Appendix D

Biological Assessment

Santa Paula Creek

Biological Assessment

Southern Steelhead (*Oncorhynchus mykiss*) and Associated Critical Habitat and Proposed Critical Habitat for Southwestern Willow Flycatcher (*Empidonax traillii extimus*)

Final Draft

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Prepared by:

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1.0 Introduction

1.1 Purpose of this Biological Assessment

Pursuant to the requirements of Section 7(c) of the Endangered Species Act (ESA) of 1973, as amended, this Biological Assessment (BA) has been prepared by the U.S. Army Corps of Engineers (Corps) to evaluate the effects of the Proposed Action on federally listed threatened and endangered species and proposed critical habitat within the Project area. Section 7(b) of the ESA requires coordination with the appropriate resource agency, in this case the National Oceanic and Atmospheric Administration's (NOAA) National Marine Fisheries Service (NMFS).

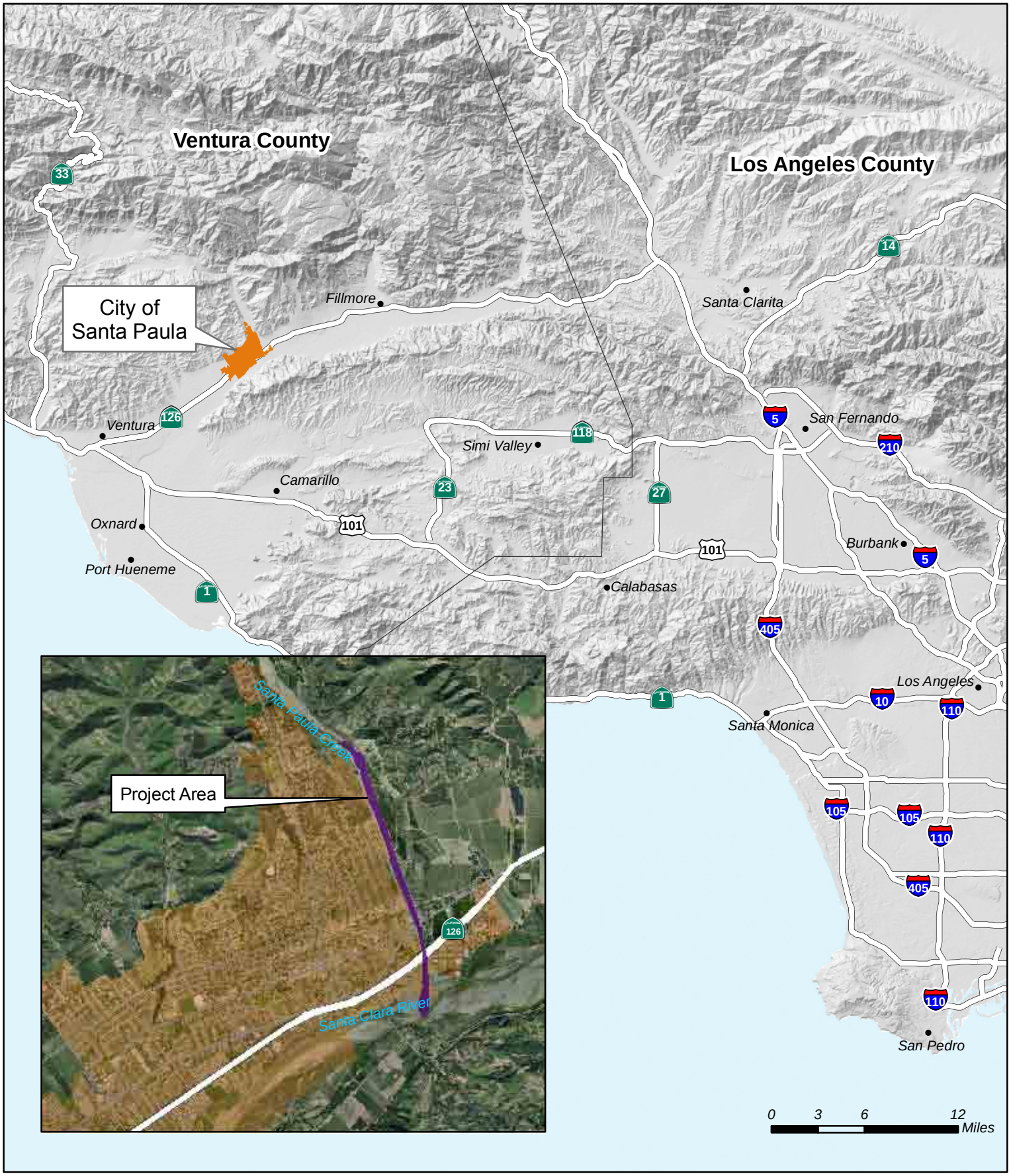
The Proposed Action includes: repair of the existing fish ladder weirs; and Operation and Maintenance (O&M) activities for the overall Santa Paula Creek Flood Control Project (the Project), including a refinement of the allowable sediment profile and design invert for the existing flood control channel. The Proposed Action will be conducted consistent with previous commitments or other measures determined by NMFS through this consultation. The 2000 BO and 2009 BO Amendment are included in Appendix A.

The primary objectives of this BA are to: (1) provide information on the natural history of federally listed species and critical habitat potentially occurring within the Project area and its vicinity; (2) evaluate the potential effects of the Proposed Action on the Southern California Evolutionarily Significant Unit (ESU) of southern steelhead (*Oncorhynchus mykiss*) and critical habitat, and proposed critical habitat for the southwestern willow flycatcher (*Empidonax traillii extimus*); (3) describe measures to avoid or minimize adverse effects on steelhead and critical habitat; and (4) provide a determination of effects for steelhead and critical habitat, and proposed critical habitat for southwestern willow flycatcher.

1.2 Project Location and Setting

The Proposed Action is located on the main stem of Santa Paula Creek in Ventura County, near the City of Santa Paula, California (***Figure 1***). Adjacent land uses include industrial areas, commercial and residential uses, open space, and agricultural land. Industrial and commercial uses are concentrated near the lower reaches, near State Route 126 (SR-126) and Telegraph Road, although there is some residential use to the east upstream of SR-126. Upstream of the railroad bridge, land uses are primarily residential to the west and agricultural to the east. West of the fish ladder is an orchard with a residential development beyond. East of the fish ladder are orchards and the toe of Topa Topa Peak, an open space area with natural vegetation. Santa Paula Creek is crossed by SR-126, Telegraph Road, and the railroad bridge towards the downstream end of the Project area.

Riparian and aquatic vegetation within the Project area is naturally maintained in a relatively seral state due to storm flows that regularly uproot or otherwise damage streamside vegetation. These vegetation communities have been observed to re-establish naturally within 1-2 years due to seeds that are transported by flows and deposited within the Project area (Corps, 2011a). Emergent wetland vegetation is limited to a few clumps of cattails found intermittently throughout the Project area, and immature riparian vegetation is dominated by willows and mulefat along the channel banks. Aquatic habitat within the Project area is generally



Basemap Source: U.S. Geological Survey, Hillshade, 30 Meter Resolution, 2004
U.S. Census Bureau, Geography Division, 2010

US Army Corps of Engineers

Figure 1
Regional Context

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composed of a dynamic bed substrate characterized by boulders and cobble of various sizes and areas of thick, soft mud; periods of high turbidity; high water temperatures; and little aquatic vegetation. The two main aquatic habitat types within the channel are riffles and runs, with a more sparse distribution of pools. Aquatic vegetation includes *Chara* sp. and *Najas* c.f. *guadalupensis.* These species are generally present in low velocity areas primarily composed of a muddy substrate.

The flood plain within the immediate vicinity of the Project area has a scoured appearance with an exposed boulder and cobble surface substrate and patches of riparian vegetation. Vegetative cover tends to be concentrated along the low flow channel banks and near locations where agricultural and/or storm drains discharge through the grouted stone side slopes of the flood control channel.

1.3 Santa Paula Creek Flood Control Project Background

The Project area is composed of a flood risk management channel (FRMC) with a grouted rock apron and corresponding fish ladder located at its hydraulic inlet, approximately 9,270 feet (2,825 meters) upstream of Santa Paula Creek's confluence with the Santa Clara River. The channel bottom width ranges from approximately 50 to 130 feet (15.2 to 39.5 meters).

The fish ladder is located within the FRMC inlet (***Figure 2***). The FRMC inlet is comprised of grouted stone across the majority of the channel. The fish ladder is offset from the centerline of the channel, closer to the right bank (looking downstream), and is comprised of a series of 17 concrete pools and notched rectangular weirs with steel cladding. Two grade stabilizers were constructed downstream of the fish ladder to address local scour after initial Project construction was completed. An approach channel extends approximately 500 feet (152 meters) upstream of the fish ladder. The approach channel is not a structural component of the fish ladder, but rather a maintained section of natural substrate that helps to maintain hydraulic connectivity and subsequent fish passage at the upstream entrance to the fish ladder. Additional stretches of Santa Paula Creek associated with fish passage include the low flow channel, which extends from the downstream end of the fish ladder, and the pilot channel, which is located from downstream of the existing invert stabilizer (Station 10+00) to the confluence with the Santa Clara River.

In the winter of 2004-2005, the largest flow event on record for Santa Paula Creek, and nearly the design event for the Project (28,000 cfs), occurred with peak flows of approximately 27,500 cubic feet per second (cfs). This event resulted in sediment accumulation in the pools and damage to the metal cladding and corner protection along the tops of the weirs, which exposed the concrete tops of the weirs to chipping and erosion. However, the overall structural integrity of the weirs and pools was unaffected.

Following the winter 2004-2005 storms, sediment was removed from portions of the FRMC to restore the channel's flood capacity in conformance with the 2000 BO. Sediment was also removed from the fish ladder and minor repairs were completed, including removing pieces of metal cladding that were detached from the edges of the weirs, removing exposed concrete reinforcement, and trimming and smoothing of the weir edges. Following the cleanout and these minor repairs, the fish ladder was returned to a condition where it was capable up functioning as designed for fish passage. However, as shown in ***Figure 3***, the steel cladding of the weirs was not replaced and the existing condition of the weir tops is composed of exposed concrete, which

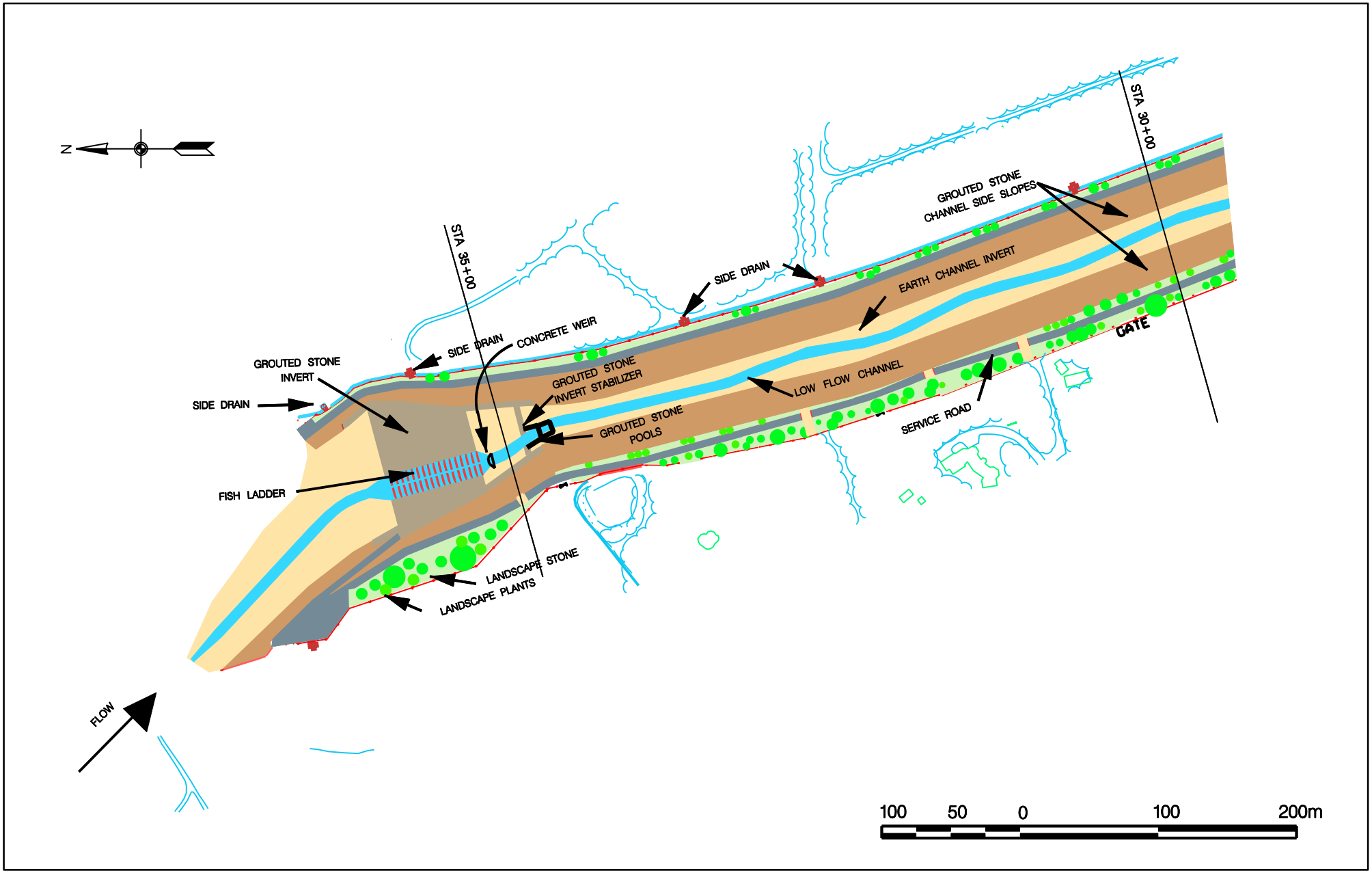
subject to erosion and damage from storm events that mobilize and transport large-grained sediment. A low flow channel runs the length of the entire FRMC from the upstream end of the fish ladder to the confluence with the Santa Clara River downstream. The low flow channel is composed of natural substrate and was considered to function as a migratory corridor for steelhead by NMFS in the 2000 BO. Observations of the site since the incorporation of the fish passage facility confirm the assumption that the site lacks habitat complexity, cover, and suitable water quality, due in large part to excessive turbidity contributions from Mud Creek, for spawning and rearing made in the 2000 BO (Corps 2011b and Corps 2012). After sediment removal in 2009, a meandering low flow channel was created, per specifications provided in the 2000 BO and 2009 BO Amendment, from just downstream of the grade stabilizer at the downstream end of the fish ladder to the Project's downstream terminus near the creek's confluence with the Santa Clara River. It was designed to replicate a riffle-run-pool sequence, with two- to four-foot boulders placed in clusters to dissipate energy and help create resting refuge and forage opportunities for aquatic species. Riparian vegetation was also planted along the channel between the SR-126 Bridge and the confluence with the Santa Clara River.

Following completion of the 2009 sediment removal, a series of storms occurred in early 2010 with peak flow rates of approximately 700 cfs, resulting in deposition of sediment in and throughout the FRMC. In many areas the newly created low flow channel downstream of the fish ladder was breached and/or aggraded with sediment, and new flow paths were created by the creek (***Figure 4***). Regular channel migration is a common characteristic of systems with high sediment yields like Santa Paula Creek (Mount 1995). It also appears that the majority of the newly planted willow (*Salix* spp.) and mulefat (*Baccharis salicifolia*) cuttings were either buried or washed downstream as a result of these storm flows (Corps 2010a). ***Figure 5*** shows sedimentation within the fish ladder pools following the 2010 storms. The early 2010 storms were monitored per the Five-Year Monitoring Plan that was initiated following the 2009 sediment cleanout. Further documentation of the effects of these storms can be found in the Post Storm Monitoring Reports for 2010 (Appendix B). Sediment has been removed from the fish ladder twice since the sediment removal project of 2009/2010, once in October of 2010 and another in June of 2011. The Five-Year Monitoring Plan is described in Section 1.5.2.2.1 of this BA.

The fish ladder provides fish passage when maintained in accordance with the Project O&M Manual. In general, sediment from storm flows accumulates in the fish ladder weir pools during storm events. Annual cleanout, as required by the Project O&M Manual, is necessary to support fish passage between the weir pools. Repairs would increase the fish ladder durability, which would decrease the risk of future repairs or maintenance work in the Project area to reduce the potential for any adverse effects to steelhead.

1.4 Project Proponents

The Corps is the lead federal agency for the Proposed Action. The Ventura County Watershed Protection District (VCWPD) is the local sponsor. Upon notification of completion of the Proposed Action, operation and maintenance responsibilities for the FRMC will be assumed by the VCWPD. The Corps will continue to implement the Five-Year Monitoring Plan to completion. Terms or conditions deemed necessary by NMFS would be incorporated into the Project O&M manual and followed by the VCWPD upon Project turnover. The Corps would, at



Source: US Army Corps of Engineers, 2004

US Army Corps of Engineers

Figure 2
Fish Ladder Schematic

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Figure 3
Existing Storm Damage to Fish Ladder Weirs

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Figure 4
Low Flow Channel Near Fish Ladder Following Large Storm Event

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Figure 5
Sedimentation in Fish Ladder Pools Following Storm Event(s)

all times, retain permit authority over maintenance actions subject to Section 404 of the Clean Water Act. Any BO requirements could be enforced through either the Section 404 regulatory program or by the Corps under the terms of the Project agreement. Project turnover would not affect the Corps' legal obligation to ensure compliance with the terms of the BO.

1.5 Project Description

The Proposed Action consists of: repair of storm damage to the fish ladder weirs and Operation and Maintenance (O&M) activities for the overall FRMC, including a refinement of the allowable sediment profile and design invert for the FRMC. Each of these elements is described below. Associated construction activities would be limited to the repair of the fish ladder, as described in Section 1.5.2 below.

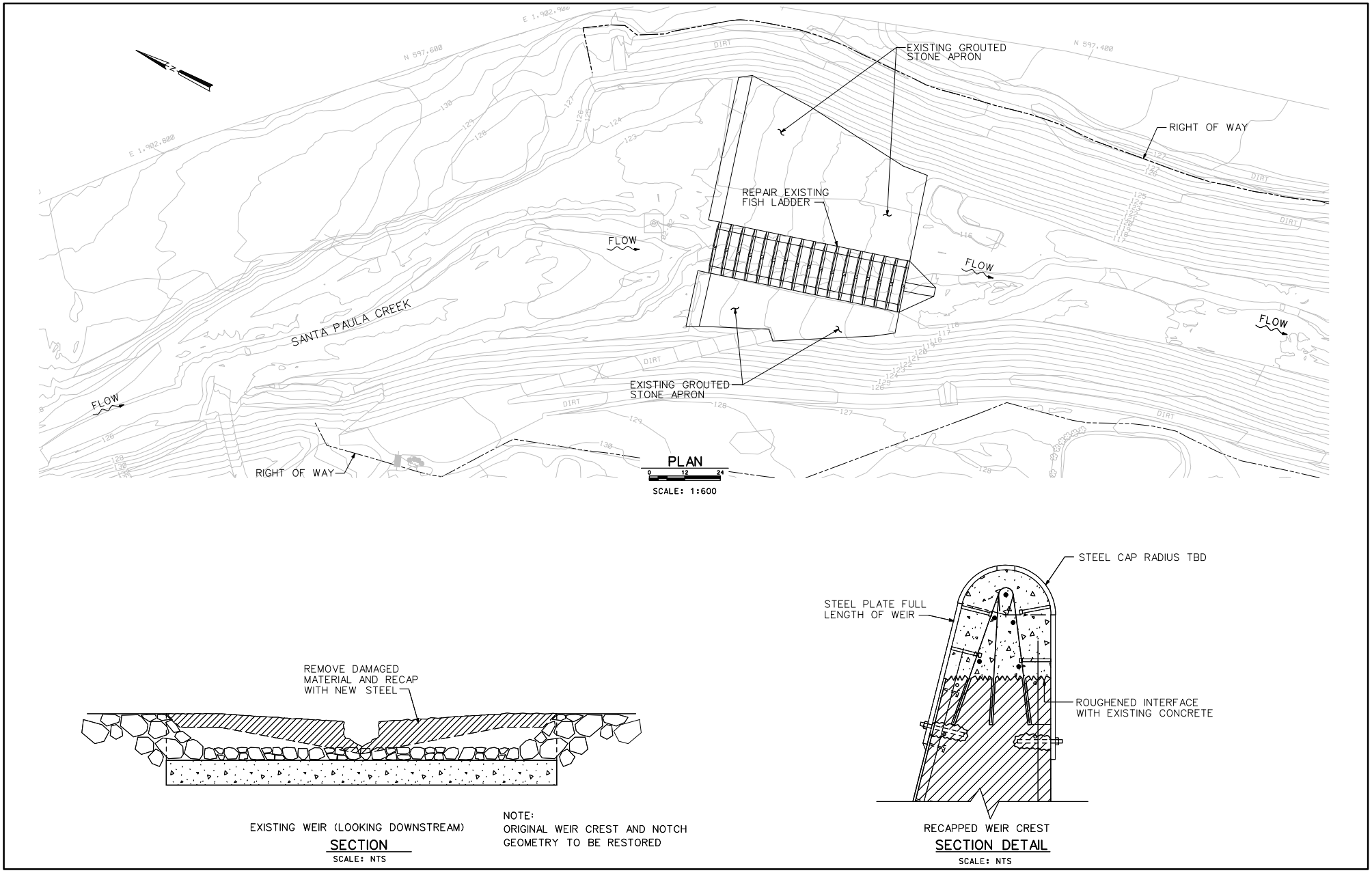
1.5.1 Fish Ladder Repairs

Minor repairs would be conducted to the weirs of the fish ladder that sustained damage from the design event that occurred during the winter of 2004 – 2005. The proposed repairs consist of saw-cutting portions of the weirs to enable the creation of a rounded edge on the weir tops and encapsulating the weir tops with steel plating to improve durability against debris and bed load impact. ***Figure 6*** shows a typical section of a recapped weir crest. The weir crest caps would consist of fabricated steel and would be composed of an adjoining front plate and a more rounded, continuous crest plate leaving no concrete exposed along the crest. The steel plate and capping would be fabricated off-site before being transported to the site and affixed to the reshaped weir crests with embedded dowels and epoxy.

The more rounded shape and the thicker continuous plate of steel over the weir crests will increase fish ladder durability and reduce the future risk of similar damage in a large storm event. The continuous crest is designed to minimize the potential for separation between the concrete and steel where water and sediment particles could erode away pockets of concrete or where debris and rocks could catch on exposed steel edges. The thicker, continuous cladding and the rounded top edges of the weir crests are also anticipated to minimize the forces of impact from large bed load and may better allow bed load material to roll over the crests during extreme flow and sediment transport events. The rounding and capping of the weirs is expected to have a negligible effect on hydraulics. The results of a HEC-RAS model that was run to evaluate the hydraulic design of rounded and capped weirs showed that the significant roughness developed by the weir structures still limits velocities over the ladder and maintains subcritical flows when overtopping of the weirs occur (Corps 2009b).

In order to accomplish the fish ladder repair, removal of sediment in the weir notches and temporary diversion of water from the fish ladder would be required for the duration of construction. Measures determined by coordination between the Corps and NMFS through this consultation, would be followed, and all activities related to water diversion would be monitored by a qualified biologist to minimize or avoid impacts to steelhead and to minimize impacts to water quality.

In-channel work to repair the fish ladder weirs would occur over a period of approximately 60 to 105 days. In-stream construction is planned to occur between June 30 and November 1 to avoid the known steelhead migratory season. Construction is expected to commence in the summer of



Source: HDR, 2011

US Army Corps of Engineers

Figure 6

Fish Ladder Profile and Typical Section of Steel Cap Reinforcement at Weir Crest

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2012 and is expected to be completed by November 1, 2012. Off-site fabrication of the weir crest caps would occur prior to, and during on-site construction work related to preparation for the capping and grouting of the weirs.

It is estimated that the number of workers on-site would not exceed eight. Construction equipment would include pipes, pumps and sandbags for flow diversion, one front end loader, one hydraulic excavator, off-road haul trucks and pickup trucks, saws, rotary hammer drill, generator, and an air compressor.

The staging area for construction, as well as future maintenance operations, is located at the downstream end of the Project area adjacent to the Santa Clara River/Santa Paula Creek confluence (see ***Figure 7***). The staging area would be used to stage construction equipment, materials, and stockpile excavated material during construction. The approximately four-acre staging area is located in the City of Santa Paula, within the VCWPD right-of-way on the west bank. Staging areas are also available along on the top of bank near the access ramp to the fish ladder and turnout areas along the access roads. Access to the site is provided by the access road located along the right bank of Santa Paula Creek. The access road extends north from East Telegraph Road at the west side of the Santa Paula Creek Bridge.

In order to avoid working in the active channel, construction would require flows in Santa Paula Creek to be diverted or piped around the work area. If culverts are used to pipe water around the work area, rather than diverting flows, they would be installed at stream grade and be of adequate size to not increase stream velocity (NMFS 2000).

Diversion activities would only occur outside of the steelhead migratory season to avoid potential impacts to steelhead. In-channel work to repair the fish ladder weirs would occur over a period of approximately two to three and a half months, outside of breeding season between June 30 and November 1. A qualified biologist would monitor any and all water diversion activities to avoid or minimize the potential for stranding of any fish. The biologist would survey all residual surface water associated with diversions for steelhead presence as flows recede. Although not expected, if steelhead are observed in the isolated channel, they would be relocated to a predetermined location along the flowing reach by the qualified biologist unless otherwise coordinated with NMFS during this consultation.

1.5.2 Operation and Maintenance

Future sediment removal is required to maintain the design channel capacity consistent with the new sediment profile and design invert, as described in the Project's O&M Manual. All foreseeable O&M activities are described in the Project O&M Manual. After notification of Project completion, activities related to the future maintenance of all Project features would be accomplished by the VCWPD for the life of the Project. It is anticipated that these future maintenance activities would be incorporated into VCWPD's Ongoing Routine Maintenance Program, which would be authorized under a Regional General Permit currently in development by the Corps Regulatory Division.

Project-wide sediment removal would occur between June 30 and November 1, which is outside of the steelhead migratory season, as defined by the BOs, or as otherwise coordinated with NMFS and the California Department of Fish and Game (CDFG). As described in the Corps'

Source: HDR | CDM, 2011

US Army Corps of Engineers

Figure 7
Action Area

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O&M Manual, if maintenance is required during the steelhead migratory season to restore passage, measures would be implemented to minimize impacts to any steelhead present, in coordination with NMFS, CDFG and other concerned resource agencies. The VCWPD would be required to follow all environmental conditions identified in environmental documents and all applicable permits, including but not limited to the BO (or other requirements determined by NMFS through this consultation), Corps 404 Permit, Streambed Alteration Agreement, and water quality certification. Sediment removal would occur after the maximum allowable sediment accumulation point is reached anywhere in the channel. At cleanout, the sediment would be removed to the new design invert. It is anticipated that the new design invert would not increase the need for channel maintenance to more often than every three years, on average.

The Corps has prepared an O&M Manual that incorporates the new sediment profile and design invert and identifies required environmental commitments. The O&M Manual is attached to this BA as Appendix C. The Corps will deliver the final O&M Manual to VCWPD before or concurrent with notification of project completion. The Corps retains the right to enforce the terms of the Local Cooperation Agreement of 1973, as amended, to which VCWPD is a party. The Agreement states that VCWPD shall operate, maintain, repair, replace, and rehabilitate the entire Project or the functional portion of the Project.

All maintenance activities occurring within the channel would occur within the approved in-stream work window (June 30 to November 1), unless otherwise coordinated with NMFS and other relevant resource agencies. In-stream maintenance activities such as sediment removal may require diversion and control of water to protect construction areas from flood flows and to protect water quality from construction activities during the low flow period that occurs within the in-stream work window.

1.5.2.1 Operation and Maintenance of the Fish Ladder and Associated Features

This section summarizes the basis for performing maintenance activities for the fish ladder over its expected 50-year life, as set forth in the O&M Manual. Operation and maintenance activities include Project-wide sediment removal (as described in Section 1.5.2 above) and annual sediment removal from the fish ladder pools (and the approach channel, low flow channel, and pilot channel, if necessary). The Corps is currently carrying out the Five-Year Monitoring Plan. Monitoring is described in detail in Section 1.5.2.2 below. Maintenance activities associated with fish passage may have to occur during the time when steelhead are known to be migrating through the Project. Monitoring and relevant conditions determined during the course of this consultation between the Corps and NMFS will inform when and where maintenance would be necessary during the steelhead migratory season. This “in-season” maintenance is further described in this Section under the sub-heading “*Maintenance During the Steelhead Migratory Season.”*

Annual Sediment Removal from Fish Ladder Pools

The VCWPD has agreed to conduct annual cleanouts of accumulated sediment from the pools of the fish ladder as part of their operation and maintenance to allow the fish ladder to optimize its capacity to provide fish passage throughout each migratory season. This activity would take place between June 30 and November 1, which is outside the migratory window for steelhead. Flows will likely be diverted around the work area to prevent excessive turbidity and potential interactions between aquatic fauna and work equipment. In-channel work associated with

removal of sediment from the fish ladder pools would typically be completed within one week, but may take longer depending on conditions, and require the use of excavating equipment, such as a backhoe or a bobcat, and a truck to haul away the sediment. The excavating equipment would only work on top of the apron to remove sediment from exposed pools. Sediment within weir pools that are buried below the design invert grade at the time of sediment removal would not be removed from the weirs.

A qualified biologist would be on-site to monitor any activities involving heavy equipment working between the grouted side slopes of the FRMC or on the fish ladder. Although steelhead are not expected to occur during the time period when these activities would be conducted, block netting would be installed upstream and downstream of the work area to prevent potential interactions between construction equipment and any steelhead present. The area between the block netting would be surveyed for steelhead presence/absence. If steelhead or any other native fish are observed, they would be captured and relocated to a predetermined site of suitable habitat on the flowing reach.

Per the O&M Manual, it may also be necessary to conduct sediment removal, re-grading, or other maintenance activity within the approach channel, low flow channel, and/or pilot channel. For example, the presence of waterfalls of more than 1 foot (0.3 meters), isolated pools where fish could be stranded or other fish passage impediments would trigger necessary maintenance outside of the fish ladder. The results of fish passage monitoring described in the O&M Manual will inform whether fish passage related maintenance in excess of the annual cleanout of the fish ladder pools is necessary. If such maintenance is necessary, it would be conducted between June 30 and November 1 using excavating equipment as described above. As described below, in-stream maintenance activities may also be needed during the steelhead migratory season.

Vegetation Management

As part of the maintenance activities, vegetation within the channel would be selectively cut if it grows greater than 2 to 3 inches (5 to 8 centimeters) in diameter at breast height (dbh) between cleanouts, unless otherwise coordinated with NMFS, U.S. Fish and Wildlife Service (USFWS), or other appropriate resource agencies. If vegetation grows to the point where the dbh is greater than 2 to 3 inches it would be cut to a height of between 1 to 2 feet (30 to 61 centimeters) from the ground to ensure it does not result in an undesirable reduction in conveyance capability while maintaining the bank protection function of the intact roots.

Cutting/pruning activities would occur in compliance measures determined by the Corps and NMFS through this consultation, and would be coordinated with a qualified biologist to minimize the potential for pruning to result in tree mortality. Pruning of this nature would allow the root system to stay intact to stabilize the banks, resprout, and provide cover functionality. This selective cutting/pruning methodology would avoid mass vegetation removal in the channel that would require heavy equipment that would disturb the channel bottom. Hand crews would be able to selectively cut/prune vegetation that is progressing outside of the desired growth parameters. Selective cutting/pruning of vegetation would not take place during migratory bird or steelhead migration seasons, unless otherwise coordinated with NMFS and/or USFWS. The use of herbicides is discouraged within the channel and would have to be would be coordinated with the appropriate agencies, including NMFS and CDFG, prior to use. All vegetation management activities in a given year, including any herbicide use, would be described in

VCWPD's Ongoing Routine Maintenance Program, which would be authorized under a Regional General Permit currently in development by the Corps Regulatory Division.

Vegetation would not be planted within the FRMC following sediment cleanout, as riparian vegetation has been observed to quickly reestablish itself through colonization by seedlings of willows and other riparian species. This colonization regularly occurs following disturbance from peak flows that create substrate for seedlings, followed by declining spring and summer flows that occur during seed dispersal. Under this natural process, new riparian vegetation would be expected to reestablish within one to two years after a disturbance, as has been observed and documented in the 2010 Summer Low Flow Channel Monitoring Report (Corps 2010b).

Repairs to the Fish Ladder

Major structural repairs to the fish ladder are not expected to be needed. The tops of the fish ladder weirs sustained minor damage from the 2004/2005 near design event, but remained structurally and functionally intact. In some instances the metal cladding on the corners of the weir tops was damaged, which left the cement portions of the weir tops susceptible to chipping from impact with large bedload. The proposed rounding of the weirs will eliminate hard edges on the weir tops, which is expected to decrease the force of impact from large bedload. The "capping" or total encapsulation of the weir top with steel will provide added protection to the weir tops and eliminate the possibility of the cap protection being ripped off of the weir top and ending up as a hazard to fish navigating the fish ladder. If the need for major structural repairs is identified during monitoring, VCWPD would coordinate with NMFS and other relevant agencies prior to conducting any repair activities.

Maintenance During the Steelhead Migratory Season

Large storm events, such as those occurring during El Nino Southern Oscillation (ENSO) years transport and deposit large amounts of sediment through the FRMC. In order to ensure flood risk management and unimpeded passage of steelhead during and following these events, maintenance activities may be required during the steelhead migratory season from November 1 to May 31. These maintenance activities would be guided by post-storm monitoring results and would likely include removal of sediment from the fish ladder pools and/or removal of obstructions that could occlude flows through the fish ladder and maintenance of upstream approach channel to the fish ladder to maintain hydraulic connectivity. If maintenance action is required to maintain fish passage as designed, VCWPD and/or the Corps would notify and coordinate with NMFS prior to conducting any such activities.

Qualified biologists would be required to oversee and monitor maintenance activities to ensure potential effects to steelhead and critical habitat are avoided or minimized to the maximum extent practicable. Depending on the nature of the occluding object, flow, and other environmental conditions, equipment such as, but not limited to, a crane, a bobcat, or a hand tool may be necessary. In all cases, the equipment would access the fish ladder via the apron so as to not cause any impacts to adjacent habitat, unless maintenance is required to the approach channel, which may require access beyond the fish ladder or project inlet apron. Depending on the size and nature of the object(s) being removed from the fish ladder, they may be deposited downstream of the fish ladder, outside of the active channel(s), or hauled to a designated disposal location. Native material (i.e., boulders, native plants) is the only type of removed material that

would be deposited downstream of the fish ladder. If the debris is deemed large enough to affect flood conveyance, it may be hauled away.

Post-storm removal activities would not start until flows had receded to a level (typically less than 500 cfs) where it is safe for equipment and crews to conduct their necessary tasks. Flows and environmental conditions permitting, qualified biologists would likely install block netting upstream and downstream of the work area to prevent potential interactions between construction equipment and steelhead. The area between the block netting would be surveyed for steelhead presence/absence. If steelhead or any other native fish are observed, they would be captured and relocated to a predetermined site of suitable habitat on the flowing reach, consistent with conditions the NMFS and the Corps determine as appropriate through the course of this consultation.

1.5.2.2 Monitoring

Two monitoring programs are described in this section: (1) monitoring currently being conducted by the Corps and (2) monitoring to be conducted by the VCWPD upon notification of completion of the Proposed Action. Monitoring to be conducted by the VCWPD as detailed in the O&M Manual (Appendix C) has been adapted based on lessons learned to date from the Five-Year Monitoring Plan being carried out by the Corps.

1.5.2.2.1 Monitoring Currently Conducted by the Corps

The Corps began implementation of a 5-year commitment to monitor the performance of the Project, including the function of the fish ladder, in 2009 under a Monitoring Plan developed in coordination with NMFS and in compliance with the2009 BO Amendment and 2000 BO RPM No. 3 and No. 4 and corresponding Terms and Conditions. Under the Proposed Action, the Corps will continue to fulfill the 5-year monitoring commitment. The Corps is currently in the third year of this commitment.

Ongoing monitoring conducted by qualified biologists from the Corps includes late spring smolt out-passage monitoring, summer low flow monitoring, and post-storm monitoring, in accordance with the Monitoring Plan. Results of monitoring are provided to NMFS after each monitoring event and in an annual report. The following paragraphs provide details on each of these monitoring activities. Monitoring reports prepared by the Corps since initiation of the Five-Year Monitoring Plan are provided in Appendix B.

Late Spring Smolt Out-Passage Monitoring

Monitoring of the fish ladder configuration and associated discharge is currently conducted once per year between April 20 and May 31, per the Corps Five-Year Monitoring Plan. This monitoring event was not a T&C of the 2000 BO or its 2009 Amendment, but was agreed upon during coordination with NMFS staff during the development of the Corps' current monitoring protocol.

Under the Corps Five-Year Monitoring Plan, the smolt out-passage monitoring occurs during low/base flow conditions to ensure barriers to movement for steelhead smolt are not present within the fish ladder. The accumulation of sediment and natural and man-made debris is documented upstream, downstream, and in the pools of the fish ladder. Sediment aggradation levels are recorded for a representative sample of pools, including pools in the upper, middle,

and lower thirds of the fish ladder. Other potential barriers to steelhead movement through the fish ladder are also documented, including the formation of isolated pools during low flow conditions or potential barriers to fish passage.

A monitoring report summarizing the data and photographs collected is submitted to NMFS and NMFS is notified immediately of any pressing concerns associated with the fish ladder function. At a minimum, the spring smolt out-passage monitoring reports include:

- Whether or not steelhead were observed
- General habitat suitability for steelhead (i.e., vegetative cover, overhanging banks, etc.)
- The location of steelhead and or potential barriers to steelhead migration (if applicable)
- Photographs and descriptions of the habitat at the point of observation (if applicable)
- Maps showing the locations where observations of steelhead, and/or barriers to steelhead movement were made (if applicable)
- Presentation of data and analyses focusing on sediment accrual within the ladder and its effect on fish passage parameters
- A qualitative description of the amount of woody debris present within the fish ladder and its immediate vicinity

Low Flow Condition Summer Monitoring

Monitoring of the fish ladder and flows is currently conducted by the Corps under the Five-Year Monitoring Plan once per year during the low flow summer season between July 1 and September 30. The accumulation of sediment and debris is documented upstream, downstream, and in the pools of the fish ladder. Measurements for sediment inundation levels, both wet and dry, are recorded for representative pools.

A monitoring report summarizing the data and photographs collected is submitted to NMFS and NMFS is notified immediately of any pressing concerns associated with the fish ladder function. At a minimum, the summer low flow monitoring reports include:

- Whether or not steelhead were observed
- General habitat suitability for steelhead (i.e., vegetative cover, overhanging banks, etc.)
- Potential barriers to migration (if applicable)
- Photographs and descriptions of the habitat at the point of observation (if applicable)
- Maps showing the locations where observations of steelhead, and/or barriers to steelhead movement were made (if applicable)
- Presentation of data and analyses focusing on sediment accrual within the ladder and its effect on fish passage parameters
- Qualitative description of the amount of woody debris present
- Collection of water quality data including temperature, flow (by U.S. Geological Survey [USGS] gage), turbidity, dissolved oxygen, and salinity

Post-Storm Monitoring

Visual observations and necessary photo documentation of the fish ladder are currently conducted following storm events that produce flows of greater than 500 cfs. Flow levels for the

storm event are also monitored and recorded from USGS gage 11113500 located approximately 3.2 miles (5.1 kilometers) upstream of the Project.

Monitoring documents sediment and debris accumulation upstream, downstream, and between weirs of the inlet structure/fish ladder, and evaluates potential low flow isolated pool formation or other migration blockages following anticipated sediment transporting flows (typically greater than 500 cfs). Due to safety concerns during high flow conditions, a qualitative assessment only of sediment inundation levels is made.

A report detailing the data and photographs collected during monitoring is submitted to NMFS and NMFS is notified immediately of any pressing concerns associated with the fish ladder function. At a minimum, the post-storm monitoring reports include:

- Whether or not steelhead were observed
- Potential barriers to migration (if applicable)
- Photographs and descriptions of the habitat at the point of observation (if applicable)
- Maps showing the locations where observations of steelhead, and/or barriers to steelhead movement were made (if applicable)
- Presentation of data and analysis focusing on sediment accrual within the ladder and its effect on fish passage parameters
- Flow rates recorded at USGS gage 11113500 located upstream of the Project
- Qualitative description of the amount of sediment and woody debris accumulation within the pools of the fish ladder
- Description of the effectiveness of the fish ladder to facilitate steelhead migration

Year End Monitoring Summary Report

A Year End Monitoring Summary Report is submitted to NMFS for each of the five years of monitoring, and includes a summary of the results and brief description of methodologies used in all monitoring efforts conducted that year. It also includes a comparison analysis to document and summarize any inter- and intra-annual trends, concerns, and/or recommendations for future operation and maintenance, sediment removal, etc.

1.5.2.2.2 Monitoring to be Conducted by the VCWPD

Upon completion of the Proposed Action, the Corps will turn the implementation of operation and maintenance responsibilities of the Project over to the VCWPD. The Corps will continue to implement the Five-Year Monitoring Plan currently in progress as described above. Operation and maintenance activities to be conducted by the VCWPD include regular inspections to be conducted in accordance with the O&M Manual upon approval of the Manual by NMFS. It is anticipated that these inspections and other regular maintenance activities may be incorporated into VCWPD's Ongoing Routine Maintenance Program, which would be authorized under a Regional General Permit currently in development by the Corps Regulatory Division. The following conditions would be included in the monitoring requirements to be performed by VCWPD.

Fish Passage Inspections

Inspection of Project features associated with fish passage shall be conducted periodically throughout each year to validate the Project's ability to enable fish passage per design. Project

features associated with fish passage include: (1) Approach Channel; (2) Fish Ladder; (3) Low Flow Channel; and (4) Pilot Channel. There are two triggers for inspection of fish passage capabilities:

- Post-Storm Inspections (storms producing flow of 500 cfs or more)
- Low Flow Inspections (mid-April to mid-July)

For all fish passage related inspections, the qualified biologist shall make visual observations, perform necessary photo documentation, and record flow levels for the Project area as well as document any steelhead observed during the inspection. Monitors shall document sediment and debris accumulation upstream, downstream, and between weirs of the inlet structure/fish ladder, and evaluate and document potential isolated pool formation or other factors that may inhibit steelhead migration through the remainder of the Project area, including the approach channel, low flow channel, and pilot channel, as described below.

Fish Ladder and Approach Channel

Pool volume must be restored when it is reduced by the presence of sediment, including the formation of hardened or vegetated beds of sediment. Sediment must be removed when the maximum depth of deposition across the pool exceeds 3.3 feet (1 meter), or when the drop between adjacent pools exceeds 1 foot (0.3 meter) between the invert of the upstream pool and the top of the water surface of the downstream pool. Large-sized boulders and other debris must be removed as soon as is practicable if it obstructs the weir notches and creates drops of greater than 1 foot (0.3 meter). The upstream end of the fish ladder will be kept clear of sediment as needed to make sure hydraulic connectivity is maintained from the approach channel into and through the fish ladder, and downstream through the remainder of the Project area to the Creek's confluence with the Santa Clara River. This may require regrading of the approach channel upstream of the fish ladder to ensure flows are directed into the fish ladder. The approach channel shall also be inspected for sharp or sudden drops that exceed 1 foot (0.3 meter) or isolated pools that could strand fish. Areas shall be restored to design conditions where this condition is not met.

Impact loading from debris or boulders may cause some cosmetic damage along the top of the fish ladder weirs. Repairs of this nature are expected to be rare, especially with the proposed repairs to the weir tops through rounding and capping. Major repairs to the weirs are not expected unless the weir is not functioning to pool water and pass the flows through the notch or there is sufficient evidence that damage may cause the weir to fail structurally. If major repairs are necessary, they shall not be implemented prior to coordination with the NMFS and other relevant agencies.

Low Flow Channel

The low flow channel runs the length of the project from the base of the fish ladder to the confluence with the Santa Clara River. The low flow channel conveys the base flow during the non-storm season. It is designed to provide a depth and velocity that allows migration of steelhead. The low flow channel will be kept operable at all times during the steelhead migration season.

The low flow channel will likely migrate along the FRMC due to seasonal flow changes and dynamic sediment deposition and erosion patterns. Based on past observations, the low flow channel will form naturally and therefore should not require maintenance apart from being reestablished after sediment cleanout operations. The low flow channel will be inspected following a storm event that exceeds 500 cfs. The low flow channel shall also be inspected during the spring and fall (described below) to ensure that a well-defined low flow path is free of obstructions throughout the project. The low flow channel will also be inspected for sharp or sudden drops that exceed 1 foot (0.3 meter), isolated pools that could strand fish, or braiding of the channel that could result in insufficient depth.

Pilot Channel

A pilot channel connects the outflows from the invert stabilizer at station 10+00 to the Santa Clara River. It is an entrenched trapezoidal channel with an earth bottom and earth side slopes that functions to direct flows from the invert stabilizer into the Santa Clara River under a controlled pathway.

The pilot channel will be inspected to ensure that positive drainage is continuous to allow the low flows of Santa Paula Creek to reach the low flows of the Santa Clara River without ponding. The pilot channel will also be inspected for sharp or sudden drops that exceed 1 foot (0.3 meter) and isolated pools that could strand fish. Areas shall be restored to design conditions where this condition is not met.

Fish Passage Inspection Reports

During post-storm and low flow inspections of features associated with fish passage, a qualified biologist will complete the checklist provided in Appendix II of the O&M Manual. NMFS will be contacted regarding proposed corrective actions and a summary report will be subsequently prepared that documents actions taken.

Semi-Annual Structural Inspections

Separate from the fish passage inspections described above, semi-annual inspections will be conducted by the VCWPD in accordance with the O&M Manual. These structural inspections would include the earth channel invert, grouted stone invert stabilizers, and other Project features to determine if any deviations have occurred from the current 'as-built' condition and whether the deviations are substantial enough to require maintenance. Semi-annual flood risk management reports will be prepared in the spring and fall. The spring report should be submitted on June 1 and the fall report on December 1. Reports will include a summary of the deviations found during the inspections, inspection logs related to the feature that requires maintenance, any investigation and test programs that were completed or to be scheduled, and any maintenance that was completed or to be scheduled.

Earth Channel Invert

The channel invert is a natural earthen streambed that consists of native soils and vegetation. Sediment deposition is expected to occur primarily in the downstream and upstream ends. If a visual inspection of channel cross sections indicates that cleanout or scour remediation actions are warranted, a survey of the invert elevations is required for comparison to the design invert elevations. When the depth of sediment exceeds the allowable depth at any location, sediment must be removed from the project to restore the invert to the design invert elevations shown in

Table 1. In addition, each channel cross section shown in ***Table 1*** will also be examined for scour. Scour that has exceeded the encroachment limits established in the O&M Manual will be addressed by placing native soil in the affected area to the design invert elevation.

The maintenance to restore the invert to design conditions will be performed no later than the beginning of the following flood season. It is expected that sediment removal will be required approximately every three years on average, but will vary depending on the severity of the cumulative storm events each year.

Grouted Stone Invert Stabilizers

Grouted stone invert stabilizers are located at station 10+00 and near station 35+00 to provide a barrier to degradation of the earth channel invert. When the depth of sediment across these structures exceeds the allowable depth shown in ***Table 1***, sediment would be removed in conjunction with sediment removal within the entire earth channel invert. In addition, the scour level at these structures shall not encroach within 1.64 feet (0.5 meter) of the bottom of the subsurface grouted stone. If such scour is identified, it will be immediately repaired.

Other Project Features

Other Project features that would be inspected for structural integrity include grouted stone channel side slopes, levees, concrete channel walls, abutments, and piers, side drains, fencing, service roads, and landscaping.

1.5.2.2 Refinement of the Allowable Sediment Profile and Design Invert

This section pertains to the entire FRMC channel, and is not restricted to the fish ladder. Maintenance as described in this section is related to the need to ensure flood capacity and protect against scour within the entire Project channel. While these activities are related to the structural integrity and function of the channel and thus have considerations for fish passage, they are not meant to address fish passage specifically. Fish passage inspections and maintenance activities for the fish ladder (i.e., regular sediment cleanout of the fish ladder pools) are described in Section 1.5.2.1 (Maintenance) and Section 1.5.2.2 (Monitoring).

A revised allowable sediment profile and design invert profile is included in the O&M Manual with detailed analyses and descriptions provided in the Hydrologic, Hydraulics, and Sedimentation Appendix (Corps 2011c). The allowable sediment profile represents the maximum volume (and height) of sediment that can accumulate above the design invert, prior to sediment removal, to safely meet the flood risk management parameters for the FRMC. The design invert profile defines the elevation of the channel invert throughout the project area after sediment removal is complete. The design invert profile has been revised to address the potential for scour in the upper reaches of the FRMC, from the general area of the railroad bridge upstream to the fish ladder. The change to the design and allowable sediment profile also provides a non-structural solution to the potential for scour at the base of the fish ladder. The allowable sediment profile has been revised in the upstream and downstream reaches of the FRMC to ensure that frequency of sediment removal is consistent with timeframes identified in the 2000 BO, while accounting for consideration of overall sediment scour and deposition patterns that have been observed in the FRMC during dry and wet season cycles since the project

was constructed. As described below, this refinement also includes modifications of the design invert to protect against scour.

Inspection for sediment deposition and scour within the FRMC channel relative to the channel's capacity to pass flows and corresponding sediment loads per design would be conducted at the end of each flood season and immediately after storms producing a flow of 5,000 cfs or more. If a visual inspection indicates that sediment cleanout or scour remediation actions are warranted, a survey of the invert elevations is required for comparison to the design invert elevations. When the accumulation of sediment exceeds the allowable at any location, sediment must be removed from the entire channel to restore the invert to the design invert elevations.

The new design invert is the same as the original design invert downstream of station 20+38, near the railroad bridge. Upstream of station 20+38, the new design invert would raise the bottom elevation in order to protect against scour along the toe of the side slopes and at the base of the fish ladder. The new upstream design invert raises the bottom elevation higher than the as-built channel bottom to increase protection against scour at the toe of the grouted stone channel side slopes. Except for isolated locations, the toe of grouted stone is typically 5 feet (1.5 meters) below the constructed channel invert.

The new design invert is set at a critical threshold so that the elevation is high enough to protect the toe of revetment from long-term scour, and at a level that would not increase sediment deposition and affect corresponding channel capacity downstream. The new design invert is not expected to increase the need for channel maintenance or the frequency of sediment removal. Sediment removal and/or scour repair within the FRMC is still expected to be necessary on the order of every three years, on average, and the average annual sediment accumulation should not exceed the General Reevaluation Report (GRR, Corps 1995) estimate of 45,000 cubic yards.

HEC-6T software was used to model sediment transport of Santa Paula Creek to produce the new design invert and the proposed allowable sediment profile. ***Table 1*** presents the proposed allowable depth of sediment above the constructed channel invert and above the new design invert throughout the Project reach. These depths represent the proposed amount of sediment allowed to accumulate on top of either the as-built invert or the new design invert.

Table 1. Allowable Sediment Accumulation Profile in the Project

Station (meters [m])	Allowable Sediment Depth above Constructed Channel Invert (m)	Allowable Sediment Depth above New Design Channel Invert (m)	Station (meters)	Allowable Sediment Depth above Constructed Channel Invert (feet [ft])	Allowable Sediment Depth above New Design Channel Invert (ft)
10+00	2.3	2.3	10+00	7.5	7.5
11+37	1.8	1.8	11+37	6	6
12+25	1.8	1.8	12+25	5.9	5.9
13+25	1.6	1.6	13+25	5.2	5.2
14+25	1.5	1.5	14+25	4.9	4.9
15+25	1.5	1.5	15+25	4.9	4.9
16+25	1.4	1.4	16+25	4.6	4.6
17+25	1.3	1.3	17+25	4.4	4.4
18+25	1.3	1.3	18+25	4.2	4.2
18+53	1.2	1.2	18+53	4.1	4.1
18+82	1.3	1.3	18+82	4.2	4.2
20+38	1.2	1.2	20+38	4	4
21+89	1.7	1.2	21+89	5.7	4
23+75	2.1	1.2	23+75	6.6	4
24+51	2.3	1.2	24+51	7.4	4
25+85	2.9	1.2	25+85	9.4	4
27+45	3.5	1.2	27+45	11.4	4
27+68	3.6	1.2	27+68	11.7	4
30+39	4.4	1.2	30+39	14.5	4
31+92	4.2	1.2	31+92	13.9	4
33+96	3.7	1.2	33+96	12.1	4
34+38	3.2	1.2	34+38	10.5	4
35+15	2.1	1.6	35+15	6.8	5.4
35+92	0	0	35+92	0	0

Note: Variations in conversions from meters to feet can be attributed to rounding.

1.6 Consultation History

Informal consultation between the Corps and the NMFS began in 1997, when the Southern California ESU of steelhead was listed as endangered under the ESA. The Corps had begun construction of the current alignment of the FRMC in 1997, including removal of the cement lined channel, improvement of the channel (in two phases), modification of the Southern Pacific Railroad Bridge for increased flow conveyance capacity, construction of a fish passage structure at the inlet, and inlet and outlet stabilization.

NMFS expressed several concerns with the fish ladder design presented in the Corps 1995 GRR and requested that the fish ladder be redesigned. In 1999, the Corps, NMFS, and the CDFG

worked very closely together for a year to redesign the fish ladder. The Corps prepared a Final Supplemental Environmental Assessment (SEA) in 2000 to address impacts related to construction of the redesigned fish ladder, developed in collaboration with NMFS and CDFG as the best design that would have the least impact on the movement of native fish.

As is detailed in the Corps' 2000 *Final Supplemental Environmental Assessment for an Additional Rock Source Site, Low Flow Channel Design, & Redesigned Fish Ladder for the Santa Paula Creek Flood Control Project, Ventura County, CA (2000 SEA)*, the original design of the fish ladder for the Project appears in Sections 5.1.6 and 5.1.13.2.1 of the 1995 EIS/EIR and in the Hydraulics Appendix (A2: pages A2-48 to A2-51). The original design was coordinated with California Department of Fish and Game (CDFG) (see Appendix J of the Final EIS/EIR). The primary species of concern was the steelhead trout, which at the time was not federally listed. The NMFS commented on the Final EIS/EIR in letter to the Corps, dated 29 September 1995. At that time, the NMFS expressed no concerns with the design of the fish ladder for the Project.

The original design had the fish ladder on the west side of the grouted stone inlet, outside of the main flow of the channel. A stop log or gate structure was planned for the upstream end of the fish ladder to minimize potential damage to the ladder during moderate to large storm flow events. The ladder itself was a trapezoidal structure with 13.5 foot x 13.5 foot resting pools, a series of approximately 25 wooden weirs, with a on-foot vertical drop between pools. Wooden planks used for the weir would be braced by two steel beams, placed in the grouted stone and supported by a concrete foundation. The fish ladder was designed for discharges ranging from 10-50 cfs. From the flow duration data, the exceedance for 10 cfs was 63% and for 50 cfs was 24%.

Annual maintenance of the fish ladder was expected to be necessary to ensure it functioned as intended. The low flow channel was expected to need to be moved if necessary several times a year to direct flows in and out of the ladder. During very large flow events it was expected that deposition might occur into the fish ladder and the wooden weirs might be damaged. Sediment removal and maintenance of the weirs was expected to be necessary.

On 18 August 1997, several Evolutionary Significant Unit (ESUs) of West Coast Steelhead were listed as Threatened and Endangered under the Endangered Species Act (ESA) (cf. 62 FR 43937); the Southern California ESU was listed as endangered. On 21 November 1997, the Corps requested concurrence from the NMFS on the Corps' determination that the Project was "not likely to adversely affect" steelhead. The Corps received concurrence from the NMFS in a letter dated 3 December 1997.

In July 1999, while reviewing VCWPD's Section 404 permit for future O&M of the of the Phase I portion of the Project, NMFS expressed concern over the design of the fish ladder for the Project. (The initial construction of the Phase I portion of the Project was completed in October 1998. The Corps was attempting to turn future O&M responsibilities over to the VCWPD as per the agreements in the GRR.) Due to concerns raised informally by the NMFS, the Corps began informal re-initiation of Section 7 Consultation of the ESA with NMFS in an attempt to resolve concerns that NMFS now had with the original design of the fish ladder. The Corps had several meetings with NMFS and CDFG to identify and receive input into the re-design of the original

fish ladder concept for the Project. The primary concerns raised by NMFS were related to the range of discharges that the original design was expected to function between (10-50 cfs) and they preferred a design that required less maintenance to ensure hydraulic connectivity at the up- and downstream portion of the ladder. These concerns were further defined in key components and criteria that NMFS and CDFG indicated for inclusion into the re-design of the fish ladder: (1) incorporating the fish ladder directly into the inlet chute, (2) having pool widths as constant as possible, (3) providing for a minimum depth of 2 feet for resting pools, and (4) configuring the weir such that it includes a 10% cross slope above the notch.

Nine preliminary designs were identified; of these nine, three were further analyzed in a second round of design. These three and the No Action, or original design, were studied in further detail. This resulted in five main alternatives with slight variations as sub-alternatives. The design that was implemented and currently exists on-site was chosen by a consensus of the resource agencies, including NMFS and CDFG, as the best re-design that would, by comparison to other alternatives, have the best likelihood of functioning hydraulically and yet be maintained with a minimal amount of effort and at a reasonable expense and have the least impact on the movement of native fish. It was agreed during a teleconference meeting between the Corps and NMFS on 7 February 2000 that the final redesign of the fish ladder would be based on Alternative 3B. Further details of this coordination are available in Appendix A of the Corp's 2000 SEA.

Alternative 3B was decided as the best alternative for re-design by the Corps and NMFS with the knowledge that a high frequency of sediment removal would be necessary and the facility would be subject to damage from heavy bedload since it would be located within the channel. It was also noted that there would be a high frequency of maintaining flow connectivity upstream and downstream of the fish ladder. This maintenance was expected to be relatively inexpensive and be able to provide fish passage over an acceptable range of discharge (Corps 2000, Appendix A, Table 5, p. 10).

The final re-designed configuration of the fish ladder is composed of a single row of weir pools that are 10 feet long, 46 feet wide, and have a 2 foot minimum depth at 10 cfs, with an overall slope of 0.741. The ladder is designed to function at flows from 10 cfs to 150 cfs; however, the ladder will likely provide passage up to 300 cfs with decreasing efficiency. The range of fish ladder flows (10-150 cfs) correlates with the 10% and 90% exceedence levels during the anticipated upstream migratory period of January through April. The weirs have a gradual slope of 1 vertical:10 horizontal to promote flow toward the weir notches. The pool and weir was designed to have a maximum drop of 1 foot between pools (Corps 2000 and NMFS 2000).

When the NMFS re-evaluated the fish ladder's design, they requested the Corps coordinate with them to develop more specific guidelines to ensure that aquatic resource, especially steelhead, would not be impacted by the low flow channel that would be constructed following routine maintenance. The Corps complied with this request and established channel dimensions and characteristics by analytical considerations that were refined with observations of the natural channel existing upstream of the Project limits.

Various combinations of channel bottom width, depth, and side slope were investigated to provide acceptable values of flow depth and velocity for the range of design discharges. The

calculations indicate that a channel with a bottom width of 10 feet and a side slope of 2 horizontal to 1 vertical will provide flow depths of 0.3, 0.9, and 1.7 feet for discharges of 10, 50, and 150 cfs, respectively. The corresponding average flow velocities were predicted to be 3.1, 4.7, and 6.6 feet per second (ft/s), respectively. These values were generally within the range of values used for the design of the fish ladder. To provide for practical construction, a range of allowable channel widths and depths was developed. The channel bottom width was allowed to range between 8.2 to 9.8 feet, the channel depth between 1.6 and 3.3 feet, and the channel side slopes between 1.5 to 2.5 horizontal to 1 vertical.

The design values for the low flow channel were checked against the dimensions of the natural low flow channel observed upstream of the Project limits, just downstream of "Fairweather Crossing," at a discharge of approximately 100 cfs. The natural low flow channel top width was somewhat greater than the top width that would result from the constructed channel, however, the narrower width would promote the desired depth of flow. The design values were also compared to the channel that was observed within the completed construction reach.

Based on the field observations, the established range of channel dimensions was judged to be satisfactory. To better simulate a natural flow channel and also for better aesthetic appeal, the low flow channel was to be excavated with slight variations in the width, depth, and side slope, as long as the channel properties are within the specified range. In addition, small boulders were to be randomly placed every several meters along the channel bottom to create artificial riffle and pool sequences. Finally, the channel was to be excavated on a meandering alignment with simple reverse curves. The curve radius was to vary between 650 to 1150 feet. These values were established by measuring the meander bend radius of the natural low flow channel upstream of the Project reach. To allow for maintenance access along the side of the low flow channel, the channel centerline was to be located no closer than 9.8 feet to the toe of the FRMC side slope. Conversely, the centerline was to be located no further than 16 feet from the toe to provide sufficient meander. This description of the low flow channel, then referred to as the pilot channel, was provided in the 2000 SEA.

The Corps requested reinitiation of Section 7 consultation with NMFS on April 17, 2000, and submitted the SEA as the Biological Assessment. The Corps received a Final BO for the redesigned fish ladder from NMFS in September 2000. The fish ladder re-design and low flow channel alignment descriptions from the Corps' 2000 SEA/BA were used in the 2000 BO with minor refinements. The minor refinements include a low flow channel bottom width of 8 to 11.5 feet, a depth of 2 to 3.25 feet, and side slopes of 1:1.5 to 1:1.25 (NMFS 2000).

The existing fish ladder was completed in 2002. In 2003, scour from a storm event created hydraulic conditions unfavorable to upstream migrating steelhead below the fish ladder inlet. After close coordination with NMFS and CDFG, the Corps constructed grouted stone grade stabilizers across the full width of the channel in the

identified areas to elevate downstream pool levels to facilitate upstream passage of steelhead. ***Figure 8*** shows the completed fish ladder in 2002, with inlet stabilization and re-constructed low flow channel downstream. Immature riparian vegetation can be seen along the banks of the low flow channel.

Source: US Army Corps of Engineers, September 2002.

US Army Corps of Engineers

Figure 8
Aerial View of the Project Inlet in 2002

Santa Paula Creek Biological Assessment

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In 2009, the Corps received additional Federal funding to remove sediment from the Project area. The Corps reinitiated consultation with NMFS upon a determination that sediment removal would disturb steelhead critical habitat. Following NMFS' review of the administrative record and subsequent communications with the Corps, the Corps proposed additional conservation measures and monitoring elements to incorporate as part of the Project to reduce impacts to critical habitat. The Corps committed to complete additional sediment analyses and to work with NMFS to ensure that the fish ladder conveyed fish passage to mitigate impacts to southern California steelhead. The Corps agreed to prepare and initiate a monitoring program to analyze the performance of the designed low flow channel following sediment removal actions to clear the weir pools. In September 2009, NMFS issued a letter amending the original 2000 BO that identified conservation measures and monitoring elements required to implement the sediment removal (NMFS 2009a).

The sediment removal began in October 2009 and was completed January 2010, removing approximately 300,000 cubic yards of material from the FRMC. A Monitoring Plan was developed consistent with the RPMs, Terms and Conditions, and environmental commitments of the 2009 Amendment to the 2000 BO.

The Corps began correspondence with the NMFS and CDFG to evaluate the existing fish ladder in 2009. Several meetings and letters were conducted and written, respectively, between December 2009 and March 2010 with NMFS, CDFG, USFWS, VCWPD, and the Corps and its contractors, HDR/CDM Joint Venture, to discuss potential repairs to the fish ladder that was constructed in 2002. NMFS submitted a letter to the Corps, dated 25 January 2010, with an attached Technical Memorandum (14 January 2010) that with the purpose of summarizing their overall understanding of fish passage alternatives being evaluated and the data needs/analyses that would be necessary to develop, compare, and assess preliminary conceptual designs.

The Corps considered NMFS concerns and commissioned further study to evaluate the existing fish ladder relative to other fish passage facility designs. Updated analysis is presented in the Corps' 9 April 2010 document titled, *Santa Paula Creek Flood Control Project Phase II: Alternatives Evaluation and Conceptual Design for Fish Passage Improvement at the Santa Paula Creek Flood Control Channel Inlet (Field Change Report)*. This document compares potential fish ladders designs, including the existing fish ladder, and their expected performance to design parameters published by NMFS and CDFG. Further analysis on sedimentation and hydraulics and hydrology were also conducted and are documented in the *Hydrology, Hydraulics, and Sedimentation Appendix (HHS Appendix) of the Design Documentation Report (DDR)* (Corps 2012).

The Corps evaluated all of the information presented in the Field Change Report, the information obtained during the meetings of 2009 and 2010, the HHS Appendix, monitoring reports, and past documents as well as the current and foreseeable funding climate. After careful evaluation of potential fish ladder design alternatives the Corps determined the existing fish ladder is capable of functioning as good, or better overall, than any of the other alternatives that were being proposed.

The Field Change Report documents the results of the predicted performance based on HEC-RAS modeling for parameters including depth, velocity, and energy dissipation factor (EDF) for

clean and with sediment conditions for: (1) the existing fish ladder; (2) an alternative with modifications to the existing fish ladder including rounding and capping of the weirs, changes to the notch geometry, training structures, and additional pools and weirs at the downstream end of the fish ladder (Alternative A); and (3) a roughened channel alternative (Alternative D-2). The design criteria, which were derived from CDFG (2009) and NMFS (2008) criteria, were as follows:

- Minimum Depth: 1 foot
- Maximum Cross-Sectional Velocity: 6 feet per second
- Maximum EDF: 4 foot-pounds per second per cubic foot for fish ladders, 7.0 ft-lbs/s/ft^3 for roughened channels

The existing fish ladder was able to maintain a depth of more than 2 feet at 1 cfs discharge, in a clean condition. This is comparable to the depth for Alternative A, and substantially more depth than Alternative D-2 for 1 cfs discharge. The average cross-sectional velocities in clean pools met the minimum design criteria for existing conditions and Alternative A in excess of 4,500 cfs, but less than 28,000 cfs. Alternative D-2 exceeded the velocity threshold at less than 1,000 cfs. EDF was 4.3 foot-pounds per second per cubic foot at 300 cfs for the existing fish ladder in a clean condition. The EDF was 4.8 foot-pounds per second per cubic foot at 300 cfs for Alternative A in a clean condition. The EDF criterion was exceeded at less than 50 cfs for Alternative D-2 in a clean condition. The existing fish ladder and Alternative A had similar velocities at the notch and were not expected to exceed the design criteria until above the scenario where overtopping of the fish ladder is anticipated to occur (Pers. comm. Jonathon Mann 2012).

The affect of sediment accumulation within ladder pools was also evaluated. To approximate the affect that sediment accumulation may have on fish passage effectiveness, variances in EDF were estimated under three physical conditions: a well maintained pool free of sediment; 1-foot of sediment accumulation across the bottom of pool; and 2 feet of sediment accumulation across the bottom of the pool. The calculated stream discharges corresponding with the recommended EDF value at the three sedimentation conditions are 243 cfs for the clean condition, 200 cfs when 1-foot of sediment has accumulated, and 151 cfs with 2-feet of sediment accumulated. This shows a slight improvement over the existing fish ladder performance described in the GRR. However, this change is likely due to the use of different calculation methods.

The Corps evaluated expected Project performance for the various alternatives along with the lessons learned from the existing fish ladder and determined the existing fish ladder can perform as well or better than any of the alternatives explored with prescribed maintenance. The existing fish ladder and Alternative A exhibited the ability for fish passage criteria to be met over the widest range of flows. The Field Change Report results confirm the range of effective fish passage flows from 10 cfs up to 150 cfs with diminishing effectiveness up to, and in excess of 300 cfs. The existing condition performed similarly or better than any of the other alternatives evaluated with and without sediment accumulation in the fish ladder pools. The rounding and capping of the existing fish ladder weirs will enable prolonged durability of the facility over time. The changes to design and allowable sediment profile are expected to diminish the need

for extension of the fish ladder in the downstream direction that were prescribed for Alternative A. The refinement of O&M measures and their implementation, informed by regular and post-storm monitoring, is expected to enable the existing fish ladder to perform as designed. O&M measures of note include an annual cleanout of the fish ladder prior to the start of the steelhead migratory season and monitoring to inform the need for maintenance of the low flow channel, including the approach channel, which guides flows into the fish ladder. This information guided the Corps to its current position, which was presented to NMFS on 14 February 2012 to discuss the proposed action detailed in this BA. Coordination with NMFS is currently ongoing relative to the proposed actions.

1.7 Action Area

The Proposed Action would affect the entire FRMC. Therefore, the action area includes the fish ladder plus an approximately 500-foot (152-meter) reach of creek and creek bed extending upstream from the fish ladder and the reach of creek and creek bed extending downstream approximately 1.65 miles (2.7 kilometers) to the confluence of Santa Paula Creek and Santa Clara River (***Figure 7***).

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2.0 Presence/Status of Listed Species and Designated Critical Habitat in Project Area

A list of threatened and endangered species which may occur in the Santa Paula USGS 7.5-minute quadrangle in which the Project area is located was obtained from a search of the California Natural Diversity Database (CNDDB) (CNDDB 2011). The CNDDB list is provided in Appendix D. Information on the presence of suitable habitat for listed species in the Project area was also obtained from the findings of field investigations conducted by Corps biologists and existing biological studies, including the BA prepared for the VCWPD for the Santa Paula Creek Maintenance Project (Entrix 2007). A site reconnaissance was conducted by a Corps biologist and consultant biologists on January 10, 2012.

The federally listed species, and candidate species, identified by the CNDDB search as having the potential to occur within the vicinity of the action area include the following:

- Santa Ana sucker (*Catostomus santaanae*), threatened
- Unarmored threespine stickleback (*Gasterosteus aculeatus williamsoni*), endangered
- Southern steelhead - southern California ESU (*Oncorhynchus mykiss irideus*), endangered
- Southwestern willow flycatcher (*Empidonax traillii extimus),* endangered
- Coastal California gnatcatcher (*Polioptila californica californica*), threatened
- Least Bell's vireo (*Vireo bellii pusillus*), endangered
- Western yellow-billed cuckoo (*Coccyzus americanus occidentalis*), candidate

Of these species, the Santa Ana sucker, southern steelhead, southwestern willow flycatcher, and least Bell's vireo (LBV) are known to occur within the vicinity of the action area. Suitable habitat is not present for the other species listed above; therefore, they are considered to be not present and are not further evaluated in this BA. Although marginal habitat for the least Bell's vireo exists near the Project area, the species was not found during protocol surveys, and has not been documented within the Project area. Based on information on species occurrence, as detailed below, the population of Santa Ana sucker in the Project area was introduced.

Critical habitat for the southwestern willow flycatcher has been proposed to include the Santa Clara River. This critical habitat would be located adjacent to the Project area at the downstream end where Santa Paula Creek enters the Santa Clara River. Therefore, this BA addresses potential impacts to southern steelhead and proposed critical habitat for southwestern willow flycatcher.

2.1 Least Bell's Vireo

LBV was listed as federally endangered in 1986 (USFWS 1986) and critical habitat was designated in 1994 (USFWS 1994). The Project area is not within designated critical habitat (USFWS 2011a). The nearest designated critical habitat is located along the Santa Clara River approximately 18 miles east of the Project area (USFWS 2011a).

The LBV is a small, insectivorous, grayish bird that migrates between wintering grounds in southern Baja California to breeding grounds in southern California. LBV are known to arrive in

southern California from mid-March to late April and begin to return to their wintering grounds between July and September (USFWS 1998).

The LBV is an obligate riparian breeder, known to prefer riparian woodlands that combine an understory of dense willows or mulefat with a canopy of tall willows for breeding. Preferred woodlands typically consist of red willow and Gooding's black willow, with a dense understory of sandbar willow, arroyo willow, mulefat, and some herbaceous species. Cottonwoods, western sycamore, and coastal live oak also commonly contribute to the over-story. The Draft Recovery Plan for the LBV (USFWS 1998) notes the structure provided by vegetation appears to be more important that the species composition or the age of the stand.

The presence of LBV within the Project area is unlikely. Pockets of marginally suitable habitat had previously occurred at irregular intervals throughout the action area. These pockets of vegetation and nearly all other vegetation within the grouted side slopes were removed during the 2009 sediment removal project.

LBV is known to occur along the Santa Clara River, but there are no documented occurrences along Santa Paula Creek (CNDDB 2011). The Corps conducted surveys within the Project area under a modified protocol, as recommended by the USFWS in 2009. Modified protocol surveys began on June 30, 2009, and were completed in July 2009. Potential LBV habitat was limited to a few small, disconnected pockets within the Project area. These pockets of habitat were marginal in quality at best, often lacking the multi-tiered structure that LBV prefer for nesting, as is described in the Primary Constituent Elements section of the Designation of Critical Habitat for the LBV (USFWS 1994).

During the 2009 survey, LBV was not found within the action area. The areas of marginal quality habitat described above were removed in the 2009 sediment removal action. Since riparian vegetation within the site is expected to remain in a relatively seral state due to the frequency of cleanouts and large bed load transported during storm events, no suitable habitat is present for LBV within the Project area. Therefore, the species was not evaluated further in this BA.

2.2 Santa Ana Sucker

The Santa Ana sucker was listed by USFWS as threatened in 2000 (USFWS 2000). Critical habitat was designated in 2005 and revised in 2010 (USFWS 2010). The Project area is not within designated critical habitat.

Native populations of this species are now restricted to three noncontiguous populations in three different stream systems in southern California: the lower and middle Santa Ana River in San Bernardino, Riverside, and Orange Counties; the East, West, and North Forks of the San Gabriel River in Los Angeles County; and lower Big Tujunga Creek, a tributary of the Los Angeles River in Los Angeles County (USFWS 2010).

Santa Ana suckers have been known to occur within the Santa Clara River and its major tributaries since the late 1920s or early 1930s. Subsequent investigations confirm that they were introduced to this system from the Los Angeles Basin about this time along with the arrival of the Owens sucker (*C. fumeiventris*) from the Owens River system via the Los Angeles aqueduct

system (Swift *et al.* 1993, Moyle 2002). These species are widespread in the river and tributaries, including Santa Paula Creek from Piru Creek downstream to near the ocean, and regularly produce hybrids that occur over most of this area. The Santa Clara River population was not included in the threatened listing because of its presumed introduced status (USFWS 2000). Therefore, the species was not evaluated further in this BA.

2.3 Southern Steelhead - Southern California ESU

The Southern California Distinct Population Segment (DPS) of steelhead which encompasses the populations occurring from the Santa Maria River to the California-Mexico border was listed as endangered in 1997 and its endangered status was reaffirmed in 2006 (NMFS 2006). In 2005, NMFS published a final designation of critical habitat, with an effective date of January 2, 2006 (NMFS 2005). Santa Paula Creek was included in the final critical habitat designation as part of the Santa Clara Calleguas Hydrologic Unit.

It is estimated that steelhead populations have been reduced to less than 1 percent of their former population size in southern California (Stoecker and Kelley 2005). Providing adequate upstream steelhead passage through Santa Paula Creek is essential for the recovery of the species to the watershed and would allow steelhead to take advantage of the spawning and rearing habitat in upper reaches of Santa Paula Creek (NMFS 2009b, Titus *et al.* 2010).

Historically, steelhead migrated upstream through the lower Santa Clara River to reach spawning grounds in Santa Paula, Sespe, and Piru Creeks. Santa Paula Creek is the first major tributary above the Vern Freeman Diversion Dam along the Santa Clara River and is one of the three main historical spawning tributaries for southern steelhead. Rainbow trout (*O. mykiss*) are the non-anadromous form of steelhead, and a wild, self-sustaining population of rainbow trout which inhabits Santa Paula Creek can produce some out-migrating smolts that emigrate to the Pacific Ocean (Stoecker and Kelley 2005, Harrison *et al.* 2006).

In 1993, a trap was installed at the fish ladder at the Vern Freeman Dam on the Santa Clara River. Since that installation, adult steelheads have been detected attempting to migrate up the River. Seven adult steelhead were trapped at the Vern Freeman Dam during the period 1993 to 2006 (Stoecker and Kelley 2005, Harrison *et al.* 2006).

Both juvenile steelhead and rainbow trout were noted as being present in Santa Paula Creek in a mid-1930s survey conducted by the CDFG. Since the 1940s, the reach of Santa Paula Creek above the Harvey Diversion Dam has been managed intensively as a catchable rainbow trout fishery. In March 1987, the USFWS conducted an electrofishing survey in Santa Paula Creek below the diversion site, which resulted in the detection of two adult steelhead and two adult resident rainbow trout. A1992 survey in the same area conducted by CDFG resulted in no detection of either steelhead or rainbow trout (Titus *et al.* 2010).

Observations of three fish that appeared to be steelhead were made in the FRMC on January 6, 2010 and January 7, 2010, near the end of the sediment removal project. Corps and NMFS staff was present when the first sighting occurred. Mr. Darren Brumback, NMFS, examined the fish and returned the fish back into the low flow channel. Mr. Brumback recommended that the biologists follow the same procedure for any other fish found and place them below the fish

ladder. The same procedure was followed per Mr. Brumback's recommendation for the other fish that was salvaged and relocated.

2.4 Proposed Critical Habitat for Southwestern Willow Flycatcher

The southwestern willow flycatcher was listed as endangered in 1995 (USFWS 1995). Critical habitat was first designated in 1997 and revised in 2005 (USFWS 2005). At that time, the Santa Clara River was excluded from the critical habitat designation; however, it is included in a proposed revision to critical habitat published in 2011 (USFWS 2011b).

The southwestern willow flycatcher breeds in relatively dense riparian tree and shrub communities in the arid southwestern United States (USFWS 2002). The species is known to breed along the Santa Clara River. The nearest documented occurrence of the species to the Project area is along the Santa Clara River approximately 2.5 miles (4 kilometers) downstream of Santa Paula Creek (CNDDB 2011). Proposed critical habitat includes a 49.4-mile (79.5-kilometer) segment of the Santa Clara River, including the area at the confluence with Santa Paula Creek (USFWS 2011b).

3.0 Environmental Baseline

3.1 Effects Analysis Methodology

Several data sources were used to describe the existing conditions of the action area and to evaluate potential impacts from the Proposed Action. Primary data sources reviewed and incorporated into this document include surveys and reports conducted by the Corps and their consultants, CNNDB species occurrences, proposed and final rules for the federal listing of species and designation of critical habitat, recovery plans, and published scientific documents that pertain directly to the specific circumstances and issues involved in this analysis. In addition, the Corps, with the assistance of its contractors (HDR/CDM Joint Venture) conducted hydrology, hydraulic, and sediment transport analyses.

The analysis of potential impacts from the Proposed Action is limited to those concerning southern steelhead, its designated critical habitat, and proposed critical habitat for southwestern willow flycatcher in the Santa Clara River. The critical habitat designation for southern steelhead indicates that the Project area provides one or more "primary constituent elements" (PCEs) that are essential to support one or more life-stage(s) of the listed species. The PCE provided by the action area is a freshwater migration corridor, which is defined as being "free of obstruction and excessive risk of predation with adequate water quantity to allow for juvenile and adult mobility; cover, shelter, and holding areas for juveniles and adults; and adequate water quality to allow for survival" (NMFS 2009b).

The proposed critical habitat for southwestern willow flycatcher is located at the Santa Clara River, which is at the far downstream end of the action area. The PCEs for flycatchers include riparian vegetation, typically dense with thickets of trees and shrubs and insect prey populations found within or adjacent to riparian flood plains or moist environments. Riparian vegetation at the downstream end of Santa Paula Creek itself is sparse and limited to small herbaceous plants and immature shrubs (***Figure 9***) that do not provide the required PCEs. However, there are patches of riparian habitat on terraced channel banks and on in-stream islands within the Santa Clara River at its confluence with Santa Paula Creek which could provide these PCEs, and this area is included in the proposed critical habitat for the species (USFWS 2011b).

3.2 Environmental Baseline

The Santa Paula Creek watershed is an approximately 45 square mile (166.5 square kilometer) sub-basin of the Santa Clara River watershed. Santa Paula Creek is the first major tributary to the Santa Clara River. Like many coastal southern California streams, the hydrology of Santa Paula Creek is characterized by steeply rising and falling hydrographs during precipitation events. Low flow conditions are present in the summer and fall months when flows are typically less than 5 cfs (USGS 2009).

Santa Paula Creek is characterized by rugged, steeply-sloped terrain at the headwaters, and is situated in the Topa Topa Mountains of the Western Transverse Range. Santa Paula Creek flows through steep gradient, narrow, bedrock canyons in the upper reaches of the watershed, with channel gradients exceeding 6 percent and consisting of large boulders and cobbles. The lower watershed is characterized by narrow reaches that cut through bedrock, and wider reaches dominated by cobbles and alluvial deposits, with channel gradients ranging from 1.5 to 2.5 percent.

High rates of sediment transport and active channel erosion have historically occurred and continue to occur in Santa Paula Creek. Sediment transport is exacerbated by cyclical wildfire events that decrease vegetation cover on high gradient hill slopes. Sedimentation and changes in channel morphology that result from large storm events can result in loss of flood conveyance capacity and impede fish passage (Stillwater Sciences 2007).

3.2.1 Steelhead Habitat

Habitat requirements of steelhead in streams generally depend on the life stage. Generally, discharge rates, water temperature, and water chemistry must be appropriate for adult and juvenile migration. Low discharge rates, high water temperature, physical barriers, low dissolved oxygen, and high levels of turbidity may delay or halt upstream migration of adults, alter timing of spawning, and delay downstream migration of juveniles. Suitable water depth and velocity and substrate composition are the primary requirements for spawning, but water temperature and turbidity are also important (NMFS 2008a).

3.2.1.1 Water Quality

Surface water quality within Santa Paula Creek is generally good; however, input from adjacent developed lands does contribute nutrients and other pollutants. In addition, Mud Creek, a tributary to Santa Paula Creek, contributes a significant amount of suspended clay and other material (Corps 2009a). Water quality monitoring conducted by the Corps as part of the Five-Year Monitoring Plan provides useful information on existing water quality conditions within the FRMC (see Appendix B for monitoring reports). Water quality parameters measured during this monitoring include temperature, dissolved oxygen, and turbidity. A summary of water quality monitoring results is provided in ***Table 2***.

Table 2. Results of Water Quality Monitoring Conducted by the Corps for the Five-Year Monitoring Plan

Monitoring Type	Date	Temperature (F)	DO (mg/L)	Average Turbidity (NTUs)	Flow during Monitoring (cfs)
Post-storm	25-Jan-10	54	11	40	NA
Post-storm	14-Apr-10	66	3	29	31
Summer low flow	8-Sep-10	67	7	12	4
Post-storm	23-Dec-10	55	2	239	150-175
Post-storm	11-Mar-11	61	9	44	25
Post-storm	23-Mar-11	52	5	345	175-200
Post-storm	28-Mar-11	55	3	293	200

F – Fahrenheit
DO – dissolved oxygen
mg/L - milligrams per liter
NTUs - nephelometric turbidity units
cfs – cubic feet per second
NA – Not Available

Optimal temperature for juvenile steelhead growth is between 45 to 65 degrees F (7.2 to 18.3 degrees Celsius) (Busby *et al.* 1996). Elevated temperatures above 70 degrees F (21.1 degrees Celsius) have been known to cause increased potential for fish mortality. As shown in ***Table 2***, the highest temperature recorded during monitoring was 67 degrees F (19.4 degrees Celsius) in

Figure 9
Riparian Habitat at the Mouth of Santa Paula Creek

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September 2010, indicating that temperatures can be higher than optimal during summer low flow conditions in the FRMC.

Dissolved oxygen (DO) plays a key role in the survival and growth of steelhead. A DO level near or at 100 percent saturation and above 9 milligrams per liter (mg/L) is required for optimal growth and survival. According to Reiser and Bjornn (1979), DO levels for spawning anadromous fish of at least 80 percent saturation with temporary levels no lower than 5.0 mg/L should meet the needs of migrating salmonids. Based on the monitoring results shown in ***Table 2***, DO is often well below optimal conditions within the FRMC.

Turbidity levels of 50 nephelometric turbidity units (NTUs) or less have been known to be harmful to steelhead and can affect their ability to search for food (Bash *et al.* 2001). High turbidity can result in accumulation of sediment and particles in the gills, making it difficult for steelhead to breathe. While southern steelhead have been known to survive in varying levels of turbidity, higher levels have been known to reduce growth rates, especially in juveniles. As shown in ***Table 2***, average turbidity levels recorded during monitoring range from 12 to 345 NTU, with higher turbidity occurring during periods of high flow. This indicates that during high flows, turbidity is likely to be well above suitable conditions for steelhead. These high flows often occur during the peak of steelhead migration in the system.

3.2.1.2 Migration Timing

In California, juvenile steelhead generally spend one to three years in freshwater before migrating to the ocean. Migration typically occurs between January and June, with the peak occurring during March through mid-May (Titus 1994). In the Santa Clara River, adult steelhead generally migrate from January to the end of May, and juvenile steelhead out-migrate between March and May (NMFS, 2008b). Peak spawning occurs during February and March (Busby *et al.* 1996). Larger juveniles out-migrate in March, followed by smaller juveniles, which continue out-migration until early summer. Juvenile out-migration typically declines in spring and early summer corresponding to declining discharges (Spina *et al.* 2005).

Southern steelhead exhibit unique ecological requirements and behaviors, such as high temperature tolerance, variable duration of different life stages, and polymorphic life history behavior (Busby *et al.* 1996, Stoecker and Kelley 2005). Their utilization of southern California streams and rivers with elevated temperatures suggests that steelhead within this ESU are able to withstand higher temperatures than populations to the north (Busby *et al.* 1996). Southern steelhead also tend to exhibit a high amount of flexibility in residence time due to the extreme and highly variable environmental conditions that exist throughout their range. Juvenile steelhead may remain in fresh water as rainbow trout, mature, and spawn without ever migrating to sea. Similarly, rainbow trout offspring may produce young that migrate to the ocean to become anadromous steelhead (Stoecker and Kelley 2005).

Southern steelhead are often impaired or blocked from accessing their natal stream because of low flow conditions from drought or human impacts. During these conditions, southern steelhead can often adapt, and either delay their upstream spawning migration until adequate flows exist or enter and ascend another suitable stream nearby (Stoecker and Kelley 2005).

3.2.1.3 Migration and Flows

The migration of southern California steelhead has a greater dependence on rainfall and stream flow than that for steelhead populations that inhabit river systems farther north (Harrison *et al.* 2006, Busby *et al.* 1996). The migration behavior of adults and juveniles has developed to coincide with the short duration peak flows that are typical of southern California rivers (Harrison *et al.* 2006). Southern California steelhead populations are thought to have adapted to the region's unpredictable climate by remaining landlocked for several years, or even generations, until rains and consequent flow conditions can provide adequate access to the ocean (Titus 1994).

Fish passage is typically available in natural channels of the south coast of California on the falling limb of flood hydrographs and generally at less than two thirds to one half of the peak flood flow value for larger flood events (Stoecker and Kelley 2005). It has been anecdotally noted that most southern steelhead tend to attempt passage upstream immediately following the peak of higher flow events, after water clarity has increased and total suspended sediment concentrations fall below about 1500 - 2000 parts per million (ppm), or approximately 200 NTU (PHES 2006).

3.2.1.4 Sedimentation Analysis

Sedimentation and scour are of large concern in maintaining a fish ladder for the FRMC. Extreme flows can result in a large amount of deposition of fines, gravels, cobbles and boulders. Reduced pool volume results in decreased attraction flow and a higher Energy Dissipation Factor which limits the ability of fish to successfully migrate upstream (NMFS 2008a, CDFG 2009). Deposition can interfere with fish passage flow and operation, and the larger material can damage structures. Scour and channel degradation that occur at lower flows can cause a lowering of the streambed near the downstream end of the fish ladder leading to fish passage impediments. Sediment deposition and channel aggradation at higher flows can cause a hydraulic disconnection near the upstream end of the fish ladder. Local scour can also damage grade control structures and undermine grouted stone channel side slopes.

The existing FRMC and inlet design was heavily influenced by Santa Paula Creek's sediment delivery potential. A considerable portion of the GRR was dedicated to the sedimentation design of the FRMC, including sediment routing, sediment budget, and sediment volume calculations (GRR Appendix A2, Corps 1995). Uncertainty is inherent in any modeling exercise. The level of uncertainty present in the prediction of sediment delivery and sediment transport conducted in the GRR was reduced by the availability of actual records of sediment removals from the flood risk management channel recorded between 1969 and 1992 (Table 6, p. 32 of GRR).

The channel between the Santa Clara River and the existing fish ladder at the inlet has a design sediment capacity of approximately 600,000 cubic yards at the peak of the design flood (28,000 cfs). At the end of a design flood, approximately 810,000 cubic yards of sediment would be expected to have accumulated in the channel, including the total volume at the time of the peak (600,000 cubic yards) plus the additional deposition volume between the peak flow and the end of the hydrograph (Corps 1995).

The need for ongoing sediment removal maintenance was considered in the original FRMC design by including an allowable deposition limit of 120,000 cubic yards, or about three times

the average annual accumulation estimate of 45,000 cubic yards. Expected maintenance requirements at the time of the GRR are described in detail in Appendix A2 of the GRR starting on page A2-32. Periodic sediment removal within the channel and fish ladder was expected by the FRMC designers in order to maintain flood conveyance and fish passage functionality (Corps 1995). The average frequency of sediment removal within the channel and fish ladder is not expected to change with the proposed action.

The actual sediment deposition patterns that have occurred since channel construction have differed from the sediment deposition patterns assumed during the design of the FRMC. Therefore, additional sedimentation modeling was conducted to determine the allowable sediment accumulation that would maintain flood capacity of the channel (Corps 2011c).

3.2.1.5 Sediment Transport Analysis

During design of the FRMC, historical and analytical data was investigated to determine the threshold for mobility of bed particles in Santa Paula Creek. Historical performance data and sediment equilibrium data correlated well and identified bed material gradations mobilized at various flow rates. For operation and maintenance purposes, hydrologic return periods associated with these flow rates are defined based on Table 3A in Appendix A of the 1995 GRR. A flow of 1,230 cfs was defined as having a 2-year return period, a flow of 4,000 cfs was defined as having a 5-year return period, and a flow of 7,300 cfs was defined as having a 10-year return period. The Field Change Report (Corps 2009b) further refined the sediment mobilization analysis based on modeling of flow data from 2003 and corresponding pictures. This analysis concluded that instantaneous flows up to 782 cfs moved sediment into the fish ladder pools, but did not move enough sediment to completely limit the functionality of the ladder or cause structural damage. Bed material transported into the ladder appeared to be on the order of a maximum of 0.5 to 1 feet in diameter (large cobbles). Instantaneous flows of up to 2,040 cfs in 2004 demonstrated movement of bed particles on the order of 2 feet in diameter (medium boulders), which completely blocked the fish ladder notches and limited the functionality of the structure relative to design thresholds. No structural damage was apparent at these flows. Instantaneous flows up to 27,500 cfs in 2005 moved all sizes of bed particles and completely filled in the fish ladder. These flows also damaged the crests of the fish ladder weirs. It should be noted that the structural integrity of the weirs was not put into question. Rather the metal cladding on the corners of the weirs was damaged and some chipping of the crests occurred.

Equilibrium transport capacities for bed material were calculated for use in the HEC-6T sedimentation analysis for representative cross sections of Santa Paula Creek in the Field Change Report. Modeling demonstrated movement of particles up to approximately 0.1 feet in diameter (coarse gravel) at flows of approximately 500 cfs. At approximately 1,000 cfs large cobbles of approximately 0.5 feet in diameter were mobilized. Model flows around 5,000 cfs demonstrated mobility of particles up to approximately 2 feet in diameter (medium boulders).

Table 1 of the HHS Appendix shows a comparison of predicted discharge frequencies from the 1995 GRR and the 2010 Santa Clara River Feasibility Study, Report Addendum: Hydrologic Modeling of the Santa Clara River with U.S. EPA Hydrologic Stimulation Program – FORTRAN (HSPF) (VCWPD 2010). The 1995 GRR discharges reflect the predicted discharge frequencies prior to the near design event in 2005. It should be noted that the discharge frequencies should be considered dynamic and not static as they will always change as further

information becomes available. The VCWPD 2010 document cites the 2-year event as 1,700 cfs, the 5-year event as 5,700 cfs, and the 10-year as 10,300 cfs.

Based on the GRR discharge frequencies, large cobbles would be expected to be mobilized at just less than a 2-year return rate and medium boulders would be mobilized between a 5-year and 10-year return period. The VCWPD discharge frequencies would suggest large cobbles would be mobilized at slightly less than a 2-year return rate and medium boulders would be expected to be mobilized around a 5-year return rate.

Historically, lower portions of Santa Paula Creek exhibited the characteristics of an alluvial fan. Santa Paula Creek carries high concentrations of sediment and debris during large flood events and had deposited these materials over a relatively wide flood plain. The channelization that has occurred in the past limits the available area for sediment deposition and for channel meandering. High flows, such as the event in January 2005, deposit hundreds of thousands of cubic yards of sediment within the FRMC and fish ladder. When lower flows are carrying less sediment load, a high channel gradient is not required for sediment transport equilibrium. However, the physical constraints of the FRMC prohibit Santa Paula Creek from meandering to a lower slope after large floods pass, when there is no need to transport high sediment loads. The equilibrium condition for low flows results in a reduced channel gradient. This can result in localized scour in areas of the FRMC where the flow interfaces with the grouted stone side slopes.

A variety of methods were used in the Sedimentation Analysis Report (Corps 2011c) to simulate the degradation that occurred after the FRMC was completed in 2002. This degradation was caused by the relatively low flows that were recorded before early 2004. The various methods used to investigate the stable slope and scour depth included sediment transport simulation with HEC6T, calculation of scour depth to an armoring layer using theoretical equations, simulation of the armoring condition using HEC6T, computation of an equilibrium stable slope using theoretical equations, computation of channel scour at low flows using regime equations, and computation of local scour at the base of sloping grade control structures using theoretical equations. Based on the HEC6T modeling results of sediment transport of Santa Paula Creek, the new design invert and the proposed allowable sediment profile were developed for the Proposed Action to alleviate the scour potential that can create unfavorable conditions for steelhead passage.

4.0 Analysis of Effects of the Proposed Action on the Endangered Southern Steelhead, Designated Critical Habitat for Steelhead, and Proposed Critical Habitat for the Southwestern Willow Flycatcher

This section evaluates the potential effects of the Proposed Action (repair of the existing fish ladder weirs with sediment removal and operation and maintenance activities, including refinement of the design and allowable sediment profiles) on the federally endangered southern steelhead, designated critical habitat for steelhead, and proposed critical habitat for the southwestern willow flycatcher. The magnitude and nature of effects are assessed for southern steelhead relative to existing conditions (environmental baseline) within the Project area as well as fish passage parameters prescribed by NMFS.

4.1 Fish Ladder Repairs with Sediment Removal

Construction would entail minor repairs to the fish ladder weir crests over a period of 60 to 105 days. In-stream construction would occur between June 30 and November 1 to avoid the known steelhead migratory season. Construction is expected to commence in the summer of 2012 and be completed by November 1, 2012. Construction would not be permitted later than this date, unless otherwise coordinated with the NMFS.

4.1.1 SWFL Critical Habitat

No construction would occur within proposed critical habitat for the southwestern willow flycatcher at the confluence of the Santa Clara River and Santa Paula Creek. This species is not present in the Project area. Therefore, there would be no direct effects or indirect effects to proposed critical habitat for the southwestern willow flycatcher.

4.1.2 Steelhead and Steelhead Critical Habitat

Construction of the Proposed Action is expected to begin in summer 2012. Construction would occur between June 30 and November 1, outside of the known steelhead migratory season to avoid potential direct impacts to steelhead. (The 2000 BO prescribes a typical work window from June 30 to November 1 but allows for the potential window extensions from June 1 to June 30 and November 1 to December 31, based on whether or not the Harvey and Vern Freeman Diversion fish passage facilities are operating.) As an additional precaution, and to minimize water quality impacts, flows would be diverted around work. Block netting would be installed upstream and downstream of the work area to prevent potential (although extremely unlikely) interactions between construction equipment and steelhead, or any other fish or aquatic organism that may be present. The area between the block netting would be surveyed for steelhead presence/absence by a qualified biologist. If any native fish are observed, they would be captured and relocated to a predetermined site of suitable habitat on the flowing reach or otherwise handled per the measures determined by the current coordination between the Corps and NMFS. Finally, in the event smolt are swimming downstream through the Project area, sufficient water will be present in the main channel to support this movement.

Additional loading of turbid water is a potential issue that may occur with construction conducted within active creek or river channels. Irregular, episodic pulses of turbid water are possible during diversion activities and placement of temporary creek crossings. However, these

increases in turbidity levels would be local and temporary in nature, lasting minutes rather than hours or days, and are expected to be less than what occurs during a typical storm event.

Turbidity levels would be tested at appropriate intervals as directed by the project biologist. The addition of short lived, increased turbidity levels would be minimal in comparison to background levels and loads contributed by upstream tributaries, such as Mud Creek (NMFS 2000). If the biologist observes excessive project-related turbidity, Corps environmental staff will coordinate with the field representative and provide suggested measures to minimize turbidity levels. Indirect effects associated with construction-related turbidity are not expected because of existing background turbidity and the fact that construction would occur outside of the migratory season for steelhead. Therefore the proposed fish ladder repairs may affect, but are not likely to have an adverse affect on the species.

The proposed repairs and sediment removal will not result in permanent changes to water quality parameters, type of substrate or other habitat features within the fish ladder or adjacent channel, and will further promote fish passage during the subsequent migratory season. Temporary impacts to adjacent terrestrial habitat may occur in staging areas and along access roads. All temporarily impacted areas will be restored to the original grade. Vegetation in areas that have been cleared and graded would be expected to reestablish through passive restoration as the seed bank is replenished during subsequent storm events. Therefore, critical habitat will not be adversely modified.

4.2 Operation

4.2.1 SWFL Critical Habitat

No changes to flow or sediment transport to Santa Paula Creek or the Santa Clara River would be anticipated during operation of the Proposed Action. Therefore, there would be no direct or indirect effects to proposed critical habitat for southwestern willow flycatcher.

4.2.2 Direct Effects to Steelhead and Designated Critical Habitat

The proposed repairs to the existing fish ladder are expected to improve the durability and operability of the fish ladder while having an insignificant impact on hydraulics. As was evident following the near design event of the 2004/2005 storm season, the existing steel corner protection could be ripped off of the cement weirs or partially separated from the weirs. The rounding and total encapsulation of the weir tops is expected to avoid this situation, which would eliminate the ability of the ladder features to cause physical harm to fish using it. This represents a beneficial effect in comparison to existing conditions for steelhead and designated critical habitat.

The potential direct effects of maintenance relative to steelhead and designated critical habitat on the overall operation of the fish ladder and low flow channel, including the approach and pilot channels, is dependent on the timing of the maintenance and is discussed in Section 4.3 of this BA. The change to the design and allowable sediment profiles is expected to provide scour protection for the Project, including the area at the base of the fish ladder. Overall, maintenance performed to the fish ladder or the low flow channel will benefit the operational ability of the Project to facilitate fish passage and perform for flood risk management.

Therefore, operation of the fish ladder under the Proposed Action is not expected to result in direct effects to the southern steelhead or designated critical habitat.

4.2.3 Indirect Effects to Steelhead and Designated Critical Habitat

Indirect effects to the steelhead that could result from the operation of the fish ladder and low flow channel components would be associated with potential migratory delays and stranding related to accumulation of sediment in ladder pools or blockage of weir notches by debris that can create a temporary barrier for fish passage.

The maintenance prescribed for the low flow channel, including the approach channel (upstream entrance to the fish ladder), will enable the low flow channel and fish ladder to operate as designed. Following major sediment cleanouts the low flow channel will be recreated per guidelines described in the O&M Manual. The re-created low flow channel will be allowed to migrate between sediment removal events in the FRMC. Monitoring will occur to ensure fish passage parameters are being met within the low flow channel, as described in the O&M Manual and in Section 1.5.2.2.2 of this BA. If monitoring shows the need for maintenance to a localized area due to potential drops in the low flow channel of greater than one foot, isolated pool formation that could lead to stranding, or areas that are not capable of meeting depth criteria for migrating steelhead or emigrating smolt, localized maintenance can occur. Wholesale reformation of the low flow channel is not recommended if the low flow channel that was re-created after sediment removal activities migrates outside of its channel, unless it is more practical to do so than apply several localized maintenance solutions.

The new design invert would prevent long-term degradation below the toe of the grouted stone side slopes and local scour at the base of the fish ladder inlet. With the maintenance prescribed in the O&M Manual, the new design invert is expected to protect the FRMC from scour impacts and maintain conditions favorable to fish passage. Potential adverse effects related to maintenance activities are discussed in Section 4.3 below.

Under the Proposed Action, there would be no change in existing conditions with respect to fish passage parameters including water depth and velocity, and the potential for sediment aggradation in fish ladder pools and blockage of the weir notches by large bed load would remain. Preventative maintenance, including annual cleanouts of the fish ladder prior to each steelhead migratory season and monitoring prescribed in the O&M Manual are expected to reduce the frequency and duration of potential impacts to fish passage. However, indirect effects to steelhead from migratory delays and stranding would not be completely eliminated. Maintenance, including removal of sediment and large bed load, would be conducted as described below to reduce impediments to fish passage.

Therefore, the potential indirect effects of the operation of the Proposed Action are likely to adversely affect the southern steelhead, but are not expected to jeopardize the continued existence of the species and not expected to adversely modify designated critical habitat.

4.3 Future Maintenance Activities

4.3.1 SWFL Critical Habitat

Maintenance activities would occur within the area proposed as critical habitat for the southwestern willow flycatcher at the confluence with the Santa Clara River. As described in Section 3.1 and shown in ***Figure 9***, riparian vegetation at the mouth of the Santa Paula Creek is of low quality and does not support flycatcher habitat. Maintenance activities would occur within the channel and would not alter existing riparian habitat for the flycatcher. Therefore, no direct or indirect effects are expected and no adverse modification to proposed critical habitat for southwestern willow flycatcher from future regular maintenance activities is expected.

4.3.2 Steelhead and Designated Critical Habitat

Results of analyses performed for potential effects to steelhead as a result of maintenance activities are presented below. The potential impacts to steelhead and designated critical habitat can generally be addressed by the time of year when maintenance needs to occur. Regular maintenance activities are expected to adhere to the same work window as that prescribed above for the construction phase of the fish ladder repairs (June 30 – November 1, with caveats for extensions from June 1 – June 30 and Nov 1 – December 31, depending on whether the Harvey Diversion ladder and Vern Freeman Diversion fish ladder are operating, respectively (NMFS 2000)). Maintenance activities may be required during the steelhead migratory season, outside of in-channel work period to restore fish passage. Potential effects to steelhead and designated critical habitat relative to the Proposed Action are described below.

4.3.2.1 Direct Effects to Steelhead and Designated Critical Habitat

Direct effects to southern steelhead and/or their critical habitat as a result of regular maintenance activities are generally expected to be similar to those from construction and include potential encounters between fish and maintenance equipment. Maintenance activities range in level of effort and expected timing. All O&M measures are detailed in the O&M Manual (Appendix C) and are expected to include, but are not limited to:

- Removal of sediment and/or scour repair throughout the FRMC channel consistent with the new sediment profile and design invert with an average frequency of approximately three years
- Annual removal of sediment from fish ladder pools and maintenance to the approach channel, low flow channel, and pilot channel (as necessary, based on monitoring and fish passage parameters described in the O&M Manual)
- Removal of aggraded sediment during the steelhead migration season from fish ladder pools
- Removal of large bed load particles or other debris that may occlude flows through weir notches
- Infrequent repairs to weirs, weir notches, and other structures due to the force of impact of moving bed load

4.3.2.1.1 Sediment Removal and/or Scour Repair Consistent with New Sediment Profile and Design Invert

Sediment removal within the channel is expected to be necessary on the order of every three years, on average, which is consistent with past predictions of sediment removal frequency. Scour repair work would be informed by monitoring. Depending on the volume of sediment and the extent of any scour repair, these activities would take from two to six months to complete. Although unlikely, potential direct effects from sediment removal and/or scour repair include interactions between fish and equipment, if fish are present. Steelhead are not expected to be present during this routine maintenance activities since they would take place outside of the steelhead migration season. In order to further diminish the likelihood of fish-equipment interactions, water would be diverted around the work area(s) under supervision of a qualified biologist.

4.3.2.1.2 Annual Sediment Removal from the Fish Ladder

VCWPD has agreed to conduct sediment removal from the fish ladder prior to the start of each steelhead migratory season. Potential direct effects to steelhead are similar to those described in 4.3.1.1, and include potential steelhead-equipment interactions. The sediment removal would take place outside of steelhead migration season. Environmental commitments detailed in Section 4.4 of this BA and measures determined during the current coordination effort between the Corps and NMFS would be followed. Water would be diverted or piped around the work area. The act of diverting flows can create turbidity, but is not expected to cause an effect to steelhead due to its short duration, typically high background levels of turbidity, and timing during seasons when steelhead are not typically present. During sediment removal activities, block netting would be installed upstream and downstream of the work area to prevent potential interactions between construction equipment and any steelhead present. The area between the block netting would be surveyed for steelhead presence/absence by a qualified biologist. If steelhead or any other native fish are observed, they would be captured and relocated to a predetermined site of suitable habitat on the flowing reach, unless otherwise coordinated with NMFS through this consultation. Given the described avoidance and minimization measures it is unlikely that any direct effects to steelhead or steelhead critical habitat would result from annual sediment removal from the fish ladder.

4.3.2.1.3 Sediment Removal Within the Fish Ladder During the Steelhead Migratory Season

It may occasionally be necessary to remove sediment from the fish ladder during the steelhead migratory season if sediment has aggraded within fish ladder pools to the point that fish passage is impeded. Monitoring after storm events that produce a discharge of 500 cfs or greater would trigger monitoring, per the O&M Manual, that would enable to a biologist to make this determination. Preventative measures, such as annual cleanouts of the fish ladder, are expected to help minimize the need for cleanouts of the fish ladder during the migratory season. As was discussed in Section 1.6 of this BA, fish passage parameters are able to be met when some sediment has aggraded in the fish ladder pools. The existing fish ladder's expected performance with 1 and 2 feet of sediment accumulation is expected to meet fish passage EDF criteria within nearly the design range of flows. As sediment aggrades in the pools of the fish ladder, the range of flows for upstream migrants may see the lower end of the range of fish passage diminish, due to insufficient depth available within pools. The Field Change Report documents a scenario where a pool is filled to the top of the notch with sediment. In this scenario, the range of fish passage flows reduces from 10 – 150 cfs to 50 – 150 cfs. It is important to note that fish passage is not precluded if this "worst case" scenario arises, although it may be somewhat restricted.

A thorough assessment of fish passage conditions would be conducted in coordination with NMFS, CDFG, and concerned resource agencies to determine if sediment removal during the migratory season is necessary to ensure passage. If maintenance is required during the steelhead migratory season to restore passage, measures would be implemented to exclude fish from the construction area. Block netting or other exclusionary devices would be set up on the upstream and downstream ends of the work area. A qualified biologist would survey for fish within the ladder pools and relocate any steelhead found within the potential work area. If it is not possible to set up block netting or other devices, as necessary, outside of the fish ladder, it may be prudent to set up block netting on a pool-by-pool basis. If steelhead or any other native fish are observed, they would be captured and relocated to a predetermined site of suitable habitat on the flowing reach, unless otherwise coordinated with NMFS during this consultation. The duration of in-channel work associated with sediment removal activities is not expected to take more than three to five days.

Direct effects to steelhead could occur from sediment removal during the steelhead migration season. Direct adverse effects could include injury or mortality to individual fish during capture and relocation efforts, if steelhead occur within areas where removal activities are conducted. With implementation of the minimization measures described above, those detailed in Section 4.4 of this BA, and any other measures determined through coordination with NMFS during this consultation, adverse direct effects would be minimized to the greatest extent possible.

4.3.2.1.4 Removal of Large Bed Load or Debris from Weir Notches During the Steelhead Migratory Season

If, during post-storm monitoring, it is determined that a boulder or other debris is causing occlusion of flows, removal would be necessary to maintain the design flow range for fish passage. This type of maintenance would be informed by post-storm monitoring detailed in the O&M Manual (Appendix C). This removal would be expected to be a short duration action, depending on the circumstances. Equipment required could be limited to hand tools, but may require the use of a backhoe, bobcat, or crane. The equipment would operate from the apron so as to avoid potential disturbance to adjacent habitat. If practicable, block netting or some other exclusionary device would be set up to preclude steelhead from accessing the work area. If steelhead or any other native fish are observed, they would be captured and relocated to a predetermined site of suitable habitat on the flowing reach, unless otherwise coordinated with NMFS through this consultation. A qualified biologist would survey the work area for steelhead and relocate any individuals to suitable habitat within the flowing reach away from the work area.

As with sediment removal described above, removal of large bed load or debris from weir notches during the steelhead migration season could result in direct adverse effects. Such effects could include direct injury or mortality to fish during capture and relocation efforts. These potential adverse effects would be short-term, and restoration of fish passage in a timely manner during the migration season would be a beneficial effect. With implementation of the minimization measures described above, those in Section 4.4 of this BA, or other measures coordinated with NMFS during this consultation, adverse effects would be minimized to the greatest extent possible.

4.3.2.1.5 Repairs to Fish Ladder Components

Inspection of the fish ladder will formally occur on an annual basis. More frequent monitoring would be performed following storm events producing discharge of at least 500 cfs to ensure fish passage needs are being met following the implementation of the Proposed Action. Fish ladder repairs are not expected to be needed with the improvements being made to the weirs, however, there is a possibility that they may need some maintenance. Inspections may uncover the need for repairs within the fish ladder to ensure it is functioning as designed. Heavy equipment may be needed to complete repairs prescribed by monitoring results. Any operation and maintenance activity requiring the use of heavy equipment will follow the direction of the Project permits, including the BO.

Water may need to be diverted around the work area to avoid working in flowing water. If work does not need to be conducted in flowing water, but there is a chance that tools or other maintenance associated debris could enter the channel, proper minimization measures would be put into place. Those measures could include, but are not limited to, block netting prior to the start of work to ensure no steelhead or other aquatic organisms near potential impact areas. All work being conducted between the grouted side slopes would be monitored by a qualified biologist. If repairs are conducted during the steelhead migration season and require diversion of water and/or fish exclusion, capture, or relocation, direct effects, including injury or mortality, could occur.

4.3.2.1.6 Effect Determination for Direct Effects to Steelhead and Designated Critical Habitat

While the prospects of fish-equipment interactions are unlikely, there is always potential when maintenance activities necessitating the use of construction equipment occurs during the migratory season. Therefore, proposed maintenance for the Project may affect, and is likely to adversely affect steelhead, but is not expected to jeopardize the continued existence of the species and is not expected to adversely modify critical habitat.

4.3.2.2 Indirect Effects

4.3.2.2.1 Maintenance Outside the Steelhead Migratory Season

Routine maintenance of the Project, including the fish ladder and low flow channel components, include, but are not limited to, tasks such as removal of sediment from the FRMC, annual removal of sediment from the fish ladder, maintenance to the approach channel, low flow channel, and pilot channel, scour remediation in the FRMC, and repairs to the fish ladder facility other structures associated with the Project. Details of all expected maintenance can be found in the O&M Manual (Appendix C). Indirect effects associated with these activities are expected to be similar to those described for construction of the weir repairs. Potential indirect effects to steelhead from routine maintenance activities include stranding due to water diversions and associated temporary increases in turbidity. As described above, removal of sediment and/or scour repair throughout the FRMC is expected to be required consistent with the new sediment profile and design invert approximately every three years. These effects are considered unlikely given that the activities would take place outside the steelhead migratory season along with the high background turbidity levels that are typically present in the creek.

Although steelhead would not be expected to be present in the channel, avoidance and minimization measures would be implemented. Block netting or some other exclusionary device would be set up to preclude steelhead from accessing the work area and a qualified biologist

would monitor activities. If steelhead or any other native fish are observed, they would be captured and relocated to a predetermined site of suitable habitat on the flowing reach unless otherwise coordinated with NMFS through this consultation. With implementation of these measures, potential adverse effects would be minimized to the greatest extent possible.

4.3.2.2.2 Maintenance During the Steelhead Migratory Season

Maintenance activities associated with maintaining fish passage through the Project may be necessary during the steelhead migratory season, as was documented in the 2000 SEA that was submitted as the BA for the construction of the existing fish ladder. Preventative measures being adopted by the Corps, such as annual sediment cleanouts from the fish ladder, maintenance to the low flow channel components, including the approach channel to the fish ladder, and repairs to Project components during the non-migratory season are designed to minimize the need for maintenance during the steelhead migratory season. A few main types of maintenance may be necessary during the steelhead migratory season: (1) removal of sediment or debris that may be lodged in a weir notch, (2) removal of aggraded sediment following a large storm or series of storms, (3) remediation of the low flow channel if drops of more than 1-foot are observed or if hydraulic connectivity needs to be restored, (4) repairs to the fish ladder or other Project components.

Monitoring, described in the O&M Manual, will inform the type of maintenance that may be necessary. Monitoring is prescribed following any storm event that produces a discharge of 500 cfs or greater. Fish passage conditions would be assessed and, if maintenance activities are deemed necessary, NMFS would be consulted to determine the best course of action prior to initiating maintenance activities. The need to maintain safety for equipment operators is an important priority in the event that these removal activities are deemed necessary.

Indirect effects to steelhead from maintenance activities during the steelhead migratory season are likely to include migration delay and potential for stranding if diversions are necessary. The indirect effects to steelhead from these potential indirect impacts should be weighed against the potential direct effects to steelhead that could occur during the implementation of the maintenance activities themselves. It is difficult to make predictions about storm events or quantify the length of time that steelhead migration would be delayed. However, predictions can be made as the predicted frequency of occurrence. As was described in Section 3.2.1.5 of this BA, medium boulders (approximately 2 feet in diameter) have been observed to become lodged in the weir notches. Medium boulders are expected to be mobilized by flood frequencies on the order of 5 -10 years. Therefore, this type of potential cause for migratory delay is not expected to occur on a regular basis. Prompt removal a notch blockage is likely to reduce the potential for sediment aggradation upstream of the occlusion, as was documented in Project monitoring reports.

The relationship of time between when a fish passage impediment occurs, (sediment accumulation, weir blockage, etc.) occurs and when it is possible for equipment to access the ladder, and then restore passage, is extremely difficult to quantify relative to the duration of hydrograph elapsed in such a dynamic system. Migration delay can result in depletion of energy reserves of spawning adults, the severity of which depends somewhat on the capacity of fish to find refuge from high flows. It may be possible for steelhead in Santa Paula Creek to withstand migration delays for some time without adverse effects if they are able to find refugia. It is

important to note, that excessively high turbidity and occasionally severely low dissolved oxygen quantities and percentages associated with high flow events in the Project reach, as documented in the 2010 and 2011 monitoring reports, may preclude migration of steelhead.

Any maintenance activity conducted during the migratory season would be closely monitored by a qualified biologist and all commitments made in Section 4.4 of this document and any further measures defined by the current coordination between the Corps and NMFS would be adhered to to make these maintenance activities as minimally impactful as possible.

4.3.2.2.3 Effect Determination for Indirect Effects to Steelhead and Designated Critical Habitat

The uncertainty surrounding the duration and frequency of migratory delay results in the Corps' determination that potential indirect effects to steelhead resulting from maintenance during the migratory season for the species may affect, and is likely to adversely affect steelhead, but is not expected to jeopardize its continued existence and is not expected to adversely modify designated critical habitat.

4.4 Conservation Measures

4.4.1 Approach

The environmental commitments and conservation measures for the Project are based on agreements made in past BOs and have been updated to reflect lessons learned from experience with the Project since its initial construction and through recent monitoring. The purpose of these measures is to avoid and minimize potential effects on steelhead to the maximum extent practicable.

4.4.2 Avoidance and Minimization Measures

1. Activities between the grouted side slopes (in-channel) associated with construction and regular maintenance of the fish ladder, excluding monitoring, shall be planned to avoid flowing water during the potential steelhead migration period. The normal in-channel work period would occur between June 30 to November 1. In-channel work may occur between June 1 and June 30, if the Harvey Diversion ladder has been closed for at least one week, and the area has been surveyed for steelhead presence. If steelhead are found or expected to be present, work shall not proceed until either steelhead are no longer present, or avoidance and/or relocation measures have been established in coordination with NMFS. In-channel work may occur between November 1 and December 31, if winter storm(s) have not generated flows that facilitate the operation of the Vern Freeman Diversion fish ladder on the Santa Clara River.

2. In-channel work and channel diversion activities for construction of the Proposed Action shall be conducted in a manner to reduce potential impacts to migrating steelhead and would include the following measures:

    a. The area shall be visually surveyed for steelhead presence by a qualified biologist or technician prior to working in-channel.

    b. The channel shall be diverted or piped outside/around the work area. Equipment shall avoid flowing water other than temporary crossing or diverting activities.

c. Residual surface water associated with the diverted channel shall be monitored for steelhead presence by a qualified biologist as soon as flows recede. If steelhead are observed in the isolated channel, they shall be immediately relocated to the flowing reach by a qualified biologist or technician.

d. Temporary culverts used in construction, maintenance, and/or operations shall be placed at stream grade and be of an adequate size to not increase stream velocity.

e. Silt fences or mechanisms to avoid sediment input to the flowing channel shall be erected adjacent to flowing water if sediment input to the stream may occur.

3. If flowing water will be disturbed by construction or operation and maintenance activities, a qualified biologist/technician shall survey the complete area that may be disturbed, including by downstream turbidity, within one week of the beginning of in-water work. The biologist shall be present during activities that occur within flowing water. If necessary, the biologist would coordinate with the construction representative to cease the work, and provide recommended measures to avoid potential construction-related effects to steelhead and their habitat.

    a. The biologist shall have knowledge and experience in anadromous steelhead biology and ecology, fish/habitat relationships, biological monitoring, and handling, collecting, and relocating steelhead species.

    b. The biologist shall rescue any steelhead that may become stranded and relocate them to an appropriate place in Santa Paula Creek or the Santa Clara River, depending upon the life stage of the fish and flow conditions in the Creek and River.

    c. The biologist shall note the number of individuals observed in the affected area, the number of individuals relocated, the approximate size of individuals, and the date and time of the collection and relocation. One or more of the following methods shall be used to capture steelhead: dip net, seine, throw net, minnow trap, and hand.

4. Following removal of sediment from the FRMC, disturbed areas should be returned to the condition they were in prior to the disturbance, as detailed below:

    a. Re-contour low flow channel components (i.e. approach channel, low flow channel, and pilot channel) per specifications detailed in the O&M Manual.
    b. Revegetate disturbed areas to the approximate pre-construction density or greater with native vegetation if the area has not naturally revegetated within the second growing period following construction

5. Maintain the fish ladder at design specifications to facilitate steelhead migration. Contact NMFS during maintenance evaluation and prior to any maintenance activities.

    a. Following observations subsequent to a bed load transport event (greater than 500 cfs), evaluate steelhead passage opportunities and conduct any necessary fish ladder maintenance per protocol detailed in the O&M Manual.
        i. Remove accumulated sediment and/or debris to insure passage to and from the fish ladder, and drainage between weirs to avoid isolated pool formation or other fish migration blockage.
            1. If removal of debris or sediment from the weir notch occurs without the need for wholesale removal of sediment from the fish ladder pools, construction equipment should operate from the apron so as to avoid potential disturbance to adjacent habitat to the maximum extent practicable.
            2. If removal of debris or sediment from the weir notch needs to occur and diversion of flows is not possible, methods shall be employed to discourage fish presence in the action area. These measures could include, but are not limited to, exclusionary devices, such as block netting.
    b. Monitor the low flow channel configuration and associated discharge at least once per year during low/base flow conditions (mid-April to mid-July) per protocol detailed in the O&M Manual.
    c. Conduct necessary maintenance of the fish ladder to meet general design specifications.

6. Remove accumulated sediment and debris annually from the fish ladder prior to the start of the steelhead migratory season. This sediment removal activity should be completed prior to November 1.

5.0 Summary and Determination of Effects

5.1 Summary and Effects Determination for the Southern California ESU of Steelhead

Potential adverse effects to steelhead related to construction and regular maintenance are expected to be minor based on avoidance, minimization, and monitoring measures detailed in this BA. Direct impacts will be minimized by conducting construction and maintenance activities outside the steelhead migratory season.

Indirect impacts are generally associated with possible migration delays and limitations to the duration of opportunity for passage (NMFS 2000), which would be minimized by conducting construction and regular maintenance outside of the steelhead migratory season and by performing post-storm monitoring following events producing discharge of 500 cfs or more to ensure fish passage needs are being met, and taking action to restore fish passage if deemed necessary.

Under the Proposed Action, there would be no change in existing conditions with respect to fish passage parameters including water depth, velocity, EDF, or drop between pools. The new design invert would prevent long-term degradation below the toe of the grouted stone side slopes and local scour at the base of the fish ladder. With regular maintenance, the new design invert should protect the FRMC from scour impacts and maintain conditions favorable to fish passage. Therefore, no indirect effects to steelhead from migratory delays due to construction and regular maintenance under the Proposed Action are expected.

There is potential for direct and indirect effects to steelhead during post-storm maintenance activities associated with the Proposed Action, including removal of sediment from fish ladder pools and removal of large bed load and debris from weir notches, as these activities could occur when steelhead are present. During these activities, water would be diverted and fish would be relocated if necessary. Direct effects could include harm or mortality to steelhead during handling. Indirect effects could include migratory delay for the duration of the maintenance activities. It is difficult to determine the length of migratory delay and the severity of effects to the species. It is possible that the high turbidity and low dissolved oxygen quantities and percentages documented during high flow events may be a factor that inhibits migration of steelhead during those high flow events.

Under the Proposed Action, the Corps would complete implementation of the Five-Year Monitoring Plan currently in progress and continue to coordinate with NMFS and concerned resource agencies to review monitoring results and, if necessary, modify the monitoring activities.

The evaluation conducted in this BA has led the Corps, as the action agency, to the determination that the construction of the fish ladder weir repairs (rounding and capping) ***may affect, but is not likely to adversely affect*** the southern steelhead. The Corps has determined that implementation of the operation and maintenance activities, including maintenance during the steelhead migratory season, ***may affect, and is likely to adversely affect*** the Southern California ESU of steelhead.

5.2 Summary and Effects to Critical Habitat for the Southern California ESU of Steelhead

Santa Paula Creek is within designated critical habitat for the Southern California ESU of steelhead. The action area is considered a freshwater migration corridor for the species. This PCE indicator is generally at risk or not properly functioning due to less than optimal water quality parameters, including low dissolved oxygen, high temperatures, and high turbidity during the period of migration, and lack of refugia such as large woody debris and undercut banks. The limited duration and extent of the Proposed Action would do nothing to change these existing conditions. Minimization measures would be implemented to limit any increases in turbidity so that migration behavior would not be disrupted.

Limiting factors to steelhead passage that occur from sedimentation would not change under the Proposed Action. Existing scour potential and channel degradation would be reduced with implementation of the new design invert and allowable sediment profile.

As a result, the Proposed Action would ***not adversely modify*** designated critical habitat for the Southern California ESU of steelhead.

5.3 Summary and Effects to Proposed Critical Habitat for the Southwestern Willow Flycatcher

Critical habitat for the southwestern willow flycatcher has been proposed on Santa Clara River, at the confluence with Santa Paula Creek. The PCEs for the species, riparian habitat and insect prey populations, are considered to be present in that location, which is at the downstream end of the action area.

The Proposed Action would not entail construction within the Santa Clara River, although maintenance activities including sediment removal could extend near the confluence if deemed necessary. This maintenance would occur within Santa Paula Creek, where riparian vegetation is sparse and immature. Maintenance would not alter existing riparian habitat for the flycatcher located along the terraced banks and in-stream islands of the Santa Clara River, and no changes to flow or sediment transport would be anticipated that would affect PCEs present there.

Therefore, the Proposed Action would ***not adversely modify*** designated critical habitat for the southwestern willow flycatcher.

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List of Acronyms and Abbreviations

BA	Biological Assessment
BO	Biological Opinion
CDFG	California Department of Fish and Game
cfs	cubic feet per second
CNDDB	California Natural Diversity Database
The Corps	U.S. Army Corps of Engineers
dbh	diameter at breast height
DO	Dissolved oxygen
DPS	Distinct Population Segment
ENSO	El Nino Southern Oscillation
ESA	Federal Endangered Species Act
ESU	Evolutionary Significant Unit
F	Fahrenheit
FRMC	Flood Control Channel
ft	feet
GRR	General Reevaluation Report
LBV	Least Bell's vireo
M	meters
mg/L	milligrams per liter
NOAA	National Oceanic and Atmospheric Administration
NMFS	National Marine Fisheries Service
NTUs	nephelometric turbidity units
PCE	Primary constituent element
ppm	parts per million
Project	Santa Paula Creek Flood Control Project
RPM	Reasonable and Prudent Measures
SEA	Supplemental Environmental Assessment
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey

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Appendices

Appendix A
Biological Opinions

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

SEP 27 2000

In Your Response Please
Refer To:
F-LB-00-16:DRB

Robert E. Koplin
U.S. Army Corps of Engineers
Los Angeles District
PO Box 532711
Los Angeles, California 90053-2325

Dear Mr. Koplin:

Enclosed is the National Marine Fisheries Service's (NMFS) biological opinion for the U.S. Army Corps of Engineers' (Corps) Santa Paula Creek Flood Control Project in the City of Santa Paula, Ventura County, California. The biological opinion addresses the effects of the proposed action on steelhead (*Oncorhynchus mykiss*) in accordance with section 7 of the Endangered Species Act of 1973, as amended (16 U.S.C. 1531 et seq.).

The biological opinion concludes the Corps' action and the resulting construction, operation, and maintenance of the project is not likely to jeopardize the continued existence of the endangered Southern California Evolutionarily Significant Unit (ESU) of steelhead, or result in the destruction or adverse modification of critical habitat. However, NMFS believes the action is likely to result in take of steelhead present in the Santa Clara River system. Therefore, an incidental take statement is attached to the biological opinion. The incidental take statement includes reasonable and prudent measures that NMFS believes are necessary and appropriate to minimize and monitor incidental take of steelhead. Please contact Darren Brumback at (562) 980-4026 if you have comments or questions.

Sincerely,

R. Lent

Rebecca Lent, Ph. D.
Regional Administrator

Enclosure

DRAFT - BIOLOGICAL AND CONFERENCE OPINION

Agency: U. S. Army Corps of Engineers (Corps)

Activity: U. S. Army Corps of Engineers' construction, operation, and maintenance of the Santa Paula Creek Flood Control Project, including flood channel, inlet structure/fish ladder, and in-channel sediment basin, in Santa Paula Creek, Ventura County, California.

Consultation Conducted By: Southwest Region, National Marine Fisheries Service (NMFS).

Date Issued: SEP 27 2000

BACKGROUND

The U. S. Army Corps of Engineers (Corps) has a long history of flood control activities along the Santa Clara River and Santa Paula Creek. The present Santa Paula Creek Flood Control Project (Project) is a continuation of this effort. The Corps and Ventura County Flood Control District (VCFCD) prepared a Final EIS/EIR for the proposed construction of a flood control channel in Santa Paula Creek (Corps 1995). Following this Final EIS the Corps prepared several Supplemental Environmental Assessments/EIR Addendums. Phase I construction was conducted between June 1997 and October 1998; this included removal of the existing concrete flood control channel and 38 energy dissipaters, and construction of a grouted stone trapezoidal, natural bottom flood control channel in the lower reach of Santa Paula Creek from the Santa Clara River confluence to approximately river mile (RM) 0.8. Phase II began in March 1999, following lifting of a court injunction. This phase of the project includes construction, and associated activities, of the upper reaches of the flood control channel and inlet structure/fish ladder, and is anticipated to be completed in March 2001. The in-channel construction is anticipated to be completed prior to January 2001 based on the project description submitted by the Corps (2000). However, subsequent personal communication with the Corps suggests that the in-channel work may not be completed until August 2001.

The Corps requested consultation on the Project in November, 1997. The NMFS concluded section 7 consultation in December, 1997, in concurring with the Corps' determination that the Project may affect, but was not likely to adversely affect endangered steelhead of the Southern California Evolutionarily Significant Unit (ESU). This determination was based on information suggesting that steelhead presence in Santa Paula Creek was unlikely to occur during construction of the Project, habitat conditions downstream of Harvey Dam likely do not support suitable spawning or rearing conditions, areas upstream of Harvey Dam that support suitable steelhead spawning and rearing habitat have continued to be inaccessible for a number of decades, and the Corps' commitment to providing adequate fish passage at the stabilizing/inlet

structure. Phase I construction was completed under this section 7 consultation.

Subsequent to completing informal consultation, observations and experiences relative to the operation of traditional style fish ladders in high sediment transport systems such as Santa Paula Creek, and the functional flow range and entrance/exit orientation of the proposed fish ladder facilitated the need for further Project review. Technical and biological staff from the Corps, NMFS and California Department of Fish and Game (CDFG) coordinated efforts to evaluate and modify the proposed fish ladder to better accommodate anticipated sediment and flow conditions in Santa Paula Creek (Corps 2000). Subsequent to the original consultation on the Project, the Corps released the Operation, Maintenance, Repair, Replacement, and Rehabilitation Manual (December, 1998) for the Project. This document provided little to no specific guidance for post-construction/sediment removal low flow channel configuration. In addition to the original fish ladder design and proposed Operations and Maintenance Manual concerns, critical habitat was designated for the Southern California Steelhead ESU in February, 2000. The Corps requested reinitiation of section 7 consultation with NMFS on April 17, 2000, and submitted the Draft Supplemental Environmental Assessment of Rock Source, Low Flow Channel and Redesigned Fish Ladder for Santa Paula Creek Flood Control Project as the Biological Assessment.

DESCRIPTION OF THE PROPOSED ACTION

The federal action includes demolition of the existing flood control channel, construction of a new flood control channel and in-channel sediment basin, and development and authorization of an operation and maintenance manual to be implemented by the Ventura County Flood Control District (VCFCD). The action area is estimated to extend from the Santa Clara River, approximately one-half mile downstream of the Santa Paula Creek confluence, upstream to approximately river mile (RM) 2.5 on Santa Paula Creek.

The proposed flood control channel encompasses approximately the lower 2 miles of Santa Paula Creek. The new channel design consists of natural gravel/cobble substrate bottom, 2:1 grouted stone side slopes, and a grouted stone/concrete stabilizing inlet structure (RM 1.82). Construction of the project includes the removal of an estimated 624,000 cubic yards of existing bed material to accommodate channel design and in-channel sediment basin specifications. This material serves as the source for the grouted stone side slopes as well. Up to an additional 100,000 cubic yards of bed material are proposed for excavation from the Santa Paula Creek terrace/flood prone area in the one-half mile reach upstream of the flood control channel, approximately RM 2.0 to RM 2.5, as needed for grouted stone side slope construction. The Draft Supplemental Environmental Assessment of Rock Source, Low Flow Channel and Redesigned Fish Ladder for Santa Paula Creek Flood Control Project (Corps 2000) estimates Project completion in March 2001. However, the Corps has suggested that construction may not be completed until August 2001. No construction activities will occur during January through March within flowing water.

The in-channel sediment basin involves increasing channel capacity in lower 2 miles of Santa Paula Creek, and installation of a stabilizing inlet structure for channel grade control, to allow for accumulation of bed material. The reach downstream from the inlet structure (RM 1.82 to RM 1.28) has a design capacity of 120,000 cubic yards, with an allowable accumulation ranging from 2 to 13 feet in depth. From RM 1.28 to RM 0.73, the allowable accumulation profile ranges from 2 to 4 feet. Only one foot of sediment accumulation would be allowed to accumulate in the reach downstream of RM 0.73 due to flood capacity constraints. The anticipated sediment removal frequency is three to four years, with a volume ranging from 120,000 to 350,000 cubic yards. The Corps proposal indicates that operations and maintenance activities would occur during the months of April through December, weather permitting (Corps 1996); periodic removal of sediment would take about 60 to 120 days (Corps 1999).

The Operations and Maintenance manual will be formulated based on the purpose and need of the project, and relative to the analysis of this biological opinion. The Operations and Maintenance manual will be subject to final approval by NMFS.

The Corps proposed the following measures to reduce impacts of the Santa Paula Creek Flood Control Project on steelhead and their habitat (Corps 2000):

Fish Passage Facility: The stabilizing inlet structure designed to prevent channel degradation (head cutting) upstream from the in-channel sediment basin is of sufficient height (> 15 feet) to constitute a barrier to upstream migrating steelhead. The Corps proposes to incorporate a fish passage structure (ladder) into the inlet structure to accommodate upstream and downstream migrating steelhead. The ladder consists of a series of in-line pools with notched weirs designed to facilitate upstream adult steelhead passage at discharges ranging from 10 cfs to 150 cfs, and anticipated to function, with decreasing efficiency, up to and in excess of 300 cfs.

Low Flow Channel: The Corps proposes low flow channel design specifications to be implemented for the completed project and all subsequent excavation activities associated with Operations and Maintenance. The intent of the channel design is to create and maintain a single, low flow channel to facilitate upstream and downstream steelhead migration through the Santa Paula Creek Flood Control Project from the confluence with the Santa Clara River (RM 0.0) to the inlet structure/fish ladder (RM 1.82). The channel design provides for a meandering low flow channel with boulders randomly spaced every few meters to simulate riffle : pool sequence. The "low flow" channel configuration specifies a bottom width of 8 to 11.5 feet, a depth of 2 to 3.25 feet, and side slopes of 1:1.5 to 1:1.2.5.

In addition, the project sponsor (VCFCD) has committed to preserve approximately 15 acres of alluvial scrub and 5 acres of riparian habitat located in the reach upstream from the inlet structure.

California Department of Fish and Game (Corps 2000) established further requirements relative

to the Project with the Project co-sponsor, VCFCD, that the Corps has indicated adoption of:

> Item #35. When operations require moving of equipment across a flowing stream, such operations shall be conducted without increasing turbidity. For repeated crossings, the operator shall install a bridge, culvert, or rock-fill crossing. The minimum diameter of culverts shall be 24 inches. The maximum lengths of culverts shall not exceed 35 feet. Flow velocities shall not be increased above ambient levels. Any such installation shall be approved by the Department's (CDFG) fishery biologist prior to placement....The crossings shall be removed by November 1st.
>
> Item #36. If the streambed has been altered during the operations, its low flow channel shall be reconfigured to simulate natural meanders, with a rough and irregular bottom, and with pools, riffles, falls, etc.
>
> Item # 39. Permanent structures shall be designed, constructed, and maintained such that they do not constitute a barrier to upstream or downstream movement of aquatic life, or cause an avoidance reaction by fish that impedes their upstream or downstream movement. This includes, but is not limited to, the supply of water at an appropriate depth, temperature, and velocity to facilitate upstream and downstream fish migration. If any aspect of the proposed project results in a long term reduction in fish movement, the Operator shall be responsible for all future activities and expenditures necessary to secure passage of fish across the structure.
>
> Item #63. The Operator **shall not** allow any activity within FLOWING WATER from November 1 to March 31...ANY WORK IN FLOWING WATER during the period from April 1 to June 1 shall be either approved by the Department's (CDFG) or surveyed ... to avoid impacts to steelhead.

Although the Streambed Alteration Agreement issued by CDFG identified above indicates the use of electrofishing for the purpose of surveying steelhead presence (Item #63) in the action area, NMFS has not provided any approval of this activity to the Corps.

LISTED SPECIES/CRITICAL HABITAT

Status

Steelhead, an ocean-going form of rainbow trout, are native to Pacific Coast streams from Alaska south to northwestern Mexico (Moyle 1976; NMFS 1997). Wild steelhead populations in California have decreased significantly from their historic levels (Swift et al. 1993). This decline prompted listing of the Southern California ESU of steelhead as endangered on August 18, 1997 (NMFS 1997), for naturally spawned populations of steelhead and their progeny residing below long-term impassible barriers. Critical habitat was designated on February 16, 2000 (NMFS

2000), and includes all waters and substrates below naturally impassable barriers, and several dams that block steelhead from using historical habitat areas.

Current estimated run sizes for the major rivers in the Southern California ESU (Busby et. al., 1996):

Santa Ynez River.....< 100
Ventura River.....< 200
Santa Clara River.....< 100
Malibu Creek.....< 100

Little escapement or trend data are available. The run estimates above are not based on survey data and cannot be used to quantitatively assess the effects of actions. Extensive habitat loss due to water development, land use practices, and urbanization are largely responsible for the current population status. In addition, hatchery practices and rainbow trout planting may have led to genetic introgression, but documentation is lacking to fully assess the situation (Busby et. al., 1996).

Life History and Habitat Requirements

The major life history stages of steelhead, relative to this discussion, involve freshwater rearing and emigration of juveniles, upstream migration of adults, spawning, and incubation of embryos (Shapovalov and Taft 1954; Moyle 1976; Cederholm and Martin 1983; Barnhart 1991; Meehan and Bjornn 1991; Busby et al. 1996; NMFS 1997). Steelhead rear in freshwater for one to three years before migrating to the ocean, usually in the spring, where they may remain for up to four years. Steelhead grow and reach maturity at age two to four while in the ocean. Adults immigrate to natal streams for spawning during October through March, but some adults do not enter coastal streams until spring. Adult immigration appears to be associated with winter/spring storm events. Adults may migrate several miles, hundreds of miles in some watersheds, to reach their spawning grounds. Although spawning may occur from December to June, the specific timing of spawning may vary among and between years, as well as, streams within a region. Migration and life history patterns of Southern California steelhead depend more strongly on rainfall and stream flow than is the case for steelhead populations farther north (Moore, 1980a). Busby, et al. (1996) identified adult migration ranges from November through June, with peak spawning occurring in February and March, in the Santa Clara River system. Spawning and smolt migration may continue through June (Busby et. al., 1996). Steelhead do not necessarily die after spawning and may return to the ocean, sometimes repeating their spawning migration one or more years. Female steelhead dig a nest in the stream and then deposit their eggs. After fertilization by the male, the female covers the nest with a layer of gravel; the embryos incubate within the gravel pocket. Hatching time varies from about three weeks to two months depending on water temperature. The young fish emerge from the nest about two to six weeks after hatching.

Habitat requirements of steelhead in streams generally depend on the life history stage

(Cederholm and Martin 1983; Bjornn and Reiser 1991). Generally, stream flow, water temperature, and water chemistry must be appropriate for adult immigration and juvenile emigration (specific habitat requirement data can be found in Bjornn and Reiser 1991). Low stream flow, high water temperature, physical barriers, low dissolved oxygen, and high turbidity can delay or halt upstream migration of adults and timing of spawning, and downstream migration of juveniles and subsequent entry into estuary, lagoon, or ocean. Suitable water depth and velocity, and substrate composition are the primary requirements for spawning, but water temperature and turbidity are also important. Dissolved oxygen concentration, pH, and water temperature are factors affecting survival of incubating embryos. Fine sediment, sand and smaller particles, can fill interstitial spaces between substrate particles, thereby reducing water-flow through and dissolved oxygen levels within a nest. Juvenile steelhead require living space (different combinations of water depth and velocity), shelter from predators and harsh environmental conditions, food resources, and suitable water quality and quantity, for development and survival. Young-of-the-year and yearling steelhead generally use riffles and runs (e.g., Roper et al. 1994) during much of a given year where these habitats exist. However, young-of-the-year and older juveniles may seek cover and cool water in pools during the summer (Nielsen et al. 1994), particularly as discharge and, therefore, space declines in summer and fall (Kraft 1972).

ENVIRONMENTAL BASELINE

Status of the Listed Species in the Action Area

Historical estimates of steelhead abundance for the Santa Clara River have been approximated by comparison of historical (pre-1948) run size estimates in the Ventura River System and habitat availability. Based on this information, the historical run size is assumed to have averaged 9000 adult steelhead (Moore, 1980b). However, the Vern Freeman Diversion located on the Santa Clara River (RM 10.5) has been operated since 1928. Prior to the early 1990's, the facility provided only incidental steelhead passage when the earthen berm was breached by river flows. In 1991, the facility was upgraded to a permanent concrete diversion structure that included a fish passage facility. The fish ladder is operated relative to Santa Clara River discharge and generally provides upstream steelhead passage opportunities when flows exceed 415 cfs at the facility. Fish trapping data has been collected at the Vern Freeman Diversion and Fish Passage Facility on the Santa Clara River, located downstream of Santa Paula Creek, from1994-1998, but is not comprehensive enough to be used to specifically estimate the size of the Santa Clara River steelhead population. These data indicate that 0 to 2 adult steelhead annually migrated to upstream spawning habitat of the Santa Clara River system during the study period. Smolts returning to the ocean each year ranged in number from 81 to 404 when the smolt trap was heavily used. Both the numbers of adults and smolts counted at the diversion probably represent a subset of the total population based on a number of factors including when trapping was done in the fish ladder, when the smolt trap was operated, and the possibility for smolts to pass directly over the diversion sill. The Sespe Creek watershed is recognized as providing the largest

portion of historic and current steelhead spawning and rearing habitat in the Santa Clara River system (Table 1 - Moore 1980b). Analysis of juvenile *O. mykiss* collected in August, 1999 from the upper reaches of the Sespe Creek system identified the presence of juvenile steelhead (Zimmerman 1999). These samples appear to represent two age classes, 0+ and 1, implying the current limited population of adult steelhead migrating into the Santa Clara River system are spawning and rearing in the Sespe Creek drainage.

Table 1. Historic and current miles of suitable and seasonably accessible steelhead spawning and rearing habitat, Santa Clara River system, from Moore (1980b).

Drainage	**Santa Paula Creek**		**Sespe Creek**		**Piru Creek**	
Historic Habitat	11 miles	12%	53 miles	60%	25 miles	28%
Current Habitat	2 miles	8%	47 miles	90%	0 miles	0%

Santa Paula Creek is a tributary to the Santa Clara River (RM 15.5). Available information suggests that Santa Paula Creek historically provided steelhead habitat and production to the Southern California Steelhead ESU. However, it is assumed that steelhead production has not occurred in the last few decades as a result of a migration barrier (Harvey Dam), that has blocked passage to suitable upstream spawning an rearing habitat. The reach downstream of this diversion, including the action area, is assumed to function as a migration corridor for steelhead, although steelhead spawning and rearing is possible (NMFS 1999).

Factors Affecting Species Environment within the Action Area

The action area identified above is or may be affected by alteration or modification of stream flow and instream habitat, passage barriers, agricultural activities, flood control activities, urbanization, high intensity flood events, poor water quality, and sedimentation in Santa Paula Creek. Moore (1980b) estimated relative spawning and rearing habitat of the Santa Clara River system (Table 1). The reduction of available habitat in Santa Paula Creek is likely the result of the Harvey Diversion Dam located approximately 3.5 miles upstream from the confluence with the Santa Clara River. Although a fish ladder was previously incorporated into this facility in1950, downstream aggregate mining operations apparently initiated head cutting up lower Santa Paula Creek and degraded the channel to an elevation that prevented steelhead use of the ladder for the last few decades. However, construction of a new fish ladder was completed at this facility in February, 2000, that should provide access to upstream suitable spawning and rearing habitat. Subsequent to completing the fish ladder at the Harvey Diversion Dam, an oil transport truck crashed and discharged approximately 4,000 gallons of partially refined crude oil into Santa Paula Creek upstream of the facility. Emergency response efforts resulted in closing the ladder, and construction of temporary detainment ponds in lower Santa Paula Creek, approximately 0.5 mile from the Santa Clara River. This further reduced the likelihood of steelhead migration into Santa Paula Creek during the peak migration period of spring 2000.

Although channel features have not been quantified, the lower 3.5 miles appears entrenched and generally absent of flood plain features. This is likely the result of previous management, such as channel and riparian vegetation manipulation associated with Santa Clara River aggregate mining and flood control efforts, and high intensity storm discharge that facilitated degradation of lower Santa Paula Creek. Rincon (1998) reported an estimated 10 feet of channel degradation at the Harvey Dam facility since 1950. Further, the present condition of this stream reach appears to lack desirable steelhead spawning and rearing components such as habitat complexity and cover. In addition, Mud Creek, a tributary at approximately RM 3.5 and immediately downstream from Harvey Dam, contributes excessively turbid water to this reach of Santa Paula Creek. The NMFS considers the habitat in the action area to function as a seasonal migratory corridor for steelhead.

As previously stated, a fish ladder was constructed upstream of the action area in February, 2000, and analyzed pursuant to section 7, Endangered Species Act (NMFS, 1999). This facility provides steelhead access to spawning and rearing habitat, and should facilitate the future presence of steelhead in Santa Paula Creek. The diversion operations may divert all flows from Santa Paula Creek upstream of the Mud Creek confluence, during summer and fall months. This further reduces the likelihood of suitable salmonid rearing habitat in the action area.

EFFECTS OF THE ACTION

Methodology for Effects Analysis

As previously indicated, population data for the Southern California Steelhead ESU are limited. Consequently, the number of steelhead that could be delayed, harmed or killed as a result of the proposed project can not be accurately estimated. The presence of a migration barrier upstream of the action area (Harvey Dam), the pre-project concrete channel and energy dissipaters in the lower 0.75 mile reach of Santa, and the existing/preconstruction channel conditions in the action area likely have limited or precluded the use of Santa Paula Creek for steelhead spawning and rearing. In addition, the action area has and will be surveyed by a biologist prior to work in flowing water during the period when construction and fish presence were most likely to overlap, April 1 to June 1. No adult steelhead were observed during surveys conducted in 1999 and 2000. Therefore, the assumption is that steelhead and their progeny are not likely to be in Santa Paula Creek during the construction phase of this project through December 2000. However, the construction of the Harvey Dam fish ladder may increase the potential for steelhead presence in winter/spring, 2001. This analysis focuses primarily on post construction effects to migrating steelhead and their habitat through the action area based on Draft Supplemental Environmental Assessment of Rock Source, Low Flow Channel and Redesigned Fish Ladder for Santa Paula Creek Flood Control Project (Corps 2000). Construction related turbidity in Santa Clara River is also discussed.

Effects on Steelhead and Critical Habitat

The project action may affect steelhead that may be migrating, spawning or rearing in the action area, and habitat parameters associated with these life history phases. Under pre-construction and proposed project conditions, steelhead that may be perceived to utilize the action area other than migration, such as rearing, are likely the result of stranding. Stranding issues are addressed relative to migration. Steelhead migration through the action area is the primary concern relative to the proposed action. Duration of opportunity, delay and stranding (temporary or permanent) of upstream and downstream migrating steelhead may result from construction activities, post construction features (such as the inlet structure/fish ladder and flood control channel), and operations and maintenance activities. These effects could result in lethal and/or non-lethal take of steelhead. In addition, artificially armored banks and frequent disturbance of the stream channel and riparian area resulting from the proposed construction, maintenance and operation is anticipated to preclude natural channel evolutionary processes that could improve habitat conditions for steelhead.

Construction

Construction activities associated with flowing water have generally occured between April 1 to December 31 since construction began in 1997. Construction was anticipated to be completed March 2001 (Corps 2000); however, the Corps subsequently indicated that the inlet structure/fish ladder may not be completed until August 2001 (Rey Farve, personal communication, 11 Sept. 2000). Adult steelhead or their progeny, rearing or outmigrating smolts, are not anticipated to have been appreciably affected by the construction phase of the project due to the limited likelihood of steelhead spawning in the reach downstream of Harvey Dam, and the fact that migration to suitable spawning and rearing habitat upstream of Harvey Dam was not possible prior to completion of the fish ladder in February, 2000. Steelhead observations, while not conclusive, conducted at the Vern Freeman Diversion Dam, Santa Clara River, indicate upstream migrating adults occurred in March, and juveniles were observed from February through June from 1994 to 2000. Further, CDFG has required that any activities that occur in flowing water during the period from April 1 to June 1 be surveyed for steelhead presence, and that no work is to occur in flowing water if steelhead are present. Although steelhead were not observed in Santa Paula Creek during construction, there is the possibility that steelhead may come in contact with construction equipment or turbidity, and delayed or stranded due to temporary water diversions related to construction activity. This is particularly a concern if construction activities occur between April and June, 2001. Although there was only a limited time when adult steelhead could have ascended Santa Paula Creek this past migration season (winter/spring 2000) and accessed suitable spawning and rearing habitat upstream of the Harvey Dam fish ladder, juvenile steelhead/smolt may be emigrating during this period through the Project area and may be harmed or killed by construction related activities. Adult and juvenile steelhead migrating through Santa Clara River near the confluence of Santa Paula Creek are likely to be temporarily present in the Santa Clara River during the construction period and exposed to increased turbidity. However, the level of turbidity contributed as a result of project construction is believed minimal relative to Mud Creek sediment contributions and back ground levels in the

Santa Clara River when steelhead are likely to be present. This is not anticipated to impact migrating steelhead in the Santa Clara River.

Flood Control Channel

The Corps developed guidelines for the proposed low flow channel, within the designed flood channel, intended to simulate natural conditions occurring in Santa Paula Creek upstream of the flood control channel. However, the reach upstream of the flood control channel has been subject to disturbance, such as channel manipulation by Ventura County Flood Control Department and recent high intensity flood flows (1998). Although the channel design parameters are not based on a natural channel in the sense of an undisturbed stream reach, the configuration is assumed to mimic pre-project conditions of Santa Paula Creek due to the similar nature of the landscape setting and previous management activities. The specifications of the low flow channel include a width of 2.5 to 3.5 meters, and depth of 0.6 to 1.0 meters with side slopes of 1:1.5 to 1:2.5. The channel alignment will meander as a series of simple reverse curves with a radius that varies from 200-350 meters. Small boulders will be randomly placed every few meters along the channel bottom to simulate a riffle:pool sequence. The Corps calculated that a channel bottom width of 3.0 meters and a side slope of 1 vertical to 2 horizontal for discharges of 10, 50, and 150 cfs would provide flow depths of 0.3, 0.9, and 1.7 feet, respectively. The corresponding average flow velocities would be 3.1, 4.7, and 6.6 ft/s. The Corps calculated Santa Paula Creek flows to meet or exceed 15 cfs 50% of time from January through April, the anticipated primary adult steelhead upstream migration period. A discharge of 15 cfs yields an approximate depth of 0.5 foot for the designed low flow channel which approaches the general recommended minimum passage depth of 0.6 foot. The velocities are within the general swimming abilities for adult steelhead reported in the literature, although these specifications are based on fish lengths (>24 inches) which are believed larger than steelhead typically observed in southern California rivers. Orsborn (1992) reported sustained (<4.6 ft/s), prolonged (<13.7 ft/s) and burst (26.5 ft/s) swimming speeds for adult steelhead. These are defined respectively as normal functions without fatigue, activities lasting 15 seconds to 200 minutes resulting in fatigue, and activities resulting in fatigue in 15 seconds or less. Further, the randomly placed boulders may provide low velocity resting areas for migrating fish, and scour undulations in the low flow channel providing areas of increased depth.

The proposed channel design may result in delays for migrating steelhead when water depths and velocities are not within a suitable range. Minimum recommended passage depths are estimated to occur on average about 50% of the time when adult steelhead are likely to be ascending the stream (January through April). However, this does not account for steelhead behavioral responses that suggest upstream migration is associated with storm generated flow events when suitable passage depths are more likely to occur as a result of increased flows. Velocities estimated to occur in the proposed channel appear to be within the swimming capabilities of steelhead for more than 90% of the anticipated discharges (<150 cfs). Downstream migrating smolts require less depth for passage than adults and should generally have suitable passage to the Santa Clara River greater than 50% of the time on average from January through April.

However, downstream migration may occur through June, during a period when flows are lower than those estimated above. Winter/spring flows may develop a thalweg, thus providing an opportunity for smolt passage at flows less than those identified for the designed low flow channel. Timing, duration, and amount of flows are influenced by local watershed conditions and character, seasonal precipitation, and water uses.

In addition, NMFS is concerned about the channel maintaining the configuration described above for which the analysis and assumptions for fish passage are based: interruption of surface flow resulting from channel aggradation, or channel braiding. The accumulation of unconsolidated gravels and cobbles in the flood control channel / in-channel sediment basin could facilitate a condition of subsurface flow by raising portions of the streambed above the elevation of local surface water resulting in interrupted flow. Development of multiple channels or braiding would increase width to depth ratios, thus reducing stream depth. These scenarios would likely adversely affect adult and juvenile steelhead through delay of migration and stranding, thus resulting in lethal and/or non-lethal take.

Inlet Structure/Fish Ladder

The Corps has incorporated a fish ladder into the inlet structure. The ladder consists of a single row of weir pools 10 feet long, 46 feet wide and 2 feet minimum depth at 10 cfs, with an overall slope of 0.741. The ladder is designed to function at flows from 10 cfs to 150 cfs; however, the ladder will likely provide passage up to 300 cfs with decreasing efficiency. The weir notches are at pool invert elevation, and the ladder is not expected to retain water if stream flows cease. The Corps flow analysis indicates that the fish ladder should generally function throughout the range of flows between the 10% and 90% exceedence levels during the anticipated upstream migratory period, January through April. The concrete weirs will be configured with a gradual slope (1 vertical:10 horizontal) from each side to a center notch, and designed for a maximum of 1 foot drop between pools.

The fish ladder design was developed in coordination among the Corps, NMFS and CDFG to accommodate steelhead passage. However, the fish ladder may result in steelhead migration delay and stranding. Upstream migrating adults may be temporarily delayed as a result of travel through the series of weir pools and/or when depth or velocities through the ladder do not facilitate passage. Flow analyses and design specifications indicate this occurrence to be less than 20% of the period when upstream migration is anticipated. In addition, upstream migration of adult steelhead is often associated with storm events, particularly the receding limb of the hydrograph which would likely be within the designed flow range. Outmigration of juvenile and adult steelhead is anticipated to occur as late as mid-June when reduced flows are likely. The notch and weir configuration is designed to detain water in the pool while providing a flow through system that does not result in residual pool formation. The ladder is anticipated to provide downstream migration to a point of near zero flow. However, if aggradation occurs between the weirs that forms residual pools during low flow periods, steelhead may be stranded and subject to desiccation and death.

Supplemental Material Excavation

The Corps proposes to excavate 65,000 to 100,000 cubic yards of alluvial material from Santa Paula Creek bed and terrace areas, upstream of the flood control channel, to supply additional material for the grouted stone side slopes. The material proposed to be excavated is reported to have primarily been deposited in the 1997-98 storm events. Only rock, size not disclosed, would be removed from the site; all fine material (sand and silt) would be left at the site. This action would remove portions of the existing terrace/floodplain area to a depth of 10 feet, including vegetation, to an elevation below the flow line along approximately 0.5 mile of Santa Paula Creek.

Limited existing site condition information and no post-construction channel parameters are provided to evaluate the proposal. In addition, there seems to be conflicting descriptions for this site. The Corps identified that the proposed excavation would occur in an area that was previously, as recent as1995, excavated and re-shaped by VCFCD. However, this reach appears to be where the Corps surveyed channel parameters for developing the low flow channel configuration and that the Corps determined was natural and undisturbed. Therefore, analysis of this aspect of the project are qualitative in nature. Excavation of material from this reach is anticipated to result in a wider, shallower wetted stream channel, and may develop unstable multiple low flow channels or braided configuration. This could increase the amount of flows necessary for migration, thus resulting in migration delay or barriers. Further, excavation may result in channel depressions that could strand migrating steelhead as flows recede and depression pools become isolated from the main flow. Concentrated deposits of fine alluvial material (sand and silt) resulting from the excavation could increase fine sediment loads and turbidity to lower Santa Paula Creek and Santa Clara River. Disturbance and/or removal of vegetation may further reduce channel stability in this reach of Santa Paula Creek; the Corps states that conditions will stabilize within two years. The Corps (Rey Farve, personal communication by electronic mail, June 9, 2000) did not identify any specific measures to facilitate revegetation of the excavated area; however, the Corps can commit to salvaging native vegetation and stockpiling the upper 6 to 12 inches of material for redistribution during final grading activity. The Corps expects that the excavated area would begin natural re-vegetation within months following disturbance.

Santa Paula Creek Flood Control Project Operations and Maintenance

The draft Operations and Maintenance Manual (December, 1998) did not adequately disclose procedures to be considered in this opinion. Coordination between NMFS and the Corps concluded that the development of an O&M Manual would follow this biological opinion and reflect the analysis of this opinion.

The Corps proposal indicates that operations and maintenance activities could occur during the months of April through December, weather permitting (Corps 1996); periodic removal of sediment would take about 60 to 120 days (Corps 1999). A primary aspect of maintenance and

operations of the Project is the excavation of 120,000 to 350,000 cubic yards of streambed material at a frequency of 3 to 4 years. Low flow channel maintenance is implied in various Corps documents relative to the periodic excavation and disturbance of the flood control channel. However, the language was in vague terms regarding low flow channel maintenance, such as "construct a low flow channel that meanders within the middle third of the stream bottom" (Final Environmental Assessment for Santa Paula Creek Flood Control Project, Corps 1996). The low flow channel design specifications proposed by the Corps (2000) should outline specific criteria for the Operations and Maintenance Manual. Although the Final Supplemental Environmental Assessment of Rock Source, Low Flow Channel, and Redesigned Fish Ladder has not been received by NMFS, the Corps has indicated that this document will commit them to not remove vegetation less than 3 inches diameter at breast height (DBH) between sediment cleanouts required to maintain the channel's design capacity (Rey Farve, personal communication by electronic mail, June 9, 2000). The Corps further indicates that any removal of vegetation between maintenance cleanouts will be coordinated with NMFS and CDFG.

Operations and maintenance of the Project is anticipated to maintain the lower 2 miles of Santa Paula Creek riparian in an immature condition through the periodic removal of sediment and associated riparian vegetation that may establish. This may result in unstable channel conditions such as accelerated lateral migration and/or braiding. This is similar to pre-construction conditions identified by the Corps. The effects on steelhead and their habitat relative to maintenance and operation activities parallel those identified under the discussion of construction. However, the increasing likelihood of steelhead presence in Santa Paula Creek, resulting from the Harvey Dam fish ladder, elevates the anticipated affects beyond those considered in the construction phase. Potential effects of operation and maintenance activities are increased turbidity and physical impact of equipment during sediment removal, and potential migration delay and stranding associated with temporary water diversion if maintenance is conducted while steelhead are migrating through this reach of Santa Paula Creek. In addition, steelhead stranded due to low water conditions may be present beyond anticipated migration period. These adverse effects could result in non-lethal and lethal take of steelhead.

The Corps will submit the proposed Operations and Maintenance Manual for the Santa Paula Creek Flood Control Project, addressing appropriate measures to avoid or reduce potential impacts to endangered steelhead and their habitat, following receipt of this biological opinion and prior to any operation or maintenance activities associated to the Project. This document is subject to NMFS approval and shall amend this biological opinion to analyze potential impacts that were not considered in this biological opinion.

Summary of Effects

As previously discussed, Santa Paula Creek has likely not provided steelhead habitat or contributed to steelhead production for several decades. Although not quantifiable due to the

lack of information on steelhead abundance and distribution in the action area, the nature of anticipated take is primarily non-lethal and associated to migration delay. The inlet structure/fish ladder and low flow channel are designed to accommodate migration during the majority of the total annual migratory period, including the primary period of adult upstream migration. The number of steelhead that could be stranded and potentially killed in the flood control channel and inlet structure/fish ladder would likely be associated with the low flow period that may occur at the latter portion of the annual steelhead outmigration, and would be a relatively small portion of total number of steelhead migrating through the action area. The effects on steelhead and critical habitat from the project action are not likely to preclude the primary function of this habitat - migration, thus, not anticipated to preclude steelhead recolonization and use of suitable spawning and rearing habitat in Santa Paula Creek.

CUMULATIVE EFFECTS

Cumulative effects include the effects of future State, tribal, local, or private actions that are reasonably certain to occur in the action area considered in this biological opinion. Future Federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to section 7 of the Act. NMFS maintains general familiarity with actions affecting steelhead in Santa Paula Creek, and is unaware of any such actions that are reasonably certain to occur within the proposed action area that would not require section 7 consultation. Consequently, we believe no cumulative effects are likely to occur except the following impact of potential recreational harvest. The California Department of Fish and Game regulates sportfishing activities in Santa Paula Creek. The current (2000) regulations allow for "trout" angling upstream of Harvey Diversion Dam with a year long open season and 5-fish bag limit. Although this area has been inaccessible to steelhead, passage capabilities were provided with the Harvey Dam Fish Ladder in February, 2000. The CDFG and NMFS are discussing interim and long term options to this issue.

CONCLUSION

After reviewing the best scientific and commercial data available, the current status of steelhead, the environmental baseline for the action area, the effects of the Santa Paula Creek Flood Control Project, and the cumulative effects, it is NMFS' biological opinion that the proposed project action is not likely to jeopardize the continued existence of the Southern California steelhead ESU, and is not likely to destroy or adversely modify critical habitat.

INCIDENTAL TAKE STATEMENT

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. NMFS interprets the term "harm" as any which actually kills or injures fish or wildlife. Such an act may include significant habitat modification or degradation where it 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 7(o)(2), taking that is incidental to and not intended as part of the proposed action is not considered to be prohibited taking under the Act provided that such taking is in compliance with this Incidental Take Statement.

The measures described below are nondiscretionary, and must be undertaken by the Corps so that they become binding conditions of any grant or permit issued to the County of Ventura Public Works Department (Project co-sponsor), as appropriate, 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 the County of Ventura Public Works Department to adhere to the terms and conditions of the incidental take statement through enforceable terms that are added to the permit or grant document, 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 action and its impact on the species to NMFS as specified in the incidental take statement. (50 CFR §402.14(i)(3))

AMOUNT OR EXTENT OF TAKE

The NMFS believes the proposed construction, operation, and maintenance of the Santa Paula Creek Flood Control Project may result in the incidental take of steelhead. Take is possible in the form of stranding, migration delay, harassment, capture and collection, stress, injury, and mortality of juvenile and adult steelhead. The NMFS anticipates incidental take of steelhead due to the project may be difficult to detect because steelhead occur in riverine habitats which makes finding a dead or impaired specimen unlikely. In addition, take in the form of migration delay is likely not possible to measure directly, and therefore quantitative and qualitative surrogates, such as low flow channel configuration, inlet structure/fish ladder design parameters, and associated water depth and velocity, were used in this analysis. These design parameters, and associated stream flow depths and velocities, are described in the accompanying biological opinion and the Corps (2000) project description.

Due to the lack of data on steelhead numbers in the ESU and action area; and the lack of data to estimate the Project's exact effects on migration, NMFS can not estimate the amount of migration delay or specific numbers of steelhead that could be injured or killed using the flood

control channel or inlet structure/fish ladder. As noted in the accompanying biological opinion, the amount of take is expected to be small and primarily in the form of non-lethal take. However, some level of lethal take resulting from stranding and dessication of individuals could occur, particularly when outmigration and low flow conditions overlap. Therefore, relocation of stranded steelhead has been identified as a Reasonable and Prudent Measure to further minimize the likelihood of lethal take resulting from the Santa Paula Creek Flood Control Project. Mortality of individual steelhead could occur during relocation or as a result of relocation efforts, but is assumed to be 2 percent or less.

The discovery of one or more injured or dead adult or juvenile steelhead in the action area including the flood control channel, inlet structure/fish ladder, and reach associated with the supplemental gravel supply would constitute exceeding the level of incidental take anticipated to occur and may require reinitiation of section 7 consultation. In addition, the accompanying biological opinion does not anticipate any form of take that is not incidental to the proposed project action.

EFFECT OF TAKE

In the accompanying biological opinion, the NMFS concluded the anticipated level of take associated with the project action is not likely to jeopardize the continued existence of the federally endangered Southern California steelhead ESU.

REASONABLE AND PRUDENT MEASURES

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

1 Develop and submit the Santa Paula Creek Flood Control Project Operations and Maintenance Manual for NMFS approval by June 1, 2001.

2. Conduct in-channel work in a manner and time that avoids or reduces disruption of steelhead migration.

3. Develop, monitor, and maintain the low flow channel configuration as defined in Draft Supplemental Environmental Assessment of the Rock Source, Low Flow Channel & Redesigned Fish Ladder for the Santa Paula Creek Flood Control Project (Corps 2000) for the reach between the inlet structure and Santa Clara River confluence.

4. Monitor and maintain the inlet structure/fish ladder to minimize delay and stranding.

5. Employ a fisheries biologist for the purposes of assessing steelhead presence/absence in the Santa Paula Flood Control Project prior to construction, and operations and maintenance activities; and for removing and relocating steelhead from the affected area.

6. Develop and monitor post-construction channel conditions associated with the supplemental rock source excavation upstream of the inlet structure/fish to facilitate fish passage and reduce turbidity.

7 Provide a final construction report and annual monitoring reports to evaluate suitable migration conditions, and develop any necessary modifications to design and/or operations and maintenance activities.

TERMS AND CONDITIONS

In order to be exempt from the take prohibitions of the ESA, the Corps must comply with the following terms and conditions, which implement the reasonable and prudent measures described above and outline required reporting/monitoring conditions. These terms and conditions are non-discretionary unless noted otherwise:

The following terms and conditions implement reasonable and prudent measure No. 1.

1) The Corps shall develop and implement an Operations and Maintenance Manual for the Santa Paula Creek Flood Control Project that incorporates all Reasonable and Prudent Measures and associated Terms and Conditions, including a monitoring plan.

2) The Corps shall submit the Santa Paula Creek Flood Control Project Operations and Maintenance Manual to NMFS by June 1, 2001 for approval and incorporation into the biological opinion.

The following terms and conditions implement reasonable and prudent measure No. 2.

1) In-channel work activities, between grouted side slopes, for operations and maintenance activities shall be planned to avoid flowing water during the potential steelhead migration period; the in-channel work period is June 30 through November 1.

a) In-channel work may occur between June 1 and June 30, if the Harvey Diversion ladder has been closed for at least one week, and the area has been surveyed for steelhead presence. If steelhead are found or expected to be present, work shall not proceed until either steelhead are no longer present, or avoidance and/or relocation measures have been established in coordination with NMFS.

b) In-channel work may occur between November 1 and December 31, if winter storm(s) have not generated flows that facilitate the operation of the Vern Freeman Diversion fish ladder on the Santa Clara River.

2) In-channel work and channel diversion activities for remaining construction of the Santa Paula Creek Flood Control Project shall not begin until May 1, 2001, and shall end prior to the following winter storm season or the first operation of the Vern Freeman Diversion

fish ladder; and shall be conducted to reduce potential impacts to migrating steelhead.

a) The area shall be visually surveyed for steelhead presence by a qualified fisheries biologist or technician prior to working in-channel.

b) The channel shall be diverted or piped outside/around the work area. Equipment shall avoid flowing water other than temporary crossing or diverting activities.

c) Residual surface water associated with diverted channel shall be monitored for salmonid presence by a qualified fisheries biologist or technician as soon as flows recede. If salmonids are observed in the isolated channel, they shall be immediately relocated to the flowing reach by a qualified fisheries biologist or technician.

d) Temporary culverts used in construction, maintenance, and/or operations shall be placed at stream grade and of adequate size to not increase stream velocity.

e) Silt fences or mechanisms to avoid sediment input to the flowing channel shall be erected adjacent to flowing water if sediment input to the stream may occur.

The following terms and conditions implement reasonable and prudent measure No. 3.

1) Monitor the low flow channel configuration and associated discharge at least once per year during low/base flow condition.

a) Establish permanent cross-sectional profile index sites between the grouted stone side-slopes to validate maintenance of designed low flow channel width, depth, and channel migration. Monitor annually for a period of five years following project construction, and following all sediment excavation activities.

b) Establish permanent upstream and downstream photo-points for visual reference to channel maintenance; at a minimum, photo-points shall be established to document conditions near the Santa Clara River confluence, Santa Paula Creek between the confluence and the inlet structure/fish ladder, and the inlet structure/fish ladder. Photos should attempt to capture the general condition, and should be taken from vantage positions such as road crossings and/or aerially. Photo documentation shall occur annually during the low flow season (summer/fall) for a period of five years following project construction, and following all sediment excavation activities.

2) Conduct visual observations, necessary photo documentation, and discharge measurements between the Santa Clara River confluence and the inlet structure/fish ladder following bedload transport storm events (>500 cfs), to evaluate post storm channel condition and steelhead passage opportunities.

3) Monitor and evaluate potential bed loss of surface flows associated to zones of aggradation. Determine discharge, and wetted channel width and depth relations associated to sediment aggradation areas and a non-aggraded control upstream of the project area.

4) Maintain the low flow channel at design specifications to facilitate steelhead migration. Contact NMFS (562/980-4020) during channel maintenance evaluation and prior to any

in-channel work activities.

a) Following annual monitoring, conduct necessary maintenance of the low flow channel to meet general design specifications.

b) Following observations subsequent to a bedload transport event (>500 cfs), evaluate steelhead passage opportunities, and conduct any necessary channel maintenance.

The following terms and conditions implement reasonable and prudent measure No. 4.

1) Validate and report inlet structure/fish ladder design specifications, such as depth and velocity, during the first winter/spring flow season following construction.

2) Monitor sediment and debris accumulation upstream, downstream, and between weirs of the inlet structure/fish ladder, and evaluate potential low flow isolated pool formation or other fish migration blockage following all sediment transporting flows (>500 cfs) for a period of five years following project construction.

3) Remove accumulated sediment and debris to insure passage to and from the fish ladder, and drainage between weirs at all flows prior to threat of isolated pool formation or other fish migration blockage.

The following terms and conditions implement reasonable and prudent measure No. 5.

1) If flowing water will be disturbed by the construction, operations or maintenance activities, the Corps shall have a qualified fisheries biologist/technician survey the complete area that may be disturbed, including downstream turbidity, within one week of the beginning of in-water work. The fishery biologist shall be present during activities that occur within flowing water, and be empowered to halt work activity and to recommend measures for avoiding adverse effects to steelhead and their habitat.

a) The fisheries biologist/technician shall have knowledge and experience in anadromous salmonid biology and ecology, fish/habitat relationships, biological monitoring, and handling, collecting, and relocating salmonid species.

b) The fisheries biologist/technician shall rescue any steelhead that may become stranded and relocate them to an appropriate place in Santa Paula Creek or Santa Clara River, depending upon the life history stage of the fish and flow conditions in Santa Paula Creek and the Santa Clara River.

c) The fisheries biologist/technician shall note the number of individuals observed in the affected area, the number of individuals relocated, the approximate size of individuals, and the date and time of the collection and relocation. One or more of the following methods shall be used to capture steelhead: dip net, seine, throw net, minnow trap, hand. Electrofishing may only be used if NMFS has reviewed the biologist's qualifications and given written approval.

d) The Corps shall require the fisheries biologist/technician to contact NMFS (562/980-4026) or 562/980-4054) immediately if one or more steelhead are found dead or injured. The purpose of the contact shall be to review the activities resulting in take and to determine if additional protective measures are required.

The following terms and conditions implement reasonable and prudent measure No. 6.

1) Re-contour low flow channel to mimic pre-project conditions or to the low flow design specifications of the flood control channel.
2) Re-contour flood plain/terrace areas to prevent areas of depressions that may form isolated pools and strand steelhead.
3) Stockpile surface material that may contain native vegetation and/or seed material and redistribute across flood plain/terrace adjacent to channel.
4) Establish permanent photo-points to document pre and post construction; repeat photos following the first and second winter/spring storm season.

a) Revegetate disturbed area to the approximate pre-construction density or greater with native vegetation if the area has not naturally revegetated within the second growing period following construction.

The following term and condition implements reasonable and prudent measure No. 7.

1) The Corps shall provide a written report to NMFS within 45 working days following completion of the construction phase of the project action. The report shall include an "as built" survey of the flood control channel and inlet structure/fish ladder.
2) The Corps shall provide an annual report of all monitoring, including photo documentation, and all in-channel operation and maintenance for a period of five years following project construction and all sediment excavation activities.
3) The Corps shall evaluate all design specifications for performance based on monitoring; and develop new design specifications as needed to facilitate migration of endangered steelhead.

The NMFS believes that relatively few steelhead will be incidentally taken as a result of the proposed action. The reasonable and prudent measures, with their implementing terms and conditions, are designed to minimize the impact of incidental take that might otherwise result from the proposed action. However, if the level of incidental take is greater than expected, reinitiation of consultation will be required to reassess the reasonable and prudent measures. As noted above, if one or more adult or juvenile steelhead is found injured or dead, the level of take anticipated has been exceeded. The Corps must immediately provide an explanation of the causes of the taking and review with NMFS the need for possible modification of the reasonable and prudent measures.

REINITIATION NOTICE

This concludes formal consultation on the actions outlined in the proposed project (Corps 2000). As provided in 50 CFR §402.16, reinitiation of formal consultation is required where discretionary Federal 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 in this opinion; (3) the action is subsequently modified in a manner that causes an effect to the listed species or critical habitat not considered in this opinion; or (4) a new species is listed or critical habitat designated that may be affected by the action. In instances where the amount or extent of incidental take is exceeded, formal consultation shall be reinitiated immediately.

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In response, refer to:
2009/04545: DB

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Los Angeles, California 90053-2325

Dear Dr. Axt:

NOAA's National Marine Fisheries Service (NMFS) is responding to the U.S. Army Corps of Engineer's (Corps) August 21, 2009, request to amend NMFS' September 27, 2000, biological opinion for the Corps' Santa Paula Creek Flood Control Project (Project) in the City of Santa Paula, California. This biological opinion was generated as a result of the determination that the Project was likely to adversely affect endangered Southern California steelhead (*Oncorhynchus mykiss*), pursuant to the U.S. Endangered Species Act (ESA). The September 27, 2000, biological opinion concluded the Project was not likely to jeopardize the continued existence of steelhead, or result in destruction or adverse modification of designated critical habitat. NMFS' response provided herein serves to amend the September 27, 2000, biological opinion through a) incorporating the additional conservation measures proposed by the Corps to reduce adverse effects of the Project on the species and designated critical habitat, b) specifying incremental and cumulative Project reviews based on the Corps' monitoring and maintenance budgetary commitment, and c) reassess ongoing Project effects in response to the designation of critical habitat for endangered steelhead in September 2005. Additional background information leading up to the decision to amend the subject biological opinion is presented as follows.

The Corps contacted NMFS via e-mail on June 18, 2009, to discuss the Corps' proposed sediment removal associated with the Project, and subsequently released the Draft Supplemental Environmental Assessment/Addendum for the Santa Paula Creek Flood Control Project Sediment Removal on July 14, 2009. Following NMFS' review of the administrative record and subsequent communication with the Corps, it became apparent that the Corps had not fully implemented the terms and conditions of the September 27, 2000, biological opinion and incidental take statement. In particular, monitoring of the Project effects (e.g. performance of the designed low-flow channel) and maintenance (e.g. sediment removal from the grade-control/fish-passageway structure) had not fully been performed.

During extreme winter storms in 2004/2005, approximately 330,000 cubic yards of sediment were deposited within the flood control channel, including the grade-control/fish-passageway structure. Sediments were removed from the fish-passageway in April 2005. The fish-passageway was observed to have been damaged during the storms and subsequently has not functioned as designed. Observations on August 6, 2009, demonstrate that the fish-passageway is not functioning as result of sediment accumulation and riparian vegetation within the weirs, which has diverted the water around the fish-passageway.

The Corps proposes to remove the accumulated sediments from the Project in conformance with the September 27, 2000, biological opinion. As a result of coordination among the Corps and NMFS staff, the Corps proposed additional measures to reduce Project effects on endangered steelhead and designated critical habitat for this species. The fish-passageway is not part of the proposed Project maintenance (sediment removal) for summer/fall 2009. However, removal of accumulated sediment and vegetation from this structure will facilitate future assessment of the condition and function of the fish-passageway. The Corps proposes to evaluate the condition and function of the fish-passageway and develop alternatives for redesigning the fish-passageway in coordination with NMFS during fiscal year 2010. Upon selecting an appropriate design alternative, the Corps and NMFS will conduct an ESA consultation on proposed modification of the fish-passageway. The ESA consultation on the fish-passageway is expected to require considerable time for appropriate analysis by NMFS staff (biological, hydrological and engineering). Therefore, NMFS urges the Corps to outline a schedule for this proposed action and initiate coordination at the earliest opportunity.

What follows is a description of the conservation measures and monitoring elements that the Corps proposes to incorporate into the Project, as well as the incremental and cumulative reviews that are necessary to assess whether the Project is implemented over time consistent with Project guidelines defined in both the description of the Project, the biological opinion, and this amendment to the biological opinion. Because critical habitat for endangered steelhead was re-designated in 2005, this amendment subsequently presents an assessment of the effects of the Project on designated critical habitat for this species.

Additional Conservation Measures and Monitoring

Conservation Measures

The Corps proposes to incorporate the following measures to better define previous components of the Project and reduce Project effects on steelhead and critical habitat.

Boulder Placement: The Corps' proposed Project resulting in the September 27, 2000, biological opinion specified that boulders would be randomly placed within the low-flow channel every few meters to simulate riffle-pool sequence. The Corps has refined this description to include:

- Boulders ranging from 2 to 4 feet in diameter will be stockpiled during sediment removal.

- Boulders will be strategically clustered or placed under guidance from Corps hydrologist(s) and biologists(s), in coordination with NMFS, to ensure the low-flow channel provides resting refuges for migrating steelhead.

The boulder placement augments the course bed material, including smaller boulders, remaining in the channel following excavation that is expected to provide channel roughness and stream energy dissipation.

Riparian Vegetation: The Corps' proposed Project resulting in the September 27, 2000, biological opinion only included the specification that riparian vegetation less than 3 inches diameter breast height (dbh) that opportunistically established would not be removed between sediment removal (maintenance) activities. The Corps has refined this description to include:

- Surface material that may contain native vegetation and/or seed material will be stockpiled during sediment removal and redistributed across the floodplain adjacent to the low-flow channel.

- Existing willow and mulefat would be collected from the Project area. Root balls and/or limbs bundled and tied with jute fiber will be planted (buried) adjacent to the low-flow channel covering a width of approximately 3 to 10 feet along both sides (similar to the observed existing riparian vegetation band). No planting would occur in the vicinity of bridges or at the confluence of the Santa Clara River.

- Collection, retention and distribution of vegetation will be monitored by a qualified biologist.

- Pre-excavation photos of riparian vegetation will be taken to document width criteria and monitor establishment success.

- Riparian vegetation greater than 2 to 3 inches dbh may be selectively cut to a level of 1 to 2 feet above ground level.

Woody Debris: The Corps' proposed Project resulting in the September 27, 2000, biological opinion provided no discussion of woody debris and was assumed to be removed from the action area during periodic excavation. The Corps has refined this description to include:

- Woody debris will be collected prior to excavation and redistributed across the floodplain similar to pre-excavation condition.

- Woody debris will not be placed near bridges or areas that may cause flooding issues.

<u>Monitoring</u>: The Corps proposes to conduct the following monitoring in addition to that specified in the September 27, 2000, biological opinion and incidental take statement:

- Monitor stream temperature and dissolved oxygen over time during the summer at upstream, downstream and mid section of the low-flow channel to assess rearing habitat suitability/potential.

- Monitor turbidity for 1 to 2 years post-excavation to assess relative contribution of Project generated fine sediment during storm runoff events that may initiate upstream migration of steelhead.

Incremental and Cumulative Project Review

The Corps' project description provided in the August 21, 2009, letter, commits funding for prescribed monitoring and maintenance of the Project for a period of five years. The Corps has been developing a draft monitoring plan, recently in coordination with NMFS, that outlines evaluation of post-excavation stream channel and habitat condition and response on an annual basis. This monitoring plan will integrate the monitoring components defined in the Reasonable and Prudent Measures and implementing Terms and Conditions of the September 27, 2000, biological opinion.

Review of NMFS' administrative record and recent communications with the Corps demonstrate that the monitoring and maintenance prescribed in the September 27, 2000, biological opinion were not fully implemented. Therefore, considering the commitment is limited to a period of five years, the Project will be incrementally reviewed among the Corps and NMFS on an annual basis to evaluate whether the Project is being implemented, maintained and monitored in accordance with the Corps' project description, including the new or refined elements of the project description that are the basis of this amendment, and the terms and conditions of the biological opinion.

Reasonable and Prudent Measure 1 and the associated implementing Terms and Conditions of NMFS' September 27, 2000, biological opinion specified receipt of the Corps' proposed monitoring plan be submitted for NMFS' review and approval by June 1, 2001. Although this monitoring plan was not received by the time frame defined in the biological opinion, NMFS expects receipt of the draft monitoring plan for review and potential agreement no later than November 1, 2009. This expectation is based on recent discussions with the Corps that indicate the Corps will collaborate with NMFS on development and implementation of the monitoring plan. The revised monitoring plan is expected to include methodology, location, frequency and approximate timing of all monitoring components.

Effects of the Project on Designated Critical Habitat

NMFS originally published a final rule designating critical habitat for the Southern California Distinct Population Segment (DPS) of endangered steelhead on February 16, 2000. In response to litigation on the grounds that the agency did not adequately consider economic impacts of the critical habitat designations, NMFS sought judicial approval of a consent decree withdrawing critical habitat designations. The District Court approved the consent decree and vacated critical habitat designations by Court order on April 30, 2002. Subsequent to vacating the original critical habitat designation, NMFS proposed critical habitat on December 10, 2004 and published a final rule designating critical habitat for the Southern California DPS steelhead on September

2, 2005[1] (NMFS 2005). Therefore, NMFS has assessed the effects of the Project on critical habitat. The assessment is described more fully as follows.

The analysis NMFS has undertaken to assess effects of the Project on critical habitat is based on (1) the primary constituent elements of the critical habitat, (2) the current condition of the critical habitat in the action area (i.e., environmental baseline), (3) the effects of the Project, and (4) cumulative effects. This analysis does not rely on the regulatory definition of "destruction or adverse modification" of critical habitat at 50 CFR §402.02. Instead, NMFS has relied upon the statutory provisions of the ESA to complete the foregoing analysis with respect to critical habitat. Therefore, destruction or adverse modification involves direct or indirect alteration that appreciably reduces the conservation value of critical habitat. Such alterations include, but are not limited to, alterations adversely modifying any of those physical or biological features that were the basis for determining the habitat to be critical. When assessing effects of the Project on steelhead, NMFS relied on the description of the Project that formed the basis of the September 27, 2000, biological opinion, and the new or refined elements of the Project including the additional conservation measures and monitoring.

Primary Constituent Elements of the Critical Habitat

The critical habitat designation identifies primary constituent elements that include sites necessary to support one or more steelhead life stages and, in turn, these sites contain the physical or biological features essential for conservation of the DPS. Specific sites include freshwater spawning sites, freshwater rearing sites, freshwater migration corridors, and estuarine areas. Within the action area, a freshwater migration corridor exists. The action area consists of the lower 2.0 miles of Santa Paula Creek, from the confluence with the Santa Clara River upstream to approximately 0.25 mile upstream of the Corps grade-control/fish-passageway structure, in Santa Paula, California.

Freshwater migration corridors for steelhead are those that are 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. Activities with the potential to affect critical habitat include road building or maintenance, modifications of the creek channel or bank, urbanization, and wetland loss (NMFS 2005).

Current Condition of the Critical Habitat in the Action Area

Approximately 2.0 miles of steelhead critical habitat lies within the action area. This constitutes approximately 13 percent of the critical habitat designated in the Santa Paula Creek watershed (Santa Paula and Sisar Hydrologic Subunits, inclusive), and a relatively small amount of the total designated critical habitat for the Southern California DPS. The current function of the action area is to provide a corridor for migrating adult and juvenile steelhead.

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1 National Marine Fisheries Service. 2005. Endangered and threatened species: designated critical habitat for seven evolutionarily significant units of Pacific salmon and steelhead in California. Federal Register 70(170): 52488–52586.

Steelhead access to spawning and rearing habitats in the Santa Paula Creek watershed was eliminated as a result of the extreme winter storm events of January 2005 that rendered the Harvey Dam fish ladder impassable. Harvey Dam is located approximately 1.5 miles upstream of the action area. This facility is currently being assessed and alternatives being developed to restore upstream steelhead passage. Additionally, the fish passage structure associated with the Corps' Santa Paula Creek Flood Control Project located at the upstream end of the action area is currently nonfunctional. This facility is scheduled to be assessed and redesigned by the Corps in coordination with NMFS in 2010.

Effects of the Proposed Action

The proposed action is expected to adversely affect one of the primary constituent elements of designated critical habitat for steelhead: a freshwater migratory corridor. Within this primary constituent element, the proposed action is expected to affect the following essential features of critical habitat: water quantity and quality, and natural cover. The following description of effects is presented in the context of these essential features of critical habitat.

Effects on water quantity. - Effects on water quantity are considered in the context of diverting flows outside of existing habitat during excavation activities and as a function of depth following excavation. Dewatering the action area will be necessary during excavation to facilitate working in the dry. However, diversion of water outside of the existing habitat would occur during the period when steelhead are not anticipated to be present. Following excavation, a migratory channel (low-flow channel) would be constructed through the action area to emulate width and depth features of the channel upstream of the action area. Therefore, the Project is not anticipated to appreciably reduce the function of migratory habitat once the migratory channel is constructed.

Effects on water quality. - Effects on water quality are expected as a result of increased fine sediment (silt and sand) remaining on the streambed and adjacent floodplain following excavation activities. This increased volume of fine sediment would be subject to entrainment in flowing water when diverted flows are redirected into the designed channel and during increased stream discharge during storm events. Entrainment of fine sediment would result in increased water turbidity (suspended particulate matter affecting the amount of light that is scattered or absorbed by a fluid). Although the potential increase in turbidity has not been quantified, the increase is not expected to represent an increase over background turbidity levels that are typically elevated during the first few rainfall events of the year as a result of upstream sources such as Mud Creek. Overall, the information available to NMFS indicates the expected increase in turbidity from the Project is not anticipated to appreciably disrupt the function or value of the action area as a migration corridor for steelhead.

Effects on natural cover. - Natural cover for steelhead includes overhanging streamside vegetation, in-channel boulders, and woody debris. For this reason, frequent (every 3 to 5 years) removal of riparian vegetation, boulders and woody debris associated with excavation within the flood control channel are of concern. However, excavation and temporary loss of cover features would be conducted during the period when steelhead are not expected to be present. The Project further incorporates measures to reclaim these features, monitor persistence and

performance of reclaimed features, and maintain these features as needed based on monitoring and coordination with NMFS. Although the Project would maintain the riparian vegetation in an immature condition and no riparian cover during the first migration season following excavation, the placement of boulders and presence of woody debris are expected to provide functional cover for migrating steelhead throughout the action area pending the growth of riparian vegetation.

Cumulative Effects

NMFS is generally familiar with activities occurring in the action area, or in upstream areas that could cause effects extending downstream into the action area. At this time, NMFS is unaware of future State, local, or private actions that would be reasonably certain to occur, beyond the continuing effects of actions described in the original biological opinion (Environmental Baseline) or in the foregoing section entitled, "Current Condition of the Critical Habitat in the Action Area." Therefore, NMFS believes no cumulative effect is likely.

Summary of Effects to Critical Habitat

The proposed Project would result in disturbance to essential features of critical habitat that affect the primary constituent element occurring within the action area – freshwater migration corridor. However, the proposed Project is not anticipated to appreciably disrupt the function or value of migratory habitat due to a) the timing of disturbance, which is outside of the anticipated migration period for steelhead, and b) development of the post-excavation low-flow channel with energy dissipation and cover features that provide a functioning migration corridor for steelhead in Santa Paula Creek.

Conclusion

After reviewing the best available scientific and commercial information, the status of the designated critical habitat (including the environmental baseline), expected effects of the proposed action, and cumulative effects, NMFS concludes the proposed action is not likely to jeopardize the continued existence or result in destruction or adverse modification of critical habitat for the Southern California DPS of endangered steelhead.

This concludes formal consultation. 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 in this opinion, (3) the action is subsequently modified in a manner that causes an effect to the listed species or critical habitat not considered in this opinion, or (4) a new species is listed or critical habitat designated that may be affected by the action. In instances where the amount or extent of incidental take is exceeded, any operations causing such take must cease pending reinitiation.

Please call Darren Brumback at (562) 980-4060 if you have any questions concerning this letter or if you would like additional information.

Sincerely,

for Rodney R. McInnis
Regional Administrator

cc: Roger Root, USFWS
Mary Larson, CDFG
Marcin Whitman, CDFG
David Crowder, NMFS
Copy to File: 151422SWR2009PR00386

Appendix B
Monitoring Reports

2010 ANNUAL REPORT FOR THE SANTA PAULA CREEK FLOOD CONTROL PROJECT

Prepared by:

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With technical assistance by:

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January 2011

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Appendix A – 2010 Post Storm Monitoring Reports
Appendix B – 2010 Smolt-Out Survey Report
Appendix C – 2010 Summer Low-Flow Monitoring Report

1.0 INTRODUCTION

1.1 PURPOSE AND NEED

The purpose of this Annual Report is to summarize the data, methodologies and photographs collected from the post-storm monitoring, smolt-out surveys and summer low flow monitoring during 2010. These surveys and/or monitoring events were conducted to comply with Reasonable and Prudent Measures (R&PM) and their associated Terms and Conditions (T&C), specifically T&C No. 1 of R&PM No. 1, of the Biological Opinion (BO) (F-LB-00-16:DRB) issued by the National Oceanic and Atmospheric Administration's (NOAA) and National Marine Fisheries Service (NMFS) on 27 September 2000. R&PM No.3 and corresponding T&C No. 3 require the U.S. Army Corps of Engineers' (Corps). The full text of the reports associated with each of the survey and/or monitoring events are attached in Appendices A, B and C to this report.

1.2 PROJECT/MONITORING LOCATION AND CONDITIONS

Monitoring activities, as described below in Sections 2, 3 and 4, took place within a portion of Santa Paula Creek (Creek) located within the City of Santa Paula, Ventura County, California. The monitoring area (Project Area) extends from Creek's confluence with the Santa Clara River upstream to approximately 500 feet upstream of the fish ladder (Fish Ladder) for a total of approximately 2.1 miles (Figure 1).

The entire Project Area lies within designated Critical Habitat for the southern California distinct population segment (DPS) of endangered steelhead trout (*Onchorhynchus mykiss*). The Project Area has historically functioned as a migratory corridor for steelhead (NMFS, 2000 and 2009).

2.0 METHODOLOGY

Subsequent to each of the monitoring events discussed herein, a monitoring protocol was drafted by Corps biologists, in conjunction with Corps Hydraulics and Hydrology (H&H) staff and NMFS staff. Six permanent sampling stations (PSS) were established as a part of this monitoring protocol. These sampling locations are assumed to provide a representative sample of conditions documented throughout the Project Area. PSSs also serve as permanent photo stations.

2.1 SURVEY EVENTS

2.1.1 POST-STORM MONITORING

Post-storm monitoring occurred after storm events that exceeded daily discharge flow of greater than 500 cubic feet per second (cfs) for the duration of the year 2010. A total of three storm events during the course of 2010 resulted in flows greater than 500 cfs. Monitoring after these three storm events took place on 26 February 2010, 20 March 2010 and 25 March 2010. Water samples were collected from each PSS within 72 hours of discharge levels peaking above 500 cfs and were analyzed for the parameters discussed below in Section 2.2.1. Due to safety constraints, flow rate measurements at each PSS were unable to be attained. For this reason the flow rate data obtained from the USGS gauge just upstream of the Fish Ladder was applied to the entire Project Area. Visual observations of channel conditions were made, at a minimum, at each PSS.

Santa Paula Creek Flood Control Project
Figure 1
Permanent Sampling Stations

2.1.2 SMOLT-OUT SURVEYS

Annual smolt-out surveys were conducted on 19 April 2011 to document the presence/absence of southern California steelhead (*Onchorhynchus mykiss*) smolt within the Project Area. These surveys were conducted in the spring of 2010 when flow rates in the Project Area were such that sampling could take place in the channel.

2.1.2 SUMMER LOW-FLOW MONITORING

Annual summer low-flow monitoring was conducted on 26 August 2011 to document the low-flow channel conditions, flow rates and water quality during the summer months. Water samples were collected from each PSS and were analyzed for the parameters discussed below in Section 2.2.1. Flow rate measurements, using the methods described below in Section 2.2.2, were taken at each PSS. Visual observations of channel conditions were made, at a minimum, at each PSS.

2.2 SAMPLING METHODS/PROTOCOLS

2.2.1 WATER QUALITY SAMPLING

Water samples were collected from each PSS and were analyzed for temperature (^{o}F), dissolved oxygen ([DO]; percent saturation and mg/L), turbidity [neophelometric turbidity units (NTUs)], and pH levels. Temperature, DO, and pH data were obtained using a Hanna Instruments multi-parameter water quality meter (Model #HI9828). At each of the PSS, a multi-sensor probe, connected to the HI9828 meter, was placed into flowing water approximately two feet from the bank of the Creek. Typically, water samples were collected from the vertical and horizontal centers of the active channel. Recordings for each of the parameters were digitally recorded by the meter and manually recorded into field notebooks at each of the sampling locations. Turbidity data was collected at each of the sampling locations with the use of a Hanna Instruments portable microprocessor turbidity meter (Model #HI93703). Additionally, water samples were obtained at each sampling location, using a clean glass cuvette, approximately one foot from the bank of the Creek for the purpose of obtaining a turbidity reading. Samples were immediately placed within the turbidity meter upon collection.

2.2.2 FLOW RATE MEASUREMENTS

Flow rate data was obtained from the USGS gauge located upstream of the Project Area, in order to provide a standard measure that could be replicated across all monitoring reports. It should be noted however that braiding of the main low flow channel in downstream areas may have resulted in decreased flow velocities in these areas. These decreased velocities are likely to be minor.

Because water in a channel flows at different rates, depending on its location, when conditions allowed (generally summer sampling only) additional flow rate measurements were taken using a simple float at each of the PSS. This will serve to document localized increases/decreases in flow rates within the Project Area (i.e., energy dissipation from boulder clusters, landform changes causing increased flow rates, etc.). A partially filled plastic water bottle, sitting approximately one inch below the water line, was released upstream and the time it took to reach a specific distance recorded. Approximate channel width and average depth were recorded and used in calculating flow rates at each sampling location. The simple float method uses an average channel width and depth within the specified measurement area to calculate flow rates.

Because the Creek is an erosive and dynamic system a constant cross-sectional area is not always present. Therefore, flow results utilizing the simple float method are intended to identify localized flow rate variations within the Project Area and should not be relied upon as the only source of flow rates for analysis but rather as an informational tool.

2.2.3 STEELHEAD SMOLT SURVEYS

The surveys were performed by team of two qualified biologists methodically walking the length of the Project Area from the confluence of Santa Paula Creek and the Santa Clara River upstream to approximately 500 feet upstream of the fish ladder. All areas where standing or flowing water was present were visually inspected. In portions of the channel where water was relatively shallow (< 1 foot) and clear (majority of survey area), visual observations were performed for the presence of fish. Dip nets with 1/8" mesh were utilized to probe under and around boulders. In areas that exhibited waters deeper than 1-foot, 1/8" mesh block netting was installed along the downstream sections. Biologists, using 1/8" mesh seine netting, then seined each section from the upstream extent of the deeper water downstream towards the block netting and documented all fish present within the area.

More traditional passive survey methods such as the utilization of rotary screw or incline plane screen traps were not employed due to the absence of deeper water, which is required for installation and to achieve trap efficiency. Additionally, the lack of channel depth and lack of large pools did not provide adequate conditions for the implementation of snorkel survey techniques/methods. Photographs were also taken at the each of the PSS.

2.2.4 VISUAL OBSERVATIONS

Visual observations were made by driving each of the access roads above the east and west banks of the Creek. Additionally, monitors walked along the Project Area reach to inspect conditions, including the fish passage facility. A series of photographs were taken at each of the PSS. A field log detailing the water's appearance, any noticeable erosion occurring within the Project Area, any potential barriers to steelhead migratory capabilities, amount of woody debris present, and the date and time of each observation was completed at each PSS.

3.0 RESULTS

3.1 WATER QUALITY SAMPLING

Water quality sampling occurred during four separate survey events in 2010. This included three post-storm and one summer low-flow surveys. The results of these sampling events are presented below in Table 3.1. A discussion of the results as they pertain to Creek conditions for steelhead is presented in Section 4.0.

Table 3.1 – Water Quality Monitoring Results for 2010

Permanent Sampling Station	Survey Event	Temperature (°F)	DO (% Saturation)	DO (mg/L)	Turbidity (NTUs)	pH
1	Post-storm No. 1	54.12	98.6	10.41	34.54	8.99
	Post Storm No. 2	64.95	32.5	3.03	25.66	8.11
	Post Storm No. 3	54.01	0*	0*	237	7.8

Permanent Sampling Station	Survey Event	Temperature (°F)	DO (% Saturation)	DO (mg/L)	Turbidity (NTUs)	pH
	Summer Low-flow	66.79	80.10	7.29	15.68	8.75
2	Post-storm No. 1	54.17	95	10.1	36.97	8.97
	Post Storm No. 2	65.11	33.3	3.1	27.44	8.54
	Post Storm No. 3	55.09	18.7	1.98	211	9.84
	Summer Low-flow	69.90	78.00	7.08	8.61	8.68
3	Post-storm No. 1	54.21	97.1	10.35	40.38	9.01
	Post Storm No. 2	65.82	33.7	3.11	28.49	8.75
	Post Storm No. 3	55.59	14.3	1.48	228	9.9
	Summer Low-flow	66.48	77.90	7.13	21.18	8.50
4	Post-storm No. 1	54.21	98.6	10.52	40.32	9.07
	Post Storm No. 2	66.19	33.8	3.12	26.39	8.96
	Post Storm No. 3	55.1	14.2	1.5	264	9.4
	Summer Low-flow	66.15	78.20	7.16	11.85	8.54
5	Post-storm No. 1	54.28	94.5	10.22	42.87	8.88
	Post Storm No. 2	66.78	31.5	2.86	39.85	8.79
	Post Storm No. 3	55.18	14.3	1.51	240	9.4
	Summer Low-flow	65.60	78.00	7.21	10.84	8.50
6	Post-storm No. 1	54.27	112	11.86	43.96	8.89
	Post Storm No. 2	66.22	29.4	2.72	27.43	8.65
	Post Storm No. 3	55.45	16.2	1.71	252	9.04
	Summer Low-flow	64.90	91.60	8.59	4.33	7.63

** Access to PSS No. 1 was limited due to high storm flows within the channel near this pss. The water quality meter was unable to be deployed in a safe manner to obtain these measurements.*

3.2 FLOW RATES

As mentioned above, flow rates were obtained from data collected from the USGS gauge located upstream from the project. Additionally, velocity and flow rates were recorded using the simple float method at each of the six PSS. Flow rates for each of the survey events are presented below in Tables 3.2 and 3.3.

Table 3.2 – USGS Santa Paula Stream Gauge Flow Rates for Survey Events in 2010.

Monitoring/Survey Event	USGS Santa Paula Creek Stream Gauge Reported Flow Rate (cfs)* During Monitoring Events	USGS Santa Paula Creek Stream Gauge Reported Peak Storm Flow Rates (cfs)*
Post Storm Event 1 – January 2010	175	700
Post Storm Event 2 – April 2010	60	900
Smolt-out – April 2010	8	n/a
Summer Low-flow – September 2010	4	n/a
Post Storm Event 3 – December 2010	265	2,120

* Approximate flow rate based on USGS hydrograph.

Table 3.3 – Measured Velocity and Volume Rates at each PSS during the Summer of 2010

PSS Location	Average Depth (feet)	Average Width (feet)	Time (seconds)	Length (feet)	Velocity (ft/sec)	Flow Rate (cubic ft/sec)
1	1.5	10.0	38	50	0.76	16.83
2	1.2	12.0	60	50	1.2	10.16

PSS Location	Average Depth (feet)	Average Width (feet)	Time (seconds)	Length (feet)	Velocity (ft/sec)	Flow Rate (cubic ft/sec)
3	0.9	6.0	75	50	1.5	3.08
4	0.8	15.0	30	50	0.6	17.03
5	1.0	7.0	70	50	1.4	4.22
6	1.3	13.0	85	50	1.7	8.48
Average	1.12	10.50	--	--	1.19	9.97

3.3 STEELHEAD SMOLT SURVEYS AND INCIDENTAL OBSERVATIONS

No steelhead were observed during the 2010 smolt out surveys, although 12 arroyo chub (*Gila orcuttii*), 1 partially armored threespine stickleback (*Gasterosteus aculeatus aculeatus*) and approximately 150 mosquitofish (*Gambusia affinis*) were documented within the survey area. Flow rate data obtained from the USGS gauge located upstream of the Project Area, indicated that during the surveys water in Santa Paula Creek was moving at a rate of approximately 8 cfs.

The majority of the Project Area was devoid of vegetation due to the completion of the recent sediment removal project and subsequent storm flows. However, some patches of native vegetation located within the upstream portions were maintained during the sediment removal project and some streamside vegetation is emerging. Willow cuttings installed along the existing low flow channel immediately after the sediment removal project below State Route 126 (SR-126 appeared to have been either buried by sediment deposition or washed away due to flows associated with recent storm events. The Creek had assumed a natural flow regime that primarily directed water along either the toe of the east or west bank, occasionally migrating from one bank across the channel to the other bank. Ancillary channels or braids were apparent in several areas, although with substantially reduced flow in comparison to the primary channel.

The low flow channel constructed after the 2009/2010 sediment removal action, per specifications provided in the biological opinions for the flood control project and coordination with NMFS, was generally limited to where the flows meandered across the Creek to the opposite bank. Consequently, the main channel currently consists of several small braided channels with relatively shallow flow in areas. Only a few of the pools that were created during the low flow channel reconstruction still exist, due to the migrating nature of the low flow channel. Large boulders that were installed within the pools of the constructed low flow channel during the sediment removal project remain in place, where the reconstructed channel is visible, and appeared to be creating areas of refuge for migrating fish where they are still located within flowing water.

During the smolt-out surveys large algal mats were observed within the Project Area. This was most noticeable within slower moving sections of the Creek and/or large pools where slow moving or stagnant water results in localized increases in water temperature.

3.4 VISUAL OBSERVATIONS

Visual observations were made to assess the overall conditions of the Creek to document such items/occurrences, but not limited to, any noticeable erosion occurring within the Project Area, any

potential barriers to steelhead migratory capabilities, and amount/presence of woody debris. No barriers to movement were observed during survey events in 2010.

Creek conditions after each of the post-storm survey events were generally consistent throughout the year. Due to the magnitude of the storm events, observation of the low flow channel that was constructed after the 2009/2010 sediment removal action was generally limited to where the flows meandered across the Creek to the opposite bank. Energy dissipation was apparent on the downstream side of roughness elements existing within the channel (i.e. boulders). Boulders and cobble of various sizes appear to have been deposited or uncovered during the storm events, which appeared to provide energy dissipation opportunities throughout the Project Area.

During the January 2010 post-storm monitoring event it was noted that the majority of flows from the Creek were flowing through the fish ladder. However, the pilot channel that was excavated upstream of the fish ladder during sediment removal activities was cut off from flows due to upstream sediment aggradation. The low flow preferred the west edge of the channel above the fish passage facility. Upon approach to the fish passage facility and grouted stone apron, the Creek makes a sharp turn to the east and enters the fish ladder.

During all of the post-storm monitoring events the Creek was observed assuming a natural flow regime that primarily directed water along either the toe of the east or west bank, occasionally migrating from one bank across the channel to the other bank. Ancillary channels or braids were apparent in several areas, although with substantially reduced flow in comparison to the primary channel.

As noted above in Section 3.3, during the smolt-out surveys large algal mats were observed within the Project Area. This was most noticeable within slower moving sections of the Creek and/or large pools where slow moving or stagnant water results in localized increases in water temperature.

During the summer months the Creek had assumed a natural flow regime that primarily directed water along either the toe of the east or west bank, occasionally migrating from one bank across the channel to the other bank. Ancillary channels or braids were apparent in several areas, although with substantially reduced flow in comparison to the primary channel. The majority of flows at the upstream extent of the Project Area were observed to flow through the Fish Ladder. The Fish Ladder had sequestered a noticeable amount of sediment (ranging from 1 – 3 feet of accumulation). Larger amounts of sediment accumulated towards the outside of the pools, with lesser amounts of aggradation occurring toward the middle of the pools. Portions of the Creek flowing through the Project Area consisted of small, secondary, braided channels that could support fish during the time that surveys were conducted. The majority of these secondary, braided channels were present in areas downstream of Highway 126. Little to no woody debris was noted during the monitoring efforts. Woody debris placed during the re-creation of the low flow channel in 2009/2010 was not observed and is presumed to have been carried downstream by the high storm flows earlier in the year.

4.0 DISCUSSION

A discussion of the results detailed in Section 3 of this report is presented below. In subsequent reporting years this section will also present and discuss trends in Project site conditions as they pertain to water quality, steelhead presence and Creek conditions.

4.1 WATER QUALITY

Temperature. Water temperature within the Creek fluctuates throughout the year. As was expected, samples taken during the winter months were much cooler than those taken in the summer. As flows receded into the summer month's slower moving sections of the Creek and/or large pools where slow moving or stagnant water results in increased water temperatures. Temperatures during the sampling events in 2010 ranged from 57ºF – 70ºF. The highest temperature readings were obtained during the summer-low flow monitoring event in September 2010. Steelhead trout can tolerate temperatures ranging from 50ºF – 70ºF, however their optimal range for growth falls between 55ºF to 65ºF. Elevated temperatures above 70ºF have been known to cause increased potential for fish mortality (Rich, 2000). The cooler temperatures present in the winter months are suitable for trout growth and development; higher temperatures present in the summer and fall, while not optimal for growth are tolerable for individuals using the Project Area solely as a migratory corridor as the exposure to the elevated temperatures will be of a short duration.

Dissolved Oxygen. Water quality in the Creek after a large storm event is generally expected to be poor; this is typical for streams of this nature. Dissolved oxygen (DO) plays a key role in the survival and growth of steelhead trout. For optimal growth a DO level near or at 100% saturation and above 9 mg/L is required (Davis, 1975). However, in cooler water temperatures trout have been known to survive in DO concentrations as low as 1.5 to 2.0 mg/L (Moyle 2002). Samples taken during post-storm monitoring events show an average saturation (% saturation) of 48.21 (ranging from approximately 14.00 – 112.00) and an average DO level (mg/L) of 4.98 mg/L (ranging from approximately 1.50 – 12.00) while results from summer sampling show an average saturation of 80.63 (ranging from approximately 78.00 – 92.00) and an average DO level (mg/L) of 7.41 mg/L (ranging from approximately 7.00 – 8.50). These are suboptimal DO conditions for steelhead trout development. On the average however, these levels are tolerable for individuals using the Project Area solely as a migratory corridor as exposure to low DO levels will be of a short duration. However, exposure to the low DO levels such as those present in December 2010 (ranging from approximately 1.50 – 2.00 mg/L), are likely to result in some percentage of mortality.

Turbidity. Turbidity levels of greater than 50 NTU's have been known to be harmful to steelhead trout and can affect their ability to search for food (Oregon, 2001). High levels of turbidity can cause sediment and particles to accumulate in the gills make it difficult for steelhead trout to breath. While southern steelhead have been known to survive in varying levels of turbidity, higher levels have been known to be fatal to salmonids (Bash et al., 2001). Post-storm water quality sampling resulted in an average of 102.57 NTU's (ranging from approximately 25 – 264 NTU's) within the PSS's in 2010 while the average for samples taken during the summer was 12.08 NTU's (ranging from approximately 4 – 21 NTU's). Increased turbidity is not unexpected in this type of watershed. The varying turbidity levels when comparing each of

the post-storm and summer low-flow sampling events could be caused by localized influences such as storm water runoff, bank erosion, agricultural influence, and plankton blooms. The most likely culprit of high turbidity levels during the post-storm monitoring events is Mud Creek, which is the first major tributary located upstream of the Project Area. Turbidity levels documented in the summer of 2010 are well within the suitable range of conditions known for steelhead.

Velocity/Flow Rates. The velocity/flow rates varied throughout the Project Area. As would be expected, velocity/flow rates after a significant storm event where substantial and averaged 166.67 cfs (ranging from approximately 60 – 265 cfs)) during 2010 monitoring events. This is in stark contrast to the flows during the smolt-out and summer low-flow surveys for which the average flow rate reported at the USGS Santa Paula Creek Stream Gauge averaged 6 cfs. Measured flows during the summer low-flow surveys averaged 11.63 cfs (ranging from approximately 3 – 17 cfs). Flow rates are influenced by the presence of riffles, pools, landform structures, and channel morphology. This was demonstrated at PSS No. 1, a relatively linear section of Creek, with the west bank comprised of concrete riprap and the east bank comprised of cobble, boulders and vertical slopes. These conditions allow for a large amount of water to move through at a relatively high velocity. In contrast to PSS No. 1, PSS No. 3 is a relatively shallow section of the creek with abundant willows (*Salix sp.)* and mulefat (*Baccharis salicifolia*) growing within the channel. The shallow nature of the channel, along with dense aquatic vegetation, provides for slower velocities and a reduced volume of flow in this section of the Creek.

4.2 STEELHEAD PRESENCE

As stated above in Section 3.3 no steelhead were observed during any of the 2010 surveys. The most recent known steelhead occurrences within or adjacent to the Project Area were in January 2010; a total of three steelhead were detected within the Project Area during sediment removal activities (Refer to Appendix B for additional information). In addition to the occurrences noted during the sediment removal activities, a review of the California Natural Diversity Database (CNDDB) reported one record (1988) of southern California steelhead located approximately ¼-mile upstream from the fish ladder (CDFG, 2010). This record indicates that three fish were caught during surveys of the area in 1987 and several were seen in the same area in 1988.

Given the Creek conditions observed during surveys conducted in 2010 it was not surprising that steelhead were not observed within the Project Area. Water quality and habitat conditions in the Project Area are not optimal for the long term sustainability steelhead trout populations within the Project Area, but appear to be within the range necessary to provide opportunities for upstream/downstream migration.

4.3 CREEK CONDITIONS

Creek conditions within the Project Area during the surveys were suboptimal for residential populations of steelhead to persist, but would provide acceptable conditions for potential upstream/downstream migration of fish through the Project Area. The Project's biological opinion assumes the portion of Santa Paula Creek flowing through the Project Area functions as a migratory corridor for the species, not live in habitat

(NMFS, 2000). Steelhead require freshwater migration corridors with suitable natural cover, such as, but not limited to, submerged and overhanging large wood, aquatic vegetation, large rocks and boulders, side channels, deep pools, and undercut banks to support juvenile and adult mobility and survival. The project site currently exhibits some of these features, including large rocks and boulders and side channels. However, the site does not currently support much woody debris, aquatic vegetation, or deep pools and undercut banks. The lack of these habitat characteristics leaves aquatic species vulnerable to predation and elevated water temperatures; however it is to be expected following large scale sediment removal projects. These habitat characteristics would be expected to reform as the creek is subject to the processes of erosion and revegetation from natural reformulation of the seed bank and plantings.

5.0 CONCLUSION

Although detected in early 2010 towards the end of sediment removal activities, no steelhead were identified during any of the survey efforts in 2010. As a result of sediment removal activities and storms flows in January, April and December of 2010, the Project Area is, for the most part, devoid of vegetation. The lack of overhanging vegetation, deep pools, cut banks and accumulated woody debris and substantial vegetative cover provide suboptimal habitat conditions for the persistence of resident steelhead populations within the Project Area. The lack of these features result in the presence of warmer, shallow waters that could promote increased levels of algae growth during the warmer periods of the year. Project Area conditions in 2010 are not optimal for the long term sustainability steelhead trout populations; however, these levels are tolerable for individuals using the Project Area solely as a migratory corridor as exposure to low DO levels, turbidity and temperature extremes are expected to be of a short duration.

The presence of large algal mats, observed during the summer months, can result in a reduction of dissolved oxygen available to aquatic wildlife such as steelhead, especially during overcast/foggy conditions and during the night. The reduction or lack of light available to the algae for the photosynthetic process will cause the algae to consume available dissolved oxygen in the water through the respiration process and reduce the amount of dissolved oxygen available to steelhead and other aquatic species. The presence of algal mats however can also result in an increase in insects that feed on the algae thus adding to the availability of food for steelhead.

As is expected after large storm events, turbidity levels were generally high during post-storm monitoring events while temperatures remained within tolerable ranges. Dissolved oxygen levels fluctuated depending on the time of year. Summer low-flow monitoring noted extremely low dissolved oxygen levels while temperatures were at the upper end of the tolerable range for steelhead trout.

Sediment accumulated in the pools of the Fish Ladder as a result of 2010 storm events. This reduced the functionality of the Fish Ladder, but did not entirely preclude the ability of fish to migrate through the Project Area.

Overtime, depending on the severity of future storm events, it is expected that riparian vegetation will naturally recruit within the areas that were disturbed during the 2009/2010 sediment removal action. If

Creek flows allow this vegetation to mature, the reemergence of a natural riparian corridor would increase the quality of habitat during subsequent surveys.

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Appendix A
2010 Post Storm Monitoring Reports

2010 POST STORM MONITORING REPORT NO. 1 FOR THE SANTA PAULA CREEK FLOOD CONTROL PROJECT

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1 INTRODUCTION

1.1 PURPOSE AND NEED

The purpose of this Post Storm Monitoring Report is to comply with Reasonable and Prudent Measure (R&PM) No. 3 and its associated Terms and Conditions (T&C), specifically T&C No. 2, of the Biological Opinion (BO) (F-LB-00-16:DRB) issued by the National Oceanic and Atmospheric Administration's (NOAA) and National Marine Fisheries Service (NMFS) on September 27, 2000 for the Santa Paula Creek Flood Control Project (Project). R&PM No.3 and corresponding T&C No. 2 require the U.S. Army Corps of Engineers' (Corps) to perform monitoring after storm events that exceeded daily mean discharge flows of 500 cubic feet per second (cfs) for a period of five years. The results of post storm monitoring events are important to evaluate the ability of the project to not only provide flood protection, but also to function as a migratory corridor in designated critical habitat for the southern California distinct population segment (DPS) of endangered steelhead trout (*Oncorhynchus mykiss*).

1.2 SUMMARY OF STORM EVENT

After completion of the sediment removal activities in early January 2010, a storm event occurred between 21 and 22 January 2010. Figure 1 shows a peak level of approximately 700 cubic feet per second (cfs) around mid-day on 22 January 2010. At this flow rate water levels in the channel were bank to bank and no evidence of the low flow channel was visible. These periods of high flow can flush steelhead trout from the upper watershed. Once flows subside, the steelhead trout will seek refuge in low energy areas of the low flow channel and would theoretically continue along their migratory route.

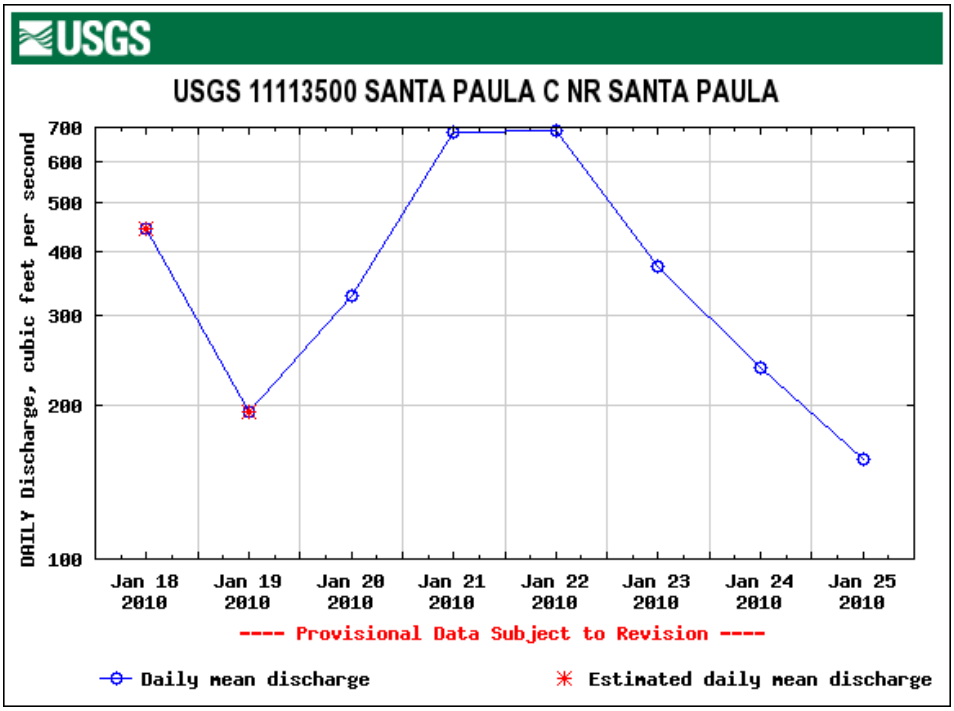

Figure 1 Hydrograph of monitored storm event taken at the Santa Paula Creek gauging station.

1.3 PROJECT LOCATION

Post-storm monitoring activities took place within the United States Army Corps of Engineers (Corps) Project located within the City of Santa Paula, Ventura County, California. The monitoring area extends from Santa Paula Creek's (Creek) confluence with the Santa Clara River upstream approximately 2 miles to approximately 500 feet upstream of the fish ladder (Project Area). Refer to Figure 2 for a graphical depiction of the Project Area.

The entire Project lies within designated critical habitat for the southern California DPS of the endangered steelhead trout. The Project Area is thought to function as a migratory corridor for steelhead.

1.4 METHODOLOGY

Subsequent to this storm event, a monitoring protocol was drafted by Corps biologists, in conjunction with Corps Hydraulics and Hydrology (H&H) staff and NMFS staff. Six permanent sampling stations (PSS) were established as a part of this monitoring protocol. These sampling locations are assumed to provide a representative sample of conditions documented throughout the Project's low flow channel. PSS's also serve as permanent photo stations. Photo documentation is provided in Appendix A. While photographs are taken at PSS No. 4, the water quality sampling at this PSS was re-located approximately 700-feet upstream from its location on Figure 2, due to access constraints. Results of the post-storm water quality monitoring, conducted on 25 January 2010, are discussed below in Section 2.

1.4.1 WATER QUALITY SAMPLING

Water samples were collected from these six locations within 72 hours of discharge levels peaking above 500 cfs and were analyzed for temperature (°F), dissolved oxygen ([DO];% saturation and mg/L), turbidity [neophelometric turbidity units (NTUs)], and pH levels. Temperature, DO, and pH data were obtained using a Hanna Instruments multi-parameter water quality meter (Model #HI9828). At each of the six sampling locations, a multi-sensor probe, connected to the HI9828 meter, was placed into flowing water approximately two feet from the bank of the Creek. Recordings for each of the parameters were digitally recorded by the meter and manually recorded into field notebooks at each of the sampling locations. Turbidity data was collected at each of the sampling locations with the use of a Hanna Instruments portable microprocessor turbidity meter (Model #HI93703). Water samples were obtained at each sampling location, using a clean glass cuvette, approximately one foot from the bank of the Creek. Samples were immediately placed within the turbidity meter upon collection. Typically, water samples would be collected from the vertical and horizontal centers of the active channel; however, due to safety constraints associated with moderate to heavy flows, this was not possible. Results of the monitoring efforts are detailed below in Section 2.

Figure 2 Santa Paula Creek PSS locations.

1.4.2 FLOW RATE MEASUREMENTS

Due to safety constraints, flow rate measurements along specified areas of the project site were unable to be attained. For this reason the flow rate data obtained from the USGS gauge just upstream of the project was applied to the entire Project Area.

1.4.3 VISUAL OBSERVATION METHODS

Visual observations were conducted by driving each of the access roads above the east and west banks of the Creek. Additionally, monitors walked along the Project Area reach to inspect conditions, including the fish passage facility. A series of photographs was taken at each of the six pre-defined sampling locations. Photographic documentation, included as Appendix A of this report, was performed to record the conditions at each of the sampling sites and throughout the greater Project Area. A field log detailing the water's appearance, any noticeable erosion occurring within the Project Area, any potential barriers to steelhead migratory capabilities, amount of woody debris present, and the date and time of sample collection was completed at each sampling location.

2 RESULTS AND DISCUSSION

2.1 WATER QUALITY SAMPLING

The monitored storm occurred on January 21 and 22, 2010, and, was the second and largest of a series of storms that passed through the area over the course of a one week time period beginning on January 18, 2010. Post-storm water quality monitoring was conducted between 10:30 a.m. and 2:30 p.m. on January 25, 2010. Results for the post-storm water monitoring event are listed in Table 1, below.

Table 1 Post-storm analytical water quality results for 25 January 2010

Permanent Sampling Station	Temperature (°F)	DO (% Saturation)	DO (mg/L)	Turbidity (NTUs)	pH
1	54.12	98.60	10.41	34.54	8.99
2	54.17	95.00	10.10	36.97	8.97
3	54.21	97.10	10.35	40.38	9.01
4	54.21	98.60	10.52	40.32	9.07
5	54.28	94.50	10.22	42.87	8.88
6	54.27	112.00	11.86	43.96	8.89

Steelhead trout can tolerate temperatures ranging from 50° F – 70° F, however their optimal range for growth falls between 55° F – 65° F. Elevated temperatures above 70° F has been known to cause increased potential for fish mortality (Rich, 2000). Temperatures recorded during this the post-storm

monitoring event indicate that cool water is present with an average temperature just above 54º F. This is at the lower end of the optimal range for growth and typical for the time of year.

Dissolved oxygen (DO) plays a key role in the survival and growth of steelhead trout. For optimal growth and survival a DO level near or at 100% saturation and above 9 mg/L is required (Davis, 1975). However, in cooler water temperatures trout have been known to survive in DO concentrations as low as 1.5 to 2.0 mg/L (Moyle 2002).The results above show an average saturation of almost 100% and DO level of over 10 mg/L. These are ideal DO conditions for steelhead trout development.

Turbidity levels of greater than 50 NTU's have been known to be harmful to steelhead trout and can affect their ability to search for food (Oregon, 2001). High levels of turbidity can cause sediment and particles to accumulate in the gills make it difficult for steelhead trout to breath. While southern steelhead have been known to survive in varying levels of turbidity, higher levels have been known to be fatal to salmonids (Bash et al., 2001). Turbidity levels presented in Table 1 average around 40 NTU's. While turbidity levels documented in Table 1 are approaching the upper range of suitable conditions known for steelhead, they are not unusual for the Project Area reach after a large storm event.

2.2 FLOW RATE MEASUREMENTS

Flow rates during post-storm monitoring field efforts were too great to quantitatively measure directly in the thalweg and behind energy dissipaters, and/or near the edges of the Creek. The USGS gauge located upstream of the Project area reported flow rates of approximately 160 – 170 cfs during this post storm monitoring event.

2.3 VISUAL OBSERVATIONS

Visual observations were made to assess the overall conditions of Project Area reach and to identify any potential erosion issues and barriers to fish passage. The Creek had assumed a natural flow regime that primarily directed water along either the toe of the east or west bank, occasionally migrating from one bank across the channel to the other bank. Ancillary channels or braids were apparent in several areas, although with substantially reduced flow in comparison to the primary channel. Due to the magnitude of the storms that passed through the area during the week prior to the monitoring survey, observation of the low flow channel that was constructed after the 2009/2010 sediment removal action was generally limited to where the flows meandered across the Creek to the opposite bank. This was most apparent in lower sections of the Project area (i.e., areas downstream of Highway 126). In the upstream areas of the Project the re-constructed low-flow channel was consistently observed to remained intact, although water levels were high enough to breach it in some locations.

Energy dissipation was apparent on the downstream side of roughness elements existing within the channel (i.e. boulders). Boulders and cobble of various sizes appear to have been deposited or uncovered during the storm, which appear to provide energy dissipation opportunities throughout the site. Boulders as part of the reconstruction of the low flow channel in 2009/2010 generally remain in

those areas where the existing low flow channel is contained within the re-constructed low flow channel, and do appear to be providing energy dissipation and resting areas for fish.

The majority of flows from the Creek are flowing through the fish ladder. However, the pilot channel that was excavated upstream of the fish ladder during sediment removal activities has been cut off from flows due to upstream sediment aggradation. The low flow appears to prefer the west edge of the channel above the fish passage facility. Upon approach to the fish passage facility and grouted stone apron, the Creek makes a sharp turn to the east and enters the fish ladder.

Although no major barriers to fish movement were identified, it was noted that in-channel braiding may occur when flows recede to a more typical low-flow condition. This potential occurrence is likely due to the magnitude of the storm flows which resulted in breaching of the low-flow channel in some areas and overall increased water load from upland runoff. Several portions of the Creek through the Project area consisted of small, secondary, braided channels that could support fish during the time that surveys were conducted. These channels could potentially become disconnected from the primary low-flow channel under drier conditions, which could lead to the pooling of water. These pools could provide stranding conditions for fish occupying these secondary channels, however, this is a natural occurrence in alluvial streams.

The fish ladder has sequestered a noticeable amount of sediment since it was cleaned out during sediment removal activities. While the total capacity of each pool has diminished with the onset of sediment aggradation, each pool appears to be able to provide adequate resting opportunities for steelhead as they move through the fish ladder. Large grain size sediments were deposited on the west side of the fish ladder pools. They appear to have been deposited from flows going over the west apron, rather than through the actual fish ladder. On average, the west side of the pools sequestered more sediment than the east side.

Little to no woody debris was noted during the post-storm monitoring field efforts. Much of the placed woody debris (placed in January 2010) in the areas just upstream from the Santa Clara River confluence was not observed and is presumed to have been carried downstream by the high storm flows.

No steelhead were observed during this monitoring effort.

3 CONCLUSION

The results of the post-storm monitoring efforts indicate that overall the water quality in the Project Area is conducive to the movement of steelhead trout. Cool water, with near 100% oxygen saturation, was present in all sampling locations. The higher turbidity levels within the Project area were not unexpected for this section of the Creek in a post storm condition and in large part are likely attributed to an upstream input of extremely turbid water from Mud Creek, a tributary to the Creek; turbidity levels were within the higher portion of the known suitable range for steelhead trout. Flows peaked at 700 cfs on 22 January 2010 and receded to relatively normal levels within 5 – 7 days. Flows dropped to

below 400 cfs within 24 hours of the peak event. A lack of woody debris was noted in all areas of the Project Area.

No barriers to fish passage were noted within the Project Area. Multiple channels were observed, and as flows recede and organize into a typical low flow condition, pooling may occur in remnant ancillary channels, which could lead to potential stranding conditions. However, this is a natural occurrence for streams of this nature. No steelhead trout were observed during the post-storm monitoring efforts.

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Appendix A
Photo Log

Permanent Sampling Station 1

West-downstream

West-upstream

West

Permanent Sampling Station 2

West-view downstream

West-view upstream

West

East-view downstream

East-view upstream

East

Permanent Sampling Station 3

West-view downstream

West-view upstream

West

East-view downstream

East-view upstream

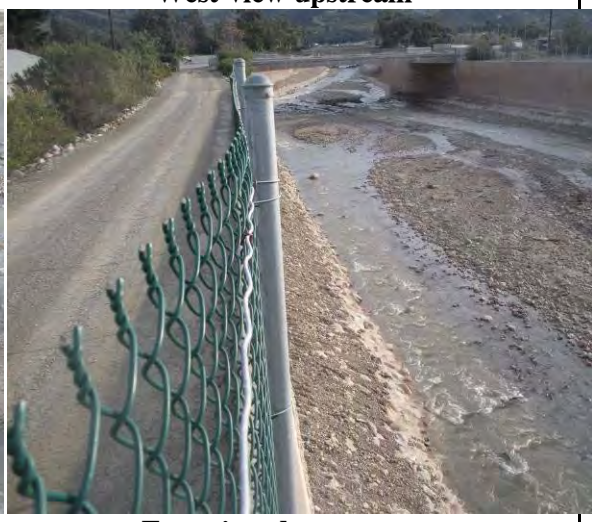
East

Permanent Sampling Station 4

West-view downstream

West-view upstream

West



East-view downstream

East-view upstream

East

Permanent Sampling Station 5

West-view downstream

West-view upstream

West

East-view downstream

East-view upstream

East

Permanent Sampling Station 6

West-view downstream

West-view upstream

West

East-view downstream

East-view upstream

East

2010 POST STORM MONITORING REPORT NO. 2 FOR THE SANTA PAULA CREEK FLOOD CONTROL PROJECT

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April 2010

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1. INTRODUCTION

1.1 PURPOSE and Need

The purpose of this Post Storm Monitoring Report is to comply with Reasonable and Prudent Measure (R&PM) No. 3 and its associated Terms and Conditions (T&C), specifically T&C No. 2, of the Biological Opinion (BO) (F-LB-00-16:DRB) issued by the National Oceanic and Atmospheric Administration's (NOAA) and National Marine Fisheries Service (NMFS) on September 27, 2000 for the Santa Paula Creek Flood Control Project (Project). R&PM No.3 and corresponding T&C No. 2 require the U.S. Army Corps of Engineers' (Corps) to perform monitoring after storm events that exceeded daily mean discharge flows of 500 cubic feet per second (cfs) for a period of five years. The results of post storm monitoring events are important to evaluate the ability of the project to not only provide flood protection, but also to function as a migratory corridor in designated critical habitat for the southern California distinct population segment (DPS) of endangered steelhead trout (Oncorhynchus mykiss).

1.2 SUMMARY OF STORM EVENT

One such storm event occurred on 12 April 2010. The hydrograph for this event is presented in Figure 1, below. Figure 1 shows a peak level of approximately 900 cubic feet per second (cfs) on 12 April 2010. These periods of high flow can mobilize steelhead migration and/or emigration within the watershed. Once flows subside, the steelhead trout will seek refuge in pools of the low flow channel and would theoretically continue along their migratory route.

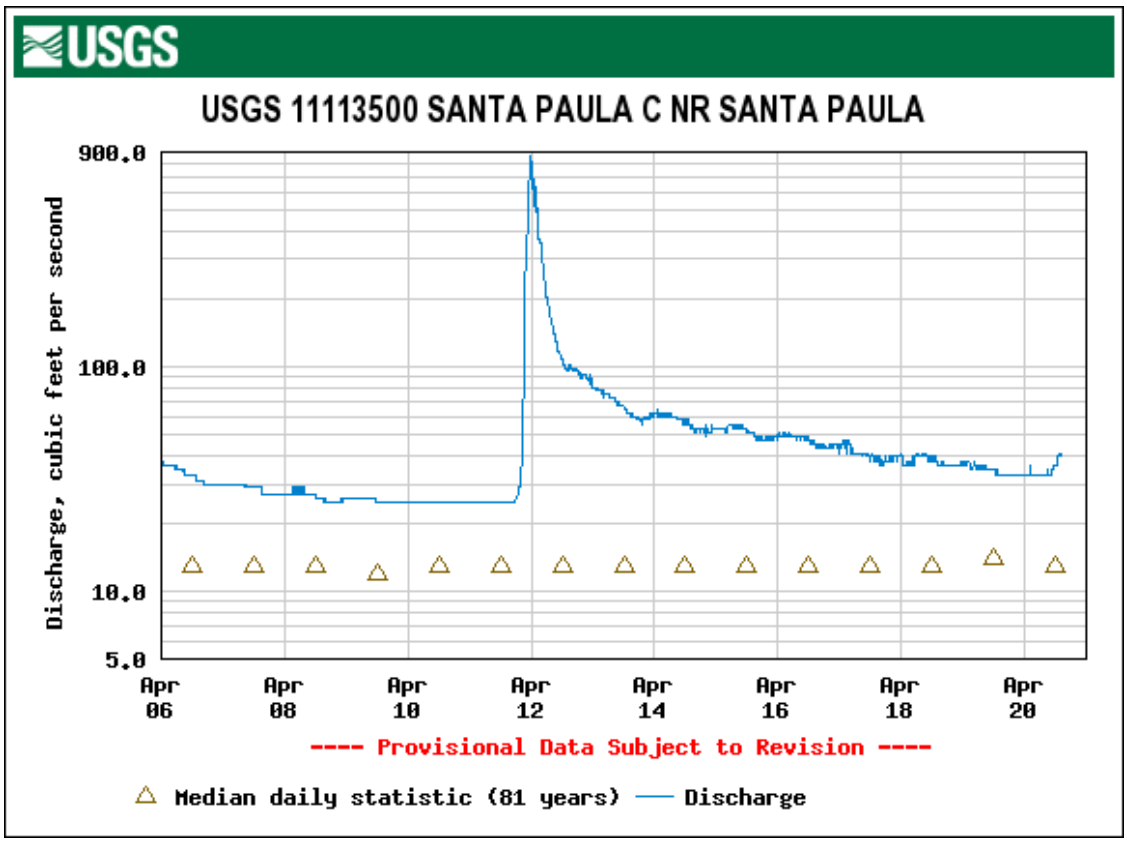

Figure 1. Hydrograph of monitored storm event taken at the Santa Paula Creek gauging station

1.3 PROJECT LOCATION

Post-storm monitoring activities took place within the United States Army Corps of Engineers (Corps) Project located within the City of Santa Paula, Ventura County, California. The monitoring area extends from Santa Paula Creek's (Creek) confluence with the Santa Clara River upstream approximately 2 miles to approximately 500 feet upstream of the fish ladder (Project Area). Please refer to Figure 2 for a graphical depiction of the Project Area.

The entire Project lies within designated Critical Habitat for the southern California distinct population segment (DPS) of endangered steelhead trout (*Oncorhynchus mykiss*). The Project Area is thought to function as a migratory corridor for steelhead, as stated in the biological opinion (BO) for the project (NMFS, 2000 and 2009).

1.4 METHODOLOGY

Subsequent to this storm event, a monitoring protocol was drafted by Corps biologists, in conjunction with Corps Hydraulics and Hydrology (H&H) staff and NMFS staff. Six permanent sampling stations (PSS) were established as a part of this monitoring protocol. These sampling locations are assumed to provide a representative sample of conditions documented throughout the Project's low flow channel. PSS's also serve as permanent photo stations. Photo documentation is provided in Appendix A. While photographs are taken at PSS No. 4, the water quality sampling at this PSS was re-located approximately 700-feet upstream from its location on Figure 2, due to access constraints. Results of the post-storm water quality monitoring, conducted on 14 April 2010, are discussed below in Section 2.

1.4.1 WATER QUALITY SAMPLING

Water samples were collected from these six locations within 72 hours of discharge levels peaking above 500 cfs and were analyzed for temperature (°F), dissolved oxygen ([DO]; % saturation and mg/L), turbidity [neophelometric turbidity units (NTUs)], and pH levels. Temperature, DO, and pH data were obtained using a Hanna Instruments multi-parameter water quality meter (Model #HI9828). At each of the six sampling locations, a multi-sensor probe, connected to the HI9828 meter, was placed into flowing water approximately two feet from the bank of the Creek. Recordings for each of the parameters were digitally recorded by the meter and manually recorded into field notebooks at each of the sampling locations. Turbidity data was collected at each of the sampling locations with the use of a Hanna Instruments portable microprocessor turbidity meter (Model #HI93703). Water samples were obtained at each sampling location, using a clean glass cuvette, approximately one foot from the bank of the Creek. Samples were immediately placed within the turbidity meter upon collection. Typically, water samples would be collected from the vertical and horizontal centers of the active channel; however, due to safety constraints associated with moderate to heavy flows, this was not possible. Results of the monitoring efforts are detailed below in Section 2.

Figure 2. Santa Paula Creek PSS locations

1.4.2 FLOW RATE MEASUREMENTS

In order to remain consistent with previous post-storm reports and due to the same safety constraints discussed in the section above, flow rate measurements along specified areas of the project site were unable to be attained. For this reason the flow rate data obtained from the USGS gauge just upstream of the project was applied to the entire Project Area.

1.4.3 VISUAL OBSERVATION METHODS

Visual observations were conducted by driving each of the access roads above the east and west banks of the Creek. Additionally, monitors walked along the Project Area reach to inspect conditions, including the fish passage facility. A series of photographs was taken at each of the six pre-defined sampling locations. Photographic documentation, included as Appendix A of this report, was performed to record the conditions at each of the sampling sites and throughout the greater Project Area. A field log detailing the water's appearance, any noticeable erosion occurring within the Project Area, any potential barriers to steelhead migratory capabilities, amount of woody debris present, and the date and time of sample collection was completed at each sampling location.

2. RESULTS AND DISCUSSION

2.1 WATER QUALITY SAMPLING

The monitored storm was an isolated event that occurred on 12 April 2010. Post-storm water quality monitoring was conducted between 12:00 p.m. and 3:00 p.m. on 14 April 2010. Results for the post-storm water monitoring event are listed in Table 1, below.

Table 1 Post-storm analytical water quality results for 14 April 2010

Permanent Sampling Station	Temperature (ºF)	DO (% Saturation)	DO (mg/L)	Turbidity (NTUs)	pH
1	64.95	32.5	3.03	25.66	8.11
2	65.11	33.3	3.10	27.44	8.54
3	65.82	33.7	3.11	28.49	8.75
4	66.19	33.8	3.12	26.39	8.96
5	66.78	31.5	2.86	39.85	8.79
6	66.22	29.4	2.72	27.43	8.65
Average	65.85	32.37	2.99	29.21	8.63

Steelhead trout can tolerate temperatures ranging from 50º F – 70º F, however their optimal range for growth falls between 55º F – 65º F. Elevated temperatures above 70º F has been known to cause increased potential for fish mortality (Rich, 2000). Temperatures recorded during this the post-storm monitoring event indicate that water temperatures are relatively high with an average temperature just above 65º F. This is at the upper end of the optimal range for growth and typical for the time of year; temperatures however are tolerable for individuals using the Project Area solely as a migratory corridor as exposure to the slightly elevated temperatures will be of a short duration.

Dissolved oxygen (DO) plays a key role in the survival and growth of steelhead trout. For optimal growth and survival a DO level near or at 100% saturation and above 9 mg/L is required (Davis, 1975). However, in cooler water temperatures trout have been known to survive in DO concentrations as low as 1.5 to 2.0 mg/L (Moyle 2002).The results above show an average saturation (% saturation) only 32.37 and an average DO level (mg/L) of 2.99 mg/L. Currently, these are suboptimal DO conditions for steelhead trout development and would likely result in mortality if resident populations were to exist within the Project Area. These levels however are tolerable for individuals using the Project Area solely as a migratory corridor as exposure to low DO levels will be of a short duration.

Turbidity levels of greater than 50 NTU's have been known to be harmful to steelhead trout and can affect their ability to search for food (Oregon, 2001). High levels of turbidity can cause sediment and particles to accumulate in the gills make it difficult for steelhead trout to breath. While southern steelhead have been known to survive in varying levels of turbidity, higher levels have been known to be fatal to salmonids (Bash et al., 2001). Turbidity levels presented in Table 1 average 29.21 NTU's. Turbidity levels documented in Table 1 are within the suitable range of conditions known for steelhead.

2.2 Flow Rate Measurements

As mentioned above, flow rates were obtained from data collected from the USGS gauge located just upstream from the project. Flows, as reported by the USGS gauge, occurred at a rate of approximately 50 – 60 cfs during the post-storm monitoring event on 14 April 2010.

2.3 Visual Observations

Visual observations were made to assess the overall conditions and to identify any potential erosion issues and barriers to fish passage. The Creek had assumed a natural flow regime that primarily directed water along either the toe of the east or west bank, occasionally migrating from one bank across the channel to the other bank. Ancillary channels or braids were apparent in several areas, although with substantially reduced flow in comparison to the primary channel. Due to the magnitude of the storms that passed through the area prior to the monitoring survey and previous storm events in early 2010, the low flow channel that was constructed after the 2009/2010 sediment removal action was generally not visible. In a few areas in the upstream of the Project Area remnants of the reconstructed low flow channel were observed but were limited to where the flows meandered across the Creek to the opposite bank.

Energy dissipation was apparent on the downstream side of roughness elements existing within the channel (i.e. boulders). Boulders and cobble of various sizes appear to have been deposited or uncovered during the storm, which appear to provide energy dissipation opportunities throughout the site. Boulders/pools placed/created as part of the reconstruction of the low flow channel in 2009/2010 were not observed/distinguishable within the remnants of the constructed channel.

The majority of flows from the Creek continue to flow through the fish ladder. The pilot channel that was excavated during sediment removal activities which directed upstream flows into the fish ladder entrance has been cut off due to upstream sediment aggradation. Currently, upstream flows appear to prefer the west

edge of the channel. Upon approach to the project inlet and fish passage facility, the Creek makes a sharp turn to the east and enters the fish ladder.

Although no major barriers to fish movement were identified, it was noted that in-channel braiding may occur when flows begin to recede to a more typical low-flow condition. This potential occurrence is likely due to the magnitude of the storm flows which resulted in breaching of the low-flow channel in most areas and overall increased water load from upland runoff. Several portions of the Creek through the project area consisted of small, secondary, braided channels that could support fish during the time that surveys were conducted. These channels could potentially become disconnected from the primary low-flow channel when drier conditions prevail. This could lead to the pooling of water which could provide stranding conditions for fish occupying these secondary channels. This condition occurs naturally in alluvial systems. Little to no woody debris was noted during the post-storm monitoring field efforts.

The fish ladder has sequestered a noticeable amount of sediment since it was cleaned out during sediment removal activities. While the total capacity of each pool has diminished with the onset of sediment aggradation, each pool appears to be able to provide adequate resting opportunities for steelhead as they move through the fish ladder. On average, the west side of the pools sequestered more sediment than the east side.

No steelhead were observed during this monitoring effort.

3. CONCLUSION

The results of the post-storm monitoring efforts indicate that current overall water quality conditions in the Project Area are not generally conducive to the persistence of and/or movement of steelhead trout. Water temperatures are at the upper limit of the optimal range for growth while dissolved oxygen levels are within the suboptimal range for steelhead trout development and would likely result in mortality if resident populations were to exist within the Project Area. Turbidity levels however are currently within the acceptable range for steelhead. Flows peaked at 900 cfs on 12 April 2010 and receded to relatively normal levels by the time the survey was conducted on 14 April 2010. Flows dropped to below 100 cfs within 24 hours of the peak event. A lack of woody debris was noted in all areas of the Project Area.

No barriers to fish passage were noted within the Project Area. Multiple channels were observed. As flows recede and organize into a typical low flow condition, pooling may occur in remnant ancillary channels, which could lead to potential stranding conditions. However, this is a natural occurrence for streams of this nature. No steelhead trout were observed during the post-storm monitoring efforts.

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Appendix A
Photo Log

Permanent Sampling Station 1

West-downstream

West-upstream

West

Permanent Sampling Station 2

West-view downstream

West-view upstream

West

East-view downstream

East-view upstream

East

Permanent Sampling Station 3

West-view downstream

West-view upstream

West

East-view downstream

East-view upstream

East

Permanent Sampling Station 4

West-view downstream

West-view upstream

West

East-view downstream

East-view upstream

East

Permanent Sampling Station 5

West-view downstream

West-view upstream

West

East-view downstream

East-view upstream

East

Permanent Sampling Station 6

West-view downstream

West-view upstream

West

East-view downstream

East-view upstream

East

2010 POST STORM MONITORING REPORT NO. 3 FOR THE SANTA PAULA CREEK FLOOD CONTROL PROJECT

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Figure 1 Hydrograph of monitored storm event taken at the Santa Paula Creek gauging station. 1
Figure 2 Santa Paula Creek PSS locations. 3

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Table 1 Post-storm analytical water quality results for 23 December 2010 4

Appendices

Appendix A: Photo Log

1. INTRODUCTION

1.1 PURPOSE AND NEED

The purpose of this Post Storm Monitoring Report is to comply with Reasonable and Prudent Measure (R&PM) No. 3 and its associated Terms and Conditions (T&C), specifically T&C No. 2, of the Biological Opinion (BO) (F-LB-00-16:DRB) issued by the National Oceanic and Atmospheric Administration's (NOAA) and National Marine Fisheries Service (NMFS) on September 27, 2000 for the Santa Paula Creek Flood Control Project (Project). R&PM No.3 and corresponding T&C No. 2 require the U.S. Army Corps of Engineers' (Corps) to perform monitoring after storm events that exceeded daily mean discharge flows of 500 cubic feet per second (cfs) for a period of five years. The results of post storm monitoring events are important to evaluate the ability of the project to not only provide flood protection, but also to function as a migratory corridor in designated critical habitat for the southern California distinct population segment (DPS) of endangered steelhead trout (*Oncorhynchus mykiss*).

1.2 SUMMARY OF STORM EVENT

One such storm event occurred on 19 December 2010. Another occurred on 22 December 2010. Figure 1 shows a peak level of approximately 2,120 cubic feet per second (cfs) on 19 December 2010 and a peak of approximately 893 cfs on 22 December 2010. The hydrograph for this event is presented in Figure 1, below.

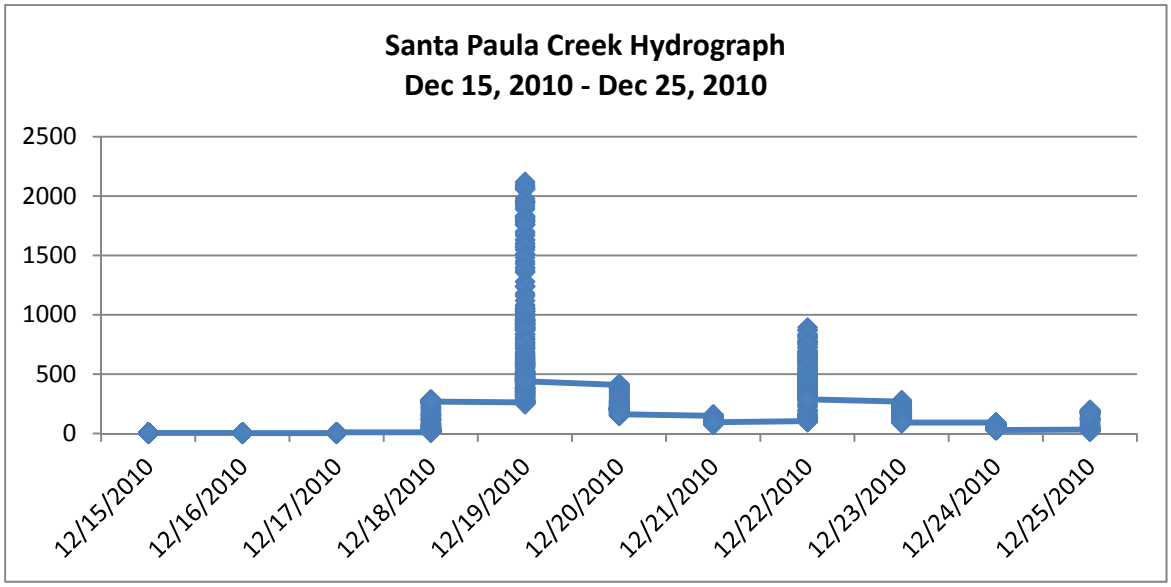

Figure 1. Hydrograph of monitored storm events taken at the Santa Paula Creek gauging station (USGS 11113500). The vertical axis represents flow rates in cubic feet per second (cfs). The horizontal access presents the range of days of examined for this hydrograph.

1.3 PROJECT LOCATION

Post-storm monitoring activities took place within the United States Army Corps of Engineers (Corps) Project located within the City of Santa Paula, Ventura County, California. The monitoring area extends from Santa Paula Creek's (Creek) confluence with the Santa Clara River upstream

approximately 2.0 miles to approximately 500 feet upstream of the fish ladder (Project Area). Please refer to Figure 2 for a graphical depiction of the Project Area.

The entire Project lies within designated Critical Habitat for the southern California distinct population segment (DPS) of endangered steelhead trout (*Oncorhynchus mykiss*). The Project Area is thought to function as a migratory corridor for steelhead, as stated in the biological opinion (BO) for the project (NMFS, 2000 and 2009).

1.4 METHODOLOGY

Subsequent to this storm event, a monitoring protocol was drafted by Corps biologists, in conjunction with Corps Hydraulics and Hydrology (H&H) staff and NMFS staff. Six permanent sampling stations (PSS) were established as a part of this monitoring protocol. These sampling locations are assumed to provide a representative sample of conditions documented throughout the Project's low flow channel. PSS's also serve as permanent photo stations. Photo documentation is provided in Appendix A. While photographs are taken at PSS No. 4, the water quality sampling at this PSS was re-located approximately 700-feet upstream from its location on Figure 2, due to access constraints. Results of the post-storm water quality monitoring, conducted on 23 December 2010, are discussed below in Section 2.

1.4.1 WATER QUALITY SAMPLING

Water samples were collected from these six locations within 72 hours of discharge levels peaking above 500 cfs and were analyzed for temperature (°F), dissolved oxygen ([DO];% saturation and mg/L), turbidity [neophelometric turbidity units (NTUs)], and pH levels. Temperature, DO, and pH data were obtained using a Hanna Instruments multi-parameter water quality meter (Model #HI9828). At each of the six sampling locations, a multi-sensor probe, connected to the HI9828 meter, was placed into flowing water approximately two feet from the bank of the Creek. Recordings for each of the parameters were digitally recorded by the meter and manually recorded into field notebooks at each of the sampling locations. Turbidity data was collected at each of the sampling locations with the use of a Hanna Instruments portable microprocessor turbidity meter (Model #HI93703). Water samples were obtained at each sampling location, using a clean glass cuvette, approximately one foot from the bank of the Creek. Samples were immediately placed within the turbidity meter upon collection. Typically, water samples would be collected from the vertical and horizontal centers of the active channel; however, due to safety constraints associated with moderate to heavy flows, this was not possible. Results of the monitoring efforts are detailed below in Section 2.1.

Figure 2. Santa Paula Creek PSS locations

1.4.2 FLOW RATE MEASUREMENTS

In order to remain consistent with previous post-storm reports and due to the same safety constraints discussed in the section above, flow rate measurements along specified areas of the project site were unable to be attained. For this reason the flow rate data obtained from the USGS gauge just upstream of the project was applied to the entire Project Area.

1.4.3 VISUAL OBSERVATION METHODS

Visual observations were conducted by driving each of the access roads above the east and west banks of the Creek. Additionally, monitors walked along the Project Area reach to inspect conditions, including the fish passage facility. A series of photographs was taken at each of the six pre-defined sampling locations. Photographic documentation, included as Appendix A of this report, was performed to record the conditions at each of the sampling sites. A field log detailing the water's appearance, any noticeable erosion occurring within the Project Area, any potential barriers to steelhead migratory capabilities, amount of woody debris present, and the date and time of sample collection was completed at each sampling location.

2. RESULTS

2.1 WATER QUALITY SAMPLING

The monitored storms occurred on 19 and 20 December 2010, and 22 December 2010. Post-storm water quality monitoring was conducted between 12:00 p.m. and 3:30 p.m. on 23 December 2010. Results for the post-storm water monitoring event are listed in Table 1, below.

Table 1 Post-storm analytical water quality results for 23 December 2010

Permanent Sampling Station	Temperature (ºF)	DO (% Saturation)	DO (mg/L)	Turbidity (NTUs)	pH
1	54.01	n/a*	n/a*	237	7.80
2	55.09	18.7	1.98	211	9.84
3	55.59	14.30	1.48	228	9.90
4	55.10	14.2	1.50	264	9.40
5	55.18	14.3	1.51	240	9.40
6	55.45	16.2	1.71	252	9.04
Average	55.07	15.54	1.64	238.67	9.23

* Access to PSS No. 1 was limited due to high storm flows within the channel of the PSS area. The water quality meter was unable to be deployed in a safe manner to obtain these measurements.

Steelhead trout can tolerate temperatures ranging from 50º F – 70º F, however their optimal range for growth falls between 55º F – 65º F. Elevated temperatures above 70º F has been known to cause increased potential for fish mortality (Rich, 2000). Temperatures recorded during this the post-storm monitoring event indicate that water temperatures are relatively cool with an average temperature just above 55º F. This is at the lower end of the optimal range for growth and fairly typical for the time of

year and would be tolerable for individuals using the Project Area solely as a migratory corridor as exposure to the slightly elevated temperatures will be of a short duration.

Dissolved oxygen (DO) plays a key role in the survival and growth of steelhead trout. For optimal growth and survival a DO level near or at 100% saturation and above 9 mg/L is required (Davis, 1975). However, in cooler water temperatures trout have been known to survive in DO concentrations as low as 1.5 to 2.0 mg/L (Moyle 2002). The results above show an average saturation (% saturation) only 15.54 and an average DO level (mg/L) of 1.64 mg/L. Currently, these are suboptimal DO conditions for steelhead trout development and would likely result in mortality if resident populations were to exist within the Project Area. These levels however are tolerable for individuals using the Project Area solely as a migratory corridor as exposure to low DO levels will be of a short duration.

Turbidity levels of greater than 50 NTU's have been known to be harmful to steelhead trout and can affect their ability to search for food (Oregon, 2001). High levels of turbidity can cause sediment and particles to accumulate in the gills make it difficult for steelhead trout to breath. While southern steelhead have been known to survive in varying levels of turbidity, higher levels have been known to be fatal to salmonids (Bash et al., 2001). Turbidity levels presented in Table 1 average 238.67 NTU's. Turbidity levels documented in Table 1 are well above the suitable range of conditions known for steelhead, however are not entirely unexpected for the Project Area reach after a large storm event, especially given the Project Area's location relative to the extremely turbid Mud Creek.

2.2 FLOW RATE MEASUREMENTS

As mentioned above, flow rates were obtained from data collected from the USGS gauge located just upstream from the project. Flows, as reported by the USGS gauge, occurred at a rate of 150 – 175 cfs during the post-storm water monitoring event on 23 December 2010.

2.3 VISUAL OBSERVATIONS

Visual observations were made to assess the overall conditions and to identify any potential erosion issues and barriers to fish passage that could exist throughout the Project Area. Multiple channels were apparent throughout most of the Project Area; however, primary flows were restricted to natural channels occasionally meandering from one grouted stone slope to the other. While the flows are largely present along the grouted side slopes in the majority of the Creek, areas downstream toward the Santa Clara River confluence were often found to be bank to bank. As flows recede to typical levels, a single, more organized low flow channel is expected to prevail, as has been observed in this system in the past. Energy dissipation was apparent on the downstream side of roughness elements existing within the channel (i.e. exposed boulders). Boulders and cobble of various sizes appear to have been deposited or uncovered during the storm, which appear to provide energy dissipation opportunities throughout the site.

The majority of flows from the Creek were observed to flow into the Project Area over the right side (looking downstream) of the concrete apron of the project inlet. A portion of the flows approaching the project inlet do enter the fish ladder. The fish ladder has sequestered a noticeable amount of sediment

since the last fish ladder cleanout which occurred in October of 2010, prior to the storm season. Therefore, pools within the fish ladder are not currently meeting design criteria. With that being said, pools are still able to provide some resting opportunities for steelhead as they attempt to navigate the fish ladder. On average, the right side (looking downstream) of the pools sequestered more sediment and larger sediment grain sizes than the left side.

A barrier to movement/migration was noted within the fish ladder. Flows attempting to move through the notch in the weir between pools four and five (working from upstream to downstream) were occluded by numerous small boulders. The occlusion created a condition where the surface elevation of flows was essentially the same across the entire wetted width of the weir. This resulted in an approximate three-foot drop between pools four and five. Design parameters identified in the 2000 BO indicate a maximum 1 foot drop between pools. The drop coupled with a diminished pool capacity worked to create an apparent barrier to movement for steelhead.

In channel braiding was noted during the monitoring effort. Several portions of the Creek through the Project Area could be characterized as small, secondary, braided channels that could support fish during the time that surveys were conducted. These channels could become disconnected from the primary low-flow channel as flows decrease and drier conditions prevail. Disconnected pools could form which could lead to stranding conditions for fish. This is a naturally occurring condition in alluvial river/stream systems. No woody debris was noted during the post-storm monitoring field efforts.

The majority of the Creek within the Project Area is devoid of vegetation due to the recent storm flows. Additionally, as compared to previous post storm monitoring events in 2010, a significantly larger amount of rock and cobble had been deposited by storm flows and was visible within the banks of the Creek. No steelhead were observed during this monitoring effort.

3. CONCLUSION

The results of the post-storm monitoring efforts indicate that current water quality conditions in the Project Area are not generally conducive to the persistence of and/or the movement of steelhead trout, but are not necessarily unexpected within the Creek during the storm season. While water temperatures are at the lower limit of the optimal range for growth, DO levels were extremely low. The low DO levels would likely result in mortality if resident populations were to exist within the Project Area. Turbidity levels were well above the acceptable range for steelhead. Flows peaked at 2,120 cfs on 19 December and at 893 cfs on 22 December 2010. Flow rates had receded to between 150 – 175 cfs by the time the survey was conducted on 23 December 2010. Flows dropped to approximately 250 cfs within 24 hours of the peak event. A lack of woody debris was noted in all areas of the Project Area.

A barrier to fish passage was observed at the weir separating pools four and five within the fish ladder. Multiple channels were observed at the time of monitoring. As flows recede and organize into a typical low flow condition, pooling may occur in remnant ancillary channels, which could lead to potential

stranding conditions. However, this is a natural occurrence for streams of this nature. No steelhead trout were observed during the post-storm monitoring efforts.

4. REFERENCES

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Appendix A
Photo Log

Permanent Sampling Stations 1

West-downstream

West-upstream

West

Permanent Sampling Stations 2

West-view downstream

West-view upstream

West

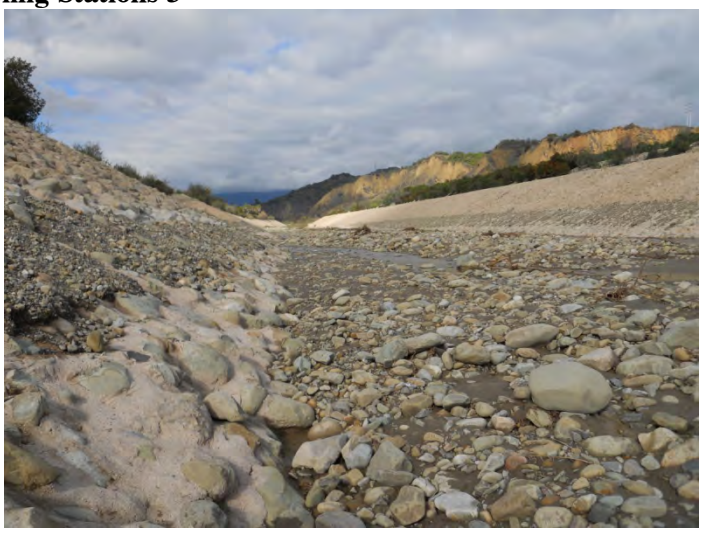
East-view downstream

East-view upstream

East

Permanent Sampling Stations 3

West-view downstream



West-view upstream

West

East-view downstream

East-view upstream

East

Permanent Sampling Stations 4

West-view downstream

West-view upstream

West

Permanent Sampling Stations 5

West-view downstream

West-view upstream

West

East-view downstream

East-view upstream

East

Permanent Sampling Stations 6

West-view downstream

West-view upstream

West

East-view downstream

East-view upstream

East

Site-wide photos

View looking east at the fish ladder and concrete apron.

View looking east at the fish ladder and concrete apron.

Appendix B
2010 Smolt-Out Survey Report

2010 SOUTHERN CALIFORNIA DPS STEELHEAD SMOLT OUT SURVEY REPORT FOR THE SANTA PAULA CREEK FLOOD CONTROL PROJECT

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May 2010

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1.0 INTRODUCTION

The purpose of this report is to document the results of a southern California steelhead (*Onchorhynchus mykiss*) survey conducted on 12 May 2010. The purpose of the survey was to document migratory conditions during the time when steelhead smolt are expected to be outmigrating toward the Pacific Ocean. This survey has been titled the "smolt out survey." It was conducted within the U.S. Army Corps of Engineers' (Corps) Santa Paula Creek Flood Control Project (Project) area (Project Area), located in the City of Santa Paula, Ventura County.

1.1 Legal Status and Background Information on the Southern California Steelhead

The southern California steelhead distinct population segment (DPS) was listed by the National Marine Fisheries Service (NMFS) as federally endangered on June 17, 1998 (63 FR 32996-32998). Critical habitat was designated on February 16, 2000 (65 FR 7764-7787). This taxon is also considered a California Species of Special Concern by the California Department of Fish and Game (CDFG).

The southern California steelhead DPS applies to coastal streams from the Santa Maria River south to the U.S.-Mexican border (NMFS, 2002). The primary drainages that support steelhead runs in this region include the Santa Maria River, Santa Ynez River, Gaviota Creek, the Ventura River, the Santa Clara River, Malibu Creek, San Mateo Creek, and Topanga Creek. The habitat requirements for steelhead in freshwater streams are often dictated by life history stages (Cederholm and Martin, 1983; Bjornn and Reiser, 1991). During adult and juvenile migrations, adequate discharge amounts, water temperatures, and water chemistry become important habitat variables. Fluctuations of these variables can result in a delay or complete halt in the upstream migration of adults towards spawning grounds and the downstream migration of juveniles towards brackish and saltwater habitats. Suitable spawning habitat requires efficient water depths and flow velocities as primary elements; however, water temperature and turbidity are also important factors. Juvenile steelhead require living space (different combinations of water depth and velocity), shelter from predators and harsh environmental conditions, food resources, and suitable water quality and quantity, for growth and survival during the summer and winter months (NMFS, 2007). The southern steelhead is distinguished from other rainbow trout as it is officially described as those that reside downstream of distinct barriers, such as waterfalls and dams, whereas rainbow trout occur in inland waters above barriers.

2.0 EXISTING PROJECT SITE CONDITIONS

The Project Area is located along Santa Paula Creek (Creek) from the confluence of the Creek and the Santa Clara River upstream to approximately 500 feet upstream of the fish ladder/project inlet. This constitutes approximately two miles of the lower portion of Santa Paula Creek. Flow rates during the 2010 smolt out surveys, based on data from the USGS gauge located upstream of the Project Area, were approximately 9.0 cubic feet per second. Channel depth within the Project area was observed to range from approximately 3 inches to 2 feet.

The Corps completed a sediment removal project throughout the majority of Project Area in January of 2010. As a result, the majority of the Project Area is currently devoid of vegetation due to the recent sediment removal project and subsequent storm flows. However, some patches of native vegetation located within the upstream portions were maintained during the sediment removal project and some streamside vegetation is emerging. Willow cuttings were installed along the existing low flow channel immediately after the sediment removal project below State Route 126 (SR-126). The majority of these cuttings appeared to have been either buried by sediment deposition or washed away due to flows

associated with recent storm events. The Creek had assumed a natural flow regime that primarily directed water along either the toe of the east or west bank, occasionally migrating from one bank across the channel to the other bank. Ancillary channels or braids were apparent in several areas, although with substantially reduced flow in comparison to the primary channel. A low flow channel constructed after the 2009/2010 sediment removal action, per specifications provided in the biological opinions for the Project and coordination with NMFS, was generally limited to where the flows meandered across the Creek to the opposite bank. Consequently, the main channel currently consists of several small braided channels with relatively shallow flow in areas. Only a few of the pools that were created during the low flow channel reconstruction still exist, due to the migrating nature of the low flow channel. Large boulders that were installed within the pools of the constructed low flow channel during the sediment removal project remain in place, where the reconstructed channel is visible, and appear to be creating areas of refuge for migrating fish where they are still located within flowing water.

3.0 METHODS

A team of two qualified biologists, from Aspen Environmental Group, were onsite on May 12, 2010, to conduct the smolt out survey. The survey was performed by methodically walking the length of the Project Area from the confluence of Santa Paula Creek and the Santa Clara River upstream to approximately 500 feet upstream of the fish ladder. All areas where standing or flowing water was present were visually inspected. In portions of the channel where water was relatively shallow (<1 foot) and clear (majority of survey area), visual observations were performed for the presence of fish. Dip nets with 1/8” mesh were utilized to probe under and around boulders. In areas that exhibited waters deeper than 1-foot, 1/8” mesh block netting was installed along the downstream sections. Biologists, using 1/8” mesh seine netting, then seined each section from the upstream extent of the deeper water downstream towards the block netting and documented all fish present within the area.

More traditional passive survey methods such as the utilization of rotary screw or incline plane screen traps were not employed due to the absence of deeper water, which is required for installation and to achieve trap efficiency. Additionally, the lack of channel depth and lack of large pools, did not provide adequate conditions for the implementation of snorkel survey techniques/methods.

Photographs were also taken at the six permanent sampling locations described in the Post Storm Monitoring Reports and the Summer Low Flow Report for 2010. These sampling locations are shown in Figure 1, attached.

4.0 RESULTS

4.1 Known Locations for Southern California Steelhead in the Vicinity of the Project Site

During sediment removal activities that occurred from October 2009 to January 2010, a total of three steelhead detections were made in the Project Area (Figure 2). All steelhead encountered in the Project Area were either relocated to a previously identified area of suitable habitat above the fish ladder or into the diversion channel when connectivity to the Santa Clara River was present. Details for each of these occurrences are presented below in Table 1.

Table 1. Steelhead Identified in Project Area

Date	Status	Implemented Action	Notes
6 Jan 2010	1 juvenile	Relocated to suitable habitat upstream of Project area.	While clearing the old active channel after the final water diversion a juvenile steelhead was found in a large pool just below the fish ladder.
6 Jan 2010	1 juvenile	Per NMFS biologist on-site, released into diversion channel which had connectivity to the Santa Clara River	While clearing the old active channel after the final water diversion a juvenile steelhead was found in a large pool just below the fish ladder.
8 Jan 2010	1 juvenile	Relocated to suitable habitat upstream of Project area	Located during work being conducted just above fish ladder.

In addition to the occurrences noted during project activities, a review of the California Natural Diversity Database (CNDDB) reported one record (1988) of southern California steelhead located approximately ¼-mile upstream from the fish ladder (CDFG, 2010). This record indicates that three fish were caught during surveys of the area in 1987 and several were seen in the same area in 1988.

4.2 Survey Results

No steelhead were observed during the May 2010 smolt out survey, although 12 arroyo chub (*Gila orcuttii*), 1 partially armored threespine stickleback (*Gasterosteus aculeatus aculeatus*) and approximately 150 mosquitofish (*Gambusia affinis*) were documented within the survey area. Flow rate data obtained from the USGS gauge located just upstream of the project, indicated that during the survey water in Santa Paula Creek was moving at a rate of approximately 8 cfs.

Current conditions at the Project appear to be suboptimal for residential populations of steelhead to persist, but would provide acceptable conditions for potential downstream migration of smolt through the Project Area. The Project's biological opinion assumes the portion of Santa Paula Creek flowing through the Project Area functions as a migratory corridor for the species, not live in habitat (NMFS, 2000). Steelhead require freshwater migration corridors with suitable natural cover, such as, but not limited to, submerged and overhanging large wood, aquatic vegetation, large rocks and boulders, side channels, deep pools, and undercut banks to support juvenile and adult mobility and survival. The project site currently exhibits some of these features, including large rocks and boulders and side channels. However, the site does not currently have much woody debris, aquatic vegetation, or deep pools and undercut banks. The lack of these habitat characteristics leaves aquatic species vulnerable to predation and elevated water temperatures, however it is to be expected following large scale sediment removal projects. These habitat characteristics would be expected to reform as the creek is subject to the processes of erosion and revegetation from natural reformulation of the seed bank and plantings.

During the survey large algal mats were observed within the Project Area. This was most noticeable within slower moving sections of the Creek and/or large pools where slow moving or stagnant water results in localized increases in water temperature. The presence of warm, shallow waters due to a lack of overhanging vegetation and a lack of a well defined low flow channel that serve to keep the water shaded and consistently flowing, respectively, could aid in the growth of these algal mats. The algal mats could also be facilitated by nutrient loading from upstream sources including agricultural runoff. The presence of large algal mats, often observed covering large stretches of the main and braided channels during the survey, can result in a reduction of dissolved oxygen available to aquatic wildlife such as steelhead, especially during overcast/foggy conditions and during the night. The reduction or lack of light available to the algae for the photosynthetic process will cause the algae to consume available dissolved oxygen in the water through the respiration process and reduce the amount of

dissolved oxygen available to steelhead and other aquatic species. The presence of algal mats however can also result in an increase in insect presence that feed on the algae thus adding to the availability of food for steelhead.

5.0 SUMMARY AND CONCLUSION

Although recently detected in the Project Area (Figure 2), no steelhead were identified during the smolt out survey conducted in May 2010. Project activities that occurred in 2009/2010 involved the removal of substantial amounts of sediment from the Santa Paula Creek channel, including the fish ladder pools. As a result, the portion of the creek that travels through the Project Area is, for the most part, devoid of vegetation at this time. The lack of substantial vegetative cover, overhanging vegetation, deep pools, cut banks, accumulated woody debris, and presence of large algal mats provide less than ideal live in conditions for steelhead, however downstream migration is still expected to be possible.

A significant amount of sediment has aggraded in the upstream pools of the fish ladder as a result of 2010 storm events. This has reduced the functionality of the ladder providing a reduction in the areas available for refuge as steelhead smolt migrate downstream in Santa Paula Creek.

Overtime, riparian vegetation is expected to naturally recruit within the previously disturbed areas and plantings of willow and mulefat cuttings are expected to be implemented. If creek flows allow this vegetation to mature, the reemergence of a natural riparian corridor would benefit the suitability of the Project Area for steelhead.

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Appendix 1 - Figures

Figure 1. Santa Paula Creek PSS locations.

Santa Paula Creek Sediment Removal Project
Southern California DPS Steelhead Smolt Out Survey Report

Aspen Environmental Group

0 125 250 500 Feet

Figure 2

Steelhead Occurrences

June 2010

Figure 3 - Permanent Sampling Station 1

West-view downstream

West-view upstream

West

Figure 4 - Permanent Sampling Station 2

West-view downstream

West-view upstream

West

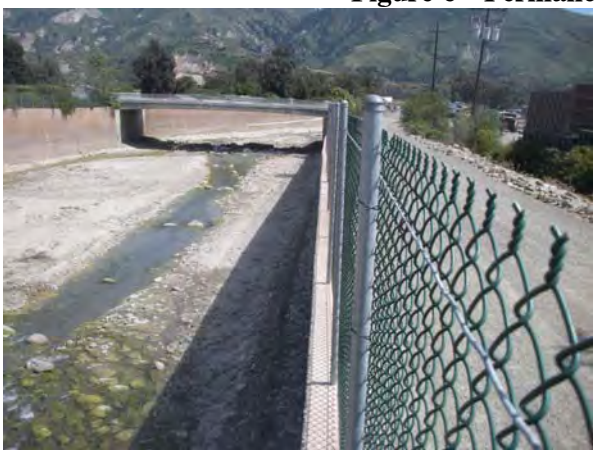
Figure 5 - Permanent Sampling Station 3

West-view downstream

West-view upstream

West

Figure 6 - Permanent Sampling Station 4



West-view downstream

West-view upstream

West

Figure 7 - Permanent Sampling Station 5

West-view downstream

West-view upstream

West

Figure 8 - Permanent Sampling Station 6

West-view downstream

West-view upstream

West

Figure 9 – Site-wide Photos

One of the remaining created boulder pools.

View from atop the fish ladder.

Algal mats present in the survey area downstream of the Hwy. 126 bridge

Appendix C
2010 Summer Low-Flow Monitoring Report

2010 SUMMER LOW FLOW REPORT FOR THE SANTA PAULA CREEK FLOOD CONTROL PROJECT

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September 2010

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1.0 INTRODUCTION

1.1 PURPOSE AND NEED

The purpose of this Summer Low Flow Monitoring Report is to comply with the Reasonable and Prudent Measures (R&PM) and associated Terms and Conditions (T&C) provided in the Biological Opinion (BO) (F-LB-00-16:DRB) for the project. This monitoring event and report are specifically described in T&C No. 1 of R&PM No. 1, of the BO issued by the National Oceanic and Atmospheric Administration's (NOAA), National Marine Fisheries Service (NMFS) on September 27, 2000. R&PM No.3 and corresponding T&C No. 3 require the U.S. Army Corps of Engineers' (Corps) to perform monitoring of the low flow channel configuration and associated discharge at least once per year during low/base flow condition.

1.2 PROJECT LOCATION

Summer low flow monitoring activities took place within as portion of Santa Paula Creek (Creek) located within the City of Santa Paula, Ventura County, California. The monitoring area (Project Area) extends from Creek's confluence with the Santa Clara River upstream to approximately 500 feet upstream of the fish ladder (Fish Ladder) for a total of approximately 2.1 miles (Figure 1).

The entire Project Area lies within designated Critical Habitat for the southern California distinct population segment (DPS) of endangered steelhead trout (*Oncorhynchus mykiss*). The Project Area has historically functioned as a migratory corridor for steelhead (NMFS, 2000 and 2009).

1.3 METHODOLOGY

This monitoring protocol was drafted by Corps biologists, in conjunction with Corps Hydraulics and Hydrology (H&H) staff and NMFS staff. The protocol includes water quality sampling, flow rate measurements, and documentation of visual observations such as barriers to movement, presence of woody debris and Fish Ladder functionality. Six permanent sampling stations (PSS) were established as a part of this monitoring protocol. These sampling locations are assumed to provide a representative sample of conditions documented throughout the Project Area. PSSs also serve as permanent photo stations. Photo station number 4 was re-located approximately 700-feet upstream from its location on Figure 1, due to access constraints. A full description of the monitoring methods/protocols is presented below in sections 1.3.1 through 1.3.3. The 2010 summer low flow monitoring event took place on September 8, 2010; results of this monitoring event are presented in Section 2 of this report.

1.3.1 Water Quality Sampling

Water samples were collected from these six locations and were analyzed for temperature (°F), dissolved oxygen ([DO]; % saturation and mg/L), turbidity [neophelometric turbidity units (NTUs)], and pH levels. Temperature, DO, and pH data were obtained using a Hanna Instruments multi-parameter water quality meter (Model #HI9828). At each of the six sampling locations, a multi-sensor probe, connected to the HI9828 meter, was placed into flowing water approximately two feet from the bank of the Creek. Recordings for each of the parameters were digitally recorded by the meter and manually recorded into field

Figure1. Santa Paula Creek PSS locations

notebooks at each of the sampling locations. Turbidity data was collected at each of the sampling locations with the use of a Hanna Instruments portable microprocessor turbidity meter (Model #HI93703). Water samples were obtained at each sampling location, using a clean glass cuvette, approximately one foot from the bank of the Creek. Samples were immediately placed within the turbidity meter upon collection. Recordings were digitally recorded by the meter and manually recorded into field notebooks at each of the sampling locations. Water samples were collected from the vertical and horizontal centers of the active low flow channel. Results of the monitoring efforts are detailed below in Section 2.1.

1.3.2 Flow Rate Measurements

Flow rate data was obtained from the USGS gauge located just upstream of the project, in order to provide a standard measure that could be replicated across all monitoring reports. It should be noted however that braiding of the main low flow channel in downstream areas may have resulted in decreased flow velocities in these areas. These decreased velocities are likely to be minor.

Because water in a channel flows at different rates, depending on it location, additional flow rate measurements were taken using a simple float at each of the six pre-defined sampling locations. This will serve to document localized increases/decreases in flow rates within the Project Area (i.e., energy dissipation from boulder clusters, landform changes causing increased flow rates, etc.). A partially filled plastic water bottle, sitting approximately one inch below the water line, was released upstream and the time it took to reach a specific distance recorded. Approximate channel width and average depth were recorded and used in calculating flow rates at each sampling location. The results are presented below in Section 2. The simple float method uses an average channel width and depth within the specified measurement area to calculate flow rates. Because the Creek is an erosive and dynamic system a constant cross-sectional area is not always present. Therefore, flow results utilizing the simple float method are intended to identify localized flow rate variations within the Project Area and should not be relied upon as the only source of flow rates for analysis but rather as an informational tool.

1.3.3 Visual Observation Methods

Visual observations were conducted by driving each of the access roads above the east and west banks of the Creek. Additionally, monitors walked along the Project Area reach to inspect conditions, including the Fish Ladder. A series of photographs was taken at each of the six pre-defined sampling locations. Photographic documentation, included as Appendix A of this report, was performed to record the conditions at each of the sampling sites and throughout the greater Project Area. A field log detailing the water's appearance, any noticeable erosion occurring within the Project Area, any potential barriers to steelhead migratory capabilities, amount of woody debris present, and the date and time of sample collection was completed at each sampling location.

2.0 RESULTS

2.1 WATER QUALITY SAMPLING RESULTS

The summer low flow monitoring event took place on September 8, 2010, between 8:00 a.m. and 3:30 p.m. Results for the water quality sampling are listed in Table 1, below.

Table 1 - Summer low flow monitoring water quality results for September 8, 2010

PSS Location	Temperature (ºF)	DO (% Saturation)	DO (mg/L)	Turbidity (NTUs)	pH
1	66.79	80.1	7.29	15.68	8.75
2	69.9	78.0	7.08	8.61	8.68
3	66.48	77.9	7.13	21.18	8.50
4	66.15	78.2	7.16	11.85	8.54
5	65.6	78.0	7.21	10.84	8.5
6	64.9	91.6	8.59	4.33	7.63
Average	66.64	80.63	7.41	12.08	8.43

Steelhead trout can tolerate temperatures ranging from 50º F – 70º F, however their optimal range for growth falls between 55º F to 65º F. Elevated temperatures above 70º F has been known to cause increased potential for fish mortality (Rich, 2000). Temperatures recorded during this the summer low flow monitoring event indicate that water temperatures are relatively warm with an average temperature just above 66º F. This is above the upper end of the optimal range for growth; however, fairly typical for the time of year.

Dissolved oxygen (DO) plays a key role in the survival and growth of steelhead trout. For optimal growth a DO level near or at 100% saturation and above 9 mg/L is required (Davis, 1975). However, in cooler water temperatures trout have been known to survive in DO concentrations as low as 1.5 to 2.0 mg/L (Moyle 2002). The results above show an average saturation (% saturation) of 80.63 and an average DO level (mg/L) of 7.41 mg/L. Currently, these are suboptimal DO conditions for steelhead trout development. These levels however are tolerable for individuals using the Project Area solely as a migratory corridor as exposure to low DO levels will be of a short duration.

Turbidity levels of greater than 50 NTU's have been known to be harmful to steelhead trout and can affect their ability to search for food (Oregon, 2001). High levels of turbidity can cause sediment and particles to accumulate in the gills make it difficult for steelhead trout to breath. While southern steelhead have been known to survive in varying levels of turbidity, higher levels have been known to be fatal to salmonids (Bash et al., 2001). Turbidity levels presented in Table 1 average 12.08 NTU's. The varying levels recorded at each PSS could be caused by localized influences such as storm water runoff, bank erosion, agricultural influence, and plankton blooms. Turbidity levels documented in Table 1 are well within the suitable range of conditions known for steelhead.

2.2 FLOW RATE MEASUREMENT RESULTS

As mentioned above, flow rates were obtained from data collected from the USGS gauge located just upstream from the project. Flows, as reported by the USGS gauge, occurred at a rate of 3.7 cfs during the monitoring event on September 8, 2010 (Figure 2).

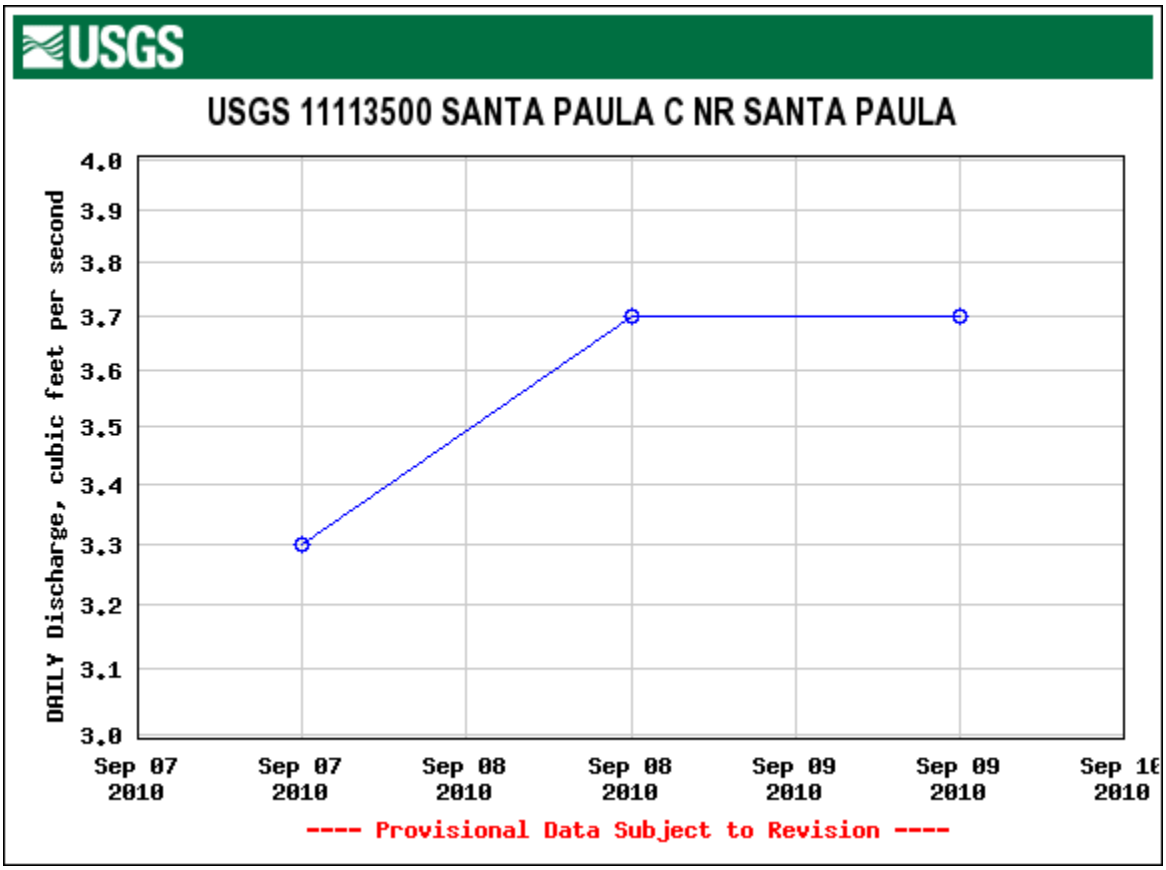

Figure 2. Hydrograph taken at the Santa Paula Creek gauging station during the low flow monitoring on September 8, 2010.

Additionally, velocity and flow rates were recorded using the simple float method at each of the six PSS using the methods described in above in Section 1.3.2. These velocity and flow rates are presented in Table 2 below. The simple float method uses an average channel width and depth within the specified measurement area to calculate flow rates. Because the Creek is an erosive and dynamic system a constant cross-sectional area is not always present. The depth and width measurements presented above are approximate and represent the average measurement within the 50ft section of the PSS used in the velocity/flow rate calculations. Therefore, flow results utilizing the simple float method are intended to identify localized flow rate variations within the Project Area and should not be relied upon as the only source of flow rates for analysis but rather as an informational tool.

As indicated by the results in Table 2 below, the velocity/flow rates vary throughout the Project Area. While the difference in velocities between the PSS locations was limited to within 1 ft/sec for all measurements there was a high amount of variability in the values for flow rate (volume of flow). For example, the measured flow rates, with the exception of PSS 3 and 5 were much higher than those reported upstream at the USGS Stream Gauge. Flow rates are influenced by the presence of riffles, pools, landform structures, and channel morphology. This is demonstrated at PSS No. 1, a relatively linear section of Creek, with the west bank comprised of concrete riprap and the east bank comprised of cobble, boulders

and vertical slopes. These conditions allow for a large amount of water to move through at a relatively high velocity. In contrast to PSS No. 1, PSS No. 3 is a relatively shallow section of the creek with abundant willows (*Salix sp.)* and mulefat (*Baccharis salicifolia*) growing within the channel. The shallow nature of the channel, along with dense aquatic vegetation, provides for slower velocities and a reduced volume of flow in this section of the Creek.

Table 2 –Velocity and Volume Rates at each PSS

PSS Location	Average Depth (feet)	Average Width (feet)	Time (seconds)	Length (feet)	Velocity (ft/sec)	Flow Rate (cubic ft/sec)
1	1.5	10.0	38	50	0.76	16.83
2	1.2	12.0	60	50	1.2	10.16
3	0.9	6.0	75	50	1.5	3.08
4	0.8	15.0	30	50	0.6	17.03
5	1.0	7.0	70	50	1.4	4.22
6	1.3	13.0	85	50	1.7	8.48
Average	1.12	10.50	--	--	1.19	9.97

2.3 VISUAL OBSERVATION RESULTS

Visual observations were made to assess the overall conditions and to identify any potential erosion issues and barriers to fish passage that exist throughout the Project Area. The Creek had assumed a natural flow regime that primarily directed water along either the toe of the east or west bank, occasionally migrating from one bank across the channel to the other bank. Ancillary channels or braids were apparent in several areas, although with substantially reduced flow in comparison to the primary channel. Observation of the low flow channel that was constructed after the 2009/2010 sediment removal action was generally limited to where the flows meandered across the Creek to the opposite bank. While the flows were largely present along the toes of slope in the majority of the Creek, areas downstream toward the Santa Clara River confluence were often found to spread out over a much wider area. Boulders and cobble of various sizes appear to have been deposited or uncovered during storms from the past winter, which appear to provide energy dissipation opportunities throughout the site. Some boulders placed as part of the restoration of the low-flow channel in 2009/2010 were visible within the remnants of the reconstructed channel that meandered between the current low-flow channel location along the east and west banks.

The majority of flows at the upstream extent of the Project Area were observed to flow through the Fish Ladder. The Fish Ladder had sequestered a noticeable amount of sediment (ranging from 1 – 3 feet of accumulation). While the total capacity of each pool appears to be diminished with the onset of sediment aggradation, each pool appears to be able to provide some resting opportunities for steelhead as they move through the Fish Ladder. On average, the west side of the pools appears to sequester more sediment than the east side. However, large cobble and boulders have become wedged into the weir notches of the ladder, likely prohibiting upstream and limiting downstream movement/passage through the ladder by steelhead trout.

Portions of the Creek flowing through the Project Area consisted of small, secondary, braided channels that could support fish during the time that surveys were conducted. The majority of these secondary, braided channels were present in areas downstream of Highway 126. These channels could potentially become

disconnected from the primary low-flow channel under drier conditions, which could lead to the pooling of water. These pools could provide stranding conditions for fish occupying these secondary channels; however, this is a natural phenomenon in dynamic alluvial systems such as this. No major barriers to fish movement were identified during the summer low flow monitoring event, with the exception of those noted in the Fish Ladder.

Little to no woody debris was noted during the monitoring efforts. Woody debris placed during the re-creation of the low flow channel in 2009/2010 was not observed and is presumed to have been carried downstream by the high storm flows earlier in the year. Lower portions of the Project Area (below Highway 126 and above the Santa Clara River confluence) had dense pockets of emerging cattails (*Typha sp.),* mulefat (*Baccharis salicifolia*), and willows (*Salix* sp.) along with a dense cover of weedy species such as, but not limited to white sweet clover (*Melilotus alba*). This vegetation occurs within the same section of Creek where willow cuttings were installed along the reconstructed low flow channel at the completion of the sediment removal project in 2009/2010. However, as noted in the 2010 Smolt Out Survey Report (May 2010) for the Project Area, the majority of the planted cuttings appeared to have been either buried by sediment deposition or washed away due to flows associated with 2010 winter storms. Areas upstream of Highway 126 up to the Fish Ladder contained sporadic and occasionally dense pockets of emerging mulefat and willows. Benches and sand bars formed from past winter storms are occupied by weedy invasive species, dominated by white sweet clover. While some emergent willows and mulefat have been observed, there is little shading of the Creek attributable to stream side vegetation. Shading provided by stream side vegetation is expected to occur once willows and mulefat within the Project Area mature. Plantings are expected to occur in the future to supplement natural recruitment.

3. CONCLUSION

The results of the summer low flow monitoring efforts indicate that current water quality conditions in the Project Area are not optimal for the long term sustainability steelhead trout populations within the Project Area, but appear to be within the range necessary to provide opportunities for downstream migration. Water temperatures are approaching the upper limit of the optimal range for growth and dissolved oxygen levels were below optimal levels. Turbidity levels however were within the acceptable range for steelhead.

No barriers to fish passage were noted within the Project Area with the exception of the Fish Ladder as described above. Sediment accumulation within the resting pools and the presence of large rocks/ boulders within the weir notches of the Fish Ladder likely limit and/or prohibit movement through the ladder. Multiple channels (or evidence of past channels) were observed. As flows continue to recede and/or drier conditions exist, pooling may occur in remnant ancillary channels, which could lead to potential stranding conditions. However, this is a natural occurrence for streams of this nature. No steelhead trout were observed during the summer low flow monitoring efforts.

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Appendix A.
Photo Log

Permanent Sampling Station 1

West-view downstream

West-view upstream

West

Permanent Sampling Station 2

West-view downstream

West-view upstream

West

East-view downstream

East-view upstream

East

Permanent Sampling Station 3

West-view downstream

West-view upstream

West

East-view downstream

East-view upstream

East

Permanent Sampling Station 4

West-view downstream

West-view upstream

West

East-view downstream

East-view upstream

East

Permanent Sampling Station 5

West-view downstream

West-view upstream

West

East-view downstream

East-view upstream

East

Permanent Sampling Station 6

West-view downstream

West-view upstream

West

East-view downstream

East-view upstream

East

2011 ANNUAL REPORT FOR THE SANTA PAULA CREEK FLOOD CONTROL PROJECT

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1.0 INTRODUCTION

1.1 PURPOSE AND NEED

The purpose of this Annual Report is to summarize the data, methodologies and photographs collected from the post-storm monitoring, smolt-out surveys and summer low flow monitoring during 2011. These surveys and/or monitoring events were conducted to comply with Reasonable and Prudent Measures (R&PM) and their associated Terms and Conditions (T&C), specifically T&C No. 1 of R&PM No. 1, of the Biological Opinion (BO) (F-LB-00-16:DRB) issued by the National Oceanic and Atmospheric Administration's (NOAA) and National Marine Fisheries Service (NMFS) on 27 September 2000. R&PM No.3 and corresponding T&C No. 3 require the U.S. Army Corps of Engineers' (Corps). The full text of the reports associated with each of the survey and/or monitoring events are attached in Appendices A, B and C to this report.

1.2 PROJECT/MONITORING LOCATION AND CONDITIONS

Monitoring activities, as described below in Sections 2, 3 and 4, took place within a portion of Santa Paula Creek (Creek) located within the City of Santa Paula, Ventura County, California. The monitoring area (Project Area) extends from Creek's confluence with the Santa Clara River upstream to approximately 500 feet upstream of the fish ladder (Fish Ladder) for a total of approximately 2.1 miles (Figure 1).

The entire Project Area lies within designated Critical Habitat for the southern California distinct population segment (DPS) of endangered steelhead trout (*Onchorhynchus mykiss*). The Project Area has historically functioned as a migratory corridor for steelhead (NMFS, 2000 and 2009).

2.0 METHODOLOGY

Subsequent to each of the monitoring events discussed herein, a monitoring protocol was drafted by Corps biologists, in conjunction with Corps Hydraulics and Hydrology (H&H) staff and NMFS staff. Six permanent sampling stations (PSS) were established as a part of this monitoring protocol. These sampling locations are assumed to provide a representative sample of conditions documented throughout the Project Area. PSSs also serve as permanent photo stations.

2.1 SURVEY EVENTS

2.1.1 POST-STORM MONITORING

Post-storm monitoring occurred after storm events that exceeded daily discharge flow of greater than 500 cubic feet per second (cfs) for the duration of the year 2011. A total of three storm events during the course of 2011 resulted in flows greater than 500 cfs. All three monitoring events took place in March. Water samples were collected from each PSS within 72 hours of discharge levels peaking above 500 cfs and were analyzed for the parameters discussed below in Section 2.2.1. Due to safety constraints, flow rate measurements at each PSS were unable to be attained. For this reason the flow rate data obtained from the USGS gauge just upstream of the Fish Ladder was applied to the entire Project Area. Visual observations of channel conditions were made, at a minimum, at each PSS.

Santa Paula Creek Flood Control Project
Figure 1
Permanent Sampling Stations

2.1.2 SMOLT-OUT SURVEYS

Annual smolt-out surveys were conducted to document the presence/absence of southern California steelhead (*Onchorhynchus mykiss*) smolt within the Project Area in April. These surveys were conducted in the spring of 2011 when flow rates in the Project Area were such that sampling could take place in the channel.

2.1.2 SUMMER LOW-FLOW MONITORING

Annual summer low-flow monitoring was conducted to document the low-flow channel conditions, flow rates and water quality during the summer months, in this case September. Water samples were collected from each PSS and were analyzed for the parameters discussed below in Section 2.2.1. Flow rate measurements, using the methods described below in Section 2.2.2, were taken at each PSS. Visual observations of channel conditions were made, at a minimum, at each PSS.

2.2 SAMPLING METHODS/PROTOCOLS

2.2.1 WATER QUALITY SAMPLING

Water samples were collected from each PSS and were analyzed for temperature (°F), dissolved oxygen ([DO]; percent saturation and mg/L), turbidity [neophelometric turbidity units (NTUs)], and pH levels. Temperature, DO, and pH data were obtained using a Hanna Instruments multi-parameter water quality meter (Model #HI9828). At each of the PSS, a multi-sensor probe, connected to the HI9828 meter, was placed into flowing water approximately two feet from the bank of the Creek. Typically, water samples were collected from the vertical and horizontal centers of the active channel. Recordings for each of the parameters were digitally recorded by the meter and manually recorded into field notebooks at each of the sampling locations. Turbidity data was collected at each of the sampling locations with the use of a Hanna Instruments portable microprocessor turbidity meter (Model #HI93703). Additionally, water samples were obtained at each sampling location, using a clean glass cuvette, approximately one foot from the bank of the Creek for the purpose of obtaining a turbidity reading. Samples were immediately placed within the turbidity meter upon collection.

2.2.2 FLOW RATE MEASUREMENTS

Flow rate data was obtained from the USGS gauge located just upstream of the project, in order to provide a standard measure that could be replicated across all monitoring reports. It should be noted however that braiding of the main low flow channel in downstream areas may have resulted in decreased flow velocities in these areas. These decreased velocities are likely to be minor.

Because water in a channel flows at different rates, depending on its location, when conditions allowed (generally summer sampling only) additional flow rate measurements were taken using a simple float at each of the PSS. This will serve to document localized increases/decreases in flow rates within the Project Area (i.e., energy dissipation from boulder clusters, landform changes causing increased flow rates, etc.). A partially filled plastic water bottle, sitting approximately one inch below the water line, was released upstream and the time it took to reach a specific distance recorded. Approximate channel width and average depth were recorded and used in calculating flow rates at each sampling location. The simple float method uses an average channel width and depth within the specified measurement area to calculate flow rates. Because the Creek is an erosive and dynamic system a constant cross-

sectional area is not always present. Therefore, flow results utilizing the simple float method are intended to identify localized flow rate variations within the Project Area and should not be relied upon as the only source of flow rates for analysis but rather as an informational tool.

2.2.3 STEELHEAD SMOLT SURVEYS

The surveys were performed by a team of two qualified biologists methodically walking the length of the Project Area from the confluence of Santa Paula Creek and the Santa Clara River upstream to approximately 500 feet upstream of the fish ladder. All areas where standing or flowing water was present were visually inspected. In portions of the channel where water was relatively shallow (< 1 foot) and clear (majority of survey area), visual observations were performed for the presence of fish. Dip nets with 1/8" mesh were utilized to probe under and around boulders. In areas that exhibited waters deeper than 1-foot, 1/8" mesh block netting was installed along the downstream sections. Biologists, using 1/8" mesh seine netting, then seined each section from the upstream extent of the deeper water downstream towards the block netting and documented all fish present within the area.

More traditional passive survey methods such as the utilization of rotary screw or incline plane screen traps were not employed due to the absence of deeper water, which is required for installation and to achieve trap efficiency. Additionally, the lack of channel depth and lack of large pools did not provide adequate conditions for the implementation of snorkel survey techniques/methods. Photographs were also taken at the each of the PSS.

2.2.4 VISUAL OBSERVATIONS

Visual observations were made by driving each of the access roads above the east and west banks of the Creek. Additionally, monitors walked along the Project Area reach to inspect conditions, including the fish passage facility. A series of photographs were taken at each of the PSS. A field log detailing the water's appearance, any noticeable erosion occurring within the Project Area, any potential barriers to steelhead migratory capabilities, amount of woody debris present, and the date and time of each observation was completed at each PSS.

3.0 RESULTS

3.1 WATER QUALITY SAMPLING

Water quality sampling occurred during four separate survey events in 2011. This included three post-storm and one summer low-flow surveys. The results of these sampling events are presented below in Table 3.1. A discussion of the results as they pertain to Creek conditions for steelhead is presented in Section 4.0.

Table 3.1 – Water Quality Monitoring Results for 2011

Permanent Sampling Station	Survey Event	Temperature (°F)	DO (% Saturation)	DO (mg/L)	Turbidity (NTUs)	pH
1	Post-storm No. 1	58.73	90.8	9.12	42.5	7.87
	Post-storm No. 2	51.84	45.5	4.99	320	8.99
	Post-storm No. 3	53.98	23.8	2.8	256	8.92

Permanent Sampling Station	Survey Event	Temperature (°F)	DO (% Saturation)	DO (mg/L)	Turbidity (NTUs)	pH
	Summer Low-flow	71.00	90.00	7.76	27.52	7.67
2	Post-storm No. 1	59.67	91.9	9.15	47.06	8.3
	Post-storm No. 2	52.21	39.9	4.17	351	9.33
	Post-storm No. 3	54.5	25.9	2.72	296	9.1
	Summer Low-flow	72.50	84.40	7.30	10.09	7.71
3	Post-storm No. 1	60.58	90.5	8.88	40.74	8.06
	Post-storm No. 2	52.52	43.5	4.69	328	9.51
	Post-storm No. 3	54.9	29.6	3.06	310	7.85
	Summer Low-flow	73.55	82.70	6.99	9.29	7.76
4	Post-storm No. 1	61.74	91.4	8.88	40.94	8.37
	Post-storm No. 2	52.58	42.5	4.57	356	9.47
	Post-storm No. 3	55.32	29	3.04	305	8.84
	Summer Low-flow	74.78	81.50	6.87	6.02	7.84
5	Post-storm No. 1	62.97	90.5	8.69	46.57	8.07
	Post-storm No. 2	52.76	43.8	4.75	357	9.4
	Post-storm No. 3	55.85	32	3.39	258	9.1
	Summer Low-flow	74.25	77.90	6.55	7.93	7.78
6	Post-storm No. 1	64.48	91	8.62	47.84	8.15
	Post-storm No. 2	52.94	42.8	4.71	359	9.36
	Post-storm No. 3	57.43	45.6	4.67	333	8.56
	Summer Low-flow	74.02	74.60	6.16	5.66	8.89

3.2 FLOW RATES

As mentioned above, flow rates were obtained from data collected from the USGS gauge located just upstream from the project. Additionally, velocity and flow rates were recorded using the simple float method at each of the six PSS. Flow rates for each of the survey events are presented below in Tables 3.2 and 3.3.

Table 3.2 – USGS Santa Paula Stream Gauge Flow Rates for Survey Events in 2011.

Monitoring/Survey Event	USGS Santa Paula Creek Stream Gauge Reported Flow Rate (cfs)* During Monitoring Events	USGS Santa Paula Creek Stream Gauge Reported Peak Storm Flow Rates (cfs)*
Post Storm Event – 10 March 2011	25	2000
Post Storm Event – 23 March 2011	110	12,400
Post Storm Event – 28 March 2011	105	2000
Smolt-out – 19 April 2011	12	n/a
Summer Low-flow – September 2011	5	n/a

* Approximate flow rate based on USGS hydrograph.

Table 3.3 – Measured Velocity and Volume Rates at each PSS during the Summer of 2011

PSS Location	Average Depth (feet)	Average Width (feet)	Time (seconds)	Length (feet)	Velocity (ft/sec)	Flow Rate (cubic ft/sec)
1	1.2	11.5	60	50	1.2	14.08
2	2.1	14.0	150	50	3.00	74.97
3	1.2	6.5	50	50	1.00	6.63
4	1.0	12.0	47.50	50	0.95	9.69
5	0.9	25.0	27.5	50	0.55	10.52
6	1.1	14.0	75	50	1.5	19.64
Average	1.25	13.83	68.33	--	1.37	22.59

3.3 STEELHEAD SMOLT SURVEYS AND INCIDENTAL OBSERVATIONS

No steelhead were observed during the 2011 smolt out surveys, although 35 arroyo chub (*Gila orcuttii*), 5 partially armored threespine stickleback (*Gasterosteus aculeatus aculeatus*), 5 Santa Ana sucker (*Catostomus santaanae*) and 11 Owens sucker (*Catostomus fumeiventris*) were documented within the survey area. Flow rate data obtained from the USGS gauge located just upstream of the project, indicated that during the surveys water in Santa Paula Creek was moving at a rate of approximately 12 cfs.

The majority of the Project Area was devoid of vegetation and is likely due to the significant storm flows that occurred in February/March 2011; some patches of emerging native vegetation were observed within the portions of the Project Area. The Creek had assumed a natural flow regime that primarily directed water along either the toe of the east or west bank, occasionally migrating from one bank across the channel to the other bank. Ancillary channels or braids were apparent in several areas, although with substantially reduced flow in comparison to the primary channel.

3.4 VISUAL OBSERVATIONS

Visual observations were made to assess the overall conditions of the Creek to document such items/occurrences, but not limited to, any noticeable erosion occurring within the Project Area, any potential barriers to steelhead migratory capabilities, and amount/presence of woody debris.

Creek conditions after each of the post-storm survey events were generally consistent throughout the year. Energy dissipation was apparent on the downstream side of roughness elements existing within the channel (i.e. boulders). Boulders and cobble of various sizes appear to have been deposited or uncovered during the storm events, which appeared to provide energy dissipation opportunities throughout the Project Area.

During the 2011 post-storm monitoring events it was noted that the majority of flows from the Creek were observed to flow over the concrete apron on the west side of the Fish Ladder. A portion of the upstream flow did make a sharp turn to the east and entered the Fish Ladder. The Fish Ladder had sequestered a noticeable amount of sediment. While the total capacity of each pool had diminished with the onset of sediment aggradation, each pool appeared to be able to provide some resting opportunities for steelhead as they move through the Fish Ladder. On average, the west side of the pools sequestered

more sediment than the east side. There was an approximately 3 - 4 foot drop between the fourth and fifth pools, starting from the top of the ladder. This is due in large part to small boulders and debris blocking the notch in the ladder and was likely prohibited upstream movement through the Fish Ladder. This impediment to fish passage was removed in June 2011 during a wholesale removal of sediment from the Fish Ladder.

During all of the post-storm monitoring events the Creek was observed assuming a natural flow regime that primarily directed water along either the toe of the east or west bank, occasionally migrating from one bank across the channel to the other bank. Ancillary channels or braids were apparent in several areas, although with substantially reduced flow in comparison to the primary channel.

During the summer months the Creek had assumed a natural flow regime that primarily directed water along either the toe of the east or west bank, occasionally migrating from one bank across the channel to the other bank. Ancillary channels or braids were apparent in several areas, although with substantially reduced flow in comparison to the primary channel. The majority of these secondary, braided channels were present in areas downstream of Highway 126. All of flows at the upstream extent of the Project Area were observed to flow through the Fish Ladder; this was mainly due the placement of a large earthen berm along the top of the western apron during the June 2011 cleanout of the Fish Ladder. The Fish Ladder had sequestered a minimal amount of sediment (ranging from 0.5 – 2 feet of accumulation) since the cleanout. Sediment appears to accumulate toward the edges of the pools first, while the center of the pools appears to transport sediment better. While the total capacity of each pool appears to be minimally diminished with the onset of sediment aggradation, each pool appeared to be able to provide adequate resting opportunities for steelhead as they move through the Fish Ladder. On average, the west side of the pools appears to sequester more sediment than the east side. Large cobble and boulders, noted in previous surveys, were not observed in the weir notches or pools of the ladder due the June 2011 cleanout of the Fish Ladder. No impediments to movement were observed within the Fish Ladder that would likely prohibit upstream or downstream movement/passage through the Fish Ladder by steelhead trout after the June 2011 cleanout of the Fish Ladder.

Little to no woody debris was noted during any of the monitoring efforts.

4.0 DISCUSSION

A discussion of the results detailed in Section 3 of this report is presented below. Where applicable a discussion of trends observed in comparison to the previous year(s) data is presented as they pertain to water quality, steelhead presence and Creek conditions.

4.1 WATER QUALITY

Temperature. Water temperature within the Creek fluctuates throughout the year. As was expected, samples taken during the winter months were much cooler than those taken in the summer. As flows receded into the summer month's slower moving sections of the Creek and/or large pools where slow moving or stagnant water results in increased water temperatures. Temperatures during the sampling

events in 2011 ranged from approximately 52ºF – 74ºF. The highest temperature readings were obtained during the summer-low flow monitoring event in September 2011. Steelhead trout can tolerate temperatures ranging from 50ºF – 70ºF, however their optimal range for growth falls between 55ºF to 65ºF. Elevated temperatures above 70ºF have been known to cause increased potential for fish mortality (Rich, 2000). The cooler temperatures present in the winter months are suitable for trout growth and development; higher temperatures present in the summer and fall, while not optimal for growth are tolerable for individuals using the Project Area solely as a migratory corridor as the exposure to the elevated temperatures will be of a short duration.

The upper and lower range of temperatures observed during 2011 surveys exceeded those observed in 2010. While the cooler water temperatures in the winter have a minimal effect on potential resident populations of steelhead trout the higher temperatures in the summer months exceeds the upper end of the tolerable range for this species. The lack of substantial vegetative cover and/or the presence of deeper pools within the Creek contribute significantly to the higher temperatures found in the summer months.

Dissolved Oxygen. Water quality in the Creek after a large storm event is generally expected to be poor; especially when Mud Creek is contributing flow to the system. Dissolved oxygen (DO) plays a key role in the survival and growth of steelhead trout. For optimal growth a DO level near or at 100% saturation and above 9 mg/L is required (Davis, 1975). However, in cooler water temperatures trout have been known to survive in DO concentrations as low as 1.5 to 2.0 mg/L (Moyle 2002). Samples taken during post-storm monitoring events show an average saturation (% saturation) of 55.00 (ranging 23.8 – 91.9% saturation) and an average DO level of 5.61 mg/L (ranging from 2.72 – 9.15 mg/L). Results from summer sampling show an average saturation of 81.85% (ranging from 74.6 – 90.0%) and an average DO level of 6.94 mg/L (ranging from 6.16 – 7.76 mg/L). These are suboptimal DO conditions for steelhead trout development. These levels however are tolerable for individuals using the Project Area solely as a migratory corridor as exposure to low DO levels will be of a short duration.

On the average dissolved oxygen levels documented within the Creek during the 2011 were similar to those observed in 2010.

Turbidity. Turbidity levels of greater than 50 NTU's have been known to be harmful to steelhead trout and can affect their ability to search for food (Oregon, 2001). High levels of turbidity can cause sediment and particles to accumulate in the gills make it difficult for steelhead trout to breath. While southern steelhead have been known to survive in varying levels of turbidity, higher levels have been known to be fatal to salmonids (Bash et al., 2001). Post-storm water quality sampling resulted in an average of 227.48 NTU's within the PSS's in 2011 while the average for samples taken during the summer was 11.09 NTU's. The turbidity levels ranged from approximately 40 – 360 NTU's during the post-storm sampling, and 5 – 27 NTU's during the summer. Increased turbidity is not unexpected in the lower reach of this watershed due to high turbidity contributions from Mud Creek, whose confluence with the Creek is located upstream. The varying turbidity levels when comparing each of the post-storm

and summer low-flow sampling events could be caused by localized influences such as storm water runoff, bank erosion, agricultural influence, and plankton blooms. Turbidity levels documented in the summer of 2011 are well within the suitable range of conditions known for steelhead.

Turbidity levels observed during post-storm sampling events in 2011 were significantly higher than those documented in 2010. While the cause for this increased turbidity is not known it is suspected that the increased levels are a result of increased storm water runoff and/or flows from Mud Creek, located upstream of the Project Area. Those levels observed during the summer of 2011 were similar to those observed in 2010.

Velocity/Flow Rates. The velocity/flow rates varied throughout the Project Area. As would be expected, velocity/flow rates after a significant storm event were substantial and averaged 80.00 cfs during 2011 monitoring events (ranging from 25 – 110 cfs). This is in stark contrast to the flows during the smolt-out and summer low-flow surveys for which the average flow rate reported at the USGS Santa Paula Creek Stream Gauge averaged 8.50 cfs. Measured flows during the summer low-flow surveys averaged 22.59 cfs (ranging from approximately 6 – 75 cfs). Flow rates are influenced by the presence of riffles, pools, landform structures, and channel morphology. This was demonstrated at PSS No. 1, a relatively linear section of Creek, with the west bank comprised of concrete riprap and the east bank comprised of cobble, boulders and vertical slopes. These conditions allow for a large amount of water to move through at a relatively high velocity. In contrast to PSS No. 1, PSS No. 3 is generally found to be a relatively shallow section of the Creek, often with abundant willows (*Salix sp.)* and mulefat (*Baccharis salicifolia*) growing within the channel. The shallow nature of the channel, along with dense aquatic vegetation, provides for slower velocities and a reduced volume of flow in this section of the Creek.

While the reported flows during the summer low-flow monitoring were similar in both years the measured flows in 2011 were approximately 10 cfs higher than were documented in 2010. This may be a result of changes in the channel morphology resulting from early 2011 storm flows or a general increase in surface flow due to the large storm events of the 2011 storm season.

4.2 STEELHEAD PRESENCE

As stated above in Section 3.3 no steelhead were observed during any of the 2011 surveys. The most recent recorded steelhead occurrences within or adjacent to the Project Area were in January 2010; a total of three steelhead were detected within the Project Area during sediment removal activities (Refer to Appendix B for additional information). In addition to the occurrences noted during the sediment removal activities, a review of the California Natural Diversity Database (CNDDB) reported one record (1988) of southern California steelhead located approximately ¼-mile upstream from the fish ladder (CDFG, 2010). This record indicates that three fish were caught during surveys of the area in 1987 and several were seen in the same area in 1988.

In June/July 2011 approximately 40 – 50 steelhead trout were reportedly observed in a large, deep pool approximately 4.25 miles upstream of the Project Area near Thomas Aquinas College at the site of a Cal Trans bridge repair project.

Given the Creek conditions observed during surveys conducted in 2011 it was not surprising that steelhead were not observed within the Project Area. Water quality and habitat conditions in the Project Area are not optimal for the long term sustainability steelhead trout populations within the Project Area, but appear to be within the range necessary to provide opportunities for upstream/downstream migration.

4.3 CREEK CONDITIONS

Creek conditions within the Project Area during the surveys were suboptimal for residential populations of steelhead to persist, but would provide acceptable conditions for potential upstream/downstream migration of fish through the Project Area. Conditions in 2011 were similar to those observed in 2010. The project's biological opinion assumes the portion of Santa Paula Creek flowing through the Project Area functions as a migratory corridor for the species, not live in habitat (NMFS, 2000). Steelhead require freshwater migration corridors with suitable natural cover, such as, but not limited to, submerged and overhanging large wood, aquatic vegetation, large rocks and boulders, side channels, deep pools, and undercut banks to support juvenile and adult mobility and survival. The Project Area currently exhibits some of these features, including large rocks and boulders and side channels. However, the site does not currently support much woody debris, aquatic vegetation, or deep pools and undercut banks. The lack of these habitat characteristics leaves aquatic species vulnerable to predation and elevated water temperatures; however it is to be expected following large scale sediment removal projects. These habitat characteristics would be expected to reform as the creek is subject to the processes of erosion and revegetation from natural reformulation of the seed bank and plantings.

In June 2011 willow (*Salix sp.)* and mulefat (*Baccharis salicifolia*) cuttings were planted, on either side of the active channel, for the length of the Project Area. During the September 2011 low-flow monitoring the majority of the cuttings appeared healthy and were showing signs of positive upward growth; some of the cuttings had newly formed branches/leaves.

5.0 CONCLUSION

Although detected in early 2010 towards the end of sediment removal activities and recently observed in upstream areas of the Creek, no steelhead were identified during the 2011 efforts. As a result of storm flows in February and March 2011, the Project Area is, for the most part, devoid of mature vegetation. Emergent riparian and aquatic vegetation was observed to have been naturally recruiting, especially below the Highway 126 bridge. Willow and mulefat cuttings were also implemented along the banks of the Creek between the fish ladder and the confluence of the Santa Clara River and appeared to be healthy, as recently as January 2012. The lack of overhanging vegetation, deep pools, cut banks and accumulated woody debris and substantial vegetative cover provide suboptimal habitat conditions for the persistence of steelhead populations within the Project Area. Project Area conditions

in 2011 are not optimal for the long term sustainability steelhead trout populations; however, these levels are tolerable for individuals using the Project Area solely as a migratory corridor as exposure to low DO levels, turbidity and temperature extremes will be of a short duration.

As is expected after large storm events, turbidity was generally poor during post-storm monitoring events while temperatures remained within tolerable ranges. Dissolved oxygen levels fluctuated depending on the time of year. Summer low-flow monitoring noted extremely low dissolved oxygen levels while temperatures were at the upper end of the tolerable range for steelhead trout.

The pools of the Fish Ladder filled with sediment as a result of storm events in February and March of 2011. This reduced the functionality of the Fish Ladder providing a reduction in the areas available for refuge as steelhead move upstream/downstream in the Creek. The Fish Ladder cleanout in June 2011 corrected the reduced functionality of the ladder; as of the last survey effort of 2011 the Fish Ladder was functioning with no observed barriers to movement.

Overtime, depending on the severity of future storm events, it is expected that riparian vegetation will naturally recruit naturally within the previously disturbed areas and the planted cuttings will flourish. If Creek flows allow this vegetation to mature, the reemergence of a natural riparian corridor would increase the potential for presence of steelhead during subsequent surveys.

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Appendix A
2011 Post Storm Monitoring Reports

2011 POST STORM MONITORING REPORT NO. 1 FOR THE SANTA PAULA CREEK FLOOD CONTROL PROJECT

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March 2011

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1. INTRODUCTION

1.1 PURPOSE AND NEED

The purpose of this Post Storm Monitoring Report is to comply with Reasonable and Prudent Measure (R&PM) No. 3 and its associated Terms and Conditions (T&C), specifically T&C No. 2, of the Biological Opinion (BO) (F-LB-00-16:DRB) issued by the National Oceanic and Atmospheric Administration's (NOAA) and National Marine Fisheries Service (NMFS) on September 27, 2000 for the Santa Paula Creek Flood Control Project (Project). R&PM No.3 and corresponding T&C No. 2 require the U.S. Army Corps of Engineers' (Corps) to perform monitoring after storm events that exceeded daily mean discharge flows of 500 cubic feet per second (cfs) for a period of five years. The results of post storm monitoring events are important to evaluate the ability of the Project to not only provide flood protection, but also to function as a migratory corridor in designated critical habitat for the southern California distinct population segment (DPS) of endangered steelhead trout (*Oncorhynchus mykiss*).

1.2 SUMMARY OF STORM EVENT

Once such storm event, exceeding the 500 cfs monitoring threshold, occurred on 26 February, 2011. Figure 1 (see below) shows a peak level of approximately 2000 cubic feet per second (cfs) on 26 February. These periods of high flow can mobilize steelhead migration and/or emigration within the watershed. Once flows subside, the steelhead trout will seek refuge in pools of the low flow channel and would theoretically continue along their migratory route.

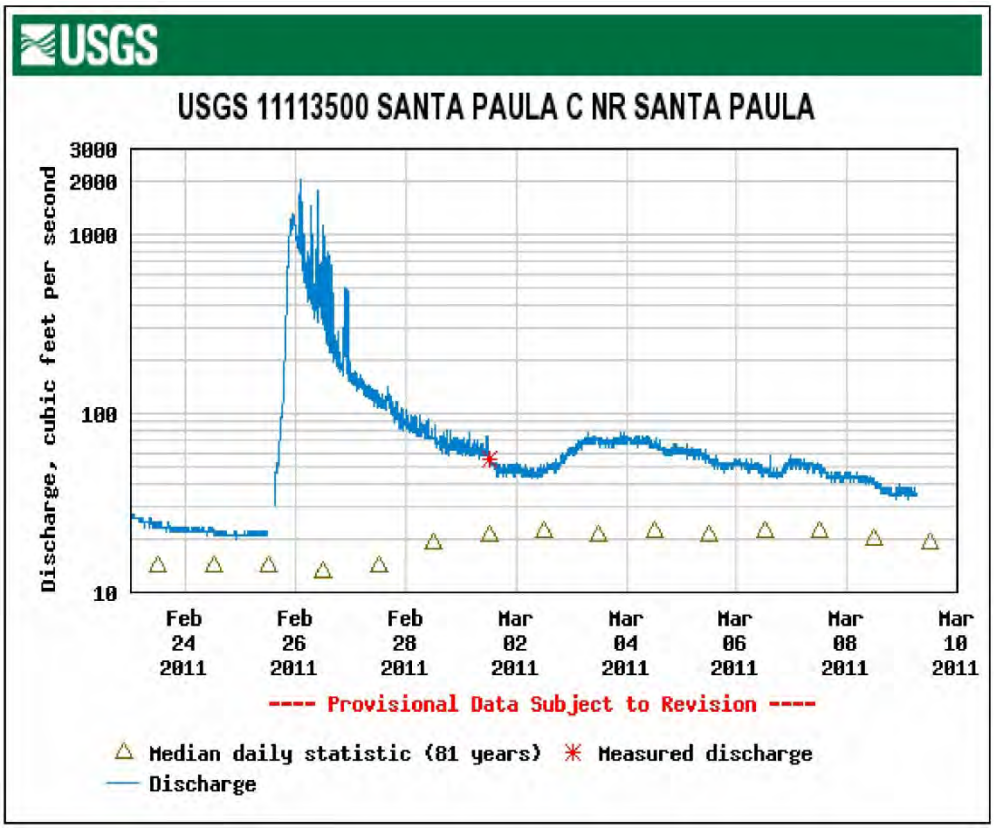

Figure 1. Hydrograph of monitored storm event taken at the Santa Paula Creek gauging station

1.3 PROJECT LOCATION

Post-storm monitoring activities took place within the United States Army Corps of Engineers (Corps) Project located within the City of Santa Paula, Ventura County, California. The monitoring area extends from Santa Paula Creek's (Creek) confluence with the Santa Clara River upstream approximately 2 miles to approximately 500 feet upstream of the fish ladder (Project Area). Please refer to Figure 2 for a graphical depiction of the Project Area.

The entire Project lies within designated Critical Habitat for the southern California distinct population segment (DPS) of endangered steelhead trout (*Oncorhynchus mykiss*). The Project Area is thought to function as a migratory corridor for steelhead, as stated in the biological opinion (BO) for the project (NMFS, 2000 and 2009).

1.4 METHODOLOGY

Subsequent to this storm event, a monitoring protocol was drafted by Corps biologists, in conjunction with Corps Hydraulics and Hydrology (H&H) staff and NMFS staff. Six permanent sampling stations (PSS) were established as a part of this monitoring protocol (refer to Figure 2 below). These sampling locations are assumed to provide a representative sample of conditions documented throughout the Project's low flow channel. PSS's also serve as permanent photo stations. Photo documentation is provided in Appendix A. Results of the post-storm water quality monitoring, conducted on 10 March 2011, are discussed below in Section 2.

1.3.1 Water Quality Sampling

Water samples were collected from these six locations within 72 hours of discharge levels peaking above 500 cfs and were analyzed for temperature (°F), dissolved oxygen ([DO];% saturation and mg/L), turbidity [neophelometric turbidity units (NTUs)], and pH levels. Temperature, DO, and pH data were obtained using a Hanna Instruments multi-parameter water quality meter (Model #HI9828). At each of the six sampling locations, a multi-sensor probe, connected to the HI9828 meter, was placed into flowing water approximately two feet from the bank of the Creek. Recordings for each of the parameters were digitally recorded by the meter and manually recorded into field notebooks at each of the sampling locations. Turbidity data was collected at each of the sampling locations with the use of a Hanna Instruments portable microprocessor turbidity meter (Model #HI93703). Water samples were obtained at each sampling location, using a clean glass cuvette, approximately one foot from the bank of the Creek. Samples were immediately placed within the turbidity meter upon collection. Recordings were digitally recorded by the meter and manually recorded into field notebooks at each of the sampling locations. Typically, water samples would be collected from the vertical and horizontal centers of the active channel; however, due to safety constraints associated with moderate to heavy flows, this was not possible. Results of the monitoring efforts are detailed below in Section 2.

Figure 2. Santa Paula Creek PSS locations

1.3.2 Flow Rate Measurements

In order to remain consistent with previous post-storm reports and due to the same safety constraints discussed in the section above, flow rate measurements along specified areas of the Project Area were unable to be attained. For this reason the flow rate data obtained from the USGS gauge just upstream of the Project was applied to the entire Project Area.

1.3.3 Visual Observation Methods

Visual observations were conducted by driving each of the access roads above the east and west banks of the Creek. Additionally, monitors walked along the Project Area reach to inspect conditions, including the fish passage facility. A series of photographs was taken at each of the six pre-defined sampling locations. Photographic documentation, included as Appendix A of this report, was performed to record the conditions at each of the sampling sites and throughout the greater Project Area. A field log detailing the water's appearance, any noticeable erosion occurring within the Project Area, any potential barriers to steelhead migratory capabilities, amount of woody debris present, and the date and time of sample collection was completed at each sampling location.

2. RESULTS AND DISCUSSION

2.1 WATER QUALITY SAMPLING

The monitored storm occurred on 26 February, 2011. Post-storm water quality monitoring was conducted between 10:00 a.m. and 3:30 p.m. on 10 March 2011. Results for the post-storm water monitoring event are listed in Table 1 below.

Table 1 Post-storm analytical water quality results for March 10, 2011

Sampling Location	Temperature (ºF)	DO (% Saturation)	DO (mg/L)	Turbidity (NTUs)	pH
1	58.73	90.8	9.12	42.5	7.87
2	59.67	91.9	9.15	47.06	8.30
3	60.58	90.5	8.88	40.74	8.06
4	61.74	91.4	8.88	40.94	8.37
5	62.97	90.5	8.69	46.57	8.07
6	64.48	91.0	8.62	47.84	8.15
Average	61.36	91.02	8.89	44.28	8.14

Steelhead trout can tolerate temperatures ranging from 50º F – 70º F, however their optimal range for growth falls between 55º F – 65º F. Elevated temperatures above 70º F has been known to cause increased potential for fish mortality (Rich, 2000). Temperatures recorded during this the post-storm monitoring event indicate that water temperatures are, on the average, relatively cool with an average temperature just above 61º F. This temperature is nearing the upper end of the optimal range for growth and fairly typical for the time of year. These temperatures would be suitable for individuals using the Project Area as a migratory corridor as exposure to the documented temperatures will be of a short duration.

Dissolved oxygen (DO) plays a key role in the survival and growth of steelhead trout. For optimal growth and survival a DO level near or at 100% saturation and above 9 mg/L is required (Davis, 1975). However, in cooler water temperatures trout have been known to survive in DO concentrations as low as 1.5 to 2.0 mg/L (Moyle 2002). The results above show an average saturation (% saturation) only 91.02 and an average DO level (mg/L) of 8.89 mg/L. Currently, these are suboptimal DO conditions for steelhead trout development and would likely result in mortality if resident populations were to exist within the Project Area. These levels however are tolerable for individuals using the Project Area solely as a migratory corridor as exposure to low DO levels will be of a short duration.

Turbidity levels of greater than 50 NTU's have been known to be harmful to steelhead trout and can affect their ability to search for food (Oregon, 2001). High levels of turbidity can cause sediment and particles to accumulate in the gills make it difficult for steelhead trout to breath. While southern steelhead have been known to survive in varying levels of turbidity, higher levels have been known to be fatal to salmonids (Bash et al., 2001). Turbidity levels presented in Table 1 average 44.28 NTU's. Turbidity levels documented in Table 1 are within the suitable range of conditions known for steelhead.

2.2 FLOW RATE MEASUREMENTS

As mentioned above, flow rates were obtained from data collected from the USGS gauge located just upstream from the project. Flows, as reported by the USGS gauge, occurred at a rate of approximately 25 cfs during the post-stormwater monitoring event on 10 March 2011.

2.3 VISUAL OBSERVATIONS

Visual observations were made to assess the overall conditions and to identify any potential erosion issues and barriers to fish passage that exist throughout the Project Area. The Creek had assumed a natural flow regime that primarily directed water along the toe of the east and west banks with the constructed low flow channel not visible due to substantial flows within the Creek. While the flows are largely present along the toes of slope in the majority of the Creek, areas downstream toward the Santa Clara River confluence were often found to be more widespread and, on occasion, spanning half the width of the channel.

The majority of flows from the Creek were observed to flow over the concrete apron on the west side of the fish ladder. A portion of the upstream flow does make a sharp turn to the east and enter the fish ladder. The fish ladder has sequestered a noticeable amount of sediment. While the total capacity of each pool has diminished with the onset of sediment aggradation, each pool appears to be able to provide some resting opportunities for steelhead as they move through the fish ladder. On average, the west side of the pools sequestered more sediment than the east side. There is an approximately 3 - 4 foot drop between the fourth and fifth pools, starting from the top of the ladder. This is due in large part to small boulders and debris blocking the notch in the ladder.

Other than the notch blockage in the fish ladder no major barriers to fish movement were identified. It was noted that in-channel braiding may occur when flows begin to recede to a more typical low-flow condition. This potential occurrence is likely due to the magnitude of the storm flows which resulted in breaching of the low-flow channel in most areas and overall increased water load from upland runoff. Several portions of the Creek through the Project Area consisted of small, secondary, braided channels that could support fish during the time that surveys were conducted. These channels could potentially become disconnected from the primary low-flow channel when drier conditions prevail. This could lead to the pooling of water which could provide stranding conditions for fish occupying these secondary channels. This condition occurs naturally in alluvial systems. Little to no woody debris was noted during the post-storm monitoring field efforts. Energy dissipation was apparent on the downstream side of roughness elements existing within the channel (i.e. boulders). Boulders and cobble of various sizes appear to have been deposited or uncovered during the storm, which appear to provide energy dissipation opportunities throughout the site.

No steelhead trout were observed during this monitoring effort.

3. CONCLUSION

The results of this post-storm monitoring effort indicate that current water quality conditions in the Project Area are not generally conducive to the persistence of and/or movement of steelhead trout. While water temperatures are within the upper optimal range for growth for steelhead trout, dissolved oxygen levels are within the suboptimal range for steelhead trout development and would likely result in mortality if resident populations were to exist within the Project Area. Turbidity levels were approaching the upper limits of the acceptable range for steelhead. Flows peaked at 2000 cfs on 26 February and receded to approximately 25 cfs by the time the survey was conducted on 11 March. Flows dropped to below approximately 100 cfs within 48 hours of the peak event. A lack of woody debris was noted in all areas of the Project Area.

No barriers to fish passage were noted within the channel (excluding the fish ladder) in the Project Area; multiple channels were observed. As flows recede and organize into a typical low flow condition, pooling may occur in remnant ancillary channels, which could lead to potential stranding conditions. However, this is a natural occurrence for streams of this nature. The 3 – 4 foot elevation gap between pools four and five (starting from the top of the fish ladder) would likely preclude the upstream movement of steelhead trout within Santa Paula Creek under most flow conditions. No steelhead trout were observed during the post-storm monitoring efforts.

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USACE (U.S. Army Corps of Engineers). 2009. Final Supplemental Environmental Assessment/Addendum, Santa Paula Creek Flood Control Sediment Removal Project, Ventura County, California.

Appendix A.
Photo Log

As mentioned in Section 1.3 (Methodology), photo locations were established during previous monitoring surveys. Photographic documentation was taken along the west and east banks of each photo location. A series of panoramic photos were taken at each photo location; however, for purposes of this report, only photos displaying upstream, downstream, and central portions along the west and east banks at each photo location are included. All additional photos are available upon request.

Photo Location 1

West-downstream

West-upstream

West

Photo Location 2

West-view downstream

West-view upstream

West

East-view downstream

East-view upstream

East

Photo Location 3

West-view downstream

West-view upstream

West

East-view downstream

East-view upstream

East

Photo Location 4

West-view downstream

West-view upstream

West

East-view downstream

East-view upstream

East

Photo Location 5

West-view downstream

West-view upstream

West

East-view downstream

East-view upstream

East

Photo Location 6

West-view downstream

West-view upstream

West

East-view downstream

East-view upstream

East

Fish Ladder

2011 POST STORM MONITORING REPORT NO. 2 FOR THE SANTA PAULA CREEK FLOOD CONTROL PROJECT

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March 2011

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Table 1 Post-storm analytical water quality results for 23 March 2011. 4

1. INTRODUCTION

1.1 PURPOSE AND NEED

The purpose of this Post Storm Monitoring Report is to comply with Reasonable and Prudent Measure (R&PM) No. 3 and its associated Terms and Conditions (T&C), specifically T&C No. 2, of the Biological Opinion (BO) (F-LB-00-16:DRB) issued by the National Oceanic and Atmospheric Administration's (NOAA) and National Marine Fisheries Service (NMFS) on September 27, 2000 for the Santa Paula Creek Flood Control Project (Project). R&PM No.3 and corresponding T&C No. 2 require the U.S. Army Corps of Engineers' (Corps) to perform monitoring after storm events that exceeded daily mean discharge flows of 500 cubic feet per second (cfs) for a period of five years. The results of post storm monitoring events are important to evaluate the ability of the Project to not only provide flood protection, but also to function as a migratory corridor in designated critical habitat for the southern California distinct population segment (DPS) of endangered steelhead trout (*Oncorhynchus mykiss*).

1.2 SUMMARY OF STORM EVENT

One such storm event occurred on 20 March, 2011. Figure 1 shows a peak level of approximately 12,400 cubic feet per second (cfs) on 20 March 2011. The hydrograph for this event is presented in Figure 1, below.

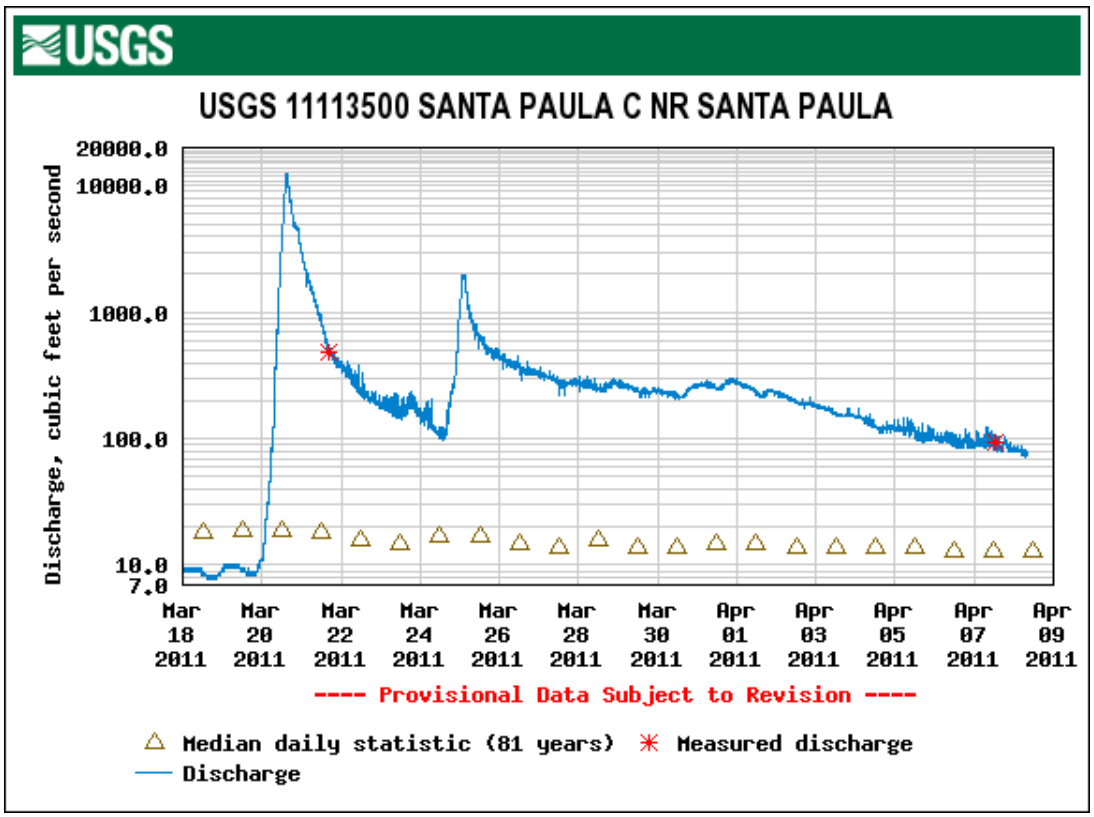

Figure 1. Hydrograph of monitored storm event taken at the Santa Paula Creek gauging station

1.3 PROJECT LOCATION

Post-storm monitoring activities took place within the United States Army Corps of Engineers (Corps) Project located within the City of Santa Paula, Ventura County, California. The monitoring area extends

from Santa Paula Creek's (Creek) confluence with the Santa Clara River upstream approximately 2.0 miles to approximately 500 feet upstream of the fish ladder (Project Area). Please refer to Figure 2 for a graphical depiction of the Project Area.

The entire Project lies within designated Critical Habitat for the southern California distinct population segment (DPS) of endangered steelhead trout (*Oncorhynchus mykiss*). The Project Area is thought to function as a migratory corridor for steelhead, as stated in the biological opinion (BO) for the Project (NMFS, 2000 and 2009).

1.4 METHODOLOGY

Subsequent to this storm event, a monitoring protocol was drafted by Corps biologists, in conjunction with Corps Hydraulics and Hydrology (H&H) staff and NMFS staff. Six permanent sampling stations (PSS) were established as a part of this monitoring protocol. These sampling locations are assumed to provide a representative sample of conditions documented throughout the Project's low flow channel. PSS's also serve as permanent photo stations. Results of the post-storm water quality monitoring, conducted on 23 March 2011, are discussed below in Section 2.

1.4.1 Water Quality Sampling

Water samples were collected from these six locations within 72 hours of discharge levels peaking above 500 cfs and were analyzed for temperature (°F), dissolved oxygen ([DO]; % saturation and mg/L), turbidity [neophelometric turbidity units (NTUs)], and pH levels. Temperature, DO, and pH data were obtained using a Hanna Instruments multi-parameter water quality meter (Model #HI9828). At each of the six sampling locations, a multi-sensor probe, connected to the HI9828 meter, was placed into flowing water approximately two feet from the bank of the Creek. Recordings for each of the parameters were digitally recorded by the meter and manually recorded into field notebooks at each of the sampling locations. Turbidity data was collected at each of the sampling locations with the use of a Hanna Instruments portable microprocessor turbidity meter (Model #HI93703). Water samples were obtained at each sampling location, using a clean glass cuvette, approximately one foot from the bank of the Creek. Samples were immediately placed within the turbidity meter upon collection. Recordings were digitally recorded by the meter and manually recorded into field notebooks at each of the sampling locations. Typically, water samples would be collected from the vertical and horizontal centers of the active channel; however, due to safety constraints associated with moderate to heavy flows, this was not possible. Results of the monitoring efforts are detailed below in Section 2.1.

Figure 2. Santa Paula Creek PSS locations

1.4.2 Flow Rate Measurements

In order to remain consistent with previous post-storm reports and due to the same safety constraints discussed in the section above, flow rate measurements along specified areas of the Project Area were unable to be attained. For this reason the flow rate data obtained from the USGS gauge just upstream of the Project was applied to the entire Project Area.

1.4.3 Visual Observation Methods

Visual observations were conducted by driving each of the access roads above the east and west banks of the Creek. Additionally, monitors walked along the Project Area reach to inspect conditions, including the fish passage facility. A series of photographs was taken at each of the six pre-defined sampling locations. Photographic documentation, included as Appendix A of this report, was performed to record the conditions at each of the sampling sites. A field log detailing the water's appearance, any noticeable erosion occurring within the Project Area, any potential barriers to steelhead migratory capabilities, amount of woody debris present, and the date and time of sample collection was completed at each sampling location.

2. MONITORING

2.1 WATER QUALITY SAMPLING

The monitored storm occurred on 20 March 2011. Post-storm water quality monitoring was conducted between 11:00 a.m. and 4:30 p.m. on 23 March 2011. Results for the post-storm water monitoring event are listed in Table 1 below.

Table 1 Post-storm analytical water quality results for 23 March 2011.

Sampling Location	Temperature (ºF)	DO (% Saturation)	DO (mg/L)	Turbidity (NTUs)	pH
1	51.84	45.50	4.99	320	8.99
2	52.21	39.90	4.17	351	9.33
3	52.52	43.50	4.69	328	9.51
4	52.58	42.50	4.57	356	9.47
5	52.76	43.80	4.75	357	9.40
6	52.94	42.80	4.71	359	9.36
Average	52.48	43.00	4.65	345.17	9.34

Steelhead trout can tolerate temperatures ranging from 50º F – 70º F, however their optimal range for growth falls between 55º F – 65º F. Elevated temperatures above 70º F has been known to cause increased potential for fish mortality (Rich, 2000). Temperatures recorded during this the post-storm monitoring event indicate that water temperatures are consistently cool throughout the Project Area with an average temperature of 52.48º F. This is below the optimal range for growth but fairly typical for the time of year and would be tolerable for individuals using the Project Area solely as a migratory corridor as exposure to the lower temperatures will be of a short duration.

Dissolved oxygen (DO) plays a key role in the survival and growth of steelhead trout. For optimal growth and survival a DO level near or at 100% saturation and above 9 mg/L is required (Davis, 1975). However, in cooler water temperatures trout have been known to survive in DO concentrations as low as 1.5 to 2.0 mg/L (Moyle 2002). The results above show an average saturation (% saturation) of only 43.00 and an average DO level (mg/L) of 4.65 mg/L. Currently, these levels are well below the levels required for optimal growth conditions for steelhead trout development and are not suitable for steelhead persistence; however, these levels are likely to rebound once turbidity levels (see below) decrease. These levels are likely tolerable for individuals using the Project Area solely as a migratory corridor, as exposure to low DO levels will be of a short duration.

Turbidity levels of greater than 50 NTU's have been known to be harmful to steelhead trout and can affect their ability to search for food (Oregon, 2001). High levels of turbidity can cause sediment and particles to accumulate in the gills make it difficult for steelhead trout to breath. While southern steelhead have been known to survive in varying levels of turbidity, higher levels have been known to be fatal to salmonids (Bash et al., 2001). Turbidity levels during this monitoring event averaged 345.17 NTU's. The turbidity levels are well above the suitable range of conditions known for steelhead, however are not entirely unexpected for the Project Area reach after a large storm event, especially given the Project Area's location relative to the extremely turbid Mud Creek.

2.2 FLOW RATE MEASUREMENTS

As mentioned above, flow rates were obtained from data collected from the USGS gauge located just upstream from the Project. Flows, as reported by the USGS gauge, occurred at a rate of approximately 175 - 200 cfs during the post-storm water monitoring event on 23 March 2011.

2.3 VISUAL OBSERVATIONS

Visual observations were made to assess the overall conditions and to identify any potential erosion issues and barriers to fish passage that exist throughout the Project Area. The Creek had assumed a natural flow regime that primarily directed water along the toe of the east and west banks. While the flows are largely present along the toes of slope in the majority of the Creek, areas downstream toward the Santa Clara River confluence were often found to be more widespread and, on occasion, spanning half the width of the channel.

The majority of flows from the Creek were observed to flow over the concrete apron on the west side of the fish ladder. A portion of the upstream flow does make a sharp turn to the east and enter the fish ladder. The fish ladder has sequestered a noticeable amount of sediment and debris. The western portions of the upper ladder were completely filled in with sediment/cobble/boulders and provide no resting pool habitat. There is an approximately 3 - 4 foot drop between the fourth and fifth pools, starting from the top of the ladder. This is due in large part to small boulders and debris blocking the notch in the ladder and is currently prohibiting upstream movement through the ladder. Lower rungs of the ladder were observed to provide limited pool

habitat that may be able to provide some resting opportunities for steelhead as they move through the fish ladder; however passage opportunities are diminished at the top of the ladder as noted above.

Other than those noted in the fish ladder no major barriers to fish movement were identified. It was noted that in-channel braiding may occur when flows begin to recede to a more typical low-flow condition. This potential occurrence is likely due to the magnitude of the storm flows which resulted in breaching of the low-flow channel in most areas and overall increased water load from upland runoff. Several portions of the Creek through the Project Area consisted of small, secondary, braided channels that could support fish during the time that surveys were conducted. These channels could potentially become disconnected from the primary low-flow channel when drier conditions prevail. This could lead to the pooling of water which could provide stranding conditions for fish occupying these secondary channels. This condition occurs naturally in alluvial systems. Additionally, 2 – 3 backwater eddy pools have formed in the upper reach of the Project Area and have the potential to provide suitable pool habitat should them remain for any length of time.

Little to no woody debris was noted during the post-storm monitoring field efforts. Energy dissipation was apparent on the downstream side of roughness elements existing within the channel (i.e. boulders). Boulders and cobble of various sizes appear to have been deposited or uncovered during the storm, which appear to provide energy dissipation opportunities throughout the site.

No steelhead trout were observed during this monitoring effort.

3. CONCLUSION

The results of the post-storm monitoring efforts indicate that current water quality conditions in the Project Area are not generally conducive to the persistence of and/or movement of steelhead trout. While water temperatures are within the tolerable (not optimal) range for steelhead trout, dissolved oxygen levels were well below the levels required for optimal growth conditions for steelhead trout development. Turbidity levels greatly exceeded the upper limits of the acceptable range for steelhead. Flows peaked at approximately 12,400 cfs on 20 March 2011 and receded to approximately 175 - 200 cfs by the time the survey was conducted on 23 March 2011. Flows dropped to below approximately 200 cfs within 48 hours of the peak event. A lack of substantial woody debris was noted in all areas of the Project Area.

No barriers to fish passage were noted within the channel (excluding the fish ladder) in the Project Area; multiple channels were observed. As flows recede and organize into a typical low flow condition, pooling may occur in remnant ancillary channels, which could lead to potential stranding conditions. However, this is a natural occurrence for streams of this nature. The 3 – 4 foot elevation gap between pools four and five (starting from the top of the fish ladder) would preclude the upstream movement of steelhead trout within Santa Paula Creek. No steelhead trout were observed during the post-storm monitoring efforts.

4. REFERENCES

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Appendix A.
Photo Log

As mentioned in Section 1.3 (Methodology), photo locations were established during previous monitoring surveys. Photographic documentation was taken along the west and east banks of each photo location. A series of panoramic photos were taken at each photo location; however, for purposes of this report, only photos displaying upstream, downstream, and central portions along the west and east banks at each photo location are included. All additional photos are available upon request.

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West-downstream

West-upstream

West

Photo Location 2

West-view downstream

West-view upstream

West

East-view downstream

East-view upstream

East

Photo Location 3

West-view downstream

West-view upstream

West

East-view downstream

East-view upstream

East

Photo Location 4

West-view downstream

West-view upstream

West

East-view downstream

East-view upstream

East

Photo Location 5

West-view downstream

West-view upstream

West

East-view downstream

East-view upstream

East

Photo Location 6

West-view downstream

West-view upstream

West

East-view downstream

East-view upstream

East

Fish Ladder

2011 POST STORM MONITORING REPORT NO. 3 FOR THE SANTA PAULA CREEK SEDIMENT REMOVAL PROJECT

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April 2011

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1. INTRODUCTION

1.1 PURPOSE AND NEED

The purpose of this Post Storm Monitoring Report is to comply with Reasonable and Prudent Measure (R&PM) No. 3 and its associated Terms and Conditions (T&C), specifically T&C No. 2, of the Biological Opinion (BO) (F-LB-00-16:DRB) issued by the National Oceanic and Atmospheric Administration's (NOAA) and National Marine Fisheries Service (NMFS) on September 27, 2000 for the Santa Paula Creek Flood Control Project (Project). R&PM No.3 and corresponding T&C No. 2 require the U.S. Army Corps of Engineers' (Corps) to perform monitoring after storm events that exceeded daily mean discharge flows of 500 cubic feet per second (cfs) for a period of five years. The results of post storm monitoring events are important to evaluate the ability of the Project to not only provide flood protection, but also to function as a migratory corridor in designated critical habitat for the southern California distinct population segment (DPS) of endangered steelhead trout (*Oncorhynchus mykiss*).

1.2 SUMMARY OF STORM EVENT

One such storm event occurred on 25 March 2011. Figure 1 shows a peak level of approximately 2000 cubic feet per second (cfs) on 25 March 2011. The hydrograph for this event is presented in Figure 1, below.

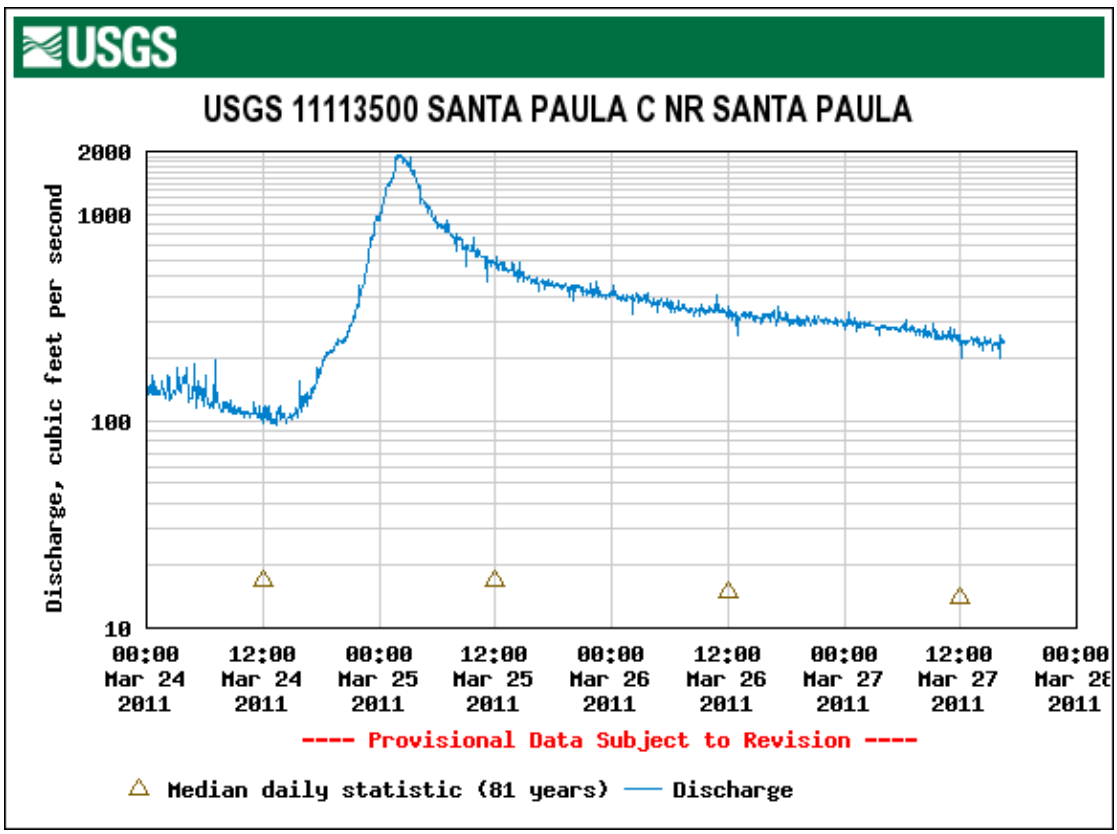

Figure 1. Hydrograph of monitored storm event taken at the Santa Paula Creek gauging station

1.3 PROJECT LOCATION

Post-storm monitoring activities took place within the United States Army Corps of Engineers (Corps) Project located within the City of Santa Paula, Ventura County, California. The monitoring area extends from Santa Paula Creek's (Creek) confluence with the Santa Clara River upstream approximately 2.0 miles to approximately 500 feet upstream of the fish ladder (Project Area). Please refer to Figure 2 for a graphical depiction of the Project Area.

The entire Project lies within designated Critical Habitat for the southern California distinct population segment (DPS) of endangered steelhead trout (*Oncorhynchus mykiss*). The Project Area is thought to function as a migratory corridor for steelhead, as stated in the biological opinion (BO) for the Project (NMFS, 2000 and 2009).

1.4 METHODOLOGY

Subsequent to this storm event, a monitoring protocol was drafted by Corps biologists, in conjunction with Corps Hydraulics and Hydrology (H&H) staff and NMFS staff. Six permanent sampling stations (PSS) were established as a part of this monitoring protocol. These sampling locations are assumed to provide a representative sample of conditions documented throughout the Project's low flow channel. PSS's also serve as permanent photo stations. Results of the post-storm water quality monitoring, conducted on 28 March 2011, are discussed below in Section 2.

1.4.1 Water Quality Sampling

Water samples were collected from these six locations within 72 hours of discharge levels peaking above 500 cfs and were analyzed for temperature (°F), dissolved oxygen ([DO];% saturation and mg/L), turbidity [neophelometric turbidity units (NTUs)], and pH levels. Temperature, DO, and pH data were obtained using a Hanna Instruments multi-parameter water quality meter (Model #HI9828). At each of the six sampling locations, a multi-sensor probe, connected to the HI9828 meter, was placed into flowing water approximately two feet from the bank of the Creek. Recordings for each of the parameters were digitally recorded by the meter and manually recorded into field notebooks at each of the sampling locations. Turbidity data was collected at each of the sampling locations with the use of a Hanna Instruments portable microprocessor turbidity meter (Model #HI93703). Water samples were obtained at each sampling location, using a clean glass cuvette, approximately one foot from the bank of the Creek. Samples were immediately placed within the turbidity meter upon collection. Recordings were digitally recorded by the meter and manually recorded into field notebooks at each of the sampling locations. Typically, water samples would be collected from the vertical and horizontal centers of the active channel; however, due to safety constraints associated with moderate to heavy flows, this was not possible. Results of the monitoring efforts are detailed below in Section 2.1.

Figure 2. Santa Paula Creek PSS locations

1.4.2 Flow Rate Measurements

In order to remain consistent with previous post-storm reports and due to the same safety constraints discussed in the section above, flow rate measurements along specified areas of the Project Area were unable to be attained. For this reason the flow rate data obtained from the USGS gauge just upstream of the Project was applied to the entire Project Area.

1.4.3 Visual Observation Methods

Visual observations were conducted by driving each of the access roads above the east and west banks of the Creek. Additionally, monitors walked along the Project Area reach to inspect conditions, including the fish passage facility. A series of photographs was taken at each of the six pre-defined sampling locations. Photographic documentation, included as Appendix A of this report, was performed to record the conditions at each of the sampling sites. A field log detailing the water's appearance, any noticeable erosion occurring within the Project Area, any potential barriers to steelhead migratory capabilities, amount of woody debris present, and the date and time of sample collection was completed at each sampling location.

2. MONITORING

2.1 WATER QUALITY SAMPLING

The monitored storm occurred on 25 March 2011. Post-storm water quality monitoring was conducted between 10:00 a.m. and 3:30 p.m. on 28 March 2011. Results for the post-storm water monitoring event are listed in Table 1 below.

Table 1 Post-storm analytical water quality results for 28 March 2011.

Sampling Location	Temperature (ºF)	DO (% Saturation)	DO (mg/L)	Turbidity (NTUs)	pH
1	53.98	23.8	2.80	256	8.92
2	54.5	25.9	2.72	296	9.10
3	54.9	29.6	3.06	310	7.85
4	55.32	29.0	3.04	305	8.84
5	55.85	32.0	3.39	258	9.10
6	57.43	45.6	4.67	333	8.56
Average	55.33	31.98	3.28	293	8.73

Steelhead trout can tolerate temperatures ranging from 50º F – 70º F, however their optimal range for growth falls between 55º F – 65º F. Elevated temperatures above 70º F has been known to cause increased potential for fish mortality (Rich, 2000). Temperatures recorded during this the post-storm monitoring event indicate that water temperatures are, on the average, relatively cool with an average temperature just above 55º F. This is within the lower end of the optimal range for growth but fairly typical for the time of year and would be tolerable for individuals using the Project Area solely as a migratory corridor as exposure to the lower temperatures will be of a short duration.

Dissolved oxygen (DO) plays a key role in the survival and growth of steelhead trout. For optimal growth and survival a DO level near or at 100% saturation and above 9 mg/L is required (Davis, 1975). However, in cooler water temperatures trout have been known to survive in DO concentrations as low as 1.5 to 2.0 mg/L (Moyle 2002). The results above show an average saturation (% saturation) only 31.98 and an average DO level (mg/L) of 3.28 mg/L. Currently, these levels are well below the levels required for optimal growth conditions for steelhead trout development and are not suitable for steelhead persistence; however, these levels are likely to rebound once turbidity levels (see below) decrease and are typical after such a large storm event in this watershed. These levels are likely tolerable for individuals using the Project Area solely as a migratory corridor, as exposure to low DO levels will be of a short duration.

Turbidity levels of greater than 50 NTU's have been known to be harmful to steelhead trout and can affect their ability to search for food (Oregon, 2001). High levels of turbidity can cause sediment and particles to accumulate in the gills make it difficult for steelhead trout to breath. While southern steelhead have been known to survive in varying levels of turbidity, higher levels have been known to be fatal to salmonids (Bash et al., 2001). Turbidity levels during this monitoring event averaged 293 NTU's. The turbidity levels are well above the suitable range of conditions known for steelhead, however are not entirely unexpected for the Project Area reach after a large storm event, especially given the Project Area's location relative to the extremely turbid Mud Creek.

2.2 FLOW RATE MEASUREMENTS

As mentioned above, flow rates were obtained from data collected from the USGS gauge located just upstream from the Project. Flows, as reported by the USGS gauge, occurred at a rate of approximately 105 cfs during the post-storm water monitoring event on 28 March 2011.

2.3 VISUAL OBSERVATIONS

Visual observations were made to assess the overall conditions and to identify any potential erosion issues and barriers to fish passage that exist throughout the Project Area. The Creek had assumed a natural flow regime that primarily directed water along the toe of the east and west banks. While the flows are largely present along the toes of slope in the majority of the Creek, areas downstream toward the Santa Clara River confluence were often found to be more widespread and, on occasion, spanning half the width of the channel.

The majority of flows from the Creek were observed to flow over the concrete apron on the west side of the fish ladder. A portion of the upstream flow does make a sharp turn to the east and enter the fish ladder. The fish ladder has sequestered a noticeable amount of sediment and debris. The western portions of the upper ladder were completely filled in with sediment/cobble/boulders and provide no resting pool habitat. There is an approximately 3 - 4 foot drop between the fourth and fifth pools, starting from the top of the ladder. This is due in large part to small boulders and debris blocking the notch in the ladder and is currently prohibiting upstream movement through the ladder. Lower rungs of the ladder were observed to provide limited pool habitat that may be able to provide some resting

opportunities for steelhead as they move through the fish ladder; however passage is likely blocked at the top of the ladder as noted above.

Other than the fish ladder no major barriers to fish movement were identified. It was noted that in-channel braiding may occur when flows begin to recede to a more typical low-flow condition. This potential occurrence is likely due to the magnitude of the storm flows which resulted in breaching of the low-flow channel in most areas and overall increased water load from upland runoff. Several portions of the Creek through the Project Area consisted of small, secondary, braided channels that could support fish during the time that surveys were conducted. These channels could potentially become disconnected from the primary low-flow channel when drier conditions prevail. This could lead to the pooling of water which could provide stranding conditions for fish occupying these secondary channels. This condition occurs naturally in alluvial systems. Additionally, 2 – 3 backwater eddy pools have formed in the upper reach of the Project Area and have the potential to provide suitable pool habitat should them remain for any length of time.

Little to no woody debris was noted during the post-storm monitoring field efforts. Energy dissipation was apparent on the downstream side of roughness elements existing within the channel (i.e. boulders). Boulders and cobble of various sizes appear to have been deposited or uncovered during the storm, which appear to provide energy dissipation opportunities throughout the site.

No steelhead trout were observed during this monitoring effort.

3. CONCLUSION

The results of the post-storm monitoring efforts indicate that current water quality conditions in the Project Area are not generally conducive to the persistence of and/or movement of steelhead trout. While water temperatures are within the lower end of the optimal range for steelhead trout, dissolved oxygen levels were well below the levels required for optimal growth conditions for steelhead trout development. Turbidity levels greatly exceeded the upper limits of the acceptable range for steelhead. Flows peaked at 2000 cfs on 25 March 2011 and receded to approximately 105 cfs by the time the survey was conducted on 28 March 2011. Flows dropped to approximately 200 cfs within 48 hours of the peak event. A lack of woody debris was noted in all areas of the Project Area.

No barriers to fish passage were noted within the channel (excluding the fish ladder) in the Project Area; multiple channels were observed. As flows recede and organize into a typical low flow condition, pooling may occur in remnant ancillary channels, which could lead to potential stranding conditions. However, this is a natural occurrence for streams of this nature. The 3 – 4 foot elevation gap between pools four and five (starting from the top of the fish ladder) would preclude the upstream movement of steelhead trout within Santa Paula Creek. No steelhead trout were observed during the post-storm monitoring efforts.

4. REFERENCES

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Appendix A.
Photo Log

As mentioned in Section 1.3 (Methodology), photo locations were established during previous monitoring surveys. Photographic documentation was taken along the west and east banks of each photo location. A series of panoramic photos were taken at each photo location; however, for purposes of this report, only photos displaying upstream, downstream, and central portions along the west and east banks at each photo location are included. All additional photos are available upon request.

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East

Photo Location 4

West-view downstream

West-view upstream

West

East-view downstream

East-view upstream

East

Photo Location 5

West-view downstream

West-view upstream

West

East-view downstream

East-view upstream

East

Photo Location 6

West-view downstream

West-view upstream

West

East-view downstream

East-view upstream

East

Fish Ladder

Appendix B
2011 Smolt-Out Survey Report

2011 SOUTHERN CALIFORNIA DPS STEELHEAD SMOLT OUT SURVEY REPORT FOR THE SANTA PAULA CREEK FLOOD CONTROL PROJECT

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5020 Chesebro Road, Suite 200
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June 2011

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Table 1 Historic Steelhead Occurrences in the Project Area 2

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Attachment 1 – Figures

1.0 INTRODUCTION

The purpose of this report is to document the results of a southern California steelhead (*Onchorhynchus mykiss*) survey conducted on 19 April 2011. The purpose of the survey was to document migratory conditions during the time when steelhead smolt are expected to be outmigrating toward the Pacific Ocean. This survey has been titled the "smolt-out survey." It was conducted within the U.S. Army Corps of Engineers' (Corps) Santa Paula Creek Flood Control Project (Project) area (Project Area), located in the City of Santa Paula, Ventura County.

1.1 Legal Status and Background Information on the Southern California Steelhead

The southern California steelhead distinct population segment (DPS) was listed by the National Marine Fisheries Service (NMFS) as federally endangered on 17 June 1998 (63 FR 32996-32998). Critical habitat was designated on 16 February 2000 (65 FR 7764-7787). This taxon is also considered a California Species of Special Concern by the California Department of Fish and Game (CDFG).

The southern California steelhead DPS applies to coastal streams from the Santa Maria River south to the U.S.-Mexican border (NMFS, 2002). The primary drainages that support steelhead runs in this region include the Santa Maria River, Santa Ynez River, Gaviota Creek, the Ventura River, the Santa Clara River, Malibu Creek, San Mateo Creek, and Topanga Creek. The habitat requirements for steelhead in freshwater streams are often dictated by life history stages (Cederholm and Martin, 1983; Bjornn and Reiser, 1991). During adult and juvenile migrations, adequate discharge amounts, water temperatures, and water chemistry become important habitat variables. Fluctuations of these variables can result in a delay or complete halt in the upstream migration of adults towards spawning grounds and the downstream migration of juveniles towards brackish and saltwater habitats. Suitable spawning habitat requires efficient water depths and flow velocities as primary elements; however, water temperature and turbidity are also important factors. Juvenile steelhead require living space (different combinations of water depth and velocity), shelter from predators and harsh environmental conditions, food resources, and suitable water quality and quantity, for growth and survival during the summer and winter months (NMFS, 2007). The southern steelhead is distinguished from other rainbow trout as it is officially described as those that reside downstream of distinct barriers, such as waterfalls and dams, whereas rainbow trout occur in inland waters above barriers.

2.0 EXISTING PROJECT SITE CONDITIONS

The Project Area is located along Santa Paula Creek (Creek) from the confluence of the Creek and the Santa Clara River upstream to approximately 500 feet upstream of the fish ladder/project inlet. This constitutes approximately two miles of the lower portion of Santa Paula Creek. Flow rates during the 2011 smolt out surveys, based on data from the USGS gauge located upstream of the Project Area, were approximately 12.0 cubic feet per second. Channel depth within the Project Area was observed to range from approximately 2 – 3 inches to 2 – 3 feet.

As a result of recent storm flows, the majority of the Project Area is currently devoid of mature vegetation. However, some patches of mature native vegetation were observed within the upstream portions of the Project Area. The Creek had assumed a natural flow regime that primarily directed water along either the toe of the east or west bank, occasionally migrating from one bank across the channel to the other bank. Ancillary channels or braids were apparent in several areas, although with substantially reduced flow in comparison to the primary channel. During the survey, unlike last year,

little to no algal cover was observed throughout the Project Area. This may be due in large part to the higher velocity flows observed during the 2011 smolt-out surveys as to compared to lower velocity flows observed in 2010. Surveys conducted in 2010 resulted in the observation of dense algal mats throughout much of the Project Area.

3.0 METHODS

A team of two biologists, from Aspen Environmental Group, were onsite on April 19, 2011 to conduct the smolt-out survey. The survey was performed by methodically walking the length of the Project Area from the confluence of Santa Paula Creek and the Santa Clara River upstream to just above the fish ladder. All areas where standing or flowing water was present were visually inspected. In portions of the channel where water was relatively shallow (<1 foot) and clear (majority of survey area), visual observations were performed for the presence/absence of fish. Dip nets with 1/8" mesh were utilized to probe under and around boulders. In areas that exhibited waters deeper than 1-foot, 1/8" mesh block netting was installed along the downstream sections. Biologists, using a 1/8" mesh seine netting, then seined each section from the upstream extent of the deeper water down towards the block netting and documented all fish present within the area.

More traditional passive survey methods such as the utilization of rotary screw or incline plane screen traps were not employed due to the absence of deeper water, which is required for installation and to achieve trap efficiency. Additionally, the lack of channel depth and presence of large pools, did not provide adequate conditions for the implementation of snorkel survey techniques/methods.

Photographs were also taken at the six permanent sampling locations described in the Post Storm Monitoring Reports and the Summer Low Flow Report for 2010. These sampling locations are shown in Figure 1, Attachment 1.

4.0 RESULTS

4.1 Known Locations for Southern California Steelhead in the Vicinity of the Project Site

During sediment removal activities that occurred from October 2009 to January 2010, a total of three steelhead were detected at the Project site (Figure 2). All steelhead encountered in the Project Area were either relocated to a previously identified area of suitable habitat above the fish ladder or into the diversion channel when connectivity to the Santa Clara River was present. Details for each of these occurrences are presented below in Table 1.

Table 1. Historic Steelhead Occurrences in the Project Area

Date	Status	Implemented Action	Notes
6 Jan 2010	1 juvenile	Relocated to suitable habitat upstream of Project Area.	While clearing the old active channel after the final water diversion a juvenile steelhead was found in a large pool just below the fish ladder.
6 Jan 2010	1 juvenile	Per NMFS biologist on-site, released into diversion channel which had connectivity to the Santa Clara River	While clearing the old active channel after the final water diversion a juvenile steelhead was found in a large pool just below the fish ladder.
8 Jan 2010	1 juvenile	Relocated to suitable habitat upstream of Project Area	Located during work being conducted just above fish ladder.

In addition to the occurrences noted during Project activities, a review of the California Natural Diversity Database (CNDDB) reported one record (1988) of southern California steelhead located approximately ¼-mile upstream from the fish ladder (CDFG, 2010). This record indicates that three fish were caught during surveys of the area in 1987 and several were seen in the same area in 1988.

In June/July 2011 approximately 40 – 50 steelhead trout were reportedly observed in a large, deep pool approximately 4.25 miles upstream of the Project Area near Thomas Aquinas college at the site of a Cal Trans bridge repair project.

4.2 Survey Results

No steelhead were observed during the April 2011 smolt-out survey although 35 arroyo chub (*Gila orcuttii*), 5 partially armored threespine stickleback (*Gasterosteus aculeatus aculeatus*), 5 Santa Ana sucker (*Catostomus santaanae*) and 11 Owens sucker (*Catostomus fumeiventris*) were documented within the survey area. Flow rate data obtained from the USGS gauge located just upstream of the Project, indicated that during the survey water in Santa Paula Creek was moving at a rate of approximately 12 cfs.

Current conditions at the Project appear to be suboptimal for residential populations of steelhead to persist, but would provide acceptable conditions for potential downstream migration of smolt through the Project Area. The Project's biological opinion assumes the portion of Santa Paula Creek flowing through the Project Area functions as a migratory corridor for the species, not live in habitat (NMFS, 2000). Steelhead require freshwater migration corridors with suitable natural cover, such as, but not limited to, submerged and overhanging large wood, aquatic vegetation, large rocks and boulders, side channels, deep pools, and undercut banks to support juvenile and adult mobility and survival. The Project site currently exhibits some of these features, including large rocks and boulders and side channels. However, the site does not currently support significant woody debris, aquatic vegetation, or deep pools and undercut banks. The lack of these habitat characteristics leaves aquatic species vulnerable to predation and elevated water temperatures; however it is to be expected within the years following large scale sediment removal projects. These habitat characteristics would be expected to reform as the creek is subject to the processes of erosion and revegetation from natural reformulation of the seed bank and plantings.

5.0 SUMMARY AND CONCLUSION

Although previously detected in the Project Area (Figure 2), no steelhead were identified during the smolt-out survey conducted in April 2011. Project activities that occurred in 2009/2010 involved the removal of substantial amounts of sediment from the Santa Paula Creek channel, including the fish ladder pools. As a result, the portion of the creek that travels through the Project Area is, for the most part, devoid of vegetation at this time. The lack of substantial vegetative cover, overhanging vegetation, deep pools, cut banks, accumulated woody debris, and presence of large algal mats provide less than ideal live in conditions for steelhead, however downstream migration is still expected to be possible.

A significant amount of cobble, boulders and sediment has aggraded in the upstream pools of the fish ladder as a result of a notch blockage that was documented in the post storm reports from 2010/2011 storm events. This has reduced the functionality of the ladder providing a reduction in the areas available for refuge within the ladder for steelhead smolt attempting to migrate downstream.

Overtime, depending on the severity of future storm events, riparian vegetation is expected to naturally recruit within the previously disturbed areas. Additionally, restoration activities are scheduled to take

place within the Project Area from June 13 – 15, 2011. This will involve the planting of willow (*Salix sp.)* and mulefat (*Baccharis salicifolia*) cuttings, on either side of the active channel, for the length of the Project Area. If creek flows allow this vegetation to mature, the reemergence of a riparian corridor would benefit the suitability of the Project Area for steelhead.

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Attachment 1 – Figures

Figure 1. Santa Paula Creek PSS locations.

Santa Paula Creek Sediment Removal Project
Southern California DPS Steelhead Smolt Out Survey Report

Aspen Environmental Group

0 125 250 500 Feet

Figure 2

Steelhead Occurrences in 2009/2010

June 2010

Figure 3 - Photo Location 1

West-view downstream

West-view upstream

West

I

West-view downstream

West-view upstream

West

East view downstream

East view upstream

East

Figure 5 - Photo Location 3

West-view downstream

West-view upstream

West

East view downstream

East view upstream

East

Figure 6 - Photo Location 4

West-view downstream

West-view upstream

West

East view downstream

East view upstream

East

Figure 7 - Photo Location 5

West-view downstream

West-view upstream

West

East view downstream

East view upstream

East

Figure 8 - Photo Location 6

West-view downstream

West-view upstream

West

East view downstream

East view upstream

East

Figure 9 – Site-wide Photos

Arroyo chub and Santa Ana/Owens sucker from a seine pull in a pool within the project area.

Small plunge pool near the center of the project area.

View from atop the fish ladder.

View from the lower end of the fish ladder.

View of the top rung of the fish ladder

View from atop the fish ladder.

Appendix C
2011 Summer Low-Flow Monitoring Report

2011 SUMMER LOW FLOW REPORT FOR THE SANTA PAULA CREEK FLOOD CONTROL PROJECT

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September 2011

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1.0 INTRODUCTION

1.1 PURPOSE AND NEED

The purpose of this Summer Low Flow Monitoring Report is to comply with the Reasonable and Prudent Measures (R&PM) and associated Terms and Conditions (T&C) provided in the Biological Opinion (BO) (F-LB-00-16:DRB) for the project. This monitoring event and report are specifically described in T&C No. 1 of R&PM No. 1, of the BO issued by the National Oceanic and Atmospheric Administration's (NOAA), National Marine Fisheries Service (NMFS) on September 27, 2000. R&PM No.3 and corresponding T&C No. 3 require the U.S. Army Corps of Engineers' (Corps) to perform monitoring of the low flow channel configuration and associated discharge at least once per year during low/base flow condition.

1.2 PROJECT LOCATION

Summer low flow monitoring activities took place within as portion of Santa Paula Creek (Creek) located within the City of Santa Paula, Ventura County, California. The monitoring area (Project Area) extends from Creek's confluence with the Santa Clara River upstream to approximately 500 feet upstream of the fish ladder (Fish Ladder) for a total of approximately 2.1 miles (Figure 1).

The entire Project Area lies within designated Critical Habitat for the southern California distinct population segment (DPS) of endangered steelhead trout (*Oncorhynchus mykiss*). The Project Area has historically functioned as a migratory corridor for steelhead (NMFS, 2000 and 2009).

1.3 METHODOLOGY

This monitoring protocol was drafted by Corps biologists, in conjunction with Corps Hydraulics and Hydrology (H&H) staff and NMFS staff. The protocol includes water quality sampling, flow rate measurements, and documentation of visual observations such as barriers to movement, presence of woody debris and Fish Ladder functionality. Six permanent sampling stations (PSS) were established as a part of this monitoring protocol. These sampling locations are assumed to provide a representative sample of conditions documented throughout the Project Area. PSSs also serve as permanent photo stations. Photo station number 4 was re-located approximately 700-feet upstream from its location on Figure 1, due to access constraints. A full description of the monitoring methods/protocols is presented below in sections 1.3.1 through 1.3.3. The 2011 summer low flow monitoring event took place on 26 August 2011; results of this monitoring event are presented in Section 2 of this report.

1.3.1 Water Quality Sampling

Water samples were collected from these six locations and were analyzed for temperature (°F), dissolved oxygen ([DO]; % saturation and mg/L), turbidity [neophelometric turbidity units (NTUs)], and pH levels. Temperature, DO, and pH data were obtained using a Hanna Instruments multi-parameter water quality meter (Model #HI9828). At each of the six sampling locations, a multi-sensor probe, connected to the HI9828 meter, was placed into flowing water approximately two feet from the bank of the Creek. Recordings for each of the parameters were digitally recorded by the meter and manually recorded into field notebooks at each of the sampling locations. Turbidity data was collected

Figure1. Santa Paula Creek PSS locations

at each of the sampling locations with the use of a Hanna Instruments portable microprocessor turbidity meter (Model #HI93703). Water samples were obtained at each sampling location, using a clean glass cuvette, approximately one foot from the bank of the Creek. Samples were immediately placed within the turbidity meter upon collection. Recordings were digitally recorded by the meter and manually recorded into field notebooks at each of the sampling locations. Water samples were collected from the vertical and horizontal centers of the active low flow channel. Results of the monitoring efforts are detailed below in Section 2.1.

1.3.2 Flow Rate Measurements

Flow rate data was obtained from the USGS gauge located just upstream of the project, in order to provide a standard measure that could be replicated across all monitoring reports. It should be noted however that braiding of the main low flow channel in downstream areas may have resulted in decreased flow velocities in these areas. These decreased velocities are likely to be minor.

Because water in a channel flows at different rates, depending on it location, additional flow rate measurements were taken using a simple float at each of the six pre-defined sampling locations. This will serve to document localized increases/decreases in flow rates within the Project Area (i.e., energy dissipation from boulder clusters, landform changes causing increased flow rates, etc.). A partially filled plastic water bottle, sitting approximately one inch below the water line, was released upstream and the time it took to reach a specific distance recorded. Approximate channel width and average depth were recorded and used in calculating flow rates at each sampling location. The results are presented below in Section 2. The simple float method uses an average channel width and depth within the specified measurement area to calculate flow rates. Because the Creek is an erosive and dynamic system a constant cross-sectional area is not always present. Therefore, flow results utilizing the simple float method are intended to identify localized flow rate variations within the Project Area and should not be relied upon as the only source of flow rates for analysis but rather as an informational tool.

1.3.3 Visual Observation Methods

Visual observations were conducted by driving each of the access roads above the east and west banks of the Creek. Additionally, monitors walked along the Project Area reach to inspect conditions, including the Fish Ladder. A series of photographs was taken at each of the six pre-defined sampling locations. Photographic documentation, included as Appendix A of this report, was performed to record the conditions at each of the sampling sites and throughout the greater Project Area. A field log detailing the water's appearance, any noticeable erosion occurring within the Project Area, any potential barriers to steelhead migratory capabilities, amount of woody debris present, and the date and time of sample collection was completed at each sampling location.

2.0 RESULTS

2.1 WATER QUALITY SAMPLING RESULTS

The summer low flow monitoring event took place on 26 August 2011, between 8:00 a.m. and 3:30 p.m. Results for the water quality sampling are listed in Table 1, below.

Table 1 - Summer low flow monitoring water quality results for 26 August 2011

PSS Location	Temperature (°F)	DO (% Saturation)	DO (mg/L)	Turbidity (NTUs)	pH
1	71.00	90.00	7.76	27.52	7.67
2	72.50	84.40	7.30	10.09	7.71
3	73.55	82.70	6.99	9.29	7.76
4	74.78	81.50	6.87	6.02	7.84
5	74.25	77.90	6.55	7.93	7.78
6	74.02	74.60	6.16	5.66	8.89
Average	73.35	81.85	6.94	11.09	7.94

Steelhead trout can tolerate temperatures ranging from 50° F – 70° F, however their optimal range for growth falls between 55° F to 65° F. Elevated temperatures above 70° F has been known to cause increased potential for fish mortality (Rich, 2000). Temperatures recorded during this the summer low flow monitoring event indicate that water temperatures are warm with an average temperature just above 73° F. This is above the upper end of the optimal range for growth; however, fairly typical for the time of year. These are likely tolerable for individuals using the Project Area solely as a migratory corridor as exposure to the higher temperatures will be of a short duration.

Dissolved oxygen (DO) plays a key role in the survival and growth of steelhead trout. For optimal growth a DO level near or at 100% saturation and above 9 mg/L is required (Davis, 1975). However, in cooler water temperatures trout have been known to survive in DO concentrations as low as 1.5 to 2.0 mg/L (Moyle 2002). The results above show an average saturation (% saturation) of 81.85 and an average DO level (mg/L) of 6.94 mg/L. Currently, these are suboptimal DO conditions for steelhead trout development. These levels however are tolerable for individuals using the Project Area solely as a migratory corridor as exposure to low DO levels will be of a short duration.

Turbidity levels of greater than 50 NTU's have been known to be harmful to steelhead trout and can affect their ability to search for food (Oregon, 2001). High levels of turbidity can cause sediment and particles to accumulate in the gills make it difficult for steelhead trout to breath. While southern steelhead have been known to survive in varying levels of turbidity, higher levels have been known to be fatal to salmonids (Bash et al., 2001). Turbidity levels presented in Table 1 average 11.09 NTU's. The varying levels recorded at each PSS could be caused by localized influences such as storm water runoff, bank erosion, agricultural influence, and plankton blooms. Turbidity levels documented in Table 1 are well within the suitable range of conditions known for steelhead.

2.2 FLOW RATE MEASUREMENT RESULTS

As mentioned above, flow rates were obtained from data collected from the USGS gauge located just upstream from the project. Flows, as reported by the USGS gauge, occurred at a rate of approximately 4 - 5 cfs during the monitoring event on 26 August 2011 (Figure 2).

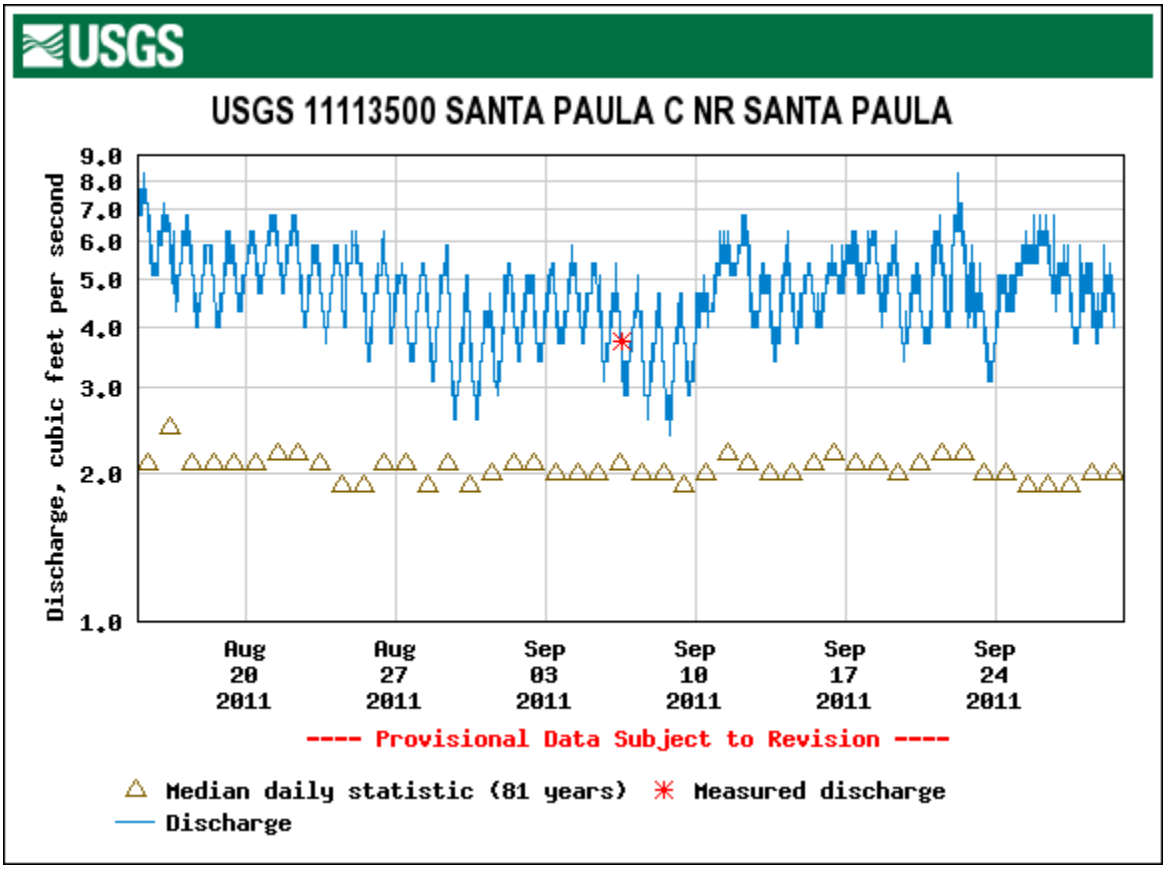

Figure 2. Hydrograph taken at the Santa Paula Creek gauging station during the low flow monitoring on 26 August 2011.

Additionally, velocity and flow rates were recorded using the simple float method at each of the six PSS using the methods described in above in Section 1.3.2. These velocity and flow rates are presented in Table 2 below. The simple float method uses an average channel width and depth within the specified measurement area to calculate flow rates. Because the Creek is an erosive and dynamic system a constant cross-sectional area is not always present. The depth and width measurements presented above are approximate and represent the average measurement within the 50ft section of the PSS used in the velocity/flow rate calculations. Therefore, flow results utilizing the simple float method are intended to identify localized flow rate variations within the Project Area and should not be relied upon as the only source of flow rates for analysis but rather as an informational tool.

As indicated by the results in Table 2 below, the velocity/flow rates vary throughout the Project Area. While the difference in velocities between the PSS locations was limited to within approximately 2 ft/sec for all measurements there was a high amount of variability in the values for flow rate (volume of flow). For example, the measured flow rates, with the exception of PSS 3, were measurably higher than those reported upstream at the USGS Stream Gauge. Flow rates are influenced by the presence of riffles, pools, landform structures, and channel morphology. This is demonstrated at PSS No. 1, a relatively linear section of Creek, with the west bank comprised of concrete riprap and the east bank comprised of cobble, boulders and vertical slopes. These conditions allow for a large amount of water

to move through at a relatively high velocity. In contrast to PSS No. 1, PSS No. 3 is a relatively shallow section of the creek with abundant willows (*Salix sp.)* and mulefat (*Baccharis salicifolia*) growing within the channel. The shallow nature of the channel, along with dense aquatic vegetation, provides for slower velocities and a reduced volume of flow in this section of the Creek.

Table 2 –Velocity and Volume Rates at each PSS

PSS Location	Average Depth (feet)	Average Width (feet)	Time (seconds)	Length (feet)	Velocity (ft/sec)	Flow Rate (cubic ft/sec)
1	1.2	11.5	60	50	1.2	14.08
2	2.1	14.0	150	50	3.00	74.97
3	1.2	6.5	50	50	1.00	6.63
4	1.0	12.0	47.50	50	0.95	9.69
5	0.9	25.0	27.5	50	0.55	10.52
6	1.1	14.0	75	50	1.5	19.64
Average	1.25	13.83	68.33	--	1.37	22.59

2.3 VISUAL OBSERVATION RESULTS

Visual observations were made to assess the overall conditions and to identify any potential erosion issues and barriers to fish passage that exist throughout the Project Area. The Creek had assumed a natural flow regime that primarily directed water along either the toe of the east or west bank, occasionally migrating from one bank across the channel to the other bank. Ancillary channels or braids were apparent in several areas, although with substantially reduced flow in comparison to the primary channel. While the flows were largely present along the toes of slope in the majority of the Creek, areas downstream toward the Santa Clara River confluence were often found to spread out over a much wider area. Boulders and cobble of various sizes appear to have been deposited or uncovered during storms from the past winter, which appear to provide energy dissipation opportunities throughout the site.

All flows at the upstream extent of the Project Area were observed to flow through the Fish Ladder. The Fish Ladder was cleaned out in June 2011 and has sequestered a minimal amount of sediment (ranging from 0.5 - 2 feet of accumulation). While the total capacity of each pool appears to be minimally diminished with the onset of sediment aggradation, each pool appears to be able to provide adequate resting opportunities for steelhead as they move through the fish ladder. On average, the west side of the pools appears to sequester more sediment than the east side. The pattern of sediment aggradation within the pools shows that sediment accumulates toward the outer edges of the pools first, while the center of the pools appears to transport most sediment and remain clear of obstruction in typical low flow condition. Large cobble and boulders, noted in previous surveys, were not observed in the weir notches or pools of the ladder; if present no impediments to movement exist within the ladder that would likely prohibit upstream or downstream movement/passage through the ladder by steelhead trout.

Portions of the Creek flowing through the Project Area consisted of small, secondary, braided channels that could support fish during the time that surveys were conducted. The majority of these secondary, braided channels were present in areas downstream of Highway 126. These channels could potentially

become disconnected from the primary low-flow channel under drier conditions, which could lead to the pooling of water. These pools could provide stranding conditions for fish occupying these secondary channels; however, this is a natural phenomenon in dynamic alluvial systems such as this. No major barriers to fish movement were identified during the summer low flow monitoring event.

Little to no woody debris was noted during the monitoring efforts. The majority of willow cuttings placed along the banks of the low flow channel in June 2011were observed to be healthy and showing signs of positive upword growth; some of the cuttings had newly formed branches/leaves. Within the lower portions of the Project Area (below Highway 126 and above the Santa Clara River confluence) native vegetation such as mulefat (*Baccharis salicifolia*) and willows (*Salix* sp.) have naturally recruited within the channel. Additionally, a dense cover of weedy species such as, but not limited to white sweet clover (*Melilotus alba*) were noted within these areas. Areas upstream of Highway 126 up to the fish ladder contained sporadic and occasionally dense pockets of emerging mulefat and willows (aside from the planted cuttings). Benches and sand bars formed from past winter storms are occupied by weedy invasive species, dominated by white sweet clover. While some emergent willows and mulefat have been observed, there is little shading of the Creek attributable to stream side vegetation. Shading provided by stream side vegetation is expected to occur once willows and mulefat within the Project Area mature.

3. CONCLUSION

The results of the summer low flow monitoring efforts indicate that current water quality conditions in the Project Area are not optimal for the long term sustainability steelhead trout populations within the Project Area, but appear to be within the range necessary to provide opportunities for downstream migration. Water temperatures are above the upper limit of the optimal range for growth and dissolved oxygen levels were below optimal levels. Turbidity levels however were within the acceptable range for steelhead.

No barriers to fish passage were noted within the Project Area. The minimal amount of sediment that had accumulated within the resting pools after the June sediment cleanout of the Fish Ladder is not likely to limit and/or prohibit movement through the ladder at this time. Multiple channels (or evidence of past channels) were observed within the Creek. As flows continue to recede and/or drier conditions exist, pooling may occur in remnant ancillary channels, which could lead to potential stranding conditions. However, this is a natural occurrence for streams of this nature. No steelhead trout were observed during the summer low flow monitoring efforts.

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Appendix A.
Photo Log

Permanent Sampling Station 1

West-view downstream

West-view upstream

West

Permanent Sampling Station 2

West-view downstream

West-view upstream

West

East-view downstream

East-view upstream

East

Permanent Sampling Station 3

West-view downstream

West-view upstream

West

East-view downstream

East-view upstream

East

Permanent Sampling Station 4

West-view downstream

West-view upstream

West

East-view downstream

East-view upstream

East

Permanent Sampling Station 5

West-view downstream

West-view upstream

West

East-view downstream

East-view upstream

East

Permanent Sampling Station 6

West-view downstream

West-view upstream

West

East-view downstream

East-view upstream

East

Fish Ladder

Appendix C
O&M Manual

US Army Corps
of Engineers
Los Angeles District

OPERATION, MAINTENANCE, REPAIR, REPLACEMENT, AND REHABILITATION MANUAL

SANTA PAULA CREEK CHANNEL IMPROVEMENTS

Santa Clara River Drainage Area,
Ventura County, California

Draft
December 2011

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OPERATION, MAINTENANCE, REPAIR, REPLACEMENT, AND REHABILITATION MANUAL

Santa Paula Creek Channel Improvements

I. INTRODUCTION

PURPOSE

This manual is intended as a guide to the operation and maintenance of Federally-constructed flood risk management facilities and provides information regarding the permits process. This manual has been prepared pursuant to the Code of Federal Regulations, Title 33, Article 208.10. The Code of Federal Regulations (Extract) is included in this manual as Appendix I

AUTHORIZATION

The project was authorized under the Amendment to Section 221 Agreement dated September 13, 1996, between USACE and the Ventura County Watershed Protection District (VCWPD), included as appendix V of this manual.

SUMMARY OF OMRR&R RESPONSIBILITIES

Responsible Agency - The principal local organization to which the responsibility for operation and maintenance of the Project has been delegated is the Ventura County Watershed Protection District (VCWPD). The VCWPD is required to set up an organizational structure capable of adequately operating and maintaining the project in accordance with the procedures and instructions contained in this manual. All operations and maintenance activities must also conform to the environmental requirements included in this manual as Appendix VI.

Appointed Official - VCWPD shall appoint an official (referred to as "Superintendent" in the basic regulations) who shall be responsible for the development and proper functioning of the operation and maintenance organization in accordance with the instructions provided in this manual.

Section 404 Permit Requirements and Exemptions - Title 33, parts 320-330, states that maintenance or other activities in which discharges of dredged or fill material (including excavation and substrate disturbance involving vegetation removal) into waters of the U.S., including but not limited to channels, floodways, and impoundments, require the responsible entity to apply for and obtain a Clean Water Act Section 404 permit from the USACE Los Angeles District Regulatory Division prior to commencement of such activities. The Santa Paula Creek is a water of the United States and subject to the Corps Clean Water Act permitting authority. Therefore any maintenance activities, proposed construction or utilities, or any other

activities that are within or partially within the Santa Paula Creek will require a 404 permit application to be completed by the agency planning the activity. Appendix III contains a sample 404 permit application. It is anticipated that routine maintenance activities conducted in accordance with this manual would be incorporated into VCWPD's Ongoing Routine Maintenance Program, which would be authorized under a Regional General Permit currently in development by the USACE Regulatory Division.

Some activities will be considered exempt. Appendix III contains copy of the Corps – EPA Joint Guidance on Clean Water Act Section 404(f)(1)(B) Exemption for Maintenance and Emergency Reconstruction of Currently Serviceable Structures, dated 4 Dec 1998 concerning the scope of the Clean Water Act Section 404(f)(1)(b). Exemption for Maintenance and Emergency Reconstruction of Currently Serviceable Structures. The Corps Regulatory Branch must be notified prior to initiation of activities in such instances to verify the work is within the scope of exempted activities.

Other Permits and Governing Agencies - The VCWPD shall be required to comply with all federal, state and local governing agency regulations. Governing agencies include, but are not limited to, the California Regional Water Quality Control Board, the State of California Department of Fish and Game, and the National Marine Fisheries Service. Appendix VI contains environmental guidance that summarizes many of the conditions already set forth. In addition, permits and agreements that were obtained for the Santa Paula project are listed in appendix VI of this manual. The VCWPD or any other applicant proposing work is responsible for complying with the environmental guidance within this manual, and for obtaining any necessary permits.

Manual Updates - In accordance with ER 1110-2-401, the Commander of the Los Angeles District U. S. Army Corps of Engineers (USACE) may update the manual to reflect changed conditions resulting from the actual inspections and maintenance and as suggested by the VCWPD in any manual update reports.

Other Uses - Other uses of the flood control project are permitted under special circumstances. The USACE District Engineer is responsible for evaluating a proposed use and determining whether or not a conflict or incompatibility exists. If the proposed alternate use requires work which involves discharges of dredged or fill material (including some methods of excavation) into waters of the United States, or involves work in or affecting navigable waters of the United States, the local sponsor or the proponent of the changed use may need a permit from the Regulatory Division. Such a use may not be implemented without approval of the USACE District Engineer.

Public Utilities - Encroachment of any new utilities or proposed construction along the project rights-of-way or any other uses is not allowed without proper permits and must not restrict the effective flood control protection provided by the project features nor interfere with the operation or maintenance functions.

Public utilities includes sewer, water, gas, oil, electricity, telephone or any other utility lines that cross any part of the project.

Continuing liaison with utility personnel will reduce maintenance problems by providing utility installation and construction crews with adequate information on design, construction, operations, and maintenance of flood control facilities.

II. PROJECT INFORMATION

LOCATION

The project is located in southern California, in Ventura County, near the eastern boundary of the City of Santa Paula. The City of Santa Paula is located on State Route 126, about 80 kilometers (50 miles) northwest of Los Angeles, California. See plate 1 in appendix IV.

CLIMATE

The climate of south-central Ventura County is wet and cool from November to April, when 90% of the annual precipitation occurs, and dry and warm from May to October. Extreme temperatures observed range from about 38 ^{0}C (100 ^{0}F) to about –4 ^{0}C (25 ^{0}F). Annual average temperatures range from 10 ^{0}C (50 ^{0}F) at the coast to 25 ^{0}C (77 ^{0}F) inland. For Ventura County, mean annual precipitation varies by year and with the terrain but averages approximately 35.6 cm (14 in).

PROJECT DESCRIPTION AND FEATURES

The Santa Paula Creek Improvements project replaced the former portion of concrete channel at the downstream end of the project with a wider and deeper trapezoidal earth bottomed channel with grouted stone side-slopes, starting at the confluence of the Santa Clara River and extending upstream approximately 3,100 meters (1.65 miles). The project is expected to convey a 28,000 cubic feet per second (cfs) event while allow for sediment to deposit along the entire length of the project area, providing improved flood risk management for the City of Santa Paula and the neighboring areas along the Santa Paula Creek.

Project features include: a grouted stone invert at the upstream end to address prior headcutting (upstream erosion) issues and allow for downstream storage of sediment within the project area; a fishway (fish ladder) placed within the grouted stone invert to facilitate fish migration; an earthen channel invert (natural channel bottom), from the base of the grouted stone inlet to the confluence with the Santa Clara River, with grouted stone invert stabilizers near the upper and lower boundaries of the earthen channel; a low flow channel extending immediately upstream of the grouted stone inlet and along the entire downstream length of the project, below the inlet, to assist in continued fish passage after O&M sediment removal; a pilot channel from station 10+00 to the confluence with the Santa Clara River; grouted stone trapezoidal channel side slopes from the grouted stone inlet to upstream of the railroad bridge, transitioning to a vertical-concrete

channel walls from the railroad bridge to Telegraph Road bridge, transitioning back to trapezoidal grouted stone channel slopes from downstream of Telegraph Road bridge to station 10+00; and, a bridge pier nose added to the railroad bridge. Other project features include service roads from upstream of the grouted stone inlet to Telegraph Road, and portions downstream to station 10+00, and landscaping adjacent to the service roads, side drains for interior drainage. These pertinent project features are described in appendix IV. Plates 1 through 7 in appendix IV show the location and layout of the project features.

This manual and as-builts drawings of the project are contained on the included CD. The drawings are in a raster format viewable directly from the CD using the viewer provided on the CD.

CONSTRUCTION HISTORY

Three contracts were associated with the construction of the Santa Paula Creek Improvements. The as-builts for each contract are provided on CD-ROM as part of this manual. See figure 1 at the end of this section for locations of each contract.

Reach 1	Specifications	DACW09-97-C-0038 Santa Paula Creek, Reach 1
	Contractor:	C. A. Rasmussen, Inc. 2360 Shasta Way Simi Valley CA 93065-1800
Reach 2	Specifications	DACW09-98-B-0020 Santa Paula Creek, Reach 2
	Contractor:	Ogden Engineering and Construction, Inc. 3211 Jermantown Rd, Suite 300 Fairfax, VA 22030
Reach 3	Specifications	DACW09-01-B-0004 Santa Paula Creek, Reach 3-Including Fish Ladder
	Contractor:	Reyes Construction, Inc. 1295 South East End Avenue Pomona, CA 91766

III – OPERATIONS, INSPECTIONS, MAINTENANCE AND REPORTS

GENERAL

Operations involve all activities required to keep the flood control system or any of its components operable for its authorized use, including appropriate maintenance of fish passage components.

Inspections and maintenance is defined as the detection and correction of any conditions within the flood risk management project that might adversely affect the project's authorized function, including consideration of fish passage. Inspections and maintenance shall be documented in reports by the VCWPD and provided, as appropriate, to regulatory agencies.

INSPECTIONS

The VCWPD shall inspect all Project features, listed in appendix IV, immediately prior to the beginning of the flood season, immediately following each major high water period, and otherwise at intervals not exceeding 90 days, and at such intermediate times as may be necessary to insure the best possible care of the protective works. Intermediate inspection times that may be necessary for the grouted stone invert and fish ladder features of the project are primarily based on flow events associated with the steelhead migration period. Refer to Appendix VI for the steelhead trout migration season.

Inspections of each project feature will be required by the VCWPD to determine if any deviations have occurred from the current 'as-built' condition and whether the deviations are substantial enough to require maintenance. Refer to the as-built drawings that are included as part of this manual on the enclosed CD to determine deviations from as-built conditions. The VCWPD inspector shall record all deviations in inspection logs indicating the feature and location, deviation from as-built condition, and cause of the deviation. The VCWPD superintendent shall review the inspection logs and determine the required maintenance.

Whenever a reporting feature cannot be directly inspected or the cause of a feature's deviation from as-built conditions is not immediately apparent, then an investigation and test program is required. The VCWPD superintendent shall propose and implement the investigation and test programs and determine the proposed maintenance for each deviation upon review of the test program results. The superintendent shall also determine which deviations are in immediate need of repair and set an aggressive schedule for the proposed maintenance to be accomplished as quickly as possible in accordance with the requirements of the environmental restrictions of appendix VI. Less serious deviations will be repaired prior to the fall semi-annual report or sooner depending on the need as determined by the superintendent.

FISH PASSAGE RELATED INSPECTIONS

Inspection of project features associated with fish passage shall be conducted periodically throughout each year to validate the projects ability to enable fish passage. There are two triggers for inspection of fish passage capabilities:

1. Post Storm Inspections (Storms producing flow of 500 cfs or more)
2. Low Flow Inspections (mid-April to mid-July)

For all fish passage related inspections, the qualified biologist shall make visual observations, necessary photo documentation, and record discharge measurements for the project area as well as document any steelhead observed during the inspection. Monitors shall document sediment and debris accumulation upstream, downstream, and between weirs of the inlet structure/fish way, and evaluate and document potential isolated pool formation or other factors that may inhibit steelhead migration through the remainder of the project area, including the low flow channel, approach channel, and pilot channel.

Any potential barriers to steelhead movement shall be documented via GPS location, photographs, and written notation to incorporate into the inspection report. Refer to Appendix IV for further details related to fish passage inspections.

REPORTS

All reports are to be submitted to the USACE District Engineer by the VCWPD superintendent as defined below, and further detailed in Appendix IV:

Semi-Annual Flood Risk Management Reports. The semi-annual reports are prepared in the spring and fall. The spring report should be submitted on June 1st and the fall report on December 1st.

The semi-annual spring report includes the required maintenance at the end of the flood season as determined by the VCWPD superintendent. The report shall include a summary of the deviations found during the inspections, inspection logs related to the feature that requires maintenance, any investigation and test programs that were completed or to be scheduled, and any maintenance that was completed or to be scheduled.

The semi-annual fall report includes any investigation and test programs and maintenance performed after the submittal of the spring report and the maintenance performed.

Information on cost of operation and maintenance is required as part of the semi-annual report. Estimates may be used for items where actual costs are not available. Operation and maintenance costs for any work performed or paid for by the operation and maintenance organization are to be shown irrespectively of the source of funds. Costs for work performed by other agencies, which are not reimbursed by the operation and maintenance organization, are not required. The reports

can be narrative letter reports as the sample provided in appendix II or summarized on a form designed by the VCWPD.

Storm Flow Operation Report. Storm Flow Operation Reports are submitted with the semi-annual spring report and contain pertinent information documenting all storm flow data and all activities related to any emergency operations procedures that are required as defined under section "IV- Emergency Operations" of this manual.

Special Reports. Special reports are prepared to describe any unusual occurrence that affects the flood control system such as earthquakes or other construction that impacts any of the flood control facility, or other unusual causes. A Special Report is to be transmitted to the District Engineer within one week of the occurrence. A copy is to accompany the next following semi-annual report.

Fish Passage Inspection Reports. The checklist provided in Appendix II shall be filled out during post storm and low flow inspections, and used to document any potential corrective actions. NMFS shall be contacted regarding proposed corrective actions and a summmary report shall be subsequently prepared that documents actions taken. Further details on fish passage inspection observation criteria that should be documented in each report are presented in Appendix IV.

Operations and Maintenance Manual Report Revisions. Revisions should include adaptive management comments, suggestions, and additional data from those directly concerned with operation and maintenance, as well as policy-making, administration, funding, and programming information. This manual will be periodically revised, as necessary, to correct observed discrepancies or inaccuracies and to address comments relative to the manual's effectiveness in fulfilling its intended function. This report will be submitted, as necessary, with the following semi-annual report.

IV - EMERGENCY OPERATIONS

GENERAL

Emergency flood operations consist of monitoring the project conditions during heavy storms and the mobilization actions required to prevent damage or failure of project features and to alert the public of possible flooding.

The emergency operation program consists of four phases: pre-stormflow, initial stormflow, final stormflow, and post-stormflow and is detailed in this section.

A copy of the Ventura County Watershed Protection District's Emergency Operation Plan is presented in Appendix VII that gives pertinent local procedures and contact information.

STORMFLOW OPERATION PHASES

Pre-Stormflow Operations. The pre-stormflow phase occurs whenever the flow in Santa Paula Creek is expected to equal or exceed 5,000 cfs based on National Weather Service rainfall forecasts and the results of the River Forecasting Model for the watershed.

(1) Superintendent shall activate appropriate VCWPD, Operation & Maintenance staff to patrol the project and determine readiness to accommodate flow.

(2) Patrol units shall become familiar with all roads leading to the access points and establish a route to efficiently patrol the entire project. Side drains should be cleaned and any accumulated debris should be removed.

(3) Communications capabilities, such as radios or cell phones, should be setup between the patrol and the superintendent and routinely checked for proper working order. No written reports are required for submittal to the District Engineer. However, internal documentation may be helpful if flow increases to the point where a stormflow report is required.

Initial Stormflow Operations. The initial stormflow phase begins when runoff starts to occur in the Creek.

(1) Superintendent shall alert all appropriate staff for potential full mobilization.

(2) Continuation of patrolling is required. All drainage features should be inspected for proper function.

(3) Communications capabilities should be routinely checked for proper working order. No written reports are required for submittal to the District Engineer.

However, documentation of any potential malfunctioning features or erosion should be noted and monitored closely.

Final Stormflow Operations. The final stormflow phase occurs when one-third of the creek's capacity has been reached (approximately 10,000 cfs).

(1) Full mobilization is required. A staffing plan for floodlighting with shifts established for 24-hour operation must be incorporated into the VCWPD's "Emergency Operation Plan." Staff must be either on duty or on-call.

(2) Patrolling units should continue to monitor and note potential problems with erosion or drainage that could result in failure of any project features. The responsibilities of the patrols include the following:

(i) Photographs should be taken at locations where stormflow damage is occurring or has occurred, where such damage has been repaired, where unusual conditions are noted, or where visual records may be useful in making maintenance determinations.

(ii) Side drains should be checked for any blockage due to obstructions or debris pile-up.

(iii) Any condition endangering any project structure should be immediately reported to the superintendent and corrective action taken.

(3) Communications capabilities should be routinely checked for proper working order. No written reports are required for submittal to the District Engineer. However, documentation of any potential malfunctioning features or erosion should be noted and monitored closely.

Post-Stormflow Operations. The post-stormflow phase occurs when the water surface elevation begins to recede below one-third of Santa Paula Creek's capacity and available meteorologic and hydrologic data indicate decreasing flow.

(1) The project should be rapidly but completely inspected. The responsibilities of the patrols include the following:

(i) All damaged Santa Paula Creek facilities should be located, reported, and photographed.

(ii) Side drains should be freed of debris and checked for any blockage.

(iii) The Santa Paula Creek channel should be checked to ascertain whether the accumulation of sediment and debris has reached the point where removal operations should be undertaken.

(iv) Appropriate temporary or permanent repairs of damaged flood control facilities should be initiated.

(v) Equipment and materials should be inventoried and made ready for subsequent stormflow.

(2) A stormflow report addressing each event that reaches the final stormflow phase is required.

COORDINATION WITH THE U.S. ARMY CORPS OF ENGINEERS

VCWPD is responsible for maintaining close liaison with the USACE Los Angeles District Emergency Operations Branch (phone #: 213-452-3444) during all four phases of flood operations. Exchange of hydrologic and hydraulic data, including precipitation and stormflow data, is useful in the operation procedures of both agencies. Pertinent information on liaison and coordination is given in the flood-emergency manual SPL OM 500-1-1, titled "Natural Disaster Activities," published annually by the District. In addition, VCWPD should contact the Regulatory Division (phone #: 805-585-2147) regarding the need for any emergency permit authorizations. The Corps has developed Regional General Permit (RGP) No. 63 authorizing Repair and Protection Activities in Emergency Situations. A copy of RGP 63 is attached in Appendix III.

APPENDIX I

CODE OF FEDERAL REGULATIONS (EXTRACT)

Title 33: Navigation and Navigable Waters

§ 208.10 Local flood protection works; maintenance and operation of structures and facilities.

(a) *General.* (1) The structures and facilities constructed by the United States for local flood protection shall be continuously maintained in such a manner and operated at such times and for such periods as may be necessary to obtain the maximum benefits.

(2) The State, political subdivision thereof, or other responsible local agency, which furnished assurance that it will maintain and operate flood control works in accordance with regulations prescribed by the Secretary of the Army, as required by law, shall appoint a permanent committee consisting of or headed by an official hereinafter called the "Superintendent," who shall be responsible for the development and maintenance of, and directly in charge of, an organization responsible for the efficient operation and maintenance of all of the structures and facilities during flood periods and for continuous inspection and maintenance of the project works during periods of low water, all without cost to the United States.

(3) A reserve supply of materials needed during a flood emergency shall be kept on hand at all times.

(4) No encroachment or trespass which will adversely affect the efficient operation or maintenance of the project works shall be permitted upon the rights-of-way for the protective facilities.

(5) No improvement shall be passed over, under, or through the walls, levees, improved channels or floodways, nor shall any excavation or construction be permitted within the limits of the project right-of-way, nor shall any change be made in any feature of the works without prior determination by the District Engineer of the Department of the Army or his authorized representative that such improvement, excavation, construction, or alteration will not adversely affect the functioning of the protective facilities. Such improvements or alterations as may be found to be desirable and permissible under the above determination shall be constructed in accordance with standard engineering practice. Advice regarding the effect of proposed improvements or alterations on the functioning of the project and information concerning methods of construction acceptable under standard engineering practice shall be obtained from the District Engineer or, if otherwise obtained, shall be submitted for his approval. Drawings or prints showing such improvements or alterations as finally constructed shall be furnished the District Engineer after completion of the work.

(6) It shall be the duty of the superintendent to submit a semiannual report to the District Engineer covering inspection, maintenance, and operation of the protective works.

(7) The District Engineer or his authorized representatives shall have access at all times to all portions of the protective works.

(8) Maintenance measures or repairs which the District Engineer deems necessary shall be promptly taken or made.

(9) Appropriate measures shall be taken by local authorities to insure that the activities of all local organizations operating public or private facilities connected with the protective works are coordinated with those of the Superintendent's organization during flood periods.

(10) The Department of the Army will furnish local interests with an Operation and Maintenance Manual for each completed project, or separate useful part thereof, to assist them in carrying out their obligations under this part.

(b) *Levees*—(1) *Maintenance.* The Superintendent shall provide at all times such maintenance as may be required to insure serviceability of the structures in time of flood. Measures shall be taken to promote the growth of sod, exterminate burrowing animals, and to provide for routine mowing of the grass and weeds, removal of wild growth and drift deposits, and repair of damage caused by erosion or other forces. Where practicable, measures shall be taken to retard bank erosion by planting of willows or other suitable growth on areas riverward of the levees. Periodic inspections shall be made by the Superintendent to insure that the above maintenance measures are being effectively carried out and, further, to be certain that:

(i) No unusual settlement, sloughing, or material loss of grade or levee cross section has taken place;

(ii) No caving has occurred on either the land side or the river side of the levee which might affect the stability of the levee section;

(iii) No seepage, saturated areas, or sand boils are occurring;

(iv) Toe drainage systems and pressure relief wells are in good working condition, and that such facilities are not becoming clogged;

(v) Drains through the levees and gates on said drains are in good working condition;

(vi) No revetment work or riprap has been displaced, washed out, or removed;

(vii) No action is being taken, such as burning grass and weeds during inappropriate seasons, which will retard or destroy the growth of sod;

(viii) Access roads to and on the levee are being properly maintained;

(ix) Cattle guards and gates are in good condition;

(x) Crown of levee is shaped so as to drain readily, and roadway thereon, if any, is well shaped and maintained;

(xi) There is no unauthorized grazing or vehicular traffic on the levees;

(xii) Encroachments are not being made on the levee right-of-way which might endanger the structure or hinder its proper and efficient functioning during times of emergency.

Such inspections shall be made immediately prior to the beginning of the flood season; immediately following each major high water period, and otherwise at intervals not exceeding 90 days, and such intermediate times as may be necessary to insure the best possible care of the levee. Immediate steps will be taken to correct dangerous conditions disclosed by such

inspections. Regular maintenance repair measures shall be accomplished during the appropriate season as scheduled by the Superintendent.

(2) *Operation.* During flood periods the levee shall be patrolled continuously to locate possible sand boils or unusual wetness of the landward slope and to be certain that:

(i) There are no indications of slides or sloughs developing;

(ii) Wave wash or scouring action is not occurring;

(iii) No low reaches of leave exist which may be overtopped;

(iv) No other conditions exist which might endanger the structure.

Appropriate advance measures will be taken to insure the availability of adequate labor and materials to meet all contingencies. Immediate steps will be taken to control any condition which endangers the levee and to repair the damaged section.

(c) *Flood walls*—(1) *Maintenance.* Periodic inspections shall be made by the Superintendent to be certain that:

(i) No seepage, saturated areas, or sand boils are occurring;

(ii) No undue settlement has occurred which affects the stability of the wall or its water tightness;

(iii) No trees exist, the roots of which might extend under the wall and offer accelerated seepage paths;

(iv) The concrete has not undergone cracking, chipping, or breaking to an extent which might affect the stability of the wall or its water tightness;

(v) There are no encroachments upon the right-of-way which might endanger the structure or hinder its functioning in time of flood;

(vi) Care is being exercised to prevent accumulation of trash and debris adjacent to walls, and to insure that no fires are being built near them;

(vii) No bank caving conditions exist riverward of the wall which might endanger its stability;

(viii) Toe drainage systems and pressure relief wells are in good working condition, and that such facilities are not becoming clogged.

Such inspections shall be made immediately prior to the beginning of the flood season, immediately following each major high water period, and otherwise at intervals not exceeding 90 days. Measures to eliminate encroachments and effect repairs found necessary by such inspections shall be undertaken immediately. All repairs shall be accomplished by methods acceptable in standard engineering practice.

(2) *Operation.* Continuous patrol of the wall shall be maintained during flood periods to locate possible leakage at monolith joints or seepage underneath the wall. Floating plant or boats will not be allowed to lie against or tie up to the wall. Should it become necessary during a flood

emergency to pass anchor cables over the wall, adequate measures shall be taken to protect the concrete and construction joints. Immediate steps shall be taken to correct any condition which endangers the stability of the wall.

(d) *Drainage structures*—(1) *Maintenance.* Adequate measures shall be taken to insure that inlet and outlet channels are kept open and that trash, drift, or debris is not allowed to accumulate near drainage structures. Flap gates and manually operated gates and valves on drainage structures shall be examined, oiled, and trial operated at least once every 90 days. Where drainage structures are provided with stop log or other emergency closures, the condition of the equipment and its housing shall be inspected regularly and a trial installation of the emergency closure shall be made at least once each year. Periodic inspections shall be made by the Superintendent to be certain that:

(i) Pipes, gates, operating mechanism, riprap, and headwalls are in good condition;

(ii) Inlet and outlet channels are open;

(iii) Care is being exercised to prevent the accumulation of trash and debris near the structures and that no fires are being built near bituminous coated pipes;

(iv) Erosion is not occurring adjacent to the structure which might endanger its water tightness or stability.

Immediate steps will be taken to repair damage, replace missing or broken parts, or remedy adverse conditions disclosed by such inspections.

(2) *Operation.* Whenever high water conditions impend, all gates will be inspected a short time before water reaches the invert of the pipe and any object which might prevent closure of the gate shall be removed. Automatic gates shall be closely observed until it has been ascertained that they are securely closed. Manually operated gates and valves shall be closed as necessary to prevent inflow of flood water. All drainage structures in levees shall be inspected frequently during floods to ascertain whether seepage is taking place along the lines of their contact with the embankment. Immediate steps shall be taken to correct any adverse condition.

(e) *Closure structures*—(1) *Maintenance.* Closure structures for traffic openings shall be inspected by the Superintendent every 90 days to be certain that:

(i) No parts are missing;

(ii) Metal parts are adequately covered with paint;

(iii) All movable parts are in satisfactory working order;

(iv) Proper closure can be made promptly when necessary;

(v) Sufficient materials are on hand for the erection of sand bag closures and that the location of such materials will be readily accessible in times of emergency.

Tools and parts shall not be removed for other use. Trial erections of one or more closure structures shall be made once each year, alternating the structures chosen so that each gate will

be erected at least once in each 3-year period. Trial erection of all closure structures shall be made whenever a change is made in key operating personnel. Where railroad operation makes trial erection of a closure structure infeasible, rigorous inspection and drill of operating personnel may be substituted therefor. Trial erection of sand bag closures is not required. Closure materials will be carefully checked prior to and following flood periods, and damaged or missing parts shall be repaired or replaced immediately.

(2) *Operation.* Erection of each movable closure shall be started in sufficient time to permit completion before flood waters reach the top of the structure sill. Information regarding the proper method of erecting each individual closure structure, together with an estimate of the time required by an experienced crew to complete its erection will be given in the Operation and Maintenance Manual which will be furnished local interests upon completion of the project. Closure structures will be inspected frequently during flood periods to ascertain that no undue leakage is occurring and that drains provided to care for ordinary leakage are functioning properly. Boats or floating plant shall not be allowed to tie up to closure structures or to discharge passengers or cargo over them.

(f) *Pumping plants*—(1) *Maintenance.* Pumping plants shall be inspected by the Superintendent at intervals not to exceed 30 days during flood seasons and 90 days during off-flood seasons to insure that all equipment is in order for instant use. At regular intervals, proper measures shall be taken to provide for cleaning plant, buildings, and equipment, repainting as necessary, and lubricating all machinery. Adequate supplies of lubricants for all types of machines, fuel for gasoline or diesel powered equipment, and flash lights or lanterns for emergency lighting shall be kept on hand at all times. Telephone service shall be maintained at pumping plants. All equipment, including switch gear, transformers, motors, pumps, valves, and gates shall be trial operated and checked at least once every 90 days. Megger tests of all insulation shall be made whenever wiring has been subjected to undue dampness and otherwise at intervals not to exceed one year. A record shall be kept showing the results of such tests. Wiring disclosed to be in an unsatisfactory condition by such tests shall be brought to a satisfactory condition or shall be promptly replaced. Diesel and gasoline engines shall be started at such intervals and allowed to run for such length of time as may be necessary to insure their serviceability in times of emergency. Only skilled electricians and mechanics shall be employed on tests and repairs. Operating personnel for the plant shall be present during tests. Any equipment removed from the station for repair or replacement shall be returned or replaced as soon as practicable and shall be trial operated after reinstallation. Repairs requiring removal of equipment from the plant shall be made during off-flood seasons insofar as practicable.

(2) *Operation.* Competent operators shall be on duty at pumping plants whenever it appears that necessity for pump operation is imminent. The operator shall thoroughly inspect, trial operate, and place in readiness all plant equipment. The operator shall be familiar with the equipment manufacturers' instructions and drawings and with the “Operating Instructions” for each station. The equipment shall be operated in accordance with the above-mentioned “Operating Instructions” and care shall be exercised that proper lubrication is being supplied all equipment, and that no overheating, undue vibration or noise is occurring. Immediately upon final recession of flood waters, the pumping station shall be thoroughly cleaned, pump house sumps flushed, and equipment thoroughly inspected, oiled and greased. A record or log of pumping plant

operation shall be kept for each station, a copy of which shall be furnished the District Engineer following each flood.

(g) *Channels and floodways*—(1) *Maintenance.* Periodic inspections of improved channels and floodways shall be made by the Superintendent to be certain that:

(i) The channel or floodway is clear of debris, weeds, and wild growth;

(ii) The channel or floodway is not being restricted by the depositing of waste materials, building of unauthorized structures or other encroachments;

(iii) The capacity of the channel or floodway is not being reduced by the formation of shoals;

(iv) Banks are not being damaged by rain or wave wash, and that no sloughing of banks has occurred;

(v) Riprap sections and deflection dikes and walls are in good condition;

(vi) Approach and egress channels adjacent to the improved channel or floodway are sufficiently clear of obstructions and debris to permit proper functioning of the project works.

Such inspections shall be made prior to the beginning of the flood season and otherwise at intervals not to exceed 90 days. Immediate steps will be taken to remedy any adverse conditions disclosed by such inspections. Measures will be taken by the Superintendent to promote the growth of grass on bank slopes and earth deflection dikes. The Superintendent shall provide for periodic repair and cleaning of debris basins, check dams, and related structures as may be necessary.

(2) *Operation.* Both banks of the channel shall be patrolled during periods of high water, and measures shall be taken to protect those reaches being attacked by the current or by wave wash. Appropriate measures shall be taken to prevent the formation of jams of ice or debris. Large objects which become lodged against the bank shall be removed. The improved channel or floodway shall be thoroughly inspected immediately following each major high water period. As soon as practicable thereafter, all snags and other debris shall be removed and all damage to banks, riprap, deflection dikes and walls, drainage outlets, or other flood control structures repaired.

(h) *Miscellaneous facilities*—(1) *Maintenance.* Miscellaneous structures and facilities constructed as a part of the protective works and other structures and facilities which function as a part of, or affect the efficient functioning of the protective works, shall be periodically inspected by the Superintendent and appropriate maintenance measures taken. Damaged or unserviceable parts shall be repaired or replaced without delay. Areas used for ponding in connection with pumping plants or for temporary storage of interior run-off during flood periods shall not be allowed to become filled with silt, debris, or dumped material. The Superintendent shall take proper steps to prevent restriction of bridge openings and, where practicable, shall provide for temporary raising during floods of bridges which restrict channel capacities during high flows.

(2) *Operation.* Miscellaneous facilities shall be operated to prevent or reduce flooding during periods of high water. Those facilities constructed as a part of the protective works shall not be used for purposes other than flood protection without approval of the District Engineer unless designed therefor.

(Sec. 3, 49 Stat. 1571, as amended; 33 U.S.C. 701c)

[9 FR 9999, Aug. 17, 1944; 9 FR 10203, Aug. 22, 1944]

APPENDIX II

REPORTING FORMS

APPENDIX II
REPORTING FORMS (OPTIONAL)

INSTRUCTIONS FOR USE

GENERAL

1. The use of sample forms presented in this appendix is optional. Other means of reporting, such as other tabular presentations or the Corps forms, can be used providing that the same basic information, operation and maintenance criteria, and maintenance accomplishment are provided. Both the spring and fall semi-annual operation and maintenance reports submitted to the Corps of Engineers, Los Angeles District, are organized in basically the same way.

SEMI-ANNUAL LETTER REPORT

2. A sample semi-annual letter report is provided in this Appendix. In general, the samples are self- explanatory. The semi-annual report present a statement of

a. The physical condition of the protective works as summarized from the logs of inspection.

b. Performance of the protective works during floods and flood-fighting activities during the past.

c. Prosecutions for encroachment or trespass.

d. Permits issued for rights-of-entry or use of rights-of-way.

e. Permits issued for improvements or construction within the flood-control improvement rights-of-way.

f. Maintenance measures taken; nature, date of construction, date of removal of temporary repairs, and date of permanent repairs.

g. Fiscal statement of cost of maintenance and operation for the period.

SAMPLE SEMI-ANNUAL LETTER REPORT

Date:

District Engineer
U.S. Army Corps of Engineers
Los Angeles District
915 Wilshire Boulevard, 13th Floor
Los Angeles, California 90017-3401

Dear Sir:

The semi-annual report for the period *(October 15, 201_ to April 15, 201_) or (April 15, 201_ to October 15, 201_)* for the **Santa Paula Creek Improvements Project** is as follows:

a. The physical condition of the protective works is indicated by the inspection reports, copies of which are enclosed and may be summarized as follows:

(Superintendent's summary of conditions)

It is our intention to perform the following maintenance work in order to repair or correct the conditions indicated.

(Outline of anticipated maintenance operations for the following 6 months)

b. During this report period, major high water periods occurred on the following dates:

DATE	MAX. ELEVATION

c. The inspection has indicated *(no) or (the following)* encroachment or trespass upon the project rights-of-way.

Action or prosecution for abatement of these encroachments or trespasses is summarized as follows: *(or state none have been necessary)*

d. *(No) or (_____)* permits have been issued *(for the following improvements or construction within the project rights-of-way).*

Executed copies of the permit documents issued are enclosed for your files.

e. The status of maintenance measures indicated in the previous report as required or as suggested by the representatives of the Commander is as follows:

(Statement of maintenance operations, item by item with percent completion)

f. The fiscal statement of the gross operation and maintenance expenditures for the current report period is as follows:

Stormflow operations	$ _____
Inspection and reporting	_____
New permit inspection	_____
Maintenance and repairs	_____
Sediment Cleanout	_____
Fish Ladder Cleanout and Repairs	_____
TOTAL	$ _____

Comments on these expenditures are as follows:

(comments)

Sincerely,

(name), Superintendent of Works

Enclosures

SEMI-ANNUAL INSPECTION REPORT
(To be submitted on 1 June and 1 December)

Project: SANTA PAULA CREEK IMPROVEMENTS PROJECT

Inspector-in-charge: _____ Date:_____

Superintendent: _____ Date:_____

INSPECTION AND MAINTENANCE

FEATURE INSPECTED (Inspect all features as detailed in Appendix IV)

a. Condition of feature (State whether the feature is in good working condition or describe the noticeable deviations or deficiencies from design condition.) See appendix IV for inspection criteria)
b. Investigation and tests required? (Yes or No, if yes, clearly describe them and follow up with supplemental report)
c. Required Maintenance (descibe the results of any investigations and tests performed and describe the required maintenance to be performed for the feature)

FISH PASSAGE FIELD INSPECTION CHECKLIST
Inspection Type: Post-Storm, or Low Flow (*Circle One*)

Date:
Time Start:
Time Finish:
Inspector:
Flow Range (see USGS Gage #11113500):

FIELD INSPECTION CHECKLIST– The parameter descriptions in Table 1, *Fish Passage Parameters and Descriptions Checklist*, below, are intended to provide a quick reference guide for the inspector. At a minimum, each of the questions presented in the parameter descriptions column of Table 1 should be answered. Please use the the General Notes section of the checklist to document any other relevant observations. Please complete one form for each of the General Reaches noted below.

Note: General Reach options include **(1)** Approach Channel, **(2)** Fish Ladder-include pool or notch #, **(3)** Low Flow Channel [Fish Ladder to Railroad Bridge], **(4)** Low Flow Channel [Railroad Bridge to Telegraph Rd Bridge], **(5)** Low Flow Channel [Telegraph Rd Bridge to Highway 126 Bridge], **(6)** Low Flow Channel [Highway 126 Bridge to Pilot Channel], **(7)** Pilot Channel to Confluence with Santa Clara River.

Table 1 Fish Passage Parameters and Descriptions Checklist

Feature (General Reach)	Parameter	Parameter Descriptions	Parameter Description Answers (Y/N)	Comments
Approach Channel (1)	Drops	Are there any waterfalls of greater than 0.3 meters (1 foot)?		
Approach Channel (1)	Flow Continuity	Are flows being directed into the fish ladder?		
Approach Channel (1)	Ponding	Are there isolated pools forming that have the potential to strand fish?		
Fish Ladder (2)	Drop Between Pools	Is the drop between water surface levels greater than 0.3 meters (1 foot) from one pool to the next?		
Fish Ladder (2)	Sediment Accumulation	Has more than 1 meter (3.28 feet) of sediment accumulated across any pools?		

Fish Ladder (2)	Notch Blockage	Is debris blocking any notch and causing a drop of more than 0.3 meters (1 foot) between pools?		
Low Flow Channel (3-6)	Drops	Are there waterfalls of more than 0.3 meters (1 foot)?		
Low Flow Channel (3-6)	Channel Braiding	Is the channel braided, resulting in insufficient depth?		
Low Flow Channel (3-6)	Flow Continuity	Have flows gone subsurface?		
Low Flow Channel (3-6)	Ponding	Are isolated pools forming that have the potential to strand fish?		
Earth Channel Invert (3-6)	Energy Dissipation	Are there energy dissipation features present (i.e. boulders, etc.)?		
Pilot Channel (7)	Drops	Are there any waterfalls of more than 0.3 meters (1 foot)?		
Pilot Channel (7)	Flow Continuity	Is flow connecting with the Santa Clara River?		
Pilot Channel (7)	Ponding	Are isolated ponds forming that have the potential to strand fish?		

Steelhead Observations:

- **Steelhead Observation #1**
  - **General Reach:** _____
  - **GPS Point #:** _____
  - **Northing** _____ **Easting** _____
  - **Photograph #'s:**_____
  - **Describe Surrounding Habitat and Other Comments: -**
    _____
    _____
  - **Length:** _____
  - **Age Class:** _____
- **Steelhead Observation #2**
  - **General Reach:** _____
  - **GPS Point #:** _____
  - **Northing** _____ **Easting** _____
  - **Photograph #'s:**_____
  - **Describe Surrounding Habitat and Other Comments: -**
    _____
    _____
  - **Length:** _____
  - **Age Class:** _____
- **Steelhead Observation #3**
  - **General Reach:** _____
  - **GPS Point #:** _____
  - **Northing** _____ **Easting** _____
  - **Photograph #'s:**_____
  - **Describe Surrounding Habitat and Other Comments: -**
    _____
    _____
  - **Length:** _____
  - **Age Class:** _____

Barriers to Movement:

- **Barrier #1**
  - **General Reach:** _____
  - **GPS Point #:** _____
  - **Northing** _____ **Easting** _____
  - **Photograph #'s:**_____
  - **Describe Barrier: (**Blockage, Insufficient Depth/Subsurface Flows, Isolated Pool Formation, etc**)-**
    _____
    _____
    _____
- **Barrier #2**
  - **General Reach:** _____
  - **GPS Point #:** _____

- **Northing** _____ **Easting** _____
- **Photograph #'s:**_____
- **Describe Barrier: (**Blockage, Insufficient Depth/Subsurface Flows, Isolated Pool Formation, etc**)-**

  _____
  _____
  _____

- **Barrier #3**
  - **General Reach:** _____
  - **GPS Point #:** _____
  - **Northing** _____ **Easting** _____
  - **Photograph #'s:**_____
  - **Describe Barrier: (**Blockage, Insufficient Depth/Subsurface Flows, Isolated Pool Formation, etc**)-**

    _____
    _____
    _____

- **General Notes: Include GPS points and photos.-**

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APPENDIX III

DEPARTMENT OF ARMY PERMIT APPLICATION

SAMPLE PERMIT APPLICATION

The following pages provide detailed instructions for preparing the Department of Army Permit Application. If you have any questions, please call the Corps of Engineers, Regulatory Branch that has jurisdiction over your area.

Instructions for Preparing a
Department of the Army Permit Application

Blocks 1 through 4. To be completed by Corps of Engineers.

Block 5. Applicant's Name. Enter the name of the responsible party or parties. If the responsible party is an agency, company, corporation or other organization, indicate the responsible officer and title. If more than one party is associated with the application, please attach a sheet with the necessary information marked **Block 5.**

Block 6. Address of Applicant. Pleas provide the full address of the party or parties responsible for the application. If more space is needed, attach an extra sheet of paper marked **Block 6.**

Block 7. Applicant Telephone Number(s). Please provide the number where you can usually be reached during normal business hours.

Blocks 8 through 11. To be completed if you choose to have an agent.

Block 8. Authorized Agent's Name and Title. Indicate name of individual or agency, designated by you, to represent you in this process. An agent can be an attorney, builder, contractor, engineer or any other person or organization. *Note:* An agent is not required.

Block 9 and 10. Agent's Address and telephone number. Please provide the complete mailing address of the agent, along with the telephone number where he/she can be reached during normal business hours.

Block 11. Statement of Authorization. To be completed by applicant if an agent is to be employed.

Block 12. Proposed Project Name or title. Please provide name identifying the proposed project (i.e., Landmark Plaza, Burned Hills Subdivision or Edsall Commercial Center).

Block 13. Name of Waterbody. Pleas provide the name of any stream, lake, marsh or other waterway to be directly impacted by the activity. If it is a minor (no name) stream, identify the waterbody the minor stream enters.

Block 14. Proposed Project Street Address. If the purpose project is located at a site having a street address (not a box number), please enter here.

Block 15. Location of Proposed Project. Enter the county and state where the proposed **project is located**. If more space is required, please attach a sheet with the necessary information marked **Block 15.**

Block 16. Other Location Descriptions. If available, provide the Section, Township and Range of the site and/or the latitude and longitude. You may also provide description of the proposed project location, such as lot numbers, tract numbers or you may choose to locate the proposed project site from a known point (such as the tight descending bank of Smith Creek, one mile down form the Highway 14 bridge). If a large river or stream, include the river mile of the proposed project site if known.

Block 17. Directions to the Site. Provide directions to the site from a known location or landmark. Include highway and street numbers as will as names. Also provide distances from known locations and any other information that would assist in locating the site.

Block 18. Nature of Activity. Describe the overall activity or project. Give appropriate dimensions of structures such as wingwalls, dikes (identify the materials to be used in construction, as well as the methods by which the work is to be done), or excavations (length, width, and height). Indicate whether discharge of dredged or fill material is involved. Also, identify any structure to be constructed on a fill, piles or float supported platforms.

The written descriptions and illustrations are an important part of the application. Please describe, in detail, what you wish to do. If more space is needed, attach an extra sheet of paper marked **Block 18.**

Block 19. Proposed Project Purpose. Describe the purpose and need for the proposed project. What will it be used for and why? Also, include a brief description of any related activities to be developed as the result of the proposed project. Give the approximate dates you plan to both begin and complete all work.

Block 20. Reason(s) for Discharge. If the activity involves the discharge of dredged and/or fill material into a wetland or other waterbody, including the temporary placement of material, explain the specific purpose of the placement of the material (such as erosion control).

Block 21. Type(s) of Material Being Discharged and the Amount of Each Type in Cubic Yards. Describe the material to be discharged and amount of each material to be discharged within Corps jurisdiction. Please be sure this description will agree with your illustrations. Discharge material includes: rock, sand, clay, concrete, etc.

Block 22. Surface Areas of Wetlands or Other Waters Filled. Describe the area to be filled at each location. Specifically identify the surface areas, or part thereof, to be filled. Also include the means by which the discharge is to be done (backhoe, dragline, etc.). If dredged material is to be discharged on an upland site, identify the site and the steps to be taken (if necessary) to prevent runoff from the dredged material back into a waterbody. If more space is needed, attach an extra

sheet of paper marked **Block 22.**

Block 23. Is any portion of the Work Already Complete? Provide any background on any part of the proposed project already completed. Describe the area already developed, structures completed, any dredged or fill material already discharged, the type of material, volume in cubic yards, acres filled, if a wetland or other waterbody (in acres or square feet). If the work was done under an existing Corps permit, identify the authorization if possible.

Block 24. Names and Addresses of Adjoining Property Owners, Lessees, etc., Whose Property Adjoins the Project Site. List complete names and full mailing addresses of the adjacent property owners (public and private) lessees, etc., whose property adjoins the waterbody or aquatic site where the work is being proposed so that they may be notified of the proposed activity (usually by public notice). If more space is needed, attach an extra sheet of paper marked **Block 24.**

Information regarding adjacent landowners is usually available through the office of the tax assessor in the county of counties where the project is to be developed.

Block 25. Information about Approvals or Denials by Other Agencies. You may need the approval of other Federal, state or local agencies for your project. Identify any application you have submitted and the status, if any (approved or denied) of each application. You need not have obtained all other permits before applying for a Corps permit.

Block 26. Signature of Applicant or Agent. The application must be signed by the owner or other authorized party (agent). This signature shall be an affirmation that the party applying for the permit possesses the requisite property rights to undertake the activity applied for (including compliance with special conditions, mitigation, etc.).

DRAWINGS AND ILLUSTRATIONS

General Information

Three types of illustrations are needed to properly depict the work to be undertaken. These illustrations or drawings are identified as a **Vicinity Map, a Plan View or a Typical Cross-section Map.** Identify each illustration with a figure or attachment number.

Please submit one original, or good quality copy, of all drawings on 8 ½x11 inch plain white paper (tracing paper or film may be substituted). Use the fewest number of sheets necessary for your drawings or illustrations.

Each illustration should identify the project, the applicant, and the type of illustration (vicinity map, plan view or cross section). **While illustrations need not be professional (many small, private illustrations are prepared by hand), they should be clear, accurate and contain all necessa ry information.**

APPLICATION FOR DEPARTMENT OF THE ARMY PERMIT (33 CFR 325)	OMB APPROVAL NO. 0710-0003 Expires June 30, 2000

Public reporting burden for this collection of information is expected to average 10 hours per response, although the majority of applications should require 5 hours or less. This includes the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Department of Defense, Washington Headquarters Service Directorate of Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington, VA 22202-4302; and to the Office of Management and Budget, Paperwork Reduction Project (0710-0003), Washington, DC 20503. Please DO NOT RETURN your form to either of those addresses. Completed applications must be submitted to the District Engineer having jurisdiction over the location of the proposed activity.

PRIVACY ACT STATEMENT

Authority: 33 USC 401, Section 10; 1413, Section 404. Principal Purpose: These laws require permits authorizing activities in, or affecting, navigable waters of the United States, the discharge of dredged or fill material into waters of the United States, and the transportation of dredged material for the purpose of dumping it into ocean waters. Routine Uses: Information provided on this form will be used in evaluating the application for a permit. Disclosure: Disclosure of requested information is voluntary. If information is not provided, however, the permit application cannot be processed nor can a permit be issued.

One set of original drawings or good reproducible copies which show the location and character of the proposed activity must be attached to this application (see sample drawings and instructions) and be submitted to the District Engineer having jurisdiction over the location of the proposed activity. An application that is not completed in full will be returned.

(ITEMS 1 THRU 4 TO BE FILLED BY THE CORPS)

1. APPLICATION NO.	2. FIELD OFFICE CODE	3. DATE RECEIVED	4. DATE APPLICATION COMPLETED

(ITEMS BELOW TO BE FILLED BY APPLICANT)

5. APPLICANT'S NAME	8. AUTHORIZED AGENT'S NAME AND TITLE *(an agent is not required)*
6. APPLICANT'S ADDRESS	9. AGENT'S ADDRESS
7. APPLICANT'S PHONE NOS. W/AREA CODE a. Residence ( ) b. Business ( )	10. AGENT'S PHONE NOS. W/AREA CODE a. Residence ( ) b. Business ( )

11. STATEMENT OF AUTHORIZATION

I hereby authorize, _____, to act in my behalf as my agent in the processing of this application and to furnish, upon request, supplemental information in support of this permit application.

APPLICANT'S SIGNATURE _____ DATE _____

NAME, LOCATION AND DESCRIPTION OF PROJECT OR ACTIVITY

12. PROJECT NAME OR TITLE *(see instructions)*

13. NAME OF WATERBODY, IF KNOWN *(if applicable)*	14. PROJECT STREET ADDRESS *(if applicable)*
15. LOCATION OF PROJECT County _____ State _____	

16. OTHER LOCATION DESCRIPTIONS, IF KNOWN, *(see instructions)*

17. DIRECTIONS TO THE SITE

18. Nature of Activity (Description of project, include all features)

19. Project Purpose (Describe the reason or purpose of the project, see instructions)

USE BLOCKS 20-22 IF DREDGED AND/OR FILL MATERIAL IS TO BE DISCHARGED

20. Reason(s) for Discharge

21. Type(s) of Material Being Discharged and the Amount of Each Type in Cubic Yards

22. Surface Area in Acres of Wetlands or Other Waters Filled *(see instructions)*

23. Is Any Portion of the Work Already Complete? ☐ Yes ☐ No IF YES, DESCRIBE THE COMPLETED WORK

24. Addresses of Adjoining Property Owners, Lessees, Etc., Whose Property Adjoins the Waterbody (If more than can be entered here, please attach a supplemental list).

25. List of Other Certifications or Approvals/Denials Received from other Federal, State or Local Agencies for Work Described in This Application.

AGENCY	TYPE APPROVAL*	IDENTIFICATION NUMBER	DATE APPLIED	DATE APPROVED	DATE DENIED

*Would include but is not restricted to zoning, building and flood plain permits

26. Application is hereby made for a permit or permits to authorize the work described in this application. I certify that the information in this application is complete and accurate. I further certify that I possess the authority to undertake the work described herein or am acting as the duly authorized agent of the applicant.

SIGNATURE OF APPLICANT	DATE	SIGNATURE OF AGENT	DATE

The application must be signed by the person who desires to undertake the proposed activity (applicant) or it may be signed by a duly authorized agent if the statement in block 11 has been filled out and signed.

18 U.S.C. Section 1001 provides that: Whoever, in any manner within the jurisdiction of any department or agency of the United States knowingly and willfully falsifies, conceals, or covers up any trick, scheme, or disguises a material fact or makes any false, fictitious or fraudulent statements or representations or makes or uses any false writing or document knowing same to contain any false, fictitious or fraudulent statements or entry, shall be fined not more than $10,000 or imprisoned not more than five years or both.

APPENDIX IV

BASIS FOR ROUTINE MAINTENANCE AND REPAIRS

APPENDIX IV
BASIS FOR ROUTINE MAINTENANCE AND REPAIRS

GENERAL

This appendix describes the project features requiring inspection along with specific inspection criteria for detecting conditions that have deviated from the as-built conditions. The feature locations are shown on plates 3 through 7 at the end of this appendix.

For each project feature, the inspector shall document any deviated condition. All inspections findings, proposed maintenance, and repairs shall be included in the appropriate reports as defined in section III of this manual. Appendix II shows the report format for the semi-annual reports.

The inspection criteria described in the following paragraphs is meant to aid the inspector in determining if deviations from the design have occurred. Corrective solutions are not presented here as the superintendent shall be responsible for determining the appropriate maintenance action to restore the damaged feature or deviated condition back to operable conditions and for assuring that the corrective maintenance is carried out.

Fish Passage Related Inspections

Inspection of project features associated with fish passage shall be conducted periodically throughout each year, as defined below, to validate the project's ability to enable fish passage and meet fish passage guidelines. Further detail on fish passage guidelines and inspection criteria are presented in the descriptions for the fish ladder and approach channel, low flow channel, grouted stone invert stabilizers, and pilot channel later in this section and in Appendix VI. Standardized checklists for reference in the field are presented in Appendix II for fish passage related inspections. There are two triggers for inspection of fish passage capabilities:

1. Post-Storm Inspections (Storms producing flow of 500 cfs or more)
2. Low-Flow Inspection (mid-April to mid-July)

For all fish passage related inspections, a qualified biologist shall make visual observations, necessary photo documentation, and document any steelhead observed during the inspection. Monitors shall observe and document sediment and debris accumulation upstream, downstream, and between weirs of the inlet structure/fish ladder, and evaluate and document potential isolated pool formation or other factors that may inhibit steelhead migration through the pilot channel, low flow channel, fish ladder, and approach channel.

Any potential barriers to steelhead movement shall be documented via GPS location, photographs, and written notation to incorporate into the inspection report.

Post Storm Inspections

The VCWPD shall inspect the project area to see if project features are providing fish passage capabilities and meeting fish passage criteria as detailed in each of the project feature sections, below, after any storm event producing flows of 500 cfs or more at the USGS Santa Paula Creek stream gage. USGS gage number 11113500 can be viewed at the following web address: http://waterdata.usgs.gov/ca/nwis/uv?site_no=11113500. The initial inspection shall occur during the portion of the receding limb of the hydrograph where flows fall below 150 cfs.

Low Flow Inspections
Inspections for fish passage capability shall also be done during the time of the year when the creek is exhibiting typical low flow conditions (between mid-April and mid-July) to evaluate the ability of the project to meet fish passage requirements.

EARTH CHANNEL INVERT

The channel invert was cut from the natural streambed and consists of earth, cobblestones, and native vegetation. The invert varies in width and the length is approximately 2,800 meters (9,200 feet). It is expected that sediment removal will be required approximately every three years but will vary depending on the severity of the cumulative storm events each year. The depth of sediment deposition is expected to be the downstream at the upstream end of project. The variation in the allowable depth of sediment deposition along the length of the channel is indicated in Table IV-1 Allowable Sedimentation Accumulation Profile shown at the end of this appendix. When the depth of sediment exceeds the allowable at any location, sediment must be removed from the project to restore the invert to the Design Invert elevations.

Inspection Criteria:

Sediment Deposition - It is critical that inspection for sediment deposition and scour be done at the end of each season and immediately after any storm event that requires activation of Emergency Flood Operations. If a visual inspection indicates that cleanout or scour remediation actions are warranted, a survey of the invert elevations is required for comparison to the Design Invert elevations. Cross section invert elevations shall be surveyed and plotted at corresponding cross-sections, as identified in Table IV-1. At each cross section, the invert elevations shall be surveyed at the left and right toe of slope and at intervals not to exceed 3 meters (10 feet) and at any significant grade break. The cross sections shall be plotted to show the existing condition grade line and the as-built condition grade line, and the allowable invert based on table IV. Maintenance is required to remove sediment when any cross section shows the surveyed invert exceeds the allowable invert. Removal of the sediment will then be required to restore the entire channel invert to the as-built invert level. Failure to do so will jeopardize the ability of the channel to convey the 28,000 cfs storm flow. The maintenance to restore the invert to design conditions shall be done no later than the beginning of the following flood season.

Local Scour - All retaining walls, grouted stone toe of slope, and bridge structures should be visually examined for local scour and repaired immediately. The frequency of scour inspections shall be at each spring semi annual inspection and after any storm event that requires activation of Emergency Flood Operations. Each cross section generated from the sediment survey shall also be examined for

scour. Scour elevations indicated on the cross sections shall be examined to ensure that scour does not pose a threat of undermining any structures. Upstream of the railroad bridge, cross section invert elevations shall not exceed scour limits as shown in Table IV-2. In general, downstream of the railroad bridge, the elevation of the scoured invert shall not be allowed to encroach within 0.5 meter (1.64 feet) of any portion of the subsurface toe of grouted stone. Scour that has exceeded the encroachment limits shall be immediately repaired.

Vegetation – Vegetation that establishes in the invert that is less than 3 inches dbh (diameter breast height) does not need to be removed since periodic storm events are expected to uproot it and wash it away. Vegetation greater than 3 inches dbh shall be selectively cut within 1- to 2-feet above ground level, as needed, in order to maintain channel design capacity.

GROUTED STONE INVERT

At the upper limit of the project, the new channel connects to the existing creek bed with a steep grouted stone invert that contains an embedded concrete fish ladder to allow passage of the steel head trout.

Inspection Criteria:

Cracks – Cracks shall be inspected for seepage and repairs will be required to eliminate any seepage.

FISH LADDER AND APPROACH CHANNEL

The fish ladder is built within the grouted stone invert and allows for the steelhead trout to reach upstream spawning beds. The fish ladder is a stair-stepped pattern made up of a series of grouted stone pools, each stepped 0.3 meter (12 inches) below the next. This geometry forces water through the weir notches, allowing the low flow to cascade over the weirs and into each pool. The fish ladder has 17 concrete weirs, with rectangular resting pools sized at 3.08 m (10 feet - 2 inches) by 12.71 m (41feet - 8 inches) between each set of weirs.

Inspection Criteria:

For additional information and requirements for operational operations and maintenance criterion, refer to Appendix VI, Environmental Protection.

Sediment deposition – Pool volume must be restored when it is significantly reduced by the presence of sediment. This includes the formation of hardened or vegetated beds of sediment in the resting pools. Sediment deposition in the resting pools must be removed when the maximum depth of deposition across the pool exceeds 1 meter (3.3 feet), or when the drop between adjacent pools exceeds 0.3 meter (12 inches) between the invert of the upstream pool and the top of the water surface of the downstream pool. Large-sized boulders and other debris must be removed as soon as possibleif it obstructs the weir notches and creates drops of greater than 0.3 meters. See Appendix VI section 1.4.1.7 for more details. The upstream end of the fish ladder should be kept clear of

sediment as needed to make sure hydraulic connectivity is maintained from the approach channel into and through the fish ladder, and downstream through the remainder of the project area to the creek's confluence with the Santa Clara River. This may require regrading of the approach channel upstream of the fish ladder to ensure flows are directed into the fish ladder.

Concrete and steel weirs – Impact loading from debris or boulders will likely cause some cosmetic damage to the weirs along the top of the weirs. Repairs are not expected unless the weir is not functioning to pool water and pass the flows through the notch or there is sufficient evidence to show the plates may disconnect or the weir is damaged to where it may fail. Cosmetic repairs for cracking or chipping should only require repair if internal steel reinforcement is exposed.

LOW FLOW CHANNEL

The low flow channel runs the length of the project from the base of the fish ladder to the confluence with the Santa Clara River. The low flow channel conveys the base flow during the non-storm season. It is designed to reach a depth and velocity that allows migration of steelhead. The low flow channel should be kept operable at all times during the steelhead migration season.

Inspection Criteria:

For additional information and requirements, refer to Appendix VI, Environmental Protection.

Geometry – The low flow channel will likely migrate along the invert due to seasonal flow changes and dynamic sediment deposition and erosion patterns. Based on observations, the low flow channel will form naturally and therefore should not require maintenance unless it is being reestablished after sediment cleanout operations. The low flow channel shall be inspected following a storm event that exceeds 5,000 cfs, and subsequent drop in flows that range between 10-150 cfs. The low flow channel shall also be inspected during the spring and fall semi-annual inspections to ensure that a well-defined low flow path is free of obstructions throughout the project.

Channel elevations – The low flow channel shall not have any sharp or sudden drops that exceed 0.3 meter (12 inches). Areas shall be restored to design conditions where this condition is not met.

Connection to invert structures – The low flow channel connects to two invert stabilizers. One stabilizer is near the fish ladder as shown on plate 3 and the other is on plate 6. The path across these grouted stone stabilizers shall be restored as soon as possible to design conditions if scour has caused a drop of greater than 0.3 meter (12 inches).

GROUTED STONE INVERT STABILIZERS

A grouted stone invert stabilizer was constructed at station 10+00 and near station 35+00. These stabilizers provide a barrier to degradation of the earth channel invert.

Inspection Criteria:

Sediment deposition - The sediment deposition across these structures are not to exceed that shown in table IV-1 at the end of this appendix. Cleanout of these structures shall be performed in conjunction with the entire earth channel invert.

Scour – The scour level shall not encroach within 0.5 meter (1.64 feet) of the bottom of the subsurface grouted stone.

Low flow channel – the low flow through these structures must be maintained to ensure adequate depths of flow are provided for the steelhead trout migration and any sudden drops in the water surface of greater than 0.3 meter (12 inches) are to be repaired by restoring the invert and low flow channel.

GROUTED STONE CHANNEL SIDE-SLOPES

The channel is primarily trapezoidal with an earth invert and 2H:1V grouted stone side-slopes. The grouted stone side-slopes extend to a depth of 1.5 - 2.25 meters (4.9 – 7.4 feet) below the finished invert to prevent any scouring along the toe from undermining the side-slopes.

Inspection Criteria:

Scour – scour along the toe of the slope should be inspected to make sure the end of the subsurface toe is not exposed. All scour should be repaired that is within 0.5 meter (1.64 feet) of the top of the subsurface toe.

Cracks – The sideslopes shall be inspected for cracks and areas that show evidence of seepage shall be repaired.

Joints along structures – The grouted stone is adjacent to concrete walls and outlet pipes. All joints along these structures shall be inspected for separation, cracking, or settlement.

PILOT CHANNEL

A pilot channel connects the outflows from the invert stabilizer at station 10+00 to the Santa Clara River. It is an entrenched trapezoidal channel with earth bottom and earth side-slopes that functions to direct the flows from the invert stabilizer into the Santa Clara River under a controlled pathway.

Inspection Criteria:

Sediment deposition removal pilot channel – The pilot channel should be inspected at the spring semi-annual inspection. The pilot channel shall be restored to original design at any time when the sediment deposition removal takes place above station 10+00 based upon the inspection criteria for the earth channel invert. The excavation shall ensure that positive drainage is continuous to allow the low flows of Santa Paula Creek to reach the low flows of the Santa Clara River without ponding.

The Pilot channel shall also be restored at any time if the sedimentation causes flows to shift location to where they may cause property loss from erosion of flooding.

LEVEES

The channel sideslopes extend above the existing ground to form levees in some locations. During flood emergency events the levees are a critical area to monitor closely. Any overtopping of a levee or seepage through the levees could result in failure of the levee and the result would be substantial flooding.

Inspection Criteria:

Seepage - Inspected for evidence of piping or seepage through the levee. Animal burrows formed within the levee must be repaired.

Erosion - Grasses should be encouraged where erosion control is required but growth must be maintained to prevent objectionable weed growth. Vegetation which produces deep roots that may lead to seepage, saturation, or erosion problems if the roots are allowed to die and decay should be controlled. Approved chemical treatments may be used for control of growth.

CONCRETE CHANNEL WALLS, ABUTMENTS, AND PIERS

Widening of the channel at the existing Ventura County Transportation Commission (VCTC) railroad bridge required removal of the existing truss and abutments. The new bridge is constructed with two spans, one span 30 meters (98.4 feet) wide supported by the existing truss, and the other span 20 meters (65.6 feet) wide supported by a new steel girder bridge. The channel beneath the bridge is constructed as a composite section with partial vertical sides using the new abutments and the remainder as trapezoidal grouted stone section at 1V:2H side slopes.

Below Telegraph Road Bridge, the creek was widened with vertical channel walls and pier noses were added to the bridge piers.

The Santa Paula Creek channel under the Santa Paula Freeway (State Route 126) was constructed with a composite mix of grouted stone slopes and concrete retaining walls, and pier noses were added to the existing bridge piers.

Inspection Criteria:

Concrete Cracking - Minor shrinkage and temperature cracking occurs in most structures, but continued development of crack patterns and increases in size of cracks are evidence of stress and possible loss of integrity in the structure. Large cracks that will allow considerable water to penetrate retaining walls must be sealed to prevent migration of backflow material through the crack. Whenever a test program is recommended to determine the condition of cracks in reporting features, the test program will include measurements to determine if the crack is stable; or if not, the rate of

displacement and crack progression. If the test program indicates that the crack is stable, the appropriate repair is recommended in the semi-annual report. However, if the crack is found to be active, an investigation program is recommended to determine the cause of the crack and the necessary corrective action.

Joints - If joints show continued evidence of opening or closing other than as a result of temperature stresses, the cause must be determined. Joint openings that permit the earth to be carried away must be sealed. Spalling must be investigated and repaired to protect the reinforcement and to prevent further erosion resulting from abrasion during storm-flows. Vegetation must be controlled to prevent joint displacement or leakage resulting from root growth or decay.

Line and Grade - Concrete channel walls, abutments, and piers must be inspected for evidence of movement from line and grade.

Deflection - Concrete walls are designed for a stable deflection. Some deflection may be expected at the top of channel walls next to bridge abutments; however, such walls must be inspected to be certain that the deflection is not increasing.

Drainage - Grading behind channel walls must be maintained to drain the area properly. Earth around structures must be maintained at original grade to preserve design loading and must be kept tight against the structure. Any conditions that would permit saturation of earth adjacent to any concrete wall or structures must be corrected. Otherwise, the earth will become saturated, resulting in undue stress on the structure and seepage through the structure may carry earth material resulting in settlement around the structure. Typical conditions to look for during inspections that may require maintenance are local settlement, surface runoff forming ponds near the structure, erosion near the structure, rodent holes, separation of fill along any part of the structure.

Local scour - The footings for these structures are designed below the expected local scour depths. Inspections should be made to determine if the local scour is increasing or has stabilized. Areas that have scoured to within 0.5 meter of any footings will require repair to restore the invert to original design grades.

SIDE DRAINS

Side drain inlet structures and ditches were constructed in the channel banks at locations where concentrated storm flows occur from adjacent sites.

Inspection Criteria:

Debris – The inlets and side drain ditches shall be checked to ensure that debris is not blocking or obstructing the flows from entering the inlet or from entering the inlet's pipe. Obstructed flows may result in water entering and eroding the channel sideslopes or the service road.

Pipe joints – check to see that no gaps are present at the joint of the exterior of the pipe and the grouted stone and that no water is seeping through the joint. This would likely indicate that the pipes might have damaged joints that are leaking. Connections at the inlet must also be watertight.

FENCING

Fencing has been installed along the project to prevent trespassing or uses which might interfere with flood control and as a safety precaution to keep the general public out of areas that may be cause them harm.

Inspection criteria:

Condition - Broken or lost caps on posts must be replaced to prevent water from collecting in pipe base and rusting the metal. Holes in the fence mesh and leaning or damaged fences must be fixed.

Gates - Gates must be checked for ease of operation.

SERVICE ROADS

Service roads built of aggregate base course parallel the channel along the top of the channel side-slopes. It can be accessed from four (4) points where Telegraph Road crosses the channel. The road provides access to all areas of the project. Access to the site must be maintained and any change in public roadways that prevents access to a defined site entrance should be reported and access restored or relocated. The road has a 2% cross slope away from the channel. As part of the service road drainage plan, a V-ditch was installed parallel and contiguous to the service road along the landward side of the road. This ditch collects drainage from surface runoff of the adjacent sites and runoff from the service road, preventing flows from crossing and eroding the road. The ditch carries the storm runoff to concrete over-pours. The over-pours are located at various points on top of the road to allow the water to cross the road and into the channel without eroding the road.

Inspection criteria

Access - All access points to the service roadway are gated and kept locked in order to prevent unauthorized use of the flood control facilities. The gates must be maintained in workable condition for use by operation and maintenance personnel. Locks and gate mechanics shall be checked for ease of use and maintained or adjusted as needed.

Surface condition - Cracks, ruts, settlement, and erosion must be repaired and the cause determined and eliminated.

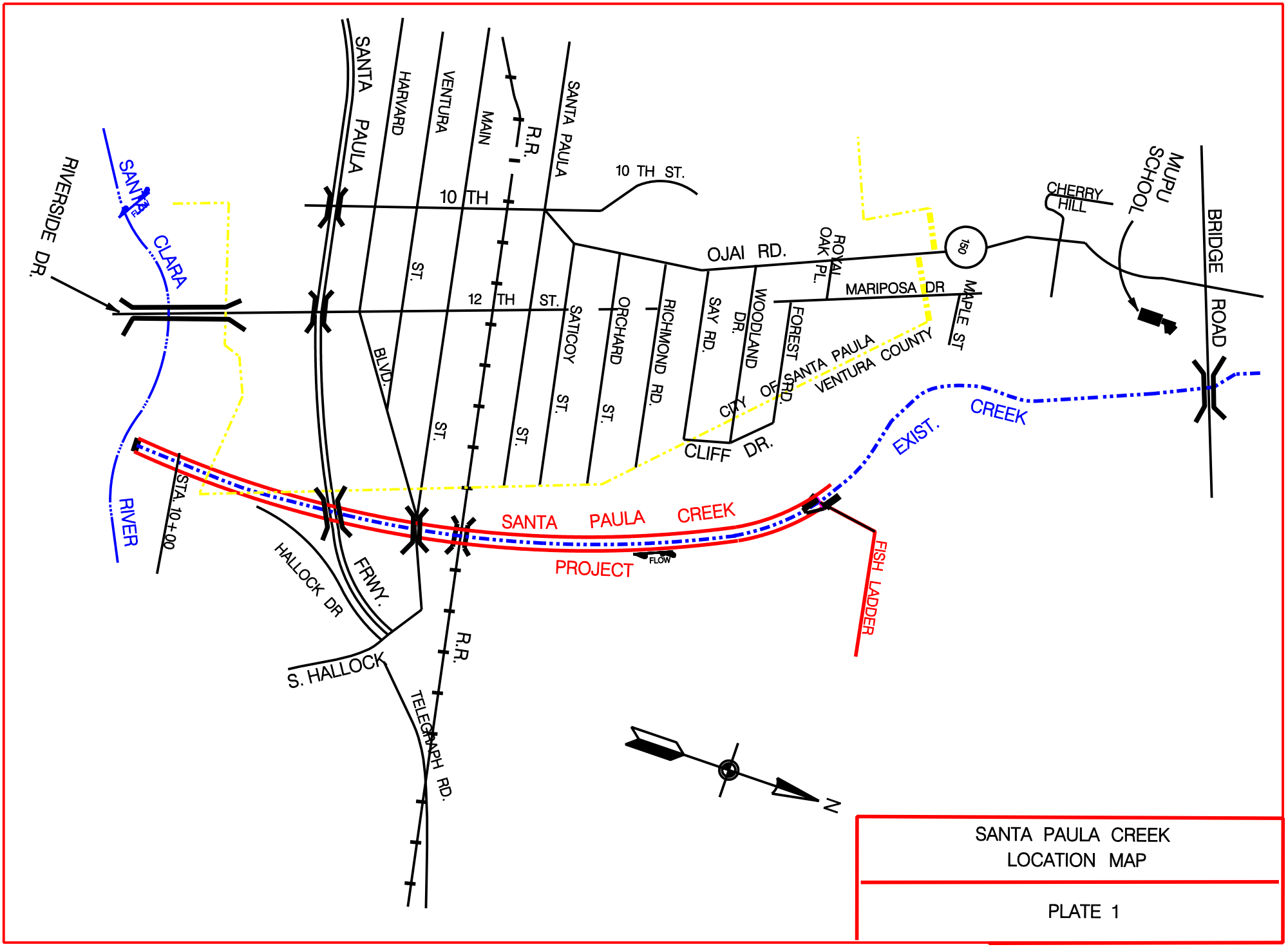
Drainage - The V-ditch must be maintained to keep sediment from collecting. Sediment will lower the capacity of the ditch may cause drainage to expand across the road and to enter the channel at unprotected points causing erosion to the channel side-slopes as well as the road. The source of any excessive sediment must be located and remedied.

LANDSCAPING

Landscaped stone and plantings are provided throughout the project. Maintenance requirements for landscaping are covered under Appendix VIII.

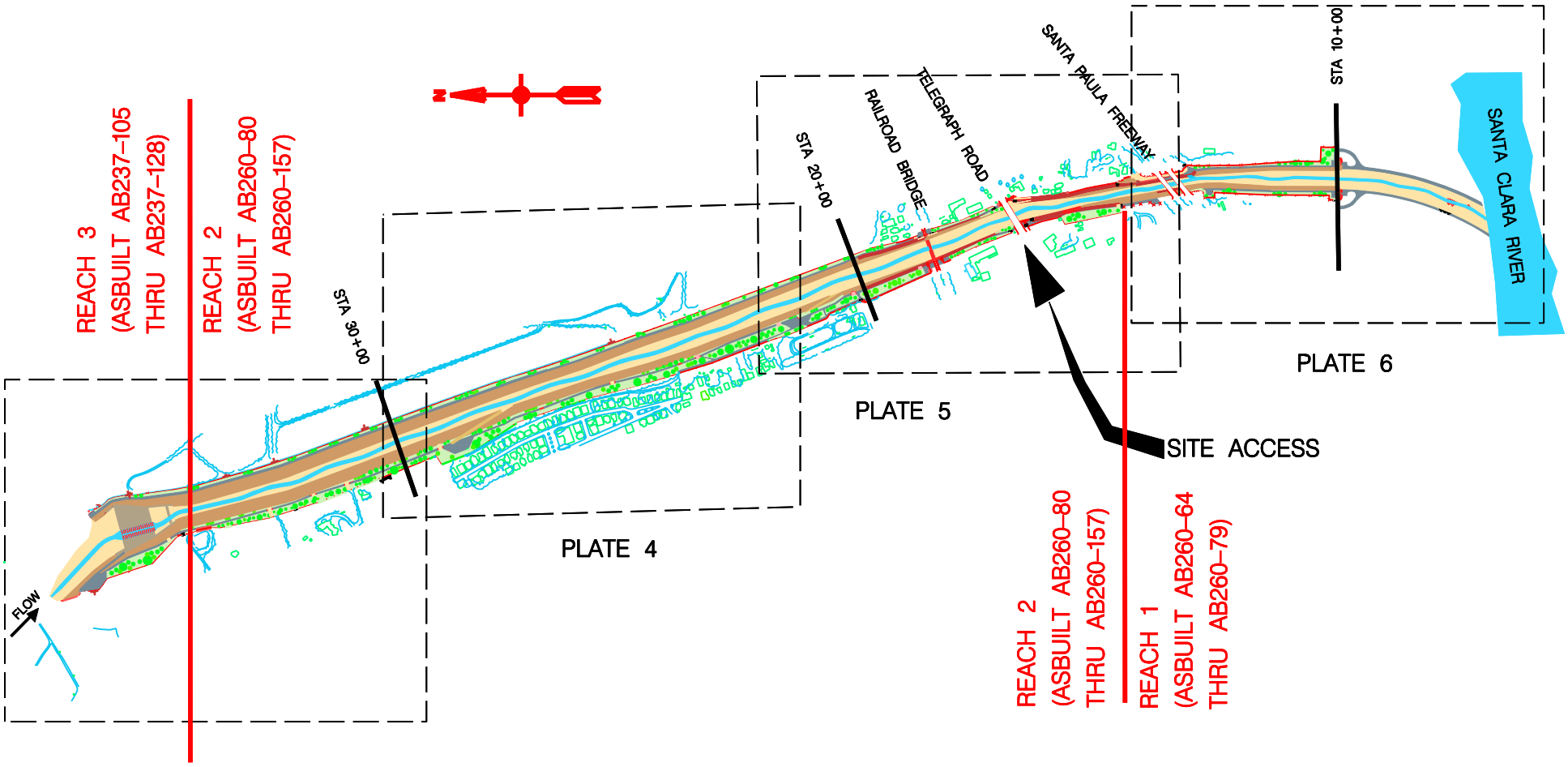
Table IV-1: Allowable Sediment deposition Accumulation Profile

Allowable Sediment Deposition, Scour and Design Invert Profiles Measurements in meters (feet)				
Station	Design Invert	Allowable Sediment Elevation	Allowable Deposition Above Design Invert	Allowable Scour Depth Below Design Invert
10+00	76.4	78.6	2.3 (7.5')	0.0 (0.0')
11+37	78.0	79.9	1.8 (6.0')	0.0 (0.0')
12+25	79.3	81.1	1.8 (5.9')	0.0 (0.0')
13+25	80.8	82.4	1.6 (5.2')	0.0 (0.0')
14+25	82.2	83.8	1.5 (4.9')	0.0 (0.0')
15+25	83.9	85.3	1.5 (4.9')	0.0 (0.0')
16+25	85.7	87.1	1.4 (4.6')	0.0 (0.0')
17+25	87.3	88.6	1.3 (4.4')	0.0 (0.0')
18+25	88.8	90.0	1.3 (4.2')	0.0 (0.0')
18+54	89.3	90.5	1.3 (4.1')	0.0 (0.0')
18+82	89.7	91.0	1.3 (4.2')	0.0 (0.0')
20+38	92.6	93.8	1.2 (4.0')	0.0 (0.0')
21+84	94.9	95.9	1.0 (3.4')	0.7 (2.3')
23+75	97.3	98.7	1.3 (4.3')	0.7 (2.3')
24+50	98.6	99.9	1.3 (4.2')	1.0 (3.2')
25+85	100.9	102.1	1.2 (4.0')	1.6 (5.3')
27+50	103.7	104.9	1.2 (4.0')	2.3 (7.5')
27+68	104.0	105.2	1.2 (4.0')	2.4 (7.7')
30+37	108.6	109.8	1.2 (4.0')	3.2 (10.6')
30+50	108.8	110.0	1.2 (4.0')	3.2 (10.5')
32+00	111.3	112.5	1.2 (3.9')	3.0 (9.9')
33+95	114.7	115.9	1.2 (4.0')	2.5 (8.2')
34+40	115.4	116.6	1.2 (3.9')	1.9 (6.4')
35+15	116.7	117.0	0.2 (0.8')	0.4 (1.3')
35+90	121.6	121.6	0.0 (0.0')	0.0 (0.0')
35+93	121.8	121.8	0.0 (0.0')	0.0 (0.0')



SANTA PAULA CREEK
LOCATION MAP

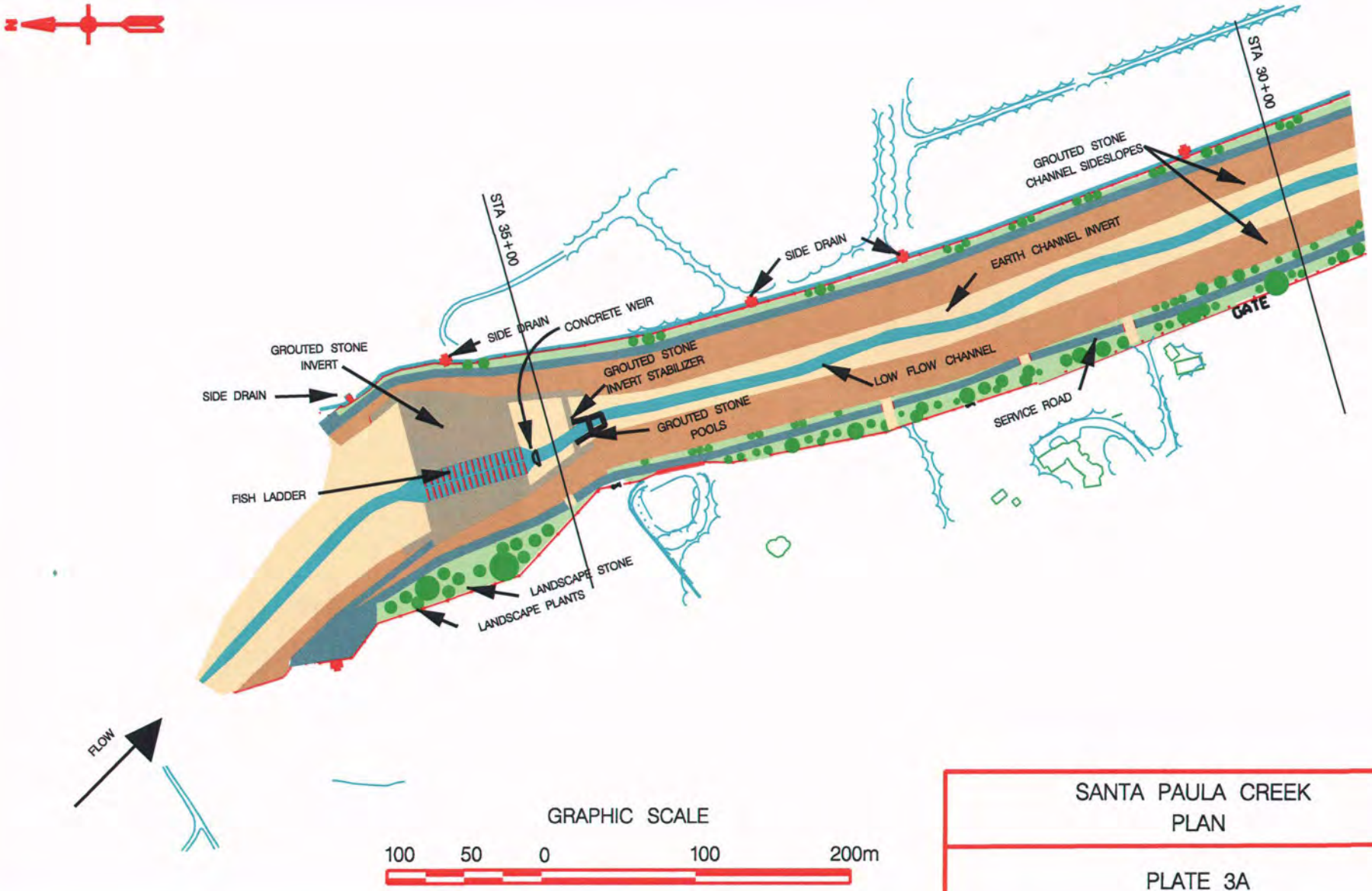
PLATE 1



SANTA PAULA CREEK
PLAN INDEX

PLATE 2

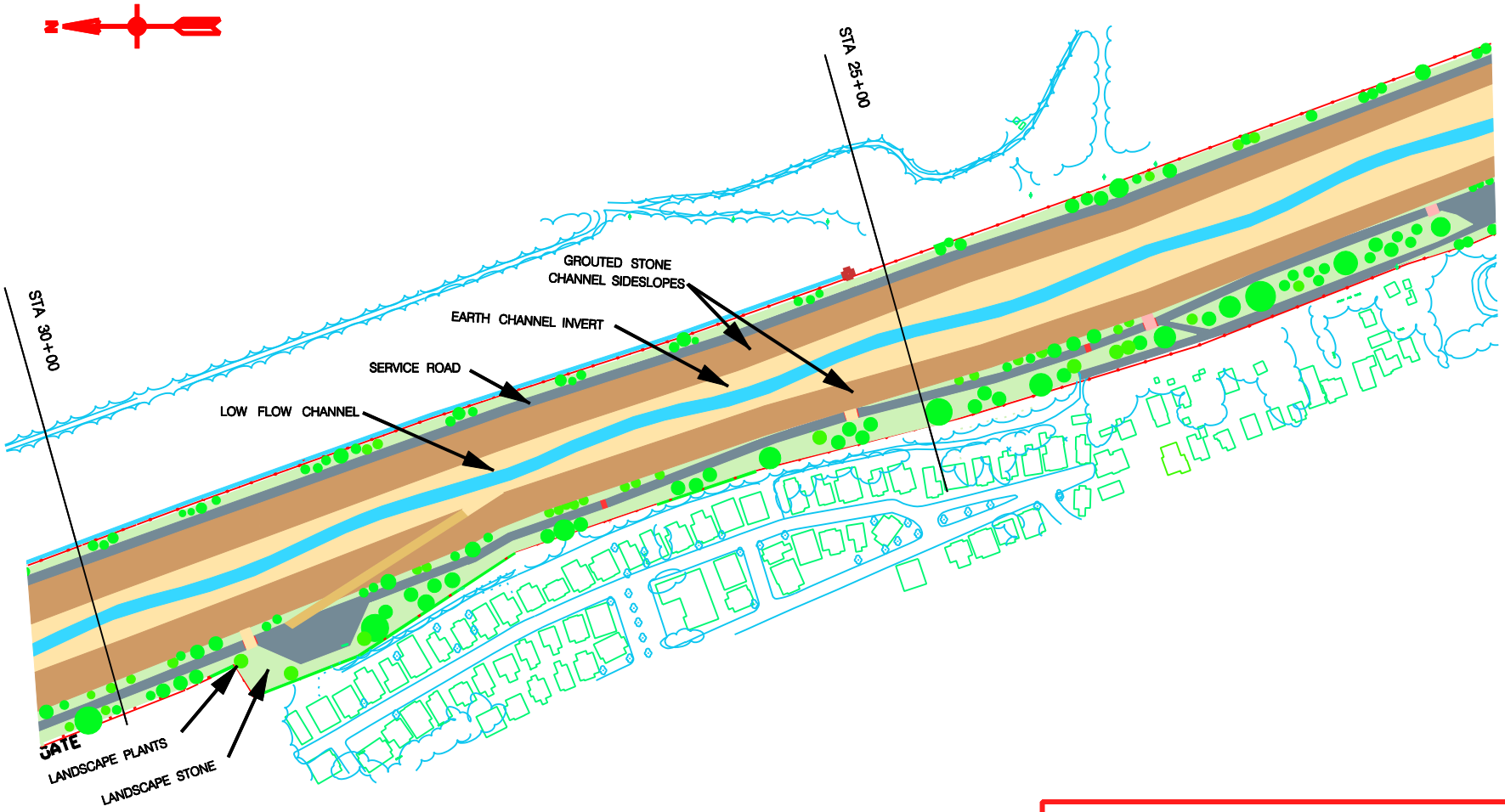
CUT LINE



SANTA PAULA CREEK
PLAN

PLATE 3A

CUT LINE



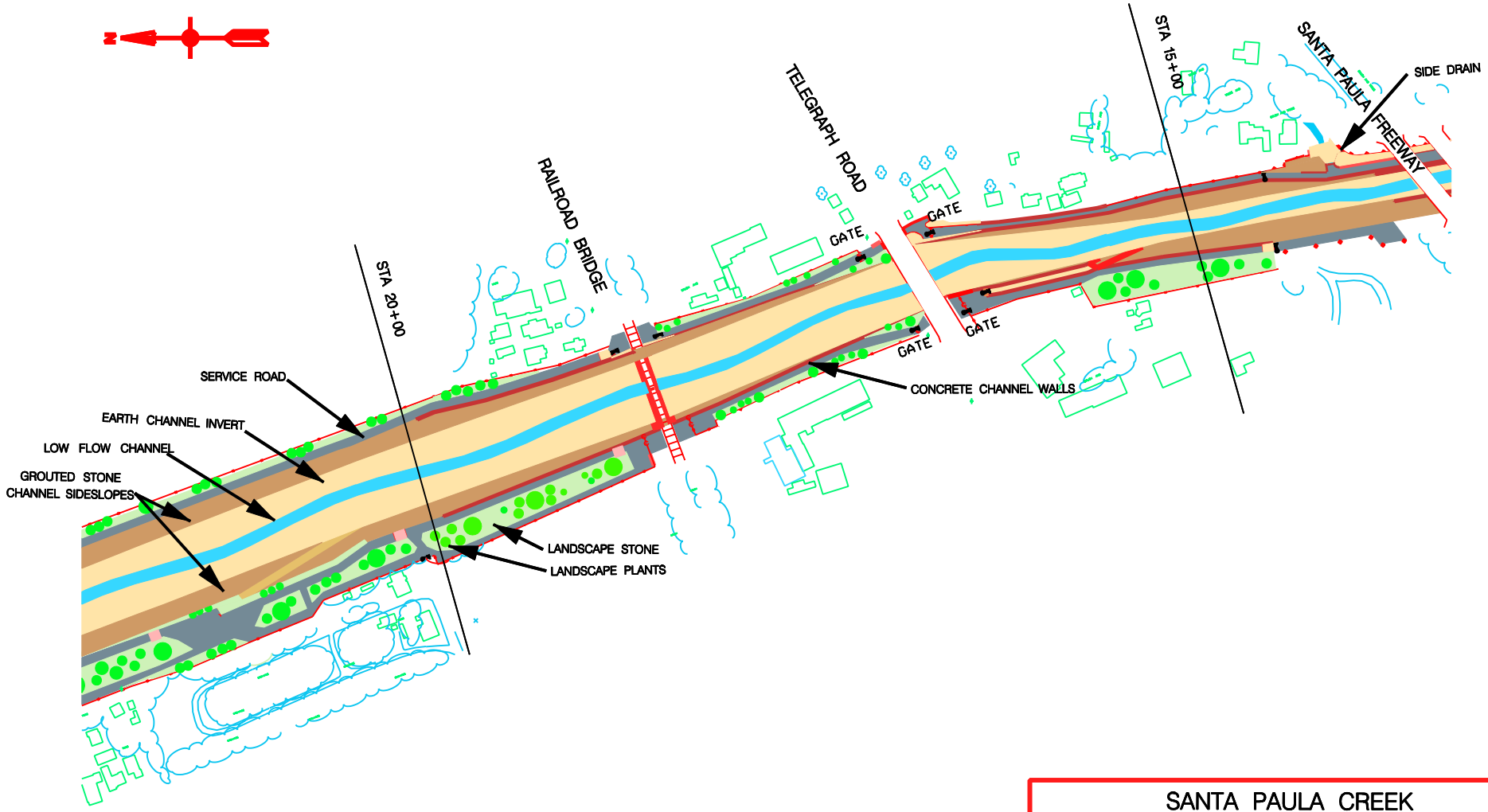
GRAPHIC SCALE

100 50 0 100 200m

SANTA PAULA CREEK
PLAN

PLATE 4

CUT LINE



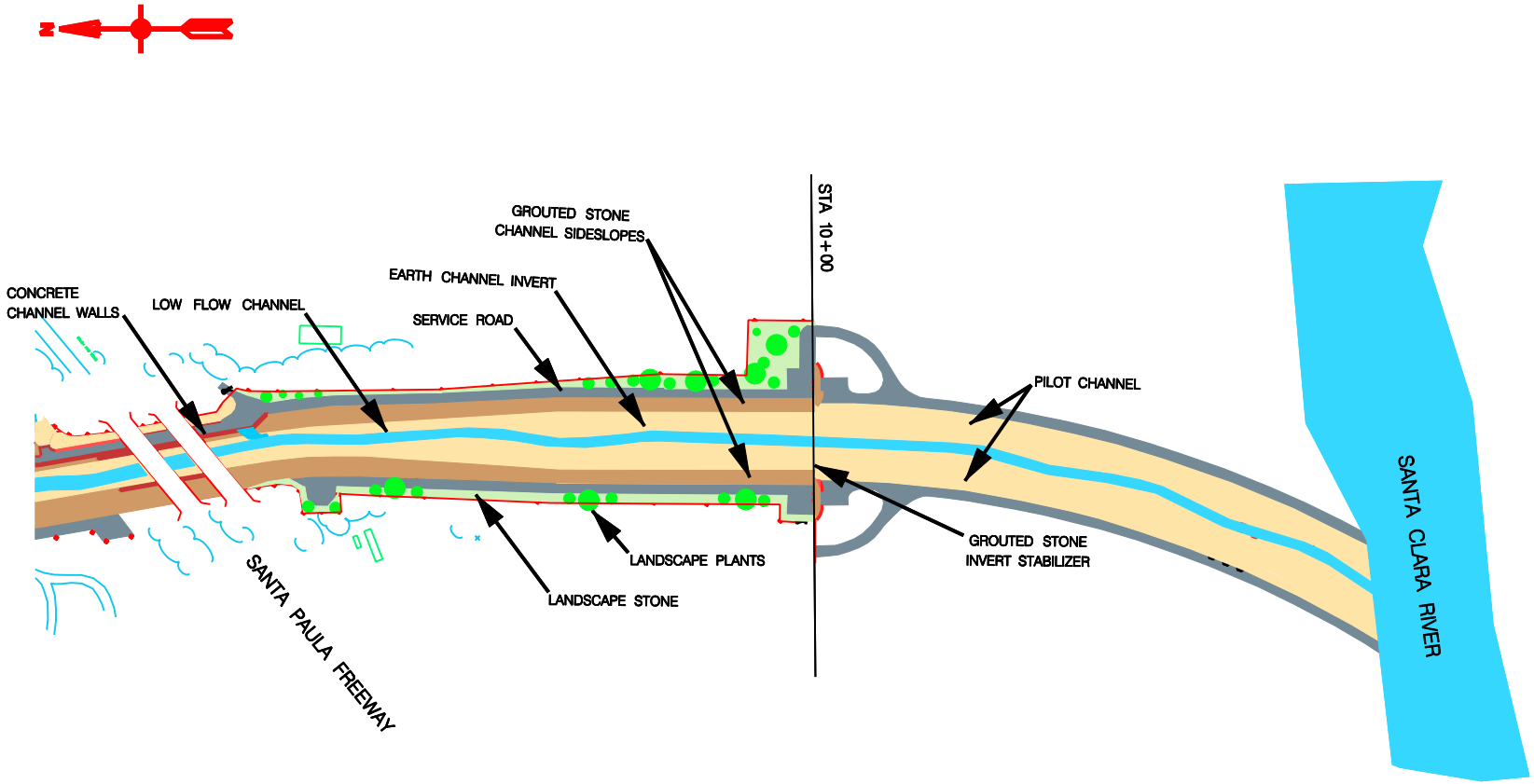
GRAPHIC SCALE

100 50 0 100 200m

SANTA PAULA CREEK
PLAN

PLATE 5

CUT LINE



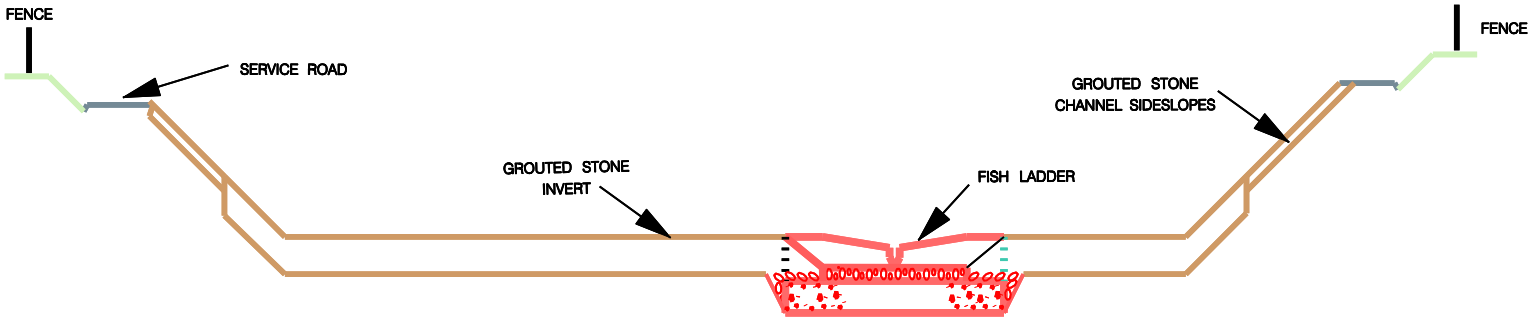
GRAPHIC SCALE

100 50 0 100 200m

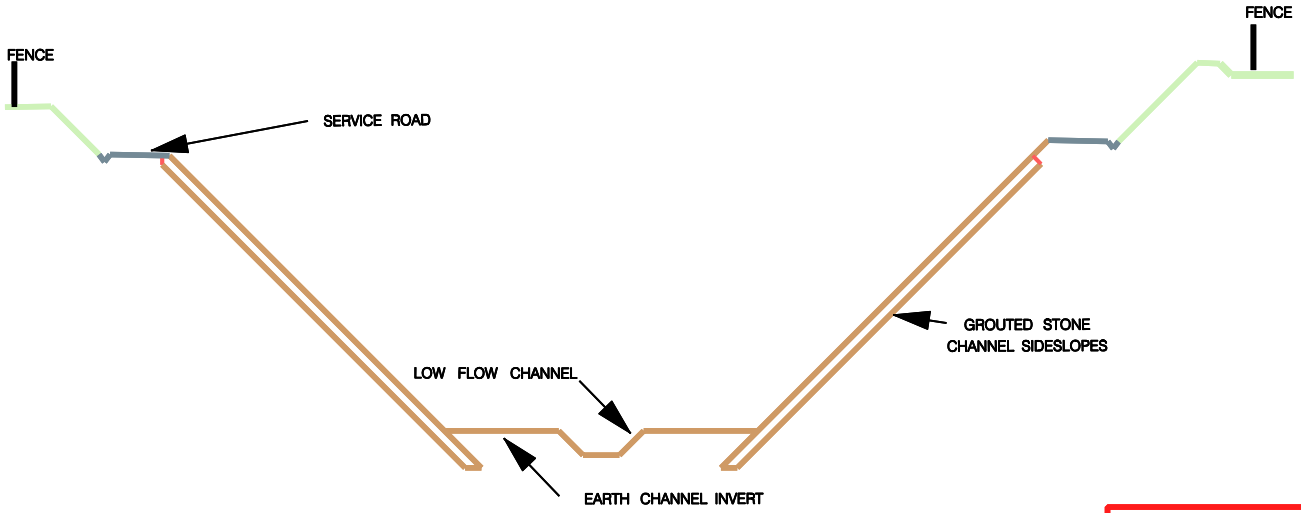
SANTA PAULA CREEK
PLAN

PLATE 6

CUT LINE



TYPICAL SECTION AT FISH LADDER



TYPICAL SECTION CHANNEL

SANTA PAULA CREEK
TYPICAL SECTIONS

PLATE 7

CUT LINE

APPENDIX V

AMENDMENT TO SECTION 221 AGREEMENT

AMENDMENT TO THE AGREEMENT
BETWEEN
THE UNITED STATES OF AMERICA
AND
VENTURA COUNTY FLOOD CONTROL DISTRICT
FOR LOCAL COOPERATION
FOR CONSTRUCTION OF THE
SANTA PAULA CREEK CHANNEL, SANTA CLARA RIVER, CALIFORNIA

THIS AMENDMENT is entered into this 18th day of September 1996, by and between the DEPARTMENT OF THE ARMY (hereinafter the "Government"), represented by the Assistant Secretary of the Army (Civil Works), and VENTURA COUNTY FLOOD CONTROL DISTRICT (hereinafter the "Non-Federal Sponsor"), represented by the Engineer-Manager.

WITNESSETH, THAT:

WHEREAS, construction of the Santa Paula Creek Channel at Ventura County, California was authorized by Public Law 858 of the 80th Congress, approved June 30, 1948, and described in the post authorization change approved by the Chief of Engineers April 12, 1973, and General Reevaluation Report approved by the Assistant Secretary of the Army (Civil Works) on April 30, 1996 and Environmental Impact Statement approved by the Chief of Engineers May 3, 1996;

WHEREAS, by determination dated May 3, 1996, the Chief of Engineers exercised his discretionary authority under 33 U.S.C. §701p to include modification of the Ventura County Transportation Commission Railroad Bridge across Santa Paula Creek, California, at 100 percent Federal expense;

WHEREAS, Section 221 of the Flood Control Act of 1970, Public Law 91-611, as amended, provides that the Secretary of the Army shall not commence construction of any water resources project, or separable element thereof, until each non-Federal sponsor has entered into a written agreement to furnish its required cooperation for the project or separable element;

WHEREAS, the Government and the Non-Federal Sponsor entered into an agreement (hereinafter the "Section 221 Agreement for Flood Control") for local cooperation at Santa Paula Creek Channel, Santa Clara River, California, (hereinafter the "Project", as defined in Article I.A. of this Amendment) on July 18, 1973;

WHEREAS, the Government, by memorandum dated 13 December 1994, recognized that the existing Section 221 Agreement for Flood Control is still binding and that the cost sharing provisions of the Water Resources Development Act of 1986 do not apply to the project;

WHEREAS, the Government and the Non-Federal Sponsor desire to enter into an Amendment to the Section 221 Agreement for Flood Control for construction of the Project;

WHEREAS, the Government and Non-Federal Sponsor have the full authority and capability to perform as hereinafter set forth and intend to cooperate in the construction of the Project in accordance with the terms of the Section 221 Agreement for Flood Control and this Amendment.

NOW, THEREFORE, the Government and the Non-Federal Sponsor agree as follows:

ARTICLE I - DEFINITIONS AND GENERAL PROVISIONS

For purposes of this Amendment:

A. The term "Project" shall mean removal of the damaged Phase I concrete channel and replacement with a trapezoidal channel with an unlined channel bottom and grouted stone sideslopes, channel capacity improvements for approximately 1.65 miles through excavation and construction of a trapezoidal channel with an unlined channel bottom and grouted stone sideslopes, an inlet, a fish ladder adjacent to the inlet, modification to the existing Ventura County Transportation Commission Railroad Bridge across Santa Paula Creek, mitigation for alluvial, riparian and aquatic impacts, and esthetic treatment as generally described in the General Reevaluation Report with Engineering Appendix (hereinafter the "GRR") approved by Assistant Secretary of the Army (Civil Works) on April 3, 1996 and Environmental Impact Statement (hereinafter the EIS), dated June 1996 and approved by the Chief of Engineers on May 3, 1996.

B. The term "total project costs" shall mean all costs incurred by the Non-Federal Sponsor and the Government in accordance with the terms of this Amendment directly related to construction of the Project. Subject to the provisions of this Amendment, the term shall include, but is not necessarily limited to: continuing planning and engineering costs incurred after October 1, 1985; advanced engineering and design costs; preconstruction engineering and design costs; engineering and design costs during construction; the costs of investigations to identify the existence and extent of hazardous substances in accordance with Article XI.A. of this Amendment; costs of historic preservation activities in accordance with Article XIV.A. of this Amendment; actual construction costs, including the costs of alteration, lowering, raising, or replacement and attendant removal of existing railroad bridges and approaches thereto; supervision and administration costs; costs of debris removal or repair of damage incurred by the Government pursuant to Article II.I of this Amendment; costs of contract dispute settlements or awards; and the value of lands, easements, rights-of-way, relocations, and suitable borrow and dredged or excavated material disposal areas. The term does not include any costs for operation, maintenance, repair, replacement, or rehabilitation; any costs due to betterments; or any costs of dispute resolution under Article IV of this Amendment.

C. The term "period of construction" shall mean the time from the date of issuance of the solicitation for the first construction contract to the date that the U.S. Army Engineer for the Los Angeles District (hereinafter the "District Engineer") notifies the Non-Federal Sponsor in writing of the Government's determination that construction of the Project is complete.

D. The term "highway" shall mean any public highway, roadway, street, or way, including any bridge thereof.

E. The term "relocation" shall mean providing a functionally equivalent facility to the owner of an existing utility, cemetery, highway or other public facility, or railroad (excluding existing railroad bridges and approaches thereto) when such action is authorized in accordance with applicable legal principles of just compensation or as otherwise provided in the authorizing legislation for the Project or any report referenced therein. Providing a functionally equivalent facility may take the form of alteration, lowering, raising, or replacement and attendant removal of the affected facility or part thereof.

F. The term "fiscal year" shall mean one fiscal year of the Government. The Government fiscal year begins on October 1 and ends on September 30.

G. The term "functional portion of the Project" shall mean a portion of the Project that is suitable for tender to the Non-Federal Sponsor to operate and maintain in advance of completion of

the entire Project. For a portion of the Project to be suitable for tender, the District Engineer must notify the Non-Federal Sponsor in writing of the Government's determination that the portion of the Project is complete and can function independently and for a useful purpose, although the balance of the Project is not complete. Prior to notification, the District Engineer shall afford the Non-Federal Sponsor the opportunity to review the basis for the determination that the portion can function independently and for a useful purpose, and consider in good faith the comments of the Non-Federal Sponsor.

H. The term "betterment" shall mean a change in the design and construction of an element of the Project resulting from the application of standards that the Government determines exceed those that the Government would otherwise apply for accomplishing the design and construction of that element.

I. The term "debris that otherwise would not have occurred had the project been completed", as utilized in Articles II,I and VI.A. of this Amendment, shall mean sediment (as the term is used in the General Reevaluation Report) which is deposited in the functional portion of the project as a result of a storm or a consecutive series of storms at an elevation higher than three feet below the Design Sediment Deposition Profile depicted in the General Reevaluation Report..

ARTICLE II - OBLIGATIONS OF THE GOVERNMENT AND THE NON-FEDERAL SPONSOR

A. The Government, subject to receiving funds appropriated by the Congress of the United States (hereinafter, the "Congress") and using those funds, shall expeditiously construct the Project [(including alteration, lowering, raising, or replacement and attendant removal of existing railroad bridges and approaches thereto)], applying those procedures usually applied to Federal projects, pursuant to Federal laws, regulations, and policies.

1. The Government shall afford the Non-Federal Sponsor the opportunity to review and comment on the solicitations for all contracts, including relevant plans and specifications, prior to the Government's issuance of such solicitations. To the extent possible, the Government shall afford the Non-Federal Sponsor the opportunity to review and comment on all contract modifications, including change orders. The Government shall consider in good faith the comments of the Non-Federal Sponsor, but the contents of solicitations, award of contracts, execution of contract modifications, issuance of change orders, and performance of all work on the Project (whether the work is performed under contract or by Government personnel), shall be exclusively within the control of the Government.

2. Throughout the period of construction, the District Engineer shall furnish the Non-Federal Sponsor with a copy of the Government's Written Notice of Acceptance of Completed Work for each contract for the Project.

B. The Non-Federal Sponsor may request the Government to accomplish betterments. Such requests shall be in writing and shall describe the betterments requested to be accomplished. If the Government in its sole discretion elects to accomplish the requested betterments or any portion thereof, it shall so notify the Non-Federal Sponsor in a writing that sets forth any applicable terms and conditions, which must be consistent with this Amendment. In the event of conflict between such a writing and this Amendment, this Amendment shall control. The Non-Federal Sponsor shall be solely responsible for all costs due to the requested betterments and shall pay all such costs to the Government prior to advertising of any such contract in accordance with Article IV of this Amendment.

C. When the District Engineer determines that the entire Project is complete or that a portion of the Project has become a functional portion of the Project, the District Engineer shall so notify the

Non-Federal Sponsor in writing and furnish the Non-Federal Sponsor with an Operation, Maintenance, Repair, Replacement, and Rehabilitation Manual (hereinafter the "OMRR&R Manual") and with copies of all of the Government's Written Notices of Acceptance of Completed Work for all contracts for the Project or the functional portion of the Project that have not been provided previously. Upon such notification and except as otherwise agreed in Article II.I of this Amendment, the Non-Federal Sponsor shall operate, maintain, repair, replace, and rehabilitate the entire Project or the functional portion of the Project in accordance with Article VI of this Amendment.

D. In accordance with Article III of this Amendment, the Non-Federal Sponsor shall provide all lands, easements, rights-of-way, and suitable borrow and dredged or excavated material disposal areas that the Government determines the Non-Federal Sponsor must provide for the construction, operation, and maintenance of the Project, and shall perform or ensure performance of all relocations that the Government determines to be necessary for the construction, operation, and maintenance of the Project.

E. The Non-Federal Sponsor may request the Government to provide lands, easements, rights-of-way, and suitable borrow and dredged or excavated material disposal areas or perform relocations on behalf of the Non-Federal Sponsor. Such requests shall be in writing and shall describe the services requested to be performed. If in its sole discretion the Government elects to perform the requested services or any portion thereof, it shall so notify the Non-Federal Sponsor in a writing that sets forth any applicable terms and conditions, which must be consistent with this Amendment. In the event of conflict between such a writing and this Amendment, this Amendment shall control. The Non-Federal Sponsor shall be solely responsible for all costs of the requested services and shall pay all such costs to the Government prior to advertisement of the work in accordance with Article IV of this Amendment. Notwithstanding the provision of lands, easements, rights-of-way, and suitable borrow and dredged or excavated material disposal areas or performance of relocations by the Government, the Non-Federal Sponsor shall be responsible, as between the Government and the Non-Federal Sponsor, for the costs of cleanup and response in accordance with Article XII.C. of this Amendment.

F. The Non-Federal Sponsor shall not use Federal funds to meet its obligations under this Amendment unless the Federal granting agency verifies in writing that the expenditure of such funds is expressly authorized by statute.

G. The Non-Federal Sponsor agrees to participate in and comply with applicable Federal floodplain management and flood insurance programs.

H. The Non-Federal Sponsor shall publicize flood plain information in the area concerned and shall provide this information to zoning and other regulatory agencies for their use in preventing unwise future development in the flood plain and in adopting such regulations as may be necessary to prevent unwise future development and to ensure compatibility with protection levels provided by the Project.

I. In the event that the Government has provided a notification that a portion of the Project is a functional portion of the Project in accordance with Article II.C. of this Amendment, and that, as determined by the Government, it becomes necessary to remove debris that otherwise would not have occurred had the Project been completed or repair damage to such functional portion of the Project caused by such debris prior to the completion of the Project, the Government, subject to the availability of funds, shall remove such debris or make such repairs. Upon the Government's notification to the Non-Federal Sponsor that the entire Project is complete in accordance with Article II. C.of this Amendment, the Government's responsibility under this paragraph shall cease and the Non-Federal Sponsor shall thereafter remove such debris that otherwise would not have occurred had the Project been completed and make such repairs as part of its obligation to operate, maintain, repair, replace, and rehabilitate the Project in accordance with Article VI of this Amendment.

ARTICLE III - LANDS, RELOCATIONS, DISPOSAL AREAS, AND PUBLIC LAW 91-646 COMPLIANCE

A. The Government, after consultation with the Non-Federal Sponsor, shall determine the lands, easements, and rights-of-way required for the construction, operation, and maintenance of the Project, including those required for relocations, borrow materials, and dredged or excavated material disposal. The Government in a timely manner shall provide the Non-Federal Sponsor with general written descriptions, including maps as appropriate, of the lands, easements, and rights-of-way that the Government determines the Non-Federal Sponsor must provide, in detail sufficient to enable the Non-Federal Sponsor to fulfill its obligations under this paragraph, and shall provide the Non-Federal Sponsor with a written notice to proceed with acquisition of such lands, easements, and rights-of-way. Prior to the end of the period of construction, the Non-Federal Sponsor shall acquire all lands, easements, and rights-of-way set forth in such descriptions. Furthermore, prior to issuance of the solicitation for each construction contract, the Non-Federal Sponsor shall provide the Government with authorization for entry to all lands, easements, and rights-of-way the Government determines the Non-Federal Sponsor must provide for that contract. For so long as the Project remains authorized, the Non-Federal Sponsor shall ensure that lands, easements, and rights-of-way that the Government determines to be required for the operation and maintenance of the Project and that were provided by the Non-Federal Sponsor are retained in public ownership for uses compatible with the authorized purposes of the Project.

B. The Government, after consultation with the Non-Federal Sponsor, shall determine the improvements required on lands, easements, and rights-of-way to enable the proper disposal of dredged or excavated material associated with the construction, operation, and maintenance of the Project. Such improvements may include, but are not necessarily limited to, retaining dikes, wasteweirs, bulkheads, embankments, monitoring features, stilling basins, and de-watering pumps and pipes. The Government in a timely manner shall provide the Non-Federal Sponsor with general written descriptions of such improvements in detail sufficient to enable the Non-Federal Sponsor to fulfill its obligations under this paragraph, and shall provide the Non-Federal Sponsor with a written notice to proceed with construction of such improvements. Prior to the end of the period of construction, the Non-Federal Sponsor shall provide all improvements set forth in such descriptions. Furthermore, prior to issuance of the solicitation for each Government construction contract, the Non-Federal Sponsor shall prepare plans and specifications for all improvements the Government determines to be required for the proper disposal of dredged or excavated material under that contract, submit such plans and specifications to the Government for approval, and provide such improvements in accordance with the approved plans and specifications.

C. The Government, after consultation with the Non-Federal Sponsor, shall determine the relocations necessary for the construction, operation, and maintenance of the Project, including those necessary to enable the removal of borrow materials and the proper disposal of dredged or excavated material. The Government in a timely manner shall provide the Non-Federal Sponsor with general written descriptions, including maps as appropriate, of such relocations in detail sufficient to enable the Non-Federal Sponsor to fulfill its obligations under this paragraph, and shall provide the Non-Federal Sponsor with a written notice to proceed with such relocations. Prior to the end of the period of construction, the Non-Federal Sponsor shall perform or ensure the performance of all relocations as set forth in such descriptions. Furthermore, prior to issuance of the solicitation for each Government construction contract, the Non-Federal Sponsor shall prepare or ensure the preparation of plans and specifications for, and perform or ensure the performance of, all relocations the Government determines to be necessary for that contract.

D. The Non-Federal Sponsor shall comply with the applicable provisions of the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, Public Law 91-646, as amended by Title IV of the Surface Transportation and Uniform Relocation Assistance Act of 1987

(Public Law 100-17), and the Uniform Regulations contained in 49 C.F.R. Part 24, in acquiring lands, easements, and rights-of-way required for the construction, operation, and maintenance of the Project, including those necessary for relocations, borrow materials, and dredged or excavated material disposal, and shall inform all affected persons of applicable benefits, policies, and procedures in connection with said Act.

ARTICLE IV - METHOD OF PAYMENT

A. In advance of the Government incurring any financial obligation associated with additional work under Article II.B. or II.E. of this Agreement, the Non-Federal Sponsor shall provide the Government with the full amount of the funds required to pay for such additional work by delivering a check payable to "FAO, USAED, Los Angeles District" to the District Engineer. The Government shall draw from the funds provided by the Non-Federal Sponsor such sums as the Government deems necessary to cover the Government's financial obligations for such additional work as they are incurred. In the event the Government determines that the Non-Federal Sponsor must provide additional funds to meet its cash contribution, the Government shall notify the Non-Federal Sponsor in writing of the additional funds required. Within 30 calendar days thereafter, the Non-Federal Sponsor shall provide the Government with a check for the full amount of the additional required funds.

B. Upon completion of the Project or termination of this Agreement, and upon resolution of all relevant claims and appeals, the Government shall conduct a final accounting and furnish the Non-Federal Sponsor with the results of the final accounting. The accounting shall determine costs due to additional work under Article II.B. or II.E. of this Amendment.

1. In the event the Government determines that the total payments provided by the Non-Federal Sponsor for the additional work is less than the total costs therefor, the Non-Federal Sponsor shall, no later than 90 calendar days after receipt of written notice, make a cash payment to the Government of whatever sum is required to fully pay for such additional work.

2. In the event the Government determines that the total payments provided by the Non-Federal Sponsor exceeds the total costs therefor, the Government shall, subject to the availability of funds, refund the excess to the Non-Federal Sponsor no later than 90 calendar days after the accounting is completed.

ARTICLE V - DISPUTE RESOLUTION

As a condition precedent to a party bringing any suit for breach of this Amendment, that party must first notify the other party in writing of the nature of the purported breach and seek in good faith to resolve the dispute through negotiation. If the parties cannot resolve the dispute through negotiation, they may agree to a mutually acceptable method of non-binding alternative dispute resolution with a qualified third party acceptable to both parties. The parties shall each pay 50 percent of any costs for the services provided by such a third party as such costs are incurred. The existence of a dispute shall not excuse the parties from performance pursuant to this Amendment.

ARTICLE VI - OPERATION, MAINTENANCE, REPAIR, REPLACEMENT, AND REHABILITATION (OMRR&R)

A. Upon notification in accordance with Article II.C. of this Amendment and for so long as the Project remains authorized, the Non-Federal Sponsor shall operate, maintain, repair, replace, and rehabilitate the entire Project or the functional portion of the Project except for removal of debris that otherwise would not have occurred had the Project been completed and repair to damage caused to the functional portion of the Project by such debris, at no cost to the Government, in a manner

compatible with the Project's authorized purposes and in accordance with applicable Federal and State laws as provided in Article VIII of this Amendment and specific directions prescribed by the Government in the OMRR&R Manual and any subsequent amendments thereto.

B. The Non-Federal Sponsor hereby gives the Government a right to enter, at reasonable times and in a reasonable manner, upon property that the Non-Federal Sponsor owns or controls for access to the Project for the purpose of inspection and, if necessary, for the purpose of completing, operating, maintaining, repairing, replacing, or rehabilitating the Project. If an inspection shows that the Non-Federal Sponsor for any reason is failing to perform its obligations under this Amendment, the Government shall send a written notice describing the non-performance to the Non-Federal Sponsor. If, after 30 calendar days from receipt of notice, the Non-Federal Sponsor continues to fail to perform, then the Government shall have the right to enter, at reasonable times and in a reasonable manner, upon property that the Non-Federal Sponsor owns or controls for access to the Project for the purpose of completing, operating, maintaining, repairing, replacing, or rehabilitating the Project. No completion, operation, maintenance, repair, replacement, or rehabilitation by the Government shall operate to relieve the Non-Federal Sponsor of responsibility to meet the Non-Federal Sponsor's obligations as set forth in this Amendment, or to preclude the Government from pursuing any other remedy at law or equity to ensure faithful performance pursuant to this Amendment.

ARTICLE VII - INDEMNIFICATION

The Non-Federal Sponsor shall hold and save the Government free from all damages arising from the construction, operation, maintenance, repair, replacement, and rehabilitation of the Project and any Project-related betterments, except for damages due to the fault or negligence of the Government or its contractors.

ARTICLE VIII - FEDERAL AND STATE LAWS

In the exercise of their respective rights and obligations under this Amendment, the Non-Federal Sponsor and the Government agree to comply with all applicable Federal and State laws and regulations, including, but not limited to, Section 601 of the Civil Rights Act of 1964, Public Law 88-352 (42 U.S.C. 2000d), and Department of Defense Directive 5500.11 issued pursuant thereto, as well as Army Regulations 600-7, entitled "Nondiscrimination on the Basis of Handicap in Programs and Activities Assisted or Conducted by the Department of the Army".

ARTICLE IX - RELATIONSHIP OF PARTIES

A. In the exercise of their respective rights and obligations under this Amendment, the Government and the Non-Federal Sponsor each act in an independent capacity, and neither is to be considered the officer, agent, or employee of the other.

B. In the exercise of its rights and obligations under this Amendment, neither party shall provide, without the consent of the other party, any contractor with a release that waives or purports to waive any rights such other party may have to seek relief or redress against such contractor either pursuant to any cause of action that such other party may have or for violation of any law.

ARTICLE X - OFFICIALS NOT TO BENEFIT

No member of or delegate to the Congress, nor any resident commissioner, shall be admitted to any share or part of this Amendment, or to any benefit that may arise therefrom.

ARTICLE XI - TERMINATION OR SUSPENSION

A. If at any time the Non-Federal Sponsor fails to fulfill its obligations under Article II.B., II.D., II.E., or IV of this Amendment, the Assistant Secretary of the Army (Civil Works) shall terminate this Amendment or suspend future performance under this Amendment unless he determines that continuation of work on the Project is in the interest of the United States or is necessary in order to satisfy agreements with any other non-Federal interests in connection with the Project.

B. If the Government fails to receive annual appropriations in amounts sufficient to meet Project expenditures for the then-current or upcoming fiscal year, the Government shall so notify the Non-Federal Sponsor in writing, and 60 calendar days thereafter either party may elect without penalty to terminate this Amendment or to suspend future performance under this Amendment. In the event that either party elects to suspend future performance under this Amendment pursuant to this paragraph, such suspension shall remain in effect until such time as the Government receives sufficient appropriations or until either the Government or the Non-Federal Sponsor elects to terminate this Amendment.

C. In the event that either party elects to terminate this Amendment pursuant to this Article or Article XII of this Amendment, both parties shall conclude their activities relating to the Project and the Government shall perform an accounting in accordance with Article IV of this Amendment.

D. Any termination of this Amendment or suspension of future performance under this Amendment in accordance with this Article or Article XII of this Amendment shall not relieve the parties of liability for any obligation previously incurred. Any delinquent payment shall be charged interest at a rate, to be determined by the Secretary of the Treasury, equal to 150 per centum of the average bond equivalent rate of the 13-week Treasury bills auctioned immediately prior to the date on which such payment became delinquent, or auctioned immediately prior to the beginning of each additional 3-month period if the period of delinquency exceeds 3 months.

ARTICLE XII - HAZARDOUS SUBSTANCES

A. After execution of this Amendment and upon direction by the District Engineer, the Non-Federal Sponsor shall perform, or cause to be performed, any investigations for hazardous substances that the Government or the Non-Federal Sponsor determines to be necessary to identify the existence and extent of any hazardous substances regulated under the Comprehensive Environmental Response, Compensation, and Liability Act (hereinafter "CERCLA"), 42 U.S.C. Sections 9601-9675, that may exist in, on, or under lands, easements, and rights-of-way that the Government determines, pursuant to Article III of this Amendment, to be required for the construction, operation, and maintenance of the Project. However, for lands that the Government determines to be subject to the navigation servitude, only the Government shall perform such investigations unless the District Engineer provides the Non-Federal Sponsor with prior specific written direction, in which case the Non-Federal Sponsor shall perform such investigations in accordance with such written direction.

B. In the event it is discovered through any investigation for hazardous substances or other means that hazardous substances regulated under CERCLA exist in, on, or under any lands, easements, or rights-of-way that the Government determines, pursuant to Article III of this Amendment, to be required for the construction, operation, and maintenance of the Project, the Non-Federal Sponsor and the Government shall provide prompt written notice to each other, and the Non-Federal Sponsor shall not proceed with the acquisition of the real property interests until both parties agree that the Non-Federal Sponsor should proceed.

C. The Government and the Non-Federal Sponsor shall determine whether to initiate construction of the Project, or, if already in construction, whether to continue with work on the Project, suspend future performance under this Amendment, or terminate this Amendment for the convenience

of the Government, in any case where hazardous substances regulated under CERCLA are found to exist in, on, or under any lands, easements, or rights-of-way that the Government determines, pursuant to Article III of this Amendment, to be required for the construction, operation, and maintenance of the Project. Should the Government and the Non-Federal Sponsor determine to initiate or continue with construction after considering any liability that may arise under CERCLA, the Non-Federal Sponsor shall be responsible, as between the Government and the Non-Federal Sponsor, for the costs of clean-up and response, to include the costs of any studies and investigations necessary to determine an appropriate response to the contamination. In the event the Non-Federal Sponsor fails to provide any funds necessary to pay for clean up and response costs or to otherwise discharge the Non-Federal Sponsor's responsibilities under this paragraph upon direction by the Government, the Government may, in its sole discretion, either terminate this Amendment for the convenience of the Government, suspend future performance under this Amendment, or continue work on the Project.

D. The Non-Federal Sponsor and the Government shall consult with each other in an effort to ensure that responsible parties bear any necessary clean up and response costs as defined in CERCLA. Any decision made pursuant to paragraph C. of this Article shall not relieve any third party from any liability that may arise under CERCLA.

E. As between the Government and the Non-Federal Sponsor, the Non-Federal Sponsor shall be considered the operator of the Project for purposes of CERCLA liability. To the maximum extent practicable, the Non-Federal Sponsor shall operate, maintain, repair, replace, and rehabilitate the Project in a manner that will not cause liability to arise under CERCLA.

ARTICLE XIII - NOTICES

A. Any notice, request, demand, or other communication required or permitted to be given under this Amendment shall be deemed to have been duly given if in writing and either delivered personally or by telegram or mailed by first-class, registered, or certified mail, as follows:

If to the Non-Federal Sponsor:

Deputy Director of Public Works
Flood Control Department
County of Ventura
800 S. Victoria Ave.
Ventura, CA 93009-1600

If to the Government:

District Engineer,
U.S. Army Engineer District, Los Angeles
ATTN: CESPL-PM-C
P.O. Box 2711
Los Angeles, California 90053-2325

B. A party may change the address to which such communications are to be directed by giving written notice to the other party in the manner provided in this Article.

C. Any notice, request, demand, or other communication made pursuant to this Article shall be deemed to have been received by the addressee at the earlier of such time as it is actually received or seven calendar days after it is mailed.

ARTICLE XIV - CONFIDENTIALITY

To the extent permitted by the laws governing each party, the parties agree to maintain the confidentiality of exchanged information when requested to do so by the providing party.

ARTICLE XV - HISTORIC PRESERVATION

A. The costs of identification, survey and evaluation of historic properties shall be paid for by the Government.

B. As specified in Section 7(a) of Public Law 93-291 (16 U.S.C. Section 469c(a)), the costs of mitigation and data recovery activities associated with historic preservation shall be borne entirely by the Government up to the statutory limit of one percent of the total amount authorized to be appropriated for the Project.

C. The Government shall not incur costs for mitigation and data recovery that exceed the statutory one percent limit specified in paragraph B. of this Article unless and until the Assistant Secretary of the Army (Civil Works) has waived that limit in accordance with Section 208(3) of Public Law 96-515 (16 U.S.C. Section 469c-2(3)). Any costs of mitigation and data recovery that exceed the one percent limit shall be paid for by the Government.

ARTICLE XVI - SAVINGS CLAUSE

In the event of a conflict between this Amendment, including any documents incorporated by reference, and any provisions in the Section 221 Agreement executed by the Parties on July 18, 1973, this Amendment shall govern. All other terms and conditions contained in the Section 221 Agreement shall remain in effect.

IN WITNESS WHEREOF, the parties hereto have executed this Amendment, which shall become effective upon the date it is signed by the Assistant Secretary of the Army (Civil Works).

THE DEPARTMENT OF THE ARMY	THE VENTURA COUNTY FLOOD CONTROL DISTRICT
BY: H. Martin Lancaster	BY: Arthur E. Goulet
H. Martin Lancaster Assistant Secretary of the Army (Civil Works)	Arthur E. Goulet Engineer-Manager
DATE: 13 SEP 1996	DATE: 8/26/96

CERTIFICATE OF AUTHORITY

I, JAMES L. McBRIDE, do hereby certify that I am the principal legal officer of the Ventura County Flood Control District, that the Ventura County Flood Control District is a legally constituted public body with full authority and legal capability to perform the terms of the Amendment between the Department of the Army and the Ventura County Flood Control District in connection with the Ventura County Flood Control District, and to pay damages in accordance with the terms of this Amendment, if necessary, in the event of the failure to perform, as required by Section 221 of Public Law 91-611 (42 U.S.C. Section 1962d-5b), and that the persons who have executed this Amendment on behalf of the Ventura County Flood Control District have acted within their statutory authority.

IN WITNESS WHEREOF, I have made and executed this certification this 26th day of AUGUST 1996.

CERTIFICATION REGARDING LOBBYING

The undersigned certifies, to the best of his or her knowledge and belief that:

(1) No Federal appropriated funds have been paid or will be paid, by or on behalf of the undersigned, to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with the awarding of any Federal contract, the making of any Federal grant, the making of any Federal loan, the entering into of any cooperative agreement, and the extension, continuation, renewal, amendment, or modification of any Federal contract, grant, loan, or cooperative agreement.

(2) If any funds other than Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with this Federal contract, grant, loan, or cooperative agreement, the undersigned shall complete and submit Standard Form-LLL, "Disclosure Form to Report Lobbying," in accordance with its instructions.

(3) The undersigned shall require that the language of this certification be included in the award documents for all subawards at all tiers (including subcontracts, subgrants, and contracts under grants, loans, and cooperative agreements) and that all subrecipients shall certify and disclose accordingly.

This certification is a material representation of fact upon which reliance was placed when this transaction was made or entered into. Submission of this certification is a prerequisite for making or entering into this transaction imposed by Section 1352, Title 31, U.S. Code. Any person who fails to file the required certification shall be subject to a civil penalty of not less than $10,000 and not more than $100,000 for each such failure.

Ventura County Flood Control District

Arthur E. Goulet
Engineer-Manager

DATE: 8/26/96

APPENDIX VI

ENVIRONMENTAL PROTECTION

APPENDIX VI

ENVIRONMENTAL PROTECTION

1.1 ENVIRONMENTAL PROTECTION REQUIREMENTS

Plan for and provide environmental protective measures to control pollution that develops during normal Operation and Maintenance (O&M) practice. Plan for and provide environmental protective measures required to correct conditions that develop during routine O&M activities associated with the project. Comply with Federal, State, and local regulations pertaining to the environment, including but not limited to water, air, and noise pollution.

1.1.2 Permit or License

The Ventura County Watershed Protection District (VCWPD) shall obtain all needed permits or licenses.

1.1.2.1 When applicable, the VCWPD shall prepare and submit a Notice of Intent and a Storm Water Pollution Prevention Plan to the California Water Resources Board (Sacramento Office) and provide a copy to the Regional Water Quality Control Board (Los Angeles) for O&M activities.

1.1.2.2 Waste Water Discharge Permit/ National Pollutant Discharge Elimination System (NPDES) Permit: This permit shall be obtained by the VCWPD and fees related to these permit should be paid by the VCWPD.

1.1.3 Emergency Response Plan: An emergency response plan shall be prepared for responding to hazardous materials spills at project construction site. The plan will identify actions to immediately control hazardous materials spills, and procedures to notify appropriate health officials.

1.2 PERMITS OBTAINED BY CORPS OF ENGINEERS AND VENTURA COUNTY WATERSHED PROTECTION DISTRICT

The Corps of Engineers obtained a Section 401 Water Quality Certification from the California Regional Water Quality Control Board (WQCB) and Ventura County Watershed Protection District (VCWPD) obtained a Section 1601 Stream Alteration permit from the State of California, Department of Fish and Game for this project. The agreement is for the entire Santa Paula Creek Flood Control Project. Also, the Biological Opinion of the National Marine Fisheries Service (NMFS) was obtained for the Project (as per requirements of the Federal Endangered Species Act) and is included in this appendix.

The VCWPD is responsible for implementing all conditions/measures identified in all permits or agreements issued by Federal, State or local resource agencies (specifically, the 401 Water Quality Certification, Streambed Alteration Agreement, and the Biological Opinion). In case of violation of any permit or agreement, the VCWPD is responsible to pay fines or penalties

imposed by a resource agency, and the VCWPD shall ensure compliance with the permits.

The Biological Opinion, Streambed Alteration Agreement, and Water Quality Certification are presented at the end of this appendix (Biological Opinion, Streambed Alteration Agreement, and Water Quality Certification), respectively. (To be Provided)

2.1 PROTECTION OF HISTORICAL, ARCHAEOLOGICAL AND CULTURAL RESOURCES

If during operations and maintenance activities items of apparent archaeological or historical interest are discovered, they shall be left undisturbed and the VCWPD shall report the find immediately to the State Historic Preservation Officer.

3.1 PROTECTION OF AIR RESOURCES

The VCWPD shall keep operation and maintenance activities under surveillance, management and control to minimize pollution of air resources. All activities, equipment, processes, and work operated or performed by the VCWPD in accomplishing the specified O&M activities shall be in strict accordance with the State of California, Ventura County Air Pollution Control District and all Federal emission and performance laws and standards. Special management techniques as set out below shall be implemented to control air pollution by the construction activities, which are included in the contract.

a. To reduce fugitive dust, the excavation site and the stockpile material shall be watered twice a day and the unpaved roads shall be watered three times a day.

b. When wind speeds exceed 20 miles per hour, all excavation and grading operations shall be suspended.

c. Truck speeds on unpaved roads shall not exceed 15 miles per hour.

d. Operation of heavy equipment shall be limited to the hours between 8:00 a.m. and 5:00 p.m. Truck transportation shall be permitted between 7:00 a.m. and 7:00 p.m., Monday through Saturday. No operation or transportation shall occur on Sundays.

e. Truck traffic shall be limited to the designated haul route; Harvard/Telegraph Road and Hallock Drive shall be used to access Highway 126.

3.1.1 Particulates

Dust particles, aerosols, and gaseous by products from all construction activities, processing and preparation of materials, such as from asphaltic batch plants, shall be controlled at all times, including weekends, holidays and hours when work is not in progress. The VCWPD shall maintain all excavations, stockpiles, haul roads, permanent and temporary access roads, plant sites, spoil areas, borrow areas, and all other work areas within or outside the project boundaries

free from particulates which would cause the air pollution standards mentioned in the paragraph: PROTECTION OF AIR RESOURCES to be exceeded or which would cause a hazard or a nuisance. Sprinkling, chemical treatment of an approved type, light bituminous treatment, baghouse, scrubbers, electrostatic precipitators or other methods will be permitted to control particulates in the work area. Sprinkling, to be efficient, must be repeated at such intervals as to keep the disturbed area damp at all times. Particulate control shall be performed as the work proceeds and whenever a particulate nuisance or hazard occurs.

3.1.2 Hydrocarbons and Carbon Monoxide

Hydrocarbons and carbon monoxide emissions from equipment shall be controlled to Federal and State allowable limits at all times.

3.1.3 Odors

Odors shall be controlled at all times for all construction activities, processing and preparation of materials.

4.1 REDUCTION OF NOISE POLLUTION

4.1.1 Construction Equipment and Vehicles

All noise producing construction equipment and vehicles using internal combustion engines shall be equipped with mufflers, and air inlet silencers where appropriate, in good operating condition that meet or exceed original factory specification. Mobile or fixed “package” equipment (e.g., are welder, air compressor) shall be equipped with shrouds and noise control features that are readily available for that type of equipment.

4.1.2 Mobile or Fixed Equipment

All mobile or fixed noise producing equipment used on the project, which is regulated for noise output by a local, state, or federal agency, shall comply with such regulation.

4.1.3 Electrically Powered Equipment

Electrically powered equipment instead of pneumatic or internal combustion powered equipment shall be used, where feasible.

4.1.4 Noise Producing O&M Activities

Noise producing O&M activities shall comply with local noise control regulations.

APPENDIX VII

VENTURA COUNTY WATERSHED PROTECTION DISTRICT EMERGENCY OPERATION PLAN
(To be Provided)

APPENDIX VIII

SUPPLEMENTAL MANUAL FOR HARDSCAPING AND ESTHETIC TREATMENT INSPECTION AND MAINTENANCE

HARDSCAPING AND AESTHETIC TREATMENT INSPECTION AND MAINTENANCE

Santa Paula Creek Channel Improvements

A. HARDSCAPING MAINTENANCE

1. Inspections. Hardscaping elements should be a part of inspection objectives during all other project inspections.

2. Landscape Stone Areas. Weed growth within landscape stone areas should not be allowed to reach a height of 18-inches before being totally removed, including root growth if removed by manual methods. Weed removal could also be by contact, post-emergent herbicide spraying, followed by cutting the weed growth down to the top of the stone layer, and removing the cut material from the project site. Stone should be straightened/replaced as necessary. Replacement stone should match the existing stone in color and quality, and should be a minimum of 12-inches in diameter in all dimensions.

3. Fencing and Gates. Replace in-kind, damaged, missing or rusting portions of fencing as necessary in a timely manner.

4. Service Road/Trail. Service Road/Trail conditions should be inspected at annually throughout the life of the project. Cracks should be sprayed with a pre-emergent herbicide or soil sterilant and then sealed. Potholes and depressions (including minor depressions that pond water) should be repaired and then repaved smooth. Vegetative growth should be kept at least 2-feet from the edge of the service road/trail. Trash, debris and stones should be removed from the trail. Seal-coat asphalt portions and sandblast concrete portions of trail vandalized by graffiti.

5. Grouted Stone. Maintenance of grouted stone located on the landward sides of channel levees should generally include repaving of damaged concrete (immediately if grouted stone is an integral component of channel structure integrity), sandblasting (preferred) or painting-over of graffiti, followed by re-staining if appropriate. Summer washdown utilizing irrigation system quick coupler valves is an available option for general cleanliness.

B. AESTHETIC PLANTINGS MAINTENANCE

1. Maintenance operations shall not compromise the structural integrity of flood control facilities.

2. Plantings should be trimmed back from all structures and the service road to provide for ease of inspections and to eliminate potential sites that would attract the homeless as a shelter or that would provide hidden areas for vandals.

3. Site Inspection. An annual inspection of all landscaped area should be undertaken near the

end of the growing season in April to determine if further landscape maintenance operations are necessary and to what extent.

4. Soil Tests. Soil testing, covering the entire project area, should occur where and whenever plant material show signs of stress indicating a possible soil contamination problem (i.e. saline soil, herbicide residual, etc.). Testing for soil contamination should include both plant suitability (soil chemical deficiencies) and plant growth tests. Prior to testing, eliminate the possibility of over or under watering as a problem cause.

5. Grass/Wildflower Areas

a. Weed Abatement Program. The grass/wildflower areas should be at a self-sustaining stage of development, capable of out-competing all but isolated areas or infrequent outbreaks of major weed infestations. Nevertheless, during the yearly April landscape area inspection, a decision should be made as to the need for and extent of that years weed abatement operations.

b. Reseeding. Determination of the need for reseeding effort should be made during the yearly April site inspection. If reseeding is necessary, grass/wildflower species not doing well should be eliminated in favor of more dominant site-adaptive species.

c. Fertilization. Maintenance fertilization of the grass/wildflower areas should occur in the early fall every 3 to 5-years utilizing a slow-release, high-nitrogen formula, complete fertilizer (or as required by soil tests) at rates recommended by the manufacturer.

6. Trees, Shrubs, Vines, Grasses

a. Inspections. Inspection of all planted material should occur during the yearly April site inspection for maintenance operations to determine if plant replacement is necessary.

b. Irrigation. Irrigation should no longer be necessary based on the construction objective of developing a self-sustaining, irrigation-free landscape. During the annual landscape inspection in April a decision should be made to determine if irrigation is required for summer supplemental watering and to what extent. Irrigation through the summer months should be kept at a survival level.

c. Plant Material Replacement. A plant can be considered unhealthy or dead if the main leader has died back, or if 25% of the crown is dead. Provide irrigation until the replacement plant is established. Replacement plantings should be of the same species as the replaced plant unless that particular species is adapting poorly to the site. Replacement species should be native if possible, with similar growth characteristics (i.e. water and soil requirements, sun exposure, size, color, texture, etc.) as the replaced plant material.

d. Pruning and Trimming. Pruning of native or other drought-tolerant trees and shrubs should be limited to removal of dead, damaged or diseased branches, to cross-branching (branches rubbing against one another), to overhanging growth hindering channel or trail operations, thinning in fire-prone areas, or for the general health of the plant or landscape.

Topping, or pruning for esthetics should not be undertaken. Cuts on branches over 2-inches in diameter should incorporate a tree wound dressing. Major pruning operations should be under the direction of a certified Arborist and should be performed only by experienced maintenance personnel trained in the basic principles/art of pruning. Trimming of vines and ornamental grass growth against parapet and retaining walls should occur whenever vines protrude/grow more than 12-inches and ornamental grass protrudes more than 18-inches into service roads or trail system space. Before vine trimming is undertaken, try tying protruding stems onto the wall. Deciduous plant material should be pruned during late winter before plants begin "leafing out". Pruning and trimming should not occur during the avian nesting season which is defined the the Streambed Alteration Agreement (CDFG 1602 Permit) as March 1 through September 1. Evergreen plant material should be pruned during early fall before major growth begins. Ornamental grass can be trimmed year-around. Trim all vegetation blocking signage and solar panels. The complete removal of a healthy plant should be limited to preserving the overall well being of the landscape such as to eliminate overcrowding. Root pruning should only be undertaken to protect paving systems, structures and underground irrigation piping. Root prune just prior to the growing season of the plant. Remove all cut material to a legal off-site landfill.

e. Weed Control. Weed growth (including grasses) at the base of trees and vine/ornamental grass pockets should not be allowed to reach a height of 4-inches before being totally removed (including root growth). Removal should be by herbicide application or other manual methods year-round. Original plantings should have plant watering basins removed to match the surrounding finished grade; maintain as part of grass wildflower areas

f. Fertilization. Maintenance fertilization for planted material should occur once a year during late fall/early winter. The formula and application rate should conform to the original specifications (IFB DACW09-01-B-0004) for "maintenance fertilizing" unless modified by soil tests.

g. Disease and Pest Control (including herbicides, insecticides, rodenticides and fungicides). When the use of a pesticide is necessary to remove a disease or pest, a state certified applicator should apply required pesticide in accordance with state EPA label restrictions and recommendations. Burrowing animals, generally rodents, should be eliminated from the project site, especially along channel slopes. Their burrows should then be filled-in to the extent possible and sealed. Inspect yearly for pests.

C. EROSION CONTROL

Erosion control (and associated slope protection) will be an important maintenance concern throughout the life of the flood control project especially on levee slopes. Erosion prevention measures, beginning with the hydromulch utilized in seed mixes and with jute mesh netting utilized within groundcover planting beds, will continue permanently through the establishment of the grass/wildflower groundcovering and through mature plantings, through the use of landscape stone, and to a lesser degree with the use of grouted stone and decomposed granite ground coverings. Repair of erosion damage should have priority over esthetic treatment maintenance/enhancement, and should permanently address the cause as well as the damage. Site inspections for erosion damage should be continual and a part of all other site inspections.

Repair of erosion damage should be immediate, either temporary or permanent, with permanent measures in place by the first rains of the fall season. Erosion control measures should include the use of temporary erosion control blankets/netting (based on severity of the problem) followed as soon as possible by reseeding/replanting, and/or by regrading, recompacting and repaving (esthetically utilizing ungrouted and grouted stone, decomposed granite, or concrete, etc.). Utilize sediment control devices (i.e. fencing, etc.) when appropriate. Rodent control/elimination should be included as part of erosion control inspections.

D. TRASH AND DEBRIS REMOVAL

Removal of trash and debris over the project site should occur periodically throughout the year. Removal of trash and debris, including eroded soil and any other obstruction to the safe utilization of the service road/trail should be continual and be undertaken as part of every site inspection/visit.

Appendix D
Species List

	Scientific Name/Common Name	Element Code	Federal Status	State Status	GRank	SRank	CDFG or CNPS
1	***Antrozous pallidus*** pallid bat	AMACC10010			G5	S3	SC
2	***Catostomus santaanae*** Santa Ana sucker	AFCJC02190	Threatened		G1	S1	SC
3	***Coccyzus americanus occidentalis*** western yellow-billed cuckoo	ABNRB02022	Candidate	Endangered	G5T3Q	S1	
4	***Elanus leucurus*** white-tailed kite	ABNKC06010			G5	S3	
5	***Empidonax traillii extimus*** southwestern willow flycatcher	ABPAE33043	Endangered	Endangered	G5T1T2	S1	
6	***Gasterosteus aculeatus williamsoni*** unarmored threespine stickleback	AFCPA03011	Endangered	Endangered	G5T1	S1	
7	***Oncorhynchus mykiss irideus*** southern steelhead - southern California DPS	AFCHA0209J	Endangered		G5T2Q	S2	SC
8	***Polioptila californica californica*** coastal California gnatcatcher	ABPBJ08081	Threatened		G3T2	S2	SC
9	***Southern Riparian Scrub***	CTT63300CA			G3	S3.2	
10	***Taxidea taxus*** American badger	AMAJF04010			G5	S4	SC
11	***Thamnophis hammondii*** two-striped garter snake	ARADB36160			G3	S2	SC
12	***Thamnophis sirtalis ssp.*** south coast garter snake	ARADB3613F			G5T1T2	S1S2	SC
13	***Vireo bellii pusillus*** least Bell's vireo	ABPBW01114	Endangered	Endangered	G5T2	S2	