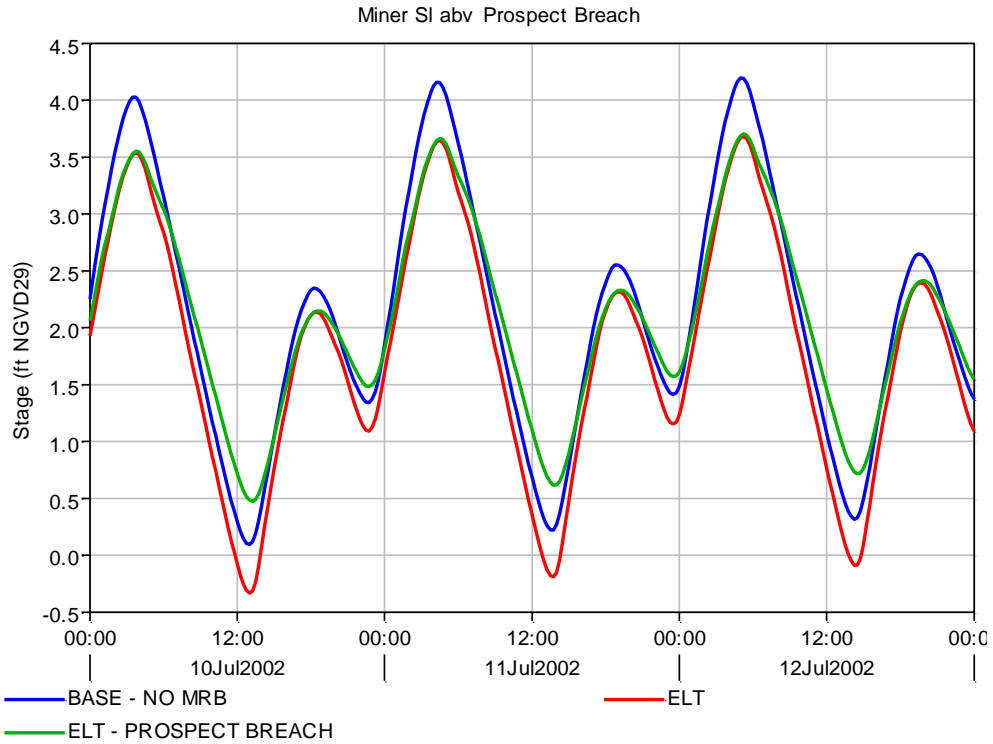


Figure 4-110 Stage in Miner Slough for Base - No SMSCG (Base), ELT and ELT - Prospect Breach scenarios.

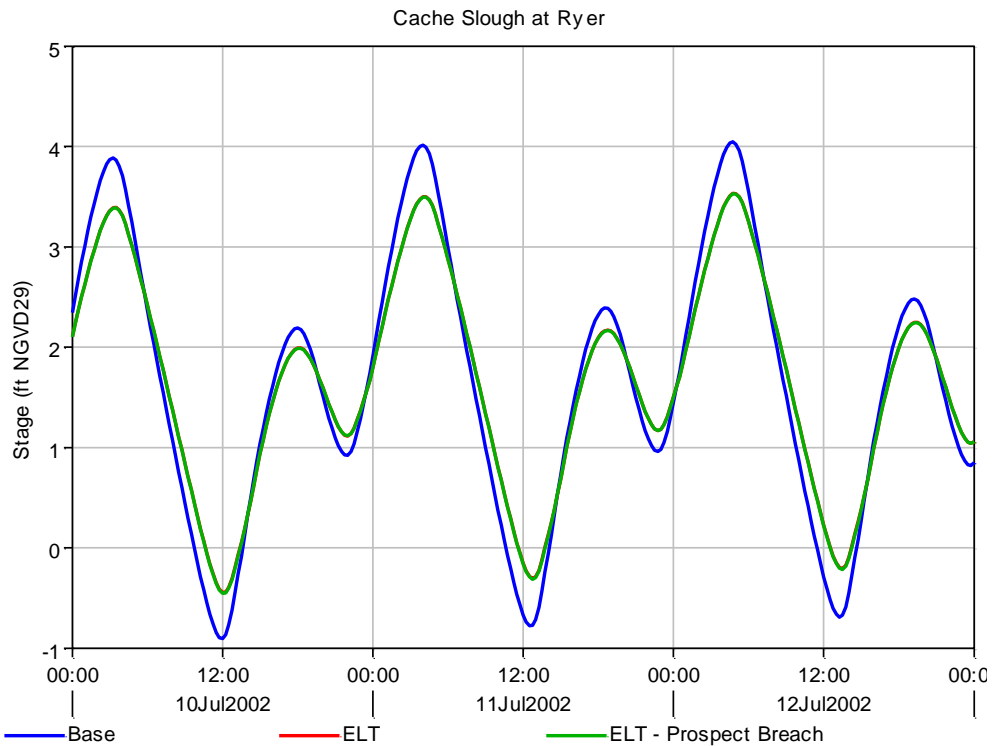


Figure 4-111 Stage in Cache Slough at Ryer Island for Base - No SMSCG (Base), ELT and ELT - Prospect Breach scenarios.

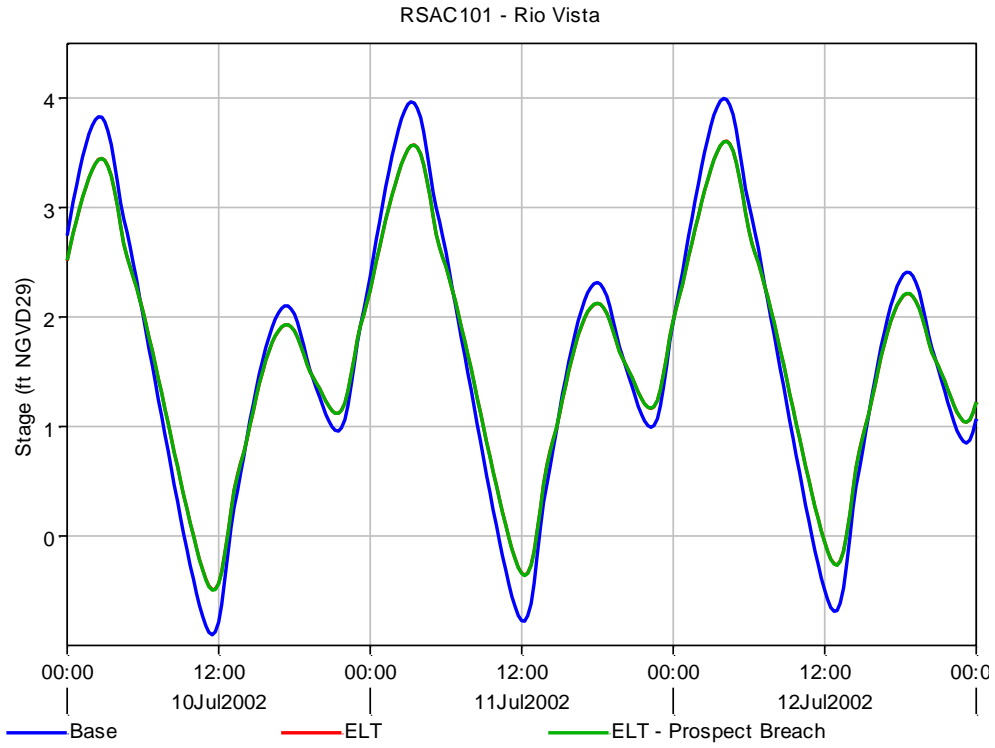


Figure 4-112 Stage in Sacramento River at RSAC101 for Base - No SMSCG (Base), ELT and ELT - Prospect Breach scenarios.

4.2.5.5 Bed Shear

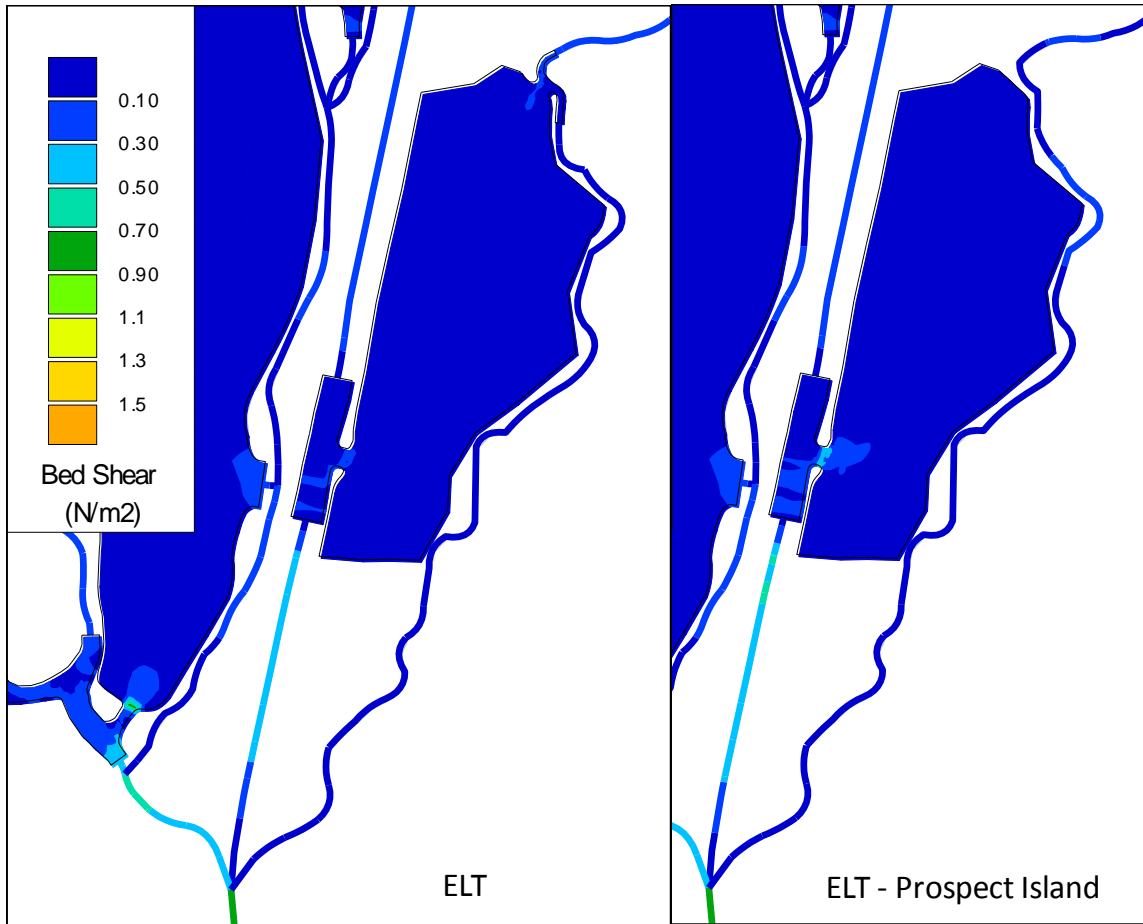


Figure 4-113 Comparison of bed shear in the Prospect Island vicinity for the ELT and ELT-Prospect Island simulations at times of peak bed shear during July 2002.

4.2.6 LLT – Little Egbert Breach

Three-month average flows for the LLT – Little Egbert Breach simulation are tabulated in Table 4-17 and plotted in Figure 4-114. Elimination of the Little Egbert breach on Cache Slough for the LLT – Little Egbert Breach case impacts flows in the north and central Delta. For the LLT case, the two breaches on Little Egbert provide additional conveyance through the island. For the LLT case, net flow direction through Little Egbert is in the upstream direction, resulting in increased net flow in the downstream direction in Cache Slough. Thus when one of the breaches is removed, as in the LLT – Little Egbert Case, the three-month average flow in Cache is decreased by 12% relative to LLT. Average flows in Miner Slough are increased by 5% relative to LLT. Impacts at RSAC128 and DCC are very small, but Georgiana Slough flows are increased by 3% relative to LLT. Other notable impacts include decreased average flows in Threemile Slough (-7%) San Andreas Landing (-4%) and Dutch Slough (-10%), and increased average flows at Jersey Point (6%), False River (4%) and Emmaton (2%).

LLT – Little Egbert Breach tidal prism results are shown in Table 4-18, Figure 4-115 and Figure 4-116. Tidal prism is strongly impacted in the north Delta. Elimination of the Little Egbert breach increases tidal prism relative to LLT by 20% in Cache Slough, by 8% in Steamboat Slough, by 13% in DCC and by 9% at RSAC123. Tidal prism is reduced relative to LLT by 24% in Miner Slough, by 10% in Sutter Slough and by 2% in Georgiana Slough. Tidal prism is reduced by 8% relative to LLT at Rio Vista, by 7% at Emmaton and by 2% at Chipps Island. Tidal prism in Threemile Slough increases by 13%. Changes in the San Joaquin River and south Delta are generally 3% or less, relative to LLT.

As shown in Table 4-19 and Figure 4-117, elimination of the Little Egbert breach on Cache Slough decreases tidal range relative to LLT by 4% in Cache Slough, by 6% in Miner Slough, by 3% in Sutter Slough and by 2% in Steamboat Slough. At most other locations throughout the Delta and Suisun Bay, tidal range is increased by 0 to 3% relative to LLT.

Profile plots of July 2002 MHHW, MSL and MLLW, in Figure 4-118 through Figure 4-121, show the small increases in tidal range in the Sacramento River below Cache Slough, in the San Joaquin River below Stockton, in Middle River below Victoria Canal and in Montezuma Slough.

For reference, time series plots of stage are provided for various locations in Figure 4-122 through Figure 4-137. A map of locations plotted is shown in Figure 4-2.

There are no new or resolved bed shear issues for this sensitivity case.

4.2.6.1 Net Flows

Table 4-17 Summary of 3-month Average flow (Jul – Sep 2002) for Base - No MRB, LLT, LLT – Little Egbert Breach simulations.

| Location | 3-month Average Flow, Jul – Sep 2002 (cfs) | | |
|-----------------------|--|-------|----------------------------|
| | Base – No MRB | LLT | LLT – Little Egbert Breach |
| Cache Sl at Ryer | 1535 | 2565 | 2254 |
| DCC | 4609 | 3449 | 3455 |
| False River | -1696 | -1806 | -1874 |
| Martinez | 4422 | 4080 | 4082 |
| Miner Slough | 2018 | 2667 | 2795 |
| Mokelumne nr SJR | 4719 | 3781 | 3849 |
| Montezuma Sl at Head | 12 | 13 | 13 |
| Montezuma Sl at Mouth | -71 | -191 | -190 |
| RMID015 | -5351 | -5265 | -5271 |
| RMID027 | -25 | -45 | -43 |
| ROLD024 | -4425 | -4541 | -4533 |
| ROLD034 | -6493 | -6603 | -6604 |
| RSAC075 Chipps Island | 4503 | 4395 | 4396 |
| RSAC092 Emmaton | 5870 | 6484 | 6605 |
| RSAC101 Rio Vista | 8256 | 9712 | 9628 |
| RSAC123 | 3607 | 4258 | 4139 |
| RSAC128 | 10999 | 10137 | 10104 |
| RSAN018 Jersey Pt | -999 | -1914 | -2023 |
| RSAN032 San Andreas | -1716 | -3216 | -3087 |
| RSAN058 | 366 | 391 | 393 |
| SLDUT007 | -113 | 68 | 61 |
| SLGEO019 Georgiana Sl | 2762 | 2408 | 2490 |
| SLTRM004 Threemile Sl | -2313 | -3012 | -2805 |
| Steamboat Sl | 2280 | 2629 | 2601 |
| Sutter Sl | 2965 | 3480 | 3540 |

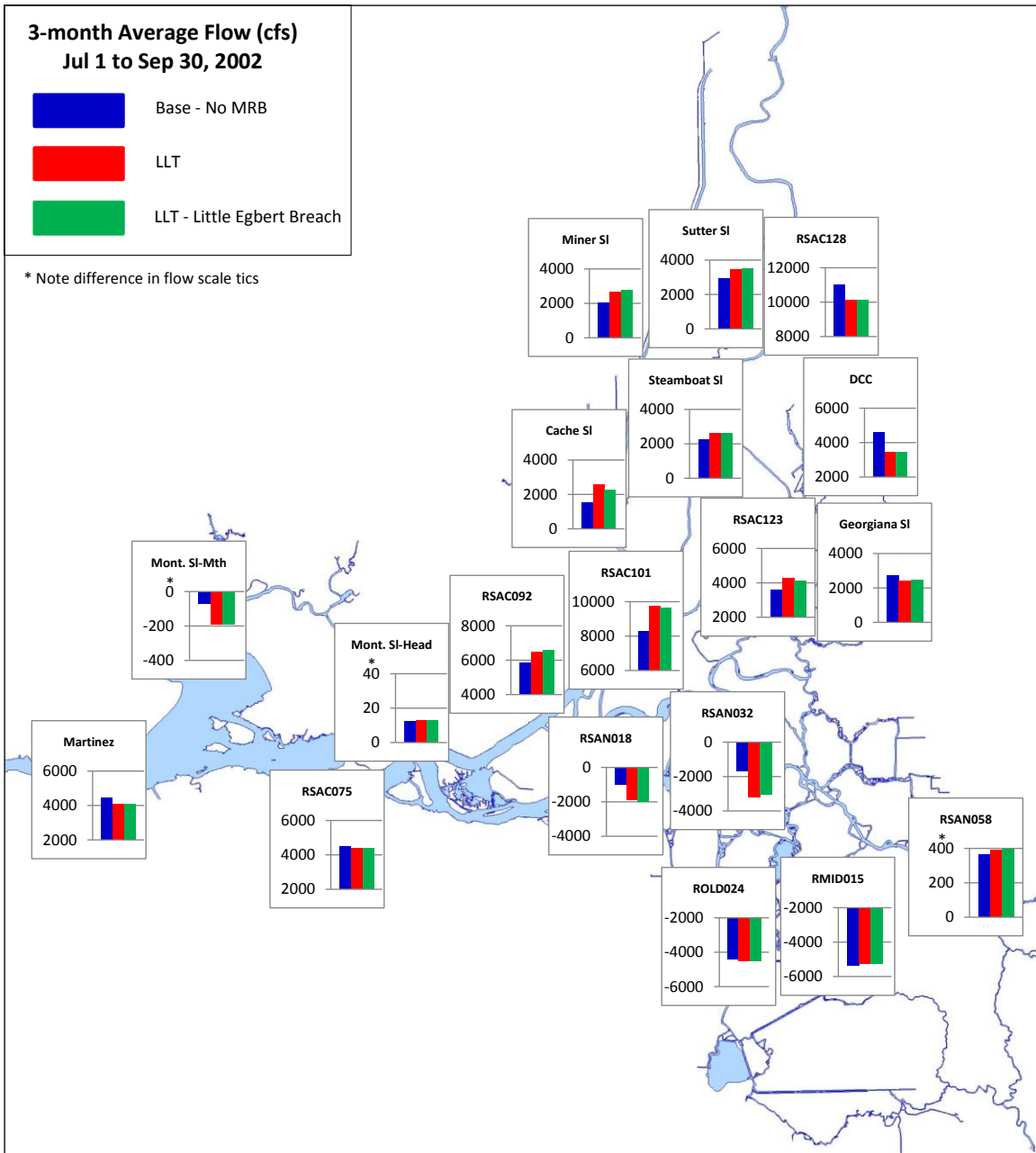


Figure 4-114 Average flows (Jul - Sep 2002) for Base - No MRB, LLT and LLT – Little Egbert Breach simulations.

4.2.6.2 Tidal Prism

Table 4-18 Summary of Apr – Dec 2002 Average Tidal Prism for Base - No MRB, LLT and LLT – Little Egbert Breach simulations, and percent change from Base- No MRB.

| Location | Base – No MRB | LLT | | LLT – Little Egbert Breach | |
|-----------------------|---------------------|---------------------|--------------------|----------------------------|--------------------|
| | Tidal Prism (ac-ft) | Tidal Prism (ac-ft) | % Change from Base | Tidal Prism (ac-ft) | % Change from Base |
| Cache Sl at Ryer | 28,697 | 26,884 | -6% | 32,242 | 12% |
| DCC | 782 | 949 | 21% | 1,073 | 37% |
| False River | 18,870 | 16,508 | -13% | 16,845 | -11% |
| Martinez | 167,717 | 170,966 | 2% | 171,420 | 2% |
| Miner Slough | 618 | 455 | -26% | 345 | -44% |
| Mokelumne nr SJR | 4,615 | 4,490 | -3% | 4,470 | -3% |
| Montezuma Sl at Head | 2,053 | 3,283 | 60% | 3,356 | 63% |
| Montezuma Sl at Mouth | 10,988 | 23,108 | 110% | 23,258 | 112% |
| RMID015 | 4,119 | 3,333 | -19% | 3,418 | -17% |
| RMID027 | 474 | 1,784 | 277% | 1,802 | 281% |
| ROLD024 | 4,427 | 3,655 | -17% | 3,750 | -15% |
| ROLD034 | 2,352 | 1,960 | -17% | 2,005 | -15% |
| RSAC075 Chipps Island | 115,263 | 108,506 | -6% | 106,519 | -8% |
| RSAC092 Emmaton | 49,256 | 50,591 | 3% | 47,273 | -4% |
| RSAC101 Rio Vista | 36,171 | 40,582 | 12% | 37,224 | 3% |
| RSAC123 | 2,499 | 1,811 | -28% | 1,983 | -21% |
| RSAN018 Jersey Pt | 50,110 | 44,549 | -11% | 45,046 | -10% |
| RSAC128 | 1,608 | 1,175 | -27% | 1,164 | -28% |
| RSAN032 San Andreas | 37,847 | 32,450 | -14% | 33,291 | -12% |
| RSAN058 | 2,385 | 2,603 | 9% | 2,663 | 12% |
| SLDUT007 | 3,073 | 2,226 | -28% | 2,249 | -27% |
| SLGEO019 Georgiana Sl | 222 | 415 | 87% | 406 | 83% |
| SLTRM004 Threemile Sl | 9,413 | 6,526 | -31% | 7,359 | -22% |
| Steamboat Sl | 913 | 598 | -35% | 643 | -30% |
| Sutter Sl | 823 | 574 | -30% | 518 | -37% |

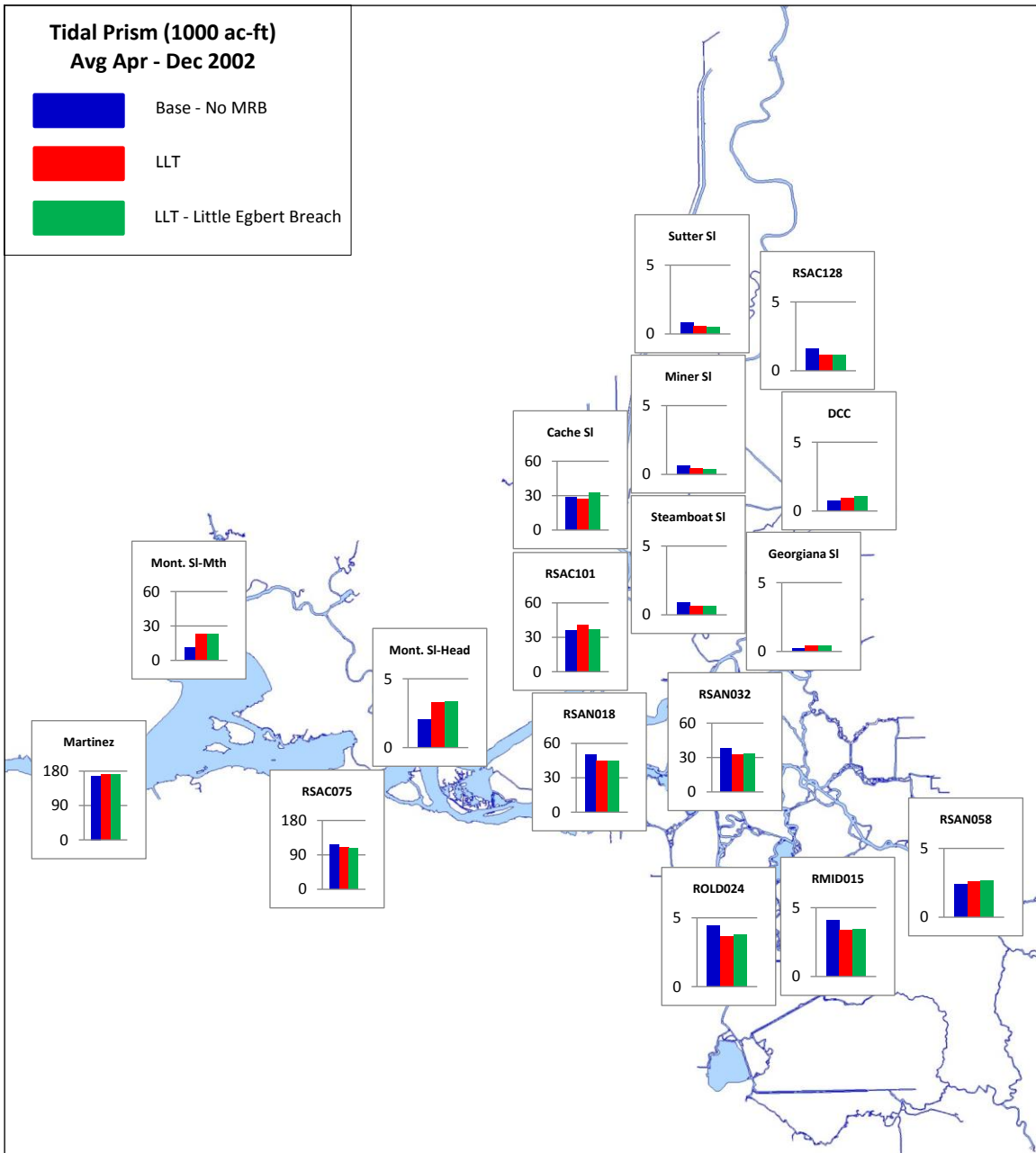


Figure 4-115 Average tidal prism (Apr - Dec 2002) for Base - No MRB, LLT and LLT – Little Egbert Breach simulations.

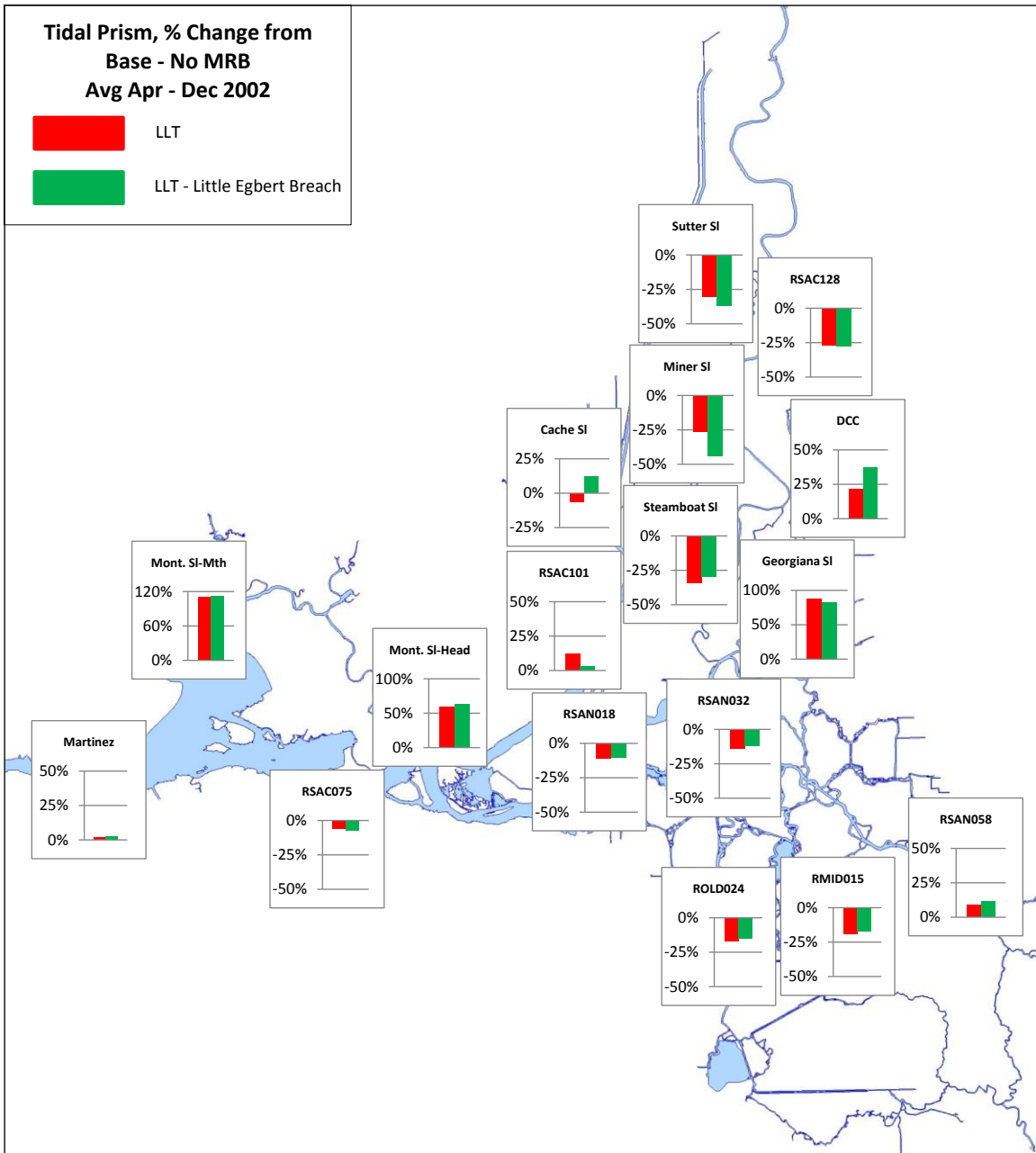


Figure 4-116 Average percent change from Base - No MRB tidal prism (Apr - Dec 2002) for LLT and LLT – Little Egbert Breach simulations.

4.2.6.3 Tidal Range

Table 4-19 Summary of Apr – Dec 2002 Average Tidal Range for Base - No MRB, LLT and LLT – Little Egbert Breach simulations.

| Location | Apr – Dec 2002 Average Tidal Range (ft) | | |
|------------------------|---|------|----------------------------|
| | Base – No MRB | LLT | LLT – Little Egbert Breach |
| Cache Sl at Ryer | 3.95 | 2.75 | 2.63 |
| DCC | 2.92 | 2.11 | 2.1 |
| False River | 3.4 | 2.93 | 3.0 |
| Martinez | 5.47 | 5.14 | 5.17 |
| Miner Slough | 3.12 | 2.62 | 2.47 |
| Montezuma Sl at Head | 4.25 | 3.64 | 3.72 |
| Montezuma Sl at Mouth | 5.0 | 4.05 | 4.11 |
| RMID015 | 3.76 | 3.14 | 3.21 |
| RMID023 | 3.49 | 2.48 | 2.54 |
| RMID027 | 3.33 | 0.56 | 0.49 |
| ROLD024 | 3.55 | 3.02 | 3.08 |
| ROLD034 | 3.36 | 2.73 | 2.78 |
| RSAC075 Chippis Island | 4.42 | 3.85 | 3.93 |
| RSAC092 Emmaton | 3.93 | 3.23 | 3.32 |
| RSAC101 Rio Vista | 3.86 | 2.79 | 2.87 |
| RSAC123 | 2.95 | 2.14 | 2.14 |
| RSAC128 | 2.91 | 2.12 | 2.11 |
| RSAN018 Jersey Pt | 3.47 | 2.98 | 3.06 |
| RSAN032 San Andreas | 3.37 | 2.89 | 2.95 |
| RSAN058 | 4.05 | 3.25 | 3.32 |
| SLDUT007 Dutch Slough | 3.59 | 3.04 | 3.12 |
| SLGEO019 Georgiana Sl | 2.95 | 2.16 | 2.16 |
| SLTRM004 Threemile Sl | 3.45 | 2.9 | 2.96 |
| Steamboat Sl | 2.69 | 1.99 | 1.96 |
| Sutter Sl | 2.57 | 1.94 | 1.88 |
| Victoria Canal | 3.48 | 2.48 | 2.53 |

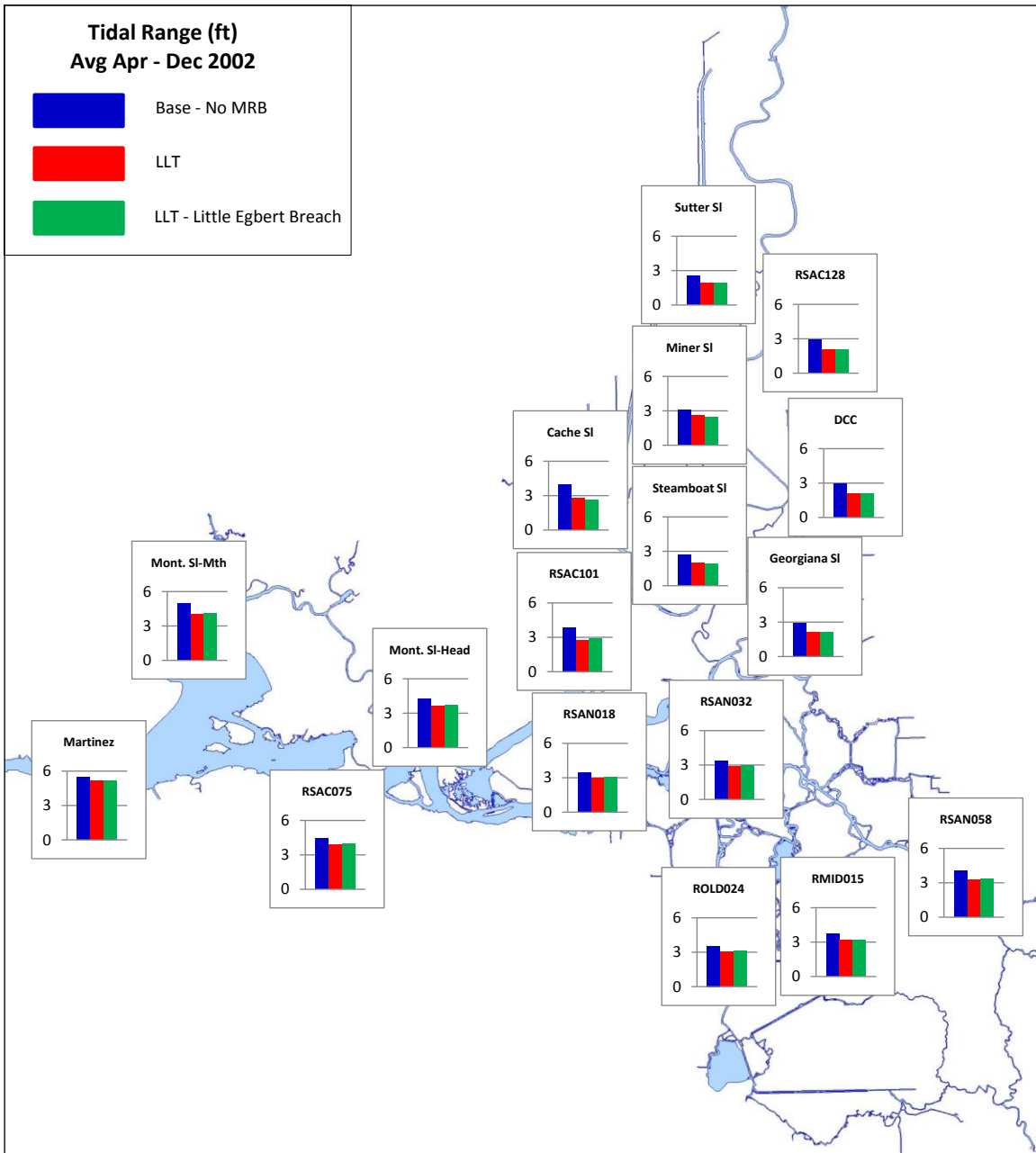


Figure 4-117 Average tidal range (Apr - Dec 2002) for Base - No MRB, LLT and LLT – Little Egbert Breach simulations.

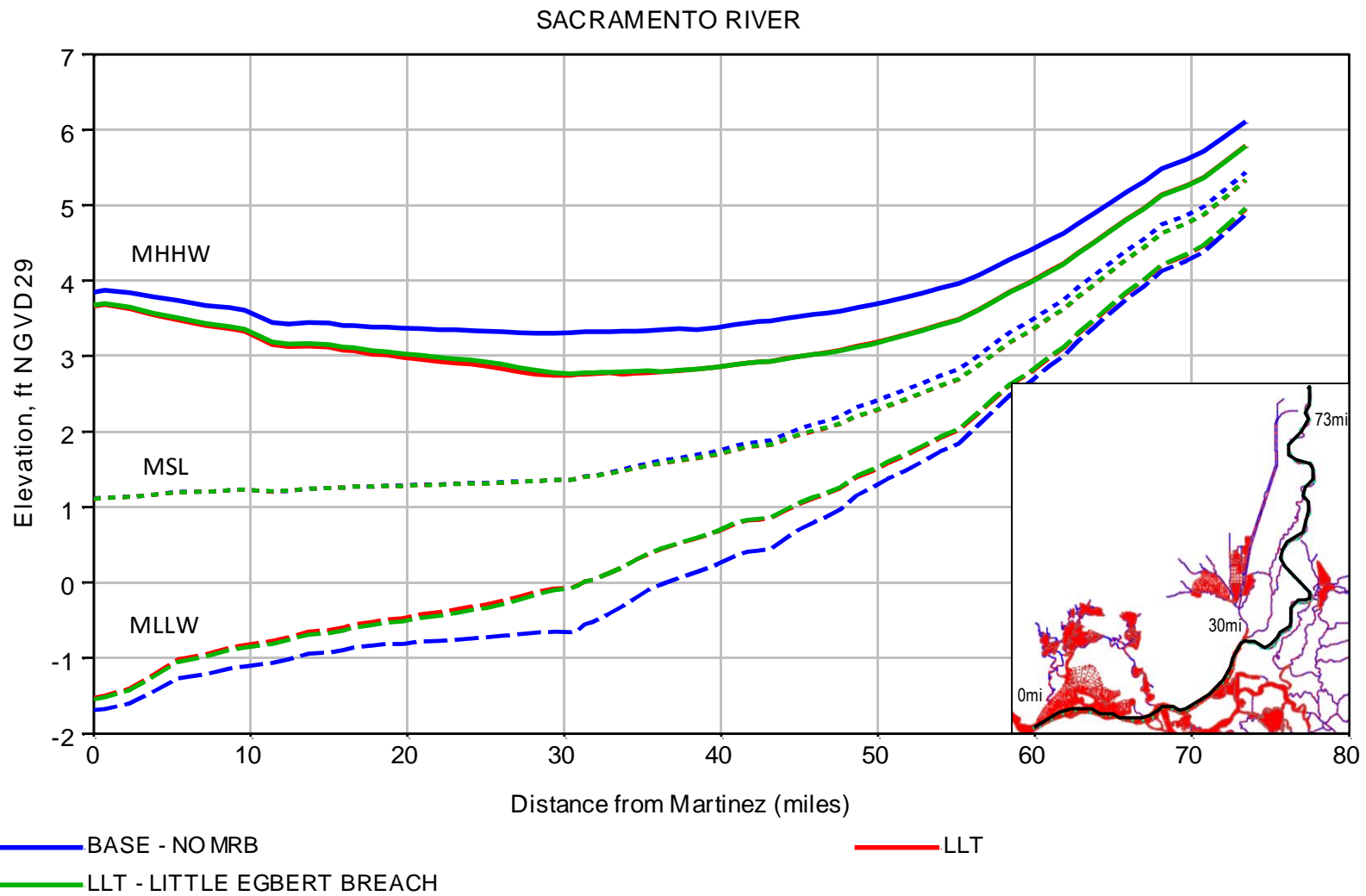


Figure 4-118 Profiles of July 2002 MHHW, MSL and MLLW along the Sacramento River for the Base - No MRB, LLT and LLT - Little Egbert Breach simulations.

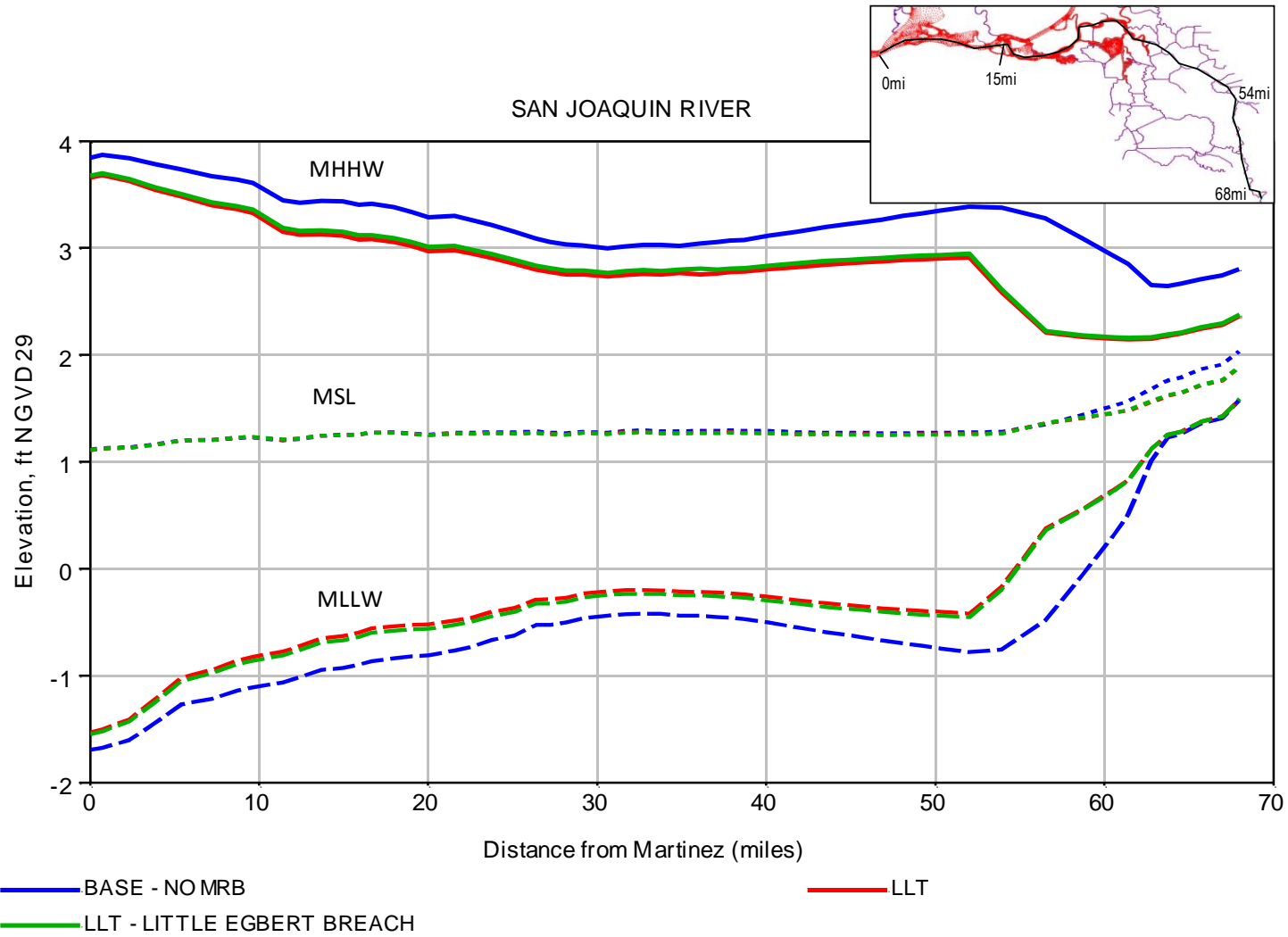


Figure 4-119 Profiles of July 2002 MHHW, MSL and MLLW along the San Joaquin River for the Base - No MRB, LLT and LLT - Little Egbert Breach simulations.

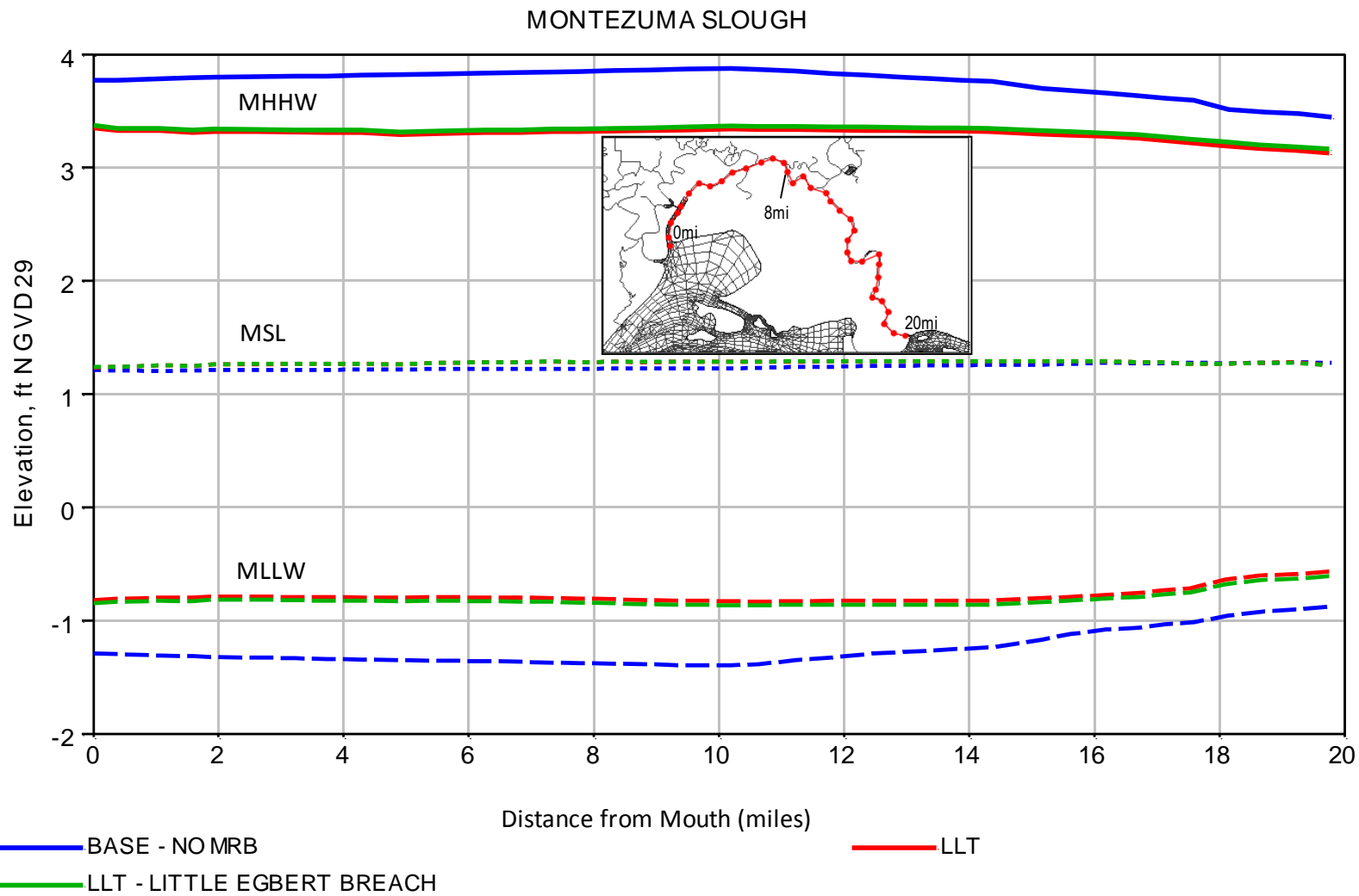


Figure 4-121 Profiles of July 2002 MHHW, MSL and MLLW along Montezuma Slough for the Base - No MRB, LLT and LLT - Little Egbert Breach simulations.

4.2.6.4 Stage Time Series

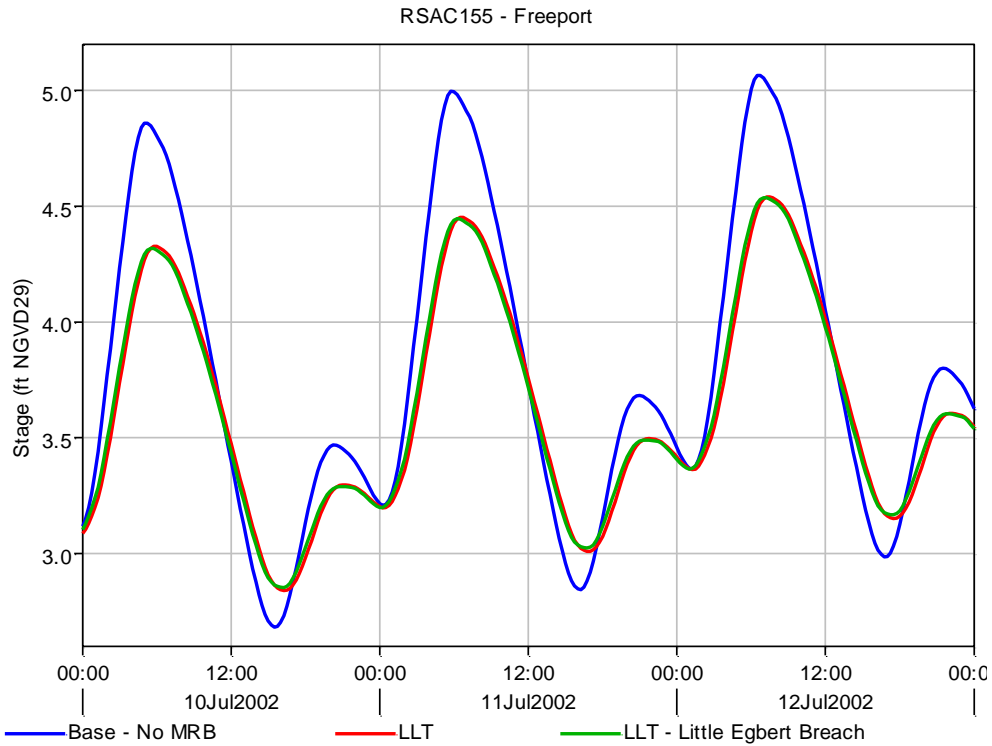


Figure 4-122 Stage at Freeport for Base - No MRB, LLT and LLT - Little Egbert Breach scenarios.

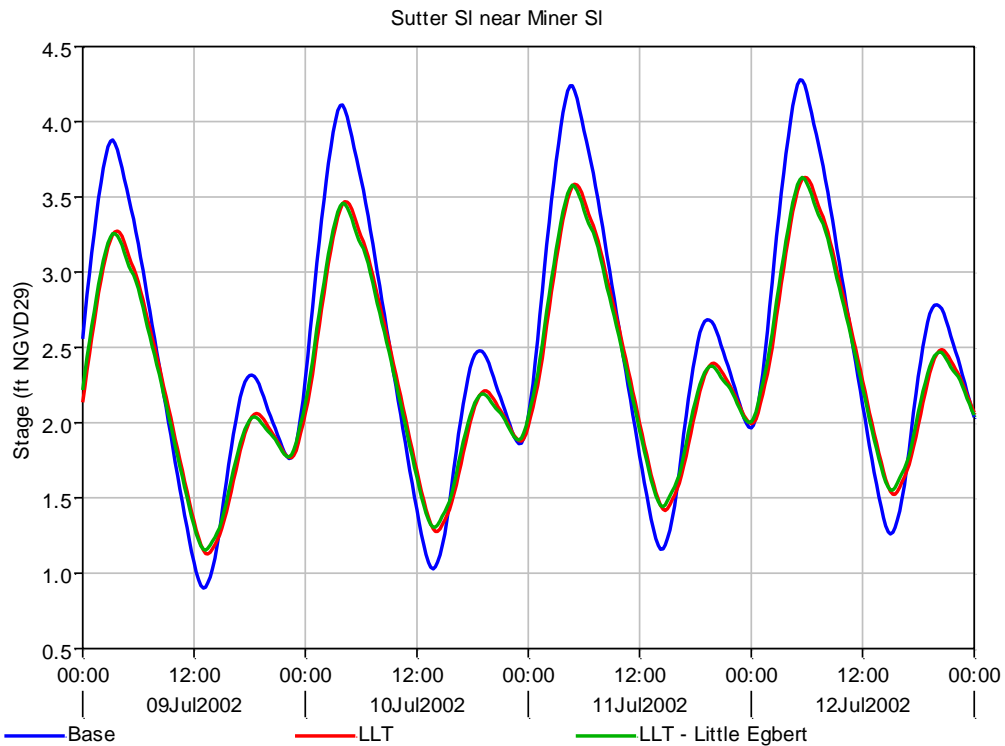


Figure 4-123 Stage in Sutter Slough for Base - No MRB, LLT and LLT - Little Egbert Breach scenarios.

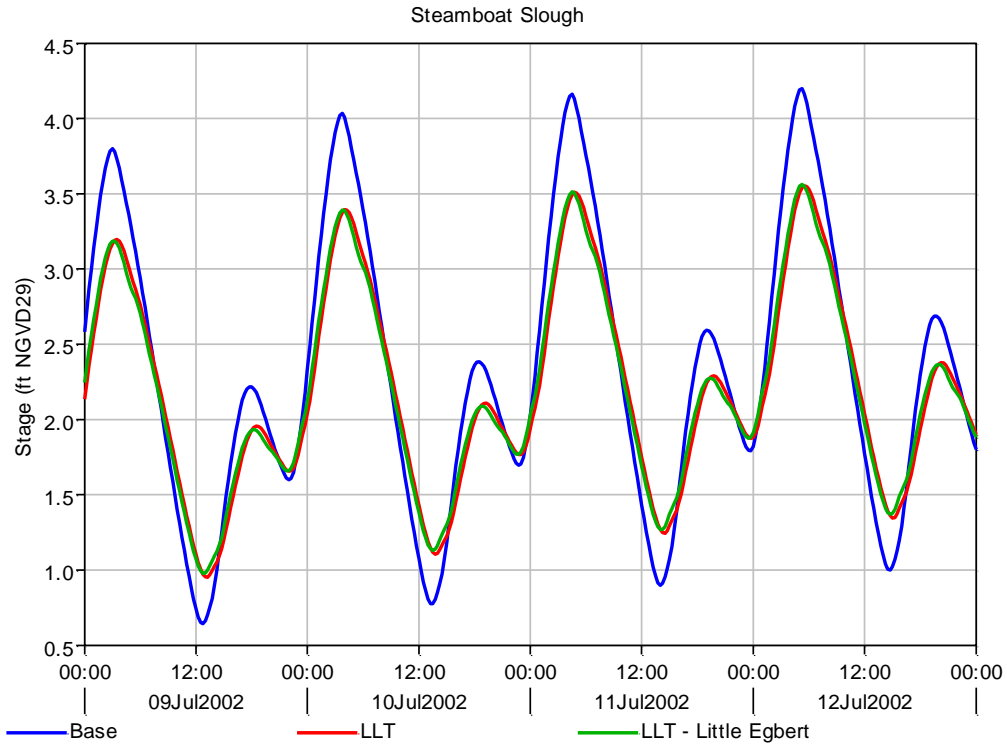


Figure 4-124 Stage in Steamboat Slough for Base - No MRB, LLT and LLT - Little Egbert Breach scenarios.

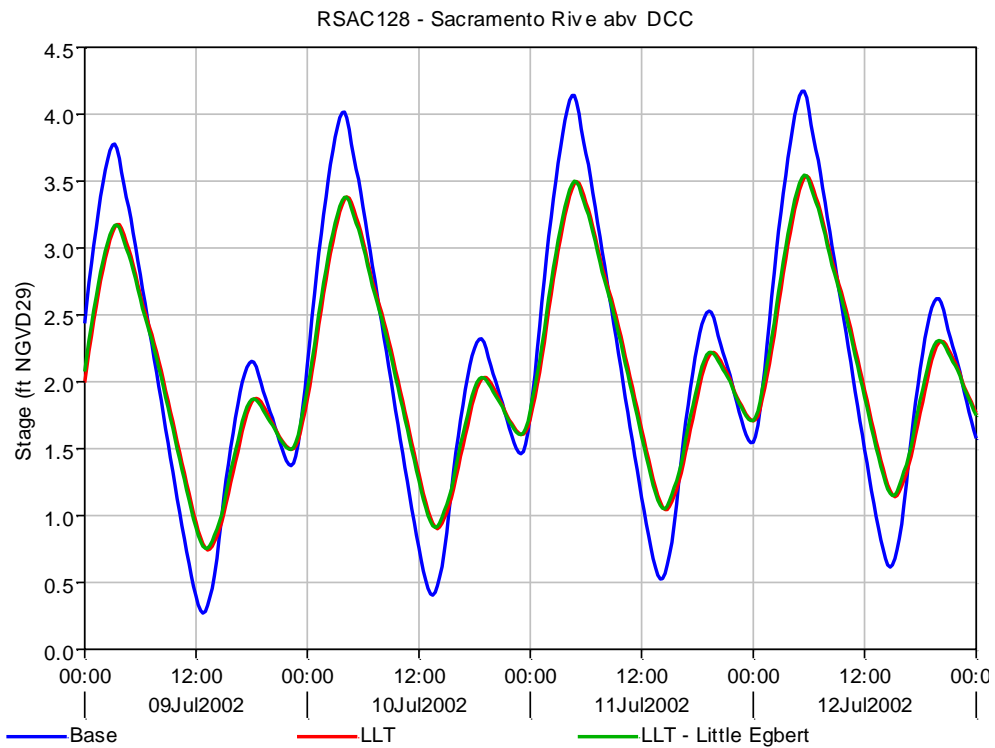


Figure 4-125 Stage at RSAC128 for Base - No MRB, LLT and LLT - Little Egbert Breach scenarios.

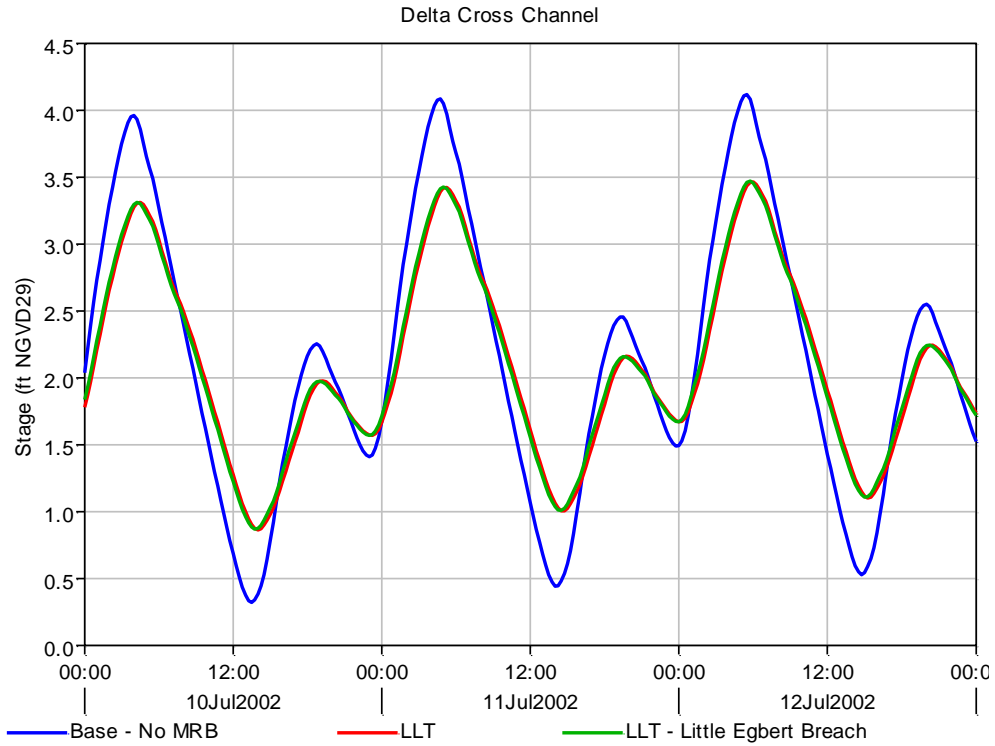


Figure 4-126 Stage at Delta Cross Channel for Base - No MRB, LLT and LLT - Little Egbert Breach scenarios.

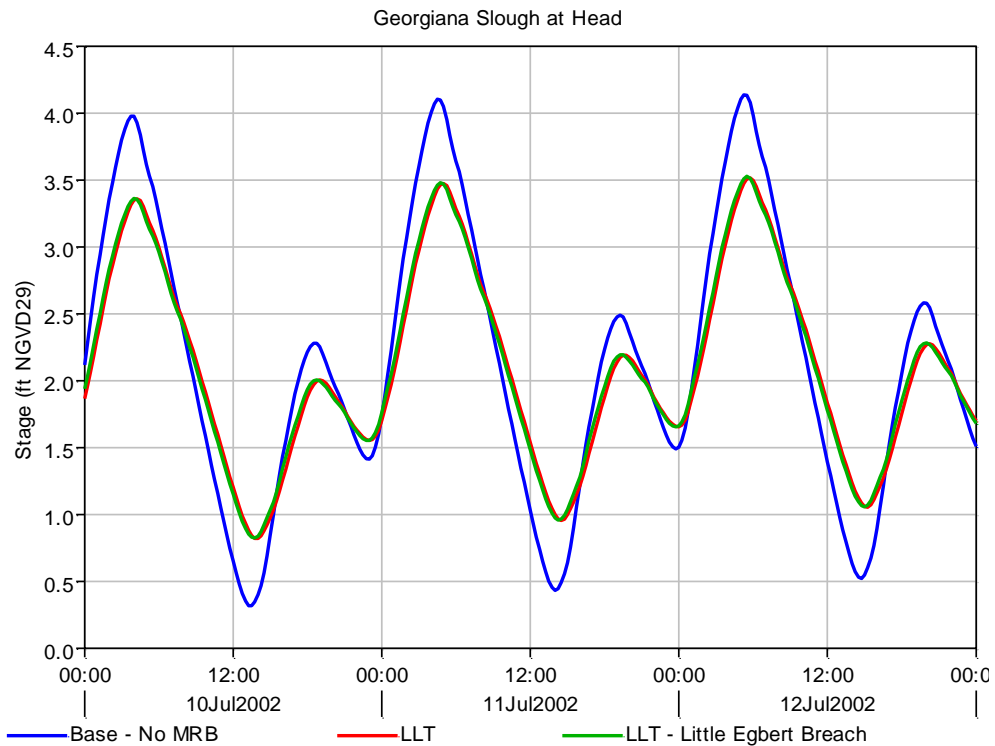


Figure 4-127 Stage in Georgiana Slough at head for Base - No MRB, LLT and LLT - Little Egbert Breach scenarios.

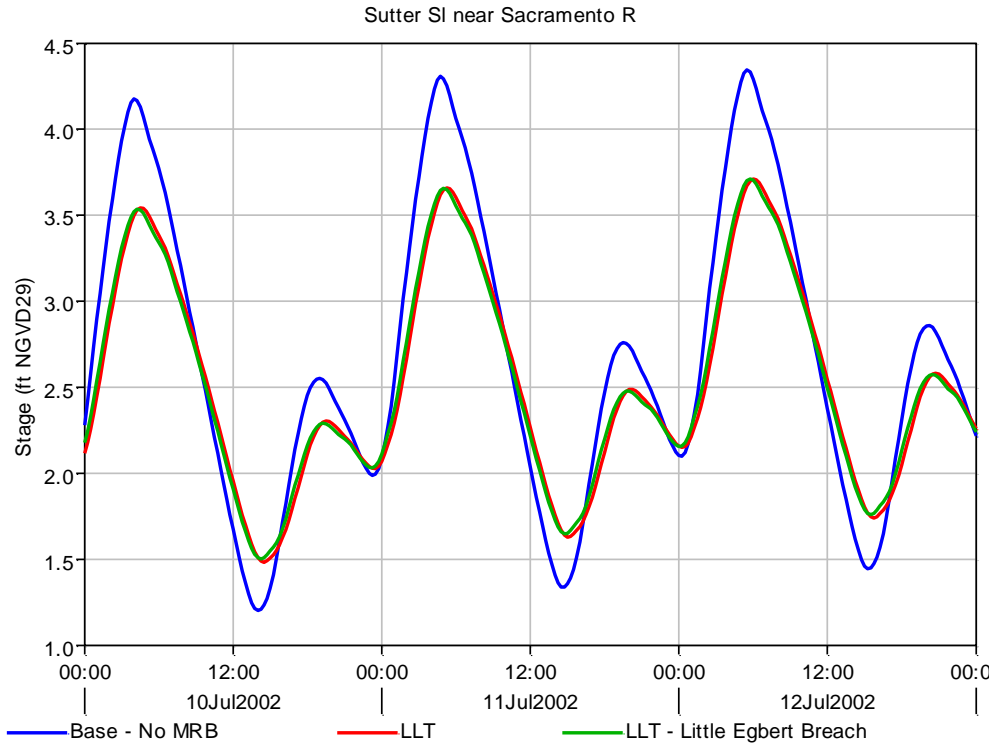


Figure 4-128 Stage in Sutter Slough near Sacramento R. for Base - No MRB, LLT and LLT - Little Egbert Breach scenarios.

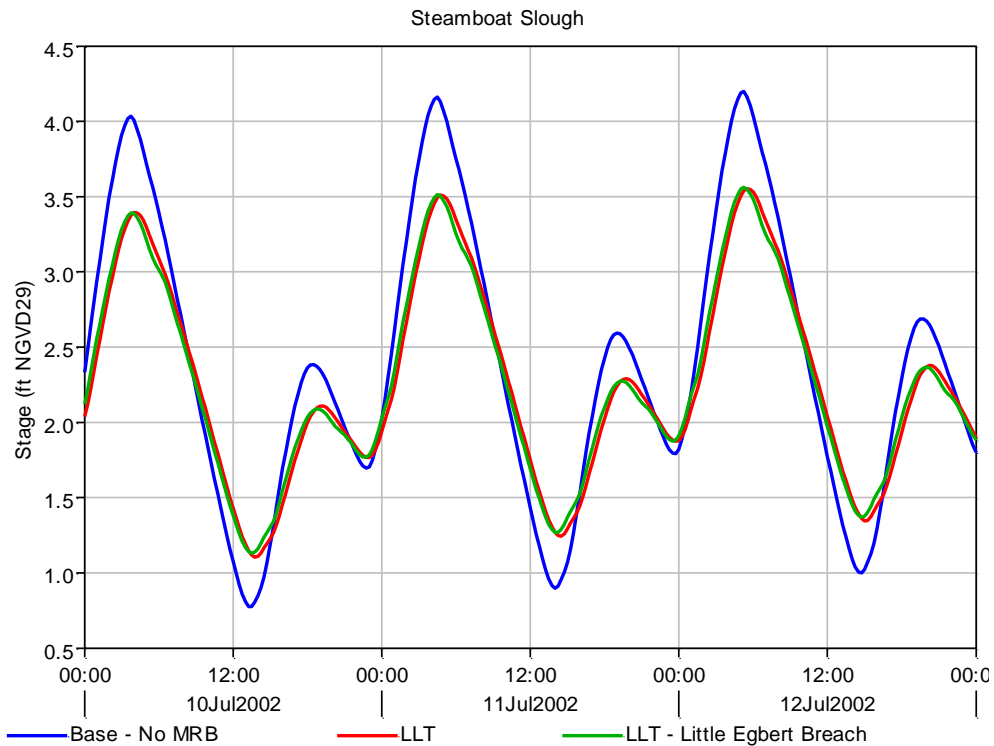


Figure 4-129 Stage in Steamboat Slough for Base - No MRB, LLT and LLT - Little Egbert Breach scenarios.

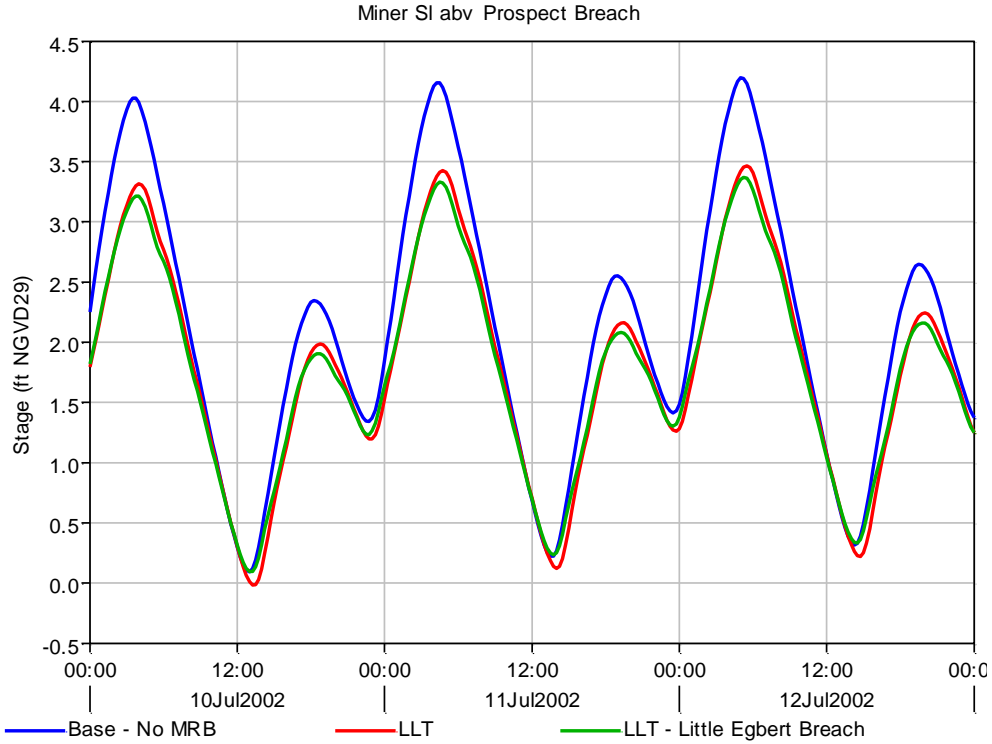


Figure 4-130 Stage in Miner Slough for Base - No MRB, LLT and LLT - Little Egbert Breach scenarios.

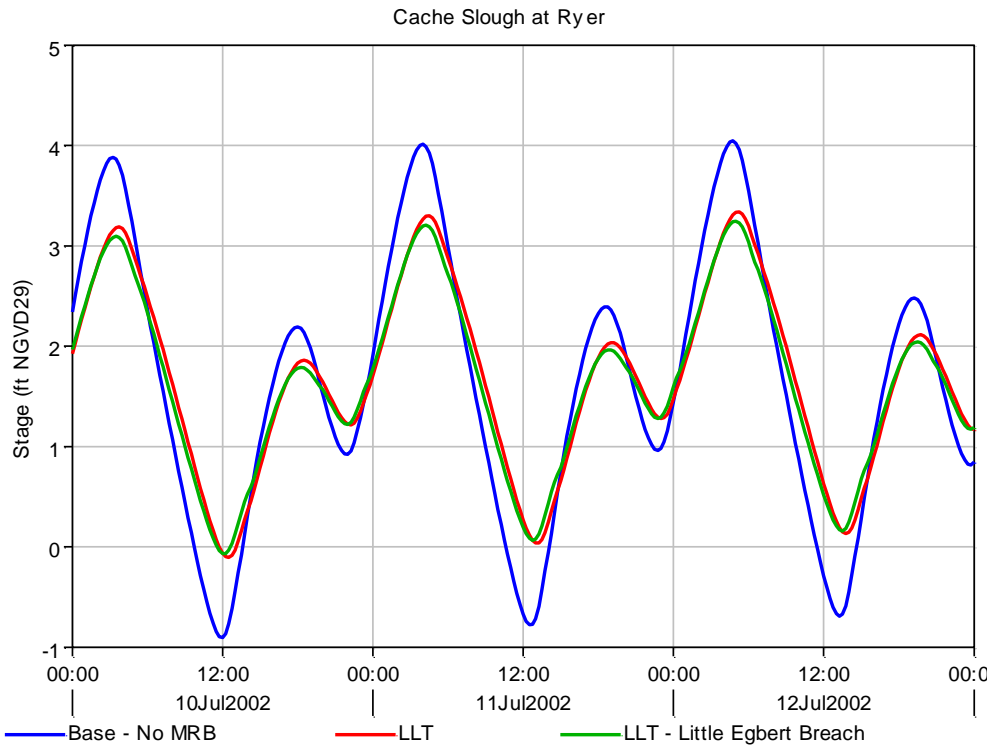


Figure 4-131 Stage in Cache Slough at Ryer Island for Base - No MRB, LLT and LLT - Little Egbert Breach scenarios.

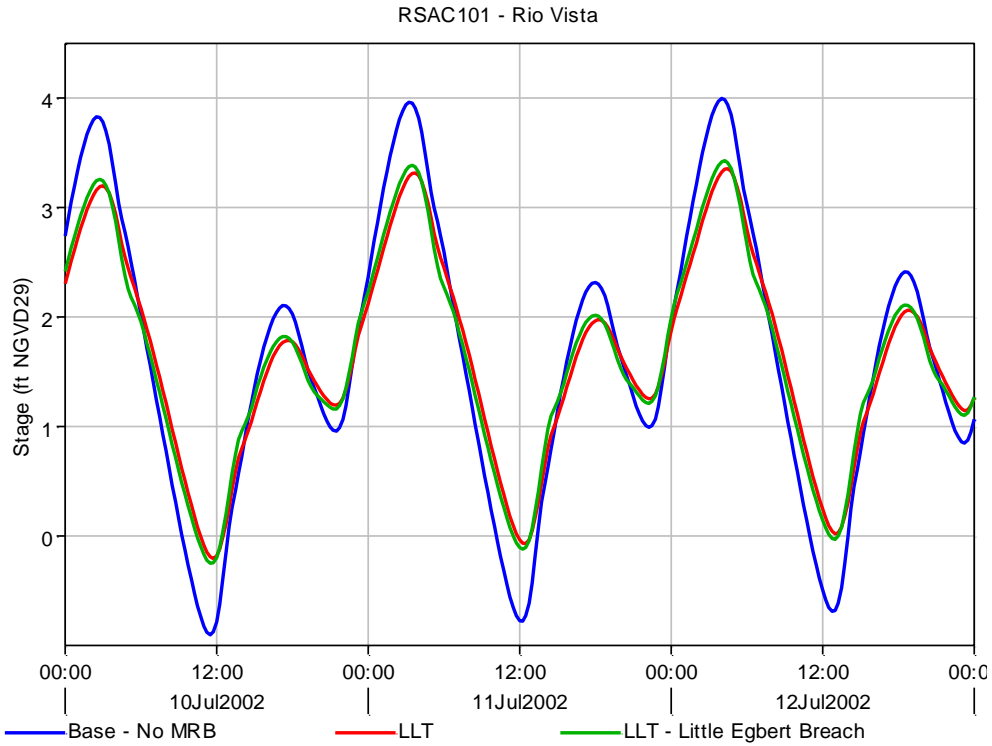


Figure 4-132 Stage at Rio Vista for Base - No MRB, LLT and LLT - Little Egbert Breach scenarios.

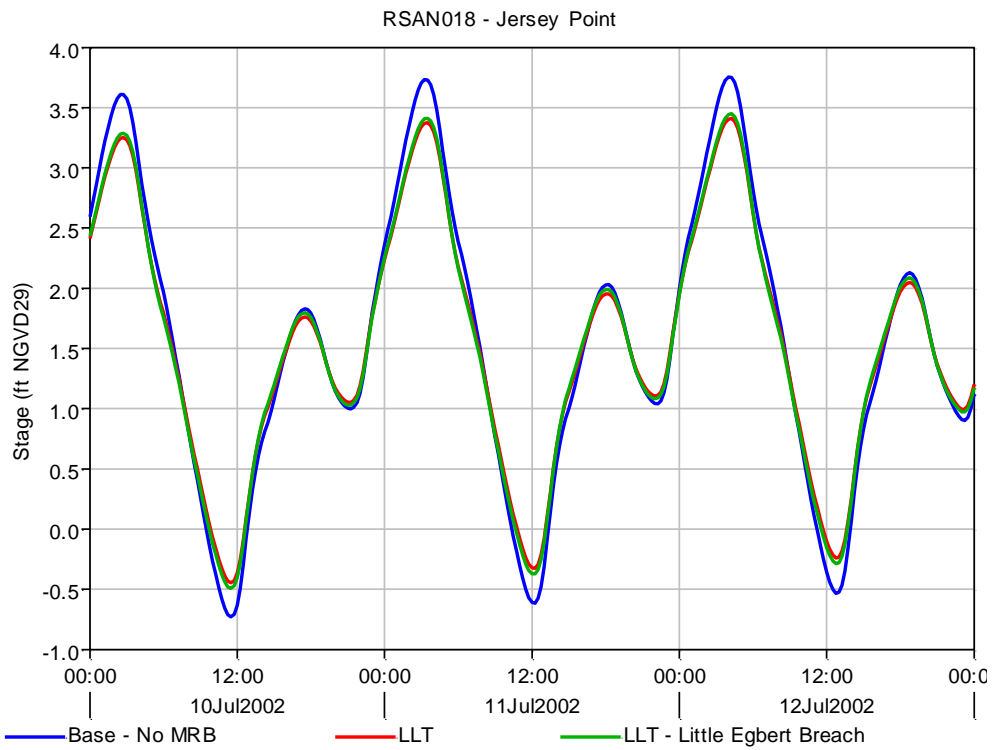


Figure 4-133 Stage at Jersey Point for Base - No MRB, LLT and LLT - Little Egbert Breach scenarios.

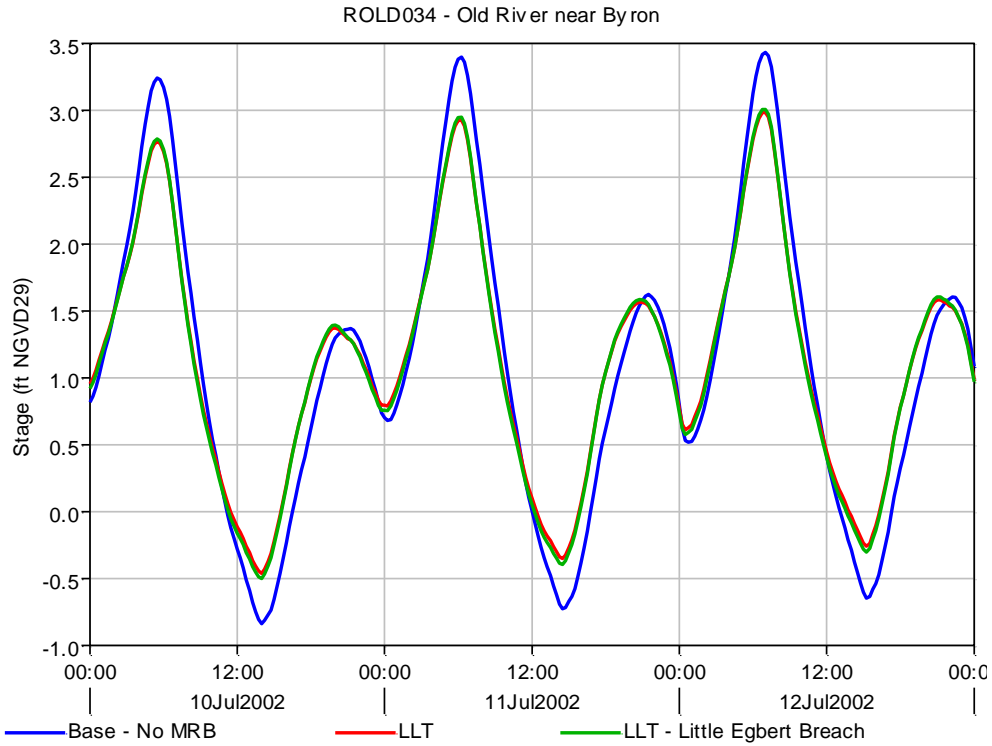


Figure 4-134 Stage in Old River at ROLD034 for Base - No MRB, LLT and LLT - Little Egbert Breach scenarios.

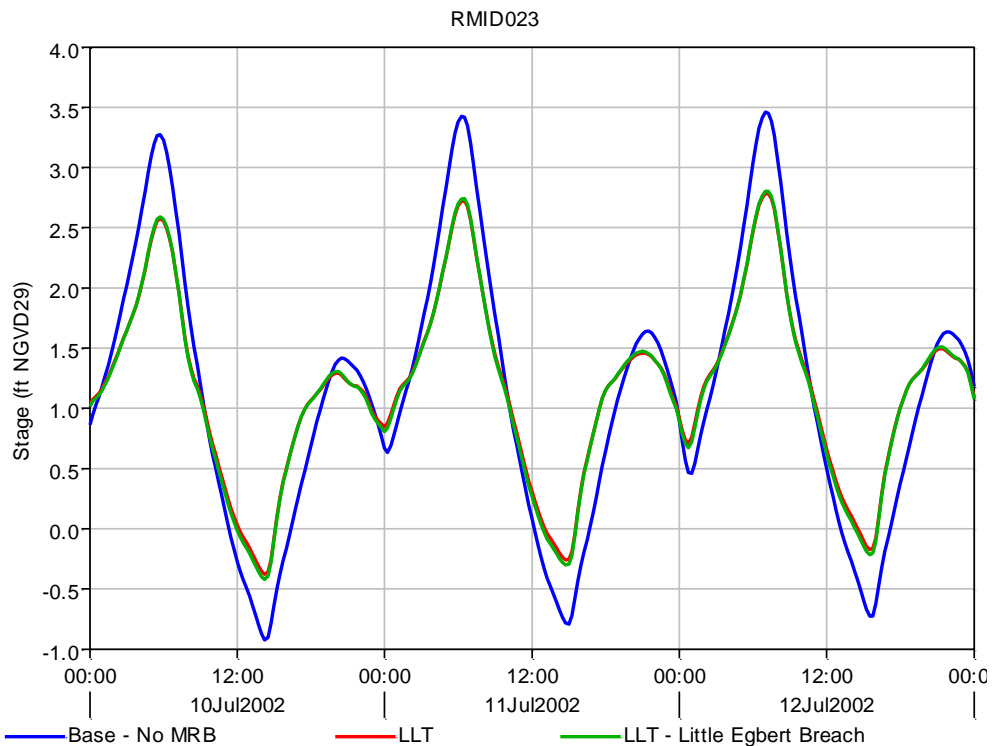


Figure 4-135 Stage in Middle River at RMID023 for Base - No MRB, LLT and LLT - Little Egbert Breach scenarios.

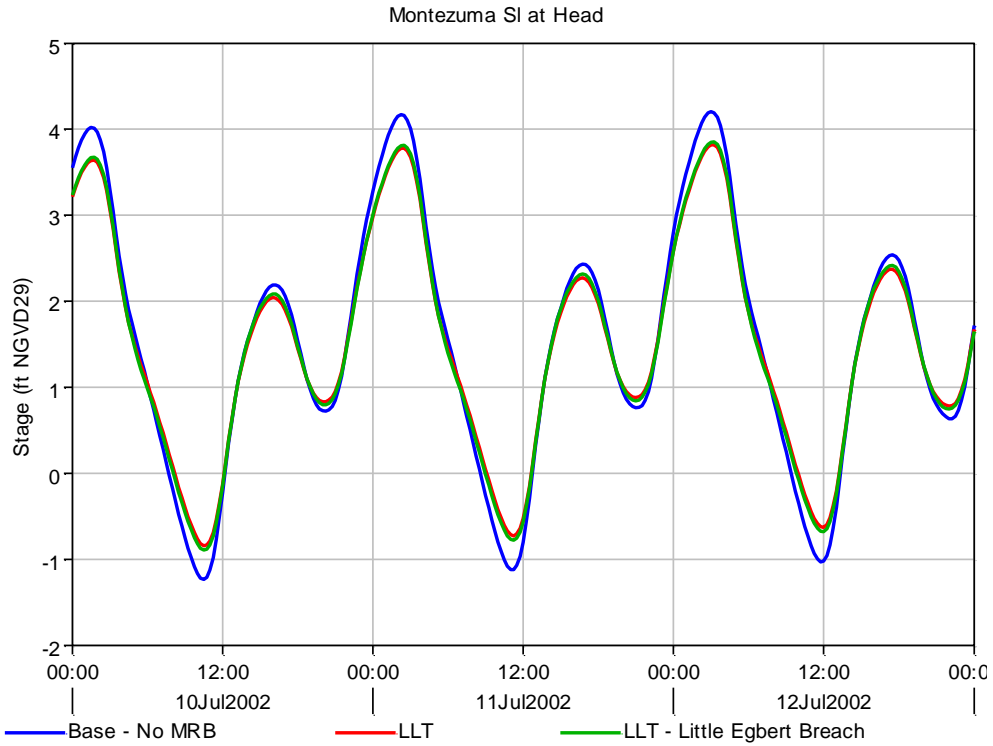


Figure 4-136 Stage in Montezuma Slough at head for Base - No MRB, LLT and LLT - Little Egbert Breach scenarios.

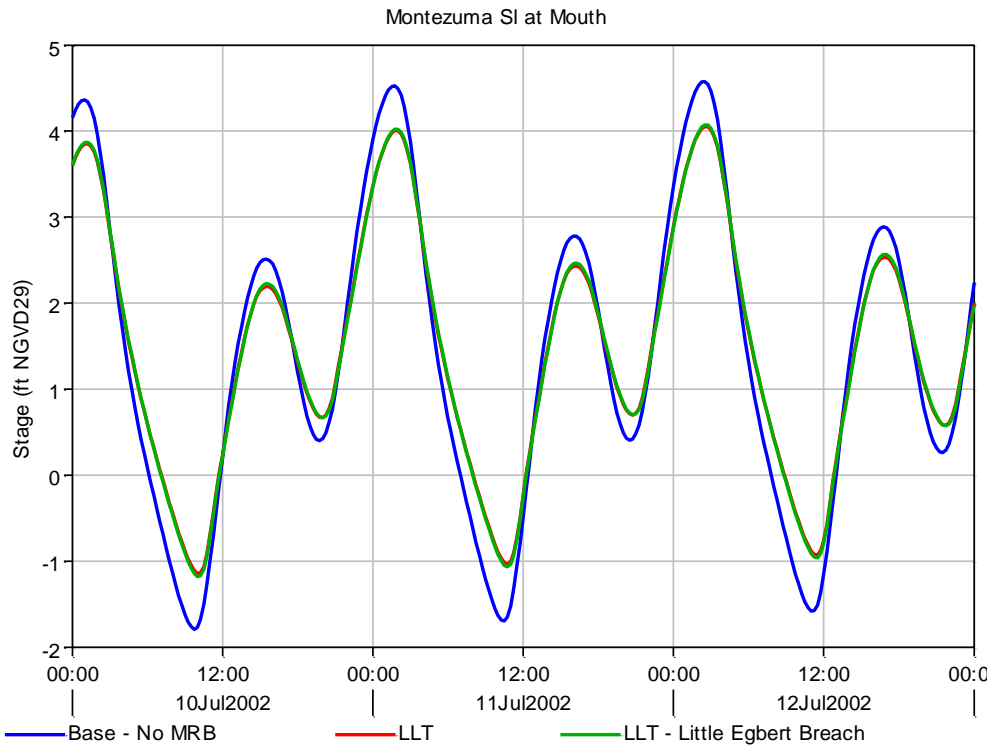


Figure 4-137 Stage in Montezuma Slough at mouth for Base - No MRB, LLT and LLT - Little Egbert Breach scenarios.

4.2.7 LLT – Sherman Breach

Three-month average flows for the LLT – Sherman Breach simulation are tabulated in Table 4-20 and plotted in Figure 4-138. Relocation of the Sherman Island breach from Threemile Slough to the San Joaquin River has minimal impact on average flows throughout the system. The largest change is in Threemile Slough itself, where average flows are decreased by 1% relative to LLT.

LLT – Sherman Breach tidal prism results are shown in Table 4-21, Figure 4-139 and Figure 4-140. Tidal prism changes are less than 1% throughout the system. The largest changes include an increase, relative to LLT, of 0.7% in Threemile Slough and a decrease of 0.7% in Georgiana Slough.

As shown in Table 4-22 and Figure 4-141, the change in the Sherman Island breach location has minimal impact on tidal range, with less than 1% change relative to LLT throughout the system.

Profile plots of July 2002 MHHW, MSL and MLLW, in Figure 4-142 through Figure 4-144, show barely discernible differences between LLT and LLT – Sherman Breach MHHW in the Sacramento and San Joaquin River near Sherman island, and no changes elsewhere.

For reference, time series plots of stage are provided for various locations in Figure 4-145 through Figure 4-153. A map of locations plotted is shown in Figure 4-2.

There are no new or resolved bed shear issues for this sensitivity case.

4.2.7.1 Net Flows

Table 4-20 Summary of 3-month Average flow (Jul – Sep 2002) for Base - No MRB, LLT, LLT – Sherman Breach simulations.

| Location | 3-month Average Flow, Jul – Sep 2002 (cfs) | | |
|-----------------------|--|-------|----------------------|
| | Base – No MRB | LLT | LLT – Sherman Breach |
| Cache Sl at Ryer | 1535 | 2565 | 2564 |
| DCC | 4609 | 3449 | 3451 |
| False River | -1696 | -1806 | -1798 |
| Martinez | 4422 | 4080 | 4081 |
| Miner Slough | 2018 | 2667 | 2668 |
| Mokelumne nr SJR | 4719 | 3781 | 3787 |
| Montezuma Sl at Head | 12 | 13 | 13 |
| Montezuma Sl at Mouth | -71 | -191 | -191 |
| RMID015 | -5351 | -5265 | -5265 |
| RMID027 | -25 | -45 | -44 |
| ROLD024 | -4425 | -4541 | -4541 |
| ROLD034 | -6493 | -6603 | -6604 |
| RSAC075 Chipps Island | 4503 | 4395 | 4395 |
| RSAC092 Emmaton | 5870 | 6484 | 6508 |
| RSAC101 Rio Vista | 8256 | 9712 | 9702 |
| RSAC123 | 3607 | 4258 | 4254 |
| RSAC128 | 10999 | 10137 | 10142 |
| RSAN018 Jersey Pt | -999 | -1914 | -1937 |
| RSAN032 San Andreas | -1716 | -3216 | -3209 |
| RSAN058 | 366 | 391 | 392 |
| SLDUT007 | -113 | 68 | 68 |
| SLGEO019 Georgiana Sl | 2762 | 2408 | 2415 |
| SLTRM004 Threemile Sl | -2313 | -3012 | -2982 |
| Steamboat Sl | 2280 | 2629 | 2625 |
| Sutter Sl | 2965 | 3480 | 3479 |

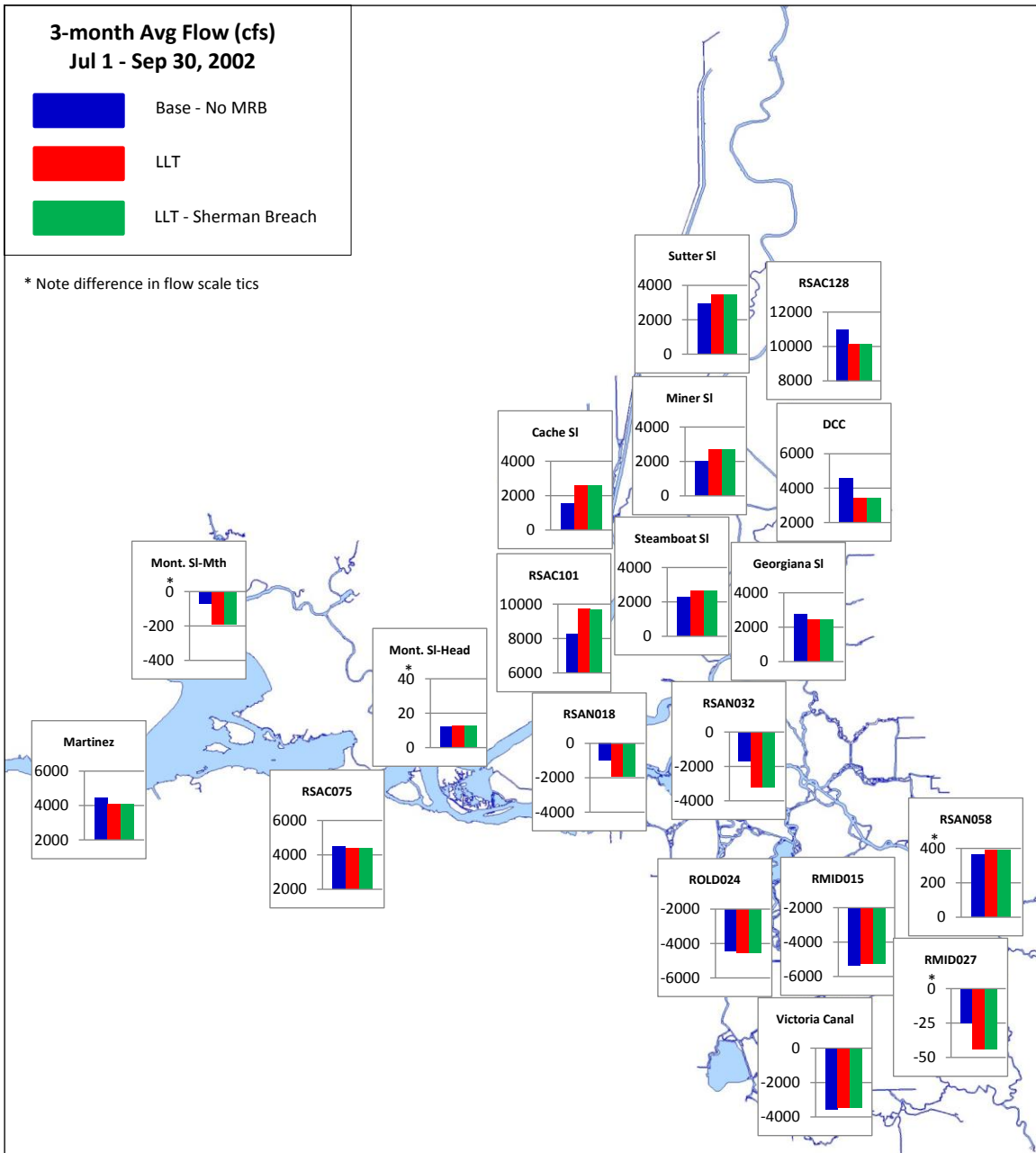


Figure 4-138 Average flows (Jul - Sep 2002) for Base - No MRB, LLT and LLT – Sherman Breach simulations.

4.2.7.2 Tidal Prism

Table 4-21 Summary of Apr – Dec 2002 Average Tidal Prism for Base - No MRB, LLT and LLT – Sherman Breach simulations, and percent change from Base- No MRB.

| Location | Base – No MRB | LLT | | LLT – Sherman Breach | |
|-----------------------|---------------------|---------------------|--------------------|----------------------|--------------------|
| | Tidal Prism (ac-ft) | Tidal Prism (ac-ft) | % Change from Base | Tidal Prism (ac-ft) | % Change from Base |
| Cache Sl at Ryer | 28,697 | 26,884 | -6% | 26,943 | -6% |
| DCC | 782 | 949 | 21% | 953 | 22% |
| False River | 18,870 | 16,508 | -13% | 16,514 | -12% |
| Martinez | 167,717 | 170,966 | 2% | 171,015 | 2% |
| Miner Slough | 618 | 455 | -26% | 457 | -26% |
| Mokelumne nr SJR | 4,615 | 4,490 | -3% | 4,491 | -3% |
| Montezuma Sl at Head | 2,053 | 3,283 | 60% | 3,285 | 60% |
| Montezuma Sl at Mouth | 10,988 | 23,108 | 110% | 23,114 | 110% |
| RMID015 | 4,119 | 3,333 | -19% | 3,335 | -19% |
| RMID027 | 474 | 1,784 | 277% | 1,785 | 277% |
| ROLD024 | 4,427 | 3,655 | -17% | 3,659 | -17% |
| ROLD034 | 2,352 | 1,960 | -17% | 1,961 | -17% |
| RSAC075 Chipps Island | 115,263 | 108,506 | -6% | 108,362 | -6% |
| RSAC092 Emmaton | 49,256 | 50,591 | 3% | 50,344 | 2% |
| RSAC101 Rio Vista | 36,171 | 40,582 | 12% | 40,688 | 12% |
| RSAC123 | 2,499 | 1,811 | -28% | 1,819 | -27% |
| RSAC128 | 1,608 | 1,175 | -27% | 1,174 | -27% |
| RSAN018 Jersey Pt | 50,110 | 44,549 | -11% | 44,643 | -11% |
| RSAN032 San Andreas | 37,847 | 32,450 | -14% | 32,484 | -14% |
| RSAN058 | 2,385 | 2,603 | 9% | 2,605 | 9% |
| SLDUT007 | 3,073 | 2,226 | -28% | 2,228 | -27% |
| SLGEO019 Georgiana Sl | 222 | 415 | 87% | 412 | 86% |
| SLTRM004 Threemile Sl | 9,413 | 6,526 | -31% | 6,574 | -30% |
| Steamboat Sl | 913 | 598 | -35% | 602 | -34% |
| Sutter Sl | 823 | 574 | -30% | 576 | -30% |

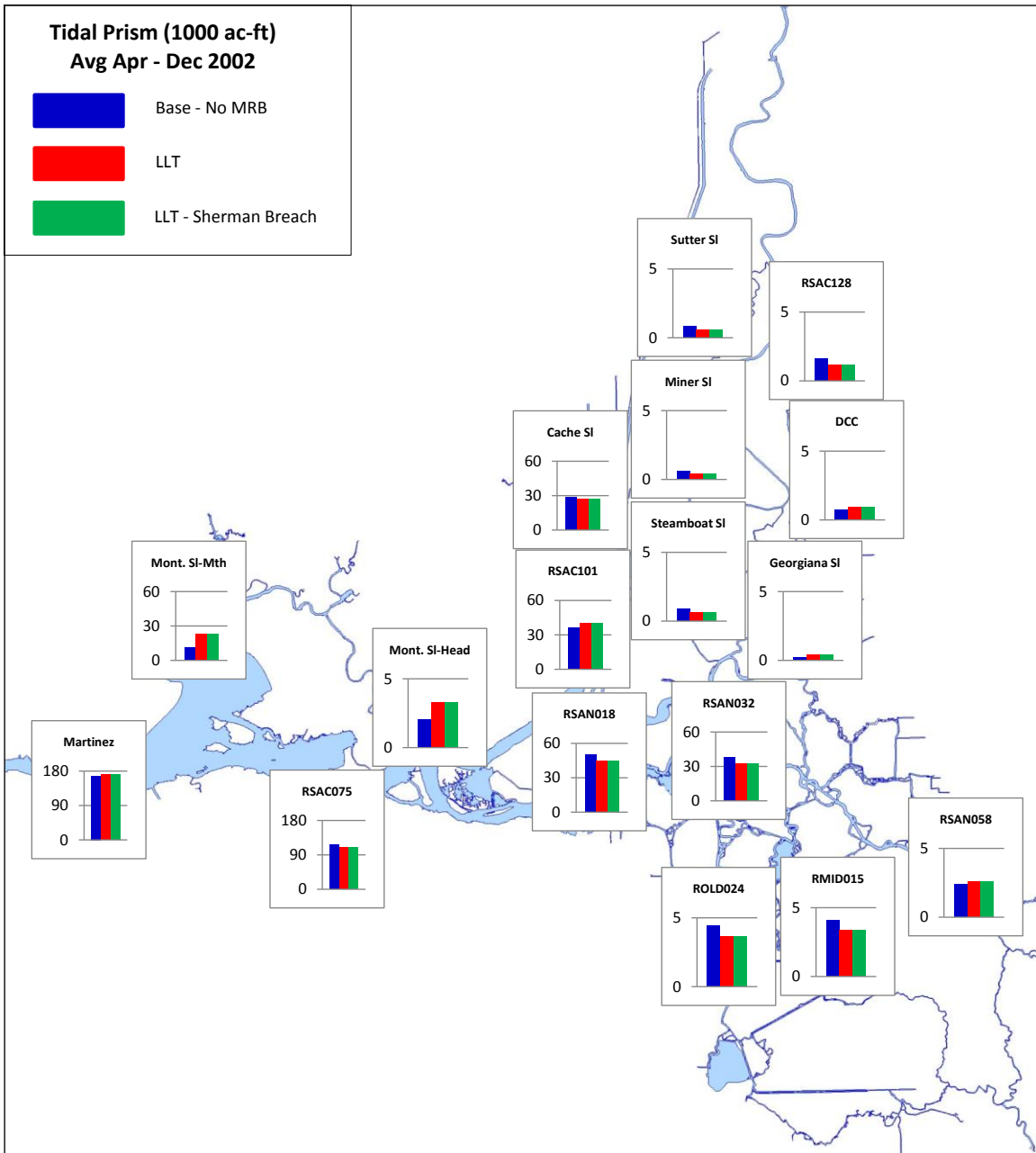


Figure 4-139 Average tidal prism (Apr - Dec 2002) for Base - No MRB, LLT and LLT – Sherman Breach simulations.

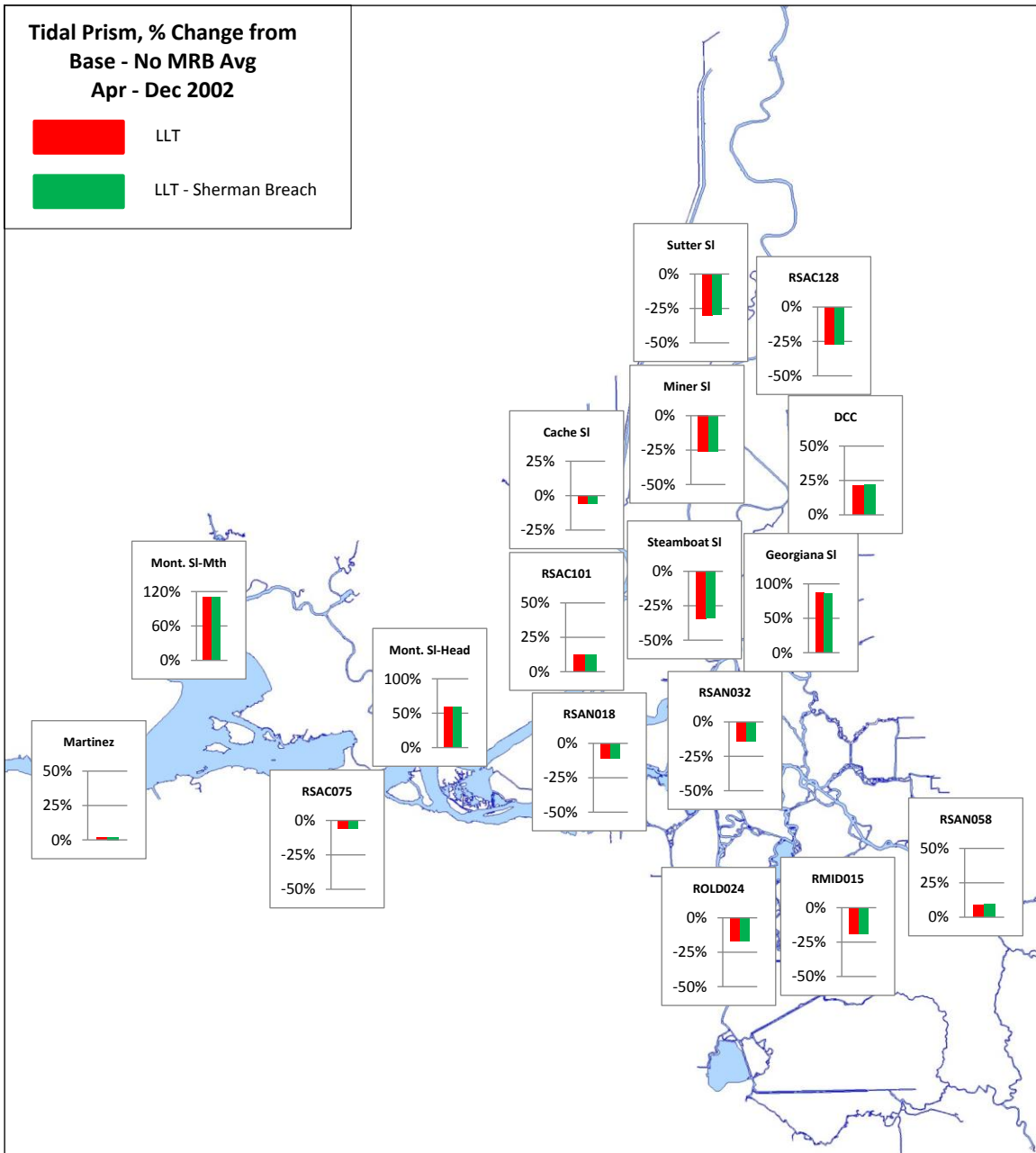


Figure 4-140 Average percent change from Base - No MRB tidal prism (Apr - Dec 2002) for LLT and LLT – Sherman Breach simulations.

4.2.7.3 Tidal Range

Table 4-22 Summary of Apr – Dec 2002 Average Tidal Range for Base - No MRB, LLT and LLT – Sherman Breach simulations.

| Location | Apr – Dec 2002 Average Tidal Range (ft) | | |
|-----------------------|---|------|----------------------|
| | Base – No MRB | LLT | LLT – Sherman Breach |
| Cache Sl at Ryer | 3.95 | 2.75 | 2.76 |
| DCC | 2.92 | 2.11 | 2.12 |
| False River | 3.4 | 2.93 | 2.94 |
| Martinez | 5.47 | 5.14 | 5.14 |
| Miner Slough | 3.12 | 2.62 | 2.63 |
| Montezuma Sl at Head | 4.25 | 3.64 | 3.65 |
| Montezuma Sl at Mouth | 5.0 | 4.05 | 4.06 |
| RMID015 | 3.76 | 3.14 | 3.15 |
| RMID023 | 3.49 | 2.48 | 2.49 |
| RMID027 | 3.33 | 0.56 | 0.56 |
| ROLD024 | 3.55 | 3.02 | 3.02 |
| ROLD034 | 3.36 | 2.73 | 2.73 |
| RSAC075 Chipps Island | 4.42 | 3.85 | 3.86 |
| RSAC092 Emmaton | 3.93 | 3.23 | 3.25 |
| RSAC101 Rio Vista | 3.86 | 2.79 | 2.8 |
| RSAC123 | 2.95 | 2.14 | 2.15 |
| RSAC128 | 2.91 | 2.12 | 2.13 |
| RSAN018 Jersey Pt | 3.47 | 2.98 | 2.99 |
| RSAN032 San Andreas | 3.37 | 2.89 | 2.9 |
| RSAN058 | 4.05 | 3.25 | 3.26 |
| SLDUT007 Dutch Slough | 3.59 | 3.04 | 3.05 |
| SLGEO019 Georgiana Sl | 2.95 | 2.16 | 2.17 |
| SLTRM004 Threemile Sl | 3.45 | 2.9 | 2.9 |
| Steamboat Sl | 2.69 | 1.99 | 2.0 |
| Sutter Sl | 2.57 | 1.94 | 1.92 |
| Victoria Canal | 3.48 | 2.48 | 2.48 |

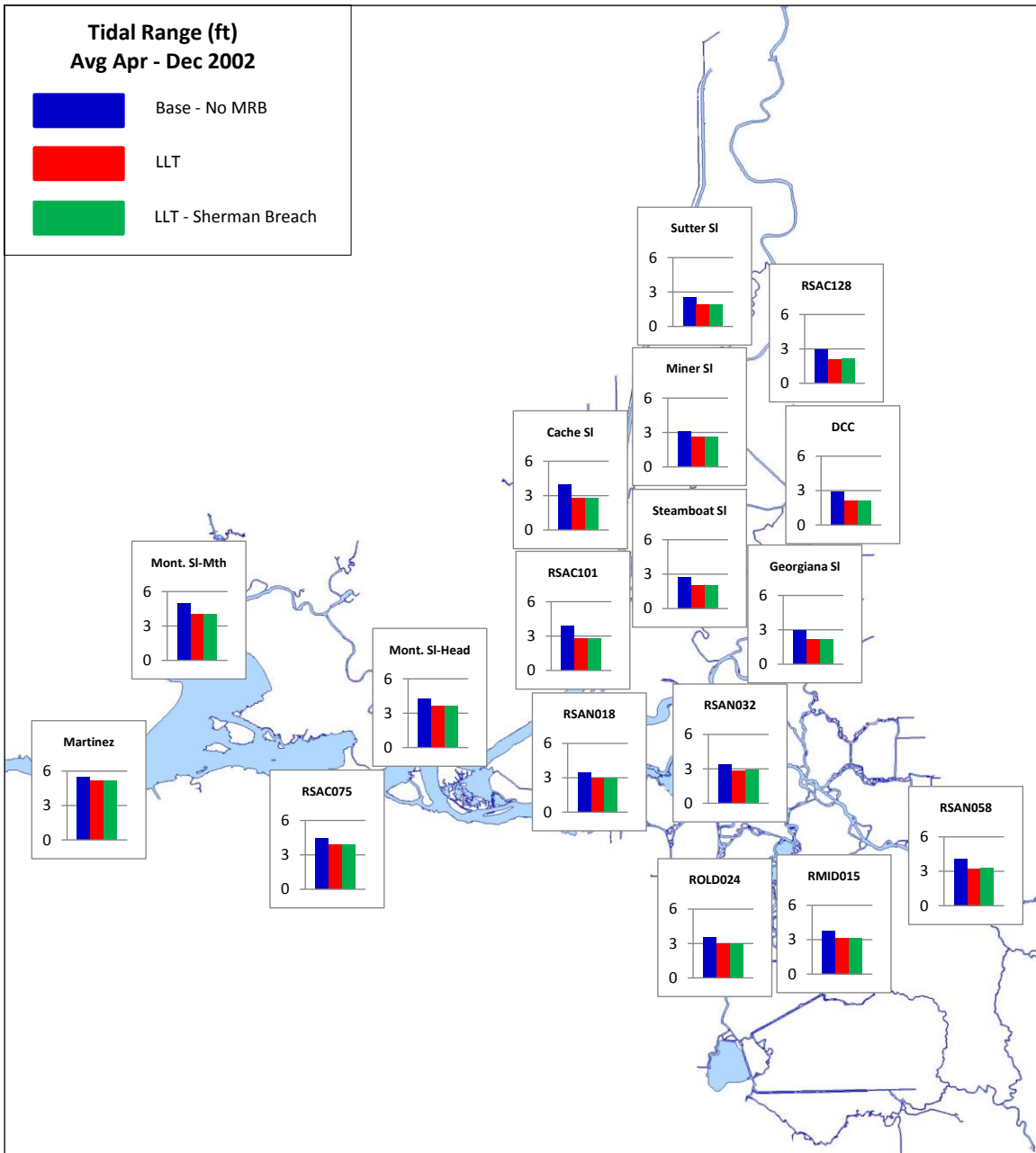


Figure 4-141 Average tidal range (Apr - Dec 2002) for Base - No MRB, LLT and LLT – Sherman Breach simulations.

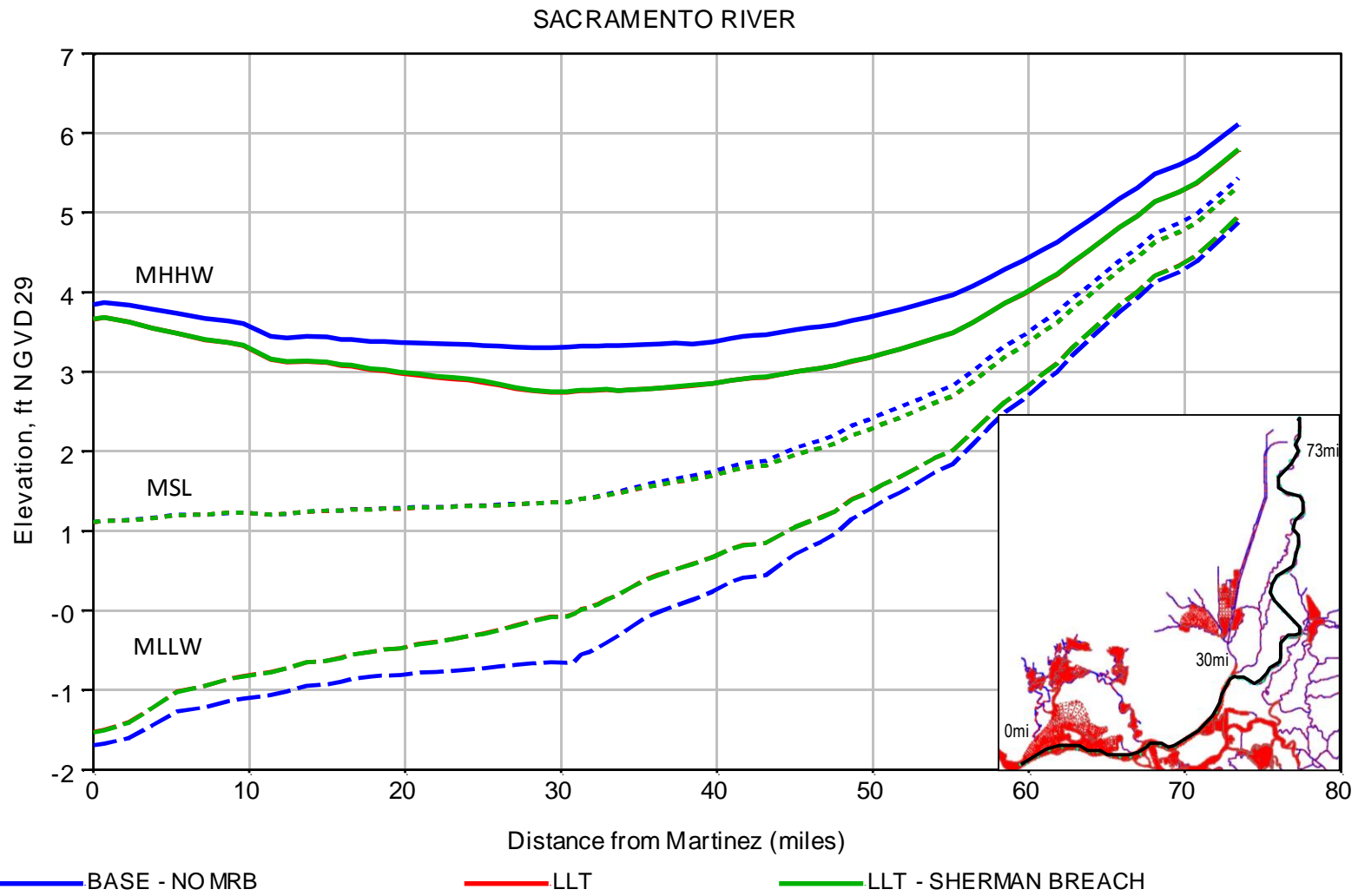


Figure 4-142 Profiles of July 2002 MHHW, MSL and MLLW along the Sacramento River for the Base - No MRB, LLT and LLT - Sherman Breach simulations.

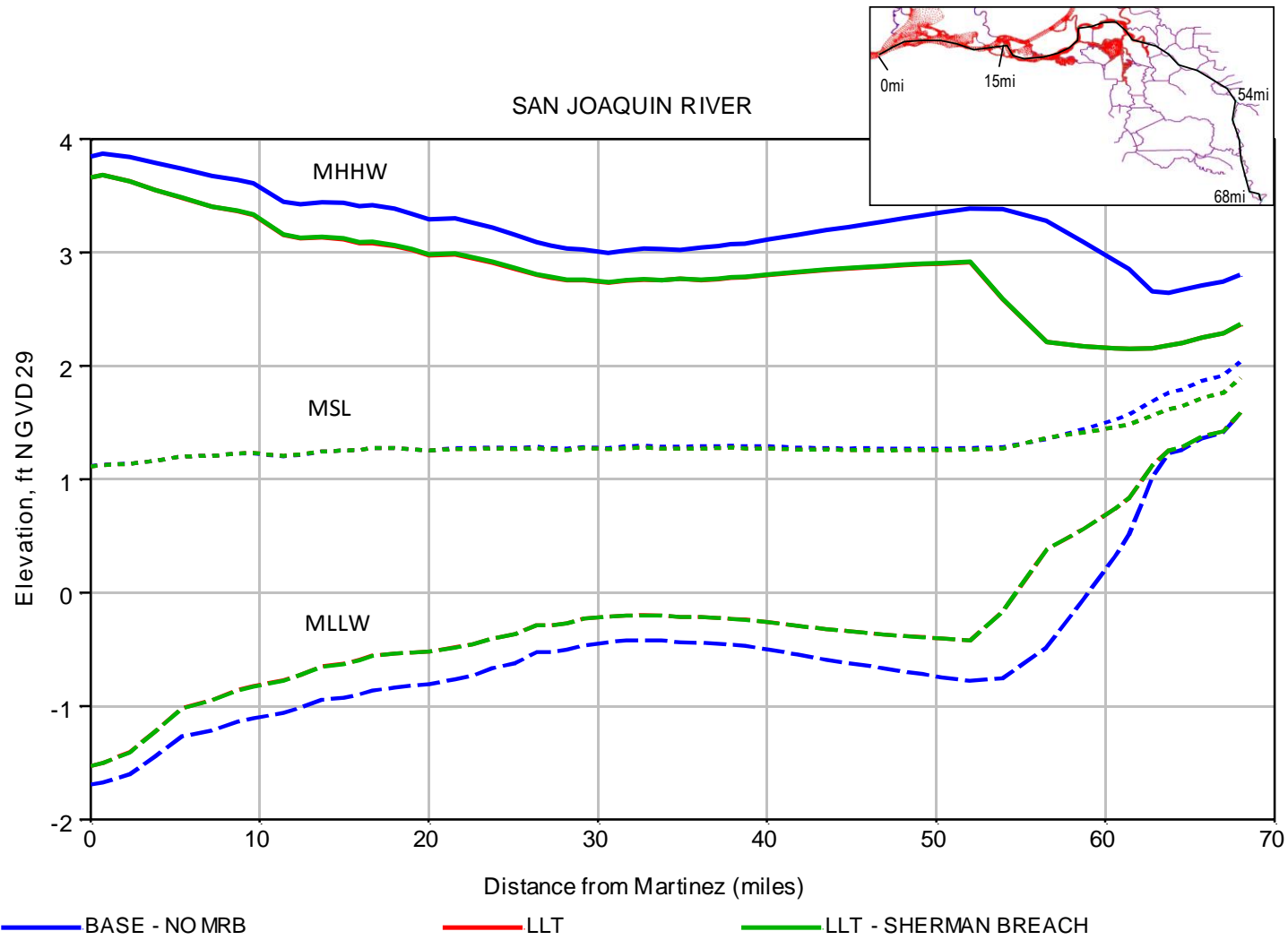


Figure 4-143 Profiles of July 2002 MHHW, MSL and MLLW along the San Joaquin River for the Base - No MRB, LLT and LLT - Sherman Breach simulations.

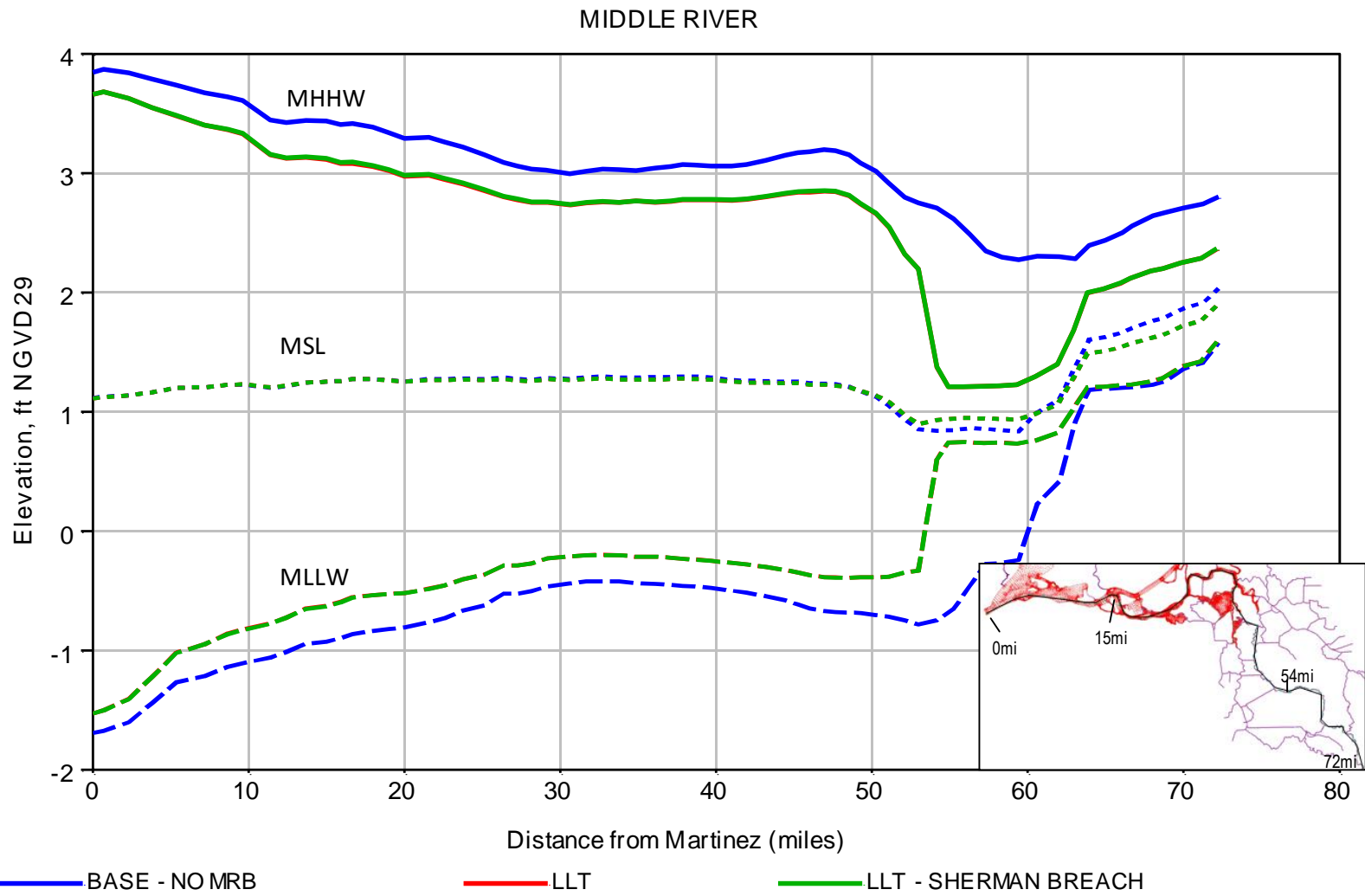


Figure 4-144 Profiles of July 2002 MHHW, MSL and MLLW along the Middle River for the Base - No MRB, LLT and LLT - Sherman Breach simulations.

4.2.7.4 Stage Time Series Plots

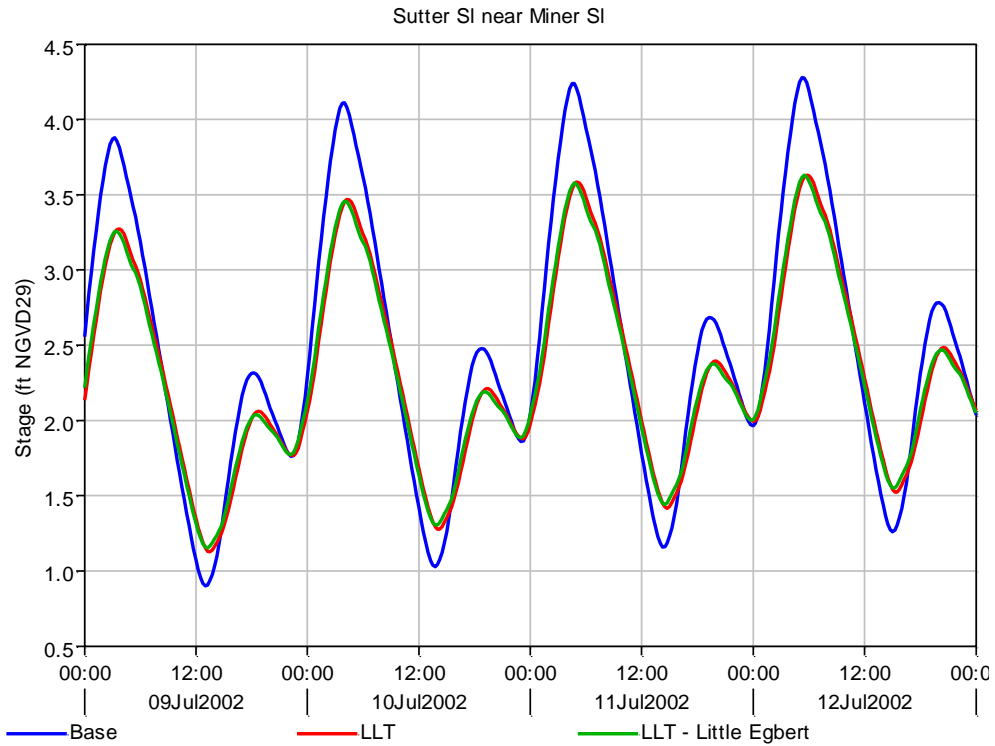


Figure 4-145 Stage in Sutter Slough for Base - No MRB, LLT and LLT - No South scenarios.

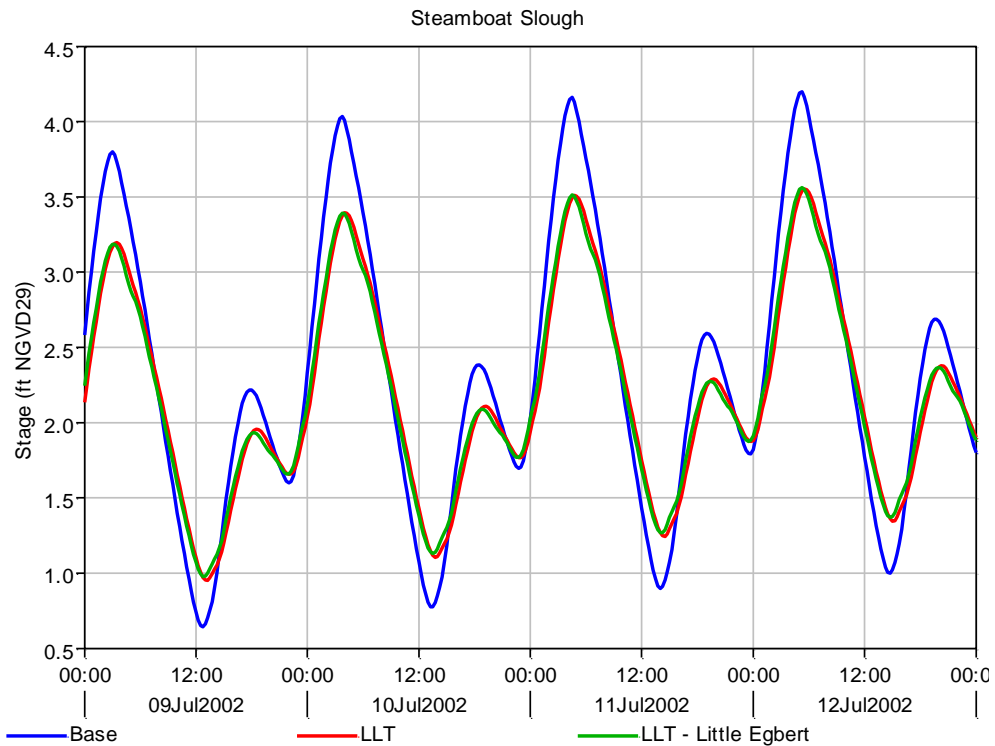


Figure 4-146 Stage in Steamboat Slough for Base - No MRB, LLT and LLT - No South scenarios.

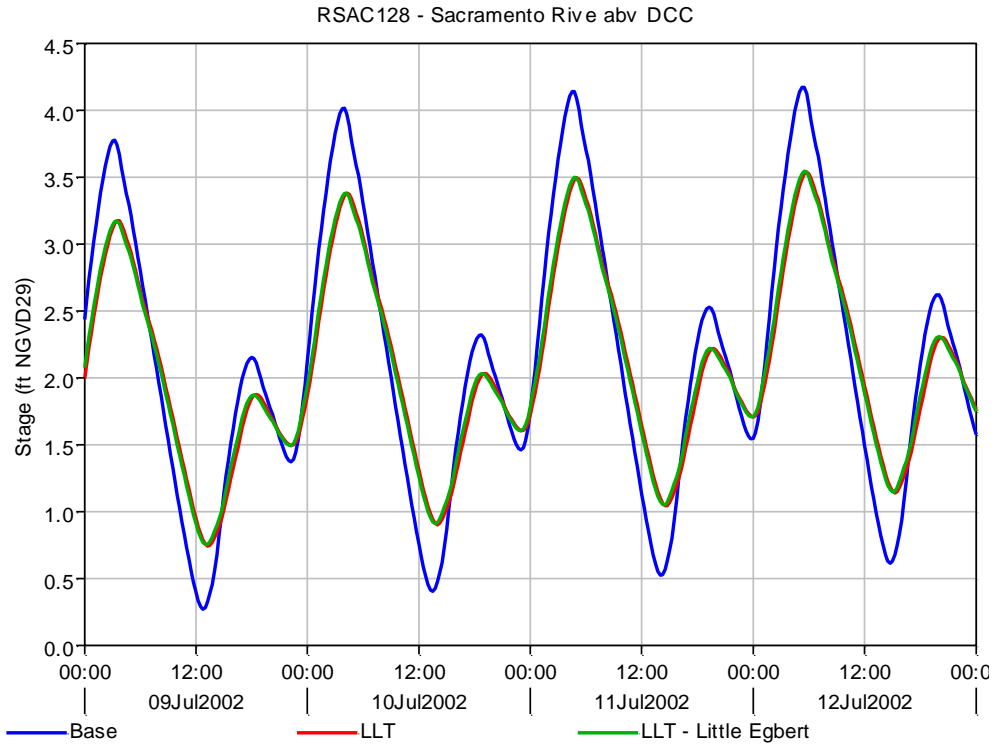


Figure 4-147 Stage at RSAC128 for Base - No MRB, LLT and LLT - No South scenarios.

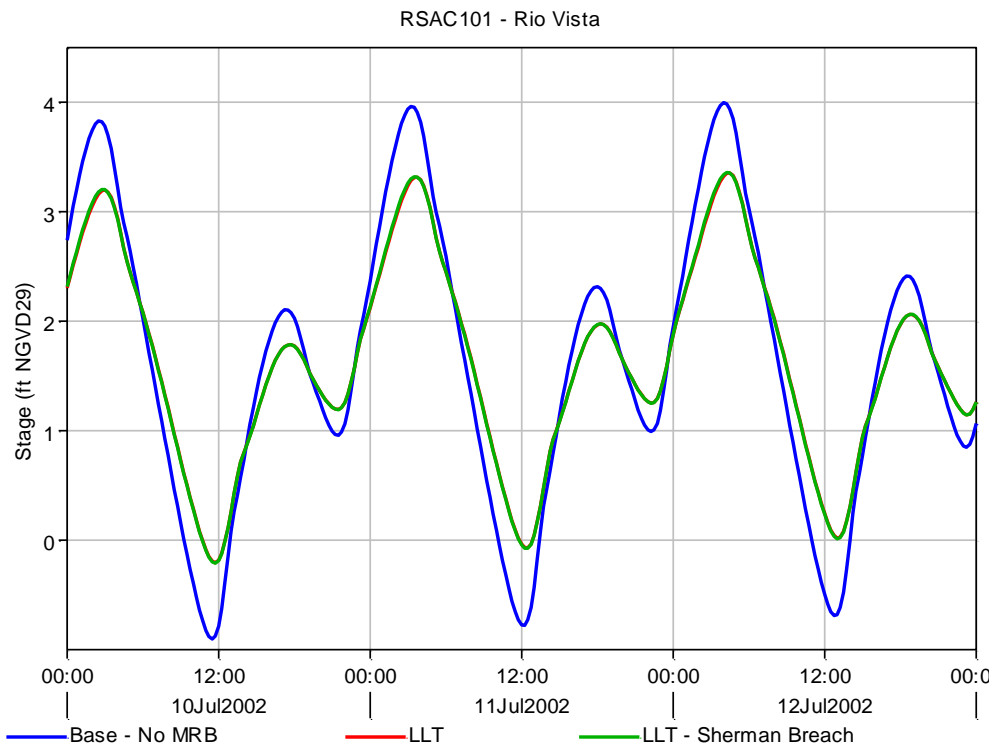


Figure 4-148 Stage at Rio Vista for Base - No MRB, LLT and LLT - No South scenarios.

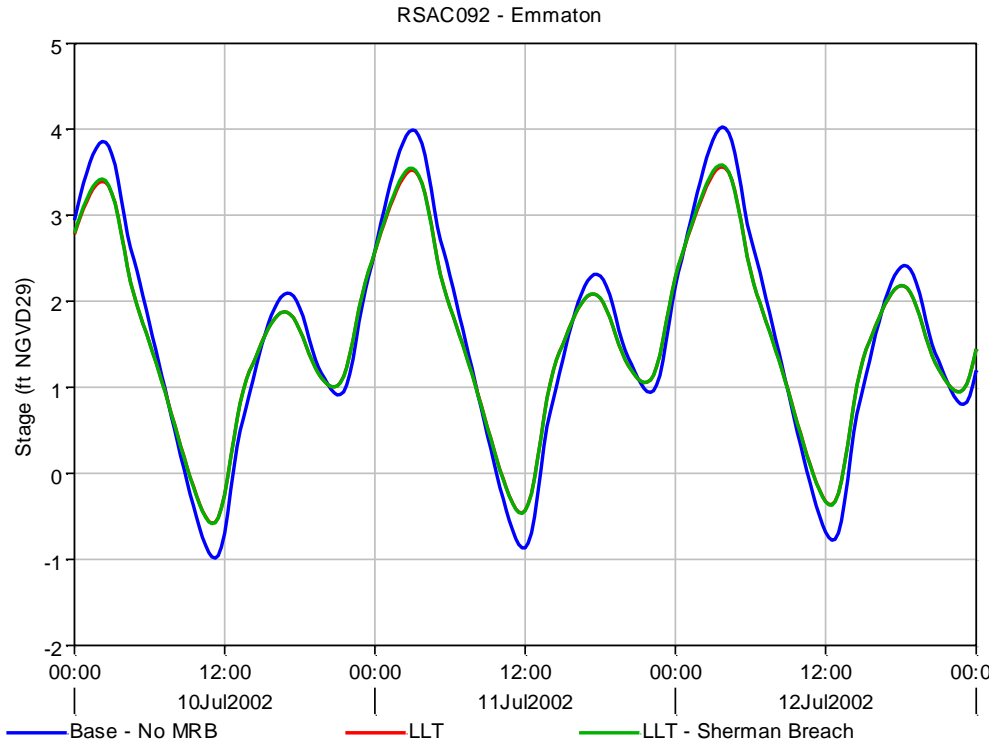


Figure 4-149 Stage at Emmaton for Base - No MRB, LLT and LLT - No South scenarios.

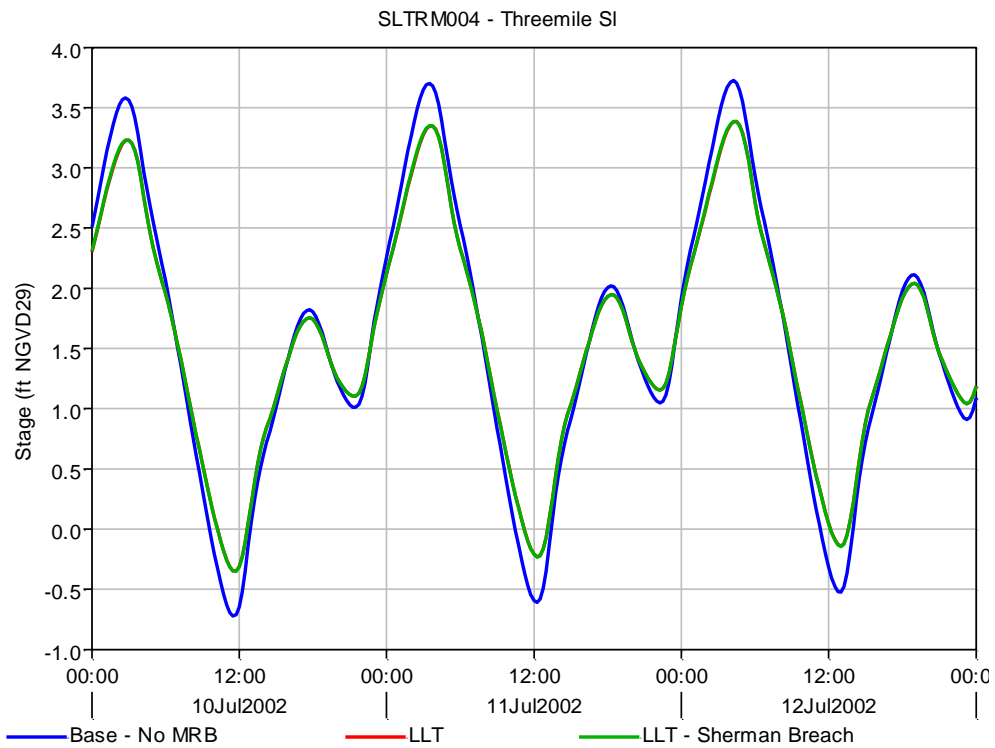


Figure 4-150 Stage in Threemile Slough for Base - No MRB, LLT and LLT - No South scenarios.

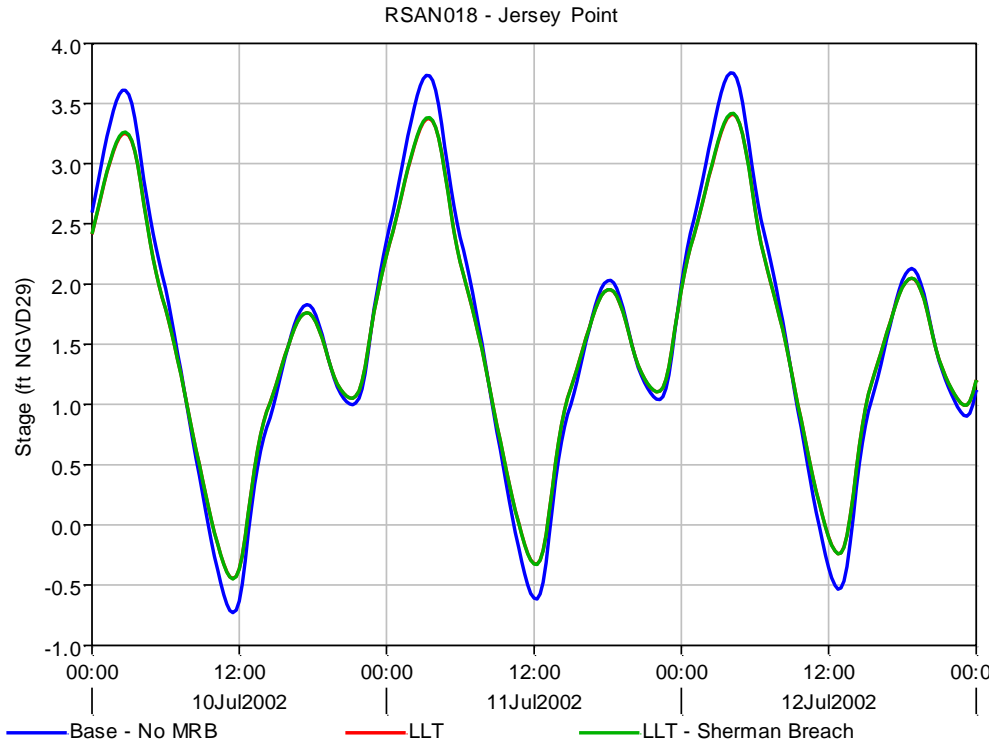


Figure 4-151 Stage at Jersey Point for Base - No MRB, LLT and LLT - No South scenarios.

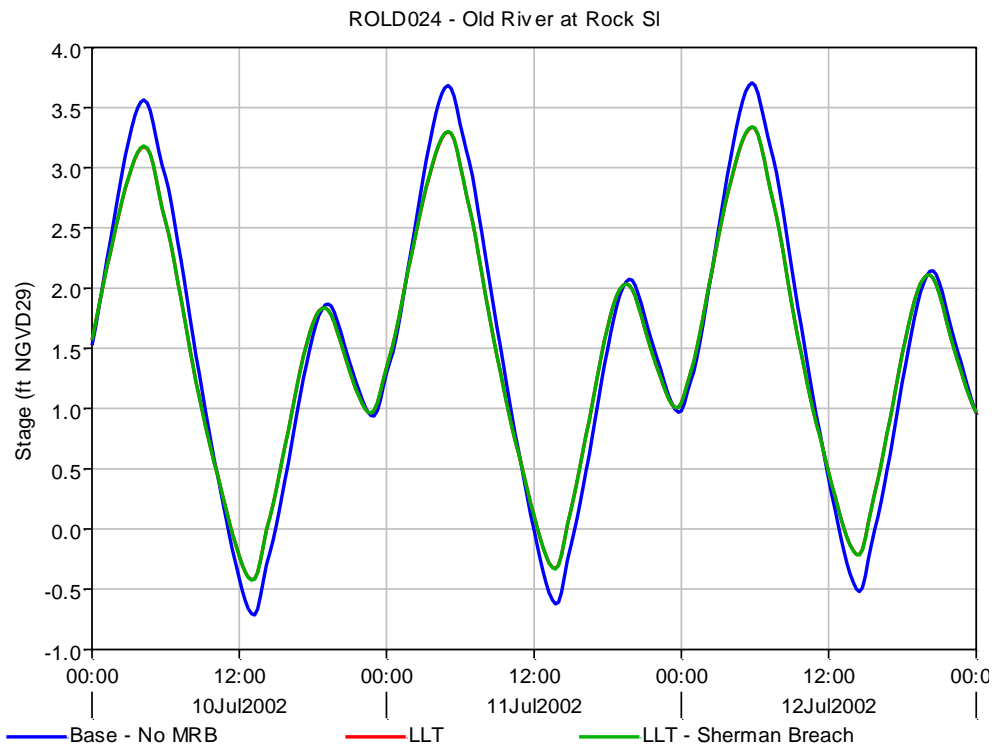


Figure 4-152 Stage at ROLD024 for Base - No MRB, LLT and LLT - No South scenarios.

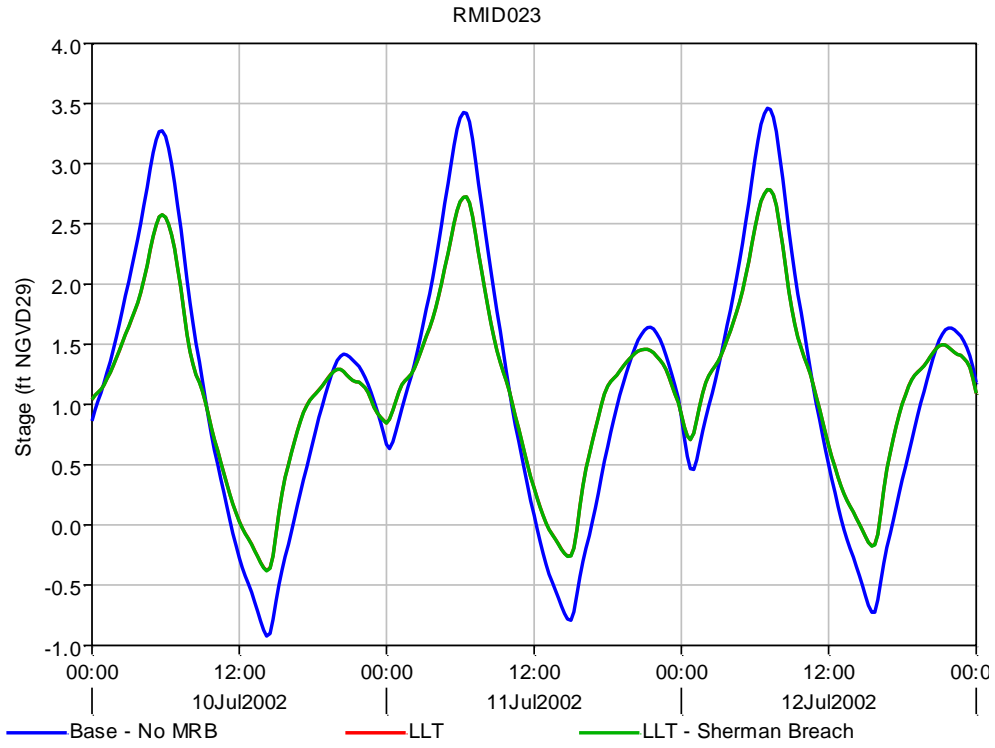


Figure 4-153 Stage RMID023 for Base - No MRB, LLT and LLT - No South scenarios.

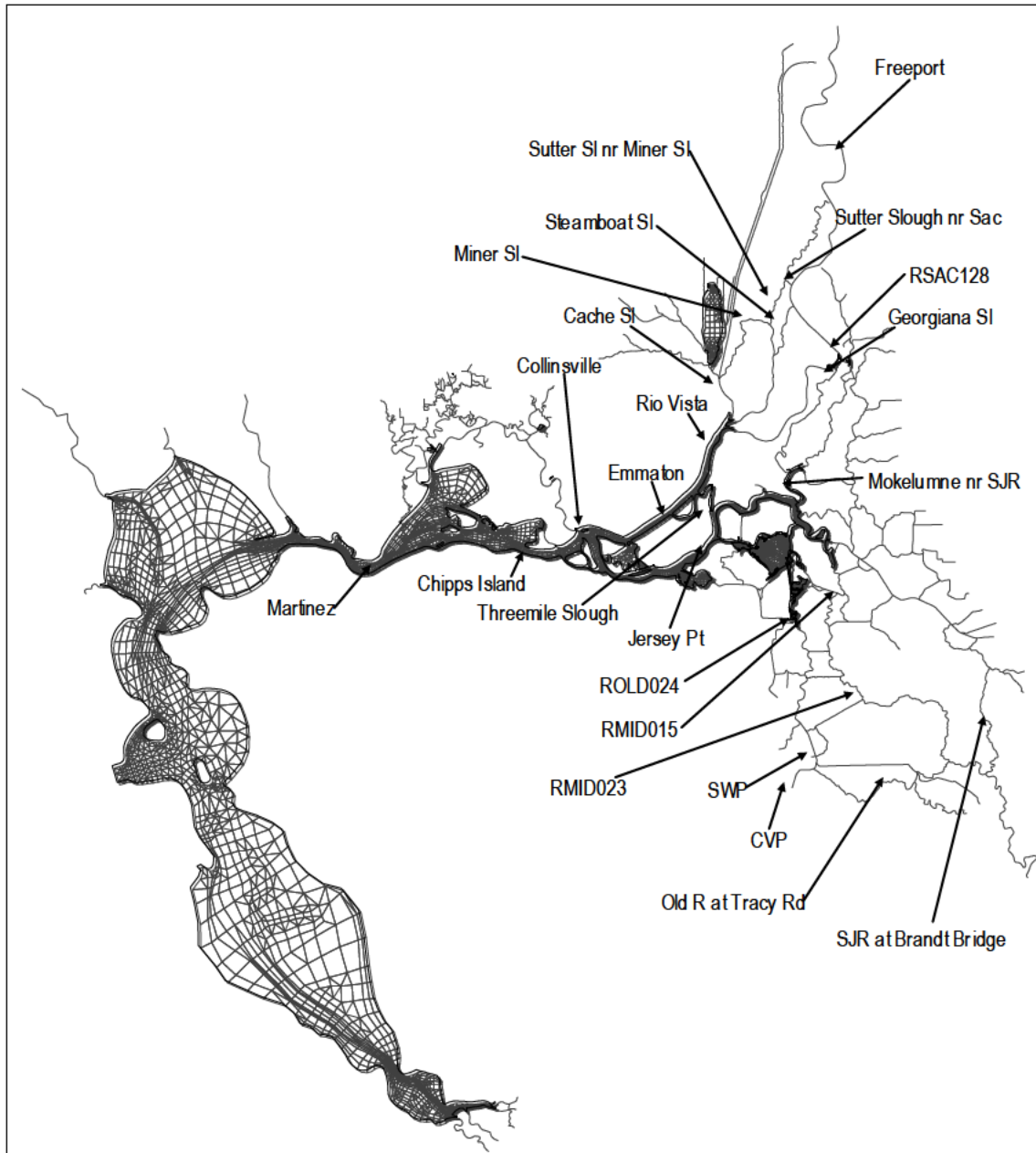


Figure 4-154 Time series plot locations in the Delta.

4.3 Hydrodynamics Summary

The hydrodynamic impacts examined in the sensitivity analysis include

- Transfer of net flows within the Delta
- Changes in Montezuma Slough flows
- Changes in the volume filling and draining during a spring-neap cycle
- Change in tidal prism at specific channel locations
- Changes in stage range

The hydrodynamic analysis metrics for the restoration cases are summarized in Table 4-23 as percent change from base restoration cases.

Transfer of Net Flow from Georgiana Slough and the Delta Cross Channel toward the Sacramento River

Of all the sensitivity cases, LLT – Little Egbert breach had the greatest impact on Georgiana Slough flows, while ELT – Prospect Breach had the greatest impact on DCC flows. In each case, the combined DCC plus Georgiana Slough flows are increased by 2% (around 100 cfs) above their respective base restoration case (LLT and ELT). Averaged flows at RSAC128, through the Delta Cross Channel and through Georgiana Slough decrease with added restoration area, however the breach configurations play an important role as well. Little Egbert and Prospect Island were breached at either end for the base restoration cases, providing conveyance through the islands. The sensitivity analyses confirm that this added conveyance results in reduced flows through Georgiana Slough and DCC, but each for different reasons.

For ELT relative to the base case, there is about a 660 cfs increase in average flow for Miner Slough upstream of the Prospect Island breach opening. By eliminating the breach, increase over the base case is reduced to 140 cfs. This shows that the connection between Miner Slough and the Ship Channel through Prospect Island increases the overall conveyance capacity between the Sacramento River above the DCC through Sutter and Steamboat Sloughs to the lower Sacramento River system, and decreases DCC flows and Sacramento River flows between Steamboat and Cache sloughs.

While elimination of the Prospect Island breach decreases Miner Slough flows, elimination of the Little Egbert breach increases flows in Miner Slough. Despite this difference, both cases result in increased DCC + Georgiana Slough flows. Thus it appears that for the LLT – Little Egbert case, the slight shift in tidal phase seen in Figure 4-127, as well as an increased tidal amplitude difference between RSAC123 and RSAN032 (see Table 4-19) cause the increased Georgiana Slough flow despite the increases in Miner Slough flows.

Montezuma Slough Flows

All sensitivity scenarios with changes in Suisun marsh or the south Delta have a 5% or greater impact on average flows at both ends of Montezuma Slough, relative to the base restoration cases. Montezuma Slough flows are obviously sensitive to conditions within Suisun Marsh, and to a lesser degree are sensitive to conditions in the south Delta. Note that average flows in Montezuma Slough at head are 12 – 13 cfs for the base and base restoration cases, so a change of 13 cfs equates to a 100% change. At the mouth of the slough, a 5% change can be 10 cfs.

Increase in Volume filling and draining the Delta between Spring and Neap Tide Cycle

In general, restoration results in overall increases in the fluctuations in tidally averaged flow over the neap-spring tide cycle downstream of the restoration areas. A comparison of Middle River tidally averaged flows for LLT and LLT – No South (Figure 4-155) illustrate this. With the South Delta ROA removed, the fluctuations in tidally averaged flows are dampened. Average water surface elevation increases in the restoration areas during the spring tide period and decreases during the neap tide period. An example of this action is shown in Figure 4-156, a plot of stage and tidally averaged stage in Middle River for the LLT – No South case. With this increasing and decreasing average water surface elevation, the restoration areas are “filling” up to the peak of the spring tide and “draining” afterwards. Any of the modifications in the sensitivity analysis can change the nature of this filling and draining action and affect the calculated 3-month average flows. The LLT – No South case shows 3-month average flows at Martinez are increased by 24 cfs relative to LLT. This is likely the result of the 3-month averaging period capturing the decreased filling and draining in the south Delta due to elimination of the south Delta ROA. The average flows are affected by the chosen averaging period. For example if the period starts when the water surface is at MSL at the midpoint of filling and draining and ends at the end of a draining cycle, there will be more outflow in LLT than in LLT – South because there is more filling and draining in LLT than LLT – No South. However, if the averaging period happens to end at the end of a filling cycle, there will be less outflow for LLT relative to LLT – No South.

Change in Tidal Prism

Of all the sensitivity cases, only the LLT – Suisun Scour case has a significant impact on tidal prism at Martinez. At this location, change from Base – No MRB tidal prism was 2% for LLT and 6% for LLT – Suisun Scour. This scenario also changes tidal prism in Montezuma Slough as expected. LLT – Suisun Scour increased tidal prism by 37% over LLT at the head of the slough and increased tidal prism 26% at the mouth of the slough.

Tidal prism changes in Montezuma Slough were smaller for the ELT – Max Suisun case. At the head of the slough, ELT – Max Suisun decreased tidal prism by 2% relative to ELT and by 4% relative to LLT. At the mouth of the slough ELT – Max Suisun increased tidal prism by 5% over ELT and decreased it by 1% below LLT. Thus a large increase in ROA area in Suisun does not increase tidal prism very much because tidal prism is limited by channel conveyance.

LLT – No South and LLT – Middle River have the largest impact on south Delta tidal prism, with changes varying between the two scenarios and by location. Aside from south Delta locations, the two scenarios have consistently the opposite effect on tidal prism relative to LLT. If one decreases the other increases. At any location where there are no impacts on tidal prism, the same is true for both scenarios. These results indicate that the LLT – Middle River case magnifies any tidal prism impacts of the south Delta ROA in the LLT case.

Tidal prism in Middle River is reduced by the South Delta restoration in the LLT scenario because flow out of the Union Island breach is out of phase with flow in the Middle River channel. This large, shallow restoration area fills and drains very slowly, so that when Middle River flows begin ebbing, Union Island is still filling. With increased Middle River conveyance

capacity in LLT – Middle River, Union Island breach flows are more in phase with Middle River flows, increasing tidal prism in Middle River.

In Cache Slough at Ryer, while tidal prism is increased by 7% over the base case for the ELT restoration cases, it is decreased by 6% for the LLT case. This is because of the restoration of Little Egbert Tract, which is breached downstream of Cache Slough at Ryer and provides flow-through conveyance with a second breach at the upstream end. Eliminating the downstream breach on Little Egbert in the LLT – Little Egbert simulation results in a 12% increase in tidal prism over the base case.

Reduction of Stage Range

Restoration diminishes tidal range throughout the system. Sensitivity analyses show that increases in channel conveyance, certain changes to breach configurations and moving or removing certain restoration areas can all impact tidal range. Geometry modifications in Suisun primarily impact Suisun Marsh and south Delta tidal range.

Geometry changes in the south Delta have localized tidal range impacts. LLT – No South increased tidal range relative to LLT in upper Middle River and Victoria Canal. LLT – Middle River reduced tidal range at RMID023 and Victoria Canal, but increased tidal range at RMID027.

ELT – Prospect Breach only affected tidal range in the north Delta, reducing it in Miner, Sutter and Steamboat Sloughs, relative to ELT. The impacts of LLT – Little Egbert were more far reaching, with increases at Rio Vista and Jersey Point, relative to LLT, and decreases in Cache, Miner, Sutter and Steamboat Sloughs.

Table 4-23 Summary of percent change from base restoration case for average flow, average tidal prism and average tidal range.

| Location | % Change from Base Restoration Case (ELT or LLT) | | | | | | | | | | | | | | | | | | | | |
|-----------------------|--|----------------|--------------------|--------------------|-----------------------|----------------------------|----------------------|--|----------------|--------------------|--------------------|-----------------------|----------------------------|----------------------|---|----------------|--------------------|--------------------|-----------------------|----------------------------|----------------------|
| | 3-month average flow (cfs) | | | | | | | Apr - Dec 2002 Average Tidal Prism (ac-ft) | | | | | | | Apr - Dec 2002 Average Tidal Range (ft) | | | | | | |
| | ELT – Max Suisun | LLT – No South | LLT – Middle River | LLT – Suisun Scour | ELT – Prospect Breach | LLT – Little Egbert Breach | LLT – Sherman Breach | ELT – Max Suisun | LLT – No South | LLT – Middle River | LLT – Suisun Scour | ELT – Prospect Breach | LLT – Little Egbert Breach | LLT – Sherman Breach | ELT – Max Suisun | LLT – No South | LLT – Middle River | LLT – Suisun Scour | ELT – Prospect Breach | LLT – Little Egbert Breach | LLT – Sherman Breach |
| Cache SI at Ryer | -1.6% | -0.6% | 0.7% | -1.1% | -24.1% | -12.1% | 0.0% | -3.4% | -0.6% | 0.7% | -2.3% | 0.2% | 19.9% | 0.2% | 0.9% | -0.4% | 0.4% | -1.8% | 0.0% | -4.4% | 0.4% |
| DCC | 0.7% | 0.5% | -0.4% | -0.3% | 2.4% | 0.2% | 0.1% | -1.2% | 3.0% | -2.2% | -2.4% | -1.6% | 13.1% | 0.4% | -0.4% | -0.9% | 0.0% | -1.4% | -1.7% | -0.5% | 0.5% |
| False River | -2.2% | 0.1% | 0.8% | -0.5% | -1.5% | 3.8% | -0.4% | -2.4% | 1.5% | -1.6% | -2.3% | 0.0% | 2.0% | 0.0% | -2.6% | -1.0% | 0.3% | -2.0% | 0.0% | 2.4% | 0.3% |
| Martinez | -2.2% | 0.6% | 0.0% | -0.3% | 0.0% | 0.0% | 0.0% | 2.3% | -0.2% | 0.2% | 3.9% | 0.0% | 0.3% | 0.0% | -2.7% | -0.2% | 0.0% | -2.9% | 0.0% | 0.6% | 0.0% |
| Miner Slough | -1.6% | -0.1% | 0.1% | -0.3% | -19.5% | 4.8% | 0.0% | 5.7% | 1.5% | -1.8% | -1.1% | -22.1% | -24.2% | 0.4% | 1.0% | -0.8% | 0.8% | -1.5% | -16.9% | -5.7% | 0.4% |
| Montezuma SI at Head | -480.0% | 92.3% | -100.0% | 3392.3% | 10.0% | 0.0% | 0.0% | -2.3% | 0.4% | -0.2% | 37.1% | -0.1% | 2.2% | 0.1% | -4.2% | -1.1% | 0.5% | -1.6% | 0.0% | 2.2% | 0.3% |
| Montezuma SI at Mouth | -302.4% | -5.8% | 5.2% | -142.4% | -2.4% | -0.5% | 0.0% | 4.5% | 0.0% | 0.0% | 25.8% | 0.0% | 0.6% | 0.0% | -6.5% | 0.0% | 0.5% | 1.0% | 0.0% | 1.5% | 0.2% |
| RMID015 | -0.1% | 1.0% | -8.7% | -0.1% | 0.1% | 0.1% | 0.0% | -2.2% | 8.1% | 29.8% | -1.8% | 0.0% | 2.6% | 0.1% | -2.0% | 2.9% | -6.4% | -1.9% | 0.0% | 2.2% | 0.3% |
| RMID027 | 1.7% | -35.6% | 57.8% | 0.0% | 0.0% | -4.4% | -2.2% | -1.3% | -74.8% | 173.5% | -0.8% | 0.0% | 1.0% | 0.1% | -- | 433.9% | 130.4% | -14.3% | -- | -12.5% | 0.0% |
| ROLD024 | 0.2% | -1.7% | 7.5% | 0.0% | 0.0% | -0.2% | 0.0% | -2.4% | 7.3% | 0.1% | -2.1% | 0.0% | 2.6% | 0.1% | -2.1% | 1.3% | -5.3% | -2.0% | 0.0% | 2.0% | 0.0% |
| ROLD034 | 0.0% | -1.7% | -0.4% | -0.1% | 0.0% | 0.0% | 0.0% | -1.6% | 5.2% | 19.1% | -0.7% | -0.1% | 2.3% | 0.1% | -1.9% | 8.4% | -21.6% | -1.8% | 0.0% | 1.8% | 0.0% |
| RSAC075 Chipps Island | -1.2% | 0.4% | 0.2% | -10.4% | 0.0% | 0.0% | 0.0% | -1.2% | 0.3% | -0.4% | -2.3% | 0.0% | -1.8% | -0.1% | -4.2% | -0.3% | 0.5% | -2.6% | 0.0% | 2.1% | 0.3% |
| RSAC092 Emmaton | -0.4% | 0.1% | -0.2% | 0.5% | -1.3% | 1.9% | 0.4% | -2.4% | 0.0% | 0.0% | -2.3% | 0.0% | -6.6% | -0.5% | -2.8% | -1.2% | 0.6% | -2.5% | 0.3% | 2.8% | 0.6% |
| RSAC101 Rio Vista | -0.2% | -0.4% | 0.4% | 0.3% | -1.3% | -0.9% | -0.1% | -2.9% | -0.5% | 0.6% | -2.2% | 0.0% | -8.3% | 0.3% | -0.9% | -1.1% | 0.4% | -2.2% | 0.0% | 2.9% | 0.4% |
| RSAC123 | 0.0% | -0.7% | 0.7% | 0.4% | 3.6% | -2.8% | -0.1% | -1.4% | 1.3% | -1.3% | -2.7% | -0.7% | 9.5% | 0.4% | -0.4% | -0.5% | 0.0% | -1.9% | -0.9% | 0.0% | 0.5% |
| RSAC128 | 0.3% | 0.1% | -0.1% | -0.1% | 2.6% | -0.3% | 0.1% | -2.4% | -3.0% | 2.9% | -1.8% | 2.6% | -1.0% | 0.0% | -0.4% | -0.5% | 0.0% | -1.9% | -1.7% | -0.5% | 0.5% |
| RSAN018 Jersey Pt | -1.6% | -1.3% | -0.7% | 1.4% | -4.5% | 5.7% | 1.2% | -2.7% | 1.5% | -1.6% | -2.4% | 0.0% | 1.1% | 0.2% | -2.6% | -1.0% | 1.0% | -2.3% | 0.0% | 2.7% | 0.3% |
| RSAN032 San Andreas | 0.2% | -1.7% | -0.4% | 0.7% | -3.6% | -4.0% | -0.2% | -2.8% | 2.1% | -2.1% | -2.6% | 0.0% | 2.6% | 0.1% | -2.3% | -0.3% | -0.7% | -2.1% | 0.0% | 2.1% | 0.3% |
| RSAN058 | 1.3% | -5.9% | -13.8% | -0.8% | 1.6% | 0.5% | 0.3% | -2.4% | -21.5% | 0.6% | -2.0% | 0.0% | 2.3% | 0.1% | -2.2% | 6.2% | -2.2% | -1.5% | 0.0% | 2.2% | 0.3% |
| SLDUT007 | 3.6% | 2.9% | -8.8% | -10.3% | 4.8% | -10.3% | 0.0% | -2.1% | 2.6% | -2.5% | -1.9% | 0.0% | 1.0% | 0.1% | -2.8% | -1.0% | 1.0% | -2.0% | 0.0% | 2.6% | 0.3% |
| SLGEO019 Georgiana SI | 0.0% | 0.7% | -0.8% | -0.7% | 1.4% | 3.4% | 0.3% | -7.6% | -6.3% | 6.7% | -1.0% | 2.7% | -2.2% | -0.7% | -0.4% | 0.0% | 0.0% | -1.4% | -1.3% | 0.0% | 0.5% |
| SLTRM004 Threemile SI | 0.3% | -1.3% | 1.5% | -0.1% | -1.5% | -6.9% | -1.0% | -2.6% | 3.7% | -4.0% | -2.8% | 0.0% | 12.8% | 0.7% | -2.3% | 3.4% | 0.0% | -2.4% | 0.0% | 2.1% | 0.0% |
| Steamboat SI | 0.0% | -0.2% | 0.2% | 0.4% | 0.5% | -1.1% | -0.2% | -0.8% | 0.9% | -0.9% | -3.0% | -2.9% | 7.6% | 0.6% | 0.0% | -0.5% | 0.5% | -1.5% | -3.2% | -1.5% | 0.5% |
| Sutter SI | -0.8% | -0.1% | 0.1% | 0.0% | -8.1% | 1.7% | 0.0% | 2.5% | 1.1% | -1.2% | -2.1% | -11.7% | -9.7% | 0.5% | 0.5% | -1.5% | -0.5% | -2.1% | -6.9% | -3.1% | -1.0% |

--Tidal range was not computed at RMID027 for all simulations.



Figure 4-155 Tidally averaged flow in Middle River at RMID015 for LLT and LLT - No South.

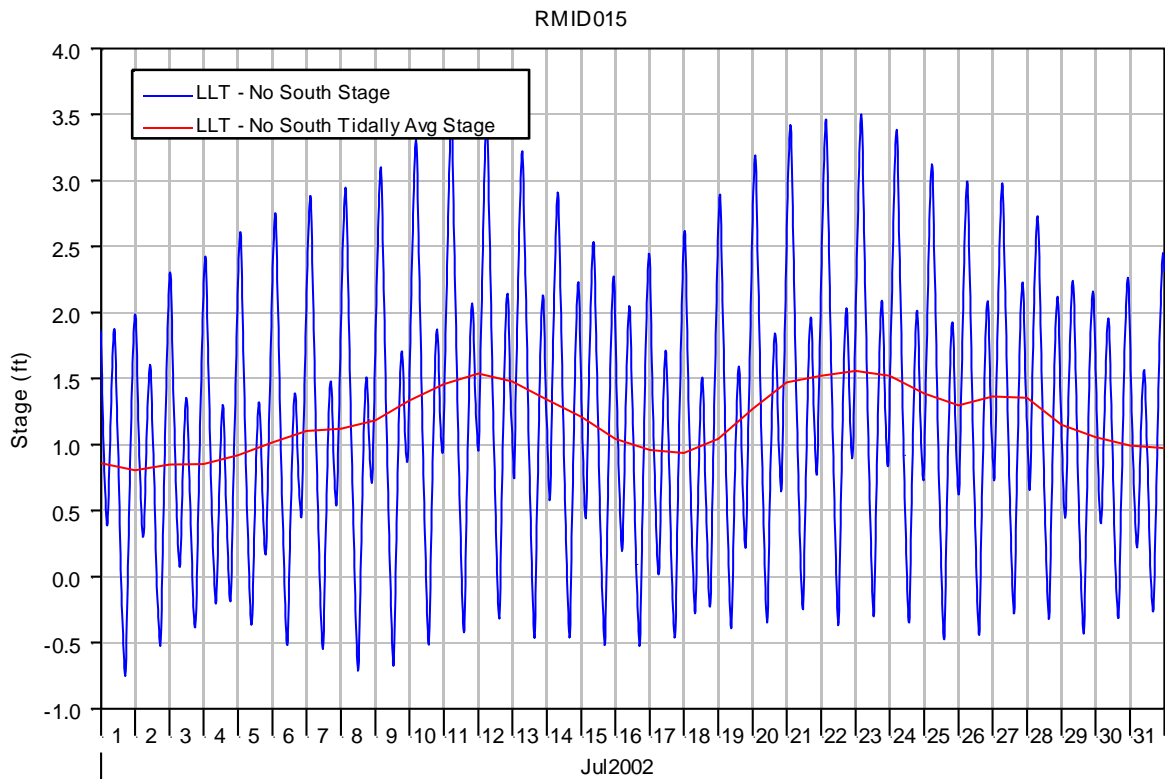


Figure 4-156 Stage and tidally averaged stage in Middle River at RMID015 for LLT - No South.

5 Electrical Conductivity (EC)

Electrical conductivity ($\mu\text{mhos cm}^{-1}$), or EC, was modeled as a surrogate for salinity. Although the RMA11 formulation assumes transport of a conservative constituent, EC is used as a practical surrogate for modeled salinity in the Bay-Delta model for several reasons, despite concerns about its non-conservative behavior. The number and reliability of measurement locations in the Bay-Delta region is much greater for EC than for other measures of salinity. In addition, transformation relationships between EC and constituents generally considered conservative, such as chloride and Total Dissolved Solids (TDS), can introduce additional error. EC underestimates true salinity at high concentrations (DWR, 2002).

To assess EC results, time series plots of tidally averaged EC and spatial plots of change from base restoration case (ELT or LLT) tidally averaged EC are provided. Locations for EC time series are shown in Figure 5-1.

For each sensitivity scenario, spatial plots are provided showing percent change from base restoration case (ELT or LLT) EC (computed using tidally averaged results). Plots of change from base case tidally averaged EC for the sensitivity cases compared with the base restoration cases are provided in the appendix. All spatial plots show results from 24 September 2002, around a time when restoration alternatives result in the greatest change from the base case. Several different views are used to emphasize different areas.

Time series of X2 are plotted for the April through December 2002 simulation period comparing the sensitivity cases with the relevant base and base restoration cases.

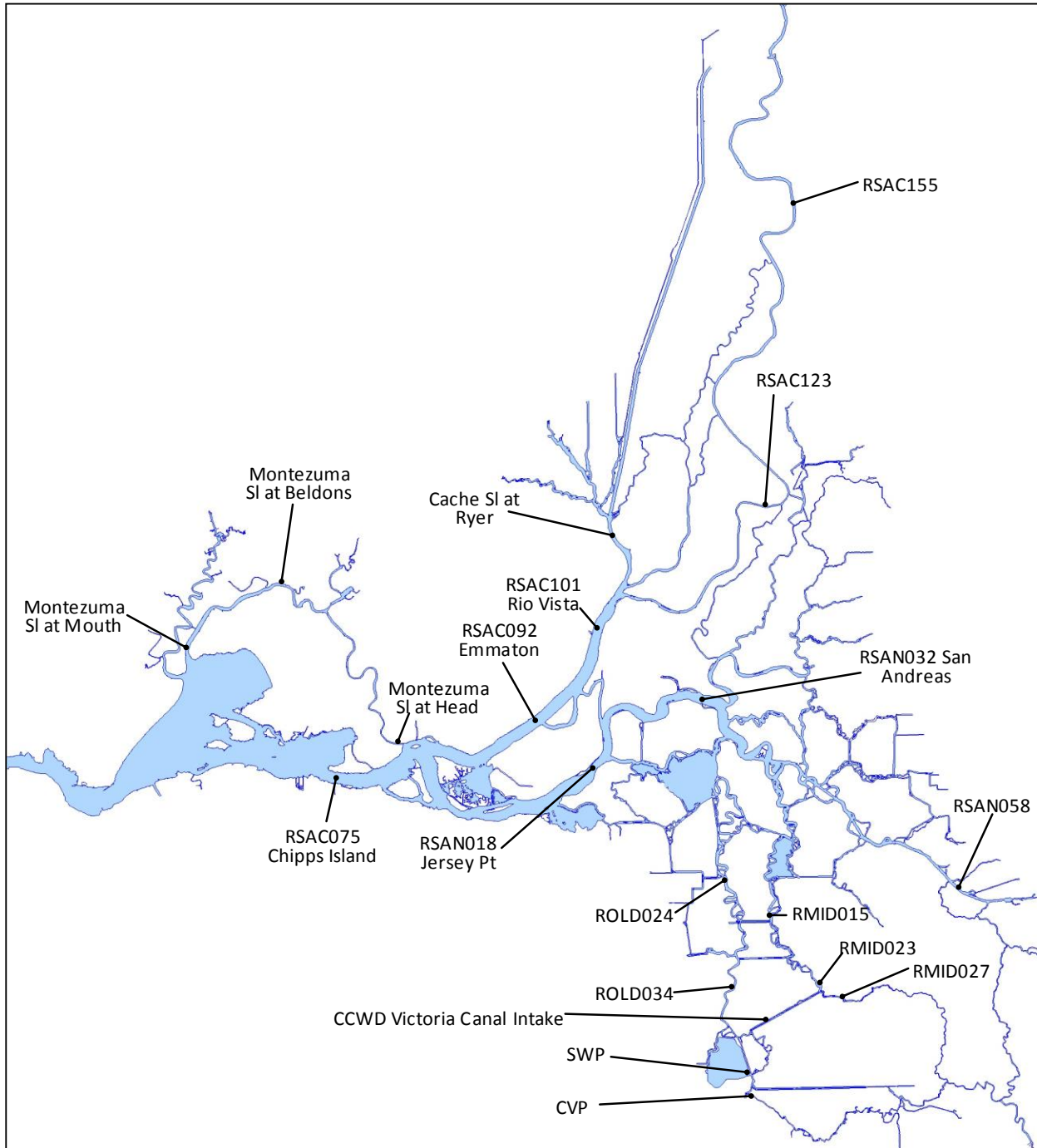


Figure 5-1 EC time series plot locations.

5.1 ELT – Maximize Suisun

EC results for the ELT – Max Suisun case are shown as time series plots of tidally averaged values in Figure 5-2 through Figure 5-20. ELT – Max Suisun EC results are very similar to ELT in the North Delta. In the central and south Delta, EC falls somewhere between ELT and LLT, tending closer to ELT at Emmaton and Rio Vista, and closer to LLT at Jersey Point. Shifting restoration area from Cache to Suisun increases EC at the exports. In Suisun Marsh and Sacramento River at Chipps Island, the ELT – Max Suisun EC is similar to LLT. None of the scenarios impact EC at Freeport.

Contour plots of tidally averaged EC percent change from ELT on September 24, 2002 are shown in Figure 5-21 through Figure 5-23 for the Delta, the south and central Delta and for Suisun Marsh. These plots show very small changes in the north Delta. There are significant EC increases around Chipps Island and up the San Joaquin to Turner Cut and into the southwest Delta in Dutch Slough, Franks Tract and Old and Middle Rivers. EC is decreased throughout most of Suisun Marsh, with the exception of Nurse Slough and in Montezuma Slough down to Beldon's Landing.

A summary of July – December 2002 monthly average EC at key locations throughout the Delta is provided in Table 5-1 for Base – No SMSCG, ELT and ELT – Max Suisun. Percent change in monthly average EC relative to the base case are provided in Table 5-2 for ELT and ELT – Max Suisun. Shifting restoration acreage from Cache to Suisun tends to have the greatest EC impacts during July and August. At Chipps Island, ELT – Max Suisun EC is about 10% greater than ELT. In the south Delta, ELT – Max Suisun EC is 2 – 8% greater than ELT. At Emmaton and above, differences are generally +/-2% or less. In Montezuma Slough at Head, EC increases by 3 – 5%. EC generally increases by about 1% at Beldon's Landing, and at Montezuma Slough at head, changes are generally +/-1% or less.

ELT – Max Suisun X2, shown in Figure 5-24, is increased by about 1 km relative to ELT during the spring and earlier summer, falling closer to LLT X2. During the remainder of the year, X2 changes are generally less than 0.5 km.

Table 5-1 Summary of July - December 2002 monthly average EC for Base - No SMSCG, ELT and ELT - Max Suisun.

| Location | Monthly Average EC (umhos/cm) | | | | | | | | | | | | | | | | | |
|-----------------------|-------------------------------|-------|------------------|-----------------|-------|------------------|-----------------|-------|------------------|-----------------|-------|------------------|-----------------|-------|------------------|-----------------|-------|------------------|
| | July 2002 | | | August 2002 | | | September 2002 | | | October 2002 | | | November 2002 | | | December 2002 | | |
| | Base - No SMSCG | ELT | ELT - Max Suisun | Base - No SMSCG | ELT | ELT - Max Suisun | Base - No SMSCG | ELT | ELT - Max Suisun | Base - No SMSCG | ELT | ELT - Max Suisun | Base - No SMSCG | ELT | ELT - Max Suisun | Base - No SMSCG | ELT | ELT - Max Suisun |
| Cache Sl at Ryer | 136 | 134 | 134 | 153 | 151 | 151 | 176 | 174 | 173 | 164 | 157 | 156 | 189 | 184 | 182 | 196 | 192 | 192 |
| CCWD Victoria Canal | 265 | 274 | 280 | 369 | 400 | 421 | 468 | 513 | 538 | 509 | 561 | 576 | 452 | 484 | 489 | 483 | 513 | 520 |
| CVP | 334 | 341 | 352 | 517 | 540 | 573 | 665 | 698 | 737 | 658 | 713 | 740 | 587 | 627 | 640 | 631 | 661 | 668 |
| Montezuma Sl at Head | 3539 | 3254 | 3427 | 4653 | 4294 | 4417 | 6856 | 6412 | 6618 | 7404 | 7064 | 7410 | 6557 | 6322 | 6545 | 3148 | 3132 | 3262 |
| Montezuma Sl at Mouth | 13705 | 14342 | 14244 | 15976 | 16618 | 16571 | 18956 | 19533 | 19456 | 20763 | 21199 | 21184 | 19462 | 20292 | 20456 | 12058 | 13439 | 13943 |
| RMID015 | 262 | 272 | 278 | 369 | 401 | 423 | 471 | 517 | 542 | 504 | 556 | 570 | 441 | 475 | 480 | 464 | 494 | 501 |
| RMID023 | 263 | 273 | 278 | 369 | 400 | 422 | 469 | 514 | 539 | 507 | 559 | 574 | 447 | 480 | 485 | 477 | 507 | 514 |
| ROLD024 | 402 | 409 | 432 | 709 | 725 | 785 | 937 | 967 | 1036 | 828 | 901 | 947 | 713 | 782 | 808 | 607 | 652 | 673 |
| ROLD034 | 361 | 368 | 386 | 617 | 638 | 688 | 805 | 838 | 895 | 755 | 822 | 861 | 651 | 710 | 732 | 601 | 646 | 663 |
| RSAC075 Chipps Island | 8211 | 7983 | 8869 | 9743 | 9397 | 10349 | 12563 | 12203 | 13236 | 13607 | 13119 | 14278 | 11989 | 11729 | 12815 | 6033 | 6014 | 6602 |
| RSAC092 Emmaton | 624 | 563 | 570 | 809 | 696 | 698 | 1499 | 1288 | 1290 | 2015 | 1791 | 1830 | 1749 | 1612 | 1642 | 821 | 789 | 797 |
| RSAC101 Rio Vista | 148 | 142 | 141 | 176 | 162 | 161 | 240 | 207 | 204 | 284 | 239 | 232 | 290 | 269 | 258 | 222 | 216 | 212 |
| RSAC123 | 127 | 127 | 127 | 154 | 154 | 154 | 165 | 165 | 165 | 142 | 142 | 142 | 184 | 184 | 184 | 169 | 169 | 169 |
| RSAC155 Freeport | 126 | 126 | 126 | 156 | 156 | 156 | 162 | 162 | 162 | 142 | 142 | 142 | 184 | 184 | 184 | 164 | 164 | 164 |
| RSAN018 Jersey Pt | 955 | 943 | 1033 | 1462 | 1422 | 1565 | 1977 | 1956 | 2115 | 1730 | 1750 | 1864 | 1504 | 1572 | 1661 | 945 | 980 | 1033 |
| RSAN032 San Andreas | 285 | 341 | 360 | 460 | 573 | 618 | 557 | 741 | 787 | 449 | 632 | 656 | 404 | 549 | 561 | 333 | 411 | 421 |
| RSAN058 | 650 | 658 | 663 | 673 | 684 | 689 | 716 | 724 | 727 | 674 | 674 | 674 | 637 | 640 | 641 | 763 | 771 | 775 |
| S-49 Beldon's Landing | 10401 | 11241 | 11335 | 13265 | 14198 | 14348 | 15825 | 16810 | 17030 | 18853 | 19376 | 19485 | 18356 | 19374 | 19754 | 12763 | 14636 | 15254 |
| SWP | 330 | 338 | 352 | 541 | 565 | 607 | 698 | 736 | 783 | 681 | 744 | 776 | 593 | 643 | 659 | 594 | 630 | 641 |

Table 5-2 Summary of July - December 2002 percent change in monthly average EC for ELT and ELT – Max Suisun relative to Base - No SMSCG.

| Location | Percent Change in Monthly Average EC (umhos/cm) Relative to Base Case | | | | | | | | | | | |
|-----------------------|---|------------------|-------------|------------------|----------------|------------------|--------------|------------------|---------------|------------------|---------------|------------------|
| | July 2002 | | August 2002 | | September 2002 | | October 2002 | | November 2002 | | December 2002 | |
| | ELT | ELT - Max Suisun | ELT | ELT - Max Suisun | ELT | ELT - Max Suisun | ELT | ELT - Max Suisun | ELT | ELT - Max Suisun | ELT | ELT - Max Suisun |
| Cache Sl at Ryer | -1% | -1% | -1% | -1% | -1% | -1% | -4% | -5% | -3% | -4% | -2% | -2% |
| CCWD Victoria Canal | 3% | 6% | 8% | 14% | 9% | 15% | 10% | 13% | 7% | 8% | 6% | 8% |
| CVP | 2% | 5% | 4% | 11% | 5% | 11% | 8% | 13% | 7% | 9% | 5% | 6% |
| Montezuma Sl at Head | -8% | -3% | -8% | -5% | -6% | -3% | -5% | 0% | -4% | 0% | -1% | 4% |
| Montezuma Sl at Mouth | 5% | 4% | 4% | 4% | 3% | 3% | 2% | 2% | 4% | 5% | 11% | 16% |
| RMID015 | 4% | 6% | 9% | 14% | 10% | 15% | 10% | 13% | 8% | 9% | 6% | 8% |
| RMID023 | 4% | 6% | 8% | 14% | 10% | 15% | 10% | 13% | 7% | 8% | 6% | 8% |
| ROLD024 | 2% | 8% | 2% | 11% | 3% | 11% | 9% | 14% | 10% | 13% | 7% | 11% |
| ROLD034 | 2% | 7% | 3% | 11% | 4% | 11% | 9% | 14% | 9% | 12% | 7% | 10% |
| RSAC075 Chipps Island | -3% | 8% | -4% | 6% | -3% | 5% | -4% | 5% | -2% | 7% | 0% | 9% |
| RSAC092 Emmaton | -10% | -9% | -14% | -14% | -14% | -14% | -11% | -9% | -8% | -6% | -4% | -3% |
| RSAC101 Rio Vista | -4% | -5% | -8% | -8% | -14% | -15% | -16% | -18% | -7% | -11% | -2% | -4% |
| RSAC123 | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| RSAC155 Freeport | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| RSAN018 Jersey Pt | -1% | 8% | -3% | 7% | -1% | 7% | 1% | 8% | 4% | 10% | 4% | 9% |
| RSAN032 San Andreas | 20% | 26% | 24% | 34% | 33% | 41% | 41% | 46% | 36% | 39% | 23% | 26% |
| RSAN058 | 1% | 2% | 2% | 2% | 1% | 2% | 0% | 0% | 1% | 1% | 1% | 2% |
| S-49 Beldon's Landing | 8% | 9% | 7% | 8% | 6% | 8% | 3% | 3% | 6% | 8% | 15% | 20% |
| SWP | 2% | 7% | 4% | 12% | 5% | 12% | 9% | 14% | 8% | 11% | 6% | 8% |

5.1.1 Tidally averaged EC time series

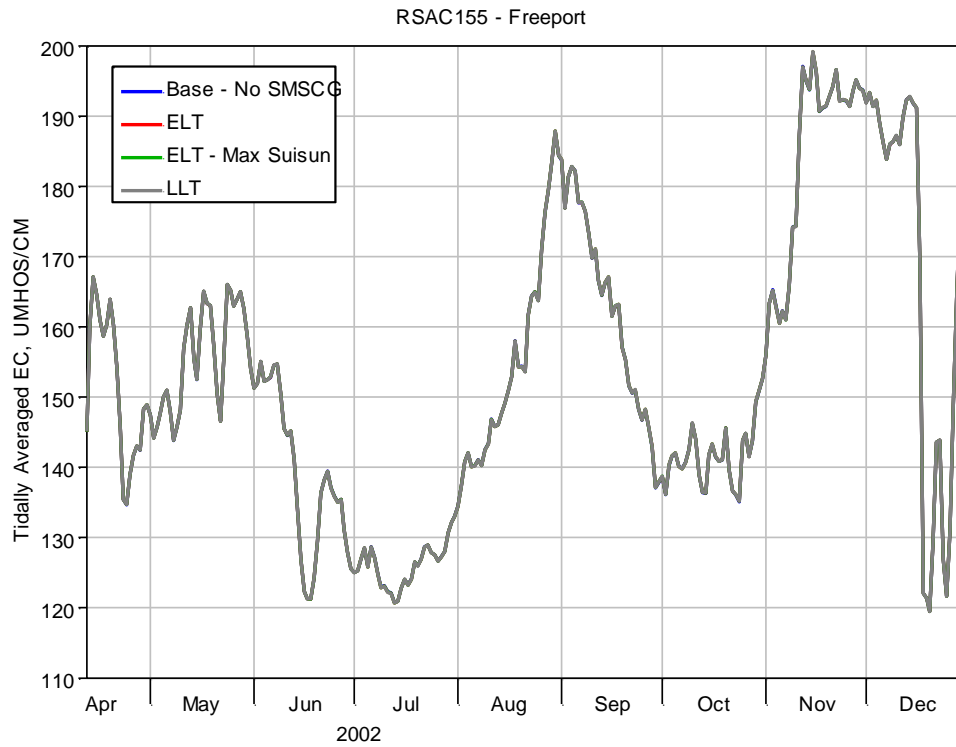


Figure 5-2 Tidally averaged EC at RSAC155 for Base – No SMSCG, ELT and ELT – Max Suisun.

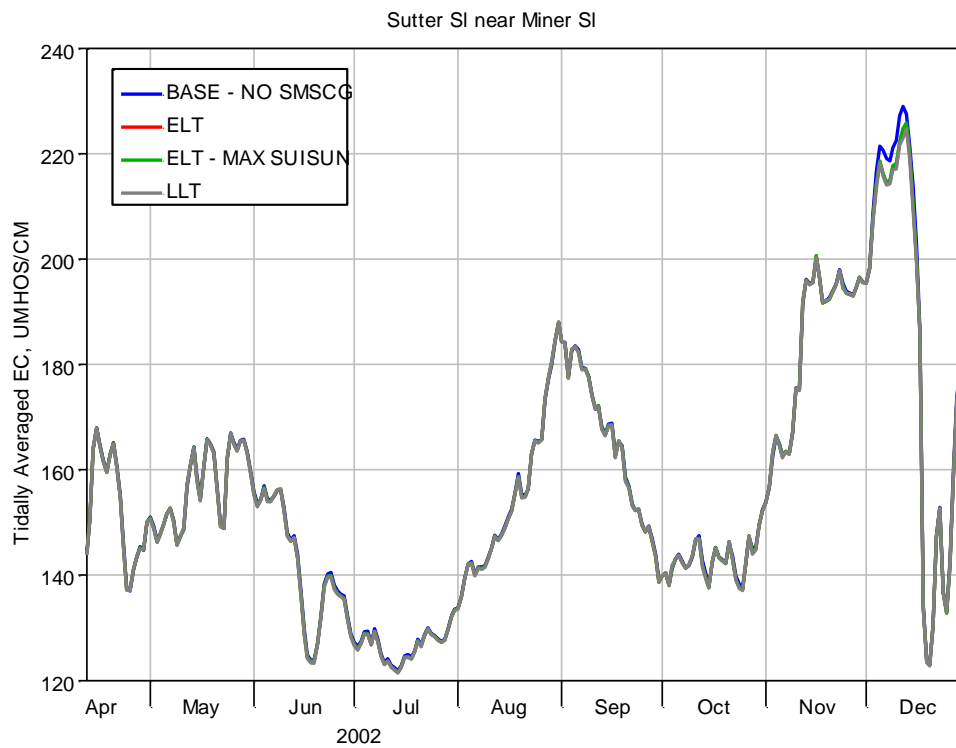


Figure 5-3 Tidally averaged EC in Sutter Slough for Base – No SMSCG, ELT and ELT – Max Suisun.

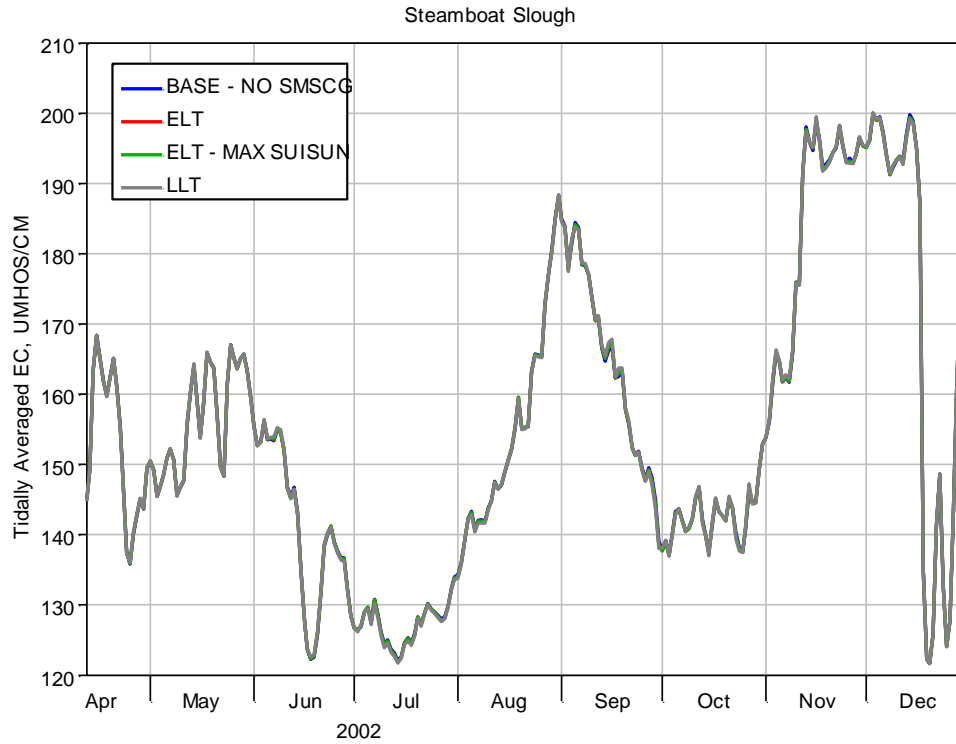


Figure 5-4 Tidally averaged EC in Steamboat Slough for Base – No SMSCG, ELT and ELT – Max Suisun.

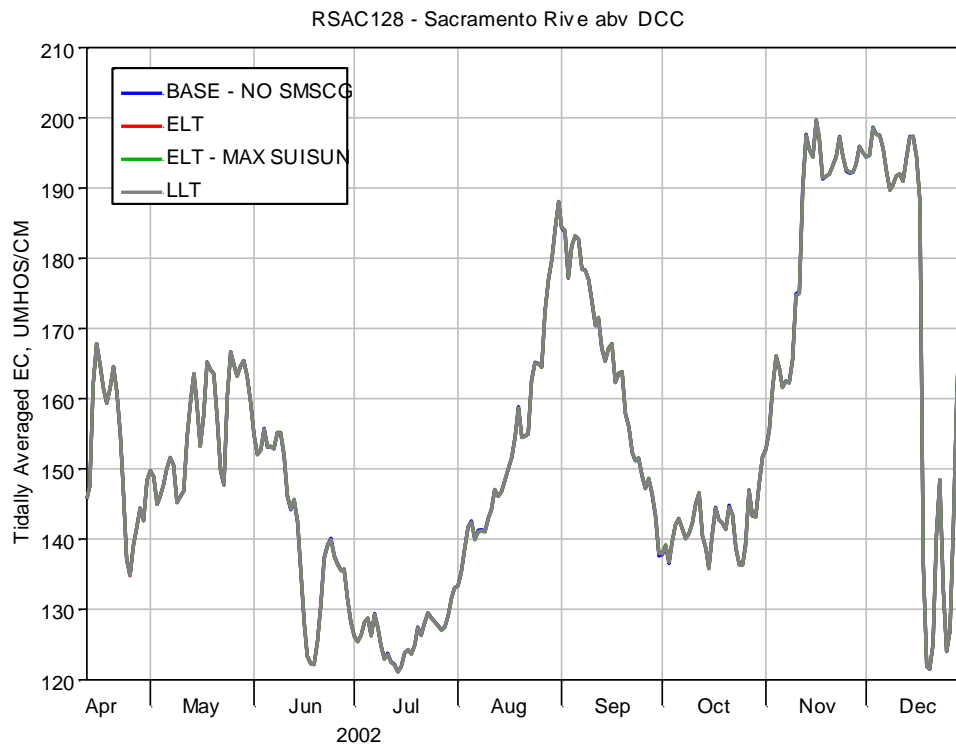


Figure 5-5 Tidally averaged EC at RSAC128 for Base – No SMSCG, ELT and ELT – Max Suisun.

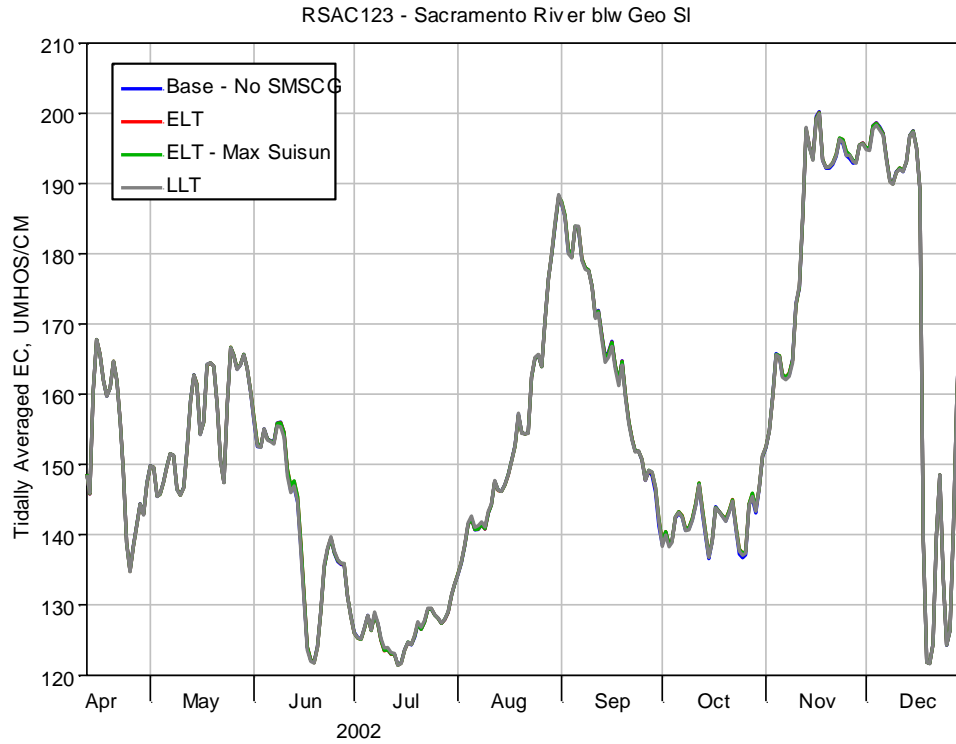


Figure 5-6 Tidally averaged EC at RSAC123 for Base – No SMSCG, ELT and ELT – Max Suisun.

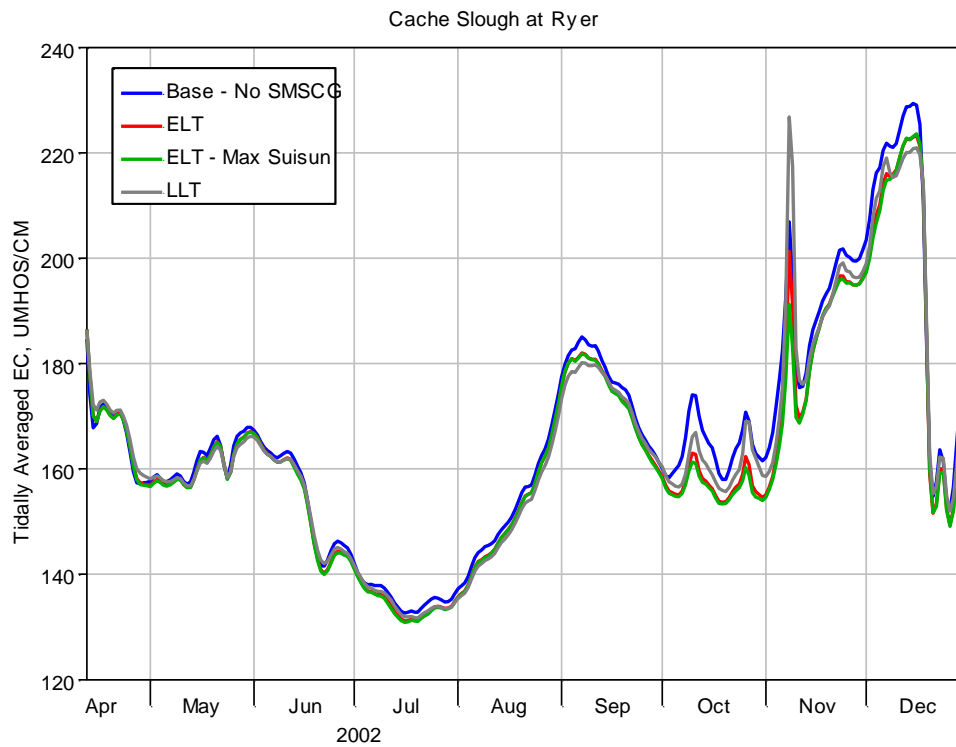


Figure 5-7 Tidally averaged EC in Cache Slough at Ryer for Base – No SMSCG, ELT and ELT – Max Suisun.

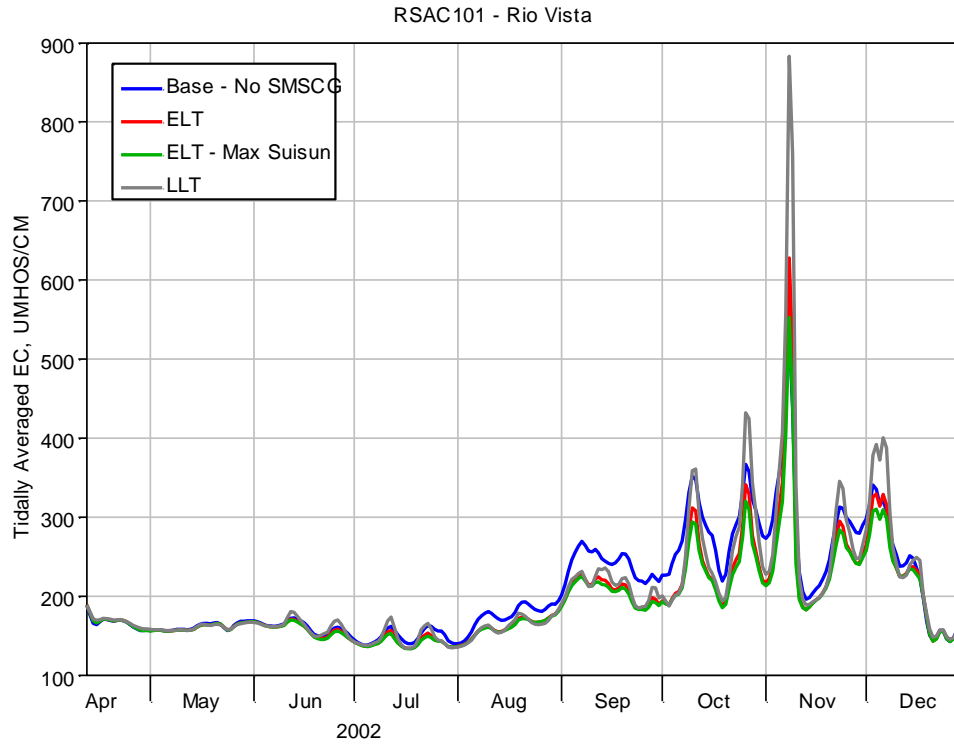


Figure 5-8 Tidally averaged EC at RSAC101 for Base – No SMSCG, ELT and ELT – Max Suisun.

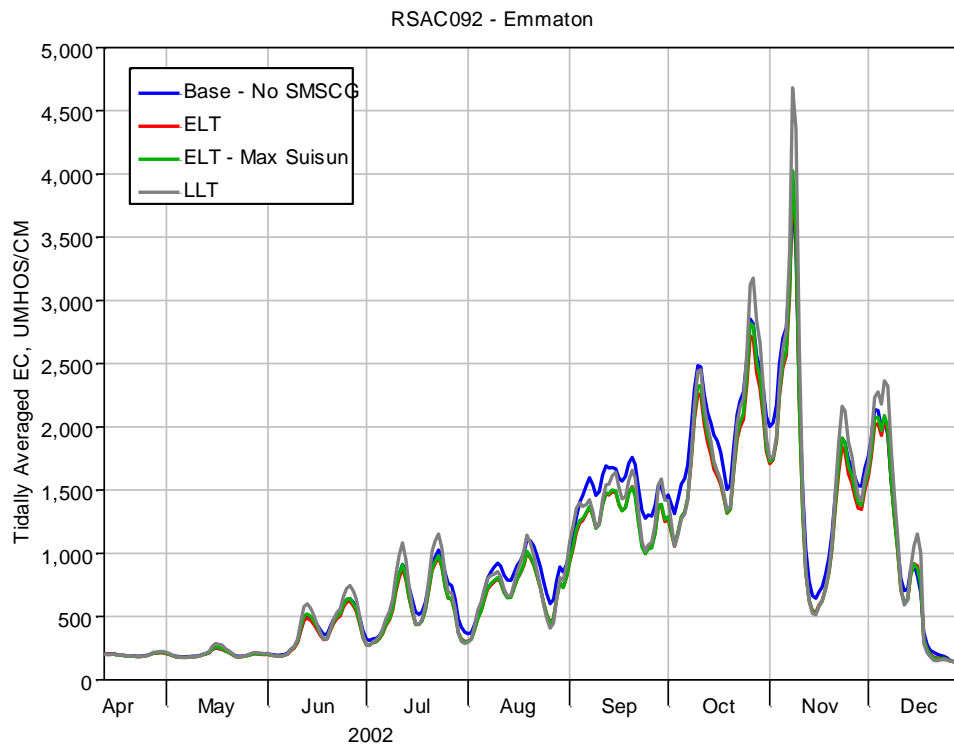


Figure 5-9 Tidally averaged EC at RSAC092 for Base – No SMSCG, ELT and ELT – Max Suisun.

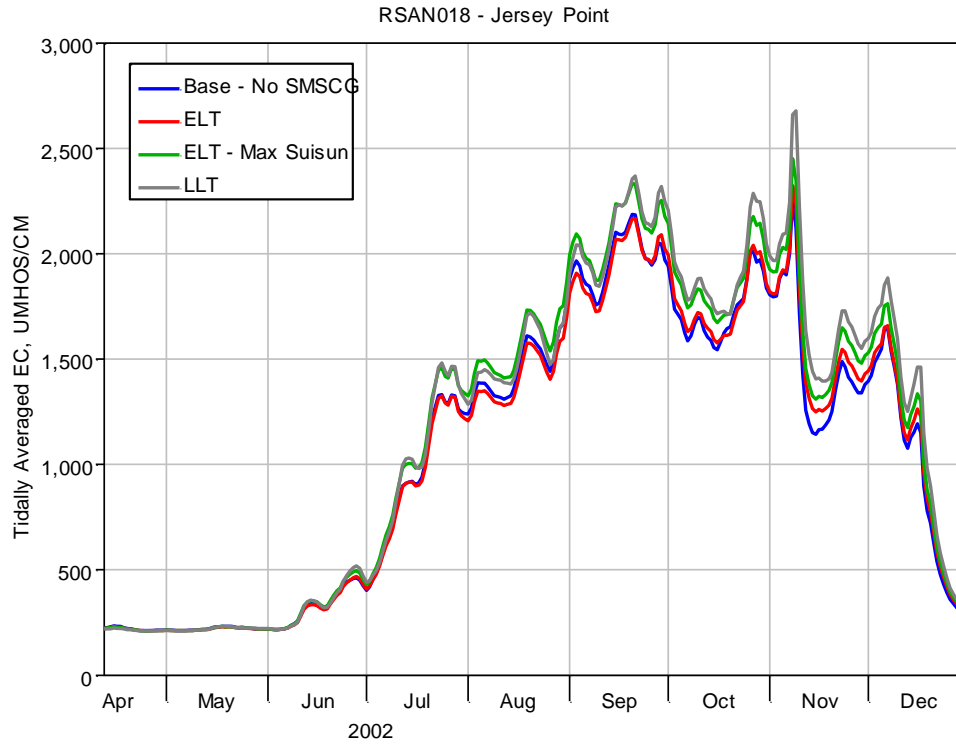


Figure 5-10 Tidally averaged EC at RSAC018 for Base – No SMSCG, ELT and ELT – Max Suisun.

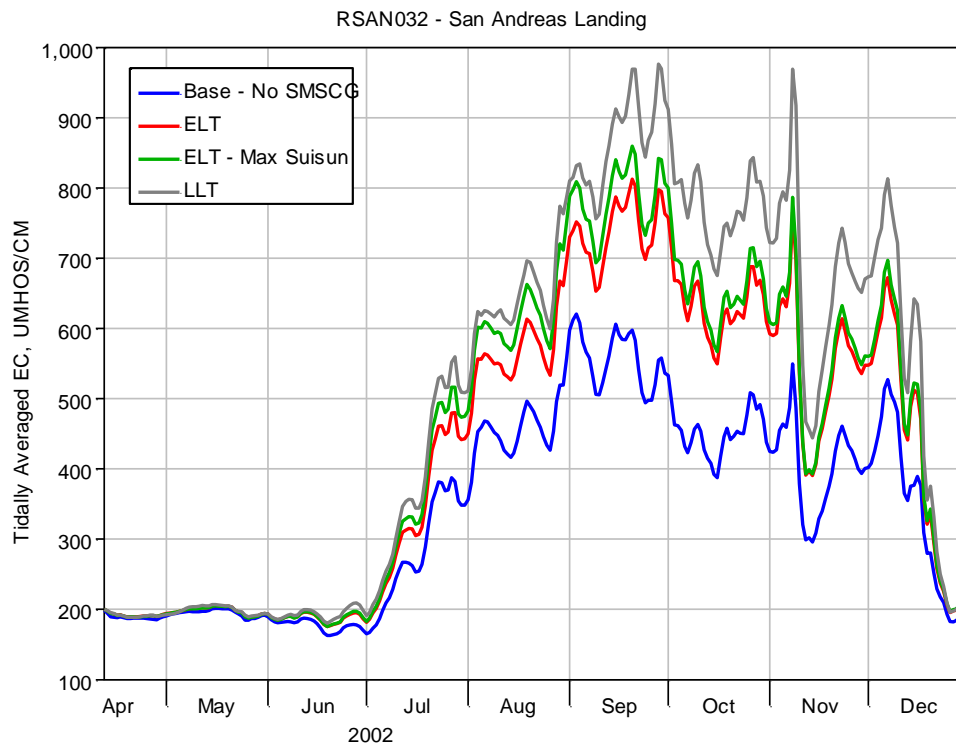


Figure 5-11 Tidally averaged EC at RSAC032 for Base – No SMSCG, ELT and ELT – Max Suisun.

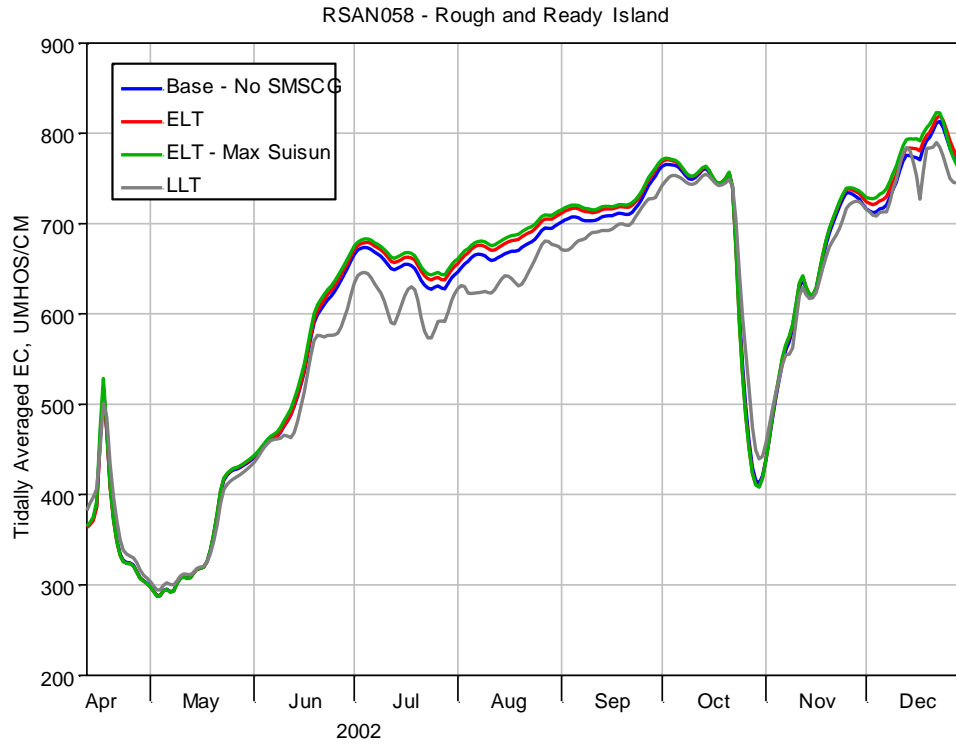


Figure 5-12 Tidally averaged EC at RSAN058 for Base – No SMSCG, ELT and ELT – Max Suisun.

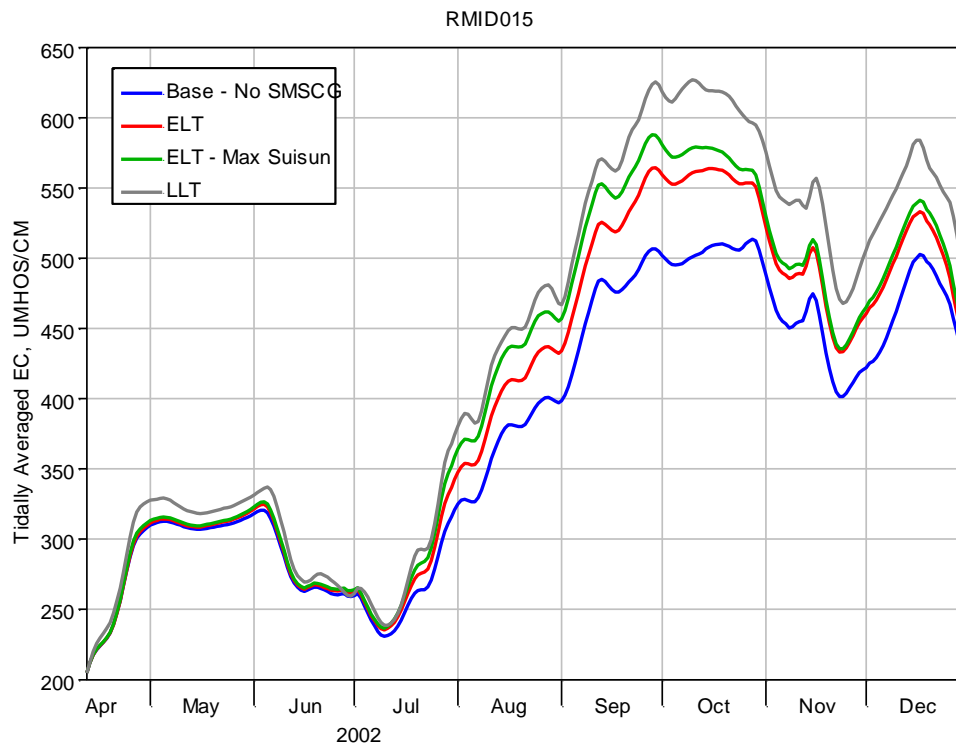


Figure 5-13 Tidally averaged EC at RMID015 for Base – No SMSCG, ELT and ELT – Max Suisun.

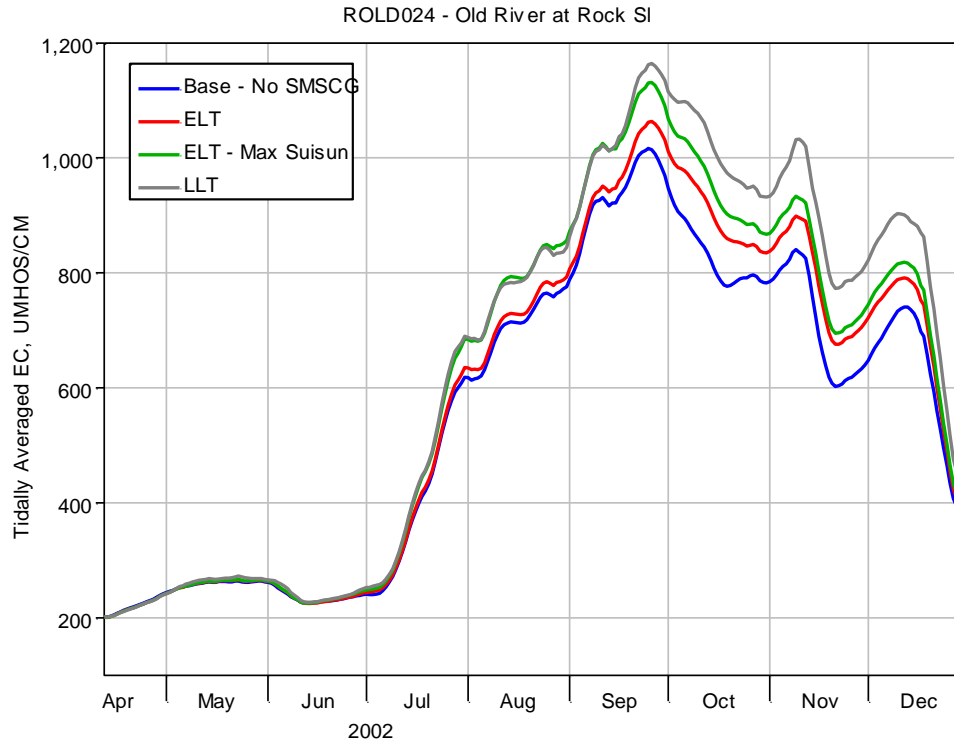


Figure 5-14 Tidally averaged EC at ROLD024 for Base – No SMSCG, ELT and ELT – Max Suisun.

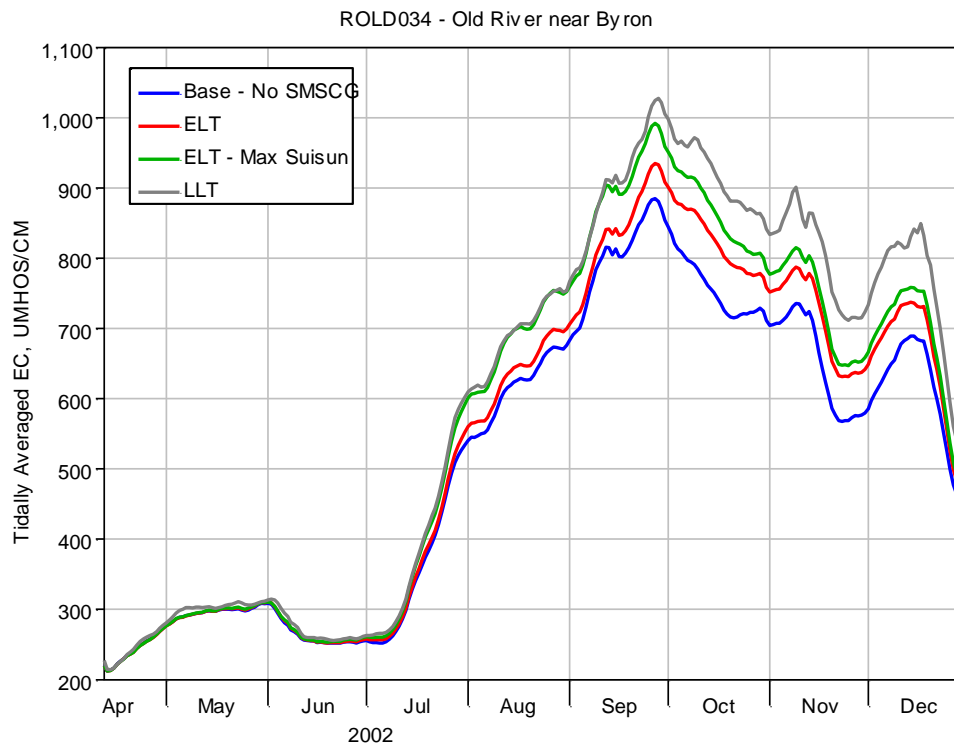


Figure 5-15 Tidally averaged EC at SWP for Base – No SMSCG, ELT and ELT – Max Suisun.

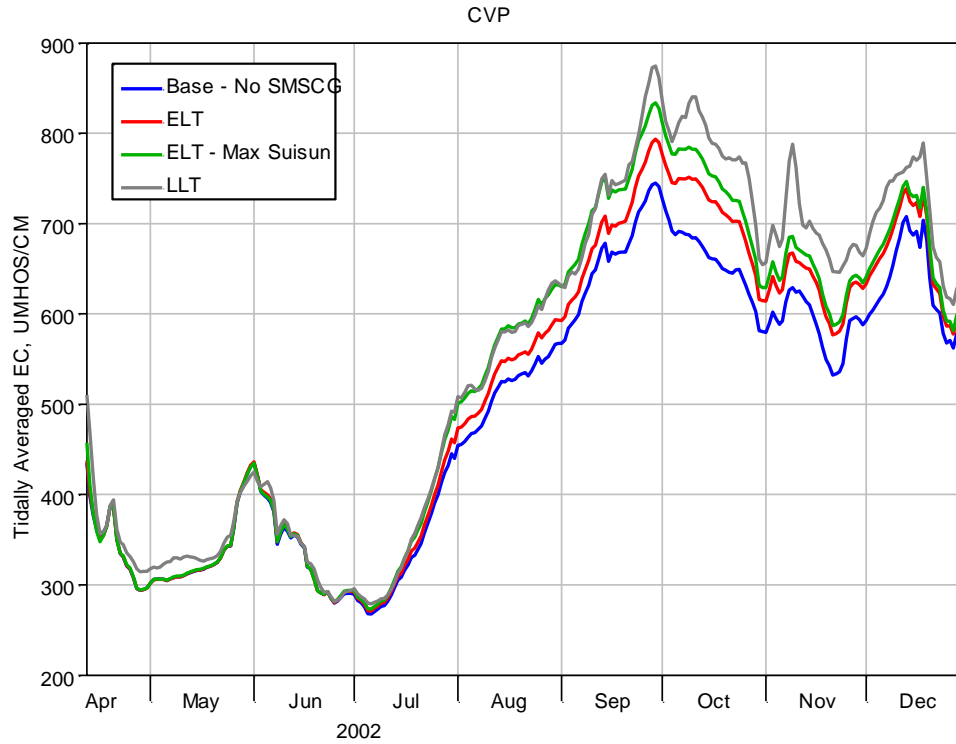


Figure 5-16 Tidally averaged EC at CVP for Base – No SMSCG, ELT and ELT – Max Suisun.

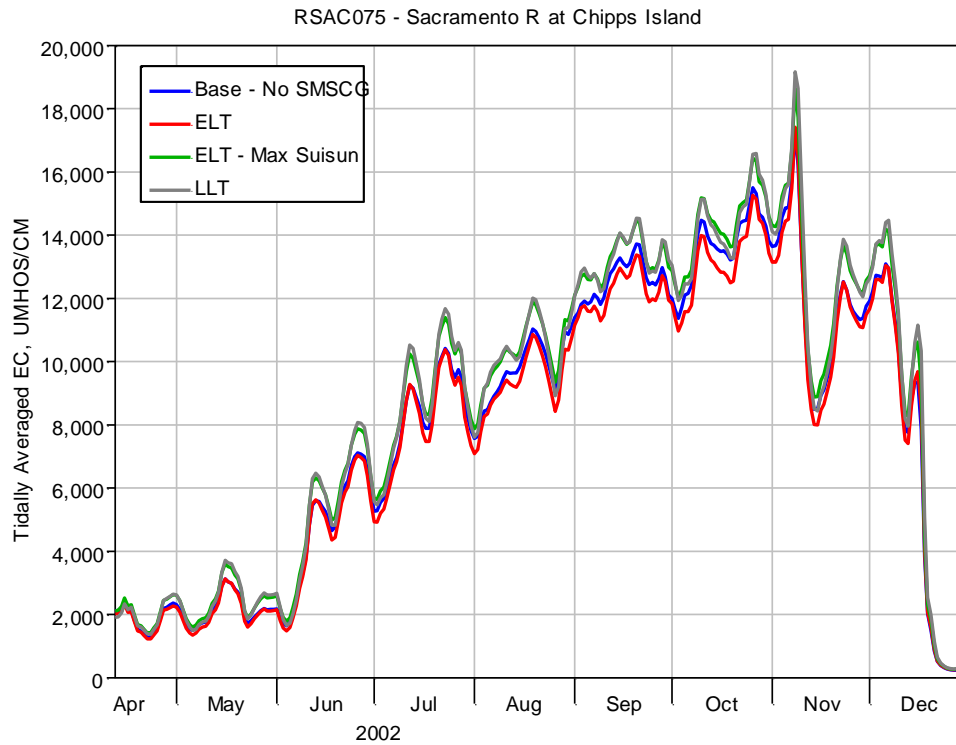


Figure 5-17 Tidally averaged EC at RSAC075 for Base – No SMSCG, ELT and ELT – Max Suisun.

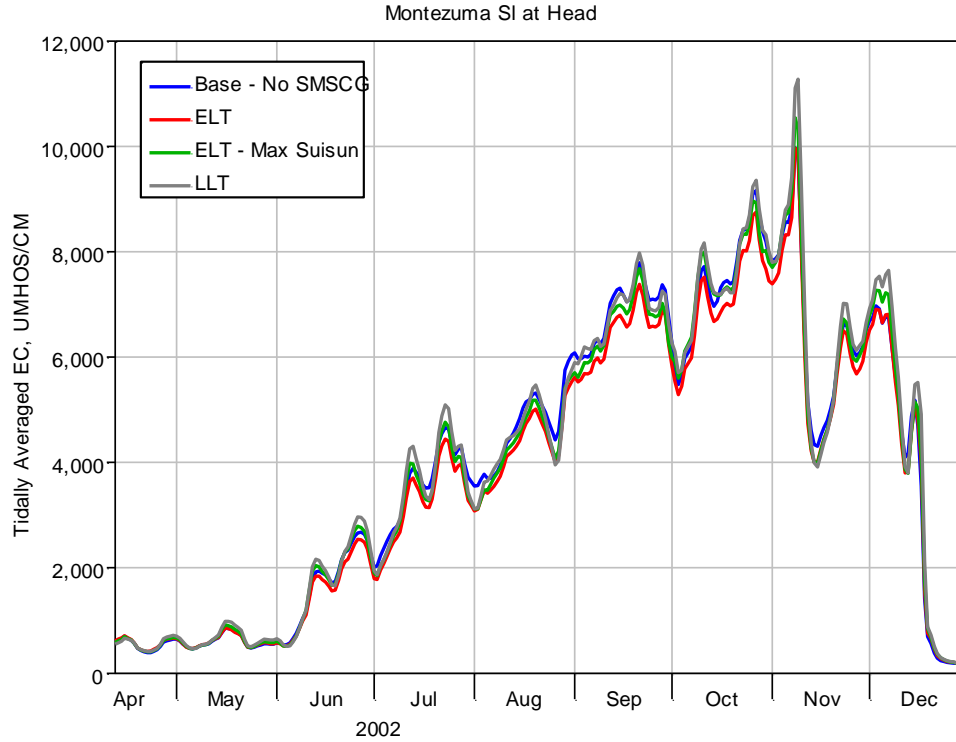


Figure 5-18 Tidally averaged EC at Montezuma SL at Head for Base – No SMSCG, ELT and ELT – Max Suisun.

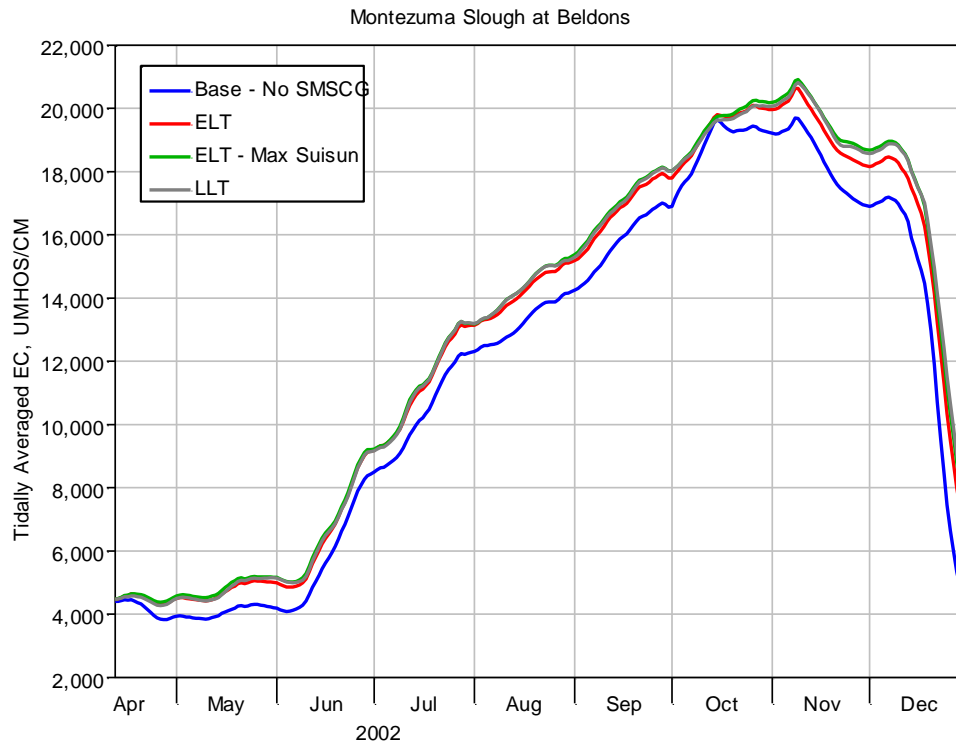


Figure 5-19 Tidally averaged EC at Montezuma Slough at Beldon's for Base – No SMSCG, ELT and ELT – Max Suisun.

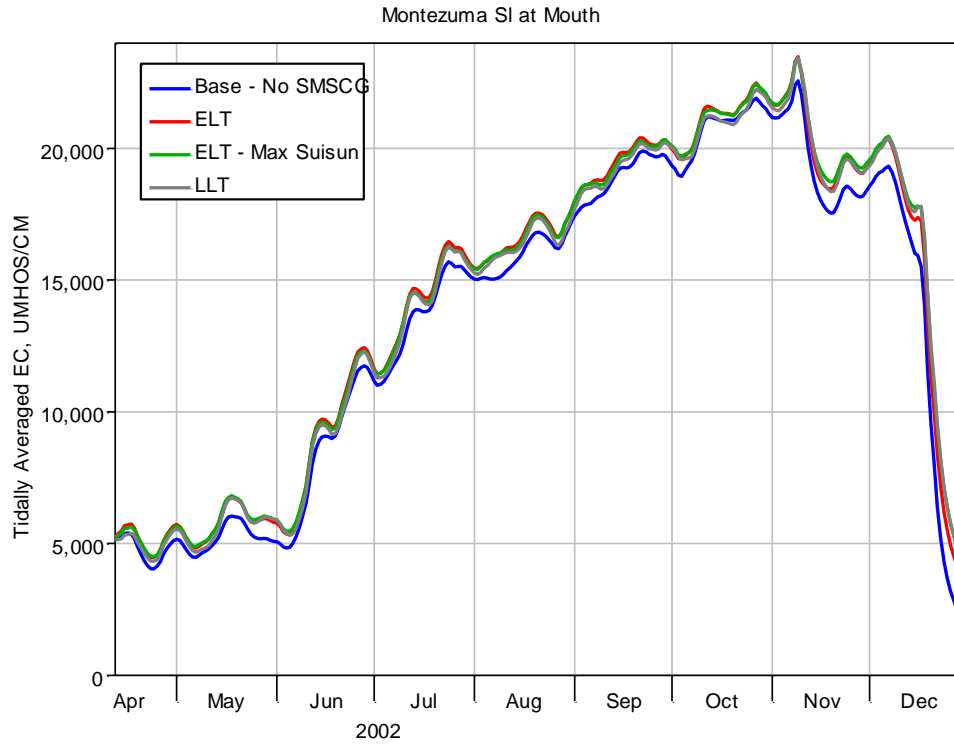


Figure 5-20 Tidally averaged EC at Montezuma SL at Mouth for Base – No SMSCG, ELT and ELT – Max Suisun.

5.1.2 Spatial Plots of EC Change

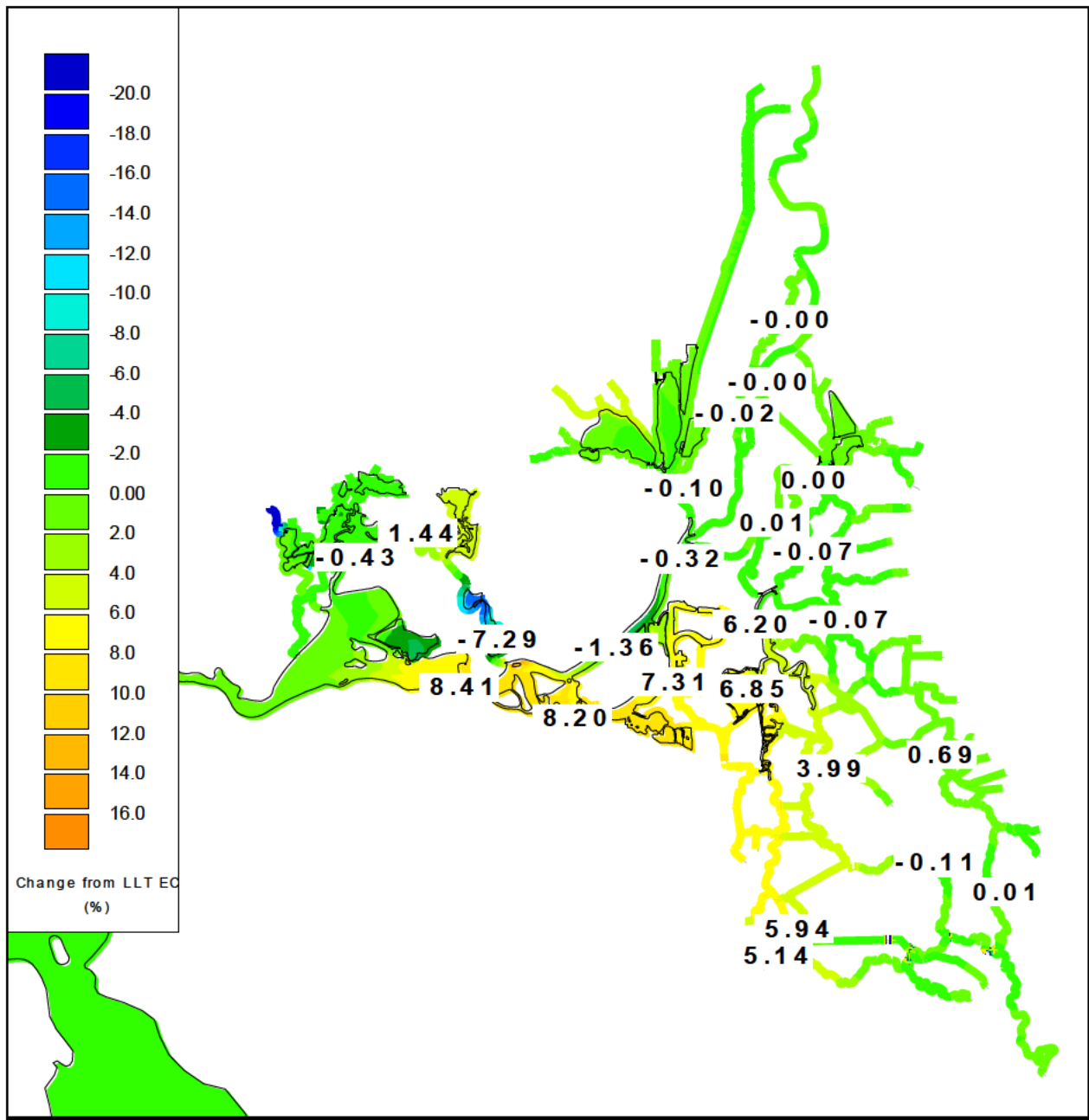


Figure 5-21 Contour plots of ELT – Max Suisun change from ELT tidally averaged EC on September 24, 2002.

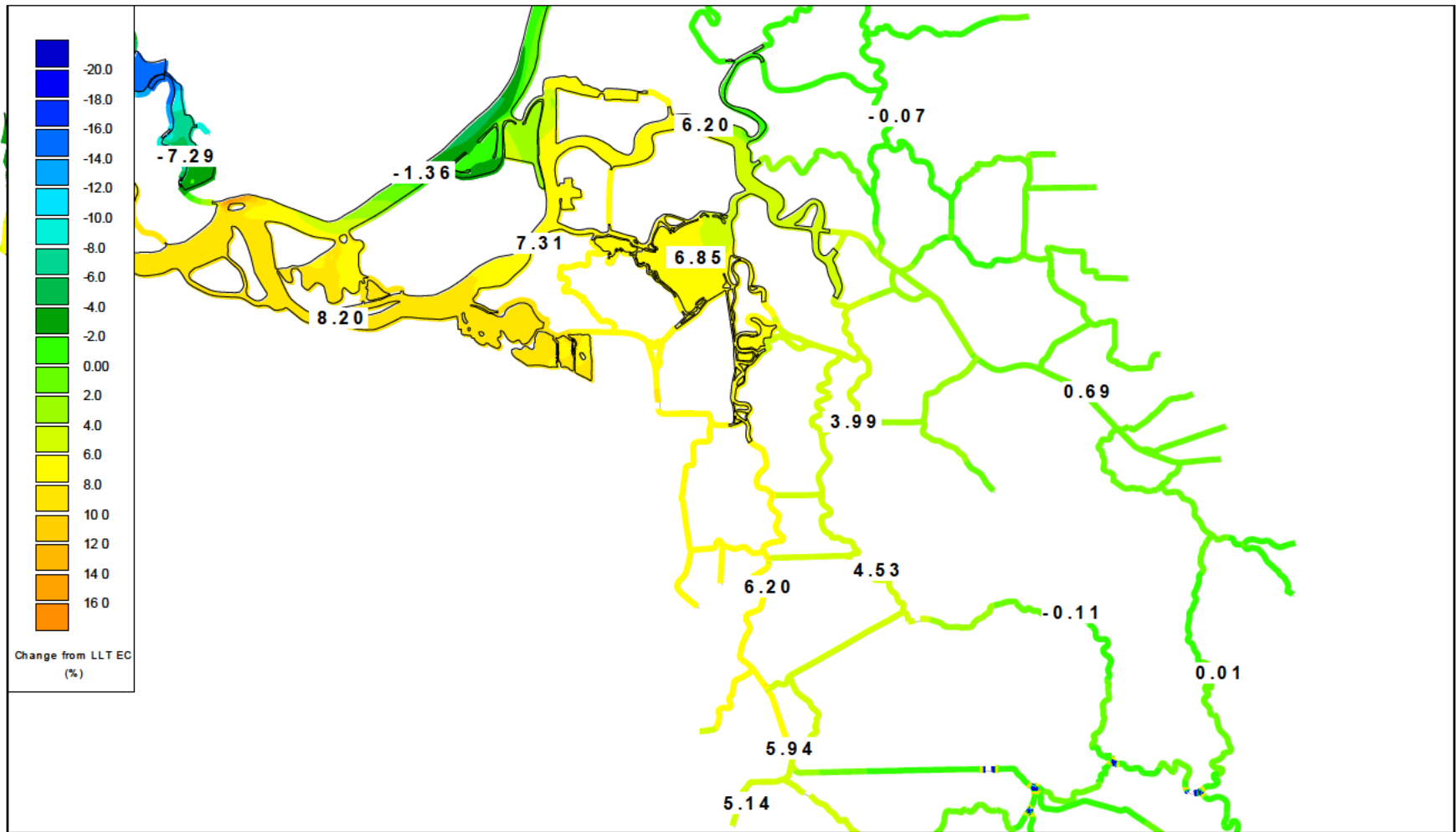


Figure 5-22 Contour plots of ELT – Max Suisun change from ELT tidally averaged EC in south Delta on September 24, 2002.

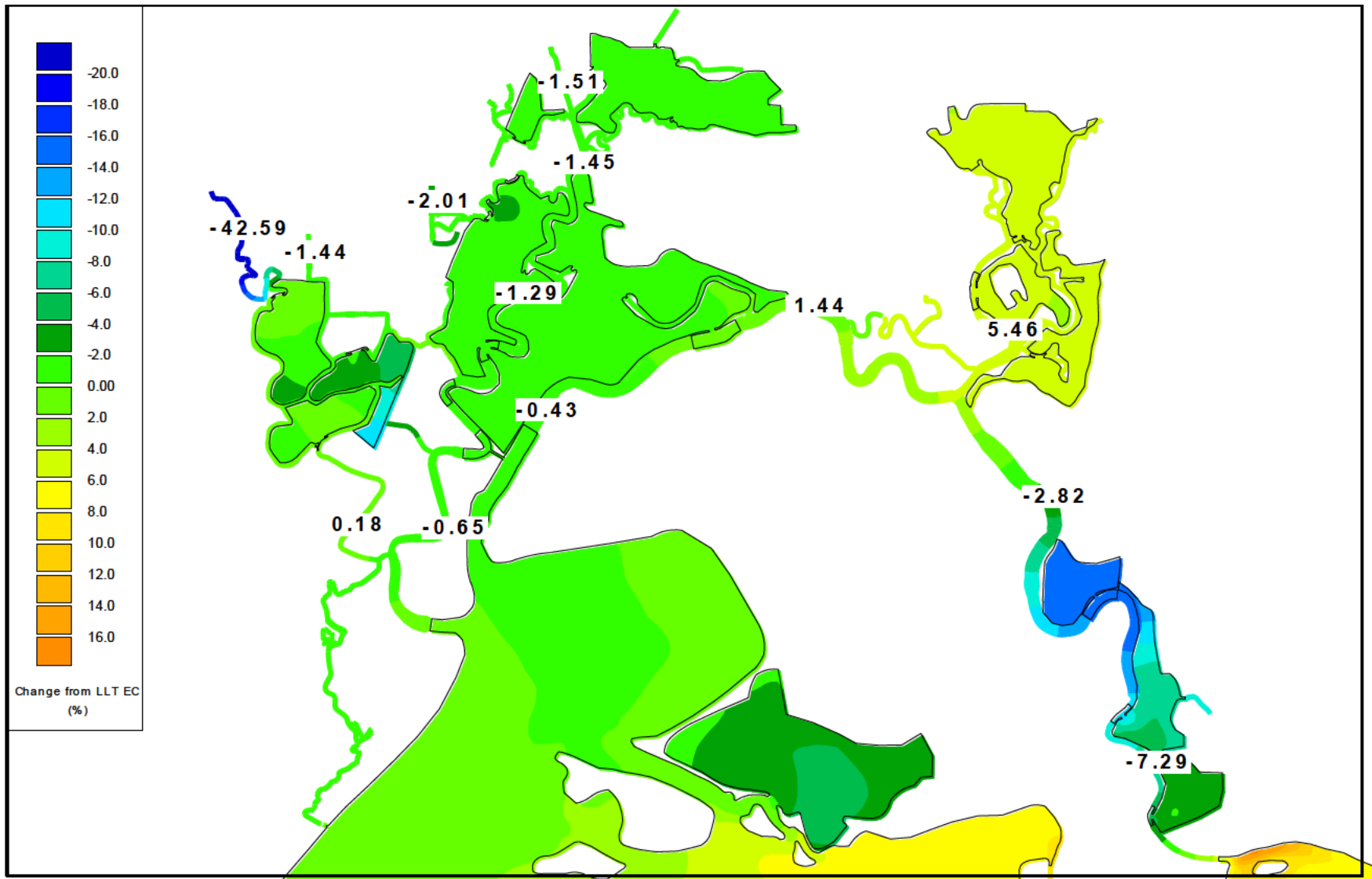


Figure 5-23 Contour plots of ELT – Max Suisun change from ELT tidally averaged EC in Suisun Marsh on September 24, 2002.

5.1.3 X2 Time Series

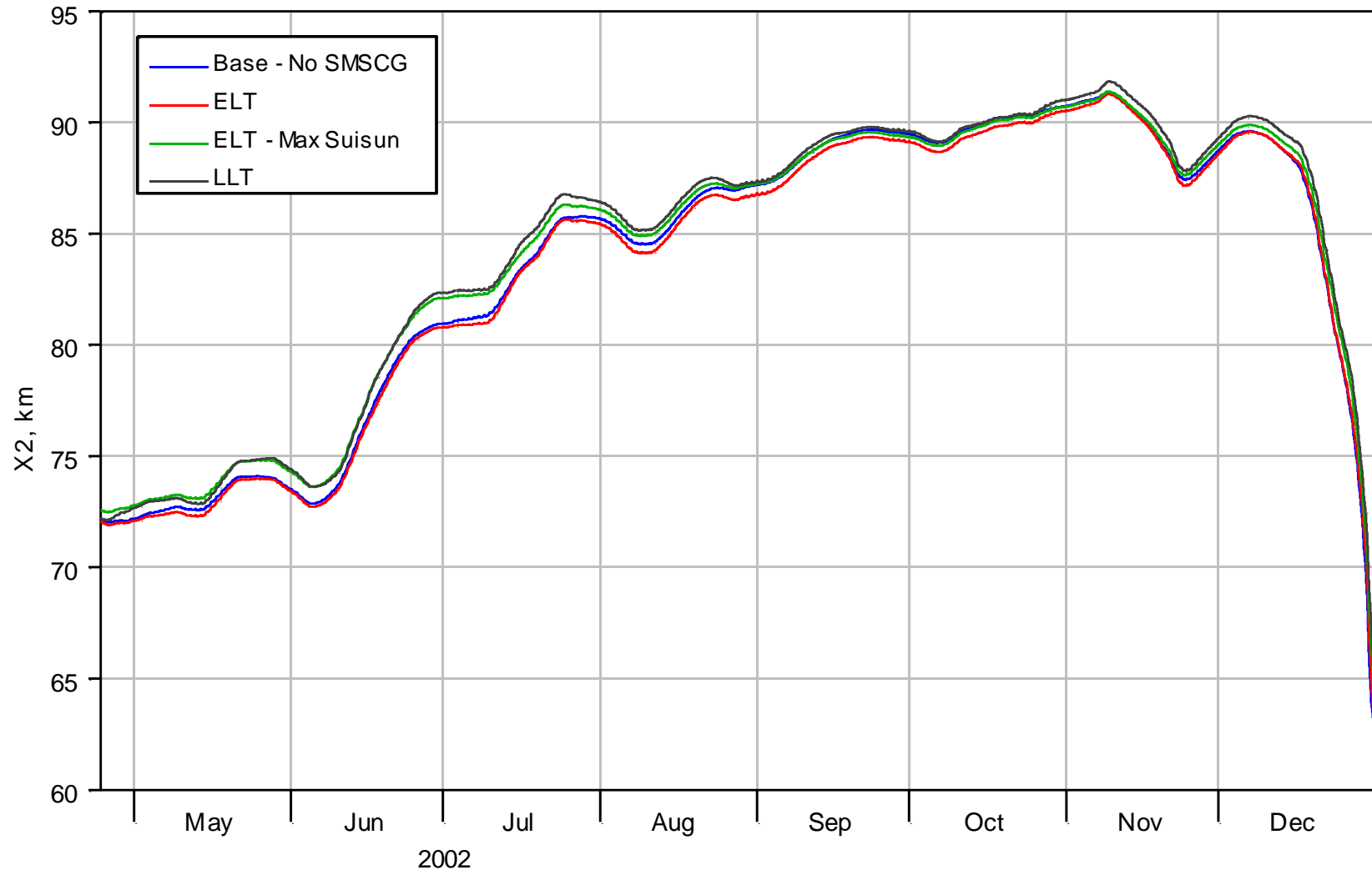


Figure 5-24 Time series of X2 for Base - No SMSCG, ELT, ELT - Max Suisun and LLT.

5.2 LLT – No South Delta ROA

EC results for the LLT – No South case are shown as time series plots of tidally averaged values in Figure 5-25 through Figure 5-46. LLT – No South EC results are very similar to LLT in the North Delta. Relative to LLT, LLT – No South decreased EC in the San Joaquin River at Jersey Point and San Andreas and increases it at Rough and Ready Island. In the south Delta, EC generally tends to decrease relative to LLT during the spring, fall and winter, when exports are lower, and increase very slightly during the summer when exports are high. Changes in Montezuma Slough are small. None of the scenarios impact EC at Freeport.

Contour plots of tidally averaged EC percent change from LLT on September 24, 2002 are shown in Figure 5-47 through Figure 5-49 for the Delta, the south and central Delta and for Suisun Marsh. Throughout most of the model domain, the LLT – No South case results in small EC changes (within +/-2%) relative to LLT. There are isolated areas with larger changes, including the channels where the South Delta ROA breaches were located in the LLT case, Sherman Island in the West Delta ROA and in Threemile Slough and the Sacramento River adjacent to the breach. There is a steep EC gradient between the Sacramento River and Threemile Slough at this time, so the small increase in Threemile Slough tidal prism (see Table 4-6) impacts salinity at this location.

A summary of July – December 2002 monthly average EC at key locations throughout the Delta is provided in Table 5-3 for Base – No MRB, LLT and LLT – No South. Percent change in monthly average EC relative to the base case are provided in Table 5-4 for LLT and LLT – No South. LLT – No South changes from base are generally within 2% of LLT changes from base.

Removal of the south Delta ROA has minimal impact on X2, as shown in Figure 5-50. Differences between LLT and LLT – No South are generally less than 0.1 km.

Table 5-3 Summary of July - December 2002 monthly average EC for Base - No MRB, LLT and LLT – No South.

| Location | Monthly Average EC (umhos/cm) | | | | | | | | | | | | | | | | | |
|-----------------------|-------------------------------|-------|----------------|---------------|-------|----------------|----------------|-------|----------------|---------------|-------|----------------|---------------|-------|----------------|---------------|-------|----------------|
| | July 2002 | | | August 2002 | | | September 2002 | | | October 2002 | | | November 2002 | | | December 2002 | | |
| | Base - No MRB | LLT | LLT - No South | Base - No MRB | LLT | LLT - No South | Base - No MRB | LLT | LLT - No South | Base - No MRB | LLT | LLT - No South | Base - No MRB | LLT | LLT - No South | Base - No MRB | LLT | LLT - No South |
| Cache Sl at Ryer | 136 | 135 | 135 | 153 | 150 | 150 | 176 | 173 | 173 | 164 | 160 | 161 | 189 | 188 | 188 | 196 | 193 | 193 |
| CCWD Victoria Canal | 264 | 288 | 286 | 367 | 432 | 436 | 469 | 553 | 563 | 511 | 615 | 614 | 453 | 543 | 522 | 482 | 561 | 553 |
| CVP | 333 | 354 | 358 | 515 | 572 | 583 | 664 | 745 | 756 | 658 | 780 | 781 | 587 | 688 | 679 | 631 | 704 | 697 |
| Montezuma Sl at Head | 3536 | 3567 | 3567 | 4650 | 4521 | 4550 | 6853 | 6816 | 6785 | 7400 | 7510 | 7511 | 6555 | 6739 | 6713 | 3149 | 3440 | 3393 |
| Montezuma Sl at Mouth | 13705 | 14112 | 14063 | 15976 | 16392 | 16351 | 18958 | 19301 | 19219 | 20766 | 20950 | 20878 | 19465 | 20279 | 20190 | 12062 | 13926 | 13798 |
| RMID015 | 261 | 285 | 285 | 367 | 437 | 437 | 469 | 565 | 567 | 503 | 612 | 607 | 442 | 522 | 513 | 463 | 542 | 534 |
| RMID023 | 262 | 285 | 285 | 367 | 436 | 436 | 468 | 560 | 564 | 507 | 614 | 611 | 448 | 527 | 518 | 477 | 552 | 547 |
| ROLD024 | 401 | 438 | 440 | 707 | 781 | 787 | 934 | 1049 | 1052 | 826 | 1014 | 1003 | 712 | 891 | 874 | 607 | 744 | 725 |
| ROLD034 | 360 | 392 | 393 | 615 | 692 | 693 | 804 | 912 | 913 | 755 | 915 | 912 | 651 | 801 | 789 | 601 | 732 | 711 |
| RSAC075 Chipps Island | 8209 | 8880 | 8884 | 9741 | 10267 | 10303 | 12563 | 13253 | 13195 | 13606 | 14160 | 14153 | 11990 | 12802 | 12790 | 6035 | 6735 | 6671 |
| RSAC092 Emmaton | 623 | 629 | 636 | 808 | 742 | 761 | 1498 | 1384 | 1400 | 2012 | 1919 | 1946 | 1748 | 1782 | 1790 | 821 | 874 | 878 |
| RSAC101 Rio Vista | 148 | 146 | 146 | 176 | 162 | 163 | 241 | 213 | 215 | 285 | 264 | 268 | 290 | 308 | 310 | 222 | 232 | 232 |
| RSAC123 | 127 | 127 | 127 | 154 | 155 | 155 | 165 | 165 | 165 | 142 | 142 | 142 | 184 | 184 | 184 | 169 | 168 | 168 |
| RSAC155 Freeport | 126 | 126 | 126 | 156 | 156 | 156 | 162 | 162 | 162 | 142 | 142 | 142 | 184 | 184 | 184 | 164 | 164 | 164 |
| RSAN018 Jersey Pt | 954 | 1028 | 1029 | 1461 | 1519 | 1530 | 1975 | 2116 | 2103 | 1728 | 1913 | 1895 | 1503 | 1766 | 1730 | 945 | 1108 | 1078 |
| RSAN032 San Andreas | 284 | 383 | 385 | 459 | 649 | 656 | 555 | 871 | 868 | 448 | 773 | 763 | 403 | 668 | 658 | 333 | 480 | 471 |
| RSAN058 | 643 | 612 | 660 | 664 | 644 | 686 | 711 | 698 | 726 | 674 | 682 | 674 | 636 | 629 | 642 | 763 | 751 | 778 |
| S-49 Beldon's Landing | 10402 | 11292 | 11226 | 13266 | 14335 | 14233 | 15826 | 16973 | 16861 | 18856 | 19371 | 19254 | 18357 | 19659 | 19517 | 12766 | 15349 | 15164 |
| SWP | 329 | 360 | 359 | 540 | 615 | 616 | 698 | 807 | 804 | 682 | 835 | 823 | 593 | 725 | 708 | 594 | 691 | 679 |

Table 5-4 Summary of July - December 2002 percent change in monthly average EC for LLT and LLT – No South relative to Base - No MRB.

| Location | Percent Change in Monthly Average EC (umhos/cm) Relative to Base Case | | | | | | | | | | | |
|-----------------------|---|----------------|-------------|----------------|----------------|----------------|--------------|----------------|---------------|----------------|---------------|----------------|
| | July 2002 | | August 2002 | | September 2002 | | October 2002 | | November 2002 | | December 2002 | |
| | LLT | LLT - No South | LLT | LLT - No South | LLT | LLT - No South | LLT | LLT - No South | LLT | LLT - No South | LLT | LLT - No South |
| Cache SI at Ryer | -1% | -1% | -2% | -2% | -1% | -1% | -2% | -2% | -1% | -1% | -2% | -2% |
| CCWD Victoria Canal | 9% | 9% | 18% | 19% | 18% | 20% | 20% | 20% | 20% | 15% | 16% | 15% |
| CVP | 7% | 8% | 11% | 13% | 12% | 14% | 19% | 19% | 17% | 16% | 12% | 11% |
| Montezuma SI at Head | 1% | 1% | -3% | -2% | -1% | -1% | 1% | 1% | 3% | 2% | 9% | 8% |
| Montezuma SI at Mouth | 3% | 3% | 3% | 2% | 2% | 1% | 1% | 1% | 4% | 4% | 15% | 14% |
| RMID015 | 9% | 9% | 19% | 19% | 20% | 21% | 22% | 21% | 18% | 16% | 17% | 15% |
| RMID023 | 9% | 9% | 19% | 19% | 20% | 21% | 21% | 21% | 18% | 16% | 16% | 15% |
| ROLD024 | 9% | 10% | 10% | 11% | 12% | 13% | 23% | 21% | 25% | 23% | 23% | 19% |
| ROLD034 | 9% | 9% | 13% | 13% | 13% | 14% | 21% | 21% | 23% | 21% | 22% | 18% |
| RSAC075 Chipps Island | 8% | 8% | 5% | 6% | 5% | 5% | 4% | 4% | 7% | 7% | 12% | 11% |
| RSAC092 Emmaton | 1% | 2% | -8% | -6% | -8% | -6% | -5% | -3% | 2% | 2% | 6% | 7% |
| RSAC101 Rio Vista | -2% | -1% | -8% | -7% | -12% | -10% | -7% | -6% | 6% | 7% | 5% | 5% |
| RSAC123 | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| RSAC155 Freeport | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| RSAN018 Jersey Pt | 8% | 8% | 4% | 5% | 7% | 6% | 11% | 10% | 18% | 15% | 17% | 14% |
| RSAN032 San Andreas | 35% | 36% | 42% | 43% | 57% | 56% | 73% | 71% | 66% | 63% | 44% | 41% |
| RSAN058 | -5% | 3% | -3% | 3% | -2% | 2% | 1% | 0% | -1% | 1% | -2% | 2% |
| S-49 Beldon's Landing | 9% | 8% | 8% | 7% | 7% | 7% | 3% | 2% | 7% | 6% | 20% | 19% |
| SWP | 9% | 9% | 14% | 14% | 16% | 15% | 23% | 21% | 22% | 19% | 16% | 14% |

5.2.1 Tidally averaged EC time series



Figure 5-25 Tidally averaged EC at RSAC155 for Base – No MRB, LLT and LLT – No South.

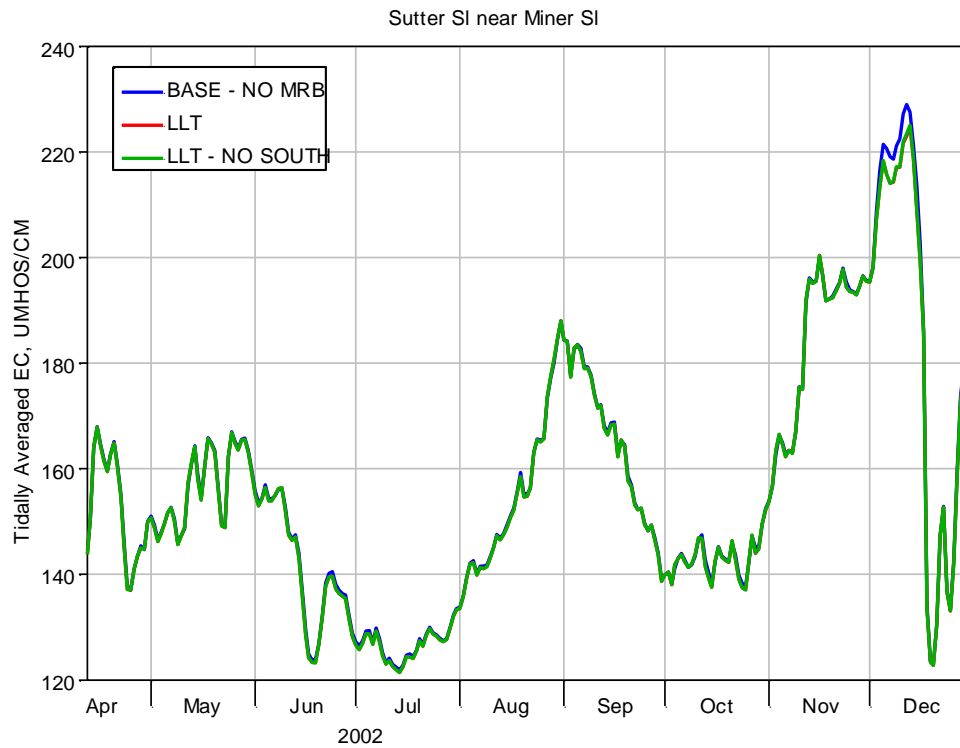


Figure 5-26 Tidally averaged EC in Sutter Slough for Base – No MRB, LLT and LLT – No South.

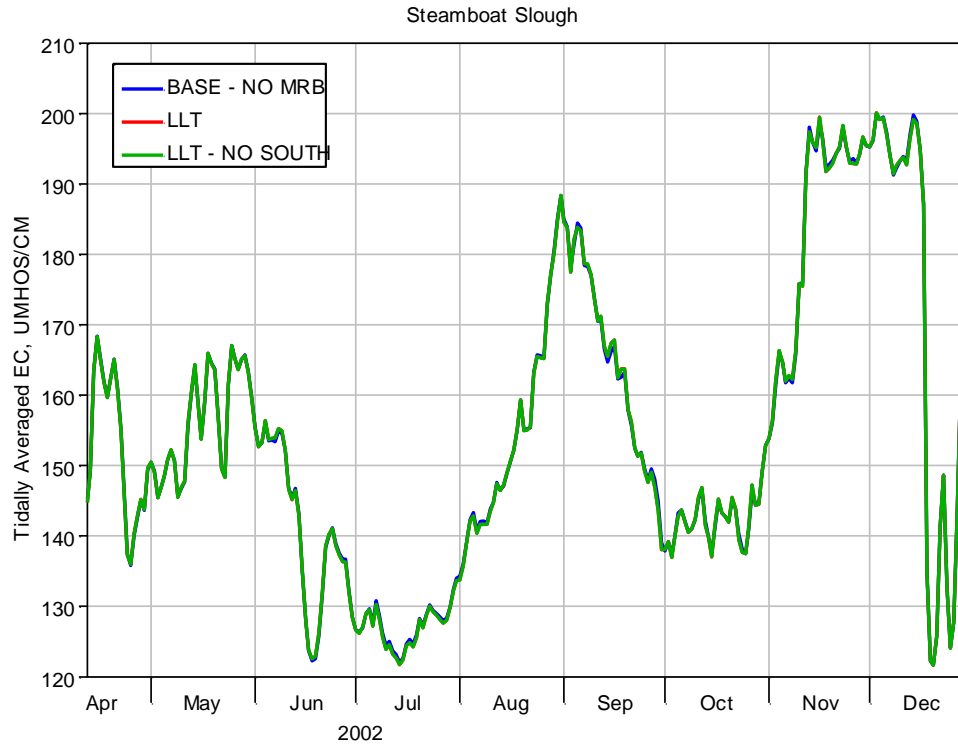


Figure 5-27 Tidally averaged EC in Steamboat Slough for Base – No MRB, LLT and LLT – No South.

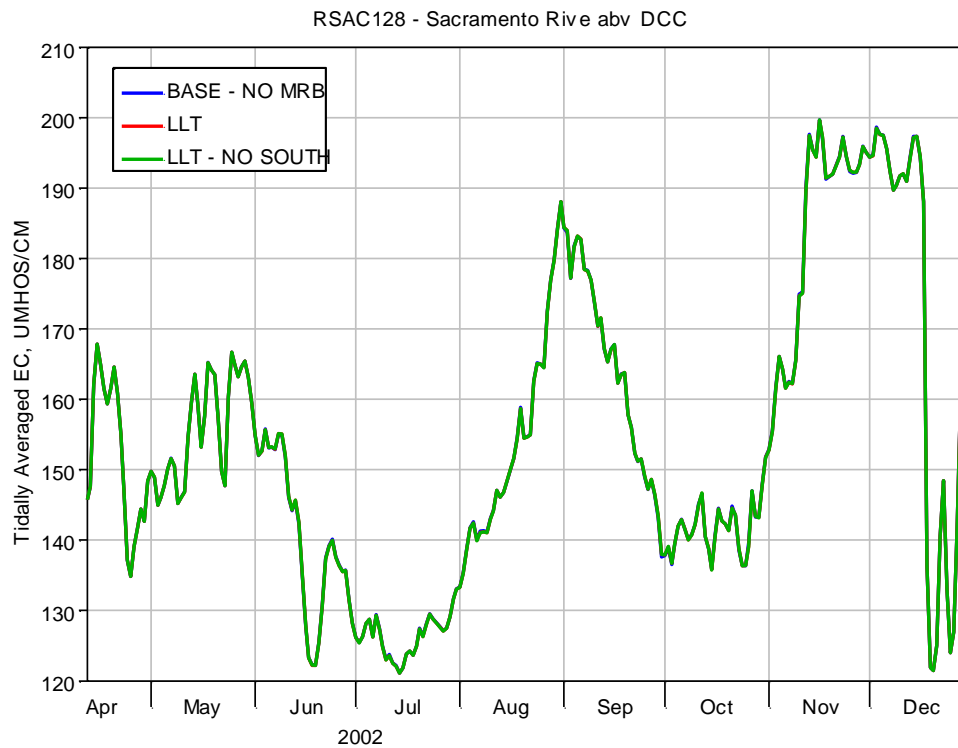


Figure 5-28 Tidally averaged EC at RSAC128 for Base – No MRB, LLT and LLT – No South.

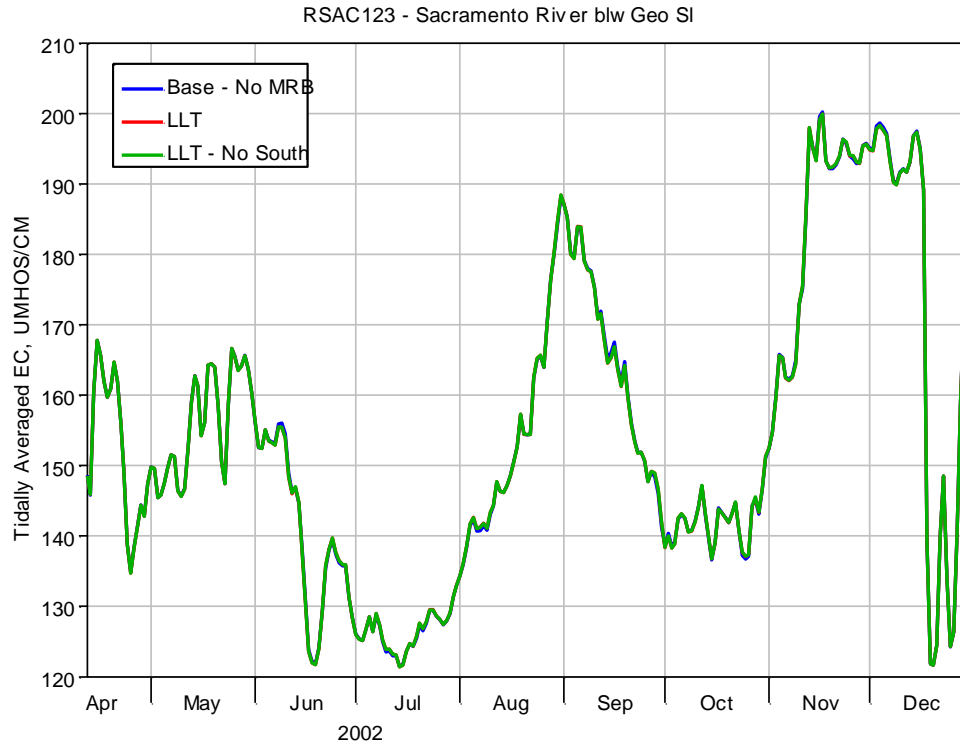


Figure 5-29 Tidally averaged EC at RSAC123 for Base – No MRB, LLT and LLT – No South.

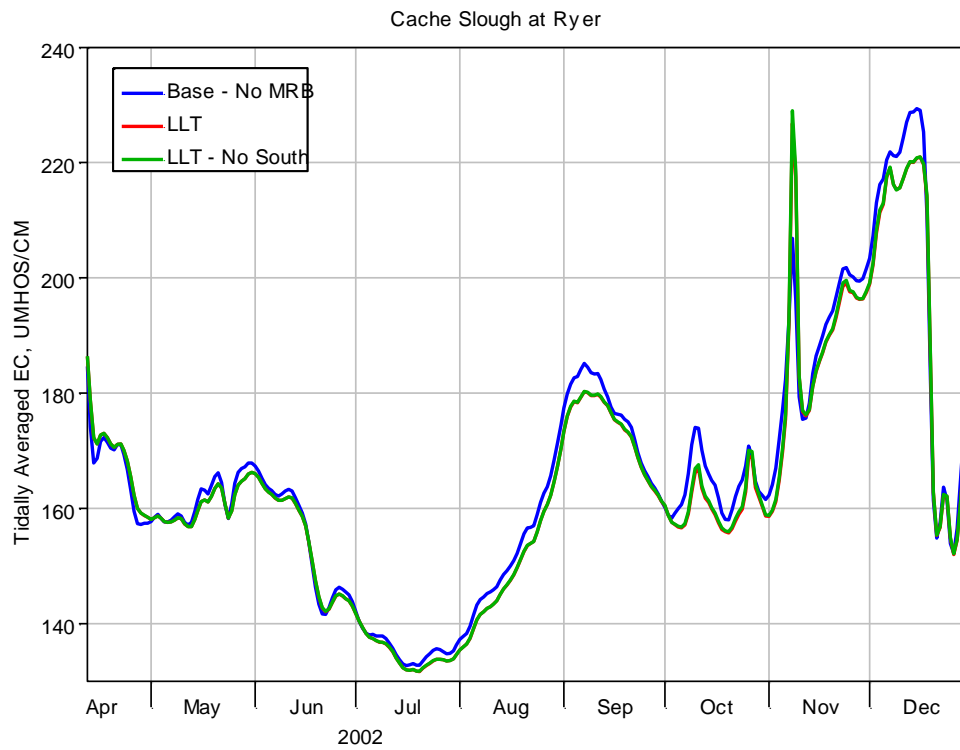


Figure 5-30 Tidally averaged EC in Cache Slough at Ryer for Base – No MRB, LLT and LLT – No South.

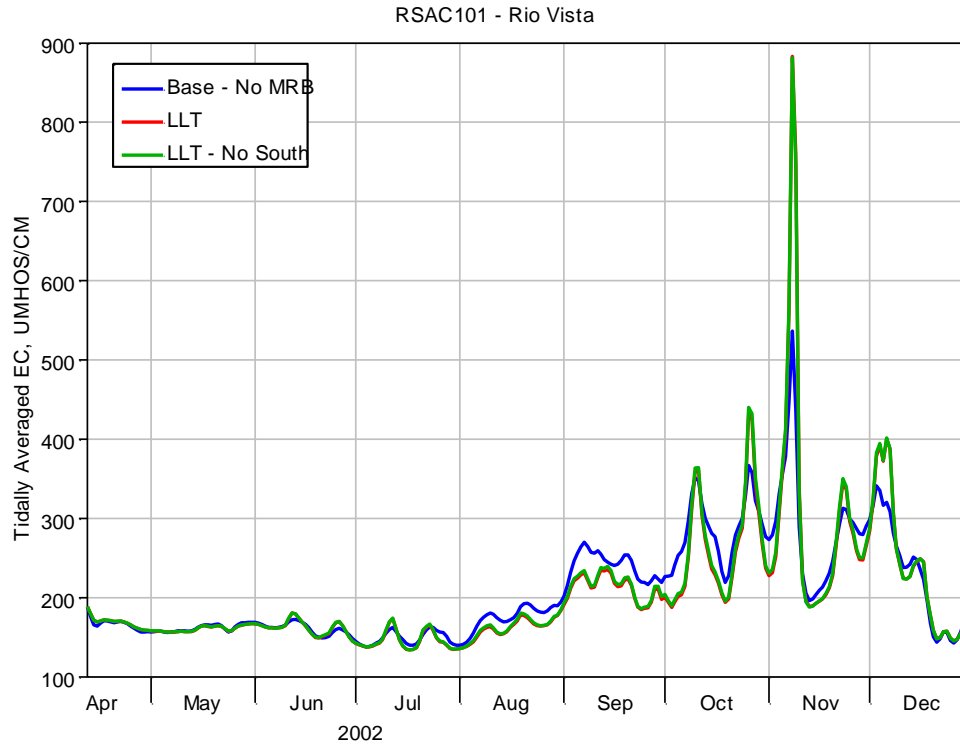


Figure 5-31 Tidally averaged EC at RSAC101 for Base – No MRB, LLT and LLT – No South.

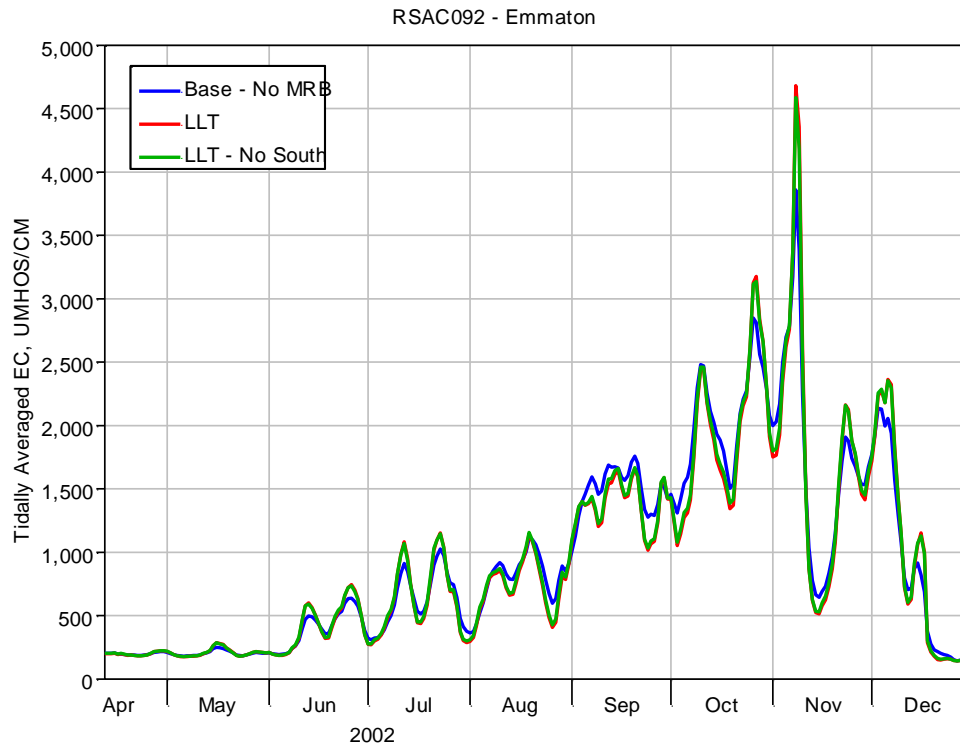


Figure 5-32 Tidally averaged EC at RSAC092 for Base – No MRB, LLT and LLT – No South.

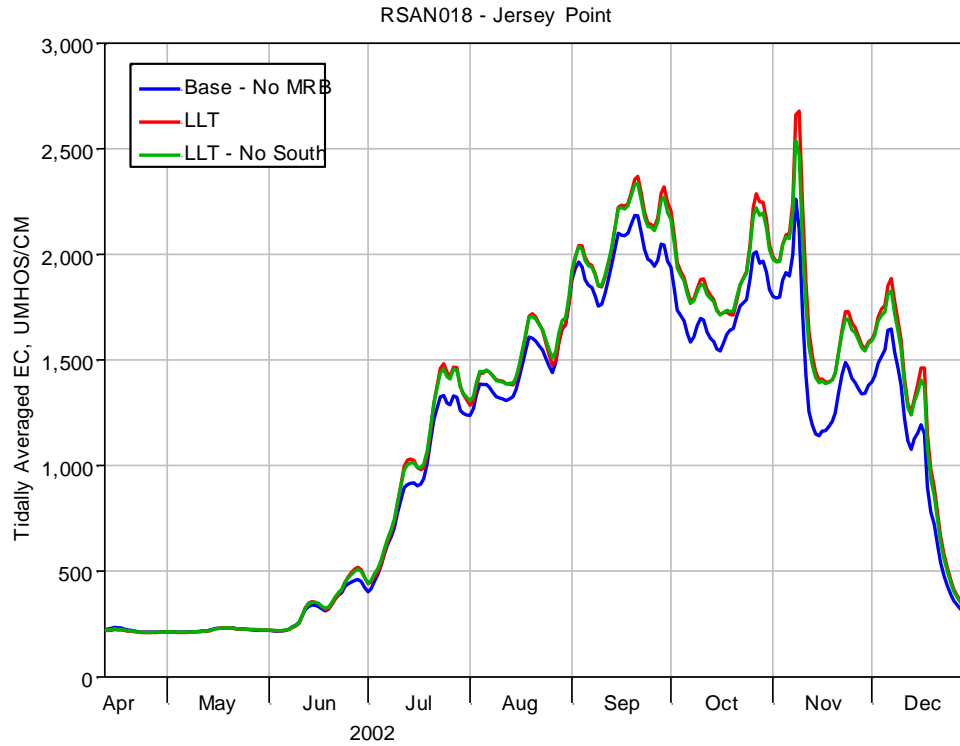


Figure 5-33 Tidally averaged EC at RSAN018 for Base – No MRB, LLT and LLT – No South.

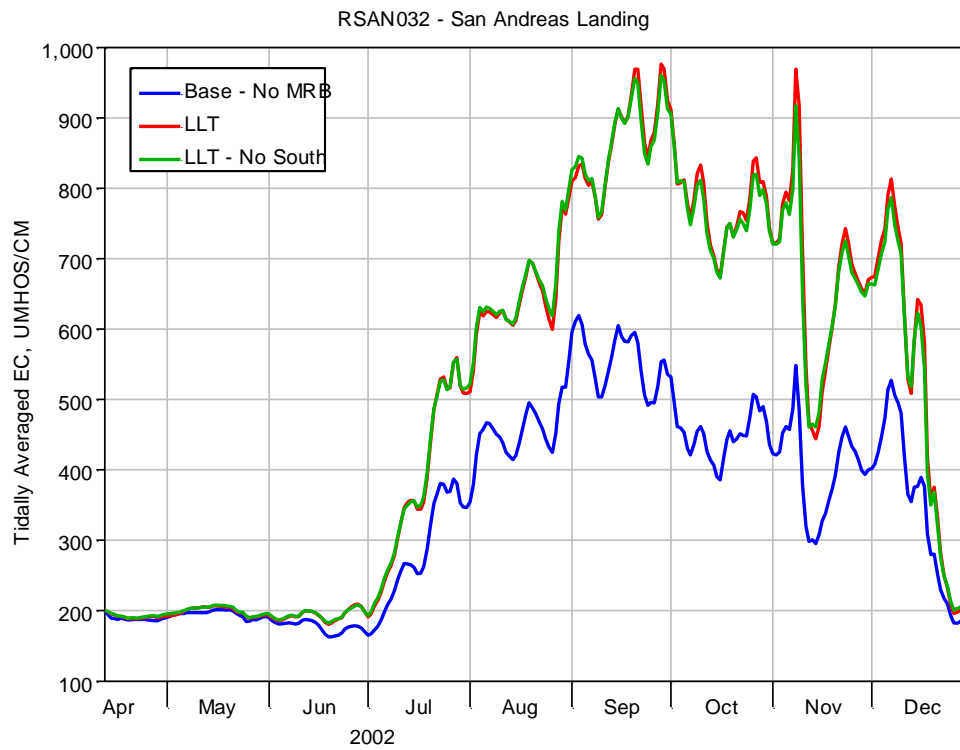


Figure 5-34 Tidally averaged EC at RSAN032 for Base – No MRB, LLT and LLT – No South.

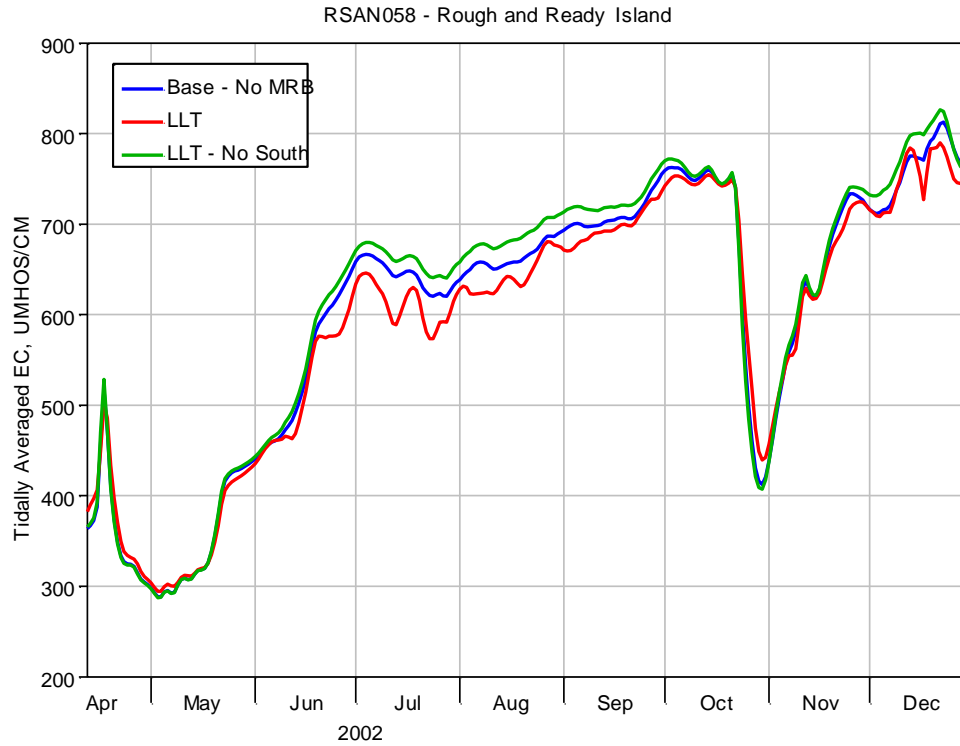


Figure 5-35 Tidally averaged EC at RSAN058 for Base – No MRB, LLT and LLT – No South.

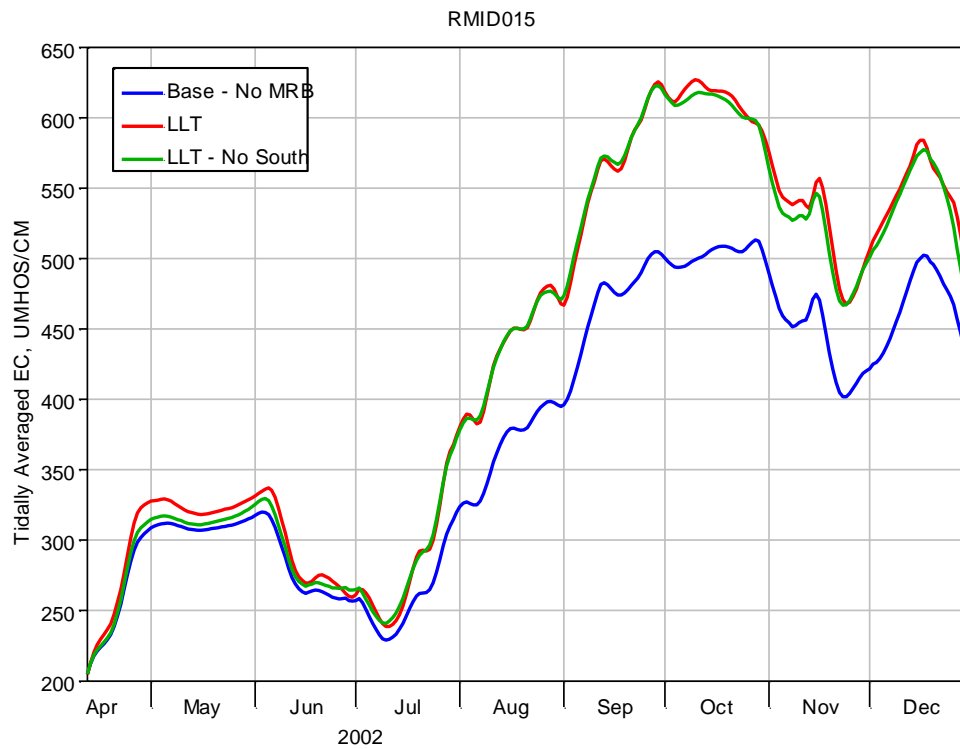


Figure 5-36 Tidally averaged EC at RMID015 for Base – No MRB, LLT and LLT – No South.

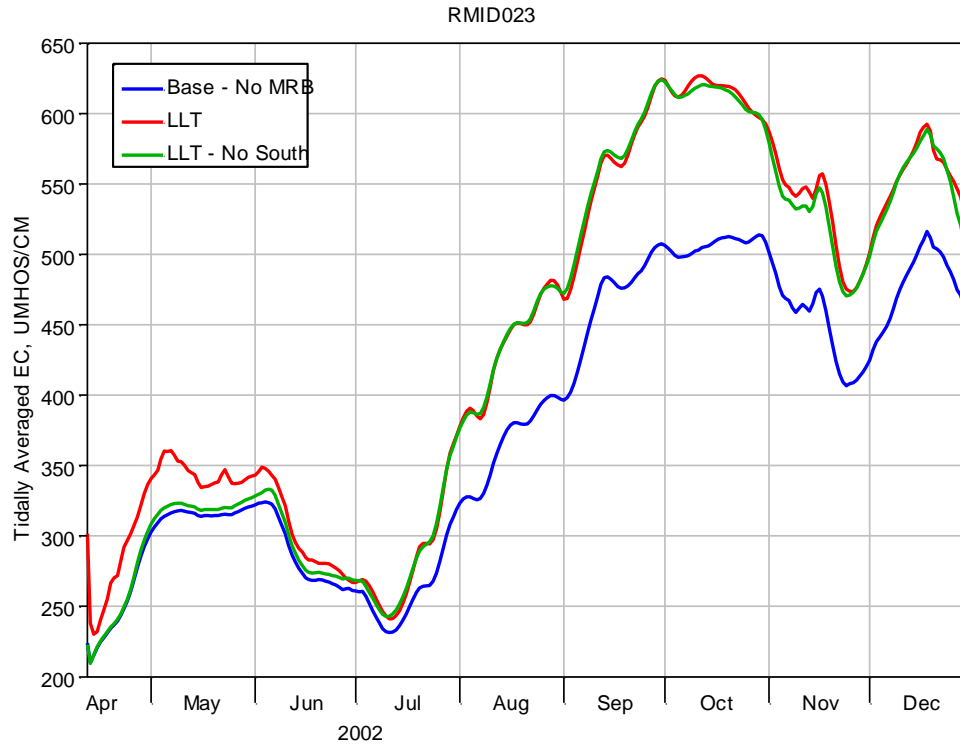


Figure 5-37 Tidally averaged EC at RMID023 for Base – No MRB, LLT and LLT – No South.

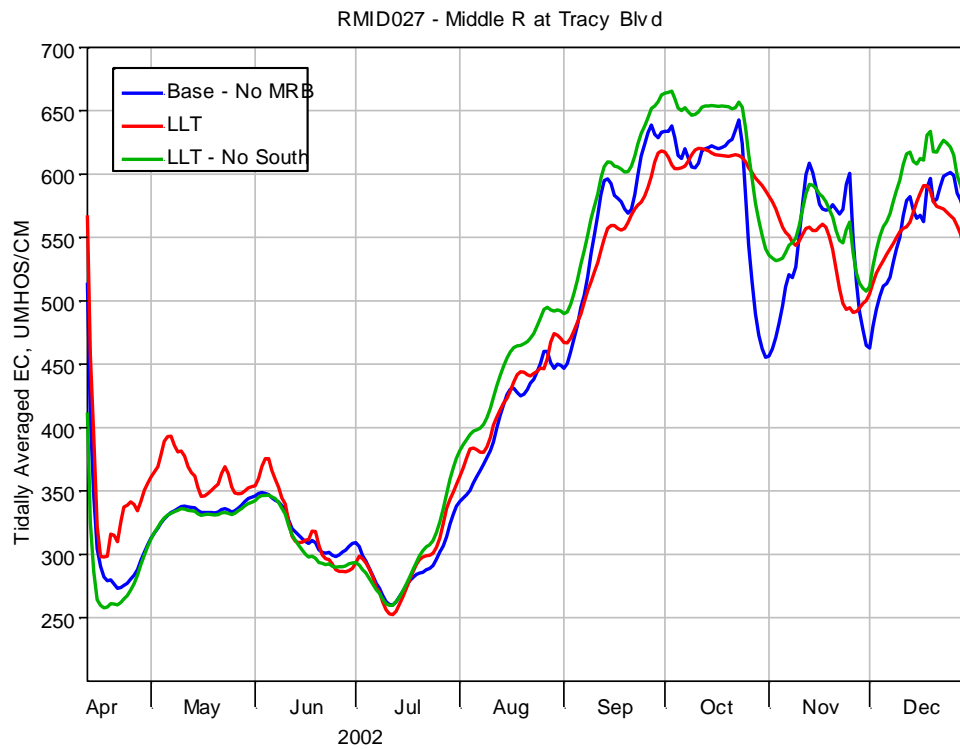


Figure 5-38 Tidally averaged EC at RMID027 for Base – No MRB, LLT and LLT – No South.

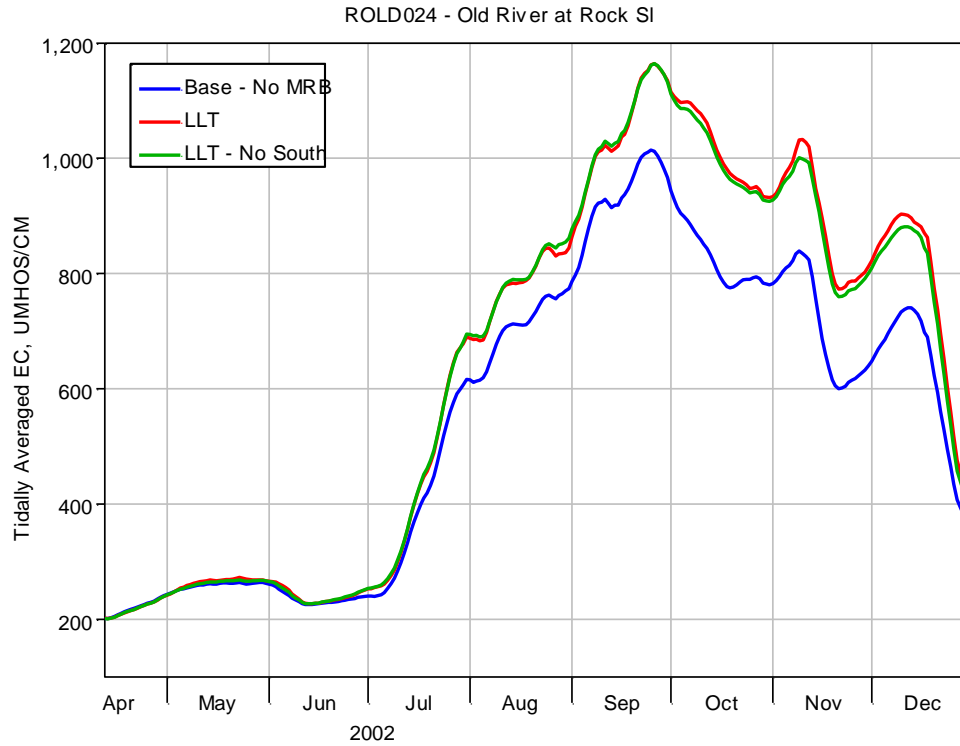


Figure 5-39 Tidally averaged EC at ROLD024 for Base – No MRB, LLT and LLT – No South.

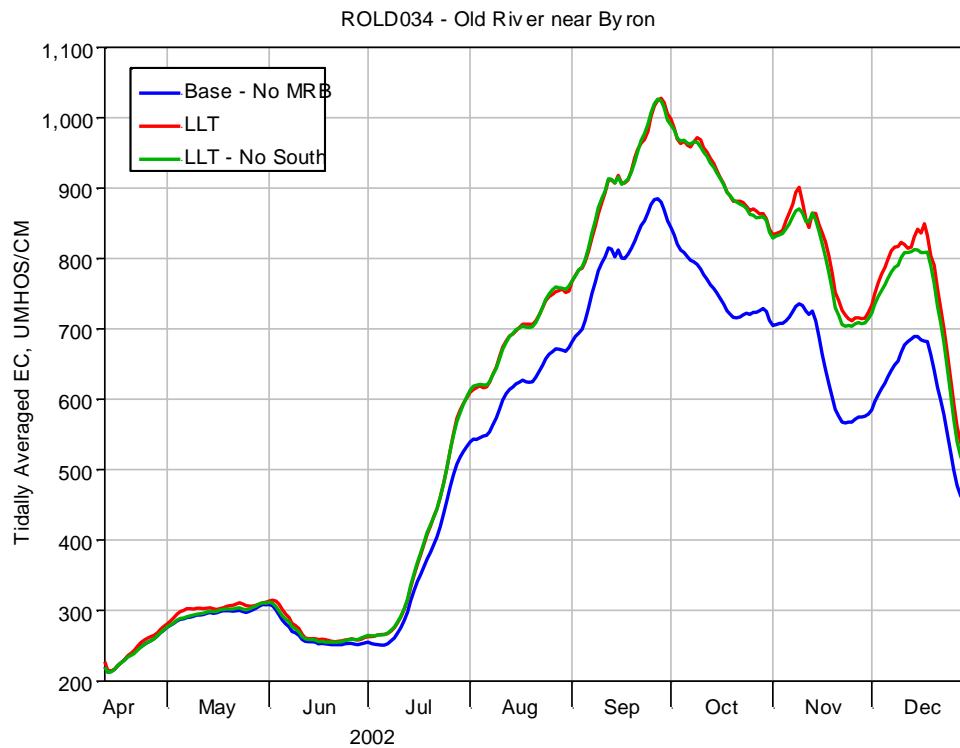


Figure 5-40 Tidally averaged EC at ROLD034 for Base – No MRB, LLT and LLT – No South.

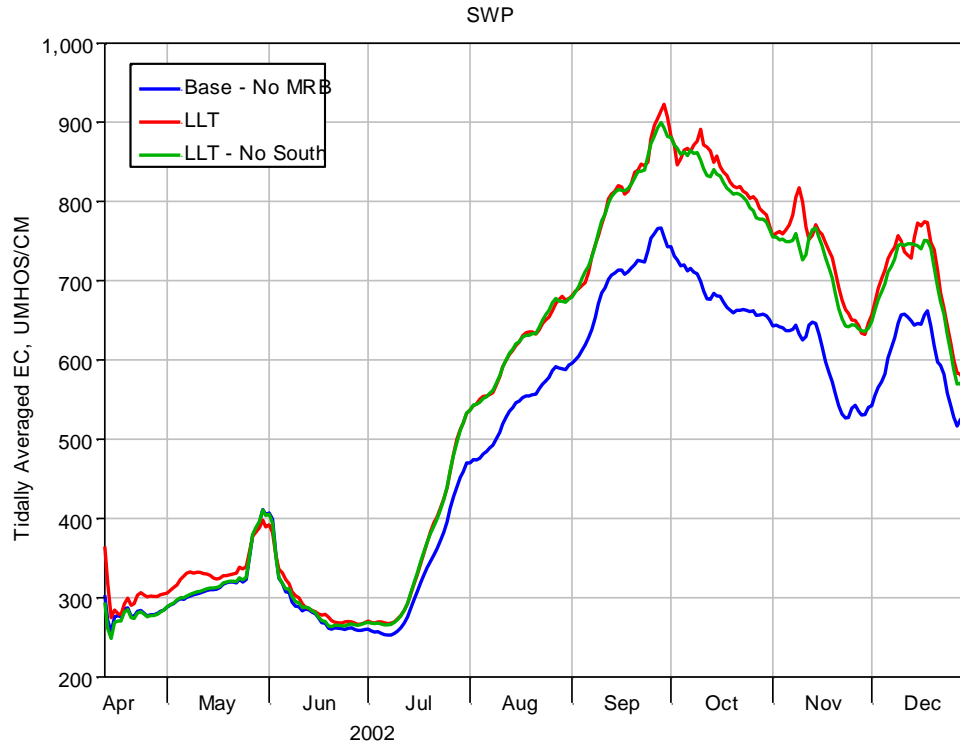


Figure 5-41 Tidally averaged EC at SWP for Base – No MRB, LLT and LLT – No South.

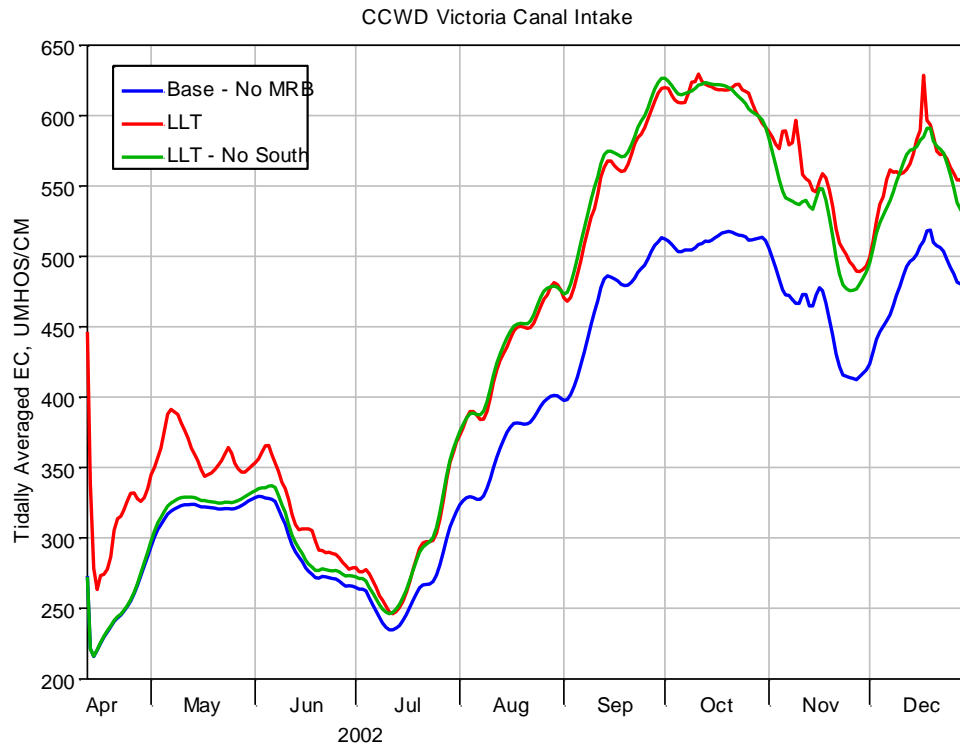


Figure 5-42 Tidally averaged EC at CCWD for Base – No MRB, LLT and LLT – No South.

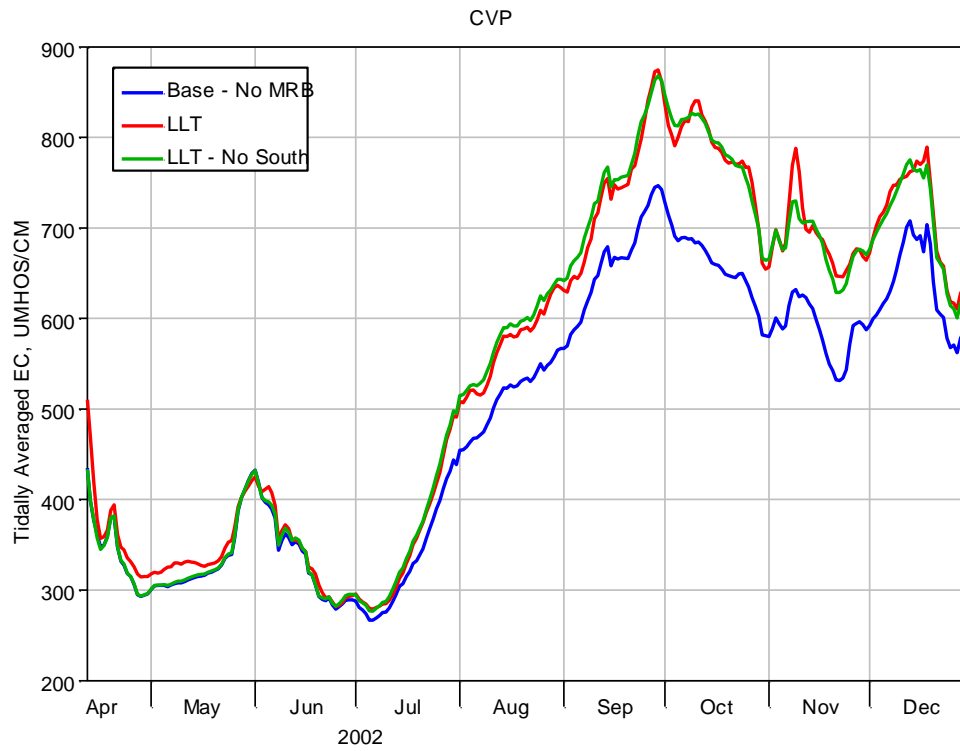


Figure 5-43 Tidally averaged EC at CVP for Base – No MRB, LLT and LLT – No South.

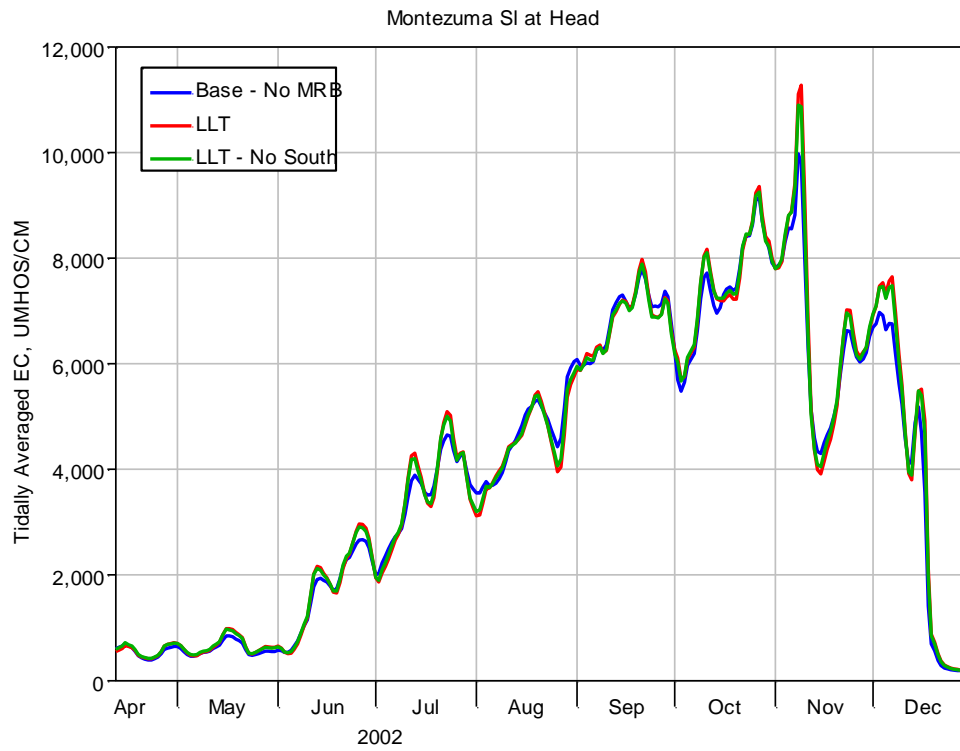


Figure 5-44 Tidally averaged EC at Montezuma SI at Head for Base – No MRB, LLT and LLT – No South.

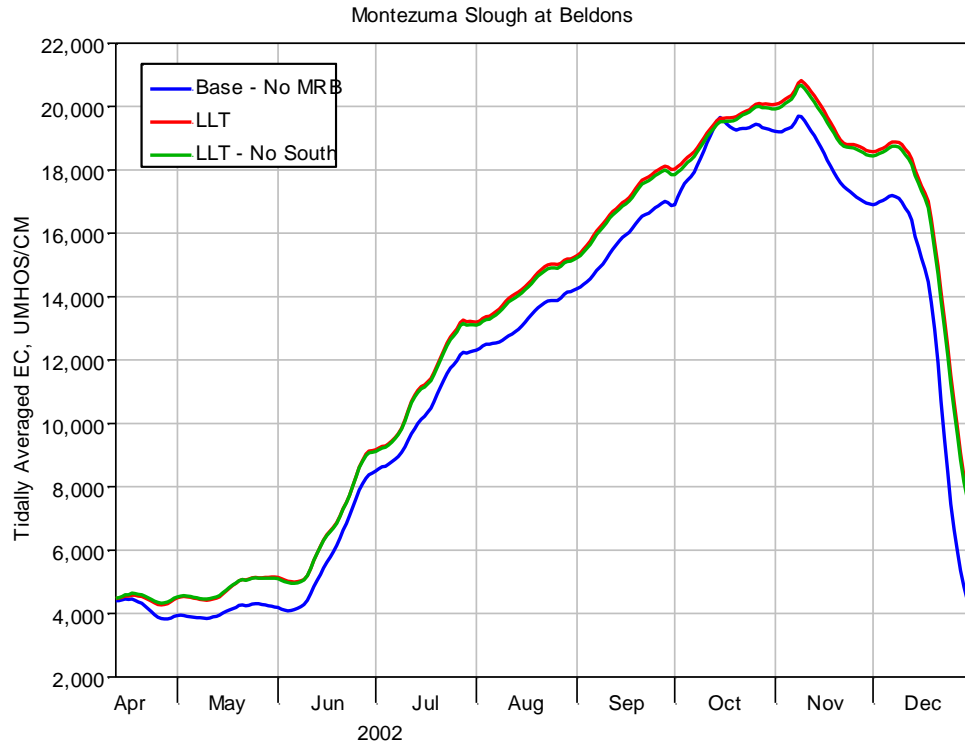


Figure 5-45 Tidally averaged EC at Montezuma Slough at Beldon’s for Base – No MRB, LLT and LLT – No South.

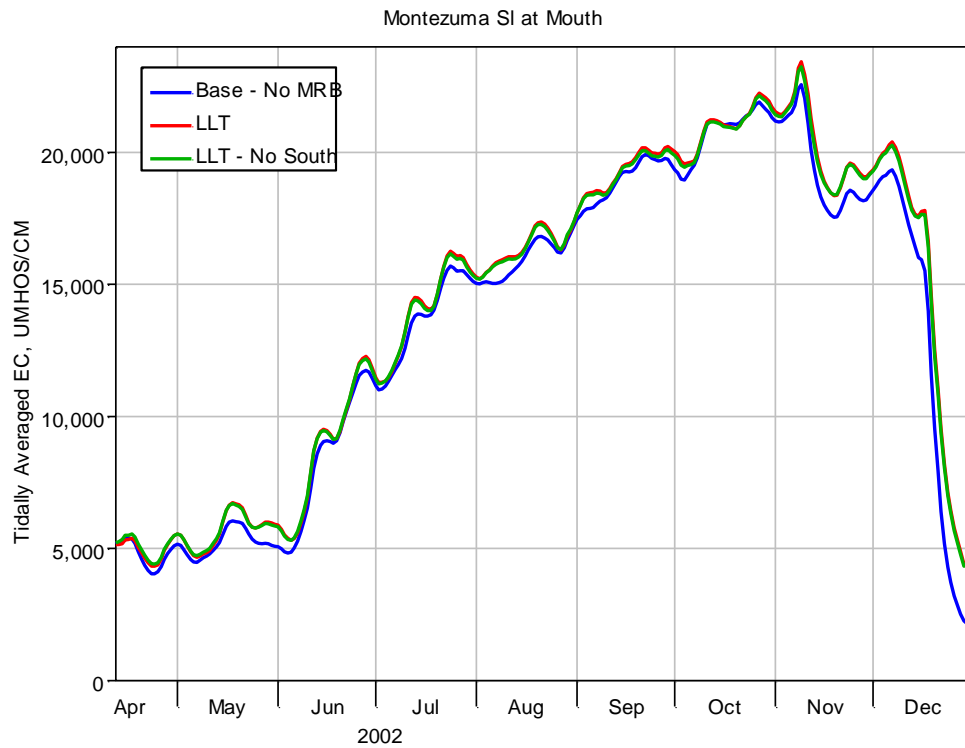


Figure 5-46 Tidally averaged EC at Montezuma Sl at Mouth for Base – No MRB, LLT and LLT – No South.

5.2.2 Spatial Plots of EC Change

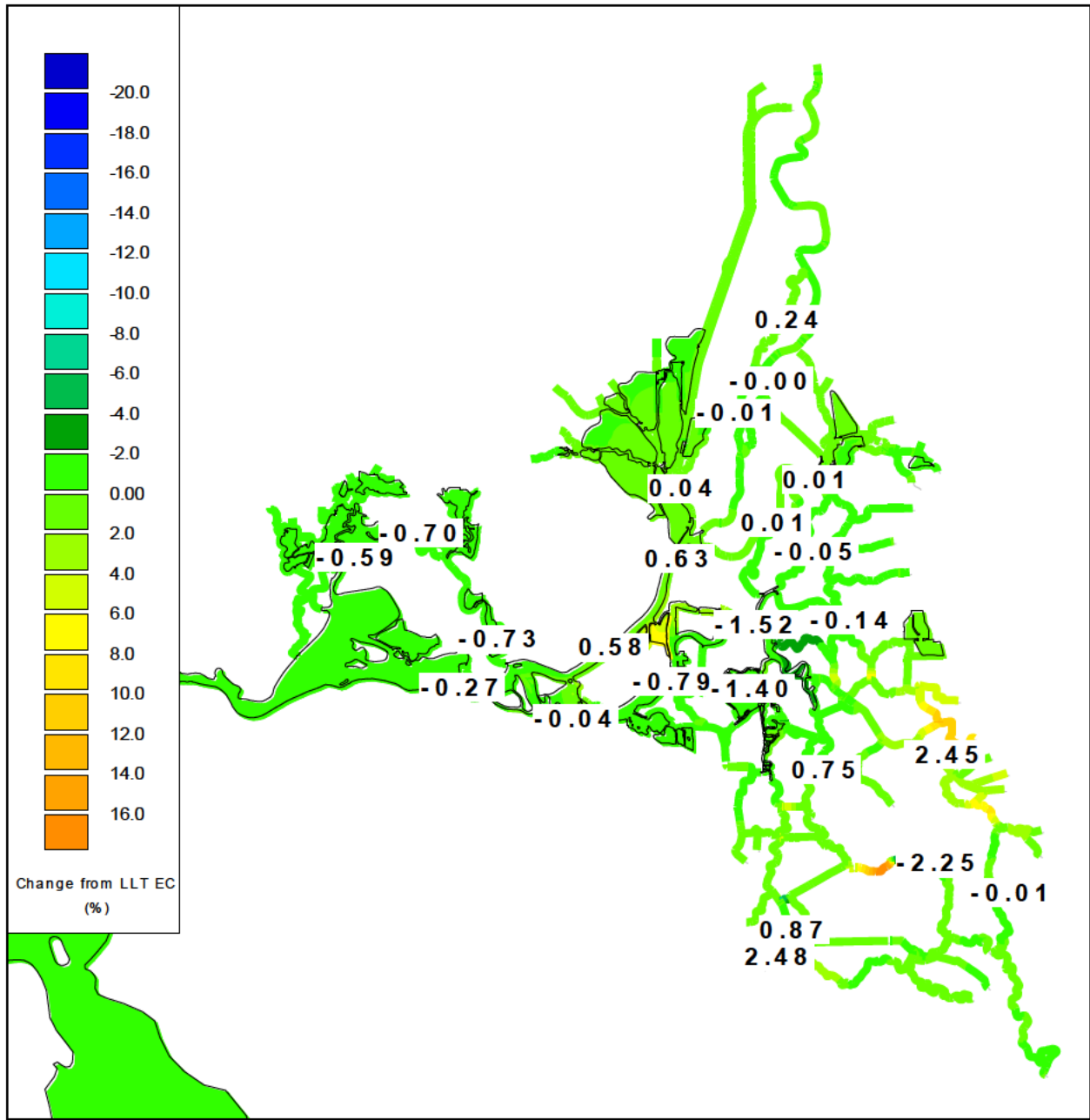


Figure 5-47 Contour plots of LLT – No South change from LLT tidally averaged EC on September 24, 2002.

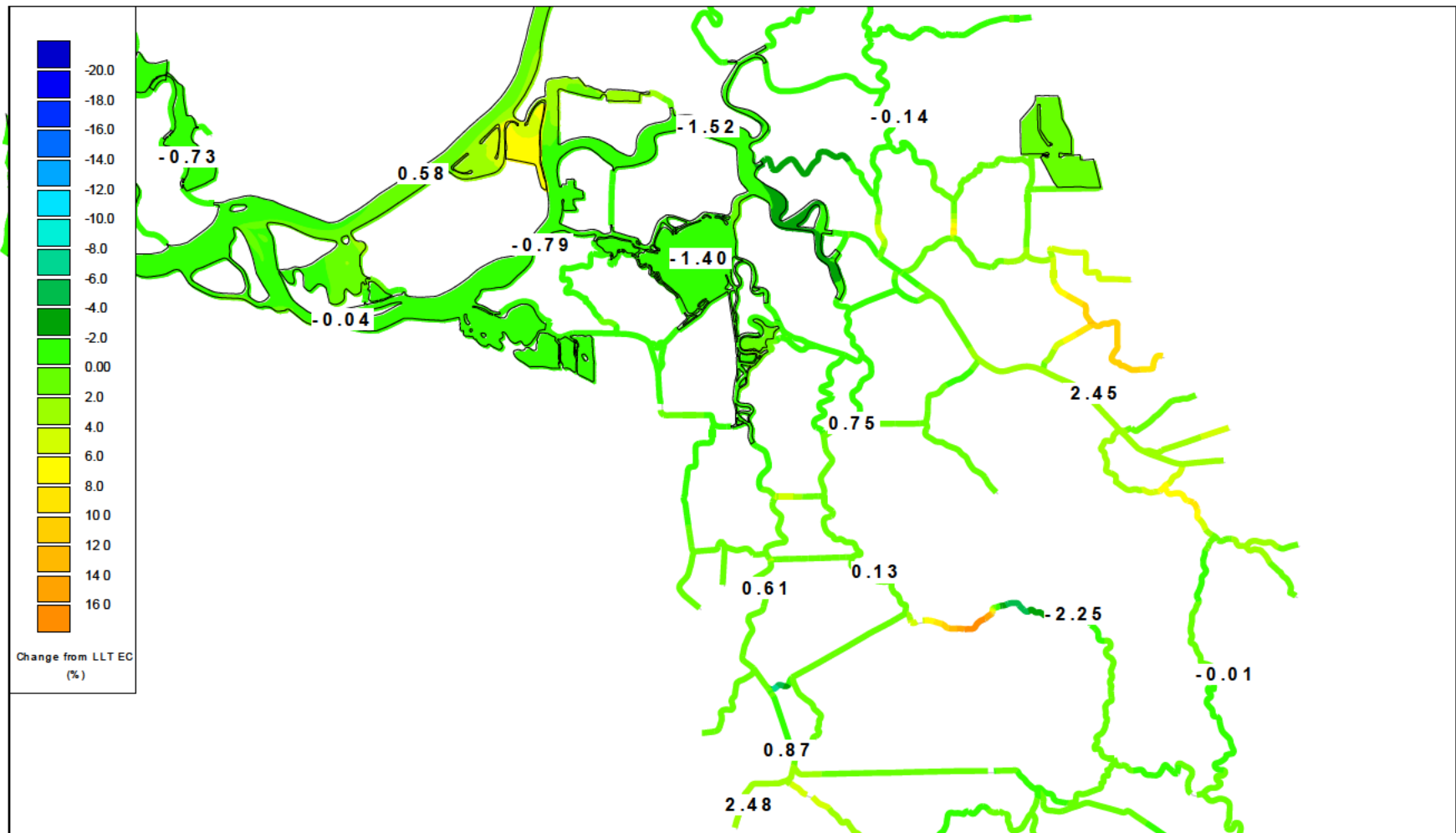


Figure 5-48 Contour plots of LLT – No South change from LLT tidally averaged EC in south Delta on September 24, 2002.

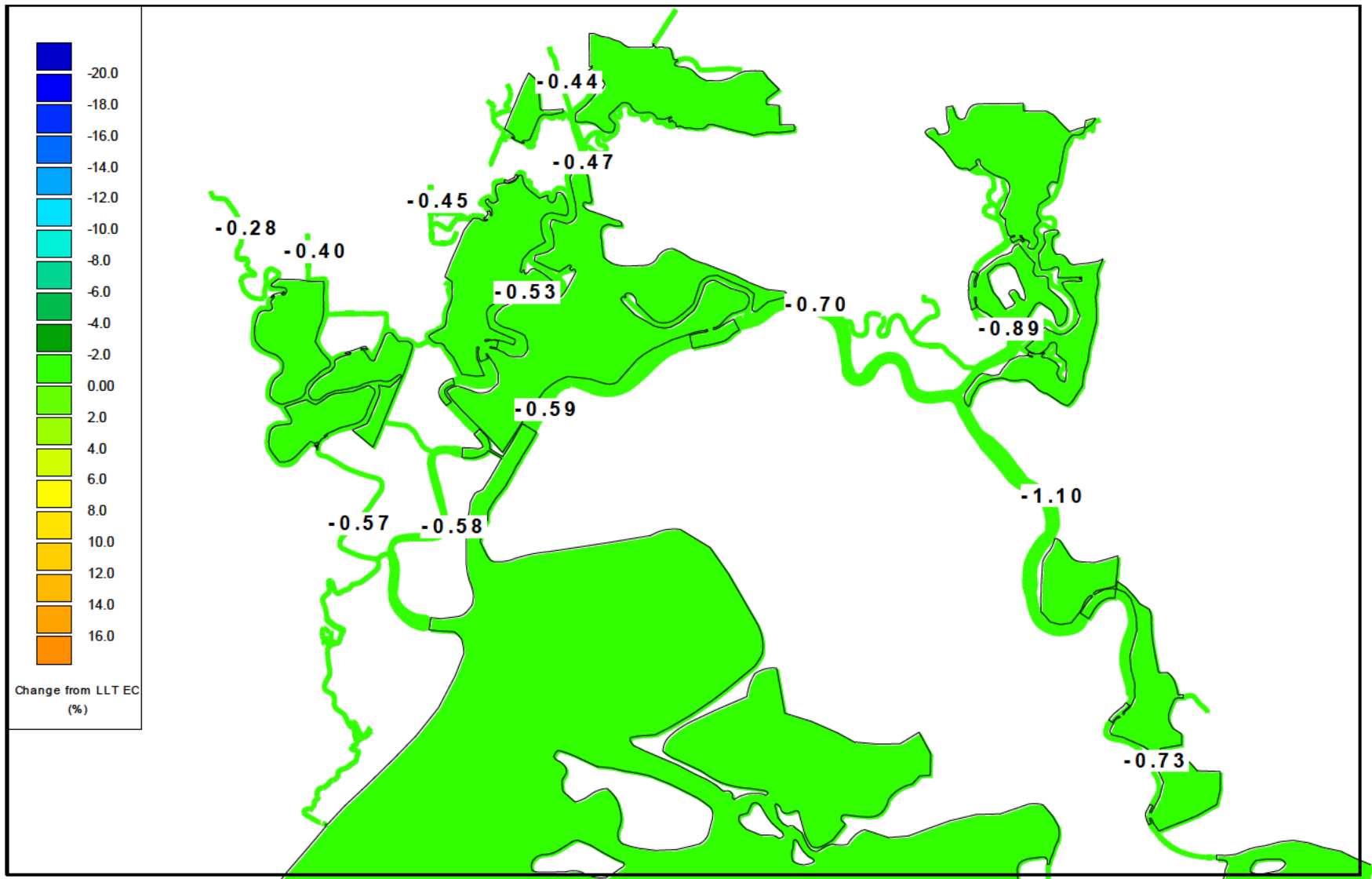


Figure 5-49 Contour plots of LLT – No South change from LLT tidally averaged EC in Suisun Marsh on September 24, 2002.

5.2.3 X2 Time Series

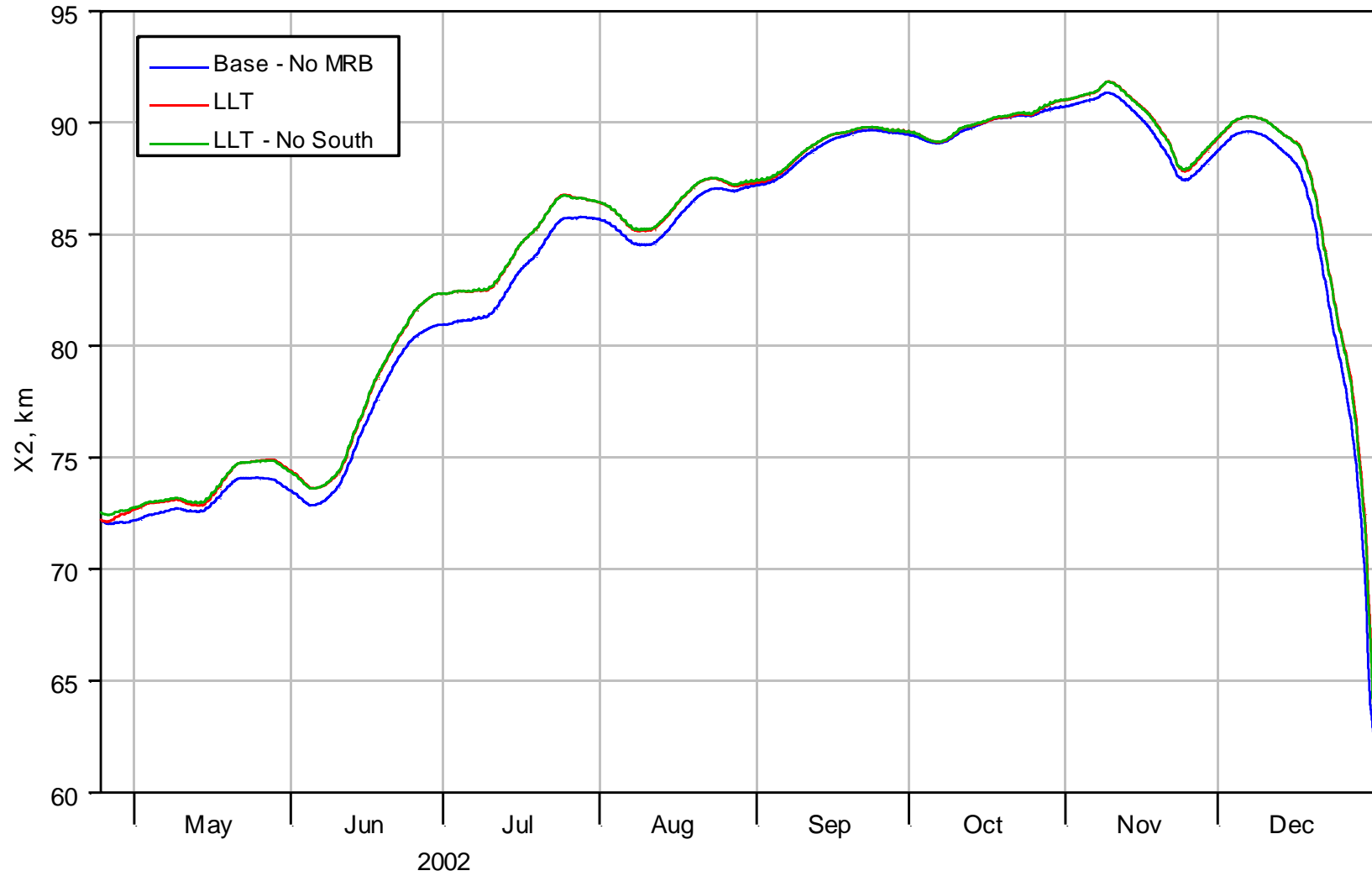


Figure 5-50 Time series of X2 for Base - No MRB, LLT and LLT - No south.

5.3 LLT – Middle River Conveyance

LLT – Middle River tidally averaged EC results are plotted as time series in Figure 5-51 through Figure 5-73. With the increased conveyance in Middle River, EC in Middle River is slower to respond to seasonal changes in flow, and peaks are lower. With increased conveyance, Union Island in the South Delta ROA is better connected to Middle River, resulting in increased mixing between the river and the restoration area. The slow mixing of Union Island water with Middle River water lags and dampens the Middle River EC response to flow changes.

At ROLD024 EC is decreased relative to LLT, while EC is increased at ROLD034. Small and varied changes occur at the exports. In Victoria Canal, the fall peak is higher for LLT – Middle River relative to LLT due to increased tidal flow and the associated influence of higher EC from Old River. In the San Joaquin River at San Andreas and RSAN058, EC is reduced relative to LLT, while changes at Jersey Point are minimal. Small decreases occur, particularly in peaks, in the Sacramento River at Emmaton and Rio Vista and in Cache Slough. Upstream and downstream on the Sacramento River, and in Suisun Marsh, EC changes are minimal. None of the scenarios impact EC at Freeport.

Contour plots of tidally averaged EC percent change from LLT on September 24, 2002 are shown in Figure 5-74 through Figure 5-76 for the Delta, the south and central Delta and for Suisun Marsh. Throughout most of the model domain, the LLT – Middle River case results in small EC changes (within +/-2%) relative to LLT. There are isolated areas with larger changes, including Union Island in the South Delta ROA. Union Island is impacted by changes in Middle River EC that vary with time. Therefore, EC increases are seen deeper in the island due to earlier increases in Middle River EC, while EC decreases occur near the breach due to decreases in Middle River EC at the time of the plot. EC is reduced in Sherman Island in the West Delta ROA and in Threemile Slough and the Sacramento River adjacent to the breach. There is a steep EC gradient between the Sacramento River and Threemile Slough at this time, so the small reduction in Threemile Slough tidal prism (see Table 4-9) impacts salinity at this location. Old River EC is higher than Middle River EC, thus flow changes in the channels joining the two rivers result in larger local EC changes at the channel junctions.

A summary of July – December 2002 monthly average EC at key locations throughout the Delta is provided in Table 5-5 for Base – No MRB, LLT and LLT – Middle River. Percent change from base EC is tabulated in Table 5-6. Percent change from base for the LLT – Middle River sensitivity case is generally within 0 – 3% of the percent change from base for LLT. The exception is San Andreas Landing, where LLT changes from base range from 30 – 70% and LLT – Middle River changes are 3 – 4% less than that.

Increased conveyance in Middle River has minimal impact on X2, as shown in Figure 5-77. Differences between LLT and LLT – Middle River are generally less than 0.1 km.

Table 5-5 Summary of July - December 2002 monthly average EC for Base - No MRB, LLT and LLT – Middle River.

| Location | Monthly Average EC (umhos/cm) | | | | | | | | | | | | | | | | | |
|-----------------------|-------------------------------|-------|--------------------|---------------|-------|--------------------|----------------|-------|--------------------|---------------|-------|--------------------|---------------|-------|--------------------|---------------|-------|--------------------|
| | July 2002 | | | August 2002 | | | September 2002 | | | October 2002 | | | November 2002 | | | December 2002 | | |
| | Base - No MRB | LLT | LLT - Middle River | Base - No MRB | LLT | LLT - Middle River | Base - No MRB | LLT | LLT - Middle River | Base - No MRB | LLT | LLT - Middle River | Base - No MRB | LLT | LLT - Middle River | Base - No MRB | LLT | LLT - Middle River |
| Cache Sl at Ryer | 136 | 135 | 135 | 153 | 150 | 150 | 176 | 173 | 173 | 164 | 160 | 160 | 189 | 188 | 187 | 196 | 193 | 193 |
| CCWD Victoria Canal | 264 | 288 | 284 | 367 | 432 | 421 | 469 | 553 | 557 | 511 | 615 | 636 | 453 | 543 | 578 | 482 | 561 | 576 |
| CVP | 333 | 354 | 355 | 515 | 572 | 562 | 664 | 745 | 739 | 658 | 780 | 783 | 587 | 688 | 698 | 631 | 704 | 716 |
| Montezuma Sl at Head | 3536 | 3567 | 3544 | 4650 | 4521 | 4496 | 6853 | 6816 | 6782 | 7400 | 7510 | 7456 | 6555 | 6739 | 6693 | 3149 | 3440 | 3428 |
| Montezuma Sl at Mouth | 13705 | 14112 | 14130 | 15976 | 16392 | 16410 | 18958 | 19301 | 19327 | 20766 | 20950 | 20971 | 19465 | 20279 | 20295 | 12062 | 13926 | 13949 |
| RMID015 | 261 | 285 | 281 | 367 | 437 | 426 | 469 | 565 | 552 | 503 | 612 | 610 | 442 | 522 | 529 | 463 | 542 | 546 |
| RMID023 | 262 | 285 | 281 | 367 | 436 | 422 | 468 | 560 | 541 | 507 | 614 | 609 | 448 | 527 | 539 | 477 | 552 | 555 |
| ROLD024 | 401 | 438 | 431 | 707 | 781 | 761 | 934 | 1049 | 1024 | 826 | 1014 | 987 | 712 | 891 | 873 | 607 | 744 | 730 |
| ROLD034 | 360 | 392 | 398 | 615 | 692 | 699 | 804 | 912 | 932 | 755 | 915 | 933 | 651 | 801 | 823 | 601 | 732 | 740 |
| RSAC075 Chipps Island | 8209 | 8880 | 8857 | 9741 | 10267 | 10238 | 12563 | 13253 | 13225 | 13606 | 14160 | 14121 | 11990 | 12802 | 12756 | 6035 | 6735 | 6716 |
| RSAC092 Emmaton | 623 | 629 | 616 | 808 | 742 | 725 | 1498 | 1384 | 1352 | 2012 | 1919 | 1870 | 1748 | 1782 | 1740 | 821 | 874 | 856 |
| RSAC101 Rio Vista | 148 | 146 | 145 | 176 | 162 | 161 | 241 | 213 | 210 | 285 | 264 | 257 | 290 | 308 | 302 | 222 | 232 | 230 |
| RSAC123 | 127 | 127 | 127 | 154 | 155 | 155 | 165 | 165 | 165 | 142 | 142 | 142 | 184 | 184 | 184 | 169 | 168 | 168 |
| RSAC155 Freeport | 126 | 126 | 126 | 156 | 156 | 156 | 162 | 162 | 162 | 142 | 142 | 142 | 184 | 184 | 184 | 164 | 164 | 164 |
| RSAN018 Jersey Pt | 954 | 1028 | 1017 | 1461 | 1519 | 1502 | 1975 | 2116 | 2099 | 1728 | 1913 | 1896 | 1503 | 1766 | 1755 | 945 | 1108 | 1096 |
| RSAN032 San Andreas | 284 | 383 | 371 | 459 | 649 | 623 | 555 | 871 | 839 | 448 | 773 | 742 | 403 | 668 | 645 | 333 | 480 | 464 |
| RSAN058 | 643 | 612 | 593 | 664 | 644 | 625 | 711 | 698 | 685 | 674 | 682 | 679 | 636 | 629 | 626 | 763 | 751 | 746 |
| S-49 Beldon's Landing | 10402 | 11292 | 11351 | 13266 | 14335 | 14411 | 15826 | 16973 | 17052 | 18856 | 19371 | 19434 | 18357 | 19659 | 19732 | 12766 | 15349 | 15446 |
| SWP | 329 | 360 | 361 | 540 | 615 | 612 | 698 | 807 | 807 | 682 | 835 | 843 | 593 | 725 | 736 | 594 | 691 | 690 |

Table 5-6 Summary of July - December 2002 percent change in monthly average EC for LLT and LLT – Middle River relative to Base - No MRB.

| Location | Percent Change in Monthly Average EC (umhos/cm) Relative to Base Case | | | | | | | | | | | |
|-----------------------|---|--------------------|-------------|--------------------|----------------|--------------------|--------------|--------------------|---------------|--------------------|---------------|--------------------|
| | July 2002 | | August 2002 | | September 2002 | | October 2002 | | November 2002 | | December 2002 | |
| | LLT | LLT - Middle River | LLT | LLT - Middle River | LLT | LLT - Middle River | LLT | LLT - Middle River | LLT | LLT - Middle River | LLT | LLT - Middle River |
| Cache SI at Ryer | -1% | -1% | -2% | -2% | -1% | -1% | -2% | -3% | -1% | -1% | -2% | -2% |
| CCWD Victoria Canal | 9% | 8% | 18% | 15% | 18% | 19% | 20% | 25% | 20% | 27% | 16% | 19% |
| CVP | 7% | 7% | 11% | 9% | 12% | 11% | 19% | 19% | 17% | 19% | 12% | 14% |
| Montezuma SI at Head | 1% | 0% | -3% | -3% | -1% | -1% | 1% | 1% | 3% | 2% | 9% | 9% |
| Montezuma SI at Mouth | 3% | 3% | 3% | 3% | 2% | 2% | 1% | 1% | 4% | 4% | 15% | 16% |
| RMID015 | 9% | 8% | 19% | 16% | 20% | 18% | 22% | 21% | 18% | 20% | 17% | 18% |
| RMID023 | 9% | 7% | 19% | 15% | 20% | 16% | 21% | 20% | 18% | 20% | 16% | 16% |
| ROLD024 | 9% | 7% | 10% | 8% | 12% | 10% | 23% | 20% | 25% | 23% | 23% | 20% |
| ROLD034 | 9% | 10% | 13% | 14% | 13% | 16% | 21% | 24% | 23% | 26% | 22% | 23% |
| RSAC075 Chipps Island | 8% | 8% | 5% | 5% | 5% | 5% | 4% | 4% | 7% | 6% | 12% | 11% |
| RSAC092 Emmaton | 1% | -1% | -8% | -10% | -8% | -10% | -5% | -7% | 2% | 0% | 6% | 4% |
| RSAC101 Rio Vista | -2% | -2% | -8% | -9% | -12% | -13% | -7% | -10% | 6% | 4% | 5% | 4% |
| RSAC123 | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| RSAC155 Freeport | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| RSAN018 Jersey Pt | 8% | 7% | 4% | 3% | 7% | 6% | 11% | 10% | 18% | 17% | 17% | 16% |
| RSAN032 San Andreas | 35% | 31% | 42% | 36% | 57% | 51% | 73% | 66% | 66% | 60% | 44% | 39% |
| RSAN058 | -5% | -8% | -3% | -6% | -2% | -4% | 1% | 1% | -1% | -2% | -2% | -2% |
| S-49 Beldon's Landing | 9% | 9% | 8% | 9% | 7% | 8% | 3% | 3% | 7% | 7% | 20% | 21% |
| SWP | 9% | 10% | 14% | 13% | 16% | 16% | 23% | 24% | 22% | 24% | 16% | 16% |

5.3.1 Tidally averaged EC time series



Figure 5-51 Tidally averaged EC at RSAC155 for Base-No MRB, LLT and LLT-Middle River.

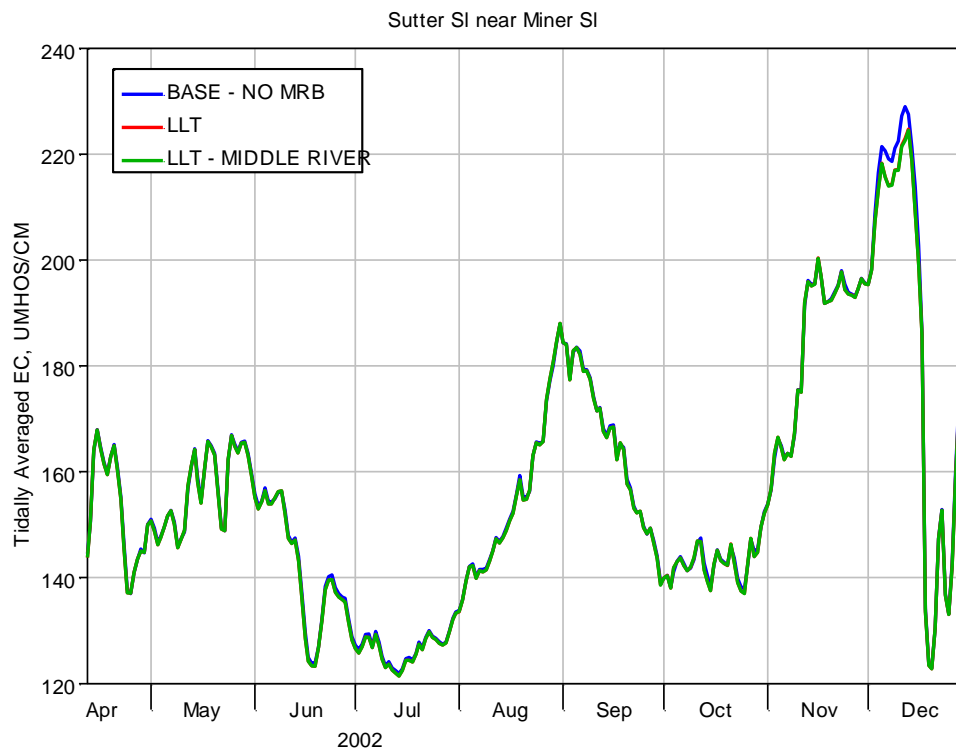


Figure 5-52 Tidally averaged EC in Sutter Slough for Base-No MRB, LLT and LLT-Middle River.

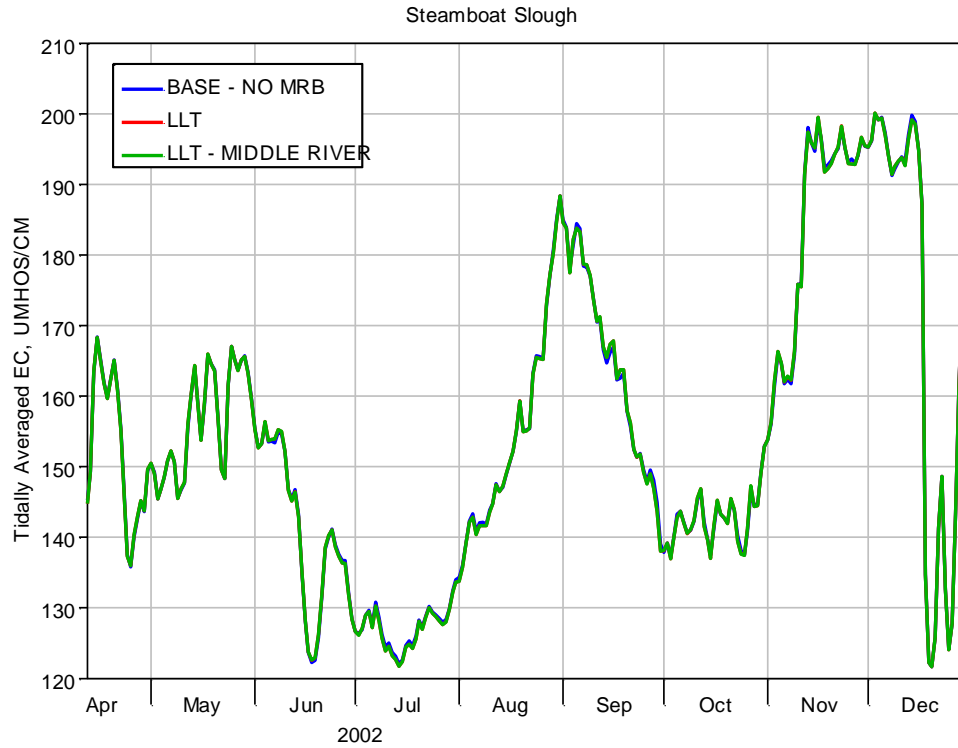


Figure 5-53 Tidally averaged EC in Steamboat Slough for Base-No MRB, LLT and LLT-Middle River.

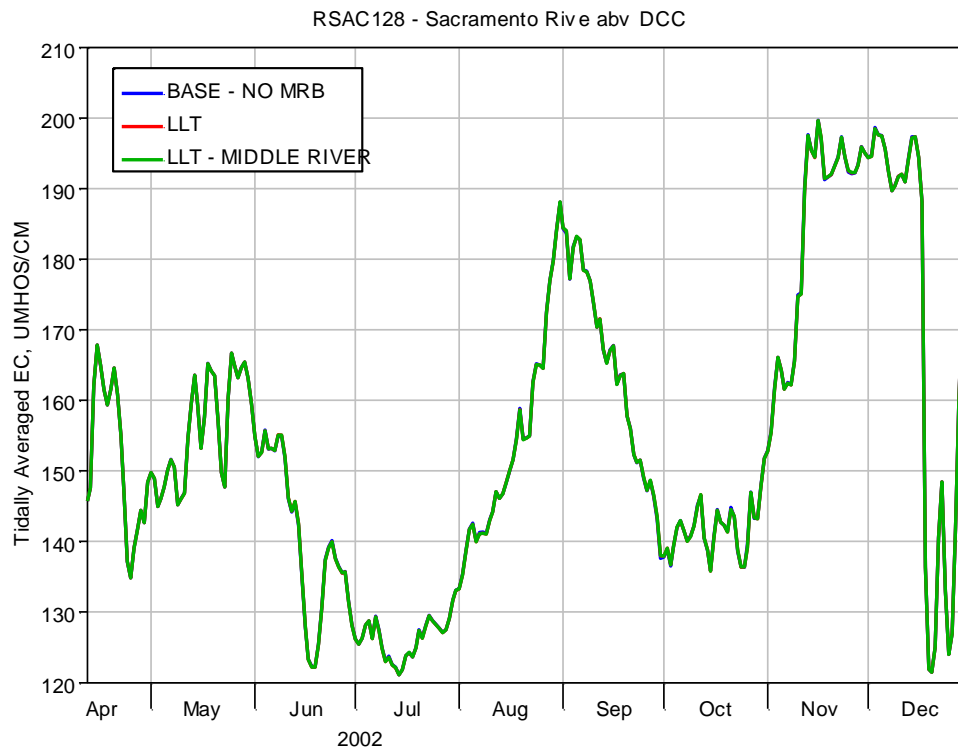


Figure 5-54 Tidally averaged EC at RSAC128 for Base-No MRB, LLT and LLT-Middle River.

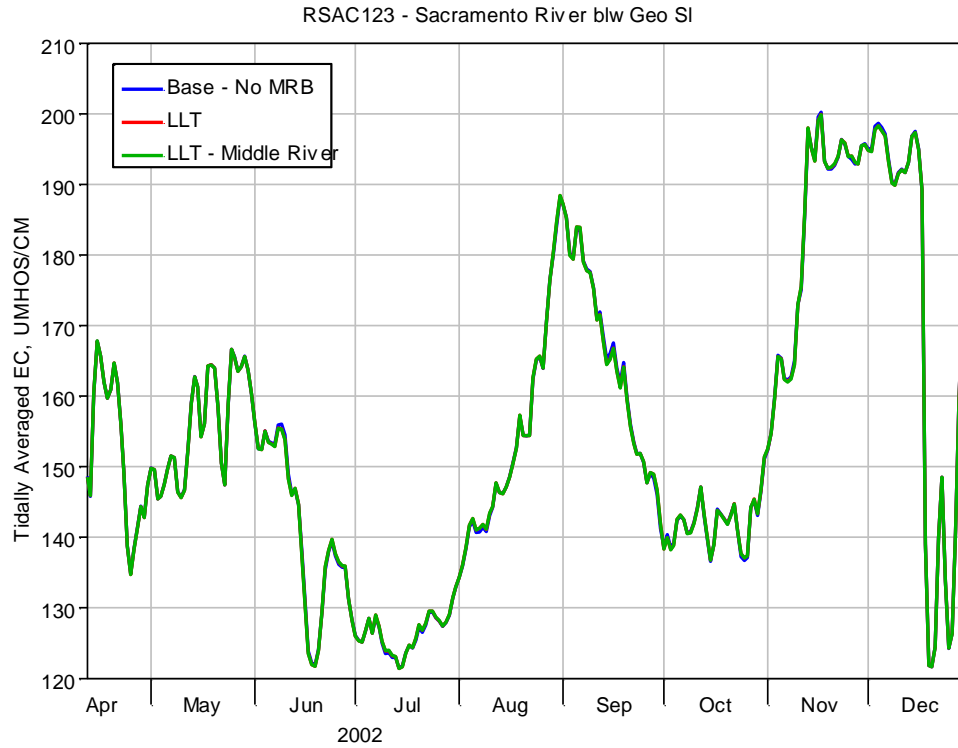


Figure 5-55 Tidally averaged EC at RSAC123 for Base-No MRB, LLT and LLT-Middle River.

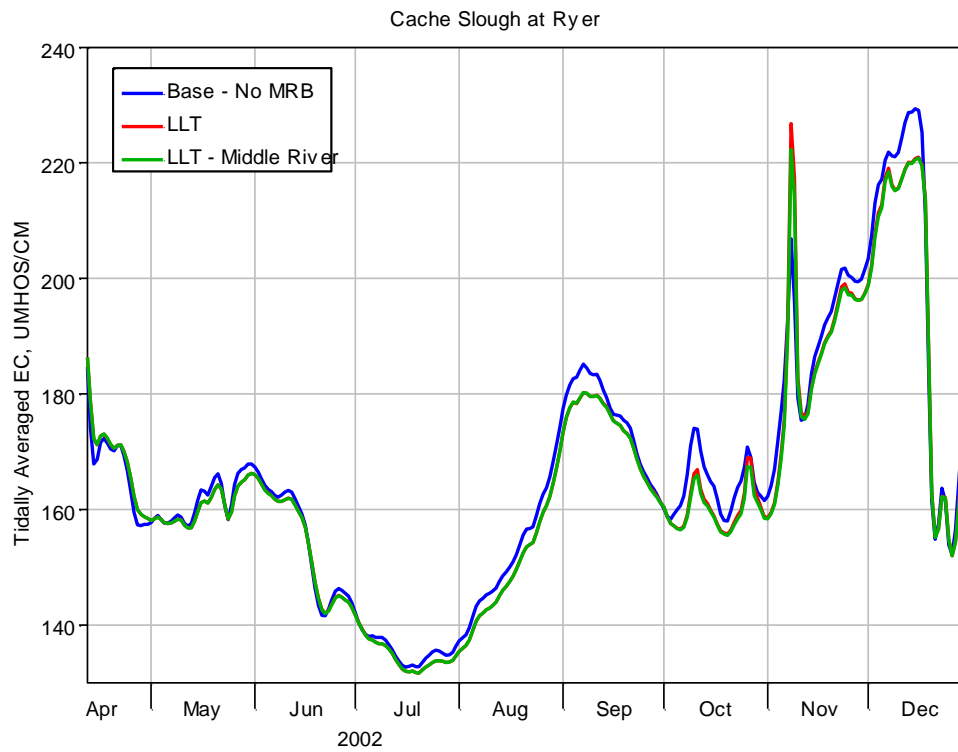


Figure 5-56 Tidally averaged EC at Cache Slough at Ryer for Base-No MRB, LLT and LLT-Middle River.

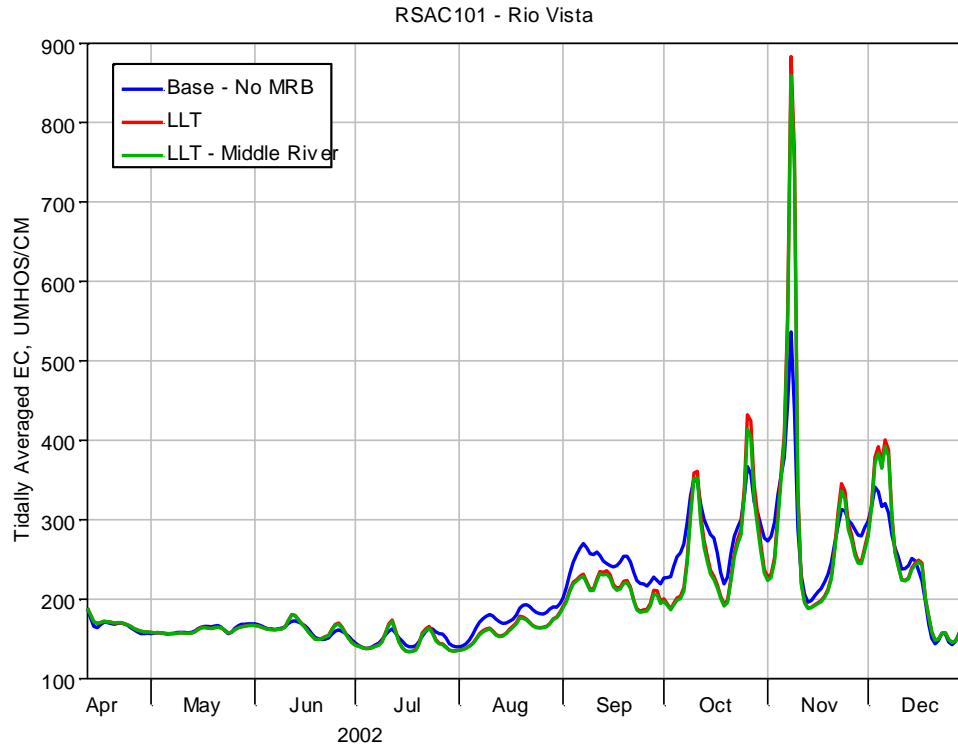


Figure 5-57 Tidally averaged EC at RSAC101 for Base-No MRB, LLT and LLT-Middle River.

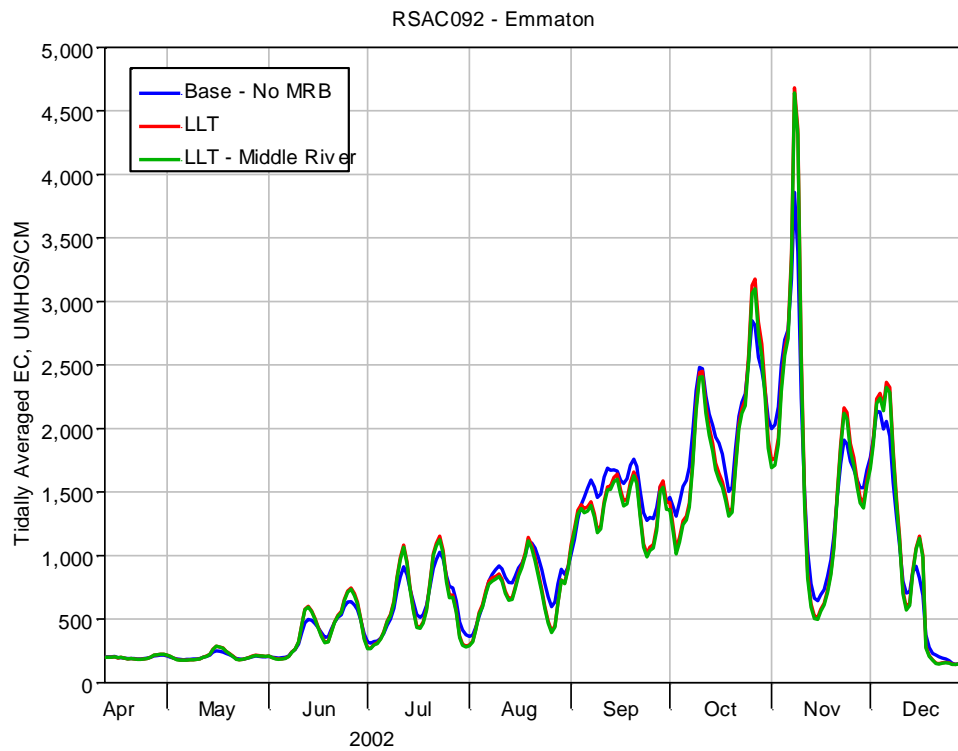


Figure 5-58 Tidally averaged EC at RSAC092 for Base-No MRB, LLT and LLT-Middle River.

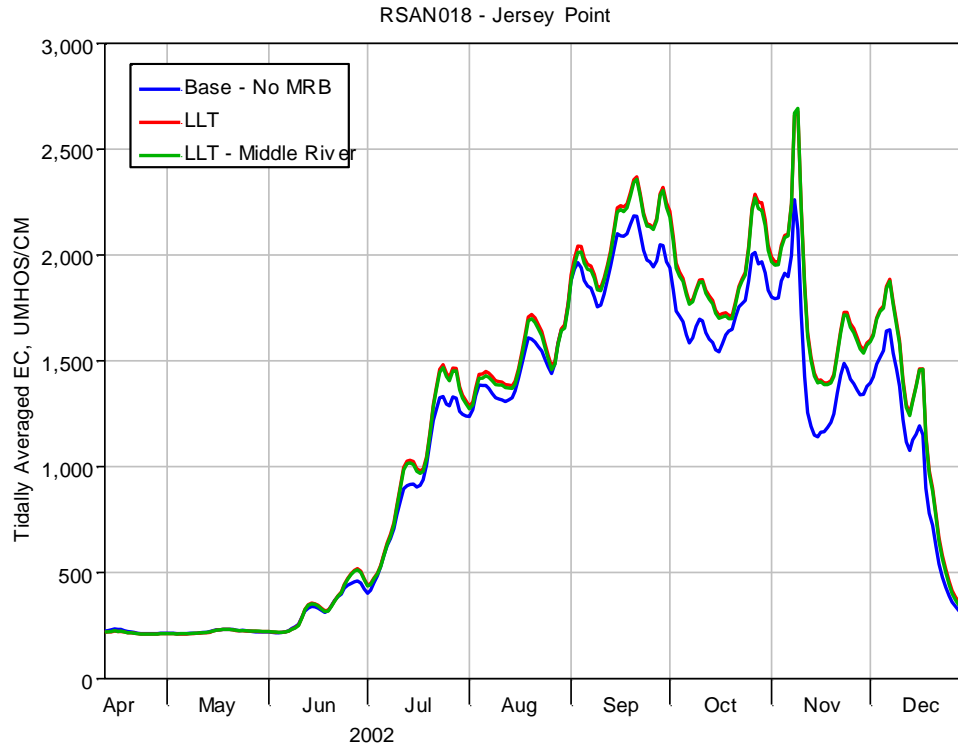


Figure 5-59 Tidally averaged EC at RSAN018 for Base-No MRB, LLT and LLT-Middle River.

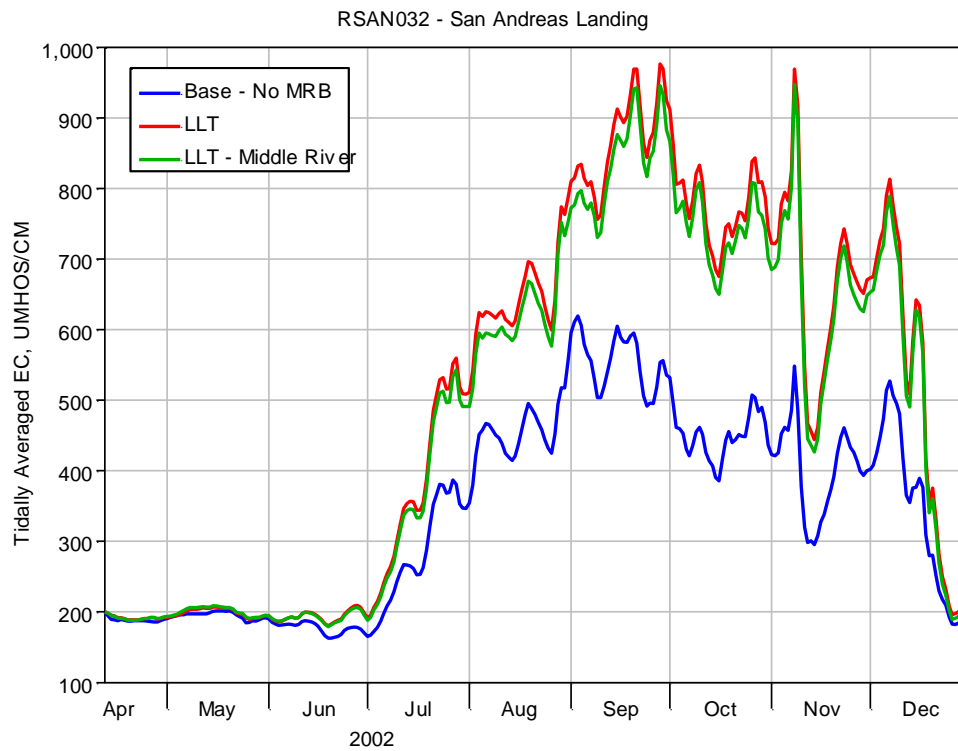


Figure 5-60 Tidally averaged EC at RSAN032 for Base-No MRB, LLT and LLT-Middle River.

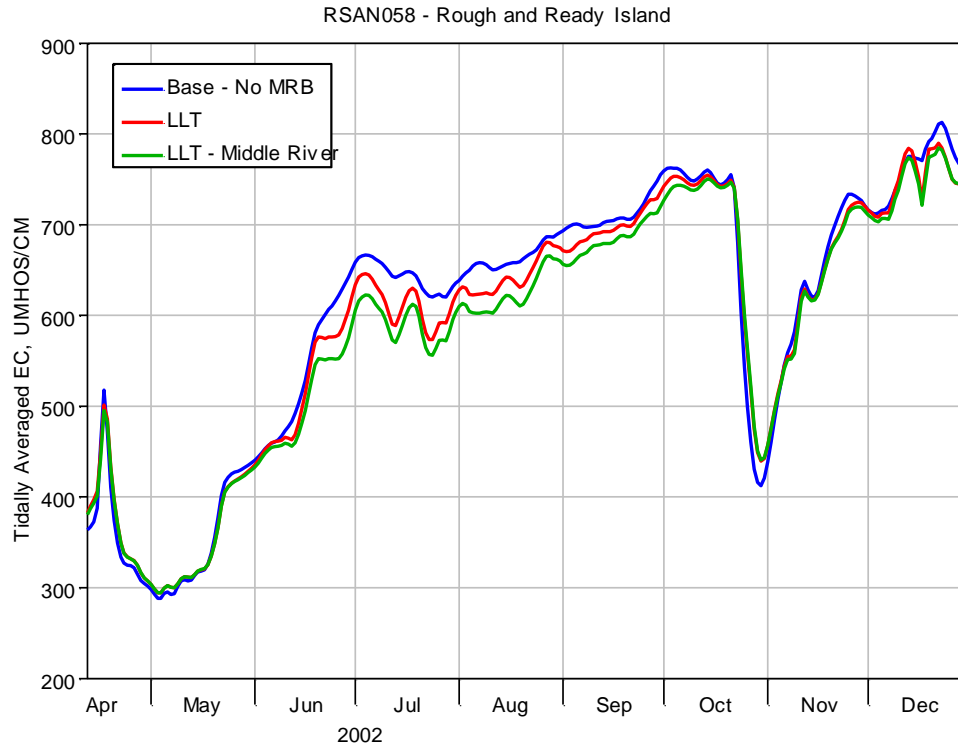


Figure 5-61 Tidally averaged EC at RSAN058 for Base-No MRB, LLT and LLT-Middle River.

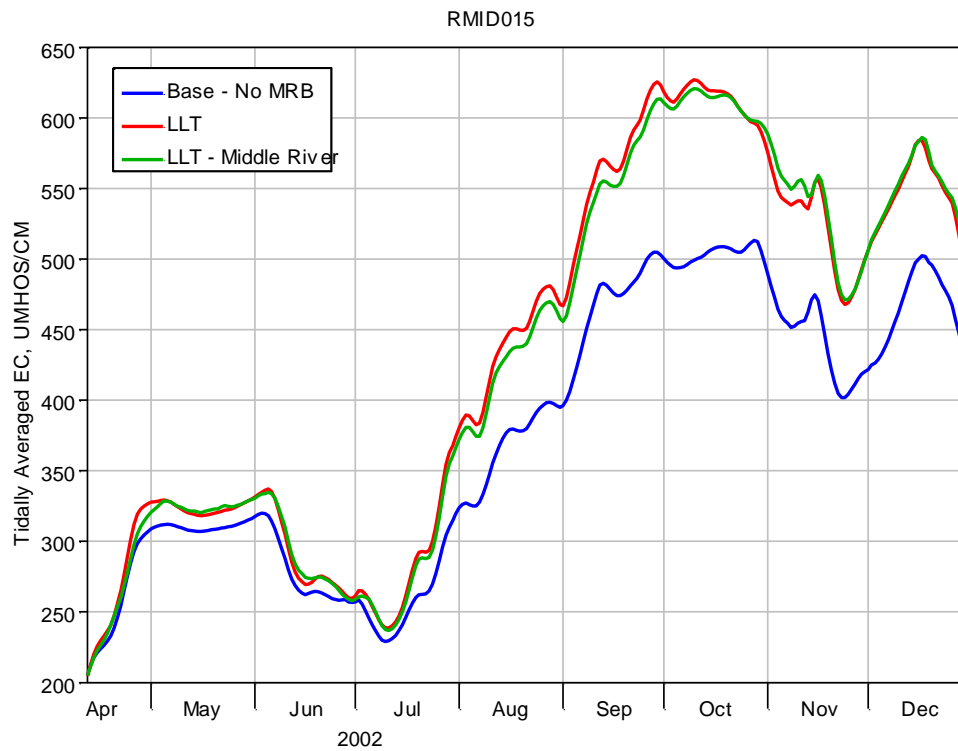


Figure 5-62 Tidally averaged EC at RMID015 for Base-No MRB, LLT and LLT-Middle River.

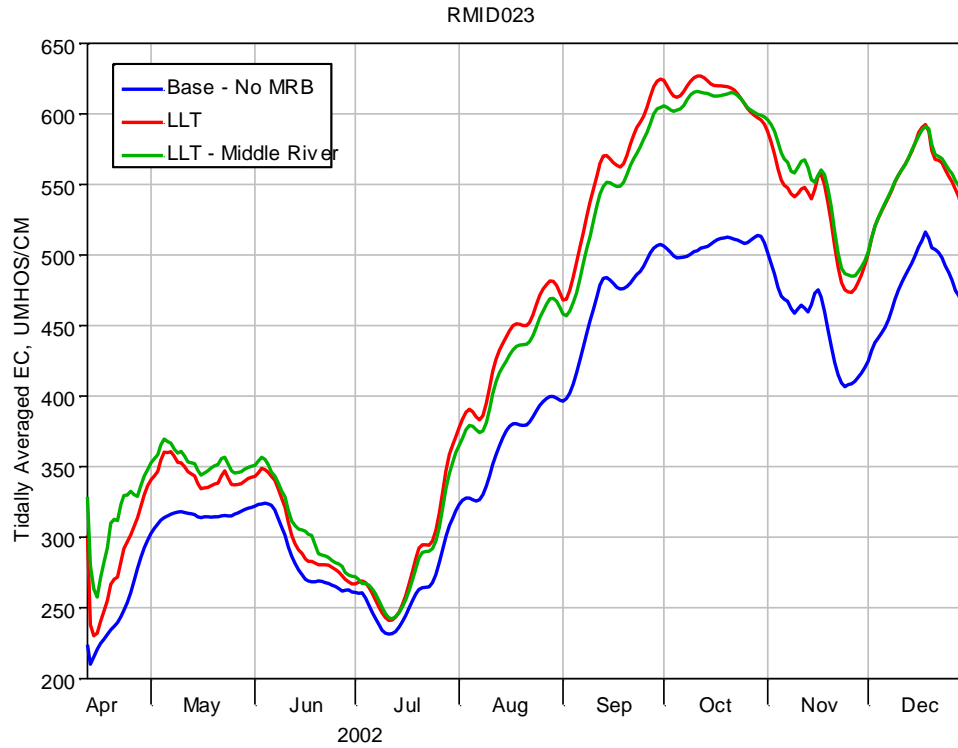


Figure 5-63 Tidally averaged EC at RMID023 for Base-No MRB, LLT and LLT-Middle River.

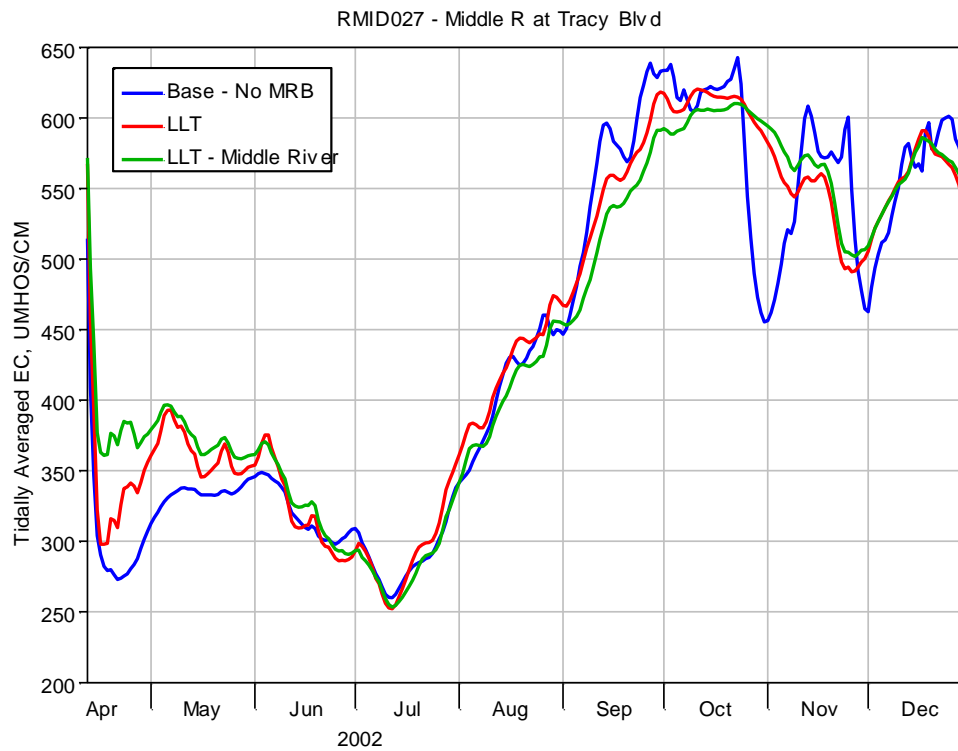


Figure 5-64 Tidally averaged EC at RMID027 for Base-No MRB, LLT and LLT-Middle River.

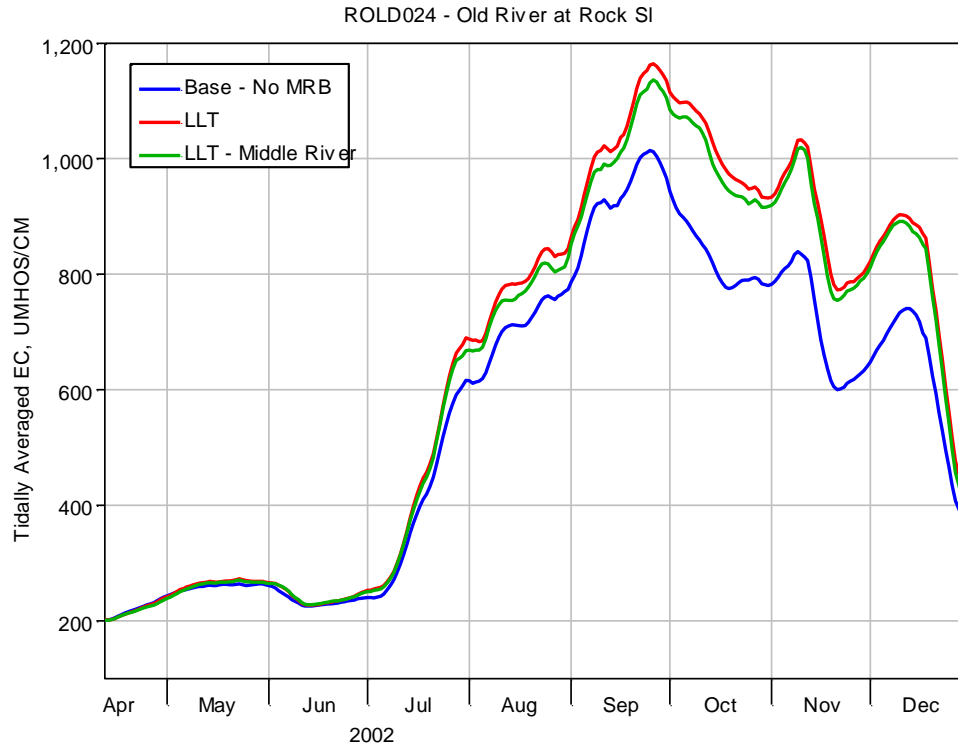


Figure 5-65 Tidally averaged EC at ROLD024 for Base-No MRB, LLT and LLT-Middle River.

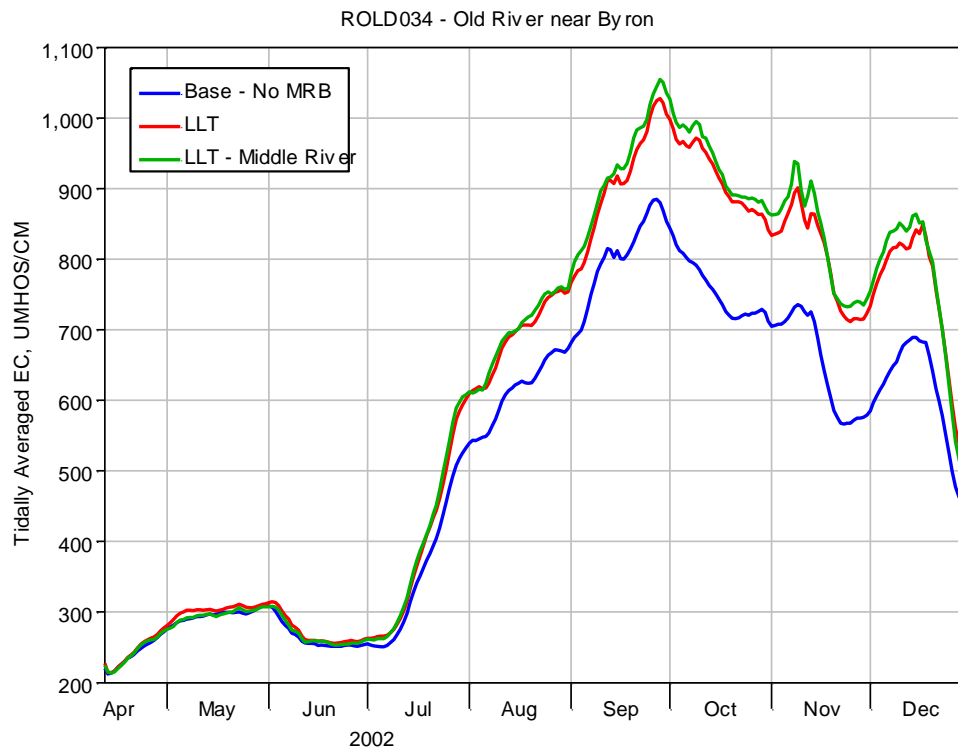


Figure 5-66 Tidally averaged EC at ROLD034 for Base-No MRB, LLT and LLT-Middle River.

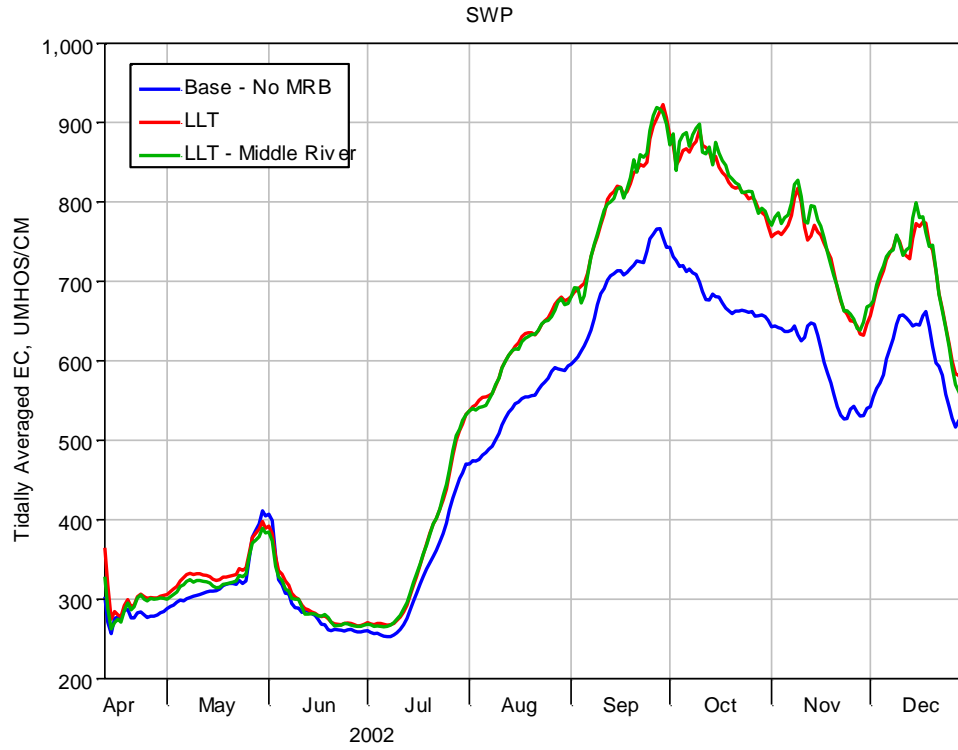


Figure 5-67 Tidally averaged EC at SWP for Base-No MRB, LLT and LLT-Middle River.

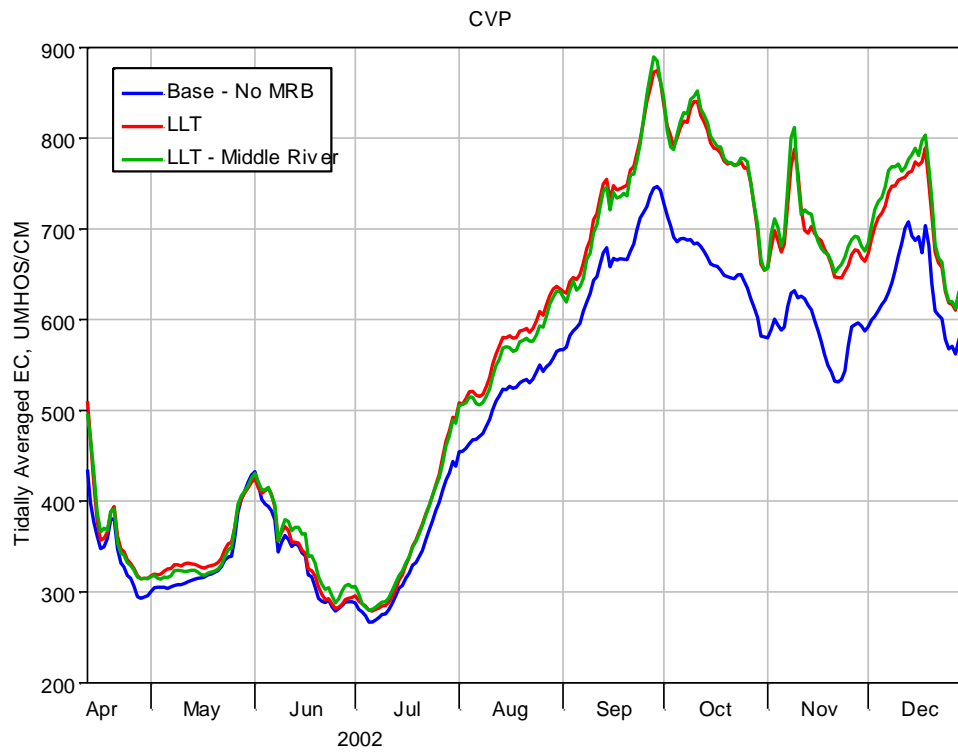


Figure 5-68 Tidally averaged EC at CVP for Base-No MRB, LLT and LLT-Middle River.

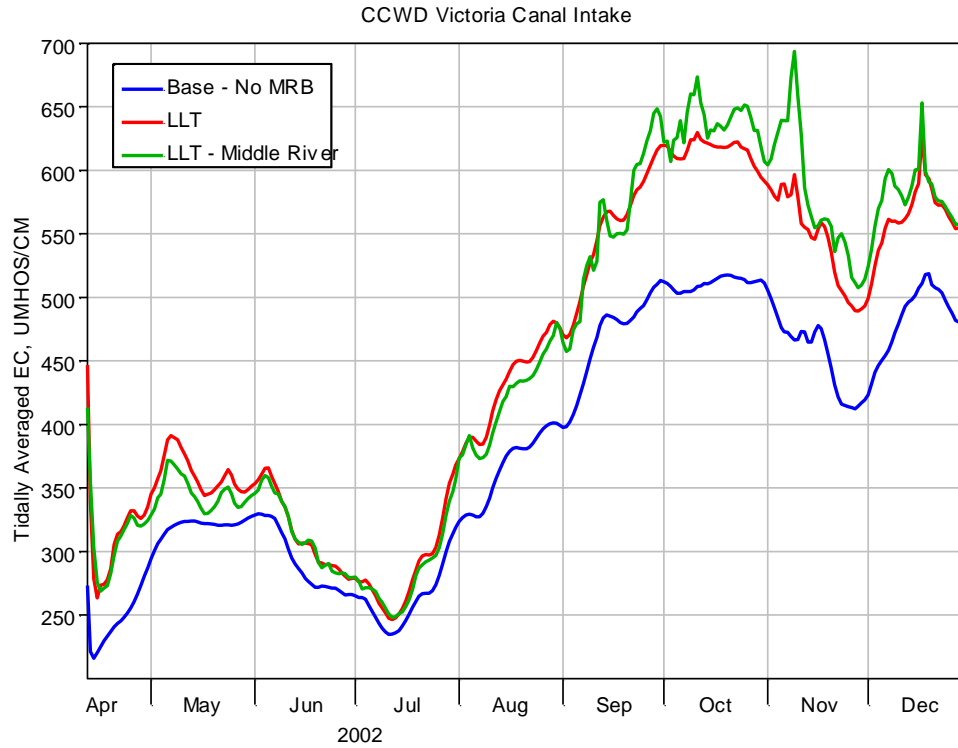


Figure 5-69 Tidally averaged EC at CCWD for Base-No MRB, LLT and LLT-Middle River.

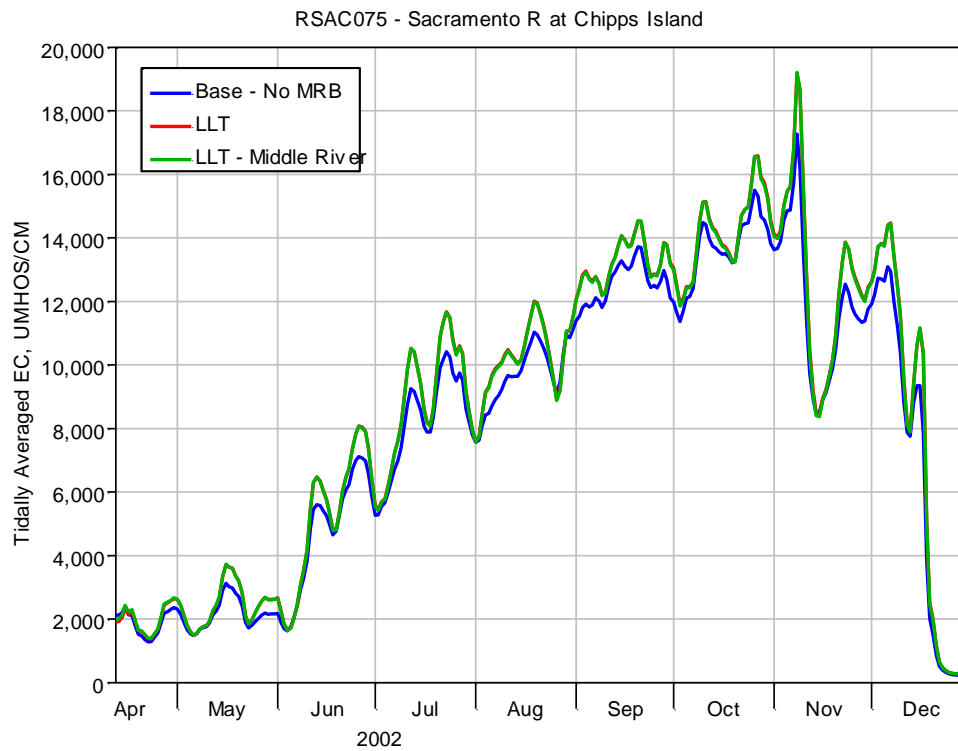


Figure 5-70 Tidally averaged EC at RSAC075 for Base-No MRB, LLT and LLT-Middle River.

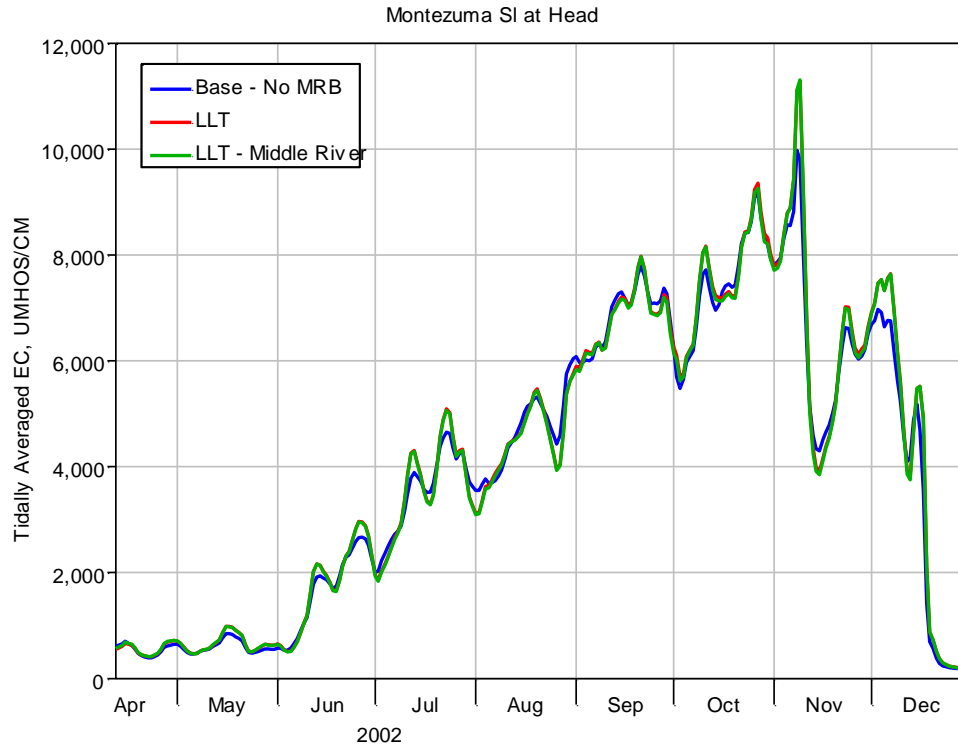


Figure 5-71 Tidally averaged EC at Montezuma SI at Head for Base-No MRB, LLT and LLT-Middle River.

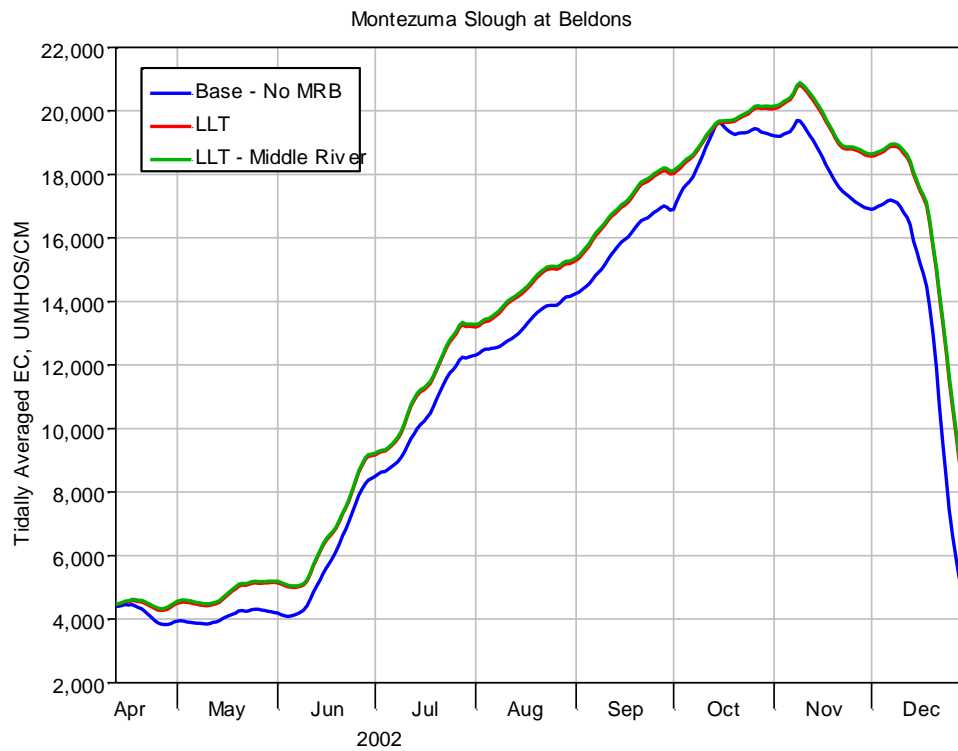


Figure 5-72 Tidally averaged EC at Montezuma Slough at Beldon's for Base-No MRB, LLT and LLT-Middle River.

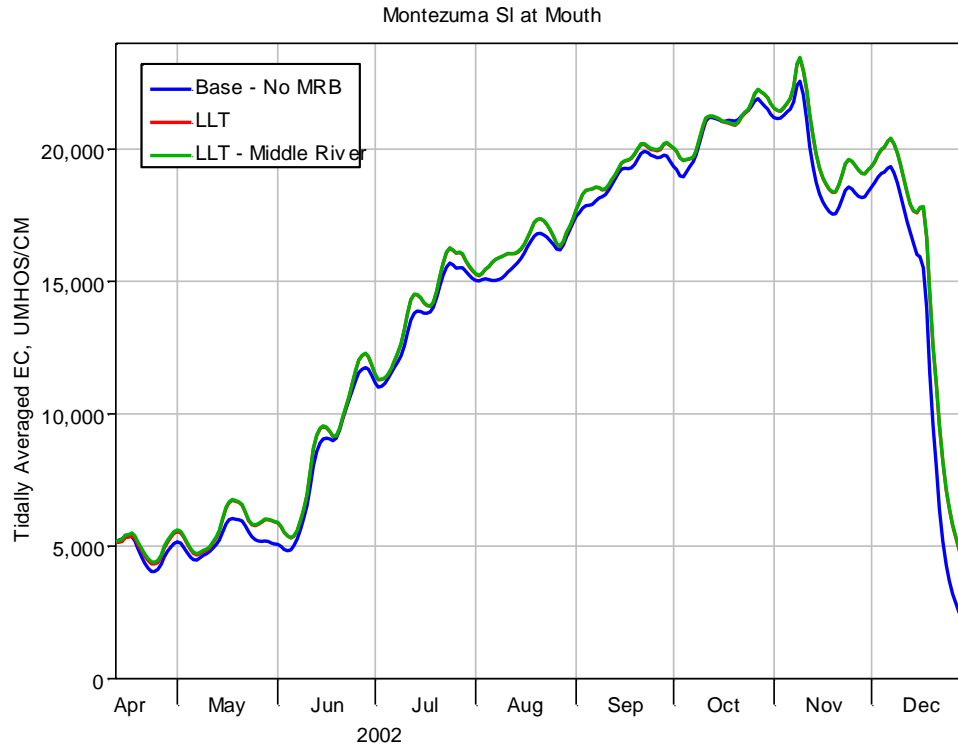


Figure 5-73 Tidally averaged EC at Montezuma SI at Mouth for Base-No MRB, LLT and LLT-Middle River.

5.3.2 Spatial Plots of EC Change

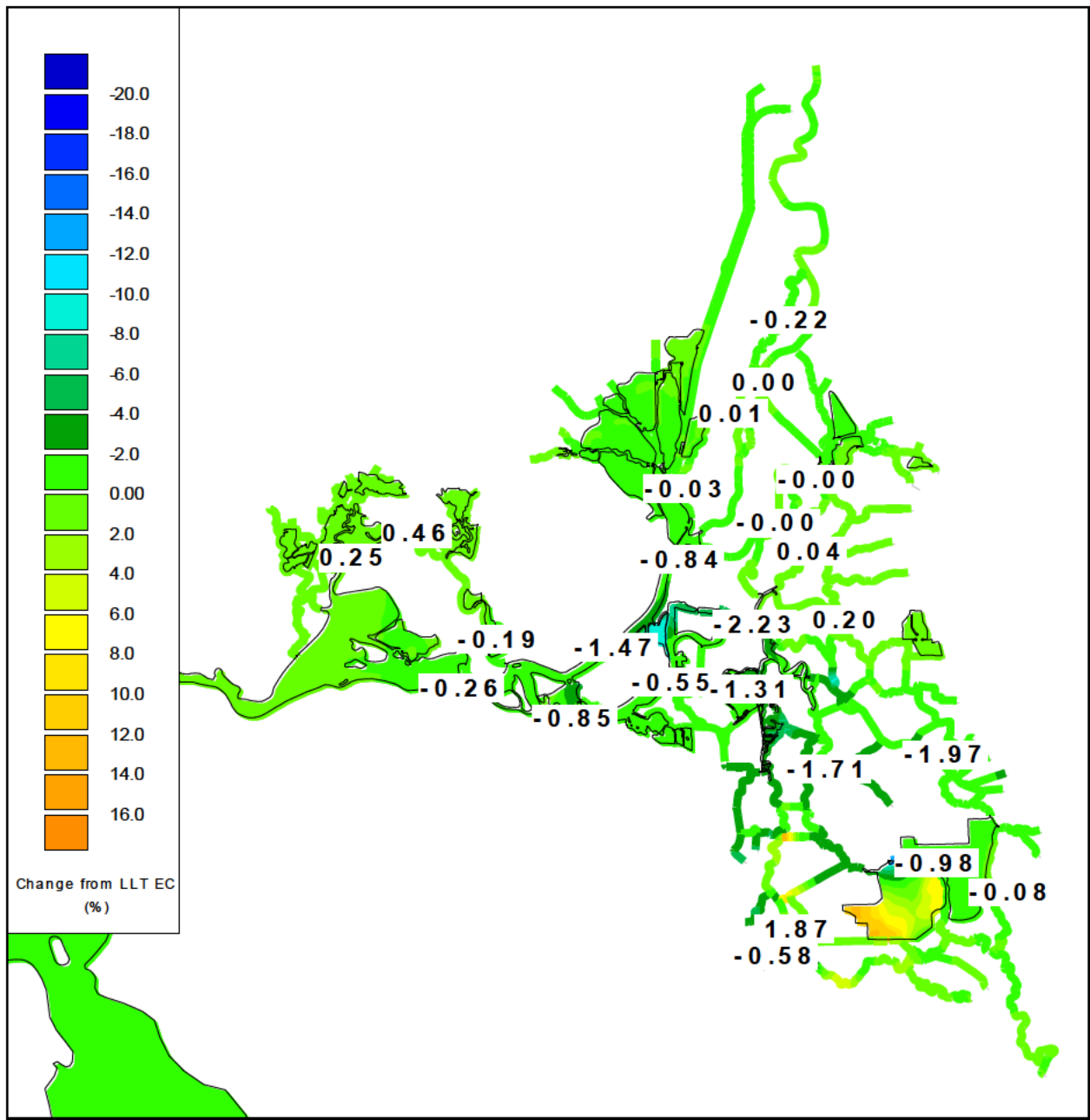


Figure 5-74 Contour plots of LLT – Middle River change from LLT tidally averaged EC on September 24, 2002.

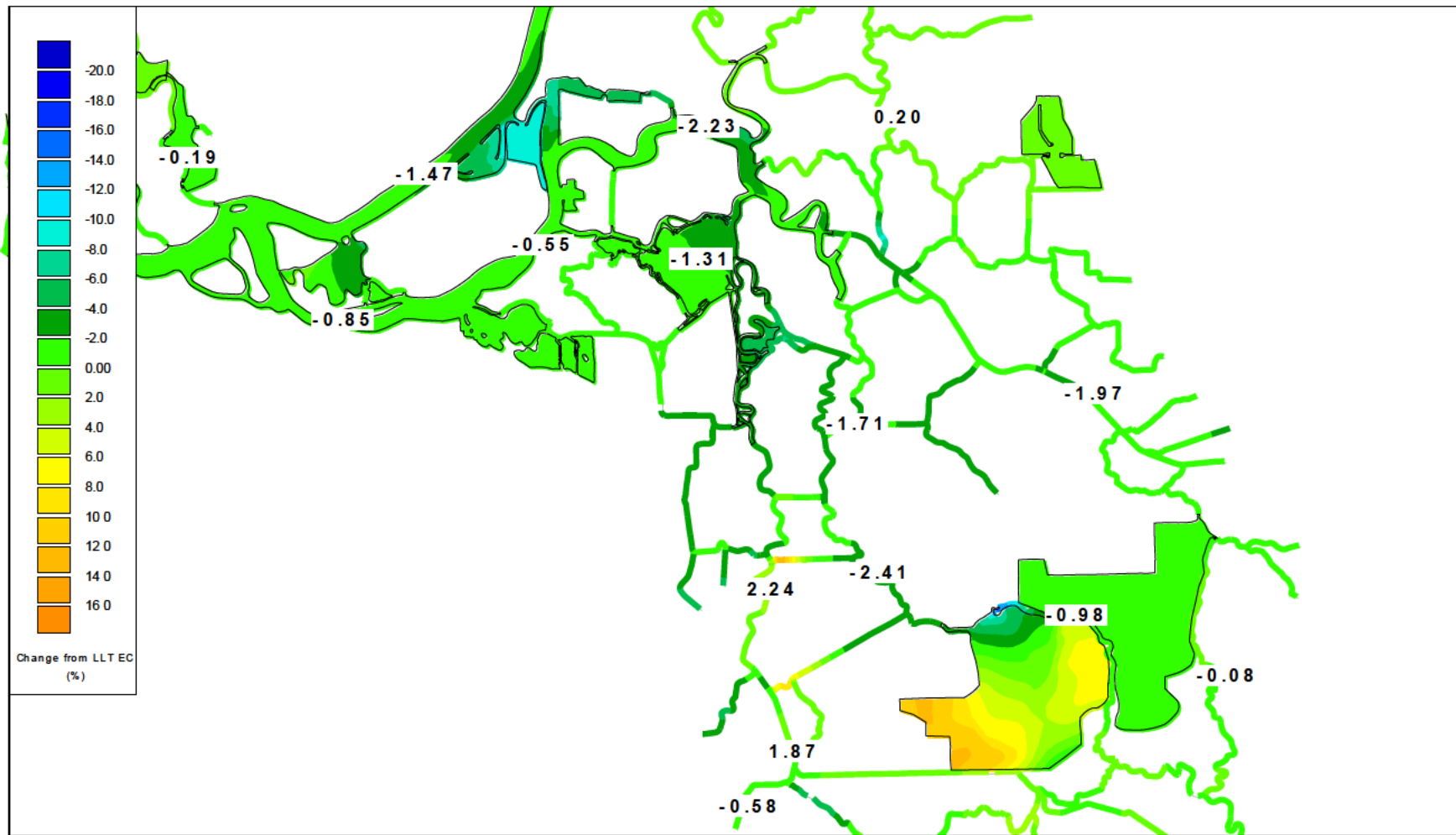


Figure 5-75 Contour plots of LLT – Middle River change from LLT tidally averaged EC in south Delta on September 24, 2002.

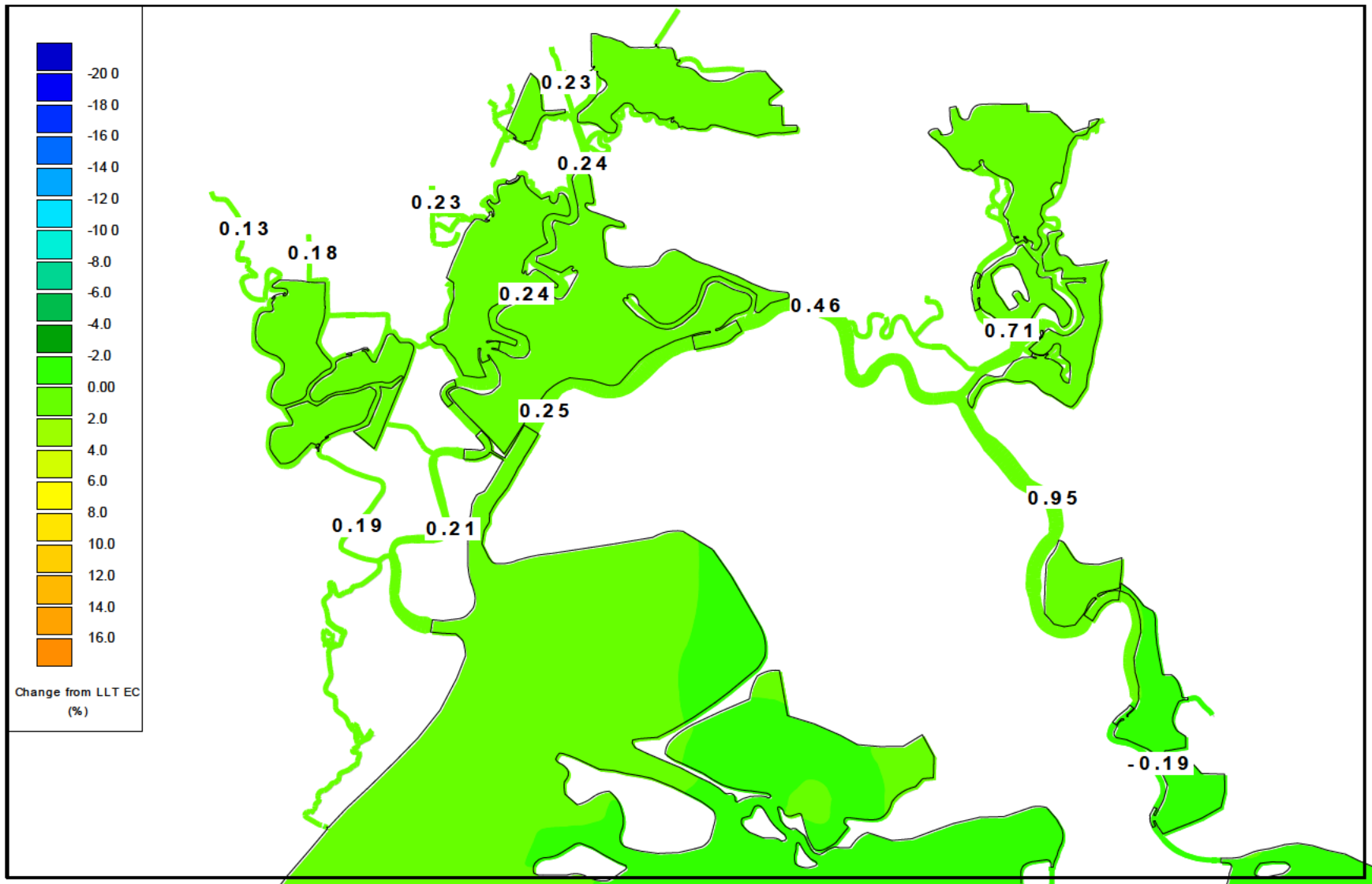


Figure 5-76 Contour plots of LLT - Middle River change from LLT tidally averaged EC in Suisun Marsh on September 24, 2002.

5.3.3 X2 Time Series

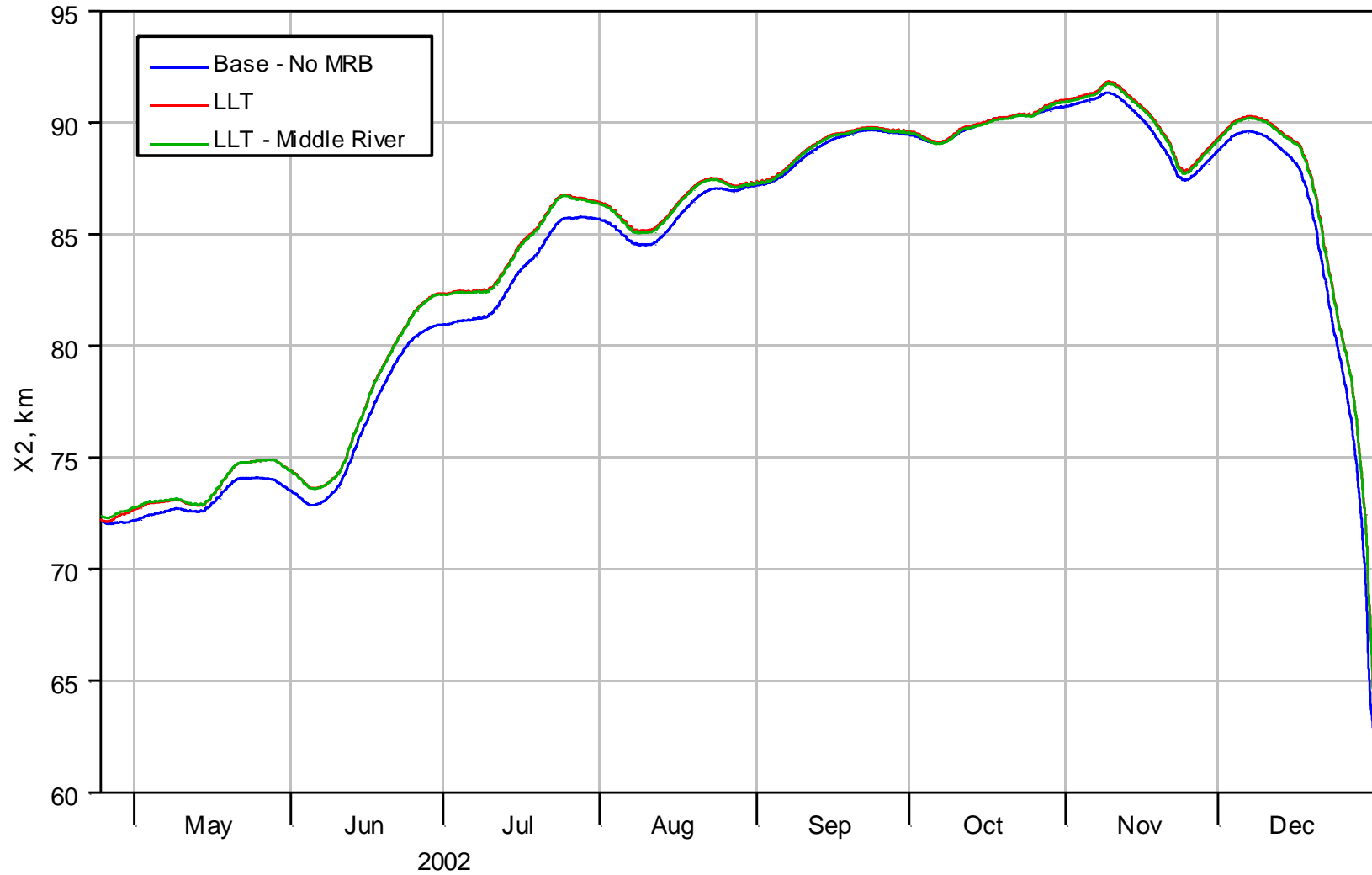


Figure 5-77 Time series of X2 for Base - No MRB, LLT and LLT - Middle River.

5.4 LLT – Suisun Scour

EC results for the LLT – Suisun Scour case are shown as time series plots of tidally averaged values in Figure 5-78 through Figure 5-97. LLT – Suisun Scour EC results are very similar to LLT in the North Delta. In the central and south Delta (including the export locations), at Chipps Island and the head and mouth of Montezuma Slough, EC is substantially increased. Time series in Montezuma Slough at Beldon’s Landing (Figure 5-96) show that LLT – Suisun Scour reduces EC below LLT throughout the simulation period. None of the scenarios impact EC at Freeport.

Contour plots of tidally averaged EC percent change from LLT on September 24, 2002 are shown in Figure 5-98 through Figure 5-100 for the Delta, the south and central Delta and for Suisun Marsh. These plots show very small changes in the north Delta. There are significant EC increases from Suisun Bay up the San Joaquin to Turner Cut and into the southwest Delta in Dutch Slough, Franks Tract and Old and Middle Rivers, including Union Island in the South Delta ROA. EC is decreased throughout most of Suisun Marsh, with the largest reductions occurring in the eastern portion of the Marsh, in Nurse Slough and in Montezuma Slough just upstream of Nurse Slough.

A summary of July – December 2002 monthly average EC at key locations throughout the Delta is provided in Table 5-7 for Base – No MRB, LLT and LLT – Suisun Scour Suisun. Percent change in monthly average EC relative to the base case are provided in Table 5-8 for LLT and LLT – Suisun Scour. LLT impacts to EC in the south Delta are on the order of 10 – 20% increase. The LLT – Suisun Scour case increases these already sizeable impacts by as much as 8 – 11% on average during July and August.

LLT – Suisun Scour X2, shown in Figure 5-101, is increased by about 1 km relative to LLT during the spring and earlier summer. During the remainder of the year, X2 changes are generally less than 0.5 km.

Table 5-7 Summary of July - December 2002 monthly average EC for Base - No MRB, LLT and LLT – Suisun Scour.

| Location | Monthly Average EC (umhos/cm) | | | | | | | | | | | | | | | | | |
|-----------------------|-------------------------------|-------|--------------------|---------------|-------|--------------------|----------------|-------|--------------------|---------------|-------|--------------------|---------------|-------|--------------------|---------------|-------|--------------------|
| | July 2002 | | | August 2002 | | | September 2002 | | | October 2002 | | | November 2002 | | | December 2002 | | |
| | Base - No MRB | LLT | LLT - Suisun Scour | Base - No MRB | LLT | LLT - Suisun Scour | Base - No MRB | LLT | LLT - Suisun Scour | Base - No MRB | LLT | LLT - Suisun Scour | Base - No MRB | LLT | LLT - Suisun Scour | Base - No MRB | LLT | LLT - Suisun Scour |
| Cache Sl at Ryer | 136 | 135 | 135 | 153 | 150 | 150 | 176 | 173 | 173 | 164 | 160 | 159 | 189 | 188 | 186 | 196 | 193 | 192 |
| CCWD Victoria Canal | 264 | 288 | 296 | 367 | 432 | 462 | 469 | 553 | 589 | 511 | 615 | 642 | 453 | 543 | 558 | 482 | 561 | 576 |
| CVP | 333 | 354 | 371 | 515 | 572 | 617 | 664 | 745 | 799 | 658 | 780 | 824 | 587 | 688 | 715 | 631 | 704 | 721 |
| Montezuma Sl at Head | 3536 | 3567 | 3898 | 4650 | 4521 | 4829 | 6853 | 6816 | 7214 | 7400 | 7510 | 7928 | 6555 | 6739 | 6979 | 3149 | 3440 | 3538 |
| Montezuma Sl at Mouth | 13705 | 14112 | 14581 | 15976 | 16392 | 16915 | 18958 | 19301 | 19760 | 20766 | 20950 | 21585 | 19465 | 20279 | 20901 | 12062 | 13926 | 14140 |
| RMID015 | 261 | 285 | 294 | 367 | 437 | 468 | 469 | 565 | 602 | 503 | 612 | 638 | 442 | 522 | 536 | 463 | 542 | 557 |
| RMID023 | 262 | 285 | 293 | 367 | 436 | 466 | 468 | 560 | 596 | 507 | 614 | 641 | 448 | 527 | 541 | 477 | 552 | 566 |
| ROLD024 | 401 | 438 | 473 | 707 | 781 | 860 | 934 | 1049 | 1144 | 826 | 1014 | 1088 | 712 | 891 | 941 | 607 | 744 | 785 |
| ROLD034 | 360 | 392 | 419 | 615 | 692 | 759 | 804 | 912 | 991 | 755 | 915 | 978 | 651 | 801 | 843 | 601 | 732 | 767 |
| RSAC075 Chipps Island | 8209 | 8880 | 9602 | 9741 | 10267 | 11046 | 12563 | 13253 | 14101 | 13606 | 14160 | 15066 | 11990 | 12802 | 13679 | 6035 | 6735 | 7238 |
| RSAC092 Emmaton | 623 | 629 | 659 | 808 | 742 | 766 | 1498 | 1384 | 1412 | 2012 | 1919 | 1976 | 1748 | 1782 | 1847 | 821 | 874 | 906 |
| RSAC101 Rio Vista | 148 | 146 | 145 | 176 | 162 | 161 | 241 | 213 | 209 | 285 | 264 | 258 | 290 | 308 | 303 | 222 | 232 | 229 |
| RSAC123 | 127 | 127 | 127 | 154 | 155 | 155 | 165 | 165 | 165 | 142 | 142 | 142 | 184 | 184 | 184 | 169 | 168 | 168 |
| RSAC155 Freeport | 126 | 126 | 126 | 156 | 156 | 156 | 162 | 162 | 162 | 142 | 142 | 142 | 184 | 184 | 184 | 164 | 164 | 164 |
| RSAN018 Jersey Pt | 954 | 1028 | 1147 | 1461 | 1519 | 1692 | 1975 | 2116 | 2317 | 1728 | 1913 | 2063 | 1503 | 1766 | 1893 | 945 | 1108 | 1188 |
| RSAN032 San Andreas | 284 | 383 | 414 | 459 | 649 | 713 | 555 | 871 | 944 | 448 | 773 | 824 | 403 | 668 | 703 | 333 | 480 | 503 |
| RSAN058 | 643 | 612 | 614 | 664 | 644 | 646 | 711 | 698 | 701 | 674 | 682 | 682 | 636 | 629 | 629 | 763 | 751 | 753 |
| S-49 Beldon's Landing | 10402 | 11292 | 10644 | 13266 | 14335 | 13307 | 15826 | 16973 | 15785 | 18856 | 19371 | 18463 | 18357 | 19659 | 18273 | 12766 | 15349 | 13414 |
| SWP | 329 | 360 | 380 | 540 | 615 | 671 | 698 | 807 | 874 | 682 | 835 | 889 | 593 | 725 | 759 | 594 | 691 | 716 |

Table 5-8 Summary of July - December 2002 percent change in monthly average EC for LLT and LLT – Suisun Scour relative to Base - No MRB.

| Location | Percent Change in Monthly Average EC (umhos/cm) Relative to Base Case | | | | | | | | | | | |
|-----------------------|---|--------------------|-------------|--------------------|----------------|--------------------|--------------|--------------------|---------------|--------------------|---------------|--------------------|
| | July 2002 | | August 2002 | | September 2002 | | October 2002 | | November 2002 | | December 2002 | |
| | LLT | LLT - Suisun Scour | LLT | LLT - Suisun Scour | LLT | LLT - Suisun Scour | LLT | LLT - Suisun Scour | LLT | LLT - Suisun Scour | LLT | LLT - Suisun Scour |
| Cache SI at Ryer | -1% | -1% | -2% | -2% | -1% | -1% | -2% | -3% | -1% | -2% | -2% | -2% |
| CCWD Victoria Canal | 9% | 12% | 18% | 26% | 18% | 26% | 20% | 26% | 20% | 23% | 16% | 19% |
| CVP | 7% | 11% | 11% | 20% | 12% | 20% | 19% | 25% | 17% | 22% | 12% | 14% |
| Montezuma SI at Head | 1% | 10% | -3% | 4% | -1% | 5% | 1% | 7% | 3% | 6% | 9% | 12% |
| Montezuma SI at Mouth | 3% | 6% | 3% | 6% | 2% | 4% | 1% | 4% | 4% | 7% | 15% | 17% |
| RMID015 | 9% | 13% | 19% | 27% | 20% | 28% | 22% | 27% | 18% | 21% | 17% | 20% |
| RMID023 | 9% | 12% | 19% | 27% | 20% | 27% | 21% | 27% | 18% | 21% | 16% | 19% |
| ROLD024 | 9% | 18% | 10% | 22% | 12% | 22% | 23% | 32% | 25% | 32% | 23% | 29% |
| ROLD034 | 9% | 16% | 13% | 23% | 13% | 23% | 21% | 30% | 23% | 30% | 22% | 28% |
| RSAC075 Chipps Island | 8% | 17% | 5% | 13% | 5% | 12% | 4% | 11% | 7% | 14% | 12% | 20% |
| RSAC092 Emmaton | 1% | 6% | -8% | -5% | -8% | -6% | -5% | -2% | 2% | 6% | 6% | 10% |
| RSAC101 Rio Vista | -2% | -2% | -8% | -9% | -12% | -13% | -7% | -9% | 6% | 4% | 5% | 4% |
| RSAC123 | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| RSAC155 Freeport | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| RSAN018 Jersey Pt | 8% | 20% | 4% | 16% | 7% | 17% | 11% | 19% | 18% | 26% | 17% | 26% |
| RSAN032 San Andreas | 35% | 46% | 42% | 55% | 57% | 70% | 73% | 84% | 66% | 74% | 44% | 51% |
| RSAN058 | -5% | -4% | -3% | -3% | -2% | -1% | 1% | 1% | -1% | -1% | -2% | -1% |
| S-49 Beldon's Landing | 9% | 2% | 8% | 0% | 7% | 0% | 3% | -2% | 7% | 0% | 20% | 5% |
| SWP | 9% | 15% | 14% | 24% | 16% | 25% | 23% | 30% | 22% | 28% | 16% | 21% |

5.4.1 Tidally averaged EC time series

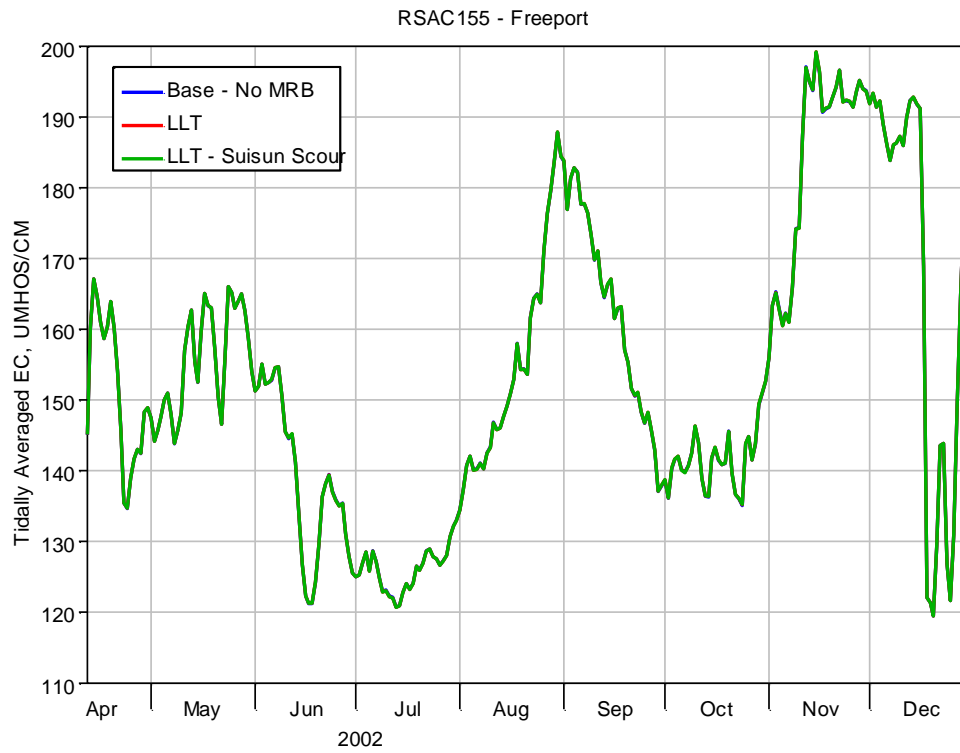


Figure 5-78 Tidally averaged EC at RSAC155 for Base-No MRB, LLT and LLT-Suisun Scour.



Figure 5-79 Tidally averaged EC in Sutter Slough for Base-No MRB, LLT and LLT-Suisun Scour.

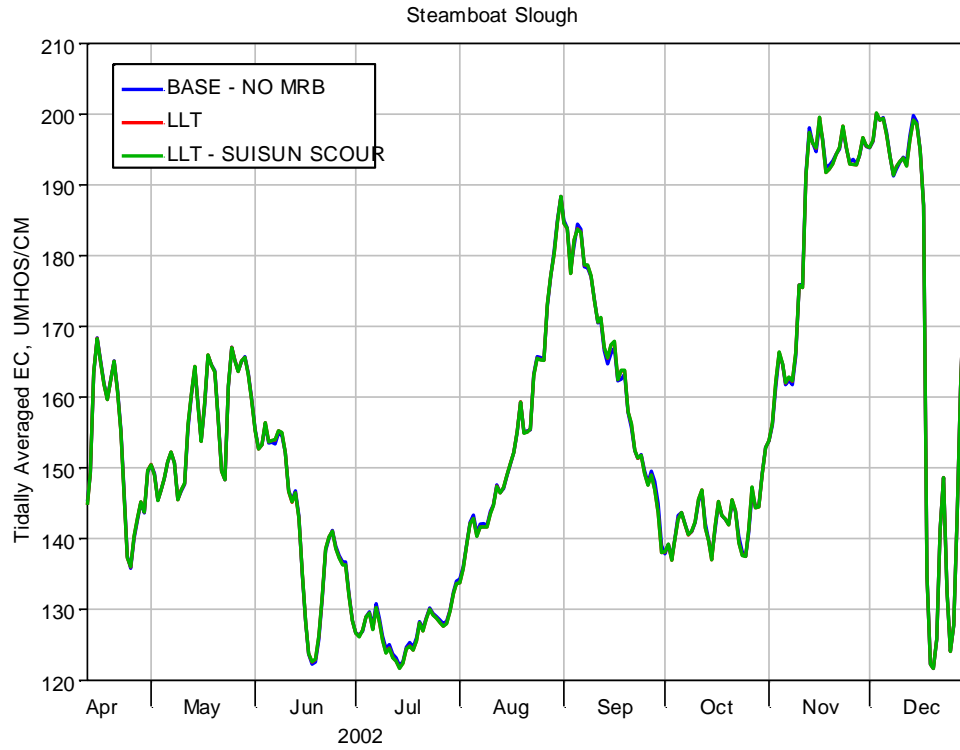


Figure 5-80 Tidally averaged EC in Steamboat Slough for Base-No MRB, LLT and LLT-Suisun Scour.

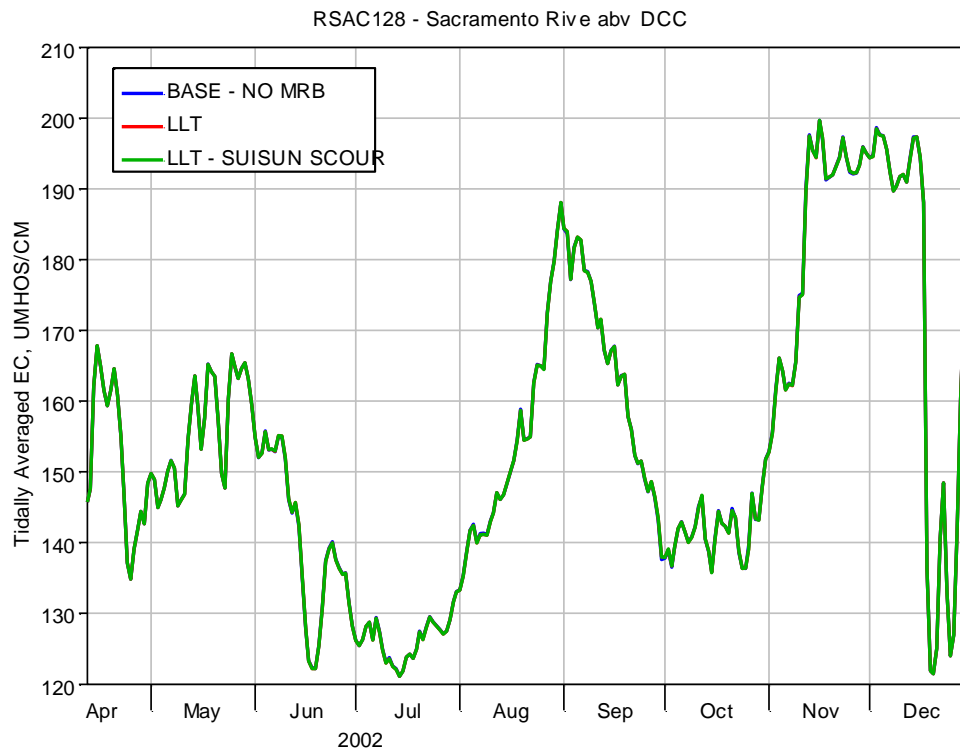


Figure 5-81 Tidally averaged EC at RSAC128 for Base-No MRB, LLT and LLT-Suisun Scour.

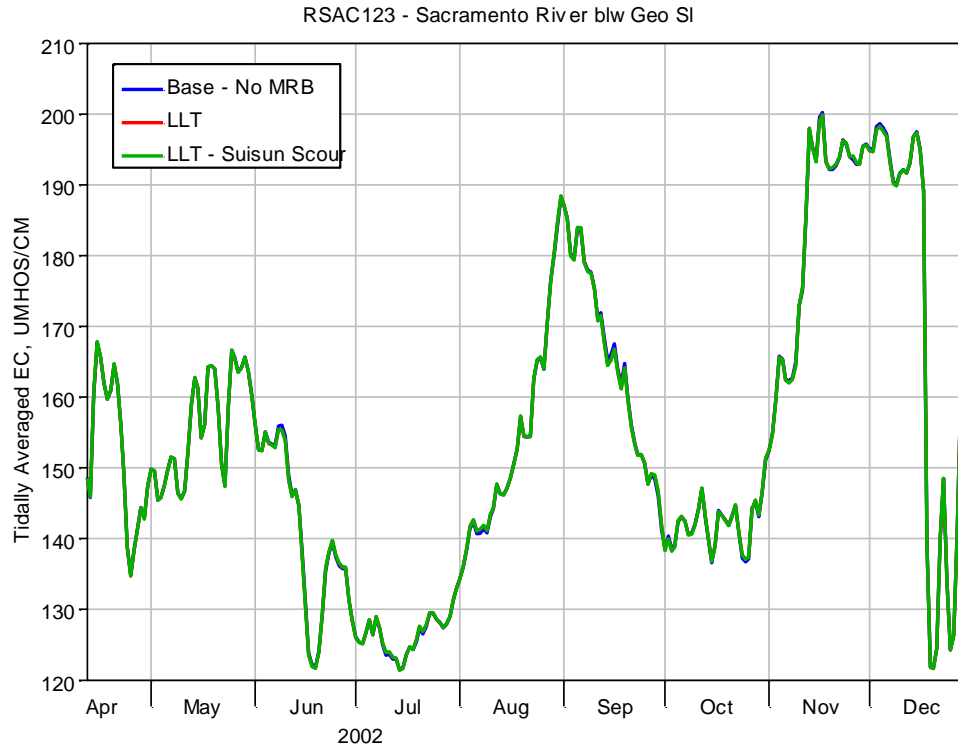


Figure 5-82 Tidally averaged EC at RSAC123 for Base-No MRB, LLT and LLT-Suisun Scour.

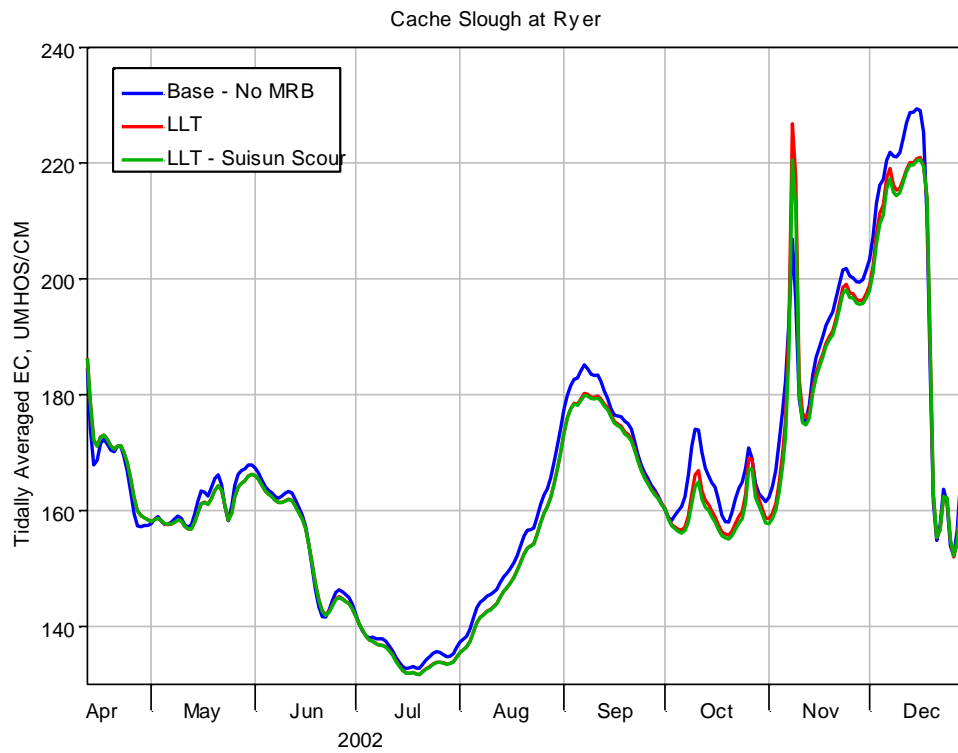


Figure 5-83 Tidally averaged EC at Cache Slough at Ryer for Base-No MRB, LLT and LLT-Suisun Scour.

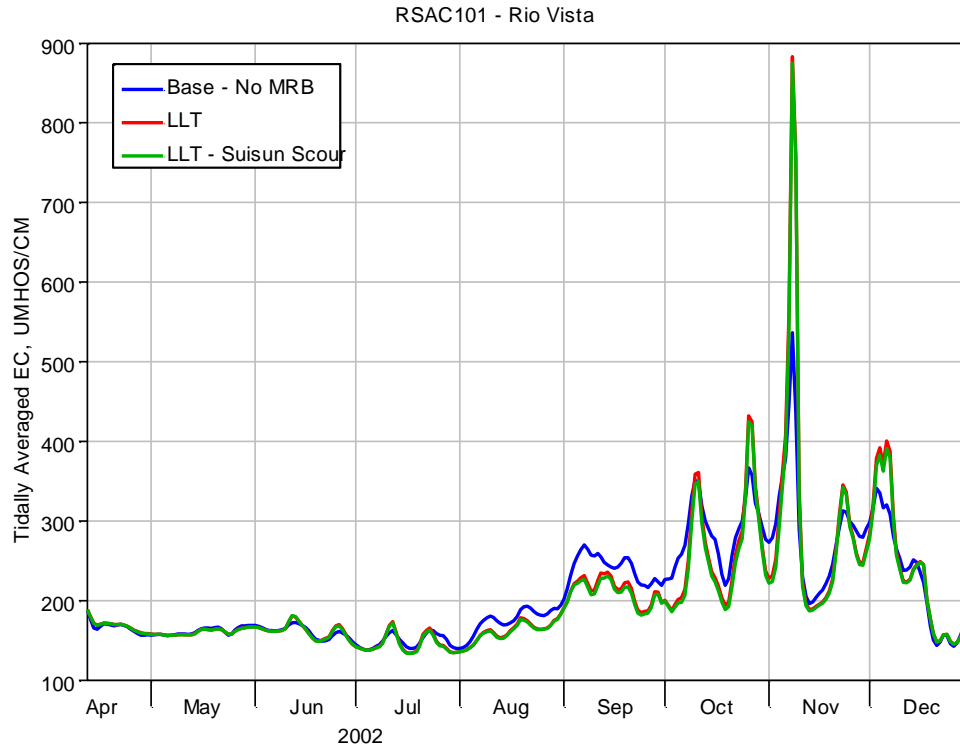


Figure 5-84 Tidally averaged EC at RSAC101 for Base-No MRB, LLT and LLT-Suisun Scour.

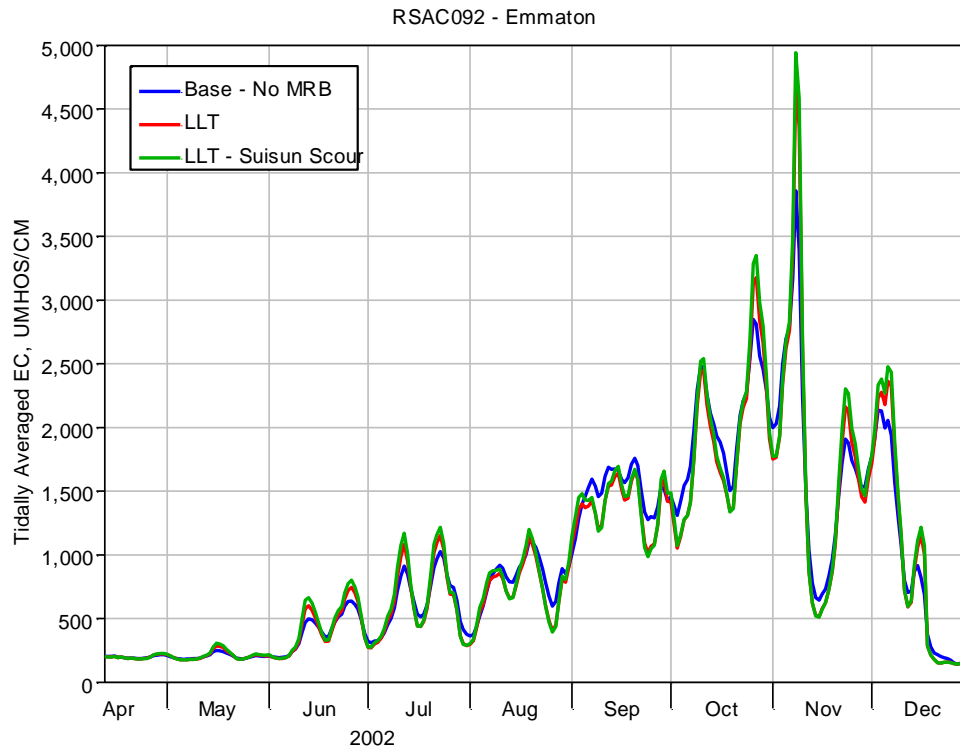


Figure 5-85 Tidally averaged EC at RSAC092 for Base-No MRB, LLT and LLT-Suisun Scour.

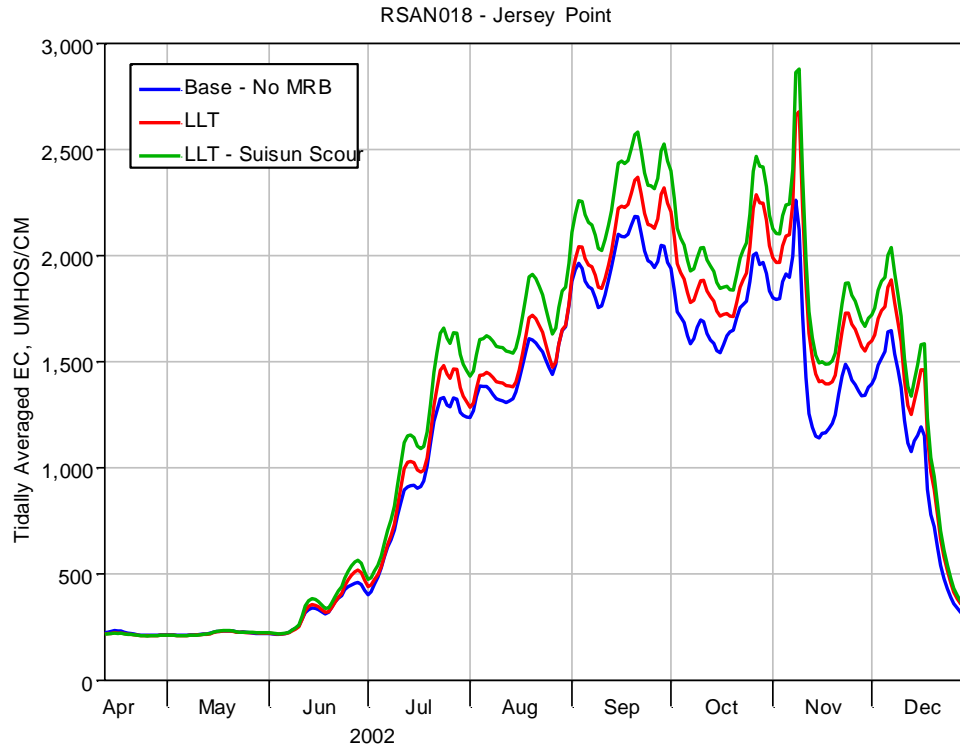


Figure 5-86 Tidally averaged EC at RSAN018 for Base-No MRB, LLT and LLT-Suisun Scour.

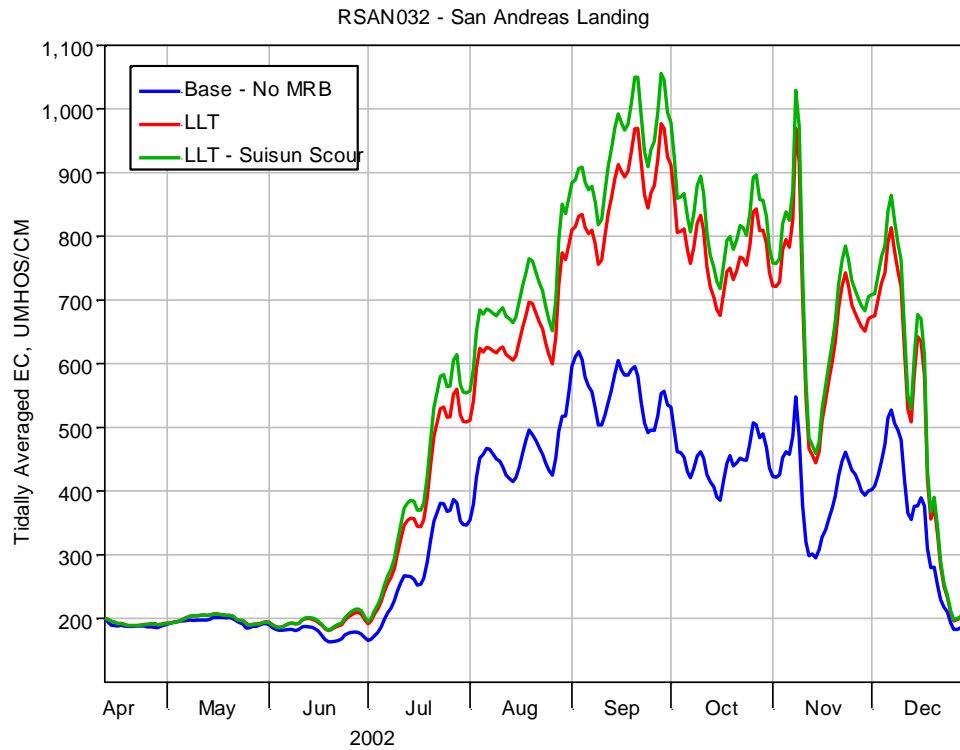


Figure 5-87 Tidally averaged EC at RSAN032 for Base-No MRB, LLT and LLT-Suisun Scour.

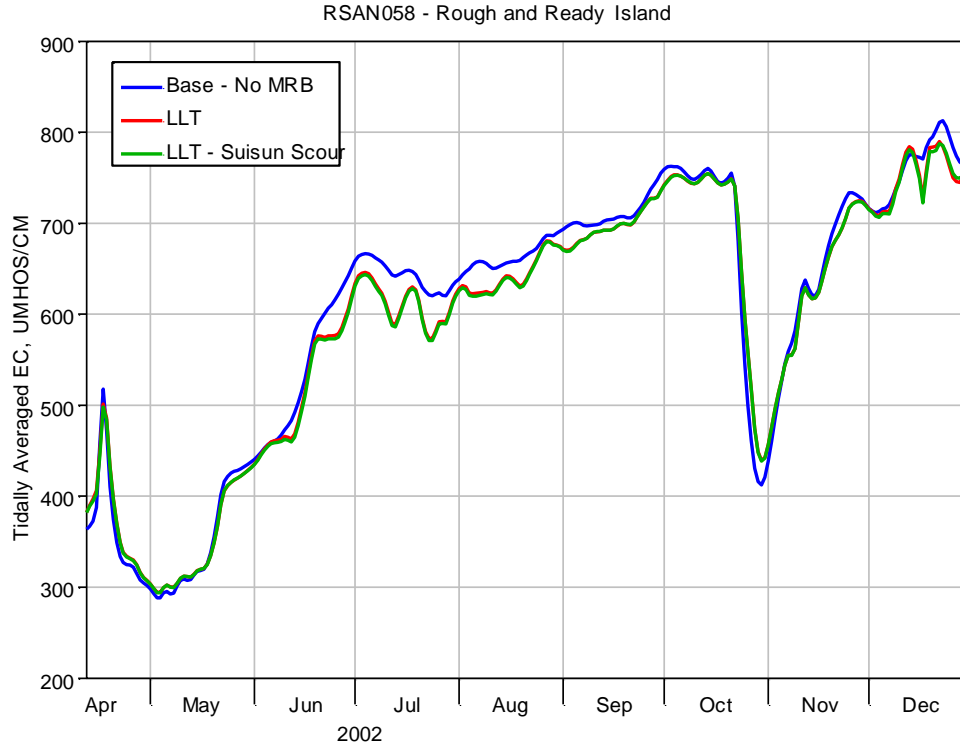


Figure 5-88 Tidally averaged EC at RSAN058 for Base-No MRB, LLT and LLT-Suisun Scour.

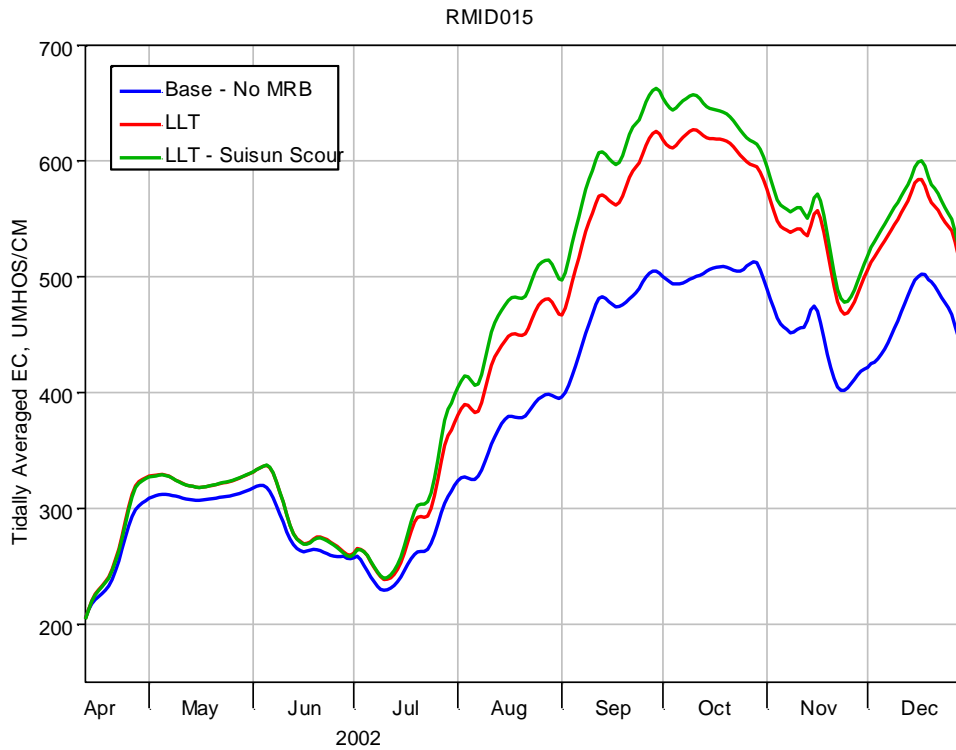


Figure 5-89 Tidally averaged EC at RMID015 for Base-No MRB, LLT and LLT-Suisun Scour.

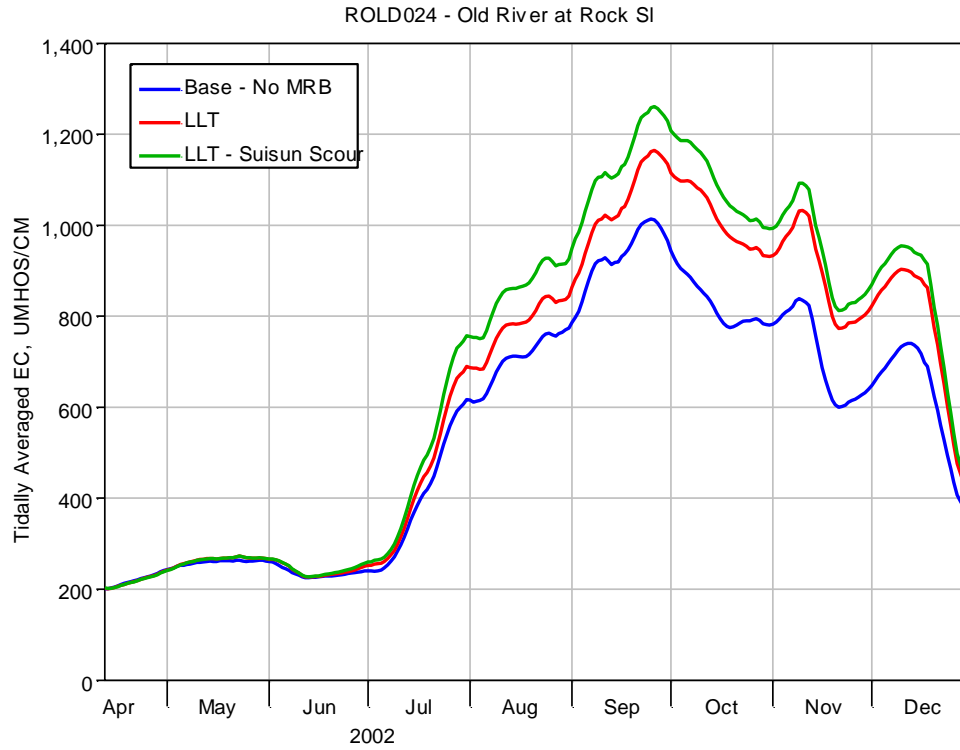


Figure 5-90 Tidally averaged EC at ROLD024 for Base-No MRB, LLT and LLT-Suisun Scour.

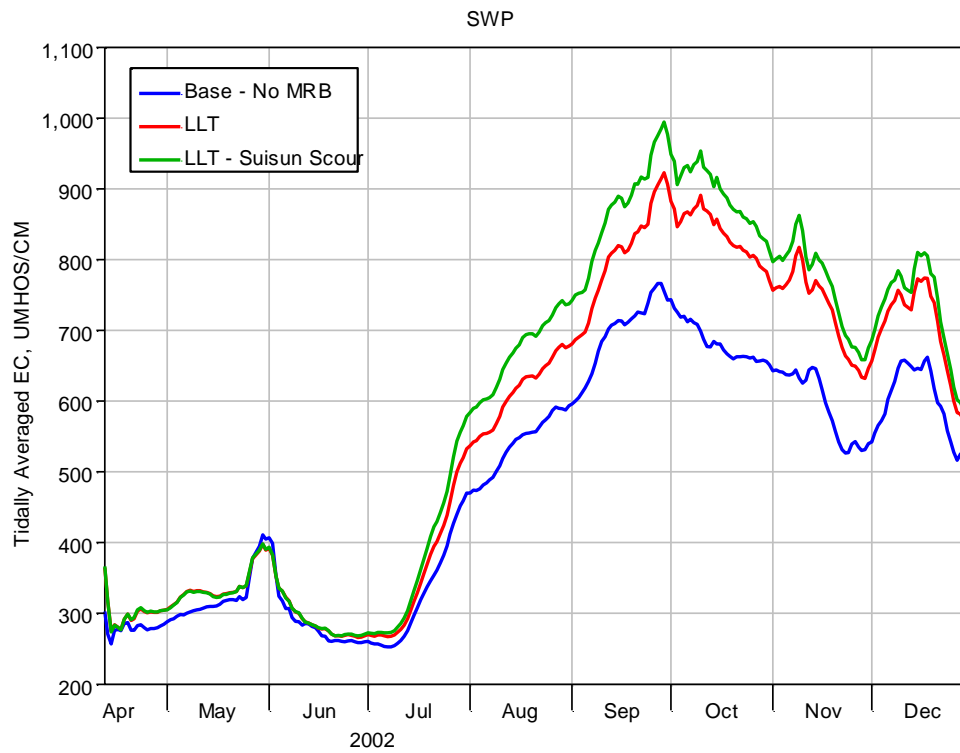


Figure 5-91 Tidally averaged EC at SWP for Base-No MRB, LLT and LLT-Suisun Scour.

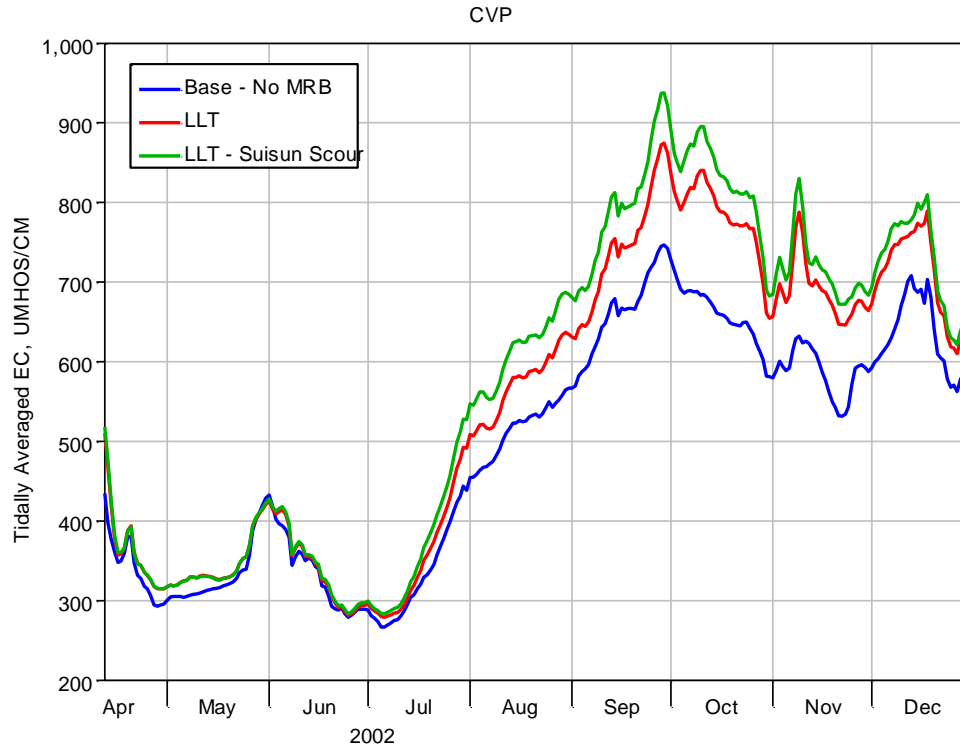


Figure 5-92 Tidally averaged EC at CVP for Base-No MRB, LLT and LLT-Suisun Scour.

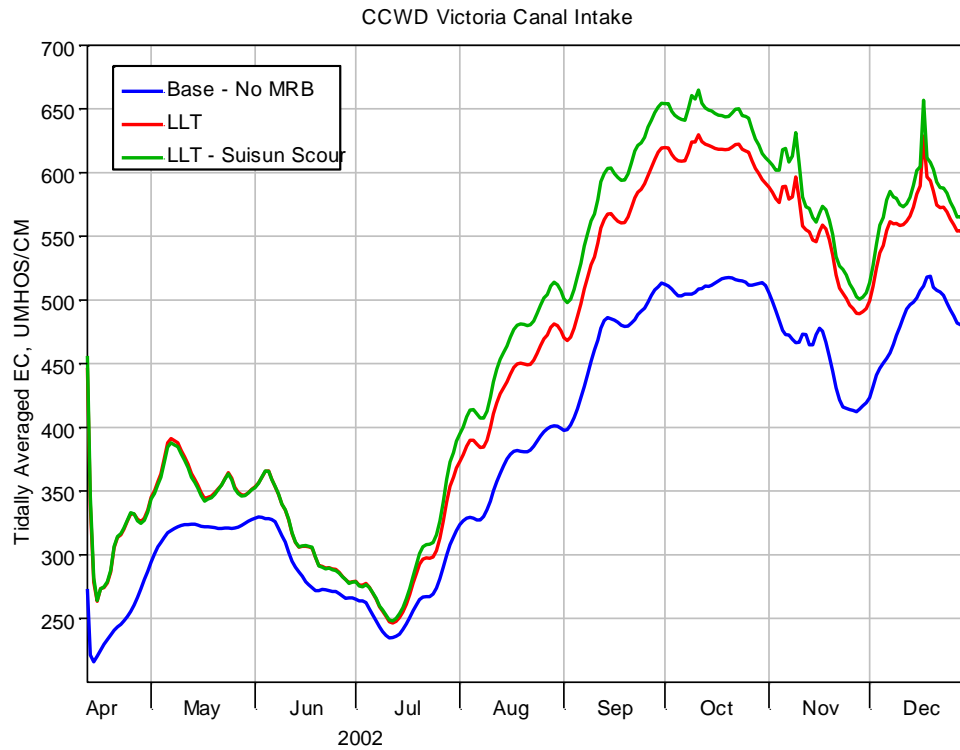


Figure 5-93 Tidally averaged EC at CCWD for Base-No MRB, LLT and LLT-Suisun Scour.

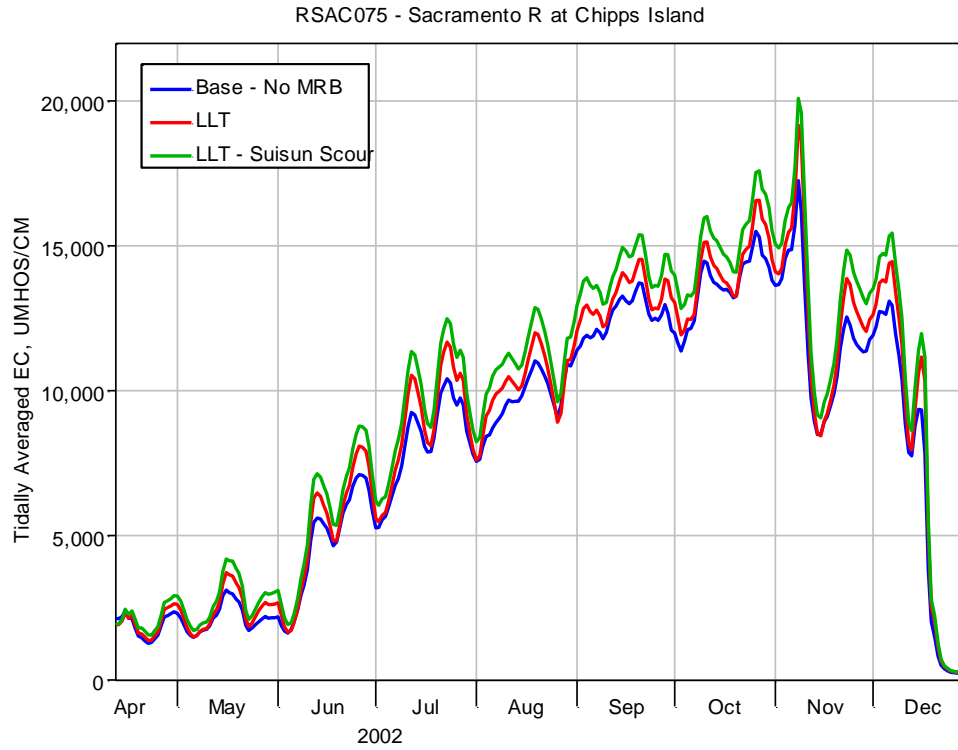


Figure 5-94 Tidally averaged EC at RSAC075 for Base-No MRB, LLT and LLT-Suisun Scour.

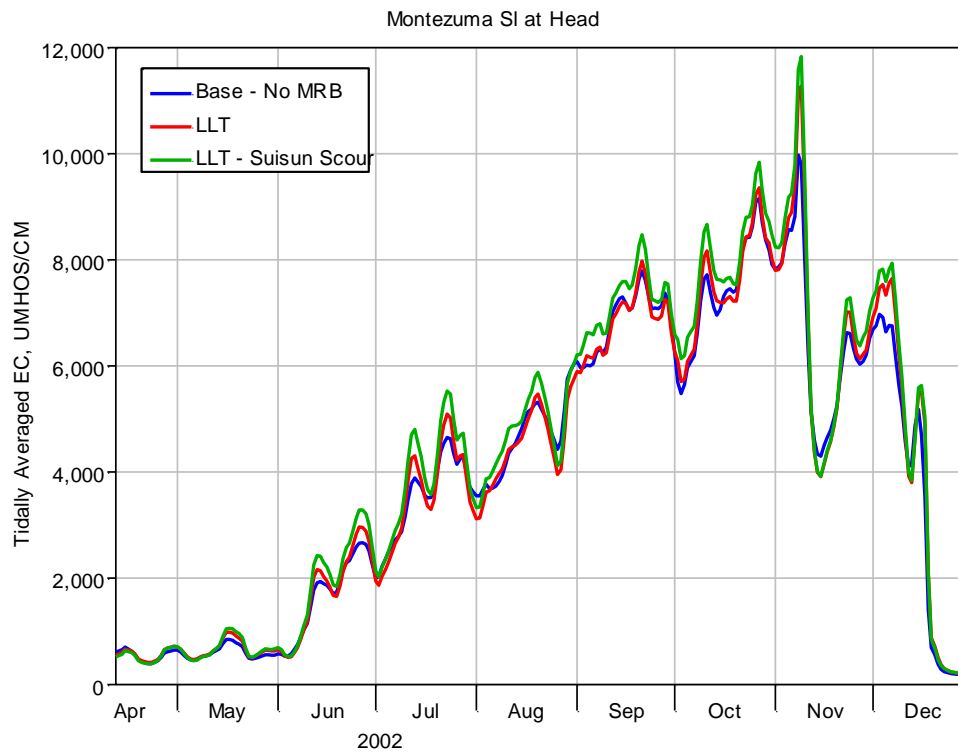


Figure 5-95 Tidally averaged EC at Montezuma SI at Head for Base-No MRB, LLT and LLT-Suisun Scour.

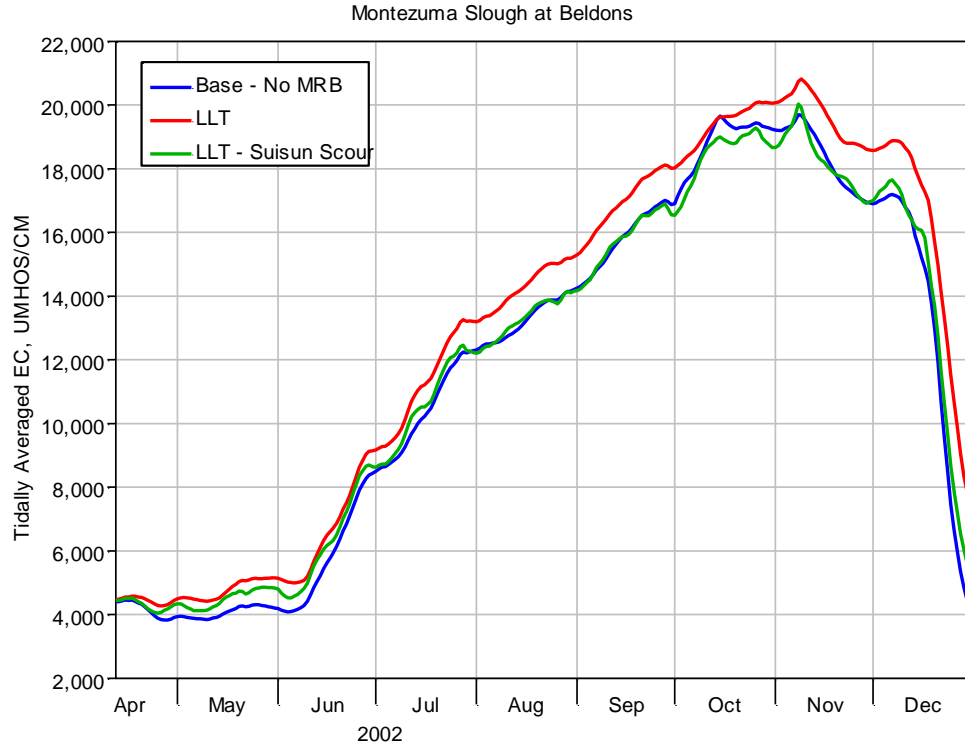


Figure 5-96 Tidally averaged EC at Montezuma Slough at Beldon’s for Base-No MRB, LLT and LLT-Suisun Scour.

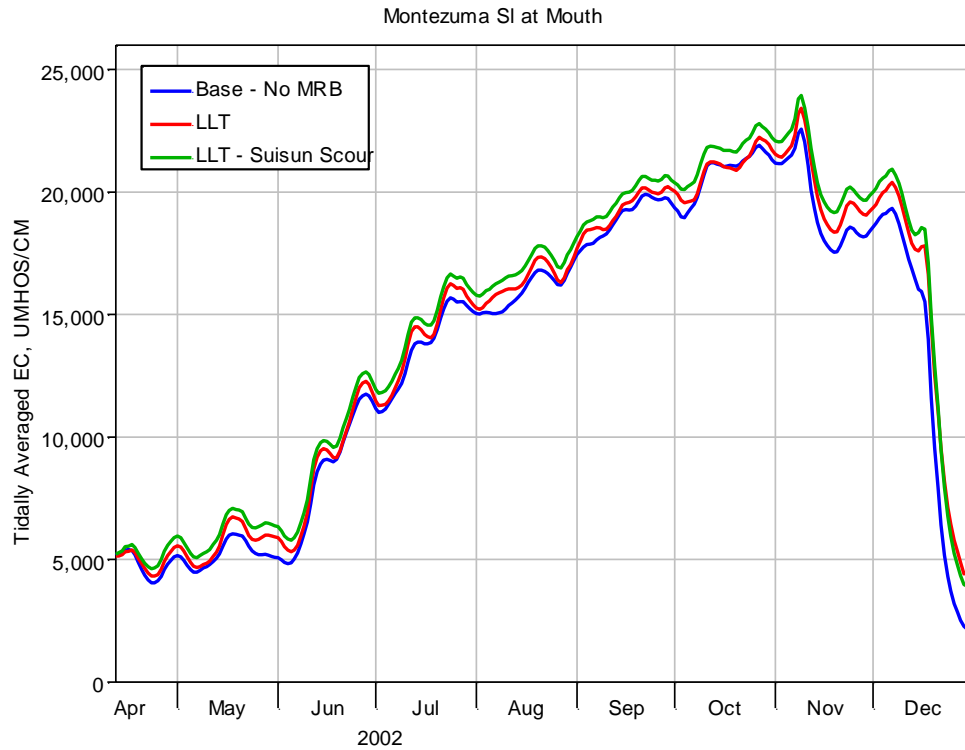


Figure 5-97 Tidally averaged EC at Montezuma Sl at Mouth for Base-No MRB, LLT and LLT-Suisun Scour.

5.4.2 Spatial Plots of EC Change

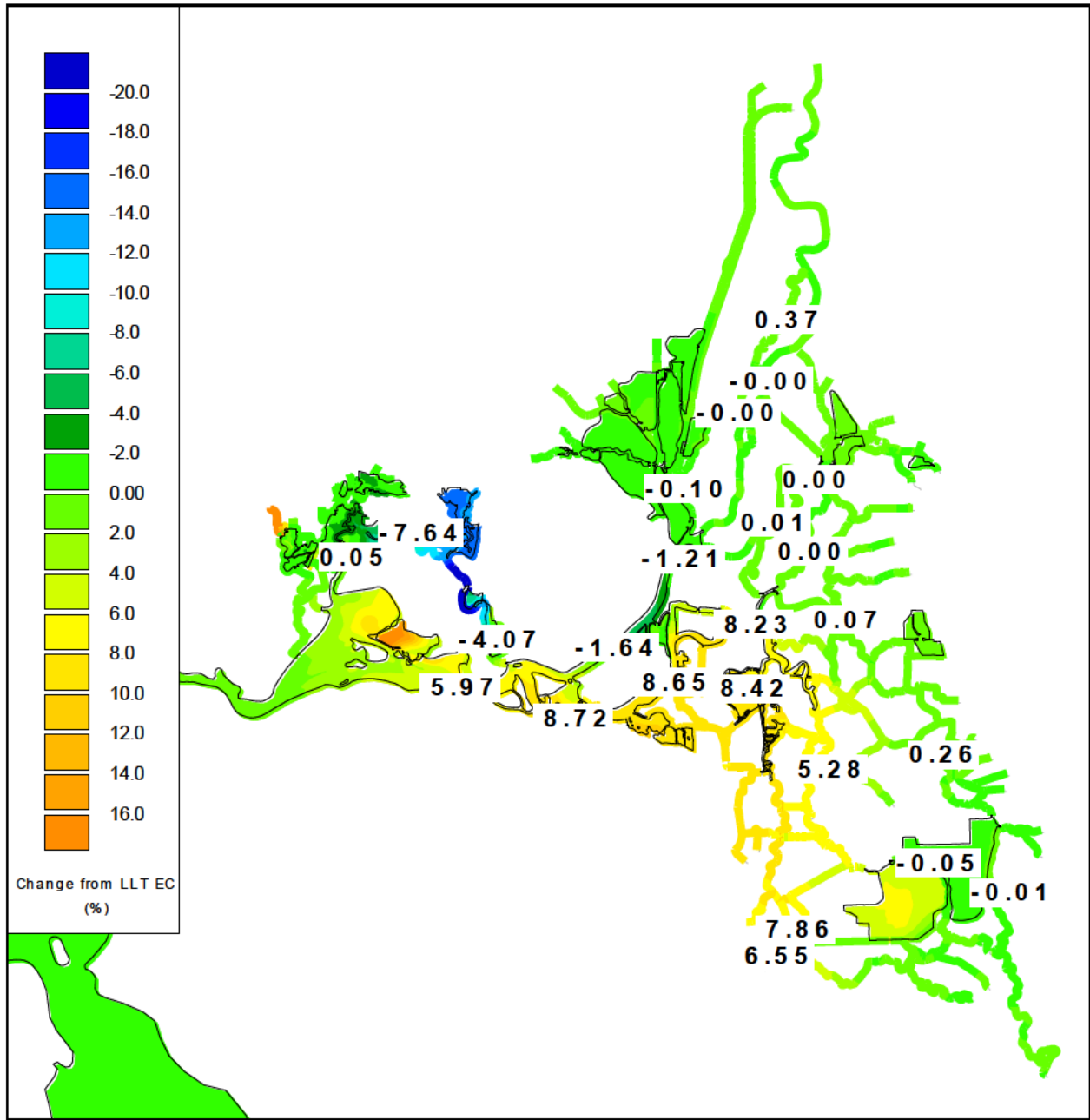


Figure 5-98 Contour plots of LLT – Suisun Scour change from LLT tidally averaged EC on September 24, 2002.

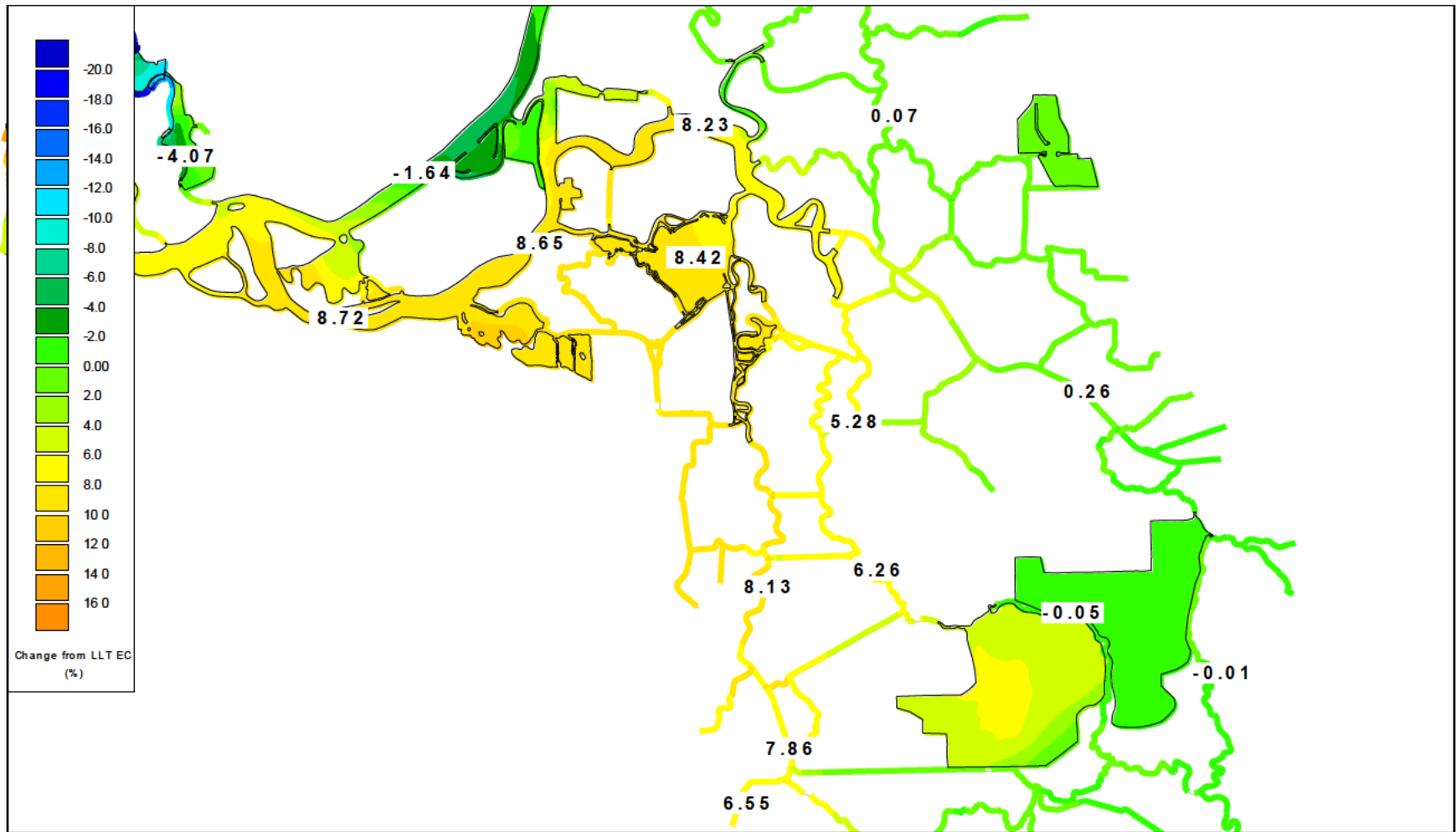


Figure 5-99 Contour plots of LLT – Suisun Scour change from LLT tidally averaged EC in south Delta on September 24, 2002.

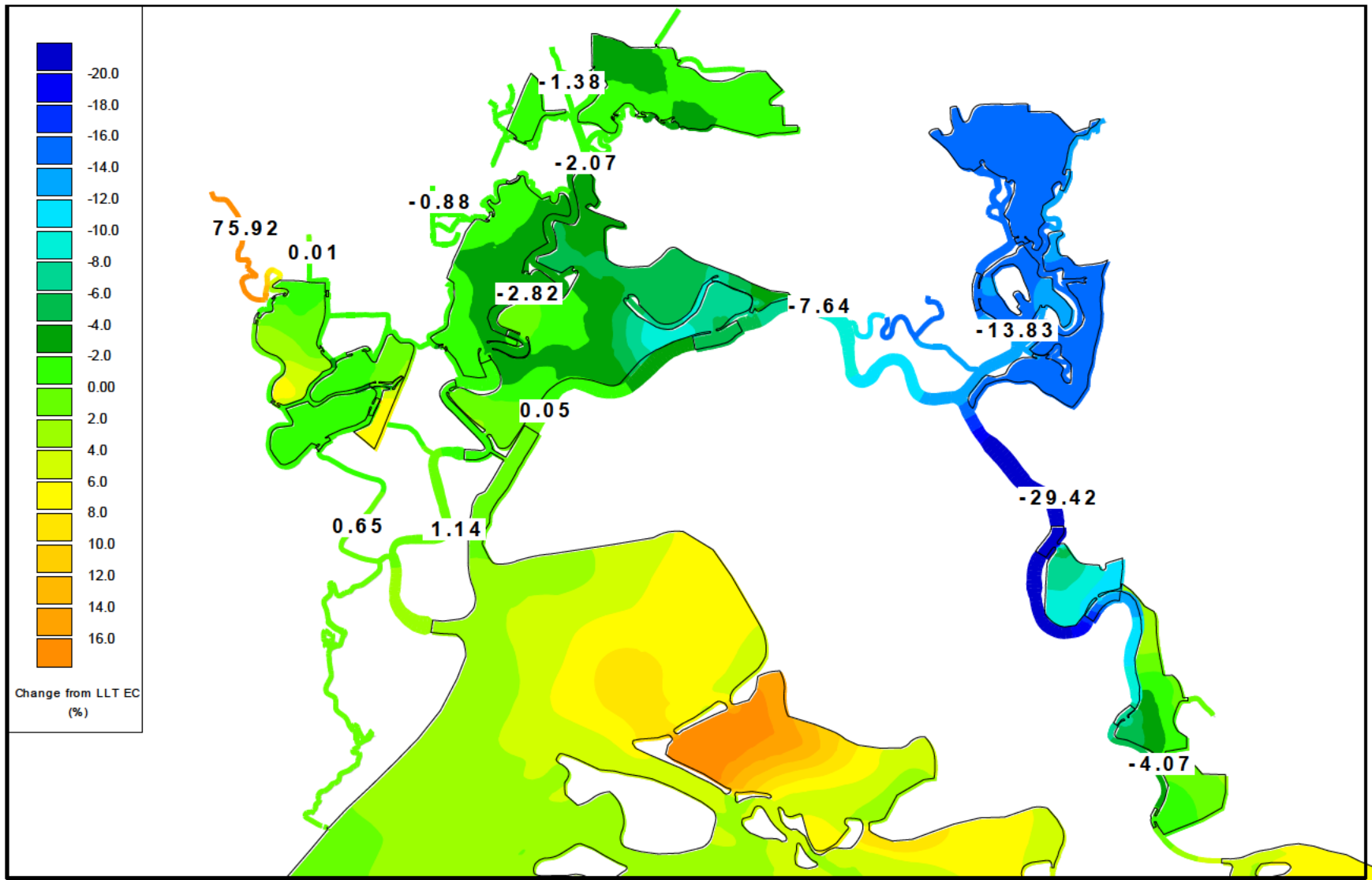


Figure 5-100 Contour plots of LLT – Suisun Scour change from LLT tidally averaged EC in Suisun Marsh on September 24, 2002.

5.4.3 X2 Time Series

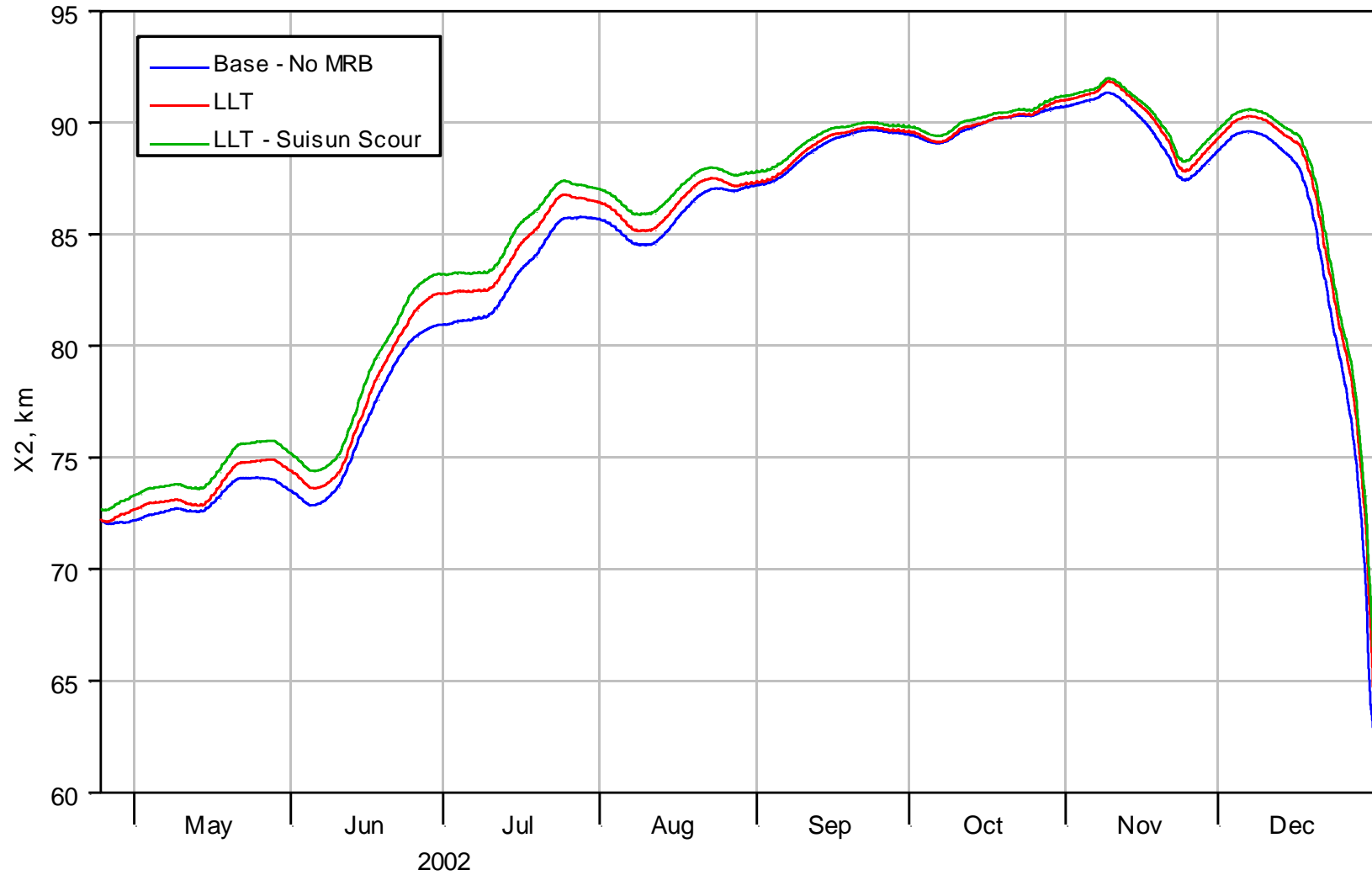


Figure 5-101 Time series of X2 for Base - No MRB, LLT and LLT – Suisun Scour.

5.5 ELT – Prospect Breach

Time series plots of tidally averaged EC for the ELT – Prospect Breach case, compared with Base and ELT results are provided in Figure 5-102 through Figure 5-121. EC in the north Delta is low overall and thus changes are small in magnitude. The difference between the ELT and ELT – Prospect Breach EC in Cache Slough at Ryer is generally less than +/-2 umhos/cm. Aside from localized impacts near Prospect Island, the largest EC impacts from the ELT – Prospect Breach case are due to the increased flow in DCC and Georgiana Slough, which causes EC in San Joaquin River at San Andreas, and in Old and Middle River to decline by about 2 – 3% relative to ELT. EC impacts along the Sacramento River and in Suisun Marsh are minimal. None of the scenarios impact EC at Freeport.

Contour plots of tidally averaged EC percent change from ELT on September 24, 2002 are shown in Figure 5-123 through Figure 5-125 for the Delta, the south and central Delta, for Suisun Marsh and for the Cache Slough ROA. These plots show that at this time, throughout most of the model domain, the LLT – No South case results in small EC changes (within +/-2% or less) relative to ELT. There are localized increases in the Cache Slough ROA in the Sacramento Deepwater Ship Channel and in Prospect Island due to removal of the Prospect Island breach and the subsequent elimination of flow conveyance from Miner Slough through Prospect Island to the Ship Channel. Changes in Suisun Marsh are minimal – less than 0.5%.

A summary of July – December 2002 monthly average EC at key locations throughout the Delta is provided in Table 5-9 for Base – No SMSCG, ELT and ELT – Prospect Breach. Percent change in monthly average EC relative to the base case are provided in Table 5-10 for ELT and ELT – Prospect Breach.

Removal of the Prospect Breach has minimal impact on X2, as shown in Figure 5-126. Differences between ELT and ELT – Prospect Breach are less than 0.1 km.

Table 5-9 Summary of July - December 2002 monthly average EC for Base - No SMSCG, ELT and ELT – Prospect Breach.

| Location | Monthly Average EC (umhos/cm) | | | | | | | | | | | | | | | | | |
|-----------------------|-------------------------------|-------|-----------------------|-----------------|-------|-----------------------|-----------------|-------|-----------------------|-----------------|-------|-----------------------|-----------------|-------|-----------------------|-----------------|-------|-----------------------|
| | July 2002 | | | August 2002 | | | September 2002 | | | October 2002 | | | November 2002 | | | December 2002 | | |
| | Base - No SMSCG | ELT | ELT - Prospect Breach | Base - No SMSCG | ELT | ELT - Prospect Breach | Base - No SMSCG | ELT | ELT - Prospect Breach | Base - No SMSCG | ELT | ELT - Prospect Breach | Base - No SMSCG | ELT | ELT - Prospect Breach | Base - No SMSCG | ELT | ELT - Prospect Breach |
| Cache Sl at Ryer | 136 | 134 | 135 | 153 | 151 | 152 | 176 | 174 | 173 | 164 | 157 | 158 | 189 | 184 | 185 | 196 | 192 | 193 |
| CCWD Victoria Canal | 265 | 274 | 271 | 369 | 400 | 390 | 468 | 513 | 502 | 509 | 561 | 550 | 452 | 484 | 475 | 483 | 513 | 506 |
| CVP | 334 | 341 | 337 | 517 | 540 | 529 | 665 | 698 | 687 | 658 | 713 | 700 | 587 | 627 | 616 | 631 | 661 | 653 |
| Montezuma Sl at Head | 3539 | 3254 | 3268 | 4653 | 4294 | 4316 | 6856 | 6412 | 6442 | 7404 | 7064 | 7086 | 6557 | 6322 | 6343 | 3148 | 3132 | 3141 |
| Montezuma Sl at Mouth | 13705 | 14342 | 14348 | 15976 | 16618 | 16631 | 18956 | 19533 | 19549 | 20763 | 21199 | 21215 | 19462 | 20292 | 20306 | 12058 | 13439 | 13450 |
| RMID015 | 262 | 272 | 269 | 369 | 401 | 391 | 471 | 517 | 506 | 504 | 556 | 545 | 441 | 475 | 466 | 464 | 494 | 487 |
| RMID023 | 263 | 273 | 270 | 369 | 400 | 391 | 469 | 514 | 503 | 507 | 559 | 548 | 447 | 480 | 471 | 477 | 507 | 500 |
| ROLD024 | 402 | 409 | 401 | 709 | 725 | 712 | 937 | 967 | 951 | 828 | 901 | 883 | 713 | 782 | 765 | 607 | 652 | 638 |
| ROLD034 | 361 | 368 | 362 | 617 | 638 | 626 | 805 | 838 | 824 | 755 | 822 | 806 | 651 | 710 | 695 | 601 | 646 | 634 |
| RSAC075 Chipps Island | 8211 | 7983 | 7990 | 9743 | 9397 | 9411 | 12563 | 12203 | 12221 | 13607 | 13119 | 13135 | 11989 | 11729 | 11742 | 6033 | 6014 | 6020 |
| RSAC092 Emmaton | 624 | 563 | 568 | 809 | 696 | 705 | 1499 | 1288 | 1308 | 2015 | 1791 | 1814 | 1749 | 1612 | 1631 | 821 | 789 | 795 |
| RSAC101 Rio Vista | 148 | 142 | 142 | 176 | 162 | 163 | 240 | 207 | 208 | 284 | 239 | 242 | 290 | 269 | 273 | 222 | 216 | 217 |
| RSAC123 | 127 | 127 | 127 | 154 | 154 | 154 | 165 | 165 | 165 | 142 | 142 | 142 | 184 | 184 | 184 | 169 | 169 | 169 |
| RSAC155 Freeport | 126 | 126 | 126 | 156 | 156 | 156 | 162 | 162 | 162 | 142 | 142 | 142 | 184 | 184 | 184 | 164 | 164 | 164 |
| RSAN018 Jersey Pt | 955 | 943 | 934 | 1462 | 1422 | 1413 | 1977 | 1956 | 1943 | 1730 | 1750 | 1734 | 1504 | 1572 | 1554 | 945 | 980 | 968 |
| RSAN032 San Andreas | 285 | 341 | 333 | 460 | 573 | 561 | 557 | 741 | 725 | 449 | 632 | 614 | 404 | 549 | 533 | 333 | 411 | 400 |
| RSAN058 | 650 | 658 | 660 | 673 | 684 | 685 | 716 | 724 | 725 | 674 | 674 | 674 | 637 | 640 | 641 | 763 | 771 | 773 |
| S-49 Beldon's Landing | 10401 | 11241 | 11251 | 13265 | 14198 | 14218 | 15825 | 16810 | 16833 | 18853 | 19376 | 19395 | 18356 | 19374 | 19391 | 12763 | 14636 | 14659 |
| SWP | 330 | 338 | 333 | 541 | 565 | 554 | 698 | 736 | 722 | 681 | 744 | 730 | 593 | 643 | 630 | 594 | 630 | 619 |

Table 5-10 Summary of July - December 2002 percent change in monthly average EC for ELT and ELT – Prospect Breach relative to Base - No SMSCG.

| Location | Percent Change in Monthly Average EC (umhos/cm) Relative to Base Case | | | | | | | | | | | |
|-----------------------|---|-----------------------|-------------|-----------------------|----------------|-----------------------|--------------|-----------------------|---------------|-----------------------|---------------|-----------------------|
| | July 2002 | | August 2002 | | September 2002 | | October 2002 | | November 2002 | | December 2002 | |
| | ELT | ELT - Prospect Breach | ELT | ELT - Prospect Breach | ELT | ELT - Prospect Breach | ELT | ELT - Prospect Breach | ELT | ELT - Prospect Breach | ELT | ELT - Prospect Breach |
| Cache SI at Ryer | -1% | 0% | -1% | -1% | -1% | -1% | -4% | -4% | -3% | -2% | -2% | -2% |
| CCWD Victoria Canal | 3% | 2% | 8% | 6% | 9% | 7% | 10% | 8% | 7% | 5% | 6% | 5% |
| CVP | 2% | 1% | 4% | 2% | 5% | 3% | 8% | 6% | 7% | 5% | 5% | 3% |
| Montezuma SI at Head | -8% | -8% | -8% | -7% | -6% | -6% | -5% | -4% | -4% | -3% | -1% | 0% |
| Montezuma SI at Mouth | 5% | 5% | 4% | 4% | 3% | 3% | 2% | 2% | 4% | 4% | 11% | 12% |
| RMID015 | 4% | 3% | 9% | 6% | 10% | 7% | 10% | 8% | 8% | 6% | 6% | 5% |
| RMID023 | 4% | 2% | 8% | 6% | 10% | 7% | 10% | 8% | 7% | 5% | 6% | 5% |
| ROLD024 | 2% | 0% | 2% | 0% | 3% | 2% | 9% | 7% | 10% | 7% | 7% | 5% |
| ROLD034 | 2% | 0% | 3% | 1% | 4% | 2% | 9% | 7% | 9% | 7% | 7% | 5% |
| RSAC075 Chipps Island | -3% | -3% | -4% | -3% | -3% | -3% | -4% | -3% | -2% | -2% | 0% | 0% |
| RSAC092 Emmaton | -10% | -9% | -14% | -13% | -14% | -13% | -11% | -10% | -8% | -7% | -4% | -3% |
| RSAC101 Rio Vista | -4% | -4% | -8% | -7% | -14% | -14% | -16% | -15% | -7% | -6% | -2% | -2% |
| RSAC123 | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| RSAC155 Freeport | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| RSAN018 Jersey Pt | -1% | -2% | -3% | -3% | -1% | -2% | 1% | 0% | 4% | 3% | 4% | 2% |
| RSAN032 San Andreas | 20% | 17% | 24% | 22% | 33% | 30% | 41% | 37% | 36% | 32% | 23% | 20% |
| RSAN058 | 1% | 2% | 2% | 2% | 1% | 1% | 0% | 0% | 1% | 1% | 1% | 1% |
| S-49 Beldon's Landing | 8% | 8% | 7% | 7% | 6% | 6% | 3% | 3% | 6% | 6% | 15% | 15% |
| SWP | 2% | 1% | 4% | 2% | 5% | 3% | 9% | 7% | 8% | 6% | 6% | 4% |

5.5.1 Tidally averaged EC time series



Figure 5-102 Tidally averaged EC at RSAC155 for Base-No SMSCG, ELT and ELT-Prospect Breach.

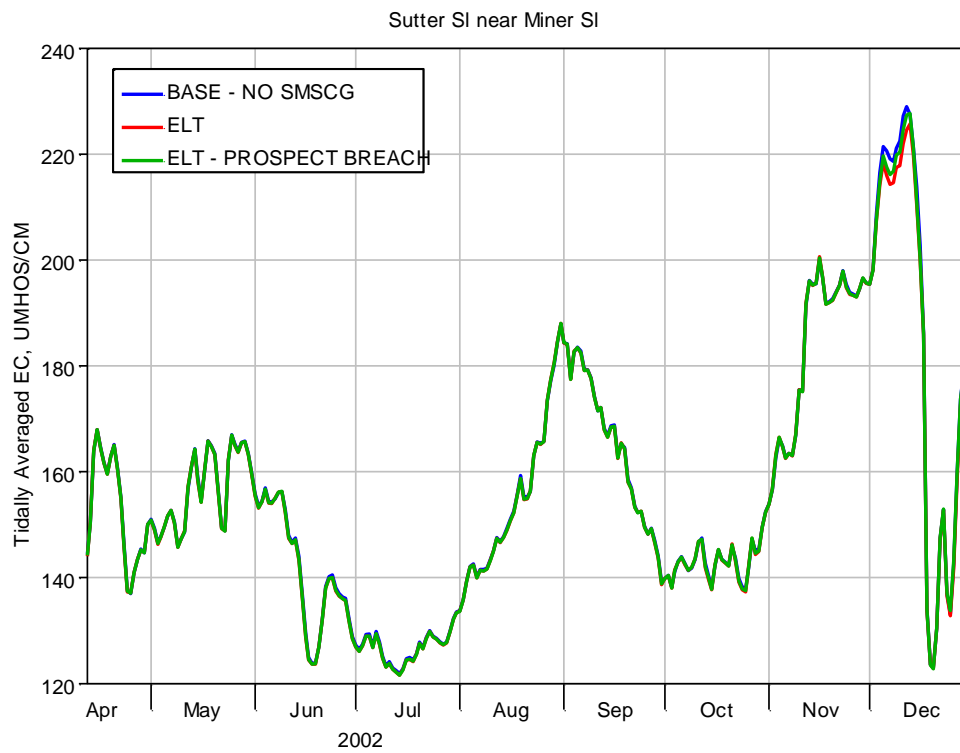


Figure 5-103 Tidally averaged EC in Sutter Slough for Base-No SMSCG, ELT and ELT-Prospect Breach.

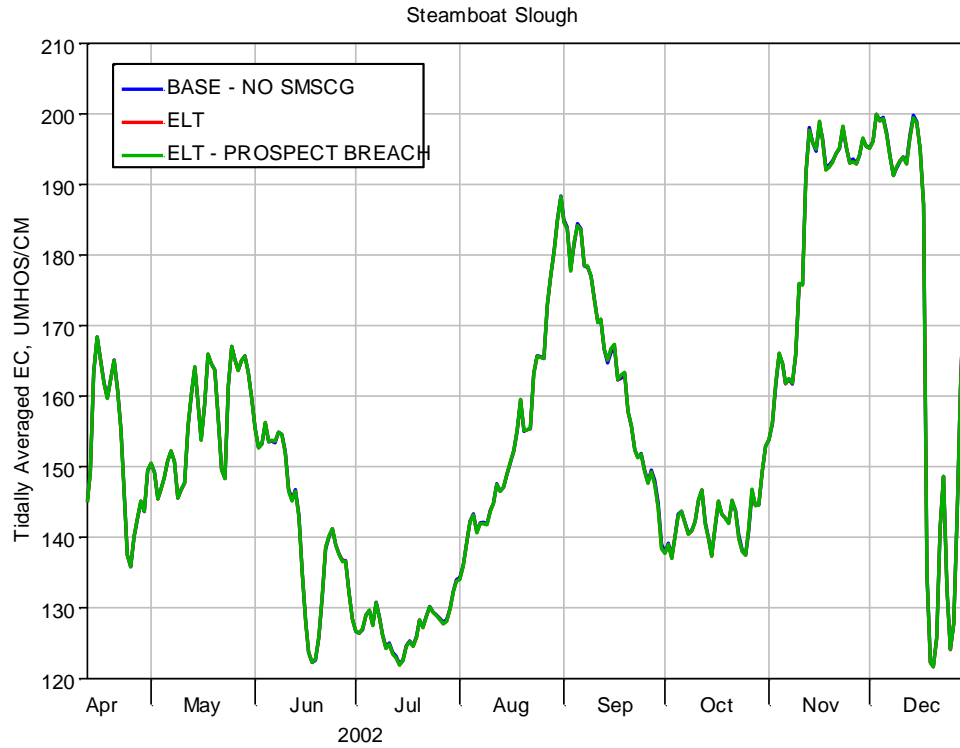


Figure 5-104 Tidally averaged EC in Steamboat Slough for Base-No SMSG, ELT and ELT-Prospect Breach.

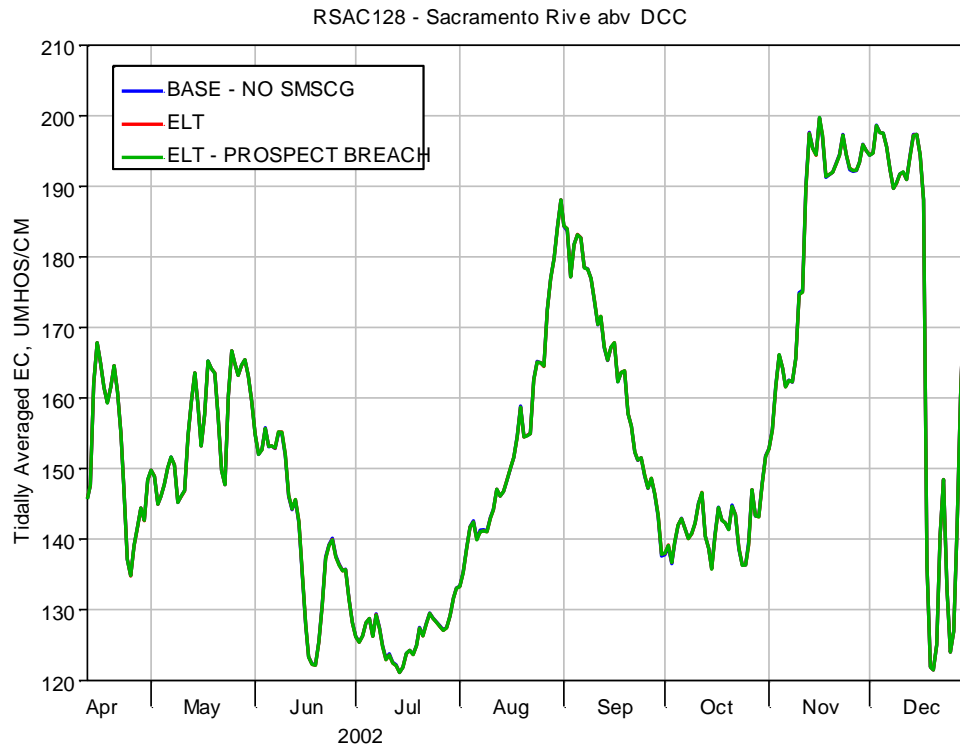


Figure 5-105 Tidally averaged EC at RSAC128 for Base-No SMSG, ELT and ELT-Prospect Breach.

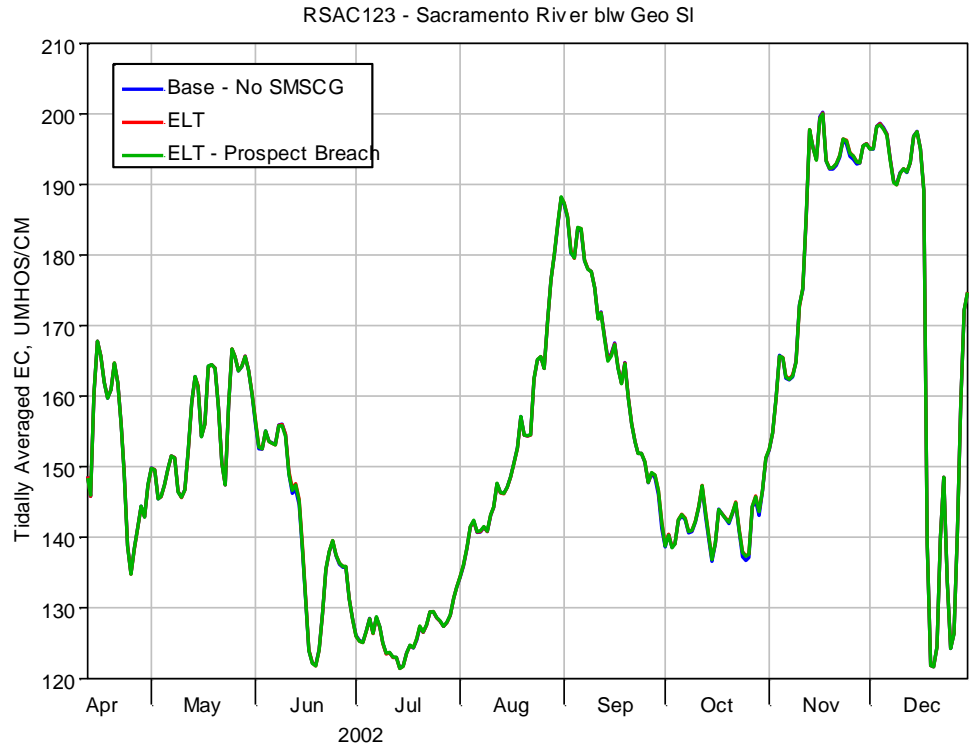


Figure 5-106 Tidally averaged EC at RSAC123 for Base-No SMSCG, ELT and ELT-Prospect Breach.

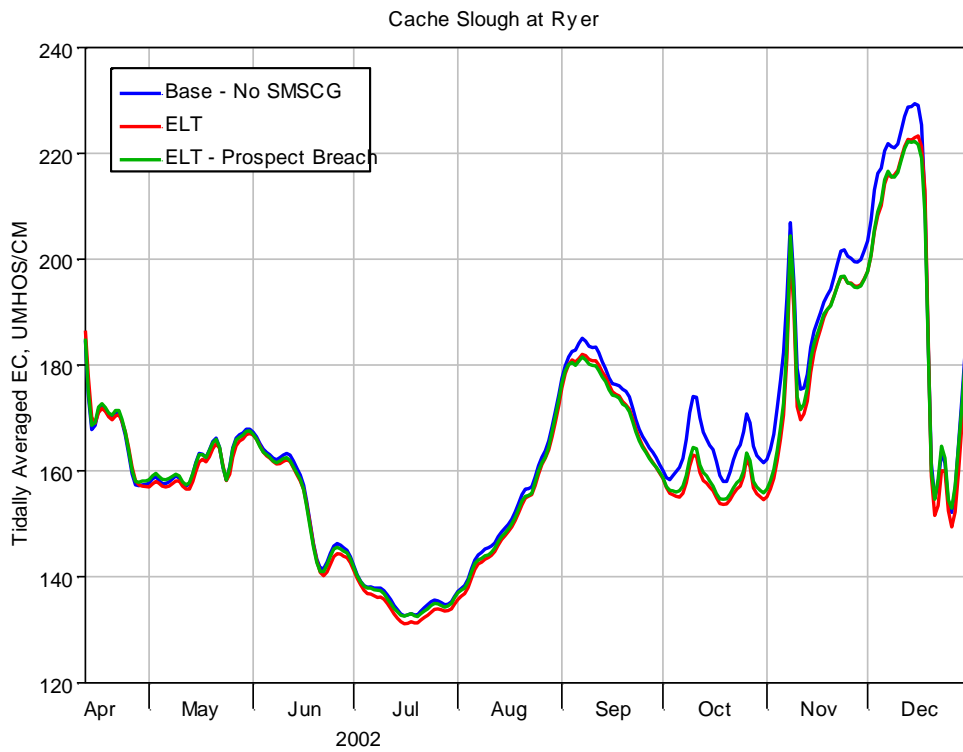


Figure 5-107 Tidally averaged EC at Cache Slough at Ryer for Base-No SMSCG, ELT and ELT-Prospect Breach.

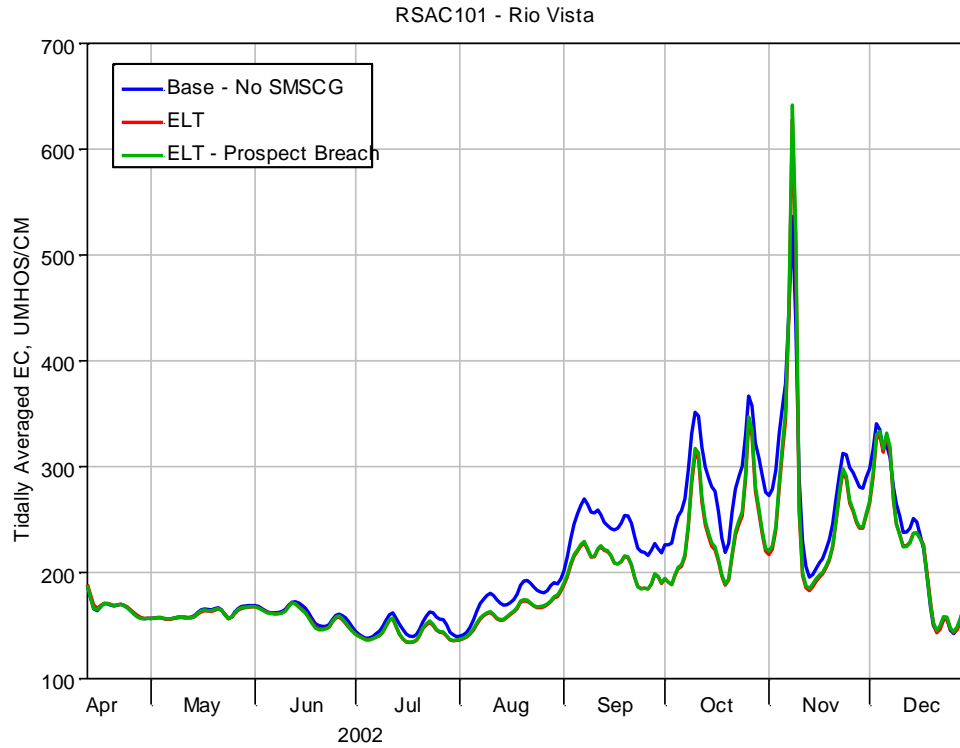


Figure 5-108 Tidally averaged EC at RSAC101 for Base-No SMSCG, ELT and ELT-Prospect Breach.

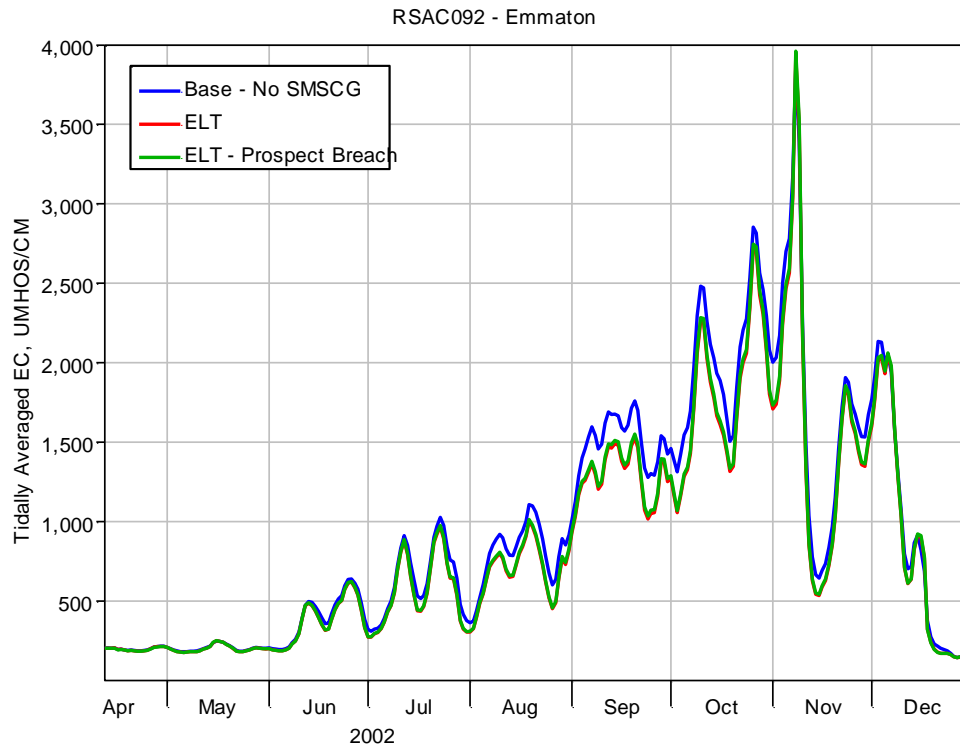


Figure 5-109 Tidally averaged EC at RSAC092 for Base-No SMSCG, ELT and ELT-Prospect Breach.

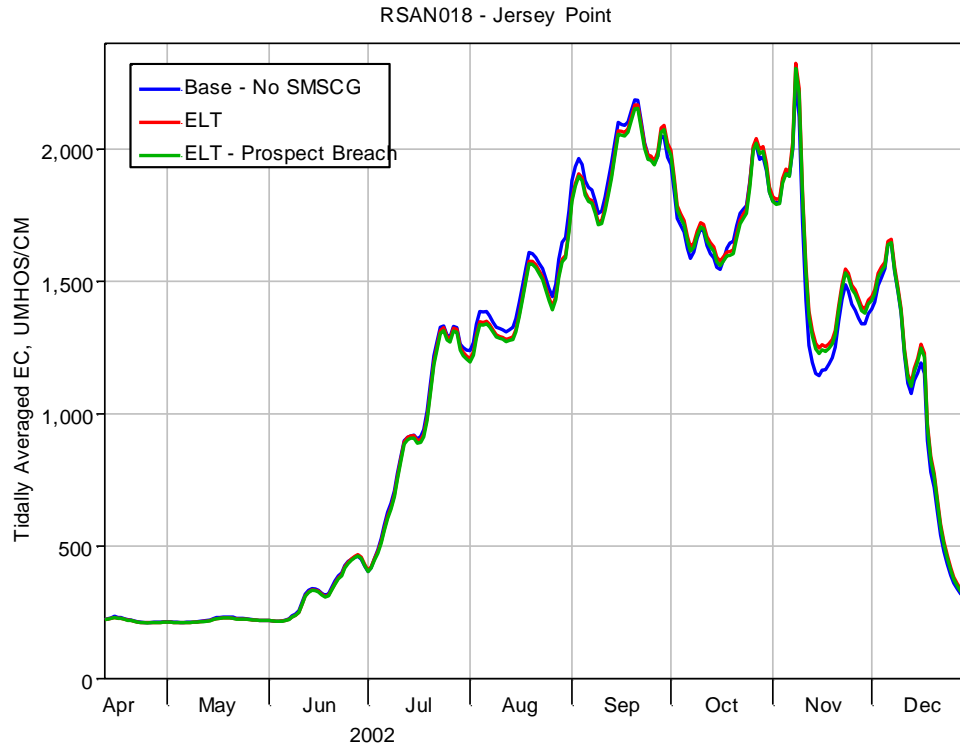


Figure 5-110 Tidally averaged EC at RSAN018 for Base-No SMSCG, ELT and ELT-Prospect Breach.

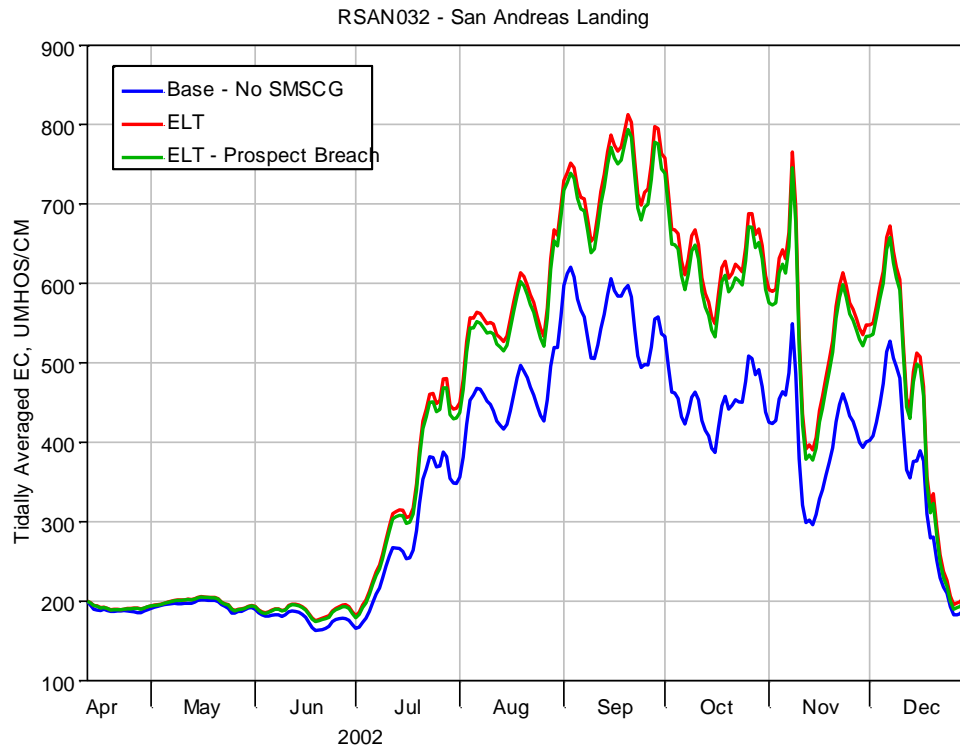


Figure 5-111 Tidally averaged EC at RSAN032 for Base-No SMSCG, ELT and ELT-Prospect Breach.

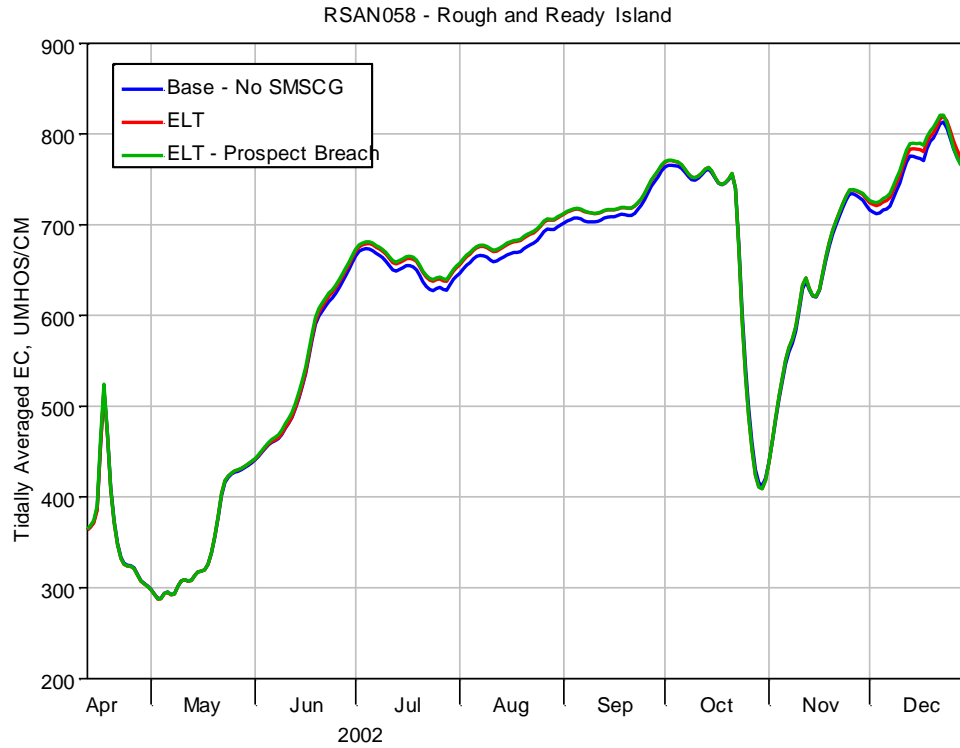


Figure 5-112 Tidally averaged EC at RSAN058 for Base-No SMSCG, ELT and ELT-Prospect Breach.

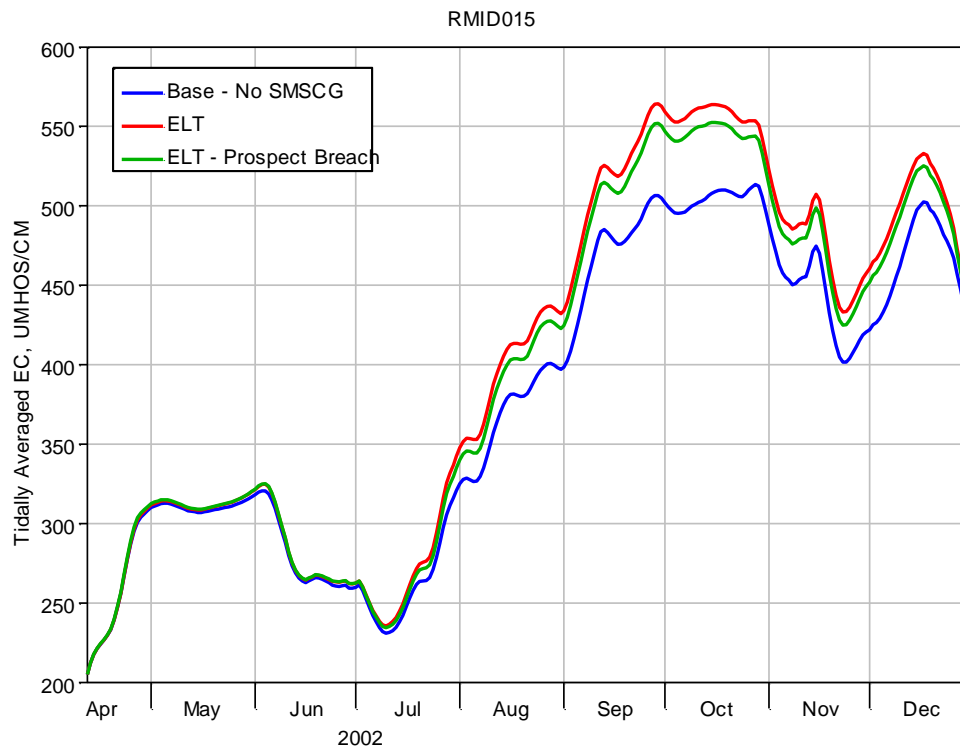


Figure 5-113 Tidally averaged EC at RMID015 for Base-No SMSCG, ELT and ELT-Prospect Breach.

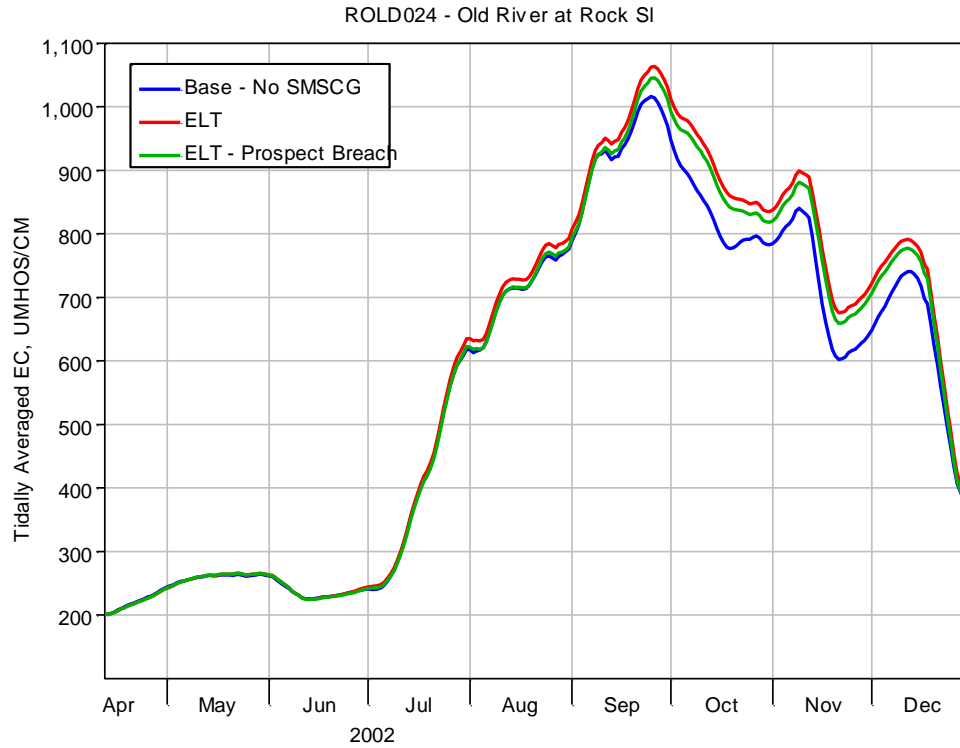


Figure 5-114 Tidally averaged EC at ROLD024 for Base-No SMSCG, ELT and ELT-Prospect Breach.

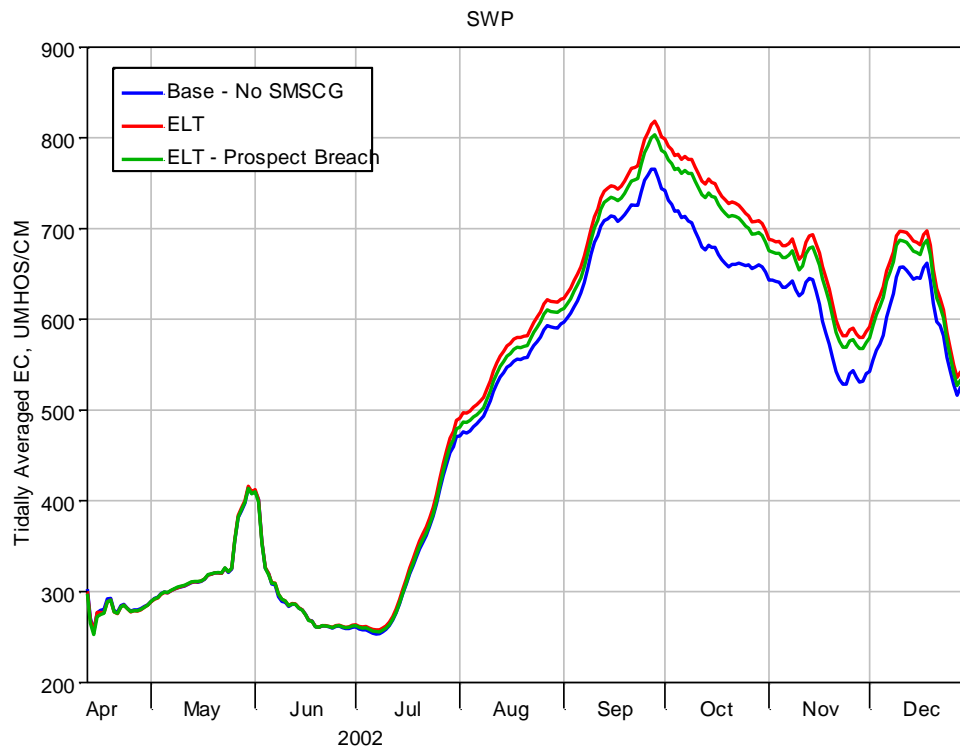


Figure 5-115 Tidally averaged EC at SWP for Base-No SMSCG, ELT and ELT-Prospect Breach.

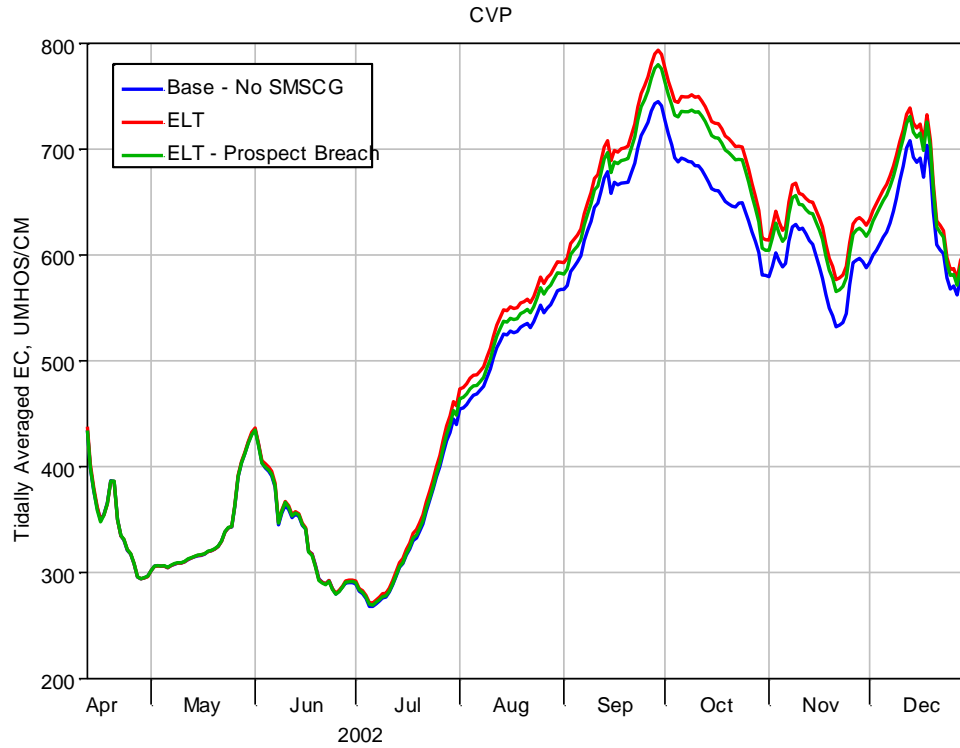


Figure 5-116 Tidally averaged EC at CVP for Base-No SMSCG, ELT and ELT-Prospect Breach.

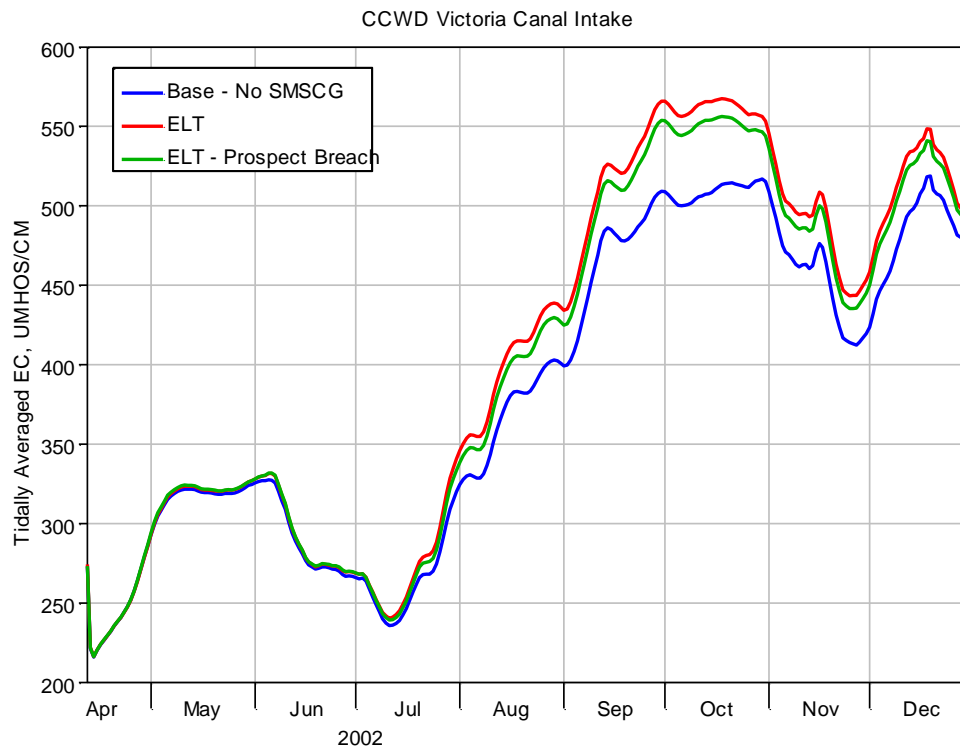


Figure 5-117 Tidally averaged EC at CCWD for Base-No SMSCG, ELT and ELT-Prospect Breach.

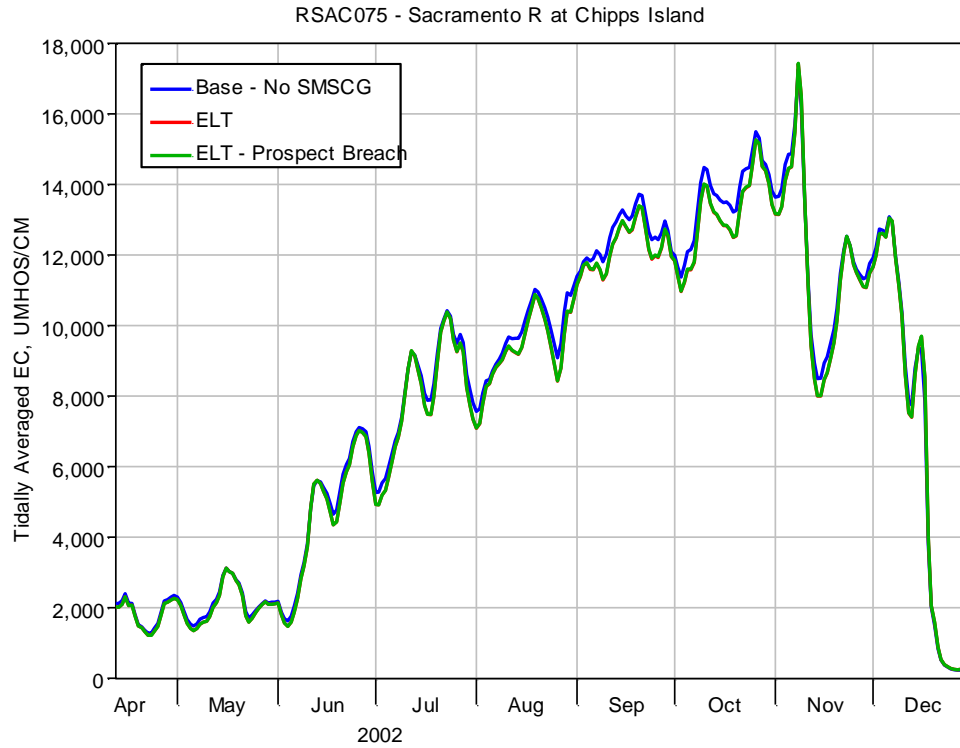


Figure 5-118 Tidally averaged EC at RSAC075 for Base-No SMSCG, ELT and ELT-Prospect Breach.

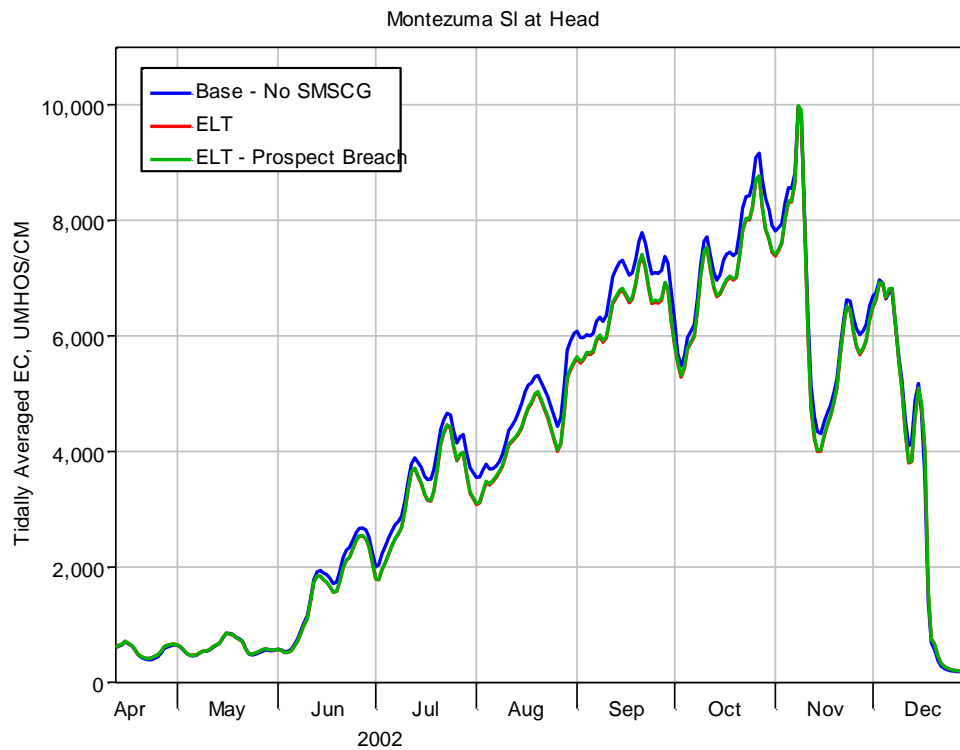


Figure 5-119 Tidally averaged EC at Montezuma SI at Head for Base-No SMSCG, ELT and ELT-Prospect Breach.

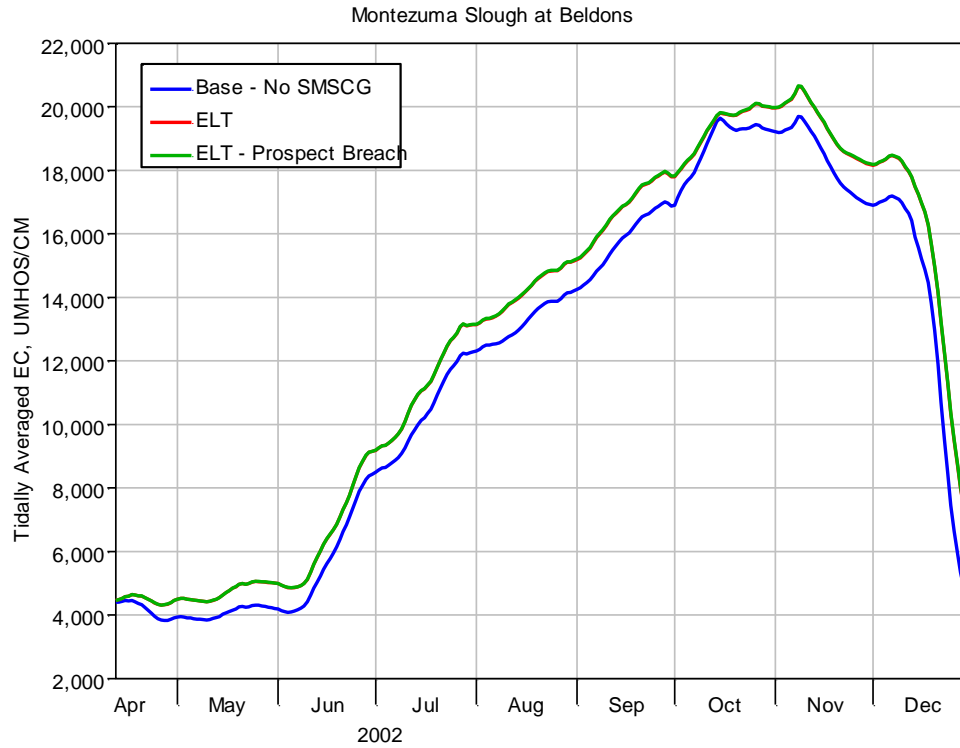


Figure 5-120 Tidally averaged EC at Montezuma Slough at Beldon's for Base-No SMSCG, ELT and ELT-Prospect Breach.

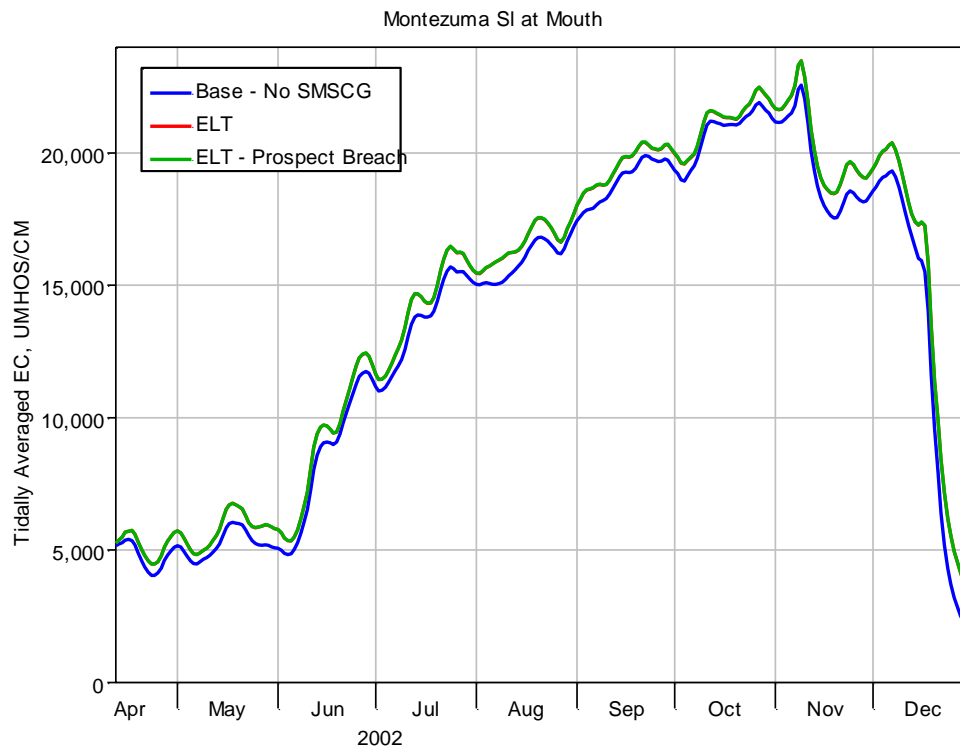


Figure 5-121 Tidally averaged EC at Montezuma SI at Mouth for Base-No SMSCG, ELT and ELT-Prospect Breach.

5.5.2 Spatial Plots of EC Change

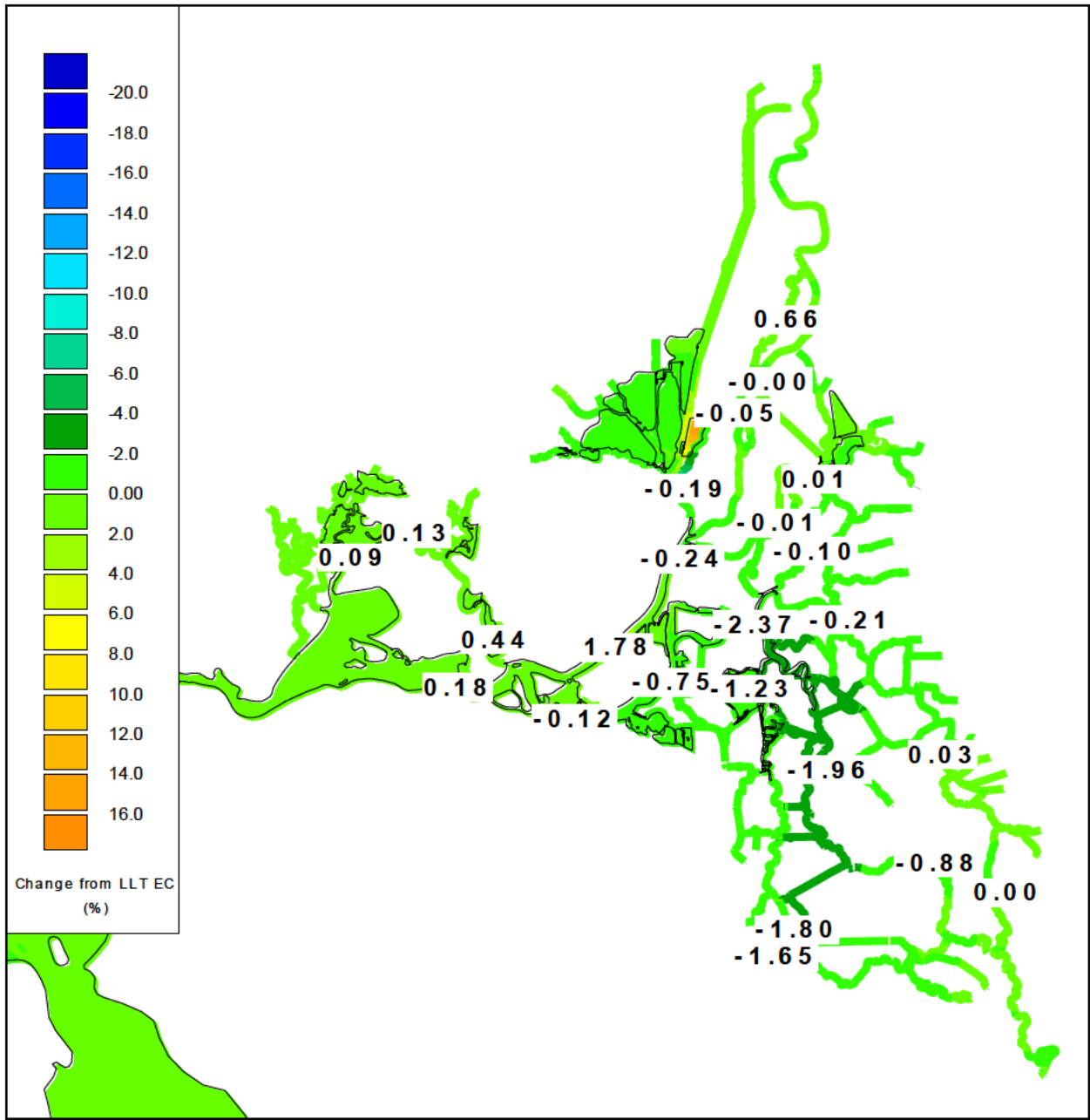


Figure 5-122 Contour plots of ELT – Prospect Breach change from ELT tidally averaged EC on September 24, 2002.

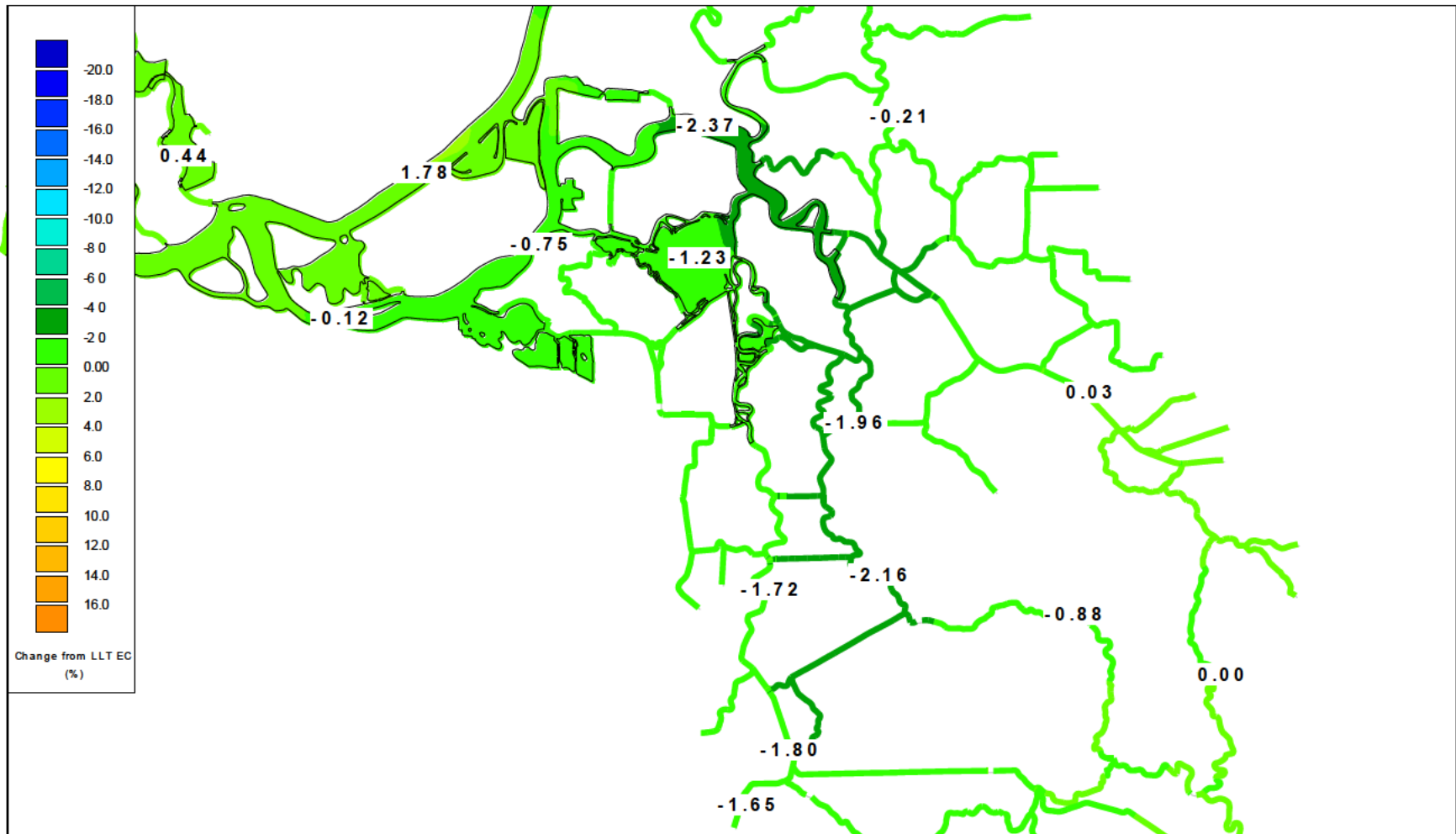


Figure 5-123 Contour plots of ELT – Prospect Breach change from ELT tidally averaged EC in south Delta on September 24, 2002.

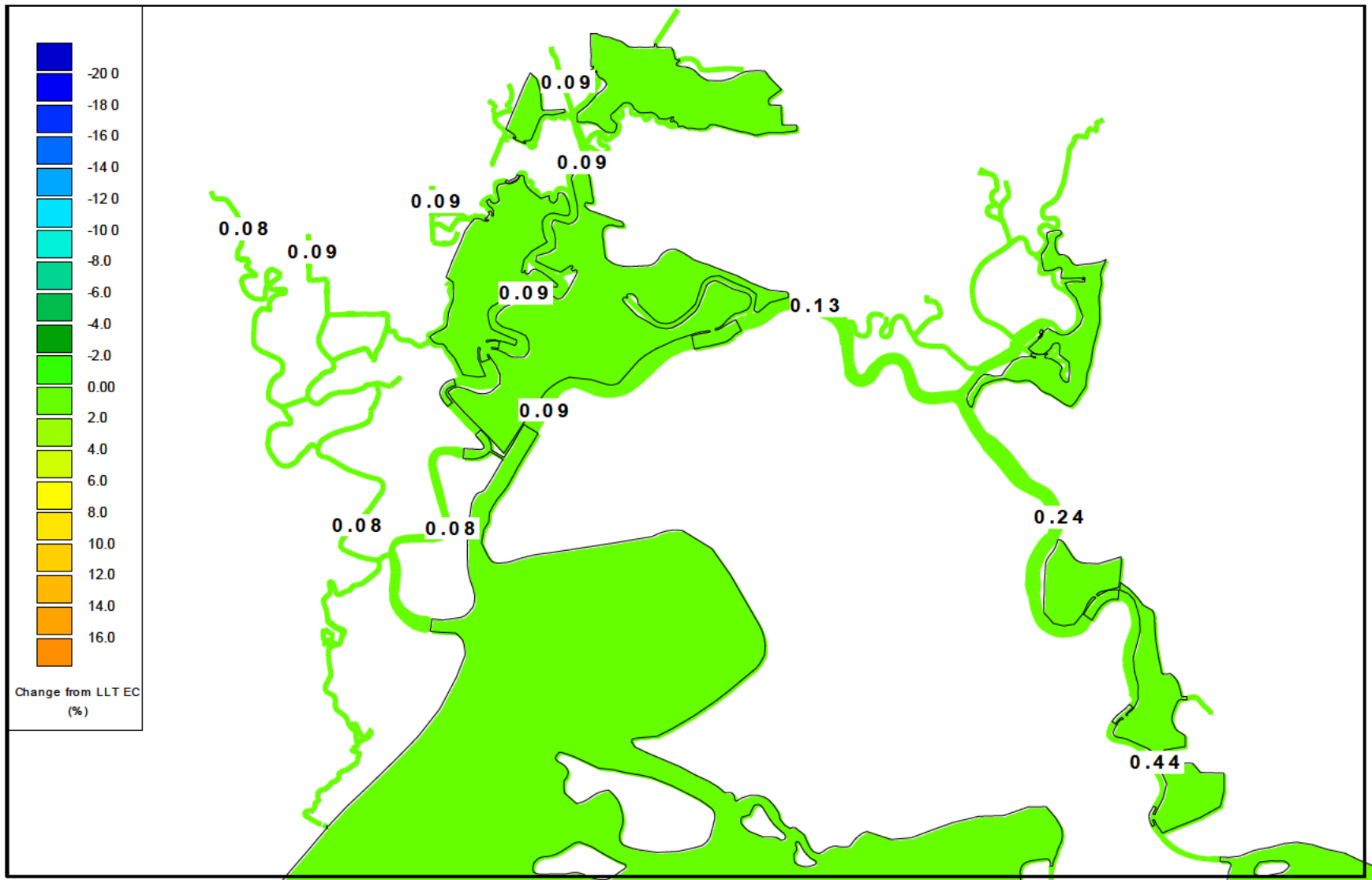


Figure 5-124 Contour plots of ELT – Prospect Breach change from ELT tidally averaged EC in Suisun Marsh on September 24, 2002.

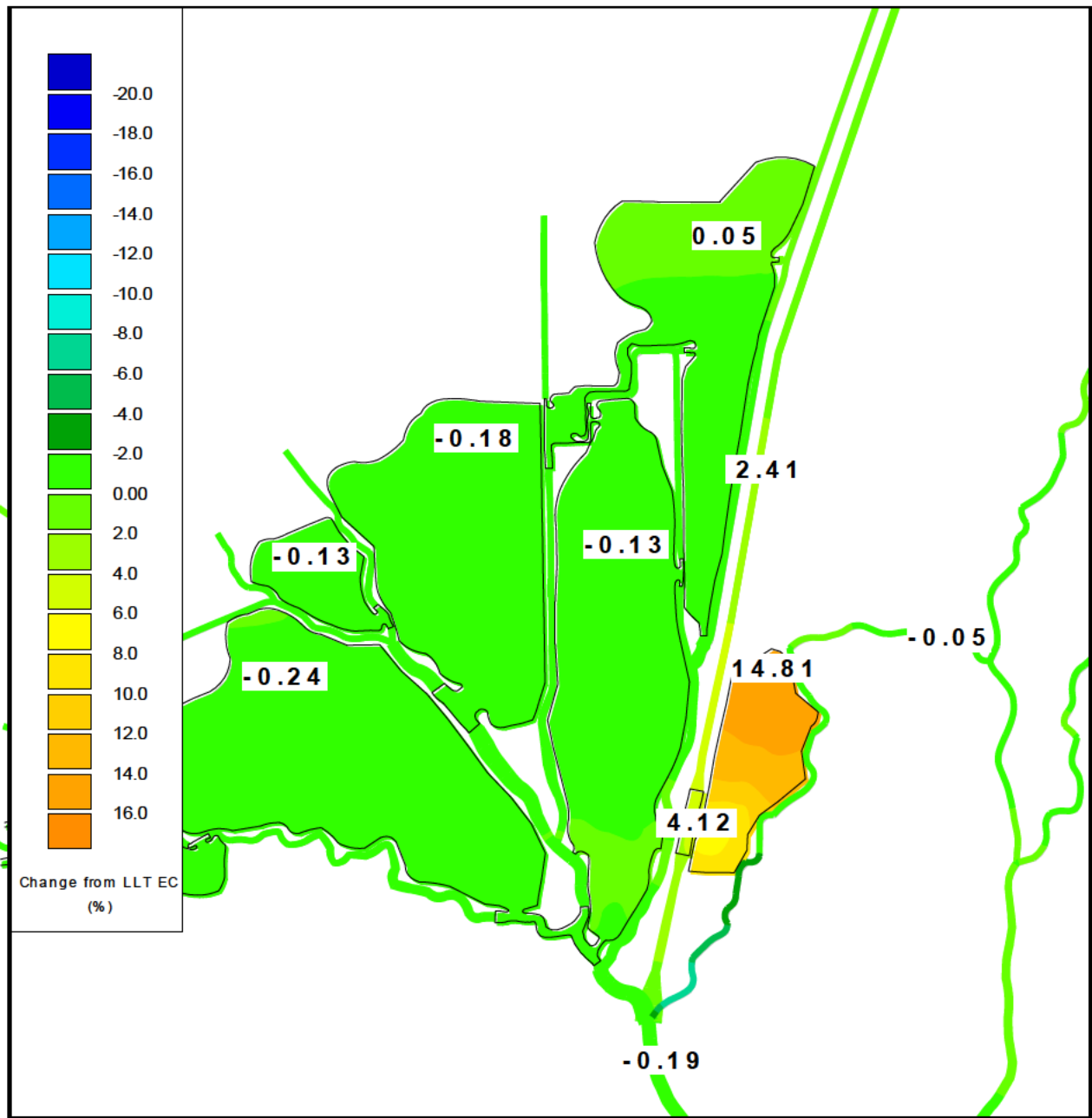


Figure 5-125 Contour plots of ELT – Prospect Breach change from ELT tidally averaged EC in the Cache Slough ROA on September 24, 2002.

5.5.3 X2 Time Series

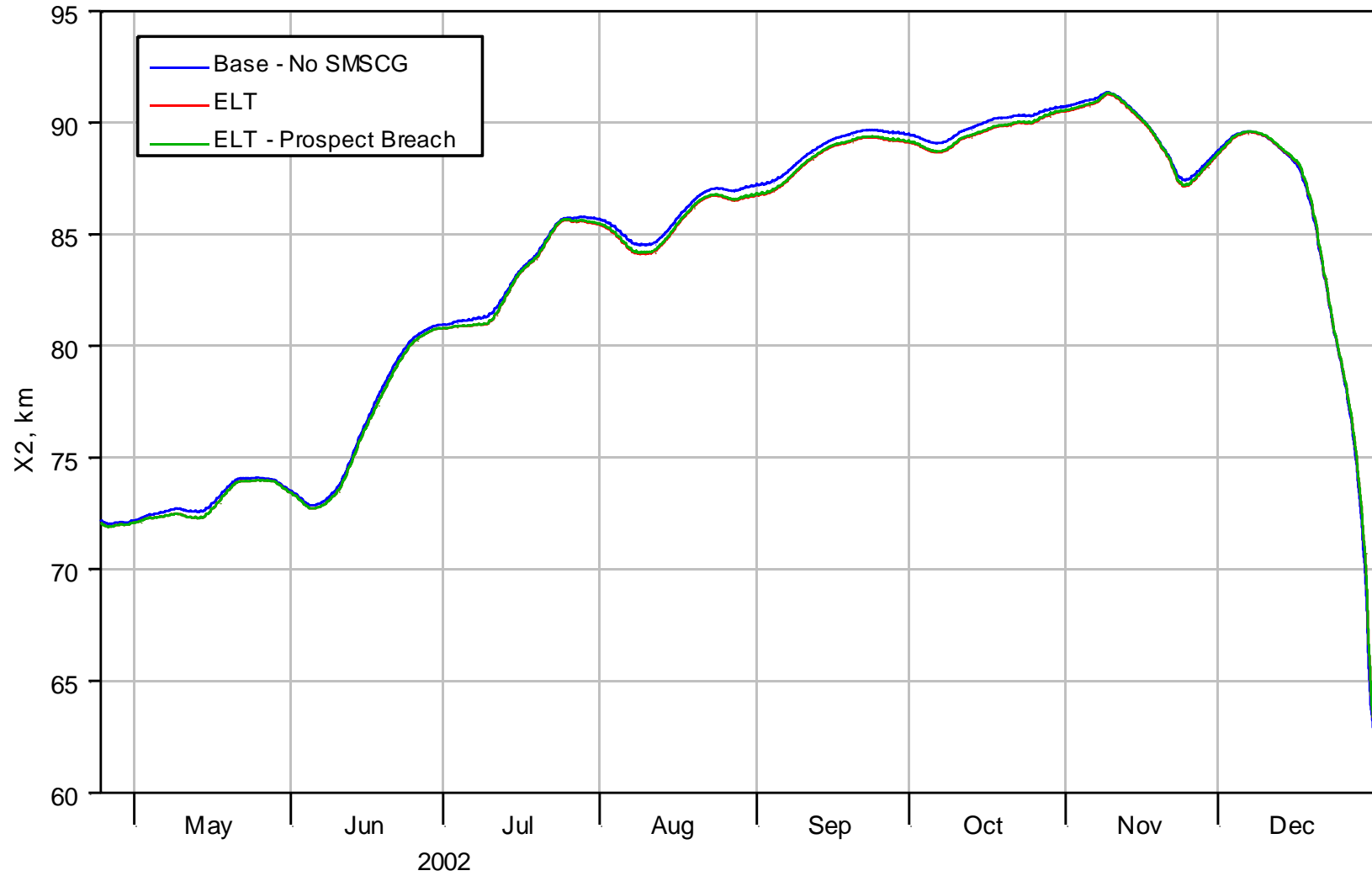


Figure 5-126 Time series of X2 for Base - No SMSCG, ELT and ELT - Prospect Breach.

5.6 LLT – Little Egbert Breach

EC results for the LLT – Little Egbert Breach case are shown as time series plots of tidally averaged values in Figure 5-127 through Figure 5-145. With the southern breach on Little Egbert Tract removed, EC is reduced in the south and central Delta, relative to the LLT case. EC is also decreased in the Sacramento River at Rio Vista and downstream to Chipps Island, and in the eastern part of Suisun Marsh. In Cache Slough at Ryer during the fall, EC is slightly reduced below LLT. There are no EC impacts at Freeport.

Contour plots of tidally averaged EC percent change from LLT on September 24, 2002 are shown in Figure 5-146 through Figure 5-149 for the Delta, the south and central Delta, for Suisun Marsh and for the Cache Slough area. These plots show small reductions (less than 1%) throughout most of the Cache Slough ROA. In the southern end of Little Egbert Tract there are larger reductions where the breach was eliminated. Changes are small throughout the remainder of the north Delta. In Suisun Marsh, EC is generally increased by 1% or less, with the exception of some areas of up to 2% decrease in Montezuma Slough upstream of Meins Landing. EC is decreased by 7% in the San Joaquin River around San Andreas Landing and decreased by 4-5% in the south Delta due to increased net flows in Georgiana Slough and Mokelumne River (see Table 4-17). Increased net flows in the Sacramento River at Emmaton (see Table 4-17) also reduce EC by 6-7% there. EC is increased by up to 15% in the West Delta ROA in Sherman Island, Decker Island and adjacent channels. This is in part due to a shift in net flows, with less flow from the Sacramento River toward the San Joaquin River (see Table 4-17).

A summary of July – December 2002 monthly average EC at key locations throughout the Delta is provided in Table 5-11 for Base – No MRB, LLT and LLT – Little Egbert Breach. Percent change in monthly average EC relative to the base case are provided in Table 5-12 for LLT and LLT – Little Egbert Breach. Monthly average EC reductions throughout south Delta, relative to LLT, are as high as 4 – 9%. There are larger reductions in the San Joaquin River at Jersey Point (3 – 7%) and San Andreas (7 – 15%), and in the Sacramento River at Emmaton (6 – 10%).

LLT – Little Egbert Breach X2, shown in Figure 5-150, is decreased by less than 0.5 km relative to LLT throughout the simulation period.

Table 5-11 Summary of July - December 2002 monthly average EC for Base - No MRB, LLT and LLT – Little Egbert Breach.

| Location | Monthly Average EC (umhos/cm) | | | | | | | | | | | | | | | | | |
|-----------------------|-------------------------------|-------|---------------------|---------------|-------|---------------------|----------------|-------|---------------------|---------------|-------|---------------------|---------------|-------|---------------------|---------------|-------|---------------------|
| | July 2002 | | | August 2002 | | | September 2002 | | | October 2002 | | | November 2002 | | | December 2002 | | |
| | Base - No MRB | LLT | LLT - Little Egbert | Base - No MRB | LLT | LLT - Little Egbert | Base - No MRB | LLT | LLT - Little Egbert | Base - No MRB | LLT | LLT - Little Egbert | Base - No MRB | LLT | LLT - Little Egbert | Base - No MRB | LLT | LLT - Little Egbert |
| Cache Sl at Ryer | 136 | 135 | 135 | 153 | 150 | 150 | 176 | 173 | 172 | 164 | 160 | 158 | 189 | 188 | 187 | 196 | 193 | 192 |
| CCWD Victoria Canal | 264 | 288 | 282 | 367 | 432 | 416 | 469 | 553 | 531 | 511 | 615 | 590 | 453 | 543 | 522 | 482 | 561 | 537 |
| CVP | 333 | 354 | 346 | 515 | 572 | 553 | 664 | 745 | 716 | 658 | 780 | 744 | 587 | 688 | 656 | 631 | 704 | 680 |
| Montezuma Sl at Head | 3536 | 3567 | 3527 | 4650 | 4521 | 4461 | 6853 | 6816 | 6772 | 7400 | 7510 | 7469 | 6555 | 6739 | 6693 | 3149 | 3440 | 3412 |
| Montezuma Sl at Mouth | 13705 | 14112 | 14167 | 15976 | 16392 | 16476 | 18958 | 19301 | 19410 | 20766 | 20950 | 21061 | 19465 | 20279 | 20376 | 12062 | 13926 | 13992 |
| RMID015 | 261 | 285 | 278 | 367 | 437 | 420 | 469 | 565 | 541 | 503 | 612 | 586 | 442 | 522 | 500 | 463 | 542 | 518 |
| RMID023 | 262 | 285 | 278 | 367 | 436 | 419 | 468 | 560 | 536 | 507 | 614 | 588 | 448 | 527 | 506 | 477 | 552 | 528 |
| ROLD024 | 401 | 438 | 423 | 707 | 781 | 753 | 934 | 1049 | 1006 | 826 | 1014 | 954 | 712 | 891 | 830 | 607 | 744 | 695 |
| ROLD034 | 360 | 392 | 380 | 615 | 692 | 667 | 804 | 912 | 874 | 755 | 915 | 866 | 651 | 801 | 751 | 601 | 732 | 688 |
| RSAC075 Chipps Island | 8209 | 8880 | 8831 | 9741 | 10267 | 10217 | 12563 | 13253 | 13224 | 13606 | 14160 | 14127 | 11990 | 12802 | 12745 | 6035 | 6735 | 6676 |
| RSAC092 Emmaton | 623 | 629 | 568 | 808 | 742 | 676 | 1498 | 1384 | 1275 | 2012 | 1919 | 1788 | 1748 | 1782 | 1665 | 821 | 874 | 821 |
| RSAC101 Rio Vista | 148 | 146 | 144 | 176 | 162 | 162 | 241 | 213 | 209 | 285 | 264 | 253 | 290 | 308 | 295 | 222 | 232 | 225 |
| RSAC123 | 127 | 127 | 127 | 154 | 155 | 154 | 165 | 165 | 165 | 142 | 142 | 142 | 184 | 184 | 184 | 169 | 168 | 169 |
| RSAC155 Freeport | 126 | 126 | 126 | 156 | 156 | 156 | 162 | 162 | 162 | 142 | 142 | 142 | 184 | 184 | 184 | 164 | 164 | 164 |
| RSAN018 Jersey Pt | 954 | 1028 | 998 | 1461 | 1519 | 1479 | 1975 | 2116 | 2051 | 1728 | 1913 | 1821 | 1503 | 1766 | 1661 | 945 | 1108 | 1047 |
| RSAN032 San Andreas | 284 | 383 | 362 | 459 | 649 | 613 | 555 | 871 | 812 | 448 | 773 | 709 | 403 | 668 | 609 | 333 | 480 | 444 |
| RSAN058 | 643 | 612 | 609 | 664 | 644 | 640 | 711 | 698 | 695 | 674 | 682 | 681 | 636 | 629 | 628 | 763 | 751 | 748 |
| S-49 Beldon's Landing | 10402 | 11292 | 11373 | 13266 | 14335 | 14453 | 15826 | 16973 | 17119 | 18856 | 19371 | 19531 | 18357 | 19659 | 19820 | 12766 | 15349 | 15502 |
| SWP | 329 | 360 | 350 | 540 | 615 | 592 | 698 | 807 | 773 | 682 | 835 | 793 | 593 | 725 | 685 | 594 | 691 | 656 |

Table 5-12 Summary of July - December 2002 percent change in monthly average EC for LLT and LLT – Little Egbert relative to Base - No MRB.

| Location | Percent Change in Monthly Average EC (umhos/cm) Relative to Base Case | | | | | | | | | | | |
|-----------------------|---|---------------------|-------------|---------------------|----------------|---------------------|--------------|---------------------|---------------|---------------------|---------------|---------------------|
| | July 2002 | | August 2002 | | September 2002 | | October 2002 | | November 2002 | | December 2002 | |
| | LLT | LLT - Little Egbert | LLT | LLT - Little Egbert | LLT | LLT - Little Egbert | LLT | LLT - Little Egbert | LLT | LLT - Little Egbert | LLT | LLT - Little Egbert |
| Cache SI at Ryer | -1% | -1% | -2% | -2% | -1% | -2% | -2% | -3% | -1% | -1% | -2% | -2% |
| CCWD Victoria Canal | 9% | 7% | 18% | 13% | 18% | 13% | 20% | 15% | 20% | 15% | 16% | 11% |
| CVP | 7% | 4% | 11% | 7% | 12% | 8% | 19% | 13% | 17% | 12% | 12% | 8% |
| Montezuma SI at Head | 1% | 0% | -3% | -4% | -1% | -1% | 1% | 1% | 3% | 2% | 9% | 8% |
| Montezuma SI at Mouth | 3% | 3% | 3% | 3% | 2% | 2% | 1% | 1% | 4% | 5% | 15% | 16% |
| RMID015 | 9% | 7% | 19% | 14% | 20% | 15% | 22% | 17% | 18% | 13% | 17% | 12% |
| RMID023 | 9% | 6% | 19% | 14% | 20% | 15% | 21% | 16% | 18% | 13% | 16% | 11% |
| ROLD024 | 9% | 5% | 10% | 7% | 12% | 8% | 23% | 16% | 25% | 17% | 23% | 14% |
| ROLD034 | 9% | 6% | 13% | 8% | 13% | 9% | 21% | 15% | 23% | 15% | 22% | 14% |
| RSAC075 Chipps Island | 8% | 8% | 5% | 5% | 5% | 5% | 4% | 4% | 7% | 6% | 12% | 11% |
| RSAC092 Emmaton | 1% | -9% | -8% | -16% | -8% | -15% | -5% | -11% | 2% | -5% | 6% | 0% |
| RSAC101 Rio Vista | -2% | -3% | -8% | -8% | -12% | -13% | -7% | -11% | 6% | 2% | 5% | 1% |
| RSAC123 | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| RSAC155 Freeport | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| RSAN018 Jersey Pt | 8% | 5% | 4% | 1% | 7% | 4% | 11% | 5% | 18% | 11% | 17% | 11% |
| RSAN032 San Andreas | 35% | 28% | 42% | 34% | 57% | 46% | 73% | 58% | 66% | 51% | 44% | 33% |
| RSAN058 | -5% | -5% | -3% | -4% | -2% | -2% | 1% | 1% | -1% | -1% | -2% | -2% |
| S-49 Beldon's Landing | 9% | 9% | 8% | 9% | 7% | 8% | 3% | 4% | 7% | 8% | 20% | 21% |
| SWP | 9% | 6% | 14% | 10% | 16% | 11% | 23% | 16% | 22% | 15% | 16% | 10% |

5.6.1 Tidally averaged EC time series

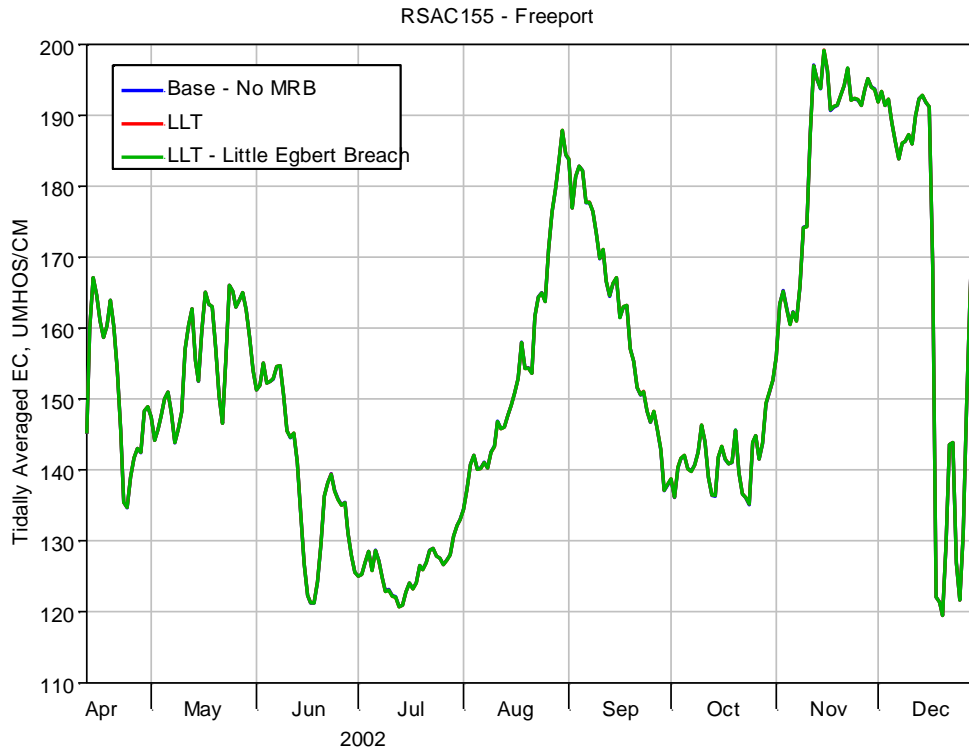


Figure 5-127 Tidally averaged EC at RSAC155 for Base-No MRB, LLT and LLT-Little Egbert Breach.



Figure 5-128 Tidally averaged EC in Sutter Slough for Base-No MRB, LLT and LLT-Little Egbert Breach.

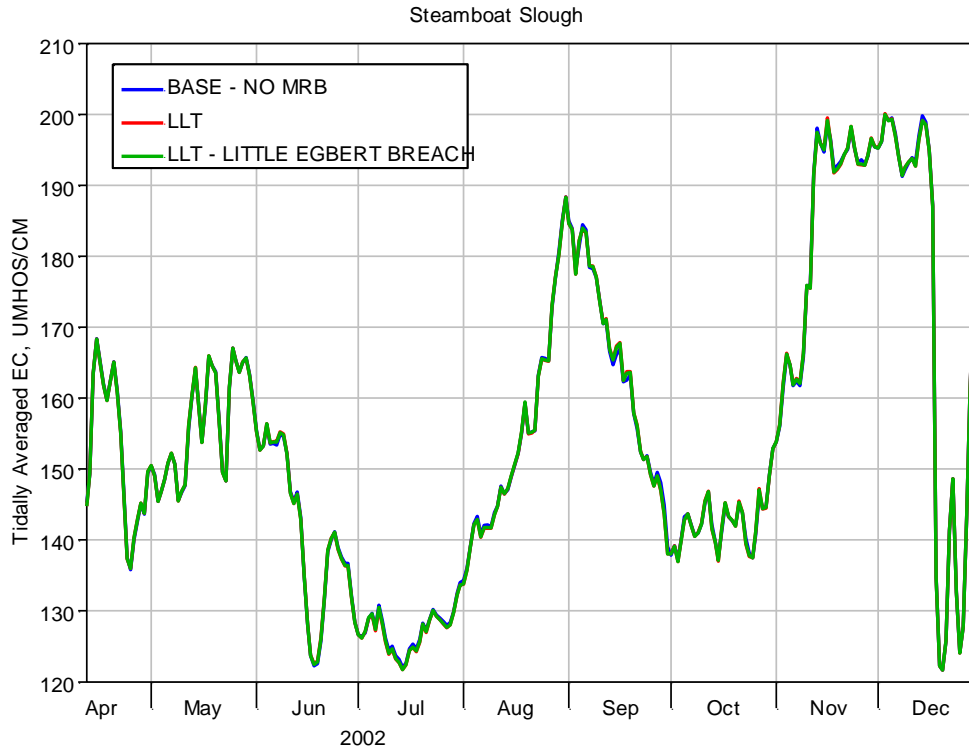


Figure 5-129 Tidally averaged EC in Steamboat Slough for Base-No MRB, LLT and LLT-Little Egbert Breach.



Figure 5-130 Tidally averaged EC at RSAC128 for Base-No MRB, LLT and LLT-Little Egbert Breach.

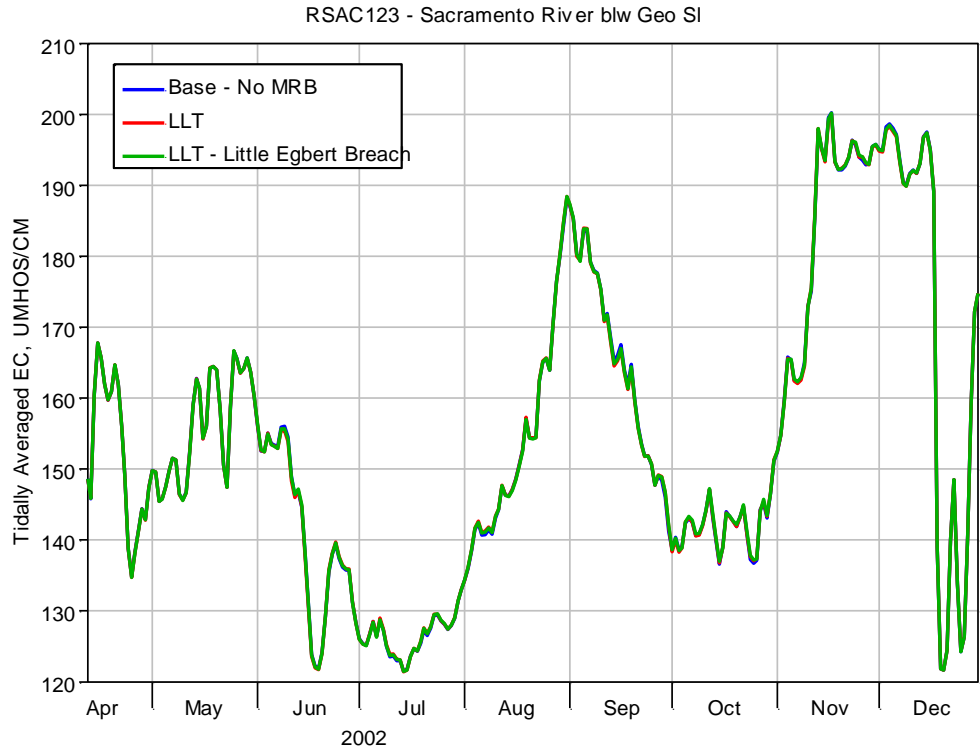


Figure 5-131 Tidally averaged EC at RSAC123 for Base-No MRB, LLT and LLT-Little Egbert Breach.

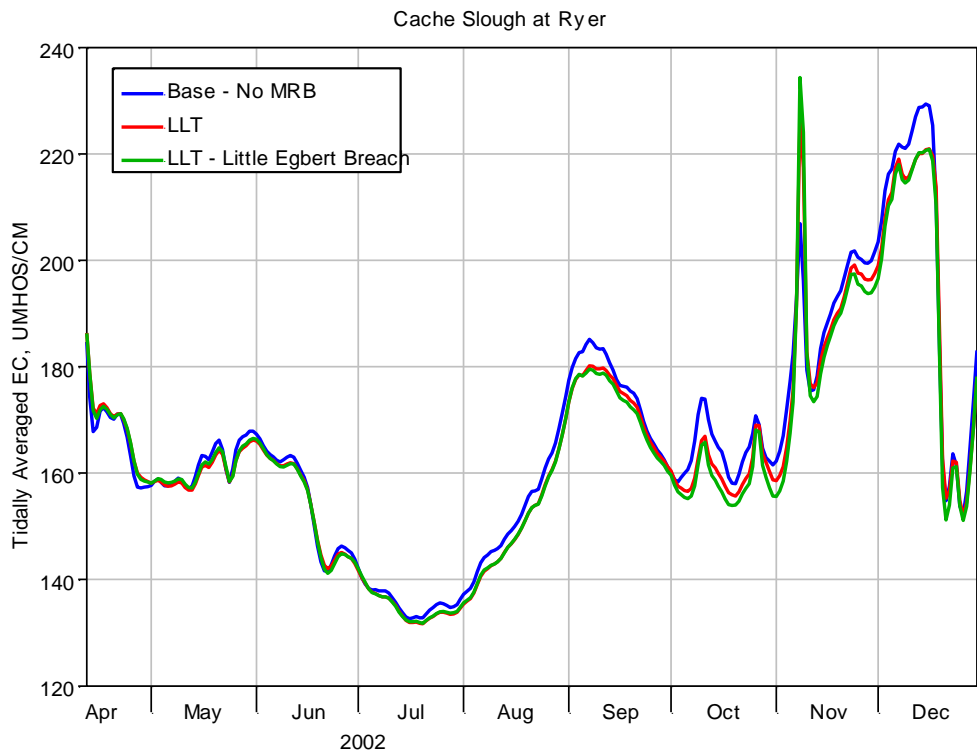


Figure 5-132 Tidally averaged EC at Cache Slough at Ryer for Base-No MRB, LLT and LLT-Little Egbert Breach.

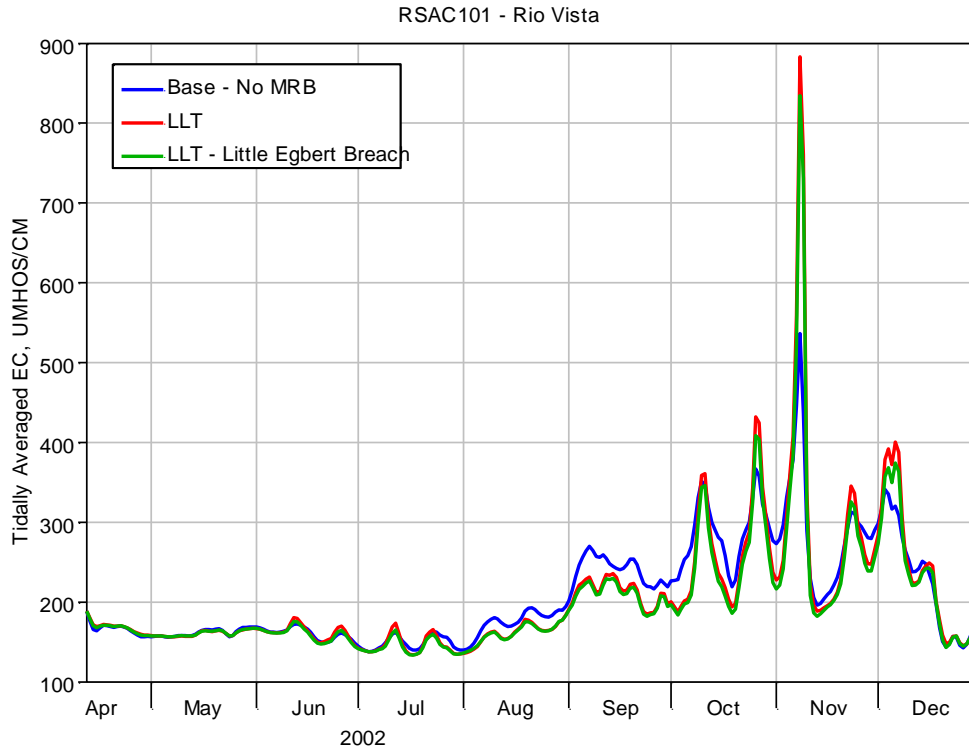


Figure 5-133 Tidally averaged EC at RSAC101 for Base-No MRB, LLT and LLT-Little Egbert Breach.

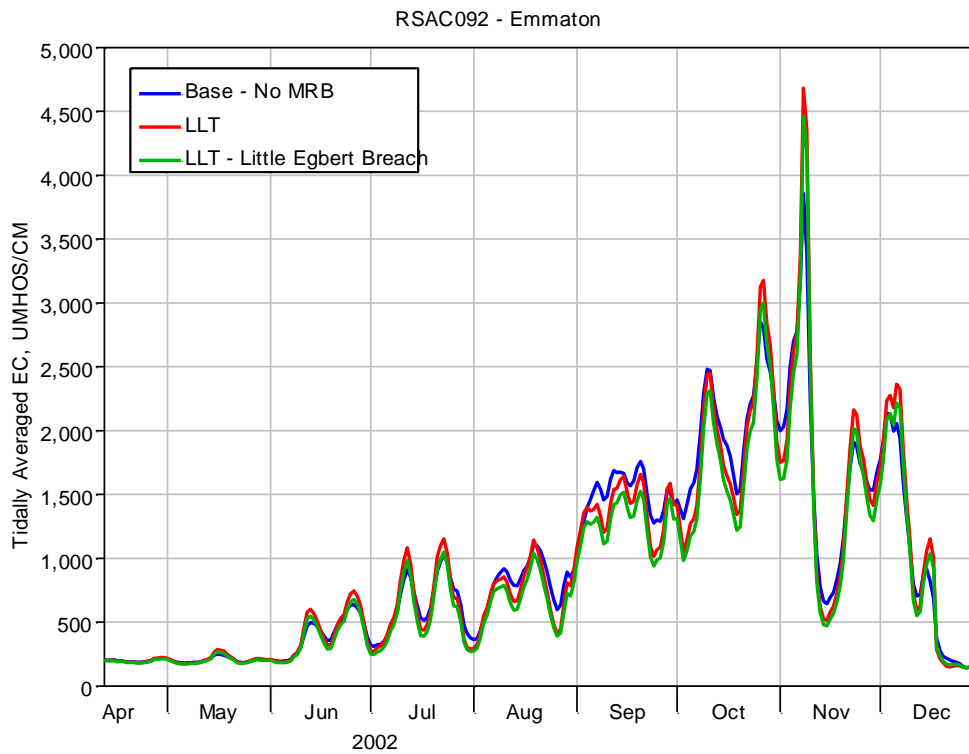


Figure 5-134 Tidally averaged EC at RSAC092 for Base-No MRB, LLT and LLT-Little Egbert Breach.

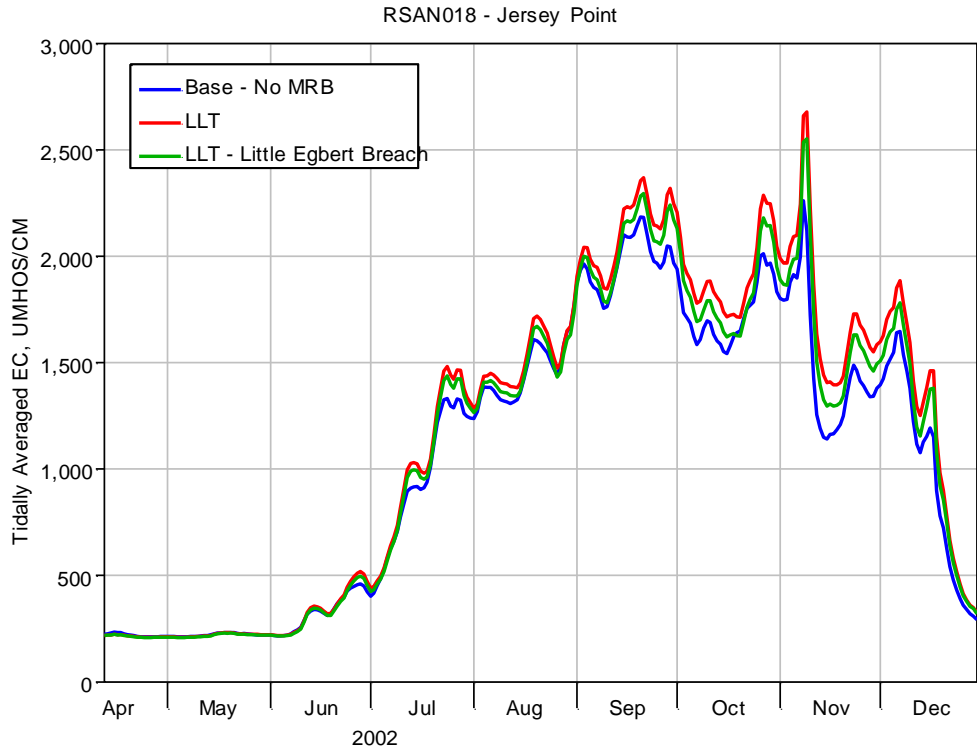


Figure 5-135 Tidally averaged EC at RSAN018 for Base-No MRB, LLT and LLT-Little Egbert Breach.

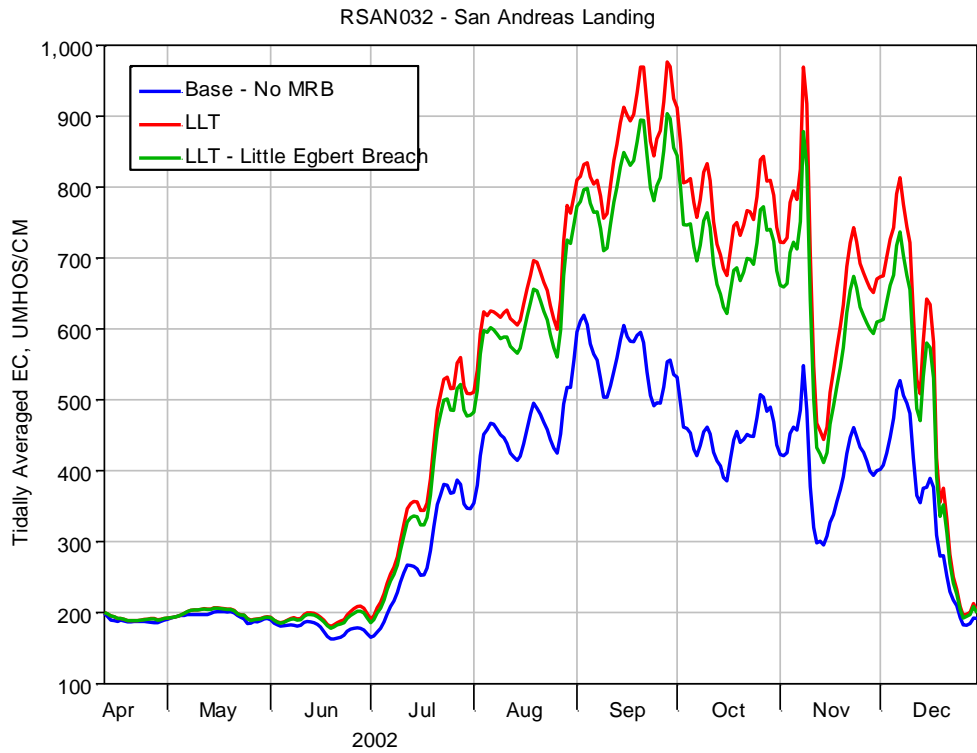


Figure 5-136 Tidally averaged EC at RSAN032 for Base-No MRB, LLT and LLT-Little Egbert Breach.

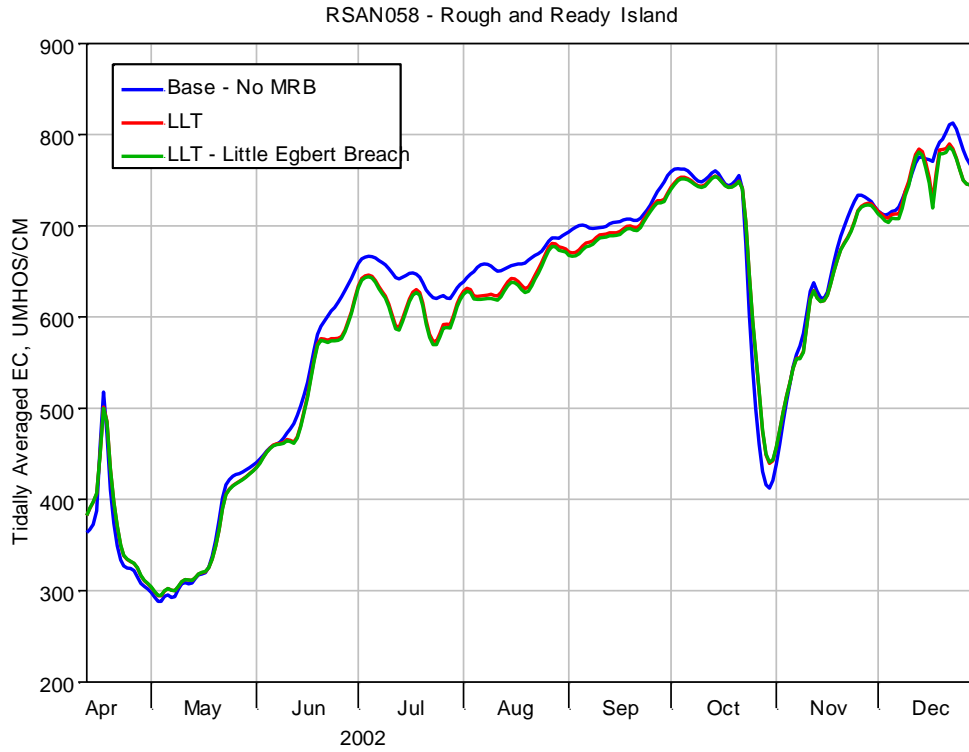


Figure 5-137 Tidally averaged EC at RSAN058 for Base-No MRB, LLT and LLT-Little Egbert Breach.

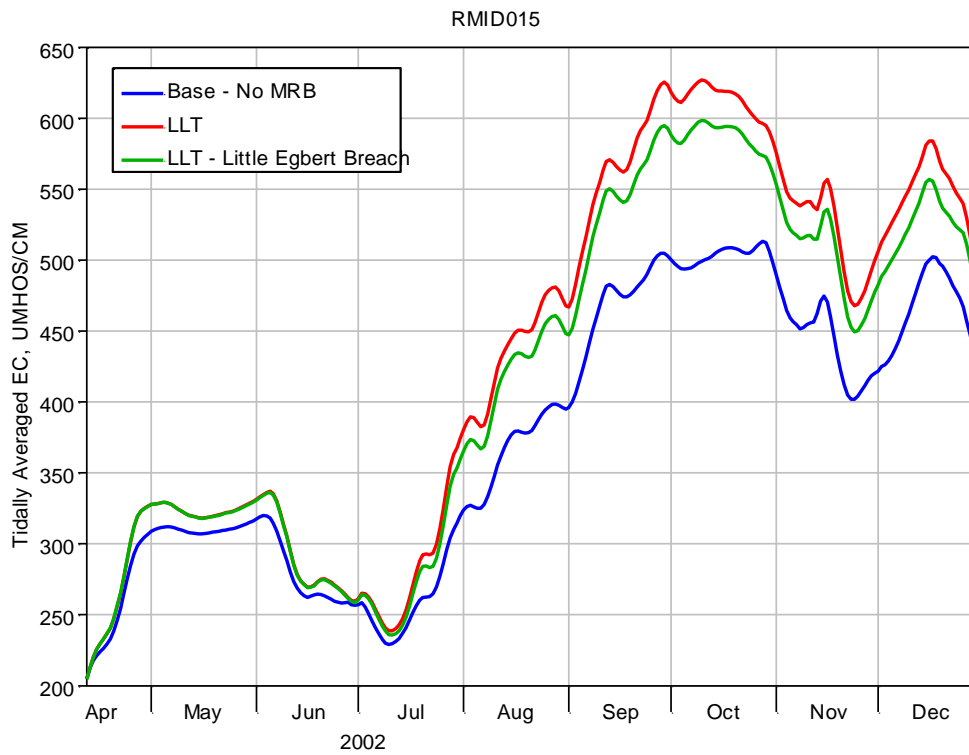


Figure 5-138 Tidally averaged EC at RMID015 for Base-No MRB, LLT and LLT-Little Egbert Breach.

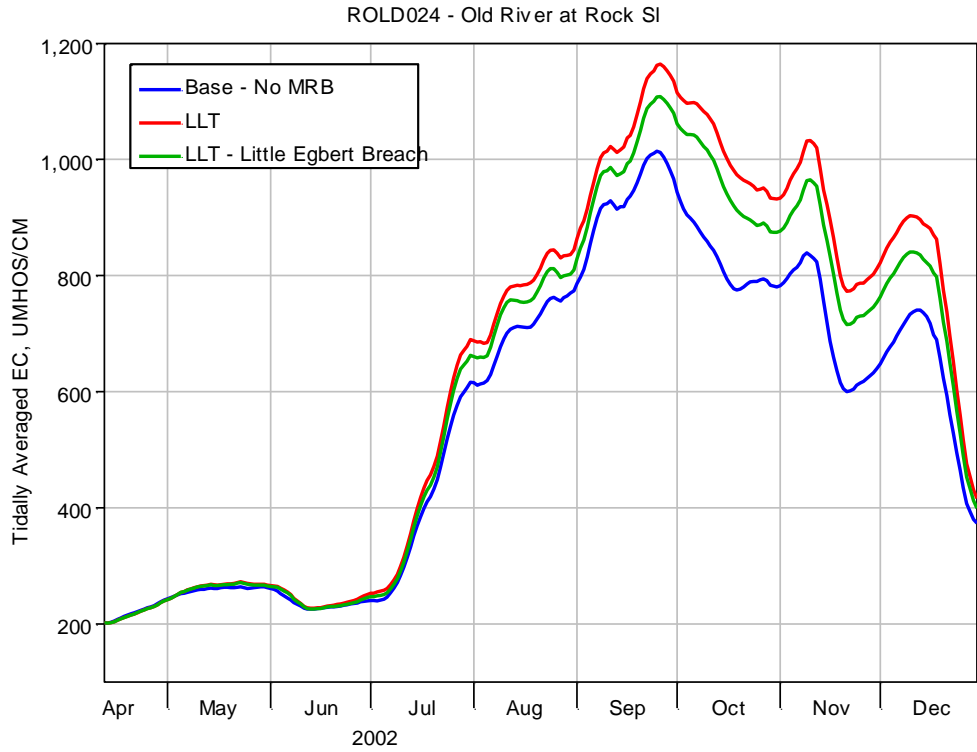


Figure 5-139 Tidally averaged EC at ROLD024 for Base-No MRB, LLT and LLT-Little Egbert Breach.

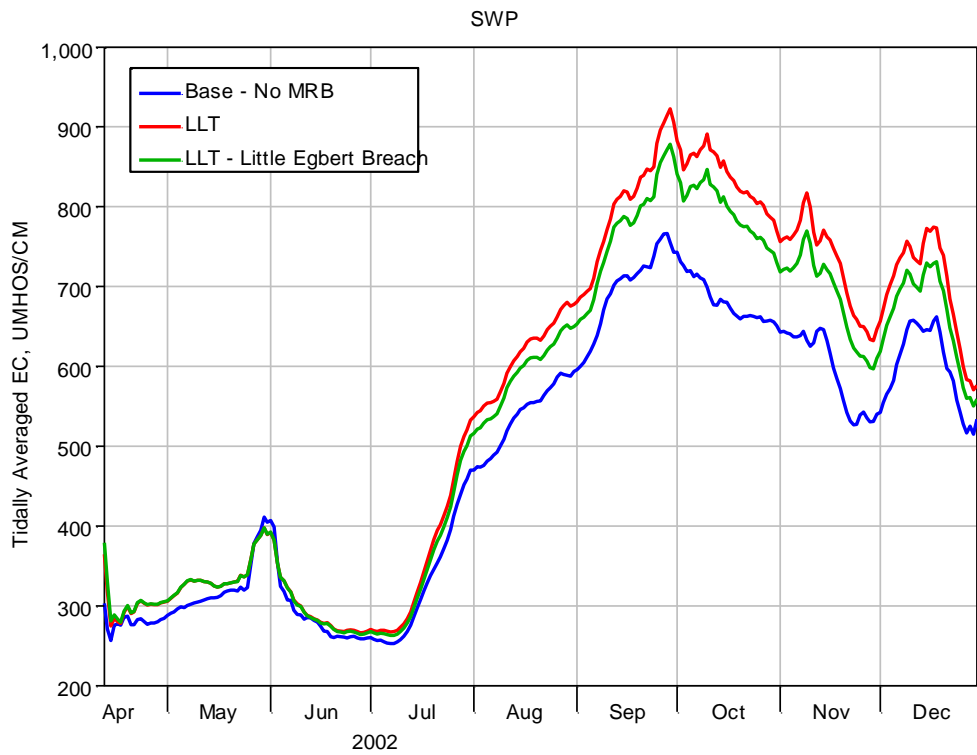


Figure 5-140 Tidally averaged EC at SWP for Base-No MRB, LLT and LLT-Little Egbert Breach.

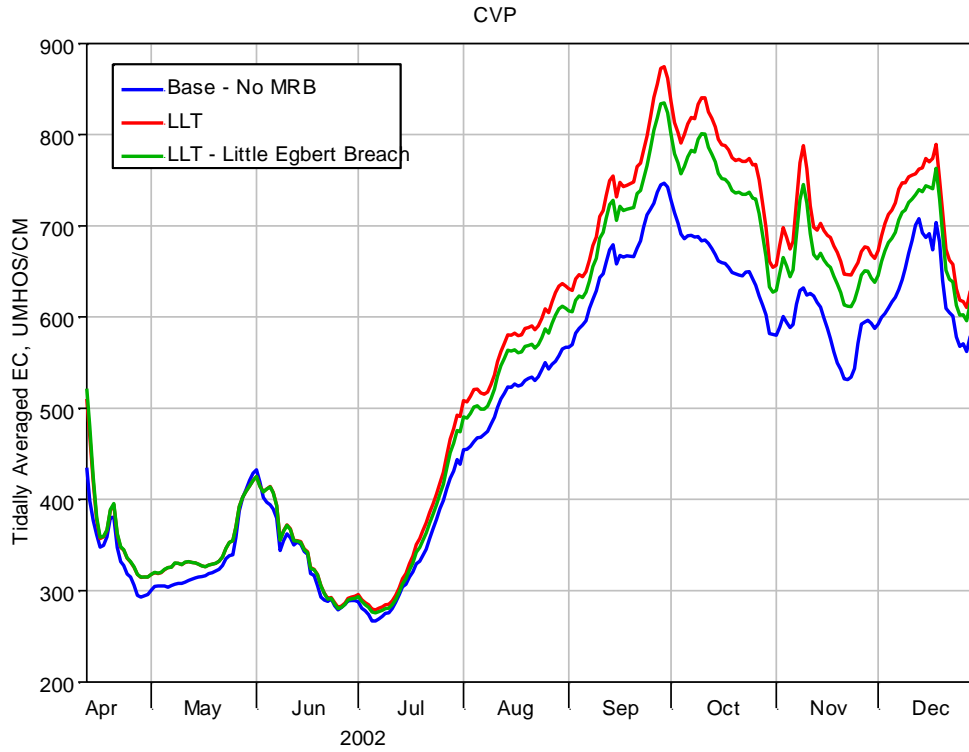


Figure 5-141 Tidally averaged EC at CVP for Base-No MRB, LLT and LLT-Little Egbert Breach.

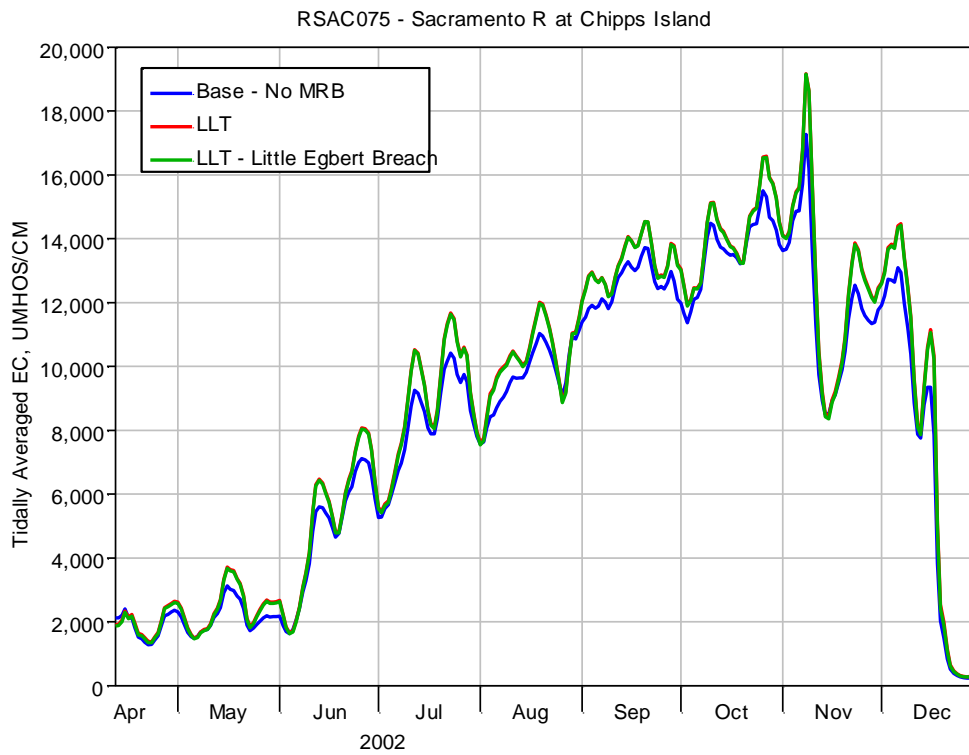


Figure 5-142 Tidally averaged EC at RSAC075 for Base-No MRB, LLT and LLT-Little Egbert Breach.

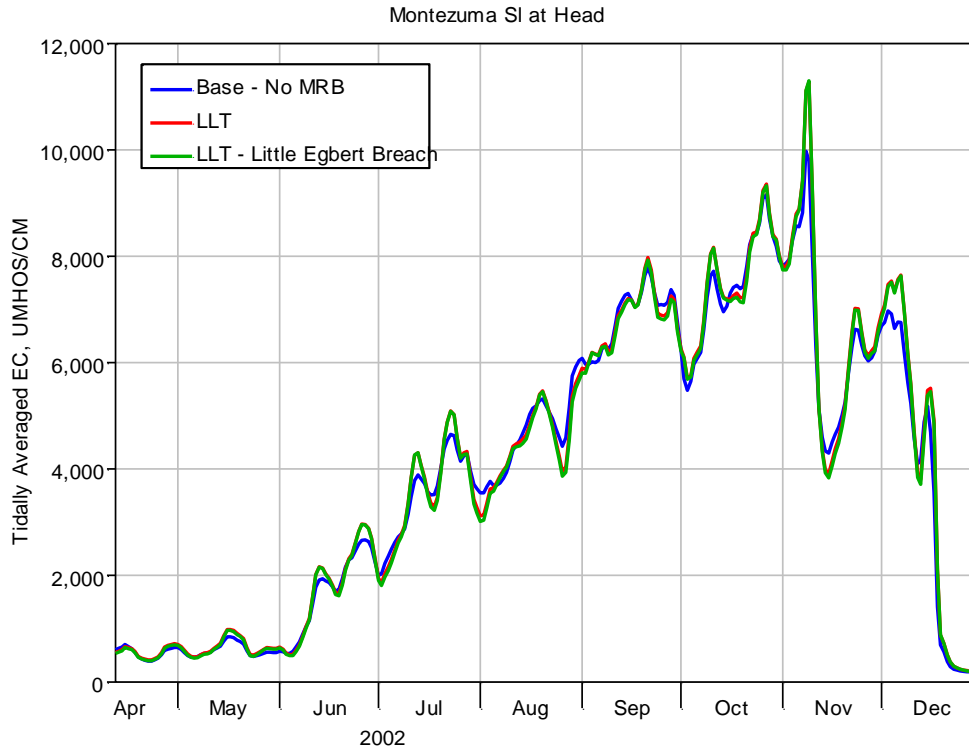


Figure 5-143 Tidally averaged EC at Montezuma SI at Head for Base-No MRB, LLT and LLT-Little Egbert Breach.

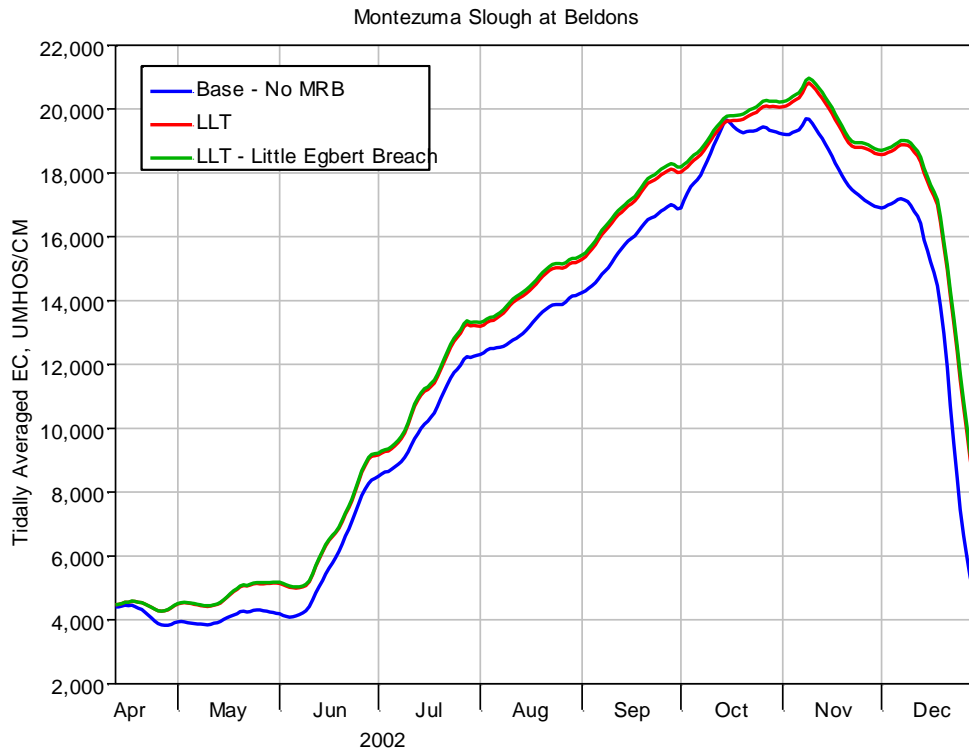


Figure 5-144 Tidally averaged EC at Montezuma Slough at Beldon's for Base-No MRB, LLT and LLT-Little Egbert Breach.

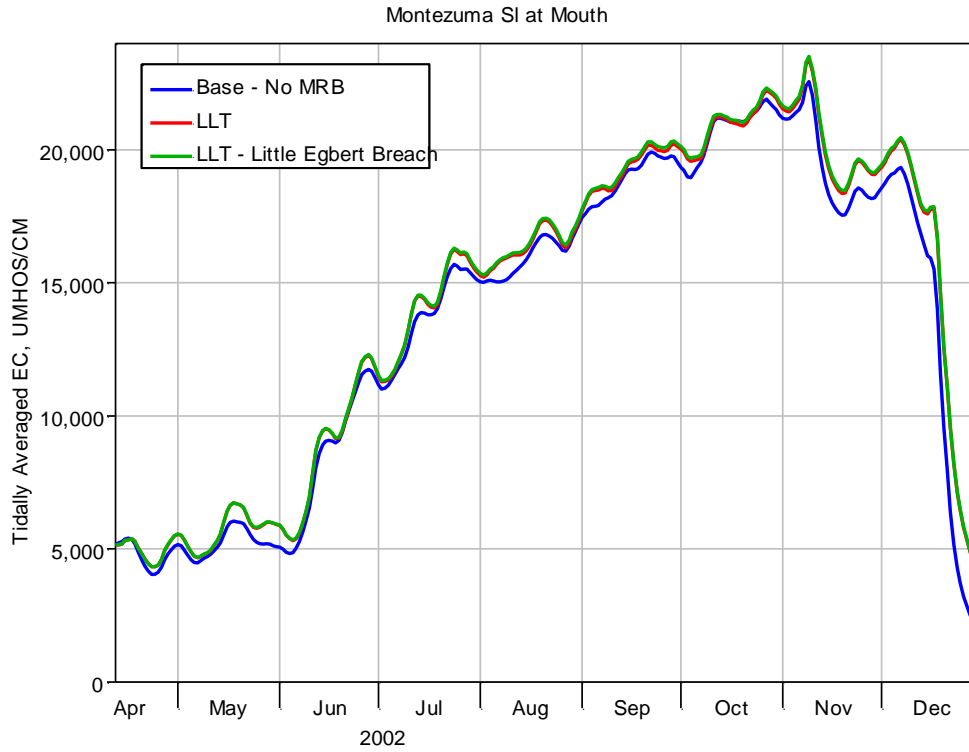


Figure 5-145 Tidally averaged EC at Montezuma SI at Mouth for Base-No MRB, LLT and LLT-Little Egbert Breach.

5.6.2 Spatial Plots of EC Change

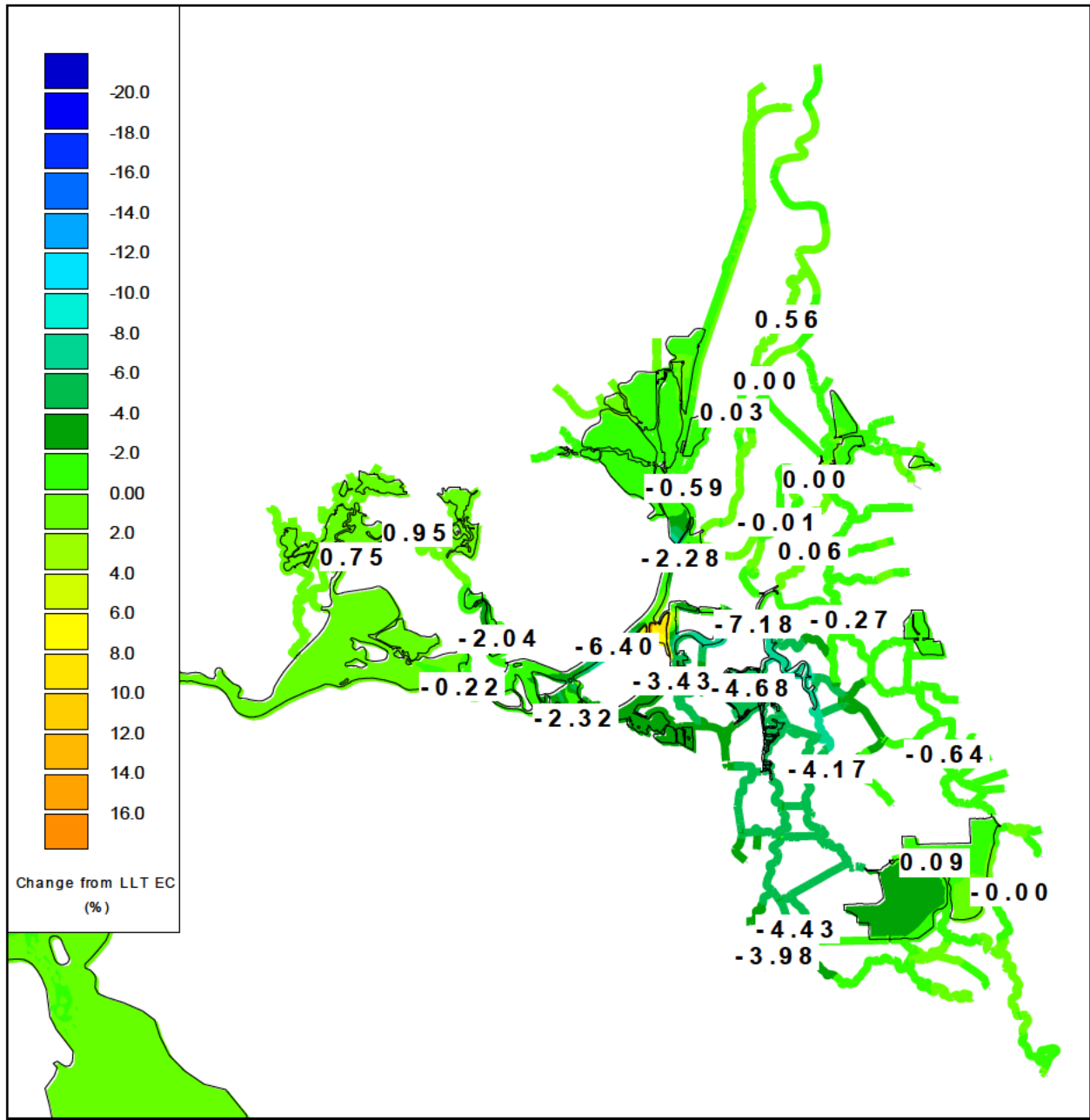


Figure 5-146 Contour plots of LLT – Little Egbert change from LLT tidally averaged EC on September 24, 2002.

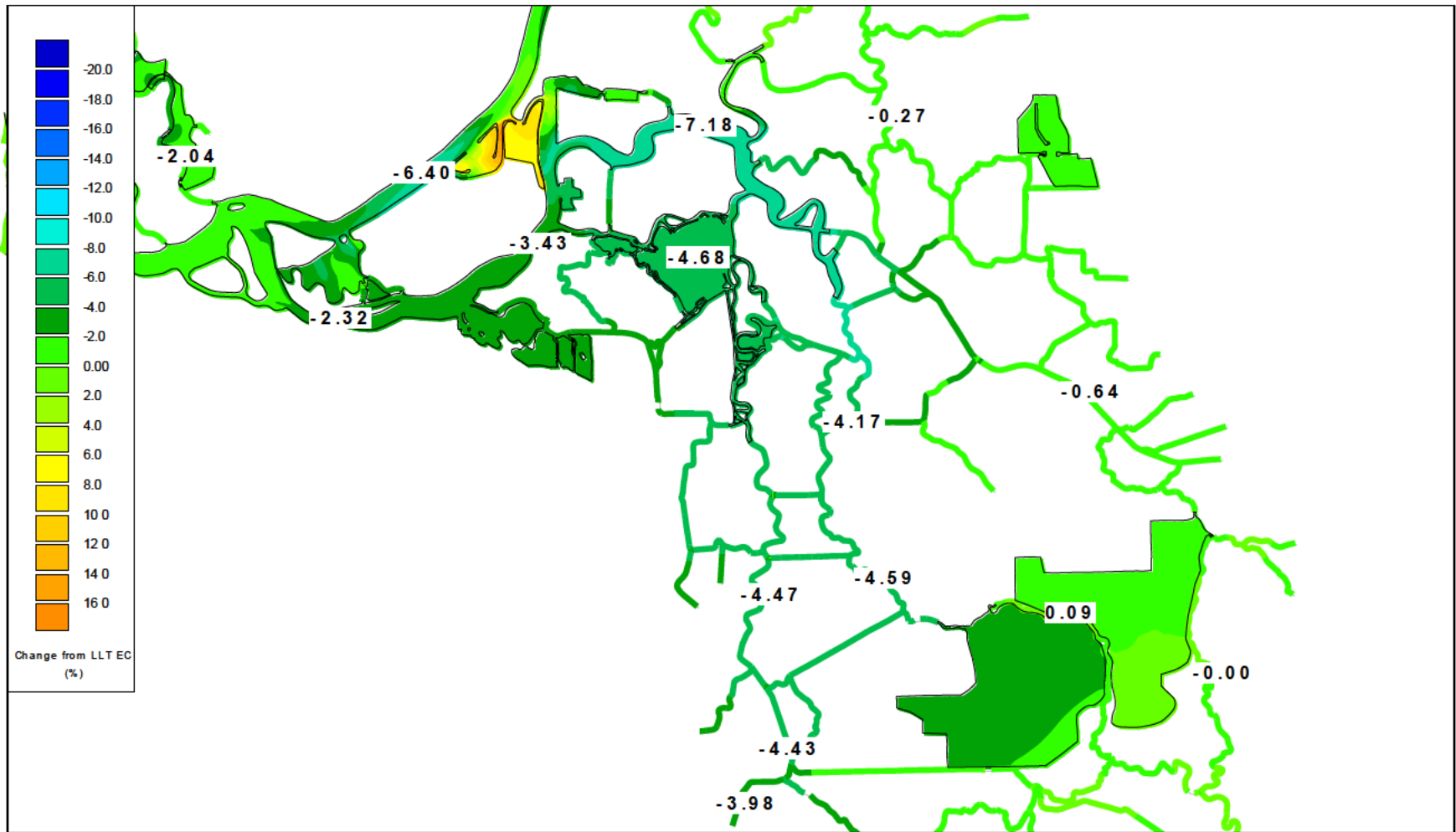


Figure 5-147 Contour plots of LLT – Little Egbert change from LLT tidally averaged EC in south Delta on September 24, 2002.

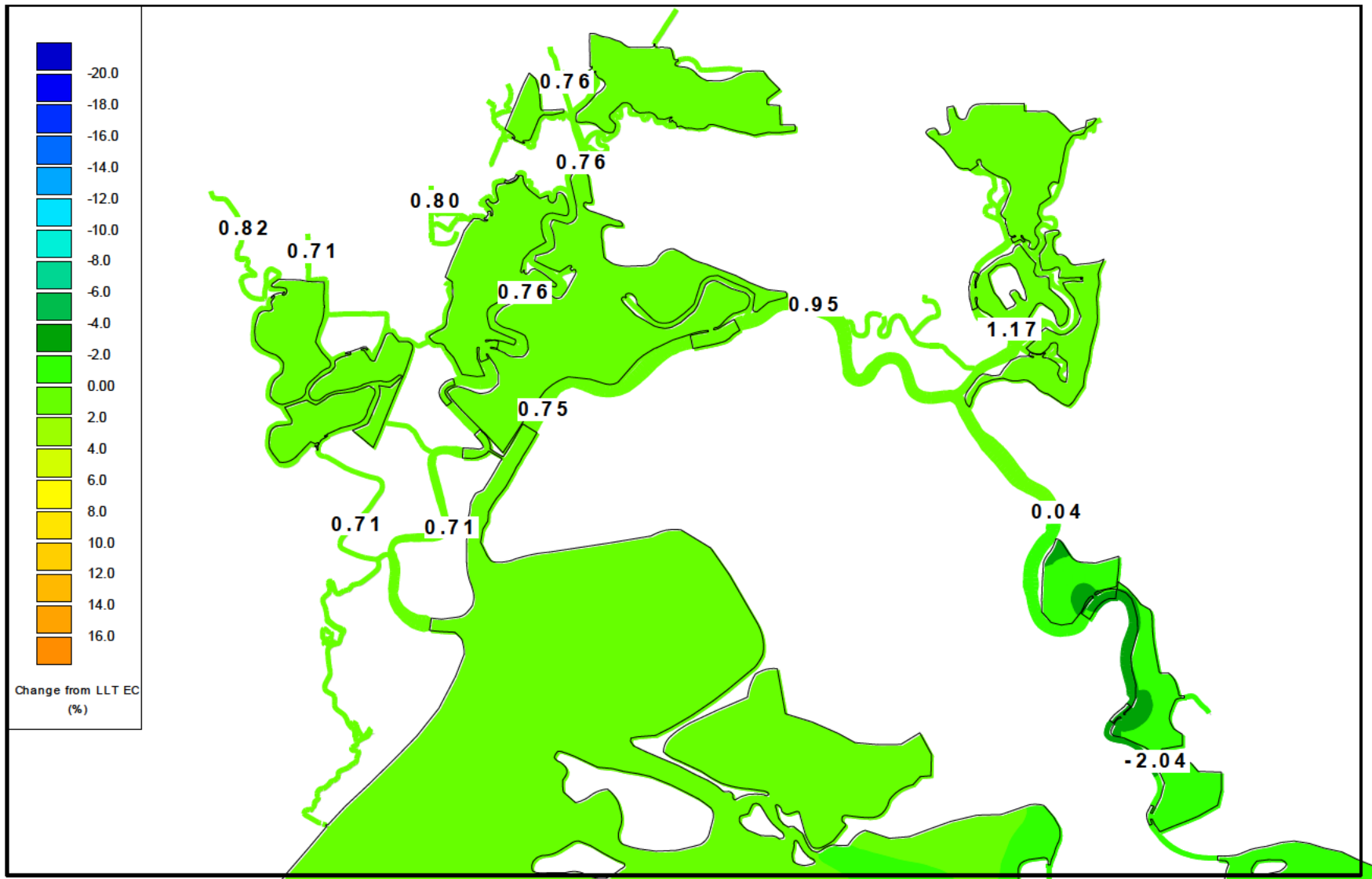


Figure 5-148 Contour plots of LLT – Little Egbert change from LLT tidally averaged EC in Suisun Marsh on September 24, 2002.

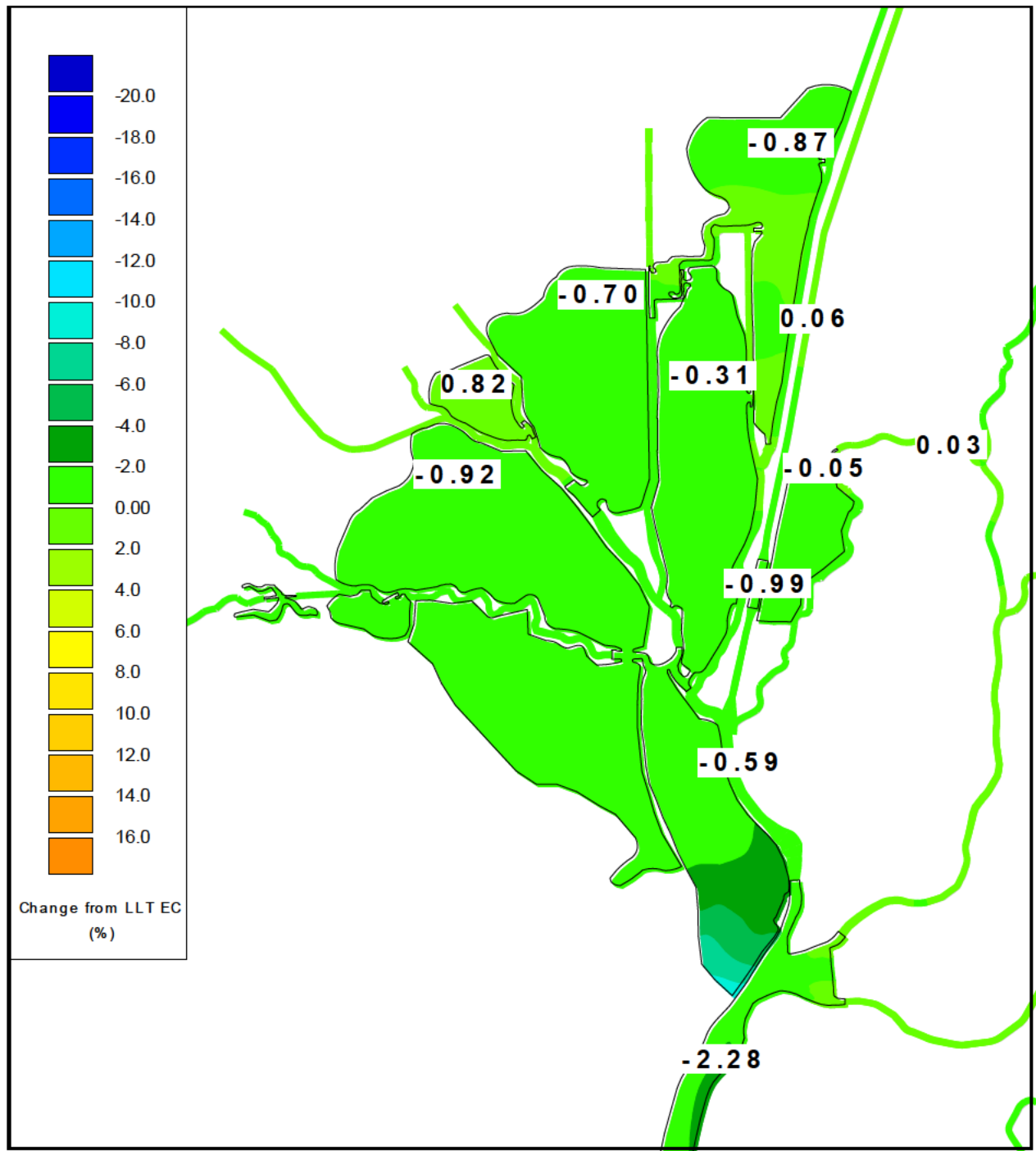


Figure 5-149 Contour plots of LLLT – Little Egbert change from LLLT tidally averaged EC in the Cache Slough ROA on September 24, 2002.

5.6.3 X2 Time Series

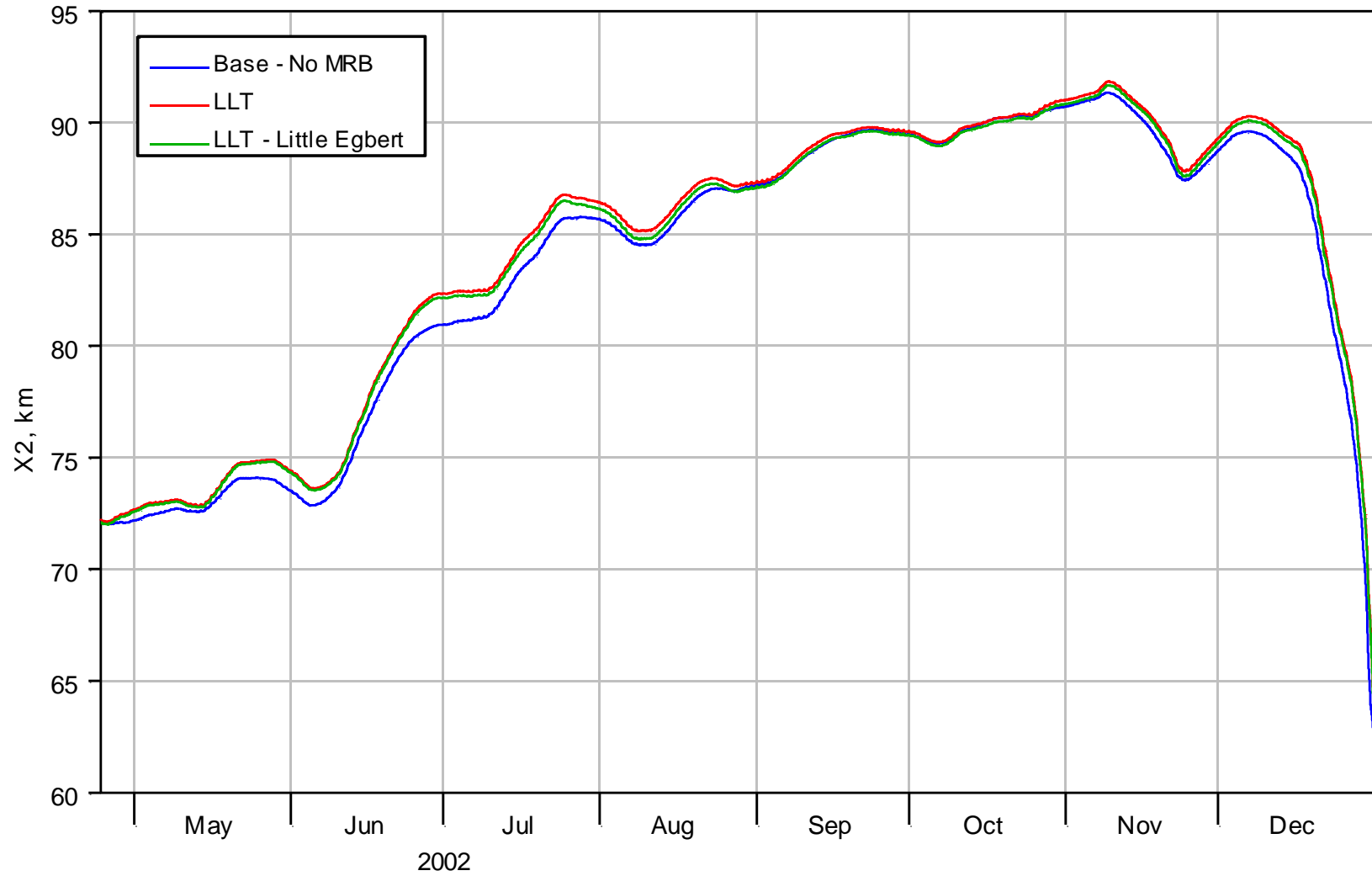


Figure 5-150 Time series of X2 for Base - No MRB, LLT and LLT – Little Egbert Breach.

5.7 LLT – Sherman Breach

EC results for the LLT – Sherman Breach case are shown as time series plots of tidally averaged values in Figure 5-151 through Figure 5-166. The EC impact of moving the Sherman Island breach from Threemile Slough to the San Joaquin River is minimal. EC peaks on the Sacramento River at Rio Vista and Emmaton are slightly reduced compared with LLT (the greatest tidally averaged EC reductions of about 40 umhos/cm occur in November). Outside that reach of the Sacramento River, and on the San Joaquin River, in the south Delta and Suisun Marsh, changes are negligible. There are no EC impacts at Freeport.

Contour plots of tidally averaged EC percent change from LLT on September 24, 2002 are shown in Figure 5-167 through Figure 5-169 for the Delta, the south and central Delta and for Suisun Marsh. These plots show a localized EC increase relative to LLT in the Sherman Island restoration area. In the LLT – Sherman Breach case, this restoration area fills with higher EC San Joaquin River water, rather than Threemile Slough water as in the LLT case.

A summary of July – December 2002 monthly average EC at key locations throughout the Delta is provided in Table 5-13 for Base – No MRB, LLT and LLT – Sherman Breach. Percent change in monthly average EC relative to the base case are provided in Table 5-14 for LLT and LLT – Sherman. These tables show reductions in monthly average EC relative to LLT up to 2% at Emmaton and Rio Vista. There are no significant changes elsewhere.

LLT – Sherman Breach X2, shown in Figure 5-170, is decreased by less than 0.1 km relative to LLT throughout the simulation period.

Table 5-13 Summary of July - December 2002 monthly average EC for Base - No MRB, LLT and LLT – Sherman Breach.

| Location | Monthly Average EC (umhos/cm) | | | | | | | | | | | | | | | | | |
|-----------------------|-------------------------------|-------|----------------------|---------------|-------|----------------------|----------------|-------|----------------------|---------------|-------|----------------------|---------------|-------|----------------------|---------------|-------|----------------------|
| | July 2002 | | | August 2002 | | | September 2002 | | | October 2002 | | | November 2002 | | | December 2002 | | |
| | Base - No MRB | LLT | LLT - Sherman Breach | Base - No MRB | LLT | LLT - Sherman Breach | Base - No MRB | LLT | LLT - Sherman Breach | Base - No MRB | LLT | LLT - Sherman Breach | Base - No MRB | LLT | LLT - Sherman Breach | Base - No MRB | LLT | LLT - Sherman Breach |
| Cache Sl at Ryer | 136 | 135 | 135 | 153 | 150 | 150 | 176 | 173 | 173 | 164 | 160 | 160 | 189 | 188 | 188 | 196 | 193 | 193 |
| CCWD Victoria Canal | 264 | 288 | 288 | 367 | 432 | 433 | 469 | 553 | 554 | 511 | 615 | 615 | 453 | 543 | 543 | 482 | 561 | 560 |
| CVP | 333 | 354 | 355 | 515 | 572 | 573 | 664 | 745 | 746 | 658 | 780 | 780 | 587 | 688 | 688 | 631 | 704 | 703 |
| Montezuma Sl at Head | 3536 | 3567 | 3556 | 4650 | 4521 | 4502 | 6853 | 6816 | 6794 | 7400 | 7510 | 7496 | 6555 | 6739 | 6726 | 3149 | 3440 | 3430 |
| Montezuma Sl at Mouth | 13705 | 14112 | 14115 | 15976 | 16392 | 16395 | 18958 | 19301 | 19303 | 20766 | 20950 | 20954 | 19465 | 20279 | 20285 | 12062 | 13926 | 13929 |
| RMID015 | 261 | 285 | 285 | 367 | 437 | 438 | 469 | 565 | 566 | 503 | 612 | 612 | 442 | 522 | 521 | 463 | 542 | 541 |
| RMID023 | 262 | 285 | 285 | 367 | 436 | 436 | 468 | 560 | 561 | 507 | 614 | 614 | 448 | 527 | 527 | 477 | 552 | 551 |
| ROLD024 | 401 | 438 | 439 | 707 | 781 | 784 | 934 | 1049 | 1053 | 826 | 1014 | 1015 | 712 | 891 | 890 | 607 | 744 | 742 |
| ROLD034 | 360 | 392 | 393 | 615 | 692 | 695 | 804 | 912 | 914 | 755 | 915 | 916 | 651 | 801 | 800 | 601 | 732 | 730 |
| RSAC075 Chipps Island | 8209 | 8880 | 8873 | 9741 | 10267 | 10256 | 12563 | 13253 | 13243 | 13606 | 14160 | 14155 | 11990 | 12802 | 12795 | 6035 | 6735 | 6727 |
| RSAC092 Emmaton | 623 | 629 | 618 | 808 | 742 | 729 | 1498 | 1384 | 1361 | 2012 | 1919 | 1897 | 1748 | 1782 | 1757 | 821 | 874 | 860 |
| RSAC101 Rio Vista | 148 | 146 | 145 | 176 | 162 | 162 | 241 | 213 | 212 | 285 | 264 | 262 | 290 | 308 | 303 | 222 | 232 | 229 |
| RSAC123 | 127 | 127 | 127 | 154 | 155 | 155 | 165 | 165 | 165 | 142 | 142 | 142 | 184 | 184 | 184 | 169 | 168 | 168 |
| RSAC155 Freeport | 126 | 126 | 126 | 156 | 156 | 156 | 162 | 162 | 162 | 142 | 142 | 142 | 184 | 184 | 184 | 164 | 164 | 164 |
| RSAN018 Jersey Pt | 954 | 1028 | 1032 | 1461 | 1519 | 1525 | 1975 | 2116 | 2124 | 1728 | 1913 | 1917 | 1503 | 1766 | 1766 | 945 | 1108 | 1109 |
| RSAN032 San Andreas | 284 | 383 | 383 | 459 | 649 | 651 | 555 | 871 | 871 | 448 | 773 | 772 | 403 | 668 | 666 | 333 | 480 | 478 |
| RSAN058 | 643 | 612 | 612 | 664 | 644 | 644 | 711 | 698 | 698 | 674 | 682 | 682 | 636 | 629 | 629 | 763 | 751 | 751 |
| S-49 Beldon's Landing | 10402 | 11292 | 11295 | 13266 | 14335 | 14339 | 15826 | 16973 | 16978 | 18856 | 19371 | 19378 | 18357 | 19659 | 19668 | 12766 | 15349 | 15354 |
| SWP | 329 | 360 | 360 | 540 | 615 | 617 | 698 | 807 | 809 | 682 | 835 | 836 | 593 | 725 | 725 | 594 | 691 | 689 |

Table 5-14 Summary of July - December 2002 percent change in monthly average EC for LLT and LLT – Sherman Breach relative to Base - No MRB.

| Location | Percent Change in Monthly Average EC (umhos/cm) Relative to Base Case | | | | | | | | | | | |
|-----------------------|---|----------------------|-------------|----------------------|----------------|----------------------|--------------|----------------------|---------------|----------------------|---------------|----------------------|
| | July 2002 | | August 2002 | | September 2002 | | October 2002 | | November 2002 | | December 2002 | |
| | LLT | LLT - Sherman Breach | LLT | LLT - Sherman Breach | LLT | LLT - Sherman Breach | LLT | LLT - Sherman Breach | LLT | LLT - Sherman Breach | LLT | LLT - Sherman Breach |
| Cache SI at Ryer | -1% | -1% | -2% | -2% | -1% | -1% | -2% | -2% | -1% | -1% | -2% | -2% |
| CCWD Victoria Canal | 9% | 9% | 18% | 18% | 18% | 18% | 20% | 20% | 20% | 20% | 16% | 16% |
| CVP | 7% | 7% | 11% | 11% | 12% | 12% | 19% | 19% | 17% | 17% | 12% | 11% |
| Montezuma SI at Head | 1% | 1% | -3% | -3% | -1% | -1% | 1% | 1% | 3% | 3% | 9% | 9% |
| Montezuma SI at Mouth | 3% | 3% | 3% | 3% | 2% | 2% | 1% | 1% | 4% | 4% | 15% | 15% |
| RMID015 | 9% | 9% | 19% | 19% | 20% | 21% | 22% | 22% | 18% | 18% | 17% | 17% |
| RMID023 | 9% | 9% | 19% | 19% | 20% | 20% | 21% | 21% | 18% | 18% | 16% | 16% |
| ROLD024 | 9% | 9% | 10% | 11% | 12% | 13% | 23% | 23% | 25% | 25% | 23% | 22% |
| ROLD034 | 9% | 9% | 13% | 13% | 13% | 14% | 21% | 21% | 23% | 23% | 22% | 22% |
| RSAC075 Chipps Island | 8% | 8% | 5% | 5% | 5% | 5% | 4% | 4% | 7% | 7% | 12% | 11% |
| RSAC092 Emmaton | 1% | -1% | -8% | -10% | -8% | -9% | -5% | -6% | 2% | 0% | 6% | 5% |
| RSAC101 Rio Vista | -2% | -2% | -8% | -8% | -12% | -12% | -7% | -8% | 6% | 4% | 5% | 3% |
| RSAC123 | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| RSAC155 Freeport | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| RSAN018 Jersey Pt | 8% | 8% | 4% | 4% | 7% | 8% | 11% | 11% | 18% | 18% | 17% | 17% |
| RSAN032 San Andreas | 35% | 35% | 42% | 42% | 57% | 57% | 73% | 72% | 66% | 65% | 44% | 44% |
| RSAN058 | -5% | -5% | -3% | -3% | -2% | -2% | 1% | 1% | -1% | -1% | -2% | -2% |
| S-49 Beldon's Landing | 9% | 9% | 8% | 8% | 7% | 7% | 3% | 3% | 7% | 7% | 20% | 20% |
| SWP | 9% | 9% | 14% | 14% | 16% | 16% | 23% | 23% | 22% | 22% | 16% | 16% |

5.7.1 Tidally averaged EC time series



Figure 5-151 Tidally averaged EC at RSAC155 for Base-No MRB, LLT and LLT-Sherman Breach.



Figure 5-152 Tidally averaged EC in Sutter Slough for Base-No MRB, LLT and LLT-Sherman Breach.

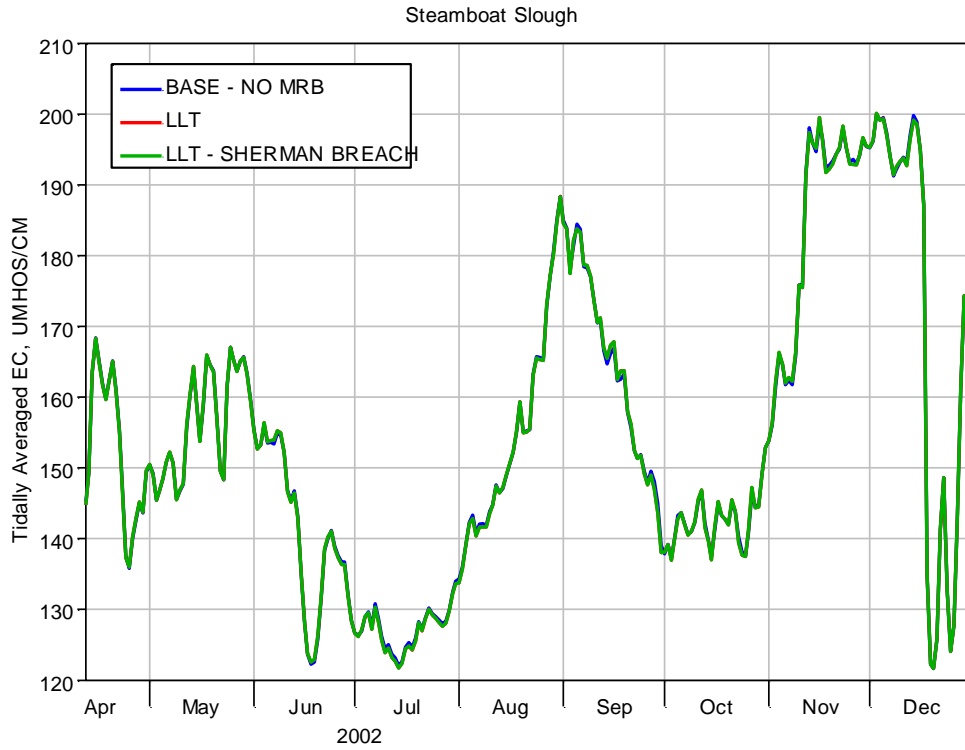


Figure 5-153 Tidally averaged EC in Steamboat Slough for Base-No MRB, LLT and LLT-Sherman Breach.

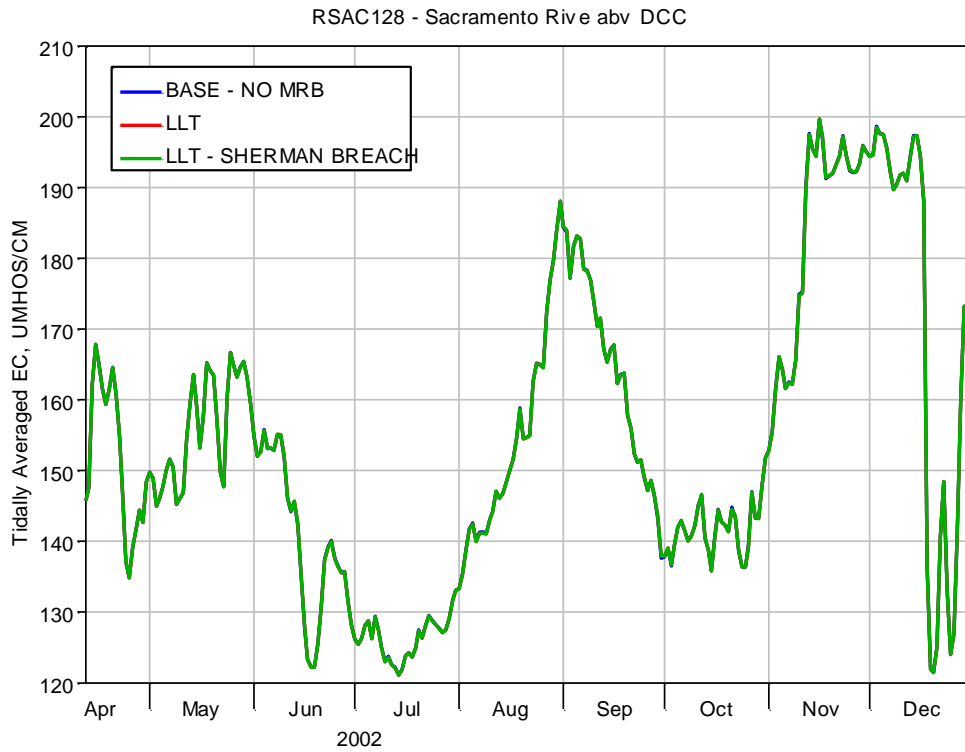


Figure 5-154 Tidally averaged EC at RSAC128 for Base-No MRB, LLT and LLT-Sherman Breach.

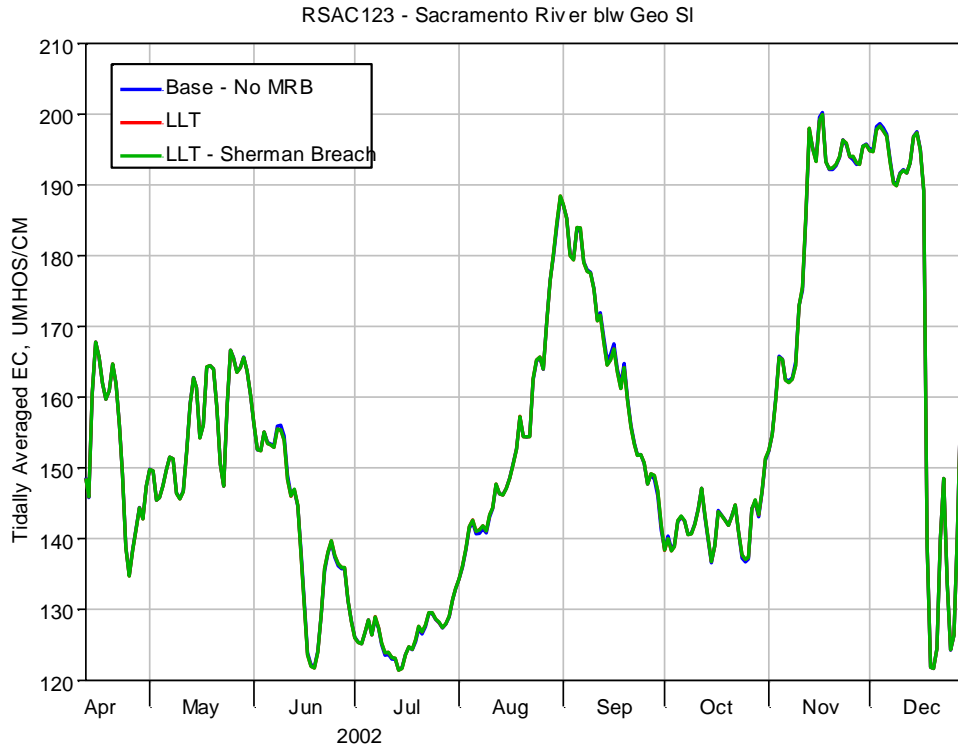


Figure 5-155 Tidally averaged EC at RSAC123 for Base-No MRB, LLT and LLT-Sherman Breach.

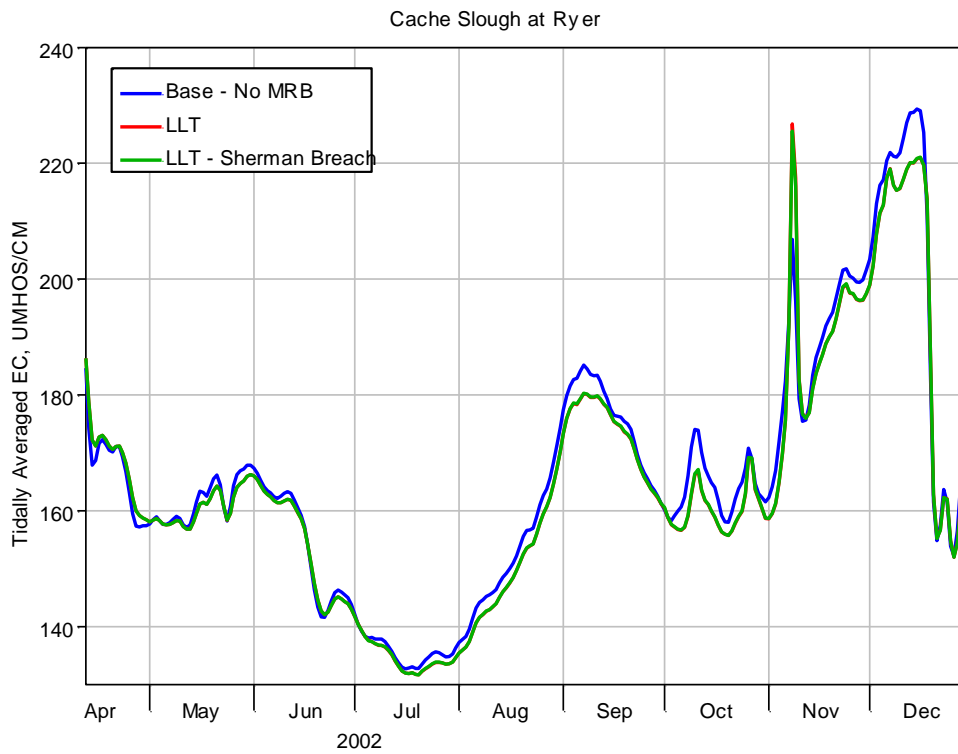


Figure 5-156 Tidally averaged EC at Cache Slough at Ryer for Base-No MRB, LLT and LLT-Sherman Breach.

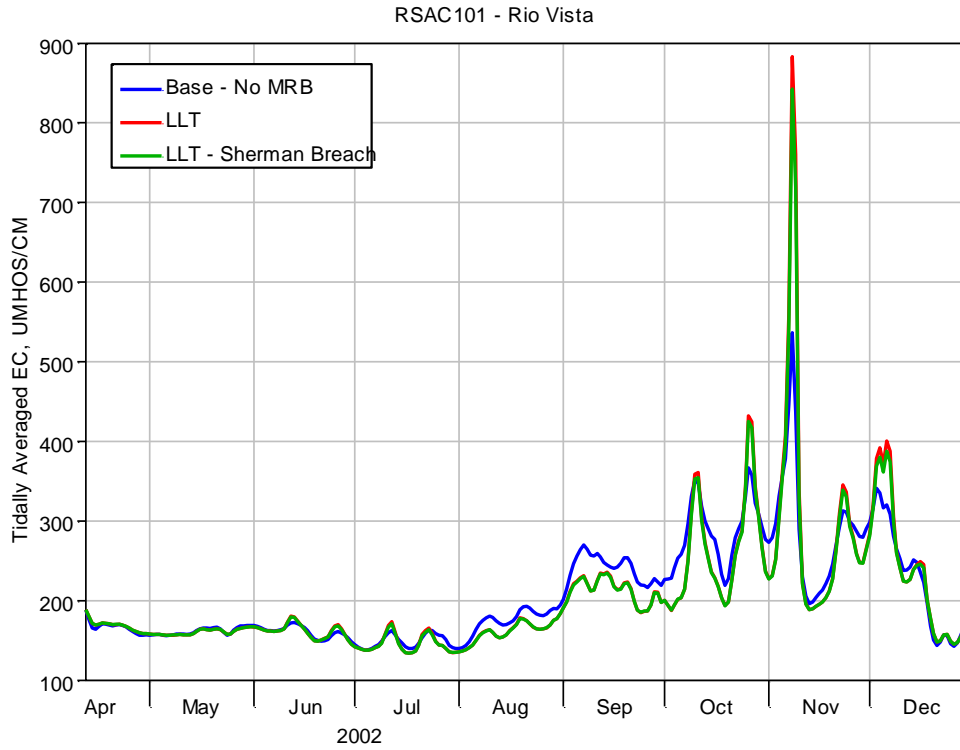


Figure 5-157 Tidally averaged EC at RSAC101 for Base-No MRB, LLT and LLT-Sherman Breach.

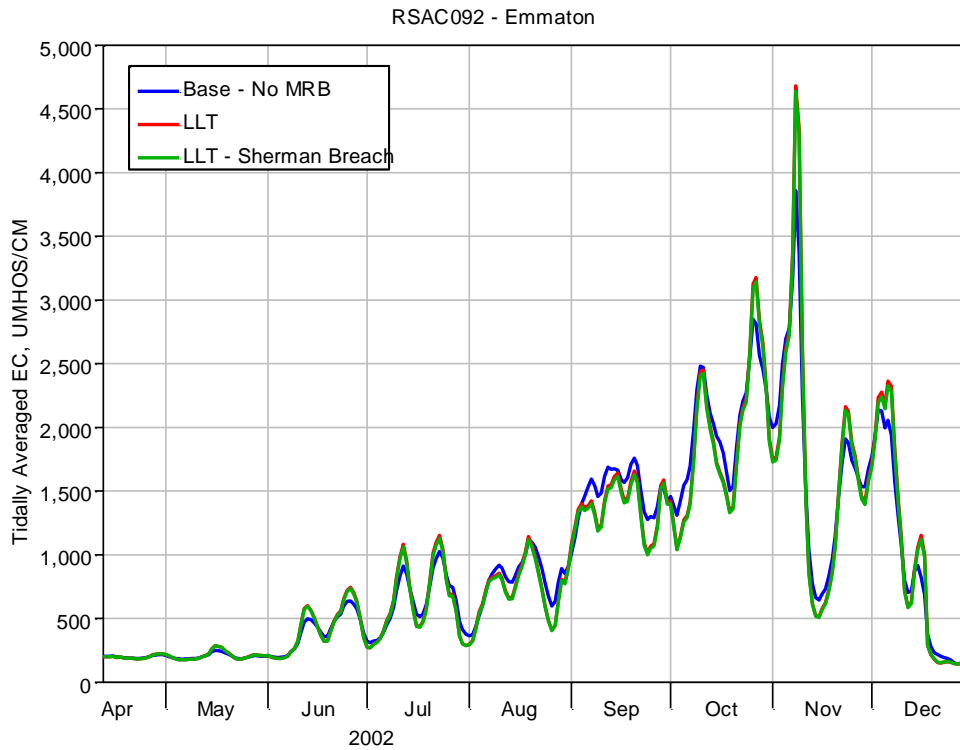


Figure 5-158 Tidally averaged EC at RSAC092 for Base-No MRB, LLT and LLT-Sherman Breach.

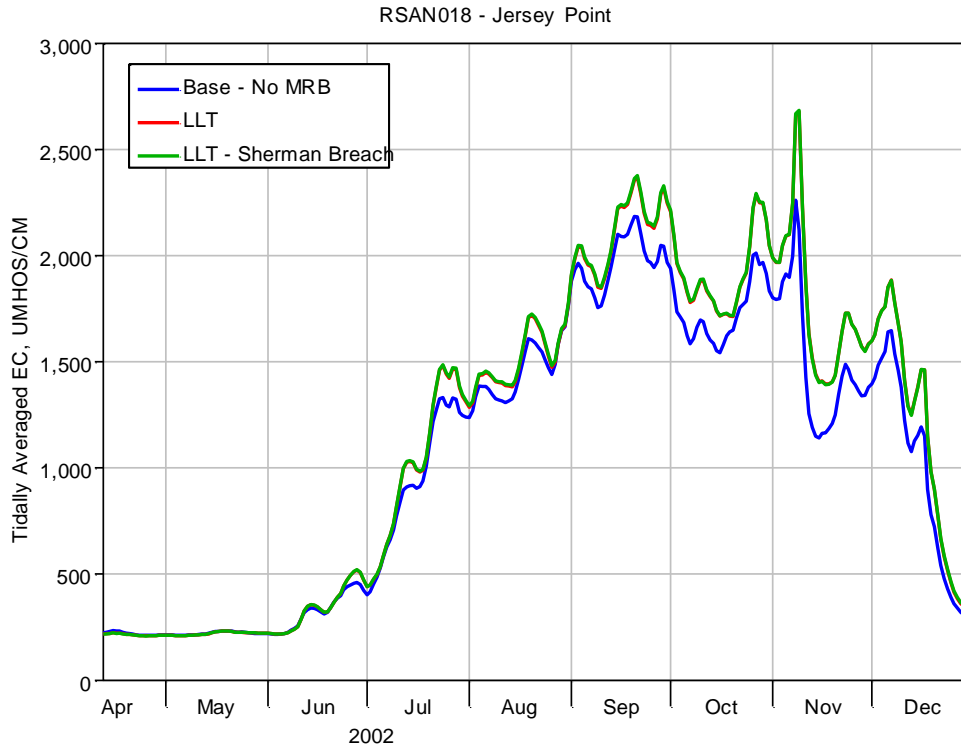


Figure 5-159 Tidally averaged EC at RSAN018 for Base-No MRB, LLT and LLT-Sherman Breach.

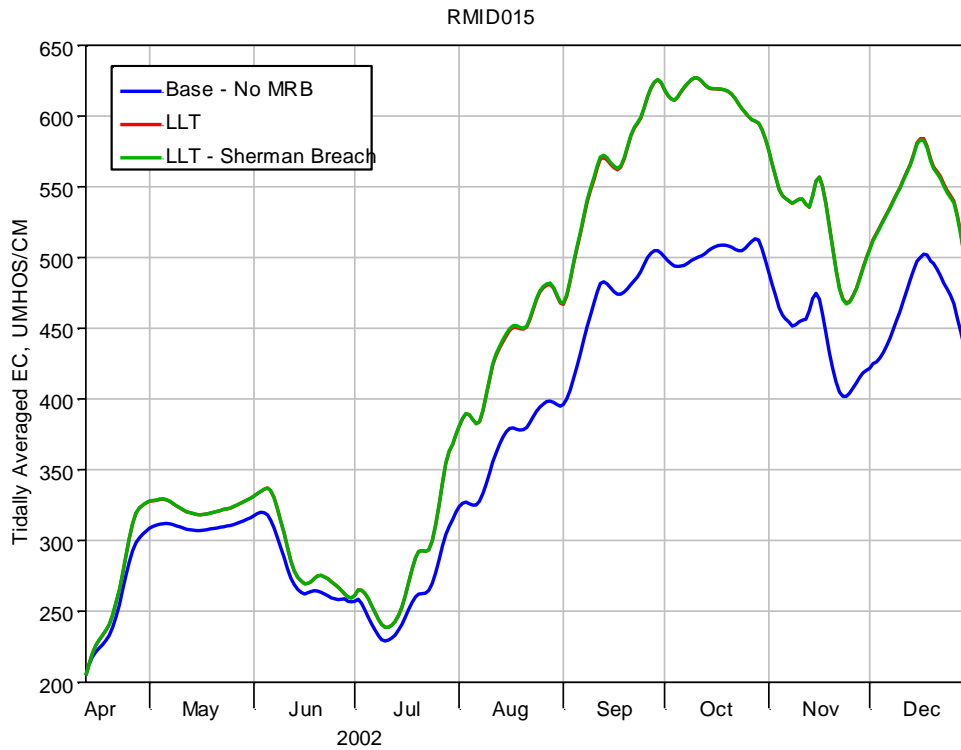


Figure 5-160 Tidally averaged EC at RMID015 for Base-No MRB, LLT and LLT-Sherman Breach.

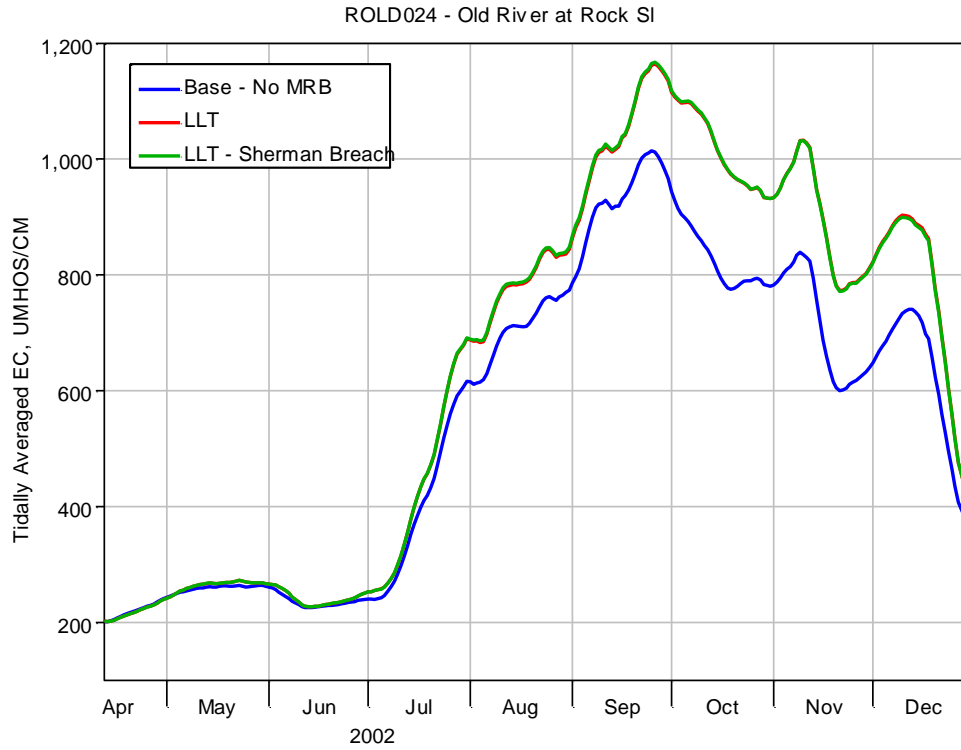


Figure 5-161 Tidally averaged EC at ROLD024 for Base-No MRB, LLT and LLT-Sherman Breach.

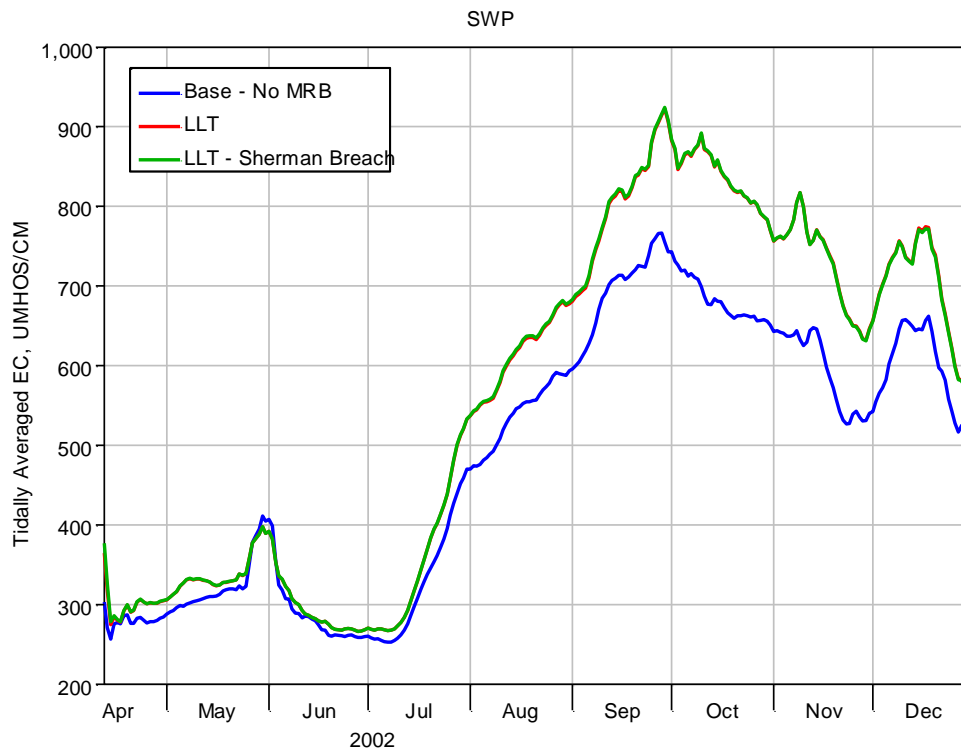


Figure 5-162 Tidally averaged EC at SWP for Base-No MRB, LLT and LLT-Sherman Breach.

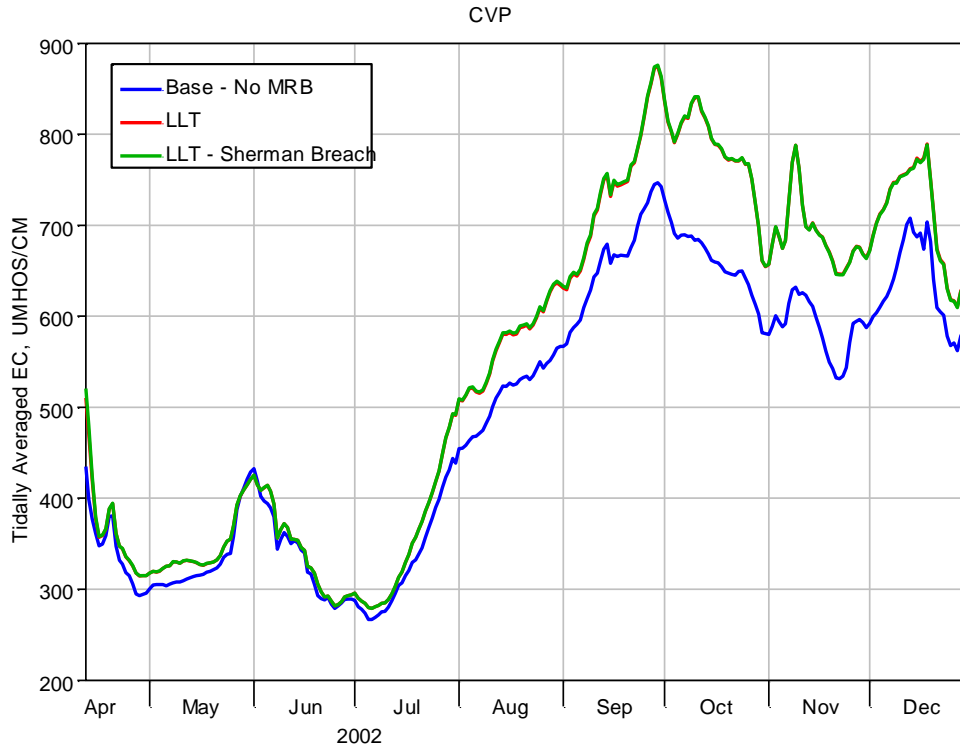


Figure 5-163 Tidally averaged EC at CVP for Base-No MRB, LLT and LLT-Sherman Breach.

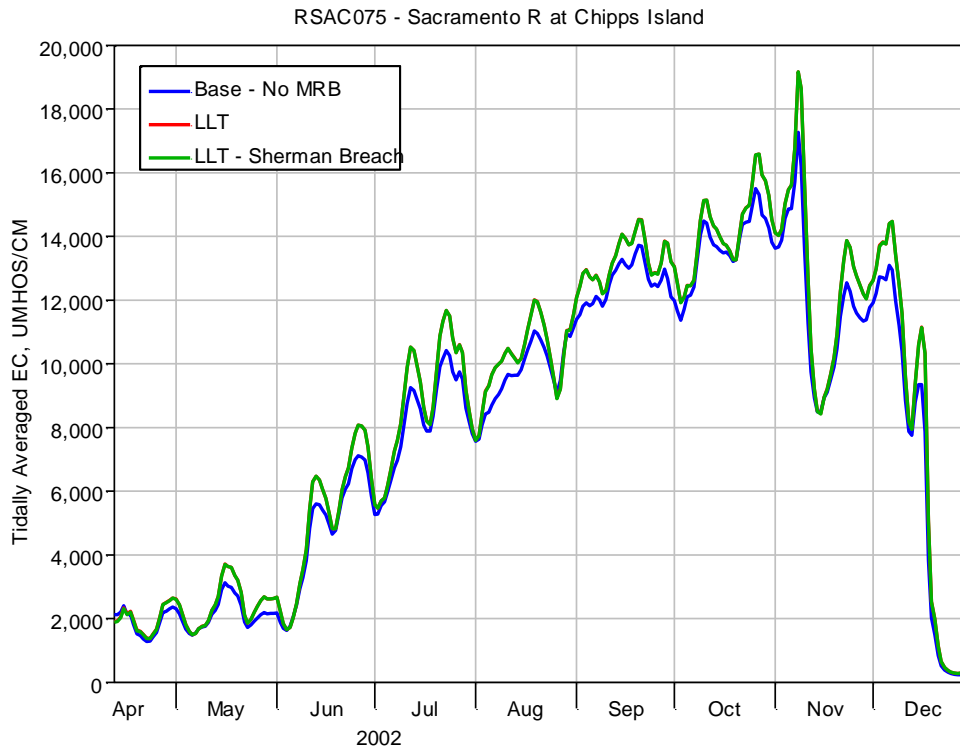


Figure 5-164 Tidally averaged EC at RSAC075 for Base-No MRB, LLT and LLT-Sherman Breach.

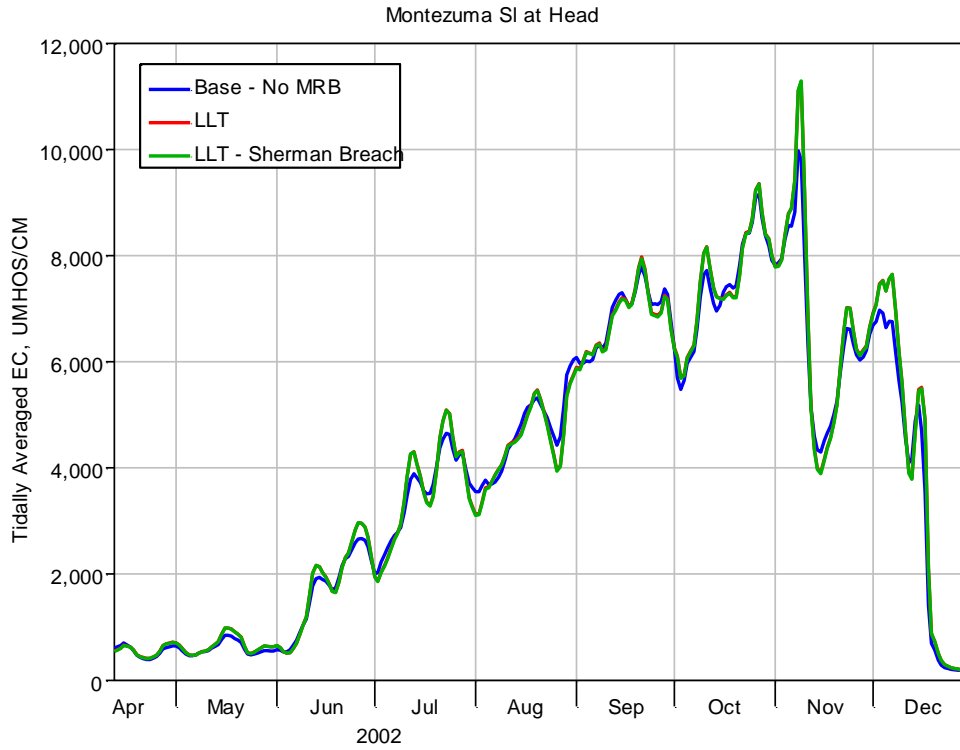


Figure 5-165 Tidally averaged EC at Montezuma SI at Head for Base-No MRB, LLT and LLT-Sherman Breach.

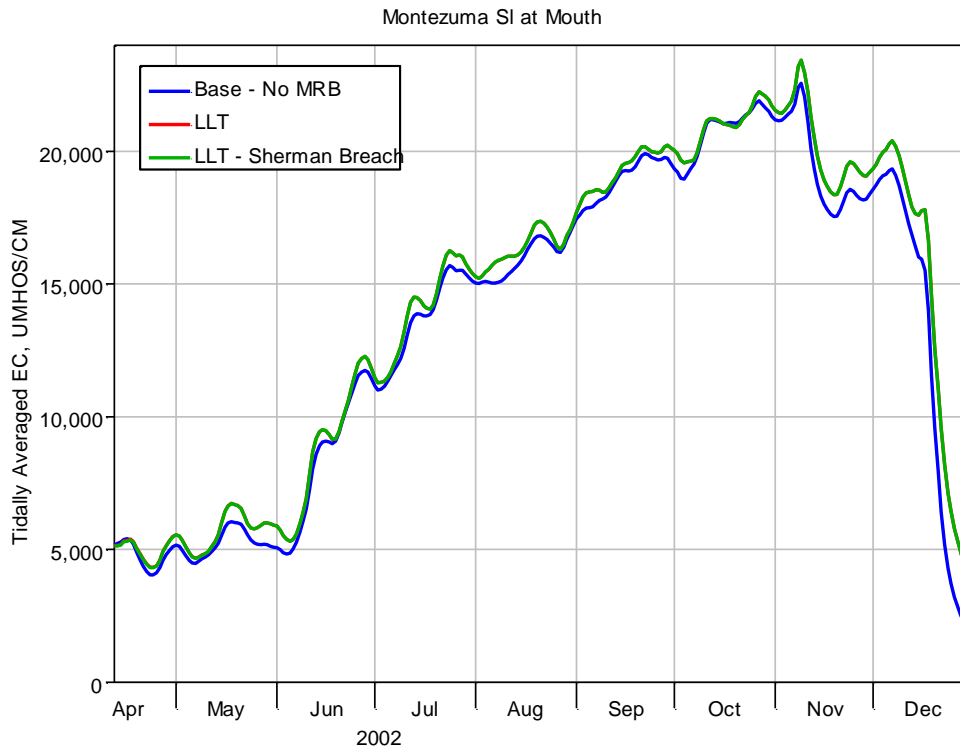


Figure 5-166 Tidally averaged EC at Montezuma SI at Mouth for Base-No MRB, LLT and LLT-Sherman Breach.

5.7.2 Spatial Plots of EC Change

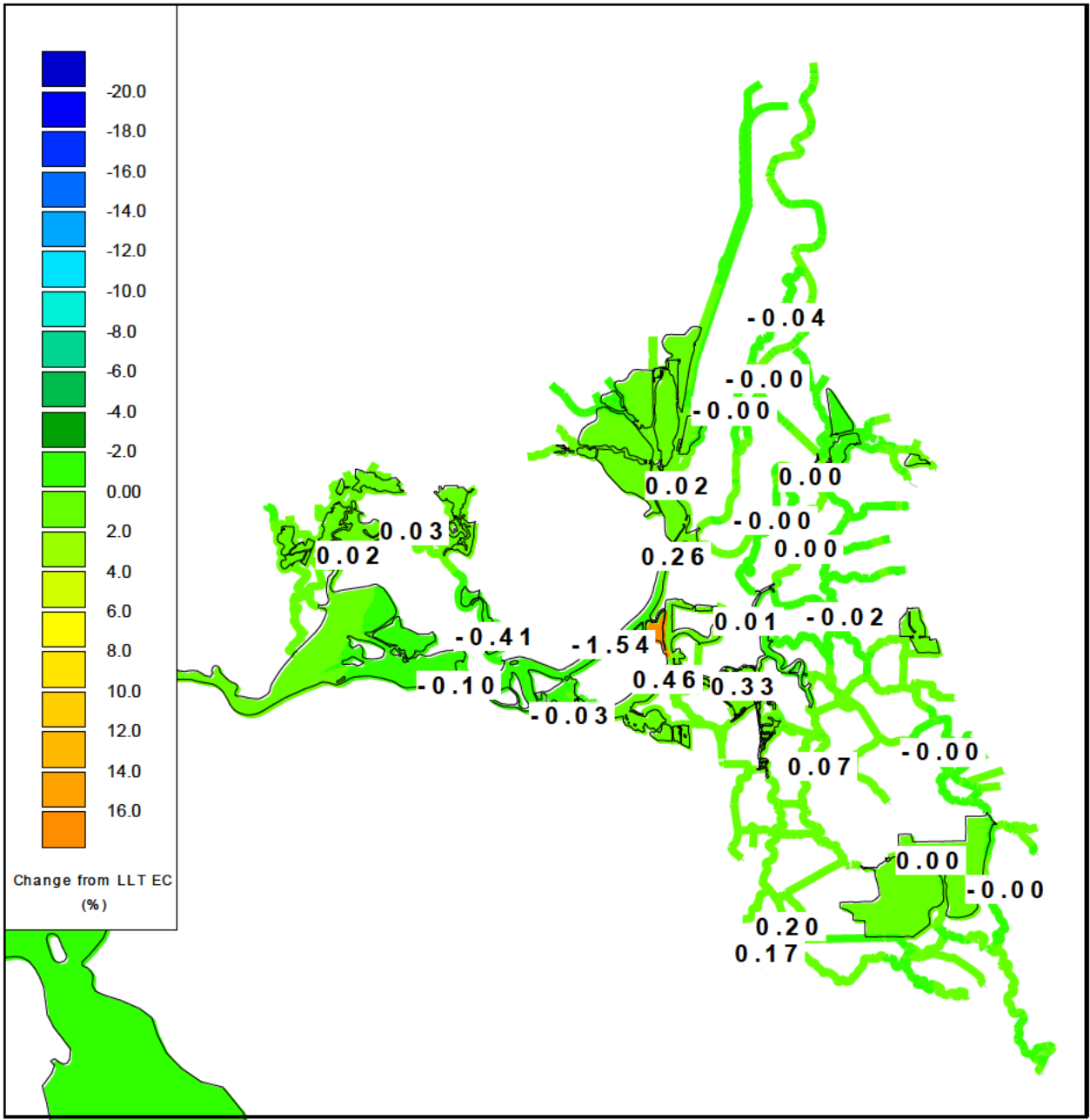


Figure 5-167 Contour plots of LLT – Sherman Breach change from LLT tidally averaged EC on September 24, 2002.

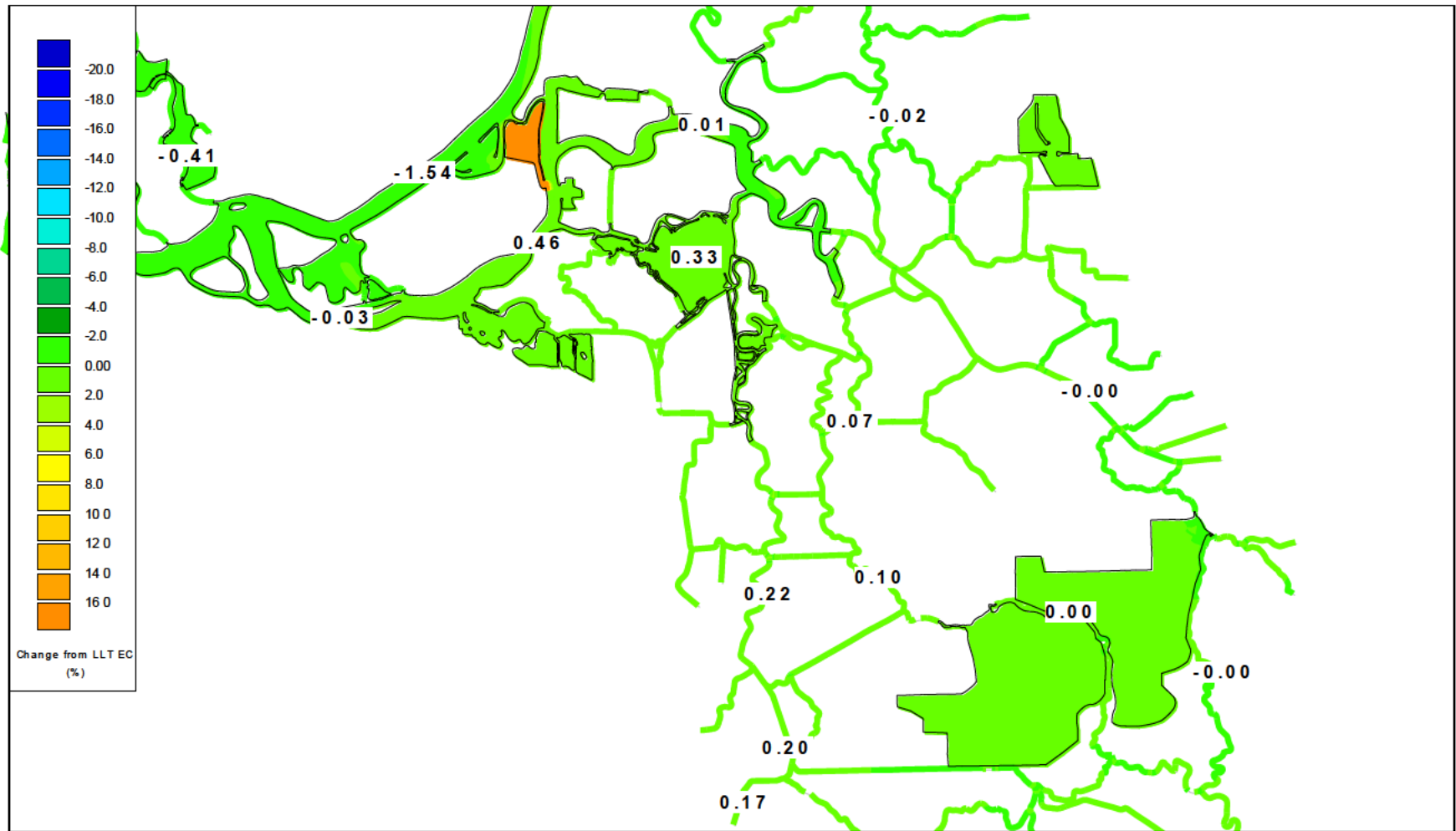


Figure 5-168 Contour plots of LLT – Sherman Breach change from LLT tidally averaged EC in south Delta on September 24, 2002.

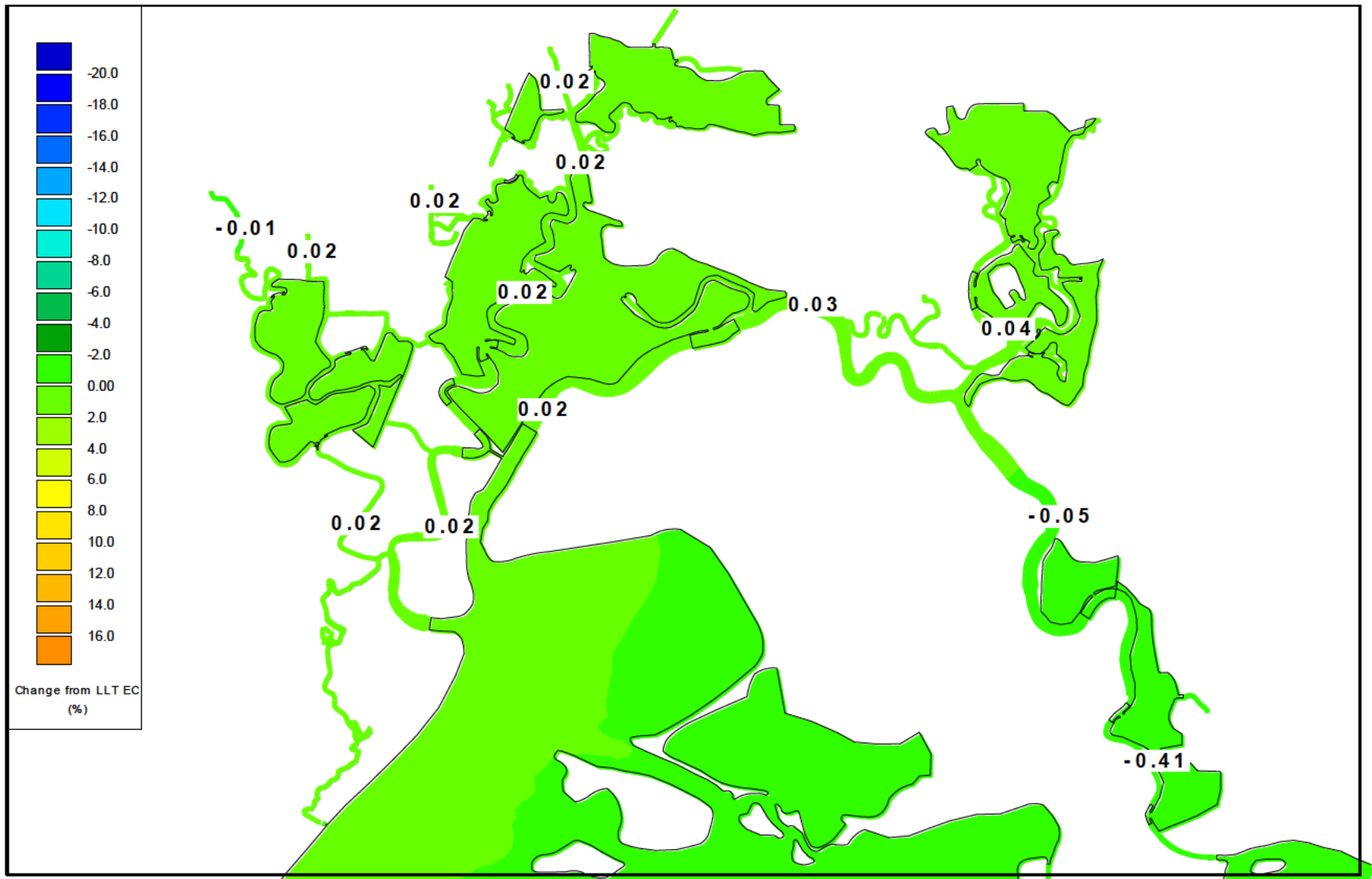


Figure 5-169 Contour plots of LLT – Sherman Breach change from LLT tidally averaged EC in Suisun Marsh on September 24, 2002.

5.7.3 X2 Time Series

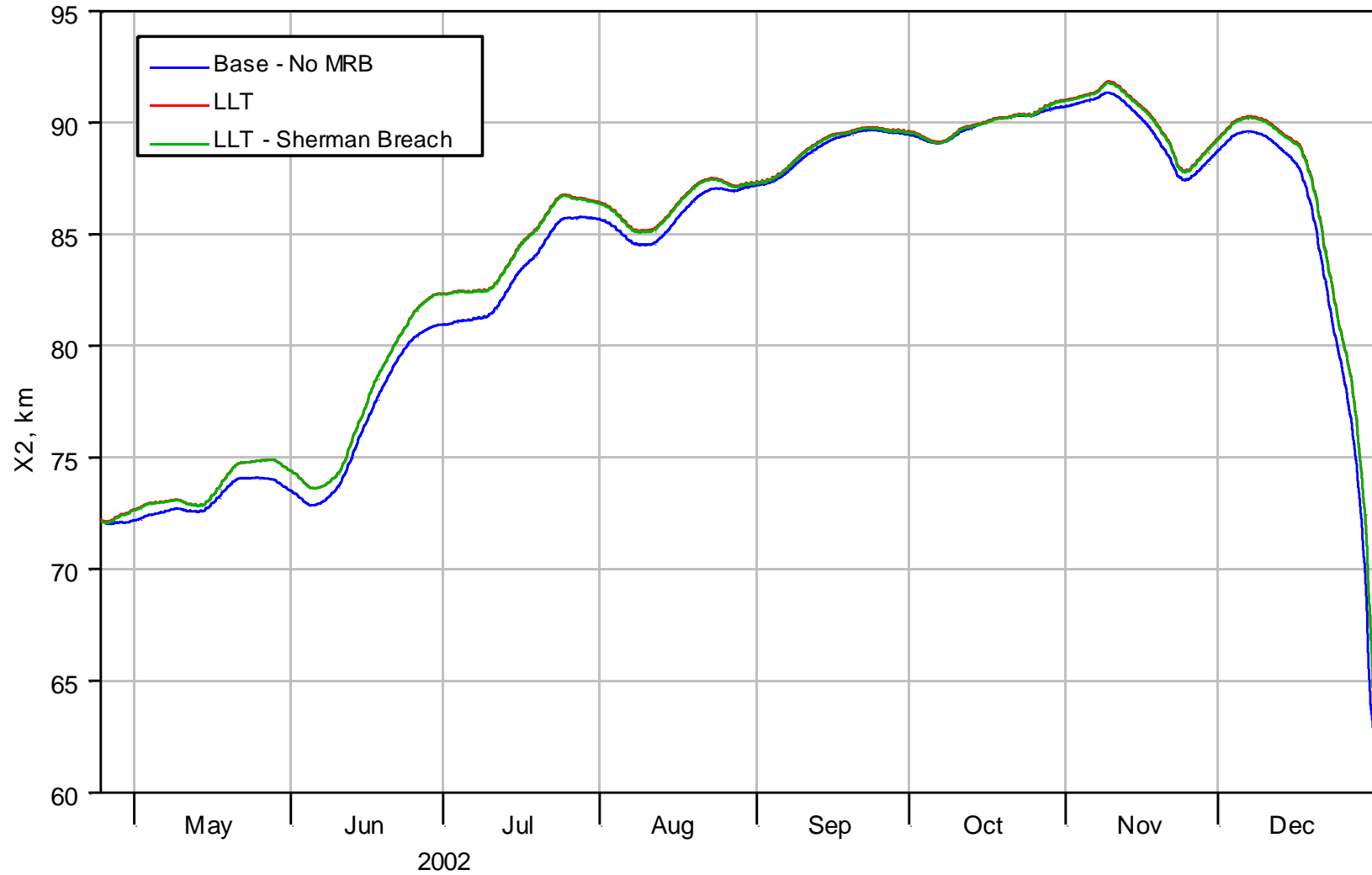


Figure 5-170 Time series of X2 for Base - No MRB, LLT and LLT – Sherman Breach.

5.8 EC Summary

The distribution of salinity in the Delta is a function of the overall flow balance, net flow distribution, and dispersive mixing associated with tidal flows.

The tidal and net (or averaged) flow changes discussed in the “Hydrodynamic Impacts” section act to change the salinity distribution in the Delta, Suisun Bay and Suisun Marsh.

A summary of July and August 2002 changes in monthly average EC relative to base restoration case (ELT or LLT) for each of the sensitivity cases is provided in Table 5-15 (Tables for September – December 2002 are provided in the [Appendix](#)). Coloration of the table cells indicates largest increases (red) and decreases (blue). None of the scenarios has large EC impacts north of Rio Vista. LLT – Suisun Scour and ELT – Max Suisun result in the largest EC increases overall, while LLT – Little Egbert results in the largest decreases overall.

Average X2 values for July 2002 are summarized in Table 5-16. The LLT restoration increases July 2002 X2 by 1.1 km. Most of the LLT sensitivity cases impact this value by a tenth of a kilometer or less. The LLT – Little Egbert case reduces July X2 by 0.3 km relative to LLT and the LLT – Suisun Scour case increase X2 by 0.7 km relative to LLT.

The ELT restoration decreases July X2 by 0.2 km relative to Base. ELT – Prospect Island does not impact July X2, however the ELT – Max Suisun case increases it by a full kilometer, bringing it closer to LLT X2.

Suisun Marsh Restoration Impacts

Acre for acre, Suisun Marsh restoration has the greatest impact on EC in the central and south Delta. Shifting restoration area from Cache Slough to Suisun Marsh increased EC in these areas and increased X2. Increasing conveyance in Suisun Marsh amplified the impact of Suisun Marsh restoration on central and south Delta EC and resulted in the highest X2 and highest EC at the exports of any scenario.

Delta Cross Channel and Georgiana Slough Flow Impacts

Changes in freshwater coming through DCC and down Georgiana Slough impact EC in the San Joaquin River around San Andreas Landing and on down into the South Delta. The LLT – Little Egbert case increases Georgiana Slough and DCC flows by 88 cfs above LLT, resulting in EC decreases of up to 7% below LLT in the south Delta.

Middle River Conveyance Impacts

With the increased conveyance in Middle River, EC in Middle River is slower to respond to changes in flow and peaks are lower. This is because the Union Island in the South Delta ROA is better connected to Middle River resulting in more mixing between Middle River and the restoration area.

Table 5-15 Summary of July and August 2002 change in monthly average EC relative to base restoration case for ELT - Max Suisun, ELT - Prospect Breach and LLT - Middle River (values for September through December are tabulated in the [Appendix](#)). Darker red indicates largest increases and darkest blue indicates largest decreases.

| Location | Percent Change in Monthly Average EC (umhos/cm) Relative to Base Restoration Case (ELT or LLT) | | | | | | | | | | | | | |
|-----------------------|--|----------------|--------------------|--------------------|-----------------------|----------------------------|----------------------|------------------|----------------|--------------------|--------------------|-----------------------|----------------------------|----------------------|
| | July 2002 | | | | | | | August 2002 | | | | | | |
| | ELT - Max Suisun | LLT - No South | LLT - Middle River | LLT - Suisun Scour | ELT - Prospect Breach | LLT - Little Egbert Breach | LLT - Sherman Breach | ELT - Max Suisun | LLT - No South | LLT - Middle River | LLT - Suisun Scour | ELT - Prospect Breach | LLT - Little Egbert Breach | LLT - Sherman Breach |
| Cache SI at Ryer | 0% | 0% | 0% | 0% | 1% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| CCWD Victoria Canal | 2% | 0% | -1% | 3% | -1% | -2% | 0% | 5% | 1% | -3% | 7% | -2% | -4% | 0% |
| CVP | 3% | 1% | 0% | 5% | -1% | -2% | 0% | 6% | 2% | -2% | 8% | -2% | -3% | 0% |
| Montezuma SI at Head | 5% | 0% | -1% | 9% | 0% | -1% | 0% | 3% | 1% | -1% | 7% | 1% | -1% | 0% |
| Montezuma SI at Mouth | -1% | 0% | 0% | 3% | 0% | 0% | 0% | 0% | 0% | 0% | 3% | 0% | 1% | 0% |
| RMID015 | 2% | 0% | -1% | 3% | -1% | -2% | 0% | 5% | 0% | -3% | 7% | -2% | -4% | 0% |
| RMID023 | 2% | 0% | -1% | 3% | -1% | -2% | 0% | 5% | 0% | -3% | 7% | -2% | -4% | 0% |
| ROLD024 | 6% | 0% | -2% | 8% | -2% | -3% | 0% | 8% | 1% | -2% | 10% | -2% | -4% | 0% |
| ROLD034 | 5% | 0% | 1% | 7% | -2% | -3% | 0% | 8% | 0% | 1% | 10% | -2% | -4% | 0% |
| RSAC075 Chipps Island | 11% | 0% | 0% | 8% | 0% | -1% | 0% | 10% | 0% | 0% | 8% | 0% | 0% | 0% |
| RSAC092 Emmaton | 1% | 1% | -2% | 5% | 1% | -10% | -2% | 0% | 3% | -2% | 3% | 1% | -9% | -2% |
| RSAC101 Rio Vista | -1% | 0% | -1% | -1% | 0% | -1% | 0% | -1% | 1% | -1% | -1% | 1% | 0% | 0% |
| RSAC123 | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| RSAC155 Freeport | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| RSAN018 Jersey Pt | 9% | 0% | -1% | 12% | -1% | -3% | 0% | 10% | 1% | -1% | 11% | -1% | -3% | 0% |
| RSAN032 San Andreas | 6% | 1% | -3% | 8% | -2% | -6% | 0% | 8% | 1% | -4% | 10% | -2% | -6% | 0% |
| RSAN058 | 1% | 8% | -3% | 0% | 0% | 0% | 0% | 1% | 7% | -3% | 0% | 0% | -1% | 0% |
| S-49 Beldon's Landing | 1% | -1% | 1% | -6% | 0% | 1% | 0% | 1% | -1% | 1% | -7% | 0% | 1% | 0% |
| SWP | 4% | 0% | 0% | 6% | -1% | -3% | 0% | 7% | 0% | -1% | 9% | -2% | -4% | 0% |

Table 5-16 Average X2 values for July.

| Simulation | Average X2 July 2002 |
|-----------------------|---------------------------------|
| Base | 83.4 |
| ELT | 83.2 |
| LLT | 84.5 |
| ELT – Max Suisun | 84.2 |
| LLT – No South | 84.5 |
| LLT – Middle River | 84.4 |
| LLT – Suisun Scour | 85.2 |
| ELT – Prospect Breach | 83.2 |
| LLT – Little Egbert | 84.2 |
| LLT – Sherman Breach | 84.4 |

6 References

- DWR, 2007a. California Department of Water Resources, Delta-Suisun Marsh Office, 2007, LiDAR Survey of the Sacramento-San Joaquin Delta.
- DWR, 2007b. California Department of Water Resources, Technical memorandum: Hydrodynamic and Water Quality Modeling for Franks Tract Project Alternatives, October, 2007.
- DWR, 2004a. California Department of Water Resources, “Methodology for Flow and Salinity Estimates in the Sacramento-San Joaquin Delta and Suisun Marsh, Twenty-fifth Annual Progress Report to the State Water Resources Control Board”, October 2004.
- DWR, 2004b. Rmatools Version 2.3, developed by Brad Tom.
- DWR, 2002. California Department of Water Resources, “Methodology for Flow and Salinity Estimates in the Sacramento-San Joaquin Delta and Suisun Marsh, Twenty-third Annual Progress Report to the State Water Resources Control Board”, June 2002.
- DWR, Suisun Marsh Branch, 2004. Unpublished data in preparation.
- DWR, 1995. California Department of Water Resources, “Estimation of Delta Island Diversions and Return Flows”, February 1995.
- ESA/PWA, 2011 “Draft Memorandum to Pete Rawlings, SAIC: Suisun Marsh ROA Channel Scour and Tidal Range Assessment”, January 14, 2011.
- King, I. P., 1990 “RMA2 – A Two-Dimensional Finite Element Model for Flow in Estuaries and Streams, Version 4.3”, Resource Management Associates.
- King, I. P., 1998 “RMA-11 – A Three-Dimensional Finite Element Model for Water Quality in Estuaries and Streams, Version 2.6”, Resource Management Associates.
- RMA, 2010. “Numerical Modeling in Support of Bay Delta Conservation Plan, Technical Study #4 – Evaluation of Tidal Marsh Restoration Effects, Preliminary Results”, March 2010.
- RMA, 2008. “Numerical Modeling in Support of Suisun Marsh PEIR/EIS”, March 2008.
- RMA, 2005. “Flooded Islands Feasibility Study: RMA Delta Model Calibration Report”, June 2005.
- RMA, 2000a. “Water Quality Impacts of Central Contra Costa Sanitary District Discharge on San Francisco Bay”.
- RMA, 2000b. “Mathematical Modeling of Hydrodynamic and Water Quality Impacts of Suisun Marsh Levee Breaches”.

RMA, 1998. "Impacts of the BADA Discharges on Copper Levels in the San Francisco Bay".

RMA, 1998. "Dilution Analysis and Water Quality Impacts of the Palo Alto Regional Water Quality Control Plant on South San Francisco Bay".

RMA, 1997. "Dilution Analysis and Water Quality Impacts of the Novato Sanitary District to San Pablo Bay".

Williams et al., 2002. "Hydraulic Geometry: A Geomorphic Design Tool for Tidal marsh Channel Evolution in Wetland Restoration Projects".

7 Appendix

7.1 *Spatial Plots of EC Change from base*

7.1.1 ELT – Maximize Suisun ROA

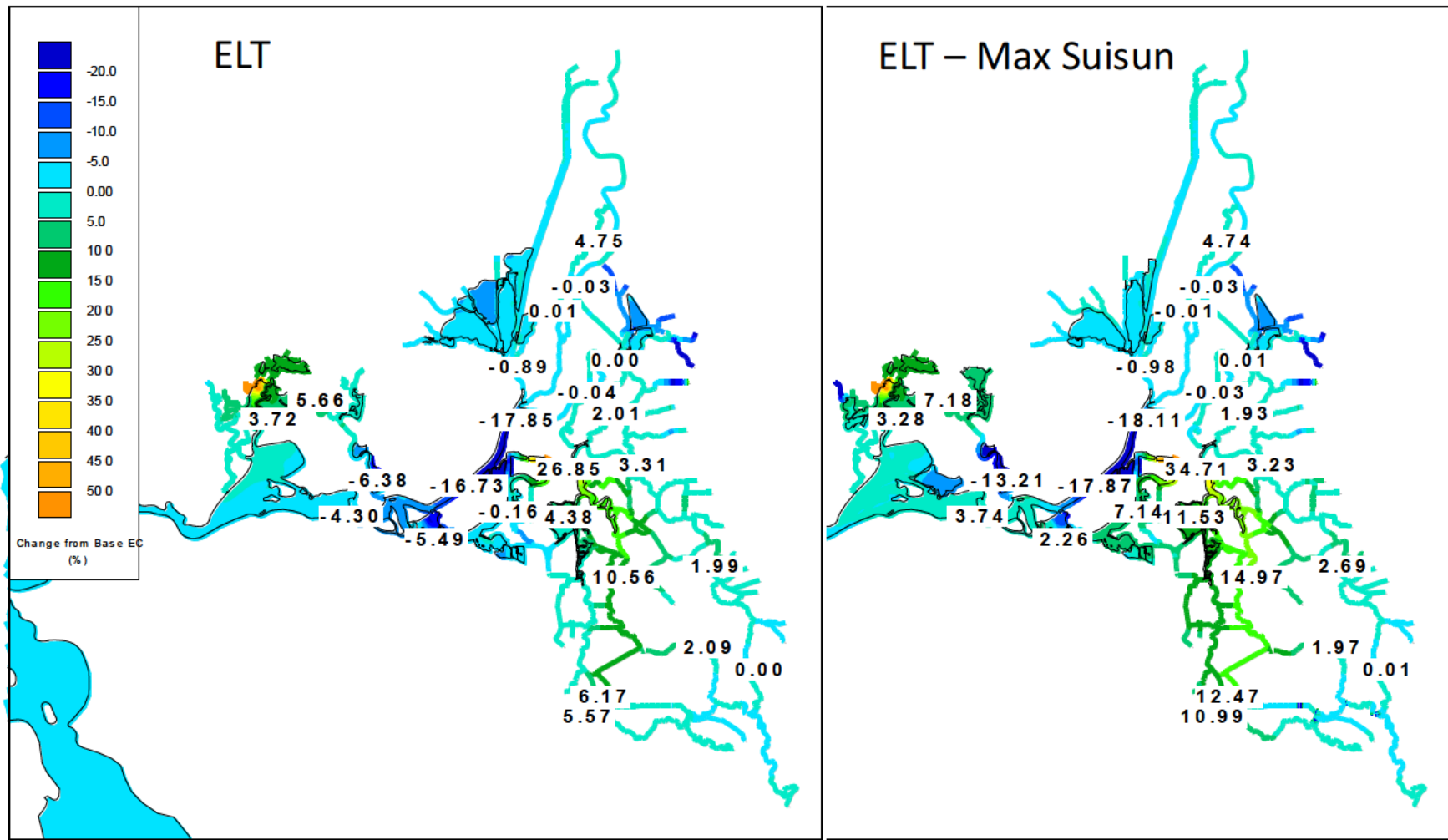


Figure 7-1 Contour plots of EC change from Base - No SMSG on September 24, 2002, for the ELT and ELT – Max Suisun simulations.

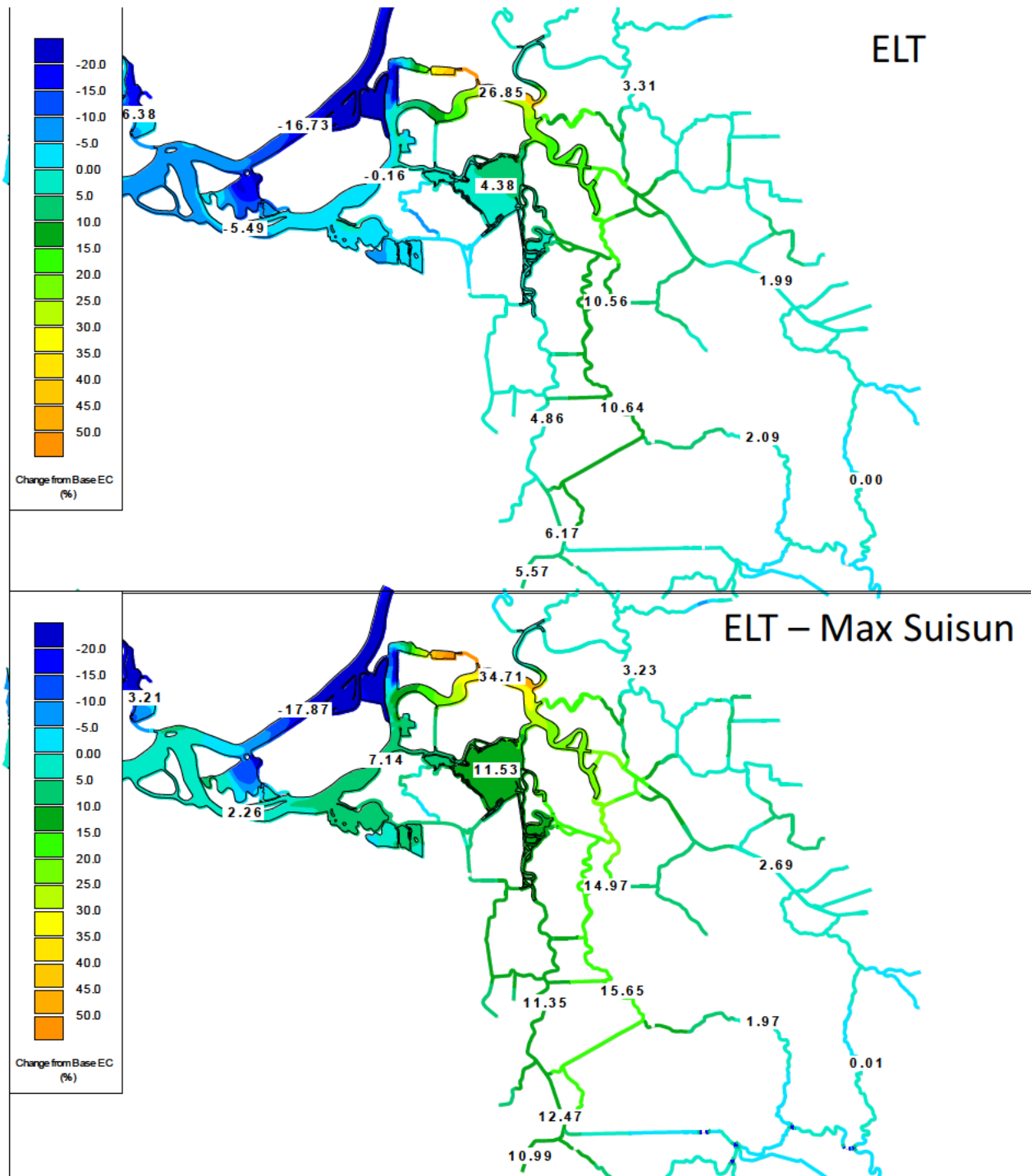


Figure 7-2 Contour plots of tidally averaged EC change from Base - No SMSCG in the south Delta on September 24, 2002, for the ELT and ELT – Max Suisun simulations.

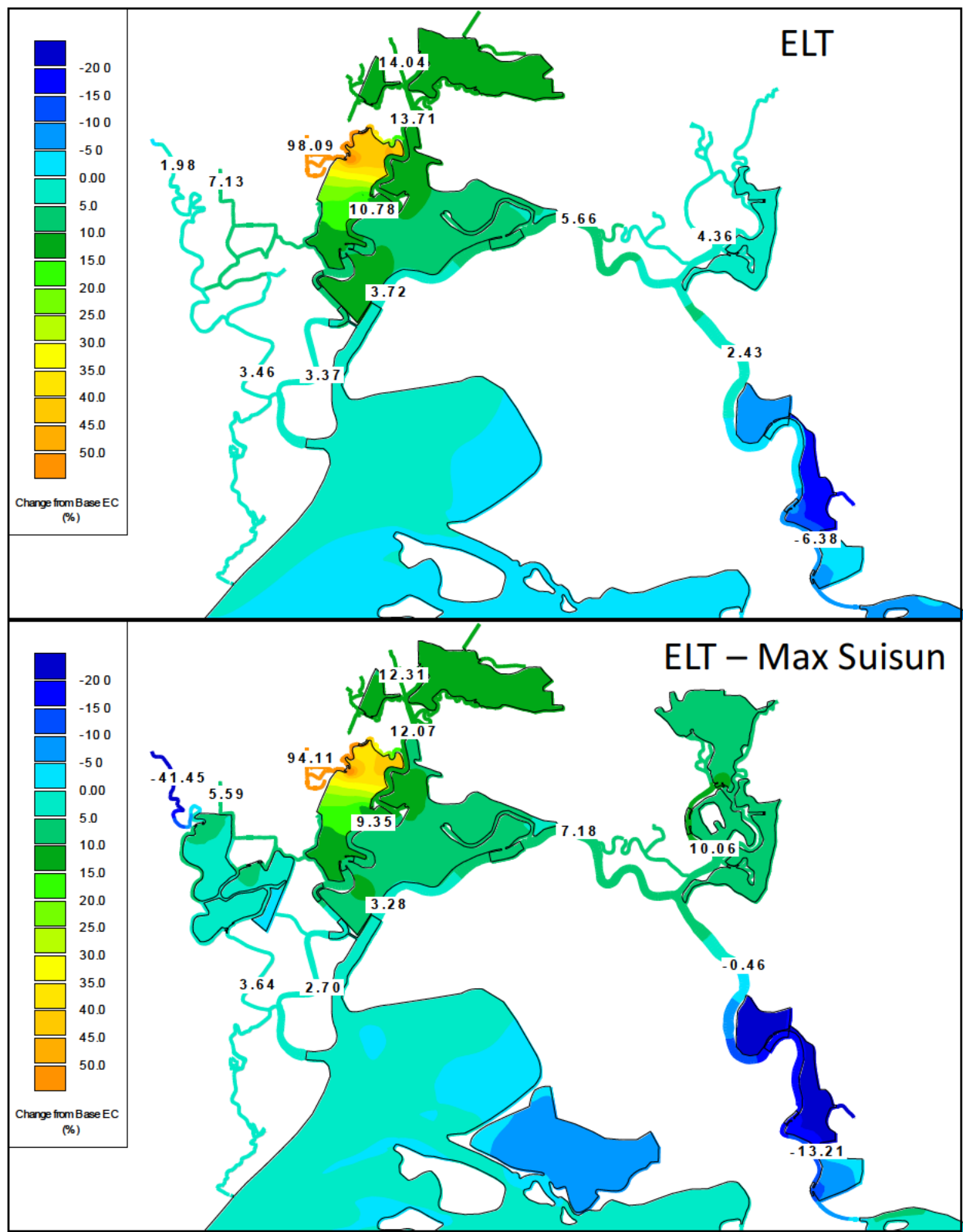


Figure 7-3 Contour plots of EC change from Base - No SMSCG in Suisun Marsh on September 24, 2002, for the ELT and ELT - Max Suisun simulations.

7.1.2 LLT – No South Delta ROA

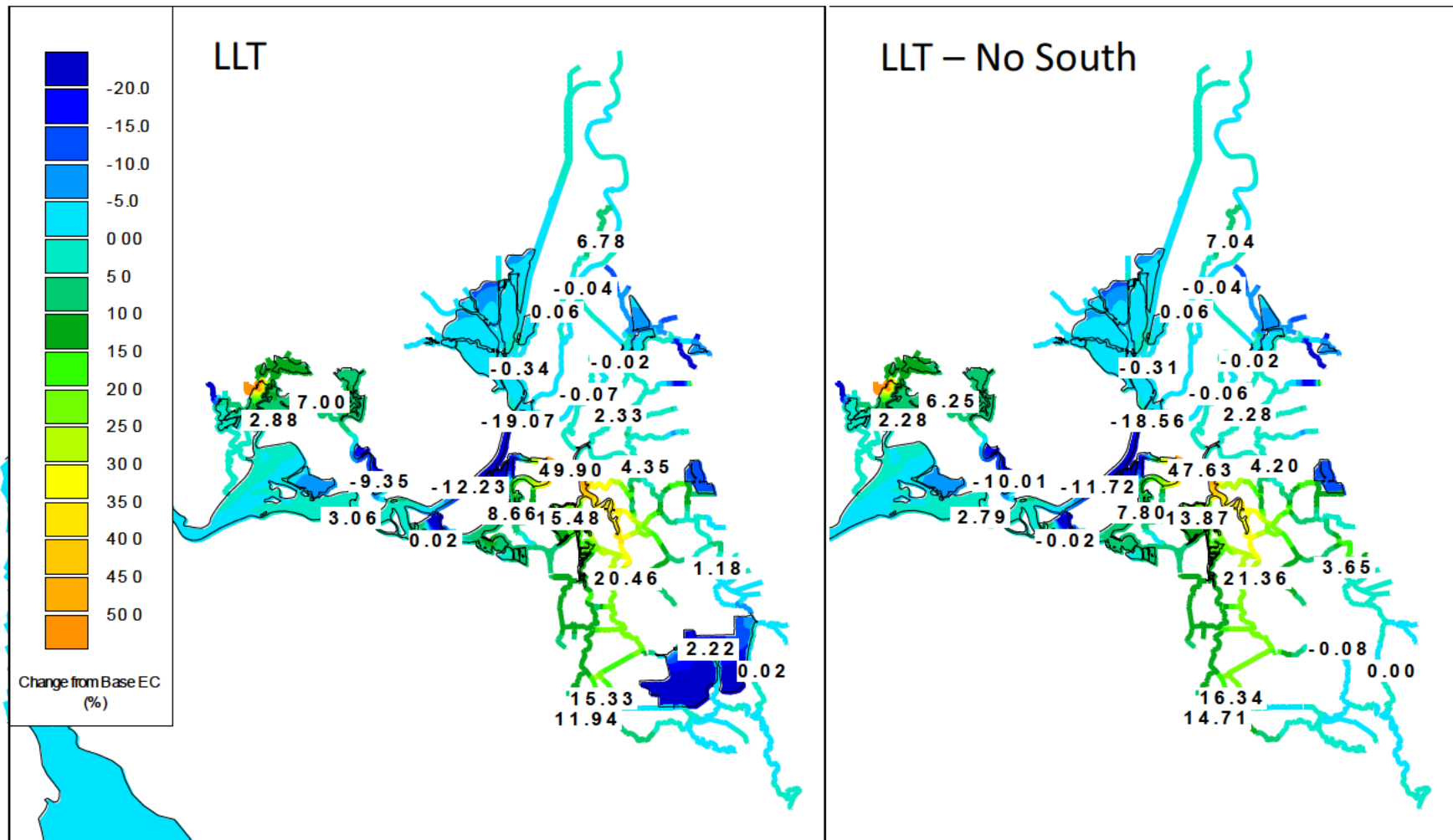


Figure 7-4 Contour plots of EC change from Base - No MRB on September 24, 2002, for the LLT and LLT - No South simulations.

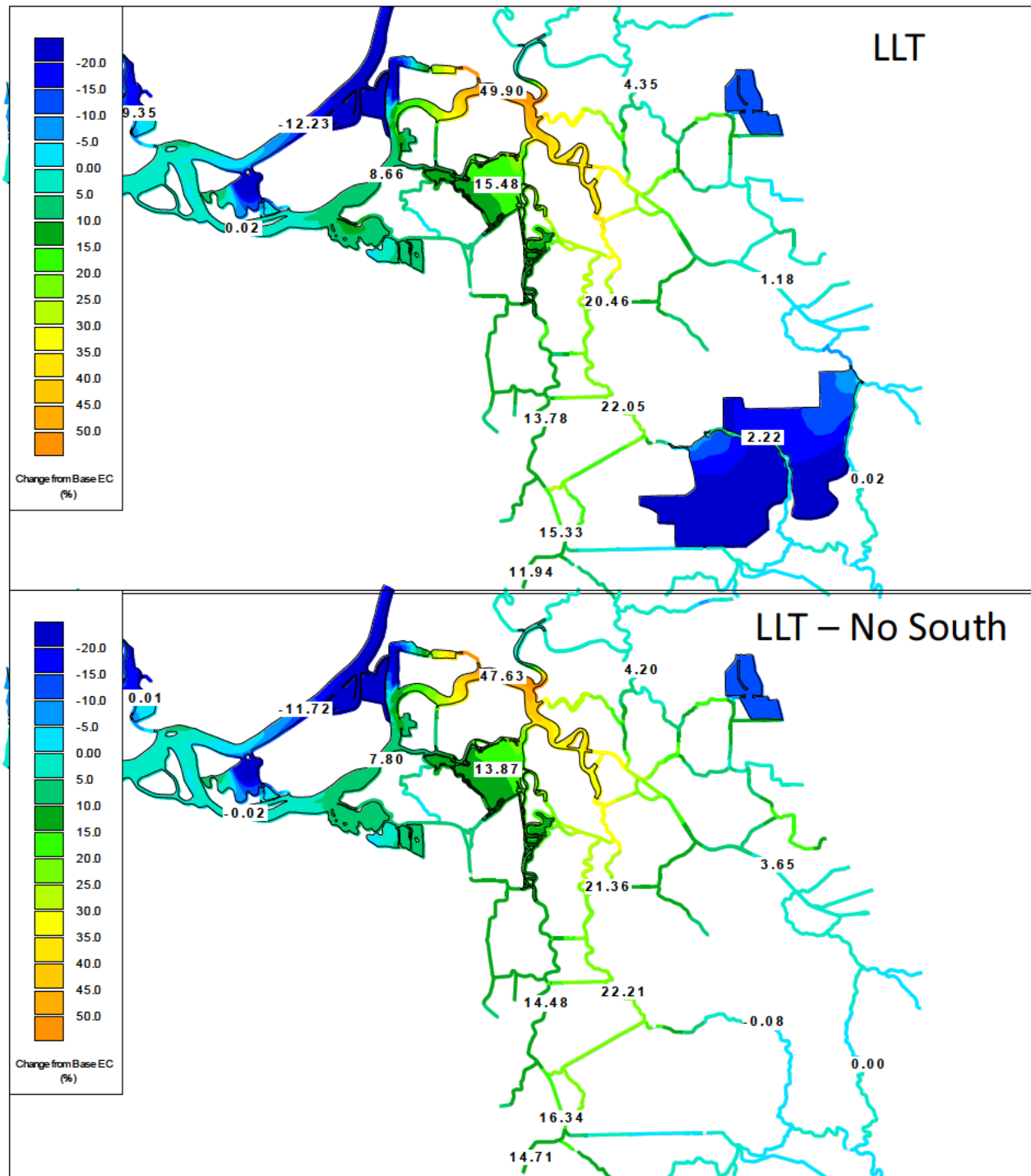


Figure 7-5 Contour plots of EC change from Base - No MRB in the south Delta on September 24, 2002, for the LLT and LLT - No South simulations.

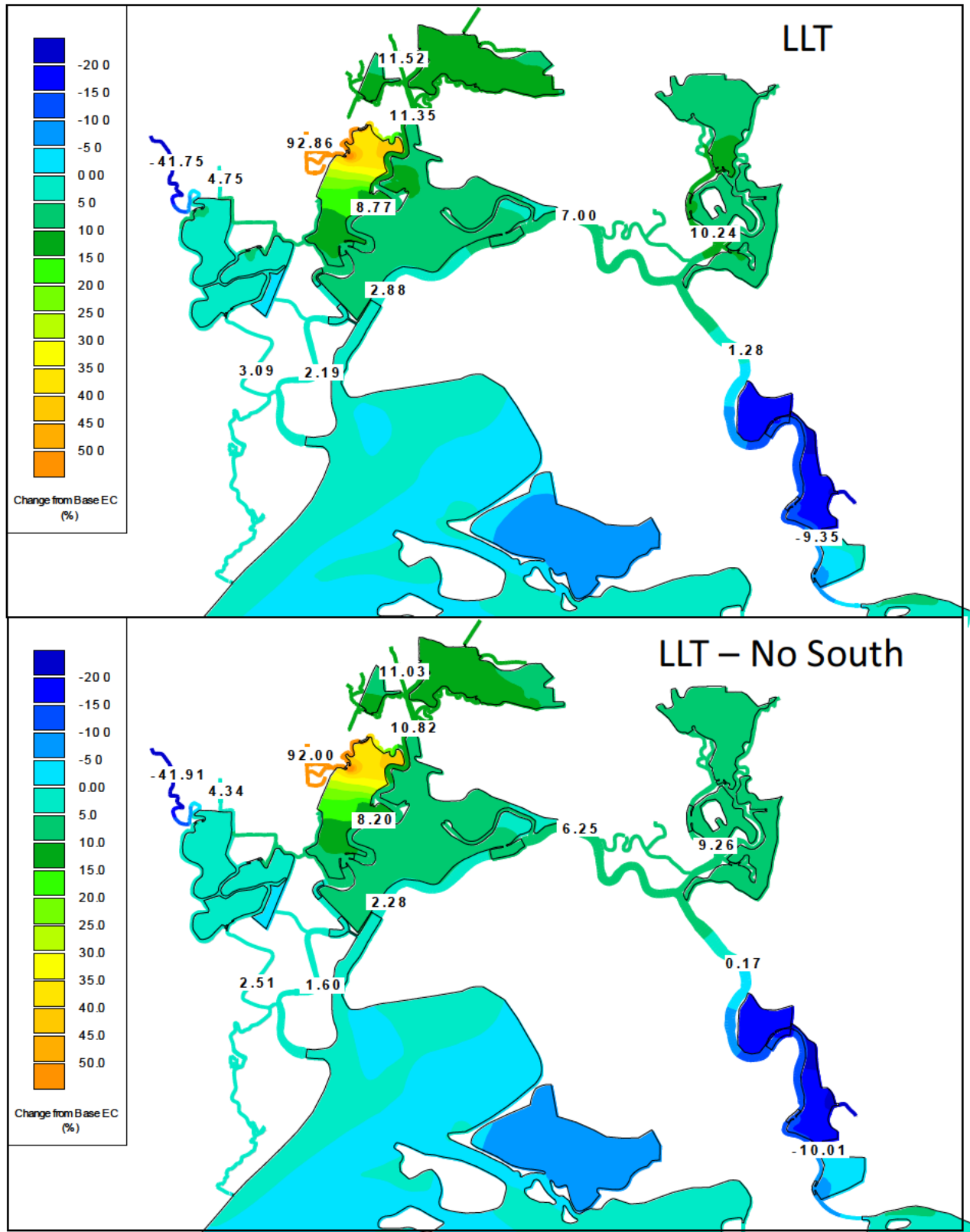


Figure 7-6 Contour plots of EC change from Base - No MRB in Suisun Marsh on September 24, 2002, for the LLT and LLT - No South simulations.

7.1.3 LLT – Middle River Conveyance

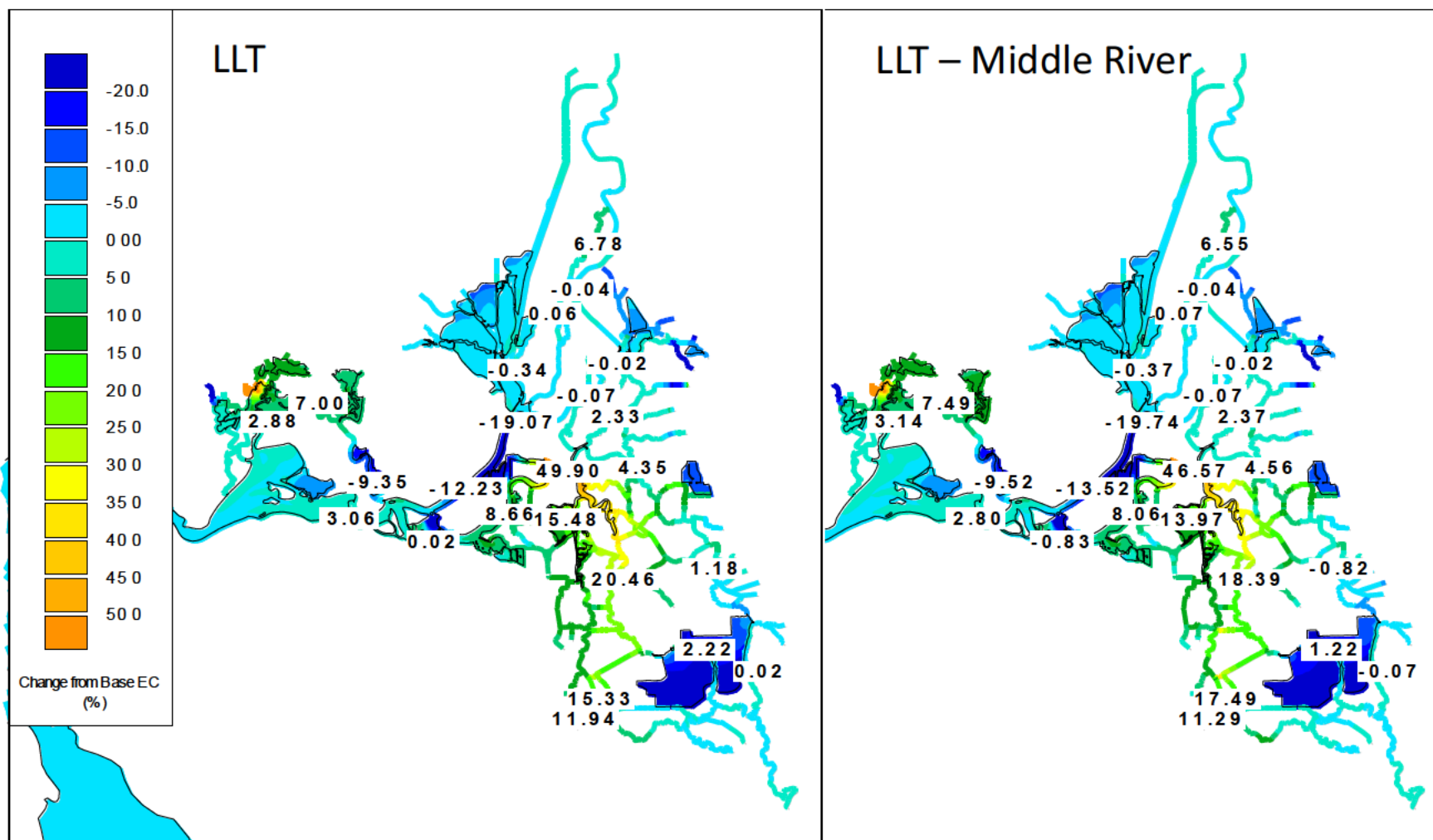


Figure 7-7 Contour plots of EC change from Base - No MRB on September 24, 2002, for the LLT and LLT - Middle River simulations.

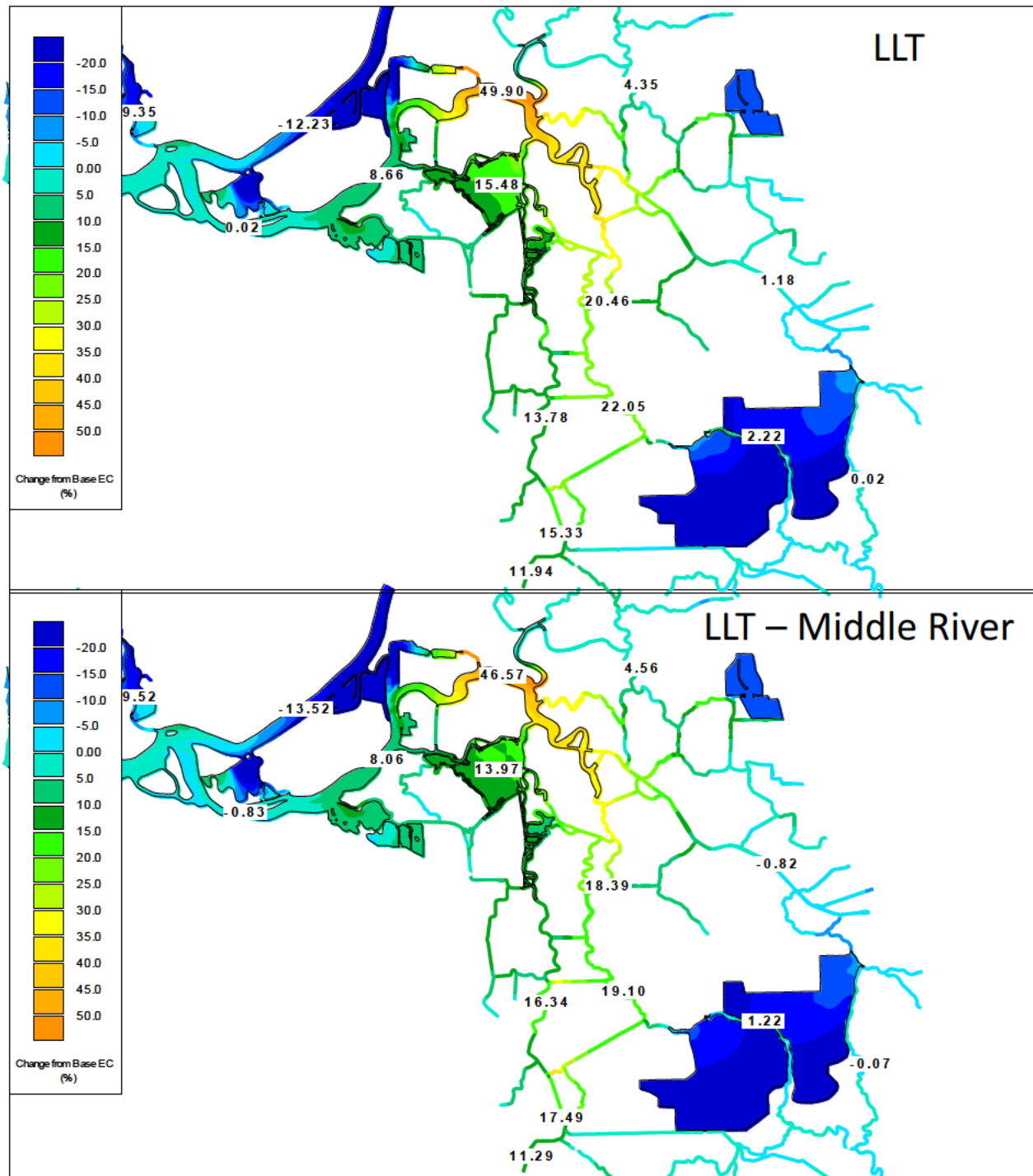


Figure 7-8 Contour plots of EC change from Base - No MRB in south Delta on September 24, 2002, for the LLT and LLT - Middle River simulations.

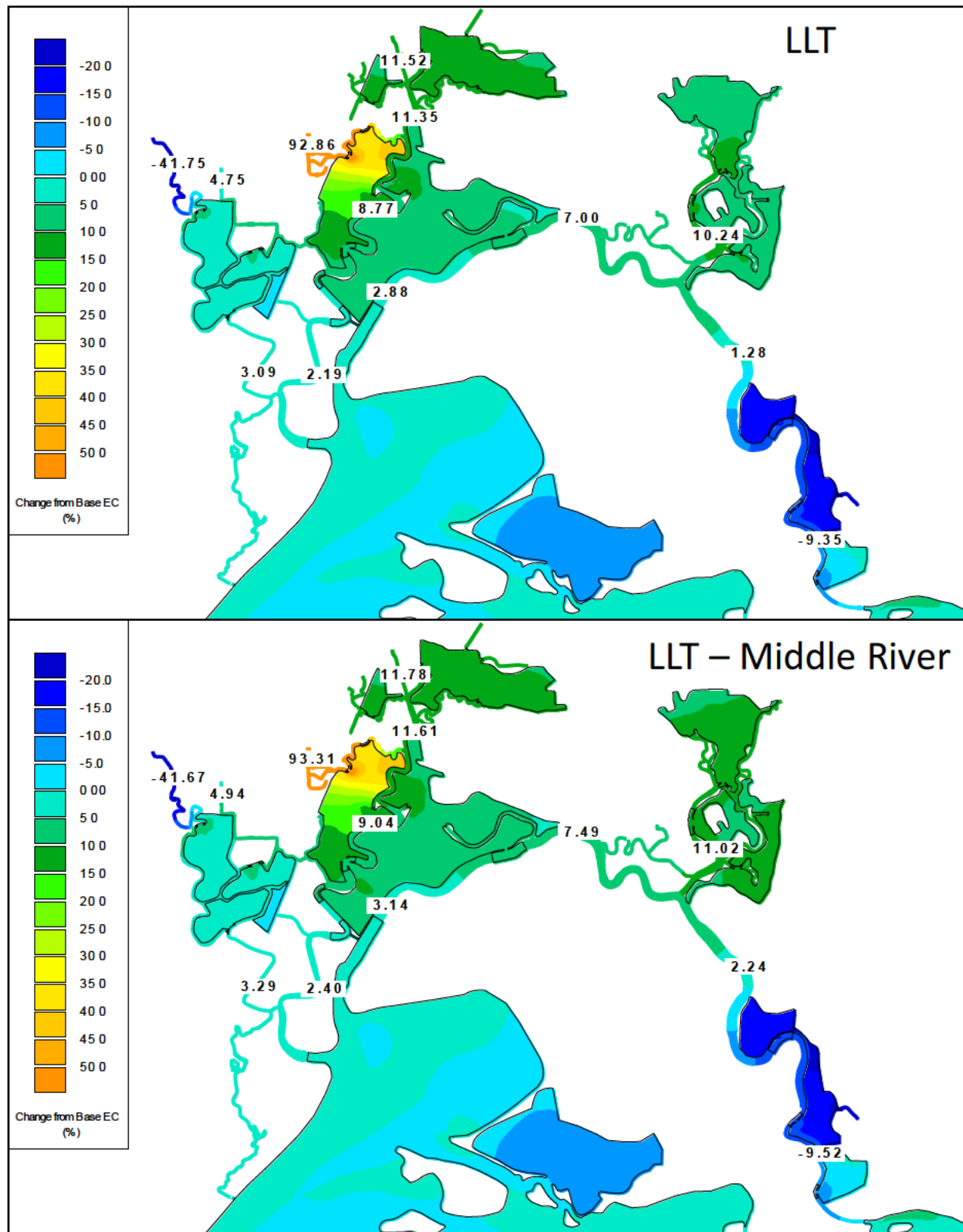


Figure 7-9 Contour plots of EC change from Base - No MRB in Suisun Marsh on September 24, 2002, for the LLT and LLT - Middle River simulations.

7.1.4 LLT – Suisun Scour

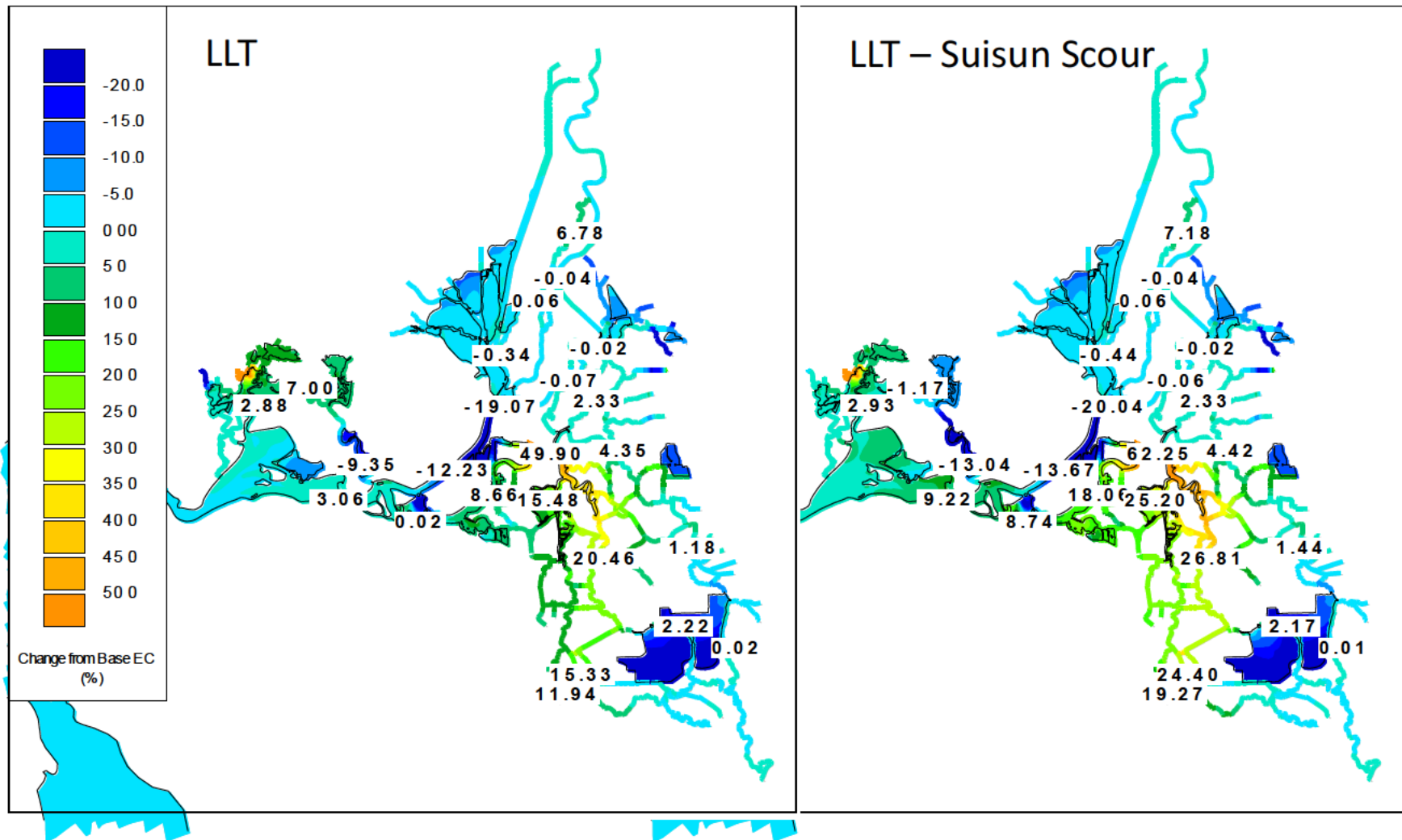


Figure 7-10 Contour plots of tidally averaged EC change from Base - No MRB on September 24, 2002, for the LLT and LLT - Suisun Scour simulations.

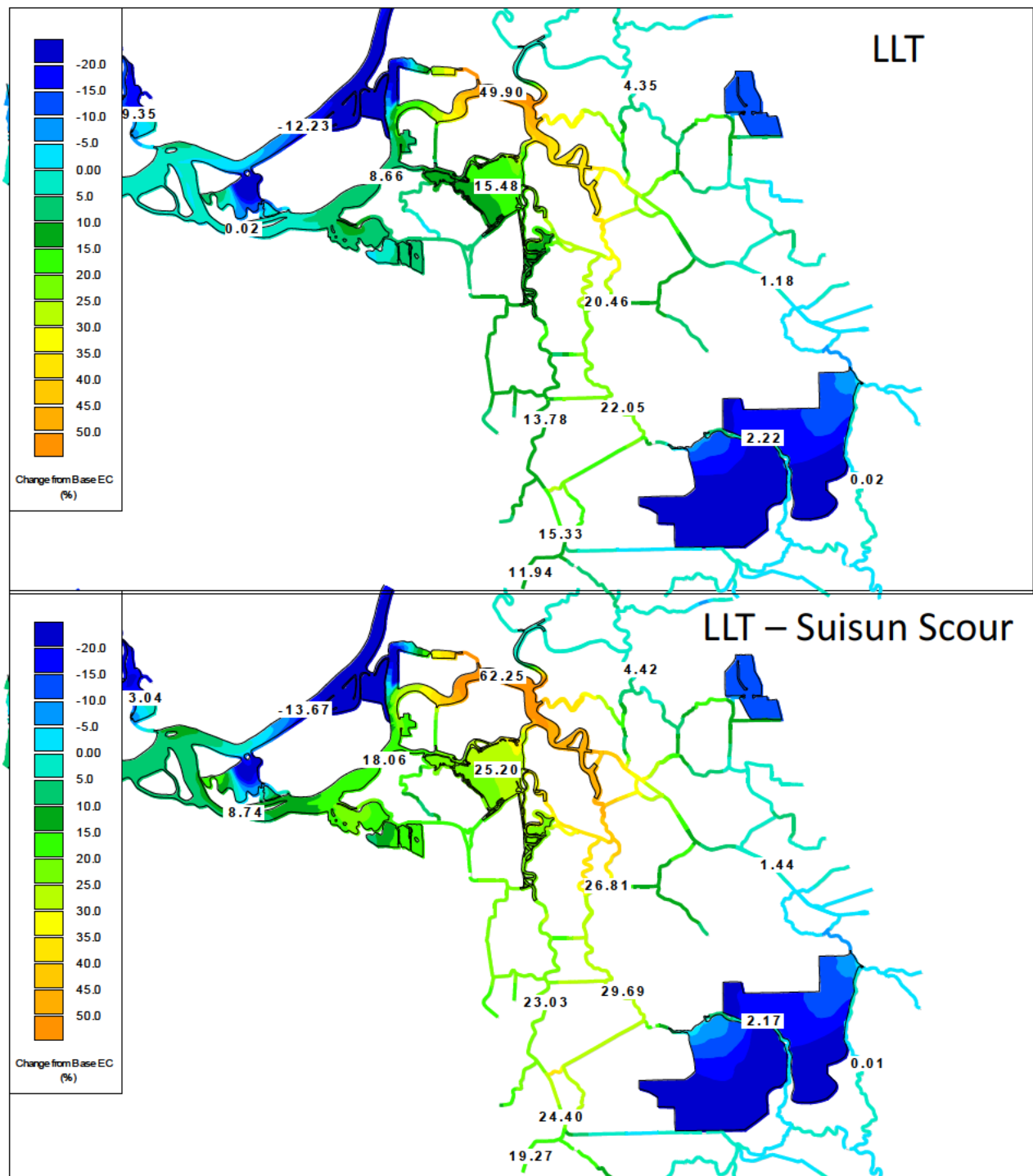


Figure 7-11 Contour plots of tidally averaged EC change from Base - No MRB in south Delta on September 24, 2002, for the LLT and LLT - Suisun Scour simulations.

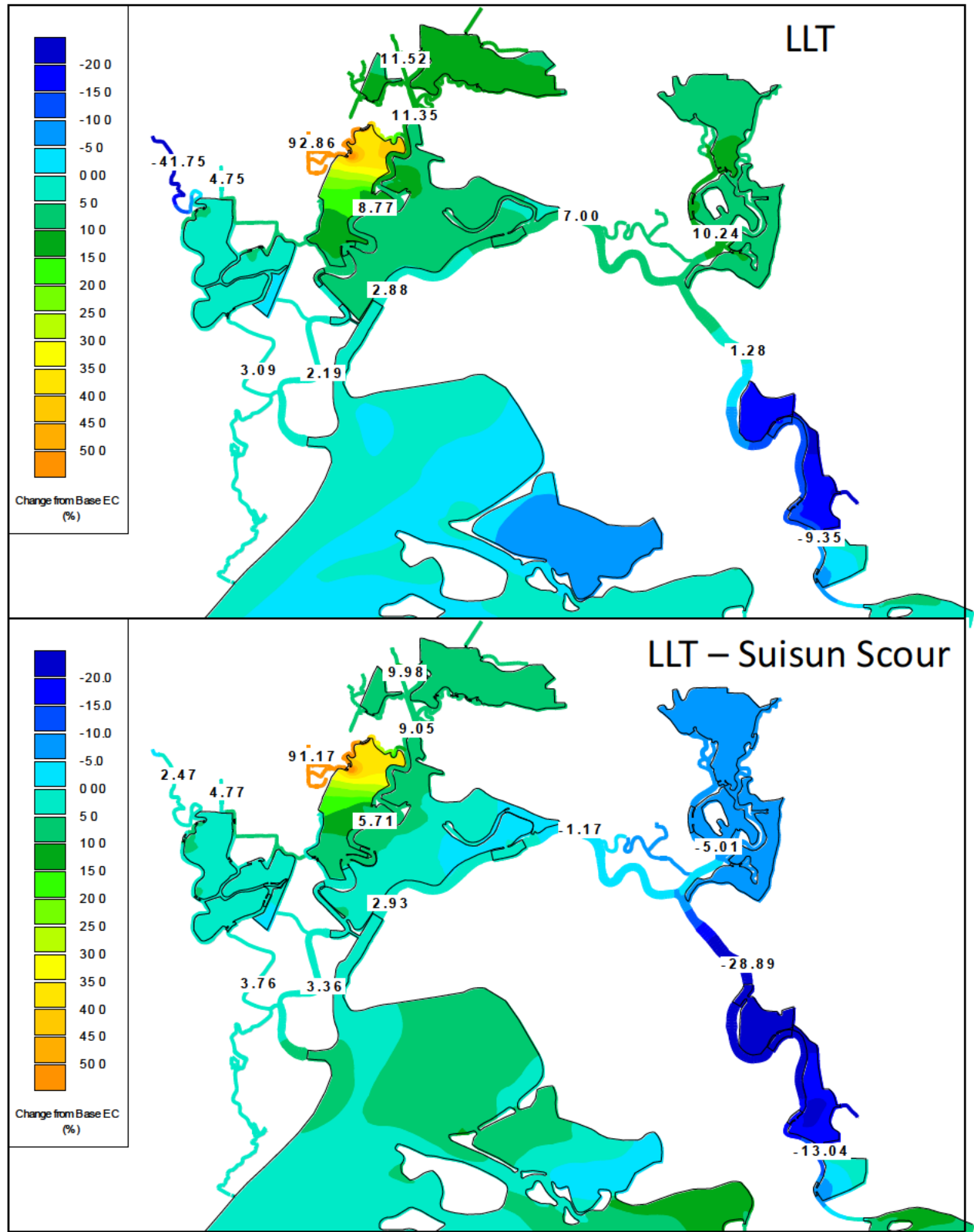


Figure 7-12 Contour plots of tidally averaged EC change from Base - No MRB in Suisun Marsh on September 24, 2002, for the LLT and LLT - Suisun Scour simulations.

7.1.5 ELT – Prospect Breach

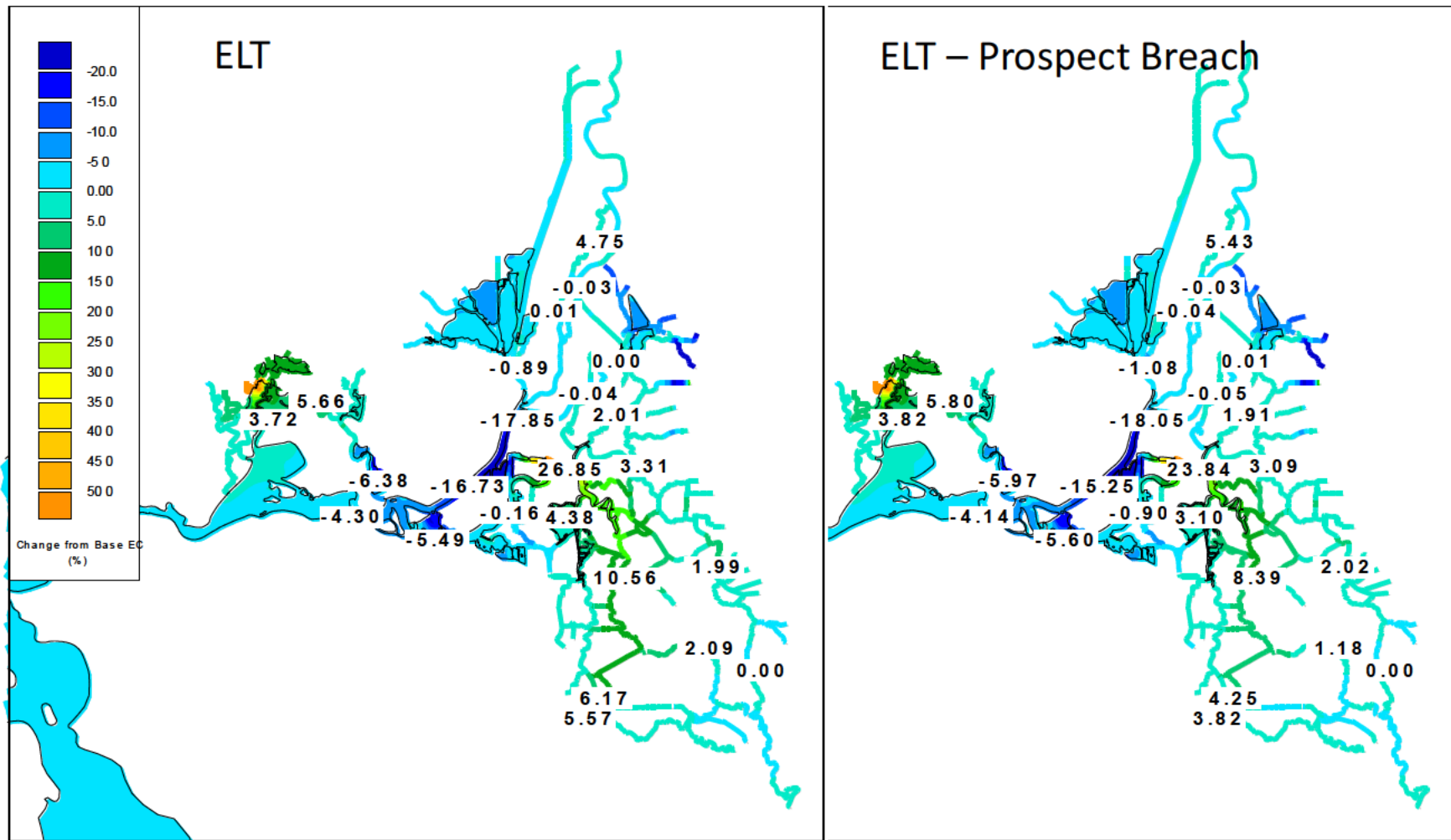


Figure 7-13 Contour plots of EC change from Base – No SMSCG on September 24, 2002, for the ELT and ELT – Prospect Breach simulations.

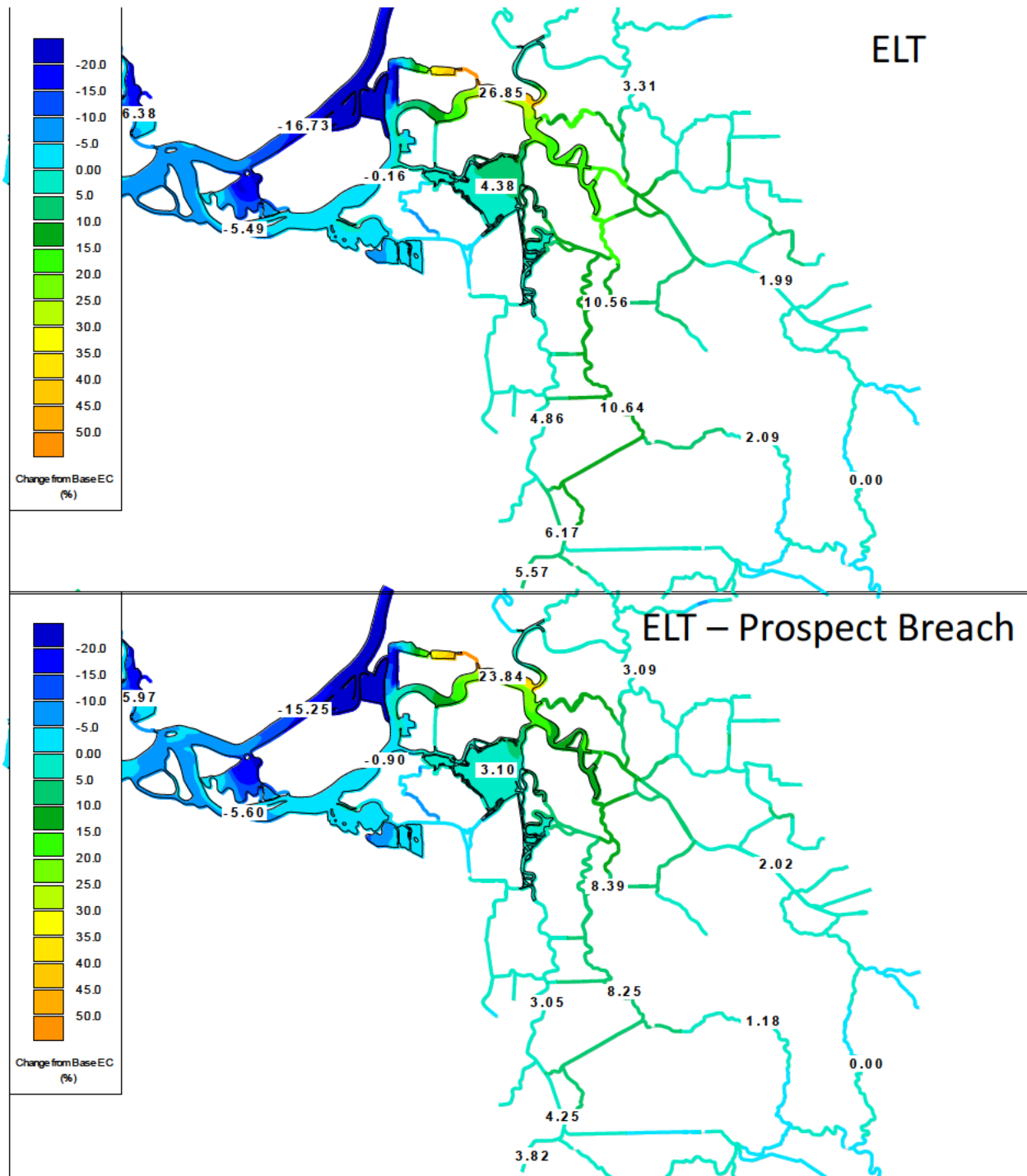


Figure 7-14 Contour plots of EC change from Base - No SMSCG in central and south Delta on September 24, 2002, for the ELT and ELT – Prospect Breach simulations.

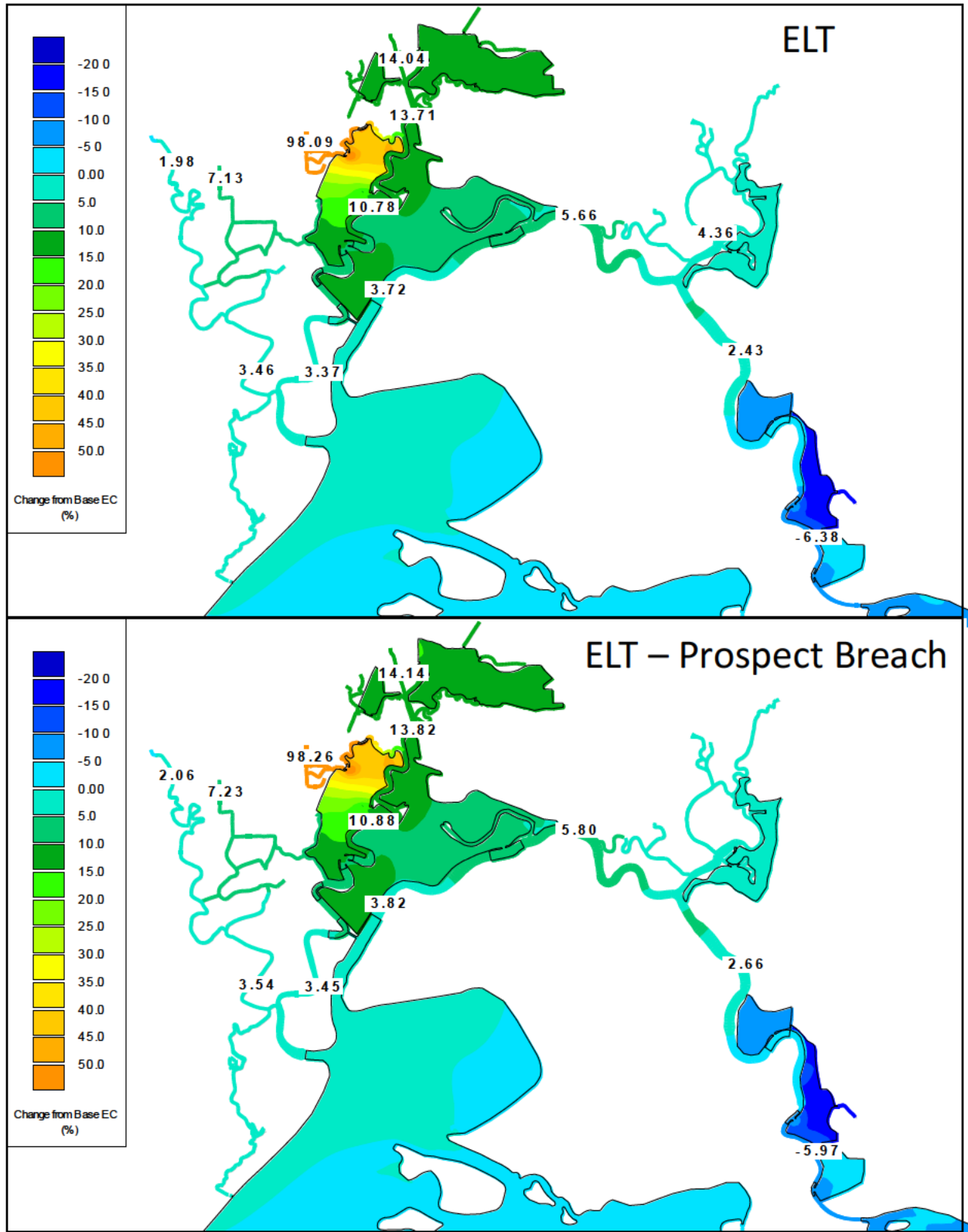


Figure 7-15 Contour plots of EC change from Base - No SMSCG in Suisun Marsh on September 24, 2002, for the ELT and ELT - Prospect Breach simulations.

7.1.6 LLT – Little Egbert Breach

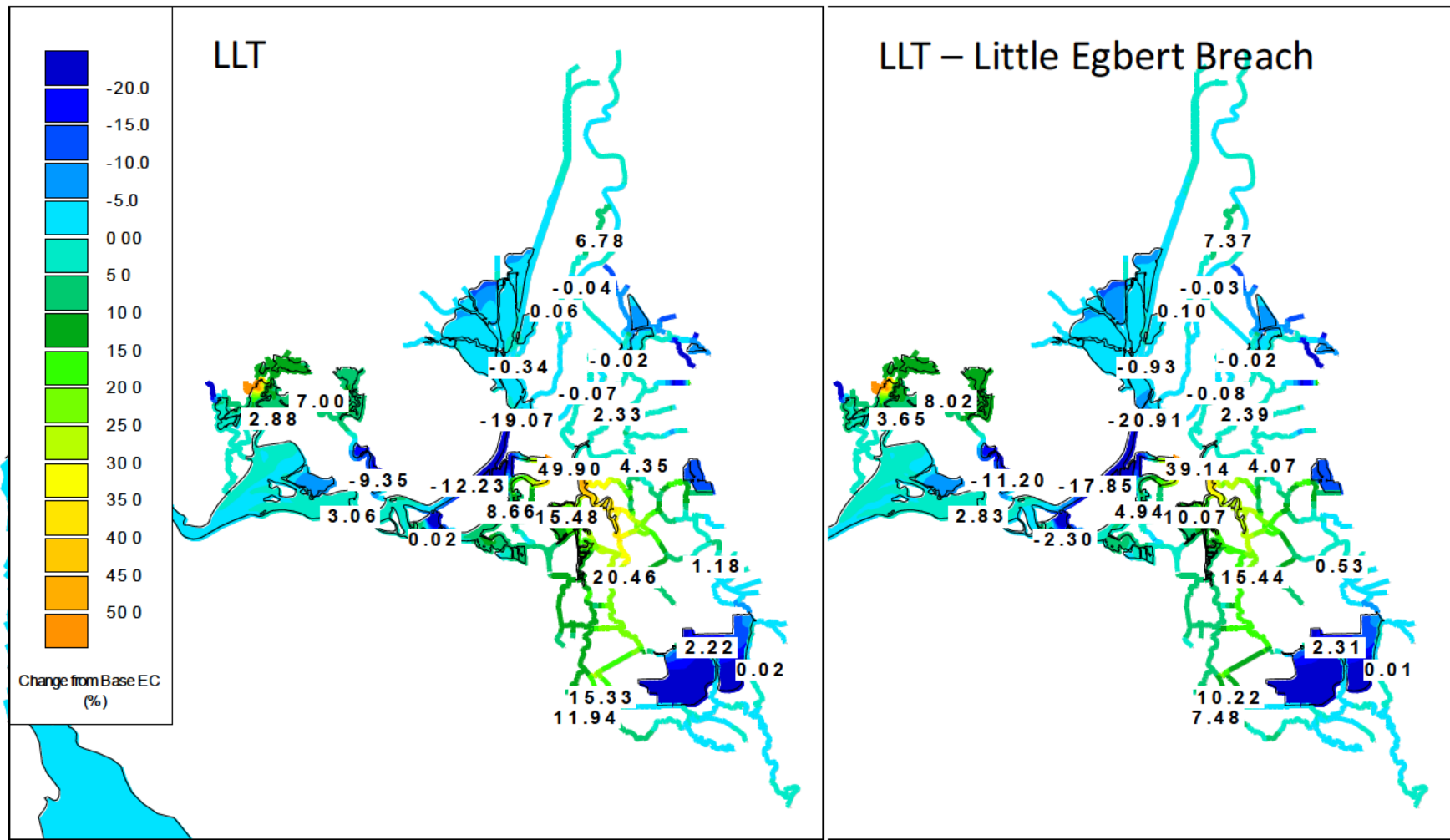


Figure 7-16 Contour plots of EC change from Base - No MRB on September 24, 2002, for the LLT and LLT - Little Egbert Breach simulations.

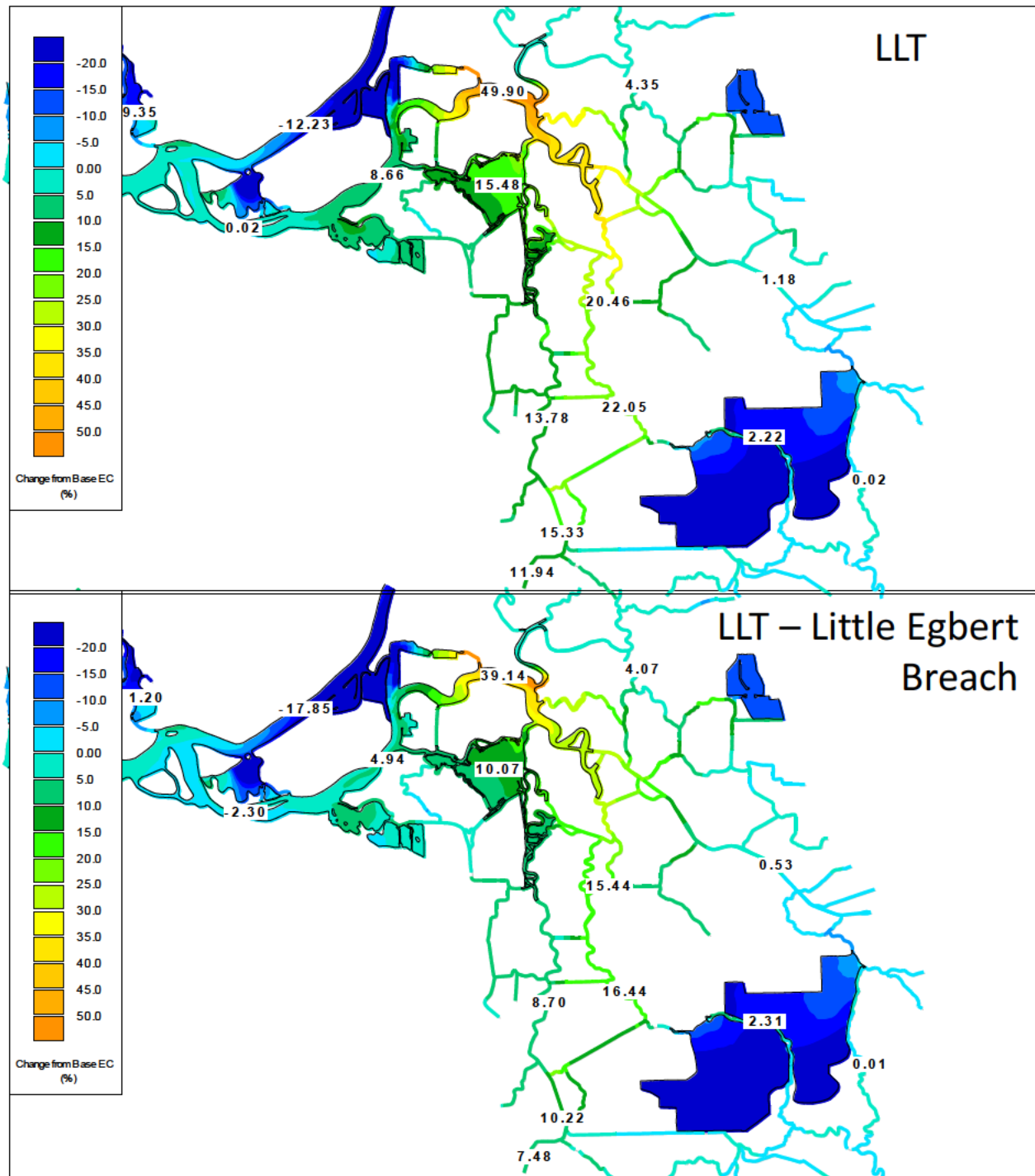


Figure 7-17 Contour plots of EC change from Base - No MRB in south Delta on September 24, 2002, for the LLT and LLT - Little Egbert Breach simulations.

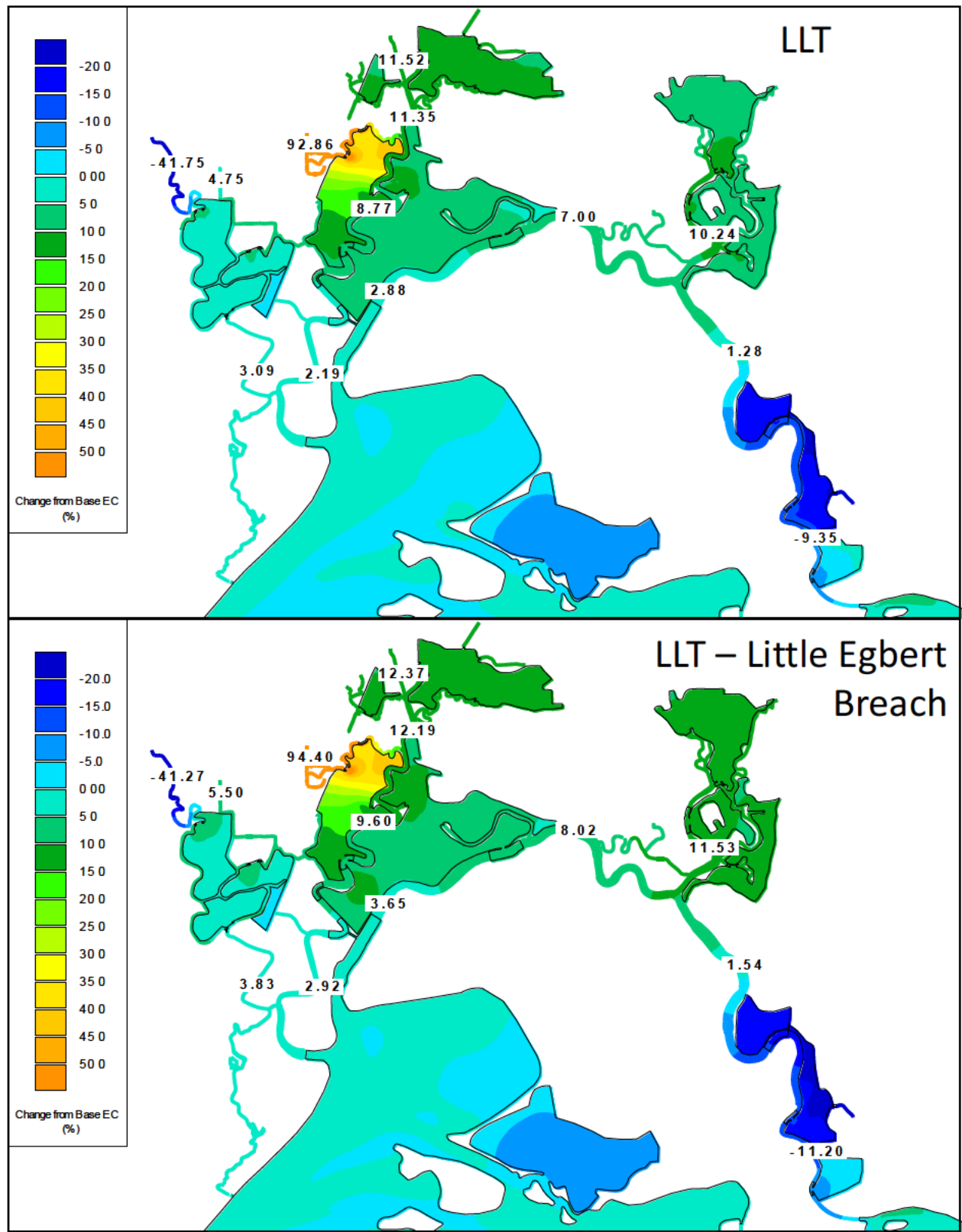


Figure 7-18 Contour plots of EC change from Base - No MRB in Suisun Marsh on September 24, 2002, for the LLT and LLT - Little Egbert Breach simulations.

7.1.7 LLT – Sherman Breach

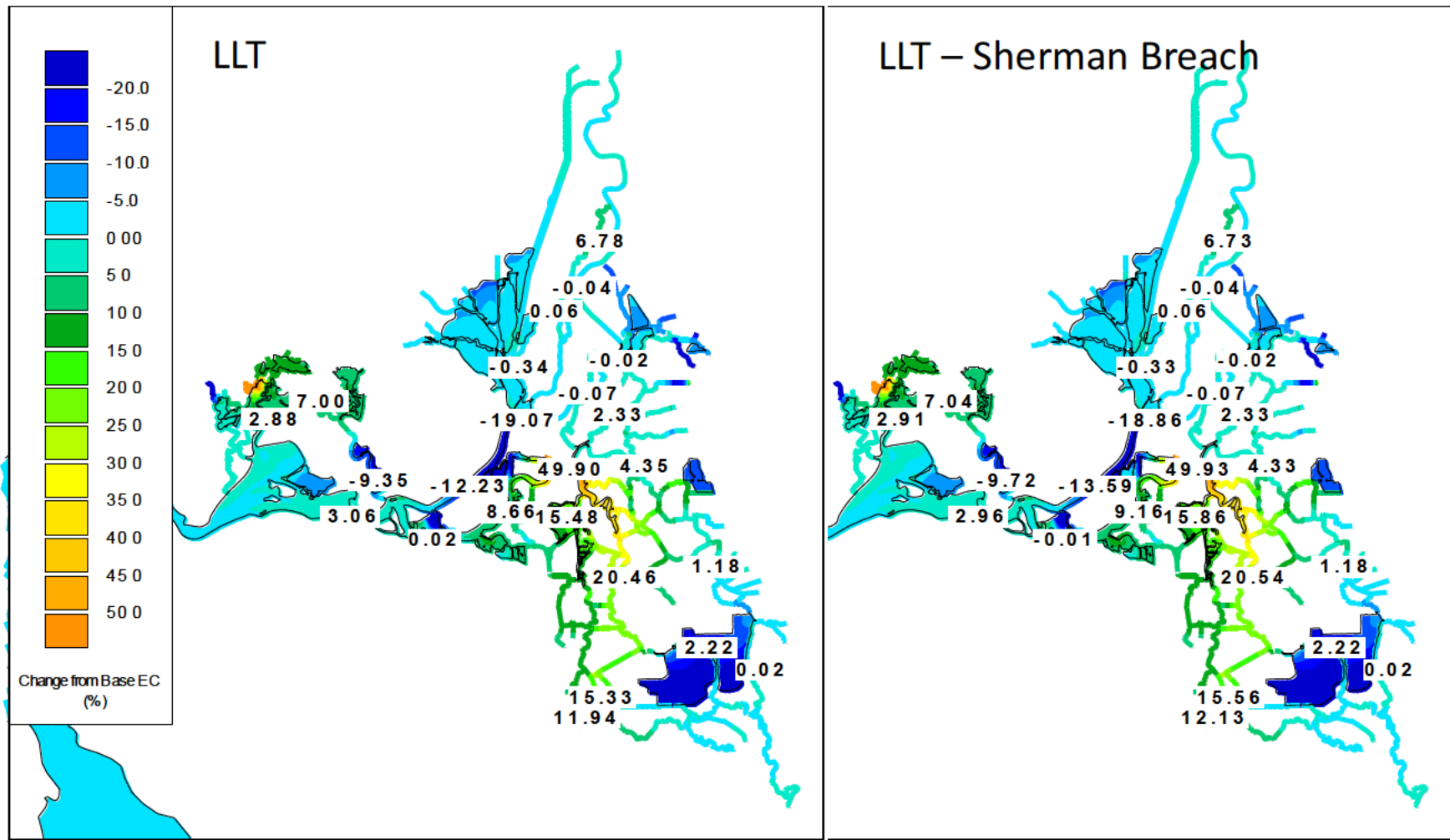


Figure 7-19 Contour plots of EC change from Base - No MRB on September 24, 2002, for the LLT and LLT - Sherman Breach simulations.

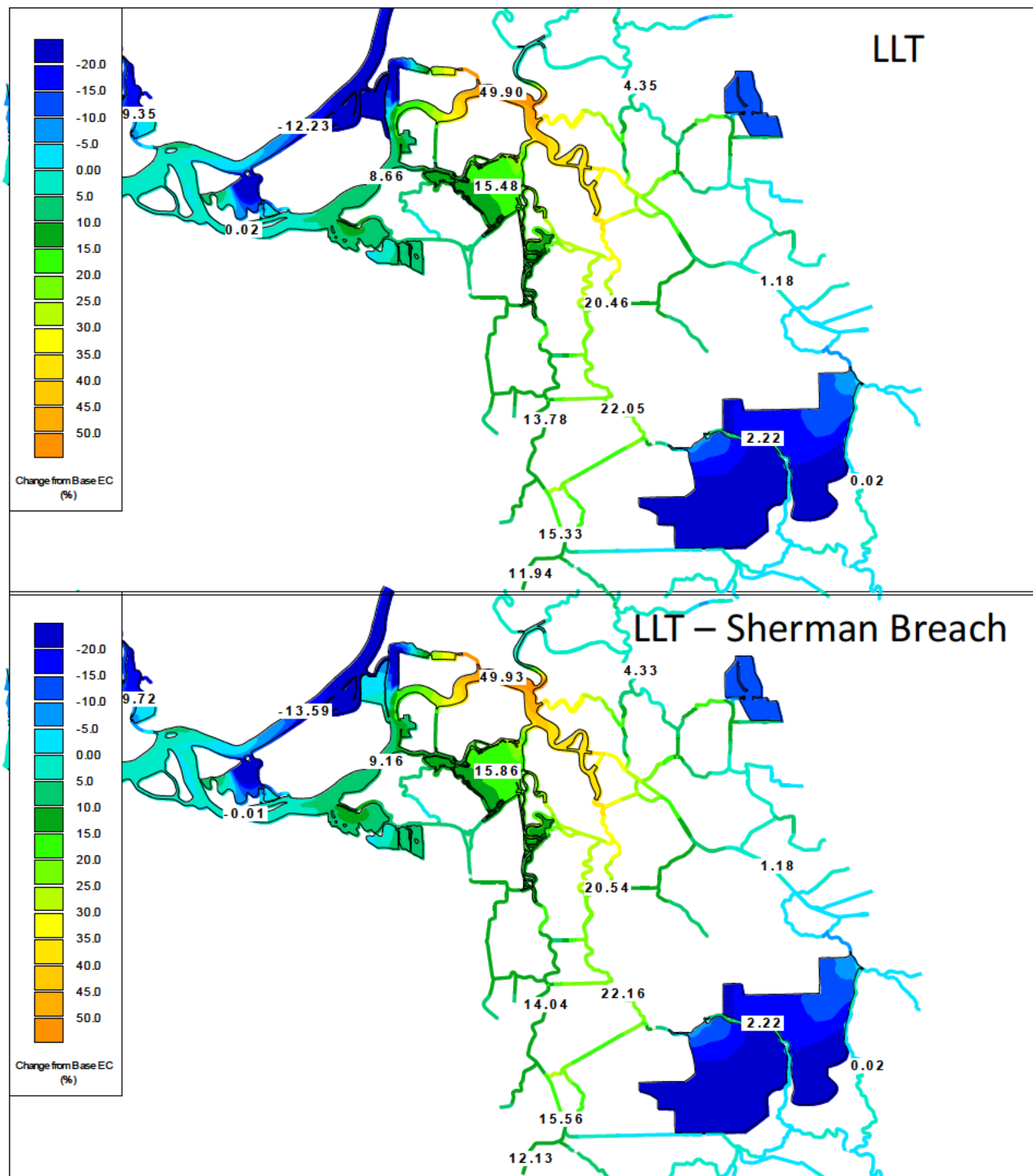


Figure 7-20 Contour plots of EC change from Base - No MRB in south Delta on September 24, 2002, for the LLT and LLT - Sherman Breach simulations.

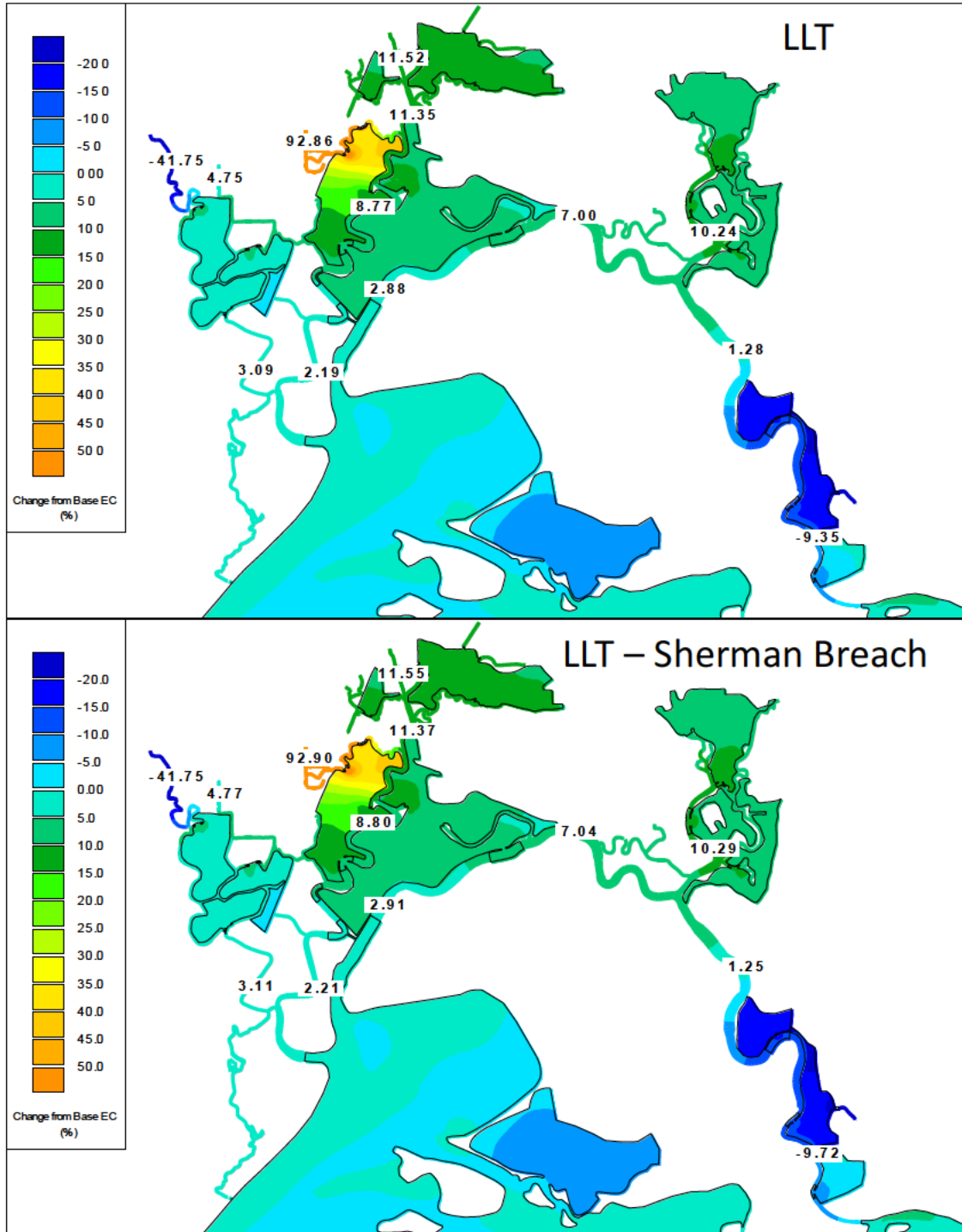


Figure 7-21 Contour plots of EC change from Base - No MRB in Suisun Marsh on September 24, 2002, for the LLT and LLT - Sherman Breach simulations.

7.2 Summary tables of change in monthly average EC

Table 7-1 Summary of September and October 2002 change in monthly average EC relative to base restoration case for ELT - Max Suisun, ELT - Prospect Breach and LLT - Middle River. Darker red indicates largest increases and darkest blue indicates largest decreases.

| Location | Percent Change in Monthly Average EC (umhos/cm) Relative to Base Restoration Case (ELT or LLT) | | | | | | | | | | | | | |
|-----------------------|--|----------------|--------------------|--------------------|-----------------------|----------------------------|----------------------|------------------|----------------|--------------------|--------------------|-----------------------|----------------------------|----------------------|
| | September 2002 | | | | | | | October 2002 | | | | | | |
| | ELT - Max Suisun | LLT - No South | LLT - Middle River | LLT - Suisun Scour | ELT - Prospect Breach | LLT - Little Egbert Breach | LLT - Sherman Breach | ELT - Max Suisun | LLT - No South | LLT - Middle River | LLT - Suisun Scour | ELT - Prospect Breach | LLT - Little Egbert Breach | LLT - Sherman Breach |
| Cache SI at Ryer | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | -1% | 1% | -1% | 0% |
| CCWD Victoria Canal | 5% | 2% | 1% | 6% | -2% | -4% | 0% | 3% | 0% | 4% | 4% | -2% | -4% | 0% |
| CVP | 6% | 2% | -1% | 7% | -2% | -4% | 0% | 4% | 0% | 0% | 6% | -2% | -5% | 0% |
| Montezuma SI at Head | 3% | 0% | 0% | 6% | 0% | -1% | 0% | 5% | 0% | -1% | 6% | 0% | -1% | 0% |
| Montezuma SI at Mouth | 0% | 0% | 0% | 2% | 0% | 1% | 0% | 0% | 0% | 0% | 3% | 0% | 1% | 0% |
| RMID015 | 5% | 0% | -2% | 7% | -2% | -4% | 0% | 3% | -1% | 0% | 4% | -2% | -4% | 0% |
| RMID023 | 5% | 1% | -3% | 7% | -2% | -4% | 0% | 3% | 0% | -1% | 4% | -2% | -4% | 0% |
| ROLD024 | 7% | 0% | -2% | 9% | -2% | -4% | 0% | 5% | -1% | -3% | 7% | -2% | -6% | 0% |
| ROLD034 | 7% | 0% | 2% | 9% | -2% | -4% | 0% | 5% | 0% | 2% | 7% | -2% | -5% | 0% |
| RSAC075 Chipps Island | 8% | 0% | 0% | 6% | 0% | 0% | 0% | 9% | 0% | 0% | 6% | 0% | 0% | 0% |
| RSAC092 Emmaton | 0% | 1% | -2% | 2% | 2% | -8% | -2% | 2% | 1% | -3% | 3% | 1% | -7% | -1% |
| RSAC101 Rio Vista | -2% | 1% | -1% | -2% | 0% | -2% | 0% | -3% | 2% | -3% | -2% | 1% | -4% | -1% |
| RSAC123 | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| RSAC155 Freeport | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| RSAN018 Jersey Pt | 8% | -1% | -1% | 9% | -1% | -3% | 0% | 7% | -1% | -1% | 8% | -1% | -5% | 0% |
| RSAN032 San Andreas | 6% | 0% | -4% | 8% | -2% | -7% | 0% | 4% | -1% | -4% | 7% | -3% | -8% | 0% |
| RSAN058 | 0% | 4% | -2% | 0% | 0% | 0% | 0% | 0% | -1% | 0% | 0% | 0% | 0% | 0% |
| S-49 Beldon's Landing | 1% | -1% | 0% | -7% | 0% | 1% | 0% | 1% | -1% | 0% | -5% | 0% | 1% | 0% |
| SWP | 7% | 0% | 0% | 8% | -2% | -4% | 0% | 4% | -1% | 1% | 6% | -2% | -5% | 0% |

Table 7-2 Summary of November and December 2002 change in monthly average EC relative to base restoration case for ELT - Max Suisun, ELT - Prospect Breach and LLT - Middle River. Darker red indicates largest increases and darkest blue indicates largest decrease

| Location | Percent Change in Monthly Average EC (umhos/cm) Relative to Base Restoration Case (ELT or LLT) | | | | | | | | | | | | | |
|-----------------------|--|----------------|--------------------|--------------------|-----------------------|----------------------------|----------------------|------------------|----------------|--------------------|--------------------|-----------------------|----------------------------|----------------------|
| | November 2002 | | | | | | | December 2002 | | | | | | |
| | ELT - Max Suisun | LLT - No South | LLT - Middle River | LLT - Suisun Scour | ELT - Prospect Breach | LLT - Little Egbert Breach | LLT - Sherman Breach | ELT - Max Suisun | LLT - No South | LLT - Middle River | LLT - Suisun Scour | ELT - Prospect Breach | LLT - Little Egbert Breach | LLT - Sherman Breach |
| Cache SI at Ryer | -1% | 0% | 0% | -1% | 1% | -1% | 0% | 0% | 0% | 0% | 0% | 0% | -1% | 0% |
| CCWD Victoria Canal | 1% | -4% | 6% | 3% | -2% | -4% | 0% | 1% | -1% | 3% | 3% | -1% | -4% | 0% |
| CVP | 2% | -1% | 2% | 4% | -2% | -5% | 0% | 1% | -1% | 2% | 2% | -1% | -3% | 0% |
| Montezuma SI at Head | 4% | 0% | -1% | 4% | 0% | -1% | 0% | 4% | -1% | 0% | 3% | 0% | -1% | 0% |
| Montezuma SI at Mouth | 1% | 0% | 0% | 3% | 0% | 0% | 0% | 4% | -1% | 0% | 2% | 0% | 0% | 0% |
| RMID015 | 1% | -2% | 1% | 3% | -2% | -4% | 0% | 1% | -1% | 1% | 3% | -1% | -4% | 0% |
| RMID023 | 1% | -2% | 2% | 3% | -2% | -4% | 0% | 1% | -1% | 1% | 3% | -1% | -4% | 0% |
| ROLD024 | 3% | -2% | -2% | 6% | -2% | -7% | 0% | 3% | -3% | -2% | 5% | -2% | -7% | 0% |
| ROLD034 | 3% | -2% | 3% | 5% | -2% | -6% | 0% | 3% | -3% | 1% | 5% | -2% | -6% | 0% |
| RSAC075 Chipps Island | 9% | 0% | 0% | 7% | 0% | 0% | 0% | 10% | -1% | 0% | 7% | 0% | -1% | 0% |
| RSAC092 Emmaton | 2% | 0% | -2% | 4% | 1% | -7% | -1% | 1% | 0% | -2% | 4% | 1% | -6% | -2% |
| RSAC101 Rio Vista | -4% | 1% | -2% | -2% | 1% | -4% | -2% | -2% | 0% | -1% | -1% | 0% | -3% | -1% |
| RSAC123 | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| RSAC155 Freeport | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| RSAN018 Jersey Pt | 6% | -2% | -1% | 7% | -1% | -6% | 0% | 5% | -3% | -1% | 7% | -1% | -6% | 0% |
| RSAN032 San Andreas | 2% | -2% | -4% | 5% | -3% | -9% | 0% | 2% | -2% | -3% | 5% | -3% | -8% | 0% |
| RSAN058 | 0% | 2% | 0% | 0% | 0% | 0% | 0% | 1% | 4% | -1% | 0% | 0% | 0% | 0% |
| S-49 Beldon's Landing | 2% | -1% | 0% | -7% | 0% | 1% | 0% | 4% | -1% | 1% | -13% | 0% | 1% | 0% |
| SWP | 3% | -2% | 1% | 5% | -2% | -6% | 0% | 2% | -2% | 0% | 4% | -2% | -5% | 0% |