Appendix 6C

Methylmercury Model Documentation

This appendix provides information about the methods, modeling tools, and assumptions used for the Remanded Biological Opinions on the Coordinated Long-Term Operation of the Central Valley Project (CVP) and State Water Project (SWP) Environmental Impact Statement (EIS) analysis. It also provides information pertaining to the development of the analytical tools and the use of input data as well as model result processing and interpretation methods used for the impacts analysis and descriptions.

This appendix is organized into three main sections that are briefly described below:

- **Section 6C.1: Modeling Methodology.** The methylmercury impacts analysis used CalSim II, the Delta Simulation Model II (DSM2), and the Central Valley Regional Water Quality Control Board (Central Valley RWQCB) Total Maximum Daily Load (TMDL) model (RWQCB Model) to assess and quantify effects of the alternatives on the long-term operations of the CVP and SWP and on the environment. This section provides information about the overall analytical framework and how some of the model input information obtained from other models was processed through the use of analytical tools.
- **Section 6C.2: Modeling Simulations and Assumptions.** This section provides a brief description of the assumptions for the RWQCB Model simulations of the No Action Alternative, Second Basis of Comparison, and Alternatives 1 through 5.
- **Section 6C.3: Modeling Results.** This section provides a description of the model simulation output formats used in the analysis and interpretation of modeling results for the alternatives impacts assessment.

6C.1 Modeling Methodology

This section summarizes the methylmercury modeling methodology used for the No Action Alternative, Second Basis of Comparison, and Alternatives 1 through 5. It describes the overall analytical framework and contains descriptions of the key analytical and numerical tools and approaches used in the quantitative evaluation of the alternatives. The alternatives include several major components that will have significant effects on SWP and CVP operations and minor effects on the water quality of the system.

6C.1.1 Overview of the Modeling Approach and Objectives

Modeling of physical and biological methylmercury processes in the Delta is necessary to evaluate changes related to the implementation of alternatives that could affect the health of humans and wildlife consuming fish in the Delta. It has been recognized that fish tissue concentrations are the best indicator of mercury contamination in the Delta as described in the RWQCB Model (Central Valley RWQCB 2011). The RWQCB Model, an empirical tissue concentration model, was based on the concentration averages of fish mercury and water concentrations of methylmercury over broad areas of the Delta (Wood 2010). The RWQCB Model is used to estimate fish tissue mercury concentrations from concentrations of dissolved methylmercury in water.

CalSim II, DSM2 (water), and the RWQCB Model (fish tissue) were used in sequence to estimate the effects of CVP and SWP operations on water and fish tissue quality in the Delta. CalSim II simulates flow in the waterways, and DSM2 simulates one-dimensional hydrodynamics in the Delta, as discussed in Chapter 5, Surface Water Resources and Water Supplies. One of the three DSM2 modules, QUAL, simulates one-dimensional source tracking in the Delta. Results from DSM2 proportioned by source area were multiplied by average source concentrations and added to determine annual average aqueous methylmercury concentrations in the Delta for all year types and dry years for specific model nodes. The RWQCB Model is based on a power curve that uses the DSM2 output to simulate aqueous methylmercury concentrations to estimate total mercury concentrations in the fish fillets of standard 350-mm-long Largemouth Bass.

Figure 6C.1 shows the modeling tools applied in the methylmercury impacts assessment and the relationship between these tools. Each model included in Figure 6C.1 provides information to the next "downstream" model in order to provide various results to support the impacts analysis.

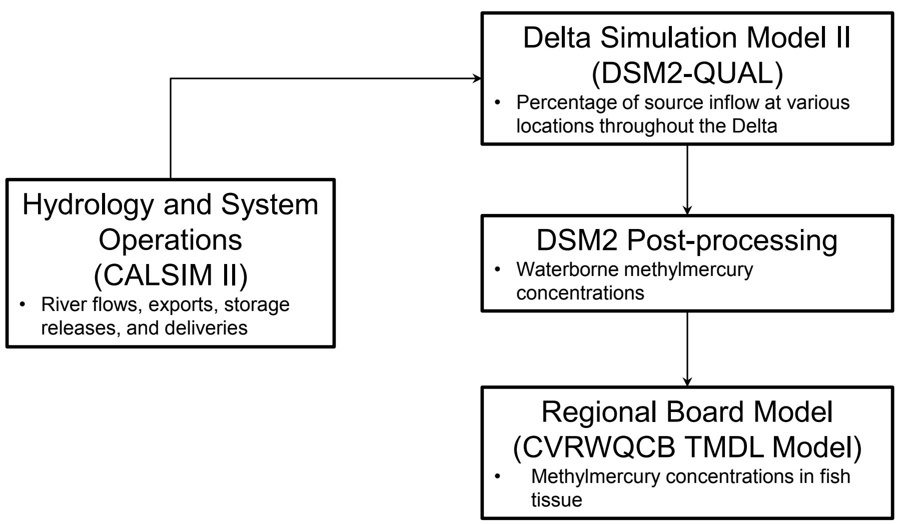

Figure 6C.1. Relationships among the Different Predictive Modeling Tools

6C.1.1.1 Modeling Objectives

Impacts on methylmercury resources in the Delta SWP and CVP Service Areas were evaluated for each alternative as part of the EIS development. Modeling objectives included the evaluation of the following:

- Percent changes in fish tissue mercury concentrations
- Exceedances of human and fish and wildlife thresholds

6C.1.2 Key Components of the Methylmercury Modeling

A calibrated regional flow model was used to provide a regional framework to be used for modeling of waterborne methylmercury concentrations. An additional model was used to translate waterborne methylmercury concentrations to total mercury concentrations in fish tissue.

6C.1.2.1 DSM2 Postprocessing

Dissolved methylmercury data were available for six inflow locations to the Delta (Table 6C.1):

- Sacramento River at Freeport (mainstem flow to Delta)
- San Joaquin River at Vernalis (mainstem flow to Delta)
- Mokelumne and Calaveras Rivers (for Eastside tributaries)
- Various Delta locations (for Delta agriculture)
- Suisun Bay (for San Francisco Bay)

Table 6C.1. Modeled Methylmercury Concentrations in Water

Location	Period*	Period Average Concentration (ng/L)			
		No Action Alternative	Alternative 1	Alternative 3	Alternative 5
Delta Interior					
San Joaquin River at Stockton	All	0.16	0.16	0.16	0.16
	Drought	0.16	0.16	0.17	0.16
Turner Cut	All	0.15	0.15	0.15	0.15
	Drought	0.14	0.14	0.14	0.14
San Joaquin River at San Andreas Landing	All	0.12	0.11	0.11	0.12
	Drought	0.11	0.11	0.11	0.11
San Joaquin River at Jersey Point	All	0.11	0.11	0.11	0.11
	Drought	0.11	0.10	0.10	0.11
Victoria Canal	All	0.14	0.14	0.14	0.14
	Drought	0.14	0.13	0.14	0.14

Location	Period*	Period Average Concentration (ng/L)			
		No Action Alternative	Alternative 1	Alternative 3	Alternative 5
Western Delta					
Sacramento River at Emmaton	All	0.10	0.10	0.10	0.10
	Drought	0.10	0.10	0.10	0.10
San Joaquin River at Antioch	All	0.10	0.10	0.10	0.10
	Drought	0.09	0.09	0.09	0.10
Montezuma Slough at Hunter Cut/ Beldon's Landing	All	0.08	0.08	0.08	0.08
	Drought	0.07	0.07	0.07	0.07
Major Diversions (Pumping Stations)					
North Bay Aqueduct at Barker Slough Pumping Plant	All	0.11	0.11	0.11	0.11
	Drought	0.11	0.11	0.11	0.11
Contra Costa Pumping Plant #1	All	0.13	0.13	0.13	0.13
	Drought	0.12	0.12	0.12	0.13
Banks Pumping Plant	All	0.14	0.13	0.13	0.14
	Drought	0.13	0.13	0.13	0.13
Jones Pumping Plant	All	0.14	0.14	0.14	0.14
	Drought	0.14	0.13	0.14	0.14

Notes:

ng/L = nanogram per liter

* "All" water years 1922-2003 represent the 82-year period modeled using DSM2; "drought" represents a 5-consecutive-year (water years 1987-1991) drought period consisting of dry and critical water year types (as defined by the Sacramento Valley 40-30-30 water year hydrologic classification index).

For DSM2 output locations, the geometric mean methylmercury concentrations from the inflow locations were combined with the modeled daily average percent inflow for each DSM2 output location to estimate waterborne methylmercury concentrations at those locations. The annual average mix of water from the six inflow sources (Table 6C.1) was calculated from daily percent inflows provided by the DSM2-QUAL model output. The daily waterborne methylmercury concentrations at DSM2 locations were calculated using the following equation:

$$C_{water\ quarterly} = [(I_1 * C_1)+(I_2 * C_2)+ (I_3 * C_3)+ (I_4 * C_4)+ (I_5 * C_5)+ (I_6 * C_6)]/100$$

Where:

- $C_{water\ daily}$ = daily average methylmercury concentration in water (micrograms/liter [µg/L]) at a DSM2 output location
- $I_{1\text{-}6}$ = modeled daily inflow from each of the six sources of water to the Delta for each DSM2 output location (percentage)
- $C_{1\text{-}6}$ = methylmercury concentration in water (µg/L) from each of the six inflow sources to the Delta (1-6)

The annual average waterborne methylmercury concentrations for the DSM2 output locations are shown in Table 6C.1.

6C.1.2.2 Regional Board Fish Tissue Model

The RWQCB Model predicts methylmercury concentration in 350-millimeter normalized Largemouth Bass fillet tissue from methylmercury in water. The Central Valley RWQCB developed an empirical power curve model based on measured Largemouth Bass fillet concentrations as averaged over large areas of the Delta compared to average methylmercury concentrations in water for those same areas and time periods (Central Valley RWQCB 2011):

Fish mercury (milligrams/kilogram, wet weight) = 20.365×(methylmercury in water, ng/L) $^{1.6374}$
(with r^2*=0.910, and P less than 0.05)*

The goal of the RWQCB Model was to establish the linkage between the 0.24 milligram per kilogram (mg/kg) tissue mercury TMDL target to a waterborne goal of 0.066 ng methylmercury/L. The RWQCB Model results are presented with the recognition of the imprecision of predicting fish tissue concentrations from estimates of methylmercury concentrations for specific Delta locations, but with the knowledge that Largemouth Bass are probably the best indicator of fish tissue contamination (see Section 6C.1.2.3). Results provide an estimated mean tissue concentration as would be expected by location and alternative. The model provides a Delta-specific, empirical estimate of the relationship between waterborne methylmercury and bioaccumulated fish tissue mercury.

The overall construction and calibration of the RWQCB Model were unchanged for this EIS analysis.

6C.1.2.3 Model Development

The RWQCB Model is based on unfiltered aqueous methylmercury data from March to October 2000 and Largemouth Bass fillet concentration data from September/October 2000. Largemouth Bass samples were chosen close in time and space to water collections. The paired samples, averaged over broad Delta areas, provided the framework for the nonlinear empirical model. Data were grouped by subareas of the Delta such as Sacramento River, Mokelumne River, Central Delta, San Joaquin River, and West Delta.

Largemouth Bass are excellent indicators of mercury contamination because they have a relatively high level of mercury compared to other species, are piscivorous, are abundantly distributed throughout the Delta, are popular gamefish, and have high site fidelity. Largemouth Bass are therefore representative of spatial patterns of tissue mercury concentrations throughout the aquatic food web, including exposure to humans.

The RWQCB Model was used to convert DSM2 estimated waterborne methylmercury concentrations to fish tissue mercury concentrations. The toxicity benchmark used to assess impacts of alternatives was the Central Valley RWQCB TMDL tissue concentration goal of 0.24 mg/kg wet weight (ww) of mercury for normalized 350-mm total length Largemouth Bass tissue (Central Valley RWQCB 2011).

6C.2 Modeling Simulations and Assumptions

This section describes the assumptions for the RWQCB Model simulations of the No Action Alternative, Second Basis of Comparison, and Alternatives 1 through 5. A description of DSM2 model assumptions is presented in Appendix 5A.

6C.2.1 Location Assumptions

The Central Valley RWQCB developed a nonlinear model based on Largemouth Bass as grouped in large regions of the Delta (rather than specific locations) compared to average methylmercury concentrations in water for those same, general regions (Central Valley RWQCB 2011). As such, the model provides a Delta-specific, general, long-term average relationship between co-located waterborne methylmercury concentrations and total mercury concentrations in Largemouth Bass fillets.

6C.2.2 Normalization and Tissue Type Assumptions

As discussed above, Largemouth Bass are excellent indicators of long-term average mercury exposure, risk, and the spatial pattern for both ecological and human health effects. A fish tissue mercury dataset was available for Largemouth Bass from locations across the Delta. However, the Largemouth Bass tissue mercury concentrations were presented as edible fillet concentrations for fish normalized to 350 mm in total length (SFEI 2010). It is important to standardize concentrations to the same length fish for establishment of the model and for model predictions because of the well-established positive relationship between fish length and age and tissue mercury concentrations (e.g., Alpers et al. 2008). This same normalization technique was used by the Regional Board for their model (Central Valley RWQCB 2011). The 350-mm size fish is an appropriate size representative of human health consumption and risk. The standardized size allows the best comparison among locations and alternatives. The fillet concentrations predicted by the model are expected to be slightly different from whole-body fish concentrations as consumed by wildlife, but comparisons among locations and alternatives and to the Regional Board benchmark will allow an evaluation of relative impacts to fish and wildlife as well as most accurately estimating impacts to human consumers.

6C.2.3 Model Application Methodology

To evaluate differences between the No Action Alternative, Second Basis of Comparison, and other alternatives for impact assessment, modeled methylmercury concentrations were compared directly (for percent change) and to the 0.24-mg/kg wet weight tissue threshold benchmark.

Results of comparisons to these benchmarks are expressed as exceedance quotients (EQs) in some of the tables and figures. Annual average methylmercury concentrations in water did not exceed the unfiltered aqueous methylmercury goal (0.06 µg/L) or the California Toxic Rule criterion for the consumption of water at the organism (0.050 µg/L) and of the organism only (0.051 µg/L), so no EQs were calculated for waterborne concentrations.

6C.2.3.1 No Action Alternative and Second Basis of Comparison Model Runs

The overall purpose of the models is to provide a set of conditions for the No Action Alternative and the Second Basis of Comparison to be used for comparison with the forecasts of the alternatives to determine whether the implementation of the alternatives is likely to result in substantial impacts to methylmercury, thereby affecting biological resources. Modeling for the No Action Alternative and the Second Basis of Comparison was completed for five Delta interior locations, three western Delta locations, and four locations near major water diversions. DSM2 postprocessing output provided estimates of the waterborne methylmercury concentration at each of those 12 locations (Table 6C.1). The RWQCB Model was then used to estimate methylmercury tissue concentrations in 350-mm Largemouth Bass. The modeled tissue methylmercury concentrations and the EQs (based on comparisons to thresholds) both served as a basis for comparison of other alternatives to identify potential impacts.

6C.2.3.2 Alternatives 1 through 5 Model Runs

For model simulations of Alternatives 1 through 5, the same procedure as described for the No Action Alternative and the Second Basis of Comparison was used with similar assumptions.

6C.3 Modeling Results

The postprocessing tool that presents the results from the RWQCB Model is an Excel-based spreadsheet tool. The general preprocessing and input files development are described in the modeling data assumptions sections above. This section focuses on data analysis and results interpretation for the impacts descriptions.

6C.3.1 Postprocessing and Results Analysis: Delta-wide Model

Output data resulting from the RWQCB Model simulations for each alternative were processed to provide a tabular depiction of potential impacts to methylmercury resources (Tables 6C.2 – 6C.4). As discussed previously, outputs from the RWQCB Model used in this analysis are annual average fish tissue mercury concentrations for all year types and separately presented for the subset of dry years.

All annual average concentrations exceed the TMDL target goal of 0.24 mg/kg tissue mercury at all locations modeled in the Delta for all years both as measured and modeled. Results are shown in Tables 6C.2 – 6C.4 and Figures 6C.2 and 6C.3. Table 6C.1 presents the period-average waterborne methylmercury concentrations by location and water year type as used to model fish tissue concentrations (Tables 6C.2 – 6C.4).

Clear patterns of differences among alternatives are apparent in Tables 6C.2 – 6C.4. The greatest increased concentrations for fish tissue mercury (over 10 percent increases) were estimated to occur near the Contra Costa Pumping Plant under Alternative 5 as compared to the Second Basis of Comparison (Table 6C.4). The highest exceedance quotients occurred along the San Joaquin River at Stockton and in the interior Delta for the No Action Alternative, Second Basis of Comparison, and Alternatives 1 through 5 (Tables 6C.2 – 6C.4).

6C.3.2 Model Limitations and Applicability

Although it is impossible to predict future hydrology, land use, and water use with certainty, the RWQCB Model and DSM2 were used to forecast impacts on fish that could result from implementation of the alternatives. Mathematical models like DSM2 can only approximate processes of physical systems. Models are inherently inexact because the mathematical description of the physical system is imperfect and the understanding of interrelated physical processes is incomplete. However, the RWQCB Model is a powerful tool that, when used carefully, can provide useful insight into processes of the physical system. Methylmercury concentrations for inflow sources to the Delta (e.g., agriculture in the Delta, Yolo Bypass, Eastside Tributaries) also caused uncertainty in the modeling because of limited data. For the Sacramento River and the San Joaquin River, about 90 data points (Chapter 6, Table 6.58; Table 6D.1) were used to estimate the mean methylmercury concentrations for these inflow sources, whereas the mean methylmercury concentrations for other inflow sources to the Delta had many fewer data points, ranging from 14 to no data points (concentrations for the Eastside Tributaries were assumed).

6C.4 References

Alpers, C. N., C. Eagles-Smith, C. Foe, S. Klasing, M. C. Marvin-DiPasquale, D. G. Slotton, and L. Windham-Meyers. 2008. *Sacramento–San Joaquin Delta Regional Ecosystem Restoration Implementation Plan, Ecosystem Conceptual Model. Mercury*. January 24.

Central Valley RWQCB (Central Valley Regional Water Quality Control Board). 2011. *Sacramento–San Joaquin Delta Estuary TMDL for Methylmercury. Final EPA Approval of Basin Plan Amendment.* Oct. 20.

SFEI (San Francisco Estuary Institute). 2010. Regional Data Center. Site accessed May 2010. http://www.sfei.org/data

Wood, M., C. Foe, J. Cooke, and L. Stephen. 2010. *Sacramento–San Joaquin Delta Estuary TMDL for Methylmercury, Final Staff Report*. April. Prepared for California Regional Water Quality Control Board: Central Valley Region, Rancho Cordova, CA.

Table 6C.2. Summary Table for Methylmercury Concentrations in 350-mm Largemouth Bass Fillets for No Action Alternative, Second Basis of Comparison, and Alternative 1

Location	Period[a]	Estimated Concentrations of Methylmercury (mg/kg ww) No Action Alternative	Estimated Concentrations of Methylmercury (mg/kg ww) Second Basis of Comparison and Alternative 1	% Change In Methylmercury Concentrations[b] Alternative 1 compared to No Action Alternative	% Change In Methylmercury Concentrations[b] No Action Alternative compared to Second Basis of Comparison	Exceedance Quotients[c] No Action Alternative	Exceedance Quotients[c] Second Basis of Comparison and Alternative 1
Delta Interior							
San Joaquin River at Stockton	All	1.00	0.99	0	0	4.2	4.1
	Drought	1.06	1.06	0	0	4.4	4.4
Turner Cut	All	0.89	0.87	-3	3	3.7	3.6
	Drought	0.84	0.81	-4	4	3.5	3.4
San Joaquin River at San Andreas Landing	All	0.59	0.58	-3	3	2.5	2.4
	Drought	0.54	0.53	-3	3	2.3	2.2
San Joaquin River at Jersey Point	All	0.57	0.54	-4	5	2.4	2.3
	Drought	0.52	0.50	-4	4	2.2	2.1
Victoria Canal	All	0.85	0.82	-4	4	3.6	3.4
	Drought	0.82	0.76	-6	7	3.4	3.2
Western Delta							
Sacramento River at Emmaton	All	0.50	0.49	-2	2	2.1	2.0
	Drought	0.48	0.47	-2	2	2.0	2.0
San Joaquin River at Antioch	All	0.50	0.47	-6	7	2.1	2.0
	Drought	0.43	0.41	-5	5	1.8	1.7

Location	Period[a]	Estimated Concentrations of Methylmercury (mg/kg ww) No Action Alternative	Estimated Concentrations of Methylmercury (mg/kg ww) Second Basis of Comparison and Alternative 1	% Change In Methylmercury Concentrations[b] Alternative 1 compared to No Action Alternative	% Change In Methylmercury Concentrations[b] No Action Alternative compared to Second Basis of Comparison	Exceedance Quotients[c] No Action Alternative	Exceedance Quotients[c] Second Basis of Comparison and Alternative 1
Montezuma Slough at Hunter Cut/Beldon's Landing	All	0.35	0.32	-6	7	1.4	1.4
	Drought	0.28	0.26	-5	5	1.1	1.1
Major Diversions (Pumping Stations)							
North Bay Aqueduct at Barker Slough Pumping Plant	All	0.56	0.56	-1	1	2.4	2.3
	Drought	0.59	0.57	-2	2	2.4	2.4
Contra Costa Pumping Plant #1	All	0.73	0.68	-6	6	3.0	2.8
	Drought	0.67	0.62	-7	8	2.8	2.6
Banks Pumping Plant	All	0.79	0.75	-5	5	3.3	3.1
	Drought	0.75	0.69	-7	8	3.1	2.9
Jones Pumping Plant	All	0.83	0.79	-4	4	3.5	3.3
	Drought	0.82	0.77	-6	7	3.4	3.2

Notes:

mg/kg = milligram per kilogram

ww = wet weight

a. “Al”: water years (1922-2003) represent the 82-year period modeled using DSM2. “Drought” Represents a 5-consecutive-year (water years 1987-1991) drought period consisting of dry and critical water year types (as defined by the Sacramento Valley 40-30-30 water year hydrologic classification index).

b. % change indicates a negative change (increased concentrations) relative to No Action Alternative or Second Basis of Comparison when values are positive and a positive change (lowered concentrations) relative to No Action Alternative or Second Basis of Comparison when values are negative.

c. Concentrations greater than 0.24 mg/kg ww mercury exceed the TMDL guidance concentration.

Table 6C.3 Summary Table for Methylmercury Concentrations in 350-mm Largemouth Bass Fillets for Alternative 3

Location	Period[a]	Estimated Concentrations of Methylmercury (mg/kg, ww) Alternative 3	% Change In Methylmercury Concentrations[b] No Action Alternative	% Change In Methylmercury Concentrations[b] Second Basis of Comparison	Exceedance Quotients[c] Alternative 3
Delta Interior					
San Joaquin River at Stockton	All	1.00	1	1	4.2
	Drought	1.07	1	1	4.5
Turner Cut	All	0.88	-2	1	3.7
	Drought	0.82	-3	1	3.4
San Joaquin River at San Andreas Landing	All	0.58	-3	0	2.4
	Drought	0.53	-2	1	2.2
San Joaquin River at Jersey Point	All	0.55	-4	1	2.3
	Drought	0.51	-2	2	2.1
Victoria Canal	All	0.83	-2	2	3.5
	Drought	0.79	-3	3	3.3
Western Delta					
Sacramento River at Emmaton	All	0.49	-2	0	2.0
	Drought	0.47	-1	0	2.0
San Joaquin River at Antioch	All	0.48	-6	1	2.0
	Drought	0.42	-3	2	1.7
Montezuma Slough at Hunter Cut/Beldon's Landing	All	0.33	-6	1	1.4
	Drought	0.27	-3	2	1.1

Location	Period[a]	Estimated Concentrations of Methylmercury (mg/kg, ww) Alternative 3	% Change In Methylmercury Concentrations[b] No Action Alternative	% Change In Methylmercury Concentrations[b] Second Basis of Comparison	Exceedance Quotients[c] Alternative 3
Major Diversions (Pumping Stations)					
North Bay Aqueduct at Barker Slough Pumping Plant	All	0.56	-1	0	2.3
	Drought	0.58	-1	2	2.4
Contra Costa Pumping Plant #1	All	0.69	-5	1	2.9
	Drought	0.64	-4	4	2.7
Banks Pumping Plant	All	0.77	-3	2	3.2
	Drought	0.72	-4	4	3.0
Jones Pumping Plant	All	0.81	-3	2	3.4
	Drought	0.80	-3	4	3.3

Notes:

mg/kg = milligram per kilogram

ww = wet weight

a. “Al”: water years (1922-2003) represent the 82-year period modeled using DSM2. “Drought” Represents a 5-consecutive-year (water years 1987-1991) drought period consisting of dry and critical water year types (as defined by the Sacramento Valley 40-30-30 water year hydrologic classification index).

b. % change indicates a negative change (increased concentrations) relative to No Action Alternative or Second Basis of Comparison when values are positive and a positive change (lowered concentrations) relative to No Action Alternative or Second Basis of Comparison when values are negative.

c. Concentrations greater than 0.24 mg/kg ww mercury exceed the TMDL guidance concentration.

Table 6C.4. Summary Table for Methylmercury Concentrations in 350-mm Largemouth Bass Fillets for No Action Alternative, Second Basis of Comparison, and Alternative 5

Location	Period[a]	Estimated Concentrations of Methylmercury (mg/kg, ww) Alternative 5	% Change In Methylmercury Concentrations[b] No Action Alternative	% Change In Methylmercury Concentrations[b] Second Basis of Comparison	Exceedance Quotients[c] Alternative 5
Delta Interior					
San Joaquin River at Stockton	All	1.00	0	0	4.1
	Drought	1.05	0	0	4.4
Turner Cut	All	0.89	0	3	3.7
	Drought	0.85	1	4	3.5
San Joaquin River at San Andreas Landing	All	0.60	1	4	2.5
	Drought	0.55	2	4	2.3
San Joaquin River at Jersey Point	All	0.57	1	5	2.4
	Drought	0.53	2	5	2.2
Victoria Canal	All	0.85	0	4	3.6
	Drought	0.82	0	7	3.4
Western Delta					
Sacramento River at Emmaton	All	0.50	0	3	2.1
	Drought	0.49	1	3	2.0
San Joaquin River at Antioch	All	0.51	1	7	2.1
	Drought	0.44	2	7	1.8
Montezuma Slough at Hunter Cut/Beldon's Landing	All	0.35	1	7	1.5
	Drought	0.28	1	7	1.2

Location	Period[a]	Estimated Concentrations of Methylmercury (mg/kg, ww) Alternative 5	% Change In Methylmercury Concentrations[b] No Action Alternative	% Change In Methylmercury Concentrations[b] Second Basis of Comparison	Exceedance Quotients[c] Alternative 5
Major Diversions (Pumping Stations)					
North Bay Aqueduct at Barker Slough Pumping Plant	All	0.56	0	1	2.4
	Drought	0.58	0	2	2.4
Contra Costa Pumping Plant #1	All	0.74	2	8	3.1
	Drought	0.70	5	13	2.9
Banks Pumping Plant	All	0.79	0	5	3.3
	Drought	0.74	-1	7	3.1
Jones Pumping Plant	All	0.83	0	5	3.5

Notes:

mg/kg = milligram per kilogram

ww = wet weight

a. “Al”: water years (1922-2003) represent the 82-year period modeled using DSM2. “Drought” Represents a 5-consecutive-year (water years 1987-1991) drought period consisting of dry and critical water year types (as defined by the Sacramento Valley 40-30-30 water year hydrologic classification index).

b. % change indicates a negative change (increased concentrations) relative to No Action Alternative or Second Basis of Comparison when values are positive and a positive change (lowered concentrations) relative to No Action Alternative or Second Basis of Comparison when values are negative. Changes of 10% or more are shaded.

c. Concentrations greater than 0.24 mg/kg ww mercury exceed the TMDL guidance concentration.

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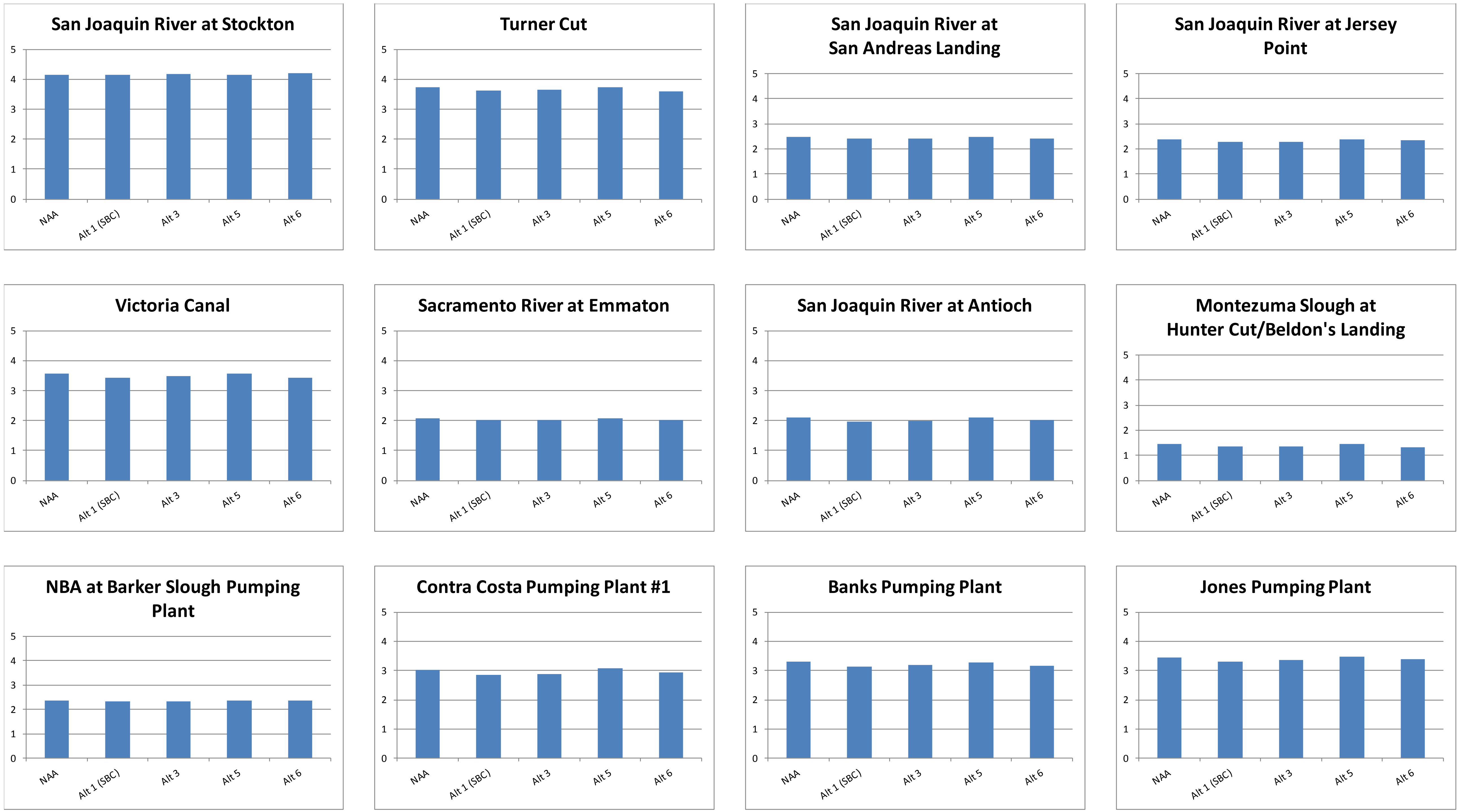

Figure 6C.2 Level of Concern Exceedance Quotients for Mercury Concentrations in 350-mm Largemouth Bass Fillets for All Years

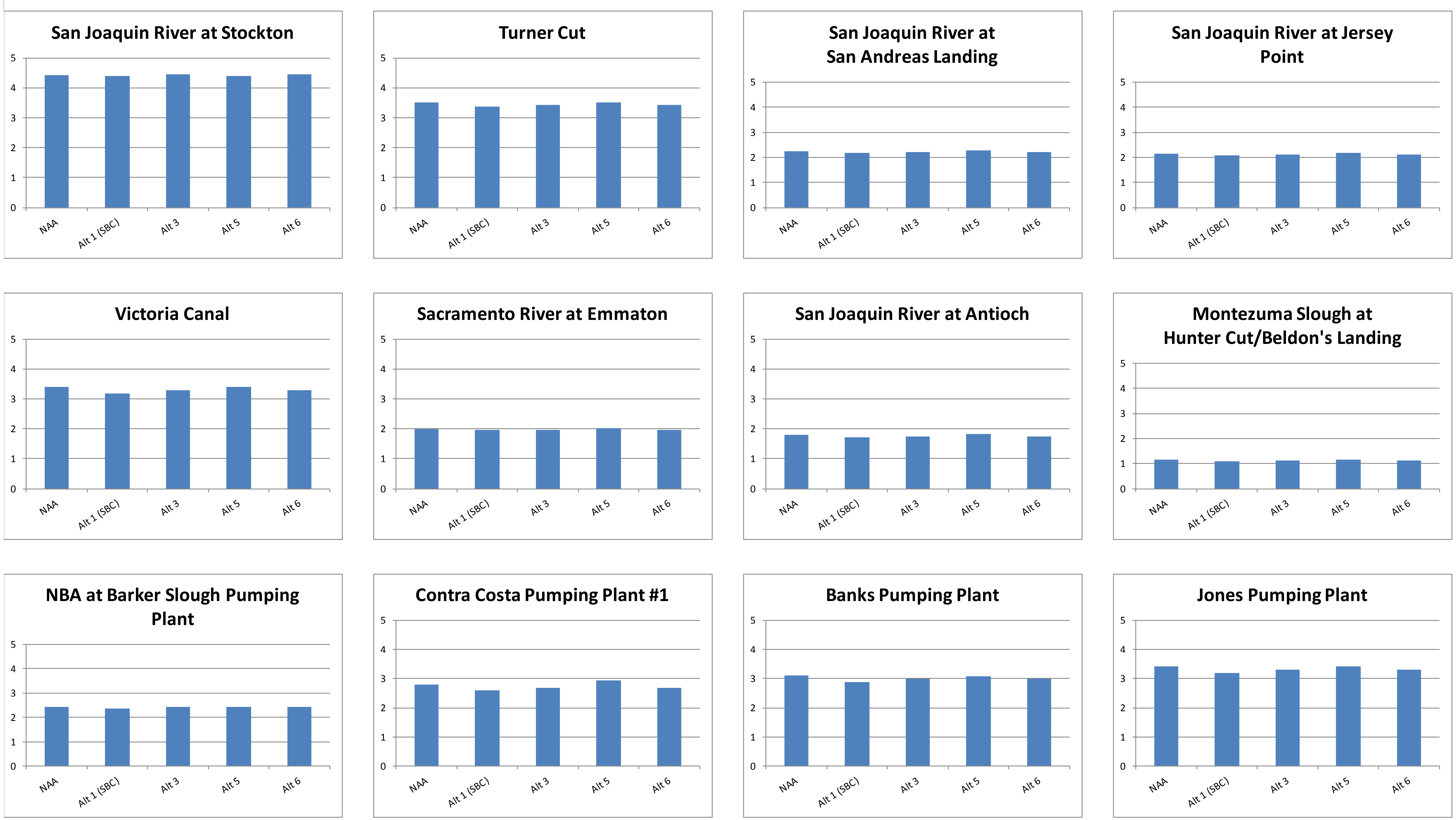

Figure 6C.3. Level of Concern Exceedance Quotients for Mercury Concentrations in 350-mm Largemouth Bass Fillets for Drought Years