The EPA Administrator, Gina McCarthy, signed the following proposed rule on June 30, 2016, and EPA is submitting it for publication in the *Federal Register* (FR). While we have taken steps to ensure the accuracy of this Internet version of the rule, it is not the official version of the rule for purposes of public comment. Please refer to the official version in a forthcoming FR publication, which will appear on the Government Printing Office's FDsys website (http://fdsys.gpo.gov/fdsys/search/home.action) and on Regulations.gov (http://www.regulations.gov) in Docket No. EPA-HQ-OW-2015-0392. Once the official version of this document is published in the FR, this version will be removed from the Internet and replaced with a link to the official version.

6560-50-P

ENVIRONMENTAL PROTECTION AGENCY

40 CFR Part 131

[EPA-HQ-OW-2015-0392; FRL-9946-01-OW]

RIN 2040-AF61

Water Quality Standards; Establishment of Revised Numeric Criteria for Selenium for the San Francisco Bay and Delta, State of California

AGENCY: Environmental Protection Agency (EPA).

ACTION: Proposed rule.

SUMMARY: The Environmental Protection Agency (EPA) is proposing to revise the current federal Clean Water Act selenium water quality criteria applicable to the San Francisco Bay and Delta to ensure that the criteria are set at levels that protect aquatic life and aquatic-dependent wildlife, including federally listed threatened and endangered species. The San Francisco Bay and Delta ecosystem is at risk due to environmental degradation, including impacts from elevated levels of selenium, and state and federal actions are underway to restore the waterway. Scientific evidence indicates that elevated selenium levels can contribute to the decline of fish and aquatic-dependent birds. EPA promulgated the San Francisco Bay and Delta's existing selenium criteria in 1992 as part of the National Toxics Rule, using EPA's recommended aquatic life criteria values at the time. However, the latest science on selenium fate and bioaccumulation

indicates that the existing criteria are not protective of aquatic life and aquatic-dependent wildlife in the San Francisco Bay and Delta. Therefore, EPA is proposing to revise the existing selenium criteria, taking into account available science, legal requirements, and EPA policies and guidance. EPA's proposal will address the Administrator's determination – described in this preamble – that EPA's previously promulgated water quality criteria are not adequate to protect the designated uses for these waters.

DATES: Comments must be received on or before *[insert date **60** days after publication in the* Federal Register*]*.

ADDRESSES: Submit your comments, identified by Docket ID No**. EPA-HQ-OW-2015-0392**, at http://www.regulations.gov. Follow the online instructions for submitting comments. Once submitted, comments cannot be edited or removed from Regulations.gov. EPA may publish any comment received to its public docket. Do not submit electronically any information you consider to be Confidential Business Information (CBI) or other information whose disclosure is restricted by statute. Multimedia submissions (audio, video, etc.) must be accompanied by a written comment. The written comment is considered the official comment and should include discussion of all points you wish to make. EPA will generally not consider comments or comment contents located outside of the primary submission (i.e. on the web, cloud, or other file sharing system). For additional submission methods, the full EPA public comment policy, information about CBI or multimedia submissions, and general guidance on making effective comments, please visit http://www2.epa.gov/dockets/commenting-epa-dockets.

Two public hearings will be held on Tuesday, August 23, 2016, one at 9:00 am and one at 2:00 pm, at EPA Region 9, 75 Hawthorne Street, San Francisco, CA 94105. Additionally, EPA

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will offer a virtual public hearing on the proposed rule via the internet on Monday evening, August 22, 2016 from 6:00 pm to 8:00 pm. For details on these public hearings, as well as registration information, please visit: https://epa.gov/wqs-tech/water-quality-standards-establishment-revised-numeric-criteria-selenium-san-francisco-bay.

FOR FURTHER INFORMATION CONTACT: Erica Fleisig, Office of Water, Standards and Health Protection Division (4305T), U.S. Environmental Protection Agency, 1200 Pennsylvania Avenue, NW, Washington, DC 20460; telephone number: (202) 566-1057; email address: Fleisig.Erica@EPA.gov; or Diane E. Fleck, P.E., Esq., Water Division (WTR-2-1), U.S. Environmental Protection Agency Region 9, 75 Hawthorne Street, San Francisco, CA 94105; telephone number: (415) 972-3527; email address: Fleck.Diane@EPA.gov.

SUPPLEMENTARY INFORMATION: This proposed rule is organized as follows:

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J. Executive Order 12898 (Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations)

I. General Information

Applicability: Entities such as industries, stormwater management districts, or publicly owned treatment works (POTWs) that directly or indirectly discharge selenium to the San Francisco Bay and Delta could be indirectly affected by this rulemaking because federal water quality standards (WQS) promulgated by EPA would be applicable to Clean Water Act (CWA) regulatory programs, such as National Pollutant Discharge Elimination System (NPDES) permitting. Citizens concerned with water quality in California could also be interested in this rulemaking. Categories and entities that could be affected include the following:

Category	Examples of potentially affected entities
Industry	Industries discharging pollutants to the San Francisco Bay and Delta.
Municipalities	Publicly owned treatment works or other facilities discharging pollutants to the San Francisco Bay and Delta.
Stormwater Management Districts	Entities responsible for managing stormwater runoff in the San Francisco Bay and Delta.

This table is not intended to be exhaustive, but rather provides a guide for readers regarding entities that could be indirectly affected by this action. Any parties or entities who depend upon or contribute to the water quality of the San Francisco Bay and Delta could be affected by this proposed rule. To determine whether your facility or activities could be affected by this action, you should carefully examine this proposed rule. If you have questions regarding the applicability of this action to a particular entity, consult the person listed in the FOR FURTHER INFORMATION CONTACT section.

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II. Background

A. *CWA and EPA Regulations*

CWA section 101(a)(2) (33 U.S.C. 1251(a)(2)) establishes a national goal, wherever attainable, of "water quality which provides for the protection and propagation of fish, shellfish, and wildlife and provides for recreation in and on the water..." In this proposal, the relevant goals are the protection and propagation of fish, shellfish, and wildlife.

CWA section 303(c) (33 U.S.C. 1313(c)) directs states to adopt WQS for their waters subject to the CWA. CWA section 303(c)(2)(A) and EPA's implementing regulations at 40 CFR part 131 require, among other things, that a state's WQS specify appropriate designated uses of the waters and water quality criteria that protect those uses. EPA's regulations at 40 CFR 131.11(a)(1) provide that "[s]uch criteria must be based on sound scientific rationale and must contain sufficient parameters or constituents to protect the designated use." For waters with multiple use designations, the criteria must support the most sensitive use (40 CFR 131.11(a)(1)). In addition, 40 CFR 131.10(b) provides that "[i]n designating uses of a water body and the appropriate criteria for those uses, the [s]tate shall take into consideration the water quality standards of downstream waters and shall ensure that its water quality standards provide for the attainment and maintenance of the water quality standards of downstream waters."

States are required to review applicable WQS at least once every three years and, if appropriate, revise or adopt new standards (CWA section 303(c)(1)). Any new or revised WQS must be submitted to EPA for review and approval or disapproval (CWA section 303(c)(2)(A) and (c)(3)). Under CWA section 303(c)(4)(B), the Administrator is authorized to determine, even

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in the absence of a state submission, that a new or revised standard is needed to meet CWA requirements.

Under CWA section 304(a), EPA periodically publishes criteria recommendations for states to consider when adopting water quality criteria for particular pollutants to meet the CWA section 101(a)(2) goals. In establishing numeric criteria, states should adopt water quality criteria based on EPA's CWA section 304(a) criteria, section 304(a) criteria modified to reflect site-specific conditions, or other scientifically defensible methods (40 CFR 131.11(b)(1)). CWA section 303(c)(2)(B) requires states to adopt numeric criteria for all toxic pollutants listed pursuant to CWA section 307(a)(1) for which EPA has published 304(a) criteria, as necessary to support the states' designated uses.

B. *National Toxics Rule*

On December 22, 1992, EPA promulgated *Water Quality Standards; Establishment of Numeric Criteria for Priority Toxic Pollutants; States' Compliance* at 57 FR 60848 (hereafter referred to as the National Toxics Rule or NTR).[1] The NTR established chemical-specific numeric criteria for priority toxic pollutants for states that EPA had determined were not in compliance with the requirements of CWA section 303(c)(2)(B). The NTR included selenium water quality criteria for the protection of aquatic life in the San Francisco Bay and Delta. On May 4, 1995, EPA issued a stay of the criteria for metals in the NTR and immediately promulgated revised criteria for metals in the NTR in the *Stay of Federal Water Quality Criteria for Metals* at 60 FR 22227 and *Water Quality Standards; Establishment of Numeric Criteria for*

[1] The NTR is codified at 40 CFR 131.36.

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Priority Toxic Pollutants; States' Compliance – Revision of Metals Criteria, at 60 FR 22229.[2] The 1995 Stay and Revision did not change the selenium water quality criteria for the San Francisco Bay and Delta. These criteria are currently applicable in the Bay and Delta, and consist of a chronic criterion of 5 micrograms per liter (µg/L), and an acute criterion of 20 µg/L. Both criteria are expressed in the total recoverable form of selenium.

The currently applicable selenium criteria for the protection of aquatic life in the San Francisco Bay and Delta were based on EPA's CWA section 304(a) recommended criteria values at the time that EPA promulgated the criteria in the NTR. These recommendations are documented in EPA's *Ambient Water Quality Criteria for Selenium – 1987*, Office of Water, EPA-440/5-87-008, September, 1987.

EPA derived the 1987 freshwater aquatic life recommended criteria values for selenium from observed impacts on fish populations at a contaminated lake, Belews Lake, in North Carolina. The lake, a cooling water reservoir, had been affected by selenium loads from a coal-fired power plant. Since aquatic life was exposed to selenium from both the water column and diet, the criteria reflect both types of exposure in Belews Lake. EPA derived the 1987 saltwater aquatic life recommended criteria values for selenium using data from lab studies. EPA calculated the criteria in accordance with EPA's *Guidelines for Deriving Numerical National*

[2] The purpose of the 1995 amendment was, in general, to replace aquatic life total recoverable metals criteria with dissolved metals criteria to reflect a revised EPA policy that dissolved metals criteria better represent the biologically available fraction of water borne metals to aquatic organisms. Although selenium was included in the analysis for the revised policy, the 1995 amendment did not include a freshwater conversion factor for selenium, and thus, the aquatic life freshwater selenium criteria in the NTR remain in the total recoverable form. The EPA policy memorandum, *Office of Water Policy and Technical Guidance on Interpretation and Implementation of Aquatic Life Metals Criteria*, by Martha G. Prothro on October 1, 1993, states that selenium is a "bioaccumulative chemical and [it is] not appropriate to adjust to percent dissolved" for freshwater selenium criteria (see policy memorandum, Attachment 2, page 5).

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Water Quality Criteria for the Protection of Aquatic Organisms and Their Uses, Office of Research and Development, 1985. The 1987 recommended freshwater criteria values for total recoverable selenium are 5 µg/L (chronic) and 20 µg/L (acute), and the saltwater criteria values for total recoverable selenium are 71 µg/L (chronic) and 300 µg/L (acute).

In the NTR, EPA promulgated selenium criteria for the San Francisco Bay and Delta based on the 1987 freshwater recommended criteria values for selenium, even though the San Francisco Bay and Delta are marine and estuarine waters. EPA used the more stringent freshwater values because of a concern that the saltwater criteria were not sufficiently protective "based on substantial evidence that there are high levels of selenium bioaccumulation in San Francisco Bay and the saltwater criteria fail to account for food chain effects" and "utilization of the saltwater criteria for selenium in the San Francisco Bay/Delta would be inappropriate." (57 FR 60898).

Since then, EPA has taken steps to revise the 1987 CWA 304(a) recommended criteria for selenium to better account for bioaccumulation through the food chain in different ecosystems. EPA recently published a revised CWA 304(a) freshwater recommended criterion for selenium: *Final Aquatic Life Ambient Water Quality Criterion for Selenium – Freshwater 2016*, US EPA, Office of Water, EPA 822-R-16-006, June, 2016. EPA considered the methodology and information used to derive the revised CWA 304(a) recommended selenium criterion, along with additional information specific to the San Francisco Bay and Delta, in developing the revised selenium criteria values for the San Francisco Bay and Delta in this proposed rule.

C. *California Toxics Rule*

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On May 18, 2000, EPA promulgated *Water Quality Standards; Establishment of Numeric Criteria for Priority Toxic Pollutants for the State of California* at 65 FR 31681 (hereafter referred to as the California Toxics Rule or CTR).[3] The CTR established numeric water quality criteria for priority toxic pollutants for inland surface waters and enclosed bays and estuaries within California. EPA promulgated the CTR after California rescinded its water quality control plans containing pollutant objectives (criteria). The criteria that EPA previously promulgated for California in the NTR,[4] together with the criteria promulgated in the CTR and California's designated uses and anti-degradation provisions, set water quality standards for priority toxic pollutants for inland surface waters and enclosed bays and estuaries in California.

As required by section 7 of the Endangered Species Act (ESA) (16 U.S.C. 1531 et seq.), EPA consulted with the U.S. Fish and Wildlife Service (FWS) and the U.S. National Marine Fisheries Service (NMFS) (collectively, the Services) concerning EPA's rulemaking actions for California. EPA initiated consultation in 1994, and in March 2000, the Services issued a final Joint Biological Opinion. The final Joint Biological Opinion requested that EPA revise its 1987 recommended criteria values for selenium to ensure the protection of species listed as threatened or endangered, and later update the criteria for California consistent with the revised recommendations. In response, EPA reserved the acute freshwater selenium criterion from the final May 2000 CTR.

[3] The CTR is codified at 40 CFR 131.38.

[4] The CTR Criteria Table at 40 CFR 131.38(b)(1) includes all water quality criteria previously promulgated in the NTR, so that readers can find all federally promulgated water quality criteria for California in one place. All criteria previously promulgated in the NTR are footnoted as such in the CTR.

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In September 2002, EPA, the Services, the U.S. Geological Survey (USGS), and the State of California met to discuss the development of revised selenium water quality criteria and recommended that California-specific selenium water quality criteria be developed as wildlife criteria. The agencies agreed that criteria should first be developed to protect aquatic life and aquatic-dependent wildlife using the Luoma-Presser (USGS) bioaccumulation model[5] for the San Francisco Bay and Delta based on the necessity for more stringent criteria in the estuary, and to subsequently develop criteria for the rest of California using appropriate methods.

Starting in 2003, EPA and the Services provided assistance to the USGS to model selenium fate and biological uptake in the San Francisco Bay and Delta using the USGS bioaccumulation model. USGS completed its report, entitled *Ecosystem-Scale Selenium Modeling in Support of Fish and Wildlife Criteria Development for the San Francisco Bay-Delta Estuary, California, Administrative Report* (the USGS Report), and submitted it to EPA in December 2010. USGS used site-specific data from various sources and species-specific data from the FWS. EPA analyzed the USGS Report and data from the FWS and other relevant reports to develop the selenium criteria for the San Francisco Bay and Delta in this proposed rule.

[5] The model developed by Theresa Presser and Sam Luoma is the selenium ecosystem bioaccumulation model first presented in *Forecasting Selenium Discharges to the San Francisco Bay-Delta Estuary: Ecological Effects of a Proposed San Luis Drain Extension, Open File Report 00-416*, Samuel N. Luoma and Theresa S. Presser, 2000, U.S. Geological Survey, Menlo Park, California. This report was revised and superseded in 2006 by *Professional Paper 1646*, Theresa S. Presser and Samuel N. Luoma, U.S. Geological Survey, Reston, Virginia. A detailed explanation of the model is contained in *A Methodology for Ecosystem-Scale Modeling of Selenium*, T.S. Presser and S.N. Luoma, 2010, Integrated Environmental Assessment and Management, Volume 6, Number 4.

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In 2013, two organizations filed a legal complaint against EPA, based in part on the fact that work on updating the reserved acute freshwater selenium criterion from the 2000 CTR had not yet been completed while EPA had previously determined, in the proposed CTR, that the criterion was among those necessary to implement section 303(c)(2)(B) of the CWA (62 FR 42160, August 5, 1997). EPA ultimately consented to a court-ordered resolution of these claims.[6] Under the terms of the court order, EPA committed to developing updated selenium criteria for the California waters covered by the original CTR. However, this proposed rule relates to a different set of selenium criteria: those selenium criteria that EPA previously proposed and finalized for the San Francisco Bay and Delta in the NTR. Since EPA has chosen to prioritize the development of this latter set of selenium criteria, EPA expects to defer proposing the remaining selenium criteria for the rest of California until no later than November 30, 2018, pursuant to the terms of the court-ordered resolution.

D. *State of California Actions*

The State of California has nine Regional Water Quality Control Boards (Regional Boards), each located in and overseeing different areas of the state. The State Water Resources Control Board (SWRCB) in Sacramento oversees the actions of the nine Regional Boards and periodically establishes policy and standards for consistency across the Regional Boards. The San Francisco Bay Regional Water Quality Control Board (SFRWQCB) and the Central Valley Regional Water Quality Control Board (CVRWQCB) oversee different parts of the Bay and Delta. The SFRWQCB oversees all parts of the San Francisco Bay including the South San

[6] *Our Children's Earth Foundation and Ecological Rights Foundation v. U.S. Environmental Protection Agency, et al.*, 13-cv-2857 (N.D. Cal, August 22, 2014).

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Francisco Bay, Lower San Francisco Bay, Central San Francisco Bay, San Pablo Bay, Carquinez Strait and Suisun Bay, and a small portion of the western side of Sacramento-San Joaquin Delta. The CVRWQCB oversees the remaining areas of the Delta which include the confluences of the Sacramento and the San Joaquin Rivers. Each Regional Board has a regional water quality control plan (Basin Plan) that sets forth the beneficial (designated) uses for the waterbodies it oversees. Once EPA finalizes the proposed criteria, each Regional Board will implement the criteria in its WQS programs for the waters it oversees.

In 1978, the SWRCB adopted a comprehensive plan for the Bay and Delta estuary: *The Water Quality Control Plan for the San Francisco Bay/Sacramento-San Joaquin Delta Estuary*. The plan was amended in 1991, 1995 and most recently in December 2006. This plan supplements the two regional Basin Plans that cover the estuary and establishes a comprehensive set of designated uses for all parts of the Bay and Delta. The plan describes the uses as existing uses.

The site-specific selenium criteria in this proposed rule are intended to protect aquatic life and aquatic-dependent wildlife, including federally listed threatened and endangered species, in the San Francisco Bay and Delta. The designated uses in the SWRCB water quality control plan for the protection of aquatic life and aquatic-dependent wildlife are listed in Table 1. The proposed criteria will establish levels of selenium that protect California's designated uses for the estuary.

Table 1. Existing Designated Uses for the San Francisco Bay and Delta

Use	Abbreviation	Definition
	WARM	Uses of water that support warm water ecosystems including, but not limited to, preservation of aquatic

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Warm Freshwater Habitat		habitats, vegetation, fish, or wildlife, including invertebrates.
Cold Freshwater Habitat	COLD	Uses of water that support cold water ecosystems including, but not limited to, preservation or enhancements of aquatic habitats, vegetation, fish, or wildlife, including invertebrates.
Migration of Aquatic Organisms	MIGR	Uses of water that support habitats necessary for the migration or other temporary activities by aquatic organisms, such as anadromous fish.
Spawning, Reproduction, and/or Early Development	SPWN	Uses of water that support high quality aquatic habitats suitable for reproduction and early development of fish.
Estuarine Habitat	EST	Uses of water that support estuarine ecosystems including, but not limited to, preservation or enhancement of estuarine habitats, vegetation, fish, shellfish, or wildlife (e.g., estuarine mammals, waterfowl, shorebirds).
Wildlife Habitat	WILD	Uses of water that support estuarine ecosystems including, but not limited to, preservation and enhancement of terrestrial habitats, vegetation, wildlife (e.g., mammals, birds, reptiles, amphibians, invertebrates), or wildlife water and food sources.
Rare, Threatened, or Endangered Species	RARE	Uses of water that support habitats necessary, at least in part, for the survival and successful maintenance of plant or animal species established under State or federal law as being rare, threatened, or endangered.

The proposed criteria are being set at levels that will protect aquatic life and aquatic-dependent wildlife consistent with WARM, COLD, EST, WILD and RARE uses, as well as protect aquatic life consistent with MIGR and SPWN uses.

E. *Applicability of EPA Promgulated Water Quality Standards When Final*

Under the CWA, Congress gave states primary responsibility for developing and adopting WQS for their waters (CWA section 303(a)-(c)). Although EPA is proposing selenium criteria for the protection of aquatic life and aquatic-dependent wildlife for marine and estuarine

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waters in California's San Francisco Bay and Delta, California continues to have the option to adopt and submit to EPA protective selenium criteria for these waters consistent with CWA section 303(c) and EPA's implementing regulations at 40 CFR part 131. EPA encourages California to expeditiously adopt protective criteria. Consistent with CWA section 303(c)(4), if California adopts and submits selenium criteria for the protection of aquatic life and aquatic-dependent wildlife, and EPA approves such criteria before finalizing this proposed rule, EPA would not proceed with the promulgation for those waters for which EPA approves California's criteria.

If EPA finalizes this proposed rule and California subsequently adopts and submits selenium criteria for the protection of aquatic and aquatic-dependent wildlife for marine and estuarine waters in the estuary, EPA proposes that once EPA approves California's WQS, the EPA-approved criteria in California's WQS would become the applicable criteria for CWA purposes and EPA's promulgated criteria would no longer be applicable criteria. EPA would undertake a rulemaking to withdraw the federal criteria for selenium, but that process would not delay California's approved criteria from becoming the sole applicable criteria for CWA purposes. EPA solicits comment on this approach.

F. *Selenium Chemistry and Biology*

Selenium is an element that occurs naturally in sediments of marine origin and enters the aquatic environment when rainwater comes into contact with deposits. Selenium can be further mobilized through anthropogenic activities such as agriculture irrigation, mining and petroleum refining. Once inorganic selenium is converted into a bioavailable form, it enters the food chain and can bioaccumulate. Depending on environmental conditions, one or another form of

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selenium such as selenate, selenite and organo-selenium, which differ in transformation rates and bioavailability, may predominate in the aquatic environment.

Selenium is an essential micro-nutrient, but the range between essential and toxic levels is narrow. A long-standing hypothesis is that toxicity occurs through biochemical pathways where excess selenium substitutes for sulphur in proteins, which alters their structure and function. More recent studies indicate that selenium may affect organisms through oxidative stress (see *Final Aquatic Life Ambient Water Quality Criteria for Selenium – Freshwater 2016,* US EPA, Office of Water, EPA 822-R-16-006, June, 2016). Elevated selenium levels in fish and other wildlife inhibit normal growth and reduce reproductive success through effects that lower embryo survival, most notably teratogenesis.

Scientific studies indicate that selenium toxicity to aquatic life and aquatic-dependent wildlife is driven by diet (i.e., the consumption of selenium-contaminated prey food) rather than by direct exposure in the water column. Selenium can accumulate in the aquatic food web through various routes and at various rates. At the bottom of the food chain, bacteria and algae can bioaccumulate selenium to levels that greatly exceed water column concentrations, and some invertebrates such as filter-feeding clams, can efficiently accumulate selenium from suspended organic and inorganic particles. In the San Francisco Bay and Delta, clam-based food webs accumulate selenium at a much higher rate than insect-based food webs, and the invasive clam species, *Potamocorbula amurensis*, now found throughout the estuary, can accumulate selenium at a much higher rate than supplanted clam species. Therefore, species that feed on this clam in the estuary, such as diving birds and sturgeon, are exposed to higher levels of bioaccumulated selenium than species that feed mainly on insects or higher-order species within an insect-based

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food chain. The vulnerability of a species to selenium toxicity is determined by a number of factors in addition to the amount of contaminated prey food consumed. A species' sensitivity to selenium, its population status, and the duration, timing and life stage of exposure are all factors to consider. In addition, the hydrologic conditions and water chemistry of a water body affect bioaccumulation; in general, slow-moving, calm waters or lentic waters enhance the production of bioavailable forms of selenium (selenite), while faster-moving waters or lotic waters limit selenium uptake given the rapid movement and predominant form of selenium (selenate). EPA considered these and other factors in determining the proposed selenium criteria for the estuary.

III. Rationale and Approach

A. *Necessity*

Ecological Health of the Estuary: The San Francisco Bay and Delta is the largest estuary on the West Coast of North America and, as part of the Pacific Flyway, serves as an important migratory stopover and wintering area for a variety of waterfowl. The estuary is formed by the intersection of two large river systems, the Sacramento and San Joaquin Rivers, which drain approximately 40 percent of California. The estuary is comprised of a series of large and small bays, marshes, and channels leading to the Pacific Ocean through the Golden Gate. The system is critical to California's ecological and economic well-being, and has long been the subject of competing interests. The estuary is the hub of California's water distribution system, providing drinking water to 25 million people, supplying irrigation for 4 million acres of farmland, and supporting over 750 different species of plants and animals. The estuary contributes to the area's economically important recreational and commercial fishing and boating industries. However, as a result of these competing demands and associated stresses, the ecosystem has suffered greatly

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and water quality in the estuary is impaired, habitat is shrinking, important fish populations are at an all-time low, and several species are listed as threatened or endangered. In recent years, pelagic (open water) species have declined, with some fish populations in serious, critical condition. This sudden collapse in pelagic species, referred to as the pelagic organism decline (or POD), has been intensively studied, but no one factor has been identified as the cause. Many factors are thought to be responsible for the decline of the estuary's health including water pollution, invasive species, water diversion and water project operations, ocean conditions (limited food and adverse temperatures), and habitat destruction and degradation. For a more detailed discussion, see *Unabridged Advanced Notice of Proposed Rulemaking for Water Quality Challenges in the San Francisco Bay/Sacramento-San Joaquin Delta Estuary*, US EPA, February 2011; 76 FR 9709, February 22, 2011.

Plan for Restoration: In 2009, the Federal Bay Delta Leadership Committee, a Cabinet-level, multi-agency committee charged with coordinating federal responses to Bay and Delta issues, issued its Interim Federal Action Plan, which outlined the federal government's proposal to address water resource management issues in the estuary. The Interim Federal Action Plan included an action for EPA to "address the effectiveness of current regulatory mechanisms designed to protect water quality in the Delta and its tributaries, including standards for toxics, nutrients, and estuarine habitat protection." In response, after extensive public comment, EPA published *Water Quality Challenges in the San Francisco Bay/Sacramento-San Joaquin Delta Estuary: EPA's Action Plan* (the Action Plan) in August 2012. In the Action Plan, EPA concluded that existing programs under the CWA were not adequately safeguarding resources, and recommended seven priority activities to advance the protection and restoration of aquatic

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resources and ensure a reliable water supply in the watershed. The priority activities are: 1. Strengthen estuarine habitat protection standards; 2. Advance regional water quality monitoring and assessment; 3. Accelerate water quality restoration through Total Maximum Daily Loads (TMDLs); 4. Strengthen selenium water quality criteria; 5. Prevent pesticide pollution; 6. Restore aquatic habitats while managing methylmercury; and 7. Support the Bay Delta Conservation Plan (now called the California WaterFix). This proposed rule is intended to advance priority activity number four, Strengthen selenium water quality criteria.

Sources of Selenium: Sources of selenium in the estuary include the tributaries flowing into the Delta and Bay, municipal and industrial wastewater discharges, stormwater discharges, atmospheric deposition, and in-bay sediments. The largest contributors are the Sacramento and San Joaquin Rivers and the five oil refineries located along the Bay.

The headwaters of both rivers originate from snowmelt in the Sierra Nevada. The Sacramento River flows north to south into the Delta, and drains the northern portion of the Central Valley. The San Joaquin River flows east to west, then turns and flows south to north into the Delta, and drains the southern and central portions of the Central Valley, which are used extensively for farming. The two rivers meet in the Delta near Antioch and flow west into the northern reaches of the Bay, then southwest to the Pacific Ocean.

Selenium concentrations in the San Joaquin River are elevated from selenium enriched soils on the west side of the Central Valley. Agricultural irrigation practices mobilize naturally occurring selenium in the heavy soils derived from marine shale and sediment. Selenium concentrations in the Sacramento River are much lower than in the San Joaquin River and are

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generally at natural background levels.[7] Flow volumes from each river vary depending on the water year type and season, and for the San Joaquin River, the volume of diversions. Therefore, selenium loads from the rivers vary, while loads from the refineries are more constant.

The San Joaquin watershed is much drier than the Sacramento watershed, and flows to the Bay from the San Joaquin River are significantly smaller than those from the Sacramento River. In addition, dams for hydropower and flood control further limit flows from the San Joaquin. Flow volume from the San Joaquin into the Delta as measured at Vernalis between 2002 and 2011 has ranged from approximately 8 to 30 percent of the flow volume from the Sacramento River at Freeport during the same time period.[8] At Clifton Court Forebay in the San Joaquin Delta below Vernalis, the State Water Project pumps water from the Delta to the California Aqueduct for delivery to Southern California, and the Central Valley Project pumps water to the Delta Mendota Canal for delivery to Central Valley farmers. As a result of these diversions, even less flow from the San Joaquin enters the northern part of the Bay.

Although flows from the San Joaquin are much smaller than flows from the Sacramento, selenium concentrations have been significantly higher than concentrations in the Sacramento. In 1998 and 1999, concentrations of dissolved selenium in the San Joaquin River averaged 0.71 µg/L, and ranged from 0.40 to 1.07 µg/L at Vernalis.[9] Concentrations in the San Joaquin have

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[7] *Water Quality Survey for Selenium in the Sacramento River and its Major Tributaries,* California Regional Water Quality Control Board, Central Valley Region, 1988, Sacramento, California.

[8] USGS National Water Information System, Surface-Water Annual Statistics for California at: http://waterdata.usgs.gov/ca/nwis/nwis (search terms: Surface Water; Annual Flow Data (Stream); Sacramento County at Freeport, USGS 11447650, and San Joaquin County at Vernalis, USGS 11303500, 2002- 2012, compare discharge in cubic feet per second based on daily-mean data for water years 2002 – 2011).

[9] *Ecosystem-Scale Selenium Modeling in Support of Fish and Wildlife Criteria Development for the San Francisco Bay-Delta Estuary, California*, Theresa S. Presser and Samuel N. Luoma, U.S. Geological Survey, 2010, Menlo, Park, California; and using data from: (1) *Selenium Biogeochemistry in the San Francisco Estuary: Changes in*

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declined recently, but continue to be higher than levels in the Sacramento River. Recent data from 2010 – 2012 show that dissolved selenium concentrations range from 0.207 to 0.47 µg/L in the San Joaquin.[10] Concentrations in the Sacramento have not materially changed during this time period. In 1998 and 1999, concentrations of dissolved selenium averaged 0.07 µg/L, and ranged from 0.05 to 0.11 µg/L at Freeport.[9] More recent data from 2010 – 2012 show levels between 0.062 and 0.09 µg/L.[10]

Concentrations of dissolved selenium in the Delta and in the northern and central portions of the Bay from 1998 – 1999 ranged from 0.070 to 0.320 µg/L.[9] Recent data from 2010 – 2012 show that concentrations have decreased, and range from 0.058 to 0.13 µg/L.[10]

Agriculture: Selenium concentrations in the San Joaquin River and the estuary are decreasing, in part, as a result of conservation actions from the agricultural industry and California's implementation of three selenium TMDLs in the Central Valley. TMDLs for a portion of the San Joaquin River, the Grassland Marshes, and Salt Slough (a tributary) are being implemented through Waste Discharge Requirements (WDRs) (permits) and the Grassland Bypass Project to reduce and reroute discharges of agricultural return flows from the west side of the watershed around sensitive wetlands.

Water Column Behavior, G.A. Cutter and L.S. Cutter, 2004, Estuarine, Coastal, and Shelf Science, 61:3 pp 463-476; (2) *Sources and Biogeochemical Cycling of Particulate Selenium in the San Francisco Bay Estuary*, M.A. Doblin, S.B. Baines, L.S. Cutter, and G.A. Cutter, 2006, Estuarine, Coastal, and Shelf Science, 76:4 pp. 681-694; and (3) *Transport, Transformation, and Effects of Selenium and Carbon in the Delta of the Sacramento-San Joaquin Rivers: Implications for Ecosystem Restoration*, L. Lucas and A.R. Stewart, 2007, CALFED Ecosystem Restoration Program, Agreement No. 4600001955, Project No. ERP-01-C07.

[10] *North San Francisco Bay Selenium Characterization Study, Final Report (Appendix B Data Tables)*, Tetra Tech, Inc. on behalf of Western States Petroleum Association, 2012, Lafayette, California.

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Between 1986 and 1996, before construction of the Grassland Bypass Project and implementation of the TMDLs, selenium loads in the San Joaquin at Patterson and Crows Landing below the confluence of the Merced River averaged 8,129 pounds per year (lbs/year). Since 2000, selenium loads have ranged from 1,526 – 6,353 lbs/year, with the lowest loads in recent years.[11] Between the mid-1990s and the mid-2000s, selenium loading to surface waters decreased by approximately one-half to two-thirds through agricultural water conservation measures such as harvesting crops that require less water, drip irrigation, water recycling and reuse on salt-tolerant crops, and land retirement. Although the final WDR loading targets have not been met, the agriculture industry has helped reduce selenium loads in the watershed. Final targets are scheduled to be achieved by 2019.

Refineries: Another source of selenium to the estuary is wastewater from the processing of selenium-rich crude oil, from the five major oil refineries located along the Bay. The recent decreases in selenium concentrations in the Bay are also the result of the refineries reducing selenium loads in wastewater discharges in response to California's implementation of more stringent NPDES permit limits. Selenium levels in crude vary, and the crude from the San Joaquin Basin can contain significantly higher levels than other sources of crude. Available data indicate that from 1986 through 1992, the cumulative selenium load to the Bay from the refineries averaged approximately 5,000 lbs/year, and ranged from 3,953 to 5,783 lbs/year.[9] In 1991, California required the refineries to reduce their mass discharge of selenium and achieve more stringent wastewater concentration limits. The refineries achieved their mass-based limits

[11] *Grassland Bypass Project Annual Report 2010-2011*, San Francisco Estuary Institute for the Grassland Bypass Project Oversight Committee, 2013, Chapter 1 (Table 7) by Michael C.S. Eacock and Stacy Brown, U.S. Bureau of Reclamation, Fresno, California.

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and revised concentration limits by 1998. The average cumulative selenium load for all refineries since 1999 has been approximately 1,200 lbs/year, down approximately 75% from early 1990 levels.[9] Activities undertaken by both the agriculture industry and the refineries have helped to reduce selenium loads to the Bay.

Invasive Clam Species: In the fall of 1986, after major flooding in the spring had wiped out large parts of the existing benthic community, a small bivalve was discovered in the northern reaches of San Francisco Bay.[12] Its population rapidly increased and spread throughout the estuary. The species, *Potamocorbula amurensis* (*P. amurensis*), commonly known as *Corbula*, is native to China, Japan, and Korea, and is thought to have been introduced to the estuary from ballast water. Adults tolerate a wide range of salinity (1 to 32 parts per thousand), and although *Corbula* flourish in subtidal waters, they can also live in intertidal mudflats.[12] The species is remarkably efficient in accumulating selenium from its environment[13] and is responsible for the accelerated bioaccumulation of selenium in the food chain of the fish and bird species in the Bay and Delta ecosystem. The species most at risk in the estuary from the *Corbula* invasion are believed to be clam-eating fish and bird species such as green and white sturgeon, scoter and scaup.

Need for Revised Criteria: EPA now has updated scientific information on selenium fate and bioaccumulation, as well as updated information on the Bay and Delta estuary ecosystem

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[12] *The Exotics Guide: Non-native Marine Species of the North American Pacific Coast*, 2011, Andrew N. Cohen, Center for Research on Aquatic Bioinvasions, Richmond, California, and San Francisco Estuary Institute, Oakland, California. http://www.exoticsguide.org.

[13] *Food Web Pathway Determines How Selenium Affects Ecosystems: A San Francisco Bay Case Study*, 2004, A. Robin Stewart, Samuel N. Luoma, Christian E. Schlekat, and Kathryn A. Hieb, Environmental Science and Technology, 38:4519-4526.

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that was not available when EPA developed the existing Bay and Delta selenium criteria in the NTR. These data indicate the need for revised criteria. The explosion of the *Corbula* population in the early 1990s has drastically changed the food web and selenium bioaccumulation dynamics in the Bay and Delta. The Ecosystem-Scale Selenium Model for the San Francisco estuary allows EPA to develop revised selenium criteria that account for site-specific and species-specific characteristics, including species with greater exposure and/or susceptibility to selenium. In doing so, EPA is following the requirements at 40 CFR 131.11(a)(1) to derive criteria that are based on a sound scientific rationale and protect the most sensitive uses, which in the case of the Bay and Delta include migration of aquatic organisms (e.g., anadromous fish species), and habitat for rare, threatened and endangered species.

Although conditions have improved from reduced agriculture and refinery loads, ambient levels of selenium are not consistently below harmful levels in all parts of the estuary. Revised criteria are necessary to help ensure that protective levels are attained in all parts of the water body and are maintained in the future to protect designated uses. Several indigenous species are listed under the ESA as threatened or endangered, including green sturgeon, Chinook salmon, steelhead trout, delta smelt and the California Ridgway's rail, and many migratory bird species use the estuary as a wintering ground, including greater and lesser scaup, and white-winged, surf, and black scoter. The analyses to develop the fish tissue and the avian egg tissue benchmarks used in the modeling, and the modeling results used to derive the proposed water column criteria, indicate the health of these species would be negatively impacted from exposure to selenium water column concentrations above 0.2 µg/L, which would be allowed to occur under the existing NTR selenium criterion of 5.0 µg/L. Accordingly, EPA finds that it is necessary to

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propose revised and more protective criteria for selenium in order to help ensure the continued protection of these vulnerable species and associated designated uses.

B. *Administrator's Determination of Necessity*

Because California's existing aquatic life criteria for selenium in the salt and estuarine waters of the San Francisco Bay, upstream to and including Suisun Bay and the Sacramento-San Joaquin Delta, as promulgated by EPA in the NTR, are not protective of the applicable designated uses per the CWA and EPA's regulations at 40 CFR 131.11, EPA determines under CWA section 303(c)(4)(B) that new or revised WQS for the protection of aquatic life and aquatic-dependent wildlife are necessary to meet the requirements of the CWA for these California waters. EPA, therefore, proposes the revised selenium aquatic life and aquatic-dependent wildlife criteria in this rule in accordance with this 303(c)(4)(B) determination. EPA's determination is not itself a final action, nor part of a final action, at this time. After consideration of comments on the proposed rule, EPA will take final agency action on this rulemaking. It is at that time that any change to the water quality standards applicable in California would occur.

C. *Approach*

USGS Ecosystem-Scale Selenium Model: The Ecosystem-Scale Selenium Model uses species-specific and hydrologic site-specific information to model the fate and biological uptake of selenium in an aquatic ecosystem through diet. The model was originally developed for the San Francisco estuary. It conceptualizes and quantifies several key variables in order to predict how selenium moves from the water environment to wildlife species through the food chain. It can link selenium tissue concentrations in fish or avian wildlife to dissolved and particulate

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selenium concentrations in the water environment and to selenium tissue concentrations in prey food.

Starting in 2003, USGS worked with the Services and EPA to model the San Francisco Bay and Delta using various scenarios and endpoints (see the USGS Report). Using the best available data for the estuary, USGS modeled a clam-based food web from the Golden Gate through Suisun Bay to Chipps Island and an insect-based food web from Benicia to Rio Vista (in the Sacramento River Delta area) and to Stockton (in the San Joaquin River Delta area). Using site-specific partitioning coefficients to determine rates of selenium transformation between dissolved and particulate phases, the model can predict how efficiently selenium enters the base of the food web. Once selenium enters the food web, using site-specific trophic transfer factors, which relate selenium concentrations in a species to selenium concentrations in its food, the model can predict how efficiently selenium moves up into prey food and to a predator species. Alternatively, a protective tissue level of selenium in an upper trophic level fish species or in a terrestrial wildlife species (any predator species) can be used to back-calculate and predict the protective concentration of selenium in the species' prey, and the protective concentration of dissolved and particulate selenium at the base of its food web in the aquatic environment.

EPA Modeling: Using information from the Services on important and/or vulnerable fish and avian wildlife species in the estuary, and building on the USGS modeling of the estuary, EPA modeled the estuary to develop site-specific scenarios on which to base the proposed criteria (see *Technical Support Document for the Proposed Aquatic Life and Aquatic-Dependent Wildlife Selenium Water Quality Criteria for the San Francisco Bay and Delta (2016),* US EPA Region 9, June, 2016).

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EPA considered various protective (benchmark) tissue values for representative fish and avian wildlife species to use in the modeling. EPA found that the most appropriate tissue benchmark values for fish species in the estuary are the recommended values in EPA's recent national recommended freshwater aquatic life criterion for selenium[14] and for avian species in the estuary, the egg tissue value discussed in EPA's approval of the State of Utah's avian wildlife criterion for Gilbert Bay of the Great Salt Lake.[15] These benchmark values represent a 10% Effect Concentration (EC10), which is a concentration or level of a pollutant that may adversely affect up to 10% of a species population. In the national recommended freshwater aquatic life criterion for selenium, EPA used EC10 concentrations to develop the selenium water quality criterion values.[14]

EPA modeled two food webs in the estuary, a clam-based web and an insect-based web, to determine protective dissolved, particulate and prey-tissue selenium values. EPA modeled a clam-based food chain for fish and two clam-based food chains for birds that consume *Corbula* from the estuary, each chain representing at-risk fish and bird species in the estuary. The clam-based fish modeling represented white and juvenile green sturgeon, important species in the estuary that EPA determined are the most vulnerable clam-eating fish species. Although white sturgeon are not listed under the ESA, green sturgeon are threatened and the estuary is designated as critical habitat for the species. Since other important vulnerable fish species in the

[14] *Final Aquatic Life Ambient Water Quality Criterion for Selenium – Freshwater 2016*, EPA 822-R-16-006, US EPA, Office of Water, 2016, Washington, D.C.
[15] *EPA Action on the Gilbert Bay Selenium Criterion and Footnote (14), and Enclosure*, US EPA Region 8, 2011, Denver, Colorado.

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estuary such as Sacramento splittail consume less *Corbula* than sturgeon, the other species should be protected if sturgeon are protected.

EPA modeled two clam-based food web scenarios for at-risk avian wildlife to represent two different patterns of avian clam-consumption in the estuary. The California Ridgway's rail (formerly the California clapper rail) is a small, endangered, indigenous bird that lives year-round in the estuary and eats mostly mollusks, but only a small percentage of *Corbula.* The five species of migratory diving waterfowl, greater and lesser scaup and white-winged, surf, and black scoter, live part-time in the estuary, but up to 90% of their diet may consist of *Corbula* from the estuary. These differences in living and eating patterns are sufficiently significant that EPA ran the model for each separately to ensure the criteria are protective of all avian wildlife in the Bay and Delta estuary.

Lastly, EPA modeled insect-eating fish to represent two important anadromous species, the endangered Chinook salmon and the threatened steelhead trout, and an important, threatened, indigenous species in the estuary, the delta smelt. Since anadromous species use the estuary as a migratory corridor, and adults returning to spawn do not feed during in-migration, EPA considered the diet of juveniles as they out-migrate through the estuary to the Pacific Ocean. Delta smelt, and juvenile Chinook salmon and steelhead trout, consume mainly insects, and do not feed on *Corbula*.

The model results indicate that clam-eating fish and clam-eating bird species are the most vulnerable species, and require lower dissolved and particulate water column selenium concentrations in the estuary than insect-eating fish in order to ensure that tissue levels stay below concentrations that may cause adverse effects. EPA considered the dissolved water

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column, particulate water column, and prey-tissue values necessary to protect all three categories of species in setting the proposed regulatory criteria values.

D. *Proposed Criteria*

Water quality criteria establish the maximum allowable pollutant level that is protective of the designated uses of a water body. States (or in this case, EPA) adopt criteria as part of water quality standards. Under the CWA, water quality standards are used to derive effluent limitations in permits for point source dischargers, thereby limiting the amount of pollutants that may be discharged into a water body to maintain its designated uses. EPA is proposing selenium water quality criteria for the San Francisco Bay and Delta in tissue and in the water column (both dissolved and particulate selenium concentrations). EPA is proposing selenium tissue concentration criteria because they reflect biological uptake through diet, the predominant pathway for selenium toxicity, and because they are most predictive of the observed biological endpoint of concern: reproductive toxicity. However, tissue concentrations present challenges when attempting to use them to regulate or limit sources of pollutants. In order to facilitate monitoring and regulation of pollutant discharges, EPA is also proposing dissolved and particulate water column selenium concentration criteria needed to ensure the tissue concentration criteria are met. Because EPA used site-specific species and hydrologic information in the Ecosystem-Scale Selenium Model to determine the protective dissolved and particulate water column and prey selenium concentrations associated with the predator tissue concentrations, EPA proposes that the criteria in different media are equivalently protective and exceedance of any one medium would indicate an impairment of the designated use.

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The proposed tissue criteria consist of fish tissue criteria, a whole body criterion of 8.5 micrograms per gram (µg/g) dry weight (dw) or a muscle criterion of 11.3 µg/g dw, and a clam (or prey) tissue criterion of 15 µg/g dw. EPA is proposing each of these tissue criteria as an instantaneous measurement not to be exceeded. The proposed chronic water column criterion is a dissolved selenium criterion of 0.2 µg/L, and the proposed particulate criterion is 1 µg/g. Each of these two values is a 30-day average, not to be exceeded more than once in three years.

Although selenium may cause acute toxicity at high concentrations, i.e., toxicity from a brief but highly elevated concentration of selenium in the water, chronic dietary exposure poses the highest risk to aquatic life and aquatic-dependent wildlife. Chronic toxicity occurs primarily through maternal transfer of selenium to eggs and causes subsequent reproductive effects. These chronic effects are observed at much lower concentrations than acute effects. Aquatic and aquatic-dependent communities are expected to be protected by the chronic criteria from any potential acute effects of selenium and an acute toxicity criterion is not pertinent for regulatory purposes. However, some high, short-term exposures could be detrimental by causing significant long-term, residual, bioaccumulative effects, i.e., by the introduction of a selenium load into the system. Therefore, EPA is also proposing an intermittent exposure water quality criterion to prevent long-term detrimental effects from these high, short-term exposures. EPA derived the proposed intermittent criterion as a fraction of the 30-day load based on the chronic water column criterion, after accounting for the background selenium concentration. EPA expects that a short-term, significantly elevated selenium scenario would rarely occur in the San Francisco Bay and Delta due to the large volume of water and tidal influences within the estuary that dilute and flush selenium loads through the Golden Gate. EPA is proposing this intermittent criterion to

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ensure protection of the ecosystem and for consistency with EPA's national recommended aquatic life criterion for selenium. A summary of the proposed criteria is included in Table 2.

Table 2. Proposed Selenium Water Quality Criteria for the San Francisco Bay and Delta

Media Type	**Tissue**		**Water Column[1]**		
			Dissolved		**Particulate**
Criteria	**Fish Whole Body or Muscle**	**Clam**	**Chronic**	**Intermittent Exposure[2]**	**Chronic**
Magnitude	8.5µg/g dw whole body or 11.3 µg/g dw muscle	15 µg/g dw	0.2 µg/L	$\boldsymbol{WQC_{int}} = \frac{0.2\ \mu g/L - \boldsymbol{C_{bkgrnd}}(\boldsymbol{1} - \boldsymbol{f_{int}})}{\boldsymbol{f_{int}}}$	1 µg/g dw
Duration	Instantaneous measurement	Instantaneous measurement	30 days	Number of days/month with an elevated concentration	30 days
Frequency	Not to be exceeded	Not to be exceeded	Not more than once in three years	Not more than once in three years	Not more than once in three years

[1] Dissolved and particulate water column values are based on total selenium (includes all oxidation states, i.e., selenite, selenate, organic selenium and any other forms) in water.

[2] Where C_{bkgrnd} is the average background selenium concentration in µg/L, and f_{int} is the fraction of any 30-day period during which elevated selenium concentrations occur, with f_{int} assigned a value ≥ 0.033 (corresponding to one day).

The proposed criteria apply to all waters of the San Francisco Bay and Delta with salinities of greater than 1 part per thousand (ppt) 95% or more of the time.

IV. Implementation and Alternative Regulatory Approaches

California will have considerable discretion to implement these selenium criteria, once finalized, through various water quality control programs, including the NPDES program, which limits discharges to waters except in compliance with an NPDES permit. Among other things, EPA's regulations: (1) specify how states and authorized tribes establish, modify or remove designated uses, (2) specify the requirements for establishing criteria to protect designated uses,

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including criteria modified to reflect site-specific conditions, (3) authorize states and authorized tribes to adopt WQS variances to provide time to achieve the applicable WQS, and (4) allow states and authorized tribes to include compliance schedules in NPDES permits to provide time for dischargers to achieve effluent limits based on the applicable WQS. Designated uses, site-specific criteria, variances, and compliance schedules are discussed in more detail below.

Designated Uses: EPA's proposed selenium criteria apply to marine and estuarine waters in the San Francisco Bay and Delta where the protection of aquatic life and aquatic-dependent wildlife are designated uses (see *The Water Quality Control Plan for the San Francisco Bay/Sacramento-San Joaquin Delta Estuary*, SWRCB, December 13, 2006). The federal regulations at 40 CFR 131.10 provide information on establishing, modifying, and removing designated uses. If California removes designated uses such that no aquatic life or aquatic-dependent wildlife uses apply to any particular water body segment affected by this rule and adopts the highest attainable use,[16] and EPA finds that removal to be consistent with CWA section 303(c) and the implementing regulations at 40 CFR part 131, then the federal selenium aquatic life and aquatic-dependent wildlife criteria would no longer apply to that water body segment. Instead, any criteria associated with the newly designated highest attainable use would apply to that water body segment.

[16] Highest attainable use is the modified aquatic life, wildlife, or recreation use that is both closest to the uses specified in section 101(a)(2) of the CWA and attainable, based on the evaluation of the factor(s) in 40 CFR 131.10(g) that preclude(s) attainment of the use and any other information or analyses that were used to evaluate attainability. There is no required highest attainable use where the state demonstrates the relevant use specified in section 101(a)(2) of the CWA and sub-categories of such a use are not attainable (see 40 CFR 131.3(m)).

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Site-Specific Criteria: The regulations at 40 CFR 131.11 specify requirements for modifying water quality criteria to reflect site-specific conditions. In the context of this rulemaking, a site-specific criterion (SSC) is an alternative value to the federal selenium criteria that would be applied on an area-wide or water body-specific basis that meets the regulatory test of protecting the designated uses, being scientifically defensible, and ensuring the protection and maintenance of downstream WQS. A SSC may be more or less stringent than the otherwise applicable federal criteria. A SSC may be appropriate when further scientific data and analyses can bring added precision to express the concentration of selenium that protects the aquatic life- and aquatic-dependent wildlife-related designated uses in a particular water body or portion of a water body. Since the San Francisco Bay and Delta is a large water body, a different SSC may be appropriate for a small segment of the estuary, e.g., South San Francisco Bay, if differing flow dynamics indicate that different criteria may be more appropriate. As discussed in section II. E., EPA proposes that once EPA approves criteria that California adopts and submits after EPA finalizes this proposed rule, the site-specific EPA-approved criteria in California's WQS would become effective for CWA purposes and EPA's promulgated criteria would no longer apply.

Variances: EPA's regulations at 40 CFR part 131.14 authorize states and authorized tribes to adopt WQS variances to provide time to achieve the applicable WQS. 40 CFR part 131 defines WQS variances at 131.3(o) as time-limited designated uses and supporting criteria for a specific pollutant(s) or water quality parameters(s) that reflect the highest attainable conditions during the term of the WQS variance. WQS variances adopted in accordance with 40 CFR part 131 allow states and authorized tribes to address water quality challenges in a transparent and predictable way. Variances help states and authorized tribes focus on making incremental

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progress in improving water quality, rather than pursuing a downgrade of the underlying water quality goals through a designated use change, when the current designated use is difficult to attain. EPA is proposing criteria that apply to use designations that California has already established. California currently has authority to use variances when implementing the criteria, as long as such variances are adopted consistent with 40 CFR 131.14 (see *Policy for Implementation of Toxics Standards for Inland Surface Waters, Enclosed Bays, and Estuaries of California*, Section 5.3, SWRCB, March 2, 2000, amended February 24, 2005; and *Procedures for Case-by-Case Exceptions from Criteria/Objectives*, SWRCB, April 15, 2008). California may use EPA-approved variance procedures, with respect to a temporary modification of its uses as it pertains to any federal criteria, when adopting such variances.

Compliance Schedules: EPA's regulations at 40 CFR 122.47 and 40 CFR 131.15 allow states and authorized tribes to include permit compliance schedules in their NPDES permits, when appropriate, in order to accommodate a discharger's need for additional time to meet its water quality-based effluent limits (WQBELs) implementing applicable WQS (such as time needed for facility upgrades and operational changes).

In 1990, EPA concluded that before a permitting authority can include a compliance schedule for a WQBEL in an NPDES permit, the state or authorized tribe must authorize its use in its WQS or implementing regulations.[17] A permit compliance schedule authorizing provision (CSAP) authorizes, but does not require, the permit issuing authority to include compliance schedules in permits. EPA's approval of the state's or authorized tribe's permit CSAP as a WQS

[17] *In the Matter of Star-Kist Caribe, Inc.* 3 EAD 172 (April 16, 1990).

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pursuant to 40 CFR 131.15 ensures that any NPDES permit that contains a compliance schedule meets the requirement that the WQBEL and any compliance deadlines derive from and comply with applicable WQS.

California is authorized to administer the NPDES program in the state, and has adopted several mechanisms to authorize compliance schedules in NPDES permits. In 2008, California adopted a statewide CSAP that EPA subsequently approved under CWA section 303(c), the *Policy for Compliance Schedules in National Pollutant Discharge Elimination System Permits*, SWRCB Resolution No. 2008-0025, April 15, 2008. This EPA-approved regulation authorizes the use of permit compliance schedules consistent with 40 CFR 131.15, and is not affected by this rule. The CSAP will allow California to grant compliance schedules, as appropriate, based on the federal selenium criteria for the Bay and Delta, once these criteria are finalized (see letters dated May 20, 2016 and May 27, 2016 from the SWRCB to EPA in the docket for this rule).

V. Endangered Species Act

Pursuant to section 7(a) of the ESA, EPA is consulting with the FWS and NMFS concerning EPA's rulemaking action for selenium water quality criteria in the San Francisco Bay and Delta. EPA will initiate informal consultation, and will transmit to the Services documentation that supports the selenium water quality criteria in this proposed rule. As a result of this consultation, EPA may modify some provisions of this proposed rule. The basis for the selenium criteria in this proposed rule stems from many years of ongoing collaboration between EPA and the Services. EPA, FWS and NMFS will continue to work closely together on this ESA consultation process.

VI. Economic Analysis

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POTWs and industrial point sources that discharge to the Bay and Delta may incur some incremental compliance actions and costs as a result of the proposed criteria. California has NPDES permitting authority for these dischargers, and retains considerable discretion in implementing standards. EPA evaluated the potential costs to the municipal and industrial NPDES dischargers associated with state implementation of EPA's proposed dissolved water column criterion. EPA did not evaluate the potential costs associated with state implementation of EPA's proposed particulate water column criterion because particulate data are not available and because the state has discretion concerning implementation. This analysis is documented in *Economic Analysis for Proposed Aquatic Life and Aquatic-Dependent Wildlife Criteria for Selenium in the San Francisco Bay and Delta, California* (prepared for EPA by Abt Associates in Partnership with PG Environmental, LLC, June, 2016), which can be found in the docket for this rulemaking.

NPDES-permitted facilities that discharge selenium to affected portions of the Bay and Delta could potentially incur compliance costs. The types of affected facilities could include industrial facilities and POTWs discharging wastewater to surface waters (i.e., point sources). EPA expects that dischargers will use the same types of controls as they are currently using to comply with existing selenium criteria applicable to the Bay and Delta, to come into compliance with the revised criteria. Since the state recently adopted the North San Francisco Bay Selenium TMDL, and the TMDL requirements and underlying analyses indicate that current ambient water quality conditions (dissolved selenium levels at or below 0.2 μg/L) will be maintained, EPA did not include costs associated with point sources covered in the TMDL analysis.

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EPA did not identify incremental compliance costs for nonpoint sources. Unlike point sources, California typically does not require nonpoint sources to achieve numeric WQBELs; instead, these sources often have best management practice (BMP) requirements, as well as load allocations associated with TMDLs. Regional Boards have already established TMDLs for selenium in the Lower San Joaquin River and the North San Francisco Bay, and EPA assumes the proposed selenium criteria will not result in the need for additional controls by nonpoint sources in those areas. It is uncertain to what extent nonpoint sources contribute selenium loadings to the Lower and South San Francisco Bay. EPA assumes that naturally-occurring selenium may be the primary source of selenium in the Lower and South San Francisco Bay, and as such, the incremental controls and costs for nonpoint sources as a result of the proposed criteria will not be significant.

A. *Identifying Affected Entities*

Potentially affected facilities include those discharging to waters subject to the proposed criteria (i.e., marine or estuarine waters) that are not already included in the North San Francisco Bay Selenium TMDL. EPA identified 16 such point source facilities, all discharging to the Lower and South San Francisco Bay. Of these potentially affected facilities, 14 are POTWs and 2 are industrial dischargers (the San Francisco International Airport and the Bottling Group, LLC). Table 3 summarizes these potentially affected facilities by type and category.

Table 3. Potentially Affected Facilities

Category	Minor	Major	All
Municipal	1	13	14
Industrial	1	1	2
Total	**2**	**14**	**16**

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B. *Method for Estimating Costs*

For all potentially affected facilities, EPA used the last five years of effluent data (when available) and ambient monitoring data from the relevant monitoring station to determine whether there is reasonable potential for the facility to cause or contribute to an excursion above the proposed dissolved water column criterion for selenium. For those facilities that have reasonable potential, EPA calculated projected effluent limits. EPA conducted reasonable potential analyses and calculated effluent limitations for each facility based on California's permitting practices.[18] In instances where the facility's maximum effluent selenium concentration exceeded the projected effluent limitations under the proposed criterion, EPA determined the likely compliance scenarios and costs. Following California's *Policy for Implementation of Toxics Standards for Inland Surface Waters, Enclosed Bays, and Estuaries of California* may result in a conservative evaluation for some point sources. However, the Regional Boards have substantial discretion to apply other implementing permitting procedures that are consistent with the Policy's requirements, and may elect to follow different methods to determine whether effluent limits are necessary and/or the value of the effluent limitations. These alternative methods may result in fewer facilities requiring action and/or less stringent permit limitations.

EPA assumed that dischargers would pursue the least cost means of compliance with WQBELs. Incremental compliance actions attributable to the proposed rule may include process

[18] Pursuant to the *Policy for Implementation of Toxics Standards for Inland Surface Waters, Enclosed Bays, and Estuaries of California,* SWRCB, California Environmental Protection Agency, March 2, 2000, amended February 24, 2005.

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optimization, source controls, end-of-pipe treatment, and alternative compliance mechanisms (e.g., site-specific criteria, variances, and dilution credits). For plants discharging at levels above California's minimum quantitation level, EPA has assumed that the facility will pursue conventional treatment methods to comply with the projected effluent limitations. Facilities operating below the quantitation level are discharging near the projected limitations, and EPA has assumed that compliance is likely to be achievable using process optimization methods. EPA annualized capital costs over 20 years using a 3% discount rate to obtain total annual costs per facility.

C. *Results*

Of the 16 potentially affected facilities that EPA identified, 14 were found to have reasonable potential to cause or contribute to an excursion above the proposed criterion. For compliance with revised WQBELs under the proposed rule, EPA estimates the total annual cost to be approximately $16 million across the 14 facilities. Of these costs, nearly all are attributable to POTW dischargers (i.e., 13 POTWs and one industrial facility, the San Francisco International Airport).

VII. Statutory and Executive Orders

A. *Executive Order 12866 (Regulatory Planning and Review) and Executive Order 13563 (Improving Regulation and Regulatory Review)*

This action is not a significant regulatory action and was, therefore, not submitted to the Office of Management and Budget (OMB) for review. The proposed rule does not establish any requirements directly applicable to regulated entities or other sources of toxic pollutants. However, these WQS may serve as a basis for development of NPDES permit limits. California

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has NPDES permitting authority, and retains considerable discretion in implementing WQS. In the spirit of Executive Order 12866, EPA evaluated the potential costs to NPDES dischargers associated with state implementation of EPA's proposed criteria. This analysis, *Economic Analysis for Proposed Aquatic Life and Aquatic-Dependent Wildlife Criteria for Selenium in the San Francisco Bay and Delta, California,* is summarized in section VI. of the preamble and is available in the docket.

B. *Paperwork Reduction Act (PRA)*

This action does not impose an information collection burden under the PRA. While actions to implement these WQS could entail additional paperwork burden, this action does not directly contain any information collection, reporting, or record-keeping requirements.

C. *Regulatory Flexibility Act (RFA)*

I certify that this action will not have a significant economic impact on a substantial number of small entities under the RFA. This action will not impose any requirements on small entities. Small entities, such as small businesses or small governmental jurisdictions, are not directly regulated by this rule.

D. *Unfunded Mandates Reform Act (UMRA)*

This action does not contain any unfunded mandate as described in UMRA, 2 U.S.C. 1531-1538, and does not significantly or uniquely affect small governments. As these water quality criteria are not self-implementing, the action imposes no enforceable duty on any state, local or tribal governments or the private sector.

E. *Executive Order 13132 (Federalism)*

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This action does not have federalism implications. It will not have substantial direct effects on the states, on the relationship between the national government and the states, or on the distribution of power and responsibilities among the various levels of government. This rule does not alter California's considerable discretion in implementing these WQS, nor would it preclude California from adopting WQS that meet the requirements of the CWA, either before or after promulgation of the final rule, which would eliminate the need for federal standards upon EPA approval of the state WQS. Thus, Executive Order 13132 does not apply to this action.

In the spirit of Executive Order 13132 and consistent with EPA policy to promote communications between EPA and state and local governments, EPA specifically solicits comments on this proposed action from state and local officials.

F. *Executive Order 13175 (Consultation and Coordination with Indian Tribal Governments)*

This action does not have tribal implications as specified in Executive Order 13175. This proposed rule does not impose substantial direct compliance costs on federally recognized tribal governments, nor does it substantially affect the relationship between the federal government and tribes, or the distribution of power and responsibilities between the federal government and tribes. Thus, Executive Order 13175 does not apply to this action.

Consistent with the EPA Policy on Consultation and Coordination with Indian Tribes, EPA consulted with tribal officials during the development of this action. EPA will continue to communicate with the tribes prior to its final action.

G. *Executive Order 13045 (Protection of Children from Environmental Health and Safety Risks)*

The EPA interprets Executive Order 13045 as applying only to those regulatory actions that concern environmental health or safety risks that the EPA has reason to believe may

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disproportionately affect children, per the definition of "covered regulatory action" in section 2-202 of the Executive Order. This action is not subject to Executive Order 13045 because it does not concern an environmental health risk or safety risk.

H. *Executive Order 13211 (Actions that Significantly Affect Energy Supply, Distribution, or Use)*

This action is not subject to Executive Order 13211, because it is not a significant regulatory action under Executive Order 12866.

I. *National Technology Transfer and Advancement Act of 1995*

This proposed rulemaking does not involve technical standards.

J. *Executive Order 12898 (Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations)*

The human health or environmental risk addressed by this action will not have potential disproportionately high and adverse human health or environmental effects on minority, low-income or indigenous populations. The criteria in this proposed rule will support the health and abundance of aquatic life and aquatic-dependent wildlife in the San Francisco Bay and Delta and will, therefore, benefit all communities that rely on these ecosystems.

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List of Subjects in 40 CFR Part 131

Environmental protection, Indians-lands, Intergovernmental relations, Reporting and recordkeeping requirements, Water pollution control.

Dated: _____.

Gina McCarthy,

Administrator.

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For the reasons set forth in the preamble, EPA proposes to amend 40 CFR part 131 as follows:

PART 131 – WATER QUALITY STANDARDS

1. The authority citation for part 131 continues to read as follows:

Authority: 33 U.S.C. 1251 *et seq*.

Subpart D—Federally Promulgated Water Quality Standards

2. Section 131.36 is amended by revising paragraph (d)(10)(ii) table entry for "Waters of San Francisco Bay upstream to and including Suisun Bay and the Sacramento-San Joaquin Delta" to read as follows:

§ 131.36 Toxics criteria for those states not complying with Clean Water Act section 303(c)(2)(B).

* * * * *

(d) * * *

(10) * * *

(ii) * * *

Water and use classification	Applicable criteria
* * * * * * *	* * * * * * *
Waters of San Francisco Bay upstream to and including Suisun Bay and the Sacramento-San Joaquin Delta	These waters are assigned the criteria in: Column B1 – pollutants 5a, 10[a] and 14 Column B2 – pollutants 5a, 10[a] and 14 Column D2 – pollutants 1, 12, 17, 18, 21, 22, 29, 30, 32, 33, 37, 38, 42-44, 46, 48, 49, 54, 59, 66, 67, 68, 78-82, 85, 89, 90, 91, 93, 95, 96, 98
* * * * * * *	* * * * * * *

[a]These freshwater selenium criteria are only applicable to the extent that the criteria under 40 CFR 131.38(b)(3) are not applicable (i.e., they are only applicable in fresh waters).

* * * * *

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3. Section 131.38 is amended as follows:

a. Revise paragraph (b)(1) table footnotes “p” and “q”;

b. Add new paragraph (b)(3);

c. Revise paragraph (c)(3)(ii);

d. Add new paragraph (c)(3)(iv); and

e. Add new paragraph (c)(3)(v).

§ 131.38 Establishment of numeric criteria for priority toxic pollutants for the State of California.

* * * * *

(b)(1) * * *

Footnotes to Table in Paragraph (b)(1):

* * * * *

p. The [Reserved] criterion referenced by this footnote does not supersede any selenium criterion set out in 40 CFR 131.36 for: waters of the San Francisco Bay, upstream to and including Suisun Bay and the Sacramento-San Joaquin Delta; and waters of Salt Slough, Mud Slough (north) and the San Joaquin River, Sack Dam to the mouth of the Merced River. The criteria set out in 40 CFR 131.38(b)(3) apply to the salt and estuarine waters of the San Francisco Bay, upstream to and including Suisun Bay and the Sacramento-San Joaquin Delta, subject to 40 CFR 131.38(c)(3)(v). The State of California adopted and EPA approved a site specific criterion for the San Joaquin River, mouth of Merced to Vernalis; therefore, the criterion referenced by this footnote does not apply to these waters.

q. The 5 µg/L criterion referenced by this footnote does not supersede any selenium

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criterion set out in 40 CFR 131.36 for: waters of the San Francisco Bay, upstream to and including Suisun Bay and the Sacramento-San Joaquin Delta; and waters of Salt Slough, Mud Slough (north) and the San Joaquin River, Sack Dam to Vernalis. The criteria set out in 40 CFR 131.38(b)(3) apply to the salt and estuarine waters of the San Francisco Bay, upstream to and including Suisun Bay and the Sacramento-San Joaquin Delta, subject to 40 CFR 131.38(c)(3)(v). The State of California adopted and EPA approved a site-specific criterion for the Grasslands Water District, San Luis National Wildlife Refuge, and the Los Banos State Wildlife Refuge; therefore, the criterion referenced by this footnote does not apply to these waters.

* * * * *

(b)(3) The selenium criteria in Table 1 to this paragraph (b)(3) apply to all the waters of San Francisco Bay upstream to and including Suisun Bay and the Sacramento-San Joaquin Delta where the salinity is greater than 1 part per thousand 95% or more of the time, subject to paragraph (c)(3)(v).

Table 1 to paragraph (b)(3): Selenium Water Quality Criteria for the Salt and Estuarine Waters of the San Francisco Bay, Upstream to and Including Suisun Bay and the Sacramento-San Joaquin Delta

Media Type	**Tissue**		**Water Column[1]**		
			Dissolved		**Particulate**
Criteria	**Fish Whole Body or Muscle**	**Clam**	**Chronic**	**Intermittent Exposure[2]**	**Chronic**
Magnitude	8.5 µg/g dw whole body or 11.3 µg/g dw muscle	15 µg/g dw	0.2 µg/L	$\boldsymbol{WQC_{int}} = \frac{0.2\ \mu g/L - \boldsymbol{C_{bkgrnd}}(\mathbf{1} - \boldsymbol{f_{int}})}{\boldsymbol{f_{int}}}$	1 µg/g dw
Duration	Instantaneous measurement	Instantaneous measurement	30 days	Number of days/month with an elevated concentration	30 days

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Frequency	Not to be exceeded	Not to be exceeded	Not more than once in three years	Not more than once in three years	Not more than once in three years

[1] Dissolved and particulate water column values are based on total selenium (includes all oxidation states, i.e., selenite, selenate, organic selenium and any other forms) in water.

[2] C_{bkgrnd} is the average background selenium concentration in µg/L. f_{int} is the fraction of any 30-day period during which elevated selenium concentrations occur. f_{int} is assigned a value ≥ 0.033 (corresponding to one day).

Note 1: Salt and estuarine waters are defined here as those in which the salinity is greater than 1 part per thousand (ppt) 95% or more of the time.

Note 2: When these criteria are used to derive water quality-based effluent limitations for point sources, a translator of 1 must be used to convert dissolved selenium criteria values into total recoverable selenium values.

(c) * * *

(3) * * *

(i) * * *

(ii) For waters in which the salinity is equal to or greater than 10 parts per thousand 95% or more of the time, the applicable criteria are the saltwater criteria in Column C.

(iii) * * *

(iv) Notwithstanding paragraphs (c)(3)(ii) and (iii) of this section, for waters of San Francisco Bay upstream to and including Suisun Bay and the Sacramento-San Joaquin Delta with salinity greater than 1 part per thousand 95% or more of the time, the selenium criteria provided in paragraph (b)(3) of this section are the only applicable selenium criteria, subject to paragraph (c)(3)(v).

(v) The criteria in paragraph (b)(3) of this section apply concurrently with any water quality criteria adopted by the state, except where California adopts site-specific selenium criteria for a segment of the estuary that EPA determines meet the requirements of Clean Water

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Act section 303(c) and 40 CFR part 131, in which case California's criteria will apply and not the criteria in paragraph (b)(3) of this section.

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