3.11 Hydrology and Water Quality

3.11.1 Introduction

This section describes existing physical conditions and current approaches to managing surface water, groundwater, water quality, and water supplies in the study area, as well as potential impacts of the types of restoration projects that would be permitted under the Order.

The environmental setting and evaluation of impacts on hydrology and water quality are based on a review of existing environmental studies, data, and modeling results; other information regarding example projects similar to the Order that may be implemented by other agencies; and other information sources listed in Chapter 8, *References*.

Comments addressing hydrology received in response to the notice of preparation (NOP) addressed effects on floodplain structure, groundwater processes, and floodplain ecohydrology; permit jurisdiction; protection of water resources; and dredging. The following comments addressing hydrology were received in response to the NOP:

- The EIR should discuss the effects of restoration projects permitted under the Order on floodplain structure.
- The EIR should discuss the effects of restoration projects permitted under the Order on groundwater elevations and groundwater recharge.
- The EIR should discuss the effects of restoration projects permitted under the Order on floodplain ecohydrology
- The EIR should take permit jurisdiction into consideration.
- The EIR should analyze protection of water resources.
- The EIR should discuss the effects of dredging for restoration projects permitted under the Order.

See Appendix B for the NOP comment letters.

3.11.2 Environmental Setting

The supply and management of water resources vary throughout California depending on population, economic, and environmental needs. The study area includes the entire geographic extent of California. The study area includes approximately 630 miles of coastal beaches, 1,100 miles of coastline, 1,600,000 acres of lakes, over 200,000 miles of rivers and streams, and 1,300,000 acres of bays and estuaries.

The State Water Board has jurisdiction throughout California. Created by the California Legislature in 1967, the State Water Board protects water quality by setting statewide policy, coordinating and supporting Regional Board efforts, and reviewing petitions that contest Regional Board actions. The nine Regional Boards exercise rulemaking and regulatory activities for each of the nine water quality control regions (basins).

This section describes the Regional Boards' boundaries and provides an overview of water resources in California, including surface and groundwater resources and water quality.

Description of Regional Boards

Regional Board 1—North Coast

The North Coast Region encompasses watersheds that drain into the Pacific Ocean from the California-Oregon state line southerly to the southern boundary of the watershed of the Estero de San Antonio and Stemple Creek in Marin and Sonoma Counties, including the Lower Klamath Lake and Lost River Sub-Basins. This region is divided into two natural drainage basins: the Klamath River Basin (which includes both the Lower Klamath Lake and Lost River Sub-basins) and the North Coastal Basin. The North Coast Region encompasses approximately 19,400 square miles and includes 340 miles of scenic coastline and remote wilderness areas, as well as urban and agricultural areas. The region covers all of Del Norte, Humboldt, Trinity, and Mendocino Counties, major portions of Siskiyou and Sonoma Counties, and small portions of Glenn, Lake, Modoc, and Marin Counties (North Coast Regional Water Board 2018).

The North Coast Region is characterized by distinct temperature zones. Along the coast, the climate is moderate and foggy, with minimal temperature variation. However, inland temperatures range widely and vary seasonally, with temperatures sometimes exceeding 100 degrees Fahrenheit (°F).

Precipitation is greater in the North Coast Region than in any other part of California, and floods can be a hazard. Surface water and groundwater resources are abundant in this region. The coastline includes coastal water such as estuaries, lagoons, and coastal wetlands. Although the North Coast Region constitutes only about 12 percent of the area of California, it produces about 41 percent of the state's annual runoff. This runoff contributes to flow in surface water streams, storage in lakes and reservoirs, and replenishment of groundwater.

Regional Board 2—San Francisco Bay

The San Francisco Bay Region includes numerous watersheds, from large ones like the Alameda Creek watershed (which encompasses 700 square miles and includes two counties and seven cities) to small watersheds such as the 1.1-square-mile Codornices Creek watershed along the Berkeley/Albany border (San Francisco Bay Regional Water Board 2017). All watersheds in this region ultimately drain to San Francisco Bay or, in coastal areas, to the Pacific Ocean. The Sacramento and San Joaquin Rivers, which enter the bay system through the Sacramento–San Joaquin Delta (Delta) at the east end of Suisun Bay, contribute almost all the freshwater inflow to San Francisco Bay; however, many small rivers and streams also convey freshwater to the bay system.

The San Francisco Bay Region is 4,603 square miles and characterized by its dominant feature, 1,100 square miles of the 1,600-square-mile San Francisco Bay, the largest estuary on the West Coast of the United States, where freshwater from California's Central Valley mixes with the saline waters of the Pacific Ocean (San Francisco Bay Regional Water Board 2017). The bay marks the natural topographic separation between the northern and southern coastal mountain ranges. The coastline includes coastal water such as estuaries, lagoons, and coastal wetlands. The San Francisco Bay Region includes all or major portions of Alameda, Contra Costa, Marin, Napa, San Francisco, San Mateo, Santa Clara, Solano, and Sonoma Counties. The region also includes coastal portions of Marin and San Mateo Counties, from Tomales Bay in the north to Pescadero and Butano Creeks in the south.

The San Francisco Bay Conservation and Development Commission (BCDC) conducts the regulatory and permitting process in accordance with the San Francisco Bay Plan (Bay Plan) within this region.

Regional Board 3—Central Coast

The Central Coast Region encompasses watersheds draining to the Pacific Ocean from Pescadero Creek south to the southeastern boundary of the Rincon Creek watershed. The Central Coast Regional Board has jurisdiction over a 300-mile-long by 40-mile-wide section of the state's central coast. Its geographic area encompasses all of Santa Cruz, San Benito, Monterey, San Luis Obispo, and Santa Barbara Counties, as well as the southern third of Santa Clara County and small portions of San Mateo, Kern, and Ventura Counties (Central Coast Regional Water Board 2019). Included in the region are urban areas such as the Monterey Peninsula and the Santa Barbara coastal plain; prime agricultural lands such as the Salinas, Santa Maria, and Lompoc Valleys; National Forest lands; extremely wet areas like the Santa Cruz Mountains; and arid areas like the Carrizo Plain. The coastline includes coastal water such as estuaries, lagoons, and coastal wetlands. The Central Coast Region is generally arid except for the Santa Cruz Mountains, but averages three times as much annual precipitation (12,090,000 acre-feet) as the Los Angeles Region, while having one-seventh the population (1.2 million versus 8 million).

Regional Board 4—Los Angeles

The Los Angeles Region includes the coastal watersheds and drainages that flow to the Pacific Ocean between Rincon Point on the western Ventura County coast and the eastern Los Angeles County line, as well as the drainages of Anacapa, San Nicolas, Santa Barbara, Santa Catalina, and San Clemente Islands (Los Angeles Regional Water Board 2014). The region also includes all coastal waters within 3 nautical miles of the continental and island coastlines. The coastline includes coastal water such as estuaries, lagoons, and coastal wetlands. The eastern regional boundary, formed by the Los Angeles County line, departs somewhat from the watershed divide; consequently, the Los Angeles and Santa Ana Regions share jurisdiction over watersheds along their common border.

The Los Angeles Region is approximately 4,447 square miles and encompasses most of Ventura and Los Angeles Counties, as well as very small portions of Kern and Santa Barbara Counties. Differences in topography are responsible for large variations in temperature, humidity, precipitation, and cloud cover throughout the region. With mild rainy winters and warm dry summers, the coastal plains and islands are noted for their subtropical Mediterranean climate. On the other hand, the inland slopes and basins of the Transverse Ranges are characterized by more extreme temperatures and little precipitation. Precipitation in the region generally occurs as rainfall, although snowfall occurs at higher elevations. Most precipitation occurs during just a few major storms (Los Angeles Regional Water Board 2014).

Regional Board 5—Central Valley

The Central Valley Region covers the entire area included in the Sacramento and San Joaquin River drainage basins. Surface waters from the two drainage basins meet and form the Delta, which ultimately drains to San Francisco Bay. The basins are bounded by the crests of the Sierra Nevada on the east and the Coast Ranges and Klamath Mountains on the west. They extend approximately 400 miles from the California-Oregon border southward to the headwaters of the San Joaquin River. The Sacramento and San Joaquin River basins cover approximately 60,000 square miles, approximately one-fourth of the state's total area and more than 30 percent of its irrigable land. The principal streams in the Sacramento River basin are the Sacramento River and its larger tributaries: the Pit, Feather, Yuba, Bear, and American Rivers to the east; and Cottonwood, Stony, Cache, and Putah Creeks to the west. Major reservoirs and lakes include Shasta Lake, Lake Oroville, Folsom Lake, Clear Lake, and Lake Berryessa. The principal streams in the San Joaquin River basin are the San Joaquin River and its larger tributaries: the Cosumnes, Mokelumne, Calaveras, Stanislaus, Tuolumne, Merced, Chowchilla, and Fresno Rivers. Major reservoirs and lakes include Pardee, New Hogan, Millerton, McClure, Don Pedro, and New Melones.

The Central Valley Region includes all or parts of 37 of California's 58 counties: Modoc, Shasta, Siskiyou, Lassen, Plumas, Tehama, Butte, Glenn, Colusa, Lake, Sutter, Yuba, Sierra, Nevada, Placer, Yolo, Napa, Solano, Sacramento, El Dorado, Amador, Alpine, Calaveras, San Joaquin, Contra Costa, Stanislaus, Tuolumne, Merced, Mariposa, Madera, Kings, Fresno, Tulare, Kern, and very small portions of San Benito, San Luis Obispo, and Ventura Counties (Central Valley Regional Water Board 2018).

The Sacramento and San Joaquin Rivers furnish roughly 51 percent of California's water supply (Central Valley Regional Water Board 2018). Two major water projects, the federal Central Valley Project (CVP) and the State Water Project (SWP), deliver water from the Delta to Southern California, the San Joaquin Valley, the Tulare Lake Basin, and the San Francisco Bay Area, and within the Delta boundaries.

Regional Board 6—Lahontan

The Lahontan Region encompasses all watersheds within the boundaries of California that drain to the Great Basin. The Lahontan Region has historically been divided into the North and South Lahontan Basins at the boundary between the Mono Lake and East Walker River watersheds (Lahontan Regional Water Board 2016). Jurisdiction extends from California's northern border to the northern Mojave Desert and includes all of California's eastern border east of the Sierra Nevada crest. The region is approximately 570 miles long and has a total area of 39,210 square miles. The Lahontan Region includes all of Mono and Inyo Counties and parts of Modoc, Lassen, Sierra, Nevada, Placer, Alpine, Kern, San Bernardino, and Los Angeles Counties.

The Lahontan Region includes the highest and lowest points in the contiguous United States (Mount Whitney and Death Valley, respectively). The topography of the remainder of the region is diverse. The Lahontan Region also has a variety of climates. The region is generally in a rain shadow; however, precipitation can be high—up to 70 inches annually—at higher elevations. Most precipitation in the mountainous areas falls as snow. Desert areas receive relatively little annual precipitation (less than 2 inches in some locations), but this can be concentrated and lead to flash flooding. Recorded temperature extremes in the Lahontan Region range from -45°F at Boca in the Truckee River watershed to 134°F in Death Valley.

Regional Board 7—Colorado River

The Colorado River Region encompasses all watersheds within the boundaries of California that drain to the Colorado River. The Colorado River Region covers approximately 13 million acres (20,000 square miles) in southeastern California. It includes all of Imperial County and portions of San Bernardino, Riverside, and San Diego Counties. This region is bounded for 40 miles on the northeast by Nevada; on the north by the New York, Providence, Granite, Old Dad, Bristol, Rodman, and Ord mountain ranges; on the west by the San Bernardino, San Jacinto, and Laguna mountain ranges; on the south by Mexico; and on the east by the Colorado River and Arizona. A significant geographical feature of the region is the Salton Trough, which contains the Salton Sea and the Coachella and Imperial Valleys. Much of the agricultural economy and industry of the region is located in the Salton Trough.

The region has the driest climate in California (Colorado River Regional Water Board 2019), with mild winters and hot summers. Temperatures range from below freezing to more than 120°F. Frost occurs in the Colorado River valleys and the Salton Trough. Snow falls in the region's higher elevations, with mean seasonal precipitation in the upper San Jacinto and San Bernardino Mountains ranging from 30 to 40 inches (Colorado River Regional Water Board 2019). Typical mean seasonal precipitation in the desert valleys is 3.6 inches at Indio and 3.2 inches at El Centro (Colorado River Regional Water Board 2019). Precipitation in the entire area occurs mostly from November through April, and in August and September, but its distribution and intensity are often sporadic. Local thunderstorms can contribute all of the average seasonal precipitation at one time, or only a trace of precipitation may be recorded at any locale for the entire season.

Regional Board 8—Santa Ana

In very broad terms, the Santa Ana Region is a group of connected inland basins and open coastal basins drained by surface streams flowing generally southwestward to the Pacific Ocean (Santa Ana Regional Water Board 2019). The coastline includes coastal water such as estuaries, lagoons, and coastal wetlands. Major bodies of water in this region include Anaheim and Newport Bays, the Santa Ana and Jacinto Rivers, and Lake Elsinore.

The Santa Ana Region is the smallest of the state’s nine regions (2,800 square miles) and is located in Southern California, roughly between Los Angeles and San Diego. The Santa Ana Region covers parts of southwestern San Bernardino County, western Riverside County, and northwestern Orange County. Although small, the region’s

4 million residents (1993 estimate) make it one of the most densely populated regions (Santa Ana Regional Water Board 2019).

The climate of the Santa Ana Region is Mediterranean: generally dry in the summer with mild, wet winters. The average annual rainfall in the region is about 15 inches, most of it occurring between November and March. Much of the area would be near-desert were it not for the influence of modern civilization (Santa Ana Regional Water Board 2019).

Regional Board 9—San Diego

The San Diego Region encompasses all watersheds that drain to the Pacific Ocean from the southern border of the Santa Ana Region's jurisdictional limits to the southern border of California (San Diego Regional Water Board 2016). The San Diego Region forms the southwest corner of California and occupies approximately 3,900 square miles.

This region encompasses most of San Diego County and parts of southwestern Riverside and Orange Counties. The western boundary of the San Diego Region consists of the Pacific Ocean coastline, which extends approximately 85 miles north from the United States and Mexico border. The coastline includes coastal water such as estuaries, lagoons, and coastal wetlands. The northern boundary is formed by the hydrologic divide that starts near Laguna Beach and extends inland through El Toro and easterly along the ridge of the Elsinore Mountains into the Cleveland National Forest. The eastern boundary is formed by the Laguna Mountains and other lesser-known mountains in the Cleveland National Forest. The southern boundary of the San Diego Region is formed by the United States/Mexico border.

The San Diego Region's coastal climate is generally mild. Temperatures average about 65°F and precipitation averages 10–13 inches. Proceeding inland, as elevations increase, average temperatures decline to 57°F in the Laguna Mountain area and precipitation increases to more than 45 inches in the Palomar Mountain area. Most precipitation falls during November through February. Variations in temperature and rainfall are larger in the inland portions (San Diego Regional Water Board 2016).

Overview of California Water Resources

Variability and uncertainty are the dominant characteristics of California's water resources. Precipitation is the primary source of California's water supply. Precipitation varies greatly from year to year, by season, and geographically throughout the state. Most snowfall and rainfall occur in the mountains in the northern and eastern areas of the state, and most water is used in the central and southern valleys and along the coast. In addition, the state's ecosystem and its agricultural and urban water users have variable demands with respect to water quantity, quality, timing, and place of use. In any given year, one of two threats often exist: The state's water systems may not have enough water to meet all water demands during droughts, or an excess of water causes floods (DWR 2013).

The amount and variability of precipitation, as well as temperature, differ dramatically between California's northern and southeastern regions. As such, statewide average information does not truly depict regional conditions and often overgeneralizes California's water conditions. Wet, average, and dry conditions presented for the entire state are not often universally the same for individual regions. It is common during the same winter that the amount of winter precipitation varies from wet to above average in one part of the state, and that it varies from below average to dry in another part. The amount, types, and intensity of precipitation can also vary within each region in a given year and from year to year. This climatic variability compounds the difficulties of reducing flood risk, sustaining ecosystems, and enhancing water supply reliability (DWR 2013).

In an average water year (such as 2010), California receives about 200 million acre-feet (MAF) of water from precipitation and imports from Colorado, Oregon, and Mexico. Approximately 50–60 percent of this total supply is used by native vegetation; evaporates to the atmosphere; provides some of the water for agricultural crops and managed wetlands (referred to as “effective precipitation”); or flows to Oregon, Nevada, the Pacific Ocean, or salt sinks, such as saline groundwater aquifers and the Salton Sea. The remaining 40–50 percent, identified as dedicated or developed water supplies, is distributed among urban and agricultural uses for protecting and restoring the environment, or as storage in surface water and groundwater reservoirs for later use. In any year, some of the dedicated supply includes water used multiple times (reused water) and water that is held in storage from previous years. Ultimately, about one-third of the dedicated supply flows to the Pacific Ocean or to other salt sinks, in part to meet environmental water requirements for designated Wild and Scenic Rivers and other environmental requirements and objectives (DWR 2013).

The historical record also shows that California has frequently experienced long, multi-year droughts, as well as extremely wet years that coincide with substantial flooding (Hanak et al. 2011). Extended, intense droughts and more extreme floods will likely occur more frequently in the future because of climate change. From 2007 through early 2017, California experienced 9 years of below-average runoff and only 2 years out of 11 where precipitation has been above the long-term average. California’s recent 5-year drought has reinforced the understanding of the harmful effects of sustained dry periods on ecosystem health and the correlation between Delta exports and overall state water supply reliability. In stark contrast, historically high combined rainfall and snowpack in late 2016 and early 2017 called into question the capacity of flood management systems to accommodate future precipitation extremes.

To cope with this hydrologic variability and manage floods during wet years, federal, state, and local agencies have constructed a vast interconnected system of surface reservoirs, aqueducts, and water diversion facilities over the last 100 years. These projects work together to make water available at the right places and times and to move floodwaters. In the past, this system has allowed California to meet most of its agricultural and urban water management objectives, and flood management objectives (DWR 2013).

Hydrologic Resources

Surface Waters

For the purposes of the analysis in this PEIR, surface waters include streams, lakes, ponds, coastal waters, lagoons, and estuaries, or are found in floodplains, dry lakes, desert washes, wetlands, and other collection sites. Water bodies modified or developed by humans, including reservoirs and aqueducts, are also considered surface waters. Surface water resources are diverse because of variations in tectonics, topography, geology/soils, climate, precipitation, and hydrologic conditions. Overall, California has the most diverse range of watershed conditions in the U.S., with varied climatic regimes ranging from Mediterranean climates with temperate rainforests in the north coast region to desert climates containing dry desert washes and dry lakes in the southern central region.

The water year (WY) is defined as starting on October 1 of the preceding year and ending on September 30 of the water year. The lowest statewide runoff on record is 15.5 MAF in WY 1977; the highest is 201.7 MAF in WY 1983 (USGS 2019). California has more than 60 major stream drainages and more than 1,000 smaller but still significant drainages that drain coastal mountains and inland mountainous areas. High snowpack levels and resultant spring snowmelt yield high surface runoff and peak discharge in the Sierra Nevada and Cascade Mountains that feed surface flows, fill reservoirs, and recharge groundwater. Federal, state, and local engineered water projects, aqueducts, canals, and reservoirs serve as the primary conduits of surface water sources to areas with limited surface water resources. Most of the surface water stored is transported for agricultural, urban, and rural residential needs to the San Francisco Bay Area and to cities and areas extending to southern coastal California. Surface water is also transported to southern inland areas, the Imperial Valley, and Central Valley areas.

Groundwater

Most runoff from snowmelt and rainfall flows down mountain streams into low-gradient valleys and either percolates into the ground or is discharged to the sea. This percolating flow is stored in alluvial groundwater basins that cover approximately 40 percent of the state (DWR 2003). Groundwater recharge occurs more readily in areas underlain by coarse sediments, primarily in mountain base alluvial fan settings. As a result, most of California's groundwater basins are located in broad alluvial valleys flanking mountain ranges, such as the Cascade Range, Coast Ranges, Transverse Ranges, and Sierra Nevada.

California's 250 major groundwater basins serve approximately 30 percent of the state's urban, agricultural, and industrial water needs, especially in the southern portion of the San Francisco Bay Area, the Central Valley, the greater Los Angeles area, and inland desert areas where surface water is limited. On average, more than 15 MAF of groundwater is extracted each year in the state, of which more than 50 percent is extracted from 36 groundwater basins in the Central Valley.

Water Quality

Land uses have a great effect on surface water and groundwater water quality in California. Both nonpoint- and point-source discharges of pollutants degrade surface water quality.

Nonpoint-source pollution is defined as not having a discrete or discernible source and is generated from land runoff, precipitation, atmospheric deposition, seepage, and hydrologic modification (EPA 2021). Nonpoint-source pollution includes runoff containing pesticides, insecticides, and herbicides from agricultural areas and residential areas; acid drainage from inactive mines; bacteria and nutrients from septic systems and livestock; volatile organic compounds (VOCs) and toxic chemicals from urban runoff and industrial discharges; sediment from timber harvesting, poor road construction, improperly managed construction sites, and agricultural areas; and atmospheric deposition and hydromodification. In contrast, point-source pollution is generated from identifiable, confined, and discrete sources, such as a smokestack, sewer, pipe or culvert, or ditch.

These pollutant sources are regulated by the U.S. Environmental Protection Agency (EPA) and State Water Board through the Regional Boards. Many of the pollutants discharged from point sources are the same as for nonpoint sources, including municipal (bacteria and nutrients), agricultural (pesticides, herbicides, and insecticides), and industrial pollutants (VOCs and other toxic effluent).

Groundwater pollution or contamination is caused by the following sources:

- Naturally occurring or man-made chemicals that are discharged onto the land surface and percolate through to groundwater resources below.
- Flow into groundwater reservoirs through improperly sealed well casings.
- Leaking underground storage tanks.
- Failed underground pipelines.

Unintended backflow into wells can also occur when plumbing and pumping systems are not properly protected against backflow. Many of the sources of pollution and their toxic constituents are similar to those associated with surface water pollution. The most common groundwater pollutants are generated from nonpoint sources of salt, nitrite, pesticides, industrial effluent, and pathogens. Salt and nitrite contamination is the most common groundwater pollution and affects 10–15 percent of California’s wells, mostly through various agricultural activities (Harter 2003). Recent long drought periods in the state have resulted in overdraft of groundwater aquifers as needs for water have increased in areas with limited surface water flow. Over-pumping increases the concentration of mineral salts in the depleted aquifer and could make the groundwater source unusable for drinking water and other beneficial uses.

Cyanobacterial harmful algal blooms (cyanoHABs), a water quality topic of concern, have been increasing since 2003 (Lehman et al. 2005). Increased occurrences of *Microcystis* cyanoHABs has been linked with increases in water temperatures which enables the growth rate of *Microcystis* to become competitive relative to other members of the phytoplankton community (Berg and Sutula 2015). A temperature threshold of 19 degrees Celsius (°C) has been identified as necessary to trigger growth of *Microcystis* in the Delta (Lehman et al. 2013), whereas temperatures of 25°C and above have been hypothesized to play a role in explaining its interannual variability (Lehman et al. 2018). Whereas water temperature appears to be a trigger for growth, other factors such as nutrient availability and high irradiance are necessary to sustain its growth and lead to the development of a bloom. In other words, once growth of *Microcysti*s has been triggered, it cannot attain high enough growth rates to accumulate biomass and become dominant unless it can 1) maintain itself at the surface of the water column where irradiance is high and 2) there is an ample supply of nutrients available in the water column at the start of the bloom (Visser et al. 2005). At any time during a bloom, if the nutrient supply is depleted or the water mixing rate increases such that the time *Microcystis* can spend at the surface becomes limited, cells may become stressed, and growth may slow down. An additional factor that will retard growth of *Microcystis* is exposure to saline water. This is evident when water containing *Microcystis* colonies is advected from the San Joaquin River into the lower Sacramento River or Suisun Bay; salinities in those regions are not conducive to growth resulting in the colonies breaking apart and blooms dissipating (Lehman et al. 2008). When *Microcystis* cells become sufficiently stressed, due to any environmental factor (e.g., light, nutrients, temperature, salinity), the colonies will settle out of the water column and the bloom will terminate (Visser et al. 1995).

Sedimentation

Sediment is considered a major pollutant according to EPA and the State Water Board and is a key total maximum daily load (TMDL) constituent that determines the impairment and 303(d) listing of impaired water bodies in a number of watersheds and river basins. Sediment is an issue for all nine Regional Boards, with water bodies of all types being affected. Sediment is of concern for many rivers and streams, estuaries, and bays and harbors. Approximately 61 percent of the North Coast Region drains to rivers and streams that are impaired by too much sediment (North Coast Regional Water Board 2017). In addition, several areas along the California coast have coastal regional sediment management plans to resolve sediment imbalance issues within their regions.

High sediment loads are harmful to beneficial uses, water quality, and aquatic habitats used by plant, amphibian, and fish communities. Erosion is influenced by various factors such as geology and soils, topography, climate, and land use practices. Sedimentation occurs when fine materials erode and are transported to a watercourse or water body, potentially increasing turbidity or resulting in elevated levels of total dissolved solids and total suspended solids. Erosion and sedimentation occur naturally but are substantially influenced by land management and land-disturbance activities.

Naturally occurring or background erosion and sedimentation are generally caused by several processes. The weathering of bedrock or saturation of soils in erosion-prone areas causes landslides, earthflows, debris flows, and other mass wasting–related processes, and lateral channel migration results in bank erosion. Channel downcutting and incision are also contributing factors. Precipitation, runoff, and wind on bare soil surfaces result in surface erosion.

Anthropogenic (related to human activity) causes of erosion and sedimentation are related to land management and land use; among these causes are timber harvesting, road building, construction activities, agriculture and grazing, and recreation. Timber harvesting, agriculture, mining, and other land-disturbing activities often result in scarification of the ground surface. The resulting areas of bare soil are susceptible to higher levels of surface runoff that could result in raindrop, sheet, and rill erosion; fluvial erosion, including from rills and gullies; and landslides. Poor road construction elements (such as undersized stream crossing culverts, long sections of undrained road surfaces and ditches leading directly to streams, and cut-and-fill road construction on steep slopes) could generate large amounts of erosion in the form of surface erosion, gully erosion, and landsliding.

Erosion at construction sites can deliver sediment to streams and water bodies. Most erosion from construction sites is caused by rainfall, surface runoff, and wind on exposed bare soil areas, resulting in surface erosion and fluvial erosion (gullying). In California, the State Water Board (through the Regional Boards) requires storm water pollution protection plans (SWPPPs) for construction sites with more than 1 acre of disturbed soil area. The SWPPP provides best management practices that are intended to effectively control erosion and sedimentation by intercepting and dispersing concentrated flows and reducing soil detachment and transport.

Agricultural and ranching activities can also result in high levels of erosion and sedimentation. Agricultural sediment pollution is generated by surface runoff over tilled and fallow or retired croplands, and by irrigated croplands. Erosion and sedimentation from rangelands and dairy farming are generated from surface runoff on overgrazed and exposed pasturelands or rangelands and trampling of streambanks and sensitive areas.

Elevated turbidity can negatively affect fish populations by reducing their feeding success (finding prey) and causing respiratory distress (clogged gills). Fine sediment also fills the interstices of gravel and cobble stream bottoms that are important feeding and spawning habitats for California’s threatened and listed fish species, such as coho salmon, Chinook salmon, steelhead trout, Lahontan and Paiute cutthroat trout, and Little Kern golden trout. Sedimentation can also impair important food sources, reduce habitat complexity, and cause the infilling of pools, thereby reducing cover from predators and increasing stream temperatures. Pollutants, such as bacteria and toxic chemicals, can attach to suspended sediment and settle onto the bottom of the streams or water bodies and, at high contaminant levels, can render surface water sources unusable and seriously degrade fish habitat.

Sedimentation also has severe effects on drinking water quality, the suitability of water for irrigation, and recreational uses. High sediment levels in drinking water can result in bad smell and taste, turbidity, suspended sediment, and toxic pollutants attached to suspended sediment particles. Irrigation waters can have serious impacts from sedimentation as pumps become clogged or impaired and dispersal systems become impaired. Sedimentation of streams and water bodies can reduce their recreational quality and usability for boating, sport fishing, and swimming; increase the number of boating and swimming accidents because of poor water clarity; and threaten public health through exposure to elevated levels of toxic chemicals, nutrients, and bacteria attached to suspended sediment in the water.

3.11.3 Regulatory Setting

This section discusses federal, state, and regional and local plans, policies, regulations, laws, and ordinances pertaining to hydrology and water quality.

Future permitted restoration projects that would be implemented under the Order may be subject to the laws and regulations listed below, as well as other local or individual restoration project requirements, depending on the project location.

Federal

Federal Emergency Management Agency–Related Laws and Regulations

The Federal Emergency Management Agency (FEMA) establishes and maintains minimum federal standards for floodplain management in the United States and its territories. The agency has a major role in managing and regulating floodplains. FEMA establishes minimum requirements for local communities' management of floodplain areas, which are defined as lowland and relatively flat areas adjoining inland and coastal waters that are subject to flooding.

FEMA also helps develop the Flood Insurance Rate Maps, which delineate the Special Flood Hazard Areas (SFHAs) and the risk premium zones applicable to the community for flood insurance purposes. An SFHA is defined as the area that will be inundated by the flood event having a 1 percent chance of being equaled or exceeded in any given year. The 1 percent annual chance flood is also referred to as the "base flood" or the "100-year flood" (FEMA 2020). "Development" is defined in the Code of Federal Regulations Title 44, 59.1(c). Per 44 Code of Federal Regulations and is any man-made change to improved or unimproved real estate, including but not limited to buildings or other structures, mining, dredging, filling, grading, paving, excavation or drilling operations or storage of equipment or materials.

Floodplain Management Regulations

As described above, FEMA requires local communities to adopt and enforce floodplain management regulations that meet or exceed federal regulations for SFHAs to be eligible to participate in the National Flood Insurance Program (NFIP). SFHAs are subject to floodplain management regulations, including building limitations, and the mandatory purchase of flood insurance.

Federal floodplain regulations are set forth primarily in Code of Federal Regulations Title 44, Part 60.3 (40 CFR 60.3) and 44 CFR 65.12. These regulations are intended to address the need for effective floodplain management and provide assurance that the cumulative effects of floodplain encroachment do not cause a rise of more than 1 foot in the water surface elevation after the floodplain has been identified on the Flood Insurance Rate Map. Local flood ordinances can set a more stringent standard. The absence of a detailed study or floodway delineation places the burden on the project proponent to perform an appropriate engineering analysis to prepare hydrologic and hydraulic analyses consistent with FEMA standards. These analyses are then used to evaluate the proposed project "*with all other existing and anticipated development*" (44 CFR 60.3). Defining future anticipated development is difficult. The purpose of this requirement is to avoid inequitable encroachments into the floodplain.

Projects that would cause an increase in water surface elevations are subject to the provisions of 44 CFR 65.12, "*Revision of flood insurance rate maps to reflect base flood elevations caused by proposed encroachments*." Under this regulation, the project proponent either must demonstrate that the project would not affect the base flood elevation (i.e., elevate the surface water level from a flood with a 1 percent chance of equaling or exceeding that level in any given year) as identified on the Flood Insurance Rate Map, or must obtain a Conditional Letter of Map Revision before the project receives a permit for construction. If the project would not affect the base flood elevation, it can be approved by the floodplain administrator for the community without receiving FEMA approvals or a Conditional Letter of Map Revision. However, the floodplain administrator can require a Conditional Letter of Map Revision if the project is believed to be sufficiently complex to warrant FEMA's review. The minimum federal regulatory requirement related to encroachments into the floodway is defined by 44 CFR 60.3(d)(3):

> *Prohibit encroachments, including fill, new construction, substantial improvements, and other development within the adopted regulatory floodway unless it has been demonstrated through hydrologic and hydraulic analyses performed in accordance with standard engineering practice that the proposed encroachment would not result in any increase in flood levels within the community during the occurrence of the base flood discharge.*

This regulation applies only to encroachments into the floodway. When such an encroachment may occur, the appropriate FEMA effective hydraulic model for the area should be used to evaluate the impacts of and mitigation options for the encroachment. A "FEMA effective hydraulic model" is a computer model that has met the requirements of NFIP regulations and is authorized for use in mapping flood hazards.

Levee Design and Maintenance Requirements

For levees to be accredited by FEMA, and to allow communities to participate in the NFIP's Preferred Risk programs, evidence must be provided that adequate design and operations and maintenance (O&M) systems are in place to provide reasonable assurance of protection from the base flood (1 percent annual chance of exceedance or 100-year flood). These requirements are outlined in 44 CFR 65.10.

U.S. Army Corps of Engineers–Related Laws and Regulations

This discussion presents an overview of the U.S. Army Corps of Engineers' (USACE's) regulatory responsibilities that apply to navigable waters and construction within the ordinary high-water mark or other waters of the United States. In addition, USACE constructs flood control and risk management projects, monitors O&M work for those projects, and provides emergency response to floods.

Flood Control Act of 1917

The Flood Control Act of 1917 was enacted in response to costly floods that occurred in the Sacramento Valley and elsewhere in the United States between 1907 and 1913. The law authorized the formation of the federal/state Sacramento River Flood Control Project, which includes various levees, weirs, control structures, bypass channels, and river channels in the Delta and its watershed. The 1917 law was modified and extended by the Flood Control Acts of 1928, 1936, and 1941.

Flood Control Act of 1936

The Flood Control Act of 1936 established a nationwide policy that flood control on navigable waters or their tributaries is in the interest of the general public welfare, and is therefore a proper activity of the federal government, in cooperation with state and local entities. The Flood Control Act of 1936, its amendments, and subsequent legislation specify the details of federal participation. Projects are either specifically authorized through legislation by Congress or through a blanket funding authority for small projects.

Operations and Maintenance of Flood Control Projects

Routine O&M activities for federal project levee structures and facilities are discussed in 33 CFR 208.10. According to these regulations (33 CFR 208.10 [5]):

> *No improvement shall be passed over, under, or through the walls, levees, improved channels or floodways, nor shall any excavation or construction be permitted within the limits of the project right-of-way, nor shall any change be made in any feature of the works without prior determination by the District Engineer of the Department of the Army or his authorized representative that such improvement, excavation, construction, or alteration will not adversely affect the functioning of the protective facilities.*

This regulation is the basis for requiring a permit before any construction at federal project levees. Types of alterations and modifications typically covered by a Section 208 permit include bridges, pump houses, stairs, pipelines, bike trails, and power poles. Major modifications or improvements to levees require approval through a Section 408 permit process (described below).

Clean Water Act

The Federal Water Pollution Control Act Amendments of 1972, also known as the Clean Water Act (CWA), established the institutional structure for EPA to regulate discharges of pollutants into the waters of the United States, establish water quality standards, conduct planning studies, and provide funding for specific grant projects. Congress has amended the CWA several times since 1972.

EPA has delegated to most states the authority to administer many provisions of the CWA. In California, the State Water Board has been designated by EPA to develop and enforce water quality objectives and implementation plans.

Section 303

Section 303 of the CWA requires states to adopt water quality standards for all surface waters of the United States. The three major components of water quality standards are designated users, water quality criteria, and antidegradation policy. Section 303(d) of the CWA requires states and authorized Native American tribes to develop a list of water quality–impaired segments of waterways. The list includes waters that do not meet water quality standards necessary to support the beneficial uses of a waterway, even after point sources of pollution have installed the minimum required levels of pollution control technology. The list includes only waters impaired by “pollutants” (clean sediments, nutrients such as nitrogen and phosphorus, pathogens, acids/bases, temperature, metals, cyanide, and synthetic organic chemicals [EPA 2017]), not those impaired by other types of “pollution” (e.g., altered flow, channel modification).

CWA Section 303(d) also requires states to maintain a list of impaired water bodies so that a total maximum daily load (TMDL) can be established. A TMDL is a plan to restore the beneficial uses of a stream, or to otherwise correct impairment. It establishes the allowable pollutant loadings or other quantifiable parameters (e.g., pH, temperature) for a water body, thereby providing the basis for establishing water quality–based controls. The calculation for establishing TMDLs for each water body must include a margin of safety to ensure that the water body can be used for the purposes designated by the state. The calculation also must account for seasonal variations in water quality (EPA 2017).

Water quality criteria are designed to protect beneficial uses. Ambient surface water quality may be judged against national and state water quality criteria and specific numeric objectives.

Section 401

In California, Section 401 water quality certification is the responsibility of the Water Boards, which certify that an activity is consistent with state-issued water quality control plans, called basin plans. Section 401 requires federal agencies to obtain certification from the state or Native American tribes before issuing permits that would increase pollutant loads to a water body. The certification is issued only if such increased loads would not cause or contribute to exceedances of water quality standards.

Section 402

Section 402 of the CWA established the National Pollutant Discharge Elimination System (NPDES) permit program to regulate point-source and nonpoint-source discharges of pollutants into waters of the United States. An NPDES permit sets specific limits for discharges of pollutants into waters of the United States and establishes monitoring and reporting requirements, as well as special conditions. The Regional Boards typically issue NPDES permits for a 5-year period. The NPDES permits are issued for long-term discharges, including discharges from wastewater treatment plants, and temporary discharges, such as discharges during construction activities. The State Water Board has adopted a Statewide Permit for Stormwater Discharges Associated with Construction Activity (Construction General Permit, Order 2009-0009-DWQ) for construction sites where 1 or more acres of soil would be disturbed. The Construction General Permit requires, among other actions, the implementation of mandatory best management practices, including pollution/sediment/spill control plans, training, sampling, and monitoring for non-visible pollutants.

Section 404

Section 404 of the CWA establishes programs to regulate the discharge of dredged and fill material into waters of the United States, including wetlands. Under Section 404, any person or public agency proposing to locate a structure, excavate, or discharge dredged or fill material into waters of the United States, or to transport dredged material for the purpose of dumping it into ocean waters, must obtain a permit from USACE. The extent of waters of the United States is defined in 33 CFR 230.3(s) and clarified in USACE Regulatory Guidance Letters. Section 404(b)(1) guidelines provide environmental criteria and other guidance used in evaluating proposed discharges of dredged materials into waters of the United States.

Rivers and Harbors Act of 1899

The Secretary of the Army, on the recommendation of the Chief of Engineers, may grant permission for the temporary occupation or use of any seawall, bulkhead, jetty, dike, levee, wharf, pier, or other work built by the United States (U.S. Code Title 33, Part 408 and Section 14 of the Rivers and Harbors Act of 1899). This permission is granted by an appropriate real estate instrument in accordance with existing regulations. This regulation requires parties other than USACE seeking to modify federal project levees to obtain a permit. Types of alterations that typically require a Section 408 permit are major modifications such as degradations, raisings, and realignments of levees, and installation of structures that span levees, such as bridges.

Sections 9 and 10 of the Rivers and Harbors Act of 1899 authorize USACE to regulate the construction of any structure or work within navigable waters. The Rivers and Harbors Act also authorizes USACE to regulate the construction of infrastructure or modifications affecting the course, location, condition, or capacity of navigable waters. USACE's jurisdiction under the Rivers and Harbors Act is limited to "navigable waters," or waters subject to the ebb and flow of the tide shoreward to the mean high-water mark that may be used to transport interstate or foreign commerce. USACE must consider the following criteria when evaluating projects within navigable waters:

- The public and private need for the activity
- Reasonable alternative locations and methods
- Beneficial and detrimental effects on the public and private uses to which the area is suited

Central Valley Project Improvement Act

The Central Valley Project Improvement Act (CVPIA), enacted by Congress in 1992, amended the authorization of the Central Valley Project to include fish and wildlife protection, restoration, and mitigation as project purposes of the CVP having equal priority with irrigation, domestic uses, and power generation. The CVPIA is discussed in further detail in Section 3.6, *Biological Resources—Aquatic.*

Coastal Zone Management Act

Congress recognized the importance of meeting the challenge of continued growth in the coastal zone by enacting the Coastal Zone Management Act (CZMA) in 1972. The CZMA, administered by the National Oceanic and Atmospheric Administration's Office of Ocean and Coastal Resource Management, provides federal incentives for states to manage and protect their coastal resources.

The CZMA outlines two national programs, the National Coastal Zone Management Program and the National Estuarine Research Reserve System. The Coastal Zone Management Program encourages states to prepare coastal zone management programs that meet specified requirements and submit them to the Office of Ocean and Coastal Resource Management for approval. In exchange for an approved program, the state becomes eligible for federal funding assistance, among other things. The overall objectives of the CZMA are to "*preserve, protect, develop, and where possible, to restore or enhance the resources of the nation's coastal zone.*"

The CZMA requires project proponents for federal permits and licenses and federal agencies proposing activities in the coastal zone that may affect coastal resources to obtain certification that the project is consistent with the state's coastal zone management program.

California has an approved coastal zone management program. The California Coastal Commission is the lead state agency responsible for implementing and enforcing the program. The coastal zone established by the Coastal Zone Management Act does not include San Francisco Bay, where development is regulated by the BCDC. In February 1977, the U.S. Department of Commerce approved the Commission's coastal management program for the San Francisco Bay segment of the California coastal zone. The Commission's coastal management program is based on the provisions and policies of the McAteer-Petris Act (discussed under State regulations), the Suisun Marsh Preservation Act of 1977, the San Francisco Bay Plan, the Suisun Marsh Protection Plan, and the Commission's administrative regulations.

Coordinated Operations Agreement

The SWP and CVP use a common water supply in the Delta. The State Water Board places conditions on the SWP's and CVP's associated water rights individually and jointly to protect the beneficial uses of water in the Sacramento Valley and the Delta estuary. The Coordinated Operations Agreement (Public Law 99-546), signed in 1986, defines the SWP and CVP facilities and their water supplies; sets forth procedures for coordination of operations; identifies formulas for sharing joint responsibilities for meeting standards; sets up a framework for the exchange of water and services between the SWP and CVP; and provides for periodic review of the agreement.

Executive Order 11988, Floodplain Management, and Executive Order 13690, Establishing a Federal Flood Risk Management Standard

Under Executive Order 11988 (1977), all federal agencies are charged with floodplain management responsibilities when planning or designing federally funded projects, or when considering permit applications for which a federal agency has review and approval authority. These responsibilities include acting to reduce the risks of flood losses, including adverse impacts on human safety, health, and welfare. Federal agencies are also responsible for restoring the natural and beneficial values of floodplains. If a proposed action is located within a floodplain, measures should be identified to minimize flood hazards, and floodplain mitigation requirements should be incorporated into the proposed action.

Executive Order 13690 (2015) revised Executive Order 11988. Executive Order 13690 directed the development of a new Federal Flood Risk Management Standard; required the use of an expanded floodplain for some federal investments; directed federal agencies, where possible, to use natural or nature-based approaches (considering ecosystem functions); and established the policy of the United States to improve the resilience of communities and federal assets against the impacts of flooding, recognizing the risks posed by climate change.

Executive Order 11990, Protection of Wetlands

This executive order directs federal agencies to provide leadership and act to minimize the destruction, loss, or degradation of wetlands, and to preserve and enhance the natural and beneficial values of wetlands in implementing civil works.

Endangered Species Act—Biological Opinions on the Long-Term Operations of the Central Valley Project and State Water Project

The U.S. Fish and Wildlife Service (USFWS) and the National Marine Fisheries Service (NMFS) released their biological opinions (BOs) on the long-term operations of the CVP and SWP in 2008 and 2009, respectively (USFWS 2008; NMFS 2009). The 2008 USFWS BO and 2009 NMFS BO included Reasonable and Prudent Alternatives to avoid jeopardy to fish species. The Reasonable and Prudent Alternatives included conditions for revised water operations, habitat restoration and enhancement actions, and fish passage actions.

Lawsuits challenged the NMFS and USFWS BOs under the Endangered Species Act (FESA) and the Administrative Procedure Act concerning the effects of the CVP and SWP on endangered fish species. Because the 2008 and 2009 BOs have been upheld by the Ninth Circuit Court of Appeals, they contain the most recent estimate of potential changes in water operations that could occur in the near future.

In August 2016, the U.S. Bureau of Reclamation (Reclamation) requested re-initiation of FESA Section 7 consultation with USFWS and NMFS on the long-term operation of the CVP and SWP. This consultation is expected to update the system-wide operating criteria for the long-term operation consistent with Section 7 requirements, to investigate the potential of including new conservation measures for listed species, and to review the existing Reasonable and Prudent Alternative actions included in the 2008 USFWS BO and 2009 NMFS BO to determine their continued substance and efficacy in meeting the requirements of FESA Section 7. However, the requirements in the 2008 USFWS BO and 2009 NMFS BO continue to affect the operational criteria for the CVP and SWP.

On August 2, 2016, Reclamation (the lead federal agency) and the California Department of Water Resources (DWR) (the applicant) jointly requested the re-initiation of FESA consultation on the coordinated long-term operation of the CVP and SWP. USFWS accepted the re-initiation request on August 3, 2016.

On January 31, 2019, Reclamation transmitted its biological assessment to USFWS. The biological assessment identified the purpose of the action as "*…to continue the coordinated long-term operation of the CVP and SWP to maximize water supply delivery and optimize power generation consistent with applicable laws, contractual obligations, and agreements; and to increase operational flexibility by focusing on nonoperational measures to avoid significant adverse effects.*"

USFWS finalized its BO on the coordinated operations of the CVP and SWP on October 21, 2019. USFWS evaluated the impact of CVP/SWP water operations on imperiled species including delta smelt and 15 terrestrial species that could be affected. The proposal includes habitat management measures in the Delta and entrainment management related to water exports in the South Delta. Ultimately, USFWS has concluded that Reclamation's proposed operations will not jeopardize threatened or endangered species or adversely modify their designated critical habitat.

Federal Antidegradation Policy

The Secretary of the Interior established the first antidegradation policy in 1968. In 1975, EPA included the antidegradation requirements in the Water Quality Standards Regulation (40 CFR 130.17, 40 CFR 55340–55341). The requirements were included in the 1987 CWA amendment in Section 303(d)(4)(B). The federal antidegradation policy requires states to develop regulations to allow an increase in pollutant loadings or changes in surface water quality only in the following cases:

- Existing surface water uses are maintained and protected, and established water quality requirements are met.
- If a project cannot maintain water quality requirements, water quality is maintained to fully protect "fishable/swimmable" uses and other existing uses.
- In Outstanding National Resource Waters, "States may allow some limited activities which result in temporary and short-term changes in water quality" (Water Quality Standards Regulations) but would not affect existing uses or special use that makes the water an Outstanding National Resource Water.

Federal Safe Drinking Water Act

The Safe Drinking Water Act was originally enacted by Congress in 1974, to protect public health by regulating the nation's public drinking water supply. The Safe Drinking Water Act authorizes EPA to set national health-based standards for drinking water to protect against both naturally occurring and human-made contaminants that may be found in drinking water. The law, amended in 1986 and 1996, requires many actions to protect drinking water and its sources, including rivers, lakes, reservoirs, springs, and groundwater wells.

Implementation of the CALFED Bay-Delta Record of Decision

In the CALFED Bay-Delta Program (CALFED) Record of Decision issued August 28, 2000, Reclamation and other federal and state agencies committed to implementing a long-term plan to restore the Bay-Delta (CALFED 2000). This plan consists of many elements: storage, conveyance, ecosystem restoration, levee integrity, watersheds, water supply reliability, water use efficiency, water quality, water transfers, and science. The Implementation Memorandum of Understanding, also signed August 28, 2000, continued the operational decision-making process that had evolved through the CALFED process. The record of decision identified numerous programs, including the Environmental Water Account to protect fish in the Bay-Delta estuary through environmentally beneficial changes to SWP/CVP operations at no loss of uncompensated water costs to the SWP and CVP water users. This project expired in 2009; however, specific provisions may be considered in future operations.

National Toxics Rule

EPA established the National Toxics Rule in 1992 to provide ambient water quality criteria for priority toxic pollutants to protect aquatic life and human health in accordance with CWA Section 303.

Wild and Scenic Rivers Act

The Wild and Scenic Rivers Act designates qualifying free-flowing river segments as wild, scenic, or recreational. The law establishes requirements applicable to water resource projects affecting wild, scenic, or recreational rivers within the National Wild and Scenic Rivers System, as well as rivers designated on the National Rivers Inventory.

Under the Wild and Scenic Rivers Act, a federal agency may not assist the construction of a water resources project that would have a direct and adverse effect on the free-flowing, scenic, and natural values of a wild or scenic river. If the project would affect the free-flowing characteristics of a designated river or unreasonably diminish the scenic, recreational, and fish and wildlife values present in the area, such activities should be undertaken in a manner that would minimize adverse impacts and is consistent with the management plan for the affected wild and scenic river, as administered by the managing federal agency for designated rivers (U.S. Forest Service, Bureau of Land Management, National Park Service, or U.S. Fish and Wildlife Service), often in partnership with local communities. CWA section 404 permitting processes also require that permitted activities not impact the designated river’s wild and scenic values and “outstandingly remarkable” resources. State and local ordinances may further protect nationally designated wild and scenic rivers or reaches of designated rivers.

Trinity River Mainstem Fishery Restoration

This topic is discussed in Section 3.6, *Biological Resources—Aquatic*.

Bay-Delta Accord of 1994

The Bay- Delta Accord, signed in 1994, established interim Bay-Delta standards supported by both the State and federal governments and allowed the federal government to return primary control over Bay-Delta water management to the State. It committed water users to provide money and water to improve the Bay-Delta ecosystem, and in return guaranteed a 3-year reprieve from additional species protection requirements. In addition, the accord started a long-term planning process to find comprehensive solutions to the environmental and water supply problems in the Bay-Delta. The CALFED Bay-Delta program, a collaborative State/federal effort, was tasked to identify a package of projects and programs to restore the Bay-Delta's ecosystem and improve water supply reliability and water quality.

State

Central Valley Flood Protection Board

The Central Valley Flood Protection Board (CVFPB), previously known as The Reclamation Board, was created in 1911. Its purpose was to help manage flood risks in the Central Valley on a system wide basis through the development of a comprehensive flood control plan for the Sacramento and San Joaquin Rivers, and to act as the nonfederal sponsor for federal flood control projects in the Central Valley. The CVFPB has jurisdiction throughout the Sacramento and San Joaquin Valleys, which is synonymous with the drainage basins of the Central Valley and includes the Sacramento–San Joaquin Drainage District.

An encroachment permit from the CVFPB is required for every proposal or plan of work that:

(1) Is located between or in the vicinity of any project levees.

(2) Is located within a CVFPB easement.

(3) Is located within a designated floodway that has been adopted by the CVFPB.

(4) Is located within 30 feet of a non-leveed regulated stream listed in California Code of Regulations Title 23, Division 1, Article 8, Table 8.1.

(5) May have a negative effect on any adopted plan of flood control.

Title 23 of the California Code of Regulations and the Water Code provide guidance to DWR and the CVFPB on enforcement of appropriate standards for flood control projects in the Central Valley. These codes authorize DWR and the CVFPB to enforce standards for erecting, maintaining, and operating levees, channels, and other flood control works within their jurisdictions.

Delta Protection Act of 1959

The Delta Protection Act (Water Code Sections 12200–12205) was enacted in 1959 for the protection, conservation, development, control, and use of the waters in the Delta for the public good. This law was enacted at the same session in which the Legislature enacted the Burns-Porter Act, financing the initial facilities of the State Water Resources Development System (now known as the SWP). The Delta Protection Act of 1959 required the SWP, in conjunction with the federal CVP, to provide salinity control and an adequate water supply for the users of water in the Delta.

Delta Protection Act of 1992

The Delta Protection Act (Public Resources Code Sections 29700–29716) includes a series of findings and declarations regarding the quality of the Delta environment and emphasizes the national, state, and local importance of protecting the Delta’s unique resources. The law mandated a state-level planning effort to address the needs of Delta communities. The Delta Protection Commission was made a permanent state agency in 2000 because a need for continued planning and management was identified.

McAteer-Petris Act

The McAteer-Petris Act, enacted on September 17, 1965, was enacted to preserve San Francisco Bay from indiscriminate filling. The law established the BCDC as a temporary state agency charged with preparing a plan for the long-term use of the bay and regulating development in and around the bay. To this end, BCDC prepared the San Francisco Bay Plan (Bay Plan).

In August 1969, the McAteer-Petris Act was amended to make BCDC a permanent agency and to incorporate the policies of the Bay Plan into state law. The Bay Plan includes findings and policies on San Francisco Bay as a resource and on developing the bay and shoreline. In addition to the findings and policies, the Bay Plan contains maps that apply these policies to the bay and shoreline, including the open water, marshes, and mudflats of Suisun Marsh. BCDC conducts the regulatory and permitting process in accordance with the Bay Plan policies and maps. The San Francisco Bay Plan is a CZMA coastal management plan.

Delta Reform Act of 2009 and Delta Plan

The mission of the Delta Stewardship Council is to promote the coequal goals of water supply reliability and ecosystem restoration in a manner that protects and enhances the unique values of the Delta as an evolving place (Water Code Section 85054). The council has a legally enforceable management framework for the Delta and Suisun Marsh called the Delta Plan, which applies best available science to further the coequal goals.

The Delta Stewardship Council was granted specific regulatory and appellate authority by the Legislature under the 2009 Delta Reform Act over certain actions that take place in the Delta or Suisun Marsh, in whole or in part. The council exercises that authority by developing and implementing the Delta Plan and its accompanying regulations.

According to the Delta Reform Act, state or local agencies approving, funding, or carrying out projects, plans, or programs, upon determining that their project is a “permitted action” subject to regulations of the Delta Plan, must certify the consistency of the project with the Delta Plan policies (Water Code Section 85225).

California Water Rights

California has a dual system for water rights: Both the riparian doctrine and the prior-appropriation doctrine apply. Riparian rights result from the ownership of land bordering a surface water source and are normally senior in priority to most appropriative rights. Owners with riparian water rights may use natural flows directly for beneficial purposes on adjoining lands without a permit from the State Water Board.

The State Water Board oversees water rights and water quality functions in California. It issues permits and licenses for appropriating water from surface and subterranean streams flowing through known and definite channels. The California courts have jurisdiction over the use of infiltrating groundwater, riparian use of surface waters, and the appropriative use of surface waters from diversions begun before 1914. Restoration projects permitted under the Order need additional approval from the State Water Board for new or modified water rights.

Urban Water Management Planning Act

The Urban Water Management Planning Act (Water Code Sections 10610–10657) requires all urban water suppliers that have more than 3,000 service connections, or that use more than 3,000 acre-feet of water annually, to submit an urban water management plan to DWR every 5 years and update the plan on or before December 31 in years ending in 5 and 0. Senate Bill (SB) 318 (2004) is the 18th and most recent amendment to the original bill, enacted in 1983, requiring preparation of urban water management plans. Amendments to SB 318 have focused on ensuring that the urban water management plan emphasizes and addresses drought contingency planning, water demand management, reclamation, desalination and groundwater resources.

California Safe Drinking Water Act

The California Safe Drinking Water Act (Health and Safety Code Sections 4010–4039.6) authorizes the California Department of Public Health to establish maximum contaminant levels that are at least as stringent as those required by USEPA under the federal Safe Drinking Water Act (as discussed in Section 3.10.3, *Regulatory Setting*, in Section 3.10, *Hazards and Hazardous Materials*). The California Department of Public Health has established maximum contaminant levels for contaminants that may occur in public water systems, including all substances for which federal maximum contaminant levels exist, and may have adverse health effects. Operators of public water systems in California must meet federal and state drinking water standards.

California Surface Water Treatment Rule

The California Surface Water Treatment Rule satisfies three specific requirements of the Safe Drinking Water Act for surface waters by:

- Establishing criteria for determining when filtration is required.
- Defining minimum disinfection levels.
- Addressing certain bacteria, viruses, turbidity, and heterotrophic plate count by setting a treatment technique.

The Surface Water Treatment Rule applies to all drinking water supply activities in California. The California Department of Public Health oversees implementation of this rule.

Porter-Cologne Water Quality Control Act

The Porter-Cologne Water Quality Control Act (Porter-Cologne Act) established the State Water Board and divided the state into nine regions, each overseen by a Regional Board. The nine Regional Boards have primary responsibility for the coordination and control of water quality within their respective jurisdictional boundaries. Under the Porter-Cologne Act, water quality objectives are limits or levels of water quality constituents or characteristics established for the protection of beneficial uses.

The Porter-Cologne Act requires the Regional Boards to establish water quality objectives while acknowledging that water quality may be changed to some degree without unreasonably affecting beneficial uses. Designated beneficial uses, together with the corresponding water quality objectives, and an antidegradation policy also constitute water quality standards under the federal Clean Water Act. The water quality objectives provide requirements for water quality control.

If USACE determines that only non-federal waters are present in the restoration project area, then no federal CWA permit would be required. Regardless of federal jurisdiction, however, the project will require a permit, or waste discharge requirements (WDRs), for impacts to any waters of the state. The WDRs would be issued by the appropriate Regional Board or, for statewide or multi-regional projects, by the State Water Board.

Under the Porter-Cologne Act, discharges to all waters of the state, including all wetlands and other waters of the state (including but not limited to isolated wetlands), are subject to state regulation.

A discharger whose project disturbs one or more acres of soil, or disturbs less than 1 acre but is part of a larger common plan of development that in total disturbs 1 or more acres, must obtain coverage under the General Permit for Storm Water Discharges Associated with Construction Activities, Construction General Permit Order No. 2009-009-DWQ. Construction activity subject to this permit includes clearing, grading, grubbing, and disturbances to the ground such as stockpiling or excavation; however, it does not include regular maintenance activities performed to restore the original line, grade, or capacity of the facility. The Construction General Permit requires the development and implementation of a storm water pollution prevention plan (SWPPP).

Water Quality Control Plans

Under the Porter-Cologne Act, waters of the state fall under jurisdiction of the State Water Board and the nine Regional Boards. “Waters of the state” means any surface water or groundwater, including saline waters, within the boundaries of the state (Water Code Section 13050[e]). The State Water Board and Regional Boards have been delegated federal authority to implement the requirements of the federal CWA in California, including issuing NPDES permits, under the Porter-Cologne Act. However, the requirements of the Porter-Cologne Act are even broader than those of the CWA. The Porter-Cologne Act requires the Regional Boards to prepare and periodically update water quality control plans, also known as basin plans. Each basin plan establishes water quality objectives sufficient to ensure that the designated beneficial uses of surface water and groundwater are reasonably protected, and actions to control nonpoint and point sources of pollution.

Any person who discharges or proposes to discharge any waste that could affect the quality of the waters of the state must file a “report of waste discharge” with the appropriate Regional Board. “Waste” includes any and all waste substances associated with human habitation, of human or animal origin, or from any producing, manufacturing, or processing operation (Water Code Section 13050[d]). Upon receipt of a report of waste discharge, the Regional Board may issue “waste discharge requirements” designed to ensure compliance with applicable water quality objectives and other requirements of the basin plan.

A public review process is conducted every 3 years to identify and prioritize the actions needed to address water quality concerns and maintain the effectiveness of the basin plan. Amendments to basin plans may include site-specific water quality objectives for a single constituent, basin-wide control programs for a suite of potential pollutants, and/or policy recommendations and strategies for addressing emerging contaminants and/or climate change.

State Water Resources Control Board Statement of Policy with Respect to Maintaining High Quality of Waters in California

In 1968, the State Water Board adopted a policy (Resolution No. 68-16, frequently referred to as the "Anti-degradation Policy") that if water quality is better than the adopted water quality requirements of the State Water Board, the higher water quality shall be maintained until it is demonstrated that the change in water quality will be consistent with maximum benefit to the people of the state, will not unreasonably affect present and anticipated beneficial uses, and will not result in water quality less than prescribed in adopted policies. The policy also stated that any activity that discharges or proposes to discharge wastes to waters with higher water quality than specified in adopted policies must implement best practicable treatment or must provide that a pollution or nuisance will not occur and that the highest water quality consistent with the maximum benefit to the people of the state will be maintained.

In July 1990, the State Water Board issued an administrative procedures update to the Regional Boards, describing procedures for findings that would allow degradation of water quality if balanced against the benefit to the public of the activity that caused the water quality degradation. The administrative procedures update stated that the findings should indicate the pollutants that will lower water quality, the socioeconomic and public benefit of the action, and the beneficial uses affected.

Water Quality Criteria for Toxics

The *Policy for Implementing Toxic Standards for Inland Surface Waters, Enclosed Bays, and Estuaries of California* is referred to as the State Implementation Policy. This state policy for water quality control was adopted by the State Water Board on March 2, 2000 and became effective by May 22, 2000. The policy applies to discharges of toxic pollutants into the inland surface waters, enclosed bays, and estuaries of California subject to regulation under the state Porter-Cologne Act (Division 7 of the Water Code) and the federal Clean Water Act. Such regulation may occur by issuing National Pollutant Discharge Elimination System permits, or through other relevant regulatory approaches. This policy establishes:

- Provisions for implementing priority pollutant criteria promulgated by EPA through the National Toxics Rule (40 CFR 131.36) (promulgated December 22, 1992 and amended May 4, 1995) and through the California Toxics Rule (40 CFR 131.38) (promulgated May 18, 2000, and amended February 13, 2001), and for priority pollutant objectives established by Regional Water Quality Control Boards in their water quality control plans.
- Monitoring requirements for 2,3,7,8-TCDD equivalents.
- Chronic toxicity control provisions.

In addition, the policy includes special provisions for certain types of discharges and factors that could affect the application of other provisions in the policy.

The California Toxics Rule is applicable to all state waters, as are the EPA advisory National Recommended Water Quality Criteria.

State Wetland Definition and Procedures for Discharges of Dredged or Fill Material to Waters of the State

The State Water Board adopted the *State Wetland Definition and Procedures for Discharges of Dredged or Fill Material to Waters of the State* (Discharge Procedures), for inclusion in the forthcoming *Water Quality Control Plan for Inland Surface Waters and Enclosed Bays and Estuaries and Ocean Waters of California,* effective May 28, 2020. The Discharge Procedures consist of four major elements: (1) a wetland definition; (2) a framework for determining whether a feature that meets the wetland definition is a water of the state; (3) wetland delineation procedures; and (4) procedures for the submittal, review, and approval of applications for water quality certifications and waste discharge requirements for dredged or fill activities.

The Discharge Procedures, formerly known as the *Wetland Riparian Area Protection Policy,* have been renamed to communicate that the procedures apply to discharges of dredged or fill material to all waters of the state, not just wetlands.

Sustainable Groundwater Management Act

The Sustainable Groundwater Management Act (SGMA) was enacted in September 2014. The SGMA establishes a new structure for locally managing California's groundwater in addition to the existing groundwater management provisions established by Assembly Bill (AB) 3030 (1992), SB 1938 (2002), and AB 359 (2011), as well as SBX7 6 (2009). The SGMA includes the following key elements:

- Provides for the establishment of a groundwater sustainability agency (GSA) by one or more local agencies overlying a designated groundwater basin or sub-basin identified in DWR Bulletin 118-03
- Requires all DWR Bulletin 118 groundwater basins found to be of "high" or "medium" priorities to prepare groundwater sustainability plans (GSPs)
- Provides for the proposed revisions, by local agencies, to the boundaries of a DWR Bulletin 118 basin, including the establishment of new sub-basins
- Authorizes DWR to adopt regulations for the development of GSPs and review the GSPs for compliance every 5 years
- Requires DWR to establish best management practices and technical measures for GSAs to develop and implement GSPs
- Provides regulatory authority to the State Water Board for developing and implementing interim GSPs under certain circumstances (such as lack of compliance with development of GSPs by GSAs)

The SGMA defines sustainable groundwater management as "the management and use of groundwater in a manner that can be maintained during the planning and implementation horizon without causing undesirable results." Undesirable results are defined as any of the following effects:

- Chronic lowering of groundwater levels
- Significant and unreasonable reduction of groundwater storage
- Significant and unreasonable seawater intrusion

- Significant and unreasonable degraded water quality, including the migration of contaminant plumes that impair water supplies
- Significant and unreasonable land subsidence that substantially interferes with surface land uses
- Depletions of interconnected surface water that have significant and unreasonable adverse impacts on beneficial uses of the surface water

Based on the basin priority definitions included in DWR's California Statewide Groundwater Elevation Monitoring program in June 2014 and confirmed in January 2015, the SGMA required that GSPs be formed by 2020 or 2022. GSPs were required by 2020 for medium- and high-priority basins identified as subject to critical overdraft conditions. GSPs must be completed for all other high- and medium-priority basins by 2022. Sustainable groundwater operations must be achieved within 20 years after completion of the GSPs.

Assembly Bill 3030: Groundwater Management Act (2002)

The Groundwater Management Act (Water Code Sections 10750–10756; AB 3030) provides a systematic procedure for an existing local agency to develop a groundwater management plan. This law provides agencies with the powers of a water replenishment district to raise revenue to pay for facilities to manage the basin (extraction, recharge, conveyance, quality).

Many agencies have adopted groundwater management plans in accordance with AB 3030. AB 3030 allows certain defined existing local agencies to develop a groundwater management plan for groundwater basins.

State Water Board Comprehensive Response to Climate Change

On March 7, 2017, the State Water Board adopted Resolution No. 2017-0012, Comprehensive Response to Climate Change. This resolution identified the potential for the use of recycled water to reduce greenhouse gas emissions if the recycled water replaces existing or future, higher carbon water supplies. Where feasible, recycled water should be treated to meet appropriate water safety standards for the intended use to meet local water supply needs. Resolution No. 2017-0012 directed staff to coordinate with the Regional Boards to make annual reporting of recycled water data a requirement of waste discharge permits and water reclamation requirements, and to work with the State Water Board's Division of Information Technology to develop an online data entry system to track the use of recycled water.

Regional and Local

The study area encompasses multiple counties and cities throughout California. Each county and city has local regulations and a general plan with policies related to hydrology and water quality. These may include goals and policies related to water service, water resources, stormwater, and groundwater. Local entities may also have mapped flood hazard areas, in addition to those mapped by FEMA, and local ordinances may regulate activities in those areas.

3.11.4 Impacts and Mitigation Measures

Methods of Analysis

Hydrology and water quality impacts from the types of restoration projects permitted under the Order are evaluated in terms of how typical construction and operation of project components could impact existing hydrology and water quality. However, the precise locations and detailed characteristics of potential future individual restoration projects are yet to be determined. Therefore, this hydrology and water quality analysis focuses on reasonably foreseeable changes from implementation of the types of projects and actions that might be taken in the future consistent with the level of detail appropriate for a program-level analysis.

Permanent impacts are considered those that would continue through the life of a project as a result of the environmental conditions caused by restoration projects permitted under the Order (e.g., removal of a small dam that could change existing water flows). Temporary impacts are considered those that would be temporary in nature (e.g., construction-related activities).

The approach to assessing hydrology and water quality impacts was to identify and review existing environmental studies, data, model results, and other information for projects that are consistent with those identified in Section 2.6, *Categories of Restoration Projects in the Order*, and Section 2.7, *Typical Construction, Operation, and Maintenance Activities and Methods*.

Thresholds of Significance

In accordance with Appendix G of the State CEQA Guidelines, an impact related to hydrology and water quality is considered significant if activities permitted by the Order would do any of the following:

- Violate any water quality standards or waste discharge requirements or otherwise substantially degrade surface or ground water quality
- Substantially decrease groundwater supplies or interfere substantially with groundwater recharge such that the project may impede sustainable groundwater management of the basin
- Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river or through the addition of impervious surfaces, in a manner which would:
  - Result in substantial on- or off-site erosion or siltation;
  - Substantially increase the rate or amount of surface runoff in a manner which would result in on or off-site flooding;
  - Create or contribute runoff water which would exceed the capacity of existing or planned stormwater drainage systems or provide substantial additional sources of polluted runoff; or
  - Impede or redirect flood flows

- In flood hazard, tsunami, or seiche zones, risk release of pollutants due to project inundation
- Conflict with or obstruct implementation of a water quality control plan or sustainable groundwater management plan

Impacts and Mitigation Measures

Table 3.11-1 summarizes the impact conclusions presented in this section for easy reference.

Table 3.11-1
Summary of Impact Conclusions—Hydrology and Water Quality

Impact Statement	Construction Activities	Constructed Facilities and Operations and Maintenance
3.11-1: Implementing restoration projects permitted under the Order could result in the release of pollutants into surface water and/or groundwater that could violate water quality standards or waste discharge requirements, substantially degrade water quality, or obstruct implementation of a water quality control plan.	LTSG	LTSG
3.11-2: Implementing restoration projects permitted under the Order could substantially deplete groundwater supplies or interfere substantially with groundwater recharge such that a project may impede sustainable groundwater management of the basin or obstruct implementation of a sustainable groundwater management plan.	LTS	LTS
3.11-3: Implementing restoration projects permitted under the Order could substantially alter the existing drainage pattern of a site or area, including through the alteration of the course of a stream or river or through the addition of impervious surfaces in a manner that could substantially increase the rate of runoff; create or contribute runoff water which would exceed the capacity of existing or planned stormwater drainage systems; or impede or redirect flood flows.	LTS	LTS

SOURCE: Data compiled by Environmental Science Associates in 2019 and 2020

NOTES: LTS = less than significant; LTSG = less than significant with implementation of general protection measures

As part of the State Water Board or Regional Board's issuance of a NOA for a restoration project under the Order, compliance with the general protection measures and mitigation measures listed below would be required when applicable to a given project. Not all general protection measures and mitigation measures would apply to all restoration projects. The applicability of the general protection measures and mitigation measures would depend on the individual restoration activities, project location, and the potentially significant impacts of the individual restoration project. Implementation of the mitigation measures would be the responsibility of the project proponent(s) under the jurisdiction of the State Water Board, appropriate Regional Board, or other authorizing regulatory agency.

Impact 3.11-1: Implementing restoration projects permitted under the Order could result in the release of pollutants into surface water and/or groundwater that could violate water quality standards or waste discharge requirements, substantially degrade water quality, or obstruct implementation of a water quality control plan.

Effects of Project Construction Activities

Construction of restoration projects permitted under the Order (e.g., culverts, bridges, fish screens, ladders, and pilings; removal of small dams, tide gates, flood gates, and legacy structures; placement of bioengineered stabilization materials; grading and excavation to reconnect, set back, or breach levees, reconnect stream and river channels, or create depressions, berms, and drainage features; installation of cofferdams during construction) could require the movement of earth and other materials and the use of heavy equipment. In-channel disturbance for the placement or removal of structures could cause temporary changes to water quality in several different ways. For example, this work could temporarily disturb streambed sediments and cause the resuspension of sediment-associated pollutants (e.g., trace metals, heavy metals, pesticides) associated with legacy (e.g., gold mining) or contemporary (e.g., watershed urbanization) activities.

Construction work could also introduce pollutants through equipment (e.g., oils, lubricants, hydraulic fluids) and materials (e.g., soil and cover materials, concrete) into affected waterways, or into flood hazard, tsunami, or seiche zones, where inundation could release the pollutants. For example, excavation and grading for a large wetland restoration project could expose and release contaminated sediments, resulting in water quality impacts on receiving waters.

Localized degradation of groundwater quality could result from temporary, short-term construction activities such as building access roads and temporary facilities, or from O&M activities such as vegetation control. If hazardous materials were to be discharged to the land surface or surface waters during this work, they could travel to underlying aquifers. If the discharge volume were large enough, the hazardous materials could degrade local groundwater quality to a sufficient degree to impair its continued use. (Section 3.10, *Hazards and Hazardous Materials*, includes more information regarding hazardous materials.)

In addition, construction activities for some restoration projects could include temporary dewatering. Groundwater extracted during dewatering operations may contain elevated levels of suspended sediment, turbidity, or other constituents (e.g., metals, construction materials) that could degrade water quality when discharged into surface waters.

The time to construct restoration projects could be as short as a few days, in the case of minor projects, or as long as several years during only certain months of the year for major projects. Therefore, the projects could result in effects on water quality that would persist throughout project construction.

As described in Section 3.1, *Approach to the Environmental Analysis*, the analysis assumes that project proponents would comply with applicable federal, state, and local regulations and ordinances. The federal Clean Water Act prohibits any stormwater discharge from a construction project unless the discharge is in compliance with an NPDES permit. The State Water Board and Regional Boards are the NPDES permitting authorities in California.

The State Water Board has adopted a Statewide General Permit for Stormwater Discharges Associated with Construction Activity (Construction General Permit, Order 2009-0009-DWQ) for construction sites where 1 or more acres of soil would be disturbed. The Construction General Permit requires, among other actions, the implementation of mandatory best management practices, including pollution/sediment/spill control plans, training, sampling, and monitoring for non-visible pollutants.

In addition, the Regional Boards may require projects to obtain an NPDES permit or waste discharge requirements before they discharge clean or relatively pollutant-free wastewaters that pose little or no threat to the quality of the receiving water (e.g., to discharge groundwater pumped during dewatering into surface waters). The NPDES discharge permit may require that groundwater removed during construction be treated before it is discharged to surface waters. Adherence to regulations may be enough to reduce impacts on water quality to less than significant in some cases.

Estuarine salinity levels, including those in the Delta and other estuaries throughout the State, are important to various water users, including municipal, industrial, and agricultural, and fish and wildlife. Salinity extends further into the estuaries during drier seasons and years since low freshwater inflows into the estuaries are diminished and less freshwater is available to offset salinity intrusion.

Restoration projects proposed for coverage under the Order could involve breaching and lowering existing levees and excavating a tidal channel network, thereby re-introducing daily tidal flows to a project site. Restored tidal exchange would also change flow patterns in the connected channels outboard of a project site. Because these tidal flows also distribute salinity within estuaries, these alterations in flow patterns could affect salinity levels in an estuary. Salinity increases are a concern to various municipalities, industries, agricultural interests, and resources agencies that depend on the availability of freshwater to maintain existing beneficial uses.

While these types of potential effects are possible, they would be expected to be rare and small, and only associated with large projects that have the potential to change tidal prism. For example, a model-based analysis of a 3,000-acre tidal marsh restoration project in the north Delta concluded that the project’s salinity effects would be less than significant because the project resulted in negligible or small changes (under worst-case conditions) in salinities that were still in compliance with water quality standards that are protective of beneficial uses (ESA 2019).

As described in Order Section VII, "*project proponents (seeking coverage under the Order) will identify the receiving waters and beneficial uses of waters of the state to be impacted by a proposed project, as listed in the applicable Regional Board water quality control plan*." This information is required in the Notice of Intent (NOI; Order Attachment B), which must be completed by a project proponent to apply for authorization under this Order.

Further, as described under Order Section XIII, "*The Water Boards will independently review any project proposed for authorization under this Order to analyze impacts to water quality and designated beneficial uses within the applicable watershed(s). If the eligibility requirements set forth in this Order including Attachment A are not met, Water Boards will not authorize the proposed project under this Order and instead require the project proponent to apply for an individual certification or certification under another Order. Specifically, the approving Water Board may only authorize the proposed project under this Order if it determines that the following requirements are met: 1) the project meets the definition of a restoration project (as defined in Section V of the Order); 2) the project adopts and implements all appropriate GPMs and CEQA mitigation measures to protect water quality and beneficial uses; 3) the project proponent fulfills all approving Water Board requirements for project information and reporting; and 4) the project is designed to protect water quality and beneficial uses in accordance with regional or statewide water quality control plans.*"

Any potential restoration projects seeking coverage under the Order would be required to undergo pre-application consultation with the approving Water Board and analyze impacts to water quality and designated beneficial uses within the applicable watershed(s) through its own environmental review pursuant to CEQA; and the project would be required to be designed to protect water quality and beneficial uses in accordance with regional or statewide water quality control plans.

The Order does not promote the construction or implementation of individual restoration projects, nor does it describe the specific size, location, implementation timing, or exact configuration of such projects. These are all factors necessary to identify the water quality impacts of constructing restoration projects permitted under the Order. Because the potential exists for adverse impacts on water quality as a result of the construction of restoration projects permitted under the Order, this impact would be **potentially significant**.

Projects implementing applicable general protection measures (Appendix E) included in the Order would further reduce impacts to hydrology and water quality. The following general protection measures may apply to hydrology and water quality:

- GPM-10: Equipment Maintenance and Materials Storage
- GPM-11: Material Disposal
- GPM-12: Fugitive Dust Reduction
- WQHM-1: Staging Areas and Stockpiling of Materials and Equipment

- WQHM-2: Storm Water Pollution Prevention Plan
- WQHM-3: Erosion Control Plans
- WQHM-4: Hazardous Materials Management and Spill Response Plan
- WQHM-5: In-Water Concrete Use
- WQHM-6: Accidental Discharge of Hazardous Materials
- IWW-1: Appropriate In-Water Materials
- IWW-2: In-Water Vehicle Selection and Work Access
- IWW-3: In-Water Placement of Materials, Structures, and Operation of Equipment
- IWW-4: In-Water Staging Areas and Use of Barges
- IWW-6: Dewatering/Diversion
- IWW-10: In-Water Pile Driving Methods
- IWW-11: Sediment Containment during In-Water Pile Driving
- IWW-12: Pile-driving Monitoring
- IWW-13: Dredging Operations and Dredging Materials Reuse Plan
- VHDR-2: Native and Invasive Vegetation Removal Materials and Methods
- VHDR-3: Revegetation Materials and Methods
- VHDR-4: Revegetation Erosion Control Materials and Methods
- VHDR-6: Herbicide Use
- VHDR-7: Herbicide Application Planning
- VHDR-8: Herbicide Application Reporting.

Integration of applicable general protection measures into project designs and plans would reduce impacts from construction activities on the water quality of the study area to a **less-than-significant** level.

Effects of Constructed Facilities (Natural or Artificial Infrastructure) and Operations and Maintenance of those Facilities

Long-term effects on water quality from restoration projects permitted under the Order are expected to be beneficial or sometimes neutral (in the case of fish screens or ladders), because the specific purpose of these projects would be to correct existing conditions that contribute to resource degradation. For example, projects implementing bioengineered bank stabilization would reduce the input of fine sediment, which would improve water quality. Other restoration projects, such as those to remove pilings and other in-water structures, would improve water quality by removing potential contaminant sources and hazards such as untreated and chemically treated wood pilings, piers, and vessels. In addition, restoration projects permitted under the Order could establish, restore, and enhance tidal, subtidal, and freshwater wetlands. For example, living shorelines provide a natural alternative to “hard” shoreline stabilization methods like stone sills or bulkheads, and provide numerous ecological benefits including water quality improvements; floodplain restoration would also improve water quality because floodplains, when inundated with water, act as natural filters by removing excess sediment and nutrients.

In regard to potential impacts associated with cyanoHABs, predicting whether these will either 1) develop, or 2) increase in frequency, severity, and/or duration, relative to a baseline, in a given location due to incremental changes in environmental factors is difficult. At a minimum, it requires knowledge of the factors for triggering (water temperature) and sustaining (high irradiance and high nutrient availability) growth and blooms in any particular location, together with data on how these factors are predicted to change. It is important to keep in mind that all three factors have to occur simultaneously for cyanoHABs to develop. Change in one factor alone will most likely not lead to a change in bloom status. For example, increase in nutrient concentration in a location with a well-mixed water column may not lead to a bloom of cyanoHAB species such as *Microcystis* as continued mixing of *colonies* to the bottom will prevent them from increasing their growth rate sufficiently to become dominant. Increase in residence time has been shown to increase cyanoHAB occurrences when it results in stratification of the water column (Carey et al. 2021). Stratification allows the surface layer to become isolated from the rest of the water column. This may increase the water temperature, water clarity, and decrease the mixing of cyanoHAB cells and colonies from the surface to the bottom allowing them to be continually exposed to high irradiance, and therefore, maintain maximum growth rates (Visser et al. 2005, Carey et al. 2012). If an increase in residence time does not lead to water column stratification, then the water may not warm sufficiently to trigger growth of cyanoHABs, or the mixing rate may not decrease sufficiently to maintain cyanoHAB species at the surface, effectively preventing the formation of colonies and accumulation of biomass. In addition, a decrease in residence time has to be sufficient that the growth rate of the cyanoHAB species exceeds the flushing rate of the water in order for colonies and biomass to accumulate in the area. If residence time is increased and stratification occurs, but the surface layer is depleted of nutrients, then cyanoHABs may not be able to develop due to nutrient limitation.

As is evident from the above discussion, changes in environmental factors and hydrology in a given location may or may not lead to changes in cyanoHABs depending on the thresholds of bloom development in that location and changes in environmental factors relative to those thresholds. However, restoration projects permitted under the Order would result in a number of improved ecological processes that would counteract these risks. For example, restoration projects have the potential to decrease water temperatures associated with the creation of shade through the restoration and enhancement of vegetation communities (e.g., riparian, emergent marsh). Restoration projects would also have the potential to improve tidal flushing, resulting in a well-mixed water column. The establishment of seagrasses, emergent marsh, and riparian vegetation would also result in increased uptake and removal of nutrients from the water. All of these beneficial ecological processes would counteract risks associated with environmental factors that contribute to increases in cyanoHABs. Finally, all projects must meet the definition of a restoration project, be consistent with categories of restoration projects described in the Order, and adhere to programmatic sideboards, including adopting applicable protection measures and design guidelines, and undergo pre-application consultation with the Water Board staff.

Routine O&M activities for restoration projects permitted under the Order could consist of periodic and routine work such as removing sediment within or near the facilities (e.g., culverts, fish screens and ladders), removing vegetation (e.g., invasive species in aquatic or riparian areas), and inspecting and maintaining facilities and natural features (e.g., replanting trees and shrubs, repairing biotechnical and other features). Routine

O&M activities would be similar to those described for construction; however, the level of activity would be less intense during the O&M phase than during construction, so the degree of temporary changes to water quality would be much less.

As described above, the Order does not promote the construction or implementation of individual restoration projects, nor does it describe the specific size, location, implementation timing, or exact configuration of such projects. Because the potential exists for adverse impacts on water quality as a result of the maintenance of restoration projects permitted under the Order, this impact would be **potentially significant**.

However, restoration projects would incorporate general protection measures (listed above under *Effects of Project Construction Activities)* that would reduce impacts from O&M activities on water quality.

Implementing these general protection measures would reduce impacts from O&M activities on water quality to a **less-than-significant** level. Further, many of the long-term effects of these projects on water quality are expected to be beneficial or neutral, because the specific purpose of these projects would be to correct existing conditions that contribute to resource degradation and/or counteract risks associated with environmental factors that contribute to water quality degradation.

Impact 3.11-2: Implementing restoration projects permitted under the Order could substantially deplete groundwater supplies or interfere substantially with groundwater recharge such that a project may impede sustainable groundwater management of the basin or obstruct implementation of a sustainable groundwater management plan.

Effects of Project Construction Activities

Construction activities for restoration projects permitted under the Order could include temporary dewatering to facilitate equipment access, excavation or placement of materials, and repair or removal of infrastructure. These activities could result in a localized, temporary reduction in groundwater levels near the construction area, which would be expected to return to preconstruction levels after dewatering activities cease (or possibly better levels, if the aquifer were depleted, or in the case of a multi-benefit restoration project). Land grading, placement of dredged or other in-water material removed (e.g., legacy structures) on land before disposal, construction of structures (e.g., fish screens, earthen embankments), and stockpiling of construction materials could change drainage patterns during construction, which typically would result in changes in groundwater recharge. Actual alterations of groundwater recharge would depend on the type of construction activity and hydrologic and hydraulic factors.

In addition, although many construction-related impacts on groundwater would be temporary, it is reasonable to expect that construction for an infrastructure restoration project (e.g., setback levee) could occur over two or more years, which could result in recurring, localized changes. However, groundwater levels would be expected to return to preconstruction levels (or better) after dewatering activities cease.

In conclusion, construction of restoration projects permitted under the Order could reduce groundwater levels and alter groundwater recharge. However, these reductions would be localized and temporary, and preconstruction conditions would be expected to resume, or be improved, after construction. Project construction would not be anticipated to obstruct with implementation of a sustainable groundwater management plan. Therefore, this impact would be **less than significant**.

Projects implementing applicable general protection measures (Appendix E) included in the Order would further reduce impacts to hydrology and water quality. The following general protection measures may apply to hydrology and water quality:

- IWW-6: Dewatering/Diversion

Implementing this general protection measure would further reduce the **less-than-significant** impact from construction activities on localized groundwater supplies and groundwater recharge.

Effects of Constructed Facilities (Natural or Artificial Infrastructure) and Operations and Maintenance of those Facilities

Some of the long-term effects of restoration projects permitted under the Order on groundwater recharge are expected to be beneficial (e.g., stream, floodplain, and riparian projects typically would improve groundwater recharge) or neutral. For example:

- Restoring off-channel/side channel habitat and/or floodplains would allow for greater inundation, which would lead to increased groundwater recharge.
- Installing beaver dam analogues would allow for greater groundwater recharge because as they trap sediment, the streambed rebuilds and forces water onto the floodplain, recharging groundwater.
- Removing legacy structures and other in-water structures would reduce the amount of impervious surfaces in the project area, which would allow for improved groundwater recharge.
- Restoration projects involving returning flows to a marsh could increase flows across the floodplain, which would enhance opportunities for groundwater recharge.

Restoration projects permitted under the Order could affect groundwater supplies and recharge. Construction work could include compaction of soil and other activities that would temporarily increase impervious land surfaces (e.g., concrete foundations for fish screens and fishways); however, these changes in land surfaces would be expected to be very small and would not be expected to result in decreases in groundwater recharge at these locations. As a result, alterations of, or interference with, groundwater recharge as a result of constructed facilities in the study area would likely be negligible. Most projects would not include large-scale impervious surfaces, and the constructed facilities, such as fish screens, or trails associated with multi-benefit projects would be relatively very small compared to the overall recharge area of a given watershed or sub-watershed. Therefore, there would be little or no likelihood for constructed facilities to affect groundwater recharge. Groundwater recharge could still occur around these facilities, and projects would not obstruct implementation of a sustainable groundwater management plan.

Slurry cutoff walls may be installed in setback levees, which could restrict water flow and affect groundwater levels. A slurry cutoff wall is a civil engineering technique used to build reinforced concrete walls in areas of soft earth close to open water, or with a high groundwater table. Slurry cutoff walls create barriers to groundwater inflow or subsurface contaminants. The potential consequences are anticipated to be localized changes in well water levels and/or high groundwater levels near the setback levees and near the locations where slurry cutoff walls are installed. However, such changes would not be expected to substantially affect groundwater resources.

Restoration projects permitted under the Order would establish, restore, and enhance stream and riparian areas and may include activity in upslope watershed sites (e.g., outside of the State and Regional Water Boards' jurisdiction). Specific project features such as small wood structures or beaver dam analogues would increase ponding and reconnect floodplains. By increasing the rate, duration, and inundation of floodplain surfaces, these features would elevate the water table during both low- and high-flow conditions, increasing groundwater recharge. Floodplain restoration would also allow for groundwater recharge because floodplains, when inundated with water, allow floodwaters to infiltrate the ground.

Therefore, operation of restoration projects permitted under the Order would not reduce groundwater supplies or impair groundwater recharge. The goal of many projects would be to improve groundwater recharge, resulting in a beneficial effect. Therefore, this impact would be **less than significant**.

The Order does not include any general protection measures applicable to this impact.

Impact 3.11-3: Implementing restoration projects permitted under the Order could substantially alter the existing drainage pattern of a site or area, including through the alteration of the course of a stream or river or through the addition of impervious surfaces in a manner that could substantially increase the rate of runoff; create or contribute runoff water which would exceed the capacity of existing or planned stormwater drainage systems; or impede or redirect flood flows.

Effects of Project Construction Activities

Construction activities for restoration projects permitted under the Order could temporarily change drainage patterns. This change could increase the rate and amount of surface runoff in a manner that would exceed the capacity of existing or planned stormwater drainage systems, result in flooding, or impede or redirect flood flows.

Project construction could require grading; levee setbacks; construction, repair, or removal of instream structures; and stockpiling of construction materials that could create physical barriers to surface runoff. The actual alterations of drainage patterns would depend on the type of construction activity (e.g., floodplain restoration; removal of small dams, tide gates, flood gates, and legacy structures) and hydrologic and hydraulic factors (e.g., changing of runoff amounts or rates).

Land grading, placement of dredged or other in-water material removed (e.g., small dams) on land before disposal, construction of structures (e.g., fish screens), and stockpiling of construction materials could change drainage patterns during construction. These barriers could redirect surface runoff and/or result in an increase in water surface elevations on and adjacent to the construction site.

Construction activities such as compacting soils could increase their imperviousness (inability to be penetrated by water), which would reduce infiltration rates and cause an associated increase in the amount and rate of surface runoff. In addition, grading activities could change the slope of the land across which drainage flows, which could change the direction, rate, and amount of surface runoff from a construction site. Many factors affect the rate and amount of surface runoff, including topography, the amount and intensity of precipitation, the amount of evaporation, roughness and permeability of the substrate, and the amount of precipitation and imported water that infiltrates into groundwater. A construction-related change in the amount or rate of surface runoff would likely only have relatively localized effects on-site and immediately downstream, or downslope, of the site. In addition, although many construction-related impacts on surface runoff would be temporary, it is reasonable to expect that construction activities for restoration projects could occur over several years, which could result in changes to surface runoff that would persist throughout project construction.

Construction of restoration projects permitted under the Order could temporarily change drainage patterns; however, these changes would not be expected to change surface runoff in a manner that could exceed existing or planned stormwater drainage systems and/or create or increase on- or off-site flooding. Any changes would likely have relatively localized effects on-site and immediately downstream (or downslope) of the site; floodplain restoration improvements would not be expected to increase surface elevations or the chance of flooding in adjacent floodplains. Therefore, restoration projects permitted under the Order would not increase the rate or amount of surface runoff in a manner that would increase the risk of flooding on- or off-site. This impact would be **less than significant**.

To further reduce the impact of project construction on the rate or amount of surface runoff in a manner that would increase the risk of flooding on- or off-site, the Order includes the following general protection measures (Appendix E):

- WQHM-1 Staging Areas and Stockpiling of Materials and Equipment
- WQHM-2: Storm Water Pollution Prevention Plan

Implementing these general protection measures would further reduce the **less-than-significant** impact from construction activities on the rate or amount of surface runoff in a manner that would increase the risk of flooding on- or off-site.

Effects of Constructed Facilities (Natural or Artificial Infrastructure) and Operations and Maintenance of those Facilities

Restoration projects permitted under the Order could result in a permanent alteration of drainage patterns. Many of the long-term effects of these projects on drainage patterns and flood flows are expected to be beneficial or neutral, because the specific purpose of these projects would be to correct existing conditions that contribute to resource degradation such as groundwater overdraft, and poor water quality and flood management. For example:

- Bioengineered bank stabilization projects integrate living woody and herbaceous materials with earthwork and recontouring of streambanks, which provides for increased bank stability.
- Placing organic and inorganic materials to stabilize and increase the structure of the soil where site constraints limit opportunities for natural channel meander reduces soil erosion.
- Restoration and enhancement of off-channel/side-channel habitat features typically creates an improved hydrologic connection between floodplains and main channels.

Floodplain restoration, including setback, breaching, and removal of levees, berms, and dikes, and hydraulic reconnection and revegetation would improve the diversity and complexity of aquatic and riparian habitat by increasing floodway capacity and inundation frequency.

Floodplain and levee restoration improvements may cause the existing course of a stream or river to change or the hydraulic roughness to increase (e.g., from plantings that increase instream vegetation density). However, such improvements would not be expected to substantially increase surface elevations, increase the chance of flooding outside of restored floodplains or decrease the channel's flow carrying capacity as floodplain and levee restoration improvements would need to meet design standards and permitting requirements. Similarly, small dams would be removed only when dams are less than 25 feet in height from the natural bed of the stream or watercourse at the downstream toe of the barrier, and the dams would be removed to restore natural stream geomorphology. Therefore, removing small dams would not be expected to substantially increase surface water elevations or the chance of flooding in adjacent or downstream floodplains. For example, the potential for setback levees to redirect flood impacts to other areas is expected to be negligible because setback levees decrease flood stages by increasing channel widths. In addition, setback levees would need to meet design standards and permitting requirements.

Floodplain restoration or other restoration projects permitted under the Order would not be expected to result in operational changes to upstream reservoirs. Upstream reservoirs that are operated for flood management must maintain certain amounts of flood control space and operate under flood control rules established in the reservoir's operation manual. Hence it is not likely that restoration would require operational changes, and if they did, there should be no impact on flood risk. In addition, large-scale floodplain restoration projects may provide for containment of reservoir releases in preparation for large storm events, which would be beneficial.

Projects such as fishways and offstream storage tanks could cause the imperviousness of the soils to increase, which would reduce infiltration rates and result in an associated increase in the amount and rate of surface runoff. The actual alterations of drainage patterns would depend on the facilities and hydrologic and hydraulic factors. The changes in drainage patterns could persist after construction, depending on project designs. For example, there could be permanent changes in land cover as a result of construction, such as increases in concrete or compacted surfaces (e.g., for fish screens) or vegetation removal.

The rate and amount of surface runoff are determined by multiple factors: topography, amount and intensity of precipitation, amount of evaporation in the watershed, and amount of precipitation and imported water that infiltrates into groundwater. However, these projects would not be expected to appreciably impede or redirect flood flows, or to negatively affect levee integrity or the potential for overtopping, once construction is complete. Projects would be designed consistent with existing regulatory requirements.

Restoration projects permitted under the Order could permanently alter drainage patterns. Many of the long-term effects of these projects on drainage patterns and flood flows are expected to be beneficial or neutral, because the specific purpose of these projects would be to correct existing conditions that contribute to resource degradation. Restoration projects could alter runoff rates and timing, as local drainage patterns could change during project construction. However, these projects would likely have relatively localized effects on-site and immediately downstream (or downslope) of the floodplain restoration improvements and would not increase surface water elevations or the chance of flooding in adjacent floodplains. Therefore, this impact would be **less than significant**.

The Order does not include any general protection measures applicable to this impact.