**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

JUN 16 2017

In **response refer** to: WCR-2016-5797

Rick M. Bottoms, Ph.D.
Regulatory Branch Chief
Department of the Army
San Francisco District, Corps of Engineers
1455 Market Street
San Francisco, California 94103-1398

Re: Endangered Act Section 7(a)(2) Biological Opinion for the Bear Gulch Upper Diversion Fish Passage Project within the Town of Woodside, San Mateo County, California (Corps File No. 2016-00145S)

Dear Dr. Bottoms:

Thank you for your letter of October 17, 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), as amended (16 USC Section 1531 *et seq.),* for construction of the Bear Gulch Upper Diversion Fish Passage Project (Project), located between Oakhill Drive and Bear Gulch Road in the Town of Woodside, San Mateo County, California. The Corps of Engineers (Corps) proposes to provide authorization pursuant to Section 404 of the Clean Water Act (CWA) of 1972, as amended (33 U.S.C. § 1344 *et seq.),* to the California Water Service Company (Cal Water) for construction of the Project.

The enclosed biological opinion is based on our review of the Project proposed by Cal Water and describes NMFS' analysis of the effects of the construction and operation of the Bear Gulch Upper Diversion Facility on threatened Central California Coast (CCC) steelhead (*Oncorhynchus mykiss)* and on designated critical habitat 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 steelbead, nor is the Project likely to result in the destruction or adverse modification of critical habitat for CCC steelhead. However, NMFS anticipates take of CCC steelhead will occur as a result of project construction. An incidental take statement with non-discretionary terms and conditions is included with the enclosed biological opinion. Cal Water has also proposed an operations plan with minimum bypass flows for the Upper Diversion Facility that is expected to benefit threatened CCC steelhead and other aquatic species downstream of the water diversion.

Please contact Mr. Andrew Trent of the NMFS North-Central Coast Office in Santa Rosa, California at (707) 578-8553, or andrew.trent@noaa.gov if you have any questions concerning this section 7 consultation, or if you require additional information.

Sincerely,

Barry A. Thom
Regional Administrator

Enclosure

cc: Frances Malamud Roam, Corps Regulatory Division, San Francisco, CA
Corinne Gray, California Department of Fish and Wildlife, Yountville, CA
Mark Bloom, California Walter Service, San Jose, CA
Copy to ARN #151422WCR.2016SR00350
Copy to Chron File

**Endangered Species Act (ESA) Section 7(a)(2) Biological Opinion and Magnuson-Stevens Fishery Conservation and M[anagement Act Essential Fish Habitat Consultation**

**Bear Gulch Upper Diversion Fish Passage Project**

NMFS Consultation Number: WCR-2016-5797

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

Affiected S,pec1es and NMFS' Determmat1ons:

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

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

**Issued By:** _____
Barry A. Thom
Regional Administrator

**Date:** JUN f 6 2017

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## LIST OF ACRONYMS

| | |
|---|---|
| BMP | best management practices |
| CCC | Central California Coast |
| CDFW | California Department of Fish and Wildlife |
| cfs | cubic feet per second |
| Corps | U.S. Army Corps of Engineers |
| CWA | Clean Water Act of 1972 |
| DPS | distinct population segment |
| DQA | Data Quality Act |
| ESA | Endangered Species Act |
| ESU | Evolutionarily Significant Unit |
| ITS | incidental take statement |
| MLA | Michael Love and Associates |
| mm | millimeter |
| NMFS | National Marine Fisheries Service |
| PBF | physical or biological features |
| PLC | programmable logic control |
| PCE | primary constituent element |
| RSP | rock slope protection |
| SWPPP | storm water pollution prevention plan |
| TL | total length |
| USGS | United States Geological Survey |

## 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 NMFS prepared the biological opinion (opinion) and incidental take statement portions of this document in accordance with section 7(b) of the 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 (section 515 of the Treasury and General Government Appropriations Act for Fiscal Year 2001, Public Law 106-554). The document will be available through NMFS' Public Consultation Tracking System (https://pcts.nmfs.noaa.gov/pcts-web/homepage.pcts). A complete record of this consultation is on file at the NMFS North-Central Coast Office in Santa Rosa, California (ARN #151422WCR2016SR00350).

### 1.2 Consultation History

In 2011, Cal Water retained the services of MLA and GHD, Inc. to evaluate fish passage and screening alternatives for the Bear Gulch Upper Diversion Facility. The resulting study recommended placing a pool and weir style fishway along the bank of Bear Gulch Creek.

On April 12, 2012, NMFS participated in an inter-agency site visit to the Bear Gulch Upper Diversion Facility to discuss fish passage and fish screen alternatives.

MLA and GHD developed preliminary (30%) designs for a north bank facility in September 2012 and plans were provided to NMFS for review. In September 2012, NMFS provided comments on the 30% design. MLA responded to NMFS' comments by letter dated July 21, 2014, to Cal Water. The July 21, 2014 response from MLA addressed NMFS' questions and incorporated NMFS' suggested modifications into the 90% design.

By letter dated October 13, 2016, the Corps requested initiation of formal consultation with NMFS pursuant to section 7 of the ESA of 1973, as amended (16 USC 1531 *et seq*.), for the proposed Bear Gulch Upper Diversion Fish Passage Project in the Town of Woodside, San Mateo County, California (Corps File Number 2016-00145S). The Corps determined the proposed project may adversely affect threatened CCC steelhead (*Oncorhynchus mykiss*) and designated critical habitat.

"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 Corps proposes provide

authorization under Nationwide Permit 27 pursuant to Section 404 of the Clean Water Act of 1972, as amended (33 U.S.C. § 1344 *et seq*.) (Corps File No. 2016-00145S) to Cal Water to construct a fish ladder and install fish screens at the Upper Diversion Facility on Bear Gulch. In-channel construction will occur during the summer and early fall of 2017 from June 15 through October 15. Operation of the water diversion may occur year-round, but will vary based on hydrologic conditions in Bear Gulch and seasonal bypass flow requirements. The project site is on Bear Gulch, a tributary to Bear Creek and subsequently to San Francisquito Creek, in the Town of Woodside, San Mateo County, California.

1.3.1 Description of the Proposed Work

Cal Water diverts surface water from Bear Gulch to an intake structure and transmission line which conveys water by gravity to an off-channel reservoir located approximately three miles from the site. The existing Bear Gulch Upper Diversion Facility consists of an approximately eight-foot tall diversion dam with a stoneblock face, topped with wooden stoplogs stacked two feet high. The dam was likely constructed as a milldam in the 1800's and it is a barrier to anadromous fish passage under most streamflow conditions.

To conserve federal-threatened CCC steelhead, Cal Water has proposes the following actions: (1) construction of fish screens on the water intake; (2) construction of a fishway for upstream and downstream passage at the dam; (3) diversion dam modifications and upgrades; and (4) minimum bypass flows to support steelhead and other aquatic species below the facility.

1.3.1.1 Site Dewatering and Fish Relocation

To facilitate construction activities, Cal Water proposes to dewater up to 200 linear feet of the channel in Bear Gulch (approximately 100 feet upstream of the dam and 100 feet downstream of the dam). Gravity-fed bypass piping will be installed to divert streamflow around the Project site. Nuisance water will be diverted into the existing 20-inch transmission line, where it will flow to the off-channel Bear Gulch Reservoir. The installation of the water management system will be the first activity in the stream channel. The general sequence of installation is as follows:

- Prepare channel bottom;
- Install bypass piping by installing either continuously welded high density polyethylene or 10-ft long aluminum irrigation type pipes with Bauer type sealed connections;
- Install upstream cofferdam;
- Set up and install submersible pump system with fish screen box;
- Dewater area between dams and conduct fish rescue;
- Install excavation dewatering system including baker type settling tank;
- Install sumps and pumps as necessary to perform the excavation and other stream work.

Upon completion of the cofferdams, NMFS-approved biologists will initiate a program to capture and relocate fish to suitable locations outside the work area. Fish will be collected using seining, dip netting, or electrofishing. Captured fish will be held in cool, shaded water that will

be continuously aerated. Fish will not be subjected to jostling or excess noise and will not be overcrowded in the containers. Two holding containers will be available to segregate young-of-the-year fish from larger fish to avoid predation. Captured fish will be relocated, as soon as possible to an instream location in which suitable habitat conditions are present.

#### 1.3.1.2 Dam Modification and Forebay Controls

Based on findings from the hydraulic investigation of the transmission pipeline (Winzler & Kelly, 2010), the hydraulic grade line at the existing diversion dam can be lowered. This lowering of the dam reduces the overall drop across the dam and the required length of the fishway. The proposed Project will remove the wooden stoplogs, as well as the supports and the two feet tall dam cap. The northern end of the dam cap will be left in place and the northern training wall will be poured against it. Demolition of the concrete cap on the upper portion of the dam will be accomplished using a hydraulic hoe ram mounted on an excavator, which should not damage the older dam underneath.

The stoplogs will be replaced by Obermeyer gates that can be used for controlling water levels and managing sedimentation at the water diversions. The Obermeyer gates will be located upstream of the dam crest, close to the screenbay inlet where they will be placed on a new concrete apron. Immediately downstream of the Obermeyer gates will be a one-foot deep plunge pool that will drain into a one-foot wide low-flow channel. The Obermeyer gates can be raised to a maximum height of 2.5 feet, but normally will be raised no higher than 2.2 feet to operate the new diversion facility. The two gates can operate independently to allow for increased control of the forebay and to sluice sediment deposited in the forebay.

#### 1.3.1.3 Fish Screening and Diversion Intake

The proposed intake screen system is a cone screen style with an integrated brush cleaner system. The screen array will be two cone screen assemblies approximately 5.5 feet in diameter by 1.5 feet tall. The screen material will comply with NMFS and CDFW Fish Screen Design Criteria for salmonids. The screen array will be cleaned by an integrated brush system that will remove debris caught on the surface of the screen and re-entrain it into the sweeping flow moving down the fishway. A hydraulic motor will power the brushes requiring a power unit that will be located in a small utility building nearby for access and maintenance by utility personnel.

The intake screens will be located in a screenbay upstream of the dam along the south bank of the channel, which will also serve as the exit channel for the fishway. A 10-foot long trashrack will be located across the inlet of the screenbay, and behind the trashrack there will be a set of guides for installation of stoplogs that will be used as “sediment sills” to limit the amount of sediment entering the screenbay. Excavation will be required to get to the required elevations for the fish screen. An excavator will be used and approximately 498 cubic yards are estimated to be removed for the fish screen structure. The sediments will be stock piled at the area near the beginning of the access road.

#### 1.3.1.4 Diversion Intake, Meter, and Junction Box

The Project proposes to construct a new diversion intake consisting of a 36-inch diameter "log manifold" placed under the two cone screens and encased in concrete. The two screens will drain into the manifold through 18-inch diameter pipes, passing under the outer screenbay wall and coupled to a new 24-inch pipe. The 24-inch pipe will tie into a new junction box, which will replace the existing intake box. A motorized operated slide-gate will be placed across the pipeline outlet to regulate the diversion flow rate. Water diverted from Bear Gulch at the new intake will be conveyed by gravity to an off-channel reservoir located approximately three miles from the site.

#### 1.3.1.5 Serpentine Pool-and Weir Fishway

Upstream and downstream fish passage over the diversion dam will be through a serpentine style pool and weir fishway attached to the screenbay. It is estimated that 158 cubic yards of sediment will need to be removed from the Bear Gulch channel for the fish ladder. The fishway weirs will be located along a center wall and oriented parallel to the overall slope of the fishway with two pools across the width. The serpentine fishway will have one foot drops between weirs and the weirs from fishway floor to crest will be three feet tall, providing for a residual pool depth of two feet to meet fishway criteria. The weirs will have a compound shape, with a total flow width of two feet. The weir crests will be formed by one-foot wide stoplogs that can be removed to drain the fishway and flush sediment from the pools. The weirs and stoplogs will be positioned at the downstream end of each pool directing the main flow around the outside corners of the pool and towards the next downstream weir. The pools below the weir will be eight feet by three feet and the minimum fishway sidewall height will be set to ensure there is at least three feet of freeboard at high passage design flow. The weir at the fishway entrance will be located at the downstream end of the plunge pool below the dam. The screenbay will serve as the fishway exit channel with the exit weir located at the downstream end of the screenbay.

#### 1.3.1.6 Downstream Scour Protection

A channel-spanning boulder weir will be constructed approximately 15 feet downstream of the fishway entrance to stabilize the tailwater control. Rock slope protection (RSP) will be placed around the ends of the boulder structure to provide scour protection. RSP will extend upstream along the north bank to the base of the dam for additional scour protection from plunging flow overtopping the dam and landing in the tailwater pool.

#### 1.3.1.7 Upstream Channel Grading

The channel has aggraded with sediment upstream of the existing dam and stoplogs. Since the project involves lowing the dam crest elevation by over two feet upstream sediment will be removed and the channel regraded. Sediment will be removed extending from the dam to approximately 100 feet upstream, with an estimate of 200 cubic yards of material being removed. The channel bed will be lowered to two to three feet at the new concrete apron, with the graded channel width averaging approximately 20 feet.

1.3.1.8 Other Construction Activities

A temporary office trailer will be set up near the entrance of the access road to the Upper Diversion facility. The existing access road to the Project site will need to be improved to accommodate some of the heavy equipment and material deliveries associated with construction. The Project site will be cleared and grubbed including the removal of 11 trees. Some logs may be retained for the log deflector system upstream of the new fish screen.

1.3.1.9 Monitoring Diversion and Bypass Flows

Cal Water proposes to incorporate measurement devices into the Upper Diversion Facility for the purpose of monitoring diversion rates and bypass flows. A magnetic flow meter, or equivalent, will be placed in the diversion pipeline upstream of the junction box to measure diversion rate. A water level sensor will be placed in the screenbay forebay and connected to programmable logic controllers (PLC) for gaging streamflow through the fishway. A second water level sensor connected to the PLC will be placed in the upstream end of the screenbay behind the trashrack to measure water levels in the forebay upstream of the Obermeyer gates. Theoretical stage-discharge rating curves will be developed for both water level sensors.

The total instream bypass flow will be the sum of the fishway and Obermeyer gate flows. The total in-stream bypass flow and the diversion flow rate would be summed to determine the total flow in Bear Gulch upstream of the facility. The total flow will be used to determine the maximum allowable instantaneous diversion rate.

1.3.1.10 Description of Proposed Minimization Measures

To avoid or minimize potential impacts to fish associated with project activities, Cal Water has proposed the following measures:

- Project activities in-channel will be restricted to the dry season (June 15 to October 15) to minimize potential impacts on water quality resulting from erosion and sediment mobilization into the live stream channel.
- Sandbags will be placed to minimize turbidity in the stream. Concrete will be allowed to fully dry and cure prior to re-watering the site.
- A SWPPP and erosion control BMPs will be developed and implemented to minimize wind or water related erosion and will be in compliance with the requirements of the Corps.
- Before any construction activities, a NMFS-approved biologist will conduct a training session for all construction personnel. At a minimum, the training will include a description of CCC steelhead and their habitat, the importance of this species, the general measures that are being implemented to conserve them as they relate to the Project, and the boundaries within which the Project may be accomplished.
- Prior to dewatering and construction, temporary fish exclusion screens will be installed upstream and downstream of the Project site.
- Following construction of the temporary cofferdam, water will be released or pumped downstream at an appropriate rate to maintain downstream flows during construction.

Once construction activities are completed, any barriers to flow will be removed in a manner that will allow flow to resume with the least disturbance to the substrate.
- Fish between the cofferdams will be captured by seine, dip net, and/or electrofisher, and then transported and released to suitable in-stream locations outside of the work area.

1.3.1.11 Bypass Flow Requirements and Maximum Diversion Rates

Cal Water proposes to operate the new Bear Gulch Upper Diversion Facility as described below:

During the period between December 15 and May 31, the Upper Diversion Dam water intake will be operated as follows:

- 1 cfs of stream flow will be allowed to pass downstream in Bear Gulch at all times when the flow in Bear Gulch immediately upstream of the Diversion Dam is less than 2.4 cfs. If flows immediately upstream of the Diversion Dam are less than 1 cfs, the full amount of Bear Gulch flow will be allowed to pass downstream.
- 2.4 cfs of streamflow will be allowed to pass downstream in Bear Gulch at all times when the flow in Bear Gulch immediately upstream of the Diversion Dam is equal to or greater than 2.4 cfs and less than 7.6 cfs.
- 7.6 cfs of streamflow will be allowed to pass downstream in Bear Gulch at all times when the flow in Bear Gulch immediately upstream of the Diversion Dam is equal to or greater than 7.6 cfs.
- The maximum instantaneous diversion rate at the Upper Diversion Dam may not exceed 12.4 cfs at any time.

During the period between June 1 and December 14, the Upper Diversion Dam will be operated as follows:

- 0.5 cfs of streamflow will be allowed to pass downstream in Bear Gulch at all times. If flows immediately upstream of the Diversion Dam are less than 0.5 cfs, the full amount of Bear Gulch flow will be allowed to pass downstream.
- The maximum instantaneous diversion rate at the Upper Diversion Dam may not exceed 12.4 cfs at any time.

## 2. ENDANGERED SPECIES ACT CONSULTATION: 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, Federal agencies must ensure that their 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 habitat. 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 and terms and conditions to minimize such impacts.

## 2.1 Analytical Approach

This biological opinion includes both a jeopardy analysis and an adverse modification analysis. The jeopardy analysis relies upon the regulatory definition of "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 biological 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 biological 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 likely 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 to assess the risk that the proposed action poses to species and critical habitat.
- Reach jeopardy and adverse modification conclusions.
- If necessary, define 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 activities at the Bear Gulch Upper Diversion Fish Passage Project 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:

- Project Design Report. Bear Gulch Upper Diversion fish Passage and Intake Screens. San Mateo County, California. Prepared for California Water Service by Michael Love & Associates and GHD, Inc. February 2016.

- Bear Gulch Upper Diversion Fish Passage Project. Biological Assessment/Essential Fish Habitat Assessment Covering the California Red-legged Frog, San Francisco Garter Snake, and Central California Coast Steelhead. Project #3411-09. Prepared for California Water Service Company by H.T. Harvey & Associates. October 5, 2016.

Information was also provided in email messages and telephone conversations during June 2016 between NMFS and Corps. 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 151422WCR2016SR00350).

## 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. Also, the opinion 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 PBFs that help to form that conservation value.

### 2.2.1 Listed Species

This biological opinion analyzes the effect of Cal Water's proposed fish passage and fish screening project at Upper Diversion Facility in Bear Gulch on the CCC steelhead. CCC steelhead are listed as threatened under the ESA (71 FR 834, January 5, 2006). The CCC steelhead 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. In addition, this biological opinion analyzes the effects on designated critical habitat for threatened CCC steelhead (September 2, 2005; 70 FR 52488). Bear Gulch in the action area is designated critical habitat for CCC steelhead.

2.2.1.1 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 which originate from the San Francisquito Creek watershed typically immigrate from the ocean to freshwater between December and April, peaking in January and February, and juveniles migrate as smolts 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 15 and October 15, only juvenile steelhead are likely to be present in the action area during construction. However, all steelhead life stages (adults, eggs, fry, juveniles, and smolts) can be present during the year-round operation of Cal Water's diversion facility on Bear Gulch.

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.

2.2.1.2 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 remains 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 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.* published in 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).

2.2.1.3 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.[1] 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.

### 2.2.2 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 twenty-first century. The greatest

[1] Other factors, such as overfishing and artificial propagation have also contributed to the current population status of this species. All these human induced factors have exacerbated the adverse effects of natural factors such as drought and poor ocean conditions.

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 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 this project consists of Cal Water's Upper Diversion Facility and Bear Gulch downstream from the facility 1.0 mile to the confluence with West Union Creek.[2] The Upper Diversion Facility is located between Oakhill Drive and Bear Gulch Road in the Town of Woodside in San Mateo County, California. The action area at the Upper Diversion Facility includes work areas, staging areas, and access areas, as well as the Bear Gulch channel extending approximately 100 feet upstream and downstream where dewatering for construction will occur. The action area also includes 1.0 mile of Bear Gulch from the Upper Diversion Facility to the confluence with West Union Creek where streamflows will be affected by the future operation of Cal Water's water diversion. The effects of streamflow reductions in Bear Gulch due to Cal Water's Upper Diversion diminish below the confluence with West Union Creek due to the greater contribution of streamflow from West Union Creek. The action area for the Project is presented in Figure 1.

### 2.4 Environmental Baseline

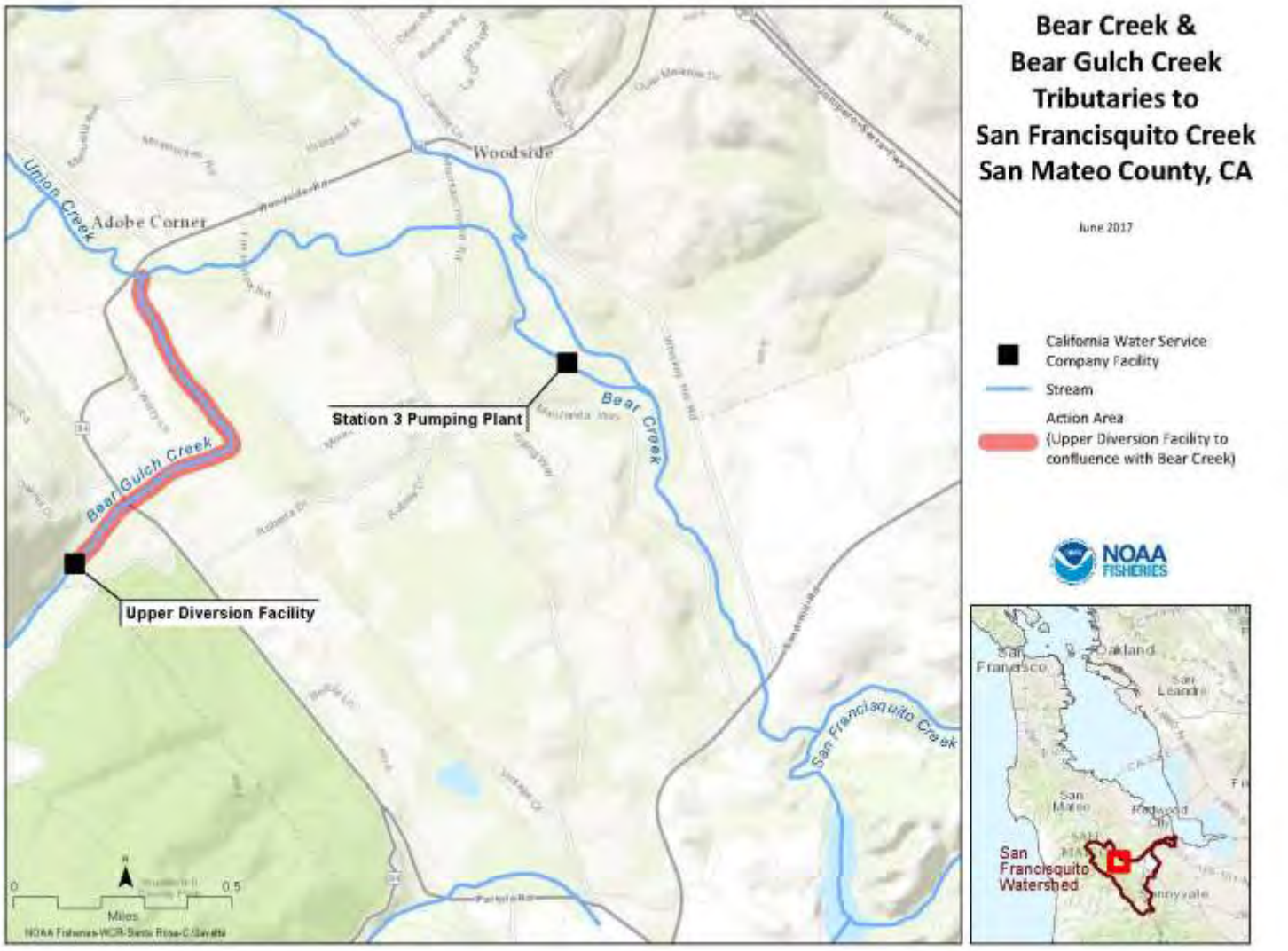
The "environmental baseline" includes the past and present impacts of all Federal, state, or private actions and other human activities in the action area, the anticipated impacts of all proposed Federal projects in the action area that have already undergone formal or early section 7 consultation, and the impact of state or private actions which are contemporaneous with the consultation in process (50 CFR 402.02).

Bear Gulch is located in a Mediterranean climatic region, with over 90 percent of annual precipitation occurring between November and April. 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. Bear Gulch in the action area is an alluvial, low gradient stream flowing through a rural-residential landscape. Large acreage private estates backup against the stream course on both sides. Relatively large flows occur in Bear Gulch during the winter and spring months; however, during dry season, portions of the creek flow may

[2] The stream below the confluence of Bear Gulch and West Union Creek is referred to as Bear Creek.

go subsurface for extended reaches (Waller 2005). The channel in the action area conveys a high sediment load ranging from silts and sands to large cobbles.

**Figure 1. Map showing the Project's action area (highlighted) which extends from the Upper Diversion Facility downstream to the confluence with West Union Creek.**




2.4.1 Status of Steelhead and Critical Habitat in the Action Area

In the late 19th and early 20th centuries, San Francisquito Creek and its tributaries, including Bear Gulch, were home to a steelhead sport fishing industry (San Francisquito Coordinated Resource and Management Plan 2001). Stanford University's Conservation Biology Center has conducted fisheries sampling throughout the watershed during the past 20 years and confirmed the presence of steelhead and their distribution throughout the watershed (Smith and Hardin 2001).

Few fish surveys have been performed in the action area of this Project, but do confirm the continued presence of CCC steelhead in Bear Gulch. An adult steelhead was observed in Bear Gulch in 1999 (Leidy *et al.* 2005). Smith and Harden (2001) observed juvenile steelhead in Bear Gulch during the summer of 2000, and reported that most of the fish observed were thought to be young-of-the-year. Smith and Hardin (2001) also reported that surface flow in 2000 was intermittent between the confluence with West Union Creek and Cal Water's Upper Diversion Dam.

During the winter of 2005, spawning surveys were conducted by CH2M Hill in Bear Gulch downstream of the Upper Diversion Dam. A total of six surveys did not confirm the presence of adult steelhead or identify spawning. However, high turbidity limited visibility during some surveys and there was a possible sighting of an adult steelhead on February 22, 2005 (Hamaker 2005a).

Bear Gulch at the Upper Diversion Dam and the channel downstream to the confluence with West Union Creek is located in second growth redwood forest. The riparian corridor is dominated by coast redwood (*Sequoia sempervirens*), coast live oak (*Quercus agrifolia*), and California bay laurel (*Umbellularia californica*). Instream habitat conditions for steelhead are good to excellent. Bear Gulch provides moderate to high quality spawning and rearing habitat; although habitat quality is diminished by a low amount of large woody debris and low/dry flow conditions during the summer and fall. Small and medium size pools provide high quality habitat for juvenile steelhead. Riffle and runs generally comprise streambed materials that are of sufficient size for quality spawning and rearing. Instream cover is provided by small boulders, large cobbles, undercut banks, woody debris, and riparian vegetation. The creek is well shaded by an overstory of second growth redwoods and bay trees. Water temperatures in Bear Gulch appear to remain suitable (<20° C) for steelhead juvenile rearing during the summer and fall months.

Overwinter habitat conditions may be limited by the presence of few secondary channels and backwater areas, but other features such as small boulders and undercut banks provide refugia from high velocity flow events. Based on current channel conditions, designated critical habitat within the action area is slightly degraded from properly functioning condition due to low flow conditions created by water withdrawals and bank stabilization.

### 2.4.2 Factors Affecting the Species Environment in the Action Area

Aquatic habitat in Bear Gulch has been moderately affected by human activities. The redwood trees in the watershed were logged during the 1800s, and second growth redwood now dominates these formerly logged areas. Portions of the creek bank adjacent to the action area have low density privately-owned residential estates. These private residences are generally located on large lots (usually 2+ acres) and are typically set back from the creek bank 100 to 200 feet. However, patios, landscaping, equestrian facilities, fences, and other structures may be found in closer proximately to the creek bank.

Water withdrawal from Bear Gulch at the Upper Diversion Dam have adversely affected aquatic habitat conditions in the action area. The Upper Diversion Dam was constructed during the late

1800s and it is designed to capture all runoff in Bear Gulch under low and moderate stream flow conditions. Cal Water currently operates the Upper Diversion Dam year-round to capture all inflow to the site up to 12.4 cfs. By removing all stream flow up to 12.4 cfs, water diversions on Bear Gulch dry the downstream channel for a distance of approximately one mile except during storm events and extended wet periods. Between storm events and under dry conditions, the only water in the one mile reach of Bear Gulch downstream of the Upper Diversion Dam is sub-surface stream flow which occasionally appears at the surface as isolated pools. The channel does not fully re-water until it reaches the confluence with West Union Creek, approximately one mile downstream of the Upper Diversion Dam. The Upper Diversion Dam also completely blocks the upstream passage of adult steelhead (Smith and Harden 2001). Due to this dam, adult steelhead have not had access to approximately 2 miles of historic spawning and rearing habitat in Bear Gulch above the Upper Diversion for more than 100 years.

Smith and Harden (2001) investigated conditions for fish passage throughout the Bear Creek watershed by hiking each waterway and inventorying each potential barrier. Sixteen barriers were identified in Bear Creek and Bear Gulch (Smith and Harden 2001). Cal Water's Upper Diversion Dam was identified as a barrier which prevents upstream access under any conditions.

Approximately 0.25 mile downstream of the Upper Diversion Dam, Smith and Harden (2001) identified the bridge apron and concrete lined channel at the Highway 84/La Honda Road crossing of Bear Gulch as a moderately severe barrier. An inclined drop from the pool downstream of the bridge's concrete apron requires fish to jump into the culvert and the concrete culvert under the roadway presents depth and velocity problems for upstream passage (Smith and Harden 2001). The California Department of Transportation (Caltrans) has identified the passage barrier at this road crossing as a high priority and efforts were initiated in 2016 to develop a design to remedy this location.

Residential development in the watershed has resulted in non-point source pollutant contamination, removal of riparian vegetation, and removal of large woody debris from the Bear Gulch channel. Bank erosion is evident in some areas and private landowners have placed rip-rap, concrete walls, and other materials along the stream bank to curb erosion. Placement of these materials has confined the stream in some areas, and diminished natural geomorphic processes and associated biological functions. Increased impervious surfaces associated with roadways and private residences in the watershed have likely decreased rainfall infiltration rates in upland habitats, increased peak flood flows, and decreased summer flows in creeks. Field observations by NMFS staff suggest some areas have been subject to channel incision during the past 20-30 years.

The long-term effects of climate change have been presented under the Rangewide Status of the Species and Critical Habitat section of this biological opinion (Section 2.2.2). These include changes in streamflow regimes, water temperatures, and rainfall patterns. Climate change poses a threat to CCC steelhead within the action area. The current climate in the action area is generally warm, and modeled regional average air temperatures show an increase in summer (Lindley *et al.* 2007) and greater heat waves (Hayhoe *et al*. 2004). The likely change in amount of rainfall in Northern and Central Coastal streams under various warming scenarios is less certain, total rainfall across the state is expected to decline. For the California North Coast, some

models show large increases (75 to 200 percent) in precipitation while other models show decreases of 15 to 30 percent (Hayhoe *et al*. 2004).

Steelhead rearing and migratory habitat are most at risk to climate change. Increasing water temperatures, and changes in the amount and timing of precipitation will impact water quality, streamflow levels, and steelhead migration. Low and warm summer flow conditions will negatively affect juvenile steelhead growth and survival. The upstream migration of adult steelhead will be impeded by low stream conditions during winter months, as well as, excessively high streamflows during large winter precipitation events. Smolt outmigration may be constrained by fewer or lower spring high flow events.

### 2.4.3 Previous Section 7 Consultations Affecting the Action Area

Pursuant to section 7 of the ESA, the NMFS has completed one previous consultation in the action area. The consultation was in regards to Cal Water's Station 3 Pumping Plant on Bear Creek approximately 2.2 miles downstream of the Bear Gulch Upper Diversion Facility. The Corps initiated consultation with NMFS in June 2006 to address the proposed construction of a fish screen at the Station 3 water diversion. During that consultation, NMFS, the Corps, CDFW, and Cal Water assessed Cal Water's operation of both the Station 3 Pumping Plant and the Upper Diversion Facility on CCC steelhead in Bear Creek and Bear Gulch, respectively. In collaboration with the agencies, Cal Water developed an operations plan with minimum bypass flows for both points of diversion (*i.e.*, Station 3 Pumping Plant and Upper Diversion Facility).

In 2006, the diversion capacity of Cal Water's Upper Diversion Facility on Bear Gulch (*i.e.*, 12.4 cfs) was considerably greater than 4.7 cfs pumping capacity of Station 3. However, the Station 3 Pumping Plant is located downstream on Bear Creek where streamflows are typically 2 to 3 times the volume of flow in Bear Gulch. The higher rate of streamflow at Station 3 is attributed to contributions from West Union Creek which enter the channel at a location approximately one mile downstream on the Upper Diversion Facility and 1.2 miles upstream of Station 3. Therefore, an operations plan was developed to provide for greater bypass flow rates at the Upper Diversion Facility and allow Cal Water to recover some of this bypass flow at the downstream Station 3 Pumping Plant. To capture a portion of the flow bypassed at the Upper Diversion Dam, there was agreement that the Station 3 Pumping Plant should be enlarged to a diversion capacity of 9 cfs. By this means, Cal Water is able minimize loss of water supply and a larger portion of Cal Water's water entitlement is diverted at a downstream location in the watershed where impacts to steelhead and critical habitat are lower.

NMFS issued a biological opinion to the Corps regarding construction of the Station 3 fish screen on September 28, 2007, and the new fish screen was constructed to accommodate a diversion rate of 9 cfs. The project benefited CCC steelhead by installing a fish screen on a previously unscreened water intake. In addition, Cal Water in 2007 adopted significantly higher bypass flows downstream of Station 3 to support steelhead and other aquatic life in Bear Creek. Cal Water's Upper Diversion Facility on Bear Gulch was considered an interrelated and interdependent activity in the NMFS September 28, 2007 biological opinion.

Habitat restoration actions within streams occupied by the CCC steelhead DPS could occur in the

action area and be covered under existing programmatic Section 7 consultations. These programmatic consultations include the NOAA Restoration Center's (RC) 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 Bear Gulch watershed. 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 May 2017, no research activities have occurred in Bear Gulch.

## 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.

### 2.5.1 Fish Relocation Activities

Fish collection and relocation will be performed in coordination with dewatering at the Upper Diversion construction site. The dewatered area upstream of the existing dam may extend up to 100 feet and downstream an additional 100 feet. The channel width within this 200-foot long reach of Bear Gulch is approximately 20 feet wide. Cal Water 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 in the immediate project area will be captured 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.

Steelhead relocation activities will occur during the summer low-flow period after emigrating smolts and kelts (post-spawned adults) have left the creek. Construction would also occur outside the adult migration and spawning season. Therefore, NMFS expects the CCC steelhead that will be captured at the Upper Diversion Facility construction site during relocation activities 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. Juvenile steelhead and other fish species have been observed in Bear Gulch, but their numbers have not been established at the Project site. However, based on typical densities of fish reported in area streams, it is unlikely greater than 200 steelhead will be captured and relocated.

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 and NMFS-approved fisheries biologists, direct effects to and mortality of juvenile steelhead during capture will be minimized.

Although sites selected for relocating fish should have similar water temperature as the capture sites and are expected to have adequate habitat available, 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 in Bear Gulch 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 relocated. Data on fish relocation efforts 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 3 percent of steelhead would be will be injured or killed during fish capture, and relocation activities.

### 2.5.2 Dewatering

The Project proposes to isolate the work area with cofferdams and bypass streamflow around the construction by gravity feed around the work area. Bypass piping will be installed to divert streamflow around the project site. The slope of the channel will allow the bypass to be gravity-fed. Submersible pumps with fish screens may be used to collect cofferdam leakage and below grade excavation nuisance water which will be diverted into the existing 20-inch transmission line, where it will flow to the off-channel Bear Gulch Reservoir. Dewatering of the channel would affect up to 200 linear feet of Bear Gulch which is designated as critical habitat for CCC steelhead. NMFS anticipates only minor temporary changes to instream flow outside of the dewatered construction area within the action area during the dewatering process prior to construction. These fluctuations in flow are anticipated to be small, gradual, and short-term. Once the cofferdams and pipeline bypass are installed and operational, stream flow above and below the work site should be the same as the pre-project conditions except within the dewatered work areas where stream flow is bypassed. The dewatering of up to 200 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 by being 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 action area 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 Bear Gulch beyond typical summer low-flow conditions. Steelhead experience intermittent conditions in many streams of the CCC DPS during summer, and the limited duration of this project's water diversion is unlikely to adversely affect individual steelhead rearing upstream or downstream of the dewatered reach.

Benthic (*i.e.*, bottom dwelling) aquatic macroinvertebrates (a salmonid prey item) within the construction site may be killed or their abundance reduced when creek habitat is dewatered (Cushman 1985). However, effects to aquatic macroinvertebrates resulting from stream flow diversions and dewatering will be temporary because construction activities would be relatively short-lived and the dewatered reach is relatively small. 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 would adversely affect CCC steelhead during and after project implementation. Because of the rapid recolonization by macroinvertebrates of the dewatered sections, NMFS does not expect the dewatering will have any lasting effects on critical habitat; thus, does not anticipate that critical habitat will be adversely affected by the temporary dewatering.

As described above, NMFS expects injury and mortality of juvenile steelhead associated with fish relocation to be less than three percent of the total number of steelhead captured, and mortality associated with dewatering activities to be less than one percent of the number of steelhead present within the action area prior to dewatering. Dewatering of 200 linear feet of channel in Bear Gulch during construction is expected to result in minor flow fluctuations, short-term loss of macroinvertebrates within the construction area, and temporary impairment of summer fish passage due to placement of the cofferdams and bypass system.

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

Although the construction site will be dewatered during construction, proposed activities at the Upper Diversion Facility would result in the disturbance of the creek bed and banks for equipment access, channel excavation, construction of the new facilities, and for the placement/removal of the cofferdams. Disturbed soils may become mobilized when fall and winter storms increase stream flow levels post construction. NMFS anticipates these activities would affect water quality and critical habitat in the action area in the form of small, short-term increases in turbidity during re-watering and subsequent higher flow events during the first winter storms post-construction. Instream and near-stream construction activities have been shown to result in temporary increases in turbidity (reviewed in Furniss *et al.* 1991, Reeves *et al.* 1991, Spence *et al.* 1996).

Increases in sediment may affect fish in a variety of ways. High concentrations of suspended sediment can disrupt normal feeding behavior and efficiency (Cordon 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 critical habitat as described above, sedimentation and turbidity levels associated with this project during cofferdam construction and removal, and the subsequent rewetting of the construction site 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 several soil and channel stabilization measures to prevent the mobilization of sediment. Due to the Project's comprehensive SWPPP and implementation of BMPs throughout the construction phase, NMFS anticipates any resulting elevated turbidity levels would be small and only occur for a short time, 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) or to salmonid prey species. NMFS expects any sediment or turbidity generated by the project would not extend more than 100 feet downstream of the work site based on the site conditions (low flows) and methods used to control sediment and turbidity (isolation of the work space from stream flows, implementation of BMPs throughout construction, *e.g.,* silt fences, straw wattles, grass seeding, *etc*.). 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 this project. Because of the comprehensive SWPPP and BMPs developed for the project, and the temporary nature of any elevated turbidity levels, NMFS also does not expect adverse effects will occur to critical habitat from increased sedimentation and turbidity generated by project activities.

When construction of the project is completed, re-watering of the work area could allow the waters of Bear Gulch to come into direct contact with wet or curing concrete. Concrete which has not completely dried may contaminate the waters of the creek by altering the pH. Wet or curing concrete can emit an alkali that is harmful to aquatic life. If concrete used during construction is not adequately cured and dried, the discharge to surface waters can elevate the pH of the creek and possibly result in aquatic life/fish kills. To address this issue, Cal Water proposes to allow concrete to fully dry and cure prior to re-watering the site. This is expected to prevent the waters of Bear Gulch from coming in direct contact with wet concrete. Alkali should not be released into the stream and pH in the creek should not be affected when the site is re-watered.

### 2.5.4 Upper Diversion Facility Operations

Cal Water currently operates the Bear Gulch Upper Diversion Facility without providing minimum bypass flows to support aquatic life downstream. The facility operates year-round and has a maximum diversion capacity of 12.4 cfs. In its current configuration, the Upper Diversion Dam effectively diverts all streamflow in Bear Gulch until the 12.4 cfs capacity of the water intake is exceeded. The facility also creates a full barrier to the upstream passage of adult steelhead (Smith and Harden 2001). The proposed Project will benefit CCC steelhead and their designated critical habitat by installing a fish ladder to provide for upstream and downstream passage at the dam, installing screens that will prevent the entrainment of fish into the water intake, and the facility will be operated to provide minimum bypass flows below the dam to support steelhead and other aquatic species in Bear Gulch. The new Upper Diversion Facility is also designed in a manner that will significantly improve sediment transport at the site by eliminating the use of stoplogs at the crest of the dam. The Obermeyer gates are designed to provide a safer and more effective means to pass sediment to the downstream channel which will minimize or avoid the need for in-channel use of heavy equipment to manage sediment accumulations. The anticipated effects of operations at the Upper Diversion Facility on CCC steelhead and their designated critical habitat are provided in detail below.

#### 2.5.4.1 Operation of New Fish Ladder

The operation of the new serpentine style fish ladder at the Upper Diversion will be beneficial to steelhead and critical habitat in Bear Gulch. Upon completion of the new fish ladder, access to approximately 2 miles of historical spawning and rearing in Bear Gulch will be restored. Upstream and downstream fish passage over the diversion dam will be provided through a serpentine style pool and weir fishway. The fishway weirs are located along a center wall and oriented parallel to the overall slope of the fishway. Unlike typical pool and weir fishways, the fishway at the Upper Diversion Dam will include two pools across the width of the fishway which will allow for the fishway to be steeper and therefore shorter than standard pool and weir fishways.

The proposed serpentine fishway has one foot drops between weirs which meet NMFS passage criteria for adult steelhead and CDFW criteria for adult resident rainbow trout. The fishway's weirs and stoplogs are positioned at the downstream end of each pool to help guide the main flow-jet around the outside corners of the pool and towards the next downstream weir. The pools below each weir are 8 feet long by 3 feet wide. They are sized to provide adequate pool volume to dissipate energy generated from the water plunging over the weir without becoming excessively turbulent at all fish passage flows.

The fishway is designed to meet fish passage criteria for steelhead when streamflows through the ladder range from 2.4 to 25.1 cfs. Adult resident trout criteria will be achieved when flows through the ladder range from 2.0 to 7.6 cfs. The design flows were developed by constructing a regional flow duration curve based on daily mean flows. The high fish passage design flow for adult steelhead (25.1 cfs) is based on the NMFS and CDFW one percent annual exceedance flow criterion. The high passage design flow for rainbow trout (7.6 cfs) is based on the five percent annual exceedance flow.

Restoration of fish passage at the Upper Diversion Dam is identified as a high priority action for CCC steelhead in the Coastal Multispecies Recovery Plan (NMFS 2016). Based on surveys of Bear Gulch above the facility, up to 2 miles of high quality historically-accessible habitat will become available to CCC steelhead. It is anticipated that, post-construction, adult steelhead returning to the watershed in the winter and spring months will navigate the fishway to access this habitat. Suitable substrate, cool perennial streamflow, abundant instream cover, and the relatively undisturbed condition of the redwood forest in Bear Gulch above the Upper Diversion Dam are expected to provide good to excellent conditions for spawning, egg/larval incubation, and juvenile rearing. This expanded area of high quality rearing and spawning habitat will increase the viability of the CCC steelhead population in the San Francisquito watershed by improving spatial structure and abundance. By expanding the amount of habitat accessible to CCC steelhead, the Project will provide long-term benefits by contributing to actions that increase population resilience and persistence over time.

2.5.4.2 Operation of New Fish Screens

The installation and operation of fish screens on Cal Water's intake will also be beneficial for CCC steelhead. The screen will prevent the entrainment and impingement of steelhead as water from Bear Gulch is diverted into the transmission pipeline that leads to an off-channel reservoir. The fish screen is designed to provide a maximum approach velocity of 0.33 cfs which will allow the smallest life stages of steelhead to freely swim away from the face of the screen (*i.e.* avoid impingement). The screen will have openings no larger than 1.75 mm which will prevent the entrainment of all life stages of steelhead into the diversion system.

The proposed screen array will be comprised of two cone screen assemblies approximately 5.5 feet in diameter and 1.5 feet tall. The new screens will be position within the screenbay at the upstream end of the fishway where good sweeping velocities through the screen box will keep debris moving downstream. A rotary brush cleaning system will be integrated into the cone screens. A brush advances around the cone surface at regular intervals that can be adjusted as flow conditions change. This system will remove debris caught on the surface of the screens and re-entrain it into sweeping flow where it will move downstream. In addition to the brush cleaning system, a 10-foot long trashrack will be constructed across the inlet of the screenbay. The trashrack will consist of vertical steel bars spaced to provide an opening of 8.5 inches wide.

When completed and operational, the new fish screen array is expected to effectively prevent the entrainment of steelhead into the water diversion system. The design approach velocity of 0.33 feet per second will allow steelhead fry and juveniles to safely swim away from the screen face without impingement. Steelhead rearing in the vicinity of the Upper Diversion Facility will not be endanger of being lost with diverted water. Steelhead smolts are expected to safely pass downstream through the screenbay and down the fishway as they emigrate towards San Francisco Bay. Sweeping flows are expected to adequately provide for fish to continue to move past the facility and, in combination with the screens' cleaning system, prevent the accumulation of debris on the screens.

2.5.4.3 Minimum Bypass Flows

Upon completion of new Bear Gulch Upper Diversion Facility, Cal Water proposes to operate the water diversion in the following manner between December 15 and May 31:

- 1.0 cfs of stream flow will be allowed to pass downstream in Bear Gulch at all times when the flow in Bear Gulch immediately upstream of the Diversion Dam is less than 2.4 cfs. If flows immediately upstream of the Diversion Dam are less than 1 cfs, the full amount of Bear Gulch flow will be allowed to pass downstream.
- 2.4 cfs of streamflow will be allowed to pass downstream in Bear Gulch at all times when the flow in Bear Gulch immediately upstream of the Diversion Dam is equal to or greater than 2.4 cfs and less than 7.6 cfs.
- 7.6 cfs of streamflow will be allowed to pass downstream in Bear Gulch at all times when the flow in Bear Gulch immediately upstream of the Diversion Dam is equal to or greater than 7.6 cfs.
- The maximum instantaneous diversion rate at the Upper Diversion Dam may not exceed 12.4 cfs at any time.

During the period between June 1 and December 14, Cal Water proposes to operate the water diversion in a manner that always provides a bypass flow of 0.5 cfs or greater. If flows immediately upstream of the diversion dam are less than 0.5 cfs, the full amount of Bear Gulch flow will be allowed to pass downstream.

The existing water intake at the Upper Diversion Dam has been operated for many decades without minimum bypass flows to protect steelhead and other aquatic life downstream. The operation of this facility without bypass requirements has adversely affected aquatic habitat conditions, including CCC steelhead critical habitat, in Bear Gulch by reducing streamflows for steelhead migration, spawning and rearing. Until the off-channel reservoir operated by Cal Water filled each winter, the Upper Diversion water intake captured all of the winter and spring base flow and reduced hydrologic peaks during storm events.

Operation of the Upper Diversion Facility has always relied on winter and spring rainfall events for water supply, and this period coincides with the adult immigration, spawning, and smolt emigration of CCC steelhead in the watershed. Fish migrating upstream must have streamflows that provide suitable water velocity and depths for successful upstream passage (Bjornn and Reiser 1991). In addition, it is important to preserve streamflows that provide adequate depths and velocities supporting suitable and preferred habitats for temporarily resting and more stationary fishes, as well as spawning. The artificial reduction of stream flows in the past has adversely affect steelhead by limiting opportunities for instream migrations and by reducing the quantity and quality of available habitat for steelhead.

In the San Francisquito watershed, over 90 percent of annual precipitation occurs between November and April. Mean annual precipitation in the Bear Gulch watershed is estimated to be 36 inches (Love & Associates and GHD 2016). The USGS stream gage on San Francisquito Creek at the Stanford Golf Course provides the best long-term record of streamflow in the watershed with flow records extending from 1931 to 1941 and then from 1951 to present.

Warm, dry summers typically create low flow or dry conditions in Bear Gulch, while the mild, wet winters result in flows ranging from moderate levels to flood events. Based on a hydrologic investigation completed for Cal Water (Iceman 2005), the mean monthly flow in the vicinity of the Upper Diversion Facility is estimated to be 6.5 cfs in February and 4.1 cfs in March. During the summer and fall months flows are typically very low in the vicinity of the Upper Diversion; the mean monthly flow is estimated to be 0.47 cfs in June and 0.15 cfs in September (Iceman 2005). The peak discharge for a 2-year return period was calculated to be 143 cfs (Love & Associates and GHD 2016).

Cal Water's minimum bypass flow requirements for the Upper Diversion are designed to work within the confines of Cal Water's water rights and ensure the withdrawal of water from the creek does not substantially impair downstream flow conditions for steelhead when the diversion is operating. Cal Water's water rights on Bear Gulch allow for year-round water diversion. Under Cal Water's proposed operations plan for the Upper Diversion Facility, water may only be diverted when streamflow levels exceed the minimum bypass requirement. The streamflow may naturally fall below the minimum bypass flow, but during these periods water diversions must cease. In this manner, the minimum bypass flow requirements prevent water diversions during periods when streamflows are at or below the flows needed for steelhead spawning, rearing, and passage.

To establish minimum bypass flows in Bear Gulch, assessments of flow needs for steelhead were performed by CH2M Hill (Hamaker 2005b) in collaboration with NMFS biologists. A fish passage assessment was performed with a modification of Thompson's (1972) method to determine passage flows for adult and juvenile steelhead. Through field surveys, stream gaging, and measurements at critical riffle locations, Cal Water's consultant, CH2M Hill, estimated the amount of bypass flow required for adult and juvenile steelhead passage (Hamaker 2005b). Hamaker (2005b) reports that bypass flows of 2.4 and 10.2 cfs are required for the successful passage of steelhead juveniles and adults, respectively, in Bear Gulch. For this assessment, Hamaker (2005b) used a minimum passage depth criterion of 0.5 feet for adult and 0.2 feet for juvenile steelhead. In addition, the flow needed to provide this depth must occur across 25 percent of the total riffle width and a minimum of 10 percent of the riffle width at the minimum passage depth must be contiguous (Hamaker 2005b).

Information provided by Hamaker (2005b), field assessments performed by NMFS and CDFW, and hydrology investigations conducted in the Bear Creek watershed (Iceman 2005) were used to evaluate Cal Water's proposed operations and minimum bypass flows on steelhead and critical habitat in Bear Gulch. This evaluation specifically assessed the stream discharge and the associated proposed diversion rate at which: 1) opportunities for juvenile and adult migrations are not diminished; 2) temporarily resting or stationary fishes are not exposed to increased risk of injury or mortality; 3) sufficient flows are provided for spawning and egg incubation; and 4) sufficient flows are provided for juvenile rearing during the summer and fall months.

*Winter and Spring Operations.*

Cal Water's proposed minimum bypass flows consist of a three-stage diversion plan during the period between December 15 and May 31. This period encompasses virtually all of the steelhead

adult upstream migration, spawning, incubation, and smolt outmigration seasons. For adult migration, a bypass flow of 7.6 cfs would be maintained downstream of dam whenever inflow to the project exceeds 7.6 cfs. When natural inflow drops below 7.6 cfs, a minimum bypass flow of 2.4 cfs provides for the passage of juvenile steelhead including outmigrating smolts if natural inflow is greater than 2.4 cfs. If natural inflow drops below 2.4 cfs, a minimum bypass of 1.0 cfs will be provided for spawning, incubation, and rearing during the period between December 15 and May 31.

During the winter and spring, Cal Water's operations plan is expected to be protective of the various freshwater life stages of CCC steelhead in Bear Gulch. The minimum bypass flow of 1.0 cfs will be provided during periods of low winter/spring base flows to protect habitats of non-migratory life stages (*e.g.*, juvenile steelhead and egg incubation) and other species. Migratory adult steelhead temporarily holding in pools downstream from the dam will be provided adequate conditions for staging prior to spawning. When natural inflow moderately increases to levels above 2.4 cfs, but less than 7.6 cfs, a minimum bypass flow of 2.4 cfs will provide for the outmigration of steelhead smolts and extend the amount of habitat for non-migratory life stages of steelhead including spawning and incubation. Adult upstream passage will be impaired under these flow conditions. However, when rainfall events increase flow levels, the bypass requirements are designed to ramp up to the next higher level and provide opportunities for upstream passage.

During inflows of 7.6 cfs or greater, a minimum bypass flow of 7.6 cfs will be maintained. This amount is slightly lower than the 10.2 cfs estimated by Hamaker (2005b) to provide adequate depths and velocities for adult upstream passage, but it is expected to allow for a marginal or better level of adult steelhead upstream movement in Bear Gulch. This finding is based on the knowledge that Hamaker's results are based on the "shallowest and potentially the most troublesome" critical riffle in the action area (Hamaker 2005b), and that critical riffles are dynamic features that frequently change during high flow events. In addition, Mosley (1982) examined depth-velocity relations in over 30 riffles for purposes of evaluating critical depths for passage of adult salmonids and he concluded that anadromous salmonids can move upstream in very shallow water for distances of some meters; however, he notes that these fish may suffer abrasion and loss of condition as a result. For these reasons and based on field work performed by CH2M Hill in collaboration with NMFS and CDFW, this three-stage approach for minimum bypass flows at the Upper Diversion, when added to the poor environmental baseline flow conditions, is anticipated to provide additional opportunity for migration, spawning, egg incubation, and juvenile rearing in Bear Gulch. However, migration, spawning, egg incubation, and juvenile rearing will remain limited during periods when flow is diverted by the Project.

Although Cal Water's minimum bypass requirements provide adequate conditions for steelhead rearing, spawning and passage, CCC steelhead are expected to be harmed under some flow regimes through the reduction of streamflow levels by water diversions from Bear Gulch. Additional streamflow above the minimum bypass rates increases water depths over critical riffles, improves cover through greater pool depths and surface turbulence, and creates higher water velocities through stream gravels. Steelhead and critical habitat benefit from these higher flow conditions in a variety of ways including easier upstream and downstream migration, additional areas of instream cover for predator avoidance, and improved water circulation in

redds for incubating eggs and larvae.

Reductions in streamflow during operation of the Upper Diversion Facility will decreases water depths over riffles and adversely affect critical habitat. Shallow riffles (*i.e.*, critical riffles) can be particularly sensitive to changes in streamflow through diminished water depth (Woodard 2012). Reduced water depths make adult steelhead migration over these riffles incrementally more challenging and may increase migration time. Downstream migrating smolts also benefit from greater water depths over riffles and increased water velocities at higher streamflow rates assist in reducing travel times during their downstream migration. Higher streamflow levels benefit adult and juvenile steelhead by providing additional areas of instream cover for holding and predator avoidance. Deeper pools provide cover for steelhead and higher water velocities typically increase the amount of surface turbulence. Steelhead redds within the creekbed require adequate water flow to bring oxygen to the eggs and larvae, and remove metabolic wastes. Higher streamflow rates typically improve water circulation in the streambed and will benefit incubating eggs and larvae in redds. In the above manner, this diminishment of Bear Gulch streamflow by operation of Cal Water's Upper Diversion Facility is expected to result in adverse effects by reducing the quantity and quality of habitat for steelhead. When streamflow levels exceed 20-25 cfs in Bear Gulch, NMFS estimates that adequate habitat space and suitable migration conditions are generally present downstream of the Upper Diversion Facility and impacts attributable to operation of the Upper Diversion rapidly diminish.

*Summer and Fall Operations.*

During the period between June 1 and December 14, the Upper Diversion Dam will be operated to maintain a bypass of 0.5 cfs of streamflow in Bear Gulch downstream of the water intake. If flows immediately upstream of the Diversion Dam are less than 0.5 cfs, the full amount of Bear Gulch flow will be allowed to pass downstream.

As presented above the monthly mean flow of Bear Gulch during the dry season (June through September) typically ranges from 0.47 to 0.15 cfs (Iceman 2005). Under existing conditions, the entire flow of Bear Gulch may be diverted at the Upper Diversion during this period and streamflow for summer/fall rearing juvenile steelhead is limited to isolated pools and flow provided by groundwater accretion. Pursuant to Cal Water's operations plan, if the flow in Bear Gulch is 0.5 cfs or less, the full amount of streamflow will be bypassed downstream. When added to the environmental baseline, Cal Water's proposed operations during the dry season will increase rearing habitat to levels similar to unimpaired hydrologic conditions.

Precipitation during the late fall months typically results in minor and short duration increases in streamflow in Bear Gulch. Cal Water is anticipated to divert water from Bear Gulch for a few hours or days during these late fall storm events. Since adult steelhead typically begin their migration from the ocean to their natal spawning streams during late December and January, steelhead adults are unlikely to arrive in the upper San Francisquito watershed and action area prior to December 15.

### 2.5.5 Effects on Critical Habitat

The action area is designated as critical habitat for CCC steelhead and Project implementation is anticipated to impact designated critical habitat. Construction activities are expected to temporarily alter water quality for CCC steelhead designated critical habitat. Post-construction, water diverted from Bear Gulch by Cal Water is anticipated to adversely affect migration, spawning, and rearing habitats of CCC steelhead downstream of the Upper Diversion Facility due to reductions in the amount of streamflow.

#### 2.5.5.1 Upper Diversion Facility Operations

Post-construction, Cal Water proposes to divert up to 12.4 cfs at the Upper Diversion and provide minimum bypass flows as described in section 1.3.1.11 of this opinion. The effects of operating the new fishway, fish screens and minimum bypass flows are described in section 2.5.4 of this opinion. The new fishway will benefit CCC steelhead by restoring access to approximately 2 miles of high quality spawning and rearing habitat above the Upper Diversion Dam. The proposed fish screen is anticipated to effectively prevent the entrainment and impingement of all life stages of CCC steelhead.

Cal Water has proposed a three-stage approach for minimum bypass flows during the winter/spring period. While the proposed minimum bypass flows are a significant improvement over current conditions, the Project is expected to adversely affect PBFs of migration, spawning, egg incubation, and juvenile rearing because the amount and quality of these habitats for steelhead is reduced when the Upper Diversion Facility is withdrawing water from Bear Gulch. During the dry season, juvenile steelhead rearing in Bear Gulch will be improved over current conditions, because water withdrawals at the Upper Diversion will be low or non-existent.

#### 2.5.5.2 Maximum Rate of Diversion and Channel Morphology

Salmonid habitat quality is influenced by high stream flow events that move water, sediment, and wood through stream channels (Montgomery 2004). Steelhead and salmon rely on streams to provide clean gravels, instream cover, sheltered pools, and channel/habitat diversity. In general, these important habitat attributes are maintained by fluvial processes including high stream flow events. A high rate of water withdrawal can cause a reduction in peak flows. Peak flow events (sometimes called "flushing flows") scour and revitalize gravel beds, import wood and organic matter from the floodplain, and support a healthy, vibrant riparian community.

Rosgen and Silvey (1996) describe bankfull flows as those discharge events which channel maintenance occurs. Channel maintenance (*e.g.*, removing fine sediment, forming and reforming bars, and meandering) includes flow events that sustain natural geomorphic processes. Bankfull flows in Bear Gulch likely provide the necessary discharge rate for periodic channel maintenance functions. The estimated peak discharge for a 2-year return period in Bear Gulch is 143 cfs (Love & Associates and GHD 2016).

This information suggests that the proposed withdrawal of up to 12.4 cfs at Upper Diversion will have little influence the high flow events that sustain geomorphic processes in Bear Gulch.

Therefore, it is expected that the magnitude and frequency of high flow events will continue to be sufficient for channel forming processes in Bear Gulch. The proposed withdrawal of up to 12.4 cfs is anticipated to have little to no effect on stream channel maintenance and geomorphic processes downstream of the Upper Diversion.

## 2.6 Cumulative Effects

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

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

## 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 biological opinion as to whether the proposed action is likely to: (1) reduce appreciably the likelihood of both the survival and recovery of a listed species in the wild by reducing its numbers, reproduction, or distribution; or (2) appreciably 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 construct a new facility at Cal Water's Upper Diversion which includes a fishway and fish screen. Once completed, Cal Water proposes to provide minimum bypass flows to protect steelhead and other aquatic species in Bear Gulch downstream of the water diversion.

As described in the Effects of the Action section above (Section 2.5), NMFS identified dewatering and fish relocation as an adverse effect on CCC steelhead. Up to 200 linear feet of Bear Gulch may be dewatered for construction activities. Prior to dewatering the site, fish would be collected and relocated from the work area. The Project is scheduled to be completed during the dry season and, therefore, it is anticipated that only juvenile steelhead will be present (< 200 juvenile CCC steelhead). Due to the timing of construction, no adult or smolt life stages of

steelhead would be affected by construction activities. Fish that elude capture and remain in the construction area 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 stream flow. However, based on the low mortality rates for similar capture and relocation efforts, NMFS anticipates few juvenile steelhead would be injured or killed by fish relocation and Project construction activities. Anticipated mortality from capture and relocation is expected to less than three percent of the total number of fish relocated, and mortality expected from dewatering is expected to be less than one percent of the fish in the action area prior to dewatering. Due to the relatively large number of juveniles produced by each spawning pair, steelhead spawning in the San Francisquito Creek watershed in future years are likely to produce enough juveniles to replace the few that may be lost at the project construction site due to relocation and dewatering. It is unlikely that the small potential loss of juveniles by the Project would impact future adult returns.

The Upper Diversion Dam fishway is designed to meet fish passage criteria for steelhead when streamflows through the ladder range from 2.4 to 25.1 cfs. Upon completion, the fishway is expected to effectively pass adult steelhead above the dam at flows up to the one percent annual exceedance flow criterion. Fish passage at this location is identified as a high priority action for CCC steelhead in the Coastal Multispecies Recovery Plan (NMFS 2016) and it will provide access to 2 miles of high quality habitat above the Upper Diversion Dam. This expanded area of rearing and spawning habitat is anticipated to increase the viability of the CCC steelhead population in the San Francisquito watershed by improving spatial structure and abundance.

The installation and operation of fish screens on Cal Water's intake will also be beneficial. The screen will prevent the entrainment and impingement of steelhead as water from Bear Gulch is diverted into the transmission pipeline that leads to an off-channel reservoir. The fish screen is designed to provide a maximum approach velocity of 0.33 cfs which will allow the smallest life stages of steelhead to freely swim away from the face of the screen (*i.e.* avoid impingement).

The action area is designated as critical habitat for CCC steelhead and Project implementation is anticipated to impact designated critical habitat. Construction activities are expected to temporarily alter water quality in the form of small, short-term increases in turbidity during re-watering and subsequent higher flow events during the first winter storms. Post-construction, Cal Water proposes to divert up to 12.4 cfs at the Upper Diversion and provide minimum bypass flows as described in section 1.3.1.11 of this opinion. Although Cal Water's minimum bypass flows provide adequate conditions for steelhead rearing, spawning and passage, CCC steelhead are expected to be adversely affected under some flow regimes through the reduction of streamflow levels by water diversions from Bear Gulch. Additional streamflow above the minimum bypass rates increases water depths over critical riffles, improves cover through greater pool depths and surface turbulence, and creates higher water velocities through stream gravels. Steelhead and critical habitat benefit from these higher flow conditions in a variety of ways (e.g., riffle water depths, available habitat areas, and water circulation through redds). The diminishment of streamflow levels in Bear Gulch during operation of Cal Water's Upper Diversion Facility is expected to adversely affect critical habitat by reducing the quantity and quality of instream habitat for steelhead in the action area.

Assessment of the proposed maximum rate of diversion on channel morphology concluded the proposed withdrawal of up to 12.4 cfs at Upper Diversion will have little influence the high flow events that sustain geomorphic processes in Bear Gulch. The estimated peak discharge for a 2-year return period in Bear Gulch is 143 cfs (Love & Associates and GHD 2016) and flow events approaching this magnitude and greater are expected to continue to maintain an active channel bed and support a healthy, vibrant riparian community. Therefore, it is expected that water diversions by Cal Water at the Upper Diversion will not diminish the magnitude and frequency of high flow events that support channel forming processes in Bear Gulch.

Overall, the range and degree of variability in ambient temperature and precipitation are likely to increase due to climate change, and these predictions further highlight the importance of providing suitable streamflow conditions and instream habitat diversity/complexity in the streams of the CCC steelhead DPS. Evaluation of Cal Water's operation of the Upper Diversion Facility water intake in accordance with the Project's minimum bypass requirements suggests the effects of water withdrawal on steelhead will not be exacerbated by the effects of climate change. If lower streamflow conditions prevail in the future due to climate change, the Upper Diversion's minimum bypass requirements remain in place and prevent water diversions during periods when streamflows are at or below the flows needed for steelhead spawning, rearing, and passage. Additionally, the dry season minimum bypass requirement at the Upper Diversion is generally greater than Bear Gulch streamflows under existing conditions. Thus, little to no water withdrawals are likely to occur during the summer and fall period when the effects of climate change are likely to increase the frequency and magnitude of low streamflows and warm water temperature conditions.

## 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' biological 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 biological opinion, NMFS determined that incidental take is reasonably certain to occur in association with construction of the new Upper Diversion Facility and future operation of the water diversion. During construction, incidental take in the form of harassment, injury and/or mortality of juvenile steelhead is anticipated during fish relocation and dewatering of the construction site. During the future operation of the Upper Diversion Facility, adverse effects to adult, juvenile, smolt, and egg/larval life stages of steelhead is anticipated due to the reduction of streamflow levels in Bear Gulch from the Upper Diversion Facility to the confluence with West Union Creek.

As described in the species effects analysis, NMFS was able to quantify the take associated with dewatering of Bear Gulch for construction of the Upper Diversion Facility. NMFS estimated that up to 200 juvenile steelhead may be collected and relocated by qualified biologists during the dewatering activities. Of these, NMFS estimated that up to six individual steelhead may be injured or killed during fish collection/relocation, and an additional two juvenile steelhead may be killed if the fish collection effort was not fully successful. Therefore, NMFS will consider the extent of take exceeded during construction if: (1) more than a total of 200 juvenile steelhead are handled during fish collection and relocation activities; or (2) more than eight juvenile steelhead are documented injuries or mortalities. No take of adult steelhead is anticipated during construction of the facility.

For Cal Water's operation of the Upper Diversion Facility, NMFS was not able to estimate the specific number of adult, juvenile, or smolt steelhead that could be harmed by reduction of streamflow levels in Bear Gulch. Monitoring or measuring the number of steelhead actually impacted by Cal Water's operation of the water diversion is not feasible. Injury or death resulting from flow reductions is difficult to quantify because many steelhead are unlikely to immediately perish when faced with the loss of habitat space or quality. These fish will most likely suffer reduced growth which will reduce their ability to survive subsequent life stages. Due to the difficulty in quantifying the number of steelhead that could be affected by reduction in streamflows during water diversions, a surrogate measure of take is necessary to establish a limit to the take exempted by this incidental take statement. For this action, compliance with the Project's minimum bypass requirements is the best surrogate measure for incidental take associated with operation of the Upper Diversion Facility. Therefore, NMFS will consider the extent of take exceeded if operations do not comply with the minimum bypass requirements of the Project, which are repeated here:

During the period between December 15 and May 31, minimum bypass flows are as follows:

- 1.0 cfs of stream flow will be allowed to pass downstream in Bear Gulch at all times when the flow in Bear Gulch immediately upstream of the Diversion Dam is less than 2.4 cfs. If flows immediately upstream of the Diversion Dam are less than 1 cfs, the full amount of Bear Gulch flow will be allowed to pass downstream.

- 2.4 cfs of streamflow will be allowed to pass downstream in Bear Gulch at all times when the flow in Bear Gulch immediately upstream of the Diversion Dam is equal to or greater than 2.4 cfs and less than 7.6 cfs.
- 7.6 cfs of streamflow will be allowed to pass downstream in Bear Gulch at all times when the flow in Bear Gulch immediately upstream of the Diversion Dam is equal to or greater than 7.6 cfs.
- The maximum instantaneous diversion rate at the Upper Diversion Dam may not exceed 12.4 cfs at any time.

During the period between June 1 and December 14, minimum bypass flows are as follows:

- 0.5 cfs of streamflow will be allowed to pass downstream in Bear Gulch at all times. If flows immediately upstream of the Upper Diversion Dam are less than 0.5 cfs, the full amount of Bear Gulch flow will be allowed to pass downstream.
- The maximum instantaneous rate of diversion at the Upper Diversion Dam may not exceed 12.4 cfs at any time.

2.9.2 Effect of the Take

In the accompanying biological opinion, NMFS has determined that the anticipated take is not likely to result in jeopardy to CCC steelhead.

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 threatened steelhead resulting from fish relocation and dewatering activities are low.

2. Ensure construction methods, minimization measures, and monitoring are properly implemented during construction of the Upper Diversion Facility.

3. Monitor operation of the Upper Diversion Facility to ensure bypass flow requirements are fully met, and the facility's fish screens and fishway are functioning properly.

4. Prepare and submit a post-construction report regarding the effects of fish relocation and construction activities.

5. Prepare and submit annual reports to NMFS regarding operation of the Upper Diversion Facility and fish bypass flows.

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 reasonable and prudent measures (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.

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

   a. Cal Water shall retain qualified biologists with expertise in the areas of anadromous salmonid biology to conduct fish relocation activities associated with construction. Cal Water will ensure that all biologists working on the project are qualified to conduct fish collections in a manner which minimizes all potential risks to steelhead.

   b. The biologists shall monitor the construction site during the placement and removal of cofferdams and during dewatering of the creek channel to ensure that any adverse effects to steelhead are minimized. The biologists will be on site during all dewatering events to capture, handle, and safely relocate steelhead. Cal Water, or the biologists, will notify NMFS biologist, Andrew Trent at (707) 578-8553 or at andrew.trent@noaa.gov 48 hours prior to capture activities in order to provide an opportunity for NMFS staff to observe the activities.

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

   d. If any salmonids are found dead or injured, the biologist will contact NMFS biologist Andrew Trent by phone immediately at (707) 578-8553, or the NMFS North Central Coast Office (Santa Rosa, California) at (707) 575-6050. The purpose of the contact is to review the activities resulting in the take and to determine if additional protective measures are required. All salmonid mortalities will be retained, placed in an appropriately-sized sealable plastic bag, labeled with the date and location, fork length, and be frozen as soon as possible. Frozen samples will 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 San Francisco Bay Branch supervisor. Any such transfer will be subject to such conditions as NMFS deems appropriate.

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

   a. The Corps and Cal Water shall allow any NMFS employee(s) or any other person(s) designated by NMFS, to accompany field personnel to visit the project site during activities described in this opinion.

3. The following term and condition implements reasonable and prudent measure 3:

   a. Cal Water shall maintain flow measuring equipment at the Upper Diversion Facility as necessary such that streamflow and diversion rates are accurately recorded.

   b. The fishway and fish screen shall be maintained by Cal Water in good condition and operational year-round.

   c. Cal Water shall inspect the fishway on a weekly, or more frequent, basis during the steelhead migration season (December 15 through May 31) to ensure the ladder is clear of debris and does not contain impediments to fish passage. Based on these inspections, Cal Water will immediately remove all obstacles from the fishway to ensure fish passage is unimpeded. Cal Water shall maintain a log to record fishway inspection results. Log records shall be made available to NMFS upon request.

   d. Cal Water shall inspect the fish screens on a weekly, or more frequent, basis during operation of the water diversion to ensure the screens are clear of debris and the cleaning system is functioning properly. Based on these inspections, Cal Water will immediately remove sediment, debris, or algal growth that is impairing the functionality of the screens. Inspections must also determine if any components of the facility are loose, broken, missing, or present sharp edges. Inspections must determine if screens are firmly attached and no gaps, tears, rips, or holes are present. Cal Water shall maintain a log to record fish screen inspection results. Log records shall be made available to NMFS upon request.

4. The following term and condition implements reasonable and prudent measure 4:

   a. The Corps or Cal Water shall provide a written report to NMFS by January 15 of the year following construction of the project. The report shall be submitted to NMFS Santa Rosa Area Office, Attention: San Francisco Bay Branch Supervisor, 777 Sonoma Avenue, Room 325, Santa Rosa, California, 95404-6528. The reports shall contain, at a minimum, the following information:

      **i.** **Construction related activities --** The report will include the dates construction began and was completed; a discussion of any unanticipated effects or unanticipated levels of effects on steelhead, 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 steelhead killed or injured during Project construction; and photographs taken before, during, and after the activity from photo reference points.

**ii.** **Fish Relocation –** The report will 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 steelhead 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.

5. The following term and condition implements reasonable and prudent measure 5:

a. Cal Water shall provide a written annual report to NMFS by November 15 of each year regarding the previous water year's (October 1 through September 30) water diversion operations, bypass flow rates, and fishway/screen condition at the Bear Gulch Upper Diversion Facility. The report shall be submitted to NMFS Santa Rosa Area Office, Attention: San Francisco Bay Branch Supervisor, 777 Sonoma Avenue, Room 325, Santa Rosa, California, 95404-6528. The reports shall contain, at a minimum, the following information:

i. **Water Diversion Rates.** The report shall include daily average diversion rates at the Upper Diversion Facility.

ii. **Fish Bypass Flows.** The report shall include daily average streamflow bypassed downstream of Cal Water's Bear Gulch intake for each day the Upper Diversion Facility was diverting flow from Bear Gulch.

iii. **Fishway Operations.** The report shall include the daily flow through the fishway during the steelhead passage timeframe December 15 through May 31. The report shall include dates when the fish ladder was not operational and maintenance/repairs performed at the fishway. The report must also present any other condition that is or could be in the future compromising the functionality of the fishway.

iv. **Fish Screen Operations.** The report shall include the results of fish screen inspections including dates when the fish screen was not fully operational and maintenance/repairs performed at the fish screens. The report must also present any other condition that is or could be in the future compromising the functionality of the fish screens

### 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 Cal Water should work collaboratively with NMFS to develop and implement a system of stream gaging in the northern portion of the San Francisquito watershed. The stream gages should be located in locations to measure and record streamflow patterns in Bear Creek, Bear Gulch, West Union Creek and Dry Creek.

### 2.11 Reinitiation of Consultation

This concludes the formal consultation for the Bear Gulch Upper Diversion Fish Passage Project on Bear Gulch in Woodside, 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 incidental take statement 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 to 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. Other interested users could include California Water Service Company, CDFW, citizens of Woodside, California, and others interested in the conservation of threatened steelhead. Individual copies of this opinion were provided to the Corps. This opinion will be posted on the Public Consultation Tracking System web site (https://pcts.nmfs.noaa.gov/pcts-web/homepage.pcts). 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 implementation and reviewed in accordance with West Coast Region ESA quality control and assurance processes.

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