Chapter 2 Background and Description of the Order

2.1 Need for a Programmatic Order

The California floristic province has been ranked as one of 25 biodiversity hotspots of global importance (Myers et al. 2000). Aquatic, riparian, floodplain, and wetland habitats are critical components, supporting the most diverse and species-rich ecosystems in the province and throughout the arid and semiarid portions of North America. Over the last century, the ecosystem services provided by aquatic riparian, floodplain, and wetland habitats have been affected by environmental degradation, land use conversions, and water management. As a result, California has more than 300 threatened and endangered species and more federally protected animals than any other state, and ranks second only to Hawaii in the number of protected plants (USFWS 2013).

Efforts to enhance and restore habitats and ecological functions and processes throughout the state are ongoing. A wide variety of California state laws, mandates, plans, mitigation requirements, and initiatives—many of which are the result of decades-long debates and reports based on scientific research—call for restoration of aquatic, riparian, and floodplain habitats.

To ensure that funding is used efficiently and that restoration projects are implemented in a timely manner, agencies have already developed programmatic processes that would permit qualifying restoration projects. Examples of these existing permits and processes are included in **Appendix D**.

The State Water Resources Control Board (State Water Board) currently has a General Order for restoration projects that qualify for the California Environmental Quality Act (CEQA) Class 33 categorical exemption (CEQA Guidelines Section 15333); a key qualification for this exemption is that habitat restoration projects are "*not to exceed five acres in size*." This authorization is the General Order for Small Habitat Restoration Projects. Restoration projects that fall outside the limited scope of this General Order for Small Habitat Restoration Projects must obtain an Individual Water Quality Certification and/or waste discharge requirements from the State Water Board and/or the appropriate Regional Board, which can require greater time and expense for restoration project proponents.

2.2 Purpose and Objectives of the Order

2.2.1 Purpose

The State Water Board developed a statewide Order to improve the efficiency of regulatory review for projects that restore aquatic and riparian habitat and improve water quality. The Order establishes a permitting process for a set of environmentally beneficial restoration project types (listed in Section 2.6, *Categories of Restoration Projects in the Order*) and associated measures to protect species and the environment.

2.2.2 Objectives

The objective of the Order is to help expedite statewide implementation of restoration projects to improve the environment and make the regulatory process efficient by interpreting state standards in a uniform manner to ensure that applicable projects are consistent with federal and state water quality laws.

2.3 Geographic Scope

The Order considers a variety of types of aquatic, riparian, wetland, and floodplain restoration projects that may take place throughout California. The State Water Board protects water quality by setting statewide policy and coordinating and supporting the Regional Boards' efforts. Nine Regional Boards conduct rulemaking and regulatory activities by basin and issue water quality control plans (basin plans). Because the Order is administered and used primarily by the Regional Boards, the study area is defined as the nine water quality control regions (**Figure 2-1**).

2.3.1 Region 1—North Coast

The North Coast Regional Board's jurisdiction encompasses watersheds draining to the Pacific Ocean from California's northern border to the southerly boundaries of the Estero de San Antonio and Stemple Creek watersheds. This region includes all of Del Norte, Humboldt, Trinity, and Mendocino Counties, and portions of Siskiyou, Modoc, Glenn, Lake, Sonoma, and Marin Counties. Major bodies of water in this region include the Smith, Klamath, Trinity, Eel, Mattole, and Russian Rivers, and Humboldt Bay.

2.3.2 Region 2—San Francisco

The San Francisco Bay Regional Board's jurisdiction encompasses watersheds draining to the Pacific Ocean from Tomales Bay in the north to Pescadero Creek in the south, excluding watersheds that drain to either the Sacramento River or the San Joaquin River. This region includes all of San Francisco County and portions of Marin, Sonoma, Napa, Solano, Contra Costa, Alameda, Santa Clara, San Mateo, and Santa Cruz Counties. The dominant feature of this region is the San Francisco Bay estuary, which conveys the waters of the Sacramento and San Joaquin Rivers into the Pacific Ocean. Other major tributaries to the San Francisco Bay estuary include the following watersheds: Alameda, Contra Costa, Marin, Napa, San Mateo, Santa Clara Basin, Solano, and Sonoma. This region also includes coastal portions of Marin and San Mateo Counties.

2.3.3 Region 3—Central Coast

The Central Coast Regional Board's jurisdiction encompasses watersheds draining to the Pacific Ocean from Pescadero Creek south to the southeasterly boundary of the Rincon Creek watershed. This region includes all of Santa Cruz and Monterey Counties and portions of San Mateo, Santa Clara, San Benito, San Luis Obispo, Santa Barbara, Kern, and Ventura Counties. Major bodies of water in this region include the Pajaro and Salinas Rivers, and Morro and Monterey Bays.

Figure 2-1 Study Area

2.3.4 Region 4—Los Angeles

The Los Angeles Regional Board's jurisdiction encompasses watersheds draining to the Pacific Ocean from the Ventura River watershed south to the San Gabriel River watershed. This region includes portions of Ventura County, Los Angeles County, and Orange, Kern, and Santa Barbara Counties. Major bodies of water in this region include the Santa Clara, Los Angeles, and San Gabriel Rivers; Santa Monica Bay; and the drainages of five coastal islands (Anacapa, San Nicolas, Santa Barbara, Santa Catalina, and San Clemente).

2.3.5 Region 5—Central Valley

The Central Valley Regional Board's jurisdiction encompasses all watersheds that drain to the Sacramento and San Joaquin Rivers. This region includes Tehama, Butte, Plumas, Colusa, Sutter, Yuba, Sacramento, San Joaquin, Stanislaus, Merced, Fresno, Kings, Tulare, Kern, Madera, Mariposa, Tuolumne, Calaveras, and Amador Counties. It also includes portions of Modoc, Lassen, Sierra, Nevada, Placer, El Dorado, and Alpine Counties to the east, and portions of San Benito, Santa Clara, Alameda, Contra Costa, Solano, Napa, Lake, Glenn, and Siskiyou Counties to the west. Major rivers in this region include the Sacramento, Pit, Feather, Yuba, Bear, American, San Joaquin, Cosumnes, Mokelumne, Calaveras, Stanislaus, Tuolumne, Merced, Chowchilla, and Fresno Rivers. Major reservoirs and lakes in this region include Shasta, Oroville, Folsom, Clear, Pardee, New Hogan, Millerton, McClure, Don Pedro, and New Melones Lakes.

2.3.6 Region 6—Lahontan

The Lahontan Regional Board's jurisdiction encompasses all watersheds within the boundaries of California that drain to the Great Basin. 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. This region includes Inyo and Mono Counties and portions of Los Angeles, Kern, San Bernardino, Alpine, El Dorado, Placer, Nevada, Sierra, Plumas, Lassen, and Modoc Counties. Major bodies of water in this region include Lake Tahoe; Eagle, Honey, Owens, and Mono Lakes; and the Susan, Truckee, Carson, Walker, Owens, and Mojave Rivers.

2.3.7 Region 7—Colorado River

The Colorado River Regional Board's jurisdiction encompasses all watersheds within the boundaries of California that drain to the Colorado River. This region includes Imperial County and portions of San Bernardino, Riverside, and San Diego Counties. Major bodies of water in this region include the Salton Sea, the Southern Mojave and Lower Colorado Rivers, the Imperial Reservoir, and Havasu and Mohave Lakes.

2.3.8 Region 8—Santa Ana

The Santa Ana Regional Board's jurisdiction encompasses the Santa Ana River watershed, which drains to the Pacific Ocean. This region includes portions of Los Angeles, San Bernardino, Riverside, and Orange Counties. Major bodies of water in this region include Anaheim and Newport Bays, the Santa Ana and Jacinto Rivers, and Lake Elsinore.

2.3.9 Region 9—San Diego

The San Diego Regional Board's jurisdiction encompasses all watersheds that drain to the Pacific Ocean from the southern border of the Santa Ana Regional Board's jurisdictional limits to the southern border of California. This region includes portions of San Diego, Riverside, and Orange Counties. Major water bodies in this region include the San Juan, Santa Margarita, San Luis Rey, Carlsbad, San Dieguito, Peñasquitos, San Diego, Pueblo San Diego, Sweet Water, Otay, and Tijuana Rivers and San Diego and Oceanside Harbor bays.

2.4 Number and Location of Anticipated Projects

The number of restoration projects that would be implemented each year under the Order is influenced by factors such as available funding, project proponents' interest in and capacity to submit qualified project applications, project permitting, and construction scheduling. Numerous potential funding sources exist for projects that could use the Order.

The Order could be used by proponents that agree to carry out their projects in conformance with the project-appropriate standards specified later in this chapter and in the associated appendices (Section 2.8, *Programmatic Sideboards, General Protection Measures, and Other Requirements*).

2.5 Authorizations and/or Permits that May Be Required for Restoration Projects

Participants must obtain any other necessary permits or authorizations from appropriate agencies before the start of a project. Any revisions made to a project as part of a permit or authorization process after submittal of a Notice of Intent (NOI) under the Order would be reviewed by the State Water Board or the applicable Regional Board before final approval. Table 2-1 summarizes other permits and authorizations that may be required.

Table 2-1
Processes, Permits, and Authorizations that May Be Required for Approval of Restoration Projects

Resource	Applicable Laws/Regulations/Permits	Regulating Agency
Multiple	CEQA and NEPA	Public and federal agencies
Wetlands and other waters	Section 404 of the Clean Water Act—individual or general permit	USACE
	Section 10 of the Rivers and Harbors Act—individual or general permit	USACE
	Section 402 of the Clean Water Act—National Pollutant Discharge Elimination System permit(s)	State Water Board and Regional Board

Table 2-1
Processes, Permits, and Authorizations that May Be Required for Approval of Restoration Projects

Resource	Applicable Laws/Regulations/Permits	Regulating Agency
Wetlands and other waters (cont.)	Section 401 of the Clean Water Act—water quality certification (waters of the United States) and waste discharge requirements under the Porter-Cologne Act (all waters of the state, including federal waters)	State Water Board and Regional Board
	Sections 1600–1607 of the California Fish and Game Code—lake and streambed alteration agreement Habitat Restoration and Enhancement Act	CDFW
Federally listed species	Section 7 of the federal Endangered Species Act—Section 7 consultation Section 10 of the federal Endangered Species Act—habitat conservation plan	USFWS, NMFS, and NOAA RC
Essential Fish Habitat	Magnuson-Stevens Fishery Conservation and Management Act	NMFS
Fish and wildlife resources	Fish and Wildlife Coordination Act report	USFWS
Cultural resources	Section 106 of the National Historic Preservation Act—consultation	SHPO
State-listed species/ state special-status species	Section 2081 of the California Endangered Species Act—incidental take permit/consistency determination Natural Community Conservation Planning Act Habitat Restoration and Enhancement Act	CDFW
	California Safe Harbor Agreement Program Act	CDFW
	California Native Plant Protection Act	CDFW
Alterations of federal flood protection projects	CFR Title 33, Sections 2018.10 and 408; encroachment permit (CCR Title 23); and Central Valley Flood Protection Board encroachment permit	CVFPB and USACE
	Agreements	Local levee districts

Table 2-1
Processes, Permits, and Authorizations that May Be Required for Approval of Restoration Projects

Resource	Applicable Laws/Regulations/Permits	Regulating Agency
Floodplains designated as Special Flood Hazard Area (SFHA)	Permit for Floodplain Development is required before construction or development begins within any SFHA	Federal Emergency Management Agency or local county/city jurisdiction
Sacramento–San Joaquin Delta and Suisun Marsh	Delta Reform Act of 2009	Delta Stewardship Council
Restoration projects are required to demonstrate consistency with the Delta Plan and its mitigation measures when carrying out, approving, or funding a 'covered action' defined by the Delta Plan	Delta Plan Certification of Consistency (Water Code Sections 85057.5 and 85225)	Delta Stewardship Council
San Francisco Bay, its shoreline, and Suisun Marsh	Coastal Zone Management Act, McAteer-Petris Act, San Francisco Bay Plan, and other local plans	San Francisco Bay Conservation and Development Commission
Coastal Zone	Federal Coastal Zone Management Act	California Coastal Commission
	California Coastal Act	
State lands	Land use lease	State Lands Commission
Transportation infrastructure and utilities	Encroachment permit	Caltrans, various utility companies, railroads, local and county roads, etc.
Other	Local grading, building, land use, and other permits	City and county departments

SOURCE: Data compiled by Environmental Science Associates in 2019

Table 2-1
Processes, Permits, and Authorizations that May Be Required for Approval of Restoration Projects

NOTES: Caltrans = California Department of Transportation; CCR = California Code of Regulations; CDFW = California Department of Fish and Wildlife; CEQA = California Environmental Quality Act; CFR = Code of Federal Regulations; CVFPB = Central Valley Flood Protection Board; NEPA = National Environmental Policy Act; NMFS = National Marine Fisheries Service; NOAA RC = National Oceanic and Atmospheric Administration Fisheries Restoration Center; Porter-Cologne Act = Porter-Cologne Water Quality Control Act; Regional Board = Regional Water Quality Control Board; SHPO = State Historic Preservation Officer; State Water Board = State Water Resources Control Board; USACE = U.S. Army Corps of Engineers; USFWS = U.S. Fish and Wildlife Service

2.6 Categories of Restoration Projects in the Order

The Order addresses restoration practices that require Section 401 water quality certification and/or waste discharge requirements. Sections 2.6.1 through 2.6.10 below present detailed descriptions of the categories of restoration project types eligible for enrollment under the Order. Each project category discussion briefly summarizes the project purpose, describes different activities and/or subproject types, and summarizes typical construction activities associated with projects falling into that category. Section 2.7 describes typical construction activities and methods in greater detail.

During the Order enrollment process, the approving Water Boards will determine whether an individual restoration project is eligible for enrollment under the Order. (Section 1.1, *Introduction and Overview of the Order*, for the Order's definition of a restoration project.) All projects permitted under the Order must also incorporate applicable general protection measures into their project design to ensure avoidance and minimization of impacts on sensitive resources.

Species protection measures have been included in this PEIR which include avoidance and/or minimization measures developed specifically to address individual covered species or covered species guilds, based upon unique life history and habitat requirements. Further, design guidelines have been developed to help project proponents ensure that projects are designed, during the development of their individual projects, in a manner that is appropriate and sustainable, minimizes adverse effects on aquatic habitats, maximizes the ecological benefits of the restoration, and is consistent with multiple permitting agency regulatory practices (e.g., CDFW, NMFS, USFWS). A list of general protection measures can be found in Section 2.8.2, *General Protection Measures,* and Appendix E. A list of species protection measures can be found in Section 2.10, *Species Protection Measures*, and Appendix F. See Appendix E for a detailed description of design guidelines.

2.6.1 Improvements to Stream Crossings and Fish Passage

Improvements to stream crossings and fish passage, including fish screens, provide a number of ecological benefits. For example, they provide safe passage for migratory

and nonmigratory species, beneficial transport of sediment and debris, and improved hydrology and hydraulics. Stream crossing and fish passage improvements must be consistent with NMFS and CDFW fish passage criteria.

Stream Crossings, Culverts, and Bridges

Stream crossing, culvert, and bridge projects generally involve removing, replacing, modifying, retrofitting, installing, or resetting existing culverts, fords, bridges, and other stream crossings and water control structures of any size. This includes projects that are developed to upgrade undersized, deteriorated, or misaligned culverts.

Projects to replace culverts or bridges are ineligible for coverage under the Order if they will not increase aquatic or riparian resource functions and/or services. Bridges and culverts should be designed to adequately convey flow and materials (e.g., the 100-year flood) in addition to allowing fish passage. Any new or replacement crossing, culvert, or bridge that intersects potential habitat for listed salmonid species, also must meet CDFW and/or NMFS fish passage criteria, as applicable. If a bridge or culvert is designed to convey less than the 100-year design flow, the project should demonstrate that a smaller culvert will not result in excessive flooding, erosion/sedimentation, headcutting,[1] or habitat impacts.

Constructing or installing a stream crossing, culvert, or bridge may include site excavation, formation and pouring of a concrete foundation and walls/abutments, and installation of the crossing structure as well as placement of bioengineered and/or rock slope protection (RSP) to protect abutments, piers, and walls. Where RSP is deemed necessary, use natural stream material to fill and cover exposed rock and/or use bioengineered techniques, listed below, where appropriate.

Fish Screens

Projects in this category involve installing, operating, and maintaining fish screens on water intakes.

Constructing or installing a fish screen usually includes site excavation, formation and pouring of a concrete foundation and walls, and installation of the fish screen structure. Typically, if the fish screen is placed in or near flood-prone areas, rock or other armoring is installed to protect the screen. Fish screen types include self-cleaning screens (including flat plate, rotary drum screens, cone screens, and other designs with a variety of cleaning mechanisms) and non-self-cleaning screens (including tubular, box, and other designs).

All fish screens must be consistent with NMFS fish screening criteria.

Fishways

This project type involves removing, relocating, constructing, repairing, operating, or maintaining fishways. This project type may include riffle-pool complexes (e.g., rock/

[1] Headcut, in stream geomorphology, is an erosional feature of some intermittent and perennial streams with an abrupt vertical drop, also known as a knickpoint, in the stream bed.

boulder ramps) or installation of fishways that bypass passage barriers. Engineered fish ladder structures should be avoided unless there are no other viable alternatives.

Constructing and/or installing fishways usually includes site excavation, formation and pouring of a concrete foundation and walls, pile driving, excavation and installation of an entry and exit channel, and installation of the fishway structure. Heavy equipment is typically used for excavation and preparation of the fishway site.

Headcut Stabilization

Stabilizing headcuts is often required to stabilize the bed of a stream and promote structural sustainability over time. This improvement is also used to stop stream incision, increase connection to the adjacent floodplain, and enhance floodplain inundation.

Construction of these project types typically includes site excavation and may include installation of a control structure (e.g., boulders, earthen fill). Heavy equipment is typically used for excavation.

2.6.2 Removal of Small Dams, Tide Gates, Flood Gates, and Legacy Structures

These projects are designed to reconnect stream corridors, floodplains, and estuaries; establish wetlands; improve passage by aquatic organisms; and restore more natural channel and flow conditions. They also help to restore fisheries access to historic habitat for spawning and rearing and improve the long-term quality of aquatic habitat and stream geomorphology. All projects must be designed with seasonal construction considerations to minimize potential adverse effects on water quality and/or aquatic species.

This project type involves removing small dams, tide gates, flood gates, and legacy structures to improve fish and wildlife migration, tidal and freshwater circulation and flow, and water quality. This project type may also include separation of streams from artificial impoundments (e.g., ponds or lakes) by realigning and/or rerouting channels around these artificial water bodies and/or through the use of vertical concrete or sheet-pile walls.

Removal of Small Dams

Small dams are removed to restore fisheries access to historic habitat for spawning and rearing and to improve long-term habitat quality and natural stream geomorphology. Types of eligible small dams include permanent, flashboard, debris basin, earthen, and seasonal dams that have the characteristics listed below.

Consistent with the NMFS programmatic restoration *Biological Opinion to Facilitate Implementation of Restoration Projects in the Central Valley* (NMFS 2018), small dams included in the Order are those defined by the California Division of Dam Safety as dams of non-jurisdictional size. Those dams are smaller in height or impounding capacity than dams as defined by California Water Code Section 2002 (Division 3, Part 1, Chapter 1, 6002), where “dam” means:

> *Any artificial barrier, together with appurtenant works, which does or may impound or divert water, and which either (a) is or will be 25 feet or more in height from the natural bed of the stream or watercourse at the*

> *downstream toe of the barrier, as determined by the department, or from the lowest elevation of the outside limit of the barrier, as determined by the department, if it is not across a stream channel or watercourse, to the maximum possible water storage elevation or (b) has or will have an impounding capacity of 50 acre-feet or more.*

In addition to the Order prohibitions related to water rights, dams under Federal Energy Regulatory Commission (FERC) jurisdiction are also generally not eligible for removal under the Order because they are generally much greater in size than the proposed size criteria found in Water Code Section 6002.

Implementing small dam removal projects may require the use of heavy equipment (e.g., self-propelled logging yarders, mechanical excavators, backhoes). Some small dams can be removed using hand tools such as jackhammers. Any use of explosives for removal of a small dam must be justified by individual restoration project conditions including equipment access difficulties. The use of explosives must occur in dry or dewatered conditions and potential harm to salmon, steelhead, and other aquatic species from the explosives blast and pressure waves must be analyzed. Using explosives is an eligible activity; however, this approach would also require additional review and approval by appropriate regulatory agencies.

Projects meeting any of the following conditions are ineligible for coverage under the Order:

- Projects involving dams licensed under FERC that have not received authorization from the Director of the State Water Board Division of Water Rights;
- Sediments stored behind the dam have a reasonable potential to contain environmental contaminants (dioxins, chlorinated pesticides, polychlorinated biphenyls [i.e., PCBs], or mercury) beyond the freshwater probable effect levels summarized in the National Oceanic and Atmospheric Administration Screening Quick Reference Table guidelines (NOAA 2008); OR
- Projects that require more detailed analysis based on the risk of significant loss or degradation of downstream spawning or rearing areas by sediment deposition.

Sites are considered to have a reasonable potential to contain contaminants of concern if they are downstream of historical contamination sources such as lumber or paper mills, industrial sites, mining sites, or intensive agricultural production going back several decades (i.e., since chlorinated pesticides were legal to purchase and use). Therefore, preliminary sediment sampling is advisable in these areas to determine whether a project is eligible for coverage under the Order.

Conversely, small dams that do not have historical contamination sources in the upstream watershed are considered to have low potential to contain contaminants; therefore, they could be considered low risk with reduced sediment sampling and evaluation.

The Order will only include dam removal that will restore natural contours upstream, naturally or with excavation, to minimize negative effects on downstream habitat. Dam

removal projects will (1) have a volume of sediment available for release that is small relative to the size of the stream channel, and that when released by storm flows, will have minimal effects on downstream habitat as verified by a qualified and appropriate scientist and engineer, and reviewed by either CDFW or NMFS engineers, or (2) are designed to remove sediment trapped by the dam down to the elevation of the target thalweg including design channel and floodplain dimensions.

Removal of Tide Gates and Flood Gates

Removal of or upgrades to existing tide and flood gates involve modifying gate components and mechanisms in tidal stream systems where full tidal exchange is incompatible with the current land use (e.g., where high-tide backwater effects are of concern). Tide/flood gate replacement or retrofitting may include such activities as installation of temporary cofferdams and dewatering pumps, and excavation of existing channels, adjacent floodplains, flood channels, and wetlands, and may include structural elements such as streambank restoration and hydraulic roughness.

The placement of new gates where they did not previously exist is not eligible for coverage under the Order. The replacement of tide gates is eligible only if project proponents can demonstrate that such a replacement would increase or enhance ecological processes. Tide and flood gates may be plugged by removing the culvert and backfilling the berm or levee to prevent fish from accessing unsuitable habitat.

Excavators, cranes, boats, barges, pumps, dump trucks, and similar equipment are typically used to implement the projects in this category.

Removal of Legacy Structures

This activity includes the removal of nonfunctioning in-channel and floodplain legacy habitat structures (e.g., grade control structures, and defunct boulder weirs) to improve water quality and channel geomorphology.

Removal of legacy structures may require the use of excavators, cranes, dump trucks, vibratory pile drivers, and similar equipment.

2.6.3 Bioengineered Bank Stabilization

Bioengineered bank stabilization projects improve riparian and stream habitat by increasing stream shade to lower stream temperatures, production of invertebrates, future recruitment of large woody material, and bank stability. Riparian habitat restoration projects increase the number of plants and plant groupings, and include natural regeneration, exclusion fencing for livestock, bioengineering, and revegetation.

To improve aquatic and riparian habitats and reduce soil erosion and sedimentation of streams and wetlands, bioengineered bank stabilization integrates living woody and herbaceous materials with earthwork and recontouring of streambanks. Both organic and inorganic materials are put into place to stabilize and improve the structure of the soil where site constraints limit opportunities for natural channel meander. Bank stabilization structures that use bioengineering techniques minimize many of the impacts on aquatic resources commonly caused by traditional or conventional engineered bank

structures. Examples of bioengineering project types include revetment[2] consisting of trees, native plant materials, or willow walls, and willow siltation baffles, brush mattresses, brush check dams, and brush bundles. Bioengineered project types may also include the placement of buried riprap[3] with soil and vegetation plantings on top.

Bioengineered bank stabilization techniques use a minimal amount of hard materials (e.g., rock) and are not intended to include traditional hard engineering techniques, which would not be permitted under the Order. Part XI, *Riparian Habitat Restoration,* of the CDFW *California Salmonid Stream Habitat Restoration Manual (Flosi et al. 2010: Vol. II)* identifies examples of techniques that would be permitted under the Order.

Bioengineered bank stabilization structures are suitable for many low-order, low-gradient stream segments where the channel is not aggrading[4] or degrading[5] rapidly, and where sufficient space is available to reshape the eroding bank to an appropriate slope. The Order would not cover projects that merely protect property from bank erosion; however, many restoration project types, including multi-benefit projects that include bioengineered bank stabilization, would be eligible for coverage under the Order.

The use of boulders should be limited in scope and quantity to the minimum necessary to stabilize the slope and protect it from expected streamflows during storms. Boulder structures should be part of a larger restoration design with the primary purpose of improving habitat, and should include a riparian revegetation element. Bridge abutments and other structural improvements installed as part of the restoration design of fish passage projects may require additional stabilization with boulder and rock banks.

Guidelines for streambank stabilization techniques are described in Part VII, *Project Implementation,* of the CDFW *Riparian Habitat Restoration Manual* (Flosi et al. 2010: Vol. I or subsequent updates).

Projects in this category may require the use of heavy equipment (e.g., self-propelled logging yarders, excavators, backhoes, and/or dump trucks).

2.6.4 Restoration and Enhancement of Off-Channel and Side-Channel Habitat

Restoring and enhancing off-channel and side-channel habitat features helps to improve aquatic and riparian habitat for fish and wildlife. Restoration project types in this category have the following benefits:

- Increase habitat diversity and complexity
- Improve heterogeneity (e.g., nonuniform character) of flows
- Provide long-term nutrient storage and substrate for aquatic macroinvertebrates
- Moderate flow disturbances

[2] Revetments are sloping structures placed on banks or cliffs in such a way as to absorb the energy of incoming water.
[3] Riprap is placed rock or other material used to armor shorelines and streambeds against scour and water, wave erosion.
[4] A stream becoming increasingly shallow as a result of sediment deposition.
[5] A stream actively deepening its channel and capable of transporting more sediment load than is presently provided.

- Increase retention of leaf litter
- Provide refuge for fish during high flows

Projects proposed for side-channel or off-channel habitat also typically improve hydrologic connections between main channels and their floodplains.

This project category typically involves reconnecting and creating side-channel, alcove, oxbow, pond, off-channel, floodplain, and other habitats, and potentially removing off-channel fill and plugs. New side channels and alcoves may be constructed in geomorphic settings that accommodate such features. This activity category typically applies to areas where side channels, alcoves, and other backwater habitats have been filled or blocked from the main channel, disconnecting them from most if not all flow events.

Work may involve removing or breaching levees, berms, and dikes; excavating channels; constructing wooden or rock tailwater[6] control structures; and constructing large wood habitat features.

The use of logs or boulders as stationary water-level control structures is an eligible project element under the Order. With the exception of offstream storage projects to reduce low-flow stream diversions, projects involving the permanent installation of a flashboard dam, head gate, or other mechanical structure are not eligible for coverage under the Order.

Excavators, bulldozers, dump trucks, front-end loaders, and similar equipment may be used to implement projects.

2.6.5 Water Conservation

Creation, operation, and maintenance of water conservation projects, including offstream storage tanks and ponds and associated off-channel infrastructure, reduce low-flow stream diversions and enhance streamflows, particularly base flows for fish and wildlife habitat during the dry season. These projects typically require placing infrastructure (e.g., pumps, piping, screens, and headgates) in or adjacent to the stream to provide alternative water intake facilities. Exclusion fencing may be constructed to manage grazing in aquatic and riparian habitat as described in Section 2.6.10, *Establishment, Restoration, and Enhancement of Stream and Riparian Habitat and Upslope Watershed Sites*.

Other projects in this category include piping ditches to create a more efficient use of water where the water saved will be dedicated to fish and wildlife under the terms of California Water Code Section 1707 or forbearance agreements. These projects are designed to improve streamflow and riparian habitat for fish and wildlife. Excavators and other heavy equipment may be used to implement the projects.

[6] Water body located downstream of a dam or other barrier.

2.6.6 Floodplain Restoration

Project types in this category improve the diversity and complexity of aquatic, meadow, and riparian habitat, as well as ecosystem function, because they have the following effects:

- Provide opportunities for sediment to deposit on the floodplain seasonally, which enhances meadow vegetation, use by birds and mammals, and fish rearing and spawning; and also provide refuge from predators and physical stressors.
- Create intermittent hydrologic connections between streams and floodplains.
- Increase floodway capacity and the frequency and duration of floodway inundation.
- Improve ecosystem functions for aquatic and terrestrial species and also improve water quality.
- Reconnect stream channels to floodplains, thus improving the fluvial dynamics of the watershed system; for example, by allowing normal patterns of sediment deposition and transport, as well as channel migration.
- Reduce or eliminate areas that strand native fish or provide habitat for nonnative predatory fish, or both.
- Provide high-flow and thermal refuges for native fish and other aquatic species.

Floodplains should mimic natural flooding patterns and remain flooded/inundated long enough to activate food webs. Floodplain restoration can involve rock placement, specifically as engineered stream material, riffle ramps, weirs, and other strategies to aggrade the channel and enable connectivity to floodplains.

Floodplain restoration projects may be implemented through various strategies. Some involve setback, breaching, and removal of levees, berms, and dikes, and excavation and/or fill for hydraulic reconnection (including restoration to stage zero[7]) and revegetation.

Levee setback projects involve constructing new levees to facilitate removal or breaching of existing levees and creation of aquatic or riparian habitat. This project type may also include filling and/or reshaping of on- and off-channel gravel pits. Levees may be adjusted or a low levee bench may be created to allow for tidal inundation or channel margin habitat.

Floodplain projects may also reconnect historical stream and river channels and freshwater deltas with floodplains, and reconnecting historical estuaries to tidal influence, through levee removal, setback, and breaching or construction of floodplain surfaces that connect at base flow. Floodplain restoration projects may be planned where floodplains and estuaries have been disconnected from adjacent streams and rivers.

[7] Streams that are fully connected with their floodplains; typically multi-thread.

Meadow and floodplain restoration may involve reconnecting down-cut channels to their floodplains to restore hydrologic processes and meadow health; filling incised, entrenched channels; creating new stream channels; regrading floodplains; or realigning channels or installing stabilization structures. Incised channels should only be filled if the watershed conditions that triggered incision have been considered and would not result in continued incision (project failure) and/or can be mitigated by the project. These restoration actions may rely on watershed processes to complete work over time to restore a channel network and floodplain that supports wetlands or grasslands.

Project proposals to create off-channel or side-channel habitats, floodplain restoration will include as appropriate information regarding considerations for water supply (channel flow, overland flow, and groundwater), water quality, and reliability; risks of channel changes; and channel and hydraulic grade.

Excavators, bulldozers, dump trucks, front-end loaders, and similar equipment may be used to implement these projects.

2.6.7 Removal or Remediation of Pilings and Other In-Water Structures

Untreated and chemically treated wood pilings, piers, vessels, boat docks, derelict seawalls (within embayments), derelict fishing gear, and similar structures built using plastic, concrete, and other materials, may be removed and/or remediated to improve water quality and habitat for fish and wildlife. These projects are designed to remove contaminant sources and hazards from stream, river, lake, and estuary habitats.

Boats, barges, excavators, dump trucks, front-end loaders, and similar equipment may be used to implement these projects.

2.6.8 Removal of Nonnative Terrestrial and Aquatic Invasive Species and Revegetation with Native Plants

Removing nonnative terrestrial and aquatic invasive species and/or revegetating with native plants improves aquatic, riparian, and wetland habitat for fish and wildlife in a variety of ways. These projects are designed to improve or provide the following benefits:

- Composition, structure, and abundance of native biological communities important for bank stability
- Stream shading, riparian canopy, and understory establishment and diversity
- Input of large wood and other organic material into streams
- Nesting and roosting habitat
- Reduction of soil erosion
- Water quality improvement
- Greater dune stability and habitat complexity
- Improved soil health
- Other ecological benefits, all of which are important elements of species habitat and water quality

Removal of Nonnative Terrestrial and Aquatic Invasive Species

Manual, mechanical, biological, and chemical methods can be used independently or in combination to remove invasive nonnative species from aquatic and riparian areas. Sites with a variety of invasive species may receive several different types of treatments. If chemical methods are used, the treatment will need to comply with labeling, application by qualified individuals (when required), as well as any required buffers from aquatic areas, and/or additional authorizations, such as a National Pollutant Discharge Elimination System (NPDES) permit, as applicable.

This project type also includes removal and/or management of nonnative predatory fish and other nonnative fish and wildlife, as long as the activity is associated with a restoration project.

Revegetation with Native Plants

Revegetation with native plants should mimic the area's naturally occurring riparian and aquatic habitats and use seed or plant stock from the local watershed. Activities may include:

- Planting and seeding native trees, shrubs, and herbaceous plants
- Placing sedges, rushes, grasses, succulents, forbs, and other native vegetation
- Gathering and installing willow cuttings, stakes, mats, and fences
- Temporary irrigation
- Coordination with upstream operators to control dam releases or instream flow levels to provide water during plant establishment

2.6.9 Establishment, Restoration, and Enhancement of Tidal, Subtidal, and Freshwater Wetlands

Establishing, restoring, and enhancing tidal, subtidal, and freshwater wetlands results in more wetland area, increased primary and secondary ecological productivity, and more diversity of habitat.

This project type generally involves grading (e.g., creating depressions, berms, and drainage features), installing related infrastructure (e.g., water control structures, siphons, sills, etc.), and/or breaching (e.g., excavating breaks in levees, dikes, and/or berms), or both, to create topography, improve water management capabilities, and/or improve hydrology that:

- Facilitates water delivery and conveyance to benefit aquatic species, wildlife, or wetland vegetative response
- Supports native wetland plants (planted or recruited naturally)
- Provides habitat elements for target species
- Provides other targeted wetland functions
- Allows fish and other aquatic species to use channel networks and marsh plains with hydrologic variability (seasonally or tidally)
- Provides hydrologic connectivity to local, low-lying subwatershed areas

These projects also establish, maintain, restore, or enhance off-channel and vernal pools to support habitat for amphibians or vernal pools, which support plants and animals.

Project types in this category also create ecotones (transitional zones between two habitat or community types [aquatic/upland interface]) and/or “living shorelines” that could use fill and excavation with native vegetation (submerged and/or emergent), alone or in combination with offshore sills (e.g., artificial reefs), to stabilize the shoreline.

Creation of ecotones could require extensive beneficial fill and have the potential to affect adjacent existing wetlands; however, these projects are necessary to allow tidal wetlands to respond to sea level rise, and they provide refuge for native wildlife and buffer wetlands from adjacent municipal and industrial land uses.

Living shorelines can provide a natural alternative to “hard” shoreline stabilization methods like stone sills or bulkheads; they provide numerous ecological benefits including water quality improvements, habitat for fish and invertebrates, and buffering of the shoreline from waves and storms.

Living shoreline projects use a suite of habitat restoration techniques to reinforce the shoreline, minimize coastal erosion, and maintain coastal processes while protecting, restoring, enhancing, and creating natural habitat for fish and aquatic plants and wildlife (e.g., wetlands, dunes, beaches, seaweed beds, rocky intertidal areas). The term “living shorelines” was coined because the approach provides living space for estuarine and coastal organisms. Strategic placement of native vegetation and natural materials or shells for native shellfish settlement enhances habitat values by creating new living space. The techniques also increase the connectivity of wetlands and deeper intertidal and subtidal lands while providing a measure of shoreline protection.

Living shoreline design strategies can use rock armoring, rock sill, groin, or breakwater installations only if the use of such design strategies is integral to the restoration basis of the design.

Project types in this category include excavation, removal, and/or placement of fill materials to restore or approximate pre-disturbance site conditions; contouring wetlands to establish more natural topography, hydrology, and/or hydraulics; and setting back, modifying, or breaching existing dikes, berms, and levees.

This project category may also include:

- Constructing transitional tidal marsh habitat (i.e., “horizontal levees,” setback berms, or ecotones slopes, including revegetation and enhancement work in the associated upland transition, intertidal, and subtidal habitat zones)
- Thin-layer sediment augmentation for tidal marshes and nearshore habitat adaptation to rising sea levels (e.g., USFWS Salt Marsh Sediment Augmentation Project – Seal Beach)

- Biological enhancements to pilings, piers, and docks (e.g., wrapping pilings, and attaching tiles and ledges to increase surface area for intertidal and subtidal species)
- Biological enhancements to estuarine and coastal shoreline stabilization structures and other nature-based solutions
- Backfilling artificial channels
- Removing existing drainage structures, such as drain tiles
- Filling, blocking, or reshaping drainage ditches to restore wetland hydrology
- Establishing tidal/fluvial channels and wetlands in tidal waters where those wetlands previously existed, or have migrated or will migrate as a result of sea level rise
- Installing structures or fill necessary to establish wetland or stream hydrology
- Constructing nesting/planting islands
- Beach renourishment
- Constructing open water areas
- Constructing noncommercial, native oyster habitat (e.g., reefs) over an unvegetated bottom in tidal waters
- Conducting noncommercial, native shellfish seeding
- Establishing submerged aquatic vegetation (e.g., eelgrass beds) in areas where those plant communities previously existed (e.g., San Francisco Bay Eelgrass Restoration)

Activities needed to establish vegetation, including plowing or disking for preparation of seed beds and planting appropriate wetland species, may also be included.

Project activities that plan for climate change, including sea level rise, should be considered in tidally influenced locations. California's Climate Adaptation Strategy recommends using ecotones and living shorelines as a potential adaptation method to reduce the need for engineered "hard" shoreline protection devices and to provide valuable, functional coastal habitat (CNRA 2018). The California State Coastal Conservancy's Climate Change Policy also supports the use of living shorelines for their ability to improve the resiliency of estuarine habitat to future sea level rise and other related effects of climate change (SCC 2011). More information about the benefits of these projects for climate change resilience can be found in sources such as the: San Francisco Bay Subtidal Habitat Goals Report, Baylands Habitat Goals Science Update, USFWS Recovery Plan for Tidal Marsh Ecosystems of Northern and Central California, Wetlands on the Edge: the Future of Southern California's Wetlands [Southern California Wetlands Recovery Project Regional Strategy Update 2018], San Francisco Estuary Adaptation Atlas, San Francisco Estuary Blueprint, San Francisco Estuary Institute & The Aquatic Science Center New Life for Eroding Shorelines Report).

Ecotone habitat levees should be used when new exterior levees are required to protect adjacent landowners from the return of tidal inundation. The project side of the levee should be constructed with areas of longer gentle slopes to accommodate upland refugia for sensitive salt marsh and brackish marsh species during higher tides associated with phenomena such as storm surges and king tide events. In addition, sidecast material should be used during the excavation of new channels to recontour pond bottoms to achieve the desired hydrology. This would include creating islands disconnected from uplands to provide future upland refugia and nesting areas in larger marshes.

Excavators, graders, bulldozers, dump trucks, front-end loaders, boats, barges, and similar equipment may be used to implement these projects.

2.6.10 Establishment, Restoration, and Enhancement of Stream and Riparian Habitat and Upslope Watershed Sites

Stream and Riparian Habitats

Establishing, restoring, and enhancing stream and riparian habitats provides the following benefits:

- Habitat complexity, diversity, and cover for fish and other aquatic species
- Increased spawning and rearing habitat
- Improved migration corridors
- Improved pool habitat and pool-to-riffle ratios
- Restoration of sinuosity
- Improved water quality
- Reconnection of the channel to the floodplain and associated functions

These projects may typically include the following activities:

- Placing large woody material and boulders
- Constructing engineered logjams
- Constructing porous boulder structures and vanes
- Installing small wood structures or beaver dam analogues
- Enhancing vegetation
- Conducting bank stabilization and erosion control work
- Stabilizing headcuts
- Augmenting and placing gravel
- Removing and replacing concrete-lined channels with natural materials

Project activities may also include excavating, sorting, placing, and contouring existing on-site materials (e.g., historic mine tailings) on perched floodplains and in channels to reconnect those habitats and improve spawning and rearing conditions.

Project types in this category typically occur in areas where channel structure is lacking because of past stream cleaning (removal of large woody material), riparian timber harvest, historic grazing and meadow dewatering practices, hydromodification, or urbanization, and in areas where natural gravel supplies are low as a result of human-caused disruptions. These projects occur in stream channels and adjacent floodplains to increase channel stability, rearing habitat, pool formation, deposition of spawning

gravel, channel complexity, hiding cover, low-velocity areas, and floodplain function. Helicopters, excavators, dump trucks, front-end loaders, full-suspension yarders, and similar equipment may be used to implement these projects.

Engineered logjams are large wood structures that include an anchoring system, such as rebar pinning, ballast rock, or vertical posts. These structures are designed to redirect flows and change scour and deposition patterns. To the extent practical, they are patterned after stable natural logjams and can be anchored in place using rebar, rock, or piles (driven into a dewatered area or the streambank, but not in water). Engineered logjams create a hydraulic shadow (low-velocity zone downstream) that allows sediment to settle. Scour holes develop adjacent to the engineered logjam. While providing valuable fish and wildlife habitat, they also redirect flow and can stabilize a streambank or downstream gravel bar.

Large woody material may be installed using either anchored or unanchored logs, or both, depending on site conditions and wood availability. Wood loading methods may include but are not limited to direct felling, whole-tree tipping and placement, use of helicopters, use of excavators, and grip hoisting.

Establishment, restoration, and enhancement of stream habitats may also include the following activities:

- Removing revetment and other streambank armoring materials
- Installing grade control structures using native/natural materials to improve general habitat and water quality, thus allowing establishment of native vegetation for birds, fish, and other species
- Improving stream morphology and channel dynamics; restoring sediment input and retention balance; and improving water quality
- Placing boulder structures (e.g., roughened channels, boulder ramps/riffle ramps, boulder weirs, vortex boulder weirs, boulder clusters, and single and opposing boulder wing deflectors)
- Placing imported spawning gravel

In addition, infrastructure located along streams and in riparian areas may be removed or relocated. The primary purpose of infrastructure removal is to eliminate or reduce impacts on riparian areas and vegetation, improve bank stability, reduce erosion, reduce sedimentation into adjacent streams, and provide for native revegetation or natural native plant recruitment. Among the types of infrastructure that could be removed or relocated are boat docks, boat haul-out locations, campgrounds and campsites, day-use sites, roads/trails, off-highway/off-road vehicle routes, and legacy railroad grades that affect aquatic resources or riparian habitat. See Section 2.6.7, *Removal or Remediation of Pilings and Other In-Water Structures*, for further detail on removal of in-water structures.

Upslope Watershed Sites

Sites in upslope watershed areas may be restored to reduce the delivery of sediment to streams, promote natural hydrologic processes, and restore habitats for birds,

amphibians, fish, and other species. This project type also includes road- and trail-related restoration including decommissioning, upgrading, and storm-proofing of roads and trails. The following are some of the specific techniques that may be used:

- Removing, installing, or upgrading culverts
- Constructing water bars[8] and dips
- Deep-ripping decommissioned roadbeds
- Reshaping road prisms to improve watershed functions
- Vegetating fill, cut slopes, and roadbeds
- Removing and stabilizing sidecast materials
- Grading or resurfacing roads and trails that have been improved for aquatic restoration, using gravel, bark chips, or other permeable materials
- Shaping the contours of the road or trail base
- Removing road fill to native soils
- Installing new culverts under trails or roads to reduce ditch length
- Stabilizing the soil and tilling compacted soils to establish native vegetation

These actions target priority roads and trails that contribute sediment to streams or disrupt floodplain and riparian functions.

This project type may also include installing exclusion fencing to manage or prevent grazing access to stream and riparian areas to facilitate the establishment of native riparian and stream habitat and the improvement of water quality. This project type includes controlled access to walkways that livestock use to cross streams and adjacent riparian areas. At stream crossings, gravel may be placed above the ordinary high-water mark within the fenced corridor to reduce trail erosion and delivery of sediment to the stream. Upland watering facilities (that do not involve water rights concerns) may be installed to reduce livestock use in riparian areas and stream channels. Planting native plants such as trees, shrubs, forbs, and graminoids may be necessary to manage invasive species and establish a healthy riparian corridor. Such projects reduce impacts of livestock on riparian soils and vegetation, streambanks, channel substrates, and water quality.

Equipment such as excavators, bulldozers, dump trucks, and front-end loaders may be used to implement these projects, which promote water quality and habitat improvement.

2.7 Typical Construction, Operation, and Maintenance Activities and Methods

The Order does not promote construction or operation and maintenance of specific facilities or other specific physical actions by the State Water Board. The State Water Board also does not propose to construct, operate, or undertake specific physical actions. Rather, the Order is designed to permit the actions of project proponents that

[8] A water bar or interceptor dike is a road construction feature that is used to prevent erosion on sloping roads, cleared paths through woodland (for utility companies such as electricity pylons), or other accessways by reducing flow length.

propose to construct habitat restoration projects in accordance with the sideboards, general protection measures, and other requirements of the Order (described in Section 2.8, *Programmatic Sideboards, General Protection Measures, and Other Requirements*).

The precise locations and detailed characteristics of potential future individual restoration projects that may be permitted under the Order are yet to be determined. Therefore, this PEIR 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. This PEIR assumes that the Order is implemented and achieves the desired outcomes. Accordingly, this PEIR evaluates the potential impacts of the types of restoration projects that the Order would encourage and promote in the study area. Once proposals for individual restoration projects consistent with the Order are developed, the lead agencies for the individual restoration projects will evaluate whether the impacts are adequately described in this PEIR, or if necessary, will be evaluated in project-level CEQA documents.

2.7.1 Construction Activities and Methods

Most restoration projects would involve construction activities. These construction activities, in turn, would result in most of the environmental impacts evaluated in this PEIR. The construction activities would be specific to each type of activity, the location of the activity, and numerous other variables related to the unique characteristics of a project.

The magnitude and characteristics of construction activities vary widely, but construction activities for restoration projects share many common features. For that reason, to help support the environmental analysis, this section includes the following basic discussion of commonly encountered construction activities that can be anticipated to take place on many if not most projects permitted under the Order.

Construction Timing

The amount of time needed to construct restoration projects varies from as short as a few days in the case of minor projects to as long as several years in the case of major projects, with activities generally limited to certain months. Major construction activities are typically concentrated during the dry season (May through October), with some mobilization occurring as early as April, aside from some areas such as the upper Sacramento River where the most restrictive in-water work window occurs during the wet season. In-water work activities are typically limited to in-water work windows (Section 2.8.2, *General Protection Measures*). Construction usually occurs only during daylight hours, but in rare cases, some activities may require continuous daytime and nighttime work (e.g., expedited projects, projects where the construction schedule is nearing the flood season).

Depending on weather and river conditions, construction can extend well into November. If a construction phase will extend into the following year’s construction season, the site is secured and “winterized” before the start of the flood season (typically November 15).

Various factors and regulations may influence construction timing. For example, work in floodways may be permitted only during the non-flood season (April 15 to November 15). In addition, work windows may be limited to the “dry season” as part of other regulatory approvals. Construction timing may also be restricted to avoid and minimize effects on federally listed and state listed threatened and endangered species. All construction for projects included in the Order would comply with applicable timing restrictions.

Construction Materials

The volume of soil borrow needed for earthen facilities can vary considerably depending on the project type. Soil borrow available at commercial sites can often be located many miles from the construction site, whereas borrow sites developed specifically for a project can often be near or adjacent to a construction site. In addition, other project construction materials (e.g., gravel, large woody debris) may be located various distances from the construction site.

Equipment Types

Depending on the type and size of the restoration project, the following are some of the types of equipment that may be used:

- Excavators
- Scrapers
- Bulldozers
- Graders
- Dredgers
- Crawlers/wheeled tractors
- Chippers/grinders (to process woody vegetation removed during site preparation)
- Sheepsfoot or tramping-foot rollers (for soil compaction)
- Roller compactors
- Smooth drum compactors
- Water trucks
- Soil and geotechnical bores
- Haul trucks (typically off-highway vehicles)
- Dump trucks
- Front-end loaders
- Cranes
- Barges
- Lubricating and fueling trucks (supporting operation of construction equipment)
- Integrated tool carriers (supporting operation of construction equipment)
- Pickup trucks
- Generators
- Backhoes
- Truck-mounted augers
- Hydroseeding trucks
- Pile drivers and vibratory hammers
- Helicopters

Less complex restoration projects may use only a small number of a few of the types of equipment listed above, whereas more complex restoration projects may use a dozen or more of many of these types of equipment.

Construction Activities

Mobilization

Construction activities begin with a mobilization phase. This phase may involve installing temporary construction offices, setting up staging areas, and transporting equipment and materials to the work site.

Staging Areas

One or more staging areas are typically required for storage and distribution of construction materials and equipment. Staging areas are usually located on or near active construction sites and may be relocated as construction progresses, especially for long, linear restoration projects. Staging areas typically include previously disturbed areas that provide parking for construction workers and may involve acquiring temporary easements from landowners.

Access and Haul Routes

Access and haul routes are designated for hauling materials to and from borrow sites, staging areas, and construction sites. Access routes are also used for employee commuting. These routes typically consist of existing public roads near construction sites; however, new off-road haul routes may also be constructed between borrow sites, staging areas, and construction sites. A minor restoration project may involve only a few trips per day for employee commuting and hauling of equipment and materials. A major restoration project that requires substantial movement of materials (such as levee setbacks to expand floodplains) can require many trips per day to haul material from borrow sites to construction sites. Projects involving construction near the water may use barges to transport personnel as well as equipment and materials, using waterways for access.

Site Preparation

Site preparation typically involves clearing the ground of structures, woody and herbaceous vegetation, and any debris using heavy equipment such as backhoes, excavators, bulldozers, mowers, and dump trucks. Structures to be cleared may consist of residences, agricultural outbuildings, irrigation facilities (distribution boxes, wells, standpipes, and pipes), power poles, utility lines, and piping. The clearing operation may be followed by grubbing operations to remove trees and other vegetation, stumps, root balls, and belowground infrastructure. Soil and geotechnical bores may be conducted to evaluate and/or verify underlying conditions. In addition, earthen material may be stripped from the ground as part of site preparation.

Debris generated during clearing and grubbing operations can be disposed of via various means, depending on the type of material and local conditions. These materials may be hauled off-site to landfills (e.g., building demolition waste), delivered to recycling facilities (e.g., concrete), or sold (e.g., organic material to cogeneration facilities). Excess earthen materials, such as organic soils, vegetation, and excavated material may be temporarily stockpiled before being re-spread at the project site or used to reclaim borrow sites (description below). No excess materials generated during site preparation or other project activities would be disposed of by open burning.

Preparation of Borrow Sites

Borrow sites are areas from which earthen materials would be removed for use in construction. Sites nearest to the construction areas are usually preferred. Using borrow sites near construction areas reduces the potential costs and environmental effects (air pollutant emissions and traffic) of hauling materials to the construction site from

greater distances. In addition, when the borrow site is within approximately one mile of the point of use, scrapers may be used instead of trucks to move soil material from a borrow site to the construction area, thereby reducing the amount of material that must be handled, the associated construction costs, and air pollutant emissions.

Borrow sites are prepared similarly to construction sites and soil samples would be obtained prior to construction to test for contamination of the borrow site, as applicable. After structures and woody vegetation are cleared from the surface, stumps, root balls, and infrastructure are removed from below ground. Typically, the borrow area is then disked to chop any remaining surface vegetation and mixed with the near-surface organic soils. Next, the top layer of earthen material is stripped from the borrow excavation area, and this soil is stockpiled at the borrow site. These soils are typically re-spread on the surface of the borrow site after the borrow has been excavated and the site has been graded to support reclamation. Debris generated during clearing and grubbing that is unsuitable for inclusion in the stockpiled soil is disposed of as appropriate via the various means described above (e.g., hauled off-site to landfills, recycled, or sold for commercial use).

Excavation depths for borrow sites typically range in depth, depending on volume requirements, the quality and extent of material available, and the method of reclaiming the borrow site.

Site Restoration and Demobilization

When construction activities are complete, any material stripped from the soil surface during site preparation is placed on appropriate facilities (e.g., levees) and in any temporarily disturbed areas where topsoil was removed. Temporarily disturbed areas are stabilized, which may include activities such as de-compaction and seeding with appropriate herbaceous native seed mixes (as appropriate). Any remaining construction debris is hauled to an appropriate waste facility. Equipment and materials are removed from the site, and staging areas and any temporary access roads are restored to pre-project conditions (e.g., de-compacted, stabilized with an herbaceous seed mix, planted for restoration to native habitat, and returned to agricultural production). Demobilization is likely to occur in various locations as construction proceeds through larger or linear restoration project areas.

Noncommercial borrow sites are restored or reclaimed by replacing topsoil that has been set aside and regraded to allow for continued uses such as farming, or the sites may be converted to other uses such as other restoration sites.

Disposal of Excess Materials

Excess organic materials consist of woody vegetation, grasses, and roots from borrow areas in restoration construction sites; excavated material that does not meet levee embankment criteria; and soil not used or unsuitable for the earthen structure under construction. Organic materials are typically used to reclaim borrow areas and temporarily disturbed sites, or are provided to local farmers for incorporation into their land to improve soil quality.

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

Construction of the project types permitted under the Order would disturb natural conditions or infrastructure. The following maintenance and monitoring activities may be necessary to support successful establishment of natural conditions:

- Mechanical and chemical weed control
- Control of invasive and other nonnative species, including predatory (e.g., nonnative bass) and nuisance species (e.g., nutria)
- Replanting and reseeding
- Installation of fencing and signage
- Adjustments to grading or soils composition
- Installation and operation of monitoring equipment, including fish counters, flow gauges, depth gauges, cameras, stakes, and similar equipment
- Maintenance and repair of instream structures installed to improve or manage habitat or hydrologic function (e.g., grade control structures, beaver dam analogs, boulder clusters)

Operations and maintenance necessary to support the functionality of constructed infrastructure may include maintenance and cleaning of fish screens, removal of debris and sediment from stream crossings, and maintenance and operation of fishways.

2.8 Programmatic Sideboards, General Protection Measures, and Other Requirements

To qualify for coverage under the Order, projects must meet the appropriate programmatic sideboards, general protection measures, and other conditions described in Sections 2.8.1 through 2.8.4. Section 2.8.5 identifies activities that are prohibited under the Order. Section 2.9 identifies design guidelines that have been developed to help project proponents ensure that the projects are designed in a manner that is appropriate and sustainable, minimizes adverse effects on aquatic resources, maximizes the ecological benefits of the restoration and is consistent with multiple permitting agency regulatory practices (e.g., CDFW, NMFS, USFWS).

2.8.1 Programmatic Sideboards

Individual restoration projects authorized through the Order should be designed, planned, and implemented in a manner that is consistent with the techniques and minimization measures presented in the following guidance documents or manuals, as appropriate to project type:

- CDFW's *California Salmonid Stream Habitat Restoration Manual*, Fourth Edition, Volume II (Flosi et al. 2010), which consists of the following four chapters:
  - Part IX, *Fish Passage Evaluation at Stream Crossings*

  - Part X, *Upslope Assessment and Restoration Practices*
  - Part XI, *Riparian Habitat Restoration*
  - Part XII, *Fish Passage Design and Implementation*

- *CDFW Fisheries Restoration Grant Program guidance documents (http://nrm.dfg.ca.gov/FileHandler.ashx?DocumentID=183423)*
- *NMFS Guidelines for Salmonid Passage at Stream Crossings* (NMFS 2001)
- *NMFS Fish Screening Criteria for Anadromous Salmonids* (NMFS 1997)
- NMFS Science based tools for evaluating stream engineering, management, and restoration proposals (Skidmore et al. 2011)
- Stream Habitat Restoration Guidelines (Cramer 2012)
- Any relevant future updates, guidance, and/or agency requirements, where appropriate

Actions not guided by the above guidance documents or manuals that may be eligible for permitting under the Order include newer, innovative approaches to restoration design that are not yet in the guidance documents or manuals but have demonstrated success. Examples include fishway operation and maintenance, and permanent removal of summer dams and other types of small dams.

The Order requires that all projects implement appropriate general protection measures to reduce the potential for ancillary effects on sensitive resources, including effects on water quality, sensitive habitats, special-status species, and other riparian and aquatic species. These required measures are described in Section 2.8.2, *General Protection Measures*. Project activities (or project types) and related project-specific protection measures are described below.

General administration of the Order will be conducted by the State Water Board. The State Water Board and Regional Boards will be responsible for enrolling individual restoration projects under the Order, as applicable, within their respective jurisdictional boundaries as outlined above. The approving Water Board will have the authority to issue a Notice of Applicability (NOA).

2.8.2 General Protection Measures

All projects permitted under the Order must incorporate *applicable* general protection measures, identified below, to ensure avoidance and minimization of impacts to aquatic/ riparian resources from construction activities. See Appendix E for full descriptions of these general protection measures and design guidelines.

General Protection Measures

- GPM-1: Receipt and Copies of All Permits and Authorizations
- GPM-2: Construction Work Windows
- GPM-3: Construction Hours
- GPM-4: Environmental Awareness Training

- GPM-5: Environmental Monitoring
- GPM-6: Work Area and Speed Limits
- GPM-7: Environmentally Sensitive Areas
- GPM-8: Prevent Spread of Invasive Exotic Plants
- GPM-9: Practices to Prevent Pathogen Contamination
- GPM-10: Equipment Maintenance and Materials Storage
- GPM-11: Material Disposal
- GPM-12: Fugitive Dust Reduction
- GPM-13: Trash Removed Daily
- GPM-14: Project Cleanup after Completion
- GPM-15: Revegetate Disturbed Areas

Water Quality and Hazardous Materials

- 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

In-Water Measures

- 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-5: Cofferdam Construction
- IWW-6: Dewatering/Diversion
- IWW-7: Fish and Aquatic Species Exclusion while Installing Diversion Structures
- IWW-8: Removal of Diversion and Barriers to Flow
- IWW-9: In-Water Pile Driving Plan for Sound Exposure
- 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

Vegetation/Habitat Disturbance and Revegetation, and Herbicide Use

- VHDR-1: Avoidance of Vegetation Disturbance
- 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-5: Revegetation Monitoring and Reporting
- VHDR-6: Herbicide Use
- VHDR-7: Herbicide Application Planning
- VHDR-8: Herbicide Application Reporting

2.8.3 Pre-Application Consultation

The project proponent shall contact the approving Water Board to submit available project information and request a pre-application consultation meeting prior to submittal of the NOI. The approving Water Board may waive pre-application meeting requirement on a case-by-case basis.

Restoration projects can be complex and often benefit from pre-application consultation with the approving Water Board during the early stages of planning and design. During the pre-application consultation meeting, the approving Water Board will review project materials and provide project-specific guidance for navigating the approval process. A site visit may also be conducted at the discretion and request of the approving Water Board. Whether or not a waiver is granted, and/or the extent of the pre-application consultation, will depend on project complexity and development of design and planning.

2.8.4 Projects Requiring Oversight by Other Agencies

The following project types may require additional design review and oversight by other regulatory agency staff and agency engineers, including but not limited to:

- NMFS—for projects where anadromous and/or marine fish considered federal special-status species[9] are present
- USFWS—for projects where freshwater fish and wildlife considered federal special-status species[9] are present
- CDFW—for projects where fish and wildlife considered state special-status species[9] are present

The aforementioned regulatory agencies may impose specific requirements, including but not limited to the following, for certain project types:

- For stream crossing projects, allow passage of the life stages and covered salmonid species historically passing there.
- For retrofit culverts, meet the fish passage criteria for the passage needs of the special-status species and life stages that historically passed through the site before the existence of the road crossing according to NMFS Crossing Guidelines and CDFW stream crossing criteria (Part XII, *Fish Passage Design and Implementation*, of the CDFW *California Salmonid Stream Habitat Restoration Manual* [Flosi et al. 2010:Vol. II]).
- Designs for fishways and culvert replacement or modification projects planned in fish–bearing waterways, reviewed and authorized by a NMFS (or CDFW) fish passage specialist before the start of work.

[9] Special-status species are species that are legally protected or otherwise considered sensitive by federal or state resource agencies (federal Endangered Species Act [FESA], California Endangered Species Act [CESA], or Species of Special Concern) or by local resource agencies.

- Designs for fishways and culvert replacement or modification designs, designed and stamped by a State of California–registered Engineer.
- Designs for fishways, consistent with the fishway design guidelines presented in NMFS's *Anadromous Salmonid Passage Facility Design* (NMFS 2011).
- New fishways, constructed to provide passage conditions suitable for year-round, bidirectional movement by adult and juvenile salmonids.
- New fishways, have a maximum vertical jump of six inches, unless NMFS guidelines are changed.
- Flow patterns in new fishways, be stable, with no water surges.
- Energy dissipation in new fishways, be complete in a step-and-pool fishway, with no carryover from pool to pool.
- Sediment composition and quantity, and effects of sediment transport, evaluated by a qualified geomorphologist for all summer dam removal projects.

2.8.5 Activities Prohibited under the Order

The following activities are not within the scope of the Order, are not analyzed in this PEIR, and will require separate permitting decisions with the State Water Board and/or Regional Boards:

- Use of gabion baskets, boxes, or cages.
- Use of cylindrical riprap (e.g., Aqualogs).
- Use of undersized riprap (e.g., will not remain in place during a 100-year flow event).
- Construction of permanent dams (does not apply to beaver dam analogs) or concrete-lined channels of any sort.
- Use of chemically treated timbers used for grade or channel stabilization structures, bulkheads, or other instream structures.
- Activities that result in long-term, substantial disruption of the movement of those species of aquatic life indigenous to the waterbody, including those species that normally migrate through the project areas (Appendix E includes additional discussion/measures on maintaining passage).
- Elimination of a riffle, pool, or riffle/pool complex that is not replaced/enhanced elsewhere by the project. (Note: In some instances, a restoration project may affect or modify a riffle/pool complex depending on project-specific conditions and design objectives. For example, a culvert removal may affect an existing pool. These types of projects would be allowed under the Order.)

- Water diversions, except to temporarily dewater the construction site of a restoration project. Some water conservation projects would be covered; Section 2.6.5*, Water Conservation*, includes further information.
- With the exception of storage projects to reduce low-flow stream diversions (Section 2.6.5), off-channel/side-channel habitat projects that require the installation of a flashboard dam, head gate, or other mechanical structures.
- Creation or potential creation of a barrier to anadromous fish passage as determined by the NMFS fish passage guidelines (including any associated maintenance activities, or lack thereof).
- Use of riprap bank protection, beyond the minimum amount needed to achieve the project goals as determined by the approving Water Board.
- Installation of infiltration galleries (i.e., subsurface structure, typically including perforated conduits in gravel, to expedite transfer of water to or from a soil).
- Managed surrogate floodplain and managed returned flows that do not allow for volitional movement (ingress and egress) of fish to the main channel (up and/or downstream).

2.9 Design Guidelines

Project type–specific design guidelines have been developed with assistance from multiple regulatory agencies (e.g., CDFW, NMFS, USFWS) to help project proponents during the design development of their individual projects, in a manner that is appropriate and sustainable, minimizes adverse effects on aquatic habitats, and maximizes the ecological benefits of the restoration (Appendix E). For example, these guidelines include designing restored streams in ways that provide fish passage and withstand probable flooding events. The project proponent may modify design approaches that do not conform with the specific guidelines, based on site-specific conditions or technological constraints or advances, or regionally accepted guidance documents.

2.10 Species Protection Measures

For purposes of this CEQA analysis, this PEIR has included a suite of species protection measures that shall be implemented by project proponents, as applicable. Applicable species protection measures are to be implemented in addition to applicable general protection measures, described above (Appendix E), when suitable habitat exists within the currently occupied range of the species and/or a species is determined to be present. Alternative measures, conditions, or technological advances to accommodate individual restoration projects may be proposed by enrollees for regulatory agency approval (NMFS, USFWS, and/or CDFW) approval. See Appendix F for full descriptions of the species protection measures.

Protection measures for special-status species are listed as follows:

- Species protection measures (i.e., measures that generally can apply to all or multiple guilds).

- Species guild protection measures (i.e., subsets of measures that generally can be applied to all species within a given guild; included below).
- All measures, including those for a specific guild, are programmatic; project-specific measures for single or smaller groups of species shall be further developed and evaluated by project proponents based on project-specific conditions with permitting agencies based on individual project-specific conditions.
- The protection measures described for species guilds are generally listed in chronological order of project implementation activities for ease of implementation (e.g., design, surveys, avoidance, work windows, work restrictions, implementation monitoring, and revegetation monitoring).
- Protection measures for plants primarily consist of avoidance measures. When complete avoidance of special-status plant species is not possible, additional protection measures have been included.

2.10.1 Species Protection Measures

- SPM-1: Preconstruction Surveys
- SPM-2: Environmentally Sensitive Areas and/or Wildlife Exclusion
- SPM-3: Species Protection Construction Work Windows
- SPM-4: Species Capture, Handling and Translocation
- SPM-5: Sensitive Species Entrapment Prevention
- SPM-6: Airborne Noise Reduction

2.10.2 Amphibian Species Protection Measures

- AMP-1: Wildlife Passage Design
- AMP-2: Rain Event Limitations
- AMP-3: Pre-Construction Survey
- AMP-4: Disease Prevention and Decontamination
- AMP-5: Lighting
- AMP-6: Clearing and Grubbing Vegetation
- AMP-7: Pump Screens
- AMP-8: Removal of Non-native Species
- AMP-9: Placement of Suitable Erosion Control Material
- AMP-10: Encounters with Species
- AMP-11: Species Observations and Handling Protocol

2.10.3 Reptile Species Protection Measures

- REP-1: Pre-Construction Survey
- REP-2: Environmentally Sensitive Area Fencing
- REP-3: Clearing and Grubbing Vegetation
- REP-4: Prohibited Use of Rodenticides
- REP-5: Species Observations and Encounters
- REP-6: Species Handling and Relocation

2.10.4 Bird Species Protection Measures

- BIRD-1: Habitat Assessment
- BIRD-2: Nest Protection Work Window
- BIRD-3: Work Area Limits
- BIRD-4: Site Access Restrictions
- BIRD-5: Monitoring

2.10.5 Mammal Species Protection Measures

- MAM-1: Conduct Habitat Assessment
- MAM-2: Exclusion Areas
- MAM-3: Use of Handheld Tools
- MAM-4: Species Trapping and Relocating
- MAM-5: Reporting Requirements

2.10.6 Invertebrate Species Protection Measures

- INVERT-1: Implement California Freshwater Shrimp Measures
- INVERT-2: Implement Vernal Pool Branchiopods Measures
- INVERT-3: Implement Valley Elderberry Longhorn Beetle Protocol
- INVERT-4: Implement Delta Green Ground Beetle Protection Measures
- INVERT-5: Implement Butterfly Protection Measures

2.10.7 Fish Species Protection Measures

- FISH-1: Habitat Disturbance Avoidance and Minimization
- FISH-2: Habitat Assessment and Surveys
- FISH-3: Fish Capture and Relocation
- FISH-4: Reporting

2.10.8 Plant Species Protection Measures

- PLANT-1: Habitat Assessment and Surveys
- PLANT-2: Avoidance of Vernal Pool and Other Annual and Perennial Species
- PLANT-3: Exclusion Buffer Establishment
- PLANT-4: Work Restrictions in the Exclusion Buffer
- PLANT-5: Biological Monitoring
- PLANT-6: Herbicide Application, Clearing, and Ground Disturbance
- PLANT-7[10]: Measures for When Effects Cannot Be Avoided

[10] Staff Note: The PEIR listed Plant-7 in error. There is not a Plant-7 protection measure.