UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION IX
75 Hawthorne Street
San Francisco, CA 94105-3901

DEC 2 9 2016

Ms. Jeanine Townsend
Clerk to the Board
State Water Resources Control Board
P.O. Box 100
Sacramento, California 95814-0100

RE: Bay-Delta Water Quality Control Plan; Phase 1

Dear Ms. Townsend:

The U.S. Environmental Protection Agency (EPA) appreciates the opportunity to review the State Water Resources Control Board's (State Water Board's) *Public Draft Revised Substitute Environmental Document in Support of Potential Changes to the Water Quality Control Plan for the San Francisco Bay/ Sacramento-San Joaquin Delta Estuary: San Joaquin River Flows and Southern Delta Water Quality*, (SED), released on September 15, 2016. Once the State Water Board concludes this process, EPA will review and act upon water quality standards in the Phase 1 update (lower San Joaquin River Flows and Southern Delta) to the Water Quality Control Plan for the San Francisco Bay/Sacramento-San Joaquin Delta Estuary (Bay-Delta WQCP),[1] pursuant to Clean Water Act §303(c).

The SED focuses on freshwater flows and summarizes the science describing multiple ways that flow directly affects fish populations and determines aquatic habitat elements that drive fish population dynamics. The SED describes the decline of aquatic resources in the lower San Joaquin River watershed and southern Delta study area, with precipitous declines in salmonid populations on the Stanislaus River and the near absence of once-plentiful migratory salmonids on the Tuolumne and Merced Rivers. The U.S. Fish and Wildlife Service (FWS),[2] National Marine Fisheries Service (NMFS),[3] California Department of Fish and Wildlife (CDFW),[4] and EPA[5] have identified the absence of sufficient flows at critical times as a primary driver of population declines. All three fisheries agencies identified salmon and steelhead populations as declining under current flow conditions. The State Water Board reached a similar conclusion in the 2010 Flows Report.[6] Recognizing that fishery declines are caused by multiple stressors, state and federal partner agencies and non-governmental organizations continue to advance actions that decrease the loading of contaminants into waterways and restore floodplains and riparian habitat. The State Board should use its unique authorities to address the flow regime to comprehensively address all stressors.

EPA commends the State Water Board for assembling, evaluating and organizing the voluminous scientific and technical information in the SED and submits the following comments and recommendations for consideration.

I. **Include All-Season Protection for Fish and Wildlife in the Narrative Objective:** The narrative objective should protect fish and wildlife beneficial uses in all months. The content of the narrative objective describes the desired water quality goal; however, it applies only in the months of February to June. Salmon and Central Valley steelhead are found in the lower San Joaquin River and its three tributaries in most months of the year, not just February to June. We recommend the following language be placed in the objective, or added as a footnote, to limit negative impacts to fish and wildlife in the months of July through January. "When implementing the LSJR flow objectives,

minimum reservoir carryover storage targets or other requirements to meet the flow objectives should not cause adverse impacts on fish and wildlife at other times of the year."

II. **Maximize Success of New Approach to Aquatic Resource Protection:** The State Water Board is proposing a new approach to managing flows on the San Joaquin River and tributaries. The existing standards are based on fixed monthly flows that vary by an index of water year precipitation called "water year type." The proposed flow standards for the lower San Joaquin River tributaries are providing a "block of water" based on a percent of unimpaired flow[7] (UF) within a range. The SED recommends that each of the tributaries provide 30-50% UF and use a starting point of 40% UF. This "block of water" will be managed during the normal spring runoff period by either (a) providing a fixed UF volume, for example 40%, throughout the period; or (b) managing the block of water in real time using adaptive management. This adaptive management approach allows for shifting the percent of UF above or below 40% in response to real-time information about current hydrological and biological conditions to achieve a greater level of beneficial use protection. The SED proposes a working group composed of interested stakeholders, water managers, water users, and biologists make adaptive-management decisions with the approval of the State Water Board or its Executive Director.

Real-time adaptive management of a "block of water" has the potential to provide more targeted aquatic-resource protection for the same amount of water as a fixed application of a percent of UF or fixed monthly flows based on water year type.[8] The proposed approach will succeed only if the rules that define the "block of water" and the procedures for changing its management are clear from the outset. EPA appreciates the advantage of flexibility as the State Water Board moves forward with this approach; however, many critical elements are left unresolved, to be developed later by a working group not yet formed. EPA recommends the following revisions to increase the probability that the WQCP amendments will successfully protect fish and wildlife beneficial uses in the lower San Joaquin River and its tributaries.

A. **Define how percent of unimpaired flow (UF) will be measured and calculated:** The State Water Board should define UF in the final adopted objective in the Bay-Delta WQCP. The objective should identify an equation and assumed coefficients used to calculate percent UF, measured flow data needed as inputs for the UF equation, and locations of measurements. These terms can be added as a footnote to Table 3 in the Bay-Delta WQCP. Identifying methods for calculating percent UF will define the volume of the block of water to be managed in a given year and provide certainty for instream and consumptive water uses.

B. **Add targets to the objective in Table 3 to increase likelihood of protecting fish and wildlife beneficial uses:** The SED implementation plan proposes to start the new flow objective at 40% UF for the tributaries and describes targets for storing cold water in reservoirs to use in other parts of the year. EPA recommends including the starting percent UF value and establishing a percent UF at Vernalis in Table 3 of the Bay-Delta WQCP to clearly define the level of intended flow and to protect water from the tributaries while in the lower San Joaquin River channel to Vernalis. EPA notes that the SED shows habitat improvements at 40-60% UF based on modeling that assumes water is stored in reservoirs and available to reduce water temperatures in rivers at other times of the year. Reservoir storage targets for cold water should be identified in the objectives if the benefits predicted in the SED are to be achieved.

C. **Adopt a flow range and starting flow value sufficient to achieve the adopted *Salmon Protection Objective*[9] and the proposed salmon 'viability' objective:** The SED provides a

substantial amount of information showing habitat improvements for fish under different flow alternatives. However, the SED does not evaluate the ability of flow alternatives to meet the proposed salmon viability objective or the *Salmon Protection Objective*, which requires doubling of the population average from the 1967-1991 baseline. Estimating cohort replacement rates (CRR) associated with each flow alternative allows for calculating the time needed to meet salmon doubling. Spring flows show a relationship to fall-run Chinook salmon juvenile survival and numbers of returning adults for spawning. These survival metrics can be used to calculate CRRs which define whether populations are increasing or decreasing. Any population showing a CRR less than 1.0 is trending towards extinction. Typical Chinook salmon populations have CRRs greater than 8. The CRR on the Stanislaus River in this watershed is less than 0.2. Understanding which flow alternatives result in a CRR greater than 1.0 and can achieve doubling in a specified time period will provide support for adopting a flow alternative that can succeed in attaining the narrative *Salmon Protection Objective* and beneficial-use protection.

The 40-50% percent UF range has a greater chance of successfully protecting the instream beneficial use than flows less than 40% UF. Higher percent UF alternatives such as 40-60% result in better rearing temperature conditions and floodplain inundation benefits. The SED shows that lethal temperatures would be reached for salmon in September on the Stanislaus, Tuolumne, and Merced Rivers, and in August, September and October in the lower San Joaquin River in an average year under the 40% UF alternative. Despite forecasted improvements at the 40% UF target, multiple scientific studies indicate flows higher than 40% of UF may be needed to meet the *Salmon Protection Objective* and protect the beneficial use.[10] The proposed 40% UF does not achieve CDFW flow recommendations to protect fall-run Chinook salmon[11] or the FWS recommended flow targets necessary to meet the *Salmon Protection Objective*.[12] Research on the Stanislaus River shows that higher flow volumes and flow variability promote instream survival and life history diversity.[13,14] High flows also correlate with better juvenile survival downstream of Vernalis needed to improve the numbers of returning spawners.

D. **Include biological goals to the objective as decision rules for shifting within the flow range.** Flow criteria or objectives should be linked to biological goals and assessment endpoints to clearly identify the desired condition of biological resources relevant to the established flows.[15] The State Water Board anticipates the working group will develop these biological goals after approval of the Bay-Delta WQCP updates. However, the criteria or objective itself should define the intended level of protection and EPA strongly recommends including at least one biological goal as the decision rule for moving within range of proposed UF. The objective should state a starting point in the range and allow flow reductions if the biological goal is achieved, and flow increases if biological goals are not achieved. One option is using the existing *Salmon Protection Objective* and survival rates to guide increases or decreases in flow within the approved range. For example, Table 3 could identify minimum flows starting at 40% UF. Flows could be reduced below 40% UF if juvenile fall-run Chinook salmon freshwater survival rates are sufficient to achieve the *Salmon Protection Objective* by 2032 and increased above 40% UF if flows are insufficient for achieving the *Salmon Protection Objective* by 2032.[16]

E. **Define management options for shaping flows within the spring window and/or shifted outside the spring months:** EPA supports the use of implementation with adaptive management for maximizing aquatic life benefits with the proposed flows. Prior to finalizing the standard, the State Water Board should clearly define the role of working group participants, the structure and function of the decision-making process, specific criteria to trigger management actions, and bounds and targets around shaping flows within the spring and/or shifted to other seasons. The

State Water Board can run optimized flow shaping and shifting scenarios to define bounds and targets for shaping flows that optimize biological and water quality benefits with minimum water volume. This would allow the working group to focus on shaping storm flows and implementing flow shifts as hydrologic events occur in real time without needing to seek Executive Director approval. Additionally, the State Water Board should define the accounting framework for protecting water shifted outside the spring window and/or into future years.

III. **San Joaquin River flows should support a migration corridor for salmonids downstream of Vernalis:** The ability of salmonids to migrate past Vernalis, through the Delta to the ocean, and then return to spawn is essential to achieving sustainable populations. Most of the freshwater from the San Joaquin River is diverted either upstream of the Phase 1 study area, or as it enters the Delta, which creates a condition whereby almost 40 kilometers of San Joaquin River channels contain water primarily from the Sacramento River; this disrupts salmon navigation signals in almost all months of almost all years and interrupts a continuous migratory corridor connecting the San Joaquin River to the Pacific Ocean.[17] This discontinuity between Vernalis on the San Joaquin River and the Pacific Ocean adversely affects migratory success for salmon and steelhead due to the mixing of physical and chemical cues.[18] Phase 1 is the appropriate forum for determining San Joaquin River basin flows high enough to provide a migratory corridor downstream of the lower San Joaquin River, connecting the Delta to the San Francisco Bay and Pacific Ocean.

IV. **Establish a coordinated monitoring and assessment program:** The SED proposal for aquatic resource protection depends heavily on real-time monitoring and assessment of water quality, hydrology and aquatic species. As part of its decision on Phase 1, the State Water Board should establish a Monitoring, Assessment, and Science Program for the lower San Joaquin River and its tributaries to provide the best available data for adaptive management and to measure progress toward reaching water quality and aquatic life goals. The Monitoring, Assessment, and Science Program would replace individual monitoring requirements for consumptive users. EPA recommends the State Water Board work with agency partners to develop a comprehensive monitoring and assessment framework that identifies a monitoring design to determine effectiveness of new and modified water quality standards, integrates aquatic resource monitoring requirements in federal and state natural resource laws, and is coordinated with the long-established Interagency Ecological Program (IEP) and emerging Delta and San Joaquin River Regional Monitoring Programs.

EPA looks forward to working closely with the State Water Board to revise and implement the Bay-Delta WQCP. Should you have any questions please contact me at (415) 972-3337 (Torres.Tomas@epa.gov) or refer staff to Nancy Woo at (415) 972-3409 (Woo.Nancy@epa.gov).

Sincerely,

Tomás Torres
Director, Water Division

[1] State Water Resources Control Board, 13 December 2006, Water Quality Control Plan for the San Francisco Bay/Sacramento-San Joaquin Delta Estuary, (Bay-Delta WQCP). Available at http://www.waterboards.ca.gov/waterrights/water_issues/programs/bay_delta/wq_control_plans/2006wqcp/index.shtml

[2] "Interior remains concerned that the San Joaquin Basin salmonid populations continue to decline and believes that flow increases are needed to improve salmonid survival and habitat." USFWS May 23, 2011 Phase I Scoping Comments, http://www.waterboards.ca.gov/waterrights/water_issues/programs/bay_delta/bay_delta_plan/water_quality_control_planning/cmmnts052311/amy_aufdemberge.pdf

[3] "Inadequate flow to support fish and their habitats is directly and indirectly linked to many stressors in the San Joaquin river basin and is a primary threat to steelhead and salmon." NMFS February 4, 2011 Phase I Scoping Comments, http://www.waterboards.ca.gov/waterrights/water_issues/programs/bay_delta/bay_delta_plan/water_quality_control_planning/cmmnts020811/010411dpowell.pdf

[4] California Department of Fish and Wildlife (2010) Quantifiable Biological Objectives and Flow Criteria for Aquatic and Terrestrial Species of Concern Dependent on the Delta. Available at http://deltacouncil.ca.gov/docs/delta-isb/final-quantifiable-biological-objectives-and-flow-criteria-aquatic-and-terrestrial. See quote in Executive Summary "…current Delta water flows for environmental resources are not adequate to maintain, recover, or restore the functions and processes that support native Delta fish."

[5] United States Environmental Protection Agency (2012) Water Quality Challenges in the San Francisco Bay/ Sacramento-San Joaquin Delta Estuary: EPA's Action Plan available at https://www.epa.gov/sfbay-delta/bay-delta-action-plan

[6] California State Water Resources Control Board (2010) Development of Flow Criteria for the Sacramento-San Joaquin Delta Ecosystem available at http://www.waterboards.ca.gov/waterrights/water_issues/programs/bay_delta/deltaflow/final_rpt.shtml

[7] Unimpaired flow is the flow that would accumulate in surface waters in response to rainfall and snowmelt, and flow downstream if there were no reservoirs or diversions to change the quantity, timing, and magnitude of flows.

[8] California water managers have some experience with "block of water" provisions, notably in the ongoing management of the 800,000 acre feet of "(b)(2)" water mandated in the federal Central Valley Project Improvement Act, as well as shorter-term management of the Environmental Water Account in the early 2000s.

[9] *Salmon Protection Objective*: "water quality conditions shall be maintained, together with other measures in the watershed, sufficient to achieve a doubling of natural production of chinook salmon from the average production of 1967-1991, consistent with the provisions of State and federal law." Table 3, page 14 of State Water Resources Control Board, 13 December 2006, Water Quality Control Plan for the San Francisco Bay/Sacramento-San Joaquin Delta Estuary.

[10] Letter from Delta Independent Science Board to State Water Resources Control Board, March 29, 2013. Available at http://www.waterboards.ca.gov/waterrights/water_issues/programs/hearings/baydelta_pdsed/docs/comments032913/richard_norgaard.pdf The Independent Science Board suggested that the 40% number "appears to be pushing the limit of benefit to salmon."

[11] California Department of Fish and Wildlife testimony to the State Water Board on March 20, 2013 http://www.waterboards.ca.gov/waterrights/water_issues/programs/bay_delta/docs/dsedoc/cdfw.pdf

[12] United States Fish and Wildlife Service 2013 testimony to State Water Board on March 20, 2013, available at http://www.waterboards.ca.gov/waterrights/water_issues/programs/bay_delta/docs/dsedoc/fws.pdf; United States Fish and Wildlife Service, September 27, 2005, Recommended Streamflow Schedules To Meet the AFRP Doubling Goal in the San Joaquin River Basin (FWS 2005), p. 27, available at: http://www.waterboards.ca.gov/waterrights/water_issues/programs/bay_delta/bay_delta_plan/water_quality_control_planning/docs/sjrf_spprtinfo/afrp_2005.pdf

[13] Zeug et al, 2014, Response of juvenile Chinook salmon to managed flow: lessons learned from a population at the southern extent of their range in North America. Fisheries Management and Ecology doi: 10.1111/fme.12063. "Greater cumulative discharge and variance in discharge during the migration period resulted in higher survival indices and a larger proportion of juveniles migrating as pre-smolts."

[14] Sturrock AM, Wikert JD, Heyne T, Mesick C, Hubbard AE, Hinkelman TM, et al. (2015) Reconstructing the Migratory Behavior and Long-Term Survivorship of Juvenile Chinook Salmon under Contrasting Hydrologic Regimes. PLoS ONE 10(5): e0122380.

[15] Final EPA-USGS Technical Report: Protecting Aquatic Life from Effects of Hydrologic Alteration, EPA Report 822–R-16-007 USGS Scientific Investigations Report 2015–5164, (December 2016) available at https://www.epa.gov/wqc/final-epausgs-technical-report-protecting-aquatic-life-effects-hydrologic-alteration-documents.

[16] For example, a new footnote to Table 3 could include the following language: "Minimum flows shall start at 40% with a minimum base flow of 1000 cfs and, with Executive Director approval, can be reduced within the adaptive management range on an annual or long term basis only if juvenile fall-run Chinook salmon freshwater survival rates are sufficient to achieve the *Salmon Protection Objective*, by 2032. These survival rates, as a five-year geometric mean, must be consistent with achievement of a natural adult production target of fall-run Chinook salmon for each tributary as follows: Stanislaus 22,000, Tuolumne 38,000, Merced 18,000. Minimum flows and base flows can be increased, with Executive Director approval, within the adaptive management range on an annual or long term basis if survival rates are insufficient to achieve the *Salmon Protection Objective* by 2032."

[17] Fleenor, William et al., February 15, 2010, On developing prescriptions for freshwater flows to sustain desirable fishes in the Sacramento-San Joaquin delta, available at: http://watershed.ucdavis.edu/pdf/Moyle_Fish_Flows_for_the_Delta_15feb2010.pdf

[18] Marston et al. December 2012. Delta Flow Factors Influencing Stray Rates of Escaping Adult San Joaquin River Fall-run Chinook Salmon (*Oncorhynchus tshawytscha*), San Francisco Estuary and Watershed Science, 10(4) Available at: http://escholarship.org/uc/item/6f88q6pf, see also 2010 Flows Report pp. 55-56