UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
West Coast Region
777 Sonoma Avenue, Room 325
Santa Rosa, California 95404-4731

January 31, 2025 **Refer to NMFS No:** WCRO-2024-01269

Lindsay Vivian
Office Chief
California Department of Transportation, District 4
Office of Biological Sciences and Permits
P.O. Box 23660, MS-8E
Oakland, California 94623-0660

Re: Endangered Species Act Section 7(a)(2) Biological Opinion and Magnuson–Stevens Fishery Conservation and Management Act Essential Fish Habitat Response for the Lagunitas Creek Bridge Replacement Project (04-0G642)

Dear Ms. Vivian:

Thank you for your letter provided on May 15, 2024, requesting initiation of consultation with NOAA's National Marine Fisheries Service (NMFS) pursuant to section 7 of the Endangered Species Act of 1973 (ESA) (16 U.S.C. 1531 et seq.) for the Lagunitas Creek Bridge Replacement Project (04-0G642).[1]

Thank you also for your request for essential fish habitat (EFH) consultation. NMFS reviewed the proposed action for potential effects on EFH pursuant to section 305(b) of the Magnuson-Stevens Fishery Conservation and Management Act (MSA), implementing regulations at 50 CFR 600.920, and agency guidance for use of the ESA consultation process to complete EFH consultation. We have concluded that the action would adversely affect EFH designated under the Pacific Coast Salmon Fisheries Management Plan (FMP). While the proposed action will result in adverse effects to EFH, the proposed project contains measures to minimize, mitigate, or otherwise offset the adverse effects; thus, no EFH Conservation Recommendations are included in this opinion.

The enclosed biological opinion is based on our review of the California Department of Transportation's (Caltrans)[1] proposed project and describes NMFS' analysis of effects on threatened Central California Coastal (CCC) steelhead (*Oncorhynchus mykiss*) and endangered Central California Coastal coho salmon (*Oncorhynchus kisutch*), and their designated critical habitat, in accordance with section 7 of the ESA. In the enclosed biological opinion, and based on the best scientific and commercial information available, NMFS concludes that the proposed

[1] Caltrans is acting as the lead agency for ESA Section 7(a)(2) and MSA Section 305(b) formal consultation under National Environmental Policy Act Assignment from Federal Highway Administration (327 Memorandum of Understanding (MOU) 2022 and 326 MOU 2022). As assigned by the MOUs, Caltrans is responsible for the environmental review, consultation and coordination on this project.

is not likely to jeopardize the continued existence of the CCC coho salmon Evolutionarily Significant Unit (ESU), the CCC steelhead Distinct Population Segment (DPS), nor is the project likely to destroy or adversely modify designated critical habitat for CCC coho salmon and CCC steelhead. However, NMFS anticipates take of CCC coho salmon and CCC steelhead will occur during dewatering, and fish relocation activities as a result of project construction. An incidental take statement with terms and conditions is included within the enclosed biological opinion.

Please contact Elena Meza at (707) 531-0706, or elena.meza@noaa.gov if you have any questions concerning this consultation, or if you require additional information.

Sincerely,

Alecia Van Atta
Assistant Regional Administrator for
California Coastal Office

Enclosure

cc: Robert Blizard, Caltrans, Robert.blizard@dot.ca.gov
copy to efile: FRN 151422WCR2024SR00111

Endangered Species Act Section 7(a)(2) Biological Opinion and Magnuson–Stevens Fishery Conservation and Management Act Essential Fish Habitat Response

Lagunitas Creek Bridge Replacement Project

NMFS Consultation Number: WCRO-2024-01269

Action Agency: California Department of Transportation (Caltrans)

Affected Species and NMFS' Determinations:

ESA-Listed Species	Status	Is Action Likely to Adversely Affect Species?	If likely to adversely affect, Is Action Likely to Jeopardize the Species?	Is Action Likely to Adversely Affect Critical Habitat?	If likely to adversely affect, is Action Likely to Destroy or Adversely Modify Critical Habitat?
Central California Coast Steelhead (*Oncorhynchus mykiss*)	Threatened	Yes	No	Yes	No
Central California Coast Coho Salmon (*Oncorhynchus kisutch*)	Endangered	Yes	No	Yes	No

Fishery Management Plan that Identifies EFH in the Project Area	Does Action Have an Adverse Effect on EFH?	Are EFH Conservation Recommendations Provided?
Pacific Coast Salmon	Yes	No

Consultation Conducted By: National Marine Fisheries Service, West Coast Region

Issued By:

Alecia Van Atta
Assistant Regional Administrator
California Coastal Office

Date: January 31, 2025

TABLE OF CONTENTS

1. INTRODUCTION

This Introduction section provides information relevant to the other sections of this document and is incorporated by reference into Sections 2 and 3, below.

1.1. Background

NOAA's National Marine Fisheries Service (NMFS) prepared the biological opinion (opinion) and incidental take statement (ITS) portions of this document in accordance with section 7(b) of the Endangered Species Act (ESA) of 1973 (16 U.S.C. 1531 et seq.), as amended, and implementing regulations at 50 CFR part 402.

We also completed an essential fish habitat (EFH) consultation on the proposed action, in accordance with section 305(b)(2) of the Magnuson–Stevens Fishery Conservation and Management Act (MSA) (16 U.S.C. 1801 et seq.) and implementing regulations at 50 CFR part 600.

We completed pre-dissemination review of this document using standards for utility, integrity, and objectivity in compliance with applicable guidelines issued under the Data Quality Act (DQA) (section 515 of the Treasury and General Government Appropriations Act for Fiscal Year 2001, Public Law 106-554). The document will be available within two weeks at the NOAA Library Institutional Repository [https://repository.library.noaa.gov/welcome]. A complete record of this consultation is on file at the California Coastal NMFS office in Santa Rosa, California.

1.2. Consultation History

On May 17, 2024, NMFS received an email from the California Department of Transportation (Caltrans) requesting to initiate formal consultation. The email included a letter requesting initiation of formal section 7 consultation, a request to consult on Essential Fish Habitat, construction plan sheets, and a biological assessment that included site photographs, and a hydrology study. After reviewing these materials, NMFS determined that there was insufficient information to initiate the consultation. NMFS requested the following, via email, on June 18, 2024 and July 12, 2024: 1) description of stormwater quantity and quality for pre-and post-project implementation, 2) proposal for post-construction stormwater treatment, 3) updated project description describing newly proposed activities (i.e., pile driving), 4) tree survey information, 5) full set of bridge design plans, 6) text description of proposed mitigation, 7) amount of grout proposed for injection for seismic stabilization and example frack out plan, 8) clarification on the total number of cast-in-drilled hole piles proposed to complete the project, and 9) description of habitat conditions associated with the with culvert proposed for widening.

Between June and August 2024, NMFS and Caltrans met several times via phone, and exchanged several emails, to discuss NMFS' information requests, updates to the project description, and to provide technical assistance. Discussion topics ranged from pile driving thresholds, importance of on-site stormwater treatment and approaches to achieve treatment, and timing to complete the biological opinion. Through these discussions Caltrans elected to remove pile driving as a proposed activity to eliminate impacts to listed species. In addition, Caltrans also developed a novel gutter system to capture and/or divert untreated stormwater runoff from draining directly into Lagunitas Creek, and instead drain to existing vegetation/soils.

On August 26, 2024, Caltrans responded to NMFS' requests via email and provided 95% design plans, more information on stormwater treatment pre- and post-construction, proposed plan for post-construction stormwater treatment, updated biological assessment, a habitat, mitigation, and monitoring plan, and provided responses to clarification requests. NMFS reviewed the information provided and while most of the information requested was provided, there were not enough information to initiate the consultation. On October 1, 2024, NMFS sent out an email requesting an updated project description, survey data on species presence within the action area, and pre-project impervious area, replaced impervious area, net new impervious area, total new impervious area, and post-post impervious area. In addition to the above, NMFS recommended an increase in treatment of stormwater runoff to cover 100% of a 24-hour storm event of the entire surface area of the proposed bridge directly over Lagunitas Creek that achieves a potential treatment rating of "high" given that an endangered species (CCC coho salmon), highly susceptible to stormwater runoff pollutants (i.e., 6PPD-q), is expected within the action area.

On November 13, 2024, Caltrans and NMFS met via teleconference to discuss permanent stormwater treatment on-site, and a verbal agreement was made to incorporate "high" stormwater treatment on-site via an infiltration-type gallery located along the northbound shoulder that would treat stormwater runoff prior to discharging to existing vegetation/soils along the bank. On December 13, 2024, Caltrans provided a memo detailing the proposed location for permanent stormwater treatment, as well as design metrics, inputs, and assumptions. NMFS reviewed this memo and determined that the proposed permanent stormwater treatment was sufficient when considering endangered CCC coho salmon. Finally, on December 23, 2024 NMFS requested a totaling of impervious surfaces associated with the bridge directly over Lagunitas Creek. Caltrans responded to NMFS' request via email on December 23, 2024. NMFS reviewed the information on this same date and determined that there was sufficient information to initiate the consultation. NMFS notified Caltrans via email on December 30, 2024, that the consultation was initiated on December 23, 2024.

Through ongoing coordination, NMFS was able to avoid impacts to listed salmonids associated with impact pile driving, and procured treatment and/or diversion of stormwater runoff from 0.119 acres of impervious surfaces that would have otherwise discharged directly into Lagunitas Creek.

Updates to the regulations governing interagency consultation (50 CFR part 402) were effective on May 6, 2024 (89 Fed. Reg. 24268). We are applying the updated regulations to this consultation. The 2024 regulatory changes, like those from 2019, were intended to improve and clarify the consultation process, and, with one exception from 2024 (offsetting reasonable and prudent measures), were not intended to result in changes to the Services' existing practice in implementing section 7(a)(2) of the Act. 89 Fed. Reg. at 24268; 84 Fed. Reg. at 45015. We have considered the prior rules and affirm that the substantive analysis and conclusions articulated in this biological opinion and incidental take statement would not have been any different under the 2019 regulations or pre-2019 regulations.

1.3. Proposed Federal Action

Under the ESA, "action" means all activities or programs of any kind authorized, funded, or carried out, in whole or in part, by federal agencies (see 50 CFR 402.02). Under the MSA, "federal action" means any action authorized, funded, or undertaken, or proposed to be authorized, funded, or undertaken by a federal agency (see 50 CFR 600.910).

Caltrans proposes to replace the Lagunitas Creek Bridge along State Route 1 (SR-1) in Marin County, California (Figure 1) along the existing alignment to provide the public with a new bridge that will meet current design standards, improve driver safety, and be consistent with the Americans with Disabilities Act (ADA) and the American Association of State Highway and Transportation Officials (AASHTO). The existing Lagunitas Creek Bridge was built in 1929, and is a three-span bridge comprised of a 100-foot steel truss middle span, and two reinforced concrete spans measuring 25 feet on either side. The existing bridge is approximately 150 feet long and 24 feet wide (0.083 acres). The existing bridge does not meet current AASHTO design requirements, is not consistent with the ADA, and is does not meet seismic design standards for roadway safety and live loads. Furthermore, untreated stormwater runoff discharges directly into Lagunitas Creek from the existing bridge scuppers, bridge deck, and surrounding impervious surfaces. SR-1 has an annual average daily traffic (AADT) volume that can be characterized as medium.[2]

The new bridge will be a three-span precast/prestressed bridge, approximately 162 feet long and 42 feet wide (0.110 acres). The roadbed will be 32 feet wide and will be comprised of two 11-foot wide lanes and two 5-foot shoulders (0.160 acres). The new bridge will be supported by a combination of piers (2) and abutments (2). The abutments will consist of four cast-in-drilled-hole (CIDH) piles that will be 42 inches in diameter, and the two piers will consist of two 84-inch diameter CIDH piles, totaling six CIDH piles to support the bridge. To stabilize liquefiable soils and ensure the bridge is seismically stable, permeation grouting (where cementitious grout is injected into soil and below grade) is needed between pier 3 and abutment 4. The project will result in a total of 0.041 acres of permanent impacts to the creek bed and banks resulting from the increased width of the new bridge, and fill associated with the bridge structural elements located only the north side of the bridge. Finally, rootwad revetment and riparian habitat vegetation will be installed along the banks of the creek resulting in 0.012 acres of permanent beneficial impacts (Appendix A).

The entire project is expected to take one construction season to complete and includes the following activities: 1) vegetation removal for temporary staging and access, 2) installation of temporary construction trestles, 3) cofferdam installation, 4) construction of new piers and abutments, 5) demolition of existing bridge and construction of new bridge, 6) installation of grout, 7) lengthening of overflow culvert, 8) installation of drainage improvements and stormwater runoff treatment, and 9) rootwad revetment installation and habitat restoration.

Heavy equipment will be used during construction activities and may include any combination of the following: excavator, hydraulic equipment, drill rigs, cranes, front-end loader, vibratory

[2] High AADT: over 10,000 vehicles per day, Medium AADT: 1,000 – 10,000 vehicles per day, Low AADT: under 1,000 vehicles per day.

hammers, bulldozer, dump trucks, concrete trucks, grader, off road forklift, service trucks and vehicles, asphalt pavers, and rollers.

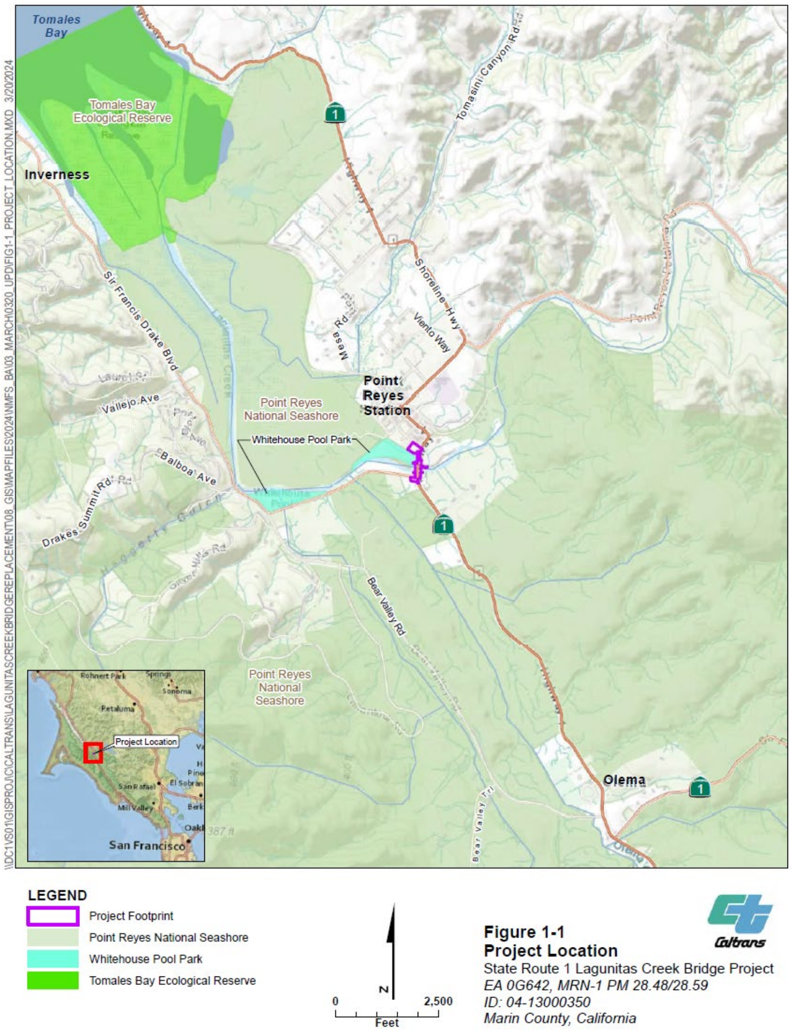

Figure 1. Project Location within Marin County, California

1.3.1. Vegetation Removal and Site Preparation

Vegetation removal (i.e., clearing) is needed to gain access to the site, and construct the new bridge. Clearing involves removing and disposing of all unwanted surface material such as trees, brush, grass, weeds, downed trees, and other materials. Vegetation will be cleared only when necessary, and cut above the existing grade, except in areas that will be excavated for bridge and roadway construction. Vegetation removal will leave stumps and root structure in place to help prevent erosion when not in conflict with new bridge and/or roadway. Two temporary staging areas will be utilized for equipment and materials storage and equipment maintenance during construction; they are located northwest of the bridge at the corner of Third Street and SR-1, and at the southwest corner of Sir Francis Drake Boulevard and SR-1. Both vacant parcels consist primarily of compacted dirt and will require a limited amount of vegetation trimming. Temporary construction easements that extend a maximum of 30 feet beyond the state right of way at all four corners of the bridge will be used to access the creek and substructure, remove existing piers/bridge, and install new piers, abutments, and bridge deck. To complete bridge construction 18 riparian trees will be removed, and 23 riparian trees will be trimmed.

1.3.2. Bridge Demolition and Construction

Following vegetation activities needed to prepare the site, temporary construction trestles will be installed to facilitate construction of the new bridge piers. Trestles are expected to require a maximum of eight 24-inch CIDH H-piles, steel deck beams, and wood decking to construct a stable platform for construction. The CIDH piles will be installed by drilling 24-inch diameter holes to a maximum of 40 feet deep, placing the H-pile, and filling the void with structural concrete. Trestles will be approximately 15 feet wide, and a maximum of 40 feet long. All CIDH piles will be placed outside the channel, on the bank, and above the ordinary high-water mark (OHMW) of Lagunitas Creek. Once trestles are in place, the new bridge piers and abutments will be constructed, using similar methods to the CIDH piles described for the temporary trestles. To minimize the duration of a full bridge closure, advanced bridge construction methods will be utilized wherein, sub-structural elements (i.e., abutments and piers) will be constructed while allowing traffic to use the existing bridge. Once the abutments and piers are in place, the temporary trestles will be removed and/or cut to three feet below grade, and the existing bridge will be closed to traffic while the bridge is dismantled. To remove the existing bridge a debris catchment system will be installed to prevent debris from entering into creek. Once installed, the bridge will either be removed in large pieces, or saw cut into smaller pieces and removed separately. Once detached, the existing bridge will be hauled away and disposed of and/or recycled. Following demolition, new bridge superstructure components (i.e., girders, approach and center spans) will be installed via a crane, starting from both abutments, and moving across the creek toward the center.

1.3.3. Widening of Overflow Culvert

Widening of the top of the culvert located approximately 300 feet north of the Lagunitas Creek bridge is required to meet the new roadbed configuration, accommodate the new bridge rail, and be consistent with Caltrans' current design specifications. The top of the culvert will be widened by one foot and nine inches, on both sides, and will occur in two stages. During stage one, temporary one lane traffic control will be established to isolate the construction area. The existing pavement will be cut and the top of the culvert will be exposed. All excavated material will be stockpiled in one of the two staging areas, or hauled off and disposed of as needed. The culvert top will be widened, and the roadway section backfilled, and then paved. Stage two will be conducted in the same manner but in the opposite roadway direction. Falsework will either be supported from the side of the existing box culvert or placed in the bottom of the box culvert. This culvert functions as an auxiliary flood water discharge during upstream flooding of Lagunitas Creek, and is expected to be dry in the summer when construction will occur. The existing impervious surface area associated with the culvert is 0.25 acres, following the widening of the culvert, impervious surface area will increase by a nominal 0.02 acres (totaling 0.27 acres). Untreated stormwater likely pools on the roadway, due to a small vegetated berm that has accumulated along the shoulder, before discharging into the surrounding vegetated area.

1.3.4. Permeation Grout Injection

A drill rig and grout injection pipe will be used to install the 360 cubic yards of grout, comprised of microfine cement and water slurry, into the ground/soil between pier 3 and abutment 4. Grouting injection holes are spaced on 4-foot centers, and grout will be injected to varying depths ranging from 20 to 4 feet below grade, with shallower depths being placed first, then moving to deeper depths. The grout will be injected into an area measuring 0.031 acres.

1.3.5. Rootwad Installation

Both creek banks, where impacted by construction activities, will be restored or enhanced to create riparian and in-stream habitat that will benefit CCC steelhead and CCC coho salmon. Enhancements include removal of existing fill material from the creek bed and installation of 135 linear feet of double-header log spurs with rootwads, reinforced anchor stones, and revegetation with a mix of native riparian vegetation (Appendix A). All in-stream restoration work will be consistent with the California Salmonid Stream Habitat Restoration Manual, Fourth Edition (or as updated) to ensure an informed design, project evaluation, monitoring, and documentation regarding project performance.

1.3.6. Dewatering

To complete construction dry working areas will need to be created, and while instream construction will be conducted during the dry season when flows are at annual lows (June 15 to October 31), Lagunitas Creek will need to be dewatered. Caltrans will utilize temporary dewatering structures comprised of sheet piles, installed via vibratory hammer, to create cofferdams that will allow for a dry working areas around the location of the new piers. The dewatered areas will be on both banks of Lagunitas Creek and are expected to dewater approximately 0.064 acres in total (Appendix B). Construction activities requiring a dry work area are expected to be completed in one season with one dewatering event. Juvenile CCC steelhead and CCC coho salmon, if present in the work area, will be collected, relocated, and/or excluded from the area prior to dewatering the work site.

1.3.7. Stormwater Treatment and Drainage Improvements

Following construction of the new Lagunitas Creek Bridge, runoff from the southbound bridge deck will be prevented from directly discharging into Lagunitas Creek and will instead drop into a square gutter system via an extension of the deck scupper. From there, runoff from 0.079 acres of impervious surface captured along the southbound shoulder will be conveyed and discharged, via pipe, to existing natural soil/vegetation at least 100 feet away from the mean high-water mark, and 80 feet from the new bridge. Additionally, runoff from 0.04 acres of impervious surface captured in the gutter system along the northbound lane of the bridge deck will drain into an infiltration-type trench where it will treat stormwater runoff prior to discharging to the existing natural soil/vegetation (Appendix C).

Table 1. Impervious Area Associated with Bridge Runoff

Impervious Surface Area	Acres
Pre-project	0.083
Replaced	0.083
Net New	0.036
Total New	0.036
Post-Project	0.119
Post-Project Treatment	0.119

The infiltration-type trench proposed to treat runoff post-construction was designed to minimize and/or prevent stormwater runoff to Lagunitas Creek during an 85th percentile, 24-hour storm event. The infiltration-type trench will be 8 feet wide, 12 feet long, 3 feet deep, and will capture and treat a drainage area of 0.04 acres of impervious surface associated with the bridge directly over Lagunitas Creek (Table 1). In order to prevent migration of water under the pavement side of the infiltration-type trench, an impermeable liner will be included, and may extend along the bottom of the gallery (Appendix C). Although the infiltration-type trench has been designed and sized to capture the runoff volume from the 85th percentile stormwater event, and to drawdown over 48-hours into site soils, an underdrain may be included in the design to promote faster drawdown and prevent ponding on the surface.

Permanent stormwater treatment methods that utilize infiltration, sorption, and effectively capture tire wear particles, such as the proposed infiltration-type trench, have a potential treatment rating of "high" (Washington State Department of Ecology 2022), which is NMFS' recommended treatment level for waterways that support endangered coho salmon. Overall, the project will treat and/or divert runoff from 0.119 acres of impervious surface associated with the bridge directly over Lagunitas Creek, providing treatment and/or avoidance of 100% impervious surfaces associated with bridge runoff (Table 1).

Following construction, runoff from the roadway associated with the widened culvert will no longer pool on the roadway. Following removal of the vegetated berm along the shoulder, runoff will discharge into existing vegetated areas for filtration prior to entering into waterways. While this method does not achieve the preferred "high" treatment rating, and is instead rated as "medium", NMFS recommended this method due to site limitations, and because this method is expected to provide separation of contaminants, including tire wear particles, prior to entering into waterways (Washington State Department of Ecology 2022).

1.3.8. Avoidance and Minimization Measures

Caltrans proposes to include several avoidance and minimization measures (AMMs) that will be implemented before, during, and after construction to prevent and minimize project-related affects to CCC steelhead and CCC coho salmon, and surrounding critical habitat. These measures include working within the in-water work window of June 15 to October 31; ensuring proper handling and relocation of listed salmonids during dewatering and fish exclusion activities; ensuring establishment of revegetation areas; preventing introduction of contaminants into waterways using a debris containment system; ensuring complete removal and proper disposal of all construction waste; implementing erosion control measures; and development of a fish handling and relocation plan, a stormwater pollution prevention plan, a stormwater management plan, and a frack out plan for permeation grouting. A detailed list of the AMMs and additional best management plans (BMPs) are described in Caltrans' Biological Assessment (2024).

We considered, under the ESA, whether or not the proposed action would cause any other activities and determined that it would not.

2. ENDANGERED SPECIES ACT: BIOLOGICAL OPINION AND INCIDENTAL TAKE STATEMENT

The ESA establishes a national program for conserving threatened and endangered species of fish, wildlife, plants, and the habitat upon which they depend. As required by section 7(a)(2) of the ESA, each federal agency must ensure that its actions are not likely to jeopardize the continued existence of endangered or threatened species or to adversely modify or destroy their designated critical habitat. Per the requirements of the ESA, federal action agencies consult with NMFS, and section 7(b)(3) requires that, at the conclusion of consultation, NMFS provide an opinion stating how the agency's actions would affect listed species and their critical habitats. If incidental take is reasonably certain to occur, section 7(b)(4) requires NMFS to provide an ITS that specifies the impact of any incidental taking and includes reasonable and prudent measures (RPMs) and terms and conditions to minimize such impacts.

2.1. Analytical Approach

This biological opinion includes both a jeopardy analysis and an adverse modification analysis. The jeopardy analysis relies upon the regulatory definition of "jeopardize the continued existence of" a listed species, which is "to engage in an action that reasonably would be expected, directly or indirectly, to reduce appreciably the likelihood of both the survival and recovery of a listed species in the wild by reducing the reproduction, numbers, or distribution of that species" (50 CFR 402.02). Therefore, the jeopardy analysis considers both survival and recovery of the species.

This biological opinion also relies on the regulatory definition of "destruction or adverse modification," which "means a direct or indirect alteration that appreciably diminishes the value of critical habitat as a whole for the conservation of a listed species" (50 CFR 402.02).

The designation(s) of critical habitat for CCC steelhead and CCC coho use the term primary constituent element (PCE) or essential features. The 2016 final rule (81 FR 7414; February 11, 2016) that revised the critical habitat regulations (50 CFR 424.12) replaced this term with physical or biological features (PBFs). The shift in terminology does not change the approach used in conducting a "destruction or adverse modification" analysis, which is the same regardless of whether the original designation identified PCEs, PBFs, or essential features. In this biological opinion, we use the term PBF to mean PCE or essential feature, as appropriate for the specific critical habitat.

The ESA Section 7 implementing regulations define effects of the action using the term "consequences" (50 CFR 402.02). As explained in the preamble to the final rule revising the definition and adding this term (84 FR 44976, 44977; August 27, 2019), that revision does not change the scope of our analysis, and in this Opinion, we use the terms "effects" and "consequences" interchangeably.

We use the following approach to determine whether a proposed action is likely to jeopardize listed species or destroy or adversely modify critical habitat:

- Evaluate the rangewide status of the species and critical habitat expected to be adversely affected by the proposed action.
- Evaluate the environmental baseline of the species and critical habitat.
- Evaluate the effects of the proposed action on species and their critical habitat using an exposure–response approach.
- Evaluate cumulative effects.
- In the integration and synthesis, add the effects of the action and cumulative effects to the environmental baseline, and, in light of the status of the species and critical habitat, analyze whether the proposed action is likely to: (1) directly or indirectly reduce appreciably the likelihood of both the survival and recovery of a listed species in the wild by reducing the reproduction, numbers, or distribution of that species; or (2) directly or indirectly result in an alteration that appreciably diminishes the value of critical habitat as a whole for the conservation of a listed species.
- If necessary, suggest a reasonable and prudent alternative to the proposed action.

2.2. Rangewide Status of the Species and Critical Habitat

This opinion examines the status of each species that is likely to be adversely affected by the proposed action. The status is determined by the level of extinction risk that the listed species face, based on parameters considered in documents such as recovery plans, status reviews, and listing decisions. This informs the description of the species' likelihood of both survival and recovery. The species status section also helps to inform the description of the species' "reproduction, numbers, or distribution" for the jeopardy analysis. The opinion also examines the condition of designated critical habitat, evaluates the conservation value of the various watersheds and coastal and marine environments that make up the designated critical habitat, and discusses the function of the PBFs that are essential for the species' conservation.

2.2.1. Species Description and Life History

This biological opinion analyses the effects of the federal action on the following Federally-listed species (Distinct Population Segment (DPS) or Evolutionary Significant Unit (ESU)) and designated critical habitat:

Central California Coast (CCC) steelhead DPS (*Oncorhynchus mykiss*)
Threatened (71 FR 834, January 5, 2006)
Critical habitat (70 FR 52488, September 2, 2005);

Central California Coast (CCC) coho salmon ESU (*O. kisutch*)
Endangered (70 FR 37160; June 28, 2005)
Critical habitat designation (64 FR 24049; May 5, 1999).

The CCC steelhead DPS includes steelhead in coastal California streams from the Russian River to Aptos Creek, and the drainages of Suisun, San Pablo, and San Francisco Bays (72 FR 5248). The CCC coho salmon ESU includes coho from Punta Gorda in northern California south to, and including, Aptos Creek in central California, as well as populations in tributaries to San Francisco Bay, excluding the Sacramento-San Joaquin River System (61 FR 56138).

The action area is within designated critical habitat for CCC steelhead and CCC coho salmon. CCC steelhead critical habitat is designated from the Russian River to the San Lorenzo River to a lateral extent of ordinary high water in freshwater stream reaches, and to extreme high water in estuarine areas. CCC coho salmon critical habitat is designated to include all river reaches assessable to listed coho salmon from Punta Gorda in northern California south to the San Lorenzo River in central California, including Arroyo Corte Madera Del Presidio and Corte Madera Creek, tributaries to San Francisco Bay. Critical habitat consists of the water, substrate, and adjacent riparian zone of estuarine and riverine reaches (including off-channel habitats).

2.2.1.1. General Life History of Listed Species

2.2.1.1.1. CCC Steelhead

Steelhead are the anadromous form of O. mykiss, spawning in freshwater and migrating to marine environments to grow and mature. Steelhead have a complex life history that requires successful transition between life stages across a range of freshwater and marine habitats (i.e., egg-to-fry emergence, juvenile rearing, smolt outmigration, ocean survival, and upstream migration and spawning). Steelhead exhibit a high degree of life history plasticity (Shapovalov and Taft 1954; Thrower et al. 2004; Satterthwaite et al. 2009; Hayes et al. 2012). The occurrence and timing of these transitions are highly variable and generally driven by environmental conditions and resource availability (Satterthwaite et al. 2009; Sogard et al. 2012).

Steelhead are generally divided into two ecotypes based on timing and state of maturity when returning to freshwater: summer-run and winter-run. Summer-run steelhead return to natal streams in spring and early summer while they are still sexually immature and spend several months maturing before spawning in January and February (Nielson and Fountain 2006). Winter-run steelhead enter natal streams as mature adults with well-developed gonads. They typically immigrate between December and April and spawn shortly after reaching spawning grounds (Shapovalov and Taft 1954; Moyle et al. 2008).

Adult steelhead spawn in gravel substrates with low sedimentation and suitable flow velocities. Females lay eggs in redds, where they are quickly fertilized by males and covered. Egg survival depends on oxygenated water circulating through the gravel, facilitating gas exchange and waste removal. Adults usually select spawning sites in pool-riffle transition areas of streams with gravel cobble substrates between 0.6 to 10.2 centimeters (cm) in diameter and flow velocities between 40 - 91cm per second (Smith 1973; Bjornn and Reiser 1991). Eggs incubate in redds for approximately 25 to 35 days depending on water temperature (Shapovalov and Taft 1954). Incubation time depends on water temperature, with warmer temperatures leading to lower incubation periods due to increased metabolic rates. Eggs hatch as alevin and remain buried in redds for an additional two to three weeks until yolk-sac absorption is complete (Shapovalov and Taft 1954). Optimal conditions for embryonic development include water temperatures between

6 and 10°C, dissolved oxygen near saturation, and fine sediments less than 5% of substrate by volume (Bjornn and Reiser 1991; USEPA 2001).

Upon emerging from redds, juvenile steelhead occupy edgewater habitats where flow velocity is lower and cover aids in predator avoidance. Rearing juveniles feed on a variety of aquatic and terrestrial invertebrates. As they grow, juveniles move into deeper pool and riffle habitats where they continue to feed on invertebrates and have been observed feeding on younger juveniles (Chapman and Bjornn 1969; Everest and Chapman 1972). Juveniles can spend up to four years rearing in freshwater before migrating to the ocean as smolts, although they typically only spend one to two years in natal streams (Shapovalov and Taft 1954; Busby et al. 1996; Moyle 2002). Successful rearing depends on stream temperatures, flow velocities, and habitat availability. Preferred water temperature ranges from 12 to 19°C and sustained temperatures above 25°C are generally considered lethal (Smith and Li 1983; Busby et al. 1996; Moyle 2002; McCarthy et al. 2009). In Central California streams, juvenile steelhead are able to survive peak daily stream temperatures above 25°C for short periods when food is abundant (Smith and Li 1983). Response to stream temperatures can vary depending on the conditions to which individuals are acclimated, however, consistent exposure to high stream temperatures results in slower growth due to elevated metabolic rates and lower survival rates overall (Hokanson et al. 1977; Busby et al. 1996; Moyle 2002; McCarthy et al. 2009).

Juveniles undergo behavioral, morphological, and physiological changes in preparation for ocean entry, collectively called smoltification. Juveniles begin smoltification in freshwater and the process continues throughout downstream migration with some smolts using estuaries for further acclimation to saltwater prior to ocean entry (Smith 1990; Hayes et al. 2008). Juveniles typically will not smolt until reaching a minimum size of 160 mm (Burgner et al. 1992). Smoltification is cued by increasing photoperiod. Stream temperatures influence the rate of smoltification, with warmer temperatures leading to more rapid transition. Downstream migration of smolts typically occurs from April to June when temperature and stream flows increase. Preferred temperature for smoltification and outmigration is between 10 and 17°C with temperatures below 15°C considered optimal (Hokanson et al. 1977; Wurtsbaugh and Davis 1977; Zedonis and Newcomb 1997; Moyle 2002; Myrick and Cech 2005). In coastal systems with seasonal lagoons, smolts may take advantage of higher growth potential in productive lagoon habitats before ocean entry (Osterback et al. 2018).

Adult steelhead are known to be highly migratory during ocean residency but little is known of their habitat use and movements. They have been observed moving north and south along the continental shelf, presumably to areas of high productivity to feed (Barnhart 1986). Adults will typically spend one to two years in the ocean, feeding and growing in preparation for spawning (Shapovalov and Taft 1954; Busby et al. 1996). Upstream migration typically begins once winter rains commence and stream flows increase. For coastal systems with seasonal freshwater lagoons, winter storms are required to breech the sandbars and allow access to upstream spawning sites. Unlike most congenerics, steelhead are iteroparous, meaning they can return to spawn multiple times. Adult steelhead may spawn up to four times in their lifetime, although spawning runs predominantly consist of first-time spawners (~59%) (Shapovalov and Taft 1954). The maximum life span of steelhead is estimated to be nine years (Moyle 2002).

2.2.1.1.2. CCC Coho Salmon

The life history of coho salmon in California has been well documented by Shapovalov and Taft (1954). In contrast to the life history patterns of other anadromous salmonids, coho salmon in California generally exhibit a relatively simple three-year life cycle. Adult coho salmon typically begin the freshwater migration from the ocean to their natal streams after heavy late fall or winter rains breach the sandbars at the mouths of coastal streams (Sandercock 1991). Delays in river entry of over a month are not unusual (Salo and Bayliff 1958, Eames et al. 1981). Migration continues into March, generally peaking in December and January, with spawning occurring shortly after arrival to the spawning ground (Shapovalov and Taft 1954).

Coho salmon are typically associated with medium to small coastal streams characterized by heavily forested watersheds; perennially-flowing reaches of cool, high-quality water; dense riparian canopy; deep pools with abundant overhead cover; instream cover consisting of large, stable woody debris and undercut banks; and gravel or cobble substrates.

Female coho salmon choose spawning areas usually near the head of a riffle, just below a pool, where water changes from a laminar to a turbulent flow and small to medium gravel substrate are present. The flow characteristics surrounding the redd usually ensure good aeration of eggs and embryos, and flushing of waste products. The water circulation in these areas also facilitates fry emergence from the gravel. Preferred spawning grounds have: nearby overhead and submerged cover for holding adults; water depth of 4 to 21 inches; water velocities of 8 to 30 inches per second; clean, loosely compacted gravel (0.5 to 5 inch diameter) with less than 20 percent fine silt or sand content; cool water ranging from 39 to 50 degrees Fahrenheit (°F) with high dissolved oxygen of 8 mg/L; and inter-gravel flow sufficient to aerate the eggs. Lack of suitable gravel often limits successful spawning.

Each female builds a series of redds, moving upstream as she does so, and deposits a few hundred eggs in each. Fecundity of female coho salmon is directly proportional to size; each adult female coho salmon may deposit from 1,000 to 7,600 eggs (Sandercock 1991). Briggs (1953) noted a dominant male accompanies a female during spawning, but one or more subordinate males may also engage in spawning. Coho salmon may spawn in more than one redd and with more than one mate (Sandercock 1991). Coho salmon are semelparous meaning they die after spawning. The female may guard a redd for up to two weeks (Briggs 1953).

The eggs generally hatch after four to eight weeks, depending on water temperature. Survival and development rates depend on temperature and dissolved oxygen levels within the redd. According to Baker and Reynolds (1986), under optimum conditions, mortality during this period can be as low as 10 percent; under adverse conditions of high scouring flows or heavy siltation, mortality may be close to 100 percent. McMahon (1983) found that egg and fry survival drops sharply when fine sediment makes up 15 percent or more of the substrate. The newly hatched fry remain in the redd from two to seven weeks before emerging from the gravel (Shapovalov and Taft 1954). Upon emergence, fry seek out shallow water, usually along stream margins. As they grow, juvenile coho salmon often occupy habitat at the heads of pools, which generally provide an optimum mix of high food availability and good cover with low swimming cost (Nielsen 1992). Chapman and Bjornn (1969) determined that larger parr tend to occupy the head of pools, with smaller parr found further down the pools. As the fish continue to grow, they move into deeper water and expand their territories until, by July and August; they reside exclusively in deep pool habitat. Juvenile coho salmon prefer: well shaded pools at least 3.3 feet deep with dense overhead cover, abundant submerged cover (undercut banks, logs, roots, and other woody debris); water temperatures of 54° to 59° F (Brett 1952, Reiser and Bjornn 1979), but not exceeding 73° to 77° F (Brungs and Jones 1977) for extended time periods; dissolved oxygen levels of 4 to 9 mg/L; and water velocities of 3.5 to 9.5 inches per second in pools and 12 to 18 inches per second in riffles. Water temperatures for good survival and growth of juvenile coho salmon range from 50° to 59° F (Bell 1973, McMahon 1983). Growth is slowed considerably at 64° F and ceases at 68° F (Bell 1973).

Preferred rearing habitat has little or no turbidity and high sustained invertebrate forage production. Juvenile coho salmon feed primarily on drifting terrestrial insects, much of which are produced in the riparian canopy, and on aquatic invertebrates growing within the interstices of the substrate and in leaf litter in pools. As water temperatures decrease in the fall and winter months, fish stop or reduce feeding due to lack of food or in response to the colder water, and growth rates slow. During December through February, winter rains result in increased stream flows. By March, following peak flows, fish resume feeding on insects and crustaceans, and grow rapidly.

In the spring, as yearlings, juvenile coho salmon undergo a physiological process, or smoltification, which prepares them for living in the marine environment. They begin to migrate downstream to the ocean during late March and early April, and out-migration usually peaks in mid-May, if conditions are favorable. Emigration timing is correlated with peak upwelling currents along the coast. Entry into the ocean at this time facilitates more growth and, therefore, greater marine survival (Holtby et al. 1990). At this point, the smolts are about four to five inches in length. After entering the ocean, the immature salmon initially remain in nearshore waters close to their parent stream. They gradually move northward, staying over the continental shelf (Brown et al. 1994). Although they can range widely in the north Pacific, movements of coho salmon from California are poorly understood.

2.2.2. Status of the Listed Species

NMFS assesses four population viability[3] parameters to discern the status of the listed ESUs and DPSs and to assess each species ability to survive and recover. These population viability parameters are: abundance, population growth rate, spatial structure, and diversity (McElhany et al. 2000). While there is insufficient data to evaluate these population viability parameters quantitatively, NMFS has used existing information to determine the general condition of the populations in the CCC steelhead DPS and the CCC coho salmon ESU, and factors responsible for the current status of these listed species.

The population viability parameters are used as surrogates for numbers, reproduction, and distribution, which are included in the regulatory definition of "jeopardize the continued existence of" (50 CFR 402.02). For example, abundance, population growth rate, and

[3] NMFS defines a viable salmonid population as "an independent population of any Pacific salmonid (genus *Oncorhynchus*) that has a negligible risk of extinction due to threats from demographic variation, local environmental variation, and genetic diversity changes over a 100- year time frame" (McElhany et al. 2000).

distribution are surrogates for numbers, reproduction, and distribution, respectively. The fourth parameter, diversity, is related to all three regulatory criteria. Numbers, reproduction, and distribution are all affected when genetic or life history variability is lost or constrained, resulting in reduced population resilience to environmental variation at local or landscape-level scales.

2.2.2.1. CCC Steelhead

Historically, approximately 70 populations of steelhead existed in the CCC steelhead DPS (Spence et al. 2008; Spence et al. 2012). Many of these populations (about 37) were independent, or potentially independent, meaning they had a high likelihood of surviving for 100 years absent anthropogenic impacts (Bjorkstedt et al. 2005). The remaining populations were dependent upon immigration from nearby CCC steelhead DPS populations to ensure their viability (McElhaney et al. 2000, Bjorkstedt et al. 2005).

While historical and present data on abundance are limited, CCC steelhead numbers are substantially reduced from historical levels. A total of 94,000 adult steelhead were estimated to spawn in the rivers of this DPS in the mid-1960s, including 50,000 fish in the Russian River –the largest population within the DPS (Busby et al. 1996). More recent estimates for the Russian River are on the order of 4,000 fish (NMFS 1997a). Abundance estimates for smaller coastal streams in the DPS indicate low but stable levels with recent estimates for several streams (Lagunitas, Waddell, Scott, San Vicente, Pudding, and Caspar creeks) of individual run sizes of 500 fish or less (62 FR 43937; August 18, 1997). Some loss of genetic diversity has been documented and attributed to previous among-basin transfers of stock and local hatchery production in interior populations in the Russian River (Bjorkstedt et al. 2005). In San Francisco Bay streams, reduced population sizes and fragmented habitat conditions has likely also depressed genetic diversity in these populations. For more detailed information on trends in CCC steelhead abundance, see Busby et al. 1996; NMFS 1997a; Good et al. 2005; Spence et al. 2008; Williams et al. 2011; and Williams et al. 2016.

CCC steelhead long-term population trends suggest a negative growth rate, indicating the DPS may not be viable in the long-term. Populations that historically provided enough steelhead immigrants to support dependent populations may no longer be able to do so, placing dependent populations at increased risk of extirpation. However, because CCC steelhead remain present in most streams throughout the DPS, roughly approximating the known historical range, CCC steelhead likely possess a resilience that has slowed their rate of decline relative to other salmonid species. The 2005 status review concluded that steelhead in the CCC steelhead DPS remain "likely to become endangered in the foreseeable future" (Good et al. 2005). On January 5, 2006, NMFS issued a final determination that the CCC steelhead DPS is a threatened species, as previously listed (71 FR 834).

While data availability for this DPS remains generally poor, the new information for CCC steelhead available since the previous viability assessment (Spence 2016) indicates that overall extinction risk is moderate and has not changed appreciably since the prior assessment (NMFS SWFSC). Although conservation efforts for CCC steelhead have reduced some threats for this DPS, most threats remain unchanged since the previous 5-year review. In addition, increased risks of wildfires, drought, and poor ocean conditions are likely to continue and worsen. Based on the 2024 status review, NMFS concluded that the CCC steelhead DPS remains threatened (NMSF 2024).

2.2.2.2. CCC Coho Salmon

Historically, the CCC coho salmon ESU was comprised of approximately 76 coho salmon populations. Most of these were dependent populations that needed immigration from other nearby populations to ensure their long-term survival. Historically, there were 11 functionally independent populations and 1 potentially independent population of CCC coho salmon (Spence et al. 2008, Spence et al. 2012). Most of the populations in the CCC coho salmon ESU are currently doing poorly as a result of low abundance, range constriction, fragmentation, and loss of genetic diversity, as described below.

Brown et al. (1994) estimated that annual spawning numbers of coho salmon in California ranged between 200,000 and 500,000 fish in the 1940s, which declined to 100,000 fish by the 1960s, followed by a further decline to 31,000 fish by 1991. More recent abundance estimates vary from approximately 600 to 5,500 adults (Good et al. 2005). Williams et al. (2011) indicated that CCC coho salmon are likely to continue to decline in number. CCC coho salmon have also experienced acute range restriction and fragmentation. Adams et al. (1999) found that in the mid 1990's coho salmon were present in 51 percent (98 of 191) of the streams where they were historically present, and documented an additional 23 streams within the CCC coho salmon ESU in which coho salmon were found for which there were no historical records. More recent genetic research has documented reduced genetic diversity within subpopulations of the CCC coho salmon ESU (Bjorkstedt et al. 2005). The influence of hatchery fish on wild stocks has likely also contributed to the lack of diversity through outbreeding depression and disease. Available data from the few remaining independent populations suggests population abundance continues to decline, and many independent populations that in the past supported the species overall numbers and geographic distributions have been extirpated. This suggests that populations that historically provided support to dependent populations via immigration have not been able to provide enough immigrants for many dependent populations for several decades. The near-term (10-20 years) viability of many of the extant independent CCC coho salmon populations is of serious concern. These populations may not have enough fish to survive additional natural and human caused environmental change.

The CCC coho salmon ESU also includes coho salmon from the following conservation hatchery programs: the Russian River Coho Salmon Captive Broodstock Program at Don Clausen Fish Hatchery in Sonoma County, California, and the smaller Southern Coho Salmon Captive Broodstock Program at Kingfisher Flat Hatchery in the Scott Creek watershed, Santa Cruz County, California. While differing in size and funding, both programs were initiated in 2001 in response to severely depressed coho salmon abundances. Fish are collected from the wild, brought into the hatcheries, genetically tested, and spawned to maximize diversity and prevent inbreeding. In the hatchery, fish are raised to various ages, fed krill, tagged, and released into streams throughout the watersheds. This release strategy allows the fish to imprint on the creek with the aim that they will return to these streams as adults so they can spawn naturally. Juvenile coho salmon and coho salmon smolts have been released into several Russian River tributaries and coastal watersheds in San Mateo and Santa Cruz counties.

None of the five diversity strata defined by Bjorkstedt et al. (2005) currently support viable coho salmon populations. According to Williams et al. (2016), recent surveys suggest CCC coho salmon abundance has improved slightly since 2011 within several independent populations (mainly north of San Francisco bay), although all populations remain well below their high-risk dispensation thresholds identified by Spence et al. (2008). The Russian River and Lagunitas Creek populations are relative strongholds for the species compared to other CCC ESU populations, the former predominantly due to out-planting of hatchery-reared juvenile fish from the Russian River Coho Salmon Captive Broodstock Program.

Overall, the available new information since the 2016 viability assessment indicates the extinction risk has not changed appreciably, with slight improvements in the two northern-most diversity strata, but little change in the Coastal Diversity Stratum and perhaps worsening conditions in the Santa Cruz Mountain Stratum. The extinction risk for CCC coho salmon as a whole thus remains high (NMFS SWFSC 2023). Based on the 2023 status review, NMFS concluded that the CCC coho salmon ESU remains endangered (NMFS 2023b).

2.2.3. Status of CCC Steelhead and CCC Coho Salmon Critical Habitat

In designating critical habitat, NMFS considers the following requirements of the species: 1) space for individual and population growth and for normal behavior; 2) food, water, air, light, minerals, or other nutritional or physiological requirements; 3) cover or shelter; 4) sites for spawning, reproduction, and rearing offspring; and 5) habitats that are protected from disturbance or are representative of the historic geographical and ecological distributions of the species (50 CFR 424.12(b)). In addition to these factors, NMFS also focuses on PBFs (formerly termed PCEs and/or essential habitat types) within the designated area that are essential to the conservation or protection (81 FR 7414).

PBFs for CCC steelhead and CCC coho salmon critical habitat, and their associated essential features within freshwater include:

1. Freshwater spawning sites with water quantity and quality conditions and substrate supporting spawning, incubation and larval development.
2. Freshwater rearing sites with:
    a. water quantity and floodplain connectivity to form and maintain physical habitat conditions and support juvenile growth and mobility;
    b. water quality and forage supporting juvenile development; and
    c. natural cover such as shade, submerged and overhanging large wood, log jams and beaver dams, aquatic vegetation, large rocks and boulders, side channels, and undercut banks.
3. Freshwater migration corridors free of obstruction and excessive predation with water quantity and quality conditions and natural cover such as submerged and overhanging large wood, aquatic vegetation, large rocks and boulders, side channels, and undercut banks supporting juvenile and adult mobility and survival.

For CCC coho salmon critical habitat, the following essential habitat types were identified: 1) juvenile summer and winter rearing areas; 2) juvenile migration corridors; 3) areas for growth and development to adulthood; 4) adult migration corridors; and 5) spawning areas. Within these areas, essential features of coho salmon critical habitat includes adequate: 1) substrate, 2) water quality, 3) water quantity, 4) water temperature, 5) water velocity, 6) cover/shelter, 7) food, 8) riparian vegetation, 9) space, and 10) safe passage conditions (64 FR 24029).

The condition of CCC steelhead and CCC coho salmon critical habitat, specifically its ability to provide for their conservation, has been degraded from conditions to support viable salmonid populations, and does not provide the full extent of conservation value necessary for the recovery of the species. NMFS has determined that currently depressed population conditions are, in part, the result of the following human-induced factors affecting critical habitat[4]: logging, agriculture, mining, urbanization, stream channelization, dams, wetland loss, and water withdrawals (including unscreened diversions for irrigation). Impacts of concern include altered stream bank and channel morphology, timber harvest, grazing, cultivation, elevated water temperature, lost spawning and rearing habitat, habitat fragmentation, impaired gravel and wood recruitment from upstream sources, degraded water quality, lost riparian vegetation, and increased erosion into streams from upland areas (Weitkamp *et al*. 1995; Busby *et al.* 1996; 64 FR 24049; 70 FR 37160; 70 FR 52488). Diversion and storage of river and stream flow has dramatically altered the natural hydrologic cycle in many of the streams within coho salmon ESUs and steelhead DPSs. Altered flow regimes can delay or preclude migration, dewater aquatic habitat, and strand fish in disconnected pools, while unscreened diversions can entrain juvenile fish. Similarly, land development has led to channelization of streams and placement of developed areas close to waterways.

2.2.4. Additional Threats to CCC Steelhead and CCC Coho Salmon Critical Habitat

2.2.4.1. Global Climate Change

Another factor affecting the range-wide status of CCC steelhead and CCC coho salmon, and aquatic habitat at large, is global climate change, which presents an additional threat to salmonids and their critical habitats. Recent work by the NMFS Science Centers ranked the relative vulnerability of west-coast salmon and steelhead to climate change. In California, listed coho salmon are generally at greater risk (high to very high risk) than listed steelhead (moderate to high risk) (Crozier et al. 2019).

Impacts from global climate change are already occurring in California. For example, average annual air temperatures, heat extremes, and sea level have all increased in California over the last century (Kadir et al. 2013). Snowmelt from the Sierra Nevada has declined; however, total annual precipitation amounts have shown no discernable change (Kadir et al. 2013). Although CCC steelhead and CCCO coho salmon are not dependent on snowmelt driven streams, they have likely already experienced some detrimental impacts from climate change through lower and more variable stream flows, warmer stream temperatures, and changes in ocean conditions. California experienced well below average precipitation during the 2012-2016 drought, as well as record high surface air temperatures in 2014 and 2015, and record low snowpack in 2015 (Williams et al. 2016). Paleoclimate reconstructions suggest the 2012-2016 drought was the most

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[4] Other factors, such as over fishing and artificial propagation have also contributed to the current population status of these species. All of these human induced factors have exacerbated the adverse effects of natural environmental variability from such factors as drought and poor ocean conditions.

extreme in the past 500 to 1,000 years (Williams et al. 2016, Williams et al. 2020, Williams et al. 2022). Anomalously high surface temperatures substantially amplified annual water deficits during 2012-2016. California entered another period of drought in 2020. These drought periods are now likely part of a larger drought event (Williams et al. 2022). This recent long-term drought, as well as the increased incidence and magnitude of wildfires in California, have likely been exacerbated by climate change (Williams et al. 2020, Williams et al. 2022, Diffenbaugh et al. 2015, Williams et al. 2019).

The threat to these listed salmonids from global climate change is expected to increase in the future. Modeling of climate change impacts in California suggests that average summer air temperatures are expected to continue to increase (Lindley et al. 2007, Moser et al. 2012). Heat waves are expected to occur more often, and heat wave temperatures are likely to be higher (Hayhoe et al. 2004, Moser et al. 2012, Kadir et al. 2013). Total precipitation in California may decline; critically dry years may increase (Lindley et al. 2007, Schneider 2007, Moser et al. 2012). Wildfires are expected to increase in frequency and magnitude (Westerling et al. 2011, Moser et al. 2012). Increases in wide year-to-year variation in precipitation amounts (droughts and floods) are projected to occur (Swain et al. 2018). Estuarine productivity is likely to change based on changes in freshwater flows, nutrient cycling, and sediment amounts (Scavia et al. 2002; Ruggiero et al. 2010). For Northern California, most models project heavier and warmer precipitation. Extreme wet and dry periods are projected, increasing the risk of both flooding and droughts (DWR 2013). Estimates show that snowmelt contribution to runoff in the Sacramento/San Joaquin Delta may decrease by about 20 percent per decade over the next century (Cloern et al. 2011). Many of these changes are likely to further degrade salmonid habitat by, for example, reducing streamflow volume and raising water temperatures during the summer.

In marine environments, ecosystems and habitats important to juvenile and adult salmonids are likely to experience changes in temperatures, circulation, water chemistry, and food supplies (Brewer and Barry 2008; Feely 2004; Osgood 2008; Turley 2008; Abdul-Aziz *et al.* 2011; Doney *et al*. 2012). Some of these changes, including increased incidence of marine heat waves, are likely already occurring, and are expected to increase (Frolicher *et al.* 2018). In fall 2014, and again in 2019, a marine heatwave, known as “The Blob” formed throughout the northeast Pacific Ocean, which greatly affected water temperature and upwelling from the Bering Sea off Alaska, south to the coastline of Mexico. The marine waters in this region of the ocean are utilized by salmonids for foraging as they mature (Beamish 2018). Although the implications of these events on salmonid populations are not fully understood, they are having considerable adverse consequences to the productivity of these ecosystems and presumably contributing to poor marine survival salmonids. The projections described above are for the mid to late 21st Century. In shorter time frames, climate conditions not caused by the human addition of carbon dioxide to the atmosphere are more likely to predominate (Cox and Stephenson 2007; Santer et al. 2011).

The threat of climate change to listed steelhead and coho salmon will likely be lower in the northern coastal areas due to the fog zone and benefits of old growth redwood forests, including shady, complex stream and riparian areas, and cool stream temperatures (NMFS 2014, NMFS 2016a). Climate change will impact forests of the western U.S., which dominate the landscape of many watersheds in the region. Forests are already showing evidence of increased drought severity, forest fire, and insect outbreak (Halofsky et al. 2020). Additionally, climate change will affect tree reproduction, growth, and phenology, which will lead to spatial shifts in vegetation. Halofsky et al. (2018) projected that the largest changes will occur at low- and high-elevation forests, with expansion of low-elevation dry forests and diminishing high-elevation cold forests and subalpine habitats.

2.2.4.2. Water Quality

Stormwater runoff from urban areas and roadways is a primary source of water quality degradation in aquatic habitats, including streams designated as CCC steelhead and CCC coho critical habitat. Various pesticides, petroleum hydrocarbons, metals, and other toxic chemical contaminants common to commercial, industrial and residential land-use activities have been documented in stormwater runoff (Caltrans 2000, 2003a, 2003b). These chemicals are mobilized from roads, lawns, and other surfaces by rainfall or irrigation, and are transported to aquatic habitats via terrestrial runoff and discharges from stormwater conveyances (Good 1993). Recent studies have identified the degradation of some tire products as a causal factor in salmonid mortalities, even in concentrations of less than one part per billion (Tian et al. 2020). The identified contaminant, 6PPD-quinone, has been found where both rural and urban roadways drain into waterways (Sutton et al. 2019). Studies have identified this issue and determined the cause of observed mortalities of adult and juvenile coho salmon in both field (Scholz et al. 2011) and laboratory settings respectively (Chow et al. 2019).

2.3. Action Area

"Action area" means all areas to be affected directly or indirectly by the federal action and not merely the immediate area involved in the action (50 CFR 402.02). The action area encompasses the streambed and banks of Lagunitas Creek where the existing bridge crosses the creek[5], the roadway associated with culvert widening, areas needed for staging and access, areas up- and downstream of the bridge proposed to be dewatered, and approximately 100 linear feet downstream of dewatered areas where temporary construction effects may occur.

2.4. Environmental Baseline

The "environmental baseline" refers to the condition of the listed species or its designated critical habitat in the action area, without the consequences to the listed species or designated critical habitat caused by the proposed action. The environmental baseline includes the past and present impacts of all federal, state, or private actions and other human activities in the action area, the anticipated impacts of all proposed federal projects in the action area that have already undergone formal or early section 7 consultations, and the impact of State or private actions which are contemporaneous with the consultation in process. The impacts to listed species or designated critical habitat from federal agency activities or existing federal agency facilities that are not within the agency's discretion to modify are part of the environmental baseline (50 CFR 402.02).

Commercial logging began in the upper Lagunitas Creek watershed in the 1860s and moved downstream until nearly all of the old growth Douglas fir and redwood trees were harvested

[5] Latitude/longitude: 38.064699, -122.805163

(UCCE, 1995). A paper mill was constructed on mainstem Lagunitas Creek near Devils Gulch in 1856, and logging continued in the Olema Creek watershed until 1962 (Prunuske Chatham Inc. 2004). Major fires have burned portions of the watershed several times (e.g., 1878, 1904, 1923, and 1945) (Prunuske Chatham Inc. and Stillwater Sciences 2009). Since the mid-1900's fire suppression has dramatically reduced the number of fires but has also increased the fuel load, and modified the vegetative community. This may result in intense fires when they do occur (Stillwater Sciences 2009).

In the early 1920s, Olema Creek between the town of Olema and its confluence with Lagunitas Creek was straightened into the 3-kilometer long "Olema Canal" that drained the surrounding land for agricultural production. Dairy farming, beef and sheep production, and potato growing dominated the more open landscapes of the lower watershed and San Geronimo, Nicasio, and Olema Valleys. Gravel and sand was mined from the streambed at the confluence of Lagunitas and Nicasio Creeks until a short time after Nicasio Dam was constructed in 1960. Ranchers regularly harvested small amounts of streambed gravel to maintain ranch roads through the 1980s.

Several reservoirs were created within the watershed. The first, Lake Lagunitas, was built in 1872, followed by Alpine Lake in 1918, and then by Bon Tempe in 1948. Peters Dam, built in 1953 to form Kent Lake, was raised 45 feet in 1982, nearly doubling reservoir capacity from 16,600 acre feet to 33,000 acre feet. The last reservoir built in the watershed was Nicasio Reservoir, formed by Seeger Dam in 1960, on Nicasio Creek. In addition to blocking anadromous fish passage to miles of spawning and rearing habitat, the impoundments have altered streamflows and reduced bedload transport from the upper reaches of the watershed, and populations have fluctuated significantly since 1970 (Ettlinger 2019). Like many watersheds supporting salmonids, historic and contemporary anthropogenic factors have negatively impacted salmonid habitat and populations. During the mid-1800s, European settlers began farming, ranching, and harvesting timber in the Lagunitas watershed. Dairy cattle were grazed across much of the watershed (UCCE 1995).

The upper part of the watershed is owned and managed by Marin Municipal Water District for water supply, and State and National Parks manage much of the lower watershed and mainstem. The Lagunitas Creek watershed holds many small rural communities including Woodacre, San Geronimo, Forest Knolls, and Lagunitas in San Geronimo Valley, as well as Nicasio, Olema, and Point Reyes Station (Prunuske Chatham Inc. 2004). Ranching on land leased from National Park Service continues on the east side of Olema Valley, and in Lagunitas Valley, within Nicasio Valley, and one private cattle ranch remains in San Geronimo Valley. Recreational use of the extensive public lands in the watershed includes hiking, bicycling, horseback riding, and camping in the state park. The railroad right-of-way from Tocaloma Bridge south through the state park has been converted into a trail. In the 20th and 21st centuries, a shift from crop cultivation towards grazing and a growing human population increased the human water demand (Stillwater Sciences 2007). Increased demand for water for the growing population and agricultural needs, along with infrastructure like roads along stream corridors, has in certain areas of the watershed, led to a simplification of stream habitat, channel incision, and an overall degradation of the habitat available to salmonids.

Giacomini Marsh lies at the mouth of Lagunitas Creek and encompasses nearly 600 acres of historic tidal marshland that was diked, drained, and managed as a dairy ranch in the 1940s. In 2008, the National Park Service restored the marsh to tidal action by breaching dikes, removing tidal gates, conducting marsh plain enhancement and creating tide channels, thus reestablishing estuarine habitat that provides rearing habitat for salmonid smolts and other aquatic species.

2.4.1. Status of Listed Species and Critical Habitat in the Action Area

The Lagunitas Creek watershed drains an area of 109 square miles and is the largest drainage into Tomales Bay. Its major tributaries include San Geronimo Creek, Devils Gulch, Cheda Creek, Nicasio Creek, and Olema Creek. The watershed experiences a Mediterranean-type climate and supports a varied vegetative community including conifers, riparian forests, shrub lands, and coastal scrub, prairie, and dunes. The mainstem of Lagunitas Creek is dominated by forest habitats, and is a perennial stream with minimum summer flows maintained by regulated releases managed by the Marin Municipal Water District. This regulation maintains instream salmonid habitat, although the creek can quickly grow and overflow its banks into floodplains during winter storm events. Downstream of Peters Dam, Lagunitas Creek flows 14 miles to Point Reyes Station, CA, under the Lagunitas Creek Bridge, and eventually drains into the southern end of the Tomales Bay Ecological Reserve. The reserve is comprised of 482 acres of salt marsh and tidal flats and spans the entire width of the bay. Where the creek passes under the existing Lagunitas Creek Bridge in Point Reyes Station, it is joined by Olema Creek, Bear Valley Creek, Haggerty Gulch Creek, and Tomasini Canyon Creek.

Lagunitas Creek is designated as critical habitat for CCC steelhead and CCC coho salmon and provides spawning, rearing, and migratory habitat. The action area contains suitable water quality and adequate natural cover such as shade, aquatic vegetation, and large woody debris providing adequate habitat complexity. In addition, the action area contains biological and physical features of critical habitat for freshwater migration for both species, including adequate water quantity free from obstructions, freshwater migration corridors during low tide, natural cover, such as overhanging vegetation, and undercut banks that support juvenile and adult mobility and survival. Lagunitas Creek flows west through this reach, and as it flows under the Lagunitas Creek Bridge on SR 1, the habitat transitions from freshwater to estuarine. The creek surface water elevation is usually affected by ocean tides entering Tomales Bay. Lagunitas Creek within the action area mainly contains substrate that is composed of sand and silt with some gravel, and stream banks that support a relatively dense riparian forest. The vegetation within the action area is classified as emergent wetlands, grasslands/herbaceous, landscaped, or riparian woodlands. The lack of stormwater treatment results in conveyance of roadway runoff from the bridge directly into Lagunitas Creek. Yet, Lagunitas Creek within the action area provides adequate features to support rearing, spawning, and migration activities.

NMFS' recovery plans (NMFS 2016, and 2012) call for a range of general actions to improve key habitat attribute indicators in Lagunitas Creek, including restoring floodplain connectivity, improvement of riparian vegetation, improve baseflows during the summer months, reducing riparian road density, improving habitat complexity (for rearing and high flow refugia), and continued improvements to water quality in Tomales Bay to improve the habitat used by summer and winter rearing juveniles, and improve survival of smolts. Several recovery actions are related specifically to Lagunitas Creek and include: 1) improve estuarine freshwater inflow, 2) increase and enhance habitat complexity features, 3) increase and enhance velocity refuge, 4) increase large wood frequency, 5) minimize red scour, and 6) prevent impairment to habitat complexity. Recovery plan action are primarily designed to restore ecological processes that support healthy salmonid populations, and address various activities that harm these processes and threaten the species' survival.

Coho salmon and steelhead populations in the watershed have fluctuated widely since 1970 and are significantly reduced from historic populations. Human-caused factors for this decline include habitat alterations such as water diversions, road building, timber harvest, urbanization, flood control structures and practices, and climate change (NMFS 2012). In Lagunitas Creek, the 2007/2008 coho run was probably the smallest run observed since annual surveys began in 1995. There was a 70 percent decline in the number of redds (gravel "nests" where eggs are laid) compared to the parent generation, which hatched three years earlier. Similar or greater declines were seen in other coastal watersheds in Marin County. This is consistent with a 73 percent decline in counts for returning CCC coho throughout their range. The decline has been attributed to reduced populations and influences of "poor ocean conditions and food supply when these coho salmon migrated to the ocean as smolts in 2006" (Ettlinger et al. 2010). Remarkably, as bad as the 2007/2008 spawning run was the 2008/2009 spawning was worse, with only 40 fish returning from the ocean. Lagunitas Creek coho are persisting due in large part to the dedication and organization of local citizens and the common vision of local agencies and political bodies to implement restoration and policies necessary to protect CCC coho salmon (NMFS 2012).

Steelhead population dynamics in Lagunitas Creek are less well understood than for coho salmon (MMWD 2011). Until recently, spawner surveys focused almost exclusively on coho salmon, and even now are conducted for only part of the steelhead spawning season, so adult steelhead run data is limited (Ettlinger *et al.* 2010). However, adult steelhead escapement estimates are becoming more accurate with use of dual-frequency identification sonar (DIDSON) technology (Atencio and Reichmuth 2014). In the 2012/2013 and 2013-2014 spawner seasons, steelhead escapements were estimated at approximately 400 and 470 respectively (Atencio and Reichmuth 2014). Numbers of age 1+ steelhead are consistently low, regardless of the abundance of age 0+ steelhead in the previous year, indicating winter survival is a key limiting factor (MMWD 2011). Age 0+ steelhead population estimates have ranged from approximately 26,000 to 75,000 since 1995, while the 1+ steelhead estimate has fluctuated between approximately 2,000 and 4,000. National Park Service (NPS) studies (Carlisle *et al.* 2009; Carlisle *et al.* 2010) on Olema Creek reported steelhead juvenile densities from 1999 – 2008 ranging from 1.1 to 2.5 fish per meter.

Recent surveys conducted by Marin Water, the Watershed Stewards Program, National Park Service, Salmon Protection and Watershed Network, and CDFW in November 2022 - March 2023 within the main stem of Lagunitas Creek and four tributaries (San Geronimo, Olema, Cheda creeks, and Devil's Gulch) found 106 coho salmon redds, and 257 live coho salmon. The official escapement estimate was 212 based on a conservative assumption of two spawners per red (Marin Water 2023). The run was less than half of average, but increased by 68% from the spawning run three years earlier. The steelhead run was one of the smallest on record, with 43 redds and 12 live fish observed. Based on an assumption of two spawners per red, the steelhead escapement was 86 adults (Marin Water 2023).

In summer 2021, Marin Water conducted surveys for juvenile coho salmon and steelhead in the Lagunitas Creek watershed. This juvenile sampling effort has been conducted every year since 1993, and includes seven index reaches in Lagunitas Creek. Through this survey effort a total of 962 juvenile coho and 458 juvenile steelhead were observed/captured via snorkel and electrofishing surveys between July and October 2021. Based on the above, the 2021 juvenile coho salmon population estimate for the entire study area was 31,360 (+/- 7,393), which is higher than the long-term average of 18,606 for all sampling years since 2003 (Marin Water 2022). The Lagunitas Creek sites accounted for 98% of the total 2021 juvenile coho population estimate, which was the highest recorded estimate for this portion of the study area (Marin Water 2022). In contrast, the 2021 juvenile steelhead population estimate for the study area was 13,962 (+/- 2,573). This was the lowest recorded juvenile steelhead estimate on record, and was much lower than the long-term average of 55,065 for all sampling years since 2003. The Lagunitas Creek sites accounted for 83% of the 2021 juvenile steelhead estimate.

While these surveys were conducted upstream of the action area, there are no barriers precluding migration of steelhead and coho from the surveyed reaches and into the action area. Thus, given the suitable habitat conditions within the action area to support salmonid migration, rearing, and spawning adults are expected to occur in the action area mid-December to April. Similarly, as indicated above, NMFS expects juvenile steelhead and coho to occur within the action area year-round when suitable streamflow exists. The number of juvenile steelhead and coho that may be present in the action area is difficult to predict with much confidence, but based on the above, NMFS expects that the action area has habitat conditions that are adequate to support juvenile steelhead and coho salmon during the proposed in-water work window (June 15 to October 31).

2.5. Effects of the Action

Under the ESA, "effects of the action" are all consequences to listed species or critical habitat that are caused by the proposed action, including the consequences of other activities that are caused by the proposed action but that are not part of the action. A consequence is caused by the proposed action if it would not occur but for the proposed action and it is reasonably certain to occur. Effects of the action may occur later in time and may include consequences occurring outside the immediate area involved in the action (see 50 CFR 402.02).

2.5.1. Fish Collection and Relocation

To facilitate completion of the project, a small portion of Lagunitas Creek, on both banks, will need to be dewatered. As discussed above, a maximum amount of 0.064 acres of Lagunitas creek surrounding the existing bridge abutments will be dewatered during one construction season using sheet piles to create cofferdams. Caltrans proposes to collect and relocate fish in the area prior to, and during dewatering, to avoid fish stranding and exposure to construction activities. Before, and during dewatering of the construction site, juvenile salmonids will be captured by a qualified biologist using one or more of the following methods: dip net, seine, thrown net, block net, minnow trap, and electrofishing. Collected salmonids will be relocated to an appropriate stream reach that will minimize impacts to captured fish, and to fish that are already residing at the release site(s). Since construction is scheduled to occur between June 15 and October 31, relocation activities will occur during the summer low-flow period after emigrating smolts have left and before adults have immigrated for spawning. Only juvenile salmonids are expected to be in the action area during the construction period. Therefore, NMFS expects capture and relocation of listed salmonids will be limited to pre-smolting and YOY juveniles.

Fish collection and relocation activities pose a risk of injury or mortality to rearing juvenile salmonids. Any fish collecting gear, whether passive (Hubert 1996) or active (Hayes et al. 1996) has some associated risk to fish, including stress, disease transmission, injury, or death. The amount of unintentional injury and mortality attributable to fish capture varies widely, depending on the method used, the ambient conditions, and the expertise and experience of the field crew. Since fish relocation activities will be conducted by qualified fisheries biologists following NMFS electrofishing guidelines (NMFS 2000), injury and mortality of juvenile salmonids during capture and relocation will be minimized. Based on prior experience with current relocation techniques and protocols to conduct the fish relocation, unintentional mortality of listed juvenile salmonids expected from capture and handling procedures is not likely to exceed two percent.

Relocated fish may also have to compete with other fish, causing increased competition for available resources such as food and habitat. To reduce the potential for competition, fish relocation sites will be pre-approved by NMFS to ensure the sites have adequate habitat to allow for survival of transported fish, and fish already present. Nonetheless, crowding could occur which would likely result in increased inter- and intraspecific competition at those sites. Responses to crowding by salmonids include self-thinning, resulting in emigration and reduced salmonid abundance with increased individual body size within the group, and/or increased competition (Keeley 2003). Relocation sites will be selected to ensure they have similar water temperatures as the capture sites, and adequate habitat to allow for survival of transported fish and fish already present. However, some of the fish released at the relocation sites may choose not to remain in these areas and move either upstream or downstream to areas that have more vacant habitat and a lower density of fish. As each fish moves, competition remains either localized to a small area or quickly diminishes as fish disperse. In some instances, relocated fish may endure some short-term stress from crowding at the relocation sites. Such stress is not likely to be sufficient to reduce their individual fitness or performance. NMFS cannot accurately estimate the number of fish likely to be exposed to competition, but does not expect this short-term stress to reduce the individual performance of juvenile salmonids, or cascade through the watershed population of these species. Fish that avoid capture during relocation may be exposed to risks described in the following section on dewatering (see Section 2.5.2 below).

As indicated above in Section 2.4.1, steelhead and coho salmon are found in Lagunitas Creek within the action area. The number of juvenile salmonids that may be present in the dewatered area is difficult to predict with much confidence. Yet, NMFS expects that juvenile steelhead and juvenile coho salmon will be encountered and relocated during dewatering activities.

Applying applicable AMMs to fish collection, relocation, and dewatering activities is expected to appreciably reduce the effects of project actions on juvenile salmonids. Specifically, salmonid collection and relocation activities conducted by NMFS-approved fisheries biologists will ensure proper equipment operation and application of NMFS guidelines thereby minimizing injury and mortality to juvenile salmonids. Restricting the work window to June 15 to October 31 will limit the effects to stream rearing juvenile salmonids. NMFS expects applying AMMs will effectively minimize injury and mortality to juvenile salmonids in the action area.

2.5.2. Dewatering

As described above, completion of the project will require dewatering of Lagunitas Creek to create dry areas for work within Lagunitas Creek and to prevent discharge of construction materials into the waterway. Vibratory hammers will be used to install sheet piles to create the coffer dams that will allow for dry working areas around the location of the new piers. Dewatering of the creek is estimated to affect up to 0.064 acres of Lagunitas Creek. NMFS anticipates temporary changes to flow within the project site during installation of the cofferdams, and during dewatering operations. These fluctuations in flow are anticipated to be small, gradual, and short-term, but are expected to cause minor, temporary loss, alteration, and reduction of aquatic habitat, and in the case of areas that will be dewatered, will likely result in mortality of any salmonids that avoid capture during fish relocation activities.

Stream dewatering could harm any rearing salmonid individuals by concentrating or stranding them in residual wetted areas before they are relocated. Juvenile salmonids that avoid capture in the project work area will likely die during dewatering activities due to desiccation, thermal stress, or may be crushed by equipment or foot traffic if not found by biologists while water levels within the cofferdam recede. Because the pre-dewatering fish relocation efforts at the project site will be performed by qualified biologists, NMFS expects that the number of juvenile salmonids that will be killed as a result of stranding during dewatering activities will be very small, likely no more than one percent of the salmonids within the work site prior to dewatering.

Dewatering operations at the work site may affect benthic (bottom dwelling) aquatic macroinvertebrates, an important food source for salmonids. Benthic aquatic macroinvertebrates at the project site may be killed or their abundance reduced when river habitat is dewatered (Cushman 1985). However, effects to aquatic macroinvertebrates resulting from dewatering activities will be temporary because construction activities will be short lived, and the dewatered reach will not exceed 0.064 acres within Lagunitas Creek. Rapid recolonization (typically one to two months) of disturbed areas by macroinvertebrates is expected following rewatering (Cushman 1985, Thomas 1986, Harvey 1986). Within the action area, the effect of macroinvertebrate loss on juvenile salmonids is likely to be negligible because food from upstream sources (via drift) would be available both up- and downstream of the dewatered areas. Based on the foregoing, juvenile salmonids are not anticipated to be exposed to a reduction in food sources at the work site from the minor and temporary reduction in aquatic macroinvertebrates as a result of dewatering activities. Because habitat in and around the action area is adequate to support salmonids, NMFS expects salmonids will be able to find food both up- and downstream of the action area as needed during dewatering activities.

2.5.3. Increased Sedimentation and Turbidity

The proposed project will result in disturbance of the streambed and banks for construction. Construction activities within the action area may result in disturbance of the dewatered streambed and banks for equipment access, construction activities, and placement/removal of stream diversion structures. While the cofferdams are in place, construction activities are not expected to degrade water quality in the action area because the work areas will be dewatered and isolated from flowing waters. This disturbed soil on the creek bank is more easily mobilized when later fall and winter storms increase streamflow levels. Thus, NMFS anticipates disturbed soils could affect water quality in the action area in the form of small, short-term increases in turbidity during rewatering (i.e., cofferdam removal), and subsequent higher flow events during the first winter storms post-construction.

Instream and near-stream construction activities have been shown to result in temporary increases in turbidity (reviewed in Furniss et al. 1991, Reeves et al. 1991, Spence et al. 1996). Sediment may affect fish by a variety of mechanisms. High concentrations of suspended sediment can disrupt normal feeding behavior and efficiency (Cordone and Kelley 1961, Bjornn et al. 1977, Berg and Northcote 1985), reduce growth rates (Crouse et al. 1981), and increase plasma cortisol levels (Servizi and Martens 1992). High turbidity concentrations can reduce dissolved oxygen in the water column, result in reduced respiratory functions, reduce tolerance to disease, and can also cause fish mortality (Sigler et al. 1984, Berg and Northcote 1985, Gregory and Northcote 1993, Velagic 1995, Waters 1995). Even small pulses of turbid water will cause salmonids to disperse from established territories (Waters 1995), which can displace fish into less suitable habitat and/or increase competition and predation, decreasing chances of survival. Increased sediment disposition can fill pools and reduce the amount of cover available to fish, decreasing the survival of juveniles (Alexander and Hansen 1986).

Chronic elevated sediment and turbidity levels may affect salmonids as described above. However, sedimentation and turbidity levels associated with cofferdam removal, rewetting of the construction sites within the action area, and subsequent rainfall events are not expected to rise to the levels described in the previous paragraph because the project's proposed soil and channel stabilization measures will be implemented to avoid and/or minimize sediment mobilization, and tidal water movement is expected to dissipate suspended sediment levels within one to two tidal cycles. Additionally, Caltrans' proposed additional AMMs and BMPs specifically aimed at reducing erosion, scour, and sedimentation in storage and staging areas, and dewatering (Caltrans 2024). Therefore, any resulting elevated turbidity levels would be minor, occur for a short period, and be well below levels and duration shown in the scientific literature as cause injury or harm to salmonids (Sigler et al. 1984, Newcombe and Jensen 1996). NMFS expects any sediment or turbidity generated by the project would not extend more than 100 feet downstream of the worksite, based on site conditions and methods used to control sedimentation and turbidity. Thus, NMFS does not anticipate harm, injury, or behavioral impacts to juvenile salmonids associated with exposure to minor elevated suspended sediment levels that could reduce their survival chances.

2.5.4. Pollution from Hazardous Materials and Contaminants

Operating equipment in and near streams has the potential to introduce hazardous materials and contaminants into streams. Potentially hazardous materials include wet and dry concrete debris, fuels, and lubricants. Spills, discharges, and leaks of these materials can enter streams directly or via runoff. If introduced into streams, these materials could impair water quality by altering the pH, reducing oxygen concentrations as the debris decomposes, or by introducing toxic chemicals such as hydrocarbons or metals into aquatic habitat. Oil and similar substances from construction equipment can contain a wide variety of polynuclear hydrocarbons (PAHs) and metals. PAHs can alter salmonid egg hatching rates and reduce egg survival as well as harm the benthic organisms that are a salmonid food source (Eisler 2000). Disturbance of streambeds by heavy equipment or construction activities can also cause the resuspension and mobilization of contaminated stream sediment with absorbed metals.

Permeation grouting, and general construction equipment needed to complete the project has the potential to release debris, hydrocarbons, concrete, and similar contaminants into surface waters during construction. These effects have the potential to harm or injure exposed fish and temporarily degrade habitat. However, AMMs proposed will substantially reduce or eliminate the potential for construction materials, concrete, and debris to enter waterways. Limiting the work window to the dry season from June 15 to October 15 will limit hazardous material exposure to juvenile salmonids, and eliminate potential for containments to adversely affect the most sensitive life stages (i.e., eggs, alevin, and fry). Equipment will be checked daily at both work sites to ensure proper operation and avoid any leaks or spills. Proper storage, treatment, and disposal of construction materials and discharge management is expected to substantially reduce or eliminate contaminants entering the waterway via runoff. Permeation grouting will be initiated only after cofferdams have been installed to prevent discharge into waterways, will quickly become a non-flowable gel that is not expected to migrate (Caltrans 2024), will be directed by a frack out plan provided to NMFS 50 days prior to construction, and will be governed by the Regional Water Quality Control Board construction general permit conditions. Finally, a Storm Water Pollution and Prevention Plan will be implemented to maintain water quality during and after construction within Lagunitas Creek; thus, rendering the potential for the project to degrade water quality and adversely affect salmonids improbable.

2.5.5. Post-Construction Water Quality

The proposed project would result in a larger bridge adding approximately 0.036 acres of net new impervious surface area to the Lagunitas Creek Bridge directly over the waterway. Despite the increased size of the new bridge, traffic is anticipated to remain at a medium AADT. Currently, there is no stormwater treatment onsite, and runoff sheet flows from the bridge directly into the waterway below. Runoff from roadways has been shown to convey contaminants that are toxic to salmonids, including steelhead and coho salmon (McIntyre et al. 2018, Chow et al. 2019, Peter et al. 2018, Tian et al. 2020, Feist et al. 2018, French et al. 2022, Sutton et al. 2019). Pollutants associated with vehicular traffic are expected to originate from the impervious surface of the new bridge deck. Published work has identified stormwater from roadways and streets as causing a high percentage of rapid mortality of adult and juvenile coho salmon (Scholz et al. 2011; McIntyre et al. 2018; Chow et al. 2019) with mortality or symptoms of exposure noticeable within hours. Mortalities have now been directly linked to motor vehicle tires, which deposit the compound 6PPD and its abiotic transformation product 6PPD-q onto roads. 6PPD or [(N-(1, 3-dimethylbutyl)-N'-phenyl-p-phenylenediamine] is used to preserve the elasticity of tires. 6PPD can transform in the presence of ozone (O3) to 6PPD-q. 6PPD-q is ubiquitous to roadways (Sutton et al. 2019) and was identified by Tian et al. (2021) as the primary cause of urban runoff coho mortality syndrome described by Scholz et al. (2011). Subsequent examinations documented impacts to steelhead also within a few hours and neither species recovered when transferred to clean water (Chow et al. 2019; French et al. 2022). The LC50 (the concentration at which 50% of the test organisms die) for juvenile coho (1+ years old) was established at an exceedingly low level (95 parts per trillion (ng/L)(Tian et al. 2022)) that is realistic and documented in the environment (Challis et al. 2021; Johannessen et al. 2022a). Subsequent examinations of younger coho salmon juveniles have found mortality at lower levels.

Greer et al. (2023) tested ~6-month-old coho juveniles and documented mortalities starting as low as 51.2 ng/L. They estimated an LC50 of 80.4 ng/L and a LC5 of 20.7 ng/L. Lo et al. (2023) tested juvenile coho ~3 weeks post swim-up and estimated a LC50 at this lifestage of 41 ng/L and a LC5 of 16.6 ng/L. There are fewer studies on steelhead thus far and no studies published examining sublethal effects on salmonids. Brinkmann et al. (2022) found a LC50 for 2-year old *O. mykiss* of 1 part per billion (µg/L) and remains the only study found reporting fish details at this time. It is anticipated that younger *O. mykiss* are likely more vulnerable to toxic effects from 6PPD-quinone in a manner similar to coho salmon. EPA (2024) examined these studies and many others to establish a screening value concentration expected to be generally protective of 95% of freshwater species exposed to 6PPD-quinone for short durations (e.g., one hour or less) of 11 ng/L.

Recent literature has shown that mortality can be prevented by infiltrating road runoff through soil media containing organic matter, which removes 6PPD-q and other contaminants (McIntyre et al. 2015; Spromberg et al. 2016; Fardel et al. 2020; WA State DOE 2022; Navicikis-Brasch et al. 2022; McIntyre et al. 2023; Rodgers et al. 2023). Research and corresponding adaptive management surrounding 6PPD is rapidly evolving.

Heavy metals such as copper and zinc, well documented contaminants in stormwater from roadways (Caltrans 2000; 2003a, 2003b; DTSC 2021), detrimentally affect salmonids at low and environmentally realistic levels. Effects include decreased resistance of fishes to disease, hyperactivity, impair respiration, disrupt osmoregulation and calcium levels and/or impact olfactory performance leading to disruption in critical fish behaviors at concentrations that are at, or just slightly above, ambient concentrations (Hansen et al. 1999a; 1999b; Baldwin et al. 2003; Sandahl et al. 2007; McIntyre et al. 2012).

Unlike traditional stormwater collection and conveyance practices, such as storm drain systems with direct outfalls to waterways, vegetated filter strips at the edges of paved surfaces, vegetated swales, and bioswales can collect and convey stormwater in ways that infiltrate into soils with large amounts of organic matter that bind or otherwise remove contaminants from the stormwater before it reaches a stream (Caltrans 2003b, McIntrye et al. 2015). As described above in section 1.3, the project will treat roadway runoff associated with impervious surfaces associated with the bridge directly over Lagunitas Creek (0.119 acres) through an infiltration gallery (Appendix C) that has a proposed treatment rating of "high", or untreated roadway runoff will be diverted 80 feet from the bridge and discharged to existing vegetation/soils. As a result of the above, 100% of stormwater associated with the bridge directly over the waterway will either be treated and/or diverted preventing direct discharge into Lagunitas Creek. In addition, runoff associated with the widened overflow culvert will be allowed to discharge into existing vegetation for filtration prior to entering into waterways. Thus, exposure to untreated roadway runoff (including 6PPD-q) will be avoided. Therefore, we expect mortality and other sublethal effects associated with construction of the new bridge and post-construction water quality, when implemented with the proposed preventative water quality control measures, will be avoided.

2.5.6. Removal of Riparian Vegetation, Increased Shade, and Habitat Modification

Eighteen trees within riparian habitat will be removed due to bridge widening, and 23 trees within riparian habitat will be temporarily impacted due to vegetation clearing, grading, and construction of the temporary detour. These trees are located along the banks of Lagunitas Creek. Riparian vegetation helps maintain stream habitat conditions necessary for salmonid growth, survival, and reproduction. Riparian zones and wetland/aquatic vegetation serve important functions in stream ecosystems such as providing shade (Pool and Berman 2001), sediment storage and filtering (Cooper et al. 1987, Mitsch and Gosselink 2000), nutrient inputs (Murphy and Meehan 1991), water quality improvements (Mitsch and Gosselink 2000), channel and streambank stability (Platts 1991), source of woody debris that creates fish habitat diversity (Bryant 1983, Lisele 1986, Shirvell 1990), and both cover and shelter for fish (Bustard and Narver 1975, Wesche et al. 1987, Murphy and Meehan 1991). Riparian vegetation disturbance and removal can degrade these ecosystem functions and removal can degrade these ecosystem functions and impair stream habitat. Removal of riparian vegetation increases stream exposure of solar radiation, leading to increases in stream temperatures (Poole and Berman 2001).

Tree and vegetation removal will be minimized to the maximum extent feasible to prevent erosion and to reduce potential impacts of riparian vegetation removal on salmonids. The removal of riparian vegetation will result in both minor permanent and temporary reductions in shade and cover for fish, and will remove sources of woody debris that may contribute to habitat diversity and complexity. Trimmed vegetation is expected to grow back and the native vegetation disturbed during construction will be replanted on-site, following project completion. The project site will be monitored to ensure the success of revegetation efforts to restore areas impacted by removal of native riparian vegetation. Therefore, the services provided by vegetation such as shade and cover, sediment storage and filtering, nutrient inputs, sources of woody debris, and habitat complexity (i.e., cover) will remain degraded at the sites until new vegetation is replanted and becomes established. When considering complete removal of trees, we expect riparian vegetation attributes on-site will return to pre-project levels after native trees are replanted and established; possibly within 5-10 years due to Caltrans' proposed AMMs, revegetation measures, and vegetation growth rates. Because of the timing and establishment of the on-site revegetation and recruitment of new woody debris, loss of riparian vegetation may cause individual salmonids to seek alternative areas for cover and forage. Such temporary displacement of salmonids is not expected to reduce their individual performance because there are sites nearby that provide these features and can accommodate additional individuals without becoming overcrowded. However, a number of individuals could remain in the area directly adjacent to areas where vegetation is either temporarily or permanently impacted. For individuals that choose to stay in the area, the impacts of reduced shade, cover, and other vegetative services (i.e., sediment storage and filtering, nutrient input, etc.) from removal of riparian vegetation is not expected to significantly reduce their performance. Furthermore, as a result of the project, the action area will see an increase in shaded environments (0.041 acres) on Lagunitas Creek because of the new bridge, and permanent loss of habitat (0.001 acres) due to fill associated with structural elements located along the north side of the bridge. This new shaded area may provide nominal benefits (i.e., cooler water temperatures) to salmonids within the action area; however, it could also reduce the amount of riparian vegetation growing on the creek banks and bed adjacent to the bridge. Due to the small area affected by new shading, NMFS expects that the effects that bridge widening will have on riparian vegetation will not negatively impact the behavior or fitness of individual salmonids. Similarly, the nominal amount of habitat permanently loss from the structural bridge elements is not expected to negatively impact the behavior or fitness of individual salmonids because there is adequate habitat to support salmonids in the surrounding area. Furthermore, completion of the project is expected to beneficially impact and improve freshwater rearing and migration PBFs within the action area through installation of 135 linear feet of rootwad revetment along both banks of Lagunitas Creek below the bridge. Installation of large woody debris within Lagunitas Creek is in line with NMFS' recovery plan actions to improvement habitat complexity and increase large wood frequency (2013, 2016). This component of the project is expected to aid in the recovery of CCC steelhead and CCC coho salmon that utilize the action area.

2.6. Cumulative Effects

"Cumulative effects" are those effects of future state or private activities, not involving federal activities, that are reasonably certain to occur within the action area of the federal action subject to consultation [50 CFR 402.02]. Future federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to section 7 of the ESA.

Some continuing non-federal activities are reasonably certain to contribute to climate effects within the action area. However, it is difficult if not impossible to distinguish between the action area's future environmental conditions caused by global climate change that are properly part of the environmental baseline *vs.* cumulative effects. Therefore, all relevant future climate-related environmental conditions in the action area are described earlier in the discussion of environmental baseline (Section 2.4).

2.7. Integration and Synthesis

The Integration and Synthesis section is the final step in assessing the risk that the proposed action poses to species and critical habitat. In this section, we add the effects of the action (Section 2.5) to the environmental baseline (Section 2.4) and the cumulative effects (Section 2.6), taking into account the status of the species and critical habitat (Section 2.2), to formulate the agency's biological opinion as to whether the proposed action is likely to: (1) reduce appreciably the likelihood of both the survival and recovery of a listed species in the wild by reducing its numbers, reproduction, or distribution; or (2) appreciably diminish the value of designated or proposed critical habitat as a whole for the conservation of the species.

CCC steelhead and CCC coho salmon occur within Lagunitas Creek, and are currently at low abundance levels throughout their ranges as compared to historical population estimates. Designated critical habitat for threatened CCC steelhead and endangered CCC coho salmon also occurs within Lagunitas Creek. Human induced factors affecting steelhead and coho salmon and their critical habitat such as logging, urbanization, stream channelization, and dams have impaired migration, spawning, and rearing habitat throughout their historic ranges.

As described in Section 2.5 Effects of the Action, NMFS identified the following components of the project that may result in effects to CCC steelhead and CCC coho salmon and/or habitat: fish collection and relocation, dewatering, increases in sedimentation and turbidity, pollution from hazardous materials and contaminants, stormwater runoff, removal of riparian vegetation, habitat modification, and increased shade. Of these, fish collections, relocation, and dewatering have the potential to result in reduced fitness, injury, and/or mortality of CCC steelhead and CCC coho salmon.

2.7.1. Listed Species

The project proposes to dewater portions of Lagunitas Creek June 15 to October 31, during low flow conditions in the summer. Therefore, it is anticipated that only rearing juvenile salmonids would be affected by project activities and no adult salmonids or migrating smolts would be affected by the project activities. Furthermore, due to the small area of stream affected, and the low summer streamflow, NMFS estimates that a very small number of juvenile salmonids will be present in the dewatered areas prior to the construction. Individuals present will likely make up a small portion of the salmonid populations within Lagunitas Creek. Anticipated mortality from relocation is expected to be two percent (or less) of the fish relocation and mortality expected from dewatering is expected to be one percent (or less) of the fish in the area prior to dewatering (combined mortality not to exceed three percent). Due to the relatively large number of juveniles produced by each spawning pair, salmonid spawning in the area in future years are likely to produce enough juveniles to replace the few juveniles that be lost as the project site due to relocation and dewatering. Thus, it is unlikely that the small potential loss of juvenile salmonids during the life of the project will impact future adult returns.

For short-term effects, climate change is not expected to significantly worsen existing conditions over the time frame considered in this biological opinion. Considering the above, we do not expect climate change to affect salmonids in the action area beyond the scope considered in this biological opinion. For the long-term effects, climate change would likely worsen conditions if total precipitation in California declines and critically dry years increase. These conditions would likely modify water quality, streamflow levels, rearing habitat and salmonid migration. The overall reduction in habitat quality caused by the project is limited to a small area of the watershed and therefore, even if climate change reduced the overall habitat quality in the future when combined with this proposed action any amplification in habitat degradation would be very small.

In addition to the adverse effects described above, we also consider the potential impacts of increased sedimentation and turbidity, pollution from hazardous materials and contaminants, stormwater runoff, removal of riparian vegetation, habitat modification, and increased shading. The implementation of an infiltration-type gallery to treat roadway runoff from impervious surfaces before entering into the water way, coupled with additional proposed AMMs pertaining to water quality treatment (i.e., diversion) are expected to render the potential for fish to be exposed to pollution from hazardous materials and contaminants during, and after, construction improbable. Increased sedimentation and turbidity, and temporary loss and degradation of habitat in the dewatered area will cease shortly after construction in completed and will only result in minor impacts to salmonids. Riparian vegetation removed to construct the project will take up to 10 years to return to pre-project levels. During this timeframe, individual salmonids exposed to reduced cover and forage will be able to successfully complete their life cycle in the action area or alternatively nearby habitats. The small shaded area that will be created by the bridge is expected to only have negligible effects on salmonids, and the installation of large woody debris is expected to benefit salmonids by providing improved rearing and migratory habitat, and will aid in recovery for steelhead and coho that utilize the action area. NMFS does not expect any of the aforementioned effects to combine with other effects in any significant way. Effects from construction are limited in time and area and fish losses due to capture and relocation are minimal and only occur to juvenile salmonids during a single construction season. Therefore, we do not expect the proposed project to affect the persistence or recovery of the Lagunitas Creek population of CCC steelhead in the DPS, or CCC coho salmon in the ESU. We base this conclusion on our findings above which considered the status of the species, the environmental baseline, all of the potential effects of the action, and the cumulative effects.

2.7.2. Critical Habitat

Regarding future climate change effects in the action area, California could be subject to higher average summer air temperatures and lower total precipitation levels. Reductions in the amount of snowfall and rainfall would reduce streamflow levels in Northern California Rivers. For this project, in-water activities would occur on a short-term basis; thus, the above effects of climate change are not likely to be detected within that period. If the effects of climate change are detected over the short term, they will likely materialize as moderate changes to the current climate conditions within the action area. As discussed above, climate change could modify water quality, stream flow levels, rearing habitat, and salmonid migration over the long-term. Because the overall reduction in rearing and migration habitat quality caused by the project is minor, or limited to a small area of the watershed, even if climate change reduced the overall habitat quality in the future, when combined with this proposed action any amplification in habitat degradation will be very small.

Effects to critical habitat from the proposed project are expected to include temporary impacts during construction activities, and altered habitat conditions post-construction from reduced riparian vegetation. During dewatering activities, forage supporting juvenile development will be diminished temporarily, and salmonid rearing habitat will be reduced in area equal to the dewatered area temporarily. Critical habitat at the site will also suffer reductions in vegetation associated cover and forage during the construction and revegetation timeframe of 5-10 years. These reductions will diminish the quality of salmonid freshwater rearing and adult forage sites during the 5-10 year construction and revegetation timeframe. However, the overall degradation of migration and rearing PBFs in the action area is minor or of limited extent and suitable migration and rearing opportunities will remain. When added to the environmental baseline, cumulative effects, species status, the effects to critical habitat from the proposed action are not expected to appreciably reduce the quality and function of critical habitat of the larger CCC steelhead DPS, or CCC coho salmon ESU.

2.8. Conclusion

After reviewing and analyzing the current status of the listed species and critical habitat, the environmental baseline within the action area, the effects of the proposed action, the effects of other activities caused by the proposed action, and the cumulative effects, it is NMFS' biological opinion that the proposed action is not likely to jeopardize the continued existence of CCC steelhead, CCC coho salmon, nor destroy or adversely modify their designated critical habitat.

2.9. Incidental Take Statement

Section 9 of the ESA and federal regulations pursuant to section 4(d) of the ESA prohibit the take of endangered and threatened species, respectively, without a special exemption. “Take” is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct. “Harm” is further defined by regulation to include significant habitat modification or degradation that actually kills or injures fish or wildlife by significantly impairing essential behavioral patterns, including breeding, spawning, rearing, migrating, feeding, or sheltering (50 CFR 222.102). “Harass” is further defined by guidance as to “create the likelihood of injury to wildlife by annoying it to such an extent as to significantly disrupt normal behavioral patterns which include, but are not limited to, breeding, feeding, or sheltering.” “Incidental take” is defined by regulation as takings that result from, but are not the purpose of, carrying out an otherwise lawful activity conducted by the federal agency or applicant (50 CFR 402.02). Section 7(b)(4) and section 7(o)(2) provide that taking that is incidental to an otherwise lawful agency action is not considered to be prohibited taking under the ESA if that action is performed in compliance with the terms and conditions of this ITS.

2.9.1. Amount or Extent of Take

In the biological opinion, NMFS determined that incidental take is reasonably certain to occur as follows:

Take of listed juvenile CCC steelhead and CCC coho salmon is likely to occur during fish relocation and dewatering of Lagunitas Creek between June 15 and October 31. Construction activities associated with bridge demolition and construction that require creek dewatering, and subsequent fish handling and relocation, will be completed in one construction season. The number of CCC steelhead and CCC coho salmon that are likely incidentally taken during dewatering activities is expected to be small, limited to pre-smolt and YOY juvenile life stage. NMFS expects that no more than two percent of the juvenile steelhead and coho salmon present within the dewatered area of Lagunitas Creek will be injured, harmed, or killed during fish relocation activities. NMFS also expects that no more than one percent of the fish within the same dewatered area will be injured, harmed, or killed during dewatering activities. If more than three percent of the total number of juvenile steelhead captured are harmed or killed, incidental take will have been exceeded. Similarly, if more than three percent of the total number of juvenile coho salmon captured are harmed or killed, incidental take will have been exceeded.

2.9.2. Effect of the Take

In the biological opinion, NMFS determined that the amount or extent of anticipated take, coupled with other effects of the proposed action, is not likely to result in jeopardy to the species or destruction or adverse modification of critical habitat.

2.9.3. Reasonable and Prudent Measures

“Reasonable and prudent measures” refer to those actions the Director considers necessary or appropriate to minimize the impact of the incidental take on the species (50 CFR 402.02).

NMFS believes the following reasonable and prudent measures are necessary and appropriate to minimize take of juvenile CCC steelhead and CCC coho salmon:

1. Undertake measures to ensure that injury and mortality to salmonids resulting from fish relocation and dewatering activities is low;
2. Undertake measures to minimize harm to salmonids from construction of the project and degradation of aquatic habitat; and
3. Prepare and submit plans and reports regarding the effects of fish relocation, construction of the project, and post-construction site-performance.

2.9.4. Terms and Conditions

In order to be exempt from the prohibitions of section 9 of the ESA, the federal action agency must comply (or must ensure that any applicant complies) with the following terms and conditions. Caltrans or any applicant has a continuing duty to monitor the impacts of incidental take and must report the progress of the action and its impact on the species as specified in this ITS (50 CFR 402.14). If the entity to whom a term and condition is directed does not comply with the following terms and conditions, protective coverage for the proposed action would likely lapse.

1. The following terms and conditions implement reasonable and prudent measure 1:

    a. Caltrans or the contractor will allow any NMFS employee(s), or any other person designated by NMFS, to accompany field personnel to visit the project site during activities described in this opinion.

    b. Caltrans or the contractor will retain qualified biologists with expertise in the area of anadromous salmonid biology, including handling, collecting, and relocation salmonids; salmonid/habitat relationships; and biological monitoring of salmonids. Caltrans or the contractor shall ensure that all fisheries biologists working on this project be qualified to conduct fish locations in a manner which minimizes all potential risks to ESA-listed salmonids. Electrofishing, if used, shall be performed by a qualified biologist and conducted according to the *NOAA Fisheries Guidelines for Electrofished Waters Containing Salmonids Listed under the Endangered Species Act, June 2000.* See: http://www.nwr.noaa.gov/ ESA-Salmon-Regulations-Permits/4d Rules/upload/electro2000.pdf.

    c. The biologists will monitor the construction sites during placement and removal of cofferdams and channel diversions to ensure that any adverse effects to salmonids are minimized. The biologists will be on site during all dewatering events to capture, handle, and safely relocate salmonids to an appropriate location. The biologist will notify NMFS staff at 707-531-0706 or elena.meza@noaa.gov, one week prior to capture activities in order to provide an opportunity for NMFS staff to observe the activities. During fish relocation activities the fisheries biologist shall contact NMFS staff at the above number, if mortality of federally listed salmonids exceeds three percent of the total , at which time salmonids collected, at which time NMFS will stipulate measures to reduce the take of salmonids.

d. Salmonids will be handled with extreme care and kept in water to the maximum extent possible during rescue activities. All captured fish will be kept in cool, shaded, aerated water protected from excessive noise, jostling, or overcrowding any time they are not in the stream, and fish will not be removed from this water except when released. To avoid predation, the biologists will have at least two containers and segregate young-of-year form larger age classes and other potential aquatic predators. Captured salmonids will be relocated, as soon as possible, to a suitable instream location (pre-approved by NMFS) in which suitable habitat conditions are present to allow for adequate survival of transported fish and fish already present.

e. If any salmonids are found dead or injured, the biological monitor will contact NMFS staff at 707-531-0706 or elena.meza@noaa.gov. All salmonid mortalities will be retained until further direction is provided by the NMFS biologist listed above.

    i. Tissue samples are to be acquired from each mortality prior to freezing the carcass per the methods identified in the NMFS Southwest Fisheries Science Center Genetic Repository protocols: Either a 1 cm square clip from the operculum or tail fin, or alternatively, complete scales (20-30) should be removed and placed on a piece of dry blotter/filter paper (e.g., Whatman brand). Fold blotter paper over for temporary storage. Samples must be airdried as soon as possible (do not wait longer than 8 hours). When tissue/paper is dry to the touch, place into a clean envelope labeled with Sample ID Number and seal the envelope.

    ii. Include the following information with each tissue sample using the Salmonid Genetic Tissue Repository form or alternative spreadsheet: Collection date, collection locations (County, river, exact location on river), collector name, collector affiliation/phone, sample ID number, species, tissue type, condition, fork length (mm), sex (M, F, or Unk), adipose fin clip (Y or N), tag (Y or N), any notes of comments.

    iii. Send tissue samples to: NMFS Coastal California Genetic Repository, Southwest Fisheries Science Center, 110 McAllister Way, Santa Cruz, California 95060.

2. The following terms and conditions implement reasonable and prudent measure 2:

    a. To ensure that the project is built as designed and contractors adhere to construction best management practices, monitoring will be performed during construction by skilled individuals. Monitors will demonstrate prior knowledge and experience in stream channel design and restoration, fish passage design, construction minimization measures, and the needs of native fish, including salmonids. Monitoring will be performed daily. The monitor(s) will work in close coordination with project management personnel, the project design (engineering) team, and the construction crew to ensure that the project is built as designed.

b. Any pumps used to divert live stream flow will be screened and maintained throughout the construction period to comply with NMFS' Fish Screening Criteria for Anadromous Salmonids (2000).

c. Construction equipment used within the river channel will be checked each day prior to work within the river channel (top of bank to top of bank) and, if necessary, action will be taken to prevent fluid leaks. If leaks occur during work in the channel, Caltrans or their contractors will contain the spill and removed the affected soils.

d. Once construction is completed, all project-introduced materials must be removed, unless otherwise noted above, leaving the creek as it was before construction. Excess materials should be disposed of at an appropriate disposal site.

3. The following terms and conditions implement reasonable and prudent measure 3:

a. Caltrans must provide a written report to NMFS by January 15 of the year following construction. The report must be submitted to the parties addressed and described above in 1.c. The report must contain, at minimum, the following information:

b. Project construction and fish relocation report – the report must contain the following contents:

i. **Construction Related Activities –** The report(s) must include the dates the construction started, a discussion of design compliance including vegetation installation; discussion of any unanticipated effects or unanticipated levels of effects on salmonids, including a description of any and all measures taken to minimize those unanticipated effects and a statement as to whether or not the unanticipated effects had any effect on ESA-listed fish; the number of salmonids killed or injured during the proposed action; and photographs taken before, during, and after the activity from photo reference points.

ii. **Fish Relocation –** The report must include a description of the location from which fish were removed and the release site including photographs; the date and time of the relocation effort; a description of the equipment and methods use to collect, hold, and transport salmonids, if an electrofisher was used for fish collection, a copy of the logbook must be included; the number of fish relocated by species; the number of fish injured or killed by species and a briege narrative of the circumstances surrounding ESA-listed fish injuries or mortalities; and a description of any problems which may have arisen during the relocation activities and a statement as to whether or not the activities had any unforeseen effects.

c. **Post-Project Monitoring Reports and Surveys –** Project reports and survey information will be sent to the address above in 1.c., and must include the following contents:

   i. **Post-Construction Vegetation Monitoring and Reporting –** Caltrans must develop and submit for NMFS' review a plan to assess the success of revegetation of the site. A draft of the revegetation monitoring plan must be submitted to NMFS (address specified above in 1.c.) for review and approval prior to the beginning of the in-stream work season. Reports documenting post-project conditions of vegetation installed at the site will be prepared and submitted annually on January 15 for the first five years following project completion, unless the site is documented to be performing poorly, then monitoring requirements will be extended. Reports will document vegetation health and survivorship and percent cover, natural recruitment of native vegetation (if any), and any maintenance or replanting needs. Photographs must be included. If poor establishment is documented, the report must include recommendations to improve conditions.

2.10. Conservation Recommendations

Section 7(a)(1) of the ESA directs federal agencies to use their authorities to further the purposes of the ESA by carrying out conservation programs for the benefit of the threatened and endangered species. Specifically, "conservation recommendations" are suggestions regarding discretionary measures to minimize or avoid adverse effects of a proposed action on listed species or critical habitat or regarding the development of information (50 CFR 402.02). NMFS has no conservation recommendations for this project.

2.11. Reinitiation of Consultation

This concludes formal consultation for the Lagunitas Creek Bridge Replacement Project (04-0G642).

Under 50 CFR 402.16(a): "Reinitiation of consultation is required and shall be requested by the federal agency, where discretionary federal involvement or control over the action has been retained or is authorized by law and: (1) If the amount or extent of taking specified in the incidental take statement is exceeded; (2) If new information reveals effects of the agency action that may affect listed species or critical habitat in a manner or to an extent not previously considered; (3) If the identified action is subsequently modified in a manner that causes an effect to the listed species or critical habitat that was not considered in the biological opinion or written concurrence; or (4) If a new species is listed or critical habitat designated that may be affected by the identified action."

3. Magnuson–Stevens Fishery Conservation and Management Act Essential Fish Habitat Response

Section 305(b) of the MSA directs federal agencies to consult with NMFS on all actions or proposed actions that may adversely affect EFH. Under the MSA, this consultation is intended to promote the conservation of EFH as necessary to support sustainable fisheries and the managed species' contribution to a healthy ecosystem. For the purposes of the MSA, EFH means "those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity", and includes the associated physical, chemical, and biological properties that are used by fish (50 CFR 600.10). Adverse effect means any impact that reduces quality or quantity of EFH, and may include direct or indirect physical, chemical, or biological alteration of the waters or substrate and loss of (or injury to) benthic organisms, prey species and their habitat, and other ecosystem components, if such modifications reduce the quality or quantity of EFH. Adverse effects may result from actions occurring within EFH or outside of it and may include direct, indirect, site-specific or habitat-wide impacts, including individual, cumulative, or synergistic consequences of actions (50 CFR 600.810). Section 305(b) of the MSA also requires NMFS to recommend measures that can be taken by the action agency to conserve EFH. Such recommendations may include measures to avoid, minimize, mitigate, or otherwise offset the adverse effects of the action on EFH (50 CFR 600.905(b))].

This analysis is based, in part, on the EFH assessment provided by Caltrans and descriptions of EFH for Pacific Coast Salmon (PFMC 2014) contained in the fishery management plans developed by the PFMC and approved by the Secretary of Commerce.

3.1. Essential Fish Habitat Affected by the Proposed Action

Pacific Coast Salmon EFH will be adversely affected by the proposed action within Lagunitas Creek.

3.2. Adverse Effects on EFH

The potential adverse effects of the project on EFH for Pacific Coast Salmon have been described in the preceding biological opinion and include temporary disturbances to the streambed, bank, and flow from project site dewatering; temporary elevated turbidity levels from suspended sediment and degraded water quality; and loss of riparian vegetation. As described in the biological opinion above, the project site dewatering and turbidity effects are anticipated to be temporary and minor due to the small amount of area impacted relative to the total quantity of habitat available in the action area. The project includes measures to protect water quality before, during, and after construction, and although riparian vegetation will be degraded, on-site revegetation of native trees and vegetation will occur to replace vegetation lost during construction activities to restore the area post-construction.

3.3. EFH Conservation Recommendations

Based on information developed in our effect analysis (see preceding biological opinion), NMFS has determined that the proposed action would adversely affect EFH for federally managed CCC coho salmon within the Pacific Salmon FMP. Section 305(b)(4)(A) of the MSA authorizes NMFS to provide EFH Conservation Recommendations that will minimize adverse effects of an activity on EFH. Although adverse effects are anticipated as a result of the proposed project, the proposed avoidance and minimization measures, and best management practices, in the accompanying biological opinion are sufficient to avoid, minimize, and/or mitigate for the anticipated effects. Therefore, no additional EFH Conservation Recommendations are necessary that would otherwise offset the adverse effects to EFH.

3.4. Supplemental Consultation

Caltrans must reinitiate EFH consultation with NMFS if the proposed action is substantially revised in a way that may adversely affect EFH, or if new information becomes available that affects the basis for NMFS' EFH conservation recommendations (50 CFR 600.920(l)).

4. DATA QUALITY ACT DOCUMENTATION AND PRE-DISSEMINATION REVIEW

The Data Quality Act (DQA) specifies three components contributing to the quality of a document. They are utility, integrity, and objectivity. This section of the opinion addresses these DQA components, documents compliance with the DQA, and certifies that this opinion has undergone pre-dissemination review.

4.1. Utility

Utility principally refers to ensuring that the information contained in this consultation is helpful, serviceable, and beneficial to the intended users. The intended users of this opinion are Caltrans or their contractors. Other interested users could include the California Department of Fish and Wildlife, the Regional Water Quality Control Board, citizens of affected areas, others interested in the conservation of aquatic riparian resources. Individual copies of this opinion were provided to Caltrans. The document will be available within 2 weeks at the NOAA Library Institutional Repository [https://repository.library.noaa.gov/welcome]. The format and naming adhere to conventional standards for style.

4.2. Integrity

This consultation was completed on a computer system managed by NMFS in accordance with relevant information technology security policies and standards set out in Appendix III, 'Security of Automated Information Resources,' Office of Management and Budget Circular A-130; the Computer Security Act; and the Government Information Security Reform Act.

4.3. Objectivity

Information Product Category: Natural Resource Plan

<u>Standards:</u> This consultation and supporting documents are clear, concise, complete, and unbiased; and were developed using commonly accepted scientific research methods. They adhere to published standards including the NMFS ESA Consultation Handbook, ESA

regulations, 50 CFR 402.01 et seq., and the MSA implementing regulations regarding EFH, 50 CFR part 600.

Best Available Information: This consultation and supporting documents use the best available information, as referenced in the References section. The analyses in this opinion and EFH consultation contain more background on information sources and quality.

Referencing: All supporting materials, information, data and analyses are properly referenced, consistent with standard scientific referencing style.

Review Process: This consultation was drafted by NMFS staff with training in ESA and MSA implementation, and reviewed in accordance with West Coast Region ESA quality control and assurance processes.

5. References

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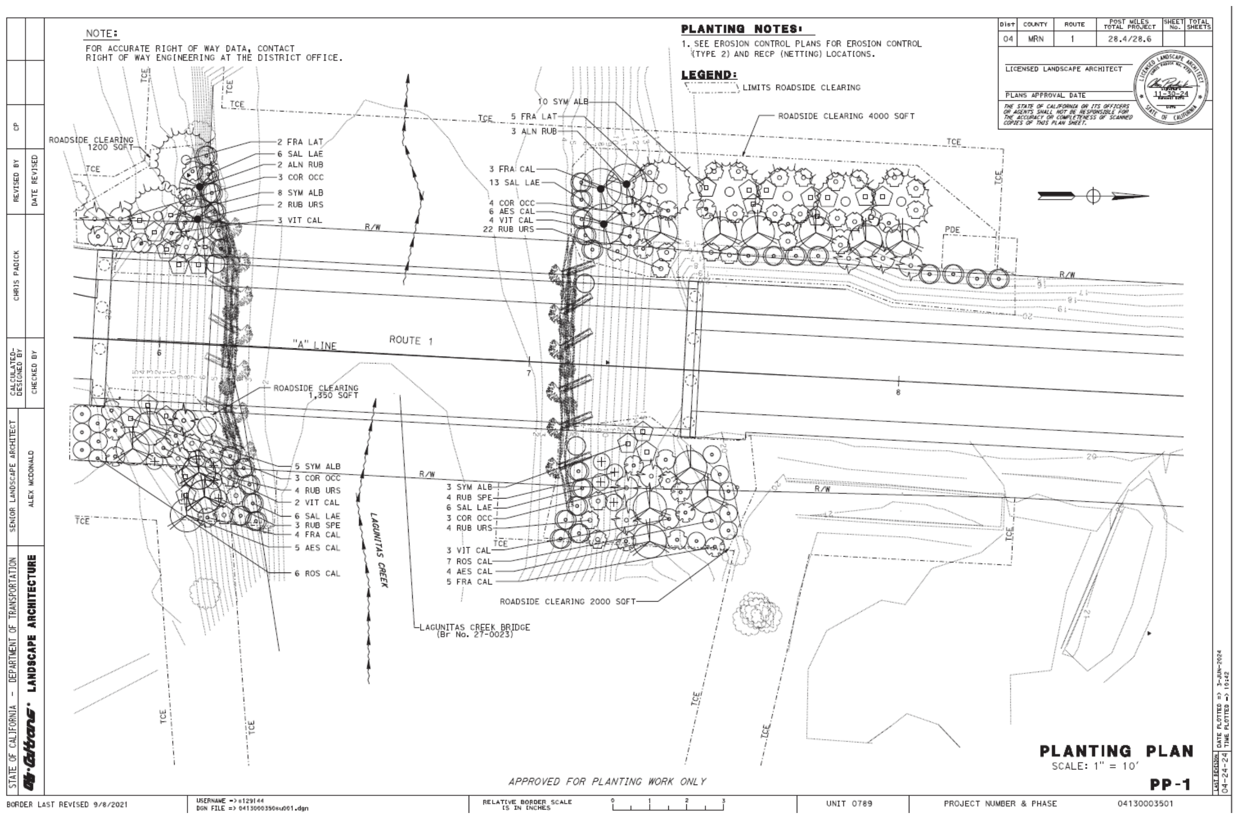
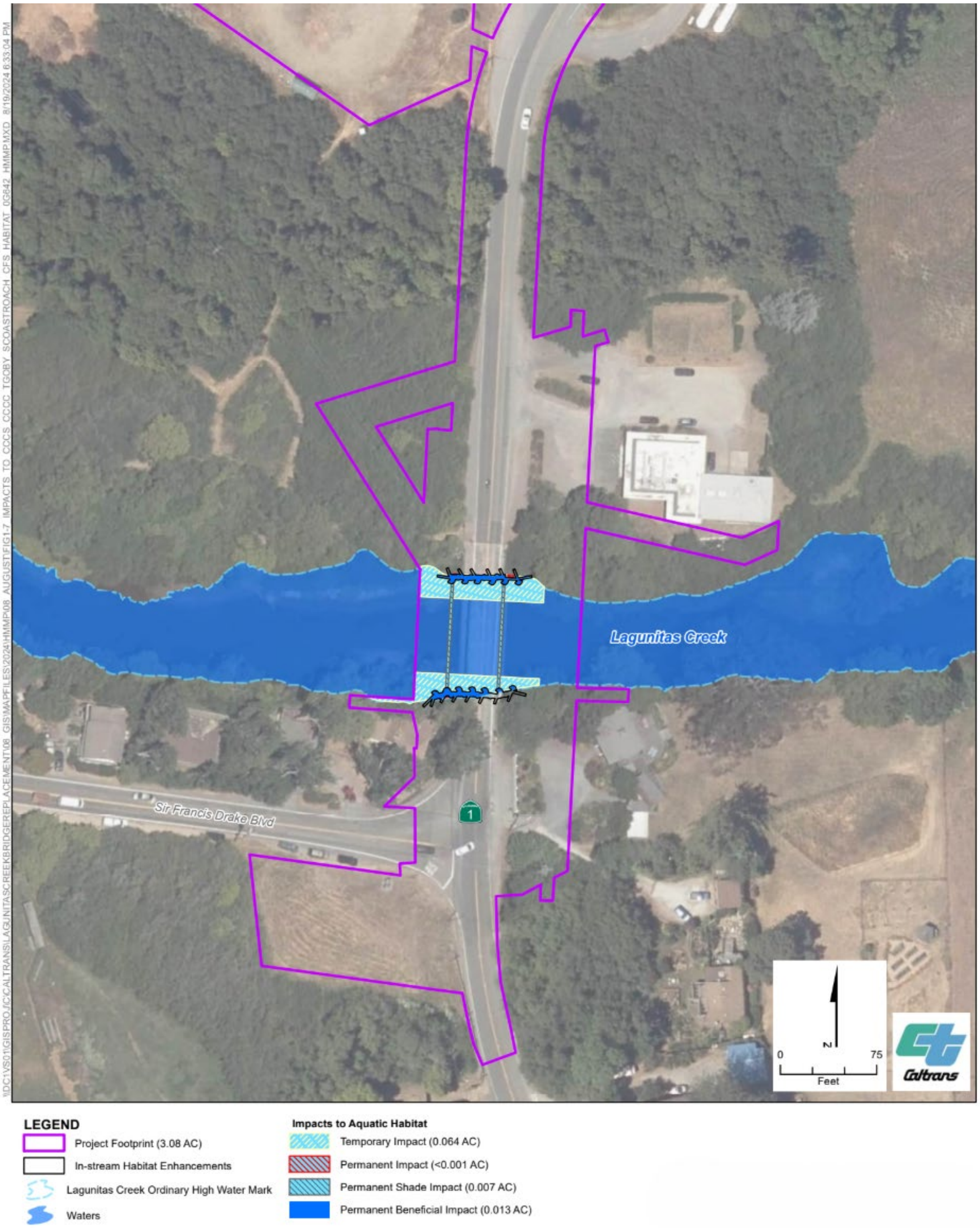
6. Appendices

6.1. Appendix A: Rootwad Revetment and Riparian Vegetation Planting Plans



6.2. Appendix B: Temporary Dewatered Area



6.3. Appendix C: Stormwater Treatment and Site Drainage