UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Southwest Region
501 West Ocean Boulevard, Suite 4200
Long Beach, California 90802-4213

May 31, 2012

In response refer to:
2012/00359

Lieutenant Colonel Torrey A. DiCiro
U.S. Army Corps of Engineers
San Francisco District
1455 Market Street
San Francisco, California 94103-1398

Dear Colonel DiCiro:

Thank you for your letter of February 2, 2012, requesting initiation of formal consultation with NOAA's National Marine Fisheries Service (NMFS) pursuant to section 7 of the Endangered Species Act of 1973 (ESA), as amended (16 U.S.C. 1531 *et seq.*), for the City of San Jose's Alum Rock Park Bank Repair and Stream Restoration Project along Upper Penitencia Creek in the City of San Jose, Santa Clara County, California (Corps File No. 2009-00193S). The United States Army Corps of Engineers (Corps) proposes to authorize the City of San Jose (City) to construct this project pursuant to Section 404 of the Clean Water Act (33 U.S.C. § 1344).

The enclosed biological opinion is based on our review of work proposed by the City and the Santa Clara Valley Transportation Authority (VTA) and describes NMFS' analysis of potential effects on threatened Central California Coast (CCC) steelhead (*Oncorhynchus mykiss*) and designated critical habitat in accordance with section 7 of the ESA. Threatened CCC steelhead are present within the project's action area and Upper Penitencia Creek is designated critical habitat for this species. In the enclosed biological opinion, NMFS concludes the project is not likely to jeopardize the continued existence of threatened CCC steelhead and the proposed instream habitat improvements are expected to benefit designated critical habitat for this species. However, NMFS anticipates take of CCC steelhead during project construction. An incidental take statement which provides this project with non-discretionary terms and conditions is included with the enclosed biological opinion.

Please contact Darren Howe at (707) 575-3152 or by email at Darren.Howe@noaa.gov if you have any questions concerning this section 7 consultation, or if you require additional information.

Sincerely,

For Rodney R. McInnis
Regional Administrator

Enclosure

cc: Chris Yates, NMFS, Long Beach, CA
Holly Costa, Corps Regulatory Division, San Francisco, CA
Ann Calnan, Santa Clara Valley Transportation Authority, San Jose, CA
Ryan Olah, USFWS, Sacramento, CA
Copy to file Administrative File: 151422SWR2012SR00053

Enclosure

BIOLOGICAL OPINION

ACTION AGENCY: U.S. Army Corps of Engineers, San Francisco

ACTION: Alum Rock Park Bank Repair and Stream Restoration Project in San Jose, California.

CONSULTATION CONDUCTED BY: National Marine Fisheries Service, Southwest Region

TRACKING NUMBER: 2011/05478

DATE ISSUED: **May 31, 2012**

I. CONSULTATION HISTORY

In October 2011, NOAA's National Marine Fisheries Service (NMFS) received the City of San Jose's (City) Notice Intent to Adopt a Mitigated Negative Declaration for the Alum Rock Park Bank Repair and Stream Restoration Project. This notice solicited public comments on the City's draft Mitigated Negative Declaration prepared for the project. By email message on October 28, 2011, NMFS staff contacted the City for the purpose of initiating technical assistance (early coordination and design review) for the project.

On November 9, 2011, the City and the Santa Clara Valley Transportation Authority (VTA) hosted a site visit to the Upper Penitencia Creek project sites for NMFS staff. VTA staff informed NMFS that they are a cooperative partner to the City, assisting with the design and implementation of several project elements.

On November 21, 2011, NMFS staff discussed the project with a representative from the City by telephone and indicated that NMFS would like to submit written comments on the proposal. Via email message on November 29, 2011, NMFS provided comments to the City and requested additional information regarding the proposed design of the floodplain at Project Site 11. On January 5, 2012, the City provided NMFS a written response to comments submitted by NMFS and the San Francisco Bay Regional Water Quality Control Board (RWQCB). The City also provided a copy of the revised Initial Study and Mitigated Negative Declaration.

By letter dated February 2, 2012, the Department of the Army, Corps of Engineers' (Corps) requested formal consultation with NMFS pursuant to section 7 of the Federal Endangered

Species Act (ESA) of 1973, as amended (16 U.S.C. 1531, *et seq*.) for the proposed Alum Rock Park Bank Repair and Stream Restoration Project along Upper Penitencia Creek in San Jose, California (Corps File No. 2009-00193S). The Corps' February 2, 2012, letter included the Biological Assessment for the project, and requested consultation to address potential effects on threatened Central California Coast (CCC) steelhead and their designated critical habitat.

On February 27, 2012, NMFS met with representatives from the City, VTA, and the RWQCB to discuss the project. Plans for construction, dewatering work sites, project monitoring, and project goals were discussed. At this meeting, VTA and the City committed to post-construction monitoring, with emphasis on project sites involving in-stream construction work. The group also discussed potential modifications at two sites (Project Site 6 and Project Site 11) in order to reduce effects to existing in-stream habitat resulting from proposed riprap placement at Project Site 6, and removal of riparian vegetation and alteration of instream habitat at Project Site 11. The day following this meeting, February 28, 2012, the City informed NMFS and the RWQCB that the work at Project Sites 6 and 11 will not occur and are no longer proposed as part of the project.

By email message on April 11, 2012, the City provided information to NMFS, RWQCB and Corps regarding the area of impact associated with the remaining project sites (listed in downstream to upstream order as: Project 8, 7, 9, 13, 5, 2, 4, 3, 10 and 1).

Methods for post-project construction monitoring were discussed through email messages and telephone conversations by NMFS and VTA during March and April 2012. VTA and NMFS staff agreed that monitoring of steelhead at Project Site 13 could assist in evaluating the removal of the fish passage barrier. Two options for post-construction fisheries monitoring at the barrier removal site were developed by NMFS and VTA: 1) participation in the Santa Clara Valley Water District (SCVWD) PIT tag program via installation of PIT tag antenna (reader) station at Project Site 13, or 2) installation of an underwater camera system at Project Site 13. As the PIT tag program by SCVWD has not been finalized for implementation within the watershed at the time of consultation, VTA and NMFS agreed that installation of a camera system could be implemented as a back-up plan. Given VTA's commitment to perform monitoring, NMFS agreed to consider both methodologies in the biological opinion, with the condition that VTA would submit the proposed monitoring plan with sufficient time to allow for implementation in 2013.

On April 25, 2012, VTA provided to NMFS, the Corps, and the City final design plans for Project Sites 3, 10, 13, 5, and 2.

On May 8, 2012, VTA transmitted to NMFS and the Corps the project's final Habitat Mitigation and Monitoring Plan.

By telephone on May 15, 2012, the City notified NMFS that:

- Project 1 has been revised to include repair of the stone veneer on the right bank pilaster at Creekside Bridge; and
- Projects 1, 4, 7, 8, and 9 are scheduled for constructed in 2013 or 2014.

Additional information was provided by email messages and telephone conversation between NMFS, the City, and VTA, in May 2012. This information confirmed construction methodologies to be used, and lengths of stream to be dewatered for Projects 2, 3, 5, 8, 10, and 13.

II. DESCRIPTION OF PROPOSED ACTION

The Corps proposes to issue a permit under Section 404 of the Clean Water Act (CWA) to the City for the Alum Rock Park Bank Repair and Stream Restoration Project. The proposal is to construct a series of 10 projects along approximately 1.6 miles of Upper Penitencia Creek, within Alum Rock Park in the City of San Jose, Santa Clara County, California. The 10 projects consist of bank stabilization, bridge repair, fish barrier removal and floodplain restoration. The City is the permit applicant to the Corps for the project, however VTA is providing project management and funding at some of the project sites for the City. VTA will have continued involvement through project implementation and post-construction monitoring. In-stream construction is scheduled to occur between June 15 and October 15 in 2012, 2013, and 2014. However, uncertain funding may delay implementation and some project construction may occur as late as 2015, 2016, or 2017. The Corps, City, VTA, and NMFS anticipate that surface flow will be present at all project sites during the construction period. To facilitate construction, temporary dewatering of the stream will be required at four locations, totaling approximately 900 linear feet of stream. Fish, including CCC steelhead, in dewatered work areas will be collected and relocated prior to dewatering. NMFS does not anticipate any interrelated or interdependent actions associated with the proposed action.

The City's Alum Rock Park contains natural mineral springs along Upper Penitencia Creek and, in the late 19th century and early 20th century, the park was famed throughout the country as a health resort. The park featured a large indoor swimming pool heated by the mineral springs and dozens of small heated mineral baths that visitors could rent. Many of the springs were enclosed in stonework grottos within the creek bed or adjacent to the creek. Stone bridges were built across the creek and walls constructed to support walkways and stairs. Many of the park's mineral spring alcoves (grottos), mineral bath depressions, walls, bridges, and various bank stabilization structures were removed in the 1970s and several of the remaining structures are in various stages of disrepair. These structures, which are referred to in the project description below, have been constructed with a variety of methods and materials including: stacked stone, sacked concrete, cast in place concrete, and mortar and native stone.

A. Description of Proposed Work

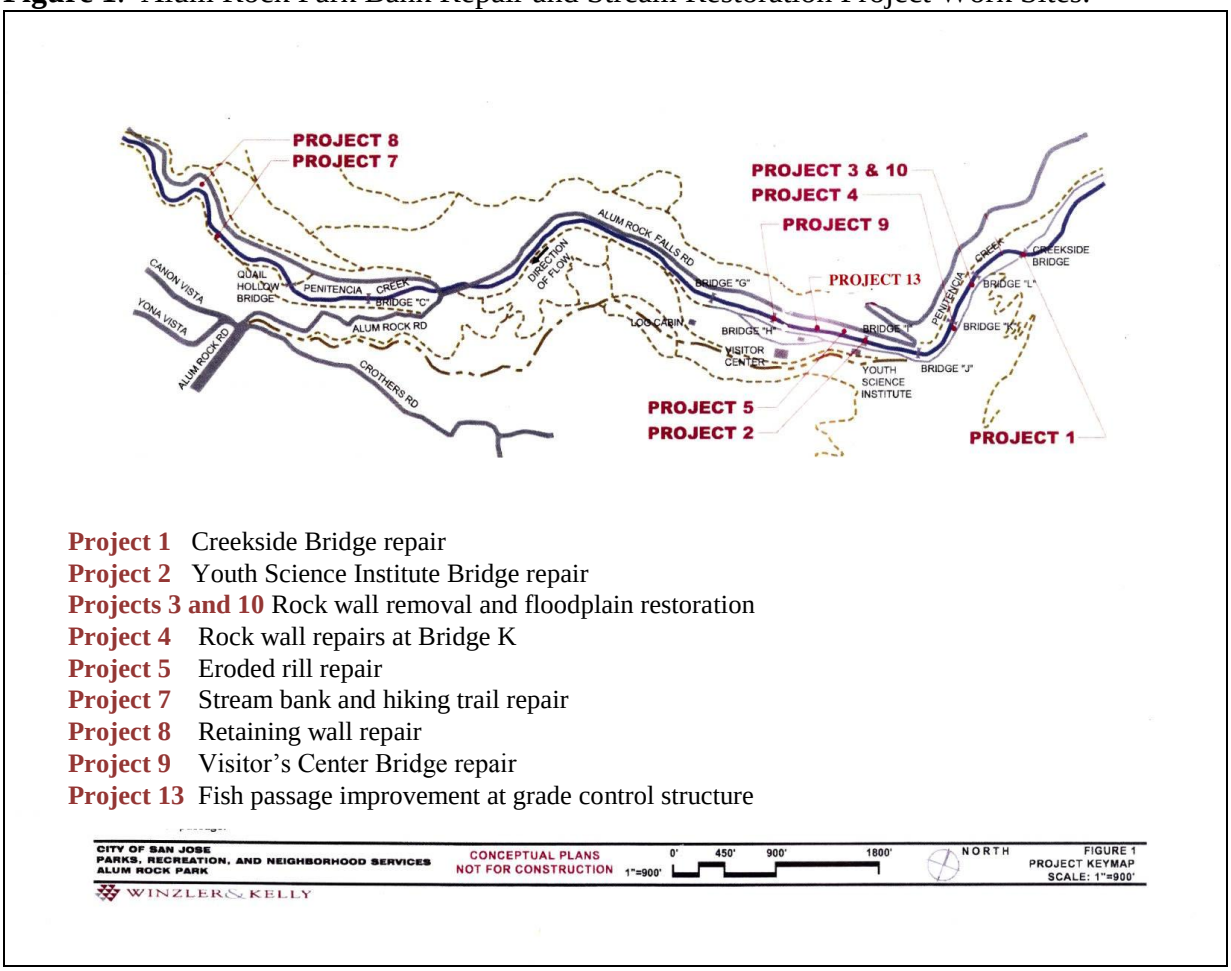
1. <u>Project Site Descriptions</u>

The Alum Rock Park Bank Repair and Stream Restoration Project is composed of 10 project sites, identified from downstream to upstream as Project Sites 8, 7, 9, 13, 5, 2, 4, 3, 10, and 1, as shown on Figure 1. Project sites were initially numbered 1 through 13, but sites 6, 11, and 12 have been omitted from the current proposal. The individual projects are described as follows:

a. Project Site 1 –Creekside Bridge Repair

Project Site 1 consists of stabilization of the left (south) bank of Upper Penitencia Creek and repairs to the abutment footing of the Creekside Bridge. Erosion along the left bank has created a gap between the bridge footing and the underlying bedrock, compromising the foundation for the footing. Approximately 62 feet of the left bank will be stabilized by laying the bank back,

Figure 1. Alum Rock Park Bank Repair and Stream Restoration Project Work Sites.



trenching in a toe of ungrouted one ton boulders, placing ungrouted ¼ ton riprap up the bank, and revegetating with native riparian vegetation. One 12-inch diameter maple tree at this site will be removed from the left bank prior to construction. To facilitate revegetation, and prevent bank

scour, geosynthetic material will be placed along the toe and between the bank and riprap. The interstices of the toe boulders will be filled with native streambed material or ¾-inch drain rock and planting soil. Coir fabric, planting soil, and an erosion control blanket will cover the surface of the riprap. The upper stream bank will be planted with shrubs. A layer native hydroseed mix will be applied to exposed areas on the bank, and toe boulder interstices in the lower and middle bank areas will be planted with live plant stakes.

In locations of erosion along the left abutment footings, voids will be filled with high strength, non-shrink grout to prevent further undercutting. Grout will be installed by hand or similar methods to cover areas of exposed concrete superstructure. A 4-inch stone veneer will be added to the existing pilaster to cover exposed concrete and blend aesthetically with the superstructure of this historic bridge.

Construction activities will require dewatering of approximately 150 linear feet of Upper Penitencia Creek at the Creekside Bridge (see section 2. Dewatering and Fish Relocation for description of dewatering activities).

b. Project Site 2 – Youth Sciences Institute Bridge Repair

Proposed work at Project Site 2 consists of repair of the failed slope along the left (south) bank of Upper Penitencia Creek immediately adjacent to the Youth Sciences Institute Bridge. The City proposes to install a 17-foot long, curved, cast-in-place concrete retaining wall along the upper bank of the creek above ordinary high water. The site is now comprised of remnants of either a failed rock wall or cobble fill. A mini-pile foundation for the retaining wall will be constructed by drilling and grouting into bedrock. The wall would be covered with a stone masonry veneer to match the existing bridge. The base of the retaining wall may be protected with new, selectively placed boulder revetment. The wall is designed to protect an existing Deodar cedar on the upper creek bank.

No construction is proposed within the creek, but equipment will need to cross the channel to access portions of the work site. Due to the site's proximity, construction of Project 2 will be concurrent with Projects 5 and 13. Approximately 500 linear feet of Upper Penitencia Creek will be temporarily dewatered for construction at Project Site 13, and this dewatered area will include Project Site 2 (see section 2. Dewatering and Fish Relocation for description of dewatering activities).

c. Project Site 3 – Removal of Rock Wall Downstream of Bridge L

The project proposes to remove an existing 120-foot long stone masonry wall extending downstream from Bridge L, an historic footbridge, on the left (south) bank of Upper Penitencia Creek. The stream channel is confined on both banks by rock walls in this reach and the left bank wall (proposed for removal) has been undercut by erosion. The encroachment of stone

walls along both banks of Upper Penitencia Creek has increased channel velocities and caused undercutting.

Following the removal of the existing stone wall, Project 10 will excavate and grade the left bank to create a floodplain area adjacent to the stream (see *j. Project Site 10 – Expansion of Floodplain Downstream of Bridge L*). Project 3's wall demolition and Project 10's construction of a floodplain will both require dewatering of Upper Penitencia Creek. The stream will be dewatered once for a distance of approximately 100 feet for the sequential construction of Projects 3 and 10 during the same construction season (see section 2**.** Dewatering and Fish Relocation for description of dewatering activities).

d. Project Site 4 – Repair of Rock Wall at Bridge K

At Project Site 4, a failing section of an existing stone retaining wall will be repaired with in-kind stone and mortar. The retaining wall is located on the left (south) bank immediately downstream of Bridge K above ordinary high water of Upper Penitencia Creek. Repairs will be performed along approximately 19 feet of the retaining wall. Mortar and native rock will be placed in existing voids in the existing wall. To alleviate groundwater seepage, weepholes will be installed in the repaired sections of wall. Existing riparian vegetation will be protected in place. No work is proposed within Upper Penitencia Creek and dewatering is not required for construction.

e. Project Site 5 – Repair of Eroded Rill

At Project Site 5, the right (north) stream bank of Upper Penitencia Creek has eroded and a rill created in the gap between two existing concrete sack walls. The project proposes to connect this 7-foot wide gap between the walls with rock, grout and a steel support pile. The area behind the new wall will be backfilled with compacted engineered fill, covered with a biodegradable erosion control mat and vegetated with native vegetation. To provide stability for the new wall, approximately 65 square feet of concrete will be installed on the bank. The constructed rock wall within the gap would match the existing bank slope.

The project site is located approximately 70 feet downstream of the Youth Science Institute Bridge and this area overlaps with the construction site the Project 13 (see *j. Project Site 13 – Fish Passage Improvement Project*). Due to the site's location, construction of Project 5 will be concurrent with Projects 2 and 13. Approximately 500 linear feet of Upper Penitencia Creek will be temporarily dewatered for construction at Project Site 13, and this dewatered area will include Project Site 5 (see section 2. Dewatering and Fish Relocation for description of dewatering activities).

f. Project Site 7 – Repair of Failing Bank Downstream of Quail Hollow Bridge

Project Site 7 will repair a collapsed portion of the left (south) bank of Upper Penitencia Creek approximately 900 feet downstream of the Quail Hollow Bridge. The upper portion of the failed

slope encroaches into an existing hiking trail located at the top of the bank. The collapsed section of bank is approximately 10-foot wide by 6-foot high. The project proposes to construct a 12-foot long retaining wall with timber lagging along the upper portion of the collapsed bank, and backfill will be placed behind the wall to re-build the shoulder of the hiking trail. High strength, non-shrink grout will be installed by hand to fill the void underneath the undercut footing and prevent further undercutting.

Both the concrete footing and timber lagging repairs are located above ordinary high water. Construction will not encroach upon the creek, dewatering will not be required, and a cluster of willows along the lower portion of the bank will be preserved in place.

g. Project Site 8 – Repair of Sack Concrete Wall and Adjacent Stream Bank

Project Site 8 involves repair of a failing sack concrete retaining wall and the adjacent stream bank located on the right (north) side of Upper Penitencia Creek approximately 1,600 feet downstream of Quail Hollow Bridge. A 33-foot long section of the existing wall has been undercut at the footing and will be repaired by filling the void with high strength, non-shrink grout between the bottom of the footing and the bedrock. Filling this void is intended to support the wall and prevent further deterioration. Immediately upstream of this wall, repairs will be made to a 50-foot long section eroding stream bank. This failure of the upper bank has undermined a portion of Alum Rock Falls Road. The failed bank will be repaired with construction of a 48-foot long soldier pile and concrete wall. The bottom portion of the wall will be roughened with ¼ ton riprap stacked at a 2:1 horizontal to vertical slope. The riprap will be trenched in at the toe, underlain by geosynthetic material, and covered with coir fabric, soil, native vegetation plantings, and an erosion control blanket and then planted with live vegetative stakes.

Construction activities will require dewatering of approximately 150 linear feet of Upper Penitencia Creek (see section 2. Dewatering and Fish Relocation for description of dewatering activities).

h. Project Site 9 – Repair of Visitor Center Bridge

The existing Visitor Center Bridge is a rock and mortar arch footbridge with a 40-foot span across Upper Penitencia Creek. The City proposes to repair the failing section of a 35-foot long stone retaining wall upstream of the Visitor Center Bridge and repair sections of a 25-foot long stone wall downstream of the bridge. Both walls are located along the left (south) bank of Upper Penitencia Creek. The walls will be repaired by replacing stones and filling voids with high strength, non-shrink grout. These repairs are intended to support the wall and prevent further deterioration.

In order to prevent further erosion of the bank adjacent to the bridge, the project will establish native vegetation and discourage foot traffic. The bank will be scarified, filled with a layer of

planting soil, covered with erosion control blanket, staked, and planted with live stakes and shrubs. Bank plantings will obscure the pathway down the banks, and a row of native blackberry at the top of bank will further discourage foot traffic. Fencing will be replaced and augmented to discourage public access.

All work at Project Site 9 will occur above ordinary high water. Construction will not encroach upon the creek and dewatering will not be required.

i. Project Site 10 – Expansion of Floodplain at Bridge L

Immediately following the removal of an existing stone wall (performed as Project 3), the 120-foot long reach of the left (south) bank downstream of Bridge L will be excavated and graded to create a floodplain area adjacent to Upper Penitencia Creek. The floodplain area will extend 120 linear feet and up to 30 feet in width. The site is designed to create an area for overflow during high stream flow events.

In order to provide scour protection through the reach, while allowing storm flows to activate the newly restored floodplain, vegetated rock slope protection will be installed at the transition from channel bed to floodplain. This rock slope protection will be installed at a lower elevation than the pre-existing rock wall. For scour protection at the left bank footing of Bridge L, a new mortared rock wall will be constructed on the south side of the bridge footing. This new wall will conform to the existing wall under the bridge and will include a concrete footing.

The floodplain restoration at Project Site 10 overlaps with the construction site for Project 3 and construction of Project 10 will immediately follow removal of Project 3's stone wall. Approximately 100 feet of Upper Penitencia Creek will be dewatered for Project 3 and the site will remain dewatered for construction of Project 10 (see section 2. Dewatering and Fish Relocation for description of dewatering activities). Therefore, no additional dewatering will be required for construction of Project 10.

j. Project Site 13 –Fish Passage Improvement Project

A concrete weir that spans the channel of Upper Penitencia Creek approximately 75 feet downstream of the Youth Science Institute Bridge has served as a grade control structure for many decades. This concrete weir has been undercut and created a downstream scour pool. As a result, a 4.5-foot vertical drop from the crest of the weir to the downstream pool surface (during base flow[1] conditions) has been created. Under low and moderate stream flow conditions this structure creates a significant barrier to the upstream migration of steelhead and other native fishes in Upper Penitencia Creek. Because of their concern about the stability of nearby infrastructure (Youth Science Institute Bridge and rock walls on the left and right banks) if the

[1] Base flow conditions are the winter-time flows between storms.

weir is removed, the project applicant proposes to leave the weir in place and to create a stable "roughened channel" in Upper Penitencia Creek suitable for fish passage.

The new roughened channel will extend for 225 linear feet downstream of the existing concrete weir. The structure will consist of a chute and pool design composed of rock and gravel substrate. Rock fill will have particle sizes ranging from 0.05 inches to 4.5 feet, with 50 percent of material greater than 1.5 feet. Associated bank improvements include slope regrading, rock wall removal, and rock protection placed at the toe of slope. The new streambed will be compacted with tamping and water jetting to reduce subsurface flow; water used for jetting will be captured and recycled to prevent downstream escape of sediments. The new modified channel will have an average channel slope of 5.1 percent. The series of chutes and pools are intended to mimic features found within a naturally occurring steep channel and provide bedform diversity suitable for passage of anadromous salmonids and other native aquatic species. Some disturbed areas in the downstream part of the project reach will be revegetated with native riparian plants.

Construction activities at Project Site 13 will require dewatering of approximately 500 linear feet of Upper Penitencia Creek (see section 2. Dewatering and Fish Relocation for a description of dewatering activities). Due to the location of Project Site 5 within the area to be dewatered for Project 13, Projects 2, 5, and 13 will be constructed at the same time during one construction season.

2. Dewatering and Fish Relocation

To facilitate construction at Project Sites 1, 2, 3, 5, 8, 10 and 13, dewatering of Upper Penitencia Creek will be required. Due to overlap, dewatering of Project Sites 3 and 10 will be combined as well as Project Sites 2, 5 and 13. Dewatering at these sites will occur once and projects will be built sequentially within the same dewatered reach during one construction season. In total, approximately 900 linear feet of Upper Penitencia Creek will be dewatered for construction at four discrete locations within Alum Rock Park. One reach will be dewatered for a distance of 100 feet, two reaches will be dewatered for a distance of 150 feet, and one reach will be dewatered for a distance of 500 feet.

Prior to in-stream construction, cofferdams will be installed at the upstream and downstream limits of dewatering areas. Cofferdams will be constructed with sandbags or gravel bags, and will not contain erodible material such as soil or fine sediment. Cofferdams will be installed and removed by hand. Temporary pipelines will be installed to divert the flow of Upper Penitencia Creek around or through the dewatered work site. Pipeline inlets will be cleaned daily. Temporary pipelines will be removed upon project completion. In-stream construction will be restricted to the period of June 15 through October 15. The duration of all in-channel construction activities will not exceed 16 weeks within one year.

Prior to dewatering, a fisheries biologist will collect and relocate fish from the work site. Fish will be collected primarily by electrofishing, but seines, dip nets, and traps may also be used, if

appropriate. Collected fish will be relocated to a suitable location in Upper Penitencia Creek upstream or downstream of the work site.

Following construction, all water diversion structures will be removed and disturbed channel areas will be restored to natural grade and substrate condition. Sites will be stabilized with erosion control materials and revegetated with native plants. Areas temporarily impacted by construction activities will be restored to pre-project condition, or enhanced through planting of native vegetation and grading.

3. Construction and Construction Monitoring

Construction activities will be performed with standard construction equipment including an excavator, dump truck, dozer, backhoe, gas-powered generator, tamper, concrete truck, and asphalt paving equipment. All in-channel construction work will be conducted between June 15 and October 15. Construction equipment will normally stage from on upland areas away from the stream and would access the sites from adjacent upland areas and adjacent stream banks.

Prior to construction, a qualified biologist will conduct a training program to familiarize all construction personnel with identification of steelhead, red-legged frogs, and other special status plants and animals. Training will also include discussion of measures and requirements to protect these species and the natural environment at work sites.

Pollutants, including soil, chemicals, fuel, concrete, slurry and washings, will not be permitted to come in contact with the flowing waters of Upper Penitencia Creek. For projects that require work within the creek bed, the stream will be diverted as described above in section 2. Dewatering and Fish Relocation, prior to the initiation of construction activities.

To ensure that projects are built as designed and contractors adhere to construction best management practices, monitoring will be performed during construction by skilled individuals. Monitors will be knowledgeable in the project designs, construction minimization measures, in-stream restoration plans, and the needs of native fish, including steelhead. Monitoring will be performed daily. The monitor(s) will work in close coordination with project management personnel, the project design (engineering) team, and the construction crew, to ensure that the project is built as designed and, for restoration projects, the intended habitat benefits are achieved.

4. Post-Construction Monitoring

To facilitate evaluation of the project's efficacy in improving instream habitat for CCC steelhead and other native fish, the City proposes post-construction monitoring of vegetation, hydrologic and geomorphic features, and biological (fisheries) conditions. The project's Habitat Mitigation and Monitoring Plan specifies vegetation planting plans for each project site and the monitoring

program's target functions and values. The Habitat Mitigation and Monitoring Plan also specifies the project's maintenance and reporting requirements.

a. Vegetation Monitoring

Vegetation monitoring will occur for 10 years following project completion to evaluate the project's efficacy in establishing native riparian vegetation and its habitat value for native species. The monitoring program will assess:

1. Plant cover by percent cover for the first five years following planting, or until the 5-year success criteria is met;

2. Plant survivorship for 10 years following planting;

3. Control of exotic (weedy) species for the first five years following planting, or until 5-year percent cover criteria is met; and

4. Photographic documentation stations will be established and photos will be taken annually to document site conditions.

b. Physical Monitoring

The City proposes to perform post-construction monitoring at the project's floodplain restoration site (Project Site 3/10) to determine if the floodplain becomes inundated during ordinary high flow events. As a measure of success, the site will be monitored to determine if finished elevations are sufficient to allow flows to inundate the new areas and meet the Corps' ordinary high water mark definition[2], thereby indicating regular inundation under ordinary high flow events.

c. Fisheries Monitoring

The project proposes to monitor post-project construction fish passage at Project Site 13. As described above, at Project Site 13, the City will construct a roughened channel to provide upstream fish passage over the existing Youth Science Institute grade control structure. During consultation, two options were proposed for monitoring fish passage and the final selection is dependent on whether the SCVWD proceeds with the application of Passive Integrated Transponder (PIT) tags on fish in Upper Penitencia Creek. If PIT tags are deployed by SCVWD in 2012 or 2013, VTA will install a PIT tag reader (*i.e.*, antenna) station. If PIT tags are not deployed by SCVWD, an automated underwater camera system will be installed. Both

[2] CWA 33 CFR 328.3(e): "The term *ordinary high water mark* means that line on the shore established by the fluctuation of water and indicated by physical characteristics such as a clear, natural line impressed on the bank, shelving, changes in the character of soil, destruction of terrestrial vegetation, the presence of litter and debris, or other appropriate means that consider the characteristics of the surrounding areas."

alternatives (either PIT tag antenna or camera system) would place the monitoring station within Upper Penitencia Creek at Project Site 13. The purpose of this monitoring element is to record successful movement of fish as they navigate the roughened channel structure. Reports detailing the results of this monitoring will be produced and submitted to NMFS annually during the 5-year monitoring period.

Under the PIT tag alternative, a PIT tag reader will detect tagged steelhead as they crossed the PIT tag antenna station. The antenna station will consist of antennas housed within an approximately 4-foot wide fiberglass shell (mat) that lies across the channel width. The site is expected to use two antennas (each within their own mat), placed in a pair at the upstream project limit. The use of paired antennas is intended to provide better detection efficiency than single antenna systems. Installation of each antenna will require very minor disturbance of the substrate to allow the mat to be placed at the same grade as the adjacent substrate. Hand tools will be used to excavate an 8-inch deep trench in the substrate across the channel and the antenna mat would be placed in the trench. Excavated substrate will be returned to the trench to transition the leading and trailing edges of the mat; resulting in the mat being flush with the adjacent substrate. Antennas will connect to reader stations located in the adjacent riparian or upland area via cables. The reader station will collect and store the data, will be equipped with a power source (either battery power or direct power) necessary to power the equipment, and will be contained within small electronics equipment enclosures, such as those that are typically mounted to utility poles, fence posts, or other similar structures.

If an underwater camera station is selected for evaluating fish passage at Project Site 13, a camera system will be installed which is capable of recording images of fish passing through a cross-section of stream. A camera will be installed underwater and a station established on the bank to collect and store the data. The site will be equipped with a power source (either battery power or direct power) necessary to power the equipment, and will be contained within small electronics equipment enclosures, such as those that are typically mounted to utility poles, fence posts, or other similar structures.

B. Action Area

The proposed project is located in Alum Rock Park within the City of San Jose, Santa Clara County, California. The action area extends along approximately 1.6 miles of Upper Penitencia Creek within Alum Rock Park. The action area includes all 10 proposed project sites and includes the stream's bed, banks and riparian corridor. Laterally, the action area encompasses the left and right banks, and the associated floodplain and riparian corridor. The action area includes areas that may be affected by stream diversion, fish capture and relocation, and construction activities occurring in approximately 1.6 miles of the stream channel. The action area also includes areas that may be affected by turbidity and sedimentation arising from project construction, and changes to summer low-flow conditions.

III. ANALYTICAL FRAMEWORK

A. Jeopardy Analysis

In accordance with policy and regulation, the jeopardy analysis in this biological opinion relies on four components: (1) the Status of the Species, which evaluates the CCC steelhead (*Oncorhynchus mykiss*) Distinct Population Segment's (DPS) range-wide conditions, the factors responsible for that condition, and the species' likelihood of both survival and recovery; (2) the Environmental Baseline, which evaluates the condition of this listed species in the action area, the factors responsible for that condition, and the relationship of the action area to the likelihood of both survival and recovery of this listed species; (3) the Effects of the Action, which determines the direct and indirect effects of the proposed Federal action and the effects of any interrelated or interdependent activities on this species in the action area; and (4) Cumulative Effects, which evaluates the effects of future, non-Federal activities in the action area on this species.

The jeopardy determination is made by adding the effects of the proposed Federal action and any Cumulative Effects to the Environmental Baseline and then determining if the resulting changes in species status in the action area are likely to cause an appreciable reduction in the likelihood of both the survival and recovery of this listed species in the wild.

The jeopardy analysis in this biological opinion places an emphasis on the range-wide likelihood of both survival and recovery of this listed species and the role of the action area in the survival and recovery of this listed species. The significance of the effects of the proposed Federal action is considered in this context, taken together with cumulative effects, for purposes of making the jeopardy determination. We use a hierarchical approach that focuses first on whether or not the effects on salmonids in the action area will impact their respective population. If the population will be impacted, we assess whether this impact is likely to affect the ability of the population to support the survival and recovery of the DPS or Evolutionary Significant Unit (ESU).

B. Adverse Modification Analysis

This Biological Opinion does not rely on the regulatory definition of "destruction or adverse modification" of critical habitat at 50 CPR 402.02, which was invalidated by the 9th Circuit Court of Appeals in 2004. Instead, we have relied upon the statutory provisions of the ESA to complete the following analysis with respect to critical habitat.

The adverse modification analysis in this Biological Opinion relies on four components: (1) the Status of Critical Habitat, which evaluates the range-wide and watershed-wide condition of critical habitat for the CCC steelhead DPS in terms of primary constituent elements (PCEs, for example, sites for spawning, rearing, and migration), the factors responsible for that condition, and the resulting conservation value of the critical habitat overall; (2) the Environmental Baseline, which evaluates the condition of critical habitat in the action area, the factors

responsible for that condition, and the conservation value of critical habitat in the action area; (3) the Effects of the Action, which determines the direct and indirect impacts of the proposed Federal action and the effects of any interrelated or interdependent activities on the PCEs in the action area and how that will influence the conservation value of affected critical habitat units; and (4) Cumulative Effects, which evaluates the effects of future, non-Federal activities in the action area on the PCEs and how that will influence the conservation value of affected critical habitat units.

For purposes of the adverse modification determination, we add the effects of the proposed Federal action on CCC steelhead critical habitat in the action area, and any Cumulative Effects, to the Environmental Baseline and then determine if the resulting changes to the conservation value of critical habitat in the action area are likely to cause an appreciable reduction in the conservation value of critical habitat range-wide. If the proposed action will negatively affect PCEs of critical habitat in the action area, we then assess whether or not this reduction will impact the value of the DPS or ESU critical habitat designation as a whole.

C. Use of Best Available Scientific and Commercial Information

To conduct the assessment, 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 effects of the project's actions 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:

1. *Biological Assessment for Alum Rock Park Bank Repair and Stream Restoration Project*. Prepared for the City of San Jose. Prepared by Winzler & Kelly, July 2011.

2. *Habitat Mitigation and Monitoring Plan for Alum Rock Park Bank Repair and Stream Restoration Project*. Prepared for the City of San Jose. Prepared by Winzler & Kelly, July 2011.

3. *Final Initial Study and Mitigated Negative Declaration for Alum Rock Park Bank Repair and Stream Restoration Projects*. City of San Jose. December 2011.

Additional information was provided to NMFS in emails messages, site visits, and telephone conversations between October 2011, and May 2012. For information that has been taken directly from published, citable documents, those citations have been referenced 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 (Administrative Record Number 151422SWR2012SR00053).

IV. STATUS OF THE SPECIES AND CRITICAL HABITAT

This biological opinion analyzes the effects of the Alum Rock Park Repair and Stream Restoration Project on the CCC steelhead DPS and designated critical habitat for this species. 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. CCC steelhead occur in Upper Penitencia Creek and are likely to be present at the project site during construction. Upper Penitencia Creek, including the project area, is designated as critical habitat for CCC steelhead (70 FR 52488; September 2, 2005)

A. Species Description and Life History

General reviews for steelhead in California document much variation in life history (Shapovalov and Taft 1954; Barnhart 1986; Busby *et al*. 1996; McEwan 2001). Adult CCC steelhead are exclusively winter run fish, typically immigrating from the ocean to freshwater spawning streams between December and April, with immigration peaking in January and February (Fukushima and Lesh 1998). Although variation occurs, in Central California's coastal streams, rearing juvenile steelhead usually live in freshwater for 2 years and then migrate to the ocean, with peak emigration of smolts to estuaries and the ocean occurring in March and April (Barnhart 1986). After ocean entry they spend 1 to 3 years maturing in the marine environment before returning to their natal streams to spawn. After spawning, steelhead adults may return to the ocean and then return to freshwater to spawn up to 4 times over their lifetime.

Juvenile 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 juveniles tend to use riffles and other habitats not strongly associated with other cover types during summer rearing more so than coho and Chinook salmon juveniles. 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 to 14.4 Celsius (°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 (Busby *et al*. 1996) and cold groundwater inflows also aid in survivability of steelhead juveniles in Mediterranean locales.

B. Species Status

In this biological opinion, NMFS assesses four population viability parameters to help us understand the status of CCC steelhead and the population's ability to survive and recover.

These population viability parameters are: abundance, population growth rate, spatial structure, and diversity (McElhany *et al.* 2000). NMFS has used existing information to determine the general condition of each population and factors responsible for the current status of the DPS.

We use these population viability parameters as surrogates for numbers, reproduction, and distribution, the criteria found within the regulatory definition of jeopardy (50 CFR 402.20). For example, the first three parameters are used as surrogates for numbers, reproduction, and distribution. We relate the fourth parameter, diversity, to all three regulatory criteria. Numbers, reproduction, and distribution are all affected when genetic or life history variability is lost or constrained resulting in reduced population resilience to environmental variation at local or landscape-level scales.

Historically, approximately 70 populations[3] of steelhead existed in the CCC steelhead DPS (Spence *et al.* 2008, Spence *et al.* 2012). Many of these populations (about 37) were independent, or potentially independent, meaning they had a high likelihood of surviving for 100 years absent anthropogenic impacts (Bjorkstedt *et al.* 2005). The remaining populations were dependent upon immigration from nearby CCC steelhead DPS populations to ensure their viability (McElhaney *et al*. 2000, Bjorkstedt *et al*. 2005).

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

CCC steelhead have experienced serious declines in abundance and long-term population trends suggest a negative growth rate. This indicates the DPS may not be viable in the long term. 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 remain present in most streams throughout the DPS, roughly approximating the known historical range, CCC steelhead likely possess a

[3] Population as defined by Bjorkstedt *et al*. 2005 and McElhaney *et al*. 2000 as, in brief summary, a group of fish of the same species that spawns in a particular locality at a particular season and does not interbreed substantially with fish from any other group. Such fish groups may include more than one stream. These authors use this definition as a starting point from which they define four types of populations (not all of which are mentioned here).

resilience that is likely to slow their decline relative to other salmonid DPSs or ESUs in worse condition. A 2005 status review concluded that steelhead in the CCC steelhead DPS remain "likely to become endangered in the foreseeable future" (Good *et al*. 2005). On January 5, 2006, NMFS issued a final determination that the CCC steelhead DPS is a threatened species, as previously listed (71 FR 834).

A more recent viability assessment of CCC steelhead concluded that populations in watersheds that drain to San Francisco Bay are highly unlikely to be viable, and that the limited information available did not indicate that any other CCC steelhead populations could be demonstrated to be viable[4] (Spence *et al.* 2008). Research monitoring data from 2008/09 and 2009/10 of adult CCC steelhead returns shows a decline in returning adults across their range compared to the last ten years (Jeffrey Jahn, personal communication, 2010). The most recent status update concludes that steelhead in the CCC steelhead DPS remain "likely to become endangered in the foreseeable future" (Williams *et al.* 2011), as new and additional information available since Good *et al.* (2005) does not appear to suggest a change in extinction risk. On August 15, 2011, NMFS chose to maintain the threatened status of the CCC steelhead (76 FR 76386).

C. Status of Critical Habitat

In designating critical habitat, NMFS considers, among other things, the following requirements of the species: 1) space for individual and population growth, and for normal behavior; 2) food, water, air, light, minerals, or other nutritional or physiological requirements; 3) cover or shelter; 4) sites for breeding, reproduction, or rearing offspring; and, generally, 5) habitats that are protected from disturbance or are representative of the historic geographical and ecological distributions of this species (50 CFR 424.12(b)). In addition to these factors, NMFS also focuses on PCEs and/or essential habitat features within the designated area that are essential to the conservation of the species and that may require special management considerations or protection.

PCEs for CCC steelhead critical habitat, and their associated essential features within freshwater include:

1. Freshwater spawning sites with water quantity and quality conditions and substrate supporting spawning, incubation and larval development;
2. Freshwater rearing sites with:
    a. Water quantity and floodplain connectivity to form and maintain physical habitat conditions and support juvenile growth and mobility;
    b. Water quality and forage supporting juvenile development; and

[4] Viable populations have a high probability of long-term persistence (> 100 years).

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 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[5]: logging, agricultural and mining activities, urbanization, stream channelization, dams, wetland loss, and water withdrawals, including unscreened diversions for irrigation. Impacts of concern include alteration of stream bank and channel morphology, alteration of water temperatures, loss of spawning and rearing habitat, fragmentation of habitat, loss of downstream recruitment of spawning gravels, loss of large woody debris, degradation of water quality, removal of riparian vegetation resulting in increased stream bank erosion, increases in erosion and sedimentation in streams from upland areas, loss of shade (higher water temperatures) and loss of nutrient inputs (Busby *et al.* 1996; 70 FR 52488, September 2, 2005). Water development has drastically altered natural hydrologic cycles in many of the streams. This 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 across the range, does not provide the full extent of conservation value necessary for the recovery of the species.

D. Global Climate Change

Global climate change presents an additional potential threat to CCC steelhead and their critical habitat. Modeling of climate change impacts in California suggests that average summer air temperatures are expected to increase (Lindley *et al.* 2007). Heat waves are expected to occur more often, and heat wave temperatures are likely to be higher (Hayhoe *et al*. 2004). Total precipitation in California may decline; critically dry years may increase (Lindley *et al.* 2007, Schneider 2007). The Sierra Nevada snow pack may decrease by as much as 70 to 90 percent by the end of this century under the highest emission scenarios modeled (Luers *et al*. 2006). Wildfires are expected to increase in frequency and magnitude, by as much as 55 percent under the medium emissions scenarios modeled (Luers *et al*. 2006). Vegetative cover may also change, with decreases in evergreen conifer forest and increases in grasslands and mixed evergreen forests. The likely change in amount of rainfall in Northern and Central Coastal streams under

[5] Other factors, such as over fishing 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.

various warming scenarios is less certain, although as noted above, total rainfall across the state is expected to decline.

For the California North Coast, some models show large increases (75 to 200 percent) in rainfall amounts while other models show decreases of 15 to 30 percent (Hayhoe *et al*. 2004). Many of these changes are likely to further degrade CCC steelhead habitat by, for example, reducing stream flows during the summer and raising summer water temperatures. 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). In marine environments, ecosystems and habitats important to sub-adult and adult salmonids are likely to experience changes in temperatures, circulation, chemistry, and food supplies (Feely *et al.* 2004, Brewer 2008, Osgood 2008, Turley 2008). 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, Smith *et al.* 2007).

V. ENVIRONMENTAL BASELINE

The environmental baseline is an analysis of the effects of past and ongoing human and natural factors leading to the current status of the species, its habitat (including designated critical habitat), and ecosystem in the action area. 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 impacts of State or private actions which are contemporaneous with the consultation in process (50 CFR 402.02).

A. Action Area Overview

Upper Penitencia Creek is a tributary to Coyote Creek and located within Santa Clara County, California. The stream drains from the Diablo Mountain Range and the watershed encompasses approximately 24 square miles. It flows westward for approximately 11 miles into the Santa Clara Valley and through the City of San Jose, where it joins Coyote Creek. Coyote Creek flows for another 10 miles before entering the San Francisco Bay. The climate is Mediterranean, 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. Flows within the watershed are highly variable and can go quickly from low base flow conditions to high flows and then quickly recede again. Water from natural springs, a small (<500 acre-feet) reservoir (Cherry Flat Reservoir), operated by the City of San José, and a perennial tributary, Arroyo Aguague, enable Upper Penitencia Creek to maintain perennial flow through the action area.

B. Status of Listed Species and Habitat in Action Area

Steelhead within Upper Penitencia Creek are part of the broader Coyote Creek population; historically a functionally independent population (Spence *et al*. 2012). Recent redd surveys conducted by NMFS (Will and Stern 2012) between December 2010 and April 2011 identified nine steelhead redds and 20 *O. mykiss* (including one adult steelhead) within Upper Penitencia Creek. Although redd density throughout the entire Upper Penitencia Creek survey area (including its tributary, Arroyo Aguague) was low (1.3 redds per river mile), redd density was highest (approximately 1.6 redds per mile) in the upper survey reach (Will and Stern 2012), which encompasses the action area for this project. Will and Stern (2012) encountered several redds within the action area of this project, and adequate spawning and rearing habitat for steelhead is present throughout the action area.

The CDFG and SCVWD have conducted electrofishing surveys in Upper Penitencia Creek in recent years. The results of Leicester (2007, 2008, 2009, and 2011) and other recent surveys (Li 2001; Porcella 2002; Moore *et al*. 2008; Moore *et al.* 2009) conducted within Upper Penitencia Creek and the broader Coyote Creek watershed, indicate steelhead densities are very low in Coyote Creek downstream of Anderson Dam, and within Upper Penitencia Creek. During annual electrofishing surveys performed by CDFG between 2008 and 2010, *O. mykiss* were encountered within Alum Rock Park each of the survey years (Leicester 2008, 2009, and 2011). Juvenile steelhead densities in Alum Rock Park reported by Leicester (2008, 2009, and 2011) are significantly higher than densities reported from other locations within the Coyote Creek watershed (Li 2001; Porcella 2002; Moore *et al*. 2008; Moore *et al.* 2009). Leicester (2008) reports juvenile *O. mykiss* densities in Upper Penitencia Creek as high as 12.9 fish per 100 feet of stream near the Youth Science Institute Bridge, and in 2010, Leicester (2010) reports densities within Alum Rock Park between 4.1 and 7.1 fish per 100 feet of stream.

PCEs of designated critical habitat for CCC steelhead in the action area include sites for spawning, rearing, migration (70 FR 52488). Essential features of these sites include spawning gravels, water quality and quantity, natural cover including large substrate and aquatic vegetation, and forage species. Within the action area of this project, the essential features of these PCEs are partially degraded and limited due to altered stream flows, channelization, and bank stabilization, but are generally adequate to support steelhead. Some sites within the action area provide adequate cover for shelter to support juvenile steelhead and low velocity refuge habitat during high flow events. Good quality substrate to support adult spawning and juvenile rearing is present, but may be limited in some reaches. The construction of stone walls and bridges along Upper Penitencia Creek throughout the action area has resulted in narrower channels that lack resting pools and lack backwater habitats. The in-stream grade control structure near the Youth Science Institute has scoured the channel and created an impediment to the upstream passage of steelhead and other native fishes. This concrete grade control structure impairs migration by limiting the duration during which adult steelhead can pass upstream and likely precludes upstream passage for juveniles. Although critical habitat in the action area has been impaired by channelization and bank stabilization, it remains the best remaining accessible steelhead habitat in the Coyote Creek watershed.

C. Factors Effecting the Species Environment in the Action Area

Historically, Alum Rock Park was developed as a mineral spring resort and park. Rock and mortar, sacked concrete, and poured concrete walls, grade control structures, bridges, and bank stabilizations are located throughout the park. These developed features variously constrain the geomorphic functions of the stream, leading to passage impediments, limited floodplain connectivity, and loss of coarse gravel and woody debris recruitment. While flows within the watershed, including the action area, are highly variable and can go quickly from low base flow conditions to high flows and then quickly recede again, water discharges from natural springs, a small (<500 acre-feet) reservoir (Cherry Flat Reservoir), operated by the City of San José, and Arroyo Aguague (a perennial tributary located upstream of the action area), enable Upper Penitencia Creek to maintain perennial flow through the action area. Operation of Cherry Flat Reservoir likely reduces peak stream flows during high rainfall events early in the winter season, but due to its small capacity (<500 acre-feet) the reservoir fills and spills during most winter and early spring months.

D. Previous Section 7 Consultations and Section 10 Permits in the Action Area

Pursuant to section 7 of the ESA, NMFS has conducted two previous interagency consultations that affected the action area of this project.

In July 2002, NMFS and the Corps completed consultation on the Alum Rock Park Bank Stabilization Project on Upper Penitencia Creek (NMFS administrative record # 151422SWR2001SR949). Repairs were made with funding from the Federal Emergency Management Agency at several sites in Alum Rock Park to repair damage from the floods of 1998. Several sites utilized biotechnical methods, while others implemented hardscape repairs. Effects to steelhead associated with this project included a small amount of juvenile steelhead loss during one year due to relocation and dewatering, and temporary construction related impacts to in-stream and riparian habitat. Hardscape repair likely extended the life of some of the channel constrictions noted above in the Environmental Baseline.

In February 2004, NMFS and the Corps completed consultation on the Alum Rock Park, Quail Hollow Crossing Removal and Bridge Construction Project on Upper Penitencia Creek (NMFS administrative record #151422SWR2003SR8546). This project resulted in the removal of a concrete low flow crossing in Upper Penitencia Creek and the channel grade was stabilized with a series of bioengineered boulder weirs. Pedestrian access across the creek was provided by the installation of a free span bridge over Upper Penitencia Creek. The site was revegetated with native riparian vegetation. Effects to steelhead associated with this project included a small amount of juvenile steelhead loss during one year from relocation and dewatering, temporary construction related impacts to in-stream and riparian habitat, and long-term improvement to steelhead habitat associated with removal of a seasonal low flow crossing structure.

In addition to the above consultations, NMFS' Section 10(a)(1)(A) research and enhancement permits and section 4(d) limits or exceptions could potentially occur in the Upper Penitencia Creek 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. The SCVWD currently holds a permit to conducted electrofishing for juvenile steelhead in Upper Penitencia Creek. In addition, the National Parks Service, CDFG, and the URS currently hold research and enhancement permits with permit coverage for steelhead sampling over a wide area in northern California including the Upper Penitencia Creek watershed. However, of these permittees, CDFG is the only permitee that has sampled fish in the watershed. CDFG's sampling efforts are reported in Leicester (2007, 2008, 2009, 2011) and summarized above. CDFG has continued its annual sampling efforts in the watershed, and would be expected to perform sampling efforts during the period in which this project and its associated post-construction monitoring efforts are to occur.

VI. EFFECTS OF THE ACTION

The purpose of this section is to identify the direct and indirect effects of the proposed action, and any interrelated or interdependent activities, on threatened CCC steelhead. Our approach was based on knowledge and review of the ecological literature and other relevant materials. We used this information to gauge the likely effects of the proposed project via an exposure and response framework that focuses on what stressors (physical, chemical, or biotic), directly or indirectly caused by the proposed action, that salmonids are likely to be exposed to. Next, we evaluate the likely response of salmonids to these stressors in terms of changes to salmonids survival, growth, and reproduction, and changes to the ability of PCEs to support the value of critical habitat in the action area. PCEs include sites essential to support one or more life stages of the species. These sites in turn contain physical and biological features that are essential to the conservation of the species. Where data to quantitatively determine the effects of the proposed action on CCC steelhead and their critical habitat are limited or not available, our assessment of effects focused mostly on qualitative identification of likely stressors and responses.

Construction activities associated with Project Sites 1, 2, 3, 5, 8, 10 and 13 may affect steelhead through fish relocation, dewatering of stream reaches, and temporary increased sediment mobilization. Project Sites 4, 7, and 9 are located along upper bank areas adjacent to Upper Penitencia Creek and potential effects consist of impacts to riparian vegetation. Only juvenile steelhead are likely to be present in the action area during the June 15 through October 15 construction period. As described above in Status of the Species and Critical Habitat, steelhead adults and smolts are not expected to be with the action area during this period. Effects to designated critical habitat include the temporary impacts of dewatering and sediment mobilization noted above, and long-term beneficial effects expected through creation of floodplain areas and planting of native riparian vegetation. The potential effects of the project's proposed activities are presented in detail below.

A. Construction-Related Fish Collection and Relocation

To facilitate construction of Project Sites 1, 2, 3, 5, 8, 10 and 13, the streambed will be temporarily dewatered. To avoid fish stranding and exposure to construction activities, the project proposes to collect and relocate fish in the work area prior to dewatering. Before and during dewatering of the construction site, juvenile steelhead and other fish will be captured. Seining or dip netting will be utilized first to keep stress and injury to fish at a minimum. Electrofishing will be used in areas where seines and dip netting are not effective to collect fish.

Electrofishing, seining, and dip netting will only occur from June 15 – October 15 when there is no potential for adult steelhead or redds to be present as described above. For Project Site 1, approximately 150 feet of Upper Penitencia Creek will be dewatered and fish will be collected in this reach. For Project Sites 3 and 10, the dewater reach overlaps and approximately 100 feet of Upper Penitencia Creek will be dewatered and fish collected. For Project Sites 5 and 13, the dewater reach overlaps and approximately 500 feet of Upper Penitencia Creek will be dewatered and fish collected. For Project Site 8, approximately 150 feet of creek will be dewatered and fish collected. In total, fish collections and dewatering would occur over 900 linear feet of Upper Penitencia Creek at four sites.

Electrofishing efforts will be conducted only by, or under the supervision of, NMFS-approved, qualified individuals following *National Marine Fisheries Service Guidelines for Electrofishing Waters Containing Salmonids Listed Under the Endangered Species Act* (NMFS 2000). Fish within the 900 linear feet of channel in the immediate project area will be captured and then transported by a qualified fisheries biologist. Collected fish will be relocated away from the work site to Upper Penitencia Creek upstream or downstream of the dewatered work area.

Although sites selected for relocating fish should have similar water temperature as the capture sites and should have ample habitat, in some instances relocated fish may endure short-term stress from crowding at the relocation sites. Relocated fish may also have to compete with other fish causing increased competition for available resources such as food and habitat. 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 cannot accurately estimate the number of fish affected by competition, but does not believe this impact will adversely affect the survival chances of individual steelhead because crowding is not anticipated based on the small area that will likely be affected and the small number of juvenile steelhead likely to be relocated.

Since fish relocation activities will be conducted by qualified fisheries biologists following both CDFG and NMFS Electrofishing guidelines (NMFS 2000), direct effects to, and mortality of juvenile salmonids during capture will be minimized. Data on fish relocation efforts since 2004

for similar project types shows most injury and mortality rates are below three percent for steelhead (Collins 2004; CDFG 2005, 2006, 2007, 2008, 2009, 2010a, 2010b). Based on this information, NMFS estimates injury and mortalities will be less than three percent of those steelhead that are captured.

Though densities of steelhead vary throughout the action area, and may not be as high during construction as the highest densities of 12.9 fish per 100 feet described above in the Environmental Baseline and reported by Leicester (2008), we used the higher density value of 12.9 fish per 100 feet of stream to avoid underestimating the number of steelhead present in the action area. Based on this value (12.9 fish per 100 feet), we estimate that as many as 117 juvenile steelhead are likely to be present within the 900 feet of four reaches to be dewatered (900/100*12.9). As described above, NMFS expects injury and mortality of juvenile steelhead associated with electrofishing to be less than three percent of the total amount of steelhead captured. Given our assumption of 3 percent injury or mortality, NMFS expects no more than four juvenile steelhead will be harmed or killed by construction related fish collection and relocation efforts.

Fish that avoid capture during construction related relocation efforts may be exposed to risks described in the following section on dewatering (see B. Project Site Dewatering).

B. Project Site Dewatering

Cofferdams with sand bags and pipeline bypass systems will be used to temporarily divert flows around the four sites that require dewatering during construction. In total, the project will require dewatering of approximately 900 linear feet of Upper Penitencia Creek in the action area.

NMFS anticipates temporary changes to instream flow downstream of dewatered areas during dewatering prior to construction. These fluctuations in flow are anticipated to be small, gradual, and short-term because continuous flow downstream of the work site will be maintained at all times during construction. These fluctuations in flow are not anticipated to result in harm to steelhead. Once the actual dewatering operation is completed, stream flow above and below the work sites should be the same as free-flowing pre-project conditions except within the dewatered reach where stream flow is bypassed.

Stream flow diversion and project work area dewatering are expected to cause temporary loss, alteration, and reduction of aquatic habitat. Stream flow diversions could harm individual rearing juvenile steelhead by concentrating or stranding them in residual wetted areas before they are relocated. Rearing steelhead could be killed or injured if crushed during construction of the water bypass system; however, fish relocation efforts are expected to remove the majority of fish in the area and direct mortality is expected to be minimal.

Juvenile steelhead that avoid capture in the project work areas will likely die during dewatering activities due to desiccation or thermal stress. Due to the pre-dewatering fish relocation efforts to

be performed by qualified biologists, NMFS expects that the number of juvenile steelhead that will be killed as a result of stranding during dewatering activities will be less than one percent of the fish within the action area prior to dewatering. Using the data from Upper Penitencia Creek described above, NMFS estimates no more than two juvenile steelhead will remain in the action area and be subject to these effects.

The temporary cofferdams and water diversion structures in the stream are not expected to impact juvenile steelhead movements in Upper Penitencia Creek beyond typical summer low-flow conditions. The cofferdams and sand bags could restrict movement of juvenile steelhead in a manner similar to the normal seasonally low flow conditions that typically occur during summer and early fall in Upper Penitencia Creek. The limited duration of water diversion (16 weeks) is unlikely to adversely affect individual steelhead rearing upstream or downstream of the dewatered reach. NMFS expects these fish will be able to find food and cover upstream or downstream of the project reach as needed during the duration of project construction.

Benthic (bottom dwelling) aquatic macroinvertebrates are an important food source for salmonids. Benthic aquatic macroinvertebrates within the project 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 will be relatively short-lived (approximately 16 weeks) and the total area to be dewatered is relatively small (total of 900 feet over a period of three to six years). Rapid recolonization (typically one to two months) of disturbed areas by macroinvertebrates is expected following rewatering (Cushman 1985, Thomas 1985, Harvey 1986). In addition, the effect of macroinvertebrate loss on juvenile salmonids is likely to be negligible because food from upstream sources (via drift) would be available downstream of the dewatered areas since stream flow, if present, will be bypassed around the project work sites. Based on the foregoing, the loss of aquatic macroinvertebrates as a result of dewatering activities is not expected to adversely affect threatened CCC steelhead.

C. Upper Bank Construction Effects

At Project Sites 4, 7, and 9, construction will be limited areas along the upper creek bank and no equipment will enter the wetted perimeter of the stream. Work at Project Sites 4 and 9 consists of repairs to existing stone retaining walls. Repairs will be performed by filling voids and replacing stones. The footprint of the retaining walls will not be expanded and both sites are located high on the bank and above ordinary high water. At Project Site 7, a small (10 feet by 6 feet) area along the upper bank has failed and the failure has encroached on an existing hiking trail located at the top of the slope. The project proposes to install a 12-foot long timber lagging wall over the failure and backfill with earth to re-build the shoulder of the hiking trail.

Due to their location on the upper banks of the stream, proposed activities at Project Sites 4, 7, and 9 are not anticipated to directly affect fish, instream habitat, or water quality in upper Penitencia Creek. Construction crews and equipment will not contact the live stream, and no

dewatering or fish handling is required at these sites. The City has proposed sediment/erosion control measures. Based on our past experiences with similar measures, NMFS expects these measures will effectively prevent the introduction of sediment, construction debris, and contaminants into the stream. Repairs to stone retaining walls will remain within the existing footprint of the structures and the new 12-foot timber lagging wall will repair an existing failed slope on the bank. Removal of small, localized patches of riparian vegetation may be necessary to facilitate construction, however, this is not expected to substantially affect riparian cover, and the project includes measures to revegetate these temporarily disturbed areas. Juvenile steelhead residing in Upper Penitencia Creek are not likely to be impacted or disturbed by the proposed construction activities at these three sites, because the expected levels of disturbance are limited to small areas and work activities will be of short duration.

D. Toxic Chemicals

Construction in and adjacent to Upper Penitencia Creek will involve the use of heavy machinery in close proximity to the channel or in the dry channel bed. The use of heavy machinery in creek channels creates the potential for toxic materials associated with mechanical equipment, such as fuels, motor oils, and antifreeze to enter the stream or channel. Oils and similar substances from construction equipment can contain a wide variety of polynuclear aromatic hydrocarbons (PAHs), and metals. Both can result in adverse impacts to salmonids. PAHs can alter salmonid egg hatching rates and reduce egg survival as well as harm the benthic organisms that are a salmonid food source (Eisler 2000). Some of the effects that metals can have on salmonids are: immobilization and impaired locomotion, reduced growth, reduced reproduction, genetic damage, tumors and lesions, developmental abnormalities, behavior changes (avoidance), and impairment of olfactory and brain functions (Eisler 2000).

The project has included several measures which reduce the chances of toxins entering streams. These measures would ensure that instream construction work only occurs during the dry season (June 15 - October 15) and that heavy equipment will only be operated in a dry creek bed. Pollution control measures, such as keeping spill containment and remediation material nearby, and refueling and servicing vehicles outside of the stream bed will be used. Due to these measures, NMFS expects that accidents will be minimized and toxic chemical contamination of the action area will be minimized to levels which are unlikely to adversely affect fish.

E. Sedimentation and Turbidity

The proposed action will result in the disturbance of the streambed and banks for equipment access and construction. In-stream and near-stream construction activities may cause temporary increases in turbidity (reviewed in Furniss *et al*. 1991, Reeves *et al*. 1991, and Spence *et al*. 1996). NMFS anticipates these activities will result in small short-term increases in turbidity during rewatering and subsequent higher flows caused by winter storms after construction is completed.

Sediment may affect fish by a variety of mechanisms. High concentrations of suspended sediment can disrupt normal feeding behavior and efficiency (Cordone and Kelley 1961, Bjornn *et al.* 1977, Berg and Northcote 1985), reduce growth rates (Crouse *et al.* 1981), and increase plasma cortisol levels (Servizi and Martens 1992). High turbidity concentrations can reduce dissolved oxygen in the water column, result in reduced respiratory functions, reduce tolerance to 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 will cause salmonids to disperse from established territories (Waters 1995), which can displace fish into less suitable habitat and/or increase competition and predation, decreasing chances of survival. Increased sediment deposition can fill pools and reduce the amount of cover available to fish, decreasing the survival of juveniles (Alexander and Hansen 1986).

Although sediment and turbidity may affect listed salmonids, turbidity levels associated with this project are not expected to rise to the levels discussed in the previous paragraph. Monitoring of projects with similar amounts of stream bed and bank disturbance, (newly replaced culverts within Humboldt County), noted temporary increases in turbidity following winter storm events (County of Humboldt 2002, 2003, 2004); the measured turbidity increase was generally less than the turbidity threshold commonly cited as beginning to cause minor behavioral changes (Henley *et al*. 2000; Newcombe 2003), and the turbidity increase was always less than turbidity levels necessary to injure or kill salmonids.

During construction, sediment input to the creek is expected to be minimal, because the project proposes to use erosion control methods to hold soil and sediment in place on the bank. NMFS does not anticipate elevated suspended sediment levels associated this project to result in harm, injury, or behavioral impacts that could reduce the survival chances for threatened CCC steelhead within the action area.

F. Post-Construction Monitoring

To evaluate passage across the fish passage improvement project at Project 13, installation of either a PIT tag antenna station or a camera station is proposed at the upstream end of the site. Under the PIT tag alternative, post-construction monitoring would be performed by PIT tag readers which would detect tagged steelhead as they crossed the Pit tag antenna. The would be located at the upstream end of Project 13, upstream of the upstream-most jump, in order to record successful upstream movement. The installation of PIT tag antennas (readers) or a camera station is not expected to affect steelhead or critical habitat. This project will only install PIT tag antennas to detect fish tagged through other programs, does not propose to handle or tag fish associated with this effort, and will result in very minor, localized impacts to channel substrate and adjacent riparian and upland habitat associated with the placement of antennas and reader stations. Because the PIT tags will be deployed by the SCVWD under their ESA Section 10(a)(1)(A) research permit, this project's monitoring program will provided useful information regarding utilization by steelhead without handling or other adverse effects on the fish.

If the camera alternative is selected for monitoring fish passage, a camera would be installed underwater in the creek and a station established on the upper bank to collect and store the data. The site would be equipped with a power source (either battery power or direct power) necessary to power the equipment, and will be contained within small electronics equipment enclosures, such as those that are typically mounted to utility poles, fence posts, or other similar structures. Camera installation and operation are anticipated to have no effects on water quality, steelhead or habitat at Project Site 13. The camera has no external moving parts and no discharge of materials would occur. The camera would operate silently and would not disturb fish or other aquatic organisms in Upper Penitencia Creek. Similarly, the installation of the camera's land-based station with the power source and data storage equipment would not affect water quality, steelhead or habitat due its small size and selective placement on the upper bank.

G. Critical Habitat Effects

The anticipated effects of the Alum Rock Park Bank Stabilization and Stream Restoration Project on designated critical habitat for CCC steelhead are primarily beneficial. Project construction activities are expected to result in short-term disturbance to the channel and the adjacent streambank areas as described above. Localized impacts to water quality may occur in the form of increased levels of turbidity and suspended sediment, but these effects are expected to be minor, localized, and short-term. Over the long-term, implementation of the project is expected to reduce the input of fine sediment into the creek, restore unimpeded fish passage at a long-standing barrier, remove some stone walls which have channelized the stream, and restore floodplain areas adjacent to Upper Penitencia Creek .

All project sites have incorporated revegetation of areas temporarily disturbed by construction activities with native riparian plant species. Revegetation is expected to stabilize soils and improve riparian cover along the creek bank. At Project Sites 3/10, the removal of a 120-foot long stone wall, combined with excavation and grading of the bank, will create a floodplain area adjacent to Upper Penitencia Creek. This expanded area of floodplain will improve natural geomorphic and hydrologic processes in Upper Penitencia Creek. The widened floodplain will provide areas of low water velocity during storm events, sediment exchange, and support riparian vegetation. These elements are expected to benefit the overall diversity and complexity of habitat conditions along the stream.

At the Youth Science Institute grade control structure, the fish passage improvement project (Project Site 13) will improve access for steelhead and other native fish to approximately 2 miles of high quality habitat in Upper Penitencia Creek upstream of this site. The roughened channel design is expected to create water depths and velocities that allow for the upstream passage of adult and juvenile steelhead under a wide range of stream flow conditions. The roughened channel also includes design elements that support complex instream habitat that is important for juvenile steelhead.

For the above reasons, the project's construction effects on critical habitat are considered minimal and post-construction, the project is expected to enhance existing habitat values and fish passage. Failing bank areas along Upper Penitencia Creek in the action area will be stabilized. Existing native riparian plants and trees at project sites will generally be retained and new protective vegetation covering with riparian plants will be installed. Rehabilitated conditions in the action area are expected to increase habitat quality for native fish species including steelhead, improve fish passage, and increase productivity of invertebrates in the action area. Thus, the project's actions are expected to increase the value of PCE's of steelhead critical habitat in the action area.

VII. Cumulative Effects

Cumulative effects are defined in 50 CFR § 402.02 as "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". Any future federal actions will be reviewed through separate section 7 consultation processes and not considered here.

NMFS does not anticipate any cumulative effects in the action area other than those ongoing actions already described in the Environmental Baseline above, and resulting from climate change. Given current baseline conditions and trends, NMFS does not expect to see significant improvement in habitat conditions in the near future due to existing land and water development in the watershed. In the long term, climate change may produce temperature and precipitation changes that may adversely affect steelhead habitat in the action area. Because this project will improve habitat, it may provide some increased resistance to climate change.

VIII. INTEGRATION AND SYNTHESIS

CCC steelhead have experienced serious declines in abundance within the range of this 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. Long-term population trends suggest a negative growth rate and indicate that the DPS may not be viable in the long term. Threatened CCC steelhead occur in Upper Penitencia Creek in densities and abundance lower than historic conditions. Due to the timing of the proposed action, no adult steelhead or steelhead smolts will be adversely affected by project construction. However, some juvenile steelhead in the action area are likely to be adversely affected. The project is expected to provide significant long-term benefits to steelhead and designated critical habitat through the restoration of floodplain areas and fish passage improvements.

Juvenile steelhead within portions of the action area during the construction period will be temporarily disturbed by fish collection and relocation. Prior to dewatering for construction, fish

will be collected and relocated from work areas. Experienced fish biologists are expected to work effectively and have low injury and mortality rates during fish collections. Fish that elude capture and remain in project areas during construction activities will likely be lost to thermal stress or crushed by heavy equipment. However, based on the low mortality rates for similar relocation efforts, NMFS anticipates few, if any, juvenile listed salmonids may be harmed or killed by fish relocation and construction activities during implementation of this project. Anticipated mortality from electrofishing and dewatering combined are expected to be less than 3 percent of the fish in the area dewatered. Because no more than 117 juvenile steelhead are likely to be present within the 900 feet of dewatered reaches, NMFS expects no more than four (4) juvenile steelhead will be harmed or killed by construction related electrofishing and relocation efforts. Similarly, NMFS expects no more than two (2) steelhead to avoid capture and be harmed or killed during dewatering activities. Thus NMFS expects no more than 6 juvenile steelhead will be harmed or killed by construction related dewatering and fish relocation over the 3-6 year period of construction activities.

Post-construction fisheries monitoring may be performed by the project with the installation of either a PIT tag antenna array or a camera station at Project 13. These methods will be used to detect fish as they pass across the upstream limit of the fish passage project at Project Site 13. Because the PIT tags will be deployed by the SCVWD under their ESA Section 10(a)(1)(A) research permit, and both the camera and PIT tag antennas are passive monitoring methods that do not affect fish or water quality, the options proposed for post-construction fish monitoring are anticipated to have no adverse effects. Methods proposed for this project's monitoring program will provided useful information regarding fish passage without handling or other adverse effects on steelhead.

Due to the relatively large number of juveniles produced by each spawning pair, spawning in the Upper Penitencia Creek watershed in future years is likely to produce enough juveniles to replace the few that may be lost at the project sites due to relocation and dewatering. It is unlikely that the small potential loss of juveniles by this project will impact future adult returns in Upper Penitencia Creek. Because the number, distribution, and reproduction of CCC steelhead in Upper Penitencia Creek is unlikely to be appreciably reduced, NMFS does not expect appreciable reduction in the number, distribution, or reproduction of the CCC steelhead DPS from this proposed project.

When construction is completed, the project is expected to improve instream habitat, riparian habitat, and floodplain habitat conditions in the action area. Riparian vegetation plantings will enhance the action area's existing streamside habitat conditions by creating shade over the stream and instream cover along the waterline. The project is expected to improve habitat conditions and survival rates for all life history stages of threatened CCC steelhead in the action area. Based on the foregoing, NMFS anticipates that the value of critical habitat for the conservation of CCC steelhead will be enhanced by project actions within the action area.

Regarding future climate change effects in the action area, California could be subject to higher

average summer air temperatures and lower total precipitation levels. The Sierra Nevada snow pack may decrease by as much as 70 to 90 percent by the end of this century under the highest emission scenarios modeled. Reductions in the amount of precipitation would reduce stream flow levels in Northern and Central Coastal rivers. Estuaries may also experience changes in productivity due to changes in freshwater flows, nutrient cycling, and sediment amounts. For this project, construction would be completed no later than 2017 and the above effects of climate change are unlikely to be detected within that time frame. The short-term effects of project construction will have completely elapsed prior to initiation of climate change effects. Long-term benefits to habitat in the action area through the project's restoration actions may provide some increased resilience to climate change.

IX. CONCLUSION

After reviewing the best available scientific and commercial data, the current status of CCC steelhead, the environmental baseline for the action area, the effects of the proposed action, and the cumulative effects, it is NMFS' biological opinion that the City's Alum Rock Park Bank Stabilization and Stream Restoration Project located on Upper Penitencia Creek is not likely to jeopardize the continued existence of threatened CCC steelhead.

After reviewing the best available scientific and commercial data, the current status of the critical habitat, the environmental baseline for the action area, the effects of the proposed action, and the cumulative effects, it is NMFS' biological opinion that the City's Alum Rock Park Bank Stabilization and Stream Restoration Project located on Upper Penitencia Creek is not likely to adversely modify or destroy critical habitat for CCC steelhead.

X. INCIDENTAL TAKE STATEMENT

Section 9 of the ESA and Federal regulation pursuant to section 4(d) of the ESA prohibit the take of endangered and threatened species, respectively, without 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 NMFS as an act which actually kills or injures fish or wildlife. Such an act may include significant habitat modification or degradation which actually kills or injures fish or wildlife by significantly impairing essential behavioral patterns, including breeding, spawning, rearing, migrating, feeding, or sheltering. Incidental take is defined as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity. Under the terms of section 7(b)(4) and section 7(o)(2), taking that is incidental to and not intended as part of the agency action is not considered to be prohibited taking under the ESA provided that such taking is in compliance with the terms and conditions of this incidental take statement.

The measures described below are nondiscretionary, and must be undertaken by the Corps for the exemption in section 7(o)(2) to apply. The Corps has a continuing duty to regulate the activity covered by this incidental take statement. If the Corps (1) fails to assume and implement the terms and conditions, or (2) fails to require its designees to adhere to the terms and conditions of the incidental take statement, the protective coverage of section 7(o)(2) may lapse. In order to monitor the impact of incidental take, the Corps must report the progress of the actions and its impact on the species to NMFS as specified in the incidental take statement (50 CFR §402.14(I)(3)).

A. Amount or Extent of Take

The amount or extent of take described below is based on the analysis of effects of the action done in the preceding biological opinion. If the action is implemented in a manner inconsistent with the project description provided to NMFS, and as a result take of listed species occurs, such take would not be exempt from section 9 of the ESA.

Take of listed CCC steelhead may occur during fish relocation and dewatering in a 900- foot reach at the Upper Penitencia Creek project sites between June 15 and October 15 from 2012 through 2017. NMFS expects that no more than 3 percent of the pre-smolt juvenile steelhead within the cumulative 900 feet of dewatered channel will be injured, harmed or killed during fish relocation. NMFS expects no more than 1 percent of the pre-smolt juvenile steelhead within the cumulative 900 feet of dewatered channel to avoid capture and be injured, harmed or killed as a result of dewatering activities. Because no more than 117 juvenile steelhead are likely to be present within the 900 feet of dewatered reaches, NMFS expects no more than four (4) juvenile steelhead will be harmed or killed by construction related electrofishing and relocation efforts. Similarly, NMFS expects no more than two (2) steelhead to avoid capture and be harmed or killed during dewatering activities. The total amount of steelhead subject to harm or mortality by project construction is not expected to exceed six (6) juvenile steelhead.

B. 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.

C. Reasonable and Prudent Measures

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

1. Undertake measures to minimize harm and mortality to steelhead resulting from construction related fish relocation and dewatering

2. Undertake measures to minimize harm and mortality to steelhead resulting from construction activities.

3. Prepare and submit plans and reports regarding the effects of fish relocation, construction and post-construction site performance.

D. Terms and Conditions

In order to be exempt from the prohibitions of section 9 of the ESA, the Corps, its permittees, and their designees must comply with the following terms and conditions, which implement the reasonable and prudent measures described above and present reporting/monitoring requirements. These terms and conditions are nondiscretionary.

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

   a. Screens used on dewatering pumps must be in accordance with the *NMFS Addendum for Juvenile Fish Screen Criteria for Pump Intakes* [available at: http://swr.nmfs.noaa.gov/hcd/pumpcrit.pdf].

   b. The Corps and/or the permitees must retain a qualified biologist with expertise in the areas of anadromous salmonid biology, including handling, collecting, and relocating salmonids; salmonid/habitat relationships; and fisheries monitoring of salmonids. The Corps and permitees must ensure that any biologist working on these projects is qualified to conduct fish collections in a manner which minimizes all potential risks to steelhead. Electrofishing, if used, must be performed by a qualified biologist and conducted according to *NMFS Guidelines for Electrofishing Waters Containing Salmonids Listed under the Endangered Species Act*, June 2000. See: http://www.nwr.noaa.gov/ESA-Salmon-Regulations-Permits/4d-Rules/upload/electro2000.pdf.

   c. The qualified biologist must monitor the construction sites during placement and removal of cofferdams, channel diversions, and access ramps to ensure that any adverse effects to salmonids are minimized. The biologist must be on site during all dewatering events to capture, handle, and safely relocate steelhead. The Corps, permitee, or the biologist must notify NMFS biologist Darren Howe at (707) 575-3152 or Darren.Howe@noaa.gov one week prior to capture activities in order to provide an opportunity for NMFS staff to observe the activities.

   d. Steelhead must 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, aerated water protected from excessive noise, jostling, or overcrowding any time they are not in the stream, and fish must not be removed from this water except when released. To avoid predation, biologist(s) must have at least two

containers and segregate young-of-year fish from larger age-classes and other potential aquatic predators. Captured salmonids will be relocated, as soon as possible, to a suitable instream location in which suitable habitat conditions are present to allow for adequate survival of transported fish and fish already present.

e. If any salmonids are found dead or injured, the biologist must contact NMFS biologist Darren Howe by phone immediately at (707) 575-3152 or the NMFS Santa Rosa Area Office at 707-575-6050. The purpose of the contact is to review the activities resulting in take and to determine if additional protective measures are required. All salmonid mortalities must be retained, placed in an appropriately-sized sealable plastic bag, labeled with the date and location of collection, fork length, and be frozen as soon as possible. Frozen samples must 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 Santa Rosa Area Office without obtaining prior written approval from the NMFS Santa Rosa Area Office, Supervisor of the Protected Resources Division. 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 permitees must allow any NMFS employee(s) or any other person(s) designated by NMFS, to accompany field personnel to visit the project sites during activities described in this opinion.

b. Fill material for cofferdams will be fully confined with the use of plastic sheeting, sheetpiles, sandbags, or with other non-porous containment methods, such that sediment does not come in contact with stream flow or in direct contact with the natural streambed. All loose fill material for cofferdams or access ramps must be completely removed from the channel by October 15, and the creek must be returned to a natural grade and substrate condition.

c. Sediment must be removed from sediment controls once it has reached one-third of the exposed height of the control. Whenever straw bales are used, they must be staked and dug into the ground 5 inches. Catch basins must be maintained so that no more than 6 inches of sediment depth accumulates within traps or sumps.

d. Construction equipment used within the creek channel will be checked each day prior to work within the creek channel (top of bank to top of bank) and, if necessary, action will be taken to prevent fluid leaks. If leaks occur during work in the channel (top of bank to top of bank), the Corps, the permit holders, or their contractor will contain the spill and remove the affected soils.

e. Once construction is completed, all temporary, construction related, project-introduced material (pipe, gravel, cofferdam, *etc*.) must be removed. Excess materials will be disposed of at an appropriate upland site.

f. A biologist must periodically monitor in-channel activities and performance of sediment control or detention devices during construction for the purpose of identifying and reporting to the applicant, the Corps, and NMFS any condition that could adversely affect steelhead or their habitat beyond the conditions described in the preceding biological opinion.

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

a. The Corps, the City of San Jose (City) and the Santa Clara Valley Transportation Authority (VTA) must provide written reports to NMFS documenting the result of project construction and post-construction monitoring. The reports must be addressed to: NMFS Santa Rosa Area Office, Attention: Supervisor of Protected Resources Division, c/o Darren Howe, 777 Sonoma Avenue, Room 325, Santa Rosa, California, 95404-6528. Electronic copies must also be provided to Darren Howe by email: Darren.Howe@noaa.gov.

i. **Project Construction and Fish Relocation Report --** The report is due no later than the first January 31st after construction is completed, and must include the following contents:

1. **Construction Related Activities --** The report must include the dates construction began and was completed; a discussion of any unanticipated effects or unanticipated levels of effects on salmonids, a description of any and all measures taken to minimize those unanticipated effects and a statement as to whether or not the unanticipated effects had any effect on ESA-listed fish; the number of salmonids killed or injured during the project action; and photographs taken before, during, and after the activity from photo reference points.

2. **Fish Relocation –** The report must include a description of the location from which fish were removed and the release site including photographs; the date and time of the relocation effort; a description of the equipment and methods used to collect, hold, and transport salmonids; if an electrofisher was used for fish collection, a copy of the logbook must be included; the number of fish relocated by species; the number of fish injured or killed by species and a brief narrative of the circumstances surrounding ESA-listed fish injuries or mortalities; and a description of any problems which may have arisen during the

relocation activities and a statement as to whether or not the activities had any unforeseen effects.

ii. **Annual Monitoring Reports –** Project annual reports will be sent to the address above in 3a.

iii. **Post-Construction Monitoring and Reporting for Project Site 10 –** The City and VTA must develop a monitoring plan to assess the finish grade of the restored floodplain at Project Site 10. Methodology must assess the elevation of the restored floodplain and the frequency of stream flow inundation of area. The proposed monitoring plan for Project Site 10 must be submitted to NMFS (address specified in 3a above) for review and approval prior to December 31, 2012.

iv. **Post-Construction Monitoring and Reporting for Project Site 13** – The City and VTA must develop a monitoring plan to assess the physical conditions at the fish passage improvement project (Project Site 13). Monitoring of physical conditions must include the creek bed elevation to ensure the project functions as designed. The proposed monitoring plan for assessing physical conditions at Project Site 13 must be submitted to NMFS (address specified in 3a above) for review and approval prior to December 31, 2012.

v. **Post-Construction Fisheries Monitoring Plan –** The City and VTA prior to January 1, 2013, City and VTA must develop a monitoring plan to assess the biological performance of the fish passage improvement project (Project Site 13). The monitoring plan must be designed to evaluate the ability of the site to pass steelhead. The proposed monitoring plan for assessing biological conditions at Project Site 13 must be submitted to NMFS (address specified in 3a above) for review and approval prior to December 31, 2012.

XI. REINITIATION NOTICE

This concludes formal consultation for the City's proposed Upper Penitencia Creek Bank Repair and Stream Restoration Project on Upper Penitencia Creek. As provided in 50 CFR §402.16, 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 take is exceeded; (2) new information reveals effects of the action that may affect listed species or critical habitat in a manner or to an extent not previously considered; (3) the identified action is subsequently modified in a manner that causes an effect to listed species or critical habitat that was not considered in the biological opinion; or (4) a new species is listed or critical habitat designated that may be affected by the identified action. In instances where the amount or extent of incidental take is exceeded, formal consultation must be reinitiated immediately.

XII. LITERATURE CITED

Ainslie, B.J., J.R. Post, and A.J. Paul. 1998. Effects of pulsed and continuous DC electrofishing on juvenile rainbow trout. North American Journal of Fisheries Management 18:905-918.

Alexander, G.R., and E.A. Hansen. 1986. Sand bed load in a brook trout stream. North American Journal of Fisheries Management 6:9-23.

Barnhart, R.A. 1986. Species profiles: life histories and environmental requirements of coastal fishes and invertebrates (Pacific Southwest), steelhead. United States Fish and Wildlife Service Biological Report 82 (11.60). 21 pages.

Berg, L., and T.G. Northcote. 1985. Changes in territorial, gill-flaring, and feeding behavior in juvenile coho salmon (*Oncorhynchus kisutch*) following short-term pulses of suspended sediment. Canadian Journal of Fisheries and Aquatic Sciences 42:1410-1417.

Bjorkstedt, E.P, B.C. Spence, J.C. Garza, D.G. Hankin, D. Fuller, W.E. Jones, J.J. Smith, and R. Macedo. 2005. An Analysis of Historical Population Structure For Evolutionarily Significant Units of Chinook Salmon, Coho Salmon, and Steelhead in the North-Central California Coast Recovery Domain. NOAA Technical Memorandum NOAA-TM-NMFS_SWFSC-382. 210 pages.

Bjornn, T.C., M.A. Brusven, M.P. Molnau, J.H. Milligan, R.A. Klamt, E. Chacho, and C. Schaye. 1977. Transport of granitic sediment in streams and its effect on insects and fish. University of Idaho, Forest, Wildlife, and Range Experiment Station, Bulletin 17, Moscow, Idaho.

Bjornn, T.C., and D.W. Reiser. 1991. Habitat requirements of salmonids in streams. Pages 83-138 *in* W.R. Meehan, editor. Influences of Forest and Rangeland Management on Salmonid Fishes and Their Habitats. American Fisheries Society Special Publication 19. American Fisheries Society. Bethesda, Maryland. 751 pages.

Brewer, P.G. and J. Barry. 2008. Rising Acidity in the Ocean: The Other CO2 Problem. Scientific American. October 7, 2008.

Busby, P.J., T.C. Wainwright, G.J. Bryant., L. Lierheimer, R.S. Waples, F.W. Waknitz, and I.V. Lagomarsino. 1996. Status review of west coast steelhead from Washington, Idaho, Oregon, and California. United States Department of Commerce, National Oceanic and Atmospheric Administration Technical Memorandum NOAA Fisheries-NWFSC-27. 261 pages.

CDFG (California Department of Fish and Game). 2005. Report to the National Marine Fisheries Service for Fisheries Restoration Grant Program Projects conducted under Department of the Army Regional General Permit No. 12 (Corps File No. 27922N) within the United States Army Corps of Engineers, San Francisco District, January 1, 2004 through December 31, 2004. March 1.

CDFG (California Department of Fish and Game). 2006. Annual report to the National Marine Fisheries Service for Fisheries Restoration Grant Program Projects conducted under Department of Army Regional General Permit No. 12 (Corps File No. 27922N) within the U.S. Army Corps of Engineers, San Francisco District, January 1, 2005 through December 31, 2005. CDFG Region 1, Fortuna Office. March 1.

CDFG (California Department of Fish and Game). 2007. Annual report to the National Marine Fisheries Service for Fisheries Restoration Grant Program Projects conducted under Department of Army Regional General Permit No. 12 (Corps File No. 27922N) within the U.S. Army Corps of Engineers, San Francisco District, January 1, 2006 through December 31, 2006. Northern Region, Fortuna Office. March 1.

CDFG (California Department of Fish and Game). 2008. Annual report to the National Marine Fisheries Service for Fisheries Restoration Grant Program Projects conducted under Department of Army Regional General Permit No. 12 (Corps File No. 27922N) within the U.S. Army Corps of Engineers, San Francisco District, January 1, 2007 through December 31, 2007. Northern Region, Fortuna Office. March 1.

CDFG (California Department of Fish and Game). 2009. Annual report to the National Marine Fisheries Service for Fisheries Restoration Grant Program Projects conducted under Department of Army Regional General Permit No. 12 (Corps File No. 27922N) within the U.S. Army Corps of Engineers, San Francisco District, January 1, 2008 through December 31, 2008. Northern Region, Fortuna Office. March 1.

CDFG (California Department of Fish and Game). 2010a. Unpublished data documenting history of fish trapped at Warm Springs Hatchery (Dry Creek) between 1980/81 and 2009/10.

CDFG (California Department of Fish and Game). 2010b. Annual report to the National Marine Fisheries Service for Fisheries Restoration Grant Program Projects conducted under Department of Army Regional General Permit No. 12 (Corps File No. 27922N) within the U.S. Army Corps of Engineers, San Francisco District, January 1, 2009 through December 31, 2009. Northern Region, Fortuna Office. March 1.

Collins, B.W. 2004. Report to the National Marine Fisheries Service for instream fish relocation activities associated with fisheries habitat restoration program projects conducted under Department of the Army (Permit No. 22323N) within the United States Army Corps of

Engineers, San Francisco District, during 2002 and 2003. California Department of Fish and Game, Northern California and North Coast Region. March 24, 2004. Fortuna, California.

Cordone, A.J., and D.W. Kelley. 1961. The influences of inorganic sediment on the aquatic life of streams. California Fish and Game 47:189-228.

County of Humboldt. 2002. Memo from Ann Glubczynski, County of Humboldt Public Works, to Margaret Tauzer, National Marine Fisheries Service, titled "2002 Monitoring Report – Five Fish Passage Enhancement Projects". June 27, 2002. 1 page.

County of Humboldt. 2003. Memo from Ann Glubczynski, County of Humboldt Public Works, to Margaret Tauzer, National Marine Fisheries Service, titled "2003 Monitoring Report – Eleven Culvert Replacements for Fish". June 23, 2003. 2 pages.

County of Humboldt. 2004. Memo from Ann Glubczynski, County of Humboldt Public Works, to Margaret Tauzer, National Marine Fisheries Service, titled "2002 Monitoring Report – Eleven Culvert Replacements for Fish Passage". June 10, 2004. 2 pages.

Cox, P., and D. Stephenson. 2007. A changing climate for prediction. Science 113:207-208.

Crouse, M.R., C.A. Callahan, K.W. Malueg, and S.E. Dominguez. 1981. Effects of fine sediments on growth of juvenile coho salmon in laboratory streams. Transactions of the American Fisheries Society 110:281-286.

Cushman, R.M. 1985. Review of ecological effects of rapidly varying flows downstream from hydroelectric facilities. North American Journal of Fisheries Management. 5:330-339.

Dalbey, S.R., T.E. McMahon, and W. Fredenberg. 1996. Effect of electrofishing pulse shape and electrofishing-induced spinal injury on long-term growth and survival of wild rainbow trout. North America Journal of Fisheries Management 16:560-569.

Eisler, R. 2000. Handbook of Chemical Risk Assessment: Health Hazards to Humans, Plants, and Animals. Volume 1, Metals. Lewis Press, Boca Raton, FL.

Feely, R.A., C.L. Sabine, K. Lee, W. Berelson, J. Kleypas, V.J. Fabry, and F.J. Millero. 2004. Impact of anthropogenic CO2 on the CaCO3 system in the oceans. Science 305, 362-366.

Fukushima L., and E.W. Lesh. 1998. Adult and juvenile anadromous salmonid migration timing in California streams. California Department of Fish and Game 84(3):133-145.

Furniss, M.J., T.D. Roelofs, and C.S. Lee. 1991. Road construction and maintenance. Pages 297-323 *in* W.R. Meehan, editor. Influences of Forest and Rangeland Management on Salmonid Fishes and Their Habitats. American Fisheries Society Special Publication 19. 751 pages.

Good, T.P., R.S. Waples, and P. Adams (editors). 2005. Updated status of federally listed ESUs of West Coast salmon and steelhead. United States Department of Commerce, NOAA Technical Memorandum NMFS-NWFSC-66. 598 pages.

Gregory, R.S., and T.G. Northcote. 1993. Surface, planktonic, and benthic foraging by juvenile Chinook salmon (Oncorhynchus tshawytscha) in turbid laboratory conditions. Canadian Journal of Fisheries and Aquatic Sciences 50:233-240.

Grossinger, R. M., R. A. Askevold, C. J. Striplen, *et al*. 2006. Coyote Creek Watershed Historical Ecology Study: historical condition, landscape change, and restoration potential in the Eastern Santa Clara Valley, California. Prepared for the Santa Clara Valley Water District. A report of SFEI's Historical Ecology, Watersheds, and Wetlands Science Programs, SFEI Publication 426, San Francisco Estuary Institute, Oakland, CA.

Harvey, B.C. 1986. Effects of suction gold dredging on fish and invertebrates in two California streams. North American Journal of Fisheries Management 6:401-409.

Hayes, D.B., C.P. Ferreri, and W.W. Taylor. 1996. Active fish capture methods. Pages 193-220 *in* B.R. Murphy and D.W. Willis, editors. Fisheries Techniques, 2nd edition. American Fisheries Society. Bethesda, Maryland. 732 pages.

Hayhoe, K., D. Cayan, C. B. Field, P. C. Frumhoff, E. P. Maurer, N. L. Miller, S. C. Moser, S. H. Schneider, K. N. Cahill, E. E. Cleland, L. Dale, R. Drapek, R. M. Hanemann, L. S. Kalkstein, J. Lenihan, C. K. Lunch, R. P. Neilson, S. C. Sheridan, and J. H. Verville. 2004. Emissions pathways, climate change, and impacts on California. Proceedings of the National Academy of Sciences of the United States of America, volume 101: 12422-12427.

Henley, W.F., M.A. Patterson, R.J. Neves, and A. Dennis Lemly. 2000. Effects of sedimentation and turbidity on lotic food webs: a concise review for natural resource managers. Reviews in Fisheries Science 8(2):125-139.

Hubert, W.A. 1996. Passive capture techniques. Pages 157-192 *in* B.R. Murphy and D.W. Willis, editors. Fisheries Techniques. Second Edition. American Fisheries Society. Bethesda, Maryland. 732 pages.

Jordan, B.A., W.K. Annable, C.C. Watson, and D. Sen. 2009. Contrasting stream stability characteristics in adjacent urban watersheds: Santa Clara Valley, California. River Research and Applications. DOI:10.1002/rra.1333

Keeley, E.R. 2003. An experimental analysis of self-thinning in juvenile steelhead trout. Oikos 102:543-550.

Leicester, M. 2007. Results of Steelhead Sampling on Upper Penitencia Creek, California Department of Fish and Game.

Leicester, M. 2008. Upper Penitencia Creek 2008 Fish Sampling Results, California Department of Fish and Game.

Leicester, M. 2009. Upper Penitencia Creek Fish Sampling, California Department of Fish and Game.

Leicester, M. 2011. Upper Penitencia Creek Fish Resources and Environmental Monitoring for 2010, California Department of Fish and Game.

Li, S. 2001. Draft electrofishing surveys on Guadalupe Creek, Stevens, Coyote and Penitencia Creeks: catch results. Loomis, CA, Aquatic Systems Research.

Lindley, S. T., R. S. Schick, E. Mora, P. B. Adams, J. J. Anderson, S. Greene, C. Hanson, B. P. May, D. R. McEwan, R. B. MacFarlane, C. Swanson, and J. G. Williams. 2007. Framework for assessing viability of threatened and endangered Chinook salmon and steelhead in the Sacramento-San Joaquin Basin. San Francisco Estuary and Watershed Science, 5.

Luers, A.L., Cayan, D.R., and G. Franco. 2006. Our Changing Climate, Assessing the Risks to California. A summary report from the California Climate Change Center. 16 pages.

McEwan, D.R. 2001. Central Valley steelhead. California Department of Fish and Game, Fish Bulletin 179(1):1-44.

McElhany, P., M.H. Rucklelshaus, M.J. Ford, T.C. Wainwright, and E.P. Bjorkstedt. 2000. Viable Salmonid Populations and the Recovery of Evolutionarily Significant Units. United States Department of Commerce, National Oceanic and Atmospheric Administration Technical Memorandum NMFS-NWFSC-42. 156 pages.

Mesa, M.G., and C.B. Schreck. 1989. Electrofishing mark-recapture and depletion methodologies evoke behavioral and physiological changes in cutthroat trout. Transactions of the American Fisheries Society 118:644-658.

Meehan, W.R., and T.C. Bjornn. 1991. Salmonid distribution and life histories. Pages 47-82 *in* Influences of Forest and Rangeland Management on Salmonid Fishes and Their Habitats. W.R. Meehan, editor. American Fisheries Society Special Publication 19. American Fisheries Society. Bethesda, Maryland. 751 pages.

Moore, M., L. Porcella, D. Salsbery, and K. Sibley. 2008. Mid-Coyote Flood Protection Project. Baseline Fisheries Monitoring Report Year 1 (2007). Santa Clara Valley Water District. April 1, 2008. 71 pages

Moore, M., L. Porcella, D. Salsbery, and V. Stevens. 2009. Mid-Coyote Flood Protection Project. Baseline Fisheries Monitoring Report Year 2 (2008). Santa Clara Valley Water District.

Newcombe, Charles P. 2003. Impact assessment model for clear water fishes exposed to excessively cloudy water. Journal of the American Water Resources Associations. 39(3): 529-544.

NMFS (National Marine Fisheries Service). 1997. Status review update for West Coast steelhead from Washington, Idaho, Oregon, and California. United States Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service. 68 pages.

NMFS (National Marine Fisheries Service). 2000. Guidelines for Electrofishing Waters Containing Salmonids Listed Under the Endangered Species Act. June 2000. United States Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service. 5 pages.

Osgood, K. E. (editor). 2008. Climate Impacts on U.S. Living Marine Resources: National Marine Fisheries Service Concerns, Activities and Needs. U.S. Dep. Commerce, NOAA Tech. Memo. NMFSF/ SPO-89, 118 p.

Porcella, L. 2002. Memo - Fish Trapping, Summary 1998-2001 upmigrant trapping and 1998-2000 outmigrant trapping, Guadalupe River and Coyote Creek, Santa Clara Valley Water District (SCVWD): 26.

Reeves, G.H., J.D. Hall, T.D. Roelofs, T.L. Hickman, and C.O. Baker. 1991. Rehabilitating and modifying stream habitats. Pages 519-557 *in* W.R. Meehan, editor. Influences of Forest and Rangeland Management on Salmonid Fishes and Their Habitats. American Fisheries Society Special Publication 19. 751 pages.

Reichmuth, M.L., B.J. Ketcham, and D. Fong. 2005. 2004 coho salmon section 10 permit report. Annual report submitted to National Marine Fisheries Service on activities

conducted under section 10(a)(1)(A) scientific research Permit 1046. PORE-NR-WR-05/05. National Park Service, Point Reyes National Seashore. September, 2005.

Scavia, D., J.C. Field, D.F. Boesch, R.W. Buddemeier, V. Burkett, D.R. Cayan, M. Fogarty, M.A. Harwell, R.W. Howarth, C. Mason, D.J. Reed, T.C. Royer, A.H. Sallenger, and J.G. Titus. 2002. Climate Change Impacts on U.S. Coastal and Marine Ecosystems. Estuaries, volume 25(2): 149-164.

Schneider, S. H. 2007. The unique risks to California from human-induced climate change. California State Motor Vehicle Pollution Control Standards; Request for Waiver of Federal Preemption, presentation May 22, 2007.

Servizi, J.A., and D.W. Martens. 1992. Sublethal responses of coho salmon (*Oncorhynchus kisutch*) to suspended sediments. Canadian Journal of Fisheries and Aquatic Sciences 49:1389-1395.

Shapovalov, L., and A.C. Taft. 1954. The life histories of the steelhead rainbow trout (*Salmo gairdneri gairdneri*) and silver salmon (*Oncorhynchus kisutch*) with special reference to Waddell Creek, California, and recommendations regarding their management. California Department of Fish and Game, Fish Bulletin 98:1-375.

Shirvell, C.S. 1990. Role of instream rootwads as juvenile coho salmon (*Oncorhynchus kisutch*) and steelhead trout (*O. mykiss*) cover habitat under varying stream flows. Canadian Journal of Fisheries and Aquatic Sciences 47:852-860.

Sigler, J.W., T.C. Bjournn, and F.H. Everest. 1984. Effects of chronic turbidity on density and growth of steelhead and coho salmon. Transactions of the American Fisheries Society 113:142-150.

Smith, D.M., Cusack, S., Colman, A.W., Folland, C.K., Harris, G.R., and Murphy, J.M. 2007. Improved surface temperature prediction for the coming decade from a global climate model. Science 317:796-799.

Spence, B.C., G.A. Lomnicky, R.M. Hughes, R.P. Novitzki. 1996. An ecosystem approach to salmonid conservation. Management Technology. Corvallis, Oregon.

Spence, B., G., E. P. Bjorkstedt, J. C. Garza, J. J. Smith, D. G. Hankin, D. Fuller, W. E. Jones, R. Macedo, T. H. Williams, and E. Mora. 2008. A framework for assessing the viability of threatened and endangered salmon and steelhead in the North-Central California Coast Recovery Domain. U.S. Department of Commerce, NOAA, National Marine Fisheries Service, Southwest Fisheries Science Center. 194 pp.

Spence, B.C., Bjorkstedt E.P., Paddock, S. and L. Nanus. 2012. Updates to biological viability criteria for threatened steelhead populations in the North-Central California Coast Recovery Domain. National Marine Fisheries Service. Southwest Fisheries Science Center, Fisheries Ecology Division. March 23.

Stillwater Sciences. 2006. Upper Penitencia Creek limiting factors analysis final technical report. Prepared for Santa Clara Valley Urban Runoff Pollution Prevention Program.

Thomas, V.G. 1985. Experimentally determined impacts of a small, suction gold dredge on a Montana stream. North American Journal of Fisheries Management 5:480-488.

Turley, C. 2008. Impacts of changing ocean chemistry in a high-CO2 world. Mineralogical Magazine, February 2008, 72(1). 359-362.

Velagic, E. 1995. Turbidity study: a literature review. Prepared for the Delta Planning Branch, California Department of Water Resources by Centers for Water and Wildland Resources, University of California, Davis.

Waters, T. F. 1995. Sediment in Streams: Sources, Biological Effects, and Control. American Fisheries Society Monograph 7. 249 pages.

Will, L.A., and G. Stern. 2012. Upper Penitencia Creek Steelhead (*Oncorhynchus mykiss*) Redd Survey Report 2010-2011. U.S. Department of Commerce, NOAA, National Marine Fisheries Service, Protected Resources Division, Southwest Region. February 2012. 29 pages.

Williams, T.H. S.T. Lindley, B.C. Spence, and D. A. Boughton. 2011. Status Review Update for Pacific Salmon and Steelhead Listed Under the Endangered Species Act: Southwest 17 May 2011 – Update to 5 January 2011 report. National Marine Fisheries Service Southwest Fisheries Science Center. Santa Cruz. CA.

Federal Register Notices Cited

62 FR 43937: National Marine Fisheries Service. Final Rule: Listing of Several Evolutionary Significant Units of West Coast Steelhead. Federal Register 62:43937-43954. August 18, 1997.

70 FR 52488: National Marine Fisheries Service. Final critical habitat designations for 19 West Coast salmon and steelhead ESUs. Federal Register 70:52488–52627. September 2, 2005.

71 FR 834: National Marine Fisheries Service. Final Listing Determinations for Ten Distinct Population Segments of West Coast Steelhead; Final Rule. Federal Register 71:834-862. January 5, 2006.

Personal Communication

Jahn, Jeffrey. NMFS, November 2010.