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

March 21, 2019 **Refer to NMFS No:** WCRO-2016-00003

Katerina Galacatos, Ph.D.
Acting Regulatory Branch Chief
Department of the Army
San Francisco District, Corps of Engineers
450 Golden Gate Avenue, 4th Floor, Suite 0134
San Francisco, California 94102-3406

Re: Endangered Species Act Section 7(a)(2) Biological Opinion for the Lower Crystal Springs Dam Stilling Basin Connecting Channel Project in San Mateo County, California (Corps File No. 2006-30317S)

Dear Dr. Galacatos:

Thank you for your letter of July 13, 2016, 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 proposed Lower Crystal Springs Dam Stilling Basin Connecting Channel Project in the County of San Mateo, California (Project). The Corps of Engineers (Corps) proposes to provide authorization pursuant to Section 404 of the Clean Water Act of 1972, as amended (33 U.S.C. § 1344 *et seq*.), to the San Francisco Public Utilities Commission to construct the Project.

The enclosed biological opinion is based on our review of the proposed Project and describes NMFS' analysis of the effects on threatened Central California Coast (CCC) steelhead (*Oncorhynchus mykiss*) in accordance with section 7 of the ESA.

In the enclosed biological opinion, NMFS concludes the Project is not likely to jeopardize the continued existence of threatened CCC steelhead. However, NMFS anticipates take of CCC steelhead will occur as a result of dewatering work areas during project construction. An incidental take statement with non-discretionary terms and conditions is included with the enclosed biological opinion.

We completed pre-dissemination review of this biological opinion using standards for utility, integrity, and objectivity in compliance with applicable guidelines issued under the Data Quality Act (section 515 of the Treasury and General Government Appropriations Act for Fiscal Year 2001, Public Law 106-554). The biological opinion will be available through the NOAA Institutional Repository (https://repository.library.noaa.gov/), after approximately two weeks. A complete record of this consultation is on file at the NMFS North-Central Coast Office in Santa Rosa, California.

Please contact Daniel Logan of the NMFS North-Central Coast Office in Santa Rosa, California at (707) 575-6053, or dan.logan@noaa.gov if you have any questions concerning this section 7 consultation, or if you require additional information.

Sincerely,

Alecia Van Atta
Assistant Regional Administrator
California Coastal Office

Enclosure

cc: Greg Brown, Corps of Engineers, San Francisco, California
Deborah Craven-Green, San Francisco Public Utilities Commission, San Francisco
Tim Ramirez, San Francisco Public Utilities Commission, San Francisco
Xavier Fernandez, San Francisco Regional Water Quality Control Board, Oakland
Randi Adair, California Department of Fish and Wildlife, Fairfield
Copy to ARN File #151422WCR2016SR00403/WCR-2016-5820

Endangered Species Act (ESA) Section 7(a)(2) Biological Opinion

Lower Crystal Springs Dam Stilling Basin Connecting Channel Project in San Mateo County California

NMFS Consultation Number: WCRO-2016-00003

Action Agency: U.S. Department of the Army, Corps of Engineers, San Francisco District

Affected Species and NMFS' Determinations:

ESA-Listed Species	Status	Is Action Likely to Adversely Affect Species?	Is Action Likely To Jeopardize the Species?	Is Action Likely to Adversely Affect Critical Habitat?	Is Action Likely To Destroy or Adversely Modify Critical Habitat?
Central California Coast steelhead (*Oncorhynchus mykiss*)	Threatened	Yes	No	No	No

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

Issued By: _____

Alecia Van Atta
Assistant Regional Administrator

Date: March 21, 2019

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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 USC 1531 *et seq*.), and implementing regulations at 50 CFR 402.

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 through the NOAA Institutional Repository (https://repository.library.noaa.gov/), after approximately two weeks. A complete record of this consultation is on file at the NMFS North-Central Coast Office in Santa Rosa, California (ARN #151422WCR2016SR00403).

1.2 Consultation History

Prior to the receipt of a consultation initiation request package from the Corps, NMFS had several conversations with staff from the San Francisco Public Utilities Commission (SFPUC) regarding observations of Central California Coast (CCC) steelhead (*Oncorhynchus mykiss*) in the stilling basin of Lower Crystal Springs Dam (LCSD). In September 2013, SFPUC staff contacted NMFS staff regarding juvenile steelhead that were stranded in the LCSD stilling basin. Apparently surface streamflow between the stilling basin and San Mateo Creek was disconnected precluding volitional egress of steelhead from the stilling basin. Water temperatures measured by SFPUC staff within the stilling basin were higher than water temperatures in San Mateo Creek and were marginal for steelhead survival. Staff from SFPUC and NMFS discussed both relocation of the stranded steelhead and the addition of cool water to the stilling basin. Ultimately, SFPUC selected the temporary solution of moderating the water temperature within the stilling basin by adding cool water from Lower Crystal Springs Reservoir.

On March 19, 2015, SFPUC and NMFS participated in a conference call to discuss modification of the LCSD stilling basin. SFPUC staff indicated that steelhead are able to enter the stilling basin at relatively low winter flows (<10 cubic feet per second [cfs]) when downstream conditions connect San Mateo Creek to the stilling basin. However, egress from the stilling basin is precluded at summer and fall baseflow conditions. Under low flow conditions during the dry season, surface streamflow between the stilling basin and Pool 2 is not contained to a defined channel, rather it flows over a field of placed riprap and then a broad area of shallow emergent wetlands without a defined channel. Any steelhead confined in the stilling basin when surface streamflow does not connect the stilling basin and Pool 2 could be exposed to high, and potentially lethal, water temperatures. SFPUC proposed to construct a permanent solution to steelhead stranding in the stilling basin by creating conditions resulting in perennial surface streamflow connectivity between the LCSD stilling basin and Pool 2. NMFS supported SFPUC's decision to proceed in developing a channel to connect the stilling basin with Pool 2 in San Mateo Creek.

On July 15, 2015, SFPUC provided NMFS, via email, a 30 percent drawing for the proposed modification to the LCSD stilling basin.

On September 16, 2015, SFPUC sent an email to NMFS indicating the SFPUC's steelhead monitoring program for San Mateo Creek associated with evaluating operation of LCSD may exceed their take limit (*i.e*., 500 juvenile CCC steelhead with mortality not to exceed four percent) if SFPUC increased the surveyed reach from 800 linear feet of stream to 1300 linear feet. This fisheries monitoring program and the associated take of threatened CCC steelhead was authorized in the October 29, 2010, biological opinion and incidental take statement issued by NMFS to the Corps and SFPUC for the LCSD Improvement Project.

On October 6, 2015, NMFS requested SFPUC, via email, provide additional details regarding proposed changes to the fish monitoring program by gear type, including specific sampling locations, estimated captures of *O. mykiss*, and estimated injuries and mortalities.

December 2, 2015, SFPUC provided to the Corps and NMFS, via email, a biological assessment of the proposed LCSD Stilling Basin Connecting Channel Project.

On June 30, 2016, SFPUC sent an email to NMFS covering several topics related to the LCSD Improvement Project. This email transmitted to NMFS the SFPUC's proposed steelhead research and monitoring program as required by term and condition 3(a) of the ITS attached to the October 29, 2010, biological opinion. The email also indicated that the SFPUC's first San Mateo Creek annual monitoring report is in review, and SFPUC requested modification to the LCSD Improvement Project biological opinion's incidental take number of juvenile steelhead to allow for additional fish captures associated with their monitoring program.

By letter dated July 13, 2016, the Corps requested initiation of formal consultation with NMFS, North-Central Coast Office, for the proposed LCSD Stilling Basin Connecting Channel Project by SFPUC in San Mateo County, California.

Following the Corps' request for consultation on the Stilling Basin Connecting Channel Project, NMFS and the Corps exchanged email messages discussing whether or not this action is best covered in a new consultation or as a reinitiated consultation of the LCSD Improvement Project.

On July 29, 2016, SFPUC provided NMFS by email the San Mateo Creek Aquatic Resources Monitoring Report for 2015. This was the first annual report submitted to NMFS for the fisheries monitoring program associated with the LCSD Improvement Project.

On October 26, 2016, SFPUC sent NMFS an email message requesting a conference call to discuss potential changes to the SFPUC's aquatic monitoring program and to ask about any potential restrictions that might be included in a NMFS-issued biological opinion for the Stilling Basin Connecting Channel Project.

Discussions continued between NMFS and SFPUC in 2017 and early 2018 regarding the SFPUC's San Mateo Creek fisheries monitoring program downstream of LCSD and whether

capture of additional juvenile CCC steelhead would assist the program meet its study objectives. The 2016 San Mateo Creek Aquatic Resources Monitoring Report was submitted to NMFS by SFPUC on July 3, 2017.

On April 30, 2018, NMFS sent to the Corps and SFPUC an email message asking for (1) a photograph of the existing outlet to Pool 2, (2) an engineering description of the new pipe outlet discharging to the stilling basin, (3) a description of the anticipated management of that new outlet, including management of the Pool 2 discharge, and (4) a description of the egress routes for any fish that may access the proposed constructed floodplain during high flows.

On May 10, 2018, SFPUC provided to the Corps and NMFS the information on the proposed operation of the new discharge pipe outlet to the stilling basin. Also, SFPUC clarified that fish egress opportunities were not designed to serve the proposed constructed floodplain.

On July 3, 2018, SFPUC provided NMFS via email the 2017 San Mateo Creek Aquatic Resources Monitoring Report.

On July 9, 2018, NMFS requested from SFPUC, via email, the actual number of fish collections from San Mateo Creek for 2015, 2016, and 2017, in order to further assess the monitoring program's request to increase the number of steelhead captures beyond the opinion's ITS allowance of 500 juvenile fish.

On July 10, 2018, SFPUC sent to NMFS, via email, clarification of some aspects of fisheries data and mentioned that SFPUC is planning on phasing out sampling at four index sites on lower San Mateo Creek and adding an array of passive integrated transponder (PIT) receivers. That same date, NMFS requested from SFPUC, via email, a description of the injury and mortality rates for steelhead, by gear types, associated with the fish monitoring program.

In August 2018, the SFPUC's project manager for the Stilling Basin Connecting Channel Project initiated dialogue with NMFS and the Corps by email and telephone regarding the status of the NMFS/Corps' consultation for construction of the connecting channel. The request from the SFPUC's project manager was to complete the consultation as soon as possible and she expressed concern with further delays in the issuance of the NMFS' biological opinion due to inclusion of modifications to the San Mateo Creek fish monitoring program in this consultation.

On October 17, 2018, the Corps, SFPUC, and NMFS participated in a conference call to discuss the information needed to complete the consultation including both the stilling basin connecting channel and the proposal to increase to the amount of allowable capture of steelhead in stream monitoring activities associated with operation of LCSD.

In November and December 2018, discussions between NMFS, the Corps and the SFPUC's project manager for the stilling basin project continued. There was request to separately address changes to the SFPUC's San Mateo Creek steelhead monitoring program because it was delaying conclusion of the consultation for construction of the stilling basin connecting channel.

On December 20 and 21, 2018, NMFS requested from SFPUC, via email, additional information to support their request to increase the number of juvenile steelhead collected in the San Mateo Creek monitoring program. Specifically, NMFS requested SFPUC provide information on collection sites, collection site selection protocol, an estimate of the number of fish SFPUC proposes to collect annually, a working theory of why the steelhead collections have increased annually, and a description of the measures taken by SFPUC to minimize injury to or mortality of steelhead collected and tagged during sampling. SFPUC provided responses to NMFS' on December 21, 2018.

On February 12, 2019, NMFS called SFPUC to let them know that there were still lingering questions related to the request for an increase in the amount of steelhead collected by the San Mateo Creek monitoring program and it was resulting in a delay in completion of the consultation with the Corps on construction of the connecting channel.

On February 20, 2019, NMFS requested from SFPUC additional information regarding the action area for this project, as the biological assessment used inconsistent descriptions and did not provided adequate detail regarding habitat conditions within the construction sites.

On February 21, 2019, NMFS requested from SFPUC, via email, clarification regarding the location of riprap with the action area, the qualities of the surface streamflow between the stilling basin and Pool 2, a description of materials proposed for use as streambed materials, a description of steelhead egress opportunities from the constructed floodplain, and the length of the area to be dewatered.

On February 26, 2019, SFPUC provided to NMFS, via email, additional information on steelhead egress opportunities, stating that the elevation of the proposed grading of the floodplain includes a preserved backwater area which will be constructed at an elevation about 0.7 feet under stream base flow and should allow for volitional steelhead egress from the area.

On February 28, 2019, NMFS requested by email information regarding water levels within the stilling basin. SFPUC provided the requested information on the same day.

Based the urgency of the connecting channel construction project and discussions with the Corps, NMFS notified SFPUC on March 4, 2019, that this consultation would be limited to the proposed construction modifications at the LCSD stilling basin and alternative means are available to address changes to steelhead collections by the SFPUC's aquatic monitoring program.

1.3 Proposed Federal Action

"Action" means all activities or programs of any kind authorized, funded, or carried out, in whole or in part, by Federal agencies (50 CFR 402.02). The U.S. Department of the Army, Corps of Engineers (Corps), San Francisco District, proposes to provide authorization pursuant to Section 404 of the Clean Water Act of 1972, as amended (33 U.S.C. § 1344 *et seq*.) (Corps File No. 2006-303175), to SFPUC for the proposed Lower Crystal Springs Dam Stilling Basin Connecting Channel Project (Project) in San Mateo County, California.

SFPUC proposes to modify the stilling basin at the LCSD by the following: (1) construction of a new channel that hydraulically connects the stilling basin to San Mateo Creek downstream; (2) replacement of two piezometers located at the base of the dam; and (3) installation of an additional discharge pipe for releases from the Crystal Springs Reservoir to San Mateo Creek. Construction of the Project is scheduled to occur over a two-month period in summer and fall of 2019.

Connecting Channel. The proposed new channel will permanently connect the stilling basin at the base of LCSD to a pool in San Mateo Creek approximately 300 feet downstream of the dam (*i.e.*, Pool 2). The 300-foot long channel excavation will pass through an area with a poorly defined channel directly downstream of the dam and provide safe fish egress from the stilling basin year-round. Under current conditions, water levels oscillate in the stilling basin and the creek which creates connected and partially disconnected conditions that can lead to fish stranding. The proposed Project will provide a permanent hydraulic connection across an area that currently does not provide adequate fish passage due to shallow and densely vegetated conditions.

To facilitate construction of the new connecting channel, cofferdams will be constructed at the top and bottom of Pool 2. A diversion system would be installed concurrent with the cofferdams to ensure flows in San Mateo Creek are sustained by maintaining continuous bypass flows around the Project's construction sites. Initially, a cofferdam will be constructed at the upstream end of Pool 2 in order to dewater the reach between the stilling basin and the top of Pool 2. During dewatering biologists will be onsite to inspect for fish and other species. Individual fish, including juvenile steelhead, will be collected and relocated to areas in San Mateo Creek within ½ mile downstream of the dam. Once the new channel section has been excavated between the stilling basin and the upstream end of Pool 2, a second cofferdam will be installed at the downstream end of Pool 2. Pool 2 will then be dewatered to complete excavation and channel construction. During the dewatering of Pool 2, fish will be collected from the pool and relocated to areas within the ½-mile reach downstream of the dam. Electrofishing may be used to collect fish and will be performed in accordance with NMFS electrofishing guidelines (NMFS 2000).

Channel excavation will cut 2.5 to 4.0 feet below the existing ground elevation. Excess soil excavated from the channel will be reused onsite (approximately 200 cubic yards) and the remainder (approximately 400 cubic yards) hauled away to be disposed at an offsite and upland location. The resulting channel and adjacent floodplain will be within 3 feet of the water table and is expected to be inundated during streamflow events in excess of the dam's fish release requirements. At this elevation, the floodplain is anticipated to provide a moist substrate for riparian trees to establish and provide shade along the 300-foot long channel. Rush (*Juncus* sp.) and willow will be planted along the edges of the channel.

At the site where the new channel crosses into the dam's stilling basin, existing rock riprap will be temporarily removed and the substrate beneath it graded to the design elevation. Riprap will then be replaced to the design invert and then grouted to the concrete sill of the stilling basin. At the downstream site where the new channel enters Pool 2, existing riprap will also be temporarily removed for the substrate to be graded to the design elevation. The riprap will then be reinstalled to meet the design elevation. Once construction is completed, cofferdams and associated

construction equipment will be removed.

Piezometer Replacement. While the stilling basin is dewatered for construction of the connecting channel, two existing piezometers located at the base of the dam will be decommissioned and two new piezometers will be installed. Each piezometer consists of a ¾-inch diameter PVC pipe extending about 30 feet into the dam's foundation from a concrete bench at the toe of the dam on the downstream face. The existing piezometers will be removed and the holes grouted with cement. The new piezometer installations require drilling approximately 2-inch diameter holes, placing the new sensors in the holes, and grouting the holes with cement. The sensor cable will routed through galvanized ridged conduit to an existing pull box embedded on the left toe of the dam.

Flow Discharge Pipe Installation. SFPUC is required to release between 3 and 17 cfs of water from Crystal Springs Reservoir to San Mateo Creek to maintain fish downstream of the dam in good condition. Releases from the reservoir to the creek are currently performed by a pipe that discharges into a dissipation structure at Pool 2. In order to provide additional flexibility, the Project will install a second discharge pipe (high-density polyethylene pipe, approximately 8 inches in diameter) that has the ability to discharge at least 3 cfs directly into the stilling basin. A small excavator would be used to bury the additional discharge pipe below the ground surface in the riparian habitat area on the north side of the proposed connecting channel. This pipeline alignment will overlap with channel excavation activities to minimize the amount of riparian area impacted by Project construction.

Avoidance and Minimization Measures.
The Project proposes the following measures to avoid and minimize the impacts of construction:

(1) Complete construction activities during the period between June 1 and October 31 with the duration of construction anticipated to be approximately two months. Planting of vegetation would occur during the subsequent fall/winter period.

(2) Before any work occurs, a qualified biologist will conduct a mandatory environmental education program for construction personnel.

(3) A qualified fish biologist will oversee dewatering, fish collection, and fish relocation activities. The qualified biologist will have at least a 4-year college degree in fisheries or biology, and at least 2 years of professional experience handling salmonids.

(4) Best management practices will be employed to avoid and minimize sediment input into the channel of San Mateo Creek, including the covering of temporary stockpiles, covering of bare areas with mulch and by revegetation, and deployment of silt curtains or other sedimentation control measures.

(5) Construction staging areas will be designated in developed and existing disturbed areas.

(6) Develop a hazardous material spill prevention and control plan that will describe storage procedures and construction site housekeeping practices, and will identify the parties responsible for monitoring and spill response.

(7) Any pumps used during dewatering will be screened as outlined in NMFS' Water Drafting Guidelines (NMFS 2001).

(8) Temporarily disturbed riparian areas along San Mateo Creek will be restored by revegetation with local native riparian plant species. Existing immature vegetation may be salvaged and replanted following construction activities. Riparian plantings would be established along a minimum distance of 360 linear feet of stream channel and within 15 feet of the water's edge. Plantings will be designed for sufficient density at maturity to provide at least 85 percent shade along the streambank.

1.4 Interrelated or Interdependent Actions

"Interrelated actions" are those that are part of a larger action and depend on the larger action for their justification. "Interdependent actions" are those that have no independent utility apart from the action under consideration (50 CFR 402.02). The continued operation of LCSD and its reservoir are interrelated and interdependent actions of this Project.

LCSD was constructed on San Mateo Creek approximately 5 miles upstream from San Francisco Bay in 1888, and the dam was subsequently raised in 1891 and 1911. Crystal Springs Reservoir was originally constructed as two separate reservoirs: Upper Crystal Springs Reservoir and Lower Crystal Springs Reservoir. With the construction of culverts to connect the upper and lower reservoirs, the two reservoirs have been operated as a single unit since 1924. LCSD is approximately 149 feet high. The dam impounds the current Crystal Springs Reservoir which has a normal operation capacity of 69,300 acre feet.

Under normal operating conditions, Crystal Springs Reservoir captures the entire inflow from tributary streams and the reservoir rarely spills. In addition to capturing local watershed runoff, Crystal Springs Reservoir receives and stores water transferred from Hetch Hetchy Reservoir on the Tuolumne River and Pilarcitos Reservoir on Pilarcitos Creek. The SFPUC's Crystal Springs/San Andreas Pipeline System and accompanying Crystal Springs Pump station move water from Crystal Springs Reservoir to the San Andreas Reservoir. From there, the San Andreas Pump Station pumps water supplies up to the Harry Tracy Water Treatment Plant for subsequent delivery to the SFPUC customers.

Since January 2015, SFPUC has operated LCSD and Crystal Springs Reservoir in a manner to support CCC steelhead in San Mateo Creek downstream of the dam. The minimum water release from Crystal Springs Reservoir to San Mateo Creek varies between 3 and 17 cfs depending on the water year type and time of year (Table 1.) To determine water year types, SFPUC uses monthly cumulative precipitation indices over 91 years of record (1919 - 2009) and two generalized release schedules are used based on this precipitation index. Schedule A releases are implemented when there are larger amounts of precipitation (<60 percent exceedance probability) and Schedule B is used for releases during drier water years (>60 percent exceedance probability). Each water year begins October 1st and ends September 30th.

Once in a schedule, there is no change of schedule until the next January 12. The two schedules utilize the same water releases for much of the year. For both schedules, water releases are the same from October 1st through January 12th and from April 2nd through September 30th. During the period of January 12th through April 1st, Schedule A releases are between 2 and 7 cfs greater than Schedule B releases. The stream gage downstream of LCSD (United States Geological Survey [USGS] 11162753) is used as the compliance point for monitoring implementation of the water release schedule.

Table 1. Summary of instream flow schedules below Lower Crystal Springs Dam.

Date	Flow release by water year type (cfs)	
	Normal/Wet (Schedule A)	Dry (Schedule B)
October 1–December 14	3	3
December 15–January 12	5	5
January 15–March 15	17*	10*
March 16–March 30	10*	8
March 31–April 30	5*	5
May 1–September 30	3	3

* Ramping rates apply

The SFPUC's operation of LCSD and the current flow schedule for San Mateo Creek downstream of the dam were addressed in a section 7 consultation between NMFS and the Corps in 2010. An opinion was issued by NMFS to the Corps and SFPUC on October 29, 2010, which provides an incidental take exemption for the continued operation of the dam in compliance with the above release schedule. The proposed Stilling Basin Connecting Channel Project does not propose any change to the flow release schedule to San Mateo Creek.

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 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 provides 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 non-discretionary reasonable and prudent measures (RPMs) and terms and conditions to minimize such impacts.

2.1 Analytical Approach

This opinion includes both a jeopardy analysis and/or an adverse modification analysis. The jeopardy analysis relies upon the regulatory definition of "to jeopardize the continued existence

of" a listed species, which is "to engage in an action that 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 opinion relies on the definition of "destruction or adverse modification," which "means a direct or indirect alteration that appreciably diminishes the value of critical habitat for the conservation of a listed species. Such alterations may include, but are not limited to, those that alter the physical or biological features essential to the conservation of a species or that preclude or significantly delay development of such features" (81 FR 7214).

The designation of critical habitat for CCC steelhead uses the term primary constituent element (PCE) or essential features. The new critical habitat regulations (81 FR 7414) replace 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 opinion, we use the term PBF to mean PCE or essential feature, as appropriate for the specific critical habitat.

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

- Identify the rangewide status of the species and critical habitat expected to be adversely affected by the proposed action.
- Describe the environmental baseline in the action area.
- Analyze the effects of the proposed action on both species and their habitat using an "exposure-response-risk" approach.
- Describe any cumulative effects in the action area.
- Integrate and synthesize the above factors by: (1) Reviewing the status of the species and critical habitat; and (2) adding the effects of the action, the environmental baseline, and cumulative effects to assess the risk that the proposed action poses to species and critical habitat.
- Reach a conclusion about whether species are jeopardized or critical habitat is adversely modified.
- If necessary, suggest a reasonable and prudent alternative to the proposed action.

2.1.1 Use of Best Available Scientific and Commercial Information

To conduct the assessment presented in this opinion, NMFS examined an extensive amount of information from a variety of sources. Detailed background information on the biology and status of the listed species and critical habitat has been published in a number of documents including peer reviewed scientific journals, primary reference materials, and governmental and non-governmental reports. Additional information regarding the potential effects of the proposed Project-related activities on the listed species in question, their anticipated response to

these actions, and the environmental consequences of the actions as a whole was formulated from the aforementioned resources, and the following:

- Lower Crystal Springs Dam Stilling Basin Connecting Channel Project - Biological Assessment for Consultation with National Marine Fisheries Service. Prepared by the San Francisco Public Utilities Commission. November 2015. 59 pages.
- Lower Crystal Springs Dam Stilling Basin Connecting Channel Project Design Drawings, 95 percent submittal. Prepared by the San Francisco Public Utilities Commission. February 2016. 19 pages.

For information that has been taken directly from published, citable documents, those citations have been reference in the text and listed at the end of this document. A complete administrative record of this consultation is on file at the NMFS North-Central Coast Office in Santa Rosa, California (Administrative Record Number 151422WCR2016SR00403).

2.2 Rangewide Status of the Species and Critical Habitat

This opinion examines the status of each species that would 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' current "reproduction, numbers, or distribution" as described in 50 CFR 402.02. The opinion also examines the condition of critical habitat throughout the designated area, evaluates the conservation value of the various watersheds and coastal and marine environments that make up the designated area, and discusses the current function of the essential PBFs that help to form that conservation value.

2.2.1 Listed Species

This opinion analyzes the effect of the proposed Project on CCC steelhead in San Mateo Creek. CCC steelhead are listed as threatened under the ESA (71 FR 834, January 5, 2006). The CCC steelhead distinct population segment (DPS) includes steelhead in coastal California streams from the Russian River to Aptos Creek, and the drainages of Suisun Bay, San Pablo Bay, and San Francisco Bay, including San Mateo Creek. San Mateo Creek is not designated as critical habitat for CCC steelhead.

2.2.2 Steelhead General Life History

Steelhead are anadromous fish, spending some time in both fresh- and saltwater. The older juvenile and adult life stages occur in the ocean, until the adults ascend freshwater streams to spawn. Eggs (laid in gravel nests called redds), alevins (gravel dwelling hatchlings), fry (juveniles newly emerged from stream gravels), and young juveniles all rear in freshwater until they become large enough to migrate to the ocean to finish rearing and maturing to adults. General reviews for steelhead in California document much variation in life history (Shapovalov

and Taft 1954, Barnhart 1986, Busby *et al.* 1996, McEwan 2001). Although variation occurs in coastal California, steelhead usually live in freshwater for 1 to 2 years in central California, then spend 2 or 3 years in the ocean before returning to their natal stream to spawn. Steelhead may spawn 1 to 4 times over their life. Adult steelhead returning from the ocean to the San Mateo Creek watershed typically immigrate to freshwater between December and April, peaking in January and February, and juveniles migrate as smolts from the watershed to the ocean from January through June, with peak emigration occurring in April and May (Fukushima and Lesh 1998). Given the proposed construction period between June 1 and October 31, only juvenile steelhead are likely to be present in the action area during construction activities.

Steelhead fry rear in edgewater habitats and move gradually into pools and riffles as they grow larger. Cover is an important habitat component for juvenile steelhead, both as a velocity refuge and as a means of avoiding predation (Shirvell 1990, Meehan and Bjornn 1991). Steelhead, however, tend to use riffles and other habitats not strongly associated with cover during summer rearing more than other salmonids. Young steelhead feed on a wide variety of aquatic and terrestrial insects, and emerging fry are sometimes preyed upon by older juveniles. Rearing steelhead juveniles prefer water temperatures of 7.2-14.4 degrees Celsius (°C) and have an upper lethal limit of 23.9°C (Barnhart 1986, Bjornn and Reiser 1991). They can survive in water up to 27°C with saturated dissolved oxygen conditions and a plentiful food supply. Fluctuating diurnal water temperatures also aid in survivability of salmonids (Busby *et al.* 1996). Juvenile steelhead emigrate episodically from natal streams during fall, winter, and spring high flows, to the ocean to continue rearing to maturity.

Adults returning to spawn may migrate several miles, hundreds of miles in some watersheds, to reach their natal streams. Although spawning typically occurs between January and May, the specific timing of spawning may vary a month or more among streams within a region, and within streams interannually. Spawning (and smolt emigration) may continue through June (Busby *et al.* 1996). Female steelhead dig a nest in the stream and then deposit their eggs. After fertilization by the male, the female covers the nest with a layer of gravel. Steelhead do not necessarily die after spawning and may return to the ocean, sometimes repeating their spawning migration one or more years. The embryos incubate within the nest. Hatching time varies from about three weeks to two months depending on water temperature. The young fish emerge from the nest about two to six weeks after hatching.

2.2.3 Status of CCC Steelhead

Historically, approximately 70 populations of steelhead are believed to have existed in the CCC steelhead DPS (Spence *et al.* 2008). Many of these populations (approximately 37) were independent, or potentially independent, meaning they historically had a high likelihood of surviving for 100 or more years absent anthropogenic impacts (Bjorkstedt *et al.* 2005). The remaining populations were dependent upon immigration from nearby CCC steelhead DPS populations to ensure their persistence (McElhaney *et al.* 2000, Bjorkstedt *et al.* 2005). While historical and current data of abundance are limited, CCC steelhead DPS 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). Near the end of the 20th century,

McEwan (2001) estimated that the wild steelhead population in the Russian River watershed was between 1,700 and 7,000 fish. 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, Soquel, and Aptos creeks) of individual run sizes of 500 fish or less (62 FR 43937). However, as noted in Williams *et al.* (2016) data for CCC steelhead populations remain scarce outside of Scott Creek, which is the only long-term dataset and shows a significant decline. Short-term records indicate the low but stable assessment of populations is reasonably accurate; however, it should be noted that there is no population data for any populations outside of the Santa Cruz Mountain stratum, other than hatchery data from the Russian River.

Although available time series data sets are too short for statistically robust analysis, the information available indicates CCC steelhead populations have likely experienced serious declines in abundance, and apparent long-term population trends suggest a negative growth rate. This would indicate the DPS may not be viable in the long term, and DPS 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 have maintained a wide distribution throughout the DPS, roughly approximating the known historical distribution, CCC steelhead likely possess a resilience that could slow their decline relative to other salmonid DPSs or ESUs in worse condition.

The 2005 NMFS status review concluded that steelhead in the CCC steelhead DPS remain "likely to become endangered in the foreseeable future" (Good *et al.* 2005), a conclusion that was consistent with a previous assessment (Busby *et al.* 1996) and supported by the NMFS Technical Recovery Team work (Spence *et al.* 2008). On January 5, 2006, NMFS issued a final determination that the CCC steelhead DPS is a threatened species, as previously listed (71 FR 834). Although numbers did not decline further during 2007/08, the 2008/09 adult CCC steelhead return data indicated a significant decline in returning adults across their range. Escapement data from 2009/2010 indicated a slight increase; however, the returns were still well below numbers observed within recent decades (Jeffrey Jahn, NMFS, personal communication, 2010).

In the Russian River, analysis of genetic structure by Bjorkstedt *et al.* (2005) concluded previous among-basin transfers of stock, and local hatchery production in interior populations in the Russian River likely has altered the genetic structure of the Russian River populations. Depending on how “genetic diversity” is quantified, this may or may not constitute a loss of overall diversity. In San Francisco Bay streams, reduced population sizes and fragmentation of habitat has likely led to loss of genetic diversity in these populations. More detailed information on trends in CCC steelhead DPS abundance can be found in the following references: Busby *et al.* 1996, NMFS 1997, Good *et al.* 2005, and Spence *et al.* 2008.

The status review by Williams *et al.* (2011) concluded that steelhead in the CCC steelhead DPS remain “likely to become endangered in the foreseeable future” as new information released since Good *et al.* (2005) did not appear to suggest a change in extinction risk. The most recent status review (Williams *et al.* 2016) reached the same conclusion. On May 26, 2016, NMFS affirmed no change to the determination that the CCC steelhead DPS is a threatened species (81 FR 33468), as previously listed (76 FR 76386).

2.2.4 CCC Steelhead Critical Habitat Status

Critical habitat was designated for CCC steelhead on September 2, 2005 (70 FR 52488). In designating critical habitat, NMFS considers, among other things, the essential PBFs within the designated area that are essential to the conservation of the species and that may require special management considerations or protection.

PBFs for CCC steelhead 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.

The condition of CCC steelhead critical habitat, specifically its ability to provide for their conservation, has been degraded from conditions known to support viable salmonid populations. NMFS has determined that present depressed population conditions are, in part, the result of the following human-induced factors affecting critical habitat: logging, agricultural and mining activities, urbanization, stream channelization, dams, wetland loss, and water withdrawals, including unscreened diversions for irrigation. Impacts of concern include alteration of streambank and channel morphology, alteration of water temperatures, loss of spawning and rearing habitat, fragmentation of habitat, loss of downstream recruitment of spawning gravels and large woody debris, degradation of water quality, removal of riparian vegetation resulting in increased streambank erosion, loss of shade (higher water temperatures) and loss of nutrient inputs (Busby *et al.* 1996, 70 FR 52488). Water development has drastically altered natural hydrologic cycles in many of the streams in the DPS. Alteration of flows results in migration delays, loss of suitable habitat due to dewatering and blockage; stranding of fish from rapid flow fluctuations; entrainment of juveniles into poorly screened or unscreened diversions, and increased water temperatures harmful to salmonids. Overall, current condition of CCC steelhead critical habitat is degraded, and does not provide the full extent of conservation value necessary for the recovery of the species. San Mateo Creek is not designated as critical habitat for CCC steelhead.

A final recovery plan for CCC steelhead was prepared by NMFS in October 2016 (NMFS 2016). The plan describes key threats, actions needed to achieve recovery, and measurable criteria by which NMFS will determine when recovery has been reached. Recovery plan actions are

primarily designed to restore ecological processes that support healthy steelhead populations, and address the various activities that harm these processes and threaten the species' survival. The recovery plan calls for a range of actions including the restoration of floodplains and channel structure, restoring riparian conditions, improving streamflows, restoring fish passage, protecting and restoring estuarine habitat, among other actions.

2.2.5 Global Climate Change

One factor affecting the range-wide status of the CCC steelhead DPS, and aquatic habitat at large is climate change. 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). Snow melt from the Sierra Nevada has declined (Kadir *et al.* 2013). However, total annual precipitation amounts have shown no discernable change (Kadir *et al.* 2013). CCC steelhead may have already experienced some detrimental impacts from climate change. NMFS believes the impacts on listed salmonids to date are likely fairly minor because natural, and local climate factors likely still drive most of the climatic conditions steelhead experience, and many of these factors have much less influence on steelhead abundance and distribution than human disturbance across the landscape. In addition, CCC steelhead are not dependent on snowmelt driven streams and, thus, not affected by declining snow packs.

The threat to CCC steelhead from global climate change will 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).

In the San Francisco Bay region, warm temperatures generally occur in July and August, but as climate change takes hold, the occurrences of these events will likely begin in June and could continue to occur in September (Cayan *et al.* 2012). Climate simulation models project that the San Francisco region will maintain its Mediterranean climate regime, but experience a higher degree of variability of annual precipitation during the next 50 years and years that are drier than the historical annual average during the middle and end of the 21st Century. The greatest reduction in precipitation is projected to occur in March and April, with the core winter months remaining relatively unchanged (Cayan *et al.* 2012).

Estuaries may also experience changes detrimental to salmonids. 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). 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 *et al.* 2004, Osgood 2008, Turley 2008, Abdul-Aziz *et al.* 2011, Doney *et al.* 2012). 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).

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 for the Project consists of the streambed and banks of San Mateo Creek from the stilling basin on the downstream side of LCSD to a distance of approximately ½ mile below the dam. This reach of stream contains the area of Project construction, cofferdams, streambed area to be dewatered, and potential fish relocation sites. Additionally, the action area includes equipment staging areas near the base of LCSD in developed and existing disturbed areas outside the creek channel.

2.4 Environmental Baseline

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 consultation, and the impact of state or private actions which are contemporaneous with the consultation in process (50 CFR 402.02).

2.4.1 Action Area Overview

The San Mateo Creek watershed is located in a Mediterranean climatic region, with over 95 percent of annual precipitation occurring between October and April. Average annual rainfall over the watershed ranges from 25 to 40 inches, with more rainfall at the higher elevations. Cool, moist coastal fog generally alternates with clear, warm weather during the months of May through September, and significant rainfall during that time is rare. San Mateo Creek flows easterly from an elevation of almost 2,000 feet into South San Francisco Bay.

LCSD was constructed on San Mateo Creek approximately 5 miles upstream from San Francisco Bay in 1888, and the dam was subsequently raised twice – in 1891 and 1911. The dam is approximately 149 feet tall and impounds up to 69,300 acre-feet of water in the reservoir. The presence and operation of LCSD for the past 131 years has impacted the steelhead population in the San Mateo Creek watershed by preventing access to historic spawning and rearing habitat, minimizing migration opportunities, reducing available wetted habitat for juvenile rearing, blocking transport of sediment, altering the natural hydrograph, and reducing the frequency and magnitude of channel forming flows. These conditions limit the potential abundance of CCC steelhead in San Mateo Creek. About 85 percent of the San Mateo Creek watershed is upstream of LCSD. All of the coarse sediment and large pieces of wood – both components of aquatic habitat – derived from upstream of the dam for the past 130 years are entrained in the reservoir upstream of the dam. Suburban development downstream of LCSD and adjacent to San Mateo Creek has increased hardscaping of the channel, created impervious surfaces, and concentrated stormwater discharge to the stream. These urbanization factors lead to a flashier stream hydrograph, increased toxic inputs, and reduced the quality of aquatic habitat.

In the action area, stream conditions range from highly disturbed within the first 500 feet below the dam to a gently sloping channel flowing through a narrow canyon alongside Crystal Springs Road to a distance of ½ mile below the dam. Within the uppermost 500 feet of the action area, the reach is dominated by the dam's concrete stilling basin, a riparian wetland area with a high density of riparian vegetation, Pool 2, and the overhead bridge crossing of Interstate 280.

The concrete stilling basin at the toe of the dam is designed to protect the dam and stream banks from erosion when the reservoir's spillway is operating. This concrete basin is approximately 155 feet wide and extends 145 feet downstream from the toe of the dam. A band of grouted riprap has been placed at the downstream edge of the stilling basin. Immediately downstream of the basin, a riparian wetland area does not contain a clearly defined channel and there are pockets of inundated areas. During the late summer and fall months, this wetland area and the stilling basin may be subject to high water temperatures, low dissolved oxygen concentrations, and conditions unsuitable for *O. mykiss*. Without a clear channel connecting to San Mateo Creek, this shallow densely vegetated area and the stilling basin have led to concerns regarding fish stranding and fish kills within areas of isolated standing water.

Downstream of the riparian wetland, Pool 2 is approximately 300 feet below the concrete stilling basin. This manmade pool feature is the head of lower San Mateo Creek, in that, reservoir releases to the stream originate from this location. Pool 2 is surrounded by rock riprap and serves as the energy dissipation basin for releases from the reservoir's discharge pipe. The SFPUC's discharges from Crystal Springs Reservoir to lower San Mateo Creek range from 3 to 17 cfs. Pool 2 is generally considered the upstream limit to anadromous fish. However, both adult and juvenile steelhead may attempt to navigate further upstream from Pool 2 through the shallow and heavily vegetated wetland area towards and into the concrete stilling basin during winter and spring periods when water flowing out of the stilling basin may be present.

Downstream of Pool 2, the channel of San Mateo Creek becomes well defined with dense vegetation along the banks. From this location to the downstream extent of the action area, San Mateo Creek passes through a relatively confined valley reach and is additionally constrained by the adjacent Crystal Spring Road, a water supply transmission pipeline, and a sewer line which also follow the creek's alignment. Instream habitat ranges from fair to good condition with alternating pools, riffles, and runs in a well-shaded canyon. Pools are relatively deep and provide good cover elements. Substrate consists of areas dominated by fine silt, but there are also areas with gravel and cobble suitable for steelhead spawning and rearing.

Streamflow in the action area is continuously monitored at USGS gage #11162753 (San Mateo Creek downstream of LCSD). Streamflow is typically limited to the amount of water released to San Mateo Creek by SFPUC from the reservoir which ranges from 3 to 17 cfs in accordance with the schedule presented in Table 1. Some additional water seeps through LCSD and passes downstream into San Mateo Creek. Water temperatures in San Mateo Creek below Pool 2 have been measured year-round by SFPUC since 2015 and these results indicate temperatures typically range from approximately 9°C in the winter to 19°C in the fall months.

2.4.2 Status of Steelhead in the Action Area

Although populations of *O. mykiss* occur both upstream and downstream of LCSD (Leidy *et al*. 2005), this dam is a barrier to anadromy and threatened CCC steelhead are currently limited to the lower 5 miles of San Mateo Creek. The overall steelhead population within the San Mateo Creek watershed was substantially affected by the construction of Upper Crystal Springs Dam in 1877 and LCSD in 1888. Since the late 1800s, LCSD has prevented anadromous fish from accessing over 80 percent of watershed.

Redd surveys conducted by SFPUC in 2015, 2016, and 2018 confirmed the presence of adult CCC steelhead spawning in the action area of San Mateo Creek (SFPUC 2016, 2017, and A. Brinkerhoff, SFPUC, personal communication 2019). SFPUC reports that within the ½-mile long action area there were 2 redds observed in 2015, 3 redds observed in 2016, and 10 redds observed in 2018. All redds were observed in January, February and early March. Redd surveys were not performed in 2017 due to excessively high streamflow conditions (SFPUC 2018).

Sampling and surveys conducted by SFPUC of juvenile *O. mykiss* are used to generate annual abundance and density estimates for the 2.3 mile-long reach of San Mateo Creek extending downstream from LCSD. Densities of juvenile *O. mykiss* have been estimated at 34, 26, 46, and 65 fish per 100 feet for years 2015, 2016, 2017, and 2018, respectively (A. Brinkerhoff, SFPUC, personal communication 2019).

2.4.3 Status of Habitat in the Action Area

Stream habitat in the action area has been highly modified by water development and urbanization. Creek flow through the action area has been impaired by Crystal Springs Reservoir for the past 130 years. The lack of winter high flow events has resulted in the accumulation of fine sediment, encroachment of riparian vegetation, and channel simplification. San Mateo Creek in the action area is characterized by a steep-sided canyon in a relatively natural channel, but some reaches have been re-aligned and straightened for the construction of Crystal Springs Road adjacent to the creek.

Instream habitat quality for steelhead has been diminished by low quantities of gravel and cobble substrate, lack of sinuosity, and narrow floodplain. Boulders, large woody debris and other forms of instream cover are lacking in many areas. Well-developed riparian vegetation within the channel and along the banks provides significant shading and an insulating canopy that moderates water temperatures. SFPUC (2017) reports coarse sediment entering San Mateo Creek from an eroding slope at one of the Interstate 280 bridge abutments has significantly increased the amount of sand and gravel in the channel in recent years.

For approximately 130 years, flow in San Mateo Creek below LCSD consisted of approximately 0.66 cfs release to the creek originating from leaky values and pipes at the dam. Releases of water from the reservoir in excess of the 0.66 cfs leakage were rare and primarily occurred when the reservoir spilled. Beginning in 2015, SFPUC initiated releases from the reservoir ranging from 3 to 17 cfs to maintain suitable conditions in lower San Mateo Creek for steelhead migration, spawning and rearing (see Table 1). Due to the large upstream water impoundment, the stream channel in the action area has experienced a lack of high flow events that would

naturally occur during most rainy seasons. As a response to the curtailment of peak flows, the channel has accumulated an excessive amount of fine sediment, channel width has narrowed, sinuosity has decreased, riparian vegetation has encroached, and there is a lack of gravel bars and other depositional features.

2.4.4 Factors Affecting the Species Environment in the Action Area

For more than 130 years the presence and operation of LCSD and urbanization have significantly affected the environment of the action area. The dam was completed in 1888 and has precluded access by steelhead to more than 80 percent of the San Mateo Creek watershed. Streamflow in San Mateo Creek has been impaired since creation of LCSD as the facility intercepts all of the upper watershed flows.

As one of the key local reservoirs serving the SFPUC's regional water system, Crystal Springs Reservoir receives water from three sources: (1) local watershed runoff including Laguna and upper San Mateo creeks; (2) Hetch Hetchy Reservoir (via the Hetch Hetchy Aqueduct), which is located on the Tuolumne River in the Sierra Nevada; and (3) Stone Dam on Pilarcitos Creek, which flows to the Pacific Ocean. Crystal Springs Reservoir represents the terminus of the 167-mile long Hetch Hetchy Aqueduct. Each year, SFPUC aims to fill Crystal Springs Reservoir to its maximum capacity by the end of the rainy season and Sierra Nevada snowmelt season (*i.e.*, April-May). Water is drawn down from June through August to meet summer water demands. Reservoir levels are maintained from November through March to collect local watershed runoff and receive water diverted from the Pilarcitos Creek watershed at Stone Dam.

As stated previously, SFPUC provided no bypass flows below the dam for fish until January 2015, though rarely water would pass the dam through its spillway and some water entered San Mateo Creek from leaks in the water transmission infrastructure. Beginning in 2015, SFPUC releases water from the reservoir to lower San Mateo Creek in accordance with the flow schedule presented in Table 1 for the purpose of sustaining steelhead and other native fish populations in good condition. Water releases from Crystal Springs Reservoir are generally cool and water temperatures are suitable for steelhead spawning and rearing.

Although flow releases for fish are now provided to lower San Mateo Creek by the SFPUC, winter high streamflow events continue to be impaired by LCSD. The lack of high flow events has caused the accumulation of fine sediment, encroachment of riparian vegetation, a reduction of channel width, and a reduction of channel sinuosity; these changes in condition have led to channel simplification in San Mateo Creek. The Dam also degrades downstream aquatic habitat conditions by intercepting wood and sediment transport, factors essential for high quality aquatic habitat. Adequate gravel and cobble substrate, and channel complexity are limited in the action area. Spawning gravels are scarce and impaired by excessive levels of fine sediment. Boulders, large woody debris and other forms of instream cover are lacking in many areas. Features such as small boulders and undercut banks in San Mateo Creek provide some refugia from high velocity flow events, however overwinter habitat conditions may be limited by the presence of few secondary channels and backwater areas.

Further below the dam in the action area, San Mateo Creek flows through a confined canyon. Urban development is present on the tops of the surrounding canyon walls. Associated roadways

are present in the action area adjacent to San Mateo Creek. Storm drains that lead to the creek from roadways, bridges and other urbanized areas are common. Suburban development contributes to increased erosion, channel simplification, chemical toxicity from stormwater discharges, and concentrated surface runoff following precipitation events. Fish kills attributed to accidental discharges of potable water from SFPUC transmission pipes to San Mateo Creek occurred in January 2011 and October 2012.

2.4.5 Previous Section 7 Consultations Affecting the Action Area

In 2001, NMFS and the Corps consulted on the SFPUC's repair of a 110-foot long segment of eroded bank above the LCSD stilling basin caused by large water releases from Crystal Springs Reservoir in 1997 and 1998 (Corps File No. 26004S). Consultation concluded with a June 19, 2001, concurrence letter from NMFS to the Corps that determined the project was not likely to adversely affect listed fish species or designated critical habitat under the jurisdiction of NMFS (NMFS PCTS #SWR-2001-2779).

In October 2010, NMFS and the Corps completed formal section 7 consultation for the SFPUC's LCSD Improvement Project (Corps File No. 30317S) and the Crystal Springs/San Andreas Transmission System Upgrade (Corps File No. 400143S) (NMFS PCTS #SWR-2010-749). The LCSD Improvement Project consultation addressed the effects of the SFPUC's improvements to LCSD and its associated water transmission system. Construction impacts and the future operation of the reservoir were evaluated in the NMFS opinion issued on October 29, 2010. The October 29, 2010, opinion concluded the LCSD Improvement Project was not likely to jeopardize the continued existence of CCC steelhead, or adversely modify or destroy designated critical habitat. Temporary effects of construction were anticipated in the area immediately below the dam as well as the permanent loss of some pool habitat at the base of the dam. Incidental take of steelhead was anticipated related to fish capture and relocation efforts during construction, and subsequent fish surveys of San Mateo Creek. Upon completion of construction in 2014/2015, the new operations plan for LCSD significantly improved streamflow conditions for all freshwater life stages of steelhead in San Mateo Creek downstream. To evaluate the long-term operation of LCSD, the opinion and incidental take statement provides for a monitoring program that involves steelhead spawning surveys, fall juvenile fish sampling, downstream migrant trapping of smolts, tagging of juvenile steelhead with passive integrated transponders (PIT), and water quality monitoring.

In August 2011, NMFS and the Corps completed formal section 7 consultation for the SFPUC's Crystal Springs Pipeline No.2 Replacement Project (Corps File No. 2008-00423S) (NMFS PCTS #SWR-2010-1197). That project entailed repairs to an existing 19-mile long water supply transmission pipeline that transported water from the Crystal Springs Pump Station at the base of LCSD to the University Mound Reservoir in San Francisco. Implementation of this project included streamside and in-water construction. On August 24, 2011, NMFS issued an opinion to the Corps on the Crystal Springs Pipeline No.2 Replacement Project that evaluated impacts related to project construction and fish relocation. The August 24, 2011, opinion concluded the pipeline replacement project was not likely to jeopardize the continued existence of CCC steelhead, or adversely modify or destroy designated critical habitat. Incidental take was

anticipated from pre-construction capture and relocation of juvenile steelhead to facilitate in-channel construction.

NMFS has completed programmatic consultations for salmonid habitat restoration actions that include the action area of this Project. To date, no habitat restoration actions covered under existing programmatic Section 7 consultations have occurred in the action area. These programmatic consultations include the NOAA Restoration Center's restoration program and the Corps' Regional General Permit #12 programmatic consultation. Both of these consultations authorize a limited amount of take for juvenile salmonids during instream work conducted in the summer months.

Section 10(a)(1)(A) research and enhancement permits and section 4(d) limits or exceptions could potentially occur in the San Mateo Creek watershed, including the action area of this Project. Salmonid monitoring approved under these programs includes carcass surveys, smolt outmigration trapping, and juvenile density surveys. In general, these activities are closely monitored and require measures to minimize take during the research activities. Through February 2019, no research activities authorized by these NMFS programs have occurred in San Mateo Creek.

2.4.6 Climate Change Impacts in the Action Area

Information discussed above in the Range-wide Status of the Species and Critical Habitat section of this opinion (Section 2.2) indicates that CCC steelhead in the action area may have already experienced some detrimental impacts from climate change. These detrimental impacts across the action area are likely to be minor because natural and local climate factors continue to drive most of the climatic conditions steelhead experience. These natural factors are likely less influential on fish abundance and distribution than anthropogenic impacts across the action area. However, in the future impacts in the action area from climate change are likely to increase as air and water temperatures warm, and precipitation rates change.

2.5 Effects of the Action

Under the ESA, "effects of the action" means the direct and indirect effects of an action on the species or critical habitat, together with the effects of other activities that are interrelated or interdependent with that action, that will be added to the environmental baseline (50 CFR 402.02). Indirect effects are those that are caused by the proposed action and are later in time, but still are reasonably certain to occur.

Construction activities associated with this Project will occur over a period of approximately eight weeks and be limited to a single work season between June 1 and October 31. Effects to threatened CCC steelhead are expected during fish relocation, during work site dewatering, and from degraded water quality.

2.5.1 Fish Relocation Activities

Fish collection and relocation will be performed in coordination with dewatering prior to construction. The dewatered area within the action area will be the entire wetted surface of San

Mateo Creek for approximately 500 linear feet, although dewatering and construction activities will be performed in two phases. Phase 1 dewatering and construction will extend from the dam's stilling basing to the upstream end of Pool 2. Phase 2 dewatering and construction will consist of Pool 2.

SFPUC proposes to collect and relocate fish to minimize the effects of dewatering the stream channel on steelhead. Before and during dewatering of the construction site, juvenile steelhead and other fish will be captured and relocated away from the work area to avoid direct mortality and minimize the possible stranding of fish in isolated pools. Fish will be captured using by seine, dip net and/or electrofisher, and then transported and released to suitable instream locations outside the work area by a qualified fisheries biologist. Release sites will be located downstream of LCSD in San Mateo Creek to a distance of up to ½ mile.

Steelhead relocation activities will occur during the summer low-flow period after emigrating smolts and kelts (post-spawned adults) have left the creek and prior to the adult migration and spawning season. Therefore, NMFS expects the CCC steelhead that will be captured at the stilling basin, wetted riparian wetland area, and at the Pool 2 construction sites for relocation will be limited to young-of-the-year and pre-smolting juveniles. Data to precisely quantify the amount of steelhead that will be relocated prior to construction are not available, but estimates can be made from available information. SFPUC (2015, 2016, 2017, 2018) report observations of juvenile *O. mykiss* from various surveys of San Mateo Creek; each survey encompassed the action area of this Project (Table 2). The estimated density of *O. mykiss* ranged from 1,135 to 2,579 fish per mile, or up to 49 *O. mykiss* per 100 linear feet of channel. SFPUC (2016, 2017, 2018) reported three year classes present in juvenile *O. mykiss* observed in San Mateo Creek. SFPUC (2015) did not report age classes of *O. mykiss* observed, though did report that *O. mykiss* length ranged from 32 to 228 millimeters – a size range that likely encompasses three year classes in a central California coastal stream (Hayes *et al.* 2008).

Table 2. Estimated density of juvenile *O. mykiss* captured in San Mateo Creek by electrofishing.

Sources:	**Year Sampled**	**Length of Reach (miles)**	**Estimated *O. mykiss* Density (per mile)**	**Estimated *O. mykiss* Density (per 100 Feet)**
SFPUC (2015)	2008	1.5	1,278 to 2,204	24.2 to 41.7
SFPUC (2016)	2015	2.3	1,402 to 2,189	26.5 to 41.5
SFPUC (2017)	2016	2.3	1,135 to 1,615	21.5 to 30.6
SFPUC (2018)	2017	2.3	1,922 to 2,579	36.4 to 48.8

Based on the highest densities of *O. mykiss* observed between 2014 and 2017 (*i.e.*, 49 per 100 linear feet) and allowing for a 25 percent variation in inter-annual abundance, the 500-foot long

dewatered Project reach may support up to 307 juvenile steelhead. This is expected to be the maximum number that would be captured and relocated by the Project during construction of the connecting channel.

Fish 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, direct effects to and mortality of juvenile steelhead during capture will be minimized.

Although sites selected for relocating fish should have similar and ample aquatic habitat as in the capture sites. In some instances relocated fish may endure short-term stress from crowding at the relocation sites. Relocated fish may have to contend with other fish causing increased competition for available resources such as food and habitat area. Frequent responses to crowding by steelhead include emigration and reduced growth rates (Keeley 2003). 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 steelhead. As each fish moves, competition remains either localized to a small area or quickly diminishes as fish disperse. NMFS does not expect impacts from increased competition would be large enough to adversely affect the survival chances of individual steelhead, or cascade through the watershed population based on the small area that would likely be affected and the relatively small number of individuals likely to be relocated (particularly when compared with the remainder of individuals throughout the drainage not affected by the Project). As described above, sufficient habitat appears to be available within the ½-mile long action area of San Mateo Creek to sustain fish relocated without crowding of other juvenile steelhead.

Based on information from other relocation efforts, NMFS estimates injury and mortalities would be less than three percent of those steelhead that are captured and relocated. Data on fish relocation efforts in California streams since 2004 shows most mortality rates are below three percent for steelhead (Collins 2004, CDFG 2005, 2006, 2007, 2008, 2009, 2010a, 2010b). Fish that avoid capture during relocation efforts may be exposed to risks described in the following section on dewatering. NMFS expects no more than three percent (approximately 10 fish) of the steelhead captured by the Project for dewatering will be injured or killed during relocation activities.

2.5.2 Dewatering

The Project proposes to isolate two work areas with cofferdams and bypass streamflow around the construction sites. Dewatering of the channel is estimated to affect up to 500 linear feet of San Mateo Creek. NMFS anticipates only minor temporary changes to the streamflow of creek outside of the dewatered construction area during the dewatering process. These fluctuations in flow are anticipated to be small, gradual, and short-term. Once the cofferdam and pipeline bypass are installed and operational, streamflow below the work sites should be the same as the pre-project conditions except within the dewatered work areas where streamflow is bypassed. The dewatering of up to 500 feet of channel is expected to cause a temporary reduction in the quantity of aquatic habitat.

Juvenile steelhead that avoid capture in the Project work area following relocation efforts may die due to desiccation, thermal stress, or be crushed by equipment or foot traffic if not found by biologists while water levels within the reach recede. However, due to fish relocation efforts, NMFS expects the number of juvenile steelhead that would die as a result of stranding during dewatering activities would be less than one percent of the steelhead within the work site prior to dewatering.

The temporary cofferdams and water diversion structures in the creek at the construction site are not expected to impact juvenile steelhead movements in San Mateo Creek beyond typical summer low-flow conditions. Steelhead experience intermittent conditions in many central California coastal streams during summer which impede upstream and downstream movements by juveniles. The limited duration (approximately two months) in combination with the summer or fall timing of this Project's water diversion are unlikely to adversely affect individual steelhead movements in San Mateo Creek.

Benthic (*i.e.*, bottom dwelling) aquatic macroinvertebrates (a salmonid prey item) within the construction sites may be killed or their abundance reduced when creek habitat is dewatered (Cushman 1985). However, effects to aquatic macroinvertebrates resulting from the construction streamflow bypass and dewatering will be temporary because construction activities would be relatively short-lived and the dewatered reach is relatively small (approximately 500 linear feet of channel). Rapid recolonization (typically one to two months) of disturbed areas by macroinvertebrates is expected following channel re-watering (Cushman 1985, Thomas 1985, Harvey 1986). Based on the foregoing, NMFS does not expect the loss of aquatic macroinvertebrates as a result of dewatering activities by the Project would adversely affect CCC steelhead during and after Project implementation.

2.5.3 Increased Mobilization of Sediment in the Stream Channel and Water Quality

During construction, Project activities would result in disturbance of the creek bed and banks for equipment access, channel excavation, removal/replacement of riprap, and for the placement/removal of the cofferdam. While the cofferdam and streamflow bypass system are in place, construction activities are not expected to degrade water quality in San Mateo Creek because the work area will be dewatered and isolated from the flowing waters of the creek. Post-construction, NMFS anticipates disturbed soils could affect water quality and critical habitat in the action area in the form of small, short-term increases in turbidity during re-watering (*i.e.*, cofferdam removal) and subsequent higher flow events during the first winter storms post-construction. Disturbed soils on the creek bank are easily mobilized when late fall and winter storms increase streamflow levels. 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).

Increases in sediment may affect fish in a variety of ways. 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 and prolonged turbidity concentrations can reduce dissolved oxygen in the water column, result in reduced respiratory functions, reduce

tolerance to diseases, 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 can 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 deposition can fill pools thereby reducing the amount of potential cover and habitat available, and smother coarse substrate particles which can impair macroinvertebrate composition and abundance (Sigler *et al.* 1984, Alexander and Hansen 1986).

Although chronic elevated sediment and turbidity levels may affect steelhead and aquatic habitat as described above, sedimentation and turbidity levels associated with this Project during cofferdam construction and removal, and the subsequent rewetting of the construction sites within the action area, and during subsequent rainfall events are not expected to rise to the levels discussed in the previous paragraph, because the Project proposes soil and channel stabilization measures to prevent the mobilization of sediment. Due to the Project's proposed use of silt curtains and other erosion control measures throughout the construction phase, and post-construction planting of native vegetation, NMFS anticipates there will be minimal area of disturbed, exposed soils remaining post-construction. Therefore, any resulting elevated turbidity levels would be small, only occur for a short period, and be well below levels and durations shown in the scientific literature as causing injury or harm to salmonids (see for example Sigler *et al.* 1984 or Newcombe and Jensen 1996). NMFS expects any sediment or turbidity generated by the Project would not extend more than 500 feet downstream of the work site based on the site conditions and methods used to control sediment. NMFS does not anticipate harm, injury, or behavioral impacts to CCC steelhead associated with exposure to the minor elevated suspended sediment levels that would be generated by the Project.

2.5.4 Effects on Habitat

As discussed above, Project construction activities are expected to result in short-term disturbance to the channel and the adjacent streambank areas. Localized impacts to water quality in the form of increased levels of turbidity and suspended sediment will be contained during construction by the cofferdams and post-construction mobilization of sediment during high flow events are expected to be minimal. Given the small amounts of sediment and turbidity generated by the Project, NMFS expects to water quality in the action area are unlikely to adversely affect habitat for CCC steelhead. Any sediment and turbidity associated with Project activities is expected to rapidly dissipate downstream in San Mateo Creek during subsequent high flows over the next rainy season.

Juvenile steelhead rearing habitat in the action area will be temporarily impacted by dewatering approximately 500 linear feet of channel. The amount of physical habitat available for rearing juveniles within these 500-foot long reach is primarily located in Pool 2. Pool 2 will be dewatered and unavailable for approximately four weeks of the eight-week construction period. During this time, food supplies within the dewatered reach of Pool 2 will be temporarily reduced. Benthic (*i.e.*, bottom dwelling) aquatic macroinvertebrates may be killed or their abundance reduced when the pool is dewatered. However, effects to aquatic macroinvertebrates resulting from streamflow diversion and dewatering is expected to be short-term. Because construction activities will be short-lived and the dewatered reach on Pool 2 is relatively small (approximately 200 feet), rapid recolonization (typically one to two months) of disturbed areas by

macroinvertebrates is expected following rewatering (Cushman 1985, Thomas 1985, Harvey 1986). Based on the foregoing, NMFS expects the temporary loss of habitat space and impacts to aquatic macroinvertebrates as a result of dewatering activities would result in only minor adverse effect to steelhead rearing habitat in the action area.

The temporary water diversion and cofferdams are not expected to adversely affect the movement of steelhead because the diversion will not be in place during periods of adult and smolt steelhead migration in San Mateo Creek. Additionally, the construction sites are located at the upstream extent of anadromous fish access in San Mateo Creek at the base of LCSD. When construction is completed, the cofferdams will be removed prior to the beginning of adult steelhead or smolt migration of December through May (Fukushima and Lesh 1998).

Post-construction, the creation of a channel connecting the stilling basin to Pool 2 will provide adult and juvenile steelhead year-round ingress and egress between the stilling basin and the flowing waters of San Mateo Creek downstream of LCSD. Under existing conditions, fluctuating flows combined with the shallow riparian wetland area adjacent to the stilling basin creates conditions where steelhead can become stranded. The connecting channel will provide a well-defined passage route from the stilling basin for steelhead to access Pool 2 and lower San Mateo Creek downstream of the dam. Post-excavation, native riparian vegetation will be planted adjacent to the connecting channel and assist with stabilizing the banks of the newly created channel. Riparian plantings will also benefit the creek through increased shade, cover, and production of allochthonous food.

In addition to improving fish passage conditions, the Project's installation of an extra discharge pipe for reservoir releases will allow SFPUC the option of passing 3 cfs or greater from the base of the dam. This secondary point of discharge at the stilling basin will supplement the current point of discharge at Pool 2. With two points of release on the downstream side of the dam, SFPUC will be able to respond to changing conditions and have increased flexibility for adaptive management. If water quality degrades within the stilling basin and juvenile steelhead are present in the basin, the supplemental discharge pipe will allow for a flow of 3 cfs or greater to pass into the stilling basin which will cool water temperatures and increase dissolved oxygen levels. This improved condition for fish passage and water quality is anticipated to provide long-term benefits to CCC steelhead in the action area.

2.5.5 Effects of Interrelated and Interdependent Operation of Lower Crystal Springs Dam and Reservoir.

In coordination with the NMFS, SFPUC developed an operations plan and flow schedule for lower San Mateo Creek below LCSD which was incorporated into the LCSD Improvement Project in 2010 (see Table 1). This new flow schedule was initiated in January 2015 and monitoring to date indicates the enhanced flow regime in lower San Mateo Creek has significantly improved conditions for steelhead over previous conditions (A, Brinkerhoff, SFPUC, personal communication 2019) The operations plan has two water release schedules (wet/normal and dry) that are based, in part, on precipitation. Releases to San Mateo Creek from the dam are highest during mid-January through March, with lower, generally constant flows the rest of the year. Based on observed conditions and the SFPUC's annual redd surveys

since 2015, this flow schedule provides sufficient water depths for adult upstream passage at critical riffles and adequate spawning habitat for adult steelhead in the action area.

The new water release schedule has significantly increased the amount and quality of juvenile rearing habitat in lower San Mateo Creek compared to pre-2015 conditions (A. Brinkerhoff, SFPUC, personal communication 2018). Based on the results of the SFPUC's sampling since 2008, juvenile steelhead densities have increased from an average of 21.0 fish per 100 feet (2008 through 2014) to an average of 42.8 fish per 100 feet (2015 through 2018) (A. Brinkerhoff, SFPUC, personal communication 2019). These density estimates indicate the *O. mykiss* population in San Mateo Creek is responding favorably to higher flow regime. Summer and fall releases from Crystal Springs Reservoir appear to be sufficient for resting, holding, and providing cover from predators. During the spring months release rates range from 5 to 10 cfs and observations to date indicate water depths over riffles are adequate for smolt passage during the emigration period under these conditions.

Although the current release schedule provides good conditions for steelhead passage, spawning and rearing, streamflows are significantly reduced during high precipitation events. Impoundment of San Mateo Creek's runoff by LCSD during the winter and spring months reduces peak streamflow over unimpaired conditions and has diminished the channel's natural geomorphic functions in the action area. As a result, the channel is less dynamic, with reduced sinuosity and reduced habitat complexity. Riparian vegetation has encroached into the channel, floodplain areas are reduced, and some channel incision has occurred. However, it is important to note that the hydrology of San Mateo Creek below LCSD has been impaired for over 130 years and the morphology of the channel has responded to this changed flow regime. The dimensions and sinuosity of the channel in the action area have reacted to a lower, stable hydrologic regime. Thus, the channel of lower San Mateo Creek has a diminished ability to convey moderate and high flow events and this condition is expected to be maintained into the future by the continued operation of LCSD.

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.

Regarding the action area within the San Mateo Creek watershed, NMFS is not aware of any other future State, tribal, local, or private actions activities that are reasonably certain to have effects within the action area beyond those actions identified in the Environmental Baseline section of this opinion, primarily water development and urbanization. NMFS expects those actions to lead to changes in stream discharge patterns, reduction of riparian vegetation, and increases in stormwater discharges and toxic inputs to San Mateo Creek. NMFS expects the impacts of those actions will be similar to the present day impacts on listed steelhead and aquatic habitat in San Mateo Creek.

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 in the environmental baseline (Section 2.4 of this opinion).

2.7 Integration and Synthesis

The Integration and Synthesis section is the final step in our assessment of the risk posed to species and critical habitat as a result of implementing the proposed action. 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 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 diminishes the value of designated or proposed critical habitat for the conservation of the species.

CCC steelhead are listed as threatened. Based on the extensive loss of historic habitat due to dams, forestry practices, and urban and agricultural land development, and the degraded condition of remaining spawning and rearing habitats, CCC steelhead have experienced severe declines.

The Project proposes to dewater a relatively small section of San Mateo Creek (approximately 500 linear feet) and construction is scheduled to occur during the dry season. Therefore, it is anticipated that only rearing juvenile steelhead will be present in the action area during construction and no adult or smolt life stages of steelhead would be affected by Project activities. NMFS estimates up to 307 juvenile CCC steelhead may be present in the reach of creek to be dewatered prior to construction.

As described in the Effects of the Action (Section 2.5 of the opinion), NMFS identified dewatering and fish relocation as the adverse effects on CCC steelhead that would result from the proposed Project. Prior to dewatering the work sites for construction, fish would be collected and relocated. Juvenile steelhead present in the Project work areas will be subject to capture, relocation, and related short-term effects. Fish that elude capture and remain in the work sites during dewatering may die due to desiccation or thermal stress, or be crushed by equipment or foot traffic if not found by biologists during the drawdown of streamflow.

Based on the low mortality rates for similar relocation efforts, NMFS anticipates few juvenile steelhead would be injured or killed by fish relocation and construction activities during implementation of this Project. Anticipated mortality from relocation is expected to be less than three percent of the fish relocated, and mortality expected from dewatering is expected to be less than one percent of the fish in the area prior to dewatering (combined mortality to not exceed four percent). Because no more than 307 juvenile steelhead are expected to be present, NMFS expects no more than 13 juvenile steelhead would be injured or killed by fish relocation and dewatering. Due to the relatively large number of juveniles produced by each spawning pair, steelhead spawning in the San Mateo Creek watershed in future years are likely to produce

enough juveniles to replace the few that may be lost at the Project site due to relocation and dewatering. Thus, it is unlikely that the small potential loss of up to 13 juvenile steelhead during the duration of Project activities will impact future adult returns.

Excavation of the 300-foot long connecting channel from the stilling basin to Pool 2 is anticipated to allow improved water conditions within the stilling basin and provide for volitional passage of steelhead between the stilling basin and Pool 2 of San Mateo Creek. Adjacent to the new connecting channel, the planting of native vegetation is expected to create shade, produce allochthonous food and shelter, and assist with stabilizing bank sediments. The installation of a secondary discharge pipe for reservoir releases will allow SFPUC the option of passing 3 cfs or greater from the base of the dam to respond to changing conditions and have increased flexibility for adaptive management.

The on-going operation of LCSD is an interrelated and interdependent activity of this Project, and SFPUC will continue to release water from Crystal Springs Reservoir in accordance with the flow regime presented in Table 1. Based on the results of surveys and sampling conducted since the new streamflow releases were initiated in 2015, habitat conditions associated with streamflow are sufficient for steelhead passage, spawning and rearing in San Mateo Creek. Adult steelhead are capable of accessing the uppermost reaches of the creek immediately below LCSD and over-summer survival of juvenile fish is good under the current reservoir release schedule.

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 and Central Coastal rivers. Estuaries may also experience changes in productivity due to changes in freshwater flows, nutrient cycling, and sediment amounts. For this Project, in-water activities will occur for about two months in a single year, and the above effects of climate change will not be detected within that time frame.

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, any effects of interrelated and interdependent activities, and cumulative effects, it is NMFS' opinion that the proposed action is not likely to jeopardize the continued existence of CCC steelhead or destroy or adversely modify its 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). "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 opinion, NMFS determined that incidental take would occur. NMFS anticipates that take of threatened CCC steelhead associated with the proposed LCSD Stilling Basin Connecting Channel Project in the County of San Mateo, California will be associated with fish collection and relocation during stream dewatering for construction activities.

The number of threatened steelhead that may be incidentally taken during Project activities is expected to be small, and limited to the juvenile (pre-smolt) life stage. Take is anticipated to occur during fish relocation and dewatering of the 500-foot long reach of San Mateo Creek within the action area during the summer or fall of 2019. The number of juvenile steelhead relocated during Project construction is anticipated to be no more than 307 fish, and no more than 13 juvenile steelhead are expected to be injured or killed during fish relocation and dewatering activities.

2.9.2 Effect of the Take

In the 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" are nondiscretionary measures that are necessary or appropriate to minimize the impact of the amount or extent of incidental take (50 CFR 402.02). NMFS believes the following reasonable and prudent measures are necessary and appropriate to minimize take of CCC steelhead:

1. Undertake measures to ensure that harm and mortality to listed steelhead resulting from fish relocation and dewatering activities is low.

2. Prepare and submit reports which summarize the effects of construction, fish relocation, dewatering activities, and post-construction site performance.

2.9.4 Terms and Conditions

The terms and conditions described below are non-discretionary, and the Corps or any applicant must comply with them in order to implement the RPMs (50 CFR 402.14). The Corps 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.

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

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

b. If any salmonids are found dead or injured, the biologist shall contact NMFS biologist Daniel Logan by phone immediately at (707) 575-6053 or the NMFS North-Central Coast Office at (707) 575-6050. The purpose of the contact is to review the activities resulting in take and to determine if additional protective measures are required. All salmonid mortalities shall be retained, placed in an appropriately-sized sealable plastic bag, labeled with the date and location of collection, fork length measured, and frozen as soon as possible. Frozen samples shall be retained by the biologist until specific instructions are provided by NMFS. The biologist may not transfer biological samples to anyone other than the NMFS North-Central Coast Office without obtaining prior written approval from the NMFS North-Central Coast Office. Any such transfer will be subject to such conditions as NMFS deems appropriate.

c. All cofferdams, pumps, pipes and other diversion materials will be removed from the stream upon work completion and no later than October 31.

The following term and condition implements reasonable and prudent measure 2:

a. The Corps or applicant must provide a written report to NMFS by January 15 of the year following construction of the proposed action. The report must be provided to NMFS North-Central Coast Office, Attention: San Francisco Bay Branch Chief, 777 Sonoma Avenue, Room 325, Santa Rosa, California, 95404-6528. The report must contain, at a minimum, the following information:

i. Construction Related Activities – The report must include the dates construction began and was completed, a discussion of any unanticipated effects or unanticipated levels of effects on salmonids, 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

Project 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 used to collect, hold, and transport salmonids, the number of fish relocated by species, the number of fish injured or killed by species and a brief 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.

iii. As-Built Conditions – The report must include as-built drawings of the connecting channel and adjacent constructed floodplain. The report shall also provide an assessment of volitional access and egress conditions for steelhead in the Project area as flows are receding from LCSD high release and spill events.

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).

1. The Corps and/or SFPUC should evaluate opportunities and implement gravel augmentation projects to enhance steelhead spawning and rearing habitat in San Mateo Creek below LCSD using coarse sediment trapped in Crystal Springs Reservoir and from other appropriate sources. About 85 percent of the San Mateo Creek watershed is upstream of LCSD and all of the coarse sediment derived from upstream sources for the past 130 years has been captured upstream of the dam. Implementation of this Conservation Recommendation will address a recovery action for CCC steelhead related to sediment (SMatC-CCCS-8.1.1.1) in the San Mateo Creek watershed.

2. The Corps and/or SFPUC should work collaboratively with NMFS to modify the culvert on lower Polhemus Creek, tributary to San Mateo Creek, to allow for the upstream passage of adult steelhead into Polhemus Creek. Polhemus Creek is the largest tributary to San Mateo Creek downstream of LCSD and one of very few tributaries with habitat suitable for use by steelhead. Approximately 0.3 mile upstream of the confluence with San Mateo Creek, Polhemus Creek passes through a 530-foot-long culvert. This culvert, with a gradient of 5 percent and two bends, is a migration barrier for the upstream movement of anadromous fish (Leidy *et al*. 2005; Entrix 2006). Implementation of this Conservation Recommendation will address recovery actions for CCC steelhead related to fish passage (SMatC-CCCS-5.1.1.3) and channel modification (SMatC-CCCS-13.1.3.1) in the San Mateo Creek watershed.

2.11 Reinitiation of Consultation

This concludes the formal consultation for the proposed Lower Crystal Springs Dam Stilling Basin Connecting Channel Project in the County of San Mateo, California.

As 50 CFR 402.16 states, reinitiation of formal consultation is required where discretionary Federal agency involvement or control over the action has been retained or is authorized by law and if: (1) the amount or extent of incidental taking specified in the ITS is exceeded, (2) new information reveals effects of the agency action that may affect listed species or critical habitat in a manner or to an extent not considered in this opinion, (3) the agency action is subsequently modified in a manner that causes an effect on the listed species or critical habitat that was not considered in this opinion, or (4) a new species is listed or critical habitat designated that may be affected by the action.

3 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.

3.1 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 is the Corps and the SFPUC. Other interested users could include the California Department of Fish and Wildlife, citizens of the County of San Mateo, and others interested in the conservation of threatened steelhead. Individual copies of this opinion were provided to the Corps, the U.S. Fish and Wildlife Service, the California Department of Fish and Wildlife, and the San Francisco Regional Water Quality Control Board. This opinion will be available through the NOAA Institutional Repository (https://repository.library.noaa.gov/), after approximately two weeks. The format and naming adheres to conventional standards for style.

3.2 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.

3.3 Objectivity

Information Product Category: Natural Resource Plan

Standards: 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 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 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 reviewed in accordance with West Coast Region ESA quality control and assurance processes.

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4.2 Personal Communication

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