State of California
State Water Resources Control Board
DIVISION OF WATER RIGHTS
P.O. Box 2000, Sacramento, CA 95812-2000
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Sites-WR-Application@Waterboards.ca.gov

PROTEST – (Applications & Petitions)

BASED ON ENVIRONMENTAL OR PUBLIC INTEREST CONSIDERATIONS
co
APPLICATION: A025517X01

PETITION FOR PARTIAL ASSIGNMENT OF STATE-FILED APPLICATION A025517 TO APPLICATION A025517X01

PETITION FOR RELEASE FROM PRIORITY OF STATE-FILED APPLICATIONS A025513, A022514, A022235, A023780, A023781, AND ANY UNASSIGNED PORTION OF STATE-FILED APPLICATION A025517 IN FAVOR OF APPLICATION A025517X01

We, Chris Shutes, Executive Director, California Sportfishing Protection Alliance (CSPA), 1608 Francisco St., Berkeley, CA 94703, blancapaloma@msn.com, (510) 421-2405; Keiko Mertz, Policy Director, Friends of the River (FOR), 3336 Bradshaw Rd., Ste 335, Sacramento, CA 95827, keiko@friendsoftheriver.org, (916) 442-3155; Chief Caleen Sisk, Winnemem Wintu Tribe, 4840 Bear Mountain Rd., Redding, CA 96003, caleenwintu@gmail.com, (530) 229-4096; Barbara Vlamis, Executive Director, AquAlliance, P.O. Box 4024, Chico, CA 95927, barbarav@aqualliance.net, (530) 895-9420; Carolee Krieger, Executive Director, California Water Impact Network (CWIN), 808 Romero Canyon Rd., Santa Barbara, CA 93108, caroleekrieger7@gmail.com, (805) 969-0824; Michael Jackson, counsel to CSPA, CWIN and AquAlliance, P.O. Box 207, 20 Crescent St., Quincy, CA 95971, mjatty@sbcglobal.net, (530) 283-0712; Steve Evans, Rivers Director, CalWild, 4920 Flora Vista Lane, Sacramento, CA 95822, sevans@calwild.org, (916) 708-3155; Lowell Ashbaugh, Conservation Chair, Fly Fishers of Davis, 677 Equador Place, Davis, CA 95616, ashbaugh.lowell@gmail.com, (530) 758-6722; James Pachl, Friends of the Swainson's Hawk, 8867 Bluff Lane, Fair Oaks, CA 95628, jamesppachl@gmail.com, (916) 844-7515; Mark Rockwell, President, Northern California Council of Fly Fishers International, 5033 Yaple Avenue, Santa Barbara, CA 93111, mrockwell1945@gmail.com, (530) 559-5759; Barbara Barrigan-Parrilla, Executive Director, Restore the Delta, 2616 Pacific Ave. #4296, Stockton, CA 95204, barbara@restorethedelta.org, (209) 479-2053; Regina Chichizola, Executive Director, Save California Salmon, P.O. Box 142, Orleans, CA 95556, regina@californiasalmon.org, (541) 951-0126; Kasil Willie, Staff Attorney, Save California Salmon, 1418 20th St., Ste. 100, Sacramento, CA 95811, kasil@californiasalmon.org, (415) 300-7453; Erin Woolley, Senior Policy Strategist, Sierra Club California, 909 12th St. #202, Sacramento, CA 95814, erin.woolley@sierraclub.org,

(916) 403-3744; and Konrad Fisher, Director, Water Climate Trust, P.O Box 990111, Redding, CA 96099; info@waterclimate.org, (415) 617-9784

(Protestants)

have read carefully the State Water Resources Control Board's (State Water Board) notice regarding Application A025517X01; the Petition for Partial Assignment of State-Filed Application A025517 to Application A025517x01; and the Petition for Release from Priority of State-Filed Applications A025513, A022514, A022235, A023780, A023781, and Any Unassigned Portion of State-Filed Application A025517 in Favor of Application A025517x01 of the Sites Project Authority.

We protest this application and these petitions because:

1) They would have adverse environmental impacts.
2) They would not best conserve the public trust.
3) They would not best conserve the public interest.
4) They would be in conflict with a general or coordinated plan or with water quality objectives established pursuant to law. (Wat. Code, § 10504.)
5) They are contrary to law, including, but not limited to, Water Code Sections 10505 and 10505.5.

We state the facts that support our allegations, our reasons for the protest, and our terms for withdrawing the protest, in the attached document entitled "Protest of the California Sportfishing Protection Alliance, Friends of the River, et al. of the Application and Petitions of Sites Project Authority Relative to Sites Reservoir."

A true copy of this protest has been served upon the applicant and petitioner by e-mail at aforsythe@sitesproject.org.

Date: August 31, 2023

Chris Shutes, Executive Director
California Sportfishing Protection Alliance

Keiko Mertz, Policy Director
Friends of the River

Chief Caleen Sisk
Winnemem Wintu Tribe

Barbara Vlamis, Executive Director
AquAlliance

Carolee Krieger, Executive Director
California Water Impact Network

Michael Jackson
Counsel to CSPA, CWIN and AquAlliance

Steve Evans, Rivers Director
CalWild

Lowell Ashbaugh, Conservation Chair
Fly Fishers of Davis

James Pachl
Friends of the Swainson's Hawk

Mark Rockwell, President
Northern California Council of Fly Fishers International

Barbara Barrigan-Parrilla, Executive Director
Restore the Delta

Regina Chichizola, Executive Director
Save California Salmon

Kasil Willie, Staff Attorney
Save California Salmon

Erin Woolley, Senior Policy Strategist
Sierra Club California

Konrad Fisher, Director
Water Climate Trust

Attachment:

Protest of the California Sportfishing Protection Alliance, Friends of the River, et al. of the Application and Petitions of Sites Project Authority Relative to Sites Reservoir

<u>Protest of the California Sportfishing Protection Alliance, Friends of the River, et al. of the Application and Petitions of Sites Project Authority Relative to Sites Reservoir</u>

The California Sportfishing Protection Alliance, Friends of the River, the Winnemem Wintu Tribe, AquAlliance, California Water Impact Network, CalWild, Fly Fishers of Davis, Friends of the Swainson's Hawk, Northern California Council of Fly Fishers International, Restore the Delta, Save California Salmon, Sierra Club California, and Water Climate Trust protest the water rights application and petitions of the Sites Project Authority relative to the proposed Sites Reservoir.

We protest this application and these petitions because:

1) They would have adverse environmental impacts.
2) They would not best conserve the public trust.
3) They would not best conserve the public interest.
4) They would be in conflict with a general or coordinated plan or with water quality objectives established pursuant to law. (Water Code Section 10504.)
5) They are contrary to law, including, but not limited to, Water Code Sections 10505 and 10505.5.

This structure of this protest generally follows the sequence of the points stated above.

I. Introduction

The Sites Reservoir project is founded on the dual deception that a massive new diversion from the Bay-Delta watershed will improve water supply reliability and improve environmental protection. It is doubly wrong.

Fish and rivers throughout the Central Valley are hemorrhaging. The state and federal water projects,[1] their agencies,[2] and their contractors have led these fish to the brink of extinction and these rivers to degradation and loss of basic function. Now, changing their hats to appear as partisans of local solutions in the Sacramento Valley, these agencies and their contractors ask for more water and more public money, and propose to control 90% of the water in a shiny new project, but with no new responsibilities to protect the public resources they have so masterfully decimated.

The Sites project lives in the faded dream of the mid-twentieth century, whose central tenet was that when water supply is short, the solution is to pour more concrete and divert more water. It is no wonder that the Sites water rights application claims it is true to, and seeks to implement, a project that was first put on the books in 1977. That 1977 "state filed application" for water, in turn, is grounded in a view of water development that was passed into law in 1927.

The Sites project is deeply inequitable. It harms all those who rely on rivers and fish for their livelihoods and sustenance, as well as for their enjoyment. This includes tribal

[1] State Water Project (SWP) and Central Valley Project (CVP).
[2] California Department of Water Resources (DWR) and Bureau of Reclamation (Reclamation).

communities whose connection to rivers, fish, and associated environments, are, in addition, cultural and religious. The Sites project will create some of the most expensive water in the state, affordable to only a few. It will thus tend to push costs for water higher generally, making water less accessible to disadvantaged communities.

Water is the lifeblood of California's rivers and fisheries. The Sites project is consistent with, and founded on, a coordinated plan for the state's water that systemically bleeds rivers, fisheries, and communities dry. There will be no water supply reliability in the Central Valley until demand for water is brought into line with what Central Valley hydrology can reliably provide. There will be no humane recognition of tribal sovereignty or the public trust until this paradigm shifts.

The proponents of Sites Reservoir won't produce a plan for operating their 1.5 million acre-foot reservoir until after it is approved. But they ask the people of California to trust them. They tell us it will give them the resources to protect fish this time around. Throughout California's history, reservoir backers have promised the world every time a new dam is built, and they have always failed to deliver. The overall result of the 1400 dams in California has been salmon and other fish species declining towards extinction, the loss of over 90% of California's wetlands, degraded water quality, and expanding toxic algae blooms in the Bay and Delta. Sites would not be the first dam to over-promise and under-deliver.

Past practice is the best indicator of future behavior. The state and federal projects, and their regulators at the State Water Board and the fish agencies, have the ability, the authority, and indeed the obligation to manage limited water resources to protect fish and rivers today. They have done the opposite. They systematically give away too much water. During dry year sequences, the projects routinely come crying to the regulators for "temporary" changes to already inadequate fisheries protections, and the regulators routinely oblige, without requiring accountability for how the latest predictable "emergency" came about.

The Sites project promises so many benefits, but what solid benefits are there really? Water for wildlife refuges that the state and federal projects should already be delivering to make up for the destruction of enormous amounts of Central Valley habitat. A pittance of water for Delta smelt in an experimental project whose effectiveness is based on a prayer.

And then there is process. So much process. The proponents of Sites, to the degree they are not already participants in the management committees that have run fish into the grave, will join the resource agencies and the water users already in the room, and talk, talk, talk.

The history of the state and federal water projects and their contractors is that they fight like crazy to make constraints on water deliveries as weak as possible. Once established, the state and federal projects and their contractors painstakingly game those constraints to maximize long-term water deliveries. The idea that voluntary consultation without strong regulation is enough to restore the state's public trust fishery and river resources utterly ignores the dismal outcome of past consultation with inadequate rules and enforcement.

The Sites Application supports itself with talking points on how the state will run out of water under conditions of climate change. It is a new tambourine banging out the same old tune. This protest is founded on the principle that if the State of California does not set limits on water use, and instead allows the state and federal projects to keep taking, taking, taking, the state is going to run out of fish and living rivers.

The State Water Board should deny this Application and accompanying Petitions.

II. The Construction and Operation of Sites Reservoir Would Have Adverse Environmental Impacts

A. Sites Reservoir Will Have Adverse Environmental Impacts in the Project Area.

1. Sites Reservoir Will Have Adverse Water Quality Impacts in the Project Area.

a. Concentrations of Metals in Sites Reservoir Will Exceed Standards and May Create Harm to Fish and Wildlife and to Public Health.

Constituent metals will enter the Sites Reservoir through a variety of sources: metal concentrations found in the Sacramento River water that is diverted into the reservoir, existing soils in the inundation area, and atmospheric deposition.

DWR's water quality monitoring station on the Sacramento River downstream of the Red Bluff Diversion Dam provides information on the water quality of water that would be diverted to the proposed project through the Tehama-Colusa Canal.

Jerry Boles, former DWR Chief of Water Quality for the Northern District, compiled data from the DWR Water Data Library (WDL), in support of his 2017 comments on the Sites DEIR/DEIS. He concluded: "Aluminum, arsenic, cadmium, chromium, iron, lead, manganese, and mercury in water samples from the Sacramento River below the Red Bluff Diversion Dam exceed various criteria and standards established to protect beneficial uses, including drinking water, public health, taste and odor for agriculture, and freshwater organisms, which includes fish. Maximum concentrations of some of these metals are many times higher than the corresponding criteria or standard."[3]

More specifically, Mr. Boles found:

- **Aluminum** exceeds the Basin Plan Primary Maximum Contaminant Level (MCL) for drinking water by one and one half times. the secondary drinking

[3] Jerry Boles, Comments on the Draft EIR/EIS for the Sites Reservoir Project: Chapter 7 Surface Water Quality, p. 3. Available at: https://www.friendsoftheriver.org/wp-content/uploads/2019/09/Boles-DEIR-comments.pdf. Attached hereto as Exhibit A.

[4] *Id.*, pp. 3-4.

water standard in the Basin Plan by seven times, and the USEPA MCL by 30 times.

- The minimum concentration of **arsenic** reported in WDL exceeds by more than 10 times nearly all the criteria and standards for protection of human health.
- The least reported concentration of **cadmium** from river water samples exceeds by five times the incremental cancer risk for drinking water.
- The least concentration of **chromium** reported in WDL exceeds the California Public Health Goal by 16 times and incremental cancer risk for drinking water by five times.
- The maximum concentration of **iron** that was reported in WDL exceeds the secondary drinking water maximum concentration level in the Basin Plan, as well as National Recommended Water Quality Criteria for taste and odor or welfare by nearly three times.
- The maximum concentration of **lead** that was reported exceeds the California Public Health Goal and California Proposition 65 maximum allowable dose level for reproductive toxicity by over four times.
- The maximum reported concentration of **manganese** exceeds the National Recommended Water Quality Criteria for taste and odor or welfare by one and a half times.
- The maximum concentration reported for **mercury** exceeds the National Recommended Water Quality Criteria for Freshwater Aquatic Life Continuous Concentration by nearly four times, and the Freshwater Aquatic Life Maximum Concentration by two times.

Mr. Boles also noted: "An additional concern with these metals is that some metals are taken up by crops (such as arsenic by rice), making the crops potentially unsuitable for consumption. Plant uptake of metals in the water supply not only affect crops grown for human consumption, but also plants grown for support of wildlife, such as in refuges."[4]

Once the water that contains constituent metals is diverted into the reservoir, evapoconcentration, in combination with "multiple years of reservoir draining," could increase constituent concentrations in Sites Reservoir by up to 48 percent.[5] Water quality declines over time when the water diverted to Sites is contaminated with metals, the soils in the reservoir contribute more salt/metal into the reservoir, and the impounded water is exposed to heat and wind, causing evaporation. Water released from Sites Reservoir to the Sacramento River is thus likely to contribute higher concentrations of constituents such as salts and metals than the water that was diverted to Sites from the Sacramento River.[6]

Any permit issued for Sites Reservoir should include a permit term that establishes a program to continuously monitor and report the metal constituents present in inflows to the reservoir, in the reservoir itself, and in outflows from the reservoir, to avoid the discharge of elevated levels of metals into the Sacramento River.

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[4] *Id.*, pp. 3-4.
[5] Sites Reservoir Project, Recirculated Draft Environmental Impact Report/Supplemental Draft Environmental Impact Statement for the Sites Reservoir Project (RDEIR/SDEIS) (November 2021), p. 6-32.
[6] *Id.*

b. Sites Reservoir Will Create an Environment that Methylates Mercury, Resulting in Contamination of Water, Soils, and Fish and Wildlife.

Methylmercury is an organic form of mercury created by anaerobic bacteria, with increased toxicity and ability to bioaccumulate in fish and other animal and plant life. Thermal stratification of Sites Reservoir from late spring through early fall would affect in-reservoir mercury methylation. Due to thermal stratification, oxygen in the hypolimnion would become depleted, which would in turn stimulate mercury methylation by bacteria. Reservoir fluctuations would also contribute to conditions favorable to mercury methylation.[7]

In his 2021 comments on the RDEIR/SDEIS, Mr. Boles discussed the significance of mercury concentrations, stating:

> Since mercury concentrations of up to only 0.52 ng/L in Lake Oroville have been sufficient to cause numeric criterion and objectives to be exceeded in this reservoir, concentrations of mercury as high as 14.4 ng/L in water diverted to the proposed reservoir from the Sacramento River at Red Bluff will undoubtedly cause highly significant impacts and substantial adverse effects in the proposed reservoir and in downstream releases. The data from Lake Oroville (which is over 50 years old) shows that even if the expected initially high mercury concentrations in the reservoir decline over time, the concentrations of mercury present in water that would be diverted to the reservoir from the Sacramento River at Red Bluff and especially at Hamilton City are sufficiently high to cause fish tissue methylmercury concentrations to exceed criterion for the protection of human health and wildlife, not just for 10 to 35 years, but for the life of the reservoir project.[8]

The 2021 RDEIR/SDEIS states: "In summary, depending on the methylmercury concentrations in Sites Reservoir releases and the water year type, operation of Sites Reservoir may result in substantial degradation of water quality in the Delta with respect to methylmercury bioaccumulation in Delta fish".[9]

Mercury that is methylated in Sites Reservoir will affect insects, birds, and terrestrial fauna, in addition to fish. It will bioaccumulate in aquatic insects consumed by birds and other wildlife. It will also accumulate in the soils at the changing edges of the reservoirs, where birds, butterflies and other fauna tend to congregate to drink and eat. Such accumulation will move up the food web to predators of those fauna that directly ingest methylmercury.

The water rights Application states: "The Authority will monitor methylmercury concentrations and implement reduction actions as part of Project construction and operation

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[7] In general, *see* State Water Board (2013), Statewide Mercury Control Program for Reservoirs. Available at: Statewide Mercury Control Program for Reservoirs.
[8] Jerry Boles, Comments on the RDEIR/SDEIS for the Sites Reservoir Project, p. 1. Available at: https://sitesproject.org/wp-content/uploads/2023/06/SRP_RSD_0019_Boles.pdf. Attached hereto as Exhibit B.
[9] RDEIR/SDEIS p. 6-81.

with the implementation of Mitigation Measure WQ-1.1: Methylmercury Management."[10] Proposed mitigation measures include removing vegetation prior to filling the reservoir, not stocking fish for 10 years, and monitoring fish tissue methylmercury once the reservoir is stocked.

In addition to these mitigation actions, a permit term should prohibit reservoir releases to the Sacramento River when the discharging water has a higher mercury concentration than the Sacramento River at the point of discharge. An additional permit term should limit the degree of reservoir fluctuation in any given year based on a schedule derived from a storage-stage curve for the reservoir.

2. The Sites Reservoir Project Will Increase Formation of Harmful Algal Blooms (HABs) in the Reservoir and in the Sacramento River.

As an offstream reservoir with relatively long residence time for stored water, high summer ambient temperatures, and high May-October water temperatures, Sites Reservoir will be a likely vector for harmful algal blooms (HABs). Release of water from Sites during such blooms, or simply of water that contains the organisms that create such blooms, represents a threat to the Sacramento River and the Delta, and to associated ecosystems. In addition, reduction of flow into the Delta due to Sites diversions may create conditions downstream of the points of diversion that increase the likelihood of HABs formation, even in the absence of releases from Sites Reservoir.

The cyanotoxins that form HABs threaten recreational activities, tribal beneficial uses, drinking water supplies, fisheries and wildlife, and crop health. Along the Sacramento River and in the Delta, these cyanotoxins pose a public health risk.

HABs thrive in waters with high nutrient loads (Nitrogen and Phosphorous), high water temperatures, light availability, and stagnant water from a lack of freshwater flow. Climate change enhances these factors to suit HABs formations throughout the San Francisco Bay-Delta Estuary and its tributaries annually.[11]

Diversions to Sites Reservoir will diminish flow in the Sacramento River and the north Delta, increasing the areas and the extent of relative stagnation, and increasing residence time of nutrients that lead to the formation of HABs.

The State Water Resources Control Board developed the FHAB Partner Monitoring Strategy to help monitor HABs throughout California. In general, the Sacramento River which is prone to low flow in drier years, is under-monitored for cyanotoxins from HABs.[12] More specifically, there is at present no monitoring done near Colusa in the HABs Report Map.[13]

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[10] Sites Water Rights Application, Request for Release from Priority, p. 7 of 11.

[11] Kudela, R. M, Howard, M. D, Monismith, S., & Paerl, H. W. (2023). Status, Trends, and Drivers of Harmful Algal Blooms Along the Freshwater-to-Marine Gradient in the San Francisco Bay–Delta System. *San Francisco Estuary and Watershed Science*, 20(4). Retrieved from https://escholarship.org/uc/item/1dz769db.

[12] Sacramento Environmental Commission. (2017). Cyanobacteria in Sacramento region waterways. In *Sacramento County*. https://emd.saccounty.gov/SEC/Documents/Final%20Cyanobacteria%20Report.pdf

[13] *See* https://mywaterquality.ca.gov/habs/where/freshwater_events.html.

Funding for the FHAB Partner Monitoring Strategy has been minimal. Filling in the data gaps near Colusa with an actual monitoring program is necessary to support the claim there will be no HABs impacts from the operation of Sites Reservoir, and is needed to establish a baseline for permitting approval of the project. One of the goals of the FHAB Partner Monitoring Strategy is "integrating HAB monitoring elements into California State Water Board programs, permits, and policies,"[14] and to date this has not been completed for the area around the proposed Sites intakes and outfall.

Reduced downstream flows from water diversions along the stem of the Sacramento River could lead to endangering the Tribal beneficial uses of the waterways for the Shingle Springs Band of Miwok Indians at the confluence of the Sacramento River and the Feather River. Zach Gigone, the environmental scientist for the Shingle Springs Band, has reported that members of the Tribe have seen HABs in recent drought years, but not in wet water year 2023.

In the Sites RDEIR/SDEIS, the model simulation of Delta inflow and outflow under Sites project alternatives shows incremental change from the No Action Alternative. However, CALSIM modeling does not attempt to model water operations in extreme drought conditions, particularly when Temporary Urgency Change Orders are in effect for Delta operations. It also does not capture the hydrological impacts of aridification, changes in soil conditions, and increased evaporation resulting from extreme heat.

The RDEIR/SDEIS explains why the formation of HABs in Sites Reservoir will be highly likely:

> Operating Sites Reservoir would result in reservoir drawdown, reduced storage volume, and higher water temperatures from late spring through fall, particularly in Dry and Critically Water Years. This would create favorable conditions for the initiation of HABs, and growth of algae and invasive aquatic vegetation. Because nutrients would be available in non-limiting concentrations in the reservoir, once HABs develop, the nutrient concentrations would be expected to be sufficient to sustain blooms as long as reservoir water temperature remained relatively warm (approximately 66°F minimum). ... Modeled temperatures would approach or exceed 66°F from May through September.[15]

The RDEIR/SDEIS proposes the following mitigation measure for HABs:

> "[W]ater quality management in Sites Reservoir as it relates to HABs would include implementation of a water quality monitoring program and a HABs action plan to minimize the potential for adverse effects on beneficial uses of water in Sites Reservoir and downstream (Section 2D.3). If cyanobacteria and cyanotoxins are confirmed near the I/O tower at a level at or exceeding the "Caution" action trigger level, releases could be made from lower in the water column (e.g., through the low-level intake) to reduce the potential for higher concentrations of cyanobacteria and cyanotoxins to be released

[14] Kudela, R. M, Howard, M. D, Monismith, S., & Paerl, H. W. (2023), *op. cit*.
[15] RDEIR/SDEIS p. 6-88.

downstream, and this action would be informed by water quality monitoring for cyanobacteria and cyanotoxins (Section 2D.3).[16]

A HABs monitoring program is necessary. However, the proposed withdrawal of water from deeper in the reservoir when a bloom is occurring is not certain to protect receiving waters from the effects of HABs. A permit condition should require development of a HABs monitoring program in Sites Reservoir and downstream of its discharge to the Sacramento River. The program should be developed jointly with CDFW and staff from the State Water Board. It should develop requirements that prohibit discharge of water from Sites to the Sacramento River that increases the concentration in the river of the cell counts of HAB-forming organisms are greater than those in the receiving water.

3. The Sites Reservoir Project May Release over 360,000 Metric Tons of CO_2e Annually, Equivalent to 80,653 Gas-Powered Cars Each Year.

Sites Reservoir will exacerbate climate change by emitting high levels of greenhouse gasses throughout the project's lifespan. A recent study has revealed that Sites would emit over 36 million tons of carbon dioxide equivalent (CO_2e) over the next 100 years.[17] This amounts to 360,000 tons (or 80,653 gas-powered cars, or 405 million pounds of coal burned) every year for 100 years. This analysis was completed using the cutting-edge All-Res[18] modeling tool, which is specifically designed to estimate emissions from reservoirs, and includes additional emissions pathways not captured by other tools or frameworks. For context, the U.S. EPA and the California Air Resources Board both require some major emitters to report emissions that exceed 25,000 tons of CO_2e per year. Emissions from Sites could exceed that threshold by 14 times.

California is already on the front lines of climate change impacts, with an increase in extreme heat, drought, wildfires, and sea level rise. Climate change has serious financial costs for Californians; the 2018 wildfires alone cost approximately $148.5 billion,[19] and estimates of cost for sea level rise in just the San Francisco Bay area range from $45-100 billion by 2100.[20] Social costs include loss of and increased cost of housing, increased displacement and migration, increased cost of resources, increased healthcare costs, and impacts to mental health and food security. For these and many other reasons, California leads the world in ambitious climate policy, and recent legislation establishes a legally binding goal for statewide carbon neutrality by 2045.[21]

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[16] RDEIR/SDEIS p. 6-89.

[17] "Estimate of Greenhouse Gas Emissions for the Proposed Sites Reservoir Project using the All-Res Modeling Tool," Tell the Dam Truth, Friends of the River, Patagonia, 2023. Attached hereto as Exhibit C. Link: https://www.friendsoftheriver.org/wp-content/uploads/2023/08/Sites-Reservoir-Project-Emissions-Report.pdf

[18] "All-Res Greenhouse Gas Tool," Tell the Dam Truth. Link: https://tellthedamtruth.com/all-reservoir-greenhouse-gas-model/

[19] Wang, D., Guan, D., Zhu, S. *et al.* Economic footprint of California wildfires in 2018. *Nat Sustain* **4**, 252–260 (2021). https://doi.org/10.1038/s41893-020-00646-7

[20] San Francisco Baykeeper "The Economic Costs of Sea Level Rise in the Bay Area" https://baykeeper.org/shoreview/economic-loss.html#:~:text=Across%20the%20Bay%20Area%2C%20the,entire%20regions%20may%20be%20abandoned.

[21] The California Climate Crisis Act, California Assembly Bill 1279 (2021-2022), Chapter 337, https://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill_id=202120220AB1279

Given its potential emissions, Sites Reservoir is contrary to law, is a step backward for climate policy, and does not pass the test for 21st century water management. Emissions from this project will harm Californians and the environment, and set the state back on legally binding climate goals.

Storage and hydropower reservoirs are a globally recognized source of anthropogenic greenhouse gasses, particularly methane, which is 25 times more potent than carbon dioxide (CO_2). The latest science shows that reservoirs significantly contribute to GHG emissions.[22] One study suggests that more methane (CH_4) bubbles come from storage reservoirs than was previously known through the processes of degassing and ebullition.[23] High methane emissions are released from reservoirs due to rapid depressurization when water moves from the depths of a reservoir, through a turbine, to the receiving waterway downstream.

Methane emissions from reservoirs are further documented by a 2017 study that states: "[W]ater-level drawdowns [of reservoirs] can stimulate ebullitive CH_4 flux in reservoirs…, thereby establishing a connection between water-level management and CH_4 emissions."[24] Additionally, it is well known within the scientific community that methane releases are a significant concern related to greenhouse gasses and accounts for about 20 percent of global emissions.[25] The U.S. Environmental Protection Agency (EPA) has taken interest and is currently researching reservoir emissions.[26]

A recent document published by the Sites Project Authority admits that the Authority's own greenhouse gas estimates for the project do not account for facility decommissioning, decay of organic matter on exposed banks, land use changes away from the reservoir, loss of sequestration, ecosystem carbon loss from dewatering of wetlands, riparian areas or mangroves, or emissions from decaying riparian vegetation due to fluctuating river levels.[27] These are critical carbon footprint metrics necessary to fully appraise potential greenhouse gas emissions from the Project. In this same document,[28] as well as in the environmental documents,[29] the Authority makes vague claims that the project will achieve net zero emissions through a plan to be developed in the future, which will include the purchase of carbon credits. Unfortunately, carbon credits are a controversial and unreliable method to reduce emissions. A growing body of

[22] John A. Harrison et al., "Year-2020 Global Distribution and Pathways of Reservoir Methane and Carbon Dioxide Emissions According to the Greenhouse Gas from Reservoirs (G-Res) Model," *Global Biogeochemical Cycles* no. 6, no. e2020GB006888 (2021)

[23] *Id.*

[24] Jake J Beaulieu et al., "Effects of an Experimental Water-Level Drawdown on Methane Emissions from a Eutrophic Reservoir," *Ecosystems (New York, N.Y.)* 21, no. 4 (2018): 657–74. Available at: , https://doi.org/10.1007/s10021-017-0176-2..

[25] EPA, "Importance of Methane," 2021, https://www.epa.gov/gmi/importance-methane.

[26] Research on Emissions from U.S. Reservoirs, U.S. EPA, August 9, 2023, webpage. Link: https://www.epa.gov/air-research/research-emissions-us-reservoirs

[27] "Sites Reservoir Frequently Asked Questions: Sites Reservoir Greenhouse Gas Emissions Evaluation," Sites Project Authority, August 2023. Attached hereto as Exhibit D.

[28] *Id.*

[29] RDEIR/SDEIS Chapter 21. Greenhouse Gas Emissions. Pg. 21-16.

scientific evidence suggests that many credits have no environmental worth and do little to mitigate emissions, with some even exacerbating warming.[30]

Proponents claim that greenhouse gas emissions from Sites Reservoir will be fully mitigated; however, this claim has three fatal flaws. First, proponents have not used the best available science and tools to estimate reservoir emissions,[31] and thus have not established a reasonable baseline for mitigation. Proponents cannot achieve their stated goal of net zero project emissions without, in fact, having an accurate accounting of those emissions. Second, proponents' plan to make a plan is not an acceptable mitigation and fails to recognize the gravity of climate change impacts in California. Climate change is happening *now,* and a to-be-developed greenhouse gas reduction plan does not provide the necessary assurances to the public that these impacts will be mitigated. Third, proponents propose mitigation measures that are not supported by evidence. Proponents have stated their intent to purchase carbon credits where reductions and Best Management Practices are unable to reduce emissions to net zero. As discussed above, carbon credits are not a scientifically supported method to reduce emissions. Further, proponents speculate that "because electricity providers in the state will be complying with the renewable energy goals under SB 100…. the electricity purchased for the Project's needs would become progressively lower in carbon intensity."[32] Speculation is not an acceptable method to reduce the impact of greenhouse gasses.

If the State Water Board approves a water rights permit for the Sites Project, it should require permit terms to update the accounting of the proposed reservoir's greenhouse gas emissions using the best available science and tools, and to require concrete mitigation measures that achieve net zero emissions consistent with the updated accounting, without relying on the purchase of carbon credits or offsets.

4. The Sites Reservoir Project Will Have Adverse Effects on Wetlands in the Project Area.

According to project proponents, Sites Reservoir would inundate and destroy terrestrial and aquatic habitat covering approximately 13,200 acres in Antelope Valley, devastating the habitat of numerous terrestrial and semi-terrestrial species.[33] More specifically, "construction of

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[30] Thales A. P. West et al., Action needed to make carbon offsets from forest conservation work for climate change mitigation. *Science* 381,873-877(2023). DOI:10.1126/science.ade3535. Link: https://www.science.org/doi/10.1126/science.ade3535

[31] In Exhibit D, "Sites Reservoir Frequently Asked Questions," the Sites Authority states that it used "'the global warming potential' approach that is endorsed by the Intergovernmental Panel on Climate Change" to estimate emissions. However, in the same document the Authority notes numerous scientifically documented emissions pathways that it failed to include in its analysis. Further, the Authority failed to use the G-res tool (a.k.a. "the carbon calculator for reservoirs), a widely available, peer reviewed, and scientifically validated GHG emissions estimation tool designed specifically for reservoir emissions. (More info on the G-res tool here: https://g-res.hydropower.org/. Examples of scientific validation of the G-res tool here: https://www.mdpi.com/2071-1050/13/21/11621, https://www.sciencedirect.com/science/article/pii/S1364815221001602, https://agupubs.onlinelibrary.wiley.com/doi/full/10.1029/2020GB006888).

[32] RDEIR/SDEIS Chapter 21. Greenhouse Gas Emissions. p. 21-13.

[33] RDEIR/SDEIS, p. ES-11. It is also important to note that this number is just an estimate and may be more because the RDEIR/SDEIS fails to accurately describe the baseline condition of the project site and the presence of special status species, undermining the accuracy of the impact analyses.

the reservoir and appurtenant facilities under Alternatives 1 or 3 would result in permanent impacts to approximately 425 acres of wetlands and 234 acres of streams, with impacts under Alternative 2 slightly lower due to a smaller reservoir footprint."[34]

Less than 10 percent of California's native wetlands remain after they were drained and diked for agricultural uses.[35] California's wetlands support millions of migrating birds each year, in addition to many other environmental and flood management benefits.[36] California cannot afford to further reduce its wetland footprint.

The Project's transmission lines will also specifically impact vernal pools, which are of critical importance to many species, including amphibians, for breeding habitat.[37] For electrical transmission lines, the RDEIR/SDEIS indicates that "[o]nly one of the two north-south transmission line alignments described in Chapter 2 would be constructed, and specific locations for the transmission line towers are currently unknown."[38] Transmission lines can have serious impacts to birds and the towers can destroy vernal pool wetlands and other important landscape features.[39]

5. The Sites Reservoir Project Will Have Adverse Effects on Terrestrial Fauna in the Project Area.

There are 33 special-status wildlife species likely to occur in the study area for the project.[40] These species will be impacted due to loss in habitat and continuous project operations. For example, the threatened giant garter snake, endemic to the area, will be negatively impacted from both construction activities and warm water deliveries through canals to the Sacramento Valley wildlife refuges and to the private rice-producing lands that surround the refuges. Construction activities are planned during the giant garter snake's active time period of May 1 and October 1, jeopardizing breeding and existing populations that are present in the project area.[41]

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[34] EPA comments on RDEIR/SDEIS, p. 5. *See also* RDEIR/SDEIS p. 9-19, 9-29. State Water Board comments on the RDEIR/SDEIS estimates different acreage amounts on p. 32: "Alternatives 1-3 are described as potentially eliminating more than 375 acres of wetland resources and more than 200 miles of stream resources."

[35] "The Central Valley Historic Mapping Project" by California State University, Chico Department of Geography and Planning and Geographic Information Center, 2003. Available at: https://www.waterboards.ca.gov/waterrights/water_issues/programs/bay_delta/docs/cmnt081712/sldmwa/csuchicodptofgeographyandplanningcentralvalley.pdf.

[36] *See* State of California Natural Resources Agency. (2010). State of the State's Wetlands: 10 Years of challenges and Progress. Sacramento, Ca. Available at: https://resources.ca.gov/CNRALegacyFiles/docs/SOSW_report_with_cover_memo_10182010.pdf

[37] *See* EPA Fact Sheet https://www.epa.gov/sites/default/files/2021-01/documents/amphibian_reptile_conservation.pdf. The latest aquatic delineation of the region's wetlands has not been updated in over 20 years. California Department of Water Resources. 2000. North of Delta Offstream Storage Investigation Progress Report, Appendix B: Wetland Delineation and Field Studies Report. Draft. Prepared for Integrated Storage Investigations, CALFED Bay-Delta Program. April 2000.

[38] RDEIR/SDEIS, p. 9-14.

[39] For discussion, *see* https://wildlife.ca.gov/Conservation/Plants/Vernal-Pools#22064101-laws-permits-and-cdfw-plant-programs.

[40] *See* RDEIR/SDEIS, p. 10-16.

[41] RDEIR/SDEIS, p. 10-80; *see also* USFWS Final Recovery Plan for the Giant Garter Snake, 2017, p. I-3.

In addition to the habitat directly lost to inundation and the construction of roads, new water conveyance infrastructure will also sever ecosystems and inhibit species movement and proliferation.[42] CDFW has identified much of the project area as having high connectivity value and high biodiversity ranking, with some areas marked as "irreplaceable and essential corridors" and "conservation planning linkages" in CDFW's Areas of Conservation Emphasis (ACE) program.[43] Connectivity between high quality habitat areas in heterogeneous landscapes is important to allow for range shifts and species migrations as climate changes.[44]

Sites Reservoir would cause habitat fragmentation that could reduce available habitat for mountain lions, American badgers, valley elderberry longhorn beetles, monarch butterflies, California red-legged frog, wester spadefoot toad, native bees, giant garter snake, tricolored blackbirds, western yellow-billed cuckoos, burrowing owls, native bats, and many other species. Sites would remove thousands of acres of contiguous, diverse habitats and eliminate local and regional connectivity for small, less mobile species. Poorly planned development can act as a barrier to wildlife movement and can affect an animal's behavior, home range, reproductive success, and physiological state, which can lead to significant impacts on individual wildlife, populations, communities, landscapes, and overall ecosystem function.[45] Habitat fragmentation has been shown to cause mortality of mountain lions, amphibians, reptiles and other organisms. Loss of connectivity decreases biodiversity and degrades ecosystems.

Climate change is increasing stress on species and causing a need for habitat flexibility and range shifting. Habitat connectivity is an essential linkage to species adaptation and persistence.

6. The Sites Reservoir Project Will Have Adverse Effects on Avian Species in the Project Area.

As discussed in the comments of NRDC et al. on the RDEIR/SDEIS, the construction and operation of Sites Reservoir will harm numerous threatened, endangered, and other special status bird species.[46] Affected avian species will include, but are not limited to, western yellow-billed

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[42] RDEIR/SDEIS, pp. 10-137 and 10-139, *see also* CDFW Comment Letter on RDEIR/SDEIS, p. 26.

[43] *See* California Department of Fish and Wildlife, Areas of Conservation Emphasis "ACE" Program, Interactive Map at https://apps.wildlife.ca.gov/ace/. For descriptions of connectivity rankings, s*ee also* CDFW's ACE Dataset Fact Sheet for Terrestrial Connectivity (DS2734) at: https://nrm.dfg.ca.gov/FileHandler.ashx?DocumentID=150835&inline.

[44] *See* Cushman, S. A., McRae, B., Adriaensen, F., Beier, P., Shirley, M., & Zeller, K. (2013). Biological corridors and connectivity. In D. W. Macdonald & K. J. Willis (Eds.), *Key Topics in Conservation Biology 2* (First Edit, pp. 384–403). John Wiley & Sons, Ltd. *See also* Heller, N. E., & Zavaleta, E. S. (2009). Biodiversity management in the face of climate change: A review of 22 years of recommendations. Biological Conservation, 142, 14–32. *See also* Krosby, M., Theobald, D. M., Norheim, R., & Mcrae, B. H. (2018). Identifying riparian climate corridors to inform climate adaptation planning. PLoS ONE, 13(11).

[45] Ceia-Hasse et al., 2018; Haddad et al., 2015; Marsh & Jaeger, 2015; Mitsch & Wilson, 1996; Trombulak & Frissell, 2000; van der Ree et al., 2011

[46] It is important to once again note that the full extent of significant impacts to avian and terrestrial species are unknown because project proponents did not 1) use specific bird surveys, 2) use an accurate species distribution survey and 3) did not complete an aquatic delineation. The harms that are revealed by project proponents are discussed herein, but could be more extensive. For more information on missing information, *see* NRDC et al. RDEIR/SDEIS Comments, *see also* EPA RDEIR/SDEIS comments.

cuckoo, bald eagle, Swainson's hawk, bank swallow, burrowing owl, golden eagle, and white-tailed kite. They exist in the project area and in reaches of the Sacramento River and Delta.[47] Each of these species is protected from "take" under the Migratory Bird Treaty Act, and many have additional listings and protections under the federal Endangered Species Act and California Endangered Species Act.

According to project proponents, the construction and ongoing operation of the project will facilitate direct take of burrowing owls, golden eagles, bald eagles, and white-tailed kite through electrocution or collision with new transmission lines.[48] Take of avian species could also occur through use of rodenticides, disturbances of nesting sites, and other means, and the RDEIR/SDEIS does not make clear how these impacts would be fully avoided.[49]

B. The Sites Project Will Have Adverse Environmental Effects in and around the Sacramento River.

1. The Sites Project Will Adversely Affect Salmon and Sturgeon in the Sacramento River.

Most of the major native cold water fishes of the Sacramento River are in dire condition.

Spring-run Chinook salmon are virtually extirpated from the mainstem Sacramento River except for its use as a migration corridor. Winter-run Chinook salmon, listed as endangered under the federal Endangered Species Act (ESA), are the focus of a major management and political struggle in just about every year; their numbers are in the low thousands, and both temperature dependent mortality and egg-to-fry survival below minima needed for survival. Production of wild Sacramento fall-run Chinook salmon has dropped precipitously; the numbers of this species necessary to support commercial and sport fishing in California are at present wholly dependent on hatchery production, which in the last three years did not produce sufficient returning adults to prevent the total closure in 2023 of California's salmon fishery.[50]

Both green sturgeon and white sturgeon are also in dire condition. Green sturgeon are ESA-listed as threatened. White sturgeon are under consideration for listing under the federal Endangered Species Act; their numbers are further threatened by algal blooms in the greater San Francisco Bay. CDFW and the California Fish and Game Commission have initiated a process to reduce allowed harvest of white sturgeon.

Existing requirements on the SWP and CVP have utterly failed to protect these fishes. Water temperature protections for winter-run salmon are inadequate and routinely go unmet.

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[47] RDEIR/SDEIS, Chapter 10.

[48] *See*, e.g., RDEIR/SDEIS at 10-87, and 10-95 to 10-97.

[49] *See*, e.g., CDFW RDEIR/SDEIS Comments Appendix A, p. 14. The Sites project will permanently impact 14,000 acres of suitable nesting habitat for the owl. Additionally, CDFW has noted that rodenticides used for pest control could negatively impact the Burrowing Owl, especially as the project lacks an Integrated Pest Management Plan.

[50] Under the federal Endangered Species Act (ESA), spring-run Chinook salmon are listed as threatened, and winter-run Chinook salmon as listed as endangered. Both species are listed under the California Endangered Species Act (CESA).

Flow requirements are too low. Measures that seek to restrict diversions when fish "are present" are, as a category of protection measures, ineffective.

Outmigration and juvenile rearing are the principal lifestages of Sacramento River salmon and sturgeon that diversions to Sites Reservoir will most negatively affect. Recent studies, confirming older studies, directly link juvenile outmigration success of both salmon and sturgeon to flow. Additional studies show that rearing habitat, and the willingness of salmon to rear in the Sacramento River, is also related to flow.

The Sites Application proposes minimal flow protection on the Sacramento River for salmon and no explicit flow protection for sturgeon. The proposed flow requirement at the Red Bluff point of diversion on the Sacramento River is the same as the 3250 cfs year-round required release from Keswick Reservoir. The proposed flow requirement at the Hamilton City point of diversion on the Sacramento River is scarcely higher at 4000 cfs.

The proposed flow requirement at Wilkins Slough of 10,700 cfs is likely to be the controlling Sacramento River flow requirement at most times.[51] The basis for the number is Michel et al. (2021), whose study of outmigrating fall-run Chinook salmon smolts from April-June did not discern a clear increased benefit in increased survival from higher flow for that species in those months at that location.[52] However, it does not follow from the 2021 study of Michel et al. that a blanket 10,700 cfs flow at Wilkins Slough is a protective of other runs of Chinook salmon or of sturgeon, particularly at other locations and in different months. On the contrary, unpacking Michel et al. (2021) shows that the Sites Authority has chosen a flow value it can live with without sufficient protection for other runs and other lifestages of salmon.

Flows upstream of Wilkins Slough in April-June are generally higher than flows at the Wilkins gage, but the opposite is true from December through March. An April-June flow at Wilkins Slough would likely mean higher flows upstream as water stored in Shasta Reservoir is released to meet irrigation diversions along the Sacramento River. Flows in December-March, prior to the irrigation season, however, are dependent on uncaptured flow from Sacramento tributaries. Flows close to the spawning reaches of the Sacramento river, particularly upstream of Clear Creek, could well remain at or near the 3250 cfs required release from Keswick Reservoir. Migration past the points of diversion would thus receive little protection from a Wilkins Slough requirement of 10,700 cfs, which Michel et al. term as a "non-linear" threshold value below which migrating salmon exhibit reduced survival. At minimum, flows of 10,700 cfs at the points of diversion would be needed to offer equivalent protection for salmon whose downstream migration had not yet caused them to reach the Wilkins gage.

Fall-run and spring-run Chinook salmon smolts migrating in April-June in the Sacramento River between Deer Creek confluence and Feather River confluence (the focus of Michel et al. 2021) generally spend little time rearing in the Sacramento River. For the most

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[51] The Application proposes 10,700 cfs from October 1 through June 15, with no diversions from June 16 through August 31. It proposes a bypass flow requirement of 5000 cfs for September. As discussed below, protestants object to the extensive season of diversion and propose limiting it, should the permit be issued, to December 1 through April 30.

[52] Michel et al., 2021, Nonlinear Survival of Imperiled Fish Informs Managed Flows in a Highly Modified River.

part, they are on the move toward the ocean. Michel et al. note these facts, but they also note that the same is not true for earlier life stages (fry and parr) of these species in earlier months of the year, which may migrate more slowly downstream, rearing in the Sacramento River.

Thus, the 10,700 cfs proposed minimum flow at Wilkins Slough is not protective of fall-run Chinook salmon in the Sacramento River in January-March, because flows upstream of Wilkins Slough prior to the start of the irrigation season are largely dependent on tributary inflow. In periods of low January-March tributary inflow, the 10,700 cfs flow would not be achieved at the points of diversion. The proposed minimum flow also is not protective of the fry and parr lifestages of fall-run Chinook, because Michel et al.'s study focused on migration and did not consider flow protection for rearing Chinook.

In contrast to Michel et al.'s lack of evaluation of rearing Chinook, Hassrick et al. (2022) observe that fry and parr winter-run Chinook salmon will utilize side-channel and other edgewater habitat in the Sacramento River at suitable flow conditions if it is available.[53] Hassrick et al. further observe, and provide data to support, the fact that such rearing habitat is present only when flows are high enough to create such habitat, such as they were in wet year 2017. Regarding migration, Hassrick et al. note that January-March pulse flows in the Sacramento River produce improved migration success for winter-run Chinook salmon in reaches from Keswick Dam to the city of Sacramento whenever, so long as the flow levels on top of which the pulse flows are released are less than 24,720 cfs. Stated differently, at least in the short term, January-March migration survival of winter-run Chinook salmon improves as flows increase, up to flow values of 24,720 cfs, in the Sacramento River, including at the proposed points of diversion for the Sites Project.

In addition, as flow levels at the point of diversion increase, the interaction of fish with the fish screen facilities is reduced.

Del Rosario et al. (2013) conducted studies that evaluated the outmigration timing of juvenile winter-run Chinook salmon on the Sacramento River.[54] Del Rosario et al. found that migrating juvenile winter-run Chinook begin their downstream migration from spawning grounds in July. It is likely that juvenile winter-run will be at the points of diversion from October through January.[55] Del Rosario et al. found that juvenile winter-run begin showing up at Knights Landing (River Mile (RM) 145) as early as October, and substantial numbers of winter-run juveniles often appear in November. The peak of the downstream migration past Knights Landing generally occurs in December.

Del Rosario et al. also found that winter-run juveniles migrate downstream in the Sacramento River on flow pulses, and specifically that "spikes" in catch in rotary screw traps at

[53] Hassrick et al. (2022), Factors Affecting Spatiotemporal Variation in Survival of Endangered Winter-Run Chinook Salmon Out-migrating from the Sacramento River.
[54] Del Rosario, R., et al. (2013), Migration Patterns of Juvenile Winter-run-sized Chinook Salmon (*Oncorhynchus tshawytscha*) through the Sacramento–San Joaquin Delta.
[55] See also Poytress et al. (2014), Compendium Report of Red Bluff Diversion Dam Rotary Trap Juvenile Anadromous Fish Production Indices for Years 2002-2012, which shows winter-run fry consistently at Red Bluff in October and November. Available at:
[Compendium Report of Red Bluff Diversion **...**]

Knights Landing corresponded to the first fall (water-year) flow event with flows above 14,125 cfs measured at Wilkins Slough. Del Rosario et al. also found, however, that flows of 10,594 cfs measured at Wilkins Slough did not correspond to comparable spikes in downstream migration of winter-run Chinook past Knights Landing.

The work of Del Rosario et al. thus suggests that an October-December bypass flow of 10,700 cfs at Wilkins Slough may retard the autumn outmigration of winter-run Chinook salmon. The prospective combined diversion to Sites of 4200 cfs at Red Bluff and Hamilton City could reduce flow from an identified flow threshold for large-scale winter-run migration event to a level identified as inadequate (reduction from 14,125 cfs to inadequate 10,594 cfs).

Moreover, Del Rosario et al. underscore the importance of life history diversity in general and for winter-run Chinook in particular. The identified relatively early outmigration of some winter-run Chinook in October and November has importance relative to the life history diversity of this endangered species that is uniquely found in the Sacramento River. Such fish benefit extensively from stochastic storm events and resulting flow pulses. Large-scale diversions in the Sacramento River during October and November are thus damaging, even if they do not reach identified thresholds, recalling also that winter-run Chinook also rear in edgewater habitat from Red Bluff downstream, and may migrate a limited distance on early season flow spikes.

The Sites Application proposes to protect downstream migration of Chinook salmon and other anadromous fishes by implementing "pulse protection" that would cease diversions to Sites reservoir after a "qualifying event" in which there is a natural (not from storage) flow pulse greater than 8000 cfs at Bend Bridge and "migrating anadromous fish are detected" at Red Bluff Diversion Dam.[56] Generically, this approach has proven ineffective in various iterations relating to the Sacramento-San Joaquin watershed. It relies on the judgment that a best-bang-for-the-most-fish measure is sufficient protection, ignoring the outsized significance of adverse effects on species when those species are in severely depressed condition.

More specifically to this Application, the proposed pulse protection measure focuses too heavily on impacts at Red Bluff, without consideration that diversions to Sites could affect rearing and migration of anadromous fish downstream. Rather than relying exclusively on the snapshot of fish detection at a single location at the top of 250 river miles or migration and rearing corridor, appropriate flow requirements at different points on the corridor, that assume both the presence of fish and the importance of other river functions, provides a more protective methodology.

Both the Application and the general messaging regarding the proposed Sites Project promote the project for its prospective environmental benefits, particularly to Chinook salmon and water temperature management in the Sacramento River.[57] However, there are no

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[56] *See* Joint Reservoir Committee & Authority Board, Agenda Item 3.1, February 17, 2023, "Status Briefing on the Final EIR/EIS, Part 1 of 3" (Final EIR Status Briefing), p. 3. Available at: https://sitesproject.wpenginepowered.com/wp-content/uploads/2022/11/03-01-Final-EIR_EIS-Status-Update.pdf.

[57] *See, e.g.*, Petition for Partial Assignment p. 5 of 8, stating that the project "could … aid in achieving cold-water benefits in the upper Sacramento River."

requirements or proposed permit terms that would make such ascribed benefits enforceable. In conditions where the Sites Project is not able to assist Reclamation in reducing temperature dependent mortality of winter-run Chinook below 30%, impacts of diversions to Sites in the subsequent outmigration season carry additional adverse consequence.[58] Therefore, a permit term that disallows diversions to Sites during the December and January outmigration season for winter-run Chinook, following a spawning season in which temperature dependent mortality of winter-run Chinook exceeded 30%, is appropriate. Equally, a permit term that disallows diversions to Sites during the December and January outmigration season for winter-run Chinook following a season in which temperature management in the Sacramento River has not allowed egg to fry survival of winter-run Chinook salmon greater than 25%, is also appropriate.[59]

Sites Reservoir could also be operated to allow less reduction in stage height in the Sacramento River downstream of Keswick Reservoir from September through December. The purpose of such operation would be to reduce redd dewatering and stranding of fall-run Chinook salmon eggs and alevin. Redd dewatering and stranding can severely diminish the survival of wild fall-run Chinook juveniles in the Sacramento River. Therefore, a permit term that disallows diversions to Sites Reservoir in the months of December through the end of the season of diversion, following a September through December time period in which the stage height of the Sacramento River just downstream of Keswick Dam has dropped more than 1.5 feet, is also warranted.[60]

Such permit terms would convert the Sites project's representations of environmental benefits to Sacramento River salmon into enforceable requirements.

The Sites Application provides no explicit protections for sturgeon.

In his seminal reference book Inland Fishes of California, Peter Moyle states that white sturgeon do not reproduce every year, and that white sturgeon tend to increase spawning activity in years with abundant flow.[61] Moyle also notes that white sturgeon tend to spawn in the Sacramento River between Knights Landing (RM 145) and Colusa (RM 231), and that spawning takes place from late February through early June.[62]

Green sturgeon generally spawn later in the season in April and May, and move farther upstream to spawn than white sturgeon. Moyle noted in 2002 that green sturgeon were present at times as far upstream as Red Bluff.[63] Despite the partial blockage of sturgeon by the old Red Bluff Diversion Dam, juvenile green sturgeon were detected in rotary screw traps at that Dam in most years from 2002-2012.[64] Detection began in May, and in some cases continued into

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[58] 30% temperature dependent mortality was a key threshold identified by the National Marine Fisheries Service (NMFS) in the Proposed Amendment to the Reasonable and Prudent Alternative of the 2009 Opinion (January 17, 2017), pdf p. 13. Available at:
NMFS's Draft Proposed 2017 RPA Amendment
[59] 25% egg to fry survival was identified as a key threshold in *Id.*
[60] 1.5 feet is a frequent depth for Chinook salmon redds.
[61] Peter Moyle, Inland Fishes of California (2002), p. 108.
[62] *Id*.
[63] *Id*., p. 111.
[64] Poytress et al. (2014), *op. cit.*

August. Since the 2013 dismantling of the Red Bluff Diversion Dam, upstream passage of green sturgeon has become much less difficult; juveniles continue to be captured in rotary screw traps at Red Bluff.[65]

Juvenile sturgeon are poor swimmers, and larval sturgeon are very small. Larval green sturgeon that pass the intake to the Tehama-Colusa Canal at Red Bluff or the intake to the Glenn-Colusa Canal at Hamilton City are susceptible to entrainment. The Sites project would also have less direct impacts to both species of sturgeon downstream of the points of diversion. These would consist of reduction of flow by up to 2200 cfs between Red Bluff and Hamilton City and up to 4200 cfs downstream of Hamilton City, when irrigation diversions to these canals are not occurring. Otherwise, the flow impact of diversions to Sites Reservoir would be the difference between the rates of diversion for irrigation and the combined capacity of the canals.

The Sites project's season of diversion through June 15 of each year extends through just about the complete spawning window for both green and white sturgeon. Shortening the season of diversion is the best protection for sturgeon in the Sacramento River.

In summary, the proposed bypass flows proposed in the Sites application are inadequate to protect salmon and sturgeon in the Sacramento River. It is misleading to consider the percent reduction in streamflow that the Sites diversions would make, on average, relative to the monthly total Sacramento River flow. Measures that rely on fish detection have both general and specific limitations in effectiveness. A more appropriate methodology is to disallow diversions that reduce flows below identified key thresholds and also to disallow diversions that would occur following known mortality thresholds for these species. It is also important to shorten the season of diversion to protect important and diverse lifestages of salmon and sturgeon.

2. Releases from Sites Reservoir Could Have Adverse Impacts to Water Temperature in the Sacramento River.

Releases from Sites Reservoir to the Sacramento River could increase the water temperature of the river. Sites Authority has represented that this would not occur for two reasons: the variable depths available for release of water from the outlet works on the proposed reservoir, and the likelihood that water temperature in the Tehama-Colusa Canal and in the Sacramento River would likely have reached an identical equilibrium at the point of discharge into the Sacramento River.

Nonetheless, it is conceivable that under some circumstances the water temperature of the discharge could exceed the water temperature of the receiving Sacramento River. Protestants therefore recommend a permit term that would prohibit releases from Sites Reservoir to the Sacramento River when the water temperature of the water thus discharged exceeds the water temperature of the Sacramento River at the point of discharge.[66]

[65] T. Cannon, pers. comm.
[66] *See also* discussion in Section V(D) below of water temperature impacts due to diversions to Sites Reservoir.

3. The Sites Reservoir Project Will Have Adverse Effects on Wetlands along the Sacramento River.

Operation of the project will also impact wetlands downstream of the project along the Sacramento River and in the Sutter and Yolo bypasses, by reducing the area of inundation at both bypasses and in Sacramento side channel habitat.[67]

The withdrawal of any water from the normal flows of the Sacramento River will have ecological consequences, with those impacts being largely a matter of degree. The Sacramento River riparian ecosystem is flow-driven. Flow changes caused by Sites could significantly impact riparian habitat and riparian-dependent species.

In 1988, as little as two percent of the riparian forests along the Sacramento River remained. These forests support a wide variety of fish and wildlife species, many of which are declining towards extinction due to the loss of habitat. While the river's threatened and endangered salmonids depend on riverside forests to provide shaded riverine habitat and large woody debris for cover, threatened and endangered wildlife dependent on the Sacramento River will also suffer as a result of extremely reduced flows from Sites. During pumping operations, Sites could take 30% or more of the flows from the upper Sacramento River alone.[68] Such a reduction in flows could have serious consequences for sensitive riparian habitat and the threatened and endangered species that rely on it.

4. The Sites Project Will Adversely Affect Riparian Species and Habitats along the Sacramento River.

Many riparian-dependent species could be impacted by Sites-induced flow changes to the Sacramento River both upstream and downstream of the project. Protestants object to all such impacts, but focus on several species of concern to provide a representative sample of potential impacts. These species include the western yellow billed cuckoo, Swainson's hawk, bank swallow, and the valley elderberry longhorn beetle.

Originally listed in 1971, the western yellow-billed cuckoo (ESA: threatened, CESA: endangered) nests in willow-dominated riparian woodlands and forages in expansive stands of cottonwood and willows. Continuing riparian succession is incredibly important to sustain breeding populations. Continued operation of dams and diversions dampens hydrologic events and functional flows that are essential to induce riparian succession and replenish riparian habitats. This cuckoo was historically found throughout the Central Valley, but is now constrained to portions of the Sacramento River and Sutter Bypass. Sites would further reduce flows and dampen the hydrograph, reducing the western yellow-billed cuckoo's little remaining habitat.

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[67] EPA comments on RDEIR/SDEIS, pp. 5-6; *see also* RDEIR/SDEIS, Appendix 11M, Chapter 9.

[68] Sites diversions have minimum bypass flow criteria of 3,250 cfs at Red Bluff Pumping Plant and 4,000 cfs at Hamilton City Pumping Station (see RDEIR/SDEIS Chapter 2. Project Description and Alternatives. Pg. 2-33). Any and all flows in addition to the controlling minimum bypass flow would be diverted.

The Swainson's hawk (CESA: threatened) has experienced a precipitous decline in California over the last century. Although historic populations may have been up to 17,136 breeding pairs, the population had shrink to 425 pairs by 1980.[69] The hawk relies heavily on riparian habitat for nesting, with a preference for cottonwoods,[70] a major riparian tree species that has drastically declined, especially where it has existed downstream from dams.[71] Cottonwoods are dependent on streamflow and groundwater;[72] thus, reduced and altered flows from Sites could reduce critical nesting habitat for the hawk. CDFW has also noted that the Sites project "will result in the significant loss of foraging habitat"[73] for the Swainson's Hawk, which could ultimately reduce range and abundance of this threatened species.

The bank swallow (CESA: threatened) relies heavily on riparian ecosystems for much of its needs. It nests in eroded banks along the Sacramento River, which are a result of dynamic functional flows, and evolution of river systems. The Sacramento River and its major tributaries are core habitat for the swallow, and most important for long term recovery of the species. CDFW has noted numerous potential impacts that Sites Reservoir could have on bank swallow populations, including flooding burrows and habitat loss.[74] The loss of nesting habitat from changes to flow regime on the Sacramento River will be compounded by the loss of 15,664 acres of foraging habitat due to the Project.[75] Opportunities for recovery diminish as remaining nesting habitat along the Sacramento River and its major tributaries disappears. By reducing and dampening flows, Sites will further jeopardize the little remaining habitat and ecosystem processes that support this threatened bird.

The valley elderberry longhorn beetle (ESA: threatened) is completely dependent on riparian ecosystems because its host plant, the elderberry shrub, relies on rivers or high groundwater tables for survival. Sites-induced flow changes could further reduce connectivity

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[69] Bloom, Peter H., The Status of the Swainson's Hawk in California, State of California, Natural Resources Agency, Department of Fish and Game, 1979. Link: https://web.archive.org/web/20180425010648/https://nrm.dfg.ca.gov/FileHandler.ashx?DocumentID=4031&inline.

[70] *Id.*

[71] Rood, S.B. and J.M. Mahoney. 1990. Collapse of riparian poplar forests downstream from dams in western prairies: probable causes and prospects for mitigation. Environ. Manage. 14:451–464.

[72] *Id.*

[73] Comments of the California Department of Fish and Wildlife on the Sites RDEIR/SDEIS, Pg. 13.

[74] CDFW Comments on the Sites Reservoir RDEIR/SDEIS, Appendix A, Pg. 15, California Department of Fish and Wildlife, 2022. Available at: https://sitesproject.org/wp-content/uploads/2023/06/SRP_RSD_0077_CDFW.pdf

> Timing of flow releases can have both direct and indirect impacts to bank swallow populations. Direct impacts and potential take can occur if high flows during the late spring and summer nesting season cause inundation of burrows or loss of nests caused by localized bank sloughing. Indirect impacts could occur with changes in flow regimes as bank swallows need winter and early spring flows to allow refreshing of erosional banks. Therefore, a change from current operations of flows on the Sacramento River as a result of the Proposed Project could beneficially or adversely impact bank swallows depending on the timing, duration, and volume of flows. CDFW recommends the FEIR/FEIS include the consideration of bank swallow life cycle in any changes in flows as a result of the Proposed Project, especially during nesting season (April 1 - August 31).

[75] RDEIR/SDEIS Ch. 10, Table 10-2d. Acreages of Permanent and Temporary Impacts on Modeled Special-Status Bird Habitats in the Study Area.

between surface and groundwater, and further fragment riparian habitat, and therefore populations of the shrub and beetle.

Riverine ecosystems are governed by patterns of temporal variation in river flows and are particularly susceptible to flow changes. Even without Sites, flows will be modified due to climate change and the near-ubiquitous human control of river flow, with severe effects on fish and wildlife species. Riverine ecosystems are particularly susceptible to flow changes. A scientific study summarized the sensitivity of riparian ecosystems:

> …even slight modifications to the historic natural flow regime had significant consequences for the structure of riparian plant networks. Networks of emergent interactions between plant guilds were most connected at the natural flow regime and became simplified with increasing flow alteration. The most influential component of flow alteration was flood reduction, with drought and flow homogenization both having greater simplifying community-wide consequences than increased flooding. These findings suggest that maintaining floods under future climates will be needed to overcome the negative long-term consequences of flow modification on riverine ecosystems.[76]

Riparian ecosystems and species are highly sensitive to even small changes in flow. Even a single hour of flow increase could destroy burrows of bank swallows. At the opposite end of the spectrum, extended large diversions could reduce connectivity between ground and surface water, threatening groundwater-dependent ecosystems with impacts to the elderberry shrub and cottonwood trees, and to the species that depend on them. Riparian-dependent species along the Sacramento River have continued to decline under the extensively modified flow regime caused by dam operations and will likely continue to decline under flow modifications, both minor and major, caused by diversions to Sites. This outcome is unacceptable due to the countless protected species that rely on the Sacramento River's riparian habitat.

C. Sites Reservoir Will Have Adverse Environmental Impacts on Pelagic and Anadromous Fish in the Sacramento-San Joaquin Bay-Delta Estuary and San Francisco Bay.

The Sites Application proposes to conform to the Delta protections for fish and other aquatic species given in Water Rights Decision 1641 (D-1641), which has utterly failed to protect Delta fisheries. Even worse, the Sites project will substantially reduce inflow to the Bay-Delta estuary in the key winter and spring months, by capturing up to 4200 cfs of otherwise uncaptured flow. Reis et al. (2019)[77] describe the controlling factors of actual Delta outflow from 2010-2018. Reis et al. found that, "Taken together, [Additional Uncaptured Outflow] and those outflows needed to maintain the [Hydraulic Salinity Barrier] accounted for the vast

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[76] Flow regime alteration degrades ecological networks in riparian ecosystems, Jonathan D. Tonkin, et al., Nature Ecology & Evolution, published online Nov. 27, 2017.

[77] Gregory J. Reis, Jeanette K. Howard, and Jonathan A. Rosenfield, Clarifying Effects of Environmental Protections on Freshwater Flows to—and Water Exports from—the San Francisco Bay Estuary, San Francisco Estuary Institute and Watershed Science, March 2019, https://escholarship.org/uc/item/8mh3r97j.

majority of actual Delta outflow."[78] Uncaptured inflow, far more than D-1641 requirements, is what sustains Delta fisheries to the degree these fisheries are sustained at all. The Sites project will adversely affect pelagic fish in the Delta and anadromous fish migrating through the Delta, precisely by reducing otherwise uncaptured Delta inflow and outflow.

In 2010, the State Water Board, as required by the Delta Reform Act, conducted a hearing on the flow needs of fish in the Bay-Delta watershed. The resulting Delta Flow Criteria Report concluded that fish need up to 75% of the unimpaired flow into and out of the Delta to thrive.[79] In 2018, the State Water Board published a Framework for the development of an update to the Bay-Delta Plan, outlining the State Water Board's Plan to consider a requirement that would limit diversions in the Bay-Delta watershed such that Delta outflow would be no less than 55% of the unimpaired outflow, with an adaptive range of between 45% and 65% of the unimpaired outflow.[80]

The precipitous collapse of pelagic and anadromous fish populations in the Sacramento-San Joaquin Bay-Delta estuary since construction of the State Water Project 1967 has been documented at considerable length. Since the State Water Project began exporting water from the Delta, the Department of Fish and Wildlife's (CDFW) Fall Midwater Trawl indices (1967-1971 versus 2016-2020) for striped bass, Delta smelt, longfin smelt, splittail, and threadfin shad have declined by 98.1, 99.9, 99.8, 99.3 and 94.3 percent, respectively.[81] The U.S. Fish & Wildlife Service's (USFWS) Anadromous Fisheries Restoration Program documents that, since 1967, in-river natural production of Sacramento winter-run Chinook salmon and spring-run Chinook salmon have declined by 98.2 and 99.3 percent, respectively, and are only at 5.5 and 1.2 percent, respectively, of doubling levels mandated by the Central Valley Project Improvement Act, California Water Code, and the California Fish and Game Code.[82]

CDFW's Memorandum of December 29, 2022 reported the 2022 Fall Midwater Trawl annual fish abundance and distribution summary. Regarding ESA "endangered" Delta smelt, the Memorandum stated:

> The 2022 abundance index was zero and continues the trend of no catch in the FMWT (Fall Midwater Trawl Survey) since 2017. (Fig. 2). No Delta Smelt were collected from

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[78] *Id.*, p. 17.

[79] *See* State Water Board (2010), Development of Flow Criteria for the Sacramento-San Joaquin Delta Ecosystem (Delta Flow Criteria Report), p. 5. Available at: http://www.waterboards.ca.gov/waterrights/water_issues/programs/bay_delta/deltaflow/docs/final_rpt080310.pdf.

[80] *See* State Water Board (July 2018), Framework for the Sacramento/Delta Update to the Bay-Delta Plan (Framework), p. 2. Available at: https://www.waterboards.ca.gov/waterrights/water_issues/programs/bay_delta/docs/sed/sac_delta_framework_070618%20.pdf.

[81] In the 3 years since 2020, none of these indices has qualitatively improved. *See* CDFW Fall Midwater Trawl Memorandum, Dec. 29, 2022, available at: 2022 FMWT Annual Memo. We incorporate this document by reference, including specifically the figures cataloguing the decline in abundance of pelagic species, including Delta smelt and longfin smelt, since 1967. It is attached hereto as Exhibit E.

[82] Part of the decline of salmon is, as suggested above, attributable to inadequate flow in the Sacramento River upstream of the Delta. In this section, we discuss salmon survival and mortality from Freeport into San Francisco Bay.

> any stations during our survey months of September-December. An absence of Delta Smelt catch in the FMWT is consistent among other surveys in the estuary.[83]

The condition of longfin smelt also continues to deteriorate, and the U.S. Fish and Wildlife Service (FWS) announced on October 6, 2022, that it is processing a petition now to list longfin smelt under the federal ESA as endangered.[84] The slight uptick in the longfin smelt index based on Fall Midwater Trawl capture of longfin smelt in 2021 and 2022 still leaves the index at two orders of magnitude below its historical levels in 1967.[85] Longfin smelt are already listed as threatened under CESA.

The abundance of Delta smelt has diminished dramatically since the Pelagic Organism Decline of the early 2000s, and more particularly since the implementation of weakened Delta salinity standards under Temporary Urgency Change Orders for Delta operations in 2014 and 2015. Since the almost total crash of the Delta smelt population in 2014 and 2015, critical flow thresholds for Delta smelt have become virtually impossible to define based on recent data. As a general matter, Delta smelt survival improves with the location of the low salinity zone in Suisun Bay rather than in the Delta. This both provides increased volume of habitat with suitable salinity, greater access to food, less likelihood of entrainment at the south Delta export facilities, and cooler water temperatures toward the end of spring.

One of the alleged benefits of the Sites project is that it will release flow through the Tule Canal and Toe Drain on the east side of the Yolo Bypass that will discharge into the Cache Slough complex. The Cache Slough complex is known to contain a small population of Delta smelt. The theorized but unproven benefit would be an increase in nutrients discharged to the Cache Slough complex that would provide additional food available to Delta smelt. This mitigation should at minimum include a monitoring program to evaluate its effectiveness. There should also be a permit term that disallows such discharges when water temperatures of the discharged water exceed 20ºC or the temperature of the receiving water.

There are, however, identified critical thresholds for Delta outflow for the survival of longfin smelt.

The State Water Board's 2017 Scientific Basis Report developed in support of the update of the Bay-Delta Plan described the importance of flow for longfin smelt:

> The population abundance of longfin smelt in fall is positively correlated to Delta outflow or X2 as its proxy during the previous winter and spring (Jassby et al. 1995; Rosenfield and Baxter 2007; Kimmerer 2002b; Thomson et al. 2010; Maunder et al. 2015; Stevens and Miller 1983; Nobriga and Rosenfield 2016). Statistically, the strongest relationship is with outflow between January and June.[86]

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[83] 2022 FMWT Memo, *op. cit.*
[84] See FWS, announcement of proposed listing of longfin smelt. Available at: https://baykeeper.org/sites/default/files/image_upload/images/FW%20longfin%20ESA%20listing.pdf
[85] 2022 FMWT Memo, *op. cit.*
[86] State Water Board (2017), Scientific Basis Report in Support of New and Modified Requirements for Inflows from the Sacramento River and its Tributaries and Eastside Tributaries to the Delta, Delta Outflows, Cold Water Habitat, and Interior Delta Flows (Scientific Basis Report), p. 3-55. Available at:

The Scientific Basis Report found: "The flows in the State Water Board analyses associated with a 50 percent probability of positive population growth was 42,800 cfs between January and June, respectively."[87]

CDFW's 2020 Incidental Take Permit for Long-Term Operation of the State Water Project in the Sacramento-San Joaquin Delta (ITP) identified a slightly higher threshold for the protection of longfin smelt, as well as Delta smelt, in the months of April and May. The ITP requires limitations on April and May Delta export operations until Delta outflow exceeds 44,500 cfs.[88]

Flow into and out of the Delta is also a strong factor in the survival of salmon and sturgeon migrating through the Delta.

Perry et al. (2018) used acoustic tracking data to find that a flow of 35,000 cfs measured at Freeport, where the Sacramento River enters the Delta, was an inflection point above which survival of juvenile salmon migrating through the Delta increased.[89] This finding is remarkably consistent with earlier studies by Martin Kjelson (1987) that used coded-wire tag data to find that April-June survival of fall-run Chinook salmon smolts topped out at flows of 30,000 cfs in the Sacramento River at Rio Vista.[90]

The Board's Scientific Basis Report, relying heavily on a study by Martin Gingras of CDFW, set a flow threshold of 37,000 cfs Delta outflow for sturgeon, stating: "Average Delta outflows of less than 30,000 cfs had a small probability of producing strong year classes and outflows of 37,000 cfs or larger between March and July were associated with a 50 percent probability of producing a good year class."[91]

In summary, the proposed bypass flows proposed in the Sites application are inadequate to protect Delta smelt, longfin smelt, salmon, and sturgeon in the Bay-Delta estuary. The State Water Board should disallow diversions to Sites Reservoir when the flow thresholds for Delta inflow and outflow identified in the dismissal terms below are not met or exceeded.

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https://www.waterboards.ca.gov/waterrights/water_issues/programs/bay_delta/docs/2022/201710-bdphaseII-sciencereport.pdf.

[87] *Id.*, p. 3-56.

[88] CDFW (2020), Incidental Take Permit for Long-Term Operation of the State Water Project in the Sacramento-San Joaquin Delta (2081-2019-066-00), p. 103. Available at: Incidental Take Permit for Long-term SWP Operations.

[89] Perry, R. W., Pope, A. C., Romine, J. G., Brandes, P. L., Burau, J. R., Blake, A. R., ... & Michel, C. J. 2018. Flow-mediated effects on travel time, routing, and survival of juvenile Chinook salmon in a spatially complex, tidally forced river delta. Canadian Journal of Fisheries and Aquatic Sciences, 75(11), 1886-1901.

[90] Martin Kjelson, The Needs of Chinook Salmon in the Sacramento-San Joaquin estuary, FWS Exhibit 31 in Bay-Delta flow hearings (1987), pdf p. 52 ("Maximum survival was reached at flows of about 30,000 cfs at Rio Vista.")

[91] Scientific Basis Report, p. 3-64.

D. Absent an Appropriate Permit Term, Sites Reservoir Will Have Adverse Impacts on the Trinity River and its Fisheries.

The Bureau of Reclamation diverts water from the Trinity River to the Sacramento River through Reclamation's Shasta/Trinity River Division of the Central Valley Project. As one of the Sites project partners, Reclamation thus has the ability to deliver water sourced in the Trinity River to the intakes of the Glenn-Colusa Canal and the Tehama-Colusa Canal for rediversion to Sites Reservoir.

Modeling in support of the 2021 RDEIR/SDEIS for the Sites Project showed no apparent effect on the Trinity River, or use of water sourced in the Trinity River, by the Sites project. However, there is no existing constraint in Reclamation's water right permits that precludes such effect or such use. Moreover, the modeling for the RDEIR/SDEIS relied on assumed, rather than required, operations of Trinity Reservoir and other aspects of the Shasta/Trinity River Division.

Sites Reservoir could negatively impact the Trinity River through Bureau of Reclamation operations that either reduce cold water storage in Trinity Lake and/or change the timing of diversions to the Sacramento River, which could cause warming of Trinity River releases and failure to meet Trinity River temperature requirements and objectives protective of salmon. Thus, operation of Sites Reservoir could adversely affect natural and hatchery runs of state and federally threatened Coho salmon, state threatened spring-run Chinook salmon, federally listed green sturgeon, fall-run Chinook salmon, and steelhead in the Trinity River and the Lower Klamath River.

At present, none of these species has a population that is anywhere near a level that achieves the recovery mandated in the 2000 Trinity River Record of Decision, an agreement between the Interior Secretary and the Hoopa Valley Tribe to restore the Trinity River's fisheries to meet Congressional fishery restoration goals.

Diversions of Trinity River water to Sites Reservoir, and resulting impacts to the Trinity's fisheries, could adversely impact the federally reserved fishing and water rights of the Hoopa Valley and Yurok Tribes, who are entitled to half of the harvestable surplus of Klamath and Trinity fisheries. Other tribal beneficial uses that could be adversely affected include commercial (Yurok only) and subsistence fishing, and cultural beneficial uses.

The Trinity River also supports in-river and ocean recreational and commercial fisheries. The lack of Klamath-Trinity fall-run Chinook has led in part to a ban on recreational and commercial fishing of salmon in California in 2023, with an extremely limited subsistence take for the two Tribes. Impacts of diversions of Trinity River water to Sites Reservoir could further restrict recreational, commercial, and tribal harvest of salmon in California.

A permit term precluding the rediversion to Sites Reservoir of water sourced in the Trinity River is necessary to protect the Trinity River, the Lower Klamath River, their fisheries, and tribal, recreational, and commercial uses of these rivers.

III. The Construction and Operation of Sites Reservoir Would Not Best Conserve the Public Trust.

A. Construction and Operations of Sites Reservoir Would Not Best Conserve Public Trust Resources.

The public trust responsibilities of the State Water Board are well understood and well documented. "The State Water Board is responsible for the protection of resources, such as fisheries, wildlife, aesthetics, and navigation, which are held in trust for the public. … The State Water Board must consider these public trust values in the balancing of all beneficial uses of water, in accordance with the Water Rights Mission Statement and Water Code §1253."[92] The State Water Board is responsible for ensuring that diversions for consumptive use are sustainable and for protecting the instream flows needed for both the restoration and ongoing preservation of public trust resources. These responsibilities are profoundly important in our era of climate change, as the State Water Board has a duty to protect the rights of future generations to enjoy the state's public trust resources as well.

As has been documented in detail above, the Sites Reservoir project will adversely affect public trust resources such as plants, fisheries, and wildlife because, non-exhaustively, it will cause changes in flow, temperature, and water quality in the Sacramento River and the Bay-Delta estuary.

The public trust responsibilities of the State Water Board extend beyond mitigating the impacts of a new water development project. As is documented below, the DWR and Reclamation, and their contractors, propose to add storage to their statewide portfolios without adding any requirements to their responsibilities under their existing water rights to protect the public trust resources they have to date utterly failed to protect. The State Water Board has an "affirmative duty" to require more of those entities seeking new water rights when those entities have failed to protect the public trust under their existing water rights.

B. Construction and Operations of Sites Reservoir Would Not Best Conserve Public Trust Resources Used by and Essential to Tribes.

The Bay-Delta Plan applies to the Sites project area.[93] The Bay-Delta Plan establishes water quality control objectives for the reasonable protection of water quality and beneficial uses. As such, the water quality objectives and beneficial uses contained in the Bay-Delta Plan constitute State water quality standards. The State Water Board is currently developing its Staff Report for the Bay-Delta Plan, and expects to release a draft Report in September 2023. Early in summer 2023, the State Water Board released a notice informing the public that "tribal beneficial uses are being considered as part of the upcoming draft staff report,"[94] and held an informational

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[92] *See* State Water Board Division of Water Rights webpage at: https://www.waterboards.ca.gov/waterrights/board_info/water_rights_process.html.

[93] See Sites Water Rights Application, Petition for Release from Priority, p. 6 of 11.

[94] Notice on Tribal Beneficial Uses, May 11, 2023. Available at: https://www.waterboards.ca.gov/board_info/calendar/docs/2023/notice_tbu_051123.pdf.

meeting. The explicit consideration of the protection of tribal beneficial uses in areas covered by the Bay-Delta Plan is therefore dependent in part on the update of the Bay-Delta Plan.

The Sites project will affect the traditional tribal territories of Miwok, Nisenan, and Patwin people in the lower reaches of the Sacramento River and the North Delta.[95] The Sites project will also affect the traditional tribal territories of the Nomlaki, Pomo, Miwok, Patwin, Konkow Maidu, and Nisenan Maidu in the mid and upper reaches of the lower Sacramento River.[96] Tribes have spoken out about the failure to conduct adequate consultation.

Tribes have relied on water systems to provide resources since time immemorial. Because of the way the water rights system was created, water rights for Tribes have been limited. This has limited the continuation of traditions, cultural practices, and access to tribally significant resources. The Sites project will have an impact on fisheries, including tribal subsistence fisheries. Aquatic resources, such as tule, are used to weave baskets and tools, and for consumption. There are Tribes that have creation stories around salmon that live in the waterways that will be affected by the project;[97] those Tribes deserve to have their cultural histories protected.

In addition, Sites Reservoir will result in reduction of floodplains and inundated wetlands along the Sacramento River and in the North Delta.[98] Floodplains are critical to the growth, production, and survival of tribal trust fisheries and cultural plants. Plants that are tribally significant include tule, willow, and mugwort, whose uses include basket weaving, boatmaking, consumption, medicines, and ceremonies.[99] These aquatic plants need adequate high-water events that provide floodplain and wetland inundation. Reduced frequency and magnitude of such inundation may reduce the quality and quantity of resources available for tribal uses.

The Application concludes that there may be surface water degradation during construction and operation, which could lead to increases in methylmercury concentrations in the water and in fish tissue.[100] This could adversely affect tribal beneficial uses.

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[95] *See* Highlights, Central Valley Flood Protection Plan, p. 20. Available at: https://water.ca.gov/-/media/DWR-Website/Web-Pages/Programs/Flood-Management/Flood-Planning-and-Studies/Central-Valley-Flood-Protection-Plan/Files/CVFPP-Updates/2022/a0000-CVFPP_U22_layout_Highlights_vFINAL_online.pdf.
[96] *Id.*, p. 21.
[97] Run4Salmon, "Mini-Lesson 1: the Winnemem Wintu," slide 3. Available at: https://docs.google.com/presentation/d/e/2PACX-1vS2mX-OT6z7E-XycrMv1DZeahc8vDU1kAbkuOwyc1J-_Y8scf5SYs7s0h2ksth00QgWZ6QtNTVnxWgz/embed?start=false&loop=true&delayms=60000&slide=id.g35f391192_057.
[98] RDEIR/SDEIS, Chapter 11, Appendix 11M, Chapter 9.
[99] https://www.parks.ca.gov/pages/486/files/plantreferenceguide2014_03_03_14.pdf.
[100] Sites Water Rights Application, Request for Release from Priority, p. 7 of 11.

IV. The Construction and Operation of Sites Reservoir Would Not Best Conserve the Public Interest.

A. Contrary to the Sites Application Petition for Assignment of a State Filing, the State Water Board Has an Affirmative Duty to Evaluate whether the Assignment Would Be Consistent with a Coordinated Plan for the Conservation of California's Water (Water Code § 10504).

The Sites water rights Application is simultaneously a petition for assignment of a state-filed application under Water Code § 10500 et seq. As such, it must meet the requirements of Water Code § 10504, and not be in conflict with a "such general or coordinated plan" that is "looking toward the development, utilization, or conservation of the water resources of the state." (Water Code § 10500.)

The Sites Petition for Assignment argues that because the Sites project is consistent with the 2018 California Water Plan update, the project therefore complies with Water Code § 10504: "Sites Reservoir does not interfere with or prevent the development of a coordinated plan because it is 'substantially in accord' with the project described in A025517 and is part of the State Water Plan and related water planning efforts."[101]

Protestants object to this interpretation of Water Code §§ 10500 and 10504. The State Water Board's obligation in making the evaluation of consistency is much more than a check-the-box exercise to ascertain consistency with this or that existing document.

In 1955, the attorney general discussed the language in Water Code § 10500, and determined:

> [S]ection 10500 continues to authorize the filing of applications on unappropriated water which, in the judgment of the Department of Finance, "is or may be required" for "the whole or any part of a general or coordinated plan." In the light of the background and the date of enactment of this section, it is not confined in its application to any particular "plan,". as, for example, the specific "State Water Plan" defined. in section 10000 and adopted and approved by section 10002.

25 Op. Atty. Gen. 8, 16.

It is the view of protestants that the Board thus has an affirmative and ongoing obligation under Water Code § 10504 to determine whether any petition for assignment of a state-filed application is consistent with "such coordinated or general plan" that, as described in Water Code § 10500, "…in its judgment is or may be required in the development and completion of the whole or any part of a general or coordinated plan looking toward the development, utilization, or conservation of the water resources of the state." This is the standard to which the Board must hew and the exercise it must independently undertake in responding to and evaluating the Sites Application and Petition for Assignment.

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[101] Sites Water Right Application/Petition for Partial Assignment (hereinafter, Petition for Assignment), p. 3 of 8.

B. Sites Reservoir Is Founded on, Will Expand, and Will Prolong the Overallocation of the State's Water, and Is Thus Not Consistent with a Coordinated Plan for the Conservation of California's Water (Water Code § 10504).

Water in California, and in particular in its Central Valley, is overallocated and overappropriated. The unmistakable evidence of the overappropriation of surface water in California is ecosystem collapse. The unmistakable evidence of the overappropriation of groundwater in California is sinking groundwater levels, shallow wells running dry, and land subsidence, due to overpumping of groundwater in the San Joaquin Valley and in some other regions. Further unmistakable evidence of the overappropriation of groundwater is also, as with surface water, ecosystem collapse.

The Sites project seeks to capture one of the last remaining unallocated large volumes of water that is susceptible to capture in California's Central Valley. In addition to the woeful state of Central Valley and Bay-Delta fisheries as described above, the scarcity of remaining water supply options is testament to the existing overallocation of Central Valley water. The elaborate nature of the hypothetical mechanisms by which the Sites project purports to provide environmental benefits, not to mention water supply benefits, is testimony to how far water developers will go to dredge the bottom of the barrel to eke out the last usable assets of a system that is fundamentally tapped out.

The State Water Project (SWP) and Central Valley Project (CVP), to which the Sites Project presents itself as fundamentally an opt-in augmentation,[102] have made full contract deliveries only in 2023, the wettest of water years.

The 2018 California Water Plan Update, which the Sites Application cites as the "coordinated" plan with which the Application is consistent,[103] contains the following definitions:

> "**Sustainability**: Sustainability of California's water systems means meeting current needs — expressed by water stakeholders as public health and safety, healthy economy, ecosystem vitality, and opportunities for enriching experiences — without compromising the needs of future generations."
>
> "**Water demand:** The desired quantity of water that would be used if the water were available and if a number of other factors, such as price, did not change. Demand is not static."

[102] *See, e.g.*, the proposed places of use, which the Petition for Assignment summarizes at p. 2 of 8 as "generally consistent with the SWP and CVP places of use."
[103] Petition for Assignment, p. 2.

"**Water supply reliability**: Percentage of the time water supplies meet demands." [104]

Thus, in this "Plan," "reliability" does not mean having a demand for water that "California's water systems" can reliably meet. It means meeting demand as often as possible even if that demand is beyond the means of the systems to consistently provide it. It is a plan for managing water debt whose foundational definitions assume overallocation of California's water.

And so it is with Sites. The Sites project is the water equivalent of burning the furniture for heat in order to stave off a day of reckoning.

The Application also claims consistency with the 2020 "Water Resilience Portfolio,"[105] a document that also assumes as a given condition the systemic overallocation and overappropriation of California's water.[106] As cited in the Application, the 2020 Portfolio promotes the Sites project. This promotion has a twisted logic. If one accepts the need to feed demand that can never be fully met, then one arrives at the conclusion that capturing more water is always a net benefit.

In August 2022, the Newsom administration published "California's Water Supply Strategy: Adapting to a Hotter, Drier Future.[107] This latest vision of management of California's water includes some mention of demand management, but only for municipal, industrial, and domestic use, at most a quarter of California's use of developed water. Regarding agricultural demand, the 2022 "Strategy" acknowledges reductions indirectly due to attrition in response to the 2014 Sustainable Groundwater Management Act (SGMA), but proposes no further regulatory measures or policies, leaving the market to randomly and stochastically weed out individual water users.[108] This market approach is the opposite of a coordinated plan. It provides nothing to rationalize future water use. It also cruelly and irresponsibly offers no planning for providing alternative economic pathways for the communities most affected by constriction of the farm economy.

The Application and Petition for Assignment are also entirely consistent with this third flawed 2022 "Strategy." Most notably, the Sites Project is in substantial part a market-based project where "partners" buy shares of reservoir storage and then deploy those shares at their

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[104] DWR, *California Water Plan Update 2018: Managing Water Resources for Sustainability*, definitions shown on pp. xiv-xv. Available at: https://water.ca.gov/-/media/DWR-Website/Web-Pages/Programs/California-Water-Plan/Docs/Update2018/Final/California-Water-Plan-Update-2018.pdf.

[105] State of California, 2020 Water Resilience Portfolio in Response to the Executive Order N-10-19 (July 2020). Available at: https://resources.ca.gov/-/media/CNRA-Website/Files/Initiatives/Water-Resilience/Final_California-Water-Resilience-Portfolio-2020_ADA3_v2_ay11-

[106] For analysis, see http://calsport.org/news/wp-content/uploads/CSPA-response-Draft-Water-Portfolio-020620.pdf.

[107] Available at: https://cawaterlibrary.net/document/californias-water-supply-strategy-adapting-to-a-hotter-drier-future/

[108] *Id.*, pp. 13-15.

individual discretion.[109] Deciding how to use scarce water resources based on an every-entity-for-itself operating regime is neither coordinated nor in the public interest.

In sum, none of the plans with which the Sites project is consistent can be rationally described as "a general or ***coordinated*** plan looking toward the development, utilization, or *conservation* of the water resources of the state." (Water Code § 10500; emphasis added.)[110]

A plan that accepts a situation in which water demand is far beyond the ability of the state's resources to supply it is not a coordinated plan at all. It is the avoidance of a plan.

A plan that leaves the market to randomly weed out water use without consideration of the social consequences is, equally, not a coordinated plan. It is the avoidance of a plan. It is also inequitable.

A plan that supports developing water at the expense of the environment in preference to reducing aggregate agricultural demand in a well-considered, organized, systematic, and socially responsible manner is not a coordinated plan. It is a deferral of an absolutely necessary plan to achieve some semblance of a balanced state water budget and to make sure that the uses of water that continue achieve the greater social good. Adding new massive diversions of water to feed an already overallocated water budget does not look toward the conservation of the water resources of the state, even in the old-timey sense in which conservation meant to make water available for use. It's more like using a home equity line of credit to pay the mortgage. While such a strategy makes resources available in the short term, it only increases the long-term debt.

The State Water Board should deny the Application and Petition for Assignment for the Sites Project because they are inconsistent with a coordinated plan for the conservation of the state's water resources (Water Code § 10504,)

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[109] See RDEIR/SDEIS at ES-10: "Water would be held in storage in the reservoir until requested for release by a Storage Partner. Water releases would generally be made from May to November but could occur at any time of the year depending on the Storage Partner's need and system conveyance capacity."

[110] We note that the Attorney General's 1955 Opinion on state-filed applications analyzed how Water Code § 10500 does not refer to any *specific* plan, but rather to "a plan:"

> [S]ection 10500 continues to authorize the filing of applications on unappropriated water which, in the judgment of the Department of Finance, "is or may be required" for "the whole or any part of a general or coordinated plan." In the light of the background and the date of enactment of this section, it is not confined in its application to any particular "plan,". as, for example, the specific "State Water Plan" defined. in section 10000 and adopted and approved by section 10002.

C. The State Water Board Should Reject the Application and Petition for Assignment Because They Will Perpetuate the Overallocation of the State's Water, Reward Poor SWP and CVP Reservoir Management, and Provide SWP and CVP Contractors with Water Supply Benefits Exempt from Requirements to Protect the Public Trust.

Even if, in the Orwellian world of California's water, the State Water Board accepts the three plans cited above as "coordinated" plans, the Board should nonetheless reject the Application ***as well as*** the Petition of Assignment because granting them would not be in the public interest. They are part of a vision for California's water in which capturing more water is purportedly part of the solution to the structural imbalance between demand and supply. In fact, they would, if granted, perpetuate and compound the overallocation of the state's water. Meeting unreasonable demands of some entities near the front of the line, slightly more frequently or slightly more fully, in any given year, just whets the appetite of those who miss out.

There is an overwhelming public interest in aligning water demand with the responsible management of what nature provides. Scalping some of the few remaining high flows left in the Central Valley system, in order to backfill dry-year deficits created by excessive water deliveries in all years, is not responsible management. It is also not a reasonable use of water under Article X, Section 2 of the California Constitution (Water Code § 100).

Stated differently, the irresponsible depletion of storage in SWP and CVP reservoirs supplies an unsustainable level of agricultural water deliveries. Such poor management will not be solved by creating additional storage. Even less will it be solved by making such storage available as private shares to (primarily) SWP and CVP contractors that can afford the high cost of water stored in Sites Reservoir. On the contrary, more storage for SWP and CVP contractors would reward and valorize the SWP and CVP's bad management of existing storage.

In part, the Sites project will shift the costs for such bad management of existing reservoirs to urban agencies that the SWP and CVP cannot reliably supply.

In other part, the Sites project will be a water supply slush fund for DWR, Reclamation, and the state and federal water contractors: a dry-year and drought water supply with no ***requirements*** to share the benefits of increased storage to better manage the protection of public trust resources. The claimed benefits of Sites Reservoir to fish and wildlife are thus speculative and without basis in fact.[111] The ascribed benefits could be achieved by the Board's exercise of existing authority under the reasonable use and public trust doctrines, to require the SWP and CVP to operate their reservoirs to protect fish and wildlife, without construction of a harmful new reservoir.

[111] See, e.g., Petition for Assignment, p. 5 of 8: "The Project could result in an improvement in water quality in parts of the Project area. Such improvements could assist with Delta outflow and seawater intrusion, aid in achieving cold-water benefits in the upper Sacramento River, provide flows to move fish food into the Sacramento River and Delta, and create in-reservoir habitat for warm-water fish species." There is nothing in the Application that requires any of the measures that "could" provide benefits, except perhaps the experimental token release of small amounts of water into the Yolo Bypass for the purported benefit of Delta smelt.

As of May 19, 2023, DWR and Reclamation have a combined allocation of 26.4% of Sites storage. Metropolitan Water District has an allocation of 22.1% of Sites storage. Altogether, DWR, Reclamation, and their contractors have well over 90% of the storage allocation in Sites Reservoir.[112] Any hypothetical benefit would be achieved by joint reoperation of, or exchange between, Sites and a SWP or CVP reservoir, with the goal of no net loss of water to water contractor deliveries. And unlike the SWP and CVP, which have extensive (though still inadequate) responsibilities for protection of public trust resources and Delta salinity control, almost all the alleged "environmental benefits" of Sites are wholly discretionary.[113]

The voluntary paradigm of Sites Reservoir and its touted "flexibility" is neither specifically nor generally in the public interest. It is consistent with the sorry fact that the State Water Board is considering permitting the Sites project potentially using a proposed (but incomplete) "voluntary agreement" as a surrogate for a water quality control plan in evaluating water availability. In some regards, allowing voluntary mitigations using Sites is worse, because a water rights permit is a long-term regulatory requirement that has no requirement for periodic review. Allowing the massive Sites project to deliver environmental protection on a discretionary basis without clear enforceability would carry the current Board's policy of preferring voluntary solutions to a new low. It would be far, far outside the public interest. It would also unlawfully delegate the Board's public trust and reasonable use responsibilities to other entities.

D. Sites Reservoir Will Institutionalize a Speculative Water Market, Contrary to the Public Interest.

As the latest and perhaps the last major addition to surface storage in California's Bay-Delta watershed, the Sites Project is set up to be the stored water supply of last resort. It is designed for deliveries in dry years and dry year sequences. Various commenters have described Sites as an "insurance policy" for dry years. However, it is not set up as a reserve that public officials allocate in dire circumstances based on need or on the public good. Sites, rather, is structured as a series of private holdings, with limited general governance of the Authority, available for use based on private economic decisions.

The Sites Project is explicitly structured to facilitate water transfers (sales). Appendix C to the January 6, 2023 Water Right Application Supplement describes the goals as follows:

> The Authority seeks a water right permit that will provide the Authority and its Storage Partners as much flexibility as possible to (1) allow for changes in Sites Storage Partners and (2) allow for Storage Partners to sell their water, to other Storage Partners and/or entities within the place of use, to assist in paying for their investment.[114]

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[112] See Sites Joint Reservoir Committee & Authority Board Agenda item 2.1, May 19, 2023. Available at: https://sitesproject.org/wp-content/uploads/2023/05/02-01-Allocations-of-Storage-Space.pdf.
[113] *See, e.g.*, list of purported project benefits and how many are hypothetical or related to process in Joint Reservoir Committee & Authority Board, Agenda Item 3.1, May 19, 2023, Status Briefing on the Final EIR/EIS, Part 3, Att. A, p. 1. Available at: 03-01 Final EIR-EIS Status Update Findings and SOC.
[114] Appendix C to the January 6, 2023 Water Right Application Supplement (Supplement App. C), p. 2.

In part, speculative water sales by Sites would be assured simply because they are assumed as part of the repayment mechanism for a $4.8 billion project. This use of water sales to pay for water infrastructure is in itself not in the public interest.

The extensive place of use proposed in the Sites Application is specifically designed to support water sales:

> Although they will be encouraged to sell to other Storage Partners first, and possibly to wait listed agencies second, these sales may extend to water users that are not Storage Partners but are located within the Authority's water right place of use. This is part of the justification for including the extent of the Central Valley Project (CVP) and State Water Project (SWP) service areas and the associated Points of Diversion and Points of Rediversion for the projects.[115]

As with the general emphasis on voluntary measures to provide Sites's alleged "environmental benefits", the Sites place of use also proposes the benefits of SWP and CVP structure without accompanying responsibilities. Sites thus would get the benefits of an enormous place of use and points of diversion, effectively building water transfers into the water right itself. The inclusion, as the place of use, of approximately 32,691,036 acres of land in 31 counties[116] facially conflicts with Water Code § 1260's requirements for a water right application to state the proposed place of diversion (subsection (e)) and the place and time where it is intended to use the water (subsection (f)). Such subversion of basic elements of water rights administration is contrary to law and not in the public interest.

Moreover, by its very existence, Sites Reservoir will increase the cost of water generally. The cost of Sites water per acre-foot of water delivered to the project's outfall into Sacramento River is estimated at $800.[117] With a calculated 23% water loss of carriage water alone for water delivered south of Delta,[118] the price tag to the turnouts of water buyers south of Delta is close to $1100 per acre-foot. Even water provided at cost or at small percentage markups will price many agencies out of the market, including urban agencies in less wealthy areas. This high-end market will inequitably place new storage benefits of Sites out of the reach of disadvantaged communities.

Equally if not more concerning is how the water market created by Sites would place upward pressure on the costs of transfer water generally.

For example, the Sacramento River Settlement Contractors are at present one of the major sources of water transfers. The Sites project will allow Sacramento River Settlement Contractors a convenient mechanism to continue the abusive business model of selling substantial amounts of water in (primarily) drier water years. It will give them more water to

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[115] *Id.*, p. 3.
[116] *See* Sites Water Right Application, January 6, 2023, p. 41.
[117] Sites Authority presentation to NGOs, confirmed by independent analysis by protestants.
[118] *See* Sites Authority, Joint Reservoir Committee & Authority Board, Agenda Item 3.2, April 21, 2023, "Reservoir Losses and Available Storage." Available at: https://sitesproject.org/wp-content/uploads/2023/04/03-02P-Conveyance-Storage-Loss.pdf.

sell, increasing an existing overallocation of water that is facially evident from their substantial serial water sales.[119] The Sites project will also reduce the administrative requirements for transfers by the Sacramento River Settlement Contractors, since, as noted above, the place of use for the Sites water rights is largely identical to the combined places of use of the SWP and CVP.[120] Sites will yield a further systemic windfall to the Sacramento River Settlement Contractors.

The institutionalization of a water market due to the structure of a water right, and the pressure such structure would place to increase revenues from water sales, are not in the public interest.

E. The Sites Reservoir Project Will Favor Wealthy Water Districts over Disadvantaged Communities.

The cost of the Sites Reservoir project is currently estimated to be $4.8 billion, with 27% of that amount coming from State and Federal funds contributed by taxpayers.[121] Even with the taxpayer subsidies, the high cost of building the reservoir, the ongoing debt service, operations and maintenance costs, combined with the uncertain water availability, indicates the average cost per acre-foot of water for the subscribers will be high, and will almost certainly increase during times of shortage.

The project members were able to obtain participation percentages by contributing to the enormous cost of the Project. The users that will benefit the most from the Project will be municipal and industrial agencies that can afford the cost. In addition to municipal and industrial uses, there are also large allocations going towards agricultural users with high returns on investment. The crops that will be irrigated are some of the top exports for the state, so the water that is being used is not necessarily going to be used to feed the people of California.[122] Poorer, historically underserved areas, which often have large disadvantaged communities, cannot afford

[119] The Sacramento River Settlement Contractors would not serially sell large quantities of water if they actually needed the water for use in their service area.

[120] In this context, it is already unclear, in Critically Dry years and in dry year sequences, what the basis in right for Sacramento River Settlement Contractors diversions (and transfers) actually is. There is no clear accounting of whether their diversions are under CVP water rights or under the Sacramento River Settlement Contractors' underlying riparian and/or pre-1914 rights. Since one of the proposed aspects of the Sites project is "exchanges" with the SWP and the CVP, future water sales conducted by the Sacramento River Settlement Contractors will be further clouded as to their basis in right and their regulatory path.

[121] Sites Project 2023 Draft Plan of Finance Update, p4 Table 2 Sources of Financing https://sitesproject.org/wp-content/uploads/2023/05/03-02-Plan-of-Finance-Update.pdf

[122] *See* California Department of Food and Agriculture (CDFA) statistics on farm exports. Available at: https://www.cdfa.ca.gov/Statistics/PDFs/2022_Exports_Publication.pdf. *See also* Application, Purposes of Use (unnumbered pages), which provide a breakdown of "Irrigation uses," as follows (2022 export ranking from CDFA stated at the end of each line):
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- Rice, 237,100 acres, 1,185,535 af/yr (top 10 ag commodity) (#6 export)
- Nuts/Deciduous, 167,300 acres, 721,029 af/yr (top 10 ag commodity) (#1 almonds, #3 pistachios, #5 walnuts)
- Dates/Citrus 99,000 acres, 433,620 af/yr (#9 oranges, #17 lemons #28 tangerines)
- Grapes 74,000 acres, 210,160 af/yr (top 10 ag commodity) (#7 table grapes)

to buy into the Sites project. They will continue to suffer as the wealthy districts, agencies, and other water users store, and buy and sell, water.

For example, Coalinga, California is a city in the Central Valley that ran out of water in the last major drought that affected the state. It is a small town in which over 50% of the residents are people of color. In 2022, Coalinga paid $1.1 million to get 600 acre-feet of water from another water district, after Coalinga's allocation from San Luis Reservoir was cut by 80%.[123] Fortunately, the Department of Water Resources stepped in to help the community, so that its water users did not have to pay the extreme cost of having water imported for essential needs like drinking water and bathing.[124] Coalinga does not have the resources to buy into the projects like Sites Reservoir and acquire water for its citizens despite the extreme need.

For small towns and cities like Coalinga, where there are large populations of people of color and/or disadvantaged communities, the inability to pay shuts them out of projects like Sites. Sites allocates no water to entities that do not have the resources to afford a portion of Sites Reservoir's expensive water. New water supply projects, which for reasons of cost as well as environmental impacts should not include massively expensive new surface storage, should prioritize water users that who are suffering most at the hands of inequitable statewide water distribution.

F. Granting Sites Water Rights Would Violate Board Policy on Racial Equity.

The water rights system in California was established during a time in history when the ability to obtain water rights was limited by race and property status, and specifically excluded indigenous peoples and people of color. The water rights system is largely based on the "first in time, first in right" doctrine of property law. However, this doctrine has created a system intertwined with racist and inequitable methods of distribution. Tribes of California who are the indisputable first occupants of the land and first users of the water have been largely excluded from owning water rights.

The water rights system has carried on its inequitable distribution for generations. A recent analysis estimates that 92% of leaders of California water agencies are white, and that 91% of water rights holders are likely white.[125] The State Water Board has acknowledged that its programs were "established over a structural framework that perpetuated inequities based on race."[126] This is a major issue for disadvantaged communities, Tribes, and fish-dependent people

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[123] *See* https://www.cnn.com/2022/11/01/us/california-water-cost-profiteering-climate/index.html#:~:text=The%20restriction%20left%20Coalinga%20short,300%20Olympic%2Dsized%20swimming%20pools.

[124] https://water.ca.gov/News/News-Releases/2022/Nov-22/DWR-Provides-Funding-to-City-of-Coalinga-for-Emergency-Water-Purchase.

[125] *See* "Who makes decisions about California's water?: A data-based look at the race and gender of the people who control California's water at the state, local, and individual level," Fidell and Shipman, 2023. Available at: https://www.restorethedelta.org/wp-content/uploads/2023-Fidell-Who-Makes-Decisions-about-Californias-Water.pdf

[126] *See* State Water Board Resolution 2021-0500, p. 2. Available at: https://www.waterboards.ca.gov/board_decisions/adopted_orders/resolutions/2021/rs2021_0050.pdf.

who are excluded from decision-making processes that will impact the land, water, and species that they rely on.

In November 2021, the State Water Board adopted its Racial Equity Resolution, which directed staff to develop a plan of action to advance racial equity within the Water Boards.[127] The resulting Racial Equity Action Plan was presented to the Board in January 2023. It is a compilation of goals, actions, and metrics intended to advance efforts to create a future where the Board equitably preserves, enhances, and restores the state's water resources and drinking water for all Californians, regardless of race.[128] The Board committed to making racial equity, diversity, inclusion, and environmental justice central to its work, and committed to center in its work and decision-making on black and indigenous people of color, who are disproportionately represented in the most vulnerable communities, while ensuring the full benefits of the Board's programs for all people.[129]

The water rights system in California is institutionally racist. Granting new water rights before making Tribes and other groups whole would perpetuate this institutional racism and violate the Board's Policy on Racial Equity.

Sites Reservoir water would be controlled by a privileged few, with little or no benefits directed to black people, indigenous people, and other peoples of color. It would also further harm these and other disadvantaged groups by commodifying water through water sales that the project's proponents claim are integral to project feasibility. Granting Sites water rights would violate the State Water Board's Policy on Racial Equity because it would perpetuate and, given its magnitude, solidify the historic imbalance of power in the use of California's water.

G. Sites Reservoir Will Incentivize the Construction of the Delta Conveyance Project.

Sites Reservoir will incentivize the construction of DWR's proposed Delta Conveyance Project because the proposed Delta tunnel would create conditions more favorable for movement of water from Sites Reservoir to project partners or transfer recipients south of Delta.

The Sites project assumes a conveyance loss of 23% for "carriage water" through the Delta.[130] Carriage water is a reduction of water allowed for export in order to account for water lost as it crosses the Delta. Water that did not cross the Delta to reach the head of Delta export facilities in the south would at least presumably not be subject to carriage water reductions. Water conveyed through a north Delta diversion facility would thus increase the yield for Sites water moved south of Delta by about 30%.

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[127] *Id.*
[128] *See* State Water Board, Racial Equity Action Plan (2023).
[129] *See* State Water Board Resolution 2021-0500, p. 7.
[130] *See* Sites Authority, Joint Reservoir Committee & Authority Board, Agenda Item 3.2, April 21, 2023, "Reservoir Losses and Available Storage," *op. cit.*

In addition, the requested season of allowed deliveries from Sites to points south of Delta is July through November,[131] consistent with the transfer window allowed in the 2019 LTO BiOp. Construction and operation of the proposed Delta Conveyance Project would allow an expansion of this window for Sites south of Delta deliveries, for two reasons. First it would add conveyance capacity for south Delta exports generally. Second, it would allow exports without constraints that limit the season of deliveries, because those constraints are largely tied to impacts of the south Delta export facilities on fish in the Delta.

In 2016, Jeffery Kightlinger, at the time General Manager of the Metropolitan Water District of Southern California (which has the single largest allocation of water among all Sites project partners), opined that Sites Reservoir without a north Delta intake for DWR export facilities had minimal value for exporters, stating:

> Sites Reservoir from the MWD perspective looks like a good sound project. The problem is, for us, it's north of the Delta. And right now we can't move water through the Delta because we were so restricted in our ability to move water, that it wouldn't provide any real benefits to anyone south of the Delta. ... I say well, the problem is I don't know why I would fund it unless I could get some of that water and I can't actually get the water unless we build a conveyance system.[132]

Perhaps as important as the physical opportunities that the proposed Delta Conveyance Project would provide deliveries from Sites Reservoir to points south of Delta is the supply-side way of approaching California's water issues that both projects promote. Construction of one mega-project with the illusory goal of increasing water supply reliability in a grossly overallocated water supply system creates momentum to construct another mega-project, because it frames the goal as achievable in the absence of large-scale demand reduction.

H. It Is Not in the Public Interest to Grant New Water Rights for Use by the SWP, the CVP, and their Contractors while Petitions to Extend Time for Existing SWP and CVP Water Rights Permits Have Lain Dormant for Thirteen Years.

DWR petitioned for extension of time on its existing water rights permits for the SWP in 2010. Reclamation petitioned for extension of time on its existing water rights permits for the CVP in 2009. Neither entity has issued a Notice of Preparation for CEQA review of the requested extensions or demonstrated any other progress in completing environmental review for the requested permit extensions. Neither entity has released any public accounting of water used under each individual permit. Neither entity has pursued protest dismissal since informing protestants more than a decade ago that progress would come in the form of completing environmental review for the Bay-Delta Conservation Plan, which never happened.

Now, as partners in the Sites project, DWR, Reclamation, and their contractors ask the State Water Board to go to the head of the line in processing the Application for a new reservoir.

[131] Final EIR Status Briefing, p. 3.

[132] Interview with Jeffery Kightlinger, Maven's Notebook, January 31, 2016. Available at: https://mavensnotebook.com/2016/07/31/a-conversation-about-water-with-jeffrey-kightlinger/.

The jump in line is inequitable. It also fails to consider that it is within the purview of State Water Board to require additional permit terms for the SWP and the CVP as part of permit extensions. New permit terms on the existing SWP and CVP permits may limit the availability, and/or increase the cost of water for the Sites project.

The State Water Board should not preferentially devote its limited administrative resources to holding hearings on the Sites Project until the State Water Board has completed proceedings to address the petitions to extend time on the permits for the SWP and the CVP.

V. The Application and Petitions Are Contrary to Law.

A. Unless Conditioned to the Contrary, the Application and Petition Are in Conflict with a Water Quality Control Plan Established Pursuant to Law (Water Code § 10504).

Temporary urgency change petitions (TUCPs) for Delta operations have become the default in sequential dry years.[133] As currently proposed, the Sites project would allow collection of water to storage by state and federal contractors, and would allow augmented water supply deliveries to state and federal contractors, during conditions when Delta water quality standards are weakened due to a TUCP.

Water Code § 10504 allows assignment of a state-filed application only if it is "not in conflict … with a water quality control plan established pursuant to law." It is DWR and Reclamation that request routine TUCPs for Delta operations in Critically Dry years and in dry year sequences. It is DWR, Reclamation, and the state and federal contractors that are both the beneficiaries of such TUCPs and the overwhelming holders of storage rights in Sites Reservoir. A Sites permit issued without limitations on Sites operations when TUCPs for Delta operations are in effect would effectively allow the SWP and CVP and their contractors an instant avoidance mechanism, negating compliance with the Bay-Delta Plan and thus with this aspect of Water Code § 10504.

It is also the contention of protestants that the Sites Application and Petition for Assignment must be evaluated under different prospective outcomes of the update of the Bay-Delta Water Quality Control Plan that is currently underway. The Board has acknowledged since at least 2010 that flows into and through the Bay-Delta estuary are inadequate to support native fish.[134] The Board must at least evaluate the Sites Application and Petition for

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[133] See State Water Board's TUCP webpage, which shows TUCPs in 2014, 2015, 2016, 2021, 2022, and even 2023. https://www.waterboards.ca.gov/waterrights/water_issues/programs/drought/tucp/index.html. Moreover, it is our understanding that pending biological opinions for the operations of the SWP and CVP will assume TUCPs in dry-year sequences.

[134] *See, e.g.*, Delta Flow Criteria Report, p. 5. ("Recent Delta flows are insufficient to support native Delta fishes for today's habitats.")
See also Scientific Basis Report, p. 1-4. ("It is widely recognized that the Bay-Delta ecosystem is in a state of crisis.")
See also Framework, pp. 5-6. ("Populations of native aquatic species in the Bay-Delta watershed have shown significant signs of decline since the last major update and implementation of the Bay-Delta Plan in the 1990s. …

Assignment under requirements that are more likely to protect fish and wildlife, and public trust resources generally. The State Water Board partially acknowledged this need in a letter from Erik Ekdahl, Deputy Director, Water Rights to Alicia Forsyth, Sites Authority, dated August 26, 2022, requesting, "quantitative estimates of the amount of water that could be reasonably diverted given the proposed project's diversion capacity and other known or reasonably foreseeable operational constraints and instream flow requirements, including proposed updates to instream flow and Delta outflow objectives in the Bay-Delta Plan."[135]

Protestants further note that while the immediate concern of Mr. Ekdahl's letter was the accuracy of a water availability analysis, this issue did not go exclusively to whether there was ***some*** water available for appropriation. Rather, it went to the public interest in the economic viability of the project, "which could have implications for the economic viability of the project for investors, including the State of California."[136]

B. The Petitions for Releases from Priority Require either Denial or Conditioning to Comply with Water Code § 10505.

The Sites Authority has submitted Petitions for Release from Priority of State Filed Applications A025513, A025514, A025517 (Remaining), A022235, A023780, and A023781 in favor of the portion of State Filed Application A025517 assigned to Sites Project Authority (hereinafter, collectively, Petitions for Release from Priority).

The Petitions for Release from Priority affirm that the Sites Authority has entered into an MOU with Colusa County to assure that the Sites Project will not deprive Colusa County of water needed for that county's development. In addition, several Colusa County entities have purchased allocations of storage in the Sites Project.

However, regarding the other counties from whose state filings the Sites Authority seeks release from priority (Glenn, Tehama, and Shasta), the Petitions for Release from Priority present no assurances that such release would not deprive those counties of water needed for their development. There is also no provision, as for Colusa County, that water in Sites would be made available at a reasonable price for such development.

To conform with Water Code § 10505, any release from priority in favor of the Sites project would require either a term that allowed the Board to revisit such release upon a showing of need for water originating in Glenn, Tehama, and/or Shasta counties for the respective development of those counties, or else a clear mechanism and terms that would make water from Sites Reservoir available for such development.

The Petitions for Release from Priority rely on an estimate that alternative sources of water would be available to Glenn, Tehama, and/or Shasta counties even if Sites is built. While

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While there are also other factors involved in the decline of these species, water diversions and the corresponding reduction in flows those diversions cause, are significant contributing factors.")

[135] Letter is included as part of the Sites Application Package posted on the State Water Board's eWrims web feature. Quote is from p. 3.

[136] *Id.*, p. 2.

that addresses water availability, it does not address the proper priority of water for counties of origin in preference to water for use outside counties of origin, and most pointedly, of water for export. Priority is, after all, the point of a release from priority.

If the State Water Board denies the assignment of State-Filed Application A025517 to the Sites Authority, it should deny the Petitions for Release from Priority. If the Board grants the assignment of State-Filed Application A025517 to the Sites Authority, it must comply with Water Code § 10505 by either denying the Petitions for Release from Priority from state-filed applications filed for Glenn, Tehama, and/or Shasta counties, or by conditioning such releases from priority to assure the eventual priority of any state-filed applications for water that may be needed for the development of those counties.

C. The Sites Project Would Violate Delta Reform Act by Increasing Reliance on the Delta for California's Water Supply.

Water Code § 85021 (part of the 2009 Delta Reform Act) states:

> The policy of the State of California is to reduce reliance on the Delta in meeting California's future water supply needs through a statewide strategy of investing in improved regional supplies, conservation, and water use efficiency. Each region that depends on water from the Delta watershed shall improve its regional self-reliance for water through investment in water use efficiency, water recycling, advanced water technologies, local and regional water supply projects, and improved regional coordination of local and regional water supply efforts.

As discussed above, a substantial majority of the water supply benefits of the Sites project are allocated to and destined for entities south of Delta. Conveyance to these entities requires export through the SWP and CVP export facilities. The Sites project is a massive export scheme that will increase Delta exports primarily in drier years, when under existing and likely future requirements environmental protections in the Delta are weak. Sites's reliance on exports stands in clear opposition to the Delta Reform Act's stated policy of reducing reliance on the Delta.

D. Unless Conditioned, Diversions to Sites Reservoir Could Violate the Basin Plan and the Clean Water Act.

The Central Valley Basin Plan requires that water temperature in the Sacramento River between Red Bluff and the City of Sacramento not exceed 68ºF to the extent feasible.[137] Diversion to Sites Reservoir when the water temperature at Hamilton City exceeds 65ºF is likely to increase the length of river that exceeds the Basin Plan's numeric standard. It is feasible not to divert water to Sites Reservoir. Thus, diversions that increased the frequency with which, or length of river in which, water temperatures downstream of Hamilton City exceeded the Basin

[137] The Water Quality Control Plan (Basin Plan) for the California Regional Water Quality Control Board Central Valley Region, Fifth Edition, Revised May 2018 (with Approved Amendments), p. 3-14: ("The temperature shall not be elevated above 56°F in the reach from Keswick Dam to Hamilton City nor above 68°F in the reach from Hamilton City to the I Street Bridge during periods when temperature increases will be detrimental to the fishery.")

Plan standard of 68ºF would violate the Basin Plan. Such diversions would also violate anti-degradation requirements of the Clean Water Act.

Such effects to water temperature would likely not occur until May or June in any given year. This is an additional reason why the season of diversion for the Sites project should end on April 30 of each water year. The specific beneficial uses this would protect would be to maintain suitable (COLD) water temperatures for migrating juvenile fall-run and spring-run Chinook salmon, adult winter-run salmon, adult and juvenile green sturgeon, and adult and juvenile white sturgeon.

E. The Bureau of Reclamation's Participation in Sites Would Not Conform to Executive Order 13990.

The Bureau of Reclamation is a federal agency participating in the Sites project. As a federal agency, Reclamation must adhere to federal laws, including federal executive orders. Executive Order 13990 requires federal agencies to prioritize environmental justice as part of agency actions.[138] The RDEIR/SDEIS noted that all action alternatives will have substantial adverse effect on minority populations and low-income populations.[139] As described above, the Sites Project would have adverse impacts on tribal uses, would be inaccessible due to cost to disadvantaged communities, would tend to increase costs for water generally, and would directly and indirectly fail to promote environmental justice for numerous other reasons. Project impacts to minority and low-income populations would thus violate federal Executive Order 13990.

VI. Conclusion: The State Water Board Should Deny the Application and Petitions.

The State Water Board should deny the Application and the Petitions. In the event that the State Water Board issues a permit for the Sites Reservoir project, it should condition the permit as described in the conditions for protest dismissal below.

VII. Conditions under Which the Protest May Be Dismissed.

A. The application and petitions should be denied.

B. If the application is granted, the petitions should be denied.

1. If the application is granted, the priority date assigned should be 2022. For the reasons stated above, Application if granted would be in conflict with a general and coordinated plan for the use of the state's waters. Thus, this application does not qualify for assignment of a state filing.
2. If the application is granted, the petitions for release from priority should be denied. There is no basis to give priority in perpetuity to a project

[138] *See* Executive Order 13990, Protecting Public Health and the Environment and Restoring Science To Tackle the Climate Crisis (Jan. 25, 2021), section 1. Available at: https://www.federalregister.gov/documents/2021/01/25/2021-01765/protecting-public-health-and-the-environment-and-restoring-science-to-tackle-the-climate-crisis.
[139] RDEIR/SDEIS, "Ch. 30: Environmental Justice and Socioeconomics," p. 2-5.

founded largely on water deliveries and water sales south of Delta over any future applications for water rights for local use.

C. If the application is granted, permit terms should include the following:

1. The season of diversion shall be from December 1 through April 30. If the requested season of diversion from September 1 through June 15 is granted, the flow requirements for December shall apply in the months of September, October, and November, and the flow requirements for April shall apply in May and June 1-15.
2. No diversions to Sites Reservoir shall be allowed when the Net Delta Outflow Index is less than 65% of the total calculated unimpaired outflow from the Delta.
3. No diversions to Sites Reservoir shall be allowed unless each of the following flow values are met or exceeded in the specified months at the designated compliance points on the Sacramento River. In cases where requirements overlap, all requirements must be met before diversions may occur.
    a. During the months of December and January, the minimum flow value at the Red Bluff gage, Hamilton City gage, and Wilkins Slough gage shall be 14,125 cfs.
    b. During the months of January, February, and March, the minimum flow value at the Red Bluff gage, Hamilton City gage, and Wilkins Slough gage shall be 24,720 cfs.
    c. During the month of April, the minimum flow value at the Red Bluff gage, Hamilton City gage, and Wilkins Slough gage on shall be 10,700 cfs.
    d. At no time shall diversions occur unless flow at the Freeport gage meets a minimum flow value of 35,000 cfs.
4. No diversions to Sites Reservoir shall be allowed when the Net Delta Outflow Index is less than 44,500 cfs in April and 42,800 cfs in January through March.
5. No diversions to Sites shall be allowed in December and January in a water year that follows a season in which temperature dependent mortality of Sacramento River winter-run Chinook salmon eggs was greater than 30%, or in which egg to fry survival of winter-run Chinook salmon was less than 25%.
6. No diversions to Sites shall be allowed in a year that follows a season in which releases from storage cause a total stage change in the Sacramento River at the Keswick Dam gage from October 1 through December 31 greater than 1.5 vertical feet.
7. No diversions to Sites shall occur when TUCPs for Delta water quality are in effect.
8. No deliveries from Sites south of Delta, except for reasons of health and safety, shall occur when TUCPs for Delta water quality are in effect.

9. The Department of Water Resources and the Bureau of Reclamation shall prioritize the use of the water they have stored in Sites Reservoir to achieve the requirements and intent of Water Right Order 90-5, in preference to making water available for delivery to project partners.
10. The Sites Authority has proposed a permit term to preclude diversion or rediversion to Sites Reservoir of water sourced in the Trinity River.[140] Protestants submit modifications to the proposed permit term, shown in strikethrough for proposed deletions and underlined for proposed additions.

    The Sites Project's diversions to storage under this Permit shall not include the diversion or rediversion of Trinity River water (water diverted by the Bureau of Reclamation from the Trinity River watershed into the Sacramento River watershed pursuant to its water rights) unless the Trinity River water is abandoned in the Sacramento River and all other diversion criteria in this Permit are met.

    Furthermore, the Sites Project's diversions to storage under this Permit shall not negatively impact <u>current and future</u> Trinity River obligations of the Bureau of Reclamation, including but not limited to those obligations specified in the 1959 Contract between the United States and Humboldt County, the Trinity River Mainstem Fishery Restoration Record of Decision, and the Long-Term Plan to Protect Adult Salmon in the Lower Klamath River, and related obligations in the Bureau of Reclamation's water right permits 11966, 11967, 11968, 11969, 11970, 11971, 11972, and 11973.

11. No diversions to Sites Reservoir shall be allowed at any time that releases from Sites Reservoir are occurring.
12. No diversions to Sites Reservoir shall occur when water temperatures at either point of diversion exceed 65ºF.
13. No releases from Sites Reservoir to the Sacramento River or the Cache Slough complex shall occur when the water temperature of the water discharged exceeds the water temperature of the receiving water.
14. No releases from Sites Reservoir through the Yolo Bypass to Cache Slough shall be allowed when the temperature of the water discharged to Cache Slough exceeds 68ºF.
15. The permit holder must develop a HABs monitoring program in Sites Reservoir and downstream of its discharge to the Sacramento River. The program must be developed jointly with CDFW and staff from the State Water Board. The plan must develop requirements that prohibit discharge of water from Sites to the Sacramento River that increases the concentration in the river of the cell counts of HAB-forming organisms are greater than those in the receiving water.

[140] *See* Sites Water Rights Application Supplement (Jan. 6, 2023), App. H.

16. The permit holder must develop a water quality monitoring and reporting program to continuously monitor and report the metal constituents present in inflows to the reservoir, in the reservoir itself, and in outflows from the reservoir,
17. To reduce methylation of mercury in Sites Reservoir, the permittee shall limit annual reservoir fluctuations according to a schedule developed with staff from the State Water Board, based on the stage/storage curve for the reservoir.
18. The permittee must update its accounting of reservoir greenhouse gas emissions using the best available science and tools, and implement concrete mitigation measures that achieve net zero emissions consistent with the updated accounting, without relying on the purchase of carbon credits or offsets.
19. In order to protect wetlands and terrestrial and avian species in the project area, the permittee, prior to commencement of construction, shall, in consultation with staff from the State Water Board and CDFW, provide accurate species distribution, focused bird surveys, a wildlife connectivity assessment, and aquatic wetland delineations. The permittee shall also, prior to commencement of construction, develop detailed plans to fully mitigate all temporary and permanent impacts of the construction and operation of Sites Reservoir on golden eagles, giant garter snakes, vernal pools, and other species and habitats according to law, including appropriate assurances and performance standards, and implement these plans during and after construction.
20. Prior to commencement of construction, permittee shall submit to the State Water Board plans for the decommissioning of the facilities associated with the project, including a funding plan.

D. If the Petition for Assignment is granted, the Petitions for Release from Priority should either be denied or conditioned. Conditions must either assure the eventual priority of any state-filed applications for water that may be needed for the development of Glenn, Tehama, and Shasta counties, or require availability of water from the Sites project to such counties at a reasonable price.

E. The Applicant shall submit a Reservoir Operations Plan to the State Water Board no less than 60 days prior to commencement of any hearings on the Application and Petitions. Protestants reserve the right to add protest dismissal terms following the release of a Reservoir Operations Plan.

1. The Reservoir Operations Plan shall describe the priorities among project partners, including priorities for timing of releases.
2. The Reservoir Operations Plan shall include an inventory of all expected system losses and the proposed allocation of such losses among project partners

F. Protestants reserve the right to add protest dismissal terms following the release of Final Environmental Impact Report/Environmental Impact Statement, and following the release of a Reservoir Operations Plan for Sites Reservoir.

Exhibit A

Comments of Jerry Boles on the Draft EIR/EIS for the Sites Reservoir Project: Chapter 7 Surface Water Quality (2017)

4314 Tuliyani Drive
Chico, CA 95973
November 17, 2017

Bureau of Reclamation
Attn: Michael Dietle
Draft EIR/EIS Comments
2800 Cottage Way, W-2830
Sacramento, CA 95825

Sites Project Office
Attn: Rob Thomson
Draft EIR/EIS Comments
P.O. Box 517
Maxwell, CA 95955

I am providing to you my comments in response to the Draft Environmental Impact Report/Environmental Impact Statement for the Sites Reservoir Project, State Clearinghouse #2001112009.

The draft EIR/EIS fails to discuss the high concentrations of a number of metals in the source waters to the proposed project, and, even more important, does not discuss water quality in the proposed reservoir. Water quality in the proposed reservoir will mimic that of the source waters, and hence the reservoir will have concentrations of a large number of metals that exceed many water quality criteria and standards. The high concentrations of metals likely to occur in the proposed reservoir will impact most, if not all, beneficial uses of the proposed project, including agricultural water supply, wildlife and fisheries, and drinking water supplies for communities that divert water from the Sacramento River, making the project potentially infeasible.

The water quality section (Chapter 7) must be completely rewritten with an objective analysis of the data and potential adverse impacts to water quality both within the reservoir and to downstream resources in the Sacramento River. Subsequently, the aquatic biological resources (chapter 12), terrestrial biological resources (chapter 14), recreation resources (chapter 21), public health and environmental hazards (chapter 28), and cumulative impacts (chapter 35) sections of the draft EIR/EIS must reassess impacts from the adverse water quality expected from the proposed project. Following these re-analyses, re-circulation of the draft EIR/EIS is necessary with appropriate disclosure information about the potential impacts from metals to water quality and its effects on agricultural water supply, wildlife and fisheries, and drinking water supplies.

I am qualified to provide these comments since my background is in water quality, as former Chief of the Water Quality and Biology Section of the Northern District of DWR in Red Bluff.

If you have any questions, please contact me via email at chicojerry@yahoo.com.

Sincerely,

Jerry Boles

Comments on Draft EIR Sites Reservoir Project: Chapter 7 Surface Water Quality

An EIR is supposed to be a disclosure document that provides information on the benefits as well as potential impacts from a proposed project. Section 7 - Surface Water Quality does not disclose potential significant adverse issues which have serious ramifications for the viability of the proposed project, but rather ignores or misconstrues available data and reports to incorrectly conclude that there are no significant water quality impacts associated with the proposed project. The EIR claims to have evaluated post-project impacts to the Sacramento River, but there are no analyses provided that indicate that this was done. It is apparent that the preparers of the EIR failed to examine or simply ignored the available data that would show potential significant adverse impacts from the proposed project.

The analyses in Section 7 completely left out any evaluation or projection of water quality that may result in Sites Reservoir from diverting high winter flows from the Sacramento River. The EIR fails to point out that due to metals loads in the various source waters, water in the proposed reservoir may not be suitable for the beneficial uses stated for the proposed project, including enhanced water management flexibility, agricultural and urban water supply, water quality improvement, and ecosystem improvement for fish protection, habitat management, and other environmental needs.

A factual evaluation of the available data is presented below, which shows significant potential adverse impacts associated with the proposed project. Some comments on specific sections of Chapter 7 of the EIR are also presented.

Available Data

The EIR cites the DWR Water Data Library (WDL) online database as the source for water quality data used to determine impacts from the proposed project. However, very limited data from the WDL are available for evaluating water quality in source waters for the proposed project. The major source water for the proposed project is the Sacramento River, with potential diversion occurring at the Tehama-Colusa Canal, Glenn-Colusa Irrigation District Main Canal, and at Moulton Weir.

The Sacramento River below the Red Bluff Diversion Dam monitoring station of DWR provides information on the quality of water that would be diverted to the proposed project through the Tehama-Colusa Canal. Metals data are available in the WDL for the Sacramento River below the Red Bluff Diversion Dam beginning in February 2006 (Table 1). However, only 33 samples have been collected since 2006, and only nine of these were from the months in which higher flows most typically occur (December through March) and from which diversions to the proposed project would occur.

Cottonwood Creek contributes the most significant input to the Sacramento River during high runoff events. The Chico-Enterprise Record in an editorial published December 28, 2016 underscored the impact of tributaries on water quality in the Sacramento River. The newspaper stated that of the 100,000 cfs flowing in the river earlier in the month, only 5,000 cfs was coming from Keswick Dam below Shasta Dam – the rest of the 100,000 cfs (95,000 cfs) was coming from tributaries downstream from Keswick Dam, of which Cottonwood Creek provides the dominant flows.

Data from Cottonwood Creek near Cottonwood are even more sporadic than those for the Sacramento River. Data are available for this station in WDL beginning in October 2004, with only seven samples collected from the Cottonwood Creek monitoring station since 2006, and only four of which were collected during the months of expected higher flows of December through March (Table 2). Data available in the WDL show that only one sample was collected (March 2006) during the same period from both Cottonwood Creek and the Sacramento River below the Red Bluff Diversion Dam since 2006. This one sample shows that metal loads in the Sacramento River are similar to those found in Cottonwood Creek, showing that Cottonwood Creek significantly affects water quality in the Sacramento River. Water quality in Cottonwood Creek will have a significant impact on diversions to the proposed reservoir and water quality data from Cottonwood Creek can be used to approximate and supplement data from the Sacramento River, though the total number of samples from both sites combined are still exceptionally low for a project of this magnitude and potential for adverse effects.

The water quality monitoring station on the Sacramento River at Hamilton City is just downstream from the GCID Main Canal. Data from the WDL is somewhat more extensive at the Hamilton City monitoring site, with metals data available in the WDL beginning in late 2003 to early 2017, though still sporadic with only 78 samples collected in the span of a little more than 13 years (159 months), and only 23 of those collected sometime during the months of expected higher flows of December through March (Table 3). Samples were collected in each of these months only twice, with the rest of the samples during these months only collected in February months each year since 2008.

The WDL shows that metals data are available for the Sacramento River opposite Moulton Weir monitoring station from mid 2003 to early 2011, for a total of 80 samples, with 27 of those from the expected higher flow months (Table 4).

Water quality sampling during the expected months of higher flows of December through March did not target high flow periods (the periods during which diversions to the proposed project would occur) but were based on a rigid and fixed monthly or semi-monthly schedule. Monitoring did not provide any information on the variation in concentrations of metals over the runoff hydrograph. Even higher concentrations of metals would likely occur during the higher flow periods during these months, but were not targeted by the limited monitoring. The relatively low number of samples and lack of samples targeting critical flows (i.e., high runoff events) are nonetheless sufficient to indicate potential significant adverse water quality impacts with the proposed project. These data illustrate the need to collect additional data during appropriate time periods (i.e., during the high flow periods when diversions from the Sacramento River would be occurring) and re-evaluate the potential adverse water quality impacts from the proposed project.

Data Analyses

Some of the analytical results shown in the WDL for metals are reported as "dissolved" and other results as "total" (or total recoverable). "Total" concentrations, which include both dissolved and particulate forms of an analyte, are probably a better representation for the concentrations of metals that will affect water quality in the proposed reservoir. As well, the State Water Resources Control Board makes no distinction between dissolved or total recoverable concentrations when considering whether a criterion is exceeded (SWRCB 2011). The proposed reservoir will thermally stratify and will also be biologically productive due to nutrients brought in from source waters. This in-situ productivity, as well as organic material brought in with the source waters, will result in anoxic conditions (i.e., lack of oxygen) in the hypolimnion (i.e., bottom water layer). While dissolved forms of metals are generally the most bioavailable, the particulate fraction of total recoverable forms will undergo chemical transformation to dissolved forms under the anoxic conditions expected in the hypolimnion of the proposed reservoir. Transformed metals will be mixed throughout the reservoir water column during turnover events, or released downstream with anoxic water from the lower depths during the summer months.

Data from the WDL (Table 1) show that aluminum, arsenic, cadmium, chromium, iron, lead, manganese, and mercury in water samples from the Sacramento River below the Red Bluff Diversion Dam exceed various criteria and standards established to protect beneficial uses, including drinking water, public health, taste and odor for agriculture, and freshwater organisms, which includes fish. Maximum concentrations of some of these metals are many times higher than the corresponding criteria or standard. For example, aluminum, in addition to exceeding the SWRCB Basin Plan Primary Maximum Contaminant Level (MCL) for drinking water by one and half times, also exceeds the secondary drinking water standard in the Basin Plan by seven times and the US Environmental Protection Agency Secondary MCL by 30 times. Even the minimum concentration of arsenic reported in WDL exceeds by more than 10 times nearly all the criteria and standards for protection of human health. The least reported concentration of cadmium from river water samples exceed by five times the incremental cancer risk for drinking water. The least concentration of chromium reported in WDL exceeds the California Public Health Goal by 16 times and incremental cancer risk for drinking water by five times. The maximum concentration of iron that was reported in WDL exceeds the secondary drinking water maximum concentration level in the Basin Plan, as well as National Recommended Water Quality Criteria for taste and odor or welfare by nearly three times. The maximum concentration of lead that was reported exceeds the California Public Health Goal and California Proposition 65 maximum allowable dose level for reproductive toxicity by over four times. The maximum reported concentration of manganese exceeds the National Recommended Water Quality Criteria for taste and odor or welfare by one and a half times. The maximum concentration reported for mercury exceeds the National Recommended Water Quality Criteria for Freshwater Aquatic Life Continuous Concentration by nearly four times, and the Freshwater Aquatic Life Maximum Concentration by two times. An additional concern with these metals is that some metals are taken up by crops (such as arsenic by rice), making the crops potentially unsuitable for consumption. Plant uptake of metals in the water supply not only affect crops grown for human consumption, but also plants grown for support of wildlife, such as in refuges.

Similarly, data from the WDL for Cottonwood Creek near Cottonwood show that aluminum, arsenic, cadmium, iron, lead, manganese, and nickel exceed various criteria and standards established to protect beneficial uses (Table 2). Similar to the Sacramento River, maximum concentrations of some of these metals are many times higher than the corresponding criteria or standards. Aluminum concentrations exceed the Basin Plan drinking water primary standard MCL by 14 times, the secondary drinking water secondary standard MCL by 70 times, the California Public Health Goal by over 20 times, the National Academy of Sciences Health Advisory and Agriculture Water Quality Goals for taste and odor threshold by nearly three times, the National Recommended Water Quality Criteria for human health and welfare for water and fish consumption by nearly 30 times, and the National Recommended Water Quality Criteria for freshwater aquatic life maximum concentration by 20 times. As with the Sacramento River, even the minimum concentration of arsenic reported in WDL exceeds nearly all the criteria and standards for protection of human health by up to 167 times. The minimum concentration of cadmium reported exceeds the incremental cancer risk for drinking water by over three times, while the maximum concentration is over twice as high as the California Public Health Goal. As with the Sacramento River, the California Public Health Goal is exceeded by the least concentration of chromium reported by 16 times and the incremental cancer risk for drinking water by five times. Iron exceeds the Basin Plan drinking water standard secondary MCL by over five times, the Agricultural Water Quality Goals for taste and odor threshold by nearly five times, the National Recommended Water Quality Criteria for taste and odor or welfare by 78 times, and the National Recommended Water Quality Criteria for freshwater aquatic life maximum concentration by over 23 times. Reported lead concentrations are two and a half times higher than the California Public Health Goal, up to twice as high as the California Proposition 65 maximum allowable dose level for reproductive toxicity, and almost twice as high as the incremental cancer risk estimate for drinking water. Manganese concentrations reported from Cottonwood Creek exceed the Basin Plan Drinking Water Standards secondary MCL by a factor of 10, are nearly twice as high as the USEPA Health Advisory for drinking water, three times as high as the Agricultural Water Quality Goals for taste and odor threshold, and over 10 times higher than the National Recommended Water Quality Criteria for taste and odor or welfare. Reported maximum mercury concentrations exceed the National Recommended Water Quality Criteria for Freshwater Aquatic Life Continuous Concentration by nearly two times, while even the lowest reported concentration is nearly equal to the recommended criterion. Nickel exceeds the California Public Health Goal by nearly five times.

The GCID Main Canal intake is slightly upstream from the Sacramento River at Hamilton City water quality monitoring station. Therefore, water quality in the GCID Main Canal will be similar to that found at the Sacramento River at Hamilton City monitoring station. Metals data for this monitoring station can be found in the WDL from November 2003 to February 2017. Similar to the upstream monitoring station on the

Sacramento River below Red Bluff, the Sacramento River at Hamilton City water quality monitoring station has been identified to contain high levels of aluminum, arsenic, cadmium, chromium, copper, iron, lead, manganese, mercury, nickel, selenium, silver, and zinc (Table 3), which exceed a large number of criteria and standards similar to those upstream at the monitoring station below the Red Bluff Diversion Dam.

High levels of metals have also been identified at the water quality monitoring station opposite the Moulton Weir, including aluminum, arsenic, cadmium, chromium, copper, iron, lead, manganese, mercury, nickel, selenium, silver, and zinc (Table 4). As with the water quality monitoring station on the Sacramento River below the Red Bluff Diversion Dam, concentrations of metals from the Sacramento River monitoring station at the Moulton Weir exceed a large number of water quality criteria designed to protect beneficial uses.

As discussed earlier, Cottonwood Creek is the major source of water to the Sacramento River during higher flow periods, but other tributaries also contribute high levels of metals to the Sacramento River. In addition, local creeks directly tributary to the proposed reservoir, such as Funks Creek and Stone Corral Creek, also carry metals concentrations that will contribute to the metals loading. Leaching from soils beneath the reservoir will also contribute additional metals, as well as nutrients.

The Basin Plan lists other chemicals that adversely affect water quality in the Sacramento River, including chlorpyrifos and diazinon. The California State Water Resources Control Board lists a number of other "constituents of concern" in the study area, including chlordane, DDT, mercury, PCBs, and dieldrin. In addition, sewer outfalls from the cities of Redding and Red Bluff contribute other contaminants, such as pharmaceuticals, to the Sacramento River. No information is provided in the EIR about effects to the proposed project from these chemical contaminants.

Discussion

The data in the WDL for the Sacramento River and Cottonwood Creek demonstrate that high concentrations of metals can be expected during the high flow months of winter (December through March) when diversions would be occurring to the proposed Sites Reservoir. Higher concentrations of metals are likely during the higher flows that can occur during these months. Such higher flows were not targeted by the limited sampling effort presented in the WDL. The high concentrations of metals in the source water will adversely impact water quality in the proposed reservoir for most, if not all, the proposed beneficial uses of the stored water.

Some metals from both the Sacramento River and Cottonwood Creek, whose concentrations did not exceed criteria in the limited sampling effort, had concentrations that nearly exceed the criteria and standards. These and other metals whose concentrations did not exceed the criteria may have higher concentrations during the higher flow periods that the proposed project would be diverting. Again, these higher flow periods were not targeted during the limited sampling effort.

Even some of the minimum concentrations of metals found in the source waters exceed criteria and standards, which means that the source waters never meet these goals and standards – the criteria are always exceeded and the water is never suitable for the beneficial use or uses the criteria or standards were designed to protect. Water quality in the proposed reservoir for these parameters will exceed the criteria and standards all the time.

Since water quality in the proposed reservoir will reflect that of the source waters, the reservoir will have concentrations of numerous metals, including aluminum, arsenic, cadmium, chromium, copper, iron, lead, manganese, mercury, nickel, selenium, silver, and zinc, that exceed a number of criteria and standards developed to protect beneficial uses. In addition, other metals that may not exceed criteria and standards in the source waters may adversely affect reservoir water quality due to synergistic effects. The State Water Resources Control Board (SWRCB 2011) states that "when multiple constituents have been found together in groundwater or surface waters, their combined toxicity should be evaluated" and that "theoretical risks from chemicals found together in a water body shall be considered additive for all chemicals having similar toxicologic effects or having carcinogenic effects." Thus, the adverse effects from the metals delivered to the proposed reservoir from the source waters may have an even greater adverse impact and pose an unacceptable level of risk. Beneficial uses potentially impacted by metals in the proposed reservoir include agricultural water supply (direct toxicity or uptake by crops making the crops unsuitable for use), wildlife (such as fish-eating birds), fisheries, recreation (including sport fishing and water contact activities such as swimming), and drinking water supplies for communities that divert water from the Sacramento River.

Releases from the proposed reservoir would occur during the summer when metals concentrations in the Sacramento River are much lower due to the majority of flow being from Shasta Reservoir, with much better water quality, though still carrying a metals load. High metals concentrations in the proposed reservoir releases could adversely affect water quality in the Sacramento River during the summer months by increasing metals loads beyond acceptable limits and adversely impact beneficial uses.

Though high concentrations of metals that exceed water quality criteria exist in source waters to the proposed project, they cannot be regulated by governmental entities since they are natural occurrences. However, once contained artificially in a reservoir, they are subject to jurisdictional control by regulatory agencies. Any releases of water from the proposed reservoir will likely be subject to review by water quality regulatory agencies to ensure that such releases do not adversely affect downstream resources due to the heavy metals loads in the releases. The SWRCB has an antidegradation policy that prohibits discharges that would degrade water quality to a level below water quality objectives because no capacity would exist for degradation that will be caused by the next downstream or downgradient uses – the ability to beneficially use the water would have been impaired, even though water quality objectives would not yet have been exceeded (SWRCB 2011). The contribution of additional metal loads from releases from the proposed Sites Reservoir during the summer could cause concentrations of metals in the Sacramento River to exceed criteria and standards or at least be subject to the antidegradation policy due to an incremental increase in metals in the Sacramento River from the proposed project. Thus, the proposed project may face prohibition of releases if stored water does not meet water quality criteria or standards or if releases can cause criteria or standards to be exceeded by downstream inputs (i.e., antidegradation poicy).

During dry years, the adverse impacts associated with the project can be expected to be even greater. Flows in the Sacramento River from upstream reservoirs on the Sacramento River (i.e., Shasta Reservoir, Whiskeytown Reservoir) will be minimized during the winter months in an effort to restore water storage levels in those reservoirs. Likewise, during wet or even normal runoff years, releases from the upstream reservoirs during the winter will be curtailed during high runoff periods to prevent downstream flooding. In any of these scenarios, tributary influences, such as Cottonwood Creek, on water quality in the Sacramento River will be much greater. The proposed project would still attempt to capture as much runoff from the Sacramento River as possible, but the water diverted to the proposed project will have even greater concentrations of metals due to the majority of flow being from tributary streams (e.g., Cottonwood Creek) during dry and possibly even wet or normal runoff years.

Similarly, during the summer in dry years, releases from upstream reservoirs (i.e., Shasta Reservoir, Whiskeytown Reservoir) will be minimized. Releases to the Sacramento River from the proposed project will have a greater impact on water quality in the Sacramento River due to less dilution being available due to curtailed flows in the river from upstream reservoirs (i.e., Shasta and Whiskeytown reservoirs).

Conclusion

The proposed project is, at best, premature. Little or no data have been collected to determine the metals loads in the higher flows of the Sacramento River that would be diverted to the proposed reservoir. An extremely small amount of data have been collected during the months in which higher flows can be expected (December through March), but higher flows during these months were not targeted in the water quality sampling. None the less, the limited data presented in the WDL show high concentrations of a number of metals which exceed numerous water quality criteria and standards in the source waters for the proposed reservoir. Extremely high concentrations of metals are present in the small streams in the reservoir footprint, which occur due to the nature of the soils in the area of the proposed reservoir. Sites Reservoir would inundate these soils resulting in leaching of metals and further incremental loading of metals to the proposed reservoir. There is no discussion in the EIR about the potential impacts of metals leaching from the soils that would be inundated by the proposed reservoir. Prior to moving forward with the project, much additional data are needed during the high flow periods in which diversions would occur from the Sacramento River, metals loading from the smaller tributaries that flow directly into the proposed reservoir, and effects from leaching of metals from soils inundated by the proposed reservoir.

The limited data that are available are sufficient to show that water quality in the proposed reservoir will have concentrations of a large number of metals that exceed many water quality criteria and standards, including those established for the protection of agricultural water supply, wildlife and fisheries, and drinking water. Metals bioaccumulation in the reservoir food web could produce adverse impacts to fish-eating birds and other animals, as well as humans, and adversely affect any potential recreational benefit from the project. Releases from the proposed reservoir could adversely affect downstream resources, including agricultural water supply, wildlife and fisheries, and drinking water supplies for communities that divert water from the Sacramento River.

Also, the EIR does not discuss the physical conditions that can be expected to occur in the proposed reservoir. Like other nearby reservoirs, the proposed reservoir will thermally stratify during the summer months, with a warm upper water layer and a cooler lower water layer. The proposed reservoir will also be biologically productive due to nutrients brought in with source waters. The biological productivity will lead to anoxic conditions (i.e., lack of oxygen) in the hypolimnion (i.e., bottom water layer). Depending on the depth from which downstream releases are made from the proposed reservoir, water released will either be warm and unsupportive of cold water fisheries in the Sacramento River (i.e., migrating salmon) or cooler but devoid of oxygen. As releases from the reservoir progress during the summer, or in years in which the reservoir is not completely filled, the reservoir will be warm from surface to bottom as the cooler lower water strata is depleted from releases or wind mixing of the upper warm water layer. Under these conditions, only warm water would be available for release from the proposed reservoir, which would not be supportive of the cold water fishery in the Sacramento River.

An EIR is a disclosure document meant to disclose pertinent project information to planners, regulatory agencies, and other interested parties and the public. This EIR did not disclose the potential impacts from metals, other contaminants, nor the physical conditions likely to exist in the proposed reservoir. The little analyses presented in the EIR misconstrues, misinterprets, and ignores water quality data that amply demonstrate significant potential adverse impacts from the proposed project. The water quality section (Chapter 7) must be completely rewritten with an objective analysis of the data and potential adverse impacts to water quality both within the reservoir and to downstream resources in the Sacramento River. Subsequently, the aquatic biological resources (chapter 12), terrestrial biological resources (chapter 14), recreation resources (chapter 21), public health and environmental hazards (chapter 28), and cumulative impacts (chapter 35) sections of the EIR must reassess impacts from the adverse water quality expected from the proposed project. Whether any of the projected beneficial uses from the proposed project can be realized, and its feasibility to meet project objectives, purpose, and need, also needs to be reconsidered in light of the potential significant adverse water quality impacts from metals. Following these re-analyses, re-circulation of the EIR is necessary with appropriate disclosure information about the potential impacts from metals to water quality and its effects on agricultural water supply, wildlife and fisheries, and drinking water supplies for communities that divert water from the Sacramento River.

EIR Needs:

- Obtain additional metals data from source waters targeting high flows from which diversions would occur
- Provide information on the water quality impacts from other chemical contaminants that adversely affect water quality in the Sacramento River (including chlorpyrifos, diazinon, chlordane, DDT, mercury, PCBs, and dieldrin) and contaminants in sewer outfalls (such as pharmaceuticals) and other discharges (such as industrial discharges)
- Evaluate the contributions of metals from local tributaries (i.e., Funks Creek and Stone Corral Creek) to the proposed reservoir
- Provide information on the contribution from leaching of metals from the inundation area of the proposed reservoir
- Evaluate effects of metals to beneficial uses within the proposed reservoir
    - fisheries,
    - wildlife (including state and federal species listed as threatened or endangered),
    - recreation
- Evaluate effects of metals to beneficial uses due to releases from the reservoir
    - agricultural supply water,
    - effects of metals on crops including incorporation of metals by crops (e.g., arsenic uptake in rice),
    - effects of metals on plants grown for support of wildlife (such as in wildlife refuges),
    - drinking water supplies,
    - fisheries,
    - wildlife (including state and federal species listed as threatened or endangered),
- Evaluate combined toxicity of multiple metals
- Evaluate contributions of metals in reservoir releases related to the SWRCB antidegradation policy
- Evaluate impacts from mercury bioaccumulation in aquatic life (especially fish) in the proposed reservoir, and effects to wildlife that feed on fish from the reservoir and recreational opportunities (i.e., sport fishing)
- Evaluate physical conditions expected in the reservoir, including thermal stratification and hypolimnetic anoxia, and effects on reservoir and downstream aquatic resources
- Conduct re-analysis of impacts due to metals, other contaminants, and physical conditions in the proposed reservoir on:
    - water quality (chapter 7),
    - aquatic biological resources (chapter 12),
    - terrestrial biological resources (chapter 14),
    - recreation resources (chapter 21),

- public health and environmental hazards (chapter 28), and
- cumulative impacts (chapter 35).

Comments on Specific Sections of EIR

7.2.1.5 Other Heavy Metals

"In addition to mercury and selenium, other heavy metals, including cadmium, copper, and zinc, impair beneficial uses of water bodies. Cadmium, copper, and zinc enter the water bodies with the sediment from eroded soils and discharges from abandoned mines, and in stormwater runoff from municipal areas (SWRCB, 2011a). The primary source in the Central Valley appears to be tailing piles located at abandoned mine sites. Many of these mines are located upstream of reservoirs; therefore, the sediment that includes the heavy metal constituents is generally captured upstream of the dam. Heavy metals appear to cause health concerns in aquatic resources and in humans that consume the fish from these water bodies."

Abandoned mines, which contribute heavy metals to area streams, are also found downstream from Shasta and Keswick dams. In addition, natural erosion and soil leaching also contribute to metals loads found in area streams, such as Cottonwood Creek, which make up the bulk of the flow in the Sacramento River during high runoff events during which flows would be diverted to the proposed reservoir. It is not that "heavy metals appear to cause health concerns in aquatic resources and humans," it is well known that they do.

7.2.4 Primary Study Area
7.2.4.1 Overview and Methodology

"DWR began monthly sampling of streams in the Primary Study Area in 1997, including physical parameters, nutrients, minerals, and metals in the water column (DWR, 2012), as well as mercury analysis of sport fish tissues collected from nearby existing reservoirs, including East Park, Stony Gorge, and Black Butte (DWR, 2007a). Routine water quality monitoring by DWR was periodically suspended due to funding limitations during portions of 2008 and 2009, and ended following the January 2010 monitoring run. Sampling results were then compared to Central Valley Basin Plan water quality criteria (CVRWQCB, 2011) (Appendix 7A California State Water Resources Control Board Constituents of Concern of Water Bodies in the Study Area) and USEPA ambient water quality criteria to prevent nuisance algal growth in streams (USEPA, 2001b)."

DWR does not indicate any data for metals in its Water Data Library until 2006 for the Sacramento River below the Red Bluff Diversion Dam, and 2003 for the Sacramento River at Hamilton City and opposite the Moulton Weir, as well as Stone Corral Creek. Funding for water quality monitoring by DWR was curtailed shortly after the 1997 date indicated in the EIR, after the project manager in the Red Bluff office was informed of potential adverse impacts from metals by the then Chief of the Water Quality and Biology Section. If additional data are available, that data should be made available in the WDL so that reviewers of this EIR can verify claims about lack of water quality issues made in the EIR. However, the data that are in the WDL adequately demonstrate significant adverse water quality issues with the proposed project. Any additional data that has not been shared will just confirm these issues.

Appendix 7A - California State Water Resources Control Board Constituents of Concern of Water Bodies in the Study Area – lists a large number of parameters for which no information is contained in this EIR. For example, chlorpyrifos, diazinon, chlordane, DDT, mercury, PCBs, and dieldrin are constituents of concern from Keswick Dam to the Delta. The EIR should assess how these constituents will impact water quality in the proposed reservoir.

7.2.4.2 East Park and Stony Gorge Reservoirs

"East Park and Stony Gorge reservoirs were sampled during the summer of 2000 to evaluate the extent of mercury contamination in fish because these reservoirs are representative of conditions that could be expected in the proposed Sites Reservoir. DWR analyses of total recoverable mercury indicate that levels in samples collected near the bottom of the water column at Stony Gorge and Black Butte reservoirs, exceeded the California Toxics Rule for protection of human health.

Fish tissue samples were collected by DWR from East Park and Stony Gorge reservoirs during 2000 to 2001. Neither catfish nor bass composites collected from East Park Reservoir exceeded the OEHHA screening value or USEPA criterion, although mercury levels in the small-sized bass approached these values, and a very large channel catfish that was analyzed individually contained tissue mercury at over twice the level of the screening value and criterion limits. Mercury concentrations in tissues of channel catfish collected from Stony Gorge Reservoir contained levels less than the screening value and criterion (DWR, 2007a)."

Mercury sampling in fish from East Park and Stony Gorge reservoirs was conducted to contribute to the knowledge of mercury contamination in a number of northern California lakes and reservoirs, not simply because these reservoirs are representative of conditions that could be expected in the proposed Sites Reservoir, though they well might. As noted, the bass from East Park Reservoir that were used for the composite analysis were small in size (about one foot long), yet approached the screening value and criterion. Larger fish can be expected to exceed these values since mercury is accumulated and magnified in fish tissues. The large catfish which contained mercury at over twice the screening value and criterion is probably representative of mercury concentrations that can be found in this species.

The EIR fails to mention that mercury contamination exceeded the screening value and criterion in a relatively small largemouth bass collected from Stony Gorge Reservoir. Though the catfish analyzed from Stony Gorge Reservoir did not exceed the screening value and criterion, the cited report states that "larger channel catfish from Stony Gorge Reservoir, therefore, may be expected to contain mercury concentrations that exceed the screening value and criterion."

Since mercury contamination in excess of criteria occurs in lakes that the EIR states are representative of conditions that could be expected in the proposed Sites Reservoir, the EIR should discuss the probability of mercury contamination in the proposed reservoir and ramifications to recreational fishing and wildlife that would consume fish from the reservoir.

7.2.4.3 Salt Lake

"Saline water has been observed to seep from underground salt springs in the vicinity of the Salt Lake fault along the slopes above the valley and along the valley floor within the proposed inundation area of Sites Reservoir. These areas are generally located in the Funks Creek watershed. The water from the underground springs accumulates along the trough of the valley and forms Salt Lake (USGS, 1915). The size of Salt Lake and adjacent seasonal brackish wetlands varies with time. The wetted area appears to vary from 0 to 30 acres. The deeper water appears to be approximately 15 acres based on observations in 2017. The depth of the water has not been monitored.

Salt Lake was only sampled on a few occasions from 1997 to 1998. In August 1997, the Salt Lake was dry. In September 1997, the springs were bubbling and the EC was 194,100 micromhos per centimeter (µmhos/cm) as compared to 3,490 µmhos/cm for the nearby Stone Corral Creek. In January 1998, there was less than 1 cfs of flow from the springs, and the EC was 7,200 µmhos/cm as compared to 540 µmhos/cm for the nearby Stone Corral Creek. From these samples, it was found that waters from this location are extremely high in minerals. The EC value on one occasion reached 194,100 micromhos per centimeter. The TDS measurement at this time was 258,000 mg/L. EC, TDS, sodium, and boron exceeded all Central Valley Basin Plan criteria. A few metals also were noted at very high concentrations (aluminum, iron, and manganese) and exceeded all criteria, and a few others exceeded some criteria (arsenic, copper, lead, and nickel). Levels of ammonia and orthophosphate also were noted at high levels and exceeded criteria. Temperatures from this site were variable, and probably depend on seasonal conditions. Concentrations present in water from this site likely depend on the season and flow."

Though the EIR states that water quality data used in the analyses are available in the WDL, data for Salt Lake could not be found. However, the EIR states that several metals (aluminum, iron, and manganese) were found in concentrations that exceed all Basin Plan criteria, while others (arsenic, copper, lead, and nickel) exceed some criteria. These metals from the springs feeding Salt Lake will add to the metals load in the proposed reservoir.

7.2.4.4 Funks Creek

"Funks Creek originates at approximately 850 feet elevation in the foothills west of Antelope Valley. The banks of this intermittent stream are heavily eroded and the gravel bed is highly disturbed and compacted by cattle. Along the north end of Antelope Valley, Funks Creek receives underground drainage from Salt Lake. Funks Creek widens as it cuts through Logan Ridge and enters the western side of the Sacramento Valley, although flows are still intermittent. Approximately 1 mile downstream of Logan Ridge, Funks Creek is impounded by Funks Reservoir. This reservoir is fed mainly from waters of the Tehama-Colusa Canal. Downstream of the reservoir, Funks Creek is bordered by agricultural lands, and much of this reach is channelized before emptying into Stone Corral Creek. This portion of Funks Creek likely has some flow year round, due to leakage from the dam at Funks Reservoir.

DWR observed aluminum, arsenic, copper, iron, manganese, mercury, nickel, and phosphorus in Funks Creek at the Glenn-Colusa Irrigation District (GCID) Main Canal station during intermittent water quality sampling. The concentrations appeared to be higher during and immediately following storm events."

As with Salt Lake, data for Funks Creek could not be found in the WDL. The data used in the analyses in the EIR must be made available for review. It is likely that the reported metals exceed various criteria, as with Salt Lake, and thus add to the metals load in the proposed reservoir.

7.2.4.5 Stone Corral Creek

"Stone Corral Creek originates at approximately 700 feet elevation in the foothills west of Antelope Valley. As the intermittent stream flows into the grasslands of Antelope Valley, the channel is narrow and the banks eroded. The much larger Antelope Creek flows into Stone Corral Creek from the south near the town of Sites. Stone Corral Creek flows through the gap in the foothills and into the western Sacramento Valley.

DWR observed aluminum, arsenic, copper, iron, manganese, nickel, and phosphorus during intermittent sampling in Stone Corral Creek near Sites station during intermittent water quality sampling. The concentrations appeared to be higher during and immediately following storm events."

Data for Stone Corral Creek are available in the WDL. These data show that not only are high concentrations of aluminum, arsenic, copper, iron, manganese, and nickel present, as reported in the EIR, but also cadmium, chromium, lead, mercury, selenium, silver, and zinc, as well as boron (Table 5). The EIR does not disclose the fact that, not only are the concentrations higher during and immediately following storm events, the resulting metals concentration in Stone Corral Creek exceed a large number of criteria and standards including those to protect drinking water, public health, freshwater aquatic life, and agricultural uses. These metals will also contribute to the metals load in the proposed reservoir.

The metals concentrations found in Stone Corral Creek, Salt Lake, and Funks Creek are a result of leaching from the soils through which these water bodies flow. Inundation of these soils by the proposed reservoir will result in an additional metals load to the reservoir.

7.2.4.6 *Tehama-Colusa Canal*

"The intake for the Tehama-Colusa Canal occurs at the southeast end of the City of Red Bluff at River Mile (RM) 243. The intake occurs downstream of the mouth of Red Bank Creek. The Tehama-Colusa Canal is approximately 111 miles long and extends from Red Bluff in Tehama County to downstream of Dunnigan in Yolo County. Funks Reservoir is approximately 66 canal miles downstream of the intake at the Sacramento River.

DWR observed aluminum, arsenic, cadmium, and iron during intermittent sampling in the Tehama-Colusa Canal downstream of the siphon under Stony Creek during intermittent water quality sampling."

The intake for the Tehama-Colusa Canal is at the Sacramento River below Red Bluff Diversion Dam water quality monitoring station. Therefore, water quality in the Tehama-Colusa Canal will be exactly that found at the Sacramento River below Red Bluff Diversion Dam monitoring station. Data for this monitoring station can be found in the WDL.

This is another example where the EIR is less than forthcoming. Not only are aluminum, arsenic, cadmium, and iron present in water diverted from the river into the canal, but, as discussed earlier, so are chromium, copper, lead, manganese, mercury, nickel, selenium, and zinc (Table 1). The highest concentrations were found during the higher flow months (December through March). As discussed earlier, many of these metals exceed a large number of criteria and standards, including those developed to protect drinking water, public health, freshwater aquatic life, and agricultural uses. Water quality in the proposed reservoir will reflect that in the Sacramento River below the Red Bluff Diversion Dam and other source waters, and exceed many of the criteria developed to protect beneficial uses of the water.

7.2.4.7 *Glenn-Colusa Irrigation District Main Canal*

"The intake for the GCID Main Canal is on a side channel off the Sacramento River at RM 205.5, north of the town of Hamilton City. GCID's Hamilton City pump station, located at the intake, diverts water into the GCID Main Canal from the Sacramento River for distribution within the GCID service area. The canal is an unlined earthen channel that stretches approximately 65 miles from the system diversion point near Hamilton City to its downstream southern terminus at the CBD near Williams, in Colusa County.

DWR observed aluminum, arsenic, cadmium, copper, iron, mercury, manganese, and phosphorus during intermittent sampling in the GCID Main Canal intake during intermittent water quality sampling."

The intake for the GCID Main Canal is slightly upstream from the Sacramento River at Hamilton City water quality monitoring station. Therefore, water quality in the GCID Main Canal will be similar to that found at the Sacramento River at Hamilton City monitoring station. Data for this monitoring station can be found in the WDL.

Not only are aluminum, arsenic, cadmium, copper, iron, manganese, and mercury present in the Sacramento River in the vicinity of the diversion into the GCID Main Canal, but so are chromium, lead, nickel, selenium, silver, and zinc (Table 3). Aluminum, arsenic, cadmium, iron, lead, manganese, mercury, and nickel are present in concentrations that exceed various criteria and standards. The highest concentrations are generally found during the higher flow months of December through March, when the proposed project may be diverting water from this area of the Sacramento River.

7.2.4.9 *Sacramento River Opposite Moulton Weir*

"DWR monitored water quality at the Sacramento River along the western bank opposite Moulton Weir station from 2000 to 2010. The water quality samples included aluminum, arsenic, copper, iron, mercury, manganese, lead, and phosphorus. Total aluminum levels in the Sacramento River at this location frequently exceeded aquatic life criteria during associated high flow conditions in the river, but rarely exceeded drinking water criteria and the agricultural goal. Arsenic levels exceeded human toxicity thresholds in all samples collected, and the criterion for protection of aquatic life for cadmium was occasionally exceeded. Copper levels frequently exceeded hardness-dependent aquatic life protection criteria during high flow conditions in the river, and iron levels frequently exceeded drinking water and aquatic life protection criteria, as well as the agricultural goal during the same river conditions. Dissolved iron levels exceeded the Central Valley Basin Plan level occasionally. Mercury levels approached, but did not exceed, the CTR criterion during the highest flows in the river. Manganese levels

occasionally exceeded drinking water standards and the agricultural goal, and lead levels rarely exceeded drinking water criteria. All samples contained total phosphorus at levels at or above the recommended criteria range to prevent nuisance algal growth in streams."

Monitored metals also included cadmium, chromium, nickel, selenium, silver, and zinc (Table 4). Contrary to the statement in the EIR, aluminum concentrations frequently exceed drinking water criteria and on several occasions the agricultural goal during the high flow months of December through March. With reported concentrations up to 38 ug/L, mercury not only approached but greatly exceeded the California Toxics Rule (CTR) criterion (0.05 ug/L) for sources of drinking water as well as the National Recommended Water Quality for freshwater aquatic life continuous concentration (0.77 ug/L) and maximum concentration (1.8 ug/L). Reported lead concentrations frequently exceed the California Public Health Goal of 0.02 ug/L, and had a median value of 0.058 ug/L. Reported nickel concentrations also exceed the California Public Health Goal.

Environmental Impacts/Environmental Consequences

7.3.1 Section 303 Evaluation Criteria and Significance Thresholds

"Significance criteria represent the thresholds that were used to identify whether an impact would be potentially significant. Appendix G of the CEQA Guidelines suggests the following evaluation criteria for water quality:

Would the Project:

- *Violate any water quality standards or waste discharge requirements?*
- *Create or contribute runoff water that would exceed the capacity of existing or planned stormwater*

  drainage systems or provide substantial additional sources of polluted runoff?

- *Otherwise substantially degrade water quality?*

  The evaluation criteria used for this impact analysis represent a combination of the Appendix G criteria and professional judgment that considers current regulations, standards, and/or consultation with agencies, knowledge of the area, and the context and intensity of the environmental effects, as required pursuant to NEPA. For the purposes of this analysis, an alternative would result in a potentially significant impact if it would cause the following:

* *A violation of any water quality standard or waste discharge requirement, or otherwise substantially degrade water quality*

If a water quality constituent declines under the action alternatives as compared to the Existing Conditions/No Project/No Action Condition, the changes are not considered to be adverse.

Qualitative Analysis of Constituents

The qualitative analysis of changes in other constituents (e.g., mercury, selenium, nutrients) was based upon an analysis of potential changes in loadings from sources of the constituent and related changes in flows that would occur from implementation of the Project as compared to the Existing Conditions/ No Project/No Action Condition. For example, the qualitative analysis of changes in mercury is based upon changes in flow patterns from the major sources of mercury in the Sacramento River watershed (e.g., tributaries to the Sacramento River)."

What the heck does this last paragraph mean? It makes absolutely no sense. The analysis of potential impacts should be based on an assessment of the expected water quality in the proposed reservoir, whether that water quality exceeds any criteria or standards, and the adverse effects that would occur if criteria or standards are exceeded, both within the reservoir and in downstream areas subject to releases from the reservoir.

7.3.4 Section 303 Impacts Associated with Alternative A

Shasta Lake and Sacramento River from Shasta Lake and Keswick Reservoir to Freeport

Impact SW Qual-1: A Violation of Any Water Quality Standard or Waste Discharge Requirement, or Otherwise Substantially Degrade Surface Water Quality

Mercury and Other Heavy Metals

"As described in Section 7.2, the sources of mercury and other heavy metals in Shasta Lake are located upstream of the lake and accumulate within Shasta Lake. Mercury in the Sacramento River downstream of Keswick Reservoir is generated along the tributaries to the Sacramento River. The generation rate and the accumulation rates of mercury and other heavy metals in Shasta Lake or along the Sacramento River would not be affected by implementation of Alternative A because there would be no new facilities constructed upstream of Shasta Lake or along the tributaries. Operations of Shasta Lake under Alternative A, as reflected by end-of-month Shasta Lake storage, would be similar to conditions under the Existing Conditions/No Project/No Action Condition, as described in Chapter 6 Surface Water Resources."

Accumulation of mercury would indeed be affected by Alternative A (and all the other alternatives) since water from the Sacramento River, containing mercury concentrations in excess of various criteria, would be diverted into the proposed reservoir. Releases from the reservoir could adversely affect downstream resources and beneficial uses due to the mercury contained in the reservoir. In addition, fisheries, wildlife, and recreation that utilize the reservoir could be adversely affected from mercury accumulation in the reservoir food web.

Summary

"Concentrations of mercury, other heavy metals, and salinity would be similar in the Sacramento River under Alternative A as compared to the Existing Conditions/No Project/No Action Condition; therefore, there would be **no impact** related to these constituents."

Again, there are potential very significant adverse impacts associated with diverting water from the Sacramento River during higher flow periods to the proposed reservoir. The Sacramento River contains concentrations of a large number of metals, including aluminum, arsenic, cadmium, chromium, iron, lead, manganese, and mercury, that significantly exceed various criteria and standards designed to protect beneficial uses. Water in the reservoir will reflect that of the water diverted from the Sacramento River, and will also exceed a number of criteria developed to protect beneficial uses. The metals may adversely affect aquatic resources in the reservoir and terrestrial resources that may utilize the reservoir (such as fish-eating birds), as well as reservoir recreation.

The metals in releases from the reservoir may adversely affect downstream resources, including drinking water supply, agricultural supply, wildlife, and fisheries, and may violate the SWRCB antidegradation policy. These are definite "impacts related to these constituents," contrary to what is stated above in this EIR. All the alternatives suffer from the exact same significant adverse impacts due to metals in the source waters.

7.4 Mitigation Measures

"Because no potentially significant direct water quality impacts were identified, no mitigation is required or recommended."

The EIR failed to identify any impacts, though significant potential adverse impacts are painfully obvious. The EIR completely ignores any assessment of the proposed project – Sites Reservoir, as well as any assessment of the adverse impacts the reservoir may pose to beneficial uses within the reservoir (i.e., fisheries, wildlife, recreation) and those adverse impacts attributable to releases from the reservoir (i.e., drinking water supply, agricultural water supply, fisheries, wildlife, recreation). As shown throughout this discussion, a number of metals significantly exceed water quality criteria and standards in the water sources to the proposed reservoir. The EIR completely ignores potential chemical contaminants (such as chlorpyrifos, diazinon, chlordane, DDT, mercury, PCBs, and dieldrin). Water quality in the reservoir will reflect that of the source waters. Therefore, the reservoir will contain a number of metals, including aluminum, arsenic, cadmium, chromium, iron, lead, manganese, and mercury, and possibly other chemical contaminants that exceed a number of water quality criteria designed to protect beneficial uses. Both water resources within the reservoir and downstream resources that receive reservoir releases may be adversely affected by the metals and chemical contaminants. The EIR also fails to address the physical properties that will exist in the reservoir (such as thermal stratification and hypolimnetic anoxia), and how they will affect both reservoir and downstream resources. The EIR needs to address how these significant adverse impacts are going to be mitigated.

References

SWRCB 2011. State Water Resources Control Board. A Compilation of Water Quality Goals, 16th Edition. April 2011.

Table 1. Sacramento River below Red Bluff Diversion Dam, Part 1 of 2

Station Name	Sample Date	Dissolved Aluminum µg/L	Total Aluminum µg/L	Dissolved Arsenic µg/L	Total Arsenic µg/L	Dissolved Cadmium µg/L	Total Cadmium µg/L	Dissolved Chromium µg/L	Total Chromium µg/L	Dissolved Copper µg/L	Total Copper µg/L	Dissolved Iron µg/L	Total Iron µg/L
SACRAMENTO R BL RED BLUFF DIV DM	2/21/06 10:45	131	154	0.702	0.789	0.013	0.016	0.97	0.98	1.08	1.21	76	162
SACRAMENTO R BL RED BLUFF DIV DM	3/1/06 11:00	1459	2240	0.857	1.06	0.017	0.055	2.75	6.1	2.59	6.09	878	2854
SACRAMENTO R BL RED BLUFF DIV DM	4/18/06 9:25	462	729	0.874	0.951	<0.1	<0.1	0.95	1.57	2.36	3.42	277	677
SACRAMENTO R BL RED BLUFF DIV DM	5/16/06 6:45	131	206	0.915	0.959	<0.1	<0.1	0.55	0.58	1.45	1.84	86.8	181
SACRAMENTO R BL RED BLUFF DIV DM	6/26/06 10:05	220	399	1.04	1.09	<0.1	<0.1	0.67	0.98	1.12	1.6	66.2	233
SACRAMENTO R BL RED BLUFF DIV DM	7/25/06 8:20	318	794	1.03	1.1	<0.1	<0.1	1	1.31	1.31	2.18	82	323
SACRAMENTO R BL RED BLUFF DIV DM	8/21/06 13:30	194	278	0.884	0.993	<0.1	<0.1	1.1	1.37	1.07	1.55	132	259
SACRAMENTO R BL RED BLUFF DIV DM	9/21/06 7:15	320	730	0.9	0.933	<0.1	<0.1	0.65	1.01	1.03	1.67	85.3	300
SACRAMENTO R BL RED BLUFF DIV DM	10/25/06 12:30	84.1	214	0.917	0.964	<0.1	<0.1	0.61	0.89	1.28	1.6	51	218
SACRAMENTO R BL RED BLUFF DIV DM	12/13/06 9:20	1238	2010	0.977	1.22	<0.1	<0.1	0.61	1.56	2.3	3.91	235	621
SACRAMENTO R BL RED BLUFF DIV DM	1/10/07 12:25	41.7	91.4	1.42	1.5	<0.1	<0.1	0.55	0.59	0.92	1.01	34.9	54.3
SACRAMENTO R BL RED BLUFF DIV DM	2/26/07 10:45	212	322	0.929	0.987	<0.1	<0.1	1.2	1.61	2.55	2.8	293	376
SACRAMENTO R BL RED BLUFF DIV DM	3/21/07 10:30	9.58	51	1.41	1.46	<0.1	<0.1	0.44	0.59	1.47	1.74	21.5	85.5
SACRAMENTO R BL RED BLUFF DIV DM	4/17/07 10:30	12.3	41	1.53	1.62	<0.1	<0.1	0.45	0.58	1.71	1.93	13.4	51.1
SACRAMENTO R BL RED BLUFF DIV DM	5/29/07 9:45	5.52	15.9	1.68	1.87	<0.1	<0.1	0.53	0.59	1.27	1.53	4.2	32.2
SACRAMENTO R BL RED BLUFF DIV DM	6/26/07 9:45	5.47	56.6	1.59	1.72	<0.1	<0.1	0.55	0.74	1.1	1.41	12.3	75.5
SACRAMENTO R BL RED BLUFF DIV DM	7/18/07 10:10	6.45	50.2	1.63	1.73	<0.1	<0.1	0.5	0.62	0.88	1.25	4.5	73.4
SACRAMENTO R BL RED BLUFF DIV DM	8/27/07 12:10	14.2	26.6	1.55	1.75	<0.1	<0.1	0.47	0.6	0.75	0.97	8.8	33.8
SACRAMENTO R BL RED BLUFF DIV DM	9/12/07 10:40	2.04	24	1.4	1.59	<0.1	<0.1	0.42	0.55	0.67	0.82	3.8	24.6
SACRAMENTO R BL RED BLUFF DIV DM	10/30/07 10:40	5.66	34.5	1.5	1.64	<0.1	<0.1	0.42	0.46	0.99	1.14	12	73
SACRAMENTO R BL RED BLUFF DIV DM	11/26/07 13:40	1.11	18	1.96	2.01	<0.1	<0.1	0.5	0.52	0.66	0.92	5.5	51.2
SACRAMENTO R BL RED BLUFF DIV DM	1/22/08 8:40	6.82	284	1.5	1.71	<0.1	<0.1	0.53	1.15	1.45	2.04	9.5	259
SACRAMENTO R BL RED BLUFF DIV DM	2/26/08 10:40	14.2	846	0.799	0.932	<0.1	<0.1	0.33	2.49	1.97	3.88	24.6	790
SACRAMENTO R BL RED BLUFF DIV DM	3/25/08 7:25	2.25	35	1.31	1.37	<0.1	<0.1	0.42	0.55	1.7	2.09	7.8	62
SACRAMENTO R BL RED BLUFF DIV DM	4/22/08 13:55	4.86	89.3	1.58	1.63	<0.1	<0.1	0.43	0.51	1.63	1.84	9.1	94.6
SACRAMENTO R BL RED BLUFF DIV DM	7/23/08 13:50	2.29	84.5	1.5	1.55	<0.1	<0.1	0.44	0.56	0.9	1.14	7.1	72.4
SACRAMENTO R BL RED BLUFF DIV DM	4/21/09 13:20	6.61	107	1.73	2.06	<0.1	<0.1	0.39	0.65	2.53	2.72	21.6	144
SACRAMENTO R BL RED BLUFF DIV DM	5/27/09 14:30	5.07	89.8	1.27	1.32	<0.1	<0.1	0.39	0.54	1.82	1.95	7.4	87.8
SACRAMENTO R BL RED BLUFF DIV DM	6/24/09 14:00	12.5	66.4	1.26	1.28	<0.1	<0.1	0.39	0.5	1.68	1.72	8.9	72.1
SACRAMENTO R BL RED BLUFF DIV DM	7/27/09 14:07	9.61	168	1.49	1.56	<0.1	<0.1	0.49	0.79	1.11	1.51	11.2	130
SACRAMENTO R BL RED BLUFF DIV DM	8/25/09 9:55	2.86	80.4	1.18	1.25	<0.1	<0.1	0.39	0.54	0.91	1.08	5.8	71.9
SACRAMENTO R BL RED BLUFF DIV DM	9/23/09 8:50	4.04	72.6	1.27	1.33	<0.1	<0.1	0.38	0.48	1.04	1.09	9.6	79.8
SACRAMENTO R BL RED BLUFF DIV DM	10/26/09 13:15	7.2	87.1	1.44	1.52	<0.1	<0.1	0.44	0.6	1.26	1.49	16.1	84.8
	Maximum	1459	2240	1.96	2.06	0.017	0.055	2.75	6.1	2.59	6.09	878	2854
	Median	9.61	89.8	1.31	1.37	0.015	0.0355	0.5	0.6	1.27	1.6	13.4	87.8
	Minimum	1.11	15.9	0.702	0.789	0.013	0.016	0.33	0.46	0.66	0.82	3.8	24.6
SWRCB Basin Plan - Drinking Water Standards -Primary MCL		1000		10									
SWRCB Basin Plan - Drinking Water Standards -Secondary MCL		200										300	
Cal EPA/OEHHA - California Public Health Goal				0.004				0.02					
USEPA Secondary MCL		50											
Cal EPA - One in a million incremental cancer risk estimate for drinking water				0.023		0.0023		0.07					
USEPA Health Advisory for drinking water				0.02									
California Proposition 65 Safe Harbor Level - Max. Allowable dose level for reproductive toxicity				0.05									
Agriculture Water Quality Goals - Taste and odor threshold													
National Recommended WQ Criteria - Taste and Odor or Welfare												300	
National Recommended WQ Criteria - Human Health and Welfare protection - water and fish consumption				0.018									
National Recommended WQ Criteria - Freshwater Aquatic Life Continuous		87										1000	
National Recommended WQ Criteria - Freshwater Aquatic Life Maximum		750											

Table 1. Sacramento River below Red Bluff Diversion Dam, Part 2 of 2

Station Name	Sample Date	Dissolved Lead µg/L	Total Lead µg/L	Dissolved Manganese µg/L	Total Manganese µg/L	Total Mercury ng/L	Dissolved Nickel µg/L	Total Nickel µg/L	Dissolved Selenium µg/L	Total Selenium µg/L	Dissolved Zinc µg/L	Total Zinc µg/L
SACRAMENTO R BL RED BLUFF DIV DM	2/21/06 10:45	<0.045	0.049	2.37	5.71	N/A	1.53	1.62	<0.149	0.15	1.45	1.89
SACRAMENTO R BL RED BLUFF DIV DM	3/1/06 11:00	0.274	1.1	13.5	78.9	N/A	2.84	8.57	<0.149	0.16	4.49	13.2
SACRAMENTO R BL RED BLUFF DIV DM	4/18/06 9:25	0.086	0.271	6.94	19.6	N/A	1.69	2.84	0.24	0.31	2.95	5.81
SACRAMENTO R BL RED BLUFF DIV DM	5/16/06 6:45	<0.04	0.075	1.64	7.63	N/A	1.14	1.34	<0.2	<0.2	0.49	1.78
SACRAMENTO R BL RED BLUFF DIV DM	6/26/06 10:05	<0.04	0.092	1.1	7.92	N/A	1.6	2.1	<0.2	<0.2	0.72	2.31
SACRAMENTO R BL RED BLUFF DIV DM	7/25/06 8:20	<0.04	0.15	1.49	11.7	1.7	1.8	3.01	<0.2	0.26	1.02	4.39
SACRAMENTO R BL RED BLUFF DIV DM	8/21/06 13:30	<0.04	0.102	1.65	5.98	0.89	1.84	2.55	<0.2	<0.2	1.51	3.22
SACRAMENTO R BL RED BLUFF DIV DM	9/21/06 7:15	<0.04	0.102	1.88	12.8	1.4	1.88	2.85	<0.2	0.24	1.18	5.92
SACRAMENTO R BL RED BLUFF DIV DM	10/25/06 12:30	<0.04	0.1	0.91	6.93	0.58	1.78	2.19	<0.2	0.26	0.69	4.16
SACRAMENTO R BL RED BLUFF DIV DM	12/13/06 9:20	0.103	0.546	3.08	38.6	0.84	1.3	2.32	<0.2	0.24	2.07	9.17
SACRAMENTO R BL RED BLUFF DIV DM	1/10/07 12:25	<0.04	<0.04	1.37	3.13	0.59	0.97	1.02	<0.2	<0.2	0.71	2.82
SACRAMENTO R BL RED BLUFF DIV DM	2/26/07 10:45	0.149	0.234	6.41	10.2	2.6	1.14	1.49	0.2	0.28	3.09	5.68
SACRAMENTO R BL RED BLUFF DIV DM	3/21/07 10:30	<0.04	0.04	1.27	4.8	0.9	0.84	0.97	<0.2	0.2	0.38	3.58
SACRAMENTO R BL RED BLUFF DIV DM	4/17/07 10:30	<0.04	<0.04	1.71	5.08	1.2	0.57	0.72	<0.2	<0.2	0.48	3.46
SACRAMENTO R BL RED BLUFF DIV DM	5/29/07 9:45	<0.04	<0.04	0.39	2.95	N/A	0.65	0.76	<0.2	0.23	0.31	3.01
SACRAMENTO R BL RED BLUFF DIV DM	6/26/07 9:45	<0.04	0.058	3.41	7.57	0.74	0.97	1.22	<0.2	0.25	1.19	4.35
SACRAMENTO R BL RED BLUFF DIV DM	7/18/07 10:10	<0.04	<0.04	0.2	4.47	0.98	0.76	1.08	<0.2	<0.2	0.31	3.37
SACRAMENTO R BL RED BLUFF DIV DM	8/27/07 12:10	<0.04	<0.04	0.33	3.8	N/A	1.25	1.4	<0.2	0.23	2	2.22
SACRAMENTO R BL RED BLUFF DIV DM	9/12/07 10:40	<0.04	0.058	0.18	3	0.58	0.89	1	<0.2	<0.2	0.5	2.34
SACRAMENTO R BL RED BLUFF DIV DM	10/30/07 10:40	<0.04	0.052	0.19	4.66	0.48	0.92	1.2	<0.2	<0.2	0.71	3.12
SACRAMENTO R BL RED BLUFF DIV DM	11/26/07 13:40	<0.04	0.078	0.32	4.71	1.2	0.63	0.93	<0.2	<0.2	0.34	2.59
SACRAMENTO R BL RED BLUFF DIV DM	1/22/08 8:40	<0.04	0.13	0.73	12.9	N/A	0.91	1.08	<0.2	<0.2	1.33	4.99
SACRAMENTO R BL RED BLUFF DIV DM	2/26/08 10:40	<0.04	0.388	0.68	23.4	N/A	1.58	3	<0.2	0.21	0.97	6.85
SACRAMENTO R BL RED BLUFF DIV DM	3/25/08 7:25	<0.04	<0.04	0.36	6.12	N/A	0.71	0.95	<0.2	0.25	0.44	3.11
SACRAMENTO R BL RED BLUFF DIV DM	4/22/08 13:55	<0.04	0.051	1.48	5.43	N/A	0.72	0.88	0.25	0.26	1.11	3.47
SACRAMENTO R BL RED BLUFF DIV DM	7/23/08 13:50	<0.04	<0.04	0.26	4.64	0.65	1.2	1.24	<0.2	<0.2	0.51	2.87
SACRAMENTO R BL RED BLUFF DIV DM	4/21/09 13:20	<0.04	0.073	0.57	5.35	N/A	0.8	0.88	<0.2	<0.2	1.07	4.06
SACRAMENTO R BL RED BLUFF DIV DM	5/27/09 14:30	<0.04	<0.04	0.43	2.32	N/A	0.82	0.96	<0.2	<0.2	0.48	2.28
SACRAMENTO R BL RED BLUFF DIV DM	6/24/09 14:00	<0.04	<0.04	0.3	3.26	N/A	0.91	1.05	0.23	0.27	1.25	3.27
SACRAMENTO R BL RED BLUFF DIV DM	7/27/09 14:07	<0.04	0.063	1.86	6.71	N/A	1.17	1.24	<0.2	<0.2	1.32	4.09
SACRAMENTO R BL RED BLUFF DIV DM	8/25/09 9:55	<0.04	<0.04	0.35	4.54	N/A	1.13	1.21	<0.2	<0.2	0.81	2.67
SACRAMENTO R BL RED BLUFF DIV DM	9/23/09 8:50	<0.04	<0.04	0.32	4.77	N/A	1.01	1.16	<0.2	<0.2	0.63	2.79
SACRAMENTO R BL RED BLUFF DIV DM	10/26/09 13:15	<0.04	0.076	2.55	7.5	N/A	0.97	1.03	<0.2	<0.2	0.94	3.12
	Maximum	0.274	1.1	13.5	78.9	2.6	2.84	8.57	0.25	0.31	4.49	13.2
	Median	0.126	0.085	1.1	5.71	0.89	1.01	1.21	0.235	0.245	0.94	3.27
	Minimum	0.086	0.04	0.18	2.32	0.48	0.57	0.72	0.2	0.15	0.31	1.78
SWRCB Basin Plan - Drinking Water Standards -Primary MCL												
SWRCB Basin Plan - Drinking Water Standards -Secondary MCL					50							
Cal EPA/OEHHA - California Public Health Goal			0.2									
USEPA Secondary MCL												
Cal EPA - One in a million incremental cancer risk estimate for drinking water												
USEPA Health Advisory for drinking water												
California Proposition 65 Safe Harbor Level - Max. Allowable dose level for			0.25									
Agriculture Water Quality Goals - Taste and odor threshold												
National Recommended WQ Criteria - Taste and Odor or Welfare					50							
National Recommended WQ Criteria - Human Health and Welfare protection -												
National Recommended WQ Criteria - Freshwater Aquatic Life Continuous						0.77						
National Recommended WQ Criteria - Freshwater Aquatic Life Maximum						1.4						

Table 2. Cottonwood Creek near Cottonwood, Part 1 of 2

Station Name	Sample Date	Dissolved Aluminum µg/L	Total Aluminum µg/L	Dissolved Arsenic µg/L	Total Arsenic µg/L	Dissolved Cadmium µg/L	Total Cadmium µg/L	Dissolved Chromium µg/L	Total Chromium µg/L	Dissolved Copper µg/L	Total Copper µg/L	Dissolved Iron µg/L	Total Iron µg/L
COTTONWOOD C NR COTTONWOOD	10/5/04 11:30	5.21	10.5	0.662	0.668	<0.011	<0.008	0.65	0.68	0.47	0.58	10.2	39
COTTONWOOD C NR COTTONWOOD	11/8/04 11:20	3.98	6.42	0.684	0.723	<0.008	<0.007	1.51	1.75	0.48	0.72	3.6	26
COTTONWOOD C NR COTTONWOOD	12/7/04 10:40	7.02	31.3	0.524	0.612	<0.012	0.081	2.04	2.33	0.66	0.7	<4.5	42
COTTONWOOD C NR COTTONWOOD	1/10/05 7:35	208	448	0.517	0.549	<0.011	<0.007	1.73	1.9	1.29	1.67	137	522
COTTONWOOD C NR COTTONWOOD	2/2/05 13:00	87.1	157	0.396	0.417	<0.011	<0.066	1.05	1.14	0.63	0.85	57.1	218
COTTONWOOD C NR COTTONWOOD	3/10/05 13:50	34.7	95.6	0.46	0.468	<0.033	<0.011	1.6	1.63	0.5	0.67	13.7	128
COTTONWOOD C NR COTTONWOOD	4/19/05 8:10	40.2	88	0.413	0.484	<0.022	<0.009	1.02	1.52	0.42	0.59	29.3	114
COTTONWOOD C NR COTTONWOOD	5/18/05 11:20	1358	14345	0.863	3.04	<0.058	0.085	2.94	36.5	4.43	39.2	963	23594
COTTONWOOD C NR COTTONWOOD	6/28/05 7:30	63.9	86.1	0.455	0.465	<0.009	<0.012	1.7	1.14	0.42	0.46	23.8	62.6
COTTONWOOD C NR COTTONWOOD	7/26/05 6:45	1.55	7.51	0.682	0.72	<0.011	<0.004	0.47	0.78	0.48	0.52	<1.51	8.6
COTTONWOOD C NR COTTONWOOD	8/22/05 11:45	2.65	32.9	0.657	0.691	<0.009	<0.009	1.7	1.98	0.5	0.54	<4.16	72.4
COTTONWOOD C NR COTTONWOOD	9/26/05 11:20	10.2	152	0.779	0.795	0.003	0.016	1.03	1.1	1.03	1.28	20.2	294
COTTONWOOD C NR COTTONWOOD	10/24/05 8:30	12.9	47.2	0.705	0.708	<0.009	<0.009	0.9	0.99	0.57	0.69	17.8	83.7
COTTONWOOD C NR COTTONWOOD	11/14/05 9:00	5.42	11.9	0.537	0.579	<0.009	<0.009	0.9	0.91	0.6	0.62	9	26.2
COTTONWOOD C NR COTTONWOOD	12/15/05 9:15	4.38	10.2	0.343	0.434	<0.005	0.007	1.04	1.24	0.41	0.41	<1.51	17.2
COTTONWOOD C NR COTTONWOOD	1/24/06 9:10	202	380	0.42	0.46	0.009	0.015	1.71	2.26	0.75	1.22	123	512
COTTONWOOD C NR COTTONWOOD	3/1/06 9:15	2533	3739	0.889	1.16	0.009	0.023	8.2	15.7	3.22	7.63	1760	5793
COTTONWOOD C NR COTTONWOOD	4/24/06 10:03	151	1225	0.394	0.569	<0.1	<0.1	1.11	4.58	0.6	2.63	122	1174
COTTONWOOD C NR COTTONWOOD	8/16/06 11:00	1.91	20.8	0.703	0.806	<0.1	<0.1	0.33	0.35	0.73	0.84	7.2	29.5
COTTONWOOD C NR COTTONWOOD	11/14/06 9:05	24.8	75.7	0.467	0.594	<0.1	<0.1	0.54	0.68	0.51	0.61	37.4	96.2
COTTONWOOD C NR COTTONWOOD	12/6/06 13:20	4.8	6.62	0.438	0.539	<0.1	<0.1	0.45	1.14	0.5	0.54	6.1	11.7
COTTONWOOD C NR COTTONWOOD	2/20/07 8:45	47.5	52.3	0.3	0.344	<0.1	<0.1	1.38	1.91	0.57	0.62	35.2	50.4
	Maximum	2533	14345	0.889	3.04	0.009	0.085	8.2	36.5	4.43	39.2	1760	23594
	Mean	18.85	64	0.5205	0.5865	0.009	0.0195	1.08	1.38	0.57	0.68	26.55	78.05
	Minimum	1.55	6.42	0.3	0.344	0.003	0.007	0.33	0.35	0.41	0.41	3.6	8.6
SWRCB Basin Plan - Drinking Water Standards -Primary MCL		1000											
SWRCB Basin Plan - Drinking Water Standards -Secondary MCL		200										300	
Cal EPA/OEHHA - California Public Health Goal		600				0.04		0.02					
USEPA Secondary MCL													
Cal EPA - One in a million incremental cancer risk estimate for drinking water				0.023		0.0023		0.07					
USEPA Health Advisory for drinking water				0.02									
California Proposition 65 Safe Harbor Level - Max. Allowable dose level for reproductive toxicity				0.05									
National Academy of Sciences Health Advisory		5000											
Agriculture Water Quality Goals - Taste and odor threshold		5000										5000	
National Recommended WQ Criteria - Taste and Odor or Welfare												300	
National Recommended WQ Criteria - Human Health and Welfare protection - water and fish consumption		87		0.018									
National Recommended WQ Criteria - Freshwater Aquatic Life		750										1000	
National Recommended WQ Criteria - Freshwater Aquatic Life													

Table 2. Cottonwood Creek near Cottonwood, Part 2 of 2

Station Name	Sample Date	Dissolved Lead µg/L	Total Lead µg/L	Dissolved Manganese µg/L	Total Manganese µg/L	Total Mercury ng/L	Dissolved Nickel µg/L	Total Nickel µg/L	Dissolved Selenium µg/L	Total Selenium µg/L	Dissolved Silver µg/L	Total Silver µg/L	Dissolved Zinc µg/L	Total Zinc µg/L
COTTONWOOD C NR COTTONWOOD	10/5/04 11:30	0.008	<0.017	2.58	11.3	N/A	1.34	1.34	0.18	<0.204	<0.077	<0.054	0.19	0.42
COTTONWOOD C NR COTTONWOOD	11/8/04 11:20	<0.001	0.008	3.06	4.36	N/A	0.86	1.53	0.33	0.35	<0.006	<0.063	0.05	0.09
COTTONWOOD C NR COTTONWOOD	12/7/04 10:40	0.012	0.028	0.46	4.09	N/A	1.07	1.2	<0.163	0.28	<0.011	<0.04	0.31	0.65
COTTONWOOD C NR COTTONWOOD	1/10/05 7:35	0.048	0.166	1.79	12.6	N/A	1.59	2.61	0.74	0.81	<0.003	0.006	0.55	1.58
COTTONWOOD C NR COTTONWOOD	2/2/05 13:00	0.017	0.063	2.87	7.91	N/A	1.41	1.93	<0.222	0.18	<0.001	<0.002	0.22	0.73
COTTONWOOD C NR COTTONWOOD	3/10/05 13:50	0.008	0.044	0.79	4.71	N/A	1.28	1.64	<0.245	0.32	<0.001	<0.036	0.16	0.44
COTTONWOOD C NR COTTONWOOD	4/19/05 8:10	0.015	0.034	1.51	5.07	N/A	0.98	1.47	0.31	0.44	<0.003	<0.005	0.2	0.53
COTTONWOOD C NR COTTONWOOD	5/18/05 11:20	0.475	7.26	8.76	563	N/A	3.38	57.9	<0.399	0.39	0.039	0.101	3.31	72
COTTONWOOD C NR COTTONWOOD	6/28/05 7:30	<0.009	<0.027	3.47	3.93	N/A	0.66	1.16	<0.14	<0.354	<0.002	<0.027	0.14	0.36
COTTONWOOD C NR COTTONWOOD	7/26/05 6:45	<0.019	<0.063	0.32	2.51	N/A	0.43	0.82	<0.145	<0.176	<0.002	<0.04	<0.083	0.15
COTTONWOOD C NR COTTONWOOD	8/22/05 11:45	<0.004	0.024	1.05	13.7	N/A	0.79	1.07	<0.227	<0.227	<0.001	<0.001	0.18	0.56
COTTONWOOD C NR COTTONWOOD	9/26/05 11:20	0.006	0.111	0.76	24.9	N/A	1.31	2.36	0.17	0.19	<0.003	<0.003	0.88	1.97
COTTONWOOD C NR COTTONWOOD	10/24/05 8:30	0.008	0.028	1.93	15.4	N/A	1.18	1.45	0.11	0.19	<0.002	<0.002	0.31	0.48
COTTONWOOD C NR COTTONWOOD	11/14/05 9:00	0.01	0.017	1.78	5.95	N/A	1.37	1.38	<0.186	<0.186	<0.009	<0.009	0.39	0.71
COTTONWOOD C NR COTTONWOOD	12/15/05 9:15	0.006	0.008	0.79	2.59	N/A	1.41	1.48	0.16	0.29	<0.001	<0.001	<0.177	<0.177
COTTONWOOD C NR COTTONWOOD	1/24/06 9:10	0.033	0.146	6.19	16.7	N/A	1.95	3.38	0.23	0.28	<0.005	<0.005	0.43	1.44
COTTONWOOD C NR COTTONWOOD	3/1/06 9:15	0.491	1.53	30.8	138	N/A	7.35	20.9	<0.149	0.15	<0.009	<0.009	3.64	13.6
COTTONWOOD C NR COTTONWOOD	4/24/06 10:03	0.04	0.444	2.06	40.8	N/A	1.51	6.9	0.21	0.32	<0.03	<0.03	0.47	4.32
COTTONWOOD C NR COTTONWOOD	8/16/06 11:00	<0.04	<0.04	1.13	5.41	0.72	1.14	1.32	0.42	0.6	<0.03	<0.03	0.14	0.73
COTTONWOOD C NR COTTONWOOD	11/14/06 9:05	<0.04	<0.04	4.82	10.7	N/A	1.56	1.77	0.56	0.63	<0.03	<0.03	<0.1	1.07
COTTONWOOD C NR COTTONWOOD	12/6/06 13:20	<0.04	<0.04	2.55	4.44	N/A	0.87	1.24	0.33	0.59	<0.03	<0.03	0.79	2.02
COTTONWOOD C NR COTTONWOOD	2/20/07 8:45	<0.04	<0.04	5	5.57	1.2	0.16	1.66	0.35	0.51	<0.03	<0.03	0.18	1.65
	Maximum	0.491	7.26	30.8	563	1.2	7.35	57.9	0.74	0.81	0.039	0.101	3.64	72
	Mean	0.0135	0.044	1.995	6.93	0.96	1.295	1.505	0.31	0.32	0.039	0.0535	0.31	0.73
	Minimum	0.006	0.008	0.32	2.51	0.72	0.16	0.82	0.11	0.15	0.039	0.006	0.05	0.09
SWRCB Basin Plan - Drinking Water Standards -Primary MCL														
SWRCB Basin Plan - Drinking Water Standards -Secondary MCL				50										
Cal EPA/OEHHA - California Public Health Goal		0.2					12							
USEPA Secondary MCL														
Cal EPA - One in a million incremental cancer risk estimate for drinking w		4.1												
USEPA Health Advisory for drinking water				300										
California Proposition 65 Safe Harbor Level - Max.														
Allowable dose level for reproductive toxicity		0.25												
National Academy of Sciences Health Advisory														
Agriculture Water Quality Goals - Taste and odor threshold				200										
National Recommended WQ Criteria - Taste and Odor or Welfare				50										
National Recommended WQ Criteria - Human Health and Welfare														
National Recommended WQ Criteria - Freshwater Aquatic Life						0.77								
National Recommended WQ Criteria - Freshwater Aquatic Life						1.4								

Table 3. Sacramento River at Hamilton City, Part 1 of 2

Station Name	Sample Date	Dissolved Aluminum µg/L	Total Aluminum µg/L	Dissolved Arsenic µg/L	Total Arsenic µg/L	Dissolved Cadmium µg/L	Total Cadmium µg/L	Dissolved Chromium µg/L	Total Chromium µg/L	Dissolved Copper µg/L	Total Copper µg/L	Dissolved Iron µg/L	Total Iron µg/L
SACRAMENTO R A HAMILTON CITY	11/25/03 9:10	N/A	12.8	N/A	1.93	N/A	<0.005	N/A	0.61	N/A	1.28	N/A	15.3
SACRAMENTO R A HAMILTON CITY	3/8/04 13:00	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SACRAMENTO R A HAMILTON CITY	5/20/04 15:00	N/A	110	N/A	1.81	N/A	0.011	N/A	0.84	N/A	1.87	N/A	172
SACRAMENTO R A HAMILTON CITY	8/12/04 10:20	N/A	189	N/A	1.36	N/A	0.016	N/A	0.76	N/A	1.65	N/A	223
SACRAMENTO R A HAMILTON CITY	10/5/04 10:05	14.5	113	1.3	1.32	<0.011	<0.008	0.9	0.98	0.72	1.43	9.6	134
SACRAMENTO R A HAMILTON CITY	11/9/04 11:40	23.6	36.1	2.49	2.52	<0.008	<0.007	1	1	0.85	1.77	15.5	87.4
SACRAMENTO R A HAMILTON CITY	12/7/04 10:40	2.54	12.5	2.38	2.54	<0.012	0.034	0.54	0.84	0.56	0.73	<4.5	7.8
SACRAMENTO R A HAMILTON CITY	1/10/05 12:15	352	413	1.48	1.55	<0.011	<0.007	1.06	1.44	1.98	2.45	225	443
SACRAMENTO R A HAMILTON CITY	2/2/05 7:35	77.5	163	1.42	1.51	<0.011	<0.066	1.67	1.88	1.53	1.73	71.5	223
SACRAMENTO R A HAMILTON CITY	3/10/05 7:30	11	75.7	2.03	2.08	<0.033	<0.011	1.29	1.39	1.09	1.37	<3.34	118
SACRAMENTO R A HAMILTON CITY	4/20/05 12:00	15.9	39.3	1.99	2.09	<0.022	<0.009	1.02	1.02	1.13	1.25	14.1	55.8
SACRAMENTO R A HAMILTON CITY	5/19/05 9:30	1075	6686	1.66	3.17	<0.058	0.076	2.69	18.9	3.11	18.7	726	10052
SACRAMENTO R A HAMILTON CITY	6/28/05 7:15	106	121	1.37	1.58	<0.009	<0.012	0.52	1.1	1.15	1.2	116	142
SACRAMENTO R A HAMILTON CITY	7/26/05 12:45	1.65	31.4	1.31	1.34	<0.011	0.007	0.63	0.69	0.73	0.81	<1.51	37.8
SACRAMENTO R A HAMILTON CITY	8/23/05 11:20	14.1	44.8	1.39	1.47	<0.009	0.016	0.46	0.68	0.86	1.13	<4.16	66.9
SACRAMENTO R A HAMILTON CITY	9/27/05 10:00	27.7	98.8	1.41	1.43	0.007	0.011	0.54	0.64	0.85	1.14	16.5	114
SACRAMENTO R A HAMILTON CITY	10/25/05 12:40	30.9	61.6	1.54	1.56	<0.009	<0.009	0.63	0.72	1	1.1	17.2	65.4
SACRAMENTO R A HAMILTON CITY	11/15/05 11:00	30.8	67.6	1.84	1.92	<0.009	0.014	0.79	0.82	1.07	1.22	26	102
SACRAMENTO R A HAMILTON CITY	12/14/05 11:45	6.67	36.7	1.94	2.1	<0.005	0.008	0.79	0.89	0.81	0.84	2.6	58.1
SACRAMENTO R A HAMILTON CITY	1/4/06 7:30	866	3462	1.61	2.35	0.014	0.092	2.61	9.74	2.47	11.2	569	4787
SACRAMENTO R A HAMILTON CITY	1/24/06 7:30	359	709	1.41	1.49	0.011	0.042	1.51	2.4	1.62	2.92	214	923
SACRAMENTO R A HAMILTON CITY	2/21/06 12:45	222	733	1.3	1.47	0.014	0.029	1.18	2.34	1.12	2.55	139	913
SACRAMENTO R A HAMILTON CITY	3/1/06 7:30	2887	4955	1.36	1.85	0.021	0.087	4.99	11.2	4.26	11.5	1773	6116
SACRAMENTO R A HAMILTON CITY	4/17/06 6:00	914	2219	1.06	1.47	<0.1	<0.1	1.69	5.11	2.51	6.68	556	2397
SACRAMENTO R A HAMILTON CITY	5/17/06 6:40	163	285	1.42	1.57	<0.1	<0.1	0.59	0.74	1.25	1.71	114	258
SACRAMENTO R A HAMILTON CITY	6/27/06 6:30	200	398	1.27	1.4	<0.1	<0.1	0.74	1.26	1.09	1.49	38.8	236
SACRAMENTO R A HAMILTON CITY	7/25/06 5:40	255	570	1.24	1.32	<0.1	<0.1	0.92	1.01	1.14	1.66	65.1	218
SACRAMENTO R A HAMILTON CITY	8/22/06 6:40	195	298	1.12	1.15	<0.1	<0.1	0.67	0.84	1.09	1.41	130	276
SACRAMENTO R A HAMILTON CITY	9/20/06 6:30	591	882	1.12	1.23	<0.1	<0.1	0.61	1.35	1.07	1.84	81.4	374
SACRAMENTO R A HAMILTON CITY	10/24/06 7:00	36.8	201	0.859	1.37	<0.1	<0.1	0.56	0.83	0.75	1.47	57.3	317
SACRAMENTO R A HAMILTON CITY	12/12/06 6:40	181	905	1.98	2.33	<0.1	<0.1	0.52	1.33	1.18	1.89	34.5	297
SACRAMENTO R A HAMILTON CITY	1/9/07 7:15	61.6	138	2.08	2.23	<0.1	<0.1	0.66	0.69	0.9	1.04	46.3	79.5
SACRAMENTO R A HAMILTON CITY	2/26/07 14:00	478	657	1.31	1.42	<0.1	<0.1	1.81	1.91	2.99	3.9	591	910
SACRAMENTO R A HAMILTON CITY	3/20/07 6:50	16.1	91.6	2.17	2.36	<0.1	<0.1	0.41	0.71	1.22	1.55	26.6	151
SACRAMENTO R A HAMILTON CITY	4/17/07 7:30	12.8	52	1.93	1.94	<0.1	<0.1	0.43	0.53	1.54	1.84	13.4	65.8
SACRAMENTO R A HAMILTON CITY	5/29/07 12:15	3.21	37.2	1.9	2.11	<0.1	<0.1	0.52	0.72	1.26	1.65	4.6	73.9
SACRAMENTO R A HAMILTON CITY	6/26/07 12:30	6.11	50.1	1.6	1.67	<0.1	<0.1	0.52	0.75	1.07	1.39	11.4	77.2
SACRAMENTO R A HAMILTON CITY	7/18/07 7:00	10.8	114	1.62	1.69	<0.1	<0.1	0.47	0.84	1.15	1.53	6.2	135
SACRAMENTO R A HAMILTON CITY	8/28/07 7:05	18.4	49.2	1.37	1.58	<0.1	<0.1	0.45	0.6	0.92	1.12	6.2	65.2
SACRAMENTO R A HAMILTON CITY	9/13/07 7:55	2.26	37.9	1.47	1.55	<0.1	<0.1	0.45	0.59	0.63	0.83	5.7	46.6
SACRAMENTO R A HAMILTON CITY	11/7/07 10:30	0.83	10.5	1.96	2.06	<0.1	<0.1	0.4	0.41	0.64	0.75	<0.1	24.7
SACRAMENTO R A HAMILTON CITY	2/20/08 12:15	5.62	85.8	2.04	2.27	<0.1	<0.1	0.49	0.78	1.09	1.26	7.4	105
SACRAMENTO R A HAMILTON CITY	5/6/08 13:05	2.94	85.3	2.14	2.16	<0.1	<0.1	0.35	0.67	1.43	1.87	10.4	117
SACRAMENTO R A HAMILTON CITY	8/6/08 9:40	2.82	70	1.6	1.68	<0.1	<0.1	0.42	0.54	0.96	1.11	10.2	84
SACRAMENTO R A HAMILTON CITY	11/5/08 7:20	10.2	95.6	2.06	2.17	<0.1	<0.1	0.31	0.51	1.49	1.95	16.4	340
SACRAMENTO R A HAMILTON CITY	2/24/09 10:40	51.1	3110	1.62	4.07	<0.1	<0.1	0.47	7.07	2.03	8.21	68.6	3310
SACRAMENTO R A HAMILTON CITY	5/5/09 8:50	14.7	439	1.83	2.05	<0.1	<0.1	0.35	1.15	1.74	3.09	27.5	428
SACRAMENTO R A HAMILTON CITY	8/11/09 8:40	2.75	35.1	1.31	1.35	<0.1	<0.1	0.36	0.46	0.88	1.05	2.3	36.3
SACRAMENTO R A HAMILTON CITY	11/3/09 7:50	2.94	47	1.87	1.94	<0.1	<0.1	0.38	0.49	1.13	1.35	10.6	66.8
SACRAMENTO R A HAMILTON CITY	2/2/10 8:45	12	340	1.37	1.43	<0.1	<0.1	0.36	1.05	1.76	3.65	17.1	383
SACRAMENTO R A HAMILTON CITY	5/4/10 7:45	10.2	160	1.31	1.85	<0.1	<0.1	0.47	0.96	1.56	2.3	12.1	236
SACRAMENTO R A HAMILTON CITY	8/3/10 11:00	7.55	24	1.4	1.42	<0.1	<0.1	0.47	0.58	1.29	1.35	10.4	51.3
SACRAMENTO R A HAMILTON CITY	11/2/10 8:30	4.63	67.4	1.97	2.06	<0.1	<0.1	0.66	1.27	1.35	1.58	15.3	130
SACRAMENTO R A HAMILTON CITY	2/1/11 9:30	5.73	53.6	1.9	1.96	<0.1	<0.1	0.43	0.55	1.29	1.41	12	59.6
SACRAMENTO R A HAMILTON CITY	5/3/11 8:55	3	24.6	1.6	1.73	<0.1	<0.1	0.45	0.53	1.4	1.59	6	32.9
SACRAMENTO R A HAMILTON CITY	8/2/11 8:10	116	159	1.41	1.45	<0.1	<0.1	0.65	0.76	1.11	1.36	87.6	176
SACRAMENTO R A HAMILTON CITY	11/1/11 8:45	56	91.5	1.21	1.58	<0.1	<0.1	0.64	0.76	0.95	1.11	43	108
SACRAMENTO R A HAMILTON CITY	1/31/12 8:25	178	276	2.04	2.2	<0.1	<0.1	0.52	0.6	1	1.33	94.1	162
SACRAMENTO R A HAMILTON CITY	5/8/12 8:30	88.3	125	2.11	2.64	<0.1	<0.1	0.3	0.45	1.6	1.62	74.9	126
SACRAMENTO R A HAMILTON CITY	8/7/12 8:00	10	28.6	1.25	1.28	<0.1	<0.1	0.39	0.5	0.67	0.95	11	45.5
SACRAMENTO R A HAMILTON CITY	11/6/12 9:35	11.6	12.5	2.09	2.17	<0.1	<0.1	0.48	0.82	0.65	0.81	34.4	41
SACRAMENTO R A HAMILTON CITY	2/6/13 9:15	3.6	127	1.98	2	<0.1	<0.1	0.32	0.75	1.1	1.32	8.2	124
SACRAMENTO R A HAMILTON CITY	5/7/13 8:05	19.2	29.5	1.74	1.77	<0.1	<0.1	0.53	0.53	1.07	1.55	32.6	66.6
SACRAMENTO R A HAMILTON CITY	8/6/13 7:30	1.05	20	1.18	1.48	<0.1	<0.1	0.45	0.66	0.53	0.86	4.3	30.1
SACRAMENTO R A HAMILTON CITY	11/5/13 9:10	1.69	24.4	2.06	2.17	<0.1	<0.1	0.39	0.46	0.5	0.82	10.6	55.2
SACRAMENTO R A HAMILTON CITY	2/4/14 9:05	0.19	6.03	2.7	2.88	<0.1	<0.1	0.52	1.31	0.72	0.85	6.2	26.2
SACRAMENTO R A HAMILTON CITY	5/6/14 8:30	4.3	37.2	2.36	2.5	<0.1	<0.1	0.37	0.46	1.48	2.03	10.6	74.5
SACRAMENTO R A HAMILTON CITY	8/12/14 9:50	1.91	18.7	1.93	2.12	<0.1	<0.1	0.44	0.52	0.72	0.87	13	38.1
SACRAMENTO R A HAMILTON CITY	11/5/14 8:50	2.57	62.4	2.05	2.12	<0.1	<0.1	0.48	11.7	0.8	4.03	13.1	264
SACRAMENTO R A HAMILTON CITY	2/10/15 9:30	21.2	1960	1	2.14	<0.1	<0.1	0.33	5.3	1.96	8	83.2	2100
SACRAMENTO R A HAMILTON CITY	5/11/15 10:00	21.9	42.4	1.76	1.81	<0.1	<0.1	0.5	0.68	1.7	2.24	25.3	53.3
SACRAMENTO R A HAMILTON CITY	8/11/15 10:20	13.4	32.2	1.65	1.72	<0.1	<0.1	0.33	0.42	0.98	1.18	17.5	40.6
SACRAMENTO R A HAMILTON CITY	11/4/15 11:27	12.6	18.9	2.43	2.61	<0.1	<0.1	0.43	0.53	0.77	0.94	23.6	36.9
SACRAMENTO R A HAMILTON CITY	2/3/16 12:10	39.7	352	1.26	1.49	<0.1	<0.1	0.44	1.73	1.15	2.14	42.8	349
SACRAMENTO R A HAMILTON CITY	5/9/16 12:15	42.5	183	2.05	2.38	<0.1	<0.1	0.41	1.12	1.75	3	45.2	188
SACRAMENTO R A HAMILTON CITY	8/8/16 8:15	45	100	1.32	1.42	<0.1	<0.1	0.43	0.55	1.26	1.58	48.9	116
SACRAMENTO R A HAMILTON CITY	11/7/16 11:00	35.3	78	1.97	2.1	<0.1	<0.1	0.41	0.5	1.06	1.29	29.3	78.3
SACRAMENTO R A HAMILTON CITY	2/6/17 13:00	136	1020	1.16	1.67	<0.1	<0.1	0.52	3.85	1.79	5.78	138	1100
	Maximum	2887	6686	2.7	4.07	0.021	0.092	4.99	18.9	4.26	18.7	1773	10052
	Mediam	16	91.5	1.615	1.81	0.014	0.016	0.51	0.76	1.115	1.49	25.3	117
	Minimum	0.19	6.03	0.859	1.15	0.007	0.007	0.3	0.41	0.5	0.73	2.3	7.8
SWRCB Basin Plan - Drinking Water Standards -Primary MCL		1000											
SWRCB Basin Plan - Drinking Water Standards -Secondary MCL		200										300	
Cal EPA/OEHHA - California Public Health Goal		600		0.004				0.02					
USEPA Secondary MCL		50											
Cal EPA - One in a million incremental cancer risk estimate for drinking water				0.023		0.0023		0.07					
USEPA Health Advisory for drinking water				0.02									
USEPA IRIS Reference Dose Drinking Water Health Advisories				2.1									
California Proposition 65 Safe Harbor Level - Max. Allowable dose level for reproductive toxicity				0.05									
Agriculture Water Quality Goals - Taste and odor threshold		5000										5000	
Calfiornia Toxics Rule Sources of Drinking Water													
National Academy of Sciences Drinking Water Health Advisories		5000											
National Recommended WQ Criteria - Taste and Odor or Welfare												300	
National Recommended WQ Criteria - Human Health and Welfare protection - water and fish consumption				0.018									
National Recommended WQ Criteria - Freshwater Aquatic Life Continuous Concentration		87										1000	
National Recommended WQ Criteria - Freshwater Aquatic Life Maximum Concentration		750											

Table 3. Sacramento River at Hamilton City, Part 2 of 2

Station Name	Sample Date	Dissolved Lead µg/L	Total Lead µg/L	Dissolved Manganese µg/L	Total Manganese µg/L	Total Mercury ng/L	Dissolved Nickel µg/L	Total Nickel µg/L	Dissolved Selenium µg/L	Total Selenium µg/L	Dissolved Silver µg/L	Total Silver µg/L	Dissolved Zinc µg/L	Total Zinc µg/L
SACRAMENTO R A HAMILTON CITY	11/25/03 9:10	N/A	0.118	N/A	1.61	N/A	N/A	1.26	N/A	<0.061	N/A	<0.012	N/A	1.25
SACRAMENTO R A HAMILTON CITY	3/8/04 13:00	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SACRAMENTO R A HAMILTON CITY	5/20/04 15:00	N/A	0.027	N/A	6.14	N/A	N/A	1.31	N/A	0.12	N/A	<0.034	N/A	1.53
SACRAMENTO R A HAMILTON CITY	8/12/04 10:20	N/A	0.08	N/A	6.88	N/A	N/A	1.84	N/A	0.28	N/A	<0.145	N/A	2.07
SACRAMENTO R A HAMILTON CITY	10/5/04 10:05	0.018	0.067	1.13	6.34	N/A	1.25	1.62	<0.144	<0.204	<0.077	<0.054	0.48	1.56
SACRAMENTO R A HAMILTON CITY	11/9/04 11:40	0.004	0.024	1.55	5.42	N/A	1.11	1.33	<0.149	0.25	<0.006	<0.063	0.52	0.88
SACRAMENTO R A HAMILTON CITY	12/7/04 10:40	<0.01	0.011	0.2	1.8	N/A	0.57	0.59	<0.163	0.28	<0.011	<0.04	0.35	0.44
SACRAMENTO R A HAMILTON CITY	1/10/05 12:15	0.064	0.168	2.22	12.4	N/A	1.39	1.98	0.3	0.34	<0.003	<0.002	1.54	3.1
SACRAMENTO R A HAMILTON CITY	2/2/05 7:35	0.029	0.084	2.54	10.6	N/A	1.02	1.53	<0.222	0.27	0.002	0.003	0.95	1.96
SACRAMENTO R A HAMILTON CITY	3/10/05 7:30	0.008	0.049	0.98	6.37	N/A	0.87	1.24	<0.245	<0.19	<0.001	<0.036	0.36	1.06
SACRAMENTO R A HAMILTON CITY	4/20/05 12:00	0.01	0.023	3.12	6.03	N/A	0.76	0.94	0.14	0.35	<0.003	<0.005	0.41	0.75
SACRAMENTO R A HAMILTON CITY	5/19/05 9:30	0.202	3.24	7.33	272	N/A	2.75	30.7	<0.399	<0.317	0.018	0.041	2.46	35
SACRAMENTO R A HAMILTON CITY	6/28/05 7:15	<0.009	<0.027	4.71	5.17	N/A	0.95	1.41	<0.14	<0.354	<0.002	<0.027	0.8	1.65
SACRAMENTO R A HAMILTON CITY	7/26/05 12:45	<0.019	<0.063	0.16	2.07	N/A	0.85	0.95	<0.145	<0.176	<0.002	<0.04	0.36	0.85
SACRAMENTO R A HAMILTON CITY	8/23/05 11:20	<0.004	0.048	0.58	3.38	N/A	0.81	1.16	<0.227	0.29	<0.001	<0.001	0.27	1.09
SACRAMENTO R A HAMILTON CITY	9/27/05 10:00	<0.004	0.047	0.51	4.61	N/A	0.99	1.35	0.23	0.23	<0.003	<0.003	0.38	1.56
SACRAMENTO R A HAMILTON CITY	10/25/05 12:40	0.011	0.028	0.69	2.88	N/A	1.13	1.22	0.11	0.23	<0.002	<0.002	0.52	1.03
SACRAMENTO R A HAMILTON CITY	11/15/05 11:00	0.04	0.047	0.98	4.81	N/A	1.02	1.24	<0.186	<0.186	<0.009	<0.009	0.56	1.25
SACRAMENTO R A HAMILTON CITY	12/14/05 11:45	0.003	0.023	0.53	4.17	N/A	0.9	1.09	<0.149	0.15	<0.001	<0.001	0.5	0.93
SACRAMENTO R A HAMILTON CITY	1/4/06 7:30	0.191	1.89	9.75	134	N/A	2.67	15.4	<0.149	0.22	<0.001	0.021	2.24	20.8
SACRAMENTO R A HAMILTON CITY	1/24/06 7:30	0.062	0.306	9.24	32.4	N/A	1.68	3.32	<0.186	0.19	<0.005	<0.005	1.55	4.71
SACRAMENTO R A HAMILTON CITY	2/21/06 12:45	0.046	0.299	5.83	27.5	N/A	1.53	3.32	<0.149	0.3	<0.009	<0.009	1	3.94
SACRAMENTO R A HAMILTON CITY	3/1/06 7:30	0.648	2.04	23.2	146	N/A	4.69	15.7	<0.149	0.29	<0.009	<0.009	5.79	21.7
SACRAMENTO R A HAMILTON CITY	4/17/06 6:00	0.188	1.01	9.56	70.9	N/A	2.31	8.02	0.23	0.27	<0.03	<0.03	2.57	12.5
SACRAMENTO R A HAMILTON CITY	5/17/06 6:40	<0.04	0.1	2.1	10.1	N/A	1.12	1.46	<0.2	<0.2	<0.03	<0.03	0.67	1.78
SACRAMENTO R A HAMILTON CITY	6/27/06 6:30	<0.04	0.079	0.69	8.87	N/A	1.29	1.87	<0.2	<0.2	<0.03	0.063	0.41	1.71
SACRAMENTO R A HAMILTON CITY	7/25/06 5:40	<0.04	0.094	1.01	9.35	1.8	1.7	2.5	<0.2	<0.2	<0.03	<0.03	0.77	2.04
SACRAMENTO R A HAMILTON CITY	8/22/06 6:40	<0.04	0.077	1.6	7.18	0.89	1.7	2.33	0.25	0.26	<0.03	<0.03	1.02	1.94
SACRAMENTO R A HAMILTON CITY	9/20/06 6:30	<0.04	0.111	2.01	14.2	1.5	1.67	2.76	0.23	0.26	<0.03	<0.03	0.65	4.79
SACRAMENTO R A HAMILTON CITY	10/24/06 7:00	<0.04	0.078	0.87	9.44	0.28	1.01	2.02	0.25	0.28	<0.03	<0.03	0.16	3.3
SACRAMENTO R A HAMILTON CITY	12/12/06 6:40	<0.04	0.186	1.04	16.9	0.72	0.96	1.75	0.25	0.29	<0.03	<0.03	0.55	4.77
SACRAMENTO R A HAMILTON CITY	1/9/07 7:15	<0.04	<0.04	2.22	5.24	0.68	1.01	1.08	<0.2	<0.2	<0.03	<0.03	0.64	2.57
SACRAMENTO R A HAMILTON CITY	2/26/07 14:00	0.262	0.581	10.3	28.8	2.8	2.22	2.99	<0.2	0.23	<0.03	<0.03	3.68	8.39
SACRAMENTO R A HAMILTON CITY	3/20/07 6:50	<0.04	0.056	2.01	8.22	1.6	0.85	1.22	<0.2	<0.2	<0.03	<0.03	0.31	2.82
SACRAMENTO R A HAMILTON CITY	4/17/07 7:30	<0.04	<0.04	3.44	8.78	1	0.8	0.9	0.24	0.33	<0.03	<0.03	0.4	2.84
SACRAMENTO R A HAMILTON CITY	5/29/07 12:15	<0.04	0.044	0.36	5.99	N/A	0.8	1.04	<0.2	0.22	<0.03	<0.03	0.55	2.86
SACRAMENTO R A HAMILTON CITY	6/26/07 12:30	<0.04	0.066	2.52	7.29	0.59	0.9	1.12	<0.2	0.21	<0.03	<0.03	0.73	3.38
SACRAMENTO R A HAMILTON CITY	7/18/07 7:00	<0.04	0.07	0.21	7.42	1.3	0.88	1.27	<0.2	<0.2	<0.03	<0.03	0.3	3.87
SACRAMENTO R A HAMILTON CITY	8/28/07 7:05	<0.04	<0.04	0.46	5.33	N/A	1.07	1.22	<0.2	<0.2	<0.03	<0.03	2	2.29
SACRAMENTO R A HAMILTON CITY	9/13/07 7:55	<0.04	0.055	0.33	4.66	1.7	0.89	1.02	<0.2	<0.2	<0.03	2.11	0.36	<0.1
SACRAMENTO R A HAMILTON CITY	11/7/07 10:30	<0.04	<0.04	0.08	3.01	0.32	0.58	0.82	<0.2	<0.2	<0.03	<0.03	0.17	2.09
SACRAMENTO R A HAMILTON CITY	2/20/08 12:15	<0.04	0.041	0.7	8.15	N/A	0.88	0.95	<0.2	0.22	<0.03	<0.03	0.71	3.31
SACRAMENTO R A HAMILTON CITY	5/6/08 13:05	<0.04	0.061	0.27	8.38	N/A	1	1.12	<0.2	<0.2	<0.03	<0.03	0.22	3.21
SACRAMENTO R A HAMILTON CITY	8/6/08 9:40	<0.04	0.044	0.39	4.98	N/A	1.04	1.2	<0.2	<0.2	<0.03	<0.03	0.45	2.43
SACRAMENTO R A HAMILTON CITY	11/5/08 7:20	<0.04	0.09	0.35	10.4	N/A	1.22	1.6	<0.2	<0.2	<0.03	<0.03	0.93	3.51
SACRAMENTO R A HAMILTON CITY	2/24/09 10:40	<0.04	1.47	1.28	101	N/A	2.59	11	0.2	0.25	<0.03	<0.03	0.52	14.3
SACRAMENTO R A HAMILTON CITY	5/5/09 8:50	<0.04	0.289	0.53	17.7	N/A	0.85	1.76	<0.2	<0.2	<0.03	<0.03	1.07	6.22
SACRAMENTO R A HAMILTON CITY	8/11/09 8:40	<0.04	<0.04	0.22	2.36	N/A	0.74	0.84	<0.2	<0.2	<0.03	<0.03	0.45	2.26
SACRAMENTO R A HAMILTON CITY	11/3/09 7:50	<0.04	0.071	0.38	7.29	N/A	0.74	0.93	<0.2	<0.2	<0.03	<0.03	0.65	3.08
SACRAMENTO R A HAMILTON CITY	2/2/10 8:45	<0.04	0.188	1.01	17.1	N/A	1.78	2.08	<0.2	<0.2	<0.03	<0.03	1.39	5.43
SACRAMENTO R A HAMILTON CITY	5/4/10 7:45	<0.04	0.11	0.52	14	N/A	0.79	1.32	<0.2	<0.2	<0.03	<0.03	0.62	2.91
SACRAMENTO R A HAMILTON CITY	8/3/10 11:00	<0.04	<0.04	0.62	4.15	N/A	0.85	1.11	<0.2	<0.2	<0.03	<0.03	0.62	2.51
SACRAMENTO R A HAMILTON CITY	11/2/10 8:30	<0.04	0.09	0.73	12.5	N/A	1.34	1.82	<0.2	0.228	<0.03	<0.03	2.32	3.33
SACRAMENTO R A HAMILTON CITY	2/1/11 9:30	<0.04	<0.04	0.67	6.4	N/A	0.71	0.9	<0.2	<0.2	<0.03	<0.03	0.76	2.68
SACRAMENTO R A HAMILTON CITY	5/3/11 8:55	<0.04	<0.04	0.49	5.05	N/A	0.6	0.65	<0.2	<0.2	<0.03	<0.03	0.28	0.51
SACRAMENTO R A HAMILTON CITY	8/2/11 8:10	<0.04	0.061	1.47	6.38	N/A	1.1	1.37	<0.2	<0.2	<0.03	<0.03	0.77	1.63
SACRAMENTO R A HAMILTON CITY	11/1/11 8:45	<0.04	<0.04	1.44	4.4	N/A	1.37	1.68	<0.2	<0.2	<0.03	<0.03	0.59	2.11
SACRAMENTO R A HAMILTON CITY	1/31/12 8:25	<0.04	<0.04	1.87	9.58	N/A	0.68	1.11	<0.2	<0.2	<0.03	<0.03	1.17	2.32
SACRAMENTO R A HAMILTON CITY	5/8/12 8:30	<0.04	<0.04	5.73	7.97	N/A	0.68	0.79	<0.2	<0.2	<0.03	<0.03	0.48	1.79
SACRAMENTO R A HAMILTON CITY	8/7/12 8:00	<0.04	<0.04	0.41	2.81	0.8	0.79	1.36	<0.2	<0.2	<0.03	<0.03	0.41	1.83
SACRAMENTO R A HAMILTON CITY	11/6/12 9:35	<0.04	<0.04	2.19	3.12	3.4	0.96	1.08	<0.2	<0.2	<0.03	<0.03	0.67	1.34
SACRAMENTO R A HAMILTON CITY	2/6/13 9:15	<0.04	<0.04	0.35	5.45	1.3	0.44	0.65	<0.2	<0.2	<0.03	<0.03	0.93	1.45
SACRAMENTO R A HAMILTON CITY	5/7/13 8:05	<0.04	<0.04	1.2	3.14	0.9	0.85	1.03	<0.2	<0.2	<0.03	<0.03	0.52	1.11
SACRAMENTO R A HAMILTON CITY	8/6/13 7:30	<0.04	<0.04	0.12	2.4	0.6	1.27	1.63	<0.2	<0.2	<0.03	<0.03	<0.1	1.09
SACRAMENTO R A HAMILTON CITY	11/5/13 9:10	<0.04	<0.04	0.58	3.53	<0.5	0.6	0.89	<0.2	<0.2	<0.03	<0.03	0.45	1.16
SACRAMENTO R A HAMILTON CITY	2/4/14 9:05	<0.04	<0.04	0.35	2.17	0.8	0.54	0.69	<0.2	0.21	<0.03	<0.03	0.21	0.97
SACRAMENTO R A HAMILTON CITY	5/6/14 8:30	<0.04	<0.04	0.74	6.62	2.5	0.47	0.7	<0.2	<0.2	<0.03	<0.03	0.38	1.24
SACRAMENTO R A HAMILTON CITY	8/12/14 9:50	<0.04	<0.04	0.99	2.82	N/A	0.76	0.84	<0.2	<0.2	<0.03	<0.03	0.37	0.74
SACRAMENTO R A HAMILTON CITY	11/5/14 8:50	<0.04	0.173	0.79	9.25	N/A	1.58	7.22	<0.2	<0.2	<0.03	<0.03	0.37	34
SACRAMENTO R A HAMILTON CITY	2/10/15 9:30	<0.04	1.52	0.96	59.6	29.1	1.36	6.88	0.26	0.31	<0.03	0.037	0.38	13.9
SACRAMENTO R A HAMILTON CITY	5/11/15 10:00	<0.04	0.048	1.15	6.15	1.1	0.92	1.27	<0.2	<0.2	<0.03	<0.03	0.62	1.37
SACRAMENTO R A HAMILTON CITY	8/11/15 10:20	<0.04	<0.04	0.91	3.21	4.4	0.88	1.36	0.34	0.35	<0.03	<0.03	<0.1	0.4
SACRAMENTO R A HAMILTON CITY	11/4/15 11:27	<0.04	<0.04	1.16	2.67	<0.5	0.66	0.92	<0.2	<0.2	<0.03	<0.03	0.5	1.06
SACRAMENTO R A HAMILTON CITY	2/3/16 12:10	<0.04	0.204	0.62	17.7	3.5	1.26	2.47	0.21	0.28	<0.03	<0.03	0.75	2.98
SACRAMENTO R A HAMILTON CITY	5/9/16 12:15	<0.04	0.194	2.28	16.8	N/A	1.05	1.78	<0.2	<0.2	<0.03	<0.03	0.49	3.45
SACRAMENTO R A HAMILTON CITY	8/8/16 8:15	<0.04	0.046	0.24	4.35	N/A	1.29	1.63	<0.2	0.21	<0.03	<0.03	0.84	1.48
SACRAMENTO R A HAMILTON CITY	11/7/16 11:00	<0.04	<0.04	0.41	2.91	N/A	1.12	1.46	<0.2	<0.2	<0.03	<0.03	0.75	1.36
SACRAMENTO R A HAMILTON CITY	2/6/17 13:00	<0.04	0.945	3.35	43	N/A	1.08	5.36	0.36	0.37	<0.03	<0.03	0.86	9.16
	Maximum	0.648	3.24	23.2	272	29.1	4.69	30.7	0.36	0.37	0.018	2.11	5.79	35
	Mediam	0.043	0.0795	0.97	6.4	1.2	0.995	1.32	0.24	0.26	0.01	0.039	0.575	2.1
	Minimum	0.003	0.011	0.08	1.61	0.28	0.44	0.59	0.11	0.12	0.002	0.003	0.16	0.4
SWRCB Basin Plan - Drinking Water Standards - Primary MCL														
SWRCB Basin Plan - Drinking Water Standards - Secondary MCL				50										
Cal EPA/OEHHA - California Public Health Goal		0.2					12							
USEPA Secondary MCL														
Cal EPA - One in a million incremental cancer risk estimate for drinking water		0.2												
USEPA Health Advisory for drinking water														
USEPA IRIS Reference Dose Drinking Water Health Advisories														
California Proposition 65 Safe Harbor Level - Max. Allowable dose level for reproductive toxicity		0.25												
Agriculture Water Quality Goals - Taste and odor threshold				200										
California Toxics Rule Sources of Drinking Water						0.05								
National Academy of Sciences Drinking Water Health Advisories														
National Recommended WQ Criteria - Taste and Odor or Welfare				50										
National Recommended WQ Criteria - Human Health and Welfare protection - water and fish consumption														
National Recommended WQ Criteria - Freshwater Aquatic Life Continuous Concentration						0.77								
National Recommended WQ Criteria - Freshwater Aquatic Life Maximum Concentration						1.4								

Table 4. Sacramento River op Moulton Weir, Part 1 of 2

Station Name	Sample Date	Dissolved Aluminum µg/L	Total Aluminum µg/L	Dissolved Arsenic µg/L	Total Arsenic µg/L	Dissolved Cadmium µg/L	Total Cadmium µg/L	Dissolved Chromium µg/L	Total Chromium µg/L	Dissolved Copper µg/L	Total Copper µg/L	Dissolved Iron µg/L	Total Iron µg/L
SACRAMENTO R OPP MOULTON WR	5/14/03 14:15	22.6	584	1.46	1.67	0.01	0.078	1.34	2.25	0.93	3.17	4.1	813
SACRAMENTO R OPP MOULTON WR	6/10/03 9:00	15.8	180	1.83	1.88	<0.031	<0.031	0.84	0.91	0.71	1.52	<2.08	214
SACRAMENTO R OPP MOULTON WR	7/10/03 10:40	36.4	116	1.58	1.69	<0.031	<0.009	0.65	0.83	1.29	1.3	17.3	137
SACRAMENTO R OPP MOULTON WR	8/13/03 11:45	4.42	215	1.45	1.5	<0.004	<0.049	0.77	0.95	0.79	1.45	<2.45	317
SACRAMENTO R OPP MOULTON WR	9/3/03 12:30	5.91	304	1.43	1.51	<0.01	<0.01	0.73	1.02	1.23	2.24	<3.1	449
SACRAMENTO R OPP MOULTON WR	10/8/03 12:40	33.5	117	0.879	1.3	<0.011	0.009	0.17	0.78	0.97	1.32	25.1	172
SACRAMENTO R OPP MOULTON WR	11/5/03 11:00	64	131	1.47	1.63	<0.02	<0.004	<0.209	1.9	1.06	1.59	61.6	151
SACRAMENTO R OPP MOULTON WR	12/8/03 10:45	1193	3448	1.63	2.84	0.019	0.175	2.23	9.25	4.25	16.4	852	5589
SACRAMENTO R OPP MOULTON WR	1/6/04 9:30	262	1248	1.73	2.13	<0.008	0.045	1.04	4.56	2.21	7.17	193	2131
SACRAMENTO R OPP MOULTON WR	2/4/04 12:20	1614	1950	1.04	1.44	<0.011	0.037	2.17	5.11	3.82	8.17	1062	2748
SACRAMENTO R OPP MOULTON WR	2/17/04 12:00	2521	8733	1.59	2.8	<0.015	0.232	9.17	24.8	7.64	27.7	2035	13032
SACRAMENTO R OPP MOULTON WR	3/8/04 11:40	184	1478	1.44	1.83	0.011	0.053	0.8	4.63	1.93	6.89	135	2133
SACRAMENTO R OPP MOULTON WR	4/7/04 9:45	26.9	160	1.61	1.74	0.009	0.013	0.54	1.16	1.46	1.99	16.6	238
SACRAMENTO R OPP MOULTON WR	5/5/04 11:00	6.14	289	1.77	1.83	0.004	0.027	0.74	1.3	0.78	2.83	<3.73	396
SACRAMENTO R OPP MOULTON WR	6/9/04 10:00	185	302	1.75	1.84	0.011	0.013	0.6	1.53	1.65	2.43	123	349
SACRAMENTO R OPP MOULTON WR	7/29/04 10:40	100	155	1.4	1.43	0.005	0.011	0.63	0.91	1.06	1.74	52.7	162
SACRAMENTO R OPP MOULTON WR	10/5/04 11:00	14.3	89	1.22	1.34	<0.011	<0.008	0.8	0.94	0.73	1.28	9.8	116
SACRAMENTO R OPP MOULTON WR	11/9/04 13:00	20	76.2	2.34	2.4	<0.008	<0.007	0.9	0.93	0.89	1.38	14.5	99.5
SACRAMENTO R OPP MOULTON WR	12/7/04 10:20	3.4	82.6	2.25	2.27	<0.012	<0.034	1.86	1.93	0.89	1.07	<4.5	114
SACRAMENTO R OPP MOULTON WR	1/10/05 11:00	459	1259	1.36	1.6	<0.011	<0.007	1.81	3.91	2.41	4.96	304	1706
SACRAMENTO R OPP MOULTON WR	2/2/05 12:25	170	582	1.51	1.58	<0.011	<0.066	2.02	2.55	1.7	3.21	143	886
SACRAMENTO R OPP MOULTON WR	3/10/05 14:45	10.2	133	1.91	1.97	<0.033	<0.011	1.52	1.74	1.17	1.62	13	222
SACRAMENTO R OPP MOULTON WR	4/20/05 10:50	20.7	130	1.97	2.07	<0.022	<0.009	1.08	1.32	1.16	1.48	13.4	182
SACRAMENTO R OPP MOULTON WR	5/19/05 11:15	314	5936	1.34	3.07	<0.058	0.138	1.37	18	1.81	20.9	196	9164
SACRAMENTO R OPP MOULTON WR	6/28/05 15:05	103	126	1.42	1.65	<0.009	<0.012	0.62	1.1	1.32	1.34	96.3	148
SACRAMENTO R OPP MOULTON WR	7/26/05 11:00	7.14	197	1.45	1.46	0.007	0.014	0.48	0.98	0.93	1.42	<3.27	270
SACRAMENTO R OPP MOULTON WR	8/23/05 9:30	8.08	84.1	1.52	1.57	<0.009	<0.009	0.5	0.59	0.89	1.08	<4.16	130
SACRAMENTO R OPP MOULTON WR	9/28/05 8:30	17.3	82.5	1.41	1.46	0.007	0.017	1	1.31	0.88	1.16	10.6	125
SACRAMENTO R OPP MOULTON WR	10/25/05 10:30	21.8	190	1.5	1.52	0.013	0.019	0.57	1.08	1.06	1.59	13.8	258
SACRAMENTO R OPP MOULTON WR	11/14/05 12:00	18.3	297	1.93	2.16	0.012	0.033	0.79	1.35	1.22	2.24	15.8	453
SACRAMENTO R OPP MOULTON WR	12/14/05 11:40	9.4	71.4	1.84	2.04	0.01	0.017	0.77	1.03	0.92	1.24	5.2	114
SACRAMENTO R OPP MOULTON WR	1/4/06 10:40	2779	4845	1.84	2.53	0.024	0.096	6.91	14.1	5.21	14.3	1670	6695
SACRAMENTO R OPP MOULTON WR	1/24/06 13:10	413	1419	1.45	1.85	0.013	0.062	1.53	4.53	1.77	5.63	283	2016
SACRAMENTO R OPP MOULTON WR	2/22/06 11:40	263	848	1.37	1.68	0.018	0.05	1.76	2.94	1.15	3.79	176	1189
SACRAMENTO R OPP MOULTON WR	3/1/06 12:10	4357	6132	1.58	1.99	0.029	0.105	6.51	13.4	5.76	14.6	2579	7827
SACRAMENTO R OPP MOULTON WR	4/17/06 11:10	1232	2222	1.06	1.56	<0.1	<0.1	2.25	5.68	2.73	7.09	782	2269
SACRAMENTO R OPP MOULTON WR	5/17/06 11:35	129	511	1.48	1.64	<0.1	<0.1	0.81	1.74	1.18	2.32	98.3	446
SACRAMENTO R OPP MOULTON WR	6/27/06 10:25	47.7	677	1.37	1.67	<0.1	<0.1	1.22	2.05	1.04	1.78	9.9	392
SACRAMENTO R OPP MOULTON WR	7/26/06 8:20	228	793	1.28	1.38	<0.1	<0.1	0.5	1.39	1.22	2.1	60.9	436
SACRAMENTO R OPP MOULTON WR	8/22/06 10:50	157	272	1.1	1.16	<0.1	<0.1	0.61	0.93	1.11	1.44	111	271
SACRAMENTO R OPP MOULTON WR	9/20/06 11:35	351	633	1.06	1.15	<0.1	<0.1	0.55	1.23	1.07	1.6	56.5	286
SACRAMENTO R OPP MOULTON WR	10/24/06 12:15	31.7	226	1.23	1.44	<0.1	<0.1	0.66	1.09	1.29	1.55	58.7	208
SACRAMENTO R OPP MOULTON WR	12/12/06 12:35	103	1584	2.6	2.74	<0.1	<0.1	0.49	3.25	1.44	2.86	133	593
SACRAMENTO R OPP MOULTON WR	1/9/07 13:00	81.8	284	1.93	2.11	<0.1	<0.1	1.66	1.74	1.02	1.4	55.9	287
SACRAMENTO R OPP MOULTON WR	2/27/07 10:00	457	524	1.27	1.38	<0.1	<0.1	1.91	2.02	2.93	3.62	464	829
SACRAMENTO R OPP MOULTON WR	3/20/07 11:15	17.6	96.9	2.13	2.36	<0.1	<0.1	0.49	0.72	1.18	1.59	26.2	166
SACRAMENTO R OPP MOULTON WR	4/18/07 10:15	16.6	105	1.9	1.98	<0.1	<0.1	0.45	0.76	1.53	2.13	15.1	139
SACRAMENTO R OPP MOULTON WR	5/30/07 9:00	3.42	99.8	2.07	2.22	<0.1	<0.1	0.5	0.94	1.28	2.09	4.7	179
SACRAMENTO R OPP MOULTON WR	6/27/07 8:00	5.35	110	1.66	1.75	<0.1	<0.1	0.5	0.95	1.09	1.68	15.4	136
SACRAMENTO R OPP MOULTON WR	7/19/07 10:05	6.46	107	1.77	1.81	<0.1	<0.1	0.47	0.86	1.02	1.49	4.4	159
SACRAMENTO R OPP MOULTON WR	8/28/07 10:40	1.04	34.3	1.69	1.72	<0.1	<0.1	0.42	0.59	0.86	1.01	2.7	51.4
SACRAMENTO R OPP MOULTON WR	9/13/07 11:40	2.77	33.8	1.44	1.61	<0.1	<0.1	0.46	0.57	0.81	0.88	5.4	46.1
SACRAMENTO R OPP MOULTON WR	10/31/07 10:55	2.04	41.1	2.18	2.23	<0.1	<0.1	0.4	0.59	0.81	1.13	9.1	112
SACRAMENTO R OPP MOULTON WR	11/27/07 11:50	0.87	27.8	2.27	2.44	<0.1	<0.1	0.48	0.54	0.78	0.9	7.3	65.7
SACRAMENTO R OPP MOULTON WR	1/23/08 12:40	3.9	218	2.63	2.75	<0.1	<0.1	0.54	1.47	1.12	1.89	5.2	273
SACRAMENTO R OPP MOULTON WR	2/27/08 10:50	10.4	1710	1.06	1.73	<0.1	<0.1	0.41	6.45	2.06	6.7	20.4	1852
SACRAMENTO R OPP MOULTON WR	3/26/08 10:10	2	56.4	2.27	2.36	<0.1	<0.1	0.42	0.73	1.26	1.61	4.9	121
SACRAMENTO R OPP MOULTON WR	4/23/08 10:30	4.59	121	2.14	2.2	<0.1	<0.1	0.43	0.88	1.35	1.95	5	188
SACRAMENTO R OPP MOULTON WR	7/24/08 11:15	2.02	62.8	1.65	1.78	<0.1	<0.1	0.41	0.6	1.07	1.25	5.1	92.9
SACRAMENTO R OPP MOULTON WR	4/22/09 11:10	3.89	66.2	2.14	2.29	<0.1	<0.1	0.38	0.58	1.67	2.11	10.1	98.6
SACRAMENTO R OPP MOULTON WR	5/28/09 12:15	2.79	86.6	1.89	1.97	<0.1	<0.1	0.35	0.57	1.81	1.96	8.6	95.8
SACRAMENTO R OPP MOULTON WR	6/25/09 9:25	3.27	101	1.43	1.52	<0.1	<0.1	0.36	0.61	1.37	1.7	6.3	126
SACRAMENTO R OPP MOULTON WR	7/28/09 10:30	7.77	142	1.39	1.53	<0.1	<0.1	0.45	0.69	1.07	1.5	11.8	126
SACRAMENTO R OPP MOULTON WR	8/27/09 9:30	1.66	30.7	1.19	1.24	<0.1	<0.1	0.35	0.46	0.88	1.06	3	38.2
SACRAMENTO R OPP MOULTON WR	9/24/09 9:50	2.09	35.9	1.34	1.36	<0.1	<0.1	0.34	0.45	0.96	1.05	4.3	40.2
SACRAMENTO R OPP MOULTON WR	10/27/09 11:40	5.31	98.5	1.76	1.85	<0.1	<0.1	0.39	0.64	1.04	1.5	17.1	123
SACRAMENTO R OPP MOULTON WR	11/18/09 11:30	2.56	60	1.94	2.14	<0.1	<0.1	0.4	0.7	0.98	1.45	8	113
SACRAMENTO R OPP MOULTON WR	12/9/09 8:15	1.73	25.8	2.53	2.64	<0.1	<0.1	0.45	0.53	0.92	1.02	3.1	51.7
SACRAMENTO R OPP MOULTON WR	1/26/10 8:45	87.7	3953	1.3	2.43	<0.1	0.144	0.59	14.7	3.45	20.2	114	4700
SACRAMENTO R OPP MOULTON WR	3/2/10 13:15	13.9	793	1.15	1.51	<0.1	<0.1	0.39	3.19	1.56	4.3	29.5	947
SACRAMENTO R OPP MOULTON WR	3/24/10 7:10	1.83	54.6	1.72	1.76	<0.1	<0.1	0.53	0.65	0.95	1.29	5.6	94.2
SACRAMENTO R OPP MOULTON WR	4/21/10 7:00	3.67	780	1.45	1.69	<0.1	<0.1	0.46	3.47	1.43	3.93	8.3	1018
SACRAMENTO R OPP MOULTON WR	5/26/10 7:00	3.46	49.6	1.2	1.26	<0.1	<0.1	0.4	0.54	1.61	1.75	1.4	69.7
SACRAMENTO R OPP MOULTON WR	6/30/10 7:00	6.01	52.4	1.28	1.46	<0.1	<0.1	0.35	0.51	1.17	1.46	5.5	71.9
SACRAMENTO R OPP MOULTON WR	7/28/10 8:40	3.8	29	1.4	1.45	<0.1	<0.1	0.44	0.56	1.33	1.45	3.8	68.8
SACRAMENTO R OPP MOULTON WR	8/31/10 10:10	6.25	34.7	1.22	1.24	<0.1	<0.1	0.27	0.6	1.19	1.26	3.5	76.2
SACRAMENTO R OPP MOULTON WR	10/26/10 8:00	12.9	682	1.55	3.49	<0.1	<0.1	0.42	3.07	1.79	3.95	25.6	830
SACRAMENTO R OPP MOULTON WR	11/30/10 8:50	4.11	48.3	1.67	1.89	<0.1	<0.1	0.58	0.73	1.19	1.29	6.9	75.1
SACRAMENTO R OPP MOULTON WR	12/13/10 11:20	2.71	93.3	1.46	1.52	<0.1	<0.1	0.44	0.91	1.21	1.66	9.1	154
SACRAMENTO R OPP MOULTON WR	1/18/11 10:45	6.13	500	1.48	1.6	<0.1	<0.1	0.47	2.8	1.45	2.77	16.3	547
	Maximum	4357	8733	2.63	3.49	0.029	0.232	9.17	24.8	7.64	27.7	2579	13032
	Mediam	14.1	148.5	1.505	1.735	0.011	0.041	0.55	1.035	1.185	1.67	15.4	198
	Minimum	0.87	25.8	0.879	1.15	0.004	0.009	0.17	0.45	0.71	0.88	1.4	38.2

Standard	Aluminum	Arsenic	Cadmium	Chromium	Copper	Iron
SWRCB Basin Plan - Drinking Water Standards -Primary MCL	1000					
SWRCB Basin Plan - Drinking Water Standards -Secondary MCL	200					300
Cal EPA/OEHHA - California Public Health Goal	600	0.004	0.04			
USEPA Secondary MCL	50					
Cal EPA - One in a million incremental cancer risk estimate for drinking water		0.023	0.0023			
USEPA Health Advisory for drinking water		0.02				
USEPA IRIS Reference Dose Drinking Water Health Advisories		2.1				
California Proposition 65 Safe Harbor Level - Max. Allowable dose level for reproductive toxicity		0.05				
Agriculture Water Quality Goals - Taste and odor threshold	5000					5000
California Toxics Rule Sources of Drinking Water						
National Academy of Sciences Drinking Water Health Advisories	5000					
National Recommended WQ Criteria - Taste and Odor or Welfare						300
National Recommended WQ Criteria - Human Health and Welfare protection - water and fish consumption		0.018				
National Recommended WQ Criteria - Freshwater Aquatic Life Continuous Concentration	87					1000
National Recommended WQ Criteria - Freshwater Aquatic Life Maximum Concentration	750					

Table 4. Sacramento River op Moulton Weir, Part 2 of 2

Station Name	Sample Date	Dissolved Lead µg/L	Total Lead µg/L	Dissolved Manganese µg/L	Total Manganese µg/L	Total Mercury ng/L	Dissolved Nickel µg/L	Total Nickel µg/L	Dissolved Selenium µg/L	Total Selenium µg/L	Dissolved Silver µg/L	Total Silver µg/L	Dissolved Zinc µg/L	Total Zinc µg/L
SACRAMENTO R OPP MOULTON WR	5/14/03 14:15	<0.025	0.299	0.17	20.7	N/A	0.65	3.17	0.11	0.2	<0.025	<0.273	0.4	4.5
SACRAMENTO R OPP MOULTON WR	6/10/03 9:00	<0.017	0.068	0.14	7.15	N/A	0.52	1.38	0.18	<0.296	<0.001	<0.251	0.3	1.5
SACRAMENTO R OPP MOULTON WR	7/10/03 10:40	0.012	0.055	2.05	5.66	N/A	0.92	1.26	<0.129	0.17	<0.011	<0.123	0.35	1.6
SACRAMENTO R OPP MOULTON WR	8/13/03 11:45	<0.003	0.124	0.48	9.98	N/A	0.95	1.8	<0.163	0.21	<0.015	<0.122	0.46	2.24
SACRAMENTO R OPP MOULTON WR	9/3/03 12:30	<0.007	0.183	0.1	18.6	N/A	1.1	2.29	<0.21	0.26	<0.144	<0.144	0.41	3.16
SACRAMENTO R OPP MOULTON WR	10/8/03 12:40	0.028	0.085	4.96	9.5	N/A	1.16	1.64	<0.327	<0.162	<0.01	<0.131	0.62	1.47
SACRAMENTO R OPP MOULTON WR	11/5/03 11:00	0.029	0.057	6.6	8.03	N/A	1.33	1.61	0.17	0.22	<0.02	<0.04	0.9	1.3
SACRAMENTO R OPP MOULTON WR	12/8/03 10:45	0.385	2.93	9.6	218	N/A	3.19	15.7	0.12	0.28	0.037	0.049	10.4	31.6
SACRAMENTO R OPP MOULTON WR	1/6/04 9:30	0.085	0.877	4.62	52.9	N/A	1.53	7.62	0.1	<0.248	<0.007	<0.014	0.9	10.9
SACRAMENTO R OPP MOULTON WR	2/4/04 12:20	0.306	1.2	11.3	83.1	N/A	3.16	8.72	0.11	<0.282	<0.015	0.088	4.09	14.4
SACRAMENTO R OPP MOULTON WR	2/17/04 12:00	0.677	4.8	31.2	381	N/A	6.92	44.5	<0.121	0.26	<0.016	0.06	7.53	56.8
SACRAMENTO R OPP MOULTON WR	3/8/04 11:40	0.054	0.541	3.02	59.7	N/A	1.28	7.41	0.2	0.31	0.04	<0.065	1.04	10.6
SACRAMENTO R OPP MOULTON WR	4/7/04 9:45	<0.022	0.09	2.06	10	N/A	1.14	1.76	<0.112	0.53	0.02	<0.031	0.5	1.54
SACRAMENTO R OPP MOULTON WR	5/5/04 11:00	<0.007	0.13	1.58	12.3	N/A	0.87	2.16	<0.166	0.23	<0.001	<0.044	0.19	2.57
SACRAMENTO R OPP MOULTON WR	6/9/04 10:00	0.082	0.112	4.82	10.2	N/A	1.3	1.99	<0.121	<0.226	<0.014	<0.081	1.22	2.38
SACRAMENTO R OPP MOULTON WR	7/29/04 10:40	0.017	0.059	1.81	4.98	N/A	1.02	1.46	0.15	0.27	<0.008	<0.067	0.47	1.31
SACRAMENTO R OPP MOULTON WR	10/5/04 11:00	0.011	0.049	2.04	7.22	N/A	1.16	1.44	<0.144	<0.204	<0.077	<0.054	0.45	1.09
SACRAMENTO R OPP MOULTON WR	11/9/04 13:00	0.008	0.04	1.69	8.14	N/A	1.09	1.24	<0.149	0.19	<0.006	<0.063	0.46	0.89
SACRAMENTO R OPP MOULTON WR	12/7/04 10:20	<0.01	0.054	0.68	7.19	N/A	0.61	0.84	<0.163	0.37	<0.011	<0.04	0.2	0.88
SACRAMENTO R OPP MOULTON WR	1/10/05 11:00	0.091	0.609	2.64	43.2	N/A	1.79	6.19	0.31	0.46	0.005	0.01	1.11	7.93
SACRAMENTO R OPP MOULTON WR	2/2/05 12:25	0.058	0.404	2.79	23.2	N/A	1.45	4.05	<0.222	0.36	0.002	0.007	0.77	4.12
SACRAMENTO R OPP MOULTON WR	3/10/05 14:45	0.011	0.094	0.78	7.17	N/A	0.83	1.6	<0.245	0.29	<0.001	<0.036	0.24	1.26
SACRAMENTO R OPP MOULTON WR	4/20/05 10:50	0.021	0.079	2.74	10.8	N/A	0.8	1.42	0.25	0.28	<0.003	<0.005	0.56	1.37
SACRAMENTO R OPP MOULTON WR	5/19/05 11:15	0.04	3.35	2.73	268	N/A	1.38	31.5	<0.399	<0.317	<0.009	0.045	1.14	39.4
SACRAMENTO R OPP MOULTON WR	6/28/05 15:05	<0.009	0.041	4.35	4.85	N/A	0.72	1.18	0.31	0.38	<0.002	<0.027	1	1.28
SACRAMENTO R OPP MOULTON WR	7/26/05 11:00	<0.018	0.039	0.63	7.35	N/A	0.69	1.55	<0.222	<0.222	<0.013	<0.013	0.55	1.86
SACRAMENTO R OPP MOULTON WR	8/23/05 9:30	<0.004	0.045	0.66	5.73	N/A	0.69	1.11	<0.227	<0.227	<0.001	<0.001	0.14	0.88
SACRAMENTO R OPP MOULTON WR	9/28/05 8:30	<0.004	0.048	0.45	4.75	N/A	0.88	1.25	0.18	0.22	<0.003	<0.003	0.23	1.13
SACRAMENTO R OPP MOULTON WR	10/25/05 10:30	0.021	0.114	1.28	10.6	N/A	1.04	1.77	<0.063	0.18	<0.002	<0.002	0.53	1.81
SACRAMENTO R OPP MOULTON WR	11/14/05 12:00	0.013	0.212	1.27	26.9	N/A	1.04	2.36	<0.186	<0.186	<0.009	<0.009	0.73	3.62
SACRAMENTO R OPP MOULTON WR	12/14/05 11:40	0.008	0.079	0.68	6.17	N/A	1.05	1.33	<0.149	0.19	<0.001	<0.001	0.66	1.78
SACRAMENTO R OPP MOULTON WR	1/4/06 10:40	0.626	2.64	24.9	164	N/A	5.91	22.2	<0.149	0.15	0.011	0.028	4.66	22.9
SACRAMENTO R OPP MOULTON WR	1/24/06 13:10	0.105	0.749	13.6	60.3	N/A	1.78	6.85	0.23	0.28	<0.005	<0.005	1.54	9.49
SACRAMENTO R OPP MOULTON WR	2/22/06 11:40	0.058	0.538	6.68	40.1	N/A	1.44	4.63	0.16	0.23	<0.009	<0.009	0.83	5.22
SACRAMENTO R OPP MOULTON WR	3/1/06 12:10	0.852	2.81	35.8	207	N/A	6.24	19.6	<0.149	0.2	<0.009	<0.009	7.67	27.9
SACRAMENTO R OPP MOULTON WR	4/17/06 11:10	0.271	1.27	13.8	83.2	N/A	2.88	9.26	<0.2	0.22	<0.03	<0.03	2.99	12.8
SACRAMENTO R OPP MOULTON WR	5/17/06 11:35	<0.04	0.183	2.83	19.1	N/A	1.08	2.15	0.22	0.26	<0.03	<0.03	0.39	2.53
SACRAMENTO R OPP MOULTON WR	6/27/06 10:25	<0.04	0.133	0.32	13.6	N/A	1	2.08	<0.2	<0.2	<0.03	0.066	0.19	2.06
SACRAMENTO R OPP MOULTON WR	7/26/06 8:20	<0.04	0.149	1.11	14	1.6	1.26	2.6	<0.2	<0.2	<0.03	<0.03	0.69	2.39
SACRAMENTO R OPP MOULTON WR	8/22/06 10:50	<0.04	0.081	1.89	8.01	0.67	1.38	2.05	0.21	0.26	<0.03	<0.03	0.55	1.5
SACRAMENTO R OPP MOULTON WR	9/20/06 11:35	<0.04	0.096	2.46	11.8	1.5	1.42	2.26	<0.2	<0.2	<0.03	<0.03	0.54	8.42
SACRAMENTO R OPP MOULTON WR	10/24/06 12:15	<0.04	0.105	2.1	12.3	0.39	1.45	2.03	<0.2	0.21	<0.03	<0.03	0.16	3.21
SACRAMENTO R OPP MOULTON WR	12/12/06 12:35	<0.04	0.264	3.24	22	1.8	2.21	2.82	<0.2	<0.2	<0.03	<0.03	1.65	6.62
SACRAMENTO R OPP MOULTON WR	1/9/07 13:00	<0.04	0.067	2.75	11	1.5	1.08	1.61	<0.2	<0.2	<0.03	<0.03	0.52	3.05
SACRAMENTO R OPP MOULTON WR	2/27/07 10:00	0.254	0.501	10.7	24.6	0.95	2.31	2.83	<0.2	<0.2	<0.03	<0.03	3.33	7.25
SACRAMENTO R OPP MOULTON WR	3/20/07 11:15	<0.04	0.071	2.35	9.98	1.7	0.85	1.21	<0.2	0.31	<0.03	<0.03	0.36	2.78
SACRAMENTO R OPP MOULTON WR	4/18/07 10:15	<0.04	0.078	3.59	11.1	1.3	0.79	1.17	<0.2	<0.2	<0.03	<0.03	0.46	3.33
SACRAMENTO R OPP MOULTON WR	5/30/07 9:00	<0.04	0.147	0.45	12.5	N/A	0.73	1.32	<0.2	<0.2	<0.03	<0.03	0.2	3.66
SACRAMENTO R OPP MOULTON WR	6/27/07 8:00	<0.04	0.092	5.8	12.7	1.1	0.79	1.19	<0.2	<0.2	<0.03	<0.03	0.49	3.4
SACRAMENTO R OPP MOULTON WR	7/19/07 10:05	<0.04	0.066	0.22	8.58	0.98	0.56	1.2	<0.2	<0.2	<0.03	<0.03	0.28	3.2
SACRAMENTO R OPP MOULTON WR	8/28/07 10:40	<0.04	<0.04	0.21	4.92	N/A	0.89	1.02	<0.2	<0.2	<0.03	<0.03	0.46	1.99
SACRAMENTO R OPP MOULTON WR	9/13/07 11:40	<0.04	0.051	0.22	4.64	0.9	0.91	0.95	<0.2	<0.2	<0.03	<0.03	0.46	2.04
SACRAMENTO R OPP MOULTON WR	10/31/07 10:55	<0.04	0.054	0.23	8.41	0.77	1.09	1.2	<0.2	<0.2	<0.03	<0.03	0.31	2.42
SACRAMENTO R OPP MOULTON WR	11/27/07 11:50	<0.04	0.082	0.31	5.67	0.75	0.89	0.92	<0.2	<0.2	<0.03	<0.03	0.29	2.33
SACRAMENTO R OPP MOULTON WR	1/23/08 12:40	<0.04	0.134	1.7	16.3	N/A	1.17	1.49	<0.2	<0.2	<0.03	<0.03	0.77	3.76
SACRAMENTO R OPP MOULTON WR	2/27/08 10:50	<0.04	0.979	0.79	61.7	N/A	1.98	8.93	0.32	0.45	<0.03	<0.03	0.46	11
SACRAMENTO R OPP MOULTON WR	3/26/08 10:10	<0.04	0.061	0.55	11.3	N/A	1	1.13	0.28	0.29	<0.03	<0.03	0.2	2.39
SACRAMENTO R OPP MOULTON WR	4/23/08 10:30	<0.04	0.095	4.21	14.4	N/A	0.92	1.36	<0.2	0.25	<0.03	<0.03	0.66	3.67
SACRAMENTO R OPP MOULTON WR	7/24/08 11:15	<0.04	0.048	0.28	5.01	38	0.65	0.85	0.24	0.28	<0.03	<0.03	0.3	2.53
SACRAMENTO R OPP MOULTON WR	4/22/09 11:10	<0.04	0.057	0.53	9.11	N/A	0.82	0.92	<0.2	0.23	<0.03	<0.03	0.28	2.66
SACRAMENTO R OPP MOULTON WR	5/28/09 12:15	<0.04	0.062	0.41	7.18	N/A	0.78	0.89	<0.2	<0.2	<0.03	<0.03	0.53	2.72
SACRAMENTO R OPP MOULTON WR	6/25/09 9:25	<0.04	0.094	0.33	6.95	N/A	0.93	1.06	0.23	0.26	<0.03	<0.03	0.94	4.54
SACRAMENTO R OPP MOULTON WR	7/28/09 10:30	<0.04	0.062	1.39	7.1	N/A	1.02	1.06	<0.2	<0.2	<0.03	<0.03	0.47	2.72
SACRAMENTO R OPP MOULTON WR	8/27/09 9:30	<0.04	<0.04	0.36	2.63	N/A	0.78	0.86	<0.2	<0.2	<0.03	<0.03	0.33	1.79
SACRAMENTO R OPP MOULTON WR	9/24/09 9:50	<0.04	<0.04	0.33	4.98	N/A	0.84	0.96	<0.2	<0.2	<0.03	<0.03	0.33	1.99
SACRAMENTO R OPP MOULTON WR	10/27/09 11:40	<0.04	0.117	4.35	12.7	N/A	0.94	1.13	<0.2	<0.2	<0.03	<0.03	0.57	2.83
SACRAMENTO R OPP MOULTON WR	11/18/09 11:30	<0.04	0.07	0.44	7.87	N/A	0.89	0.99	<0.2	<0.2	<0.03	<0.03	0.32	2.59
SACRAMENTO R OPP MOULTON WR	12/9/09 8:15	<0.04	<0.04	0.32	7.77	N/A	0.57	0.71	<0.2	<0.2	<0.03	<0.03	0.5	2.41
SACRAMENTO R OPP MOULTON WR	1/26/10 8:45	0.077	4.39	1.92	204	N/A	3.62	25.6	0.23	0.26	<0.03	0.071	0.59	35.9
SACRAMENTO R OPP MOULTON WR	3/2/10 13:15	<0.04	0.604	0.96	45.5	N/A	2.53	4.77	0.24	0.27	<0.03	<0.03	0.84	7.53
SACRAMENTO R OPP MOULTON WR	3/24/10 7:10	<0.04	0.05	0.58	7.08	N/A	0.71	0.8	<0.2	<0.2	<0.03	<0.03	0.23	2.29
SACRAMENTO R OPP MOULTON WR	4/21/10 7:00	0.313	0.56	0.44	37.7	N/A	0.72	4.76	<0.2	0.21	<0.03	<0.03	0.24	7.17
SACRAMENTO R OPP MOULTON WR	5/26/10 7:00	0.048	0.05	0.32	4.64	N/A	0.6	0.73	<0.2	<0.2	<0.03	<0.03	0.42	2.29
SACRAMENTO R OPP MOULTON WR	6/30/10 7:00	<0.04	<0.04	0.28	5.87	N/A	0.73	0.87	<0.2	<0.2	<0.03	<0.03	0.56	2.17
SACRAMENTO R OPP MOULTON WR	7/28/10 8:40	<0.04	0.066	0.33	5.81	N/A	0.86	1.01	<0.2	<0.2	<0.03	<0.03	0.73	2.23
SACRAMENTO R OPP MOULTON WR	8/31/10 10:10	<0.04	0.043	0.5	6.58	N/A	0.8	1.04	<0.2	<0.2	<0.03	<0.03	0.51	1.99
SACRAMENTO R OPP MOULTON WR	10/26/10 8:00	<0.04	0.556	2.25	34	N/A	1.45	3.88	<0.2	0.27	<0.03	<0.03	1.3	6.87
SACRAMENTO R OPP MOULTON WR	11/30/10 8:50	<0.04	0.046	0.58	6.62	N/A	1.33	1.37	<0.2	<0.2	<0.03	<0.03	1.15	2.82
SACRAMENTO R OPP MOULTON WR	12/13/10 11:20	<0.04	0.149	0.6	11.3	N/A	0.62	1.12	<0.2	<0.2	<0.03	<0.03	0.13	2.89
SACRAMENTO R OPP MOULTON WR	1/18/11 10:45	<0.04	0.399	0.83	24.2	N/A	0.88	2.81	<0.2	0.22	<0.03	0.042	1.03	4.83
	Maximum	0.852	4.8	35.8	381	38	6.92	44.5	0.32	0.53	0.04	0.088	10.4	56.8
	Mediam	0.058	0.095	1.335	10.7	1.1	1.01	1.52	0.215	0.26	0.0155	0.047	0.515	2.69
	Minimum	0.008	0.039	0.1	2.63	0.39	0.52	0.71	0.1	0.15	0.002	0.007	0.13	0.88
SWRCB Basin Plan - Drinking Water Standards -Primary MCL														
SWRCB Basin Plan - Drinking Water Standards -Secondary MCL				50										
Cal EPA/OEHHA - California Public Health Goal		0.02					12							
USEPA Secondary MCL														
Cal EPA - One in a million incremental cancer risk estimate for drinking water		4.1												
USEPA Health Advisory for drinking water				300										
USEPA IRIS Reference Dose Drinking Water Health Advisories														
California Proposition 65 Safe Harbor Level - Max Allowable dose level for reproductive toxicity		0.025												
Agriculture Water Quality Goals - Taste and odor threshold				200										
California Toxics Rule Sources of Drinking Water						0.05								
National Academy of Sciences Drinking Water Health Advisories														
National Recommended WQ Criteria - Taste and Odor or Welfare				50										
National Recommended WQ Criteria - Human Health and Welfare protection - water and fish consumption														
National Recommended WQ Criteria - Freshwater Aquatic Life Continuous Concentration						0.77								
National Recommended WQ Criteria - Freshwater Aquatic Life Maximum Concentration						1.4								

Table 5. Stone Corral C nr SI, Part 1 of 2

Station Name	Sample Date	Dissolved Aluminum µg/L	Total Aluminum µg/L	Dissolved Arsenic µg/L	Total Arsenic µg/L	Dissolved Boron mg/L	Dissolved Cadmium µg/L	Total Cadmium µg/L	Dissolved Chromium µg/L	Total Chromium µg/L	Dissolved Copper µg/L	Total Copper µg/L	Dissolved Iron µg/L	Total Iron µg/L
STONE CORRAL C NR SI	5/27/98 10:20	N/A	N/A	N/A	N/A	0.4	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
STONE CORRAL C NR SI	3/5/01 15:45	N/A	N/A	N/A	N/A	<0.1	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
STONE CORRAL C NR SI	4/9/01 9:00	N/A	N/A	N/A	N/A	0.6	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
STONE CORRAL C NR SI	2/20/02 11:30	N/A	N/A	N/A	N/A	0.4	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
STONE CORRAL C NR SI	3/7/02 9:30	N/A	N/A	N/A	N/A	0.5	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
STONE CORRAL C NR SI	3/18/02 11:20	N/A	N/A	N/A	N/A	0.5	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
STONE CORRAL C NR SI	4/10/02 16:45	N/A	N/A	N/A	N/A	0.6	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
STONE CORRAL C NR SI	5/13/02 8:45	N/A	N/A	N/A	N/A	0.7	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
STONE CORRAL C NR SI	12/18/02 15:15	N/A	N/A	N/A	N/A	0.2	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
STONE CORRAL C NR SI	1/9/03 12:15	N/A	N/A	N/A	N/A	0.3	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
STONE CORRAL C NR SI	1/23/03 10:50	N/A	N/A	N/A	N/A	0.1	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
STONE CORRAL C NR SI	2/6/03 10:00	N/A	N/A	N/A	N/A	0.3	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
STONE CORRAL C NR SI	3/11/03 14:25	N/A	N/A	N/A	N/A	0.5	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
STONE CORRAL C NR SI	3/17/03 11:45	N/A	N/A	N/A	N/A	0.2	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
STONE CORRAL C NR SI	4/8/03 13:10	N/A	N/A	N/A	N/A	0.5	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
STONE CORRAL C NR SI	4/28/03 11:00	N/A	N/A	N/A	N/A	0.6	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
STONE CORRAL C NR SI	5/14/03 12:40	3.68	51.9	1.94	2.34	0.6	0.079	0.03	8.1	6.51	4.46	4.69	<3.31	59.5
STONE CORRAL C NR SI	1/6/04 11:30	143	559	1.4	1.45	0.2	<0.008	<0.016	3.4	3.64	2.25	3.28	92.3	691
STONE CORRAL C NR SI	2/4/04 13:00	1399	2065	1.34	1.46	0.2	<0.011	0.016	2.76	3.06	4.71	4.75	1289	1600
STONE CORRAL C NR SI	2/17/04 13:30	1280	6149	1.26	1.91	<0.1	<0.015	0.025	5.74	11	5.45	14.9	966	7420
STONE CORRAL C NR SI	3/8/04 12:45	42.5	55.5	0.719	0.97	0.3	0.006	0.013	1.62	1.86	1.56	1.95	15.5	59
STONE CORRAL C NR SI	4/7/04 10:15	4.17	49.5	1.01	1.27	0.4	<0.005	<0.006	3.6	3.62	2.36	3.01	<2.76	67.1
STONE CORRAL C NR SI	5/5/04 11:50	1.75	3.71	2.21	2.25	0.6	0.011	0.021	6.05	6.49	3.18	3.24	<3.75	10.5
STONE CORRAL C NR SI	10/5/04 14:30	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
STONE CORRAL C NR SI	11/8/04 9:50	5.18	19.8	8.84	9.86	1	0.187	0.195	7	7.37	3	7.65	23.4	67.3
STONE CORRAL C NR SI	12/7/04 12:45	21.9	134	5.05	5.2	0.6	0.176	0.36	5.97	8.43	3.75	4.04	11.8	175
STONE CORRAL C NR SI	1/10/05 13:30	458	1369	1.06	1.23	0.2	0.035	0.037	2.74	3.67	2.72	3.74	331	1285
STONE CORRAL C NR SI	2/2/05 10:45	121	182	1.19	1.19	0.3	0.104	0.524	2.72	2.87	1.84	2.03	73.8	178
STONE CORRAL C NR SI	3/10/05 13:00	4.5	23.6	1.19	1.26	<0.1	0.082	0.13	3.28	3.72	1.86	2.21	<3.34	32.1
STONE CORRAL C NR SI	4/19/05 7:20	4.24	4.98	1.25	1.36	0.5	0.028	0.031	4.9	4.92	1.79	2.56	<5.67	<3.58
STONE CORRAL C NR SI	5/19/05 9:50	2.52	6.37	1.65	1.8	0.4	<0.058	<0.015	3.47	4.86	1.93	2.69	<4.53	11.1
STONE CORRAL C NR SI	6/28/05 13:30	4	4.44	2.01	2.57	0.7	0.036	0.04	0.93	4.4	2.21	3.3	10.5	12.2
STONE CORRAL C NR SI	7/24/05 0:00	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
STONE CORRAL C NR SI	8/22/05 0:00	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
STONE CORRAL C NR SI	9/26/05 0:00	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
STONE CORRAL C NR SI	10/24/05 0:00	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
STONE CORRAL C NR SI	11/14/05 9:35	2.27	2.66	8.32	8.66	0.8	<0.009	<0.009	3.78	3.87	4	4.13	26	36.2
STONE CORRAL C NR SI	12/14/05 10:15	2.94	3.44	6.79	7.14	0.7	0.011	0.014	5.18	8.08	1.88	4.38	33.1	41
STONE CORRAL C NR SI	1/24/06 11:45	23.1	28.1	1.76	1.81	0.4	<0.002	<0.002	5.42	5.65	1.65	2.96	14.3	40
STONE CORRAL C NR SI	2/22/06 9:45	7.08	9.09	1.79	1.84	0.5	<0.009	<0.009	7.91	8.93	2.49	2.75	7.9	20.6
STONE CORRAL C NR SI	3/1/06 10:25	1991	2268	1.41	1.49	0.2	0.011	0.051	4.32	4.57	5	5.77	1370	2282
STONE CORRAL C NR SI	4/17/06 8:30	206	265	0.77	0.774	0.2	<0.1	<0.1	1.27	1.42	1.38	1.48	181	236
STONE CORRAL C NR SI	5/17/06 10:00	2.37	4.04	1.75	1.81	0.4	<0.1	<0.1	4.03	4.28	1.78	1.98	0.7	4.3
STONE CORRAL C NR SI	6/27/06 9:00	1.39	34	3.08	3.53	0.6	<0.1	<0.1	1.05	1.48	1.26	1.99	22.9	70.5
STONE CORRAL C NR SI	7/26/06 0:00	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
STONE CORRAL C NR SI	10/24/06 0:00	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
STONE CORRAL C NR SI	12/12/06 10:30	135	598	6.74	9.96	0.8	<0.1	<0.1	5.1	9.05	4.32	6.1	53.2	222
STONE CORRAL C NR SI	1/9/07 11:30	11.1	74.1	5.49	5.7	0.7	<0.1	<0.1	4	4.83	1.82	1.94	42.7	117
STONE CORRAL C NR SI	2/27/07 8:30	34.6	36.9	3.41	3.86	0.6	<0.1	<0.1	0.98	1.69	3.9	3.96	57.9	81.1
STONE CORRAL C NR SI	3/20/07 9:50	5.74	64.1	3.26	3.49	0.7	<0.1	<0.1	0.66	1.03	1.1	1.35	61.1	215
STONE CORRAL C NR SI	4/18/07 8:00	4.48	16.4	4.19	4.38	0.7	<0.1	<0.1	0.91	0.97	0.69	0.83	47.3	89.4
STONE CORRAL C NR SI	5/30/07 0:00	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
STONE CORRAL C NR SI	8/28/07 0:00	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
STONE CORRAL C NR SI	9/13/07 0:00	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
STONE CORRAL C NR SI	10/31/07 0:00	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
STONE CORRAL C NR SI	1/23/08 11:30	9.77	3188	1.41	2.23	0.1	<0.1	<0.1	0.41	8.39	5.11	10.8	42.3	3247
STONE CORRAL C NR SI	2/27/08 10:05	1.94	770	1.12	1.4	0.2	<0.1	<0.1	0.23	1.87	2.49	3.5	4.1	634
STONE CORRAL C NR SI	3/26/08 9:10	0.94	33.5	1.57	2.15	0.4	<0.1	<0.1	0.36	0.49	2.97	3.01	2.7	62.7
STONE CORRAL C NR SI	4/23/08 9:50	1.73	50.6	2.63	2.97	0.6	<0.1	<0.1	0.53	0.55	3.82	3.86	7.9	78.4
STONE CORRAL C NR SI	7/23/08 0:00	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
STONE CORRAL C NR SI	4/22/09 0:00	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
STONE CORRAL C NR SI	5/28/09 0:00	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
STONE CORRAL C NR SI	6/25/09 0:00	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
STONE CORRAL C NR SI	7/28/09 0:00	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
STONE CORRAL C NR SI	8/27/09 0:00	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
STONE CORRAL C NR SI	9/24/09 9:00	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
STONE CORRAL C NR SI	10/21/09 0:00	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
STONE CORRAL C NR SI	11/18/09 0:00	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
STONE CORRAL C NR SI	12/9/09 0:00	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
STONE CORRAL C NR SI	1/26/10 10:45	27.1	3100	0.682	1.42	0.1	<0.1	<0.1	0.26	7.11	3.01	9.95	54.8	33.5
STONE CORRAL C NR SI	3/2/10 12:20	3.34	960	1.16	1.45	0.2	<0.1	<0.1	0.27	2.29	2.85	4.4	11.5	894
STONE CORRAL C NR SI	3/24/10 9:05	0.66	8.66	1.85	1.87	0.5	<0.1	<0.1	0.43	0.47	2.34	2.41	3	19.2
STONE CORRAL C NR SI	4/21/10 9:00	3.61	175	0.961	1.12	0.4	<0.1	<0.1	0.48	0.73	2.21	2.86	3.8	225
STONE CORRAL C NR SI	5/26/10 8:50	1.45	1.46	4.07	4.12	0.6	<0.1	<0.1	0.62	0.68	2.28	2.39	1.4	5.1
STONE CORRAL C NR SI	6/29/10 0:00	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
STONE CORRAL C NR SI	8/31/10 0:00	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
STONE CORRAL C NR SI	10/26/10 0:00	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
STONE CORRAL C NR SI	11/30/10 10:30	2.35	6.7	6.04	6.24	0.8	<0.1	<0.1	2.2	2.44	2.79	3.04	9.9	48.4
STONE CORRAL C NR SI	12/13/10 10:10	1.23	2.25	6	6.22	0.7	<0.1	<0.1	3.55	3.73	4.11	4.22	5.2	19.6
STONE CORRAL C NR SI	1/18/11 12:25	3.06	105	2.07	2.14	0.4	<0.1	<0.1	0.74	0.91	2.82	2.99	9.2	131
	Maximum	1991	6149	8.84	9.96	1	0.187	0.524	8.1	11	5.45	14.9	1370	7420
	Median	4.36	50.05	1.775	2.025	0.5	0.0355	0.034	2.75	3.695	2.49	3.14	23.15	70.5
	Minimum	0.66	1.46	0.682	0.774	0.1	0.006	0.013	0.23	0.47	0.69	0.83	0.7	4.3

Criteria	Dissolved Aluminum	Total Aluminum	Dissolved Arsenic	Total Arsenic	Dissolved Boron	Dissolved Cadmium	Total Cadmium	Dissolved Chromium	Total Chromium	Dissolved Copper	Total Copper	Dissolved Iron	Total Iron
SWRCB Basin Plan - Drinking Water Standards -Primary MCL	1000												
SWRCB Basin Plan - Drinking Water Standards -Secondary MCL	200											300	
Cal EPA/OEHHA - California Public Health Goal	600		0.004			0.04							
USEPA Secondary MCL													
Cal EPA - One in a million incremental cancer risk estimate for drinking water			0.023			0.0023							
USEPA Health Advisory for drinking water	50		0.02										
California Proposition 65 Safe Harbor Level - Max. Allowable dose level for reproductive toxicity			0.05										
California Toxics Rule Sources of Drinking Water													
California Toxics Rule Freshwater Aquatic Life Protection Continuous Concentration													
California Toxics Rule Freshwater Aquatic Life Protection Maximum Concentration													
Agriculture Water Quality Goals - Taste and odor threshold			100		0.7							5000	
California Notification Level - Drinking Water					1								
National Academy of Sciences Health Advisory for Drinking Water	5000												
USEPA IRIS Reference Dose Drinking Water Health Advisory			2.1										
National Recommended WQ Criteria - Taste and Odor or Welfare												300	
National Recommended WQ Criteria - Human Health and Welfare protection - water and fish consumption													
National Recommended WQ Criteria - Freshwater Aquatic Life Continuous Concentration	87											1000	
National Recommended WQ Criteria - Freshwater Aquatic Life Maximum Concentration	750												

Table 5. Stone Corral C nr SI, Part 2 of 2

Station Name	Sample Date	Dissolved Lead µg/L	Total Lead µg/L	Dissolved Manganese µg/L	Total Manganese µg/L	Total Mercury ng/L	Dissolved Nickel µg/L	Total Nickel µg/L	Dissolved Selenium µg/L	Total Selenium µg/L	Dissolved Silver µg/L	Total Silver µg/L	Dissolved Zinc µg/L	Total Zinc µg/L
STONE CORRAL C NR SI	5/27/98 10:20	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
STONE CORRAL C NR SI	3/5/01 15:45	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
STONE CORRAL C NR SI	4/9/01 9:00	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
STONE CORRAL C NR SI	2/20/02 11:30	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
STONE CORRAL C NR SI	3/7/02 9:30	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
STONE CORRAL C NR SI	3/18/02 11:20	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
STONE CORRAL C NR SI	4/10/02 16:45	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
STONE CORRAL C NR SI	5/13/02 8:45	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
STONE CORRAL C NR SI	12/18/02 15:15	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
STONE CORRAL C NR SI	1/9/03 12:15	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
STONE CORRAL C NR SI	1/23/03 10:50	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
STONE CORRAL C NR SI	2/6/03 10:00	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
STONE CORRAL C NR SI	3/11/03 14:25	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
STONE CORRAL C NR SI	3/17/03 11:45	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
STONE CORRAL C NR SI	4/8/03 13:10	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
STONE CORRAL C NR SI	4/28/03 11:00	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
STONE CORRAL C NR SI	5/14/03 12:40	0.058	0.042	0.17	9.03	N/A	2.57	3.14	7.33	7.37	0.131	<0.197	0.86	1.25
STONE CORRAL C NR SI	1/6/04 11:30	0.036	0.256	9.48	42.9	N/A	2.32	3.56	3.02	3.07	<0.007	<0.014	0.46	2.74
STONE CORRAL C NR SI	2/4/04 13:00	0.266	0.507	13.1	32.3	N/A	3.27	3.79	0.66	1.25	<0.015	0.207	4.24	5.21
STONE CORRAL C NR SI	2/17/04 13:30	0.782	2.91	36.1	203	N/A	3.58	15.8	0.26	0.38	<0.016	0.056	4.53	24.9
STONE CORRAL C NR SI	3/8/04 12:45	0.009	0.094	1.66	3.57	N/A	2.11	2.32	1.34	2.38	0.054	0.09	0.82	1.05
STONE CORRAL C NR SI	4/7/04 10:15	0.05	0.065	1.15	4.6	N/A	2.4	2.58	4.26	4.48	0.03	<0.031	1.3	1.65
STONE CORRAL C NR SI	5/5/04 11:50	0.035	0.038	0.85	2.41	N/A	2.82	2.85	8.2	8.22	0.09	<0.044	1.38	1.4
STONE CORRAL C NR SI	10/5/04 14:30	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
STONE CORRAL C NR SI	11/8/04 9:50	0.059	0.142	27.2	43.1	N/A	4.98	9.72	30	30.4	0.082	0.107	1.78	1.81
STONE CORRAL C NR SI	12/7/04 12:45	0.244	0.293	1.07	30.6	N/A	3.29	3.49	10.5	10.6	0.05	0.086	0.99	1.44
STONE CORRAL C NR SI	1/10/05 13:30	0.111	0.428	2.61	32.1	N/A	2.24	3.48	1.69	1.84	0.009	0.015	1.46	4.64
STONE CORRAL C NR SI	2/2/05 10:45	0.095	0.117	7.35	19.8	N/A	2.15	2.63	2.32	2.87	0.004	0.007	0.99	1.45
STONE CORRAL C NR SI	3/10/05 13:00	0.05	0.057	1.17	6.21	N/A	1.53	2.29	3	3	<0.001	<0.036	0.73	3.86
STONE CORRAL C NR SI	4/19/05 7:20	0.054	0.147	2.44	3.02	N/A	2.12	2.15	4.22	5.06	<0.003	<0.005	0.81	0.88
STONE CORRAL C NR SI	5/19/05 9:50	0.006	0.038	0.73	2.12	N/A	1.43	2.09	4.07	4.46	<0.009	0.021	0.7	0.74
STONE CORRAL C NR SI	6/28/05 13:30	0.094	0.099	2.4	6.88	N/A	1.96	2.45	5.68	5.9	0.05	0.173	0.91	1.72
STONE CORRAL C NR SI	7/24/05 0:00	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
STONE CORRAL C NR SI	8/22/05 0:00	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
STONE CORRAL C NR SI	9/26/05 0:00	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
STONE CORRAL C NR SI	10/24/05 0:00	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
STONE CORRAL C NR SI	11/14/05 9:35	0.007	0.008	20.3	21.2	N/A	7.73	8.27	20.6	20.7	<0.009	<0.009	1.55	1.57
STONE CORRAL C NR SI	12/14/05 10:15	0.008	0.014	17.1	19	N/A	8	8.64	21.4	22.6	<0.001	0.041	1.04	1.36
STONE CORRAL C NR SI	1/24/06 11:45	0.013	0.021	29.4	32.6	N/A	3.34	3.9	5.53	5.63	<0.005	0.011	0.84	0.87
STONE CORRAL C NR SI	2/22/06 9:45	<0.045	0.009	8.96	13.9	N/A	3.57	3.39	6.31	7.05	<0.009	<0.009	0.91	1.03
STONE CORRAL C NR SI	3/1/06 10:25	0.536	1.38	29.8	46.9	N/A	4.79	5.55	0.8	1.06	<0.009	<0.009	6.47	7.11
STONE CORRAL C NR SI	4/17/06 8:30	0.054	0.089	9.99	14.1	N/A	2.65	3.23	1.75	1.99	<0.03	<0.03	1.27	1.61
STONE CORRAL C NR SI	5/17/06 10:00	<0.04	<0.04	1.65	1.73	N/A	1.59	1.98	5.38	5.93	<0.03	<0.03	0.9	0.93
STONE CORRAL C NR SI	6/27/06 9:00	<0.04	<0.04	8.27	39.4	N/A	2.15	3.46	3.58	3.97	0.087	0.165	0.6	0.64
STONE CORRAL C NR SI	7/26/06 0:00	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
STONE CORRAL C NR SI	10/24/06 0:00	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
STONE CORRAL C NR SI	12/12/06 10:30	<0.04	0.122	18.5	71.3	N/A	4.37	6.92	15.6	21.8	<0.03	<0.03	0.79	3.78
STONE CORRAL C NR SI	1/9/07 11:30	0.2	0.215	32.8	80.2	0.29	3.07	3.23	19.6	20.6	<0.03	<0.03	1.04	2.53
STONE CORRAL C NR SI	2/27/07 8:30	0.05	0.121	28	29.3	N/A	2.59	3.79	9.75	13.7	<0.03	<0.03	1.32	3.01
STONE CORRAL C NR SI	3/20/07 9:50	<0.04	0.062	35.3	89.4	0.92	1.2	1.44	6.1	7.26	<0.03	<0.03	0.97	2.79
STONE CORRAL C NR SI	4/18/07 8:00	0.06	0.068	25.6	41.4	2.3	1.3	1.38	5.73	5.93	<0.03	<0.03	1.03	2.42
STONE CORRAL C NR SI	5/30/07 0:00	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
STONE CORRAL C NR SI	8/28/07 0:00	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
STONE CORRAL C NR SI	9/13/07 0:00	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
STONE CORRAL C NR SI	10/31/07 0:00	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
STONE CORRAL C NR SI	1/23/08 11:30	0.06	2.04	2.41	92.6	N/A	3.43	9.39	0.65	0.9	<0.03	0.033	0.5	16.3
STONE CORRAL C NR SI	2/27/08 10:05	<0.04	0.272	0.54	30.8	N/A	1.66	2.46	2.2	2.5	<0.03	<0.03	0.64	4.66
STONE CORRAL C NR SI	3/26/08 9:10	<0.04	0.064	1.63	27.9	N/A	2.13	3.1	3.53	4.02	<0.03	<0.03	0.8	2.42
STONE CORRAL C NR SI	4/23/08 9:50	0.046	0.059	8.33	19.1	N/A	3.77	3.86	9.54	9.75	<0.03	<0.03	1.28	2.94
STONE CORRAL C NR SI	7/23/08 0:00	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
STONE CORRAL C NR SI	4/22/09 0:00	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
STONE CORRAL C NR SI	5/28/09 0:00	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
STONE CORRAL C NR SI	6/25/09 0:00	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
STONE CORRAL C NR SI	7/28/09 0:00	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
STONE CORRAL C NR SI	8/27/09 0:00	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
STONE CORRAL C NR SI	9/24/09 9:00	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
STONE CORRAL C NR SI	10/21/09 0:00	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
STONE CORRAL C NR SI	11/18/09 0:00	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
STONE CORRAL C NR SI	12/9/09 0:00	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
STONE CORRAL C NR SI	1/26/10 10:45	<0.04	1.91	1.52	106	N/A	4.36	8.87	0.59	0.63	<0.03	<0.03	0.86	16.1
STONE CORRAL C NR SI	3/2/10 12:20	<0.04	0.438	0.69	46.6	N/A	2.29	2.98	2.02	2.54	<0.03	<0.03	1.08	5.48
STONE CORRAL C NR SI	3/24/10 9:05	<0.04	<0.04	2.65	14.4	N/A	1.57	2.33	4.97	5.56	<0.03	<0.03	1.04	2.44
STONE CORRAL C NR SI	4/21/10 9:00	<0.04	0.087	1.64	12.6	N/A	1.51	1.98	2.93	3	<0.03	<0.03	1.06	2.7
STONE CORRAL C NR SI	5/26/10 8:50	<0.04	<0.04	0.14	1.34	N/A	2	2.06	4.31	4.4	<0.03	<0.03	1.85	2.52
STONE CORRAL C NR SI	6/29/10 0:00	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
STONE CORRAL C NR SI	8/31/10 0:00	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
STONE CORRAL C NR SI	10/26/10 0:00	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
STONE CORRAL C NR SI	11/30/10 10:30	<0.04	<0.04	63.4	75.9	N/A	2.04	2.1	1.36	1.42	<0.03	<0.03	2.7	3.76
STONE CORRAL C NR SI	12/13/10 10:10	<0.04	<0.04	0.29	16	N/A	1.93	2.61	1.74	1.88	0.089	0.12	2.17	2.5
STONE CORRAL C NR SI	1/18/11 12:25	<0.04	0.057	38.2	78.8	N/A	1.25	1.72	3.43	3.5	0.064	0.347	1.42	1.79
	Maximum	0.782	2.91	63.4	203	2.3	8	15.8	30	30.4	0.131	0.347	6.47	24.9
	Median	0.054	0.0965	5	28.6	0.92	2.305	3.12	4.145	4.43	0.059	0.086	1.035	2.43
	Minimum	0.006	0.008	0.14	1.34	0.29	1.2	1.38	0.26	0.38	0.004	0.007	0.46	0.64
SWRCB Basin Plan - Drinking Water Standards -Primary MCL														
SWRCB Basin Plan - Drinking Water Standards -Secondary MCL				50										
Cal EPA OEHHA - California Public Health Goal		0.2					12		30					
USEPA Secondary MCL														
Cal EPA - One in a million incremental cancer risk estimate for drinking water														
USEPA Health Advisory for drinking water														
California Proposition 65 Safe Harbor Level - Max. Allowable dose level for reproductive tox		0.25												
California Toxics Rule Sources of Drinking Water						0.05								
California Toxics Rule Freshwater Aquatic Life Protection Continuous Concentration									5					
California Toxics Rule Freshwater Aquatic Life Protection Maximum Concentration									20					
Agriculture Water Quality Goals - Taste and odor threshold									20					
California Notification Level - Drinking Water														
National Academy of Sciences Health Advisory for Drinking Water														
USEPA IRIS Reference Dose Drinking Water Health Advisory														
National Recommended WQ Criteria - Taste and Odor or Welfare				50										
National Recommended WQ Criteria - Human Health and Welfare protection - water and														
National Recommended WQ Criteria - Freshwater Aquatic Life Continuous Concentration														
National Recommended WQ Criteria - Freshwater Aquatic Life Maximum Concentration														

Exhibit B

Comments of Jerry Boles on the RDEIR/SDEIS for the Sites Reservoir Project (2022)

From: Jerry Boles
To: EIR-EIS-Comments@SitesProject.org
Subject: Comments on Sites Reservoir Project Revised Draft EIR/Supplemental Draft EIS
Date: Wednesday, January 5, 2022 1:55:32 PM
Attachments: Sites DEIR 2.docx

Attached are my comments on the Sites Reservoir Project Revised Draft Environmental Impact Report/Supplemental Draft Environmental Impact Statement.

Jerry Boles

The Draft EIR is an improvement from the 2017 version in that it at least acknowledges some water quality issues, but continues to ignore other water quality issues, makes inaccurate and misleading statements, and offers conflicting and contradicting strategies to attempt to lessen significant and substantial adverse impacts.

The data in the WDL for the Sacramento River and Cottonwood Creek demonstrate that high concentrations of metals can be expected during the high flow months of winter (December through March) when diversions would be occurring to the proposed Sites Reservoir. Higher concentrations of metals are likely during the higher flows that can occur during these months. Such higher flows were not targeted by the limited sampling effort presented in the WDL. The high concentrations of metals in the source water will adversely impact water quality in the proposed reservoir for most, if not all, the proposed beneficial uses of the stored water.

Some metals from both the Sacramento River and Cottonwood Creek, whose concentrations did not exceed criteria in the limited sampling effort, had concentrations that nearly exceed the criteria and standards. These and other metals whose concentrations did not exceed the criteria may have higher concentrations during the higher flow periods that the proposed project would be diverting. Again, these higher flow periods were not targeted during the limited sampling effort.

Even some of the minimum concentrations of metals found in the source waters exceed criteria and standards, which means that the source waters never meet these goals and standards – the criteria are always exceeded and the water is never suitable for the beneficial use or uses the criteria or standards were designed to protect. Water quality in the proposed reservoir for these parameters will exceed the criteria and standards all the time.

Since water quality in the proposed reservoir will reflect that of the source waters, the reservoir will have concentrations of numerous metals, including aluminum, arsenic, cadmium, chromium, copper, iron, lead, manganese, mercury, nickel, selenium, silver, and zinc, that exceed a number of criteria and standards developed to protect beneficial uses. In addition, other metals that may not exceed criteria and standards in the source waters may adversely affect reservoir water quality due to synergistic effects. The State Water Resources Control Board (SWRCB 2011) states that "when multiple constituents have been found together in groundwater or surface waters, their combined toxicity should be evaluated" and that "theoretical risks from chemicals found together in a water body shall be considered additive for all chemicals having similar toxicologic effects or having carcinogenic effects." Thus, the adverse effects from the metals delivered to the proposed reservoir from the source waters may have an even greater adverse impact and pose an unacceptable level of risk. Beneficial uses potentially impacted by metals in the proposed reservoir include agricultural water supply (direct toxicity or uptake by crops making the crops unsuitable for use), wildlife (such as fish-eating birds), fisheries, recreation (including sport fishing and water contact activities such as swimming), and drinking water supplies for communities that divert water from the Sacramento River.

Releases from the proposed reservoir would occur during the summer when metals concentrations in the Sacramento River are much lower due to the majority of flow being from Shasta Reservoir, with much better water quality, though still carrying a metals load. High metals concentrations in the proposed reservoir releases could adversely affect water quality in the Sacramento River during the summer months by increasing metals loads beyond acceptable limits and adversely impact beneficial uses.

Though high concentrations of metals that exceed water quality criteria exist in source waters to the proposed project, they cannot be regulated by governmental entities since they are natural occurrences. However, once contained artificially in a reservoir, they are subject to jurisdictional control by regulatory agencies. Any releases of water from the proposed reservoir will likely be subject to review by water quality regulatory agencies to ensure that such releases do not adversely affect downstream resources due to the heavy metals loads in the releases. The SWRCB has an antidegradation policy that prohibits discharges that would degrade water quality to a level below water quality objectives because no capacity would exist for degradation that will be caused by the next downstream or downgradient uses – the ability to beneficially use the water would have been impaired, even though water quality objectives would not yet have been exceeded (SWRCB 2011). The contribution of additional metal loads from releases from the proposed Sites Reservoir during the summer could cause concentrations of metals in the Sacramento River to exceed criteria and standards or at least be subject to the antidegradation policy due to an incremental increase in metals in the Sacramento River from the proposed project. Thus, the proposed project may face prohibition of releases if stored water does not meet water quality criteria or standards or if releases can cause criteria or standards to be exceeded by downstream inputs (i.e., antidegradation poicy).

During dry years, the adverse impacts associated with the project can be expected to be even greater. Flows in the Sacramento River from upstream reservoirs on the Sacramento River (i.e., Shasta Reservoir, Whiskeytown Reservoir) will be minimized during the winter months in an effort to restore water storage levels in those reservoirs. Likewise, during wet or even normal runoff years, releases from the upstream reservoirs during the winter will be curtailed during high runoff periods to prevent downstream flooding. In any of these scenarios, tributary influences, such as Cottonwood Creek, on water quality in the Sacramento River will be much greater. The proposed project would still attempt to capture as much runoff from the Sacramento River as possible, but the water diverted to the proposed project will have even greater concentrations of metals due to the majority of flow being from tributary streams (e.g., Cottonwood Creek) during dry and possibly even wet or normal runoff years.

Similarly, during the summer in dry years, releases from upstream reservoirs (i.e., Shasta Reservoir, Whiskeytown Reservoir) will be minimized. Releases to the Sacramento River from the proposed project (whether directly to the Sacramento River or indirectly through the CBD or GCID) will have a greater impact on water quality in the Sacramento River due to less dilution being available due to curtailed flows in the river from upstream reservoirs (i.e., Shasta and Whiskeytown reservoirs).

The limited data that are available are sufficient to show that water quality in the proposed reservoir will have concentrations of a large number of metals that exceed many water quality criteria and standards, including those established for the protection of agricultural water supply, wildlife and fisheries, and drinking water. Metals bioaccumulation in the reservoir food web could produce adverse impacts to fish-eating birds and other animals, as well as humans, and adversely affect any potential recreational benefit from the project. Releases from the proposed reservoir could adversely affect downstream resources, including agricultural water supply, wildlife and fisheries, and drinking water supplies for communities that divert water from the Sacramento River.

The Basin Plan lists other chemicals that adversely affect water quality in the Sacramento River, including chlorpyrifos and diazinon. The California State Water Resources Control Board lists a number of other "constituents of concern" in the study area, including chlordane, DDT, mercury, PCBs, and dieldrin. In addition, sewer outfalls from the cities of Redding and Red Bluff contribute other contaminants, such as pharmaceuticals, to the Sacramento River. Other than diazinon and a brief discussion of chlorpyrifos, DDT, and dieldrin, no information is provided in the EIR about effects to the proposed project from these chemical contaminants.

Chapter 6. Surface Water Quality

p. 6-2 and 6-3: Table 6-1b summarizes operation impacts for surface water quality resources. Impact WQ-2 (Violate any water quality standards or waste discharge requirements or otherwise substantially degrade surface water quality during operation) is identified as CEQA significant and unavoidable (SU) and NEPA substantial adverse effect (SA) for all alternatives. Yet, somehow this is deemed as not conflicting with or obstructing implementation of a water quality control plan (Impact WQ-5). Since, as identified as Impact WQ-2, the project will violate water quality standards of the Central Valley Water Quality Control Plan (Basin Plan), this is obviously a significant impact and substantial adverse effect which conflicts with the Basin Plan.

p. 6-19: "Mean mercury concentrations in Shasta Lake and in the Sacramento River at Red Bluff and Hamilton City are substantially lower than the CTR criterion for mercury in freshwater (50 nanograms per liter [ng/L])." The Sites Reservoir project will not be diverting "mean" concentrations of mercury (or any other constituent), but rather the higher concentrations of constituents generally associated with the higher flows from which the project will be diverting. In the Sacramento River at Hamilton City, Table 6-5 shows that total mercury concentrations have been measured as high as 54 ng/L, which are higher than the CTR criterion of 50 ng/L, and raise concern for significant and substantial adverse effects when waters with these types of concentrations are diverted into the reservoir.

Table 6-5 also shows that total mercury concentrations have been measured as high as 14.4 ng/L in the Sacramento River at Red Bluff but only 0.52 ng/L in Lake Oroville. Yet these relatively low concentrations of total mercury from the water in Lake Oroville have been sufficient to cause fish from this reservoir to exceed the numeric criterion and objectives for all trophic levels of fish, including both sport and prey fish, for the protection of human health and wildlife as contained in the Sacramento–San Joaquin River Delta Estuary TMDL for Methylmercury and Water Quality Control Plan for Inland Surface Waters, Enclosed Bays, and Estuaries of California—Tribal and Subsistence Fishing Beneficial Uses and Mercury Provisions. Fish tissue concentrations as high as 0.7 mg/kg have been found in fish from Lake Oroville (DWR 2007). Since mercury concentrations of up to only 0.52 ng/L in Lake Oroville have been sufficient to cause numeric criterion and objectives to be exceeded in this reservoir, concentrations of mercury as high as 14.4 ng/L in water diverted to the proposed reservoir from the Sacramento River at Red Bluff will undoubtedly cause highly significant impacts and substantial adverse effects in the proposed reservoir and in downstream releases.

The DEIR on page 6-17 states that "in newly constructed reservoirs, the initial inundation of soils and vegetation can cause higher net methylmercury production in early years after filling, when organic carbon is relatively abundant, relative to long-term average production. This initial spike in mercury methylation can increase the concentrations of water column methylmercury to double or triple the long-term average concentrations for up to 10 years." It also states that "the literature suggests that fish tissue concentrations of methylmercury may peak 3–8 years after filling, with concentrations slowly declining to a lower steady-state after 10–35 years." The data from Lake Oroville (which is over 50 years old) shows that even if the expected initially high mercury concentrations in the reservoir decline over time, the concentrations of mercury present in water that would be diverted to the reservoir from the Sacramento River at Red Bluff and especially at Hamilton City are sufficiently high to cause fish tissue methylmercury concentrations to exceed criterion for the protection of human health and wildlife, not just for 10 to 35 years, but for the life of the reservoir project.

The DEIR states on page 6-22 states that "the effects of mixtures of metals on organisms in the Sacramento River are poorly understood." Nonetheless, the SWRCB states that when multiple constituents are found together, the combined toxicity of the multiple constituents should be evaluated. "In the absence of scientifically valid data to the contrary, Section 2550.4(g) of Chapter 15. Article 5 regulations referenced in the SWRCB's Site Investigation and Cleanup Policy requires that theoretical risks from chemicals found together in a water body shall be considered additive for all chemicals having similar toxicological effects or having carcinogenic effects. This requirement is also found in the California hazardous waste management regulations (Title 22 of CCR, Secion 66264.94(f) and in the USEPA Risk Assessment Guidance for Superfund (RAGS)." This DEIR did not consider the combined effects of metals and is therefore deficient.

The DEIR states on page 6-22 that metal concentration measurements are shown in Appendix 6E but that "this is not an exhaustive presentation of all measurements, but instead is provided to show patterns of metal concentrations at the Sites Reservoir intake locations (near Red Bluff and Hamilton City), in the CBD, and upstream of one of the potential release locations (upstream of the CBD)." The DEIR should not selectively filter the available data in order to support its contentions, but should show all data even though the data may prove contentions incorrect.

The DEIR states on page 6-23 that "for most metals there is little difference in concentration between upstream and downstream locations on the Sacramento River." This is not true at all. Data in WDL show substantial differences between upstream and downstream locations. For example, comparing the data for the Sacramento River at Keswick to that at Red Bluff show total aluminum as 492 ug/L vs. 3,630 ug/L, total copper as 4 ug/L vs. 14.7 ug/L, total iron as 294 ug/L vs. 4,160 ug/L, and total lead as 1.56 ug/L vs. 3.14 ug/L, all substantial differences. The differences in concentrations for these and other constituents is attributed to tributary stream inflows, with the most significant in terms of both flow and contribution of these constituents being Cottonwood Creek.

The DEIR states on page 6-31 that “contaminated sediments could move into Sites Reservoir as suspended sediments during high flows, but the main supplies of contaminated sediments and their potential effects would remain in the Sacramento River channel because the amount of sediment contained in the diversions to Sites Reservoir would be small compared to what is contained in the Sacramento River channel.” The concentration of contaminated or suspended sediments would be exactly the same in the water diverted to Sites Reservoir and that in the Sacramento River at the point and time of diversion – there is no difference in sediment load. The only difference is that the Sacramento River will carry a substantially greater load of sediment due to the substantially greater flow in the Sacramento River than the amount of water diverted to the proposed reservoir.

The DEIR states on page 6-31 that “wind, rain, and wave action commonly erode bare soil adjacent to reservoirs and could cause erosion along the edge of Sites Reservoir when it is not full. These phenomena may temporarily increase turbidity along the reservoir’s edge prior to settling of the sediment, but this increase would not markedly affect beneficial uses of the reservoir (i.e., recreation, water supply, fisheries and wildlife).” Erosion of soils in the exposed inundation zone will re-suspend soils laden with metals and other contaminants, which may then contribute to impacts in the reservoir or downstream releases.

Page 6-33 states that “when Sites Reservoir would release water to the Sacramento River, it would constitute 6%–7% of the Sacramento River flow on average and 12%–13% when discharges are relatively high compared to river flow,” and therefore “water quality in Sites Reservoir would have limited effect on the water quality in the Sacramento River.” However, page 6-32 states that evapoconcentration could increase constituent concentrations in Sites Reservoir by up to 48%. Therefore, water released from Sites Reservoir to the Sacramento River could contribute higher concentrations of constituents such as metals. The DEIR does not evaluate the effects from these higher concentrations on water quality and beneficial uses of the Sacramento River. Also, during “operational exchanges” when additional water is released from Sites Reservoir and water is held back in Shasta or Oroville reservoirs, the percent of water from Sites Reservoir constituting the total flow in the Sacramento River will be increased, potentially adversely affecting water quality in the river and impacting downstream water users.

Page 6-37 discusses Harmful Algal Blooms in relation to “whether cyanobacteria and cyanotoxins may be released from the reservoir with dead pool withdrawals” and “the elevation of the low-level intake from which dead pool withdrawals would be released.” “Dead pool” usually refers to water in a reservoir that cannot be drained by gravity through a dam's outlet works. How is the project planning on withdrawing water from the dead pool?

Page 6-42 states that the “metals analysis relies on best available data provided by DWR’s WDL” and that “these data were collected intermittently over multiple years, with measurements representing a wide range of flow conditions.” This is not true. The statement of “best available data” is an attempt to portray the WDL data as robust, which it is not. While the data were collected “intermittently over multiple years,” the data are better described as “spotty.” Sample collection for this sparse data did not target a “wide range of flow conditions,” but rather were based on a fixed schedule regardless of flow conditions. The metals data from DWR’s Water Data Library (WDL) “provide a general understanding of how metal and pesticide concentrations may vary with flow and location, allow the identification of trends, and support the impact analysis and conclusion." Water quality data in the WDL for diversion locations of the project are extremely limited. From the Sacramento River below the Red Bluff Diversion Dam, only 26 samples were collected by DWR between the years of 2000 and 2020 (Table 1) during the project's primary months of diversion to storage (January through March, p. 6-32). In eight of the 20 years of data collection from this monitoring station, only one sample was collected during the primary months of diversion to storage; only two years saw four samples collected (both were drought years); in the remaining years only two to three samples were collected during the months of January through March. This pattern of data collection is even more sparse for the Sacramento River at Hamilton City (Table 2). Only 20 samples were collected from the Hamilton City monitoring site during the project's primary months of diversion to storage. Only one sample was collected from this site in 10 of the 20 years of data collection; three samples were collected in two of the monitoring years, and four samples were collected in one year (which was a drought year). This scant yearly data collection does not "provide a general understanding of how metal and pesticide concentrations may vary with flow and location, allow the identification of trends, and support the impact analysis and conclusion." Collection of these 26 samples was not timed to address variations in concentrations due to variations of flow, but were grab samples collected on a more or less set schedule without the intent to provide sufficient data for impact analysis for any type of storage project. Concentrations of many of the metals analyzed from these samples were found to be higher when flows were higher during sample collection. However, variation in concentrations due to flow was not considered during sample collection, and even higher concentrations of metals may be found with flows higher than those during the limited sample collection.

The project proposes to collect additional samples for metals at a frequency sufficient to better understand the relationship with variations in flow, but this is only after the project has been constructed. These post-project data would "refine the understanding of metals as more data would likely improve the accuracy of equations used in this analysis for estimating metal concentrations," which is commendable but too late to better understand the adverse effects prior to construction of the project. The project proponents have been pursuing this project for over 20 years. They were also made aware of water quality issues related to this project from comments on the 2017 DEIR, providing ample time for additional data collection to further elucidate the issues prior to preparation of the current DEIR, but no data were collected by the project proponents. Failing this, now they propose to collect this needed data but only after the project is completed to determine the severity of the problems. This is backwards. CEQA requires impact analysis prior to approval and construction of a project, not afterwards. This project should not be constructed and then data collected to see if it will work or to determine the adverse impacts, but rather data should be collected and evaluated prior to approval of this project to determine adverse impacts and potential mitigation.

Based on the limited available data, the project focuses on only four metals (aluminum, copper, iron, and lead) considered to be of greatest concern due to seasonal changes in concentration and concentrations above standards (p. 6-42). The only "standards" considered are a "California MCL," "California Secondary MCL," and Freshwater Chronic Standard for Aquatic Life Protection. There are a large number of other numeric water quality thresholds applicable to this project, including California and Federal Drinking Water Standards (MCLs), California Public

Health Goals (PHGs), California State Notification and Response Levels for Drinking Water, Suggested No-Adverse-Response Levels (SNARLs), Cancer Risk Estimates, Health-based criteria from USEPA Integrated Risk Information System (IRIS), Proposition 65 Safe Harbor Levels, California Toxics Rule Criteria to Protect Human Health and Aquatic Life, USEPA Recommended Criteria to Protect Human Health and Aquatic Life, Agricultural Use Protective Limits, and Taste and Odor Based Criteria. These assessment thresholds have been summarized by the SWRCB and are presented below in Tables 3 and 4. These are the thresholds to which the proposed project should be compared, but apparently not utilized in the DEIR analyses.

In addition to the four metals considered in the DEIR, arsenic, cadmium, manganese, nickel, and zinc concentrations in water from the Sacramento River below the Red Bluff Diversion Dam as well as at Hamilton City exceed various criteria (Tables 3 and 4). The tables also show potential metal concentrations in Sites Reservoir due to evapoconcentration, as discussed on page 6-32 of the DEIR.

Cottonwood Creek is the main tributary contributor to winter flows in the Sacramento River at Red Bluff and is primarily responsible for elevated metals concentrations in the river. As an example of the influence of Cottonwood Creek on metals concentrations in the Sacramento River at Red Bluff, on March 1, 2006 when the total aluminum concentration in Cottonwood Creek was measured as 3,739 ug/L, the concentration in the Sacramento River was 2,240 ug/L (Table 5). But, similar to previous monitoring in the Sacramento River, monitoring of Cottonwood creek did not target higher flows and even higher concentrations of metals are likely to be found with the higher flows. Nor did monitoring in Cottonwood Creek always coincide with sample collection in the Sacramento River. For example, on May 5, 2005, a total aluminum concentration of 14,345 ug/L was analyzed from Cottonwood Creek, but no corresponding sample was collected from the Sacramento River. Estimating the total aluminum concentration using the concentration reported from Cottonwood Creek multiplied by the ratio of concentrations in the Sacramento River and Cottonwood Creek ((Cottonwood Cr) x (Sacramento River/Cottonwood Creek)) from March 1, 2006 yields an estimated concentration in the Sacramento River of 8,594 ug/L for May 5, 2005. This total aluminum concentration is much higher than the few measured analyses from the Sacramento River, and serves to reiterate the likelihood that even higher concentrations of metals would undoubtedly be found with more frequent monitoring and targeting of higher flows, which are the flows that would be diverted to the proposed reservoir. This same relationship applies to other metals and demonstrates that the analysis in the DEIR was not “conservative” but used the little available data to underestimate metal concentrations likely to occur. Since the project proponents have failed to collect any water quality data in the 20 years they have been promoting this project, using data projections such as that discussed above is the most appropriate measure to arrive at a reasonable evaluation.

The concentration of metals in Sites Reservoir was then calculated using the projected maximum Sacramento River concentration and applying the 48 percent evapoconcentration factor described in the DEIR. Using the “conservative” approach of the DEIR, the projected metals concentrations in the Sacramento River at Hamilton City during the May through September release period was next calculated using the maximum metal concentrations in the Sacramento River at Hamilton City (from WDL). The projected metals concentrations in the river at Hamilton City were calculated using 13 percent of the Sites Reservoir concentration after evapoconentration (Table 5) and 87 percent of the Sacramento River at Hamilton City concentration (WDL). The Sacramento River at Hamilton City site was used with the assumption that water quality in the river at Hamilton City would be similar to downstream water quality near Dunnigan, the river release site for Alternative 2. The projected metals concentrations in the Sacramento River at Hamilton City, even with dilution of Sites Reservoir releases with Sacramento River water, exceed various water quality objectives or promulgated criteria (Table 6).

Similar results can be expected for discharges from Sites Reservoir to the Colusa Basin Drain. Table 6 shows that concentrations of metals in the CBD, when mixed with 13 percent of water from Sites Reservoir and assuming average metal concentrations in the CBD (p. 6E-10), exceed water quality objectives or promulgated criteria for aluminum, arsenic, copper, iron, lead, manganese, and nickel. Introduction of water from Sites Reservoir to the CBD results in even higher concentrations in the CBD of most metals, including aluminum, cadmium, chromium, copper, iron, lead, manganese, nickel, selenium, and zinc.

The "evaluation of concentration assuming no settling of suspended sediment" starting on page 6-44 used data from the "November–May period of higher flows and concentrations to better focus on the range of flows that may occur when Sacramento River water would be diverted to Sites Reservoir." This is inconsistent with other statements in the DEIR that state that the project's primary months of diversion to storage would be January through March (page 6-32).

The DEIR states the settling of sediment entering the reservoir would substantially reduce the concentration of metals (page 6-45). Though settling of sediment (and organic matter) entering the reservoir would reduce total metal concentrations, the DEIR does not take into account resuspension of settled sediments by winds or inundation zone erosion when the reservoir level is reduced. In addition, dissolution of metals from the bottom sediments under the anoxic conditions expected to occur in the reservoir can substantially increase metals concentrations in the hypolimnion, which will become distributed throughout the water column following fall turnover. "Settling in the reservoir of 95% or more of the sediment that enters the reservoir" would create a significant source for metals in the reservoir from resuspension or dissolution during certain times of the year.

Table 1. Water Quality Data from the Sacramento River below Red Bluff during the Primary Diversion Period of January through March (D=dissolved, T=total)

Sample Date	D-Aluminum ug/L	T-Aluminum ug/L	D-Arsenic ug/L	T-Arsenic ug/L	D-Cadmium ug/L	T-Cadmium ug/L	D-Chromium ug/L	T-Chromium ug/L	D-Copper ug/L	T-Copper ug/L	D-Iron ug/L	T-Iron ug/L
1/10/05	212	322	1.11	1.18	<0.011	<0.007	1.1	1.14	1.93	2.5	143	358
2/2/05	50.1	134	0.893	0.976	<0.011	<0.066	1.35	2.42	1.67	2.04	39.8	185
3/9/05	11	97.3	1.29	1.33	<0.033	<0.011	1.21	1.23	1.39	1.84	8.1	150
1/4/06	1081	2851	1.3	1.65	0.018	0.081	2.48	7.68	6.99	9.42	811	3925
1/24/06	273	347	0.94	1.05	0.018	0.036	1.26	1.32	1.74	2.23	166	394
2/21/06	131	154	0.702	0.789	0.013	0.016	0.97	0.98	1.08	1.21	76	162
3/1/06	1459	2240	0.857	1.06	0.017	0.055	2.75	6.1	2.59	6.09	878	2854
1/10/07	41.7	91.4	1.42	1.5	<0.1	<0.1	0.55	0.59	0.92	1.01	34.9	54.3
2/26/07	212	322	0.929	0.987	<0.1	<0.1	1.2	1.61	2.55	2.8	293	376
3/21/07	9.58	51	1.41	1.46	<0.1	<0.1	0.44	0.59	1.47	1.74	21.5	85.5
1/22/08	6.82	284	1.5	1.71	<0.1	<0.1	0.53	1.15	1.45	2.04	9.5	259
2/26/08	14.2	846	0.799	0.932	<0.1	<0.1	0.33	2.49	1.97	3.88	24.6	790
3/25/08	2.25	35	1.31	1.37	<0.1	<0.1	0.42	0.55	1.7	2.09	7.8	62
2/23/09	55.6	3630	0.519	1.33	<0.1	<0.1	0.4	6.67	2.54	9.81	88.5	3740
1/25/10	127	3375	0.567	1.51	<0.1	<0.1	0.51	10.3	3.55	14.7	132	4160
2/1/10	25.5	426	0.635	0.727	<0.1	<0.1	0.3	1.07	2.14	3.34	24.1	442
3/1/10	14.0	485	0.596	0.768	<0.1	<0.1	0.33	1.6	1.55	3.03	27	574
3/23/10	1.86	13.2	1	1.06	<0.1	<0.1	0.41	0.45	1.48	2.01	8.8	33.4
1/19/11	6.75	175	0.913	1.03	<0.1	<0.1	0.57	1.22	1.54	2.42	18.6	214
1/31/11	6.26	61.4	1.17	1.18	<0.1	<0.1	0.44	0.61	1.57	1.75	9.8	69.2
2/5/13	6.69	152	1.07	1.31	<0.1	<0.1	0.33	0.56	1.23	1.66	11.4	157
2/3/14	8.61	19.3	1.92	1.93	<0.1	<0.1	0.44	0.49	0.79	0.93	31.3	46
2/3/15	4.64	169	1.29	1.62	<0.1	<0.1	0.3	0.72	1.55	3.26	10	207
2/8/16	18.7	78.8	1.23	1.33	<0.1	<0.1	0.51	0.62	1.33	1.81	23.6	104
2/6/17	130	761	0.857	1.11	<0.1	<0.1	0.46	2.11	1.64	4.67	126	729
2/13/18	4.59	23.2	1.55	1.61	<0.1	<0.1	0.58	0.71	0.96	1.22	13.2	51.2
2/18/20			1	1								
Count	26	26	27	27	4	4	26	26	26	26	26	26
Minimum	1.86	13.2	0.52	0.73	ND	ND	0.30	0.45	0.79	0.93	7.8	33.4
Average	151	659	1.07	1.24	0.02	0.05	0.78	2.11	1.90	3.44	117	776
Maximum	1459	3630	1.92	1.93	0.018	0.081	2.75	10.3	6.99	14.7	878	4160

Table 1. Continued

Sample Date	D-Lead ug/L	T-Lead ug/L	D-Manganese ug/L	T-Manganese ug/L	T-Mercury ng/L	D-Nickel ug/L	T-Nickel ug/L	D-Selenium ug/L	T-Selenium ug/L	D-Silver ug/L	T-Silver ug/L	D-Zinc ug/L	T-Zinc ug/L
1/10/05	0.045	0.144	1.38	10.5	ND	1.02	1.6	0.29	0.3	<0.003	0.003	1.67	3.91
2/2/05	0.021	0.075	1.11	7.66	ND	0.9	1.32	ND	ND	<0.001	0.003	1.64	3.15
3/9/05	0.012	0.072	0.64	6.24	ND	0.77	1.2	ND	0.22	<0.001	ND	0.41	2.48
1/4/06	0.575	1.51	10.7	113	ND	2.94	12.2	ND	0.35	<0.001	0.015	7.63	18.8
1/24/06	0.048	0.147	7.25	15.6	ND	1.46	2.11	ND	0.19	<0.005	ND	2.49	3.76
2/21/06	ND	0.049	2.37	5.71	ND	1.53	1.62	ND	0.15	<0.009	ND	1.45	1.89
3/1/06	0.274	1.1	13.5	78.9	ND	2.84	8.57	ND	0.16	<0.009	ND	4.49	13.2
1/10/07	ND	ND	1.37	3.13	0.59	0.97	1.02	ND	ND	<0.03	ND	0.71	2.82
2/26/07	0.149	0.234	6.41	10.2	2.6	1.14	1.49	0.2	0.28	<0.03	ND	3.09	5.68
3/21/07	ND	0.04	1.27	4.8	ND	0.84	0.97	ND	0.2	<0.03	ND	0.38	3.58
1/22/08	ND	0.13	0.73	12.9	ND	0.91	1.08	ND	ND	<0.03	ND	1.33	4.99
2/26/08	ND	0.388	0.68	23.4	ND	1.58	3	ND	0.21	<0.03	ND	0.97	6.85
3/25/08	ND	ND	0.36	6.12	ND	0.71	0.95	ND	0.25	<0.03	ND	0.44	3.11
2/23/09	ND	2.25	1.33	133	ND	1.44	9.9	ND	ND	<0.03	ND	1.28	26
1/25/10	0.069	3.14	1.91	144	ND	13.2	15.7	0.26	0.88	<0.03	0.099	0.76	0.88
2/1/10	ND	0.245	0.74	17.2	ND	1.9	2.01	ND	ND	<0.03	ND	2.09	8.08
3/1/10	ND	0.338	0.88	23.1	ND	0.96	2.44	0.2	0.21	<0.03	ND	0.99	6.09
3/23/10	ND	ND	0.52	3.24	ND	0.6	0.67	0.51	0.61	<0.03	ND	0.19	1.99
1/19/11	ND	0.172	0.86	12.2	ND	1.17	1.38	0.22	0.24	<0.03	ND	1.62	4.38
1/31/11	ND	ND	0.58	5.32	ND	0.81	0.98	ND	ND	<0.03	ND	2.32	4.08
2/5/13	ND	0.055	0.32	4.75	1.2	0.52	0.8	ND	ND	<0.03	ND	1.19	2.84
2/3/14	ND	ND	2.66	4.57	0.7	0.43	0.5	ND	ND	<0.03	ND	0.65	1.09
2/3/15	ND	0.166	0.19	4.75	3.4	0.93	1.3	ND	ND	<0.03	ND	0.88	4.43
2/8/16	ND	0.065	0.32	6.73	1.5	0.82	1.19	0.25	0.28	<0.03	ND	0.94	2.53
2/6/17	ND	0.575	2.78	31.1	ND	1.41	3.09	ND	0.26	<0.03	ND	0.78	7.37
2/13/18	ND	ND	0.34	3.16	ND	1.32	1.7	ND	ND	<0.03	ND	0.29	0.56
2/18/20													
Count	8	20	26	26	6	26	26	7	16	0	4	26	26
Minimum	ND	ND	0.19	3.13	ND	0.43	0.50	ND	ND	ND	ND	0.19	0.56
Average	0.149	0.54	2.35	27	1.7	1.7	3.0	0	0	ND	0	1.56	6
Maximum	0.575	3.14	13.5	144	3.4	13.2	15.7	0.5	0.88	ND	0.099	7.63	26

Table 2. Water Quality Data from the Sacramento River at Hamilton City during the Primary Diversion Period of January through March (D=dissolved, T=total)

Sample Date	D-Aluminum µg/L	T-Aluminum µg/L	D-Arsenic µg/L	T-Arsenic µg/L	D-Cadmium µg/L	T-Cadmium µg/L	D-Chromium µg/L	T-Chromium µg/L	D-Copper µg/L	T-Copper µg/L	D-Iron µg/L	T-Iron µg/L
1/10/05	352	413	1.48	1.55	<0.011	<0.007	1.06	1.44	1.98	2.45	225	443
2/2/05	77.5	163	1.42	1.51	<0.011	<0.066	1.67	1.88	1.53	1.73	71.5	223
3/10/05	11	75.7	2.03	2.08	<0.033	<0.011	1.29	1.39	1.09	1.37	<3.34	118
1/4/06	866	3462	1.61	2.35	0.014	0.092	2.61	9.74	2.47	11.2	569	4787
1/24/06	359	709	1.41	1.49	0.011	0.042	1.51	2.4	1.62	2.92	214	923
2/21/06	222	733	1.3	1.47	0.014	0.029	1.18	2.34	1.12	2.55	139	913
3/1/06	2887	4955	1.36	1.85	0.021	0.087	4.99	11.2	4.26	11.5	1773	6116
1/9/07	61.6	138	2.08	2.23	<0.1	<0.1	0.66	0.69	0.9	1.04	46.3	79.1
2/26/07	478	657	1.31	1.42	<0.1	<0.1	1.81	1.91	2.99	3.9	591	916
3/20/07	16.1	91.6	2.17	2.36	<0.1	<0.1	0.41	0.71	1.22	1.55	26.6	154
2/20/08	5.62	85.8	2.04	2.27	<0.1	<0.1	0.49	0.78	1.09	1.26	7.4	105
2/24/09	51.1	3110	1.62	4.07	<0.1	<0.1	0.47	7.07	2.03	8.21	68.6	3210
2/2/10	12	340	1.37	1.43	<0.1	<0.1	0.36	1.05	1.76	3.65	17.1	383
2/1/11	5.73	53.6	1.9	1.96	<0.1	<0.1	0.43	0.55	1.29	1.41	12	59.6
1/31/12	178	276	2.04	2.2	<0.1	<0.1	0.52	0.6	1	1.33	94.1	162
2/6/13	3.6	127	1.98	2	<0.1	<0.1	0.32	0.75	1.1	1.32	8.2	124
2/4/14	0.19	6.03	2.7	2.88	<0.1	<0.1	0.52	1.31	0.72	0.85	6.2	26.2
2/10/15	21.2	1960	1	2.14	<0.1	<0.1	0.33	5.3	1.96	8	63.2	2100
2/3/16	39.7	352	1.26	1.49	<0.1	<0.1	0.44	1.73	1.15	2.14	42.8	349
2/6/17	136	1020	1.16	1.67	<0.1	<0.1	0.52	3.85	1.79	5.78	138	1100
Count	20	20	20	20	20	20	20	20	20	20	20	20
Minimum	0.19	6.03	1.00	1.42	0.011	0.029	0.32	0.55	0.72	0.85	6.2	26.2
Average	289	936	1.66	2.02	0.02	0.06	1.08	2.83	1.65	3.71	216	1115
Maximum	2887	4955	2.7	4.07	0.021	0.092	4.99	11.2	4.26	11.5	1773	6116

Table 2. Continued

Sample Date	D-Lead µg/L	T-Lead µg/L	D-Manganese µg/L	T-Manganese µg/L	T-Mercury ng/L	D-Nickel µg/L	T-Nickel µg/L	D-Selenium µg/L	T-Selenium µg/L	D-Silver µg/L	T-Silver µg/L	D-Zinc µg/L	T-Zinc µg/L
1/10/05	0.064	0.168	2.22	12.4	N/A	1.39	1.98	0.3	0.34	<0.003	<0.002	1.54	3.1
2/2/05	0.029	0.084	2.54	10.6	N/A	1.02	1.53	<0.222	0.27	0.002	0.003	0.95	1.96
3/10/05	0.008	0.049	0.98	6.37	N/A	0.87	1.24	<0.245	<0.19	<0.001	<0.036	0.36	1.06
1/4/06	0.191	1.89	9.75	134	N/A	2.67	15.4	<0.149	0.22	<0.001	0.021	2.24	20.8
1/24/06	0.062	0.306	9.24	32.4	N/A	1.68	3.32	<0.186	0.19	<0.005	<0.005	1.55	4.71
2/21/06	0.046	0.299	5.83	27.5	N/A	1.53	3.32	<0.149	0.3	<0.009	<0.009	1	3.94
3/1/06	0.648	2.04	23.2	146	N/A	4.69	15.7	<0.149	0.29	<0.009	<0.009	5.79	21.7
1/9/07	<0.04	<0.04	2.22	5.24	0.68	1.01	1.08	<0.2	<0.2	<0.03	<0.03	0.64	2.57
2/26/07	0.262	0.581	10.3	28.8	2.8	2.22	2.99	<0.2	0.23	<0.03	<0.03	3.68	8.39
3/20/07	<0.04	0.056	2.01	8.22	1.6	0.85	1.22	<0.2	<0.2	<0.03	<0.03	0.31	2.82
2/20/08	<0.04	0.041	0.7	8.15	N/A	0.88	0.95	<0.2	0.22	<0.03	<0.03	0.71	3.31
2/24/09	<0.04	1.47	1.28	101	N/A	2.59	11	0.2	0.25	<0.03	<0.03	0.52	14.3
2/2/10	<0.04	0.188	1.01	17.1	N/A	1.78	2.08	<0.2	<0.2	<0.03	<0.03	1.39	5.43
2/1/11	<0.04	<0.04	0.67	6.4	N/A	0.71	0.9	<0.2	<0.2	<0.03	<0.03	0.76	2.68
1/31/12	<0.04	<0.04	1.87	9.58	N/A	0.68	1.11	<0.2	<0.2	<0.03	<0.03	1.17	2.32
2/6/13	<0.04	<0.04	0.35	5.45	1.3	0.44	0.65	<0.2	<0.2	<0.03	<0.03	0.93	1.45
2/4/14	<0.04	<0.04	0.35	2.17	0.8	0.54	0.69	<0.2	0.21	<0.03	<0.03	0.21	0.97
2/10/15	<0.04	1.52	0.96	59.6	29.1	1.36	6.88	0.26	0.31	<0.03	0.037	0.38	13.9
2/3/16	<0.04	0.204	0.62	17.7	3.5	1.26	2.47	0.21	0.28	<0.03	<0.03	0.75	2.98
2/6/17	<0.04	0.945	3.35	43	N/A	1.08	5.36	0.36	0.37	<0.03	<0.03	0.86	9.16
Count	20	20	20	20	20	20	20	20	20	20	20	20	20
Minimum	0.008	0.041	0.35	2.17	0.68	0.44	0.65	0.2	0.19	0.002	0.003	0.21	0.97
Average	0.16	0.66	3.97	34.08	5.68	1.46	3.99	0.27	0.27	0.00	0.02	1.29	6.38
Maximum	0.648	2.04	23.2	146	29.1	4.69	15.7	0.36	0.37	0.002	0.037	5.79	21.7

Table 3. Water Quality Objectives, Numeric Thresholds, and Exceedances for the Sacramento River below Red Bluff

Constituent / Parameter	Water Quality Objective or Promulgated Criterion	Numeric Thresholds Recommended to Implement Objective or Criterion: Source of Numeric Threshold *(footnotes in parentheses are at bottom of table)*	Numeric Threshold ug/L	G=Groundwater IS=Inland SW E=EB/Estuary O=Ocean	WDL Data Dissolved Max (ug/L)	WDL Data Dissolved Min (ug/L)	WDL Data Total Max (ug/L)	WDL Data Total Min (ug/L)	Evapoconcentrated Dissolved Max (ug/L)	Evapoconcentrated Dissolved Min (ug/L)	Evapoconcentrated Total Max (ug/L)	Evapoconcentrated Total Min (ug/L)
Aluminum					1459	1.86	3630	13.2	2159	2.75	5372.4	19.5
	Chemical Constituents	California Primary MCL	1,000	G & IS	x		x		x		x	
		California Secondary MCL	200	G & IS	x		x		x		x	
		Water Quality for Agriculture (Ayers & Westcot)	5,000	G & IS							x	
	Tastes and Odors	California Secondary MCL	200	G & IS	x		x		x		x	
	Toxicity - humans	California Public Health Goal for Drinking Water	600	G & IS	x		x		x		x	
	Toxicity - fw aquatic life	USEPA National Recomm. WQ Criteria, 4-day avg, total (f)	87	IS	x		x		x		x	
		USEPA National Recomm. WQ Criteria, 1-hour avg, total (f)	750	IS	x		x		x		x	
Arsenic					1.92	0.52	1.93	0.73	2.84	0.77	2.8564	1.08
	Chemical Constituents	California Primary MCL	10	G & IS								
		Water Quality for Agriculture (Ayers & Westcot)	100	G & IS								
	Toxicity - humans	California Public Health Goal for Drinking Water	0.004	G & IS	x	x	x	x	x	x	x	x
		USEPA National Recomm. WQ Criteria, water & fish consump.	0.018	IS	x	x	x	x	x	x	x	x
		USEPA National Recomm. WQ Criteria, fish consumption	0.14	E & O	x	x	x	x	x	x	x	x
		Cal EPA - One in a million incremental cancer risk estimate for drinking water	0.023	G & IS	x	x	x	x	x	x	x	x
		USEPA Health Advisory for drinking water	0.02	G & IS	x	x	x	x	x	x	x	x
		California Proposition 65 Safe Harbor Level - Max. Allowable dose level for reproductive toxicity	0.05	G & IS	x	x	x	x	x	x	x	x
	CTR - fw aquatic life	California Toxics Rule (USEPA), 4-day average (dissolved)	150	IS								
		California Toxics Rule (USEPA), 1-hour average (dissolved)	340	IS								
	CTR - sw aquatic life	California Toxics Rule (USEPA), 4-day average (dissolved)	36	E								
		California Toxics Rule (USEPA), 1-hour average (dissolved)	69	E								
	CA Ocean Plan - aq life	Aquatic Life Protection Objective, 6-month median	8	O								
		Aquatic Life Protection Objective, daily maximum	32	O								
		Aquatic Life Protection Objective, instantaneous maximum	80	O								
Cadmium					0.02	ND	0.081	ND	0.03	ND	0.11988	ND
	Chemical Constituents	California Primary MCL	5	G & IS								
		Water Quality for Agriculture (Ayers & Westcot)	10	G & IS								
	Toxicity - humans	California Public Health Goal for Drinking Water	0.04	G & IS			x				x	
		Cal EPA - One in a million incremental cancer risk estimate for drinking water	0.023	G & IS			x		x		x	
	CTR - fw aquatic life	California Toxics Rule (USEPA), 4-day average, dissolved (l)	1.1	IS								
		California Toxics Rule (USEPA), 1-hour average, dissolved (l)	1.6	IS								
	CTR - sw aquatic life	California Toxics Rule (USEPA), 4-day average, dissolved	9.3	E & O								
		California Toxics Rule (USEPA), 1-hour average, dissolved	42	E & O								
	CA Ocean Plan - aq life	Aquatic Life Protection Objective, 6-month median	1	O								
		Aquatic Life Protection Objective, daily maximum	4	O								
		Aquatic Life Protection Objective, instantaneous maximum	10	O								
Chromium (III)					2.75	0.3	10.3	0.45	4.07	0.44	15.244	0.67
	Chemical Constituents	California Primary MCL (total chromium)	50	G & IS								
	Toxicity - humans	USEPA IRIS Reference Dose (c)	10,500	G & IS								
		Cal EPA - One in a million incremental cancer risk estimate for drinking water	0.07	G & IS	x	x	x	x	x	x	x	x
	NTR - fw aquatic life	National Toxics Rule (USEPA), 4-day average, dissolved (l)	84	IS								
		National Toxics Rule (USEPA), 1-hour average, dissolved (l)	260	IS								
	CA Ocean Plan - humans	Human Health Protection Objective, fish consumption	190,000	O								
	Toxicity - sw aquatic life	USEPA National Recomm. WQ Criteria, acute tox info / 10	1,030	E & O								

Table 3. Continued

Constituent / Parameter	Water Quality Objective or Promulgated Criterion	Numeric Thresholds Recommended to Implement Objective or Criterion: Source of Numeric Threshold *(footnotes in parentheses are at bottom of table)*	Numeric Threshold ug/L	G=Groundwater IS=Inland SW E=EB/Estuary O=Ocean	WDL Data: Dissolved Max	Dissolved Min	Total Max	Total Min	Evapoconcentrated: Dissolved Max	Dissolved Min	Total Max	Total Min
					ug/L		ug/L		ug/L		ug/L	
Copper					6.99	0.79	14.7	0.93	10.3	1.17	21.756	1.38
	Chemical Constituents	California Primary MCL	1,300	G & IS								
		California Secondary MCL	1,000	G & IS								
		Water Quality for Agriculture (Ayers & Westcot)	200	G & IS								
	Tastes and Odors	California Secondary MCL & USEPA Nat. Rec. WQ Criteria	1,000	G & IS								
	Toxicity - humans	California Public Health Goal for Drinking Water	300	G								
	CTR - humans	California Toxics Rule (USEPA) for sources of drinking water	1300	IS								
	CTR - fw aquatic life	California Toxics Rule (USEPA), 4-day average, dissolved (I)	4.1	IS	x		x		x		x	
		California Toxics Rule (USEPA), 1-hour average, dissolved (I)	5.7	IS	x		x		x		x	
	CTR - sw aquatic life	California Toxics Rule (USEPA), 4-day average, dissolved	3.1	E	x		x		x		x	
		California Toxics Rule (USEPA), 1-hour average, dissolved	4.8	E	x		x		x		x	
	CA Ocean Plan - aq life	Aquatic Life Protection Objective, 6-month median	3	O	x		x		x		x	
		Aquatic Life Protection Objective, daily maximum	12	O			x				x	
		Aquatic Life Protection Objective, instantaneous maximum	30	O								
Iron					878	7.8	4160	33.4	1299	11.5	6156.8	49.4
	Chemical Constituents	California Secondary MCL	300	G & IS	x		x		x		x	
		Water Quality for Agriculture (Ayers & Westcot)	5,000	G & IS							x	
	Tastes and Odors	California Secondary MCL	300	G & IS	x		x		x		x	
	Toxicity - fw aquatic life	USEPA National Recomm. WQ Criteria, 4-day average	1,000	IS			x		x		x	
Lead					0.58	ND	3.14	ND	0.85	ND	4.6472	ND
	Chemical Constituents	California Primary MCL	15	G & IS								
		Water Quality for Agriculture (Ayers & Westcot)	5,000	G & IS								
	Toxicity - humans	California Public Health Goal for Drinking Water	0.2	G & IS	x		x		x		x	
		California Proposition 65 Safe Harbor Level - Max. Allowable dose level for reproductive toxicity	0.25	G & IS	x		x		x		x	
	CTR - fw aquatic life	California Toxics Rule (USEPA), 4-day average, dissolved (I)	0.92	IS			x				x	
		California Toxics Rule (USEPA), 1-hour average, dissolved (I)	24	IS								
	CTR - sw aquatic life	California Toxics Rule (USEPA), 4-day average, dissolved	8.1	E								
		California Toxics Rule (USEPA), 1-hour average, dissolved	210	E								
	CA Ocean Plan - aq life	Aquatic Life Protection Objective, 6-month median	2	O			x				x	
		Aquatic Life Protection Objective, daily maximum	8	O								
		Aquatic Life Protection Objective, instantaneous maximum	20	O								
Manganese					13.5	0.19	144	3.13	20	0.28	213.12	4.63
	Chemical Constituents	California Secondary MCL	50	G & IS			x				x	
		Water Quality for Agriculture (Ayers & Westcot)	200	G & IS							x	
	Tastes and Odors	California Secondary MCL	50	G & IS			x				x	
	Toxicity - humans	California DPH Notification Level for drinking water	500	G & IS								
		USEPA National Recomm. WQ Criteria, fish consumption	100	IS & E & O			x				x	
Mercury							0.0034	ND			0.00503	ND
	Chemical Constituents	California Primary MCL	2	G & IS								
	Toxicity - humans	California Public Health Goal for Drinking Water	1.2	G								
	CTR - humans	California Toxics Rule (USEPA) for sources of drinking water	0.05	IS								
		California Toxics Rule (USEPA) for other waters	0.051	IS & E								
	Toxicity - fw aquatic life	USEPA National Recomm. WQ Criteria, 4-day avg, dissolved	0.77	IS								
		USEPA National Recomm. WQ Criteria, 1-hour avg, dissolved	1.4	IS								
	Toxicity - sw aquatic life	USEPA National Recomm. WQ Criteria, 4-day avg, dissolved	0.94	E & O								
		USEPA National Recomm. WQ Criteria, 1-hour avg, dissolved	1.8	E & O								
	CA Ocean Plan - aq life	Aquatic Life Protection Objective, 6-month median	0.04	O								
		Aquatic Life Protection Objective, daily maximum	0.16	O								
		Aquatic Life Protection Objective, instantaneous max	0.4	O								

Table 3. Continued

Constituent / Parameter	Water Quality Objective or Promulgated Criterion	Numeric Thresholds Recommended to Implement Objective or Criterion: Source of Numeric Threshold *(footnotes in parentheses are at bottom of table)*	Numeric Threshold ug/L	G=Groundwater IS=Inland SW E=EB/Estuary O=Ocean	WDL Data: Dissolved Max (ug/L)	WDL Data: Dissolved Min (ug/L)	WDL Data: Total Max (ug/L)	WDL Data: Total Min (ug/L)	Evapoconcentrated: Dissolved Max (ug/L)	Evapoconcentrated: Dissolved Min (ug/L)	Evapoconcentrated: Total Max (ug/L)	Evapoconcentrated: Total Min (ug/L)
Nickel					13.2	0.43	15.7	0.5	19.5	0.64	23.2	0.74
	Chemical Constituents	California Primary MCL	100	G & IS								
		Water Quality for Agriculture (Ayers & Westcot)	200	G & IS								
	Toxicity - humans	California Public Health Goal for Drinking Water	12	G	x		x		x		x	
		USEPA National Recomm. WQ Criteria, fish consumption	4,600	IS & E & O								
	CTR - humans	California Toxics Rule (USEPA) for sources of drinking water	610	IS								
		California Toxics Rule (USEPA) for other waters	4,600	IS & E								
	CTR - fw aquatic life	California Toxics Rule (USEPA), 4-day average, dissolved (l)	24	IS								
		California Toxics Rule (USEPA), 1-hour average, dissolved (l)	220	IS								
	CTR - sw aquatic life	California Toxics Rule (USEPA), 4-day average, dissolved	8	E	x		x		x		x	
		California Toxics Rule (USEPA), 1-hour average, dissolved	74	E								
	CA Ocean Plan - aq life	Aquatic Life Protection Objective, 6-month median	5	O	x		x		x		x	
		Aquatic Life Protection Objective, daily maximum	20	O							x	
		Aquatic Life Protection Objective, instantaneous maximum	50	O								
Selenium					0.51	ND	0.88	ND	0.75	ND	1.30	
	Chemical Constituents	California Primary MCL	50	G & IS								
		Water Quality for Agriculture (Ayers & Westcot)	20	G & IS								
	Toxicity - humans	California Public Health Goal for Drinking Water	30	G & IS								
		USEPA National Recomm. WQ Criteria, water & fish consump.	170	IS								
		USEPA National Recomm. WQ Criteria, fish consumption	4,200	E & O								
	NTR - fw aquatic life	National Toxics Rule (USEPA), 4-day average, total	5	IS								
		National Toxics Rule (USEPA), 1-hour average, total	20	IS								
	CTR - sw aquatic life	California Toxics Rule (USEPA), 4-day average, dissolved	71	E								
		California Toxics Rule (USEPA), 1-hour average, dissolved	290	E								
	CA Ocean Plan - aq life	Aquatic Life Protection Objective, 6-month median	15	O								
		Aquatic Life Protection Objective, daily maximum	60	O								
		Aquatic Life Protection Objective, instantaneous maximum	150	O								
Zinc					7.63	0.19	26	0.56	11.3	0.28	38.5	0.83
	Chemical Constituents	California Secondary MCL	5,000	G & IS								
		Water Quality for Agriculture (Ayers & Westcot)	2,000	G & IS								
	Tastes and Odors	California Secondary MCL	5,000	G & IS								
	Toxicity - humans	USEPA IRIS Reference Dose (c)	2,100	G & IS								
		USEPA National Recomm. WQ Criteria, water & fish consump.	7,400	IS								
		USEPA National Recomm. WQ Criteria, fish consumption	26,000	E & O								
	CTR - fw aquatic life	California Toxics Rule (USEPA), 1-hour average, dissolved (l)	54	IS								
		California Toxics Rule (USEPA), 4-day average, dissolved (l)	54	IS								
	Toxicity - sw aquatic life	USEPA National Recomm. WQ Criteria, 4-day avg, dissolved	81	E & O								
		USEPA National Recomm. WQ Criteria, 1-hour avg, dissolved	90	E & O								
	CA Ocean Plan - aq life	Aquatic Life Protection Objective for Lead, 6-month median	20	O			x				x	
		Aquatic Life Protection Objective for Lead, daily maximum	80	O								
		Aquatic Life Protection Objective for Lead, instantaneous max	200	O								

Table 4. Water Quality Objectives, Numeric Thresholds, and Exceedances for the Sacramento River at Hamilton City

Constituent / Parameter	Water Quality Objective or Promulgated Criterion	Numeric Thresholds Recommended to Implement Objective or Criterion: Source of Numeric Threshold (footnotes in parentheses are at bottom of table)	Numeric Threshold ug/L		WDL Data: Dissolved Max (ug/L)	WDL Data: Dissolved Min (ug/L)	WDL Data: Total Max (ug/L)	WDL Data: Total Min (ug/L)	Evapoconcentrated: Dissolved Max (ug/L)	Evapoconcentrated: Dissolved Min (ug/L)	Evapoconcentrated: Total Max (ug/L)	Evapoconcentrated: Total Min (ug/L)
Aluminum					2887	0.19	4955	6.03	4273	0.28	7333	8.92
	Chemical Constituents	California Primary MCL	1,000	G & IS	X		X		X		X	
		California Secondary MCL	200	G & IS	X		X		X		X	
		Water Quality for Agriculture (Ayers & Westcot)	5,000	G & IS							X	
	Tastes and Odors	California Secondary MCL	200	G & IS	X		X		X		X	
	Toxicity - humans	California Public Health Goal for Drinking Water	600	G & IS	X		X		X		X	
	Toxicity - fw aquatic life	USEPA National Recomm. WQ Criteria, 4-day avg, total (f)	87	IS	X		X		X		X	
		USEPA National Recomm. WQ Criteria, 1-hour avg, total (f)	750	IS	X		X		X		X	
Arsenic					2.7	1.00	4.07	1.42	4.0	1.48	6.02	2.10
	Chemical Constituents	California Primary MCL	10	G & IS								
		Water Quality for Agriculture (Ayers & Westcot)	100	G & IS								
	Toxicity - humans	California Public Health Goal for Drinking Water	0.004	G & IS	X	X	X	X	X	X	X	X
		USEPA National Recomm. WQ Criteria, water & fish consump.	0.018	IS	X	X	X	X	X	X	X	X
		USEPA National Recomm. WQ Criteria, fish consumption	0.14	E & O	X	X	X	X	X	X	X	X
		Cal EPA - One in a million incremental cancer risk estimate for drinking water	0.023	G & IS	X	X	X	X	X	X	X	X
		California Proposition 65 Safe Harbor Level - Max. Allowable dose level for reproductive toxicity	0.05	G & IS	X	X	X	X	X	X	X	X
		USEPA IRIS Reference Dose Drinking Water Health Advisories	2.1	G & IS	X		X		X		X	X
	CTR - fw aquatic life	California Toxics Rule (USEPA), 4-day average (dissolved)	150	IS								
		California Toxics Rule (USEPA), 1-hour average (dissolved)	340	IS								
	CTR - sw aquatic life	California Toxics Rule (USEPA), 4-day average (dissolved)	36	E								
		California Toxics Rule (USEPA), 1-hour average (dissolved)	69	E								
	CA Ocean Plan - aq life	Aquatic Life Protection Objective, 6-month median	8	O								
		Aquatic Life Protection Objective, daily maximum	32	O								
		Aquatic Life Protection Objective, instantaneous maximum	80	O								
Cadmium					0.021	ND	0.092	ND	0.031	ND	0.136	ND
	Chemical Constituents	California Primary MCL	5	G & IS								
		Water Quality for Agriculture (Ayers & Westcot)	10	G & IS								
	Toxicity - humans	California Public Health Goal for Drinking Water	0.04	G & IS			X				X	
		Cal EPA - One in a million incremental cancer risk estimate for drinking water	0.0023	G & IS	X		X		X		X	
	CTR - fw aquatic life	California Toxics Rule (USEPA), 4-day average, dissolved (l)	1.1	IS								
		California Toxics Rule (USEPA), 1-hour average, dissolved (l)	1.6	IS								
	CTR - sw aquatic life	California Toxics Rule (USEPA), 4-day average, dissolved	9.3	E & O								
		California Toxics Rule (USEPA), 1-hour average, dissolved	42	E & O								
	CA Ocean Plan - aq life	Aquatic Life Protection Objective, 6-month median	1	O								
		Aquatic Life Protection Objective, daily maximum	4	O								
		Aquatic Life Protection Objective, instantaneous maximum	10	O								

Table 4. Continued

Constituent / Parameter	Water Quality Objective or Promulgated Criterion	Source of Numeric Threshold *(footnotes in parentheses are at bottom of table)*	Numeric Threshold ug/L		WDL Data Dissolved Max (ug/L)	WDL Data Dissolved Min (ug/L)	WDL Data Total Max (ug/L)	WDL Data Total Min (ug/L)	Evapoconcentrated Dissolved Max (ug/L)	Evapoconcentrated Dissolved Min (ug/L)	Evapoconcentrated Total Max (ug/L)	Evapoconcentrated Total Min (ug/L)
		Numeric Thresholds Recommended to Implement Objective or Criterion										
Chromium (III)					4.99	0.32	11.2	0.55	7.39	0.47	16.6	0.814
	Chemical Constituents	California Primary MCL (total chromium)	50	G & IS								
	Toxicity - humans	USEPA IRIS Reference Dose (c)	10,500	G & IS								
		Cal EPA/OEHHA - California Public Health Goal	0.02	G & IS	x	x	x	x	x	x	x	x
		Cal EPA - One in a million incremental cancer risk estimate for drinking water	0.07	G & IS	x	x	x	x	x	x	x	x
	NTR - fw aquatic life	National Toxics Rule (USEPA), 4-day average, dissolved (l)	84	IS								
		National Toxics Rule (USEPA), 1-hour average, dissolved (l)	260	IS								
	CA Ocean Plan - humans	Human Health Protection Objective, fish consumption	190,000	O								
	Toxicity - sw aquatic life	USEPA National Recomm. WQ Criteria, acute tox info / 10	1,030	E & O								
Copper					4.26	0.72	11.5	0.85	6.30	1.07	17.0	1.258
	Chemical Constituents	California Primary MCL	1,300	G & IS								
		California Secondary MCL	1,000	G & IS								
		Water Quality for Agriculture (Ayers & Westcot)	200	G & IS								
	Tastes and Odors	California Secondary MCL & USEPA Nat. Rec. WQ Criteria	1,000	G & IS								
	Toxicity - humans	California Public Health Goal for Drinking Water	300	G								
	CTR - humans	California Toxics Rule (USEPA) for sources of drinking water	1300	IS								
	CTR - fw aquatic life	California Toxics Rule (USEPA), 4-day average, dissolved (l)	4.1	IS	x		x		x		x	
		California Toxics Rule (USEPA), 1-hour average, dissolved (l)	5.7	IS			x		x		x	
	CTR - sw aquatic life	California Toxics Rule (USEPA), 4-day average, dissolved	3.1	E	x		x		x		x	
		California Toxics Rule (USEPA), 1-hour average, dissolved	4.8	E			x		x		x	
	CA Ocean Plan - aq life	Aquatic Life Protection Objective, 6-month median	3	O	x		x		x		x	
		Aquatic Life Protection Objective, daily maximum	12	O							x	
		Aquatic Life Protection Objective, instantaneous maximum	30	O								
Iron					1773	6.2	6116	26.2	2624	9.18	9052	38.8
	Chemical Constituents	California Secondary MCL	300	G & IS	x		x		x		x	
		Water Quality for Agriculture (Ayers & Westcot)	5,000	G & IS			x				x	
	Tastes and Odors	California Secondary MCL	300	G & IS	x		x		x		x	
	Toxicity - fw aquatic life	USEPA National Recomm. WQ Criteria, 4-day average	1,000	IS	x		x		x		x	
Lead					0.648	0.008	2.04	0.041	0.959	ND	3.02	ND
	Chemical Constituents	California Primary MCL	15	G & IS								
		Water Quality for Agriculture (Ayers & Westcot)	5,000	G & IS								
	Toxicity - humans	California Public Health Goal for Drinking Water	0.2	G & IS	x		x		x		x	
		Cal EPA - One in a million incremental cancer risk estimate for drinking water	0.2	G & IS	x		x		x		x	
		California Proposition 65 Safe Harbor Level - Max. Allowable dose level for reproductive toxicity	0.25	G & IS	x		x		x		x	
	CTR - fw aquatic life	California Toxics Rule (USEPA), 4-day average, dissolved (l)	0.92	IS			x		x		x	
		California Toxics Rule (USEPA), 1-hour average, dissolved (l)	24	IS								
	CTR - sw aquatic life	California Toxics Rule (USEPA), 4-day average, dissolved	8.1	E								
		California Toxics Rule (USEPA), 1-hour average, dissolved	210	E								
	CA Ocean Plan - aq life	Aquatic Life Protection Objective, 6-month median	2	O			x				x	
		Aquatic Life Protection Objective, daily maximum	8	O								
		Aquatic Life Protection Objective, instantaneous maximum	20	O								

Table 4. Continued

Constituent / Parameter	Water Quality Objective or Promulgated Criterion	Source of Numeric Threshold *(footnotes in parentheses are at bottom of table)*	Numeric Threshold ug/L		WDL Data				Evapoconcentrated			
		Numeric Thresholds Recommended to Implement Objective or Criterion			Dissolved		Total		Dissolved		Total	
					Max	Min	Max	Min	Max	Min	Max	Min
					ug/L		ug/L		ug/L		ug/L	
Manganese					23.2	0.35	146	2.17	34.3	0.52	216	3.21
	Chemical Constituents	California Secondary MCL	50	G & IS			x				x	
		Water Quality for Agriculture (Ayers & Westcot)	200	G & IS							x	
	Tastes and Odors	California Secondary MCL	50	G & IS			x				x	
	Toxicity - humans	California DPH Notification Level for drinking water	500	G & IS								
		USEPA National Recomm. WQ Criteria, fish consumption	100	S & E & O			x				x	
Mercury							0.029	######			0.0431	0.00101
	Chemical Constituents	California Primary MCL	2	G & IS								
	Toxicity - humans	California Public Health Goal for Drinking Water	1.2	G								
	CTR - humans	California Toxics Rule (USEPA) for sources of drinking water	0.05	IS								
		California Toxics Rule (USEPA) for other waters	0.051	IS & E								
	Toxicity - fw aquatic life	USEPA National Recomm. WQ Criteria, 4-day avg, dissolved	0.77	IS								
		USEPA National Recomm. WQ Criteria, 1-hour avg, dissolved	1.4	IS								
	Toxicity - sw aquatic life	USEPA National Recomm. WQ Criteria, 4-day avg, dissolved	0.94	E & O								
		USEPA National Recomm. WQ Criteria, 1-hour avg, dissolved	1.8	E & O								
	CA Ocean Plan - aq life	Aquatic Life Protection Objective, 6-month median	0.04	O								
		Aquatic Life Protection Objective, daily maximum	0.16	O								
		Aquatic Life Protection Objective, instantaneous max	0.4	O								
Nickel					4.69	0.44	15.7	0.65	6.94	0.65	23.2	0.96
	Chemical Constituents	California Primary MCL	100	G & IS								
		Water Quality for Agriculture (Ayers & Westcot)	200	G & IS								
	Toxicity - humans	California Public Health Goal for Drinking Water	12	G			x				x	
		USEPA National Recomm. WQ Criteria, fish consumption	4,600	S & E & O								
	CTR - humans	California Toxics Rule (USEPA) for sources of drinking water	610	IS								
		California Toxics Rule (USEPA) for other waters	4,600	IS & E								
	CTR - fw aquatic life	California Toxics Rule (USEPA), 4-day average, dissolved (l)	24	IS								
		California Toxics Rule (USEPA), 1-hour average, dissolved (l)	220	IS								
	CTR - sw aquatic life	California Toxics Rule (USEPA), 4-day average, dissolved	8	E			x				x	
		California Toxics Rule (USEPA), 1-hour average, dissolved	74	E								
	CA Ocean Plan - aq life	Aquatic Life Protection Objective, 6-month median	5	O			x		x		x	
		Aquatic Life Protection Objective, daily maximum	20	O							x	
		Aquatic Life Protection Objective, instantaneous maximum	50	O								
Selenium					0.36	0.20	0.37	0.19	0.53	ND	0.55	ND
	Chemical Constituents	California Primary MCL	50	G & IS								
		Water Quality for Agriculture (Ayers & Westcot)	20	G & IS								
	Toxicity - humans	California Public Health Goal for Drinking Water	30	G & IS								
		USEPA National Recomm. WQ Criteria, water & fish consump.	170	IS								
		USEPA National Recomm. WQ Criteria, fish consumption	4,200	E & O								
	NTR - fw aquatic life	National Toxics Rule (USEPA), 4-day average, total	5	IS								
		National Toxics Rule (USEPA), 1-hour average, total	20	IS								
	CTR - sw aquatic life	California Toxics Rule (USEPA), 4-day average, dissolved	71	E								
		California Toxics Rule (USEPA), 1-hour average, dissolved	290	E								
	CA Ocean Plan - aq life	Aquatic Life Protection Objective, 6-month median	15	O								
		Aquatic Life Protection Objective, daily maximum	60	O								
		Aquatic Life Protection Objective, instantaneous maximum	150	O								

Table 4. Continued

Constituent / Parameter	Water Quality Objective or Promulgated Criterion	Numeric Thresholds Recommended to Implement Objective or Criterion: Source of Numeric Threshold (footnotes in parentheses are at bottom of table)	Numeric Threshold ug/L		WDL Data: Dissolved Max	WDL Data: Dissolved Min	WDL Data: Total Max	WDL Data: Total Min	Evapoconcentrated: Dissolved Max	Evapoconcentrated: Dissolved Min	Evapoconcentrated: Total Max	Evapoconcentrated: Total Min
					ug/L		ug/L		ug/L		ug/L	
Zinc					5.79	0.21	21.7	0.97	8.5692	0.31	32.1	1.44
	Chemical Constituents	California Secondary MCL	5,000	G & IS								
		Water Quality for Agriculture (Ayers & Westcot)	2,000	G & IS								
	Tastes and Odors	California Secondary MCL	5,000	G & IS								
	Toxicity - humans	USEPA IRIS Reference Dose (c)	2,100	G & IS								
		USEPA National Recomm. WQ Criteria, water & fish consump.	7,400	IS								
		USEPA National Recomm. WQ Criteria, fish consumption	26,000	E & O								
	CTR - fw aquatic life	California Toxics Rule (USEPA), 1-hour average, dissolved (l)	54	IS								
		California Toxics Rule (USEPA), 4-day average, dissolved (l)	54	IS								
	Toxicity - sw aquatic life	USEPA National Recomm. WQ Criteria, 4-day avg, dissolved	81	E & O								
		USEPA National Recomm. WQ Criteria, 1-hour avg, dissolved	90	E & O								
	CA Ocean Plan - aq life	Aquatic Life Protection Objective for Lead, 6-month median	20	O			x				x	
		Aquatic Life Protection Objective for Lead, daily maximum	80	O								
		Aquatic Life Protection Objective for Lead, instantaneous max	200	O								

Table 5 Projected Metals Concentrations

	Sample Date	D-Aluminum ug/L	T-Aluminum ug/L	D-Arsenic ug/L	T-Arsenic ug/L	D-Cadmium ug/L	T-Cadmium ug/L	D-Chromium ug/L	T-Chromium ug/L
Cottonwood Creek	3/1/06	2533	3739	0.889	1.16	0.009	0.023	8.2	15.7
Sacramento R below Red Bluff	3/1/06	1459	2240	0.857	1.06	0.017	0.055	2.75	6.1
Multiplication Factor (SacR/CottonwoodCr)		0.6	0.6	1.0	0.9	1.9	2.4	0.3	0.4
Maximum Cotonwood Creek Concentration		2533	14345	0.889	3.04	0.009	0.085	8.2	36.5
Projected Maximum Sacramento River Concentration		1459	8594	0.857	2.78	0.017	0.203	2.75	14.2
Sites Reservoir Concentration after Evapoconcentration (48 percent)		2159	12719	1.27	4.11	0.025	0.30	4.07	21.0
Sacramento River at Hamilton City (May throughSeptember, WDL)		1075	6686	2.36	3.17	0.007	0.076	2.69	18.9
Effects of Sites Reservoir Releases on Water Qualityin the Sacramento River at Hamilton City		1216	7470	2.22	3.29	0.009	0.105	2.87	19.17

	Sample Date	D-Copper ug/L	T-Copper ug/L	D-Iron ug/L	T-Iron ug/L	D-Lead ug/L	T-Lead ug/L	D-Manganese ug/L	T-Manganese ug/l
Cottonwood Creek	3/1/06	3.22	7.63	1760	5793	0.491	1.53	30.8	138
Sacramento R below Red Bluff	3/1/06	2.59	6.09	878	2854	0.274	1.1	13.5	78.9
Multiplication Factor (SacR/CottonwoodCr)		0.8	0.8	0.5	0.5	0.6	0.7	0.4	0.6
Maximum Cotonwood Creek Concentration		4.43	39.2	1760	23594	0.491	7.26	30.8	563
Projected Maximum Sacramento River Concentration		3.56	31.29	878	11624	0.274	5.2	13.5	322
Sites Reservoir Concentration after Evapoconcentration (48 percent)		5.27	46.3	1299	17203	0.41	7.7	20.0	476
Sacramento River at Hamilton City (May throughSeptember, WDL)		3.11	18.7	726	10052	0.202	3.24	7.33	272
Effects of Sites Reservoir Releases on Water Qualityin the Sacramento River at Hamilton City		3.39	22.29	801	10982	0.228	3.82	8.97	299

	Sample Date	D-Nickel ug/L	T-Nickel ug/L	D-Selenium ug/l	T-Selenium ug/l	D-Silver ug/L	T-Silver ug/L	D-Zinc ug/L	T-Zinc ug/L
Cottonwood Creek	3/1/06	7.35	20.9	0	0.15	ND	ND	3.64	13.6
Sacramento R below Red Bluff	3/1/06	2.84	8.57	0	0.16	ND	ND	4.49	13.2
Multiplication Factor (SacR/CottonwoodCr)		0.4	0.4	1.0	1.1	-	-	1.2	1.0
Maximum Cotonwood Creek Concentration		7.35	57.9	0.74	0.81	0.039	0.101	3.64	72
Projected Maximum Sacramento River Concentration		2.84	23.7	0.74	0.86	-	-	4.49	70
Sites Reservoir Concentration after Evapoconcentration (48 percent)		4.20	35.1	1.10	1.28	-	-	6.65	103
Sacramento River at Hamilton City (May throughSeptember, WDL)		2.75	10.7	0.34	0.35	0.018	2.11	2.46	35

Table 6. Projected metals concentrations in the Sacramento River at Hamilton City and CBD with dilution of Sites Reservoir water in the respective water bodies

Constituent / Parameter	Water Quality Objective or Promulgated Criterion	Numeric Thresholds Recommended to Implement Objective or Criterion: Source of Numeric Threshold *(footnotes in parentheses are at bottom of table)*	Numeric Threshold	Units	G=Groundwater IS=Inland SW E=EB/Estuary O=Ocean	Sacramento River at Hamilton City: Dissolved	Sacramento River at Hamilton City: Total	Colusa Basin Drain: Dissolved	Colusa Basin Drain: Total
Aluminum						1216	7470	338	2542
	Chemical Constituents	California Primary MCL	1,000	ug/L	G & IS	x	x		x
		California Secondary MCL	200	ug/L	G & IS	x	x		x
		Water Quality for Agriculture (Ayers & Westcot)	5,000	ug/L	G & IS		x		
	Tastes and Odors	California Secondary MCL	200	ug/L	G & IS	x	x		x
	Toxicity - humans	California Public Health Goal for Drinking Water	600	ug/L	G & IS	x	x		x
	Toxicity - fw aquatic life	USEPA National Recomm. WQ Criteria, 4-day avg, total (f)	87	ug/L	IS	x	x		x
		USEPA National Recomm. WQ Criteria, 1-hour avg, total (f)	750	ug/L	IS	x	x		x
Arsenic						2.22	3.29	3.85	4.67
	Chemical Constituents	California Primary MCL	10	ug/L	G & IS				
		Water Quality for Agriculture (Ayers & Westcot)	100	ug/L	G & IS				
	Toxicity - humans	California Public Health Goal for Drinking Water	0.004	ug/L	G & IS	x	x	x	x
		USEPA National Recomm. WQ Criteria, water & fish consump.	0.018	ug/L	IS	x	x	x	x
		USEPA National Recomm. WQ Criteria, fish consumption	0.14	ug/L	E & O	x	x	x	x
	CTR - fw aquatic life	California Toxics Rule (USEPA), 4-day average (dissolved)	150	ug/L	IS				
		California Toxics Rule (USEPA), 1-hour average (dissolved)	340	ug/L	IS				
	CTR - sw aquatic life	California Toxics Rule (USEPA), 4-day average (dissolved)	36	ug/L	E				
		California Toxics Rule (USEPA), 1-hour average (dissolved)	69	ug/L	E				
	CA Ocean Plan - aq life	Aquatic Life Protection Objective, 6-month median	8	ug/L	O				
		Aquatic Life Protection Objective, daily maximum	32	ug/L	O				
		Aquatic Life Protection Objective, instantaneous maximum	80	ug/L	O				
Cadmium						0.009	0.105	0.054	0.089
	Chemical Constituents	California Primary MCL	5	ug/L	G & IS				
		Water Quality for Agriculture (Ayers & Westcot)	10	ug/L	G & IS				
	Toxicity - humans	California Public Health Goal for Drinking Water	0.04	ug/L	G & IS		x		
	CTR - fw aquatic life	California Toxics Rule (USEPA), 4-day average, dissolved (l)	1.1	ug/L	IS				
		California Toxics Rule (USEPA), 1-hour average, dissolved (l)	1.6	ug/L	IS				
	CTR - sw aquatic life	California Toxics Rule (USEPA), 4-day average, dissolved	9.3	ug/L	E & O				
		California Toxics Rule (USEPA), 1-hour average, dissolved	42	ug/L	E & O				
	CA Ocean Plan - aq life	Aquatic Life Protection Objective, 6-month median	1	ug/L	O				
		Aquatic Life Protection Objective, daily maximum	4	ug/L	O				
		Aquatic Life Protection Objective, instantaneous maximum	10	ug/L	O				
Chromium (III)						2.87	19.17	1.14	5.95
	Chemical Constituents	California Primary MCL (total chromium)	50	ug/L	G & IS				
	Toxicity - humans	USEPA IRIS Reference Dose (c)	10,500	ug/L	G & IS				
	NTR - fw aquatic life	National Toxics Rule (USEPA), 4-day average, dissolved (l)	84	ug/L	IS				
		National Toxics Rule (USEPA), 1-hour average, dissolved (l)	260	ug/L	IS				
	CA Ocean Plan - humans	Human Health Protection Objective, fish consumption	190,000	ug/L	O				
	Toxicity - sw aquatic life	USEPA National Recomm. WQ Criteria, acute tox info / 10	1,030	ug/L	E & O				
Copper						3.39	22.29	3.24	11
	Chemical Constituents	California Primary MCL	1,300	ug/L	G & IS				
		California Secondary MCL	1,000	ug/L	G & IS				
		Water Quality for Agriculture (Ayers & Westcot)	200	ug/L	G & IS				
	Tastes and Odors	California Secondary MCL & USEPA Nat. Rec. WQ Criteria	1,000	ug/L	G & IS				
	Toxicity - humans	California Public Health Goal for Drinking Water	300	ug/L	G				
	CTR - humans	California Toxics Rule (USEPA) for sources of drinking water	1300	ug/L	IS				
	CTR - fw aquatic life	California Toxics Rule (USEPA), 4-day average, dissolved (l)	4.1	ug/L	IS		x		x
		California Toxics Rule (USEPA), 1-hour average, dissolved (l)	5.7	ug/L	IS		x		x
	CTR - sw aquatic life	California Toxics Rule (USEPA), 4-day average, dissolved	3.1	ug/L	E	x	x		x
		California Toxics Rule (USEPA), 1-hour average, dissolved	4.8	ug/L	E		x		x
	CA Ocean Plan - aq life	Aquatic Life Protection Objective, 6-month median	3	ug/L	O	x	x	x	x
		Aquatic Life Protection Objective, daily maximum	12	ug/L	O		x		
		Aquatic Life Protection Objective, instantaneous maximum	30	ug/L	O				
Iron						801	10982	260	3580
	Chemical Constituents	California Secondary MCL	300	ug/L	G & IS	x	x		x
		Water Quality for Agriculture (Ayers & Westcot)	5,000	ug/L	G & IS		x		
	Tastes and Odors	California Secondary MCL	300	ug/L	G & IS	x	x		x
	Toxicity - fw aquatic life	USEPA National Recomm. WQ Criteria, 4-day average	1,000	ug/L	IS		x		x

Table 6. Continued

Constituent / Parameter	Water Quality Objective or Promulgated Criterion	Numeric Thresholds Recommended to Implement Objective or Criterion: Source of Numeric Threshold *(footnotes in parentheses are at bottom of table)*	Numeric Threshold ug/L	Units	G=Groundwater IS=Inland SW E=EB/Estuary O=Ocean	Sacramento River at Hamilton City: Dissolved	Sacramento River at Hamilton City: Total	Colusa Basin Drain: Dissolved	Colusa Basin Drain: Total
Lead						0.228	3.82	0.106	1.68
	Chemical Constituents	California Primary MCL	15	ug/L	G & IS				
		Water Quality for Agriculture (Ayers & Westcot)	5,000	ug/L	G & IS				
	Toxicity - humans	California Public Health Goal for Drinking Water	0.2	ug/L	G & IS	x	x		x
	CTR - fw aquatic life	California Toxics Rule (USEPA), 4-day average, dissolved (l)	0.92	ug/L	IS	x	x		x
		California Toxics Rule (USEPA), 1-hour average, dissolved (l)	24	ug/L	IS				
	CTR - sw aquatic life	California Toxics Rule (USEPA), 4-day average, dissolved	8.1	ug/L	E				
		California Toxics Rule (USEPA), 1-hour average, dissolved	210	ug/L	E				
	CA Ocean Plan - aq life	Aquatic Life Protection Objective, 6-month median	2	ug/L	O		x		
		Aquatic Life Protection Objective, daily maximum	8	ug/L	O				
		Aquatic Life Protection Objective, instantaneous maximum	20	ug/L	O				
Manganese						8.97	299	14.9	208
	Chemical Constituents	California Secondary MCL	50	ug/L	G & IS		x		x
		Water Quality for Agriculture (Ayers & Westcot)	200	ug/L	G & IS		x		x
	Tastes and Odors	California Secondary MCL	50	ug/L	G & IS		x		x
	Toxicity - humans	California DPH Notification Level for drinking water	500	ug/L	G & IS				
		USEPA National Recomm. WQ Criteria, fish consumption	100	ug/L	IS & E & O		x		x
Nickel						2.94	13.88	3.33	11.2
	Chemical Constituents	California Primary MCL	100	ug/L	G & IS				
		Water Quality for Agriculture (Ayers & Westcot)	200	ug/L	G & IS				
	Toxicity - humans	California Public Health Goal for Drinking Water	12	ug/L	G		x		
		USEPA National Recomm. WQ Criteria, fish consumption	4,600	ug/L	IS & E & O				
	CTR - humans	California Toxics Rule (USEPA) for sources of drinking water	610	ug/L	IS				
		California Toxics Rule (USEPA) for other waters	4,600	ug/L	IS & E				
	CTR - fw aquatic life	California Toxics Rule (USEPA), 4-day average, dissolved (l)	24	ug/L	IS				
		California Toxics Rule (USEPA), 1-hour average, dissolved (l)	220	ug/L	IS				
	CTR - sw aquatic life	California Toxics Rule (USEPA), 4-day average, dissolved	8	ug/L	E		x		x
		California Toxics Rule (USEPA), 1-hour average, dissolved	74	ug/L	E				
	CA Ocean Plan - aq life	Aquatic Life Protection Objective, 6-month median	5	ug/L	O		x		x
		Aquatic Life Protection Objective, daily maximum	20	ug/L	O				
		Aquatic Life Protection Objective, instantaneous maximum	50	ug/L	O				
Selenium						0.438	0.47	0.516	0.627
	Chemical Constituents	California Primary MCL	50	ug/L	G & IS				
		Water Quality for Agriculture (Ayers & Westcot)	20	ug/L	G & IS				
	Toxicity - humans	California Public Health Goal for Drinking Water	30	ug/L	G & IS				
		USEPA National Recomm. WQ Criteria, water & fish consump.	170	ug/L	IS				
		USEPA National Recomm. WQ Criteria, fish consumption	4,200	ug/L	E & O				
	NTR - fw aquatic life	National Toxics Rule (USEPA), 4-day average, total	5	ug/L	IS				
		National Toxics Rule (USEPA), 1-hour average, total	20	ug/L	IS				
	CTR - sw aquatic life	California Toxics Rule (USEPA), 4-day average, dissolved	71	ug/L	E				
		California Toxics Rule (USEPA), 1-hour average, dissolved	290	ug/L	E				
	CA Ocean Plan - aq life	Aquatic Life Protection Objective, 6-month median	15	ug/L	O				
		Aquatic Life Protection Objective, daily maximum	60	ug/L	O				
		Aquatic Life Protection Objective, instantaneous maximum	150	ug/L	O				
Zinc						3	43.9	1.56	19.1
	Chemical Constituents	California Secondary MCL	5,000	ug/L	G & IS				
		Water Quality for Agriculture (Ayers & Westcot)	2,000	ug/L	G & IS				
	Tastes and Odors	California Secondary MCL	5,000	ug/L	G & IS				
	Toxicity - humans	USEPA IRIS Reference Dose (c)	2,100	ug/L	G & IS				
		USEPA National Recomm. WQ Criteria, water & fish consump.	7,400	ug/L	IS				
		USEPA National Recomm. WQ Criteria, fish consumption	26,000	ug/L	E & O				
	CTR - fw aquatic life	California Toxics Rule (USEPA), 1-hour average, dissolved (l)	54	ug/L	IS				
		California Toxics Rule (USEPA), 4-day average, dissolved (l)	54	ug/L	IS				
	Toxicity - sw aquatic life	USEPA National Recomm. WQ Criteria, 4-day avg, dissolved	81	ug/L	E & O				
		USEPA National Recomm. WQ Criteria, 1-hour avg, dissolved	90	ug/L	E & O				
	CA Ocean Plan - aq life	Aquatic Life Protection Objective for Lead, 6-month median	20	ug/L	O		x		
		Aquatic Life Protection Objective for Lead, daily maximum	80	ug/L	O				
		Aquatic Life Protection Objective for Lead, instantaneous max	200	ug/L	O				

A "Reservoir Management Plan" is identified on page 6-47. The RMP Page 2D-37) states that "past studies of metal concentrations in the Sacramento River have not focused on high flows that will be the source water for Sites Reservoir. Metal concentrations at the diversion(s) will be measured within 24 hours of the start of diversions at RBPP and every 2 weeks during continuous diversions." "After 2 years of measuring metal concentrations in the diversions, the frequency of measurements will decrease to monthly." Rather than focusing on a strict protocol or set schedule of monitoring at 2-week intervals, monitoring should target a range of flow conditions to better understand the relationship between flow and metals concentrations. Event based monitoring may require data collection biweekly, weekly, or even on a daily basis as flow conditions vary. Additional consideration for monitoring would include analyzing differences in water quality based on whether flows are primarily composed of water from Shasta Lake or tributary inflows dominate the flow in the Sacramento River at the diversion points, and dry, normal, and wet year effects on water quality. Two years of data collection likely will not be sufficient to provide the required information.

The description of the SWRCB's Antidegradation Policy on page 6-47 is misleading in stating that the policy allows for some degradation in consideration for increased beneficial uses, the supposed beneficial use being increased water supply from the proposed reservoir. The Antidegradation Policy prohibits discharges that would degrade water quality even though the degradation would not exceed water quality objectives because no capacity would exist for degradation that will be caused by the next downstream or downgradient uses – the ability to beneficially use the water would have been impaired, even though water quality objectives would not yet have been exceeded (SWRCB 2011). The contribution of additional metal loads from releases from the proposed Sites Reservoir during the summer would cause concentrations of metals in the Sacramento River (through direct releases or releases through the CBD or GCID) to exceed criteria and standards or at least be subject to the Antidegradation Policy due to an incremental increase in metals in the Sacramento River from the proposed project. Thus, the proposed project may face prohibition of releases if stored water does not meet water quality criteria or standards or if releases can cause criteria or standards to be exceeded by downstream inputs (i.e., Antidegradation Policy).

On page 6-54, page 6-57, and elsewhere, statements concerning expected mercury levels in fish, nutrients, and dissolved organic carbon in the reservoir explain that "this would be an effect on the Project itself occurring within the Sites Reservoir, rather than an effect from the Project on the surrounding environment." This seems to imply that the project would not be responsible for these issues in the reservoir since it is the location where the reservoir is placed that is responsible. It is the construction of the reservoir that creates the problem. The creation of the reservoir creates a problem for the surrounding environment (i.e., birds that will prey on fish contaminated with high levels of mercury in the reservoir).

The discussion on page 6-57 also explains that "any increases in reservoir nutrient concentrations may benefit fish." However, management of the mercury problem in the reservoir includes not introducing fish into the reservoir for at least 10 years (Mitigation Measure WQ-1.1). So, there are not any fish that would benefit from the increased nutrient concentrations in the reservoir. Even if there were fish in the reservoir, increased nutrient concentrations would lead to increased HABs (an impact) and anoxia in the hypolimnion as the organic materials (HABs) produced in the epilimnion sink and decompose in the hypolimnion, eliminating the hypolimnion as habitat for fish (another impact). As well, the anoxic hypolimnion will result in the dissolution of metals from the sediments back into the water column, yet another adverse impact from the increases in reservoir nutrient concentrations.

This section on page 6-54 of the report also acknowledges that long-term methylmercury concentrations in fish in the proposed reservoir can reasonably be expected to be about 0.85 mg/kg ww, which greatly exceeds the 0.2 mg/kg ww of the California sport fish objective.

Because Harmful Algal Blooms (HABs) are expected to be relatively high in surface water of the reservoir (page 6-55), "releases could be made from lower in the water column (e.g., through the low-level intake) to reduce the potential for higher concentrations of cyanobacteria and cyanotoxins to be released downstream." This is proposed as a strategy on page 6-57 to avoid effects from initial filling of Sites Reservoir on downstream conditions. However, a statement on page 6-16 indicates that water would be released from the surface rather than lower in the water column to avoid releasing water with high concentrations of mercury: "Due to this stratification, reservoir releases from the warmer, upper layer of water (i.e., the epilimnion) during the summer are less likely to have elevated methylmercury concentrations compared to releases from the deeper hypolimnion." Water quality is affected whether water is released from the surface (HABs) or bottom (mercury). Neither release scenario, then, is effective at mitigating impacts; releases from the bottom to avoid HABs results in high levels of mercury being released, while releases from the surface to avoid mercury results in high levels of HABs being released. One mitigation strategy conflicts with the other. Withdrawing water between the epilimnion and hypolimnion (i.e., the metalimnion) may avoid releasing water with high HABs (epilimnion) or mercury (hypolimnion), but this narrow band of water would quickly be depleted, leaving no option but to release water with either high concentrations of HABs or mercury.

One of the methylmercury management strategies is to not stock Sites Reservoir with fish for the first 10 years following its initial filling (page 6-59). How will the project prevent someone from taking it upon themselves to stock fish of their choosing, as has happened at many other reservoirs (e.g., Northern pike in the Upper Feather River reservoirs). What will the project do to prevent someone from stocking fish and to mitigate this stocking when it does occur?

Another methylmercury management strategy is to introduce an oxidant, such as nitrate, to the reservoir bottom waters (near the sediment-water interface) to reduce anoxia (page 6-59). "If this method is employed, reservoir releases will be made from a higher tier (i.e., higher elevation) in the I/O tower to avoid discharging bottom waters." Introduction of nitrates will serve as a nutrient source to stimulate increased algal ((HABs) growth following reservoir turnover. Releases from above the hypolimnion will be affected by HABs.

From page 6-70: "Thermal stratification in the summer would likely result in a reduction of oxygen toward the bottom of the reservoir in the hypolimnion. However, reservoir fish would likely not be affected by this reduction because they would not be in the hypolimnion." According to this DEIR, some of the fish species that would be introduced into the reservoir (after 10 years) include cold-water species. These fish require the cold water of the hypolimnion for survival. Reduction of oxygen in the hypolimnion will adversely affect these species.

The DEIR on page 6-81states that "concentrations of metals released from Sites Reservoir could be higher than their concentrations in the Sacramento River at the point of discharge, potentially degrading river water quality." "The release of Sites Reservoir water to the CBD under Alternatives 1, 2, and 3 would likely reduce metals concentrations in the CBD because metal concentrations in the CBD are generally higher than metals concentrations in the Sacramento River regardless of time of year." As discussed earlier, release of water to the CBD from Sites reservoir results in elevated concentrations of most metals in the CBD. However, even if release of water from Sites Reservoir to the CBD did not cause metal concentrations in the CBD to be increased, the total volume of poor quality metal laden water being released to the Sacramento River at the CBD outfall is increased with the introduction of water from Sites Reservoir, thereby causing greater adverse impacts on water quality in the Sacramento River than if just CBD water was released. The additional metals load in CBD due to the addition of water from Sites Reservoir may, when combined with other downstream discharges, result in the need for additional water treatment by downstream users, particularly municipal or industrial users.

The DEIR states on page 6-81 that "high concentrations of total metals in the Sacramento River water diverted to storage may be reduced substantially by settling of suspended sediment. This would cause concentrations to drop and approach the dissolved, filtered measurements." The DEIR does not take in account the dissolution of metals from the settled sediments under the anoxic conditions expected in the reservoir. Dissolution of metals from the settled sediments will add to those already present in the dissolved form. In addition, the DEIR states that evapoconcentration could increase metals concentrations in the reservoir by up to 48 percent.

The DEIR on page 6-82 states that "to demonstrate a range of results for the Sacramento River, these graphs show two types of results for concentrations in the Sacramento River downstream of the Sites discharge: Concentrations assuming median river concentrations mixed with Sites Reservoir concentrations that assume no settling of suspended sediment. This represents typical river concentrations mixed with Sites concentrations that are probably unrealistically high." Sites Reservoir will not be diverting "median" river concentrations, but rather the higher concentrations occurring with higher flows in the January through March period. Throughout this DEIR, comments are made that analyses are "conservative," meaning that the DEIR considers worst case scenarios in the analyses. The analyses are not "conservative" at all, but are an underestimation of the concentration of metals that will occur in the reservoir since the available data does not identify the higher concentration of metals that will occur with higher flows.

The DEIR on page 6-82 states that "the total aluminum, total copper, and total iron concentrations in Sites Reservoir are likely to frequently exceed aquatic life protection standards if settling did not reduce these concentrations." As noted previously, settling of sediments is not a permanent sink for metals in the reservoir. Dissolution of metals under anoxic conditions will allow metals from the sediments to re-enter the water column, which may then lead to even more exceedances of water quality standards for aquatic life protection.

In discussing effects on aquatic communities in the reservoir due to metals, the DEIR on page 6-82 states “these effects would occur on an aquatic community in a reservoir that is not present under existing conditions so there would be no substantial degradation of water quality relative to existing conditions.” Strange statement. There is no degradation under existing conditions without the reservoir, but there are certainly impacts on the aquatic community when the reservoir is constructed. The SWRCB sets water quality standards and objectives that includes reservoirs.

The DEIR on page 6-83 states “acute synergistic metal effects in the river would be greater than what might occur in Sites Reservoir because metal concentrations in the Sacramento River during high flow events are much higher than concentrations expected in Sites Reservoir.” Diversions to Sites Reservoir would occur during high flow events, so metals concentrations in Sites Reservoir would be similar to those in the Sacramento River during these events. The DEIR goes on to state “as described above, once suspended sediment settles in Sites Reservoir, most metals are expected to occur at levels below water quality standards for aquatic life protection, which would limit the likelihood of synergistic effects.” The DEIR considered only four metals, but nonetheless found that “with these assumptions for partial settling, concentrations for total aluminum may be close to the 620 µg/L water quality standard for aquatic life protection, hovering between about 500 µg/L and 750 µg/L” and “total copper concentrations may occasionally exceed water quality standards for aquatic life protection” (page 6-82). This conclusion conflicts with the earlier and does not support the conclusion that most metals are expected to occur at levels below water quality standards for aquatic life protection.

Graphs are presented on pages 6-84 and 6-85 that depict estimated concentrations of various metals going back as far as the year 1920 to the year 2000. There are no metals data for nearly all the years depicted in the graphs, so how were the estimates determined?

The DEIR on page 6-86 states that “arsenic levels measured in the Sacramento River are below regulatory standards.” Arsenic levels in the Sacramento River near Red Bluff as well as at Hamilton City exceed several goals and objectives, including the California Public Health Goal for Drinking Water, USEPA National Recommended WQ Criteria for water and fish consumption, and USEPA National Recommended WQ Criteria for fish consumption. Though not regulatory, these goals are criteria to which arsenic concentrations should be compared to evaluate impacts.

The DEIR states on page 6-88 that “in drought years, releases from the reservoir’s normal operating dead pool would be made through the low-level intake” and on page 6-89 that “if cyanobacteria and cyanotoxins are confirmed near the I/O tower at a level at or exceeding the “Caution” action trigger level, releases could be made from lower in the water column (e.g., through the low-level intake) to reduce the potential for higher concentrations of cyanobacteria and cyanotoxins to be released downstream. This hypolimnial release would result in water with high concentrations of methylmercury being released downstream.

In determining CEQA significance on page 6-92, the DEIR reiterates that “releasing water from lower in the reservoir if cyanobacteria and cyanotoxins are confirmed near the I/O tower at a level at or exceeding the “Caution” action trigger level, would further reduce any potential for adverse water quality effects," which ignores the conflicting issue of high methylmercury concentrations in the lower water. The DEIR on page 6-93 also states that "in the Sacramento River, discharges to the river from Sites Reservoir would occur after reductions in total metal concentrations due to settling of suspended sediment. These discharges would not cause substantial increases in concentration or exceedances or exacerbation of exceedances of water quality standards for metals in the Sacramento River." This ignores the importance of redistribution of metals from the reservoir sediments due to dissolution. Any increases in concentrations or exceedances of water quality standards for metals is a concern for downstream water users, even if not "substantial."

Mitigation for impacts to Stone Corral Creek include "release occasional pulses of high flow. Flow pulses could flush away low-quality sediment and water from the bottom of the reservoir adjacent to Sites Dam." This would flush contaminant laden sediments downstream, resulting in downstream impacts including smothering of aquatic habitat with toxics laden sediments. Adding "a vertical extension in the reservoir at the withdrawal point. This extension would pull water from higher in the reservoir, where metal concentrations are expected to be lower" and "pump water from the top of Sites Reservoir for release into Stone Corral Creek." But HABs are higher in this water that would be supplied from the upper water column of the reservoir – trading one impact for another.

Another mitigation for Stone Corral Creek (page 6-95) is to "pump water from the top of Sites Reservoir for release into Stone Corral Creek. Based on the demonstration of the effect of partial settling of suspended sediment on total metal concentrations in Sites Reservoir and the conservative nature of this assessment, metal concentrations in Sites Reservoir are expected to meet water quality standards for the protection of aquatic life during the drier parts of the year in water located above the deepest portions of the reservoir." This conflicts with earlier statements in this DEIR (page 6-82) that states "based on the calculations that demonstrate the effect of partial settling of suspended sediments, settling of suspended sediment may have a substantial effect on total metal concentrations. With these assumptions for partial settling, concentrations for total aluminum may be close to the 620 µg/L water quality standard for aquatic life protection, hovering between about 500 µg/L and 750 µg/L (Figure 6-9). Total copper concentrations may occasionally exceed water quality standards for aquatic life protection." Even higher concentrations could be expected had the effects of dissolution of metals from the sediments been considered in the analysis.

The DEIR on page 6-100 states that "the net effect of the Project would be to enhance beneficial uses of water, and water quality could improve in parts of the study area. For example, during some months the increases in Delta outflow could reduce seawater intrusion and under certain circumstances Alternatives 1, 2, and 3 could allow for seasonal storage changes in Shasta Lake that could help to preserve cold-water supply for fish through exchanges with Sites Project water." Increased releases from Sites Reservoir to preserve water in Lake Shasta will result in a greater percentage of water in the Sacramento River being composed of Sites Reservoir water, which results in less dilution from Shasta releases, and greater metals concentrations in the Sacramento River.

This section goes on to say "the development of Sites Reservoir for Alternative 1, 2, or 3 would create in-reservoir habitat and thus net benefits for Reservoir cold-water and warm-water fish species." Cold water fish species would be impacted by the anoxic conditions expected to occur in the hypolimnetic environment required by such fish. In addition, high methylmercury concentrations in the reservoir will impact all fish species. Mitigation for mercury includes not stocking fish for at least 10 years, so there would be no net benefits to cold-water and warm-water fish species for at least 10 years.

This section also states that "operations would increase water supply reliability for refuges, municipalities, and agriculture, particularly in Dry and Critically Dry Water Years." Though reliability may increase, the quality of water provided by Sites Reservoir may not be suitable for wildlife habitat in refuges and may require additional treatment by municipalities, particularly in dry and critically dry years when less dilution water would be available from existing water projects.

The Sacramento River from Red Bluff to Knights Landing is on the Clean Water Act Section 303(d) Impaired Water Bodies list for PCBs, but there is no discussion in this DEIR about PCBs.

Chapter 5. Surface Water Resources

The DEIR on page 5-28 states that "in-lieu exchanges between Sites Reservoir releases and flow in the Sacramento River would occur when Sites Reservoir releases were used to meet local Storage Partner demands (Sacramento River Settlement Contractors, Reclamation, or, most likely, GCID) that normally would be met through diversions from the Sacramento River." There would be no dilution of water from Sites Reservoir with water from the Sacramento River under such exchanges, and therefore water with higher levels of metals would be supplied to local Storage Partners, particularly GCID, with associated adverse effects. There is no discussion about the adverse effects of such exchanges from metals or other water quality parameters (HABs, cyanotoxins, etc.) to the local water users, including use on wildlife refuges.

The SWRCB is engaged in activities to address the precipitous declines of native aquatic species and the ecosystem they depend upon. These activities include updating the Water Quality Control Plan for the San Francisco Bay/Sacramento-San Joaquin Delta Estuary to protect the Bay-Delta watershed and its many beneficial uses. The SWRCB is focusing on the Sacramento River and its tributaries, Delta tributaries, Delta outflows, and interior Delta flows. As with the Lower San Joaquin River and Southern Delta update, the SWRCB is concerned about adequate flows in the Sacramento River system to protect instream fish and wildlife, and is proposing Delta inflows of up to 65% of unimpaired flow in the Sacramento River. These updates to the Bay-Delta Plan will reduce the amount of water available for diversion to the proposed Sites Reservoir. There is no discussion about how the reduced flows available for diversion from the Sacramento River due to updates to the Bay-Delta Plan will affect the viability of the proposed Sites Reservoir project.

Chapter 10. Wildlife Resources

In discussing Impact WILD-1k: Golden Eagle and Bald Eagle, the DEIR states on page 10-96 that "the completed reservoir would provide new bald eagle foraging habitat (fish in the reservoir) and result in new nesting sites or wintering habitat because of the proximity to new foraging habitat. These would be beneficial effects." There would be no fish in the reservoir for at least 10 years (Mitigation Measure WQ-1.1), so there would be no new bald eagle foraging habitat and no new nesting sites or wintering habitat because of the proximity to new foraging habitat, therefore no beneficial effects. After 10 (or more) years, any fish stocked into the reservoir would develop a mercury burden which would impact fish eating birds, such as the bald eagle.

CEQA Significance Determination and Mitigation Measures finds that implementation of Alternative 1 or 3 would have the beneficial effects of providing new bald eagle foraging habitat (Sites Reservoir) and new nesting sites or wintering habitat because of the proximity to the new foraging habitat. As explained above, there is no new foraging habitat or nesting or wintering habitat because there will be no fish in the reservoir for at least 10 years. This is also true for the *NEPA Conclusion* on page 10-99. There is no discussion of any mitigation measures to prevent bald eagles, or other fish eating birds, from ingesting fish contaminated with mercury, or how their populations will be mitigated due to the adverse effects from ingestion of mercury laden fish.

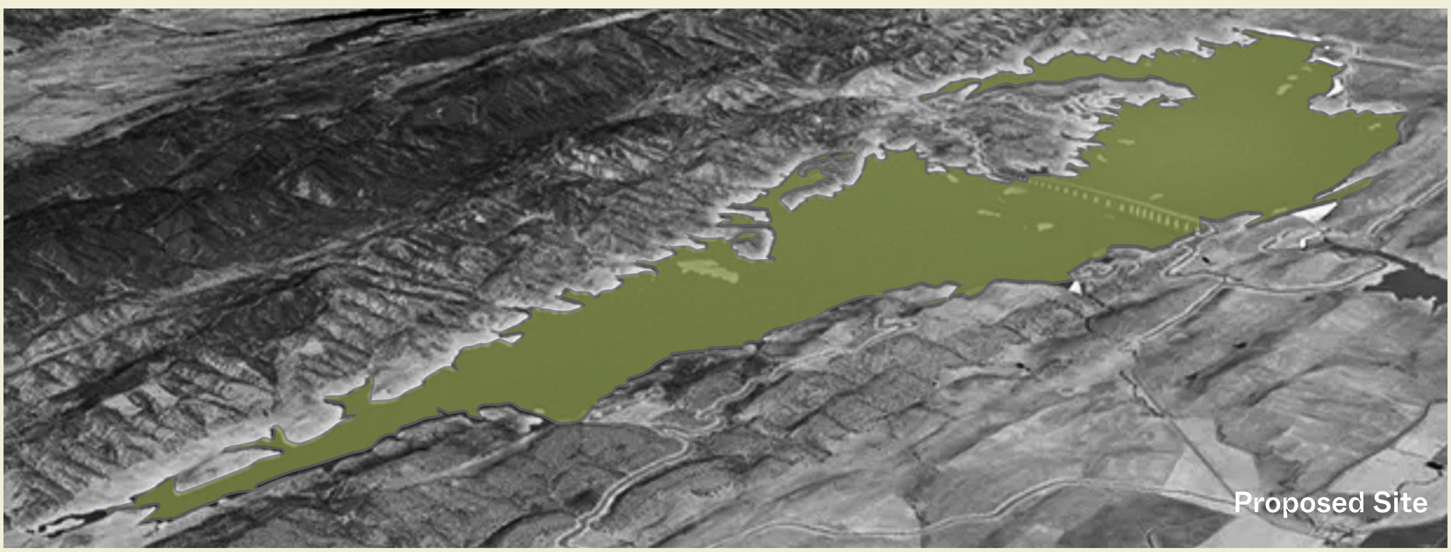
In discussing impacts to various species of bats, the DEIR states that "the completed reservoir would provide a new drinking water source and foraging habitat (insects associated with the reservoir) for bats. This would be a beneficial effect of the Project." The DEIR does not address the impacts to bats from ingesting water laden with cyanotoxins from HABs in the reservoir, nor the effects of mercury in the insects that the bats would be eating.

DWR 2007. Mercury Contamination in Fish from Northern California Lakes and Reservoirs. July 2007

Exhibit C

Estimate of Greenhouse Gas Emissions for the Proposed Sites Reservoir Project using the All-Res Modeling Tool

Estimate of Greenhouse Gas Emissions for the **Proposed Sites Reservoir Project** using the All-Res Modeling Tool



Prepared by Tell The Dam Truth and Friends of the River
Funded by Patagonia

Executive Summary

The Proposed Sites Reservoir project in northern California would divert water out of the Sacramento River to fill a 1.5 million acre-foot reservoir to serve as municipal water supply for agencies in northern and southern California. The project has generated both support and opposition, as well as controversy.

At the same time, knowledge and science about the environmental impacts of dams and reservoirs has increased significantly in the U.S. and across the planet, with a focus on the greenhouse gas (GHG) emissions caused by dams and reservoirs, especially methane.

In this report, we apply a newly developed tool, "All-Res", to estimate the life cycle GHG emissions from the Sites Reservoir project. The All-Res modeling tool is an advancement over existing modeling tools used to estimate GHG emissions from reservoir systems because All-Res includes all of the cradle-to-grave greenhouse gas emission source categories documented in peer-reviewed scientific literature attributable to dam and reservoir systems including hydropower facilities.

The Sites Project is **estimated to emit approximately**

362,000

METRIC TONS OF CO_2E/YEAR

The Sites Project will emit* approximately **the same as**

80,653

GAS-POWERED AUTOMOBILES DRIVEN FOR ONE YEAR, OR,

405,985,051

POUNDS OF COAL BURNED IN ONE YEAR, OR,

45,679

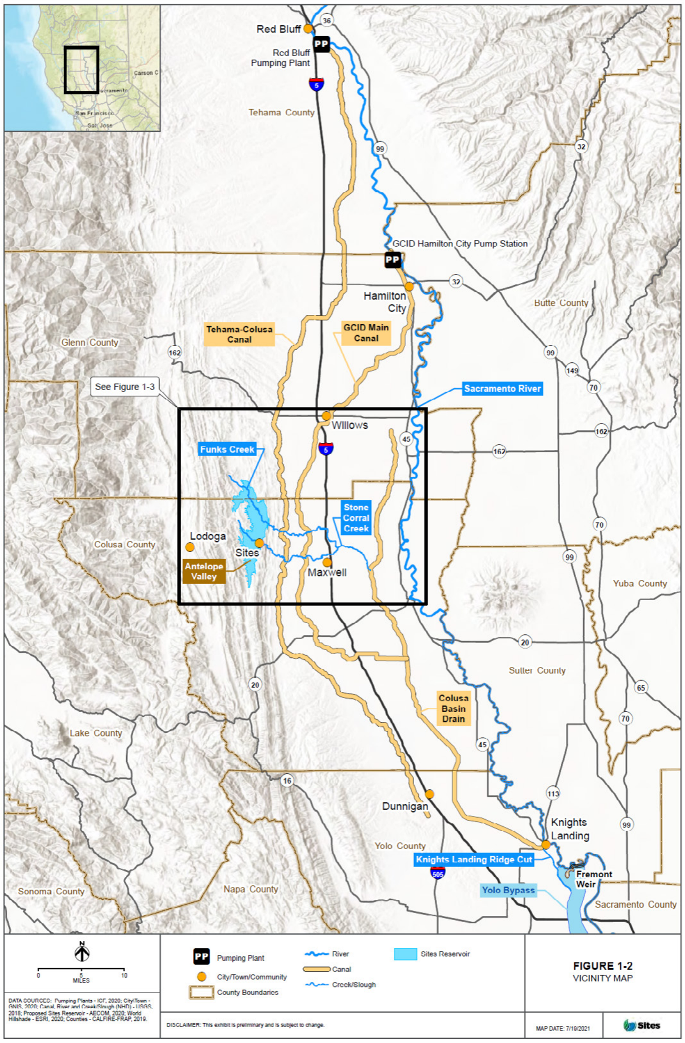
HOMES' ENERGY USE FOR ONE YEAR.

*using the U.S. EPA's emissions comparison tool

Further, the EPA requires large facilities to report if their emissions exceed 25,000 metric tons of CO_2e/year. Further yet, the most significant GHG emitted by the Sites Reservoir (and all reservoirs) is methane, a potent contributor to short-term climate change targeted by both the State of California and the U.S. Government as needing to be mitigated and decreased.

We strongly encourage decision-makers and public agencies to consider the GHG emissions caused by the proposed Sites Reservoir project in any ongoing or future permitting and funding decisions.

Figure 1: Vicinity Map, Sites Reservoir Project, California.



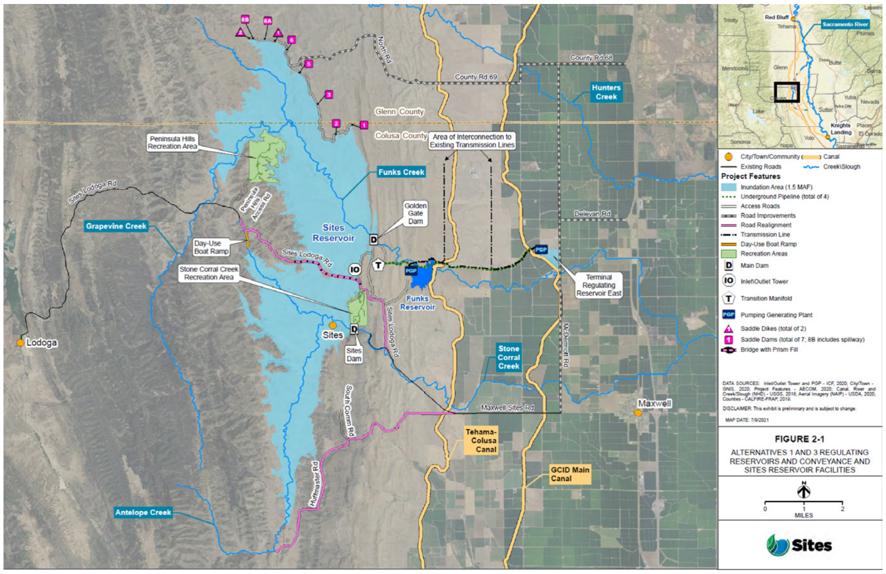
Introduction

Over the last few decades, dam and reservoir projects have come under increasing scientific scrutiny because of the greenhouse gases they emit. Dozens of scientific studies have found that dam and reservoir projects, including hydropower, can emit varying levels of greenhouse gases (GHGs), and sometimes even projects built primarily for hydropower production can emit even more GHGs than coal-fired powerplants producing an equal amount of electricity.[1234]

Further, in 2022 for the first time in history, the U.S. Environmental Protection Agency reported dam and reservoir emissions to the United Nations Framework Convention on Climate Change, using IPCC guidelines, thus setting the precedent for these reports across the U.S. during dam permitting processes.[5]

Using readily available emissions models that estimate GHGs from hydropower projects, and using data provided from public sources including the Revised Draft Environmental Impact Report/Supplemental Draft Environmental Impact Statement for the proposed Sites Reservoir (USBR, 2021), we developed and applied the All-Res Modeling Tool[6] to calculate the total carbon footprint over the lifecycle of the Sites Reservoir Project, located in northern California.

Figure 2: Sites Reservoir Facilities



1 https://www.climatecentral.org/news/hydropower-as-major-methane-emitter-18246
2 https://www.washingtonpost.com/news/energy-environment/wp/2016/09/28/scientists-just-found-yet-another-way-that-humans-are-creating-greenhouse-gases/
3 https://www.latimes.com/science/la-xpm-2013-aug-01-la-dams-greenhouse-gas-hot-spots-20130801-story.html
4 https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0161947
5 https://therevelator.org/dam-emissions-reporting/
6 https://savetheworldsrivers.org/all-res/

The Sites Reservoir Project includes an off-stream reservoir to capture additional water from major storms and store the water until it is proposed to be used. Water would be diverted and pumped from the Sacramento River into two existing canals located in the northern portion of the Central Valley (**Figure 1**). The diverted water would be pumped into the reservoir from one or two pumping plants (**Figure 2**). The reservoir for the preferred alternative (Alternative 1) would inundate approximately 13,200 acres and hold up to 1.5 million acre-feet of water, withheld by two larger dams, seven smaller saddle dams, and two saddle dikes.

As stated on the Sites Reservoir website[7], the project would be operated in the following manner:

> Sites Reservoir is a "beneficiary pays" project, which means that the benefits of the project go to those paying. Each participant (including environmental uses) has control over their portion of the storage space and a proportionate share of the water diverted into Sites Reservoir. There is flexibility in the timing and uses of the water, including for the environment. The assurance of water being in the reservoir is largely the result of the individual participant decisions in their operations of their portion of the facility. This way, each member is assured to receive what they pay for in a way that works within and complements that member's water supply portfolio.

The project is to be owned and operated by the Sites Project Authority, composed of some Sacramento Valley public agencies[8]. The California Water Commission has allocated approximately $875 million in funds for the project,[9] including $44 million to pay for environmental review and permitting (to be approved on May 17, 2023),[10] and the U.S. Congress has appropriated approximately $214 million for the project as of 2022. [11] The U.S. Department of Agriculture is providing a $449 million loan.[11] The U.S. EPA has invited the Sites Project Authority to apply for a $2.2 billion low-interest WIFIA loan.[13]

7 https://sitesproject.org/frequently-asked-questions/
8 https://sitesproject.org/wp-content/uploads/2022/09/Sites-Joint-Powers-Agreement-1.pdf
9 https://cwc.ca.gov/Water-Storage/WSIP-Project-Review-Portal/All-Projects/Sites-Project
10 https://cwc.ca.gov/-/media/CWC-Website/Files/Documents/2023/05_May/May2023_Item_11_WSIPEarlyFunding_Final.pdf
11 https://sitesproject.org/wp-content/uploads/2023/01/Sites-Reservoir-News-Release_Additional-80M-Federal-Funds_1.4.2023.pdf
12 https://www.friendsoftheriver.org/wp-content/uploads/2018/12/Trump-officials-announce-450-million-loan-R-R-Searchlight-Nov-27-2018.pdf
13 https://www.acwa.com/news/sites-reservoir-to-pursue-wifia-loan/ https://www.epa.gov/wifia/what-wifia

THE ALL-RES MODELING TOOL

We applied the All-Res modeling tool for the Sites Reservoir project and compared total greenhouse gas emissions from the reservoir and its construction and operation over its life cycle to other emissions sources using the U.S. Environmental Protection Agency's emissions comparison calculator.

All-Res uses a cradle-to-grave, full life cycle inventory approach to calculate the total carbon footprint over the life cycle of a dam and reservoir system. The All-Res modeling framework uses a 100-year life cycle period, a common metric in greenhouse gas accounting for dam and reservoir facilities.

The All-Res modeling tool is an advancement over existing models used to estimate greenhouse gas emissions from reservoir systems because it examines the full, cradle-to-grave scope of the greenhouse gas emissions source categories documented in peer-reviewed scientific literature attributable to a dam and reservoir project. Existing tools examine only a portion of the lifecycle scope, leaving out emissions from end-of-life facility decommissioning, downstream biogenic emissions caused by the facility, carbon leakage, loss of ecosystem function, and significant fractions of land-use-change emissions.

The following emissions pathways are included in the All-Res modeling tool:

- Construction
- Facility operations and maintenance
- Facility decommissioning
- Reservoir surfaces
- Decay of organic matter on exposed banks of the reservoir
- Degassing methane through hydropower turbines and non-hydropower spillways

- Carbon leakage: land use changes away from the reservoir, including deforestation and vegetation changes, to replace inundated farmland and ranchland

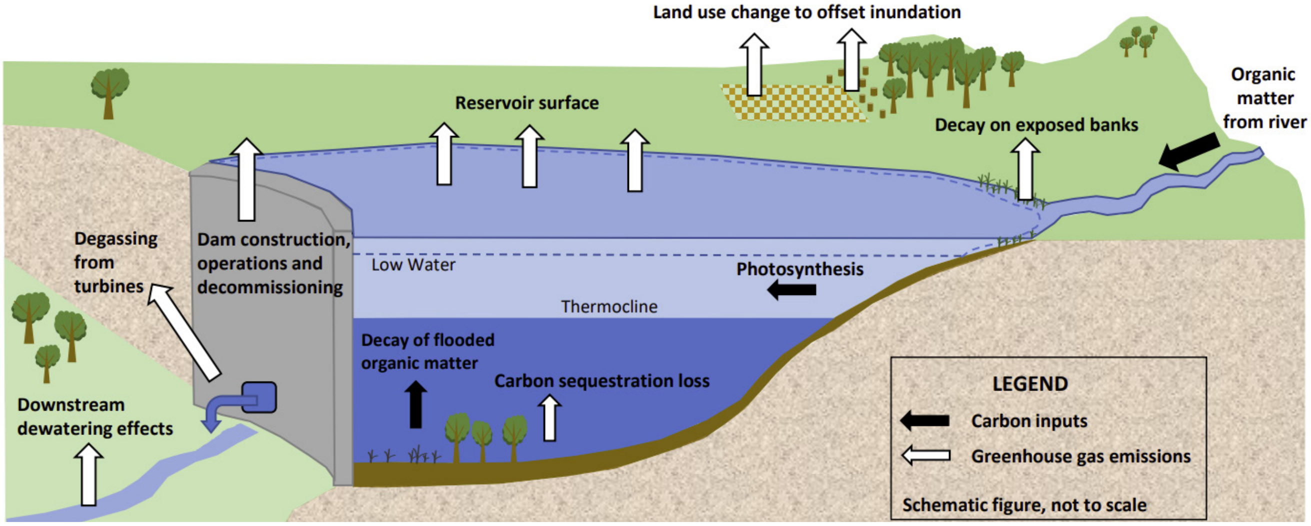
- Land use changes beneath the reservoir, including loss of carbon sequestration by vegetation that becomes inundated and emissions from anaerobic decay of that vegetation, as well as the lost ecosystem function of future carbon sequestration in the inundated former forest, and downstream effects, including ecosystem carbon loss from dewatering of wetlands, riparian areas, or mangroves, and emission releases from decaying riparian vegetation due to from fluctuating river levels.

Each of these are described below, including a summary of the key components and methods used to estimate the emissions from each pathway. See **figure 3**, below, for a graphical depiction of all emissions sources and pathways.

Per convention, All-Res estimates emissions for a 100-year evaluation period, and converts all methane (CH_4) and nitrous oxide (N_2O) emissions into CO_2e (carbon dioxide equivalent) emissions. N_2O emissions are calculated from ecosystem losses downstream, but are not quantified from reservoir surfaces or banks due to a lack of published data and models to account for those emissions.

The All-Res model also considers the quantified uncertainty of input data for all emissions pathways, and incorporates that into a Monte Carlo uncertainty analysis to estimate emissions confidence intervals. As more data becomes available and simulation models improve, this uncertainty will likely be reduced compared to the current version of this modeling tool.

Figure 3:
Emissions pathways in a dam and reservoir facility included in All-Res.



EMISSIONS PATHWAYS INCLUDED IN THE ALL-RES MODELING TOOL

Construction

Construction is a component of total emissions associated with reservoirs due to the large amount of energy required to heat limestone, clay, and cement to create the concrete that is used in construction, as well as the fuel burned in construction equipment on site and to quarry and deliver rock and aggregate used in dam construction. CO_2 emissions associated with the proposed Sites Reservoir construction that are in the All-Res modeling tool are taken directly from the Draft Environmental Impact Statement[14] (DEIS).

Operations and Maintenance

Emissions from Operations and Maintenance (O&M) activities at the Sites project include maintenance activities, use of recreational areas around the reservoir, and boating on the reservoir. Emissions in this pathway also include those associated with the electricity required to pump water into the supply canals and up into the reservoir, emissions associated with distribution and transmission of electricity, and then subtracting the electricity that is generated by the project. As with the construction pathway, emissions from the O&M pathway are taken from the DEIS.

California has enacted legislation to reduce greenhouse gas emissions 40% below 1990 levels by 2030, and an 80% reduction by 2050. Project construction is planned to be completed by 2029 with O&M to begin in 2030. The project proponents are planning net zero emissions by 2040, for ongoing O&M, by implementing a series of greenhouse gas reduction measures. Fossil Fuel emissions associated with O&M activities are computed only for the 2030-2040 period.

Decommissioning

Decommissioning of a reservoir has the potential to produce a significant amount of both CH_4 and CO_2 from the mineralization and decomposition of carbon present in exposed lakebed sediments. Pacca[15] estimated that emissions associated with decommissioning were an order of magnitude larger than emissions during the life of a large U.S. reservoir. Song et al[16] provides a

14 https://sitesproject.org/environmental-review/draft-environmental-impact-report-environmental-impact-statement/
15 Pacca, S., 2007. Impacts from decommissioning of hydroelectric dams: a life cycle perspective. Climatic Change, Vol 84 pp 281-294.
16 Song et al, 2018. Cradle-to-Grave Greenhouse Gas Emissions from Dams in the United States of America. Science, Elsevier. www.sciencedirect.com/science/article/pii/S1364032118302235

range of emissions factors of CO_2e per MW-hour of power production, and these are adapted for use in this non-hydropower reservoir application. Emissions associated with decommissioning the pumping plants and associated power lines and other infrastructure are included for this pathway for the Sites project.

Reservoir Surface

Greenhouse gases from the reservoir enter the atmosphere from the surface of the water body. These gases come from decomposing organic matter that flows into a reservoir from its watershed, from vegetation and soils that become inundated, and from aquatic plants and algae that produce CH_4,CO_2, and N_2O. Diffusion and bubbling (ebullition) bring the gases that are not oxidized in the reservoir to the reservoir surface.

Due to the different processes involved in the production of various gases, the All-Res modeling tool conservatively limits surface emissions estimates to CH_4. Deemer et al.[17] provided an estimated CH_4 surface flux emissions for 75 reservoirs worldwide. For the Sites project we used the average flux of 28 reservoirs that were in the Temperate Region of the Deemer et al.[18] database, which is the geographic zone for the Sites project.

Exposed Banks

The shorelines (banks) of reservoirs are exposed when water levels fluctuate due to reservoir operations. The periodic exposure and subsequent inundation of the reservoir banks creates conditions that can produce CH_4 from vegetation present in this zone. The DEIS includes predicted reservoir surface areas each month based on modeled water levels in the reservoir. The area for exposed banks was taken as the difference between the maximum and minimum surface areas for the long-term simulated inflows. Harrison et al.[19] documented how reservoir surface fluctuation increases methane emissions from reservoir banks and surfaces, and Deemer et al.[20] provides an estimate of the CH_4 surface emissions per unit area of exposed banks, which is used in this modeling tool.

17 Deemer, Bridget R., John A. Harrison, Siyue Li, Jake J. Beaulieu, Tonya DelSontro, Nathan Barros, José F. Bezerra-Neto, Stephen M. Powers, Marco A. dos Santos, and J. Arie Vonk. "Greenhouse Gas Emissions from Reservoir Water Surfaces: A New Global Synthesis." BioScience 66, no. 11 (November 1, 2016): 949–64. https://doi.org/10.1093/biosci/biw117.
18 Ibid 17.
19 Harrison, J. A., B.R. Deemer, M.K. Birchfield, and M.T. O'Malley. 2017. Reservoir Water-Level Drawdowns Accelerate and Amplify Methane Emission. Environmental Science & Technology 41: 1267-1277. https://doi.org/10.1021/acs.est.6b03185.
20 Ibid 8.

Turbines

Discharge of reservoir water through turbines or outlets, referred to here as the turbines pathway, can be a source of emissions. These emissions are due to degassing of methane-rich water discharged from the oxygen-depleted depths of the reservoir through the turbines. These emissions are released due to the rapid drop in hydrostatic pressure when water exits the turbine into the river/reservoir/ canal downstream. Emissions of CH_4 are much higher for outlets that are situated below the thermocline, in the hypolimnion, due to the anoxic conditions present in those waters. Delwiche et al.[21] estimated that CH_4 emissions at outlets are likely 80 to 95 percent of surface emissions, which is consistent with other publications. A value of 80% of surface emissions has been used in the current version of All-Res on other projects.

The proposed Sites Reservoir is designed to have a multi-level inlet/outlet tower within the reservoir, from which water may be drawn from multiple depths ranging from near the surface to near the bottom. The depths from which the water would likely be drawn through the tower is not specified in the design documents. To take this uncertainty into account, we make the assumption that water may be drawn equally from below and above the thermocline, reducing the estimated emissions by half, to 40% of surface emissions.

Land Use Changes Under The Reservoir

Inundation of vegetated land beneath a reservoir affects greenhouse gas emissions in two pathways: the loss of ecosystem function as future carbon sequestration (uptake) from the vegetation had the reservoir not inundated the site, and the production of CO_2 due to decomposition of that inundated vegetation. These gasses are released through the reservoir surface and turbines but are included in this emissions pathway due to uncertainties in the release pathway to the atmosphere. The IPCC greenhouse gas inventory guidance (Penman et al.,[22] Lasco et al.,[23] and Lovelock et al.[24]) for estimating the carbon stock (mass), the changes in carbon stock, and the greenhouse gas emissions and removals associated with changes in land use are used for this pathway. Estimated inundation areas of oak woodlands, wetlands, grasslands – the vegetation in the proposed inundation area – were derived from the Sites Reservoir DEIS.

21 Delwiche et al, 2022. Estimating Drivers and Pathways for Hydroelectric Reservoir Methane Emissions Using a New Mechanistic Model. JGR Biogeosciences, 127, e2022JG006908.
22 Penman et al, 2003. Good Practice Guidance for Land Use, Land-Use Change and Forestry. IPCC National Greenhouse Gas Inventories Programme.
23 Lasco et al, 2006. Volume 5 Chapter 5, Cropland. 2006 IPCC Guidelines for National Greenhouse Gas Inventories.
24 National Greenhouse Gas Inventories.

Land Use Changes Away From The Reservoir (Carbon Leakage)

“Carbon leakage” describes the change in CO_2 emissions that occur due to a land use change away from a reservoir to replace land uses in areas that were inundated. The most common example is the need to replace inundated farmland to match the food production prior to the loss of farmland due to inundation. For the Sites project it is assumed that the farmland losses are negligible, but accounts for replacing settlements, grasslands and forests. IPCC guidance (Penman et al.,[25] Lasco et al.,[26] and Lovelock et al.[27]) for estimating the changes in carbon stock due to changes in land use were used for this pathway. Estimated inundation areas of oak forests and settlements were provided in the DEIS.

Downstream Effects

A reservoir can affect emissions in downstream areas due to changes in river flow. Reservoirs typically decrease river flow downstream, which can have the effect of reducing and drying out of wetland and other riparian vegetation, causing a loss of ecosystem carbon and nitrogen through decomposition of dead plants and loss of soil organic carbon and nitrogen. This decomposition process produces CH_4, CO_2 and N_2O. In addition, hydropower reservoirs can affect downstream emissions due to fluctuating river levels caused by changes in the hydrologic flow regime. The latter effects may be similar to those for shorelines of reservoirs, with additional emissions produced due to the periodic exposure and subsequent inundation of the river banks.

No direct estimation of wetland loss in the Sacramento – San Joaquin River Delta is apparent in the DEIS analysis. We estimate that 3,686 acres of wetlands in the Sacramento River – San Joaquin River Delta would be impacted by the project. The term “impacted” means freshwater marsh, underlain with peat soils, that would no longer reliably receive flows that would sustain the hydrology of those soils in their native, anoxic state. The peat in the delta area is therefore assumed to decompose in the same ways that peat soils drained for agricultural production would decompose.[28, 29] The acreage estimate was arrived at by using the 1% overall

25 Ibid 13.
26 Ibid 14.
27 Ibid 15.
28 Huang et al, 2021. Tradeoff of CO2 and CH4 emissions from global peatlands under water-table drawdown. Nature Climate Change 11:618-622.
29 Eve et al, 2014. Quantifying Greenhouse Gas Fluxes in Agriculture and Forestry: Methods for Entity‑Scale Inventory. Technical Bulletin Number 1939. U.S. Department of Agriculture, Washington, DC. 606 pages.

reduction in total flows from the Sacramento River to the Delta based on modeled flows presented in the DEIS. The impacted wetlands assumes that half of the inflow to the Delta freshwater wetland of 737,295 acres[30] comes from Sacramento River. This estimate assumes an even ratio of stage to surface area in the region of river inflows to the Delta, for which no analysis is provided in the DEIS.

The DEIS discusses widespread ecosystem recovery and improvement projects in the region, however none of the projects are clearly described as "additional." These are projects being implemented by the California Department of Water Resources (DWR) that are already in planning or implementation stages. For these projects to be classified as "additional" – meaning they would offset carbon emissions from loss of wetland in the Delta due to the proposed Sites project – they would have to be planned and implemented as a direct result of the Sites project. Freshwater wetland restoration requires additional flows be dedicated to restoring wetlands in total, and thus with a net loss of freshwater inflow to the Delta, it isn't clear how any additional restoration activities could occur.

Uncertainty Analyses

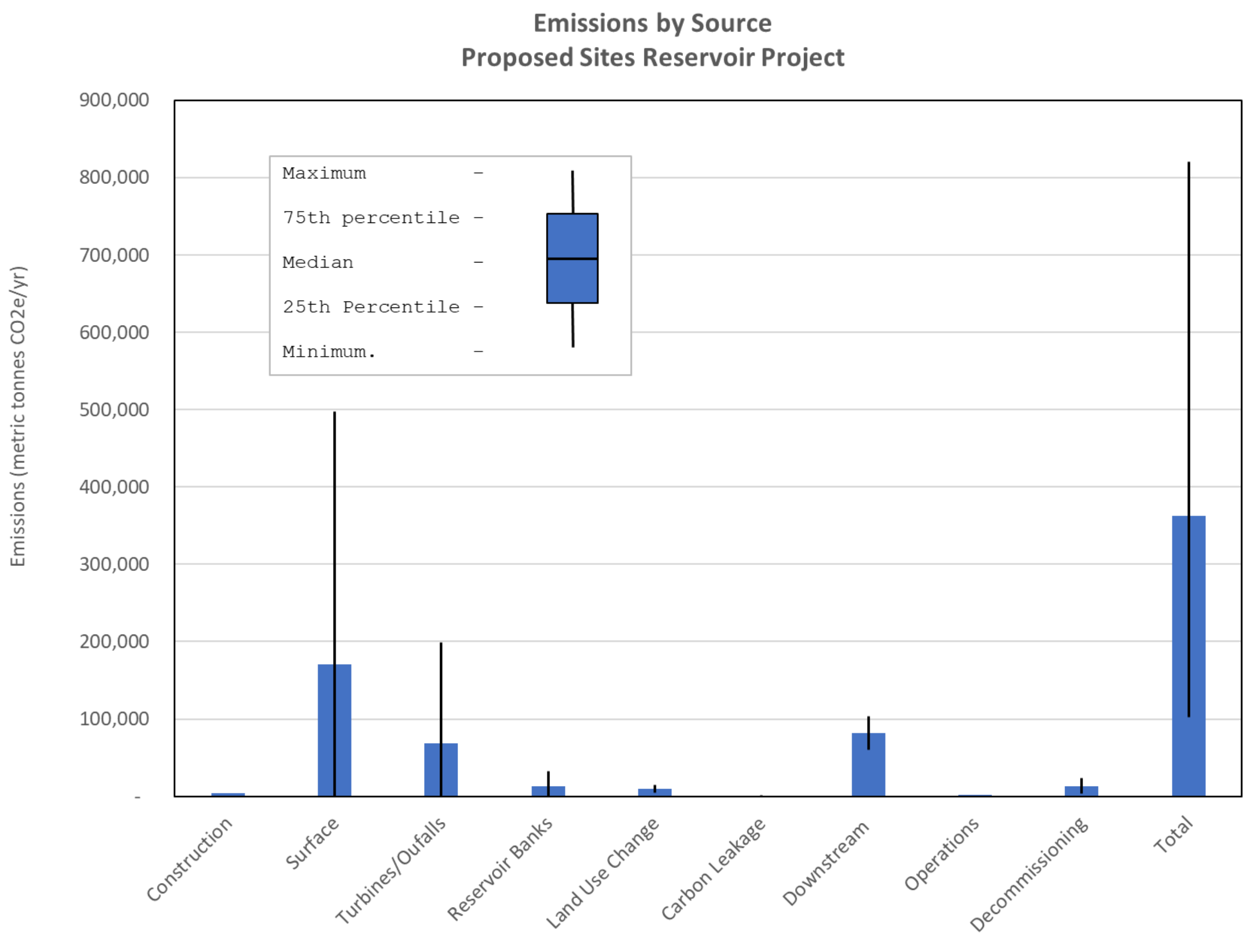
To account for uncertainty in the emissions models, the All-Res modeling tool includes an uncertainty analysis. The analysis uses a Monte-Carlo process that utilizes the published probability distributions of emissions factors, carbon stocks, and construction materials, based on published ranges and standard deviations, where provided. Using a 1000-iteration approach, the resulting emissions are described by their mean and percentile distributions which are presented in the model output. The uncertainty analysis was not applied to emissions associated with the Construction, nor to the Operations and Maintenance, pathways since emissions from those pathways were provided in the DEIS.

30 Young et al, 2021. Food Web Fuel Differs Across Habitats and Seasons of a Tidal Freshwater Estuary. Estuaries and Coasts 44, 286–301.

SITES RESERVOIR PROJECT RESULTS

The Sites Reservoir project is predicted to emit approximately 36.2 million metric tons of CO_2e over its 100-year lifecycle, or approximately 362,000 metric tons of CO_2e/year. The most significant emissions would be methane from the reservoir surface and turbines as well as carbon dioxide and nitrous oxide from the loss of ecosystem carbon in the wetlands of the San Joaquin-Sacramento River Delta. See **figure 4** below.

Figure 4:
Distribution of predicted emissions of CO_2e/year by emissions pathway for the Sites Reservoir Project over its 100-year lifecycle.



31 https://www.epa.gov/energy/greenhouse-gas-equivalencies-calculator

For comparison, using the EPA's GHG emissions calculator, this amount of yearly emissions is equivalent to the emissions described in **Figure 5** below:

Figure 5:
Emissions Comparisons From EPA's Website

362,437 Metric Tons **of Carbon Dioxide (CO_2) equivalent**

This is equivalent to greenhouse gas emissions from:

- **80,653** gasoline-powered passenger vehicles driven for one year ?
- **929,124,940** miles driven by an average gasoline-powered passenger vehicle ?

This is equivalent to CO_2 emissions from:

- **40,782,829** gallons of gasoline consumed ?
- **35,602,849** gallons of diesel consumed ?
- **405,985,051** pounds of coal burned ?
- **4,798** tanker trucks' worth of gasoline ?
- **45,679** homes' energy use for one year ?
- **70,521** homes' electricity use for one year ?
- **1,998** railcars' worth of coal burned ?
- **838,293** barrels of oil consumed ?
- **16,650,020** propane cylinders used for home barbeques ?
- **0.097** coal-fired power plants in one year ?
- **0.911** natural gas-fired power plants in one year ?
- **44,087,795,796** number of smartphones charged ?

For further comparison, the U.S. Environmental Protection Agency requires that certain large emitters in the U.S. report under the EPA's Greenhouse Gas Reporting Program if their emissions equal or exceed 25,000 metric tons of CO_2e/year. **The Sites project's estimated emissions are over 14 times greater than the EPA's reporting threshold.**

Some proponents of the project point to the electricity generated by the project as a significant boon to its development. This argument has little merit because:

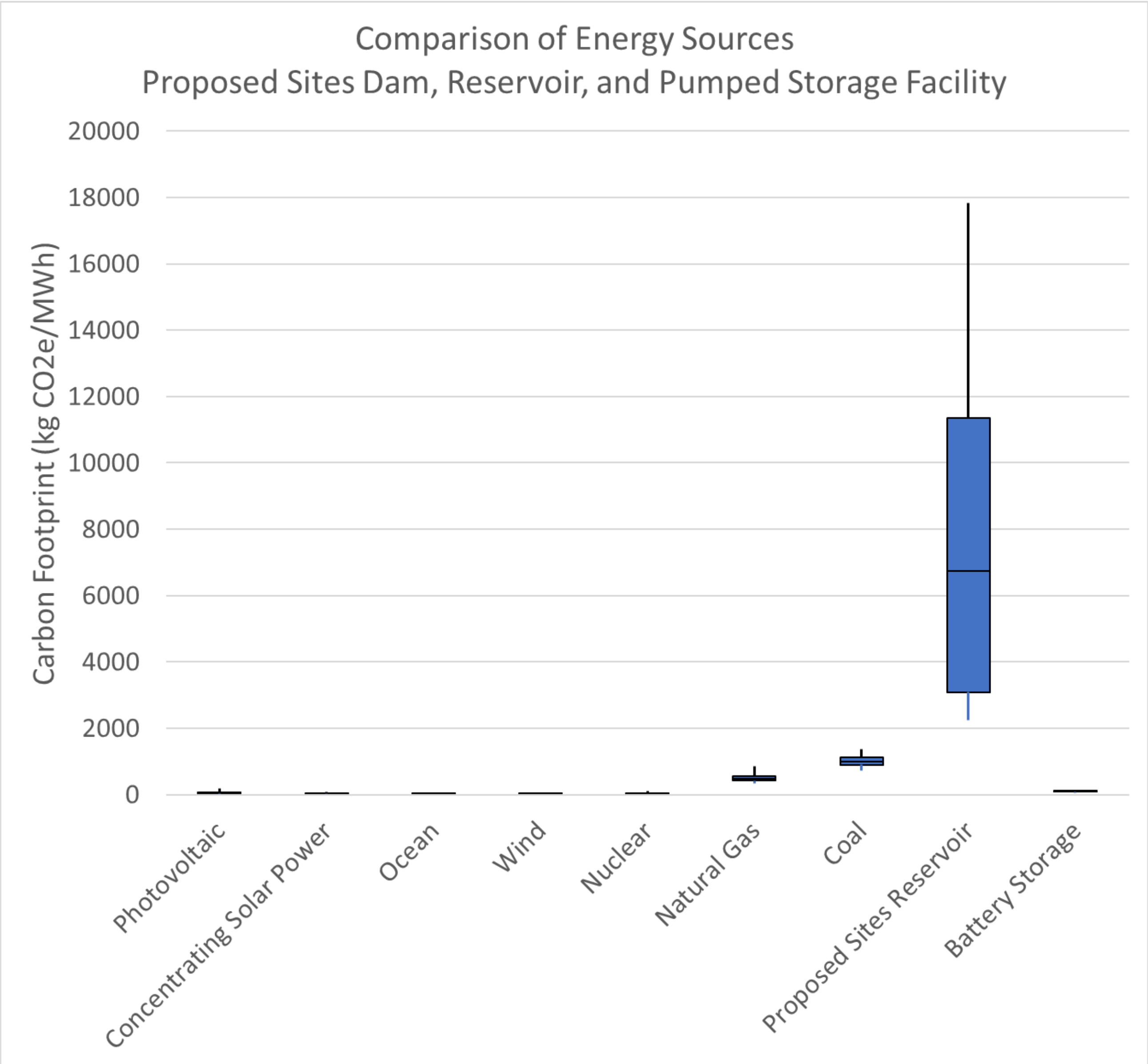
First, the project is estimated to generate only a small amount of electricity, up to 46 GWh of energy per year as a long-term average, and up to 74 GWh/year during dry and critically dry water years. For comparison, an average gas-fired powerplant produces 650 MWh/year.

Second, like all "pumped storage" facilities, the Sites project would require more electricity to pump the water out of the Sacramento River and into the canals, and then into the reservoir, than the project would generate through its turbines.

Third, if the greenhouse emissions attributable to the project by the All-Res Modeling Tool are compared to the emissions of other electricity generating sources, Sites would be an enormous emitter in a MWh/year comparison. The median emissions per MWh for Sites are estimated to be approximately 6,800 kilograms of CO_2e whereas a coal-fired powerplant is only 1,000 kilograms of CO_2e/MWh. See **Figure 6** below.

32 https://www.epa.gov/ghgreporting
33 https://www.eia.gov/todayinenergy/detail.php?id=38312#:~:text=Most%20of%20the%20installed%20capacity,600%20MW%20to%20700%20MW

Figure 6: Emissions comparisons for Other Energy Sources



THE AUTHORS

Gary Wockner, PhD, is an award-winning environmental activist and author who directs Tell The Dam Truth. Gary has over two decades of experience protecting rivers in Colorado, the Southwest U.S., and across the world. He has written and lectured extensively for public audiences and the media about the greenhouse gas emissions caused by dams and reservoirs.

Mark Easter is an ecologist, retired from Colorado State University, where he worked for over two decades developing and implementing ecosystem greenhouse gas accounting methods and decision support systems for agriculture, forestry, wetlands, and other land uses. He has authored or co-authored more than fifty publications and contributed to multiple others in the field of ecosystem GHG accounting. Mark is a TTDT consultant.

Gordon McCurry, PhD, is a hydrologist with more than 35 years of experience with quantitative analyses and modeling of groundwater and surface water systems. He has been involved in evaluating the hydrologic effects of climate change for several decades, focusing on how changes in precipitation and temperature affect both water supply and water demand, and how water management practices need to adapt to our new hydrology. Gordon is a TTDT consultant.

Tell The Dam Truth (TTDT) fights the climate crisis by advocating for the protection and restoration of river ecosystem biodiversity and carbon sequestration. TTDT works to include all of the impacts of dams in all public decision-making around dam permitting, re-licensing, and decommissioning. TTDT receives funding and support from **Patagonia**.

TELLTHEDAMTRUTH.COM

Friends of the River (FOR) is dedicated to preserving and restoring California's rivers, streams, and their watersheds as well as advocating for sustainable water management. Friends of the River was founded in 1973 during the struggle to save the Stanislaus River from New Melones Dam. Friends of the River is nationally recognized as an authority on the adverse impacts of dams on rivers and ecosystem. FOR has led successful campaigns for the permanent protection of many outstanding California rivers and streams. Friends of the River has 3,500 members, 7 staff, and a 10 member Board of Directors.

FRIENDSOFTHERIVER.ORG

PRINTABLE MAPS OF THE SITES RESERVOIR PROJECT

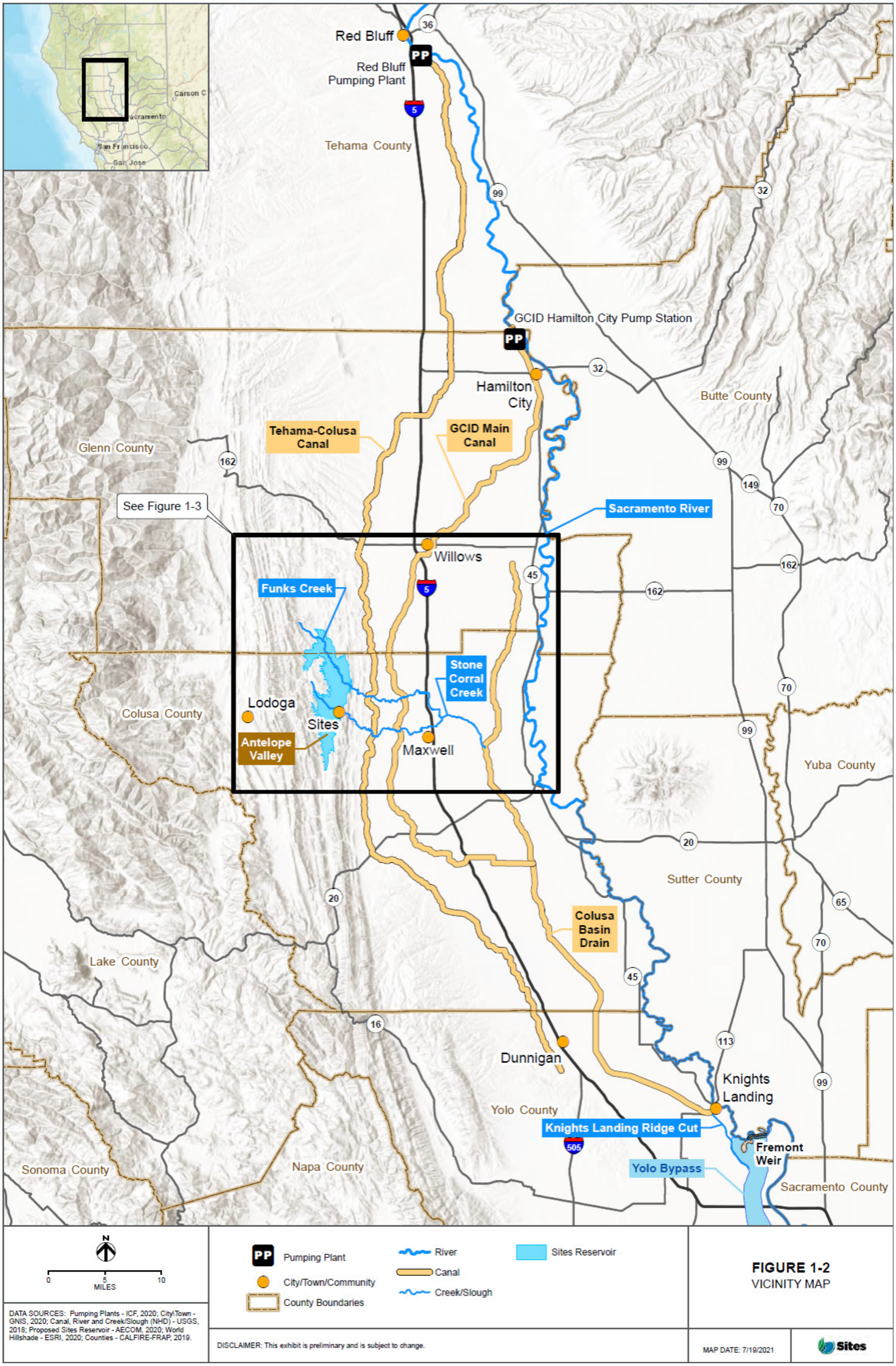


Figure 1: Vicinity Map, Sites Reservoir Project, California.

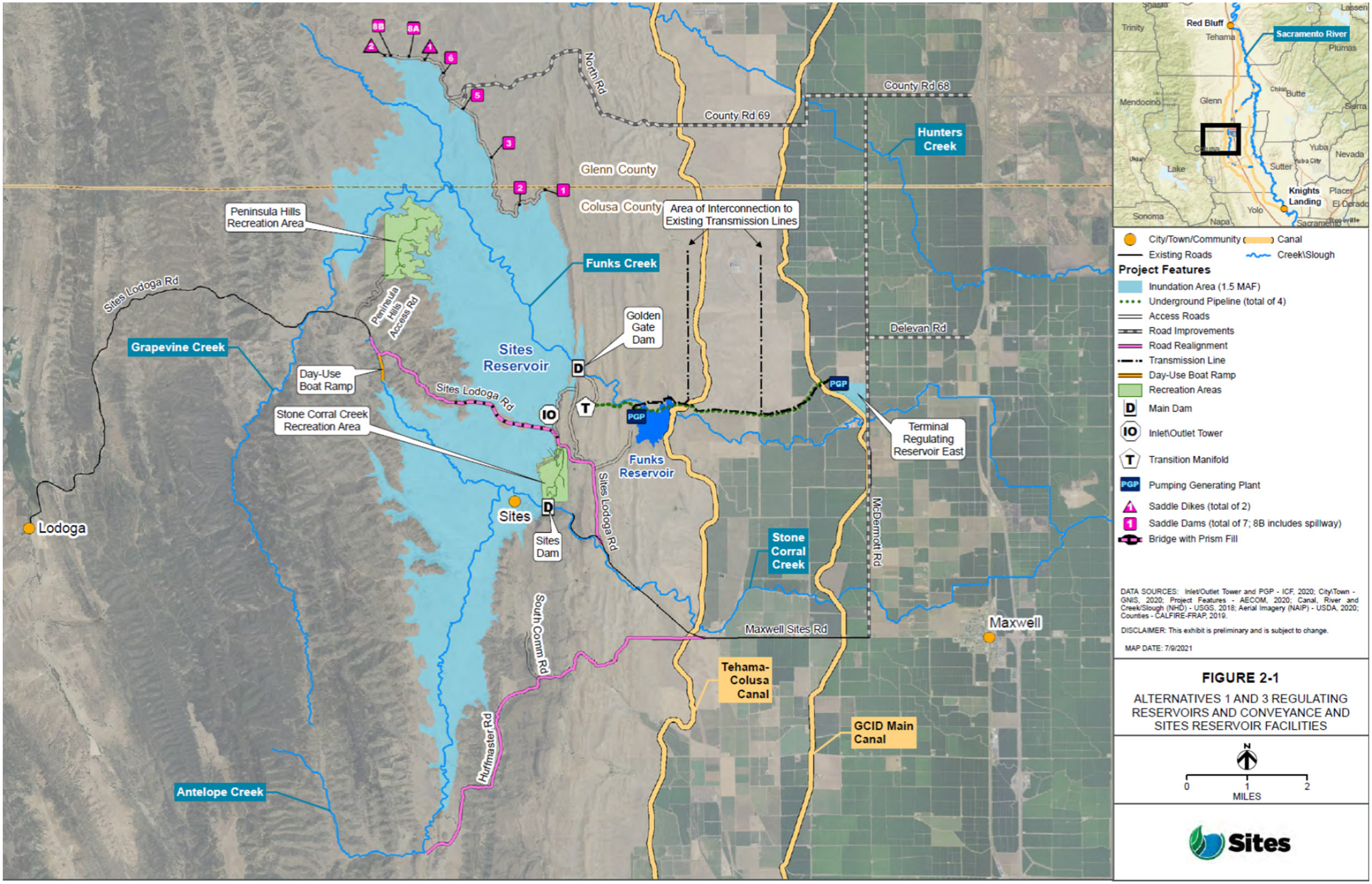


Figure 2: Sites Reservoir Facilities

Exhibit D

Sites Reservoir Frequently Asked Questions: Sites Reservoir Greenhouse Gas Emissions Evaluation

Sites

SITES RESERVOIR

August 2023

Frequently Asked Questions:
Sites Reservoir Greenhouse Gas Emissions Evaluation

Background

A recent Boiling Point Newsletter from LA Times reporter Ian James raises questions about the analysis of greenhouse gas emissions (GHGs) from the future Sites Reservoir. The report cites a new analysis, called the All Res Tool, which was developed by Tell the Dam Truth/Friends of the River (TTDT/FOR) groups opposing the building of the reservoir. The following FAQ addresses the questions raised in the article about the Sites Project's greenhouse gas emissions and provides a comparison of the analyses done by TTDT/FOR and the Sites GHG experts.

1. Do water storage reservoirs emit greenhouse gases?

Yes, water storage reservoirs, such as dams, can emit greenhouse gases under certain conditions. These emissions primarily come from the decomposition of organic matter that is submerged in low or no oxygen environments when the reservoir is created. It's important to note that not all reservoirs emit significant amounts of greenhouse gases. The emission levels depend on various factors such as reservoir size, climate, water management practices. The Sites Project Final EIR/EIS attempts to estimate greenhouse gas emissions conservatively. Actual levels are expected to be lower than estimated.

2. What does a side-by-side comparison of the results for Sites Reservoir using the two methods of analyzing greenhouse gases referenced in the Boiling Point Newsletter article look like?

Emissions Comparision	Sites Project Final EIR/EIS		TTDT/FOR Report	
Annual Emissions ($MT\ CO_2e$/year)	Construction	11,622 - 11,712		
	Operations	56,613 - 72,736		
	Total	**68,235 - 84,363**	**Total:**	**362,000**

3. Why is there such a large difference in the results of greenhouse gas emissions?

The evaluation of greenhouse gas emissions has many complexities and is still a developing area of science. The Sites Final EIR/EIS analysis uses an internationally recognized standard method called the "global warming potential" approach that is endorsed by the Intergovernmental Panel on Climate Change and is used extensively to analyze greenhouse gas emissions for activities all over the world. The method used in the TTDT/FOR Report is newly developed, not widely used, and specifically geared toward evaluating water storage reservoir emissions. It is also unclear if the TTDT/FOR analysis has been peer reviewed and if the assumptions and ranges used are applicable to an off-stream reservoir like Sites Reservoir. These groups are generally not in favor of any dams and reservoirs built on rivers. The proposed Sites Reservoir is an off-stream reservoir that would not dam a major river system. The TTDT/FOR Reports recognizes that tracking emissions from reservoirs is complicated and highly variable. As noted in Mr. James article, John Harrison, a professor at Washington State University that reviewed the report, says "due to a lack of supporting data and relevant studies, many of the flux estimates put forth in this report are necessarily quite uncertain."

Here's a table that analyzes each component involved in both analysis:

Analysis Component	Sites Project Draft and Final EIR/EIS	TTDT/FOR Report
Construction Emissions	Included in Draft and Final	Included (uses DEIR/EIS estimate)
Facility operations & maintenance	Included in Draft and Final	Included (uses DEIR/EIS estimate)
Facility decommissioning	Not included	Included
Reservoir surfaces (CH4 only)	Included in Final	Included
Decay of organic matter on exposed banks	Not included[1]	Included
Degassing methane through hydropower turbines & non-hydropower spillaways	Included in Final	Included
Land use changes away from the reservoir (Carbon leakage)	Not included[1]	Included
Land use changes beneath the reservoir (CO2 only)	Partially included in Final[2]	Included

[1] Not included in IPCC guidance for Flooded Lands.

[2] Does not include loss of sequestration; ecosystem carbon loss from dewatering of wetlands, riparian areas or mangroves; or emission releases from decaying riparian vegetation due to fluctuating river levels.

4. What is Sites planning to do to address greenhouse gas emissions from the construction and operation of the Project?

Sites Reservoir is a 21st century project that will have an overall positive outcome for society and the environment as we face the impacts of climate change. Regarding greenhouse gas emissions specifically, the environmental document for Sites finds that, without mitigation, greenhouse gas emissions could be significant. However, the Sites Project Authority commits to a "net zero" threshold for greenhouse gas emissions over the life of the project. This is a high bar for any project and means actions will be taken by the Authority to avoid and minimize emissions resulting from the project construction and operations, and when needed to offset for actual emissions in excess of baseline conditions.

Below are a few examples of how Sites will achieve net zero emissions, and the table below provides a summary of all of the actions currently under consideration:

- Proactive assessment of upcoming construction activity and early investment in GHG reduction efforts prior to the emissions occurring (such as prior to construction and operational activities)
- Use a whole toolbox of measures included in the upcoming Final EIR/EIS to avoid, reduce, and then offset GHG emissions
- Increasing the proportion of renewable energy purchases for the Project's electricity needs to the highest amount that is feasible with 60% of the Project's power needs from renewable, carbon-free sources starting in 2030
- Removing vegetation and material from the bottom of the reservoir before we fill it with water

As part of achieving net zero, the Project will prioritize strategies to reduce emissions in the following order (1) onsite measures for construction or operations, (2) offsite measures, and (3) carbon credits. The order of priority for the location of selected measures is as follows (1) within the Project footprint, (2) within communities in the vicinity of the Project site, (3) in the Sacramento Valley Air Basin, (4) in the state of California, and (5) in the United States. The Authority will seek opportunities to implement GHG reduction measures in minority and low-income communities in and near the Project site and report on the effort and outcomes in the annual reporting required. The Authority is also committed to monitoring, reporting and enforcement requirements to achieve net zero. This includes full and open public disclosure on the Authority's website on annual emissions along with avoidance, minimization and offsetting measures.

Exhibit E

2022 Fall Midwater Trawl Annual Fish Abundance and Distribution Summary, California Department of Fish and Wildlife

State of California
Department of Fish and Wildlife

Memorandum

Date: December 29, 2022

To: Erin Chappell
Regional Manager
Bay Delta Region

From: James White
Environmental Scientist
Bay Delta Region

Subject: 2022 Fall Midwater Trawl annual fish abundance and distribution summary

The California Department of Fish and Wildlife (CDFW) has conducted the Fall Midwater Trawl Survey (FMWT) to index the fall abundance of pelagic fishes annually since 1967 (except 1974 and 1979). FMWT equipment and methods have remained consistent since the survey's inception, allowing the indices to be compared across time. These relative abundance indices are not intended to approximate population sizes; however, indices reflect general patterns in population change (Polansky et al. 2019).

Presently, the FMWT conducts 4 monthly surveys from September through December and calculates a monthly abundance index for each survey. The annual abundance index, for each pelagic species, is the sum of the monthly survey indices. Monthly abundance indices are calculated by averaging catch per tow for index stations in each region, multiplying each regional average by its respective weighting factor (i.e., a scalar based on water volume) for each region, and summing those products for all 14 regions (White and Baxter 2022). Sampling regions range from San Pablo Bay upstream to Stockton on the San Joaquin River, to near Hood on the Sacramento River, and into Cache Slough and through the Sacramento River Deep Water Ship Channel (SRDWSC). During each monthly survey, one 12-minute oblique midwater trawl tow is conducted at each of 100 index stations used for index calculation and at an additional 22 non-index stations that provide enhanced distribution information (Fig. 1). All fish are identified and counted at each station.

The 2022 sampling season began September 6 and was completed on December 16. During all four months, all 122 fish tows were conducted. Here we report catch from index and non-index stations, species distributions by region, and annual abundance indices for seven pelagic fish species; Delta Smelt (native), Striped Bass (introduced), Longfin Smelt (native), American Shad (introduced), Threadfin Shad (introduced), Splittail (native), and Wakasagi (introduced). A map of species distribution by station is also publicly available online: (FMWT Species Distribution Map).

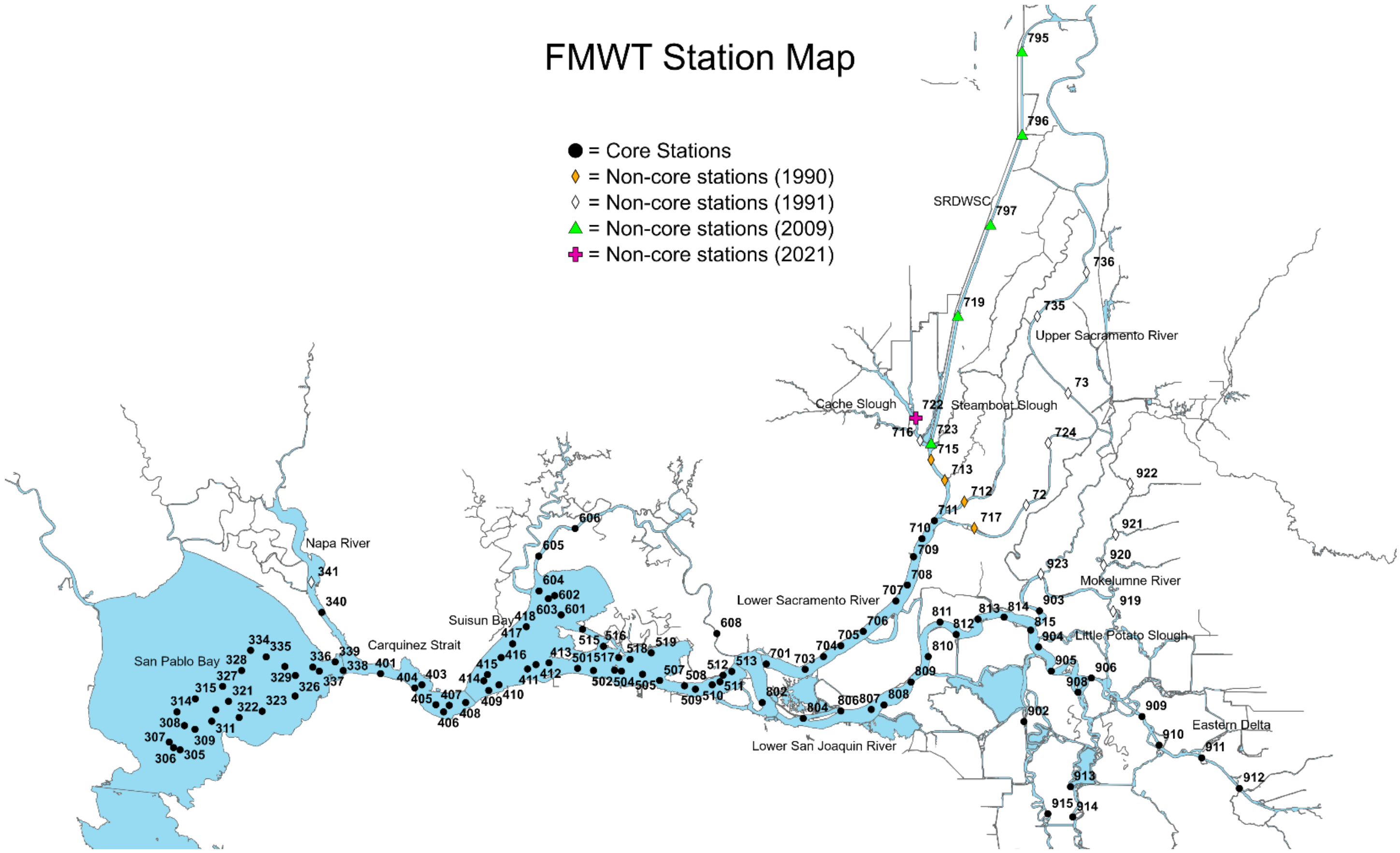


Figure 1. Map of CDFW Fall Midwater Trawl Survey monthly sampling sites among index and non-index stations in the upper San Francisco Estuary, California, USA.

Delta Smelt (*Hypomesus transpacificus*)

The 2022 abundance index was zero and continues the trend of no catch in the FMWT since 2017 (Fig. 2). No Delta Smelt were collected from any stations during our survey months of September-December. An absence of Delta Smelt catch in the FMWT is consistent among other surveys in the estuary. The Enhanced Delta Smelt Monitoring (EDSM) survey of the U.S. Fish and Wildlife Service (USFWS) caught 3 Delta Smelt among 61 sampling days (between 9/6 and 12/15) comprised of 1,997 tows (U.S. Fish and Wildlife Service 2022). On November 29-30, 2022, the Experimental Release Technical Team released 12,942 marked adult Delta Smelt from culture into the Sacramento River near Rio Vista (U.S. Fish and Wildlife Service 2022b). Neither FMWT nor EDSM caught these released Delta Smelt during December sampling. While FMWT did not catch any Delta Smelt, it does not mean there were no smelt present, but the numbers are very low and below the effective detection threshold by most sampling methods.

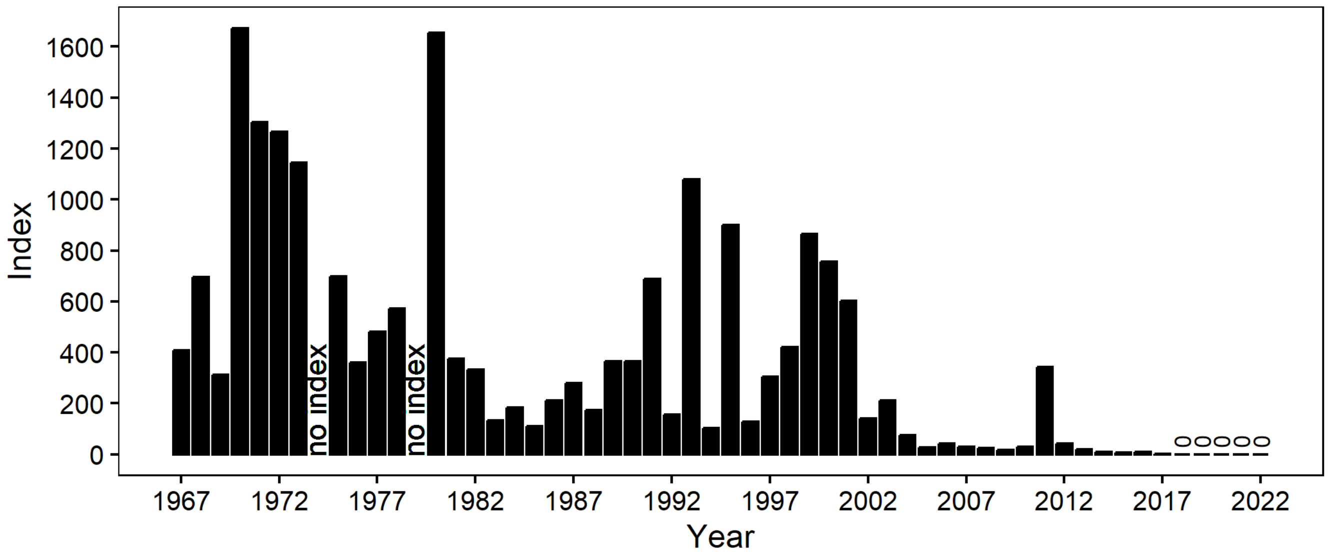


Figure 2. FMWT Delta Smelt annual abundance indices (all ages), 1967-2022. Index values for the past 5 years are shown in detail.

Age-0 Striped Bass (*Morone saxatilis*)

The 2022 abundance index was 66, representing a 15% increase from last year's index (Fig. 3).

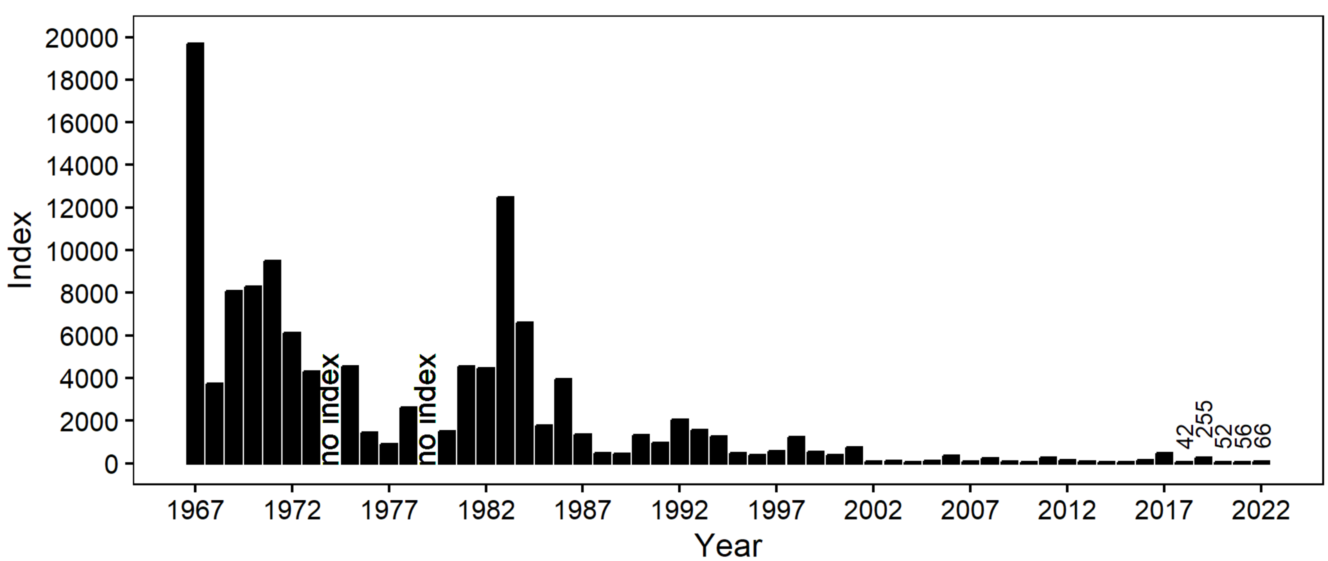


Figure 3. FMWT age-0 Striped Bass annual abundance indices, 1967-2022. Index values for the past 5 years are shown in detail.

Striped Bass were collected every month during September-December. A total of 53 age-0 Striped Bass were collected at index stations and 7 from non-index stations. Monthly catch was highest in October, with catch being highest in Suisun Bay among months (Table 1).

Table 1. Age-0 Striped Bass catch among regions during the 2022 Fall Midwater Trawl survey sampling at index and non-index stations. SRDWSC = Sacramento River Deepwater Shipping Channel.

Month	*Type*	*Region*	*Catch*
September	Index	Lower Sacramento River	2
September	Index	Suisun Bay	7
September	Non-Index	Mokelumne River	4
October	Index	Carquinez Strait	1
October	Index	Eastern Delta	8
October	Index	Lower Sacramento River	3
October	Index	Lower San Joaquin River	1
October	Index	Suisun Bay	13
November	Index	Lower Sacramento River	4
November	Index	Lower San Joaquin River	1
November	Index	Suisun Bay	5
November	Non-Index	SRDWSC	1
December	Index	Carquinez Strait	1
December	Index	Eastern Delta	4
December	Index	Suisun Bay	3
December	Non-Index	Mokelumne River	1
December	Non-Index	SRDWSC	1
Total			**60**

Longfin Smelt (*Spirinchus thaleichthys*)

The 2022 abundance index was 403, representing a 20% increase from last year’s index (Fig. 4).

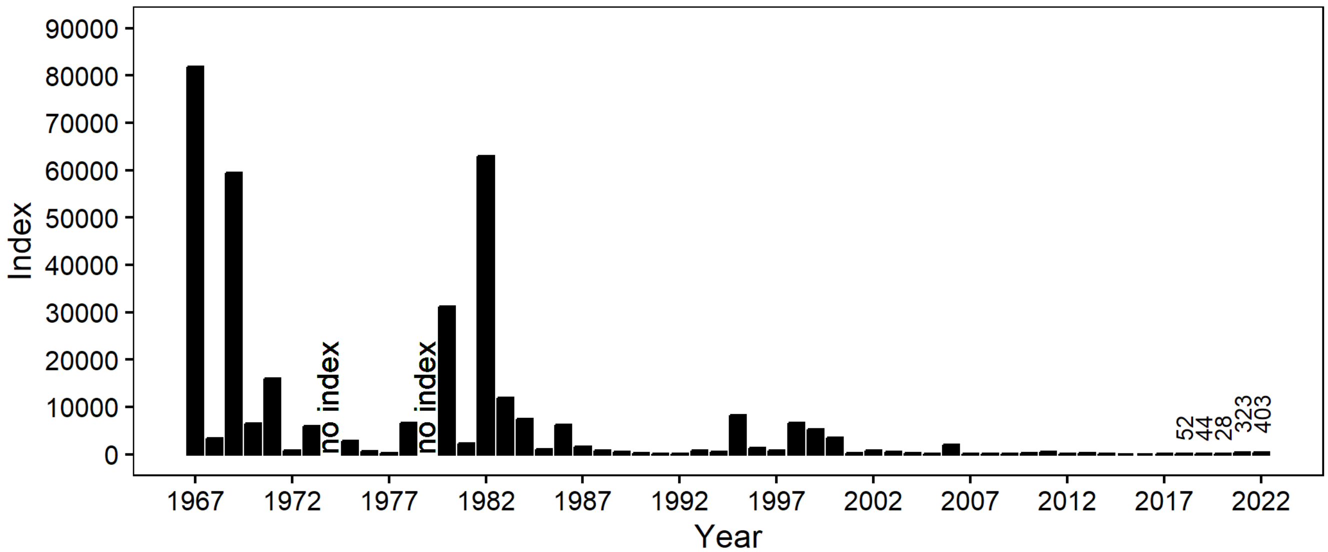


Figure 4. FMWT Longfin Smelt annual abundance indices, 1967-2022. Index values for the past 5 years are shown in detail.

A total of 187 Longfin Smelt were collected at index stations and none from non-index stations. Monthly catch was highest in October, with catch being highest in San Pablo Bay among months (Table 2). Higher catch is usually expected in December as Longfin Smelt adults return to the estuary from the ocean to spawn as water temperatures drop in the late fall or winter. The majority (>88%) of Longfin Smelt caught have been age-0 (Table 3). The FMWT only measures the first 50 individuals of any fish species caught during a tow. The adjusted length frequency adjusts for the fish not measured by calculating the ratio of total catch to the number of fish measured multiplied by the length frequency.

Table 2. Longfin Smelt catch among regions during the 2022 Fall Midwater Trawl survey sampling at index and non-index stations.

Month	*Type*	*Region*	*Catch*
September	Index	Carquinez Strait	1
September	Index	Lower Sacramento River	2
September	Index	Suisun Bay	2
October	Index	San Pablo Bay	95
October	Index	Suisun Bay	4
November	Index	Lower Sacramento River	2
November	Index	Lower San Joaquin River	1
November	Index	San Pablo Bay	8
November	Index	Suisun Bay	18
December	Index	Carquinez Strait	1
December	Index	Lower San Joaquin River	1

Month	*Type*	*Region*	*Catch*
December	Index	San Pablo Bay	12
December	Index	Suisun Bay	40
Total			**187**

Table 3. Longfin Smelt catch per station, fork length (mm), frequency, and age class data during the 2022 Fall Midwater Trawl survey sampling at all stations.

Month	*Station*	*Catch*	*Fork Length*	*Adjusted Length Frequency*	*Age Class*
September	408	1	54	1.00	Age 0
September	418	1	61	1.00	Age 0
September	503	1	101	1.00	Age 1+
September	704	1	50	1.00	Age 0
September	705	1	57	1.00	Age 0
October	307	86	44	1.72	Age 0
October	307	86	49	3.44	Age 0
October	307	86	50	1.72	Age 0
October	307	86	52	6.88	Age 0
October	307	86	53	15.48	Age 0
October	307	86	54	12.04	Age 0
October	307	86	55	3.44	Age 0
October	307	86	56	3.44	Age 0
October	307	86	57	10.32	Age 0
October	307	86	58	3.44	Age 0
October	307	86	59	1.72	Age 0
October	307	86	60	5.16	Age 0
October	307	86	61	1.72	Age 0
October	307	86	62	10.32	Age 0
October	307	86	66	1.72	Age 0
October	307	86	91	1.72	Age 1+
October	307	86	95	1.72	Age 1+
October	309	2	55	1.00	Age 0
October	309	2	56	1.00	Age 0
October	311	3	56	1.00	Age 0
October	311	3	57	1.00	Age 0
October	311	3	65	1.00	Age 0

Month	*Station*	*Catch*	*Fork Length*	*Adjusted Length Frequency*	*Age Class*
October	314	3	55	1.00	Age 0
October	314	3	57	1.00	Age 0
October	314	3	64	1.00	Age 0
October	325	1	53	1.00	Age 0
October	515	1	80	1.00	Age 1+
October	601	1	68	1.00	Age 0
October	603	1	83	1.00	Age 1+
October	606	1	61	1.00	Age 0
November	315	4	59	1.00	Age 0
November	315	4	67	1.00	Age 0
November	315	4	68	1.00	Age 0
November	315	4	72	1.00	Age 0
November	323	1	60	1.00	Age 0
November	328	1	60	1.00	Age 0
November	329	1	56	1.00	Age 0
November	336	1	62	1.00	Age 0
November	411	1	64	1.00	Age 0
November	415	1	55	1.00	Age 0
November	417	1	65	1.00	Age 0
November	418	1	100	1.00	Age 1+
November	503	1	66	1.00	Age 0
November	509	5	56	1.00	Age 0
November	509	5	59	2.00	Age 0
November	509	5	63	1.00	Age 0
November	509	5	67	1.00	Age 0
November	510	2	63	1.00	Age 0
November	510	2	64	1.00	Age 0
November	511	1	72	1.00	Age 0
November	512	1	95	1.00	Age 1+

Month	*Station*	*Catch*	*Fork Length*	*Adjusted Length Frequency*	*Age Class*
November	513	1	70	1.00	Age 0
November	515	2	57	1.00	Age 0
November	515	2	63	1.00	Age 0
November	603	1	63	1.00	Age 0
November	704	1	74	1.00	Age 0
November	706	1	63	1.00	Age 0
November	802	1	66	1.00	Age 0
December	314	2	60	1.00	Age 0
December	314	2	64	1.00	Age 0
December	315	1	60	1.00	Age 0
December	321	1	80	1.00	Age 0
December	327	1	67	1.00	Age 0
December	329	4	57	1.00	Age 0
December	329	4	63	2.00	Age 0
December	329	4	67	1.00	Age 0
December	336	2	62	1.00	Age 0
December	336	2	70	1.00	Age 0
December	337	1	94	1.00	Age 1+
December	404	1	99	1.00	Age 1+
December	416	3	67	1.00	Age 0
December	416	3	71	1.00	Age 0
December	416	3	73	1.00	Age 0
December	417	6	60	1.00	Age 0
December	417	6	63	1.00	Age 0
December	417	6	69	1.00	Age 0
December	417	6	87	1.00	Age 1+
December	417	6	97	1.00	Age 1+
December	417	6	101	1.00	Age 1+
December	418	6	61	1.00	Age 0

Month	*Station*	*Catch*	*Fork Length*	*Adjusted Length Frequency*	*Age Class*
December	418	6	63	2.00	Age 0
December	418	6	69	1.00	Age 0
December	418	6	71	1.00	Age 0
December	418	6	84	1.00	Age 0
December	502	1	71	1.00	Age 0
December	504	1	74	1.00	Age 0
December	508	3	65	1.00	Age 0
December	508	3	77	1.00	Age 0
December	508	3	94	1.00	Age 1+
December	510	5	63	1.00	Age 0
December	510	5	97	1.00	Age 1+
December	510	5	104	1.00	Age 1+
December	510	5	110	1.00	Age 1+
December	510	5	125	1.00	Age 1+
December	511	2	98	1.00	Age 1+
December	511	2	107	1.00	Age 1+
December	515	1	70	1.00	Age 0
December	517	2	72	1.00	Age 0
December	517	2	74	1.00	Age 0
December	604	4	65	2.00	Age 0
December	604	4	78	1.00	Age 0
December	604	4	95	1.00	Age 1+
December	605	1	70	1.00	Age 0
December	606	5	59	1.00	Age 0
December	606	5	65	1.00	Age 0
December	606	5	67	1.00	Age 0
December	606	5	73	1.00	Age 0
December	606	5	80	1.00	Age 0
December	811	1	108	1.00	Age 1+

Threadfin Shad (*Dorosoma petenense*)

The 2022 abundance index was 257, representing a 14% increase from last year's index (Fig. 5).

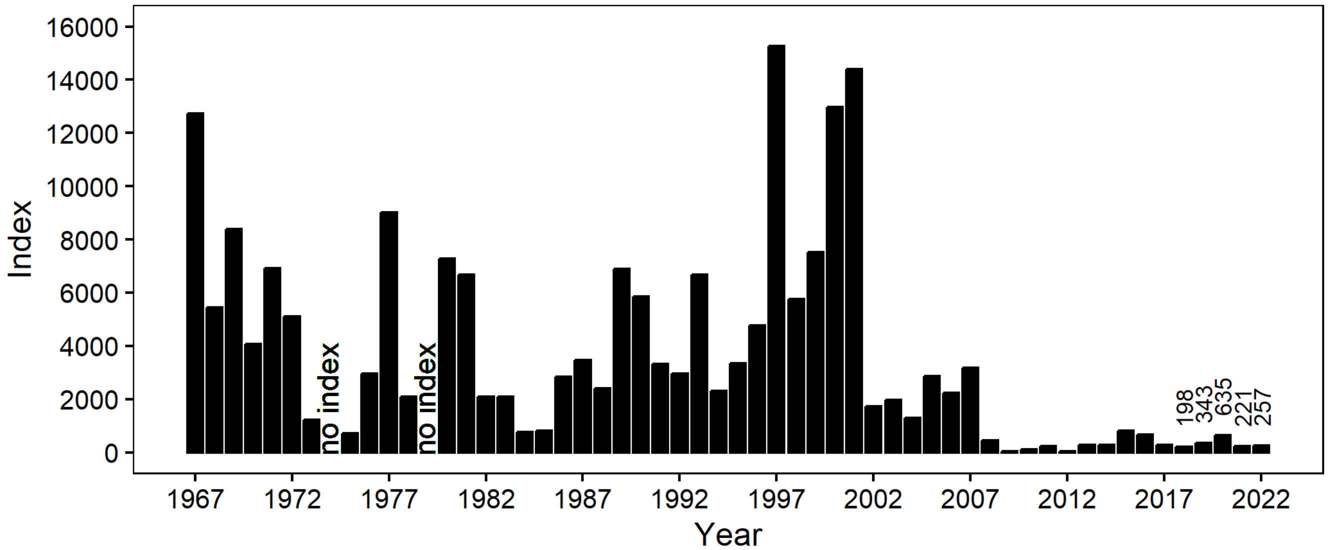


Figure 5. FMWT Threadfin Shad annual abundance indices, 1967-2022. Index values for the past 5 years are shown in detail.

A total of 211 Threadfin Shad were collected at index stations and 1,340 from non-index stations. The greatest monthly catch was in December, with catch being highest in SRDWSC among months (Table 4).

Table 4. Threadfin Shad catch among regions during the 2022 Fall Midwater Trawl survey sampling at index and non-index stations. SRDWSC = Sacramento River Deepwater Shipping Channel.

Month	*Type*	*Region*	*Catch*
September	Index	Lower Sacramento River	2
September	Index	Lower San Joaquin River	4
September	Non-Index	SRDWSC	495
October	Index	Lower Sacramento River	24
October	Index	Lower San Joaquin River	4
October	Index	Suisun Bay	5
October	Non-Index	SRDWSC	336
November	Index	Lower Sacramento River	20
November	Index	Lower San Joaquin River	36
November	Index	San Pablo Bay	1
November	Index	Suisun Bay	7
November	Non-Index	SRDWSC	36

Month	*Type*	*Region*	*Catch*
December	Index	Carquinez Strait	6
December	Index	Eastern Delta	12
December	Index	Lower Sacramento River	23
December	Index	Lower San Joaquin River	57
December	Index	San Pablo Bay	2
December	Index	Suisun Bay	8
December	Non-Index	Cache Slough	3
December	Non-Index	Mokelumne River	1
December	Non-Index	SRDWSC	467
December	Non-Index	Upper Sacramento River	2
Total			**1,551**

American Shad (*Alosa sapidissima*)

The 2022 abundance index was 698, representing a 43% increase from last year's index (Fig. 6). Abundance indices have fluctuated substantially during the period 2018-2022, ranging from a low of 398 to a high of 1,955.

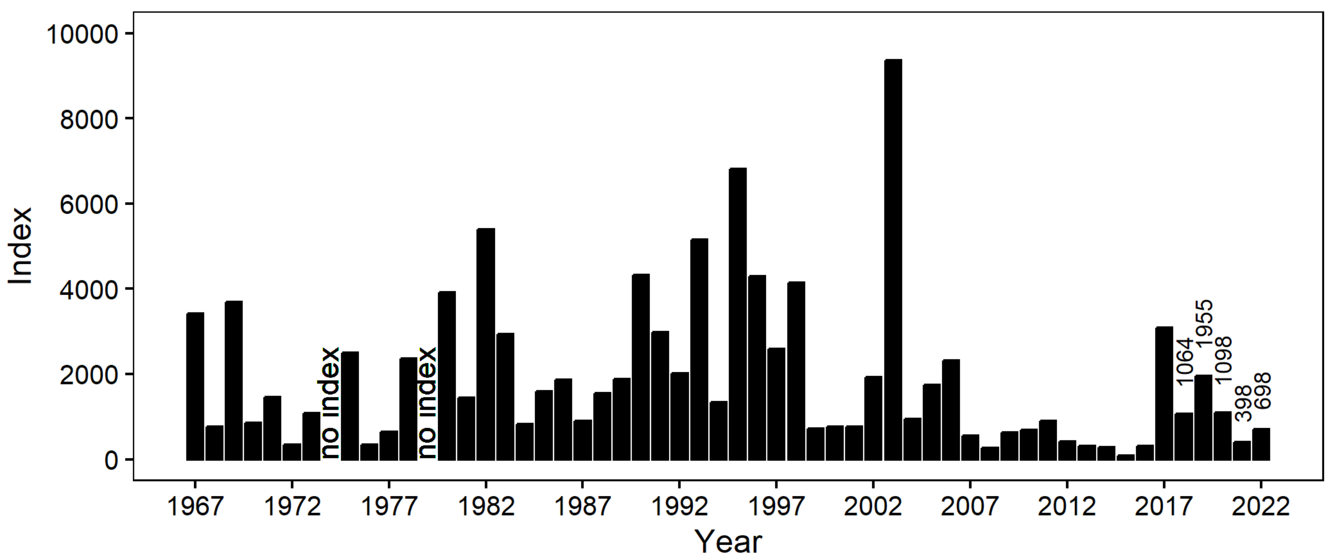


Figure 6. FMWT American Shad annual abundance indices, 1967-2022. Index values for the past 5 years are shown in detail.

A total of 432 American Shad were collected at index stations and 150 from non-index stations. American Shad were collected mostly from Suisun Bay with the greatest monthly catch in December (Table 5).

Table 5. American Shad catch among regions during the 2022 Fall Midwater Trawl survey sampling at index and non-index stations. SRDWSC = Sacramento River Deepwater Shipping Channel.

Month	*Type*	*Region*	*Catch*
September	Index	Carquinez Strait	35
September	Index	Lower Sacramento River	9
September	Index	Lower San Joaquin River	1
September	Index	San Pablo Bay	4
September	Index	Suisun Bay	7
September	Non-Index	Mokelumne River	1
September	Non-Index	SRDWSC	45
September	Non-Index	Steamboat Slough	9
October	Index	Carquinez Strait	20
October	Index	Lower Sacramento River	25
October	Index	Lower San Joaquin River	4
October	Index	San Pablo Bay	2
October	Index	Suisun Bay	69
October	Non-Index	SRDWSC	33
November	Index	Carquinez Strait	17
November	Index	Lower Sacramento River	10
November	Index	Lower San Joaquin River	3
November	Index	San Pablo Bay	32
November	Index	Suisun Bay	51
November	Non-Index	SRDWSC	35
December	Index	Carquinez Strait	28
December	Index	Eastern Delta	4
December	Index	Lower Sacramento River	1
December	Index	Lower San Joaquin River	12
December	Index	San Pablo Bay	22
December	Index	Suisun Bay	76
December	Non-Index	Cache Slough	7

Month	Type	Region	Catch
December	Non-Index	Mokelumne River	3
December	Non-Index	Napa River	1
December	Non-Index	SRDWSC	16
Total			**582**

Splittail (*Pogonichthys macrolepidotus*)

The 2022 Splittail abundance index was zero which shows a continuing trend of very little to no catch of Splittail in FMWT (Fig. 7). During most years, FMWT data does not accurately reflect trends in age-0 Splittail abundance, as the index is low or zero except in relatively wet years, such as 2011, when age-0 fish tend to be abundant. FMWT operates in water >2 m deep, whereas Splittail, particularly age-0 fish, appear to primarily inhabit water <2 m deep (Sommer et al. 1997; Moyle et al. 2004). However, FMWT does effectively detect strong year classes, such as the one in 1998 and the most recent one in 2011.

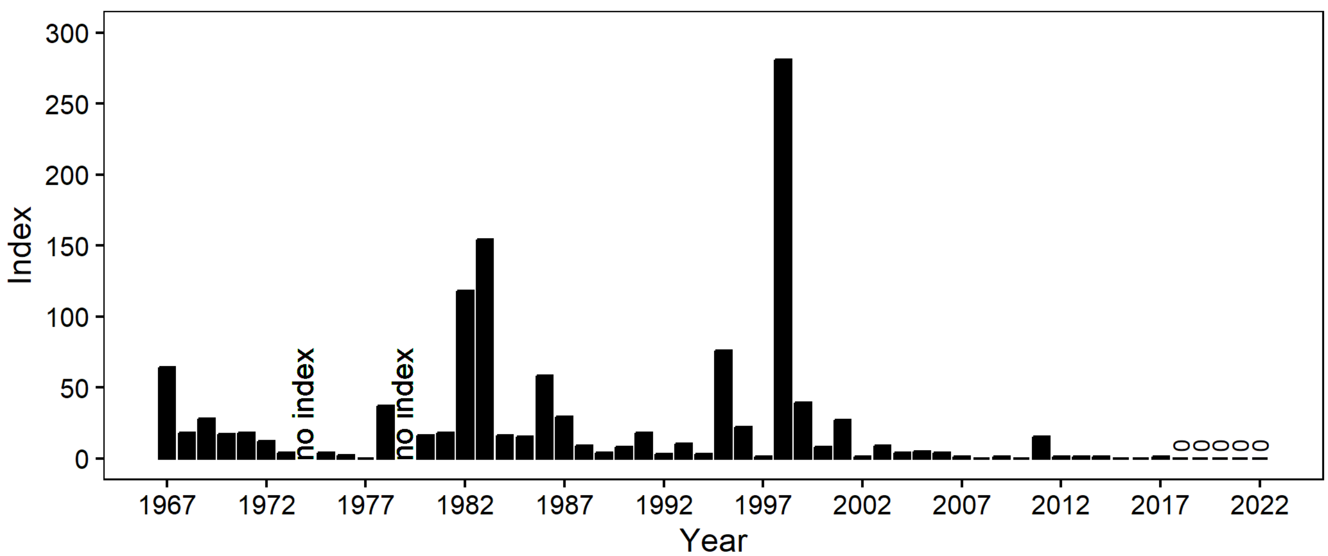


Figure 7. FMWT Splittail annual abundance indices, 1967-2022. Index values for the past 5 years are shown in detail.

Wakasagi (*Hypomesus nipponensis*)

Wakasagi were first introduced to northern California reservoirs by California Fish & Game in 1959 to provide forage for rainbow trout and other salmonids. It is believed they were present in the SF Estuary as early as 1974, but they were not detected in the Estuary until 1990 by other surveys (Moyle 2002; Davis et al. 2022). The first detection of Wakasagi by the FMWT survey was in 1995. The 2022 abundance index was zero because Wakasagi were only caught at non-index stations (Fig. 8).

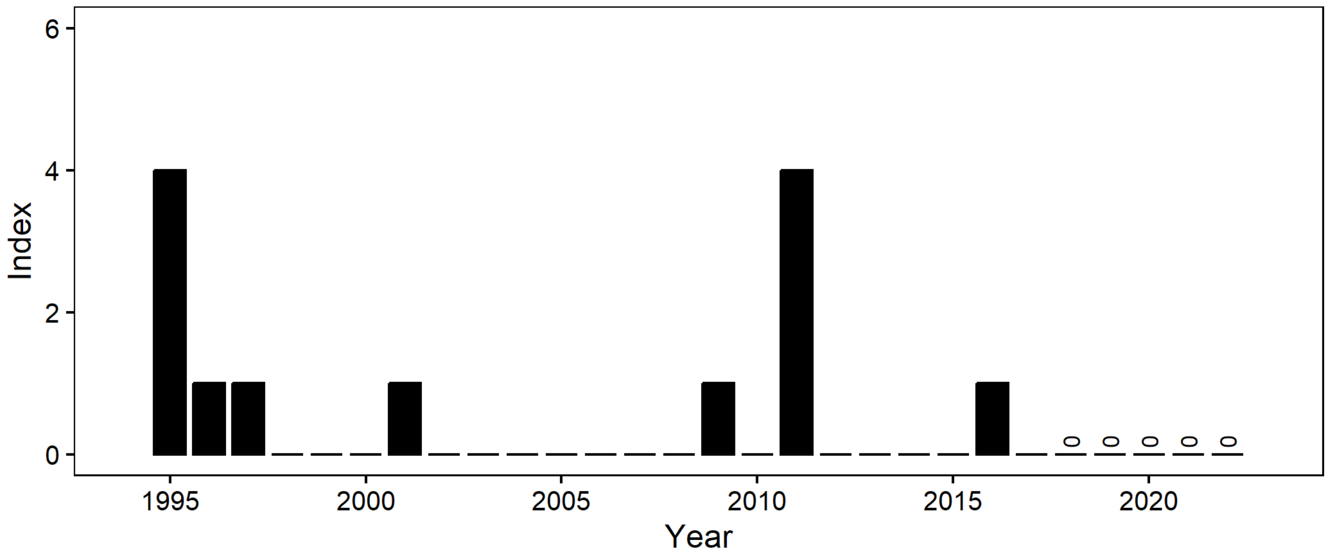


Figure 8. FMWT Wakasagi annual abundance indices, 1995-2022. Index values for the past 5 years are shown in detail.

A total of zero Wakasagi were collected at index stations and 25 from non-index stations. Monthly catch was highest in October and December, with catch being highest in SRDWSC among months (Table 6). Little is known about the life history of the California population of Wakasagi compared to the Japanese populations. Wakasagi in the SF Estuary have yet to become abundant, despite broad temperature (2-29°C) and salinity (0-29 ppt) tolerances (Moyle 2002). FMWT tends to catch this species in the freshwater areas of the north Delta, catch is infrequent and in higher numbers during wet water years.

Table 6. Wakasagi catch among regions during the 2022 Fall Midwater Trawl survey sampling at index and non-index stations. SRDWSC = Sacramento River Deepwater Shipping Channel.

Month	*Type*	*Region*	*Catch*
September	Non-Index	SRDWSC	15
October	Non-Index	SRDWSC	1
November	Non-Index	SRDWSC	7
December	Non-Index	SRDWSC	2
Total			**25**

cc: Jim Hobbs, Steve Slater, Lauren Damon, Kathy Hieb

References

Davis, BE, Adams, JB, Lewis, LS, Hobbs, JA, Ikemiyagi, N, Johnston, C, Mitchell, L, Shakya, A, Schreier, B and Mahardja, B. 2022. Wakasagi in the San Francisco Bay–Delta Watershed: Comparative Trends in Distribution and Life-History Traits with Native Delta Smelt. San Francisco Estuary and Watershed Science. 20(3). doi:10.15447/sfews.2022v20iss3art2

Moyle PB. 2002. Inland Fishes of California: revised and expanded. Univ of California Press.

Moyle PB, Baxter RD, Sommer T, Foin TC, Matern SA. 2004. Biology and Population Dynamics of Sacramento Splittail (*Pogonichthys macrolepidotus*) in the San Francisco Estuary: A Review. San Francisco Estuary and Watershed Science. 2(2):1–47. doi:10.15447/sfews.2004v2iss2art3.

Polansky L, Mitchell L, Newman KB. 2019. Using Multistage Design-Based Methods to Construct Abundance Indices and Uncertainty Measures for Delta Smelt. Transactions of the American Fisheries Society. 148(4):710–724. doi:gf6d7j.

Sommer TR, Baxter RD, Herbold B. 1997. Resilience of Splittail in the Sacramento–San Joaquin Estuary. Transactions of the American Fisheries Society. 126(6):961–976. doi:cm4253.

U.S. Fish and Wildlife Service. 2022a. Enhanced Delta Smelt Monitoring Daily Report. Accessed on 12/23/2022. https://www.fws.gov/media/edsm-daily-report-0.

US. Fish and Wildlife Service. 2022b. Notification: Release of brood year 2022 delta smelt at Rio Vista in the Sacramento River. U.S. Fish and Wildlife Service San Francisco Bay-Delta Fish & Wildlife Office Sacramento, CA. http://www.cbr.washington.edu/sacramento/workgroups/delta_smelt.html

White JR, Baxter RD. 2022. Incorporating expanded sampling into an alternative abundance index for the Fall Midwater Trawl survey. California Fish and Wildlife Journal. 108(4):1–16. doi:10.51492/cfwj.108.21.