Carpinteria Creek Watershed

Post Fire Assessment - Project Report
Final - Grant Agreement #D1813302

prepared for

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California State Water Resources Control Board

prepared by

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SCHR

EARTH ISLAND

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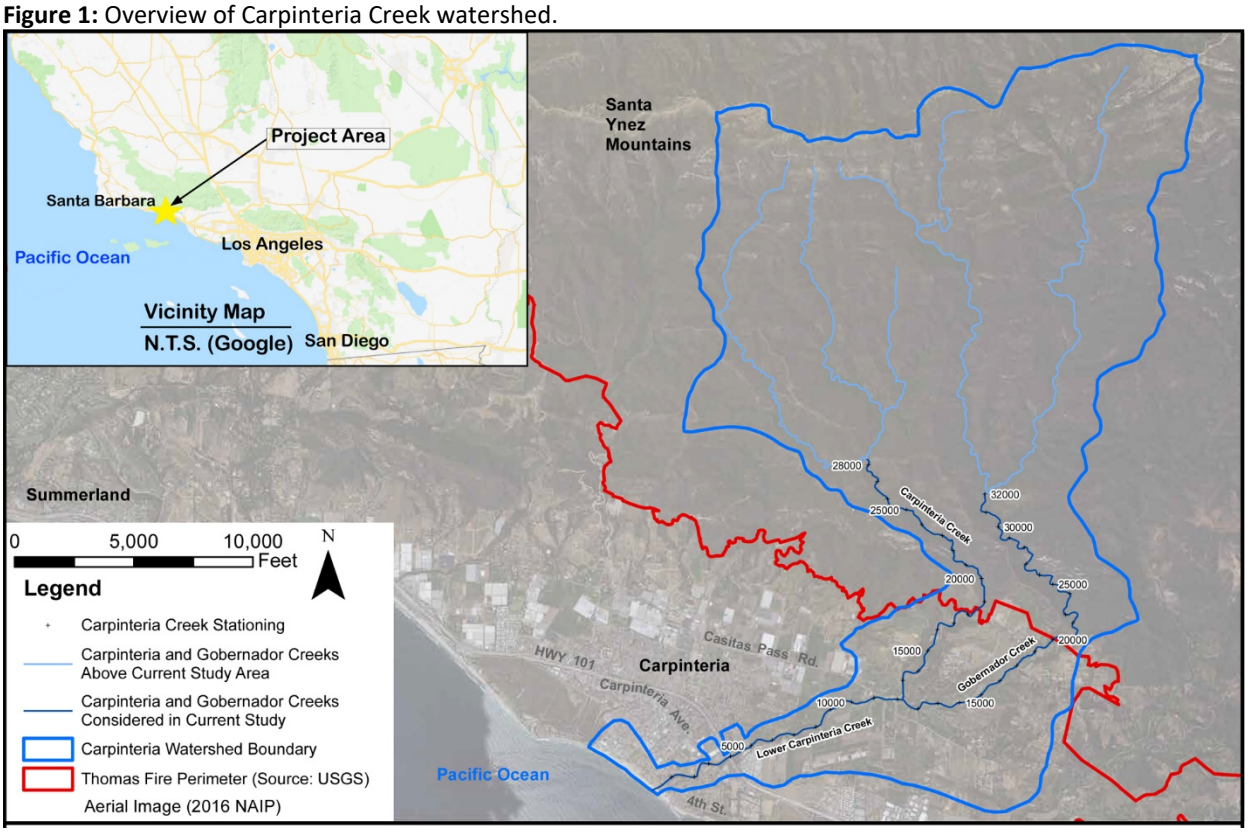
1.0 INTRODUCTION

1.1 Overview

The Carpinteria Creek Watershed has been identified as a high priority for restoration and recovery of steelhead (Oncorhynchus mykiss) on the Santa Barbara South Coast due to the size of the watershed, the number of miles of accessible anadromous habitat, the historic quality of the habitat, and the fact that much of the watershed is publicly owned (Cachuma RCD, 2005; Stoecker, 2002) (Figure 1). In 2005 a Watershed Plan was prepared by the Cachuma Resource Conservation District and the Carpinteria Creek Watershed Coalition outlining the condition of the watershed and identifying specific projects sites to address deficiencies and impacts in the watershed that affect steelhead. These projects were prioritized based on their cost effectiveness at addressing watershed impacts and the viability of steelhead use of the watershed. Following completion of the Watershed Plan, resource agencies, governmental bodies, and non-profits have aggressively pursued efforts to address the priorities outlined in the Plan. Those efforts have specifically addressed many of the migration barriers that have been identified in both Carpinteria and Gobernador Creeks.

Figure 1: Overview of Carpinteria Creek watershed.



In December, 2017 and January, 2018 the Thomas Fire burned an estimated 8,124 acres in the Carpinteria Creek watershed, which represents up to 99% of the total watershed area. A high intensity rainfall event on January 9, 2018 resulted in a record flood event, with a large portion of the watershed being affected by a debris flow. In response to these unprecedented events, the California State Water Board provided funding to South Coast Habitat Restoration (SCHR) to prepare an update to the 2005 Carpinteria Creek Watershed Plan.

1.2 Purpose and Need

As discussed above, Carpinteria and Gobernador Creeks are considered high priority systems for the overall restoration and recovery of steelhead on the South Coast. Due to this designation a significant investment has been made in addressing the key limiting factors in the watershed, namely the presence of partial or complete fish passage barriers that have historically prevented steelhead from accessing the entire length of anadromous habitat in the watershed and especially the high quality habitat in the upper watershed that occurs on public land.

The Thomas Fire and debris flow event had a major, immediate impact on Carpinteria and Gobernador Creeks through the input of fine sediment, filling of pools, and removal of riparian vegetation. The debris flows also threatened the infrastructure, namely new bridges, that were installed to address many of the fish passage issues that were identified in the 2005 Watershed Plan.

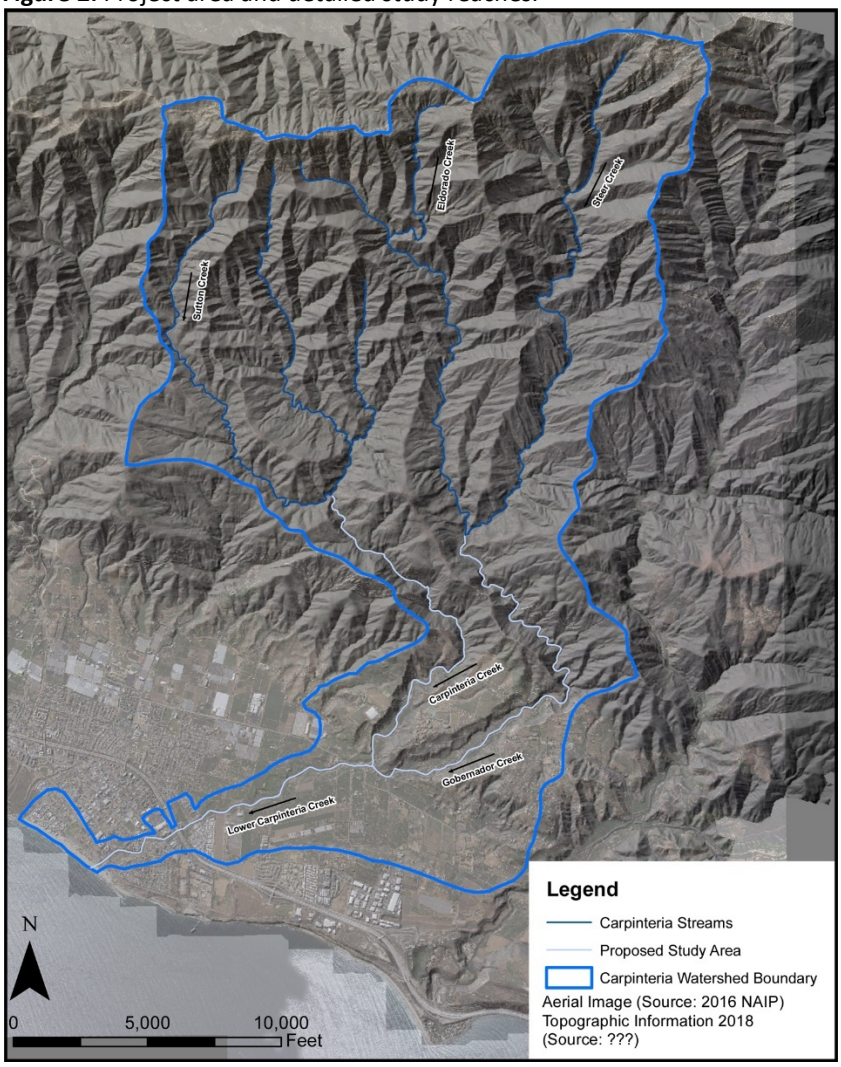
In response to the observed impact to the newly installed crossing structures, SCHR conducted a reconnaissance of these structures and submitted a grant application to the State Water Board to evaluate the condition of several of these structures and design and implement the recommended repairs. Although the State Water Board was willing to fund the efforts to restore fisheries habitat, they asked that the first step in this process consist of a watershed-wide effort to evaluate post-fire and debris flow conditions in Carpinteria and Gobernador Creek, update the recommendations identified in the 2005 Watershed Plan, and prioritize where the funding should be directed to ensure that the limited monies available for steelhead restoration and enhancement were being spent wisely. In response to the State Water Boards request, SCHR applied for and received a grant to develop an update to the 2005 Watershed Plan that develops a list of prioritized restoration actions based on the findings of the study, with site-specific concept designs including erosion and sediment source control measures to benefit water quality and aquatic habitat.

1.3 Plan Focus and Scale

Although there is an interest in understanding the impacts of the Thomas Fire on conditions throughout the watershed, time and resource constraints focused the assessment on the approximately 6.5 miles of mainstem channel in Carpinteria and Gobernador Creeks that are accessible to steelhead (Figure 2). Of the 6.5 miles of accessible habitat, approximately 2 miles of upper Carpinteria Creek were not assessed

due to an inability to obtain landowner permission to access a portion of privately held land and the adjacent, upstream public land. Despite this omission, the areas that were evaluated and the associated past projects and project recommendations are thought to be sufficiently comprehensive to inform the prioritization effort.

Figure 2: Project area and detailed study reaches.



1.4 Other Plans and Processes

Information and recommendations generated in previous and ongoing studies in the Carpinteria Creek Watershed is essential for this plan to successfully identify what has been accomplished, the condition of the watershed prior to the Thomas Fire, and to define new priorities. Past work that comprehensively analyzed watershed conditions in relation to steelhead habitat include the following:

- Matt Stoecker and Conception Coast Project. June 2002. Steelhead Assessment and Recovery Opportunities in Southern Santa Barbara County, California.
- Ecology Consultants, Inc. February 2004. Steelhead Habitat and Population Study Carpinteria Creek Watershed.
- Cachuma Resource Conservation District and the Carpinteria Creek Watershed Coalition. March, 2005. Carpinteria Creek Watershed Plan.
- National Marine Fisheries Service. January 2012. Southern California Steelhead Recovery Plan. Southwest Regional Office, National Marine Fisheries Service.

More recently, California Department of Fish and Wildlife is in the middle of a multi-year effort to evaluate steelhead status on the South Coast through repeat habitat typing and red surveys, which includes Carpinteria and Gobernador Creeks. These efforts have included pre and post Thomas Fire and debris flow assessments with additional surveys anticipated in the future. In addition to these habitat assessments, the U.S. Forest Service published their mandatory post-fire risk assessment report referred to as the Thomas Fire Burned Area Response (BAER) Assessment. A multi-agency assessment of risks was also developed for the Thomas Fire and was published as the Thomas Fire Watershed Emergency Response Team (WERT) Report. This study focused on hazards associated with post-fire floods and debris flows and specifically evaluated the status of debris basins in the various watersheds and their ability to buffer the impact of debris flow events.

1.5 Technical Advisory Committee

As a part of this project, South Coast Habitat Restoration (SCHR) has assembled a group of professionals under a Technical Advisory Committee (TAC). The purpose of the TAC is to solicit input throughout the duration of the project to gain insight from local practitioners. During this process, TAC members provided data resources, photos, reviewed the watershed assessment and restoration plans, and commented on conceptual project designs proposed within this report. The TAC is made up of professionals from various agencies and institutions—Central Coast Regional Water Board, U.S. Forest Service, National Oceanic Atmospheric Administration, California Department of Fish and Wildlife, Santa Barbara County Flood Control District, City of Carpinteria, and Waterways Consulting. SCHR hosted the TAC for two meetings throughout the project to solicit expertise during a pre-assessment meeting and once near the Plan's completion. TAC input and suggestions have been included as a part of this study to embrace cross-agency needs, collaboration and multi-disciplinary expertise. Table 1 lists the personnel included in the TAC and their respective Roles and Responsibilities.

Table 1: Carpinteria Creek Watershed Technical Advisory Committee members, roles, and responsibilities.

Name	Agency/Organization	Roles and Responsibilities
Katie McNeill	RWQCB	Provide Data, Review Restoration Plan, Site Design Comments
Mike Godwin	RWQCB	Provide Data, Review Restoration Plan, Site Design Comments
Kristie Klose	US Forest Service	Provide Data, Photos, Review Restoration Plan
Lee Harrison	NOAA	Provide Data, Review Restoration Plan, Site Design Comments
Stacie Smith	NOAA	Review Restoration Plan, Site Design Comments
Mary Larson	CDFW	Review Restoration Plan, Site Design Comments
Maureen Spencer	SB County Flood Control	Provide Data, Photos, Review Restoration Plan, Site Design Comments
Nick Bobroff	City of Carpinteria	Photos, Review Restoration Plan, Site Design Comments
John Dvorsky	Waterways Consulting	Provide Data, Photos, Author Restoration Plan, Site Design
Daniel Malmon	Waterways Consulting	Provide Data, Photos, Author Restoration Plan, Site Design
Mauricio Gomez	South Coast Habitat Restoration	Project Coordination, Provide Data, Review Restoration Plan, Site Design Comments
Jason White	South Coast Habitat Restoration	Project Coordination, Provide Data, Review Restoration Plan, Site Design Comments

2.0 EXISTING CONDITIONS ASSESSMENT

2.1 General Watershed Conditions

Carpinteria and Gobernador Creeks drain an approximately 15.3 square mile watershed along the South Coast of Santa Barbara County. Discharging directly to the Pacific Ocean through a small coastal lagoon, the channel rise steeply, reaching a peak elevation of 4,690 feet at Divide Peak which separates Santa Barbara and Ventura Counties. Approximately 57% of the watershed is public land managed by the U.S. Forest Service's Los Padres National Forest. A GIS analysis conducted by Stoecker (2003) identified 35 miles of stream channel in the watershed, 43% of which was determined to be perennial.

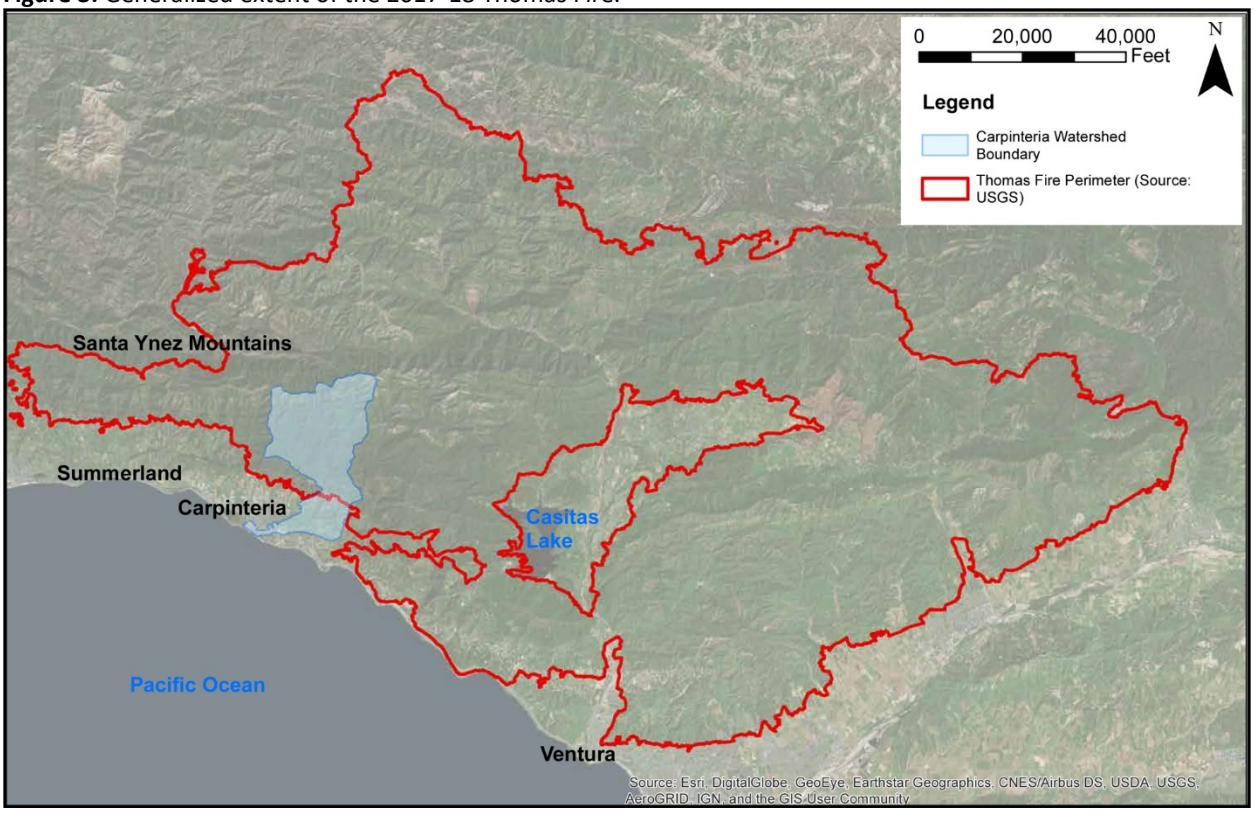
The climate is characterized as Mediterranean with cool, wet winters and dry, warm summers. From May through October the area typically receives no rainfall though high summer temperatures are often moderated by a persistent marine layer, especially in June and July. Although total annual precipitation averages 23 inches, much of that total rainfall occurs during a handful of storm events on a given year. Rainfall totals can vary dramatically between the coastal plain and the ridgetops due to orographic enhancement and the tendency for storms to rotate in from the south, which increases rainfall rates even more due to the steepness of the Santa Ynez Mountains and the east-west trend of the range. When orographic enhancement combines with infusion of subtropical moisture, rainfall rates and precipitation totals in higher elevation areas can often be double the amounts measured on the coastal plain. Three relatively recent high flow events are associated with high monthly rainfall totals such as January 1969 (18.3 inches), January 1995 (21.4 inches), and February 1998 (23.5 inches).

2.2 Thomas Fire

The Thomas Fire started on December 4, 2017 near Thomas Aquinas College on Santa Paula Creek in Ventura County. The fire proceeded to burn over 280,000 acres in Ventura and Santa Barbara Counties, before it was declared fully contained on January 12, 2018, and was the largest fire in California history at the time (Figure 3). Much of the fire occurred in steep, mountainous terrain of the Los Padres National Forest including most of the mountainous portion of Carpinteria Creek and all of the mountainous portion of Gobernador Creek.

A GIS analysis conducted as part of the Fisheries Specialist Report of the Burned Area Emergency Response Assessment (Klose, 2018) identified 1909 miles of stream habitat affected by the fire, which included 111 miles of perennial streams. Nearly 80 miles of stream designated as critical habitat for federally endangered southern California steelhead were estimated to have burned. Of this, approximately 15 miles of the impacted critical habitat occurs in the Carpinteria and Gobernador Creeks system.

Figure 3: Generalized extent of the 2017-18 Thomas Fire.



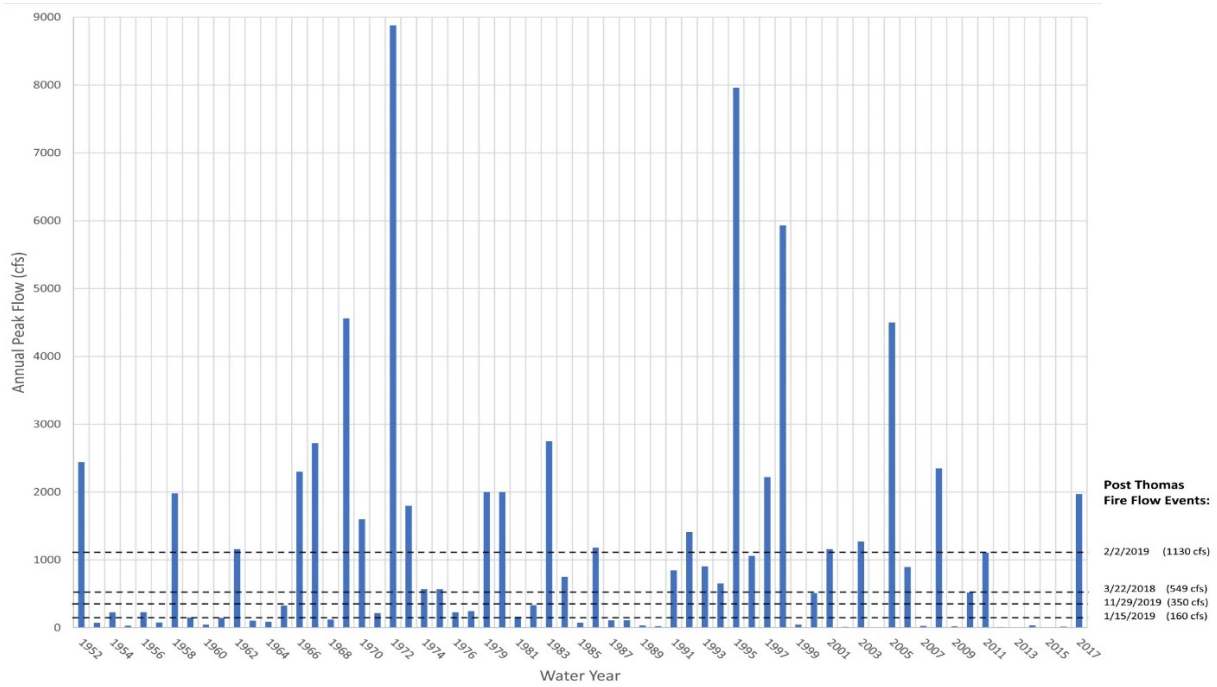
2.3 Debris Flow and Subsequent High Flow Events

The risk to stream systems does not often come from the fire itself, but from the subsequent input of sediment stored on the hillslope behind vegetation and more catastrophic events such as debris or mudflows that often result from high intensity precipitation events on a burned landscape. In many cases, but not all, riparian corridors often do not burn during the fire incident, due to their location in the lowest point in the surrounding landscape and the fact that they are relatively moist. The impact to stream and riparian corridors typically occur in reaches impacted by large floods and/or debris flows following the fire event. Depending on the magnitude and extent of the event, a debris flow can strip the entire valley bottom of riparian vegetation, leaving a completely denuded valley bottom where the vegetation community could have been on the order of 50 or 100 years old.

On January 9, 2018, a high intensity rainfall event struck the Thomas Fire burn area, including the Carpinteria and Gobernador Creek watersheds. According to the Thomas Fire Watershed Emergency Response Team (WERT) Report, maximum rainfall intensities were reported to be 6.48 in/hr for the 5-minute duration rainfall and 3.44 in/hr for the 15-minute duration rainfall. This storm event initiated debris flows that inundated areas within Montecito and Carpinteria. These levels of rainfall intensity are dramatic, to say the least, and if consistently applied across the entire, burned watershed, would result

in a debris flow event with a return frequency of several hundred years. Although the total amount of rainfall that occurred during the January 9, 2018 storm was not unusual, the intensity was.

Figure 4: Historic annual peaks at USGS Gage 11119500 and post fire and debris flow peak events.

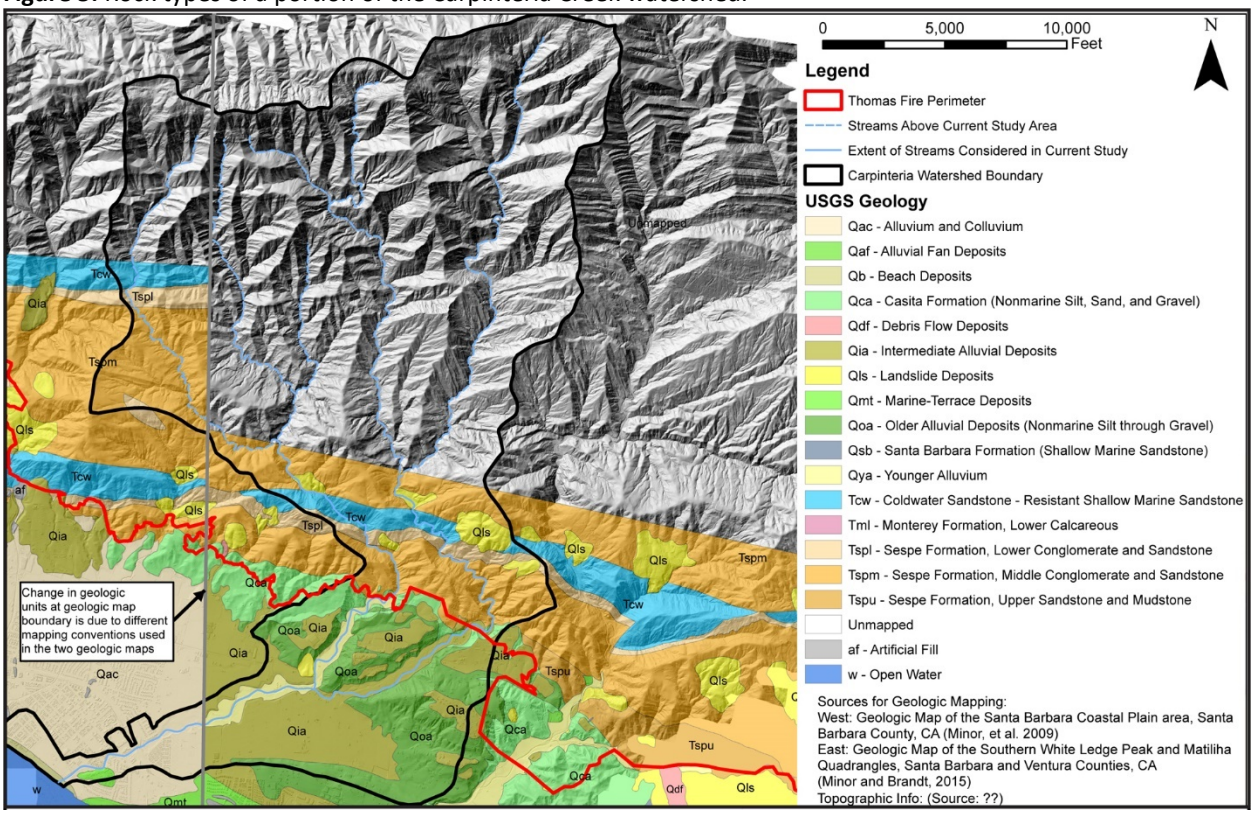


The high flow event in Carpinteria and Gobernador Creeks that resulted from the debris flow was unfortunately not measurable. At the onset of the event, the gage (USGS Gage 11119500) was destroyed and therefore did not record the peak stage. The event is also not necessarily comparable to a streamflow event because much of the flow volume includes sediment and debris, rather than just water. Subsequent to the debris flow event the gage was repaired and a new rating curve was established. Since the debris flow event, four significant storms have occurred with recurrence intervals that are equal to or exceed the mean annual flood (Figure 4) with the largest occurring on February 2, 2019 with an estimated discharge of 1,130 cubic feet per second (cfs). In comparison, the flood of record, which occurred in 1969, was slightly under 9,000 cfs. The fact that at least four, relatively high magnitude events have occurred since the fire and debris flow suggests high runoff rates associated with a lack of vegetation due to the fire.

2.4 Geology

The Carpinteria Creek watershed is underlain by a mix of sedimentary rocks along the southern flank of the Santa Ynez Mountains in Santa Barbara County, California (Figure 5). The watershed contains portions of two distinct physiographic and geologic subregions: the Santa Ynez Mountains and the Santa Barbara coastal plain.

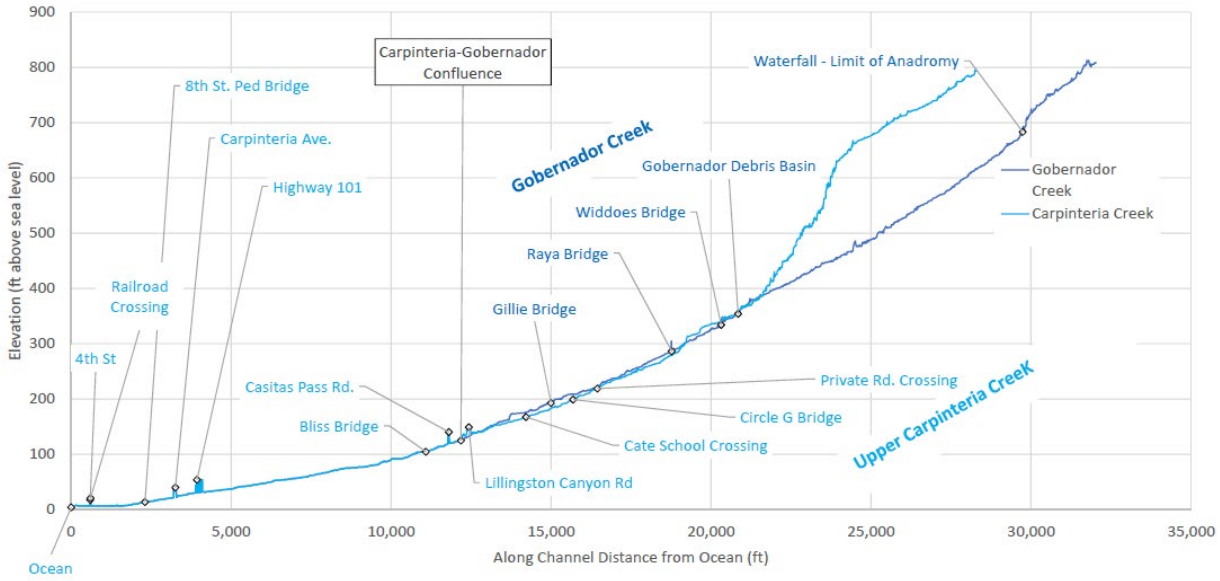
Figure 5: Rock types of a portion of the Carpinteria Creek watershed.



The Santa Ynez Mountains are the most prominent part of the Western Transverse Range physiographic province, an east-west trending group of mountain ranges that are “transverse” to the mostly north-south trending ranges in California. The rugged mountainous part of the watershed is characterized by thin soils and steep slopes on tilted sedimentary strata ranging in age from Eocene (as old as 40 million years old) to Pleistocene (as young as about 10,000 years old). This part of the watershed consists of mostly resistant, southward-dipping marine and non-marine sedimentary rocks that record a long history of continental margin sedimentation followed by uplift and tilting (Minor and Brandt, 2015). The most important formations exposed in this upper portion of the watershed include (from oldest to youngest): the Eocene Coldwater Sandstone, a resistant, shallow-marine sandstone; the Oligocene Sespe Formation, a predominantly reddish-brown sequence of non-marine sandstone and conglomerate; the Pleistocene Casitas Formation, consisting of nonmarine interbedded conglomerate, sand, and siltstone; and Pleistocene “Older Alluvial” deposits, which are fan deposits near the toe of the Santa Ynez mountains. The latter two (Casitas Formation and Older Alluvial deposits) are similar and related, and for the purposes of this project can be considered as approximately the same rock type. In addition to the in-place sedimentary strata, several large-scale landslide complexes are also mapped within the upper watershed (Figure 5). Differences in the resistance of the formations in the dipping

strata of the Santa Ynez mountains are reflected in transitions in channel morphology between wider floodplain reaches and steeper and narrower sections (Figure 6).

Figure 6: Longitudinal profiles and landmarks in Gobernador and Carpinteria Creeks.



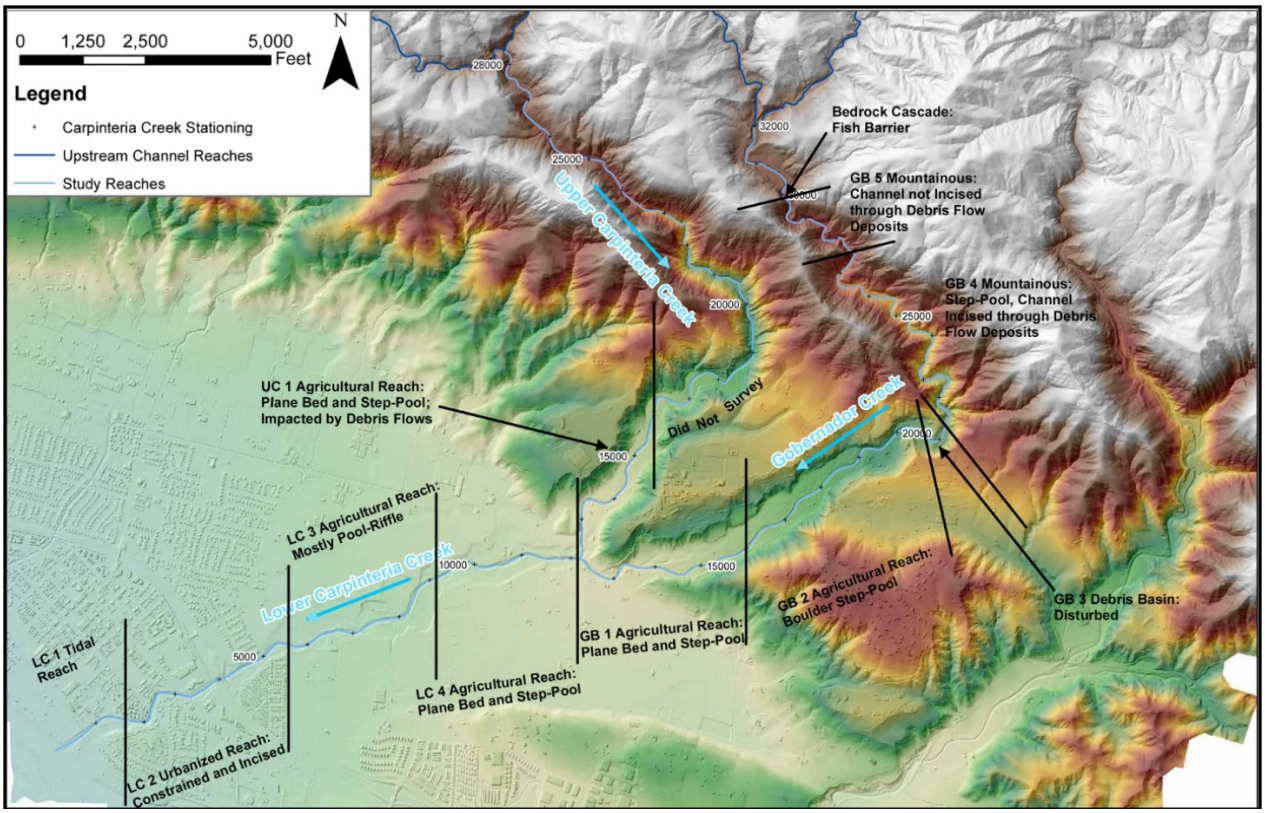
The transition to the coastal plain portion of the watershed is roughly at the confluence of Carpinteria and Gobernador Creeks. The coastal plain consists of younger, less consolidated, and more flat-lying strata, including fans, active channels, floodplains, marine terraces, and artificial fill. Both the mountain and coastal plain portions of the watershed have been affected by recent seismicity along a series of east-west trending faults (e.g., Minor et al., 2009; Minor and Brandt, 2015).

2.5 Geomorphology and Channel Conditions

A basic understanding of the geomorphology and current channel conditions in Carpinteria Creek is central to developing an appropriate watershed restoration plan. A 3-day reconnaissance field visit plus limited desktop analysis was conducted to characterize the basic geomorphic conditions in the study area. The purpose of the geomorphic analysis was to better define the existing conditions and impairments of the different reaches to help identify which possible restoration approaches might be most appropriate for steelhead enhancement in Carpinteria and Gobernador Creeks. The following discussion summarizes the observations, interpretations and implications of the geomorphic reconnaissance.

The sharp transition from the upper, mountainous portion of the watershed to the downstream, coastal plain are visible in the shaded relief image created using the post-fire LiDAR data (Figure 7). This figure also summarizes the geomorphic reaches delineated in the reconnaissance. The geomorphic reaches are discussed below and further detailed in tabular form (Table 2).

Figure 7: Shaded relief and geomorphic reach breaks within the study area.



2.6 Natural and Human Influences on Geomorphology

The distinctive geology and topography of the upper watershed creates the conditions for flashy runoff, high sediment loads, and catastrophic landslides and debris flows that have impacted the channels, most recently during the post-Thomas fire debris flows in January 2018. Boulder deposits visible in bank exposures along much of the channel reflect the long history of boulder-transporting debris flows and their influence on channel morphology; similar deposits are present along other streams draining the Santa Barbara front range. A sharp decrease in the valley gradient from the upper, mountainous portion of the watershed to the coastal plain has caused the deposition of alluvial fans near the Carpinteria-Gobernador Creek confluence (units Qoa and Qca in Figure 5). Prior to human intervention, deposition of gravels at the mountain front caused lateral channel migration and channel shifting across the coastal plain.

Table 2. Geomorphic Reaches and Subreaches in Study Area

Reach Name	Lower End of Reach (ft)	Upper End of Reach (ft)	Reach Length (mi)	Gradient	Dominant Bed Material	Morphology[1]	Nearby Land Use	Primary Geomorphic Impairments	Potential Restoration Approaches[2]	Notes
Lower Carpinteria Creek										
LC 1	0	1648	0.31	0.02%	Sand?[3]	Dune-ripple[3]	Urban and park	Floodplain encroachment; channel incision; lack of pools	Increase and enhance riparian buffer where possible; introduce large wood at estuary; small floodplain enhancement opportunity along left bank.	Flat tidal reach; constrained on the right bank by sewage treatment plant; narrow floodplain on the left bank
LC 2	1648	5600	0.75	0.94%	Sand with sparse gravel-cobble-boulder	Plane-bed and pool-riffle	Urban	Floodplain encroachment; channel incision; gravel embedment from fines; lack of pools and other cover elements	Increase and enhance riparian buffer zone; bank layback to reduce erosion; look into floodplain benching opportunities; restoration opportunities are limited due to dense development.	Carpinteria city reach; urbanized and constrained; 6 bridge crossings. Dominance of sand in the bed may be due to low slope but may also partially reflect a temporary oversupply of fines following Thomas Fire.
LC 3	5600	9600	0.76	0.99%	Sand with about 30% gravel-cobble-boulder	Plane-bed and pool-riffle	Agricultural	Floodplain encroachment; channel incision; gravel embedment from fines; lack of pools and other cover elements	Increase and enhance riparian buffer zone; Floodplain reconnection or benching; wait for fines to be flushed and pools to re-form.	Agricultural reach; partly constrained by orchards, with some narrow floodplain. Mostly incised. Large amount of sand in bed may be due to post-Thomas fire debris flows upstream. Apparent plane-bed subreaches may be due to these post-fire fines.
LC 4	9600	12183	0.49	1.63%	Boulder-cobble with sand	Plane-bed, pool-riffle and step-pool	Agricultural	Floodplain encroachment; channel incision; lack of pools and other cover elements; possible passage impairment related to one or more knickpoint(s)	Increase and enhance riparian buffer zone; Floodplain reconnection or benching; wait for fines to be flushed and pools to re-form.	Steeper step-pool and plane-bed reach in agricultural area, with discontinuous narrow terrace floodplain; mostly incised. One boulder step is a 4' drop and could be a migrating knickpoint. Boulder banks are prevalent. Large amount of sand in bed may be due to post-Thomas fire debris flows upstream. Apparent plane-bed subreaches may be due to these post-fire fines.
Upper Carpinteria Creek										
UC 1[4]	12183	15689	0.66	1.87%	Sand with sparse gravel-cobble-boulder	Boulder step pool	Agricultural	Floodplain encroachment; channel incision; gravel embedment from fines; lack of pools and other cover elements	Increase and enhance riparian buffer zone; Floodplain reconnection or benching; wait for fines to be flushed and pools to re-form.	Step pool
Gobernador Creek										
GB 1	12183	16000	0.72	2.31%	Boulder-cobble with sand	Plane-bed and step pool	Agricultural	Floodplain encroachment; channel incision; possible passage impairment related to one or more knickpoint(s); scarcity of overhanging riparian cover	Increase and enhance riparian buffer zone; Floodplain reconnection or benching; wait for fines to be flushed and pools to re-form.	Boulder step-pool with abundant fines. Agricultural area with constrained floodplain. Reach appears to have been heavily incised relative to floodplain prior to Thomas Fire. Large amount of sand in bed may be due to post-Thomas fire debris flows upstream. Apparent plane-bed subreaches may be due to these post-fire fines.
GB 2	16000	20700	0.89	2.90%	Boulder and cobble	Boulder step pool	Agricultural	Floodplain encroachment; channel incision, erosion of high banks, scarcity of overhanging riparian cover	Increase and enhance riparian buffer; lay back eroding banks; remove remaining concrete low water crossing from stream channel.	Similar to GB 1, but steeper with less fines in bed. No obvious debris flow deposits; presumably debris flows stopped upstream in debris basin.
GB 3	20700	21300	0.11	--	Varies depending on activities at debris basin	Disturbed	Debris Basin	Inhibited fish passage below debris basin (concrete) and at the head of dredged area due to oversteepened channel; lack of any in-stream habitat.	Revisit and revise sediment management plan; improve fish passage below debris dam.	Gobernador Debris Basin
GB 4	21300	25500	0.80	3.04%	Boulder and gravel	Boulder step pool	National Forest	Generally good quality habitat. Gravel embedment and scarcity of pools due to debris flow fines; scarcity of overhanging riparian cover.	None recommended at this time.	Channel is incised 2 to 4 feet into post-fire debris flow deposits, forming some pools. Upstream end coincides with lithologic boundary at the contact between the middle (downstream) and lower (upstream) members of the Sespe Formation
GB 5	25500	29739	0.80	3.95%		Boulders with pools infilled by sand and gravel	National Forest	Gravel embedment and scarcity of pools due to debris flow fines; scarcity of overhanging riparian cover.	None recommended at this time. Pools should re-form as debris flow fine gravel and sand are gradually transported downstream.	Channel is heavily impacted by post-fire debris flows with relatively little post-debris flow incision at the time of survey. Few to no pools

Notes:

1. Channel type based on classification scheme of Montgomery and Buffington (1998). Where more than one type is specified, multiple channel types are present within reach.
2. Possible restoration treatment types based on geomorphic observations during reconnaissance; specific project possibilities are identified later in the report.
3. Inferred; reach was visited during high flow on January 31, 2019 when bed was not visible.
4. Reach not assessed in full due to high flow conditions at time site visit was scheduled. Conditions observed from existing crossings and top of bank along most, but not all of reach.

In addition to the climate and geologic controls, geomorphic and channel conditions in the lower reaches are impacted by human factors. The channel and floodplain are constrained in places by urban and agricultural land uses and by human efforts to reduce bank migration and loss of adjacent land. Artificial containment of the channel banks in places may have contributed to gradual erosion of the channel bed, creating an incised condition in which an entrenched channel is bounded by high, unstable and eroding banks. Within the agricultural and urbanized reaches, the entrenched channel seldom overtops the high banks, resulting in abandoned terraces in place of former floodplain. These terraces are now occupied by orchards and by the City of Carpinteria, and the channel is confined to a relatively narrow channel with a limited active floodplain. Where this occurs, high flows remain within the channel, concentrating the shear stress from high flows on the channel bed and banks, further exacerbating erosion. Incised channels typically have a relatively low degree of channel complexity and heterogeneity, which tends to degrade their habitat value. Incised channel conditions like this are common in urbanized and constrained channels throughout the region.

In addition to lateral containment, sediment has been removed periodically from debris basins on both creeks near the base of the mountains. This activity has been done as a hazard mitigation strategy to reduce downstream flooding. However, debris removal has also reduced the amount of gravel and sand sized sediment (bed material) available to lower reaches and may have further contributed to channel incision, creating bank erosion risks. Increased runoff from rain on the urbanized coastal plain may also contribute to high, flashy flow peaks and increases in-channel erosion.

2.7 Impact of Thomas Fire and Post-Fire Debris Flows

The Thomas Fire burned most of the upper watershed in December 2017. Before the fire was completely out, an unusually heavy rainstorm over the burn area generated a series of debris flows in the Santa Ynez Mountains, including Carpinteria and Gobernador Creeks, in which large boulders were carried in a slurry-like mixture. Local and national scientists have conducted a considerable amount of research into the geomorphology of these debris flows, how they were initiated, where they traveled, and how they deposited. Most of that effort was focused in the Montecito area, about 10 miles west of Carpinteria Creek, where boulder-laden debris flows reached the coastal plain and caused catastrophic damage and loss of life. Unlike in Montecito, the debris flows caused less damage to infrastructure in the Carpinteria watershed. The most likely explanation for this is that the debris flows were halted further up in the watershed and did not reach the coastal plain, where most of the population and infrastructure are. The field reconnaissance visit led to the following observations, interpretations, and speculations about the impact of the debris flows on geomorphology and channel conditions:

- Photos from upper Gobernador Creek show the size of boulders that moved during this event (Photo A), as well as the large quantity of finer grained material that filled most of the pools and simplified the morphology of the upper watershed (Photo B). In places, the channel has since

incised into the debris flow deposits within the upper watershed. The same conditions are likely to be present in the mountainous portion of upper Carpinteria Creek, which was not visited due to access constraints.

- In Gobernador Creek, the Gobernador Debris Basin appears to have captured most of the coarser-grained material and halted the debris flow, though a large amount of fines and wood apparently passed through the debris basin. In upper Carpinteria Creek, it appears that the boulder-laden debris flow stopped just above the confluence with Gobernador Creek, at the base of the mountain front (Figure 7). Large boulders were deposited in the short reach between the Lillingston Canyon Road crossing and Gobernador Creek confluence, creating a series of cascades that may be an impediment to fish passage (Photo C). However, there is little clear evidence of debris flow boulder deposits downstream of the confluence. One possible explanation is that high flow within Gobernador Creek had temporarily backwatered Carpinteria Creek at the time those boulders arrived, reducing the downstream gradient and halting the propagation of the debris flow into the coastal plain. While this is a speculative interpretation about the mechanism for debris flow deposition without solid evidence, it is apparent that lower Carpinteria Creek (below the confluence) was spared the impact of catastrophic boulder laden debris flows as observed in Montecito.

- Although lower Carpinteria Creek does not appear to have been impacted by boulder debris flows, the event likely delivered a large amount of fine-grained sediment that temporarily deposited in the channel within the coastal plain. Fine grained sediment from the event is still present in certain portions of the channel in lower Carpinteria Creek and in sections of lower Gobernador Creek,

temporarily filling space between coarser gravel and reducing the depth of pools. Since this study did not systematically compare bed material composition before and after the event, this is a speculative conclusion. However, if accurate this interpretation has at least two implications for the current study: (1) post-fire fine sediment may have infiltrated coarser sediment and created a condition of embedment that may be an impairment for fish rearing and spawning in parts of lower Carpinteria Creek; and (2) this aspect of the system may currently be in a short term transient state, and future high flows may naturally alleviate this perceived impairment by winnowing out fines. This conclusion is supported by the fact that in steeper reaches, recovery, which is defined as flushing of fine sediments from pools, appears to be occurring at a faster rate, presumably due to higher energy conditions that enhance fine sediment mobilization.

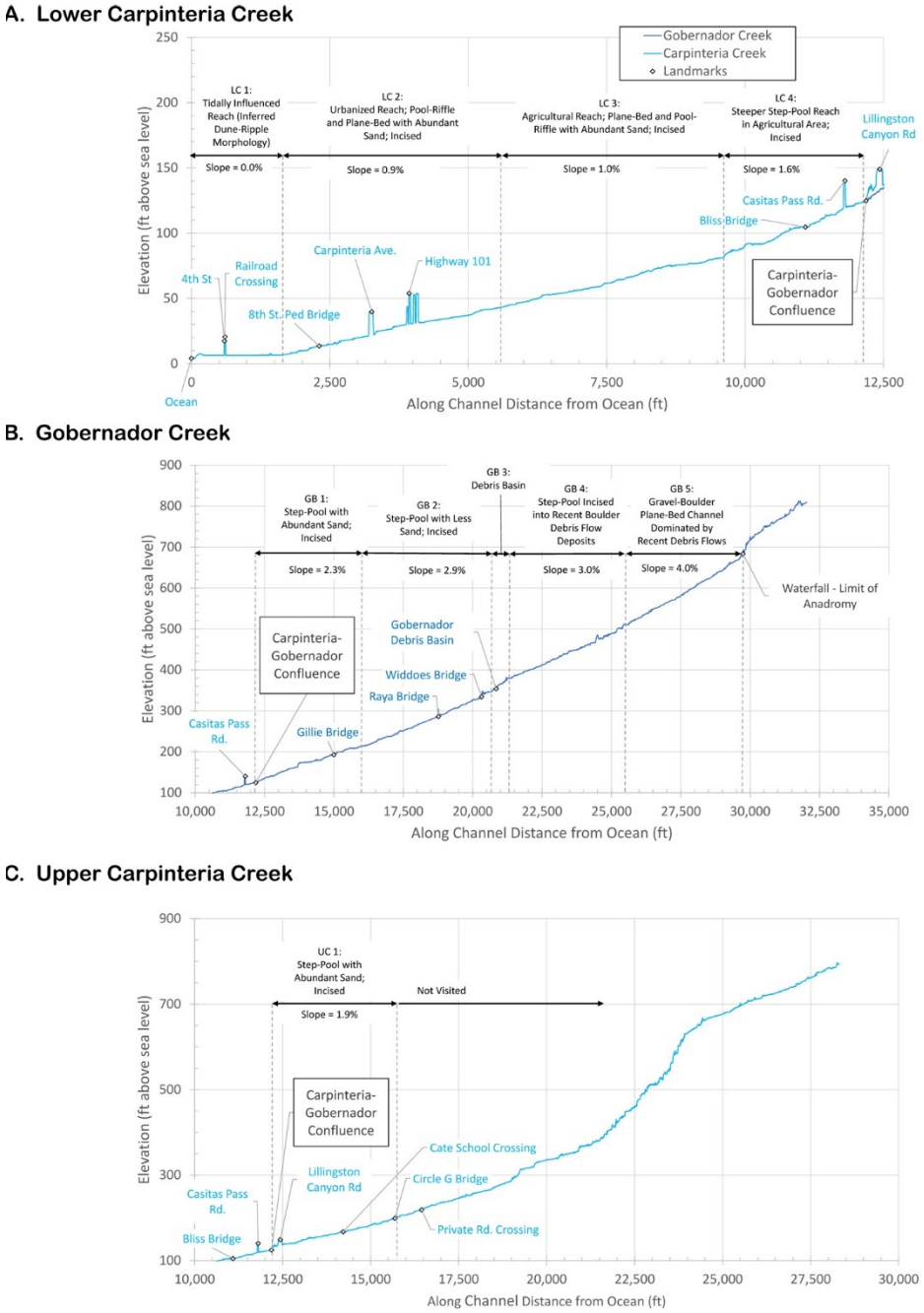
Debris flows of the magnitude that occurred following the Thomas Fire result when three physical conditions interact: 1) High intensity fire event, 2) High intensity rainfall event, and 3) Abundant supply of stored colluvial material on hillslope and zero order colluvial hollows. Given the magnitude of the debris flow event that occurred in the Carpinteria watershed, subsequent debris flow events associated with the Thomas Fire are not likely to occur given recovery of vegetation and the exhaustion of the sediment supply. This is supported by the literature which has shown that post-fire debris flow events typically occur within the first two years following the fire (DeGraff et. al., 2015; Florsheim et. al., 2015; Wohlgemuth, 2006). These studies suggest that the exhaustion of the supply and recovery of vegetation greatly reduces both risk of additional debris flow events and orders of magnitude reduction in sediment flux to the channels within one to two years following a fire.

2.8 Geomorphic Subreaches

Based on the field reconnaissance and desktop investigation, the study area was divided into a series of geomorphic reaches and subreaches, each having distinctive characteristics, impairments, and constraints (Table 1). The extent and characteristics of these reaches are more clearly described in Table 2, which also identifies some of the possible impairments and potential restoration approaches that may be appropriate for each reach. The purpose of defining and describing the geomorphic reaches in this way is to identify differences in impairment and to highlight various types of restoration approaches that may be appropriate within different parts of the system.

The three primary reaches are (1) Lower Carpinteria Creek (Reach LC) (below the Carpinteria-Gobernador Confluence); (2) Gobernador Creek (Reach GB) above the confluence; and (3) Upper Carpinteria Creek (Reach UC) above the confluence. These are further subdivided into “subreaches” according to geomorphic and other descriptive criteria listed in Table 2. The longitudinal profiles of the three reaches are shown in Figure 8, and a selection of photographs of each of the reaches is provided in Appendix C. The reaches are discussed below from downstream to upstream.

Figure 8: Longitudinal profiles of mapped geomorphic reaches.



Lower Carpinteria Creek. Lower Carpinteria Creek includes the main stem of Carpinteria Creek from the ocean to the confluence with Gobernador Creek (Figure 8A). It includes the small coastal lagoon and a short (about ¼ mile), flat-bottomed reach that is tidally influenced (Subreach LC-1). Subreach LC-2, with a 1% gradient, traverses the urbanized portion of the watershed in the City of Carpinteria; as a result the

channel and floodplain are constrained and encroached on by streets, roads, bridges, housing, and other features, and the channel appears to be incised, with some high eroding banks. This reach is impaired by incision, bank erosion, hydromodification (increased storm runoff due to extensive roads and other paved surfaces), and historical floodplain filling. Subreach LC-3 has similar characteristics and morphology to subreach LC-2, but traverses an area dominated by avocado orchards and contains a narrow and discontinuous riparian corridor. The bed material is dominated by cobble-sized sediment and sand. Some of the sand in the bed may be related to a temporary oversupply of fines from the Thomas burn area that may gradually be flushed out as the watershed recovers from the fire. The transition from LC-3 to Subreach LC-4 is marked by a steepening of the gradient from 1% to 1.6%, an increase in boulder step pool morphology, and a decrease in the amount of fines in the bed relative to downstream. Subreach LC-4 is also in the agricultural zone of the watershed, with a mostly incised channel and a prevalence of high vertical banks.

The primary impairments in Lower Carpinteria Creek appear to be related to floodplain encroachment, channel incision and simplification, and an associated lack of in-channel complexity and pools.

Gobernador Creek. Gobernador Creek (Figure 8B) is similar in size, physiography, and geology to Carpinteria Creek above the confluence. Subreach GB-1 is a step-pool reach with abundant sand (maybe derived in part from the Thomas Fire), and boulder banks. The channel is incised into the surrounding orchards that dominate the adjacent floodplain, limiting the amount of available native riparian cover. Subreach GB-2 is similar to but steeper than GB-1, and contains less fines in the bed. Two bridges have recently been built to replace former artificial passage barriers at low water crossings in this reach. Subreach GB-2 may be impacted by ongoing sediment removal at the Gobernador Debris Basin, leading to channel incision below the basin and related headcuts. Subreach GB-3 is heavily disturbed by the activities at the debris basin and lacks much habitat. The downstream end of the debris basin is a partial or full fish passage barrier, and the upstream extent of dredging commonly creates an unnaturally steep slope that may be an impediment to fish passage.

Upstream of the debris basin, geological factors are more dominant in determining the geomorphic characteristics. Subreach GB-4 is a boulder step-pool reach with a 3% slope, with widespread evidence of the valley being obliterated by recent debris flows. The channel has since incised 1 to 5 feet into the debris flow deposits in this subreach. In contrast, less post-debris flow geomorphic adjustment is apparent in subreach GB-5, in which pools are generally filled and the channel is filled with thick and flat deposits of gravel, lacking channel complexity, aside from boulders.

Upper Carpinteria Creek. The profile of upper Carpinteria Creek (Figure 8C) shows distinct transitions related in part to the underlying geology. Only the lowermost reach (subreach UC-1) was visited during the geomorphic reconnaissance. In that reach, evidence of recent boulder-laden flows from the Thomas Fire burn area is widespread. Boulders were lifted out of the incised channel and deposited on the tops

of high banks during the January 2018 debris flow event. Reach UC-1 contains abundant fine sediment and a relative lack of pools. These characteristics may be a transient condition that could change without intervention over the next several years, however, as the channel continues to flush the sediment deposited during the catastrophic debris flows.

2.9 Fisheries

The Southern California Coast Steelhead Distinct Population Segment (DPS) is listed as endangered and is comprised of steelhead populations (*Oncorhynchus mykiss*) extending from the Santa Maria River system south to the U.S. border with Mexico. Freshwater, non-anadromous, populations of rainbow trout also occur in the same geographic region, frequently co-occurring in the same river systems as the anadromous form. Several documents provide a comprehensive review of the status of steelhead populations in Carpinteria and Gobernador Creeks including:

- Matt Stoecker and Conception Coast Project. June 2002. Steelhead Assessment and Recovery Opportunities in Southern Santa Barbara County, California.
- Ecology Consultants, Inc. February 2004. Steelhead Habitat and Population Study Carpinteria Creek Watershed.
- National Marine Fisheries Service. 2016. South-Central/Southern California Coast Steelhead Recovery Planning Domain – 5-Year Review: Summary and Evaluation of Southern California Coast Steelhead Distinct Population Segment.

These documents provide an exhaustive discussion of life histories, historic and current distribution, and opportunities and constraints for recovery of Southern California Coast steelhead populations. Generally, the findings suggest that a limited amount of data are available to understand the current status of steelhead in much of the Santa Barbara South Coastal streams, including Carpinteria and Gobernador Creeks. The data are primarily limited to historic observations, historic and current habitat assessment data, and surveys and observations documenting the presence of rainbow trout spatially in the watershed. Despite the lack of data, it is abundantly clear that anadromous *O.mykiss* may either be present in low numbers or non-existent in the Carpinteria and Gobernador system, especially given the recent prolonged and severe drought and subsequent fire and debris flow.

As discussed in the documents listed above, populations of *O.mykiss* can theoretically consist of a mix of resident fish, which are referred to as rainbow trout, and anadromous fish, which are referred to as steelhead. In a particular watershed, these life histories tend to segregate spatially based on the presence of barriers to migration, both natural and anthropogenic. Resident populations tend to reside upstream of a barrier whereas anadromous populations tend to occur where there is access from the ocean. This apparent segregation is enforced by the tremendous reproductive advantage that anadromous fish have over resident fish.

Despite this segregation, studies have shown that there is life history overlap that occurs with some resident fish deciding to migrate to the ocean (or getting washed out in some cases) to become anadromous and some offspring of anadromous adults opting to stay in freshwater to carry out their entire life cycle. The mechanism for this overlap is not well understood nor is the rate at which it occurs. Some researchers have postulated that this behavior is in response to resource availability or population pressures. It may also be a useful adaption in watersheds with frequent disturbance regimes that would include fire, flooding, or drought. Populations that have a higher rate of overlap may be adapting to climatic impacts that decimate either anadromous or resident populations in part of or within an entire watershed. If an entire watershed is impacted by a fire or flood event, anadromous populations may still be available to repopulate at least the portion of the watershed that is accessible. Similarly, if an anadromous population was wiped out by poor ocean conditions, resident fish could provide an opportunity to restore anadromous runs.

Human impacts in a watershed create additional stressors to this already tenuous adaptation to frequent disturbance. Water withdrawals, habitat loss, and the presence of multiple man-made barriers all greatly reduce the likelihood that steelhead or rainbow trout will be able to recover from the next disturbance event. This is especially true in the case of the Thomas Fire and debris flow where most of the watershed burned, leaving little in the way of refuge from the impact. If an anadromous population is not present in Carpinteria and Gobernador Creeks to "reseed" the system following the Thomas Fire disturbance, the best chance for fish recovery in the system would be either the chance survival of a viable resident population or the longer-term opportunity for stray anadromous fish to utilize the Carpinteria system from nearby watershed that were not as impacted by the fire and associated debris flow event.

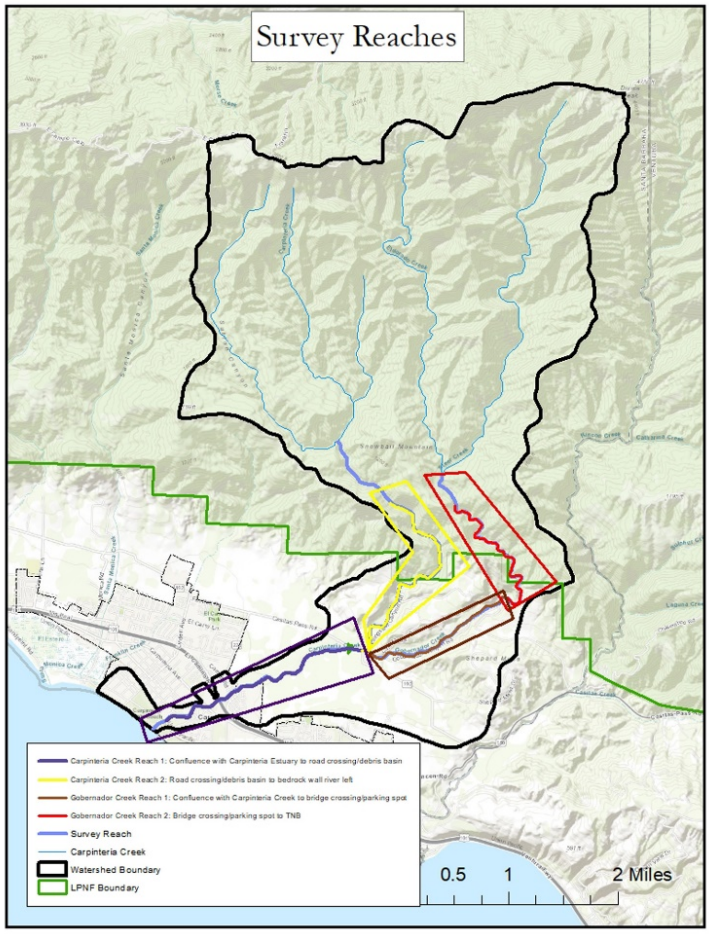
To understand the impact of the fire and debris flow on fish habitat and recovery of habitat conditions over time, CDFW is periodically conducting habitat typing surveys in Carpinteria and Gobernador Creeks. Figure 9 identifies the extent of the surveys in each creek along with the reach designations. These surveys will represent a valuable dataset to assess long-term impacts of the fire and debris flow on habitat, relative to conditions prior to the fire and debris flow.

Given the limited time available for this assessment, our analysis of fish habitat conditions did not include a detailed habitat typing survey within the project limits identified in Figure 9. The intent of this document is to ultimately provide a set of restoration project recommendations to assist in the recovery of habitat in the watershed. Consequently, a more general and rapid assessment of habitat conditions was determined to be a more appropriate approach, with support to this effort provided by the more detailed and long-term assessment efforts.

Despite our desire to conduct a rapid assessment, there was also an interest in providing a comparison to pre-fire and debris flow conditions. This was accomplished by utilizing the reach-scale habitat

characterization methodology described in Stoecker (2003). The Stoecker assessment was conducted for all primary Santa Barbara South Coast streams, including Carpinteria and Gobernador Creeks. The extent of that assessment overlapped the survey extent adopted by CDFW for their recent habitat typing work. The method consists of characterizing key habitat parameters along relatively homogeneous segments of stream channel. Habitat parameters characterized for each habitat reach include abundance of spawning gravel, substrate embeddedness, stream gradient, flow conditions, pool abundance, instream cover, and riparian canopy cover. A score is applied to each habitat parameter based on the observed condition in each reach. The scores are then tabulated to produce a habitat rating for each delineated reach.

Figure 9: CFDW survey extents for long-term study of habitat quality and spawning in Carpinteria and Gobernador Creeks.

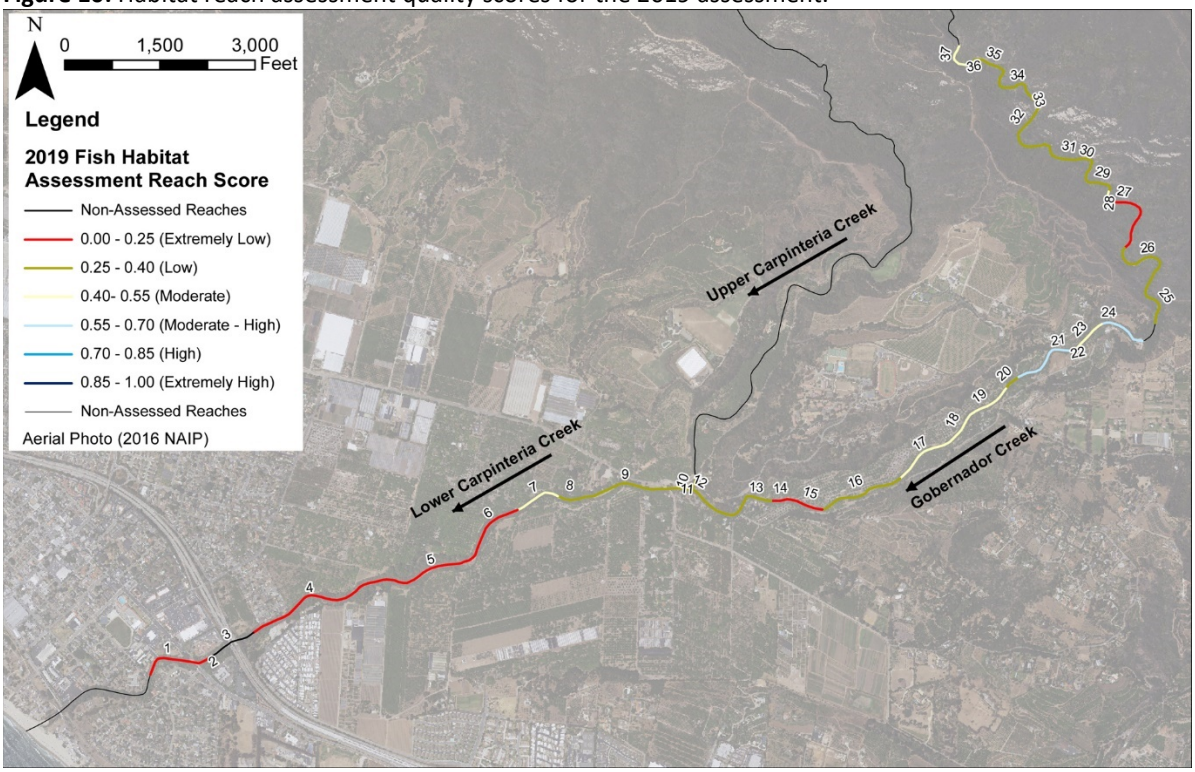


The Stoecker method was conducted on all accessible reaches within the project study area, which included all of lower Carpinteria Creek up to the confluence, and all of Gobernador up to the first identified natural barrier. Upper Carpinteria was not surveyed due to a combination of high flows during the assessment period and a lack of landowner permission to access conditions upstream of the

Circle G Bridge. The area on Carpinteria Creek between the confluence with Gobernador and the Circle G Bridge was evaluated visually but not surveyed for habitat conditions.

Within the assessed portions of Carpinteria and Gobernador Creeks, a total of 37 habitat reaches were characterized including 8 within lower Carpinteria Creek and 29 in Gobernador Creek (Figure 10). As a general rule, habitat reach breaks were primarily defined by changes in channel slope and confinement. Differences in the habitat quality rating throughout the study area were primarily defined by the presence or absence of pools, the presence or absence of a riparian canopy, and the degree of embeddedness. All habitat reaches received a relatively low habitat quality score and in most cases received scores that were significantly lower than the scores received in the 2002 surveys (Figure 11).

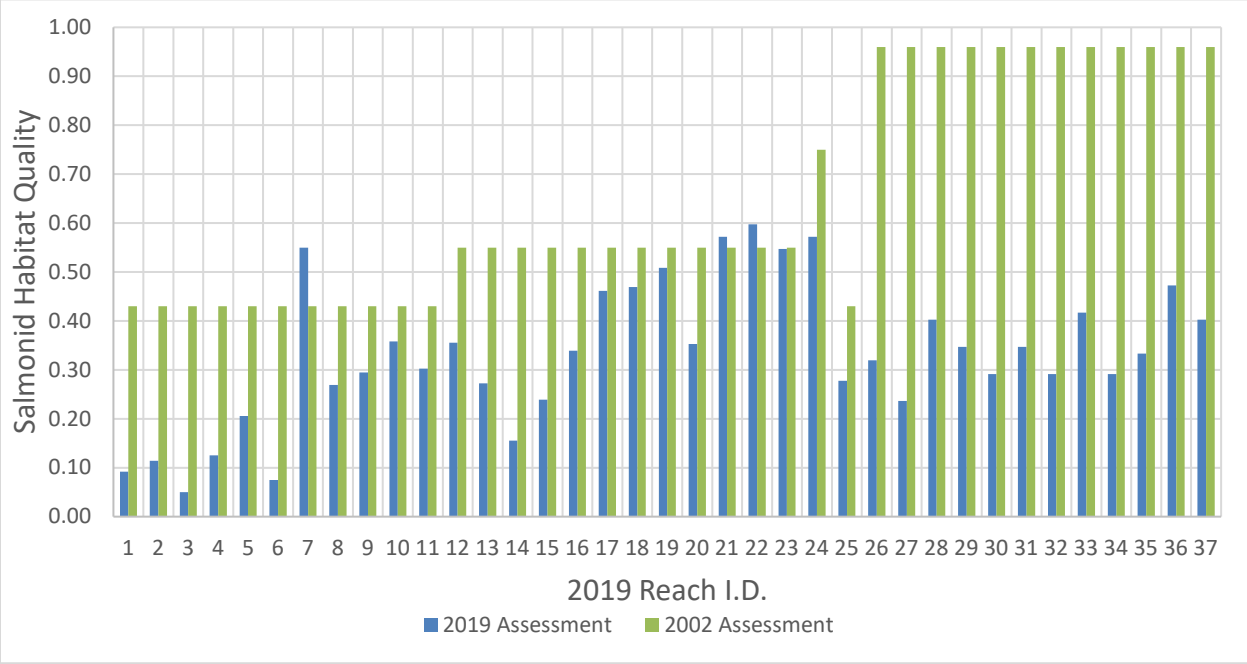
Figure 10: Habitat reach assessment quality scores for the 2019 assessment.



All of the habitat reaches were overwhelmed by fine sediment and sand associated with the debris flow event and material delivered from the denuded hillslopes. This material has filled pools and continues to mobilize even during moderate flow events. The current supply of this material is unlimited given the lack of stabilizing vegetation, resulting in remobilization of in-channel and channel margin deposits following rain events. It is anticipated that as the supply of this material declines over time as vegetation stabilizes the hillslope and floodplain deposits, habitat conditions will recover as fine sediment is transported out of the system or is deposited in adjacent floodplain areas. Field observations during the assessment suggest that habitat conditions in higher gradient areas will recover

faster than lower gradient areas. This is primarily due to the importance of deep pool habitat in overall reach-scale habitat quality and the fact that higher gradient areas are associated with higher energy conditions that maintain pools and transport fine sediment. Pools have already begun to reform in Gobernador where the gradient is higher and forcing elements such as large boulders are present to enhance and maintain localized scour.

Figure 11: Comparison between the 2019 and 2002 (Stoecker) habitat reach assessment quality scores.



2.10 Riparian

One of the most significant impacts to channel conditions in Carpinteria and Gobernador Creeks was the impact to the mature riparian corridor. Although the extent to which the fire directly impacted the riparian corridor was not documented in detail, it is often the case that fires extend to the margin of the riparian corridor but don't often burn the corridor directly. Consequently, riparian areas typically survive fires intact and provide an area of refuge to an otherwise heavily impacted landscape. Despite the likelihood of the mature riparian corridor surviving the fire, the subsequent debris flow scoured the entire channel and low floodpain areas, leaving only mature riparian trees along the terrace margins that were above the elevation of the debris line. In the canyon areas of both Carpinteria and Gobernador, all vegetation was scoured from the valley floor, even in the less confined reaches.

Recent assessment work points to the resiliency of the native riparian species and their adaptation to frequent disturbance. In the case of the cottonwoods, sycamore, willow, and bay, the intact root masses of mature trees that were washed away during the debris flow event are resprouting, with vigorous annual growth a result of stored energy that was protected from the force of the debris flow.

Similarly, understory species such as elderberry, scrub oak, mugwort, and poison oak all appeared to have survived and are vigorously regrowing along the channel margins and pocket floodplains. Although it will take decades to recover, the regrowth observed only a little more than one year after the debris flow shows positive signs.

Independent of the anticipated recovery of the riparian corridor following the debris flow event, historical and long-term stressors on the health and viability of a native riparian corridor exist on Gobernador Creek, primarily in areas downstream of the canyon reaches. The primary stressors observed during the assessment was the lack of a significant riparian buffer at the top of bank. Given the overall incision of the channel, most of the mature riparian vegetation along lower Gobernador and Carpinteria Creek exists either as a narrow strip between the active channel and the toe of the terrace or at the top of the terrace. In many cases, adjacent land uses have either limited or completely removed the riparian strip along the terrace margin. In these situations, lateral movement of the channel and erosion of the terrace bluff can result in loss of the entire riparian buffer strip on either side of the channel with little to no potential for recovery.

To understand the existing status of riparian areas throughout lower Gobernador and Carpinteria Creeks and to what extent the stressors discussed above exist longitudinally throughout the lower basin, an assessment was conducted to document the following:

- Approximate extent of riparian vegetation,
- Characterization of the condition of the buffer and how constrained it is by adjacent land uses,
- Identification of whether there are opportunities to expand the buffer in the future based on the adjacent land use type,
- Presence of a significant non-native component within the existing riparian buffer (primarily eucalyptus), and
- Locations of post and wire revetments that could be removed in parallel with a riparian enhancement project.

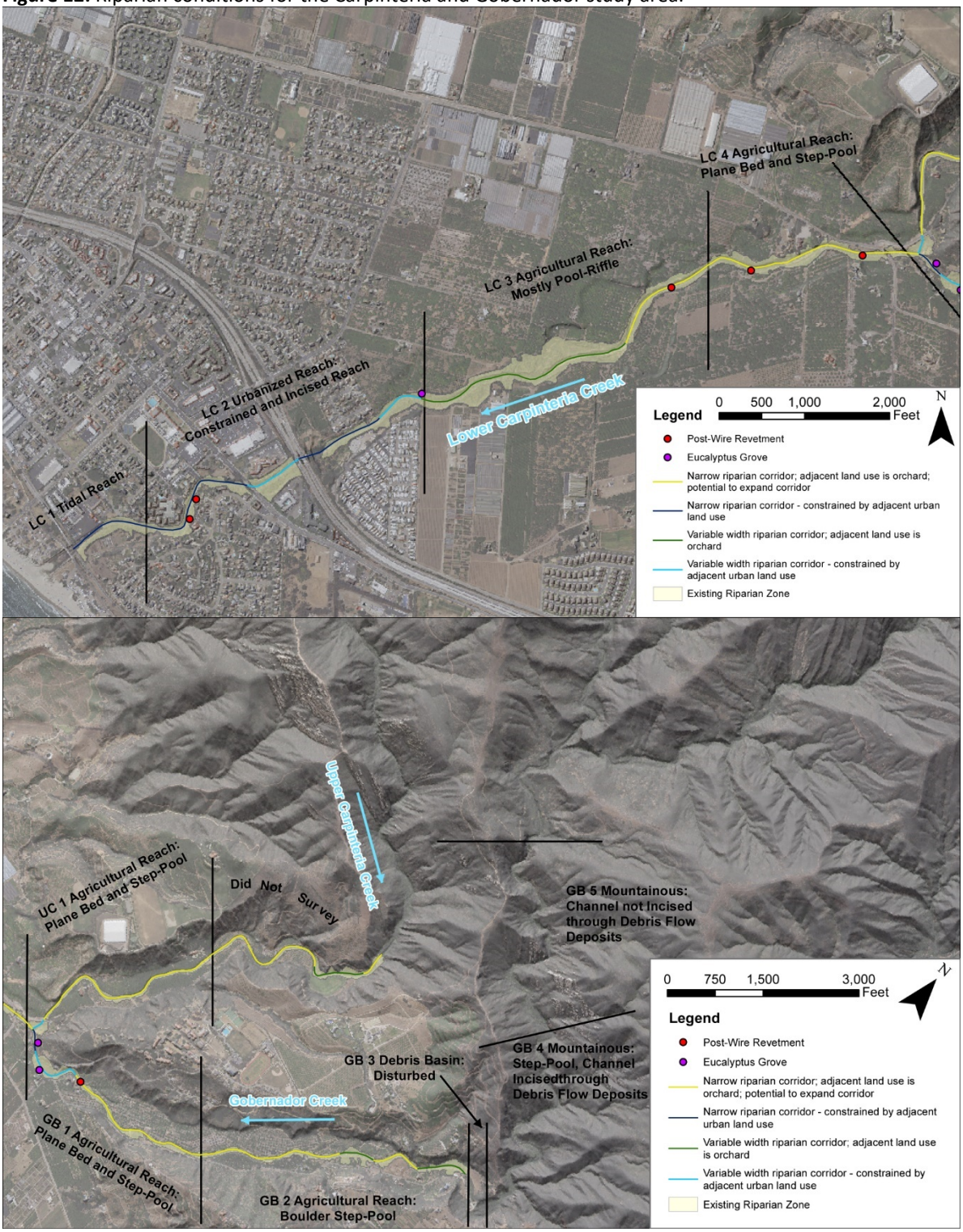
The assessment consisted of a combination of aerial photo and field based analysis. Aerial photos were used to develop a coarse map of the extent of riparian areas along the non-canyon reaches of both Carpinteria and Gobernador Creek extending from the Pacific Ocean upstream to the historic debris basin on Carpinteria Creek and the existing debris basin on Gobernador Creek. To the extent possible, only native riparian areas where mapped and mature avocado orchards were excluded. Field verification was required in some areas where mature avocado orchards create the impression of a continuous riparian canopy given the density of those orchards which contrasts with orchards with younger trees where there is a clear signature of an orchard given the fact that they are planted in rows and are equally spaced. There is a potential that some areas were incorrectly identified as riparian that may be orchard though the mature avocado orchards tend to have a darker hue than the native riparian, especially where sycamore dominates.

Although some field verification focused on the mapping of the riparian areas, most of the field effort was used to map locations of eucalyptus groves and extents of existing post and wire revetments. The field assessment was also used to better understand the potential for expanding the riparian buffer based on adjacent land use constraints. This assessment identified four types of riparian conditions within the assessment reach:

- Riparian areas of variable width where a reasonable buffer exists on one, if not both, sides of the channel with an adjacent land use dominated by agriculture,
- Riparian areas of a variable width where a reasonable buffer exists on one, if not both, sides of the channel with an adjacent land use constrained by urban infrastructure,
- Riparian areas with little to no buffer with an adjacent land use dominated by agriculture, and
- Riparian areas with little to no buffer with an adjacent land use constrained by urban infrastructure.

Figure 12 provide a visual depiction of the mapped extent of existing riparian areas along with a longitudinal classification of riparian condition as defined by the four categories outlined above. What is evident from the map is that a large percentage of the study area falls within the category defined by a lack of a meaningful riparian buffer with an adjacent land use consisting of agriculture, primarily avocado orchards. This condition represents a significant opportunity to partner with willing property owners to potentially increase riparian buffers through programs such as conservation easements and tax deferrals that has the potential to also benefit property owners by providing them with a buffer from creek impacts associated with lateral channel migration and bank erosion.

Figure 12: Riparian conditions for the Carpinteria and Gobernador study area.



3.0 RESTORATION PLAN

3.1 Previous Project Identification and Prioritization

The 2005 Carpinteria Creek Watershed Plan outlines a range of potential project actions to improve the conditions of the watershed. These recommendations include the following project types that consist of general programmatic efforts as well as specific project actions:

- Outreach and Education,
- Fish passage projects identified by Stoecker (2003),
- Development of a restoration plan for the estuary,
- Invasive, non-native weed removal program, consisting primarily of Giant Reed (*Arundo donax*),
- Streambank stabilization to reduce fine sediment inputs,
- Development of a monitoring program, which included water quality as well as effectiveness monitoring of implemented restoration projects,
- Property acquisition in urban reaches,
- Post and wire revetment removal, and
- Improvements to Best Management Practices on agricultural land.

A total of 15 site specific projects and programs were identified and ranked from one to three with one representing the highest priority. The specific approach to ranking the identified projects was not discussed in the 2005 Plan, though most of the projects consisted of fish passage improvements and were pulled from the Stoecker (2003) report which did include a comprehensive ranking system.

Since 2005, many of the stakeholders and project partners that were involved in preparation of the 2005 Plan have been active in obtaining funding and implementing the project priorities. Consequently, a large majority of the recommended actions have been implemented, including most of the fish passage barriers and removal of a significant amount of the *Arundo donax*. To understand the degree to which the partners have implemented projects identified in the 2005 Plan, we compiled a list of past projects and summarized their status (Figure 13 and Table 3). The 2012 NMFS Recovery Plan also identified development of a habitat restoration plan for the Carpinteria Creek lagoon as a specific project action that would aid in the recovery of steelhead in the watershed.

3.2 Updated List of Restoration Recommendations

As discussed in the purpose and need section at the beginning of the report, the primary objective of this assessment is to build upon past work by providing an updated listed of potential actions in the watershed that will aid in the recovery of steelhead and their habitat. To accomplish this goal we reviewed the projects identified in the 2005 Watershed Plan and the 2012 Recovery Plan, worked with

Figure 13: Map of past projects, projects status, and new project recommendations.

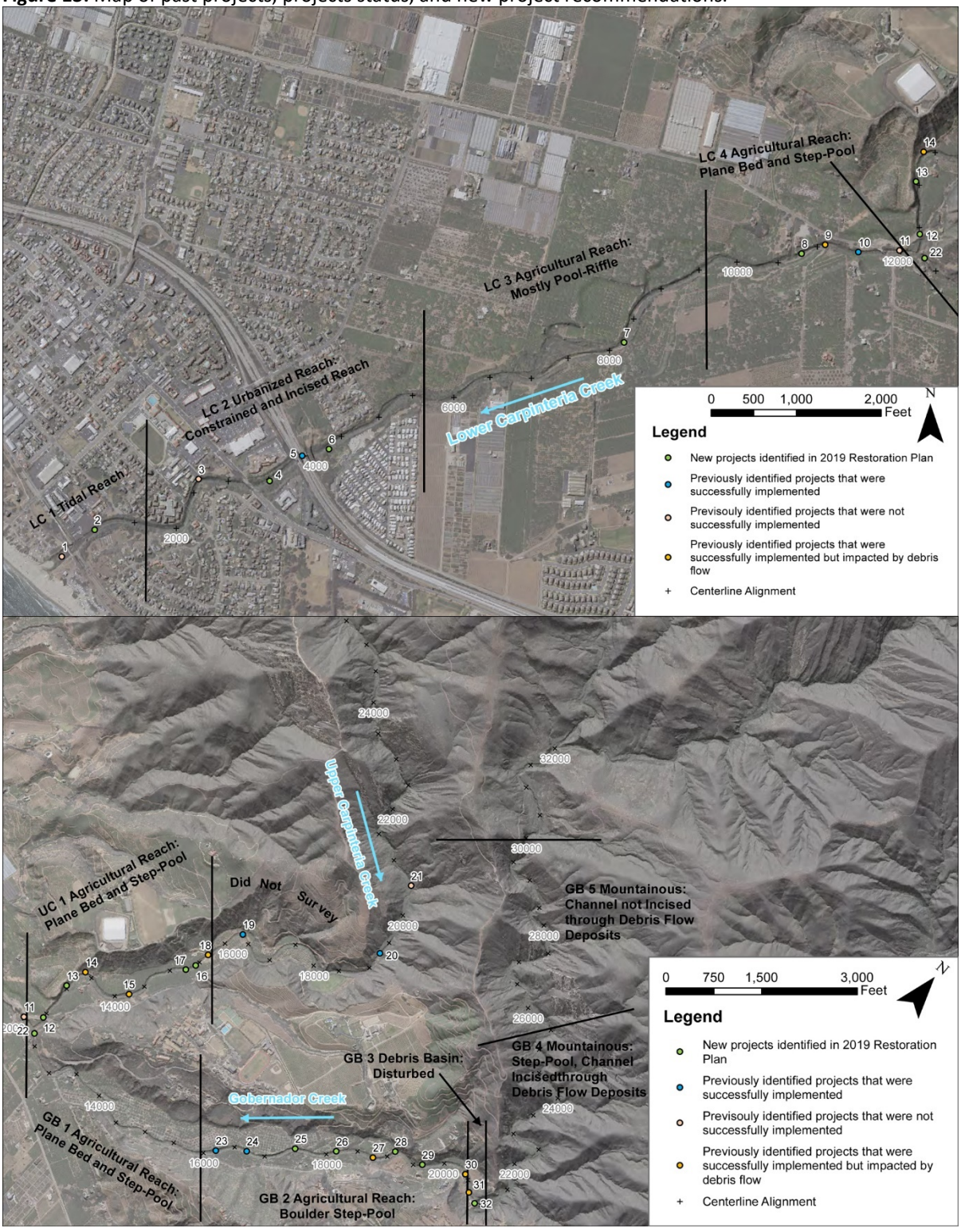


Table 3: Summary Table of Past Project Recommendations, Implemented Projects, and Newly Recommended Projects and Their Status.

Site Number	Project Name	Source of Project Identification	Impairments Addressed?	Project Type	Project Purpose and Impairments to be Addressed	Geomorphic Reach	River Station (ft)	Project Description and Notes
1	Carpinteria Lagoon Enhancement Plan	2005 Watershed Plan; NMFS Steelhead Recovery Plan	No	Lagoon enhancement	Create rearing habitat in tidal estuary	LC1	500	Develop a restoration plan for the lagoon to improve water quality and associated juvenile rearing habitat. The plan would evaluate site potential and determine opportunities and constraints for restoration with specific projects identified to pursue design and implementation funding.
2	Treatment Plant Reach Instream Improvements	2019 Restoration Plan	No	Channel and floodplain restoration	Increase in-stream habitat complexity and cover; lower water temperature	LC1	1000	Move low flow channel so it is adjacent to riparian left bank as opposed to the concrete right bank at sewage treatment plant. Create vegetated low floodplain surface on river right; enhance riparian floodplain on river left.
3	8th Street Bank Protection Project	2005 Watershed Plan	No	Bank protection	Protect infrastructure (condos); reduce fine sediment inputs	LC2	2650	Install bank protection at outside of a bend at 15' to 20' high eroding bank next to condominium complex. Not much opportunity to lay back and improve floodplain due to proximity of building. Incorporate habitat elements where feasible. Primary purpose would be to protect private property that is endangered due to the position on the outside of an eroding bend.
4	Highway 101 to Carpinteria Ave Floodplain Bench	2019 Restoration Plan	No	Floodplain lowering and revegetation	Create high flow refuge habitat; attenuate floods	LC2	3500	Lower and revegetate floodplain bench on river left adjacent to Motel 6 so it is flooded more frequently and builds a more functional floodplain that could provide refuge habitat for fish and attenuate floods. Could create up to 1.5 acres of improved floodplain and improved riparian along 500 feet of channel.
5	Pedestrian Crossing at Highway 1	2005 Watershed Plan	Yes	Fish passage improvement	Improve fish passage	LC2	4000	This project was identified in the 2005 Watershed Plan as a low severity barrier (BR_CA_1). This project was addressed during reconstruction/widening of Highway 101.
6	Carpinteria Creek Park Floodplain Bench	2019 Restoration Plan	No	Floodplain lowering and revegetation	Create high flow refuge habitat; attenuate floods	LC2	4300	Lower and revegetate floodplain bench on river left adjacent to a local park so it is flooded more frequently and builds a more functional floodplain that could provide refuge habitat for fish and attenuate floods. Could create as much as 4 acres of improved floodplain. Size of project is limited by the adjacent lightly used park and parking area.
7	Outer Bend Floodplain Restoration	2019 Restoration Plan	No	Riparian floodplain enhancement	Improve in-channel habitat; create high flow refuge habitat; protect eroding orchard; attenuate floods	LC3	8200	Improve habitat quality and reduce erosion at outer bend in adjacent to an orchard. Instream wood structures, high flow channel, and headcut stabilization in the orchard could all be elements of the project. The project would reduce fine sediment input to Carpinteria Creek, improve instream habitat and provide localized attentuation of high flows.
8	Lower Carpinteria Instream Enhancement	2019 Restoration Plan	No	Engineered log structures	Instream habitat complexity	LC4	10800	Opportunity to install LWD structures in less confined reach to improve instream habitat without increasing flooding or risks to adjacent property owners.
9	Bliss Bridge Improvements	2005 Watershed Plan	Yes but flood damage identified	Replace abutment protection at bridge	Protect bridge	LC4	11100	Replace and rearrange some boulders near the toe of slope underneath the bridge to replace protection lost during the debris flow. Indentified as a extremely high to impassible barrier in the 2005 Watershed Plan (BR_CA_2). Addressed in a previous effort.
10	Pipe Crossing	2005 Watershed Plan	Yes	Fish passage improvement	Improve fish passage	LC4	11500	Low severity fish passage barrier identified in the 2005 Watershed Plan consisting of an unknown pipe crossing (BR_CA_3). During the 2019 walk-through this site was not observed as an issue and may have been addressed through a previous project.
11	USGS Gage	2005 Watershed Plan	No	Fish passage improvement	Improve fish passage	LC4	12000	Gage represents a partial fish passage barrier at lower flows. Modifications would still need to retain ability to monitor flow via a stable cross-section and rating curve. Identified as a low severity fish passage barrier in the 2005 Watershed Plan (BR_CA_4).
12	Lillingston Canyon Road Fish Passage	2019 Restoration Plan	No	Fish passage improvement	Improve fish passage	UC1	12400	Boulders deposited below Lillingston Canyon Bridge, just upstream of confluence with Gobernador, create a partial fish passage barrier. Project would rearrange or remove boulders deposited during the debris flow, and possibly place them against the toe of eroding high bank on river left to divert high flow towards the lower right bank line.
13	Cate School Floodplain and Riparian Enhancement	2019 Restoration Plan	No	Lay back eroding bank and create natural riparian buffer	Improve riparian cover; reduce fine sediment inputs	UC1	13000	Along the right bank of Carpinteria Creek there is approximately 500 feet of steep bankline and low terrace that appears to have been used as a historic road but currently consist of one row of avocado orchard. This project would lay back the bank angle and remove the row of avocados to restore a native riparian buffer.
14	Cate School Bank Protection Project	2010 Cate School Bank Project	Yes	Revisit former restoration project	Address eroding bankline	UC1	13400	Revisit 2010 Cate School Bank Project (SCHR project) to evaluate whether adaptive management would be helpful following the recent debris flows and large floods.
15	Cate School Bridge	2005 Watershed Plan	Yes but flood damage identified	Replace protection at bridge	Protect bridge	UC1	14200	Replace and rearrange some boulders near toe of slope to replace protection lost during debris flows. Identified as an extremely high to impassible barrier in the 2005 Watershed Plan (BR_CA_5).
16	Bankline Improvements below Circle G Bridge	2019 Restoration Plan	No	Lay back eroding bank and create natural riparian buffer	Improve riparian cover; reduce fine sediment inputs	UC1	15250	Lay back 10' to 15' high eroding banks on one or both sides of creek over about 400 feet to reduce erosion and improve riparian buffer. Would require sacrificing one or more rows of avocado trees.
17A and 17B	Tributary at Mesa Outfall and Stormwater Management	2019 Restoration Plan	No	Erosion repair and upland sediment reduction	Infrastructure failure and water quality	UC1	15400	Address instability of concrete outfall structure. Outfall tributary, referred to as Mesa, was noted as turbid during site evaluation. Project would also include Also evaluating opportunities to reduce sediment inputs at this tributary through combination of upland Best Management Practices and/or detention basin adjacent to Lillingston Canyon Road.
18	Circle G Bridge Improvements	2005 Watershed Plan	Yes but flood damage identified	Replace protection at bridge	Protect bridge	UC1	15700	Replace and rearrange some boulders near toe of slope to replace protection lost during debris flows. Identified as an extremely high to impassible barrier in the 2005 Watershed Plan (BR_CA_5). Identified as an impassible barrier in the 2005 Watershed Plan (BR_CA_6).

Table 3: Summary Table of Past Project Recommendations, Implemented Projects, and Newly Recommended Projects and Their Status.

Site Number	Project Name	Source of Project Identification	Impairments Addressed?	Project Type	Project Purpose and Impairments to be Addressed	Geomorphic Reach	River Station (ft)	Project Description and Notes
19	Pinkham Crossing	2005 Watershed Plan	Yes	Fish passage improvement	Improve fish passage	UC2	16300	Identified as amoderate severity passage barrier in the 2005 Watershed Plan (BR_CA_7). Project was addressed previously. Due to lack of access, it is unknown if the replaced structure was impacted by the debris flows and is in need of repair.
20	Carpinteria Debris Basin	2005 Watershed Plan	Yes	Fish passage improvement	Improve fish passage	UC2	19300	Identified as an impassible barrier in the 2005 Watershed Plan (BR_CA_8). Has since been removed by the County and no longer acts as a debris basin. Due to access constraints this site was not visited during the 2019 assessment.
21	Seasonal Diversion Structure	2005 Watershed Plan	No	Fish passage improvement	Improve fish passage	UC2	20500	Site identified as a moderate severity passage barrier in the 2005 Watershed Plan (BR_CA_9). The site consists of a seasonal push up structure to facilitate seasonal water diversion. It appears to only impact fish passage during low flows and likely blows out each winter. This site was not visited during the 2019 assessment.
22	Gobernador Creek Confluence Passage Project	2019 Restoration Plan	No	Fish passage improvement	Improve fish passage	GB1	12300	Boulder accumulations create a partial passage impediment in lowermost Gobernador Creek about 150 feet upstream from the confluence. Could be addressed within same project as #12 above.
23	Pipe Debris Barrier	2005 Watershed Plan	Yes	Fish passage improvement	Improve fish passage	GB2	16200	Identified as a low severity passage barrier in the 2005 Watershed Plan (BR_CA_GR_1). Site consists of a boulder jam associated with the presence of a failed post and wire revetment. During the 2019 assessment no detrimental conditions were identified so it is likely the site blew out during a high flow event.
24	Gillie Bridge Improvements	2005 Watershed Plan	Yes	Fish passage improvement	Improve fish passage	GB2	16700	Bridge held up well during high flows in Jan. 2018; no improvements needed. Identified as two separate fish passage barriers in the 2005 Watershed Plan (BR_CA_GR2 and GR3). The sites were addressed by removal of both structures with a bridge used by both landowners.
25	Bankline Improvements in Lower Gobernador	2019 Restoration Plan	No	Bank stabilization	Riparian improvement; reduce fine sediment inputs	GB2	17500	Address high eroding bank on outside of bend next to avocado orchard; layback bank and plant riparian
26	Remove instream crossing	2019 Restoration Plan	No	Infrastructure removal from stream	Remove concrete from channel; address partial fish passage impediment	GB2	18150	Remove concrete low water crossing and concrete apron that is or could create fish passage barrier in Gobernador Creek; access is available via Raya Bridge about 500' upstream. Not identified in original barrier assessment.
27	Raya Bridge Improvements	2005 Watershed Plan	Yes but flood damage identified	Replace protection at bridge	Protect bridge	GB2	18750	Replace and rearrange some boulders near toe of slope to replace protection lost during debris flows. Boulders may have been dislodged by flows that exit channel at outside of bend at STA 7,000 and re-enter channel just upstream of the bridge. Identified as an extreme to impassible barrier in the 2005 Watershed Plan (BR_CA_GR_4).
28	Raya Bank Stabilization and Floodplain Enhancement	2019 Restoration Plan	No	Erosion Reduction	Address outer bend erosion and improve floodplain	GB2	19150	Address approximately 300 feet of outer bank erosion upstream of the Raya bridge. Opportunities at the site exist to enhance floodplain and riparian habitat.
29	Constricted Channel	2019 Restoration Plan	No	Erosion Reduction	Address outer bend erosion and fish passage	GB2	19650	Address approximately 75 feet of outer bank erosion in a highly constricted section of the channel. The constricted section has resulted in formation of a boulder cascade that likely impacts fish passage at low to moderate flows. Could be addressed at the same time as the erosion issue.
30	Widdoes Crossing Improvements	2005 Watershed Plan	Yes but flood damage identified	Replace protection at bridge	Protect bridge	GB2	20400	Lay back bank upstream of Widdoes bridge; replace boulders lost during large January 2018 events. Identified as an impassible fish barrier in the 2005 Watershed Plan (BR_CA_GR_5). Addressed in previous restoration efforts.
31	Gobernador Debris Basin Fish Passage	Santa Barbara County	Yes but flood damage identified	Fish passage improvement	improve fish passage over damaged weir structures	GB3	20700	Grouted rock weirs installed during debris basin upgrade were damaged during the flood event resulting in a passage barrier that likely affects passage during low to moderate flows. The structures need to be replaced. Recommend roughened channel rather than replacing with previous design.
32	Gobernador Debris Basin Management Plan	2019 Restoration Plan	No	Management plan for sediment removal	improve fish passage, address incision downstream of basin	GB3	20900	Current activities at the debris basin may impact fish passage as well as reduce coarse bedload to downstream reaches. Consider revising operations plans to provide better fish passage and consider re-introducing some coarse bed material below debris basin to help reduce and possibly reverse some of the incision that has occurred downstream of the Gobernador debris basin.

	Previously identified projects that were not implemented
	Previously identified projects that were successfully implemented
	Previously identified projects that were successfully implemented but impacted by debris flow
	New projects identified in 2019 Restoration Plan

the project partners and stakeholders to determine which project have been implemented, which have not, and what their current status is, and then visited each of the sites (except for the sites upstream of the Circle G Bridge on Carpinteria Creek due to access constraints) to verify its status and determine if additional work would be required to address the identified impairment. New projects were also identified during the assessment to address key limiting factors identified in the watershed such as fish passage, water quality (e.g. – fine sediment loading and water temperature), limited high quality rearing habitat, especially in the lower watershed, and a lack of high flow refugia. Based on the status of a particular project, each was classified into the following categories (see Table 3 and Figure 13):

- Category 1: Previously identified sites that were addressed by a past project,
- Category 2: Previously identified sites that have not yet been addressed,
- Category 3: Previously identified sites that were addressed by a past project but were impacted by the post-fire debris flow event and require additional work, and
- Category 4: New projects that were identified as part of this assessment.

A more detailed description of all of the projects that were identified as part of Categories 2, 3, and 4 are described in additional detail in Appendix A. These projects were also carried forward into the project prioritization and ranking process for further development.

3.3 Project Prioritization

Each of the projects within Categories 2, 3, and 4 were included as potential projects because they were identified as opportunities to address key limiting factors to a healthy steelhead population in the watershed either through a past assessment effort, NMFS's recovery plan process, or as part of the current assessment. Given that the number of projects identified likely exceeds the funding available and would be beyond the institutional capacity of the project partners to implement simultaneously, some sort of prioritization process must be employed to rank the projects and identify the order that the projects should be funded, designed and implemented.

Many factors can and should be considered when developing a prioritization approach. Those factors include the following:

- Project cost,
- The degree to which the project, if implemented, is expected to enhance habitat, improve water quality, and address the key limiting factors,
- Property ownership and the willingness of a landowner to partner on the project,
- The likelihood that the project will succeed at achieving the project objectives, and
- Project constructability.

Each of these selection criteria can be scored and weighted to produce a numerical scoring system that provides some level of objectivity to the process along with a repeatable outcome. It has been our

experience that, especially within a project area of this size and with stakeholders that have an intimate knowledge of the watershed and potential project sites, that a blind scoring system does not necessarily produce an intuitive outcome. Consequently, scoring values and weights are adjusted to produce an expected outcome. To avoid a process that is fraught with challenges, we instead solicited input directly from the stakeholders and Technical Advisory Committee to assist us in identifying the priorities. To facilitate this process with the stakeholders and TAC, we provided them with information about each of the sites, a brief overview of the proposed project, a ballpark cost associated with implementing the project, our opinion on the expected project benefits and uplift, and an initial prioritization recommendation.

A discussion of our approach to the prioritization and associated criteria were also provided. Those included the following:

- As discussed above, our preliminary prioritization was not based on a scoring system.
- The extent to which the project addresses the limiting factors, or impairments, was considered through a characterization of habitat uplift which was classified for each project as high, moderate, or low,
- The estimated cost to implement the project was considered, but did not drive the prioritization since pursuit of project funding is ultimately affected by cost and therefore will affect which projects get implemented through the fundraising process and the vetting that comes along with that,
- Landowner support for the project was also not considered because that parameter can change through time. Consequently, considering that as a factor in the prioritization has the potential to limit future grant opportunities,
- The prioritization did consider these key factors:
    - Both upper Carpinteria and Gobernador, within the Los Padres National Forest, has been identified in the past as being highest quality habitat,
    - It is likely that both anadromous and resident fish were wiped out by fire and debris flow following the extended drought and may not currently reside in the watershed; If a small population exists, fish passage will be key to reseeding basin,
    - There is a strong interest amongst the stakeholders and project partners to maintain goodwill with landowners that have cooperated on past fish passage projects, and
    - Instream habitat enhancement opportunities are constrained by adjacent land uses, especially in confined channel reaches.

Table 4: Preliminary Project Prioritization and Ranking

Site Number	Project Name	Source of Project Identification	Project Type	Project Purpose and Impairments to be Addressed	Habitat Value / Uplift Potential	Estimated Project Cost	Implementation Priority	Ranking
31	Gobernador Debris Basin Fish Passage	Santa Barbara County	Fish passage improvement	improve fish passage over damaged weir structures	High	$$$	High	1
30	Widdoes Crossing Improvements	2005 Watershed Plan	Replace abutment and channel protection at bridge	Protect bridge	Moderate	$$	High	2
12*	Lillingston Canyon Road Fish Passage	2019 Restoration Plan	Fish passage improvement	Improve fish passage	High	$$$	High	3
27	Raya Bridge Improvements	2005 Watershed Plan	Replace abutment protection at bridge	Protect bridge	Moderate	$	High	4
9	Bliss Bridge Improvements	2005 Watershed Plan	Replace abutment protection at bridge	Protect bridge	Moderate	$	High	5
32	Gobernador Debris Basin Management Plan	2019 Restoration Plan	Management plan for sediment remvoal	improve fish passage, address incision downstream of basin	High	$$$	High	6
13	Cate School Floodplain and Riparian Enhancement	2019 Restoration Plan	Lay back eroding bank and create natural riparian buffer	Improve riparian cover; reduce fine sediment inputs	Moderate	$$$	High	7
1	Carpinteria Lagoon Enhancement Plan	2005 Watershed Plan	Lagoon enhancement	Create rearing habitat in tidal estuary	High	$$	High	8
16	Bankline Improvements below Circle G Bridge	2019 Restoration Plan	Lay back eroding bank and create natural riparian buffer	Improve riparian cover; reduce fine sediment inputs	Moderate	$$	High	9
26	Remove instream crossing	2019 Restoration Plan	Infrastructure removal from stream	Remove concrete from channel; address partial fish passage impediment	Moderate	$$	High	10
7	Outer Bend Floodplain Restoration	2019 Restoration Plan	Riparian floodplain enhancement	Improve in-channel habitat; create high flow refuge habitat; protect eroding orchard; attenuate floods	Moderate	$$$$	High	11
15	Cate School Bridge	2005 Watershed Plan	Replace protection at bridge	Protect bridge	Moderate	$	Medium	1
8	Lower Carpinteria Instream Enhancement	2019 Restoration Plan	Engineered log structures	Instream habitat complexity	Moderate	$$$	Medium	2
25	Bankline Improvements in Lower Gobernador	2019 Restoration Plan	Bank stabilization	Riparian improvement; reduce fine sediment inputs	Moderate	$$$	Medium	3

Table 4: Preliminary Project Prioritization and Ranking

Site Number	Project Name	Source of Project Identification	Project Type	Project Purpose and Impairments to be Addressed	Habitat Value / Uplift Potential	Estimated Project Cost	Implementation Priority	Ranking
29	Constricted Channel	2019 Restoration Plan	Erosion Reduction	Address outer bend erosion and fish passage	Moderate	$$	Medium	4
4	Highway 101 to Carpinteria Ave Floodplain Bench	2019 Restoration Plan	Floodplain lowering and revegetation	Create high flow refuge habitat; attenuate floods	Moderate	$$$	Medium	5
6	Carpinteria Creek Park Floodplain Bench	2019 Restoration Plan	Floodplain lowering and revegetation	Create high flow refuge habitat; attenuate floods	Moderate	$$$	Medium	6
28	Raya Bank Stabilization and Floodplain Enhancement	2019 Restoration Plan	Erosion Reduction	Address outer bend erosion and improve floodplain	Moderate	$$	Medium	7
18	Circle G Bridge Improvements	2005 Watershed Plan	Replace protection at bridge	Protect bridge	Moderate	$	Medium	8
2	Treatment Plant Reach Instream Improvements	2019 Restoration Plan	Channel and floodplain restoration	Increase in-stream habitat complexity and cover; lower water temperature	Moderate	$$$$	Medium	9
11	USGS Gage	2005 Watershed Plan	Fish passage improvement	Improve fish passage	Low	$$	Medium	10
14	Cate School Bank Protection Project	2010 Cate School Bank Project	Revisit former restoration project	Address eroding bankline	Low	$$	Low	1
17	Mesa Tributary Outfall and Stormwater	2019 Restoration Plan	Erosion repair and upland BMP's	Infrastructure failure and water quality	Low	$$	Low	2
22*	Gobernador Creek Confluence Passage Project	2019 Restoration Plan	Fish passage improvement	Improve fish passage	Low	$$	Low	3
3	Creekwind Condos Bank Protection Project	2005 Watershed Plan	Bank protection	Protect infrastructure (condos); reduce fine sediment inputs	Low	$$$	Low	4

*** - Sites 12 and 22 may be combined into a single project.**

Cost Estimate: $ = <$50000; $$ = $50,000 to $150,000; $$$ = $150,000 to $300,000; $$$$ = $300,000 to $500,000; $$$$$ = >$500,000

- It is unlikely that the watershed would be impacted by another debris flow event associated with the Thomas Fire, given that the remaining supply of sediment on the hillslope has been exhausted due to the previous debris flow event. Furthermore, debris flow deposits that are currently impacting water quality during storm events are likely to stabilize over time due to natural recovery of riparian and hillslope vegetation. The biggest long-term impacts to water quality/turbidity will likely be similar to pre-fire conditions and consist of bank erosion and sources of chronic fine sediment from roads, construction, poor agricultural practices, hydromodification impacts from development.

Table 4 provides a summary of the initial prioritization based on these factors.

3.4 Programmatic Recommendations

The previous sections outline specific project actions that can be developed and implemented on a site by site basis to enhance habitat or improve watershed conditions for steelhead. In addition to these site-specific actions, this section provides additional programmatic-level recommendations that include longer-term efforts that may function as site specific actions but ultimately would provide a cumulative benefit to watershed health. These programmatic-level activities also differ from site specific actions in that they may require a more extensive, longer-term outreach effort and may also need institutional and community support to be successful.

The programmatic recommendations include the following:

- **Riparian Buffers:** Much of the watershed lacks adequate riparian buffers that are resilient to events such as fire, debris flows, channel incision, and bank erosion. In many sections of a lower watershed the riparian area consists of frequently disturbed, early seral stage vegetation within the incised valley bottom and either no riparian vegetation on the adjacent terraces or a single line of trees (see Figure 12). If this single line of trees is lost to bank erosion or removal of a line of trees at the top of bank during a large flood event, that narrow buffer is gone and is not likely to be replaced through future native recruitment. This condition is not easily reversed due to the presence of high value agricultural land where there is a desire to maximize orchard production. Despite these constraints, there may be opportunities to work with the agricultural community to begin to expand riparian buffers onto the adjacent terraces with the potential to create conservation easements that could offset the costs to landowners. We recommend that various options be explored to enhance riparian buffers throughout lower Carpinteria and Gobernador to increase shade, enhance inputs of terrestrial invertebrates and leaf litter, and create resiliency in a system that is potentially only one high flow event from losing this important element of ecosystem, the riparian canopy.
- **Removal of Non-native, invasive species:** Previous efforts to take a comprehensive approach to removing *Arundo donax* from the watershed appear to have been very successful. Although

some *Arundo* still exists in pockets in the watershed, most specifically in the urban reach of Carpinteria Creek, it does not appear to be widespread. The non-native species that was identified the most and likely has the most impact at this point appears to be eucalyptus. Although many people value the eucalyptus because it is one of the larger trees on the landscape and may provide habitat for some native species, its impact within the small remaining patches of native riparian habitat can be significant. Eucalyptus trees are known to be allelopathic to other plants and the litter produced by the eucalyptus can result in a dead zone underneath and around entire groves. Three large groves of eucalyptus were identified and mapped in the lower watershed and there are likely other smaller groves or individual trees throughout the watershed in the riparian areas (see Figure 12). We recommend a program to remove these stands and restore native riparian species to these areas. Targeted removal of the remaining stands of *Arundo* could also be incorporated into this program.

- **Post and Wire Revetment Removal:** Post and wire revetment was used in the past throughout Santa Barbara County to address bank erosion issues. Much of it is either deteriorating or never achieved its intended affect. When it fails it also creates localized impacts to the channel and in some cases can create localized fish passage barriers. As part of the assessment of the study area, the locations of remaining post and wire revetment were mapped (see Figure 12). Six areas of post and wire revetment were identified during the assessment consisting of shorter segments on the order of 200 feet that occur on one side of the channel to sections that extend up to 1,000 feet on both sides of the channel. Although it may not make sense to specifically target areas as an independent project to remove existing post and wire revetments, it may make sense to include removal of the post and wire revetments as a component of other projects, including any riparian restoration efforts that are implemented.

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Appendix A

Project Site Descriptions and Photos

Potential Project Site #1

Project Name: Carpinteria Lagoon Enhancement Plan

Project Type: Lagoon Enhancement

Location: Lower Carpinteria Creek; Reach LC1

Impairment Addressed: Lack of rearing habitat in lower Carpinteria Creek

Status: Recommended in 2005 Watershed Plan and 2012 Recovery Plan; Not implemented

Recommendation: Develop an enhancement plan to identify enhancement opportunities and constraints

Ranking: High – Priority 8

Potential Project Site #2

Project Name: Treatment Plant Reach Instream Improvements

Project Type: Channel and Floodplain Restoration

Location: Lower Carpinteria Creek; Reach LC1

Impairment Addressed: Lack of riparian on right bank; Instream cover

Status: Identified in 2019 Watershed Plan

Recommendation: Move flow path away from rock and concrete; Add instream complexity.

Ranking: Medium; Priority 9

Potential Project Site #3

Project Name: 8th Street Bank Protection Project

Project Type: Bank Protection

Location: Lower Carpinteria Creek; Reach LC2

Impairment Addressed: Protect infrastructure (condos); reduce fine sediment inputs

Status: Recommended in 2005 Watershed Plan; Not implemented

Recommendation: Install bank protection at outside of bend; Incorporate habitat elements where feasible.

Ranking: Low; Priority 4

Potential Project Site #4

Project Name: Highway 101 to Carpinteria Ave Floodplain Bench

Project Type: Floodplain Lowering and Revegetation

Location: Lower Carpinteria Creek; Reach LC2

Impairment Addressed: Lack of off-channel habitat; Lack of riparian buffer

Status: Identified in 2019 Watershed Plan

Recommendation: Lower and revegetate floodplain bench on river left adjacent to Motel 6.

Ranking: Medium; Priority 5

Potential Project Site #6

Project Name: Carpinteria Creek Park Floodplain Bench

Project Type: Floodplain lowering; Revegetation

Location: Lower Carpinteria Creek; Reach LC2

Impairment Addressed: Lack of off-channel habitat; Lack of riparian buffer

Status: Identified in 2019 Watershed Plan

Recommendation: Lower and revegetate floodplain bench on river left adjacent to a local park.

Ranking: Medium; Priority 6

Potential Project Site #7

Project Name: Outer Bend Floodplain Restoration

Project Type: Riparian Floodplain Enhancement

Location: Lower Carpinteria Creek; Reach LC3

Impairment Addressed: Lack of rearing habitat and high flow refugia

Status: Identified in 2019 Watershed Plan

Recommendation: Instream wood structures, high flow channel, and headcut stabilization in the orchard could all be elements of the project

Ranking: High; Priority 11

Potential Project Site #8

Project Name: Lower Carpinteria Instream Enhancement

Project Type: Engineered Log Structures

Location: Lower Carpinteria Creek; Reach LC4

Impairment Addressed: Lack of instream habitat complexity

Status: Identified in 2019 Watershed Plan

Recommendation: Install LWD structures in less confined reach to improve instream habitat

Ranking: Medium; Priority 2

Potential Project Site #9

Project Name: Bliss Bridge Improvements

Project Type: Replace Abutment Protection at Bridge

Location: Lower Carpinteria Creek; Reach LC4

Impairment Addressed: Flood impacts to past fish passage projects

Status: Recommended in 2005 Watershed Plan; Implemented but flood damage identified

Recommendation: Replace and rearrange some boulders near the toe of slope underneath the bridge

Ranking: High; Priority 5

Potential Project Site #11

Project Name: USGS Gage

Project Type: Fish Passage Improvement

Location: Lower Carpinteria Creek; Reach LC4

Impairment Addressed: Fish passage

Status: Recommended in 2005 Watershed Plan; Not implemented

Recommendation: Retrofit site to improve fish passage without compromising site for data collection

Ranking: Medium; Priority 10

Potential Project Site #12

Project Name: Lillingston Canyon Road Fish Passage

Project Type: Fish Passage Improvement

Location: Upper Carpinteria Creek; Reach UC1

Impairment Addressed: Fish passage

Status: Identified in 2019 Watershed Plan

Recommendation: Rearrange or remove boulders deposited during the debris flow

Ranking: High; Priority 3

Potential Project Site #13

Project Name: Cate School Floodplain and Riparian Enhancement

Project Type: Lay Back Eroding Bank and Create Riparian Buffer

Location: Upper Carpinteria Creek; Reach UC1

Impairment Addressed: Lack of riparian; Fine sediment.

Status: Identified in 2019 Watershed Plan

Recommendation: Lay back bank and remove the row of avocados to restore a native riparian buffer

Ranking: High; Priority 7

Potential Project Site #14

Project Name: Cate School Bank Protection Project

Project Type: Revisit Former Restoration Project

Location: Upper Carpinteria Creek; Reach UC1

Impairment Addressed: Address eroding bankline

Status: Recommended in 2010 Cate School Bank Project; Implemented

Recommendation: Evaluate whether adaptive management would be helpful following the recent debris flows and large floods

Ranking: Low; Priority 1

Potential Project Site #15

Project Name: Cate School Bridge

Project Type: Replace Protection at Bridge

Location: Upper Carpinteria Creek; Reach UC1

Impairment Addressed: Flood impacts to past fish passage projects

Status: Recommended in 2005 Watershed Plan; Implemented but flood damage identified

Recommendation: Replace and rearrange some boulders near toe of slope to replace protection lost during debris flows

Ranking: Medium; Priority 1

Potential Project Site #16

Project Name: Bankline Improvements below Circle G Bridge

Project Type: Lay Back Eroding Bank and Create Riparian Buffer

Location: Upper Carpinteria Creek; Reach UC1

Impairment Addressed: Lack of riparian; Fine sediment.

Status: Identified in 2019 Watershed Plan

Recommendation: Lay back eroding banks on one or both sides of creek and expand riparian buffer

Ranking: High; Priority 9

Potential Project Site #18

Project Name: Circle G Bridge Improvements

Project Type: Replace Protection at Bridge

Location: Upper Carpinteria Creek; Reach UC1

Impairment Addressed: Flood impacts to past fish passage projects

Status: Recommended in 2005 Watershed Plan; Implemented but flood damage identified

Recommendation: Replace and rearrange boulders near toe of slope to replace protection lost during debris flows

Ranking: Medium; Priority 8

Potential Project Site #22

Project Name: Gobernador Creek Confluence Passage Project

Project Type: Fish Passage Improvement

Location: Gobernador Creek; Reach GB1

Impairment Addressed: Fish passage

Status: Identified in 2019 Watershed Plan

Recommendation: Rearrange or remove boulder accumulations. Could be addressed within same project as Site #12

Ranking: Low; Priority 3

Potential Project Site #25

Project Name: Bankline Improvements in Lower Gobernador

Project Type: Bank Stabilization

Location: Gobernador Creek; Reach GB2

Impairment Addressed: Lack of riparian; fine sediment inputs

Status: Identified in 2019 Watershed Plan

Recommendation: Layback bank and plant riparian buffer

Ranking: Medium; Priority 3

Potential Project Site #26

Project Name: Remove Instream Crossing

Project Type: Infrastructure Removal from Stream

Location: Gobernador Creek; Reach GB2

Impairment Addressed: Fish passage

Status: Identified in 2005 Watershed Plan

Recommendation: Remove concrete low water crossing and associated apron. Reroute to new access point

Ranking: High; Priority 10

Potential Project Site #27

Project Name: Raya Bridge Improvements

Project Type: Replace Protection at Bridge

Location: Gobernador Creek; Reach GB2

Impairment Addressed: Flood impacts to past fish passage projects

Status: Recommended in 2005 Watershed Plan; Implemented but flood damage identified

Recommendation: Replace toe boulders to protect right abutment

Ranking: High; Priority 4

Potential Project Site #28

Project Name: Raya Bank Stabilization and Floodplain Enhancement

Project Type: Erosion Reduction

Location: Gobernador Creek; Reach GB2

Impairment Addressed: Fine sediment; in-channel compexity

Status: Identified in 2019 Watershed Plan

Recommendation: Stabilize streambank, enhance floodplain, and plant riparian vegetation

Ranking: Medium; Priority 7

Potential Project Site #30

Project Name: Widdoes Crossing Improvements

Project Type: Replace Protection at Bridge

Location: Gobernador Creek; Reach GB2

Impairment Addressed: Flood impacts to past fish passage projects

Status: Recommended in 2005 Watershed Plan; Implemented but flood damage identified

Recommendation: Lay back bank upstream of Widdoes bridge; replace abutment toe protection

Ranking: High; Priority 2

Potential Project Site #31

Project Name: Gobernador Debris Basin Fish Passage

Project Type: Fish Passage Improvement

Location: Gobernador Creek; Reach GB3

Impairment Addressed: Fish passage

Status: Identified by Santa Barbara County; Implemented but flood damage identified

Recommendation: Construct roughened channel to replaced grouted rock weirs

Ranking: High; Priority 1

Potential Project Site #32

Project Name: Gobernador Debris Basin Management Plan

Project Type: Management Plan for Sediment Removal

Location: Gobernador Creek; Reach GB3

Impairment Addressed: Fish passage; Bed load continuity.

Status: Identified in 2019 Watershed Plan

Recommendation: Prepare management/operations plan to address local and reach-scale impacts of sediment basin

Ranking: High; Priority 6

Appendix B

Concept Designs and Cost Estimates

for Highest Priority Projects

Project Name: Bliss Bridge Improvements
Project Site: #9
Project Type: Replace abutment protection at bridge
Location: Lower Carpinteria Creek; Reach LC4
Impairment Addressed: Flood and debris flow impacts to past fish passage project
Ranking: High; Priority 5

The Bliss Crossing is located on the mainstem of Carpinteria Creek, just downstream of the Casitas Pass Road crossing. Historically the site consisted of a concrete ford crossing and associated grouted rock structure that blocked fish passage. The ford crossing was replaced in 2008 with a freespan bridge structure and the channel was reconstructed to facilitate fish passage and stabilize the creek channel. The bridge abutments consist of shallow concrete footings with embedded steel pile and pile cap. The bridge abutments were protected with 1 to 2-ton Rock Slope Protection (RSP) installed at a slope of 1.75:1, extending below the finished bed elevation of the reconstructed channel.

The overall impact to the Bliss Bridge due to the post-Thomas fire flood and debris flow was minimal. No damage occurred to the bridge or the abutments and the bridge had adequate capacity to covey the high flow event. The impacts were confined to mobilization of some of the 1 to 2-ton RSP along the base of the right abutment (see photo). The proposed repair at this site consists of reconstructing the right bank RSP slope under the bridge to ensure long-term protection of the abutment and steel piles. Site access will likely be achieved along the right bank, just downstream of the bridge. The site will be revegetated with native riparian species following construction.

LEGEND

- EXISTING CONTOURS (105 / 106)
- SURVEY CONTROL POINT (60)
- EXISTING BRIDGE DECK
- EXISTING CULVERT
- EXISTING FENCE
- EDGE OF PAVEMENT
- EXISTING TREE (32"S)

ABBREVIATIONS

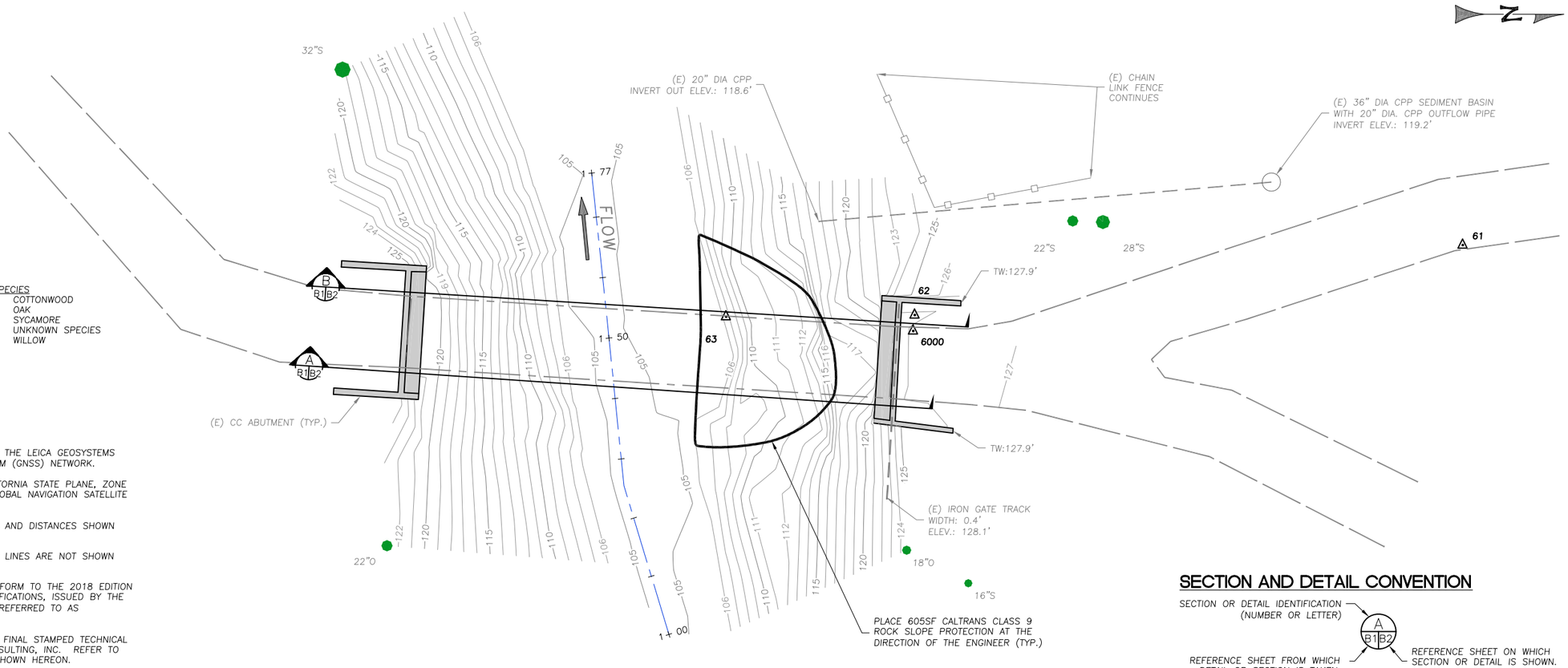
CC	CONCRETE
DIA.	DIAMETER
E	EXISTING
ELEV.	ELEVATION
ESM	ENGINEERED STREAMBED MATERIAL
FG	FINISHED GRADE
MAX	MAXIMUM
MIN	MINIMUM
N	NEW
RSP	ROCK SLOPE PROTECTION
SF	SQUARE FEET
TBD	TO BE DETERMINED
TYP	TYPICAL

TREE SPECIES

C	COTTONWOOD
O	OAK
S	SYCAMORE
TREE	UNKNOWN SPECIES
W	WILLOW

GENERAL NOTES

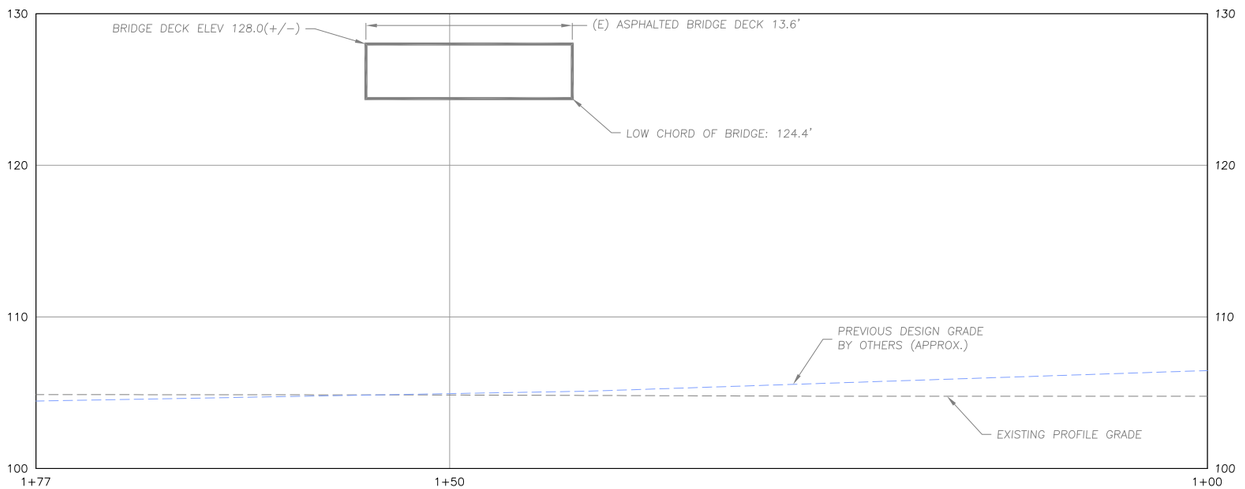
1. TOPOGRAPHIC MAPPING WAS PERFORMED BY:
   WATERWAYS CONSULTING, INC.
   509A SWIFT STREET
   SANTA CRUZ, CA 95060
   SURVEY DATES: MARCH 6–8, 2019.
2. ELEVATION DATUM: GPS TIES TO NAVD88 USING THE LEICA GEOSYSTEMS SMARTNET GLOBAL NAVIGATION SATELLITE SYSTEM (GNSS) NETWORK.
3. BASIS OF BEARINGS: GPS TIES TO NAD83 CALIFORNIA STATE PLANE, ZONE 5 USING THE LEICA GEOSYSTEMS SMARTNET GLOBAL NAVIGATION SATELLITE SYSTEM (GNSS) NETWORK.
4. CONTOUR INTERVAL IS ONE FOOT. ELEVATIONS AND DISTANCES SHOWN ARE IN DECIMAL FEET.
5. THIS IS NOT A BOUNDARY SURVEY. PROPERTY LINES ARE NOT SHOWN HEREON.
6. ALL CONSTRUCTION AND MATERIALS SHALL CONFORM TO THE 2018 EDITION OF THE STATE OF CALIFORNIA STANDARD SPECIFICATIONS, ISSUED BY THE DEPARTMENT OF TRANSPORTATION (HEREAFTER REFERRED TO AS "STANDARD SPECIFICATIONS").
7. THESE DESIGNS ARE INCOMPLETE WITHOUT THE FINAL STAMPED TECHNICAL SPECIFICATIONS PREPARED BY WATERWAYS CONSULTING, INC. REFER TO TECHNICAL SPECIFICATIONS FOR DETAILS NOT SHOWN HEREON.



SECTION AND DETAIL CONVENTION

SITE 9 EXISTING CONDITIONS

SCALE: 1" = 20'



CREEK PROFILE

SCALE: 1" = 10'

B1B2

* CALL BEFORE YOU DIG *

CONTACT UNDERGROUND SERVICE ALERT (USA)
PRIOR TO ANY CONSTRUCTION WORK 1-800-227-2600

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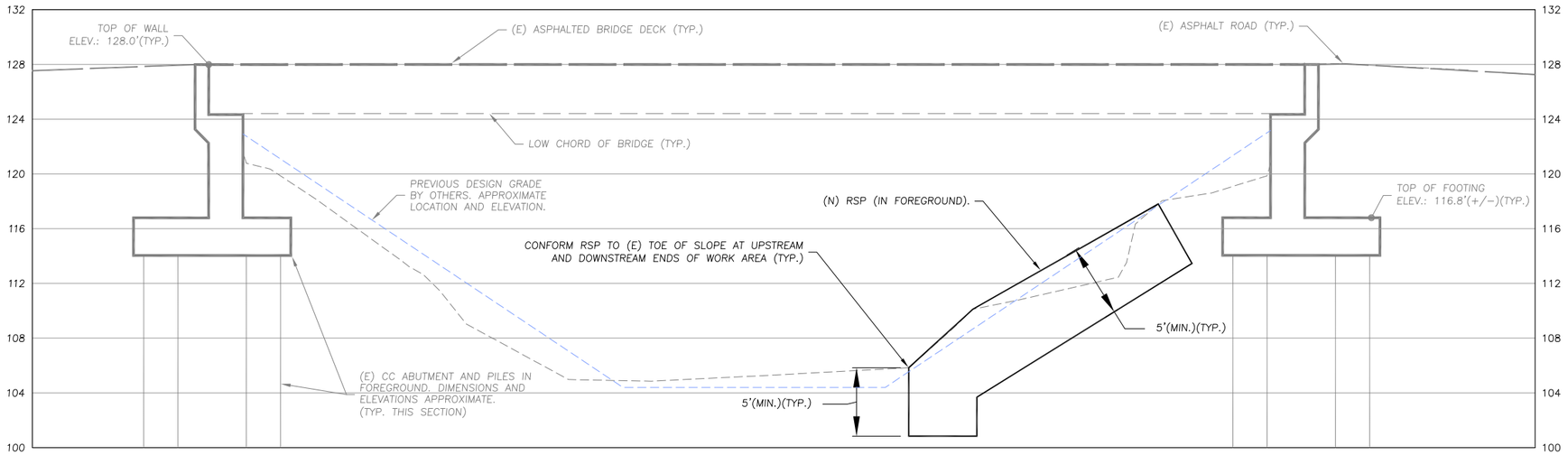
CARPINTERIA CREEK RESTORATION ASSESSMENT
CONCEPT LEVEL DESIGN PLANS
BLISS BRIDGE IMPROVEMENTS (SITE #9)

BAR IS ONE INCH ON ORIGINAL DRAWING. ADJUST SCALES FOR REDUCED PLOTS

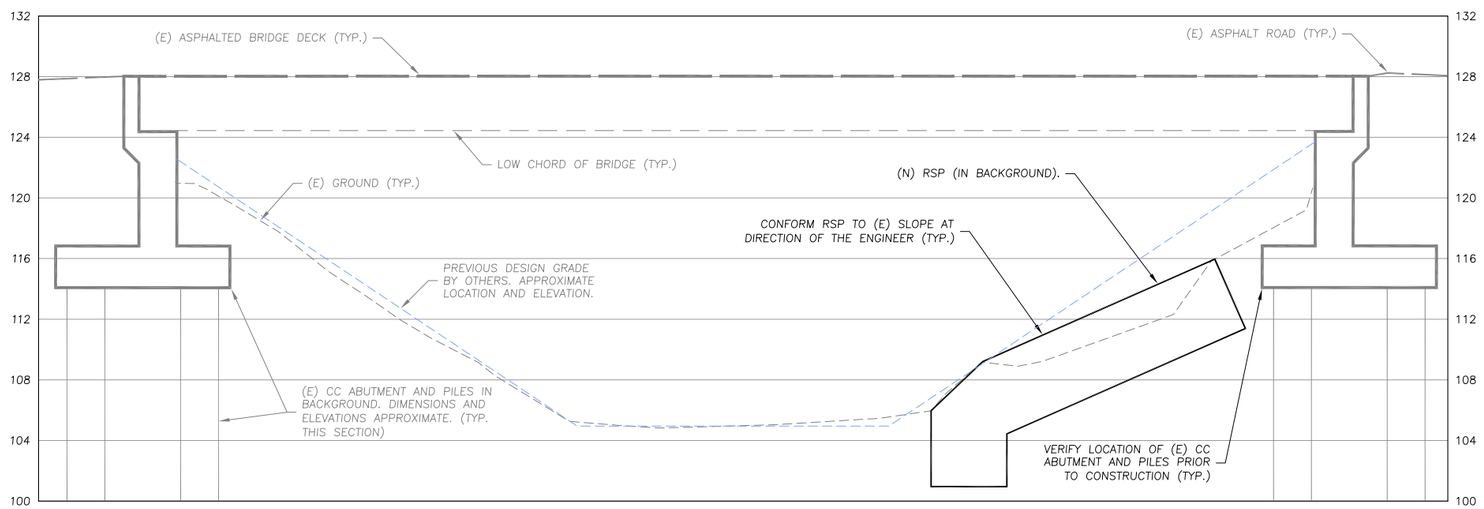
0 1"

FIGURE

B-1



SITE 9 SECTION
SCALE: 1" = 10'
B R1 B2



SITE 9 SECTION
SCALE: 1" = 10'
A R1 B2

WATERWAYS CONSULTING INC.
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CARPINTERIA CREEK RESTORATION ASSESSMENT
CONCEPT LEVEL DESIGN PLANS
BLISS BRIDGE IMPROVEMENTS (SITE #9)

BAR IS ONE INCH ON ORIGINAL DRAWING. ADJUST SCALES FOR REDUCED PLOTS
0 1"

FIGURE
B-2

WATERWAYS CONSULTING, INC.

CARPINTERIA POST FIRE ASSESSMENT- SITE 9 BLISS BRIDGE IMPROVEMENTS
CONCEPT DESIGN SUBMITTAL
ENGINEER'S ESTIMATE OF PROBABLE CONSTRUCTION COSTS

Job No: 18-042 3/29/2019

ITEM NO.	ITEM	ESTIMATED QUANTITY	UNIT	UNIT COST	TOTAL
1	MOBILIZATION	1	LS	$5,000	$5,000
2	SITE ACCESS	1	LS	$5,000	$5,000
3	TEMPORARY FENCE - TYPE ESA	65	LF	$8	$520
4	TEMPORARY SILT FENCE	50	LF	$8	$400
5	DEWATERING (OPTIONAL)	1	LS	$2,000	$2,000
6	SLOPE PROTECTION FABRIC	67	SY	$15.00	$1,008
7	CLEARING AND GRUBBING	1	LS	$2,500	$2,500
8	ROCK SLOPE PROTECTION (RSP)	112	CY	$110	$12,324
9	REVEGETATION	0.10	ACRE	$50,000	$5,000
				SUBTOTAL	$33,752
				CONTINGENCY (25%)	$8,438
				TOTAL	$42,191
10	ENGINEERING DESIGN	1	LS	$6,500	$6,500
11	CONSTRUCTION PHASE SERVICES	1	LS	$4,600	$4,600
				PROJECT TOTAL	$53,291

NOTES:

1. Quantities shown are approximate only; the Contractor shall be responsible for all work indicated on the Drawings and prescribed in the Specifications.
2. In the event that the product of a unit price and an estimated quantity does not equal the extended amount stated, the unit price will govern and the correct product of the unit price and the estimated quantity shall be deemed to be the bid amount.
3. Cost Estimate does not include cost of special inspections, if required.
4. Cost Estimate does not include irrigation and maintenance of vegetation.
5. Cost estimate does not include construction staking or other survey related items.

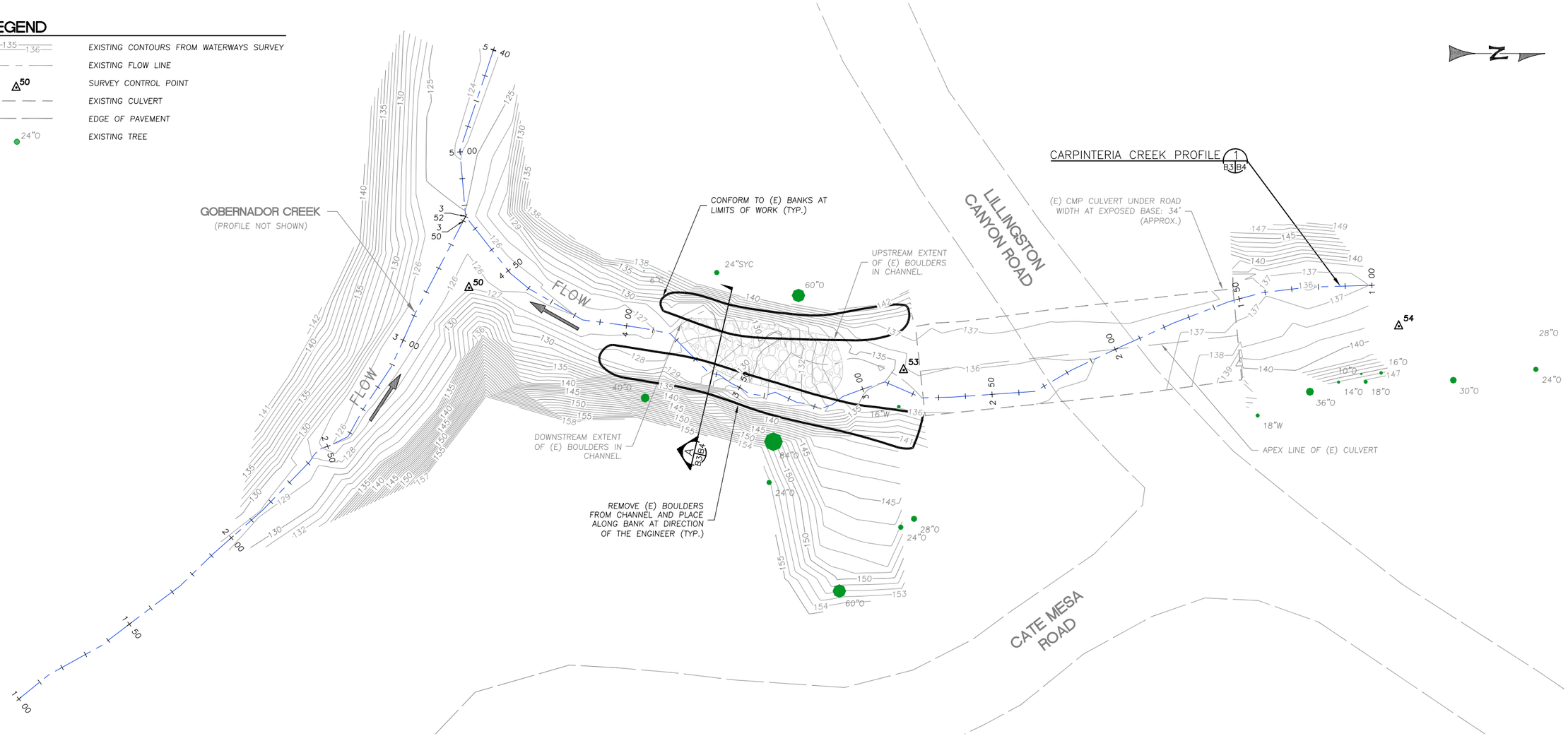
Project Name: Lillingston Canyon Road Fish Passage
Project Site: #12
Project Type: Fish passage
Location: Upper Carpinteria Creek; Reach UC1
Impairment Addressed: Fish passage caused by deposition of debris flow boulders
Ranking: High; Priority 3

Lillingston Canyon Road crosses the mainstem of Carpinteria Creek just upstream of the confluence with Gobernador Creek. Based on the post-Thomas fire geomorphic assessment it appears that the boulder-laden debris flow that affected Upper Carpinteria Creek stopped at the base of the mountain front in the vicinity of the Lillingston Canyon crossing. Large boulders were deposited in the short reach between the Lillingston Canyon Road crossing and Gobernador Creek confluence, creating a series of cascades that was determined to be impeding fish passage, significantly reduced the conveyance capacity of the culvert, and is causing erosion of the adjacent streambanks and hillslopes as Carpinteria Creek cuts around the deposited boulders (see photo). One potential explanation of why the boulders deposited in this location is that high flow in Gobernador Creek reached the confluence faster than flows on Carpinteria Creek, resulting in backwatering at the confluence that extended a considerably distance upstream, reducing the water surface slope on Carpinteria Creek and halting the propagation of the debris flow. Deposition upstream of the confluence and through the culvert ultimately caused floodwaters to overtop the crossing and flow along Lillingston Canyon Road.

The proposed project at this site would consist of reorienting the deposited boulders to create a fish passable channel along the center of the valley bottom and placing the deposited boulders along the toe of the slopes to limit additional lateral migration of the channel and erosion of the streambanks and adjacent hillslope. Additional investigation of the depth of the culvert footings will need to be completed during the design phase to determine an appropriate slope for the channel. Access to the site will be obtained along the left bank, downstream of the crossing near the entrance to the Cate School.

LEGEND

- EXISTING CONTOURS FROM WATERWAYS SURVEY
- EXISTING FLOW LINE
- SURVEY CONTROL POINT
- EXISTING CULVERT
- EDGE OF PAVEMENT
- EXISTING TREE



SITE 12 CONCEPT

SCALE: 1" = 40'

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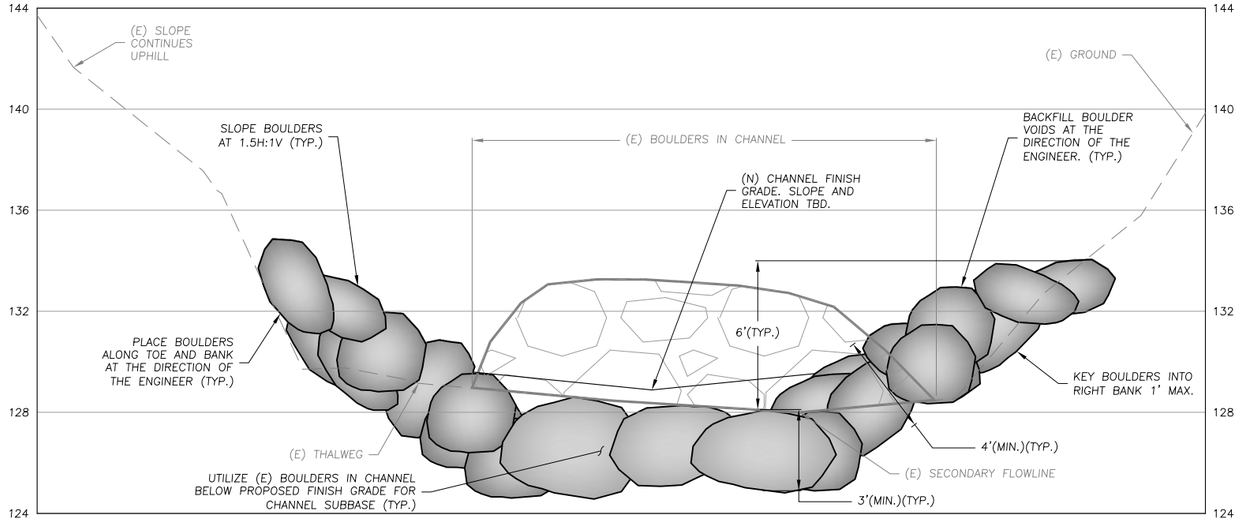
CARPINTERIA CREEK RESTORATION ASSESSMENT
CONCEPT LEVEL DESIGN PLANS LILLINGSTON CANYON ROAD FISH PASSAGE (SITE #12)

BAR IS ONE INCH ON ORIGINAL DRAWING. ADJUST SCALES FOR REDUCED PLOTS

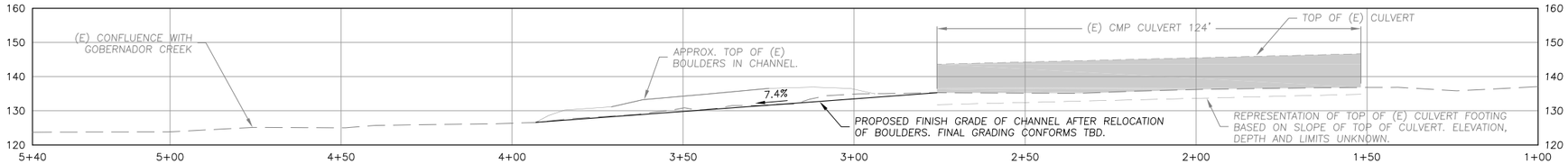
0 1"

FIGURE

B-3



SECTION (A, B3|B4)
SCALE: 1" = 6'



CARPINTERIA CREEK PROFILE (1, B3|B4)
SCALE: 1" = 40'

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CARPINTERIA CREEK RESTORATION ASSESSMENT
CONCEPT LEVEL DESIGN PLANS LILLINGSTON CANYON ROAD FISH PASSAGE (SITE #12)

BAR IS ONE INCH ON ORIGINAL DRAWING. ADJUST SCALES FOR REDUCED PLOTS
0 1"

FIGURE
B-4

WATERWAYS CONSULTING, INC.

CARPINTERIA POST FIRE ASSESSMENT- SITE 12 LILLINGSTON CANYON ROAD FISH PASSAGE CONCEPT DESIGN SUBMITTAL

ENGINEER'S ESTIMATE OF PROBABLE CONSTRUCTION COSTS

Job No: 18-042 3/29/2019

ITEM NO.	ITEM	ESTIMATED QUANTITY	UNIT	UNIT COST	TOTAL
1	MOBILIZATION	1	LS	$5,000	$5,000
2	ACCESS	1	LS	$5,000	$5,000
3	TEMPORARY FENCE - TYPE ESA	250	LF	$8	$2,000
4	TEMPORARY SILT FENCE	250	LF	$8	$2,000
5	DEWATERING (OPTIONAL)	1	LS	$10,000	$10,000
6	SLOPE PROTECTION FABRIC	290	SY	$15.00	$4,350
7	CLEARING AND GRUBBING	1	LS	$15,000	$15,000
8	ROCK SLOPE PROTECTION (RSP)	235	CY	$47	$11,111
9	OVEREXCAVATE TOE OF BANK	170	CY	$40	$6,800
10	REGRADE CHANNEL	100	CY	$65	$6,500
11	REVEGETATION	0.20	ACRE	$50,000	$10,000
				SUBTOTAL	$77,761
				CONTINGENCY (25%)	$19,440
				TOTAL	$97,201
12	ENGINEERING DESIGN	1	LS	$9,500	$9,500
13	CONSTRUCTION PHASE SERVICES	1	LS	$6,050	$6,050
				PROJECT TOTAL	$112,751

NOTES:

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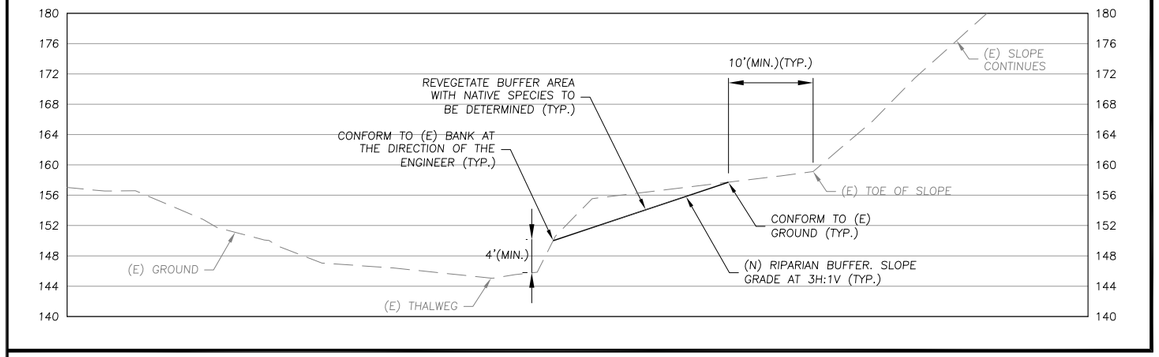
4. Cost Estimate does not include irrigation and maintenance of vegetation.
5. Cost estimate does not include construction staking or other survey related items.

Project Name: Cate School Floodplain and Riparian Enhancement
Project Site: #13
Project Type: Sediment reduction and riparian enhancement
Location: Upper Carpinteria Creek; Reach UC1
Impairment Addressed: Lack of riparian; Fine sediment
Ranking: High; Priority 7

This site is located approximately 500 feet upstream of the Lillingston Road crossing on property owned by the Cate School. The site consists of a steep eroding right bank lined with two rows of mature avocado trees along a narrow, historic floodplain bench (see photo). In discussion with Cate School administrators, the two rows of avocados are not productive and are difficult to access given their location. The would either need to be rehabilitating and removed/replaced to make them viable. Consequently, they have expressed interest in this project and support enhancement/restoration of Carpinteria Creek.

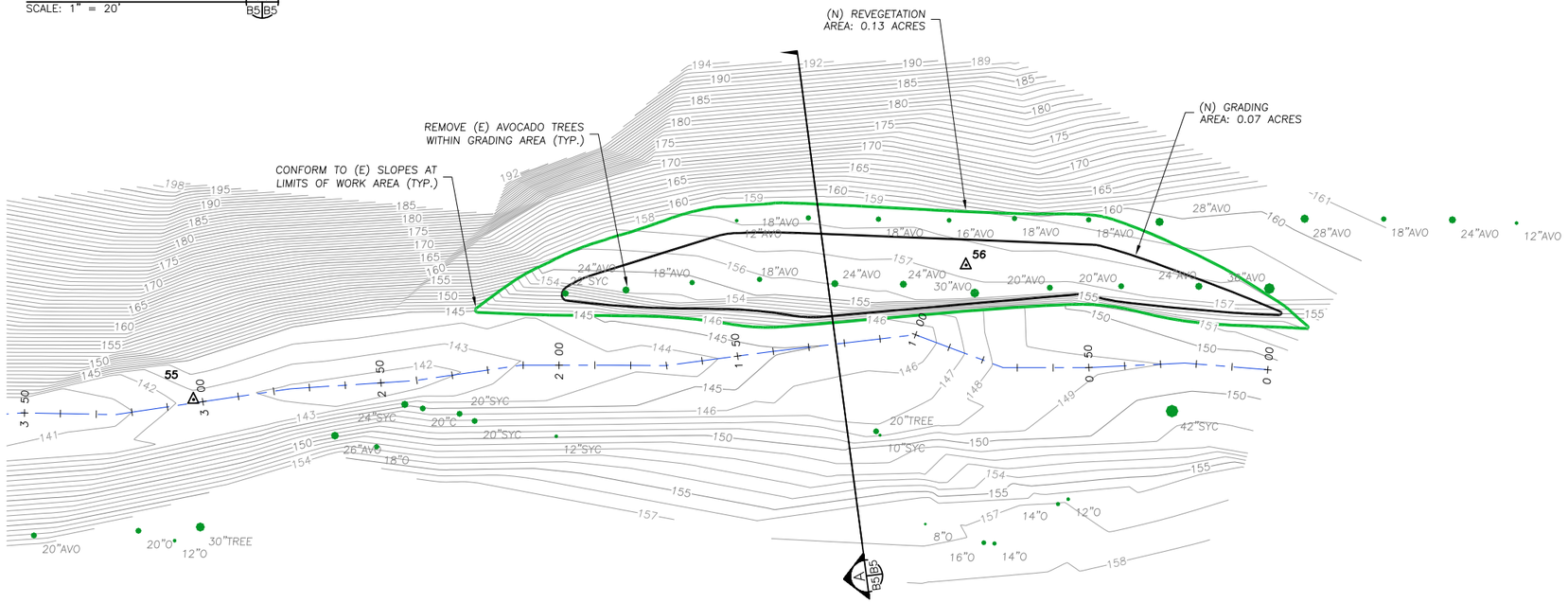
The proposed project would consist of removing the avocado trees from the historic floodplain terrace, laying the steep, eroding slope back at a 3:1 slope, and replanting the site laid back bank, terrace and adjacent hillslope with native riparian species. In addition, there may be opportunities on the left bank to plant some additional riparian vegetation in discrete areas that are not already vegetated, to create a continuous corridor of native riparian through this reach of channel. Approximately 200 feet of bank would be laid back and revegetated.



SECTION

SCALE: 1" = 20'

A B5|B5

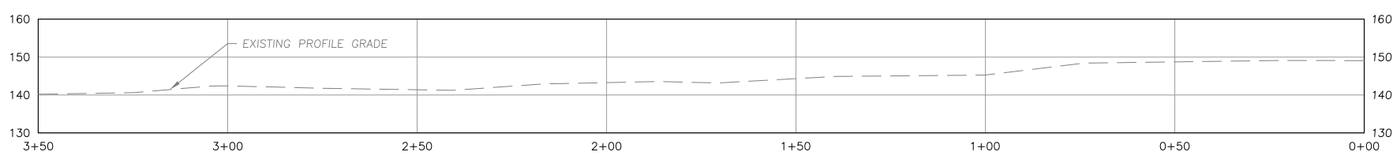


LEGEND

- 85 / 86 — EXISTING CONTOURS FROM WATERWAYS SURVEY
- 55 — SURVEY CONTROL POINT
- 24"AVO — EXISTING TREE

SITE 13 CONCEPT DESIGN

SCALE: 1" = 40'



CREEK PROFILE

SCALE: 1" = 40'

B5|B5

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CARPINTERIA CREEK RESTORATION ASSESSMENT
CONCEPT LEVEL DESIGN PLANS
CATE SCHOOL FLOODPLAIN RIPARIAN ENHANCEMENT (SITE #13)

BAR IS ONE INCH ON ORIGINAL DRAWINGS. ADJUST SCALES FOR REDUCED PLOTS

0 1"

FIGURE

B-5

WATERWAYS CONSULTING, INC.

CARPINTERIA POST FIRE ASSESSMENT
SITE 13 CATE SCHOOL FLOODPLAIN AND RIPARIAN ENHANCEMENT
CONCEPT DESIGN SUBMITTAL
ENGINEER'S ESTIMATE OF PROBABLE CONSTRUCTION COSTS

Job No: 18-042 3/29/2019

ITEM NO.	ITEM	ESTIMATED QUANTITY	UNIT	UNIT COST	TOTAL
1	MOBILIZATION	1	LS	$5,000	$5,000
2	SITE ACCESS	1	LS	$5,000	$5,000
3	TEMPORARY FENCE - TYPE ESA	500	LF	$8	$4,000
4	TEMPORARY SILT FENCE	275	LF	$8	$2,200
5	SLOPE PROTECTION FABRIC (OPTIONAL)	605	SY	$15.00	$9,075
6	CLEARING AND GRUBBING	1	LS	$15,000	$15,000
7	UNCLASSIFIED EXCAVATION AND OFFHAUL	300	CY	$50	$15,000
8	REVEGETATION	0.20	ACRE	$50,000	$10,000
				SUBTOTAL	$65,275
				CONTINGENCY (25%)	$16,319
				CONSTRUCTION TOTAL	$81,594
9	ENGINEERING DESIGN	1	LS	$9,000	$9,000
10	CONSTRUCTION PHASE SERVICES	1	LS	$7,500	$7,500
				PROJECT TOTAL	$98,094

NOTES:

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3. Cost Estimate does not include cost of special inspections, if required.
4. Cost Estimate does not include irrigation and maintenance of vegetation.
5. Cost estimate does not include construction staking or other survey related items.

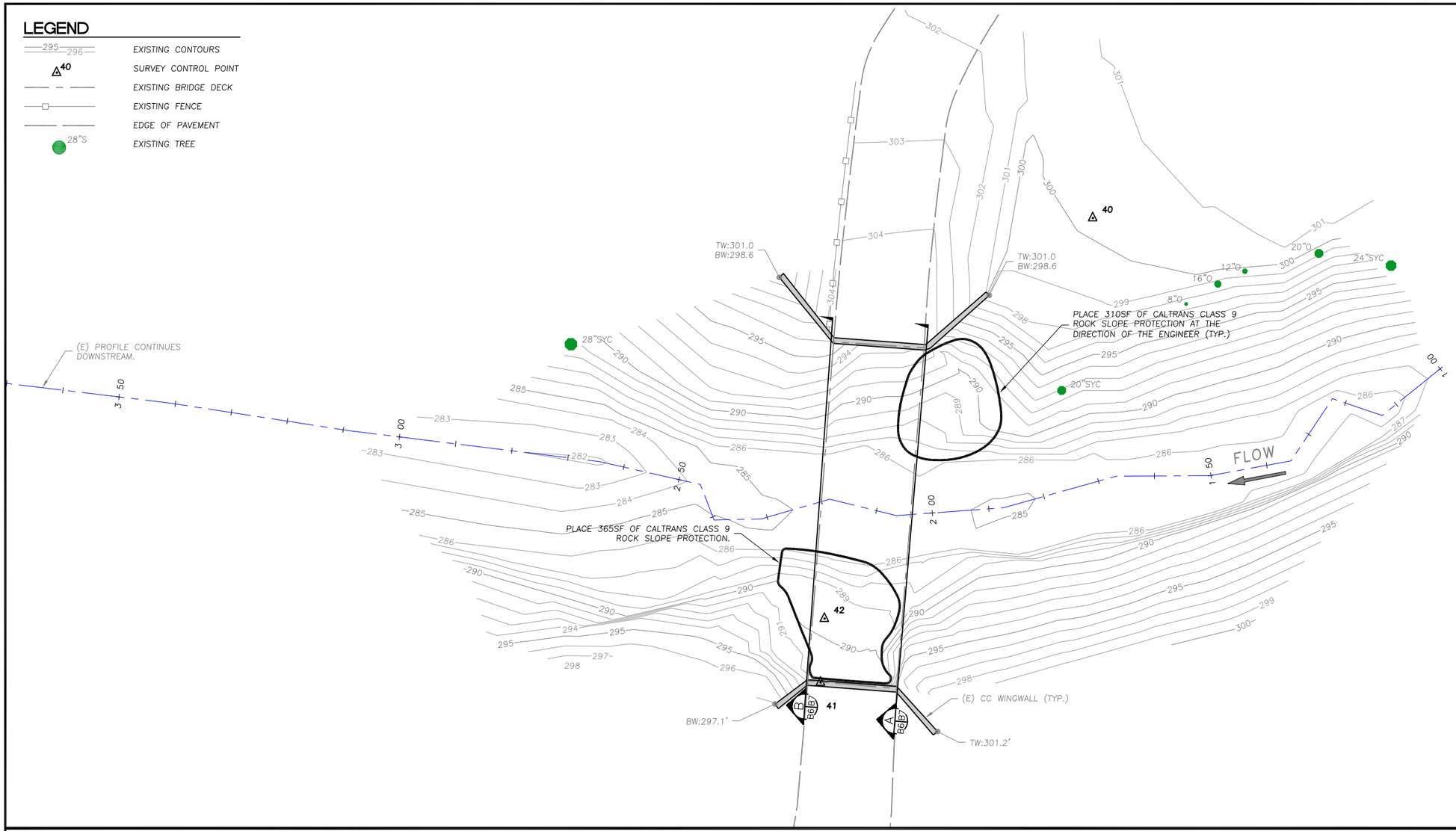
Project Name: Raya Bridge Improvements
Project Site: #27
Project Type: Replace abutment protection at bridge
Location: Gobernador Creek; Reach GB2
Impairment Addressed: Flood and debris flow impacts to past fish passage project
Ranking: High; Priority 4

The Raya Crossing is located on the mainstem of Gobernador Creek in Reach GB2. Historically the site consisted of a series of two concrete ford crossing approximately 300 feet apart that blocked fish passage. The downstream ford crossing was removed and the upstream ford crossing was replaced with a freespan bridge in 2007. At both sites the channel was reconstructed to facilitate fish passage and stabilize the creek channel. The bridge abutments for the new crossing consist of concrete footings and concrete retaining walls embedded below the finished bed elevation of the channel. The bridge abutments were protected with 2-ton Rock Slope Protection (RSP) installed at a slope of 2:1, extending below the finished bed elevation of the reconstructed channel.

The overall impact to the Raya Bridge due to the post-Thomas fire flood and debris flow was moderate. The bridge was slightly overtopped by the high flow event though there was only minimal damage to the upstream railings. The primary impacts were to the 2-ton RSP along both banks, with the most significant impact occurring along the left bank where most of the RSP was washed away, exposing the retaining wall (see photo). On the right bank, some RSP was mobilized at the upstream side of the bridge, though it appears that the impact was surficial and could easily be repaired. The proposed repair at this site consists of reconstructing the left bank RSP slope under the bridge to ensure long-term protection of the abutment and retaining wall. Along the right bank, the repair consists of replacing the mobilized RSP rather than reconstructing the entire slope. Site access will likely be achieved along the left bank, just upstream of the bridge. The site will be revegetated with native riparian species following construction.

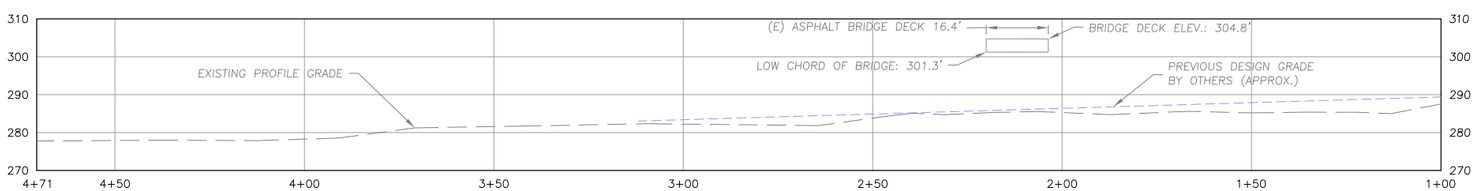
LEGEND

- EXISTING CONTOURS
- SURVEY CONTROL POINT
- EXISTING BRIDGE DECK
- EXISTING FENCE
- EDGE OF PAVEMENT
- EXISTING TREE



SITE 27 EXISTING CONDITIONS

SCALE: 1" = 20'



CREEK PROFILE

SCALE: 1" = 40'

C8 | C8

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CARPINTERIA CREEK RESTORATION ASSESSMENT
CONCEPT LEVEL DESIGN PLANS
RAYA BRIDGE IMPROVEMENTS (SITE #27)

BAR IS ONE INCH ON ORIGINAL DRAWING. ADJUST SCALES FOR REDUCED PLOTS

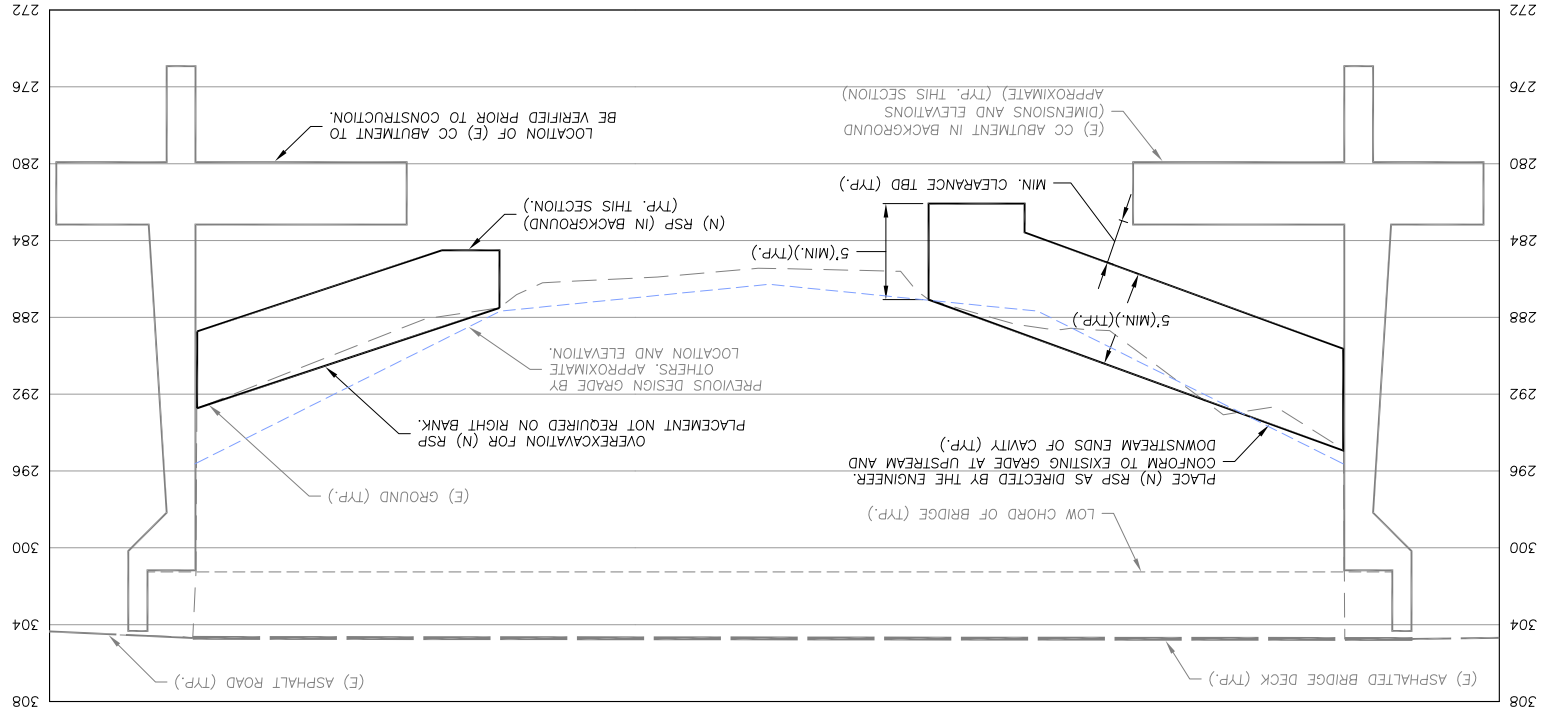
0 1"

FIGURE
B-6

SITE 27 STATION

SCALE: 1" = 10'

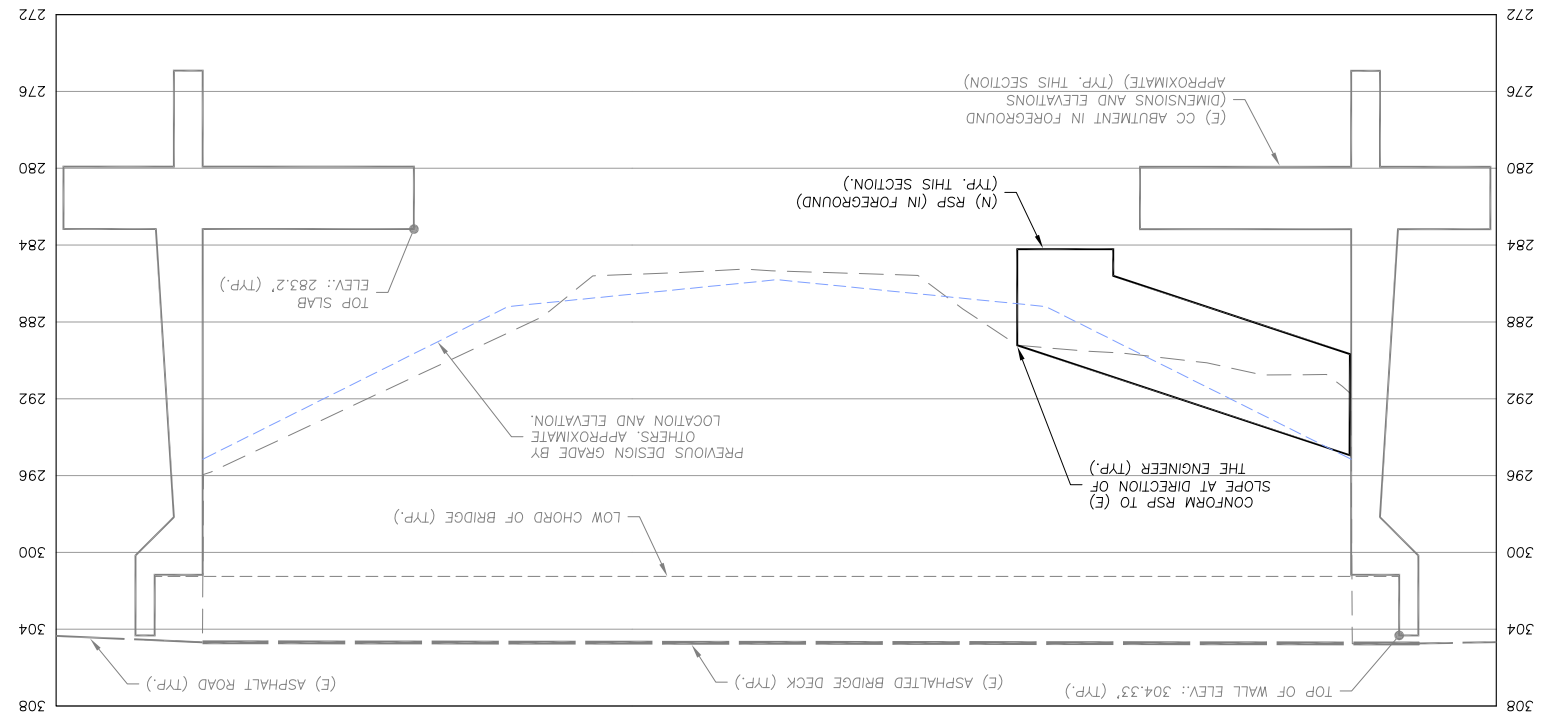
A B6|B7



SITE 27 SECTION

SCALE: 1" = 10'

B B6|B7



CARPINTERIA CREEK RESTORATION ASSESSMENT
CONCEPT LEVEL DESIGN PLANS
RAYA BRIDGE IMPROVEMENTS (SITE #27)

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BAR IS ONE INCH ON ORIGINAL DRAWING. ADJUST SCALES FOR REDUCED PLOTS

0 1"

FIGURE B-7

WATERWAYS CONSULTING, INC.

CARPINTERIA POST FIRE ASSESSMENT- SITE 27 RAYA BRIDGE IMPROVEMENTS
CONCEPT DESIGN SUBMITTAL
ENGINEER'S ESTIMATE OF PROBABLE CONSTRUCTION COSTS

Job No: 18-042 3/29/2019

ITEM NO.	ITEM	ESTIMATED QUANTITY	UNIT	UNIT COST	TOTAL
1	MOBILIZATION	1	LS	$5,000	$5,000
2	ACCESS	1	LS	$5,000	$5,000
3	TEMPORARY FENCE - TYPE ESA	155	LF	$8	$1,240
4	TEMPORARY SILT FENCE	75	LF	$8	$600
5	DEWATERING (OPTIONAL)	1	LS	$2,000	$2,000
6	SLOPE PROTECTION FABRIC	41	SY	$15.00	$615
7	CLEARING AND GRUBBING	1	LS	$2,500	$2,500
8	ROCK SLOPE PROTECTION (RSP)	125	CY	$110	$13,678
9	REVEGETATION	0.10	ACRE	$50,000	$5,000
				SUBTOTAL	$35,633
				CONTINGENCY (25%)	$8,908
				TOTAL	$44,542
10	ENGINEERING DESIGN	1	LS	$7,500	$7,500
11	CONSTRUCTION PHASE SERVICES	1	LS	$4,600	$4,600
				PROJECT TOTAL	$56,642

NOTES:

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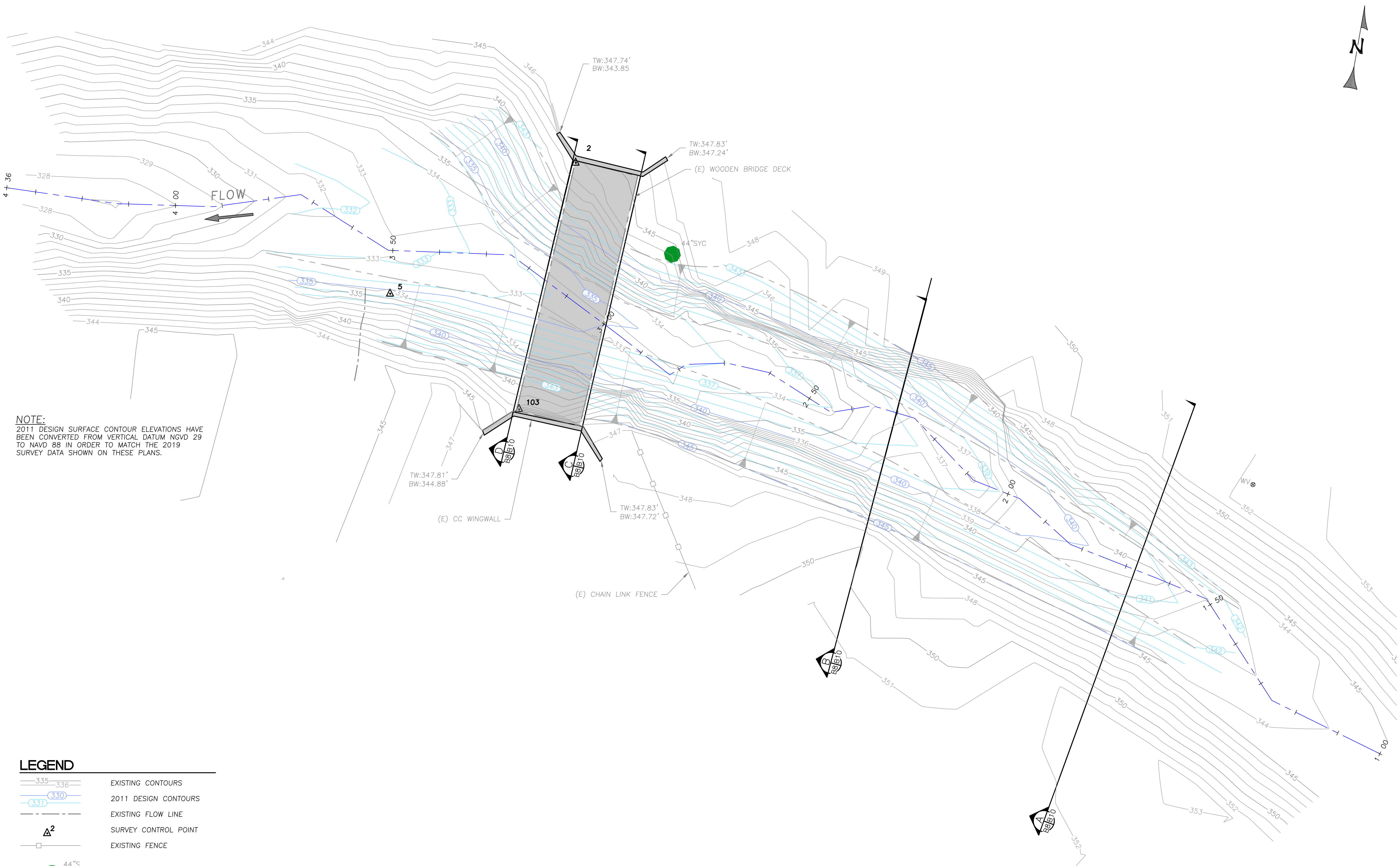
3. Cost Estimate does not include cost of special inspections, if required.
4. Cost Estimate does not include irrigation and maintenance of vegetation.
5. Cost estimate does not include construction staking or other survey related items.

Project Name: Widdoes Crossing Improvements
Project Site: #30
Project Type: Replace abutment protection at bridge
Location: Gobernador Creek; Reach GB2
Impairment Addressed: Flood and debris flow impacts to past fish passage project
Ranking: High; Priority 2

The Widdoes Crossing is located on the mainstem of Gobernador Creek in Reach GB2, approximately 500 feet downstream of the County-managed Gobernador Debris Basin. Historically the site consisted of a concrete ford crossing that blocked fish passage. The ford crossing was replaced with a freespan bridge in 2011. The bridge abutments for the new crossing consist of shallow concrete footings and concrete retaining walls. The bridge abutments and footings were protected with Rock Slope Protection (RSP) installed at a slope of 1.5:1. Conveyance capacity at the new bridge was constrained by the overall natural width of the channel, the depth of the bed relatively to the elevation of the adjacent wide terraces, and the desire to protect a large sycamore located on the left bank.

The overall impact to the Widdoes Bridge due to the post-Thomas fire flood and debris flow was severe. The Widdoes Bridge is the first structure and channel constriction downstream of the Gobernador Debris Basin. Although the Debris Basin prevented large boulders from impacting the bridge, it did not prevent trees and other debris from reaching the bridge. It is estimated that over 700 cubic yards of logs and debris racked up on the upstream side of the bridge, plugging the bridge and causing the entire flow of Gobernador Creek to flow over and around the structure. Despite these impacts, the only damage to the bridge was to the railings and the deck. The structure itself and the footings and abutments were not damaged. There was significant reworking of the RSP installed to protect the footings and abutments and the bed and banks of the channel, both upstream and downstream of the structure were reworked. Based on survey data collected at the site, the bed profile and elevation did not appear to have changed significantly but the channel widened under the bridge.

The proposed repair at this site will require reconstructing the channel, banks, and abutment protection. To increase the cross-section under the bridge, the redesign proposes removal of the large sycamore that was originally protected during construction of the bridge in 2011. Based on site observations and survey it was determined that the sycamore results in an unreasonable constraint on the channel dimensions resulting in long-term risk to the structure. Furthermore, the impact of the flood and debris racking appears to have significantly impacted or killed the sycamore. If the tree were to fall on the bridge structure there would be significant damage. Removing the tree allows for creation of a larger cross-section through the bridge and the opportunity to lay back the steep bank upstream of the bridge. Following reconstruction of the channel, banks, and abutment protection the site will be revegetated with native riparian species following construction.



NOTE:
2011 DESIGN SURFACE CONTOUR ELEVATIONS HAVE BEEN CONVERTED FROM VERTICAL DATUM NGVD 29 TO NAVD 88 IN ORDER TO MATCH THE 2019 SURVEY DATA SHOWN ON THESE PLANS.

LEGEND

335 336	EXISTING CONTOURS
330 331	2011 DESIGN CONTOURS
	EXISTING FLOW LINE
△2	SURVEY CONTROL POINT
	EXISTING FENCE
44"S	EXISTING TREE
WV⊗	WATER VALVE
	SLOPE DIRECTION ARROW
	2011 DESIGN TOP/TOE LINE

SITE 30 EXISTING CONDITIONS

SCALE: 1" = 20'

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CARPINTERIA CREEK RESTORATION ASSESSMENT
CONCEPT LEVEL DESIGN PLANS
WIDDOES CROSSING IMPROVEMENTS (SITE #30)

BAR IS ONE INCH ON ORIGINAL DRAWING, ADJUST SCALES FOR REDUCED PLOTS
0 1"

FIGURE
B-8

NOTE:
REFER TO DETAIL 1, THIS SHEET
FOR TYPICAL RSP SECTION DETAILS.

LEGEND

- EXISTING CONTOURS
- EXISTING FLOW LINE
- SURVEY CONTROL POINT
- EXISTING FENCE
- EXISTING TREE
- WATER VALVE
- SLOPE DIRECTION ARROW

FLOW

CONFORM GRADING TO MATCH (E) CHANNEL GRADE

TW:347.74'
BW:343.85

TW:347.83'
BW:347.24'

(E) WOODEN BRIDGE DECK

REMOVE (E) 44" SYCAMORE.

44"SYC

PLACE 2,450SF OF CALTRANS CLASS 9 RSP AT THE DIRECTION OF THE ENGINEER (TYP.)

TW:347.81'
BW:344.88'

(E) CC WINGWALL

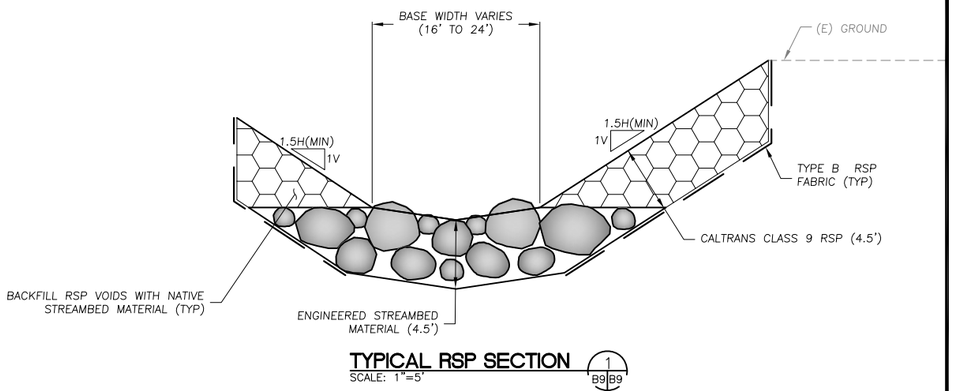
TW:347.83'
BW:347.72'

LIMITS OF RSP AND PLACEMENT ALONG LEFT BANK TBD.

(E) CHAIN LINK FENCE

PLACE 3,125SF OF ESM AT THE DIRECTION OF THE ENGINEER (TYP.)

CONFORM GRADING TO MATCH (E) CHANNEL GRADE.



TYPICAL RSP SECTION
SCALE: 1"=5'
1 B9|B9

SITE 30 CONCEPT DESIGN
SCALE: 1" = 20'

WATERWAYS CONSULTING INC.
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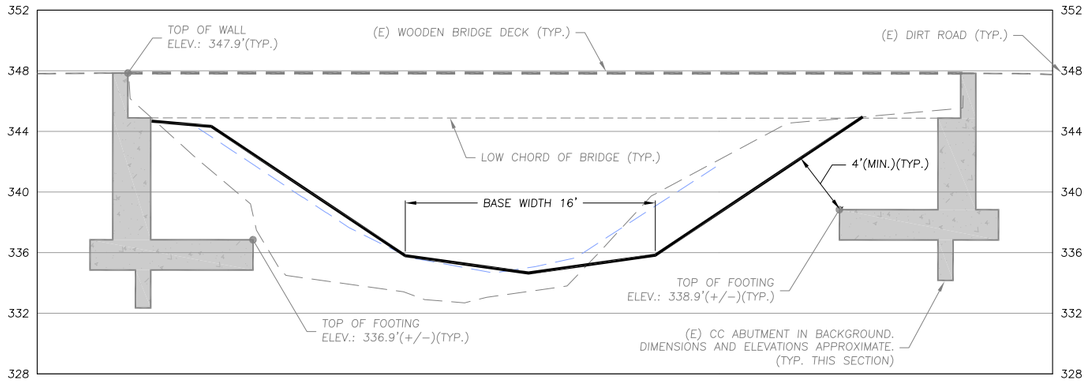
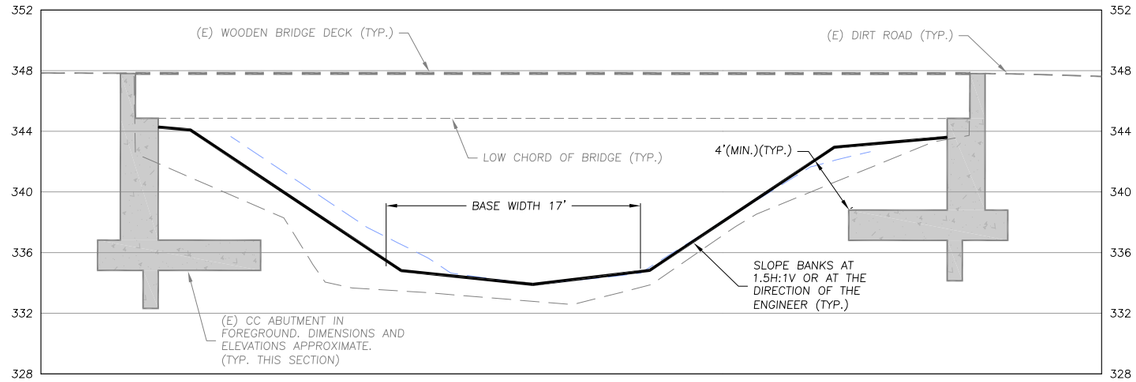
CARPINTERIA CREEK RESTORATION ASSESSMENT
CONCEPT LEVEL DESIGN PLANS
WIDDOES CROSSING IMPROVEMENTS (SITE #30)

BAR IS ONE INCH ON ORIGINAL DRAWING. ADJUST SCALES FOR REDUCED PLOTS
0 1"

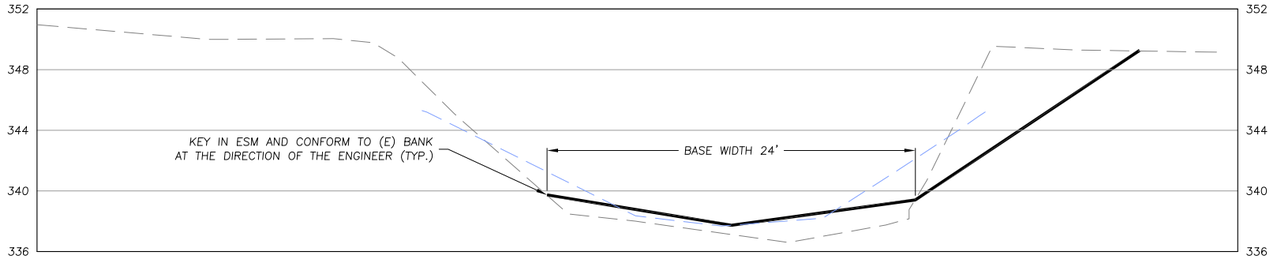
FIGURE
B-9



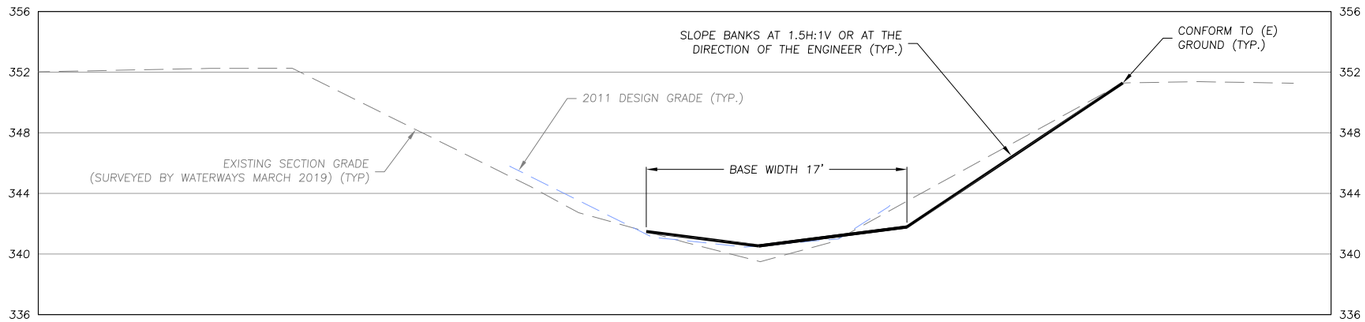
SITE 30 SECTION
SCALE: 1" = 10'
C B8 B10



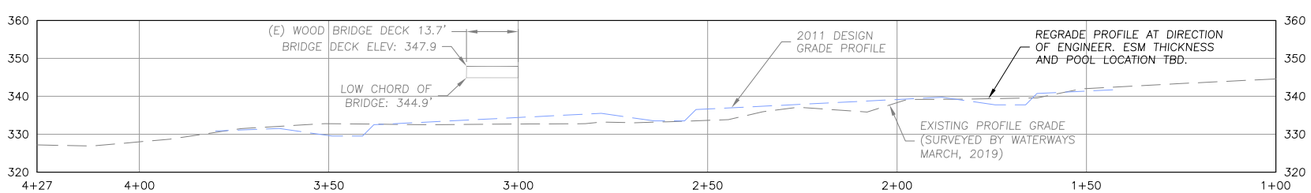
SITE 30 SECTION
SCALE: 1" = 10'
D B8 B10



SITE 30 SECTION
SCALE: 1" = 10'
B B8 B10



SITE 30 SECTION
SCALE: 1" = 10'
A B8 B10



CREEK PROFILE
SCALE: 1" = 40'
– B8 B10

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CARPINTERIA CREEK RESTORATION ASSESSMENT
CONCEPT LEVEL DESIGN PLANS
WIDDOES CROSSING IMPROVEMENTS (SITE #30)

BAR IS ONE INCH ON ORIGINAL DRAWING. ADJUST SCALES FOR REDUCED PLOTS
0 1"

FIGURE
B-10

WATERWAYS CONSULTING, INC.

CARPINTERIA POST FIRE ASSESSMENT- SITE 30 WIDDOES BRIDGE IMPROVEMENTS
CONCEPT DESIGN SUBMITTAL
ENGINEER'S ESTIMATE OF PROBABLE CONSTRUCTION COSTS

Job No: 18-042 3/29/2019

ITEM NO.	ITEM	ESTIMATED QUANTITY	UNIT	UNIT COST	TOTAL
1	MOBILIZATION	1	LS	$5,000	$5,000
2	ACCESS	1	LS	$5,000	$5,000
3	TEMPORARY FENCE - TYPE ESA	350	LF	$8	$2,800
4	TEMPORARY SILT FENCE	60	LF	$8	$480
5	DEWATERING (OPTIONAL)	1	LS	$2,500	$2,500
6	SLOPE PROTECTION FABRIC	400	SY	$15.00	$6,005
7	CLEARING AND GRUBBING	1	LS	$5,000	$5,000
8	ROCK SLOPE PROTECTION (RSP)	550	CY	$110	$60,500
9	ENGINEERED STREAMBED MATERIAL (ESM)	265	CY	$110	$29,150
10	REVEGETATION	0.20	ACRE	$50,000	$10,000
				SUBTOTAL	$126,435
				CONTINGENCY (25%)	$31,609
				TOTAL	$158,044
11	ENGINEERING DESIGN	1	LS	$10,000	$10,000
12	CONSTRUCTION PHASE SERVICES	1	LS	$10,400	$10,400
				PROJECT TOTAL	$178,444

NOTES:

1. Quantities shown are approximate only; the Contractor shall be responsible for all work indicated on the Drawings and prescribed in the Specifications.
2. In the event that the product of a unit price and an estimated quantity does not equal the extended amount stated, the unit price will govern and the correct product of the unit price and the estimated quantity shall be deemed to be the bid amount.
3. Cost Estimate does not include cost of special inspections, if required.
4. Cost Estimate does not include irrigation and maintenance of vegetation.
5. Cost estimate does not include construction staking or other survey related items.

Appendix C

Digital Photo Appendix of Site Assessment

January 2019 and February 2019

Appendix D

Fish Habitat Assessment

Summary Report

CDFW Habitat Typing—Carpinteria Creek Winter 2019

Summary:

CDFW Type II Habitat Typing was employed to understand the habitat characteristics, namely for the Southern California Steelhead, within the Carpinteria Creek Watershed. Surveys were completed on three separate field days over the course of a two-month period along three distinct reaches of Carpinteria Creek. Per usual, CDFW samples four distinct reaches in Carpinteria Creek during Habitat Typing surveys, however, due to landowner access issues, one distinctly defined reach, the Upper Carpinteria Creek Reach, was not surveyed (shown in yellow on Figure 1). Habitat Typing Survey protocols focus on physical characteristics of the river channel to inventory and understand the value of such habitats through time. For the purposes of this report completed for the *State Water Resources Control Board,* this memorandum is inclusive of qualitative descriptions of each distinct stream reach in-lieu of a full analysis described in Appendix J of the California Salmonid Stream Habitat Restoration Manual. Such an approach is justified given a detailed Fisheries Assessment is provided within the Existing Watershed Conditions section of this report. The inclusion of this memo and datasheets is to provide CDFW with additional data collected approximately one year after the debris flow to assist in their continued efforts to evaluate riverine habitats in Carpinteria Watershed.

Survey Methodology:

The habitat inventory conducted in Carpinteria Creek follows the Habitat Type II methodology presented in the California Salmonid Stream Habitat Restoration Manual (Flosi et al, 1998). This inventory was conducted by a two-person team on three separate field days over the course of two months. Upper Gobernador stream reach was started first on January 30, 2019, with the assistance of CDFW staff, however its' entirety not completed that same day. Subsequently Lower Carpinteria Reach was completed in one day on February 25, 2019, which was followed by the completion of Lower Gobernador Creek reach and the remainder of Upper Gobernador Creek on February 26, 2019. All habitat units included in the survey are classified according to habitat type and their lengths are measured. It is important to note that surveys completed on January 30, 2019 were done using a 200 foot transect tape while all other field days utilized a 50 meter transect tape to measure length. This is reflective is the accompanied data sheets. The inventory uses a method that samples approximately 10% of the habitat units within the survey reach. All pool units are measured for maximum depth, depth of pool tail crest (measured in the thalweg), dominant substrate composing the pool tail crest, and embeddedness. All habitat unit types are measured for all the parameters and characteristics on the field form.

Discussion:

Table 1: Overview Summary of Carpinteria Creek Watershed Habitat Type Composition

Survey Reach	*Habitat Unit Count*	*Reach Length (m)*	*Percent Riffle*	*Percent Pools*	*Percent Flatwater*
Lower Carpinteria	36	3400.5	85.3	1.8	12.9
Lower Gobernador	64	2603.7	91.6	5.6	2.8
Upper Gobernador	55	2260.3	96.3	3.5	0.1
System Total	155	8350.3	90.4	3.5	6.2

Location Map:

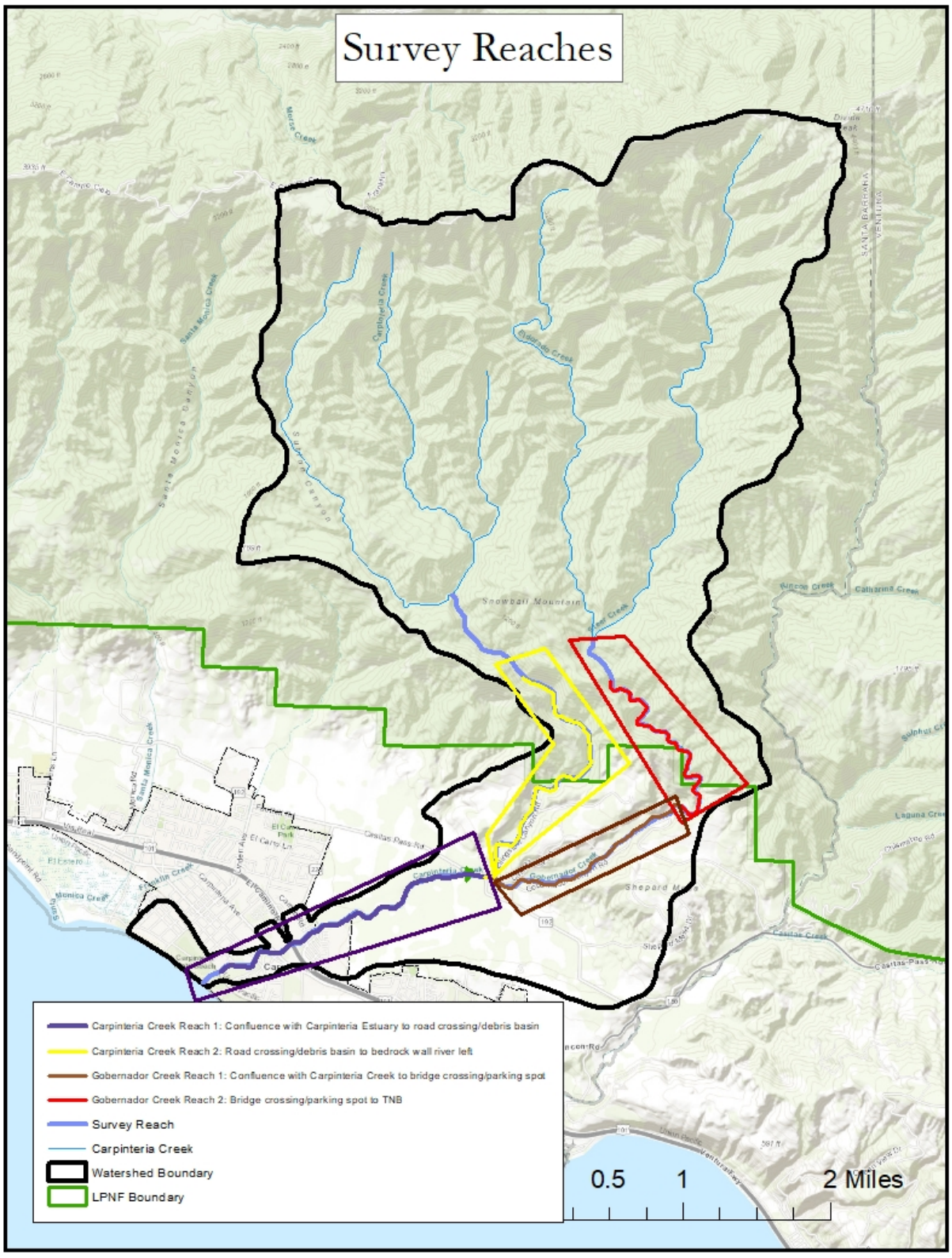

Figure 1: CDFW Identified Stream Survey Reaches

Lower Carpinteria Creek:

Description: Lower Carpinteria Creek is defined as the mainstem Carpinteria Creek from the confluence of Upper Carpinteria Creek and Gobernador Creek to the river's terminus at the Pacific Ocean (shown in purple on Figure 1). This reach is characterized by low instream gradients and semi-uniform planar instream habitats. The lower part of this reach is dominated by urban influences such as housing, businesses, roadways and other public infrastructure (i.e. Wastewater Treatment Plant near the mouth). Agricultural, mainly avocado orchards, dominate the upper zone of this reach.

Habitat Characteristics: There were a total of 36 distinct habitat units surveyed over a 3400-meter length of the Lower Carpinteria reach. Of those, 18 were classified as riffles, 8 as pools and 10 as flatwater habitats. Of the total 3400.5 meter reach length, 2899 meters of riffle (85.3%), 62 meters of pool (1.8%), and 439.5 meters of flatwater (12.9%) were measured respectively. The average, maximum, and minimum length riffle habitat extents were 161 meter, 522 meter and 10 meters respectively. The average, maximum, and minimum length pool habitat extents were 6.2 meter, 12 meter and 2 meters respectively. The average, maximum, and minimum length flatwater habitat extents were 55 meter, 200 meter and 8.5 meters respectively.

Table 2: Lower Carpinteria Creek Habitat Unit Counts, Lengths and Percent Abundance

Habitat Unit	*Total Count*	*Average Length (m)*	*Max Length (m)*	*Min Length (m)*	*Percent Abundance*
Riffle	18	161	522	10	85.3
Pool	8	6.2	12	2	1.8
Flatwater	10	55	200	8.5	12.9
Reach Total	36	-	-	-	100
System Total	155	-	-	-	40.7

Lower Gobernador Creek

Description: Lower Gobernador Creek is defined as the point from the confluence upstream to about the Gobernador Debris Basin (shown in brown on Figure 1). Moving upstream from Lower Carpinteria Creek, reach geomorphology and habitat values see an uptick in complexity with slightly higher stream gradients and less deposited fine sediments. More cobbles and boulders are present in this reach comparatively to Lower Carpinteria Creek. Avocado orchards almost entirely dominate adjacent land uses within this reach, which in many sections abut the top of the streambanks with avocado trees. As such, there is a lack of, or thin band of, native riparian trees along the banks of this reach. Moreover, the channel is continuing to incise, possibly due to the sediment withheld from the debris basin, which has encouraged associated headcuts in this reach.

Habitat Characteristics: There were a total of 64 distinct habitat units surveyed over a 2603-meter length of the Lower Carpinteria Reach. Of those, 31 were classified as riffles, 29 as pools and 4 as flatwater habitats. Of the total 2603 meters reach length, 2386 meters of riffle (91.6%), 145.7 meters of pool (5.6%), and 72 meters of flatwater (2.8%) were measured respectively. The average, maximum, and minimum length riffle habitat extents were 77 meter, 250 meter and 3 meters respectively. The average, maximum, and minimum length pool habitat extents were 5 meter, 11 meter and 1 meter respectively. The average, maximum, and minimum length flatwater habitat extents were 18 meter, 24 meter and 8 meters respectively.

Table 3: Lower Gobernador Creek Habitat Unit Counts, Lengths and Percent Abundance

Habitat Unit	*Total Count*	*Average Length (m)*	*Max Length (m)*	*Min Length (m)*	*Percent Abundance*
Riffle	31	77	250	3	91.6
Pool	29	5	11	1	5.6
Flatwater	4	18	24	8	2.8
Reach Total	64	-	-	-	100
System Total	155	-	-	-	31.2

Upper Gobernador Creek

Description: Upper Gobernador Creek is defined as the stream reach located above the Gobernador Debris Basin to the limit of anadromy for steelhead at an impassable fish barrier (shown in red on Figure 1). This reach extends through Forest Service lands, which as a result, has minimal direct anthropogenic influences on channel morphology and habitat characteristics. Fire and debris flow events are the dominant drivers in shifts in the landscape. Upper Gobernador is characterized by higher stream gradients, approximately 3%, and is dominated by large boulders (debris flow deposits), cobbles and gravels. The primary habitat creation features are large boulders that have created scour and subsequent pools downstream. Habitat in this reach was seen as most suitable for fish, however it is apparent that with each rainfall event, sediment is still very actively arranging itself as it pulses influx downstream.

Habitat Characteristics: There were a total of 55 distinct habitat units surveyed over a 2346.1 meter length of the Lower Carpinteria Reach. Of those, 28 were classified as riffles, 26 as pools and 1 as flatwater habitats. Of the total 2346.1 meter reach length, 2260.3 meter of riffle (96.3%), 82.4 meters of pool (3.5%), and 3.3 meters of flatwater (0.1%) were measured respectively. The average, maximum, and minimum length riffle habitat extents were 80.7 meter, 400 meter and 1.8 meters respectively. The average, maximum, and minimum length pool habitat extents were 3.2 meters, 8 meters and 1 meter respectively. The average, maximum, and minimum length flatwater habitat extents were 3.3 meter, 3.3 meter and 3.3 meters respectively.

Table 4: Upper Gobernador Creek Habitat Unit Counts, Lengths and Percent Abundance

Habitat Unit	*Total Count*	*Average Length (m)*	*Max Length (m)*	*Min Length (m)*	*Percent Abundance*
Riffle	28	80.7	400	1.8	96.3
Pool	26	3.2	8	1	3.5
Flatwater	1	3.3	3.3	3.3	0.1
Reach Total	55	-	-	-	100
System Total	155	-	-	-	28.1

Conclusions:
Lower Carpinteria consisted of largely of flatwater and riffle habitats, a combined 98.2 percent of available habitat. This is most likely due to low gradients and large influx of fine sediments subsequent the debris flow event. These habitats were shallow and offered little refuge to fish throughout. It would be expected that any fish utilizing this habitat would be for the purposes of migrating upstream to better suited habitat or to acclimate their physiology in the lagoon to cope with more fresh or saline waters. Lower Carpinteria comprised ~41 percent of all habitat surveyed.

Lower Gobernador consisted of the most percent pools that any reach surveyed. This is likely due to the occurring incision and associated headcuts that have contributed to pools immediately downstream. This reach has higher potential to hold fish than Lower Carpinteria and offers ore refuge in the form of pools, bubble curtains, overhangs, boulder clusters and small woody debris. Lower Gobernador reach consisted of 5.6 percent pool habitat and 94.6 percent riffle/flatwater. This is the largest percentile of pools compared to any other reach. Lower Gobernador comprised ~32 percent of total habitat surveyed.

Upper Gobernador comprised 3.3 percent pool habitats and 96.7 percent riffle/flatwater habitats. This reach was almost entirely enveloped in the Thomas Fire scar and much of the riparian corridor within this reach burned and was dislodged during the debris flow. However, a small percentage of trees within the riparian corridor withstood the burn and debris flow and have begun to regenerate leaves and signs of life. While there is evidence of incision in this reach, it is expected that sediment will begin to aggrade with the establishment of more vegetation and as the channel begins to find equilibrium in its' longitudinal profile. Upper Gobernador comprised ~28 percent of all surveys reaches.

For the entire surveyed reaches of Carpinteria Creek, riffle and flatwater combined to comprise 96.5% of the habitat, while pools comprised 3.5% of all surveyed habitats. This offers insight to how little rearing habitat is available to Southern Steelhead Trout. It is expected that the system at large will begin to form new and more suitable habitats for steelhead into the future, however the rate at which improved habitat becomes available will be dependent on the rates of re-vegetation, frequency/intensity of hydrological and fire events and mobilization/deposition of sediments. It should also be noted that there were no sightings of any anadromous or resident populations of trout within the system during surveys periods. It is inferred that all trout populations within the basin were extirpated during the debris flow event.

Datasheets are included below for further use by CDFW to assist in their continued efforts to evaluate riverine habitats in Carpinteria Watershed.

Citation:
Flosi, Gary & L. Reynolds, F. (2002). *California Salmonid Stream Habitat Restoration Manual.*

Habitat Inventory Data Form

*Not required to be recorded/calculated during survey

Form# 1 of ____

Date: 6/25/19	Stream Name: Lower Carp		*T: *R: *S:
Surveyors:	GPS/Camera:		Lat: Long:
*Quad:	*Channel Type:	Reach: Lower	BFW: @HU#
Time: 8:00	H_2O Temp:	Air Temp: 54°	Flow: 20cfs · *Pg Length (ft): · *Total Length (ft):

	Habitat Unit Number	001	002	003	004	005	006	007	008	009	010*
	Habitat Unit Type	R	Run	Riffle	Run	riffle	run	riffle	run	riffle	run
	Side Channel Type	x	x								
	Length ~~(ft)~~ m	350	21	200	8.5	411	200	120	95	340	43
	Mean Width (ft)	12	5								7
	Mean Depth (ft)	.4	.6								.8
	Maximum Depth (ft)	1.2	1.2								1.5
	Depth Pool Tail Crest (ft)	x	.5								.3
	Pool Tail Embeddedness	x	0								0
	Pool Tail Substrate	x	4								4
	LWD Count D>1&L6to20	9	1								0
	LWD Count D>1&L>20	4	0								0
Shelter Rating	% Unit Open	95	90								90
	% Unit Covered	5	10								10
	% undercut bank		100								
	% swd (d<12")										
	% lwd (d>12")	100									
	% root mass										
	% terr. vegetation										
	% aqua. vegetation										
	% bubble curtain										30
	% boulders										70
	% bedrock ledges										
Substrate Composition 2 Most Dominant	A) Silt/Caly										
	B) Sand	1	1								1
	C) Gravel (0.08-2.5")	2	2								
	D) Sm Cobble										2
	E) Lg Cobble (5-10")										
	F) Boulder (>10")										
	G) Bedrock										
	% Exposed Substrate	0									5
	% Total Canopy	72	18			60		30			30
	% Deciduous Trees	60	[illegible]			90		70			100
	% Evergreen Trees	40	x			10		30			
Bank Composition & Vegetation	Rt Bk Composition	4	4								4
	Rt Bk Dominant Vg	7	7								7
	% Rt Bk Vegetated	30	70								80
	Lft Bk Composition	4	4								3
	Lft Bk Dominant Vg	7	7								7
	% Lft Bk Vegetated	70	90								70

Bank Composition Types	Comments: **S**tructures **C**hannel **D**iversions **T**ribs **E**rosion **B**iota **P**assage **A**ccess **G**PS **O**ther
1) Bedrock 2) Boulder 3) Cobble/Gravel 4) Silt/Clay/Sand	001: Slow to plunge pool riffle until 9/4 Bridge [illegible] 002: Pipe ← Ends below bridge revege [illegible]
Vegetation Types 5) Grass 6) Brush 7) Deciduous Trees 8) Evergreen Tress 9) No vegetation	

Habitat Inventory Data Form

*Not required to be recorded/calculated during survey

Form# 2 of

Date: 2/25/19	Stream Name: Lower Carpinteria		*T:	*R:	*S:
Surveyors:	GPS/Camera:		Lat:	Long:	
*Quad:	*Channel Type:	Reach:	BFW:	@HU#	
Time:	H_2O Temp:	Air Temp:	Flow:	*Pg Length (ft):	*Total Length (ft):

Habitat Unit Number		011	012	013	014	015	16	17	18	19	20	
Habitat Unit Type		riffle	run	riffle	pool	riffle	run	riffle	pool	riffle	pool	
Side Channel Type		x	x		x							
Length (ft) m		150	50	62	9	171	50	522	7	32	12	
Mean Width (ft)		7	10		7				3	7	7	
Mean Depth (ft)		.4	.4		1				1.2	1.2	1.2	
Maximum Depth (ft)		.8	1.3		1.5				1.6	1.5	1.5	
Depth Pool Tail Crest (ft)		x	x		.5				.7	.9	.7	
Pool Tail Embeddedness		x	x		25%				40	20	20	
Pool Tail Substrate		x	x		6			2	2	4	4	
LWD Count D>1&L6to20		0	0		0							
LWD Count D>1&L>20		0	0		0							
Shelter Rating	% Unit Open	85	90		90							
	% Unit Covered	15	10		10							
	% undercut bank											
	% swd (d<12")											
	% lwd (d>12")											
	% root mass											
	% terr. vegetation	60										
	% aqua. vegetation											
	% bubble curtain	10										
	% boulders	31	160		100							
	% bedrock ledges											
Substrate Composition 2 Most Dominant	A) Silt/Caly											
	B) Sand	1	1									
	C) Gravel (0.08-2.5")	2	2		2							
	D) Sm Cobble				1							
	E) Lg Cobble (5-10")											
	F) Boulder (>10")											
	G) Bedrock											
% Exposed Substrate		20	5		5							
% Total Canopy		72	72		42			36			48	
% Deciduous Trees		90	100		60			30			70	
% Evergreen Trees		10	+		40			70			30	
Bank Composition & Vegetation	Rt Bk Composition	4	3		4							
	Rt Bk Dominant Vg	7	7		7							
	% Rt Bk Vegetated	90	85		90							
	Lft Bk Composition	4	3		3							
	Lft Bk Dominant Vg	7	7		6							
	% Lft Bk Vegetated	90	85		7							

Bank Composition Types
1) Bedrock
2) Boulder
3) Cobble/Gravel
4) Silt/Clay/Sand

Vegetation Types
5) Grass
6) Brush
7) Deciduous Trees
8) Evergreen Tress
9) No vegetation

Comments: **S**tructures **C**hannel **D**iversions **T**ribs **E**rosion **B**iota **P**assage **A**ccess **G**PS **O**ther

Tiny pipe

Habitat Inventory Data Form

*Not required to be recorded/calculated during survey

Form# 3 of ____

Date:	Stream Name: Lower Carp		*T: *R: *S:	
Surveyors:	GPS/Camera:		Lat:	Long:
*Quad:	*Channel Type:	Reach:	BFW:	@HU#
Time:	H_2O Temp:	Air Temp:	Flow:	*Pg Length (ft): / *Total Length (ft):

Habitat Unit Number		021	022	023	(024)	25	26	27	28	29	30
Habitat Unit Type		riffle	pool	riffle	pool	riffle	run	pool	riffle	pool	riffle
Side Channel Type		x	x	x							
Length ~~(ft)~~ m		10	10	48	2	80	42	3	150	3	121
Mean Width (ft)		8	7		6		7	9		10	
Mean Depth (ft)		.7	1.2		1		1	1.6		1.5	
Maximum Depth (ft)		.9	1.6		1.4		1.4	2.3		2.1	
Depth Pool Tail Crest (ft)		x	.8		1.6		x	.9		.8	
Pool Tail Embeddedness		x	30%		35%		x	60		35	
Pool Tail Substrate		x	3		4		x	3		3	
LWD Count D>1&L6to20		6	x		0		1				
LWD Count D>1&L>20		6	x		0		0				
Shelter Rating	% Unit Open	95	50		50		90				
	% Unit Covered	5	50		50		10				
	% undercut bank										
	% swd (d<12”)										
	% lwd (d>12”)										
	% root mass										
	% terr. vegetation				70						
	% aqua. vegetation										
	% bubble curtain		50								
	% boulders	100	50		30		100				
	% bedrock ledges										
Substrate Composition 2 Most Dominant	A) Silt/Caly										
	B) Sand	1			2		1				
	C) Gravel (0.08-2.5”)	2									
	D) Sm Cobble						2				
	E) Lg Cobble (5-10”)		1		1						
	F) Boulder (>10”)		2								
	G) Bedrock										
% Exposed Substrate		5	10		5		5				
% Total Canopy		60	60		96		72			46.5	
% Deciduous Trees		35	35		50		50			70	
% Evergreen Trees		65	65		50		50			30	
Bank Composition & Vegetation	Rt Bk Composition	4	2		4		2				
	Rt Bk Dominant Vg	8	8		7		7				
	% Rt Bk Vegetated	90	90		80		80				
	Lft Bk Composition	2	2		4		2				
	Lft Bk Dominant Vg	8	8		8		8				
	% Lft Bk Vegetated	40	40		50		60				

Bank Composition Types
1) Bedrock
2) Boulder
3) Cobble/Gravel
4) Silt/Clay/Sand

Vegetation Types
5) Grass
6) Brush
7) Deciduous Trees
8) Evergreen Tress
9) No vegetation

Comments: **S**tructures **C**hannel **D**iversions **T**ribs **E**rosion **B**iota **P**assage **A**ccess **GPS** **O**ther

021	022	023	024	25	26	27	28	29	30
	wall on river [illegible]				[illegible] 51155				

Habitat Inventory Data Form

*Not required to be recorded/calculated during survey

Form# 4 of ____

Date:	Stream Name: Lower Carp						*T:	*R:	*S:	
Surveyors:	GPS/Camera:						Lat:		Long:	
*Quad:	*Channel Type:		Reach:				BFW:		@HU#	
Time:	H_2O Temp:	Air Temp:	Flow:		*Pg Length (ft):		*Total Length (ft):			
Habitat Unit Number	31	32	33	34	35	36				
Habitat Unit Type	pool	riffle	pool	riffle	pool	riffle				
Side Channel Type										
Length (~~ft~~) m	16	23	4	39	2.	70				
Mean Width (ft)	7	8	6		12					
Mean Depth (ft)	1.5	.6	.8		1.7					
Maximum Depth (ft)	3.2	1	1.2		2.3					
Depth Pool Tail Crest (ft)	.7	X	.6		1					
Pool Tail Embeddedness	15	X	35		0					
Pool Tail Substrate	3	X	3		4					
LWD Count D>1&L6to20	9	0			0					
LWD Count D>1&L>20	0	9			0					
Shelter Rating										
% Unit Open	50	80			100					
% Unit Covered	50	20			0					
% undercut bank										
% swd (d<12")										
% lwd (d>12")										
% root mass										
% terr. vegetation										
% aqua. vegetation										
% bubble curtain	80	20								
% boulders	20	80								
% bedrock ledges										
Substrate Composition 2 Most Dominant										
A) Silt/Caly					1					
B) Sand										
C) Gravel (0.08-2.5")	1	1			2					
D) Sm Cobble	2	2								
E) Lg Cobble (5-10")										
F) Boulder (>10")										
G) Bedrock										
% Exposed Substrate	5	10			0					
% Total Canopy	90	90			66					
% Deciduous Trees	50	50			50					
% Evergreen Trees	50	50			50					
Bank Composition & Vegetation										
Rt Bk Composition	2	2			2					
Rt Bk Dominant Vg	75	90			6					
% Rt Bk Vegetated	7	7			50					
Lft Bk Composition	4	4			3					
Lft Bk Dominant Vg	8	8			8					
% Lft Bk Vegetated	75	90			80					
Comments: Structures Channel Diversions Tribs Erosion Biota Passage Access GPS Other										
		partly under bridge								

Bank Composition Types
1) Bedrock
2) Boulder
3) Cobble/Gravel
4) Silt/Clay/Sand

Vegetation Types
5) Grass
6) Brush
7) Deciduous Trees
8) Evergreen Tress
9) No vegetation

Habitat Inventory Data Form

*Not required to be recorded/calculated during survey

Form# 1 of ____

Date: 2/26/19	Stream Name: GOB Lower	*T:	*R: *S:
Surveyors: Jason White	GPS/Camera:	Lat:	Long:
*Quad:	*Channel Type:	Reach: Lower GOB.	BFW: @HU#
Time: 9:55	H_2O Temp:	Air Temp:	Flow: 5cfs · *Pg Length (ft): · *Total Length (ft):

		1	2	3	4	5	6	7	8	9	10
Habitat Unit Number		1	2	3	4	5	6	7	8	9	10
Habitat Unit Type		run	riffle	pool	riffle	pool	riffle	pool	run	pool	riffle
Side Channel Type		X	1X								
Length (ft)		18	48	11	11	7	80	8	22	2	250
Mean Width (ft)		7	7	6		4		8		7	
Mean Depth (ft)		.8	1	1.1		1.5		2		1.8	
Maximum Depth (ft)		1.3	1.6	1.5		2.5		3.2		2.8	
Depth Pool Tail Crest (ft)		/		.4		.6		.6		.9	
Pool Tail Embeddedness		/		80		50		0		0	
Pool Tail Substrate		/		3		3	4	4		4	
LWD Count D>1&L6to20		0	1								
LWD Count D>1&L>20		0	0								
Shelter Rating	% Unit Open	60	70	50							
	% Unit Covered	40	30	50							
	% undercut bank										
	% swd (d<12")										
	% lwd (d>12")										
	% root mass										
	% terr. vegetation										
	% aqua. vegetation										
	% bubble curtain	50	50	70							
	% boulders	50	50	30							
	% bedrock ledges										
Substrate Composition 2 Most Dominant	A) Silt/Caly										
	B) Sand	1	1	2							
	C) Gravel (0.08-2.5")										
	D) Sm Cobble		2	1							
	E) Lg Cobble (5-10")										
	F) Boulder (>10")	2									
	G) Bedrock										
% Exposed Substrate		10	5	5							
% Total Canopy		54	30	6			30			24	
% Deciduous Trees		95	60	20			40			30	
% Evergreen Trees		5	40	80			60			70	
Bank Composition & Vegetation	Rt Bk Composition	2	4	2							
	Rt Bk Dominant Vg	7	5	5							
	% Rt Bk Vegetated	30	50	30							
	Lft Bk Composition	2	2	2							
	Lft Bk Dominant Vg	8	5	8							
	% Lft Bk Vegetated	70	60	50							

Comments: **S**tructures **C**hannel **D**iversions **T**ribs **E**rosion **B**iota **P**assage **A**ccess **GPS** **O**ther

1	2	3	4	5	6	7	8	9	10
[illegible]									

Bank Composition Types
1) Bedrock
2) Boulder
3) Cobble/Gravel
4) Silt/Clay/Sand

Vegetation Types
5) Grass
6) Brush
7) Deciduous Trees
8) Evergreen Tress
9) No vegetation

Habitat Inventory Data Form

*Not required to be recorded/calculated during survey

Form# 2 of

Date:	Stream Name: Lower Gobernador				*T:	*R:	*S:			
Surveyors:	GPS/Camera:				Lat:		Long:			
*Quad:	*Channel Type:		Reach:		BFW:		@HU#			
Time:	H_2O Temp:	Air Temp:		Flow:	*Pg Length (ft):		*Total Length (ft):			

Habitat Unit Number	11	12	13	14	15	16	17	18	19	20
Habitat Unit Type	pool	riffle	run	riffle	pool	riffle	run	v.sh	pool	riffle
Side Channel Type	X									
Length (ft) m	2	45	8	40	2	158	24	34	8	88
Mean Width (ft)	7	11	6		6	9				
Mean Depth (ft)	1.8	.6	1.9		1	.6			1.8	
Maximum Depth (ft)	1.2	1.3	1.4		1.5	1.2			2.1	
Depth Pool Tail Crest (ft)	.6	/	/		.4	/		.6	.6	
Pool Tail Embeddedness	40	/			30	/			0	
Pool Tail Substrate	3	/	/		3	/		1	4	
LWD Count D>1&L6to20	X	2	X			1				
LWD Count D>1&L>20	1	1	1			1				
% Unit Open	60	100	40			60				
% Unit Covered	40		60			40				
Shelter Rating: % undercut bank										
Shelter Rating: % swd (d<12")										
Shelter Rating: % lwd (d>12")										
Shelter Rating: % root mass										
Shelter Rating: % terr. vegetation										
Shelter Rating: % aqua. vegetation		/								
Shelter Rating: % bubble curtain	80		60			60				
Shelter Rating: % boulders	20		40			40				
Shelter Rating: % bedrock ledges										
Substrate Composition 2 Most Dominant: A) Silt/Caly										
Substrate Composition 2 Most Dominant: B) Sand	2		1			1				
Substrate Composition 2 Most Dominant: C) Gravel (0.08-2.5")		1								
Substrate Composition 2 Most Dominant: D) Sm Cobble	1	2	2			2				
Substrate Composition 2 Most Dominant: E) Lg Cobble (5-10")										
Substrate Composition 2 Most Dominant: F) Boulder (>10")										
Substrate Composition 2 Most Dominant: G) Bedrock										
% Exposed Substrate	5	20	5			20				
% Total Canopy	25.5	24	54			48			30	
% Deciduous Trees	60	20	20			60			(60)	
% Evergreen Trees	40	80	80			40			40	
Bank Composition & Vegetation: Rt Bk Composition	2	2	4			3				
Bank Composition & Vegetation: Rt Bk Dominant Vg	7	6	6			7				
Bank Composition & Vegetation: % Rt Bk Vegetated	70	70	70			50				
Bank Composition & Vegetation: Lft Bk Composition	2	2	2			4				
Bank Composition & Vegetation: Lft Bk Dominant Vg	8	8	8			7				
Bank Composition & Vegetation: % Lft Bk Vegetated	70	70	70			60				

Bank Composition Types
1) Bedrock
2) Boulder
3) Cobble/Gravel
4) Silt/Clay/Sand

Vegetation Types
5) Grass
6) Brush
7) Deciduous Trees
8) Evergreen Tress
9) No vegetation

Comments: **S**tructures **C**hannel **D**iversions **T**ribs **E**rosion **B**iota **P**assage **A**ccess **G**PS **O**ther

Habitat Inventory Data Form

*Not required to be recorded/calculated during survey

Form# 2 of ____

Date:	Stream Name: Lower Gubernador					*T:	*R:	*S:			
Surveyors:	GPS/Camera:					Lat:	Long:				
*Quad:	*Channel Type:			Reach:		BFW:	@HU#				
Time:	H_2O Temp:	Air Temp:		Flow:		*Pg Length (ft):		*Total Length (ft):			

Habitat Unit Number		(21)	22	23	24	25	26	27	28	29	30	
Habitat Unit Type		pool	riffle	pool	riffle	pool	riffle	pool	riffle	pool	riffle	
Side Channel Type												
Length (ft) m		11	183	3	88	5	31	3	5	5	36	
Mean Width (ft)		8	9	6		7		6		7		
Mean Depth (ft)		1.1	.8	1.3		1.3		2		2		
Maximum Depth (ft)		1.6	1.3	1.9		2.3		2.5		2.8		
Depth Pool Tail Crest (ft)		.5	1	.7		.5		.3		.6		
Pool Tail Embeddedness		0	1			30		50		30		
Pool Tail Substrate		4	1			3		3		3		
LWD Count D>1&L6to20		X	2									
LWD Count D>1&L>20		X	2									
Shelter Rating	% Unit Open	80	50									
	% Unit Covered	20	20	50								
	% undercut bank			50								
	% swd (d<12")											
	% lwd (d>12")											
	% root mass											
	% terr. vegetation											
	% aqua. vegetation											
	% bubble curtain	100	50	1								
	% boulders		50	1								
	% bedrock ledges											
Substrate Composition 2 Most Dominant	A) Silt/Caly											
	B) Sand	2	1									
	C) Gravel (0.08-2.5")			1								
	D) Sm Cobble	1	2									
	E) Lg Cobble (5-10")											
	F) Boulder (>10")											
	G) Bedrock											
% Exposed Substrate		0	15									
% Total Canopy		27	48			34.5			25.5			
% Deciduous Trees		100	80			50			50			
% Evergreen Trees		0	20			50			50			
Bank Composition & Vegetation	Rt Bk Composition	4	3									
	Rt Bk Dominant Vg	7	7									
	% Rt Bk Vegetated	100	50									
	Lft Bk Composition	2	3									
	Lft Bk Dominant Vg	7	5									
	% Lft Bk Vegetated	100	100									

Bank Composition Types
1) Bedrock
2) Boulder
3) Cobble/Gravel
4) Silt/Clay/Sand

Vegetation Types
5) Grass
6) Brush
7) Deciduous Trees
8) Evergreen Tress
No vegetation

Comments: **S**tructures **C**hannel **D**iversions **T**ribs **E**rosion **B**iota **P**assage **A**ccess **G**PS **O**ther

Habitat Inventory Data Form

*Not required to be recorded/calculated during survey

Form# 4 of ____

Date:		Stream Name: Low Gap				*T:		*R:		*S:	
Surveyors:		GPS/Camera:				Lat:			Long:		
*Quad:		*Channel Type:		Reach:		BFW:			@HU#		
Time:	H_2O Temp:	Air Temp:		Flow:		*Pg Length (ft):			*Total Length (ft):		

Habitat Unit Number		31	32	33	34	35	36	37	38	39	40	
Habitat Unit Type		pool	riffle	pool	riffle	pool	riffl	pool	riffle	pool	riffle	
Side Channel Type		X										
Length (ft) m		7	31	9	240	3	38	9	3	8.7	41	
Mean Width (ft)		8	12	8		12		14		6		
Mean Depth (ft)		1.1	.7	1		.7		1		1.6		
Maximum Depth (ft)		2	1.3	2		1.8		2.3		2		
Depth Pool Tail Crest (ft)		.5	/	.3		.1		.6		.4		
Pool Tail Embeddedness		50	/	40		30		40		26		
Pool Tail Substrate		3	/	3		3		3		3		
LWD Count D>1&L6to20		/	9	1								
LWD Count D>1&L>20		/	0	/								
Shelter Rating	% Unit Open	70	70	/								
	% Unit Covered	30	30	/								
	% undercut bank											
	% swd (d<12")											
	% lwd (d>12")											
	% root mass											
	% terr. vegetation											
	% aqua. vegetation											
	% bubble curtain	30	50									
	% boulders	20	50									
	% bedrock ledges											
Substrate Composition 2 Most Dominant	A) Silt/Caly											
	B) Sand											
	C) Gravel (0.08-2.5")	1	1									
	D) Sm Cobble		2									
	E) Lg Cobble (5-10")											
	F) Boulder (>10")	2										
	G) Bedrock											
% Exposed Substrate		5	20									
% Total Canopy		54	30			25.5			19.5			
% Deciduous Trees		100	95			70			75			
% Evergreen Trees		0	5			30			25			
Bank Composition & Vegetation	Rt Bk Composition	3	4									
	Rt Bk Dominant Vg	6	6									
	% Rt Bk Vegetated	50	60									
	Lft Bk Composition	2	3									
	Lft Bk Dominant Vg	6	6									
	% Lft Bk Vegetated	60	70									

Bank Composition Types
1) Bedrock
2) Boulder
3) Cobble/Gravel
4) Silt/Clay/Sand

Vegetation Types
5) Grass
6) Brush
7) Deciduous Trees
8) Evergreen Tress
9) No vegetation

Comments: **S**tructures **C**hannel **D**iversions **T**ribs **E**rosion **B**iota **P**assage **A**ccess **G**PS **O**ther

Habitat Inventory Data Form

*Not required to be recorded/calculated during survey

Form# 5 of ____

Date:	Stream Name: Low Gob		*T: *R: *S:
Surveyors:	GPS/Camera:		Lat: Long:
*Quad:	*Channel Type:	Reach:	BFW: @HU#
Time: H2O Temp:	Air Temp:	Flow:	*Pg Length (ft): *Total Length (ft):

Habitat Unit Number	41	42	43	44	45	(46)	47	48	49	50
Habitat Unit Type	pool	riffle	pool	riffle	pool	riffle	pool	riffle	pool	riffle
Side Channel Type										
Length (ft) m	7	90	6	93	1	163	2	29	8	9
Mean Width (ft)	7	12	16		10	10	16		8	
Mean Depth (ft)	1.8	.7	1		1.2	.8	1		1.2	
Maximum Depth (ft)	2.3	1.3	1.4		2.3	1.3	1.9		2	
Depth Pool Tail Crest (ft)	.3	/	.3		.3	/	.4		.4	
Pool Tail Embeddedness	15	/			30	/	60		50	
Pool Tail Substrate	3	/			3	/	3		3	
LWD Count D>1&L6to20	6	0				1				
LWD Count D>1&L>20	0	5				0				
Shelter Rating: % Unit Open	80	80				70				
Shelter Rating: % Unit Covered	20	20				30				
Shelter Rating: % undercut bank										
Shelter Rating: % swd (d<12")						5				
Shelter Rating: % lwd (d>12")										
Shelter Rating: % root mass										
Shelter Rating: % terr. vegetation										
Shelter Rating: % aqua. vegetation										
Shelter Rating: % bubble curtain	100	80				60				
Shelter Rating: % boulders		20				35				
Shelter Rating: % bedrock ledges										
Substrate Composition 2 Most Dominant: A) Silt/Caly										
B) Sand	1	2								
C) Gravel (0.08-2.5")	2	1				2				
D) Sm Cobble						1				
E) Lg Cobble (5-10")										
F) Boulder (>10")										
G) Bedrock										
% Exposed Substrate	0	5				5				
% Total Canopy	45	57			25.5	36			33	
% Deciduous Trees	50	60			90	90			80	
% Evergreen Trees	50	40			10	10			20	
Bank Composition & Vegetation: Rt Bk Composition	3	7				4				
Rt Bk Dominant Vg	8	8				7				
% Rt Bk Vegetated	80	60				46				
Lft Bk Composition	2	2				2				
Lft Bk Dominant Vg	7	7				7				
% Lft Bk Vegetated	20	40				50				

Comments: **S**tructures **C**hannel **D**iversions **T**ribs **E**rosion **B**iota **P**assage **A**ccess **GPS** **O**ther

	41	42	43	44	45	46	47	48	49	50
Comments					Road instream crossing		Gullie			

Bank Composition Types
1) Bedrock
2) Boulder
3) Cobble/Gravel
4) Silt/Clay/Sand

Vegetation Types
5) Grass
6) Brush
7) Deciduous Trees
8) Evergreen Tress
9) No vegetation

Habitat Inventory Data Form

*Not required to be recorded/calculated during survey

Form# 6 of ____

Date:	Stream Name: Lower Cow		*T:	*R:	*S:
Surveyors:	GPS/Camera:		Lat:	Long:	
*Quad:	*Channel Type:	Reach:	BFW:	@HU#	
Time:	H_2O Temp:	Air Temp:	Flow:	*Pg Length (ft):	*Total Length (ft):

Habitat Unit Number		51	52	53	54	55	56	57	58	59	60
Habitat Unit Type		pool	riffle	pool	riffle	pool	riffle	pool	riffle	pool	riffle
Side Channel Type											
Length (ft)		2	22	3	14	3	135	5	73	3	10
Mean Width (ft)		8	7	7		8		10	16	8	
Mean Depth (ft)		1.1	.7	2		1.8		1	.4	1.2	
Maximum Depth (ft)		1.6	1.7	2.4		2.4		1.5	1.1	1.8	
Depth Pool Tail Crest (ft)		.4	/	.4		.5		.4	/	.4	
Pool Tail Embeddedness		60	/	20		15		15	/	30	
Pool Tail Substrate		3	/	3		3		3	/	3	
LWD Count D>1&L6to20		0	0						1		
LWD Count D>1&L>20		0	0						0		
Shelter Rating	% Unit Open	90	90						90		
	% Unit Covered	10	10						10		
	% undercut bank										
	% swd (d<12")										
	% lwd (d>12")										
	% root mass										
	% terr. vegetation										
	% aqua. vegetation										
	% bubble curtain	50	50						50		
	% boulders		50						50		
	% bedrock ledges										
Substrate Composition 2 Most Dominant	A) Silt/Caly										
	B) Sand										
	C) Gravel (0.08-2.5")	1	1						1		
	D) Sm Cobble								2		
	E) Lg Cobble (5-10")	2	2								
	F) Boulder (>10")										
	G) Bedrock										
% Exposed Substrate		10	20						10		
% Total Canopy		54	78			36			9		
% Deciduous Trees		70	60			60			80		
% Evergreen Trees		30	40			40			20		
Bank Composition & Vegetation	Rt Bk Composition	2	2						4		
	Rt Bk Dominant Vg	8	7						5		
	% Rt Bk Vegetated	50	50						50		
	Lft Bk Composition	2	2						2		
	Lft Bk Dominant Vg	7	7						7		
	% Lft Bk Vegetated	70	50						60		

Bank Composition Types
1) Bedrock
2) Boulder
3) Cobble/Gravel
4) Silt/Clay/Sand

Vegetation Types
5) Grass
6) Brush
7) Deciduous Trees
8) Evergreen Tress
9) No vegetation

Comments: **S**tructures **C**hannel **D**iversions **T**ribs **E**rosion **B**iota **P**assage **A**ccess **G**PS **O**ther

Habitat Inventory Data Form

*Not required to be recorded/calculated during survey

Form# 7 of ____

Date:	Stream Name: Lower Gisborne	*T:	*R: *S:
Surveyors:	GPS/Camera:	Lat:	Long:
*Quad:	*Channel Type:	Reach:	BFW: @HU#
Time:	H_2O Temp:	Air Temp:	Flow: *Pg Length (ft): *Total Length (ft):

Habitat Unit Number		C01	62	63	64						
Habitat Unit Type		pool	riffle	pool	riffle						
Side Channel Type		X									
Length (ft)		2	72	2	43						
Mean Width (ft)		10	10	8							
Mean Depth (ft)		1	.5	1.2							
Maximum Depth (ft)		1.6	1.5	1.6							
Depth Pool Tail Crest (ft)		.4	/	.3							
Pool Tail Embeddedness		50	/	15							
Pool Tail Substrate		3	/	3							
LWD Count D>1&L6to20		1	4								
LWD Count D>1&L>20		1	5								
Shelter Rating	% Unit Open	50	90								
	% Unit Covered	50	10								
	% undercut bank										
	% swd (d<12")										
	% lwd (d>12")										
	% root mass										
	% terr. vegetation										
	% aqua. vegetation										
	% bubble curtain	90	100								
	% boulders	10									
	% bedrock ledges										
Substrate Composition 2 Most Dominant	A) Silt/Caly										
	B) Sand										
	C) Gravel (0.08-2.5")	1	1								
	D) Sm Cobble		9								
	E) Lg Cobble (5-10")										
	F) Boulder (>10")	9									
	G) Bedrock										
% Exposed Substrate		10	30								
% Total Canopy		76.5	25.5								
% Deciduous Trees		60	80								
% Evergreen Trees		10	20								
Bank Composition & Vegetation	Rt Bk Composition	2	2								
	Rt Bk Dominant Vg	7	7								
	% Rt Bk Vegetated	60	50								
	Lft Bk Composition	2	2								
	Lft Bk Dominant Vg	7	7								
	% Lft Bk Vegetated	60	50								

Bank Composition Types
1) Bedrock
2) Boulder
3) Cobble/Gravel
4) Silt/Clay/Sand

Vegetation Types
5) Grass
6) Brush
7) Deciduous Trees
Evergreen Tress
vegetation

Comments: **S**tructures **C**hannel **D**iversions **T**ribs **E**rosion **B**iota **P**assage **A**ccess **G**PS **O**ther

Habitat Inventory Data Form

*Not required to be recorded/calculated during survey

Form# 1 of ____

Date: 1/30/2019	Stream Name: Gobernador Reach 2		*T: *R: *S:
Surveyors: Michael, Casey, JW	GPS/Camera:		Lat: 34.40879 Long: 119.46419
*Quad:	*Channel Type:	Reach:	BFW: 62 ft @HU#
Time: 1:20	H_2O Temp: 62.91	Air Temp: 63.9F	Flow: — | *Pg Length (ft): | *Total Length (ft):

Section	Field	001	002	(003)	004	005	006	007	008	009	010
	Habitat Unit Type	Riffle	Pool	Lateral	Flatwater	R	P	R	P	R	P
	Side Channel Type	NA	NA	NA	NA	NA	NA	NA	NA		
	Length (ft)	108	5	65	11	277	8	86	10	1312	5
	Mean Width (ft)	9	5	7.5	3						
	Mean Depth (ft)	.3	1.0	0.5	0.7						
	Maximum Depth (ft)	.8	1.8	1.2	1.1						
	Depth Pool Tail Crest (ft)	—	.5	NA	NA						.4
	Pool Tail Embeddedness	—	50	NA	NA						0
	Pool Tail Substrate	—	C	NA	NA						B
	LWD Count D>1&L6to20	4	1	3	0						
	LWD Count D>1&L>20	2	0	0	3						
Shelter Rating	% Unit Open	75	25	45	30						
	% Unit Covered	25	75	25	70						
	% undercut bank	0	0	0	0						
	% swd (d<12")	5	0	5	5						
	% lwd (d>12")	5	0	0	0						
	% root mass	5	0	5	5						
	% terr. vegetation	0	0	0	0						
	% aqua. vegetation	0	0	0	0						
	% bubble curtain	40	60	50	40						
	% boulders	45	40	40	50						
	% bedrock ledges	0	0	0	0						
Substrate Composition 2 Most Dominant	A) Silt/Caly	/	-	/	-						
	B) Sand	1		2	-						
	C) Gravel (0.08-2.5")	2	1	1	1	1					
	D) Sm Cobble	/	/	/	-						
	E) Lg Cobble (5-10")	/	/		-						
	F) Boulder (>10")	/	2	-	2						
	G) Bedrock	/	/	-	-						
	% Exposed Substrate	30	0	30	15						
	% Total Canopy	64.5	60	69	33				21		
	% Deciduous Trees	60	5	80	100				40		
	% Evergreen Trees	40	95	20	0				60		
Bank Composition & Vegetation	Rt Bk Composition	3	3	3	2						
	Rt Bk Dominant Vg	7	5	7	7						
	% Rt Bk Vegetated	30	15	25	50						
	Lft Bk Composition	3	1	3	3						
	Lft Bk Dominant Vg	8	8	8	7						
	% Lft Bk Vegetated	50	85	10	5						

Bank Composition Types
1) Bedrock
2) Boulder
3) Cobble/Gravel
4) Silt/Clay/Sand

Vegetation Types
5) Grass
6) Brush
7) Deciduous Trees
8) Evergreen Tress
9) No vegetation

Comments: **S**tructures **C**hannel **D**iversions **T**ribs **E**rosion **B**iota **P**assage **Ac**cess **GPS** **O**ther

End: 34.40800, -119.46278

Start 34.40865, -119.46209

Habitat Inventory Data Form

*Not required to be recorded/calculated during survey

Form# 2 of

Date:	Stream Name: Upper Crab	*T:	*R: *S:
Surveyors:	GPS/Camera:	Lat:	Long:
*Quad:	*Channel Type:	Reach:	BFW: @HU#
Time: H_2O Temp:	Air Temp:	Flow:	*Pg Length (ft): *Total Length (ft):

Habitat Unit Number		011	012	013	014	015	016	017*	018	019	020
Habitat Unit Type		R	P	R	P	R	P	R	P	R	P
Side Channel Type		\	\								
Length (ft)		104	8	80	8	214	12.5	232	15.2	21	10
Mean Width (ft)		6.0	10					8.5			
Mean Depth (ft)		0.5	.7					.4			
Maximum Depth (ft)		1.0	1.1					.8			
Depth Pool Tail Crest (ft)		\	.3		.3		.4	\	.3		.6
Pool Tail Embeddedness		\	10		25		10	\	0		25
Pool Tail Substrate		\	C		C		B	\	B		D
LWD Count D>1&L6to20		0	0					2			
LWD Count D>1&L>20		0	0					0			
Shelter Rating	% Unit Open	85	80					85			
	% Unit Covered	15	20					15			
	% undercut bank	0	0					0			
	% swd (d<12")	0	0					0			
	% lwd (d>12")	0	0					0			
	% root mass	0	0					0			
	% terr. vegetation	0	0					0			
	% aqua. vegetation	0	0					0			
	% bubble curtain	25	30					30			
	% boulders	75	70					70			
	% bedrock ledges	0	0					0			
Substrate Composition 2 Most Dominant	A) Silt/Caly	~~/~~	/					/			
	B) Sand	2	1					2			
	C) Gravel (0.08-2.5")	1	/					1			
	D) Sm Cobble	~~/~~	/					/			
	E) Lg Cobble (5-10")	~~/~~	/					/			
	F) Boulder (>10")	~~/~~	2					/			
	G) Bedrock	/	/					/			
% Exposed Substrate		10	10					30			
% Total Canopy		58.5	55.5				31.5	19.5			
% Deciduous Trees		0	5				10	30			
% Evergreen Trees		100	95				90	70			
Bank Composition & Vegetation	Rt Bk Composition	3	3					1			
	Rt Bk Dominant Vg	7	7					8			
	% Rt Bk Vegetated	15	50					50			
	Lft Bk Composition	3	3					3			
	Lft Bk Dominant Vg	7	7					8			
	% Lft Bk Vegetated	15	80					55			

Bank Composition Types
1) Bedrock
2) Boulder
3) Cobble/Gravel
4) Silt/Clay/Sand

Vegetation Types
5) Grass
6) Brush
7) Deciduous Trees
8) Evergreen Tress
9) No vegetation

Comments: **S**tructures **C**hannel **D**iversions **T**ribs **E**rosion **B**iota **P**assage **A**ccess **G**PS **O**ther

Canopy cover includes Canyon wall →

Habitat Inventory Data Form

*Not required to be recorded/calculated during survey

Form# 3 of ____

Date:	Stream Name: Upper Gob		*T:	*R: *S:
Surveyors:		GPS/Camera:	Lat:	Long:
*Quad:	*Channel Type:	Reach:	BFW:	@HU#
Time:	H_2O Temp:	Air Temp:	Flow:	*Pg Length (ft): / *Total Length (ft):

Habitat Unit Number		021	*022	023	024	025	026	027	028	029	030
Habitat Unit Type		R	P	R	P	R	P	R	P	P	
Side Channel Type		\	\								
Length (ft)		162	9	986	7	96	10	25	17	6	
Mean Width (ft)		6.0	5								
Mean Depth (ft)		.3	.9								
Maximum Depth (ft)		.9	1.2								
Depth Pool Tail Crest (ft)		/	.3		.9		.5	[illegible]	.5		
Pool Tail Embeddedness		/	5		15%		10	[illegible]	5		
Pool Tail Substrate		/	3		6		B	[illegible]	B 8		
LWD Count D>1&L6to20		0	0								
LWD Count D>1&L>20		3	0								
Shelter Rating	% Unit Open	70	40								
	% Unit Covered	30	60								
	% undercut bank	/	.								
	% swd (d<12")	/	.								
	% lwd (d>12")	20	.								
	% root mass	/	.								
	% terr. vegetation	/	.								
	% aqua. vegetation	/	/								
	% bubble curtain	40	70								
	% boulders	40	30								
	% bedrock ledges	/	/								
Substrate Composition 2 Most Dominant	A) Silt/Caly	/	/								
	B) Sand	1	1								
	C) Gravel (0.08-2.5")	2	/								
	D) Sm Cobble	/	2								
	E) Lg Cobble (5-10")	/	.								
	F) Boulder (>10")	/	/								
	G) Bedrock	/	/								
% Exposed Substrate		15	5								
% Total Canopy		21	33				48				
% Deciduous Trees		0	0				50				
% Evergreen Trees		100	100				50				
Bank Composition & Vegetation	Rt Bk Composition	4	3								
	Rt Bk Dominant Vg	8	8								
	% Rt Bk Vegetated	65	25								
	Lft Bk Composition	3	1								
	Lft Bk Dominant Vg	8	8								
	% Lft Bk Vegetated	40	25								

Bank Composition Types	Comments: Structures Channel Diversions Tribs Erosion Biota Passage Access GPS Other
1) Bedrock 2) Boulder 3) Cobble/Gravel 4) Silt/Clay/Sand	025: 15 G Boulder cascade 027: 16 Boulder cascade
Vegetation Types 5) Grass 6) Brush 7) Deciduous Trees 8) Evergreen Tress 9) No vegetation	

Habitat Inventory Data Form

*Not required to be recorded/calculated during survey

Form# 4 of ____

Date: 2/26	Stream Name: Upper Grobercreek			*T:	*R: *S:
Surveyors: JASON White	GPS/Camera:			Lat:	Long:
*Quad:	*Channel Type:		Reach: upper	BFW:	@HU#
Time:	H_2O Temp:	Air Temp:	Flow:	*Pg Length (ft):	*Total Length (ft):

Habitat Unit Number		001	002	003	004	5	6	7	8	9	10
Habitat Unit Type		RIFFLE	pool	riffle	pool	riffle	pool	riffle	pool	riffle	pool
Side Channel Type		x									
Length (ft)		100	2	10	3	31	8	400	3	25	8
Mean Width (ft)		6	5		6		1.6		6		6
Mean Depth (ft)		.4	1.5		7		2		1.5		2.1
Maximum Depth (ft)		1	2		2.4		20		2.1		1.7
Depth Pool Tail Crest (ft)		1	.5		.6		.7		.7		.6
Pool Tail Embeddedness			0		15		25		40		70
Pool Tail Substrate			4								
LWD Count D>1&L6to20		1	1								
LWD Count D>1&L>20		8	8								
Shelter Rating	% Unit Open	80	90								
	% Unit Covered	70	10								
	% undercut bank										
	% swd (d<12")										
	% lwd (d>12")										
	% root mass										
	% terr. vegetation										
	% aqua. vegetation										
	% bubble curtain	40									
	% boulders	60	100								
	% bedrock ledges										
Substrate Composition 2 Most Dominant	A) Silt/Caly										
	B) Sand		2								
	C) Gravel (0.08-2.5")	1	1								
	D) Sm Cobble	2									
	E) Lg Cobble (5-10")										
	F) Boulder (>10")										
	G) Bedrock										
% Exposed Substrate		90	90								
% Total Canopy		48	48			46.5			60		
% Deciduous Trees		50	50			50			40		
% Evergreen Trees		50	50			50			60		
Bank Composition & Vegetation	Rt Bk Composition	4	4								
	Rt Bk Dominant Vg	8	8								
	% Rt Bk Vegetated	90	50								
	Lft Bk Composition	4	4								
	Lft Bk Dominant Vg	8	8								
	% Lft Bk Vegetated	90	50								

Bank Composition Types
1) Bedrock
2) Boulder
3) Cobble/Gravel
4) Silt/Clay/Sand

Vegetation Types
5) Grass
6) Brush
7) Deciduous Trees
8) Evergreen Tress
9) No vegetation

Comments: **S**tructures **C**hannel **D**iversions **T**ribs **E**rosion **B**iota **P**assage **A**ccess **G**PS **O**ther

Habitat Inventory Data Form

*Not required to be recorded/calculated during survey

Form# 5 of

Date:	Stream Name:	*T: *R: *S:	
Surveyors:	GPS/Camera:	Lat: Long:	
*Quad:	*Channel Type:	Reach:	BFW: @HU#
Time:	H_2O Temp:	Air Temp:	Flow:	*Pg Length (ft):	*Total Length (ft):

Habitat Unit Number		11	12	13	14	15	16	17	18	19	20
Habitat Unit Type		riffle	pool	riffle	pool	riffle	pool	riffle	pool	riffle	pool
Side Channel Type		X	X								
Length (ft) m		4	1	2	3	6	3	2.9	3	2.76	5
Mean Width (ft)		6	6		6		6		10		6
Mean Depth (ft)		.8	1.5		1.6		1.7		1.5		1.2
Maximum Depth (ft)		1	2		2.2		2.0		2.5		2
Depth Pool Tail Crest (ft)		/	.5		.6		.4		.4		.6
Pool Tail Embeddedness		/	20		20		20		15		50
Pool Tail Substrate		/	3								
LWD Count D>1&L6to20		0	0								
LWD Count D>1&L>20		0	0								
Shelter Rating	% Unit Open	90	90								
	% Unit Covered	10	10								
	% undercut bank										
	% swd (d<12")										
	% lwd (d>12")										
	% root mass										
	% terr. vegetation										
	% aqua. vegetation										
	% bubble curtain	166	108								
	% boulders										
	% bedrock ledges										
Substrate Composition 2 Most Dominant	A) Silt/Caly										
	B) Sand										
	C) Gravel (0.08-2.5")	2	1								
	D) Sm Cobble	1	1								
	E) Lg Cobble (5-10")										
	F) Boulder (>10")		2								
	G) Bedrock										
% Exposed Substrate		5	0								
% Total Canopy		57	57			55.5			54		
% Deciduous Trees		30	30			40			30		
% Evergreen Trees		70	70			60			70		
Bank Composition & Vegetation	Rt Bk Composition	2	2								
	Rt Bk Dominant Vg	5	5								
	% Rt Bk Vegetated	20	20								
	Lft Bk Composition	2	2								
	Lft Bk Dominant Vg	8	8								
	% Lft Bk Vegetated	80	80								

Bank Composition Types
1) Bedrock
2) Boulder
3) Cobble/Gravel
4) Silt/Clay/Sand

Vegetation Types
5) Grass
6) Brush
7) Deciduous Trees
8) Evergreen Tress
9) No vegetation

Comments: **S**tructures **C**hannel **D**iversions **T**ribs **E**rosion **B**iota **P**assage **A**ccess **G**PS **O**ther

Habitat Inventory Data Form

*Not required to be recorded/calculated during survey

Form# 6 of

Date:	Stream Name:					*T:	*R:		*S:		
Surveyors:	GPS/Camera:					Lat:		Long:			
*Quad:	*Channel Type:		Reach:			BFW:		@HU#			
Time:	H_2O Temp:	Air Temp:		Flow:		*Pg Length (ft):		*Total Length (ft):			
Habitat Unit Number		21	22	23	24	25	26				
Habitat Unit Type		riffle	pool	riffle	pool	riffle	pool				
Side Channel Type		X	X								
Length ~~(ft)~~ (m)		25	7	150	3	12	2				
Mean Width (ft)		6	6		11		15				
Mean Depth (ft)		.7	2.2		1.5		1.3				
Maximum Depth (ft)		1.5	3.1		2.0		2.1				
Depth Pool Tail Crest (ft)		/	.5		.5		.5				
Pool Tail Embeddedness		/	30		10		10				
Pool Tail Substrate		/	3		3						
LWD Count D>1&L6to20		1	0								
LWD Count D>1&L>20		2	0								
Shelter Rating	% Unit Open	50	80								
	% Unit Covered	50	20								
	% undercut bank										
	% swd (d<12")										
	% lwd (d>12")										
	% root mass										
	% terr. vegetation										
	% aqua. vegetation										
	% bubble curtain	90	80								
	% boulders	50	20								
	% bedrock ledges										
Substrate Composition 2 Most Dominant	A) Silt/Caly										
	B) Sand										
	C) Gravel (0.08-2.5")	2									
	D) Sm Cobble	1									
	E) Lg Cobble (5-10")		2								
	F) Boulder (>10")		1								
	G) Bedrock										
% Exposed Substrate		15	5								
% Total Canopy		60	60			90					
% Deciduous Trees		50	40			50					
% Evergreen Trees		50	50			50					
Bank Composition & Vegetation	Rt Bk Composition	2	2								
	Rt Bk Dominant Vg	5	5								
	% Rt Bk Vegetated	60	60								
	Lft Bk Composition	2	2								
	Lft Bk Dominant Vg	5	5								
	% Lft Bk Vegetated	75	75								

Bank Composition Types
1) Bedrock
2) Boulder
3) Cobble/Gravel
4) Silt/Clay/Sand

Vegetation Types
5) Grass
6) Brush
7) Deciduous Trees
8) Evergreen Tress
9) No vegetation

Comments: **S**tructures **C**hannel **D**iversions **T**ribs **E**rosion **B**iota **P**assage **A**ccess **G**PS **O**ther

Sand 15

Appendix E

Project Specific

Reporting Requirements

Project Specific Reporting Requirements

This section of the report was developed to satisfy the grant agreement requirements set forth as a part of this project. Herein lies a summary of lessons learned during the project, a summary of outreach for community stakeholders, an overview of funding and a series of planned follow-up activities.

Lessons Learned

A very useful tool utilized as a part of this project was the employment of a Technical Advisory Committee (TAC). The TAC was very informative during review of the deliverables and project planning/scoping. The TAC was made up of various natural resource professionals to leverage their local experience and respective fields of study. TAC member consisted of professionals from various agencies and institutions including the Central Coast Regional Water Board, U.S. Forest Service, National Oceanic Atmospheric Administration, California Department of Fish and Wildlife, Santa Barbara County Flood Control District, City of Carpinteria, and Waterways Consulting. Throughout the duration of the Project, the TAC met two times and were solicited on more occasions for review.

Another lessoned learned was to utilized plans to evaluate progress within the watershed. In 2005, a watershed management plan was developed for the Carpinteria Creek Watershed which laid out project recommendations. This report took those recommendation into account while developing project priorities for future implementation. This assisted in identifying chronic impairments throughout the watershed and delivers context to the temporal scale of restoration progress.

Summary of Outreach

To solicit community member and stakeholders invested in the Carpinteria Creek Watershed, SCHR deployed an event ad in the local newspaper, *The Coastal View* (see below). Local land stewards and interested parties attended and were briefed with a project presentation and open discussion.


EVENTS
MARCH 14 → 20

→ South Coast Habitat Restoration outreach at IBC

Island Brewing Company, 5049 6th St., will host South Coast Habitat Restoration for an outreach event on **Wednesday, March 20, from 6 to 7:30 p.m.** Interested community members are invited to an informal presentation and open discussion about the completion of the Carpinteria Creek Watershed Assessment and Restoration Plan report completed by SCHR and their contracted engineers for the State Water Resource Control Board. The report assessed the impacts of the Thomas Fire/Flooding on the Carpinteria Creek watershed and presented strategies for possible restoration actions to enhance watershed health.

Overview of Project Funding

South Coast Habitat Restoration initially put forth an application for the SWRCB's *Nonpoint Source Pollution Control Program Federal Clean Water Act Section 319(h) Grant*, for the implementation of repairing former restoration sites that were impacted by the Thomas Fire debris flows. That initial application was denied by the SWRCB, however, the SWRCB reached back out to SCHR to inquiry about developing an Existing Watershed Conditions Assessment and Restoration Plan for Carpinteria Creek Watershed. SCHR obliged, and thus created the inception of this project. This idea being that the SWRCB would know with more confidence about where to fund projects in the watershed in the

future. This project now provides a pathway for restoration in the watershed for the SWRCB, SCHR and other agencies and practitioners to implement restoration projects in the future.

Planned or Potential Follow-up Activities

As concept level designs were developed for this report at 5 different locations. SCHR will utilized those conceptual levels designs and cost estimates to apply for additional funds to continue design work and ultimately implementation. SCHR will be looking to various funders including the SWRCB, NOAA, CDFW, the Coastal Conservancy, the National Fish and Wildlife Foundation and other funders to solicit monies in order to progress restoration throughout the watershed. It is hopeful that other non-profit organizations, special districts and municipalities will do the same.

Incorporation of the Nine Key Elements

This report does not explicitly call out or identify any named key elements, however the report does address the nine key elements at large. Herein is a brief discussion on how each key element is considered within the report.

Table 1: Nine Key Elements to a Watershed Based Plan

Key	Nine Required Watershed Elements (A-I)
A	An identification of the causes and sources or groups of similar sources that will need to be controlled to achieve the load reductions estimated in this watershed-based plan.
B	An estimate of the load reductions expected for the management measures described under paragraph (c) below.
C	A description of the nonpoint source management measures that will need to be implemented to achieve the load reductions estimated under paragraph (b) above and an identification (using a map or a description) of the critical areas in which those measures will be needed to implement this plan.
D	An estimate of the amounts of technical and financial assistance needed associated costs, and/or the sources and authorities that will be relied upon, to implement this plan.
E	An information/education component that will be used to enhance public understanding of the project and encourage their early and continued participation in selecting, designing, and implementing the nonpoint source management measures that will be implemented.
F	A schedule for implementing the nonpoint source management measures identified in this plan that is reasonably expeditious.
G	A description of interim, measurable milestones for determining whether nonpoint source management measures or other control actions are being implemented.
H	A set of criteria that can be used to determine whether loading reductions are being achieved over time and substantial progress is being made toward attaining water quality standards and, if not, the criteria for determining whether this watershed-based plan needs to be revised or, if a nonpoint source TMDL has been established, whether the nonpoint source TMDL needs to be revised.
I	A monitoring component to evaluate the effectiveness of the implementation efforts over time, measured against the criteria established under item (h) immediately above.

Key Element A:

Load reductions for this report were not explicitly calculated given the complexity and unknowns about sediment distribution, deposition and erosional factors still at play due to recent debris flow. However, the plan does identify a plethora of site-specific locations experiencing erosion or at risk of being chronic sediment sources in the future. A list of site-specific projects can be found within Table 3 of this Report.

Key Element B:

There were not estimated load reductions done as a part of this report given the unpredictability of estimating loads post fire and debris flow event. Much of the sediment loading from non-point sources originates from upstream forestlands recently burned in the Thomas Fire and from streambank erosion following the debris flow. It would be too speculative to estimate a hard

number, therefore the report offers basic management solutions at the site-specific level to reduce sediment loading; however at this point the quantities are incalculable.

Key Element C:
There are many site-specific recommendations to reduce the amount of sediment loading from non-point sources in the watershed. Figure 13 in the report identifies the sites for consideration and the recommended project types for reducing sediment loading.

Key Element D:
In this report, concept level designs and cost estimates were produced for the five highest priority sites within the watershed. These are found in Appendix B. Further, the utilization of the Technical Advisory Committee incorporated the knowledge and expertise of local agencies, stakeholders and project partners to develop potential priority projects throughout the watershed, which accounted for potential collaboration of agencies, funding sources, and other projects being taken on by other entitles (i.e. City of Carpinteria).

Key Element E:
At the end of this reports near completion, a community outreach event was held to inform the community members, private landowners and stakeholders about the plans intent, promote buy in and provide a vision for restoration for the watershed. Community members attended the presentation and open discussion. South Coast Habitat Restoration will continue to relay the importance of this report to funders, private landowners and community members to produce buy-in and ultimately more implement more restoration projects within the watershed.

Key Element F:
As there are 32 site-specific potential projects identified in this plan, there is not timeline for completion set within the report. It would be unreasonable to anticipate an expedited plan for all sites within the report. Some sites identified in the report were even identified in the 2005 watershed management plan that had yet to be implemented. However, because concept level designs have been developed for 5 sites, a process has already begun for eventual project implementation at some sites.

Key Element G:
There are no explicitly defined measures to determine whether non-point source management practices are being employed on the landscape because this plan is a planning document and doesn't authoritatively initiate any on the ground activities that could be monitored to understand reductions in non-point sources.

Key Element H:
There are no implemented projects as a part of this plan, and accordingly no associated criteria. However, upon any implemented project, South Coast Habitat Restoration will employ project monitoring and will utilize as-built engineering plans to identify changes in sediment loading. No TMDLs have been established in the watershed.

Key Element I:
There are no implemented projects as a part of this plan, however, upon any implemented project, South Coast Habitat Restoration will employ project monitoring and will utilize as built engineering

plans to identify changes in sediment loading through time. Typically, monitoring occurs for the course of five years after project completion.