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

June 13, 2012

In response refer to:
2012/00083

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

Dear Colonel DiCiro:

Thank you for your letter of January 17, 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 Marin County Flood Control and Water Conservation District's (District) proposed sediment removal from lower Novato Creek and tributaries. The project is located along a portion of Novato Creek and its tributaries within the City of Novato, Marin County, California (Corps File No. 2004-28601N).

This document transmits NMFS' biological opinion (Enclosure) based on our review of the U.S. Army Corps of Engineers' (Corps) proposed issuance of a Clean Water Act Section 10 and Section 404 permit to the District for undertaking the sediment removal project. Threatened Central California Coast (CCC) steelhead (*Oncorhynchus mykiss*) are present within the project's action area, though Novato Creek is not designated critical habitat for any species under the jurisdiction of NMFS. The enclosed biological opinion describes NMFS' analysis of the effects of the issuance and implementation of the permit on threatened CCC steelhead in accordance with section 7 of the ESA. In the enclosed biological opinion, NMFS concludes the project is not likely to jeopardize the continued existence of CCC steelhead. NMFS anticipates take of ESA-listed CCC steelhead will occur as a result of the project. Therefore, NMFS has included an incidental take statement with non-discretionary terms and conditions with the enclosed biological opinion.

Also, NMFS reviewed the proposed project for potential project-related effects to Essential Fish Habitat (EFH) under the Magnuson-Stevens Fisheries Conservation and Management Act (16 U.S.C. 1801 *et seq.*) Based on the project description and the location of the project in the Novato Creek watershed, NMFS has determined that EFH does not occur in the project area and

will not be affected by the proposed action. Therefore, no EFH consultation was conducted by NMFS.

Please contact Daniel Logan at (707) 575-6053 or by email at dan.logan@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, California
Bryan Matsumoto, Corps Regulatory Division, San Francisco, California
Hugh Davis, Marin County Flood Control & Water Conservation District, San Rafael, California
Copy to Administrative File: 151422SWR2012SR00021

Enclosure

BIOLOGICAL OPINION

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

ACTION: Lower Novato Creek Sediment Removal Project (Corps File No. 2004-28601N).

CONSULTATION CONDUCTED BY: National Marine Fisheries Service, Southwest Region

TRACKING NUMBER: 2012/00083

DATE ISSUED: **June 13, 2012**

I. CONSULTATION HISTORY

On January 19, 2012, NOAA's National Marine Fisheries Service (NMFS) received a letter dated January 17, 2012, from the U.S. Army Corps of Engineers (Corps), San Francisco District, requesting initiation of formal consultation on the Lower Novato Creek Sediment Removal Project in Marin County, California. The project site is in the City of Novato. The Corps determined that the project, as proposed, is not likely to adversely affect Central California Coast (CCC) coho salmon (*Oncorhynchus kisutch*), Central Valley steelhead (*O. mykiss*), Central Valley Spring-Run Chinook salmon (*O. tshawytscha*), Sacramento River Winter-Run Chinook salmon, and the Southern Distinct Population Segment (DPS) of North American green sturgeon (*Acipenser medirostris*), and requested informal consultation regarding these species. Further, the Corps determined that the project, as proposed, is likely to adversely affect CCC steelhead, and requested initiation of formal consultation regarding this species. Based on NMFS' review of the project description, the location of the project in the Novato Creek watershed, and the project's action area, NMFS determined that the project, as proposed, will have no effect on CCC coho salmon, Central Valley steelhead, Central Valley Spring-Run Chinook salmon, Sacramento River Winter-Run Chinook salmon, or the Southern DPS of North American green sturgeon. These species, and their critical habitats, are not present in the project's action area and are not discussed further in this biological opinion. CCC steelhead are present in Novato Creek and are likely to be adversely affected by the proposed project.

This biological opinion is based on information provided to NMFS by the Corps with its January 17, 2012, letter. Also, NMFS considered other sources of scientific and commercial information, including journal articles and technical reports. A complete administrative record of this

consultation is on file in the NMFS North Central Coast Office (File Number 151422SWR2012SR00021).

II. DESCRIPTION OF PROPOSED ACTION

The Corps proposes to issue a permit (Corps File No. 2004-28601N) to the Marin County Flood Control and Water Conservation District (District) under Section 10 and Section 404 of the Clean Water Act for the Lower Novato Creek Sediment Removal Project. The purpose of the proposed project is to minimize the risk of flooding in areas surrounding lower Novato Creek. To achieve this purpose, sediment in portions of Novato Creek and two of its tributaries will be removed by heavy equipment. Project construction will be limited to one summer/fall dry season and will occur between June 15 and October 31 of 2012. NMFS does not anticipate any interdependent or interrelated actions associated with the proposed action.

A. Description of Proposed Work

The applicant proposes to use excavators to remove about 70,000 cubic yards of substrate from Novato Creek and two of its tributaries, Warner Creek and Arroyo Avichi, to restore 50 year flood capacity to these channels. Prior to dredging the material, the applicant will place temporary cofferdams across the streams at the upstream and downstream ends of the project sites. The cofferdams will be constructed using compacted native materials and a waterproof membrane. All cofferdams and associated structures used for dewatering will be removed from the work areas following substrate dredging. All water between the cofferdams, as well as any persistent surface flow from upstream of the cofferdams, will be collected using screened pumps and conveyed to the Baccaglio Basin detention pond. Final grading of the dewatered channels will be done with bulldozers or other heavy equipment.

B. Description of Proposed Minimization Measures

To minimize direct impacts to fish, all fish present will be collected and relocated to upstream areas with suitable habitat. Fish relocation will occur as the channels are dewatered prior to sediment removal. Fish relocation activities will be conducted by qualified fisheries biologists following both California Department of Fish and Game (CDFG) and NMFS guidelines. To reduce turbidity, dredging will not occur until the channel is dewatered. The applicant will use best management practices (BMPs) to control sediment and other potential pollutants from entering the Novato Creek or its tributaries during project activities. Some riparian vegetation will be removed during the project; however, no riparian trees will be removed. Any disturbed areas (access ramps and spoils areas) will be seeded with native grasses. A low flow channel will be recreated in the channel bottom once sediments are removed.

The Corps proposes to incorporate the following special conditions in its permit provided to Marin County to further minimize effects to threatened steelhead:

1) All debris generated as a result of project construction shall be removed from the site and disposed of at Redwood Landfill.
2) All removed sediment will be transported by truck and disposed of at the Novato Levee, Gnoss Field, Marsh Road, or Redwood Landfill, all in designated upland locations.
3) Cofferdams must be removed immediately following project completion and by October 31.
4) Heavy machinery will be kept out of the creek channel to the maximum extent practicable for project completion.
5) All staging, maintenance, and storage of heavy machinery shall be conducted in such a location and manner that no fuel, oil, or other petroleum products may run off or be washed by rainfall into the water or creek bottom.
6) All appropriate best management practices shall be implemented throughout the project site to help minimize sediment disturbance and suspension within the water.
7) Any change in the project design, materials, or construction methods, must be approved by the Corps in writing.

C. Description of the Action Area

The action area encompasses 6,130 linear feet of Novato Creek extending from about the Diablo Avenue crossing, downstream to 500 feet downstream of the Northwestern Pacific Railroad trestle, and portions of two Novato Creek tributaries: Warner Creek and Arroyo Avichi (Figure 1). In Warner Creek the project area extends from near the Diablo Avenue crossing to the streams confluence with Novato Creek and is 2280 linear feet. The project area for Arroyo Avichi is 1180 linear feet from near the South Novato Boulevard crossing of Arroyo Avichi to the stream's confluence with Novato Creek. These lengths include the amount of stream to be dewatered, plus an additional 500 feet upstream in each stream to allow for fish relocations. The action area extends laterally to encompass the riparian corridor to the top of bank of all three streams. The action area is sufficiently large enough to include any area downstream in which measurable turbidity or fish relocations may occur. The action area is within the City of Novato, Marin County, California. Novato Creek is a tributary to San Pablo Bay.

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 DPS's 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.

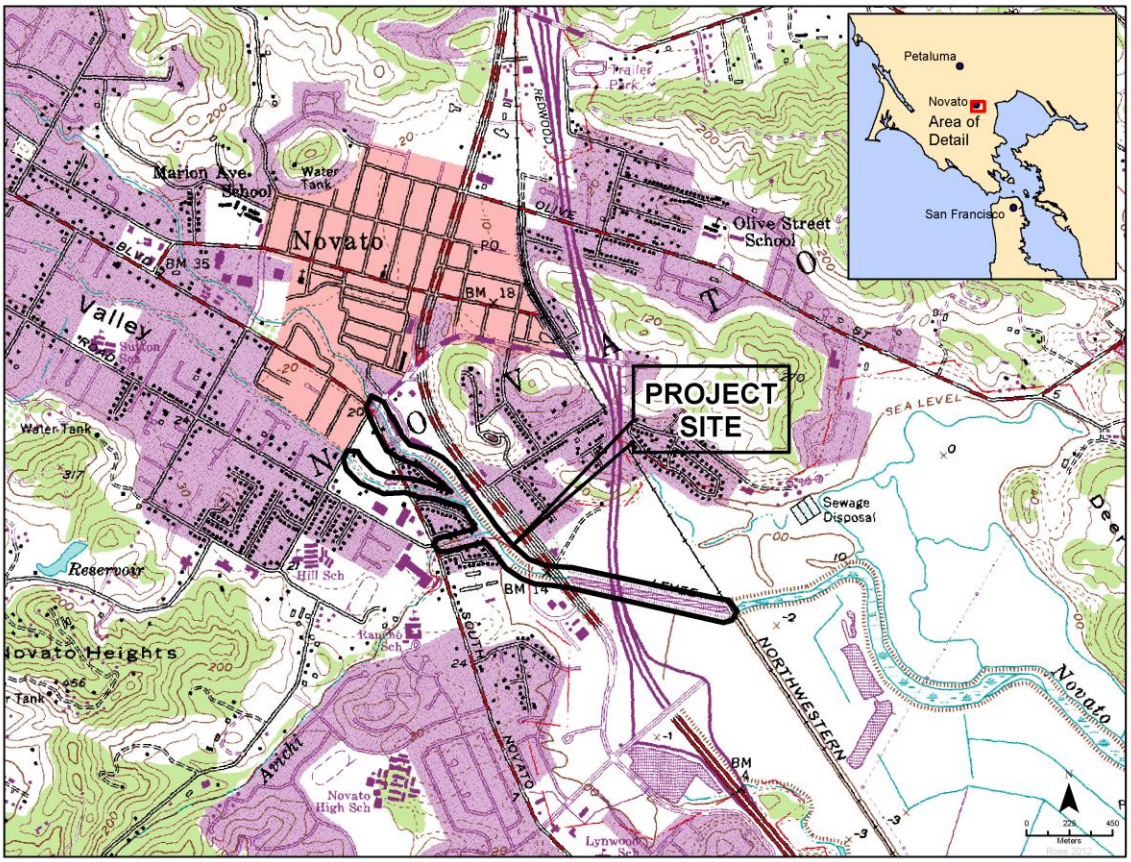

Figure 1. Black polygon identifying the action area for the Novato Creek sediment removal project.

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.

B. 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 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, information provided by the Corps in its January 17, 2012, consultation submission to NMFS, and project information provided by the District via phone conversations and email. 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.

IV. STATUS OF THE SPECIES

This biological opinion analyzes the effects of the District's proposed sediment removal from lower Novato Creek and tributaries on the CCC steelhead DPS. CCC steelhead are listed as threatened under the Endangered Species Act of 1973 (ESA), as amended (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 Novato Creek and its tributaries and are likely to be present at the project site during the proposed sediment removal activities.

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 October and April, with immigration peaking in January and February. 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 from January through June, with peak emigration of smolts to estuaries and the ocean occurring in April and May (Fukushima and Lesh 1998). 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). 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 § 402.02). 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[1] 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

[1] 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).

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 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[2] (Spence *et al.* 2008). Research monitoring data from the 2008/09 and 2009/10 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 December 7, 2011, NMFS chose to maintain the threatened status of the CCC steelhead (76 FR 76386).

C. Global Climate Change

Global climate change presents an additional potential threat to CCC steelhead and their aquatic 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,

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

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 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 streamflows 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 and Barry 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, 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

The project area is dominated by urban development from the City of Novato. Novato is the fastest growing municipality in Marin County.[3] The U.S. Census Bureau reports the 2000 human population of Novato was 47,630 and the 2010 population was 58,652 - more than 23 percent increase in that decade. The County of Marin anticipates continued growth in the population of Novato and has projected a theoretical build-out population of Novato of approximately 63,000 by 2020. All of the stream channels are trapezoidal and have been straightened and channelized.

[3] http://www.marinwatersheds.org/novato_creek.html

Streamflow throughout most of the Action Area is tidally influenced. Residential and commercial development has encroached on all stream banks. Highway 101 and Sonoma Marin Area Rail Transit train tracks cross Novato Creek within the Action Area.

B. Status of Listed Species and Habitat in Action Area

NMFS' search of fisheries data for salmon and steelhead recovery planning indicates that rigorous estimates of steelhead abundance for Novato Creek have not been done. However, there have been several limited fish surveys undertaken in Novato Creek in recent years (Rich 1997, Fawcett Environmental Consulting 2000, Leidy *et al*. 2005, Fawcett Environmental Consulting 2006, Fawcett Environmental Consulting 2009); all of these surveys encountered steelhead. Two of the surveys (Fawcett Environmental Consulting 2006, 2009) were conducted wholly in the proposed project area. Those surveys were conducted during previous sediment removal projects; in those surveys biologists collected 12 juvenile steelhead (2006) and 94 juvenile steelhead (2009). Collections upstream of the project area have encountered steelhead throughout the watershed. NMFS assumes that the population of steelhead in the action area is small given the collections of Fawcett Environmental Consulting (2006, 2009) and the current habitat conditions in Novato Creek within the action area.

The stream channels in the action area are generally trapezoidal flood control channels. Channel width ranges from 15 to 75 feet in the action area. A thin strip of riparian trees occurs in the upstream third of the action area. Beginning at the confluence of Vineyard Creek and Novato Creek and continuing downstream, most of the riparian trees have been removed from the action area. Throughout the action area, the riparian undergrowth is regularly removed from the stream banks during flood control maintenance. Some stream banks consist of concrete walls.

Streamflow in Novato Creek, including the action area, is perennial and typically ranges from 1 to 5 cubic feet per second (cfs) during the summer months. Streamflow is less in Warner Creek and, in many years, surface flow is not present in the lower portions of Arroyo Avichi. Water surface elevation in the action area is influenced by tidal action and releases from North Marin Water District facilities upstream of the action area. Water temperatures measured in Novato Creek, Warner Creek, and Arroyo Avichi in May and June 1996 ranged from 15.6 to 22.8 °C. Although water temperatures have not been recorded in the period of July through September, Rich estimates water temperatures are considerably higher than optimal for steelhead during its rearing life stage (Rich 1997).

The stream channels in the action area are dominated by low gradient areas most are tidally influenced. The streambed is mostly composed of sand and silt and does not provide any steelhead spawning habitat. In general, instream cover for steelhead is lacking. Some instream cover is provided by undercut banks and walls, concrete, and small amounts of emergent vegetation. Large instream woody debris, boulders, and other features for structural complexity are lacking in the action area. Overwinter habitat conditions are poor because the channel lacks habitat complexity and velocity refuge. Oversummering conditions are poor due to the lack of

habitat complexity and high water temperatures (Rich 1997). Although aquatic habitat in the action area is currently in poor condition, this habitat is important to CCC steelhead because the reach provides migration connectivity between spawning and rearing habitat upstream and estuarine and marine habitats downstream.

C. Factors Affecting Species Environment within the Action Area

Urban and rural residential development, flood control and bank stabilization, and agricultural activities likely contribute to excessive sedimentation, low woody debris abundance and recruitment, elevated water temperature, chemical toxicity, and atypical stream hydrology throughout the Novato Creek watershed. These factors likely limit production of steelhead in the action area. Novato Creek has several steelhead migration barriers (dams and culverts) upstream of the action area that affect sediment conditions, water flow, and temperature in the action area.

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

Pursuant to section 7 of the ESA, NMFS has conducted four previous interagency consultations that affected the action area of this project. In June 2005, NMFS and Corps completed an informal consultation on a bank stabilization project for the Lynwood and Cheda Pump Stations project (NMFS administrative record #151422SWR05SR00278). This pump stations project had discountable and insignificant effects to water quality associated with construction that quickly dissipated; no long-term effects were anticipated. NMFS completed two informal consultations (151422SWR2000SR405 in 2000, 151422SWR04SR9235 in 2004), and one formal consultation (151422SWR2008SR00180 in 2008) with the Corps on sediment removal projects in 2000, 2004, and 2008 respectively. The project areas in the three previous consultations and the presently proposed project are the same. Sediment removal during those previous projects had similarly discountable and insignificant effects to water quality (minor and temporary increases in turbidity), and resulted in temporary changes to channel substrate and benthic fauna. Fish relocation from the 2008 sediment removal project resulted in significant mortality of juvenile steelhead (see section VI. A. following); though fish relocation from all previous sediment removal projects resulted in no fish injuries or mortality.

NMFS' Section 10(a)(1)(A) research and enhancement permits and section 4(d) limits or exceptions for fish research and monitoring activities could potentially occur in the Novato 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 CDFG and NMFS' Southwest Fisheries Science Center currently hold permits to conducted fish surveys over a wide area in northern California including the Novato Creek watershed. However, neither CDFG nor NMFS' Southwest Fisheries Science Center has a current survey project with the watershed.

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. Where data to quantitatively determine the effects of the proposed action on CCC steelhead were limited or not available our assessment of effects focused mostly on qualitative identification of likely stressors and responses.

The project activities that are expected to affect steelhead include fish relocation, dewatering of stream reaches, and contamination of water by chemical and sediment contaminants. Sediment removal does not change the width of the channels or the substrate composition within the action area, though the channel will be deeper. Only juvenile steelhead are likely to be in the action area during the June 15 through October 31 project period. The potential effects of project activities on juvenile steelhead are presented in following subsections.

A. Fish Relocation Activities

Before and during dewatering the construction sites, the applicant proposes to capture and relocate fish away from the work site to avoid direct mortality and minimize the possible stranding of fish in isolated pools. Fish in the project site will be captured by seine, dip net and/or electrofisher, and then transported and released to a suitable upstream location. Data to precisely quantify the amount of steelhead that will be relocated prior to construction are not available. Using fish relocation data from the two most-recent sediment removal actions undertaken by the District in Novato Creek (2004 and 2008), NMFS anticipates between 0.1 to 10 steelhead per 1000 feet of the dewatered area (Fawcett Environmental Consulting 2006, 2009). However, interannual variation in juvenile fish abundance occurs in response to variations in cohort strength, variations in precipitation and temperature, variations in predator or prey abundance, restoration actions, and other factors. In consideration of this potential variation, NMFS will assume that in some years 25 percent more juvenile steelhead may be present in the area to be dewatered. Since the dewatered area is 9,590 feet long, NMFS expects up to 120 juvenile steelhead could be within the area to be dewatered. All steelhead present in the area to be dewatered will need to be relocated or they will perish when the stream is dewatered. Steelhead relocation activities will occur during the summer low-flow period after smolts have emigrated and before adults have immigrated to the proposed project site. Therefore, NMFS expects that only juvenile steelhead will be present in the action area and effected by relocation activities. Given typical steelhead life history and previous fish surveys from Novato Creek, impacts to steelhead will be expressed onto two year classes, but only for one season.

Fish relocation activities pose a risk of injury or mortality to rearing juvenile steelhead. Any fish collecting gear, whether passive (Hubert 1996) or active (Hayes *et al.* 1996) has some associated risk to fish, including stress, disease transmission, injury, or death. The amount of unintentional injury and mortality attributable to fish capture varies widely depending on the method used, the ambient conditions, and the expertise and experience of the field crew. Since fish relocation activities will be conducted by qualified fisheries biologists following both the CDFG and NMFS guidelines, direct effects to and mortality of juvenile steelhead during capture will be minimized. Data from two years of similar salmonid relocation activities in Humboldt County indicate that average mortality rate is below one percent (Collins 2004). During most of the previous sediment removal activities undertaken by the District on Novato Creek, no fish injuries or mortalities were observed. However, during the 2008 sediment removal activities 69 steelhead were captured from Novato Creek and 27 died (≈ 39 percent mortality) (Fawcett 2009). The fish died from exposure to dotted smartweed (*Polygonum punctatum*) a common riparian plant. The plant was placed in the buckets used for transporting steelhead to provide cover for the fish. Subsequent research using threespine stickleback (*Gasterosteus aculeatus*), a more durable species, documented the potential toxicity of dotted smartweed[4]. Fish relocation efforts continued in 2008 immediately following the fish mortalities, as the cofferdams were in place, water was receding, and water temperatures were rising. Even though the water temperature was high (29° C), no additional mortalities were observed once dotted smartweed was no longer used in the buckets. NMFS believes that the fish mortality observed in 2008 is not typical of efforts from that consulting firm and will not be repeated. Unpublished data from the consulting firm used to relocate fish in 2008 demonstrate that historic and subsequent relocations resulted in mortality rates consistent with those reported in Collins (2004). Since NMFS expects up to 120 juvenile steelhead to be relocated during this project, 2 juvenile steelhead are likely to be injured or killed during this project. Those fish that avoid capture may be exposed to risks described in the following section on dewatering.

Although sites selected for relocating fish 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 (Keeley 2003). Some of the fish released at the relocation sites may choose not to remain in these areas and may move either upstream or downstream to areas that have more habitat and a lower density of fish. As each fish moves, competition remains either localized to a small area or quickly diminishes as fish disperse. NMFS cannot accurately estimate the number of fish affected by competition, but does not believe this impact will be large enough to affect the survival chances of individual fish. For example, the use of multiple release sites will help facilitate fish dispersion, limiting competition. Once the project is complete, juvenile steelhead rearing space will return to the dewatered area.

B. Dewatering

[4] Potential Lethal Effects of Common Streamside Plants on Native Fish. A poster presented at the 2009 annual meeting of the California-Nevada Chapter of the American Fisheries Society, by Michael Fawcett, Daniel Logan, and Amanda Morrison.

NMFS anticipates temporary changes in streamflow within and downstream of project sites during dewatering activities. These fluctuations in flow are anticipated to be small, gradual, and short-term. Streamflow in the vicinity of the project sites should be the same as free-flowing conditions except during dewatering and at the dewatered reach where streamflow is bypassed. Streamflow diversion and project site dewatering are expected to cause temporary loss, alteration, and reduction of aquatic habitat.

Streamflow diversions could harm individual rearing juvenile steelhead by concentrating or stranding them in residual wetted areas before they are relocated (Cushman 1985). Rearing steelhead could be killed or injured if crushed during diversion activities, though direct mortality is expected to be minimal due to relocation efforts prior to installation of the diversion. Juvenile steelhead that avoid capture in the project site will die during dewatering activities. Few juvenile steelhead are likely to avoid capture due to the limited amount of hiding cover in the action area. Because of this, NMFS expects that the number of juvenile salmonids in the action area that will be killed as a result of stranding during dewatering activities will be similar to the number of steelhead killed during relocation (2 juvenile steelhead). Another manner by which steelhead may be harmed or killed during dewatering or stream bypass activities is to be entrained into the pumps or discharge line. NMFS expects juvenile steelhead will not be harmed or killed by entrainment. The applicant will screen all pumps to ensure that juvenile steelhead will not be entrained during dewatering events.

Benthic (*i.e.*, substrate dwelling) 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 streamflow diversions and dewatering will be temporary because construction activities will be relatively short-lived, and rapid recolonization (about two to three months) of disturbed areas by macroinvertebrates is expected to follow in one to two months following construction (Cushman 1985, Thomas 1985, Harvey 1986). In addition, the effect of macroinvertebrate loss on juvenile salmonids is likely to be negligible because juvenile salmonids are not anticipated in the tidal areas downstream of the dewatered work area. 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. Toxic Chemicals

Sediment removal activities in Novato Creek and its tributaries 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 ensure that instream construction work only occurs during the dry season (June 15 - October 31). The applicant and its contractors propose to maintain any and all fuel storage and refueling site in an upland location well away from the stream channel; that vehicles and construction equipment be in good working condition, showing no signs of fuel or oil leaks, and that any and all servicing of equipment be conducted in an upland location. For instream activities, NMFS does not anticipate any localized or appreciable water quality degradation from toxic chemicals or adverse effects to ESA-listed salmonids associated with the proposed project, as the stream will be dewatered, giving the applicant and its contractors ample opportunity to attend to any spill prior to toxic chemicals reaching the waters of Novato Creek or its tributaries. NMFS anticipates that proposed BMPs and responses by the applicant and its contractors to any accidental spill of toxic materials should be sufficient to restrict the effects to the immediate area and not enter the waterway. 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 not likely to adversely affect fish.

D. Increased Mobilization of Sediment within the Stream Channel

NMFS anticipates that short-term increases in turbidity will occur during proposed dewatering activities, construction and removal of cofferdams, and sediment removal activities. 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). Sediment may affect salmonids feeding behavior and efficiency, resulting in reduced growth rates. High turbidity concentrations can reduce dissolved oxygen in the water column, effecting respiratory function. Also, because of turbidity, salmonids disperse from established territories, which can displace fish into less suitable habitat and/or increase competition and predation, decreasing chances of survival.

The District has included BMPs to reduce the likelihood of sediments from entering the streams. NMFS assumes that these actions will be effective at reducing sedimentation rates. Downstream of the action area, Novato Creek is shallow, influenced by tidal action, and exposed to high-levels of turbidity due to storm flow runoff events, wind and wave action, and benthic foraging activities of other aquatic organisms. Also, given that steelhead use of the project area during the summer months is very low and that any steelhead encountered during this project will be relocated upstream of the upstream cofferdams and that the area downstream of the downstream most cofferdam is in tidal estuarine habitat, no steelhead are anticipated in the downstream areas when the cofferdams are removed. Therefore, any short-term impact associated with turbidity during implementation of this project is expected to be discountable.

E. Changes to Substrate Following Sediment Removal

The stream channels within the action area are straightened trapezoidal channels managed for flood conveyance. Sediment removal is unlikely to affect steelhead migration through the action area because the project will create a low channel in the action area to assist steelhead migration at winter and spring base flows. The District will lower the channel bottom by removing up to 4 feet of sediment from the channel bottom during this project. The channel bottom substrate within the action area is dominated by sand and silt. Sediment removal activities will not change the composition of the substrate. Removal of up to 4 feet of substrate may affect benthic habitat within the channel. Benthic habitat provides foraging opportunities for fish, providing a substrate for infaunal and bottom-dwelling organisms, such as polychaete worms, crustaceans, and other potential prey items. However, this conversion of benthic habitat will be likely be temporary as layers of mud and silt will become deposited during subsequent tide cycles and organisms from neighboring substrate will reinvade the project area. Also, steelhead use of this area is very low most of the year, particularly during the summer months when this project will occur. All of the steelhead spawning habitat and all of the high- or medium-quality rearing habitat is upstream of the project area. Steelhead use the project area for migration. Overall, the potential substrate effects of this project are considered insignificant or discountable and are not expected to result in either a net change to existing habitat values.

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 previously in the Environmental Baseline. 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 further exacerbate the degraded habitat conditions in the action area.

VIII. INTEGRATION AND SYNTHESIS OF EFFECTS

A small number of juvenile steelhead are expected within the action area. The loss of 27 juvenile steelhead in the action area 2008 is unlikely to have affected future juvenile numbers in the action area because subsequent generations of steelhead spawning upstream have likely produced enough steelhead to use the higher quality rearing habitat upstream and the poor quality rearing habitat in the action area. Steelhead present in the action area during the construction window will be limited to the juvenile life stage. Only a small number of juvenile steelhead will be affected by the project, and few, if any, will perish. This is due to the relocation efforts and the

low injury and mortality rates expected from fish collections. The number of steelhead likely affected by the proposed project make up a small proportion of steelhead in Novato Creek watershed since higher quality summer rearing habitat exists upstream of the action area. Consequently, the number of steelhead likely affected by the proposed project make up an even smaller proportion of the CCC steelhead DPS. It is unlikely that the small potential loss of juveniles during the proposed action will impact future adult returns. Due to the relatively large number of juveniles produced by each spawning pair, steelhead spawning in the Novato Creek watershed in future years are likely to produce enough juveniles to replace the few that may be lost to effects at the project site.

NMFS anticipates that short-term increases in turbidity will occur during proposed dewatering activities, construction and removal of cofferdams, and sediment removal activities. These impacts will be temporary, and NMFS anticipates that proposed BMPs will control sediment satisfactorily. Also, during the proposed action, NMFS does not anticipate steelhead being present downstream of the dewatered work area – the area in which increases in turbidity may occur. Therefore, NMFS believes that effects to steelhead downstream of dewatered work area are discountable.

Regarding future climate change effects in the action area, California could be subject to higher average summer air temperatures and lower total precipitation levels. Reductions in the amount of precipitation would reduce streamflow levels in Northern and Central Coastal rivers. Estuaries may also experience changes in productivity due to changes in freshwater flows, nutrient cycling, and sediment amounts. For this project, construction would be completed no later than 2012 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 these climate change effects. As described above, future numbers of adult steelhead are not anticipated to be affected by the proposed project.

VIII. 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 District's proposed sediment removal from lower Novato Creek and tributaries is not likely to jeopardize the continued existence of threatened CCC steelhead.

IX. 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.

Implementation of this project is expected to result in incidental take of threatened CCC steelhead. Juvenile steelhead are expected to be subject to capture for relocation efforts and any fish that avoids relocation efforts will be killed when the work area is dewatered. Up to 120 juvenile steelhead are likely to be collected and relocated during project implementation. NMFS anticipates no more than four juvenile steelhead present in the area to be dewatered will be harmed or killed during relocation and dewatering efforts

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 ensure that harm and mortality to listed salmonids resulting from fish relocation and dewatering activities is low.

2. Undertake measures to minimize harm to listed salmonids resulting during and after construction of the project.

3. Prepare and submit a report to document the effects of construction and relocation activities and 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. The applicant must retain a qualified biologist with expertise in the areas of anadromous salmonid biology, including handling, collecting, and relocating salmonids; salmonid/habitat relationships; and biological monitoring of salmonids. The Corps must ensure that all biologists working on this project be qualified to conduct fish collections in a manner which minimizes all potential risks to ESA-listed salmonids. 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.

    b. The biologist must monitor the construction site during placement and removal of channel diversions and cofferdams 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 ESA-listed salmonids. The biologist must notify NMFS biologist Daniel Logan at (707) 575-6053 or dan.logan@noaa.gov one week prior to capture activities in order to provide an opportunity for NMFS staff to observe the activities.

    c. ESA-listed fish 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, the biologist 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.

d. If any salmonids are found dead or injured, the biologist must contact NMFS biologist Daniel Logan by phone immediately at (707) 575-6053 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 must notify the NMFS Santa Rosa Area Office, by letter stating the project commencement date, at least 7 days prior to implementation. The letter must be sent to NMFS Santa Rosa Area Office, Attention: Supervisor of Protected Resources Division, 777 Sonoma Avenue, Room 325, Santa Rosa, California, 95404-6528.

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

    c. A qualified biologist must monitor in-channel activities and performance of sediment control or detention devices for the purpose of identifying and reconciling any condition that could adversely affect salmonids or their habitat. The biologist must report immediately 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 and applicant must provide a written report to NMFS by January 15 of the year following construction. The report must be submitted to NMFS Santa Rosa Area Office Attention: Supervisor of Protected Resources Division, 777 Sonoma Avenue, Room 325, Santa Rosa, California, 95404-6528. The report must contain, at a minimum, the following information:

        i. **Construction related activities --** The report must include the dates construction began and was completed; a discussion of any unanticipated effects or unanticipated levels of effects on salmonids, a description of any and all measures taken to minimize those unanticipated effects and a statement as to whether or not the unanticipated effects had any effect on ESA-listed fish;

the number of salmonids killed or injured during the project action; and photographs taken before, during, and after the activity from photo reference points.

ii. **Fish Relocation --** The report must include a description of the location from which fish were removed and the release site including photographs; the date and time of the relocation effort; a description of the equipment and methods used to collect, hold, and transport salmonids; if an electroshocker 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.

X. REINITIATION NOTICE

This concludes formal consultation on the proposed Lower Novato Creek Sediment Removal Project in the City of Novato. 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.

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