3.4 Water Quality

Maintaining beneficial uses of Delta waters depends on controlling several key water quality variables (e.g., salinity, water temperature, dissolved oxygen [DO], and DOC) in Delta waters. This section describes these key water quality variables, the objectives associated with maintaining beneficial uses of Delta waters, existing Delta water quality conditions, and impacts of Intertie operations on key water quality variables in Delta channels and exports. Information is also presented in Appendix D, "Delta Tidal Hydraulic and Water Quality Modeling Methods and Results for the Delta-Mendota/California Aqueduct Intertie," on the historical Delta water quality conditions to provide a context for assessing water quality effects of the No Action Alternative.

3.4.1 Affected Environment

This section is supported by a technical appendix that provides an evaluation of available Delta water quality data and describes the DSM2 modeling methods and results used in this section. Technical Appendix D, "Delta Tidal Hydraulic and Water Quality Modeling Methods and Results for the Delta-Mendota Canal/California Aqueduct Intertie," and Appendix E, "DSM2 Modeling Studies of the Delta-Mendota Canal/California Aqueduct Intertie," describe the available Delta salinity (EC) data and the results of the DSM2 hydrodynamic and water quality modeling of Delta salinity conditions for the Intertie. The DSM2 model results, based on CALSIM monthly Delta inflows, diversions, and exports, for the Existing Condition and No Action baseline conditions are the primary source of impact assessment information. The wide range of historical water quality data that provide the basis for calibration of the water quality simulations from the DSM2 model are collected and evaluated under the following water quality monitoring and sampling programs.

Interagency Ecological Program of the Sacramento–San Joaquin Estuary

The Interagency Ecological Program (IEP), previously the Interagency Ecological Study Program (IESP), was initiated in 1970 by DWR, DFG, Reclamation, and USFWS to provide information about the effects of CVP and SWP exports on fish and wildlife in the Bay-Delta estuary. Other agencies (e.g., SWRCB, EPA, the Corps, and U.S. Geological Survey [USGS]) have joined the IEP and provide staff members and funding to assist in obtaining biological, chemical, and hydrodynamic information about the San Francisco Bay and Sacramento–San Joaquin Delta Estuary.

Agencies participating in the IEP conduct extensive programs of monitoring of tidal stage and flows, salinity (EC) measurements, routine water quality, and fish

sampling, as well as more intensive special studies, in the Delta. IEP maintains its data in an extensive centralized database (www.IEP.ca.gov). Technical IEP reports are issued, and newsletters and annual meetings provide participants and the interested public with timely information about study results.

California Department of Water Resources Municipal Water Quality Investigations Program

DWR's Municipal Water Quality Investigations Program (MWQI) program encompasses the previous Interagency Delta Health Aspects Monitoring Program (IDHAMP) and Delta Island Drainage Investigations (DIDI). IDHAMP was initiated by DWR in 1983 to provide a reliable and comprehensive source of water quality information for judging the suitability of the Delta as a source of drinking water (California Department of Water Resources 1989). The major issue of concern was the potential formation of disinfection byproducts (DBPs) such as trihalomethanes (THMs) and bromate in treated drinking water from the Delta.

MWQI studies have documented that Delta exports contain relatively high concentrations of DOC, a THM precursor. Agricultural drainage discharges containing natural decomposition products of peat soil and crop residues are considered dominant sources of DOC in Delta waters (California Department of Water Resources 1994). Additionally, DOC is contributed to Delta waters by Delta inflows.

The MWQI program has determined that bromide (Br) in Delta water contributes significantly to formation of the THMs observed in treated drinking water from the Delta. Sources of Br^- in Delta water are seawater intrusion, San Joaquin River inflow containing agricultural drainage, and possible groundwater sources. Br concentrations have been found to be a relatively constant fraction of chloride in the Delta.

The Delta agricultural drainage component of the MWQI program has sampled discharge points of irrigation drainage water in the Delta since 1985. In general, intensive surveys of agricultural drains on Delta islands have shown high DOC concentrations that may represent a significant contribution to DOC concentrations in Delta waters (California Department of Water Resources 1990). The salt content and DOC concentrations of the drainage water are found to be greatest during October–March as a result of the leaching of salts from Delta island soils between growing seasons.

Compliance Monitoring Program for Delta Standards

D-1485 (State Water Resources Control Board 1978), issued by SWRCB in August 1978, amended previous water right permits of DWR and Reclamation for the SWP and CVP facilities, respectively. D-1485 also set numerical water

quality objectives and requirements for Delta outflow, export pumping rates, salinity as measured by EC, and chloride (Cl^-) to protect three broad categories of beneficial uses: fish and wildlife, agriculture, and municipal and industrial water supply. The standards included adjustments to reflect hydrologic conditions under different water-year types.

D-1485 has required DWR and Reclamation to conduct comprehensive water quality monitoring of the Delta. Annual reports have been prepared on observed water quality conditions in the Delta and compliance with limits set in D-1485 (California Department of Water Resources 1978). DWR and Reclamation are responsible for adjusting their operations to satisfy the applicable flow and salinity objectives. Most of these compliance stations have continuous EC monitors; others are sampled routinely for chemical and biological measurements. D-1641, which implements the 1995 Water Quality Control Plan for the San Francisco Bay/Sacramento–San Joaquin Delta Estuary (WQCP), provides an update of the D-1485 monitoring program.

EC monitors at Jersey Point and Emmaton (agricultural salinity compliance stations from April through August) are especially important for managing the linkage between upstream reservoir releases and export pumping that will maintain sufficient Delta outflow to satisfy Delta water quality objectives. The CVP and SWP operations staffs have access to telemetered data from these and several other EC monitors. The DWR Delta Operations Water Quality Section prepares and distributes a daily report of data on flows and EC to assist in decision-making on Delta water project operations.

3.4.2 Approach

Methodology

The following sections provide an overview of the methods used in conducting this analysis. A more detailed description is provided in Appendix D, “Delta Tidal Hydraulic and Water Quality Modeling Methods and Results for the Delta-Mendota Canal/California Aqueduct.”

Exporting more water at the CVP Tracy Pumping Plant could reduce Delta outflows and higher exports, as well as discharges from agricultural drainage within the Delta, may also alter the movement of water in the San Joaquin River and Old River so that lower quality waters may be diverted at the CCWD intakes or exported at the CVP and SWP pumping plants. These possible changes in water movement in the Delta serve in part as the rationale for the selection of water quality parameters of interest for this analysis.

Water quality conditions in the Delta are influenced by natural environmental processes, water management operations, agricultural diversions and drainage, and wastewater discharge practices. Variables that have not been identified as

current problems in the Delta and those that are not likely to be affected by Intertie operations were not selected as impact assessment variables.

Delta water quality conditions can vary dramatically because of year-to-year differences in runoff and water storage releases and seasonal fluctuations in Delta flows. Concentrations of materials in the river inflows are often related to streamflow volume and season. Transport and mixing of materials in Delta channels are strongly dependent on river inflows, tidal flows, agricultural diversions, drainage flows, wastewater effluents, exports, and cooling water flows. An accurate assessment of possible Delta water quality effects therefore requires consideration of the patterns of Delta channel flows (see Section 3.3, Delta Tidal Hydraulics). Channel flows are used in the water quality portion of the DSM2 model to evaluate potential water quality impacts, such as salinity impacts from changes in Delta outflow and DO impacts from changes in the Stockton DWSC flows.

The following Delta water quality variables are included in this analysis:

- EC (surrogate for salinity),
- DOC (THM and DBP precursor),
- DO,
- temperature, and
- suspended sediments.

Water quality impacts of salinity increases were assessed for Emmaton, Jersey Point, Old River at Rock Slough (representative of diversions at CCWD Rock Slough intake), Old River at SR 4 (CCWD Los Vaqueros intake), SWP Banks Pumping Plant, and CVP Tracy Pumping Plant. DOC changes were evaluated at the two CCWD intake locations and the SWP Banks and CVP Tracy Pumping Plants. DO concentration changes were evaluated at Stockton. Temperature and suspended sediments were evaluated qualitatively throughout the Delta.

The following discussion of potential water quality impacts identifies changes attributable to implementing the Proposed Action under the simulated 2001 and 2020 levels of development. This is accomplished by comparing model results for the 2001 LOD with the Proposed Action (i.e., Proposed Action) and the 2001 LOD without the Proposed Action (i.e., Existing Condition), as well as comparing model results for the 2020 LOD with the Proposed Action (i.e., Proposed Action) and the 2020 LOD without the Proposed Action (i.e., No Action).

Modeling

The CALSIM model was used to determine likely future monthly Delta inflows and exports associated with the 2001 Existing Condition, 2020 No Action and the Proposed Action. DSM2 was used to simulate tidal and net channel flows in the

major Delta channels for a 16-year sequence of water years 1976–1991. The DSM2 water quality module was also used to simulate EC and DOC for this same 16-year sequence. These water quality results are described and compared in this section.

There are many unpredictable processes and events that may affect water quality in the Delta that could not be simulated with the assessment models developed for simulating likely effects of the Intertie operations. Examples of unpredictable factors that are expected to influence Delta water quality conditions include occasional periods of relatively high-salinity pulses of San Joaquin River inflows, intensive agricultural-salt leaching following periods of drought, and short-term increases in DOC concentrations associated with storm runoff.

Significance Criteria

An alternative may result in a significant impact if it would result in:

- beneficial uses of water being substantially adversely affected, and
- existing adopted water quality standards being exceeded.

3.4.3 Environmental Consequences

Existing Condition

For EC and DOC analysis, computer modeling was used as the basis for developing the existing EC and DOC condition at an Existing Condition 2001 LOD. This existing condition for the 2001 LOD is plotted for comparison with the Proposed Action in figures presented in the following environmental analysis.

No Action Alternative

For EC and DOC analysis, computer modeling was used as the basis for developing the No Action Alternative at a 2020 LOD. The No Action Alternative is plotted and used for comparison with the Proposed Action Alternative in figures presented in the following environmental analysis.

Compared to simulated Existing Condition, under the No Action Alternative an Intertie would not be constructed or operated and, as a result, no significant future change in Delta water quality conditions would occur. Water quality conditions would remain largely the same. Because no Intertie would be constructed, the No Action Alternative would not lead to any significant adverse environmental effect. Changes in operations would not occur at the Tracy Pumping Plant or the DMC; therefore, the Tracy Pumping Plant would not be able to restore its capacity to pump to the authorized amount of 4,600 cfs.

Proposed Action Alternative

Electrical Conductivity

EC is a general measure of dissolved minerals and is the most commonly measured variable in Delta waters. EC is generally considered a conservative parameter, not subject to sources or losses internal to a water body. Therefore, changes in EC values can be used to interpret the movement of water and the mixing of salt in the Delta and can be used as a measurement of salinity. EC values increase with evaporation, decrease with rainfall, and may be elevated in agricultural drainage flows in the Delta. Because EC is a temperature-sensitive measurement, Delta EC measurements are standardized to 25°C.

Seawater intrusion from the modeled downstream boundary of the estuary at Martinez (i.e., Benicia) has a large effect on salinity in the Suisun Bay portion of the estuary. The estuarine entrapment zone, an important aquatic habitat region associated with high levels of biological productivity, is defined by the mean daily EC range of about 2–10 milliSiemens per centimeter (mS/cm) (Arthur and Ball 1980). The X2 objective in the 1995 WQCP requires that the 2 ppt salinity (i.e., 2.64 microSiemens per centimeter (µS/cm] EC) be maintained downstream of Collinsville or Chipps Island, depending on the previous month's runoff conditions. The location of the estuarine salinity gradient and associated entrapment zone is estimated from EC monitoring data and is directly related to Delta outflow EC and has therefore been selected as a variable for impact assessment.

Proposed Action Alternative impacts were measured based on changes in the monthly EC values compared to the monthly values simulated under the Existing Condition and No Action. The monthly EC results for the 1976–1991 period simulated by the DSM2 model are used for all of the locations. The most accurate monthly changes are considered to be those simulated by DSM2, which is able to evaluate effects from outflow changes as well as shifts in the contributions from agricultural drainage and San Joaquin River inflows. Monthly results for the entire 1922–1994 period simulated by the CALSIM II model are also shown in Appendix D for Emmaton and Jersey Point because the relationship between EC and effective outflow has been well established.

Impact WQ-1: Potential for Delta Salinity Changes at Emmaton

Modeled Existing Condition (2001 LOD) Comparison

Figure 3.4-1 shows the monthly EC value comparison between the Proposed Action and 2001 Existing Condition at Emmaton for 1976–1991 as simulated by the DSM2 model. Applicable EC objectives for Emmaton for April to August range from 450 µS/cm to 2,780 µS/cm, depending on water-year type. Many months (September–March) have no EC objectives at Emmaton. It is therefore difficult to evaluate the monthly maximum significance threshold. The bottom graph in Figure 3.4-1 indicates the changes in EC at Emmaton, with Proposed Action EC values plotted against the simulated Existing Condition EC values. For reference, the red line on the graph indicates a 10% increase from the simulated Existing Condition baseline EC value. For those months with a maximum EC objective, the CALSIM II model attempts to maintain the appropriate EC value (simulated as part of the Artificial Neural Network (ANN) module). Not all the EC values that are above the red line are significant monthly impacts because there may not be an EC objective for the month.

Table 3.4-1 indicates that the average simulated Existing Condition EC at Emmaton for the 16-year period simulated with the DSM2 model was 1,114 µS/cm. The average Emmaton EC with the Proposed Action was 1,115 µS/cm. The average increase at Emmaton was therefore just 1 µS/cm (0.1% of the simulated Existing Condition baseline average). Because this long-term increase is less than 5% of the 2001 Existing Condition baseline average, the months in which significant changes may occur are mitigated by the months with lower EC values, and by the small number of these significant monthly EC changes. At Emmaton, there were just three months (out of 192) with a change of more than 10% of the baseline simulated Existing Condition EC value. Although these relatively large monthly changes may occur under Intertie operations, the frequency is low enough not to result in any reductions in beneficial uses as indicated by the maximum allowable EC values, and the simulated changes at Emmaton are considered to be less than significant. No mitigation is required.

Modeled No Action Condition (2020 LOD) Comparison

Figure 3.4-2 shows the monthly EC value comparison between the Proposed Action and No Action at Emmaton for 1976–1991 as simulated by the DSM2 model. Table 3.4-1 summarizes the relative change between simulated No Action and Proposed Action EC conditions at Emmaton. For reasons similar to those explained above for the modeled Existing Condition comparison, changes in average monthly EC values at Emmaton are appreciably small and are therefore considered to be less than significant. No mitigation is required.

Impact WQ-2: Potential for Delta Salinity Changes at Jersey Point

Modeled Existing Condition (2001 LOD) Comparison

Figure 3.4-3 shows the monthly EC values comparison between the Proposed Action and simulated Existing Condition for 1976–1991 as simulated by the DSM2 model. Applicable EC objectives for Jersey Point for April to August range from 450 µS/cm to 2,200 µS/cm, depending on water-year type. Many months (September–March) have no EC objectives at Jersey Point. The bottom graph indicates the changes in EC, with the Proposed Action EC values plotted against the simulated Existing Condition EC values. For reference, the red line on the graph indicates a 10% increase from the baseline EC value. For those months with a maximum EC objective, the CALSIM II model attempts to maintain the appropriate EC value (simulated as part of the ANN module). However, not all the EC values that are above the red line are significant monthly impacts because there may not be an EC objective for the month.

Table 3.4-1 indicates that the average simulated Existing Condition EC at Jersey Point for the 16-year period simulated with the DSM2 model was 1,075 µS/cm. This is almost the same at the simulated average EC at Emmaton. However, the peak EC values are higher at Emmaton than at Jersey Point. In comparison, the average simulated EC for the Proposed Action was 1,080 µS/cm. The average increase at Jersey Point was therefore 5 µS/cm (0.5% of the simulated Existing Condition baseline average). Because this long-term increase is less than 5% of the simulated Existing Condition baseline average, the months in which EC increases are offset by months with lower EC values and by the small number of these significant monthly EC changes. At Jersey Point, there were just five months (out of 192) with a change of more than 10% of the 2001 Existing Condition baseline EC value. Although these relatively large monthly changes might occur under the Proposed Action, the frequency is low enough to maintain beneficial uses, and the simulated changes at Jersey Point are considered to be less than significant. No mitigation is required.

Modeled No Action Condition (2020 LOD) Comparison

Figure 3.4-4 shows the monthly EC value comparison between the Proposed Action and No Action at Emmaton for 1976–1991 as simulated by the DSM2 model. Table 3.4-1 summarizes the relative change between simulated No Action and Proposed Action EC conditions at Jersey Point. For similar reason to that explained for the modeled Existing Condition comparison above, changes in average monthly EC values at Jersey Point are appreciably small and are therefore considered to be less than significant. No mitigation is required.

Impact WQ-3: Potential for Delta Salinity Changes at Rock Slough

Modeled Existing Condition (2001 LOD) Comparison

Figure 3.4-5 shows the monthly EC values comparison between the Proposed Action and 2001 Existing Condition for 1976–1991 as simulated by DSM2. The

Table 3.4-1. DSM2 Simulated Changes in EC (µS/cm) at Assessment Locations for the Proposed Action Compared with Existing Condition (2001 LOD) and No Action (2020 LOD) Conditions for 1976–1991

A. EC values for Existing Condition (2001 LOD)

	EC Existing Condition Average	EC Proposed Action Average	EC Change	EC Percent Change	Number of Changes >10% Base	Average Change	Number of Changes >100 µS/cm	Average Change
Emmaton	1,114	1,115	1	0.1%	3	93	na	na
Jersey Point	1,075	1,080	5	0.5%	5	136	na	na
Rock Slough	532	533	1	0.2%	na	na	0	—
Old River at SR4	466	468	2	0.4%	na	na	0	—
Clifton Court Forebay	444	445	1	0.2%	na	na	0	—
CVP Tracy Pumping Plant	521	522	1	0.2%	na	na	0	—
Old River at Tracy Road Bridge	587	587	0	0.0%	na	na	0	—
Middle River at Mowery Bridge	600	601	1	0.2%	na	na	0	—
Grant at Tracy Boulevard	596	597	1	0.2%	na	na	0	—

B. EC values for No Action (2020 LOD)

	EC No Action Average	EC Proposed Action Average	EC Change	EC Percent Change	Number of Changes >10% Base	Average Significant Change	Number of Changes >100 µS/cm	Average Change
Emmaton	1,111	1,106	-5	-0.5%	3	67	na	na
Jersey Point	1,080	1,081	1	0.1%	7	109	na	na
Rock Slough	539	540	1	0.2%	na	na	0	—
Old River at SR4	467	468	1	0.3%	na	na	0	—
Clifton Court Forebay	446	447	1	0.2%	na	na	0	—
CVP Tracy Pumping Plant	526	526	0	0.0%	na	na	0	—
Old River at Tracy Road Bridge	590	590	0	0.0%	na	na	0	—
Middle River at Mowery Broidge	605	577	-28	-4.6%	na	na	0	—
Grant at Tracy Boulevard	600	600	0	0.0%	na	na	0	—

applicable EC objective at Rock Slough is 1,000 µS/cm. The bottom graph indicates the monthly changes in EC, with the Proposed Action EC values plotted against the simulated Existing Condition EC values. For reference, the red line on the graph indicates a 100-µS/cm increase from the baseline EC value. The CALSIM II model attempts to maintain the appropriate outflow to satisfy the maximum EC objective (simulated as part of the ANN module).

Table 3.4-1 indicates that the average simulated Existing Condition EC at Rock Slough was 532 µS/cm. This is about half of the average EC at Jersey Point. In comparison, the average simulated EC for the Proposed Action was 533 µS/cm. The average increase at Rock Slough was only about 1 µS/cm (0.2% of the 2001 Existing Condition baseline average). The impact is considered less than significant. No mitigation is required.

Modeled No Action (2020 LOD) Comparison

Figure 3.4-6 shows the monthly EC value comparison between the Proposed Action and No Action at Rock Slough for 1976–1991 as simulated by the DSM2 model. Table 3.4-1 summarizes the relative change between simulated No Action and Proposed Action EC conditions at Rock Slough. For reasons similar to those explained for the 2001 Existing Condition comparison above, changes in average monthly EC values at Rock Slough are appreciably small and are therefore considered to be less than significant. No mitigation is required.

Impact WQ-4: Potential for Delta Salinity Changes at Old River at State Route 4 Bridge

Modeled Existing Condition (2001 LOD) Comparison

Figure 3.4-7 shows the monthly EC values comparison between the Proposed Action and 2001 Existing Condition for 1976–1991 as simulated by DSM2. CCWD constructed the Los Vaqueros intake and pumping plant just upstream of the SR 4 Bridge. The applicable EC objective at the SR 4 Bridge (CCWD intake) is 1,000 µS/cm. The bottom graph indicates the changes in EC at the SR 4 Bridge, with the Proposed Action EC values plotted against the 2001 Existing Condition EC values. For reference, the red line on the graph indicates a 100-µS/cm increase from the simulated Existing Condition baseline EC value. The CALSIM II model attempts to maintain the appropriate Delta outflow to protect the maximum EC objective (simulated as part of the ANN module).

Table 3.4-1 indicates that the average simulated Existing Condition EC at Old River at the SR 4 Bridge for the 16-year period simulated with the DSM2 model was 466 µS/cm. This is slightly lower than the average Rock Slough EC. In comparison, the average simulated EC for the Proposed Action was 468 µS/cm. The average increase at SR 4 was therefore only about 2 µS/cm (0.4% of the simulated Existing Condition baseline average). These changes in monthly EC values are very small and are therefore considered to be less than significant. No mitigation is required.

Modeled No Action (2020 LOD) Comparison

Figure 3.4-8 shows the monthly EC value comparison between the Proposed Action and No Action Condition at the SR 4 Bridge for 1976–1991 as simulated by the DSM2 model. Table 3.4-1 summarizes the relative change between simulated No Action and Proposed Action EC conditions at the SR 4 Bridge. For reasons similar to those explained for the modeled Existing Condition comparison above, changes in average monthly EC values at the SR 4 Bridge are very small and are therefore considered to be less than significant. No mitigation is required.

Impact WQ-5: Potential for Delta Salinity Changes at Clifton Court Forebay (State Water Project Banks Pumping Plant)

Modeled Existing Condition (2001 LOD) Comparison

Figure 3.4-9 shows the monthly EC values comparison between the Proposed Action and simulated Existing Condition, including provision for water export at the SWP Banks Pumping Plant, for 1976–1991 as simulated by DSM2. The applicable EC objective at the SWP Banks Pumping Plant is 1,000 µS/cm. The bottom graph indicates the changes in EC at CCF, with the Proposed Action EC values plotted against the simulated Existing Condition EC values. For reference, the red line on the graph indicates a 100-µS/cm increase from the baseline EC value.

Table 3.4-1 indicates that the average 2001 Existing Condition EC at CCF was 444 µS/cm. In comparison, the average simulated EC for the Proposed Action was 445 µS/cm. The average increase at the SWP Banks Pumping Plant was therefore only about 1 µS/cm (0.2% of the simulated Existing Condition baseline average). Changes in average monthly EC values are very small and are therefore considered less than significant. No mitigation is required.

Modeled No Action (2020 LOD) Comparison

Figure 3.4-10 shows the monthly EC value comparison between the Proposed Action and No Action Condition at CCF for 1976–1991 as simulated by the DSM2 model. Table 3.4-1 summarizes the relative change between simulated No Action and Proposed Action EC conditions at CCF. For reasons similar to those explained for the modeled Existing Condition comparison above, changes in average monthly EC values at CCF are very small and are therefore considered to be less than significant. No mitigation is required.

Impact WQ-6: Potential for Delta Salinity Changes at Central Valley Project Tracy Pumping Plant

Modeled Existing Condition (2001 LOD) Comparison

Figure 3.4-11 shows the monthly EC values comparison between the Proposed Action and simulated Existing Condition for 1976–1991 as simulated by DSM2.

The applicable EC objective at the CVP Tracy Pumping Plant is 1,000 µS/cm. The bottom graph indicates the changes in EC at the CVP Tracy Pumping Plant, with the Proposed Action EC values plotted against the simulated Existing Condition EC values. For reference, the red line on the graph indicates a 100-µS/cm increase from the simulated Existing Condition baseline EC value. EC changes of more than 100 µS/cm will be above the red line.

Table 3.4-1 indicates that the simulated average Existing Condition EC at CVP Tracy Pumping Plant was 521 µS/cm. This EC is higher than the average SWP Banks Pumping Plant EC because the CVP Tracy facility pumps more of the San Joaquin River water that is diverted down Old River and Grant Line Canal. In comparison, the average simulated EC for the Proposed Action was 522 µS/cm. The average increase at the CVP Tracy Pumping Plant was therefore only 1 µS/cm (0.2% of the simulated Existing Condition baseline average). No mitigation is required. Changes in average monthly EC values are very small and are therefore considered less than significant. No mitigation is required.

Modeled No Action (2020 LOD) Comparison

Figure 3.4-12 shows the monthly EC value comparison between the Proposed Action and No Action at the CVP Tracy Pumping Plant for 1976–1991 as simulated by the DSM2 model. Table 3.4-1 summarizes the relative change between simulated No Action and Proposed Action EC conditions at the CVP Tracy Pumping Plant. For reasons similar to those explained for the modeled Existing Condition comparison above, changes in average monthly EC values at the CVP Tracy Pumping Plant are very small and are therefore considered to be less than significant. No mitigation is required.

Impact WQ-7: Potential Changes in Delta Salinity at Old River at Tracy Road Bridge

Modeled Existing Condition (2001 LOD) Comparison

Figure 3.4-13 shows the monthly EC values comparison between the Proposed Action and simulated Existing Condition for 1976–1991 as simulated by DSM2. The applicable EC objective at the Old River at Tracy Road Bridge is 1,000 µS/cm from September through March but is reduced to 700 µS/cm during the April–August irrigation season. The bottom graph indicates the changes in EC at Old River at the Tracy Road Bridge, with the Proposed Action EC values plotted against the simulated Existing Condition EC values. For reference, the red line on the graph indicates a 100-µS/cm increase from the simulated Existing Condition baseline EC value. EC changes of more than 100 µS/cm will be above the red line. The solid dots indicate months when the EC objective is 700 µS/cm. A change that is slightly below the red line would indicate a significant monthly change in these months.

Table 3.4-1 indicates that the simulated average Existing Condition EC at Old River at the Tracy Road Bridge was 587 µS/cm. This is higher than the average CVP Tracy Pumping Plant EC because the CVP Tracy facility pumps a higher

portion of the Sacramento River water. In comparison, the average simulated EC for the Proposed Action was also 587 µS/cm. There was no simulated change in average EC at this location because the simulated San Joaquin River EC and agricultural drainage EC influences remain unchanged with the Proposed Action. This impact is considered less than significant. No mitigation is required.

Modeled No Action (2020 LOD) Comparison

Figure 3.4-14 shows the monthly EC value comparison between the Proposed Action and No Action at the Tracy Road Bridge for 1976–1991 as simulated by the DSM2 model. Table 3.4-1 summarizes the relative change between simulated No Action and Proposed Action EC conditions at the Tracy Road Bridge. For reasons similar to those explained for the modeled Existing Condition comparison above, changes in average monthly EC values at the Tracy Road Bridge are very small and are therefore considered to be less than significant. No mitigation is required.

Impact WQ-8: Potential Change in Delta Salinity at Middle River at Mowry Bridge

Modeled Existing Condition (2001 LOD) Comparison

Figure 3.4-15 shows the monthly EC values comparison between the Proposed Action and simulated Existing Condition for 1976–1991 as simulated by DSM2. The applicable EC objective at Middle River at the Mowry Bridge is 1,000 µS/cm from September through March but is reduced to 700 µS/cm during the April–August irrigation season. The bottom graph indicates the changes in EC at Middle River at the Mowry Bridge, with the Proposed Action EC values plotted against the simulated Existing Condition EC values. The red line on the graph indicates a 100-µS/cm increase from the simulated Existing Condition baseline EC value. The months with an EC objective of 700 µS/cm are shown with a red dot. During the months when the EC objective is 700 µS/cm, a change that is slightly below the red line would indicate a significant monthly change in EC.

Table 3.4-1 indicates that the average 2001 Existing Condition EC at Middle River at the Mowry Bridge was 600 µS/cm. This is the highest EC value of any of the south Delta channels upstream of the barriers, because the Middle River at Mowry Bridge salinity has the greatest contribution from the San Joaquin River. In comparison, the average simulated EC for the Proposed Action was 601 µS/cm (0.2% of the simulated Existing Condition baseline average). Changes in average monthly EC values are very small and are therefore considered less than significant. No mitigation is required.

Modeled No Action (2020 LOD) Comparison

Figure 3.4-16 shows the monthly EC value comparison between the Proposed Action and No Action at the Mowry Bridge for 1976–1991 as simulated by the DSM2 model. Table 3.4-1 summarizes the relative change between simulated No Action and Proposed Action EC conditions at the Mowry Bridge. For

reasons similar to those explained for the modeled Existing Condition comparison above, changes in average monthly EC values at the Mowry Bridge are comparatively large, but actually represent a decrease in EC and are therefore considered to be less than significant. No mitigation is required.

Impact WQ-9: Potential Changes in Delta Salinity at Grant Line Canal at Tracy Road Bridge

Modeled Existing Condition (2001 LOD) Comparison

Figure 3.4-17 shows the monthly EC values comparison between the Proposed Action and simulated Existing Condition for 1976–1991 as simulated by DSM2. The applicable EC objective at Grant Line Canal at the Tracy Road Bridge is 1,000 µS/cm from September through March but is reduced to 700 µS/cm during the April–August irrigation season. The bottom graph indicates the changes in EC at Grant Line Canal at the Tracy Road Bridge, with the Proposed Action EC values plotted against the simulated Existing Condition EC values. For reference, the red line on the graph indicates a 100-µS/cm increase from the simulated Existing Condition baseline EC value. The months with an EC objective of 700 µS/cm are shown with a red dot. During the months when the EC objective is 700 µS/cm, a change that is slightly below the red line would indicate a significant monthly change in EC.

Table 3.4-1 indicates that the average simulated Existing Condition EC at Grant Line Canal at the Tracy Road Bridge was 596 µS/cm. This is almost the same as the average EC at Old River at Tracy Road Bridge. In comparison, the average simulated EC for the Proposed Action was 597 µS/cm. The average increase at the Grant Line Canal at Tracy Road Bridge was therefore only 1 µS/cm (0.2% of the simulated Existing Condition baseline average). Changes in average monthly EC values are very small and are therefore considered less than significant. No mitigation is required.

Modeled No Action (2020 LOD) Comparison

Figure 3.4-18 shows the monthly EC value comparison between the Proposed Action and No Action Condition at the Grant Line Canal at Tracy Road Bridge for 1976–1991 as simulated by the DSM2 model. Table 3.4-1 summarizes the relative change between simulated No Action and Proposed Action EC conditions at the Grant Line Canal at Tracy Road Bridge. For reasons similar to those explained for the modeled Existing Condition comparison above, changes in average monthly EC values at the Grant Line Canal at Tracy Road Bridge are comparatively large, but actually represent a decrease in EC and are therefore considered to be less than significant. No mitigation is required.

Dissolved Organic Carbon

DOC concentration is one of the primary variables that influence the potential for formation of DBP (i.e., DOC is a precursor). DBP concentrations are important

in judging the quality of drinking water sources (CALFED Bay-Delta Program 2000b). The DSM2 model was used to simulate DOC concentrations at the CVP and SWP exports and CCWD diversion locations. The inflow DOC concentrations that were estimated for the Sacramento and San Joaquin Rivers are shown in Appendix D. The assumed Sacramento River DOC concentrations were about 2 mg/l in most months, and the highest monthly DOC values during the first month of substantial runoff were just less than 6 mg/l. The assumed San Joaquin River DOC values during most months were about 3.5 mg/l, and the highest DOC values were about 10 mg/l during the first month with substantial runoff each water year. These assumed monthly DOC concentrations do not change with the Proposed Action and were assumed to be the same for the simulated Existing Condition and the simulated No Action.

The DOC concentrations within the Delta will be higher than the river inflow concentrations because of the contribution of agricultural drainage DOC. The DOC in the CVP exports is often very similar to the San Joaquin River inflow DOC. Periods with high agricultural drainage contributions in the winter will raise the CVP and SWP export DOC concentrations to above the San Joaquin River concentration.

The DOC concentrations at the SWP and CCWD water supply intakes will be higher than the river inflow concentrations because of the agricultural drainage DOC. The DOC in the Rock Slough intake is closer to the Sacramento River inflow DOC than the SR 4 intake. Both of these CCWD intakes can have a high contribution from the San Joaquin River DOC at times of high San Joaquin River flow. Periods with high agricultural drainage contributions in the summer will raise the Rock Slough and SR 4 DOC concentrations to above the San Joaquin River concentration.

Impact WQ-10: Potential Incremental Increases in Dissolved Organic Carbon at Contra Costa Water District Rock Slough Intake

Modeled Existing Condition (2001 LOD) Comparison

Figure 3.4-19 shows the monthly DOC concentrations at the CCWD Rock Slough intake for the Proposed Action compared with simulated Existing Condition DOC concentrations. There were only a few months with slightly increased DOC concentrations. There were some months with slightly reduced (beneficial) DOC concentrations. Table 3.4-2 indicates that the average DOC concentration for the 1976–1991 period was 3.37 mg/l for the modeled Existing Condition and comparatively was 3.36 mg/l for the Proposed Action. Average modeled DOC declines marginally with the proposed action and, therefore, the incremental DOC impacts at Rock Slough resulting from the Proposed Action are considered less than significant. No mitigation is required.

Modeled No Action (2020 LOD) Comparison

Figure 3.4-20 shows the monthly average DOC comparison between the Proposed Action and simulated No Action condition at the Rock Slough Intake.

Table 3.4-2. DSM2 Simulated Changes in Dissolved Organic Carbon (mg/l) at Assessment Locations for the Proposed Action Compared with Existing Condition (2001 LOD) and No Action (2020 LOD) Conditions for 1976–1991

	DOC Existing Condition Average	DOC Proposed Action Average	DOC Change	DOC % Change	>0.4 mg/l Number of Significant Changes	Average Significant Change
A. DOC values for Existing Condition (2001 LOD)						
Rock Slough (Los Vaqueros Intake)	3.37	3.36	0.01	-0.05%	0	0.00
Old River at SR4	3.74	3.73	0.00	0.13%	2	0.64
CVP Tracy	3.70	3.70	-0.01	-0.32%	0	0.00
Clifton Court Forebay (SWP Banks)	3.78	3.78	0.00	-0.06%	0	0.00

	DOC No Action Average	DOC Proposed Action Average	DOC Change	DOC % Change	>0.4 mg/l Number of Significant Changes	Average Significant Change
B. DOC values for No Action (2020 LOD)						
Rock Slough (Los Vaqueros Intake)	3.36	3.36	0.00	0.07%	1	0.42
Old River at SR4	3.74	3.73	0.02	0.31	3	0.82
CVP Tracy	3.69	3.71	-0.01	-0.33%	0	0.33
Clifton Court Forebay (SWP Banks)	3.79	3.79	0.00	-0.04%	0	0.00

Table 3.4-2 summarizes the relative change between simulated No Action and Proposed Action DOC conditions at the Rock Slough Intake. There were only several months with slightly elevated DOC under the Proposed Action relative to the simulated No Action (Figure 3.4-20), and there was no change in average DOC between simulated No Action and Proposed Action DOC conditions (Table 3.4-2). The impact is considered less than significant. No mitigation is required.

Impact WQ-11: Potential Incremental Increases in Dissolved Organic Carbon at Contra Costa Water District Los Vaqueros Intake

Modeled Existing Condition (2001 LOD) Comparison

Figure 3.4-21 shows the monthly DOC concentrations at the CCWD Los Vaqueros intake for the Proposed Action compared with simulated Existing Condition DOC concentrations. There are only a few months with slightly increased DOC concentrations. Table 3.4-2 indicates that the overall average DOC concentration for the 1976–1991 period was 3.74 mg/l for the modeled simulated Existing Condition and was 3.73 mg/l for Proposed Action. Average modeled DOC declines marginally with the Proposed Action and, therefore, the incremental DOC impacts at Los Vaqueros resulting from the Proposed Action are considered less than significant. No mitigation is required.

Modeled No Action (2020 LOD) Comparison

Figure 3.4-22 shows the monthly average DOC comparison between the Proposed Action and simulated No Action condition at the Los Vaqueros Intake. Table 3.4-2 summarizes the relative change between simulated No Action and Proposed Action DOC conditions at the Los Vaqueros Intake. There were only several months with slightly elevated DOC under the Proposed Action relative to the simulated No Action (Figure 3.4-22) and there was only a marginal 0.01 mg/l decrease in average DOC between the simulated No Action and Proposed Action DOC conditions (Table 3.4-2). The impact is considered less than significant. No mitigation is required.

Impact WQ-12: Potential Incremental Increases in Dissolved Organic Carbon at State Water Project Banks Pumping Plant

Modeled Existing Condition (2001 LOD) Comparison

Figure 3.4-23 shows the monthly DOC concentrations at the SWP Banks pumping plant for the Proposed Action compared with simulated Existing Condition DOC concentrations. Table 3.4-2 indicates that the overall average DOC concentrations for the 1976–1991 period were 3.78 mg/l for the simulated Existing Condition and 3.78 mg/l for the Proposed Action. No change in average DOC concentrations was simulated. The DOC impacts at the SWP Banks pumping plant are considered less than significant. No mitigation is required.

Modeled No Action (2020 LOD) Comparison

Figure 3.4-24 shows the monthly average DOC comparison between the Proposed Action and simulated No Action condition at the SWP Banks Pumping Plant. Table 3.4-2 summarizes the relative change between simulated No Action and Proposed Action DOC conditions at the SWP Banks Pumping Plant. There were no months with DOC elevated above 0.4 mg/l for the Proposed Action compared to the simulated No Action (Figure 3.4-24), and there was no significant change in average DOC between the simulated No Action and Proposed Action DOC conditions (Table 3.4-2). The impact is considered less than significant. No mitigation is required.

Impact WQ-13: Potential Incremental Increases in Dissolved Organic Carbon at Central Valley Project Tracy Pumping Plant

Modeled Existing Condition (2001 LOD) Comparison

Figure 3.4-25 shows the monthly DOC concentrations at the CVP Tracy Pumping Plant for the Proposed Action compared with simulated Existing Condition DOC concentrations. Table 3.4-2 indicates that the overall average DOC concentrations for the 1976–1991 period were 3.70 mg/l for the 2001 Existing Condition and 3.70 mg/l for the Proposed Action. No change in average DOC concentration was simulated. The DOC impacts at the CVP Tracy Pumping Plant are considered less than significant. No mitigation is required.

Modeled No Action (2020 LOD) Comparison

Figure 3.4-26 shows the monthly average DOC comparison between the Proposed Action and 2020 No Action condition at the CVP Tracy Pumping Plant. Table 3.4-2 summarizes the relative change between 2020 No Action and Proposed Action DOC conditions at the CVP Tracy Pumping Plant. There were only several months with slightly elevated DOC under the Proposed Action relative to the 2020 No Action (Figure 3.4-26), and there was only a marginal 0.02-mg/l increase in average DOC between 2020 No Action and Proposed Action DOC conditions (Table 3.4-2). The impact is considered less than significant. No mitigation is required.

Dissolved Oxygen

DO is often used as an indicator of the balance between sources of oxygen (e.g., aeration and photosynthesis) and the consumption of oxygen in decay and respiration processes. The DO saturation concentration changes with temperature, and DO concentration often varies diurnally with algae photosynthesis. DO concentrations in Delta channels are not generally considered to be a problem, except near the Stockton DWSC and in some dead-end sloughs. The lower San Joaquin River is listed by the Central Valley RWQCB as an impaired water body under Section 303(d) of the Clean Water Act. The RWQCB initiated the preparation of a total maximum daily load

(TMDL) analysis in early 1999 and organized a forum for stakeholder involvement. A substantial amount of data has been collected through CALFED and stakeholder funding.

The RWQCB has produced a series of reports on the Stockton DWSC low DO problem (Central Valley Regional Water Quality Control Board 2002). This report includes a comprehensive analysis of the seasonal data collected in the fall by DWR (boat surveys) and by the City of Stockton (NPDES weekly compliance monitoring) as well as the hourly data collected by DWR at the Rough and Ready Island water quality monitoring station since 1983. An ultrasonic velocity meter (UVM) device has measured the tidal flow at Stockton since 1995.

Daily minimum DO concentrations from each of these data sources from 1996 through 2001 correlated with flow (during the late-summer and fall period). The general relationship suggests that the DWSC minimum DO concentration will increase as the flow is increased to about 1,500 cfs. The average DO increase is apparently about 0.15 to 0.20 mg/l for each 100 cfs of increased flow.

Based on this observed and apparent correlation with flow, for impact evaluation purposes, the assumed change in DO was +0.2 mg/l for each 100-cfs increase in flow, within the range of 0 to 1,500 cfs of Stockton flow. Similarly, a reduction in DO of 0.2 mg/l was also assumed for a 100-cfs reduction in flow, within the range of 0 cfs to 1,500 cfs of Stockton flow. The DO concentration at a flow of 1,500 cfs is estimated from the available data to be about 6.0 mg/l. A flow of 1,000 cfs will therefore be assumed to correspond to a minimum DO of about 5.0 mg/l (the Basin Plan criterion for DO). A flow of 500 cfs will be assumed to correspond to a minimum DO of 4.0 mg/l. A monthly summer flow of 0 cfs is assumed to provide a DO of 3 mg/l.

Impact WQ-14: Incremental Changes in Stockton Deep Water Ship Channel Dissolved Oxygen Concentrations from Changes in the San Joaquin River Flow past Stockton

Modeled Existing Condition (2001 LOD) Comparison

Figure 3.4-27 shows the Stockton flows simulated by the DSM2 model for the Proposed Action and simulated Existing Condition. Only flows of less than 1,500 cfs are assumed to have an effect on the DWSC DO concentrations. Because the simulated operation of the temporary head of Old River barrier and agricultural barriers during the summer months is not changed by the Proposed Action, the simulated San Joaquin River flows at Stockton flows were not changed enough to be detected on the graph. Therefore, no simulated changes in the DO concentration during low-flow periods in the Stockton DWSC caused by the Proposed Action are expected. The impact is considered less than significant. No mitigation is required.

Modeled No Action (2020 LOD) Comparison

Figure 3.4-28 shows simulated San Joaquin River at Stockton flows as well as estimated changes in water column DO a result of the Proposed Action compared to simulated No Action conditions. No significant change in flows was simulated and, therefore, no simulated change in DO is expected. The impact is considered less than significant. No mitigation is required.

Temperature

Temperature governs rates of biochemical processes and is considered a major environmental factor in determining organism preferences and behavior. Fish growth, activity, and mortality are related to temperature. The maximum (saturated) concentration of DO in water is lower at higher temperatures.

Water temperatures are determined predominantly by surface heat exchange processes, which are a function of weather. Delta temperatures are influenced only slightly by water management activities. The most common environmental impacts associated with water temperatures are localized effects of discharges of water at substantially elevated temperatures (e.g., thermal shock). Temperature measurements from the temporary barriers in the south Delta were used to qualitatively evaluate the small temperature changes that are expected from the Proposed Action. In comparison to simulated Existing Condition and simulated No Action conditions that include the temporary barriers during the summer, no significant temperature impacts are expected from the Proposed Action.

Suspended Sediments

The presence of suspended sediments (SS) (often measured as turbidity) is a general indicator of surface erosion and runoff into water bodies or resuspension of bottom sediment materials. Following major storms, water quality is often degraded by inorganic and organic solids and associated adsorbed contaminants, such as metals, nutrients, and agricultural chemicals, that are resuspended or introduced in runoff. Such runoff and resuspension episodes are relatively infrequent, persist for only a limited time, and, therefore, are not often detected in regular sampling programs.

The attenuation of light in Delta waters is controlled by SS concentrations (with some effects from chlorophyll). SS concentrations are often elevated as a result of increased flocculation (i.e., aggregation of particles) in the estuarine salinity gradient (i.e., freshwater-saltwater interface). High winds and tidal currents also contribute to increased SS in the estuary. The Proposed Action will not change these storm-related and entrapment zone effects of SS and associated contaminants. No significant impacts on SS are expected from the Proposed Action.

3.4.4 Cumulative Impacts

As described in Section 3.2, "Water Supply," and Appendix B, there are no substantial changes in the upstream CVP or SWP facilities and no changes in the CVP and SWP Delta operations for the simulated No Action. There will be no cumulative effects of the Proposed Action unless new CVP or SWP facilities are added to the upstream system or different CVP and SWP Delta operational criteria are introduced. An updated OCAP evaluation (expected during 2004) will further address these potential future changes. Furthermore, as discussed in Section 3.2, the Proposed Action has little potential to contribute to any significant cumulative impacts. Most of the reasonably foreseeable projects described in Section 3.2 would substantially increase water availability in the CVP and SWP system. It is possible that instream flows in affected streams would also be increased.

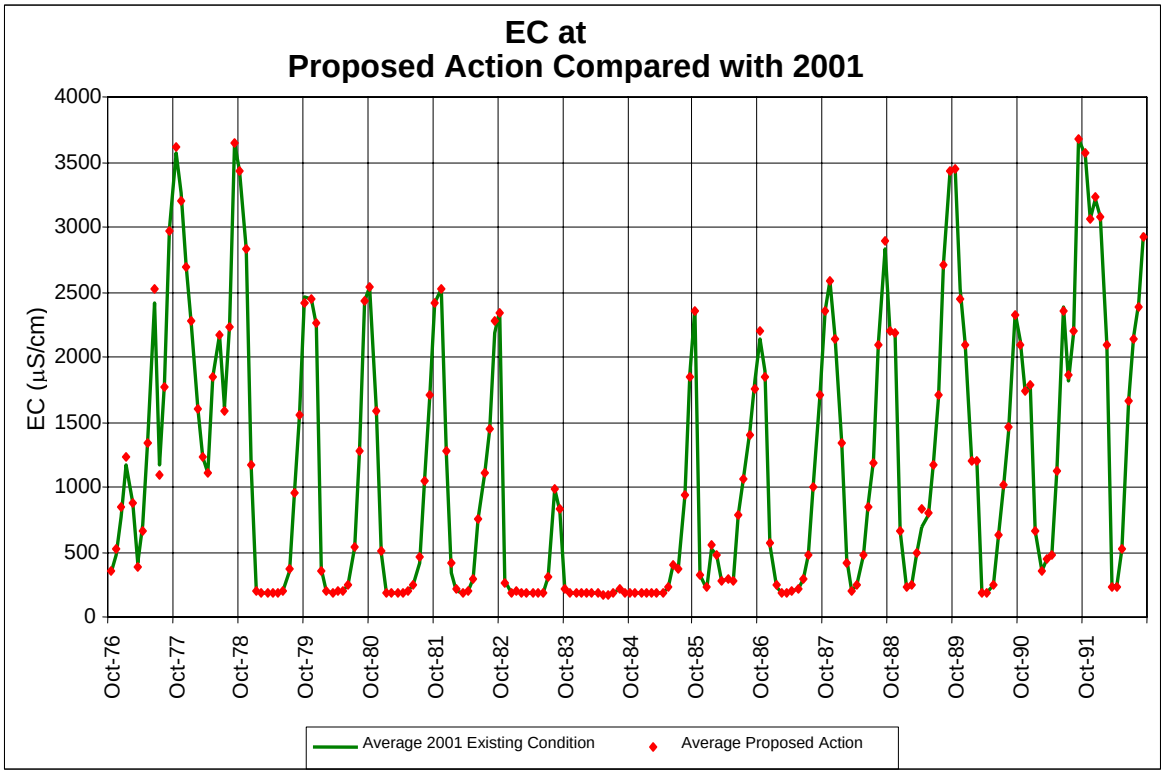
The cumulative effects of the Proposed Action in combination with implementation of other potential future projects conceivably could substantially increase the amount of water available to the CVP and SWP. In addition, several of the reasonably foreseeable projects could result in improved water quality throughout the system and particularly within the Delta. These projects would generally result in increased flows into the Delta, increased exports from the Delta for water supply purposes, and increased Delta outflows for environmental and water quality purposes.

Even with additional CVP or SWP facilities, the full impacts of the Proposed Action are disclosed in the impact evaluation shown in this section. This is because the full use of the Proposed Action is already simulated in the 2001 CALSIM II and the 2001 DSM2 modeling scenarios. Nevertheless, the DSM2 model was used to simulate the Proposed Action and No Actions, which include future increased CVP and SWP demands.

Table 3.4-1 shows the summary of EC results for No Action and Proposed Action simulations compared with the Existing Condition and Proposed Action EC simulation results. There are no substantial changes in EC between Existing Condition and No Action simulated conditions. There are no increased cumulative impacts on EC from the Proposed Action.

Table 3.4-2 shows the summary of DOC results for No Action and Proposed Action simulations compared with the Existing Condition and Proposed Action DOC simulation results. There are no substantial changes in DOC between Existing Condition simulated conditions and No Action simulated conditions. There are no increased cumulative impacts on DOC from the Proposed Action.

Figure 3.4-1. DSM2–Simulated EC (µS/cm) at Emmaton for the Proposed Action and Existing Condition (2001 LOD), 1976–1991



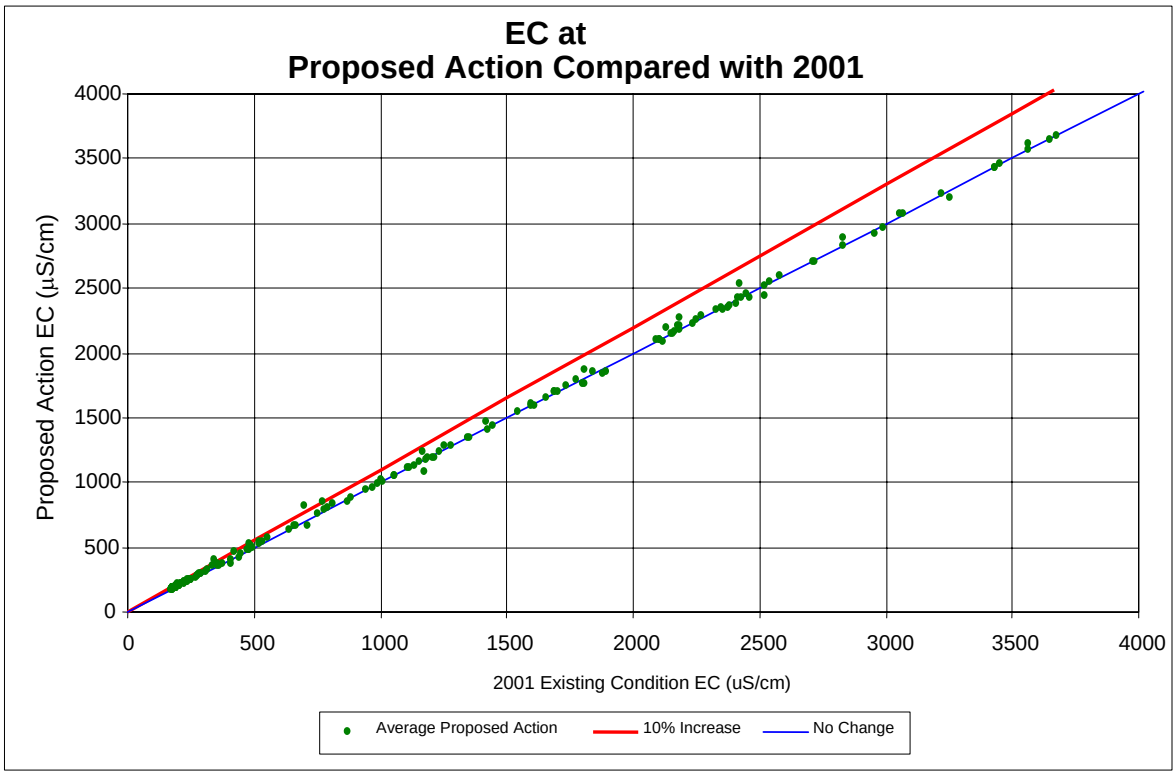
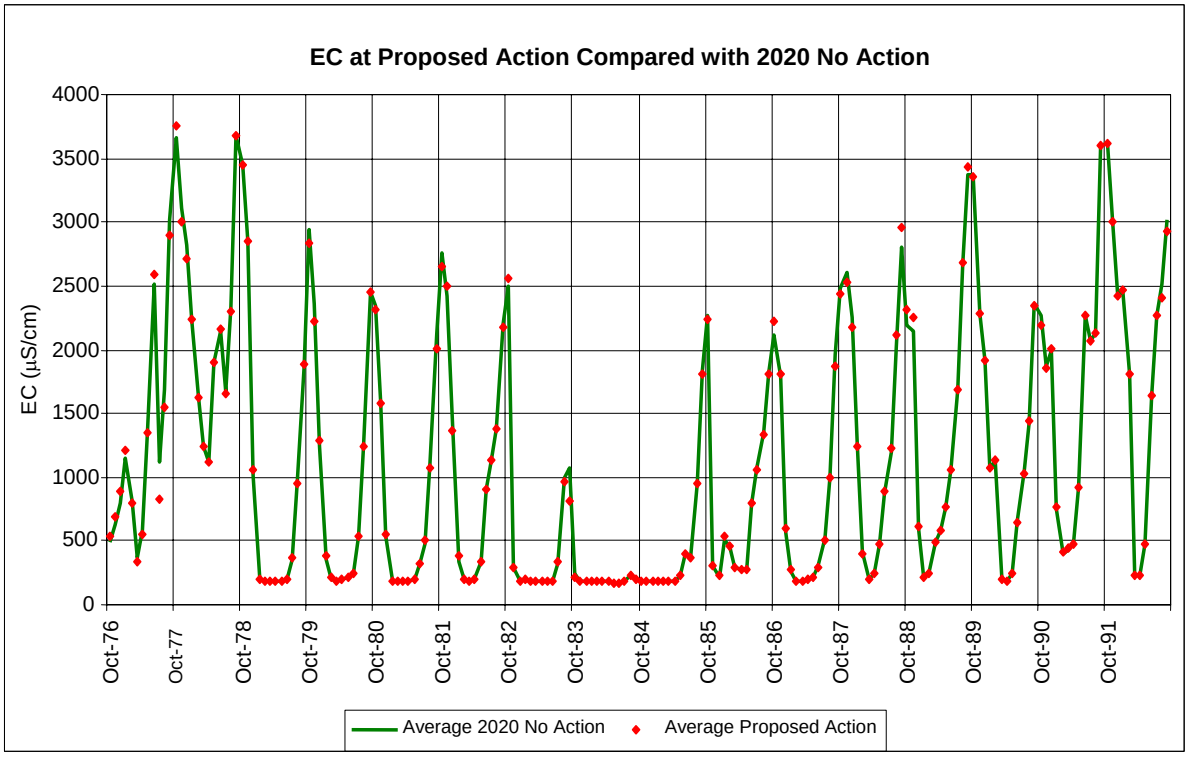


Figure 3.4-2. DSM2–Simulated EC (µS/cm) at Emmaton for the Proposed Action and No Action (2020 LOD) Condition, 1976–1991



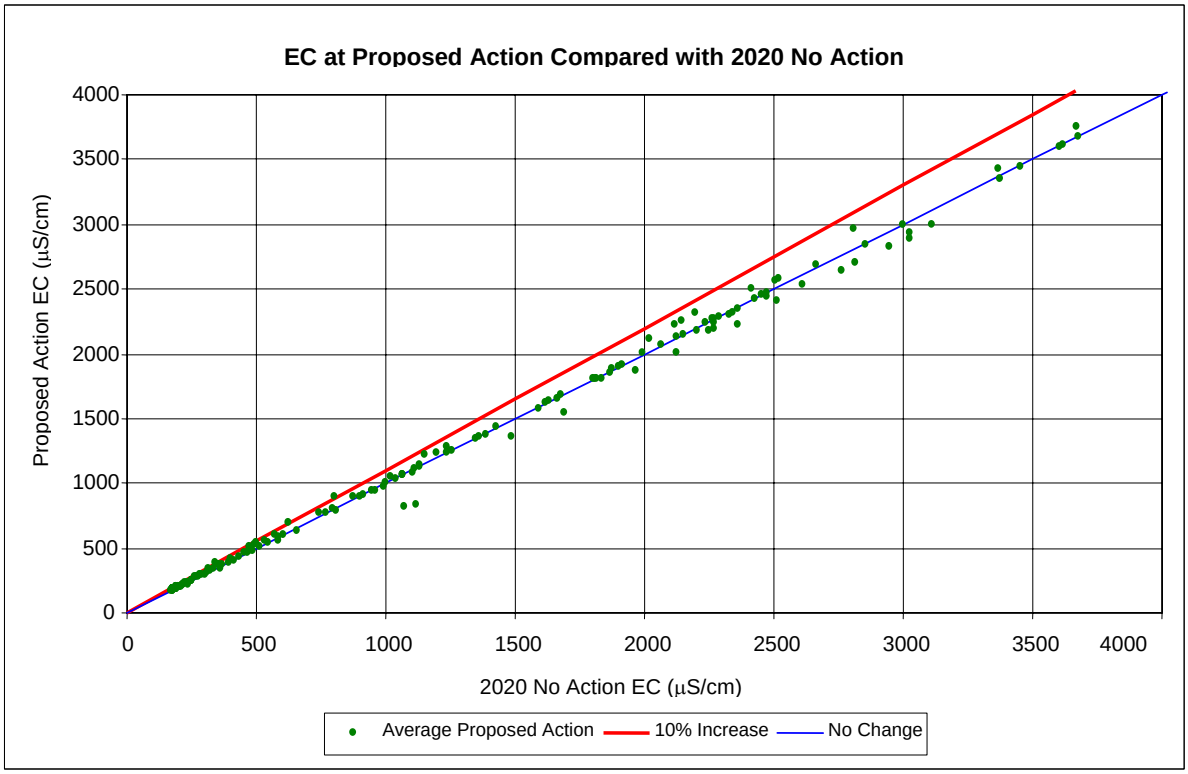
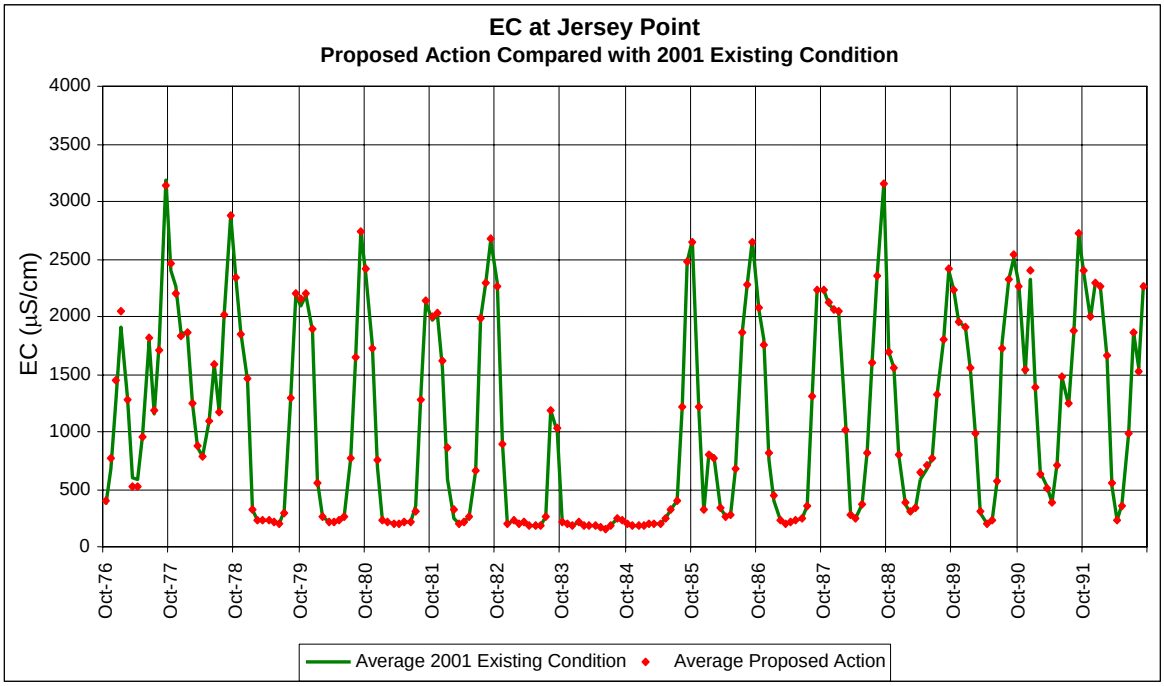


Figure 3.4-3. DSM2–Simulated EC (µS/cm) at Jersey Point for the Proposed Action and Existing Condition (2001 LOD), 1976–1991



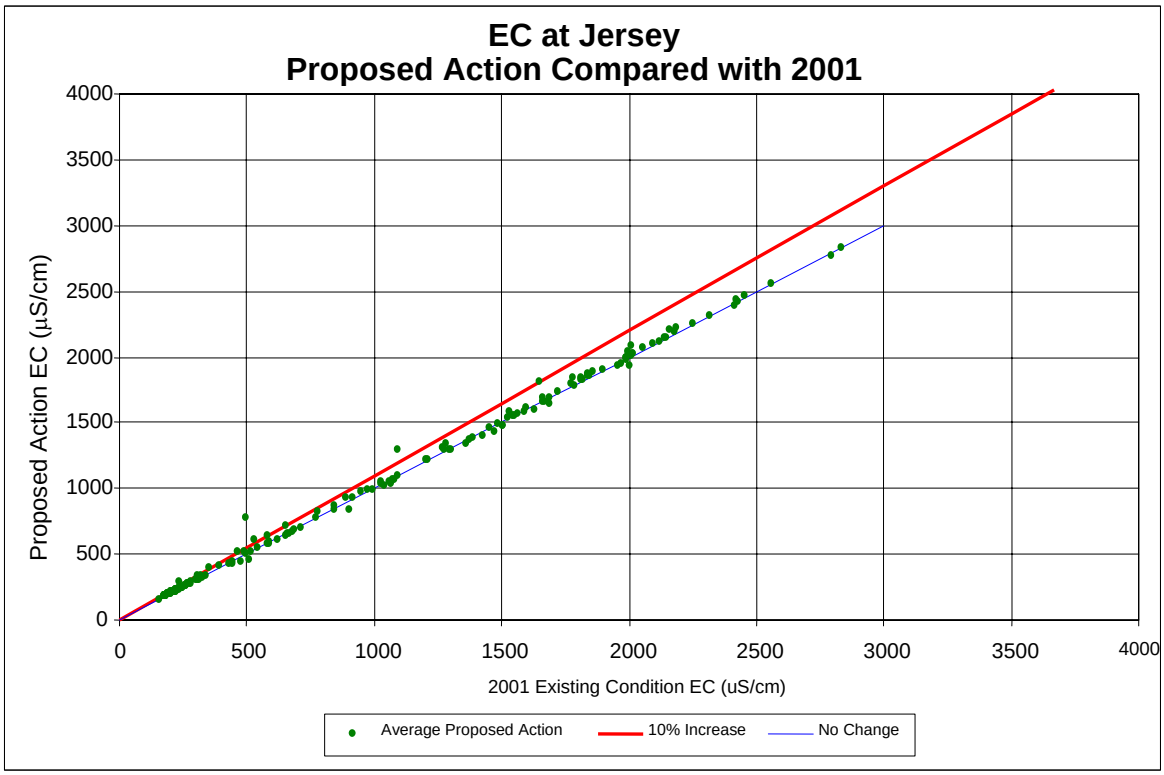
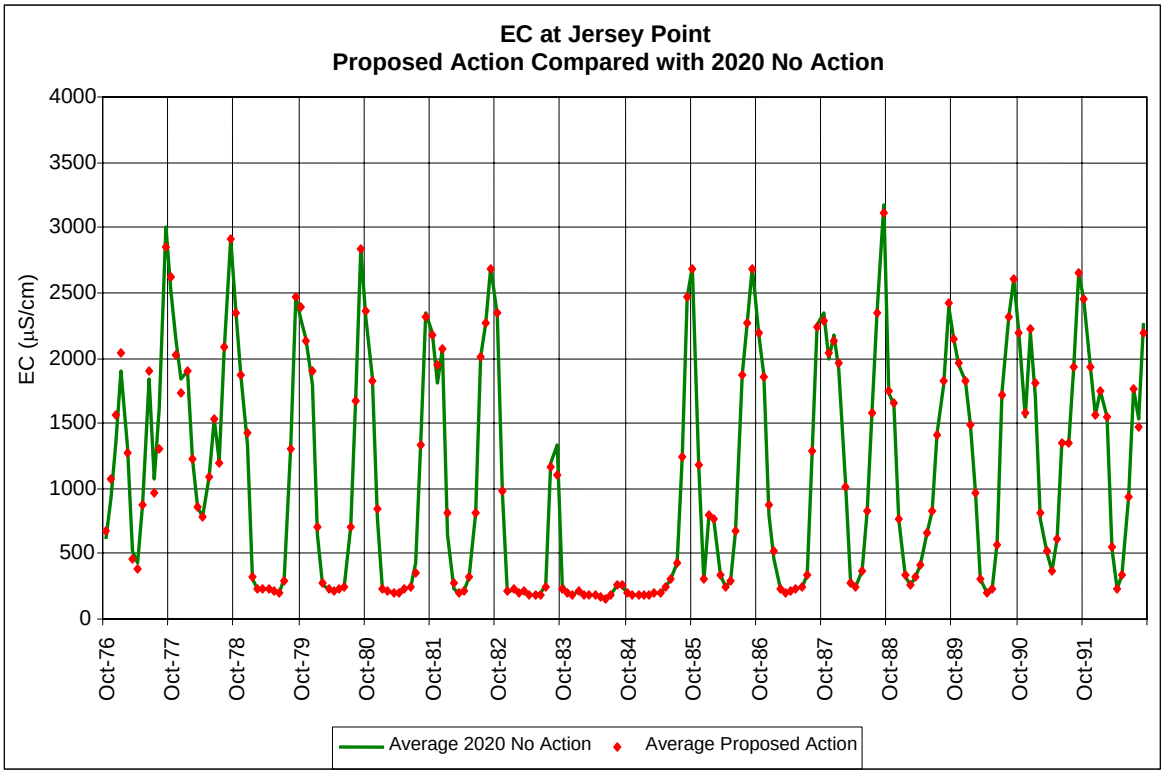


Figure 3.4-4. DSM2–Simulated EC (µS/cm) at Jersey Point for the Proposed Action and No Action (2020 LOD) Condition, 1976–1991



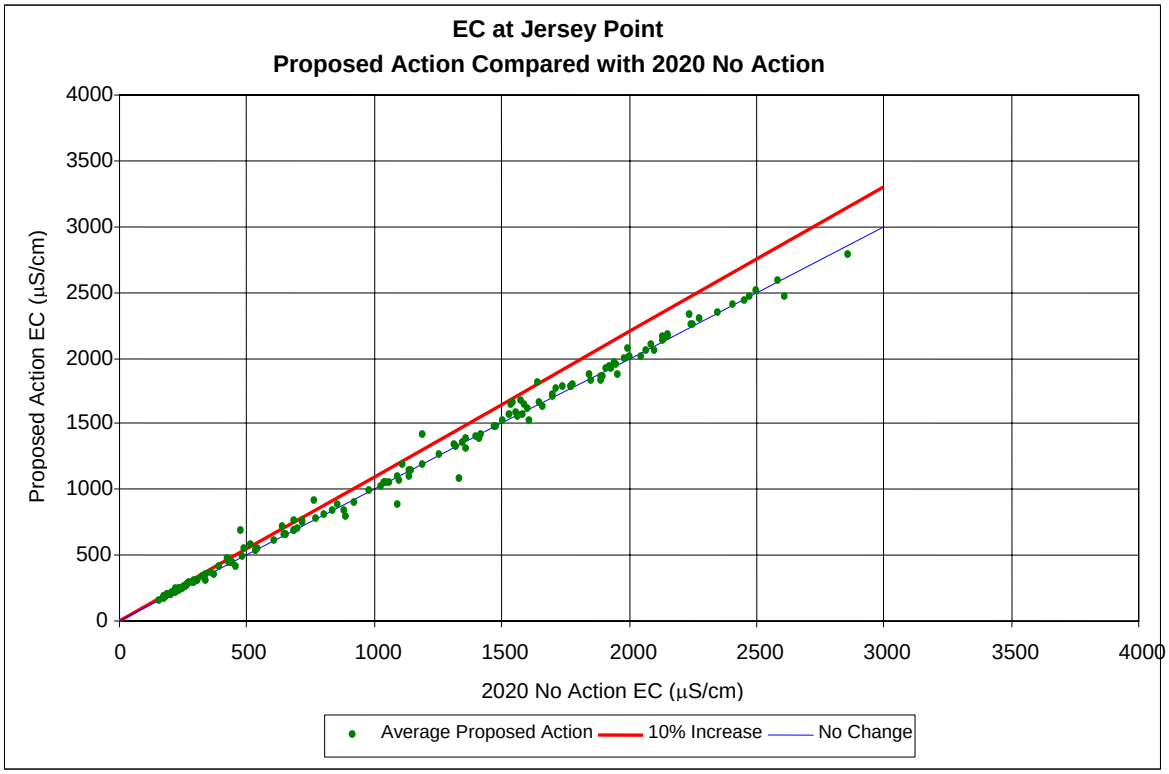
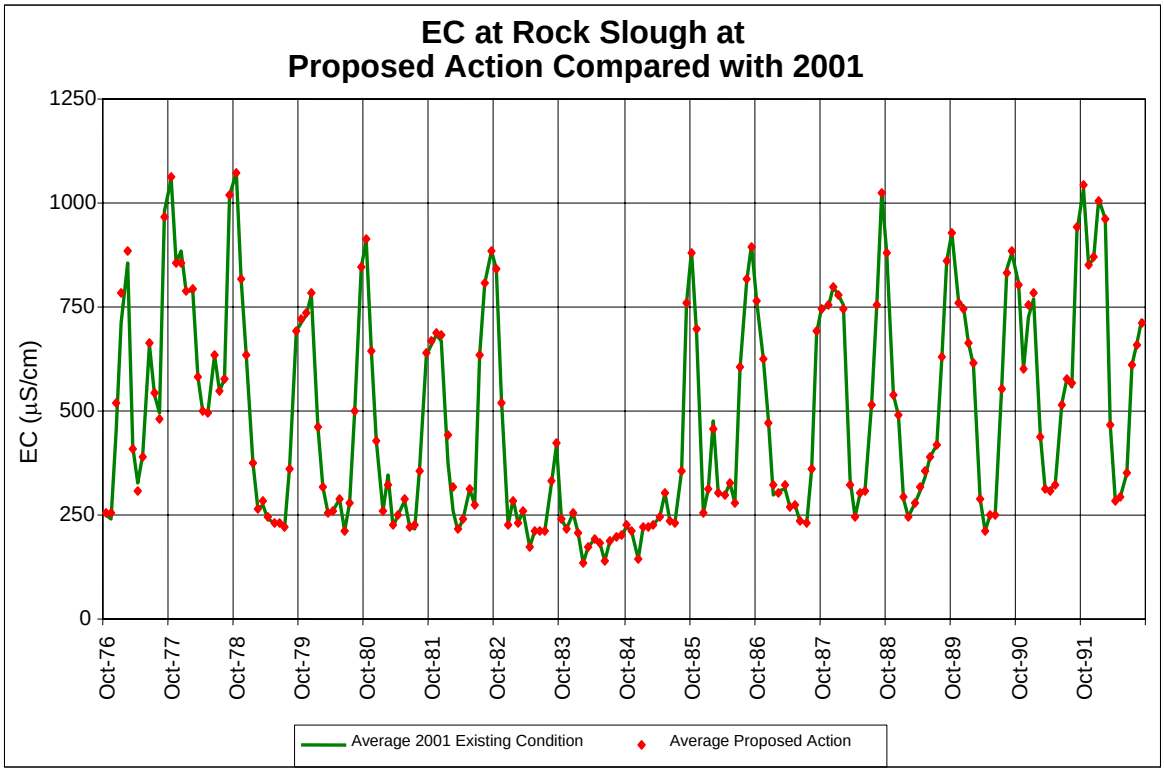


Figure 3.4-5. DSM2–Simulated EC (µS/cm) in Old River at Rock Slough for the Proposed Action and Existing Condition (2001 LOD), 1976–1991



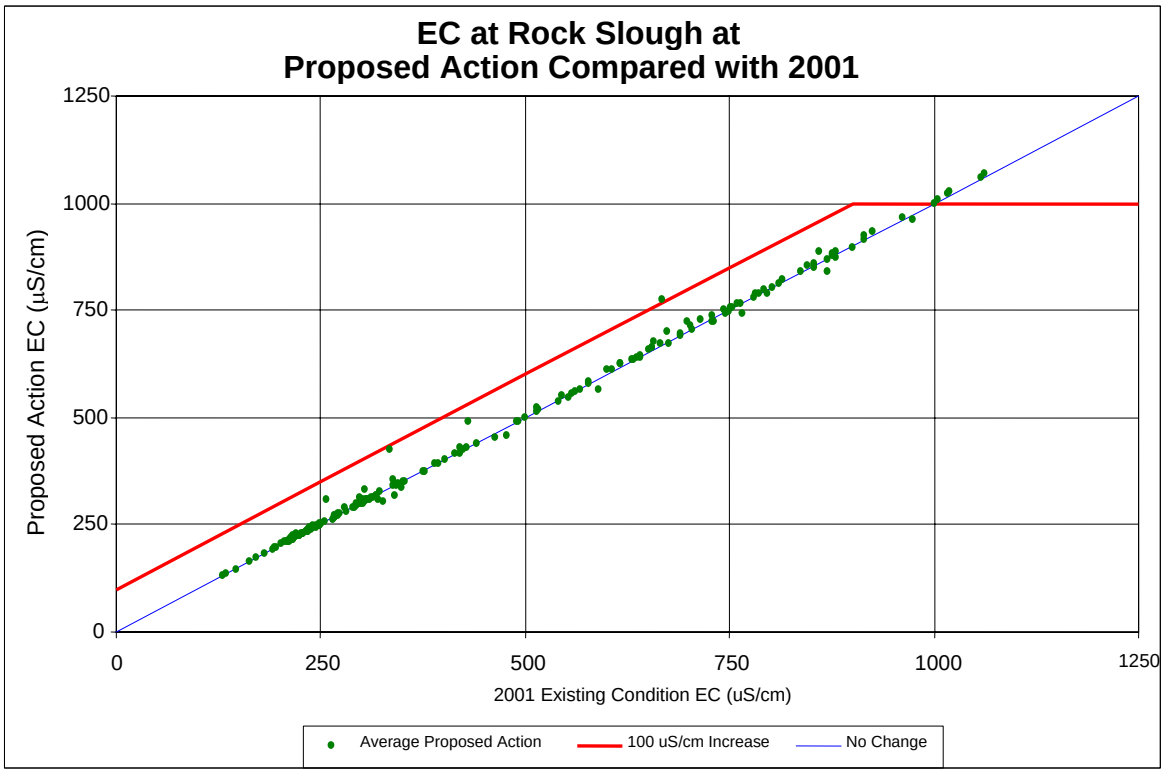
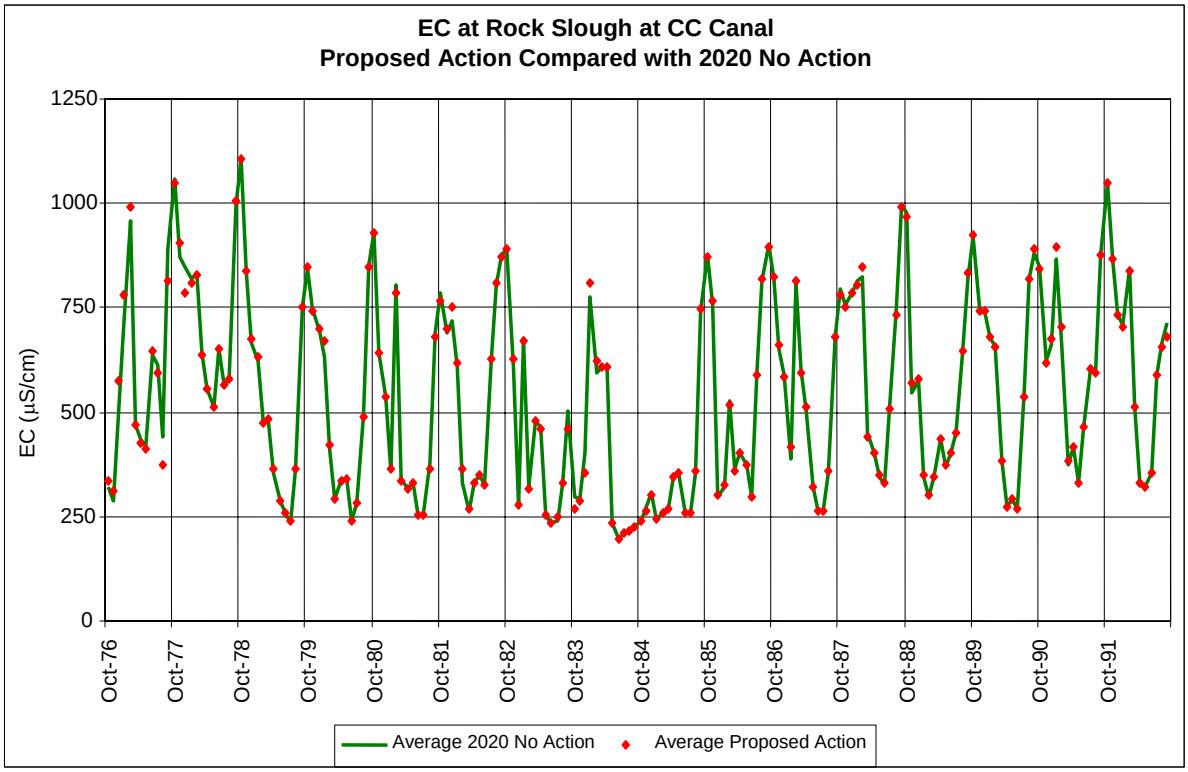


Figure 3.4-6. DSM2–Simulated EC (µS/cm) in Old River at Rock Slough for the Proposed Action and No Action (2020 LOD) Condition, 1976–1991



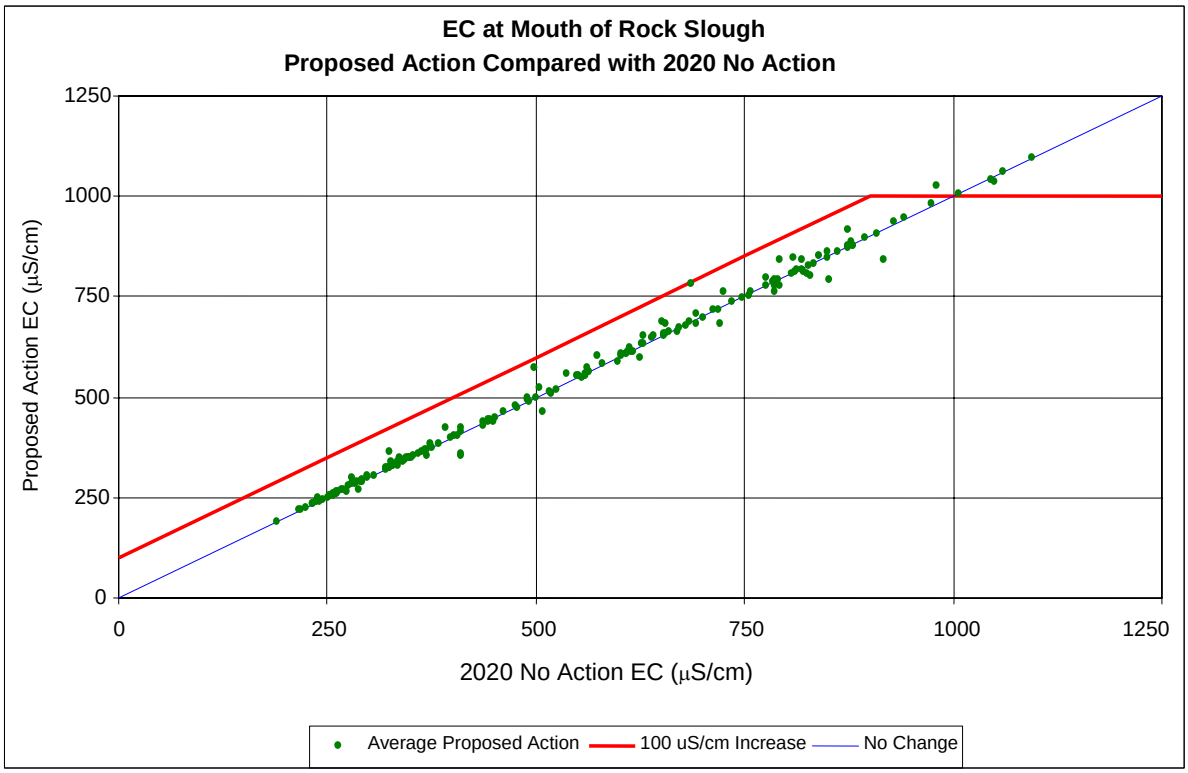
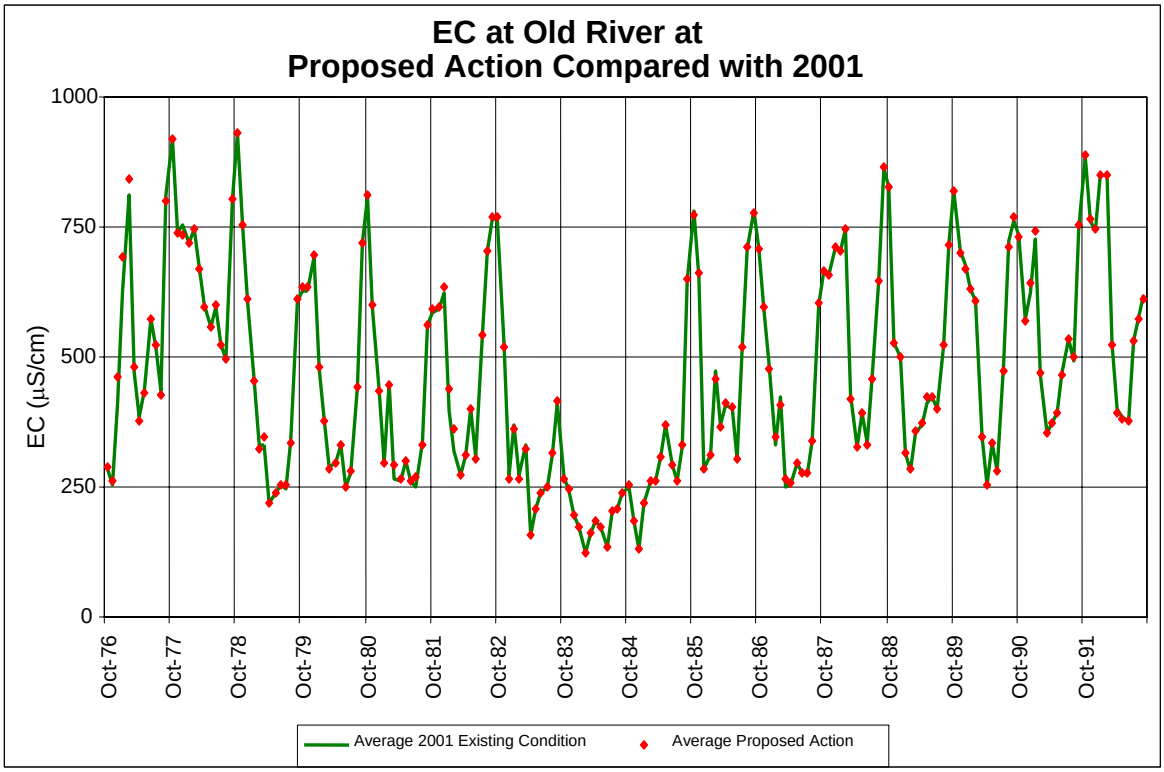


Figure 3.4-7. DSM2–Simulated EC (µS/cm) in Old River at State Route 4 for the Proposed Action and Existing Condition (2001 LOD), 1976–1991



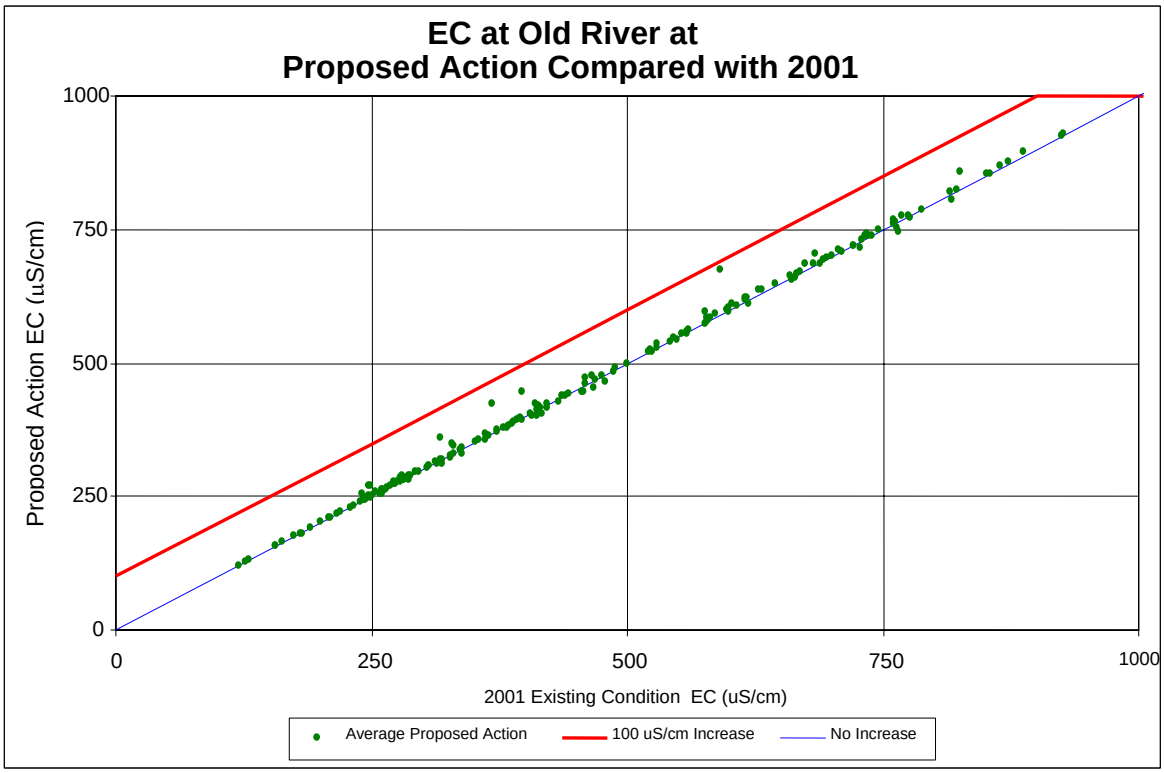
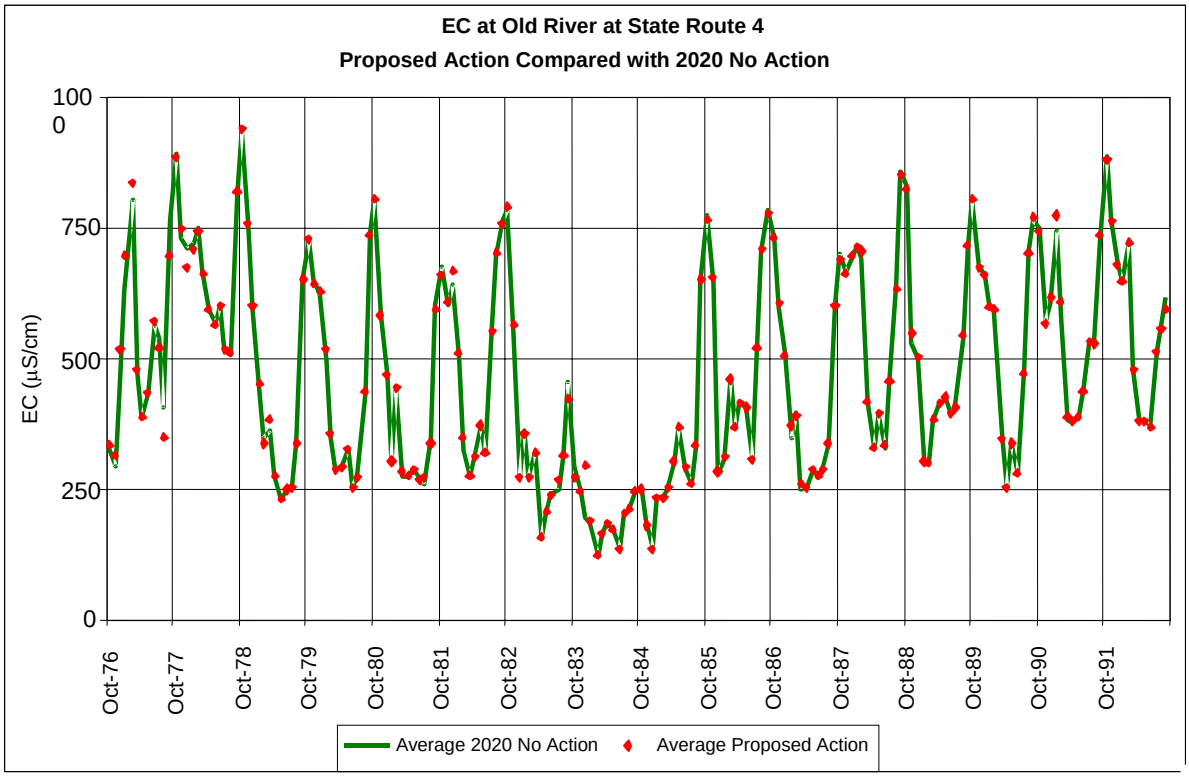


Figure 3.4-8. DSM2–Simulated EC (µS/cm) in Old River at State Route 4 for the Proposed Action and No Action (2020 LOD) Condition, 1976–1991



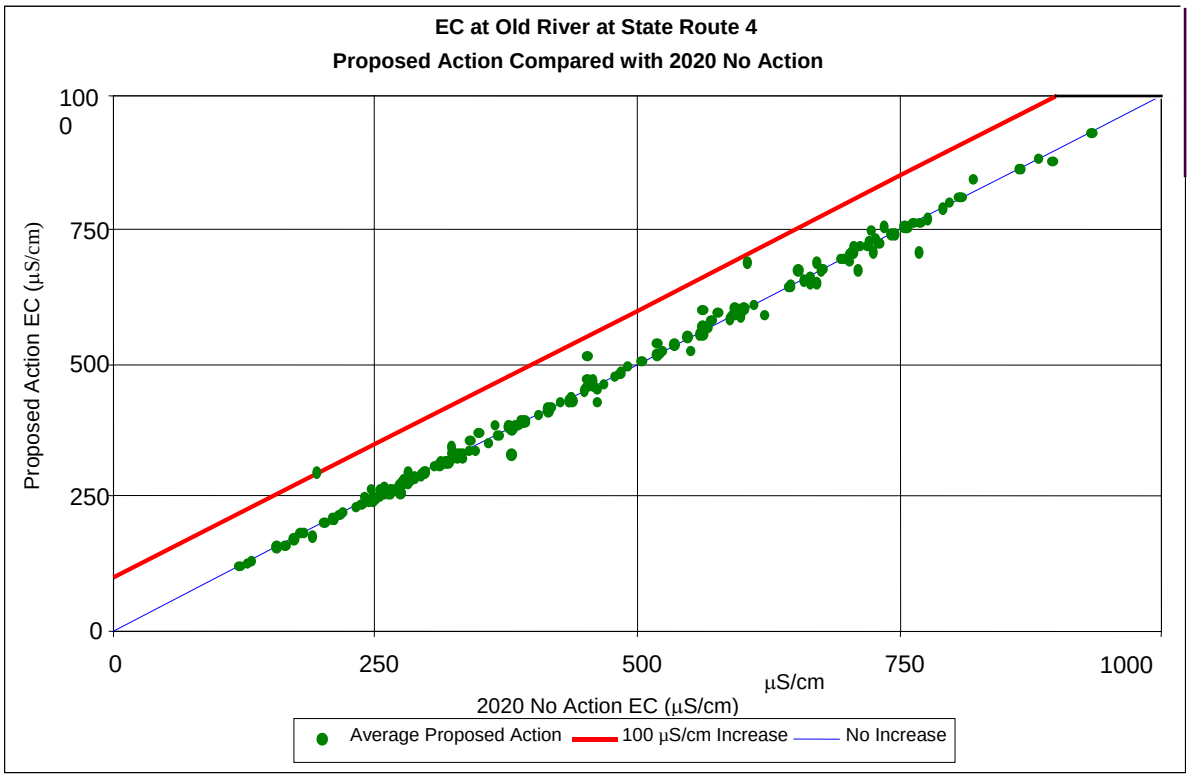
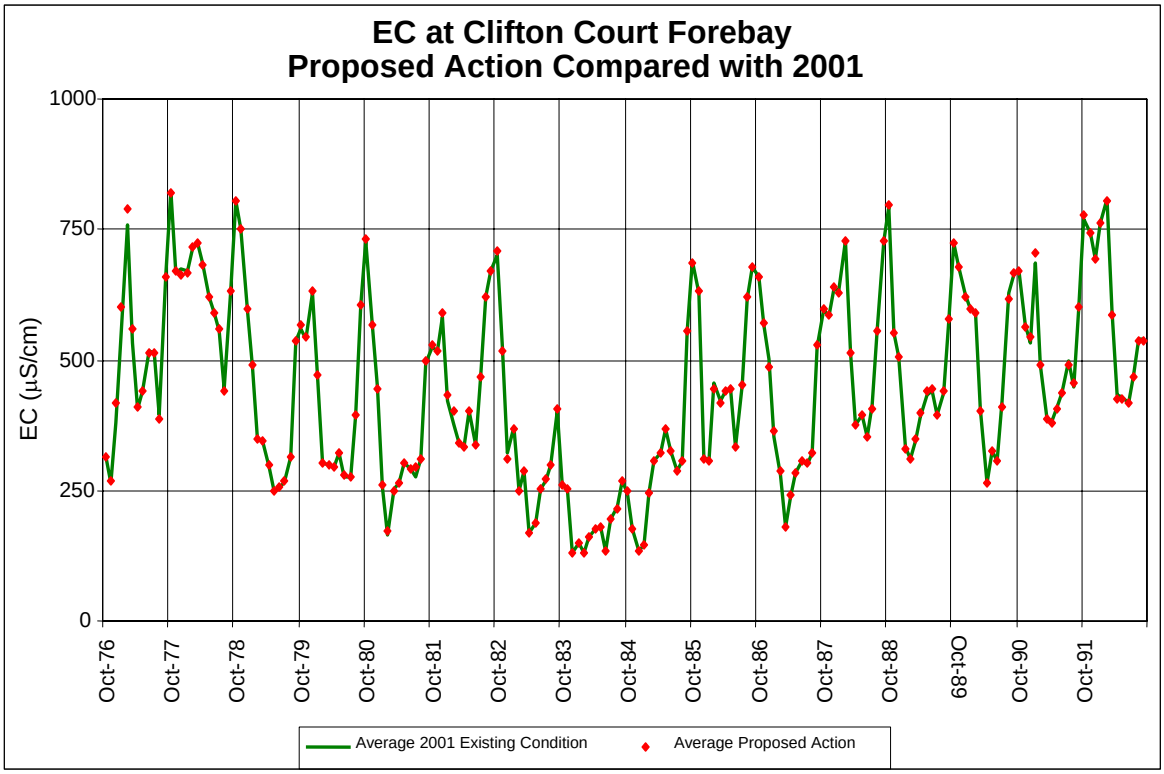


Figure 3.4-9. DSM2–Simulated EC (µS/cm) at Clifton Court Ferry (SWP Banks) for the Proposed Action and Existing Condition (2001 LOD), 1976–1991



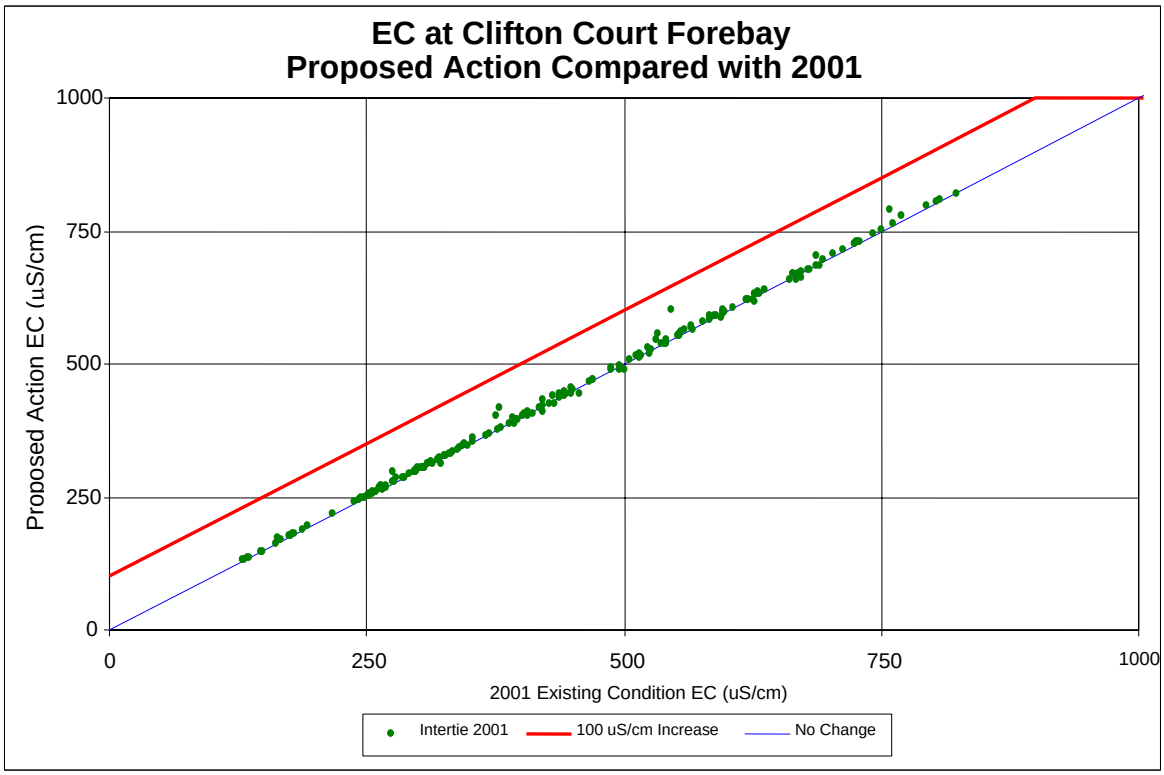
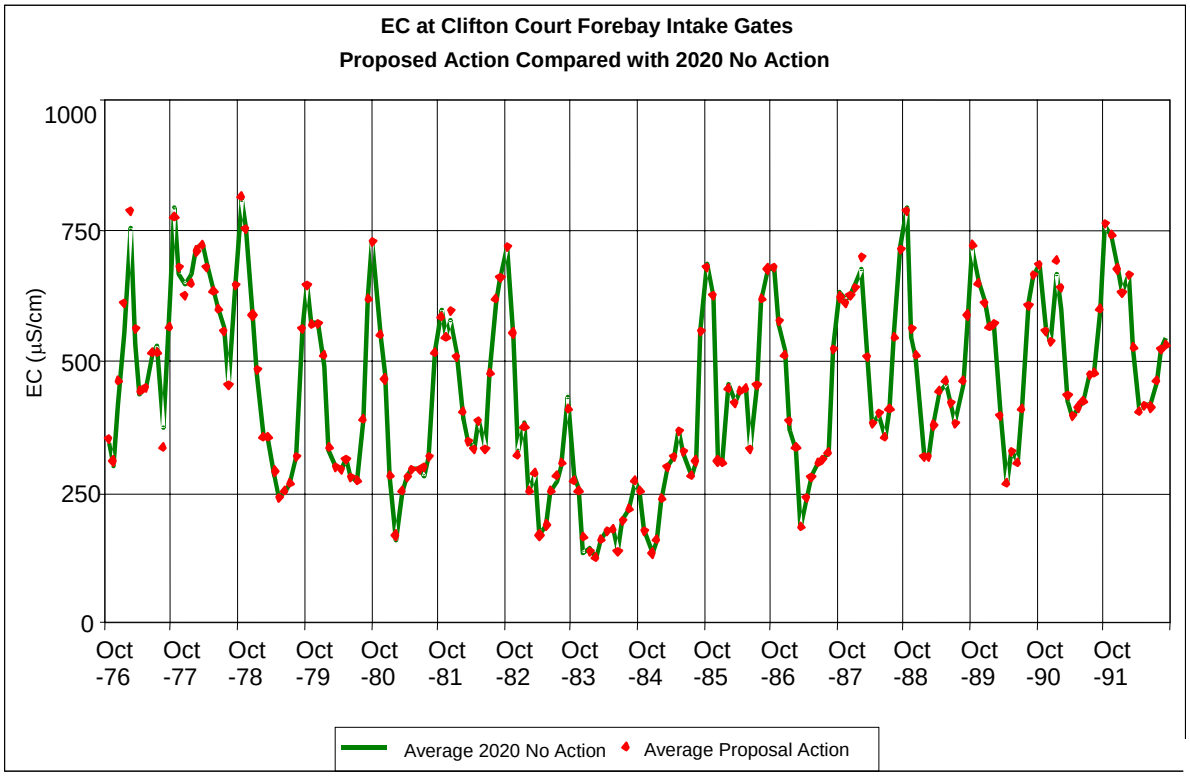


Figure 3.4-10. DSM2–Simulated EC (µS/cm) at Clifton Court Ferry (SWP Banks) for the Proposed Action and No Action (2020 LOD) Condition, 1976–1991



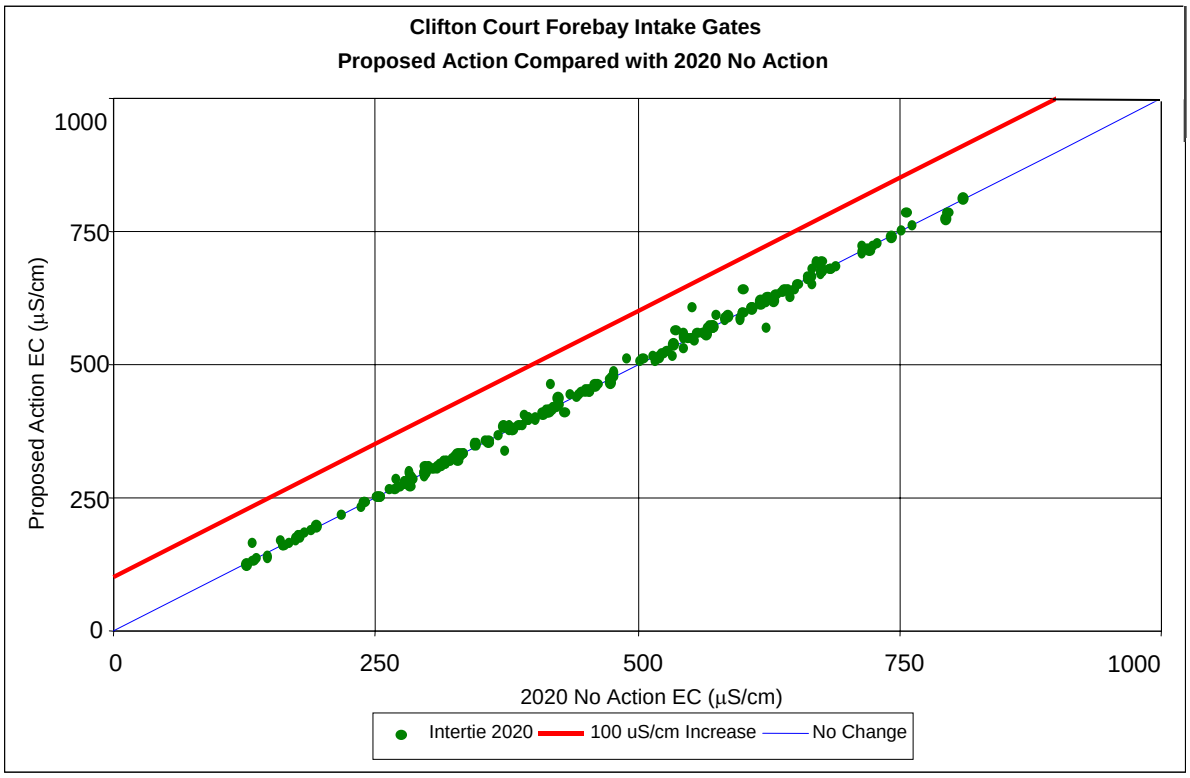
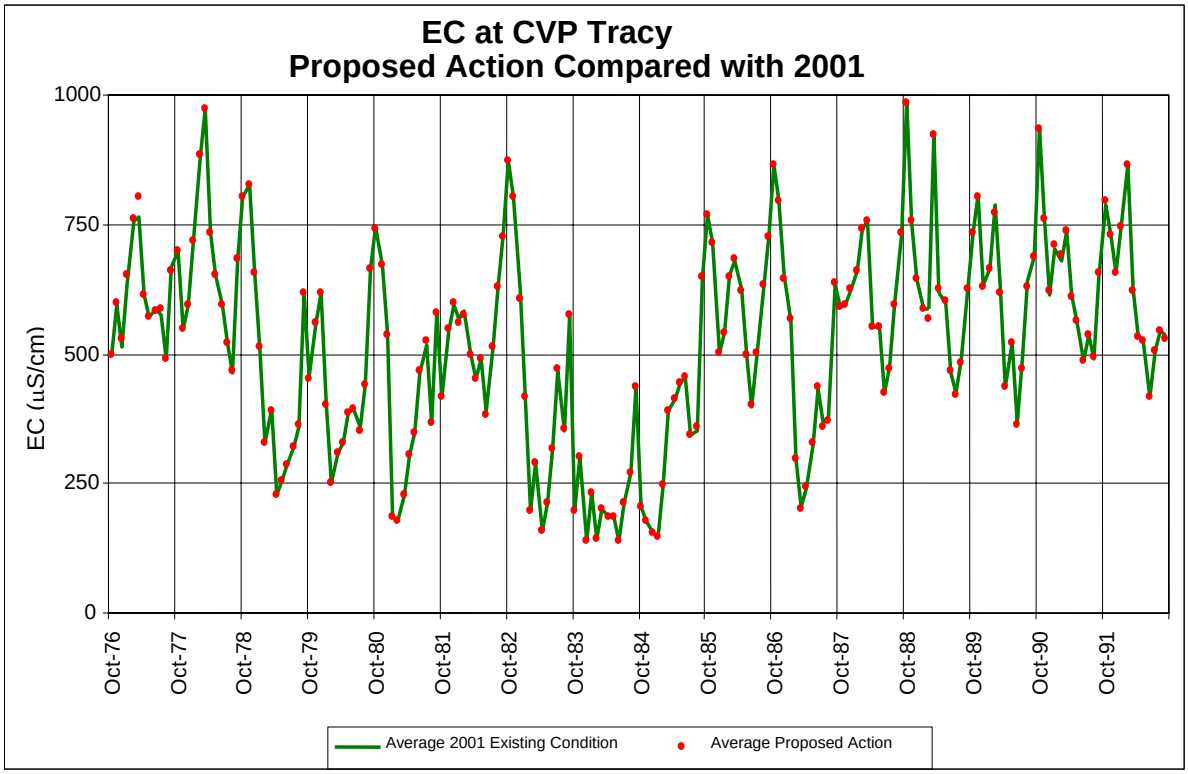


Figure 3.4-11. DSM2–Simulated EC (µS/cm) at CVP Tracy Pumping Plant for the Proposed Action and Existing Condition (2001 LOD), 1976–1991



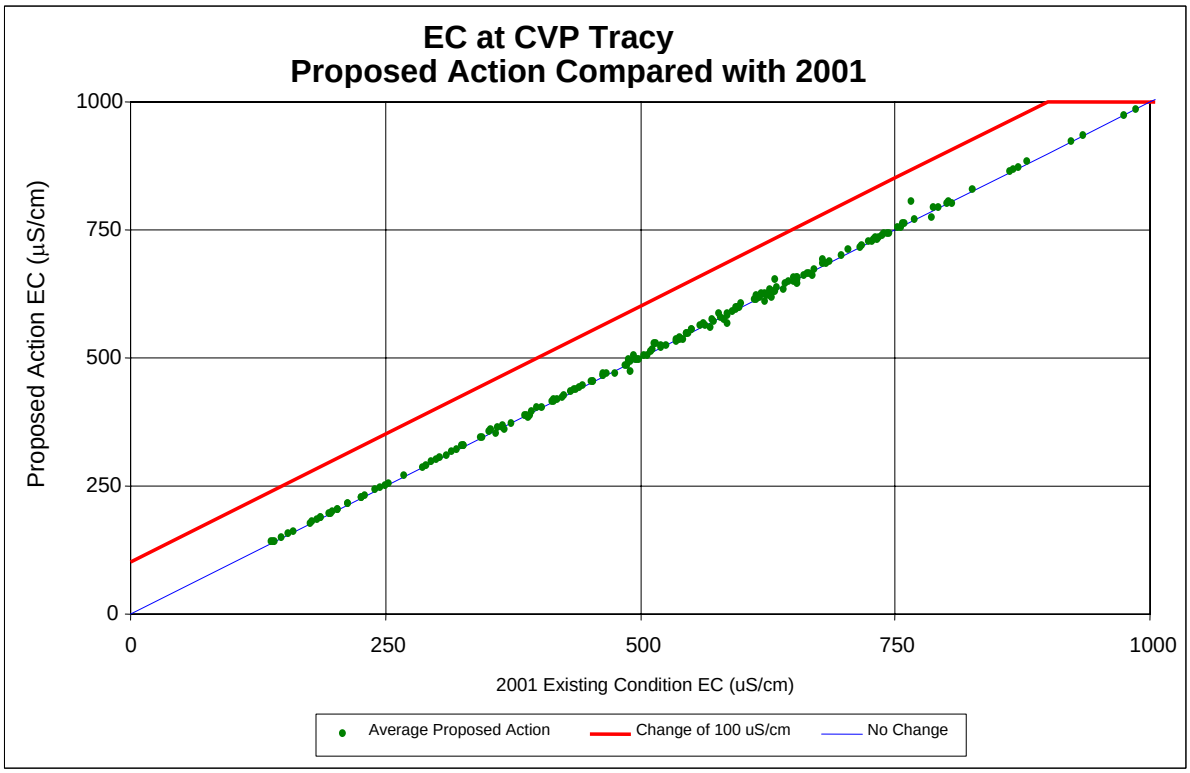
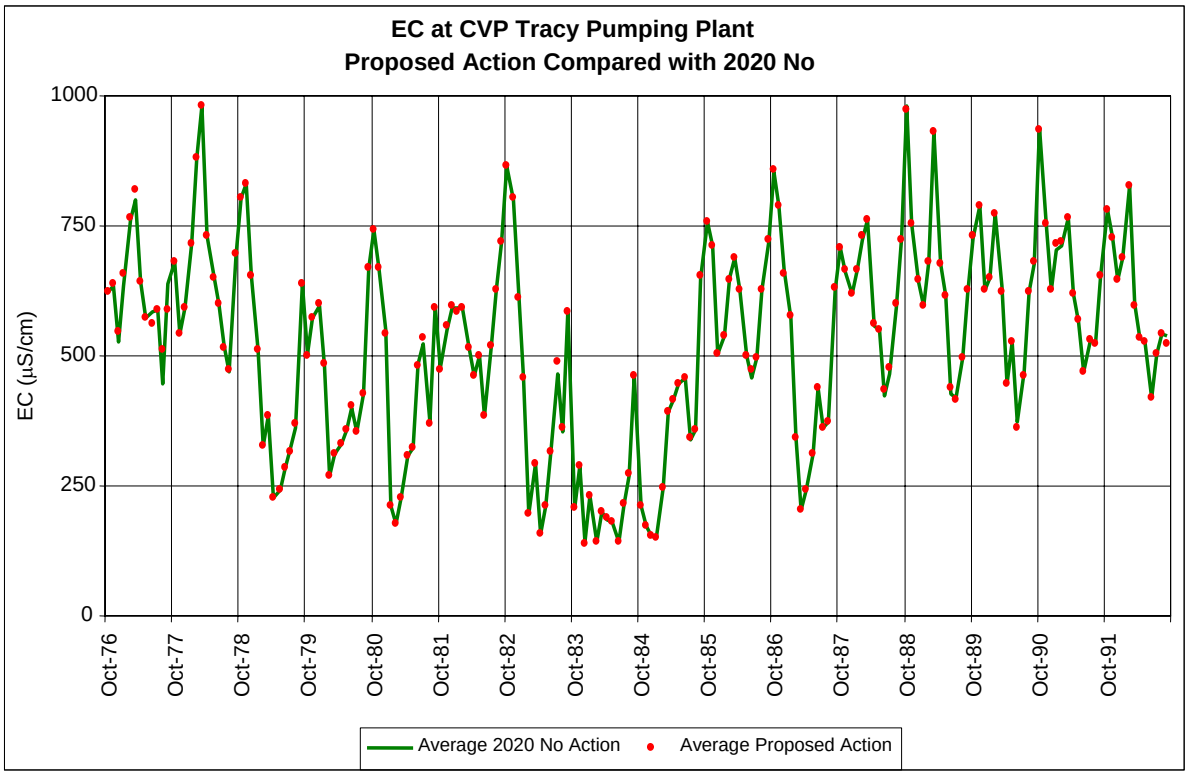


Figure 3.4-12. DSM2–Simulated EC (µS/cm) at CVP Tracy Pumping Plant for the Proposed Action and No Action (2020 LOD) Condition, 1976–1991



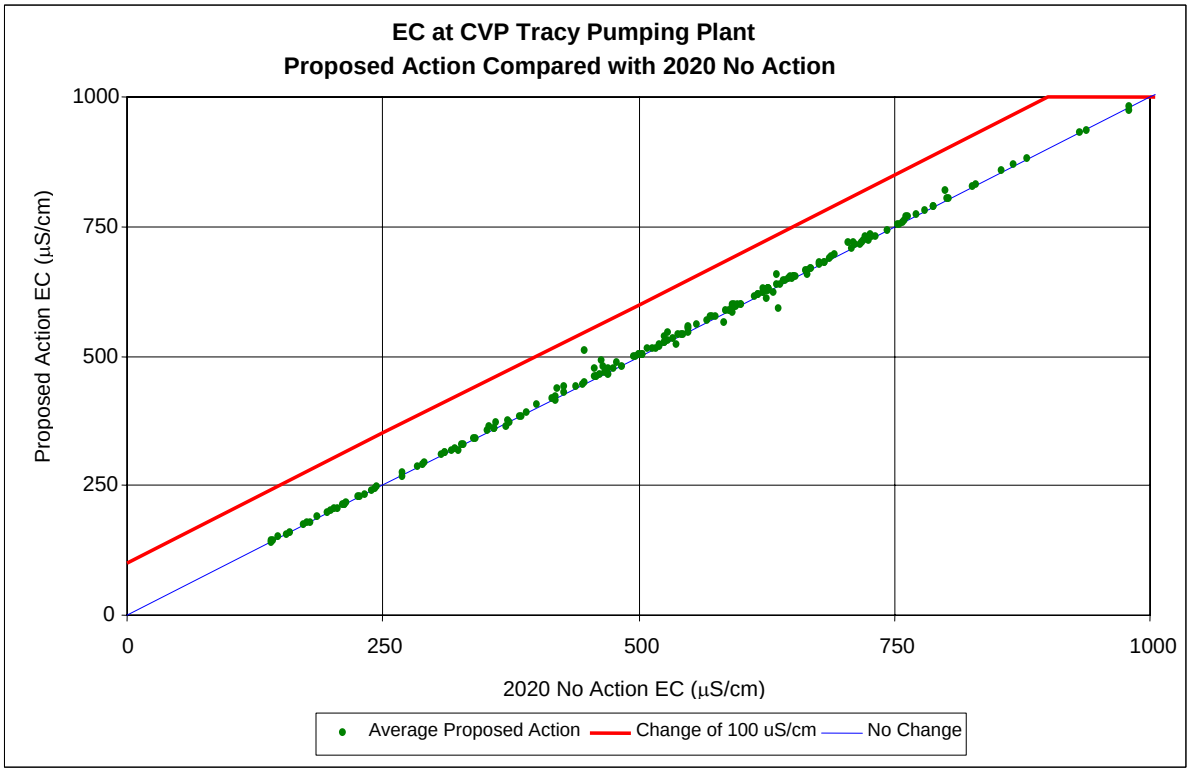
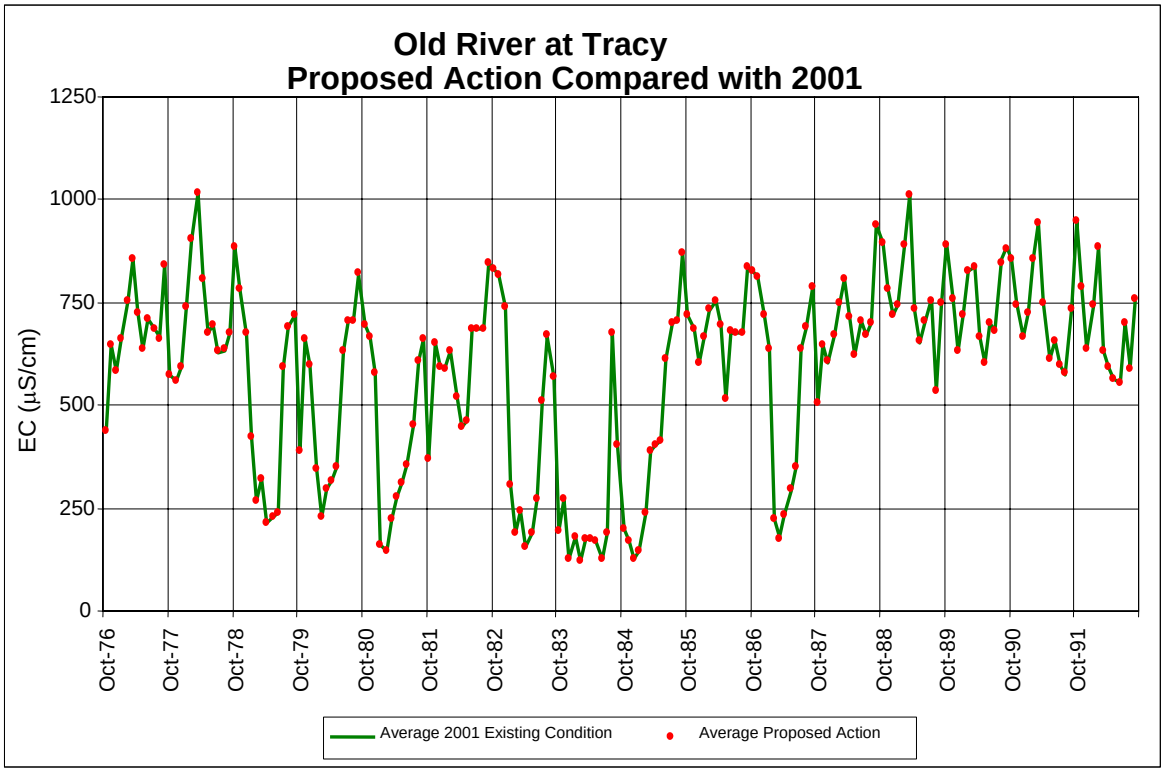


Figure 3.4-13. DSM2–Simulated EC (µS/cm) in Old River at Tracy Boulevard Bridge for the Proposed Action and Existing Condition (2001 LOD), 1976–1991



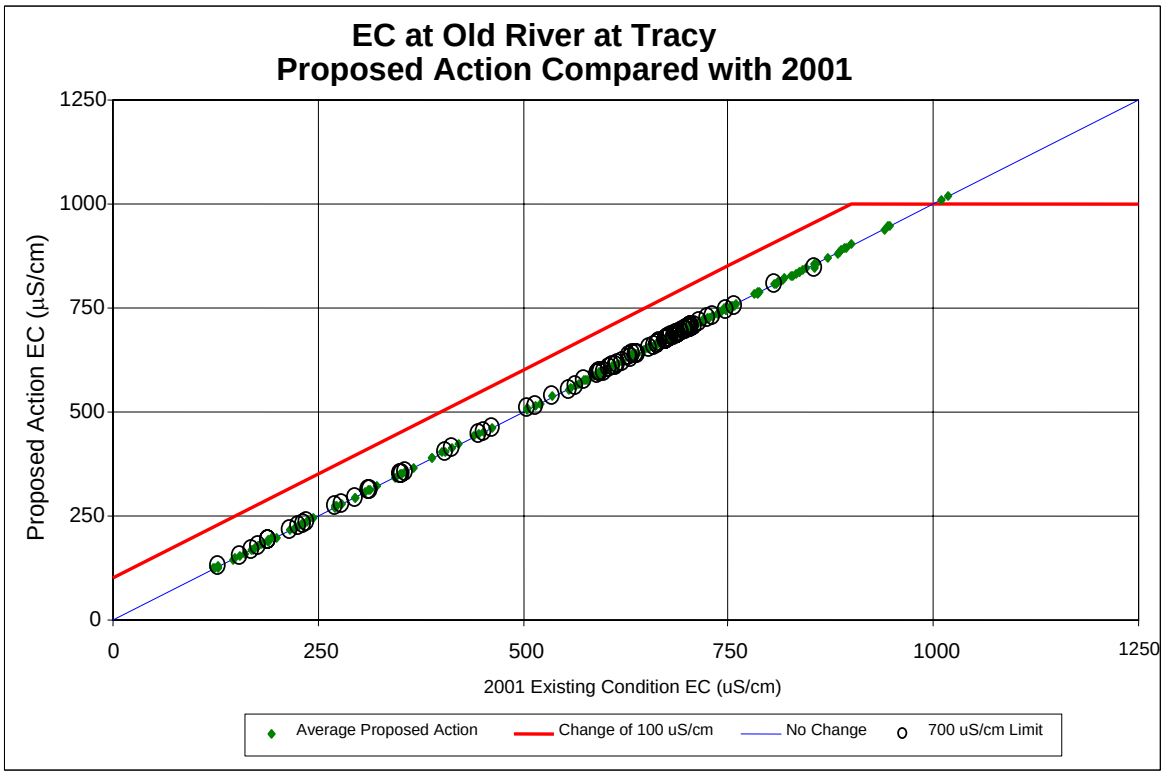
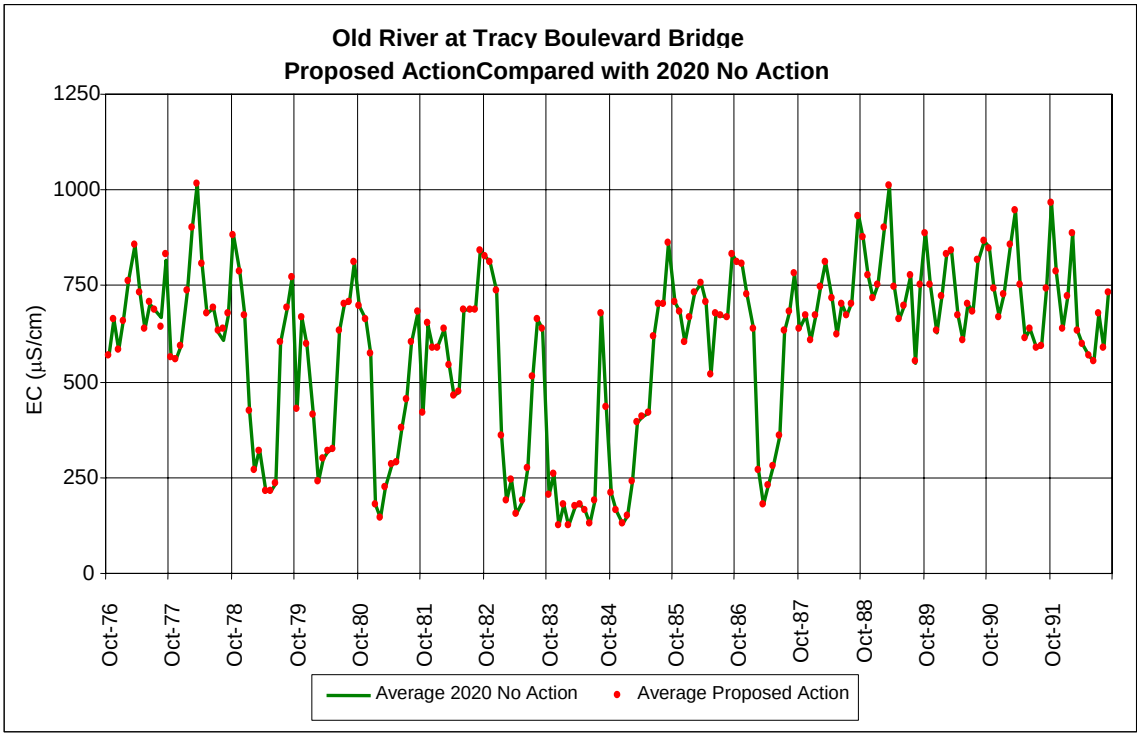


Figure 3.4-14. DSM2–Simulated EC (µS/cm) in Old River at Tracy Boulevard Bridge for the Proposed Action and No Action (2020 LOD) Condition, 1976–1991



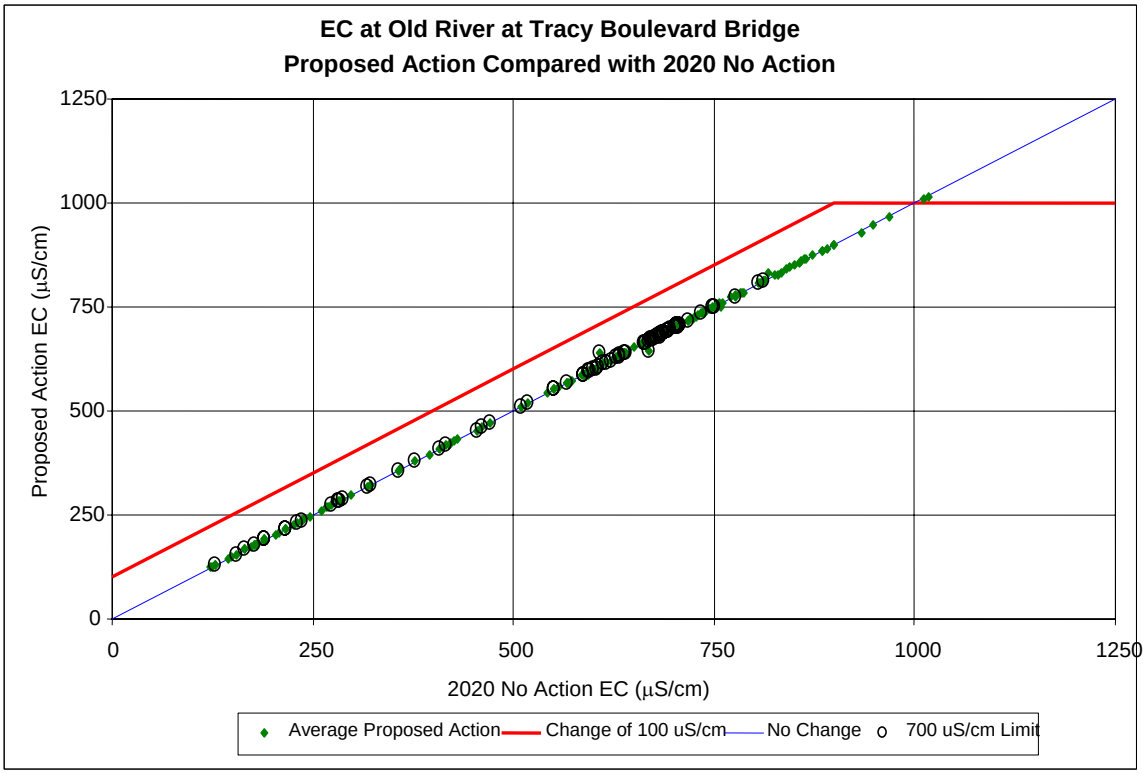
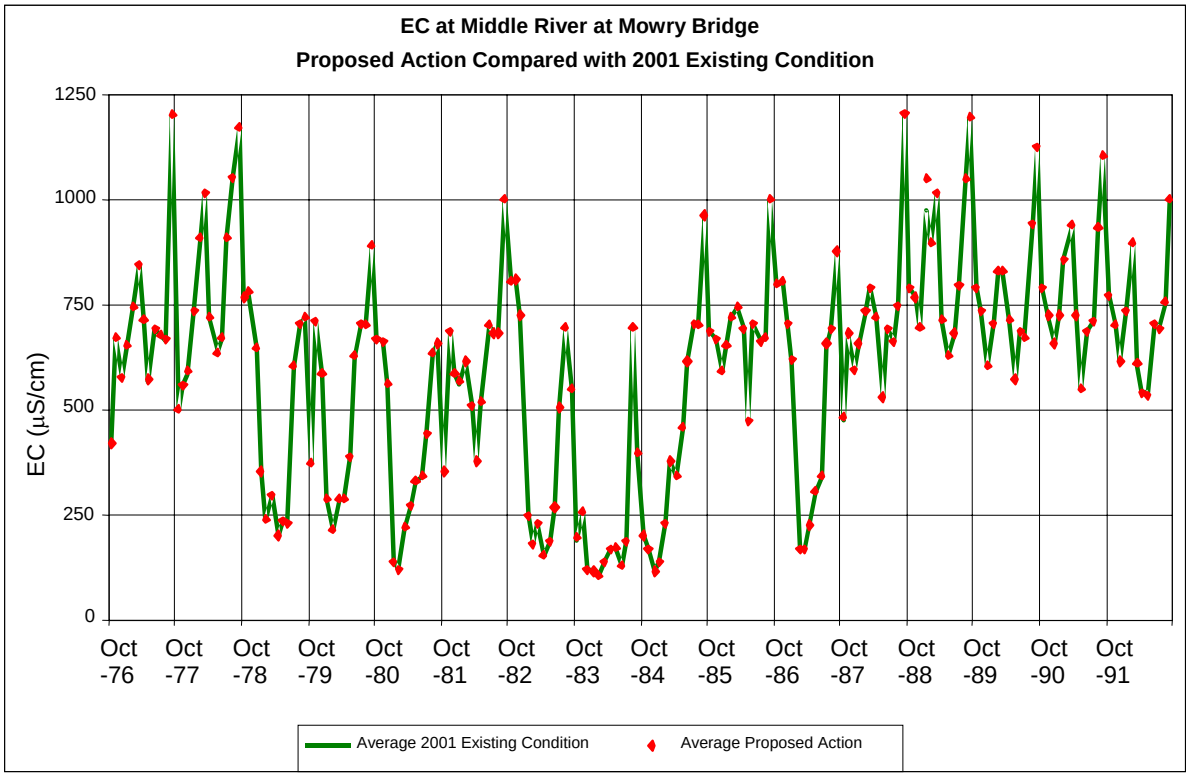


Figure 3.4-15. DSM2–Simulated EC (µS/cm) in Middle River at Mowry Bridge for the Proposed Action and Existing Condition (2001 LOD), 1976–1991



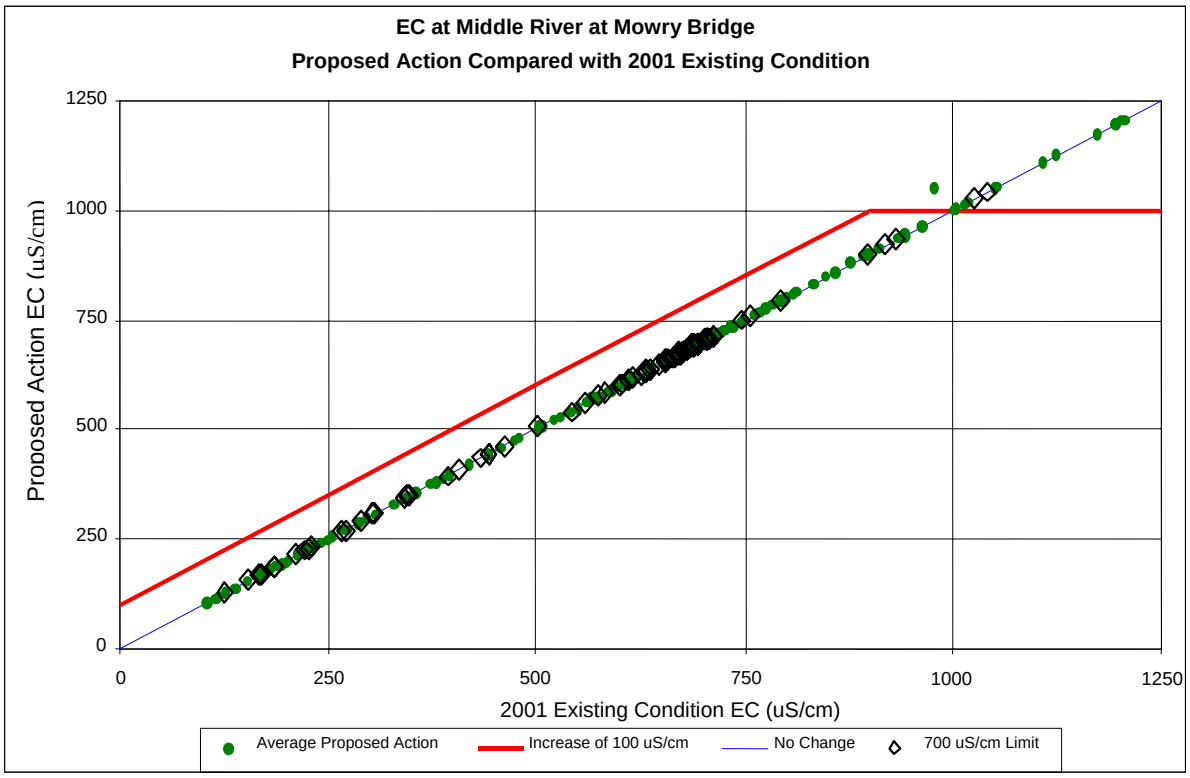
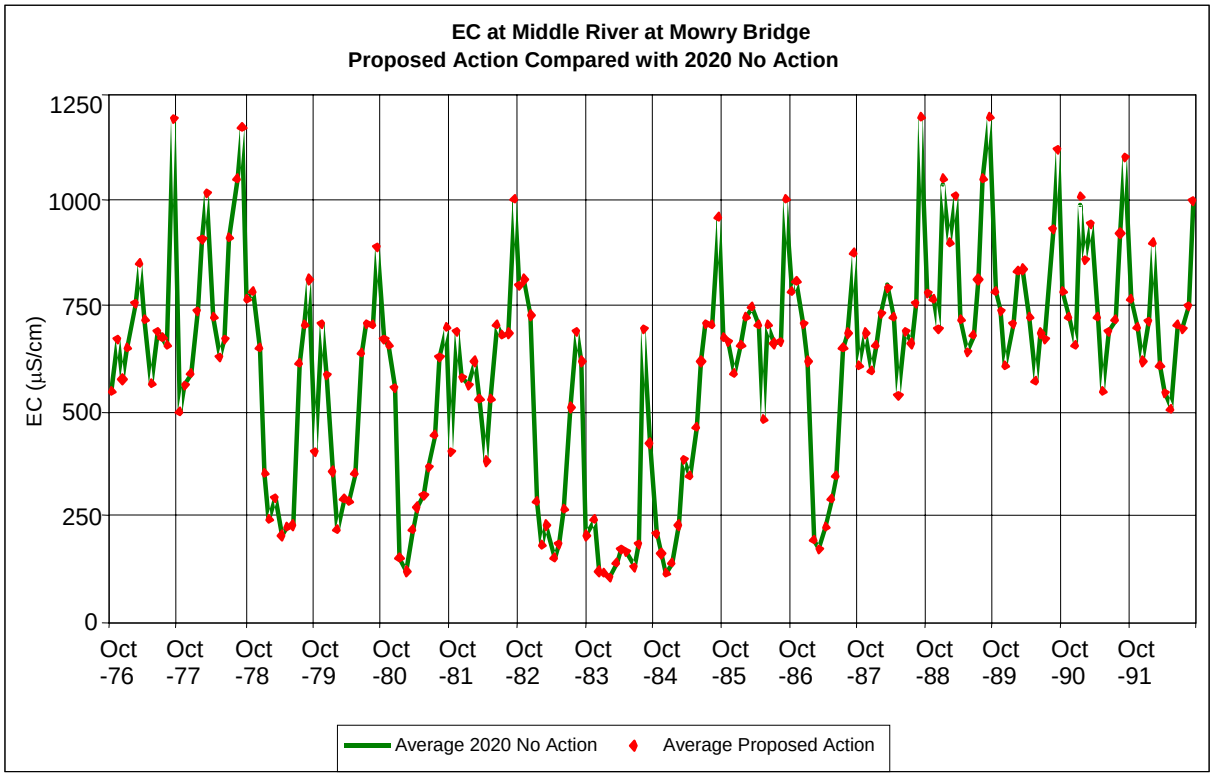


Figure 3.4-16. DSM2–Simulated EC (µS/cm) in Middle River at Mowry Bridge for the Proposed Action and No Action (2020 LOD) Condition, 1976–1991



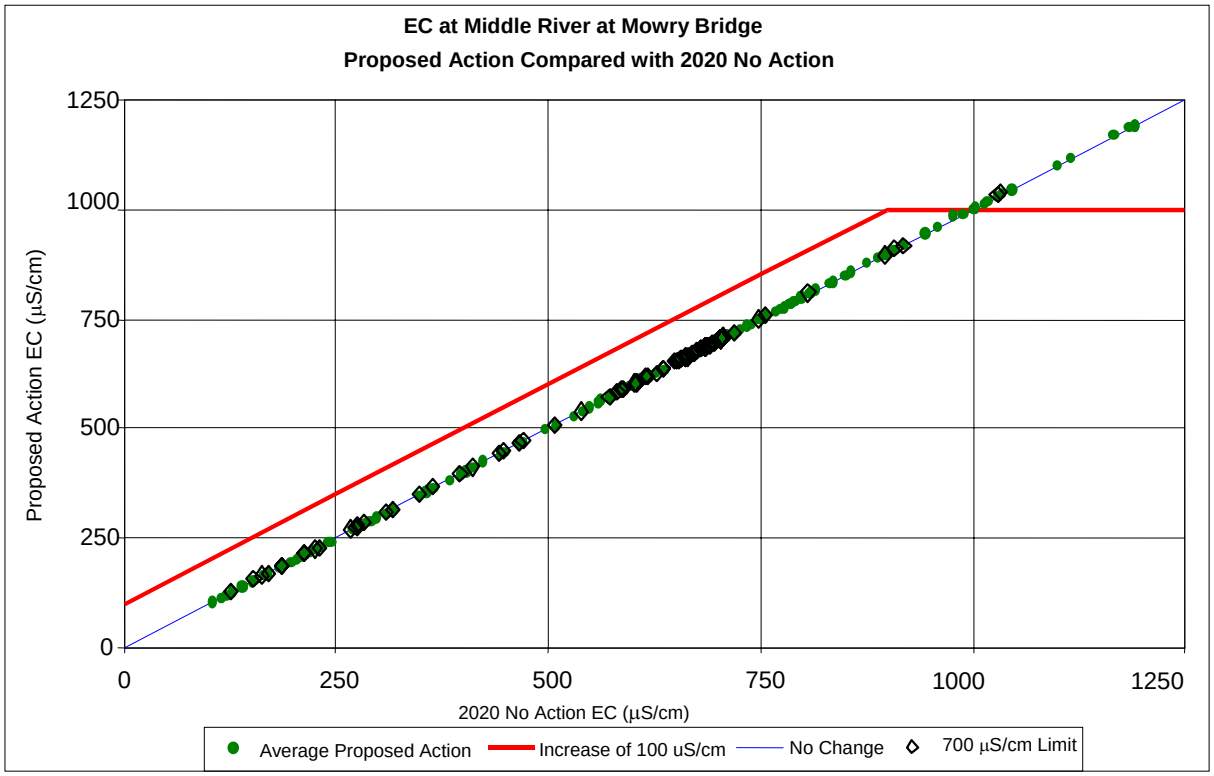
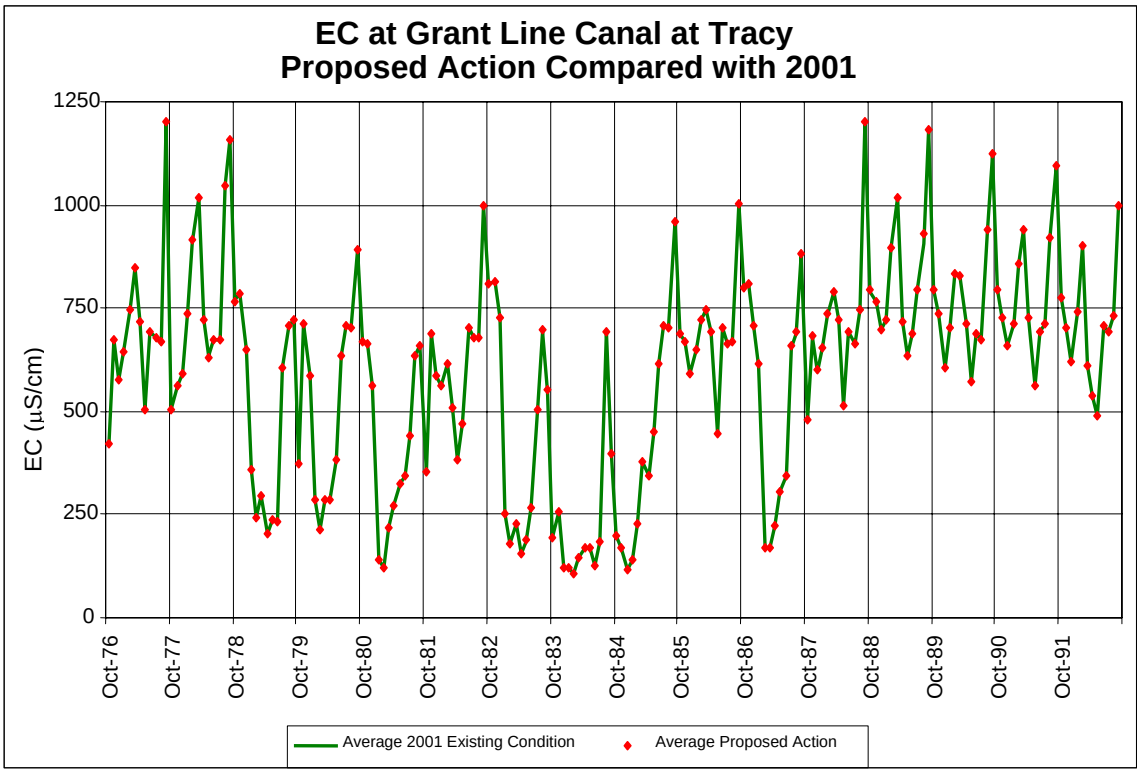


Figure 3.4-17. DSM2–Simulated EC (µS/cm) in Grant Line Canal at Tracy Boulevard Bridge for the Proposed Action and Existing Condition (2001 LOD), 1976–1991



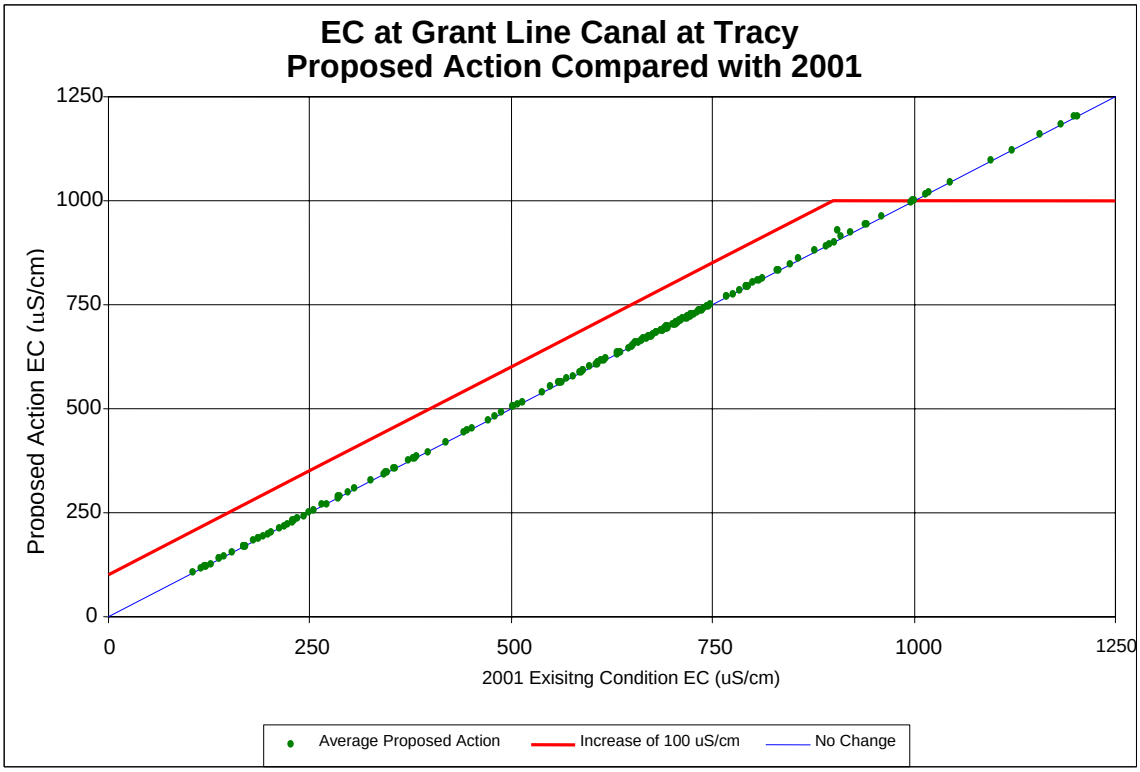
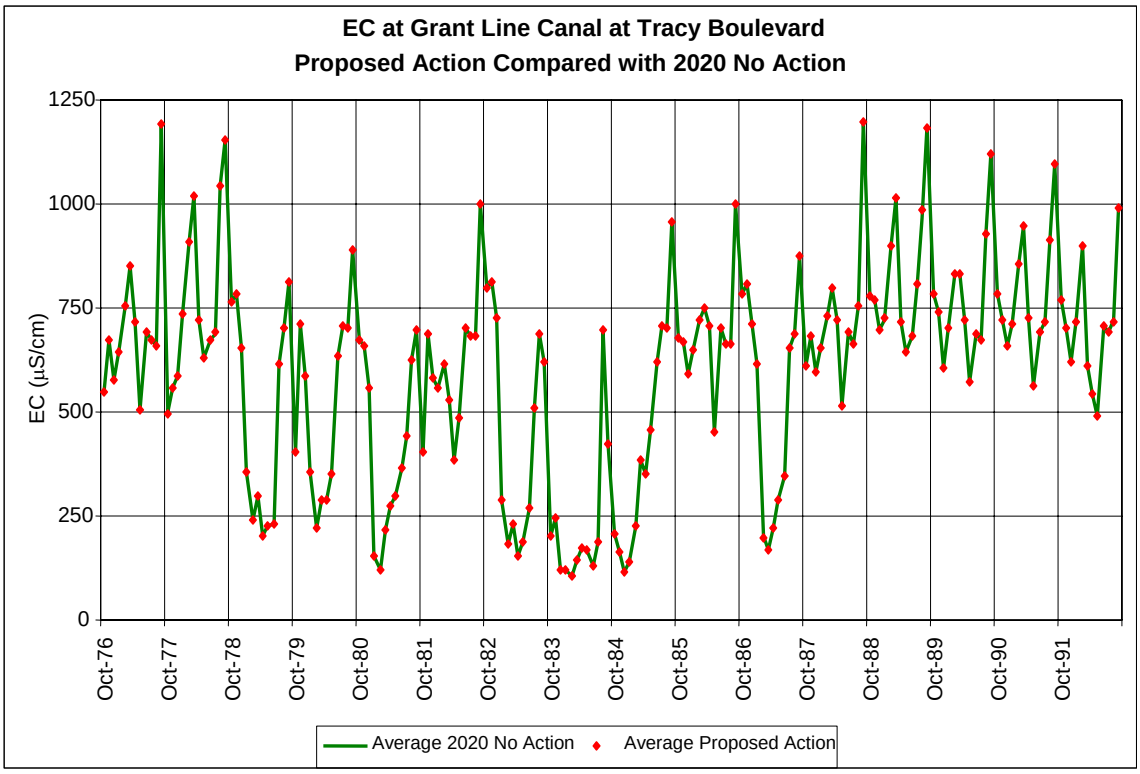


Figure 3.4-18. DSM2–Simulated EC (µS/cm) in Grant Line Canal at Tracy Boulevard Bridge for the Proposed Action and No Action (2020 LOD) Condition, 1976–1991



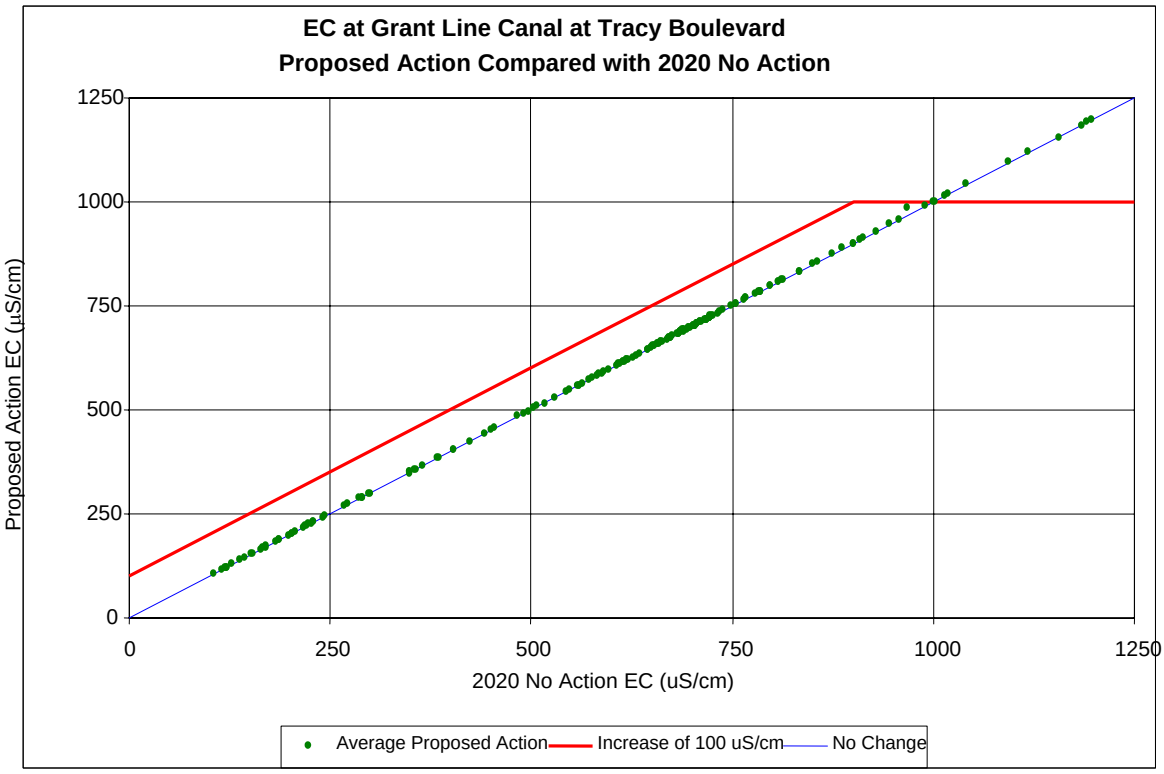
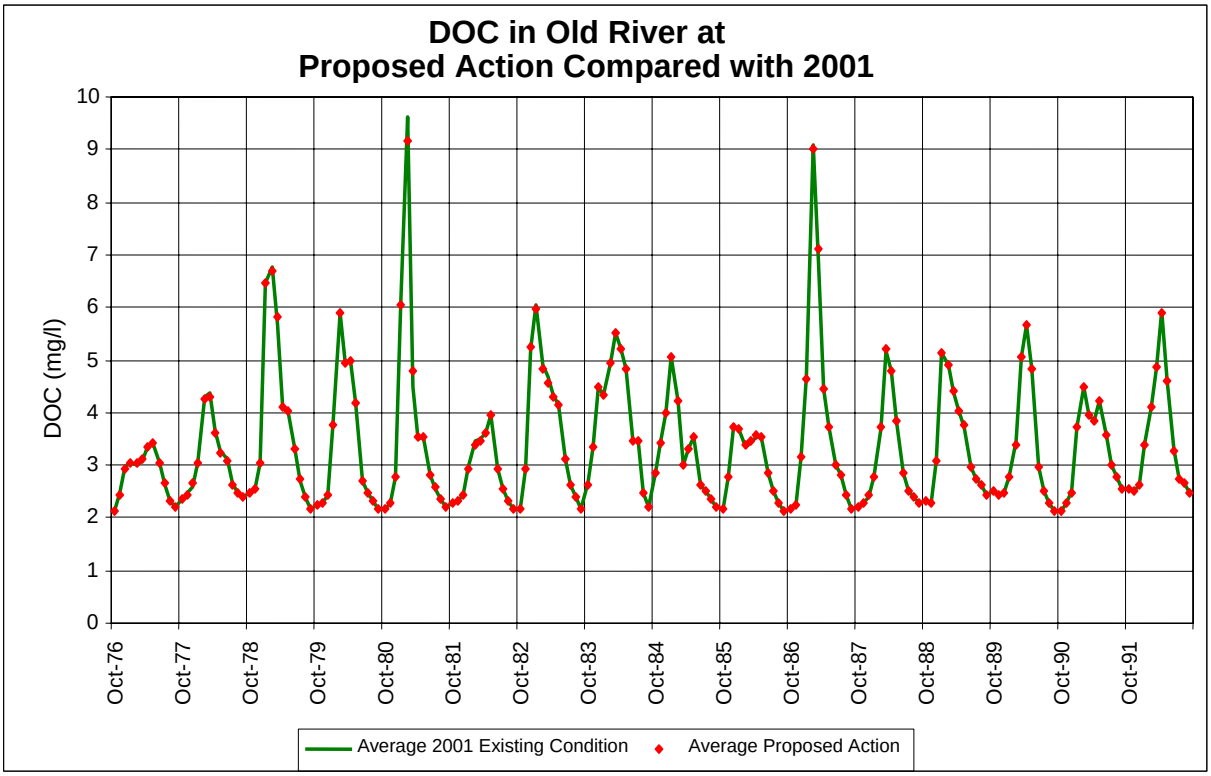


Figure 3.4-19. DSM2–Simulated DOC (mg/l) in Old River at Rock Slough for the Proposed Action and Existing Condition (2001 LOD), 1976–1991



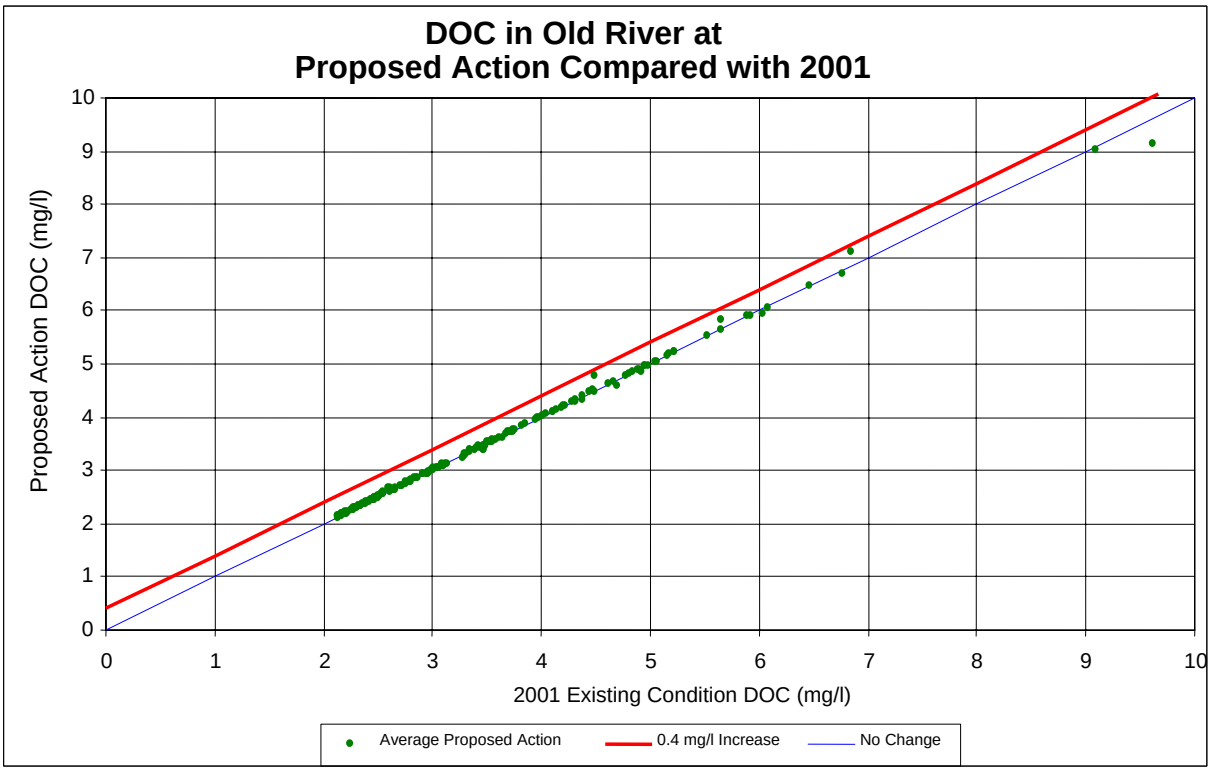
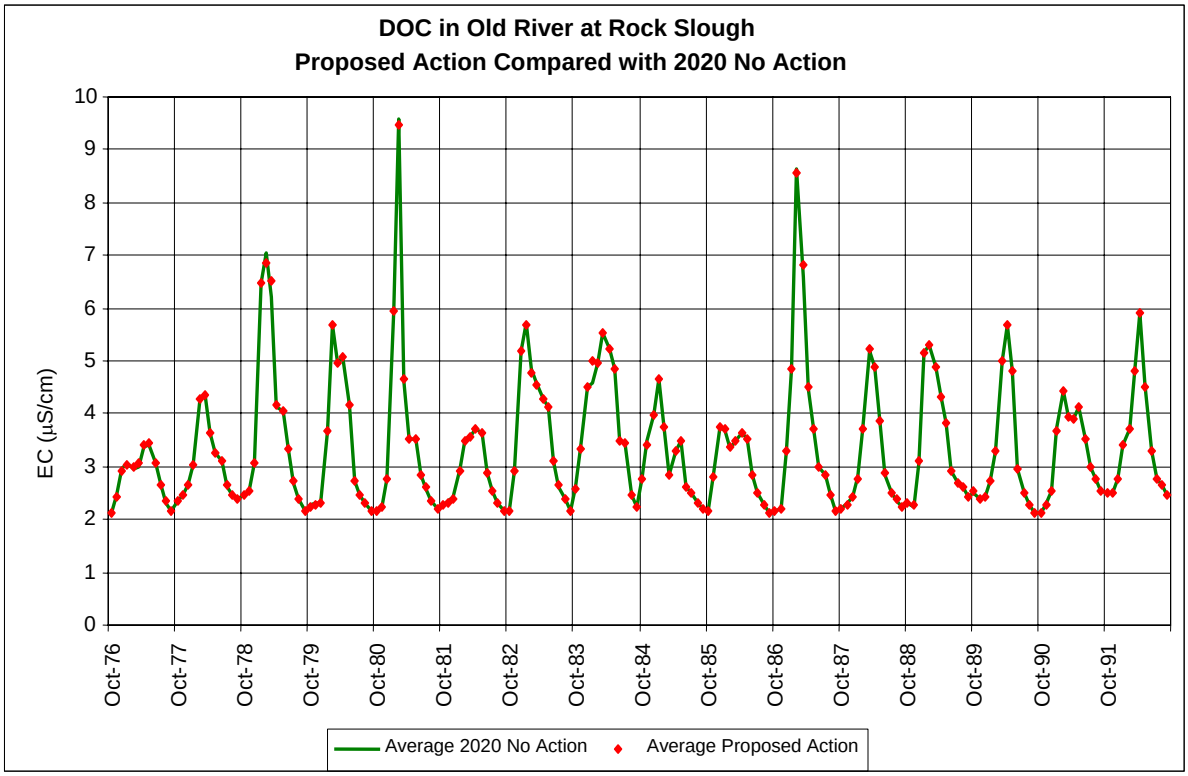


Figure 3.4-20. DSM2–Simulated DOC (mg/l) in Old River at Rock Slough for the Proposed Action and No Action (2020 LOD) Condition, 1976–1991



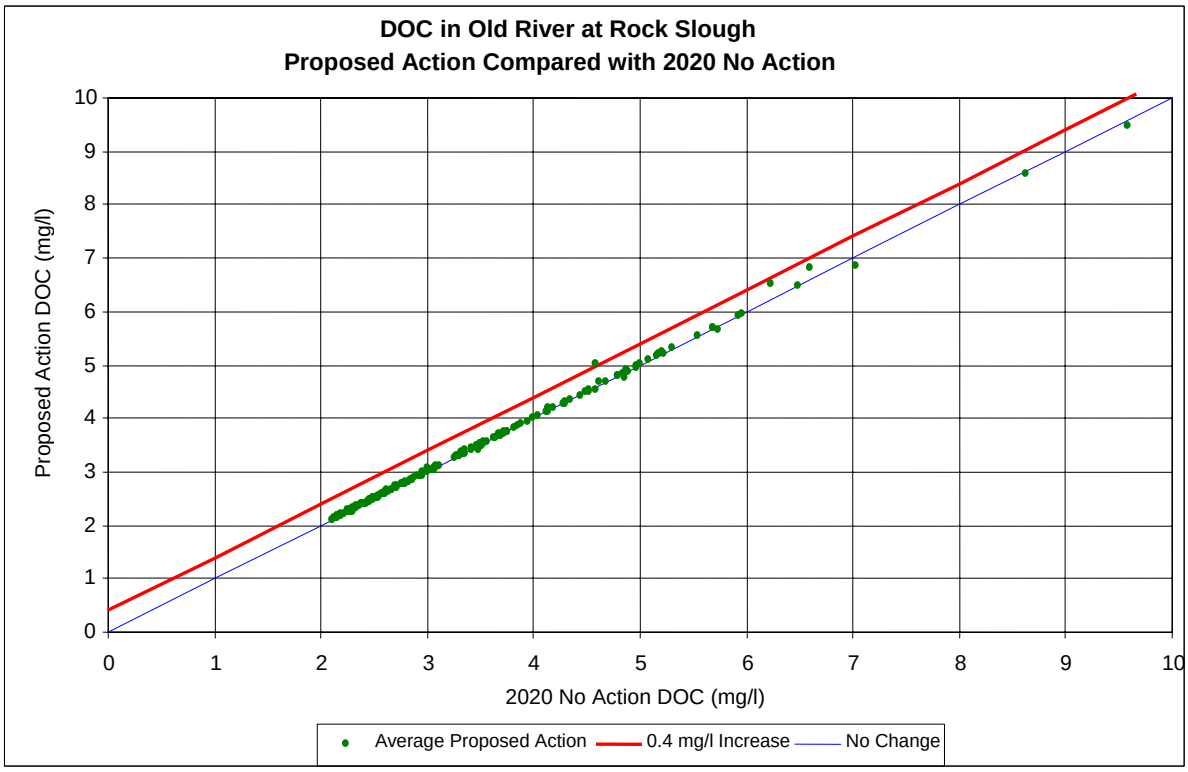
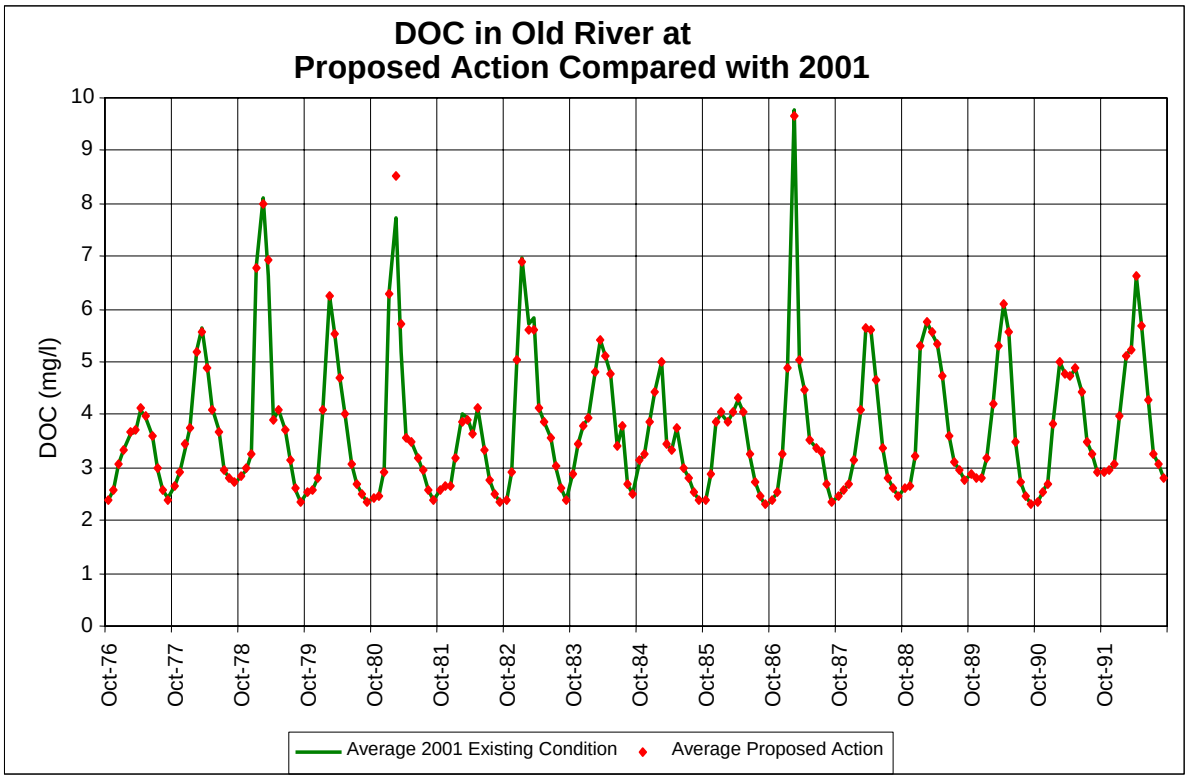


Figure 3.4-21. DSM2–Simulated DOC (mg/l) in Old River at State Route 4 Bridge (Los Vaqueros Intake) for the Proposed Action and Existing Condition (2001 LOD), 1976–1991



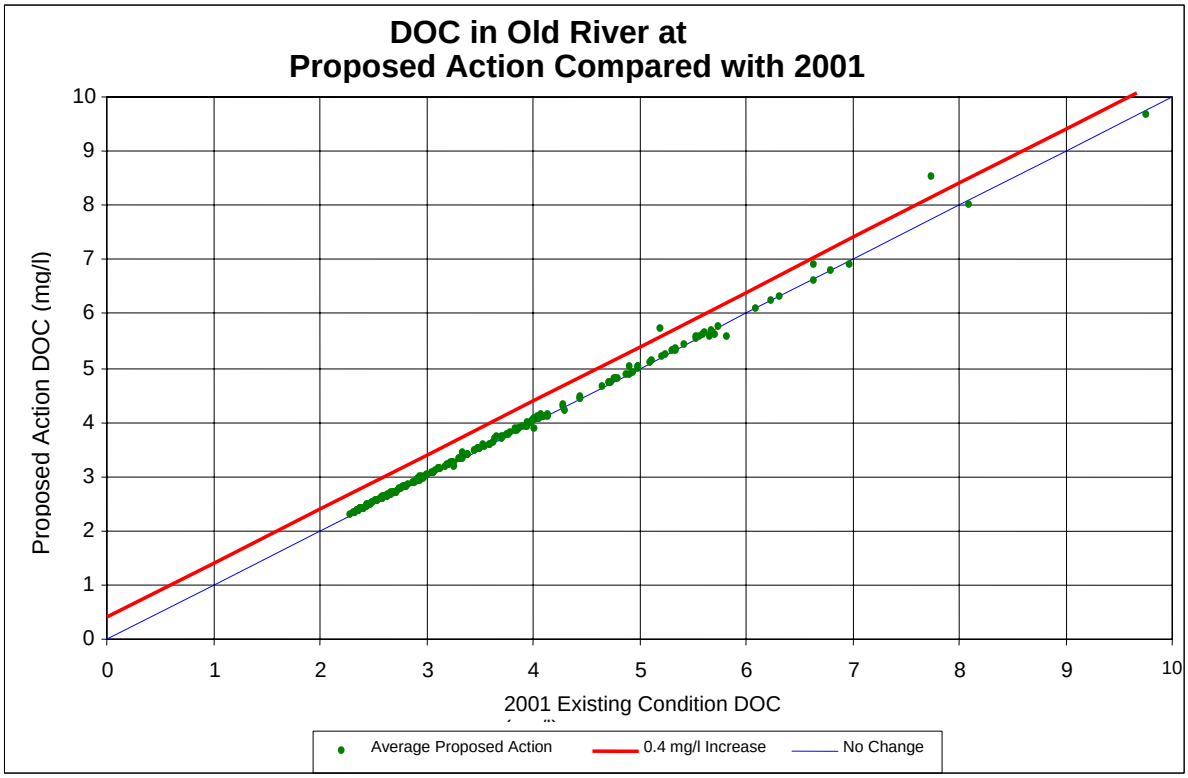
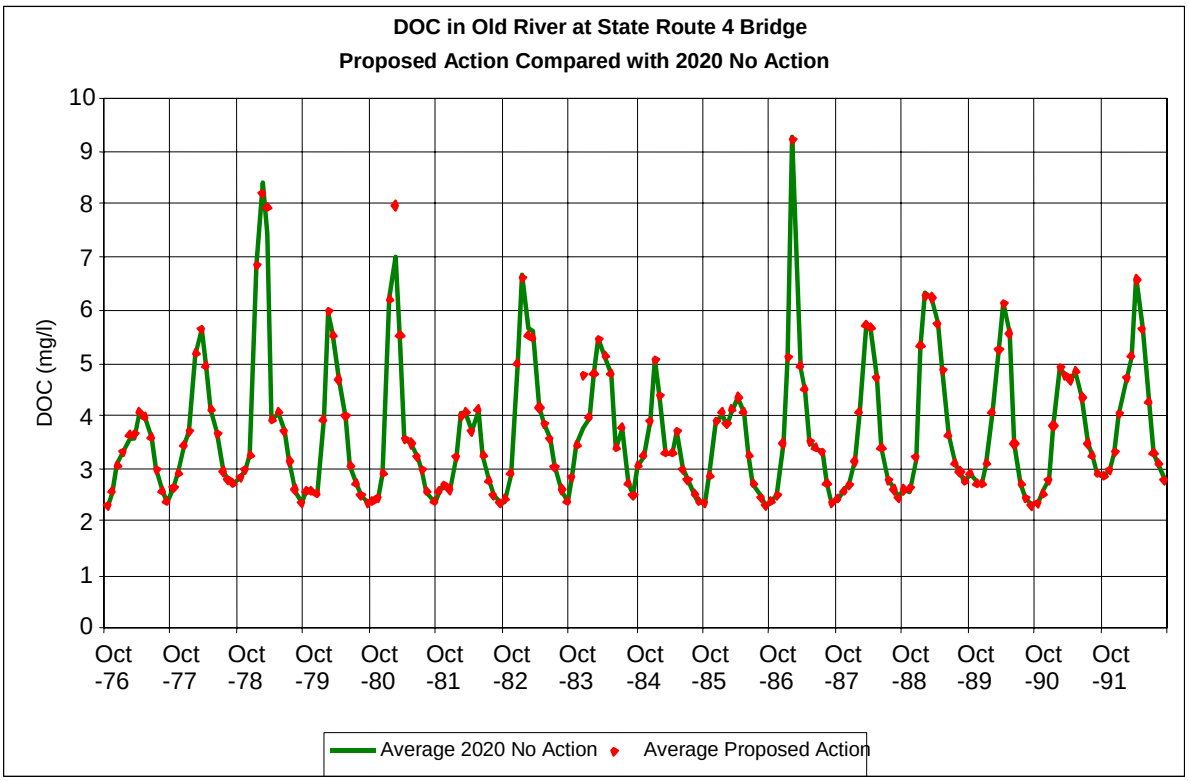


Figure 3.4-22. DSM2–Simulated DOC (mg/l) in Old River at State Route 4 Bridge (Los Vaqueros Intake) for the Proposed Action and No Action (2020 LOD) Condition, 1976–1991



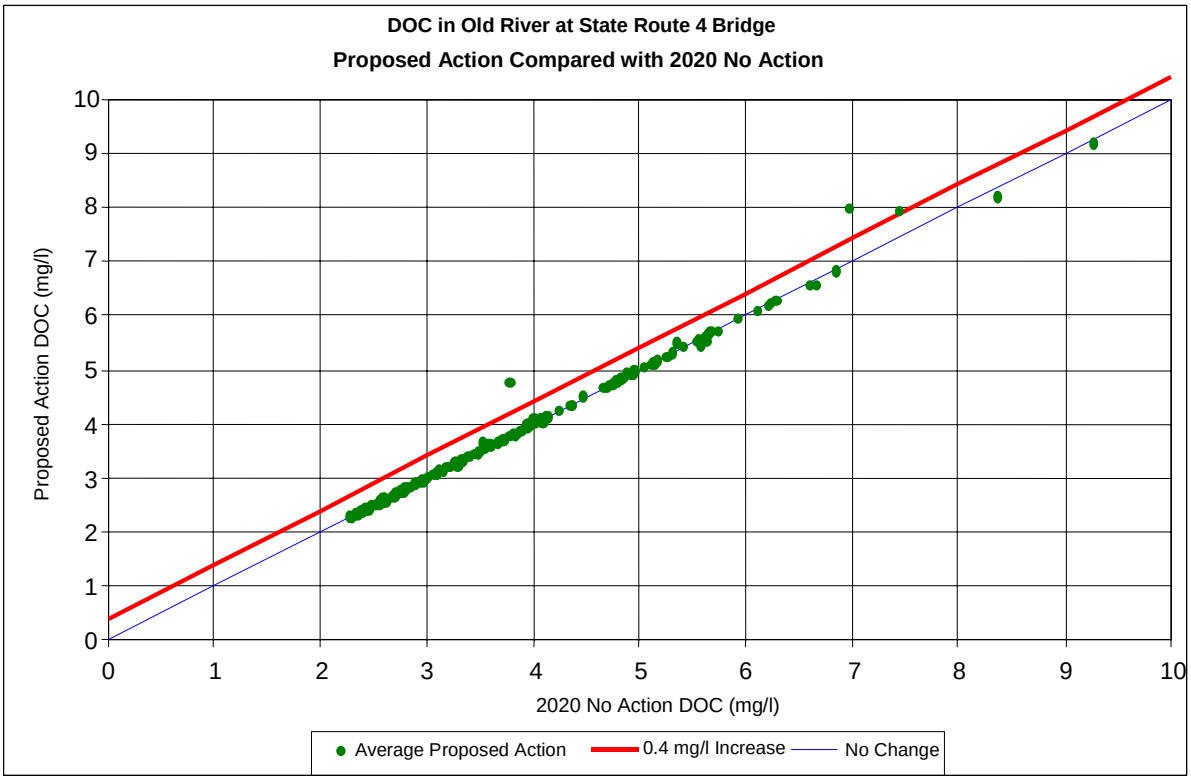
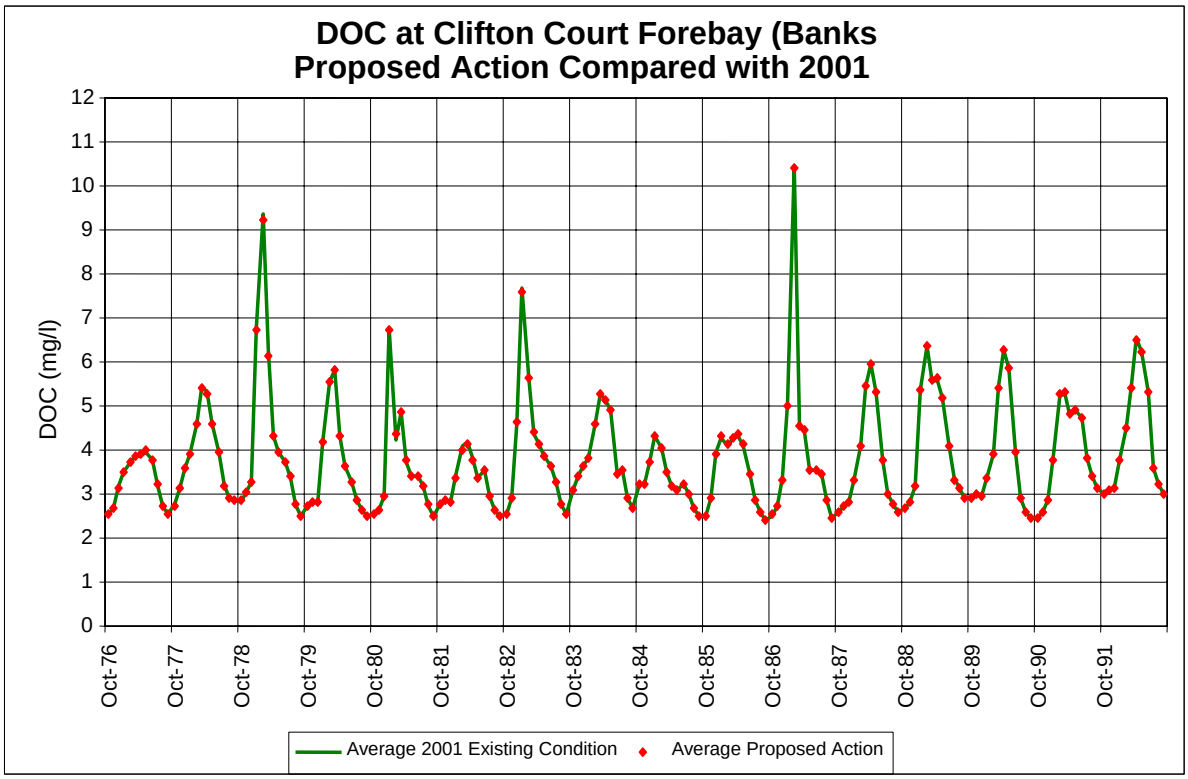


Figure 3.4-23. DSM2–Simulated DOC (mg/l) in Clifton Court Forebay (SWP Banks Pumping Plant) for the Proposed Action and Existing Condition (2001 LOD), 1976–1991



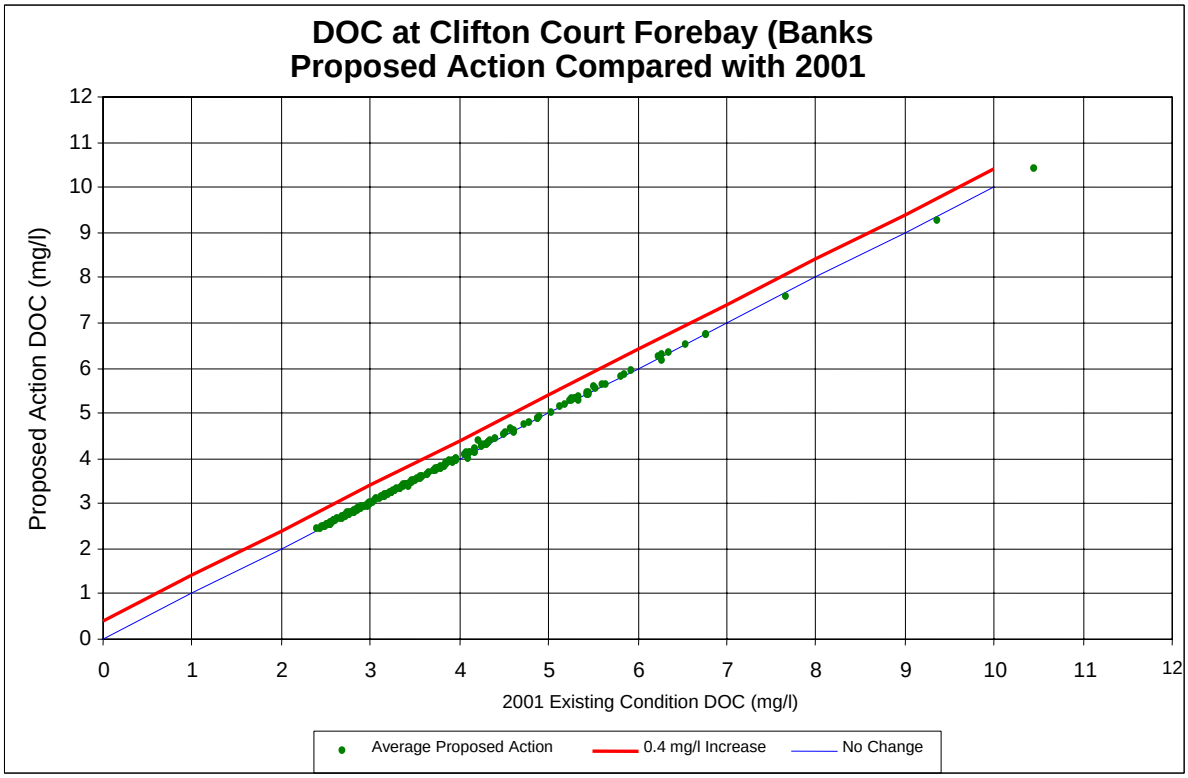
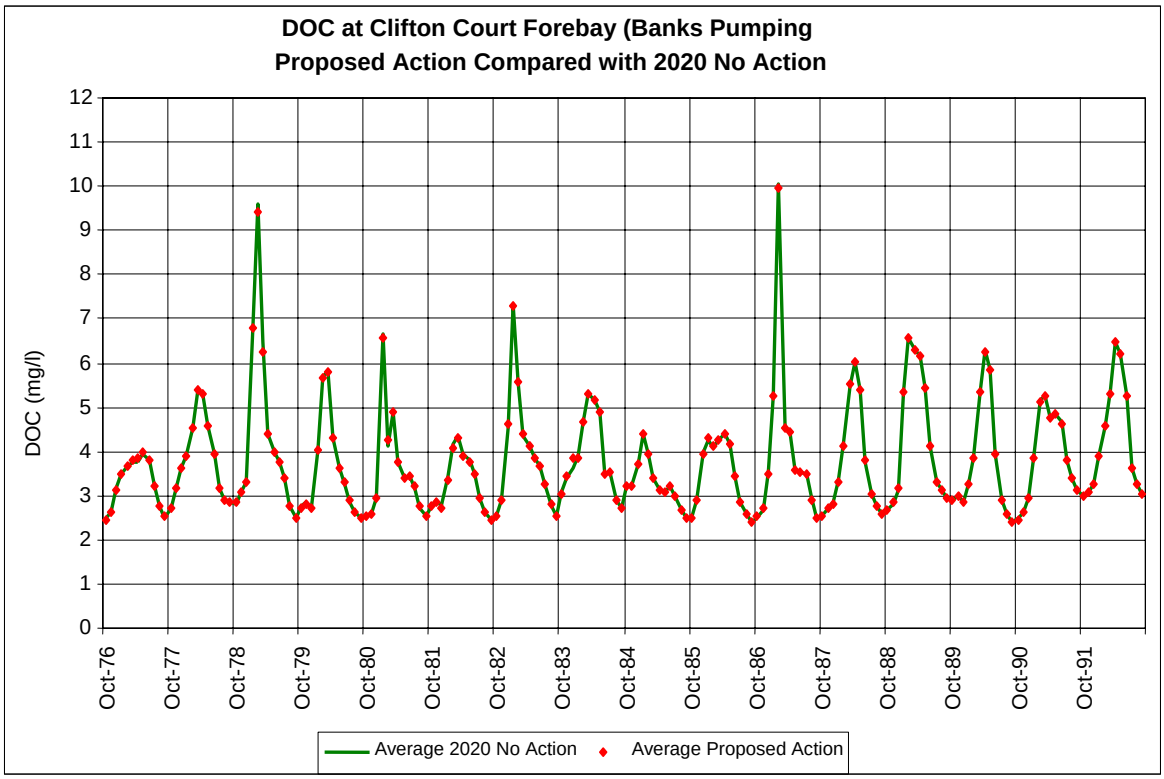


Figure 3.4-24. DSM2–Simulated DOC (mg/l) in Clifton Court Forebay (SWP Banks Pumping Plant) for the Proposed Action and No Action (2020 LOD) Condition, 1976–1991



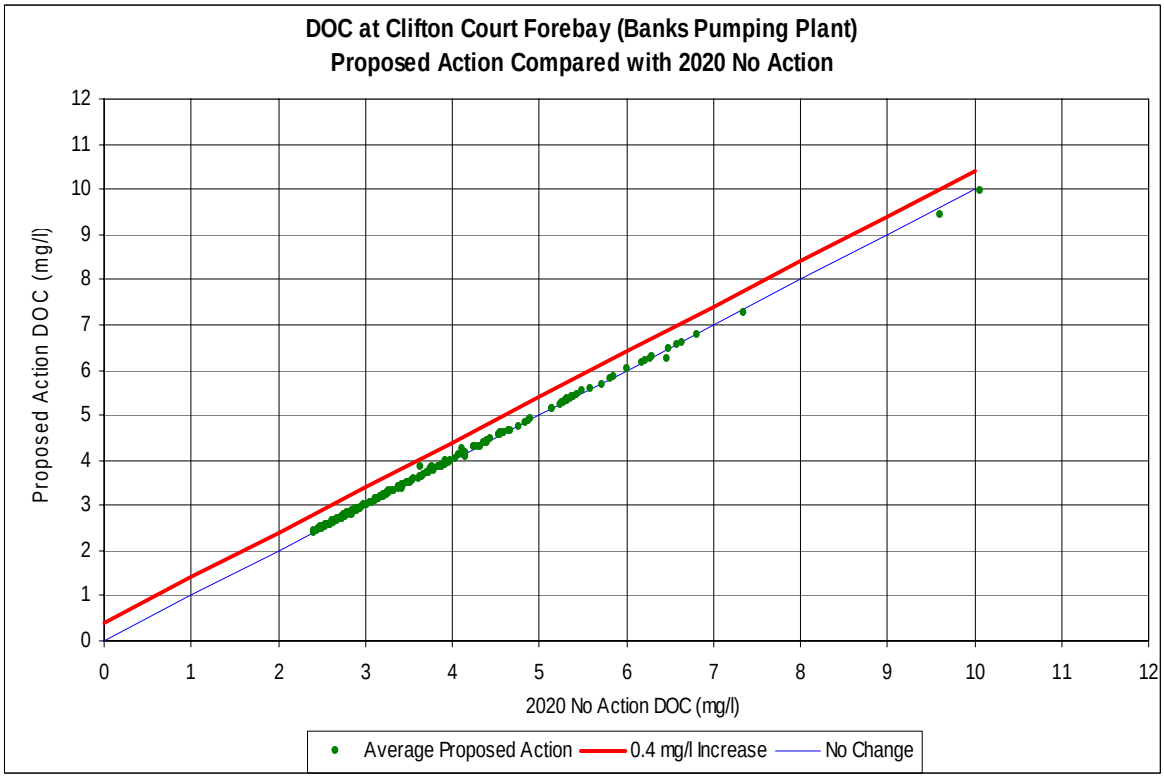
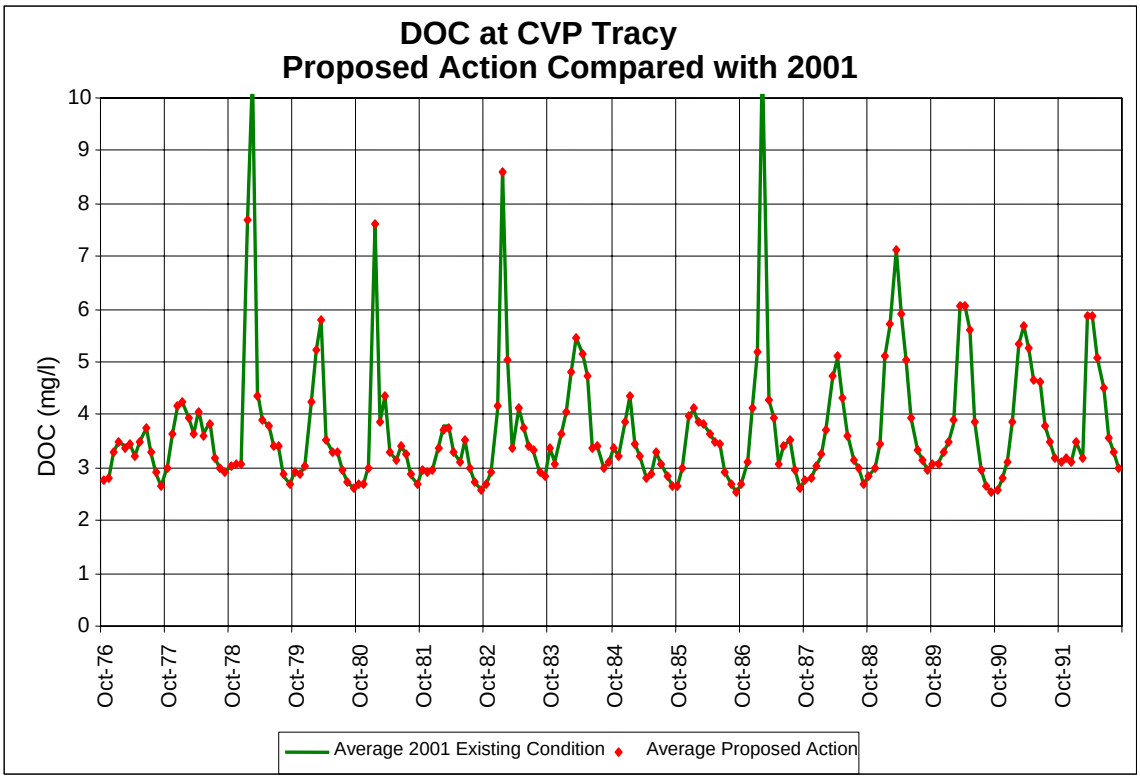


Figure 3.4-25. DSM2–Simulated DOC (mg/l) at CVP Tracy Pumping Plant for the Proposed Action and Existing Condition (2001 LOD), 1976–1991.



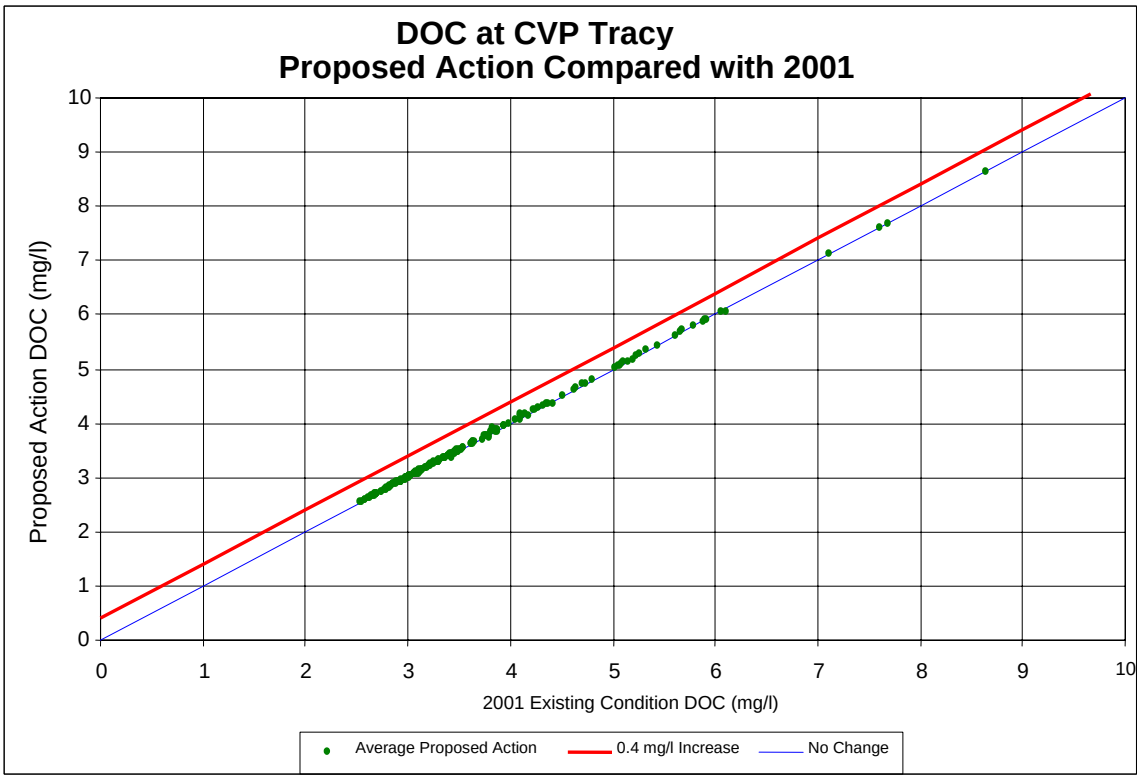
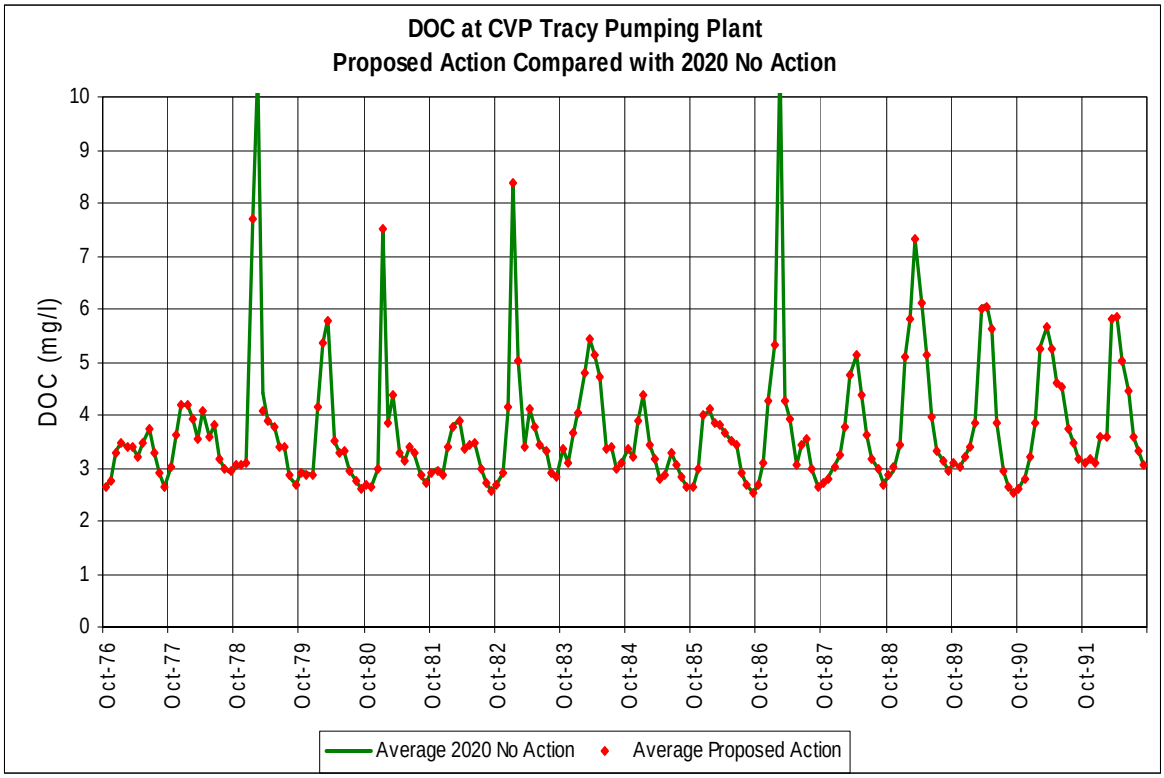


Figure 3.4-26. DSM2–Simulated DOC (mg/l) at CVP Tracy Pumping Plant for the Proposed Action and No Action (2020 LOD) Condition, 1976–1991.



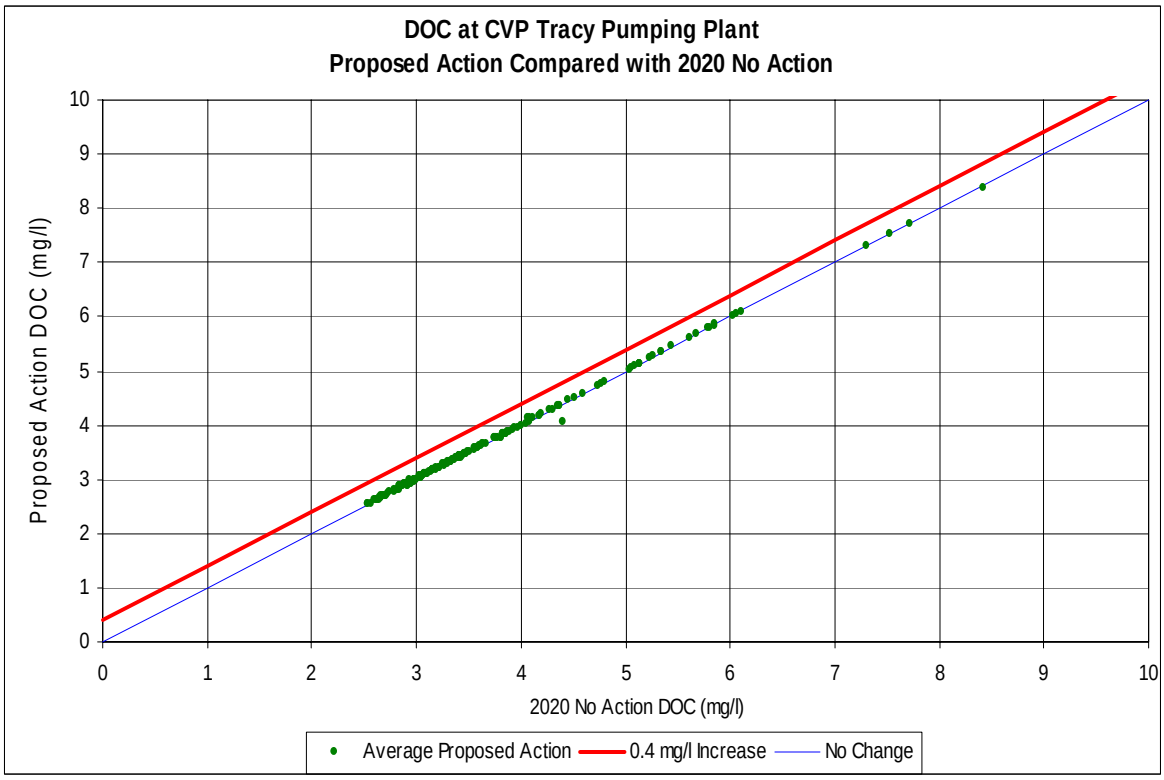
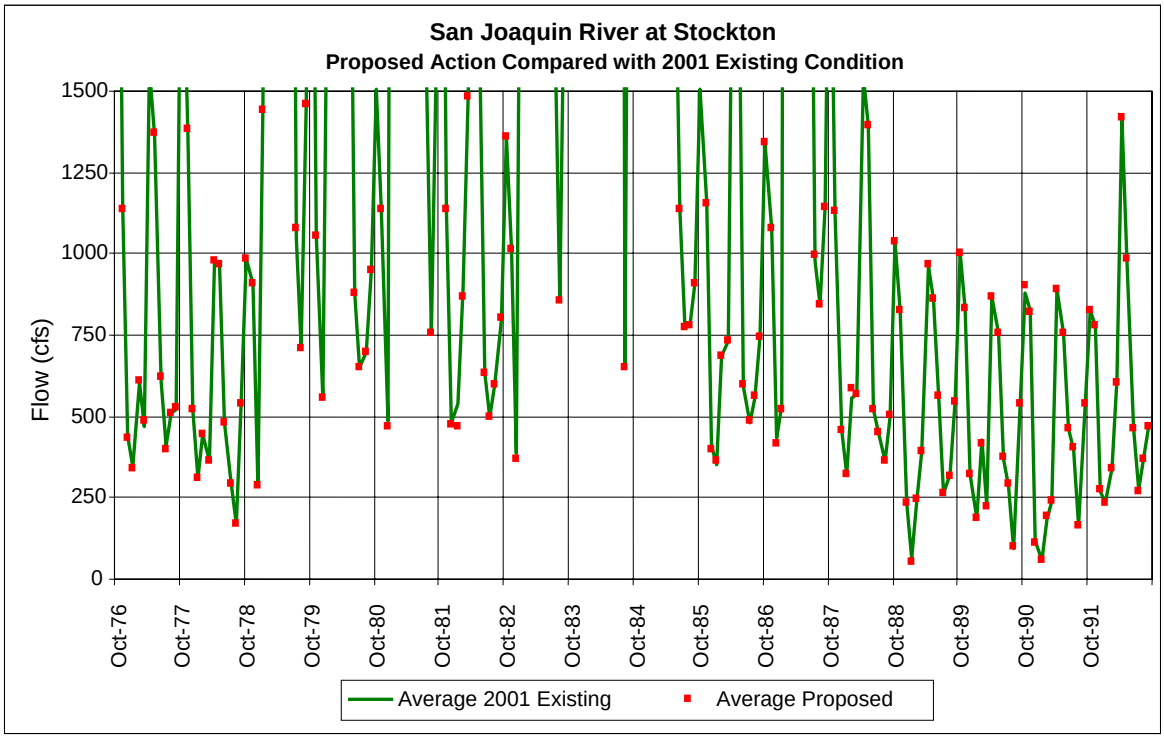


Figure 3.4-27. DSM2–Simulated Flow (cfs) and Estimated Summer Dissolved Oxygen Concentrations (mg/l) in the Stockton Deep Water Ship Channel for the Proposed Action and Existing Condition (2001 LOD), 1976–1991



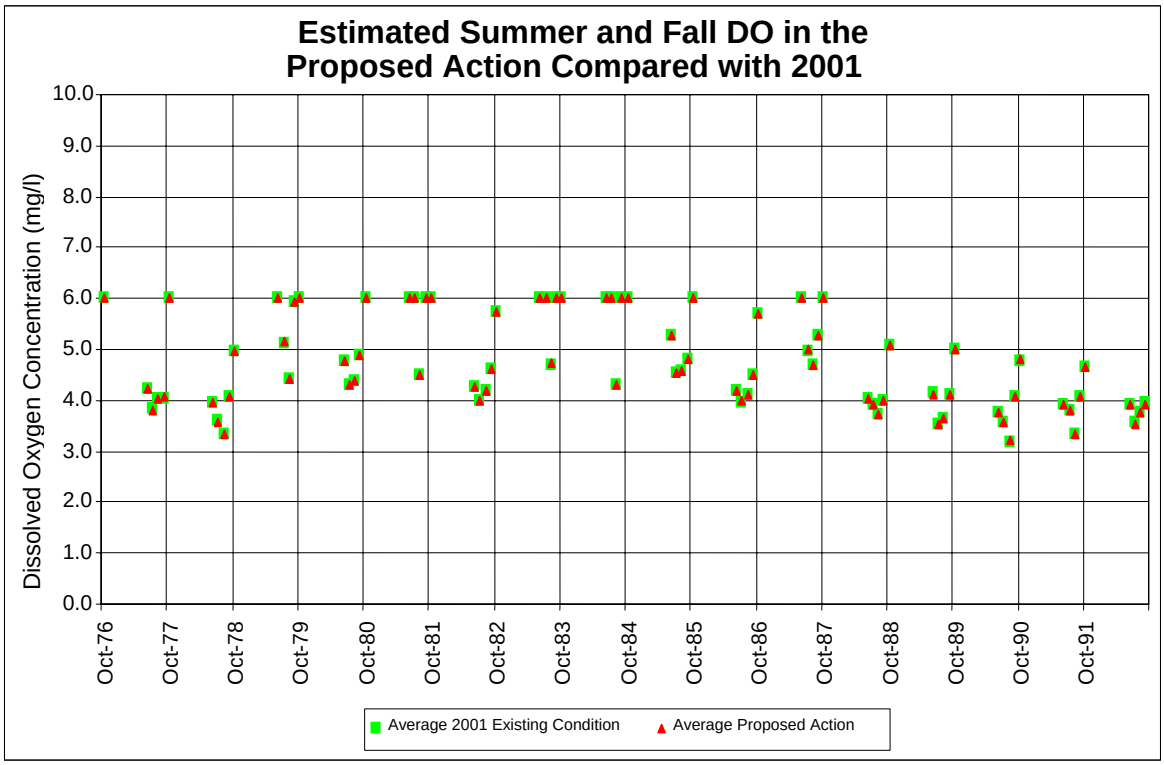
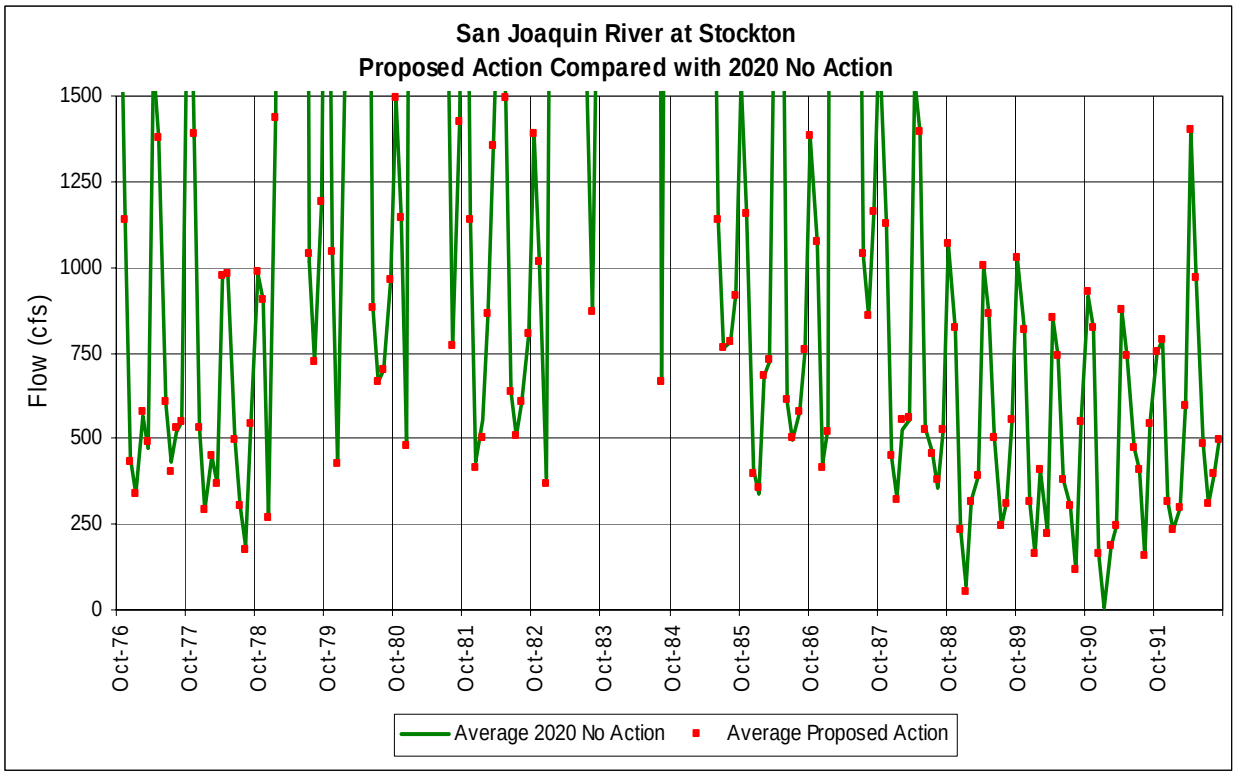
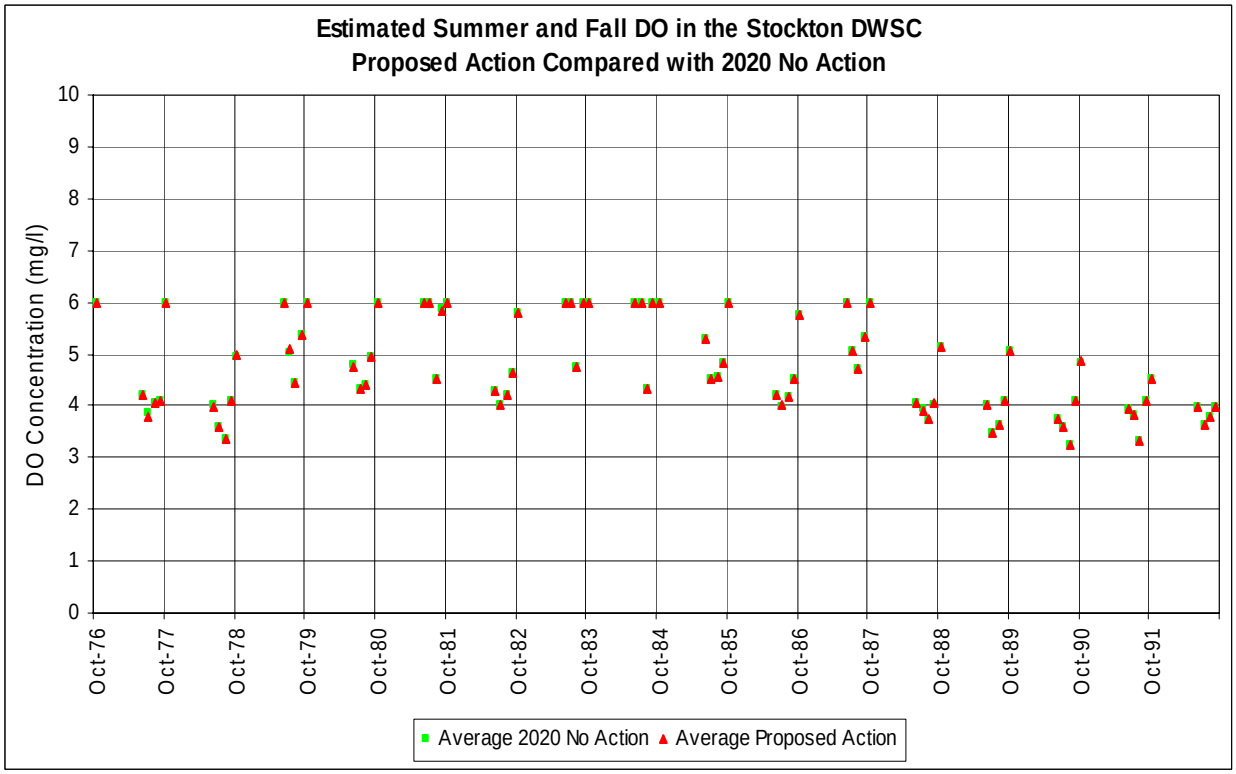



Figure 3.4-28. DSM2–Simulated Flow (cfs) and Estimated Summer Dissolved Oxygen Concentrations (mg/l) in the Stockton Deep Water Ship Channel for the Proposed Action and No Action (2020 LOD) Condition, 1976–1991