Appendix A

Napa County Stream Maintenance Manual

Napa County
Stream Maintenance Manual

Draft

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ACRONYMS AND ABBREVIATIONS

ac	acre(s)
ACHP	Advisory Council on Historic Preservation
ANSI	American National Standards Institute
APAP	Aquatic Pesticide Application Plan
Assessment District	Rutherford Reach Benefit Zone Assessment District
BA	Biological Assessment
BAAQMD	Bay Area Air Quality Management District
BASMAA	Bay Area Stormwater Management Agencies Association
BMPs	Best Management Practices
BO	Biological Opinion
Cal-IPC	California Invasive Plant Council
CCR	California Code of Regulations
CDFG	California Department of Fish and Game
CDFW	California Department of Fish and Wildlife
CDPR	California Department of Pesticide Regulation
CEQA	California Environmental Quality Act
CFD	Community Facilities District
CFR	Code of Federal Regulations
CHRIS	California Historical Resources Information System
CIP	Capital Improvement Project
CMP	corrugated metal pipe
CNDDB	California Natural Diversity Database
Corps or USACE	U.S. Army Corps of Engineers
CRHR	California Register of Historical Resources
CWA	Clean Water Act
CY	cubic yards
dbh	diameter at breast height
District	Napa County Flood Control and Water Conservation District
DPS	Distinct Population Segment
EPA or USEPA	U. S. Environmental Protection Agency
ESA	Endangered Species Act
ESL	environmental screening level

F&G Code	California Fish and Game Code
FIFRA	Federal Insecticide, Fungicide, and Rodenticide Act
GIS	Geographic Information System
GPS	global positioning system
HPTRM	high performance turf reinforcement matting
ISA	International Society of Arboriculture
ITP	incidental take permit
IWR	Institute for Water Resources
LAC	Landowner Advisory Committee
lf	linear feet
LWD	Large Woody Debris
Manual	Stream Maintenance Manual
MBTA	Migratory Bird Treaty Act
MLD	Most Likely Descendent
MOU	Memorandum of Understanding
MS4	Municipal Separate Storm Sewer
NAHC	Native American Heritage Commission
NCMAD	Napa County Mosquito Abatement District
NCSPPP	Napa County Stormwater Pollution Prevention Program
NCSWMP	Napa County Storm Water Management Plan
NHPA	National Historic Preservation Act of 1966
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NOI	Notice of Intent
NPDES	National Pollutant Discharge Elimination System
NRCS	Natural Resources Conservation Services, a division of the U.S. Department of Agriculture
NRHP	National Register of Historic Places
NWIC	Northwest Information Center
OHWM	Ordinary High Water Mark
PA	Programmatic Agreement
PAC	Private Applicator Certification
PCN	Preconstruction Notification Report

PCR	Public Resources Code
QAC	Qualified Applicator Certificate
QAL	Qualified Applicator License
RCD	Resource Conservation District
RGP	Regional General Permit
RMA	Routine Maintenance Agreement
RWQCB or Regional Board	Regional Water Quality Control Board
SHPO	State Historic Preservation Officer
SMP	Stream Maintenance Program
SWRCB	State Water Resources Control Board
TCR	Tribal Cultural Resource
TMDL	Total Maximum Daily Load (under Clean Water Act)
TRM	Turf reinforcement mat
USACE	U.S. Army Corps of Engineers
USEPA	U. S. Environmental Protection Agency
USFWS	U.S. Fish and Wildlife Service
VRSS	Vegetated reinforced soil slope
WQO	Water Quality Order
WDR	Waste Discharge Requirement

GLOSSARY OF SIGNIFICANT TERMS

Arboriculture	The art, science, technology and business of tree care. Arboriculture is practiced by arborists. Arborists are trained to promote tree health, discern tree problems and take measures to correct them.
Adaptive management	Learning from experience by adjusting management practices based on the feedback received through monitoring.
Aggradation	To build up a land surface or streambed through the natural deposition of material.
Alluvial fan	A landscape feature that is formed by the accumulation of sediment and organic material deposited by flowing water, and formed at the point where a stream enters a valley or plain or another, larger stream.
Amphibian	A cold-blooded vertebrate that spends some time on land but must breed and develop into an adult in water. Frogs, salamanders, and toads are amphibians.
Anadromous fish	Fish that are born and rear in freshwater, move to the ocean to grow and mature, and return to freshwater to reproduce. Salmon, steelhead, and lamprey eel are examples of anadromous species.
Armoring	Protective coverings or structures (natural or man-made) used to dissipate the erosive energy of water.
Aspect	The horizontal direction to which a slope faces. For example, a slope which falls down to a deep valley on its western side and a shallower one on its eastern side has a *westerly aspect* or is a *west-facing slope*.
Bank failure	Occurs where a significant portion of the sreambank has failed, slumped, eroded into the creek below, or has been removed entirely.
Bank stabilization	The act of preventing erosion or repairing an eroded bank in order to provide a stable streambank.
Bankfull elevation	The upper level of water that occurs approximately every 2 years during a high flow event.
Baseflow	Groundwater discharge to the stream; the flow not accounted for by storm runoff.
Bedform	A feature of a river or other flowing body of water that is formed by the movement of sediment and other material due to the flow of water.
Best Management Practices (BMPs)	A technique or series of techniques, which is the best known practice available to be effective in protecting water quality and stream habitat.
Brackish water	Somewhat salty, especially from being a mixture of fresh and salt water.

Channel	A stream or river bed; generally refers to the physical form where water commonly flows.
Channel reach	*See: Stream reach.*
Cofferdam	A temporary watertight structure that is pumped dry to enclose an area underwater and allow construction work to be carried out.
Coir logs	Durable biodegradable erosion prevention logs made of fiber from the husk of coconuts.
Culvert	A transverse drain, usually a metal pipe, set beneath the road surface which drains water from the inside of the road to the outside of the road. Culverts are used to drain ditches, springs, and streams across the road alignment.
Detritus	Organic debris formed by the decomposition of plants or animals; fragments of rock that have been worn away.
Dewatering	The temporary diversion of water away from a work site to protect water quality and allow progression of work. Diversion is accomplished with coffer dams, pipes, or other means. Water is removed from the work site only, and not the entire stream or body of water.
Downed tree	Trees and large branches that naturally fall into stream channels. Such debris can promote recruitment of woody in channels to benefit instream habitat. However, downed trees may threaten flood conveyance capacity or channel stability.
Drainage basin	*See: Watershed.*
Drop inlet	A vertical riser on a culvert inlet, usually of the same diameter as the culvert, and often slotted to allow water to flow into the culvert as streamflow rises around the outside. Drop inlets are often used on stream or ditch relief culverts where sediment or debris would otherwise threaten to plug a traditional horizontal inlet.
Easement	A limited right to make use of a property owned by another, e.g. a right of way across the property.
Ecology	The study of the relationships between living organisms and their interactions with their natural or developed environment.
Emergency	"A sudden, unexpected occurrence, involving a clear and imminent danger, demanding immediate action to prevent or mitigate loss of, or damage to, life, health, property or essential public services. Emergency includes such occurrences as fire, flood, earthquake, or other soil or geologic movements, as well as such occurrences as riot, accident, or sabotage." (CEQA 15359).
Emergent plant	A rooted herbaceous plant species that has parts extending above the surface of the water.

Endangered Species	Any species which is in danger of extinction throughout all or a significant portion of its range; an official designation of the California and/or Federal Endangered Species Acts.
Energy dissipator	A device or material (often rocks) used to reduce the energy of flowing water, typically used at and below culvert outlets and other drainage structures to prevent erosion.
Erosion	The wearing away of land surface primarily by wind or water. Erosion occurs naturally as a result of weather or runoff, but can be intensified by clearing, grading, or excavation of the land surface. Erosion usually refers to processes of surface erosion (rain drop erosion, rilling, gullying, and ravelling) and not to mass soil movement (landsliding).
Erosion protection	The act of preventing erosion from occurring or repairing an eroded bank in order to provide a stable streambank that will not require additional maintenance in the foreseeable future
Estuary	The wide lower course of a river where the tide flows in, causing fresh and salt water to mix.
Filamentous algae	Single algae cells that form long threads, or filaments that intertwine to form a mat that resembles wet wool.
Filter fabric (geotextile)	A synthetic fabric manufactured and designed for use in, among others, subsurface and surface drainage applications. Filter fabric is especially useful in maintaining a separation between coarse aggregate and finer native soil particles.
Floodplain	A nearly level alluvial plain that borders a channel and is occasionally inundated by floods (unless artificially protected). The landform is formed by sediment transport and deposition from flows over the streambank and lateral movement of the stream. The '100-year floodplain' represents the area potentially inundated for an unusual but possible flood event with the probability of occurring once every 100 years on the average.
Geographic information system (GIS)	A computer system designed for storing, manipulating, analyzing, and displaying data in a geographic context, usually as maps.
Geomorphology	The study of the physical features of the surface of the earth, including their form, nature, origin, and development. *See also Fluvial geomorphology*.
Geotextile	*See: Filter fabric.*
Gravel bars	Accumulations of small rocks deposited by moving water.
Groundwater	The standing body of water beneath the surface of the ground, consisting largely of surface water that has seeped down into the earth.
Hardscape	Inanimate, engineered elements of landscaping, such as rock.

Headwater	The place from which the water in the river or stream originates.
Hydraulic roughness	The amount of frictional resistance water experiences when passing over land and channel features.
Hydro-seeding (hydraulic seeding)	An erosion control technique for applying a slurry of seed, fertilizer and mulch by hydraulically spraying the mixture on the ground surface. Hydro-seeding is typically performed on slopes that are too steep for dry seeding.
Hydrology	The scientific study of the properties, distribution, use, and circulation of the water on Earth and in the atmosphere in all of its forms.
Hydromodification	The "alteration of the hydrologic characteristics of waters, which in turn could cause degradation of water resources (source: EPA).
Invasive species	Species that show a tendency to spread out of control.
Invertebrate	An animal that does not have a backbone, e.g. an insect or worm.
Large woody debris (LWD)	Portions of downed trees, such as large branches and root wads, that collect in the stream and provide channel structure and habitat for aquatic animals.
Limbing	The removal of unwanted branches from a tree.
Loppers	A large type of scissors used for pruning twigs and small branches. They are usually operated with two hands.
Microclimate	A microclimate is the climate of a small, specific place within an area as contrasted with the climate of the entire area. For example, a small sunny area that is sheltered from harsh winds and frost of the surrounding region. Such a microclimate provides a different habitat than its surroundings.
Ordinary High Water Mark (OHWM)	"That line on the shore established by the fluctuations of water and indicated by physical characteristics such as a clear, natural line impressed on the bank, shelving, changes in the character of the soil, destruction of terrestrial vegetation, the presence of litter and debris, or other appropriate means that consider the characteristics of the surrounding area." [33 CFR 328.3(e)]
Outfall	The location where discharge from a culvert (drainage pipe) occurs.
Out-migration	The life cycle phase of anadromous salmonid fish, where juveniles move downstream from fresh water to the estuary and then the ocean for their salt water phase.
Propagule	Any of various usually vegetative portions of a plant, such as a bud or other offshoot, that aid in dispersal of the species and from which a new individual may develop.
Pruning	To cut branches away from a plant to manipulate growth.

Rearing	The phase of a life cycle for a salmonid fish, where juveniles emerge from eggs and grow to large enough size to become adults or migrate to the ocean (for anadromous forms).
Reach	*See: Stream reach.*
Reconnaissance	A preliminary inspection of an area to obtain geographic, hydrographic, or similar data prior to a detailed survey.
Refugia	An isolated place of relative safety from danger and hardship used by aquatic species, such as fish; the only remaining high quality habitat within an area.
Riffle	An area of rocks or a sandbar lying just beneath the surface of the water.
Rip-rap	Large rocks or other suitable material placed on the ground or along streambanks as an armoring device to prevent or reduce erosion.
Riparian	The banks and other lands adjacent to lakes, watercourse, estuaries, and wet areas. Often refers to water-loving vegetation along the water's edge.
Runoff	Rainfall which flows overland across the surface or hillslopes and along roads and trails.
Salmonid	A species of fish that is a member of the salmon and trout family. Also see: Anadromous fish.
Scour	To clear something out by passing water through it; a place that has been scoured, especially by water.
Sediment	Organic or inorganic material that is carried or suspended in water and that settles out to form deposits in the stream system or receiving waters.
Shade tolerance	A plant's abilities to tolerate low light levels.
Silt fence	A constructed barrier used to contain soil eroded from a construction site. The barrier is made from filter fabric stretched between fence posts placed on contour along a slope.
Siltation	Fine-grained sediment, especially of mud or clay particles at the bottom of a river or lake.
Spawning	The phase of adult salmonid fish where redds (nests) are made and eggs are laid in gravels of streams.

Species of Special Concern	A designation used by California (CSC) and federal (FSC) agencies to refer to those species of animals (and sometimes plants) that have declining population levels, limited ranges, and/or continuing threats that have made them vulnerable to extinction. They may soon reach the point where they meet criteria for listing as threatened or endangered under the State and/or Federal Endangered Species Acts. No special legal protections are associated with this designation alone.
Stream	A natural waterway that transports water in a perennial, intermittent, or ephemeral circumstance.
Streambank	That portion of the channel bank cross-section that controls the lateral movement of water.
Streambank erosion	A natural process driven by stream bank characteristics (erodibility) and hydraulic/gravitational forces. Many land use activities can affect both of these components and lead to accelerated bank erosion. Acceleration of this natural process leads to a disproportionate sediment supply, stream channel instability, land loss, habitat loss and other adverse effects.
Streambank stabilization	*See: Bank stabilization.*
Stream channel incision	The deepening of the channel of a stream by erosion.
Stream reach	A continuous portion of a stream between two designated points.
Swale	A depression or low area on a hillslope which rarely carries runoff except during high rainfall events.
Terrace	A low-gradient surface formed by fluvial aggradation or erosion when the stream flowed at a higher elevation in the landscape. The term implies that the surface is rarely inundated by floods in the current climate.
Threatened Species	Any species which is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range; an official designation under the California and/or Federal Endangered Species Acts.
Toe-of-slope	The base of an embankment; the base of the streambank where it meets the channel bed
Total Maximum Daily Load (TMDL)	A process under the federal Clean Water Act that provides a tool for implementing State water quality standards and is based on the relationship between pollution sources and instream water quality conditions.
Tree snags	A dead or dying tree that is still standing in place.
Tributary	A stream or river that flows into a larger stream, river, or lake.
Turbidity	Water that is cloudy or muddy usually due to suspended sediment.

Understory	Lower vegetation in a forest; a layer of small trees and bushes below the level of the taller trees.
Watershed	The area or drainage basin contributing water, organic matter, dissolved nutrients and sediments to a stream or lake.
Wetlands	Areas that are inundated by surface water or ground water with a frequency sufficient to support, and under normal circumstances do or would support, a prevalence of vegetative or aquatic life that require saturated or seasonally saturated soil conditions for growth and reproduction (Executive Order 11990, signed 1977, U.S. President Carter).
Winterize	To perform erosion prevention and erosion control work on a work site in preparation for winter rains.

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Chapter 1
INTRODUCTION

1.1 District Mission and Program Background

The Napa County Flood Control and Water Conservation District (District) was formed in 1951 with the dual goals of providing flood protection and water conservation to Napa County. More specifically, the District's principal objectives are to:

- Provide protection from flood events to life, property, and infrastructure in the District,
- Enhance and construct storm drainage systems and flood control prevention facilities, and
- Assure that Napa County's domestic, municipal, industrial, and agricultural water needs are met.

Since the District's forming, flood protection and water conservation approaches have evolved, particularly with regard to an increased focus on the protection of natural resources within the District's boundaries. Napa County land use is a mix of rural and urban lands including small cities and towns and a significant agricultural presence. Large areas of the County are also undeveloped and natural, with many unaltered stream reaches in the District. Local streams provide habitat for a range of flora and fauna including certain rare, threatened or endangered species.

In 1996, the District created the Maintenance and Watershed Management Program (Joint Zone Project No. 96-1) allowing the District to approve a budget annually for watershed maintenance and management activities in the County. To finance annual budgets, the District assesses County properties in proportion to the direct benefits received from the watershed maintenance and management program. A summary of the annual maintenance workplan, budget, and required funding by assessments is provided in the District's annual fiscal project report.

The District's Maintenance and Watershed Management Program enables the District at its discretion to reduce the potential for flood damage along the riparian corridors on private and public lands throughout Napa County. The District responds to citizen and government alerts to potential flooding or erosion problems and conducts annual creek and river surveys to assess and prioritize potential issues that can be addressed through maintenance. Through its periodic surveys, the District can also identify illegal dumping activities, stormwater drainage issues, and other stream-related hazards. The Maintenance and Watershed Management Program funds and supports:

- Maintenance of approximately 13 miles of District-owned flood control channels and easements,
- Maintenance of County-owned and other public agency-owned channel reaches by agreement,

- Debris and vegetation management for flood hazard reduction and resource protection throughout the District, particularly within the Napa River and Green Valley Creek and their tributaries,
- Erosion protection for river and stream banks, and
- Maintenance of two dredge material disposal sites (at Edgerly Island and Imola Avenue) associated with Napa River dredging conducted by the U.S. Army Corps of Engineers (USACE).

In 1998, Napa County voters approved Measure A which provides local funding for flood protection and watershed improvement projects throughout Napa County. This initiative, which is supporting construction of the award-winning Napa River/Napa Creek Flood Protection Project, also established Napa County's commitment to "Living River" principles as the basis for all watershed and riparian activities. This Manual demonstrates the District's commitment to sustain the river, its tributaries and all waterways throughout Napa County as natural living watercourses. Maintenance will be performed within an adaptive management framework and will reflect a prescriptive approach designed to preserve natural resources.

The District also conducts maintenance as requested and funded by private landowners. In 2008, the District adopted a Resolution to form the Rutherford Reach Benefit Zone Assessment District (Assessment District). The purpose of the Assessment District is to establish and collect fees to fund maintenance activities within 41 parcels located on both sides of the Rutherford Reach of the Napa River (4.5 miles of the river located south of St. Helena, from Zinfandel Lane to Oakville Cross Road.) These landowners participated in the Napa River Rutherford Reach Restoration Project. River restoration on these parcels was completed in 2014. The District conducts monitoring and maintenance activities for the project with funds from the Assessment District. Maintenance activities in the Assessment District are implemented according to the Final Maintenance Plan for the Napa River Rutherford Reach Restoration Project (Rutherford Reach Maintenance Plan, **Appendix B**) developed specifically for the Rutherford Reach restoration project and are consistent with those described in this Manual.

The District conducts maintenance of the Napa River / Napa Creek Flood Protection Project (Flood Protection Project), constructed jointly by USACE and the District. The Flood Protection Project was designed to provide protection for up to a 100-year flood event and enhanced, restored, and created wildlife and wetland habitat within the Napa River floodplain. The Flood Protection Project Area covers a 6.9-mile reach of the Napa River from Trancas Street in the city of Napa to the State Route 29 crossing downstream. The Flood Protection Project includes the South Wetland Opportunity Area (SWOA), 1,400 acres of land north of Highway 29 and west of the Napa River (shown as the Flowage Easement Area in **Figure 1-7**). The SWOA consists of intertidal marshes and sloughs, open mudflats, seasonal wetlands, and alluvial floodplains. Maintenance activities associated with the Flood Protection Project are performed in accordance with the *Final Operations, Maintenance, Repair, Replacement, and Rehabilitation Manual for the Napa River / Napa Creek Flood Protection Project* (OMRR&R Manual) (USACE 2018; **Appendix M**).

In 2010, the District established the Bank Stabilization Cost Share Program, a District-funded program to assist private property owners with bank erosion repairs on their property. Landowners must acquire designs and all necessary regulatory permits as well as two or more bids from contractors in order to be eligible for a cost-share reimbursement from the District.

When District support is requested by the landowner, the District may offer consultation regarding bank stabilization design, permitting, and installation of the repair. The program incentivizes biotechnical solutions by offering a larger percentage cost-share to such projects. Since establishment, this program has resulted in installation of successful bank stabilization projects that also provide valuable habitat enhancement throughout the County.

In 2014, the District established the Napa County Flood Control and Water Conservation District Community Facilities District No. 2014-01 pursuant to the Mello-Roos Community Facilities Act of 1982 to levy a special tax to finance the cost of maintenance services within the Oakville to Oak Knoll Reach of the Napa River. As of 2018, the Community Facilities District (CFD) is funded by special taxes on 40 parcels within the Oakville to Oak Knoll Reach Restoration Project (83 acres of riparian restoration along 9 miles of the river from Oakville Cross Road to Oak Knoll Avenue.) The CFD includes a Future Annexation Area including properties along tributaries to the Napa River reach between Zinfandel Lane and Oak Knoll Avenue. The District conducts monitoring and maintenance activities for the project with funds from the CFD. District activities in the CFD are implemented according to the *Napa River Restoration Oakville to Oak Knoll Maintenance Program* (OVOK Project Maintenance Program, **Appendix A**) developed specifically for the restoration project and are consistent with those described in this Manual.

The District frequently partners with the Napa County Resource Conservation District (RCD) to implement watershed stewardship projects. The Napa County RCD is a California Special District that provides technical and educational assistance to property owners and managers and stakeholders to conserve, protect, and restore natural resources throughout Napa County and a small portion of Solano County. The Napa County RCD developed a fish barrier assessment report entitled the Napa River Fish Barrier Plan (2011), which has guided high priority fish barrier removal projects within the Napa River Watershed. Small barriers have been removed through the SMP by the District and Napa County RCD. One of the Napa County RCD's programs is targeted at reducing erosion from unpaved road systems and improving upland habitat through implementing better road maintenance practices. Descriptions of the Napa County RCD's road maintenance activities are presented in Chapter 11. These activities were developed following the methods outlined in California Department of Fish and Wildlife's (CDFW) *Part X California Stream Habitat Restoration Manual* (Flosi et. al 2006), Mendocino County Resource Conservation District's *Forest and Ranch Roads Handbook* (Weaver, W.E., and Hagans, D.K. 2014), Napa County's *Guidelines for County Road Maintenance Practices that Protect Aquatic Habitat and Salmonid Fisheries* (Napa County, 2014), and approved Best Management Practices (BMPs) by the State Water Resources Control Board (SWRCB). The Napa County RCD undertakes these maintenance activities to improve and maintain unpaved roadways and drainages to reduce watershed erosion and improve water quality. Whereas the District's focus is maintaining streams on public lands, the Napa County RCD is primarily focused on working with private landowners to reduce the erosion potential from unpaved roads on private lands into creeks. By including the RCD's rural road maintenance activities in the SMP, the District seeks to demonstrate a watershed-wide approach to improving stream resources in Napa County.

The District can provide technical expertise and assistance to the Napa County Public Works Department's Roads Division (County Roads Division or County) when maintenance activities are needed at the intersection of County road infrastructure and a stream, such as road creek crossings and culverts. The County is responsible for maintaining 446 miles of county-owned roads, approximately 550 culverts, and 124 road bridges.

Figure 1-6 shows the locations of road and creek crossings throughout the County. The County typically conducts repairs at 5-10 road sites that intersect with a natural stream in a given year. The County is responsible for maintenance of their infrastructure but, at times, collaborates with the District on maintenance activities that may affect stream resources, for example at culverts or crossings. Routine maintenance activities are necessary to maintain the structural and functional integrity of County roads, bridges, and roadside drainage facilities. The primary routine maintenance activities conducted by the County include clearing of debris from culverts, minor vegetation removal, debris removal, biotechnical bank stabilization, and culvert repair or replacement. Descriptions of the County's routine maintenance activities which may be supported by the District's SMP are described throughout this Manual.

The District partners with cities and towns within Napa County, including the Cities of Calistoga, St. Helena, the Town of Yountville and City of Napa. The City of American Canyon is a new partner for the District, and the streams which run through the American Canyon are now described in this Manual. Stream maintenance activities performed by the District for its municipal partners are subject to the permit conditions that govern the District's Stream Maintenance Program. The inclusion in this Manual of stream reaches that the District may conduct maintenance activities in on behalf of its municipal partners does not confer permit coverage to the partnering municipality for activities that they undertake independently, rather only those activities that the District oversees and includes in permit notification documents. The City of American Canyon is responsible for maintaining approximately 7.5 miles of streams that include North Slough, Rio del Mar Channel, Newell Creek, American Canyon Creek, Walsh Creek and the Walsh Creek Overflow, which all flow into Napa River. Regular minor maintenance includes vegetation clearing and tree trimming, downed tree management, and mowing herbaceous vegetation along stream top-of-banks. Other maintenance activities that may be performed by the District include sediment and debris removal from culvert aprons, culverts and bridge structures, and some sediment removal along segments of drainages as necessary to ensure adequate flood conveyance flows. Detention basins will be periodically cleared of vegetation and sediment to restore and maintain their structural integrity and designed functions.

District services and activities in support of the maintenance programs and tasks summarized above are the focus of this Stream Maintenance Manual (Manual). The Manual was first developed by the District in 2012. The California Department of Fish and Wildlife (CDFW) issued a 10-year approval and San Francisco Bay Regional Water Quality Control Board (RWQCB) issued a 5-year approval to conduct the maintenance activities as described in the Manual.

This Manual Update (2019) describes expanded District maintenance activities, revised maintenance approaches and new partnerships. The Manual Update provides the basis to secure additional regulatory approvals under federal regulations, including the federal Clean Water Act (CWA) and Endangered Species Act (ESA) through application for a Regional General Permit with the USACE.

In addition to these roles described above, the District plays a very important role in the County in providing guidance, education, and stewardship for creek issues to private landowners and other agencies operating within the County. While this role is not formally defined in any statute, this role of providing leadership through example is very important to the District. For example, if a private landowner calls the District regarding a fallen tree or other issue. District staff will visit the site, meet with the landowner, and discuss potential treatment approaches. Whereas private landowners may (or may not) be knowledgeable on environmental regulations, best management practices (BMPs), or overall watershed functions; District staff play an important role in educating landowners and watershed stakeholders on undertaking sound stream management practices that consider and avoid potential environmental effects. Similarly, the District plays a similar role with other County agencies if and when issues arise that involve County creeks. For example, as discussed above, the District provides guidance to the County Roads Division.

For these reasons and because the District considers itself as “creek stewards” for the County, the District sees this Manual as not only an internal reference manual for District staff, but also an important educational and guidance document for the County at large.

In addition to stream maintenance, the District is involved with many other on-going programs and activities that are not addressed in this Manual or covered by the District’s Stream Maintenance Program (SMP), including:

- Installation and operation of rainfall and stream stage gages throughout the County,
- Cost share funding for upgrading major storm drain trunk lines owned by local cities and the County,
- Participation in federal/state flood protection grant programs,
- Groundwater monitoring,
- Oversight of adjudicated watersheds,
- Preparation of special studies for flood protection and watershed management,
- Development of standardized and integrated floodplain management regulations, and
- Assistance for the local community with National Pollutant Discharge Elimination System (NPDES) stormwater compliance requirements.

1.2 Maintenance Needs and Manual Purpose

The District has maintenance responsibilities for flood control channels that the District owns in fee title, as well as other channels for which the District has a maintenance agreement or easement. The District is also responsible for operating and maintaining elements of the Flood Protection Project. The location and ownership type for District maintained channels are presented in the maps described in Section 1.3 below. Besides routine and prescriptive channel maintenance, the District also provides discretionary maintenance in other channels, maintains instream facilities for their proper functioning, and responds to public requests for maintenance activities at other stream and channel locations. As described above, maintenance activities that may be conducted by the District in areas for which other municipalities, such as the City of American Canyon, are responsible for maintaining are also included in this Manual and SMP.

The primary purpose of this Manual is to provide clear and consistent guidance to District staff administering the SMP. Updating this Manual has enabled the District to review existing approaches and streamline and improve maintenance protocols. An equally important objective for this Manual is to provide clearly articulated guidance to avoid and minimize environmental impacts while conducting maintenance. This Manual also describes the program’s organizational framework to oversee routine maintenance activities and ensure that maintenance is compliant with the terms and conditions of regulatory permits.

As stated above, the District's approach and perspective toward stream management has expanded over the years to include resource protection and environmental sustainability in addition to just flood control and channel maintenance. The District now sees itself not merely as a flood management bureau, but more broadly as a resource management agency with a duty to integrate environmental benefits (such as habitat protection and enhancement) into stream maintenance activities. The District applies environmental management principles to ensure that stream maintenance activities are restorative in nature and are enhancing ecosystem processes that help to mitigate flood related hazards.

This evolution in stream maintenance approach is consistent with the expansion of local, state, and federal regulations which have increased environmental requirements for maintenance projects. Compliance with federal environmental laws and regulations such as the federal ESA and CWA, and state laws and regulations administered by the CDFW and RWQCBs has resulted in an increasingly extensive project review and authorization process. This Manual also serves as the program description to support programmatic permits to authorize the District's maintenance activities.

Another purpose of this Manual is to provide other Napa County stakeholders such as individual towns, community groups, or private landowners with a reference manual which they can use to plan their own specific maintenance needs. However, this Manual is not intended to provide regulatory coverage or authorization for non-District sponsored maintenance activities. Private landowners and other agency-sponsored projects that are not notified and/or overseen by the District would require separate permits and regulatory approvals. The goal is to have a coordinated and collaborative approach among local stakeholders to preserve Napa County's riparian and stream resources while protecting life and property from flood damage.

1.3 Program Area and Maintenance Location Types

The District has the authority to conduct maintenance anywhere in the County. However, the majority of routine maintenance activities are conducted in the Napa River watershed, specifically on tributaries to the Napa River. This Manual focuses on routine maintenance activities conducted in the Napa River watershed, but maintenance activity methods described in the Manual can be applied anywhere in the County.

Figure 1-1 presents the entire stream maintenance program area in Napa County, California. The Napa River valley primary maintenance area is presented in larger-scale regional maps in Figure 1-2 through Figure 1-4. More frequently maintained Napa River tributaries and channel reaches are highlighted in these regional maps. More specifically, **Figure 1-2** shows the northern portion of the Napa River watershed including key Napa River tributaries Sulphur Creek, Canon Creek, and York Creek. **Figure 1-3** depicts the Yountville region including key Napa River tributaries Beard Ditch, Hopper Creek, Yountville Outfall and Collector, Dry Creek, and the Salvador Collector (Solano Ditch). **Figure 1-4** shows the Napa River tributaries maintained in the City of Napa region and Napa County Airport region, including key Napa River tributaries Sheehy and Fagan creeks. **Figure 1-5** shows the Napa River tributaries maintained in the City of American Canyon region including American Canyon Creek, Newell Creek, Walsh Creek, and Rio del Mar. In the southeastern portion of the County, tributaries to Green Valley Creek, which drains to Suisun Bay, are maintained by the District though maintenance in these areas is conducted infrequently.

Also shown on the Figure 1-1 maps are the restoration projects (Rutherford and Oakville to Oak Knoll reaches), and dredged material rehandling sites (Edgerly Island and Imola Avenue) maintained by the District.

1.3.1 Channel Types

This Manual describes four types of flood control channels and streams based on their form, where the District may conduct maintenance activities. The four different channel types include: (1) engineered channels and "collectors," (2) modified channels, (3) semi-modified channels, and (4) natural streams. The District can conduct maintenance anywhere in the county, but maintenance activities are most frequently conducted in the channels identified in **Table 1-1**. Table 1-1 lists the channels the District directly owns or has maintenance easements for and the channel type. However, the channels listed in Table 1-1 are not a comprehensive list of the District's maintenance locations.

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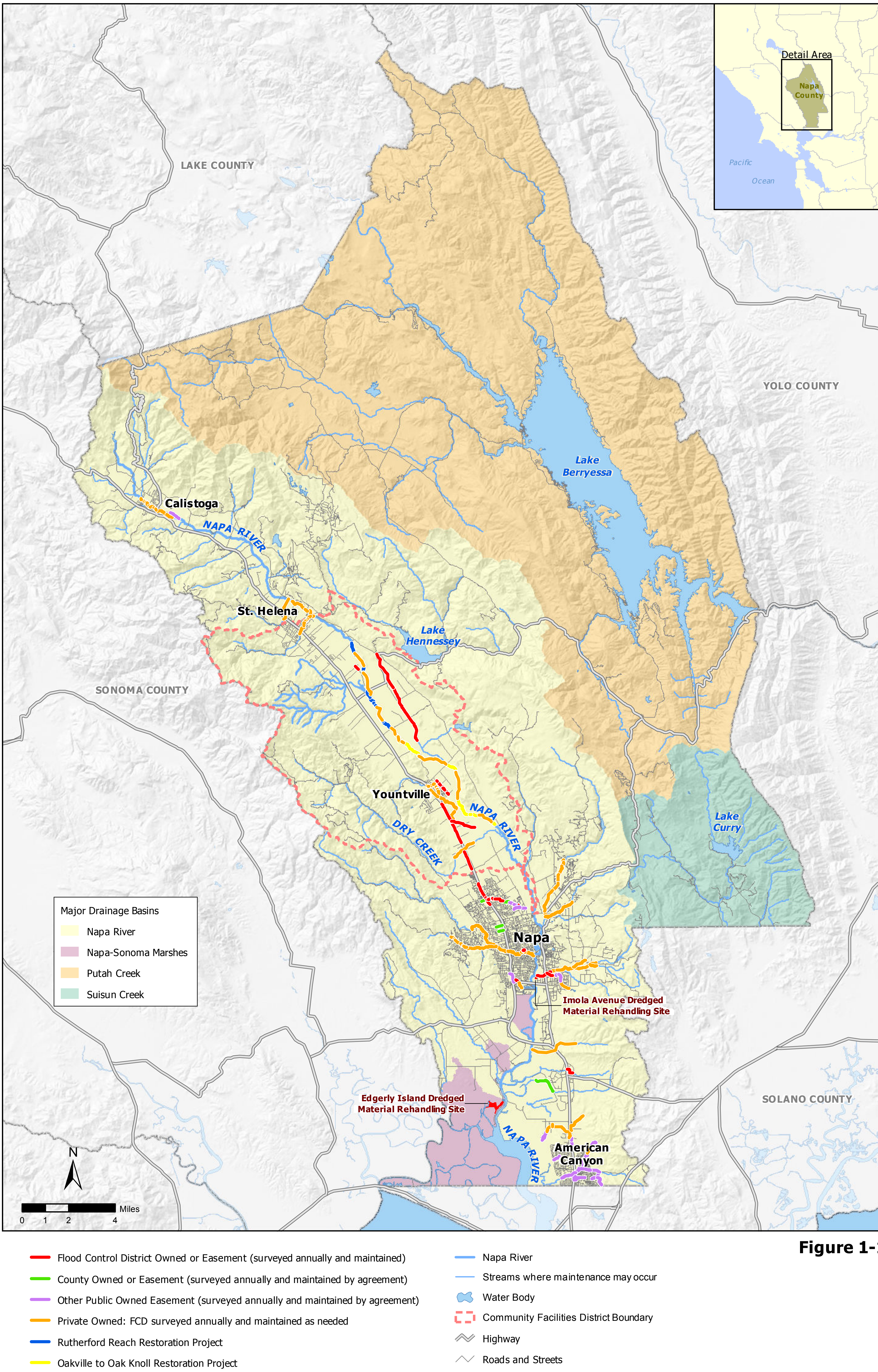

Figure 1-1

Napa County
Stream Maintenance Program Area
and Maintenance Reaches

Source: Napa County Flood Control & Water Conservation District, 2010; Napa County GIS, 2010. USGS

Back of Figure 1-1

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Miles

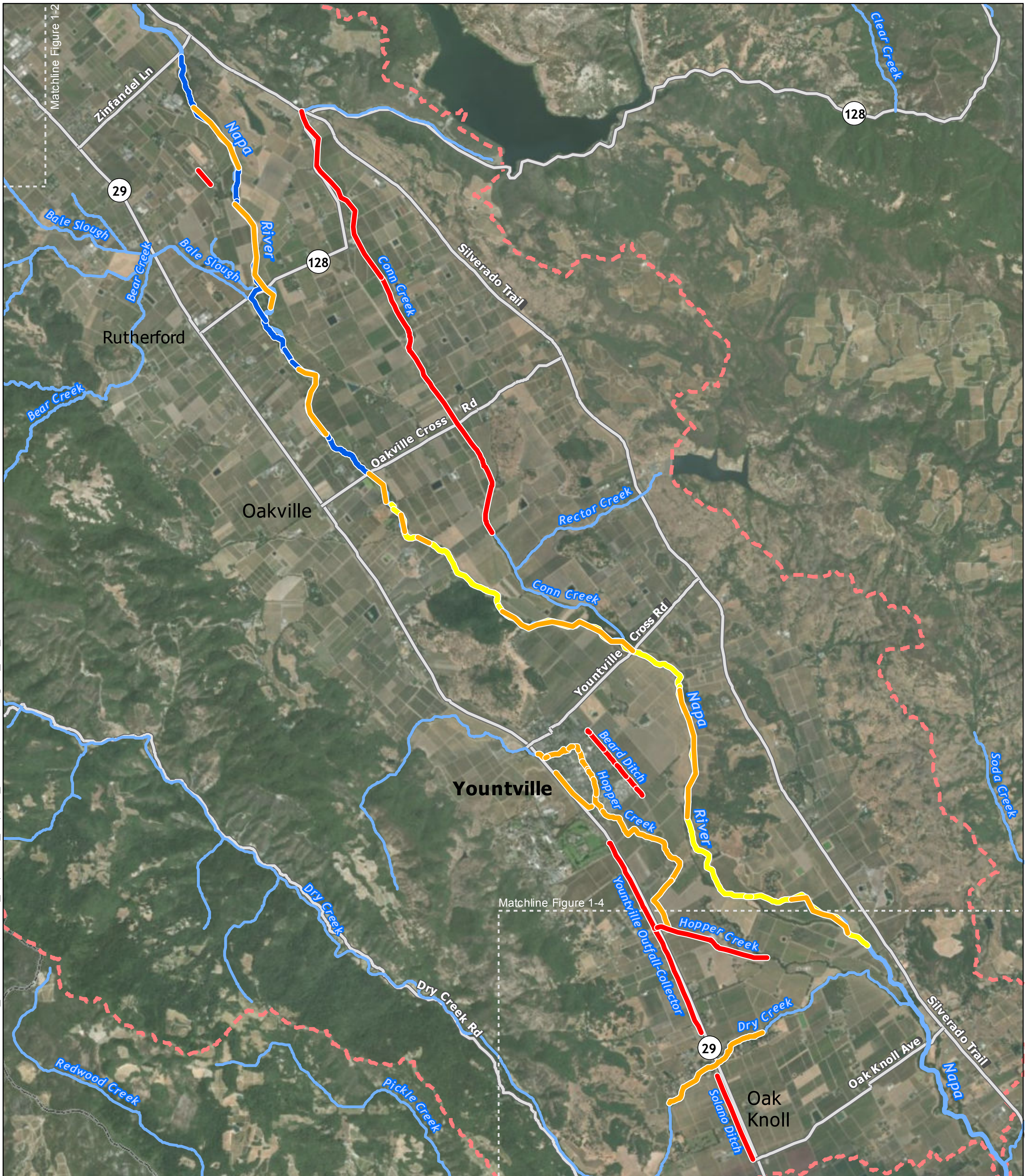
Horizon WATER and ENVIRONMENT

Flood Control District Owned or Easement (surveyed annually, maintained)
County Owned or Easement (surveyed annually, maintained by agreement)
Other Public Owned Easement (surveyed annually, maintained by agreement)
Private Owned: FCD surveyed annually, maintained as needed
Rutherford Reach Restoration Project
Oakville to Oak Knoll Restoration Project
Napa River
Streams where maintenance may occur
Community Facilities District Boundary

Figure 1-2

Napa County Stream Maintenance Program
Calistoga-St. Helena Region

Back of Figure 1-2



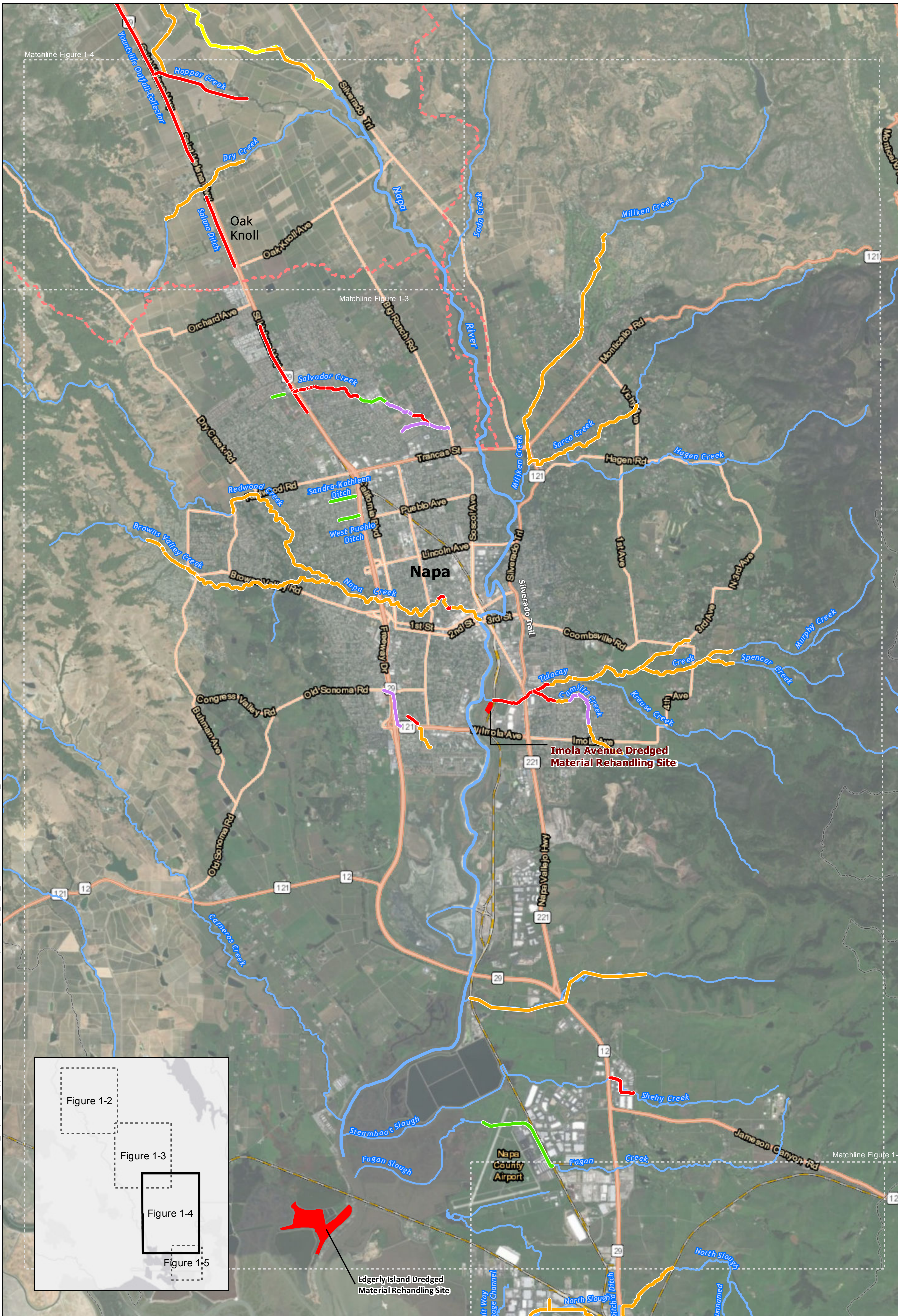
Flood Control District Owned or Easement (surveyed annually, maintained)
County Owned or Easement (surveyed annually, maintained by agreement)
Other Public Owned Easement (surveyed annually, maintained by agreement)
Private Owned: FCD surveyed annually, maintained as needed
Rutherford Reach Restoration Project
Oakville to Oak Knoll Restoration Project
Napa River
Streams where maintenance may occur
Community Facilities District Boundary
Roads and Highways

Horizon WATER and ENVIRONMENT

Figure 1-3

Napa County Stream Maintenance Program
Rutherford-Yountville-Oak Knoll Region

Back of Figure 1-3



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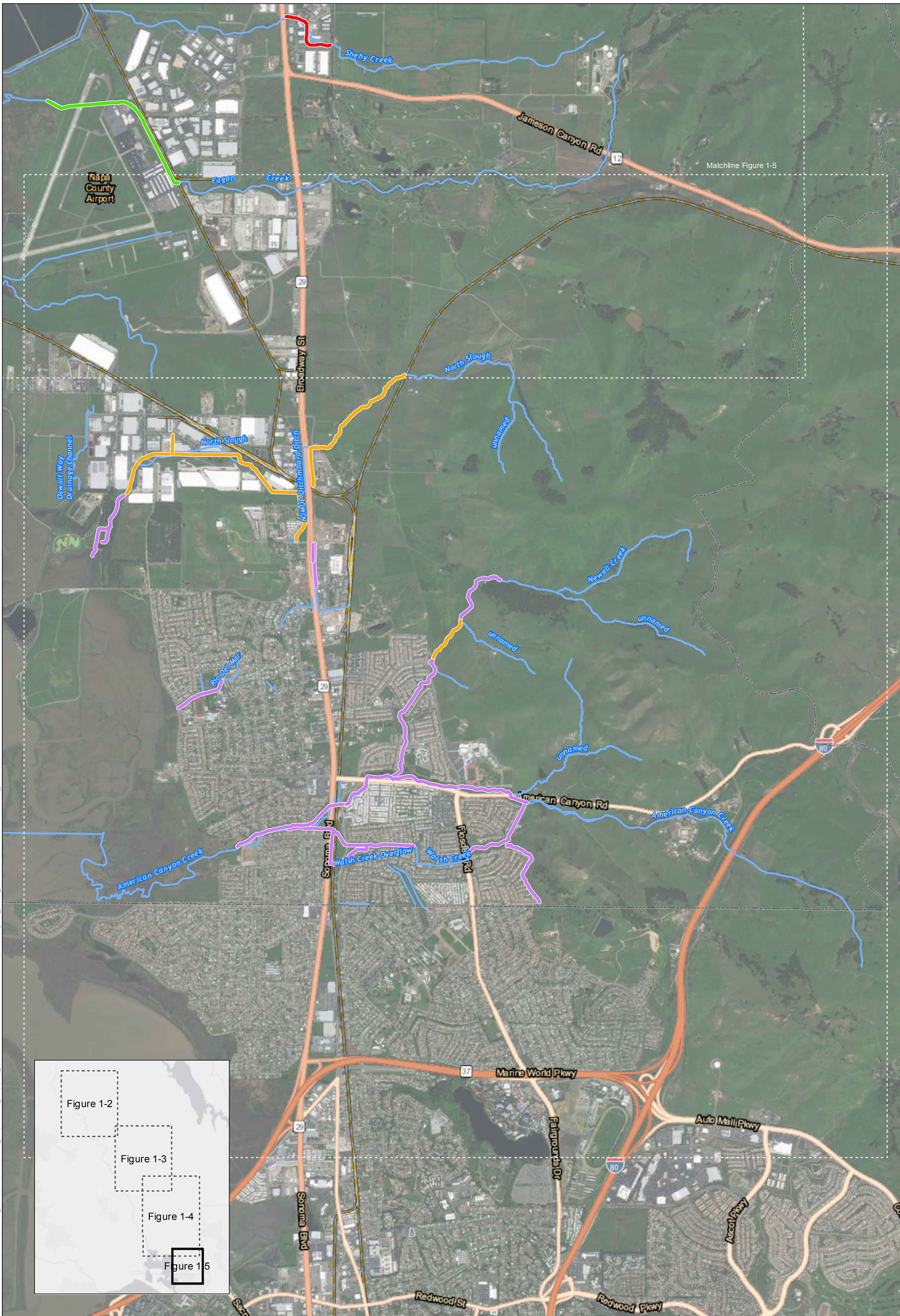
Horizon WATER and ENVIRONMENT

- Flood Control District Owned or Easement (surveyed annually, maintained)
- County Owned or Easement (surveyed annually, maintained by agreement)
- Other Public Owned Easement (surveyed annually, maintained by agreement)
- Private Owned: FCD surveyed annually, maintained as needed
- Rutherford Reach Restoration Project
- Oakville to Oak Knoll Restoration Project
- Napa River
- Streams where maintenance may occur
- Community Facilities District Boundary

Figure 1-4

Napa County Stream Maintenance Program
Napa Region

Back of Figure 1-4



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Miles

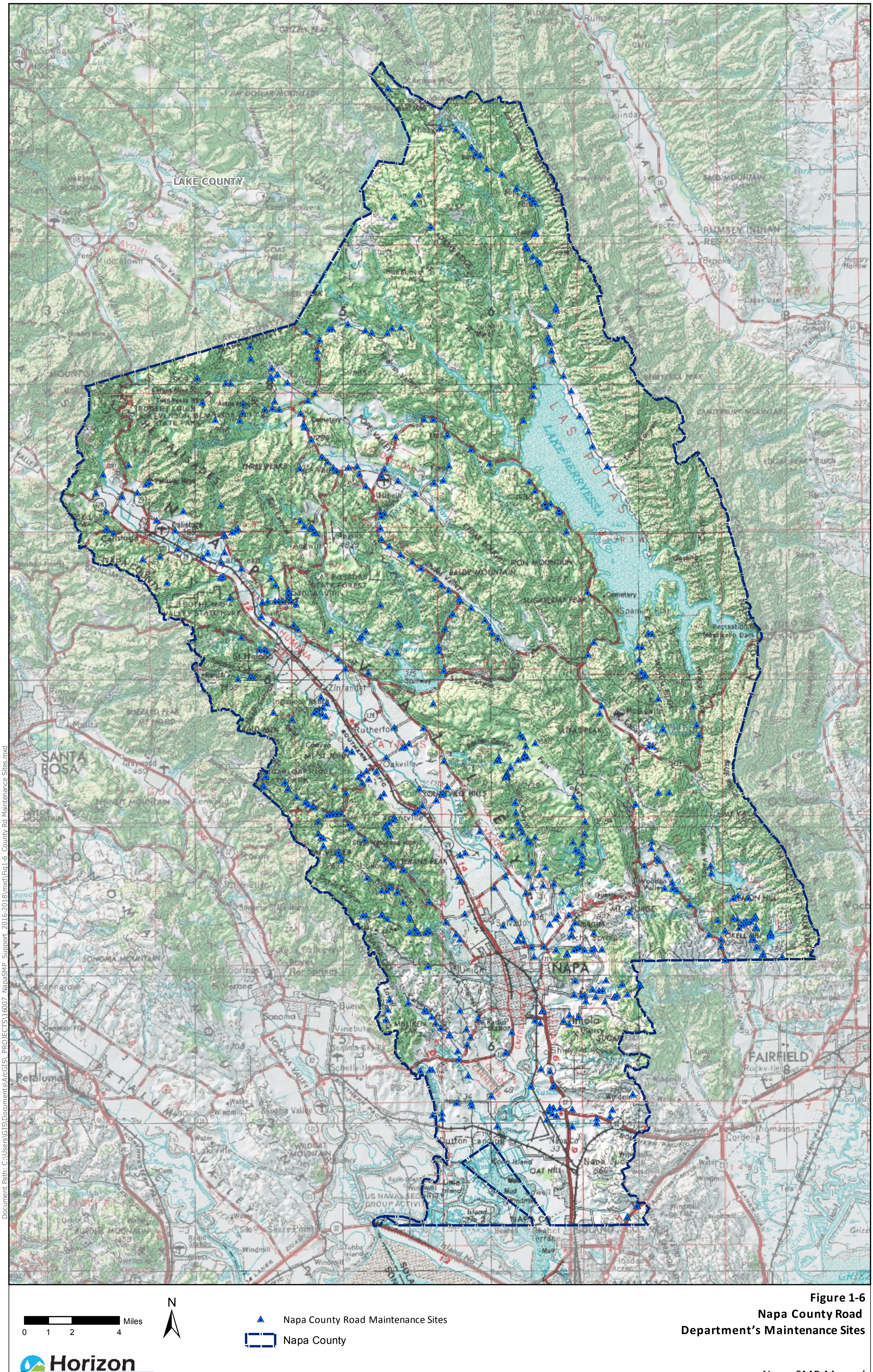
Horizon
WATER and ENVIRONMENT

Flood Control District Owned or Easement (surveyed annually, maintained)
County Owned or Easement (surveyed annually, maintained by agreement)
Other Public Owned Easement (surveyed annually, maintained by agreement)
Private Owned: FCD surveyed annually, maintained as needed
Rutherford Reach Restoration Project
Oakville to Oak Knoll Restoration Project
Napa River
Streams where maintenance may occur
Community Facilities District Boundary

Figure 1-5

Napa County Stream Maintenance Program
American Canyon Region

Back of Figure 1-5



Napa County Road Maintenance Sites

Napa County

Figure 1-6
Napa County Road Department's Maintenance Sites

Horizon WATER and ENVIRONMENT

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Back of Figure 1-6

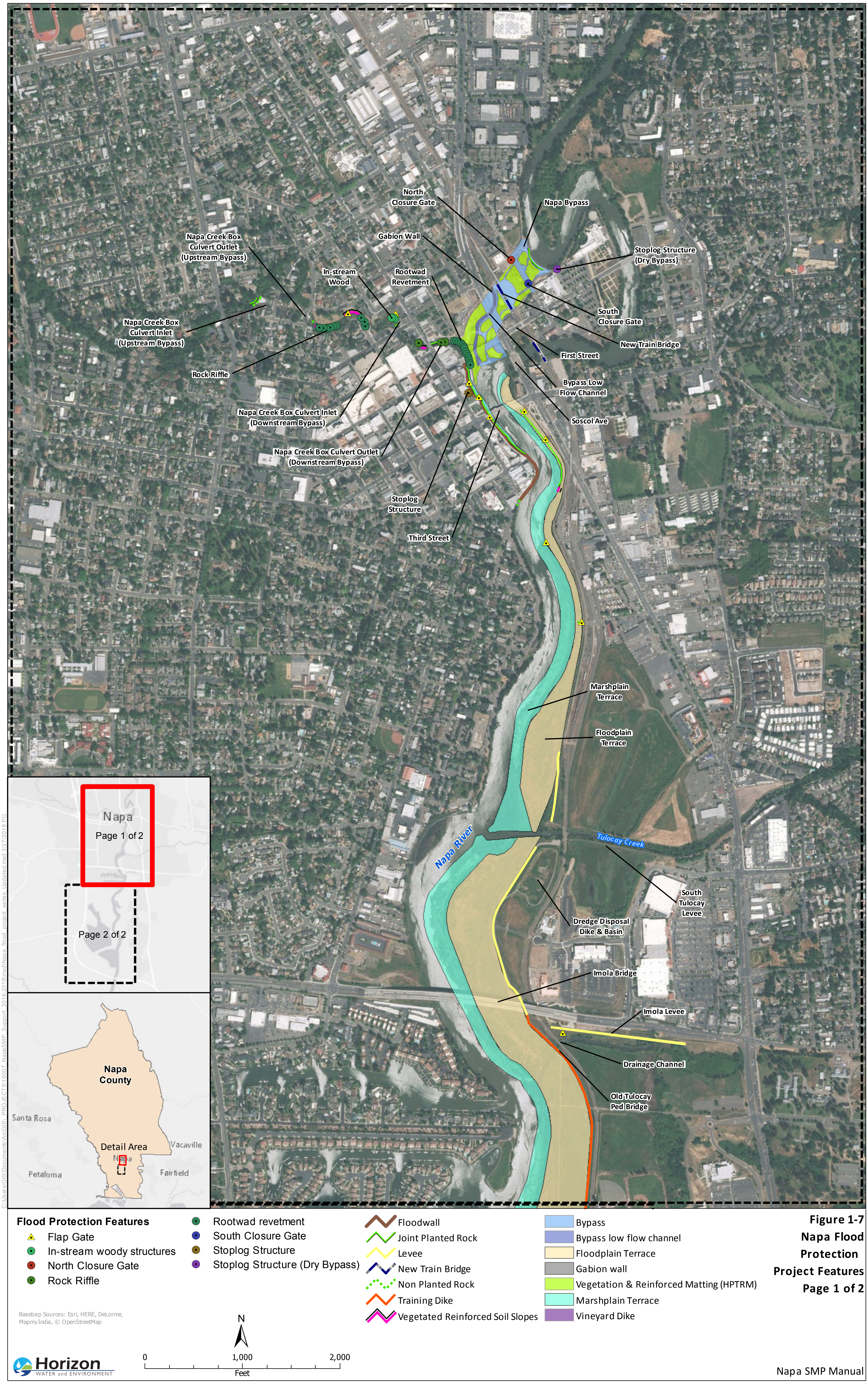
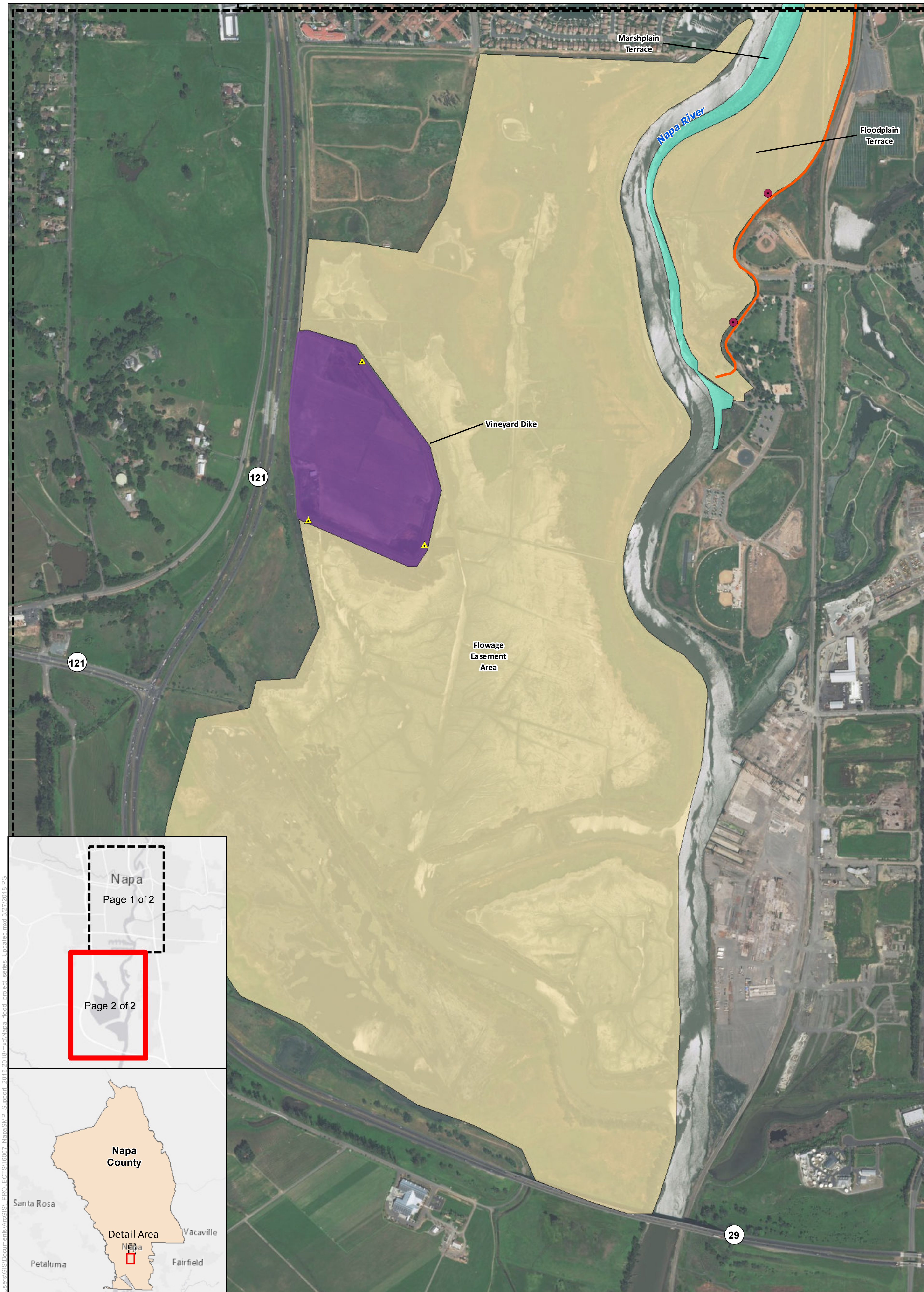


Figure 1-7 Napa Flood Protection Project Features Page 1 of 2

Back of Figure 1-7 (1 of 2)



Flood Protection Features

- Flap Gate
- Planting Berm
- Floodwall
- Joint Planted Rock
- Levee
- New Train Bridge
- Non Planted Rock
- Training Dike
- Vegetated Reinforced Soil Slopes
- Bypass
- Bypass low flow channel
- Floodplain Terrace
- Gabion wall
- Vegetation & Reinforced Matting (HPTRM)
- Marshplain Terrace
- Vineyard Dike

Basebap Sources: Esri, HERE, DeLorme, MapmyIndia, © OpenStreetMap

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Feet

Horizon
WATER and ENVIRONMENT

Figure 1-7
Napa Flood Protection Project Features Page 2 of 2

Back of Figure 1-7 (2 of 2)

Table 1-1. List of Maintenance Channel Reaches and Channel Type

District Easements	Engineered	Modified	Semi-modified	Natural
Conn Reach 1-3		X		
Beard	X			
Yountville Collector	X			
Yountville Oufall Reach 1	X			
Yountville Outfall Reach 2		X		
Solano Ditch	X			
Salvador Collector	X			
Salvador Creek Reach 1-2		X		
Salvador Creek Reach 3				X
Tulocay Creek Reach 1			X	
Tulocay Creek Reach 2		X		
Camille Creek				X
Sheehy Creek		X		
Fagan Creek	X			
Other Creeks Surveyed Annually				
Browns Valley Creek				X
Redwood Creek				X
Milliken Creek				X
Sarco Creek				X
Dry Creek				X
Sulphur Creek				X
York Creek				X
Napa River in Calistoga				X
Napa River Rutherford and OVOK Reaches				X
Bear Creek Tributary Restoration Project				X
Murphy Creek				X
Napa Creek			X	X
Hopper Creek			X	
American Canyon Creek		X		
Newell Creek		X		
North Slough		X		
Rio del Mar		X		
Walsh Creek		X		

Engineered flood control channels are typically v-shaped or trapezoidal channels (or ditches where they are small). In some locations, such channels are referred to as “collectors” where they may typically collect runoff from other small local drainages, often running parallel to major roads. Examples of engineered flood control channels include the Yountville Collector and Solano Ditch. “Collector” channels in Napa County, such as the Yountville Collector or Salvador Collector channels typically collect and convey flows near roads and rail lines that may intersect the original pathway of the creek. Collectors were designed with steepened banks (generally 2:1 or less), little to no riparian corridor vegetation, and currently support poor quality habitat for species such as salmonids. These channels are typically filled with aquatic vegetation, such as cattails. **Figure 1-8** illustrates a typical cross section for engineered channels or collectors.

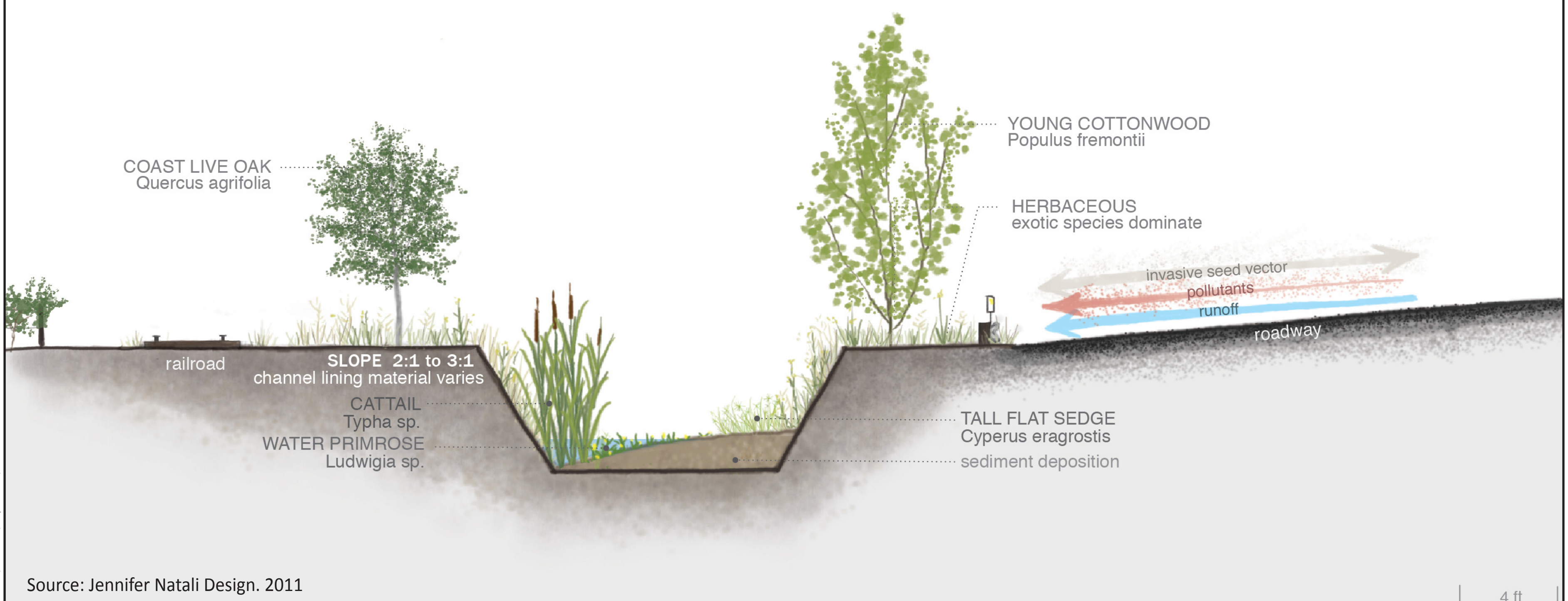
Modified channels are channels that have been widened or straightened to increase channel conveyance capacity, but not necessarily engineered to a specific design flow or specification. Examples of modified channels include the Yountville Outfall and lower reach of Salvador Creek. A typical cross section for a modified creek is shown in **Figure 1-9**. These channel reaches were primarily modified to prevent flooding of adjacent agricultural and residential developments. The banks and overall alignment of the creek channel is wider and straighter than typical natural channel to allow for increased flow conveyance capacity. Modified channels often support a low flow channel nested within the channel bed and some riparian corridor vegetation.

Semi-modified channels maintained by the District are illustrated in **Figure 1-10**. Examples of these channel types are found at Conn Creek and Tulocay Creek. In comparison to modified channels, semi-modified channels typically have natural, un-modified stream beds and support a higher percentage of native vegetation to non-native vegetation, and a moderate to mature riparian corridor. The banks of these channels may have been modified to prevent flooding or bank erosion.

District maintenance of natural channels (as illustrated in **Figure 1-11**) is far more limited than its maintenance activities in modified and engineered channels. Maintenance activities in natural channels are generally limited to vegetation and large woody debris (LWD) management, invasive species eradication support, removal of trash, debris, and abandoned structures, and consultations on erosion and bank stabilization. District staff typically do not conduct sediment removal or bank stabilization activities in natural channels.

Solano Ditch

Yountville Collector



Source: Jennifer Natali Design. 2011

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Horizon WATER and ENVIRONMENT

Figure 1-8
Typical Channel Cross Section - Collector

Salvador Creek: Reach 1

Yountville Outfall: Reach 1

Source: Jennifer Natali Design. 2011

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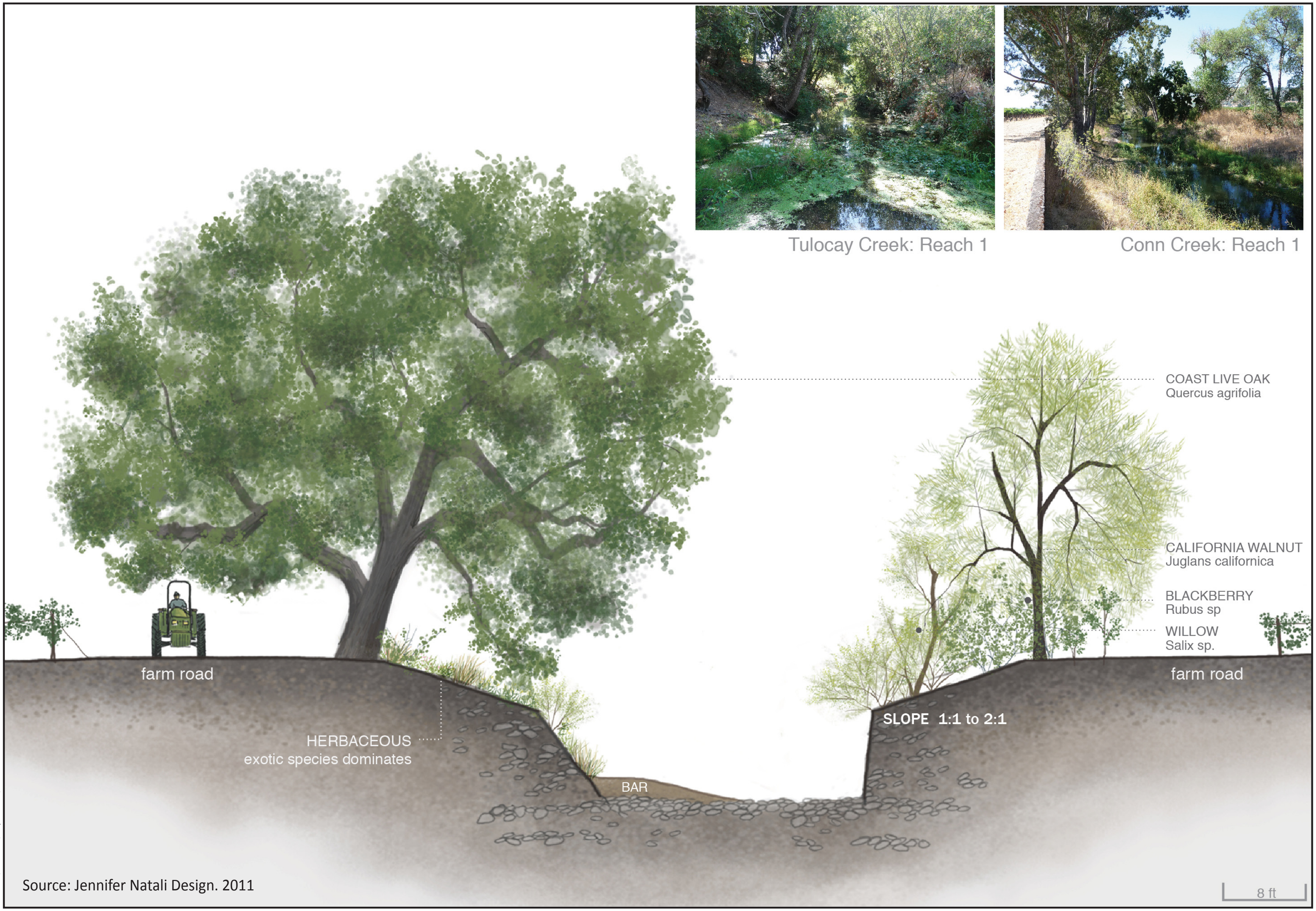
Horizon WATER and ENVIRONMENT

Figure 1-9
Typical Channel Cross Section - Modified



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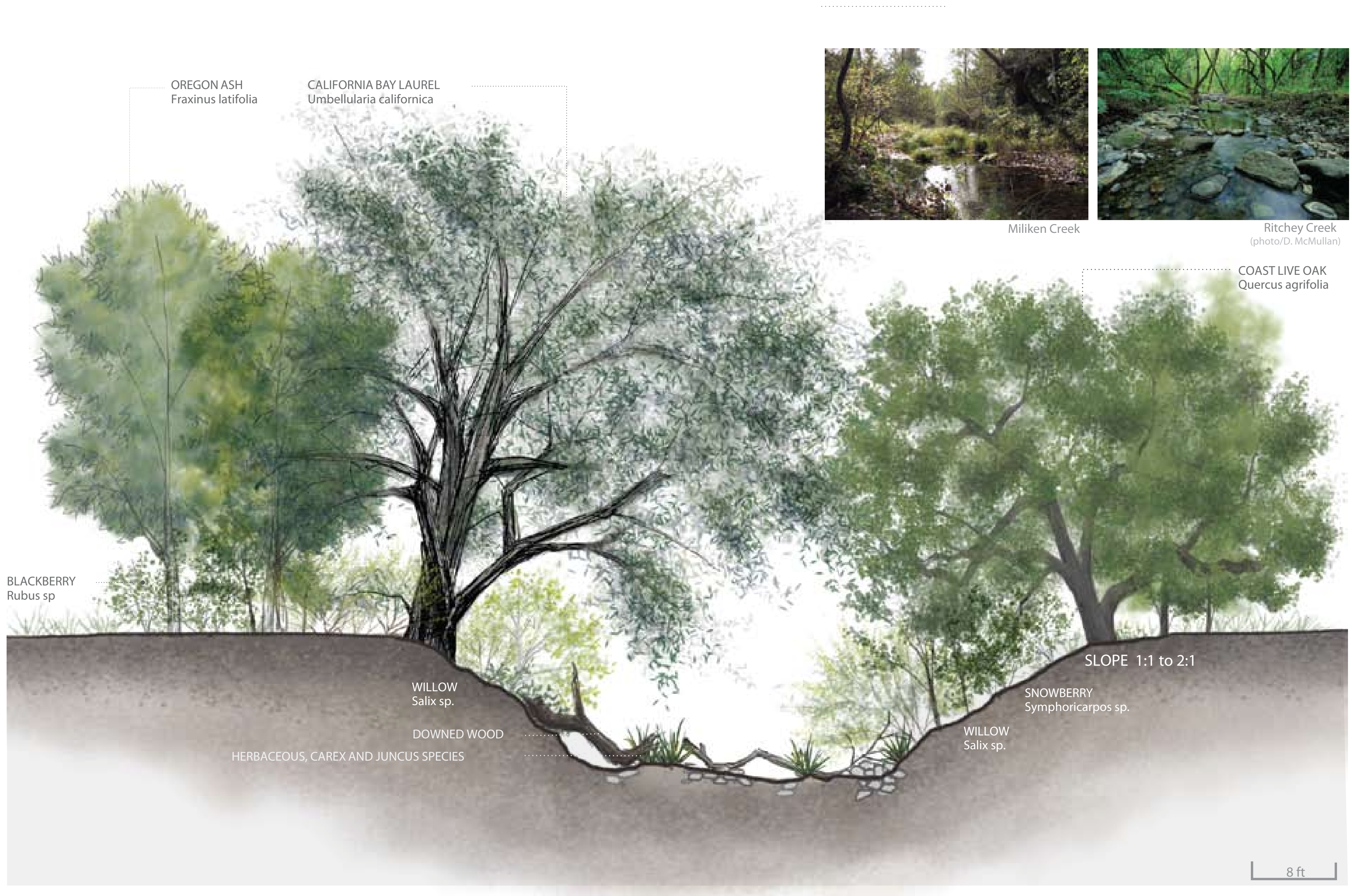
Horizon WATER and ENVIRONMENT

Figure 1-10
Typical Channel Cross Section - Semi-modified and Natural



Source: Jennifer Natali Design. 2012

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Horizon WATER and ENVIRONMENT

Figure 1-11
Typical Channel Cross Section - Natural Channel

This maintenance program operates in channels owned by various parties, not just the District. Where the District conducts maintenance, but does not own the channel, then they have maintenance arrangements or easements with other parties to facilitate the maintenance work. These ownership-maintenance arrangements are described below. Whereas Section 1.3.1 above described the general channel types, the discussion below is focused on ownership and the status of maintenance agreements. The maps of Figure 1-1 through Figure 1-6 show different channel ownership status by color.

District Owned Channels / Easements Maintained (Red Channels): The District maintains 7.3 miles of flood control channels that it owns and has maintenance easements for. Many of these District owned channels are engineered channels, typically built by other agencies and deeded to the District. A few of these channels were designed and built to convey a specific design discharge (i.e. the 100-year flood event), but most have no known specific discharge design. Most of these flood control channels were constructed with a trapezoidal cross-section with earthen banks and streambeds. Some channels have sections with hardened banks and beds formed in rock or concrete. Bed and bank hardening typically occurs at or near road and culvert crossings to protect these structures. Typical maintenance activities in District owned channels includes vegetation thinning and pruning, grass mowing (maintenance roads), erosion protection and bank stabilization, sediment and debris removal, trash removal, exotic and invasive vegetation removal, and native tree and shrub planting. Structures and facilities such as access roads, drop inlet culverts, outfalls, flap gates, and road crossing culverts constructed in association with the District's flood control channels may also require routine maintenance. Often, intersecting drainage structures, bridges and adjacent roadways, or other infrastructure is owned by an entity other than the District. District owned channels are surveyed annually for their maintenance condition. An annual maintenance workplan is developed based on the annual survey to identify and prioritize maintenance activities.

County Owned Channels / Easements Maintained (Green Channels): These channels (4.2 miles) are owned by Napa County (not the District), but the District performs channel maintenance on them on behalf of the County. Although the District conducts maintenance, it is not obligated to do so, or to maintain any specific level of hydraulic capacity. These channels are generally engineered channels or ditches, but also include some modified streams. County owned and District maintained channels include a portion of lower Salvador Creek, Maher-Trent Ditch, Sandra-Kathleen Ditch, and West Pueblo Ditch and Fagan Creek near the Napa County Airport (Figure 1-4). In general, the level of maintenance and the activities performed on these County owned creeks is very similar to those described above for District owned red channels. The District surveys these County owned green channels annually and determines their maintenance needs and priorities in coordination with the County.

Other Public Owned Channels / Easements Maintained (Purple Channels): These channels (1.5 miles) are similar to the above but owned by other public entities such as towns or cities, school districts and the District provides consultations and offers maintenance support upon request by the public entity landowner. Example purple channels include a section of lower Salvador Creek, portions of the Salvador Creek Tributary, and a small reach of Camille Creek that are owned by the City of Napa and Hopper Creek owned by the Town of Yountville (Figure 1-4). For example, the District and the Town of Yountville have established an agreement that allows the District to conduct specific maintenance activities (e.g., sediment management, debris removal, and planting) within Hopper Creek (see Appendix D). Maintenance activities, and the survey and maintenance prioritization process described above for District and County owned channels generally also applies to purple channels.

Privately Owned Streams Annually Surveyed for Possible Maintenance (Orange Channels): Most of Napa County's natural streams are owned by private landowners. The District has identified several flood-prone stream reaches, generally within urban areas, where the District surveys conditions to identify potential maintenance needs. If a maintenance need is identified, the property owner is contacted and permission is requested prior to the District conducting any maintenance. Example orange channels include portions of the Napa River and Sulphur Creek in northern Napa County (Figure 1-2), Hopper and Dry creeks in the Yountville region (Figure 1-3), and Browns Valley, Redwood creeks, and some portions of Tulocay Creek in the City of Napa region (Figure 1-4). The Rutherford and Oakville to Oak Knoll reaches of the Napa River are included in this category; these river reaches are privately owned but maintained by the District. Maintenance activities are generally limited to vegetation and LWD management, invasive species eradication support, removal of trash, debris, and abandoned structures, and consultations on erosion and bank stabilization. The District's Bank Stabilization Cost Share Program is available to support biotechnical bank repairs (using vegetation) on private property. The District maintains streambanks in the Rutherford and Oakville to Oak Knoll reaches of the Napa River as part of the maintenance agreements for those two restoration projects. The District typically would not conduct sediment removal or hardscaped bank stabilization activities in these privately-owned streams. This is particularly true in non-urban areas. However, District support is available to support such activities, if it is warranted, and if the owner obtains all required regulatory permits.

Other Streams – Maintenance upon Request: The remaining creeks in Napa County, shown as thin blue lines in the maps of Figure 1-1 through Figure 1-4 are privately owned creeks where District supported maintenance may occur only following a specific owner request for support and District evaluation and confirmation that the request is suitable. Maintenance work in these channels may typically involve clearing debris or vegetation management to address a flow obstruction or erosion concern. Similar to privately owned streams described above, the District's Bank Stabilization Cost Share Program is available to support installing biotechnical bank repairs on private property. The District typically do not conduct sediment removal or hardscaped bank stabilization activities in these other streams.

The District offers its support to both public and private landowners within the District to provide technical assistance for stream-related problems and develop a consistent local strategy for sustaining natural streams. Such District involvement helps to reduce potentially more impacting maintenance approaches by well-meaning but often untrained property owners. District staff regularly conducts public outreach to educate stream owners about stream care.

1.3.3 Dredged Material Rehandling Sites (Red)

The District plans to obtain permits for dredge spoil storage operations at the Edgerly Island and Imola Avenue dredged material rehandling sites under a separate process outside of this stream maintenance program. In the meantime, the SMP is intended to cover ongoing routine maintenance activities at these two sites.

Edgerly Island. The Edgerly Island dredged material rehandling site is located approximately 3.5 miles northwest of the City of American Canyon and bordered by the Napa River to the east and Mud Slough to the west (Figure 1-4). The District purchased the 39-acre property in 1981 for placement of dredged material from the Napa River. The site was modified in 2004 and has capacity to receive approximately 300,000 cubic yards (CY) of material. The District conducts routine disking of the land surface, controls invasive plants, maintains flow gates, and manages ditch drainage on the property. The District also owns the 45-acre parcel adjacent to the west. This site is maintained as a wetland mitigation site. Maintenance conducted on the 45-acre parcel are minimal and primarily include maintaining tide gates.

Imola Avenue. The Imola Avenue dredged material rehandling site is an excavated earthen basin located in the City of Napa on the east bank of the Napa River at the previous location of the Napa Sanitation District's wastewater treatment plant (Figure 1-4). This site is owned by the District and has the capacity to receive approximately 50,000 CY of material dredged from the Napa River. Maintenance activities conducted on this property include annual disking, mowing the basin levee, and maintaining drainage outfall structures.

1.3.4 Restoration Projects

Napa River Restoration: Rutherford Reach Maintenance (Dark Blue). The District, in consultation with the Rutherford Landowner Advisory Committee, proactively conducts restorative activities for properties in the Assessment District, and maintains features constructed as part of the Restoration Project that collectively result in more stable streambanks for the benefit of the property owners. Maintenance activities are identified in the *Rutherford Reach Restoration Maintenance Plan* and *Oakville to Oak Knoll Maintenance Plan* (included as Appendix A) and include vegetation management, large woody debris realignment and/or relocation, debris/large trash removal, biotechnical bank stabilization, controlling non-native invasive plants and Pierce's disease host plants, maintaining the function of in-stream habitat enhancement structures, and annual surveys and reporting.

Napa River Restoration: Oakville to Oak Knoll Reach Maintenance (Yellow). Similar to the Rutherford Reach, the Oakville to Oak Knoll Reach restoration project is also maintained by the District. Maintenance is conducted according to the *Napa River Restoration: Oakville to Oak Knoll Reach Community Facilities District Guidance Document* (included as **Appendix B**). Annual maintenance activities include monitoring, including annual surveys, vegetation management, downed tree and debris management, and biotechnical bank stabilization projects. Maintenance goals are to minimize bank erosion, maintain functioning of constructed in-stream habitat enhancement structures, and controlling non-native invasive plants and Pierce's disease host plants.

1.3.5 Resource Conservation District Maintenance Projects

The Napa County RCD assists landowners with maintenance of privately owned unpaved roads throughout the County to prevent impacts on water quality and stream hydrology due to erosion and increased road runoff. Maintenance activities include installing or replacing stream crossings (ford crossings, armored fill crossings, culverts), decommissioning stream crossings, installing cross-road drains (deep waterbars), and converting unused roads to recreational trails. Typically, the RCD supports private property owners along a maximum of 5 miles of roads per year.

1.3.6 Napa County Roads Maintenance Activities

The County Roads Division is responsible for road maintenance within the County unincorporated area. Where roads and stream intersect such as at road creek crossings and culverts (Figure 1-6), maintenance activities include clearing sediment and debris from concrete-lined channels and around structures, vegetation management, herbicide application, downed tree removal, replacement plantings, culvert replacement, biotechnical bank stabilization, and repair or in-kind replacement of drainage structures (e.g., storm drain outfalls, tide gates, sediment basins, trash racks, bridges and access ramps). As part of the SMP, the District may support the above-described maintenance activities on behalf of the County at stream crossings or where stream management is required and regulatory notifications have occurred in accordance with the District's permit conditions.

1.3.7 Napa River / Napa Creek Flood Protection Project

As described in Section 1.1, above, the District is responsible for maintaining features of the Flood Protection Project which includes about 6.7 miles of the Napa River and two-thirds of a mile along Napa Creek. The project is intended to reconnect the Napa River to its floodplain, create wetlands throughout the area, maintain fish and wildlife habitat, and retain natural characteristics of the Napa River. Completed project features include creation of marshplain and floodplain terraces; two bypass culverts along Napa Creek; construction of levees, dikes and floodwalls; biotechnical bank stabilization; two new railroad bridges; utility relocations; maintenance roads; recreational trails; and flood closure gates. The locations of project features subject to ongoing maintenance are shown in Figure 1-7. Maintenance activities associated with the Flood Protection Project that are consistent with activities currently conducted by the District include clearing debris and obstructions from improved channels and floodways; monitoring and removing sediment; vegetation management and erosion protection on levees, dikes and berms; inspection and maintenance of two underground box culvert bypasses along Napa Creek; and repair of riprap and planted rock slope protection along Napa River and Napa Creek. In addition, storm drainage facilities that require inspection and maintenance under the O&M Manual include drainage channels, flapgates, and storm drainage inlets and outlets.

Specific vegetation management activities include monitoring and replanting vegetation on the marshplain terrace, removing invasive vegetation and debris in the southern portion of the project area (between Imola Avenue and the Highway 29 crossing), maintaining vegetation at the dry bypass inlet and outlet, and monitoring grazing activities in the southern portion of the Flood Protection Project. As noted previously, maintenance activities associated with the Flood Protection Project and that are consistent with maintenance activities currently conducted by the District are described in more detail in the USACE authorized O&M Manual and thus incorporated by reference in this Manual (Appendix M).

1.4 Summary of Maintenance Activities

The SMP includes the following primary activities: vegetation management including invasive plant management, tree maintenance, and downed tree management; erosion protection and bank stabilization; sediment and debris removal and small habitat enhancement projects. These core maintenance activities occur mainly in District, County, or City owned engineered flood control channels shown as red, green, and purple channels in Figure 1-1 through Figure 1-5, and in a limited manner in other streams.

These maintenance activities are summarized below and described in more detail in Chapters 5 through 9. Chapter 10 describes maintenance activities conducted at restoration projects within the CFD, sediment rehandling sites at Edgerly Island and Imola Avenue, and the Edgerly Island mitigation wetland. Chapter 11 describes the RCD's maintenance activities. Other minor and less frequent maintenance activities conducted by the District are described in Chapter 12. Impact avoidance and minimization measures are discussed in Chapter 4 and the mitigation program is described in Chapter 13.

While this Manual focuses on describing maintenance activities, the District also recognizes it is important to identify the underlying causes that may lead to maintenance being required. To this end, the District is committed to understanding the reasons why maintenance is needed, including tracking the frequency of maintenance, monitoring which activities are conducted where, and identifying whether locations are inherently more prone to certain maintenance activities. Chapter 14 includes a general workplan that the District undertakes to improve its understanding of channel conditions, identify potential underlying causes for maintenance, and develop channel discharge and vegetation objectives.

1.4.1 Vegetation and Tree Management

Vegetation management generally refers to the trimming, pruning, mowing, and removal of flow-constricting vegetation, or vegetation creating excess instream roughness within the flood control channels and other constructed facilities. Specific maintenance activities presented in this Manual include invasive plant management (Chapter 5), tree and vegetation maintenance (Chapter 6), and downed tree management (Chapter 7). Vegetation management activities are conducted to maintain flow conveyance capacity, reduce vegetation directed flow that causes bank erosion, establish a canopy of riparian trees, and control invasive vegetation. Management methods include hand removal, mechanical removal, and herbicide applications. Vegetation management and removal activities are relatively consistent from year to year, though locations change depending on recent growth and blockages. Vegetation management also includes the planting new trees and shrubs along District channels. Vegetation management is performed in a manner to prevent loss of habitat and erosion and does not include clear cutting or wholesale removal of vegetation or use of herbicides to control submerged vegetation.

1.4.2 Erosion Protection/Bank Stabilization and Managed Streambank Retreat

The repair and stabilization of stream banks is undertaken when a bank is weakened, unstable, or failing. If left untreated, eroding or failing streambanks can cause damage to adjacent properties; increase the flood hazard and threaten public safety; threaten and impair roads, transportation, and access; generate erosion and increase downstream sediment yields; and impacts to riparian habitat and other natural resources. The District and County repairs and stabilizes eroding or failing streambanks to address these issues and prevent further degradation of stream conditions. Depending on the amount of precipitation received, five to ten bank stabilization projects are conducted annually, with each project covering approximately 100 to 500 linear feet (lf) of stream bank. Bank stabilization repairs in engineered channels within the County's jurisdiction are typically 200 lf or less, while bank repairs within natural creeks are limited to 100 feet. Bank stabilization activities for an individual project beyond 1,000 feet are considered beyond routine and outside of the program. Under this program, the District and County are limited to conducting 2,500 lf of bank stabilization projects in a given year. Bank stabilization activities are generally conducted between June 15th and October 31st when streams are at their driest. When possible, bank stabilization is conducted in a preventative manner by planting exposed banks with appropriate native species. If a more engineered approach is needed, biotechnical approaches are preferred. Limited prescriptive biotechnical designs are included in this manual. More involved projects are subject to individual project permits.

Managed Streambank Retreat. Managed streambank retreat is a passive restoration approach where a landowner removes vineyards within a buffer area along the river channel and installs an alternative agricultural crop that can thrive in a riparian buffer zone or restores the area with native riparian and upland plant species. Within the managed streambank retreat zone, landowners are agreeing to allow the river to naturally expand with the understanding that the District will implement maintenance actions to stabilize the stream bank before it reaches the defined managed retreat line. The District will collaborate with landowners to manage these areas in a manner that meets the riparian enhancement objectives and is consistent with the landowner’s land management regime. Typical maintenance actions will include the planting of native riparian and upland species, invasive and Pierce’s disease plant management, biotechnical bank stabilization, grading the upper bank to form a stable slope, and erosion control measures.

Currently, landowners within the CFD boundary can participate in the managed bank retreat technique. The overall goal of managed streambank retreat is to expand this land management concept to create a more expansive riparian corridor along the Napa River and its tributaries for terrestrial species and to better support long-term habitat sustainability. Further discussion of this maintenance concept is provided in Chapter 8, *Streambank Protection and Stabilization*.

1.4.3 Sediment and Debris Removal

Deposited and accumulated excess sediment in District maintained channels can reduce flow capacity and thereby increase the potential for flooding. Sediment removal activities are focused to target channels whose conveyance capacity is significantly limited due to accumulated sediment and debris. Besides improving flow conveyance for flood management, sediment removal activities may provide other beneficial outcomes including improved fish passage, improved circulation and water quality, enhanced geomorphic functions, and improved aquatic habitat. Sediment and debris removal activities are generally conducted from June 15th to October 31st when streams are typically at their driest. The number of sediment removal projects undertaken annually and the quantity of sediment removed in a given year depend on recent weather and hydrologic conditions, as well as the frequency and extent of past maintenance activities.

The District typically implements small-scale localized sediment removal activities in channel segments roughly 250-500 feet long, and the City of American Canyon typically conducts small-scale sediment removal in channels typically 100-200 feet long. At sites within the County Roads Division’s jurisdiction, localized debris and sediment removal is confined to areas within and around existing culverts and flood control channels (up to 200 CY). On average 100 to 500 CY of sediment is removed from up to ten sites per year. Most commonly, the District needs to alleviate a specific flow concern at an individual crossing, culvert, or other in-channel facility that experiences moderate sediment accumulation. A sediment removal project may include vegetation management as well, such as when cattails are removed and the District removes sediment accumulation below the cattails in the rooting zone. Removed sediment and debris is taken to appropriate disposal sites based on the quality and conditions of the collected sediment and debris. Chapter 9 describes the program’s disposal activities. The Maintenance Program does not include large sediment removal projects that are not routine as described in this Manual.

1.4.4 Maintenance Activities Compared by Channel Type

Figure 1-12 summarizes the range of maintenance activities routinely conducted in maintained channels according to channel type. Figure 1-11 includes photographs of project examples in District creeks and a summary of the key maintenance issues with the different channel types. The extent and intensity of maintenance is least at natural channels and semi-modified channels and more involved for modified channels and collector channels.

The maintenance activities identified in Figure 1-11 for frequently maintained channels are representative of the work implemented by channel type throughout the County.

1.4.5 Maintenance Activities Compared by Adjacent Land Use Type

The frequency and intensity of maintenance activities are influenced by adjacent land uses. In developed or urbanized areas, the full suite of maintenance activity types (vegetation management, bank stabilization, and sediment/debris removal) may be implemented to protect life and property from potential flood damage. The majority of urbanized areas and residences are clustered in the valley floor where the land is flat. This is also where much of the sediment transported from upstream tributary areas deposits in stream channels and reduces channel conveyance capacity.

Key concerns for stream maintenance adjacent to vineyards or other farmed lands are loss of valuable agricultural property due to bank erosion often caused by downed trees or other channel stabilization issues. As such, downed tree management and bank stabilization are the most frequent maintenance activities implemented adjacent to agricultural property.

In open space areas such as County parks, land preserves, and upper tributary areas, the land is allowed to moderate itself naturally and maintenance activities are less frequently conducted. If a downed tree is blocking public access, blocking a culvert, or threatening adjacent private property, the District will address the tree following its downed tree management protocols (see Chapter 7.)

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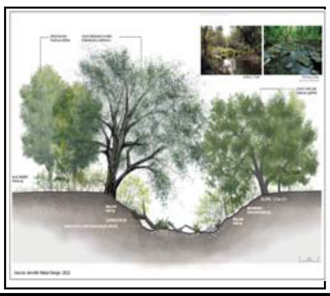
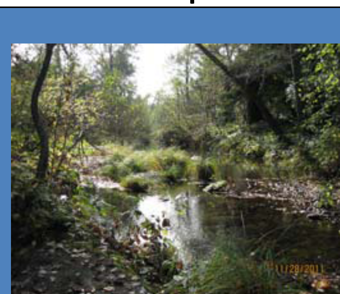
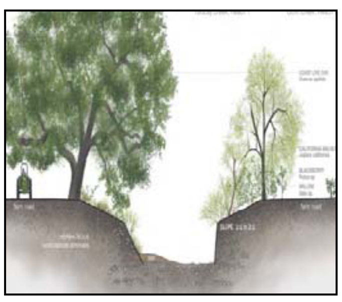
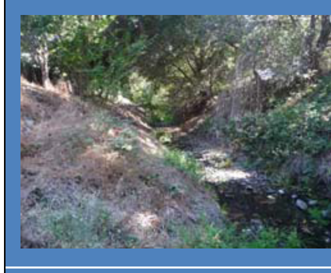
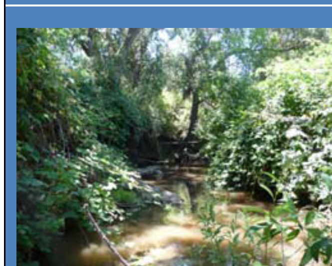
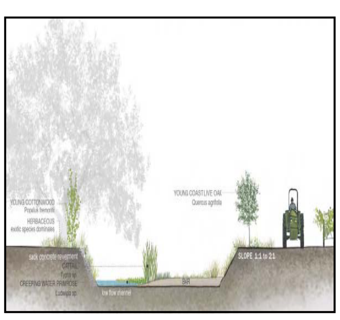
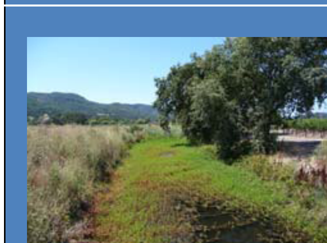
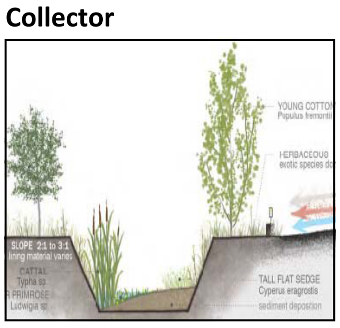
Figure 1-12. Stream Maintenance Activity by Channel Type

Channel Type	District Example	Creek	Key Issue	Vegetation Management	Downed Tree Management	Large Woody Debris (LWD) Recruitment	Invasive Removal	Sediment Removal	Debris Removal	Bank Stabilization	Habitat Enhancement
				Maintenance Activities							
Natural Channel 		Natural Channel	Invasive Exotic Species (Arundo), Downed Tree, Bank Instability, Dumping, Flooding, Native Plant Restoration Maintenance	O	O	●	●	O	●	O	●
		Rutherford & Oakville to Oak Knoll		●	●	●	●	O	●	●	●
Semi-Modified 		Conn 1,2,3, Camille, Tulocay 1	Invasive Exotic Species (Ivy, Privet, Eucalyptus, Blackberry), Bank Instability, Incision, Downed Tree, Flooding	●	●	●	●	O	●	●	●
		Salvador 3	Invasive Exotic Species (Ludwigia, Blackberry, Ivy), Willow Pruning Sediment Accumulation, Dumping, Downed Tree, Bank Instability Poor Canopy Structure	●	●	●	●	O	●	●	●
Modified 		Salvador 1,2	Invasive Exotic Species (Blackberry, Ludwigia, Harding grass, Periwinkle), Flooding, Dumping, Downed Tree, Willow Pruning, Native Plant Restoration Maintenance	●	●	●	●	●	●	●	●
		Sheehy, Fagan	Invasive Exotic Species (Blackberry, Sweet Fennel, Poison Hemlock), Flooding, Dumping, Downed Tree, Willow Pruning	●	●	●	●	O	●	●	●
		Yountville Outfall,	Poor Canopy Structure, Sediment Accumulation, Downed Tree, Invasive Exotic Species(Ludwigia, Harding Grass, Wild Radish), Flooding, Native Plant Restoration Maintenance	●	●	●	●	●	●	O	●
Collector 		Yountville, Salvador Collectors	Poor Canopy Structure, Bank Instability, Invasive Exotic Species (Ludwigia, Harding Grass), Sediment Accumulation, Dumping, Flooding, Native Plant Restoration Maintenance	●	●	●	●	●	●	●	●
		Beard, Solano, Webber Ditch	Invasive Exotic Species (Periwinkle, Harding Grass, Blackberry), Poor Canopy Structure, Bank Instability, Stormwater Runoff, Dumping	●	●	O	●	●	●	●	●

● Maintenance Activity May be Implemented
O Maintenance Activity Will Not be Implemented

Back of Figure 1-12

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1.4.6 Activities Not Covered

Activities not covered under the District's routine SMP include:

- Capital improvement projects (CIPs),
- Redesign or reshaping of channels, and
- Emergency activities and procedures.

Routine stream maintenance does not include projects that would alter the designed flood conveyance capacity of a channel. Large construction projects and CIPs are not considered routine stream maintenance and are not included in this Manual. However, future CIPs will consider using, or adapting the protocols in this Manual once their project becomes operational and requires maintenance.

A situation is considered an "emergency" if it is a sudden, unexpected occurrence involving a clear and imminent danger that demands immediate action to prevent or mitigate loss of or damage to life, health, property, or essential public services (Public Resource Code Section 21060.3). Although emergency situations will not be covered by the permits authorizing the routine maintenance activities of this Manual, the District will make every effort to follow the guidance provided in this Manual when implementing activities under emergency conditions.

1.5 Impact Avoidance and Minimization

The District's maintenance approach is founded on clearly understanding the maintenance need at a site and precisely identifying the specific location, extent, and suite of maintenance activities to be implemented. The District's approach is also built on having a comprehensive understanding of the stream system's functioning, its site-specific process, and the natural and aquatic resources at the maintenance site or reach.

Chapter 3 of this Manual provides a description of the program area's geomorphic and biological setting. More precisely, Chapter 3 provides reach characterizations ("reach sheets") that describe the geomorphic, hydrologic, habitat, and species conditions for the District's channels where maintenance frequently occurs. Note that reach sheets have not been developed for all District maintained channels, though the District aims to develop additional reach sheets for uncharacterized maintenance reaches in the future. Over time, additional reach sheets will be added to the Manual. Each reach is considered within its sub-basin and watershed context. The reach sheets also summarize the key maintenance considerations at each reach and what may be environmental enhancement opportunities. Defining this baseline of what physical processes operate and what biological resources are found at a given reach is fundamental to the District's adaptive management approach. Understanding these resources, their locations and how they interact guides the District on how to avoid, minimize, and mitigate environmental impacts. Understanding these resources also influences how, where, and when maintenance activities should occur.

As described in Chapter 4, impact avoidance and minimization is a 3-part process that begins with broad level activity planning and focuses down to the details informing maintenance activities at a given project site. At the broadest scale, the District developed Maintenance Principles to provide overarching first-stage impact reducing guidance for maintenance activities (see Chapter

4, Section 4.2). The following Maintenance Principles were chartered to guide the maintenance program and avoid and reduce potential environmental impacts:

1. Apply the minimum maintenance necessary
2. Minimize mechanized maintenance, favor hand maintenance
3. Non-Routine large scale maintenance is outside of program
4. Understand and monitor the river system
5. Protect and enhance physical processes, landforms, riparian habitat and ecology
6. Manage stream resources for long-term sustainability and resiliency

From this basis, more targeted impact avoidance and minimization measures are then applied during the maintenance planning phase (second-stage) when the annual maintenance workplan is developed (see Chapter 14). Additionally, the District developed specific channel maintenance BMPs to guide operational activities during maintenance implementation (third-stage) to reduce remaining potential environmental impacts (see Section 4.4).

The avoidance and minimization measures and Maintenance Principles outlined in Chapter 4 reduce the potential impact of maintenance work. However, where the District conducts ground disturbing stream maintenance activities such as excavation that is part of a streambank stabilization project, they will implement mitigation projects to address impacts to riparian and freshwater wetland habitat. Typical mitigation projects involve channel habitat enhancement and restoration activities including tree and understory plantings and invasive species removal that are described in Chapter 13. To provide mitigation for impacts on aquatic habitat for special-status species (e.g., steelhead and California freshwater shrimp), the District also looks for opportunities to develop instream habitat complexity features (including LWD) and gravel augmentation projects.

Some ground disturbing activities may be subject to annual limits in permit conditions. As described in this Manual, sediment removal activities are limited to 1,500 lf per year and biotechnical streambank stabilization projects are limited to 2,500 lf total per year. Mitigation may be required for certain ground disturbing activities such as sediment removal activities in natural channels and streambank stabilization projects that require hardscape fill in jurisdictional waters or wetlands. If the area where maintenance activities are planned already has sufficient planting, or is in good condition regarding invasive plants, such that restoration activities are not needed on-site, then the District will undertake the enhancement and restoration activities at another channel location. The objective of the mitigation planting is to enhance the complexity and diversity of the riparian canopy cover, improve channel shading, and develop a functioning understory along the channels that are currently dominated by non-native invasive species.

The District's routine vegetation management activities will have temporary impacts. The District rarely removes trees from the riparian zone. As described in Chapter 6, *Vegetation and Tree Maintenance Activities*, the District would only remove a tree if it is causing a flood or erosion hazard, is trapping a significant volume of debris, or is otherwise a hazard to people or existing infrastructure. If the District removes a native tree (3 to 6" diameter at breast height [dbh]) they will mitigate for this impact by replanting at a 3:1 ratio with a suitable riparian tree species at the same location or somewhere else along the same stream. Mitigation and tree planting activities will be reported in the District's annual maintenance summary report.

Taken together, the application of the Maintenance Principles, additional pre-maintenance planning avoidance measures described in Chapter 4, and the BMPs (shown in Table 4-1) provide a comprehensive and integrated approach to avoiding and minimizing program impacts. As structured and implemented, the Stream Maintenance Program is not anticipated to result in substantial environmental impacts. In compliance with the California Environmental Quality Act (CEQA), an Initial Study was completed and a Notice of Determination for a Negative Declaration was filed on February 10, 2012 (State Clearinghouse No. 2011122050). A new CEQA compliance document will be developed for the Manual Update (**Appendix C** which is forthcoming). Temporary impacts from stream maintenance activities are avoided and minimized through the approaches described above and detailed further in this Manual Update. The District's long history of habitat protection and enhancement activities as described in Chapter 4 integrated with the program's "self-mitigating" maintenance actions will enhance habitat throughout the County. Residual permanent impacts that could occur as a result of some maintenance activities (e.g., bank hardening in jurisdictional waters/wetlands at bank repair sites) would require compensatory mitigation; such mitigation options are described in Chapter 13.

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Chapter 2
Regulatory Compliance

2.1 Overview

This chapter describes the principal federal and state environmental regulations and policies applicable to the maintenance activities described in this manual. This chapter is not intended to provide an exhaustive review of environmental regulations. Rather, a summary overview of the directly applicable regulations is provided together with the District's compliance approach. Regulatory compliance is also described in Chapter 4, *Impact Avoidance and Minimization*, and Chapter 14, *Program Management and Reporting*.

Table 2-1 lists federal, state, and local regulations which are applicable to the stream maintenance activities described throughout this manual.

Table 2-1. Summary of Regulations

Regulatory Agency	Law/Regulation	Purpose	Permit/Authorization Type
USACE – San Francisco District	CWA Section 404	Regulates placement of dredged and fill materials into waters of the United States and below the ordinary high water mark (OHWM).	Regional/General Permit
	Rivers and Harbors Act Section 10	Regulates work in navigable waters of the U.S.	Section 10 Compliance
San Francisco Bay RWQCB or Regional Board	CWA Section 401	Water quality certification for placement of materials into waters of the United States.	401 Water Quality Certification is required for federal permits, including Nationwide Permits
	CWA Section 402	NPDES program regulates discharges of pollutants.	▪ NPDES Municipal General Permit – Phase II ▪ NPDES Aquatic Pesticides General Permit
	CWA Section 303	Recognition and remediation of impaired water bodies through establishment of Total Maximum Daily Loads (TMDLs) to track and reduce pollutants and restore beneficial uses.	Napa TMDLs ▪ Sediment (adopted by Regional Board in 2009 and by the State Board in 2010; awaiting federal approvals) ▪ Pathogens (approved by U.S. Environmental Protection Agency [USEPA] in 2006) ▪ Nutrients (currently under development)

Regulatory Agency	Law/Regulation	Purpose	Permit/Authorization Type
	Porter-Cologne Water Quality Control Act	Regulates discharges of materials to land and protection of beneficial uses of waters of the State.	Waste Discharge Requirements (WDRs)
CDFW – Bay Delta Region	Fish and Game Code Section 1600	Applies to activities that will substantially modify a river, steam or lake. The Agreement includes reasonable conditions necessary to protect those resources.	Routine maintenance activities are covered under a Routine Maintenance Agreement (RMA)
	California Endangered Species Act (CESA) (F&G Code Section 2081[b])	Regulates project activities that may affect state threatened or endangered species.	CESA compliance: Consistency determination with USFWS/NMFS Biological Opinions
U.S. Fish and Wildlife Service (USFWS) and National Marine Fisheries Service (NMFS)	ESA Section 7	USACE must consult with USFWS and NMFS if threatened or endangered species may be affected by the project.	In most cases, Biological Opinions (BOs) are issued.
State Historic Preservation Officer (SHPO)	National Historic Preservation Act of 1966 (NHPA) Section 106	USACE must consult with SHPO if historic properties may be affected by the project.	In most cases, Programmatic Agreements or Memorandum of Agreement are prepared.
Local Tribes	Assembly Bill 52	District must consult California Native American tribes that are traditionally and culturally affiliated with the geographic area of the proposed project if requested by the tribe.	If necessary, Memoranda of Understanding with the tribes to outline protocols for consultation on the program or projects.

The permits and regulatory compliance requirements for the Maintenance Program are described below by permitting agency including the CDFW, RWQCB, USACE, and others. Note that construction of the Napa Creek/Napa River Flood Protection Project (Flood Protection Project) features were covered under separate regulatory permits; however the routine maintenance of these project features will covered by the SMP's regulatory permits.

2.2 Department of Fish and Wildlife

2.2.1 California Fish and Game Code Section 1602 - Streambed Alteration Agreement

In 2012, the District and CDFW entered into a RMA to provide permitting coverage and terms for the District's general maintenance activities. The 2012 RMA (Notification No. 1600-2011-0349-R3), which expires December 31, 2022, provides guidance, terms, and conditions for the implementation of vegetation management, sediment and debris removal, and culvert maintenance activities; required impact avoidance and minimization approaches; and notification responsibilities. The RMA and other permits obtained by the District are presented in **Appendix D**.

While the District is the primary stream maintenance agency in the County, there are other channels throughout the County which are owned and maintained by other local landowners, incorporated towns, and cities. These entities maintain their stream channels under similar regulatory requirements as the District and likewise have to apply for and receive approval from regulatory agencies to conduct instream maintenance. For example, the Town of Yountville maintains channels within their jurisdiction under an RMA issued by CDFG (now referred to as CDFW) on May 22, 2009 (Notification No. 1600-2008-0297-3). Yountville's Agreement covers vegetation maintenance, debris removal, minor sediment removal, and erosion control and bank stabilization activities. When the District undertakes routine maintenance activities within streams also managed by another municipality, those activities are included in the District's notification and report documents.

Similar to the District, in 2012, the County Roads Division entered into a similar RMA with CDFW to provide permit coverage for routine maintenance activities that take place within County maintained road creek crossings and culverts. The County's RMA (Notification No. 1600-2011-0351-R3), which expired December 31, 2017 and was renewed in January 2018 and provides guidance, terms, and conditions for the implementation of vegetation management, sediment and debris removal, biotechnical bank stabilization, maintenance and repair of existing sidewalks and trails, and culvert maintenance activities; required impact avoidance and minimization approaches; and notification responsibilities.

The City of American Canyon also entered into a RMA with CDFW to provide permit coverage for routine maintenance activities that occur within channels and other flood control facilities in American Canyon. The City of American Canyon's RMA (Notification No. 1600-2017-0147-R3) was issued in August 2017 and expires on December 31, 2021. The City's RMA provides terms and conditions for routine maintenance activities including sediment and debris removal, minor vegetation removal, debris removal, bank stabilization using biotechnical techniques, and removal of hazardous man-made structures. When the District undertakes routine maintenance activities in the City of American Canyon's flood control facilities, those activities will be included in the District's SMP notification and report documents. Note that maintenance work completed by the City of American Canyon without direct District oversight will be subject to the City's own permits.

2.2.2 California Endangered Species Act

The CESA is defined in California Fish and Game Code (F&G Code) Section 2080 *et seq.* CESA was originally enacted in 1970 to designate wildlife, fish, and plants as "endangered" or "rare." In 1984, CESA was amended and species were reclassified as "endangered" or "threatened." As of January 1985, all "rare" wildlife species were reclassified as "threatened" and the term "rare" was eliminated from the code.

CESA states that all native species of fishes, amphibians, reptiles, birds, mammals, invertebrates, and plants, as well as their habitats that are threatened with extinction and those experiencing a significant decline that, if not halted, will lead to a threatened or endangered designation, will be protected or preserved.

Like the federal ESA (described in Section 2.5 below), the CESA also allows for incidental take of listed species. Take is defined under the F&G Code (Section 86) as to “hunt, pursue, catch, capture, or kill, or attempt to hunt, pursue, catch, capture, or kill.” The incidental take permit process is outlined in the CESA (F&G Code Section 2081). Section 2081(b) provides a means by which agencies or individuals may obtain authorization for incidental take of state-listed species. Take must be incidental to, and not the purpose of, an otherwise lawful activity. Requirements for an F&G Code Section 2081(b) permit include the identification of impacts on listed species; development of mitigation measures that minimize and fully mitigate impacts; development of a monitoring plan; and assurance of funding to implement mitigation and monitoring.

Chapter 3, Section 3.2 (and Table 3-1) describe listed species that may occur in the program area. State-listed species potentially occurring in the program area include Clara Hunt’s milk-vetch (*Astragalus clarianus*), Sebastopol meadowfoam (*Limnanthes vinculans*), Calistoga popcorn-flower (*Plagiobothrys strictus*), California freshwater shrimp (*Syncaris pacifica*), Delta smelt (*Hypomesus transpacificus*), Longfin smelt (*Spirinchus thaleichthys*), Swainson’s Hawk (*Buteo swainsoni*), Bald eagle (*Haliaeetus leucocephalus*), and Townsend’s big-eared bat (*Corynorhinus townsendii*).

The District’s Stream Maintenance Program is structured to avoid take of listed species.

2.3 Regional Water Quality Control Board

2.3.1 Clean Water Act Section 401 Water Quality Certification and Waste Discharge Requirements

The Regional Board issues water quality certifications and WDRs for stream maintenance projects. Water quality certifications are issued when a project occurs within the jurisdiction of waters of the U.S. and a CWA Section 404 permit is required from the USACE (see Section 2.4 below). Section 401 water quality certifications are issued by the Regional Boards to complete Section 404 permits, including the use of applicable Nationwide permits. In general, for stream maintenance projects, Section 404 permits authorized by the USACE are required when maintenance work affects jurisdictional wetlands and/or occurs within or below the ordinary high-water mark (OHWM[1]) along a stream course.

WDRs are issued when the project occurs outside of federal jurisdiction but occurs within Waters of the State under state jurisdiction. WDRs are issued for discharges to land and waters of the state. For example, the Regional Board issues WDRs for disposal of sediment and vegetation removed from the channels as part of maintenance activities.

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[1] OHWM - Defined by USACE as that line on the shore established by the fluctuations of water and indicated by physical characteristics such as a clear, natural line impressed on the bank, shelving, changes in the character of the soil, destruction of terrestrial vegetation, the presence of litter and debris, or other appropriate means that consider the characteristics of the surrounding areas. The USACE is the final arbitrator in determining the OHWM.

Through the development of the 2012 maintenance manual, the District and San Francisco Bay Regional Board staff coordinated closely to develop appropriate permits to authorize the program. This included developing a template Section 401 certification permit for District use in conjunction with using USACE Nationwide permits for Section 404 coverage. In 2012, the Regional Board issued a WDR and 401 certification (Order No. R2-2012-0063) to provide the District with regulatory coverage for maintenance activities occurring within Waters of the State. This permit expired August 31, 2017 and is included in Appendix D. The District has coordinated with Regional Board staff and was granted an extension of this WDR and 401 certification through 2018. This Manual update will allow completion of the pending WDR and 401 certification application.

2.3.2 Clean Water Act Section 402 – NPDES Stormwater Program

All the incorporated and unincorporated areas within the Napa River watershed are covered under the *General Permit No. CAS000004 Waste Discharge Requirements for Storm Water Discharges from Small Municipal Separate Storm Sewer Systems (MS4s)* Water Quality Order (WQO) No. 2013-0001-DWQ (Small MS4 General Permit or Phase II Municipal General Permit), issued by the State Water Resources Control Board (SWRCB). The General Permit was issued in 2013 and expired in June 2018. An amendment to the Small MS4 General Permit was adopted by the SWRCB on December 19, 20017 and is effective as of January 1, 2019. The County of Napa, cities of American Canyon, Napa, St. Helena and Calistoga, and the Town of Yountville are each co-permittees of the general permit. These organizations partnered to form the Napa County Stormwater Pollution Prevention Program (NCSPPP). The NCSPPP is administered by the District's Stormwater Program Coordinator who ensures that all the NCSPPP partners develop, implement and enforce a stormwater management program to reduce pollutants. The Napa County Storm Water Management Plan (NCSWMP) provides for consistent methods to prevent stormwater pollution; protect and enhance water quality in creeks and wetlands; preserve beneficial uses of local waterways; and comply with state and federal regulations. These goals are met through development of annual action plans, adoption and enforcement of local ordinances, education and outreach efforts, monitoring, and other activities. Compliance efforts are documented in reports submitted to the SWRCB annually.

Implementation of the NCSWMP directly influences the quantity and quality of stormwater received in the channels maintained by the District. In turn, stream maintenance activities described in this manual function to ensure compliance with NPDES permits through enhancement of riparian and in-channel features which filter storm runoff and improve water quality. Additionally, maintenance activities include trash and debris clearing and consistent implementation of maintenance BMPs throughout the watershed. Stream maintenance efforts will also assist with TMDL compliance requirements.

2.3.3 Clean Water Act Section 402 – NPDES Aquatic Pesticide Application Program

The Statewide General NPDES Permit for Residual Aquatic Pesticide Discharges to Waters of the U.S. from Algae and Aquatic Weed Control Applications (WQO 2013-0002-DWQ; General Permit No. CAG990005) or the NPDES Weed Control Permit was adopted in March 2013 and expired November 30, 2018. The NPDES Weed Control Permit is administratively continued until a new permit is issued; the State Water Board anticipates that a new one will be issued in late 2019 or in 2020. Pollutants associated with aquatic pesticide application that require coverage under this permit include over-applied or misdirected pesticide products and pesticide residues. Residues are any pesticide byproduct, or breakdown product, or pesticide product that is present after the use of the pesticide to kill or control the target weed. This permit addresses the application of 2,4-D, acrolein, copper, diquat, endothall, fluridone, glyphosate, imazapyr, sodium carbonate, peroxyhydrate and triclopyr based aquatic pesticides to surface waters for control of aquatic weeds.

Key requirements of the General Permit include the following:

- Compliance with the requirements of California Toxics Rule (40 Code of Federal Regulations [CFR] Part 131) and the state's Policy for Implementation of Toxics Standards for Inland Surface Waters, Enclosed Bays, and Estuaries of California (SWRCB 2000).
- Compliance with other applicable receiving water limitations and with effluent limitations.
- The permittee must be licensed by the California Department of Pesticide Regulation (CDPR) or work under the supervision of someone who is licensed if the aquatic pesticide is considered a restricted material.
- Preparation of, and adherence to, an Aquatic Pesticide Application Plan (APAP).
- Compliance with specific monitoring and reporting requirements of the permit.
- Adherence to all label instructions and terms of any applicable use permits.
- Maintenance of a Pesticide Application Log.
- Compliance with Public Notice Requirements.

To obtain coverage under this General Permit, a discharger must submit a completed Notice of Intent (NOI), a vicinity map, and the first annual fee to the appropriate Regional Board. These items constitute a complete application package, the submittal of which authorizes the discharge of pollutants associated with the application of aquatic pesticides in compliance with the General Permit.

In conducting stream maintenance, the District controls growth of invasive plants such as cattails, *Ludwigia*, pepperweed, *Arundo donax*, tamarisk, and scarlet sesbania by applying herbicides. As described above, application of herbicides directly to waters of the U.S. is regulated under the NPDES General Weed Control Permit. While the District has coverage under this permit, for the purposes of this Manual Update, in-water herbicide applications are considered beyond the scope of the SMP. .

Application of pesticides to control invasive plants on stream banks above the OHWM and within the riparian corridor (i.e., outside of federal jurisdiction, but within state jurisdiction) are not regulated under the NPDES General Weed Control Permit. Application of pesticides within waters of the state is regulated by the Regional Boards. The regulatory compliance process is identified case-by-case.

2.3.4 Napa River Sediment TMDL and Sediment Reduction and Habitat Enhancement Plan

More than half of fine sediment delivered to Napa River during the 10-year period of 1994 to 2004 was associated with land use activities, including roads, human-caused channel incision, vineyards, intensive historical livestock grazing, and urban stormwater runoff (San Francisco Bay RWQCB 2009). Other key sources of fine sediment included instream channel erosion. Under the authority of Section 303 of the CWA, the Regional Board evaluated the effects of increased sediment on beneficial uses within the Napa River watershed. Based on the evaluation, the Regional Board established a TMDL to reduce sediment loading and established the Napa River Sediment Reduction and Habitat Enhancement Plan to restore beneficial uses. The Regional Board adopted both plans in September 2009. The plans were approved by the SWRCB in 2010 and the Basin Plan amendment was approved at that time. The plans were also approved by the USEPA in 2011. As such, the plans are being carried by the County.

The goals of the Napa River Sediment Reduction and Habitat Enhancement Plan are to:

- Conserve the steelhead trout population
- Establish a self-sustaining Chinook salmon population
- Enhance the overall health of the native fish community
- Enhance the aesthetic and recreational values of the river and its tributaries

To achieve these goals, specific actions are needed to:

- Attain and maintain suitable gravel quality and diverse streambed topography in freshwater reaches of Napa River and its tributaries
- Protect and/or enhance base flows in tributaries and the mainstem of the Napa River
- Reduce the number and significance of human-made structures in channels that block or impede fish passage
- Maintain and/or decrease summer water temperatures in tributaries to the Napa River

The District’s SMP directly supports the goals of the TMDL by reducing sediment loading and sediment storage in Napa County channels. As discussed in Chapter 8, the District repairs and stabilizes eroding streambanks which are a key sediment source for downstream sediment accumulation. Similarly, the District removes accumulated sediment and debris blockages which cause further sediment trapping and deposition (see Chapter 9).

The Napa County RCD’s road maintenance projects, as described in Chapter 11, are intended to reduce sediment transport from existing unpaved roads and directly meet the TMDL’s performance standard for reducing road-related sediment delivery to channels below 500 cubic yards per mile over a 20-year period. Additionally, as described in Chapters 7 and 13, retention and enhancement of LWD in the channels maintained under this program directly meets the habitat enhancement goals of the TMDL. Specifically, the Habitat Enhancement Plan component of the TMDL Implementation Plan (as stated in the Basin Plan Amendment) identifies the following stressors, management objectives, and actions:

Table 5.1 (of Basin Plan Amendment): Recommended Actions to Reduce Sediment Load and Enhance Habitat Complexity in Napa River and its Tributaries

Stressor	Management Objectives	Actions
Habitat degradation as a result of mainstem Napa River and lower reaches of its larger tributaries incising	▪ Reduce rates of sediment delivery (associated with incision and accelerated bank erosion) to channels, by 50 percent. ▪ Enhance channel habitat as needed to support self-sustaining run of Chinook salmon and enhance the overall health of the native fish community.	1.1 Develop and implement plans to enhance stream-riparian habitat conditions, and reduce fine sediment supply in the mainstem Napa River and lower tributary reaches
Habitat degradation as a result of reduction in large woody debris in stream channels	Enhance quality of rearing habitat for juvenile salmonids	1.2 Develop and implement performance standards for protection of ecologically significant large woody debris in stream channels

Table 5.4 (of Basin Plan Amendment): Recommended Actions to Protect and/or Enhance Stream Temperature

Stressor	Management Objectives	Actions
Stressful summer water temperatures in tributaries	*Enhance amount of ecologically significant large woody debris in channels*	*See Table 5.1*
	Enhance potential shade along riparian corridors	4.3 Implement management actions to accelerate recovery of native riparian tree species

The stream maintenance manual directly implements TMDL Actions 1.1, 1.2, and 4.3 identified as part of the Habitat Enhancement Plan. Vegetation management and habitat enhancement activities (described in Chapters 6 and 13, respectively) include planting and management of native riparian tree species. Stream maintenance activities seek to encourage development of a native riparian canopy over stream channels to reduce summer water temperatures. Downed tree management and LWD enhancement activities directly benefit instream complexity and salmonid habitat.

Through conducting the stream maintenance activities described in this manual, the District supports and enhances instream fish habitat as guided by the TMDL. Implementation of the maintenance BMPs provides for consistent management of stream channels and compliance with TMDL and NPDES requirements. Because the TMDL is not yet approved by the USEPA, the TMDL is not currently enforceable. However, it is anticipated that county compliance with the TMDL will be required in the new Phase II Municipal General Permit (as discussed previously).

2.4 Army Corps of Engineers

2.4.1 CWA Section 404 Nationwide Permits

Though infrequent, on occasion the District may need to conduct maintenance work below the OHWM of channels. These are areas within the Waters of the U.S. and fall within the jurisdiction of USACE. As described above in this manual, maintenance work rarely involves extensive dredging or the placement of fill. However, critical sediment blockages or bank failures do need to be maintained and addressed. When work beneath OHWM is necessary, such as with bank stabilization or sediment removal projects, the District's maintenance activities are consistent with activities administered and permitted by the USACE's Nationwide Permit Program. More specifically, Nationwide Permits 3 (maintenance), 13 (bank stabilization), 18 (minor discharges), 19 (minor dredging), 27 (aquatic habitat restoration, establishment, and enhancement activities), and 43 (stormwater management facilities) are directly applicable to proposed activities and are utilized for stream maintenance activities.

The procedure for conducting activities under the Nationwide Permit Program generally involves submitting a preconstruction notification report (PCN) to the USACE. The PCN must contain contact information for the permitted, location and description of the project, delineation of waters and wetlands, list of endangered or threatened species, and information on historic properties. The PCN is submitted to the USACE for review and approval. If the USACE determines that minimal impacts would result from the project, they provide a written response whether the project can proceed under the terms and conditions of the Nationwide Permit. Approvals from the Regional Board, USFWS, NMFS, and SHPO may be required in conjunction with using Nationwide permits.

Concurrent with this Manual update, the District has applied for programmatic coverage of maintenance activities subject to USACE jurisdiction under a Regional General Permit (RGP). The District will conduct formal consultations with the USACE, and other agencies (described below) to obtain federal and state approvals for routine maintenance activities within waters of the U.S.

2.5 Other Agencies

2.5.1 U.S. Fish and Wildlife Service

Federal Endangered Species Act

If, as part of USACE permitting, it is determined that the maintenance project would have the potential to affect a threatened or endangered species or critical habitat, the USACE must comply with Section 7 of the ESA, which protects plant and wildlife species determined by USFWS to be at risk of extinction. USFWS is responsible for protecting listed plants and wildlife other than marine species and anadromous fishes, which are protected by the NMFS.

As described in Section 4.4, the USACE will consult with USFWS either formally or informally to address the effects of the project on terrestrial species and their habitats. As part of the District's application for an RGP, a Biological Assessment (BA) that describes potential effects of maintenance activities on listed species and their habitat has been prepared and will be submitted to USFWS as part of the formal consultation between USFWS and the Corps. Upon review of the

BA, the USFWS will issue a BO with "incidental take" provisions to the USACE permit manager. Chapter 3, Section 3.2.3 describes federally listed species that may occur in the program area.

Migratory Bird Treaty Act

In addition to the ESA, the USFWS administers the Migratory Bird Treaty Act (MBTA). The MBTA makes it unlawful in any manner, unless expressly authorized by permit in accordance with federal regulations, to pursue, hunt, take, capture, kill, cause to be shipped, exported, or imported, deliver for transportation, transport or cause to be transported, carry or cause to be carried, or receive for shipment, transportation, carriage, or export at any time, or in any manner, any migratory bird, or any part, nest, or egg of any such bird. The definition of "take" is any act to "pursue, hunt, shoot, wound, kill, trap, capture or collect, or attempt to pursue, hunt, shoot, wound, kill, trap, capture or collect." This includes most actions, direct and indirect, that can result in take or possession, whether it is temporary or permanent, of any protected species. Although harassment and habitat modification do not themselves constitute take under the MBTA or the California Fish and Game Code (F&G Code), such actions that result in direct loss of birds, nests, or eggs, including nest abandonment or failure, are considered take under such regulations. A list of migratory birds protected under the MBTA is available in 50 CFR Section 10.13. On December 8, 2004, the U.S. Congress passed the Migratory Bird Treaty Reform Act (Division E, Title I, Section 143 of the Consolidated Appropriations Act, 2005, PL 108–447), which excludes all migratory birds that are non-native or have been human-introduced to the U.S. or its territories. It defines a native migratory bird as a species present within the U.S. and its territories as a result of natural biological or ecological processes. USFWS published a list of the bird species excluded from the MBTA on March 15, 2005 (70 Federal Register 12710).

All native bird species occurring in the program area are protected by the MBTA. Maintenance activities, such as vegetation management, may require the removal of vegetation at work sites where migratory birds are nesting. Compliance with the MBTA will be met through the implementation of BMPs requiring pre-activity surveys before any breeding-season maintenance activities are implemented so that take of migratory birds is avoided.

Bald and Golden Eagle Protection Act

The Bald and Golden Eagle Protection Act of 1940 protects eagles from commercial exploitation and safeguards their continued survival in the U.S. This law provides for the protection of the bald eagle (the national emblem) and the golden eagle by prohibiting, except under certain specified conditions, the taking, possession, and commerce of such birds. USFWS, which enforces the Bald and Golden Eagle Protection Act, can issue permits for the take of eagles under limited circumstances. However, no such permit will be needed for the proposed maintenance activities, which will avoid any such impacts through implementation of BMP BIO-1, "Minimize Impacts to Nesting Birds via Site Assessments and Avoidance Measures."

2.5.2 National Marine Fisheries Service

Federal Endangered Species Act

For protected marine and aquatic fish species and habitat, the USACE may need to consult with the National Marine Fisheries Service (NMFS). The federal consultation process between the USACE and NMFS is similar to the process described above for USFWS, whereby, NMFS evaluates potential impacts on threatened and endangered fish species and their critical habitat through preparation of a BA. A BO will be requested from NMFS for ESA-listed fish species and habitat that may be affected by the maintenance program.

2.5.3 State Historic Preservation Officer

National Historic Preservation Act - Section 106

If during the federal permitting and review process, the USACE determines there is a potential to affect historic properties, compliance with Section 106 of the National Historic Preservation Act (NHPA) is required. Section 106 of the NHPA of 1966, as amended, requires federal agencies to take into account the effects of their undertakings on historic properties, which are cultural resources that are listed, or are eligible for listing, in the National Register of Historic Places (NRHP). Historic properties can include buildings, historic-era and prehistoric archaeological sites, objects, districts, and landscapes. THE NHPA authorizes the Secretary of the Interior to expand and maintain the NRHP, and the Secretary has established an Advisory Council on Historic Preservation (ACHP) as an independent federal entity to develop and oversee the nation's preservation policies. Section 106 of the NHPA requires federal agencies to afford the ACHP a reasonable opportunity to comment before licensing or approving the expenditure of funds on any undertaking that may affect historic properties, and it requires federal agencies to coordinate with the Native American tribes, the interested public, and the SHPO in the state where the proposed action will take place.

Since the District has applied for an RGP to discharge fill into waters of the U.S. under the authority of CWA Section 404, USACE must comply with Section 106 of the NHPA because an RGP would be an undertaking by USACE as defined under Interim Guidance for Implementing Title 33, CRF Part 325, Appendix C, and under Title 36, CFR Part 800.16(y). Title 33, CFR Part 325, Appendix C establishes the procedures to be followed by USACE to fulfill NHPA requirements.

Earth-disturbing activities (e.g., sediment removal activities in natural and earthen channels) that are conducted under the maintenance program within USACE jurisdiction (e.g., below the OHWM) and affect previously undisturbed soils will require compliance with Section 106 of the NHPA. Other earth-disturbing activities that may require compliance with Section 106 of the NHPA include biotechnical bank stabilization projects in the event that excavation is required beyond a channel's as-built design. Because the exact locations and nature of future projects are unknown and will be identified over the term of the Section 404 permit, the District will enter into a programmatic agreement (PA) with the USACE and the SHPO to establish a process under which the District will comply with the implementing regulations of Section 106 pursuant to 36 CFR 800.14(b)(1)(ii) and 36 CFR 800.14(b)(2). The PA will be a legally binding document to ensure that the District will comply with the Section 106 requirements for each project that falls under the USACE permit. The PA will outline the protocols required for Section 106 compliance.

2.5.4 Local Tribes

Assembly Bill 52, which was approved in September 2014 and which went into effect on January 1, 2015, requires that lead agencies consult with a California Native American tribe that is traditionally and culturally affiliated with the geographic area of a proposed project, if so requested by the tribe. The bill, chaptered in State CEQA Guidelines Section 21084.2, also specifies that a project with an effect that may cause a substantial adverse change in the significance of a tribal cultural resource (TCR; defined under Public Resources Code [PRC] Section 21074) is a project that may have a significant effect on the environment. Mitigation measures for TCRs must be developed in consultation with the affected California Native American tribe pursuant to newly chaptered PRC Section 21080.3.2, or according to Section 21084.3. Section 21084.3 identifies mitigation measures that include avoidance and preservation of TCRs and treating TCRs with culturally appropriate dignity, taking into account the tribal cultural values and meaning of the resource.

Native American tribes who have a cultural affiliation with the SMP area include the Wappo and the Yocha Dehe Wintun Nation. Both of these tribes have notified the District that they would like to be informed of proposed projects through formal notification pursuant to PRC Section 21080.3.1(b)(1). As a result, the District is required to notify these tribes about the maintenance program or specific projects developed by the program, and consult with the tribes if the tribes respond, in writing, that they would like to consult on the program or projects. Through the SMP's CEQA process, the District will consult with the tribes about the presence of TCRs within the program or individual project areas, and mitigation measures for any TCRs that might be impacted by project activities. The District may enter into Memoranda of Understanding with the tribes to outline protocols for consultation on the program or project.

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Chapter 3
ENVIRONMENTAL SETTING

The SMP's maintenance approach relies on first recognizing the fundamental hydrologic, geomorphic, and biologic processes that influence a given stream reach and then adaptively managing and maintaining streams based on the underlying processes. Understanding the physical and biological setting of a particular stream reach and other contributing factors is key to determining the timing, frequency, strategy and need for various maintenance elements. In this chapter, an overview of the geomorphic setting and biological resources are provided in Sections 3.1 and 3.2. Section 3.3 describes the cultural resources environmental setting. The creeks of Napa County often have important cultural resource histories. Understanding and documenting cultural resources is also a requirement of the CWA, and Section 404 permitting. In Section 3.4, the chapter continues with individual stream reach characterizations for primary maintenance reaches in the SMP. These stream reach characterizations provide a summary of existing physical and biological conditions and highlight routine maintenance activities and needs.

3.1 Geomorphic Setting

As described in Chapter 1, Section 1.3, *Program Area and Channel Ownership Types*, and shown in the maps of Chapter 1, the maintenance activities in this SMP manual are focused in the Napa River, Putah Creek, and Green Valley Creek watersheds. The Napa River watershed is a generally northwest-southeast oriented drainage basin whose shape and alignment follows the regional geologic structure. The watershed is defined by the Mayacamas Mountains to the west, which provides a ridgeline with several steep eastward and southeastward flowing tributaries that descend to the valley floor. The eastern watershed boundary is formed by an unnamed ridgeline formed of several individual peaks including Howell Mountain, Atlas Peak, and Mt. George. Similar to the west side of the watershed, numerous tributary streams emerge from the eastern slopes and descend toward the valley floor. The northern watershed boundary is formed in the headwaters of Mt. St. Helena north of Calistoga and the southern watershed boundary is formed by the tidally influenced marshes of the Napa River near San Francisco Bay.

The Putah Creek watershed is similar in alignment to the Napa River watershed but is to the interior (east) of the Napa River watershed and generally has less precipitation due to a rain shadow effect. The Upper Putah Creek watershed drains to Lake Berryessa in eastern Napa County. Downstream of Monticello Dam at Lake Berryessa, Putah Creek leaves Napa County and becomes the boundary between Yolo and Solano Counties, eventually flowing into the Yolo Bypass about one-quarter mile west of the Sacramento Deep Water Channel. Green Valley Creek is a smaller watershed, southeast of the Napa River watershed that drains to the Suisun Marsh area, north of Suisun Bay, south of the town of Cordelia.

The watershed structure and stream network are relevant in considering sediment delivery and stream maintenance needs. The higher mountains that ring the Napa River, Putah Creek, and Green Valley Creek watersheds provide the headwater source areas for runoff and sediment that accumulate in the tributary and valley floor streams below. The steep canyons and headwater mountain streams deliver flows and sediment to the valley floors and often build characteristic alluvial fans at the base of the mountains. Historically, these alluvial fans functioned as depositional areas that stored sediments in the topographic transition between the higher and steeper headwater areas and the more gently sloping floodplain of the Napa Valley floor. Historically, during large flood events, streams migrated across these alluvial fan and valley floor floodplain and distributed sediments evenly across the surface. Over time, fans propagated downstream onto the valley floor at variable rates depending upon sediment sources, climatic conditions, and tectonic activity (earthquakes and motion along fault lines).

The topographic transition between mountain, fan, and plain is important in considering maintenance needs for the channels that are maintained under this program. As shown in the maps of Chapter 1, many of the maintenance channels begin in the historic alluvial fan zone, most often in the lower fan areas. Historically these were reaches that received abundant sediment from upstream sources. Over time these reaches may have stored this sediment in the channel, distributed and deposited it along the fan or floodplain surface, or carried it in the channel toward the next larger river confluence downstream.

The historic geomorphic system was altered and affected greatly by land use practices and infrastructure developed in the 19th and 20th centuries. Grazing, agriculture, vegetation conversion, road development, flood protection, river navigation and many other activities combined to change the physical system. Under existing conditions, with many developed land uses adjacent to creeks that are maintained by the District, City of American Canyon and County, many of the streams have been channelized and are engineered and maintained for flood control purposes. Streams that previously migrated and deposited their materials across a broad fan or plain surface are now contained in generally more linear channels with gradients that are typically governed by hardened road crossings upstream and downstream.

Development of the larger north-south highways and roadways of the County, like Highway 29 on the west side of the valley and Silverado Trail on the east side of the valley, resulted in the culverting of several streams and the development of “collector” ditches and creeks that run parallel to the highway. Collector channels like the Yountville Outfall North Collector, Yountville Outfall South Collector, Solano Road Ditch, and North Salvador Collector channels collect flows from multiple tributaries draining from the west into a single channel that parallels Highway 29, and then pass the flows beneath the highway in generally larger culverts. The District maintains these collector channels for sediment accumulation, bank stabilization, and vegetation management. The construction of the smaller road networks that extend up into the tributary subbasins of the watershed have also had an important geomorphic effect of generally increasing runoff and sediment transport to downstream creeks.

Stream channel incision is another geomorphic legacy that affects some of the channels maintained by the District. Different from the situation of abundant sediment deposition described above, incising channels are actively eroding and down-cutting into their floodplain. There are several possible causes for channel incision including hydromodification effects (due to land use changes) whereby runoff and streamflows are more erosive due to higher peak volumes and velocities. Sometimes channels incise because the “base” or “trunk” stream into which they flow has itself “sunk” or incised, and therefore the tributary follows this lead by incising to meet the elevation of the downstream receiving water. Alternatively, channels sometimes incise because there is an active “headward migrating knickpoint” that moves upstream through a system eroding and lowering the channel bed as it moves upstream. Channel incision is another geomorphic process that affects the District’s maintenance needs. Incised channels are typically at greater risk for bank destabilization and in need of bank repair.

Much of the routine maintenance work covered under this SMP occurs along smaller tributary streams to the Napa River, where occasional vegetation management, debris clearing, sediment removal, or bank stabilization activities are needed. This program also includes routine maintenance work along the mainstem Napa River including areas that are part of the Napa River/Napa Creek Flood Protection Project (Flood Protection Project), creeks in American Canyon, County road crossings of creeks or tributaries throughout the county, and roads on private property including some at tributary or creek crossings. Typical maintenance activities are described in detail in Chapters 5-12 of this manual. For the mainstem Napa River, in addition to general vegetation management, sediment and debris clearing, and bank stabilization activities if needed, the District also conducts maintenance of on-going ecologic restoration projects at the Rutherford Reach and Oakville to Oak Knoll project sites as described in Chapter 10.

3.2 Biological Resources

This section describes the biological resources that occur in aquatic and terrestrial habitats that are potentially affected by activities covered by this SMP.

3.2.1 Biotic Communities

Aquatic Habitats

Aquatic habitats in Napa County are highly diverse in size, type, and function. The streams that form the drainage network within the County are the primary aquatic habitat relevant to program activities. To a lesser extent, freshwater wetlands, including seeps and springs, may also be affected by program activities. With the exception of a brackish wetland adjacent to the Edgerly Island Facility, the brackish wetland within the Flood Protection Project area, and some brackish wetlands in the downstream portions of maintenance areas in the vicinity of American Canyon, saline wetlands (i.e., salt and brackish marsh) that occur in the southern part of the County are not included in the program area, and are not addressed in this manual. Likewise, vernal pools are not likely to be affected by the activities conducted under the SMP, and are not addressed in this manual. As described in Chapter 10, the District conducts maintenance in the Edgerly Island vicinity and maintains a 45-acre (ac) wetland mitigation site adjacent to the dredged material rehandling facility. RCD activities will likely occur in or near tributary streams generally higher in the watershed than other program activities, affecting habitats such as intermittent streams.

<u>Streams and Drainages</u>

Streams and drainages in the program area include tributaries to the Napa River, San Pablo Bay, Suisun Creek, Putah Creek and Green Valley Creek, and other smaller water conveyance features such as ditches and swales. The characteristics of the aquatic habitat associated with these features vary considerably. Several of the Napa River tributaries provide perennial aquatic habitat for fish and wildlife. Many smaller streams and drainages experience periods of low flow or no surface flow during summer and fall.

Aquatic vegetation, primarily Ludwigia, in the Yountville Outfall.

Only a few species of vascular plants typically grow within fast-flowing streams. Species that may be found in or adjacent to such streams in the program area include torrent sedge (*Carex nudata*), giant chain fern (*Woodwardia fimbriata*), spicebush (*Calycanthus occidentalis*), and small-fruited bulrush (*Scirpus microcarpus*). Certain non-vascular plants, such as aquatic mosses and filamentous algae that are tightly attached to rocks by strong holdfasts, can survive the fast current. Low gradient, slow flowing streams and drainages in the program area support dense growth of aquatic vegetation such as *Ludwigia* (see photo), water plantain (*Alisma plantago-aquatica*), and smartweeds (*Polygonum* spp.).

Common, widespread bird species that use stream habitats in the program area include herons, egrets, and waterfowl. Some species of amphibians use stream habitats for breeding, particularly bullfrogs (*Lithobates catesbeianus*), which are not native to California. Native amphibians that may be present in and around aquatic habitats in the program area include Coast Range newt (*Taricha torosa torosa*), Pacific treefrog (*Hyla regilla*), California red-legged frog (*Rana draytonii*), foothill yellow-legged frog (*Rana bolyii*), and California toads (*Bufo boreas halophilus*). Pacific pond turtles (*Actinemys marmorata*) also use these habitats, often concentrated in areas of optimal habitat such as side channel and backwater areas. California freshwater shrimp (*Syncaris pacifica*) are found in pools in low-gradient streams such as the Napa River, Garnett Creek and Huichica Creek (Jones & Stokes and EDAW 2005). Fish species occurring in the program area found are described in Section 3.2.2.

Functions and values provided by instream aquatic habitat include the following:

- Maintenance of surface and groundwater quality through filtration and decomposition of pollutants;
- Groundwater aquifer recharge;
- Water for human, animal, and wildlife use;
- Wildlife habitat;
- Opportunities for recreation, including fishing and boating; and
- Opportunities for conservation and restoration of fish and wildlife habitat.

Freshwater Wetlands

Freshwater wetlands are distributed throughout the program area in swales, low-lying areas and around ponds and reservoirs. Freshwater wetlands in the program area are typically characterized by monocots—grasses and grass-like plants in the sedge and rush families—that are tolerant of extended exposure to saturated soils or inundation by surface water. Perennial wetlands that hold water for most or all of the year are characterized by dense stands of cattail (*Typha* spp.) and bulrush or tule (*Schoenoplectus [=Scirpus]* spp). Ponds and other open water areas may support plants with floating leaves, such as pondweeds (*Potamogeton* spp.), mosquito fern (*Azolla* spp.), and duckweed (*Lemna* spp. and *Wolfia* spp.), or submerged plants, such as Canadian pondweed (*Elodea canadensis*) and *Najas* spp. Associated species in perennial wetlands include other bulrush species, creeping spikerush (*Eleocharis macrostachya*), mannagrass (*Glyceria* spp.), floating water-primrose, water-plantain, umbrella flatsedge (*Cyperus eragrostis*), mint (*Mentha* spp.), buttercup, and smartweeds. Wetlands with more seasonal water supply support sedges (*Carex* spp.) and rushes (*Juncus phaeocephalus*, *J. effusus*, *J. balticus*, and others). Mediterranean barley (*Hordeum marinum* ssp. *gussoneanum*), Italian ryegrass, curly dock (*Rumex crispus*), and hyssop loosestrife (*Lythrum hyssopifolia*) are common associated species in seasonal wetlands.

Freshwater wetlands, particularly those with native vegetation and high structural complexity, provide high-quality wildlife habitat that offers nesting, foraging, roosting, and cover for a variety of species. The high plant productivity typical of freshwater wetlands offers abundant food sources and cover for wildlife. The wildlife community that receives the most evident benefit from freshwater wetlands is birds. Common and uncommon bird species typically associated with emergent freshwater wetlands that may be found in the County include grebes, rails (e.g., Virginia rail [*Rallus limicola*], American coot [*Fulica americana*]), herons, egrets, ducks (e.g., wood duck [*Aix sponsa*], cinnamon teal [*Anas cyanoptera*]), shorebirds, marsh wren (*Cistothorus palustris*), and common yellowthroat (*Geothlypis trichas*). In addition to the abundance of birds, other vertebrates found in freshwater wetlands include amphibians, reptiles, and mammals. Amphibians and reptiles that use freshwater wetlands include Pacific chorus frogs, western toads (*Bufo boreas*), and garter snakes (*Thamnophis* spp.), which in turn provide food for animals including birds and mammals. Mammal visitors to freshwater wetlands include deer mouse (*Peromyscus* spp.), California meadow vole (*Microtus californicus*), river otter (*Lutra canadensis*), and mule deer (*Odocoileus hemionus*). Muskrats (*Ondatra zibethicus*) and beaver (*Castor canadensis*) may use freshwater wetlands for cover, food, and/or hut construction. Many bat species forage for insect prey over wetlands. Freshwater wetlands typically contain many invertebrates—such as dragonflies, craneflies, and snails—that provide an important food source for other species.

Functions and values provided by freshwater wetlands include the following:

- Maintenance of surface water quality through filtration and decomposition of pollutants,
- Groundwater recharge,
- Flood control, due to storage of flood and storm surge waters,
- Water for stock and wildlife use,
- Wildlife habitat, and
- Recreation, including bird watching, hunting, and fishing.

Maintenance of native communities, connectivity with the watershed, and a natural hydrologic regime are necessary to maintain these values. Aquatic habitats and wetlands are frequently colonized by invasive species of plants, invertebrates, fish, and amphibians. Invasive species readily displace native species and commonly prey upon them. Ponds, reservoirs, canals, and lowland rivers are often the sites of exotic or nonnative species introductions and concentrations, including many aquatic invertebrates (e.g., insects, snails, clams, crayfish,), many nonnative fish species, and bullfrogs (Jones & Stokes and EDAW 2005).

In general, alteration of hydrology and environmental change resulting from dams, water withdrawals, and land use conversion of riparian and floodplain areas are the primary threats to streams in the program area. Altered hydrology has been identified as the primary cause or a contributing factor in the decline of several fish species (Moyle et al. 1996), and low summer flows in Napa River tributary streams have been shown to reduce feeding and growth opportunities for rearing steelhead (Stillwater Sciences 2007).

Brackish Wetlands

Brackish wetlands in the program area include the 45-ac mitigation site adjacent to the Edgerly Island Facility, the diked tidal marsh on the Edgerly Island facility, and brackish emergent wetlands in the Flood Protection Project area. Vegetation in the mitigation site is dominated by ruderal species in the ecotone between wetland areas and upland area, with some pockets of native plants such as coyotebrush (*Baccharis pilularis*). Wetter areas of the site include species such as pickleweed and various hydrophytic graminoids. Based on communication with the USACE and because the Edgerly Island wetlands are within an isolated and enclosed basin controlled by a structure, the wetlands were found to not be federally jurisdictional under the Clean Water Act. Vegetation community composition in the diked brackish marsh on the Edgerly Island site generally follows the topographic gradients. The lowest vegetated portions of the site are dominated by saltmarsh sandspurry (*Spergularia marina*); and non-native brassbuttons (*Cotula coronopifolia*) is also present. As elevation increases the diked marsh community includes non-native species such as fat hen (*Atriplex prostrata*) and rabbitsfoot grass (*Polypogon monspeliensis*). The upper extents of the diked marsh habitat are dominated by perennial ryegrass (*Festuca perennis*) and salt grass (*Distichlis spicata*).

Dominant plant species in brackish emergent wetlands in the Napa River Flood Protection Project include southern bulrush (*Schoenoplectus californicus*), saltmarsh bulrush (*Bolboschoenus maritimus* ssp. *paludosus*), Oregon gumweed (*Grindelia stricta*), marsh jaumea (*Jaumea carnosa*), rushes (*Juncus* spp.), narrowleaved cattail (*Typha angustifolia*), pickleweed (*Salicornia pacifica*), and salt grass (Stillwater Sciences 2018). Tidal mudflats are found adjacent to brackish wetlands in the Flood Protection Project area, and vegetative cover is sparse in these areas (Stillwater Sciences 2018).

Small areas of brackish wetlands may also be found in the downstream portion of maintained channels in the vicinity of American Canyon.

Brackish wetlands provide habitat for many species. Bird species typically associated with brackish wetlands include similar assemblages to those associated with freshwater wetlands. Mammals such as shrews, bats, raccoons, and mice may occur in this habitat.

Terrestrial Habitats

Riparian Woodlands

Riparian woodlands and forests are found along waterways throughout the County. Valley oak riparian woodlands and mixed willow riparian forest are the most common riparian vegetation community types in the Napa Valley, Carneros, and Jameson/American Canyon areas (Jones & Stokes and EDAW 2005). Valley oak riparian woodlands in Napa County are characterized by valley oak (*Quercus lobata*) and one of two suites of co-dominant tree species, either California bay (*Umbellularia californica*), coast live oak (*Q. agrifolia*), walnut (*Juglans californica* var *hindsii*) and Oregon ash (*Fraxinus latifolia*), or Fremont cottonwood (*Populus fremontii*) and coast live oak (Jones & Stokes and EDAW 2005). Valley oak riparian woodlands constitute only a small fraction of the County's overall area, but are particularly valuable in terms of providing wildlife habitat. Valley oak riparian woodlands that are not heavily grazed typically contain a variety of plant species in the understory, such as bracken fern (*Pteridium aquilinum*), Santa Barbara sedge (*Carex barbarae*), arroyo willow (*Salix lasiolepis*), California rose (*Rosa californica*), common snowberry (*Symphoricarpus albus*), California blackberry (*Rubus ursinus*), and wild grape (*Vitus californica*) (Jones & Stokes and EDAW 2005). Valley oak woodland and savanna also occurs on the open valley floor, where it was historically quite extensive (Jones & Stokes and EDAW 2005, SFEI 2008).

Mixed willow riparian woodlands and scrub includes Pacific willow (*Salix lucida ssp. lasiandra*), red willow (*Salix laevigata*), black willow (*Salix gooddingii*), narrowleaf or sandbar willow (*Salix exigua*), and arroyo willow (Jones & Stokes and EDAW 2005). These species may be found in pure or mixed stands. Other species found in mixed willow riparian forests include Fremont cottonwood, valley oak, coast live oak, California rose, California blackberry, common snowberry, white alder (*Alnus rhombifolia*), and big-leaf maple (*Acer macrophyllum*).

Riparian woodlands and forests are valuable for wildlife since they provide shade, water, favorable microclimates, and important movement corridors. In-stream woody debris from riparian trees and shrubs also provides important habitat elements, forming scour pools and logjams used by insects, amphibians, and fish (Riparian Habitat Joint Venture 2004). Riparian forests are particularly important for California landbird species, providing breeding habitat, over-wintering grounds, migration stopover areas (Riparian Habitat Joint Venture 2004), and movement corridors for bird species with somewhat limited mobility such as California quail (*Callipepla californica*). Multilayered, structurally complex vegetation enhances quality of riparian habitat.

Wildlife associated with riparian forests include amphibians such as Pacific tree frog (*Pseudacris regilla*); reptiles such as ring-necked snake (*Diadophis punctatus*) and sharp-tailed snake (*Contia tenuis*); birds such as black phoebe (*Sayornis nigricans*), yellow-breasted chat (*Icteria virens*), bushtit (*Psaltriparus minimus*), Pacific-slope flycatcher (*Empidonax difficilis*), and orange-crowned warbler (*Vermivora celata*); and mammals such as raccoon (*Procyon lotor*), ringtail (*Bassariscus astutus*), bobcat (*Lynx rufus*), and shrews (*Sorex* spp.). In recent years beavers have established a colony on Salvador Creek near Vintage High School (See Chapter 11, Figure 11-2). A variety of bat species may roost in riparian trees including the western red bat (*Lasiurus blossevillii*), a state species of special concern. Riparian habitat also contributes essential functions to aquatic habitats that support steelhead (*Oncorhynchus mykiss*), Chinook salmon (*O. tshawytscha*), and other fish species.

Functions and values provided by riparian woodlands and forest include the following:

- Stabilization of stream banks;
- Maintenance of stream water temperatures through shading of the channel;
- Movement corridors for wildlife;
- Habitat for wildlife, and inputs of coarse woody debris and detritus to streams;
- Opportunities for recreation, including hunting, bird-watching, hiking, and horseback riding.

Oak Woodlands

Oak woodlands are common in the County, covering more than 167,000 ac or 33 percent of land in the County (Jones & Stokes and EDAW 2005). Most of these woodlands are mixed oak with multiple dominant oak species such as coast live oak, interior live oak (*Quercus wislizeni*), blue oak (*Q. douglasii*), and California black oak (*Q. kelloggii*) (Jones & Stokes and EDAW 2005). Other oak woodlands include evergreen oak woodlands (dominated by coast live oak and interior live oak) and deciduous oak woodlands (dominated by blue oak or valley oak) (Jones & Stokes and EDAW 2005). The understory in these woodlands often contains annual or perennial grass species, poison oak (*Toxicodendron diversilobum*), hairy honeysuckle (*Lonicera hispidula*), and rigid hedge nettle (*Stachys ajugoides*) (Jones & Stokes and EDAW 2005).

Oak woodlands provide valuable food resources and habitat for wildlife. Acorns and oak-feeding insects provide food for many bird and wildlife species (Jones & Stokes and EDAW 2005). Birds such as ash-throated flycatcher (*Myiarchus cinerascens*), Hutton's vireo (*Vireo huttoni*), orange-crowned warbler, lark sparrow (*Chondestes grammacus*), Bullock's oriole (*Icterus bullockii*), Lawrence's goldfinch (*Carduelis lawrencei*) and lesser goldfinch (*Carduelis psaltria*) are found in oak woodlands (Jones & Stokes and EDAW 2005). Mammals which may be found in these habitats include northern raccoon (*Procyon lotor*), striped skunk (*Mephitis mephitis*), gray fox (*Urocyon cinereoargenteus*), bobcat (*Lynx rufus*), Columbian black-tailed deer (*Odocoileus hemionus columbianus*), and mountain lion (*Puma concolor*) (Jones & Stokes and EDAW 2005).

Functions and values provided by oak woodlands include the following:

- Habitat for wildlife;
- Opportunities for recreation, including hunting, bird-watching, hiking, and horseback riding.

Non-native Annual Grasslands

Annual grassland covers approximate 10 percent of the County (Jones & Stokes and EDAW 2005). Dominant species in this habitat include non-native annuals such as wild oat (*Avena* spp.), brome (*Bromus* spp.), wild barley (*Hordeum* spp.), Italian ryegrass (*Festuca perrenis*), medusa head (*Elymus caput-medusae*) and annual fescue (*Festuca* spp.) (Jones & Stokes and EDAW 2005). Forbs which may be present include miniature lupine (*Lupinus bicolor*), Douglas's lupine (*Lupinus nanus*), California poppy (*Eschscholzia californica*), clover (*Trifolium* spp.), filaree (*Erodium* spp.), birdsfoot trefoil (*Lotus corniculatus*), evening snow (*Linanthus dichotomus*), purple owl's-clover

(*Castilleja densiflora*), valley tassels (*Castilleja attenuata*), blow wives (*Achyrachaena mollis*), buttercup (*Ranunculus* spp.), star thistle (*Centaurium* sp.), and smooth cat's-ear (*Hypochaeris glabra*) (Jones & Stokes and EDAW 2005).

Many wildlife species use grasslands for breeding or other habitat. Bird species known to breed in annual grasslands include western bluebird (*Sialia mexicana*), loggerhead shrike (*Lanius ludovicianus*), California horned lark (*Eremophila alpestris actia*), Savannah sparrow (*Passerculus sandwichensis*), Say's phoebe (*Sayornis saya*) and western meadowlark (*Sturnella neglecta*) (Jones & Stokes and EDAW 2005). Species such as golden eagle (*Aquila chrysaetos*), northern harrier (*Circus cyaneus*), American kestrel (*Falco sparverius*), white-tailed kite, and red-tailed hawk (*Buteo jamaicensis*) use annual grasslands as foraging habitat (Jones & Stokes and EDAW 2005).

Functions and values provided by non-native annual grasslands include the following:

- Habitat for wildlife;
- Opportunities for recreation, including hunting, bird-watching, hiking, and horseback riding.

3.2.2 Fish Resources

The Napa County streams and waterways provide habitat for a wide variety of freshwater, marine, and anadromous fish species. The County's fish communities include both native and non-native (introduced) fish species. Native fish species found primarily in freshwater habitats in the Napa River watershed include river lamprey (*Lampetra ayresi*), Western brook lamprey (*L. richardsoni*), Pacific lamprey (*L. tridentata*), Sacramento splittail (*Pogonichthys macrolepidotus*), Sacramento pikeminnow (*Ptychocheilus grandis*), hardhead (*Mylopharodon conocephalus*), California roach (*Hesperoleucus symmetricus*), Sacramento sucker (*Catostomus occidentalis*), steelhead/rainbow trout, Chinook salmon, threespine stickleback (*Gasterosteus aculeatus*), riffle sculpin (*Cottus gullosus*), prickly sculpin (*Cottus asper*), and tule perch (*Hysterocarpus traski*) (Leidy 2007, Koehler and Blank 2010). The Green Valley Creek watershed has similar composition, including Pacific lamprey, California roach, Sacramento pikeminnow, steelhead/rainbow trout, threespine stickleback, prickly sculpin, and tule perch (Leidy 2007). The Suisun Creek watershed includes the same native species as the Green Valley Creek watershed, plus additional species such as hitch and Sacramento blackfish (*Orthodon microlepidotus*) (Leidy 2007). The Putah Creek watershed in Napa County supports native fish such as hardhead, Sacramento pikeminnow, Sacramento hitch, Sacramento sucker, and riffle sculpin (UC Davis 2016). Of these fishes, the Pacific and river lampreys, steelhead, and Chinook salmon are anadromous, meaning that adults reside in the ocean but spawning and rearing takes place in fresh water. Sacramento splittail have a similar life history, residing in salt water estuarine habitats as adults and migrating into large rivers to spawn in fresh water. The Monticello Dam that forms Lake Berryessa is a total barrier to anadromous fish passage, thus no anadromous fish are found upstream of the dam in the Putah Creek watershed (CDFW et al. 2016).

Non-native freshwater species in the Napa River watershed include common carp (*Cyprinus carpio*), goldfish (*Carassius auratus*), fathead minnow (*Pimephales promelas*), golden shiner (*Notemigonus crysoleucas*), channel catfish (*Ictalurus punctatus*), white catfish (*Ameiurus catus*), brown bullhead (*Ameiurus nebulosus*), wakasagi (*Hypomesus nipponensis*), inland silverside (*Menidia beryllina*), western mosquitofish (*Gambusia affinis*), striped bass (*Morone saxatilis*), largemouth bass (*Micropterus salmoides*), smallmouth bass (*Micropterus dolomieu*), bluegill

(*Lepomis macrochirus*), redear sunfish (*Lepomis microlophus*), green sunfish (*Lepomis cyanellus*), white crappie (*Pomoxis annularis*), and black crappie (*Pomoxis nigromaculatus*) (USACE 2006, Leidy 2007, Koehler and Blank 2010). The Putah Creek watershed contains white crappie, black crappie, brown trout (*Salmo trutta*), bluegill, common carp, smallmouth bass and others (UC Davis 2016). The Green Valley Creek watershed contains common carp, rainwater killifish (*Lucania parva*), inland silverside, western mosquitofish and yellowfin goby (*Acanthogobius flavimanus*) (Leidy 2007). The Suisun Creek watershed contains species such as common carp, golden shiner, fathead minnow, rainwater killifish, striped bass, green sunfish, and largemouth bass (Leidy 2007). Some non-native fishes found in fresh water habitats in the also use salt water or brackish water during a portion of their life cycle. These include inland silversides and striped bass.

Anadromous salmonids

Steelhead are relatively widespread in Napa Valley streams (Ecotrust and Friends of Napa River 2001 and 2002, Stillwater Sciences and Dietrich 2002, Leidy et al. 2005, Koehler and Blank 2010), but current abundance is thought to be only a small fraction of historical levels. Fall-/late fall-run Chinook salmon also spawn and rear in the Napa River (Koehler and Edwards 2008, Koehler and Blank 2010). Annual observations in the Napa River of spawning adults and juvenile Chinook salmon by the Napa County RCD from 2004–2010 indicate that successful spawning occurs in most years (Koehler and Blank 2010). Steelhead were historically present in the Green Valley Creek watershed, and are known to occur downstream of Lake Curry in Suisun Creek (Leidy et al. 2005).

Small numbers of juvenile chum salmon (*Oncorhynchus keta*) have been found in the Napa River estuary (USACE 2006), but a spawning population has not been documented in the Napa River watershed. In 2010, several hundred juvenile sockeye/kokanee salmon (*O*. *nerka*) were identified in outmigrant traps in the Napa River (Koehler and Blank 2010). These fish are believed to have originated from a landlocked population in an upstream reservoir (J. Koehler, pers. comm., 2010).

Despite considerable habitat degradation and loss of anadromous fish habitat relative to historical conditions, the Napa River watershed still contains extensive areas of relatively high-quality spawning and rearing habitat for steelhead and salmon (Koehler and Blank 2010). The Napa River watershed is considered one of the most important watersheds in the San Francisco Bay Area for conservation and restoration of the Central California Coast Distinct Population Segment (DPS) of steelhead (Becker et al. 2007).

Carneros Creek, a tributary to the Napa River located in the southwestern part of the program area, is an example of a potentially important conservation and restoration opportunity for steelhead. Compared to many other Napa Valley streams, Carneros Creek has a relatively unaltered channel and no fish passage barriers separating it from San Francisco Bay (Grossinger et al. 2004). Management actions to conserve the value of this stream for steelhead and other species include the restoration of riparian vegetation and the management of surface and groundwater withdrawals to ensure adequate baseflow is maintained year-round (Carneros Creek Stewardship 2005).

3.2.3 Special-Status Species

There are several special-status species that utilize aquatic, riparian, oak woodland and grassland habitats present in the County, and have the potential to occur in the program area. Special-status species include those:

- listed as endangered, threatened, or candidate under the federal Endangered Species Act;
- listed as endangered, threatened, or candidate under the California Endangered Species Act;
- designated as Species of Special Concern by CDFW; and/or
- designated as Fully Protected by the California Fish and Game Code (F&G Code) (Sections 3511, 4700, 5050 and 5515).

In addition, plant species are included if they are designated as Special Vascular Plants in the CDFW Natural Diversity Database (CDFW 2016a). CDFW also recognizes several sensitive natural communities that occur in the program area, including: Coastal and Valley Freshwater Marsh, Mixed Willow Riparian forests and Fremont Cottonwood Riparian Forests and several additional types of willow riparian forest.

Information on special-status species that may occur within the program area was gathered from Jones & Stokes and EDAW (2005). This list was cross-checked and updated with results from the USWFS list of federally listed and proposed endangered and threatened species for the County (USFWS 2016), and a California Natural Diversity Database (CNDDB) search for Napa County (CDFW 2016b). The special-status species list was then refined to include only those species associated with riparian forest/woodland, oak woodlands, grasslands, freshwater wetland, brackish wetland, and open water/stream habitats, including ephemeral streams (**Table 3-1**).

Table 3-1. Special-Status Plant and Animal Species Potentially Occurring in the Program Area[a]

Common Name *Scientific name*	**Regulatory Status and General Habitat Types**						
	Status[b] (Federal/ State/ Other)	**Annual Grassland**	**Oak Woodlands**	**Riparian Forest/ Woodland**	**Freshwater Wetland**	**Brackish Wetlands[c]**	**Open Water/ Stream**
Plants							
Napa false indigo *Amorpha californica* var. *napensis*	–/–/1B.2		✓				
bent-flowered fiddleneck *Amsinckia lunaris*	–/–/1B.2, SLC	✓	✓				
twig-like snapdragon *Antirrhinum virga*	–/–/4.3		✓	✓			
Konocti manzanita *Arctostaphylos manzanita* ssp. *elegans*	–/–/1B.3		✓				
Brewer's milkvetch *Astragalus breweri*	–/–/4.2	✓					
Clara Hunt’s milk-vetch *Astragalus clarianus*	FE/ST/1B.1	✓	✓				
San Joaquin spearscale *Atriplex joaquiniana*	–/–/1B.2	✓					

Common Name *Scientific name*	Regulatory Status and General Habitat Types						
	Status[b] (Federal/ State/ Other)	**Annual Grassland**	**Oak Woodlands**	**Riparian Forest/ Woodland**	**Freshwater Wetland**	**Brackish Wetlands[c]**	**Open Water/ Stream**
Big-scale balsamroot *Balsamorhiza macrolepis*	–/–/1B.2	✓					
Narrow-anthered California brodiaea *Brodiaea californica* var. *leptandra*	–/–/1B.2	✓					
Large-Flowered pink star tulip *Calochortus uniflorus*	–/–/4.2		✓	✓			
Salt marsh owl's clover *Castilleja ambigua* ssp. *ambigua*	–/–/4.2	✓	✓				
Tracy's clarkia *Clarkia gracilis* ssp. *tracyi*	–/–/4.2		✓				
Soft bird's-beak Cordylanthus mollis ssp. mollis =Chloropyron molle ssp. molle	FE/SR/ 1B.2					✓	
Dwarf downingia *Downingia pusilla*	–/–/2B02	✓	✓				
Dwarf spikerush *Eleocharis parvula*	–/–/4.3				✓		
Marsh horsetail *Equisetum palustre*	–/–/3, LR				✓		
Narrow-leaved daisy *Erigeron greenei [=Erigeron angustatus]*	–/–/1B.2		✓				
St. Helena fawn lily *Erythronium helenae*	–/–/4.2		✓				
Nodding harmonia *Harmonia nutans [=Madia nutans]*	–/–/4.3	✓	✓				
Northern California black walnut *Juglans californica* var *hindsii*	—/–/1B.1		✓	✓			
Delta tule pea *Lathyrus jepsonii* var *jepsonii*	–/–/1B.2				✓	✓	
Colusa layia *Layia septentrionalis*	–/–/1B.2	✓	✓				
Legenere *Legenere limosa*	–/–/1B.1				✓		
woolly-headed lessingia *Lessingia hololeuca*	–/–/3	✓	✓				
Mason's Lilaeopsis *Lilaeopsis masonii*	–/R/1B.1			✓	✓	✓	

Common Name *Scientific name*	**Regulatory Status and General Habitat Types**						
	Status[b] (Federal/ State/ Other)	**Annual Grassland**	**Oak Woodlands**	**Riparian Forest/ Woodland**	**Freshwater Wetland**	**Brackish Wetlands[c]**	**Open Water/ Stream**
charparral lily *Lilium rubescens*	–/–/4.2		✓				
Wooly meadowfoam *Limnanthes floccosa* ssp. *floccosa*	–/–/4.2	✓					
Sebastopol meadowfoam *Limnanthes vinculans*	FE/SE/1B.1			✓	✓		
Bristly leptosiphon *Leptosiphon acicularis [=Linanthus acicularis]*	–/–/4.2	✓	✓				
Jepson's leptosiphon *Leptosiphon jepsonii [=Linanthus jepsonii]*	–/–/1B.2	✓	✓				
Hoover's wild parsnip *[=Lomatium ciliolatum var. hooveri]*	–/–/4.3		✓				
Cobb Mountain lupine *Lupinus sericatus*	–/–/1B.2		✓				
California loosestrife *Lythrum californicum*	–/–/LR				✓		
Heller's bush mallow *Malacothamnus helleri*	–/–/3.3		✓	✓			
green monardella *Monardella viridis*	–/–/4.3	✓	✓				
Cotula navarettia *Navarettia cotulifolia*	–/–/4.2, LR	✓					
Calistoga popcorn-flower *Plagiobothrys strictus*	FE/ST/1B.1	✓					
Napa blue grass *Poa napensis*	–/–/1B.1	✓					
Marin knotweed *Polygonum marinense*	–/–/3.1				✓	✓	
Lobb's aquatic buttercup *Ranunculus lobbii*	–/–/4.2, LR		✓	✓			✓
California beaked rush *Rhynchospora californica*	–/–/1B.1				✓		
Victor's gooseberry *Ribes victoris*	–/–/4.3		✓	✓			
Marsh checkerbloom *Sidalcea oregana* ssp. *hydrophila*	–/–/1B.1			✓	✓		

Common Name *Scientific name*	**Regulatory Status and General Habitat Types**						
	Status[b] (Federal/ State/ Other)	**Annual Grassland**	**Oak Woodlands**	**Riparian Forest/ Woodland**	**Freshwater Wetland**	**Brackish Wetlands[c]**	**Open Water/ Stream**
Suisun Marsh aster *Symphyotrichum lentum [=Aster lentus]*	–/–/1B.2				✓	✓	
Marsh zigadenus Toxicoscordion fontanum	–/–/4.2				✓		
Hernandez turpentine weed *Trichostema rubisepalum*	–/–/4.3	✓	✓				
showy Indian clover *Trifolium amoenum*	FE/–/1B.1	✓					
Saline clover *Trifolium depauperatum* var. *hydrophilum =Trifolium hydrophilum*	–/–/1B.2	✓			✓	✓	
Oval-leaved viburnum *Viburnum ellipticum*	–/–/2B.3		✓	✓			
Invertebrates							
valley elderberry longhorn beetle *Desmocerus californicus dimorphus*	FT/–			✓			
California freshwater shrimp *Syncaris pacifica*	FE/SE			✓			✓
Fish							
Delta smelt *Hypomesus transpacificus*	FT/SE						✓
River lamprey *Lampetra ayresi*	–/SSC						✓
Pacific lamprey *Lampetra tridentata*	FSC/–						✓
Hardhead *Mylopharodon conocephalus*	–/SSC						✓
Steelhead (Central California Coast DPS) *Oncorhynchus mykiss*	FT/–						✓
Chinook salmon (fall/late fall-run) *O. tshawytscha*	FSC/–						✓
Sacramento splittail *Pogonichthys macrolepidotus*	–/SSC						✓
Longfin smelt *Spirinchus thaleichthys*	–/ST						✓
Amphibians							
California giant salamander *Dicamptodon ensatus*	–/ SSC						✓

Common Name *Scientific name*	Regulatory Status and General Habitat Types						
	Status[b] (Federal/ State/ Other)	**Annual Grassland**	**Oak Woodlands**	**Riparian Forest/ Woodland**	**Freshwater Wetland**	**Brackish Wetlands[c]**	**Open Water/ Stream**
California red-legged frog *Rana draytoni*	FT/ SSC			✓	✓		✓
Foothill yellow-legged frog *Rana boylii*	SC/ SSC						✓
Western spadefoot *Scaphiopus hammondii*	–/ SSC						✓
Reptiles							
Pacific pond turtle *Actinemys marmorata*	–/ SSC			✓	✓		✓
Birds							
Tricolored blackbird *Agelaius tricolor*	–/ SSC				✓		
Golden eagle *Aquila chrysaetos*	–/ SFP		✓				
Short-eared owl *Asio flammeus*	–/SSC				✓		
Swainson's hawk *Buteo swainsoni*	–/ST			✓			
Western snowy plover *Charadrius alexandrinus nivosus* (coastal populations)	FT/ SSC (interior population)					✓	✓
Northern harrier *Circus cyaneus*	–/ SSC				✓	✓	
Yellow warbler *Dendroica petechia*	–/ SSC			✓			
White-tailed kite *Elanus leucurus*	–/ SFP			✓	✓	✓	
American peregrine falcon *Falco peregrinus anatum*	FD/ SD, SFP				✓		
Salt marsh common yellowthroat *Geothlypis trichas sinuosa*	–/ SSC				✓	✓	
Bald eagle *Haliaeetus leucocephalus*	FD/SE, SFP			✓			
Yellow-breasted chat *Icteria virens*	–/ SSC			✓			
California black rail *Laterallus jamaicensis coturniculus*	-/ST, SFP					✓	
San Pablo song sparrow[d] *Melospiza melodia samuelis*	–/ SSC					✓	
Purple martin *Progne subis*	–/ SSC			✓			

Common Name *Scientific name*	Regulatory Status and General Habitat Types						
	Status[b] (Federal/ State/ Other)	Annual Grassland	Oak Woodlands	Riparian Forest/ Woodland	Freshwater Wetland	Brackish Wetlands[c]	Open Water/ Stream
California Ridgway's rail *Rallus obsoletus obsoletus*	FE/SE					✓	
Yellow-headed blackbird *Xanthocephalus xanthocephalus*	–/ SSC				✓		
Mammals							
Pallid bat *Antrozous pallidus*	–/ SSC		✓	✓			
California ringtail *Bassariscus astutus raptor*	–/ SFP			✓			
Townsend's big-eared bat *Corynorhinus townsendii*	–/ ST, SSC		✓	✓			
Greater western mastiff bat *Eumops perotis californicus*	–/ SSC		✓	✓			
Western red bat *Lasiurus blossevillii*	–/ SSC		✓	✓			
Salt marsh harvest mouse Reithrodontomys raviventris	E/E, SFP					✓	

[a] Species which occur within serpentine habitats were not included, since program activities are not anticipated to occur in serpentine areas.

[b] Status codes for plants include Federal/State/other (California Rare Plant Rank [CRPR], CNDDB, or local rarity) categories while those for animals include Federal/State categories only:

Federal:

FE = Listed as endangered under the federal Endangered Species Act
FT = Listed as threatened under the federal Endangered Species Act
FD = Federally delisted
PD = Federally proposed for delisting
FSC = Federal species of concern

State:

SE = Listed as endangered under the California Endangered Species Act
ST = Listed as threatened under the California Endangered Species Act
SD = State delisted
SC = State candidate for listing
SSC = Considered a species of special concern by the State of California
SFP = Fully protected by the State of California
SR = State Rare

California Rare Plant Ranks:

1A. Presumed extinct in California
1B. Rare or endangered in California and elsewhere
2. Rare or endangered in California, more common elsewhere
3. Plants for which we need more information – Review list
4. Plants of limited distribution – Watch list
Threat Codes:
.1- Seriously threatened in California
.2- Moderately threatened in California
.3- Not very threatened in California

Other:

LR = Considered by local experts to be rare in the Napa County portion of its range, although it may be more common elsewhere (see Tables 4-6 and 4-7 in Jones & Stokes and EDAW (2005)).

[c] Brackish wetlands are limited to those at the Edgerly Island site, the adjacent mitigation wetland, and those in the Flood Protection Project.

[d] San Pablo sparrow could utilize scrub and ruderal habitats adjacent to southern marshes.

3.3 Cultural Resources

This section provides a context for the cultural resources found in Napa County, describes the various types of cultural resources that occur, and discusses the sensitivity for cultural resources that may be potentially affected by stream maintenance activities.

3.3.1 Cultural Resources Context

Prehistoric Native American Context

Archaeological records show that the Napa region has a long history of occupation by Native Americans. Research indicates that the Napa Valley was certainly well-inhabited by 3000 B.C., and possibly as far back as 5,000 B.C.. Evidence from Lake Berryessa suggests an even older date of 6,000 B.C.. However, use of Napa Valley and the surrounding mountains likely occurred much earlier, as archaeological sites from adjacent Sonoma and Lake counties point to occupation dating to 10,000 B.C., and possibly earlier (Moratto 2004). In Napa Valley, remnants of ancient occupation may be buried under the alluvium that has accumulated at the valley edges and on the valley floor. The earliest cultural remains suggest that people were transient or seasonal visitors to the region. As various populations moved through the area and the region became more populated, indigenous groups began to settle for longer periods of time. By 500 B.C., populations had become mostly sedentary and large villages were established in the valley (Bennyhoff 1977).

Ethnographic Context

The program area was primarily inhabited by the Wappo and Patwin tribal groups prior to and at the time of colonization. These tribes shared similar lifestyles, technologies, subsistence strategies, and settlement patterns. The Wappo were the primary occupants within the county (Sawyer 1978). They held the entirety of the Napa Valley from just north of present-day Napa, north to beyond the county line to Cobb Mountain in Lake County. Within Napa County, the western limits of their territory, during ethnographic times, roughly corresponded to the current County boundary along the ridge of the Mayacmas Mountains. To the east, their lands extended to the area around Angwin and included Chiles Valley. The Patwin inhabited the southern reaches of Napa County, from Napa to Suisun Bay, and all lands east of the Wappo territory, including the valley where modern-day Lake Berryessa stands, and beyond into the Sacramento Valley (Johnson 1978). The very northeastern portions of Napa County, including Pope Valley and much of the Putah Creek headwaters, were in Lake Miwok territory (Callaghan 1978).

Hispanic and American Periods

In 1823 the first European explorers, Don Francisco Castro and Franciscan Friar Jose Altamira, traveled through Napa Valley in search of a site for a new mission. They explored present-day Petaluma, Sonoma, and Napa before settling on Sonoma as the location for the mission.

In the 1830s, the Napa Valley became one of the first areas in California to be settled by American farmers. George C. Yount was the first pioneer to settle in Napa County. Yount, who came to California in 1831 to hunt and trap sea otters, received a land grant in the Napa Valley from the Mexican government. Rancho Caymus encompassed more than 11,000 ac and extended north from the western foothills of Mt. St. John to what is now the intersection of Zinfandel Lane and Silverado Trail. From 1836 to 1846, most of the Rancho was used for grazing horses, cattle, and sheep, with a small portion set aside for cultivating wheat.

When California was granted statehood in 1850, Napa was part of the district of Sonoma. Later that year, when counties were established throughout the state, Napa became one of the original 27 California counties, with Napa City (later shortened to Napa) as the County seat.

The Spanish and Mexican missionaries are credited with planting the first grapevines and introducing winemaking to California. In 1838 the first grape vines in Napa Valley were planted by George Yount. While Yount is considered the first to plant table grapes in Napa Valley, it was Agoston Harazthy who made the first effort to improve the variety of planted grapes, growing techniques, and winemaking. Harazthy introduced zinfandel into California in 1852 and also planted additional European varietals in the Napa Valley in the 1860s.

The wine industry continued to grow in Napa Valley during the 1870s, with the number of wineries between Calistoga and Oakville doubling from 15 to 30. Since then, the wine industry weathered a series of highs and lows—phylloxera infestations, the San Francisco earthquake of 1906, Prohibition, the economic crisis of the Great Depression—however viticulture remained the dominant agricultural activity in Napa Valley. Rising from the problems that faced the wine and wheat industries during the late 1800s, fruit growing (mostly apples, peaches, olives, and prunes) became important secondary crops in the valley.

Cultural Resources Sensitivity

A records search of the program area and maintenance reaches was conducted at the Northwest Information Center (NWIC) of the California Historical Resources Information System at Sonoma State University in January 2017 (NWIC File No. 12-0886) and March 2018 (NWIC File No. 17-2023). The purpose of the record search was to provide baseline information about the number of recorded cultural resources within the program area in order to ascertain the general sensitivity of the region for cultural resources. The NWIC information has largely been derived from study results filed at the Information Center, and is not necessarily a comprehensive reflection of all cultural resources work conducted in the county. Data were also accumulated from historic-period maps and literature for Napa County. It is important to note that a vast majority of the waterways and roads included in the program area have not been completely surveyed for archaeological resources.

The record search revealed that 895 Native American archaeological resources, 240 historic-period archaeological resources, and 121 multicomponent (containing both Native American and historic-period materials) resources have been recorded in the Program area. Not surprisingly, these resources are recorded throughout the entirety of the program area. The NWIC noted that Native American sites are dense throughout Napa Valley and tend to cluster on mid-slope terraces and trending ridgelines; in areas at the interface between the foothills and low-lying terrain; and in areas near intermittent and perennial watercourses, wetlands, and areas marginal to the San Francisco Bay. All of Napa Valley, the eastern slopes of the Mayacamas Mountains, and the western slopes of the Vaca Ranges, Chiles Valley, and the San Francisco Bay margins and its associated wetlands were all identified as having a high potential for unrecorded Native American resources. Other locations with a high potential for Native American sites are the Putah Creek watershed, including what is now Lake Berryessa, Pope Valley, Capell Valley, Snell Valley, Big Basin, Mysterious Valley, Wooden Valley, and Cherry Valley.

Similarly, historic-period sites have been recorded throughout the program area. These resources date back to the early 1800s and Spanish mission expansion, and largely relate to early ranching and farming efforts. The Napa River and Valley have been used as a travel corridor for people and goods alike throughout the historic period. With much of the early homesteading and industry beginning near or along the Napa River and its associated tributaries, along with farming in the smaller valleys throughout Napa County, there is a high potential for unrecorded historic-period archaeological resources to be within the program area.

Six bridges within the program area, and under County jurisdiction, have been determined eligible for listing on the National Register of Historic Places (Caltrans 2018).

3.4 Channel Characterizations

Detailed characterizations of conditions at District primary maintenance channel reaches are provided on the following pages. These channel condition assessments are provided to describe the existing/baseline conditions of the channels at the time of this manual. These characterizations are presented in a north to south order as follows:

- Napa River Reaches 1, 2, and 3
- Conn Creek Reaches 1, 2, and 3
- Beard Ditch
- Yountville Outfall – North Collector
- Yountville Outfall – South Collector Reaches 1 and 2
- Yountville Outfall Reaches 1 and 2
- Solano Ditch
- North Salvador Collector Reaches 1 and 2
- South Salvador Collector
- Salvador Creek Reaches 1, 2, and 3
- Tulocay Creek Reaches 1 and 2
- Camille Creek
- Sheehy Creek
- Fagan Creek
- American Canyon Creek
- Newell Creek
- North Slough
- Rio Del Mar
- Walsh Creek

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Napa River – Reach 1

OWNERSHIP: Private with District easement

LOCATION: Downstream of the Kimball Reservoir to St. Helena

ADJACENT LAND USE: Mostly vineyards. Residential areas in the cities of Calistoga and St. Helena. Also includes Kimball WTP, and Calistoga WWTP.

UPSTREAM: Napa River, Kimball Reservoir

LENGTH: 13.2 miles

MAJOR TRIBUTARIES: (Upstream to downstream) Blossom Creek, Garnett Creek, Cyrus Creek, Nash Creek, Biter Creek, Ritchey Creek, Mill Creek, Canon Creek, York Creek, and Sulfur Creek

CROSSINGS: (Upstream to downstream) Evey Road, Tubbs Lane, Myrtledale Road, Berry Street, Greenwood Ave, Lincoln Avenue, Private (164 Foothill Boulevard), Dunaweal Lane, Maple Lane, Larkmead Lane, Bale Lane, Lodi Lane, and Deer Park Road.

Photo 1. Typical conditions of the riparian corridor, looking upstream from Pioneer Park in Calistoga. Bank vegetation and canopy cover is generally very dense with little to no instream emergent vegetation (*August 2017*).

REACH SETTING

Napa River – Reach 1 includes the upper valley section of the Napa River. Reach 1 receives flows from upper watershed tributaries that descend from the Mayacmas Mountains and Kimball Reservoir (Figure 1). The upstream portion of Reach 1 includes the lower foothills of the mountains (alluvial fan) before the river reaches the bottom of the Napa Valley (alluvial plain) north of Calistoga. Downstream of Calistoga, the Napa River flows southeast across the valley floor collecting flows from tributaries draining the Palisades and Howell Mountain to the east and southern flank of the Mayacmas Mountains to the west.

Photo 2. Typical conditions of the riparian corridor, near the lower portion of Reach 1 in St. Helena (*August 2017*).

PHYSICAL CONDITIONS

Physical Features: Average width at top of bank ranges 50-60 feet, while the average width of the riparian zone is 100-125 feet. The channel is narrowly confined by relatively steep banks and/or levees in many places.

Geomorphic Setting: Reach 1 is characterized by riffle-run-pool sequences. This reach typically experiences seasonal flow and is mostly dry upstream of Calistoga, but does maintain areas of perennial inundation and deeper pools. Reach 1 has energetic high flows and bed material generally consists of boulders, cobbles, and coarse gravel with most fine material transported downstream. However, some fine material accumulates in pools on the outside of channel bends or in areas where the channel expands significantly, such as after bridge crossings.

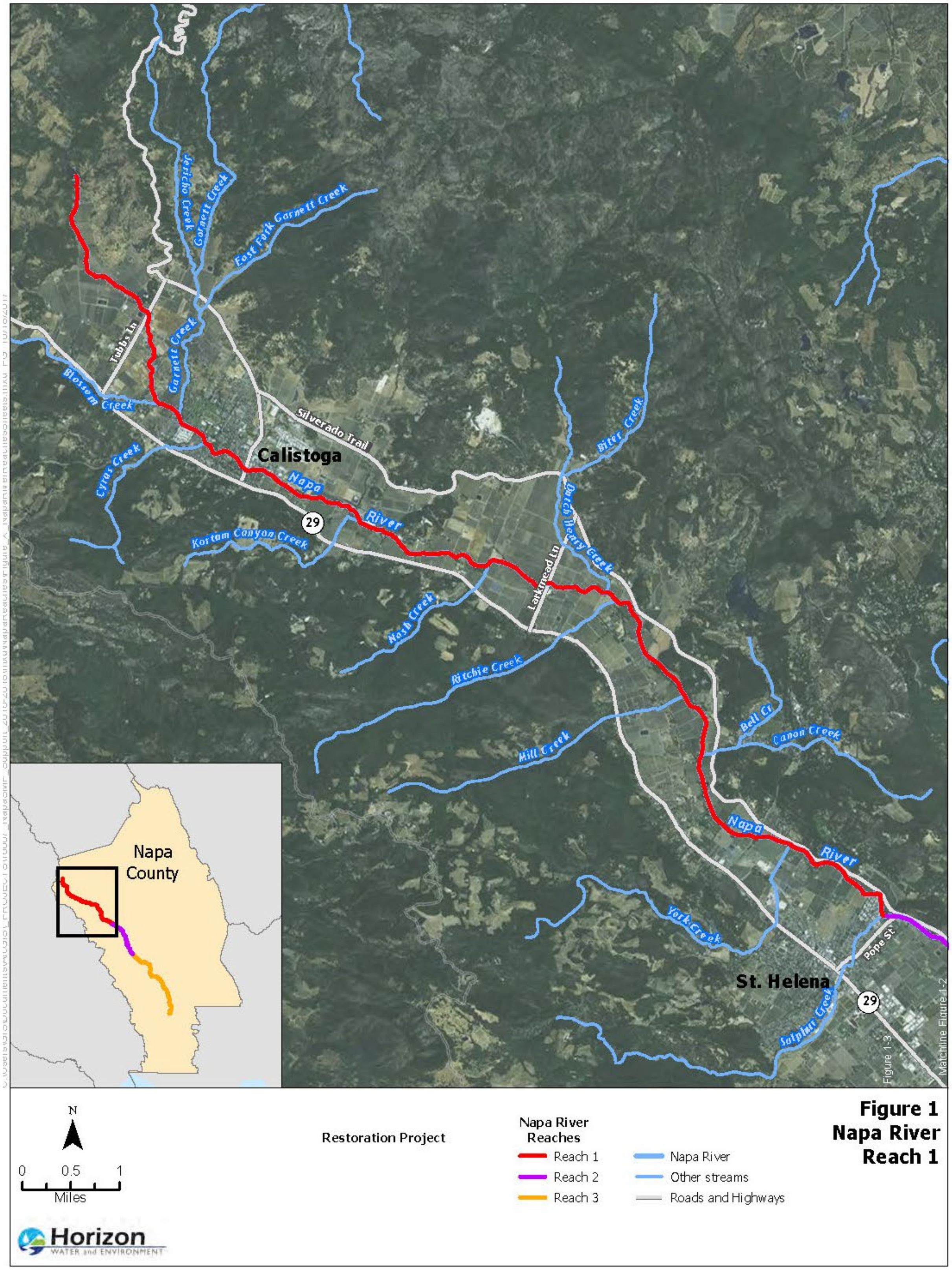


Figure 1
Napa River
Reach 1

BIOLOGICAL CONDITIONS

Vegetative Communities and Unique Habitat Features:

In general, the Napa River corridor is narrow and generally surrounded by vineyards or other agricultural uses, or concentrated areas of residential development near cities and towns, often constrained by levees. Valley oak riparian forest is the most abundant vegetation community along the river. Valley oak (*Quercus lobata*) is dominant and one of two suites of tree species is sub-dominant; either California bay (*Umbellularia californica*), coast live oak (*Q. agrifolia*), walnut (*Juglans californica* var *hindsii*) and Oregon ash (*Fraxinus latifolia*), or Fremont cottonwood (*Populus fremontii*) and coast live oak. The understory community in the valley oak riparian forest typically includes species such as bracken fern (*Pteridium aquilinum*), Santa Barbara sedge (*Carex barbarae*), arroyo willow (*Salix lasiolepis*), California rose (*Rosa californica*), common snowberry (*Symphoricarpus albus*), California blackberry (*Rubus ursinus*), and wild grape (*Vitus californica*). Invasive species present include Himalayan blackberry (*Rubus armeniacus*) and smilo grass (*Stipa miliacea* var. *miliacea*).

Plants that may be found below ordinary high water include torrent sedge (*Carex nudata*), giant chain fern (*Woodwardia fimbriata*), and small-fruited bulrush (*Scirpus microcarpus*). Certain non-vascular plants, such as aquatic mosses and filamentous algae that are tightly attached to rocks by strong holdfasts can survive the fast current. Slow flowing or backwater sections of the river support aquatic vegetation such as cattail (*Typha* spp.), nutsedge (*Cyperus* spp.), and smartweeds (*Persicaria* spp.).

From Kimball Reservoir downstream to the Evey Road crossing in Calistoga, a large area of mixed oak and coniferous forest is present to the west of the river. This area provides habitat connectivity to sparsely developed foothill areas to the north and west of this portion of the reach.

An area of continuous oak woodland habitat is located to the north of the river from approximately 0.5-1.0 mile downstream of Bale Lane (3522 Silverado Trail, St. Helena). A second area of continuous oak woodland/coniferous forest is located in the vicinity of the intersection of Pratt Avenue and Silverado Trail in St. Helena. These areas provide habitat connectivity to the hills to the north and east of this reach.

Special Status Species:

Table 1 lists potential special-status species within Reach 1. Figure 2 shows recorded CNDDB occurrences. Note: American Peregrine Falcon and Calistoga popcornflower are listed as occurring within the entire Calistoga Quadrangle (i.e., the upstream most portion of Reach 1), as indicated in Figure 2.

Table 1. Special-Status Species with the Potential to Occur in the Reach

Species	Potential to Occur
Steelhead *Oncorhynchus mykiss*	**Present.** The Napa River is designated critical habitat for this species.
California freshwater shrimp *Syncaris pacifica*	**Present.** CNDDB occurrences are present within this reach.
Western pond turtle *Actinemys marmorata*	**Present.** CNDDB occurrences are present within this reach.
Foothill yellow-legged frog *Rana boylii*	**Possible.** Suitable habitat is present and CNDDB occurrences are present nearby.
Swainson's Hawk *Buteo swainsoni*	**Possible.** Recorded occurrence downstream and suitable habitat is present in this reach.
Yellow Warbler *Setophaga petechia*	**Present.** This species has been observed in this reach and suitable habitat is present.

Table 1. Special-Status Species with the Potential to Occur in the Reach

Species	Potential to Occur
Pallid Bat *Antrozous pallidus*	**Present.** Suitable habitat is present and CNDDB occurrences are present within this reach.
Townsend's big-eared bat *Corynorhinus townsendii townsendii*	**Possible.** Suitable habitat is present and CNDDB occurrences are present nearby.
Western Red Bat *Lasiurus blossevilli*	**Possible.** Suitable habitat is present.

Major Restoration Sites:

Arundo control and revegetation with native riparian species has been a top priority for the District within Reach 1. The Arundo Management Program aims not only to control Arundo for the purpose of restoring channel capacity but also to re-establish complex and resilient riparian ecosystems within the infested reaches. Active revegetation of the areas previously affected by Arundo infestations is integrated with the District's treatment program as noted in chapter 5 and Appendix H. The District has controlled approximately 2.6 acres of Arundo within the 10 mile reach between the city of Calistoga and the city of Saint Helena. The District has installed over 740 native trees and thousands of native shrubs and understory species. These efforts began over ten years ago and have been refined to incorporate lessons from the District's experience.

Within the city of Calistoga, the riparian corridor is constrained by urban development and prone to channel incision. This reach of the Napa River has been vulnerable to an accelerated loss of the remaining trees as they fall into the channel. For example, following the loss of several large valley oaks, the Calistoga Elementary School suffered significant bank failure (see Photo 6 below). The District partnered with the school to solicit grant funding and develop plans for a biotechnical bank stabilization project. On a smaller scale, the District has partnered with the City of Calistoga and private landowners within the reach to undertake several biotechnical stabilization projects both as District-led projects and landowner-led projects supported through the Streambank Stabilization Cost-share Program. The District has also successfully modified and retained several large downed trees to provide bank stability and habitat complexity within the reach.

The St. Helena Flood Project was completed in 2011 and included floodwalls and levees to provide 200 year flood protection. The project installed 44,000 native plants including over 700 trees. The habitat features include expanded floodplain terraces as well as a backwater alcove and in-channel large woody debris structures. The District assists the City of St. Helena with vegetation maintenance activities within the project.

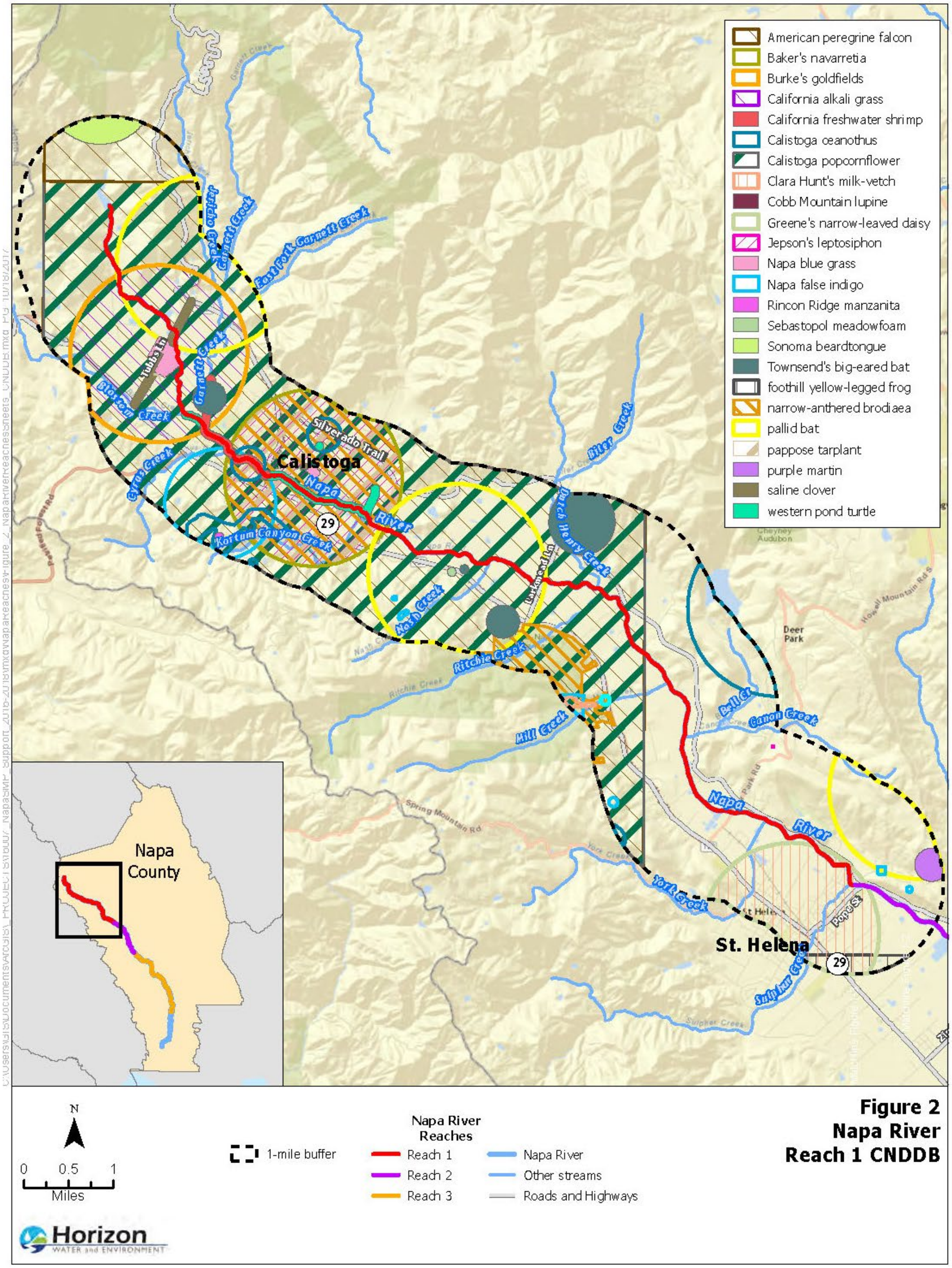


Figure 2
Napa River
Reach 1 CNDDB

Photo 3. Flood terrace restoration site near the confluence of Sulfur Creek in St. Helena. Restoration activities were taken to ensure projects meet performance criteria (*August 2017*).

Photo 4. Facing downstream near XXXX. The right bank (photo right) was regraded to include a wider setback and gravel/cobble bar (photo foreground) and is typical for Reach 1 (*August 2017*).

Photo 5. Large woody debris jam at the Berry Street bridge pier. Jams such as this have the potential to jeopardize infrastructure integrity, divert flows and thereby cause heightened erosion or result in localized flooding (August 2017).

Photo 6. Site of a recent severe erosion and bank failure at Calistoga Elementary School. A mostly confined channel and steep banks result in similar bank failures in this reach (*August 2017*).

Photo 7. (Left) The biotechnical bank stabilization project installed at the Calistoga Elementary School included vegetated soil lifts, extensive native plantings, and habitat log structures *(November 2017)*.

Photo 8. Untreated Arundo patch in St. Helena area. Uncontrolled Arundo can produce large amounts of biomass and reduce channel capacity. (June 2016)

Photo 9. The same patch following manual removal of Arundo biomass. Follow-up herbicide treatments have proven to be targeted and effective. Arundo sites between Calistoga and Big Tree Lane are in final phases of eradication and most have had no resprouts for several years. (August 2016)

Photo 10. An Arundo revegetation site near Lodi Lane planted with Blue elderberry (Sambucus mexicana), Santa Barbara sedge (Carex barbarae), and Fremont's Cottonwood (Populus fremontii) among other species. Erosion control BMP's were also installed with the plants. (November 2016)

Photo 11 (left). Willow fence below eroding bank near Bale Lane. Small scale biotechnical projects in the area are occasionally installed alongside revegetation sites to address incipient erosion problems. (November 2016)

Napa River – Reach 2

OWNERSHIP: Private with District easement

LOCATION: St. Helena to Oakville Cross Road

ADJACENT LAND USE: Mostly vineyards; several wineries and sparse residential development; St. Helena WWTP

UPSTREAM: Napa River – Reach 1

LENGTH: 6.9 miles

MAJOR TRIBUTARIES: (Upstream to downstream) Bale Slough, Bella Oaks Creek

CROSSINGS: (Upstream to downstream) Pope Street, Zinfandel Lane, Rutherford Road, Oakville Cross Road

Photo 1. Looking upstream from Zinfandel Lane. Bank vegetation and canopy cover is generally dense with minimal emergent vegetation (*August 2017*).

REACH SETTING

Napa River – Reach 2 includes the mid-valley section of the Napa River as it flows southeast near the eastern side of the valley and across the alluvial plain. Reach 2 receives flows from Bale Slough, which drains the western side of the valley (i.e., Mayacmas Mountain), and from smaller, unnamed tributaries and overland flows draining the Vaca Ranges and eastern side of the valley (Figure 1).

Photo 2. Looking upstream near Oakville Cross Road. The channel remains inundated from winter to summer and may support emergent vegetation in shallower areas (*May 2015*).

PHYSICAL CONDITIONS

Physical Features: Average width at top of bank ranges 40-60 feet, while the average width of the riparian zone is 200-250 feet. The channel is narrowly confined by relatively steep banks and/or levees in many places.

Geomorphic Setting: Reach 2 is characterized by run-pool-glide sequences. Although much of this reach is perennially inundated, flow is seasonal as some portions dry up or experience subterranean flow during the late summer/early fall. Flow energy varies widely in Reach 2 with bed material ranging in size from cobbles and coarse gravel to large areas of fine material. Very large depositional bars are located downstream of the Sulfur Creek confluence, downstream of Pope Street, and downstream of Rutherford Road, as well as periodically throughout the reach. Large woody debris (LWD) jams are also common. Some channel braiding is present in this reach.

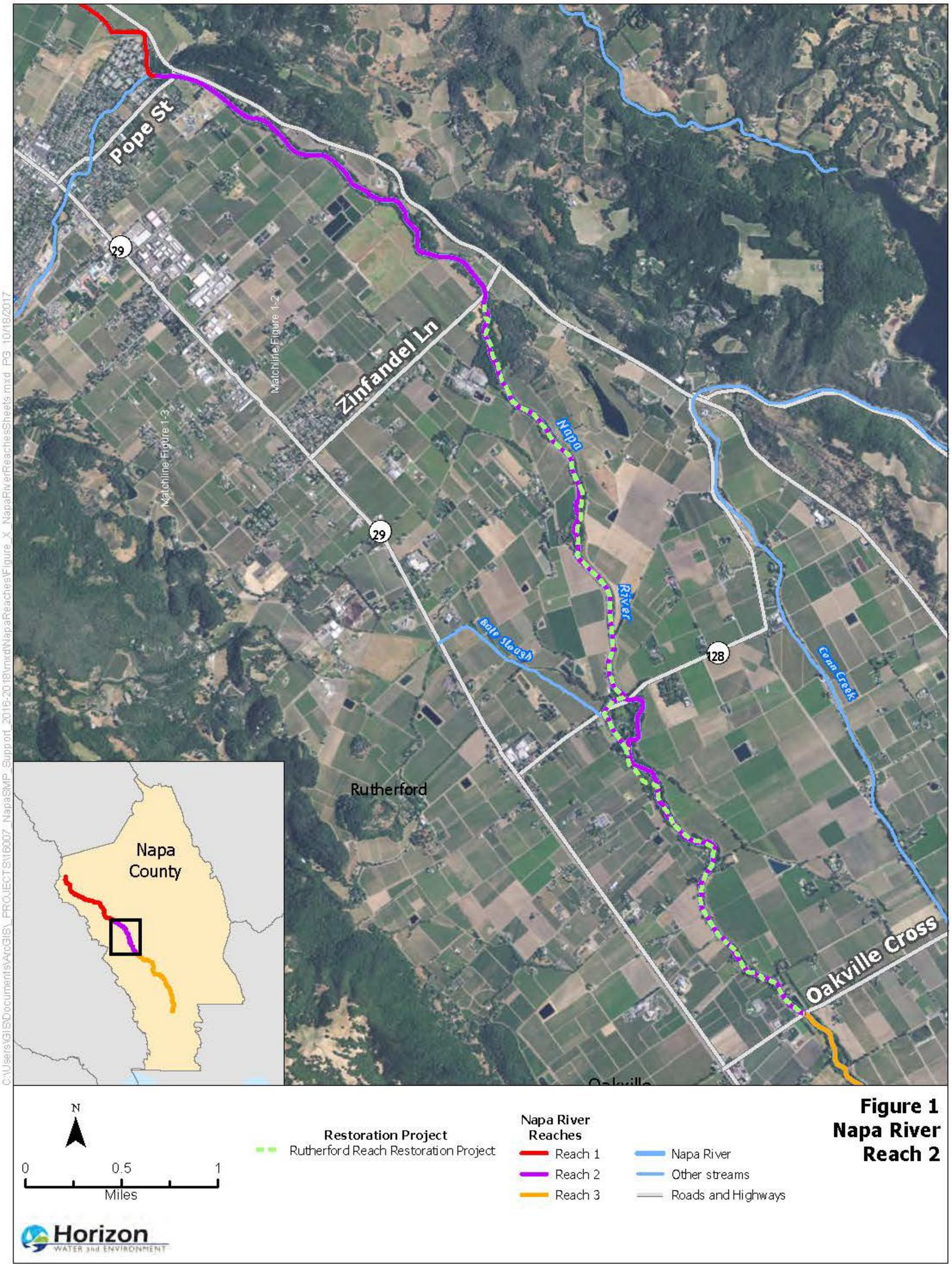


Figure 1
Napa River
Reach 2

BIOLOGICAL CONDITIONS

Vegetative Communities and Unique Habitat Features:

In general, the Napa River corridor is narrow and generally surrounded by vineyards or other agricultural uses, or concentrated areas of residential development near cities and towns, often constrained by levees. Valley oak riparian forest is the most abundant vegetation community along the river. Valley oak (*Quercus lobata*) is dominant and one of two suites of tree species is sub-dominant; either California bay (*Umbellularia californica*), coast live oak (*Q. agrifolia*), walnut (*Juglans californica* var *hindsii*) and Oregon ash (*Fraxinus latifolia*), or Fremont cottonwood (*Populus fremontii*) and coast live oak. The understory community in the valley oak riparian forest typically includes species such as bracken fern (*Pteridium aquilinum*), Santa Barbara sedge (*Carex barbarae*), arroyo willow (*Salix lasiolepis*), California rose (*Rosa californica*), common snowberry (*Symphoricarpus albus*), California blackberry (*Rubus ursinus*), and wild grape (*Vitus californica*). Invasive species present include Himalayan blackberry (*Rubus armeniacus*) and smilo grass (*Stipa miliacea* var. *miliacea*).

Plants that may be found below ordinary high water include torrent sedge (*Carex nudata*), giant chain fern (*Woodwardia fimbriata*), and small-fruited bulrush (*Scirpus microcarpus*). Certain non-vascular plants, such as aquatic mosses and filamentous algae that are tightly attached to rocks by strong holdfasts can survive the fast current. Slow flowing or backwater sections of the river support aquatic vegetation such as cattail (*Typha* spp.), nutsedge (*Cyperus* spp.), and smartweeds (*Persicaria* spp.).

An area of continuous valley oak (*Quercus lobata*) woodland habitat is located to the east of the river downstream of Zinfandel Lane in St. Helena for approximately 0.3 mile. This expands the riparian corridor to the east, but does not directly connect with nearby open spaces.

An area of coast oak woodland and douglas fir forest is located across Silverado Trail to the east of the river from downstream of Howell Mt Road to 805 Silverado Trail in St. Helena. This area provides habitat connectivity to the hills to the north and east of this reach.

Special Status Species:

Table 1 lists potential special-status species within Reach 2. Figure 2 shows recorded CNDDB occurrences. Note: Foothill yellow-legged frog are mapped within the entire Rutherford Quadrangle (i.e., the downstream portion of Reach 2), as indicated in Figure 2.

Table 1. Special-Status Species with the Potential to Occur in the Reach

Species	Potential to Occur
Steelhead *Oncorhynchus mykiss*	**Present.** The Napa River is designated critical habitat for this species.
California freshwater shrimp *Syncaris pacifica*	**Present.** CNDDB occurrences are present within this reach.
Western pond turtle *Actinemys marmorata*	**Present.** This species observed in this reach.
Foothill yellow-legged frog *Rana boylii*	**Possible.** Suitable habitat is present and CNDDB occurrences are present nearby.
Swainson's Hawk *Buteo swainsoni*	**Present.** Known nest site and suitable habitat is present in this reach.
Yellow Warbler *Setophaga petechia*	**Present.** This species has been observed in this reach and suitable habitat is present.

Table 1. Special-Status Species with the Potential to Occur in the Reach

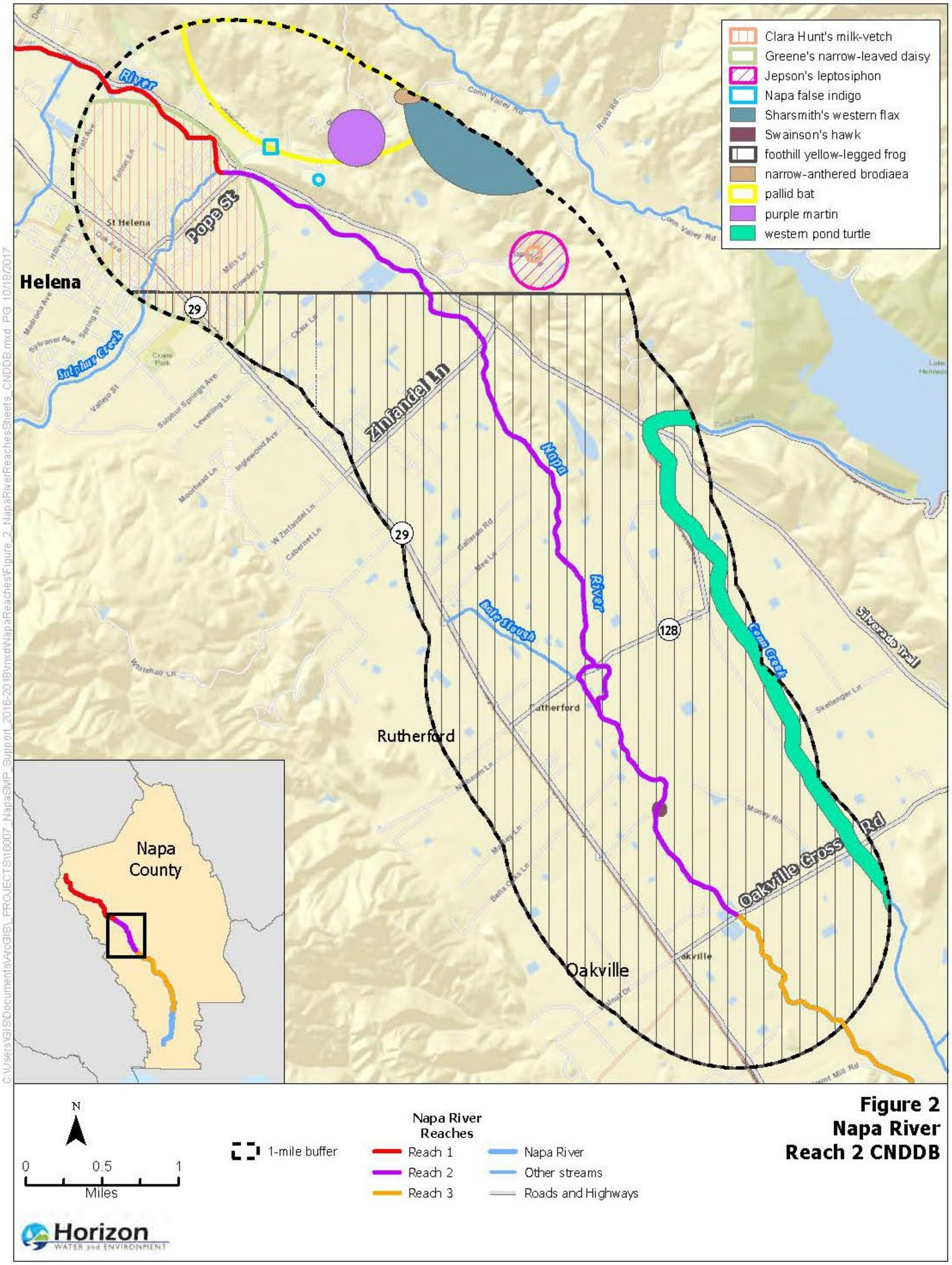
Species	Potential to Occur
Pallid Bat *Antrozous pallidus*	**Present.** Suitable habitat is present and CNDDB occurrences are present within this reach.
Townsend's big-eared bat *Corynorhinus townsendii townsendii*	**Possible.** Suitable habitat is present.
Western Red Bat *Lasiurus blossevilli*	**Possible.** Suitable habitat is present.

Major Restoration Sites:

As shown in Figure 1, the Napa River Rutherford Reach Restoration Project is the major restoration project within Reach 2, which was completed in 2014. The Napa County Flood Control and Water Conservation District (District) is responsible for conducting monitoring and maintenance activities for this project under the SMP. This stretch of the Napa River is privately owned but maintained by the District. Maintenance activities typically conducted include vegetation management, large woody debris realignment and/or relocation, debris/large trash removal, biotechnical bank stabilization, controlling non-native invasive plants and Pierce's disease host plants, maintaining the function of in-stream habitat enhancement structures, and annual surveys and reporting.

The Rutherford project included control of over 1.6 acres of Arundo between Zinfandel Lane and Oakville Cross Road. An additional 0.5 acres of Arundo has been controlled through the SMP between Zinfandel Lane and Pope Street. Treatment and revegetation of Arundo within this reach is ongoing.

The District maintains a small area within the St. Helena Wastewater Treatment Plant as a source for willow and cottonwood cuttings to be used in restoration projects. Cuttings from this site have been useful for habitat restoration and bank stabilization efforts in areas without adequate plant material sources nearby.



Clara Hunt's milk-vetch
Greene's narrow-leaved daisy
Jepson's leptosiphon
Napa false indigo
Sharsmith's western flax
Swainson's hawk
foothill yellow-legged frog
narrow-anthered brodiaea
pallid bat
purple martin
western pond turtle
Helena
St Helena
Pope St
River
Napa
Zinfandel Ln
Sulphur Creek
Bale Slough
Conn Creek
Silverado Trail
Oakville Cross Rd
Rutherford
Oakville
29
128
Napa County
1-mile buffer
Napa River Reaches
Reach 1
Reach 2
Reach 3
Napa River
Other streams
Roads and Highways
0
0.5
1
Miles
Horizon
Figure 2
Napa River
Reach 2 CNDDB

Photo 3. Post-restoration vegetative growth after increasing bank setbacks and grading of in-channel floodplain benches (*August 2017*).

Photo 4. Looking at the downstream face of the Zinfandel Lane bridge. This bridge/channel was designed to allow debris and sediment to pass downstream unobstructed thereby requiring less frequent maintenance (*August 2017*).

Photo 5. Looking upstream at the Bella Oaks restoration site. Restoration efforts at this site included bank setbacks, construction of a high flow side channel. Willow wattles are placed in the side channel to increase roughness and trap sediment (May 2014).

Photo 6. Vegetative soil lifts at the Bella Oaks restoration site in the Rutherford Reach (*November 2013*).

Napa River – Reach 3

OWNERSHIP: Private with District easement

LOCATION: Oakville Cross Road to 3rd Street, Napa

ADJACENT LAND USE: Mostly vineyards; several wineries and sparse residential development; Napa River Ecological Reserve; residential and commercial areas in the city of Napa; Trancas Crossing Park (flood control); Napa Flood Control Project.

UPSTREAM: Napa River – Reach 2

LENGTH: 14.6 miles

MAJOR TRIBUTARIES: (Upstream to downstream) Conn Creek, Dry Creek, Soda Creek, Milliken Creek, and Napa Creek

CROSSINGS: (Upstream to downstream) Oakville Cross Road, Yount Mill Road, Yountville Cross Road, Oak Knoll Avenue, Trancas Street, Lincoln Avenue, 1st Street, Soscol Avenue, and 3rd Street

Photo 1. Typical glide section and habitat conditions in Reach 3. Bank vegetation and canopy cover is generally very dense with little-to-no instream emergent vegetation (*January 2016*).

REACH SETTING

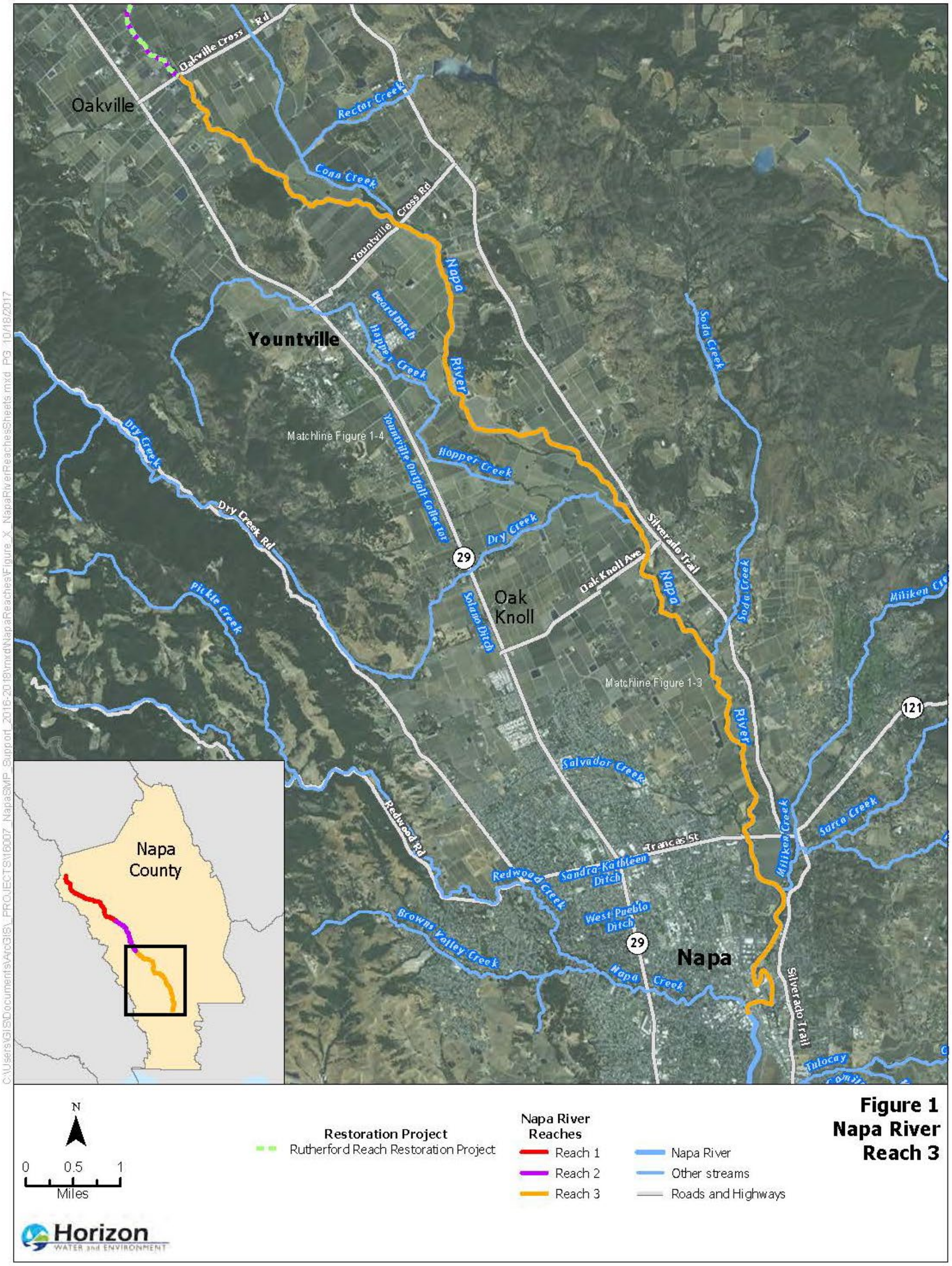
Napa River – Reach 3 includes the lower portion of the Napa River as the slope continues to decrease and the channel begins to widen. The lower portion of this reach is within the tidal range of San Pablo Bay, which extends upstream to near Trancas Street. Reach 3 has a higher susceptibility of flooding where tidally influenced. This reach receives flows from tributaries draining the Howell Mountains to the east and the Mayacmas Mountains to the west.

Photo 2. Typical channel conditions with steep, eroded banks and dense vegetation on the mid- and upper banks (*January 2016*).

PHYSICAL CONDITIONS

Physical Features: Reach 3 generally supports a wider riparian zone ranging from 250-300 feet, but with confined sections approximately 150 feet wide. The wetted channel expands significantly from 80-90 feet near the upstream end of the reach to over 110-120 in City of Napa.

Geomorphic Setting: The upstream portions of Reach 3 are characterized by run-glide-pools before transitioning to deeper pools and open channel downstream of Trancas Street in Napa (i.e., head of tide). The slope in this reach decreases compared to upstream reaches, and limited channel braiding and secondary channels are present in the upstream portions. This reach typically experiences perennial flow. Reach 3 is a depositional reach and bed material typically consists of fine material. Trancas Crossing Park and the Napa Oxbow/Flood Control Project are active floodplain areas that help alleviate flooding impacts to surrounding development.


Oakville
Oakville Cross Rd
Rector Creek
Conn Creek
Yountville Cross Rd
Napa River
Yountville
Beard Ditch
Hopper Creek
Matchline Figure 1-4
Yountville Outfall Collector
Hopper Creek
Dry Creek
Dry Creek Rd
Dry Creek
Silverado Trail
Soda Creek
Soda Creek
29
Oak Knoll
Oak Knoll Ave
Napa
Pickle Creek
Solano Ditch
Milliken Cre
Matchline Figure 1-3
River
121
Salvador Creek
Redwood Rd
Trancas St
Milliken Creek
Sarco Creek
Redwood Creek
Sandra Kathleen Ditch
West Pueblo Ditch
Browns Valley Creek
29
Napa
Napa Creek
Silverado Trail
Tulocay
Napa County
N
0 0.5 1
Miles
Horizon
WATER and ENVIRONMENT
Restoration Project
Rutherford Reach Restoration Project
Napa River Reaches
Reach 1
Reach 2
Reach 3
Napa River
Other streams
Roads and Highways
Figure 1
Napa River
Reach 3

BIOLOGICAL CONDITIONS

Vegetative Communities and Unique Habitat Features:

In general, the Napa River corridor is narrow and surrounded by vineyards or other agricultural uses. Other portions of the corridor are surrounded by concentrated areas of residential development near cities and towns, often constrained by levees. Valley oak riparian forest is the most abundant vegetation community along the river. Valley oak (*Quercus lobata*) is dominant and one of two suites of tree species is sub-dominant; either California bay (*Umbellularia californica*), coast live oak (*Q. agrifolia*), walnut (*Juglans californica* var *hindsii*) and Oregon ash (*Fraxinus latifolia*), or Fremont cottonwood (*Populus fremontii*) and coast live oak. The understory community in the valley oak riparian forest typically includes species such as bracken fern (*Pteridium aquilinum*), Santa Barbara sedge (*Carex barbarae*), arroyo willow (*Salix lasiolepis*), California rose (*Rosa californica*), common snowberry (*Symphoricarpus albus*), California blackberry (*Rubus ursinus*), and wild grape (*Vitus californica*). Invasive species present include Himalayan blackberry (*Rubus armeniacus*) and smilo grass (*Stipa miliacea* var. *miliacea*).

Plants that may be found below ordinary high water include torrent sedge (*Carex nudata*), giant chain fern (*Woodwardia fimbriata*), and small-fruited bulrush (*Scirpus microcarpus*). Certain non-vascular plants, such as aquatic mosses and filamentous algae that are tightly attached to rocks by strong holdfasts can survive the fast current. Slow flowing or backwater sections of the river support aquatic vegetation such as cattail (*Typha* spp.), nutsedge (*Cyperus* spp.), and smartweeds (*Persicaria* spp.).

Mixed hardwood habitat are found on the slopes of Yountville Hills just west of the river. The Napa River Ecological Reserve is located just upstream Yountville Cross Road and has a broader riparian corridor than surrounding areas as well as high quality habitat. Mixed oak and hardwood habitats are located on Wapoo Hills, to the east of the river. Additionally, patches of riparian forest that expand the narrow riparian corridor are located approximately 0.3 mi north and south of Oak Knoll Ave in Napa.

Special Status Species:

Table 1 lists potential special-status species within Reach 3. Figure 2 shows recorded CNDDB occurrences. Note: Foothill yellow-legged frog are mapped within the entire Rutherford Quadrangle (i.e., the upstream portion of Reach 3), as indicated in Figure 2.

Table 1. Special-Status Species with the Potential to Occur in the Reach

Species	Potential to Occur
Mason's Lilaeopsis *Lilaeopsis masonii*	**Present.** CNDDB occurrences are present in this reach.
Steelhead *Oncorhynchus mykiss*	**Present.** The Napa River is designated critical habitat for this species.
Longfin smelt *Spirinchus thaleichthys*	**Possible.** Suitable habitat is present in the downstream portion of the reach and a CNDDB occurrence is present in this reach.
California freshwater shrimp *Syncaris pacifica*	**Possible.** Known occurrences upstream of this reach and suitable habitat is present.
Western pond turtle *Actinemys marmorata*	**Present.** This species observed in this reach.
Foothill yellow-legged frog *Rana boylii*	**Possible.** Suitable habitat is present and CNDDB occurrences are present nearby.
Swainson's Hawk *Buteo swainsoni*	**Possible.** Recorded occurrences upstream and downstream and suitable habitat is present in this reach.

Table 1. Special-Status Species with the Potential to Occur in the Reach

Species	Potential to Occur
Yellow warbler *Setophaga petechia*	**Present.** This species has been observed in this reach and suitable habitat is present.
Pallid bat *Antrozous pallidus*	**Possible.** Suitable habitat is present and CNDDB occurrences are present nearby.
Townsend's big-eared bat *Corynorhinus townsendii townsendii*	**Possible.** Suitable habitat is present.
Western red bat *Lasiurus blossevilli*	**Possible.** Suitable habitat is present.

Major Restoration Sites:

The Oakville to Oak Knoll Restoration Project is a major restoration project within Reach 3, which stretches 4.8 miles along 9 miles of river from Oakville Cross Road to Oak Knoll Avenue. The District is responsible for conducting monitoring and maintenance activities for this restoration project. Annual maintenance activities include monitoring such as annual surveys, vegetation management, downed tree and debris management, and biotechnical bank stabilization projects. The project's objectives include increasing the quality and quantity of available floodplain habitat, rehabilitating sites with extreme erosion, enhancing riparian ecosystems by installing native plants and removing invasive plant species. Approximately 4.8 acres of Arundo has been removed from the reach through the restoration project and the maintenance actions of the OVOK CFD.

The Project includes four construction groups (A-D) intended to be designed, permitted and implemented as grant funding is secured. Construction is complete for Groups A and C; implementation of Groups B and D will be complete by 2021.

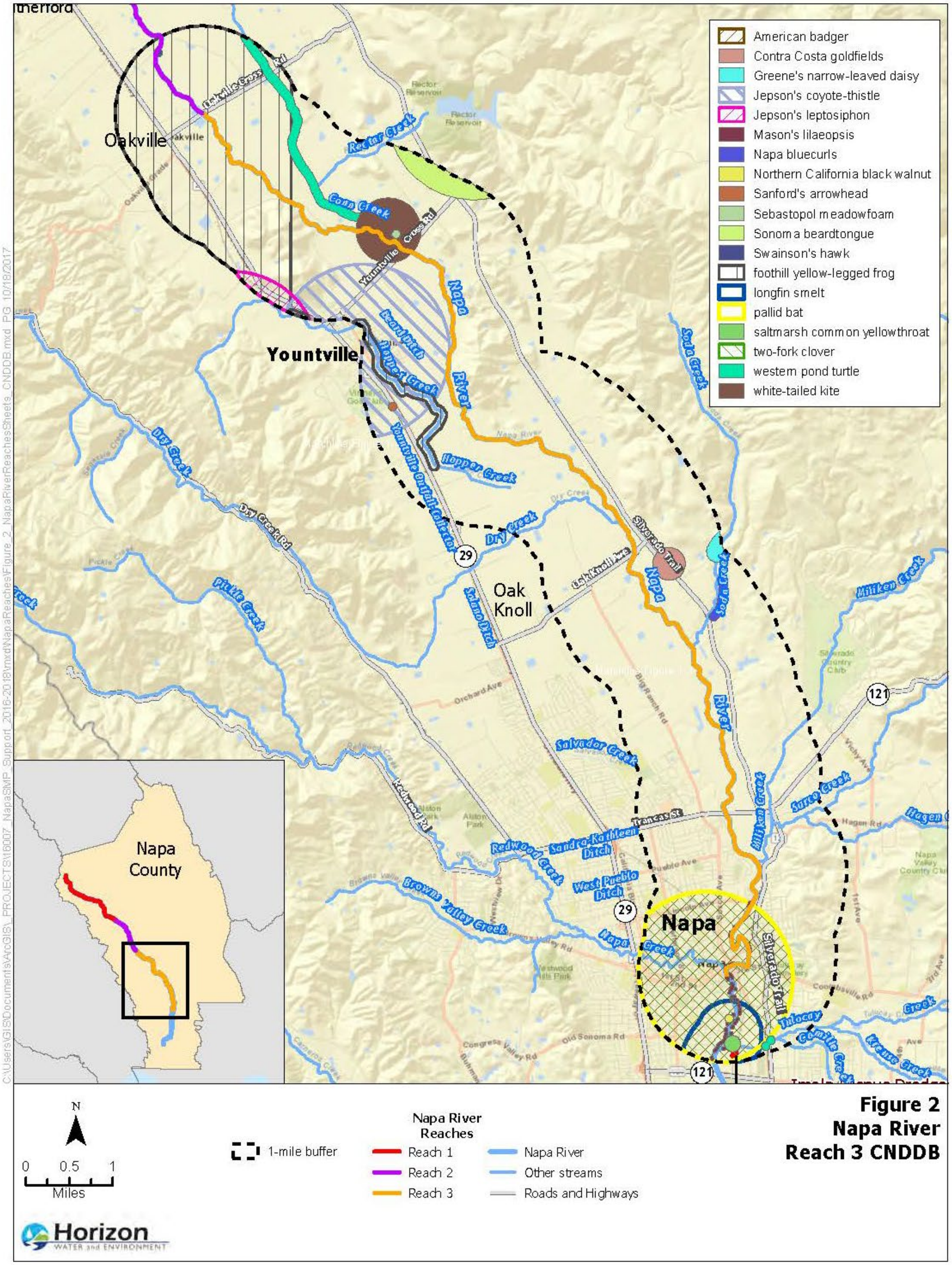

American badger
Contra Costa goldfields
Greene's narrow-leaved daisy
Jepson's coyote-thistle
Jepson's leptosiphon
Mason's lilaeopsis
Napa bluecurls
Northern California black walnut
Sanford's arrowhead
Sebastopol meadowfoam
Sonoma beardtongue
Swainson's hawk
foothill yellow-legged frog
longfin smelt
pallid bat
saltmarsh common yellowthroat
two-fork clover
western pond turtle
white-tailed kite
Oakville
Yountville
Oak Knoll
Napa
Napa County
1-mile buffer
Napa River Reaches
Reach 1
Reach 2
Reach 3
Napa River
Other streams
Roads and Highways
0 0.5 1
Miles
Horizon
Figure 2
Napa River
Reach 3 CNDDB

Photo 3. Eroding banks near the head of a ~4,300-foot long island where the Napa River splits into two separate channels. Bank sheering have resulted in near vertical sections of bank that continue to erode. This area is part of the Oakville to Oak Knoll – Group D (*August 2017*).

Photo 4. LWD jam that formed during one season. Two or three of these LWD jams form every season and can result in localized flooding or redirect high flows and create new areas of erosion and/or destabilize banks (*August 2017*).

Photo 5. Oakville to Oak Knoll – Group C, Site 14. The right (west) bank levee was setback and bank slope decreased to help combat erosion. This managed bank retreat and expanded riparian corridor will help restore natural alluvial process *(August 2017)*.

Photo 6. Oakville to Oak Knoll – Group A, Site 23. The site features a backwater alcove that was constructed to increase connectivity to the channel. Revegetation efforts enhanced the diversity and abundance of native riparian plant species. (*August 2018*)

Conn Creek – Reach 1

OWNERSHIP: Private with District easement

LOCATION: From Beckstoffer Vineyards offices to Skellenger Lane

ADJACENT LAND USE: Vineyards

UPSTREAM: Channel conditions immediately upstream are similar to those described for this reach. Streamflow is controlled by Conn Creek Dam approximately 3.5 miles upstream.

LENGTH: 2,890 feet

AVERAGE TOP-OF-BANK WIDTH: 70-80 feet

Photo 1. Looking downstream from the upstream end of the reach (Photo taken from the bridge on the Beckstoffer Vineyards property, August 4, 2010).

REACH SETTING

Reach 1 of Conn Creek is a modified channel that appears to have been dredged and/or straightened for agricultural land use and/or flood control. The upstream portion of the reach is generally in poor condition with respect to aquatic and riparian habitat (Photos 1 and 2). In the middle and downstream portions of the reach, some mature trees (predominantly eucalyptus) line the banks and the channel has geomorphic features (e.g., low flow channel, floodplain surfaces) that are indicative of recovery of natural channel processes (Photo 4).

Photo 2. In the upstream portion of the reach, the channel has a trapezoidal cross-section with minimal riparian habitat. A thick layer of algae covers the channel bed. Vegetation along the banks is primarily non-native, invasive herbaceous species and eucalyptus. (*Looking east from the west bank, August 4, 2010*).

PHYSICAL CONDITIONS

Active channel: Channel width is 30-40 feet; the bed is 12-15 feet beneath the top of banks. A bankfull channel (18-20 feet wide by 2-4 feet deep) is distinguishable in the downstream section of the reach (Photo 4). The bed slope is approximately 0.3%.

Bed sediments/texture: The bed is largely composed of 2 to 6-inch cobble, often covered by sand and algae.

Bank structure: The channel has 10 to 15-foot-high earthen banks; slopes range from 1:1 to 2:1 (all photos); the west (right) bank is very steep in some sections. Concrete retaining walls line a short section (50-75 feet) of banks at the upstream portion of the reach (Photo 1).

Water quality: On August 4, 2010 the upstream portion of the reach had isolated pools covered with algae and aquatic vegetation (Photo 2). The low flow channel in the middle and downstream portions of the reach had standing water approximately 2 feet in depth. All water appeared stagnant and eutrophic (all photos).

Channel processes: Sediment supply is limited by the dam upstream. In locations where sediment deposition does occur, in-channel bars have formed within an over-widened flood control channel. An inset channel develops and migrates laterally, causing some bank erosion.

<u>BIOLOGICAL CONDITIONS</u>

Aquatic or instream habitat: The streambed is largely a uniform and linear “run” without any significant in-channel habitat features, with the exception of some small scour pools. Aquatic macrophytes and algae are widespread (all photos). Bed substrate is dominated by small to medium sized cobble. Conn Creek is known to support steelhead (*Oncorhynchus mykiss*). The lower portion of this reach may provide suitable rearing habitat.

Vegetation composition:

Channel: algae and unidentified macrophytes

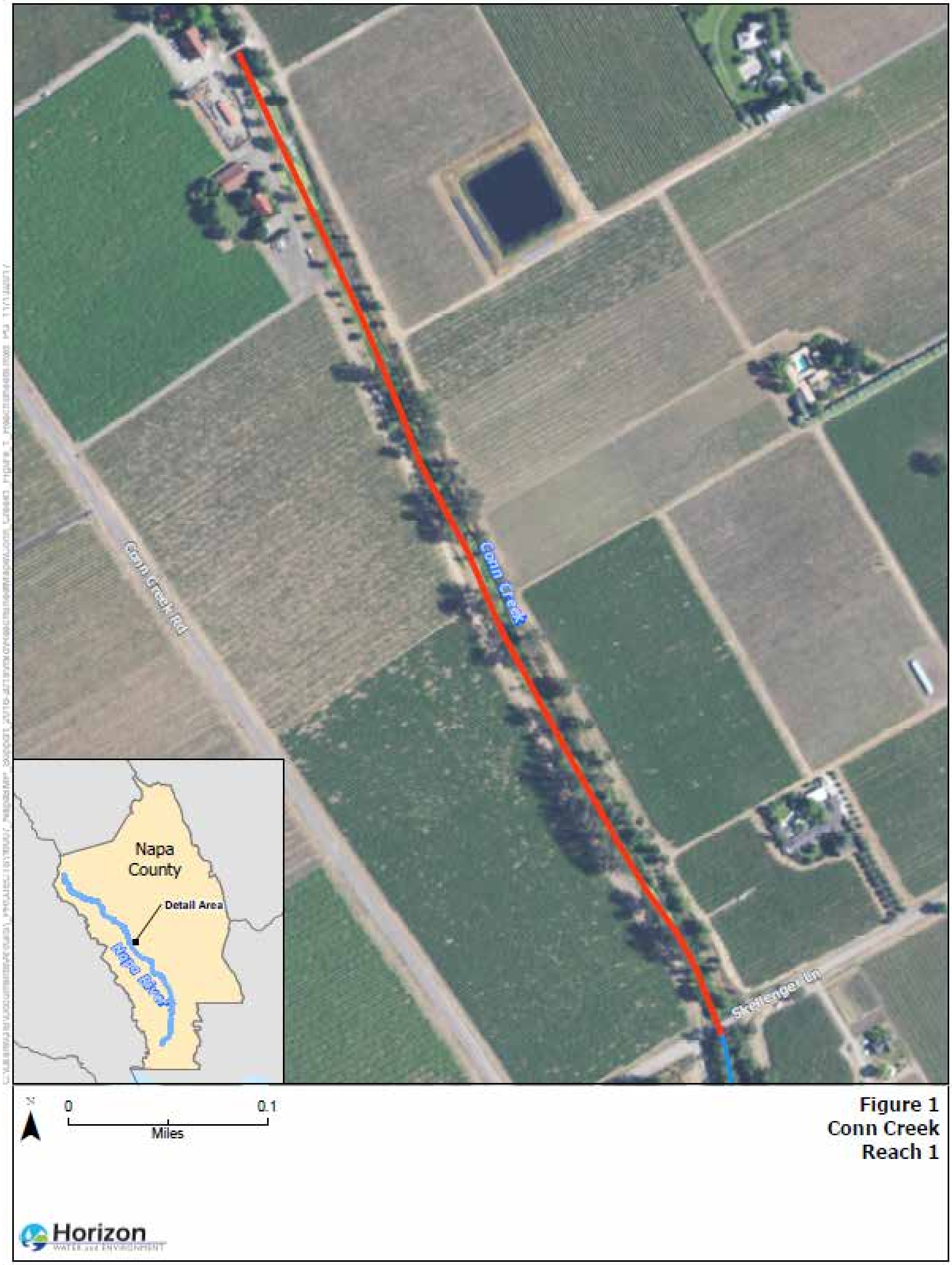
Banks: <u>Understory</u>: Predominantly herbaceous non-natives. There are some coast live oak (*Quercus agrifolia*) saplings along the banks, as well as some recruitment of willow on the lower banks (Photo 4).

<u>Overstory/Canopy</u>: Mature eucalyptus are dominant, with interspersed with a few cottonwoods (*Populus fremontii*) and willow (*Salix* spp.).

<u>MAINTENANCE HISTORY</u>

This reach of Conn Creek was a Soil Conservation Service (SCS) flood control project. 2014 maintenance activities included vegetation management (8 cubic yards), invasive removal (16 cubic yards), and blackberry removal (8 cubic yards) at Skellenger Road. In 2016, similar activities took place including vegetation maintenance (50 cubic yards), invasive removal (100 cubic yards), and blackberry removal (25 cubic yards).

	
Photo 3. In late summer, much of the reach has relatively stagnant water with considerable algae and aquatic vegetation growth (*Looking east near the middle portion of the reach, August 4, 2010*).	**Photo 4.** In the middle to downstream portion of the reach a bankfull channel has formed within the larger flood conveyance channel; mature trees (predominantly eucalyptus) shade the channel (*Looking upstream near Skellenger Lane, August 4, 2010).*
	
Photo 5. Looking downstream at willows (2014).	**Photo 6.** Looking downstream after vegetation pruning and debris removal (2014).



Map A. Reach 1 of Conn Creek.

Conn Creek – Reach 2

OWNERSHIP: Private with District easement

LOCATION: From Skellenger Lane to Oakville Road

ADJACENT LAND USE: Vineyards

UPSTREAM: Conn Creek – Reach 1. Approximately 4 miles upstream streamflow is controlled by Conn Creek Dam

LENGTH: 4,900 ft

AVERAGE TOP-OF-BANK WIDTH: 70-110 ft

Photo 1. Looking upstream near the upstream end of Reach 2 *(August 4, 2010).*

REACH SETTING

Downstream of Skellenger Lane (i.e., at the Reach 1-2 transition) conditions along Conn Creek change markedly. A mature, diverse riparian forest lines the banks and the channel is less modified than in Reach 1. It appears that the channel has not been dredged, straightened or otherwise modified in recent years (Photo 1). The channel has well established bed forms (e.g., in-channel bars) and inset floodplain benches (Photo 1). In the middle of the reach there is a small headcut that maintains approximately 2 to 3 ft of grade in the channel (Photo 3 and Map A). Downstream of the headcut, the streambed is more uniform than in the upstream section due to relatively recent incision (perhaps 5-10 years) (Photo 4)

Photo 2. Typical streambed substrate, medium sized pebbles in Reach 2 *(August 4, 2010).*

PHYSICAL CONDITIONS

Active channel: The channel width is 30-40 feet; the bed is 12-15 feet beneath the top of banks. The bankfull channel is 18-20 feet wide by 2-4 feet deep. Bed slope is approximately 0.3%.

Bed sediments/texture: The bed is composed of 2 to 4 inch cobble (Photo 2).

Bank structure: The channel has 10 to15-foot high earthen banks; slopes are approximately 3:1. There is a substantial levee along the upstream portion of the west (right) bank.

Water quality: On August 4, 2010, the upstream portion of the reach had isolated pools (Photo 1). The low flow channel in the downstream portion of the reach had standing water approximately 2–3 feet in depth (Photo 4). Water temperature was not measured, but felt cool to moderate (~60s). Water quality/clarity appeared better in this reach than in Reach 1, likely due to the shading provided by the well-developed riparian canopy.

Channel processes: Sediment supply is limited by the dam upstream. This reach has likely undergone periods of incision due to historic downcutting of the mainstem Napa River, reduction in sediment supply, and historic channel modifications. Streambed erosion at the active headcut (Photo 3) appears to occur at a relatively slow rate. This assumption is based on the condition of the bed and bank, as well as vegetation, downstream of the headcut.

<u>MAINTENANCE HISTORY</u>

This reach of Conn Creek was a Soil Conservation Service (SCS) Flood Control Project. In 2016, maintenance activities conducted within this reach included removal of eucalyptus saplings, vegetation management, and blackberry bush removal.

<u>BIOLOGICAL CONDITIONS</u>

Aquatic or instream habitat: Upstream of the headcut the streambed has a generally well developed pool-riffle sequence, though pools tend to be shallow. Downstream of the headcut the streambed is largely a uniform "run" without significant in-channel habitat features. Bed substrate is dominated by large gravel to small cobble. Conn Creek is known to support steelhead (*Oncorhynchus mykiss*). This reach may provide suitable rearing habitat.

Vegetation composition:

Channel: algae and unidentified macrophytes

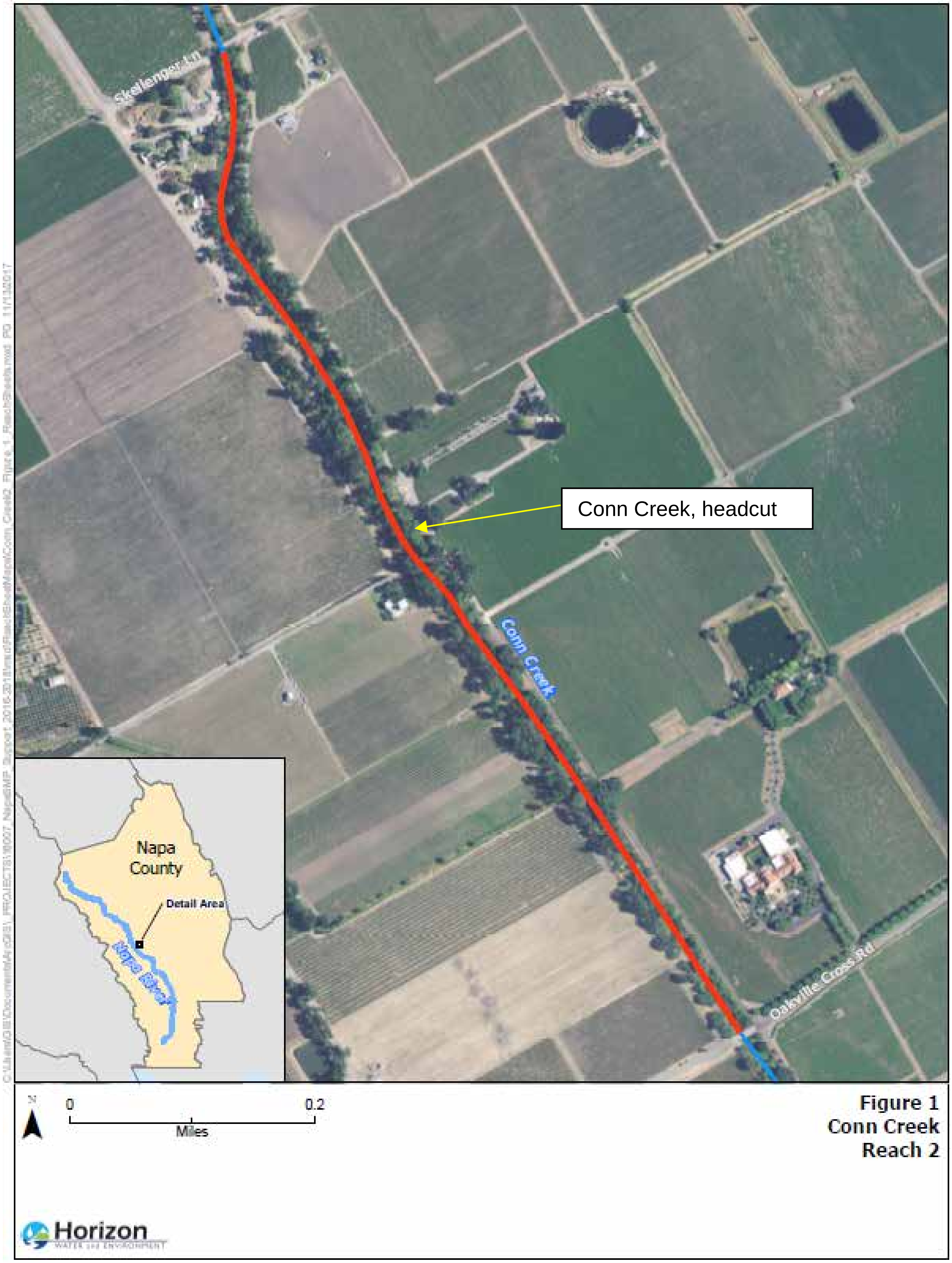
Banks/Riparian Corridor - <u>Understory</u>: Predominantly native and non-native vines including Himalayan blackberry (*Rubus discolor*), California blackberry (*Rubus ursinus*), and periwinkle (*Vinca major*).

<u>Overstory/Canopy</u>: Mature trees form a contiguous riparian corridor. Species include eucalyptus, cottonwood (*Populus fremontii*), willow (*Salix* spp.), oak (predominantly *Quercus agrifolia*), black walnut (*Juglans californica*) and California buckeye (*Aesculus californica*). There is some recruitment of white alder (*Alnus rhombifolia*), willow, and Oregon ash (*Fraxinus latifolia*) along the lower and mid banks.

Photo 3. 2-3 ft deep headcut is found midway through Reach 2. Tree roots provide bed stability at this location and the rate of headward migration appears slow (*Looking upstream near the middle portion of the reach, August 4, 2010).*

Photo 4. As a result of recent bed incision, the bankfull channel in the downstream portion of the reach is deeper and straighter than in the upstream portion. The riparian corridor remains intact, with mature native riparian trees lining the banks (*Looking upstream near Oakville Road, August 4, 2010*).

Conn Creek – Reach 2



Map A. Approximate location of headcut in Reach 2 of Conn Creek.

Conn Creek – Reach 3

OWNERSHIP: Private with District easement

LOCATION: From Oakville Road to end of District maintenance easement (Map A).

ADJACENT LAND USE: Vineyards

UPSTREAM: Conn Creek – Reach 2. Approximately 5 miles upstream streamflow is controlled by Conn Creek Dam

LENGTH: 5,700 ft

AVERAGE TOP-OF-BANK WIDTH: 70-90 ft

Photo 1. Looking upstream near the upstream end of the reach *(August 4, 2010).*

Photo 2. Looking upstream in the lower portion of Reach 3 *(August 4, 2010).*

REACH SETTING

Downstream of Oakville Road (i.e., at the Reach 2-3 transition) conditions along Conn Creek change again markedly. The mature riparian forest in Reach 2 gives way to a less dense, less diverse, younger age stand of oaks and willows. The channel bed is far less complex than in Reach 2, largely lacking riffles, pools and/or bars (Photo 1). This plane bed form suggests that the channel may have been dredged, straightened or otherwise modified for flood control in recent history.

PHYSICAL CONDITIONS

Active channel: The channel bed width is 25-35 feet wide; the bed is 12-15 feet beneath the top of banks. The bankfull channel is the width of the bed (20-25 feet) and 2-3 feet deep, marked by a low bench along the bank. The bed slope is approximately 0.3%.

Bed sediments/texture: The bed is composed predominately of coarse gravel, pebbles, and up to medium size cobbles (Photo 4).

Bank structure: The channel has 10 to 12-foot high earthen banks; slopes are approximately 3:1. Approximately two thirds downstream through the reach, the channel turns to the west. At this location riprap has been placed to protect the east (left) bank from erosion (Photo 3).

Water quality: In contrast to Reaches 1 and 2, Reach 3 was nearly entirely dry in August 2010, with the exception of some isolated small, shallow pools (Photo 2 and 4). A thick layer of algae covered much of the stream substrate (Photos 1 and 4), suggesting that stagnant water persists well into the dry season.

Channel processes: Sediment supply is limited by the dam upstream, yet this reach appears to be depositional. The channel is also less incised than in Reaches 1 and 2. It is plausible that this reach is depositional because the cross-section of the active channel is wider than in Reach 2. The transition from a narrow to wide section often results in sediment deposition.

Maintenance History

This reach of Conn Creek was a Soil Conservation Service (SCS) flood control project. In 2016, maintenance activities conducted within this reach included removal of eucalyptus saplings, vegetation management, and blackberry bush removal.

Biological Conditions

Aquatic or instream habitat: The streambed is largely a uniform linear "run" without significant in-channel habitat features. Bed substrate is dominated by coars gravel, pebbles, up to medium sized cobble. Conn Creek is known to support steelhead (*Oncorhynchus mykiss*). This reach likely provides suitable rearing habitat.

Vegetation composition:

Channel: algae; cattail (*Typha latifolia*), nut sedge (*Cyperus* sp.), rushes (*Juncus* sp.) and hardstem bulrush (*Schoenoplectus* [=*Scirpus*] *acutus*) along the margins.

Banks/Riparian Corridor- Understory: Herbaceous non-natives such as bristly oxtongue (*Picris echioides*) and poison hemlock (*Conium maculatum*) are dominant. Other species include rabbit's foot grass (*Polypogon monspeliensis*), curly dock (*Rumex crispus*), and stinging nettle (*Urtica dioica*).

Overstory/Canopy: Mature oaks (predominantly *Quercus agrifolia*) and eucalyptus are dominant along the top of bank. Willows (*Salix* spp.) are abundant along the toe.

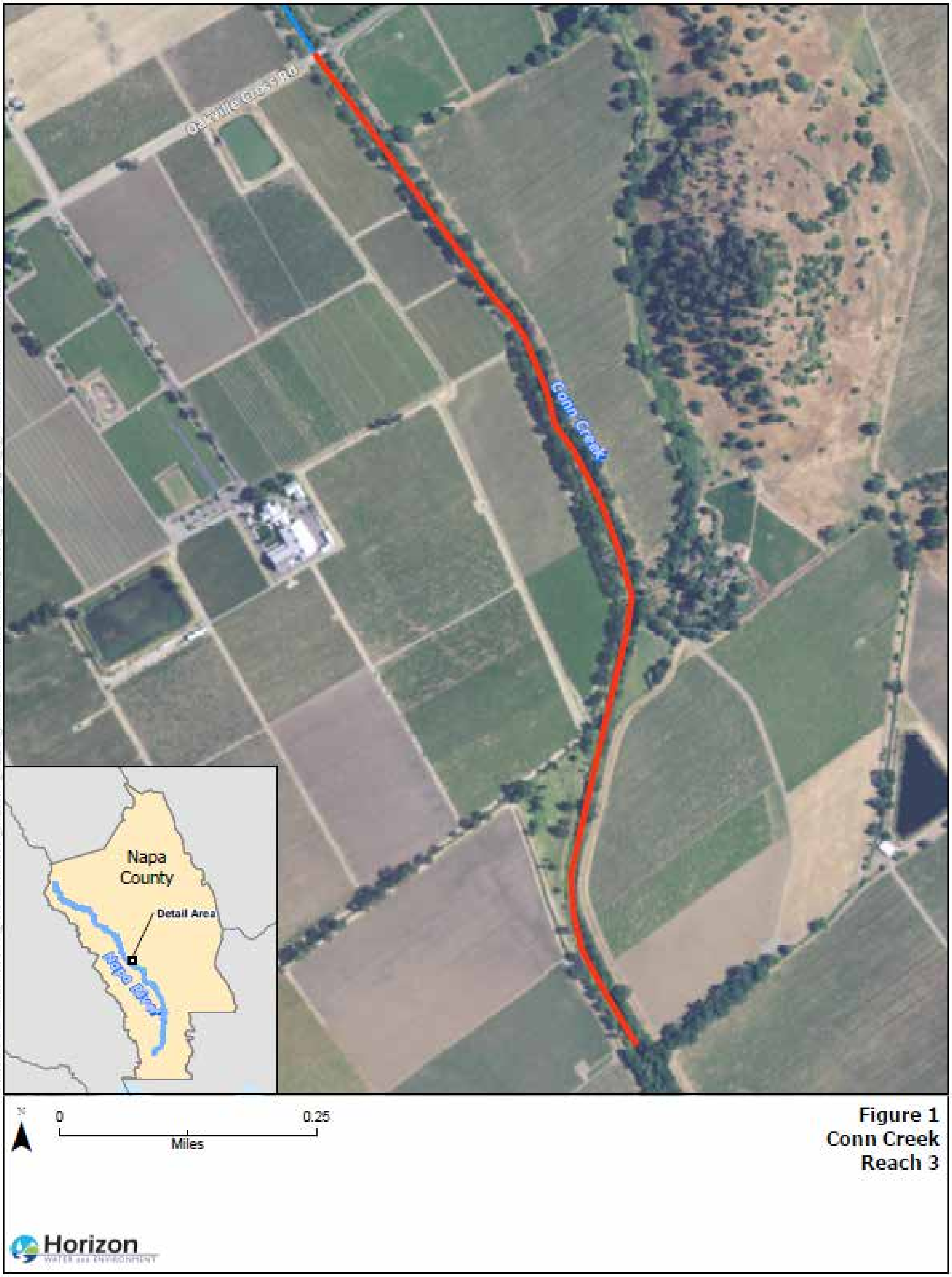
Listed species with potential to occur:

Many (6 to 10) Snowy Egrets, Great Egrets and Great Blue Heron were observed in one location, suggesting this site may serve as a rookery.

Photo 3. Looking upstream at the riprap section where the channel turns towards the west. Erosion-resistant riprap sloughed into the channel has resulted in some local bed scour and pooling (*August 4, 2010).*

Photo 4. Typical streambed substrate in Reach 3. Note the algae cover on substrate *(August 4, 2010).*

Conn Creek – Reach 3



Map A. Conn Creek- Reach 3 begins at Oakville Road and flows approximately 5,900 feet to the end of the District maintenance easement. Conn Creek meets the Napa River approximately 1.5 miles further downstream.

Beard Ditch

OWNERSHIP: Town of Yountville with District easement

LOCATION: Eastern boundary of Town of Yountville, between Finnell Road and Land Lane.

ADJACENT LAND USE: vineyard (to east); single-family residential, park (to west).

UPSTREAM: Residential and agricultural drainage

LENGTH: 2,780 ft

AVERAGE TOP-OF-BANK WIDTH: 20-25 ft

Photo 1. Looking downstream from Finnell Road. Dense emergent vegetation occludes the culvert at this crossing (*August 4, 2010*).

REACH SETTING

Beard Ditch is a trapezoidal engineered channel that collects runoff primarily from residential development to the west. There is a stormwater detention outfall near Land Lane. Discharge is routed downstream into a swale that flows through vineyards.

Photo 2. Looking downstream from the mid-point of the Beard Ditch (near Oak Circle). Photo depicts typical conditions in the reach. Adjacent land uses include vineyards along the east (left) bank and residential development along the west (right) bank (*August 4, 2010*).

PHYSICAL CONDITIONS

Active channel: The channel bottom is 8-10 feet wide, with a 2-foot wide low flow channel. The channel bed is 3 feet beneath the top of banks. The bed slope is approximately 1%.

Bed sediments/texture: The bed is formed in native soils. Bed sediments appear to be fine textured.

Bank structure: The banks are formed of native soils that generally slope at 2:1 to 3:1 (Photo 2).

Water quality: Water was present at the downstream end of the reach in a pool below the bridge at Land Lane. The water in the pool was clear.

Channel processes: Runoff and fine sediment transported from developed areas to west are routed to the ditch. There may also be some drainage/sediment entering the ditch from adjacent vineyards. There appears to be some deposition of sediment at the Finnell Road crossing (Photo 1). Sediment deposition at this location is likely the result of an abrupt change in hydraulics at the culvert outlet.

BIOLOGICAL CONDITIONS

Aquatic or instream habitat: Instream habitat is dominated by hydrophytic vegetation (Photo 2). The low flow channel is not well defined. There is a perennial pool at the downstream end of the reach. This pool had some small fishes present; no bullfrog (*Rana catesbeian*) tadpoles were observed.

Vegetation composition:

Channel: Vegetation in the channel is dominated by tall flat sedge (*Cyperus eragrostis*). Broad-leaved cattail (*Typha latifolia*) is dominant in the section just downstream of Finnell Road (Photo 1). Other species present include curly dock (*Rumex crispus*), rushes (*Juncus* spp.) and Italian ryegrass (*Lollium* sp.)

Banks: Understory: Predominantly herbaceous non-native species such as bristly oxtongue (*Picris echioides*), *periwinkle* (*Vinca major*), prickly lettuce (*Lactuca serriola*), and Himalayan blackberry (minor component). There is also some sporadic willow (*Salix* sp.) recruitment.

Overstory/Canopy: Minimal overstory component; there are a few mature oaks adjacent to the ditch.

RECENT MAINTENANCE ACTIVITIES

In 2016, recent maintenance activities conducted in this reach included vegetation management (15 cubic yards of removal) and cattail removal (50 feet).

Beard Ditch

Map A. The District's maintenance easement on Beard Ditch extends from Finnell Road to Land Lane

North Yountville Collector (NYC)

OWNERSHIP: Private with County easement

LOCATION: Between Hwy 29 (to east) and Solano Ave (to west), reach begins about 1/3 mi south of California Drive, continues to Yountville Outfall confluence.

ADJACENT LAND USE: Hwy 29 and railroad transportation corridor to east; vineyard and golf course to west.

UPSTREAM: Hinman Creek; flows through Vintners Golf Club.

LENGTH: 5,400 ft

AVERAGE TOP-OF-BANK WIDTH: 30-35 ft

Photo 1. Looking downstream from upstream end of the NYC. Two concrete box culverts pass flows from the main upstream tributary into the NYC. Note the dense aquatic and emergent vegetation in the channel (*August 4, 2010*).

REACH SETTING

The North Yountville Collector (NYC) is a trapezoidal engineered channel that collects runoff from natural drainages, vineyards and Vintners golf course to the west. The NYC begins at twin concrete box culverts that cross under Solano Ave. (Photo 1). The NYC joins the South Yountville Collector and flows east becoming the Yountville Outfall.

Photo 2. Looking downstream near Vineyard View Drive. The channel supports interspersed patches of aquatic vegetation dominated by Ludwigia (foreground) and emergent vegetation dominated by broad-leaved cattail (background). Note cottonwoods planted by District on east (left) bank (*August 4, 2010*).

PHYSICAL CONDITIONS

Active channel: channel bed is 15-20 ft. wide; no low flow channel is distinguishable. The channel bed is 4-6 ft. beneath the top of banks. Bed slope is approximately 0.2%

Bed sediments/texture: Bed sediments are mostly fine sands, silts, some mud.

Bank structure: trapezoidal channel has 4-6 ft. high earthen banks, generally sloped at 2:1 - 3:1 (Photo 2). Concrete has been placed at the transition to the Yountville Outfall (Photo 5).

Water quality: On 8/4/10 nearly the entire channel was inundated, with maximum depths (~ 2 ft.) in the lower portion of the reach. Water clarity appeared poor-fair (Photo 3); water was stagnant at locations.

Channel processes: Deposition of fine sediment appears to be significant in this reach. Dense aquatic and emergent vegetation traps sediment and reduces stormflow velocities, which further encourages sediment deposition. There are limited areas of minor bank erosion, but flow conditions do not appear fast or deep enough to cause widespread bank failure.

BIOLOGICAL CONDITIONS

Aquatic or instream habitat: Instream habitat is dominated by aquatic and emergent vegetation (All Photos). The low flow channel is not well defined. Hundreds of bullfrog (Rana catesbeiana) tadpoles were observed in perennial pools.

Vegetation composition:

Channel: Dominant or sub-dominant species include *Ludwigia*, broad-leaved cattail (Typha latifolia), and tall flat sedge (*Cyperus eragrostis*). Hardstem bullrush (*Scirpus* [Schoenoplectus] *acutus*) occurs in isolated patches.

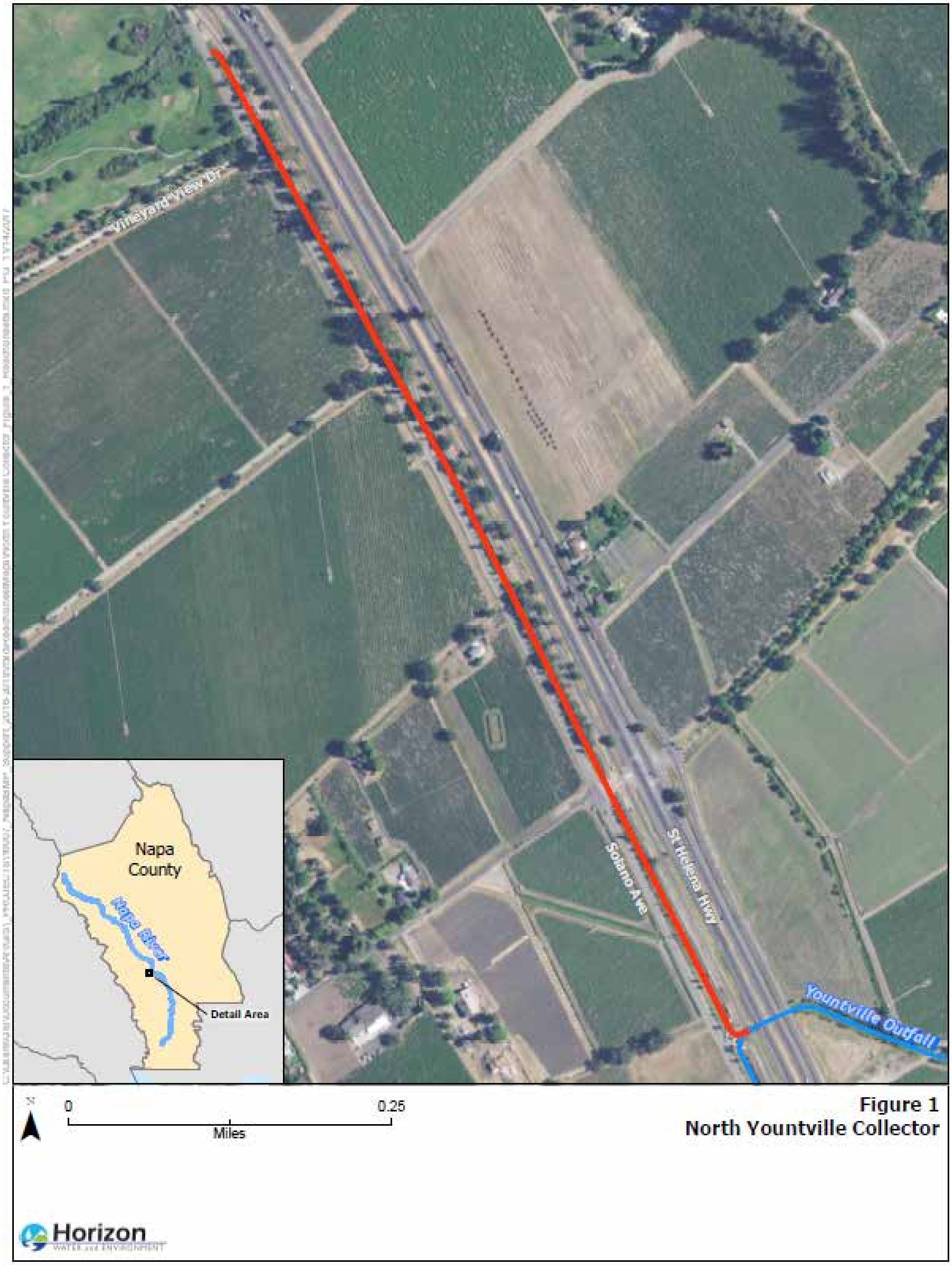
Banks: Understory: Predominantly herbaceous non-natives.

Overstory/Canopy: Extensive planting of native trees along both banks; predominantly coast live oak (Quercus agrifolia) and cottonwood (Populus fremontii). Many trees are well established and thriving; trees range from approximately 5-15 ft in height. There are some mature oaks and *Eucalyptus* on east bank (Photos 1 and 4).

MAINTENANCE CONSIDERATIONS AND MAINTENANCE HISTORY

Based on a channel inventory conducted in 2014, maintenance needs identified include localized cattail management and maintaining planted trees along the top of bank on an annual basis. As noted above, sediment deposition should be monitored. In 2013, sediment was removed at the confluence of the South and North Yountville Collector (photo 3). In 2016, maintenance activities that occurred in this reach (near Hoffman Lane) included cattail removal (100 linear feet) and invasive plant removal (6 cubic yards).

	
Photo 3. Confluence of south and north Yountville collectors Upstream of railroad bridge and Highway 29, first winter after Sediment removal project. (*2014)*	**Photo 4**. Looking downstream from Hoffman Lane (prior to cattail removal work in 2016).
	**Photo 5 (left)**. Looking downstream from Hoffman Lane after cattail removal work (*2016*).



Map A. North Yountville Collector.

OWNERSHIP: Private with County easement

LOCATION: Between Hwy 29 (to east) and Solano Ave. (to west), from Hillview Lane downstream (north) to tributary at Mile Marker 2.0.

ADJACENT LAND USE: Hwy 29 and railroad transportation corridor (east); vineyard (west).

UPSTREAM: Drainage from vineyards and natural areas.

LENGTH: 3,300 ft

AVERAGE TOP-OF-BANK WIDTH: 30-35 ft

Photo 2. Looking downstream in the upper portion of the SYC. The channel is formed in native soils. The channel bottom and banks are dominated by non-native herbaceous vegetation (*August 4, 2010*).

REACH SETTING

The South Yountville Collector (SYC) is a trapezoidal engineered channel that collects runoff from natural drainages and vineyards to the west. The SYC begins at a concrete box culvert that crosses under Solano Ave. (Photo 1). Reach 1 of the SYC flows for approximately 2,760 ft. before a major tributary enters from the west, which marks the transition to SYC – Reach 2.

Photo 1. Upstream end of the SYC. A concrete box culvert passes flows (beneath Solano Ave.) from an unnamed tributary to the west into the SYC (*August 4, 2010*).

PHYSICAL CONDITIONS

Active channel: The channel bed is 5 ft. wide; the low flow channel is indistinguishable. The channel bed is 6-8 ft. below the top of banks. The bed slope is gentle, less than 0.5%.

Bed sediments/texture: Fines/native soils.

Bank structure: Trapezoidal channel has 6-8 ft. high earthen banks, generally sloped at 2:1 - 3:1 (Photo 2). Sack concrete and riprap are placed along the east (right) bank at the upstream end of the reach (Photo 1)

Water quality: No water present on 8/4/10.

Channel processes: Runoff and fine sediment are transported from adjacent vineyards and roadways into the channel. No significant sediment deposition was observed. The road grades directly to the top of bank, allowing stormwater from adjacent roads to flow directly into channel (Photo 3).

BIOLOGICAL CONDITIONS

Aquatic or instream habitat: There is limited, if any, aquatic habitat in this reach.

Vegetation composition:

Channel: Predominantly herbaceous non-native species such as bristly oxtongue (*Picris echioides*), wild radish (*Raphanus sativus*), and wild oats (*Avena fatua*). Some wetland-associated species such as tall flat sedge (*Cyperus eragrostis*) and curly dock (*Rumex crispus*) are present in the lower portion of the reach (Photo 4).

Banks: Understory: Predominantly herbaceous non-natives.

Overstory/Canopy: Extensive planting of native trees, predominantly cottonwood (Populus fremontii), along both banks (Photo 3). There are many mature oak trees, and a few eucalyptus trees, along the east bank (Photos 2 and 3).

MAINTENANCE CONSIDERATIONS AND MAINTENANCE HISTORY

Based on a channel inventory conducted in 2014, the primary maintenance needs identified include annual cattail management and maintenance of planted trees along the top of bank to create shade canopy.

Photo 3. Looking upstream from the mid-point of SYC Reach 1. Note the cottonwoods planted along both banks (*August 4, 2010*).

Photo 4. The lower section of the reach has some wetland-associated plant species in the channel bed (*August 4, 2010*).

Map A. Reach 1 (red line) of the South Yountville Collector. The tributary that joins at Solano Ave MM 2.0 marks the reach break.

South Yountville Collector (SYC) – Reach 2

OWNERSHIP: Private with County easement

LOCATION: Adjacent to (east of) Solano Ave., from tributary at Mile Marker 2.0 downstream (north) to Yountville Outfall.

ADJACENT LAND USE: Hwy 29 and railroad transportation corridor (east); vineyard (west).

UPSTREAM: Reach 1 of SYC; Drainage from vineyards and natural areas.

LENGTH: 2,080 ft

AVERAGE TOP-OF-BANK WIDTH: 30-35 ft

Photo 1. Upstream end of the SYC- Reach 2. The culvert at Mile Marker 2.0 marks the upstream end of the reach. Note the cottonwoods planted along the channel (*Looking downstream, August 4, 2010*).

REACH SETTING

The South Yountville Collector (SYC) is a trapezoidal engineered channel that collects runoff from natural drainages and vineyards to the west. Reach 2 of the SYC joins the North Yountville Collector and flows east becoming the Yountville Outfall.

Photo 2. Looking upstream in the mid-portion of SYC Reach 2. The channel is formed in native soils. Dense aquatic vegetation, such as *Ludwigia*, grows in the channel (*August 4, 2010*).

PHYSICAL CONDITIONS

Active channel: The channel bed is 12-15 ft. wide; the low flow channel is indistinguishable. The channel bed is 4-8 ft. below the top of banks. The bed slope is less than 0.5%.

Bed sediments/texture: Fines/native soils.

Bank structure: The trapezoidal channel has 4-8 ft. high earthen banks, generally sloped at 2:1 -3:1 (Photo 2). Concrete has been placed at the transition to the Yountville Outfall (Photo 4).

Water quality: On 8/4/10 the channel appeared saturated, but limited standing water was observed due to the dense cover of aquatic vegetation.

Channel processes: Deposition of fine sediment likely occurs in this reach, but channel capacity does not appear to be significantly compromised. An assessment of as-built versus current cross-sectional area would help assess the extent of sedimentation that has occurred in the channel.

BIOLOGICAL CONDITIONS

Aquatic or instream habitat: Instream habitat is dominated by aquatic and emergent vegetation (All Photos). The low flow channel is not well defined.

Vegetation composition:

Channel: Dominant or sub-dominant species include Ludwigia, broad-leaved cattail (Typha latifolia), and tall flat sedge (Cyperus eragrostis).

Banks: Understory: Predominantly herbaceous non-natives.

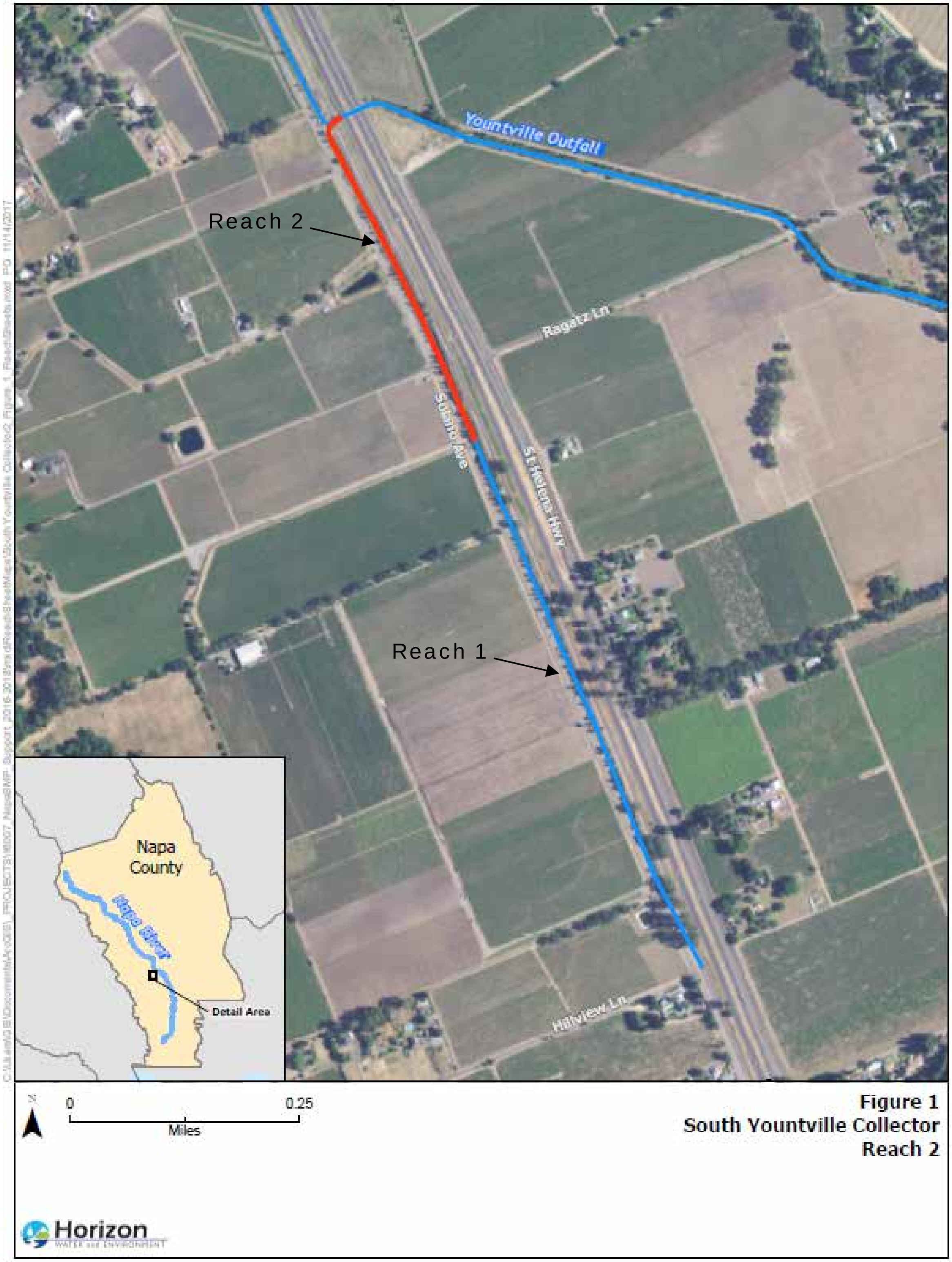
Overstory/Canopy: Extensive planting of native trees along both banks; predominantly cottonwood (Populus fremontii). Many trees are well established and thriving (Photo 1).

MAINTENANCE CONSIDERATIONS AND MAINTENANCE HISTORY

Based on a channel inventory conducted in 2014, the primary maintenance needs identified include annual cattail management and maintenance of planted trees along the top of bank to create shade canopy. Sediment management and ongoing management of *Ludwigia* was also identified as an ongoing maintenance need. In 2013, sediment was removed from the confluence of the South and North Yountville Collector and monitoring sediment deposition should be continually monitored.

Photo 3. Looking upstream from mid-reach area. Note the cottonwoods planted along banks and cattails in channel (*August 4, 2010*).

Photo 4. Looking upstream from the confluence with the Yountville Outfall. Note dense *Ludwigia* in the channel (*August 4, 2010*).



Map A. Reach 2 (red line) of the South Yountville Collector. The tributary that joins at Solano Ave MM 2.0 marks the reach break.

Yountville Outfall – Reach 1

OWNERSHIP: Private with District easement

LOCATION: From Hwy 29 to Ragatz Lane.

ADJACENT LAND USE: Hwy 29 and railroad transportation corridor at west end; vineyard to the north and south.

UPSTREAM: North and South Yountville Collectors, which receive discharge from Hinman Creek and other smaller drainages.

LENGTH: 2,750 ft

AVERAGE TOP-OF-BANK WIDTH: 50-60 ft

Photo 1. Looking downstream from upstream end of the Yountville Outfall near Hwy 29. Note the dense aquatic vegetation in the channel (*August 4, 2010*).

REACH SETTING

The Yountville Outfall is an engineered/modified channel that collects runoff from the North and South Yountville Collector channels. The Yountville Outfall begins at Hwy 29, and then flows southeasterly through vineyards on the valley floor. The wide outfall channel stores abundant sediment in instream bars/deposits.

Photo 2. Looking downstream from a bridge approximately 500 feet downstream of Hwy 29. The channel is dominated by aquatic vegetation (predominantly *Ludwigia*). Large instream bars collect sediment. The District has planted native trees along the channel (*August 4, 2010*).

PHYSICAL CONDITIONS

Active channel: The channel bed is 35-40 ft. wide; small low flow channel follows perimeter of instream sediment deposits. The channel bed is 6-8 ft. beneath the top of banks. The bed slope is less than 0.5%.

Bed sediments/texture: Bed sediments are predominately fines with gravel in some areas.

Bank structure: trapezoidal channel has 6-8 ft. high earthen banks, generally sloped at 1:1 - 1.5:1 (Photos 1 and 2).

Water quality: On 8/4/10 the nearly the entire channel was inundated with approximately 2 ft. of standing/stagnant water. Water clarity appeared poor-fair. The channel had less water at the downstream end of the reach.

Channel processes: Abundant deposition of fine sediment occurs in this reach and collects in instream sediment bars/benches. Channel may be over-widened (compared to historic channel alignment) this, along with aquatic vegetation, reduces storm flow velocities and promotes sediment deposition. When the Napa River is at flood stage, the Yountville Outfall is backwater flooded.

<u>BIOLOGICAL CONDITIONS</u>

Aquatic or instream habitat: Instream habitat is dominated by aquatic and emergent vegetation (All Photos). The low flow channel is not well defined.

Vegetation composition:

Channel: Dominant or sub-dominant species include *Ludwigia*, broad-leaved cattail (Typha latifolia), and Polygonum spp.

Banks: <u>Understory</u>: Predominantly herbaceous non-natives including bristly oxtongue (Picris echioides), wild radish (*Raphanus sativus*), and Harding grass (*P*halaris aquatica).

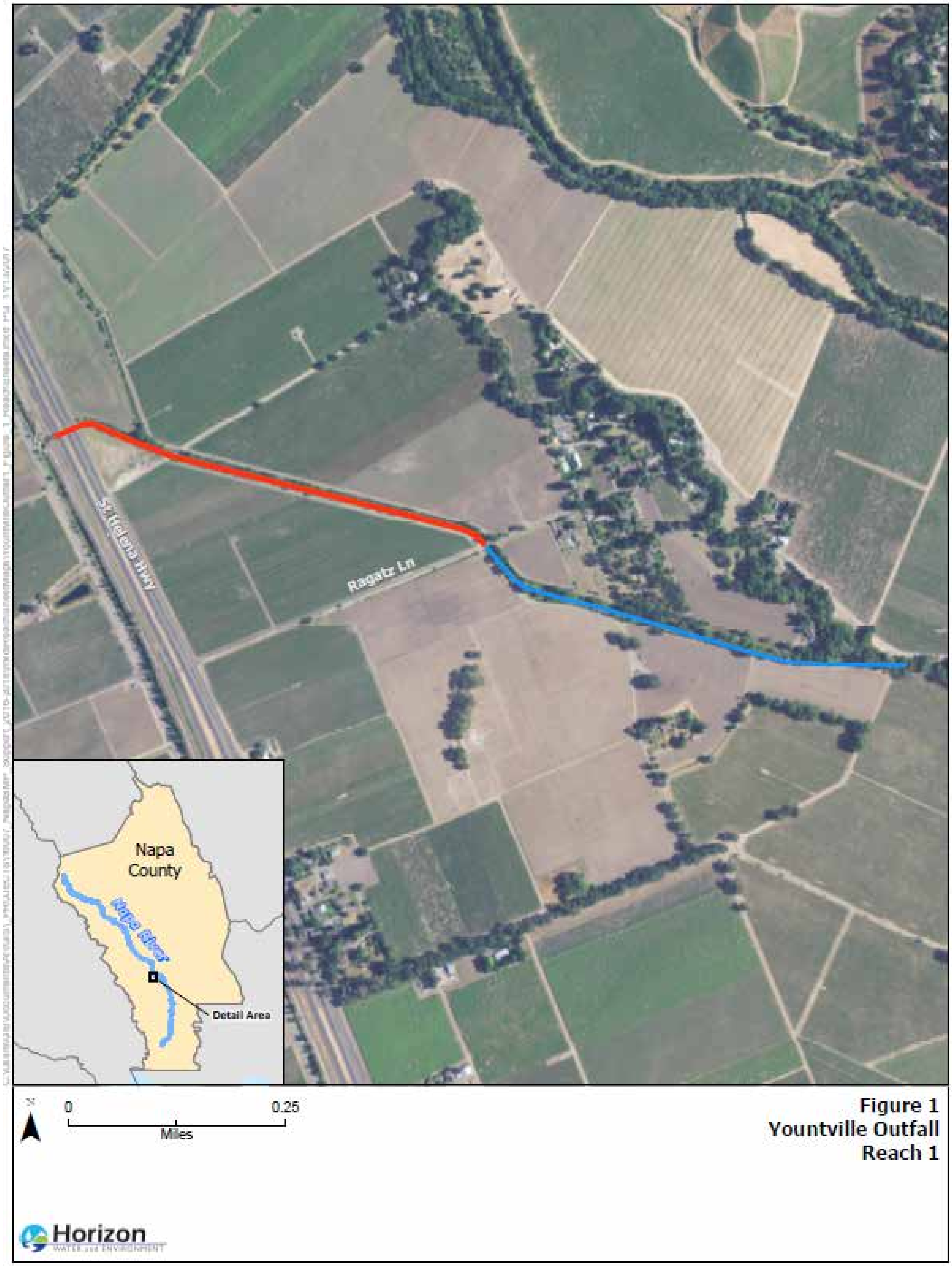
<u>Overstory/Canopy</u>: Planting of native trees along both banks; predominantly coast live oak (Quercus agrifolia) and cottonwood (Populus fremontii). There are a few mature oaks on the north bank near the downstream end of the reach (Photo 4).

<u>MAINTENANCE CONSIDERATIONS</u>

Based on a channel inventory conducted in 2014, maintenance needs identified include targeted willow pruning every two years; monitoring and assessment of the box culvert, railroad abutment at Highway 29, and agricultural bridge (Photos 3 and 5); *Ludwigia* management (Photo 6), and sediment management every 5-8 years near the box culvert outfall and near an agricultural bridge abutment.

	
Photo 3. Agricultural bridge.	**Photo 4**. Ragatz Lane bridge at upstream end of the reach.
	
Photo 5. Sediment deposition downstream of agricultural bridge.	**Photo 6.** Ragatz Lane box culvert with invasive *Ludwigia* colonizing channel upstream.

Yountville Outfall – Reach 1



Map A. Reach 1 of the Yountville Outfall

Yountville Outfall – Reach 2

OWNERSHIP: Private with District easement

LOCATION: From Ragatz Lane to the end of District maintenance easement near Trubody Lane

ADJACENT LAND USE: vineyards

UPSTREAM: Yountville Outfall –Reach 1

LENGTH: Approximately 2,700 ft

AVERAGE TOP-OF-BANK WIDTH: 45-55 ft

Photo 1. Looking downstream from Ragatz Lane. Note the well-established trees along the riparian corridor (*August 4, 2010*).

REACH SETTING

The Yountville Outfall Reach 2 is a modified channel that is in the process of recovery from historical dredging and straightening. In contrast to Yountville Outfall Reach 1, the bed and banks exhibit geomorphic features (e.g., low flow channel, floodplain surfaces, scour pools) that are indicative of recovery of natural channel processes (i.e., erosion and deposition).

Photo 2. Typical conditions in the upper portion of the reach (Looking downstream from approximately 200 feet downstream of Ragatz Lane bridge). The channel bed is dominated by aquatic vegetation (predominantly *Ludwigia*). Native trees form a relatively well established riparian corridor (*August 4, 2010*).

PHYSICAL CONDITIONS

Active channel: The channel bed is 25-30 ft wide; the bed is 6 -10 ft beneath the top of banks. An inset low-flow (annual type - bankfull) channel (8 ft wide by 2-4 ft deep) is distinguishable in the downstream section of the reach. The bed slope is less than 0.5%.

Bed sediments/texture: Bed sediments are native soils and alluvial fines (Photos 3 and 4).

Bank structure: The channel has 6-10 ft high earthen banks; slopes range from 2:1 to 3:1 (All Photos).

Water quality: On 8/4/10 nearly the entire reach was dry.

Channel processes: Deposition of fine sediment likely occurs in the upper portion of this reach as aquatic vegetation reduces storm flow velocities and promotes sedimentation. Pockets of streambed and bank erosion were observed in the lower portion of the reach (Photo 4). When the Napa River is at flood stage, the Yountville Outfall is backwater flooded.

BIOLOGICAL CONDITIONS

Aquatic or instream habitat: In the upstream portion of the reach instream habitat is dominated by aquatic and emergent vegetation (Photos 1 and 2). In the lower portion of the reach there appear to be some scour pools formed in the bed (Photos 3 and 4). Bed substrate is dominated by fines.

Vegetation composition:

Channel: Dominant or sub-dominant species include *Ludwigia*, broad-leaved cattail (Typha latifolia), and Polygonum spp.

Banks: Understory: Predominantly herbaceous non-natives including bristly oxtongue (Picris echioides), wild radish (*Raphanus sativus*), poison hemlock (Conium maculatum), and Harding grass (*P*halaris aquatica); some Himalayan blackberry (Rubus discolor) was also observed.

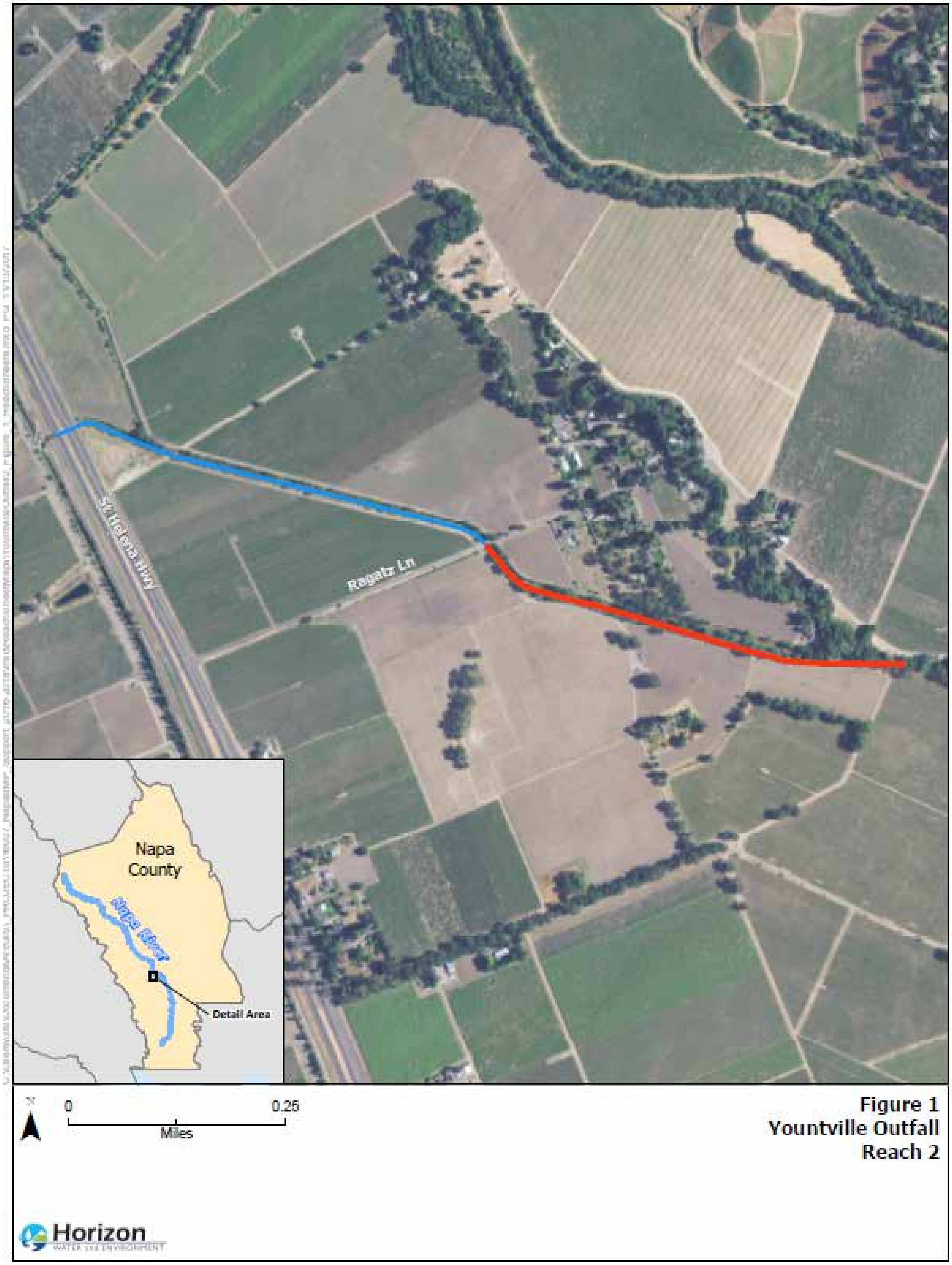
Overstory/Canopy: Mature native trees such as coast live oak (Quercus agrifolia) and black walnut (Juglans californica) line the banks of the channel. There is some recruitment of alder (Alnus rhombifolia) and willow (Salix spp.) on the lower banks (Photo 5).

Photo 3. A relatively dense riparian canopy shades portions of the channel *(Looking upstream, August 4, 2010)*

Photo 4. In the downstream portion of the reach a bankfull channel has formed within the larger flood conveyance channel; note large woody debris crossing channel *(Looking downstream near Trubody Lane, August 4, 2010).*

MAINTENANCE CONSIDERATIONS

Based on a channel inventory conducted in 2014, maintenance needs identified include targeted willow pruning every two years and *Ludwigia* management near the Ragatz Lane box culvert. Sediment accumulation should also be monitored and addressed every 5-8 years.



Map A. Reach 2 (red) of the Yountville Outfall extends from Ragatz Lane to Trubody Lane.

Solano Ditch

OWNERSHIP: Private with County easement

LOCATION: Adjacent to (east of) Solano Ave., from Oak Knoll Ave. (upstream and south end) to approximately 500 feet south of Darms Lane (downstream and north end).

ADJACENT LAND USE: Hwy 29 and railroad transportation corridor (east); vineyard (west)

UPSTREAM: no defined tributary upstream, runoff catchment areas to west

LENGTH: 4,250 ft

AVERAGE TOP-OF-BANK WIDTH: 25 ft

Photo 1. Looking downstream near Oak Knoll Ave [Solano Ave to west (left)]. Mature oaks grow along the upstream portion of the Solano Ditch corridor (*August 4, 2010*).

REACH SETTING

Solano Ditch is a linear trapezoidal channel that collects runoff from vineyards and upland areas to the west and routes this discharge northward to Dry Creek. The channel bottom is lined with concrete. Consequently, runoff is transported rapidly through the ditch and no aquatic habitat is present along the bed of the ditch.

Photo 2. Looking downstream from the mid-point of the Solano Ditch. The channel bottom and low banks are lined with concrete. The upper banks are formed in native soils. Vegetation on the upper banks consists of non-native herbaceous species (*August 4, 2010*).

PHYSICAL CONDITIONS

Active channel: The channel bottom is 3.5 ft wide; the top width of the concrete channel is approximately 10 ft. The channel bed is 4-8 ft. beneath the top of banks.

Bed sediments/texture: The bed is formed of concrete. There is minimal sediment deposition within the channel (Photo 2).

Bank structure: The lower banks are formed of concrete (Photo 2). The upper banks are formed in native soils, generally sloped at 2:1 (Photo 2).

Water quality: No water present on 8/4/10.

Channel processes: Runoff and fine sediment are transported from adjacent vineyards, natural drainages, and roadways to the west into the channel. The concrete lined channel appears to efficiently convey runoff and sediment; no significant deposition was observed (Photo 2).

<u>Biological Conditions</u>

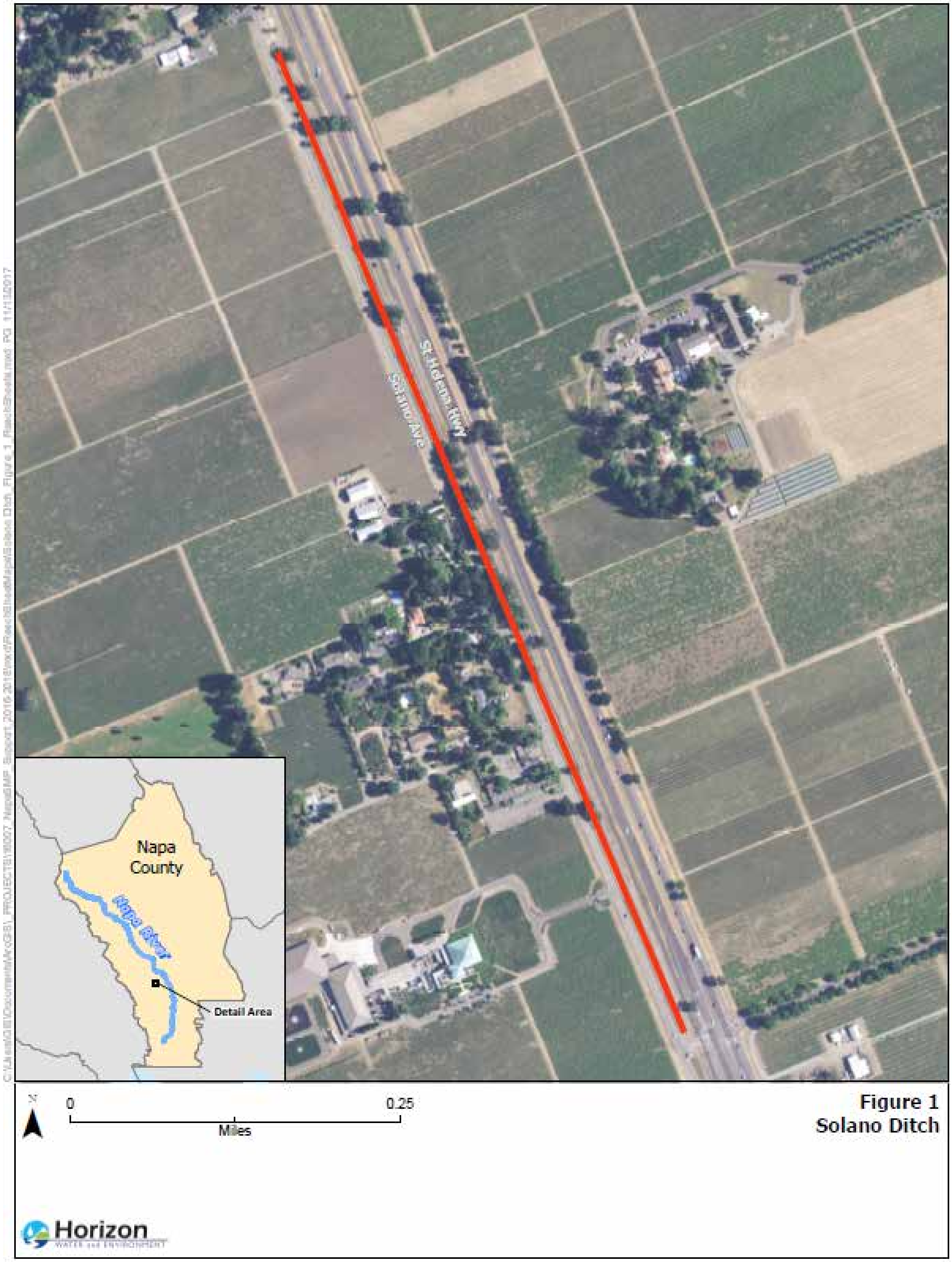
Aquatic or instream habitat: There is limited, if any, aquatic habitat present in this reach due to the concrete lining of the channel.

Vegetation composition:

Channel: None.

Banks: <u>Understory</u>: Predominantly herbaceous non-native species such wild radish (*Raphanus sativus*), prickly lettuce (*Lactuca serriola*), bull thistle (*Cirsium vulgare*) and Harding grass (*P*halaris aquatica). There is some Himalayan blackberry (*Rubus discolor*) growing along the west (left) bank (Photo 3); it appears that the District may be managing this patch of invasive blackberry.

<u>Overstory/Canopy</u>: Upstream portion of the reach has mature oaks (predominantly Quercus agrifolia) lining the channel. A few oaks have been planted by the District along the channel.



Map A. Solano Ditch.

North Salvador Collector (NSC) – Reach 1

OWNERSHIP: City of Napa and Private with District easement

LOCATION: Adjacent to (east of) Solano Ave., between Luke Dr. upstream (north) and Salvador Ave. downstream (south)

ADJACENT LAND USE: Hwy 29 and railroad transportation corridor to east; medium/high density residential, senior citizens community, and light commercial use to west

UPSTREAM: Culverted tributaries capture runoff from developed areas and vineyards to west

LENGTH: 1,820 feet

AVERAGE TOP-OF-BANK WIDTH: 40 feet

Photo 1. Reach 1 is an intermittent stream that is dry much of the year. In channel vegetation is dominated by mesic species. Riparian trees, predominately oaks, planted by the District line the east side of channel (right side of the photo) (*Looking upstream from mid-point in the reach, August 4, 2010*).

REACH SETTING

North Salvador Collector (NSC) is a linear trapezoidal channel that collects runoff from developed areas, vineyards, and natural drainages to the west and routes this discharge downstream (southward) into NSC Reach 2. The catchment area for Reach 1 is relatively limited. Consequently, this reach is intermittent (or ephemeral) and conveys less runoff than Reach 2 downstream which has larger tributary areas.

Photo 2. Looking downstream from Luke Road (Solano Ave to west (left). Note riparian enhancement plantings (primarily oaks) on the left bank and retaining wall on right bank (*August 4, 2010*).

PHYSICAL CONDITIONS

Active channel: The channel bed is 8-10 ft. wide; no distinguishable low flow channel. The channel bed is 4-6 ft. beneath the top of banks. The bed slope is less than 0.5%.

Bed sediments/texture: Alluvial fine sediment over native soils (Haire loam) with some riprap placed in the bed and lower banks.

Bank structure: The trapezoidal channel has 4-6-foot-high earthen banks, generally sloped at 2:1 to 3:1 (Photo 1). There is a concrete retaining wall/floodwall in the upper portion of the reach (near Luke Dr.) on the right bank (Photo 2).

Water quality: no water present on 8/4/10.

Channel processes: runoff and fine sediment are transported from upstream vineyards, development, and roadways into the channel. Channel transport capacity appears in relative balance with sediment delivery, with no significant deposition occurring. The road grades directly to the top of bank, allowing stormwater from adjacent road to flow directly into channel (Photo 1).

<u>Biological Conditions</u>

Aquatic or instream habitat: There is limited, if any, aquatic habitat in this reach. Due to the lack of flows, the streambed does not exhibit distinct morphology that could provide aquatic habitat (e.g., pools, riffles, bank alcoves, etc).

Vegetation composition:

Channel: Predominantly herbaceous non-native species such as bristly oxtongue (*Picris echioides*), wild radish (*Raphanus sativus*) and wild oats (*Avena fatua*). Some wetland associated species are present such as tall flat sedge (*Cyperus eragrostis*) and curly dock (*Rumex crispus*).

Banks: <u>Understory</u>: bristly oxtongue, wild radish, wild oats, and Harding grass (*Phalaris aquatic*).

<u>Overstory/Canopy</u>: Extensive planting along left bank by District. Predominantly coast live oak (Quercus agrifolia); also cottonwood (Populus fremontii) and big leaf maple (Acer macrophyllum). These trees are well established and thriving; trees range from approximately 10-15 ft in height, and 2-5 inches dbh.

Map A. Reach 1 (red line) and Reach 2 (blue line) of the North Salvador Collector. The confluence of Salvador Creek, just south of Salvador Ave, marks the reach break.

North Salvador Collector (NSC) – Reach 2

OWNERSHIP: City of Napa and Private with District easement

LOCATION: Adjacent to (east of) Solano Ave., Salvador Ave. (upstream) runs south to South Salvador Collector confluence.

ADJACENT LAND USE: Hwy 29 and railroad transportation corridor to east; single-family residential to west

UPSTREAM: North Salvador Collector- Reach 1; upper Salvador Creek.

LENGTH: 2,400 ft

AVERAGE TOP-OF-BANK WIDTH: 45-50 ft

Photo 1. Near the upstream end of Reach 2, two 60-inch concrete culverts deliver flows from upper Salvador Creek, which originates in the Mayacamas Mountains to the west (*August 4, 2010*).

REACH SETTING

The North Salvador Collector (NSC) is a linear trapezoidal engineered channel that collects runoff from vineyards and natural drainages to the west. Reach 2 of the NSC begins at the Salvador Ave. crossing. Approximately 60 feet downstream of the crossing, twin concrete culverts enter the channel from the west (right bank, Photo 1). These culverts convey flows from a culverted reach of (upper) Salvador Creek. Downstream, Reach 2 joins the South Salvador Collector and then flows east beneath Hwy 29, becoming (lower) Salvador Creek.

Photo 2. Looking downstream near the mid-point Reach 2. Reach 2 NSC collects more runoff than Reach 1 NSC. Consequently, hydrophytic vegetation is present through most of the channel (*August 4, 2010*).

PHYSICAL CONDITIONS

Active channel: The channel width is 15-20 ft. with low flow channel 2-4 feet wide (when water flow present). The channel bed is 6-8 feet beneath the top of banks at the upstream end, and 3-5 feet beneath the top of banks at the downstream end. The bed slope is less than 0.5%.

Bed sediments/texture: Native soils (Haire loam) with some riprap placed in the bed and lower banks. Sack concrete has been placed opposite the Salvador Creek culvert outfall (Photo 1) at the upstream end of the reach to stabilize portions of the west bank.

Bank structure: trapezoidal channel has 4-6 ft. high earthen banks, generally sloped at 2:1 - 3:1 (Photo 1). Sack concrete has been placed along extensive portions of the western bank in the lower reach.

Water quality: Some areas of ponding were observed in Aug 2010. Water clarity appeared poor-fair at the upstream end (Photo 2), and good at the downstream end. Small areas of sheen were observed (less than 5 ft2).

Channel processes: Deposition of fine sediment appears to be significant in this reach. A “wedge” of fine sediment has developed in the lower reach, where it is deepest, and is less deep in the upstream direction. This depositional pattern is caused by the concrete weir at the downstream end of the reach that traps sediment and establishes channel grade.

Biological Conditions

Aquatic or instream habitat: Aquatic habitat consists of isolated shallow-ponded depressions surrounded by tall emergent vegetation. The low flow channel is not well defined.

Vegetation composition:

Channel: A diverse assemblage of hydrophytes. Dominant or sub-dominant species include in the upstream portion include tall flat sedge (*Cyperus eragrostis*) and penny royal (*Mentha pulegium*); broad-leaved cattail (Typha latifolia) is dominant in the section downstream of Wine District Road*.* Other species present include curly dock (*Rumex crispus*), Himalayan blackberry (*Rubus discolor*), and rushes (*Juncus* spp.)

Banks: Understory: Predominantly herbaceous non-native species such as bristly oxtongue (*Picris echioides*), wild radish (*Raphanus sativus*) and wild oats (*Avena fatua*).

Overstory/Canopy: Planting of native trees along left bank, predominantly coast live oak (Quercus agrifolia); trees are smaller than those planted in Reach 1. Some mature oaks on left bank (Photo 1).

Maintenance Considerations and Maintenance History

Based on a channel inventory conducted in 2014, the primary maintenance needs identified include localized cattail management and maintenance of planted trees along the top of bank to create shade canopy, annual mowing of non-native invasive weeds. Hydraulic constriction and streambed erosion issues were also observed downstream of the Wine Country Road box culvert (Photos 3 and 4).

Photo 3. Wine Country Rd. box culvert. (2014)

Photo 4. Wine Country Rd. box culvert. (2014)

In 2016, maintenance activities conducted within this reach included removal of cattails (1,000 linear feet), invasive plant removal (25 cubic yards), and blackberry busy removal (10 cubic yards).

North Salvador Collector (NSC) – Reach 2

Map A. Reach 2 (red line) and Reach 1 (blue line) of the North Salvador Collector. The confluence of upper Salvador Creek, just south of Salvador Ave, marks the reach break.

South Salvador Collector (SSC)

OWNERSHIP: Private with District easement

LOCATION: Adjacent to Solano Ave. (to west), between Trower Ave. upstream (to south) and confluence with North Salvador Collector downstream to north

ADJACENT LAND USE: Hwy 29 and railroad corridor to east; Public school and fire station to west

UPSTREAM: Culverted drainage

LENGTH: 1,360 ft

AVERAGE TOP-OF-BANK WIDTH: 30-40 ft

Photo 1. Typical section of the SSC (*Looking downstream from upper portion of the reach; August 4, 2010*). Note dense emergent vegetation growing in the channel.

REACH SETTING

The South Salvador Collector (SSC) is a linear trapezoidal drainage channel that collects runoff from vineyards, residential development and natural drainages to the west. The SSC is a north flowing channel that joins the North Salvador Collector to form Salvador Creek, which then flows east toward the Napa River. Only one reach was identified for the SSC.

Photo 2. Culvert outlet at upstream end of the SSC. Water clarity at this location was good (*August 2010*). Note emergent vegetation growing immediately downstream of outfall.

PHYSICAL CONDITIONS

Active channel: The channel bed is 10 to 20 feet wide; no low flow channel present. The channel bed is 5-7 feet beneath the top of banks at the upstream end, and 3-5 feet beneath the top of banks at the downstream end.

Bed sediments/texture: alluvial fine sediment.

Bank structure: The channel is trapezoidal with 4-6 foot-high earthen banks, generally sloped at 2:1 to 3:1 (Photo 1).

Water quality: Some ponding throughout the reach. Water clarity near the upstream culvert appeared good on August 4, 2010 (Photo 2).

Channel processes: Deposition of fine sediment appears to be significant in this reach, with associated growth of emergent vegetation in the freshly deposited material. Deposition in the downstream portion of the reach is likely related to flood-stage hydraulics. The Highway 29 culvert crossing restricts flow during flood events, which causes backwatering of the North and South Salvador Collectors. The SSC is backwatered to a greater extent than the NSC because discharge in the NSC is greater. Low velocities of sediment-laden flood waters create ideal conditions for deposition.

South Salvador Collector (SSC)

BIOLOGICAL CONDITIONS

Aquatic or instream habitat: Aquatic habitat consists of isolated shallow ponded depressions surrounded upstream and downstream by tall emergent vegetation. The low flow channel is not well defined.

Vegetation composition:

Channel: Broad-leaved cattail (Typha latifolia) is dominant in this reach. Knotweed (*Polygonum* sp.) also occurs in perennial inundated portions of the channel.

Banks: Understory: Predominantly herbaceous non-native species; unidentified *Apiaceae* dominant.

Overstory/Canopy: Planting of native trees along right bank, several planted cottonwoods (Populus fremontii) are thriving (Photo 2). There are a few mature Monterey cypress (Cupressus macrocarpa) on right bank (Photo 1).

MAINTENANCE HISTORY

In 2014, the District conducted cattail removal along a 300-foot section of channel near Trower Avenue. Photos 3 and 4 show before and after images of the cattail management area. 2016 maintenance work included cattail removal (1,000 linear feet), invasive plant removal (25 cubic yards), and blackberry removal (10 cubic yards).

	
Photo 3. Looking downstream at cattails from Trower Avenue. *(2014)*	**Photo 4.** Looking upstream at cattail management area after cattail removal. *(2014)*

South Salvador Collector (SSC)

Map A. South Salvador Collector.

Salvador Creek – Reach 1

OWNERSHIP: District owned

LOCATION: From Highway 29 downstream to Trower Ave. crossing

ADJACENT LAND USE: Vineyards and residential development to north; residential development to south.

UPSTREAM: North and South Salvador Collectors

LENGTH: 3,910 ft

AVERAGE TOP-OF-BANK WIDTH: 40-50 ft

Photo 1. Typical conditions in the upstream portion of the reach (*Looking downstream, July 2010*).

REACH SETTING

Reach 1 of Salvador Creek is a modified channel that conveys runoff from the North and South Salvador Collectors. The reach begins at Hwy 29, and flows southeasterly through residential development and vineyards on the valley floor. The channel has been highly modified for flood control purposes. Consequently, the channel has a simple cross-sectional form with relatively uniform bed and banks.

Photo 2. Looking upstream from a bridge approximately 1,600 ft downstream of Hwy 29. Dense growth of *Ludwigia* covers the channel. The District has planted native trees along the south bank (right side of photo) (*July 2010*).

PHYSICAL CONDITIONS

Active channel: The channel bed is 25-30 feet wide; no low flow channel is distinguishable. The channel bed is 5-7 feet beneath the top of banks. The bed slope is less than 0.5%.

Bed sediments/texture: Bed sediments appear to be sands and fines.

Bank structure: The channel is trapezoidal and has 5 to 7-foot-high earthen banks, generally sloped at 1:1 to 1.5:1 (All Photos). Riprap has been placed at the toe of slope along much of the channel (Photo 4), and armors several isolated stretches of streambank.

Water quality: On 7/8/10 the nearly the entire channel was inundated with approximately 2 feet of standing/stagnant water. Water clarity appeared good.

Channel processes: Reach characterized by deep trapezoidal channel, with sequences of depositional patches and deeper pools. Channel alignment follows bends (which may follow historic channel alignment). Outer bends are more erosive with higher velocity flows, inner bend areas are depositional. Sediment collects at downstream end of reach between crossings where channel is widened.

BIOLOGICAL CONDITIONS

Aquatic or instream habitat: Instream habitat is dominated by aquatic vegetation (All Photos). The low flow channel is not well defined.

Vegetation composition:

Channel: *Ludwigia* is dominant (Photo 4). Broad-leaved cattail (Typha latifolia) present.

Banks: Understory: Predominantly herbaceous non-natives including bristly oxtongue (Picris echioides), Harding grass (*P*halaris aquatica), and periwinkle (Vinca major); Himalayan blackberry (Rubus discolor) also common.

Overstory/Canopy: Planting of native trees along south bank; predominantly coast live oak (Quercus agrifolia), willow (Salix sp.) and cottonwood (Populus fremontii). There are many mature trees, predominantly oaks and black walnut (*Juglans californica*), along the banks in the lower portion of the reach.

Map A. Reach 1 (Red) of Salvador Creek extends from Highway 29 to Trower Avenue.

MAINTENANCE CONSIDERATIONS AND MANAGEMENT OPPORTUNITIES

There is some relatively minor streambank erosion in several locations, generally at outer bend locations along the reach. At this time, this erosion does not warrant direct treatment, but the District will continue to monitor these sites.

There is sediment accumulation in the short section between the Jefferson Street and Trower Ave. crossings (Photo 5), including some culvert blockage at the Trower Ave. crossing. The sediment at these locations was targeted for removal during the summer of 2012. The underlying cause of sediment deposition at this site (as shown in Photo 5) is the widening of the overall channel area between the Trower Ave. and Jefferson St. This channel section is culverted and the combination of the slight gradient, widened channel, and channel bend (creating a point bar on the inner bend between Jefferson St. and Trower Ave. has resulted in the observed deposition.

The District has taken steps to enhance ecological conditions in this reach through extensive planting of native trees (Photo 6). Additional planting was conducted in 2013. There is dense growth of aquatic vegetation in the reach. *Ludwigia* management strategies could be considered, along with other management approaches for the existing invasive plant species. In 2016, recent maintenance activities included downed tree removal (Photos 7 and 8), vegetation management (10 cubic yards), invasive plant removal (24 cubic yards), and removal of blackberry bushes (30 cubic yards).

Photo 3. Looking downstream from a bridge approximately 1,600 ft downstream of Hwy 29 (*July 2010*).

Photo 4. Looking upstream from Jefferson St. Note riprap at the toe of slope on south bank (left side of photo) (*July 2010*).

	
Photo 5. Sediment accumulation along the south bank (right side of photo) between Jefferson St. and Trower Ave. (*December 2009*).	**Photo 6.** Extensive planting of native trees along the south (right) bank (*July 2010*).
	
Photo 7. Looking upstream at downed tree crossing creek at Valencia St. *(2016)*	**Photo 8.** Looking upstream at downed tree removal site at Valencia St. *(2016)*

Salvador Creek – Reach 2 (no District easement)

OWNERSHIP: Napa Valley Unified School District; City of Napa. No District easement.

LOCATION: From Trower Ave. downstream to Garfield Lane

ADJACENT LAND USE: Vintage High School and recreational facilities.

UPSTREAM: Salvador Creek - Reach 1

LENGTH: 2,730 ft

AVERAGE TOP-OF-BANK WIDTH: 50-60 ft

Photo 1. Typical conditions in the upstream portion of the reach. Water is pooled downstream due to beaver dam seen in Photo 2 (*Looking downstream from Trower Ave, July 8, 2010*).

REACH SETTING

Reach 2 of Salvador Creek is a transitional reach between the modified channel of Reach 1 and the more natural channel in Reach 3. The upstream portion of the reach maintains a modified form, but has more variability and diverse habitat than in Reach 1; the lower section of the reach is more characteristic of a natural channel. Multiple beaver dams at the high school create flow and debris blockages that reduce conveyance capacity and increase the flood risk.

Photo 2. The first beaver dam located approximately 600 ft downstream of Trower Ave. Dam pools water upstream as seen in Photo 1 (*July 8, 2010*).

PHYSICAL CONDITIONS

Active channel: The channel bed is 20-25 feet wide; no low flow channel is distinguishable. The channel bed is 5-7 feet beneath the top of banks. The bed slope is less than 0.5%.

Bed sediments/texture: Bed sediments appear to be sands and fine sediment.

Bank structure: 5 to 7-foot-high earthen banks, generally sloped at 1:5-2:1 (All Photos). Concrete has been along the north bank in a section in the downstream portion of the reach (Photo 4).

Water quality: On 7/8/10 the entire channel was inundated. Water depths varied with distance from beaver dams with the deepest water pooling occurring immediately upstream of dams. Water was generally stagnant. Water clarity appeared poor-fair.

Channel processes: Sediment deposition occurs in sequence of small instream bars and benches. Beaver dams trap sediment and debris (Photo 2), dams also reduce flow velocities upstream, which favors the deposition of suspended sediment.

BIOLOGICAL CONDITIONS

Aquatic or instream habitat: Deep pools formed by beaver dams. Some aquatic vegetation in shallower areas. The low flow channel is not well defined. Significant large woody debris (LWD) from beaver activity.

Vegetation composition:

Channel: *Ludwigia* in shallow ponded areas. Broad-leaved cattail (Typha latifolia) along margins of channel.

Banks: Understory: Predominantly herbaceous non-natives including bristly oxtongue (Picris echioides), Harding grass (*P*halaris aquatica) and curly dock (Rumex crispus); blackberry (Rubus spp.) also common.

Overstory/Canopy: Willow (Salix sp.) and cottonwood (Populus fremontii); many trees have been damaged/destroyed by beaver activity.

MAINTENANCE CONSIDERATIONS AND MAINTENANCE HISTORY

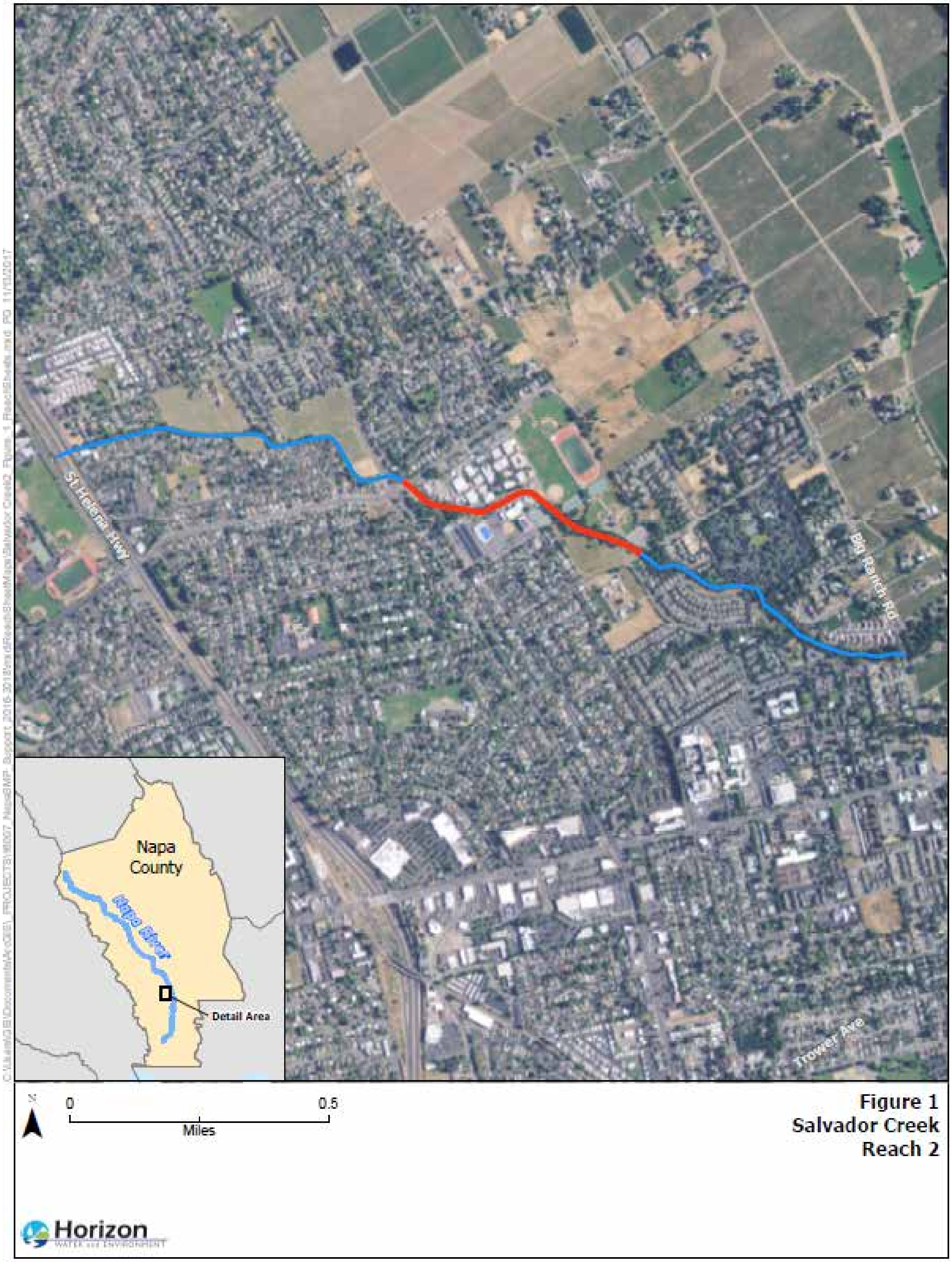
Based on a channel inventory conducted in 2014, maintenance activities identified for this reach included monitoring the box culvert at the High School foot bridge and monitor sediment deposition.

In 2014, maintenance work completed included vegetation management (20 cubic yards), invasive plant removal (24 cubic yards), and blackberry bush removal (30 cubic yards) at Jefferson Street. In 2016, recent maintenance activities conducted within this reach included vegetation management (20 cubic yards), removal of invasive plants (30 cubic yards), and removal of blackberry bushes (30 cubic yards) at Jefferson Street (see Photos 5 and 6).

	
Photo 3. Downed trees crossing the channel from beaver activity (*July 8, 2010*).	**Photo 4**. Looking downstream from a bridge in the lower portion of the reach. Note concrete lining on north bank (left side of photo) (*July 8, 2010*).

	
Photo 5. Looking downstream at non-native invasive blackberry and willows in channel. *(2016)*	**Photo 6**. Looking downstream after willow pruning and blackberry removal. *(2016)*

Salvador Creek – Reach 2 (no District easement)



Map A. Reach 2 of Salvador Creek (shown as red line above) extends from Trower Avenue to Garfield Lane.

Salvador Creek – Reach 3

OWNERSHIP: District, City of Napa, and Private with District easement.

LOCATION: From Garfield Lane to Big Ranch Road. District easement includes Summerbrooke Circle to private automobile bridge (Map A).

ADJACENT LAND USE: Residential development.

UPSTREAM: Salvador Creek- Reach 2 development.

LENGTH: 3,110 ft

AVERAGE TOP-OF-BANK WIDTH: 45-55 ft

Photo 1. Typical conditions in the upper portion of the reach (*Looking downstream, September 22, 2010*).

REACH SETTING

Compared to upstream Reaches 1 and 2, Reach 3 of Salvador Creek is a more natural channel that flows through a well established riparian corridor. The upstream portion of Reach 3 has dense riparian vegetation on both banks and relatively good floodplain connectivity. Bank angle and height gradually increase in the downstream direction. The downstream portion of the reach is deeply incised with very steep streambanks (Photos 3, 4 and 5). Many streambanks are highly unstable (Photo 5).

Photo 2. An active headcut marks the upstream extent of the incised portion of the reach (*Looking upstream, July 8, 2010*).

PHYSICAL CONDITIONS

Active channel: channel bed is 12-15 ft wide. In the upper portion of the reach the channel bed is 6-10 ft beneath the top of banks, and 12-18 ft in the lower portion of the reach. The bed slope is approximately 0.3%.

Bed sediments/texture: Bed sediments are composed of a wide range of grain sizes, from fines to large boulders.

Bank structure: 6-20 ft high earthen banks. 2:1 to 3:1 in the upper portion transitioning to near vertical in the lower portion of the reach (All Photos).

Water quality: The entire reach was inundated on July 8, 2010. Water depths were approximately 1-3 ft in the upstream portion of the reach. There were many deep pools (~6 ft) in the lower portion. Water clarity was turbid, likely due to organic constituents (i.e., not mineral sediment).

Channel processes: Mid-way through the reach there are a series of headcuts that suggest the channel is actively incising. The stability of these headcuts and the rate of migration were not assessed. The downstream portion of the reach has clearly undergone recent incision as evidenced by the steep streambanks and recruitment of large trees into the channel (Photos 3, 4, and 5).

Biological Conditions

Aquatic or instream habitat: Predominantly pool and run habitat with a few riffles. Many pools are shaded with root assemblages and other habitat features.

Vegetation composition:

Channel: Limited vegetation in the channel. Some rushes (*Juncus* sp.) on the channel margins.

Banks: Understory: Predominantly herbaceous non-natives including bristly oxtongue (Picris echioides) and Harding grass (*P*halaris aquatica) in open areas adjacent to the channel. A few Arundo patches in the downstream area (Photo 6). Many native trees and shrubs planted as part of the Salvador Creek habitat restoration project. Dense Himalayan blackberry (*Rubus discolor*) thickets in the lower portion of the reach.

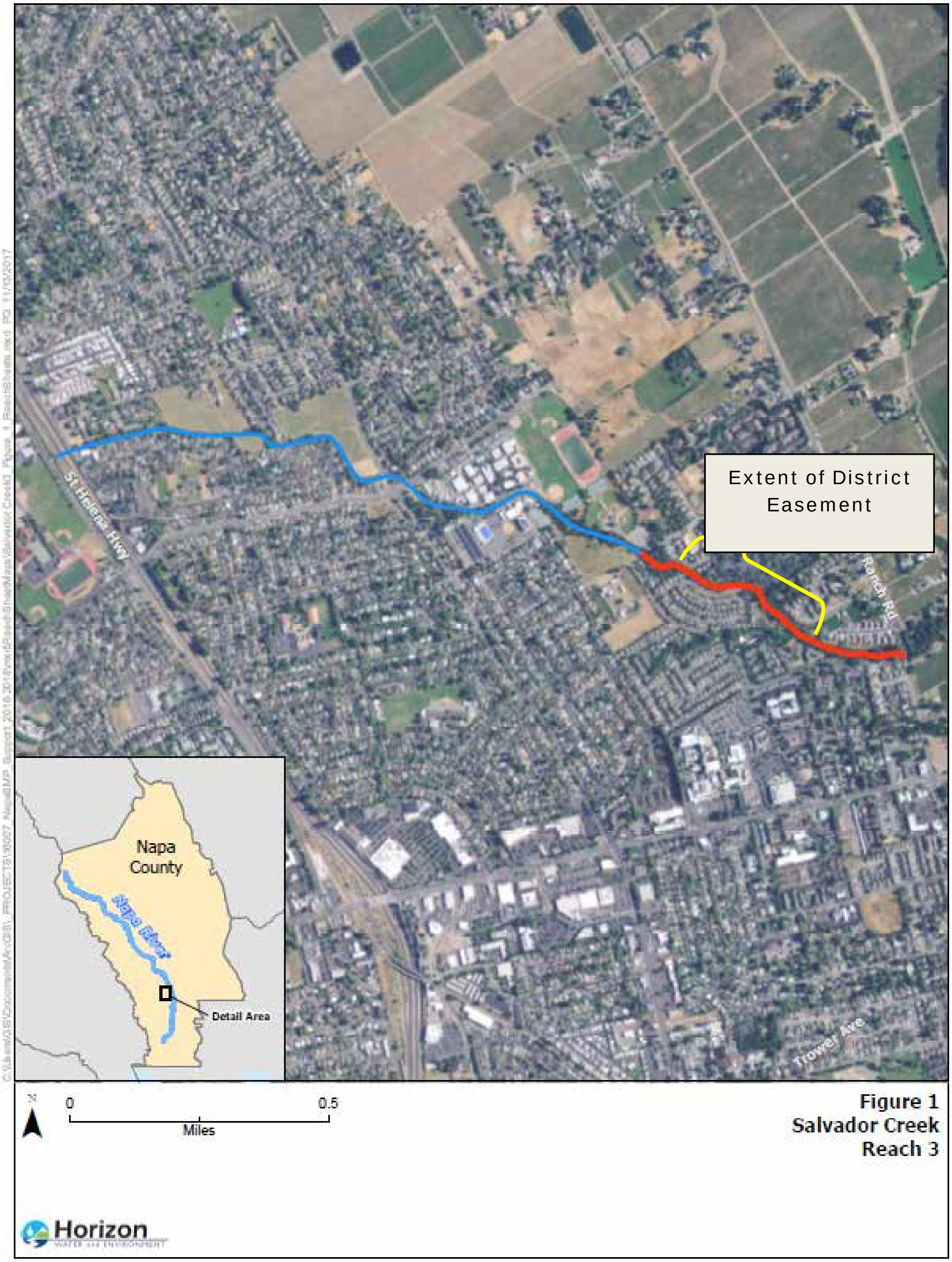
Overstory/Canopy: Mature, diverse canopy dominated by willow (*Salix* spp.); oaks (Quercus spp.) are sub-dominant.

Maintenance History

In 2014 and 2016, maintenance activities conducted include vegetation maintenance (12 cubic yards) and removal of invasive plants (20 cubic yards) at Summerbrooke Circle.

Photo 3. Typical conditions in the lower portion of the reach, with deep pools and undercut streambanks (to right). (*Looking downstream, July 8, 2010*).

Photo 4. Looking upstream from Big Ranch Road. Note streambank erosion on left side of photo, undercutting the streambank (*July 8, 2010*).



Map A. Reach 3 of Salvador Creek (shown as red line above) extends from Garfield Lane to Big Ranch Road. The District's maintenance easement extends from Summerbrooke Circle downstream to a private automobile bridge.

Tulocay Creek – Reach 1

OWNERSHIP: Private with District easement

LOCATION: From upstream portion of District easement near Twin Creeks Court to Soscol Ave.

ADJACENT LAND USE: Residential development in the upstream portion; commercial development in downstream portion.

UPSTREAM: Natural stream with well developed riparian corridor

LENGTH: 1,530 ft

AVERAGE TOP-OF-BANK WIDTH: 60-80 ft

Photo 1. Looking downstream from the upstream end of reach (*September 22, 2010*).

REACH SETTING

Reach 1 Tulocay Creek begins as a natural/semi-natural channel surrounded by residential development. The channel appears to have been modified in the past, but has recovered from historical disturbance. There is well developed instream and riparian habitat in this portion of the reach (Photo 1). This condition persists for approximately 500-700 ft as the creek gradually transitions to a more modified channel with uniform bed and banks. Between the confluence of Camille and Soscol Ave (Map A), the creek is a highly modified drainage channel, with the exception of the well-established riparian trees on the south (left) bank (Photo 3).

Photo 2. Near confluence of Camille Creek, the more natural Tulocay Creek section transitions to a more modified flood control type channel (*Looking downstream from the Tulocay-Camille Creek confluence, September 2010*).

PHYSICAL CONDITIONS

Active channel: The channel bed is 15-20 ft wide (Photo 1); the bed is 12-15 ft beneath the top of banks. The bed slope is less than 0.5%.

Bed sediments/texture: The bed is composed of 2 to 4-inch cobble in the upstream portions of the reach. There is abundant sand and fine sediment accumulation in a large mid channel bar just upstream of the Soscol Avenue crossing (Photo 4).

Bank structure: The channel has 10-15 ft high earthen banks; generally sloping at 2:1 to 3:1 (all photos). The south (left) bank near Soscol Ave is formed by a concrete retaining wall (Photo 4).

Water quality: On September 22, 2010, nearly the entire reach was inundated. Water quality/clarity appeared fair-good. Pools were generally covered with duckweed.

Channel processes: Sediment transport in the upstream portion of the reach appears balanced (no evidence of substantial erosion or deposition). In the relatively recent past (less than 50 years), it appears that the channel incised through this reach, as evidenced by tall, steep banks off-set from the contemporary channel and development of an in-set floodplain. There appears to be substantial sediment deposition at the Camille Creek confluence and at the Soscol Ave crossing. Deposition in these areas is caused by localized hydraulic conditions (i.e., decrease in slope, increase in channel width causes deposition).

BIOLOGICAL CONDITIONS

Aquatic or instream habitat: The upstream portion of the reach has relatively well-developed pool-riffle habitat that quickly transitions to a uniform "run" without any significant in-channel habitat features. Bed substrate is dominated by large gravel to small cobble. In the middle and downstream portions of the reach there is minimal development of aquatic habitat; vegetation such as cattail (*Typha latifolia*) is abundant in the channel.

Vegetation composition:

Channel: Duckweed and cattail are dominant. Pennywort (*Hydrocotyle* sp.) also observed.

Banks: Understory: Himalayan blackberry (*Rubus discolor*) is dominant in areas with a dense riparian canopy; stinging nettle (*Urtica dioica*) and wild grape (*Vitis californica*) are also common. In areas without a well-developed canopy, herbaceous non-natives are dominant. The canopy in the upstream portion of the reach is dominated by coast live oak (Quercus agrifolia) and black walnut (*Juglans calfornica*) in the mid-upper bank range, with willow (Salix spp.) and white alder (*Alnus rhombifolia*) occupying the inset floodplain. In the lower portion of the reach there are some new riparian plantings on the north (right) bank (Photo 3), and some mid-seral riparian trees on the south (left) bank.

MAINTENANCE CONSIDERATIONS AND MAINTENANCE HISTORY

Based on a channel inventory conducted in 2014, maintenance needs identified included willow pruning every two years and annual monitoring, monitoring and assessment of the bridge crossing, monitoring and managing sediment accumulation and cattail growth near the confluence with Camille Creek, and monitoring streambanks for erosion repairs. In 2014, maintenance activities completed included vegetation management and 100 linear feet of cattail removal at the upstream end of this reach near Shurtleff Avenue.

Photo 3. Tulocay Creek - typical channel conditions between Camille Creek and Soscol Ave. (*Looking downstream, September 22, 2010*).

Photo 4. Looking upstream from Soscol Ave crossing. Abundant sediment collects in a large and well developed mid channel bar (sediment wedge). Vegetation grows on deposited sediment, debris is caught on bar too. *September 22, 2010).*

Map A. Reach 1 of Tulocay Creek is depicted as the red line. Camille Creek joins Tulocay Creek mid-way through Reach 1. Reach 2 of Tulocay Creek begins downstream of Soscol Ave.

Tulocay Creek – Reach 2

OWNERSHIP: Private with District easement

LOCATION: From Soscol Ave. upstream (east) to UPRR bridge downstream (west)

ADJACENT LAND USE: Commercial development along Soscol Ave. corridor at upstream portion; Open space in downstream portions.

UPSTREAM: Tulocay Reach 1

DRAINAGE AREA: 12.6 mi^2 at old USGS gauging station.

LENGTH: 1,900 ft

AVERAGE TOP-OF-BANK WIDTH: 65-85 ft

Photo 1. Looking downstream from Soscol Ave. abundant instream vegetation over deposited sediment. (*September 22, 2010*).

REACH SETTING

Reach 2 of Tulocay Creek is a modified drainage channel with uniform bed and banks. The upper 2/3rd of the reach is a freshwater drainage; the lower 1/3rd is a tidally influence brackish channel (Map A). There is commercial development adjacent to the channel in the upper 400 ft of the reach (Map A); in the downstream portion the adjacent land use is largely open space, areas that may serve as a floodplain for the Napa River.

Photo 2. Looking upstream in the upper portion of the reach, Dense aquatic and emergent vegetation in the upstream portion of the reach. Note USGS gauging station on right side of photo (*September 22, 2010*).

PHYSICAL CONDITIONS

Active channel: The channel bed is 25-35 ft wide (Photo 1); the bed is 15 ft beneath the top of banks. The bed slope is less than 0.5%.

Bed sediments/texture: The bed is composed of fine alluvial and marine sediments.

Bank structure: The channel has 15-18 ft high earthen banks that slope more gently along northern bank 2:1 to 3:1, and steeper at outer bend on south bank 1:1 to 2:1 where bank erosion is observed just upstream of the USGS gage (Photo 5).

Water quality: In September 2010, nearly the entire reach was inundated. Water quality/clarity appeared fair-good.

Channel processes: Sediment transport in the upstream portion of the reach appears to be impeded by dense vegetation growth in the channel. The low flow channel is either not present or poorly defined. Most low flows occur as shallow diffuse flows across channel bed. During high flows, it is likely that suspended sediment is transported through the upper portion of the reach, but much bed load delivered from Tulocay Reach 1 is likely deposited. The modified cross-section (i.e., over-widened) and lack of riparian canopy promotes emergent marsh vegetative conditions that cause fine sediment accumulation.

BIOLOGICAL CONDITIONS

Aquatic or instream habitat: In the freshwater portion of the reach there is minimal development of aquatic habitat; vegetation such as cattail (*Typha latifolia*) and smartweed (*Polygonum* sp.) occlude the channel. The tidal portion has a small, open-water slough bounded by tall emergent vegetation (Photo 4).

Vegetation composition:

Channel: Cattail, smartweed, rice cut grass *(Leersia oryzoides*) are dominant in the freshwater portion. California bulrush (Schoenoplectus [=Scirpus] californicus) is dominant in the tidal section.

Banks: Understory: Predominantly herbaceous non-native species such bristly oxtongue (*Picris* echioides), field mustard (Brassica or Hirschfeldia sp.), wild radish (*Raphanus sativus*), prickly lettuce (*Lactuca serriola*), and bull thistle (*Cirsium vulgare*); many coyote bush (Baccharis pilularis) shrubs near the top of bank.

Overstory: Extensive planting of native trees along both banks; predominantly cottonwood (Populus fremontii). These trees are well established and thriving (Photos 3 and 4).

	
Photo 3. Typical channel conditions near the mid-point of the reach. Note, some isolated sections of riprap are found along the banks (*Looking downstream, September 22, 2010*).	**Photo 4.** Bulrush line the lower channel banks in the tidal portion of the reach. Cottonwoods have been planted along the upper banks throughout the length of the reach (*Looking upstream from the UPRR bridge., September 22, 2010).*

MAINTENANCE CONSIDERATIONS

Based on a channel inventory conducted in 2014, maintenance needs identified included monitoring and assessment of the bridge crossing, monitoring and managing sediment accumulation, and monitoring streambanks for erosion repairs.

Tulocay Creek – Reach 2

Map A. Reach 2 of Tulocay Creek is depicted as the red line above. Reach 2 begins at Soscol Ave. and extends downstream to the UPRR bridge. The approximate extent of tidal influence is denoted above.

Camille Creek

OWNERSHIP: Private with District easement

LOCATION: From South Terrace Dr. to Tulocay Cr. confluence (Map A)

ADJACENT LAND USE: Residential development (single family homes).

UPSTREAM: Natural section of Camille Cr. through residential area.

LENGTH: 1,250 ft

AVERAGE TOP-OF-BANK WIDTH: 35-45 ft

Photo 1. Looking upstream at the South Terrace Road culvert crossing. Note the significant drop in bed elevation at the culvert and steep streambanks bounding the channel (*September 2010*).

REACH SETTING

Camille Creek is a natural channel tributary to Tulocay Creek. The upstream portion of the reach is deeply incised with very steep streambanks (Photos 1 and 2). Bank angle and height gradually decrease in the downstream direction (Photos 3 and 4). The reach has good riffle-run habitat and a well established riparian corridor.

Photo 2. Looking downstream near South Terrace Drive. Note the well defined low flow channel, coarse bed material and steep streambanks (*September 2010*).

PHYSICAL CONDITIONS

Active channel: The channel bed is 8-10 feet wide with a well-defined 3-foot wide low flow channel. In the upper portion of the reach the channel bed is 18-20 feet wide beneath the top of banks, and 12-15 feet wide in the lower portion of the reach.

Bed sediments/texture: Gravel bed stream with rock size ranging up to medium cobble.

Bank structure: 12-20 foot-high earthen banks. Near vertical in the upper portion of the reach transitioning to gentler sloping 3:1 in the lower portion (all photos).

Water quality: Upstream portion of the reach was dry on September 22, 2010, with the exception of a few small isolated pools (Photo 5). Water in the pools was turbid. The downstream portion had a small volume of continuous flow. Water quality appeared good.

Channel processes: The channel has incised over the last several decades as evidenced by the perched culvert and steep banks in the upstream portion of the reach (Photo 1). The streambed appears to have stabilized more recently with no apparent localized degradation (e.g., headcuts) observed. During large flow events, discharges exiting the culvert at South Terrace Road likely have the potential to cause significant bed and bank erosion.

Biological Conditions

Aquatic or instream habitat: Good riffle-run habitat; few large pools. Clean, loose cobble in the upper section. Some deposition of fines over gravel/cobble in the lower section.

Vegetation composition:

Channel: English ivy (*Hedera helix*) encroaching on channel in upper section.

Banks: Understory: English ivy is dominant in the upper section. Himalayan blackberry (*Rubus discolor*) and stinging nettle (*Urtica dioica*) are also common. Streambanks in the lower section are often bare ground (Photo 4).

Overstory/Canopy: Mature, diverse canopy including coast live oak (*Quercus agrifolia*), black walnut (*Juglans californica*), big leaf maple (*Acer macrophyllum*), blue elderberry (Sambucus mexicana), and a few white alder (*Alnus rhombifolia*) sprouts/saplings; some *Acacia* trees in the lower section.

Photo 3. Typical conditions in the middle portion of the reach (*Looking upstream, September 22, 2010*).

Photo 4. Typical conditions in the lower portion of the reach (*Looking upstream, September 22, 2010*).

Maintenance Considerations and Maintenance History

Based on a channel inventory completed in 2014, maintenance needs identified for Camille Creek included vegetation pruning every two years and annual monitoring. The creek should also monitor the banks for ivy infestation and damaging trees. In the future, the District may want to consider replacing non-native ivy with native plants. 2014 maintenance activities included removing 16 cubic yards of non-native vegetation.

Map A. Camille Creek is denoted by the red line in the map above.

Sheehy Creek

OWNERSHIP: Private with District easement

LOCATION: From North Kelly Road downstream (west) to Highway 29.

ADJACENT LAND USE: Office and light-industrial Park

UPSTREAM: Agricultural fields; Reach receives surface runoff and subsurface flow from Chardonnay Country Club and irrigated fields.

LENGTH: 1,965 ft

AVERAGE TOP-OF-BANK WIDTH: 70-80 ft

Photo 1. Looking downstream (west) from the bridge at North Kelly Road *(September 2010).* Stagnant water and poor water quality observed.

REACH SETTING

The District-maintained reach of Sheehy Creek is significantly modified for drainage and flood control. The channel generally has a trapezoidal cross-section, and a planform alignment that appears to have been modified to accommodate the development of the industrial park. The District has planted native trees along the banks, which has substantially enhanced the riparian habitat along the drainage corridor.

MAINTENANCE HISTORY:

In 2010, bank stabilization work was performed at the downstream end of the reach (Photos 3 and 4). Cattails in the middle of the main channel are mowed on a routine basis. In 2016, 250 linear feet of cattails were removed.

Photo 2. Looking upstream from the pedestrian footbridge in the middle portion of the reach. Note well established riparian plantings on both banks *(September 2010).*

PHYSICAL CONDITIONS

Active channel: The channel bed is 20-30 ft wide; the bed is 10-15 ft beneath the top of banks.

Bed sediments/texture: The bed is composed of sands and fine sediment (Photo 4). Some riprap has been placed in the channel bed at the downstream portion of the reach.

Bank structure: The channel has 10-12 ft high earthen banks; slopes are typically 3:1. Slopes on the right bank in the downstream portion of the reach are considerably steeper (~1:1). Riprap has been placed on the banks on the outer bends of meanders and near the culverts at North Kelly Road and Highway 29.

Water quality: On September 22, 2010 water in the upstream portion of the reach appeared stagnant and was covered with aquatic vegetation (Photo 1). In the middle and lower portions of the reach the water was flowing and appeared clear (Photos 2 and 3). The observation of significant streamflow (estimated to be 0.25 to 0.5 cfs) within a drainage of this size in late September suggests the creek receives runoff and/or subsurface flow from agricultural sources or the adjacent golf course. The golf course and adjacent fields are irrigated with recycled water from the Napa County Sanitation District.

Channel processes: The channel is depositional and traps fine sediment delivered from the upper watershed. There is a significant sediment "wedge" that begins at the downstream end of the reach near Highway 29 (Photo 3), and continues upstream.

Biological Conditions

Aquatic or instream habitat: Aquatic habitat consists of shallow open water areas (Photo 1), as well as long stretches of dense cattail (*Typha latifolia*) growth (Photo 2). The low flow channel is not well defined.

Vegetation composition:

Channel: Duckweed and pennywort (Hydrocotyle sp.) in pools; cattail, horsetail (Equisetum sp.), and hardstem bulrush (*Schoenoplectus* [=*Scirpus*] *acutus*) along the margins of the channel.

Banks/Riparian Corridor:

Understory: primarily herbaceous non-natives such as bristly oxtongue (*Picris echioides*), wild oats (*Avena fatua*), Harding grass (*Phalaris aquatic*), bull thistle (*Cirsium vulgare*)*, and* periwinkle (*Vinca major*).

Overstory/Canopy: A diverse assemblage of native trees and shrubs planted from mid to top of bank. Species include cottonwood (Populus fremontii), oaks (predominantly Quercus agrifolia), big leaf maple (Acer macrophyllum), California buckeye (Aesculus californica), dogwood (Cornus sp.), white alder (Alnus rhombifolia), blue elderberry (Sambucus Mexicana), coyote brush (Baccharis pilularis), toyon (Heteromeles arbutifolia), and wild rose (Rosa californica).

Maintenance Considerations and Maintenance History

Based on a 2014 channel inventory, maintenance needs identified for Sheehy Creek included monitoring and assessment of the box culvert underneath the road crossing, annual monitoring of a beaver dam upstream and downstream of the box culvert, monitoring vegetation and drainage outfalls, and vegetation maintenance at the top of bank. In 2014, approximately 250 linear feet of cattail removal occurred at Executive Court.

Photo 3. Looking upstream near Highway 29 crossing. Recent riprap was placed along banks and channel bed. Channel bed and riprap crossing create depositional area upstream where sediment accumulates and cattails grow (*September 22, 2010).*

Photo 4. Recent bank stabilization work performed by District included riprap placement upstream of the Highway 29 culvert crossing *(view is looking downstream, September 22, 2010).*

Map A. Reach receives surface runoff and subsurface flow from upgradient irrigated fields and golf course.

Fagan Creek

OWNERSHIP: Napa County

LOCATION: Adjacent to (west of) Airport Road, from UPRR tracks through Napa County Airport.

ADJACENT LAND USE: Napa County Airport (west and south); Industrial park and UPRR tracks (east).

UPSTREAM: Semi-natural portion of Fagan Creek with mid-seral riparian corridor.

CONTRIBUTING DRAINAGE AREA: 6.8 mi^2 at downstream end.

LENGTH: 5,350 ft (see Reach Setting for details).

AVERAGE TOP-OF-BANK WIDTH: 70-80 ft

Photo 1. Looking upstream from Airport security fence in the upper portion of the reach. Areas upstream of this point were not surveyed by foot due to access limitations, but from a distance, this section appeared to be of similar character to the channel immediately downstream (*September 22, 2010*).

REACH SETTING

The District-maintained portion of Fagan Creek is a trapezoidal engineered channel. The entire reach lies adjacent to or within the boundaries of the Napa County Airport. The upper 3,400 ft is open channel, which transitions to a 1,350 ft culverted section that flows underneath the airport runways, followed by 600 ft of open channel that discharges to Fagan Slough (Map A). Fagan Slough is a tidal channel that is tributary to the Napa River. The Fagan Creek watershed is approximately 6.8 mi^2 and includes open space, vineyards, a golf course, portions of Highways 12 and 29, as well some commercial and residential development.

Photo 2. Looking downstream from the bridge at Airport Road. Note willow and blackberry growing on channel banks. (*September 22, 2010*)

PHYSICAL CONDITIONS

Active channel: The channel bed is 10 to 12 feet wide. The channel bed is 15 to 18 feet beneath the top of banks.

Bed sediments/texture: Bed sediments are predominantly sands and fines.

Bank structure: The trapezoidal channel has 15-18 feet high earthen banks, generally sloped at 2:1 (Photo 2). There is a concrete section approximately 250 ft downstream of the bridge at Airport Road (Photo 3).

Water quality: In September 2010 nearly the entire channel was inundated. Water clarity appeared fair (Photos 2 and 3); water was stagnant at most locations.

Channel processes: Deposition of fine sediment appears to occur in this reach, particularly in the area between the Airport Road crossing and the concrete reinforced cross-section downstream (Photo 4). Areas upstream of the Airport Road bridge do not appear to have significant sediment accumulation.

<u>BIOLOGICAL CONDITIONS</u>

Aquatic or instream habitat: Instream habitat is dominated by aquatic and emergent vegetation (All Photos).

Vegetation composition:

Channel: Dominant or sub-dominant species include duckweed and broad-leaved cattail (*Typha latifolia*)

Banks: <u>Herbaceous/Understory</u>: Predominantly herbaceous non-natives including poison hemlock (*Conium maculatum*), sweet fennel (*Foeniculum vulgare*), and mustard (*Brassica* or *Hirschfeldia* sp); there are large patches of Himalayan blackberry (*Rubus discolor*) (Photo 2).

<u>Overstory/Canopy</u>: Willow (*Salix* spp.) and black walnut (*Juglans californica*) saplings throughout the channel.

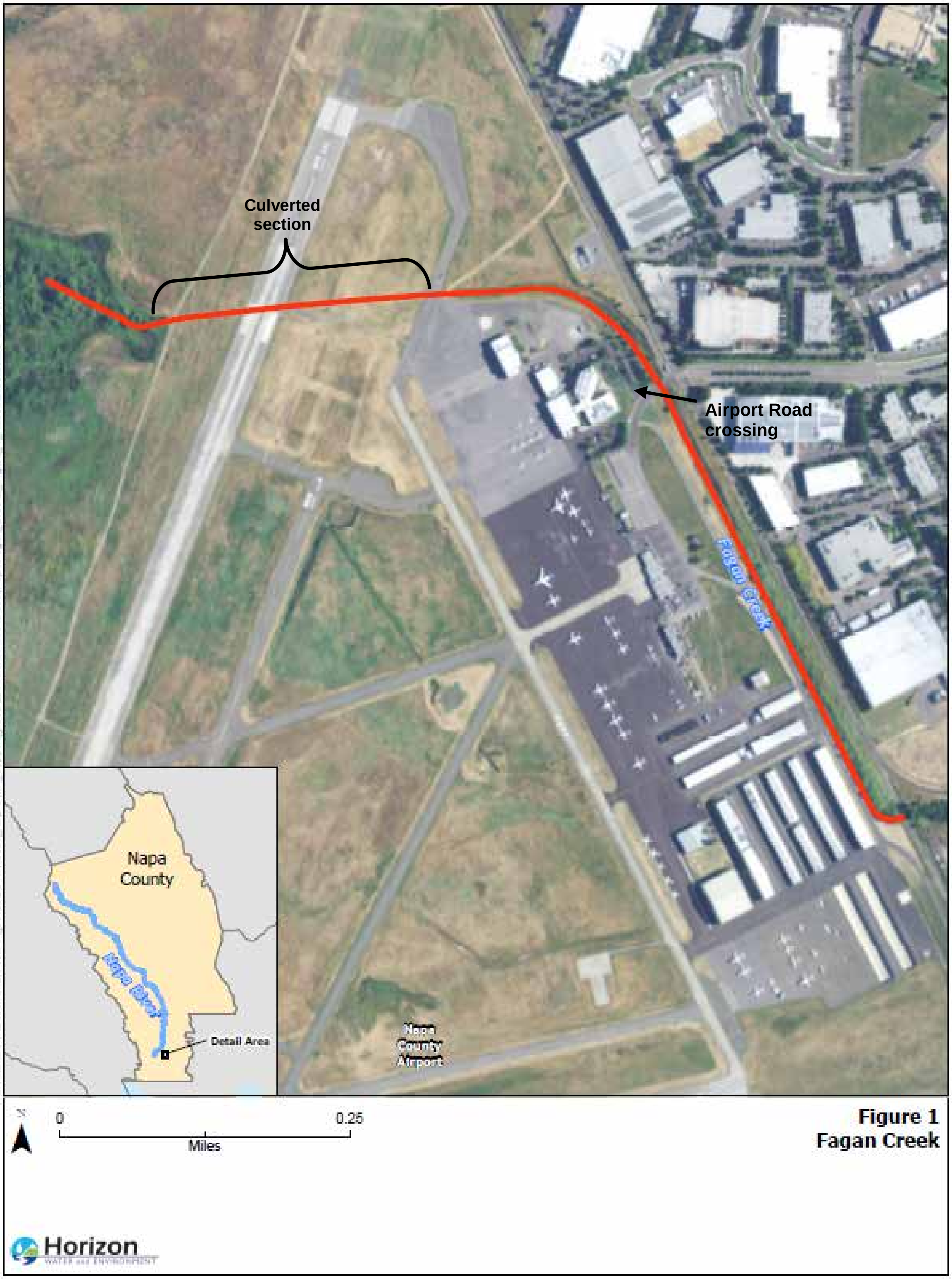
<u>MAINTENANCE CONSIDERATIONS AND MAINTENANCE HISTORY</u>

Based on a channel inventory completed in 2014, maintenance needs identified for Fagan Creek included removal of blackberry bushes and revegetating the banks with native plants, willow pruning every two years, and monitoring the creek for erosion and sedimentation issues every 5 years. The District should also continually monitor the culvert underneath the airport runway, box culvert under road crossing and the railroad abutment. 2014 maintenance activities included vegetation management (10 cubic yards), blackberry bush removal (8 cubic yards) (see Photos 5 and 6). Similar maintenance activities took place in 2016.

Photo 3. A sediment "plug" has accumulated upstream of a concrete-reinforced cross-section of the channel. (*Looking west, September 2010*).

Photo 4. In the lower portion of the reach the open channel transitions to a culverted section (background) that flows beneath the airport runways (*Looking west, September 22, 2010*).

	
Photo 5. Looking upstream at blackberry along banks near Airport Blvd. *(2014)*.	**Photo 6.** Looking downstream after blackberry removal near Airport Blvd. *(2014).*



Map A. The upper 3,400 feet of the reach is open channel, which transitions to a 1,350-foot culverted section that flows underneath the airport runway, followed by 600 feet of open channel that discharges to Fagan Slough.

American Canyon Creek

OWNERSHIP: City of American Canyon, Napa Valley Unified School District

LOCATION: From American Canyon Rd at American Canyon High School to Kimberley Park

ADJACENT LAND USE: Urban, residential

UPSTREAM: Open space; grazing land

LENGTH: 9,825 feet

AVERAGE TOP-OF-BANK WIDTH: 30-60 feet

Photo 1. Looking upstream in the middle portion of the reach with well-defined channel structure and well-developed riparian canopy. Impairments frequently include trash and trampled understory vegetation (*February 2018*).

REACH SETTING

American Canyon Creek is a modified, earthen channel that conveys runoff from the foothills to the east of the City of American Canyon toward the Napa River to the west. Newell Creek is the main tributary which joins the main stem near American Canyon Road. Several constructed retention basins are located north of the creek within the channel corridor between Newell Drive and the Newell Creek confluence. These basins allow stormwater to infiltrate into the soil thereby improving water quality and providing wildlife habitat. Two additional basins with surface connectivity to the main channel are located between the confluence with Newell Creek and American Canyon Road. In areas without such basins, the channel corridor is generally characterized by undeveloped buffers (neighborhood "green belts") of mowed annual grasses and paved walking trails.

Photo 2. Dense willow growth along the floodplain bench immediately downstream of the American Canyon Road bridge (background) near Silver Oak Trail. Sediment appears to be aggrading as a result of willow growth obstructing flow (*February 2018*).

PHYSICAL CONDITIONS

Active channel: For the majority of the reach upstream of Elliot Drive, the channel bed is 3-8 feet wide and at least one bank features a floodplain bench throughout most of the reach. The channel bed is 5-10 feet beneath the top of banks. At the most downstream end of the reach the channel is only 2-4 feet below the top of banks and the channel bed width expands to 10 feet.

Bed sediments/texture: Bed sediments appear to be sands and fine material.

Bank structure: The channel has 5- to 10-foot-high earthen banks, generally sloped at 2:1 to 3:1 (all photos).

Water quality: Nearly the entire reach remains inundated throughout dry season due to contributions from urban runoff and nuisance water.

Channel processes: This reach is characterized as an earthen channel with sequences of depositional patches and deeper pools. Sediment accumulates at the downstream end of reach (near Kimberley Park) where the channel slope becomes very gradual and at road crossings where the channel widens. During storm events, off channel retention basins capture stormwater thereby reducing downstream peak flows and sediment load, and allowing for groundwater recharge.

BIOLOGICAL CONDITIONS

Aquatic or instream habitat: Perennial flow, earthen bed and banks, mature willows (*Salix* spp.) along the banks and margins of the wetted channel, and sporadic pools provide habitat for some aquatic fish (e.g., California roach [*Lavinia symmetricus*], prickly sculpin [*Cottus asper*]) and amphibian species (e.g., western pond turtle [*Actinemys marmorata*] and Pacific treefrog [*Pseudacris regilla*]).

Vegetation composition:

Channel: Instream vegetation is generally sparse in areas with thick canopy cover, to dense emergent vegetation in open canopy areas. Dominant or sub-dominant species consists of broad-leaved cattail (*Typha latifolia*). Rushes (*Juncus* sp.) are present along the wetted channel margins.

Banks: Understory: Predominantly herbaceous non-natives including bugle hedge-nettle *(Stachys ajugoides),* leafy bent grass *(Agrostis pallens),* Dallis grass *(Paspalum dilatatum),* rabbit's foot grass *(Polypogon monspeliensis),* and periwinkle (*Vinca major*); Himalayan blackberry (*Rubus armeniacus*) also common. Infrequent remnant patches of Santa Barbara sedge (*Carex barbarae*) are occasionally found along banks.

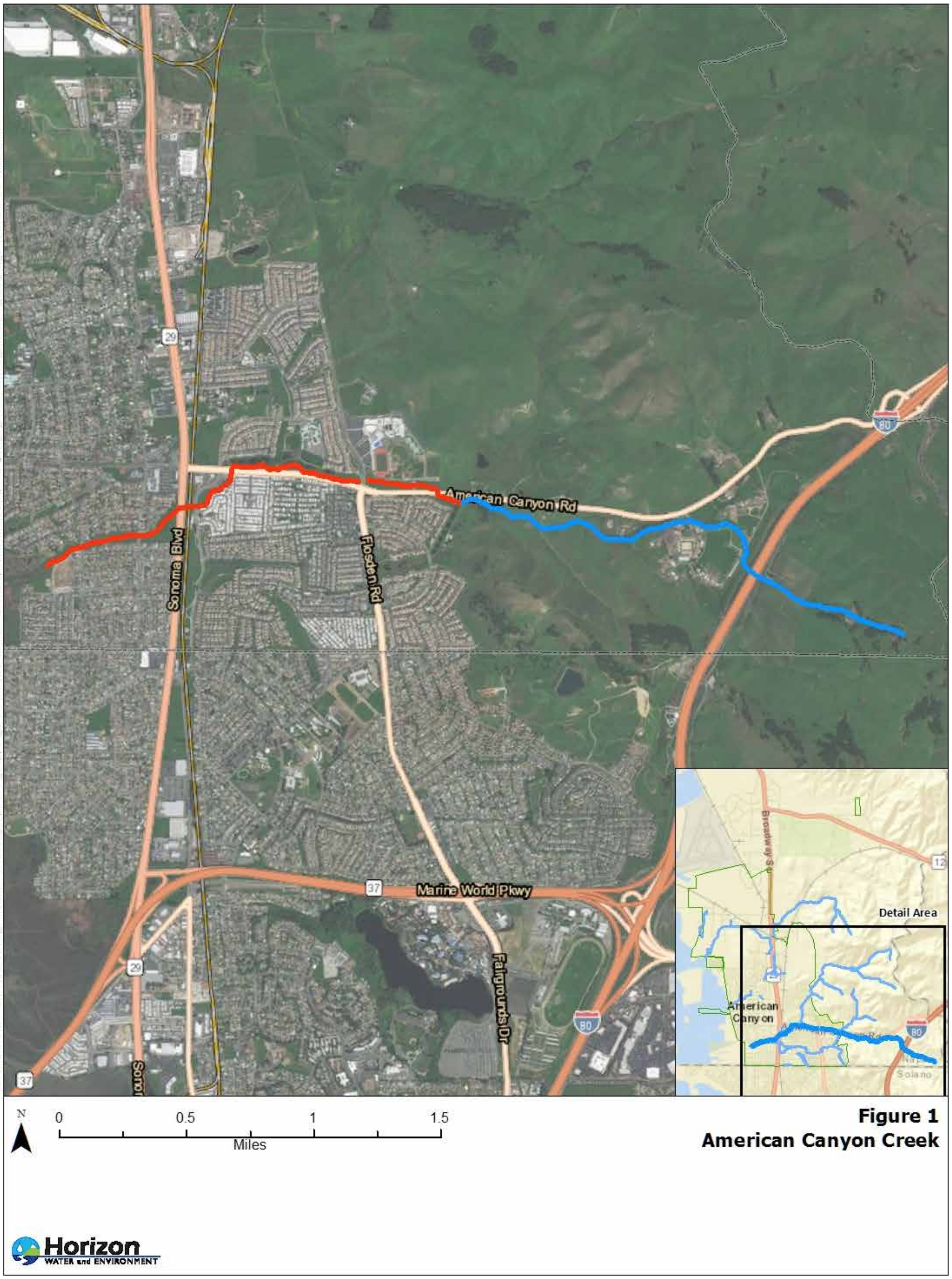
Overstory/Canopy: Natural recruitment of woody riparian species is abundant along banks and floodplain benches, and include red willow (*Salix laevigata*), arroyo willow (*Salix lasiolepis*), and Oregon ash (*Fraxinus latifolia*). Tree species on the top of bank are predominantly coast live oak (*Quercus agrifolia*) and valley oak (*Quercus lobata*) with infrequent California bay laurel (*Umbellularia californica*). Native oaks have been planted along the north and south banks. Non-native trees along the banks include eucalyptus (*Eucalyptus* sp.) and privet (*Ligustrum* sp.).

Basins: The sediment basins along American Canyon Creek feature dense stands of bulrushes (*Schoenoplectus acutus*) and cattails (*Typha latifolia*). Basins appear to be relatively homogenous in shape, without any notable gaps in the vegetation cover.

Photo 3. Section of the creek with a constricted channel and dense non-native blackberry along the banks. (*February 2018*)

Photo 4. In-channel basin near the confluence with Newell Creek. Dense emergent vegetation (consisting mostly of cattails) fill the basin (*February 2018*).

American Canyon Creek



Map A. The American Canyon Creek maintenance reach (red) extends from American Canyon Road at American Canyon High School to Kimberley Park.

Maintenance Considerations and Management Opportunities

The reach has numerous locations where vegetation management would alleviate flow constrictions and reduce flood risks. In most instances, management of non-native vegetation (such as Himalayan blackberry and Pampas grass) and selective willow pruning (removing only lower branches and retaining mature willow habit) would increase the flow conveyance of the channel while providing riparian habitat for wildlife. Periodic removal of cattails from the constructed basins along American Canyon Creek would restore capacity of the features. This vegetation management would typically involve manual cutting and removal of the cattail biomass. Sediment removal at the constructed basins may also periodically be necessary to restore their intended function.

Sediment routinely accumulates at several bridge crossings. The underlying causes of sediment deposition at these sites are a combination of factors. Upstream of the crossing on American Canyon Road, a near 90 degree bend in the channel creates a depositional point bar on the inner bend. Downstream of the crossing, mature willows appear to be causing local eddying and sediment deposition. Farther downstream at the lower end of the reach, sediment accumulation appears to be caused by the natural widening of the channel cross-section and a decrease in channel slope.

	
Photo 5. Sediment accumulation and vegetation encroachment upstream of the crossing of Newell Drive at American Canyon Road. (*February 2018*)	**Photo 6.** Example of well-defined channel and riparian vegetation along the banks looking downstream. Few branches are low enough on these mature willows cause to cause significant flow constrictions. (*February 2018*)
	
Photo 7. Looking upstream from the concrete apron at the Elliot Drive bridge crossing. Aggraded sediment and dense vegetation significantly reduce the conveyance capacity of the channel (*February 2018*).	**Photo 8.** Dense willow growth obstructs a significant portion of the channel upstream of Broadway Road (*February 2018*).

Newell Creek

OWNERSHIP: City of American Canyon

LOCATION: From Newell Drive to confluence with American Canyon Creek at American Canyon Road

ADJACENT LAND USE: Urban, residential

UPSTREAM: Open space; grazing land

LENGTH: 1,537 feet

AVERAGE TOP-OF-BANK WIDTH: 10-30 feet

Photo 1. Looking upstream from Shenandoah Drive. This reach is a modified, straight, earthen channel. The banks support mostly grasses and herbaceous vegetation (*March 2018*).

REACH SETTING

Newell Creek is a modified, earthen channel that conveys runoff from the foothills to the east of the City of American Canyon toward the creek's confluence with American Canyon Creek and eventually to the Napa River. The upper watershed of Newell Creek is a mix of agriculture and open space land uses. The Newell Open Space Preserve and Red-legged frog mitigation area comprise the headwaters of this stream. At the downstream end of the reach the creek is buffered by a "greenbelt" area of mowed annual grass that separates the riparian vegetation from surrounding residential areas. There are several adjacent upland areas with constructed basins that are intended to provide water quality enhancement and habitat mitigation.

Photo 2. Dense willow growth (as indicated by the arrow) is causing a significant flow obstruction within the main channel upstream of Silver Oak Trail. The culverts in the foreground provide overflow capacity (*March 2018*).

PHYSICAL CONDITIONS

Active channel: The channel bed is 2-5 feet wide; at least one bank features a floodplain bench through the lower half of the reach. The channel bed is 3-8 feet beneath the top of banks.

Bed sediments/texture: Bed sediments appear to be sands and fine material.

Bank structure: The channel has 3 to 8-foot-high earthen banks, generally sloped at 2:1 to 3:1 (All Photos).

Water quality: Nearly entire reach remains inundated throughout dry season due to contributions from urban runoff and nuisance water.

Channel processes: The channel form has been extensively simplified and straightened. Intermittent flow and the homogenous trapezoidal form limits instream geomorphic features.

BIOLOGICAL CONDITIONS

Aquatic or instream habitat: Intermittent streamflow and periodic inundation limit instream habitat. Instream willow thickets may provide suitable nesting habitat for passerine bird species.

Vegetation composition:

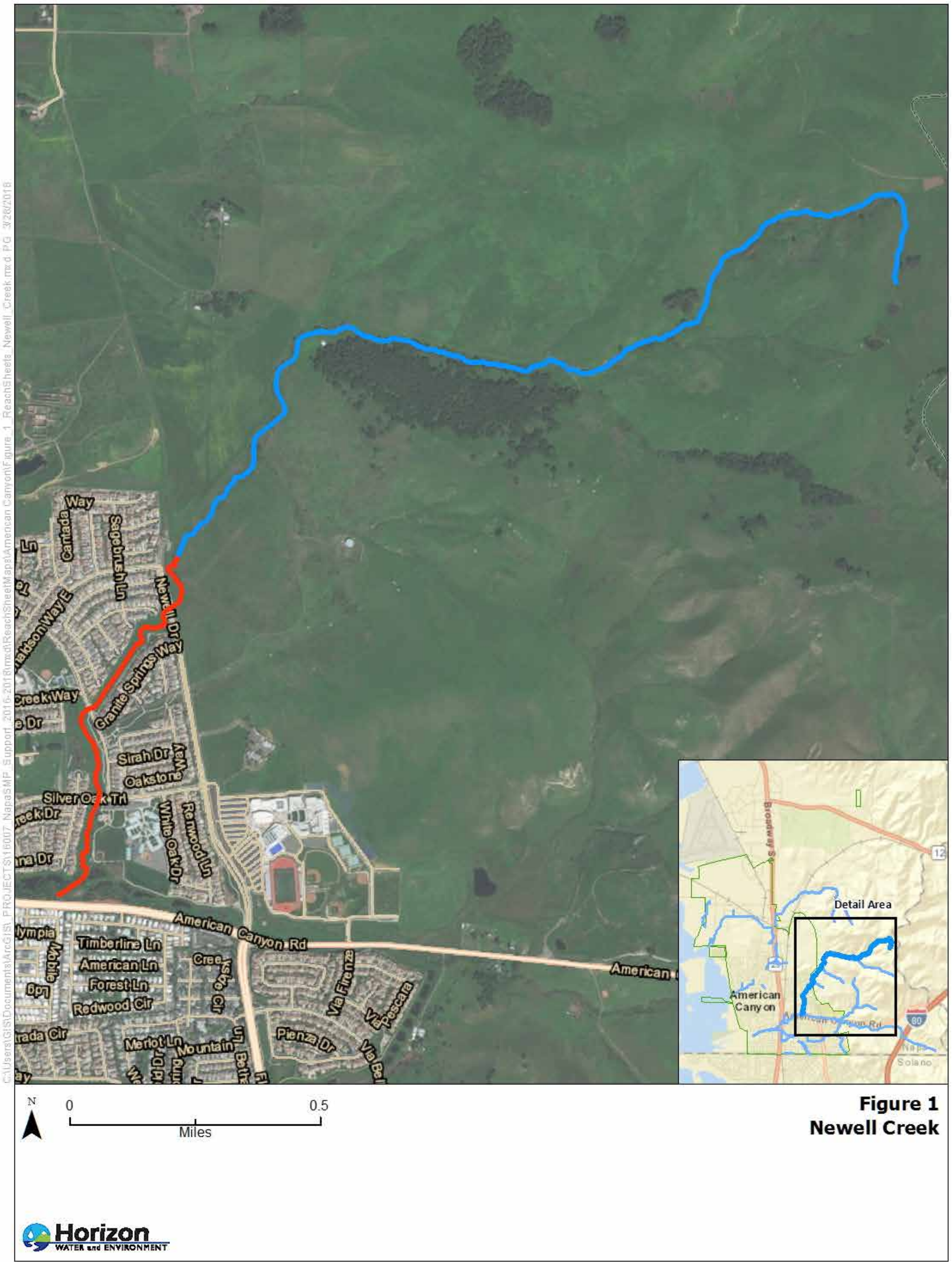
Channel: Emergent species are sparsely intermixed with upland herbaceous vegetation and/or willow thickets along the shallow portions of the channel. Aquatic vegetation consists of sparsely distributed broad-leaved cattail (Typha latifolia) and rushes (Juncus sp.) along the channel bed.

Banks: Banks support predominantly non-native grasses and herbaceous species, including Harding grass (*Phalaris aquatica*), wild oats (*Avena fatua*), ripgut brome (*Bromus diandrus*), and Fuller's teasel (*Dipsacus fullonum*). Himalayan blackberry (Rubus armeniacus) is also common throughout the reach. Infrequent remnant patches of Santa Barbara sedge (*Carex barbarae*) and (*Elymus triticoides*) are occasionally found along the banks as well. Red willow (*Salix laevigata*) and arroyo willow (*Salix lasiolepis*) appear infrequently throughout the reach but become more abundant at road crossings and near the confluence with American Canyon Creek. Trees grow sporadically on the top of bank with predominant species consisting of coast live oak (Quercus agrifolia) with infrequent California buckeye (Aesculus californica). Planted native trees along north and south banks appeared to be mostly comprised of native live oaks.

Basins: The sediment basins along American Canyon Creek contain stands of bulrushes (*Schoenoplectus acutus*) and cattails (*Typha latifolia*). Basins appear to be relatively homogenous in shape, without visible gaps in the vegetative cover.

Photo 3. Downstream face of the Silver Oak Trail crossing. Non-native blackberry constrict the crossing opening and reduce conveyance capacity (*March 2018*).

Photo 4. Dense willow growth upstream of the Shenandoah Drive bridge (*March 2018*).



Map A. The Newell Creek maintenance reach (Red) extends from Newell Drive to confluence with American Canyon Creek at American Canyon Road.

MAINTENANCE CONSIDERATIONS AND MANAGEMENT OPPORTUNITIES

The reach has a moderate number of locations where overgrown vegetation substantially reduces flow conveyance and increases flooding risks. In most instances, management of non-native vegetation, such as Himalayan blackberry, and selective willow pruning (removing only lower branches and retaining mature willow habit) would provide adequate flow conveyance, specifically at road crossings.

Periodic removal of cattails from the constructed basins along Newell Creek would restore capacity of the features. This vegetation management would typically involve manual cutting and removal of the biomass. Periodic sediment removal from the basins may also be necessary to restore their intended function.

Due to relatively sparse riparian cover and limited woody species within the channel corridor, this reach could benefit from augmentation with native tree and shrub species. Modification of the mowing regime to allow for an unmowed buffer strip along the top of the banks would allow for natural recruitment of woody species along the channel. In addition, planting trees and shrubs in areas where banks are currently dominated by non-native grasses and herbaceous annuals would enhance bank stability, increase shading of the channel, and provide a more complex vegetative structure for wildlife.

	
Photo 5. Management activities are limited to mowing along the top of bank for most of the reach (*February 2018*).	**Photo 6.** Willows are relatively sparse throughout the reach, but they are present at nearly every bridge undercrossing where they have the potential to cause significant flow constrictions. (*February 2018*).

North Slough

OWNERSHIP: Private

LOCATION: From Lombard Road east of Hwy 29 downstream to the beginning of City wastewater treatment plant property

ADJACENT LAND USE: Urban, industrial

UPSTREAM: Open space; vineyards; grazing land

LENGTH: 6,435 feet

AVERAGE TOP-OF-BANK WIDTH: 25-40 feet

Photo 1. The downstream portion reach of North Slough is well vegetated and has generous, high quality buffer lands immediately adjacent to the channel. This section contains several constructed off-channel basins (*March 2018*).

REACH SETTING

North Slough is a modified, earthen channel that conveys runoff from the foothills to the northeast of the City of American Canyon toward its confluence with the Napa River. The maintenance reach is characterized by a relatively broad channel and modest riparian buffer with industrial warehouses in the adjacent uplands. Several minor drainage ditches drain to the channel in the vicinity of Highway 29. A portion of the reach is maintained by a private contractor as a mitigation site.

Photo 2. A swale has formed outside of the high earthen banks through middle section of the reach near Commerce Boulevard. The buffer separates the channel from a complex of warehouses (*March 2018*).

PHYSICAL CONDITIONS

Active channel: The channel bed is 4-10 feet wide; low flow channel is distinguishable and at least one bank features a floodplain bench through the entire reach. The channel bed ranges from 3 to 12 feet beneath the top of banks.

Bed sediments/texture: Bed sediments appear to be sands and fine material.

Bank structure: In the beginning of the reach, the channel has 3- to 6-foot-high earthen banks, generally sloped at 2:1 or 3:1 (Photo 2). Downstream, larger, constructed berms are 8 to 10 feet above the channel at approximately 2:1 slope (Photo 4).

Water quality: Stream is intermittent throughout the reach, usually drying completely by mid-summer. The off-channel basins are also intermittent and typically dry out in the summer.

Channel processes: The channel appears to be relatively uniform with stable bed and banks. Sediment conditions appear neutral to transport-limited with respect to the transport capacity of the channel.

Biological Conditions

Aquatic or instream habitat: Intermittent streamflow and periodic inundation limit instream aquatic habitat. Dense cattail and other emergent vegetation may provide habitat for invertebrates, amphibians (e.g., western pond turtle [*Emys marmorata*] and Pacific treefrog [*Pseudacris regilla*]), passerine bird species (e.g., Red-wing Blackbird [*Agelaius phoeniceus*], Marsh Wren [*Cistothorus palustris*], Song Sparrow [*Melospiza melodia*], Black Phoebe [*Sayornis nigricans*], etc.), and foraging habitat for wading birds (e.g., Great Egret [*Ardea alba*], Great Blue Heron [*Ardea Herodias*], and Snowy Egret [*Egretta thula*]).

Vegetation composition:

Channel: Dense willow thickets are present in many portions of the reach with dense stands of broad-leaved cattail (Typha latifolia) in open canopy areas.

Banks: Vegetation consists predominantly of herbaceous non-native species, including tall fescue (*Festuca arundinaceae*), ripgut brome (*Bromus diandrus*), vetch (*Vicia* sp.), and bristly ox-tongue (*Picris echioides*). Infrequent remnant patches of Santa Barbara sedge (*Carex barbarae*) and creeping wild rye (*Elymus triticoides*) are occasionally found along banks as well. Himalayan blackberry (Rubus armeniacus) and coyote brush (Baccharis pilularis) commonly occur in the reach.

Tree cover varies from sparse in the upstream portion of the reach, moderate to dense cover in the middle portion of the reach, and dense cover in the downstream portion. Natural recruitment of woody riparian species is abundant along lower banks and floodplain benches. Red willow (*Salix laevigata*), arroyo willow (*Salix lasiolepis*), and Oregon ash (*Fraxinus latifolia*) commonly occur near the wetted channel with coast live oak (Quercus agrifolia) and valley oak (Quercus lobata) on the upper banks. Planting of native trees along south bank appeared to be mostly comprised of native oaks with occasional California bay laurel (*Umbellularia californica*) and California buckeye (*Aesculus californica*).

Photo 3. Looking upstream of Commerce Boulevard, banks are comprised of tall, stable earthen berms with occasional sections of riprap. North of the channel, developed land approaches to within 40 feet of the channel (*March 2018*).

Photo 4. One of the minor stormwater ditches draining into North Slough near Highway 29. Cattail growth is abundant throughout ditch (*February 2018*).

Map A. North Slough Reach (Red) extends from Lombard Road east of Hwy 29 downstream to the beginning of City wastewater treatment plant property.

Maintenance Considerations and Management Opportunities

The reach has a relatively sparse riparian canopy and could benefit from additional planting of native species. Previously planted native species are still young and relatively small in stature. As they mature, the plantings will enhance bank stability, increase shade on the channel, and provide more complex vegetative structure for wildlife.

There seems to be limited need for sediment removal in the reach at present. Small ditches feeding into North Slough around Hwy 29 may benefit from vegetation management in lieu of sediment removal. Downstream of the bridge on Commerce Boulevard, heavy vegetation growth and about 1-foot of sediment have accumulated on the concrete apron. Sediment removal may be needed to provide sufficient capacity for flow conveyance.

	
Photo 5. Native oak planting along the left (south) bank of North Slough. Plantings consist of upland species near the top of bank. (*March 2018*).	**Photo 6.** Dense cattail downstream of the Commerce Boulevard crossing (*March 2018*).

Rio Del Mar Creek

OWNERSHIP: Private, City of American Canyon

LOCATION: From Rio Del Mar Road downstream to Wetlands Edge Road

ADJACENT LAND USE: Urban residential

UPSTREAM: Culverted section of Rio Del Mar Creek

LENGTH: 2,451 feet

AVERAGE TOP-OF-BANK WIDTH: 20-40 feet

Photo 1. Upstream of Donaldson Way the channel supports invasive vegetation covering rock slope protection along the banks (*March 2018).*

REACH SETTING

Rio Del Mar Creek is a modified, earthen channel that conveys stormwater runoff from the neighborhoods in the northwestern portion of the City of American Canyon toward the Napa River to the west. The maintenance reach is characterized by urban residential areas including city parklands and two public schools. Currently, most of the upland areas adjacent to the channels are actively managed either as sports fields or "greenbelts" of mowed grasses with adjacent pedestrian paths.

Photo 2. The upstream portion of the reach downstream of Donaldson Way. Understory vegetation is dominated by invasive plants. Trash is a frequent impairment (*March 2018*).

PHYSICAL CONDITIONS

Active channel: The channel bed is 4-8 feet wide; low flow channel is distinguishable and at least one bank features a floodplain bench through the lower half of the reach. The channel bed is 3-5 feet beneath the top of banks.

Bed sediments/texture: Bed sediments appear to be sands and fines with some imbedded cobble (Photo 1).

Bank structure: The channel has 3 to 5-foot-high earthen banks, generally sloped at 3:1 or shallower. Banks are sloped at 2:1 and mostly hardened where stream passes behind houses upstream of Donaldson Way (Photos 1 and 2).

Water quality: Stream is intermittent throughout the reach, with most sections drying completely by mid-summer.

Channel processes: Reach characterized by modified, straightened channel, with stable banks and relatively uniform channel bed features.

BIOLOGICAL CONDITIONS

Aquatic or instream habitat: Instream habitat contains patches with abundant aquatic vegetation, generally in areas with less willow canopy cover.

Vegetation composition:

Channel: Instream vegetation is generally sparse with curly dock (*Rumex crispus*) and tall nutsedge (*Cyperus eragrostis*) growing along the channel margins. In areas with less willow canopy cover, emergent vegetation (e.g., broad-leaved cattail [Typha latifolia]) forms dense stands.

Banks: Upstream of Donaldson Way, English Ivy (*Hedera* helix) is dominant on the banks with non-native and ornamental trees along the top of bank. Himalayan blackberry (Rubus armeniacus) and other non-native species are also common on the banks. Downstream of Donaldson Way, woody vegetation is sparse and herbaceous non-native species (e.g., Harding grass [*Phalaris aquatica*], tall fescue [*Festuca arundinacea*], ripgut brome [*Bromus diandrus*], and bristly ox-tongue [*Picris echioides*]) are dominant. Woody vegetation in this portion of the reach is comprised mostly of planted native oaks- primarily coast live oak (Quercus agrifolia). Red willow (*Salix laevigata*) and arroyo willow (*Salix lasiolepis*) become more abundant downstream of the Donaldson Elementary School where the channel broadens.

Photo 3. Downstream section of the reach, adjacent to Spikerush Circle, with a broad floodplain and mature willows along the channel (*February 2018*).

Photo 4. Emergent aquatic vegetation is abundant in the area adjacent to Spikerush Circle, where the channel is more broad and flow diffuse (*February 2018*).

Rio Del Mar Creek

Map A. Rio Del Mar Reach (Red) from Rio Del Mar Road downstream to Wetlands Edge Road.

MAINTENANCE CONSIDERATIONS AND MANAGEMENT OPPORTUNITIES

The downstream portion of the reach features abundant willow growth, some of which could cause a local flow obstruction. However, infrastructure in the area is well removed from the areas does not appear to be immediately threatened. Pruning and thinning lower limbs that cross the channel in these areas while maintaining an intact canopy could be beneficial.

The middle portion of the reach has sparse riparian cover and could benefit from additional planting of native species. Additional plantings will enhance bank stability, increase shade on the channel, and provide more complex vegetative structure for wildlife.

The upper portion of the reach could benefit from invasive plant management which targets species such as English ivy and Himalayan blackberry.

	
Photo 5. Young willows and cattails upstream of a pedestrian bridge on the Donaldson Elementary School property (*February 2018*).	**Photo 6.** Downstream of the pedestrian bridge on the Donaldson Elementary School property. Abundant willow growth is promoting minor sediment accumulation (*February 2018*).

Walsh Creek

OWNERSHIP: Private, City of American Canyon

LOCATION: From near American Canyon Road downstream to confluence with American Canyon Creek at Lansford Court

ADJACENT LAND USE: Urban, residential

UPSTREAM: Open space, grazing lands

LENGTH: 11,378 feet

AVERAGE TOP-OF-BANK WIDTH: 10-45 feet

Photo 1. Upstream of Flosden Road, the channel corridor is broad with minimal woody riparian vegetation and abundant emergent aquatic vegetation. Channel appears to join with adjacent constructed basins (*March 2018).*

REACH SETTING

Walsh Creek is a modified, earthern channel that conveys urban runoff from the neighborhoods in the eastern portion of the City of American Canyon to American Canyon Creek and then the Napa River to the west. The stream originates on private property to the east of Via Bellagio. The maintenance reach is characterized by urban residential areas immediately adjacent to the channel. In the section upstream of Flosden Road the channel flows through a series of constructed basins (Photo 1). Downstream of Flosden Road, the channel is relatively straight and confined by adjacent housing development (Photo 2). The channel corridor widens and the channel splits upstream of Lincoln Highway but converges to a single channel at Highway 29. Portions of this reach are managed by private contractors as mitigation sites.

Photo 2. Downstream of Flosden Road, the channel corridor narrows with limited woody riparian vegetation on the upper banks and floodplain benches. Emergent aquatic vegetation is abundant within the channel (March 2018).

PHYSICAL CONDITIONS

Active channel: The channel bed is 3-12 feet wide; low flow channel is distinguishable and at least one bank features a floodplain bench through the lower half of the reach. The channel bed is 3-8 feet beneath the top of banks.

Bed sediments/texture: Bed sediments appear to be sands and fine material.

Bank structure: The channel has 3 to 8-foot-high earthen banks, generally sloped at 3:1 or 2:1 (All Photos). Some sections have been armored with riprap where houses approach the creek.

Water quality: Stream now contains some water in the channel because of the effects of adjacent urban residential drainage.

Channel processes: Reach characterized by modified channel, with stable banks and relatively uniform channel bed features. A series of instream basins are located between Via Bellagio and Flosden Road and adjacent Ventana Drive. In several sections, invasive plants are causing significant flow obstructions. One major inflow from a culvert that drains a portion of the City of Vallejo contributes significant water to the system downstream of Ventana Drive.

BIOLOGICAL CONDITIONS

Aquatic or instream habitat: Intermittent streamflow and periodic inundation limit instream aquatic habitat. Dense cattail and other emergent vegetation may provide habitat for invertebrates, amphibians (e.g., Pacific treefrog [*Pseudacris regilla*]), passerine bird species (e.g., Red-wing Blackbird [*Agelaius phoeniceus*], Marsh Wren [*Cistothorus palustris*], Song Sparrow [*Melospiza melodia*], Black Phoebe [*Sayornis nigricans*], etc.), and foraging habitat for wading birds (e.g., Great Egret [*Ardea alba*], Great Blue Heron [*Ardea Herodias*], and Snowy Egret [*Egretta thula*]).

Vegetation composition:

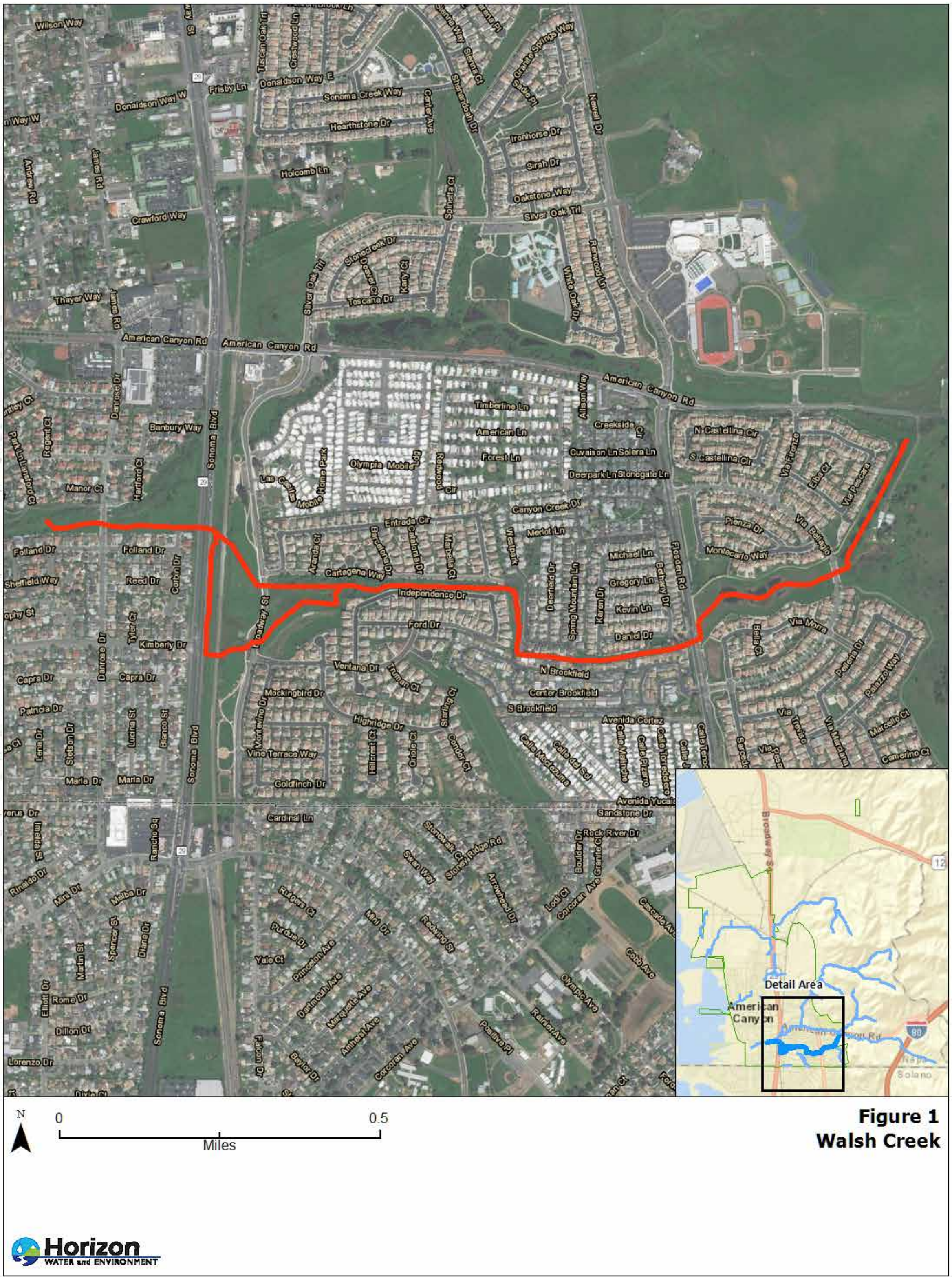
Channel: Instream vegetation consists of broad-leaved cattail (Typha latifolia) and California bulrush (Schoenoplectus acutus). Rushes (Juncus sp.) present along channel margins and banks.

Banks: Dominant vegetation consists predominantly of herbaceous non-natives, including Harding grass (*Phalaris aquatica*), wild oats (*Avena fatua*), ripgut brome (*Bromus diandrus*), and Fuller's teasel (*Dipsacus fullonum*). Himalayan blackberry (Rubus armeniacus) and coyote bush (Baccharis pilularis) are present throughout the reach, becoming abundant between Broadway and the confluence with American Canyon Creek. Pampas grass (Cortaderia selloana) also becomes abundant downstream from the railroad tracks to the confluence with American Canyon Creek. Infrequent remnant patches of Santa Barbara sedge (*Carex barbarae*), creeping wild rye (*Elymus triticoides*) and California wild rose (*Rosa californica*) are occasionally found along banks as well.

Red willow (*Salix laevigata*) and arroyo willow (*Salix lasiolepis*) appear dense in limited stretches of the reach. Other riparian tree species include Oregon Ash (*Fraxinus latifolia*) and a small number of Fremont's cottonwood (*Populus fremontii*). Tree species on the top of bank are predominantly coast live oak (Quercus agrifolia) with infrequent California buckeye (Aesculus californica).

Photo 3. Section of the creek along Independence Drive with abundant aquatic vegetation in the channel and few riparian trees along the banks (*March 2018*).

Photo 4. Downstream of Broadway Avenue bridge, sediment has accumulated and emergent aquatic vegetation obstructs the channel (*March 2018*).



Map A. Walsh Creek Reach (Red) from near American Canyon Road downstream to confluence with American Canyon Creek at Lansford Court.

Chapter 4
IMPACT AVOIDANCE AND MINIMIZATION

4.1 Overview

This chapter describes planning steps taken prior to maintenance work to ensure that activities are conducted effectively and environmental impacts are avoided and minimized to the maximum extent practicable.

Impact avoidance and minimization is a 3-part process. As the initial step, *Maintenance Principles* (described below in Section 4.2) provide programmatic guidance to assess if maintenance is necessary, and if necessary conducted in such a way to reduce impacts (described in Section 4.2). Second-stage impact avoidance measures are then applied during development of the annual maintenance workplan, still prior to any maintenance work being done, to further refine the maintenance approach (described in Section 4.3). Third-stage impact avoidance measures include several BMPs that are implemented during maintenance activities to further avoid or reduce impacts (described in Section 4.4).

4.2 Environmental Principles for Maintenance

Maintenance Principles were specifically developed to guide the maintenance activities in this Manual conducted by the District. To ensure that environmental impacts are avoided or reduced as much as possible, the following Maintenance Principles are applied:

1. Apply the minimum maintenance necessary
2. Minimize mechanized maintenance, where possible favor hand maintenance
3. Non-routine large scale maintenance is outside of program
4. Understand and monitor the river system and identify hydraulic constrictions/limitations
5. Protect and enhance physical processes, landforms, riparian habitat, and ecology
6. Manage stream resources for long-term sustainability and resiliency

4.2.1 Principle 1: Apply the Minimum Maintenance Necessary

This basic principle is foundational to the entire maintenance program - that no unnecessary intervention in streams will occur and that maintenance is strategically applied. The following questions are asked by the District maintenance manager prior to any potential stream work, as triggers to clarify the specific need and objective of potential work activities:

- Is there a maintenance need due to a known flood occurrence in the area or an elevated flood risk due to lack of maintenance? Has overbank flooding occurred at the reach threatening or causing damage to property? If so, was the flooding due to a lack of maintenance, or an overall deficiency in the channel capacity for the storm which occurred?

- If flooding has occurred, was it due to reduced channel capacity caused by potential maintenance issues of sedimentation, vegetation growth, or bank failure?
- Is there a clearly identified flow impediment (e.g., sediment or shrubs blocking a culvert, a downed tree, etc.) that is increasing the flood risk or hazard?
- Has streambank erosion or a bank failure occurred at the potential maintenance site that threatens adjacent structures such as bridges, roads, or homes?
- Has streambank erosion or bank failure occurred at the potential maintenance site that leads to increased sediment yields into the channel and downstream receiving waters?
- Is there excessive growth of non-native plants? Is this impeding flow, degrading native riparian vegetation, or impacting bank stability?

If answers to any of these questions are "yes" then maintenance may be necessary. The annual channel survey and reconnaissance process (described in Chapter 14, *Program Management*) provides the basis for maintenance planning and prioritizing. Answering the above questions may not be a simple yes/no response, as the site-specific situation may be intermediate or conditional. The District will be prudent in initiating maintenance activities. The District will only plan maintenance projects when a clearly identified need is established.

To further support Principle 1, the District is undertaking a field-based effort to collect additional stream channel information for all of its owned maintenance channels and easements. The goal of the additional data collection effort is to develop channel capacity and vegetation management objectives for District channels. Having channel specific (or reach specific) objectives for channel capacity and vegetation conditions assists the District in understanding when thresholds are exceeded whereby maintenance may be required. Understanding such thresholds will assist the District in developing a consistent approach for maintenance work identification and prioritization. The District's proposed workplan to conduct this data collection effort is described in Chapter 14. Channel objectives data collected to date is provided in Appendix F.

4.2.2 Principle 2: Minimize Mechanized Maintenance, Where Possible Favor Hand Maintenance

In conducting routine maintenance, the District limits the use of mechanized equipment where possible. For vegetation management activities, this means that work crews may use hand tools such as sheers, loppers, hand saws, mowers, and chainsaws. Other mechanized means are used when the vegetation is too thick or robust such that hand tools are not feasible. If the maintenance project requires mechanized equipment to conduct grading or earth moving activities, then they occur similar to the activities description provided in Chapter 8, *Streambank Protection and Stabilization*, and Chapter 9, *Sediment and Debris Removal Activities*. BMPs described below in Section 4.4 guide the use of mechanized equipment.

4.2.3 Principle 3: Non-Routine Large Scale Maintenance is Outside of Program

Large scale maintenance projects that are extensive in their area or distance are considered outside of the routine maintenance program and its programmatic permits. Due to their large size, such non-routine projects would be developed and permitted independently to the routine SMP. The following guidance is provided to describe what would be extensive maintenance projects beyond the scope of routine maintenance described in this Manual and accompanying permits:

- Sediment removal activities that involve more than 1,500 linear feet of channel are considered beyond routine and outside of the program.
- Bank stabilization activities for an individual project site that is greater than 1,000 linear feet of channel are considered beyond routine and outside of the program.

4.2.4 Principle 4: Understand and Monitor the River System and Identify Hydraulic Constrictions/Limitations

When stream maintenance is necessary, the identified project reach should be studied and evaluated as to why instream conditions now require active maintenance. Any identified hydraulic constrictions and limitations should be identified through this process as well. The following questions help the District and City of American Canyon focus the reach assessment:

- What are the governing hydraulic and geomorphic conditions at the reach? Is the reach primarily depositional or erosional? Are there observed depositional features such as mid-channel bars, point bars, or other deposits? Are there observed erosional features such as undercut banks or channel incision? Does the channel slope represent a significant change from either upstream or downstream conditions? Are hardened structures found at channel crossing, bank protection, or drop structure sites that strongly influence channel conditions? Do channel structures create flow constraints that influence hydraulic conditions and/or create flow blockages or backwatering conditions?
- Do the existing channel cross section form, in-channel features (such as bars and benches, etc.) and reach slope suggest the channel is in dynamic equilibrium with a relative balance of erosional and depositional forces? Or, is the reach strongly depositional or erosional, thus suggesting a non-equilibrium condition?
- What is the relationship between this reach and upstream and downstream conditions? In particular, what are upstream sediment inputs to this reach and how are those inputs either stored in the reach or transported further downstream?
- Have historic maintenance activities at this reach strongly influenced its current functioning? Do such influences affect conditions either upstream or downstream?
- Has maintenance at this reach been on-going in past or recent years indicating a chronic condition?

This principle of understanding the stream system and its processes is demonstrated in the channel characterization sheets, or reach sheets, provided in Chapter 3 and the channel objectives study shown in Appendix F. In developing the reach sheets of Chapter 3, the questions above (and others) were asked at each of the District's owned in fee and maintenance easement channels. In addition to the descriptive reach sheets, where available - channel as-built designs, streamflow records, historic maps and cross sections, photographs, and hydraulic modeling results may all be used to evaluate reach conditions and set the most appropriate maintenance course.

As maintenance is conducted at particular reaches, the District and City of American Canyon will review the existing channel characterization sheets for their accuracy and update the sheets as necessary. Additionally, as maintenance work occurs, the District and City of American Canyon will be revising the characterization sheets to include a discussion of underlying causes for the maintenance activities that occur at the particular reach. For example, issues at a particular reach may be identified as chronic and routine as related to some upstream cause, or perhaps described as more episodic and not regular. There may be watershed-scale issues, like sediment sources or upstream land uses, leading to the maintenance need; or more localized structural issues like a culvert or crossing that requires some immediate local treatment. Depending upon the underlying causes, more targeted long-term watershed based approaches or shorter-term on-site solutions may be sought for a particular maintenance issue.

As part of the SMP, the District and City of American Canyon will monitor channel conditions through their annual survey and reconnaissance activities (Chapter 14). Through an evolving database maintained by the District, maintenance actions will be tracked from year to year to further inform the system understanding and thereby make the best maintenance decisions (see Chapter 10 for further discussion on the District's database). The District maintains the Napa Valley Regional Rainfall and Stream Monitoring System to help inform flood monitoring stages for tributaries and the Napa River. This website is publicly available and provides current and historical rainfall data https://napa.onerain.com/home.php.

As described above under Principle 1, the District is undertaking a field-based effort to collect additional stream channel information to develop channel capacity and vegetation management objectives for District channels. This effort will further support Principle 4 in providing improved understanding of the river system. The District's proposed workplan to conduct the data collection effort is described in Chapter 14 and data collected to date is presented in Appendix F. The District is also overseeing long-term monitoring activities associated with the Rutherford and Oakville to Oak Knoll Restoration Projects (see monitoring plan in Appendix A).

4.2.5 Principle 5: Protect and Enhance Physical Processes, Landforms, Riparian Habitat, and Ecology

The District's flood management objective is to provide a balance between flood protection and also protecting and enhancing river physical and biological processes and riparian habitat on a watershed scale. The District applies environmental management methods to ensure that maintenance activities are restorative in nature and enhance physical processes. Functioning geomorphic features and processes including floodplains, benches, and other instream features should be considered when undertaking any maintenance activities. For example, maintenance activities should consider channel dimensions, sediment loads, and existing landforms when considering sediment removal or erosion treatments. Any channel maintenance should ensure that it is "working with" the dominant channel processes and not counter to those processes.

Similarly, how the channels physical processes and landforms support instream habitat should also be considered prior to any instream maintenance. Over time, the maintenance approach will manage channels to provide both flood protection and ecologic functions with reduced maintenance needs. This management approach recognizes each reach's existing functional condition and flood management needs, but also looks forward toward improving each reach's ecologic condition. The District maintenance actions are intended to mitigate flood hazards while enhancing channel complexity and native riparian vegetation buffers.

The following questions are asked by District stream managers at each maintenance reach to help guide District maintenance activities toward protecting and enhancing the riparian ecology of the channel and its easement corridor.

- What do the observed physical landforms or channel shape infer about channel processes? How might such processes affect the post-maintenance condition? Will the inferred physical processes "work with" the planned maintenance activities, or be counter to those activities?
- What do the observed physical landforms infer about the rate and magnitude of depositional or erosional processes? Do potential maintenance activities incorporate the rate and magnitude of such instream processes and landforms into their design? Do potential maintenance activities make sense in light of the dominant channel processes?
- What are the existing natural habitats and aquatic resources at the reach (see reach sheets of Chapter 3)? How are these features supported by the physical processes?
- Are particular in-channel features such as LWD or gravel bars present that provide valuable habitat?
- Do the presence of these features or resources influence how, where, and when maintenance activities might occur?
- Which habitat features and functions can be preserved in the context of hydraulic capacity?
- Are there known occurrences of threatened or endangered species at the reach?
- Can habitat conditions at the reach be improved to support additional species or enhanced to improve the quality of existing habitat?
- What would be the best way to preserve habitat function and advance vegetative succession toward a desired climax community?

The SMP includes follow-up monitoring to evaluate the progress of the gradual stepwise ecological improvement at each maintenance reach (see Chapter 15).

4.2.6 Principle 6: Manage Stream Resources for Long-Term Sustainability and Resiliency

The District's approach for channel maintenance seeks to integrate activities that in time will reduce the overall need for channel maintenance and promote the establishment of more resilient channels and riparian corridors throughout the watershed. For example, a feedback sequence is observed in some District channels whereby: (1) fine sediments are trapped by emergent vegetation such as cattails; (2) this deposition in turn raises the streambed uniformly, lowers bed slope, creates a shallow and diffuse flow condition – and this encourages additional sediment trapping; which (3) ultimately reduces habitat quality and flood conveyance capacity. A sustainable approach to this problem aims to prevent or break this depositional sequence in place of just continuing to remove sediment and vegetation. The District has identified three potential approaches to remedy this situation. Planting canopy vegetation along streambanks to shade the channel and inhibit emergent marsh vegetation is one approach to address this condition.

Another potential approach might be to develop low-flow sediment transport channels to maintain an active low-flow channel and convey fine sediment through the reach. A third approach involves identifying and limiting key watershed sediment sources and reducing sediment delivery from upper watershed source areas to the District's channels. All three of these approaches increase environmental sustainability and reduce the overall need for in-channel maintenance activities.

4.3 Impact Avoidance and Minimization Measures

Consistent with the maintenance principles presented above, the District identifies maintenance sites during the annual work planning process described in Chapter 14, *Program Management and Monitoring.* As part of standard operation procedures, the District implements impact avoidance and minimization measures referred to as BMPs. BMPs are operational or procedural practices, and structural or engineered controls which are implemented to protect natural resources. These measures are an integral part of the SMP and are implemented to ensure that maintenance activities protect and enhance existing habitat and also protect maintenance workers and the community from equipment hazards.

The SMP's BMPs are included in **Table 4-1** and were developed to protect the natural resources of Napa County and the creeks, channels, other facilities maintained by the District. Table 4-1 includes general BMPs applicable to all maintenance activities and project-specific BMPs for vegetation maintenance activities, bank stabilization projects, sediment removal activities, post-project restoration, and minor activities. Many of these measures, such as biological or cultural resource surveys, coincide with permit compliance requirements (see Chapter 2, *Regulatory Compliance*). The general groups of BMPs are described below.

The BMPs contained in this manual are intended for application program-wide, as directed by District staff. Measures may be adjusted and modified on a site-by-site basis and as needed to provide the most protection of the site and surrounding area. Implementation and functioning of the BMPs will be evaluated and revised annually, or as needed, to ensure the most adequate and appropriate protection of natural resources. Adjustments to BMPs are reported to regulatory agencies as part of the annual reporting process (see Chapter 14).

4.3.1 Work Windows

Channel maintenance activities occurring during the rainy season can result in potential environment impacts, particularly to aquatic habitats. Potential impacts could include erosion from stockpiled sediments or pollutants from work equipment entering the creek. To prevent such wet season impacts, maintenance activities primarily occur during the dry season when rain and flows are minimal. Additionally, regulatory permitting conditions restrict the period and location of certain activities to protect biological resources. Listed below are the current work windows for the maintenance program[1]. Note these work windows may change as new permits are issued or amended.

[1] These work window restrictions are stated in the District's 2012 Routine Maintenance Agreement with the CDFW

Maintenance Activity	Maintenance Period
Maintenance on any creek, except Dry Creek, Walsh Creek, and the Napa River (due to special-status species restrictions)	April 15 – October 15
Ground-disturbing activities and any maintenance on Dry Creek, Walsh Creek, and the Napa River	June 15 – October 31
Debris removal immediately necessary to prevent flooding	Any time

Additionally, removal of standing trees is prohibited between February 1 and August 31 to avoid impacts to nesting birds. However, if a standing tree must be removed due to the presence of hazard conditions (see Chapter 6, Section 6.4, *Tree Removal and Relocation*) during the February 1 to August 31 period, then a nesting bird survey would be conducted by a qualified biologist according to standard District protocols and the tree would not be removed unless potential impacts to nesting birds can be avoided. Results of nesting bird surveys would be included in the annual summary maintenance report.

4.3.2 Channel Roughness and Capacity Objectives to Guide Maintenance

In support of Maintenance Principle 1 (apply the minimal amount of maintenance) as described above, the District developed a channel roughness and capacity assessment protocol. This protocol helps guide the annual stream assessment process by identifying which streams require maintenance and prioritizing the needed work. The assessment protocol involves a field-based evaluation of conditions, similar to the triggers described above and in Chapter 6, *Tree and Vegetation Maintenance Activities*. For vegetation management activities, such as tree pruning, this will involve assessing current roughness conditions compared to an allowable roughness criterion for the individual reach. Similarly, the District developed capacity criteria for individual reaches to guide if and when sediment removal activities are necessary. As part of the channel assessment process, the District developed estimates of quasi-equilibrium channel conditions that the District will work to maintain in order to preserve the hydrological capacity of individual reaches.

4.3.3 Biological Surveys

The majority of maintenance activities are conducted in earthen channels and minimally modified by hardscape features such as concrete, and therefore maintenance activities could affect biological resources. Maintenance activities are conducted in creek channels that provide habitat for a variety of species, including some special-status species which are protected under federal and state regulations. Based on possible occurrence of species as listed in Table 3-1 in Chapter 3, species-specific impact avoidance and minimization measures will be applied prior to conducting maintenance activities in those reaches.

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and 2012 WDRs/Water Quality Certification with the RWQCB.

Activities conducted under this Program will comply with applicable federal, state, and local laws and policies that protect biological resources, including but not limited to the federal ESA, federal MBTA, CESA, CEQA, and the F&G Code. Compliance with these regulations is described in Chapter 2, *Regulatory Compliance*. Avoidance measures for special-status species would ultimately be issued by regulatory agencies, but the measures provided in the BMP Table (Table 4-1) are implemented by the District and Napa RCD as standard practice.

4.3.4 Aquatic Species Impact Avoidance Approaches

Federal and state listed special-status species, including salmonids (Chinook and steelhead), California freshwater shrimp (*Syncaris pacifica*), California red-legged frog, and Pacific pond turtles (*Actinemys marmorata*), may be present in stream reaches maintained under this program.

If maintenance activities would disturb habitat of these species, such as maintenance of in-channel vegetation or bank stabilization or sediment removal activities that require channel dewatering, the District would notify and consult, if necessary, with state and federal agencies to obtain their approval of the maintenance activities. The agency coordination process would occur as part of the annual work notification procedure, as described in Chapter 14. The District may establish avoidance, minimization, and mitigation measures with regulatory agencies on a case-by-case basis.

If suitable California freshwater shrimp habitat is present then such habitat will be avoided during implementation of routine maintenance activities.

Typical avoidance and minimization measures used by the District and prescribed by regulatory agencies to protect aquatic species include:

- Restricting the work window to avoid critical life stage periods
- Pre-maintenance surveys
- Dewatering protocols, including species relocation
- Monitoring during maintenance
- Post-maintenance restoration
- Post-maintenance monitoring

As standard practice, the District implements these measures particularly for projects involving channel dewatering (dewatering protocols are included in Table 4-1). However, where there is a potential to disturb federal or state listed special-status species, no maintenance activities would be conducted without first notifying and securing approvals from the appropriate regulatory agency.

4.3.5 Herbicide Application Restrictions

Herbicides can be toxic to people and wildlife if not handled properly. However, the safe use of herbicides is a critical method for stream maintenance, especially to control invasive and exotic plants. All herbicide applications occur in accordance with federal, state, and local regulations.

As described in Chapter 5, *Invasive Plant Management Activities*, the District applies herbicides to plants in upland areas (vegetation growing along and on top of stream banks) as well as directly to submerged vegetation (plants growing in or adjacent to the water, such as cattails).

Measures to avoid and minimize effects of herbicide application include:

- Herbicides are used on a site by site basis and only when necessary, such as when hand and mechanical methods are unsuccessful.
- Application will occur when the climate is dry (between June 15 and November 15), wind is not above 5-10 mph, and no rain is in the forecast for the next 24 hours.
- Targeted spot spraying and hand painting of cut stumps are the primary methods of herbicide application. Foliar spraying may be conducted to control growth on larger plants such as exotic trees or large stands of pampas grass.
- District staff and contractors are trained annually on proper herbicide handling and use. Staff are trained by District or County staff with a current CDPR Qualified Applicator Certificate (QAC). The District contracts all herbicide work out to contractors with QAC and Private Applicator Certification (PAC) on staff. Contractors and staff with the QAC are required to complete 20 hours of continuing education every 2 years to stay licensed.

4.3.6 Cultural Resource Survey

Some ground-disturbing activities identified in this Manual would have the potential to affect cultural resources. For example, if bank stabilization, culvert repair/replacement, or sediment removal activities require excavation, disturbance or compaction of native soils in natural channels these activities could disturb or damage buried resources, if present. Similarly, these same maintenance activities could result in disturbance or damage of buried resources if ground disturbance extends beyond the as-built design of earthen channels or constructed basins. Consequently, such ground-disturbing activities conducted under this program must comply with federal, state, and local laws and policies protecting cultural resources and human remains, including but not limited to the National Historic Preservation Act and Assembly Bill 52. Compliance with these regulations is discussed in Chapter 2, *Regulatory Compliance*. Note that a detailed cultural resources survey is not necessary for routine maintenance activities that do not involve ground disturbance of native soils (e.g., tree trimming or native plantings).

For maintenance that requires ground-disturbance and affects soils beyond the channel design (e.g., some bank stabilization projects), a cultural resources investigation will be conducted. The process will follow the approach as outlined in the Cultural Resource BMPs below. Depending on the level of sensitivity of the site, the cultural resources investigation will include some or all the following elements:

- Background research and Native American consultation
- Pedestrian survey
- Documentation
- Management requirements, if necessary

When cultural resources are identified within a maintenance project area, the first consideration should be to avoid the resource, if feasible. If an archaeological resource cannot be avoided and project activities will impact the site, the resource must be evaluated for significance and eligibility for listing in the NRHP and California Register of Historical Resources (CRHR). Resources determined to be historic properties/historical resources[2] through evaluation will require mitigation. Avoidance or capping of an eligible resource is the preferred mitigation; however, if a site cannot be preserved, data recovery is an acceptable method of mitigation. Data recovery involves additional excavation to retrieve important information from those portions of a site that will be disturbed by the project. If project activities are directly adjacent to an archaeological site, construction work should be monitored by a qualified archaeologist. If maintenance must occur, then an unanticipated discovery plan would be developed and recovery work would be coordinated with local Native American tribal representatives.

4.3.7 Pollution Safety Planning

As creeks are common locations for illegal dumping of trash containing hazardous waste, such as tires, oil filters, paint cans, and electronic devices, project activities could encounter hazardous waste. Creek channels also receive runoff from streets and urbanized areas which carry non-point source contaminants like oil and paint that are poured down storm drains. Thus, indirect contamination of creeks occurs when contaminants are transported through the storm drain network and deposited directly to streams. Presence of these contaminants can sometimes be observed as an oily sheen, a discoloration of the soil, or an unnatural chemical odor. If presence of potential contaminants is observed at the site, the area will be treated as if a hazardous spill occurred. In addition, any observed contamination as evidenced by chemical-like odors, oily sheens, or irregularly colored sediment will be immediately reported to the local fire department's hazardous materials team.

Soil testing may be conducted prior to sediment removal projects. Soil testing is primarily conducted where quantities of excavated sediment would be taken to a permitted disposal site or landfill. Soil testing and disposal approvals would be coordinated with the appropriate regulatory agencies, such as the RWQCB. Should soils be encountered during maintenance that contain concentrations of substances that exceed hazardous waste levels, the contaminated area will be treated as if a hazardous spill occurred (i.e., a Spill Prevention and Response Plan will be implemented) and all measures to ensure compliance with federal, state, and local regulations will be taken.

4.3.8 Public Outreach

Many SMP maintenance areas are located in residential areas or in close proximity to business, schools, and libraries. Maintenance activities would have very little potential to disrupt traffic circulation except in situations when it is necessary to close travel lanes temporarily (e.g., to remove debris from a bridge or culvert), or where maintenance vehicles are traveling to and from

[2] Resources determined eligible for the NRHP are referred to as *historic properties*; those found eligible to the CRHR are called *historical resources*.

the maintenance sites (e.g., fill hauling). Most District maintenance channels have on-site roads adjacent to the channel that provide access for maintenance.

To reduce potential inconvenience to the public and protect their safety during maintenance activities, measures such as keeping the work site clean, reducing loud noises, and maintaining vehicle and pedestrian access. The duration of maintenance activities at a particular project site or reach will vary from a less than a day to a week. To minimize the effects of noise on neighboring homes and businesses, work will be limited to normal business hours (8:00 a.m.–5:00 p.m.). Routine activities in residential areas will not occur on Saturdays, Sundays, or County holidays. Sound control devices will be actively used on all power equipment.

As an effort to keep the public informed about pending stream maintenance work (why the maintenance is necessary, when it occurs, and what a neighborhood can expect when crews arrive to conduct maintenance work), the District may conduct an annual presentation of general maintenance activities to the public for information purposes. Prior to the District's annual stream surveys, an educational flyer is sent out to all private property owners adjacent to the creeks that are surveyed. The flyer informs private property owners of the District's SMP, the date of the annual creek survey, the Districts contact info, and other watershed management services. Additionally, the District has developed materials for public information and education through its website and brochures to inform the community about the District's watershed management programs. The District will continue to host creek cleanup events and partner with other local agencies and watershed stakeholders to assist and guide private property owners with riparian enhancement and management techniques. The District regularly responds to community concerns regarding flow-related hazards and stream maintenance questions.

4.4 Self-Mitigating Approach of Program

The District sees its SMP as an integrated stream management approach that involves protecting and enhancing existing instream resources and creating opportunities for improved future resources while maintaining necessary flood conveyance and bank stability condition in the District channels.

The application of the Maintenance Principles (Section 4.2), implementing additional pre-maintenance planning avoidance measures (described above in Section 4.3), and following the protective BMPs (shown in Table 4-1) provides a comprehensive and integrated approach to avoid and minimize program impacts. Temporary impacts from stream maintenance activities are avoided and minimized through the approaches described above and detailed further in this Manual. However, where the District conducts ground disturbing stream maintenance activities, they conduct the habitat enhancement and restoration activities described in Chapter 13 to mitigate for residual temporary and permanent effects. As described in Chapter 13, the District undertakes expansive riparian planting projects, develops instream habitat complexity features including LWD, and undertakes gravel augmentation projects where appropriate, in addition to conducting other measures to improve stream habitat conditions. These projects are expected to provide sufficient mitigation for SMP impacts to riparian and wetland habitat.

The District's long history of habitat protection and enhancement activities as described in this chapter serve as "self-mitigating" actions integrated with the maintenance activities.

4.5 Habitat Protection and Enhancement Goals

The District's primary habitat enhancement goals are to:

- Protect and enhance instream physical processes that create or maintain diverse flow conditions and a range of instream landforms including bars, riffles, pools, and benches (where these landforms are appropriate).
- Protect and enhance instream water quality conditions. While water quality conditions greatly depend on watershed source areas and land uses, instream flow blockages, debris, and other pollution negatively effects water quality. The District protects and enhances instream water quality through alleviating flow blockages to maintain circulation, and removing debris and trash.
- Protect and enhance riparian vegetation to develop more continuous vegetated corridors and more complete and complex canopy structure along the District's stream courses. The District's streamside vegetation enhancement program involves aggressive planting of native vegetation, removing invasive plants, and managing emergent vegetation on the channel bed to reduce flow blockages.
- Protect and enhance aquatic instream habitats used by benthic macro invertebrates, fish, amphibians, birds and other wildlife along the District's stream courses.

Instream habitats for wildlife reflect a complex ecology, integrating the physical processes, water quality, and vegetation conditions as described in the other goals above. The District will avoid and minimize maintenance activities to the minimum necessary in areas of known or observed sensitive species and employ best management practices and restoration activities in such areas to leave them in better ecologic condition following maintenance.

Table 4-1. Stream Maintenance Best Management Practices

General BMPs

These BMPs will be implemented by the stream maintenance crew, as appropriate and as overseen by site managers, for all activities associated with the maintenance program. These BMPs are grouped according to use of general maintenance practices, dewatering activities, public safety, and reporting procedures. The majority of these BMPs are implemented prior to and during maintenance operations, though the level of activity varies depending on the work type.

BMP Number	BMP Title	BMP Description
General Maintenance Practices		
GEN-1	Work Windows	▪ Maintenance on any creek, except Dry Creek, Walsh Creek, and the Napa River (due to special-status species restrictions), will generally occur between April 15 and October 15. ▪ All ground-disturbing maintenance activities (i.e., bank stabilization and sediment removal) occurring in the channel will take place between June 15 and October 31. ▪ Hand pruning and hand removal of vegetation will occur year round, except when: ▪ Wheeled or tracked equipment needs to access the site by crossing a creek, ponded area, or secondary channel; or ▪ Work occurs in streams that support salmonids. In these streams, instream vegetation maintenance will cease on December 31 or when local rainfall greater than 0.5 inches is predicted within a 24-hour period of planned activities, whichever happens first. ▪ Removal of standing trees will not occur between February 1 and August 31 to avoid impacts on nesting birds, except after implementation of Measure BIO-1. ▪ Modification and removal of large wood, such as downed trees, is generally conducted during the dry season, but can occur at any time of the year, if imminent danger of a flood threat precludes leaving the wood in place. ▪ Herbicide applications will generally occur between June 15 and November 15, with an extension through December 31 or until the first occurrence of any of the following conditions; whichever happens first: ○ Local rainfall greater than 0.5 inches is forecasted within a 24-hour period from planned application events; or ○ When salmonids begin upmigrating and spawning, as determined by a qualified biologist (typically in November/December)

BMP Number	BMP Title	BMP Description
GEN-2	Minimize the Area of Disturbance	To minimize impacts to natural resources, soil disturbance will be kept to the minimum footprint necessary to complete the maintenance operation.
GEN-3	Erosion and Sediment Control Measures	▪ Upland soils exposed due to maintenance activities will be seeded and stabilized using erosion control fabric or hydroseeding. The channel bed and areas below the Ordinary High Water Mark (OHWM) are exempt from this BMP. ▪ Erosion control fabrics will consist of natural fibers that will biodegrade over time. No plastic or other non-porous material will be used as part of a permanent erosion control approach. Plastic sheeting may be used to temporarily protect a slope from runoff, but only if there are no indications that special-status species would be impacted by the application. ▪ Erosion control measures will be installed according to manufacturer's specifications. ▪ Appropriate measures include, but are not limited to, the following: ○ Silt Fences ○ Straw Bale Barriers ○ Brush or Rock Filters ○ Storm Drain Inlet Protection ○ Sediment Traps ○ Sediment Basins ○ Erosion Control Blankets and Mats ○ Soil Stabilization (i.e. Tackified straw with seed, jute or geotextile blankets, broad cast and hydro-seeding, etc.) ▪ All temporary construction-related erosion control methods (e.g., silt fences) shall be removed at the completion of the project. The following Bay Area Stormwater Management Agencies Association (BASMAA) BMPs provide guidance and specifications on implementation of the erosion control measures listed above (see also www.basmaa.com): ○ SC-3. Sediment Basins ○ SC-4. Straw or Sand Bag Barriers ○ SC-5. Sediment Traps ○ SC-6. Silt Fences ○ SS-1. Erosion Control Blankets, Mats, and Geotextiles ○ VR-1. Brush or Rock Filters

BMP Number	BMP Title	BMP Description
		○ VR-4b. Temporary Outlet Protection ○ VR-4b. Storm Drain Inlet Protection ○ WD-1. Earth Dike ○ WD-1. Slope Drain ○ WD-3. Temporary Drains and Swales
GEN-4	Dust Management Controls	The District will implement the Bay Area Air Quality Management District's (BAAQMD) Basic Dust Control Measures (www.baaqmd.gov) at maintenance sites less than four acres in size. Current measures stipulated by the BAAQMD Guidelines include the following: 1. All exposed surfaces (e.g., parking areas, staging areas, soil piles, graded areas, and unpaved access roads) shall be watered two times per day. 2. All haul trucks transporting soil, sand, or other loose material off-site shall be covered. 3. All visible mud or dirt track-out onto adjacent public roads shall be removed using wet power vacuum street sweepers at least once per day. The use of dry power sweeping is prohibited. 4. All vehicle speeds on unpaved roads shall be limited to 15 mph. 5. All roadways, driveways, and sidewalks to be paved shall be completed as soon as possible. Building pads shall be laid as soon as possible after grading unless seeding or soil binders are used. 6. Idling times shall be minimized either by shutting equipment off when not in use or reducing the maximum idling time to 5 minutes (as required by the California airborne toxics control measure Title 13, Section 2485 of California Code of Regulations [CCR]). Clear signage shall be provided for construction workers at all access points. 7. All construction equipment shall be maintained and properly tuned in accordance with manufacturer's specifications. All equipment shall be checked by a certified visible emissions evaluator. 8. Post a publicly visible sign with the telephone number and person to contact at the lead agency regarding dust complaints. This person shall respond and take corrective action within 48 hours. The Air District's phone number shall also be visible to ensure compliance with applicable regulations.
GEN-5	Staging and Stockpiling of Materials	▪ To the extent feasible, staging will occur on access roads, surface streets, or other disturbed areas that are already compacted and only support ruderal vegetation. Similarly, all maintenance equipment and materials (e.g., road rock and project spoil) will be contained within the existing service roads, paved roads, or other pre-determined staging areas. Staging areas for equipment, personnel, vehicle parking, and material storage will be sited as far as possible from major roadways.

BMP Number	BMP Title	BMP Description
		▪ To prevent sediment-laden water from being released back into waterways during transport of spoils to disposal locations, truck beds will be lined with an impervious material (e.g., plastic), or the tailgate blocked with wattles, hay bales, or other appropriate filtration material. ▪ Building materials and other maintenance-related materials, including chemicals and sediment, will not be stockpiled or stored where they could spill into water bodies or storm drains. ▪ No runoff from the staging areas may be allowed to enter water ways, including the creek channel or storm drains, without being subjected to adequate filtration (e.g., vegetated buffer, hay wattles or bales, silt screens). The discharge of decant water to water ways from any on-site temporary sediment stockpile or storage areas is prohibited. ▪ During the dry season, no stockpiled soils will remain exposed and unworked for more than 7 days. During the wet season, no stockpiled soils will remain exposed, unless surrounded by properly installed and maintained silt fencing or other means of erosion control.
GEN-6	Stream Access	District personnel will use existing access ramps and roads to the extent feasible. If necessary to avoid large mature trees, native vegetation, or other significant habitat features, temporary access points will be constructed in a manner that minimizes impacts according to the following guidelines: 1. Temporary access points will be constructed as close to the work area as possible to minimize equipment transport. 2. In considering channel access routes, slopes of greater than 20 percent will be avoided, if possible. 3. Disturbed areas will be revegetated or filled with compacted soil, seeded, and stabilized with erosion control fabric immediately to prevent future erosion. 4. Personnel will use the appropriate equipment for the job that minimizes impacts. Appropriately-tired vehicles, either tracked or wheeled, will be used depending on the site and maintenance activity.
GEN-7	In-Channel Minor Sediment Removal	For in-channel minor sediment removal activities, work will be conducted from the top of the bank if access is available and there are flows in the channel.
GEN-8	On-Site Hazardous Materials Management	1. An inventory of all hazardous materials used (and/or expected to be used) at the worksite and the end products that are produced (and/or expected to be produced) after their use will be maintained by the worksite manager. 2. As appropriate, containers will be properly labeled with a "Hazardous Waste" label and hazardous waste will be properly recycled or disposed of off-site.

BMP Number	BMP Title	BMP Description
		3. Contact of chemicals with precipitation will be minimized by storing chemicals in watertight containers or in a storage shed (completely enclosed), with appropriate secondary containment to prevent any spillage or leakage. 4. Petroleum products, chemicals, cement, fuels, lubricants, and non-storm drainage water or water contaminated with the aforementioned materials will not contact soil and not be allowed to enter surface waters or the storm drainage system. 5. All toxic materials, including waste disposal containers, will be covered when they are not in use, and located as far away as possible from a direct connection to the storm drainage system or surface water. 6. All trash that is brought to a project site during maintenance activities (e.g., plastic water bottles, plastic lunch bags, cigarettes) will be removed from the site daily.
GEN-9	Existing Hazardous Materials	1. For any proposed ground disturbing activities, the District will conduct a search for existing known contaminated sites on the SWRCB's GeoTracker website (geotracker.waterboards.ca.gov) upon selection of project location. 2. For any proposed ground disturbing maintenance sites located within 1,500 feet of any "open" sites where contamination has not been remediated, the District will contact the Regional Water Quality Control Board (RWQCB) case manager identified in the database. The District will work with the case manager to ensure maintenance activities would not affect cleanup or monitoring activities or threaten the public or environment 3. If hazardous materials, such as oil, batteries or paint cans, are encountered at the maintenance sites, the District will carefully remove and dispose of them according to the *Spill Prevention and Response Plan* (forthcoming). District staff will wear proper protective gear and store the waste in appropriate hazardous waste containers until it can be disposed at a hazardous waste facility.
GEN-10	Spill Prevention and Response	The District will prevent the accidental release of chemicals, fuels, lubricants, and non-storm drainage water into channels following these measures: 1. New District field personnel will be appropriately trained in spill prevention, hazardous material control, and cleanup of accidental spills. 2. Equipment and materials for cleanup of spills will be available on site and spills and leaks will be cleaned up immediately and disposed of according to guidelines stated in the *Spill Prevention and Response Plan* (forthcoming). 3. Field personnel will ensure that hazardous materials are properly handled and natural resources are protected by all reasonable means.

BMP Number	BMP Title	BMP Description
		4. Spill prevention kits will always be in close proximity when using hazardous materials (e.g., at crew trucks and other logical locations). All field personnel will be advised of these locations. 5. District staff will routinely inspect the work site to verify that spill prevention and response measures are properly implemented and maintained. Spill Response Measures: For small spills on impervious surfaces, absorbent materials will be used to remove the spill, rather than hosing it down with water. For small spills on pervious surfaces such as soil, the spill will be excavated and properly disposed rather than burying it. Absorbent materials will be collected and disposed of properly and promptly.
GEN-11	Fire Prevention	1. All earthmoving and portable equipment with internal combustion engines will be equipped with spark arrestors. 2. During the high fire danger period (April 1–December 1), work crews will: a. Have appropriate fire suppression equipment available at the work site. b. Keep flammable materials, including flammable vegetation slash, at least 10 feet away from any equipment that could produce a spark, fire, or flame. c. Not use portable tools powered by gasoline-fueled internal combustion engines within 25 feet of any flammable materials unless a round-point shovel or fire extinguisher is within immediate reach of the work crew (no more 25 feet away from the work area).
GEN-12	Vehicle and Equipment Maintenance	1. All vehicles and equipment will be kept clean. Excessive build-up of oil and grease will be prevented. 2. All equipment used in the creek channel will be inspected for leaks each day prior to initiation of work. Action will be taken to prevent or repair leaks, prior to use. 3. Incoming vehicles and equipment will be checked for leaking oil and fluids (including delivery trucks, and employee and subcontractor vehicles). Leaking vehicles or equipment will not be allowed onsite. 4. No heavy equipment will operate in a live stream (see Dewatering BMPs). 5. No equipment servicing will be done in the creek channel or immediate floodplain, unless equipment stationed in these locations cannot be readily relocated (i.e., pumps and generators). 6. If necessary, all servicing of equipment done at the job site will be conducted in a designated, protected area to reduce threats to water quality from vehicle fluid spills. Designated areas will not directly connect to the ground, surface water, or the storm drain system. The service area will be clearly designated with berms, sandbags, or other barriers. Secondary containment, such as a drain pan, to catch spills or leaks will be used when removing or changing fluids. Fluids will be stored in appropriate containers with covers, and properly recycled or disposed of offsite.

BMP Number	BMP Title	BMP Description
		7. If emergency repairs are required in the field, only those repairs necessary to move equipment to a more secure location will be conducted in the channel or floodplain. 8. Equipment will be cleaned of any sediment or vegetation before transferring and using in a different watershed to avoid spreading pathogens or exotic/invasive species. 9. Vehicle and equipment washing can occur onsite only as needed to prevent the spread of sediment, pathogens or exotic/invasive species. No runoff from vehicle or equipment washing is allowed to enter water bodies, including creek channels and storm drains, without being subjected to adequate filtration (e.g., vegetated buffers, hay wattles or bales, and silt screens). The discharge of decant water from any onsite wash area to water bodies or to areas outside of the active project site is prohibited. Additional vehicle and equipment washing will occur at the approved wash area in the District's corporation yard.
GEN-13	Vehicle and Equipment Fueling	1. No fueling will be done in the channel (top-of-bank to top-of-bank) or immediate floodplain unless equipment stationed in these locations cannot be readily relocated (e.g., pumps and generators). 2. All off-site fueling sites (i.e., on access roads above the top-of-bank) will be equipped with secondary containment and avoid a direct connection to soil, surface water, or the storm drainage system. 3. For stationary equipment that must be fueled on-site, secondary containment, such as a drain pan or drop cloth, will be used to prevent accidental spills of fuels from reaching the soil, surface water, or the storm drain system.
Dewatering		
GEN-14	Dewatering Measures	1. When work in flowing streams is unavoidable, streamflow will be diverted around the work area with use of a temporary dam or bypass according to the measures below. 2. Prior to dewatering, consult with a fisheries biologist and schedule work to into account the life cycles of salmon, steelhead, and other special-status aquatic species such as freshwater shrimp and California red-legged frog. Identify seasonal work restrictions or limited procedures to protect aquatic species 3. Prior to dewatering, the best means to bypass flow through the work area will be determined to minimize disturbance to the channel and avoid direct mortality of fish and other aquatic vertebrates. 4. The area to be dewatered will encompass the minimum area necessary to perform the maintenance activity. 5. The period of dewatering will extend only for the minimum amount of time needed to perform the maintenance activity.

BMP Number	BMP Title	BMP Description
		6. Depending on the channel configurations, sediment removal activities may occur where the flows are not bypassed around the work site as long as a berm is left between the work area and stream flows to minimize water quality impacts during excavation activities. 7. In reaches that contain deep pools, the District will maintain these pools, as is practical, by constructing temporary fencing surrounding the pool and avoiding pool dewatering. Pools in construction sites may be isolated by upstream or downstream barriers, such as culverts. This approach does not apply to sediment removal activities that require removal of all sediment to restore the design capacity. 8. If California freshwater shrimp may be present in the area to be dewatered, such as deep pools with overhanging vegetation, dewatering shall not occur without approval from USFWS and CDFW. Pool dewatering where California freshwater shrimp may be present shall only occur if Incidental Take Permit (ITP) is secured from CDFW.
		Construction: 1. Where feasible and appropriate, dewatering will occur via gravity driven systems and diversion structures shall be installed on concrete sections of the channels, such as concrete box culverts often used at road crossings. 2. Construction of cofferdams will begin in the upstream area and continue in a downstream direction, and the flow will be diverted only when construction of the dams is completed. 3. Coffer dams will be installed both upstream and downstream not more than 100 feet from the extent of the work areas. 4. Instream cofferdams will only be built from materials such as sandbags, clean gravel, or rubber bladders which will cause little or no siltation or turbidity. No earthen fill will be used to construct the cofferdam. Plastic sheeting will be placed over sandbags to minimize water seepage into the maintenance areas. The plastic sheets will be firmly anchored to the streambed to minimize water seepage. If necessary, the footing of the cofferdam will be keyed into the channel bed at an appropriate depth to capture the majority of subsurface flow needed to dewater the streambed. 5. Stream flows will be allowed to gravity flow around or through the work site using temporary bypass pipes or culverts. Bypass pipe diameter will be sized to accommodate, at a minimum, twice the volume of the summer baseflow. Pipes will be designed to minimize turbidity and the potential to wash contaminants into the stream. 6. When use of gravity-fed dewatering is not feasible and pumping is necessary to dewater a work site, a temporary siltation basin and/or use of silt bags may be required to prevent sediment from re-entering the wetted channel. Implementation:

BMP Number	BMP Title	BMP Description
		1. A qualified biologist will be present to ensure that fish and other aquatic vertebrates are not stranded during construction and implementation of channel dewatering. 2. If necessary to remove stranded fish or other aquatic vertebrates, electrofishing will be used to collect and relocate fish from the work area. If relocation is necessary, Measure GEN-15 will be implemented. 3. Downstream flows adequate to prevent fish or vertebrate stranding will be maintained at all times during dewatering activities. 4. Diverted and stored water will be protected from maintenance activity-related pollutants, such as soils or equipment lubricants or fuels. 5. If necessary, discharged water will pass over some form of energy dissipater to prevent erosion of the downstream channel. Silt bags will be equipped to the end of discharge hoses and pipes to remove sediment from discharged water. 6. If used, temporary pump discharge pipes and hoses will be designed to minimize turbidity and the potential to wash contaminants into the stream. A filtration/settling system will be included to reduce downstream turbidity (e.g. filter fabric, turbidity curtain, etc.). The selection of an appropriate system is based on the rate of discharge. If feasible, water that is pumped into a pipe should discharge onto the top of bank into a densely vegetated area. 7. For full channel dewatering, filtration devices or settling basins will be provided as necessary to ensure that the turbidity of discharged water is not visibly more turbid than in the channel upstream of the maintenance site. If increases in turbidity are observed, additional measures will be implemented such as a larger settling basin or additional filtration. If increases in turbidity persist, the District's Stream Maintenance Program Manager will be alerted since turbidity measurements may be required. Deconstruction: 1. When maintenance is completed, the flow diversion structure will be removed as soon as possible but no more than 48 hours after work is completed. Impounded water will be released at a reduced velocity to minimize erosion, turbidity, or harm to downstream habitat. If salmonids are present upstream of the site, a fisheries biologist will be onsite during the rewatering phase to ensure no fish are stranded as water levels drop. Cofferdams will be removed such that surface elevations of water impounded above the cofferdam are lowered at a rate greater than one inch per hour. 2. When diversion structures are removed, to the extent practicable, the ponded flows will be directed into the low-flow channel within the work site to minimize downstream water quality impacts. 3. The area disturbed by flow bypass mechanisms will be restored at the completion of the project. This may include, but is not limited to, recontouring the area and planting of riparian vegetation.

BMP Number	BMP Title	BMP Description
GEN-15	Relocation of Aquatic Species for Dewatering	As identified above, before a work area is dewatered, fish and other aquatic vertebrates will be captured and relocated to avoid injury and mortality and minimize disturbance. The following guidelines will apply. ▪ Before removal and relocation begins, a qualified fisheries biologist will identify the most appropriate release location(s). Release locations should have water temperatures similar to the capture location and offer ample habitat for released fish and aquatic vertebrates, and should be selected to minimize the likelihood of reentering the work area or becoming impinged on the exclusion net or screen. ▪ The means of capture will depend on the nature of the work site, and will be selected by a qualified fisheries biologist who has a current CDFW scientific collecting permit and is experienced with capture and handling protocols for fish and aquatic vertebrates, including California freshwater shrimp. Complex stream habitat may require the use of electrofishing equipment, whereas in outlet pools, vertebrates may be captured by pumping down the pool and then seining or dipnetting. Electrofishing will be used only as a last resort; if electrofishing is necessary, it will be conducted only as approved by USFWS, NMFS, and CDFW, and by properly trained personnel following the NMFS Guidelines dated June 2000. ▪ To the extent feasible, relocation will be performed during morning periods. Air and water temperatures will be measured periodically, and relocation activities will be suspended if temperatures exceed the limits allowed by NMFS guidelines. ▪ To prevent aquatic vertebrates from reentering the work area, the channel will be blocked by placing fine-meshed nets or screens above and below the work area. To minimize entanglement, mesh diameter will not exceed 1/8 inch. The bottom edge of the net or screen will be secured to the channel bed to prevent fish from passing under the screen. Exclusion screening will be placed in low velocity areas to minimize impingement. Screens will be checked periodically and cleaned of debris to permit free flow of water. ▪ Handling of aquatic vertebrates will be minimized. When handling is necessary, personnel will wet hands or nets before touching them. ▪ Fish will be held temporarily in cool, shaded water in a container with a lid. Overcrowding in containers will be avoided; at least two containers will be used and no more than 25 fish will be kept in each bucket. Aeration will be provided with a battery-powered external bubbler. Fish will be protected from jostling and noise, and will not be removed from the container until the time of release. A thermometer will be placed in each holding container and partial water changes will be conducted as necessary to maintain a stable water temperature. Fish will not be held more than 30 minutes. If water temperature reaches or exceeds NMFS limits, fish will be released and relocation operations will cease. ▪ If fish are abundant, capture will cease periodically to allow release and minimize the time fish spend in holding containers.

BMP Number	BMP Title	BMP Description
		▪ Fish will not be anesthetized or measured. However, they will be visually identified to species level, and year classes will be estimated and recorded. ▪ Reports on fish relocation activities will be submitted to CDFW and NMFS in a timely fashion. ▪ If mortality during relocation exceeds 5%, relocation will cease and CDFW and NMFS will be contacted immediately or as soon as feasible. ▪ When feasible, initial fish relocation efforts will be performed several days prior to the scheduled start of construction. The fisheries biologist will perform a survey on the same day before construction begins to verify that no fish have moved back into the project area.
GEN-16	Pump/Generator Operations and Maintenance	When needed to assist in channel dewatering, pumps and generators will be maintained and operated in a manner that minimizes impacts to water quality and aquatic species. 1. Pumps and generators will be maintained according to manufacturers' specifications to regulate flows to prevent dryback or washout conditions. 2. Pumps will be operated and monitored to prevent low water conditions, which could pump muddy bottom water, or high water conditions, which creates ponding. 3. Pump intakes will be screened to prevent entrainment of fish and other vertebrates. If pumping is necessary in streams that support steelhead, a minimum of 2.28mm screens will be installed to prevent entrainment.
GEN-17	Testing and Disposal of Sediment	For projects involving sediment removal, and as specified in the Sediment Sampling and Analysis Guidelines (Stream Maintenance Manual Appendix K), the District will test the sediment to be removed to determine the suitability for disposal or reuse based on its chemical qualities. The test results and proposed disposal or reuse locations will be submitted to the RWQCB for review and approval. As specified in the Sediment Sampling and Analysis Guidelines, samples will be analyzed according to the *Beneficial Reuse of Dredged Materials: Sediment Screening and Testing Guidelines* (RWQCB 2000), as appropriate for the proposed disposal or reuse site. The results will be compared against federal and state environmental screening levels (ESLs) for protection of human health, groundwater quality, and terrestrial receptors. If hazardous levels of contaminants (as defined by federal and state regulations) are present, the material will be taken to a permitted hazardous waste facility. The waste discharge requirements included in the discharge orders issued by the RWQCB dictate the degree of sediment sampling and testing required to obtain approval for sediment disposal or reuse. This mitigation measure incorporates these requirements by reference to ensure adequate protection of water quality.

Public Safety

BMP Number	BMP Title	BMP Description
GEN-18	Planning for Pedestrians, Traffic Flow, and Safety Measures	1. Work will be staged and conducted in a manner that maintains two-way traffic flow on public roadways in the vicinity of the work site. If temporary lane closures are necessary, they will be coordinated with the appropriate jurisdictional agency and scheduled to occur outside of peak traffic hours (7:00 – 10:00 a.m. and 3:00 – 6:00 p.m.) to the maximum extent practicable. Any lane closures will include advance warning signage, a detour route and flaggers in both directions. When work is conducted on public roads and may have the potential to affect traffic flow, work will be coordinated with local emergency service providers as necessary to ensure that emergency vehicle access and response is not impeded. 2. Bicycle and pedestrian facility closures will be scheduled outside of peak traffic hours (7:00 – 10:00 a.m. and 3:00 – 6:00 p.m.) to the maximum extent practicable. 3. Public transit access and routes will be maintained in the vicinity of the work site. If public transit will be affected by temporary road closures and require detours, affected transit authorities will be consulted and kept informed of project activities. 4. Adequate parking will be provided or designated public parking areas will be used for maintenance-related vehicles not in use through the maintenance period. 5. Access to driveways and private roads will be maintained. If brief periods of maintenance would temporarily block access, property owners will be notified prior to maintenance activities.
GEN-19	Public Safety Measures	The District will implement public safety measures during maintenance as follows: 1. If necessary, construction signs will be posted at job sites warning the public of construction work and to exercise caution. 2. Where work is proposed adjacent to a recreational trail, warning signs will be posted several feet beyond the limits of work. Signs will also be posted if trails will be temporarily closed. 3. If needed, a lane will be temporarily closed to allow for trucks to pull into and out of access points to the work site. 4. Fencing, either the orange safety type or chain link will be installed above repair sites on bank stabilization projects. 5. When necessary, District or contracted staff will provide traffic control and site security.
GEN-20	Minimize Noise Disturbances to Residential Areas	The District will implement maintenance practices that minimize disturbances to residential areas surrounding work sites. 1. With the exception of emergencies, work will be conducted during normal working hours (8:00 a.m. – 5:00p.m). Maintenance activities in residential areas will not occur on Saturdays, Sundays, or District observed

BMP Number	BMP Title	BMP Description
		holidays except during emergencies, or with approval by the local jurisdiction and advance notification of surrounding residents. 2. Advanced notification will be provided 1 week prior to the start of construction to adjacent properties within 180 feet of a proposed maintenance site where heavy equipment will be used. 3. Powered equipment (vehicles, heavy equipment, and hand equipment such as chainsaws) will be equipped with adequate mufflers. 4. Excessive idling of vehicles will be prohibited beyond 5 minutes.
GEN-21	Work Site Housekeeping	▪ District employees and contractors will maintain the work site in neat and orderly conditions on a daily basis, and will leave the site in a neat, clean, and orderly condition when work is complete. Slash, sawdust, cuttings, etc. will be removed to clear the site of vegetation debris. As needed, paved access roads and trails will be swept and cleared of any residual vegetation or dirt resulting from the maintenance activity. ▪ For activities that last more than one day, materials or equipment left on the site overnight will be stored as inconspicuously as possible, and will be neatly arranged. ▪ The District's maintenance crews are responsible for properly removing and disposing of all debris incurred as a result of construction within 72 hours of project completion and as directed by the Stream Maintenance Program Manager.

Vegetation Management BMPs

These BMPs provide specific and detailed guidance on the variety of vegetation management procedures implemented by the District. BMPs for the following maintenance techniques are included: tree pruning, plant removal, herbicide application, and site restoration. It is assumed that these measures will be implemented by field crews trained in these procedures. To avoid potential impacts on biological resources, none of these measures will be implemented until authorization from the Stream Maintenance Manager is received.

BMP Number	BMP Title	BMP Description
Tree Pruning		
VEG-1	Routine Pruning Measures	1. Pruning will be performed according to the most recently published National ANSI A300 Pruning Standards and International Society of Arboriculture (ISA) BMPs for Tree Pruning, which include guidance on pruning practices, pruning objectives, pruning methods (types), palm pruning, and utility pruning.

BMP Number	BMP Title	BMP Description
		2. Pruning activities will follow National ANSI Z133.1-2006 Standards for safe operation of tree care machinery, and safety equipment such as carabiners, helmets, and arborist ropes to ensure the safety of the tree climbers.
Non-Native and Invasive Plant Removal		
VEG-2	Minimize Local Erosion Increase from In-channel Vegetation Removal	To minimize the potential effect of localized erosion, the toe of the bank will be protected by leaving vegetation to the maximum extent possible.
VEG-3	Arundo and Tamarisk Removal	Removal of Arundo and tamarisk will be conducted according to the Napa River Watershed Invasive Plant Management: Arundo Management and Riparian Enhancement Plan developed in 2015 and the Napa County Flood Control and Water Conservation District Aquatic Pesticide Application Plan (Appendix G). Removal of tamarisk may follow the same guidelines as for Arundo but may be modified based on further research of effective treatment methods (i.e. mixture of imazapyr and glyphosate).
Herbicide Application		
VEG-4	Standard Herbicide Use Requirements	▪ Only herbicides and surfactants that have been approved for aquatic use by the EPA and are registered for use by the CDPR will be used for aquatic vegetation control work. ▪ Herbicide application will be consistent with Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) label instructions and use conditions issued by the US EPA, CDPR, and the Napa County Agricultural Commissioner. ▪ Herbicide application in upland areas will not be made within 48 hours of predicted rainfall. ▪ The lowest recommended rate to achieve project objectives of both herbicides and surfactants will be utilized to achieve desired control. ▪ An indicator dye may be added to the tank mix to help the applicator identify areas that have been treated and better monitor the overall application. ▪ No application to plants whose base is submerged in the channel. Application of herbicides to plants growing directly in the water is not covered under this program and require additional authorizations according to state and local regulations.
Site Restoration		
RESTOR-1	Restore Channel Features	Low-flow channels within streams will be returned as closely as possible to their original location and form after sediment removal activities. The restored low-flow channel will be configured with the appropriate depth for fish passage without creating a possible future bank erosion problem. The

BMP Number	BMP Title	BMP Description
		depth and size of the low flow channel and pools will emulate the pre-construction conditions as closely as possible, within the finished channel topography.
RESTOR-2	Seeding	Sites where maintenance activities result in exposed soil will be stabilized to prevent erosion and revegetated with native vegetation as soon as is appropriate after maintenance activities are complete. For most sites, an erosion control seed mix will be applied to exposed soils, and down to the ordinary high water mark (OHWM). 1. The seed mix will consist of California native grasses (e.g., Hordeum brachyantherum ssp. californicum, Elymus glaucus , Bromus carinatus, Danthonia californica, and Melica californica). 2. One or two nonnative sterile grass species may be added to the seed mix provided that the amount does not exceed 25% of the total seed mix by count. 3. Locally native wildflower and/or shrub seeds may also be included in the seed mix. 4. Temporary earthen access roads will be seeded when site and horticultural conditions are suitable.
RESTOR-3	Planting Material	Revegetation and replacement plantings shall consist of locally collected native species or native species acquired from native plant nurseries within the bay area. Plant selection will be developed based on surveys of natural areas on the same creek that have a similar ecological setting. These “reference sites” provide information as to what species would be found in the area and an approximate population density.
RESTOR-4	Bank Protection Plantings	1. New trees will have an average spacing of 10-12 feet and shrubs an average spacing of 6-8 feet. 2. Pole plantings shall be collected on site and installed wherever possible depending on soil and water conditions.
RESTOR-5	Site Maintenance	Follow-up maintenance will be performed on sites that have been seeded and planted. 1. Maintenance will include replacing dead or dying plants where appropriate, weeding, removing non-native plant colonizers, and ensuring that all plants receive sufficient water. 2. Irrigation will be implemented as needed throughout the establishment period. The District may maintain or repair bank stabilization projects that are less than 2 years old that are damaged by winter flows. The District will report post construction maintenance work at individual sites as part of the Post-Construction Report submitted by January 15 of each year or if necessary, the subsequent year. Appropriate BMPs will be applied during maintenance repairs.

Biological Resource BMPs

These BMPs will be implemented as appropriate to avoid and minimize impacts on special-status species. These BMPs may be modified during project permitting and agency approvals of annual projects. Additional measures for protection of aquatic species during dewatering activities are described in Measures GEN-14 through GEN-16. None of these measures will be implemented until authorization from the Stream Maintenance Manager is received.

BMP Number	BMP Title	BMP Description
BIO-1	Minimize Impacts to Nesting Birds via Site Assessments and Avoidance Measures	1. For activities occurring between February 1 and August 31, project areas will be checked by a qualified biologist, for nesting birds within 2 weeks prior to starting work. If a lapse in project-related work of 2 weeks or longer occurs, another focused survey will be conducted before project work can be reinitiated. 2. If nesting birds are found, a buffer will be established around the nest and maintained until the young have fledged. Appropriate buffer widths are 250 feet for raptors, herons, and egrets; 25 feet for ground-nesting non-raptors; and 50 feet for non-raptors nesting on trees, shrubs and structures. A qualified biologist may identify an alternative buffer based on a site specific-evaluation. No work within the buffer will occur without written approval from a qualified biologist, for as long as the nest is active. 3. If a pre-activity survey in high-quality San Francisco common yellowthroat breeding habitat (as determined by a qualified biologist) identifies more singing male San Francisco common yellowthroats than active nests, then the inconspicuous nests of this species might have been missed. In that case, maintenance activities in that area shall be delayed until the San Francisco common yellowthroat non-breeding season (i.e., August 16–March 14). 4. The boundary of each buffer zone will be marked with fencing, flagging, or other easily identifiable marking if work will occur immediately outside the buffer zone. 5. All protective buffer zones will be maintained until the nest becomes inactive, as determined by a qualified biologist. 6. If monitoring shows that disturbance to actively nesting birds is occurring, buffer widths will be increased until monitoring shows that disturbance is no longer occurring. If this is not possible, work will cease in the area until young have fledged and the nest is no longer active.
BIO-2	Avoid and Minimize Impacts to Special-Status Invertebrate Species	1. A District qualified biologist will conduct a desktop audit of the CNDDB, vegetation maps, soils maps, and aerial photos to determine whether suitable special-status invertebrate habitat is potentially present in or adjacent to a maintenance activity. 2. If the District biologist determines that a special-status invertebrate could occur in the activity area, then a habitat suitability assessment at the maintenance site will be conducted.

BMP Number	BMP Title	BMP Description
		3. If the District determines that known occurrences have been documented and suitable habitat is present for California freshwater shrimp at the maintenance site, then the District would avoid working in areas where habitat is present.
BIO-3	Protection of Sensitive Fauna Species from Herbicide Use	Only following the guidelines and in accordance with federal and state regulations; approved herbicides and adjuvants may be applied in habitat areas for sensitive wildlife species (including salmonids, California red-legged frog, California freshwater shrimp) only if applications occur in accordance with federal and state regulations. For sprayable or dust formulations: when the air is calm or moving away from sensitive wildlife habitat, applications will commence on the side nearest the habitat and proceed away from the habitat. When air currents are moving toward habitat, applications will not be made within 200 yards (600 feet) by air or 40 yards (120 feet) by ground upwind from occupied habitat. However, these distances may be modified for the control of invasive species on salmonid streams if the following measures are implemented: ▪ A qualified biologist will determine presence/absence of sensitive resources in designated herbicide use areas and develop site-specific control methods (including the use of approved herbicide and surfactants). ▪ A qualified fisheries biologist will review proposed herbicide application methods and stream reaches. The fisheries biologist will conduct a pre-construction survey (and any other appropriate data research) to determine whether the proposed herbicide application would adequately protect against fish kills, and prescribe measures to ensure adequate protection of biological resources.
BIO-4	Applicator Training	District staff that handle and apply herbicides will be trained annually on proper herbicide handling and use. Staff will be trained by a District or County staff with a pesticide applicator certificate obtained from the State Department of Pesticide Regulation. Training will include review of the BMPs included in the District's Aquatic Pesticide Application Plan (Appendix G), with particular focus on target and non-target plants, environmental impact avoidance measures, and herbicide label requirements. The District will ensure that applicators are properly trained in handling and use of herbicides, have a current Qualified Applicator Certificate (QAC), or Qualified Applicator License (QAL). A QAC/QAL must complete 20 hours of continuing education every 2 years to stay licensed, and therefore are up-to-date on the latest techniques for pest control.
BIO-5	Herbicide Application Planning and Coordination	When a site is selected for application of herbicides, adjacent and downstream water users (farmers and agencies with water rights diversions) will be notified to ensure their water supply is not

BMP Number	BMP Title	BMP Description
		impacted during the aquatic herbicide treatment period. The District will post an annual work plan on the District website.
BIO-6	Avoid and Minimize Impacts to Special-Status Plant Species and Sensitive Natural Vegetation Communities	If there are known occurrences of special status plant species near the project site a qualified botanist will identify special status plant species and sensitive natural vegetation communities and clearly map or delineate them as needed in order to avoid and/or minimize disturbance, using the following protocols: 1. A desktop audit of the CNDDB, vegetation maps, soils maps, and aerial photos to identify if suitable habitats for special status plants and sensitive natural vegetation communities are potentially located within or near work areas. 2. Surveys of areas identified as sensitive natural communities or suitable habitat for special status plant species will be conducted by a qualified botanist prior to commencement of work. 3. Surveys will be conducted during the appropriate time of the year to adequately identify plants. 4. The qualified botanist will ensure avoidance and minimize impacts by implementing one or more of the following, as appropriate, per the botanist’s recommendation: a. Flag or otherwise delineate in the field the special status plant populations and/or sensitive natural community to be protected; b. Allow adequate buffers around plants or habitat; the location of the buffer zone will be shown on the maintenance design drawings and marked in the field with stakes and/or flagging in such a way that exclusion zones are visible to maintenance personnel without excessive disturbance of the sensitive habitat or population itself (e.g., from installation of fencing). c. Time construction or other activities during dormant and/or non-critical life cycle period; d. Store removed sediment off site; and e. Limit the operation of maintenance equipment to established roads whenever possible. 5. No herbicides, terrestrial or aquatic, will be used in areas identified as potential habitat for special status plants species or containing sensitive natural communities, until a qualified botanist has surveyed the area and determined the locations of special status plant species present. Per BMP BIO-3, approved herbicides may only be used once site-specific control methods have been developed. 6. If special status plant species are present and maintenance cannot avoid impacts to the species, then a qualified botanist will determine the ecologically appropriate minimization measures for

BMP Number	BMP Title	BMP Description
		the species. Minimization measures may include transplanting, seed collection, or both, depending on the physiology of the species. 7. The District will not conduct maintenance activities that would result in the reduction of a plant species range or compromise the viability of a local population.
BIO-7	Protection of Special-Status Amphibian and Reptile Species	1. A District qualified biologist will conduct a desk audit of the CNDDB, vegetation maps, soils maps, and aerial photos to determine whether suitable special-status amphibian or reptile habitat is present in or adjacent to a maintenance activity. 2. If the District Biologist determines that a special-status amphibian or reptile could occur in the activity area, a qualified biologist will conduct one daytime survey within a 7 day period preceding the onset of maintenance activities. 3. If no special status amphibian or reptile is found within the activity area during a pre-activity survey, the work may proceed. 4. If a special-status amphibian or reptile, or the eggs or larvae of a special status amphibian or reptile, is found within the activity area during a pre-activity survey or during project activities, the qualified biologist shall notify the District's program manager about the special-status species and conduct the following work specific activities: i. For minor maintenance activities and for vegetation removal activities that will take less than 1 day, the qualified biologist shall conduct a special status species survey on the morning of and prior to the scheduled work. A. If no special status species is found, the work may proceed. B. If eggs or tadpoles of a special status species are found, a buffer will be established around the location of the eggs/tadpoles and work may proceed outside of the buffer zone. Work within the buffer zone will be rescheduled until the time that eggs have hatched and/or tadpoles have metamorphosed. C. If an active western pond turtle nest is detected within the activity area, a 25 ft-buffer zone around the nest will be established and maintained during the breeding and nesting season (April 1 – August 31). The buffer zone will remain in place until the young have left the nest, as determined by a qualified biologist. D. If adults or juveniles of a special status species are found, one of the following three procedures will be implemented: i. If, in the opinion of the qualified biologist, capture and removal of the individual to a safe place outside of the work area is less likely to result in adverse effects than leaving the individual in place and rescheduling the

BMP Number	BMP Title	BMP Description
		work (e.g., if the species could potentially hide and be missed during a follow-up survey), the individual will be captured and relocated by a qualified biologist (with USFWS and/or CDFW approval, depending on the listing status of the species in question), and work may proceed. ii. If, in the opinion of the qualified biologist, the individual is likely to leave the work area on its own, and work can be feasibly rescheduled, a buffer will be established around the location of the individual(s) and work may proceed outside of the buffer zone. No work will occur within the buffer zone. Work within the buffer zone will be rescheduled. iii. If, in the opinion of the qualified biologist, adverse effects to the individual cannot be avoided by the previous two options, work will be halted and alternative approaches such as suspending the project or modifying the techniques used will be evaluated. ii. For minor maintenance and vegetation removal activities that will take more than 1 day, the qualified biologist shall conduct a special-status species survey on each morning of and prior to the scheduled work commencing. A. If eggs or tadpoles of a special status species are found, a buffer will be established around the location of the eggs/tadpole and work may proceed outside of the buffer zone. Work within the buffer zone will be rescheduled until the time that eggs have hatched and/or larvae have metamorphosed. B. If an active western pond turtle nest is detected within the activity area, a 25 ft-buffer zone around the nest will be established and maintained during the breeding and nesting season (April 1 – August 31). The buffer zone will remain in place until the young have left the nest, as determined by a qualified biologist. C. If adults or juveniles of a special status species are found, the individual will be captured and relocated by a qualified biologist (with USFWS and/or CDFW approval, depending on the listing status of the species in question), and work may proceed.
BIO-8	Protection of Bat Colonies	1. A District Wildlife Biologist will conduct a desk audit to determine whether suitable habitat (appropriate roost trees or anthropogenic structures) is present for bat colonies within 100 feet of the work site, staging areas, or access routes. 2. If potential bat colony habitat is determined to be present, within two weeks prior to the onset of work activities a qualified biologist will conduct a survey to look for evidence of a bat use. If evidence is observed, or if potential roost sites are present in areas where evidence of bat use

BMP Number	BMP Title	BMP Description
		might not be detectable (such as a tree cavity), an evening survey and/or nocturnal acoustic survey may be necessary to determine if the bat colony is active and to identify the specific location of the bat colony. 3. If an active bat maternity colony is present then the qualified biologist will make the following determinations: a. The work can proceed without unduly disturbing the bat colony. b. There is a need for a buffer zone to prevent disturbance to the bat colony, and implementation of the buffer zone will reduce or eliminate the disturbance to an acceptable level. c. Work cannot proceed without unduly disturbing the bat colony; thus, the work will be postponed until after July 31. 4. If a non-breeding bat hibernaculum is found in a tree or structure that must be removed or physically disturbed, the qualified biologist will consult with CDFW prior to initiating any removal or exclusion activities.
BIO-9	Protection of dusky-footed woodrats	1. If a woodrat nest is identified in a work area, the District will attempt to preserve the nest and maintain an intact dispersal corridor between the house and undisturbed riparian habitat. 2. If the woodrat nest cannot be avoided, a qualified biologist shall deconstruct the nest by hand and relocate the nest materials to the nearest undisturbed suitable riparian habitat.

Cultural Resource BMPs

This group of BMPs are intended to be implemented specifically during ground-disturbing activities, including bank stabilization, sediment removal, and tree removal activities. Implementation of these BMPs will be coordinated by the Stream Maintenance Manager and directed by qualified cultural resource specialists. The review is also directed to review the Cultural Sensitivity Maps included in Appendix A of the SMP Manual.

BMP Number	BMP Title	BMP Description
CUL-1	Review Cultural Sensitivity Maps	During the early phases of the Annual Work Plan development, the District will review the Cultural Sensitivity Maps (Appendix E of the SMP Manual) for all locations where ground-disturbing activities are proposed and would affect native soils beyond the as-built design of a channel or other flood control facility. Based on the location of such projects, BMPs CUL -2 through CUL-4 shall be implemented as follows: ▪ High Sensitivity: BMP CUL-2 and CUL-3 ▪ Moderate Sensitivity: BMP CUL-2 ▪ Low Sensitivity: *BMPs CUL-2 through CUL- 4 not required* ▪ Unknown Sensitivity: BMP CUL-4 BMPs CUL-5 and CUL-6 are applicable to all ground-disturbing projects, no matter the sensitivity level of the project location.
CUL-2	Field Inventory for High or Moderately Sensitive Areas	The District will review the assessor's parcel data maintained by the Napa County Department of Planning, Building, and Environmental Services to determine if there is information about previous cultural resources studies or sites within a project area. If the County's Department of Planning, Building, and Environmental Services data indicate that a project area has not yet been surveyed for cultural resources, the District will contact the California Historical Resources System/Northwest Information Center (CHRIS/NWIC) to determine if any cultural resources studies have been conducted or if cultural sites have been previously recorded within the road maintenance area. If the CHRIS/NWIC data indicate that the project area has previously been surveyed and no cultural resources have been identified, the District can go forward with the project with no additional studies. If the CHRIS/NWIC data indicate that the project area has not been previously studied, or has been studied and cultural resources are present, a cultural resources specialist will conduct a field inventory of the project area to determine the presence/absence of surface cultural materials associated with either prehistoric or historic occupation. The results, along with any mitigation and/or management recommendations, would be presented to the District in an appropriate report format and include any necessary maps, figures, and correspondence with interested parties. A summary table indicating appropriate management actions (e.g., monitoring during construction, presence/absence testing for subsurface resources; data recovery, etc.) will be

BMP Number	BMP Title	BMP Description
		developed for each project site reviewed. The management actions will be implemented onsite to avoid significant impacts to cultural resources.
CUL-3	Construction Monitoring for Highly Sensitive Cultural Areas	The District will retain a qualified archaeologist to be present onsite during any ground disturbing activities within highly sensitive cultural areas (as indicated in the maps of Appendix E). If any cultural resources are discovered during these or any other project activities, the measures developed under BMP CUL-2 or as described for BMP CUL-6 will be implemented as appropriate.
CUL-4	Review of Projects with Native Soil	A cultural resources specialist will conduct a review and evaluation of those sites that would involve disturbance/excavation of soil to determine their potential for affecting significant cultural resources. The evaluation of the potential to disturb cultural resources will be based on an initial review of archival information provided by the CHRIS/NWIC in regard to the project area based on a 0.25-mile search radius. It is recommended that this initial archival review be completed by a professional archaeologist who will be able to view confidential site location data and literature to arrive at a preliminary sensitivity determination. If necessary, a further archival record search and literature review (including a review of the Sacred Lands Inventory of the Native American Heritage Commission); and a field inventory of the project area may be conducted. The results along with any mitigation and/or management recommendations would be presented as described above in BMP CUL-2.
CUL-5	Pre-Maintenance Educational Training	At the beginning of each maintenance season and before conducting ground disturbing stream maintenance activities, all personnel will participate in an educational training session conducted by a qualified cultural resources specialist. This training will include instruction on how to identify historic and prehistoric resources that may be encountered, and the appropriate protocol if any resources are discovered during maintenance work.
CUL-6	Discovery of Cultural Remains or Historic or Paleontological Artifacts	Examples of cultural remains are: obsidian and chert flaked-stone tools (e.g., projectile points, knives, scrapers) or significant areas of tool making debris; culturally darkened soil (“midden”) containing heat-affected rocks, artifacts, or shellfish remains; and stone milling equipment (e.g., mortars, pestles, handstones, or milling slabs); and battered stone tools, such as hammerstones and pitted stones. Historic-period artifacts might include stone, concrete, or adobe footings and walls; filled wells or privies; and deposits of metal, glass, and/or ceramic refuse. Paleontological artifacts include fossilized remains of plant and animals. Work in areas where remains or artifacts are found will be restricted or stopped until proper protocols are met.

BMP Number	BMP Title	BMP Description
		1. Work at the location of the find will halt immediately within 50 feet of the find. A "no work" zone shall be established utilizing appropriate flagging to delineate the boundary of this zone, which shall measure at least 50 feet in all directions from the find. 2. The District shall retain the services of a Consulting Archaeologist or Paleontologist, who shall visit the discovery site as soon as practicable, and perform minor hand-excavation to describe the archaeological or paleontological resources present and assess the amount of disturbance. 3. The Consulting Archaeologist shall provide to the District and the U.S. Army Corps of Engineers (Corps), at a minimum, written and digital-photographic documentation of all observed materials, utilizing the guidelines for evaluating archaeological resources for the California Register of Historic Places (CRHP) and National Register of Historic Places (NRHP). Based on the assessment, the District and Corps shall identify the CEQA and Section 106 cultural-resources compliance procedures to be implemented. 4. If the find appears to not meet the CRHP or NRHP criteria of significance, and the Corps archaeologist concurs with the Consulting Archaeologist's conclusions, construction shall continue while monitored by the Consulting Archaeologist. The authorized maintenance work shall resume at the discovery site only after the District has retained a Consulting Archaeologist to monitor and the Stream Maintenance Manager has received notification from the Corps to continue work. 5. If the find appears significant, avoidance of additional impacts is the preferred alternative. The Consulting Archaeologist shall determine if adverse impacts to the resources can be avoided. 6. When avoidance is not practical (e.g., maintenance activities cannot be deferred or they must be completed to satisfy the SMP objective), the District shall develop an Action Plan and submit it to the Corps within 48 hours of Consulting Archaeologist's evaluation of the discovery. The action Plan may be submitted via e-mail to the Corps at: (holly.n.costa@ usace.army.mil). The Action Plan is synonymous with a data-recovery plan. It shall be prepared in accordance with the current professional standards and State guidelines for reporting the results of the work, and shall describe the services of a Native American Consultant, if the resource is a Native American site, and a proposal for curation of cultural materials recovered from a non-Native American grave context. 7. The recovery effort will be detailed in a report prepared by the archaeologist in accordance with current archaeological standards. Any non-Native American grave artifacts will be placed with an appropriate repository. 8. The Consulting Paleontologist will meet the Society for Vertebrate Paleontology's criteria for a "qualified professional paleontologist" (Society of Vertebrate Paleontology Conformable Impact Mitigation Guidelines Committee 1995).

BMP Number	BMP Title	BMP Description
		9. The paleontologist will follow the Society for Vertebrate Paleontology's guidelines for treatment of the artifact. Treatment may include preparation and recovery of fossil materials for an appropriate museum or university collection, and may include preparation of a report describing the finds. The District will be responsible for ensuring that paleontologist's recommendations are implemented. 10. In the event of discovery of human remains (or the find consists of bones suspected to be human), the field crew supervisor shall take immediate steps to secure and protect such remains from vandalism during periods when work crews are absent.) 11. Immediately notify the Napa County Coroner and provide any information that identifies the remains as Native American. If the remains are determined to be from a prehistoric Native American, or determined to be a Native American from the ethnographic period, the Coroner shall contact the Native American Heritage Commission (NAHC) within 24 hours of being notified of the remains. The NAHC then designates and notifies within 24 hours a Most Likely Descendant (MLD). The MLD has48 hours to consult and provide recommendations for the treatment or disposition, with proper dignity, of the human remains and grave goods. 12. Preservation in situ is the preferred option. Human remains shall be preserved in situ if continuation of the maintenance work, as determined by the Consulting Archaeologist and MLD, will not cause further damage to the remains. The remains and artifacts shall be documented and the find location carefully backfilled (with protective geo-fabric if desirable) and recorded in District project files. 13. Human remains or cultural items exposed during maintenance that cannot be protected from further damage shall be exhumed by the Consulting Archaeologist at the discretion of the MLD and reburied with the concurrence of the MLD in a place mutually agreed upon by all parties.

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Chapter 5
Invasive Plant Management Activities

5.1 Overview

Riverine ecosystems are highly susceptible to invasion by non-native plant species because of their dynamic hydrology and the efficient dispersal of propagules through channels. These rapidly spreading plants can out-compete native plants and reduce habitat values (Bossard et al. 2000). In addition, invasive plants can reduce channel capacity and increase hydraulic roughness, which in turn leads to increased potential for flooding (Bossard et al. 2000). Some species can also reduce bank stability due to their shallow root systems (Bossard et al. 2000). The practice of controlling the population of invasive plants is known as invasive plant management.

This chapter addresses invasive plant management activities conducted as part of the SMP, as well as management of Pierce's disease host plants. Pierce's disease is an infection caused by the bacterium *Xylella fastidiosa* and is spread by insects known as sharpshooters. This disease affects grape vines and has no known cure, and is of major concern to vineyards in the County. Chapters that address other aspects of vegetation management include Chapter 6, *Tree and Vegetation Maintenance Activities*; Chapter 7, *Downed Tree Management*; and Chapter 13, *Mitigation Program*. Invasive plant management practices are adaptive and this manual will be revised periodically to accurately reflect the District's approach and techniques. The District's management of invasive species is based on an adaptive strategy which allows for operational procedures, maintenance activities, and treatment approaches to be updated as new BMPs are developed to minimize potential impacts.

The following sections of this chapter describe more specific invasive plant maintenance activities and provide information on individual invasive plant species, including:

Section 5.2 Maintenance Goals and Triggers

Section 5.3 Herbicide Application Program

Section 5.4 Invasive Species and Pierce's Disease Host Plant Profiles

5.2 Maintenance Goals and Triggers

5.2.1 Maintenance Goals

The primary invasive plant management goals are to:

- ensure adequate flood conveyance capacity is provided,
- enhance instream and riparian ecologic conditions through:
    - reducing and removing exotic and invasive species,
    - encouraging the growth and presence of native vegetation, and

    - managing emergent vegetation in the channel.

- enhance native riparian plant communities and canopy complexity

In most channels, meeting these goals requires balancing flood protection needs with habitat protection or enhancement opportunities. Although it is possible to identify an “ideal” or “target” vegetation configuration, it may not be possible to achieve this condition in all reaches of all channels. As described in Chapter 3, *Environmental Setting*, a range of existing channel vegetation conditions is observed in the program area. Additionally, Figure 13-1 in Chapter 13 illustrates the wide range of riparian vegetation zones that potentially occur in District channels.

5.2.2 Maintenance Triggers

In general, invasive plant management is appropriate when any of the following conditions occur:

- Invasive plant growth is significantly decreasing flood conveyance capacity, particularly where infrastructure or adjacent properties are at risk.
- Invasive non-native plants are reducing the success of native vegetation. Pierce’s disease host plants are spreading in areas adjacent to vineyards.

As described in Chapter 4, Maintenance Principles 1 and 3; and also described in Chapter 14, the District developed channel capacity objectives and invasive species target conditions for individual reaches as a tool to help guide maintenance. These objectives identify when plant growth has significantly reduced conveyance capacity such that maintenance is warranted.

Invasive plant treatment priorities are defined by the following three guidelines per the District’s Aquatic Pesticide Application Plan [APAP], which is provided in Appendix G:

1. Assign highest priority to fastest growing and most disruptive infestations that affect the most highly valued native habitat type(s) within the program area.
2. Consider the difficulties of control, giving higher priority to infestations most likely to be able to be controlled with available technology and resources.
3. Consider species, which are not yet problematic, but could become problematic if they spread throughout the District’s general maintenance area, for priority treatment. The invasive species management program includes regularly monitoring the District’s maintenance area for these species in order to quickly detect and eliminate them if they ever do appear.

5.3 Invasive Plant Management Program

The primary invasive exotic weeds managed in the program area are *Arundo donax*, tamarisk (*tamarix spp.*), scarlet sesbania (*Sesbania punicea*), Perennial pepperweed (*Lepidium latifolium*), and Himalayan blackberry (*Rubus armeniacus* [syn. *Rubus discolor*]). These species rapidly invade stream channels, often growing aggressively to the exclusion of other riparian species. The rapid and voluminous growth of these invasive plants can significantly reduce channel capacity. Additionally, the District manages invasive species which are hosts for Pierce's disease, such as periwinkle (*Vinca major*) and grape (*Vitis* spp.), blackberry (*Rubus armeniacus* [syn. *Rubus discolor*]), English ivy (*Hedera heliz)*, cape ivy (*Delairea odorata*), *Arundo donax*, tree-of-heaven (*Alianthus altissima*), Scotch broom (*Cytisus scoparius*). In general, native plants are avoided, however on occasion it may be necessary to mow large patches of mugwort (*Artemisia douglasiana*) prior to replanting with more desirable native that are not Pierce's Disease hosts. Managing invasive vegetation is a continuous, routine, and on-going activity of the SMP. Additionally, the District employs an adaptive management strategy regarding invasive weeds, which is described in detail in Appendix G. **Table 5-1** summarizes invasive plant removal activities conducted by the District between 2001 and 2015. Where measured, the length or volume of removal activities is also listed in the table.

Management of invasive species is an important ongoing activity to control and minimize environmental impacts from exotic species and encourage the reestablishment and ecological health of native plant species.

Table 5-1. Invasive Plant Management Activities Conducted 2000-2015

Creek or Project Site	Invasive Species Removed	Amount of Work (shown as Linear Feet Removed*, Cubic Yards, or Acres)
Blossom Creek	Arundo	90 lf
Conn Creek	Eucalyptus, Arundo, Blackberry, Vinca	3,000 lf
Dry Creek	Arundo	150 lf
Garnet Creek	Arundo	40 lf
Napa Creek	Arundo	400 lf
Napa River	Arundo	Approx. 40,000 lf
Salvador Creek	Blackberry, Vinca	4,000 lf
Simmons Creek	Arundo	60 lf
Sulphur Creek	Arundo, Tamarisk	200 lf (Arundo), 300 lf (Tamarisk)
Summerbrooke	Blackberry	1,000 lf
Tulocay/Camille Creeks	Blackberry, Fennel, Arundo, Acacia Trees	5,000 lf
Salvador Creek	Blackberry	25 CY
Hopper Creek	Blackberry	10 CY
Napa River (Oakville Cross Rd)	Arundo	3 ac
Milliken Creek	Blackberry	10 CY
Murphy Creek	Blackberry	20 CY

Creek or Project Site	Invasive Species Removed	Amount of Work (shown as Linear Feet Removed*, Cubic Yards, or Acres)
Napa River (Yountville Cross Rd)	Arundo	2.5 ac
Napa River (Pope St.)	Arundo	2 ac
Yountville Collector	Blackberry	6 CY
Camille Creek	Blackberry	20 CY
Witwhether Creek	Blackberry	16 CY
Napa Creek	Blackberry, English Ivy and Cape Ivy	20 CY
Redwood Creek	Blackberry and Cape Ivy	16 CY
Napa River (Lincoln St.)	Arundo and Blackberry	0.5 ac
Lower Browns Valley	Arundo	0.25 ac
Fagan Creek	Blackberry	20 CY
Soscol Creek	Blackberry	50 CY
York Creek	Blackberry	24 CY
Sulphur Creek	Tree of Heaven	15 CY
Wooden Valley Creek	Blackberry	30 CY

5.3.1 Herbicide Application for Invasive Species Control

The safe use of herbicides is an important tool for vegetation management, especially to control invasive and exotic plants. All herbicide applications conducted by the District occur in accordance with label instructions, as well as federal, state, and local regulations. Herbicides may be applied on the top of bank, along the banks of channels and may include targeted spraying and direct application (using a brush on stumps of trees that have been recently cut).

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Targeted spot spraying and hand painting of cut stumps are the primary methods of herbicide application. Wicking may also be used as an application method. Foliar spraying may be conducted to control growth on larger plants such as large stands of pampas grass and Arundo. When using a foliar spray, the District will typically cut the vegetation in the early summer and conduct the foliar spray to regrowth in the early fall. Herbicide application is conducted when the climate is dry (between June 15 and November 15), wind is not above 5-10 mph, and no rain is forecast for the next 24 hours. Glyphosate (trade name: Roundup® and Rodeo®) is typically used for control of invasive and exotic plants. Imazapyr (trade names: Arsenal®, Chopper®, and Stalker®) is infrequently used throughout the watershed. The District uses glyphosate and imazapyr for both terrestrial and aquatic herbicide applications. Glyphosate (such as Rodeo®) may be used along the top of stream banks and access roads in American Canyon and along County road facilities; no herbicides are used to control submerged or emergent vegetation. Herbicides are used on a site by site basis and only when necessary, such as when hand and mechanical methods are unsuccessful. The District typically applies herbicide during 8 non-consecutive weeks between June and October. The District uses an average of 25 gallons of herbicide (with active ingredient glyphosate) on an average of 30 acres in a given year. In American Canyon, a maximum monthly average of 5-8 gallons of herbicide (with active ingredient glyphosate) is used on over 3 to 5 acres annually. The District does not exceed the maximum allowable application rate according to the label of herbicide product used. For example, the maximum allowable application rate of Roundup Pro Concentrate is 2.125 gallons (8 pounds of glyphosate acid) per 1 acre per year.

An APAP has been prepared for in-channel use of herbicide and is included as Appendix G. The APAP outlines target invasive species, aquatic application procedures, monitoring protocols and BMPs for herbicide application. Once an invasive plant management area is identified, actions taken include prevention, mechanical removal, grazing, herbicide application or no action. Monitoring protocols to determine the presence of any residual aquatic herbicides are provided in Appendix G.

Arundo control is a major invasive plant management goal for the District. Eradication of this species in the Napa River Watershed is possible, as it has not yet reached a high level of infestation. The District has prepared an Arundo Restoration Plan which covers past and current treatment approaches, as well as riparian enhancement and mitigation following Arundo treatment (Napa County Flood Control & Water Conservation District 2015). This plan is provided in Appendix H. The District's Arundo management program is based on an adaptive management strategy which allows for operational procedures, maintenance activities, and treatment approaches to be updated as new BMPs are developed to minimize potential impacts. Arundo management is covered under a CDFW permit for invasive species management. The following three paragraphs are modified from the Arundo Restoration Plan.

The first step in the Arundo removal process is to cut the plant at the base in early summer using a chainsaw or flail mower and then the biomass is chipped along the top of the bank. The District then contracts with a licensed pesticide applicator to carry out the initial round of herbicide treatment in late September through early October using Glyphosate (2-5%), a non-ionic surfactant, and blue marker dye. Applicators only apply herbicide to the new growth and use a targeted application procedure. Annual monitoring of each site is carried out for the following two to three maintenance seasons, to determine if the infestation requires follow up herbicide treatments.

Once the District determines that the infestation has been completely controlled, a riparian enhancement strategy is developed. The riparian enhancement strategy includes identifying areas that require erosion control BMP's and/or are suitable revegetation sites. The first stage includes spreading native grass and wildflower seed and/or the placement of woodchips or rice hay along the bank. The second step is to identify suitable revegetation areas and determine if there is a point of connection for irrigation or if an alternative watering system is required. In suitable revegetation areas, the District will choose appropriate native plants from the riparian plant palette (Table 13-2). Plant selection is based on site conditions. The objective is to create a multi-layered riparian canopy that enhances the complexity and diversity of the riparian structure to improve channel shading and create a functional understory that can compete with other non-natives. This process is further described in Chapter 13, *Mitigation Program*.

Once the Arundo has been successfully removed from a site and riparian enhancement efforts have been carried out, the District will continue to monitor plant survivorship, irrigation systems, and re-growth for five years. Ongoing maintenance of treatment sites is critical and may include management of other non-natives, mulching to improve soil structure and water holding capacity, and installation of additional plants to mimic the natural successional development of the riparian structure.

5.4 Invasive Species and Pierce's Disease Host Plant Profiles

In the paragraphs below, summary species profiles for the primary invasive, exotic, and Pierce's disease host plants managed by the District are presented along with stream management considerations and approaches. Other invasive species, such as yellow star thistle, are also managed by the District. Management approaches for control of other species are the same as those described below.

***Arundo donax* removal by California Conservation Corps team**

Arundo donax, also known as giant reed or Arundo, is a bamboo-like plant targeted by the District as a priority weed. This species reproduces vegetatively and does not produce viable seed. When established within stream channels and floodplains, Arundo can quickly reduce conveyance capacity, increase hydraulic roughness, and increase the flood risk. The plant's shallow roots encourage mobility in high flow events. Dislodged Arundo pieces move downstream, often plugging culverts or creating debris blockages at bridge crossings. Upon settling, Arundo will rapidly colonize at its new downstream location. In this manner, entire streams systems have been invaded in a relatively short time period. The dense lower stalks and root masses of Arundo are also effective at trapping fine sediment, whereby a positive feedback process occurs. Arundo settles, traps fine sediment, the channel bed elevates, more Arundo colonizes, more sediment is trapped, and so on. Arundo favors stream beds and banks in full sun conditions. Developing a native riparian canopy that can shade the channel is a long-term strategy to reduce Arundo presence.

The District's approach to managing Arundo is to target removal activities by sub-watershed, beginning in upstream areas and eradicating Arundo colonies progressively downstream through each sub-watershed. Because infestations are mostly located on private property, the District's program includes significant outreach to landowners to gain permission to conduct treatments and follow-on revegetation activities. The District's control methods are described in Section 5.3. Annual monitoring is conducted, and follow-up herbicide application is conducted if needed. Following Arundo control, a riparian enhancement strategy is developed and carried out, as described in Chapter 13, Mitigation Program. **Tamarisk**, like Arundo, is a highly invasive plant that can rapidly reduce channel capacity, increase channel roughness, and thereby increase the flood risk. Currently, tamarisk is less common than Arundo in the Napa River watershed. However, conditions are favorable for Tamarisk presence to increase. Tamarisk is also known to occur in channels throughout American Canyon. To minimize the spread of Tamarisk, each occurrence of the plant is eradicated as found. In general, the eradication methods are the same as described above for Arundo including a standard herbicide mix of glyphosate, a non-ionic surfactant, and ammonium sulfate. Future treatment techniques for Tamarisk may vary as more effective treatment methods are developed. The District does not currently manage Tamarisk outside of the Napa River Watershed, but future management in other watersheds could occur under the CDFW permit for invasive species management.

Tamarisk removal

Pampas Grass (*Cortaderia selloana*) favors dunes, bluffs, coastal shrublands and marshes, inland riparian areas, and disturbed areas. It was introduced as an ornamental plant and for erosion control. Each plume produces up to 100,000 seeds that are widely dispersed by wind and develop without fertilization. Pampas grass quickly colonizes bare ground, but establishment is generally poor where the seedlings must compete with other grasses or sedges. This species is found throughout channels in American Canyon.

Pampas grass is eradicated by either targeted spot spraying or hand painting of cut stumps. Foliar spraying may be conducted to control growth on larger plants such as exotic trees or large stands of pampas grass.

Scarlet Sesbania

Scarlet sesbania, or red sesbania, is a popular landscape plant that has recently been discovered in riparian areas in the Napa Valley. Sesbania has the potential to dominate native riparian vegetation, a problem that has occurred in the Central Valley. The District eradicates sesbania whenever the plant is encountered. The eradication methods for sesbania generally involve pulling individual plants by hand or with weed wrenches but in cases of large infestations cutting stalks and painting each stalk-stump by hand with a 50% diluted concentration of glyphosate is preferred.

Himalayan Blackberry is commonly found in reaches throughout the County with little to no riparian canopy. This species generally grows from the bank slope, particularly near (or at) the toe-of-slope and can grow into and across the channel bed quickly, often within a single season. This species is a host for the bacterium that causes Pierce’s disease. Exotic blackberry vines are generally removed by hand or mechanically removed using a bladed weed-eater, or an excavator or Bobcat® with a flail mower attachment. Blackberry stems ("canes") are then raked together, picked up, and removed from the site using a dump truck. If a mechanical technique is used such as a flail mower or other chopping machine, efforts to remove all slash, sawdust, cuttings, etc. will be taken to leave the site free of vegetative debris. Remaining cut canes will then be painted with an herbicide (generally glyphosate) to control re-growth. The development of a canopy encouraged by tree planting also helps to reduce the re-growth of blackberries.

Ludwigia in Yountville Outfall

Water primrose (*Ludwigia peploides montevidensis*) is an invasive, exotic, aquatic weed which appears to be spreading on the west coast as well as nationally. The species occurs in tributaries to the Napa River, including Salvador Creek. It is also known to occur in City of American Canyon channels particularly at downstream bridge supports where it can quickly grow and fill up channels. Generally, winter streamflow rises above the Ludwigia patches or flushes the plants downstream. In most cases, Ludwigia patches are not problematic in conveying flood flows. However, accumulated Ludwigia is known to collect at downstream bridge piers where it can quickly grow, completely fill channels (as shown in the photo), and create flow blockages. Ludwigia also provides some beneficial functions similar to the native species (*Ludwigia peploides peploides*) including, bank toe stabilization, nutrient exchange and uptake, and cover for young fish and amphibians. While these functions may not be enough to support presence of Ludwigia in District flood control channels, it does provide sound reasoning for leaving it in a channel if there is no other emergent cover, or where the degree of Ludwigia present does not create a flow blockage.

Mechanical removal is the primary method to control Ludwigia and is generally conducted using a long-reach excavator from maintenance roads adjacent to the project site channel. Where the channel is too wide, the excavator may occasionally travel partially down the bank in areas that will not impact existing native and riparian vegetation. The excavator will work from the mid-bank position, thus reducing the need for multiple trips along the bank slope by smaller equipment. The District anticipates the need to periodically manage Ludwigia between June 15th and October 31st.

Debris generated from invasive plant management activities are either left on site to decay and redistribute nutrients into the soil or, if plant and root clippings remain viable for regrowth, the debris it taken to the local landfill for disposal.

Perennial pepperweed (*Lepidium latifolium*) is perennial noxious weed that typically grows in moist and seasonally wet areas, and can tolerate saline and alkaline conditions. It can form dense stands that exclude native vegetation. This species reproduces both vegetatively (by creeping roots and root fragments) and by seed. Plants are multiple stemmed and grow stiffly erect masses up to 5 feet in height. The leaves are lanceolate, bright green to gray green, and entire or toothed. Basal leaves are stalked, up to 1-foot long and 3 inches wide and have serrate margins. Flowering occurs from early summer to fall. The above-ground portions of the plant typically die back in late fall and winter. This species is typically treated with a foliar spray such as Imazapyr in the spring when new growth is exhibited.

Periwinkle (*Vinca major*) is an herbaceous, invasive vine that also is a host for Pierce's disease. It is a low growing and rapidly spreading ground cover that can out-compete native plants. Unlikely many invasive species, periwinkle is highly shade tolerant and can become established in areas with heavily closed canopies. Periwinkle is easily removed using hand tools such as hoes and shovels. When performing hand removal, it is important that all portions of the roots and shoots be removed as periwinkle will actively root from these leftover stems. Chemical treatment options are available such as foliar spraying with Rodeo®, but based on the shallow rooting nature of the plant, hand removal is likely the best method unless large swaths of the plant have become established.

Grape (*Vitis* spp.) vines from adjacent vineyards, and hybrids with native grape (*Vitis californica*), have become established within several portions of the program area. Grapes are hosts for Pierce's disease. Additionally, these rapidly growing vines can climb vegetation and outcompete them for light, slowly causing the decline and death of native canopy trees. Grape vines can become quite woody and difficult to cut without power tools. In addition, their roots can grow extremely deep and the plants regenerate rapidly when the growing shoots are cut. A combination of mechanical and chemical control methods is an effective method for controlling grape vines.

Tree of Heaven (*Ailanthus altissima*) is an invasive tree that spreads both by seed and by sprouts and can form dense stands, particularly in riparian zones. This species forms many root suckers when cut, which can complicate management efforts (Hunter 2000). Cutting the tree and immediately applying full strength (41 percent) glyphosate to the stump is thought to be the most effective method for killing the tree and eliminating root suckering (Hunter 2000). Seedlings may be pulled up by hand, ensuring the root is removed.

English Ivy (*Hedera helix*) and **Cape Ivy** (*Delairea odorata*) are invasive vines that are also hosts of Pierce's Disease. English ivy spreads by rhizomes and seed, while cape ivy reproduces only vegetatively in California (Watershed Project and Cal-IPC 2004). These plants can form dense mats which exclude native vegetation. Hand-removal of these species is appropriate. For cape ivy, all fragments of the plant should be removed, as this plant can easily resprout from stem or root fragments. For ivy that is growing into trees, the vine can be cut and the stump treated with herbicide to prevent resprouting (Watershed Project and Cal-IPC 2004).

California Blackberry (*Rubus ursinus*) is a native vine that is a host for Pierce's Disease. This plant is less aggressive than Himalayan blackberry, but grows in similar conditions and can be treated similarly. Where California Blackberry is removed, the District aims to revegetate the area with a native plant species that is not a Pierce's disease host.

Mugwort (*Artemisia douglasiana*) is a native herbaceous plant that is a common breeding host of the bluegreen sharpshooter (the vector for Pierce's disease), and can support *Xylella fastidiosa*. This species can be removed manually or may be mowed, and the area replanted with native species that are not Pierce's disease hosts.

Mulefat (*Baccharis salicifolia*) is a native shrub that is a host plant for *X. fastidiosa*. This species can be removed manually.

Blue Elderberry (*Sambucus nigra* ssp. *caerulea*) is a host for *X. fastidiosa* and is a breeding host of bluegreen and glassywinged sharpshooters. This species is not actively removed from riparian areas, but it generally should not be planted in sites adjacent to vineyards.

5.5 Napa River/Napa Creek Flood Protection Project Invasive Plant Management

The Flood Control Project area covers a 6.7-mile reach of the Napa River from Trancas Street in the city of Napa to State Route 29 (upstream to downstream, respectively), including an area solely for the purposes of habitat restoration known as the South Wetland Opportunity Area (SWOA) or Flowage Easement Area, and encompasses over 1,400 acres of land (see Figure 1-7). The SWOA consists of intertidal marshes and sloughs, open mudflats, seasonal wetlands, and alluvial flood plains. Pursuant to the Project's USFWS Biological Opinion, the District is responsible for controlling invasive plants within the SWOA. The District has developed an Invasive Plant Control Plan for the Flood Protection Project which includes a schedule for annual spring identification and mapping surveys, prioritization of treatment areas by species, and control options, which is consistent with inventory and control methods outlined by the California Invasive Plant Council. A typical invasive plant treatment area would be within the higher zones of the intertidal marsh. Target species are mapped within this zone and maintenance actions are prioritized based on the severity of invasive plant infestation. Invasive plant species prevalent in the Flood Protection Project area and SWOA include perennial pepperweed, yellow star-thistle, fennel and giant reed.

Managing perennial pepperweed is a high priority, particularly in wetland and brackish marsh areas within the Flood Protection Project area. Perennial pepperweed is scattered throughout seasonal wetland and wrack lines of brackish marsh areas within the Flood Control Project area and may interfere with primary habitat management and restoration goals.

In general, it is assumed that populations are established and spreading, and complete eradication is impossible. However, it is possible to control its spread with annual herbicide treatment, re-vegetation, and monitoring.

Other priority invasive plant species that are managed throughout the Napa Flood Protection Project area include giant reed, purple loosestrife (*Lythrum salicaria*), tree of heaven, smooth cordgrass (*Spartina alterniflora*), and fennel (*Foeniculum vulgare*) (USACE 2016). Growth of these species are controlled such that individual patches of these species are no larger than 100 square feet, and the total cover of these species is less than 1-percent throughout the Project area and the SWOA (USACE, April 2018).

Chapter 6
TREE AND VEGETATION MAINTENANCE ACTIVITIES

6.1 Overview

Tree and vegetation maintenance refers to the selective trimming, thinning, and removal of trees and vegetation that increase the flood risk or are a flood hazard. The District's routine tree and vegetation maintenance activities include trimming, thinning, or removing trees and vegetation debris that cause flow blockages, direct flows erosively into streambanks or facilities, or significantly increase hydraulic roughness and thereby reduce channel conveyance capacity. The District conducts vegetation maintenance activities within District managed and owned easements and channels in addition to several project features of the Napa River/Napa Creek Flood Protection Project (Flood Protection Project) and within American Canyon's channels respectively, on an as-needed basis. Maintenance activities also include planting trees, shrubs, and grasses in District maintained channels. See Chapter 9, *Sediment and Debris Removal Activities,* for discussion about sediment and vegetation removal activities conducted at detention basins. See Chapter 13, *Mitigation Program,* for a discussion of revegetation activities. This chapter describes the District's techniques and procedures for tree and vegetation maintenance. Chapter 7, *Downed Tree Management,* describes maintenance activities specifically related to downed trees within stream channels.

The types of tree maintenance activities are relatively consistent from year to year, though the work locations change. Years that experience high flows, flooding or strong winds may require additional work to clear downed trees or vegetation debris (see maintenance discussion in Chapter 7). Conversely, tree maintenance needs following dry or drought years are generally reduced. Some channels may require annual tree maintenance while others do not. This largely depends on the type of trees in and adjacent to the channel. For example, channels characterized by early seral cattails or young willows may need annual pruning while channels with a later seral mature riparian canopy (especially on the upper bank) generally require less branch thinning and tree removal to maintain flow capacity.

Tree maintenance techniques include hand removal using hand-held tools and equipment, mechanical removal using heavier equipment, and herbicide application. The District uses hand-held tools to prune trees and vegetation to maintain flow capacity. Impacts to channel banks and stream beds can be minimized through the use of larger equipment staged along the top of bank, versus inside the channel; or brought inside channel through a defined access route to facilitate the removal of larger vegetative materials. The use of larger equipment for tree removal includes using track mowers, winches, rubber-tracked skid steer equipped with a flail mower, or an excavator staged along the top of bank or a crane staged outside the riparian area. Additionally, arboricultural tree rigging methods are often utilized to minimize disturbances to surrounding vegetation and streambanks. The tree rigging techniques are customized according to project needs and can be combined with the use of the equipment described above.

Tree maintenance activities vary depending on the type of stream channel or facility involved. While the methods described in this Manual are the common practices of the District, maintenance techniques may shift over time and by location depending on site constraints and new techniques. As discussed in Chapter 1 and again in Chapter 14, *Program Management*, maintenance practices are adaptive and this Manual will be revised periodically to accurately reflect the District's most current maintenance approach and techniques.

The following sections of this chapter describe more specific tree and vegetation maintenance activities, including:

Section 6.2 Maintenance Goals and Triggers

Section 6.3 Tree Pruning and Management

Section 6.4 Tree Removal and Relocation

Section 6.5 Vegetation Management

6.2 Maintenance Goals and Triggers

6.2.1 Maintenance Goals

The primary tree and vegetation maintenance goals are to:

- ensure that adequate flood conveyance capacity is provided,
- minimize flow obstructions,
- maintain stable streambank conditions, and where possible
- enhance instream ecologic conditions through:
  - encouraging the growth and presence of native vegetation,
  - developing a mature and complex riparian canopy of native species,
  - managing and enhancing bank vegetation to improve streambank stability,
  - managing emergent vegetation in the channel, and
  - preserving large woody material along channel edges.

In most channels, meeting these goals requires balancing flood protection needs with habitat protection or enhancement opportunities. Although it is possible to identify an "ideal" or "target" vegetation configuration, it may not be possible to achieve this condition in all reaches of all channels at all times. As described in Chapter 3, *Environmental Setting*, a range of existing channel vegetation conditions is observed in the program area. Additionally, Figure 13-1 in Chapter 13 illustrates the wide range of riparian vegetation zones that potentially occur in SMP channels. The overall goal is to move the existing channel condition towards the target condition over time.

6.2.2 Maintenance Triggers

In general, tree and vegetation maintenance is appropriate when any of the following conditions occur:

- Tree and vegetation growth is significantly decreasing flood conveyance capacity, particularly where infrastructure or adjacent properties are at risk.

- Tree and vegetation growth is creating a significant flow obstruction or is directing (or diverting) flows erosively into a streambank or other facility.

- Tree and vegetation growth obstructs access to channels and facilities or threatens District facilities or neighboring property.

- Invasive nonnative trees and/or plants are reducing the success of native vegetation,

- Tree damage from wildlife (beavers) or flood debris has compromised the stability of the tree and is causing a potential hazard,

- Tree and vegetation maintenance offers good opportunities to improve habitat value for fish and wildlife.

As described in Chapter 4, Maintenance Principles 1 and 3, and described in Chapter 14, the District has developed channel capacity objectives and vegetation target conditions for individual reaches (Appendix F). The District has identified roughness objectives for District owned flood control easements, when tree and vegetation growth has significantly reduced conveyance capacity and is exceeding the tolerance for loss of freeboard and maintenance is warranted.

The decision to remove, thin, prune, or preserve individual trees will be made in the field by District field staff familiar with Napa County and regional vegetation and riparian ecology. Consideration for individual tree removal or thinning will be based on several factors including:

- What is the degree of blockage across the channel and where is the tree located in the channel? Are there better trees to preserve? Are there any natives nearby that could replace the function of the tree in question in the next year?

- What is the type and age of the tree? Are there a lot of these trees already in the channel reach? Are there better trees to preserve?

- Is the tree (or trees) posing a flood hazard or public safety concern?

- Can the individual tree be pruned or thinned (before consideration of removal) to provide the necessary conveyance capacity?

- Does the tree under consideration provide shade or other habitat benefits?

- Does the tree under question provide longer-term canopy development or riparian corridor benefits?

The rationale to either thin, prune, or remove trees will be based on addressing these questions above. Answering these questions requires the oversight and guidance of a stream manager that is familiar with the Program Area’s vegetation and knowledgeable of channel botanical conditions.

6.3 Tree Pruning and Management

6.3.1 Considerations and Rationale for Pruning

The District seeks to develop and preserve healthy native riparian vegetation along stream courses to the degree allowable considering potential flooding and erosion threats. The District is promoting the development of mature complex riparian corridors which function to intercept rain water buffering peak flows and stabilizing streambanks. Prior to any tree management activities, several issues are considered to minimize potential effects and to improve maintenance results.

The rationale to either thin, prune, or remove trees is based on addressing the maintenance trigger questions presented in Section 6.2 above. Answering these questions requires the oversight and guidance of a biologist or arborist that is familiar with the vegetation in the area and is knowledgeable of channel botanical conditions. The degree or standard of pruning will be targeted to support channel capacity and vegetation objectives. The District has refined tree maintenance methods to ensure that disturbances to surrounding vegetation and streambanks are minimized. The goal is to maintain channel roughness objectives, while enhancing the diversity and complexity of the native riparian vegetation communities.

See Chapter 7 for a discussion of management of downed trees.

6.3.2 Managing Trees for Their Channel Function

In general, all types of trees (native or non-native) are managed according to their location and role in the channel. The following paragraphs describe maintenance priorities for specific zones in the channel cross section.

1) **Upper Bank Zone**: in general, native trees located on the upper banks are retained unless they are a fall or safety hazard, have already fallen, are creating erosional or flow deflecting problems, or present a channel access issue. Depending on the level of invasiveness of a particular species, select non-native trees may be managed on a case by case basis in the upper bank zone, depending upon the health of the tree, its contribution to the riparian corridor, and what else is growing nearby (based on the approach described in Chapter 4).

2) **Mid Bank Zone**: in general, native trees and shrubs located on the side banks in the mid bank zone are retained unless they are causing significant debris accumulation, causing bank erosion or scour through tree falling or deflecting flows, presenting a fall hazard, or are limiting access. Often naturally recruited native shrubs are retained in this zone but are not actively planted. Similar to the upper bank zone, in the mid bank zone, moderately acceptable non-native species are managed on a case by case basis, based on an evaluation of the health of the tree, its contribution to the riparian corridor, and what else is growing nearby (based on the approach described in Chapter 4).

Photo depicting mid bank, lower bank, and instream zones.

3) **Lower Bank Zone (toe of bank)**: in general, native and moderately acceptable non-native trees located at the toe and on the side bank are retained unless the following conditions occur:

   - the tree is growing excessively horizontal, blocking flows, and cannot be pruned or trained into a more upright posture to convey flows;
   - the tree is trapping significant debris or sediment (defined as a deposit greater than 2 ft deep or covering more than 100 sq ft of the lower bank or instream channel zone);
   - the tree is directing or diverting flows to cause bank erosion or scour; or
   - the tree is presenting a considerable public safety or fall hazard.

4) **Instream Zone**: trees are targeted for thinning and removal when:

   - an aggressive stand of willow is developing and significantly constricting channel capacity (based on the vegetation assessment described in Chapter 3);
   - the instream tree is demonstrated to catch significant debris; or
   - the instream tree is causing excessive bank scour.

   Exceptions to this thinning and removal approach for the instream zone include:

   - when instream trees cause no evidence of bank scour and minimal debris accumulation.
   - when single trunk trees or readily prunable trees occur, such as willows, alder, Fremont cottonwood, and Oregon ash. These species are generally retained in the channel, especially if they provide significant shade or promote instream habitat that is not destabilizing the tree itself or the bank zone.
   - when the channel has enough capacity to allow trees well-spaced and upright to establish and mature in the channel.

Across these channel zones, mature, healthy, native trees are generally only removed if channel capacity is significantly limited or if the tree is causing erosion or creating unacceptably high hydraulic roughness in the channel and the situation cannot be rectified though limbing or pruning. The rationale for removing a native tree is based on the pre-maintenance survey and the presence of the triggering conditions described in Chapter 4.

6.3.3 Tree Pruning Methods

Maintenance activities related to tree pruning focus on selectively thinning brush and multi-trunked trees. The preferred maintenance approach is to prune lower limbs up to the top of the channel banks, if possible. Multi-stemmed trees are pruned down to fewer trunks and lower limbs are removed up to the top of the channel banks, if possible. The goal of this maintenance approach is to develop a native canopy over the channel but not to increase channel roughness such that the flood hazard is increased. This pruning technique helps alleviate flood hazards while maintaining a healthy portion of the tree canopy.

In the top-of-bank area outside the stream channel (including the access road and adjacent above channel area), healthy mature native trees are trimmed if a limb is blocking the access road, hanging over a fence into a private yard, appears unbalanced or broken, or to maintain appropriate spacing for access (targeted ideal spacing). Enough space will be maintained along the access road to allow maintenance and emergency vehicles.

Tree pruning considers the structure of local riparian canopy and tree growth characteristics. For example, if the active channel is fully shaded by early seral arroyo willow, the complete removal of which would expose the channel to direct sunlight, pruning and thinning techniques, such as allowing a narrow strip of vegetation to persist on the sides of the banks to shade the channel, will be used. This process is repeated for each tree assessed for removal. Vegetation removal may be phased to reduce potential impacts of reducing channel shade. The reach will also be identified for planting of more desirable trees the following planting season.

Pruning on the bank side slopes usually requires careful hand clearing using chainsaws, pole saws, pruners, and loppers. Hand clearing may also be used at the top-of-bank to remove hazard trees (e.g., snags, dying or dead trees, broken branches) from areas with high public use or that are adjacent to residences or other structures. Tree pruning methods may include placing a pulley and load line in the top of an adjacent tree to allow for the pruned limbs to be slowly brought down, which helps to minimize disturbances to surrounding trees and understory vegetation. Larger equipment such as sky tracks are sometimes utilized to assist with the removal of larger sections of trees; this method allows crews to lift large sections or limbs off the bank with little disturbance to streambanks. The use of larger equipment and tree rigging methods helps minimize impacts to streambanks and surrounding vegetation.

6.3.4 Willow Pruning and Removal

Willows are perhaps the most common channel vegetation type throughout the program area. Willows generally grow from the lower bank slope (near or at the toe-of-slope) and can grow into and across the channel bed quickly, often within a single season. Arroyo and sandbar willows are the most prominent vegetation maintenance issue due to their rapid growth (over 1.5 inches in diameter per year) and the bushy structure of the plant which is effective at slowing flows and trapping debris. White alder, big leaf maple, Oregon ash, red and Pacific willow species are better suited to flood control channels because they generally form a single main trunk that can be limbed up and pruned so as not to extensively block the channel cross section. The rapid growth, multi-stemmed base, and bushy nature of arroyo and sand bar willows generally prevent this type of management approach, though in some cases (especially where arroyo willow is the dominant tree along a stretch of channel), these trees are being managed toward a more upright stature. In general, arroyo willow pruning to form an upright tree requires considerably more management effort since the form of the tree is not naturally upright and the attempt is working against the central tendency of the tree. Species like red, yellow, and Pacific willow are retained where they do not present issues for flows or roughness, or where possible, are transplanted when feasible.

Salvador Creek before willow pruning

The District generally conducts willow removal from June 15th to October 31st. Arroyo willows are removed wherever they are significantly impeding flows and reducing the channel conveyance capacity. If arroyo willows are not removed (in cases where the canopy is needed and channel integrity is not at risk), they are pruned to minimize their ability to catch debris and impede the flow of water. Red and yellow willows are generally retained but pruned to reduce the number of branches and trunks below the top of the channel banks.

Willow removal generally requires hand clearing using chainsaws, pole saws, pruners, and loppers. Willow stumps may be hand treated with an herbicide such as glyphosate to prevent future growth. Cut vegetation must then be removed from the channel. This is achieved using a variety of methods including hand removal (passing branches up the slope), attaching a line to the cut limbs and pulling them up the slope with the aid of an excavator arm, using an excavator reaching into the channel from top-of-bank, by angled pulls using a line, or using a winch on a truck or tractor.

Salvador Creek after willow pruning

In cases where arroyo willow root wads protrude from the channel bottom after limbs have been pruned, these are generally left in place but depending on the channel size and geometry, the root wad may require removal to reduce roughness on the channel bed. See Chapter 7 for further details on large woody debris management.

Tree debris from pruning and removal activities is either chipped and left onsite for landowners to use as mulching material, or chipped and hauled to the Napa Recycling and Waste Service Center for re-use and resale in their composting program.

6.4 Tree Removal and Relocation

Mature, healthy, native and non-native trees may be removed if channel capacity is significantly limited, the tree is causing a significant streambank erosion issue, or if the tree is creating unacceptably high hydraulic roughness in the channel and the situation cannot be rectified through limbing or pruning. The rationale for removing a mature tree is based on the pre-maintenance survey and the presence of the triggering conditions described above. The location of the channel and the channel type will also influence any decisions regarding tree removal, with a much higher sensitivity and reluctance to remove trees in non-engineered channel locations in non-urban areas.

In addition, as part of the District's inspection of Flood Protection Project features, new tree growth on dikes and levees will be monitored. Trees, including their roots, will be removed from the dike and levee sideslopes (landside toe and 15 feet from the waterside toe). After removal, the voids will be filled by placing levee fill material in 6-inch lifts and compacting.

Sick or dying mature trees may be removed if they reduce channel capacity, increase roughness, are prone to falling, or present a potential safety hazard to recreational users (where publicly accessible) or adjacent structures. On-site, District stream managers will evaluate tree health, channel capacity, and potential hazard conditions and decide upon the proper course of tree thinning, pruning, or removal. A tree is considered a hazard if in the professional judgment of District stream managers (based on previous experience) the tree has a high likelihood to fall within the coming year (due to storm, high wind, natural decay, or other causes) and the falling of that tree would pose a direct hazard to people, roads, infrastructure, or other facilities.

Tree snags will be left in place to provide habitat for birds and small mammals if the snags do not otherwise pose a flood or safety hazard. Sick, dying, or dead trees and snags may also be pruned to reduce the flood and/or safety hazard while also providing habitat. Dead or dying trees, or other trees that pose a risk of falling, that do not pose a threat to people, roads, infrastructure, or other facilities will be evaluated for their preservation on-site. This topic of downed tree management is the subject of Chapter 7.

Tree removal techniques use hand-held tools and occasional use of heavier mechanical equipment. Removed trees are chipped for mulch and either left onsite or taken to the Napa Recycling and Waste Service Center for composting. As described above in Chapter 4, if a standing tree must be removed due to the presence of hazard conditions during the March 1 to August 15 period, then a nesting bird survey would be conducted by a qualified biologist according to standard BMP protocols to avoid any potential impact to nesting birds. Results of any nesting bird survey would be included in the annual summary maintenance report.

6.4.1 Tree Relocation Opportunities

Native trees selected for removal will be evaluated for potential relocation to other channel sites. Desirable trees for relocation will typically have a single trunk, straight vertical orientation, and good long-term potential to provide riparian canopy. Target species for relocation include alders, red willow, or Pacific willow. The relocation site will be evaluated for channel roughness, existing flow conveyance, and erosion/sedimentation conditions to ensure that the introduced tree will not cause any increased flood threat. The tree removal process will preserve the tree's root structure, include pruning to compensate for root damage, and provide immediate planting and irrigation at the new site. The vacated tree site will be treated like a bank stabilization project, using bioengineered techniques (described in Chapter 7) to back fill and stabilize the excavated root zone. Some trees, like large red or Pacific willows can be cut into large sprigs and planted at other toe-of-bank or mid-bank sites using an auger. Spring planting can reduce the need for full-scale tree removal and replanting. Non-native trees will not be considered for relocation; however, upon their removal the excavated root zone will also be treated and repaired. Also see discussion of downed tree management in Chapter 7.

6.5 Cattail Management

Cattails

Cattails are commonly (but not necessarily) found in reaches with little to no riparian canopy. Cattails generally establish in low-gradient channels in areas of slow-moving or stagnant flow. Finer sediments naturally settle out in these locations, but further sedimentation is encouraged by cattails which trap sediment and further reduce flow velocities. Cattails are often the climax community (the final stage in ecological succession) developed in channels in need of sediment removal. In the photo (right), cattails have established within a portion of the channel bed. When this growth expires at the end of the dry season, dead plant matter can settle and redirect flows to the opposite side of the channel, which can lead to bank erosion if not managed.

Cattails are generally removed using bladed weed-eaters. In areas where mature trees do not prohibit access, heavy equipment, such as an excavator with a flail mower extension positioned at top-of-bank, may be used. This approach to cattail management is a shorter-term solution as cattails readily grow back. Cattail removal may also be combined with sediment removal. In such cases, the channel is cleared of both sediment and cattails using methods described in Chapter 9 in order to restore channel capacity. This approach includes removal of cattail roots along with the sediment and can successfully reduce cattail re-growth for several years. Over the long-term, cattail growth is further discouraged by the development of a canopy over the channel and strategic planting of cattail competitors. The District anticipates the need to periodically manage cattails between June 15th and October 31st.

6.6 Other Vegetation Management Activities Associated with the Napa River / Napa Creek Flood Protection Project

Within the Flood Protection Project area, the District is responsible for inspecting and maintaining vegetation that establishes on project features including the marsh and floodplain terrace, Napa Creek, Flowage Easement Area, inlet and outlet of the dry bypass, and biotechnical bank stabilization areas (Figure 1-7). The following paragraphs summarize vegetation maintenance activities that occur at these features. Additional information can be found in the *Operations, Maintenance, Repair, Replacement and Rehabilitation Manual for the Napa River / Napa Creek Flood Protection Project* (USACE, April 2018), which is incorporated by reference.

6.6.1 Marsh and Floodplain Terrace

Vegetation on the floodplain terrace is closely monitored to ensure that flow conveyance is not significantly reduced. This feature should be restricted to native grasses/shrubs (i.e., coyote brush) with occasional trees, although native shrubs and trees should not establish on the slope of the interface of the marsh plain terrace and the floodplain terrace at a distance of 30 feet perpendicular inland. Other vegetation maintenance activities that occur within this area include thinning of non-native plants and mowing along an access road that runs the length of the floodplain terrace to provide a buffer between areas supporting pickleweed.

Within the marshplain terrace, vegetation conditions are monitored and compared to design vegetated conditions after storm events that bring the river stage elevation to 12 feet NAVD 88 or greater and once per year in March. The need for additional plantings are determined based on these monitoring efforts. If planting goals established by the Napa Flood Protection Project are not being met, the District will investigate the cause of plant mortality and develop measures to re-establish vegetation in affected areas. Typically, new plants are installed between April and July. In addition, the District is responsible for monitoring and removing any vegetation that impedes design flood conveyance.

6.6.2 Flowage Easement Area

The Flowage Easement Area (Figure 1-7) is frequently flooded during large storm events; thus monitoring vegetation growth is important in this area. The District is responsible for monitoring woody vegetation growth along with bank erosion and unauthorized planting of row crops. Where vegetation impedes flow and/or obscures inspection and routine maintenance, non-native vegetation and debris should be removed.

6.6.3 Napa Creek Revegetation

The District is responsible for maintaining vegetation at project features along Napa Creek. Vegetation is monitored to ensure the health of plantings including willows growing in the vegetated reinforced soil slopes (as shown in Figure 1-7), willows and alders adjacent to the channel, and upland trees and shrubs. Willows are inspected to ensure that they are actively growing and irrigation should be inspected to ensure it is in working order.

The District is responsible for monitoring Napa Creek revegetation areas at least twice per year by staff with an understanding of biotechnical applications.

6.6.4 Dry Bypass Inlet-Outlet Inspection and Volunteer Growth

The Napa Dry Bypass consists of a 1,300-foot-long channel about 200 and 300 feet wide that crosses below 1st Street, Soscol Avenue, and Napa Valley Wine Train Dry Bypass Bridge. The bypass includes various types of vegetation and turf reinforced matting to secure the channel lining and prevent scour. The inlet and outlet of the bypass are lined with rock for erosion protection and layered with coir matting and plantings. Vegetation present in the inlet and outlet depressions are inspected on a bi-annual basis to ensure soil is held in place.

6.6.5 Biotechnical Bank Stabilization

As shown in Figure 1-7, the Napa Dry Bypass channel is comprised of plantings for bank stabilization including high performance turf reinforcement matting (HPTRM) material. This material is intended to remain in close contact with the underlying soil surface and if contact is lost, is susceptible to erosion during heavy rainfall events. All slopes, channels and banks containing HPTRM should be monitored after storm events and vegetation should be repaired consistent with the original design.

6.6.6 Vegetated Reinforced Soil Slopes

Five-layer and two-layer vegetated reinforced soil slopes are installed on Napa Creek banks to prevent erosion and promote vegetation. Vegetated reinforced soil slope treatments include horizontal brush layers planted between lifts and vertical willow poles planted on top of lifts to provide cover and structure. These structures are inspected by District staff following the first few flood events in a given year or at least twice per year. Cut branches and rooted plants are examined for survival and growth and absence of disease, and other animal/human damage. Damaged vegetation should be repaired prior to the next rainy season.

Chapter 7
DOWNED TREE MANAGEMENT

7.1 Overview

Large trees varying in length from 20 to 100 feet tall and two to three feet in diameter fall into and across District-maintained channels every year. This natural process promotes recruitment of woody debris in channels and enhances instream habitat by providing channel shading, flow eddies, scour pools, refugia for aquatic species, and encouraging growth of streamside vegetation. However, downed trees and branches can also potentially increase the flood risk and raise flow elevations. Downed trees may collect debris, block flows, or redirect flows erosively towards a streambank. When these processes elevate the flood risk, increase erosion, or occur near a facility such as a stream crossing or culvert, the downed tree may require management activities including tree removal, pruning, stabilization, or repositioning. The District considers downed trees (and their woody debris) a highly valuable ecologic resource to stream channels. The District manages downed trees and woody debris for flood control and habitat benefits. Downed trees within the County Roads Division's maintenance easement are handled by the District as well. Downed tree management also occurs on an as-needed basis as part of ongoing maintenance of the Napa River / Napa Creek Flood Protection Project.

Downed trees can provide valuable refuge and habitat opportunities if properly managed and left in place.

Downed tree management is one of the District's most frequent stream maintenance activities. The District also seeks to apply a restorative maintenance approach to downed tree management activities to create and enhance instream woody debris structures throughout the county. These habitat enhancement activities are discussed further in Chapter 13 *Mitigation Program*. The District views downed trees as potential micro habitat restoration projects as downed trees offer an opportunity to enhance instream physical process that can help to capture sediment and reverse channel incision processes over time. **Table 7-1** summarizes the total number of downed tree projects conducted by the District between 2012 and 2016.

Table 7-1. Downed Tree Projects Completed from 2012 to 2017

Stream Maintenance Year	Total Downed Tree Projects
2012	9
2013	8
2014	10
2015	13
2016	16
2017	11

While this chapter, *Downed Tree Management,* and the subject of Chapter 6, *Vegetation and Tree Maintenance Activities*, are related and could have been combined; the District prefers to address downed tree management as its own focused chapter in this Manual because of its importance.

The District conducts the majority of downed tree maintenance using hand tools and equipment. However, on occasion heavy equipment including backhoes, rubber-tracked excavators, or cranes may be used to relocate or remove trees within the channel. Additionally, tree rigging techniques are employed to facilitate the re-orienting of downed trees or removal of sections from the channel. Downed tree management is generally conducted during the dry season, but can occur year-round, as needed to prevent flooding or erosion.

Downed tree management activities vary depending on the type of stream channel or facility involved. While the methods described here are the common practices of the District, maintenance techniques may shift over time and by location depending on site constraints and new techniques. As discussed in Chapter 1 and again in Chapter 14, maintenance practices are adaptive and this manual will be revised periodically to accurately reflect the District's most current maintenance approach and techniques.

The following sections describe more specific downed tree management planning and activities, including:

Section 7.2 Downed Tree Maintenance Goals and Triggers

Section 7.3 Downed Tree Monitoring

Section 7.4 Downed Tree Preservation

Section 7.5 Downed Tree Repositioning

Section 7.6 Downed Tree Removal

7.2 Downed Tree Management Goals and Triggers

7.2.1 Management Goals

The primary downed tree management goals are similar to those for tree maintenance (presented in Chapter 6). However, downed tree management goals emphasize maintenance of instream habitat in addition to channel capacity, including to:

- ensure that adequate flood conveyance capacity is provided;
- minimize flow obstructions;
- maintain stable streambank conditions, and where possible;
- enhance instream ecologic conditions through:
    - providing instream habitat for aquatic species,
    - creating varied geomorphic and hydraulic conditions in flood control channels, and
    - encouraging the growth and presence of native vegetation.

In most channels, meeting these goals requires balancing flood protection needs and habitat enhancement opportunities.

Downed tree and woody debris recruitment efforts conducted by the District in Napa County align with other regional stream management goals, including the *Guidelines for County Road Maintenance Practices that Protect Aquatic Habitat and Salmon Fisheries* (Napa County 2014) which was developed from the *Guidelines for Protecting Aquatic Habitat and Salmon Fisheries for County Road Maintenance* (also known as the FishNet4C Manual - FishNet4C 2004), *Caring for Creeks in Napa County* (Napa County RCD 2006), the *Memorandum of Understanding for Woody Debris Management in Riparian Areas of the Lagunitas Creek Watershed* developed in 2007 by partner agencies in Marin County, and *Maintaining Wood in Stream: a Vital Action for Fish Conservation* (Opperman et al. 2006).

While maximizing habitat benefits of woody debris are sought in the program area, the benefits are evaluated in balance with the potential for flooding or erosion effects, or threats to infrastructure downstream due to the presence of the wood. The District's preference is to first retain woody debris on-site if possible, and if not possible, then to reposition or relocate the wood to another suitable location. If the woody debris has the potential to significantly threaten bank stability, public safety, or channel conveyance capacity, the wood is removed from the channel. Wood removal is always considered a last resort.

7.2.2 Management Triggers

During the annual stream assessment process (described in Chapter 4, *Impact Avoidance and Minimization*, and Chapter 14, *Program Management and Reporting*) and as alerted by the public, the District's stream maintenance managers evaluate and prioritize management actions for downed trees. In general, downed tree management is appropriate when any of the following triggering conditions occur:

- The downed tree is significantly decreasing flood conveyance capacity (particularly where infrastructure or adjacent properties are at risk), or
- The downed tree is obstructing or deflecting streamflow causing bank destabilization (particularly where infrastructure or adjacent properties are at risk), or
- There is an opportunity to improve habitat value for fish and wildlife.

These triggers are evaluated in the field by the maintenance manager or trained personnel. The decision to preserve, reposition, or remove downed trees is made in the field by maintenance staff familiar with channel and wetland ecology conditions. The decision-making process and rationale for downed tree management actions are described below.

7.3 Downed Tree Monitoring

When a downed tree is reported, the District will visit the site to assess the tree and its position in the channel. The District's first preference is to retain downed trees on-site and in the position it landed. If the tree does not trigger the two management conditions described in Section 7.2, above, then no physical action will be taken. The tree will be photographed and its species, size, and global positioning system (GPS) location recorded. An example map of downed tree monitoring sites is shown in **Figure 7-1**, and representative photos of downed trees are presented below. Downed trees left in place are monitored annually as part of the District's annual stream reconnaissance and assessment surveys to evaluate whether and how much their position has changed, the habitat benefits provided, and whether the tree has shifted such that it now threatens flood conveyance or bank stabilization. New photos are taken and notes entered into the District's database. The District has developed a large woody debris (LWD) monitoring database to help inform management methods. The District monitors LWD features to ensure that they are not becoming flood hazards and to learn more about different preservation techniques and channel responses. LWD monitoring helps the District better understand the stability of downed trees in different channel types and the long-term physical and ecological benefits.

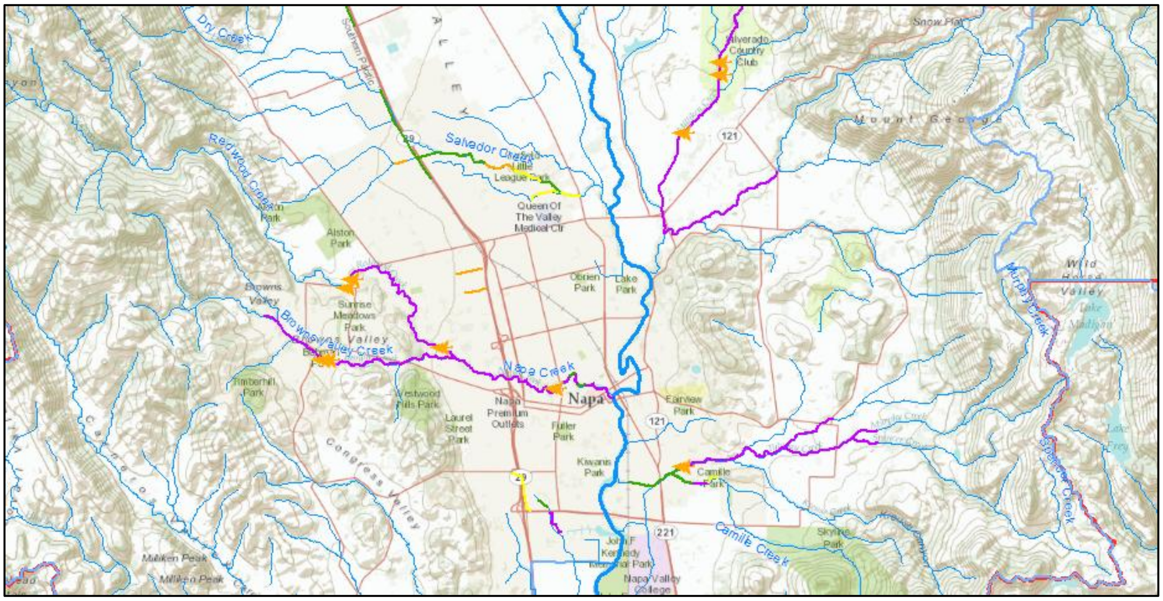

Figure 7-1. Map of Downed Tree Monitoring Locations (shown in orange)

Downed trees monitored in Redwood Creek.

Downed trees retained as LWD, providing habitat complexity in Redwood Creek.

7.4 Downed Tree Preservation

7.4.1 Considerations and Rationale for Retaining Wood on-site

The District's preference is to first retain woody debris on-site if the debris is providing habitat, geomorphic, or other channel stability benefits and is not increasing the flood threat. Sites are evaluated for whether the woody debris is significantly obstructing flows, deflecting flow toward banks, is located on a dike/levee/berm slope, or is located near a channel crossing, structure, or other facility. District stream managers consider several issues to minimize flood risks and improve habitat in relation to downed trees, including:

- What is the type, size and age of the downed tree?
- Does the tree under review provide significant channel shading or other instream habitat complexity benefits (if submerged in the channel), such as fish refugia or foraging areas?
- What is the degree of blockage across the channel contributed by the downed tree, or by other factors?
- Where is the tree located in the channel and how is it positioned to flow currents?
- How secure is the tree across (or in) the channel?
- Can the downed tree be repositioned, adjusted, or modified (before consideration of removal) to provide the necessary conveyance capacity?
- What upstream and downstream conditions might influence or be influenced by the tree?
- What type of structure or infrastructure is located in the top of bank vicinity and does the downed tree pose a flow related hazard to those facilities?

The rationale to retain downed trees is based on addressing the questions above. Answering these questions requires the oversight and guidance of a biologist or arborist that is familiar with the vegetation in the area and is knowledgeable of channel conditions. Consistent with the Flood Protection Project, woody debris present on dikes, levees and berm slopes must be removed.

7.4.2 Preservation Methods

The following three preservation methods are implemented by the District, in order of preference. Each method is illustrated in **Figure 7-2**.

1) **Leave downed tree in place:** based on the wood retention rationale evaluation described above, and if no management triggers are initiated - then the downed tree will be left in place and monitored in case conditions change that trigger the need for management actions. See Photo 1 in **Figure 7-2**.

2) **Limb downed tree branches:** if based on the wood retention rationale evaluation, the downed tree provides habitat functions, and does not significantly decrease flood capacity or alter streamflow – then the down tree will be left in place. But, if the downed tree exhibits branches that are perpendicular to flow, extend higher than two feet above the streambed, or has branches that could collect debris, those branches will be trimmed or limbed but the majority of the downed tree will be left in place. See Photo 2 in **Figure 7-2** and below.

3) **Re-orient downed tree:** If the downed tree is in a position that is reducing channel capacity or a portion of the tree impedes flow and is likely to catch debris, then the downed tree may be re-oriented and retained in the channel.

4) **Cut downed tree into smaller pieces:** If the downed tree is in a position that does not immediately trigger the need for repositioning or removal, but may pose a threat in the future

or a portion of the tree impedes flow or could catch debris, the tree may be cut into shorter lengths or specific sections of the tree may be removed. See Photo 3 in **Figure 7-2**.

If necessary, hand-held tools will be used to limb or cut downed trees. No heavy equipment is involved with preserving downed trees within the channel environment. The photos presented after **Figure 7-2** show before and after photos of a large downed tree that required removal of tree limbs.

Photo 1. Example of a downed tree across the channel causing flow blockage.

Photo 2. Downed tree limbed, left in place, and modified slightly to function as a weir.

Photo 3. Downed tree, cut into smaller sections and repositioned in the channel to create instream complexity.

Photo 4. Downed tree repositioned parallel to direction of flow in the channel.

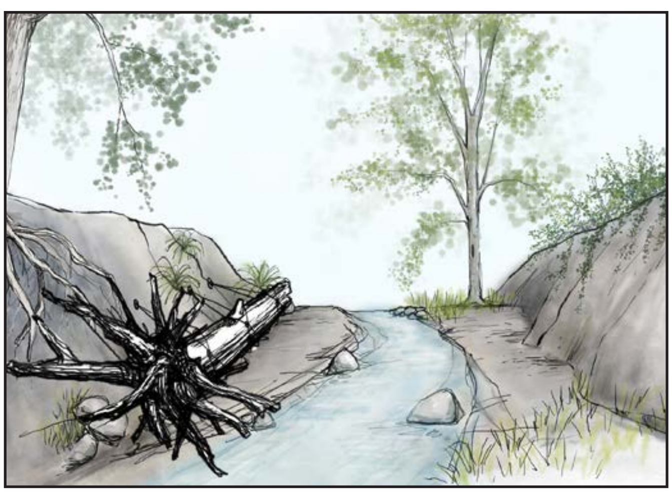

Photo 5. Downed tree repositioned parallel to direction of flow in the channel and secured in place with cables.

Source: Jennifer Natali Design 2011.

Project 10.004\NapaSMP\Sept2011

Horizon WATER and ENVIRONMENT

Figure 7-2

Preservation Techniques for Downed Trees

Before: Large downed tree constricting flow along the Napa River

After: Tree limbs crossing channel removed and large wood preserved on streambank to enhance instream habitat.

7.5 Downed Tree Repositioning

7.5.1 Considerations and Rationale for Repositioning

The District's preference is to first retain woody debris on-site in the channel and leave the woody debris in place. If the downed tree triggers the need for maintenance, it may be repositioned within the channel. Key determinants include whether the woody debris is significantly obstructing flows, deflecting flow toward banks, or is located near a channel crossing, structure, or other facility. Several issues are considered to minimize potential effects and to improve habitat results while reducing the need for maintenance.

The rationale to retain but reposition downed trees is based on addressing the same trigger questions presented in Section 7.4 above for downed tree preservation. Answering these questions requires the oversight and guidance of a biologist or arborist that is familiar with the vegetation in the area and is knowledgeable of channel conditions.

7.5.2 Methods for Repositioning

Depending on site specific conditions and the responses to the site assessment questions above, the District may reposition a downed tree to improve flood conveyance or instream habitat benefits.

Field crew repositioning a downed tree in Wing Canyon

Trees that are repositioned to be more parallel to flow currents in the channel will not be secured in place, unless needed (see Photo 4 in **Figure 7-2**). In some cases, it may be necessary to secure wood in a specific place to create instream habitat, such as inducing a scour pool for use by salmonids. If necessary, the repositioned wood will be cabled or anchored in place to the banks or some other method with input from regulatory agencies, such as CDFW and NMFS (see Photo 5 in **Figure 7-2**). The District will retain root masses of the downed trees to the extent feasible. Repositioning of downed trees is conducted using hand-held tools and occasionally heavier mechanical equipment. The GPS location of the tree is entered into the District's database and the tree location and condition are monitored annually. If needed, the trees are adjusted to improve habitat conditions and prevent flooding. The map above in **Figure 7-1** illustrates the locations of the repositioned downed trees currently being monitored by the District.

7.6 Downed Tree Removal

Tree Crew utilizing a crane to re-orient downed tree instream and remove debris jam.

In the event that a downed tree cannot be retained on-site due to channel capacity issues, or if the tree cannot be repositioned favorably (as described above), then downed trees may be removed if channel capacity is significantly limited or if the tree is creating unacceptably high hydraulic roughness in the channel or diverting flows and thereby causing a heightened erosion or flooding risk. The rationale for removing a downed tree is based on the pre-maintenance survey and the triggering conditions described above. The District's first preference is to retain downed trees on-site (if possible). The next preference is to reposition downed trees if necessary. Removing downed trees from channels is the lowest preference option. As noted previously, downed trees on dikes, levees and berm slopes and the toe easement areas of these structures must be removed.

At the time that District stream managers assess the downed tree for retaining it in the creek, and/or repositioning in the channel, they will also assess if the downed tree may need to be removed. As described in Chapter 6, tree snags will be left in place to provide habitat for birds and small mammals if the snags do not otherwise pose a flood or safety hazard. Downed tree removal techniques use hand-held tools and occasional use of heavier mechanical equipment. Removed trees are chipped for mulch and either left onsite or taken to the Napa Recycling and Waste Service Center for composting. When a large tree with a connected rootwad is significantly blocking flow in a channel and must be removed, the District will try to salvage the tree and utilize it in the Napa River Restoration Project Reaches.

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Chapter 8
STREAMBANK PROTECTION AND STABILIZATION

8.1 Overview and Purpose

The District employs a watershed wide approach to environmental management and works throughout the County to assist private property owners with streambank issues. Streambank erosion is a natural process, but due to hydromodifications, historical agricultural activities and urban development, many streams are confined and cannot naturally evolve without affecting adjacent infrastructure. Over several maintenance seasons, the District has made a concerted effort to implement preventative measures to reduce streambank erosion. These preventative measures include assisting landowners with the installation of erosion control fabric, extensive planting of riparian vegetation along exposed streambanks (see Section 3.4, *Channel Characterization*, in Chapter 3) and removing non-native and invasive species along watercourses (Chapter 5). Most of the vegetation planting along program area channels has occurred within the past 5 years and the erosion protection functions of vegetation are now beginning to take effect. The full benefit of erosion reduction and bank stabilization from the District's past planting activities will take several years (10-15+) to achieve as the planted trees reach maturity. With time, these preventative measures not only reduce streambank erosion, but also improve ecological functions and values of channels in the program area.

However, it is impossible to prevent all channel bank erosion and instability. Erosion protection and bank stabilization maintenance activities are sometimes needed to minimize soil loss and manage potential erosion that may still occur and threaten property or infrastructure. The District evaluates streambank erosion issues during annual stream surveys and outreach efforts to landowners when issues are impacting infrastructure or stream resources. The District assesses issues and evaluates risks to determine how to assist individual landowners and tries to educate property owners regarding best management practices to protect property and environmental resources. The District acts as a local resource agency that can facilitate environmental stewardship through collaborative implementation strategies.

The County Roads Division (County) is also responsible for repairing earthen engineered channels within their jurisdiction using biotechnical erosion control techniques. If biotechnical solutions are not feasible given site-specific conditions (e.g., poor soils, percolation of water, steepness of slopes and limited space), other bank repair methods may be conducted on a case-by-case basis. On average, the County conducts 5-10 bank stabilization projects per year and are typically confined to an area within 20 feet (landward) of the failed or failing bank or bank structure. Where necessary, the County also conducts in-kind replacement of rock slope protection beneath culvert inlets and outlets and within existing concrete lined channels. Under the SMP, the District would conduct such bank repair work on behalf of the County.

This chapter describes streambank protection and stabilization practices that may be conducted as part of the District's SMP. The District's resources are limited and it is not feasible to coordinate reach-wide erosion control and streambank protection on every tributary. So, an adaptive management methodology has been developed that includes a matrix of techniques and management approaches. Where preventative erosion control techniques are sufficient, the District will employ biotechnical erosion control techniques that typically do not require significant grading or armoring. Where erosion is impacting non-critical property and/or stream resources, the District will employ a more aggressive biotechnical solution that may include laying overstepped top of banks back to create a stable slope that facilitates planting and installation of erosion control BMPs. When critical infrastructure is at risk, the District takes an advisory role by offering assistance through the Streambank Cost-Share Program, which provides financial assistance but requires that the landowner hire an engineering firm, attain necessary permits and construct the project.

The number of streambank issues addressed on an annual basis will vary, but typical projects range from 50-500 lf. The District is limited to conducting 2,500 lf of biotechnical streambank stabilization projects (total) in a given year. The District attempts to address the cause of the streambank erosion as well as the entire extent of the issue. Bank stabilization activities may occur in the District's flood control channels, at other stream channels, at facilities including culvert outlets or bridge abutments, and in natural stream banks.

Different mechanisms may cause bank erosion or destabilization. In channels maintained commonly by the District and creek road crossings maintained by the County, bank erosion typically occurs from direct shearing due to erosive streamflows. An additional mechanism for erosion and overall bank instability includes rotational slumping of the bank following saturation conditions. This typically happens when bank soils are saturated following a sustained period of high flows. When flow elevations recede and the saturated bank begins to drain toward the creek, soil pore water pressure is elevated and this can cause instability through slumping. Stream banks can also fail through block separation and falling, which may have similar causes as for rotational slumping, but the failure mechanism is expressed differently.

In addition to these erosive "driving forces," bank stability is also dependent on the "resistant forces" that keep the bank in place. Factors that influence the bank's internal stability include the shear strength of the bank materials; the relative steepness of the bank slope; groundwater elevations; soil texture, porosity, and permeability; drainage and seepage issues; root strength provided by vegetation, etc. Understanding both the driving and resistant factors at a streambank site is very important in developing an appropriate bank treatment and repair approach (see Section 8.3). Additional causes for potential bank destabilization may be found in previous channel modifications. For example, the removal of past vegetation may have weakened the bank. A culvert outfall may be directing erosive flows directly at a vulnerable bank. The channel alignment or hardening on an opposite bank may be directing erosive flows disproportionally against a vulnerable bank. Understanding such causal factors, within the framework of understanding the balance of "driving erosive forces" and "resistant strengthening forces" at work at each bank site helps District stream managers assess destabilized streambanks and select appropriate treatments.

The number of bank stabilization projects undertaken by the District in a given year depends on weather and hydrologic conditions during the recent years. A higher number of bank stabilization projects are more likely to occur during or following wet years when streamflows are elevated, flow velocities are higher, and bank soils are saturated for longer periods with high soil pore water pressure.

If unattended, the consequences of not repairing a destabilized or failing stream bank include:

- increased flood risk and property damage to adjacent properties,
- undermining and loss of roads, bridges, transportation, and access,
- increased erosion and sediment yield from the eroded bank transported downstream, and
- impacts to riparian habitat and other natural resources at the eroded bank site, as well as downstream through increased sediment loading.

This manual presents standard treatments and repair approaches that will be applied as appropriate throughout the program area. All bank repair activities will follow the impact avoidance and minimization approach and principles described in Chapter 4, including the best management practices presented in Table 4-1. Permits necessary to support these activities are described in Chapter 2 *Regulatory Compliance*.

In 2010, the District established the countywide Bank Stabilization Cost Share Program (summarized in **Appendix J**), a District-funded program to assist private property owners with bank erosion repairs on their property. When District support is requested by the landowner, the District oversees bank stabilization design, permitting, and installation of the repair. To incentivize biotechnical projects, the District offers a 75% cost share to landowners. Where hardscaping is necessary, the District will share 50% of the project cost. Since its establishment, this successful program has implemented approximately 20 bank stabilization projects throughout the County using the techniques described in this chapter. In recent years, the program has been utilized less due to high engineering and permitting costs. The District is in the process of re-evaluating the program to identify ways of overcoming these constraints.

The following sections describe the SMP's maintenance goals and triggers for conducting bank repair work (Section 8.2), standard treatments and repair approaches (Section 8.3), and the construction approach (Section 8.4). Post-project restoration and monitoring activities are described in Chapter 13.

8.2 Maintenance Goals and Triggers

8.2.1 Streambank Protection and Stabilization Goals

The goals of erosion streambank protection and stabilization projects are to manage erosion, to repair or enhance an eroded bank, or to provide a stable streambank that will not require additional maintenance in the foreseeable future. An equally important goal is to provide a stabilized bank that avoids using hardscape features whenever feasible and attempts to protect and maintain natural stream bank functions to the extent possible.

Achieving this balance between stability and environmental function is challenging. The standard treatments presented in Section 8.3 were designed to achieve these goals within a range of bank conditions and stability requirements. As described above, identifying and understanding the root cause (or causes) of instability in the affected reach is critical in developing the most appropriate treatment solution.

In general, bank stabilization and repair projects will be designed to achieve one or more of the following related outcomes:

- Improved channel and/or bank stability.
- Reduced need for future or repeated bank maintenance.
- Reduced loading of eroded sediment into the channel and to downstream reaches, reducing the need for sediment management.
- Improved bank conditions to support vegetation and increase habitat value.

Note that because improved streambank stability reduces sediment input, into the channel and supports developing a mature riparian corridor, bank stabilization can be used as a coordinated treatment with other sediment removal, downed tree, and tree and vegetation maintenance activities. In this way, bank stabilization activities can provide several benefits to the overall health and function of the channel.

8.2.2 Bank Stabilization Triggers

In general, bank stabilization and repair activities are commonly required where one or more of the following conditions apply:

Bank stabilization and repair projects are only undertaken if certain conditions are met. Consideration is given to the improvement of the overall health and functioning of the channel in designing and implementing these projects.

1. Bank failure has occurred whereby a significant portion of the bank-toe, mid-bank, or bank-crest have failed, slumped, eroded into the creek below, or have been removed entirely. Under this condition, the bank must be repaired to re-establish the basic bank structure.
2. Chronic bank erosion is occurring, whereby a portion of the bank is exposed to on-going erosion and sloughing of its earthen materials. This condition may not represent as large a volume of lost material as Condition 1 described above, but untreated, this type of condition will typically progress and become increasingly more erosive. Recreating the entire bank structure may not be necessary under this condition. More often, specifically applied, or localized rehabilitation may be adequate.
3. A channel facility such as a culvert outfall or culvert crossing that needs to be repaired, replaced, or improved. Under these circumstances, bank stabilization and repair activities may be required to integrate the facility maintenance improvement with the adjacent streambank. This District would conduct these activities with the County Roads Division, as necessary.
4. Existing bank protection measures have failed. In this situation, the District has an opportunity to replace past bank protection features with newer design approaches which may provide additional environmental benefits.
5. Bank erosion or failure poses a threat to existing infrastructure or adjacent land uses and/or increases the public risk of flooding.

These triggers are focused to guide maintenance decisions on District engineered stream channels and road creek crossings managed by the County, in generally urban areas. For non-engineered channels in non-urban areas these triggers will be evaluated more sensitively in light of site conditions, adjacent land use, and the risk and impact of flooding.

8.3 Standard Biotechnical Treatments

8.3.1 Overview

This section presents five standard erosion protection and bank stabilization treatments to serve as templates for more specific site design needs. All of these standard treatments utilize biotechnical methods to provide erosion protection. Biotechnical erosion control incorporates live vegetation with other natural elements (e.g., wood, biodegradable erosion control products, rock) to provide structural stability to streambanks. Native riparian vegetation within the erosion control treatments increase bank sheer strength, and provide habitat benefits including increased shade canopy, nesting, foraging, etc. For most of the reaches in the program area, biotechnical stabilization approaches are preferable to hardscape engineered approaches (e.g., riprap, gabions). In some specific locations, a limited amount of hardscape may be necessary, due to site conditions or constraints such as locally high flow velocities or sheer stresses, seepage, bank materials with poor strength/cohesion, or the presence of existing infrastructure. When hardscape is necessary, it will most often accompany or supplement one of the standard biotechnical treatments. The use of rock in specific capacities, such as at the toe of slope, in combination with other biotechnical measures and plantings on the higher bank can be a very effective approach for stabilizing a bank. Hardscape will only be used where no effective alternative is feasible due to the magnitude of the hydraulic forces involved, the need to protect infrastructure, or an adjacent land use constraint.

Note that in some cases, bank stabilization may not offer the most effective (or the most cost-effective) solution over the long term. Where there is extensive bank and channel failure or where reliable bank protection cannot be provided, or where heavily engineered solutions would be the only option for reliable armoring, it may be preferable to remove or re-contour the channel bed or to realign a short segment of the channel. Such channel reshaping or grading approaches may provide a more effective, longer-term solution that supports overall stream health and function compared to more traditional bank stabilization approaches. Activities requiring a significant redesign or reshaping of the channel would not be considered routine maintenance and are beyond the scope of this manual.

Chapter 14 provides more information on administering the SMP, including the annual work cycle of site reconnaissance, site evaluation, project prioritization, and the project design process that that may be necessary for bank stabilization projects.

8.3.2 Treatment Options

Figure 8-1 through **Figure 8-5** present a range of biotechnical approaches to provide erosion protection or address streambank instability. Each of the treatment templates is described below. **Appendix I** includes typical design plans along with a more detailed description of construction methods associated with each treatment type.

The District has developed five standard bank stabilization and repair methods which can be customized **with detailed design elements to best suite site-specific conditions.**

Description: Figure 8-1 presents a relatively simple biotechnical approach to control bank erosion. The components of this treatment include: (1) a coir log, (2) erosion control fabric, (3) live woody cuttings, and (4) revegetation. Coir logs consist of tightly bound cylinders of coir fibers (coconut fiber) that are held together by fiber netting made from coir twine. Coir logs are generally available in 10 to 20-foot lengths and are 12 to 20 inches in diameter. Coir logs provide effective toe protection in areas of low velocity water flow.

Coir logs are effective in providing erosion and stream scour protection during the period of time it takes for larger woody vegetation to become established on the streambank. The coir log is anchored with live woody cuttings (e.g., willow, cottonwood), wood stakes, or both. Once established, live woody cuttings planted in the coir log and at the toe of slope provide long-term toe scour protection. Coir logs are constructed of 100% biodegrade materials (coconut husks) and will decompose over a 3- to 5-year period.

During coir log installation, the bank slope is prepared for revegetation by ensuring that the soil provides a suitable growth medium for native plants; a revegetation specialist may be consulted to evaluate soil conditions. After installation, the coir fiber log may become saturated with water and vegetation can be planted directly on the logs. The soil on the slope above the coir log is scarified (roughened) to a depth of approximately 6 inches to prepare the seed bed. Following seed application, the slope is mulched with a thin layer (approximately 1-2 inches) of weed-free straw, then covered with an erosion control fabric. The fabric is made from 100% biodegradable materials (typically jute). The fabric weight, typically expressed in grams per cubic meter (g/m^3), is determined by slope angle and site specific hydraulic conditions. Once the fabric is properly installed, woody cuttings and container or nursery stock are planted in the appropriate revegetation zones (see Chapter 13, *Mitigation Program*).

Applicability: This treatment is typically suitable for streambanks experiencing low to moderate flow velocities and have finished slopes of 2h:1v (i.e., the slope is 2 horizontal units to every 1 vertical unit) or shallower.

Considerations: While the bank is protected by erosion control fabric during the vegetation establishment period, high flows may exceed the erosion protection capabilities of the temporary treatments.

Variations: Modifications of the coir log template design include replacing the coir roll with a willow wattle (i.e., a bundle of live willow branches) and/or replacing the erosion control fabric with a live brush mattress (i.e., willow poles laid in a crisscross pattern on the bank slope) as described below. These variants can be considered in locations where channel capacity can accommodate very high bank roughness conditions. These variants also require high water availability for woody riparian vegetation and a high confidence in the successful establishment of vegetation. For locations with high velocity and shear stress, the coir roll may be replaced with rock slope protection (i.e., riprap) to provide more robust scour protection. The rock slope protection may need to extend further up the bank than the coir log.

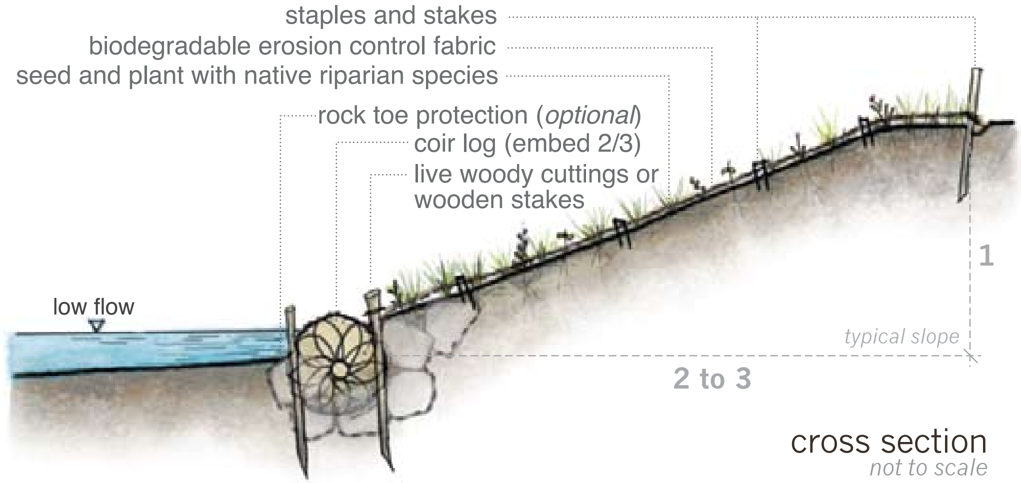
COIR LOG AND EROSION CONTROL FABRIC

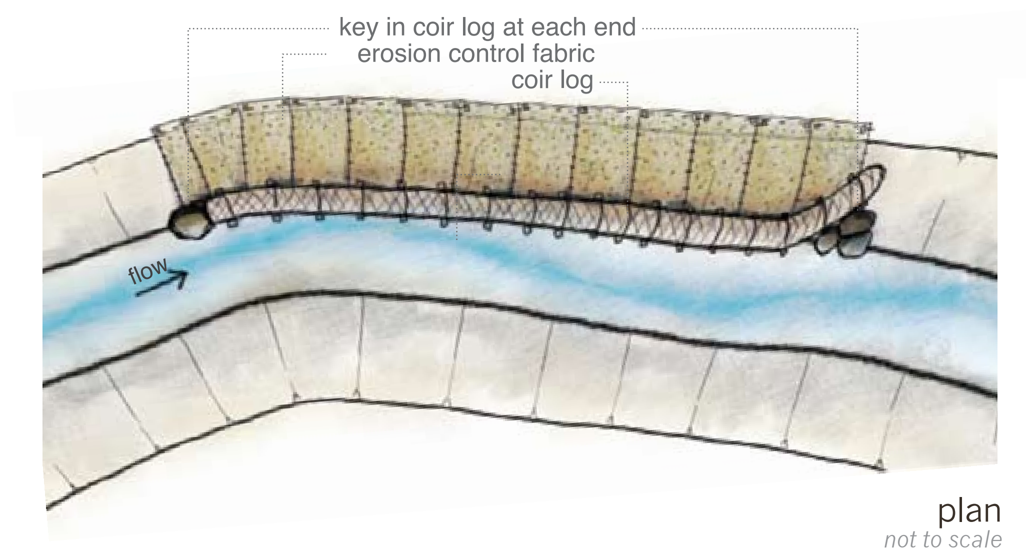
DESCRIPTION
This treatment provides simple biotechnical erosion protection and bank stabilization. A coir log placed at the toe of the slope protects from scour. Erosion control fabric protects the bank slope from erosion during the vegetation establishment period.

APPLICABILITY
Suitable for low to moderate velocity and shear stress conditions. Recommended for newly graded banks and existing banks with 2h:1v slopes or shallower.

CONSIDERATIONS
May require a wide right-of-way to accommodate broad bank slopes.

VARIATIONS
Replace coir log with willow wattle and/or replace erosion control fabric with live brush mattress to increase vegetation cover. Where feasible, consider including a floodplain bench to increase flood flow capacity, channel complexity and diversity of riparian vegetation. Provide rock toe protection in high energy settings.





Source: Jennifer Natali Design. 2011

Figure 8-1
Coir Log and Erosion Control Fabric Template

Brush Mattress (*Figure 8-2****)***

Description: The brush mattress (**Figure 8-2**) is a simple biotechnical approach that utilizes live willow pole cuttings to provide structure and stability to the streambank. Prior to installing the brush mattress, some minor grading, clearing and grubbing of the streambank may be necessary to prepare the slope. The brush mattress is constructed by placing a dense layer of willow pole cuttings parallel to the slope (i.e., perpendicular to stream flow). Wood stakes are then driven in between the pole cuttings at a close spacing (approximately 2-foot on center). Jute rope or twine is then woven between the stakes to create a grid or web to secure the pole cuttings. The stakes are then driven in fully to compress the brush mattress against the streambank. Soil may be placed on the slope to backfill voids and ensure good contact between the slope substrate and willow cuttings.

Applicability: The brush mattress is typically suitable for slopes up to 2h:1v. This treatment may be suitable for moderate to high energy settings. This treatment is a cost-effective stabilization approach and can often be constructed by hand, without the use of heavy equipment.

Considerations: This treatment is only suitable for locations with adequate soil moisture to support the growth of willows. For mesic or moderately dry sites that are at the threshold of suitability, supplemental irrigation may be useful to establish willows. Irrigation should be applied in a manner that will “train” root growth to shallow ground water. This requires a high volume, low frequency irrigation regime. This treatment is not recommended in locations where bank stability is required to protect infrastructure because the brush mattress is vulnerable to failure during the vegetation establishment period. This treatment will also result in dense vegetation growth, so channel capacity should be able to accommodate high roughness conditions (see Chapter 3).

Variation: Incorporating toe protection (e.g., rock or coir log) may be necessary in high energy settings.

BRUSH MATTRESS

DESCRIPTION

This treatment protects slopes with a dense layering of live willow branches. Once established, the willow thickets provide roughness and cover for fish during high flows, and habitat for various riparian associated wildlife species.

APPLICABILITY

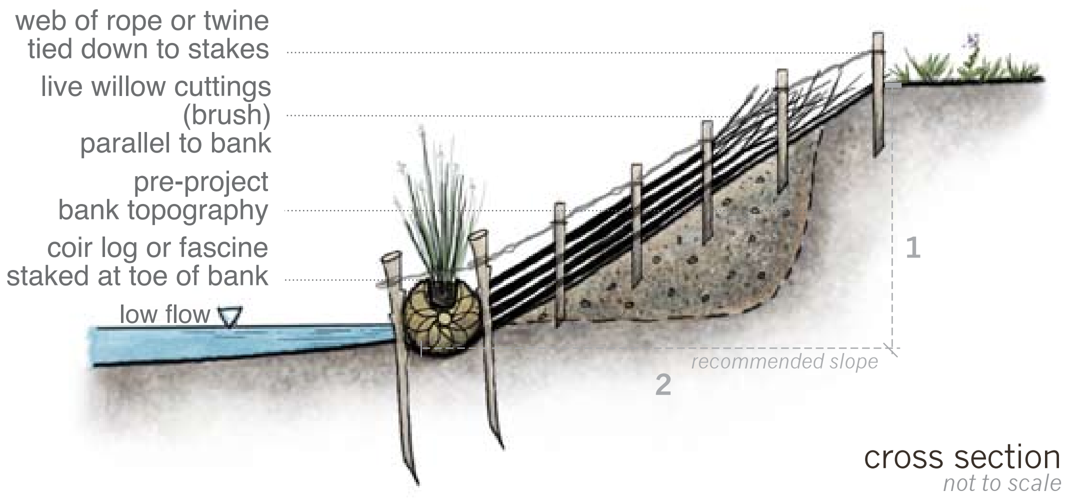
Suitable for moderate to high velocity and shear stress flow conditions for stream reaches with moderately sloped banks. Minimal construction access required. Discourages foot traffic in areas prone to informal trails.

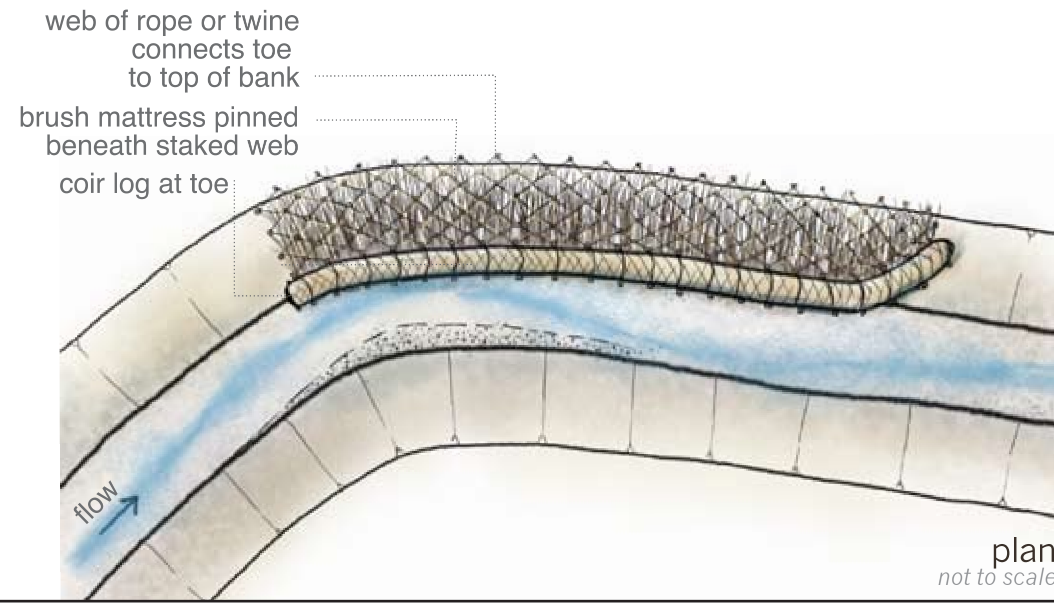
CONSIDERATIONS

May require toe protection. Requires large amount of willow cuttings. Best installed during wet season to encourage willow rooting. Stream banks are vulnerable to erosion during establishment period. This labor-intensive technique requires some skill and care to tightly pin down branches. High roughness may reduce channel capacity.

VARIATIONS

Combine with toe protection such as coir logs, root wads, or live facines.





Source: Jennifer Natali Design. 2011

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Figure 8-2
Brush Mattress Template

Willow Wall (Figure 8-3)

Description: Figure 8-3 illustrates a biotechnical approach that utilizes live willow pole cuttings to provide structure and stability to the streambank. The willow wall is constructed by planting a row of willow stakes (approximately 2 to 3 feet apart) near the toe of slope; long willow poles are then woven through the stakes to construct a willow "fence" at the toe of the slope. Soil is backfilled and compacted behind the fence, which creates a "terrace." A second willow fence is then constructed further up the embankment, then backfilled to create the next terrace. This process is repeated up the bank slope until the willow wall reaches the top of bank or transitions to another suitable erosion control treatment (e.g., erosion control fabric). The terraces between the willow fences can be seeded with native species and planted with container or nursery stock plants. Erosion control fabric and/or mulch may also be placed on the terraces to provide erosion protection during the vegetation establishment period.

Applicability: Since the wall can be constructed with hand tools and labor it is particularly useful for stabilizing banks that have limited access for construction equipment. Consequently, this type of biotechnical treatment is often used in remote locations with limited access, though it is suitable for use in some urban settings (see "Considerations" below). The willow wall can also be an effective stabilization treatment for steep banks and/or for confined right-of-ways. This treatment also provides a relatively cost-effective stabilization option because the willow cuttings can be collected from adjacent areas and the wall may be constructed with the aid of volunteers.

Considerations: This treatment is only suitable for locations with adequate soil moisture to support the growth of willows. For mesic sites that are at the threshold of suitability, supplemental irrigation may be useful to establish willows. Irrigation should be applied in a manner that will "train" root growth to shallow ground water. This requires a high volume, low frequency irrigation regime. This treatment is not recommended in locations where bank stability is required to protect infrastructure because the willow wall is vulnerable to failure during the vegetation establishment period. This treatment will also result in dense vegetation growth, so channel capacity should be able to accommodate a high roughness conditions.

Variations: This treatment may incorporate a live brush mattress where willows are layered on the slope or on the terraces. The willow wall may transition to erosion control fabric (see **Figure 8-1**) in drier vegetation zones that do not support willow growth.

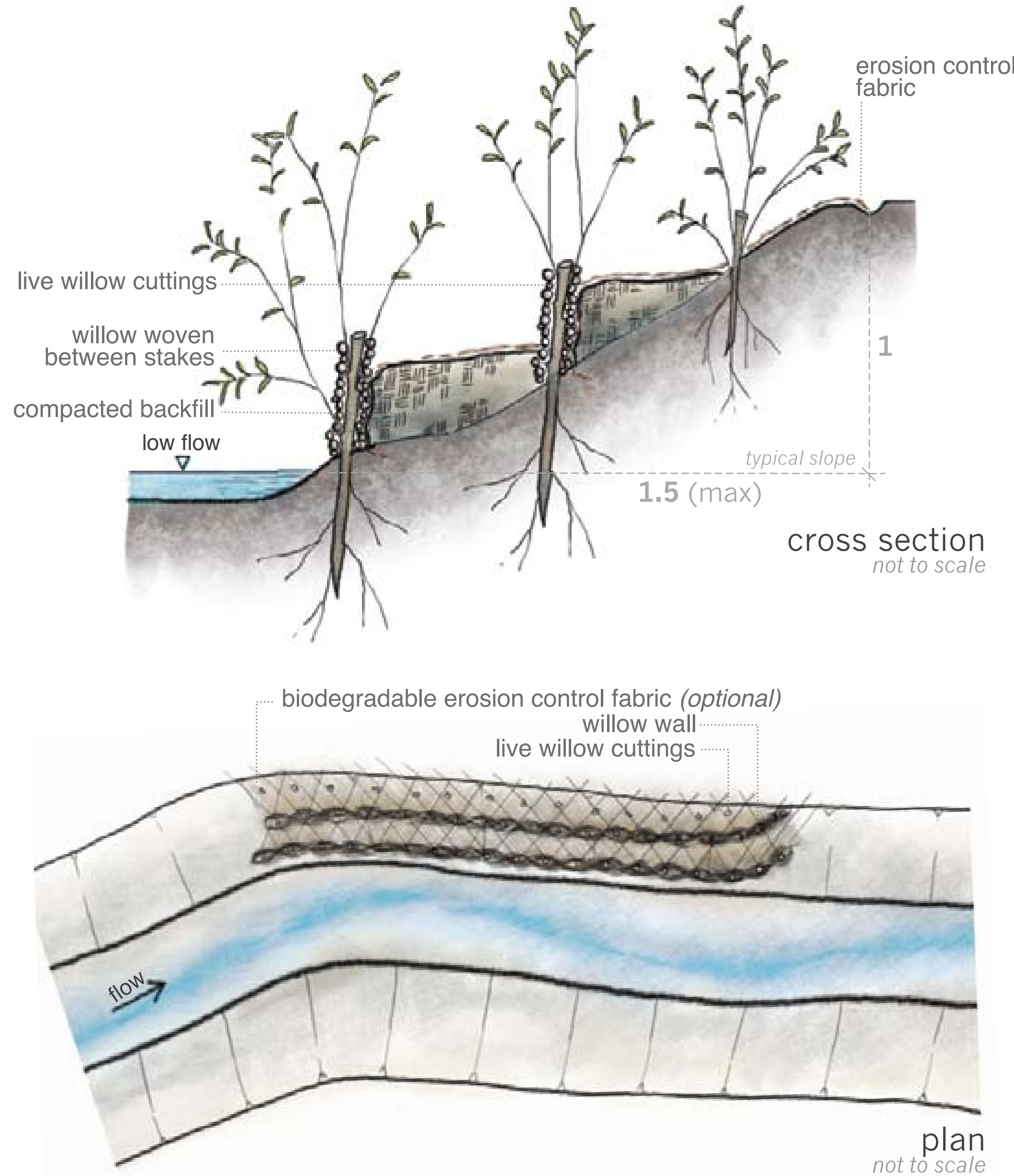
WILLOW WALL

DESCRIPTION
The willow pole cuttings are used as a biotechnical structural element to increase bank strength. Once established, willow pole cuttings will provide dense vegetated cover with high habitat value.

APPLICABILITY
Suitable for moderate velocity and shear stress flow conditions. Suitable for steep slopes. Can be constructed with hand tools and labor, especially useful where access is limited.

CONSIDERATIONS
Generally not suitable for protecting infrastructure. Mature willows will increase roughness and may require maintenance and thinning. Site should be appropriate for increased roughness.

VARIATIONS
Can be combined with brush mattress or soil lifts.



Source: Jennifer Natali Design. 2011

Figure 8-3
Willow Wall Template

8.3.3 Encapsulated Soil Lifts (Figure 8-4)

Description: Figure 8-4 illustrates a biotechnical treatment that can be used to reconstruct a steep, eroded streambank in moderate to high energy flow environments. This treatment is constructed by stacking layers of soil that are encapsulated (wrapped) in erosion control fabric. The soil lifts are typically compacted in-place with heavy equipment. Willow cuttings are laid horizontally between the soil lifts and planted perpendicularly into the soil. When the willows become established they provide stability to the embankment.

Applicability: Encapsulated soil lifts are useful for protecting or stabilizing steep banks in confined streams or narrow right-of-ways. This treatment allows for construction of vegetated slopes that exceed 2h:1v. This treatment may be suitable for high energy settings, particularly if a small amount of rock is provided at the toe of the slope.

Considerations: This treatment is best suited for locations with adequate soil moisture to support willow growth. The soil lifts generally require construction access for heavy equipment. When used in moderate and high energy settings, careful attention must be paid to construction of the transition to existing banks so that soil lifts do not destabilize; rock slope protection may be required.

Variations: Incorporating rock slope protection up to ordinary high water level on the channel may be necessary or desirable in some settings. A civil engineer should be consulted to determine appropriate sizing and extents of rock slope protection. Consider incorporating additional habitat features into the design such as LWD, root wads, and floodplain benches.

Crib Wall (*Figure 8-5****)***

Description: A crib wall is an engineered structure that can be used to protect very steep banks in moderate to high energy flow environments. Crib wall construction typically begins with clearing and grubbing, then excavation of foundation base so the crib wall can be keyed into the bank and below the immediate depth of local scour (**Figure 8-5**). Vertical log piles or piers are driven into the streambed, followed by placement of the horizontal crib members. Steel cable or rebar pins are often used to join the crib piers and members. As successive lifts of the crib wall are constructed, they are filled with a rock-soil mix; this material should be derived from local stream substrate, when feasible. Erosion control fabric may be used to contain soil/substrate in the crib wall. Live woody cuttings are laid horizontally in the structure, as well as planted perpendicularly into the soil at the top. When the willows become established they provide additional stability and hold the soil/substrate in place.

Applicability: This treatment is useful for protecting or stabilizing very steep banks in confined streams or narrow right-of-ways and allows for establishment of vegetation on slopes that exceed 1h:1v. The crib wall may be suitable for high energy settings provided that it is anchored properly. This treatment may be a suitable alternative to conventional hardscape approaches (e.g. riprap) that are typically used to protect infrastructure.

Considerations: This treatment requires construction access for heavy equipment. When used in moderate and high energy settings, careful attention must be paid to the construction of the transition to existing banks; rock slope protection may be required. This treatment is costly to design and construct.

ENCAPSULATED SOIL LIFTS

DESCRIPTION

This treatment uses soil and sediment wrapped in erosion control fabric to reconstruct stream banks. Live willow cuttings are planted in interstitial spaces. Provides high habitat and aesthetic value once vegetation is established.

APPLICABILITY

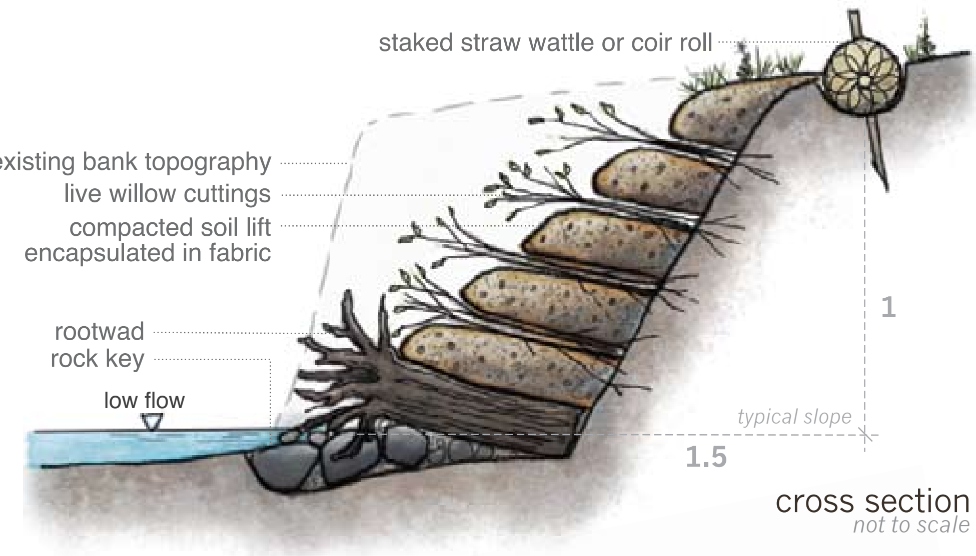
Suitable for steep slopes with moderate to high velocity and shear stress flow conditions. Appropriate for confined areas or constricted right-of-ways.

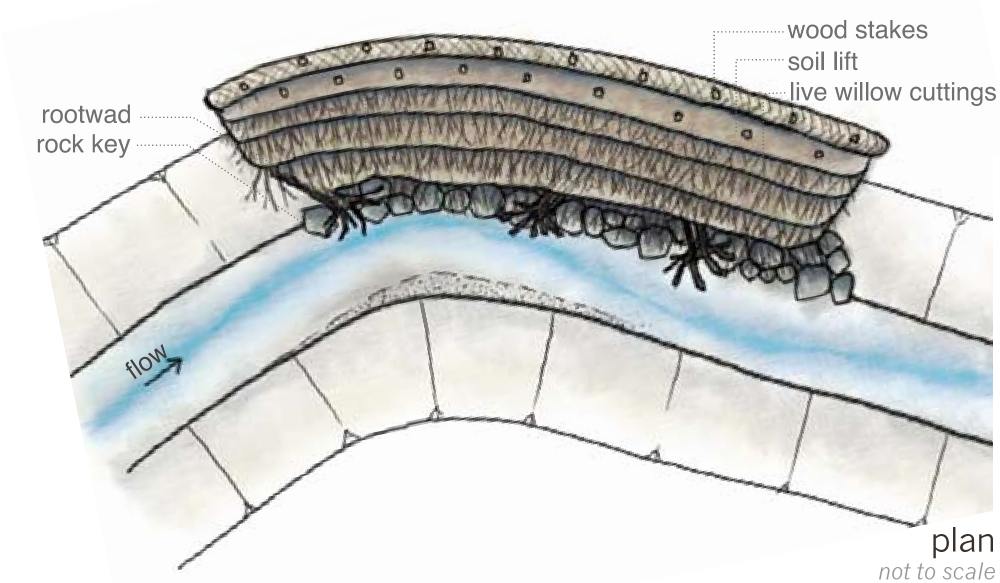
CONSIDERATIONS

Costly to construct and requires good access. Reuse native bank soil when feasible. Incorporate root wads or large woody debris when feasible to increase habitat complexity.

VARIATIONS

Provide rock toe protection in high energy settings.





Source: Jennifer Natali Design. 2011

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Figure 8-4
Encapsulated Soil Lifts Template

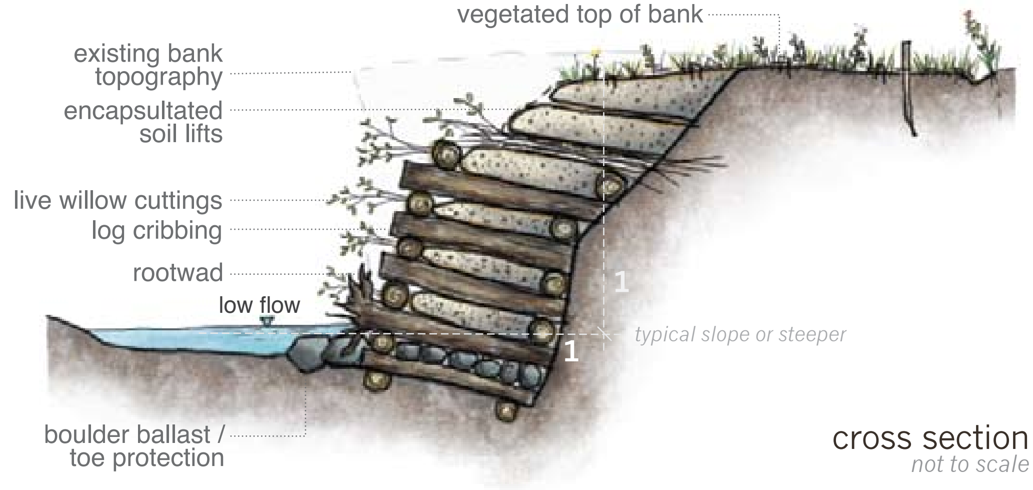
CRIB WALL

DESCRIPTION
This treatment involves construction of an engineered log crib structure filled with native soil and/or stream substrate. Suitable for restoring or establishing native riparian vegetation on extremely steep slopes. Provides high habitat value on confined, steep banks.

APPLICABILITY
Suitable for high velocity and high shear stress flow conditions for stream reaches with steep, overhanging banks. May be appropriate where right-of-way is highly constrained or where valuable infrastructure is threatened by erosion.

CONSIDERATIONS
Costly to construct and requires heavy equipment access. Requires boulder ballasts and anchoring. Risk of downstream impacts if crib wall is dislodged in high flows. Reuse native bank soil when feasible.

VARIATIONS
Transition to encapsulated soil lifts above ordinary high water.



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Source: Jennifer Natali Design. 2011

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Figure 8-5
Crib Wall Template

Variations: The District may use a hybrid approach with encapsulated soil lifts in the crib matrix, or transition to encapsulated lifts above ordinary high water.

Preventative Erosion Controls

This technique combines many of the treatment options described above, namely erosion control fabric with coir logs and other biotechnical elements, to prevent additional erosion at small actively eroding areas. It may also include minor grading or reshaping of streambanks to lay back over-steepened sections to create a stable slope.

Applicability: This treatment is typically suitable for streambanks experiencing low to moderate flow velocities and have finished slopes of 2h:1v (i.e., the slope is 2 horizontal units to every 1 vertical unit) or shallower.

Considerations: While the bank is protected by erosion control fabric during the vegetation establishment period, high flows may exceed the erosion protection capabilities of the temporary treatments.

Variations: The District may pair this approach with downed tree projects. A common erosion issue throughout the County occurs when undermined trees fail and the entire rootwad and tree end up in the stream leaving an un-vegetated and overstepped bank. In such cases, the District may choose to modify the tree and reshape the bank to allow for planting and erosion control BMPs.

8.3.4 Selection and Design of Appropriate Bank Treatments

Figure 8-6 provides guidance for selecting appropriate erosion control and bank stabilization treatments. **Figure 8-6** includes guidance for permissible shear stress and velocity, slope steepness, right-of-way width, construction access, and cost. Additional guidance for selecting suitable channel lining materials is provided in **Table 8-1** which lists permissible shear stress and velocity for various channel lining materials. **Table 8-2** lists permissible shear stress levels for various bank treatment options. In addition, **Table 8-3** provides entrainment velocities for various bed and bank materials and may be used to evaluate critical velocity (streamflow velocity at which erosion begins to take place) for initial screening of the appropriate bank treatment options.

From the standard designs presented in Section 8.3.2, the District can customize these templates to accommodate site-specific conditions including bank width, bank height, channel alignment, vegetation type, and soil conditions. Prior to implementing any erosion protection or bank stabilization measures, the District will evaluate and consider how reach-specific, as well as watershed-scale geomorphic processes, influence erosion at each site. Additional site-specific analyses to complete erosion protection designs may include: hydraulic modeling to estimate depth of flow, velocity and shear stress analysis at the bank protection site; and soil testing to determine geotechnical properties and suitability for revegetation.

TECHNIQUE APPLICABILITY AND CONSIDERATIONS

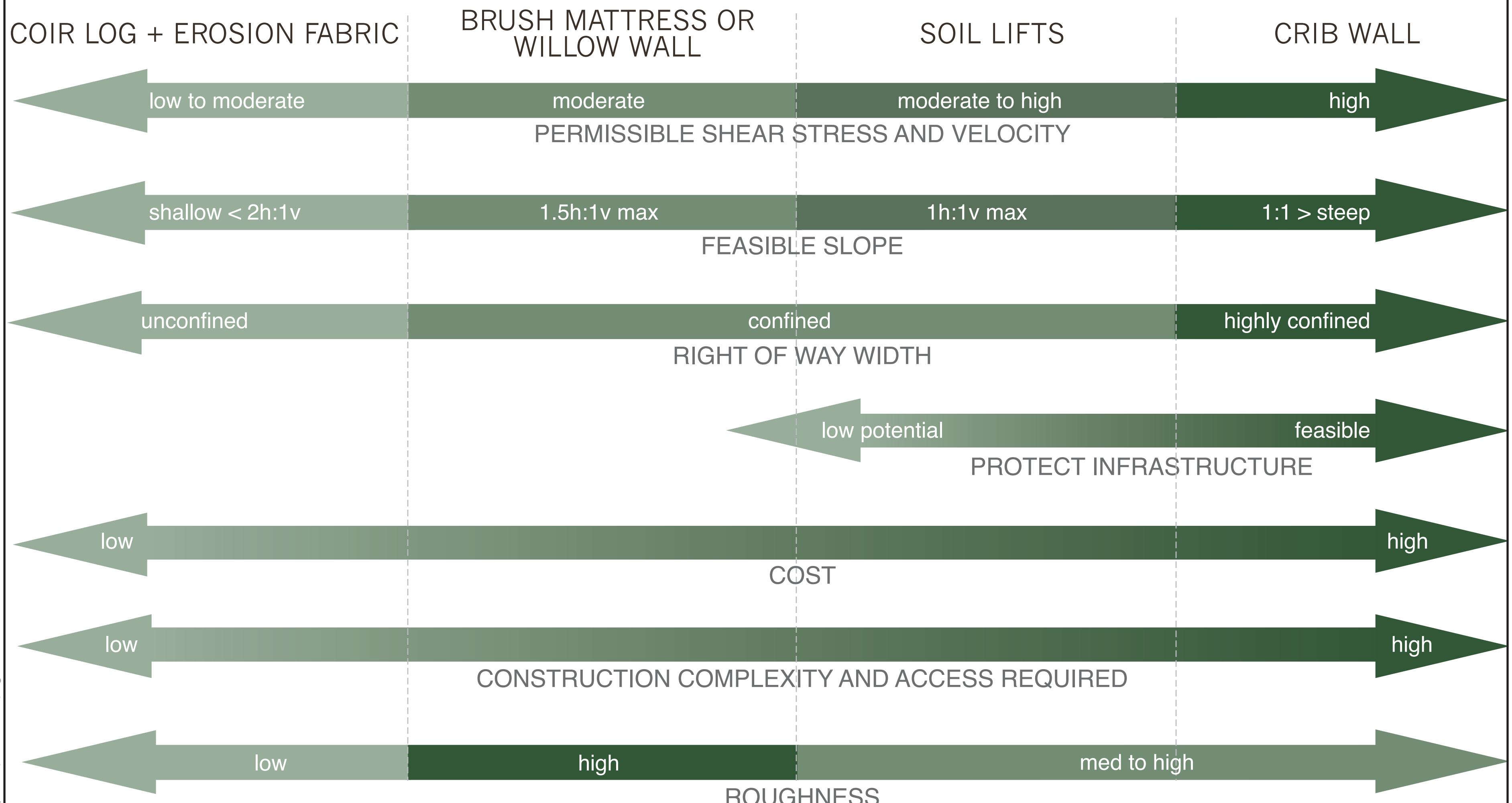

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Figure 8-6
Erosion Control and Bank Stabilization Technique Applicability and Considerations

Boundary Category	Boundary Type	Permissible Shear Stress (lb/sq ft)	Permissible Velocity (ft/sec)	Citation(s)
Soils	Fine colloidal sand	0.02 - 0.03	1.5	A
	Sandy loam (noncolloidal)	0.03 - 0.04	1.75	A
	Alluvial silt (noncolloidal)	0.045 - 0.05	2	A
	Silty loam (noncolloidal)	0.045 - 0.05	1.75 – 2.25	A
	Firm loam	0.075	2.5	A
	Fine gravels	0.075	2.5	A
	Stiff clay	0.26	3 – 4.5	A, F
	Alluvial silt (colloidal)	0.26	3.75	A
	Graded loam to cobbles	0.38	3.75	A
	Graded silts to cobbles	0.43	4	A
	Shales and hardpan	0.67	6	A
Gravel/Cobble	1-in.	0.33	2.5 – 5	A
	2-in.	0.67	3 – 6	A
	6-in.	2.0	4 – 7.5	A
	12-in.	4.0	5.5 – 12	A
Vegetation	Class A turf	3.7	6 – 8	E, N
	Class B turf	2.1	4 - 7	E, N
	Class C turf	1.0	3.5	E, N
	Long native grasses	1.2 – 1.7	4 – 6	G, H, L, N
	Short native and bunch grass	0.7 - 0.95	3 – 4	G, H, L, N
	Reed plantings	0.1-0.6	N/A	E, N
	Hardwood tree plantings	0.41-2.5	N/A	E, N
Temporary Degradable RECPs	Jute net	0.45	1 – 2.5	E, H, M
	Straw with net	1.5 – 1.65	1 – 3	E, H, M
	Coconut fiber with net	2.25	3 – 4	E, M
	Fiberglass roving	2.00	2.5 – 7	E, H, M
Non-Degradable RECPs	Unvegetated	3.00	5 – 7	E, G, M
	Partially established	4.0-6.0	7.5 – 15	E, G, M
	Fully vegetated	8.00	8 – 21	F, L, M
Riprap	6 – in. d_{50}	2.5	5 – 10	H
	9 – in. d_{50}	3.8	7 – 11	H
	12 – in. d_{50}	5.1	10 – 13	H
	18 – in. d_{50}	7.6	12 – 16	H
	24 – in. d_{50}	10.1	14 – 18	E
Soil Bioengineering	Wattles	0.2 – 1.0	3	C, I, J, N
	Reed fascine	0.6-1.25	5	E
	Coir roll	3 - 5	8	E, M, N
	Vegetated coir mat	4 - 8	9.5	E, M, N
	Live brush mattress (initial)	0.4 – 4.1	4	B, E, I
	Live brush mattress (grown)	3.90-8.2	12	B, C, E, I, N
	Brush layering (initial/grown)	0.4 – 6.25	12	E, I, N
	Live fascine	1.25-3.10	6 – 8	C, E, I, J
	Live willow stakes	2.10-3.10	3 – 10	E, N, O
Hard Surfacing	Gabions	10	14 – 19	D
	Concrete	12.5	>18	H

[1] Ranges of values generally reflect multiple sources of data or different testing conditions.

A. Chang, H.H. (1988).
B. Florineth. (1982)
C. Gerstgraser, C. (1998).
D. Goff, K. (1999).
E. Gray, D.H., and Sotir, R.B. (1996).
F. Julien, P.Y. (1995).
G. Kouwen, N.; Li, R. M.; and Simons, D.B., (1980).
H. Norman, J. N. (1975).
I. Schiechtl, H. M. and R. Stern. (1996).
J. Schoklitsch, A. (1937).
K. Sprague, C.J. (1999).
L. Temple, D.M. (1980).
M. TXDOT (1999)
N. Data from Author (2001)
O. USACE (1997).

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Table 8-1. Table from Fischenich (2001) provides permissible shear stress and velocity for various channel lining materials.

Table 8-2. Compiled Permissible Shear Stress Levels for Streambank Soil Bioengineering Practices

Practice	Permissible Shear Stress (lb/ft^2)*	Permissible Velocity (ft/s)*
Live poles (Depends on the length of the poles and nature of the soil)	Initial: 0.5 to 2 Established: 2 to 5+	Initial: 1 to 2.5 Established: 3 to 10
Live poles in woven coir turf reinforcement mats (TRM) (Depends on installation and anchoring of coir)	Initial: 2 to 2.5 Established: 3 to 5+	Initial: 3 to 5 Established: 3 to 10
Live poles in riprap (joint planting) (Depends on riprap stability)	Initial: 3+ Established: 6 to 8+	Initial: 5 to 10+ Established: 12+
Live brush sills with rock (Depends on riprap stability)	Initial: 3+ Established: 6+	Initial: 5 to 10+ Established: 12+
Brush mattress (Depends on soil conditions and anchoring)	Initial: 0.4 to 4.2 Established: 2.8 to 8+	Initial: 3 to 4 Established: 10+
Live fascine (Very dependent on anchoring)	Initial: 1.2 to 3.1 Established: 1.4 to 3+	Initial: 5 to 8 Established: 8 to 10+
Brush layer/branch packing (Depends on soil conditions)	Initial: 0.2 to 1 Established: 2.9 to 6+	Initial: 2 to 4 Established: 10+
Live cribwall (Depends on nature of the fill (rock or earch), compaction and anchoring)	Initial: 2 to 4+ Established: 5 to 6+	Initial: 3 to 6 Established: 10 to 12
Vegetated reinforced soil slopes (VRSS) (Depends on soil conditions and anchoring)	Initial: 3 to 5 Established: 7+	Initial: 4 to 9 Established: 10+
Grass turf – bermudagrass, excellent stand (Depends on vegetation type and condition)	Initial: 3.2	Initial: 3 to 8
Live brush wattle fence (Depends on soil conditions and depth of stakes)	Initial: 0.2 to 2 Established: 1.0 to 5+	Initial: 1 to 2.5 Established: 3 to 10
Vertical bundles (Depends on bank conditions, anchoring, and vegetation)	Initial: 1.2 to 3 Established: 1.4 to 3+	Initial: 5 to 8 Established: 6 to 10+

*(USDA NRCS 1996b; Hoag and Frippp 2002; Fischenich 2001; Gerstrasser 1999; Nunnally and Sotir 1997; Gray and Sotir 1996; Schiechtl and Stern 1994; USACE 1997; Florineth 1982; Schoklitsch 1937) as cited in USDA 2007.

Table 8-3. Typical Velocities Required to Entrain Channel Bed and Bank Materials

Channel Bed or Bank Material Type	Flow Velocity Required to Entrain Materials				
	0 - 2 ft/sec	2 - 4 ft/sec	4 - 6 ft/sec	6 - 8 ft/sec	> 8 ft/sec
Sandy soils					
Firm loam					
Mixed gravel and cobbles					
Average turf					
Degradable rolled erosion control products (RECPs)					
Bioengineering					
Good turf					
Permanent RECPs					
Armoring					
Gabions					
Riprap					
Concrete					

RECP = rolled erosion control products

Key:

	Appropriate
	Use Caution
	Not Appropriate

Source: Adapted from Fischenich 2001

8.4 Bank Stabilization at County Maintained Road Crossings and Drainages

At County maintained road creek crossings and culverts , biotechnical treatment methods are considered as a first option for repairing engineered channel banks and replacing existing rock slope protection, as described in Section 8.3 above. However, at sites where biotechnical treatment methods are infeasible, hardening of channels and in-kind replacement of concrete and rock slope protection may be necessary. The District would replace rock slope protection in areas such as culvert inlets and outlets, and in concrete lined sections of channel at or near road creek crossings. Bank repairs involving hardening of engineered channels are limited to 200 lf, whereas repairs of natural channels is limited to 100 lf.

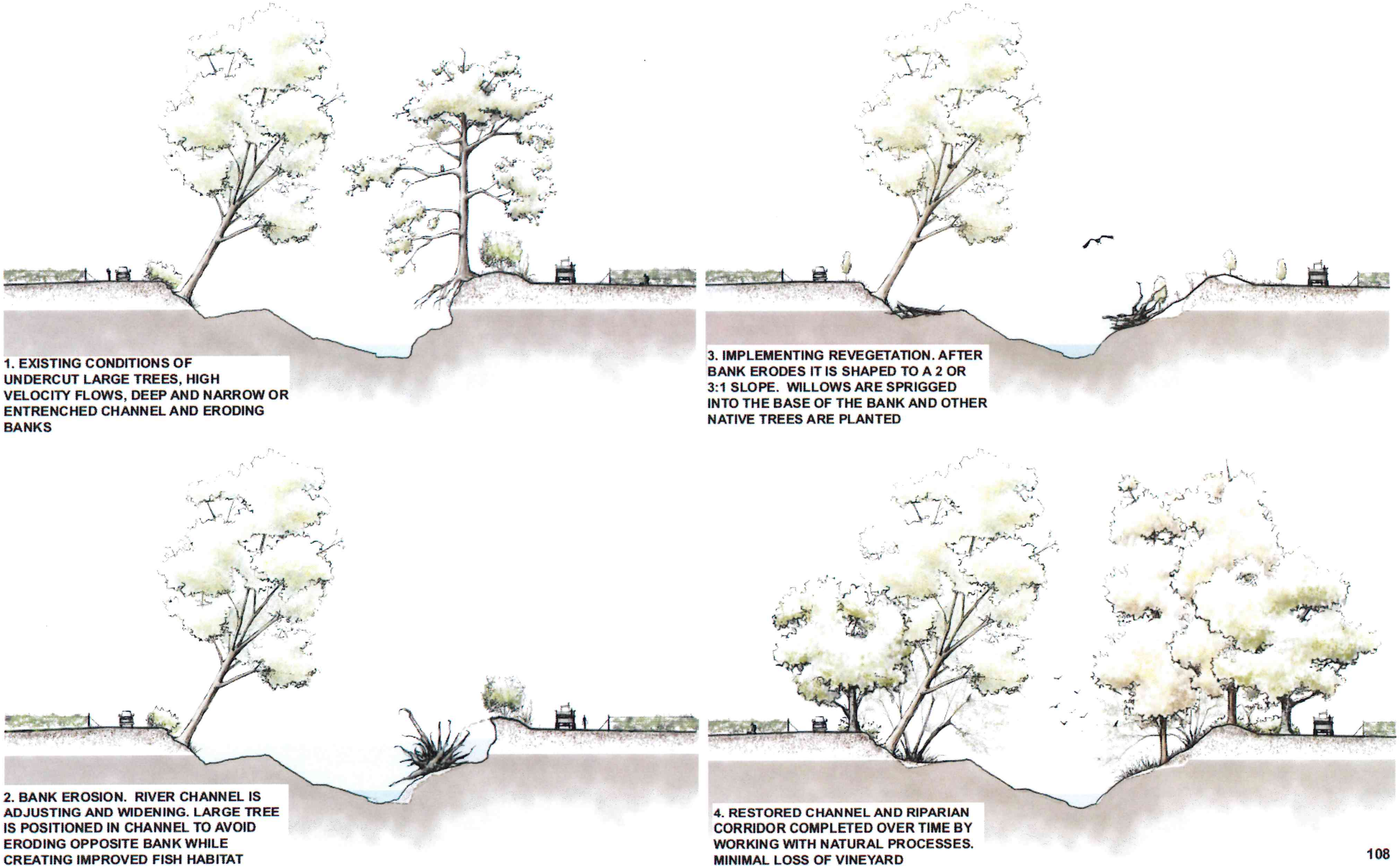
8.5 Channel Widening – Managed Streambank Retreat

Managed streambank retreat is a passive restoration approach where a landowner removes vineyards, or other active agriculture, within a buffer area along the river channel and installs an alternative agricultural crop that can thrive in a riparian buffer zone or restores the area with native riparian and upland plant species. Within the managed streambank retreat zone, the landowner allows the river to naturally expand with the understanding that the District will implement maintenance actions to stabilize the streambank before it reaches the defined managed retreat line. In some cases, after setting the agricultural infrastructure back, minor bank shaping and installation of biotechnical features may be installed. This method minimizes the need for larger streambank protection measures while expanding the riparian corridor. The District will collaborate with landowners to manage these areas in a manner that meets the riparian enhancement objectives and is consistent with the landowner's land management regime.

The various phases of managed streambank retreat are illustrated in **Figure 8-7**. In Phase 1, agricultural crops and access roads are moved farther from the channel and outside the managed retreat zone. The riparian corridor within the managed retreat zone is then planted with native trees and shrubs or biotechnical features are installed. In Phase 2, the top of the channel bank would be regraded to a gentler slope after dead trees have fallen into the channel. Newly disturbed areas surrounding the old tree would be planted with native vegetation or erosion control BMPs would be installed. Over time, inner channel benches will form within the widened channel cross section and the riparian corridor will provide enhanced habitat for terrestrial and aquatic wildlife.

Currently, landowners within the Rutherford and Oakville to Oak Knoll Restoration Project reaches can participate in the managed bank retreat technique. The overall goal of managed streambank retreat is to expand this land management concept to all suitable channels in the Community Facilities District boundary and eventually countywide, to create a more expansive riparian corridor along the Napa River and its tributaries for terrestrial species and to better support long-term habitat and agricultural sustainability.

Specific maintenance actions within managed streambank retreat zones are highly dependent upon site-specific conditions and vary depending on the landowner's level of participation. However, typical maintenance actions will include the planting of native riparian and upland species, invasive and Pierce's disease plant management, biotechnical bank stabilization, grading the upper bank to form a stable slope where a tree has fallen into the channel, and application of erosion control measures. Implementation of maintenance actions are conducted using a variety of methods involving hand tools, power tools, and equipment such as a skid steer or excavator. The District prefers to stage equipment along the top of bank (e.g., above ordinary high water mark). However, if the channel is dry during the work period, then equipment may be used in the channel to facilitate maintenance actions. In the event a site experiences large scale retreat or erosion, the District will collaborate with the landowner to identify a solution. Landowners may choose to pay for additional services to support the design, permitting, and implementation of larger streambank stabilization projects that are beyond the scope of this Program.



Source: California Land Stewardship Institute et al. 2011

Horizon WATER and ENVIRONMENT

Figure 8-7
Phases of Managed Streambank Retreat

8.6 Construction Approach

Bank stabilization activities are generally conducted from June 15th to October 31st when streams are at their driest. In dry years, work may begin earlier than June 15th and extend past October 31st (usually not longer than an extra two weeks on either end), provided that the District has received permission from the appropriate regulating agencies. Bank stabilization projects typically require 3 to 5 days to complete. As feasible and suitable, where earthen backfill is required for a bank stabilization project, the material will be collected from local stream deposits, such as blocked culverts or aggraded streambed locations.

Bank stabilization projects covered under this program will not affect more than 1,000 consecutive lf of bank. The majority of bank stabilization projects will encompass between 100 and 500 lf of bank. Repairs shall be confined to an area not to exceed 20 feet beyond (landward) of the failed or failing bank or structure. The District has learned that smaller projects are not necessarily better when addressing erosion issues, because a “band-aid” approach does not guarantee a long-term solution to the root cause of the issue. If a healthy and intact riparian zone is present adjacent to the bank failure site, care will be taken to disturb the least amount of vegetation possible, including mature trees. Access, staging, and project construction will be conducted to minimize impacts on existing riparian vegetation. Bank failure sites may contain exposed soils or be covered in shrub or ruderal vegetation such as grasses or blackberries. Overgrown vegetation will only be removed to the extent necessary to repair the bank.

When bank stabilization projects occur, banks will be recontoured to match the adjacent bank slope (i.e., returned to pre-failure condition). Most District-maintained channels have bank slopes of 2:1 or steeper. As described above, if site conditions allow, the bank slope may be stabilized at a less steep slope (to reduce the likelihood of renewed failure), but only if the work is conducted within the confines of the original channel as-built condition and the District’s maintenance easement. Stabilized banks will be flush with the existing bank slope, and only limited new material may protrude from the bank.

Equipment used for bank stabilization activities may include extending arm excavators, small bulldozers (Bobcat style), front-end loaders, and 10 CY dump trucks. Staging for repair activities will occur on adjacent access roads. Soil and rip-rap will be staged in areas that have been previously disturbed (i.e., service road, turn-outs, etc.). The majority of the work will take place from the top of bank zone and care is taken to minimize the area of disturbance. Appendix I includes typical design plans, construction methods, and other construction details (e.g., typical depth and width of excavation) for each biotechnical treatment option described in Section 8.3.2 above.

BMPs and avoidance and minimization measures will be applied based on the equipment used, site conditions, and access to the site (see Table 4-1.) If repair activities affect the active channel, the work area will be isolated from flowing stream segments using silt fences, wattles, and/or cofferdams. Dewatering techniques and additional BMPs appropriate to bank stabilization projects are described in Table 4-1.

Chapter 9
SEDIMENT AND DEBRIS REMOVAL ACTIVITIES

9.1 Overview

By filling a portion of the channel cross section, deposited or accumulated sediment and debris can reduce a channel's capacity to safely convey streamflow. To alleviate this flood risk, the District may remove excess sediment and debris from their flood control channels and facilities and those that are owned by other municipalities, as well as those that are under the County Roads Division's maintenance responsibility. Sediment and debris removal mostly occurs within modified/engineered channels or within proximity to culverts and bridges. The SMP does not include any expansion of channel capacity beyond the original functioning channel condition. Sediment and vegetation removal is also necessary at the Town of Yountville's in-channel detention basins and at detention basins in American Canyon.

The number of sediment and debris removal projects undertaken in a given year and the quantity of sediment removed depend on recent hydrologic and weather conditions, the frequency of past storm events, and the history and extent of past maintenance activities. Sediment and debris removal needs are generally greater following a wet winter with higher than usual runoff, slope erosion, and sediment delivery compared to an average or dry winter when sediment yields are less. Collectively, the District implements up to ten sediment removal projects immediately after a wet winter and then may go a year or two without needing to conduct any sediment removal projects.

The District's sediment removal activities vary in length depending on channel characteristics and covers channel segments roughly 250-500 lf long. These projects typically occur only in District owned or maintained engineered or modified flood control channels. The City of American Canyon's forecasted sediment removal activities are typically 100-200 lf long and would involve removal of 25-50 cubic yards of sediment per site. The County primarily conducts sediment removal from existing drainage ditches and roadside culverts. On average, 100 to 500 CY of sediment is removed from up to ten sites per year. Most commonly, the District needs to alleviate a specific flood concern at an individual crossing, culvert, or other in-channel facility that experiences moderate sediment accumulation. At crossings, culverts, or other facilities, sediment removal often occurs in concrete lined channels. For the Napa River/Napa Creek Flood Protection Project (Flood Protection Project), the Napa Creek box culverts, flapgates, and trench drains are inspected for sediment accumulation as well. The District may also undertake geomorphic shaping projects, where instream depositional features such as gravel bars or benches may be realigned or reshaped to reduce the flood hazard or redirect erosive flows away from vulnerable streambanks. The District has learned that, to minimize impacts, it is best to remove sediment less frequently, but to address the issue comprehensively when implementing such projects.

In general, the District rarely undertakes large reach-scale sediment removal projects, where sediment is removed from an entire length of channel reach. Because reach-scale projects are infrequent, they are not considered routine maintenance and are not covered under the programmatic permits for the Program. Under the SMP, sediment removal projects are limited to no greater than 1,500 lf.

All channel sediment removal activities will follow the impact avoidance and minimization approach and principles described in Chapter 4, including the BMPs presented in Table 4-1. Permits necessary to support sediment removal activities are described in Chapter 2.

As part of maintenance of the Flood Protection Project, the District is responsible for monitoring sediment deposition occurring in Napa River downstream of the bypass inlet (near the oxbow). As described in the Flood Protection Project's O&M Manual (USACE 2018), once all project features are constructed, the District will periodically re-survey representative cross sections of the Napa River within the Flood Protection Project area, re-evaluate Manning's n values and develop a modified HEC-RAS 1D2D model to determine the need for future maintenance activities including possible sediment removal.

Maintenance of the lower Napa River from the Third Street bridge in the City of Napa and downstream is overseen by the U.S. Army Corps of Engineers (USACE) as part of the Napa River Navigation project. The USACE periodically dredges the Napa River to maintain navigational use. The District provides and manages dredge spoil sites at Edgerly Island and the Imola Site (also utilized by the Napa Sanitation District) for placement of material dredged by the USACE. Sediment disposal and reuse activities at these sites are further described in Chapter 10, *Maintenance of Restoration Projects and Other Sites*, Section 10.3. Activities conducted on the lower main stem Napa River are authorized by regulatory agencies independently from the District's routine SMP.

9.2 Sediment Sources

Sediment delivered to the District's flood control channels has a variety of upstream sources. Transported sediment may be derived from upland erosive areas such as steep and exposed hillsides, active landslides, or gullies. Erosion may also occur in less steep locations, but due to land use practices or erosive soil types, may provide abundant sediment loading to the downstream channel. Erosion is particularly susceptible at construction and grading areas and where new roads are developed or old roads expanded.

Beside these watershed sources, sediment is also provided directly from erosion and transport of instream channel sediment. Instream sediment sources from bank erosion, transport of sediment from depositional features like instream bars or benches, or erosion of the channel bed itself (incision) may be a significant contributor to downstream sediment delivery. This effect is pronounced where "hydromodification" occurs, whereby development or land use practices reduce surface infiltration capacity, increase surface runoff, and thereby increase streamflow peak discharge and velocity. All these processes result in more erosive streamflows.

In developing the Total Maximum Daily Load (TMDL) for the Napa River Watershed, the San Francisco Bay Regional Water Quality Control Board (RWQCB) investigated sediment sources in the Napa River watershed between 1994 and 2004. The RWQCB (2009) concluded that:

1. More than half of fine sediment delivered to the Napa River is associated with land use activities, including roads, channel incision, vineyards, intensive livestock grazing, and urban stormwater runoff.

2. Channel incision, in addition to being a significant sediment source, is the primary cause of channels being isolated2 from their floodplains. Channels that are disconnected from their floodplains have reduced spawning and rearing habitat for salmon and steelhead.

3. Sediment loads vary greatly depending upon geologic conditions, land use activities, and the location of dams.

4. Thirty percent of the Napa River watershed drains into reservoirs which capture upstream gravel and sand, and most of the finer sediment input to upstream channels. However, human induced erosion downstream of dams is high. The fine sediment load in the lower Napa River downstream of the major reservoirs is substantially elevated.

The RWQCB studies concluded that, between 1994 and 2004, the sediment load into the Napa River at Soda Creek was 466 metric tons per km^2 per year, or roughly 185% of the estimated natural (or baseline) erosion rate of 252 metric tons per km^2 per year. **Table 9-1** summarizes the RWQCB's findings on sediment sources in the Napa River Watershed.

Table 9-1. Mean Annual Sediment Delivery to Napa River at Soda Creek (1994-2004)

Source	Estimated Mean Annual Delivery Rate (metric tons/yr)
Land areas upstream of dams (fine sediment discharged from reservoirs)	
▪ Natural Processes	7,000
▪ Human Actions	11,000
Land areas downstream of dams	
▪ Natural Processes	92,000
▪ Human Actions	
Channel incision and associated bank erosion	37,000
Road-related sediment delivery (all processes)	55,000
Surface erosion associated with vineyards and/or livestock grazing	37,000
Gullies and shallow landslides associated with vineyards, and/or intensive historical grazing	30,000
Urban stormwater runoff and wastewater Discharges	2,500
Total	**272,000**

Notes: From (RWQCB 2009). Drainage area for Napa River at Soda Creek = 584 km2. Estimates above do not include sediment deposited and retained in tributary reservoirs, which includes all gravel and sand, and most of the finer sediment input to channels located upstream of the reservoirs. Approximately 104,000 metric tons per year of sediment are deposited in tributary reservoirs, 48,000 metric tons per year of which is derived from natural processes (Above estimates are rounded to the nearest thousand).

As shown in Figure 1-1 and described in the channel characterizations of Chapter 3, the District's flood control channels are primarily located along the southern Napa Valley floor and along the lower alluvial fan reaches of the side valley tributaries that descend toward the Napa River. City of American Canyon's flood control channels are located further south with American Canyon Creek descending toward the Napa River.

The District's primary maintenance reaches are located in the more gently sloping valley floor region. From a watershed perspective, these areas are generally depositional environments. However, within the program area, not all reaches are depositional. More site-specific in-channel hydraulic conditions determine whether sediment is eroded, transported, or deposited in a given reach. Factors such as channel gradient (slope), channel width, alignment, sinuosity, and depth of flow all influence instream sedimentary processes. Subtle transitions from higher gradient to lower gradient sections may favor sediment to fall out of suspension and deposit. Similarly, transitions from a narrower stream section to a wider channel may also cause flow dispersion, reduced velocities, and result in net deposition and bed aggradation. Transitions from piped or culverted sections to an open-channel, or transitions at road crossings or structures may also favor sediment fall out and deposition.

The relevance of these site-specific sedimentary processes to maintenance needs is that certain locations in the program area are more prone to sedimentation and are therefore more prone to requiring routine and repeated maintenance. Many of these areas are identified in the channel characterization sheets of Chapter 3, *Environmental Setting*. When the underlying factors causing sediment deposition are understood and identified, maintenance activities can be tailored to be more effective. Focusing the sediment removal work specifically to deposition prone areas, and not to wholesale reaches, helps avoid and minimize potential environmental impacts associated with sediment removal activities. These approaches are further described in Chapter 4.

The District is also collaborating with other local entities to address watershed sediment sources upstream in an effort to manage sediment loads and minimize maintenance needs. The Napa RCD is working throughout the County with landowners on upland road improvement projects to reduce upstream inputs of fine sediment. These road practices are described in Chapter 11 and demonstrate the District's and RCD's commitment to watershed wide collaboration and environmental management. The District is tracking annual sediment load reductions associated with watershed enhancement projects. See Section 13.4.1 for additional discussion about the District's progress in both tracking sediment load reductions and meeting goals of the Napa River Sediment TMDL.

9.3 Maintenance Goals and Triggers

9.3.1 Sediment and Debris Removal Goals

The District's goals for sediment removal activities are to:

- identify and prioritize stream locations that require sediment and debris removal and maintenance to ensure adequate flood conveyance capacity;
- understand the underlying geomorphic processes at all of the District's maintenance channels to inform and guide appropriate maintenance actions;
- develop an appropriate maintenance target condition for sites that balances flood protection needs, economizes maintenance activities, and avoids and minimizes environmental impacts;
- improve water quality conditions through sediment management, including the removal of fine sediments; and to

- conduct maintenance that will enhance stream function while minimizing the need for repeat maintenance.

Where appropriate, target conditions for each reach are identified according to management needs, reach functioning, and other opportunities and constraints. In this way, stream sections are managed to maintain and enhance sediment conveyance, water quality, and habitat. To the extent possible, the District seeks to preserve and/or enhance beneficial instream bed forms and habitat features (including LWD) that support in-channel complexity, diverse cover, and local habitats.

The District's approach to sediment removal and management is to implement maintenance incrementally as needed. Incremental maintenance prevents sudden, drastic alterations in sediment load within individual reaches, which could accelerate further aggradation or incision. Incremental implementation also allows time for monitoring, evaluating channel conditions, and adaptively adjusting the maintenance approach as needed. The incremental maintenance approach has a spatial component and a temporal component, in that sediment removal activities will occur in specific reaches at a given time and not throughout an entire stream system in any given year. Therefore, stream maintenance activities for specific reaches will be prioritized annually with only the reaches in highest need being treated.

9.3.2 Sediment Removal Triggers

In general, sediment removal activities are appropriate when any of the following conditions applies:

- The channel is systemically aggrading such that channel capacity is significantly reduced and the risk of flooding increases. The degree to which channel capacity has been reduced is determined based on visual assessment (during dry season and wet season conditions), cross section comparisons to the as-built channel condition, and any past record of flooding conditions. The District will be supporting a stream data collection effort as described in Chapter 14, Section 14.8, *Data Collection and Management*.
- Accumulated sediment is covering or blocking culvert outfalls, drop-inlets, drainage ditches, or filling box culverts, threatening to cause flooding.
- Sediment is accumulating in a way that supports excessive vegetation growth, threatening channel capacity or creating undue roughness.
- Sediment accumulation is impeding fish passage.
- Instream structures designed to direct flows for flood management are causing excessive sediment deposition. Examples include culverts that are filling with sediment.
- Sediment and vegetation in detention basins has accumulated so much that the basins are clogging outlet pipe openings and/or stormwater capture capacity is substantially reduced.

The need for sediment management action is unlikely if none of these trigger conditions are present. The District may also need to evaluate the overall channel form including channel geometry and invert elevations to better understand why certain reaches are chronically depositional.

9.4 Sediment Removal Activities at Culverts and Stream Crossings

As introduced above, sediment removal activities typically occur at small localized sites (less than 500 lf long) that experience sediment deposition or blockages. Sediment removal activities may often occur at culverts and stream crossings (and immediately upstream and downstream of crossings) where sediments tend to collect and deposit. Sediment removal activities generally occur under dry channel conditions. However, if maintenance is necessary where water is in the channel, dewatering would be conducted (see discussion below).

Sediment removal projects will typically involve the following activities:

- removal of accumulated sediment from up to five channel, culvert, or pipe locations per year;
- typical project distance of 100-500 lf and 50-100 CY of sediment removal per maintenance site (within engineered flood control channels);
- typical project distance of 25 lf in natural channels;
- if mechanized sediment removal is necessary, excavation equipment will be located outside of channel on maintenance access roads above high bank locations. From that location, excavators can remove sediment and place it directly onto hauling trucks, keeping all mechanized equipment outside of the channel;
- if using a long reach excavator is not possible (for example, within a covered box culvert), maintenance staff may use small Bobcat®, skid-steer, or walk-behind power-shovel to remove sediment on concrete surfaces or hardened facilities. A vacuum truck is also used to remove sediment from smaller culverts and pipes;
- where possible, maintenance staff will use non-mechanized hand tool approaches for smaller scale projects or in working around sensitive instream locations that are not hardened surfaces; and
- if repeated channel entrance is necessary, maintenance staff will identify temporary access locations and develop access ramps along the stream banks, to minimize repeated disturbance to bank locations.

Smaller culverts (12 to 24 inches) made of corrugated metal pipe (CMP) often drain from adjacent properties directly into District-maintained channels. Neither the District nor other partner municipalities is responsible for maintaining local private drainage culverts beyond the each entity's property or maintenance easement, but both maintain the outlet of such culverts when they enter flood control channels under their maintenance. A culvert outlet that is blocked with sediment or vegetation will not drain properly. Removing sediment from a small culvert outlet may require similar techniques as described above for culvert crossings but may also simply require digging out the culvert outlet by hand.

The sections below discuss sediment removal operations and techniques. Regulatory compliance requirements for sediment removal are not reviewed in this chapter, but are presented in *Chapter 2, Regulatory Compliance*.

9.4.1 Channel Access and Staging

Access to the project site and staging of equipment and vehicles will take place on existing access roads adjacent to the channel. Flood control channels maintained by the District typically have at least one access road running along the top-of-bank on one side of the channel. Some channels have an access road on either side of the channel. Where feasible, mechanized sediment removal is conducted using an excavator from the top-of-bank access road. This reduces the need for equipment within the channel. Where feasible, instream work is conducted from the north side of the channel to avoid needing to remove vegetation (and the accompanying shade reduction) from the south side.

When the channel shape, bank height, or the presence of large mature trees prevents the use of the top-of-bank access roads, an access ramp (earthen or hardened, if already existing) may be used to move equipment lower on the bank of the channel, or move the equipment into the channel. Access ramp locations are selected to avoid impacts to vegetation, while providing efficient, safe equipment access to the work area. If used, access ramps are temporary and will be regraded and replanted following the sediment removal activities. Following maintenance, the ramps will be seeded with native grasses and erosion control fabric will be installed.

When necessary, sediment removal activities can be conducted from within the channel bed. This approach is favored where top-of-bank or side-bank access is unavailable, or would require unnecessary damage to trees along the riparian corridor. Scrapers, skid loaders, bulldozers, and smaller Bobcat® type loaders are used when working directly in the channel bed. All removed sediment, whether working from top-of-bank, mid-bank, or in channel will be placed in 10- or 20-cubic-yard dump trucks located on the access road or within the staging area.

9.4.2 Mechanized Sediment Removal

Aggraded sediment can be removed with a long-reach excavator, bulldozer, scraper, or front loader. As described above, the preferred approach is to have the long-reach excavator located on the access road adjacent to the channel. Once excavated, sediment is placed directly into dump trucks parked on the access road. BMPs and avoidance and minimization measures will be applied to sediment removal activities based on equipment used, site conditions, and access to the site. If equipment is operated in such a way that loose sediment may possibly enter the active channel, erosion control fabric will be installed at the toe-of-slope or along the edge of the active channel to avoid delivery of any dislodged sediment into the channel and/or low-flow channel. If equipment is used within the channel, or if activities conducted from top-of-bank may affect the active channel, the work area will be isolated from flowing stream segments using silt fences, wattles, and/or cofferdams (see the Dewatering section below). Additional BMPs are identified in Table 4-1 and will be applied as appropriate to all sediment removal projects.

9.4.3 Dewatering

Dewatering of the stream may be required in order to conduct sediment removal in the channel. Many program area creeks are intermittent or ephemeral. Such creeks are dry in the summer maintenance season and therefore do not need dewatering for maintenance. Other creeks are perennial and carry flow year-round. Several of the channels in urbanized areas, or downstream of urbanized areas that were historically dry in summer, now receive flows from urban runoff and contain water year-round. In American Canyon, dewatering activities are expected to be necessary in American Canyon Creek, Walsh Creek, and Newell Creek.

If the channel is conveying water or ponding at the time of maintenance, dewatering techniques will be used. The District typically uses a small-scale and flexible approach with a small coffer dam (typically made of sand bags) less than 1 foot deep, a small portable pump (5 horsepower or less), and 4-inch flexible pipeline to re-route flows around the work site downstream. Where dewatering occurs, work sections are kept short, less than 100 lf to minimize dewatering effects. Pumping rates are set to match inflows to the coffer dam with the downstream release of the diverted flows. Pump intake lines are protected with screens according to NMFS and CDFW criteria (i.e., not larger than 1/8 inch) to prevent the entrainment of aquatic species. The diverted flows are released back into the channel as near as possible to the downstream end of the project area. Silt bags are used at the end of the diversion pipe to reduce any sediment discharge downstream and to dissipate flow velocity and prevent scour at the discharge site.

Channels will only be dewatered to the extent necessary to conduct sediment removal activities while protecting water quality and avoiding impacts to aquatic species. Specific BMPs for channel dewatering are described in Table 4-1.

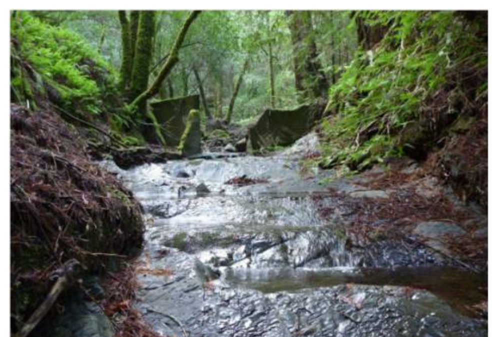
9.5 Sediment and Vegetation Removal from Detention Basins

Detention basins are located throughout the City of American and are intended to improve the quality of urban runoff from impervious surfaces including roads, parking lots, residential neighborhoods, commercial areas and industrial sites. The basins are intended to reduce peak stormwater runoff rates by providing temporary storage and reducing erosive flows during large storm events. The detention basins are designed to help slow the rate of runoff and improve the quality of the stormwater before leaving the detention basins. They also collect and trap sediment, pollutants, and other debris from stormwater that would otherwise end up clogging creeks and streams. Vegetation within the basins help filter out pollutants in sediment before the runoff reaches the outlet of the basin. Routine maintenance of detention basins includes removing dead cattails, bulrush, and other decomposing vegetation where vegetation has visibly clogged outlet pipe openings and removing accumulated sediment to restore the basin capacity to its as-built condition. Vegetation and sediment removal work is primarily conducted using hand tools but, depending on the size of the basin, heavier mechanized equipment is used (e.g., backhoes or excavators with a flail mower attached).

9.6 Debris Removal

Debris removal involves removing non-sedimentary materials that are deposited in channels as a result of high flows or through human activity. Such debris includes tires, shopping carts, trash, furniture, clothing, homeless encampments, and other substances. Whereas sediment accumulation typically involves the raising of the stream bed in a uniform manner and the development of instream depositional features such as instream bars; non-sedimentary debris typically occurs in the form of isolated objects or debris mounds or snags. However, such debris whether in the form of a snag, mound, or isolated object can significantly reduce channel conveyance capacity and affect hydraulic conditions. In particular, debris jams can divert and redirect flows into streambanks and thereby increase bank erosion. Large debris is also problematic when caught against crossings and bridge abutments which leads to raised water elevations and blocked culvert entrances and outfalls.

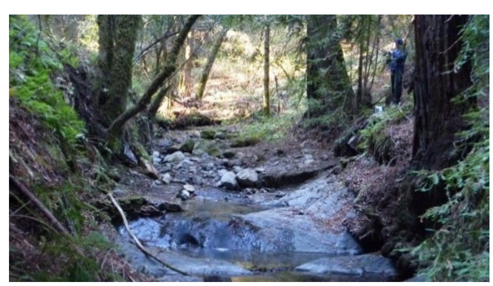
The District routinely monitors flood control channels within their respective jurisdiction to remove debris that impairs hydraulic conditions or reduces channel conveyance capacity. Based on these routine inspections, debris removal occurs on an as-needed basis. Debris removal may also be required to provide access for minor maintenance activities at stream gages, culvert outfalls, flap gates, and grade control structures.



Abandoned instream dam on Wing Canyon Creek before removal

Debris removal activities are generally conducted by work crews using hand tools and occasionally a winch. Heavy equipment is typically not used for debris removal. Non-vegetative debris is removed from the site via dump truck for disposal at a solid waste landfill. However, containers of hazardous waste, such as paint and oil, are sealed in protective containers and disposed at an appropriate hazardous waste facility. BMPs identified in Table 4-1 will be applied, as appropriate.

As creek and watershed stewards, the District assists private property owners and other local partners (including agencies) in assessing existing instream obstructions and abandoned structures for possible removal. As feasible, the District will assist local watershed stakeholders through removing such obstructions and abandoned facilities using hand tools and approaches as described in this Manual. Related to debris removal, the District also coordinates with local



Wing Canyon Creek after removal of the abandoned instream dam in 2012

law enforcement to control the establishment of homeless encampments on the flood control channels that are owned by the District and City of American Canyon. Such encampments can be major sources for debris, garbage, and water pollution. Signs are posted 48 hours in advance of homeless encampment removal.

There are many abandoned instream dams that remain in County creeks. These abandoned dams (generally small in nature) have typically outlived their purpose and now remain as instream barriers. Other constructed instream facilities considered for potential removal will be evaluated on a case by case basis for consistency with the management objectives and principles of the Stream Maintenance Program. The photos above illustrate before and after photos of an instream dam on Wing Canyon creek in 2012. This structure was removed by hand-held tools and with approval from CDFW.

9.7 Sediment and Debris Disposal

For projects involving sediment removal, and as specified in the Sediment Sampling and Analysis Guidelines included in **Appendix K**, the District will test the sediment to be removed to determine the suitability for disposal or reuse based its chemical qualities. The discharge orders issued by the Regional Water Board dictate the degree of sediment sampling and testing required for sediment disposal or reuse associated with this maintenance program. This Manual incorporates these requirements by reference. As specified in the Sediment Sampling and Analysis Guidelines, sediment samples will be collected and analyzed according to the *Beneficial Reuse of Dredged Materials: Sediment Screening and Testing Guidelines* (RWQCB 2000) as appropriate for wetland, channel, or floodplain restoration purposes. Sediment reused for agricultural or commercial use purposes would be tested according to specific analytes listed in Appendix K. Sediment testing results will be submitted to the Regional Water Board for review and approval.

Sediment disposal and reuse sites are identified when the need for sediment removal activities arise; sediment removal and disposal activities may not be necessary every year. In general, sediment disposal sites can be characterized into five categories based on potential reuse or disposal opportunities. These categories include (1) on-site reuse, (2) other wetland, channel, or floodplain restoration reuse, (3) upland agricultural or commercial reuse (dry), (4) landfill disposal, and (5) hazardous waste disposal. These five options will be evaluated in decreasing preference with site selection based on the quality of sediment. The preference is to select disposal options that most beneficially reuse the sediment with the least environmental effects. If hazardous levels of contaminants are present, the material is taken to a permitted hazardous waste facility.

The District maintains two sediment disposal sites in association with the U.S. Army Corps of Engineers dredging activities for navigation along the Napa River. These sites are the Edgerly Island and Imola sites. For each site, the District intends to prepare management plans and secure dredged material rehandling permits from federal, state and local regulatory agencies. Below is a brief description of each site. Routine maintenance activities conducted at these sediment reuse and disposal sites are also described in Chapter 10, *Maintenance of Special Projects and Other Sites*, Section 10.3.

Edgerly Island Rehandling Site. The Edgerly Island Rehandling Site (Figure 1-4) was reconfigured to receive sediment spoils in 2004. The total capacity of this site to receive sediment spoils is 300,000 CY. The site was only utilized once and has not been active since; the site is nearly empty. Prior to receiving any sediment spoils in the future, the District will need to obtain a Waste

Discharge Requirements (WDR) from the Regional Board. This site would provide a long-term solution for sediment and debris disposal.

Imola Rehandling Site. The Imola Site (Figure 1-4) was reconfigured to receive sediment spoils in 2006. This site has the capacity to receive 50,000 CY of sediment spoils. This site was last utilized for sediment disposal in 2017 pursuant to a separate WDR.

Further detail on sediment sampling methods, sediment chemical analysis, and disposal and reuse options are discussed in Appendix K.

Trash debris removed from District channels is taken to one of two places depending on the nature of the debris. Non-hazardous material is taken to the Napa County Corporation yard at 933 Water Street in Napa, while large bulky items and hazardous materials including tires are taken to the Napa County Waste Transfer Station at 889 Devlin Road in American Canyon. Debris from City of American Canyon channels may be delivered to the transfer station in American Canyon or another nearby permitted landfill.

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Chapter 10
Maintenance of Special Projects and Other Sites

10.1 Overview and Purpose

As described in Chapter 1, *Introduction*, the District conducts routine maintenance on District-owned property and also performs monitoring and maintenance for special projects. This chapter describes District maintenance activities at:

- Restoration projects within the Napa County Community Facilities District (CFD),
- Sediment rehandling sites (Edgerly Island and Imola Avenue sites), and
- The Napa River/Napa Creek Flood Protection Project.

The District is supporting private property owners by maintaining two Napa River restoration projects, the Rutherford Reach and the Oakville to Oak Knoll Reach projects. Each project has a maintenance plan that was developed by the District and has been approved by federal and state regulatory agencies. These reaches are encompassed by an established CFD and the District's maintenance work is funded by property tax assessments through the CFD. The maintenance agreement and unique maintenance approaches applied to these projects are described in Section 10.2. Section 10.3 describes maintenance activities conducted on two properties the District owns for rehandling of sediment material dredged from the Napa River. The District is also responsible for conducting routine maintenance of the Napa Flood Protection Project as described in the USACE authorized Operation, Maintenance, Repair, Replacement and Rehabilitation Manual (USACE, April 2018).

10.2 Maintenance within the Community Facilities District

The CFD encompasses the topographic area draining to the Napa River between Zinfandel Lane and Oak Knoll Avenue; an area covering approximately 57,230 acres and nearly 20 miles of the Napa River mainstem, and numerous tributaries to the Napa River. Participating landowners in the Rutherford and Oakville to Oak Knoll restoration projects are included in the CFD. Creekside landowners within the CFD area may annex into the CFD if they wish to receive maintenance services from the District. Details on the maintenance activities conducted within the CFD are provided below.

10.2.1 Rutherford Reach

In 2008, the District adopted a Resolution to establish formation of the Rutherford Reach Benefit Zone Assessment District (Assessment District). The purpose of the Assessment District is to establish and collect fees to fund maintenance activities within 41 parcels located on both sides of the Rutherford Reach of the Napa River (4.5 miles of the river located south of St. Helena from Zinfandel Lane to Oakville Cross Road). These parcels are participants of the Napa River Rutherford Reach Restoration Project. River restoration on these parcels was completed in 2014.

The District conducts monitoring and maintenance activities for the project with funds from the Assessment District, which include different rates from the CFD; participants in the Rutherford Assessment District pay Assessment District rates, not CFD rates.

District maintenance activities in the Assessment District are implemented according to the Rutherford Reach Maintenance Plan (Jones & Stokes 2008) developed specifically for the restoration project (see Appendix A). Maintenance activities include debris removal and relocation of large wood; vegetation management; streambank erosion control; repair and maintenance of floodplain benches; maintenance of created vegetation buffers; repair and maintenance of aquatic habitat enhancement structures; repair and maintenance of streambank stability structures; invasive plant removal and revegetation; and annual surveys and assessments. Maintenance methods implemented in the Rutherford Reach are consistent with those described in this Manual, and are consistent with the maintenance activities conducted in the Oakville to Oak Knoll Reach described below.

10.2.2 Oakville to Oak Knoll Reach

Within the Oakville to Oak Knoll restoration reach, preventative and routine maintenance of the river and restoration features will be funded through property tax assessments collected from landowners through a CFD and adopted by the District. The CFD assessment is different than the assessment applied to property owners in the Rutherford Reach. The core group of landowners with restoration projects on their parcels formed the CFD in 2014; these are the property owners of 23 restoration sites located between Oakville Cross Road and Oak Knoll Avenue. The CFD boundary was extended by the District to provide property owners along tributaries to the Napa River reach between Zinfandel Lane and Oak Knoll Avenue (1,016,306 linear feet) with the opportunity to annex in and receive maintenance services for their properties. The core landowners formed a Landowner Advisor Committee (LAC) to guide and review annual maintenance and monitoring actives. The CFD funds annual District maintenance and monitoring activities as described in the CFD Guidance Document (Napa County 2014), including annual surveys, vegetation management, downed tree and debris management, and biotechnical bank stabilization projects along the river (see Appendix A). Annual maintenance needs vary from year to year depending on the magnitude of winter storm events and landowner requests. The District’s objective is to work with landowners to ensure the long-term success of the restoration project and to enhance physical processes and biological resources through the entire restoration reach.

10.2.3 Community Facilities District Maintenance Activities

Currently, the CFD maintenance program is focused on maintaining the restoration features installed by the Rutherford and Oakville to Oak Knoll restoration projects. However, the District envisions broadening maintenance activities to other private property owner participants in the future. The maintenance objectives, triggers, and activities described below would apply to any location in the CFD.

The objectives of the CFD maintenance program are to:

1. Minimize bank erosion through vegetation management, large woody debris (LWD) realignment and/or relocation, debris/large trash removal, and biotechnical stabilization.

2. Maintain the function of constructed instream habitat enhancement structures.

3. Control target non-native invasive and Pierce's disease host plants, to the extent practicable, within the riparian corridor of the reach.

Within the CFD, and throughout the County, the District takes an integrated stream maintenance approach that involves protecting and enhancing existing instream resources while ensuring that restored features are functioning as designed. The CFD maintenance program is intended to proactively address streambank erosion and failure to protect environmental resources and properties within the CFD and maintain features constructed as part of the Rutherford and Oakville to Oak Knoll restoration projects. Maintenance efforts also include controlling target invasive non-native and Pierce's disease host plants within the riparian corridor. Maintenance efforts in the CFD are not intended to address catastrophic streambank failure, emergency repairs, or large streambank erosion issues on private property. Such repairs would require separate regulatory permits and approvals and would be implemented by individual landowners in coordination with the appropriate regulatory agencies.

The following sections describe the specific types of activities included in the maintenance program. Each year, the activities identified in the annual work plan will be implemented by District staff, crews supplied by the District, or by landowner-supplied work crews overseen by District staff. For some activities (depending on the nature and scope of the work they entail), maintenance crews will also be required to implement measures to avoid and/or minimize environmental impacts; this is described further in Table 4-1 (see Chapter 4).

Maintenance Triggers

Maintenance actions at restoration projects are triggered by observed conditions at specific restoration features installed during project construction. Triggers are summarized in **Table 10-1** below.

Table 10-1. CFD Monitoring Program and Maintenance Implementation Guidelines

Restoration Project Action	Monitoring Parameter	Maintenance Triggers
Stabilize eroding banks with biotechnical methods	▪ Eroding stream bank survey ▪ Napa RCD fisheries studies	▪ Bank erosion advances significantly from previous monitoring period ▪ Biotechnical stabilization feature fails or is experiencing erosion
Widen selected reaches to create inset floodplain benches and secondary channels	▪ Channel morphology survey	▪ Sediment deposition degrades the function of restoration feature ▪ Erosion degrades the function of restoration feature
Add in-channel large wood & roughness boulders or modify downed trees to preserve LWD within the channel	▪ Large woody debris survey ▪ Survey of California fresh water shrimp habitat structures ▪ Napa RCD fisheries studies	▪ Restoration feature fails or the function is degraded ▪ Sediment aggrades and buries a structure ▪ Erosion threatens the stability of the structure ▪ Debris jam or blockage degrades the function

Restoration Project Action	Monitoring Parameter	Maintenance Triggers
Augment channel with gravel	▪ Channel geomorphology survey ▪ Erosion/deposition pins	▪ Gravel mobilizes downstream, augmentation areas become heavily vegetated and begins aggrading ▪ The designed function is degraded
Floodplain restoration	▪ Channel geomorphology survey ▪ Erosion/deposition pins ▪ Vegetation survey	▪ Abundant nonnative invasive vegetation growth ▪ Sediment deposition degrades intended function ▪ Significant erosion of restoration feature or bank
Expand riparian forest	▪ Vegetation survey	▪ Abundant nonnative invasive vegetation growth ▪ Riparian restoration plant mortality exceeds 20% of installed plants within the first three years ▪ Erosion of restoration feature

Maintenance Activities for Constructed Restoration Features

Maintenance activities for constructed features in the Rutherford and Oakville to Oak Knoll restoration projects include the following:

- Controlling non-native invasive plants
- Vegetation pruning
- Replanting native species
- Irrigation maintenance and installation
- Installation and repair of erosion control fabric and coir logs
- Minor grading
- Installation and repair of biotechnical bank stabilization elements
- Replacing logs and boulders
- Modification of downed trees to enhance LWD within channel

Preventative maintenance activities may be implemented proactively to prevent streambank erosion and failure and associated impacts to adjacent properties and environmental resources.

The District conducts annual surveys of the Rutherford and OVOK Maintenance Reaches to identify issues such as bank erosion, downed trees, and invasive plants. These surveys also are used to prioritize potential habitat enhancement opportunities such as riparian planting, LWD preservation, managed streambank retreats, and repair to constructed habitat features. The District maps all proposed maintenance actions and coordinates maintenance activities with individual landowners. In general, maintenance activities within these reaches employ the same methods outlined in the above sections. The District's environmental management approach within the restoration reaches is based on an adaptive management strategy that aims to rehabilitate degraded sections of the river through micro-restoration projects. An example of this approach would be a managed streambank retreat project, which may begin when an eroding streambank causes a tree to fail and fall across the river. If the tree were to be left in place, the flows would be redirected and could continue to cause bank erosion and impact adjacent infrastructure. In this case, the District might work with the landowner to relocate infrastructure at the top of bank, lay the bank back to a stable geometry to facilitate the installation of native plants, and modify or re-orient the downed tree to minimize the potential for flow diversions or debris jams.

Managed streambank retreat projects may require the use of large equipment positioned along the top of bank to re-orient downed trees and to regrade overstepped streambanks. To re-orient a downed tree, the District would use a construction fork lift (Skytrack) or crane that is staged along the top of bank. In some cases, winches on trucks or chippers with pulleys placed in adjacent trees may be sufficient to re-orient a downed tree. Medium sized excavators staged along the top of bank would be utilized to re-shape streambanks to establish a stable geometry. Biotechnical features would be constructed by hand crews and would vary from willow mattress to riparian planting depending on site conditions; often multiple techniques would be used at one site.

Maintenance Activities throughout the CFD

Maintenance activities to be conducted on private property participants in the CFD include the following:

- Downed tree management
- Debris removal
- Vegetation management
- Erosion control/bank stabilization
- Riparian planting
- Culvert erosion repair

Maintenance methods for these activities are implemented as described in Chapter 5 through Chapter 12.

Managed Streambank Retreat

Managed streambank retreat is a passive restoration approach that is being implemented in the Rutherford and Oakville to Oak Knoll restoration project reaches, but may extend to all participating properties in the CFD. Managed streambank retreat is where a landowner removes vineyards within a buffer area along the river channel and installs an alternative agricultural crop that can thrive in a riparian buffer zone or restores the area with native riparian and upland plant species. Within the managed streambank retreat zone, landowners are agreeing to allow the river to naturally expand with the understanding that the District will implement maintenance actions to stabilize the streambank before it reaches the defined managed retreat line. The District will collaborate with landowners to manage these areas in a manner that meets the riparian enhancement objectives and is consistent with the landowner's land management regime. Typical maintenance actions will include the planting of native riparian and upland species, invasive and Pierce's disease plant management, biotechnical bank stabilization, grading the upper bank to form a stable slope, and erosion control measures.

The overall goal of managed streambank retreat is to expand this land management concept to create a more expansive riparian corridor along the Napa River and its tributaries for terrestrial species and to better support long-term habitat sustainability. Further discussion of this maintenance concept is provided in Chapter 8, Streambank Protection and Stabilization.

10.3 Dredged Material Rehandling: Edgerly Island and Imola Avenue Sites

The District intends to secure dredged material rehandling permits from federal, state, and local regulatory agencies and will establish management plans for each site as needed to support USACE dredging of the Napa River. In the meantime, routine general maintenance of the two sites is included in this Manual. Background information and maintenance activities conducted on each site is presented below.

10.3.1 Edgerly Island

The Edgerly Island dredged material rehandling site is located approximately 3.5 miles northwest of the City of American Canyon and bordered by the Napa River to the east, Mud Slough to the west. Adjacent properties include Napa River Reclamation District sanitary sewer treatment ponds to the north, private residential properties to the east, and wildlife habitat conservation lands owned by the California Department of Fish and Wildlife to the south and west (Figure 1-4). This property was diked from tidal inundation from the Napa River in the early 1900's and used for agriculture to grow hay.

The District purchased the 39-acre property in 1981 for disposal of dredged material from the Napa River. Dredged materials were placed at the site in 1987-1988. In 1994, the dredged material was removed and the District reconstructed the site by raising the levees and increasing the overall capacity of the site to approximately 330,000 cubic yards; this work was implemented in 2004.

The property was surveyed in 2013 to evaluate and delineate potentially jurisdictional waters of the U.S. and State. Approximately 22 acres of the 39-acre parcel were determined to support wetlands, including a diked marsh and a seasonally ponded depression (Horizon Water and Environment 2013[1]). The wetland delineation was evaluated in the field by the U.S. Army Corps of Engineers and the wetlands were determined to not be federally jurisdictional under the Clean Water Act. However, the wetlands are considered waters of the State under the California Porter-Cologne Water Quality Control Act under the protection of the Regional Water Quality Control Board.

Within the 39-acre parcel, the District conducts routine disking of the land surface, controls invasive plants (i.e., eucalyptus tree management and iceplant removal), maintains flow gates, and manages ditch drainage on the property. Aside from regular annual mowing of the parcel during the dry season, maintenance efforts are primarily triggered when the District is alerted to an issue on or adjacent to the property. Maintenance is conducted with heavy equipment (disker and mower), by hand (shovels and weed whackers), and with use of herbicides to control invasive plants. Detail regarding invasive plant maintenance activities is presented in Chapter 5, *Invasive*

[1] Horizon Water and Environment. 2013. Wetland Delineation for the Edgerly Island Dredged Material Reuse Site, Napa County, California. Prepared for Napa County Flood Control and Water Conservation District. September. HWE Project No. 10.004.

Plant Management. Maintenance of the rehandling site consists of annual disking to manage vegetation within the spoil area. The drop-board culvert is annually inspected and vegetation is cleared from around the inlets and outlets to help facilitate positive drainage. The levees surrounding the dredge spoil area are mowed and weed-whacked annually in order to minimize potential fire hazards. Vegetation management occurs within the drainage channel along the outside edge of the levees (outside of the 45-acre wetland) to ensure that stormwater flows away from the site unimpeded.

The District also owns the 45-acre parcel adjacent to the west of the dredged material rehandling property. This site is maintained as a wetland mitigation site to offset impacts of dredging the Napa River. Maintenance activities conducted on the 45-acre mitigation parcel primarily include maintaining drainage channel network, tide gates, levee road infrastructure and non-native invasive plants species. Management of the 45-acre wetland consists of periodically opening of the sluice gate during a medium or high tide event to allow for the flushing of interior drainage channels. The flushing of the drainage channels is done as a passive management technique, implemented to maintain the integrity of the channel geometry and the hydraulic function of the system. The sluice gate is serviced annually to make sure it functions appropriately and can be operated effectively. Channel maintenance and vegetation management occurs on an as need basis within the 45-acre parcel and ranges from physical removal of non-natives using hand tools and equipment. The periodic flushing of the drainage channel is implemented as a type of passive vegetation management, which ensures that non-native and native species do not colonize the drainage channels and reduce the hydraulic capacity and function of the drainage system. On a semi-annual basis the District conducts minor channel excavation using had tools to ensure that the channel network is does not silt in and create channel blockages. Standing pools of water that become disconnected are prime mosquito habitat and require chemical control which is conducted by the Napa County Mosquito Abatement District. To minimize the need for chemical control the District maintains a functional drainage network through periodic tidal flushing and silt removal on an as needed basis.

10.3.2 Imola Avenue

The Imola Avenue dredged material rehandling site is an excavated earthen basin located in the City of Napa on the east bank of the Napa River at the former location of the Napa Sanitation District’s wastewater treatment plant (Figure 1-4). This site is owned by the District and has the capacity to receive 50,000 cubic yards of material dredged from the Napa River. This site does not currently support jurisdictional wetlands. Sediment from Napa River dredging was last deposited on the site in 2017. Maintenance activities conducted on this property include annual disking and mowing the basin levee, and maintaining drainage outfall structures. Maintenance methods include mowing using a tractor and weed-eating around the basin infrastructure.

10.4 Maintenance of the Napa River/Napa Creek Flood Protection Project

As noted in previous chapters, the District is responsible for inspecting and maintaining the Napa River Flood Protection Project. Routine maintenance activities conducted as part of the Flood Project typically include annual mowing of vegetation on levees, dikes, and berms, periodic filling of holes created by burrowing animals on levee slopes, repair of concrete box culverts, riprap, planted rock slope protection and periodic removal of accumulated debris and sediment from culverts which may impede hydraulic capacity. Additional details regarding inspections and standard maintenance practices conducted at these sites are outlined in the USACE authorized Operation, Maintenance, Repair, Replacement and Rehabilitation Manual (USACE, April 2018), which is incorporated herein by reference. The Operation, Maintenance, Repair, Replacement and Rehabilitation Manual (OMRR&R), prepared in accordance with the provisions of the *Code of Federal Regulations* Title 33, Chapter II - Corps of Engineers, Department of the Army, Part 208 - Flood Control Regulations (33 CFR 208), also includes environmental documents and approvals issued to construct, operate and maintain the Flood project including:

- Biological Opinion's (BO) issued by the National Marine Fisheries Service (NMFS) and U.S. Fish & Wildlife Service (USFWS)
- The Final Supplemental Environmental Impact Statement/Environmental Impact Report (FSEIS-EIR), dated March 1999, evaluating the environmental effects of the Project under National Environmental Policy Act and California Environmental Quality Act (USACE, 1999)

Both USFWS and NMFS issued BO’s included pertinent conservation measures necessary for construction, and operations and maintenance procedures. The final OMRR&R manual contains the conservation measures required by the USFWS and NMFS issued BO’s. The OMRR&R development also included regulatory review by state regulatory agencies (California Regional Water Quality Control Board and the California Department of Fish and Wildlife).

Chapter 11
RESOURCE CONSERVATION DISTRICT ROUTINE ACTIVITIES

11.1 Background

Through this Manual and on-going watershed coordination and planning efforts, the District works closely with the Napa County Resource Conservation District (Napa County RCD) to protect streams and watershed resources in the County. This chapter describes routine maintenance activities that the Napa County RCD undertakes to improve and maintain unpaved roadways and drainages to reduce watershed erosion and improve water quality. Whereas the District's focus is maintaining streams on public lands, the Napa County RCD is primarily focused on working with private landowners to reduce the erosion potential from unpaved roads on private lands into creeks. The Napa County RCD also works closely with the Land Trust of Napa County and the Napa County Regional Parks and Open Space District to implement projects that reduce erosion and sediment loading into local creeks from unpaved roads. Napa County's Department of Public Works, Roads Division does not work on unpaved or non-improved roads and is not the subject of this chapter.

As with other partner entities, any collaborative projects included in the SMP will be overseen by the District and subject to all applicable permitting conditions. For example, the RCD's maintenance activities will be included in the District's notification document and annual report to the permitting agencies as described in Chapter 14.

RCDs are some of California's earliest and longest-serving local conservation organizations. RCDs operate at the local level, working with private landowners and government agencies to identify natural resource management needs and support local land managers to implement conservation solutions on a voluntary basis. Conservation Districts were conceived by the federal government in the early 1930's as a result of the Dust Bowl and were later sanctioned by the State of California in 1938 to provide assistance to local managers in addressing soil and resource conservation challenges. They are "Special Districts," organized under Division 9 of the California Public Resources Code. The Napa County RCD was formed in 1945. This district includes overs over 500,000 acres of predominantly rural land in Napa and Solano Counties including the Napa River watershed from Mt. St. Helena to the Napa-Sonoma Marsh, much of the Putah Creek watershed, and the upper portion of the Suisun Creek watershed.

The mission of the Napa County RCD is to empower the community to voluntarily conserve, protect, and restore natural resources in a landscape that supports agriculture, urban areas, and wild spaces. The Napa County RCD provides technical and educational assistance to property owners/managers and other stakeholders to identify and achieve their natural resource management goals. The Napa County RCD serves as a source of information and can provide technical guidance, permitting assistance, and financial incentives for landowners/managers interested in implementing conservation or habitat enhancement practices. Participation in Napa County RCD programs is voluntary and relies upon cooperation and collaboration. Napa County RCD programs include:

- LandSmart® Planning: providing technical assistance to land owners and managers to identify and prioritize management practices according to individual needs, goals, and timelines.
- LandSmart® On-the-Ground: providing technical and financial assistance to landowners to implement best management practices to achieve resource and land management goals from erosion control to fish habitat improvement.
- LandSmart® Water Resources: providing local solutions for water security, including projects such as irrigation efficiency, storm water management, and monitoring of ground and surface water.
- LandSmart for Kids® and LandSmart® Education: creating connections and inspiring conservation by offering community members and youth direct engagement with the local landscape and agricultural properties of the North Bay.
- Resource Monitoring: providing important data to the community that informs decision-making and tracks changes in watershed health over time.
- Huichica Creek Sustainable Demonstration Vineyard: experimenting and demonstrating sustainable vineyard practices and promoting healthy vineyards in a healthy ecosystem.

The focus of the practices covered in this chapter of the Manual fall within LandSmart® On-the-Ground and are specifically related to reducing erosion from existing unpaved road systems to improve water quality by reducing fine sediment transport to waterways.

Based on evidence of widespread erosion and concerns regarding adverse impacts to fish habitat, in 1990 the San Francisco Bay Regional Water Quality Control Board listed the Napa River as impaired by sedimentation. The primary impetus for listing was a concern regarding substantial decline since the 1940s in abundance and distribution of steelhead and salmon in the Napa River and its tributaries. Subsequently, the Water Board identified existing "roads" as a significant source of sediment stating that on average, 50 CY of sediment is produced per mile of road, per year in the Napa River watershed.

To address erosion from existing unpaved roads, the Napa County RCD has adopted an approach to work with landowners and managers to prevent erosion through improved road maintenance practices. Specific road maintenance practices can immediately benefit streams and aquatic habitat by reducing sediment delivery from the road system, detaining flows to provide opportunities to recharge the groundwater system, and reducing annual road maintenance costs. The maintenance practices recommended in this chapter will reduce the impact of future human-caused erosion on biological productivity of streams and improve water quality of future storm runoff by reducing the transport of fine sediments.

The location of road maintenance projects in a given year is uncertain and will depend on landowner interest and the condition of the existing road. Routine maintenance activities can be carried out anywhere within the Napa County RCD's jurisdiction. The Napa County RCD anticipates that no more than 5 miles of road maintenance treatments will be carried out per year. Road maintenance activities will follow applicable impact avoidance and minimization approaches and principles described below (Section 11.6) and in Chapter 4, including best management practices presented in Table 4-1.

The sections below describe routine road maintenance goals and activities in more detail.

11.2 Unpaved Road Maintenance Goals: Reducing Road-related Sediment Sources & Hydromodification

The Napa County RCD's goals for routine road maintenance activities include:

- To identify and prioritize road maintenance locations, where existing degraded roads deliver sediment to streams that support anadromous fish habitat or otherwise support beneficial uses of water;
- To assess and understand existing road conditions and site-specific erosion processes to guide appropriate maintenance actions and minimize environmental impacts; and
- To conduct maintenance that will reduce sediment transport from existing unpaved roads and minimize need for repeat maintenance.

The Napa County RCD categorizes the potential impacts of unpaved roads on hydrologic and water quality conditions into three major categories: episodic erosion, chronic erosion, and hydromodification. In general, routine road maintenance activities are triggered when any of these conditions exist or are likely to occur based on field observations and assessments conducted using protocol of the California Department of Fish and Wildlife (*Part X California Stream Habitat Restoration Manual* (Flosi et. al 2010) and the Handbook for Forest, Ranch and Rural Roads (Weaver, W., Weppner, E., and Hagans, D.K. 2014).

- Episodic erosion occurs when soils fail in response to storm events or other "episodic" triggers such as landslides. The goal of road maintenance in this instance is to prevent episodic erosion from occurring. Stream crossing washouts, road-related landslides, and gullying are examples of episodic erosional features that can be avoided through proactive and proper maintenance of secure and stable roadways. Erosion volumes from potential episodic erosion sites are quantified as potential volumes that may or may not occur during any given storm event and may be transported in one large pulse on in several pulses over an indeterminate time period. Key triggers for prioritizing this type of maintenance activity includes observing the initiation of rills, gullies, or other erosional features at the roadway that could be vulnerable during the next large storm event.
- Chronic erosion occurs when sediment from road surfaces, inboard ditches, and road cuts collect in stormwater runoff and are delivered to a stream system. This erosional process is chronic because it occurs during all storms that produce runoff. Unpaved roads tend to have greater priority over paved road for treatment because they have more erodible surface area and are less expensive to treat. The goal of road maintenance for treating chronic erosion is to shape road surfaces and improve road drainage to avoid stormwater concentration and to disperse runoff at regular intervals to locations that are stable.
- Hydromodification occurs when stormwater runoff collected by the road system alters the hydrology of rural watersheds. Poorly constructed roads tend to collect surface flows from the landscape and concentrate those flows into discrete discharge points. Hydromodification increases the peak discharge rates in downstream creeks or channels. These increased flows can cause the stream channel to incise, erode its banks, and

thereby also lower the water table. Concentrated flows also make for a 'flashier' watershed, reducing the potential for groundwater recharge, decreasing summertime flows, and making for a drier hillslope below the road. Similar to treatment of chronic erosion, the goal of routine road maintenance to address hydromodification is to shape road surfaces and improve road drainage to avoid stormwater concentration.

11.3 Routine Road Maintenance Activities in or Near Waterways

The activities detailed in this section were developed following the methods outlined in California Department of Fish and Wildlife's (CDFW) *Part X California Stream Habitat Restoration Manual* (Flosi et. al 2006), Mendocino County Resource Conservation District's *Forest and Ranch Roads Handbook* (Weaver, W.E., and Hagans, D.K. 2014), Napa County's *Guidelines for County Road Maintenance Practices that Protect Aquatic Habitat and Salmonid Fisheries* (Napa County, 2014), and approved Best Management Practices (BMPs) by the State Water Resources Control Board (SWRCB).

Routine road maintenance treatments in or near waterways can be grouped into 3 primary categories: routine maintenance, road decommissioning at or near creeks, and road-to-trail conversion at or near creeks.

11.3.1 Routine Road Maintenance Activities at or Near Creeks

Routine road maintenance activities improve the resiliency of existing roads to large storms while ensuring safe vehicle access. Examples include upgrading stream crossings, culvert replacements to accommodate larger peak storm flows, and road-shaping treatments, such as critical dips, to prevent stream diversions. Additional maintenance activities to improve road drainage and reduce erosion and sediment loading to creeks include removing unstable sidecast and fill materials from steep road adjacent slopes, improving roadside ditches, removing berms, and improving the overall road slope either through outsloping, crowning or insloping to improve surface runoff dispersion. Routine road maintenance may include adding road rock or rock armor as needed to fortify road surfaces and crossings.

Stream Crossings:

- **Ford Crossings**. Ford crossings are designed so that the vehicle travels across the stream bed. These are installed in locations where the existing road crossing is already eroding or the crossing is vulnerable to erosion. The advantage of ford crossings is that no culvert is installed which keeps the stream crossing open, avoids sediment plugging of culverts, and maintains a more continuous stream profile. No fill or armor material is placed in the stream bed to accommodate the crossing. They are constructed with a dip in the axis of the crossing to prevent diversion of the stream flow. By design, this type of stream crossing is adequately sized for the 100-year peak storm flow and has reduced diversion potential (**Figure 11-1**). See Appendix L, typical drawings 5a and 20 for further description.

Figure 11-1. Example of a ford stream crossing

- **Armored Fill Stream Crossings**. Armored fill crossings are constructed by using interlocking rock armor of sufficient size to fortify the channel as well as resist sediment transport on the road by stream flow. They are constructed with a dip in the axis of the crossing to prevent diversion of the stream flow, and focus the flow over the part of the fill that is most densely armored. By design, this type of stream crossing is adequately sized for the 100-year peak storm flow and has reduced diversion potential (**Figure 11-2**). See Appendix L, typical drawings 5a-7 for further description.

Figure 11-2. Example of an armored fill stream crossing at Simmons Canyon Creek

- **Culverts at Stream Crossings.** Where culverts show sign of failure or erosion, the Napa County RCD recommends replacing them with culverts that are sized to accommodate the 100-year peak storm flow, and set at the base of the roadfill in line with the natural channel gradient (i.e., channel slope), to prevent further erosion at the culvert outfall. This requires replacing and installing culverts that are of a sufficient length to construct fill slopes at a stable 50% (2:1) slope angle (**Figure 11-3** and **Figure 11-4**). See Appendix L, typical drawings 1a, 1b, and 2 for further description.

Figure 11-3. Example of culverted stream crossing with a single post trash rack

- **Secondary Structures at Stream Crossings**. Secondary structures installed at stream crossings include downspouts and trash racks to support culvert function, and rock armor to buttress and/or reduce erosion of steep fill-slopes (Figure 11-3 and Figure 11-4). See Appendix L, typical drawings 1c, 3, and 4 for further description.

Figure 11-4. Example of rock armor used to protect fillslope at a culverted stream crossing

- **Critical Dips at Stream Crossings with Diversion Potential.** These features are essential to directing flood flows across the road and back into the original channel downstream of the crossing in a stable and non-erosive manner (Figure 11-4). See Appendix L, typical drawing 1c for further description.

- **Earthen Sediment Retention Basins**. Sediment basins are a simple but effective measure for capturing and storing roadbed derived sediment along road approaches where there are no options for changing road drainage patterns to disconnect the roadbed and inboard ditch from the adjacent stream channel (**Figure 11-5**).

Figure 11-5. Example of sediment basin adjacent to roadway

11.3.2 Road Decommissioning Activities at or Near Creeks

Road decommissioning may be the best management practice for legacy road systems that are no longer needed to access the property. Decommissioning does not require complete topographic destruction of the roadbed to achieve effective erosion prevention. Rather, the process can be thought of as similar to the long-term winterization of a road. Generally, with this maintenance approach, all road-related drainage structures and fill material are removed from the stream crossings so that they no longer will erode into the stream channel. Additionally, unstable sidecast or fillslope materials on the downslope side of a road are excavated. Excavated materials can be either stockpiled along the cutbanks to promote vegetative growth or endhauled to a stable location. All lengths of road draining to treatment sites require surface decompaction, construction of cross-road drains, and/or partial outsloping to reduce chronic erosion and promote vegetative growth.

- **Decommissioned Stream Crossings.** Stream crossing excavations are decommissioning treatments used for roads that are built across stream channels. The fill material (including the culvert) is completely excavated and the original streambed and side slopes are exhumed. Excavated spoil is permanently stored at nearby, stable upland locations where it will not erode. As a final measure, the sides of the channel may be cut back to slopes of 2:1, and mulched and seeded for erosion control (**Figure 11-6**). See Appendix L, typical drawing 14 for further description.

Figure 11-6. Example of a decommissioned stream crossing

11.3.3 Road to Trail Conversion Activities at or Near Creeks

Road-to-trail conversion combines techniques from both upgrading and decommissioning. A road-to-trail conversion ensures at least a 4 to 6-foot road width exists for hiking or quad four-wheeler access. Existing fill material is excavated from the stream crossings to minimize episodic erosion possibilities and to provide for a 'ford crossing' or an 'armored fill crossing' to allow for continued low-impact access. Unstable sidecast or fillslope materials on the downslope side of a road are excavated. Excavated materials from both stream crossings and fillslopes can be permanently stockpiled along the cutbanks as long as a 4 to 6-foot wide tread remains for access. All lengths of road draining to treatment sites require application of road drainage techniques (e.g., removing berms, constructing rolling dips, outsloping, crowning, or insloping the road) to improve dispersion of surface runoff.

Stream crossings:

- **Ford crossings**. Ford crossings are excavated in the same way as a decommissioned road crossing but an adjoining fillslope is constructed to maintain access across the stream bed. No fill or armor material is placed in the stream bed. By design this type of stream crossing is adequately sized for the 100-year peak storm flow and has reduced diversion potential (Figure 11-1). See Appendix L, typical drawing 5a and 20 for further description.

- **Armored fill crossings**. A majority of the fill material is excavated from the stream crossing but a 4 to 6-foot wide armored fill crossing is constructed near the top of the excavated area to provide for hiking or quad four-wheeler access. Armored fills are constructed using the same methods described for routine road maintenance above. By design, this type of stream crossing is adequately sized for the 100-year peak storm flow and has reduced diversion potential (Figure 11-2). See Appendix L, typical drawings 5a-7 for further description.

11.4 Routine Road Maintenance Activities in Upland Locations

Similar to the activities described above, the activities described in this section are implemented to avoid and reduce potential erosional effects of unpaved roads in the County. The routine road activities described below occur in upland areas outside of Clean Water Act (CWA) jurisdictional waters of the U.S., wetlands, or waters of the State. Individual work locations may require compliance with federal or state Endangered Species Act (ESA) provisions, which would be evaluated on a case-by-case basis.

11.4.1 Road Grading and Repair

- **Increasing Drainage Dispersal.** This activity focuses on changing road shapes to disperse and diffuse runoff, versus concentrating runoff and increasing its erosive potential. This activity involves grading roadbeds to outsloped, insloped or crowned roadbed shapes, with no outside berm or with frequent berm breaches along the outside edge of the road (Figure 11-6). This approach allows collected road runoff to disperse more frequently than running down a long length of road and becoming erosive. See Appendix L, typical drawings 9a-9c, and 12 for further description.

- **Road Drainage.** Constructing rolling dips, Waterbars, cross road drains or ditch relief culverts can be an effective approach to reduce the erosion potential. Rolling dips, waterbars, and cross road drains are a road-shaping practices that disperse road surface runoff, and ditch relief culverts disperse runoff from cutbanks and inboard ditches (**Figure 11-7**). See Appendix L, typical drawings 8, 10, 11, 11b, 17 19a-19c, and 21 for further description.

Figure 11-7. Example pre- and post-cnstruction photos of road outsloping and rolling dip construction

- **Road Ripping or Decompaction**. Road ripping is a technique in which the surface of a road is disaggregated or "decompacted" to a depth of at least 18 inches using mechanical rippers. This action increases infiltration of precipitation and runoff and thereby reduces or eliminates surface runoff and may enhance revegetation success. See Appendix L, typical drawings 10 and 17 for further description.

- **Decommission Outslope.** This treatment approach places excavated materials from the stream crossings and unstable fillslopes along the cutbank portion of the road surface. These stockpiled fills will act to not only buttress the cutbanks and disperse runoff but to also allow for vegetative growth on these otherwise overstepped areas (**Figure 11-8**). See Appendix L, typical drawing 15 for further description.

Figure 11-8. Example pre- and post-photos of a decommission outsloped road

11.4.2 Repairing Fillslope Failures

Excavation of unstable or potentially unstable sidecast material along the outside edge of a road prism, and placement of the spoil on the roadbed, against the adjacent cutbank or end-hauled to a stable location (**Figure 11-9**). See Appendix L, typical drawing 13 for further description.

Figure 11-9. Example pre- and post-construction photos of a fillslope excavation

11.5 Road Maintenance Methods

The following section describes general construction methods used to conduct the above-described routine road maintenance activities. Pre-construction activities for all road maintenance activities entail clearing and grubbing the maintenance site, limited vegetation removal if necessary, and mobilizing construction equipment and materials at the maintenance site. Typical equipment used for road maintenance usually consists of excavator, backhoe, bull dozer, compacting roller, dump truck, and a water truck. Staging of equipment and materials are confined to the existing road prism or outside of the riparian area.

- **Ford and Armored Fill Crossings.** At ford and armored fill crossings, construction methods may involve removing existing drainage structure (e.g., a culvert) if applicable and excavation to create a dip in the roadway. The dip should be wide enough to accommodate 100-year flow event. At armored fill crossings, rock armor is delivered and placed along the road lengths draining into the crossing to protect against erosion of the road. For the downstream side of an armored stream crossing, appropriate sized rock should be placed to prevent transport by stream flow.

- **Culverts at Stream Crossings.** Culvert replacement and installation work involves mobilizing equipment to the work area and installing temporary fencing around the work area. Typical work involves using an excavator to remove the existing degraded culvert section, preparing the culvert bed, and then lowering the new culvert in place. Once the culvert has been installed, the trench will be backfilled, compacted, and restored to match surrounding surfaces.

- **Secondary Structures at Stream Crossings.** Installation of secondary structures at stream crossings entails delivering secondary structures such as trash racks or rock armor. Trash racks may be comprised of galvanized pipe or fence posts, and should generally be equal to the diameter of the expected woody debris (up to 4 inches). Depending on the size, the secondary structure may be installed by hand tools.

- **Critical Dips at Stream Cross.** Critical dips should be constructed on the lower side of the stream crossing and should extend from the cutbank to the outside edge of the road surface. Work entails excavating the road surface, grading the road to the desired slope, and off-hauling removed soil to an upland area. Equipment that may be used include a small dozer, grader, and excavator.

- **Earthen Sediment Retention Basins.** Construction of sediment retention basins includes clearing and grubbing the site, establishing a trench along the center line of the earthen fill embankments, and filling the embankment with clean, low-permeability soils or rocks. Ongoing maintenance of these basins typically entail inspection, removal of accumulated sediment when half full, and occasional erosion protection measures to minimize off-site erosion.

- **Decommissioned Stream Crossings.** Decommissioning roads at stream crossings consist of excavating the road itself at the crossing, establishing stable side slopes (e.g., 2:1), excavating unstable or potentially unstable sidecast and fill slope materials that could fail and deliver sediment to a stream, and conducting road surface drainage treatments like ripping, outsloping and/or cross draining to disperse and reduce surface runoff. Typical equipment used for these types of improvements include a hydraulic excavator, a bulldozer, and dump trucks to dispose spoil and debris material (Weaver et al. 2014).

- **Road Grading and Repair in Upland Areas.** Road maintenance in upland areas involves similar activities to those described above near waterways.

11.5.1 Construction Timing and Extent of Maintenance Sites

Road maintenance activities are generally conducted from June 15 to October 31 when streams are at their driest. In dry years, work may begin earlier than June 15 and extend past October 31 (usually not longer than an extra two weeks on either end), provided that the Napa County RCD has received permission from the appropriate regulating agencies.

Typical stream crossing projects will not exceed 50-200 lf channel lengths. Stream crossing improvements can take anywhere from 1-5 days to complete. Ground disturbance will only encompass the removal of road and earthen material above and below the crossing. Construction site access, staging areas, and project construction activities will be conducted in a manner that minimizes impacts to surrounding vegetation. Depending on site conditions, vegetation removal may be required but will only be conducted where necessary to access the road maintenance site.

Where road related sediment is excavated, steam bank slopes will be laid back to a 2:1 slope angle where possible. Excavated slopes will conform with existing channel geometry upstream and downstream of project area. All bare slope will be seeded with native grass seed and straw mulched to 100% cover.

11.6 Road Maintenance Impact Avoidance and Minimization Measures

While the overall goal of these road maintenance projects is to reduce the erosive effects of existing unpaved roads, and thereby provide a net environmental benefit to the watershed, the implementation of such treatments may potentially cause some short-term environmental effects. This section describes impact avoidance and minimization techniques that will be implemented to reduce any negative short-term effects of the maintenance projects.

Pre-construction Surveys: As described in Table 4-1, pre-construction surveys will be conducted for nesting birds and applicable special-status species. For activities occurring between February and August 31, Napa County RCD will retain a qualified biologist to check the maintenance site for nesting birds within 2 weeks prior to initiating work. With respect to special-status species, Napa County RCD will retain a qualified biologist to conduct a desktop review of the California Natural Diversity Database (CNDDB), available vegetation and soil maps, and aerial photos to determine whether suitable habitat is present for special-status species. Surveys of areas identified as sensitive natural communities or suitable habitat for special-status species will then be conducted at and near the work area. For special-status amphibians or reptile species, a qualified biologist will conduct a survey of the work area within 7 days prior to commencing maintenance activities. Protocols listed in BMPs BIO-1, BIO-2, BIO-4, and BIO-5 (see Table 4-1) will be followed to avoid and minimize impacts to special-status species and nesting birds.

Other Measures to Reduce Impacts to Habitat and Protected Species: Table 4-1 identifies other BMPs to reduce effects on biological resources. As described in BMP BIO-7, in the event that a dusky-footed woodrat nest is identified in the work area, Napa County RCD or its biologist will preserve the nest and maintain an intact dispersal corridor between the nest and undisturbed riparian habitat. Napa County RCD's biologist will also conduct desktop reviews to determine whether suitable habitat is present for bat colonies within 100 feet of the work area or access routes. If potential bat colony habitat is determined to be present, a bat survey will be conducted to look for evidence of bat use. The biologist will determine whether work can proceed without disturbing the bat colony, the potential need for a buffer zone to prevent disturbance, or whether work can proceed without disturbing the colony.

Exclusion Measures: Once pre-construction surveys have been completed for nesting birds and if the biologist finds nesting birds, buffer zones described in BMP BIO-1 should be established until the young birds have fledged. Appropriate buffers vary for raptors and certain species and should thus be established consistent with BMP BIO-1. Similarly, if special-status plants are present in the work area, the biologist will place flags in the field and establish buffers around sensitive plants or natural communities and ensure that they are visible to construction workers (see BMP BIO-4 for more detail). If special-status eggs or tadpoles of special-status amphibians or reptiles are found in the work area, buffer zones shall also be established around the location of eggs/tadpoles. In the event that juveniles or adult special-status species are found, the biologist will determine whether the individual is likely to leave the work area on its own and if so, will establish a buffer zone around the individual. Refer to BMPs BIO-5 for more details on exclusion zones for special-status amphibians and reptiles.

Cultural Resources BMPs: Prior to the start of construction, Napa County RCD will review assessor's parcel data maintained by the Napa County Department of Planning, Building, and Environmental Services to determine if there is information about previous cultural resources studies or sites within a project area. If the Napa County Department of Planning, Building, and Environmental Services data indicate that a project area has not yet been surveyed for cultural resources, Napa County RCD will contact the California Historical Resources System/Northwest Information Center (CHRIS/NWIC) to determine if any cultural resources studies have been conducted or if cultural sites have been previously recorded within the road maintenance area. If the CHRIS/NWIC data indicate that the project area has previously been surveyed and no cultural resources have been identified, Napa RCD can go forward with the project with no additional studies. If the CHRIS/NWIC data indicate that the project area has not previously been studied, or has been studied and cultural resources are present, Napa RCD will retain a cultural resources specialist to conduct a field inventory to determine the presence/absence of surface cultural materials associated with either prehistoric or historic occupation and summarize results in a report consistent with BMP CUL-2. Note that the cultural resources specialist may have to contact the CHRIS/NWIC to get more detailed information about known cultural resources within the project area. In the event that the work area is deemed highly sensitive with respect to cultural resources, a qualified archaeologist will be present onsite during ground disturbing activities (per CUL-3). Other cultural resources BMPs that would be implemented include a pre-construction educational training (BMP CUL-5). In the event of accidental discovery of cultural remains or historic or paleontological artifacts, work will be restricted or stopped until proper protocols are met. Refer to BMP CUL-6 for additional details.

Project Limits: Road maintenance activities at stream crossings are generally limited to 200 feet in length per site. In upland areas, road maintenance is limited to 5 miles total per year.

Dewatering: Although road maintenance will occur during the dry season when flows are expected to be low or absent, dewatering may be necessary if stream flow is present. Dewatering methods may include the use of a temporary cofferdam, stream bypass, and pumping or draining water out of the work area. Prior to dewatering, Napa County RCD and a qualified fisheries biologist will determine potential presence of fish and aquatic vertebrates and the appropriate dewatering method that will result in the least disturbance to the channel and aquatic species. Before the work areas are dewatered, fish and other aquatic species will be captured and relocated to avoid injury and minimize disturbance.

To prevent aquatic vertebrates from re-entering the work area, fine-meshed nets or screens should be installed above and below the work area. A qualified fisheries biologist with a CDFW scientific handling permit will be on-site in the event that fish or other aquatic species are present in the work area and require relocation. Relocation protocols identified in BMP GEN-15 (see Table 4-1) should be followed. If dewatering occurs in areas where California freshwater shrimp may be present, such activities will only occur if an Incidental Take Permit (ITP) from CDFW has been secured.

To minimize impacts on water quality and aquatic species, pumps and generators should be maintained according to manufacturer's specifications and the intakes will be screened to prevent entrainment of fish or other aquatic vertebrates. Mesh screening will not exceed 1/8 inch. Dewatering activities should encompass the minimum area necessary and be performed only for the minimum amount of time needed in order to conduct in-water maintenance work. Instream cofferdams should be built of materials such as sandbags, clean gravel, or rubber bladders which result in no siltation or turbidity.

Other Site Protection BMPs: Erosion and sediment control measures would be implemented to stabilize stream banks and protect water quality. Consistent with BMP GEN-3 (Table 4-1), example BMPs that would be employed include installation of geotextile fabrics or biodegradable erosion control blankets to protect soil surfaces on steep slopes, storm drain inlet protection, straw bale barriers, silt fences, and other measures listed in BMP GEN-3. Once construction is completed, disturbed upland soils would be seeded with native grass seed and mulched with certified weed free straw.

Construction Monitoring: If nesting birds are found on-site, a biologist will be retained during the construction period to monitor nesting birds, maintain buffers, and ensure that disturbance to active nests does not occur. For activities that involve construction for more than 1 day, a qualified biologist will be retained on-site to conduct a special-status species survey on each morning of and prior to scheduled construction work. In addition, if a temporary bypass system is used for dewatering, the pumps will be monitored throughout the duration of construction to prevent low water conditions and avoid pumping of muddy bottom water.

11.7 Road Maintenance Annual Implementation Process

11.7.1 Routine Road Maintenance Assessments

On an annual basis, Napa County RCD will conduct an inventory process that involves reaching out to private landowners to determine where road repair and maintenance is needed. Once a series of potential sites has been provided, Napa County RCD staff will visit the sites and inspect the road and adjacent hillslope areas to determine which are treatable and where road maintenance work would be beneficial. RCD staff will fill out an inventory data form documenting current conditions and recommended treatments, and then enter this data into either a Microsoft Access database or a Microsoft Word document. RCD staff will make note of the problem type (e.g., stream crossing or upland area), erosion potential, apparent processes and relationships to the nature of the problem, initial details for proposed treatment, an estimate of excavation volume, and an estimate of equipment and labor hours. All potential repair sites will be mapped using ArcGIS software, and photos of the site are documented.

After inventorying all potential road repair sites, Napa County RCD will rank and prioritize the sites based on the severity of the problem areas, budget constraints, design considerations, and staff availability. If field observations determine that the cross-sectional area of active stream channel is greater than 3 feet by 1 foot and a replacement culvert is needed, runoff calculations are modeled to determine capacity needed for 100-year flow events. At stream channels with cross-sectional areas equal to or less than 3 feet by 1 foot, an 18-inch culvert or armored fill may be the appropriate treatment method. Typically, at maintenance locations where a stream crossing provides anadromous fish passage, further engineering work will be required. In addition, the number of road maintenance sites addressed in a given year depends on RCD staff availability. Currently, Napa County RCD staff has one staff person available to assess road maintenance sites and that person typically evaluates up to 5 miles of road per year. Collectively, these factors are taken into account when considering treatment costs and ranking road maintenance sites.

11.7.2 Construction

Once Napa County RCD has prioritized repair sites for a given year, RCD staff will prepare construction plans and specifications. Staff may retain appropriate engineering support to develop construction plans and specifications for select sites that require fish passage or bridge installation. After the design phase is completed, the construction phase will begin by implementing appropriate pre-construction surveys and BMPs described in Section 11.6, above, and initiate mobilize construction equipment. Typically work will be completed during the dry season between June 15 and October 31. In dry years, work may commence prior to June 15 and extend beyond October 31 (no more than 2 weeks). Photos of the site will be captured at the end of construction.

11.7.3 Reporting and Monitoring

After construction is complete, staff will compile a report documenting the site characterization, treatment methods used, results of construction activities, total construction costs, and source of funds used. The report will also include as-built design plans, sediment savings from project, and pre- and post-construction photos of the road maintenance sites.

In the long-term, Napa County RCD will work collaboratively with private landowners to conduct ongoing monitoring of the road maintenance site. Depending on the site, two types of monitoring may be useful: topographic surveys and/or photo monitoring. Topographic surveys can be completed by using a tape and clinometer, or auto-level, both prior to construction and then afterwards. This method is useful for documenting erosional changes in a stream channel, particularly at decommissioned stream crossings. Photo monitoring is a useful method for capturing success of revegetation at the work site. In addition, and although more difficult and costly than site monitoring, geomorphic processes can also be monitored over time. Sediment sampling may be conducted above and below maintenance sites to document sediment delivery to stream channels from the road maintenance site, and determine long-term success of a particular repair (Flosi et al. 2006).

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Chapter 12
OTHER MAINTENANCE ACTIVITIES

12.1 Overview

In addition to the primary maintenance activities described in Chapters 5 through 10, the District conducts several other maintenance activities as part of their overall maintenance program. Though routine and expected, these other activities occur on a less frequent basis and include maintaining access roads and drainage ditches, replacing culverts, bridge support structures, drainage systems, recreational facilities, and managing beaver activities. Some of these facilities were constructed under the Napa River/Napa Creek Flood Protection Project (Flood Protection Project).

The frequency and location of other maintenance projects in a given year is uncertain and will depend on the timing and extents of past maintenance activities, recent hydrologic conditions, the age and condition of facilities, and other factors.

All other maintenance activities described herein will follow the impact avoidance and minimization approach and principles described in Chapter 3, including the best management practices presented in Table 3-1.

The District may partner with the Napa County Roads Division for maintenance at sites where roads, bridges, or other engineered facilities intersect with a stream. While the District generally maintains only the instream component of such features or facilities, these sites provide opportunities for productive collaboration with the Roads Division. By describing the common maintenance activities in this Manual, the District seeks to provide technical expertise and a consistent approach to the management and stewardship of instream resources in Napa County. As with other partner entities, any collaborative projects included in the SMP will be overseen by the District and subject to all applicable permitting conditions. Projects undertaken by the District on behalf of the County Roads Division will be included in the District's notification document and annual report to the permitting agencies as described in Chapter 14.

In general, other maintenance activities can be conducted anywhere within the District's maintenance jurisdiction as well as the Flood Protection Project area. The sections below describe maintenance activities and triggers for conducting these maintenance activities in more detail.

12.2 Channel Access Road Maintenance

Channel access road maintenance includes vegetation management and removal. Over time, asphalt pavement will deteriorate and may need to be repaired or replaced. Access road maintenance work is done with hand tools, mechanized equipment, or herbicide application equipment (for vegetation management). If repaving work is needed, paving equipment is used as well. The potential timing for road maintenance activities is:

- Access road tree/shrub pruning – All year.

- Herbicide application on the County's channel access roads or road shoulders – April 1st to October 15th.
- Mowing access roads – April 1st to October 15th.

Vegetation removal will be accomplished by mowing grasses, pruning limbs and branches that overhang the road, and/or applying contact herbicides approved for use in aquatic environments. The access road and the area between the access road and adjacent fence lines that enclose the District's right-of-way or easement will be maintained using mowers or hand tools to reduce fire hazards and protect the roadway and fence. Similarly, in American Canyon, vegetation removal involves maintenance of weeds and grasses in upland areas along the top-of-bank areas of streams and access roads. Hand tools such as pole saws, loppers, and chainsaws will be used to remove tree limbs that overhang the road or otherwise block access.

The District may use glyphosate (trade names: Roundup® or Rodeo®) or imazapyr (trade names: Arsenal®, Chopper®, and Stalker®) herbicide or a similar product on the surfaces of gravel access roads to discourage weeds from establishing on the roadway and protect the integrity of the road surface. In American Canyon, herbicides such as glyphosate (trade names: Rodeo®, Roundup Quickpro Concentrate MSDS®, Weather Guard Complete®) may be used but is typically only used when hand and mechanical methods are unsuccessful. Spraying is limited to as a narrow corridor as possible, and only gravel road surfaces will be treated.

As described in Chapter 4, all herbicide application activities will be conducted in accordance with label instructions as well as applicable federal, state, and local regulations (under regulatory authority of the USEPA, State Water Resources Control Board, State Department of Pesticide Regulation, and the Napa County Agricultural Commissioner, respectively) and the District will utilize BMPs identified in Table 4-1 when applying herbicides.

12.2.1 Roadside Drainage Ditches

Roadside drainage ditches, also known as V-ditches, are generally located above and beyond the top-of-bank zone of stream channels, principally along County roads. County road facilities are maintained by Napa County Roads Division in accordance with BMPs established as part of the County's MS4 Stormwater Program. County road drainage ditches are not maintained by the District on behalf of the County and therefore not described in detail in this Manual. Infrequently, such ditch features may be located along the District's channel access roads.

12.2.2 Maintenance Triggers

In general, channel access road maintenance is appropriate when any of the following conditions occur:

- Grasses are 12 inches or taller.
- Limbs or branches are overhanging channel access road(s) and impeding access.
- Weeds are observed on the access road.
- Leaf litter and grasses have reduced the capacity of roadside ditches by at least 50 percent
- Failure or erosion is observed at roadside ditches such that re-grading work is necessary.
- Sediment has substantially accumulated upstream of culverts and/or within drainage ditches and sediment removal is needed.

The need for channel access road maintenance is unlikely if none of these trigger conditions are present.

12.3 Culvert Repair and Replacement

Culverts in the program area occasionally require repair or replacement. The County owns and is responsible for maintaining approximately 540 culverts at road crossings of stream channels (see Figure 1-6). Under the SMP, the District would conduct maintenance at these culverts on behalf of the County. The installation and repair of drop-inlet culverts and the clearing, repair, or replacement of road crossing culverts are the most common routine culvert maintenance activities. A discussion of these culvert activities is provided below.

12.3.1 Drop-Inlet Culverts

Drop-inlet culverts are typically used to route local drainage from local collectors or ditches to the stream channel below. Commonly these drop-inlet culverts cross beneath the access road and exit into the channel bank a few feet above the toe-of-slope. Clearing sediment and debris and repairing existing drop-inlet culverts are routine maintenance activities. Typically, culvert clearing work is conducted using hand tools. A vacuum truck may also be used to remove sediment from smaller culverts. **Figure 12-1** shows an example design detail of how drop-inlet culverts may be repaired at sites where bank failure has occurred around the culvert. In this example, a small amount of hardscape is included at the toe-of-slope to provide added erosion protection for the bank. However, hardscape is not always required and would be utilized on a site-specific basis. Installing a new drop-inlet culvert may be appropriate when existing drainage ditches and routing systems are not adequate. Pooled water along maintenance access roads above channels can overtop the streambank, and flow directly down the bank into the channel. Such overtopping flows (due to poor drainage) can increase the opportunity for bank erosion or bank failure due to saturated soils.

The following impact avoidance guidance applies to the District’s maintenance of drop-inlet culverts:

- Sediment has substantially accumulated in an existing culvert and requires removal.
- Repair or replacement of an existing culvert will occur within the same footprint as the original culvert.
- The culvert outfall path, from the culvert edge down to toe-of-slope will be protected with erosion control material as needed to dissipate energy and reduce the erosion potential.
- The culvert placement and outfall will be installed to minimize outfall velocity and reduce the potential for future bank erosion and scour from outfall. Energy dissipation approaches will be used as needed.

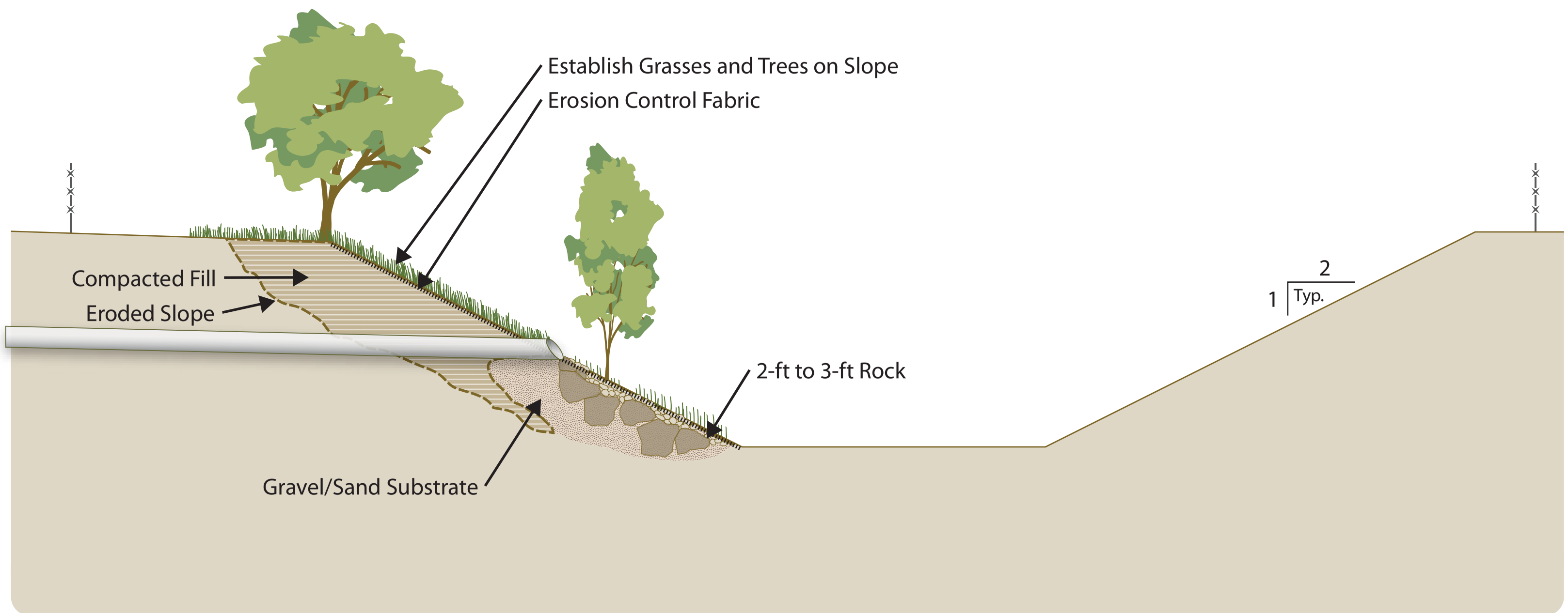

Photo1. Example of a Culvert Failure.


Photo 2. Same site as Photo 1 after bank repair using minimum necessary rock rip-rap.

Horizon WATER and ENVIRONMENT

Figure 12-1
Bank Stabilization Treatment Design—Culvert Repair

12.3.2 Road-Crossing Culverts

The County Roads Division and the District's responsibility to maintain culverted road crossings depends on the ownership of the facility. Under the SMP, the District may conduct culvert maintenance at culverted road crossings for its facilities or those owned by Napa County when regulatory notifications have been made. In addition to the sediment removal activities described in Chapter 7, on occasion these culverts may require repair or replacement due to structural failures of the culvert or problems with supporting footings or headwalls. Installation of new or replacement culverts is limited up to 48-inch diameter culverts. Causes of failures may include improper sizing, misalignment, the road design and its loadings, and/or the age of materials. Culvert failure typically reduces hydraulic capacity due to flow obstruction and blocking by the culvert, sediment, or debris that collects as a result of the failure. Failure may also lead to increased erosion downstream of the culvert where concentrated flows may become more erosive.

Repair or replacement of an existing culvert will occur within the same footprint as the original culvert. Culvert replacement will include replacing the culvert (generally CMP or reinforced concrete pipe) and anchoring it in place with steel reinforced concrete or grouted rip-rap depending upon the road crossing situation. Dewatering of the stream may be required. Culverts will generally be installed using an excavator working above the channel from top-of-bank. Culverts will be placed at grade and anchored to subgrade. Backfill and road material will be laid, graded, and compacted. Repair of existing culverts will typically involve sealing voids/cracks within concrete surfaces with pressurized grout.

Similar to other maintenance projects, staging will occur to the extent possible on the access road adjacent to the stream channel. As appropriate, exposed soil on streambanks that remains after culvert maintenance activities will either be seeded with grass and covered with erosion control fabric or planted according to District on-site restoration planting designs.

This Manual intends to cover repair activities for existing culverts of typical sizes within the County and District's jurisdiction. However, the installation of replacement culverts is limited up to a 48" size diameter for purposes of this program. Required culvert installation larger than 48" would occur outside of the program.

12.3.3 Maintenance Triggers

In general, culvert replacement or repair is appropriate when any of the following conditions apply:

- Existing culvert has been crushed, is deteriorating, or otherwise damaged and cannot operate properly.
- Existing culvert is improperly sized or has been positioned (situated) incorrectly such that the culvert cannot function properly.
- The supporting footings or headwalls of a culvert are cracked or otherwise damaged and cannot adequately support the culvert.

12.4 Bridge Maintenance

The County Roads Division maintains approximately 124 bridges throughout Napa County. While California Department of Transportation oversees maintenance of a subset of these bridges, maintenance activities addressed by Caltrans are considered routine and covered under this SMP. Routine bridge maintenance activities involve the minor repair or replacement of existing bridge abutments, embankments and existing riprap fortifications. Note that larger-scale bridge maintenance activities such as complete replacement of bridge footings are conducted outside this maintenance program. Riprap or concrete may be used to protect bridge support structures that are actively undermined and present an imminent risk of failure. Hardened materials are applied when one of the following conditions apply: (1) riprap or concrete where it previously existed has deteriorated and needs to be replaced (no increase in impervious surfaces compared to existing conditions); and (2) large woody materials (root wads or logs) are not available or appropriate for repair.

As part of the Napa Flood Protection Project, the Napa Valley Wine Train Dry Bypass Bridge and Old Tulocay Creek pedestrian bridge are inspected annually to determine whether the structure conforms to its As-built design condition. The drainage systems are inspected for any blockages and debris. All drains are typically flushed with water to remove accumulated debris and sediment.

12.4.1 Maintenance Triggers

In general, bridge maintenance is necessary when any of the following conditions apply:

- Erosion protection improvements at the base of a bridge are necessary when scour damage begins to undermine the structural stability of bridge wingwalls and/or abutments.
- Debris has accumulated within the drainage system of bridges.
- Displacement of riprap at foot of supporting structures

12.5 Drainage System and Outfall Maintenance

For the Flood Protection Project, many storm drainage facilities were constructed that will require ongoing inspection and maintenance. These include drainage systems that collect surface runoff behind dikes, levees, floodwalls and retaining walls. The District will be responsible for conducting routine inspection and maintenance of outlets and flap gates to avoid clogging or flooding of areas behind dikes, levees and floodwalls.

Flapgates are inspected on an annual basis and inspected for presence of debris, sediment and vegetation growth, or misalignment which would preclude positive closure and operation of a flapgate. The District will determine the need for cleaning individual structures. If required, typical maintenance involves removing accumulated debris, sediment and vegetation from the inlets and outlets and within the conduit pipes.

In addition, storm drains, trench drains and wall drain outlets are inspected throughout the Flood Protection Project area. Over time, these facilities may experience blockages due to vegetation, trash, siltation and debris. The District is responsible for inspecting these facilities periodically.

Inspections may involve removing outlet and drain covers, and flushing water through trench drains to remove water and debris.

12.5.1 Maintenance Triggers

In general, drainage system and outfall maintenance activities are conducted when the following conditions apply:

- Debris, sediment and vegetation growth is observed in flapgates.
- Blockages due to debris, sediment and/or vegetation growth has been observed in storm drains, trench drains and wall drain outlets.

12.6 Beaver Controls

Heavy beaver activity, such as observed in Salvador Creek (Reach 2) (see Photo 1 in **Figure 12-2**), presents several maintenance concerns. Beaver dams block the channel and introduce woody debris into the creek. The beaver felled logs become the basis to catch debris and develop a more solid dam as seen in Photo 1 of Figure 11-2. Beaver activity also reduces riparian habitat at rates that exceed the recruitment and growth of trees, as the beavers target younger trees (Photo 2 in Figure 11-2) and larger and older trees (Photo 3 in Figure 11-2). If left unabated, this activity will likely continue through the reach and multiple flow obstruction dams will develop. As an area becomes backwatered (ponded) by the beaver dams, sediment may begin to accumulate in the ponded area. Ponded environments encourage the growth of aquatic vegetation, such as Ludwigia and cattails, which further reduces flood carrying capacity and degrades in-channel habitat.

Beaver activities are monitored as part of the annual stream reconnaissance surveys (see Chapter 15). The District's approach to managing beaver activity is to generally allow it to occur. The District recognizes the habitat benefit of beaver debris jams, especially for species that outhaul on perched debris such as western pond turtles. However, when debris dams build up to a degree that adversely impacts a significant reach upstream and downstream, such as shown in Photo 1 of Figure 11-2, the District will trim branches and cut through long sections with a chain saw so the blockage will break up during the next large flow event. Management activities are conducted to be the least invasive to not disturb the beaver's habitat while ensuring flood conveyance capacity is maintained.

12.6.1 Maintenance Triggers

In general, beaver control activities are conducted when the following conditions apply:

- Debris dams build up to a degree such that upstream and downstream reaches are adversely affected. Adverse conditions may entail sediment accumulation and subsequent cattail growth upstream of a beaver dam and flood carrying capacity has been noticeable reduced.

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Photo 1. Beaver dam located in Salvador Creek, approximately 600 ft downstream of Trower Avenue (July 8, 2010).

Photo 2. Downed trees crossing the channel from beaver activity (July 8, 2010).

Photo 3. Beaver activity on large cottonwoods (July 8, 2010).

Horizon WATER and ENVIRONMENT

Figure 12-2
Photos of Beaver Activities on Salvador Creek

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Chapter 13
MITIGATION PROGRAM

13.1 Introduction

This chapter outlines and describes mitigation options available for offsetting the maintenance program's residual impacts on wetlands, waters, riparian resources, and federally and state listed species. As described in Chapter 4, *Impact Avoidance and Minimization,* the District applies a 3-step approach for conducting maintenance activities by (1) applying the SMP Maintenance Principles to ensure environmental impacts are avoided as much as possible, (2) implementing avoidance and minimization measures during development of the annual maintenance workplan, and (3) then implementing BMPs to further avoid or reduce impacts. Overall, the maintenance program is designed to avoid and minimize most potential impacts but the program may result in some residual impacts that require compensatory mitigation.

Once the program is operating under regulatory approvals and permits, annual mitigation will be provided as necessary to address any residual impacts that require compensatory action. The District, in coordination with maintenance staff of the County, municipal partners and Napa RCD, will prioritize maintenance projects for the coming year. The District will then annually notify regulatory agencies about maintenance projects proposed for the coming year and mitigation needs will also be identified. The following sections provide the context and basis for a variety of mitigation approaches that may be utilized.

13.2 Impacts Requiring Mitigation

The purpose of this section is to preliminarily identify the maintenance activities that may trigger the need for compensatory mitigation. Note that a CEQA environmental impact evaluation for the maintenance program will be completed in the near future. Further, maintenance activities will be reviewed and approved by federal and state agencies as explained in Chapter 2, *Regulatory Compliance*, through the regulatory approval process. The discussion presented below represents a general review of potential impacts that may occur due to the maintenance activities described in this manual. Section 13.2 will be revised based on input received from regulatory agencies and through the CEQA public review process.

Aquatic (riverine and wetlands) and riparian habitats, and special-status species dependent on these habitats, are natural resources regulated by federal and state agencies as explained in Chapter 2, *Regulatory Compliance*. Napa County streams provide spawning and rearing habitat for special-status fish species including steelhead and fall run Chinook salmon (as described in Chapter 3, *Environmental Setting*). Special-status amphibians that may be present in and around aquatic habitats include but are not limited to California red-legged frog, foothill yellow-legged frog, and Pacific pond turtles. California freshwater shrimp can also be found in low-gradient streams such as the Napa River, Garnett Creek and Huichica Creek.

The estimation of mitigation needs considers the residual effects of maintenance activities on these habitat types, after implementing impact avoidance and minimization measures and BMPs described in Chapter 4, *Impact Avoidance and Minimization*.

The following maintenance activities would potentially require compensatory mitigation due to permanent loss of wetlands, waters of the U.S., and other habitat functions and services. In general, these activities are avoided and would only be undertaken as a last resort. The District anticipates these types of activities would be infrequent.

- **Live Tree Removal**. Tree removal over 6 inches dbh. For any maintenance activities that result in removal of live native trees greater than 6 inches dbh, mitigation involving planting of native trees will be required. Removal of non-native trees greater than 3 inches dbh may also require mitigation.
- **Riparian Vegetation Removal**. Riparian vegetation removal and permanent conversion of riparian habitat to grassland, ruderal, and non-riparian habitat. Compensatory mitigation would be required for removal of riparian vegetation.
- **Hardscape Fill in Jurisdictional Waters/Wetlands**. Hardscape fill in jurisdictional waters/wetlands that would result in a permanent loss of wetlands or waters of the U.S. would require mitigation to address the loss of wetlands and potential loss of habitat for federally or state listed species. Maintenance activities that may result in fill of wetlands (or other waters) may include placement of rock at toe of the bank for bank stabilization repairs, bridge support maintenance activities conducted on behalf of the County, and some rural road maintenance activities near creeks that are conducted on behalf of the Napa County RCD (e.g., armored fill crossings). Such activities may result in potential impacts on habitat supporting aquatic special-status species (e.g., steelhead and California freshwater shrimp), as well as general riparian habitat. Compensatory mitigation may be required for activities that involve permanent fill of wetlands or waters of the U.S.
- **Sediment Removal from Natural Channels or Modified Channels**. Sediment removal activities could result in impacts on special-status aquatic species habitat, particularly if the sediment supports wetland vegetation or if the sediment/gravel removed provides suitable habitat for aquatic species. Such impacts may be temporary or permanent depending on the extent, degree, and frequency of the sediment removal activities.

The following maintenance activities and associated habitat impacts would not likely result in permanent habitat losses and would not likely require compensatory mitigation.

- **Sediment Removal from Modified Channels and Engineered Structures**. Sediment removal below OHWM in concrete lined or engineered earthen channels, within the aquatic and riparian habitat zones (freshwater marsh wetland impacts) may result in temporary impacts on waters of the U.S. and state, but is performed as needed to meet flood hazard reduction objectives and often to improve overall habitat and stream function. The BMPs outlined in this manual are implemented and therefore no compensatory mitigation for impacts to jurisdictional waters should be required. Note that this work may require species-specific compensatory mitigation if conducted in areas where special-status species have potential to occur (e.g. in American Canyon).
- **Biotechnical Bank Stabilization.** Biotechnical bank stabilization repairs will incorporate native vegetation plantings to restore habitat functions affected by the bank failure.

Bank stabilization repairs that do not involve installation of rock fill, reduce active erosion, and include a native vegetation planting component would generally be "self-mitigating" and would likely not require compensatory mitigation.

- **Tree and shrub pruning and mowing activities**. This vegetation management activity is considered temporary and would not substantially impact habitat functions or values.
- **Downed tree management within creek**. The downed tree management program is predicated on preserving large wood in the stream whenever possible. Therefore, the impact would be considered a temporary impact, and no permanent loss of habitat would occur. This type of activity should be considered self-mitigating and have a beneficial effect to in-stream habitat.
- **Invasive Plant Management.** Invasive plant management activities would benefit aquatic and riparian habitat zones. Removal of invasive plants and non-native trees would not require compensatory mitigation.
- **Debris Removal**. This activity has a beneficial effect on water quality and habitat conditions and therefore, in general compensatory mitigation is not required for debris removal activities.
- **Access Road Maintenance**. Regrading and repair of unpaved access roads in upland areas that are limited to the existing footprint of the road would not result in adverse impacts to sensitive biological resources. In general, compensatory mitigation is not required for these maintenance activities.
- **Drainage System and Outfall Maintenance**. Removing debris and sediment from flapgates, storm drains and trench drains is a temporary impact and would benefit water quality and habitat conditions. As such, compensatory mitigation is not anticipated for these maintenance activities.
- **Beaver Controls**. This is a temporary impact and would be limited to trimming branches, cutting sections of beaver debris jams to break up blockages and installing temporary water level management devices such as perforated pipe.

13.3 Mitigation Options to Address Impacts

The mitigation approaches described below would be used to compensate for the permanent loss of habitat functions and services. Where feasible, the District's mitigation preference is to implement mitigation on-site, immediately adjacent or near the maintenance site, or within the same watershed.

13.3.1 Mitigation Notification

Following annual inspections of maintenance sites for a given year, the District, in coordination with its maintenance program partners, will prepare a maintenance notification report describing the proposed maintenance activities for that given year. As discussed in Chapter 14, the notification report will summarize anticipated impacts on riparian resources, wetlands and waters of the U.S. and state, and federally and state listed species. The annual notification report will describe avoidance and minimization measures, BMPs, and mitigation that would be provided to offset the program's permanent impacts to riparian resources, wetlands/waters, and special-status species. Compensatory mitigation for impacts to waters of the U.S. would be provided in accordance with the USACE South Pacific Division's "Final 2015 Regional Compensatory Mitigation and Monitoring Guidelines," (USACE 2015), the "Compensatory Mitigation Site Protection Instrument Handbook for the Corps Regulatory Program" (Institute for Water Resources [IWR] 2016a), and "Implementing Financial Assurance for Mitigation Project Success" (IWR 2016b) the most recent guidance provided by the USACE.

13.3.2 Mitigation to Address Impacts to Riparian and Freshwater Wetland Habitat and Habitat Utilized by Special-Status Aquatic Species

Revegetation at Bank Stabilization Sites

Under this program, the District and County are limited to conducting 2,500 linear feet of biotechnical streambank stabilization projects in a given year. For bank stabilization maintenance projects, the District will revegetate the sites with native riparian species regardless of whether the pre-project site was vegetated or not. By doing so, the District and County can provide additional functions and values appropriate to a riparian streambank environment. The overall goal is to provide adequate riparian or freshwater wetlands functions and values to offset any residual impacts caused by the maintenance activity. If the bank repairs are expected to result in impacts to California freshwater shrimp habitat, revegetating the site with riparian vegetation that provides overhanging canopy over existing pools could provide mitigation for this species.

Revegetation is a critical component of all biotechnical erosion control treatments. Successful revegetation projects typically use many types of plant materials including seed, live woody cuttings, and nursery stock. Guidelines for use of these plant materials in SMP projects are provided below. **Table 13-1** provides a basic seed mix that is suitable for riparian and streambank revegetation projects in the program area. The species in the seed mix provide a range of riparian habitat conditions. This list may be customized for individual erosion protection or stabilization projects.

Table 13-1. Basic Seed Mix for SMP Erosion Control and Bank Stabilization Projects

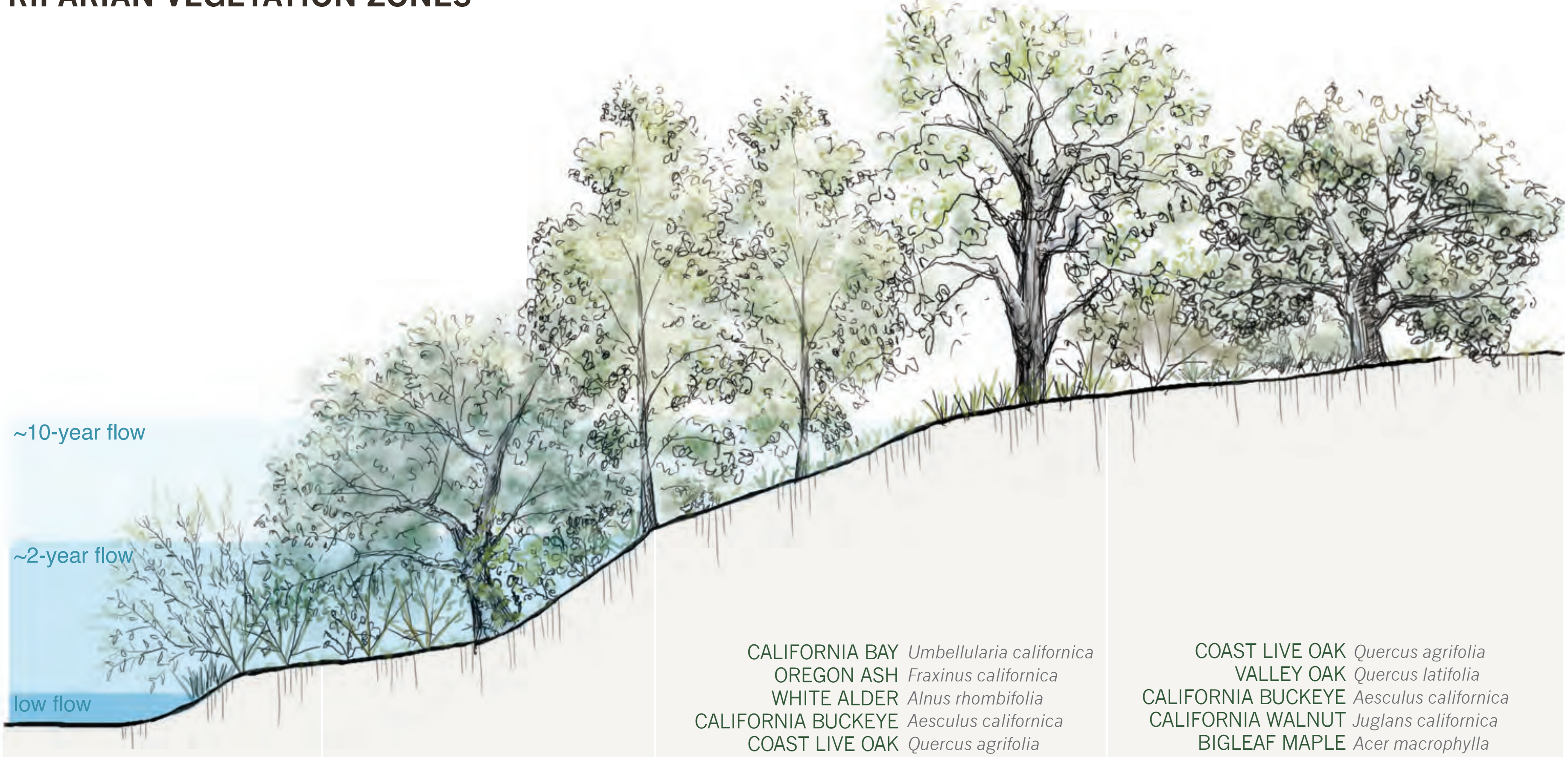
Scientific Name	Common Name	Application Rate (lbs/acre)	Growth Form
Achillea millefolium	yarrow	2	forb
Artemisia douglasiana	mugwort	4	forb
Bromus carinatus	California brome	4	grass
Lupinus bicolor	miniature lupine	2	forb
Deschampsia cespitosa	tufted hairgrass	4	grass
Elymus glaucus	blue wildrye	4	grass
Eschscholzia californica	California poppy	2	forb
Festuca idahoensis	Idaho fescue	8	grass
Hordeum brachyantherum	California barley	8	grass
Leymus triticoides	creeping wild rye	4	grass
Nassella pulchra	Purple needle-grass	4	grass
Poa secunda	one sided blue grass	4	grass
Vulpia microstachys	vulpia	8	grass

Live woody cuttings provide an economical means to propagate plants and are especially useful for streambank erosion protection because they have high survival and growth rates. Woody species successfully propagated in the field from cuttings include willows (*Salix* spp.), dogwood (*Cornus* spp.), and cottonwood (*Populus Fremontii*). Numerous technical reports have been published by the Natural Resources Conservation Service (NRCS) Aberdeen Plant Materials Center that provide guidance for harvesting, storing, and planting, live woody cuttings. Example articles published by the NRCS Aberdeen Plant Materials Center that may be useful (available online at www.nrcs.usda.gov/wps/portal/nrcs/publications/plantmaterials/pmc/west/idpmc/pub/) include:

- Zierke, M. and J.C. Hoag. 1995. Collection, Establishment, and Evaluation of Unrooted Woody Cuttings to Obtain Performance Tested Ecotypes of Native Willows and Cottonwoods. USDA-NRCS Aberdeen Plant Materials Center. Aberdeen, ID. Feb. 1994. 15p. (ID# 3237).
- Hoag, J.C. 1998. Establishment Techniques for Woody Vegetation in Riparian Zones of the Arid and Semi-arid West. USDA-NRCS Aberdeen Plant Materials Center. Aberdeen, ID. 5p. (ID# 1057).
- Hoag, J.C. and D. Tilley. 2007. How to Manipulate Water in a New, Restored, or Enhanced Wetland to Encourage Wetland Plant Establishment. Aberdeen PMC. aberdeen, ID. Riparian/wetland project information series no. 22. 5p. (ID# 7243).
- Tilley, D.J. and J.C. Hoag. 2009. Pre-soaking hardwood willow cuttings for fall versus spring dormant planting. Aberdeen PMC. Aberdeen, ID. Information Series 25. 9p. (ID# 8305).

Container plants or nursery stock are used to establish shrubs and trees that are difficult to propagate from seed or cuttings in natural settings. **Figure 13-1** depicts riparian vegetation zones that occur along typical streambank cross sections in the program area and species that commonly occur in each zone. **Figure 13-1** is used by the District and County as a general palette to identify suitable trees for replanting in the aquatic/streamside, riparian bench, riparian banks, and higher bank/terrace zones. For each of the riparian vegetation zones, there is a list of species that may serve as a planting palette for erosion control and bank stabilization projects. The planting palettes can be applied to all of the treatments. The appropriate species to plant will vary based on several factors including soil conditions, water availability, streambank slope angle, aspect, shade tolerance, and propagule sources. Native vegetation established in undisturbed adjacent areas is often a good indicator of species suitable for revegetation at erosion protection/stabilization sites.

RIPARIAN VEGETATION ZONES



AQUATIC & STREAMSIDE

BULRUSH	*Scirpus species*
IRISLEAF RUSH	*Juncus xiphioides*
TORRENT SEDGE	*Carex nudata*
SANDBAR WILLOW	*Salix exigua*

RIPARIAN BENCH

RED WILLOW	*Salix laevigata*
ARROYO WILLOW	*Salix lasiolepis*
DOGWOOD	*Cornus sericea*
MARSH BACCHARIS	*B. douglasii*
RUSH	*Juncus species*
SEDGE	*Carex species*

RIPARIAN BANKS

CALIFORNIA BAY	*Umbellularia californica*
OREGON ASH	*Fraxinus californica*
WHITE ALDER	*Alnus rhombifolia*
CALIFORNIA BUCKEYE	*Aesculus californica*
COAST LIVE OAK	*Quercus agrifolia*
VALLEY OAK	*Quercus latifolia*
FREMONT COTTONWOOD	*Populus fremontii*
SNOWBERRY	*Symphoricarpus albus*
ROSE	*Rosa californica*
BLACKBERRY	*Rubus ursinus*
CALIFORNIA GRAPE	*Vitis californica*

HIGH FLOODPLAIN/TERRACE

COAST LIVE OAK	*Quercus agrifolia*
VALLEY OAK	*Quercus latifolia*
CALIFORNIA BUCKEYE	*Aesculus californica*
CALIFORNIA WALNUT	*Juglans californica*
BIGLEAF MAPLE	*Acer macrophylla*
BOX ELDER	*Acer negundo*
FREMONT COTTONWOOD	*Populus fremontii*
COFFEEBERRY	*Rhamnus californica*
ELDERBERRY	*Sambucus mexicana*
TOYON	*Heteromeles arbutifolia*
SPICE BUSH	*Calycanthus occidentalis*

Source: Jennifer Natali Design. 2011

Figure 13-1
Riparian Vegetation Zones

For bank stabilization and repair projects, native riparian trees will be planted above the bankfull elevation (approximately, the 2-year event water level) and/or at the top-of-bank, spaced appropriately based on tree species and the desired canopy extent. Trees will be selected from the plant palettes provided in **Figure 13-1**. Tree selection will consider site location, how appropriate the site is for the tree type, and the potential for the tree to destabilize the bank slope in the future. Where appropriate, native grasses will be seeded or planted in areas disturbed by bank stabilization activities, including between existing or newly-planted trees.

On-site or Off-site Planting

Aside from bank stabilization repair sites, riparian planting either in the vicinity of other maintenance sites or at an off-site location could also provide mitigation for ground-disturbing impacts to riparian habitats, freshwater wetlands, and tree removal impacts. If the area where maintenance activities is planned to occur already has sufficient planting such that restoration activities are not needed on-site, then the riparian planting could be conducted at another channel location.

The objective of the mitigation planting is to enhance the complexity and diversity of the riparian canopy cover, improve channel shading, and develop a functioning understory along the channels that are currently devoid of vegetation or dominated by non-native invasive species. Riparian planting will enhance habitat for birds, amphibians, and other wildlife using terrestrial riparian areas while providing shading, sources of organic matter and coarse woody debris, and water quality benefits to aquatic species. In certain locations, planting riparian trees along streambanks can also provide mitigation for impacts to habitat utilized by special-status aquatic species.

As described in Chapter 6, *Tree and Vegetation Maintenance Activities*, the District would only remove a tree if it is causing a flood or erosion hazard, is trapping a significant volume of debris, or is otherwise a hazard to people or existing infrastructure. Consistent with the District's individual Routine Maintenance Agreement with CDFW, the District would provide on-site or off-site riparian planting to mitigate for tree removal impacts. Native trees between 3 and 6 inches dbh removed during maintenance activities would be replaced at a 3:1 ratio. Per the District's individual Routine Maintenance Agreements, native trees with a dbh of 6 inches or greater would be replaced at a 6:1 ratio. The planting palette for riparian planting activities is shown in **Table 13-2**. This list of species may evolve as the program adapts to maturing and improving riparian restoration efforts. Riparian planting may also include site preparation, including minor grading and topsoil preparation, and incorporation of soil amendments.

Table 13-2. Riparian Planting Palette

Botanical Name	Common Name
Trees	
Acer macrophyllum	Big leaf maple
Aesculus californica	California buckeye
Alnus rhombifolia	White alder
Fraxinus latifolia	Oregon ash
Juglans hindsii	Black walnut
Populus fremontii	Fremont's cottonwood
Quercus agrifolia	Coast live oak
Quercus lobata	Valley oak
Salix laevigata	Red willow
Salix lasiandra	Arroyo willow
Umbellularia californica	Bay laurel
Shrubs	
Baccharis pilularis	Coyote bush
Calycanthus occidentalis	Western spice bush
Heteromoles arbutifolia	Toyon
Rhamnus californica	Coffeeberry
Rosa californica	California wild rose
Symphoricarpos albus	Snowberry
Low herbaceous plants	
Carex barbarae	Santa Barbara sedge
Carex praegracilis	California field sedge
Elymus glaucus	Blue wildrye
Euthamia occidentalis	Western goldenrod
Festuca idahoensis	Idaho fescue
Juncus balticus	Baltic rush
Juncus effusus var. brunneus	Pacific rush
Leymus triticoides	Creeping wildrye
Lonicera hispidula	Honeysuckle
Muhlenbergia rigens	Deergrass
Melica Californica	California melic

Figure 13-1 illustrates riparian vegetation zones according to bank location in cross section view and lists targeted tree planting types. **Table 13-3** summarizes the District's riparian planting efforts to-date. As shown in the table, between 2000 and 2011, the District has planted 6,495 trees along 31,650 linear feet (nearly 6 miles) of streams throughout the county. A portion of these planting activities were specifically conducted to revegetate bank stabilization projects on Conn Creek, Tulocay Creek, and Salvador Creek. On average, 590 trees are planted annually as part of the District's SMP. The District maintains two willow farms (in St. Helena and Napa) to support planting and revegetation activities throughout the county.

Table 13-3. Summary of Riparian Planting Activities 2000-2016

Creek or Project Site	Linear Feet Planted	Number of Trees Planted	Number of Understory Species Planted
Conn Creek	330	11	43
Blossom Creek	30	2	210
Dry Creek	30	4	33
Fagan Creek	600	43	72
Garnett Creek	40	11	44
Milliken Creek	30	3	72
Napa Creek	425	298	416
Napa River	4,800	952	3,501
Oak Knoll Ditch	4,700	100	0
Salvador Creek	3,575	2,024	105
Salvador Outfall at Summerbrooke	1,300	400	200
Solano/Salvador Avenue Collector	5,600	750	30
Sulphur Creek	250	50	9
Tulucay/Camille Creeks	2,450	114	139
Yountville Collector	10,200	2,030	65
Yountville Outfall	2,600	600	0
Totals	**36,960**	**7,392**	**4,939**

Opportunities for riparian planting and restoration will be evaluated on a case-by-case basis at all maintenance locations. Specific revegetation plan details are highly dependent on site-specific conditions at each planting site, particularly with regard to hydrology and soils. Riparian planting restoration sites will be prioritized toward:

- Stream reaches where the existing vegetation is absent or of low quality, or where there is a gap in the riparian canopy and corridor such that vegetation growth will improve connectivity between existing patches of high-quality riparian habitat.
- Stream reaches where invasive plant species have been removed and native riparian plant establishment is a priority to establish prior to potential recolonization by the invasive plants.
- Stream reaches where overall vegetation planting and canopy development will provide functions (shade, refugia, etc.) for sensitive fish and/or wildlife species.

Volunteer riparian planting

Invasive Species Plant Removal

While the District routinely conducts invasive plant removal as part of the SMP, as described in Chapter 5, *Invasive Plant Management Activities;* this activity can be proactively expanded into larger areas to provide additional resource benefits of removing invasive species and supporting a healthy native riparian corridor. This type of activity can serve as mitigation for impacts on aquatic habitat, for example, due to the placement of rock or riprap fill. This work is conducted in areas to ensure adequate flood conveyance capacity and enhancing instream habitat in areas where non-native plants are reducing the success of native vegetation. Since the District can only address a certain number of sites in a given year and may not have enough resources to address all prioritized sites, the District, could conduct a larger-scale invasive plant removal project at, or in the vicinity of, maintenance activities that result in impacts to aquatic habitat.

Trash Removal

In addition to the mitigation options described above, the District proactively conducts trash removal efforts to further protect creek water quality and habitat conditions. The District's trash removal efforts can also provide mitigation for some of the SMP's impacts.

13.3.3 Mitigation to Address Impacts to Aquatic Habitat for Special-Status Species

Instream Habitat Complexity

Creating instream complexity features in Napa County streams can improve and enhance aquatic habitat for species such as steelhead and California freshwater shrimp. In this way, improving or enhancing aquatic habitat by developing more instream complexity provides suitable mitigation for potential impacts to these special-status species or their habitats. A complex instream and channel bed environment provides habitat heterogeneity, cover, and refugia during a range of flow conditions. In coordination with other maintenance activities, District stream managers will evaluate channels and maintenance sites in their respective jurisdictions for opportunities to enhance or develop instream complexity features for mitigation purposes. Examples of instream complexity features include:

- Enhancing an existing, or developing new LWD features that provide cover and refugia during high flow events as well as channel diversity in lower flow events.
- Enhancing existing, or developing new deep channel pools that provide rearing habitat and refugia during high flow events as well as habitat during extreme low water times.
- Enhancing existing, or developing new cobble/gravel bars and benches that provide spawning and rearing habitats for fish, refugia during higher flow events, and areas suitable for good invertebrate drift.
- Developing other instream geomorphic features that increase channel bedforms, increase the range of channel velocities, and increase the overall range of habitat conditions.

The goal of these mitigation projects is to enhance existing instream complexity features and/or create new features within fish bearing streams in the program area. New instream features may be developed to achieve several habitat objectives, including: increasing pool habitat in homogenized stream reaches, providing escape cover for rearing and spawning fish, deepening feeding areas in riffle habitat, creating a variety of stream flow velocities for cover, sorting gravel, and providing resting areas for upstream migration. Additionally, improving instream function can benefit other aquatic flora and fauna by improving the overall stream complexity for which these species depend upon for survival. If effective, new instream complexity features (particularly in highly modified, urban streams) can augment or replace existing structural features required for successful spawning and rearing of salmonids in the freshwater environment. The District anticipates that two instream habitat projects could be implemented per year to provide mitigation needs for the program.

Newly developed instream habitat improvements may use log structures, boulder structures, or a combination of both log and boulder structures to achieve more complex habitats. Possible configurations of boulders or logs include weirs, clusters, single and opposing wing deflectors, spider logs, and digger logs. The construction materials selected for each instream complexity feature would depend upon the target objective and site conditions.

The new instream complexity features will be monitored and reported upon in annual monitoring and notification reports. If site appropriate, new instream complexity features can be integrated with gravel augmentation mitigation projects as described below.

Gravel Augmentation

Instream gravel and course sediment along a streambed can be a fundamental habitat element to a healthy functioning stream directly supporting life-cycle needs of fish, amphibians and other aquatic wildlife. Often, gravel and course streambed sediment supply is reduced due to dams or other upstream barriers that trap sand, gravel, and course bed materials upstream behind the barrier. In addition to curtailing sediment supply, dams, reservoirs, and other upstream barriers also moderate or reduce the magnitude of stream flows such that natural gravel mobilization and transport processes are diminished. Flood control dams or other facilities reduce flow magnitude and duration resulting in less frequent (or non-occurrence) of flows strong enough to mobilize sediments along the channel bed.

Gravel augmentation provides direct benefits for improving fish spawning and rearing habitat, and can provide suitable mitigation for impacts to aquatic habitat used by special-status fish like steelhead and Chinook salmon. Gravel augmentation helps mitigate for general instream impacts related to sediment removal activities for spawning and rearing salmonids.

The general goal of gravel augmentation projects is to improve fish spawning and rearing habitat by enhancing sedimentary materials within the channel bed. The District can reuse watershed specific gravels collected through sediment removal activities as a source for the gravel augmentation projects. The District would collect, sort, separate, and reuse clean, appropriately sized gravel. When designing a gravel augmentation project, several factors will be considered, including: the existing channel conditions; the grain size distribution of the sediment to be added; the volume of gravel to deposit; the frequency of gravel addition that will be required in light of sediment transport; how the added gravel will interact with to the existing flow regime and/or channel geometry; and the extent of augmentation effects within the channel reach.

Opportunities to augment gravel in non-tidal salmonid streams will be assessed annually. The District will assess stream reaches that are particularly diminished of gravel and assess the feasibility for gravel augmentation. The District anticipates that two to five gravel augmentation projects could be implemented per year for mitigation purposes.

13.3.4 Partner with Local Watershed Organizations

An additional opportunity to provide mitigation for the program's routine maintenance activities is found through partnering with local watershed organizations including the Napa County RCD, the Land Trust of Napa County, Napa County Regional Parks and Open Space District, and Friends of Napa River. During 2010-2014, the District partnered with the Napa RCD and other entities and landowners to successfully restore 4.5 miles of the Napa River through the Rutherford Reach Restoration Project.

The Napa RCD has led the Rural Roads Program and the Upper Napa River Watershed Assessment Program, both of which were initiated to reduce excessive sedimentation from rural roads. Sediment from roads can degrade fish habitat, impact bank stability and the stream's conveyance capacity, and adversely affect water quality. Through the Rural Roads Program, the RCD works with land managers to assess and improve road conditions and ensure proper maintenance with the goal of protecting Napa County's clean waterways. As described in Chapter 11, Resource Conservation District Routine Activities, the RCD also carries out other programs such as LandSmart for Kids® and LandSmart® Education, which bring students, teachers, community volunteers, land managers, and natural resource professionals to complete restoration projects. The RCD also works with landowners on riparian restoration projects. Funding such projects can provide several watershed benefits and is an effective way to offset potential impacts of the maintenance program.

The Land Trust of Napa County is a nonprofit organization dedicated to permanently protecting land. This organization partners with landowners and develops conservation plans and conservation easements and serves as the responsible entity for monitoring conserved lands in perpetuity. The District could help contribute funds to the Land Trust of Napa County to support land protection projects.

The Napa County Regional Park and Open Space District works to protect and preserve watershed, natural areas and wildlife habitat, improve Napa County's public parks, trails and other outdoor recreational facilities, and manage outdoor science and conservation education programs. This organization hosts monthly volunteer events, some of which involve removal of invasive plant species, clearing fallen trees, and tree planting efforts.

The Friends of Napa River is a non-profit organization comprised of community members and their mission is to serve as the Napa community's voice for responsible protection, restoration, development and celebration of the Napa River and its watershed. This organization sponsors watershed clean-up events and provides watershed education programs for students and the general public. To provide mitigation for the maintenance program's impacts, the District would contribute funds that support watershed clean-up events and watershed education programs.

13.3.5 Mitigation Banks

In addition to the mitigation approaches described above including mitigating in-kind and at an on-site or off-site location or partnering with local organizations on restoration efforts; the District could also purchase mitigation credits from accredited mitigation banks for specific species as needed. There are no wetland mitigation banks that serve Napa County. Depending on the maintenance program's potential impacts on specific special-status species, the County may purchase compensatory credits from mitigation banks that provide habitat for federally and state listed species. Mitigation banks that provide credits for California red-legged frog include:

- Mountain House Conservation Bank
- North Bay Highlands Conservation Bank
- Ohlone Preserve Conservation Bank
- Ohlone West Conservation Bank
- Oursan Ridge Conservation Bank

The District largely avoids conducting maintenance activities in areas supporting valley elderberry longhorn beetle. In the event that potential impacts on valley elderberry longhorn beetle may occur, the District could purchase credits from the River Ranch Conservation Bank.

In addition, the City of American Canyon has established a California Red-legged Frog Preserve for the purpose of mitigating impacts resulting from routine maintenance activities within drainages that support this species (documented in USFWS Biological Opinion #08ESMF00-2011-F-0481). By including the City of American Canyon in the SMP, the District proposes to utilize remaining available mitigation credits when necessary to compensate for California red-legged frog impacts resulting from SMP implementation within American Canyon.

13.4 Mitigation Monitoring and Reporting

For any mitigation efforts that the District undertakes in support of the maintenance program, they will ensure adequate monitoring to document that the mitigation is operational and successfully providing the functions and values needed to offset potential program impacts. For District-led on-site and off-site mitigation projects, the District will be responsible for monitoring such projects for a period of at least 5 years depending upon the type of mitigation project. The RWQCB may require monitoring and reporting every year for the first 5 years and subsequent monitoring/reporting once at year 7 and once at year 10. For watershed partnering mitigation projects in which the District serves as a partner funding the mitigation through an agency like Napa County RCD, it is anticipated that the local partner (RCD, Land Trust of Napa County, Napa County Regional and Park and Open Space District, or Friends of Napa River) will monitor and provide reporting on the site throughout the required monitoring period. While it is the watershed partner's responsibility to monitor site conditions, the District will be responsible for communicating monitoring results annually to regulators as part of the maintenance program's reporting process. The annual notification and reporting actions are described in Chapter 14 in more detail. Specific details describing the monitoring responsibilities of the District will be included in each year's annual notification and summary report of routine maintenance conducted. Long-term monitoring for special projects such as the Napa River Flood Protection Project or the Rutherford and Oakville to Oak Knoll Restoration Projects is reported on in separate individual annual monitoring reports submitted directly to respective regulatory agencies and in adherence to project specific monitoring plans.

13.4.1 Napa River Sediment TMDL Progress Tracking

The County and its municipal partners through the MS4 Stormwater Permit Program track and document projects that will reduce the input of fine sediment associated with streambank erosion, failed culverts and upland roads in effort to track progress in achieving performance standards outlined in the TMDL for Sediment in the Napa River. The District's annual reports document riparian habitat enhancement and mitigation projects conducted on a yearly basis, several of which are aimed to reduce sediment delivery. One of the key performance standards for vineyards, grazing lands, rural lands, and lands within parks and open space and the County Public Works Department is to reduce road-related sediment delivery to channels by at least 500 cubic yards per mile over a 20-year period. As shown in **Table 13-4**, in 2015 and 2016, the District and Napa County RCD have collaborated on several upland road improvement projects that reduce sediment delivery and directly help meet TMDL performance standards. In 2015, the Napa County RCD conducted 10 erosion repair projects on 8.8 miles of roads on the Wildlakes Preserve, managed by the Land Trust of Napa County. The erosion repairs span 3.34 miles of roads and are anticipated to prevent 6,634 cubic yards of sediment from delivering to the stream system over the next 20 years. The Simmons Canyon Creek improvements were road-related fill crossings that were treated by installing 1-2 feet of rock armor along the outside fill slope to prevent approximately 20 cubic yards of road-fill material from eroding. The Simmons Canyon Creek improvements are anticipated to prevent 105 cubic yards of chronic sediment from delivering to the stream system annually.

Going forward, the District may build upon Table 13-4 to track habitat enhancement projects that help the District and County reduce sediment delivery and therefore, utilize the table to track progress in meeting TMDL requirements. A table similar to this may be incorporated in future notification packages.

Table 13-4. Habitat Enhancement Projects that Reduce Sediment Delivery (2015-2016)

Tributary to	Linear Feet (lf)	On-site Sediment Removal (cubic yards [CY])	Reduction of Sediment Delivery Over Next 20 Years
Swartz Creek	20	8	6,634 CY
Swartz Creek	20	7	
Swartz Creek	20	6	
Bell Canyon Creek	20	6	
Bell Canyon Creek	20	6	
Bell Canyon Creek	20	6	
Bell Canyon Creek	20	5	
Bell Canyon Creek	20	3	
Bell Canyon Creek	20	4	
Bell Canyon Creek	20	6	
Simmons Canyon Creek	20	10	105 CY per year
Simmons Canyon Creek	20	10	
Simmons Canyon Creek	20	10	

Chapter 14
PROGRAM MANAGEMENT AND REPORTING

14.1 Annual Work Cycle

This chapter outlines and describes how the stream maintenance program is implemented and administered by the Napa County Flood Control and Water Conservation District (District). The management and operation of the maintenance program occurs as an annual cycle of activities described in this chapter as the “work cycle.” The components of the maintenance work cycle are shown in **Figure 14-1** and described in the sections below.

The work cycle begins with the program-wide stream reconnaissance and assessment. The stream assessment process guides the development of that year’s workplan. Projects such as vegetation maintenance, downed tree management, localized sediment removal at culvert crossings, or minor bank repairs represent the large majority of maintenance projects conducted by the District. The majority of the maintenance activities along County roads include minor biotechnical bank stabilization, bridge support maintenance, culvert repair and replacement, and repairing drainage ditches adjacent to County roads. All maintenance activities utilize the appropriate programmatic impact avoidance, minimization, and mitigation programs outlined in this manual.

Stream reconnaissance and assessment begins in the early spring and the project workplan is generally developed later in the spring following the site assessments. Project descriptions, impact calculations of maintenance activities and mitigation projects are then developed. More project planning and refinement then occurs through June. The relevant regulatory agencies are notified of the year’s projects in late spring and provided information on project locations, activities, surveys, sediment testing and disposal (if necessary) and any other key issues. Projects are then implemented during the summer season with follow-up annual reporting activities occurring in the fall.

The District administers and oversees the maintenance program throughout all steps of the work cycle. It is recognized that a successful program is based on continuous management and oversight. The District has appointed a stream maintenance manager whose central responsibility is to supervise and guide the program. A key responsibility for the Manager is to provide communication and coordination between District and the relevant regulatory agencies throughout all steps of the work cycle. The stream maintenance manager is also responsible for coordinating identified maintenance needs with the partnering municipalities, Napa County RCD, and the County. The Program is administered consistently with the goals, principles, and activities as described in this manual. In addition to the annual work cycle, every five years the Program is reviewed for its overall effectiveness and adequacy.

Another key element to supporting an effective stream maintenance program is to establish and maintain a comprehensive data management system. Data management is required throughout the maintenance work cycle from organizing the initial stream assessment and inventory, to charting reach conditions and project requirements, to providing post project monitoring and reporting. Data collection and management for the Program is described below in Section 14.8.

14.2 Stream Reconnaissance and Assessment and Road Maintenance Assessments

14.2.1 Stream Reconnaissance and Assessment

In the early spring around April, a reconnaissance of the District-maintained channels and channels owned by other entities such as cities that the District is partnering with is conducted on a reach-by-reach basis to assess potential maintenance needs. The reconnaissance includes a field assessment of maintenance needs in District-owned, and other publicly owned channels including the Rutherford and Oakville to Oak Knoll restoration reaches (as shown in the Chapter 1 maps).

Conditions in privately owned channels (identified in orange in Chapter 1 maps) are assessed on an annual basis. As described in Chapter 1, Section 1.3.2, the District surveys conditions in privately owned channels (orange channels in Chapter 1 maps) to identify potential maintenance needs. If a maintenance need is identified, the property owner is contacted and permission is requested prior to conducting any maintenance. When requested or planned, maintenance activities are included in the annual workplan along with other program maintenance activities.

District staff familiar with the guidelines and principles of the program conduct the stream channel assessments. The assessment process evaluates the need for maintenance and follows the guidance and maintenance principles described in Chapter 3. During the survey, the channel characterization sheets (provided in Chapter 2) are referenced in the field, reviewed for their accuracy, and updated as appropriate. The channel characterization sheets are also updated to include an appraisal of underlying causes for the maintenance situation. The stream assessment process is also supported by information provided by Geographic Information System (GIS) mapping, aerial photography, and the District's stream maintenance data management system. The data management system is accessed during the stream assessment process to query past maintenance activities, identify specific resource conditions, and prioritize maintenance activities by reach to develop the year's workplan.

For each reach, District staff assesses site conditions and resources in terms of the potential need for vegetation management, downed tree management, bank stabilization, and sediment removal. Channel vegetation conditions are assessed for the presence of cattails, blackberries, willows, exotics, etc. and the need for vegetation removal or management to prevent flooding. Stream surveyors record the locations of potential maintenance activities using GPS within the online GIS stream survey database. Maintenance locations are also associated with non-spatial data including the type of maintenance, dimensions of the work area, notes regarding site access and constraints, as well as a brief description of relevant stream resources within the reach.

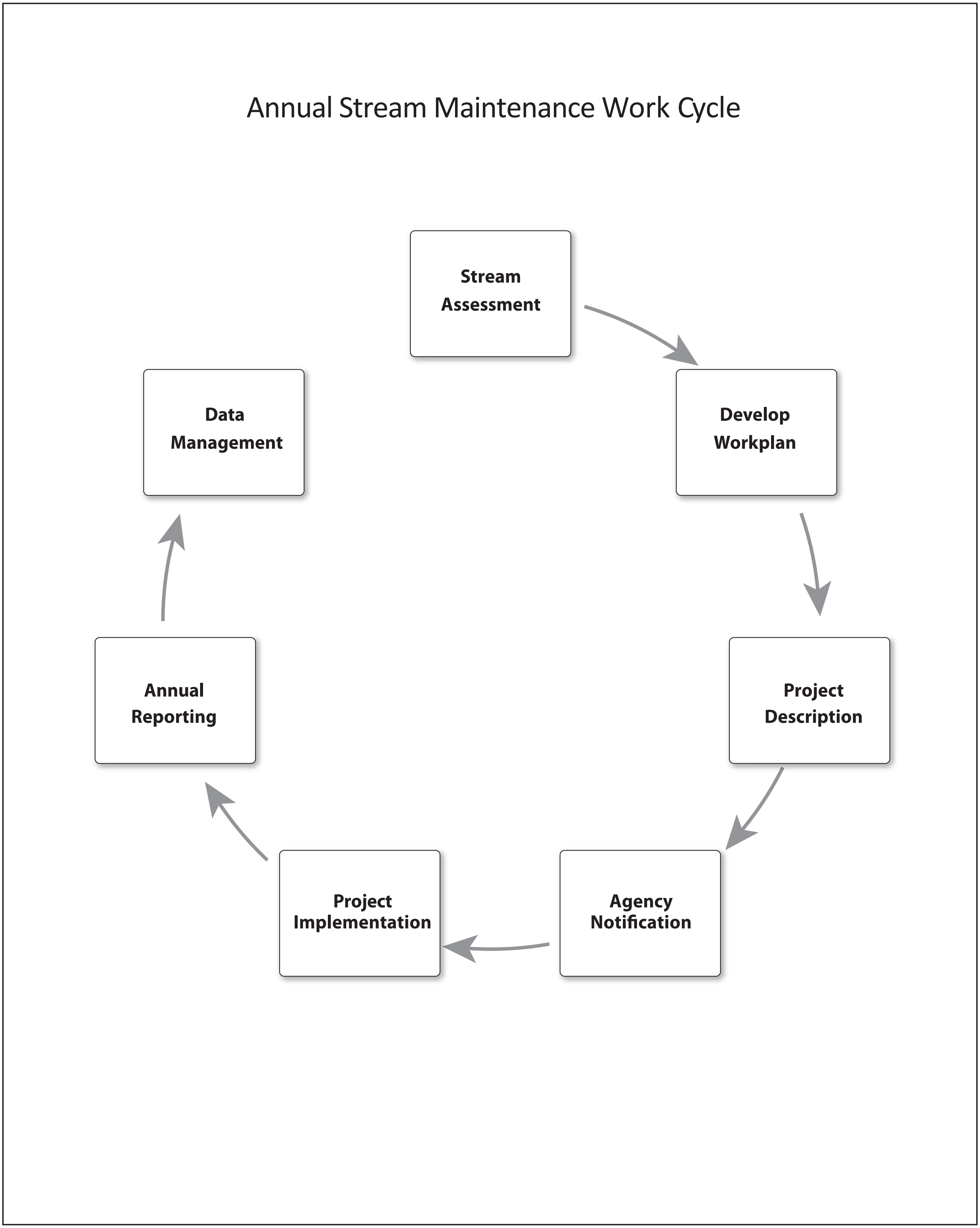


Figure 14-1
Annual Work Cycle

Stream/Channel Assessment Report

Browns Valley Creek

Date 5/28/2009 **Survey Time (hr)** 3.00 **Surveyor** Sauer, Chris **Type** Routine **Survey ID** **1243552259**

Upstream Location Borette Ave. tee, **Downstream Location** Thompson Ave

Comments BV Creek had quite a lot of problems that have occurred and need to be addressed.

WP	Problem Category	Bank	Observations	Recommendation	Priority	Crew Time (hr)
100	Encroachment	Left	6'to8' wide path has been cut into bank from top of bank down to the creek bed.	Send letter. Notify Fish and Game.	Medium	
101	Dumping	Left	10'x30' pile of garden debris has been dumped down the creek bank and to the creek bed.	Send educational letter	Low	
102	LWD	Right	1'x30' log is lying on creek bank and down into the creek bed.	Remove if there is time.	Medium	2.0
103	Dumping	Right	15'x20' pile of garden debris has been dumped down the bank and into the creek bed.	Send educational letter		
104	Bank Erosion	Right	Vertical wall, 15' hi x 70' long has just fallen over and into the creek bed. Has left eroding bank behind.	Notify property owner re. County Bank Repair Program	Low	
321	Bank Erosion	Right	Gabion basket wall has had the bottom basket rust out and has lost all the stones from the basket. The toe of this wall is now destabilized and the entire wall is in danger of falling apart.	Send letter to property owner re: the County Bank Repair Program.	High	
322	Other	Center	Bridge culvert is filling with gravel, has filled perhaps one quarter of its capacity.	Monitor	Medium	
325	LWD	Right	8"x20' broken branch is lying across the creek and is propped 2' over the creek bed. It could catch debris and create a jam.	Remove from center of creek and move to the side of creek.	High	1.0

Source: NCFCWCD 2009.

Figure 14-2
Example Stream Assessment Report

Potential maintenance projects receive rankings ranging from high priority to low priority. The maintenance prioritization is initially identified based on the site assessment. The prioritization is further refined as part of the planning process described in Section 14.3 below. High priority sites indicate that maintenance may be needed that year, whereas low priority sites may not require immediate maintenance. Based on the field reconnaissance, review of the channel characterization sheets, and subsequent prioritization using the maintenance database, an initial list of reaches requiring maintenance for the current work cycle is compiled.

14.2.2 Routine Road Maintenance Assessments

As described in Chapter 11, *Resource Conservation District Routine Activities*, the Napa County RCD also conducts an inventory process to determine where upland road repair and maintenance is needed. These inventories involve coordination with private landowners and typically occur year around as needed.

Similarly, the County goes through a similar inventory process to verify which road crossings and culverts require maintenance. This inventory process is typically conducted in late fall, prior to the start of the wet season.

Once these assessments are complete, the Napa County RCD and County Roads Division staff responsible for conducting road evaluations will then meet with the District to review and discuss high priority road maintenance sites that should be addressed that year.

14.3 Work Planning

The preliminary list of project sites developed during the reconnaissance process is reviewed and further prioritized based on:

- guidance provided by Maintenance Principles (Chapter 4);
- the relative severity of reach conditions and need for maintenance;
- Program considerations, management goals, and management triggers, as described under the corresponding approaches in Chapters 4 through 12;
- consideration of past/recent flooding conditions; and
- overall maintenance needs in the program area.

Following this prioritization, the stream maintenance manager may consolidate the list of potential projects into a smaller set of projects to serve as the workplan for the given year. The number of projects prioritized in any given year is dependent on several factors, most notably climatic conditions of the preceding years. Projects marked as low priority and not included in the current cycle’s workplan are noted for inspection and reassessment during the next work cycle.

The following list provides an estimated range and number of project types anticipated to be conducted annually. However, actual maintenance needs in any given year are largely dictated by climate conditions in the given year or recent years. It is expected that annual work plans may include:

- an average of 2,000 lf invasive vegetation management at multiple reaches on an ongoing, annual basis,
- a range of 2,000-5,000 lf of vegetation maintenance (e.g., pruning and thinning) -at multiple reaches on an ongoing, annual basis,
- approximately 15-25 downed tree management projects occur on an annual basis,
- up to 20 bank stabilization projects per year,
- 2-5 localized sediment removal projects at culverts and crossings per year,
- 2-3 culvert replacement projects per year,
- up to 5 miles of private road maintenance treatments conducted by Napa County RCD, and
- 2 instream habitat enhancement projects and 2 gravel augmentation projects per year (which may provide mitigation for other maintenance activities).

Maintenance activities are expected to generate from 200-500 CY of sediment and debris per year. Sediment may be disposed at the Edgerly Island Rehandling Site or the Imola Site and debris is taken to local landfills (as described in Chapter 10).

As described in Chapter 10, the District maintains two restoration projects on private property, the Rutherford Reach and the Oakville to Oak Knoll Reach. The District may conduct maintenance throughout any location in the CFD. Annual surveys and assessments of the Rutherford Reach and Oakville to Oak Knoll Reach are conducted in the spring time to identify priority maintenance needs for the upcoming year. Maintenance activities would occur in accordance with the maintenance plans developed for each project. Maintenance activities typically include debris removal and relocation of large wood, vegetation management, streambank erosion control, repair and maintenance of floodplain benches, invasive plant removal, repair and maintenance of aquatic habitat enhancement structures, and other activities described in Section 10.2.

As specified in the maintenance plans for both restoration projects (see Appendix A for detail), The District will work with the Landowner Advisory Committees, which are comprised of a core group of landowners that are within the restoration project areas, to identify and prioritize annual maintenance needs. District staff will conduct routine surveys (at least once per year) to identify and assess issues of concern. District staff will use their standard data sheets, aerial photographs, and GPS units to document the nature and extent of any issues observed during the surveys. It may also be necessary to conduct interim river surveys shortly after large storm events (e.g., greater than 10-year flood event) to identify areas that may require immediate treatment to prevent additional streambank failure and to protect existing infrastructure and environmental resources. Based on the annual and interim river surveys, the District will prioritize annual maintenance needs and develop a work plan detailing the location and scope of maintenance activities planned for the coming year.

14.4 Project Description

A brief project description is developed to describe the maintenance activities proposed for the year. The project description includes an evaluation of the maintenance sites in context with the surrounding drainage area and identifies maintenance needs and impact avoidance measures.

14.4.1 Identify Site Context

Site maintenance begins with considering the reach setting and context, as discussed in Chapter 3. Relevant site information to be reviewed (as available) includes reach descriptive sheets, reach assessment database entries, channel engineering designs and as-built designs, the most recent channel cross section surveys, hydraulics and flow capacity conditions, and information on environmental resources and adjacent land uses. If necessary, these existing data sources are updated, or data gaps completed as needed. For example, reach sheets are updated based on current conditions of the site, maintenance work from the previous year, and any changes in occurrence data for special-status species.

To further guide the maintenance process, reach- and site-based constraints are identified. For example, site- or reach-scale constraints such as a narrow corridor width, the presence of infrastructure like pipelines or road crossings, the presence of threatened or endangered species, or the existing channel already being in a degraded or incised condition could all influence the maintenance approach and which treatments to use. Site and reach constraints may also influence the need for special access or equipment that may differ from the approaches described in this manual. If site constraints and environmental considerations result in the need to use equipment or approaches other than those described in the manual, a detailed description of the necessary approach is included in the project description and discussed with regulatory agency staff during the notification process (see Chapter 2 for more detail on the regulatory compliance process).

The stream maintenance manager uses all relevant information including the observed field conditions, understanding of sediment and reach processes, results of channel cross section surveys, hydraulic analysis (as available), and the consideration of site constraints to develop an appropriate approach for maintenance activities.

The Napa County RCD goes through a similar process in which a staff person will inspect potential road repair sites on private property throughout the county. Similarly, County Roads Division staff will inspect potential County road repair sites (e.g., roadside drainage systems, culverts, bridges and bank repair sites) that are in need of repair. RCD and County staff will make notes on existing problems, erosion potential, apparent processes and relationships to the nature of the problem, make note of any constraints at each site, and estimate treatment methods potentially needed.

14.4.2 Identify Treatments and BMPs

Treatment approaches are identified based on the site conditions, the key fluvial processes, and other influencing constraints. Tree maintenance projects, including downed tree maintenance, are designed to maintain trees to provide necessary flood control while maintaining as much habitat and creek shading as possible. Bank stabilization projects use bioengineered treatments that respond to the cause and degree of the bank failure to develop a sustainable design. For RCD-led road maintenance projects, if field observations determine that the cross-section area of an active stream channel is greater than 3 feet by 1 foot and a new culvert is required, runoff calculations are modeled to determine capacity needed for 100-year flow events. Further engineering may also be needed where road maintenance is required at stream crossings that provide anadromous fish passage.

Following the identification of the treatment approach, activity-specific BMPs are identified based on the practices listed in Table 4-1. For example, tree trimming activities may be required to occur outside the migratory bird and raptor nesting period. All projects utilize appropriate program-wide BMPs for impact avoidance and minimization as identified in Chapter 4 and Table 4-1.

14.4.3 Develop Project Description

Following the analysis of site context and the development of treatment designs, a summary project description is developed for each maintenance project. The project description serves as the formal characterization of project activities and supports permitting requirements. The project description includes the following information:

- Project type (i.e., invasive plant management, tree maintenance, downed tree management, sediment removal, bank stabilization, road maintenance, levee or berm maintenance, floodwall maintenance, culvert or storm drainage maintenance, or other minor maintenance)
- Project location address and/or location description
- Project site map
- Updated channel characterization sheet for project reach (as needed)
- Short description of activities including treatments selected, equipment used, access, staging, etc. If activities will be conducted differently from the activity description in the Manual, identify differences and provide an explanation of why the different approach is required.
- Length (linear feet) and area (acres) of creek channel that will be disturbed by activities.
- For vegetation management projects, identify the extent of invasive species control, tree maintenance, downed tree management, and native species management will be conducted.
- For bank stabilization projects, identify how much fill material (including vegetation fill materials) will be placed in the bank slope
- For sediment removal projects, identify quantity (cubic yards) of sediment to be removed
- For road maintenance projects, identify how much fill material (if any) will be installed within stream crossings
- For all projects, identify how much (cubic yards) sediment and other debris requires disposal and identify the disposal location

- Any appropriate figures including cross sections, design details of structures to be maintained, and plan view maps for activities as appropriate.
- A brief summary of the activity-specific BMPs to be implemented with the project.

14.5 Mitigation Plan

As part of the Annual Notification, the District will identify mitigation and watershed enhancement projects for maintenance activities to address any permanent impacts on jurisdictional wetlands, waters, and/or special-status species. The mitigation projects will describe the on-site and/or off-site enhancement activities. Mitigation projects will include the following types of information as appropriate:

- A description of on-site habitat restoration or enhancement activities planned for the coming year including the locations, lengths, areas, and other project details;
- A description of off-site habitat restoration or enhancement activities that are led by the District or the County;
- A description of habitat restoration and enhancement projects led by local watershed organizations that the County will help fund, including:
  - A description of each off-site restoration project, including its name, the project partners, project cost, length and area of mitigating activities;
  - A description of how these off-site watershed projects will address watershed processes and functions that will provide suitable mitigation for the year's maintenance activities;
  - Schedule for implementing mitigation project activities;
  - A statement describing the status of permit approvals necessary to perform project (if applicable); and
  - A mitigation and reporting plan.
- A description of the mitigation bank, its location, and the types and amount of credits that will be purchased.

Permitting agencies will have the opportunity to review and comment on the proposed annual mitigation plan. The annual mitigation plans will be consistent with the mitigation approaches outlined above and in Chapter 13.

14.6 Agency Notification

By June 15thof each year, the District notifies the relevant regulatory agencies of the planned SMP projects for that year's maintenance workplan (see Figure 14-1) through submittal of a workplan notification packet. The notification packet contains the workplan, project descriptions, sediment disposal plan, and supporting materials described above. Notification packets will also contain a description of maintenance activities that will result in temporary and permanent impacts on jurisdictional wetlands and waters and impacts to special-status species, and a proposal for providing compensatory mitigation for the program's impacts.

As noted in Section 14.3, above, the workplans for maintenance activities proposed at the Oakville to Oak Knoll and Rutherford Reach restoration projects Is developed separately and will include more detailed information including annual and interim river survey results. Any deviations from standard routine maintenance methods are described in detail along with any relevant impact avoidance measures, BMPs, or mitigation considerations necessary to minimize environmental impacts. Similarly, if during implementation of maintenance activities, an issue arises that requires a different treatment or approach than described in the notification package, the stream maintenance manager sends an updated notification to the relevant agencies with this project change.

The annual workplans must be approved by the relevant regulatory agencies as described in the project permits. If requested, the District can host a tour of the identified maintenance sites. The regulatory agencies have 30-days to review the notification packets. Agency confirmation of the annual workplan and approvals to proceed with maintenance are commonly received before July 15th.

14.6.1 Semi-Annual Reporting for the Napa River/Napa Creek Flood Protection Project

For the Flood Protection Project, the District is required to submit semi-annual reports within a 10-day period prior to June 1 and December 1 of each year to the USACE (SPN) District Engineer. These reports shall cover all inspection, maintenance and operation of project features described throughout this manual and the O&M Manual (USACE 2016), which has been incorporated by reference in this manual. The reports shall describe inspection results conducted in October (before flood season) and June (post-flood season).

14.7 Project Implementation

Once the District receives a notice to proceed from the relevant regulatory agencies, maintenance activities may be initiated. If the District does not receive a response to the notification packet by July 15th, the District assumes that the workplan was reviewed and proceeds with initiating the planned maintenance activities that are non-ground disturbing and not anticipated to require mitigation. All maintenance activities are conducted in accordance with the project description, program wide and activity-specific BMPs, and terms of the maintenance permits. This includes conducting preconstruction surveys for fish and wildlife and other resources, if activities may affect these resources.

An on-site project supervisor trained in the maintenance manual oversees and guides all maintenance activities and ensures that the proper maintenance principles and avoidance and minimization approaches as described in Chapter 4 are employed.

When projects are implemented, data is collected at the project site prior to, during, and immediately after, project implementation, or as required by regulatory permits. Data collected may include: before, during, and after photos; quantification of material removed (for sediment removal projects) or placed (for bank stabilization projects and road repair projects); length and area of vegetation maintenance activities (herbicide application, tree trimming, native plantings); sensitive species or other resources encountered at the site during preconstruction surveys or during project implementation; and any additional information as required to update the maintenance database.

14.8 Annual Reporting

After the conclusion of the SMP maintenance season (after October 31st), the District sends the relevant regulatory agencies an annual summary report, by January 31st of the following year, describing the workplan status and confirming which projects from the workplan were completed. The report includes the following information and complies with permitting requirements issued by relevant regulatory agencies.

- The extent to which the workplan was completed during the maintenance season (i.e., identify projects that were or were not implemented). If projects were not implemented, note why and if the project will be incorporated into the next year's workplan or if the project will be placed on a watch list.
- If activities were conducted according to the project description, and if not, how the actual project varied from the project description.
- Site photos before and after project completion.
- Total length of stream channel that was maintained for the individual projects in the workplan.
- How much sediment and vegetation was removed and acres affected, if applicable.
- The extent of invasive species controls implemented, including the quantity of herbicides applied.
- How much material was placed on-site and acres affected, if applicable such as for bank stabilization projects and road maintenance projects.
- How much material was disposed off-site, disposal locations, and acres affected, if applicable.
- If any species or other sensitive resources were encountered during construction and if so, what impact avoidance steps were taken in response.
- A brief description of site monitoring, including bank stabilization and revegetation monitoring.
- Any lessons learned from that year's activities including treatments that were not effective, administrative difficulties, and proposed steps to facilitate the process.
- Recommended updates (if any) to the program BMPs.

At the conclusion of the annual work cycle, the District also updates and verifies the maintenance database, and the BMP list (Table 4-1) as appropriate to include any updates or changes made over the recent work cycle. In this way, developing the next year's workplan is built on updated information across the program.

Per the Aquatic Pesticide Application Plan (Appendix G), the District prepares and submits an annual report to the RWQCB by March 1st. The report clearly states whether discharge of aquatic herbicides, their residues, or their degradation by-products occurred. The annual report contains information including compliance with the *Statewide General NPDES Permit for Residual Aquatic Pesticide Discharges to Waters of the U.S. from Algae and Aquatic Weed Control Applications* (WQO 2013-0002-DWQ; General Permit No. CAG990005), summary of aquatic herbicide application events, summary of monitoring data, and identification of BMPs and their effectiveness in meeting permit requirements. The report also includes any proposed changes to the APAP, BMPs, and monitoring program, as necessary to further ensure compliance with the General Permit.

Reporting of maintenance activities completed associated with the Rutherford and Oakville to Oak Knoll Restoration Projects is performed independently from the SMP Annual Report.

14.8.1 Reporting Requirements for the Napa River/Napa Creek Flood Protection Project

The semi-annual reporting requirements for the Napa River/Napa Creek Flood Protection Project are as outlined in the Flood Project O&M Manual and summarized above in Section 14.6.1. The District is required to submit additional monitoring reports for the Flood Protection Project:

Annual Vegetation and Revegetation Reports. In addition, the District is required to submit an annual vegetation report to relevant resource agencies and an annual revegetation report to be submitted to the USACE (SPN) District Engineer. The annual vegetation report should document health of existing vegetation, any observed damage to vegetation, description of naturally recruited native plants, description and quantity of plants to be installed, and photos taken at the time of the inspection. The revegetation report should focus on all revegetation sites and address all significant events that occurred during the prior year, a checklist for all inspections, photographs depicting observed conditions and any identified damage, and a summary of overall vegetation conditions for the reporting period (USACE 2016).

Comprehensive Vegetation Monitoring Studies. For the Flowage Easement Area (see Figure 1-7), The District is required to conduct comprehensive vegetation monitoring studies every 5 years starting in spring 2018. These studies should follow the format and procedures in the USACE study and compare conditions of sites as described in the Project's 1999 Final EIS-EIR and other subsequent documents. Inspections shall be conducted in the spring between March and May. Transect survey data collected to-date is provided as an appendix to USACE's 2016 O&M Manual. The vegetation monitoring studies should include presence/absence survey results, overview of vegetative cover as measured in quadrants along permanent transects, percent cover of woody species, a visual count of naturally recruited vegetation, and measurements of water salinity along transects.

14.9 Data Collection and Management

Data collection and monitoring efforts are critical to measuring the success of program implementation. The District currently maintains an extensive GIS database which includes location data on stream channels managed under their authority. The majority of the maps included in this Manual were generated from the District's GIS database. To properly track the progress of management activities towards achieving the maintenance program's goals and compliance with programmatic permit conditions, this database is upgraded or revised as the stream maintenance program adapts to best meet the stream maintenance goals. The following data are collected or updated at various stages in the implementation process:

- GIS reach mapping and channel characterizations
- maintenance activities to date
- pre- and post-project photos
- target invasive species locations
- channel cross sections (if necessary)
- specific data required by permits
- special status species survey results
- notification packages and annual reports

Data or documentation of the maintenance projects are entered into the database during each cycle of the work plan, as described in Section 14.1 above. The database can be queried to chronicle past maintenance activities or prioritize future actions. The maintenance database is an important tool for the stream maintenance manager. The database contains back-up technical information to compile the agency notification packages and annual reports.

The Napa County RCD will track ongoing monitoring of road maintenance sites on a separate track through topographic surveys and/or photo monitoring. Sediment sampling may also be conducted above and below road maintenance sites to document sediment delivery to stream channels from the road repair sites.

The regulatory agencies receive necessary information on maintenance activities (based on the permit requirements and the description of activities in this manual). Information saved in the database also provides insight into future Manual updates, as discussed in Section 14.9 below.

14.9.1 Data Collection to Develop Channel Maintenance Objectives

During the first 5-year period of the Maintenance Program (2012-2017) the District worked closely with the San Francisco Bay RWQCB to develop a data collection approach to develop channel specific maintenance objectives. As described above in several locations of this Manual, an improved understanding of channel conditions, including causal factors for maintenance, flow capacity objectives, and vegetation maintenance objectives for specific channel reaches help target the District's maintenance efforts. The District undertook developing channel maintenance objectives for several reaches as presented in the following reports, which are included in **Appendix F**: *Stream Maintenance Program Quantitative Assessment & Channel Inventories Work Plan* (2014), Tulocay and Camille Creek Channel Assessments Memorandum (Napa County RCD 2015), and *Stream Maintenance Program Channel Quantitative Assessment Report* (2017). Since the 2012 Manual was completed, the District has completed channel assessments for Salvador Creek, Tulocay Creek, Camille Creek, Fagan Creek, and Sheehy Creek. These assessments describe reach characteristics (e.g. length, drainage area and slope), conveyance capacity of culverts that feed into the creek, stage-discharge relationships, and includes channel capacity objectives.

As part of this 2019 Manual Update, the District will work closely with the San Francisco RWQCB to develop another channel assessment approach. Currently, the District proposes to identify one stream reach per year where routine maintenance activities will be assessed for the following conditions: typical maintenance needs; geomorphic and hydrologic conditions; vegetation communities; habitat functions and values, existing constraints and limiting factors to achieving improved habitat functioning; opportunities for potential habitat enhancement or restoration; and longer-term maintenance goals. The overall objective of these stream assessments is to develop a balanced understanding of the underlying flood management needs and habitat conditions and opportunities at each reach, such that a list of restorative maintenance recommendations can be developed that achieves flood management objectives while also enabling or supporting habitat improvements. The goal is to identify small-scale restoration actions that can be integrated with the SMP's maintenance activities and that will enhance physical and biological processes over time. The District would then develop restorative maintenance recommendations for the stream reach assessed. These restorative maintenance activities would be integrated into routine maintenance projects that are conducted annually and would be tracked through the District's annual reports submitted to the resource agencies.

14.10 Five-Year Program Review

Every 5 years, the District and the relevant regulatory agencies review the stream maintenance program for its overall effectiveness. This review includes an assessment of maintenance activities conducted to date, BMPs employed, data management, adequacy of adaptive updates and revisions to the manual, and overall program coordination and communication between the District and the regulatory agencies. This current Manual revision process in 2019 is conducted as part of the 2019 5-year program review process.

Through the 5-year program review process, the District's Program Manager will coordinate discussions and meetings with relevant regulatory agency staff to review the last 5-year program period and discuss any key updates or revisions planned for the next 5-year program period. Program changes or updates made at the 5-year review may require additional CEQA review. Manual revisions may also require an updating of permit terms, which occurs through a collaborative process between the District and the relevant permitting agencies.

Chapter 15
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Appendix A

Rutherford Reach Restoration Maintenance Plan and Oakville to Oak Knoll Maintenance Plan

1.1 Napa River Restoration Oakville to Oak Knoll Maintenance Program

1.1 **Napa River Restoration Project Maintenance Program**

1.2 Annual Maintenance Planning

1.3 Maintenance Activities

1.4 Managed Streambank Retreat

1.5 Restoration Project Monitoring and Adaptive Management

1.6 Regulatory Compliance

1.7 Community Facilities District Funding Approach

1.8 Construction Schedule

The Napa County Flood Control and Water Conservation District's (District) river restoration maintenance program for the Oakville to Oak Knoll Reach relies on recognizing fundamental hydrological, geomorphic, and biologic processes that affect a given stream reach and adaptively managing and maintaining streams and restoration projects based on the underlying processes. Restoration project maintenance depends on a collaborative working relationship between the District and private landowners who agree to participate in the river restoration project and fund annual maintenance and monitoring of the project reach. The District's monitoring and maintenance approach is designed to place reach scale restoration activities within a watershed context.

Program area

The proposed Napa River Restoration: Oakville to Oak Knoll Project (Project) includes 4.8 miles of active channel restoration activities along nine miles of the mainstem Napa River between the Oakville Cross Road Bridge and the Oak Knoll Avenue Bridge (**Figure 1**). The Project is immediately downstream of the Rutherford Project, which is a 4.5-mile stretch of the Napa River south of the City of Saint Helena, extending from Zinfandel Lane in the north to Oakville Cross Road. Historic changes in land use and management in the Napa River Watershed have resulted in confinement of the river into a narrow channel, loss of riparian and wetland habitats, accelerated channel incision and bank erosion, and reduction in the quality and quantity of instream habitat for salmonids and other native fish. The purpose of the Project is to restore and enhance long-term river and floodplain function, enhance native riparian plant communities, improve the quality and resilience of aquatic and terrestrial riparian habitat, and reduce property damage and sediment delivery associated with ongoing bank erosion processes.

Overview

Within the Project reach, preventative and routine maintenance of the river and restoration features will be funded through property tax assessments collected from local landowners through a Community Facilities District (CFD) and adopted by the District. A core group of landowners with restoration projects on their parcels will form the CFD and other landowners may annex in if they wish to receive services. The core group of landowners will form a Landowner Advisor Committee (LAC) to guide and review annual maintenance and monitoring actives. The CFD will fund annual maintenance and

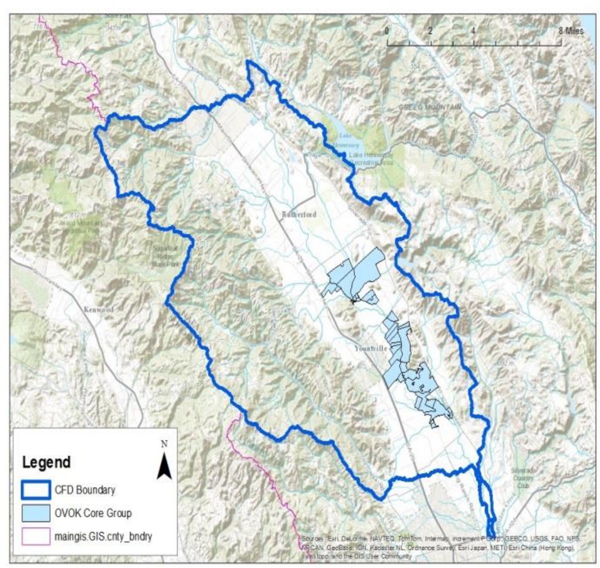


Figure 1: OVOK CFD Boundary and Core parcels.

monitoring activities, including annual surveys, vegetation management, downed tree and debris management, and biotechnical bank stabilization projects along the river on participating landowner parcels. Annual maintenance needs will vary from year to year depending on the magnitude of winter storm events and landowner requests. The District's objective is to work with landowners to ensure the long-term success of the Project and to enhance physical processes and biological resources through the entire restoration reach.

Maintenance Program Objectives

The objectives of the Restoration Project Maintenance Program are to:

1. Minimize bank erosion through vegetation management, large woody debris (LWD) realignment and/or relocation, debris/large trash removal, and biotechnical stabilization.

2. Maintain the function of constructed instream habitat enhancement structures.

3. Control target non-native invasive and Pierce's disease host plants, to the extent practicable, within the riparian corridor of the reach.

Oversight and Coordination

The core group of landowners has been invited to form the LAC to oversee implementation of the program and to coordinate maintenance activities with local landowners and vineyard managers. The LAC requested that the District Board adopt a CFD, funded through a property tax assessment program under procedures established in the District Act, to conduct maintenance in the restoration reach of the Napa River.

The LAC is comprised of landowners and their representatives and is supported by District staff. Participation in the LAC is open to any participating landowner, or their representative, who have river frontage within the restoration area or CFD boundary. It is anticipated that the LAC will meet biannually to review, evaluate, and prioritize annual maintenance activities based on the maintenance surveys, landowner maintenance requests and available funding, and to review and approve the annual maintenance report.

All maintenance activities will be conducted under regulatory permits issued in conjunction with the Project with oversight by the District.

1.2 Annual Maintenance Planning

Annual Maintenance Survey

District staff will conduct routine (at least once a year) surveys to identify and assess issues of concern relative to the Project objectives. Surveys will focus on identifying, mapping, and assessing:

- Actively eroding streambanks, managed streambank retreat areas, including effectiveness of prior stabilization measures.
- Areas of excessive vegetation growth and/or accumulations of LWD or trash that are contributing to streambank erosion.

- Storm-related damages to streambank stabilization and aquatic habitat enhancement structures.
- Weed eradication, Pierce's disease host plant status, and revegetation sites.
- River conditions and biological monitoring.

The District will use its standard stream maintenance survey data sheets. Data sheets, aerial photographs, and GPS units will be used to document the nature and extent of issues encountered during surveys and to identify recommended treatments or remedial actions. Photos will also be taken to document each problem site. The results of the surveys will be compiled into a report and presented to the landowners and permitting agencies for review. It may also be necessary to conduct interim river surveys shortly after large storm events (> 10-year flood event) to identify areas that may require immediate treatment to prevent additional streambank failure and protect existing infrastructure and environmental resources.


Photo 1: Annual river maintenance survey.

Landowner Maintenance Requests

In addition to maintenance needs identified through the annual river survey, landowners will be able to submit individual maintenance requests to the District for review and evaluation. Maintenance requests will be limited to the following problem types: actively eroding streambanks; debris accumulations; downed trees/LWD; vegetation management; and storm-related damages to streambank stabilization and aquatic habitat enhancement structures and revegetation sites.

Maintenance requests would be submitted to the District by April 1 of each year to be considered for inclusion in that year's stream maintenance work plan. Maintenance of earthen berms, access roads, and other infrastructure is not included in the maintenance program and will be the responsibility of individual landowners.

Evaluation and Triggers for Maintenance Activities

As described above, the annual river survey report and any individual landowner maintenance requests will be considered by the District annually. The District will evaluate and prioritize annual work activities based on the following considerations:

- Condition of existing bank stabilization and instream habitat enhancement structures.
- Potential for future significant streambank failure/erosion beyond the riparian corridor and vegetated buffer.
- Risk to adjacent infrastructure and agriculture (i.e., structures, earthen berms, roads, pumps, utilities, crops).
- Potential for future significant streambank failure/erosion.

- Potential for increased flood risk.
- Potential to enhance or expand riparian corridor.
- Available budget.

Based on an evaluation and prioritization of problems identified through the annual river survey and landowner requests, the District will prepare a work plan describing the location and scope of maintenance activities proposed to be conducted that year. The work plan will not be implemented until landowner approval is received. Following completion of annual maintenance activities, the District will prepare a supplemental report documenting work completed that year, associated costs, remaining budget, and adequacy of funding to complete required maintenance.

1.3 Maintenance Activities

The District takes an integrated stream maintenance approach that involves protecting and enhancing existing instream resources while ensuring that the restoration features are functioning as intended. As described above, the maintenance program is intended to proactively address streambank erosion and failure in order to protect environmental resources and properties within the Project reach and maintain features constructed as part of the Project. It also includes activities to control target invasive non-native and Pierce's disease host plants within the riparian corridor. The maintenance program is not intended to address catastrophic streambank failure, emergency repairs, or large streambank erosion issues that would require Project- specific permits. Such repairs would be implemented by individual landowners in coordination with the appropriate agencies or a landowner may choose to participate in the optional services through the CFD, which are outlined in Section 1.7.

The following sections describe the specific types of activities included in the maintenance program. Each year, the activities identified in the annual work plan will be implemented by District staff, crews supplied by the District, or by landowner-supplied work crews overseen by District staff. For some activities (depending on the nature and scope of the work they entail), maintenance crews will also be required to implement measures to avoid and/or minimize environmental impacts; this is described further in the Best Management Practices (**Appendix A**).

Maintenance of Constructed Features

Constructed features, such as biotechnical stabilization areas and habitat enhancement structures, will need to be monitored to ensure that they are performing correctly and to identify any areas of damage or failure. Depending on their performance, some features may require repair or maintenance.

Photo 2: Erosion issue at restoration site.

During the first three years following restoration, the contractor(s) selected by the County to implement the restoration project will be responsible for monitoring and maintenance of all constructed features. Maintenance and monitoring during this three year period will be funded by grants and Measure A. Once the initial post-construction monitoring and maintenance period has elapsed and the County has accepted the Project as successfully completed, all Project features will transition to the Oakville to Oak Knoll maintenance program under the oversight of the District.

Maintenance activities for constructed features are expected to include the following:

- Controlling weeds and other non-native invasive plants.
- Minor vegetation pruning.
- Replanting native species.
- Hand watering.
- Installation and repair of erosion control fabric and coir logs.
- Minor grading.
- Installation and repair of biotechnical bank stabilization elements.
- Replacing logs and boulders.
- Installing new utility or boulder and cable anchors.

Preventative Maintenance Activities

The District's maintenance activities will be implemented to enhance or develop instream complexity features, improve bank conditions, and expand native riparian plant communities. Certain activities may be implemented proactively within the Project reach to prevent streambank erosion and failure and associated impacts to adjacent properties and environmental resources.

Downed Tree Management

In alignment with the Sediment Total Maximum Daily Load (TMDL) for the Napa River watershed, the District seeks to promote recruitment of woody debris in channels to benefit instream habitat. The District may leave downed trees in place or modify downed trees to encourage formation of channel features, such as scour pools and slack water areas, which are used by juvenile salmonids and increase stream channel complexity. However, if the tree threatens flood conveyance capacity or channel stability (i.e., stream banks destabilization), the District may modify the downed tree by trimming off branches or cutting it into smaller pieces. If further action is needed to minimize the potential for flow obstruction, the District may reposition the tree in the channel, such as move it from perpendicular to parallel to stream flow, or remove the tree entirely. Downed tree management is generally conducted during the dry season but can occur year-round to prevent flooding or erosion.

Debris Removal

Removal of debris, such as tires, shopping carts, barrels, and other trash that deposits within the Project, will be removed from the channel and disposed of at appropriate disposal sites. Debris removal may include

Photo 3: Debris jam along Napa River.

clearing of vegetation debris that racks up on restoration features, on downed trees, or on other channel vegetation. Debris jams will be disassembled if they are significantly blocking the channel, redirecting flows and causing erosion issues, or degrading the function of a restoration feature. Methods used to remove debris will vary depending upon the size of material and available access. When feasible, debris removal activities will be conducted by work crews using hand tools. However, removal of larger materials may require the use of heavy equipment. Native vegetative debris may be cut up or chipped on-site, removed and transported to a suitable disposal site, or burned in accordance with State and local permits. Non-native vegetative debris (i.e., giant reed) will be removed and transported to a suitable disposal site, mulched (for materials that do not contain viable seed) in place, or burned in accordance with State and local permits.

Vegetation Management

Vegetation management refers to the trimming, pruning, mowing, and removal of vegetation. Vegetation management may be necessary to control weeds to support the establishment of restoration plantings. In some cases, vegetation may cause flow constrictions or increase erosion, in which case minor pruning may be necessary. Vegetation management also includes the removal on non-native invasive species and Pierce's host vegetation as described below.

In-Channel Vegetation: Within the Project, native vegetation, such as willows, generally occur on low floodplain benches and at the toe of the streambank. While these plants provide habitat for native species, they are also effective at trapping sediment leading to the development of substantial in-channel gravel bars that shift stream flows and cause streambank erosion and failure. Willows and other species (<4 inches in diameter) may be pruned or removed in areas where they significantly impede stream flow or are causing bank erosion issues.

In-channel vegetation will be removed by hand crews using loppers, hand saws, and chain saws. In cases where herbicide use is considered advantageous and it's consistent with the landowner's property management regime, trees may be cut off at the base of the trunk and the stump painted with an approved herbicide. Herbicide will be applied according to manufacturer's specifications by licensed applicators in a manner that minimizes drip and drift into the stream channel. Only U.S. Environmental Protection Agency-approved aquatic formulations of glyphosate (e.g., Aquamaster, Aqua Neat/Roundup, Rodeo) and imazapyr (e.g., Habitat/Stalker) will be used. In cases where herbicide use is not consistent with the landowner's property management regime, physical removal techniques alone may be employed. If necessary, cuttings may be removed from the channel and stockpiled at top of bank. Debris may be transported to a suitable disposal site or mulched in place.

Invasive Non-Native and Pierce's Diseases Host Vegetation: A number of invasive non-native and Pierce's disease host plants occur within the Project. These species reduce the value of habitat for native wildlife by preventing the establishment and growth of desirable native species and decreases overall plant diversity. Additionally, some of these species act as host plants for the bacterium that causes Pierce's disease, resulting in significant damage to streamside vineyards.

Photo 4: CCC crews removing Arundo .

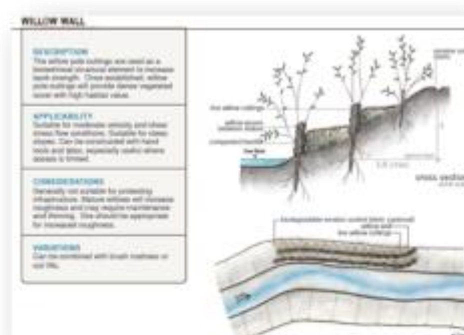
Although existing patches of target invasive non-native plants will be treated as part of the Project, success of the restoration effort will rely on ongoing maintenance to control spread of these undesirable species throughout the reach. Key invasive non-native and Pierce's disease host plants that may be targeted for removal include, but are not limited to:

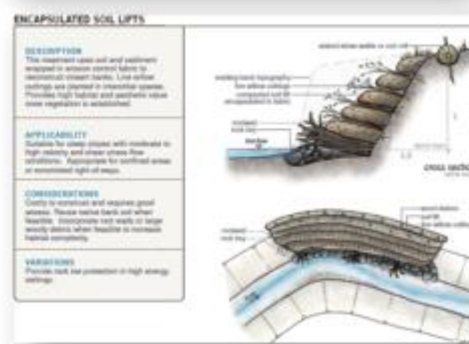
- Himalayan blackberry (*Rubus discolor*);
- Periwinkle (*Vinca major*);
- Giant reed (*Arundo donax*);
- Tree of heaven (*Alianthus altissima*);
- Sesbania (*Sesbania punicea*); and
- Wild grape (hybrid) (*Vitis* spp).

Target invasive non-native and Pierce's disease host plants will be removed by hand crews using weed wrenches, bladed weed eaters, loppers, hand saws, chain saws, and at times, a rubber-tracked skid steer with flail mower may be used outside of the wetted channel. Herbicide application will be limited to cutting and painting stumps or foliar spot spray using backpack, ATV, or truck-mounted sprayers. Herbicide will be applied according to manufacturer's specifications by licensed applicators in a manner that minimizes drip and drift into the stream channel. Only U.S. Environmental Protection Agency-approved aquatic formulations of glyphosate (e.g., Aquamaster, Aqua Neat/Roundup, Rodeo) and imazapyr (e.g., Habitat/Stalker) will be used.

Erosion Control/Bank Stabilization

The repair and stabilization of stream banks is undertaken when a bank is weakened, unstable, or failing. In areas where minor erosion has been identified, biotechnical methods may be used, which incorporate live vegetation with other natural elements (e.g., wood, biodegradable erosion control products, rock) to provide structural stability to streambanks.





Biotechnical bank stabilization approaches include erosion control fabric with coir logs, brush mattresses, willow walls, encapsulated soil lifts, and crib walls. Typically, these treatments will be implemented in combination with riparian planting projects to stabilize eroding streambanks and enhance native riparian plant communities. Erosion control and biotechnical bank stabilization elements will be installed using hand tools. However, some projects may require the use of a small excavator staged along the top of bank to perform minor grading or to place material. Hardscape rock materials may be used only at the toe of streambanks in combination with these measures if no effective alternative is feasible due to the magnitude of hydraulic forces involved, the need to protect infrastructure, or an adjacent land use constraint. In the event that the erosion or bank failure is catastrophic or exceeds the maximum linear footage of biotechnical bank stabilization projects allowed under the Project's regulatory permits, the landowner will be responsible for the repair and can choose to collaborate with the District to implement a larger project consistent with the Project objectives and the optional services outlined in program funding methodology.

Riparian Planting

Areas subject to minor erosion may be hydroseeded with an appropriate native or sterile seed mix, and/or planted with native riparian species to stabilize eroding banks and reduce localized flow velocities and erosion potential. The goal of riparian planting is to enhance habitat for fish, birds, amphibians, and other wildlife using terrestrial riparian areas while providing shading, sources of organic matter and coarse woody debris, and water quality benefits to aquatic species. The planting palette will be consistent with the Project; the list of species will evolve to mimic the successional development of the riparian forest. Opportunities for riparian planting and restoration will be evaluated on a case-by-case basis at all maintenance locations within the Project.

Photo 5: CCC during riparian planting.

Culvert Erosion Repair

Existing drainage culverts and drop inlets within the Project that are blocked or in need of repair may contribute to overtopping flows (due to poor drainage), which can increase the opportunity for bank erosion or bank failure due to saturated soils. The clearing and repair of these structures will be coordinated with individual landowners. The goal of culvert inspection and repair is to ensure that existing infrastructure does not adversely impact the restoration projects or degraded bank conditions and aquatic resources. The District will implement minor erosion control or a bank stabilization project as a preventative measure if a drainage structure is contributing to bank erosion. In the event the structure needs to be replaced, the landowner will be responsible for the cost of replacing the structure, but the District will provide technical oversight to ensure the replacement is done in a manner that minimizes or avoids potential impacts. In some cases, a small amount of hardscape may be necessary at the toe-of-slope to provide added erosion protection for the bank. Repairs may require the use of erosion control materials, such as coir logs, coir blankets, brush mattresses, or soil lifts. In some cases, larger equipment, such as a mini-excavator, may be staged along the top of bank to facilitate minor grading actions or to place material. For replacement of existing infrastructure, landowners may be required to get additional permits before implementing replacement projects.

The following impact avoidance guidance applies to the District's maintenance of drop-inlet culverts:

- Repair of an existing culvert will occur within the same footprint as the original culvert.
- The culvert outfall path, from the culvert edge down to toe-of-slope, will be protected with erosion control material as needed to dissipate energy and reduce the erosion potential.

- The culvert repair will be installed to minimize outfall velocity and reduce the potential for future bank erosion and scour from outfall. Energy dissipation approaches will be used as needed.

1.4 Managed Streambank Retreat

The goal of managed streambank retreat is to create a more expansive riparian corridor for terrestrial species and a wider channel cross section that supports long-term habitat sustainability. It is a passive restoration technique that allows landowners to participate in riparian restoration as part of the CFD. In a managed streambank retreat zone, a landowner may choose to remove vineyards to install an alternative agricultural crop consistent with an Agroforestry model of a riparian buffer zone or restore the area with native riparian and upland plant species. Within the managed streambank retreat zone, landowners are agreeing to allow the river to naturally expand with the understanding that a maintenance action will take place to stabilize the stream bank before it reaches the defined managed retreat line. Typical maintenance actions will include the planting of native riparian and upland species, invasive and Pierce's disease plant management, biotechnical bank stabilization, laying the bank back to a stable slope, and erosion control measures. The District will collaborate with landowners to manage these areas in a manner that meets the Project objectives and is consistent with the landowner's land management regime.

Specific maintenance actions within managed streambank retreat zones are highly dependent upon site-specific conditions and will vary depending on the landowner's level of participation. The District will implement the above maintenance actions within these zones using a variety of methods using hand tools, power tools and small equipment, such as a skid steer or small excavator. In the event that a site experiences large scale retreat or erosion the District will collaborate with the landowner to identify a solution. Landowners may choose to pay for additional services to support the design, permitting and implementation of larger biotechnical streambank stabilization projects that are beyond the scope of the maintenance program.

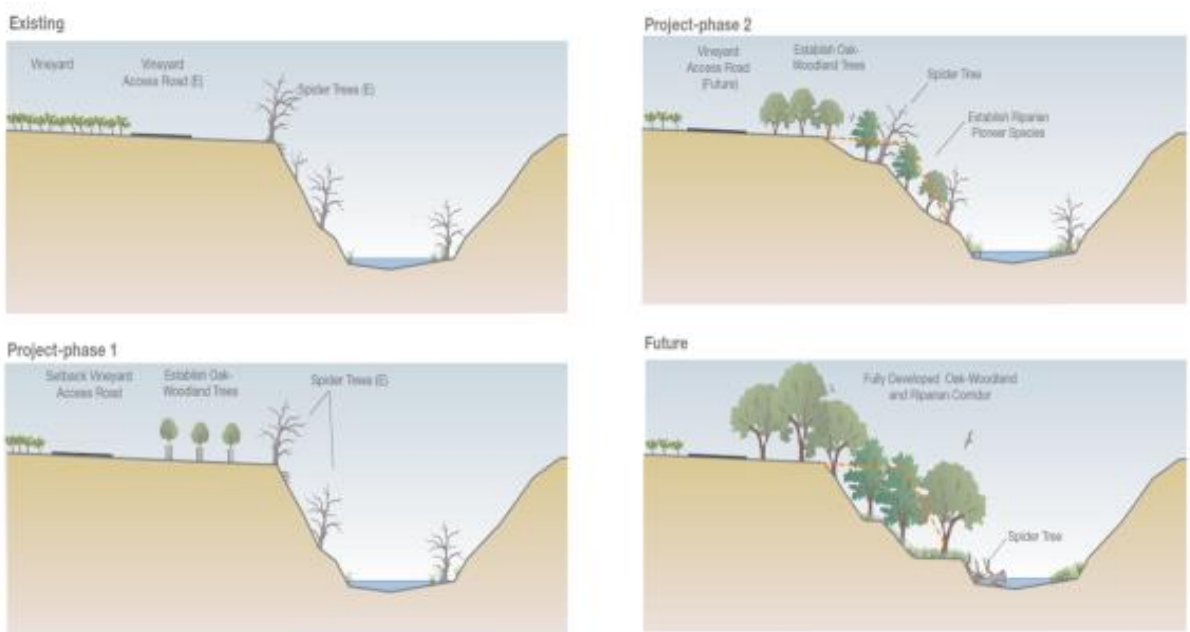


Figure 2: Theoretical example of managed retreat concept.

1.5 Restoration Project Monitoring and Adaptive Management

Restoration Project Objectives

For the purposes of monitoring Project success, the goals and objectives of the Project include:

- Streambank Stability-minimizing the need for ongoing channel stabilization and repair work by establishing a more self-sustaining channel design that reduces maintenance needs;
- Physical Processes-enhancing geomorphic channel forms and processes to support a more diverse and complex instream condition;
- Floodplain Connectivity-increasing river and floodplain interactions where possible;
- Habitat-increasing and enhancing riverine, riparian, and floodplain habitat functions, with a focus to improve habitat for fish and wildlife;
- Riparian Plant Communities-removing invasive non-native vegetation and replanting with native vegetation that will not promote Pierce's disease in vineyards;
- Sediment TMDL-supporting the sediment reduction and habitat enhancement goals of the Napa River Sediment TMDL; and
- Stakeholder Participation-coordinating with landowners to address their interests with regard to river-adjacent farmland and property.

Monitoring and Adaptive Management Approach

Restored Project areas will be monitored following construction to ensure that each restoration area performs as designed and meets Project objectives. It is likely that the grant funding agencies and permitting agencies for the Project will require monitoring to demonstrate that specific requirements have been achieved. For example, a common Project permit monitoring requirement is to evaluate post-Project planting to evaluate the success of new plantings, or a description of how instream features have performed over time. Additionally, grant funding agencies often require that the Project site be maintained for 10-20 years to ensure that the Project is successful and meeting the intended function.

The Project will include adaptive management strategies in the event that post-project conditions are not meeting original Project designs or objectives. Examples of adaptive management actions are described below.

The adaptive management framework links Project objectives to proposed monitoring elements based on the understanding of process-based relationships between existing conditions and restoration techniques aimed at achieving desired outcomes. The monitoring program provides a basis for evaluating the function of specific restoration features and informs annual maintenance activities. The monitoring program will entail an Annual Survey of the entire restoration reach, which uses a function-based stream assessment framework that may be event based and channel maintenance needs using rapid assessment formats. Monitoring activities could consist of activities such as vegetation surveys, channel morphology survey, fisheries survey, wildlife surveys, and photo documentation of structures.

The monitoring program is designed to evaluate the success of the Project at meeting the objectives of reducing excessive channel bank and bed erosion, enhancing aquatic and riparian habitat, and protecting property. The monitoring program is organized around the Project objectives and is designed to address progress towards meeting stated Project goals and informing maintenance needs. **Table 2** provides the restoration actions, monitoring parameters, maintenance triggers, and maintenance actions to be implemented for the Project.

The adaptive management strategy consists of assessing annual monitoring data to determine if restoration elements are functioning as intended. In the event that a restoration element is not meeting its intended purpose, the restoration team will review the issue and prescribe a maintenance action that can be implemented to restore the intended function. Alternatively, the District may continue monitoring the restoration feature over multiple years to see if it develops the intended function over time. The adaptive management strategy is based on the understanding that rivers are dynamic systems and allows for the District to make professional judgments in prescribing or not prescribing maintenance actions. In the event that a restoration element fails, the District will evaluate the site to determine if it is providing an unintended function that is valuable to the Project. In the event that it is determined that the restoration element is not providing a valuable function to the Project, a maintenance action or larger design solution may be implemented.


Photo 6: After Construction of Restoration Project


Photo 7: During High Flow Monitoring

Monitoring Framework

Table 1: River Monitoring Guidelines

Goals/ Objective	***Performance Indicator***	***Frequency***	***Performance Standards***	***Monitoring Method***
Streambank Stability	Eroding Streambank Survey	Bi-Annually	-Positive trends in reduction of bank erosion	-Eroding Streambank Survey -ITAS Assessment
Riparian Plant Communities	-Area successfully treated -Plant survival	Annual Survey For Five Years	-80% survival of native plants -Evidence of successful natural recruitment by year 5 at revegetation sites	-Vegetation Monitoring -Direct Count Plant Survival
Aquatic & Terrestrial Habitat	-LWD Structure Persistence (# years, % persistence) -Riffle length & Frequency -High flow refugia in constructed alcoves & velocities	Bi-Annually	-Increase in seasonal and high flow refugia, -Increase in riffle frequency, -Persistence of installed habitat enhancement structures	-LWD Survey -Channel Morphology Survey -Salmon Habitat Velocity Survey
Sediment TMDL & Channel Morphology	-ITAS Assessment -Length & Area of Actively Eroding Streambanks -Longitudinal Thalweg Survey	ITAS-Annual Survey Thalweg survey-pre and post project	-Reduction in length, or surface area of actively eroding streambanks	-Eroding Streambank Survey -Longitudinal Thalweg Survey
Stakeholder Participation	Landowner Advisory Task Force Participation	Two Meetings Annually	-Landowner Participation in Restoration Project -Landowner Advisory Committee Participation -Ongoing Collaboration Between District and Landowners	-Records of Landowner Maintenance Requests -Landowner Advisory Committee Meetings Attendance Records -Records of Landowner Access Agreements

Photo 8: Looking Downstream During Construction of the Rutherford Project

Photo 9: Looking Upstream After Construction

Photo 10: Looking Downstream During High flow Monitoring

Table 2: Monitoring Program and Maintenance Implementation Guidelines

Restoration Action	Monitoring Parameter	Maintenance Triggers	Maintenance Actions
Stabilize actively eroding banks with biotechnical methods	▪ Eroding stream bank survey ▪ Napa RCD fisheries studies	▪ Bank erosion advances significantly from previous monitoring period ▪ Biotechnical stabilization feature fails or is experiencing erosion	▪ Continue Monitoring ▪ Erosion control Environmental Commitment ▪ Biotechnical bank stabilization improvement ▪ Minor grading ▪ Riparian Planting
Widen selected reaches to create inset floodplains benches and secondary channels	▪ Channel morphology survey	▪ Sediment deposition degrades the function of restoration feature ▪ Erosion degrades the function of restoration feature	▪ Continue Monitoring ▪ Vegetation maintenance ▪ Erosion control Environmental Commitment ▪ Biotechnical bank stabilization ▪ Riparian planting
Add in-channel large wood & roughness boulders	▪ Large woody debris survey ▪ Survey of California fresh water shrimp habitat structures ▪ Napa RCD fisheries studies	▪ Restoration feature fails or the function is degraded ▪ Sediment aggrades and buries a structure ▪ Erosion threatens the stability of the structure ▪ Debris jam or blockage degrades the function	▪ Continue monitoring ▪ Debris management ▪ Biotechnical bank stabilization ▪ Replace LWD structure or boulders ▪ Install new utility, log pin or boulder and cable anchor
Augment channel with gravel	▪ Channel Geomorphology survey ▪ Erosion/deposition pins	▪ Gravel mobilizes downstream ▪ Gravel augmentation areas become heavily vegetated and begins aggrading ▪ The designed function is degraded	▪ Continue monitoring ▪ Vegetation maintenance ▪ Augment channel with gravel at site or upstream
Floodplain Restoration	▪ Channel Geomorphology survey ▪ Erosion/deposition pins ▪ Vegetation survey	▪ Abundant nonnative invasive vegetation growth ▪ Sediment deposition degrades intended function ▪ Significant Erosion of restoration feature or bank	▪ Continue monitoring ▪ Vegetation maintenance ▪ Riparian planting ▪ Biotechnical bank stabilization
Expand Riparian Forest	▪ Vegetation survey	▪ Abundant nonnative invasive vegetation growth ▪ Riparian restoration plant mortality exceeds 20% of installed plants within the first three years ▪ Erosion of restoration feature	▪ Continue monitoring ▪ Vegetation maintenance ▪ Riparian Planting ▪ Hand watering ▪ Erosion control Environmental Commitment

1.6 Regulatory Compliance

The California Environmental Quality Act (CEQA) review will be completed for the Project in 2014. The Project Initial Study/Mitigated Negative Notice of Determination is on file (State Clearing House).

The regulatory permits acquired for the entire Project reach include:

- USACE CWA 404 Permit (No. 2008-00366N), with construction phase reviews for updated wetland delineations and cultural resources;
- Project Biological Assessment: NMFS and USFWS biological opinions;
- California Natural Diversity Database Record Search; and
- County Grading and Floodplain Management permit: the Project has been determined to be in compliance with County grading and floodplain management ordinances through completion and submittal to FEMA of a Conditional Letter of Map Revision (CLOMR) in 2008.

The regulatory permits which are issued by restoration implementation (construction) phase include:

- RWQCB 401 Water Quality Certifications;
- CDFW 1602 Streambed Alternation Permits; and
- CDFW Section 2081 of California Endangered Species Act-Incidental Take Permit.

The regulatory permits which are issued for routine and preventative maintenance include:

- CDFW 1602 Streambed Alteration Permits; and
- RWQCB 401 Water Quality Certification and 404 Waste Discharge Requirement.
- USACE CWA 404 Permit may be needed for bank stabilization depending on the site and design solution.

1.7 Community Facilities District Funding Approach

The CFD funding approach provides a mechanism for the District to collaborate with landowner's on the long-term maintenance of the OVOK restoration project. The CFD approach is flexible which allows for additional landowners to opt into the program, allows all participating landowners to receive a base level of services and allows for landowners to request additional services if interested. A general description of the CFD process is described below.

<u>What is a CFD special tax?</u>
A CFD special tax is levied on taxable property within a district area that is used to finance the annual maintenance of the Restoration Project Maintenance Program.

<u>How does a CFD special tax work?</u>
Special taxes for a CFD are levied annually and are levied on the property tax bill.

How is the Special Tax calculated?
Each parcel's special tax is calculated based on each parcel's linear frontage and/or its restoration linear frontage.

Does the CFD special tax have a maximum amount?
Yes, the CFD has a maximum special tax amount which cannot be exceeded, subject to an annual inflation index. The amount of special tax levied may fluctuate from year to year; however, it may not exceed its annual maximum amount.

Does a CFD special tax decrease?
Property owners may be charged less than the maximum special tax or less than the prior year's special tax depending on the revenue needs of the District.

When does the CFD special tax expire?
The Oak Knoll CFD will have a sunset clause not to exceed 20 years, a term consistent with many grant funding requirements.

Is a parcel subject to the special tax if it does not receive any of the restoration improvements?
No, only those parcels that have received any of the restoration maintenance program are subject to the special tax.

Once a parcel is charged the special tax, can it be removed from the taxed thereafter?
No, once a parcel is subject to the special tax, it will receive the annual special tax subject to the 20 year sunset.

If my parcel is not included in the original formation of the CFD, may I chose to annex my parcel into the CFD?
Yes, every year a parcel owner may sign an annexation form with the District and then be subject to the special tax.

When and how are the CFD special taxes collected?
The special tax is usually collected by the County Tax Collector as part of your property tax bill. Under certain circumstances, the District can elect to bill the property owners directly

CFD Rate Description

Each participating parcel will be subject to the Channel Maintenance and Monitoring Costs described in **Table 3** and charged the given rate for these services. Any parcel with a restoration project on it will also be charged for the Maintenance of Restoration Features. An estimate budget for the CFD appears in **Table 4** below and outlines how the funds would be spent on any given year.

Table 3: CFD Rate Description

Budget Item	Unit	Rate	Estimated Annual Budget
Monitoring	Linear Feet	$0.24	$14,480
Channel Maintenance	Linear Feet	$0.88	$59,500
Maintenance of Restoration Features	Linear Feet of Restoration Site	$1.17	$34,140

Table 4: Estimated Annual Maintenance and Monitoring Budget

	Budget Item	Cost Breakdown	Percentage of Total Budget	Estimated Total Budget
Routine Channel Maintenance Activities				
1	Downed Tree Management	Work: 5 days @ $2,340 per crew day = $11,700	11	11,700
2	Debris Management	Work: 5 days @ $2,140 per crew day = $10,700	10	10,700
3	Vegetation Management	Work: 10 days @ $2,140 per crew day = $21,400	20	21,400
4	Streambank Erosion Control	Erosion/biotechnical: 5 days @ $2,340 per crew day =$11,700; mis. supplies and equipment $4,000	15	15,700
Restoration Site Maintenance				
5	Repair and maintenance of Floodplain Benches	Repair and maintenance work: 2 days @ $2,340 per crew day = $4,680; mis. supplies and equipment $500	5	5,180
6	Maintenance of Created Vegetation Buffers	Plantings: 4 days @ $1,840 per crew day = $7,360	7	7,360
7	Repair and Maintenance of Aquatic Habitat Enhancement Structures	Work: 2 days @ $2,340 per crew day = $4,680	4	4,680
8	Repair and maintenance of Streambank Stability Structures	Work: 2 days @ $2,340 per crew day = $4,680	4	4,680
9	Invasive Plants Removal, PD Management and Revegetation	Herbicide: 4 days @ $2,140 per day = $8,560; Planting: 2 days @ $1,840 per crew day = $3,680	11	12,240
Monitoring				
10	Annual Surveys, Development of Work Plans, Assessment Management	Surveys: 3 days (3 persons) @ $1,920 per day = $5,760; Reports: 3 days @ 640 per day = $1,920; Planning/Permiting: 3 days @ $640 per day = $1,920; mis supplies $400	9	10,000
11	Monitoring	Surveys: 2 days (2 persons) @ $1,280 per day = $2,560; Monitoring Report: 3 days @ 640 per day = 1,920	4	4,480
Total			**100**	**108,120**

Description of Optional Services

There are optional services built into the CFD funding methodology to help landowners cover the costs of larger scale managed retreat projects. These optional services require a landowner to identify a project and sign up for the additional assessment. The costs outlined below will not be charged to the landowner unless they initiate one or more of the below projects in coordination with the District. This is also meant to be a tool to assist other landowner within the CFD boundary with raising funds to support future restoration projects or used as matching funds to apply for grants.

Table 5: Optional services

Optional Services			
Activities	Unit	Trigger Events	Maximum Cost Per Linear Ft.
Managed Retreat-Back Planting	Linear Feet	Landowner Initiated	$75
Managed Retreat-Biotechnical Streambank Stabilization	Linear Feet	Landowner Initiated & Bank Erosion	$200
Planning, Design, Permitting of a Restoration Project	Linear Feet	Landowner Initiated	$250
Implementation of a Restoration Project	Linear Feet	Landowner Initiated	$1,000

Table 6: CFD Formation Timeline

#	**Description**	**Item:**	**Date:**
1	Review draft Rate and Method of Apportionment	Report	May 15
2	Resolution of Intention to Establish CFD	Resolution	June 17
3	Record CFD Boundary Map with County		July 1
4	Review draft CFD Report	Report	July 1
5	Notice of Public Hearing in newspaper - 7 days prior to hearing		July 29
6	Resolution of Formation - Public Hearing	Resolution	Aug 5
7	Resolution Calling for Special Election	Resolution	Aug 5
8	Resolution Declaring Results	Resolution	Aug 5
9	Ordinance Levying Special Tax	Ordinance	Aug 5
10	Record Notice of Special Tax Lien		By Aug 20
11	Submit Special Tax roll to County Auditor		Aug 10
12	Initial Tax Collection		December 2014

1.8 County of Napa OVOK Restoration Project Construction Schedule

Construction Grouping Rationale

The proposed construction groups were defined using a number of criteria related to maintaining overall project schedule, regulatory conditions, anticipated construction costs, available funding, and landowner coordination. In addition, project goals and priorities for specific types and scale of habitat creation were also considered in the construction groupings. A list of specific evaluation criteria and summary discussion of each proposed construction group follows:

1. Anticipated Construction Duration

2. Regulatory and Permitting Requirements

- CDFW 1600-Stream Bed Alteration Agreement, CDFW ITP-Incidental Take Permit

- Air Quality Impacts (disposal of material)

3. Anticipated Construction Cost

4. Available Funding: Grant Awards and Cycles

5. Landownership and Duration of Potential Impact to Vineyard Operations

Construction Group Summaries

Group A

Based on field surveys and technical design evaluations, the Group A projects are expected to create limited temporary impacts to existing natural resources including habitat areas and specific aquatic species such as California Freshwater Shrimp (a listed threatened species). Permitting (CDFW 1600) for Group A is expected to be complete in time to allow for construction during the 2015 summer. Based on the scale and scope of the Group A projects construction is estimated to be completed under one season. All of the project sites in Group A fall under two landowners, Jackson Family Estates and Constellation. The majority of the sites are on land owned by Constellation, which simplifies coordination and limits construction impacts to a single construction season. Napa County has secured grant funding coupled with Measure A that is consistent with the anticipated construction costs for the group. The combination of factors prioritizes this group for the first phase of construction.

Construction Group A (Sites 23, 22, 21, 7, 4, 3) Project Schedule

	Activity	*Date*
Preliminary Design & Permitting	Complete Supplemental Site Surveys and Analyses	February 2014
	Complete Topographic Surveys	March 2014
	CEQA Comment Period and Approval	March to May 2014
Final Design & Permitting	Grant Acquisition (Application Development & Submittal)	February to December 2014
	65%-Design Submittal and Landowner Review	July 2014 to August 2014

	Construction Permitting Including Agency Site Visits	October 2014 to March 2015
	95%-Design Submittal and Landowner Review	December 2014 to January 2015
	Final Design and Bidding	April 2015
Construction Implementation	Pre-construction Activities (Biological-Surveys, Landowner Site Preparations, etc)	February to June 2015
	Begin Grading & Construction	June 2015
	End Grading & Construction	November 2015
	Revegetation	November 2015 to April 2016

[1] Final construction implementation dates conditional on grant funding

Group B

Based on field surveys and technical design evaluation, the Group B projects are expected to create limited temporary impacts to existing natural resources including habitat areas and specific aquatic species such as California Freshwater Shrimp (a listed threatened species). Based on the scale and scope of the Group A projects construction is estimated to be completed under one season. The majority of project sites in Group B fall under two relatd landowners Tom and Launce Gamble. Planning for design and construction at the proposed sites requires coordination between the County, the landowner and the lessee of the property, Treasury, which extends the project schedule for this construction group. Funding for these proposed projects has not been identified. The combination of factors extends the construction schedule for this group.

Construction Group B (20, 19, 18, 17, 16, 15) Project Schedule

	Activity	*Date*
Preliminary Design & Permitting	Complete Supplemental Site Surveys and Analyses	January 2016
	Complete Topographic Surveys	October 2015
	CEQA Comment Period and Approval	March to May 2014
Final Design & Permitting	Grant Acquisition (Application Development & Submittal)	February 2015 to September 2016
	65%-Design Submittal and Landowner Review	March to June 2016
	Construction Permitting Including Agency Site Visits	July to September 2016
	95%-Design Submittal and Landowner Review	September to December 2016
	Final Design and Bidding	January to March 2017
Construction Implementation	Pre-construction Activities (Biological-Surveys, Landowner Site Preparations, etc)	February to June 2017
	Begin Grading & Construction	June 2017
	End Grading & Construction	November 2017
	Revegetation	November 2017 to April 2018

[1] Final construction implementation dates conditional on grant funding

Group C

Based on field surveys and technical design evaluations, the Group C projects are expected to require specific permits (CDFW ITP) related to anticipated impacts to existing natural resources including habitat areas and specific aquatic species such as California Freshwater Shrimp (a listed threatened species). Permitting for Group C is expected to be completed over a period of 12 to 18 months leading to construction in 2016. The Group C projects present a unique opportunity to create expansive habitat enhancement areas connected to CDFW's Napa River Ecological Preserve. The proposed projects also address significant areas of degraded habitat and extensive areas of bank instability and erosion. Based on the signifcant scale and scope of the Group C projects construction is estimated to be completed over a period of two seasons. The project sites in Group C fall under four (4) separate landowners, Berringer, Missimer, Traina, and Silverado, which requires more complex coordination to coordinate effective construction phasing. Donation of the Missimer parcel to the Napa County Land Trust is not anticipated to be complete until 2016. Napa County is in the process of strategizing funding opportunities based on the relatively high anticpated construction costs for the group. The combination of factors priortizes this group for the later phases of construction assuming funding is available and secured.

Construction Group C (14, 13, 12, 11) Project Schedule

	Activity	***Date***
Preliminary Design & Permitting	Complete Supplemental Site Surveys and Analyses	October 2014
	Complete Topographic Surveys	January 2014
	CEQA Comment Period and Approval	March to May 2014
Final Design & Permitting	Grant Acquisition (Application Development & Submittal)	February 2014 to Decemeber 2015
	65%-Design Submittal and Landowner Review	October 2014 to December 2014
	Construction Permitting Including Agency Site Visits	January 2015 to December 2015
	95%-Design Submittal and Landowner Review	September 2015 to January 2016
	Final Design and Bidding	February to March 2016
Construction Implementation	Pre-construction Activities (Biological-Surveys, Landowner Site Preparations, etc)	February to June 2016
	Begin Grading & Construction	June 2016 (Phase 1) & June 2017 (Phase 2)
	End Grading & Construction	November 2016 (Phase 1) & November 2017 (Phase 2)
	Revegetation	November 2016 to April 2017 (Phase 1) & November 2017 to April 2018 (Phase 2)

[1] Final construction implementation dates conditional on grant funding

Group D

Based on field surveys and technical design evaluations, the Group D projects are expected to create limited temporary impacts to existing natural resources including habitat areas and specific aquatic species such as California Freshwater Shrimp (a listed threatened species). Based on the signifcant scale and scope of the Group D projects construction is estimated to be completed over a period of two seasons. The project sites in Group D fall under four (4) separate landowners; Miller, Massa, Krug, and Silverado Premium Properties which will require more effort to coordinate access agreements and construction phasing. The project sites are grouped, in part, due to their proximity and adjacency to one another as well as the more complex landowner scenario. Napa County is in the process of pursuing grant funding opportunities to support the relatively high anticpated construction costs for the group. Planning for design and construction at the proposed sites requires coordination between the County and landowners which extends the project schedule for this construction group. Funding for these proposed projects has not been identified. The combination of factors extends construction for this group to the later phases of the project.

Construction Group D (10, 9, 8, 6, 5, 2, 1) Project Schedule

	Activity	***Date***
Preliminary Design & Permitting	Complete Supplemental Site Surveys and Analyses	January 2017
	Complete Topographic Surveys	January 2017
	CEQA Comment Period and Approval	March to May 2014
Final Design & Permitting	Grant Acquisition (Application Development & Submittal)	February 2016 to October 2017
	65%-Design Submittal and Landowner Review	May to July 2017
	Construction Permitting Including Agency Site Visits	May to July 2017
	95%-Design Submittal and Landowner Review	October to December 2017
	Final Design and Bidding	February to May 2018
Construction Implementation	Pre-construction Activities (Biological-Surveys, Landowner Site Preparations, etc)	February to June 2018
	Begin Grading & Construction	June 2018 (Phase 1) & June 2019 (Phase 2)
	End Grading & Construction	November 2018 (Phase 1) & November 2019 (Phase 2)
	Revegetation	November 2018 to April 2019 (Phase 1) & November 2019 to April 2020 (Phase 2)

[1] Final construction implementation dates conditional on grant funding

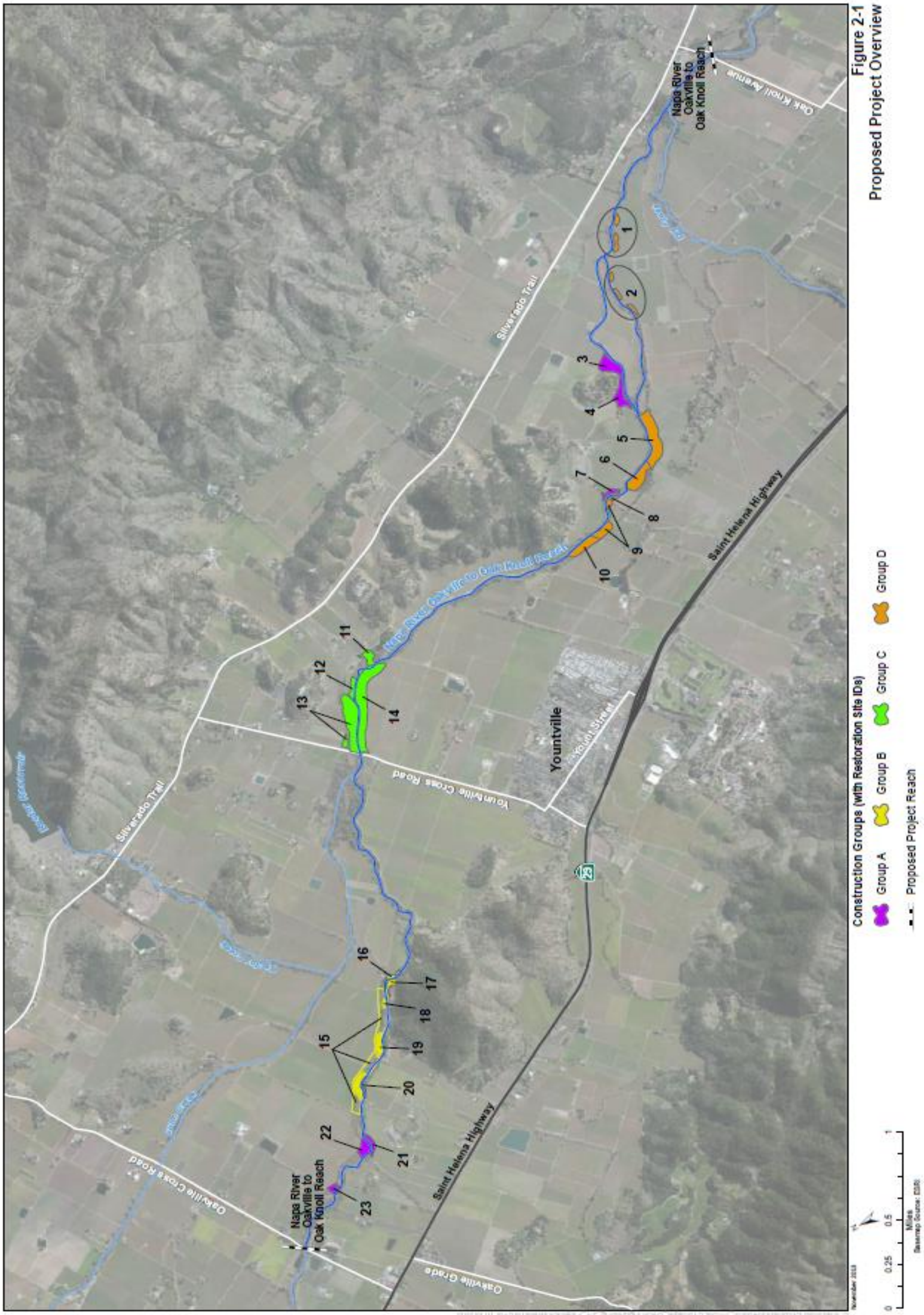


Figure 2-1
Proposed Project Overview
Napa River Oakville to Oak Knoll Reach
Silverado Trail
Oak Knoll Avenue
Saint Helena Highway
Yountville
Yount Street
Yountville Cross Road
Oakville Cross Road
Oakville Grade
Construction Groups (with Restoration Site IDs)
Group A
Group B
Group C
Group D
Proposed Project Reach
Miles

Final Maintenance Plan for the Napa River Rutherford Reach Restoration Project

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Introduction

The maintenance program for the Rutherford Reach of the Napa River has been developed by the Rutherford Reach Landowner Advisory Committee (LAC) and Napa County Flood Control and Water Conservation District (District) to support the Napa River Rutherford Reach Restoration Project (Rutherford Restoration Project) and to guide implementation of routine maintenance activities within the Rutherford Reach of the Napa River. The maintenance program has been developed to carefully balance the needs of local landowners with protecting and enhancing the natural resources of the Napa River.

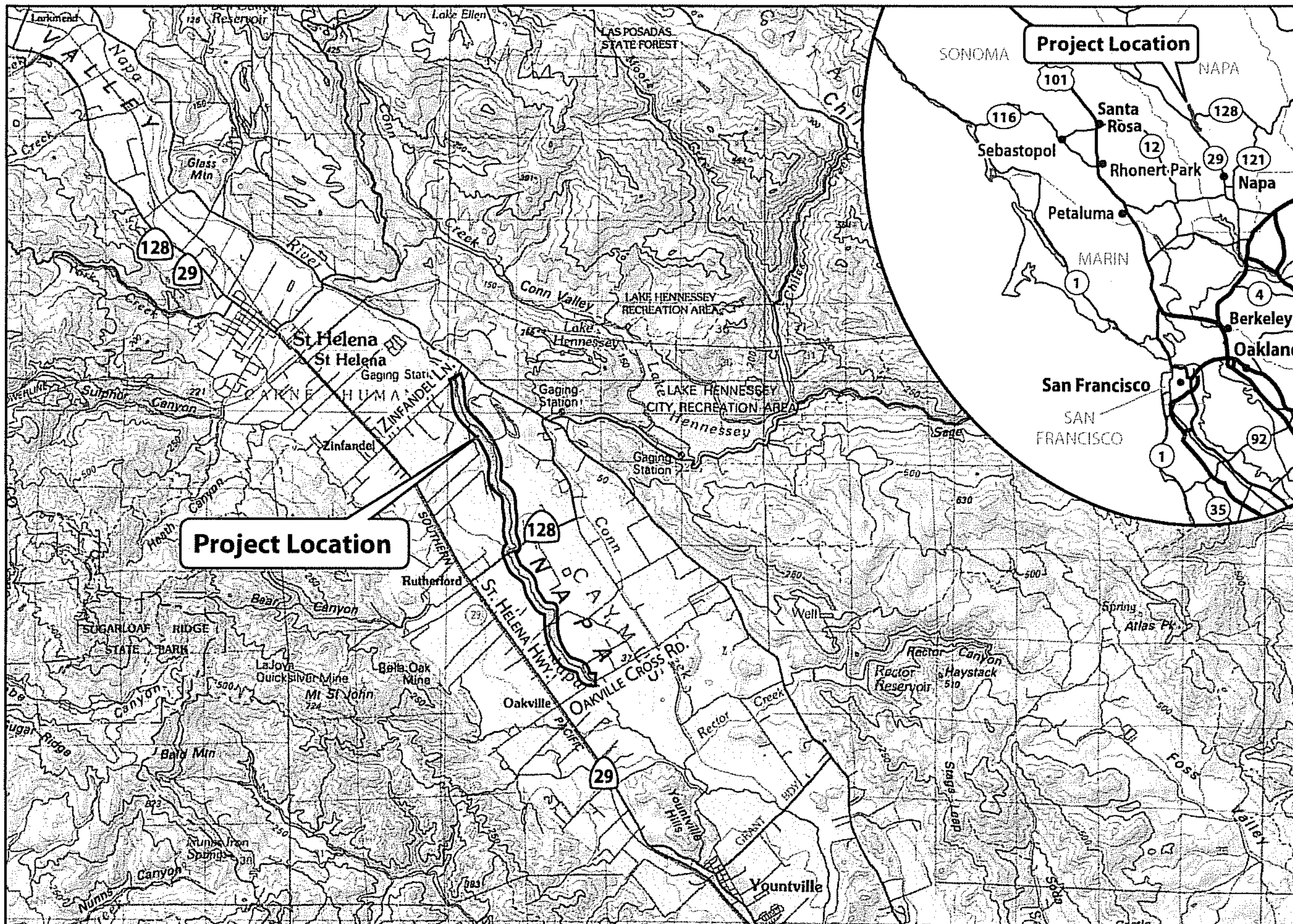
As described below, the maintenance program is intended to maintain bank protection and river enhancement features constructed as part of the Rutherford Restoration Project and to prevent new streambank erosion problems from forming in order to protect environmental resources and properties within the Rutherford Reach of the Napa River. The maintenance program is not intended to address catastrophic streambank failure, emergency repairs, or significant streambank erosion in areas not treated by the Rutherford Restoration Project. Such repairs would be implemented by individual landowners in coordination with appropriate agencies. Other non-emergency treatments that fall outside the scope of the maintenance program, because of scale or cost, may be incorporated into the design of future phases of the Rutherford Restoration Project. Additionally, the maintenance program includes activities to control targeted invasive non-native vegetation and Pierce's Disease (PD) host plants within the riparian corridor reachwide.

The purpose of this document is to define the overall maintenance program for the Rutherford Reach and describe key program elements including: maintenance activities; oversight and implementation responsibilities; and measures to avoid or minimize impacts to environmental resources. This document is intended for use by local landowners and vineyard managers, District maintenance staff, and environmental and regulatory agency staff.

Maintenance Program Overview

Program Area

The program area is located along a 4.5-mile reach of the Napa River south of the City of Saint Helena, extending from Zinfandel Lane in the north to Oakville Cross Road, in the south (Figure 1). Historic changes in land use and management in the Napa River Watershed have resulted in confinement of the river into a narrow channel, loss of riparian and wetland habitats, accelerated channel incision and bank erosion, and reduction in the quality and quantity of instream habitat for salmonids and other native fish. Additionally, because of this ongoing degradation, properties along the Rutherford Reach have been



Jones & Stokes

Figure 1
Regional Location

subject to bank instability and failure leading to the loss of valuable vineyard land, threat to structures, and costly repairs.

Program Objectives

The objectives of the Maintenance Program are to:

- Minimize bank erosion through vegetation management, large woody debris (LWD) realignment and/or relocation, debris/large trash removal, and biotechnical stabilization.
- Maintain the function of constructed instream habitat enhancement structures.
- Control target non-native invasive and PD host plants, to the extent practicable, within the riparian corridor of the Rutherford Reach.

Oversight and Coordination

An LAC has been established to oversee implementation of the program and to coordinate maintenance activities with local landowners and vineyard managers. The LAC requested that the District Board adopt a Special Benefit Zone Project, funded through a property tax assessment program under procedures established in the District Act, to conduct maintenance in the Rutherford reach of the Napa River.

The LAC is comprised of landowners and their representatives and is supported by District staff. Participation in the LAC is open to any landowner, or their representative, who have river frontage within the Rutherford Reach. The LAC will select three (3) representatives from the LAC to represent the recommendations of the LAC to the District Board. The three representatives will be designated as the Chair, Co-Chair, and Secretary of the LAC, and will serve for a 2-year period. It is anticipated that the LAC will meet biannually to review, evaluate, and prioritize annual maintenance activities based on the maintenance surveys, landowner maintenance requests, and available funding, and to review and approve the annual maintenance report.

All maintenance activities will be conducted pursuant to regulatory permits issued in conjunction with the Rutherford Restoration Project, with oversight by the District.

Maintenance Surveys

District staff in coordination with the LAC will conduct routine annual surveys to identify and assess issues of concern relative to the program objectives. Surveys will focus on identifying, mapping, and assessing:

- Actively eroding streambanks, including effectiveness of prior stabilization measures.

- Areas of excessive vegetation growth, and/or accumulations of LWD or trash that are contributing to streambank erosion.
- Storm-related damages to streambank stabilization and aquatic habitat enhancement structures
- Weed, PD host plant, and invasives eradication and revegetation sites.

The District will work with the LAC to develop standard data sheets for the maintenance survey. Data sheets, aerial photographs, and GPS units will be used to document the nature and extent of the problem, and to identify recommended treatments or remedial actions. Photos will also be taken to document each problem site. The results of the survey will be compiled into a report and presented to the LAC for review. It may also be necessary to conduct interim river surveys shortly after large storm events (< 10-year flood event) to identify areas that may require immediate treatment to prevent additional streambank failure, and protect existing infrastructure and environmental resources.

Landowner Maintenance Requests

In addition to maintenance needs identified through the annual river survey, landowners may submit individual maintenance requests to the LAC for review and evaluation. Maintenance requests should be submitted to the LAC by April 1 each year to be considered for inclusion in that years' work plan. Maintenance requests eligible for funding with assessment funds will be limited to the following problem-types: 1) actively eroding streambanks; 2) debris accumulations; 3) downed trees/LWD; 4) vegetation removal; and 5) storm-related damages to streambank stabilization, aquatic habitat enhancement structures, and revegetation sites. Landowners may also submit requests to the LAC for maintenance work that they would like to fund and execute themselves under District oversight and pursuant to regulatory Project permits. We anticipate that the majority of such requests will be focused on accomplishing additional PD host plant control beyond what is budgeted for using strictly assessment funds. The District and LAC will review landowner work requests and provide field supervision as needed to ensure landowner-sponsored actions are compliant with applicable permit conditions. While maintenance of earthen berms, access roads, and other infrastructure remain exclusively the responsibility of individual landowners and are largely exempt from regulation (located outside of most agencies' jurisdictions but for the County), the LAC and District will track the condition of these project elements and any maintenance required to maintain the original project design.

Evaluation and Prioritization of Maintenance Activities

As described above, the annual river survey report and any individual landowner maintenance requests will be submitted to the LAC for review. The committee will evaluate and prioritize annual work activities based on the following considerations:

- Condition of existing bank stabilization and instream habitat enhancement structures.
- Potential for future significant streambank failure/erosion beyond the riparian corridor and vegetated buffer.
- Risk to adjacent infrastructure and agriculture (i.e., structures, earthen berms, roads, pumps, utilities, crops).
- Potential for future significant streambank failure/erosion.
- Potential for increased flood damage.
- Available budget.

Based on an evaluation and prioritization of problems identified through the annual river survey and landowner requests, the LAC will prepare a work plan describing the location and scope of maintenance activities proposed to be conducted that year. Following completion of annual maintenance activities, the committee will prepare a supplemental report documenting work completed that year, associated costs, remaining budget, and adequacy of funding to complete required maintenance.

Funding and Implementation

Routine maintenance activities will be funded through property tax assessments collected from local landowners through a Special Benefit Zone Project adopted by the District for the Rutherford Reach. The District has retained an assessment engineer to develop a basis for assessing individual landowners to fund the program based on the benefits derived from the program. This will be presented this fall in an Engineer's Report for landowners to review the method of allocation and total proposed assessment for their individual property. The assessment will be subject to a Proposition 218 vote of the landowners throughout the reach scheduled for late 2008. Table 1 provides an estimate of cost in 2008 dollars to perform the expected annual maintenance activities. In years where maintenance expenditures are less than the total assessment collected by the District, any remaining funds will be retained in an interest-bearing (reserve) account to supplement the budget for maintenance activities conducted in future years. A cap will be placed on reserve funds.

Match funding to supplement property tax assessments may be provided by landowners and/or organizational partners (such as the County, resource agencies, the local RCD, and the California Conservation Corps). Work supported by match funding must be: limited to activities defined in this plan; compliant with any applicable permit restrictions; and, integrated into the annual work plan and year-end report.

Activities identified in the annual work plan prepared by District staff in coordination with the LAC, will be implemented by District staff, and/or

Table 1 Estimated Costs for Typical Annual Maintenance Activities

Tasks	Estimated Costs	Annual Cost
1 Debris Removal and Relocation of LWD	3days@$1,700 per crew day = $5,100; misc supplies and equ	$6,600
2 Vegetation Management	3 days@$1,700 per crew day = $5,100: misc supplies and equipment $2,500	$7,600
3 Streambank Erosion Control	**Planting:** 5 days @ $1,700 per crew day = $8,500; **Plant and other materials:** $5,000, **Irrigation:** 5 days (2 persons) @ $570/day = $2,850	$16,350
4 Repair and Maintenance of Floodplain Benches	**Planting:** 5 days @ $1,700 per crew day = $8,500; **Plant and other materials:** $5,000, **Irrigation:** 5 days (2 persons) @ $570/day = $2,850	$16,350
5 Maintenance of Created Vegetation Buffers	**Planting:** 2 days @ $1,700 per crew day = $3,400; **Plant materials:** $1,500, **Irrigation:** 5 days (2 persons) @ $570/day = $2,850	$7,750
6 Repair and Maintenance of Aquatic Habitat Enhancement Structures	**Planning:** 2 days @ $50 per hour = $800. **Work:** 2 days @ $1,700 per crew day = $2,600; **Equipment:** $2,000	$5,400
7 Repair and Maintenance of Streambank Stability Structures	**Planning:** 2 days @ $50 per hour = $800. **Work:** 2 days @ $1,700 per crew day = $3,400; Plant and other materials: $5,000: **Equipment:** $2,000	$11,200
8 Invasive Plants Removal and Revegetation	**Herbicide:** 2 days@ $400 per day (1person) =$800; **Planting:** 3 days @ $1,700 per crew day = $6,800; **Irrigation:** 3 days (2 persons) @ $570 per day = $1,710	$9,310
9 Annual surveys, and development of work plans, assessment management.	**Surveys:** 5 days (2 persons) @ $1000 per day = $5000; **Reports:** 2 days @ $400 per day = $800; **Develop Priorities:** 2 days @ $400 per day = $800; **Admin:** 50 hrs @ $70 per hour = $3,500	$10,100
10 Monitoring		$7,500
	Total	**$98,160**

landowner-supplied work crews overseen by District staff, and/or crews supplied by organizational partners including California Conservation Corps or Napa County RCD overseen by District staff. Specific maintenance activities that will be implemented under this program are described in detail below. Depending upon the type and scope of the maintenance activities, work crews may also be required to implement measures to avoid and/or minimize impacts to environmental resources as described below under *Best Management Practices*.

Maintenance Activities

Certain activities may be implemented proactively within the Rutherford Reach to prevent streambank erosion and failure, and associated impacts to adjacent properties and environmental resources. Preventative maintenance activities identified as part of the maintenance program for the Rutherford Reach are described in detail below.

Debris Removal

Debris consists of material deposited within the river channel by receding flood flows and includes small (<12 inches in diameter and/or <6 feet long) downed trees and limbs, tires, shopping carts, barrels, trash, and other materials. Debris removal would be required in cases where accumulations of debris within the river channel are blocking or shifting flood flows resulting in localized flooding or streambank erosion.

Methods used to remove debris will vary depending upon the size of material and available access. Whenever feasible, debris removal activities will be conducted by work crews using hand tools. However, removal of larger materials may require use of heavy equipment. Native vegetative debris may be cut-up or chipped on-site, removed and transported to a suitable disposal site, or burned in accordance with state and local permits. Non-native vegetative debris (i.e., giant reed) and non-vegetative debris will be removed and transported to a suitable disposal site, mulched (for materials that do not contain viable seed) in place, or burned in accordance with state and local permits.

Downed Tree Relocation/Stabilization

Existing mature trees that are toppled during storm events can block or shift flood flows resulting in localized flooding and streambank erosion. This is especially critical when downed logs lodge in bridge openings, near bridge abutments, or at pump intake structures. However, downed trees also provide valuable habitat for native fish. Downed trees determined to pose a flooding or erosion risk may be stabilized in place or relocated to reduce risk and improve local habitat conditions. Downed trees may be cut on-site by work crews using hand tools to facilitate stabilization or relocation. Relocation and/or repositioning of downed trees will likely require heavy equipment working from the top of the adjacent streambank. Relocated/repositioned trees should be anchored in place using standard methods for anchoring large woody debris structures (e.g., cables and utility pole anchors, cable and boulder anchors) to prevent structures from dislodging in large storm events.

Vegetation Management

In-Channel Vegetation

Within the Rutherford Reach, native vegetation such as willows, generally occur on low floodplain benches and at the toe of the streambank. While these plants provide habitat for native species, they are also effective at trapping sediment leading to the development of substantial in-channel gravel bars that can shift stream flows and cause streambank erosion and failure. Willows and other species (<4 inches in diameter) will be removed in areas where they significantly impede stream flows.

In-channel vegetation will be removed by hand crews using loppers, hand saws, and chain saws. In cases where herbicide use is considered advantageous and is consistent with the landowner's property management regime, trees will be cut off at the base of the trunk and the stump painted with an approved herbicide. Herbicide will be applied according to manufacturer's specifications by licensed applicators in a manner that minimizes drip and drift into the stream channel. Only U.S. Environmental Protection Agency-approved aquatic formulations of glyphosate (e.g., Rodeo, AquaMaster, AquaNeat/Roundup) and imazapyr (e.g., Habitat/Stalker) will be used. Following herbicide applications, dead biomass will be left on site to decompose. In cases where herbicide use is not consistent with the landowner's property management regime, physical removal techniques alone may be employed. If necessary, cuttings may be removed from the channel and stockpiled at top of bank. Debris may be transported to a suitable disposal site, mulched in place, or burned in accordance with state and local permits.

Invasive Non-Native and Pierce's Disease Host Vegetation

A number of invasive non-native and PD host plants occur within the Rutherford Reach. These species reduce the value of habitat for native wildlife by preventing the establishment and growth of desirable native species, and decrease overall plant diversity. Additionally, some of these species act as host plants for the bacterium that causes PD resulting in significant damage to streamside vineyards. Although existing patches of target invasive non-native plants will be treated as part of the Rutherford Restoration Project, success of the restoration effort will rely on ongoing maintenance to control spread of these undesirable species throughout the reach. Key invasive non-native and PD host plants that may be targeted for removal include, but are not limited to:

- Himalayan blackberry
- Periwinkle
- Giant reed

- Tree-of- heaven
- Tamarisk
- Mulefat
- Mugwort
- Wild grape (hybrid)
- Sesbania

Target invasive non-native and PD host plants will be removed by hand crews using weed wrenches, bladed weedeaters, loppers, hand saws, and chain saws. In cases where herbicide use is considered advantageous and is consistent with the landowner's property management regime, control of some species such as Himalayan blackberry may require repeated herbicide applications. Herbicide application will be limited to cutting and painting stumps, or foliar or spot spray using backpack or ATV-mounted sprayers. Herbicide will be applied according to manufacturer's specifications by licensed applicators in a manner that minimizes drip and drift into the stream channel. Only U.S. Environmental Protection Agency-approved aquatic formulations of glyphosate (e.g., Rodeo, AquaMaster, AquaNeat/Roundup) and imazapyr (e.g., Habitat/Stalker) will be used. Following herbicide applications, dead biomass will be left on site to decompose. Where herbicide use is not consistent with the landowner's property management regime, physical eradication and removal techniques (tarping and mechanical removal) and/or non-toxic weed control alternatives may be employed. Where necessary, cuttings may be removed from the channel and stockpiled at top of bank. Plant materials containing viable seed will be immediately bagged to prevent re-establishment. Debris may be transported to a suitable disposal site, mulched (for materials that do not contain viable seed) in place, or burned in accordance with state and local permits.

Erosion Control

In areas where minor erosion has been identified, biotechnical methods may be used in areas outside of the riparian corridor and vegetated buffer to proactively stabilize eroding banks and prevent streambank failure and large-scale deposition of sediment in the river channel, and protect adjacent property and infrastructure. Typically these treatments will be implemented in combination for effective treatment.

Planting

Areas subject to minor erosion may be hydroseeded with an appropriate native or sterile seed mix, and/or planted with native riparian species to stabilize eroding banks, and reduce localized flow velocities and erosion potential. A list of native tree and shrub species suitable for streambank revegetation are provided in Table 2. Plants material will be selected based on location-specific (i.e., top-of-bank, lower channel slope) recommendations (Table 2). Plantings may require irrigation for up to 3 years following installation depending upon planting location. Because of the potential for storm-related damages to a fixed irrigation system, plants installed below top of bank will be hand watered using nearby water sources provided by the landowners.

Other Erosion Control Treatments

Implementation of the treatments described above or treatment of other minor streambank erosion sites may require installation of erosion control blankets and/or coir logs. Erosion control blankets will consist of coconut fiber or other 100% biodegradable materials. Blankets will be installed in vertical strips and anchored with wooden stakes or starch staples. Blankets will be overlapped to facilitate anchoring. Coir logs will be 100% coconut fiber and will be installed using wooden stakes.

Maintenance of Constructed Features

Several streambank and channel improvements will be constructed by the Rutherford Reach Restoration Project to provide ecological benefits within this reach of the Napa River. Following the County's notice of completion of post construction maintenance and acceptance of the project-constructed features, maintenance of the features constructed as part of the Rutherford Reach Restoration Project will be incorporated into the Rutherford Reach maintenance program under LAC oversight. Maintenance activities for these features are described in detail below.

Floodplain Benches

As part of the Rutherford Restoration Project, streambanks in selected areas will be graded to create inset floodplain benches at approximately the 1.5-year flood elevation (typically about 10 - 15 feet above the existing low-flow channel invert) to widen the floodway and reduce localized flow velocities, and provide opportunities for planting riparian vegetation. Bench width and slope angle vary depending on overall channel width, adjacent land uses, and other factors. However, in general, benches are expected to range from 10 to 30 feet wide and will slope very gently away from the river, with an approximate difference of 1 foot in elevation between the outer and inner terrace edges. Floodplain slopes will be graded to a stable angle (3:1 or 2:1).

Maintenance of these areas will be conducted by work crews using hand tools and will typically include: controlling weeds and other non-native invasive plants; replanting native species; irrigation and/or hand watering; and installation of erosion control fabric and coir logs (if necessary). In some cases minor grading using hand tools or heavy equipment may be required to repair damage caused by large storm events.

Vegetated Buffers

In selected areas of the Rutherford Reach, vegetated buffers will be created between the edges of the existing riparian corridor and newly constructed earthen berms or access roads. The primary purpose of the vegetated buffer is to provide space between the river and adjacent land uses to allow the channel to widen naturally and to avoid the need for landowners to implement measures to protect adjacent property/land uses. These buffers will be planted with suitable native tree and shrub species as identified in Table 2.

Maintenance of these areas will be conducted by work crews using hand tools and will include: controlling weeds and other non-native invasive plants; replanting native species; irrigation system maintenance; and irrigation/hand watering.

Aquatic Habitat Enhancement Structures

Several types of large woody debris and rock structures are proposed to be installed in the river channel to enhance existing aquatic habitat for native fish. These structures include: rock weirs, grade-control riffles, off-bench branch cover, branch bundles, and spider log structures. Maintenance of these structures will be accomplished by work crews using hand tools and heavy equipment and may include: replacing logs and boulders; installing new utility or boulder and cable anchors; and installing native plants. Equipment such as excavators, front-end loaders, power augers, and dump trucks will be used to transport and place logs and boulders.

Streambank Stabilization Structures

Several types of wood and rock structures are proposed to be installed in the river channel to stabilize the toes of actively eroding banks. Maintenance of these structures will be accomplished by work crews using hand tools and heavy equipment and may include: replacing logs and boulders; installing new utility or boulder and cable anchors; and installing native plants. Equipment such as excavators, front-end loaders, power augers, and dump trucks will be used to transport and place logs and boulders.

Best Management Practices

The following section describes best management practices (BMPs) that will be implemented in conjunction with maintenance activities to avoid and/or minimize effects on environmental resources.

Table 2. Proposed Restoration Planting Palette, by Planting Zone

Planting Zone	Inundation Frequency	Groundwater Depth	Substrate	Planting Palette
Bank toe/bar	<1.5 year	<5 feet	Rock, gravel, sand	*Alnus rhombifolia* White alder *Salix laevigata* Red willow *Salix lasiolepis* Arroyo willow *Salix lutea* Yellow willow
Floodplain bench	1.5 year	10–15 feet	Silty clay loam	*Alnus rhombifolia* White alder *Carex barbarae* Santa Barbara sedge *Cornus glabrata* Brown dogwood *Fraxinus latifolia* Oregon ash *Leymus triticoides* Creeping wildrye *Populus fremontii* Fremont cottonwood *Salix laevigata* Red willow *Salix lasiolepis* Arroyo willow
Lower floodplain slope	1.5–5 years	15–22 feet	Silty clay loam	*Aesculus californica* California buckeye *Aristolochia californica* Pipevine *Calycanthus occidentalis* Western spicebush *Carex barbarae* Santa Barbara sedge *Heteromeles arbutifolia* Toyon *Leymus triticoides* Creeping wildrye *Populus fremontii* Fremont cottonwood *Rosa californica* California wild rose *Salix laevigata* Red willow *Symphoricarpos albus* Snowberry

Planting Zone	Inundation Frequency	Groundwater Depth	Substrate	Planting Palette
Upper floodplain slope	5–10 years	22–24 feet	Silty clay loam	*Aesculus californica* California buckeye *Aristolochia californica* Pipevine *Calycanthus occidentalis* Western spicebush *Carex barbarae* Santa Barbara sedge *Heteromeles arbutifolia* Toyon *Leymus triticoides* Creeping wildrye *Lonicerna hispidula* Honeysuckle *Quercus agrifolia* Coast live oak *Umbellularia californica* California bay
Floodplain terrace	>10 years	>24 feet	Consolidated silty clay loam, artificial fill	*Aesculus californica* California buckeye *Aristolochia californica* Pipevine *Bromus carinatus* California brome *Calycanthus occidentalis* Western spicebush *Carex barbarae* Santa Barbara sedge *Heteromeles arbutifolia* Toyon *Hordeum brachyantherum* Meadow barley *Leymus triticoides* Creeping wildrye *Lonicerna hispidula* Honeysuckle *Melica californica* California melic *Quercus agrifolia* Coast live oak *Quercus lobata* Valley oak *Rosa californica* California wild rose *Symphoricarpos albus* Snowberry *Umbellularia californica* California bay *Vulpia microstachys* Small fescue

Access and Staging

Whenever feasible, equipment staging and access will occur on the access road adjacent to the work site. If it is not possible to access the work site from an existing road, site access and staging will be accomplished in a way that minimizes damages to surrounding native vegetation. Staging, storage of equipment, materials, fuels lubricants, and other possible contaminants will be located at least 100 feet away from the top of the streambank. Additionally, vehicles and power equipment will be refueled at least 100 feet away from the top of the streambank.

Site Housekeeping

To minimize the effects of maintenance activities on neighboring homes and businesses, the following site "housekeeping" measures will be implemented.

- Maintenance sites will be maintained in a neat and orderly condition, and the site will be left free of any garbage or debris.
- For activities that last more than one day, materials, equipment, or stockpiled debris left on the site overnight will be stored in a manner that does not block access roads.
- Landowners will be notified at least 48 hours prior to any maintenance activities occurring on their property.

Noise Control

To minimize the effects of maintenance activities on neighboring homes and businesses, the following noise control measures will be implemented.

- Work will be limited to normal business hours (8:00 a.m.–5:00 p.m.), Monday through Friday. No activities will occur on Saturdays, Sundays, or recognized holidays.
- All power equipment will be equipped with sound-control devices no less effective than those provided as original equipment. All equipment will be operated and maintained to meet the applicable District standards for construction noise generation. No equipment will be operated with an unmuffled exhaust.

Erosion and Sediment Control

Any maintenance work involving modifications to the stream channel and banks will be restricted to the minimum necessary to address the problem. Inchannel work will be limited to the dry season (April 15–October 15). Work requiring stream dewatering, stream crossings, or work within the live stream will not begin before June 1.

To the extent feasible all inchannel work will be conducted by equipment operating from dry areas outside the low-flow channel. To the extent feasible, erosion control measures such as installing silt fencing, fiber rolls, or erosion control blankets will be implemented to minimize sediment input to the active channel.

Biological Resources Protection

Migratory Birds

In order to avoid adverse effects related to disturbance of migratory birds (protected under the federal Migratory Bird Treaty Act, the California Fish and Game Code, and CEQA), a qualified biologist will conduct preconstruction surveys for migratory birds and their nests at each work site no more than 1 week prior to the initiation of any construction activity planned to occur during the migratory bird nesting season (February 15–August 1). If preconstruction surveys identify active nests belonging to common migratory bird species, an exclusion zone will be established around each nest to minimize disturbance-related impacts on nesting birds. If active nests belonging to special-status migratory birds are identified, a no-activity buffer zone will be established around each nest. The radius of the exclusion zone/no-activity zone and the duration of exclusion will be determined in consultation with the U.S. Fish and Wildlife Service and the California Department of Fish and Game.

Fish

To reduce the likelihood of adverse impacts on salmonids that use the Napa River corridor, any work activities below the top-of-streambank will be limited to the dry season (April 15–October 15), with the condition that construction requiring stream dewatering, stream crossings, or work in the live stream may not commence before June 1.

Prior to activities disturbing the bed or banks of the active low-flow channel, coffer dams or culverts will be installed to divert flow around the work area. Stream flow downstream of the work area will be maintained. Any native fish present in the work area will be relocated to a suitable location by a qualified biologist. If it is necessary to pump the work area to remove seepage and maintain a dry condition, pumps will be placed in flat areas well away from the channel and secured by anchoring to a tree or stake. Pumps will be refueled at least 100 feet away from the top of the streambank. Wastewater will be discharged to an upland location where it will not drain back into the channel.

California Freshwater Shrimp

Prior to activities disturbing the bed or banks of the active low-flow channel, the District will retain a qualified biologist to conduct preconstruction dipnet surveys for California freshwater shrimp at each inchannel work site. If the species are determined to be present, the biologist will capture and relocate them to a suitable site downstream of the work area.

Northwestern Pond Turtle

Prior to activities disturbing the bed or banks of the active low-flow channel, the District will retain a qualified biologist to conduct preconstruction surveys for northwestern pond turtle at each inchannel work site. Surveys will take place no more than 72 hours prior to the onset of maintenance activities (including site preparation) with the potential to disturb turtles or their habitat. If the species is determined to be present, the biologist will capture and relocate them to a suitable site downstream of the construction area. If preconstruction surveys identify active nests, the biologist will establish no-disturbance buffer zones around each nest using temporary orange construction fencing. The radius of the buffer zone and the duration of exclusion will be determined in consultation with the U.S. Fish and Wildlife Service and the California Department of Fish and Game. The buffer zones and fencing will remain in place until the young have left the nest, as determined by a qualified biologist.

Cultural Resources

Several known cultural resources sites have been identified within the program area, and it is possible that other unknown sites may be disturbed or damaged by some maintenance activities (e.g., minor grading). If buried cultural resources, such as chipped or ground stone, historic debris, building foundations, or human bone are discovered inadvertently during ground-disturbing activities, work will stop in that area and within 100 feet of the find until a qualified professional archaeologist can assess the significance of the find and develop appropriate treatment measures in consultation with the District, and other appropriate authority.

Additionally, if human remains are discovered, there is to be no further excavation or disturbance of the site or any nearby area reasonably suspected to overlie adjacent human remains until the Napa County Coroner has been informed and has determined that no investigation of the cause of death is required. If the remains are of Native American origin, ground-disturbing activities may not resume until the descendents of the deceased Native American(s) have made a recommendation regarding means of treating or disposing of, with appropriate dignity, the human remains and any associated grave goods as provided in California Public Resources Code Section 5097.98. If NAHC is unable to identify a descendent or the descendent fails to make a recommendation within 24 hours after being notified by the NAHC, work may then resume.

Maintenance Responsibilities

As described above, it will be the responsibility of the District and local landowners to oversee and implement the Rutherford Reach maintenance program. Both District staff and local landowner representatives will serve on the LAC and will review, evaluate, and prioritize annual maintenance activities. Additionally, District staff will be responsible for supervising maintenance work crews. Work crews may be comprised of California Conservation Corps members, local RCD or NRCS staff, vineyard employees, and/or contract labor.

Regulatory Compliance

Implementation of the maintenance program will require compliance with federal and state environmental regulations including Section 1600 of the California Department of Fish and Game Code, Sections 401 and 404 of the Clean Water Act, state and federal endangered species acts, and the California Environmental Quality Act. All maintenance of constructed features will be limited to maintaining the original design approved by relevant regulatory agencies. Ongoing compliance with these regulations will be addressed through environmental and regulatory compliance documentation in process for the Rutherford Reach Restoration Project. As part of the compliance process additional BMPs and permit conditions relevant to the maintenance activities described above may be identified. Additionally, following completion of annual maintenance activities, District staff will submit a report to the LAC, regulatory agencies, the Flood District Board, and all project landowners documenting activities completed that year.

Appendix B

Napa River Restoration: Oakville to Oak Knoll Reach

Community Facilities District Guidance Document

NAPA COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT

Community Facilities District No. 2014-01

Community Facilities District Report

Oakville - Oak Knoll
Maintenance, Monitoring and Restoration Project

Napa, California
September 2014

Prepared by: Kristin Lowell Inc.

COMMUNITY FACILITIES DISTRICT REPORT

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Napa County Flood Control and Water Conservation District
Community Facilities District No. 2014-01
(Oakville - Oak Knoll Maintenance, Monitoring and Restoration Project)

INTRODUCTION

On August 12, 2014, the Napa County Flood Control and Water Conservation District (the "District") Board of Directors adopted a "Resolution of the Board of Directors of the Napa County Flood Control and Water Conservation District to Establish a Community Facilities District" (the "Resolution of Intention"), stating its intention to form the Napa County Flood Control and Water Conservation District Community Facilities District No. 2014-01 (Oakville – Oak Knoll Maintenance, Monitoring and Restoration Project) (the "CFD") pursuant to the Mello-Roos Community Facilities Act of 1982, Sections 53311 et. seq., California Government Code (the "Act") and to levy a special tax to finance the costs of certain public services in and for such Community Facilities District.

In the Resolution of Intention, the District expressly ordered the preparation of a written report (the "Report"), for the CFD containing the following:

1. A description of the Services which will be required to adequately meet the needs of the CFD; and

2. An estimate of the fair and reasonable cost of the Services included therewith.

For particulars, reference is made to the Resolution of Intention for the CFD, as previously approved and adopted by the Council.

NOW, THEREFORE, the undersigned does hereby submit the following data:

A. DESCRIPTION OF SERVICES. A general description of the proposed services is set forth in Exhibit "A" attached hereto and hereby made a part hereof.

B. PROPOSED BOUNDARIES OF THE COMMUNITY FACILITIES DISTRICT. The proposed boundaries of the CFD are those properties and parcels in which special taxes may be levied to pay for the costs and expenses of the Services. The proposed boundaries of the CFD are described on the recorded map of the CFD on file with the Secretary of the District, to which reference is hereby made. A reduced copy of the proposed boundaries of the CFD is set forth in Exhibit "B" attached hereto and hereby made a part hereof.

C. COST ESTIMATE. The cost estimate for the Services for the CFD is set forth in Exhibit "C" attached hereto and hereby made a part hereof.

D. RATE AND METHOD OF APPORTIONMENT OF SPECIAL TAX. The Rate and Method of Apportionment of Special Tax for the CFD is set forth in Exhibit "D" attached hereto and hereby made a part hereof.

E. LIST OF SPECIAL TAXED PARCELS. The list of parcels to receive the special tax is set forth in Exhibit "E" attached hereto and hereby made a part hereof.

CERTIFICATIONS

The undersigned respectfully submits the enclosed Community Facilities District Report as directed by the Board of Directors.

Dated: September 11, 2014

PHILLIP M. MILLER, PE
District Engineer

I HEREBY CERTIFY that the enclosed Community Facilities District Report was filed with me on the 12 day of September, 2014.

GLADYS I. COIL, Secretary of the District Board
Napa County, California

By Gladys I. Coil

I HEREBY CERTIFY that the Community Facilities District Report was approved and confirmed by the Board of Directors of the Napa County Flood Control and Water Conservation District, on the 23rd day of September, 2014.

GLADYS I. COIL, Secretary of the District Board
Napa County, California

By Gladys I. Coil

EXHIBIT A

Napa County Flood Control and Water Conservation District
Community Facilities District No. 2014-01
(Oakville - Oak Knoll Maintenance, Monitoring and Restoration Project)

<u>LIST OF AUTHORIZED SERVICES</u>

The public services to be funded by Napa County Flood Control and Water Conservation District CFD No. 2014-01 shall consist of maintenance, monitoring, and restoration of the Napa River between Oakville and Oak Knoll reach. The objectives of the services are to:

1. Minimize bank erosion through vegetation management, large woody debris realignment and/or relocation, debris/large trash removal, and biotechnical stabilization.
2. Maintain the function of constructed instream habitat enhancement structures.
3. Control target non-native invasive and Pierce's disease host plants, to the extent practicable, within the riparian corridor of the reach.

For a complete description of the authorized services please refer to the Napa River Restoration Oakville to Oak Knoll Reach CFD Guidance Document, attached hereto as Exhibit F.

EXHIBIT B

Napa County Flood Control and Water Conservation District
Community Facilities District No. 2014-01
(Oakville - Oak Knoll Maintenance, Monitoring and Restoration Project)

BOUNDARY MAP

Reference is hereby made to the recorded boundary map on file in the office of the Secretary of the District for a description of the boundaries of the CFD. A reduced copy of the cover page of the boundary map is included on the following page.

PROPOSED BOUNDARIES OF

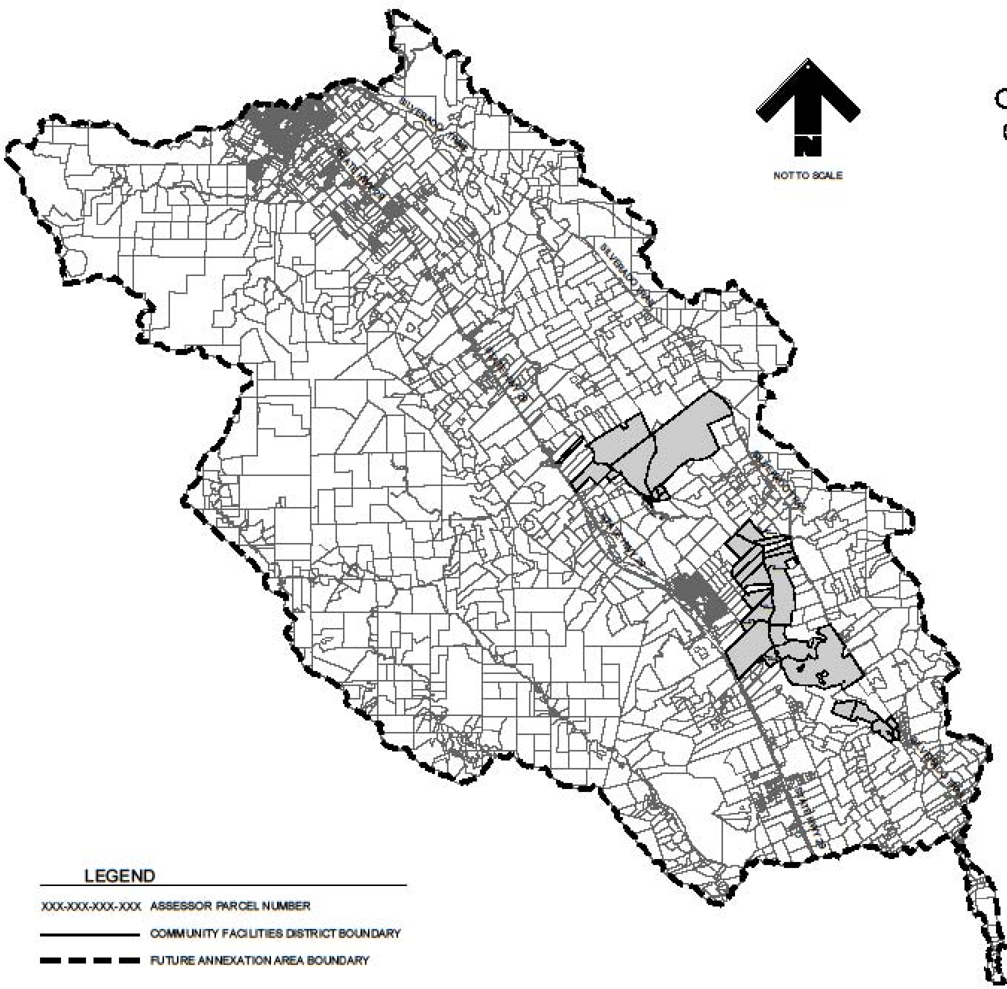
NAPA COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT

COMMUNITY FACILITIES DISTRICT NO. 2014-01

(Oakville - Oak Knoll Maintenance, Monitoring and Restoration Project)

COUNTY OF NAPA, STATE OF CALIFORNIA

SHEET 1 OF 6



1. FILED IN THE OFFICE OF THE CLERK OF THE BOARD OF THE BOARD OF DIRECTORS THIS ________ DAY OF ______________ 2014.

SECRETARY OF THE BOARD
NAPA COUNTY FLOOD CONTROL & WATER CONSERVATION DISTRICT

2. I HEREBY CERTIFY THAT THE WITHIN MAP SHOWING PROPOSED BOUNDARIES OF NAPA COUNTY FLOOD CONTROL & WATER CONSERVATION DISTRICT COMMUNITY FACILITIES DISTRICT NO 2014-01, COUNTY OF NAPA, STATE OF CALIFORNIA, WAS APPROVED BY THE BOARD OF DIRECTORS, AT A MEETING THEREOF, HELD ON THE ______ DAY OF ____________ 2014.

SECRETARY OF THE BOARD
NAPA COUNTY FLOOD CONTROL & WATER CONSERVATION DISTRICT

3. FILED THIS _____ DAY OF ____________ 2014 AT THE HOUR OF ________ O'CLOCK, _____N IN BOOK ______ OF MAPS OF ASSESSMENT AND COMMUNITY FACILITIES DISTRICTS AT PAGE ______ IN THE OFFICE OF THE COUNTY RECORDER, IN THE COUNTY NAPA, STATE OF CALIFORNIA.

COUNTY RECORDER
COUNTY OF NAPA

INSTRUMENT NUMBER: ______________________

KRISTIN LOWELL INC.
PUBLIC FINANCE SOLUTIONS

File: K:\lore\13KX\1307.30\Oak Knoll\2014\OAK KNOLL-EXHIBIT.dwg Aug 20, 2014 - 10:56am mwinkler

EXHIBIT C

Napa County Flood Control and Water Conservation District
Community Facilities District No. 2014-01
(Oakville - Oak Knoll Maintenance, Monitoring and Restoration Project)

COST ESTIMATE

The following estimate is the projected annual expense for the initial year the services are to be provided.

Budget Item	Cost Breakdown	Annual Cost Estimate
Monitoring, Permiting, Planning		
Annual Surveys, Development of Work Plans, Assessment Management	Linear Feet	$7,652
Monitoring	Linear Feet	$5,000
Total Cost and Rate		**$12,653**
Channel Maintenance Activities		
Down Tree Management	Linear Feet	$12,000
Debris Management	Linear Feet	$10,000
Vegetation Management	Linear Feet	$12,000
Streambank Erosion Management	Linear Feet	$12,394
Total Cost and Rate		**$46,394**
Maintenance of Restoration Features		
Repair and maintenance of Floodplain Benches	Acreage or Linear Feet	$4,000
Maintenance of Created Vegetation Buffers	Acreage or Linear Feet	$4,800
Repair and Maintenance of Aquatic Habitat Enhancement Structures	Acreage or Linear Feet	$5,100
Repair and maintenance of Streambank Stability Structures	Acreage or Linear Feet	$5,100
Invasive Plants Removal, PD Management and Revegetation	Acreage or Linear Feet	$10,000
Total Cost and Rate		**$20,560**
Total Cost of Community Facilities District		**$79,608**

EXHIBIT D

Napa County Flood Control and Water Conservation District
Community Facilities District No. 2014-01
(Oakville - Oak Knoll Maintenance, Monitoring and Restoration Project)

RATE AND METHOD OF APPORTIONMENT OF SPECIAL TAX

A special tax shall be levied within the Napa County Flood Control and Water Conservation District Community Facilities District No. 2014-01 (the "CFD") and shall be collected each fiscal year for 20 years commencing with Fiscal Year 2014-2015, in an amount determined through the application of the procedures described below. All the property in the CFD, unless exempted by law, shall be taxed for the purposes, to the extent, and in the manner herein provided, including property subsequently annexed to the CFD, unless a separate Rate and Method of Apportionment of Special Tax is adopted for the annexation area.

A. DEFINITIONS

The terms hereinafter set forth have the following meanings:

"Act" means the Mello-Roos Community Facilities Act of 1982, as amended, being Chapter 2.5 of Part 1 of Division 2 of Title 5 of the California Government Code.

"Administrative Expenses" means, for any Fiscal Year, any actual or reasonably estimated costs directly related to the administration of the CFD, including: the costs of computing and levying the Special Taxes (whether by the District or any designee thereof); the costs of collecting the Special Taxes (whether by the County on the property tax rolls, by the District through direct billing of the property owners, by the County or the District through foreclosure proceedings, or otherwise); the fees and expenses of legal counsel; costs related to property owner inquiries regarding the Special Tax; and all other costs and expenses of the District in any way related to the establishment or administration of the CFD or administration of the Special Tax.

"Administrator" means the District Engineer or designee thereof responsible for the annual administration of the Special Tax.

"Assessor's Parcel" means a lot or parcel shown on an official map of the County Assessor designating parcels by Assessor's parcel numbers.

"Authorized Services" means those public services authorized to be funded by the CFD as set forth in the Resolution of Intention:

- Channel Maintenance
- Monitoring
- Restoration Site Maintenance

"Base Special Tax" means the Special Tax levied against each Assessor's Parcel for each Fiscal Year, as determined in accordance with Section D below.

“Board” means the Napa County Flood Control and Water Conservation District Board of Directors, acting as the legislative body of the CFD.

“CFD” means the Napa County Flood Control and Water Conservation District Community Facilities District No. 2014-01.

“County” means the County of Napa.

“District” means the Napa County Flood Control and Water Conservation District.

“Exempt Property” means all Assessor’s Parcels that are exempt from the Special Tax under Section E below.

“Fiscal Year” means the period starting July 1 and ending on the following June 30.

“Future Annexation Areas” means the areas designated for potential future annexation into the CFD as shown in the CFD boundary map recorded in the County Recorder’s Office.

“Linear Footage” means the number of linear feet of river frontage on an Assessor’s Parcel, as determined by the District from time to time in accordance with Section D.

“Maintenance Parcel” means any Assessor’s Parcel classified as such for any Fiscal Year under Section B.

“Maximum Special Tax” means the maximum Special Tax, determined in accordance with Section C below, that can be levied in a particular Fiscal Year on an Assessor’s Parcel.

“Monitoring Parcel” means any Assessor’s Parcel classified as such for any Fiscal Year under Section B.

“Optional Services” means the services included in Authorized Services and identified as Optional Services as set forth in the Resolution of Intention, which a Property Owner may request for an Assessor’s Parcel in accordance with Section E herein. Optional Services include:

- Managed Retreat, such as back planting
- Managed Retreat, such as biotechnical streambank stabilization
- Planning, Design, Permitting of a Restoration Project
- Implementation of a Restoration Project

“Optional Services Special Tax” means a special tax on an Assessor’s Parcel in addition to Base Special Tax to pay for Optional Services as requested from a Property Owner.

“Parcel Classification” means the classification of each Assessor’s Parcel made by the District for each Fiscal Year under Section B.

“Property Owner” means, for each Fiscal Year, the legal owner of an Assessor’s Parcel as shown on the last equalized County Assessor’s roll for that Fiscal Year, or such other owner of the fee interest in that Assessor’s Parcel who has provided proof of ownership to the District.

“Resolution of Intention” means the resolution entitled “Resolution of Intention of the Board of Directors of the Napa County Flood Control and Water Conservation District to Establish a Community Facilities District” adopted by the Board on August 12, 2014, and as may be amended from time to time.

“Restoration Linear Footage” means the number of linear feet on an Assessor’s Parcel that was part of the Restoration Project, as determined by the District from time to time in accordance with Section D.

“Restoration Project” means the capital improvement project funded through the District to restore and enhance long term river and floodplain function, enhance native riparian plant communities, improve the quality and resilience of aquatic and terrestrial riparian habitat, and reduce property damage and sediment delivery associated with ongoing bank erosion processes.

“Restoration Project Parcel” means any Assessor’s Parcel classified as such for any Fiscal Year under Section B.

“Special Taxes” means the special taxes authorized to be levied by the CFD under the Act, the Resolution of Intention, and this Rate and Method of Apportionment of Special Tax.

“Special Tax Requirement” means, for each Fiscal Year, that amount required, after taking into account available amounts held in the funds and accounts established for the CFD to: (i) pay Administrative Expenses; (ii) pay directly for Authorized Services; and (iii) pay for reasonably anticipated delinquent Special Taxes based on the delinquency rate for Special Taxes levied in the previous Fiscal Year.

“Taxable Property” means, for each Fiscal Year, all of the property within the boundaries of the CFD that is subject to the Special Tax and not exempt from the Special Tax pursuant to the Act.

B. ASSIGNMENT TO PARCEL CLASSIFICATION

Each Fiscal Year, the District shall classify each Assessor’s Parcel as Taxable Property or Exempt Property, and shall then further classify each Assessor’s Parcel of Taxable Property in one or more of the following categories:

- Maintenance Parcel
- Monitoring Parcel, and
- Restoration Project Parcel.

The District may classify an Assessor’s Parcel as a Restoration Project Parcel only if that Assessor’s Parcel is included in the Restoration Project.

C. MAXIMUM SPECIAL TAX

Each Fiscal Year, the Maximum Special Tax for each Assessor's Parcel shall equal the sum of (i) the current Base Special Tax determined pursuant to Section D, (ii) any Optional Services Special Tax requested to be levied on that Assessor's Parcel for that Fiscal Year by the respective Property Owner pursuant to Section E, (iii) any Base Special Taxes or Optional Services Special Taxes from prior Fiscal Years that have not yet been paid, and (iv) penalties and interest that have accrued on the delinquent Special Taxes.

D. CALCULATION OF BASE SPECIAL TAX

The Base Special Tax for each Assessor's Parcel shall be based on its Parcel Classifications under Section B and its Linear Footage and Restoration Linear Footage determined as set forth below.

The Base Special Tax per Linear Foot and Restoration Linear Foot for each Parcel Classification is shown below in Table 1.

Table 1
Base Special Tax

Parcel Classification	Linear Foot Base Special Tax	Restoration Linear Foot Base Special Tax
Maintenance Parcel	$0.88	$0.00
Monitoring Parcel	$0.24	$0.00
Restoration Project Parcel	$0.00	$1.17

All of the Base Special Taxes set forth in Table 1 above shall increase each Fiscal Year, beginning with Fiscal Year 2015-16, by the same percentage as the increase, if any, in the March Engineering News Record Construction Cost Index for the City of San Francisco.

The total Base Special Tax for each Assessor's Parcel shall equal the sum of the Base Special Taxes for each applicable Parcel Classification for that Assessor's Parcel, calculated as set forth in Table 1 above.

For Fiscal Year 2014-15, the Linear Footage and Restoration Linear Footage for each Assessor's Parcel in the CFD are set forth in Exhibit A hereto. For future Fiscal Years, the Linear Footage and Restoration Linear Footage for each Assessor's Parcel shall be determined by the District in its sole discretion, as will be evidenced by an amendment to Exhibit A hereto filed with the District Administrator, and the recordation of an amendment to the Notice of Special Tax Lien for the CFD.

E. CALCULATION OF OPTIONAL SERVICES SPECIAL TAX

Any Property Owner may request that the District provide Optional Services to that Property Owner's respective property in the CFD. The Optional Services Special Tax will be levied in addition to the Base Special Tax.

The Optional Services Special Tax per Linear Foot for each Optional Service is shown below in Table 2.

Table 2
Optional Services Special Tax

Optional Services	Linear Foot Optional Service Special Tax
Managed Retreat-Back Planting	$75.00
Managed Retreat-Biotechnical Streambank Stabilization	$200.00
Planning, Design, Permitting of Restoration Project	$250.00
Implementation of a Restoration Project	$1,000.00

Any Property Owner who desires to request Optional Services on an Assessor's Parcel must submit a signed written request for that Assessor's Parcel, in the form attached as Exhibit B hereto (the "Request and Consent"), for each Fiscal Year during which the Optional Services Special Tax will be levied, specifying the specific Optional Services requested. The Property Owner must submit a Request and Consent no later than the May 1 immediately preceding the beginning of the Fiscal Year for which the Optional Services are requested.

F. METHOD OF APPORTIONMENT; PROVISION OF SERVICES

Each Fiscal Year, the Board shall levy Special Taxes on each Assessor's Parcel classified as Taxable Property in an amount equal to the sum of the following: (a) Base Special Taxes up to 100% of the applicable Maximum Special Tax as needed to satisfy the Special Tax Requirement, plus (b) the amount of Optional Services Special Taxes set forth in a Request and Consent submitted by the applicable Property Owner pursuant to Section E.

Each Fiscal Year, the District shall provide Authorized Services to each parcel of Taxable Property in accordance with its classifications under Section B, and with any Request and Consent submitted by the applicable Property Owner pursuant to Section E. as follows:

- Any Assessor's Parcel classified as and subject to the levy of Base Special Taxes as a Maintenance Parcel shall receive that portion of Authorized Services designated as "Maintenance Services" under the Resolution of Intention.

- Any Assessor's Parcel classified as and subject to the levy of Base Special Taxes as a Monitoring Parcel shall receive that portion of Authorized Services designated as "Monitoring Services" under the Resolution of Intention.

- Any Assessor's Parcel classified as and subject to the levy of Base Special Taxes as a Restoration Project Parcel shall receive that portion of Authorized Services designated as "Restoration Project Services" under the Resolution of Intention.

- Any Assessor's Parcel for which the District has received a Request and Consent by the preceding May 1 shall receive those Optional Services specified in the Request and Consent.

G. EXEMPTIONS

No Special Tax shall be levied on any Assessor's Parcel that is expressly exempted by the Act.

H. FUTURE ANNEXATIONS

Any Property Owner of an Assessor's Parcel that is not included in the original CFD formation but within the CFD Future Annexation Area, as shown on the CFD boundary map may request to annex his/her property into the CFD at any time. The Special Tax levied against that Assessor's Parcel number shall be subject to the Special Tax calculation as identified in Sections D and E above.

I. REVIEW/APPEAL PROCESS

Any Property Owner may file a written appeal of the Special Tax on his/her property with the CFD Administrator, provided that the appellant is current in his/her payments of Special Taxes. During the pendency of an appeal, all Special Taxes previously levied must be paid on or before the payment date established when the levy was made. The appeal must specify the reasons why the appellant claims the Special Tax was levied in error. The CFD Administrator shall review the appeal, meet with the appellant if the CFD Administrator deems necessary, and advise the appellant of its determination. If the CFD Administrator agrees with the appellant, the CFD Administrator shall make a recommendation to the Board to eliminate or reduce the Special tax on the appellant's property and/or to provide a refund to appellant. The approval of the Board or its designee must be obtained prior to any such elimination or reduction. If the CFD Administrator disagrees with the appellant and the appellant is dissatisfied with the determination, the appellant then has 30 days in which to appeal to the Board by filing a written notice of appeal with the Clerk of the Board, provided that appellant is current in his/her payments of Special Tax. The second appeal must specify the reasons why the appellant disagrees with the CFD Administrator's determination. The Clerk of the Board shall schedule the appeal to be heard before the Board.

J. MANNER OF COLLECTION

The Special Tax shall be collected in the same manner and at the same time as ordinary *ad valorem* property taxes; provided, however that the District may directly bill the Special Taxes, may collect Special Taxes at a different time or in a different manner if necessary to meet its financial obligations, and may covenant to foreclose and may actually foreclose on a delinquent Assessor's Parcel as permitted by the Act.

The Special Tax shall be levied and collected starting in Fiscal Year 2014-15, and the final year of the Special Tax levy shall be Fiscal Year 2033-34.

EXHIBIT E

Napa County Flood Control and Water Conservation District
Community Facilities District No. 2014-01
(Oakville - Oak Knoll Maintenance, Monitoring and Restoration Project)

LIST OF SPECIAL TAXED PARCELS

APN	Legal Owner	Land Use	Linear Frontage	Linear Frontage Units	Restoration Linear Frontage	Maintenance $	Monitoring $	Restoration $	TOTAL Parcel Special Tax
031-080-005-000	Jackson Family Estates I Llc	AGR	1,763	1,763	686	$1,551.44	$423.12	$802.62	$2,777.18
031-080-017-000	Traina Vineyards Llc	AGR	263	263		$231.44	$63.12	$0.00	$294.56
031-080-031-000	Franciscan Vineyards Inc	AGR	2,897	2,897	1,491	$2,549.36	$695.28	$1,744.47	$4,989.12
031-100-030-000	7550 Llc	AGR	722	722	624	$635.36	$173.28	$730.08	$1,538.72
031-110-003-000	State Farm Ranch Llc	AGR	4,009	4,009	1,730	$3,527.92	$962.16	$2,024.10	$6,514.18
031-110-011-000	State Farm Ranch Llc	AGR	2,518	2,518		$2,215.84	$604.32	$0.00	$2,820.16
031-110-018-000	Gamble George T & Collette Y	RES	318	302	318	$265.76	$72.48	$372.06	$710.30
031-110-021-000	Gamble George T & Collette Y	RES	133	126	133	$110.88	$30.24	$155.61	$296.74
031-140-002-000	Gamble George T Tr	RES	167	159	167	$139.57	$38.06	$195.39	$373.02
031-140-003-000	Gamble George T Tr	RES	886	842	560	$740.70	$202.01	$655.20	$1,597.92
031-140-007-000	1552 Yount Mill Road Llc	RES	191	181	72	$159.28	$43.44	$84.24	$286.96
031-160-022-000	Gamble George T Tr	AGR	840	840		$739.20	$201.60	$0.00	$940.80
031-160-023-000	Gamble George T Tr	AGR	727	727		$639.76	$174.48	$0.00	$814.24
031-220-014-000	Yahome Vineyards Lp	AGR	353	353	200	$310.64	$84.72	$234.00	$629.36
031-220-016-000	Traina J Todd Buchanan Etal	AGR	710	710	710	$624.80	$170.40	$830.70	$1,625.90
031-220-017-000	Missimer Family Limited Partnership	UAGR	1,482	741	1,482	$652.08	$177.84	$1,733.94	$2,563.86
036-010-013-000	Miller Vineyards Llc	UAGR	2,012	1,006	895	$885.28	$241.44	$1,047.15	$2,173.88
036-010-020-000	Yahome Vineyards Lp	AGR	2,440	2,440		$2,147.20	$585.60	$0.00	$2,732.80
036-010-026-000	Treasury Wine Estates Americas Co	AGR	1,832	1,832	1,832	$1,612.16	$439.68	$2,143.44	$4,195.28
036-010-027-000	Treasury Wine Estates Americas Co	AGR	685	685	685	$602.80	$164.40	$801.45	$1,568.66
036-010-028-000	Treasury Wine Estates Americas Co	AGR	908	908	564	$799.04	$217.92	$659.88	$1,676.84
036-010-029-000	Treasury Wine Estates Americas Co	AGR	1,761	1,761		$1,549.68	$422.64	$0.00	$1,972.32
036-010-030-000	Treasury Wine Estates Americas Co	AGR	333	333		$293.04	$79.92	$0.00	$372.96
036-010-031-000	Treasury Wine Estates Americas Co	AGR	258	258		$227.04	$61.92	$0.00	$288.96

APN	Legal Owner	Land Use	Linear Frontage	Linear Frontage Units	Restoration Linear Frontage	Maintenance $	Monitoring $	Restoration $	TOTAL Parcel Special Tax
036-110-034-000	Russell Janice R Suc Tr	AGR	1,353	1,353	952	$1,190.20	$324.60	$1,113.84	$2,628.64
036-120-063-000	Spp Napa Vineyards Llc	AGR	938	938	759	$825.44	$225.12	$888.03	$1,938.60
036-120-073-000	Spp Napa Vineyards Llc	AGR	3,882	3,882	1,083	$3,416.16	$931.68	$1,267.11	$5,614.96
036-120-075-000	Spp Napa Vineyards Llc	AGR	3,120	3,120		$2,745.60	$748.80	$0.00	$3,494.40
039-040-032-000	Yahome Vineyards Lp	AGR	5,398	5,398		$4,750.24	$1,295.52	$0.00	$6,045.76
039-040-041-000	Robert Mondavi Properties Inc	AGR	2,131	2,131		$1,875.28	$511.44	$0.00	$2,386.72
039-040-050-000	Robert Mondavi Properties Inc	AGR	1,295	1,295	130	$1,139.60	$310.80	$152.10	$1,602.50
039-040-052-000	Robert Mondavi Properties Inc	AGR	6,455	6,455	2,500	$5,680.40	$1,549.20	$2,925.00	$10,154.60
039-051-001-000	Spp Napa Vineyards Llc	AGR	1,774	1,774		$1,561.12	$425.76	$0.00	$1,986.88
Total			**54,554**	**52,721**	**17,573**	**$46,394.31**	**$12,652.99**	**$20,560.41**	**$79,607.78**

Appendix C

CEQA Document – Initial Study/ Mitigated Negative Declaration

(*provided under separate cover)*

Appendix D

CDFW and RWQCB Permits and Memorandum of Understanding with the Town of Yountville

CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD
SAN FRANCISCO BAY REGION

ORDER NO. R2-2012-0063

WASTE DISCHARGE REQUIREMENTS AND WATER QUALITY CERTIFICATION for:

NAPA COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT
STREAM MAINTENANCE PROGRAM
NAPA COUNTY

The California Regional Water Quality Control Board, San Francisco Bay Region (hereinafter the Regional Water Board), finds that:

1. The Napa County Flood Control and Water Conservation District (District) has applied to the Regional Water Board for authorization to implement its Stream Maintenance Program (SMP) for routine stream maintenance activities, including vegetation management, downed tree management, erosion protection and bank stabilization, sediment and debris removal, minor maintenance, and habitat enhancement projects in streams within its maintenance jurisdiction. It is anticipated that routine maintenance activities will not only provide flood protection and maintain channel conveyance capacity but will also enhance and protect natural resources.
2. This Order applies to the District's stream maintenance activities conducted pursuant to the SMP within the Napa River watershed, which drains to San Pablo Bay, and that portion of the Suisun Creek watershed within Napa County, which drains to Suisun Bay. This Order does not apply to stream maintenance activities conducted in the Lake Berryessa/Putah Creek watershed, which is under the jurisdiction of the Central Valley Regional Water Board. Therefore, all descriptions, findings, and provisions in this Order apply only to stream maintenance activities within the Napa River watershed and that portion of the Suisun Creek watershed within Napa County.
3. The District developed a SMP Manual and appendices, dated May 2012, to guide implementation of the SMP. The SMP Manual describes an integrated approach for protection and enhancement of in-stream aquatic resources, while providing necessary flood conveyance capacity. The SMP Manual includes flood control channel maintenance activities, impact avoidance measures, best management practices (BMPs), program mitigation, program oversight and management, program-area resources, and a characterization of channels to be maintained.
4. On August 23, 2011, the District initially filed an application for Waste Discharge Requirements (WDRs) and Water Quality Certification (WQC) with the Regional Water Board, which was subsequently updated in March 2012.

SMP Description, Impacts, and Mitigation

5. The SMP covers four primary activities: vegetation management, downed tree management, erosion protection and bank stabilization, and sediment and debris removal. The District conducts these maintenance activities within District, Napa County, or City of Napa-owned engineered flood control channels. In addition to these primary activities, the SMP also involves other minor maintenance activities and habitat enhancement projects. These other minor (occurring less frequently) maintenance activities include replacing culverts, maintaining access roads and drainage ditches, and managing beaver activities. The SMP also includes a habitat protection and

enhancement component that consists of a riparian planting program, in-stream habitat complexity enhancement, and in-stream gravel augmentation.

6. The District is responsible for the maintenance of the 7.3 miles of flood control channels that it owns and for which it has maintenance easements. Many of these District-owned channels are engineered channels, often built by other agencies and deeded to the District. Although a few were designed and built to convey a specific design discharge (i.e., the 100-year flood event), most have no available specific discharge design. Most of these engineered channels were constructed with a trapezoidal cross-section with earthen banks and streambeds. However, some channels have sections with hardened banks and beds formed in rock or concrete. Bed and bank hardening typically occurs at or near road and culvert crossings to protect these structures. Typical maintenance activities in District-owned channels include vegetation thinning and pruning, grass mowing (maintenance roads), erosion protection and bank stabilization, sediment and debris removal, trash removal, exotic and invasive vegetation removal, and native tree and shrub planting.
7. The District performs maintenance on 4.2 miles of channels owned by Napa County on behalf of the County. Although the District conducts maintenance, it is not obligated to do so, or to maintain any specific level of hydraulic capacity. These channels are generally engineered channels or ditches, but also include some modified streams. County-owned/District-maintained channels include a portion of lower Salvador Creek, Maher-Trent Ditch, Sandra-Kathleen Ditch, and West Pueblo Ditch and Fagan Creek near the Napa County Airport. Typical maintenance activities in County-owned channels include vegetation thinning and pruning, grass mowing (maintenance roads), erosion protection and bank stabilization, sediment and debris removal, trash removal, exotic and invasive vegetation removal, and native tree and shrub planting.
8. The District responds to citizen and government alerts to potential flooding or erosion problems and conducts annual creek and river surveys to assess and prioritize potential issues that can be addressed through maintenance. Through its periodic surveys, the District can also identify illegal dumping activities or non-authorized streambed construction projects.
9. The District provides consultations and offers maintenance support for 1.5 miles of channels owned by other public entities, such as neighboring towns or cities, and school districts upon request by the public entity owner. These channels include a section of lower Salvador Creek, portions of the Salvador Creek tributary, and a small reach of Camille Creek that are owned by the City of Napa. Maintenance activities, and the survey and maintenance prioritization process, described above for District- and County-owned channels apply to publicly-owned channels as well.
10. The District has identified 26 miles of privately-owned flood prone reaches of streams, generally within urban areas, which it surveys regularly to monitor for potential problems. Identified problems are referred to the property owner and permission is requested prior to the District conducting any maintenance. Examples of such channels include portions of the Napa River and Sulphur Creek in northern Napa County, Hopper and Dry creeks in the Yountville region, and Browns Valley, Redwood, and some portions of Tulucay creeks in the City of Napa region. Maintenance activities are generally limited to vegetation and downed tree management, invasive species eradication, trash removal and consultations on erosion, and bank stabilization.
11. The remaining creeks in Napa County are privately-owned creeks where District maintenance activities may only take place following a specific owner request and District staff evaluation of

the request. District's maintenance work in these channels may typically involve clearing debris or vegetation management to address a flow obstruction or erosion concern.

12. Vegetation management refers to maintaining, trimming, mowing, and removal of vegetation that constricts flows within the flood control channels and other constructed flood control facilities. Vegetation management activities are conducted to maintain flow conveyance capacity, establish a canopy of riparian trees, and control invasive vegetation. Vegetation management and removal activities are relatively consistent from year to year, though locations change depending on recent vegetation growth and blockages. Vegetation management techniques include removal using non-mechanical methods, such as hand pruning and herbicides application. Heavy equipment is also used occasionally. On average, approximately 1,000 linear feet of vegetation management is conducted annually. No herbicides are applied directly to submerged vegetation in water. Herbicides are only applied above the high water line within channel banks. Vegetation management is performed year-round in a manner to prevent loss of habitat and erosion, and does not include clear cutting or wholesale removal of vegetation.

13. Downed tree management refers to the management of trees and large branches that naturally fall into stream channels to maintain channel capacity and minimize flow obstructions in channels. The District seeks to promote recruitment of woody debris in channels to benefit in-stream habitat. Therefore, the District's objective is to leave downed trees in place whenever possible to encourage the formation of channel features such as scour pools and slack water areas which are used by juvenile salmonids. However, if the tree or branch threatens flood conveyance capacity or channel stability, the District will modify the downed tree by trimming off branches or cutting it into smaller pieces. If further action is needed to ensure flood protection, the tree may be repositioned in the channel, such as moved from perpendicular to parallel to stream flow, or may be removed from the channel. Downed tree management is generally conducted during the dry season, but can occur year-round to prevent flooding or erosion.

14. Bank stabilization involves repairing stream banks where a weakened, unstable, or failing bank causes or threatens to cause damage to an adjacent property, creates excessive erosion, creates a public safety concern such as flooding or threatening roads, or impacts riparian habitat and other natural resources. The District's objective is to conduct bank stabilization in a preventative manner by planting exposed banks with appropriate native species. If a more engineered approach is needed, the District prefers to use biotechnical approaches. Biotechnical erosion controls incorporate live vegetation with other natural elements to provide structural stability to stream banks. Bank stabilization approaches include erosion control fabric with coir logs, brush mattresses, willow walls, encapsulated soil lifts, and crib walls. If no effective alternative is feasible due to the magnitude of the hydraulic forces involved, or other land use or flooding constraints, then the District may use rock at the toe of a stream bank, in combination with other stream bank stabilization measures, to repair an eroding stream bank. Individual bank stabilization projects covered under the SMP will not affect more than 100 contiguous linear feet of stream bank annually and are limited to biotechnical designs. The District has not included bigger projects in the SMP for which the District will need to obtain individual permits.

15. Sediment removal from channels maintained by the District occurs when sediment accumulates and significantly reduces the capacity of the channel and its ability to convey flood waters. Besides improving flow conveyance for flood management, sediment removal activities may provide other beneficial outcomes including improved fish passage, improved circulation and water quality, enhanced geomorphic functions, and improved aquatic habitat. The number of sediment removal projects undertaken annually and the quantity of sediment removed in a given

year depends on past weather and hydrologic conditions, as well as the frequency and extent of past maintenance activities. Based on past activities, the District expects to conduct two to five sediment removal projects annually. For most sediment removal projects, excavators are used from the top-of-bank. For projects where the use of excavators from the top-of-bank is not possible, or would cause major vegetation impacts, sediment removal equipment may be used within the channel. For larger equipment, this may require the construction of temporary access ramps. Most commonly, the District needs to alleviate a specific flow concern at an individual crossing, culvert, or other in-channel facility that experiences regular sediment accumulation. Any sediment removal projects greater than 500 linear feet are subject to individual project permits.

16. The District conducts several other maintenance activities as part of its overall maintenance program. These other activities occur on a less frequent basis and include replacing culverts, maintaining access roads and drainage ditches, and managing blockages by beavers, which may use freshwater wetlands for cover, food, and hut or dam construction. Beaver activities are monitored as part of the annual stream reconnaissance surveys. When debris dams build up to a degree that adversely impacts a significant reach upstream and downstream, the District will trim branches and cut through long sections with a chain saw so the blockage will break up during the next large flow event. These other maintenance activities are conducted anywhere in the District's maintenance jurisdiction. The District anticipates performing two to three minor maintenance projects annually.

17. The District implements stream maintenance activities in an integrated stream management approach that involves protecting and enhancing existing in-stream resources while providing for flood conveyance capacity in the stream channels.

    a. The habitat protection and enhancement component consists of a riparian planting program, in-stream habitat complexity enhancement, and in-stream gravel augmentation. Riparian planting enhances habitat for wildlife using terrestrial riparian areas while providing shading, sources of organic matter and coarse woody debris, and water quality benefits to aquatic species. The District currently plants approximately 650 trees annually.

    b. The District evaluates channels and maintenance sites for opportunities to enhance or develop in-stream complexity features within fish-bearing streams. If a site is deemed appropriate, new in-stream complexity features can be integrated with gravel augmentation projects. The District implements two in-stream habitat complexity enhancement projects annually.

    c. Gravel augmentation projects improve fish spawning and rearing habitat. Opportunities to augment gravel in non-tidal salmonid streams will be assessed annually. The District expects to implement up to three gravel augmentation projects annually.

18. The SMP Manual contains Sediment Sampling and Analysis Guidelines (Appendix D). These guidelines set forth requirements for sampling, analysis, and characterization, reuse and disposal of sediment removed as part of SMP activities. Sediment reuse or disposal options are based on the chemical quality of the sediment removed.

19. The District generates an annual total of 200 cubic yards of sediment and debris through its maintenance activities. Removed sediment and debris is reused, recycled or taken to appropriate disposal sites based on the quality and conditions of the collected sediment and debris. Disposal sites include two sites maintained in association with the U.S. Army Corps of Engineers (Army Corps) for dredging activities along the Napa River, namely the Edgerly Island Disposal Site and the Napa Sanitation District's Imola Site. Sediment and debris may also be taken to the nearest

landfill for disposal. Vegetative debris generated by maintenance activities are either chipped and left onsite or taken to a local compost or mulch facility.

20. The following activities are not included in the SMP and therefore not covered in this Order: capital improvement projects, projects that would alter the designed flood conveyance capacity of a channel, sediment removal or dredging projects greater than 500 feet in length, maintenance of restoration projects outside of flood control channels for which maintenance and monitoring is performed under project-specific permits, maintenance of the Army Corps' Napa River/Napa Creek Flood Protection Project, and emergency activities and procedures. A situation is considered an "emergency" if it is a sudden, unexpected occurrence involving a clear and imminent danger that demands immediate action to prevent or mitigate loss of or damage to life, health, property, or essential public services. Emergencies include such occurrences as fire, flood, earthquake or other soil or geologic movements, as well as such occurrences as riot, accident or sabotage (California Public Resources Code section 21060.3).

21. Ground disturbing maintenance activities that occur in the channel below top-of-bank (including downed tree management, mechanized vegetation management, bank stabilization, and sediment removal) will take place during the low-flow or dry season (herein defined as June 15-October 31), unless an exception is granted. Exceptions may be made on a project-by-project basis with advance approval of federal and State regulatory agencies as appropriate. Herbicide applications, installation of in-stream habitat complexity features, and installation of gravel augmentation projects will also be conducted during the low-flow or dry season.

22. Non-ground disturbing work may be performed in the channel zone, but outside the low-flow channel, throughout the year. This includes hand removing non-native invasive plant species, planting riparian vegetation, maintaining channel access roads for drainage and accessibility, conducting minor repairs of culverts, and managing beaver activities, provided there is no discharge of waste that may adversely impact water quality or beneficial uses. Debris removal by hand necessary to prevent flooding may also be performed throughout the year.

23. The District will conduct an annual inventory and assessment of the routinely-maintained stream reaches in the County, which describes water quality, geomorphology and habitat. Assessments will be updated periodically to reflect changes and progress in achieving the goals of the SMP. Understanding stream resources, their locations, and interactions is fundamental to the District's approach to avoid, minimize and mitigate environmental impacts of routine maintenance activities. The District developed these channel characterizations to provide enough detail and photo documentation to support the annual review and approval of maintenance projects.

24. The SMP Manual includes the District's planning guidelines or principles to determine the essential routine maintenance activities that will be included in the Annual Workplans. These principles consider the natural function of the system, provide an understanding of local physical constraints, identify sensitive habitats, consider watershed processes, determine when action is needed, identify maintenance activities needed, and strive to recognize and implement solutions to minimize the on-going need for maintenance activities. Each stream reach is evaluated within its sub-basin and watershed context, and key maintenance considerations and environmental enhancement opportunities are summarized in the Annual Workplans.

25. The District has included in the SMP Manual an approach that minimizes detrimental impacts to beneficial uses. In the SMP Manual, the District proposes activities that will result in long-term beneficial effects on riparian and aquatic habitat for a suite of fish and wildlife species. Strategic sediment reduction activities, such as stabilization of landslide-prone areas and improved land use

practices in upper watersheds and along reaches currently delivering sediment, will reduce the amount of sediment delivered to maintained channels. These benefits will be realized through the reduction of maintenance over time, the reduction in the need to conduct reach-scale sediment removal in creeks, the removal of migratory barriers or impediments, and the creation of more natural stream channels and stream corridors. When considered collectively, the beneficial effects achieved through implementation of the SMP will help build a healthier and more naturally functional stream network and watershed.

26. Although the Regional Water Board agrees with the District determination that no significant environmental effects will result from implementation of the SMP, the less-than significant impacts on beneficial uses and water quality from SMP activities that cannot be entirely avoided through pre-maintenance planning will be mitigated through implementation of the mitigation measures and BMPs described within the SMP Manual.

27. The District will implement onsite and offsite mitigation to mitigate for the less-than significant permanent and temporary impacts from stream maintenance activities covered under this Order. Onsite in-kind mitigation will mitigate for the loss of stream functions and riparian habitat from sediment removal and bank stabilization projects as described in the SMP Manual. Onsite in-kind mitigation may include planting of riparian trees, understory shrubs or aquatic plants, removal of exotic and invasive species and corresponding riparian planting, construction of low-flow channels and other geomorphic features to enhance in-stream habitat and hydrologic function, and removal of migration barriers. Additionally, if onsite in-kind mitigation is not possible, then offsite in-kind mitigation will be implemented at a location within the watershed area that would benefit from this type of mitigation. Permanent and temporary impacts will be mitigated offsite by restoring or enhancing habitat and stabilizing eroded areas within the same watershed. Offsite mitigation includes funding local watershed restoration projects within the impacted watershed that would increase riparian habitat and reduce the overall need to remove sediment in certain flood control channels.

28. This Order requires submittal of Annual Workplans acceptable to the Executive Officer by June 1 of each year. The Annual Workplans will describe the channel maintenance activities to be conducted during the upcoming maintenance season, including an assessment of potential permanent and temporary project impacts, proposed habitat protection and enhancement projects, and the proposed mitigation and monitoring projects that would compensate for any unavoidable adverse impacts, as outlined in the SMP Manual and final California Environmental Quality Act compliance document. The Annual Workplans will describe the sediment reuse, recycled and disposal locations, site specific reuse or disposal criteria, and the test results from sampling sediments from proposed sediment removal projects.

29. This Order requires submittal of Annual Reports acceptable to the Executive Officer by January 31 of the following year. The Annual Reports will describe channel maintenance activities conducted, descriptions of mitigation implemented, and monitoring results. The Annual Reports will include any lessons learned and recommendations to update BMPs identified in the SMP Manual, if needed.

30. This Order requires that, after each maintenance season, the District and Regional Water Board staff meet to discuss the performance of the SMP, review lessons learned from the prior maintenance season, and determine the need to improve stream maintenance techniques and BMPs. The District shall implement all stream maintenance techniques and BMPs deemed necessary by the Executive Officer in connection with such review.

31. The County adopted on June 3, 2008, the "Napa County Post Construction Runoff Management Requirements" and will incorporate Low Impact Development (LID) principles and techniques into its SMP activities to the maximum extent practicable. Applicable LID activities may include installing/retrofitting stormwater/flood control basins and implementing stormwater treatment BMPs.

32. **California Wetlands Portal:** It has been determined through regional, State, and national studies that tracking of mitigation/restoration projects must be improved to better assess the performance of these projects, following monitoring periods that last several years. In addition, to effectively carry out the State's Wetlands Conservation Policy of no net loss to wetlands, the State needs to closely track both wetland losses and mitigation/restoration project success. Therefore, we require that the applicant use once annually the California Wetlands Form to provide all SMP information related to impacts and mitigation/restoration measures. An electronic copy of the form and instructions can be downloaded at: http://www.waterboards.ca.gov/sanfranciscobay/certs.shtml. Project information concerning impacts and mitigation/restoration will be made available at the web link: http://www.californiawetlands.net.

33. This Order is effective only if the District pays all fees required under Title 23, California Code of Regulations (23 CCR).

Regulatory Framework

34. The Water Quality Control Plan for the San Francisco Bay Basin (Basin Plan) is the Regional Water Board's master water quality control planning document. It designates beneficial uses and water quality objectives for waters of the State, including surface waters and groundwater. It also includes implementation plans to achieve water quality objectives. The Basin Plan was duly adopted by the Regional Water Board and approved by the State Water Resources Control Board (State Water Board), Office of Administrative Law and U.S. Environmental Protection Agency, where required.

35. The Basin Plan lists the following existing and potential beneficial uses for surfaces waters within the Napa River watershed:

    a. Agricultural Supply (AGR)
    b. Cold Freshwater Habitat (COLD)
    c. Municipal and Domestic Supply (MUN)
    d. Fish Migration (MIGR)
    e. Fish Spawning (SPWN)
    f. Freshwater Replenishment (FRSH)
    g. Navigation (NAV)
    h. Non-contact Water Recreation (REC-2)
    i. Rare, Threatened, or Endangered Species (RARE)
    j. Water Contact Recreation (REC-1)
    k. Warm Freshwater Habitat (WARM)
    l. Wildlife Habitat (WILD)

The District routinely conducts maintenance activities on the Napa River and other drainages within the Napa River watershed: Camille, Conn, Dry, Fagan, Hopper, Salvador, Sheehy, Sulphur, and Tulucay creeks; Beard and Solano ditches; the Yountville Outfall and Collector; and the Salvador Collector. Vegetation management, bank stabilization, and sediment removal activities covered by this Order may temporarily impact the beneficial uses identified above.

36. The Basin Plan lists the following existing and potential beneficial uses for surfaces waters within the Suisun Creek watershed:

    a. Cold Freshwater Habitat (COLD)

    b. Fish Migration (MIGR)

    c. Fish Spawning (SPWN)

    d. Freshwater Replenishment (FRSH)

    e. Non-contact Water Recreation (REC-2)

    f. Rare, Threatened, or Endangered Species (RARE)

    g. Water Contact Recreation (REC-1)

    h. Warm Freshwater Habitat (WARM)

    i. Wildlife Habitat (WILD)

    The District routinely conducts maintenance activities in the Suisun Creek watershed. Vegetation management, bank stabilization, and sediment removal activities covered by this Order may temporarily impact the beneficial uses identified above.

37. The Napa-Sonoma Valley (Napa Valley) and Napa-Sonoma Volcanic Highlands groundwater basins are located in the Napa River watershed area and support the beneficial uses listed below:

    a. Agricultural Water Supply (AGR)

    b. Industrial Service Water Supply (IND)

    c. Industrial Process Water Supply (PROC)

    d. Municipal and Domestic Water Supply (MUN)

38. The Napa River is identified as impaired on the Clean Water Act (CWA) section 303(d) list by nutrients, pathogens, and sedimentation/siltation.

39. The Napa River drains into San Pablo Bay. San Pablo Bay is identified as impaired on the CWA section 303(d) list by chlordane, DDT, dieldrin, dioxin compounds, furan compounds, invasive species mercury, PCBs and selenium.

40. Suisun Creek is identified as impaired on the CWA section 303(d) list by low dissolved oxygen and temperature.

41. Suisun Creek drains into Suisun Marsh and Suisun Bay. Suisun Marsh is identified as impaired on the CWA section 303(d) list by mercury, nutrients, organic enrichment/low dissolved oxygen and salinity/TDS/chlorides. Suisun Bay is identified as impaired on the CWA section 303(d) list by chlordane, DDT, diazinon, dieldrin, dioxin compounds, furan compounds, invasive species, mercury, nickel, PCBs, PBDEs and selenium.

42. The California Environmental Quality Act (CEQA) requires all discretionary projects approved by public agencies to be in full compliance with CEQA and requires a lead agency (in this case, the District) to prepare an appropriate environmental document for such projects. The District prepared and certified the Stream Maintenance Program Initial Study/Negative Declaration (IS/ND) on February 9, 2012, State Clearinghouse No. 2011122050. The IS/ND found no significant impacts that are under the purview and jurisdiction of the Regional Water Board: 1) aquatic species including habitat for special status species, 2) water quality, and 3) hazardous materials. The IS/ND also found that the mitigation measures would mitigate any remaining impacts to less than significant levels. The mitigation measures specified in the SMP Manual include a combination of compensatory mitigation and watershed-level project funding to mitigate for any temporary disturbance or loss of aquatic habitat and specific BMPs to mitigate for the remaining maintenance activity-related impacts.

43. The Regional Water Board, as a responsible agency under CEQA, has considered the IS/ND. The Regional Water Board finds that the proposed activities will not result in significant environmental effects. To the extent any activities potentially have less-than-significant effects on water quality, the Regional Water Board finds that further mitigation measures specified in the SMP Manual and additional monitoring required by the Regional Water Board in this WDR/WQC will avoid or substantially lessen the effects on water quality, as discussed in the negative declaration. In adopting this WDR/WQC, the Regional Water Board has eliminated or substantially lessened the less-than-significant effects on water quality, and therefore approves the project. Overall, the Regional Water Board finds that the SMP will enhance and protect natural resources and the environment.

44. The District's maintenance activities are consistent with activities administered and permitted by the Army Corps' Nationwide Permit Program. Specifically, when the District needs to conduct maintenance work below the ordinary high water mark (OHWM) of channels, such as with bank stabilization or sediment removal projects, the District will seek coverage under Nationwide Permits 3 (Maintenance), 13 (Bank Stabilization), 18 (Minor Discharges), 19 (Minor Dredging), 27 (Aquatic Habitat Restoration, Establishment, and Enhancement Activities), and 43 (Stormwater Management Facilities).

45. Pursuant to 23 CCR sections 3857 and 3859, the Regional Water Board is issuing WDRs and WQC for the activities proposed in the SMP Manual.

46. The Regional Water Board has notified the District and interested parties of its intent to issue WDRs and WQC for the activities proposed in the SMP Manual.

47. The Regional Water Board, in a public meeting, heard and considered all comments pertaining to this Order.

IT IS HEREBY ORDERED that, the Regional Water Board certifies that the Stream Maintenance Program described herein shall comply with sections 301, 302, 303, 306, and 307 of the Clean Water Act, and with applicable provisions of State law, provided that the District complies with the following terms and conditions:

A. Discharge Prohibitions

1. The direct or indirect discharge of wastes, as defined in section 13050(d) of the Water Code (CWC), within or outside of the active project site, to surface waters or surface water drainage courses is prohibited, except as authorized in this Order.
2. The discharge shall not cause degradation of any water supply.
3. All vegetation management activities that could result in the runoff of pesticides, which are not registered for aquatic use, into waters of the State are prohibited.
4. Vegetation management activities that could result in the destabilization of stream banks or increase sediment input into waters of the State are prohibited.
5. Downed tree management activities that could result in the destabilization of stream banks or increase sediment input into waters of the State are prohibited.
6. Excavated sediment shall remain within designated disposal areas at all times. The designated disposal areas are: a) any offsite, authorized temporary or permanent location maintained in compliance with federal and State regulations, b) any onsite, authorized temporary or permanent location, provided material shall be isolated and contained to prevent impacts to waters of the State and their beneficial uses, or c) a permitted landfill.
7. The discharge of sediment and runoff or decant water from excavated materials disposed of at any temporary or permanent disposal site, to waters of the State, is prohibited.
8. The discharge of wastewater (effluent) into a channel, stream or groundwater resulting from the handling and placement of removed sediment at a temporary stockpile site (if used) is prohibited.
9. Habitat protection and enhancement activities that could result in the destabilization of stream banks or increase sediment input into waters of the State are prohibited.
10. Maintenance activities subject to these requirements shall not cause a condition of pollution or nuisance as defined in CWC section 13050 (l) and (m), respectively.
11. Groundwater beneficial uses shall not be degraded as a result of the SMP.
12. No debris, soil, silt, sand, cement, concrete, or washings thereof, or other construction related materials or wastes, oil or petroleum products or other organic or earthen material shall be allowed to enter into or be placed where it may be washed by rainfall or runoff into waters of the State. When operations are completed, any excess material shall be removed from the work area and any areas adjacent to the work area where such material may be washed into waters of the State.

B. Discharge Specifications

1. Appropriate soil erosion control measures shall be undertaken and maintained to prevent discharge of sediment to surface waters or surface water drainage courses.
2. Excavated material shall be fully contained to prevent any transport by wind, surface runoff or erosion into waters of the State. At no point within the containment area shall the elevation of sediment exceed that of the containment levees.

3. In accordance with CWC section 13260, the District shall file with the Regional Water Board a report of any material change in the character, location, or quantity of this waste discharge that is beyond the scope of this Order. Any proposed material change in the discharge requires approval by the Regional Water Board after a hearing under CWC section 13263.
4. The District shall immediately, and in no case no later than within 24 hours of occurrence, notify the Regional Water Board staff by telephone or e-mail whenever an adverse condition occurs as a result of a discharge. An adverse condition includes, but is not limited to, a violation or threatened violation of the conditions of this Order, spill of petroleum products or toxic chemicals, or damage to control facilities that could affect compliance. A written notification of the adverse condition shall be submitted to the Regional Water Board within five days of occurrence. The written notification shall identify the adverse condition, describe the actions necessary to remedy the condition, and specify a timetable, subject to approval by the Executive Officer, for the remedial actions that follow any initial response to the adverse condition.

C. Receiving Water Limitations

1. SMP activities shall not cause the following conditions to exist in waters of the State at anyplace:
   a. Waters shall not contain floating material, including solids, liquids, foams, and scum, in concentrations that cause nuisance or adversely affect beneficial uses.
   b. Waters shall not contain oils, greases, waxes, or other materials in concentrations that result in a visible film or coating on the surface of the water or on objects in the water, that cause nuisance, or that otherwise adversely affect beneficial uses.
   c. Waters shall not contain biostimulatory substances in concentration that promote aquatic growth to the extent that such growth cause nuisance or adversely affect beneficial uses.
   d. Waters shall be maintained free of toxic substances in concentrations that are toxic to, or that produce detrimental physiological responses in human, plant, animal, or aquatic life.
   e. There shall be no alteration of temperature beyond present natural background levels.
   f. Dissolved oxygen, with the following beneficial use designations, shall not be reduced below the following minimums in the receiving water from the point of discharge:
      - WARM 5.0 mg/l minimum
      - COLD 7.0 mg/l minimum
2. SMP activities shall not cause the following limits to be exceeded in waters of the State at any point:
   a. *Dissolved Oxygen:*
   5.0 (WARM) or 7.0 (COLD) mg/l minimum. When natural factors cause lesser concentrations, then this discharge shall not cause further reduction in the concentration of dissolved oxygen.
   b. *Dissolved Sulfide:*
   All water shall be free from dissolved sulfide concentrations above natural background levels.
   c. *pH:*
   A variation of natural ambient pH by more than 0.5 pH units.

d. *Toxicity:*
All waters shall be maintained free of toxic substances in concentrations that are lethal to or that produce other detrimental responses in aquatic organisms.

e. *Un-ionized Ammonia:*
0.025 mg/L as N, annual median; and 0.16 mg/L as N, maximum.

f. *Salinity:*
The project shall not increase total dissolved solids or salinity to adversely affect beneficial uses.

g. *Turbidity:*
Waters shall be free of changes in turbidity that cause nuisance or adversely affect beneficial uses. Increases from normal background light penetration or turbidity relatable to waste discharge shall not be greater than 10 percent in areas where natural turbidity is greater than 50 NTU.

3. SMP activities shall not cause a violation of any particular water quality standard for receiving waters adopted by the Regional Water Board or the State Water Board as required by the CWA and regulations adopted there under. If more stringent applicable water quality standards are promulgated or approved pursuant to CWA section 303, or amendments thereto, the Regional Water Board will revise and modify this Order in accordance with such more stringent standards.

D. Provisions

Vegetation Management

1. The District shall follow the vegetation removal and management guidelines described in the SMP Manual.
2. Vegetation management and replanting shall be conducted using a strategy which maximizes the functions of the vegetation to shade the active channel, stabilize channel banks, and provide in stream habitat.

Downed Tree Management

3. The District shall follow the downed tree management guidelines described in the SMP Manual.
4. Downed tree management shall be conducted using a strategy which maximizes the functions of the vegetation to stabilize active channel banks and provide in stream habitat.
5. Downed tree management activities shall not adversely impact the riparian zone or habitat. Overall impacts of downed tree management activities shall improve beneficial uses.

Erosion Protection/Bank Stabilization

6. The District shall use the bank stabilization methods described in the SMP Manual. Any minor changes to the bank repair methods that still meet the overall criteria and function of the methods described in this WDR/WQC and the SMP shall be proposed in the Annual Workplans and approved in writing by the Regional Water Board Executive Officer.
7. The use of soil bioengineering systems as presented in the Natural Resource Conservation Service (NRCS) and Army Corps manuals shall be used as the first and primary strategy for streambank stabilization projects. Rock and riprap installation shall be limited to only those areas experiencing

shear stresses that exceed the performance of vegetation based soil bioengineering systems as designated in NRCS and Army Corps shear stress tables[1].

Sediment and Debris Removal

8. The District shall follow the sediment and debris removal guidelines described in the SMP Manual.
9. Targeted and localized sediment removal in engineered channels shall occur in limited areas that do not exceed 500 linear feet of channel length.
10. The District shall implement the Sediment Sampling and Analysis Guidelines in the SMP Manual.
11. The District may temporarily stockpile excavated sediment prior to disposal or reuse, provided that appropriate State and federal regulations are met and BMPs are implemented to protect water quality and beneficial uses. The excavated sediment may be stockpiled onsite within engineered containment areas so that it can be loaded into trucks for offsite disposal within three working days. The excavated sediment may also be temporarily stockpiled at an offsite location so that runoff, sediment, or decant water from the excavated materials shall not contact waters of the State.
12. Sediment removed as part of maintenance activities shall be properly characterized through laboratory analytical testing, as described in the approved Sediment Sampling and Analysis Guidelines (Appendix D of the SMP Manual), and shall be hauled offsite to suitable upland disposal sites, including the Edgerly Island Disposal Site and the Napa Sanitation District's Imola Site. Sediment and debris may also be taken to the nearest landfill for disposal. Vegetative debris generated by maintenance activities are either chipped and left onsite or taken to a local compost or mulch facility. Proposed disposal locations shall be submitted by the District annually in the Annual Workplans for approval by the Executive Officer.
13. The District will test sediment targeted for removal to determine the suitability for disposal or reuse based on sediment chemistry. Sampling frequency shall follow the *Guidelines for Implementing the Inland Testing Manual in the San Francisco Bay Region* (DMMO, September 2001). As specified in Appendix D of the SMP Manual, the Sediment Sampling and Analysis Guidelines, sediment samples will be collected and analyzed according to the *Beneficial Reuse of Dredged Materials: Sediment Screening and Testing Guidelines* (RWQCB 2000), as appropriate for the proposed disposal or reuse site. Sediment testing results will be submitted to the Regional Water Board for review and approval. Sediment disposal and reuse sites are identified when the need for sediment removal activities occurs, which may not be necessary every year. In general, sediment disposal sites can be characterized into five categories based on potential reuse or disposal opportunities. These categories include (1) onsite reuse, (2) other wetland, channel, or floodplain restoration reuse, (3) upland agricultural or commercial reuse (dry), (4) landfill disposal, and (5) hazardous waste disposal. The goal is to select disposal options that most beneficially reuse the sediment with the least environmental effects. If hazardous levels of contaminants are present, the material shall be taken to a permitted hazardous waste facility.

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[1]Fischenich, J.C. (2001) Stability Thresholds for Stream Restoration Materials, EMRRP Technical Notes Collection (ERDC TNEMRRP-SR-29), U.S. Army Engineer Research and Development Center, U.S. Army Corps of Engineers, Vicksburg, MS.

Bentrup, Gary, J. Chris Hoag (1998) <u>The Practical Streambank Bioengineering Guide, User's Guide for Natural Streambank Stabilization Techniques in the Arid and Semi-Arid Great basin and Intermountain West</u>, USDA NRCS, Wash. D.C.

14. The District shall have equipment and supplies onsite (or readily available nearby) that could be deployed quickly to provide additional filtration if turbidity is observed.
15. All staging shall occur on adjacent access roads or previously-disturbed areas. Soil and riprap shall be staged in areas that have been previously-disturbed (e.g., service road, turnouts). If repair activities affect the active channel, the work area shall be effectively isolated from flowing stream segments using silt fences, wattles, or cofferdams, and restored to pre-project conditions after maintenance is complete.
16. The discharge of any hazardous, designated or non-hazardous waste as defined in Title 27 California Code of Regulations, Division 2, Subdivision 1, Chapter 2 shall be conducted in accordance with applicable State and federal regulations.
17. The District shall clean up, remove and relocate any wastes that are discharged in violation of this Order.
18. The District shall demonstrate compliance with all permitting and CEQA review requirements for offsite sediment disposal sites proposed for the SMP and for any alternative offsite sediment disposal sites. If requested by the Executive Officer, a delineation of existing jurisdictional waters of the State and United States at any temporary or permanent sediment disposal site, verified according to the Army Corps delineation standards, shall be conducted prior to the preparation for disposal and submitted for the Executive Officer's acceptance prior to the disposal of sediment.

Other Minor Maintenance Activities

19. The District shall follow the other minor maintenance activities guidelines described in the SMP Manual.
20. Other stream maintenance activities shall not result in direct or cumulative significant impacts to water quality or beneficial uses of waters of the State.
21. Maintenance activities that may result in modifications to stream cross-sections and or profiles shall be implemented to achieve sustainable and appropriate channel geometries.

Habitat Protection and Enhancement

22. The District shall follow the habitat protection and enhancement guidelines described in the SMP Manual.
23. Habitat protection and enhancement activities shall not result in direct or cumulative significant adverse impacts to water quality or beneficial uses of waters of the State.
24. Habitat protection and enhancement activities shall be conducted using a strategy which maximizes the functions of the vegetation to shade the active channel, stabilize active channel banks, and provide in-stream habitat.
25. Habitat protection and enhancement activities shall not adversely impact the riparian zone, shade, canopy coverage, or habitat. Overall impacts of vegetation management activities shall improve beneficial uses.

Quantitative Assessments

26. The District shall develop a Workplan and an implementation schedule for developing channel capacity objectives and estimates of flood stage-discharge relationships. The development of this information will guide the selection of annual maintenance locations needed for flood protection as reported in the Annual Workplans. Channel dimension objectives that facilitate stream

equilibrium conditions, address excessive erosion and deposition problems, and promote sustainable habitat conditions, shall be developed and used to guide channel grading and enhancements activities. The Workplan and its associated supporting documentation shall be submitted to the Regional Water Board by May 31, 2014, for approval by the Executive Officer. Specifically:

a. The District shall develop roughness objectives for all major channels contained in the SMP Manual and determine the tolerance for loss of freeboard in engineered flood control channels.

b. The District shall provide preliminary estimates of stage–discharge relationships for channel reaches most likely subject to maintenance (including those areas and channels identified in the inventories for targeted and localized sediment and vegetation removal projects). These estimates should be based on field measurements. For those channels lacking sufficient high flow data, the District shall implement a program for developing stage-discharge relationships for larger magnitude flows.

c. The District shall develop estimates of channel dimensions for best establishing quasi-equilibrium conditions to avoid future excessive erosion of or deposition within an active channel. These dimensions can be established using a combination of information from regional stream restoration curves, reference reach data, computation of effective discharges, shear stresses and other assessments. These estimations of active channel dimensions should guide the management approaches contained in the maintenance plans and be used in implementing the maintenance activities in order to achieve more sustainable channel shapes and floodplains.

Best Management Practices

27. The District shall implement the BMPs contained within the SMP Manual and the IS/ND (or alternative BMPs of comparable effectiveness) to prevent pollutants from draining, being washed, or otherwise discharging into waters of the State during SMP activities.

28. The District shall follow the procedures and protocols in the Fishnet 4C Manual when removing large woody debris for maintenance purposes[2]. Large woody debris shall not be removed or be managed in a channel if it potentially functions as habitat for salmonids or other threatened and endangered species. If the large woody debris poses a credible risk of blocking a culvert, bridge, or otherwise obstructing flow, or causing structural damage, or destabilizing a channel, it may be relocated, repositioned or cabled to a stream bank in a manner to protect existing habitat. For channels designated by the SMP to not have potential salmonid or other threatened and endangered species habitat, large woody debris can be immediately removed or relocated to a more suitable location if the large woody debris is posing a significant and imminent threat of structural damage.

29. The District shall divert any flow at the site around the active maintenance areas in a non-erosive manner.

30. The District shall operate pumps/generators in locations where spills will not result in direct discharge to streams or other waters of the United States.

31. The District shall halt work activities if fish, amphibians or other aquatic organisms are exhibiting stress or dead within 1,000 feet of work activity or discharge. The District shall immediately

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[2] Fishnet 4C, MFG, Inc., Prunuske Chatham, Inc., Pacific Watershed Associates (2004) Guidelines For Protecting Aquatic Habitat and Salmon Fisheries for County Road Maintenance, prepared for Fishnet 4C Counties, California Department of Fish and Game, National Marine Fisheries Service, California Resources Agency.

assign a qualified biologist to investigate the cause of the problem, to define an acceptable corrective action plan, and to determine if the cause is related to SMP activities. The District shall immediately report all incidents involving dead or stressed aquatic organisms, as well as prescribed action plans, to Regional Water Board and California Department of Fish and Game (CDFG) staff.

Mitigation

32. The District shall implement the Mitigation Monitoring and Reporting Program included in the SMP Manual for all less-than significant effects on water quality that may result from activities under the SMP.

33. The District shall mitigate for both permanent and temporary impacts from its stream maintenance activities by implementing in-kind onsite mitigation, and shall only implement in-kind offsite mitigation if there is no opportunity to mitigate onsite.

34. The District shall mitigate for the temporal loss of beneficial uses by funding offsite watershed-level projects that would address watershed-level issues such as erosion to reduce the overall need to conduct stream maintenance activities.

35. Watershed mitigation projects may include such activities as headwater-area erosion control, revegetation of riparian corridors, invasive plant removal, or other stream restoration practices. Watershed-based mitigation shall provide restorative and mitigating watershed solutions by partnering with local private property owners, municipalities, restoration organizations, creek groups, schools, and resource conservation districts. Post-construction stormwater treatment/LID projects that are not required by the State Water Board's Phase II Municipal Stormwater Permit and provide improvements to water quality may be considered as watershed mitigation projects.

36. The District shall submit proposed mitigation sites to the Executive Officer for approval as part of the Annual Workplans. In the event that a proposed mitigation activity is denied or a site is rescinded for any reason, an alternative mitigation proposal that provides comparable levels of mitigation shall be submitted to the Executive Officer for concurrence no later than 90 days following denial or rescission. The District shall implement those alternative mitigation proposals that the Executive Officer has approved.

37. The District shall mitigate for impacts to water quality and beneficial uses from its vegetation management activities. Mitigation shall include revegetation with native vegetation, and other methods.

Monitoring and Reporting

38. The District shall monitor all active project sites according to the Monitoring and Reporting Program attached to this Order. All self-monitoring reports shall be submitted annually to the Regional Water Board as part of the Annual Reports.

39. The District shall submit the Annual Workplans that include information on the projects that will be conducted in the upcoming year. The District shall include in the Annual Workplans a list of proposed projects that would impact channels identified as potential habitat for threatened or endangered species, or providing habitat for different lifecycles for salmonids (i.e., migration, spawning, rearing, or refugia).

40. The District shall submit Annual Reports according to the process established in Chapter 10 of the SMP Manual.

41. The Annual Workplans shall be submitted by June 1 of each year. The Executive Officer will approve the Annual Workplans for that year's projects and provide a notice to proceed, or indicate needed modifications to the Annual Workplans, within 30 days of receiving it.

42. The Annual Reports shall be submitted by January 31 of the following year. The District is required to use the standard California Wetlands Form to provide all SMP information describing impacts and restoration measures. An electronic copy of the form can be downloaded at: http://www.waterboards.ca.gov/sanfranciscobay/certs.shtml. The completed form shall be submitted electronically to habitatdata@waterboards.ca.gov or shall be submitted as a hard copy to both (1) the Regional Water Board (see the address on the letterhead), to the attention of California Wetlands Portal and (2) the San Francisco Estuary Institute, 4911 Central Avenue, Richmond, CA 94804, to the attention of Mike May;

43. The District shall submit the inventories noted below. The purpose of the inventories is to guide assessments and determine specific causes of maintenance problems and to develop priority maintenance prevention projects. Each inventory and its associated support documentation shall be submitted to and approved by the Executive Officer.

    a. An inventory of engineered channels shall be submitted with the 2014 Annual Workplans. The inventory shall include a list of all areas and channels identified as engineered channels and all channels that are subject to routine maintenance activities including the specific location of the areas and channels identified.

    b. Inventories for the following types of projects shall be submitted with the Annual Workplans when these types of projects are included in the Annual Workplans:

        i. An inventory of targeted sediment and vegetation removal areas.

        ii. An inventory of localized sediment and vegetation removal areas where activities occur on an on-going basis. Localized projects that are newly-discovered and not listed in the inventory shall be included in the Annual Workplans for that year.

    c. The following inventories shall be submitted with the 2014 Annual Workplan:

        i. An inventory of the stream reaches with hydraulic constrictions (e.g., under-sized culverts, bridge abutments, railroad trestles, utility crossings, and other natural or human caused obstructions) potentially causing backwater conditions, increased water surface elevations, bank instabilities, or fish passage barriers.

        ii. An inventory of stream reaches that are a priority for maintenance based on chronic problems, such as sediment accumulation, flooding, or excessive erosion. The inventory should include an assessment of the causes of the chronic problems and a corrective action plan.

        iii. An inventory of those reaches that potentially function as migration, spawning, or high flow refugia habitat for salmonids.

        iv. An inventory of stream reaches that flow through alluvial fan landscapes.

44. The following activities are exempt from annual notification requirements and may occur any time at the discretion of the District and consistent with the SMP: maintenance of existing access roads located along the top-of-bank where there will be no impact on waters of the State; maintenance of drainage ditches along existing service roads where all work is above the level of top-of-bank of the adjacent stream, and there will be no impact to waters of the State; removal of debris (e.g.,

trash, shopping carts) accumulations using hand labor and not involving the removal of vegetation or large woody debris; and beaver management activities that would not disturb the beavers' habitat.

45. Maintenance activities on any channels identified as modified or natural in the SMP Manual shall require project-specific notification to the Regional Water Board.

46. Project specific notification on all channels shall include photo documentation of existing conditions, a description of the project, and an assessment of the need for the proposed maintenance activities. The District shall also provide post-maintenance photo documentation. The District shall report if any of the proposed projects could impact any channels identified as functioning as potential habitat for threatened or endangered species, or providing habitat for different life cycles for salmonids (i.e., migration, spawning, rearing, or refugia).

47. For maintenance work in engineered channels and District maintenance easements, Regional Water Board staff will review and comment on the project-specific notification information within 30 days of receiving the notification. If Regional Water Board staff has not contacted the District within this 30-day time period, then the District can proceed with the maintenance work as documented in the project specific notification.

48. For maintenance work outside District easements in natural channels, the project-specific notification information will be reviewed by Regional Water Board staff within 30 days. Any ground disturbing activities will require approval of the Executive Officer before work is initiated. If Regional Water Board staff has not contacted the District within a 30-day time period, then the District can proceed with non-ground disturbing maintenance work as documented in the project specific notification.

49. Before June 15 of each year, the District shall organize a meeting and field tour with the Regional Water Board along with other regulatory agencies, to discuss the projects scheduled for the upcoming maintenance season.

50. After each maintenance season, the District and Regional Water Board staff shall meet to discuss the performance of the SMP, review lessons learned from the completed construction season, and determine the need to implement improved stream maintenance techniques and BMPs. The District shall implement all stream maintenance techniques and BMPs deemed necessary by the Executive Officer in connection with such review.

51. After five years of SMP implementation, the District and Regional Water Board, along with other regulatory agencies, shall review the SMP to evaluate its overall effectiveness, and the Regional Water Board shall consider issuing WDRs for an additional five years to allow continuation of SMP implementation. The review shall include an assessment of maintenance activities conducted to date, BMPs, adequacy of the SMP mitigation program, data management, adaptive updates and revisions of the SMP Manual, and overall program coordination and communication between the District and the regulatory agencies. The SMP Manual, and the WDRs and WQC may be revised or updated based on this review.

Fees

52. The fee amount for the WDRs and WQC shall be in accordance with the current fee schedule, per 23 CCR section 2200(a)(1), based on the discharge's Threat to Water Quality and Complexity rating of the Discharge to Land or Surface Waters, plus applicable surcharge(s). The Threat and Complexity rating shall be rated as 3B, and shall remain at this level throughout the period of this

Order. After the initial year, this portion of the fee shall be billed annually to the District. The fee payment shall indicate the Order number, WDID number, and the applicable season.

Records Provisions

53. The District shall maintain a data management system to monitor stream maintenance activities, natural resources in the SMP area, permitting requirements and mitigation efforts.
54. The Executive Officer may request that data be provided to the Regional Water Board at times outside of the reporting requirements specified in this Order.
55. The District shall retain records of all monitoring information, including all calibration and maintenance records, copies of all reports required by this Order, and records of all data used to complete the application for this Order, for a period of at least five years from the date of the sample, measurement, report or application. This period may be extended by request of the Executive Officer at any time.
56. The District shall submit electronic versions of any submitted reports or documents.

General Provisions

57. All Provisions in this Order apply to all channels and activities identified in the SMP Manual.
58. The following activities are not included in the SMP Manual and therefore not covered in this Order: capital improvement projects, projects that would alter the designed flood conveyance capacity of a channel, large sediment removal or dredging projects (greater than 500 feet in length), maintenance of restoration projects outside of flood control channels for which maintenance and monitoring is performed under project-specific permits, maintenance of the Army Corps Napa River/Napa Creek Flood Protection Project, and emergency activities and procedures. A situation is considered an “emergency” if it is a sudden, unexpected occurrence involving a clear and imminent danger that demands immediate action to prevent or mitigate loss of or damage to life, health, property, or essential public services. Emergency includes such occurrences as fire, flood, earthquake or other soil or geologic movements, as well as such occurrences as riot, accident or sabotage (California Public Resources Code section 21060.3).
59. The District shall comply with all the Prohibitions, Discharge Specifications, Receiving Water Limitations, and Provisions of this Order immediately upon adoption of the Order or as provided in the Order.
60. The District shall comply with all necessary approvals or permits for the SMP and its mitigation projects from applicable government agencies, including, but not limited to, the Regional Water Board, CDFG, the Army Corps, U.S. Fish and Wildlife Services (FWS), National Marine Fisheries Services, and local agencies. The District shall submit copies of such approvals or permits to the Executive Officer prior to SMP implementation.
61. This certification does not allow for the take, or incidental take, of any special status species. The District shall use the appropriate protocols, as approved by CDFG and FWS, to ensure that maintenance activities do not impact the Beneficial Use of the Preservation of Rare and Endangered Species.
62. The District shall implement the SMP in accordance with the conditions described in the SMP Manual and the findings herein and shall comply with all applicable water quality standards.
63. SMP activities occurring within the channel shall only occur from June 15 to October 31 or the first significant rainfall after October 15, whichever occurs first (significant rainfall is defined as

0.5 inch of rain in a 24-hour period). No new in-stream sediment removal or bank stabilization work shall start after October 15 of any year, but work already underway shall have until October 31 to be completed. Disturbed soil related to SMP activities shall be stabilized and winterized. Required planting shall be performed no later than the fall/winter planting season in the year following project installation.

64. If, at any time, an unauthorized discharge to surface water (including wetlands, rivers or streams) occurs, or any water quality problem arises, the associated SMP activities shall cease immediately until corrective actions have been implemented, including ensuring that adequate BMPs are implemented to eliminate the discharge and clean up and remediate any recoverable pollutants. The Regional Water Board shall be notified promptly and in no case more than 24 hours after the unauthorized discharge or water quality problem arises.

65. All mitigation activities shall be completed as described in the Mitigation Monitoring and Reporting Program and the SMP.

66. Issuance of WDRs and WQC is subject to modification or revocation upon administrative or judicial review, including review and amendment pursuant to CWC section 13330 and 23 CCR section 3867.

67. The Regional Water Board may add to or modify conditions of this Order, as appropriate, to implement any new or revised total maximum daily load requirements.

68. The Regional Water Board may add to or modify the conditions of this Order, as appropriate, to implement any new or revised water quality standards and implementation plans adopted or approved pursuant to the CWC or CWA section 303.

69. The District shall maintain a copy of this Order and all relevant plans and BMPs at SMP work sites, so as to be available at all times to site operating personnel.

70. The District shall correct any and all problems that arise from an SMP activity, including a failure to meet the conditions of this Order that results in an unauthorized release of pollutants, including sediment.

71. The District shall permit Regional Water Board staff or its authorized representative, upon presentation of credentials:

    a. Entry on to the premises on which maintenance activities are planned or underway, wastes are located, or in which records are kept.

    b. Access to copy any records required to be kept under the terms and conditions of this Order.

    c. Access to inspect any treatment equipment, monitoring equipment or monitoring method required by this Order.

    d. Access to sample any discharge or surface water covered by this Order.

72. In the event of any violation or threatened violation of the conditions of this Order, the violation or threatened violation shall be subject to any remedies, penalties, process or sanctions as provided for under applicable State or federal law. The District shall implement all mitigation measures identified in the SMP Manual relating to aquatic species, water quality, and hazardous materials. In addition, the District shall comply with the Monitoring and Reporting Program attached to this Order, and the SMP Manual and its maintenance-related appendices including the Sediment Sampling and Analysis Guidelines and the Vegetation Management Plan.

73. This Order is not transferable.
74. The authorization of this Order for SMP activities expires on August 31, 2017. Mitigation and monitoring requirements that extend beyond the term of this Order are not subject to the expiration date outlined above, and remain in full effect and are enforceable.

I, Bruce H. Wolfe, Executive Officer, do hereby certify that the foregoing is a full, complete and correct copy of an Order adopted by the California Regional Water Quality Control Board, San Francisco Bay Region on August 8, 2012.

____
Bruce H. Wolfe
Executive Officer

Attachment A: Napa County Stream Maintenance Manual

State of California – The Natural Resources Agency
DEPARTMENT OF FISH AND GAME
Bay Delta Region
7329 Silverado Trail
Napa, CA 94558
(707) 944-5500
www.dfg.ca.gov

EDMUND G. BROWN, JR, Governor
CHARLTON H. BONHAM, Director

June 12, 2012

Napa County Flood Control
and Water Conservation District
Attention: Richard Thomasser
804 First Street
Napa, California 94559

Subject: Final Lake or Streambed Alteration Agreement
Notification No. 1600-2011-0349-R3
Napa County Stream Maintenance Program

Dear Mr. Thomasser:

Enclosed is the final Streambed Alteration Agreement ("Agreement") for the Napa County Stream Maintenance Program ("Project"). Before the Department may issue an Agreement, it must comply with the California Environmental Quality Act ("CEQA"). In this case, the Department, acting as a responsible agency, filed a notice of determination ("NOD") on June 12, 2012 based on information contained in the Negative Declaration the lead agency prepared for the Project.

Under CEQA, filing a NOD starts a 30-day period within which a party may challenge the filing agency's approval of the project. You may begin your project before the 30-day period expires if you have obtained all necessary local, state, and federal permits or other authorizations. However, if you elect to do so, it will be at your own risk.

If you have any questions regarding this matter, please contact Suzanne Gilmore, Environmental Scientist, at (707) 944-5536 or sgilmore@dfg.ca.gov .

Sincerely,

CJ Weightman

Craig J. Weightman
Acting Environmental Program Manager
Bay Delta Region

cc: Warden Morton
Lieutenant Jones
Suzanne Gilmore

Conserving California's Wildlife Since 1870

CALIFORNIA DEPARTMENT OF FISH AND GAME
BAY DELTA REGION
7329 SILVERADO TRAIL
NAPA, CALIFORNIA 94558
(707) 944-5520
WWW.DFG.CA.GOV

STREAMBED ALTERATION AGREEMENT
NOTIFICATION NO. 1600-2011-0349-R3
MULTIPLE SITES

NAPA COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT
NAPA COUNTY STREAM MAINTENANCE PROGRAM

This Streambed Alteration Agreement (Agreement) is entered into between the California Department of Fish and Game (DFG) and the Napa County Flood Control and Water Conservation District (Permittee) as represented by Richard Thomasser acting on behalf of Permittee.

RECITALS

WHEREAS, pursuant to Fish and Game Code (FGC) section 1602, Permittee notified DFG on September 27, 2011 and submitted additional information on November 20, 2011 that Permittee intends to complete the project described herein.

WHEREAS, pursuant to FGC section 1603, DFG has determined that the project could substantially adversely affect existing fish or wildlife resources and has included measures in the Agreement necessary to protect those resources.

WHEREAS, Permittee has reviewed the Agreement and accepts its terms and conditions, including the measures to protect fish and wildlife resources.

NOW THEREFORE, Permittee agrees to complete the project in accordance with the Agreement

PROJECT LOCATION

This Agreement authorizes routine maintenance activities in the County of Napa that fall under the jurisdiction and responsibility of Permittee. Project activities will occur within Napa County, including the Napa River, Putah Creek (Lake Berryessa), and Suisun Creek watersheds as shown in Exhibit 1.

PROJECT DESCRIPTION

The project is limited The Napa County Flood Control and Water Conservation District (NFCD) (Permittee) proposes to conduct routine maintenance within the County of Napa. Routine maintenance shall be defined as those periodically scheduled and implemented activities necessary to maintain the water transport capacity of stream channels and maintain the structural and functioning integrity of existing flood control and sediment detention structures on or affecting streams.

Maintenance activities which both parties agree may be considered "routine" are described in Attachment A. In brief summary, these activities include clearing of debris from existing culverts, minor vegetation removal, debris removal in streams sufficient to restore water flow, bank stabilization using bio-engineered techniques, maintenance and repair of existing sidewalks and trails, and removal of hazardous man-made structures from water bodies for public safety and habitat improvement. Routine maintenance do not include any new work other than described in Attachment A. Routine maintenance does not include the removal of or damage to living riparian vegetation other than that specified in Attachment A.

This 1602 Agreement consists of the Agreement, Attachment A (covered activities), Attachment B (list of definitions), and Exhibit 1 (map of the sections of creeks and channels).

PROJECT IMPACTS

Projects impacts that could occur if the measures to protect fish and wildlife are not followed:

Existing fish or wildlife resources the project could substantially adversely affect include: California red-legged frog (*Rana draytonii*), foothill yellow-legged frog (*Rana boylii*), western pond turtle *(Actinemys marmorata)*, steelhead (*Oncorhynchus mykiss irideus*), pallid bat (*Antrozous pallidus*), common aquatic and terrestrial species.

The adverse effects the project could have on the fish or wildlife resources identified above include: chronic and stochastic increases of sedimentation to streams, loss or decline of riparian and/or emergent marsh habitat, direct take of fish and other aquatic species.

MEASURES TO PROTECT FISH AND WILDLIFE RESOURCES

1. Administrative Measures

Permittee shall meet each administrative requirement described below.

1.1 Documentation at Project Site. Permittee shall make the Agreement, any extensions and amendments to the Agreement, and all related notification materials and California Environmental Quality Act (CEQA) documents, readily available at the project site at all times and shall be presented to DFG personnel, or personnel from another state, federal, or local agency upon request.

1.2 Providing Agreement to Persons at Project Site. Permittee shall provide copies of the Agreement and any extensions and amendments to the Agreement to all persons who will be working on the project at the project site on behalf of Permittee, including but not limited to contractors, subcontractors, inspectors, and monitors.

1.3 Notification of Conflicting Provisions. Permittee shall notify DFG if Permittee determines or learns that a provision in the Agreement might conflict with a provision imposed on the project by another local, state, or federal agency. In that event, DFG shall contact Permittee to resolve any conflict.

1.4 Project Site Entry. Permittee agrees that DFG personnel may enter the project site at any time to verify compliance with the Agreement.

1.5 Inspections. DFG personnel or its agents may inspect the routine maintenance activities performed at any of the work sites at any time. As a result of field inspection, DFG may require that additional conditions be applied to specific activities to protect sensitive biological resources. Such conditions may be amended into this Agreement with the agreement of both parties, or if an exception to authorized activities is identified, Permittee may be asked to submit separate written notification to DFG Bay Delta Region pursuant to Condition 1.7, below.

1.6 Authorized Routine Maintenance Activities. Only those activities specifically described in the Project Description shall be conducted under this Agreement.

1.7 Exceptions to Authorized Activities. Permittee shall submit separate written notification (Forms FG 2023 and FG 2024) pursuant to Section 1602 of the California Fish and Game Code, together with the required fee prescribed in the DFG Streambed Alteration Agreement fee schedule, and otherwise follow the normal notification process prior to the commencement of work activities in all cases where one or more of the following conditions apply:

The proposed work does not meet the criteria established for Covered Activities in Attachment A of this Agreement;

Work will occur at a location where the Department advises Permittee that conditions affecting fish and wildlife resources on the site have substantially changed or such resources would be adversely affected by the proposed activity; and/or

The proposed work would adversely impact a State of California (State) Species of Special Concern or State or federally listed rare, threatened, endangered or candidate species or its habitat.

2. Avoidance and Minimization Measures

To avoid or minimize adverse impacts to fish and wildlife resources identified above, Permittee shall implement each measure listed below when doing maintenance activities within the scope of this RMA.

2.1 Work within creeks with natural (earthen) bottoms shall be performed only between June 15 and October 15 to minimize adverse impacts to fish and wildlife resources and their habitats. Revegetation work is not confined to this time period. Debris removal immediately necessary to prevent flooding may be conducted at anytime.

2.2 No phase of the project shall be initiated if construction work and installation of associated erosion control measures cannot be completed prior to the onset of a storm event predicted by 72-hour weather forecasts from the National Weather Service.

2.3 No equipment shall be operated in wetted portions of the stream (including but not limited to ponded, flowing, or wetland areas) at any time.

2.4 This Agreement does not authorize the take of any State or federally listed threatened species, endangered species, species of special concern, or candidate species discovered at work sites. If DFG determines, or Permittee finds that there are such species on the work site, Permittee shall notify DFG Bay Delta Region, US Fish and Wildlife Service (USFWS), and/or US Army Corps of Engineers (USACOE) as appropriate. Permittee shall immediately cease work until DFG and other applicable agencies deem that the concern over special status species has been resolved. This agreement does not authorize capture and/or handling of listed species.

2.5 Activities occurring within potential habitat for California freshwater shrimp shall be limited to vegetation management and debris removal above the water level. Vegetation or debris overhanging into pools or glides within the natural reaches of the channel shall not be removed or altered.

2.6 If Permittee or its employees, contractors, or agents injures or kills a special-status species, or finds any such animal injured or dead, all activities in the work area shall immediately cease, and DFG and U.S. Fish and Wildlife Service shall be notified by telephone within 1 hour of the discovery.

2.7 Prior to conducting maintenance activities at a given site, a qualified biologist or biological monitor shall assess physical site features to determine whether the site and/or surrounding areas are likely to support special-status species. Permittee shall also consult a current map of California Natural Diversity Database (CNDDB) occurrences in the project area and determine whether the work site is within reasonable dispersal distance of a known species occurrence.

2.8 A qualified biologist shall hold an annual training session for staff responsible for performing routine maintenance activities. Staff will be trained to recognize special-status species and their habitats. Staff will also be trained to use protective measures to ensure that such species are not adversely impacted by routine maintenance activities. The training program shall be updated at least annually to reflect current special-status species management practices. At least one staff person with up-to-date training in special-status species protective measures shall be present at each work site at all times.

2.9 If maintenance work or tree removal occurs during the nesting season of protected raptors and migratory birds (February 1 to August 31), a focused survey for active nests of such birds shall be conducted by a qualified biologist (as determined by a combination of academic training and professional experience in biological sciences and related resource management activities) within 15 days prior to the beginning to Project-related activities. The results of the survey shall be faxed to (707) 944-5595. Refer to Notification Number 1600-2011-0349-3 when submitting the survey to the Department. If this survey finds evidence of such nesting work shall be postponed until the younglings have fledged. If a lapse in Project-related work of 7 days or longer occurs, another focused survey shall be conducted and if required, consultation with the Department shall be required before Project work can be reinitiated.

2.10 A qualified biologist or biological monitor shall conduct a habitat assessment for bats at work sites where culverts, structures and/or trees would be removed or otherwise disturbed for a period of more than two hours. The habitat assessment shall include a visual inspection of features within 50 feet of the work area for potential roosting features no more than 48 hours prior to disturbance of such features. Habitat features found during the survey shall be flagged or marked.

If any habitat features identified in the habitat assessment will be altered or disturbed by project activities, a phased disturbance strategy shall be employed. Non-habitat trees or structural features shall be removed one (1) day prior to removal of habitat features. Permittee shall not attempt to directly disturb (e.g. shake, prod) roosting features.

If bats (individuals or colonies, not just roosting habitat) are detected during the habitat assessment, DFG Bay Delta Region shall be notified immediately. DFG reserves the right to provide additional provisions to this agreement in the event that roosting bats are found.

2.11 If suitable habitat for the California red-legged frog exists at a given work site or within reasonable dispersal distance, a qualified biologist or biological monitor shall conduct a reconnaissance-level survey for this species within 48 hours of the commencement of routine maintenance activities. Surveys from previous years may be used as a guide, but should not be relied upon to determine whether habitat is present. If California red-legged frogs are found during surveys or construction, work shall be placed on hold until further notice from DFG. DFG reserves the right to require separate written notification (Forms FG 2023 and FG 2024) pursuant to Section 1602 of the California Fish and Game Code or provide additional provisions to this Agreement in the event that California red-legged frogs are discovered.

2.12 If habitat for western pond turtles, yellow-legged frogs, rare plants, or other special-status species exists at a given work site and such species are known to exist within reasonable dispersal distance of the work area, a qualified biologist or biological monitor shall conduct a reconnaissance-level survey within 48 hours of the commencement of routine maintenance activities. If there is potential for rare plants to occur at a work site, biological surveys shall be conducted during the appropriate blooming period, prior to initiation of routine maintenance activities. If special-status species are found during surveys or construction and could be adversely impacted by work activities, work shall be placed on hold until further notice from DFG. DFG reserves the right to require separate written notification (Forms FG 2023 and FG 2024) pursuant to Section 1602 of the California Fish and Game Code or provide additional provisions to this Agreement.

2.13 In order to protect the valley elderberry long-horned beetle, elderberry plants (*Sambucas nigra*) shall not be removed or pruned.

2.14 The disturbance or removal of native vegetation shall not exceed the minimum necessary to prevent potential flooding. Precautions shall be taken to avoid other damage to vegetation by people or equipment. Branches and/or limbs overhanging the channel and impacting water flows shall be properly pruned. Woody and herbaceous plants, fallen trees, or trunks or limbs lodged in the bed or bank causing flow restriction shall be cut off at the bed or bank invert with small tools and removed with winch and cable or other equipment operated from top of bank. Root structures are not to be disturbed. Large woody debris that does not obstruct the flow of water shall be left in place.

2.15 Invasive plant species including Himalayan blackberry (*Rubus armeniacus)*, vinca (*Vinca minor*), pampas grass (*Cortaderia selloana*). Giant redd (*Arundo donax)*, pepper weed (*Lepidium dictyotum*), and non-native invasive grasses within each area of operations shall be removed and areas denuded of vegetation shall be replanted with locally propagated native tree and shrub species. Appropriate native plants and spacing can be found in the "California Salmonid Stream Habitat Restoration Manual." Planting techniques can include seed casting, hydroseeding, or live planting methods using the techniques in Part XI of the Manual. The most current version of the manual can be found at: http://www.dfg.ca.gov/fish/REsources/HabitatManual.asp

2.16 Permittee shall avoid activities that will spread or introduce exotic plants. All invasive exotic plants at work sites shall be removed in such a manner that they will not sprout or be allowed to spread.

2.17 Herbicides may be used at the Permittee's discretion with implementation of the following protective measures:

Permittee shall use caution to apply the least practicable amount of herbicides necessary to effectively control nuisance plants.

Permittee shall use the least concentrated formulation of herbicide possible and practicable.

All herbicides shall be applied by a certified pesticide applicator in accordance with regulations set by the California Department of Pesticide Regulation and according to labeled instructions.

Permittee shall use extreme caution to not apply any herbicide directly to water. If herbicides must be applied next to water, Permittee shall use preventative measures to ensure that the chemical does not accidentally flow into or stream through the air into the water.

Herbicides shall only be applied on calm days with winds below 5 miles per hour.

Care shall be taken to avoid spraying native vegetation with herbicides. Spraying within 100 feet of existing mitigation sites shall be done by hand.

Should any fish or animal kills occur following application of herbicides, such kills shall be reported to DFG Bay Delta Region within 24 hours.

Permittee shall use Milestone, rather than Weedestroy (or other 2,4,D product) wherever and whenever possible. Weedestroy is not to be applied within 10 feet of open water.

Regardless of the contents of this Agreement, Permittee is responsible for any environmental damage caused by the application or use of substances that prove harmful to fish and aquatic wildlife.

2.18 Live trees may be removed only if they are blocking flow or restricting the capacity of the channel; no other trees shall be removed. Any trees which must be cut from stream banks shall be cut at ground level, leaving the root mass in place to maintain bank stability. If root mass is to be removed within the channel, Permittee shall notify DFG for written approval. Any trees removed shall be replaced according to Measure 3.1, and exposed/ disturbed areas shall be revegetated.

2.19 Willow thinning for bioengineering material shall be conducted in such a manner as to encourage willows to achieve mature overstory vegetation. Thinning of willows shall focus on removal of lower branches that will impede low flows. At no time shall more than 1/3 of a willow be harvested. Care shall be taken during harvest not to trample or over harvest the willow sources.

2.20 To ensure a successful revegetation effort, all plants shall be monitored and maintained as necessary for five years. The following success criteria shall apply:

All planting shall have a minimum of 80% survival at the end of 5 years.

Planting shall attain 75% cover after 5 years.

If the survival and/or cover requirements are not meeting these goals, Permittee is responsible for replacement planting, additional watering, weeding, invasive exotic eradication, or any other practice, to achieve these requirements. Replacement plants shall be monitored with the same survival and growth requirements for five years after planting.

Revegetation monitoring shall be conducted annually for a period of five (5) years to determine whether these goals have been met. If the survival and/or cover requirements are not projected to meet these goals, based on annual monitoring, Permittee is responsible for replacement planting, additional watering, weeding, invasive exotic eradication, or any other practice(s) that would to achieve these requirements.

2.21 Staging areas shall be located at least 30 feet from the top of bank or on the outboard side of levees. Vegetation disturbance shall be limited to the immediate construction footprint and a single access pathway.

2.22 Staging and storage areas for equipment, materials, fuels, lubricants and solvents shall be located outside of the stream channel and banks. Stationary equipment such as motors, pumps, generators, compressors and welders, located adjacent to the stream, shall be positioned over drip-pans. Any equipment or vehicles driven and/or operated in proximity to the stream must be checked and maintained daily. Vehicles must be moved away from the stream prior to refueling and lubrication.

2.23 Except as explicitly described in Attachment A of this Agreement, the removal of native soils, rock, gravel, vegetation, and vegetative debris from the stream bed or stream banks is prohibited. Embedded pieces of large woody debris or stumps that potentially serve as basking sites or that encourage pool formation shall be left in place if there is adequate flood flow capacity.

2.24 Permittee shall remove all debris, raw construction materials and wastes from the project site following the completion of maintenance activities. Food-contaminated wastes generated during construction shall be removed on a daily basis to avoid attracting predators to work sites. All temporary fences, barriers, and/or flagging shall be completely removed from work sites and properly disposed of upon completion of maintenance activities. Permittee or its contractors shall not dump any litter or construction debris within the riparian/stream zone.

2.25 All exposed soils within the work area shall be stabilized immediately following the completion of earthmoving activities to prevent erosion into the stream channel. Erosion control measures, such as silt fences, straw hay bales, gravel or rock lined ditches, water check bars, and broadcasted straw shall be used. Erosion control measures shall be monitored during and after each storm event for effectiveness. Modifications, repairs and improvements to erosion control measures shall be made as needed to protect water quality. At no time shall silt laden runoff be allowed to enter the stream or directed to where it may enter the stream.

2.26 Upon completion of construction and prior to the onset of wet weather, all construction material and/or debris, including removed vegetation, shall be removed from the stream channel to an area not subject to inundation.

2.27 Flow diversions shall be done in a manner that prevents pollution and/or siltation and which shall provide flows to downstream reaches. Flows to downstream reaches shall be provided during all times that the natural flow would have supported aquatic life. Said flows shall be sufficient quality and quantity, and of appropriate temperature to support fish and other aquatic life both above and below the diversion. Normal flow shall be restored to the affected stream immediately upon completion of work at that location.

2.28 Culvert replacement shall not increase culvert size by more than 12 inches.

2.29 All bank stabilization projects shall be conducted using bioengineering techniques. Use of concrete and rip rap may only occur in areas such as culvert inlets and outlets, previously rip rapped areas and existing concrete lined channels. Installation of gabions is not included in this agreement. Mitigation for rip rap installation shall at a minimum include removal of concrete, rip rap, or other hard structure from an adjacent site at a ratio of 3:1. Proposed mitigation shall be included in any notification as required under Condition #4.1

2.30 Permittee shall ensure that bioengineered features do not transfer the erosive force of the stream to the opposite or downstream banks or cause the formation of downstream eddies. The channel shall not be narrowed as a result of bank repairs, and features that modify the natural stream gradient (as measured on a longitudinal profile) shall not be installed in the channel.

2.31 All sediment removal projects greater than 25 linear feet shall receive written approval from DFG prior to project activities.

3. Compensatory Measures

To compensate for adverse impacts to fish and wildlife resources identified above that cannot be avoided or minimized, Permittee shall implement each measure listed below.

3.1 All native trees between 3 and 6 inches in diameter (at breast height) removed as a result of proposed work activities shall be replaced at a 3:1 ratio with a combination of native trees and/or appropriate understory and lower canopy plantings. Native trees greater than 6 inches in diameter shall be replaced with native trees at a 6:1 ratio to mitigate for permanent net loss of canopy cover. Non-native trees greater than 3 inches in diameter shall be replaced at a 1:1 ratio. All trees greater than 24 inches in diameter shall be replaced on an inch-for-inch basis. Replacement plantings shall consist of 5-gallon saplings; locally-collected seeds, stakes, or other suitable nursery stock, as appropriate and shall be native species adapted to the lighting, soil and hydrological conditions at the replanting site. If replanting within the work area is unfeasible due to slope steepness or other physical constraints, replacement trees may be planted at an alternate location along the stream corridor as approved by DFG.

3.2 All disturbed slopes around and on the banks shall be seeded, mulched and fertilized with native perennial, shrub and grass species to replace the same habitat type removed. Native grasses shall be from the following list: Meadow barley (*Hordeum brachyantherum)*, Blue wildrye (*Elymus glaucus)*, California brome (*Bromus carinatus)*, Creeping wildrye (*Leymus triticoides)*, California oatgrass (*Danthonia californica)*, and California melic (*Melica californica)*. Seeding shall be completed before October 15 of the year construction begins.

4. Reporting Measures

Permittee shall meet each reporting requirement described below.

4.1 The Applicant shall provide to the Department of Fish and Game Bay Delta Region written notification of proposed routine maintenance activities to be performed that year by **June 1** of each year. The written notification of proposed routine maintenance activities shall include:

1) Work plans describing the type and scope of work planned including the volume and type of materials displaced, the equipment to be used; and type, density and area of vegetation to be affected.

2) Proposed mitigation measures including but limited to invasive species removal and/or native habitat replacement.

3) The location of the covered activity, and the name, if any of the river or stream affected.

4) The earliest commencement date, estimated termination date and proposed hours of operation.

5) Directions to the work site including a map displaying the public and private roads used to access the work site.

6) Plan-view maps showing site attributes before and after completion of the covered activity. The maps shall also delineate the location of permanent and temporary storage areas for equipment, materials, spoils; and any important fish or wildlife habitat features (e.g. snags and nests in the terrestrial environment; LWD, deep pools, and undercut banks in the aquatic environment) in the area of disturbance.

7) Pre-project photographs of each covered activity including important fish and wildlife habitat features.

4.2 The Permittee shall provide the Department of Fish and Game Bay Delta Region written notification of maintenance Projects completed each year. Annual reports shall include the Project location, a brief Project description, quantity of material removed from each site in cubic yards, and all associated impacts to vegetation. Spatially referenced before/after photographs. Each annual report shall include the appropriate fee determined from the DFG Streambed Alteration Agreement Fee Schedule for work completed under this Agreement based upon the number of Projects completed in the reporting period. Reports and annual fees are due by **January 1**. The Department may terminate this agreement if late reports and fees are not submitted.

4.3 The Permittee shall provide a status report to the Department of Fish and Game Bay Delta Region every four years. The status report shall be delivered to the Department no later than 90 days prior to the end of each four-year period, and shall include all of the following:

1) A copy of the original agreement
2) The status of the activity covered by the agreement
3) An evaluation of the success or failure of the measures in the agreement to protect the fish and wildlife resources that the activity may substantially adversely affect.
4) A discussion of any factors that could increase the predicted adverse impacts on fish and wildlife resources, and a description of the resources that may be adversely affected.

4.4 Notification to the California Natural Diversity Database. If any sensitive species are observed in project surveys, Permittee shall submit California Natural Diversity Database (CNDDB) forms to the CNDDB within five working days of the sightings, and provide DFG Bay Delta Region with copies of the CNDDB forms and survey maps.

4.5 Biological Surveys. The results of any biological surveys conducted shall be emailed or faxed to DFG Bay Delta Region prior to commencement of work, referencing Notification 1600-2011-0349-3. Permittee is encouraged to combine survey results for multiple sites and multiple species into a single document.

CONTACT INFORMATION

Any communication that Permittee or DFG submits to the other shall be in writing and any communication or documentation shall be delivered to the address below by U.S. mail, fax, or email, or to such other address as Permittee or DFG specifies by written notice to the other.

To Permittee:

Napa County Flood Control and Water Conservation District
Attn: Richard Thomasser
804 First Street
Napa, California 94559
Fax (707) 259-8619
Richard.thomasser@countyofnapa.org

To DFG:

Department of Fish and Game
Bay Delta Region – Regional Manager
7329 Silverado Trail
Napa, California 94558
Attn: Lake and Streambed Alteration Program
Notification #1600-2011-0349-R3
Fax (707) 944-5553

LIABILITY

Permittee shall be solely liable for any violations of the Agreement, whether committed by Permittee or any person acting on behalf of Permittee, including its officers, employees, representatives, agents or contractors and subcontractors, to complete the project or any activity related to it that the Agreement authorizes.

This Agreement does not constitute DFG's endorsement of, or require Permittee to proceed with the project. The decision to proceed with the project is Permittee's alone.

SUSPENSION AND REVOCATION

DFG may suspend or revoke in its entirety the Agreement if it determines that Permittee or any person acting on behalf of Permittee, including its officers, employees, representatives, agents, or contractors and subcontractors, is not in compliance with the Agreement.

Before DFG suspends or revokes the Agreement, it shall provide Permittee written notice by certified or registered mail that it intends to suspend or revoke. The notice shall state the reason(s) for the proposed suspension or revocation, provide Permittee an opportunity to correct any deficiency before DFG suspends or revokes the Agreement, and include instructions to Permittee, if necessary, including but not limited to a directive to immediately cease the specific activity or activities that caused DFG to issue the notice.

ENFORCEMENT

Nothing in the Agreement precludes DFG from pursuing an enforcement action against Permittee instead of, or in addition to, suspending or revoking the Agreement.

Nothing in the Agreement limits or otherwise affects DFG's enforcement authority or that of its enforcement personnel.

OTHER LEGAL OBLIGATIONS

This Agreement does not relieve Permittee or any person acting on behalf of Permittee, including its officers, employees, representatives, agents, or contractors and subcontractors, from obtaining any other permits or authorizations that might be required under other federal, state, or local laws or regulations before beginning the project or an activity related to it.

This Agreement does not relieve Permittee or any person acting on behalf of Permittee, including its officers, employees, representatives, agents, or contractors and subcontractors, from complying with other applicable statutes in the FGC including, but not limited to, FGC sections 2050 et seq. (threatened and endangered species), 3503 (bird nests and eggs), 3503.5 (birds of prey), 5650 (water pollution), 5652 (refuse disposal into water), 5901 (fish passage), 5937 (sufficient water for fish), and 5948 (obstruction of stream).

Nothing in the Agreement authorizes Permittee or any person acting on behalf of Permittee, including its officers, employees, representatives, agents, or contractors and subcontractors, to trespass.

AMENDMENT

DFG may amend the Agreement at any time during its term if DFG determines the amendment is necessary to protect an existing fish or wildlife resource.

Permittee may amend the Agreement at any time during its term, provided the amendment is mutually agreed to in writing by DFG and Permittee. To request an amendment, Permittee shall submit to DFG a completed DFG "Request to Amend Lake or Streambed Alteration" form and include with the completed form payment of the corresponding amendment fee identified in DFG's current fee schedule (see Cal. Code Regs., tit. 14, § 699.5).

TRANSFER AND ASSIGNMENT

This Agreement may not be transferred or assigned to another entity, and any purported transfer or assignment of the Agreement to another entity shall not be valid or effective, unless the transfer or assignment is requested by Permittee in writing, as specified below, and thereafter DFG approves the transfer or assignment in writing.

The transfer or assignment of the Agreement to another entity shall constitute a minor amendment, and therefore to request a transfer or assignment, Permittee shall submit to DFG a completed DFG "Request to Amend Lake or Streambed Alteration" form and include with the completed form payment of the minor amendment fee identified in DFG's current fee schedule (see Cal. Code Regs., tit. 14, § 699.5).

EXTENSIONS

In accordance with FGC section 1605(b), Permittee may request one extension of the Agreement, provided the request is made prior to the expiration of the Agreement's term. To request an extension, Permittee shall submit to DFG a completed DFG "Request to Extend Lake or Streambed Alteration" form and include with the completed form payment of the extension fee identified in DFG's current fee schedule (see Cal. Code Regs., tit. 14, § 699.5). DFG shall process the extension request in accordance with FGC 1605(b) through (e).

If Permittee fails to submit a request to extend the Agreement prior to its expiration, Permittee must submit a new notification and notification fee before beginning or continuing the project the Agreement covers (Fish & G. Code, § 1605, subd. (f)). .

EFFECTIVE DATE

The Agreement becomes effective on the date of DFG's signature, which shall be: 1) after Permittee's signature; 2) after DFG complies with all applicable requirements under the California Environmental Quality Act (CEQA); and 3) after payment of the applicable FGC section 711.4 filing fee listed at http://www.dfg.ca.gov/habcon/ceqa/ceqa_changes.html.

TERM

This Agreement shall expire on December 31, 2022, unless it is terminated or extended before then. All provisions in the Agreement shall remain in force throughout its term. Permittee shall remain responsible for implementing any provisions specified herein to protect fish and wildlife resources after the Agreement expires or is terminated, as FGC section 1605(a)(2) requires.

EXHIBITS

The documents listed below are included as exhibits to the Agreement and incorporated herein by reference.

A. Attachment A - Covered Activities
B. Attachment B - Definition of Terms
C. Attachment C - Annual Notifications of Proposed Work (reserved for future exhibits)
D. Exhibit 1 - Map of Napa County streams and water bodies for maintenance

ATTACHMENT A
COVERED ACTIVITIES

1. Vegetation Management:

Removal of parts of woody and herbaceous plants, fallen trees, or trunks or limbs lodged in the bed or bank causing flow restriction shall be cutoff at the bed or bank invert with small tools and removed with winch and cable or other equipment operated from top of bank. Root structures are not to be disturbed and the debris disposed at a place where it cannot reenter State waters. No heavy equipment may be operated in the streambed.

Control of weeds and grasses on channel access roads or shoulders by mowing, or herbicide application may take place between April 1st and October 15th of each year. Herbicide application will conform to all applicable County, State, and Federal Regulations and licenses. Only EPA registered herbicides (such as Rodeo) shall be use in channels for vegetation control. Only mowing or EPA registered herbicides (such as Rodeo) shall be used to control weeds and grasses on channel banks.

Vegetation enhancement associated with other routine maintenance activities including replanting, new planting, and maintenance of plantings.

2. Debris and Sediment Removal:

Physical removal of silt, debris, rubbish, non-living materials, and algae from concrete lined channels where no flow or minimal flow is present. If water is present a flow diversion structure would be constructed up stream and water would be discharged down stream through a sediment control structure.

Removal of small amounts of debris and sediment from within and around structures (less than 200 cu yd.) affecting no more than 25 ft of watercourse in natural channels and 50 ft. in constructed flood control channels. (See definition of structures).

Removal of sediment and debris from waterways affecting no more than 25 feet of a watercourse in a natural stream channel, 150 feet in an artificial earthen channel or 200 feet in a concrete lined channel.

These activities will not exceed a cumulative annual total of 100 feet in a natural stream and 500 feet in a flood control channel (including concrete lined). Sediment removal shall not exceed an annual total of 500 cubic yards.

*Note all sediment removal projects greater than 25 feet in length shall receive written approval from DFG prior to project activities.

3. Structure Maintenance and Repair:

Repair, replacement in kind, or maintenance of drainage and erosion control structures including but not limited to, storm drain outfalls, tide gates, slide gates, culverts, revetments, bank protection, energy dissipaters, grade structures, sediment basins, weirs, trash racks, stream gauge structures, fish ladders, fish screens, utility line crossings, bridges (including support structures), road embankments, and access ramps.

AUTHORITY

If the person signing the Agreement (signatory) is doing so as a representative of Permittee, the signatory hereby acknowledges that he or she is doing so on Permittee's behalf and represents and warrants that he or she has the authority to legally bind Permittee to the provisions herein.

AUTHORIZATION

This Agreement authorizes only the project described herein. If Permittee begins or completes a project different from the project the Agreement authorizes, Permittee may be subject to civil or criminal prosecution for failing to notify DFG in accordance with FGC section 1602.

CONCURRENCE

The undersigned accepts and agrees to comply with all provisions contained herein.

NAPA COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT

Richard Thomasser	May 9, 2012 Date

FOR DEPARTMENT OF FISH AND GAME

C J Weightman Craig Weightman Acting Program Manager	June 12, 2012 Date

Prepared by: S. Gilmore
Environmental Scientist

Date sent: March 15, 2012
Revised sent: April 17, 2012
Revised sent: May 8, 2012

Repair, maintain or resurface existing bike lanes, paths, and sidewalks within the riparian corridor or stream zone so long as the width of the paved surface is not increased.

4. Bank Repair:

Repair of concrete lined channels in-kind.

Repair of constructed engineered channels 200 linear feet or less using the method of least impact to complete the repair. The primary repair method shall be bioengineering techniques such as a brush mattress or willow wall, etc. If bioengineering (see definition of bioengineering) techniques do not provide a solution to the repair of the eroded banks (because of such as poor soils, percolation of water, limited space or steepness of slopes) other methods may be explored.

Repair in natural channels is limited to 100 feet using the method of least impact to accomplish the repair.

5. Temporary Water Diversions

Temporary water diversions associated with other related maintenance activities using structures such as cofferdams not exceeding 3 feet in height or sumps, with or without pumps, provided that all water is discharged into a silt control structure before release and provided that the channel is restored to its original configuration after work is completed.

7. Exempt Activities

The following routine maintenance activities are not subject to the provisions of the Routine Maintenance Agreement (RMA) between the State of California Department of Fish and Game and NFCD. These activities are also not subject to the provisions of Section 1600 of the State Department of Fish and Game Code if performed within the parameters stated below.

a. Trash and debris removal not including silt removal (baby diapers, shopping carts, metal, wood, plastic etc).

b. Removal of trash and vegetation from trash racks, pilings and piers. This is vegetation that has flowed down the channel and has piled up on the trash rack or pilings and piers that would impede the flow leading to potential flooding upstream.

c. Servicing of water quality monitoring stations, stream gages, etc. What this means is replacing damaged sensors, uncovering intake tubes, replacing samplers. Repairing damaged equipment housing.

Note: Materials embedded in the bottom of the channel are subject to the provisions of Fish and Game Code Section 1600.

ATTACHMENT B
DEFINITION OF TERMS
As used herein and for purposes of the Agreement

Bioengineering: the application of the principles of engineering and natural sciences to flood control maintenance and erosion control. Bioengineering applications may be used to reduce the impacts on the natural and urban environment. Methods that may be used: willow wattling, revegetation with native plants, seeding, installation of rootballs, brush layering, brush matting, inter-planting riprap, plantings and combinations of the above methods.

Biological monitor: a person employed by the Permittee who has undergone training in avoidance and minimization measures specific to special-status species potentially present at a given site. The biological monitor is responsible for ensuring that such measures are properly performed to protect against take. The biological monitor must have attended the most recent annual training conducted by the Permittee's qualified biologist and must demonstrate basic familiarity with species biology, avoidance measures, and the terms of the Agreement, if asked. If the biological monitor is to perform pre-work habitat assessments, s/he must be familiar with applicable habitat assessment methodology for listed species.

Channel reach: a section of a stream defined by uniform habitat features, such as a particular type of bed substrate, geomorphologic channel characteristics, and riparian vegetation. In urban environments, reaches may be defined by upstream and downstream barriers, such as bridge footings or weirs.

Concrete-lined channel: flood control channels with concrete sides and bottom.

Debris: non-living vegetative or woody matter, trash, concrete rubble, etc. This definition does not include living vegetation.

Emergency project: is defined in the State Fish and Game Code, section 1600.

Facility: the collective flood control structures and management practices employed with the watershed of a stream draining to the San Francisco Bay. From a flood control perspective, the stream and its tributaries are the primary component of the "facility".

Flood control channel or engineered channel: an artificial open channel or ditch constructed for drainage or flood control purposes.

Flood control structures: levee, dams, and artificially constructed channels for flood control purposes.

Heavy equipment: any equipment used including tractors that is larger than a pick-up truck:

Rubber tired backhoe/loaders

Rubber tired skip loaders

Rubber tracked or tired bobcat loaders

Rubber tired flail mowers

Drag lines with buckets

Hyrdo-vacum machines operated from top of bank

Natural channel: a stream or watercourse that has not been modified as described above. A natural channel may include erosion control structures, culverts or other minor modifications.

Project: a routine maintenance activity performed by the Permittee during a given year. Each annual activity shall be construed as one project for fee purposes. A project does not include minor debris removal such as minor tree trimming, removing a shopping cart or a bag of garbage.

Qualified biologist: a person with a combination of academic training and professional experience in the biological sciences.

Reasonable dispersal distance: the distance from a particular location, such as a CNDDB occurrence location or a critical habitat location, that a given species would be expected to disperse for mating, breeding, foraging, nesting, and other activities. The reasonable dispersal distance can be determined on a species-by-species level based on current scientific literature. For example, CNDDB occurrences of California red-legged frog in a given creek indicate a high likelihood that this species also occurs downstream within the same creek system because flows provide easy downstream dispersal.

Special-status species: any species identified as a candidate or sensitive species in local or regional plans, policies or regulations, or by DFG or the U.S. Fish and Wildlife Service. Plants on Lists 1A, 1B, or 2, published by the California Native Plant Society, are also considered special-status species for the purposes of this Agreement.

Structure: storm drain outfalls, tide gates, slide gates, culverts, revetments, bank protection, energy dissipaters, grade structures, sediment basins, weirs, diversion structures, trash racks, stream gauge structures, fish ladders, fish screens, utility line crossings, bridge piers.

Take: as defined in Section 86 of the California Fish and Game Code, and for federally listed species, as defined in Section 9 of the U.S. Endangered Species Act.

EXHIBIT 1
ROUTINE MAINTENANCE LOCATIONS FOR NAPA COUNTY FLOOD CONTROL DISTRICT

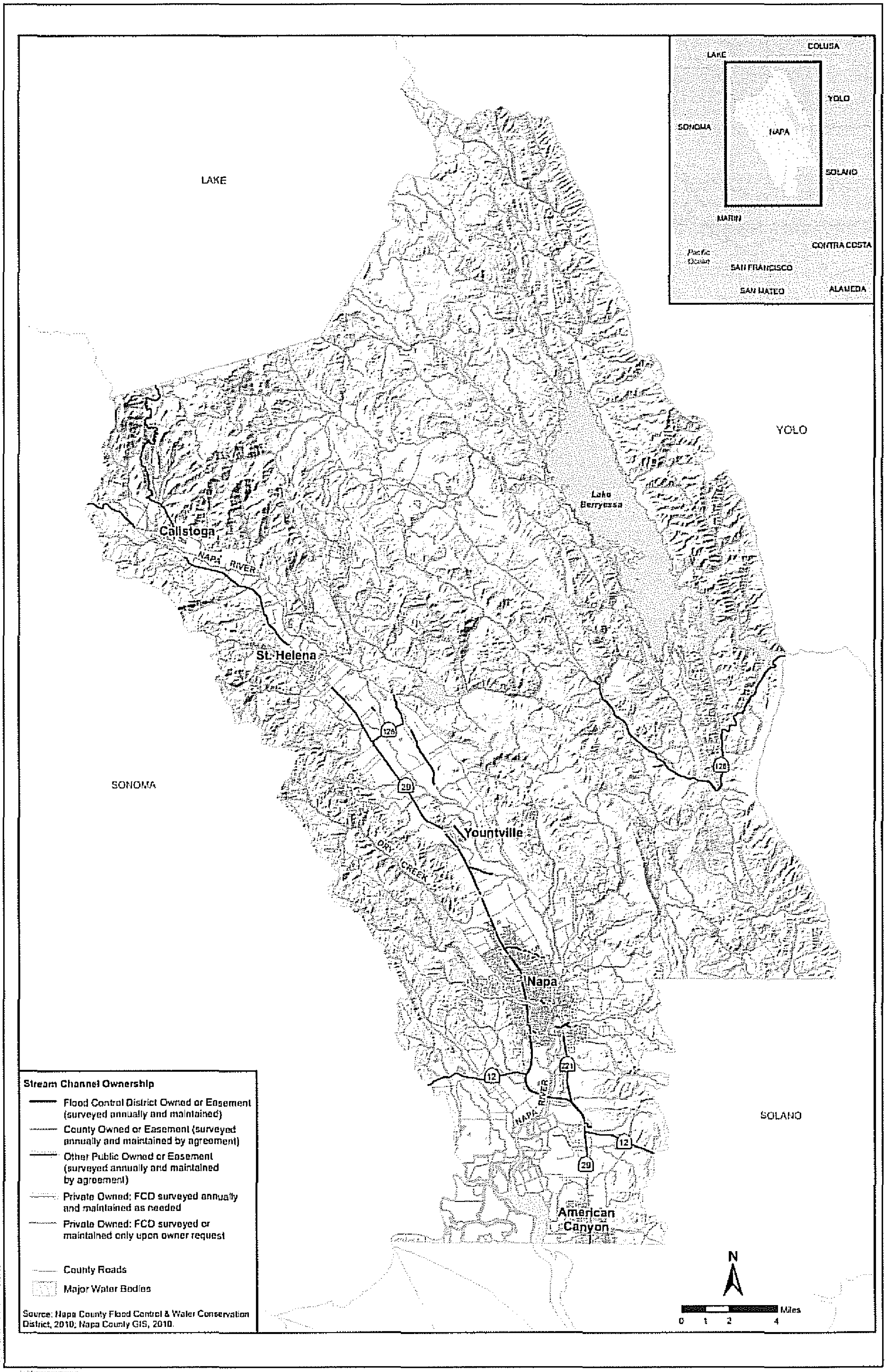

Figure 1-1
Napa County Stream Maintenance Program Area and Maintenance Reaches

ATTACHMENT C
ANNUAL NOTIFICATIONS OF PROPOSED WORK

(Reserved for future exhibits)

FOR DEPARTMENT USE ONLY				
Date Received	Amount Received	Amount Due	Date Complete	Notification No.
9/27/11	$ 2689.50	$		1600-2011-0349-3

Ck# 491496 County of Napa Warrant

STATE OF CALIFORNIA
DEPARTMENT OF FISH AND GAME

Gilmore Morton Shelton

NOTIFICATION OF LAKE OR STREAMBED ALTERATION

Complete EACH field, unless otherwise indicated, following the enclosed instructions and submit ALL required enclosures. Attach additional pages, if necessary.

1. APPLICANT PROPOSING PROJECT

Fish & Game
SEP 27 2011
Yountville

Name	Richard Thomasser, Operations Manager		
Business/Agency	Napa County Flood Control and Water Conservation District		
Street Address	804 First Street		
City, State, Zip	Napa, CA 94559		
Telephone	(707) 259-8600	Fax	(707) 259-8619
Email	richard.thomasser@countyofnapa.org		

2. CONTACT PERSON (*Complete only if different from applicant*)

Name			
Street Address			
City, State, Zip			
Telephone		Fax	
Email			

3. PROPERTY OWNER (*Complete only if different from applicant*)

Name			
Street Address			
City, State, Zip			
Telephone		Fax	
Email			

4. PROJECT NAME AND AGREEMENT TERM

A. Project Name	Napa County Stream Maintenance Program
B. Agreement Term Requested	☐ Regular (*5 years or less*) ☑ Long-term (*greater than 5 years*)

C. Project Term		D. Seasonal Work Period		E. Number of Work Days
Beginning (*year*)	Ending (*year*)	Start Date (*month/day*)	End Date (*month/day*)	
2012	2022	01/01	12/31	

5. AGREEMENT TYPE

Check the applicable box. If box B, C, D, or E is checked, complete the specified attachment.	
A.	☐ Standard *(Most construction projects, excluding the categories listed below)*
B.	☐ Gravel/Sand/Rock Extraction (*Attachment A*) *Mine I.D. Number:* ______
C.	☐ Timber Harvesting (*Attachment B*) THP *Number:* ______
D.	☐ Water Diversion/Extraction/Impoundment (*Attachment C*) *SWRCB Number:* ______
E.	☑ Routine Maintenance (*Attachment D*)
F.	☐ DFG Fisheries Restoration Grant Program (FRGP) *FRGP Contract Number:* ______
G.	☐ Master
H.	☐ Master Timber Harvesting

6. FEES

Please see the current fee schedule to determine the appropriate notification fee. Itemize each project's estimated cost and corresponding fee. ***Note: The Department may not process this notification until the correct fee has been received.***

	A. Project	B. Project Cost	C. Project Fee
1	10 year Stream Maintenance Program		
2			
3			
4			
5			
		D. Base Fee *(if applicable)*	$2,689.50
		E. TOTAL FEE ENCLOSED	$2,689.50

7. PRIOR NOTIFICATION OR ORDER

A. Has a notification previously been submitted to, or a Lake or Streambed Alteration Agreement previously been issued by, the Department for the project described in this notification?

☐ Yes (*Provide the information below*) ☑ No

Applicant: ______ Notification Number: ______ Date: ______

B. Is this notification being submitted in response to an order, notice, or other directive ("order") by a court or administrative agency (including the Department)?

☑ No ☐ Yes (*Enclose a copy of the order, notice, or other directive. If the directive is not in writing, identify the person who directed the applicant to submit this notification and the agency he or she represents, and describe the circumstances relating to the order.*)

☐ *Continued on additional page(s)*

8. PROJECT LOCATION

A. Address or description of project location.
(*Include a map that marks the location of the project with a reference to the nearest city or town, and provide driving directions from a major road or highway*)

Project Location: Stream maintenance activities can occur anywhere throughout Napa County. However, the District has maintenance authority (ownership or easement agreements) for approximately 13 miles of flood control channels and easements throughout the county, including the Napa River and Lake Berryessa watersheds.

Map: Refer to Figure 1-1 through Figure 1-5 in Chapter 1 of the Stream Maintenance Manual.

Directions: Various; locations change on an annual basis depending on the locations that require maintenance.

☑ *Continued on additional page(s)*

B. River, stream, or lake affected by the project.	*Attached maps
C. What water body is the river, stream, or lake tributary to?	San Pablo Bay and Lake Berryessa
D. Is the river or stream segment affected by the project listed in the state or federal Wild and Scenic Rivers Acts?	☐ Yes ☑ No ☐ Unknown
E. County	Napa

F. USGS 7.5 Minute Quad Map Name	G. Township	H. Range	I. Section	J. ¼ Section
Napa	6N	4W		

☐ *Continued on additional page(s)*

K. Meridian (*check one*) ☐ Humboldt ☑ Mt. Diablo ☐ San Bernardino

L. Assessor's Parcel Number(s)

Varies Annually

☐ *Continued on additional page(s)*

M. Coordinates (*If available, provide at least latitude/longitude or UTM coordinates and check appropriate boxes)*

Latitude/Longitude	*Latitude:* Varies Annually	*Longitude:* Varies Annually
	☐ Degrees/Minutes/Seconds ☐ Decimal Degrees	☐ Decimal Minutes
UTM	*Easting:*	*Northing:* ☑ Zone 10 ☐ Zone 11
Datum used for Latitude/Longitude or UTM	☐ NAD 27	☐ NAD 83 or WGS 84

NOTIFICATION OF LAKE OR STREAMBED ALTERATION

9. PROJECT CATEGORY AND WORK TYPE *(Check each box that applies)*

PROJECT CATEGORY	NEW CONSTRUCTION	REPLACE EXISTING STRUCTURE	REPAIR/MAINTAIN EXISTING STRUCTURE
Bank stabilization – bioengineering/recontouring	☐	☑	☑
Bank stabilization – rip-rap/retaining wall/gabion	☐	☑	☑
Boat dock/pier	☐	☐	☐
Boat ramp	☐	☐	☐
Bridge	☐	☐	☐
Channel clearing/vegetation management	☐	☐	☑
Culvert	☐	☐	☑
Debris basin	☐	☐	☑
Dam	☐	☐	☐
Diversion structure – weir or pump intake	☐	☐	☑
Filling of wetland, river, stream, or lake	☐	☐	☑
Geotechnical survey	☐	☐	☐
Habitat enhancement – revegetation/mitigation	☐	☐	☑
Levee	☐	☐	☑
Low water crossing	☐	☐	☐
Road/trail	☐	☐	☐
Sediment removal – pond, stream, or marina	☐	☐	☑
Storm drain outfall structure	☐	☐	☑
Temporary stream crossing	☐	☐	☐
Utility crossing : Horizontal Directional Drilling	☐	☐	☐
Jack/bore	☐	☐	☐
Open trench	☐	☐	☐
Other *(specify)*:	☐	☐	☐

10. PROJECT DESCRIPTION

A. Describe the project in detail. Photographs of the project location and immediate surrounding area should be included.
- Include any structures (e.g., rip-rap, culverts, or channel clearing) that will be placed, built, or completed in or near the stream, river, or lake.
- Specify the type and volume of materials that will be used.
- If water will be diverted or drafted, specify the purpose or use.

Enclose diagrams, drawings, plans, and/or maps that provide all of the following: site specific construction details; the dimensions of each structure and/or extent of each activity in the bed, channel, bank or floodplain; an overview of the entire project area (i.e., "bird's-eye view") showing the location of each structure and/or activity, significant area features, and where the equipment/machinery will enter and exit the project area.

Stream maintenance activities conducted by the District are described in detail the Stream Maintenance Manual (attached). Maintenance include the following activities:
1. Vegetation Management includes trimming, pruning, mowing, and removal of flow constricting vegetation and planting native vegetation within stream channels and the riparian corridor. These activities are conducted to maintain flow conveyance capacity, establish a native riparian corridor and control non-native, invasive vegetation. Herbicides are also used to control non-native, invasive vegetation. Management activities are relatively consistent, though locations change annually depending on recent growth and blockages. Vegetation management occurs year-round. See Chapter 4 of the Manual for further details.
2. Downed Tree Management involves addressing tree and limb obstructions which threaten flood conveyance or channel stability. This is one of the most common stream maintenance activities conducted by the District. The preference is to leave downed wood in place to provide instream aquatic habitat. However, if necessary to maintain flood control, downed trees and limbs are either cut into smaller pieces, repositioned in the channel, or removed entirely as a last resort. Downed tree management occurs year-round. See Chapter 5 of the Manual for further details.
2. Erosion Protection and Bank Stabilization involves preventative erosion measures, such as planting appropriate native species along exposed banks, and bank repairs using a variety of biotechnical approaches. More involved repairs requiring engineered solutions, are subject to individual project permits. See Chapter 6 of the Manual for further details.
3. Sediment and Debris Removal activities are conducted to maintain the flow capacity of a stream channel and prevent flooding. Typically sediment removal activities take place along 100-200 ft long channel segments to alleviate a specific flood control problem at an individual crossing, culvert or other facility. Removed sediment and debris is taken to appropriate disposal sites. Sediment and debris removal activities occur during June 15th to October 31st. See Chapter 7 of the Manual for further details.

☑ *Continued on additional page(s)*

B. Specify the equipment and machinery that will be used to complete the project.

Hand maintenance equipment: sheers, loppers, hand saw mowers, chainsaws, shovels, picks
Heavy equipment: flail mower, rubber-tracked excavators, extending arm excavators, small bulldozers, front end loaders, 10 cubic yard dump trucks

☐ *Continued on additional page(s)*

C. Will water be present during the proposed work period (specified in box 4.D) in the stream, river, or lake (specified in box 8.B).	☑ Yes ☐ No (*Skip to box 11*)
D. Will the proposed project require work in the wetted portion of the channel?	☑ Yes (*Enclose a plan to divert water around work site*) ☐ No

11. PROJECT IMPACTS

A. Describe impacts to the bed, channel, and bank of the river, stream, or lake, and the associated riparian habitat. Specify the dimensions of the modifications in length (linear feet) and area (square feet or acres) and the type and volume of material (cubic yards) that will be moved, displaced, or otherwise disturbed, if applicable.

Program impacts are currently being evaluated in a CEQA compliance document. Impacts will be generally similar throughout the County. Impact avoidance and minimization measures will be implemented and site-specific conditions will be evaluated annually as projects are identified for maintenance. Annual notification reports including site-specific impact evaluations will be submitted to regulatory agencies for review and approval prior to implementation of maintenance activities.

☑ *Continued on additional page(s)*

B. Will the project affect any vegetation? ☑ Yes (*Complete the tables below*) ☐ No

Vegetation Type	Temporary Impact	Permanent Impact
Varies annually. See Manual.	Linear feet: ____ Total area: ____	Linear feet: ____ Total area: ____
	Linear feet: ____ Total area: ____	Linear feet: ____ Total area: ____

Tree Species	Number of Trees to be Removed	Trunk Diameter (range)
Varies annually. See Manual.		

☑ *Continued on additional page(s)*

C. Are any special status animal or plant species, or habitat that could support such species, known to be present on or near the project site?

☑ Yes *(List each species and/or describe the habitat below)* ☐ No ☐ Unknown

See Manual and forthcoming CEQA document.

☑ *Continued on additional page(s)*

D. Identify the source(s) of information that supports a "yes" or "no" answer above in Box 11.C.

CEQA analysis

☑ *Continued on additional page(s)*

E. Has a biological study been completed for the project site?

☐ Yes (*Enclose the biological study*) ☑ No

Note: A biological assessment or study may be required to evaluate potential project impacts on biological resources.

F. Has a hydrological study been completed for the project or project site?

☐ Yes (*Enclose the hydrological study*) ☑ No

Note: A hydrological study or other information on site hydraulics (e.g., flows, channel characteristics, and/or flood recurrence intervals) may be required to evaluate potential project impacts on hydrology.

12. MEASURES TO PROTECT FISH, WILDIFE, AND PLANT RESOURCES

A. Describe the techniques that will be used to prevent sediment from entering watercourses during and after construction.

See BMPs identified in Table 3-1 of the Manual.

☑ *Continued on additional page(s)*

B. Describe project avoidance and/or minimization measures to protect fish, wildlife, and plant resources.

See BMPs identified in Table 3-1 of the Manual.

☑ *Continued on additional page(s)*

C. Describe any project mitigation and/or compensation measures to protect fish, wildlife, and plant resources.

See BMPs identified in Table 3-1 of the Manual.

☑ *Continued on additional page(s)*

13. PERMITS

List any local, state, and federal permits required for the project and check the corresponding box(es). Enclose a copy of each permit that has been issued.

A. San Francisco Regional Water Quality Control Board ☐ Applied ☐ Issued

B. ______________________ ☐ Applied ☐ Issued

C. ______________________ ☐ Applied ☐ Issued

D. Unknown whether ☐ local, ☐ state, or ☐ federal permit is needed for the project. (*Check each box that applies*)

☐ *Continued on additional page(s)*

NOTIFICATION OF LAKE OR STREAMBED ALTERATION

14. ENVIRONMENTAL REVIEW

A. Has a draft or final document been prepared for the project pursuant to the California Environmental Quality Act (CEQA), National Environmental Protection Act (NEPA), California Endangered Species Act (CESA) and/or federal Endangered Species Act (ESA)?

☑ Yes (*Check the box for each CEQA, NEPA, CESA, and ESA document that has been prepared and enclose a copy of each*)

☐ No (*Check the box for each CEQA, NEPA, CESA, and ESA document listed below that will be or is being prepared*)

☐ Notice of Exemption	☑ Mitigated Negative Declaration	☐ NEPA document (*type*): ______
☐ Initial Study	☐ Environmental Impact Report	☐ CESA document (*type*): ______
☐ Negative Declaration	☐ Notice of Determination (*Enclose*)	☐ ESA document (*type*): ______
☐ THP/ NTMP	☑ Mitigation, Monitoring, Reporting Plan	

B. State Clearinghouse Number (*if applicable*)	In progress		
C. Has a CEQA lead agency been determined?	☑ Yes (*Complete boxes D, E, and F*)	☐ No (*Skip to box 14.G*)	
D. CEQA Lead Agency	Napa County		
E. Contact Person	Patrick Lowe	F. Telephone Number	(707) 259-5937

G. If the project described in this notification is part of a larger project or plan, briefly describe that larger project or plan.

N/A

☐ *Continued on additional page(s)*

H. Has an environmental filing fee (Fish and Game Code section 711.4) been paid?

☐ Yes (*Enclose proof of payment*) ☑ No (*Briefly explain below the reason a filing fee has not been paid*)

Filing fee will be paid when the CEQA Notice of Determination is filed (spring 2012).

Note: If a filing fee is required, the Department may not finalize a Lake or Streambed Alteration Agreement until the filing fee is paid.

15. SITE INSPECTION

Check one box only.

☑ In the event the Department determines that a site inspection is necessary, I hereby authorize a Department representative to enter the property where the project described in this notification will take place at any reasonable time, and hereby certify that I am authorized to grant the Department such entry.

☐ I request the Department to first contact (*insert name*) ______________________ at (*insert telephone number*) ______________________ to schedule a date and time to enter the property where the project described in this notification will take place. I understand that this may delay the Department's determination as to whether a Lake or Streambed Alteration Agreement is required and/or the Department's issuance of a draft agreement pursuant to this notification.

16. DIGITAL FORMAT

Is any of the information included as part of the notification available in digital format (i.e., CD, DVD, etc.)?

☑ Yes (Please enclose the information via digital media with the completed notification form)

☐ No

17. SIGNATURE

I hereby certify that to the best of my knowledge the information in this notification is true and correct and that I am authorized to sign this notification as, or on behalf of, the applicant. I understand that if any information in this notification is found to be untrue or incorrect, the Department may suspend processing this notification or suspend or revoke any draft or final Lake or Streambed Alteration Agreement issued pursuant to this notification. I understand also that if any information in this notification is found to be untrue or incorrect and the project described in this notification has already begun, I and/or the applicant may be subject to civil or criminal prosecution. I understand that this notification applies only to the project(s) described herein and that I and/or the applicant may be subject to civil or criminal prosecution for undertaking any project not described herein unless the Department has been separately notified of that project in accordance with Fish and Game Code section 1602 or 1611.

Signature of Applicant or Applicant's Authorized Representative

Date: 9-20-11

Richard Thomasser, P.G.

Print Name

STATE OF CALIFORNIA
DEPARTMENT OF FISH AND GAME

NOTIFICATION OF LAKE OR STREAMBED ALTERATION

Applicant Name: Napa County Flood Control & Water Conserv District

Project Title: Napa County Stream Maintenance Program

ATTACHMENT D

Routine Maintenance

If the applicant is notifying the Department to obtain an agreement for routine maintenance activities, Section I must be completed and the information and documents described in Sections II and III must be submitted with the notification.

I. REGULARLY RE-OCCURRING MAINTENANCE ACTIVITIES

These are generally activities designed to maintain channel capacity. Check each box that applies:

- ☑ Sediment removal:
  - ☑ In and around bridges, culverts, storm drain outlets, and/or water diversion inlets
  - ☑ Stream channel bottom
  - ☐ Pond or lake
  - ☐ Marina basin
  - ☐ Other: ______________________.
- ☑ Clearing trash and debris
- ☑ Removing fallen trees
- ☑ Removing dead (not dormant) trees and shrubs
- ☑ Vegetation:
  - ☑ Limbing and/or trimming of branches and tree limbs
  - ☐ Vegetation removal under high power lines
  - ☑ Mowing levee slopes and stream banks
  - ☑ Mowing within stream and floodway channels
  - ☑ Removing emergent (e.g., bulrush and cattails) or other near water vegetation with:
    - ☑ hand tools
    - ☑ mechanical vegetation cutters and shredders
    - ☑ heavy equipment (soil disturbance)
    - ☑ chemicals

☑ Removing vegetation from the ***upper half*** of the bank with:

- ☑ hand tools
- ☑ mechanical vegetation cutters or shredders
- ☑ heavy equipment (soil disturbance)
- ☑ chemicals

☑ Removing vegetation from the ***lower half*** of bank with:

- ☑ hand tools
- ☑ mechanical vegetation cutters or shredders
- ☑ heavy equipment (soil disturbance)
- ☑ chemicals

☑ Removing vegetation within the channel with:

- ☑ hand tools
- ☑ mechanical vegetation cutters and shredders
- ☑ heavy equipment (soil disturbance)
- ☑ chemicals

☑ Removing invasive, non-native plants with:

- ☑ hand tools
- ☑ mechanical vegetation cutters and shredders
- ☑ heavy equipment (soil disturbance)
- ☑ chemicals

☐ Other: ______________________________.

☐ Debris and brush pile burning

☐ Burning levees

☑ Minor erosion repair:

- ☑ Repair at existing erosion control sites
- ☑ New erosion repair

☑ Revegetation with local, native plant species

NAPA COUNTY FLOOD CONTROL AND
WATER CONSERVATION DISTRICT AGREEMENT NO. 459 (FC)

TOWN OF YOUNTVILLE AGREEMENT NO. _____

MEMORANDUM OF UNDERSTANDING
RELATED TO WATERSHED AND STREAMS MANAGEMENT

This MEMORANDUM OF UNDERSTANDING ("MOU") is made as of September 15, 2015, by and between the Napa County Flood Control and Water Conservation District, a special District of the State of California ("District"), and the Town of Yountville, a municipal corporation of the State of California ("Town").

WHEREAS, the District and Town share overlapping responsibilities for stream maintenance and watershed management; and

WHEREAS, the Parties will mutually benefit from coordinating human and financial resources to achieve the greatest watershed management; and

WHEREAS, District and the Town now desire to enter into this Agreement to set forth the manner in which the Parties shall collaborate in watershed and stream management:

NOW, THEREFORE, in consideration of the foregoing, the mutual agreements of the parties, and other valuable consideration the sufficiency of which is hereby acknowledged, the parties hereby agree as follows:

1. The Parties shall meet as needed, but at least once each fiscal year, to plan watershed and stream management priorities and the fiscal responsibilities of each Party related thereto.

2. The activities covered by this agreement are outlined in Exhibit A and may include sharing of labor resources or financial resources provided those resources are appropriate for the activities to be performed. Financial support shall meet and adhere to any and all conditions and or restrictions that pertain to the revenues to be used by either party.

3. The financial commitments of the Parties to either fund or perform activities of joint benefit and interest shall be outlined and approved through the normal and customary budgeting procedures of each party.

4. The cost of labor, materials, and supplies, direct and indirect expenditures shall be at those rates determined through the normal and customary procedures of the Parties and such labor, materials, and supplies, direct and indirect expenditures shall be appropriated following the purchasing and accounting rules of each party.

ADDITIONAL TERMS AND CONDITIONS

5. **Term.** The term of this Agreement shall be ongoing unless terminated by either party without cause upon thirty (30) days written notice.

6. **Other Termination.** If, during the term of this Agreement or any extension thereof subsequent to the first fiscal year during the term, DISTRICT or TOWN is unable to appropriate sufficient funds to meet its obligations under this Agreement, such funds are not otherwise available to DISTRICT or TOWN for this purposes, and there are no other legal procedures or available funds by or with which such obligations can be met, and such non-appropriation of funds has not resulted from any act or omission within the control of DISTRICT or TOWN each Party shall have the right to terminate this Agreement by giving the other Party written notice of such termination at least thirty (30) days prior to the effective date of the termination. In the event of such termination, the Parties shall be obligated to each other only for payment of compensation and reimbursement of expenses for services satisfactorily completed or incurred and for which invoices are submitted as of the effective date of such termination.

7. **Hold Harmless/Indemnification.** To the full extent permitted by law, DISTRICT and TOWN shall each defend, indemnify and hold harmless each other as well as their respective officers, agents and employees from any claims, suits, proceedings, loss or liability, including reasonable attorney's fees, for personal injury (including death) or damage to property, arising out of or connected with any acts or omissions of that party or its officers, agents, employees, volunteers, or other contractors or their subcontractors, when performing any activities or obligations required of that party under this Agreement. Each party shall notify the other party immediately in writing of any claim or damage related to activities performed under this Agreement. The parties shall cooperate with each other in the investigation and disposition of any claim arising out of the activities under this Agreement, providing that nothing shall require either party to disclose any documents, records or communications that are protected under peer review privilege, attorney-client privilege, or attorney work product privilege.

8. **Warranty of Legal Authority**. Each party warrants and covenants that it has the present legal authority to enter into this Agreement and to perform the acts required of it hereunder. If any party is found to lack the authority to perform the acts required of it hereunder or is prevented from performing the acts by a court of competent jurisdiction, this Agreement shall be void as to that party.

9. **Assignment/Delegation.** As between the District and Town, neither party hereto shall assign, or transfer any benefit or obligations of this Agreement without the prior written consent of the other, and no assignment shall be of any force or effect whatsoever unless and until the other party shall have so consented.

10. **Severability**. In the event any provision of this Agreement is held to be invalid or unenforceable, the valid or enforceable portion thereof and the remaining provisions of this Agreement will remain in full force and effect.

11. **Attorneys' Fees**. The prevailing party in any legal action brought by one party against the other and arising out of this Agreement shall be entitled to reimbursement for its expenses, including court costs and reasonable attorneys' fees.

12. **Waiver**. Any waiver (express or implied) by either the District or Town of any breach of this Agreement shall not constitute a waiver of any other or subsequent breach.

13. **Notices**. Whenever notice is to be given, it shall be in writing and delivered by personal, overnight express or courier service, with a written receipt, or sent by registered or certified mail in a sealed envelope, postage prepaid, return receipt requested and addressed as follows:

District:	*Town:*
District Engineer	Public Works Director
Napa County Flood Control	Town Of Yountville
and water Conservation District	6550 Yount Street
804 First Street	Yountville, CA 94559
Napa, CA 94559	

Changes may be made in addresses to where notices are to be delivered by giving notice pursuant to this paragraph.

13. **Entire Agreement**. This document is intended both as the final expression of the agreement between the parties hereto with respect to the included terms and as a complete and exclusive statement of the terms of the Agreement.

14. **Amendment**. This Agreement may only be amended in writing by an amendment authorized by the District's Board of Directors and the Town's Town Council.

15. **Recitals Adopted.** The parties hereby agree to and adopt the Agreement recitals as portions of the Agreement.

16. **Joint Defense in Event of Third Party Challenges to the Agreement**. In the event of a third party challenge of any type to this Agreement, the parties agree to jointly defend the validity and implementation of the Agreement.

17. **Counterparts Signature.** This Agreement may be executed in counterparts, each of which shall be an original, but all counterparts shall constitute one agreement.

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IN WITNESS WHEREOF, this Agreement was executed by the parties hereto as of the date first above written.

TOWN OF YOUNTVILLE

By: ______________________
JOHN F. DUNBAR, Mayor

"ENTITY"

ATTEST: MICHELLE DAHME,
Yountville Town Clerk

By: ______________________

APPROVED AS TO FORM:
MICHAEL R. COBDEN,
Yountville Town Attorney

By: ______________________

NAPA COUNTY FLOOD CONTROL AND ~~WATER~~ CONSERVATION DISTRICT, a special district of the State of California

By: ______________________
BRAD WAGENKNECHT
Chairperson of the Board of Directors

"DISTRICT"

APPROVED AS TO FORM Office of County Counsel By: *Robert C. Martin* (By E-Sign.) County Counsel Date: December 23, 2014	APPROVED BY THE BOARD OF DIRECTORS OF THE NAPA COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT Date: 9/15/15 Processed By: Deputy Clerk ~~of the Board~~ District Secretary	ATTEST: GLADYS I. COIL ~~Clerk of the Board of Supervisors~~ District Secretary By: ______________________

EXHIBIT A

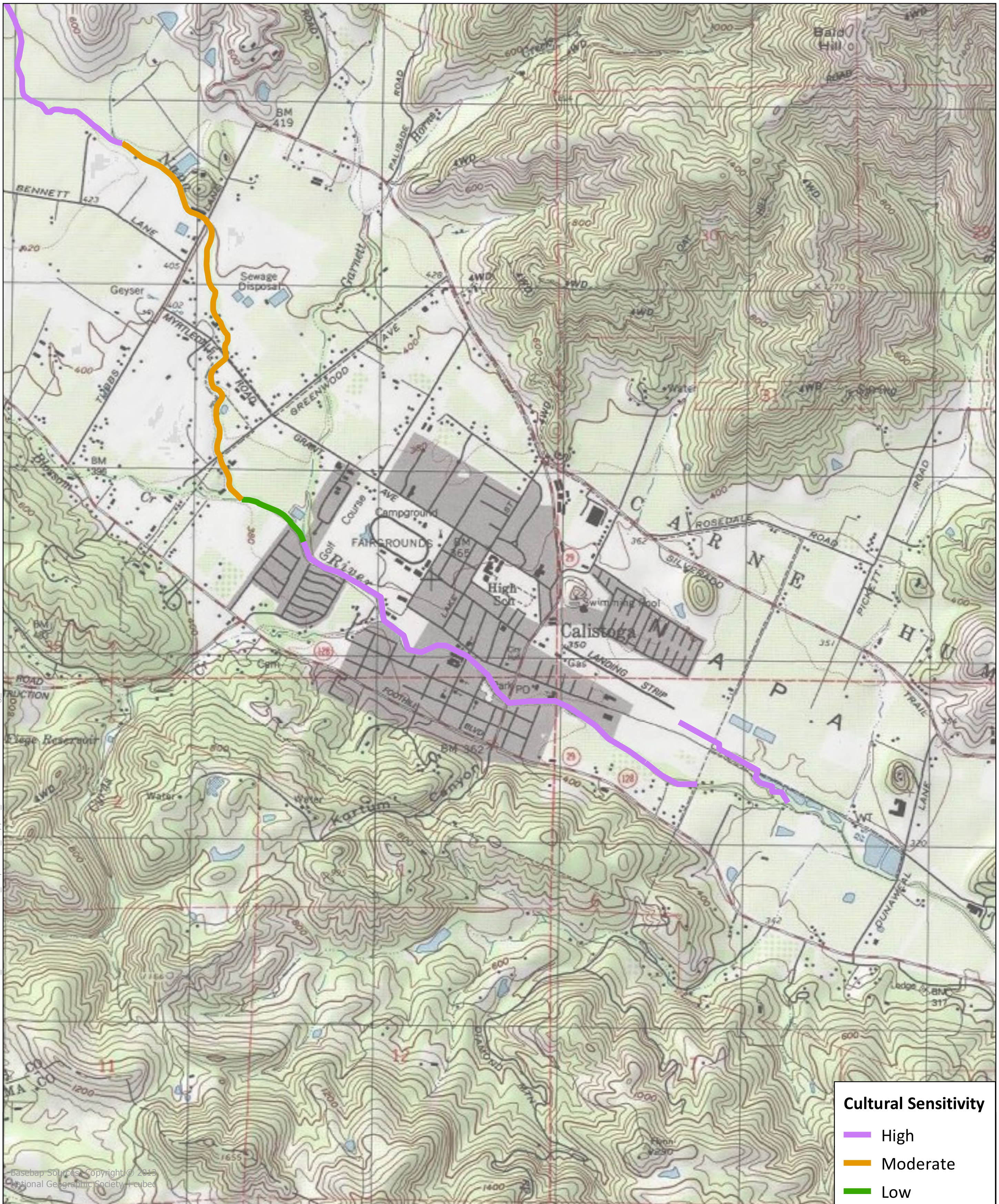
ACTIVITIES OF MUTUAL INTEREST AND BENEFIT

The following activities are covered by this MOU as being of mutual watershed and streams benefit to the District and Town. This list may be amended from time to time.

1) The District and Town will meet annually to coordinate and prioritize annual stream maintenance activities within the Town limits.
2) Agreed upon projects will be included in the District Stream Maintenance Program Annual Notification Document.
3) At the District discretion the implementation of stream and channel maintenance activities including; vegetation management, sediment removal, biotechnical bank stabilization, and debris management will occur annually.
4) District will assist Town with maintenance, assessment and restoration of stream channels and other waterways within the coterminous District/Town boundaries.
5) The District will coordinate permits and contractors to carry out annual channel maintenance activities within the Town's channels and drainage easements.
6) Water conservation programs and activities shall be defined and implemented by the District and Town.
7) Project development, management and implementation to support mutual watershed and streams benefit activities.

Appendix E

Cultural Resources Sensitivity Maps



Cultural Sensitivity

High

Moderate

Low

N

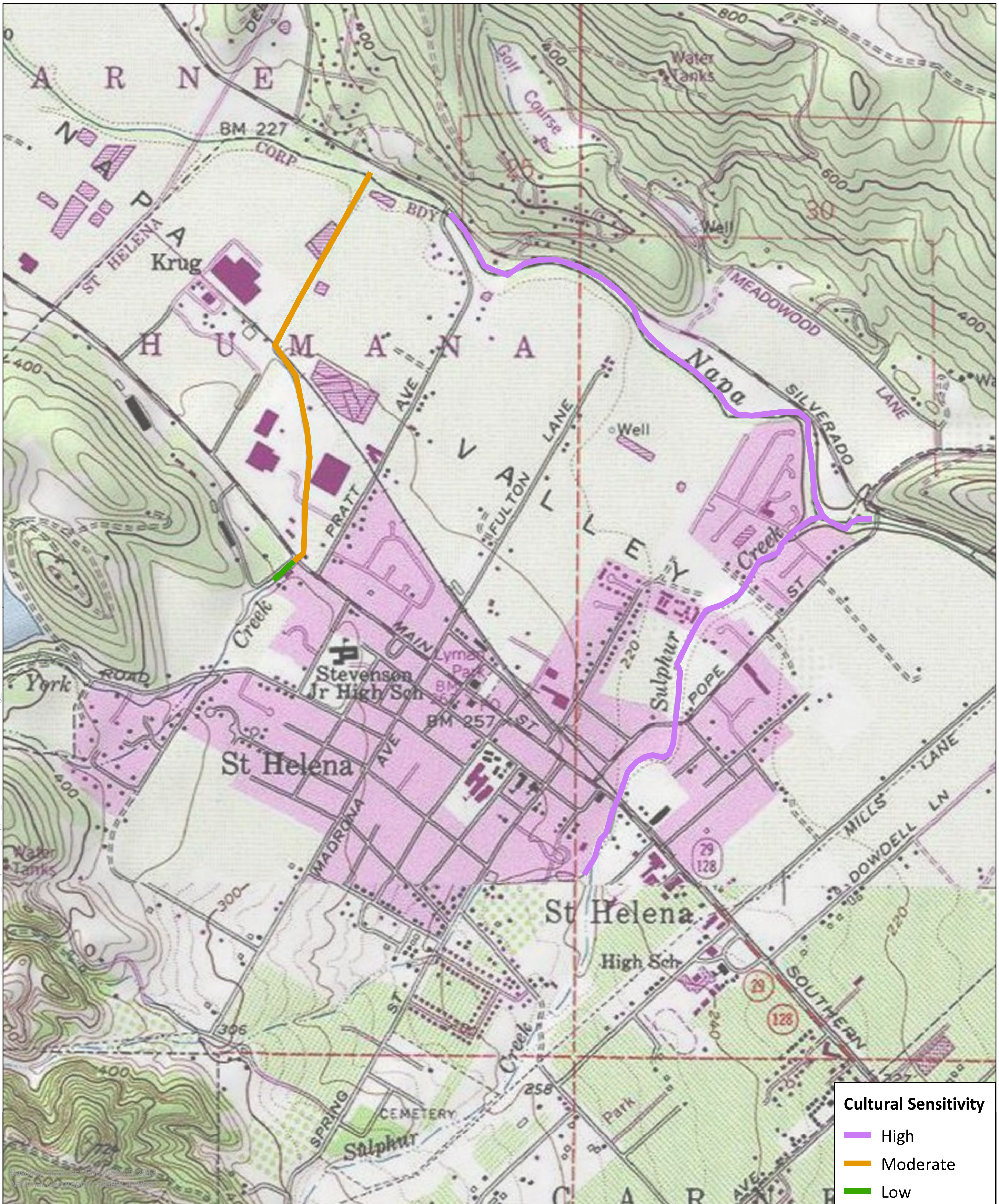
0 0.5 1

Miles

Figure E-1

Cultural Resource Sensitivity:

Calistoga Area

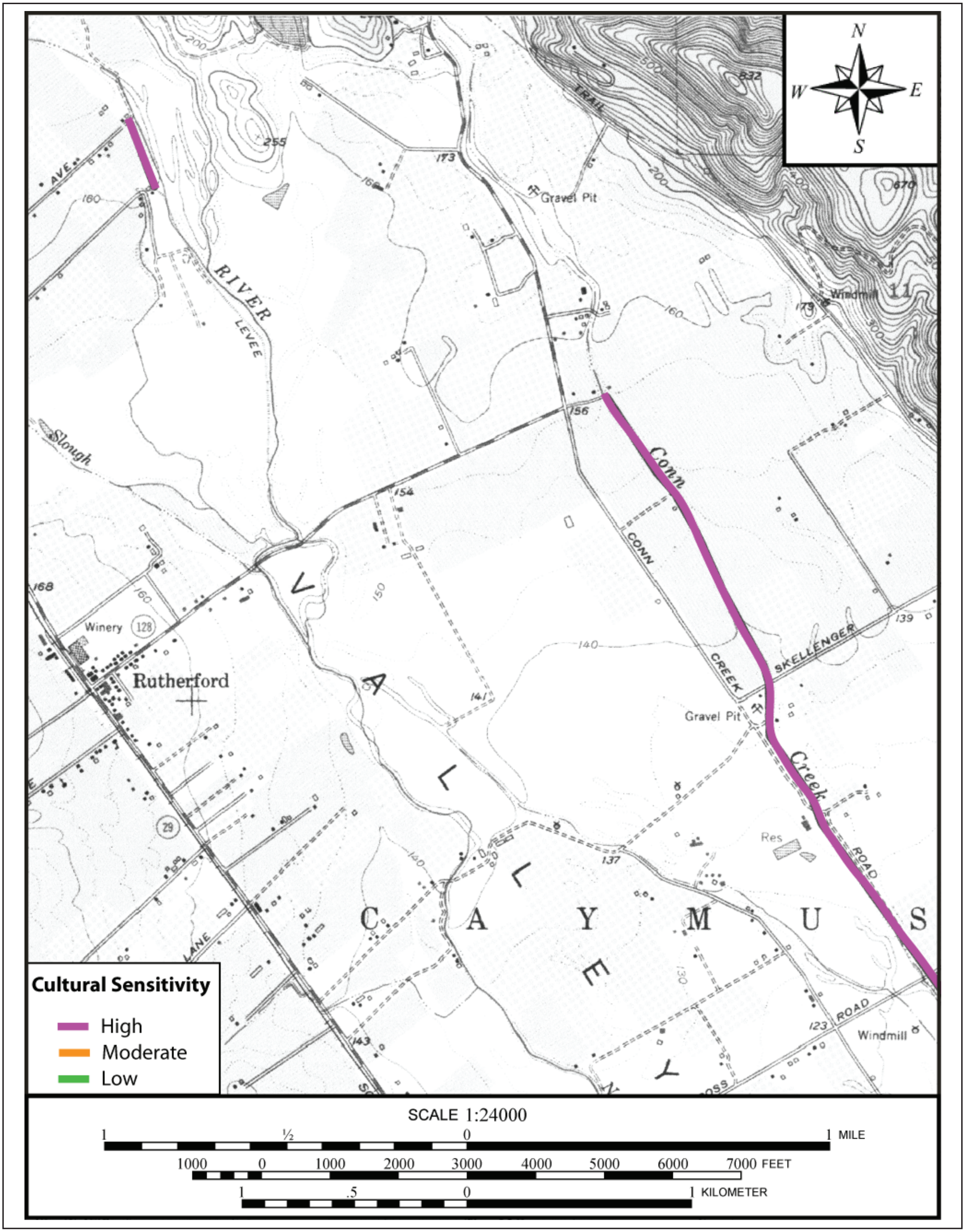


N

0 0.5 1
Miles

Figure E-2
Cultural Resource Sensitivity:
St. Helena Area

C:\Users\GIS\Documents\ArcGIS_PROJECTS\16007_NapaSMP_Support_2016-2018\mxd\cultural\Fig_E2.mxd 7/18/2017 PG



NAPA COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT
American Canyon • Calistoga • Napa
St. Helena • Yountville • Napa County

Figure E-3
Cultural Resource Sensitivity: Conn Creek Area

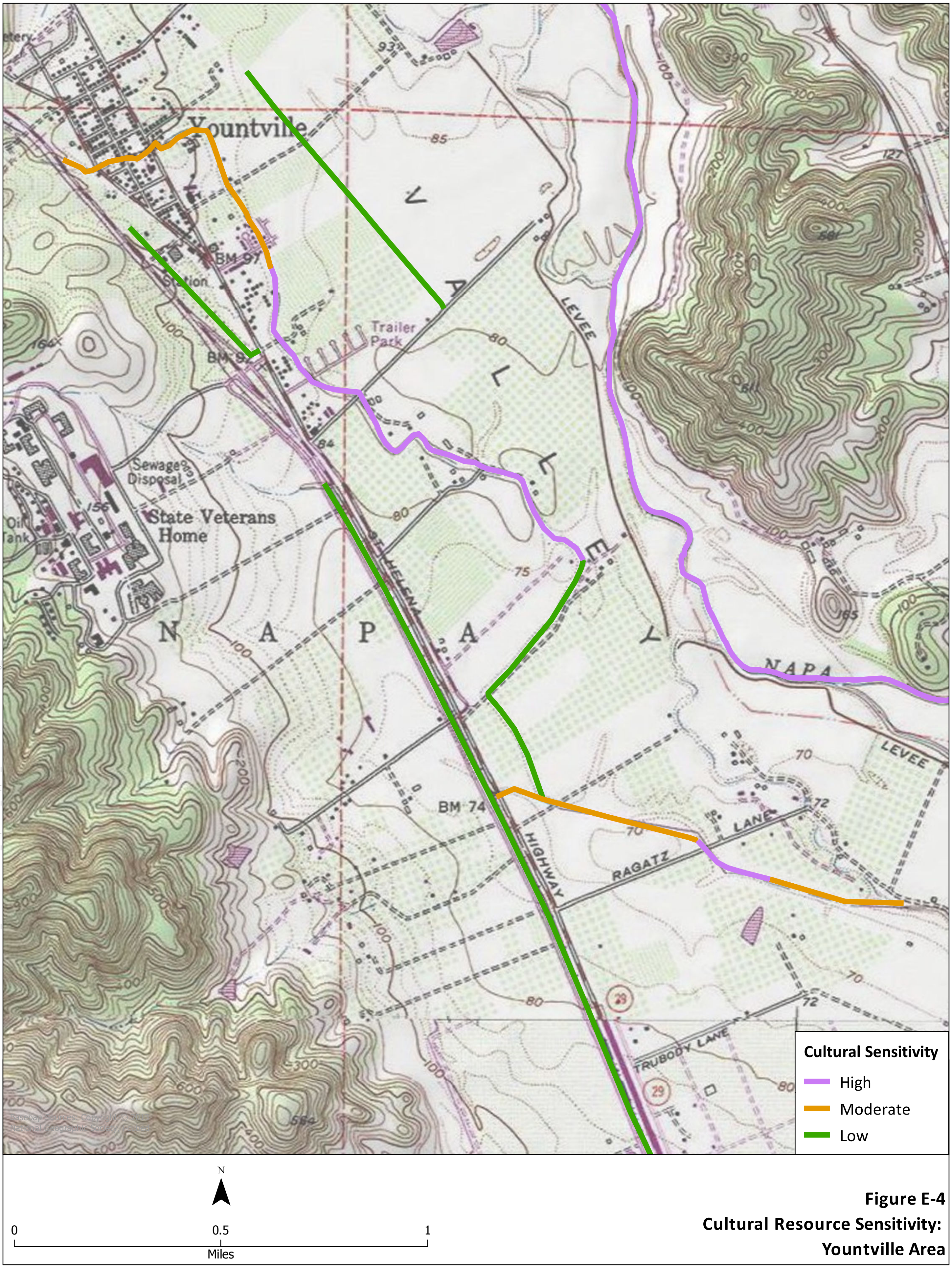
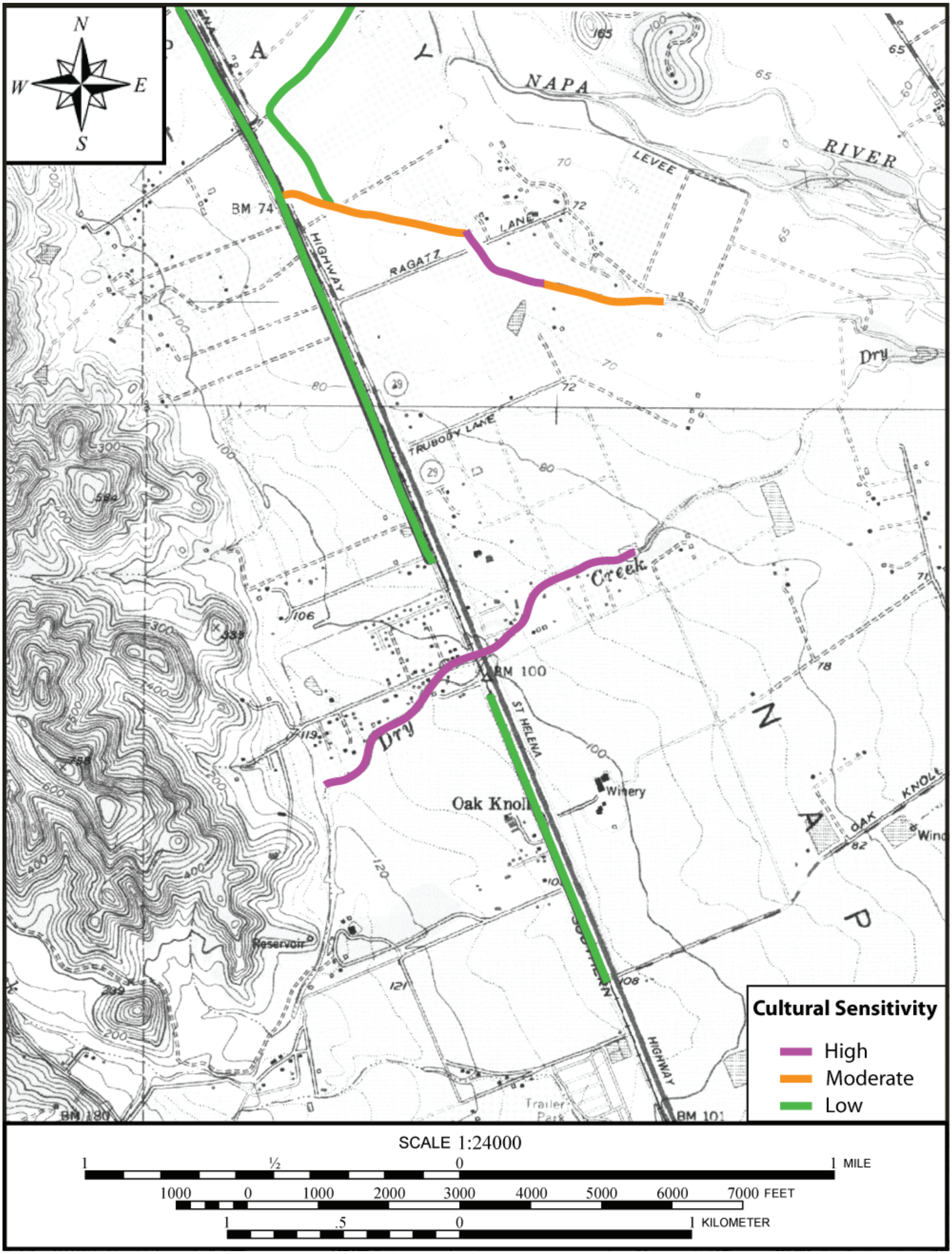


Figure E-4
Cultural Resource Sensitivity: Yountville Area



Project: \ 10.004\NapaSMP\Origer\Oct2011

NAPA COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT
American Canyon • Calistoga • Napa
St. Helena • Yountville • Napa County

Figure E-5
Cultural Resource Sensitivity: Oak Knoll Area

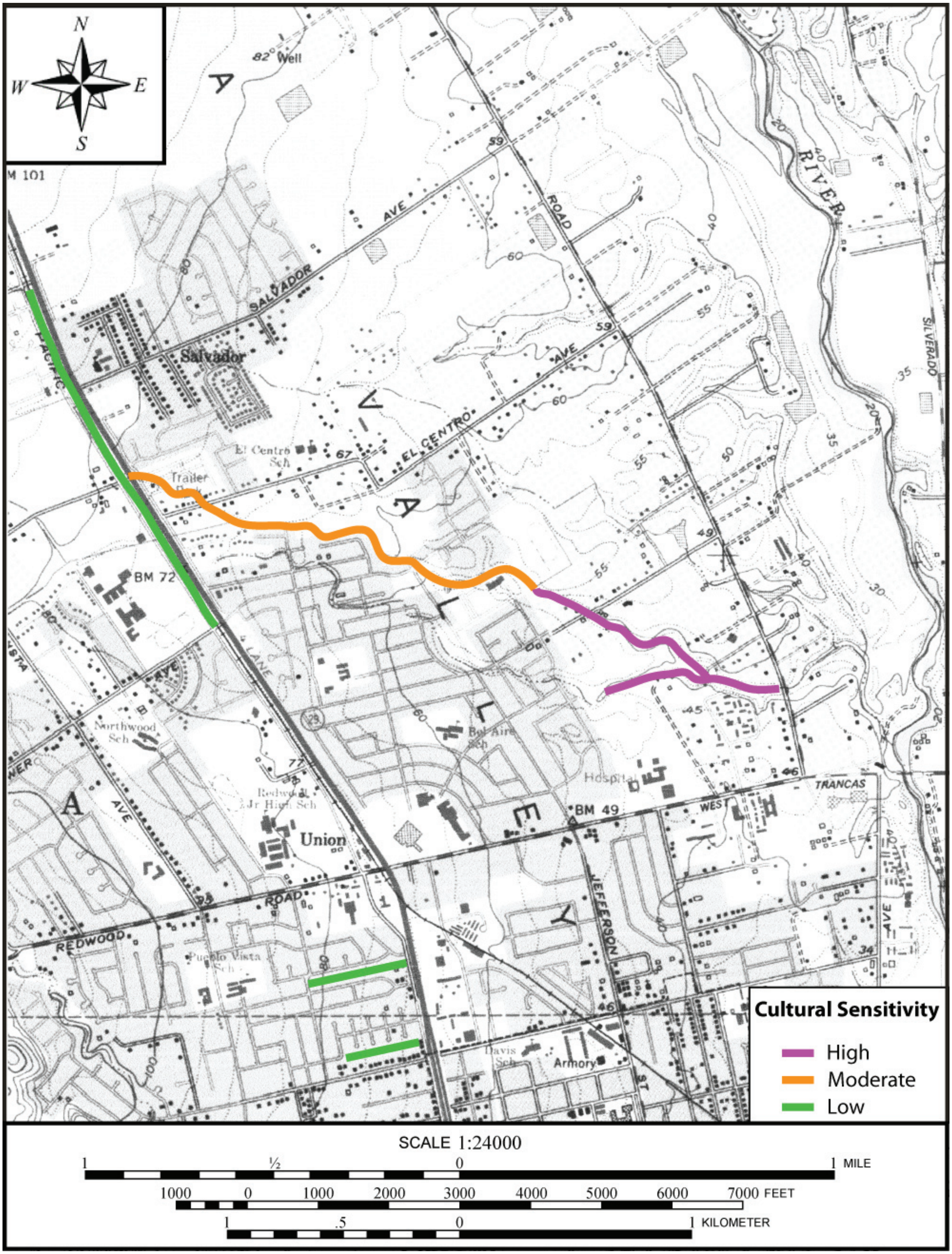


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Figure E-6
Cultural Resource Sensitivity: City of Napa North

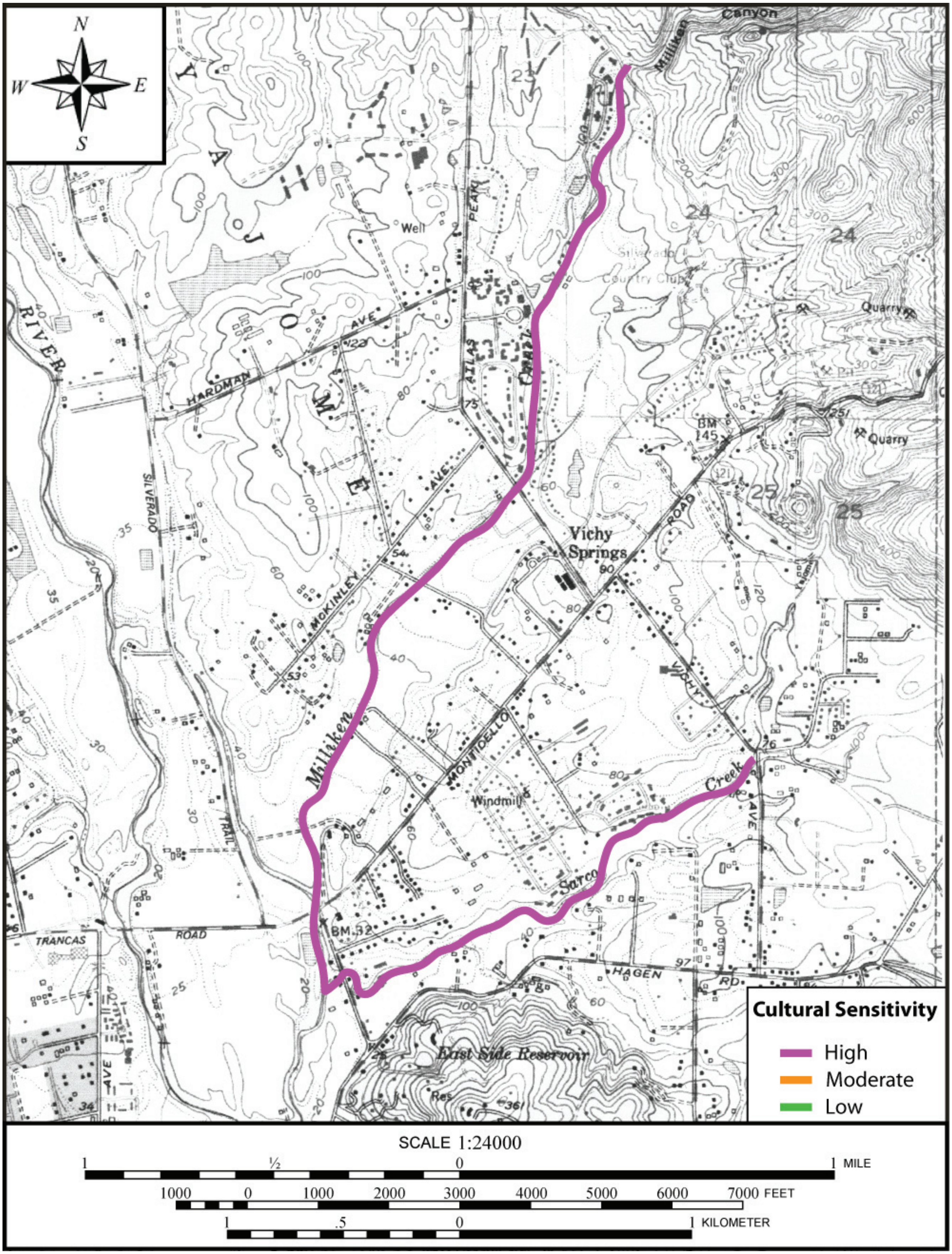

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Figure E-7
Cultural Resource Sensitivity: Milliken-Sarco Area

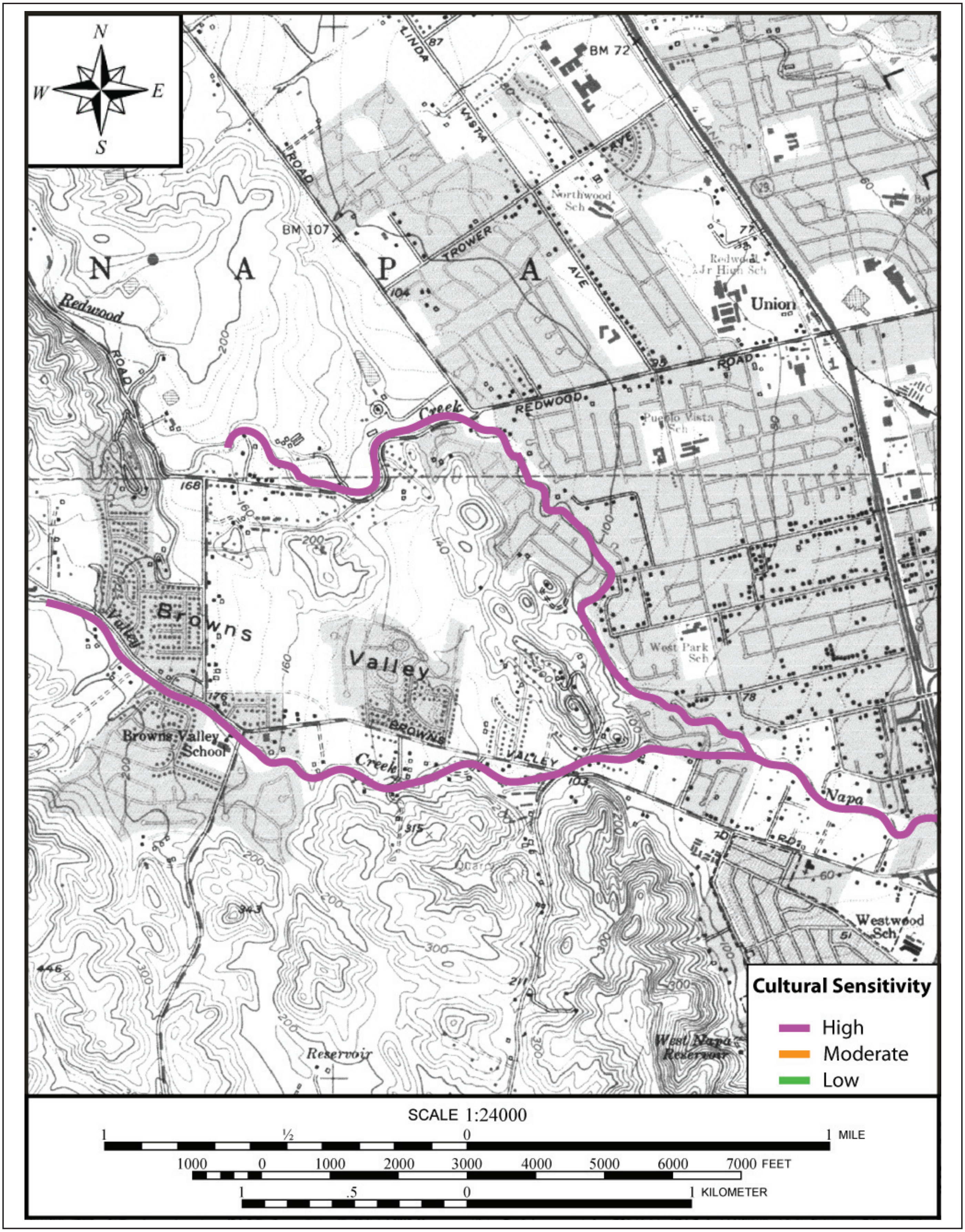

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Figure E-8

Cultural Resource Sensitivity: Browns Valley Area

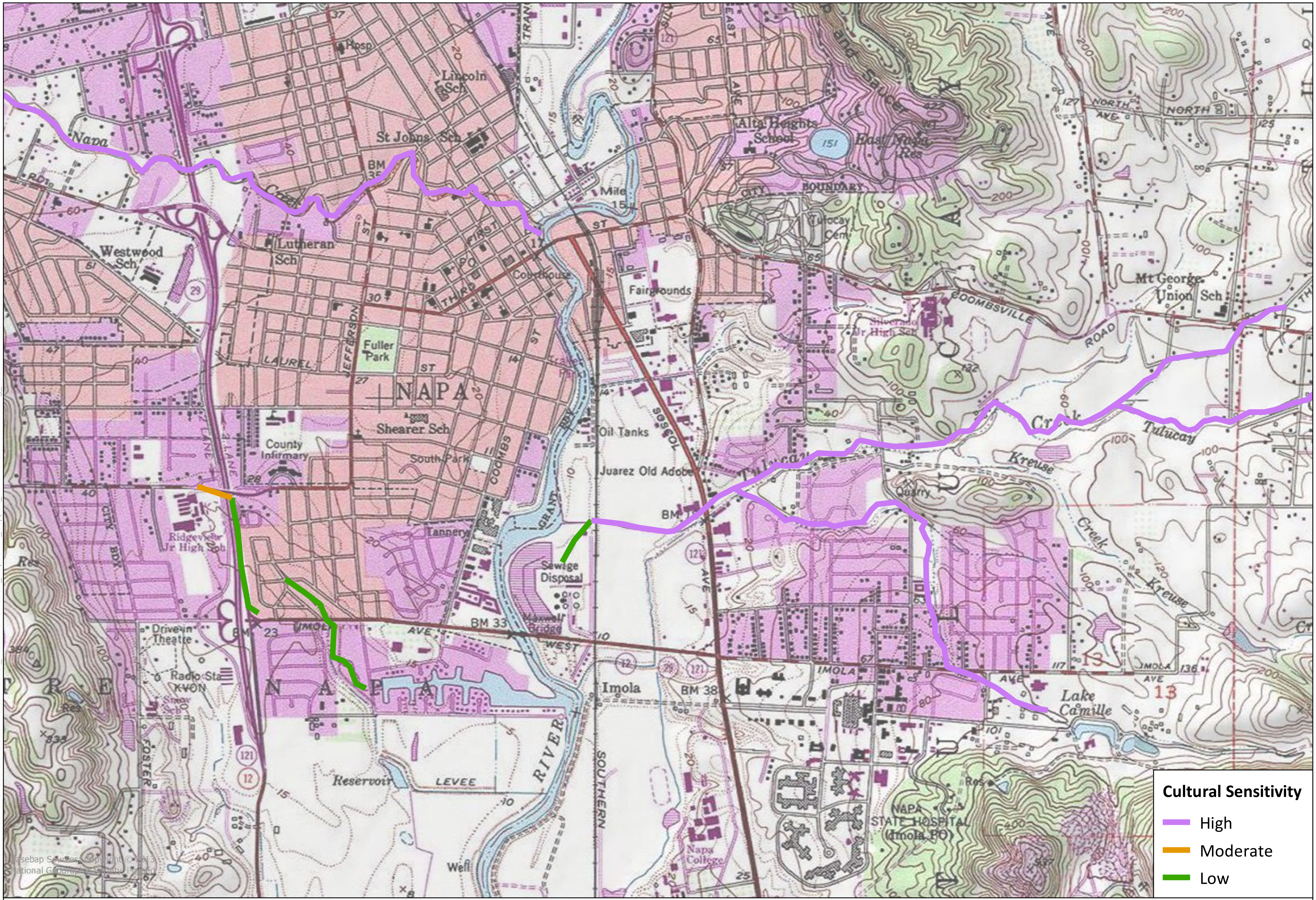

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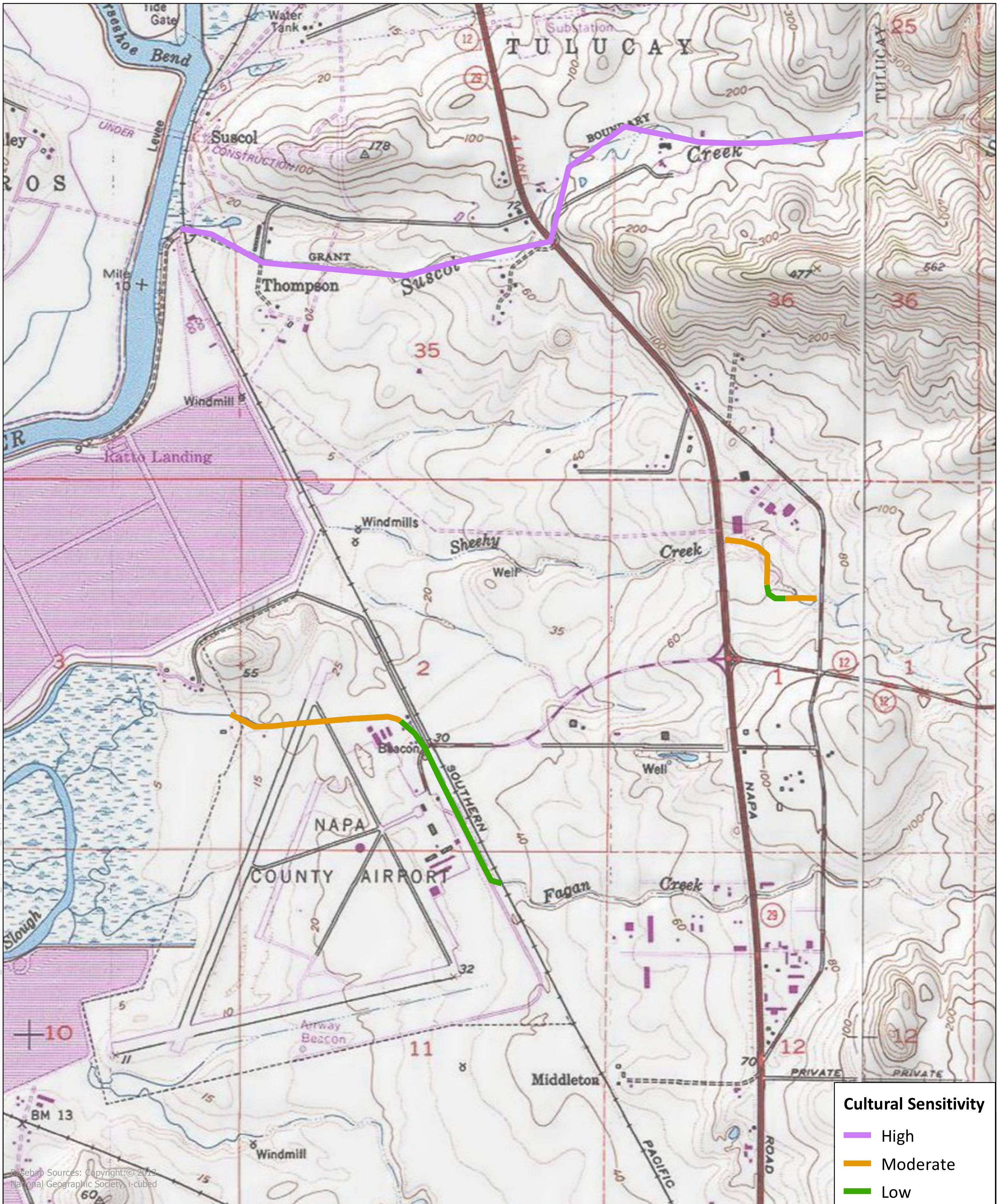
Figure E-9
Cultural Resource Sensitivity: Central Napa Area



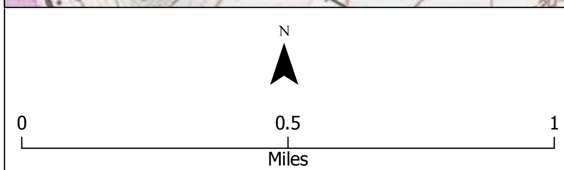


Figure E-10
Cultural Resource Sensitivity:
Airport Area

Figure E-11
Cultural Resource Sensitivity:
Rutherford Reach Restoration Project

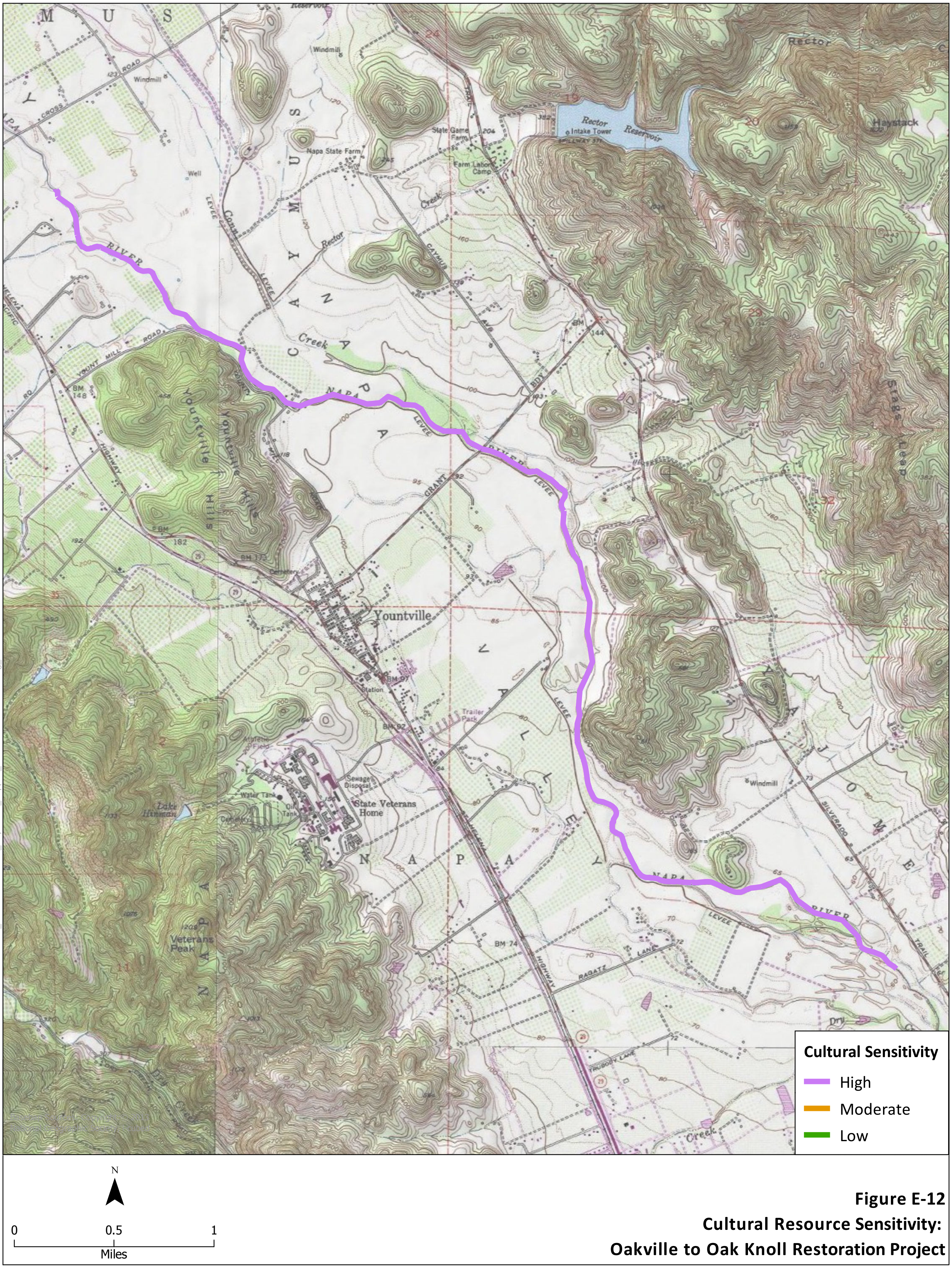


Figure E-12
Cultural Resource Sensitivity: Oakville to Oak Knoll Restoration Project

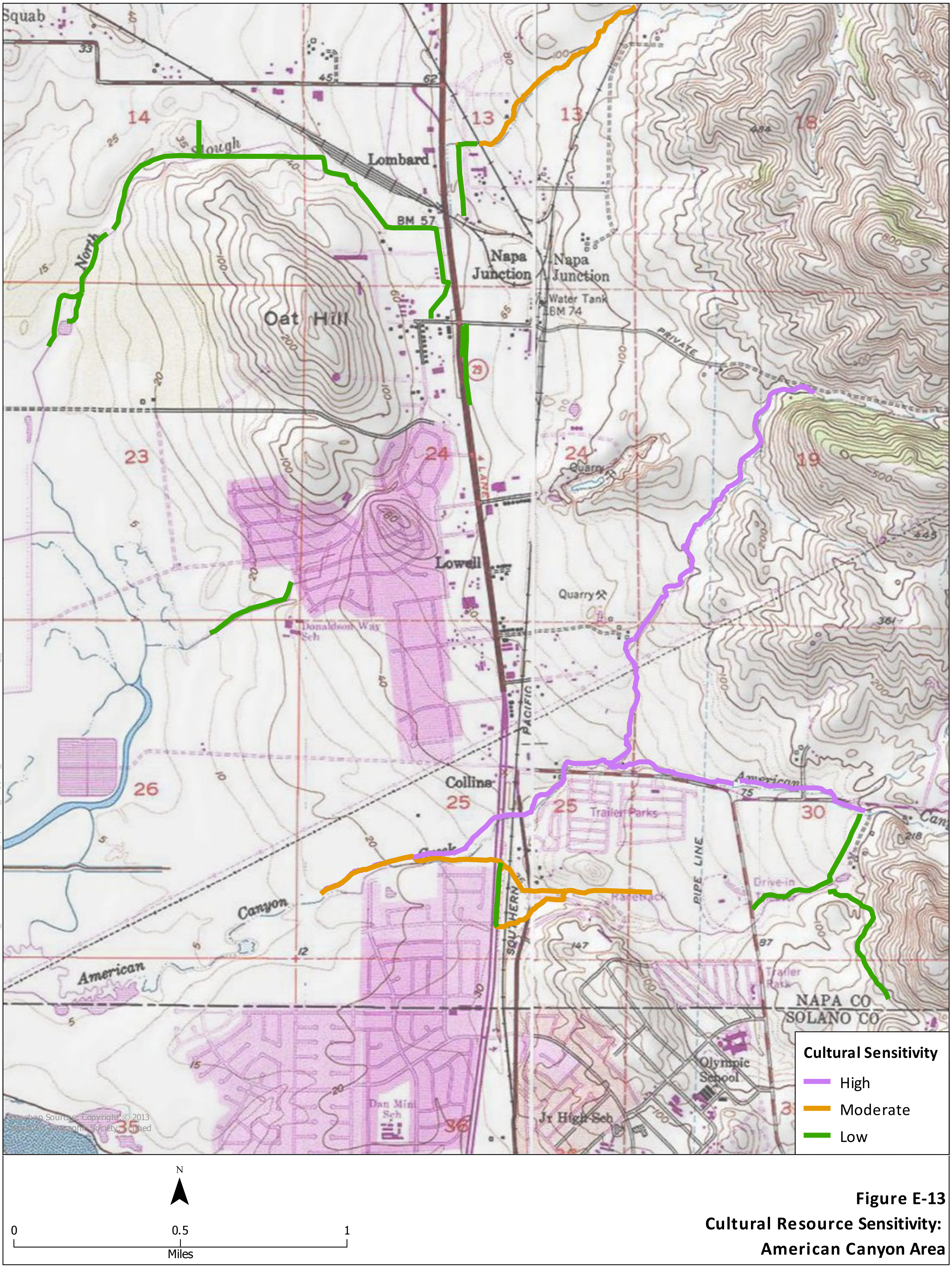


Figure E-13
Cultural Resource Sensitivity:
American Canyon Area

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Appendix F

Stream Maintenance Program Channel Quantitative Assessment Reports

Napa County Flood Control and Water Conservation District

PHILLIP M. MILLER, P.E.
DISTRICT ENGINEER

May 30, 2014

Mr. Fred Hetzel
San Francisco Bay Regional Water Quality Control Board
1515 Clay Street, Suite 1400
Oakland, CA 94612

Dear Mr. Hetzel:

Subject: **Waste Discharge Requirement & Water Quality Certification Order No. R2-2012-0063: Stream Maintenance Program Quantitative Assessment and Channel Inventories Work Plan**

The Napa County Flood Control and Water Conservation (District) has prepared the enclosed Stream Maintenance Program (SMP) Quantitative Assessment and Channel Inventories Work Plan.

In 2012, the District finalized the Stream Maintenance Manual and updated the programs permits. Provision 26 of the WDR/WQC required the District to develop a work plan for conducting quantitative assessments of engineered flood control channels. Provision 43 required that the District develop a number of channel inventories and identify potential preventative maintenance projects. The enclosed report provides the Districts approach and work plan for carrying out the quantitative assessments and includes all the requested inventories. The District intends to use this information to inform and guide future maintenance activities.

If you have any questions feel free to contact, Shaun Horne (shaun.horne@countyofnapa.org/(707)259-8624), or contact Rick Thomasser (richard.thomasser@countyofnapa.org/(707)259-8657.

Thank you for taking the time to review the Report and Work Plan. We look forward to continuing to collaborate with you to protect and enhance natural resources while reducing flood risk.

Sincerely,

Richard Thomasser, P.G.
Watershed and Flood Control Operations Manager
(707) 259-8657
richard.thomasser@countyofnapa.org

Napa County Flood Control and
Water Conservation District

Stream Maintenance Program
Quantitative Assessment & Channel Inventories
Work Plan

Prepared For:

Water Boards

Order No. R2-2012-0063

Napa County Flood Control &
Water Conservation District
804 First Street
Napa CA, 94559-2623
Contact: Richard Thomasser
707-259-8657

NAPA COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT
American Canyon • Calistoga • Napa
St. Helena • Yountville • Napa County

May 30, 2014

Quantitative Assessment & Channel Inventories Work Plan 2014

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QUANTITATIVE ASSESSMENT & CHANNEL INVENTORIES WORK PLAN

1.0 Introduction

The Napa County Flood Control and Water Conservation District is responsible for maintaining the hydrological capacity of flood control channels and natural streams to minimize flooding. The District sees itself not merely as a flood management bureau, but more broadly as a resource management agency with a duty to integrate environmental benefits (such as habitat protection and enhancement) into stream maintenance activities.

The District has maintenance responsibilities for flood control channels that the District owns in fee title, as well as other channels for which the District has a maintenance agreement or easement. The location and channel ownership types for District maintenance are presented in the in Figure 1 below. The District's staff surveys flood control channels and easements annually and prescribes maintenance activities based on existing conditions. The stream maintenance program has four primary activities: vegetation management, downed tree management, erosion protection and bank stabilization, and sediment and debris management.

The District also provides discretionary maintenance in other county channels, maintains instream facilities for their proper functioning, responds to public requests for maintenance activities at other stream and channel locations and is involved in the maintenance of ongoing restoration projects. In recent years, the District has been collaborating with private landowners and other local entities on the implementation of riparian and stream restoration projects as well as on the long term monitoring and maintenance of such projects. Additionally, the District administers a Stream Bank Stabilization Cost-Share program to assist private landowners with the implementation of biotechnical bank stabilization projects in an effort to reduce streambank erosion, improve water quality, and protect property.

2.0 Stream Maintenance Program

In 2011, the District developed the Stream Maintenance Manual (SMM) to guide maintenance activities and to expand the programs permit coverage. The objective of the Manual is to provide clearly articulated guidance to avoid and minimize environmental impacts while conducting maintenance. The Manual also describes the program's organizational framework to oversee routine maintenance activities and ensure that maintenance is compliant with the terms and conditions of regulatory permits. As part of the SMP Regional Water Quality Control Boards Waste Discharge Requirements and Water Quality Certification (Order No. R2-2012-0063) the District is required to develop an inventory of engineered channels and develop a quantitative assessment of flood control channels. As part of this effort and in accordance with provision 26 of the WDR, the District has developed this work plan to carry out the quantitative channel assessment over the coming years. The purpose of this inventory and assessment is to develop priority maintenance prevention projects to enhance the physical and biological processes within the County's flood control channels.

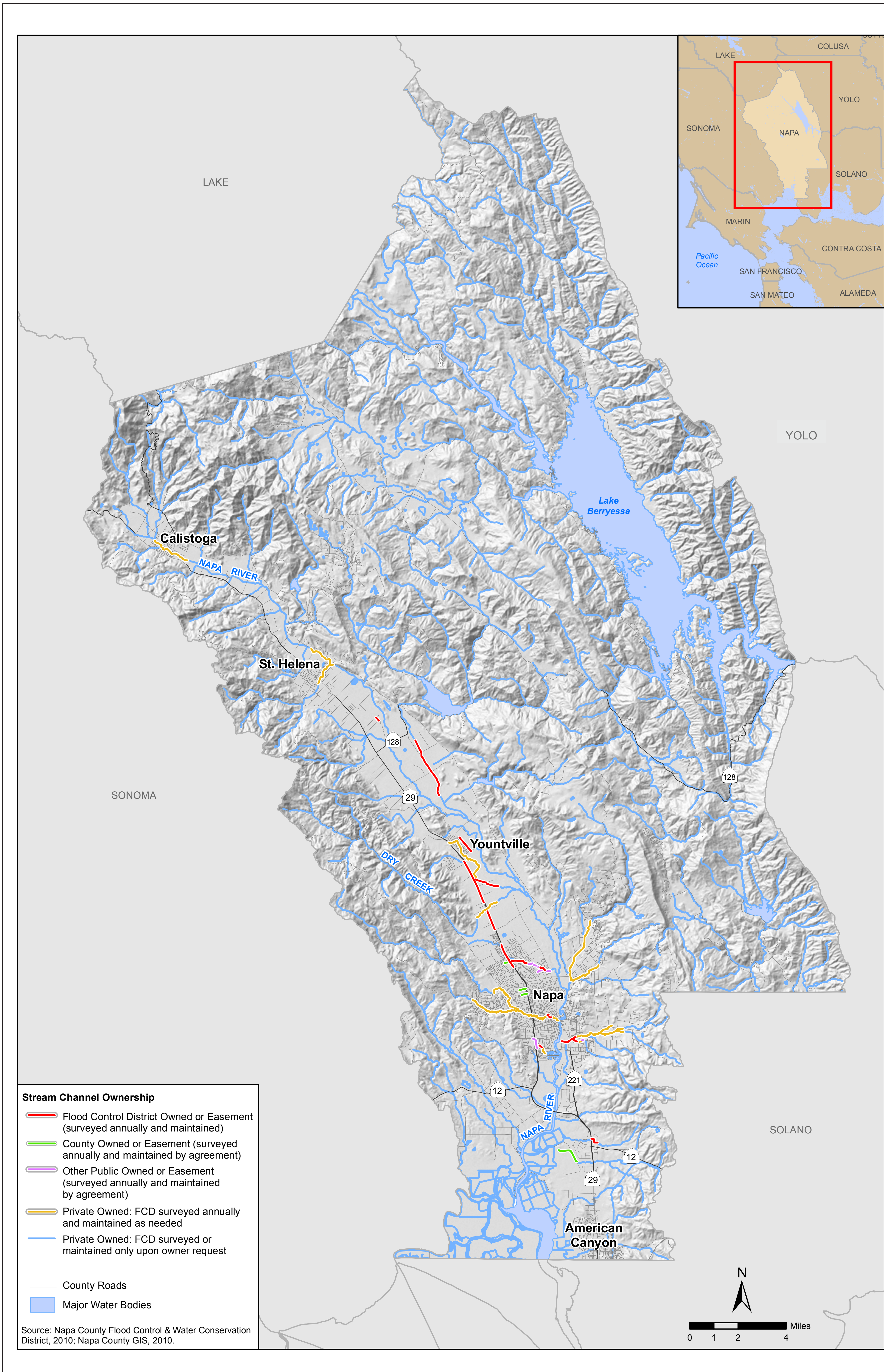

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Figure 1
Napa County Stream Maintenance Program Area and Maintenance Reaches

In order to better understand channel conditions, the frequency of channel maintenance activities, and how channels respond to maintenance activities the District is actively mapping maintenance activities and monitoring post project conditions. The District conducts stream surveys each year and is developing monitoring tools to help document the response of maintenance projects. The District updated its stream maintenance database in 2013-2014 to a web based geo database, which allows field crews to use a mobile application to assess channel maintenance issues in the field and collect pertinent pre and post project details. The District has also been developing tools to monitor the presence, stability, function, and habitat characteristics of Large Woody Debris structures in natural channels. The District is committed to applying scientific principles to channel maintenance activities to enhance stream habitat conditions and physical processes while maintaining adequate channel capacity to minimize flooding.

2.1 Channel Types

The District maintains three types of flood control channels and streams where the District may conduct maintenance activities, including: engineered channels and "collectors", modified/semi-modified channels, and natural streams. The SMM describes these channels and associated maintenance activities in greater detail (SMM Ch. 2).

Engineered flood control channels are typically v-shaped or trapezoidal channels (or ditches where they are small). In some locations, such channels are referred to as "collectors" where they may typically collect runoff from other small local drainages. The District owns and maintains (or provides maintenance of an easement) for approximately 5.3 miles of engineered collector channels. Examples of engineered flood control channels include the Yountville Collector and Solano Ditch. "Collector" channels in Napa County, such as the Yountville Collector or Salvador Collector channels typically collect and convey flows near roads and rail lines that may intersect the original pathway of the creek. Collectors were designed with steepened banks (generally 2:1 or less), little to no riparian corridor vegetation, and currently support poor quality habitat for species such as salmonids. These channels are typically filled with aquatic vegetation, such as cattails.

Modified channels are channels that have been widened or straightened to increase channel conveyance capacity, but not necessarily engineered to a specific design flow or specification. Examples of modified channels include the Yountville Outfall and lower reach of Salvador Creek. The District owns and maintains (or provides maintenance of an easement) for approximately 3.1 miles of modified channels. These channel reaches were primarily modified to reduce flooding of adjacent agricultural and residential developments. The banks and overall alignment of the creek channel is wider and straighter than natural channels to allow for increased flow conveyance capacity. Modified channels often support a low flow channel nested within the channel bed and some riparian corridor vegetation. Semi-modified channels have natural, un-modified stream beds and support a higher percentage of native vegetation to non-native vegetation, and a moderate to mature riparian corridor. The banks of these channels may have been modified to prevent flooding or bank erosion. The District owns and maintains (or provides maintenance of an easement) for approximately 4.5 miles of semi-modified channels. Examples of these channels include Tulocay and Conn Creek.

The District has also identified several flood prone reaches of streams (26 mi), generally within urban areas which it surveys regularly to monitor for potential problems. Examples include portions of the Napa River and Sulpher Creek in northern Napa County (Figure 1), Hopper and Dry creeks in the Yountville region. The remaining creeks in Napa County, shown as a thin blue line in the maps of Figures 1 are privately owned creeks where District maintenance activities may take place only following a specific owner request and District staff evaluation of the appropriateness of the request. Maintenance activities are generally limited to vegetation and LWD management, invasive species eradication support, removal of trash, debris, and abandoned structures, and biotechnical erosion and bank stabilization.

3.0 Quantitative Assessment

The District has developed a workplan and implementation approach for carrying out the quantitative assessments of flood control easements and channels. The quantitative assessment will be carried out in channels that receive routine maintenance activities and are consider engineered flood control channels. The District conducted the quantitative assessment in accordance with provision 26 of the WDR/WQC.

Provision 26

The District shall develop a workplan and an implementation schedule for developing channel capacity objectives and estimates of flood stage-discharge relationships. The Development of this information will guide the selection of annual maintenance locations needed for flood protection as reported in the Annual Workplans. Channel dimensions objectives that facilitate stream equilibrium conditions, address excessive erosion and deposition problems, and promote sustainable habitat conditions, shall be developed and used to guide channel grading and enhancements activities.

- *A. The District shall develop roughness objectives for all major channels contained in the SMP Manual and determine the tolerance for loss of freeboard in engineered flood controls channels.*
- *B. The District shall provide preliminary estimates of stage-discharge relationships for channel reaches most likely subject to maintenance (including those areas and channels identified in the inventories for targeted and localized sediment and vegetation removal projects). These estimates should be based on field measurements. For those channels lacking sufficient high flow data, the District shall implement a program for developing stage-discharge relationships for larger magnitude flows.*
- *C. The District shall develop estimates of channel dimensions for best establishing quasi equilibrium conditions to avoid future excessive erosion of or deposition within an active channel. These dimensions can be established using a combination of information from regional stream restoration curves, reference reach data, computation of effective discharges, shear stresses and other assessments. These estimations of active channel dimension should guide the management approaches contained in the maintenance plans and be used in implementing the maintenance activities in order to achieve more sustainable channel shapes and floodplains.*

Stream Maintenance Assessment Approach

The District's stream maintenance approach relies on recognizing fundamental hydrologic, geomorphic, and biologic processes that affect a given stream reach and adaptively managing and maintaining streams based on the underlying processes. Understanding the physical and biological setting of a particular stream reach and other contributing factors is key to determining the timing, frequency, strategy and need for various maintenance elements. To inform maintenance activities, the District developed Reach Characterization Sheets (Reach Sheets) that describe channel conditions at the District's primary maintenance locations. The Reach Sheets provide a description of the existing/baseline conditions of the channels including reach setting, physical conditions, biological conditions, and vegetation composition. The District is proposing to expand the Channel Reach Sheets in the SMM to include the quantitative assessment information to help inform maintenance activities.

The District is working with the Napa County Resource Conservation District (RCD) to develop channel assessment procedures that could be rolled out in subsequent years to the other streams channels in the SMP. An assessment of Salvador Creek was carried out to demonstrate the assessment approach and a proposed work plan for the remainder of the District's flood control channels is outlined in the subsequent section.

3.1 Salvador Creek Channel Assessment

The Napa County Stream Maintenance Manual divides Salvador Channel into three reaches (Reaches 1 through 3). General reach characteristics were computed for each reach using geographic information systems (GIS) methods, as summarized in Table 1. Reaches 1 through 3 are located between Highway 29 and Big Ranch Road. Stream crossings include two major street crossings (Jefferson Street and Trower Avenue culverts), three small private vehicular bridges, and five pedestrian bridges.

Table 1: Reach characteristics, Reaches 1 through 3, Salvador Creek.

Reach	Length (ft)	Drainage Area (mi^2)	Slope (ft/ft)
1	3,750	4.71	0.0026
2	2,850	4.88	0.0027
3	3,170	5.59	0.0063

Reach slope was calculated from topographic profiles extracted from the LIDAR digital elevation model (DEM) for Napa County. There were short sections near the middle of Reaches 1 and 2 that had greater slopes, 0.0056 and 0.0080, respectively, but the lesser slope was selected for the reaches to be most conservative.

Channel Capacity

The Jefferson Street and Trower Avenue culverts are located approximately 200-feet apart at the downstream end of Reach 1. Of these two culverts, the one with the smallest capacity will control the discharge and establish the capacity objective for the upstream reach. The District visited the culvert sites and collected culvert dimensions, inverts, and roadway elevations, and performed analyses of the culverts using the HY-8 software developed by the Federal Highway Administration (FHWA). The analyses revealed that the Trower Avenue culvert has the smaller capacity, conveying 1,360 cubic feet per second (cfs) at the top of the inlet. Therefore, the upstream channel, Reach 1, should convey a maximum of 1,360 cfs at the top-of-bank without spilling onto its floodplain.

The channel capacity objectives for Reaches 2 and 3 were computed by increasing the capacity flow for Reach 1 proportionally by the increase in drainage area. The channel capacity objectives for Salvador Creek are listed in Table 2.

Table 2: Channel capacity objectives Salvador Creek.

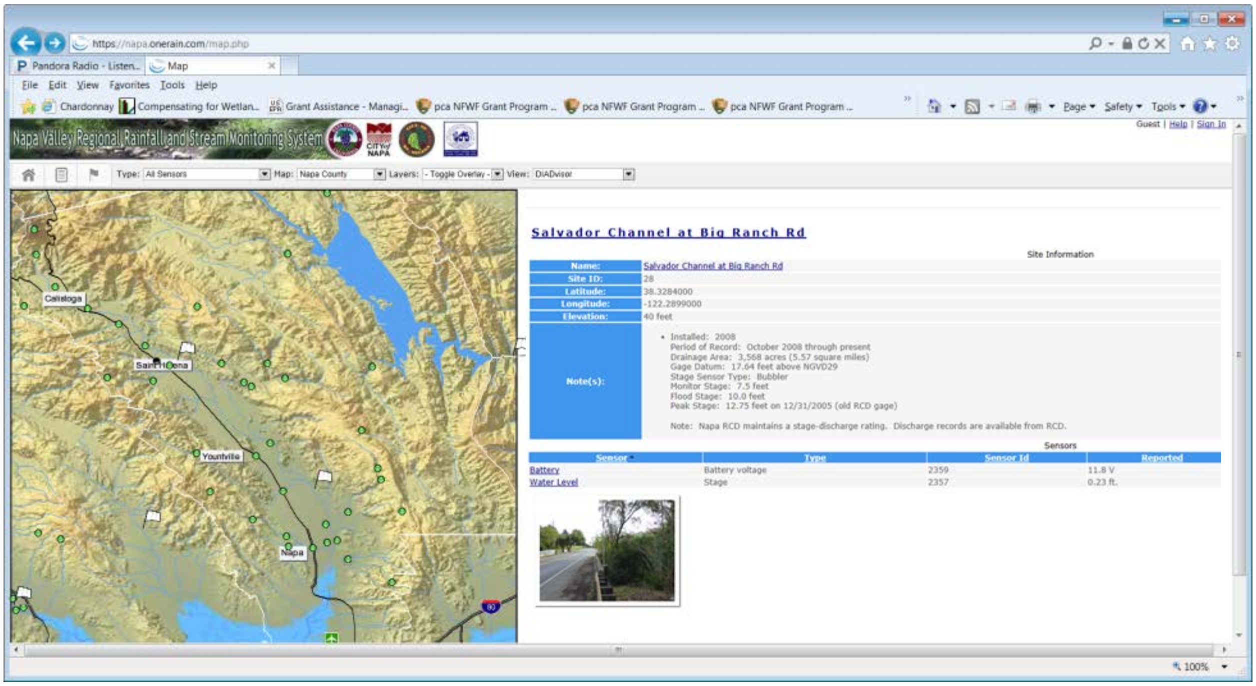
Reach	Channel Capacity Objective (cfs)
1	1,360
2	1,410
3	1,610

Channel capacity objectives are often reported in terms of peak-flow estimates; however, peak flows for Salvador Creek are not well understood and it is currently unknown what return period event corresponds to these capacity flows. The watershed is highly urbanized and common stormflow events such as the 1- and 2-years floods are known to nearly fill the channel. For example, the USGS regression equations, a common tool for estimating peak flows, predicts a 2-year flow of 324 cfs for Salvador Creek, but 9 of 10 years of stream gaging data collected at Station 28 have recorded flows well above that level, and indicate a 2-year flow of 635 cfs. Continued operation of Station 28 will eventually result in a more robust dataset which will help with frequency analysis of higher flows.

Stage-Discharge Relationships

Salvador Creek at the Big Ranch Road crossing is the location of ALERT flood warning Station 28, and a stage-discharge rating for this station has been developed over the past several years. The discharge at Station 28 is a reasonable estimate of discharge for all locations in Reach 3. The Station 28 rating is included as Figure 2, and discharge data is publically available in real-time on napa.onerain.com. Water enters Reach 3 via storm drain outfalls which may give the Station 28 discharge a high bias for upstream locations.

Figure 2: Napa One Rain Stream and Rain Gauge Website



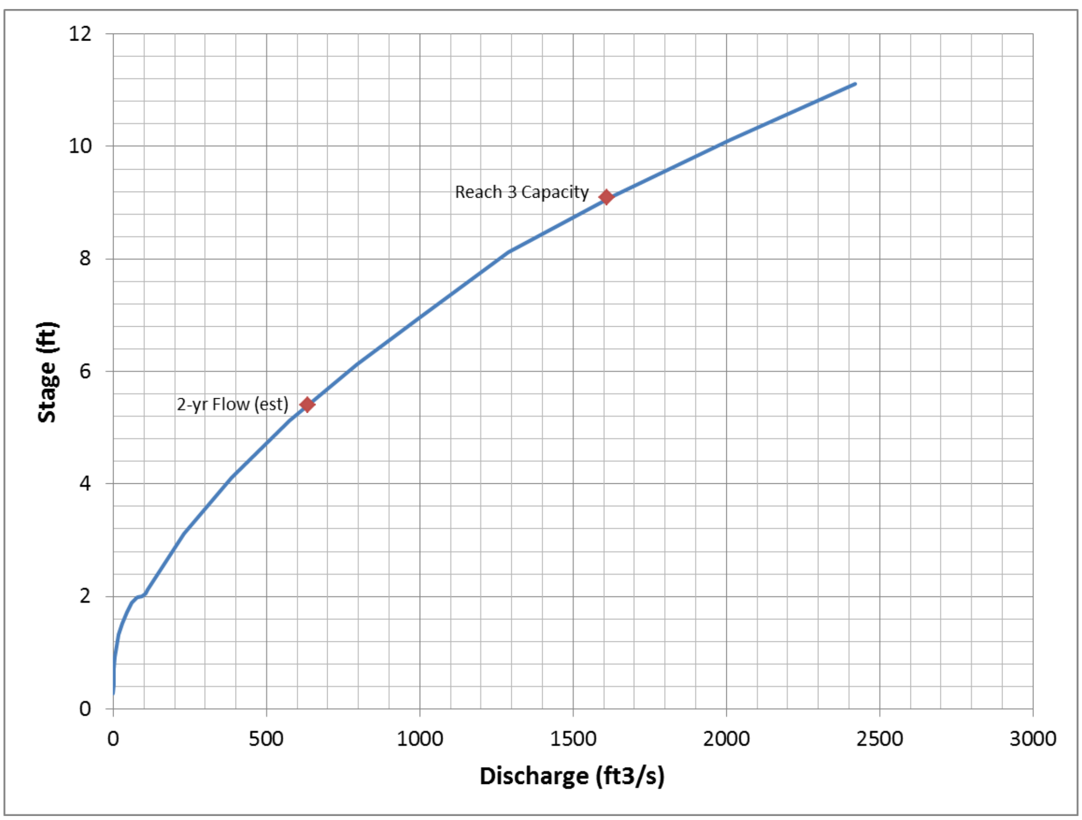


Figure 3: Stage-discharge rating for Station 28, Salvador Creek at Big Ranch Road.

A preliminary discharge estimate for Reaches 1 and 2 can be obtained by decreasing the flow at Station 28 proportionally by the decrease in drainage area, which is 84% for Reach 1 and 87% for Reach 2. However, although this method gives a discharge estimate, it is not tied to stage within Reaches 1 or 2 which may be helpful for guidance of channel maintenance activities. In addition, constructing and long-term operation and maintenance of a streamgaging station will not be an option for assessment of other ungaged channels in the SMP. To demonstrate how a preliminary stage-discharge relationship for a channel can be developed in a simple manner using an existing culverted crossing, a rating curve from the output of the HY-8 analysis of the Trower Avenue culvert described above (Figure 3).

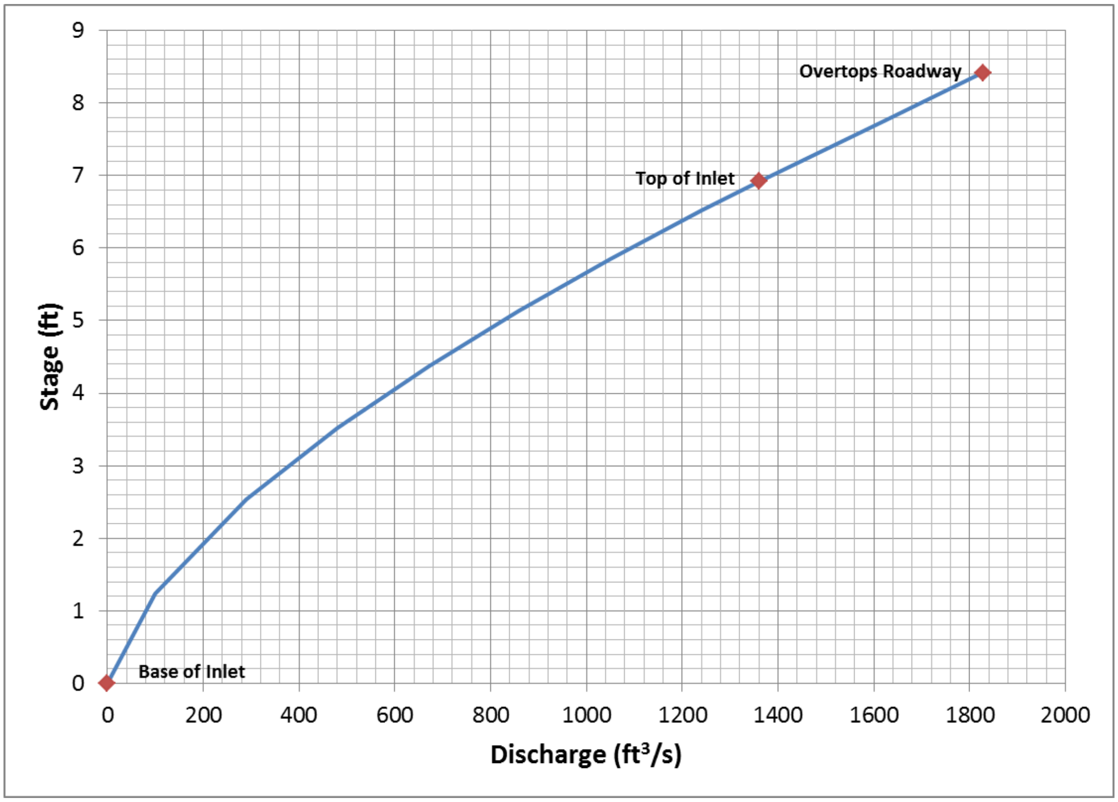


Figure 4: Stage-discharge rating for Reaches 1 and 2, Salvador Creek, HY-8 analysis of the Trower Avenue culvert.

This rating predicts discharge based on the headwater depth of the Trower Avenue culvert, and is a good estimate of discharge for other locations in the channel near the culvert. Due to the short length of the reaches, the absence of tributaries, and the small amount of additional contributing drainage area for Reach 2, this estimate is also reasonable for any location in Reaches 1 and 2 for many purposes, including guiding channel maintenance decisions. Water does enter Salvador Creek via storm drain outfalls in both reaches, which will give the Trower culvert discharge a high bias for Reach 1 locations upstream, and a low bias for Reach 2 locations.

Figure 5: Salvador Channel at Big Ranch Rd. (28) water level December 2, 2012

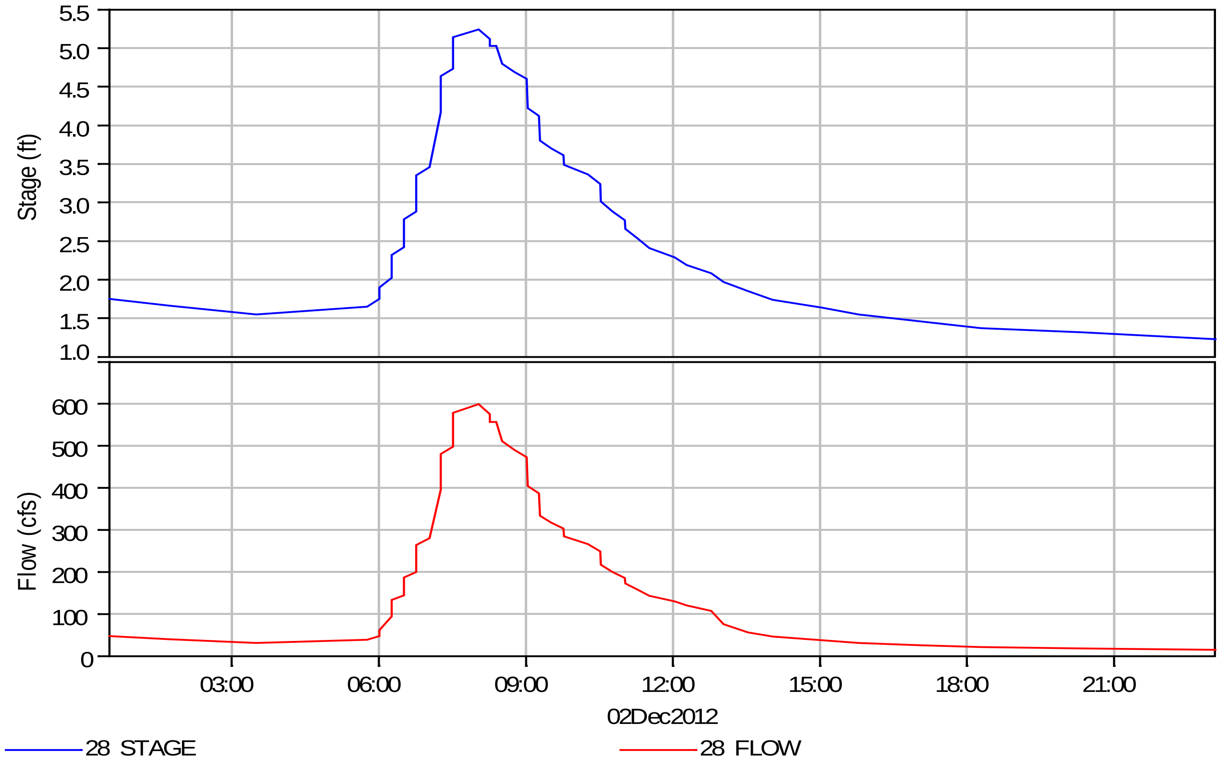


Photo 1: Trower St. bridge on 12-2-2012 at 9:34 am

Photo 2: Byway east bridge on 12-2-2012 at 9:44 am

High Flow Monitoring

The District will carry out high flow monitoring during winter months for all flood control channels being assessed. The high flow monitoring photos will help the District develop a more accurate understanding of channel capacity and stage discharge relationships.

Estimates of Quasi-Equilibrium Channel Dimensions

To develop estimates of quasi-equilibrium channel dimensions to avoid excessive erosion or deposition within each reach of Salvador Channel, channel cross section surveys were compiled as part of previous modeling efforts, and selected only those cross sections located in stable subreaches of the channel. These cross sections represent the channel in a quasi-equilibrium state. Cross-sectional area, bank slope, bottom width, and depth were calculated and averaged for each cross section to develop an idealized cross section for the reach. The number of cross sections used in each reach and the idealized channel dimensions are presented in Table 3. Figures 3 through 5 depict the idealized cross sections in relation to the surveyed cross sections. These ideal dimensions can be compared to cross sections measured at problem sites in the future to guide maintenance activities.

Table 3: Idealized channel dimensions, Salvador Creek.

Reach	No. of Cross Sections	Range of Cross Sectional Area (ft^2)	Average Cross Sectional Area (ft^2)	Idealized Channel Dimensions
1	4	192 – 231	211	**Shape:** Trapezoidal **Bottom width (ft):** 16.0 **Left Bank Slope (H:1V):** 1.5 **Right Bank Slope (H:1V):** 1.5 **Depth (ft):** 7.7 **Area (ft^2):** 212
2	7	245 – 372	314	**Shape:** Trapezoidal **Bottom width (ft):** 20.0 **Left Bank Slope (H:1V):** 2.0 **Right Bank Slope (H:1V):** 3.0 **Depth (ft):** 7.9 **Area (ft^2):** 314
3	3	196 – 256	222	**Shape:** Trapezoidal **Bottom width (ft):** 8.0 **Left Bank Slope (H:1V):** 1.0 **Right Bank Slope (H:1V):** 2.0 **Depth (ft):** 9.7 **Area (ft^2):** 223

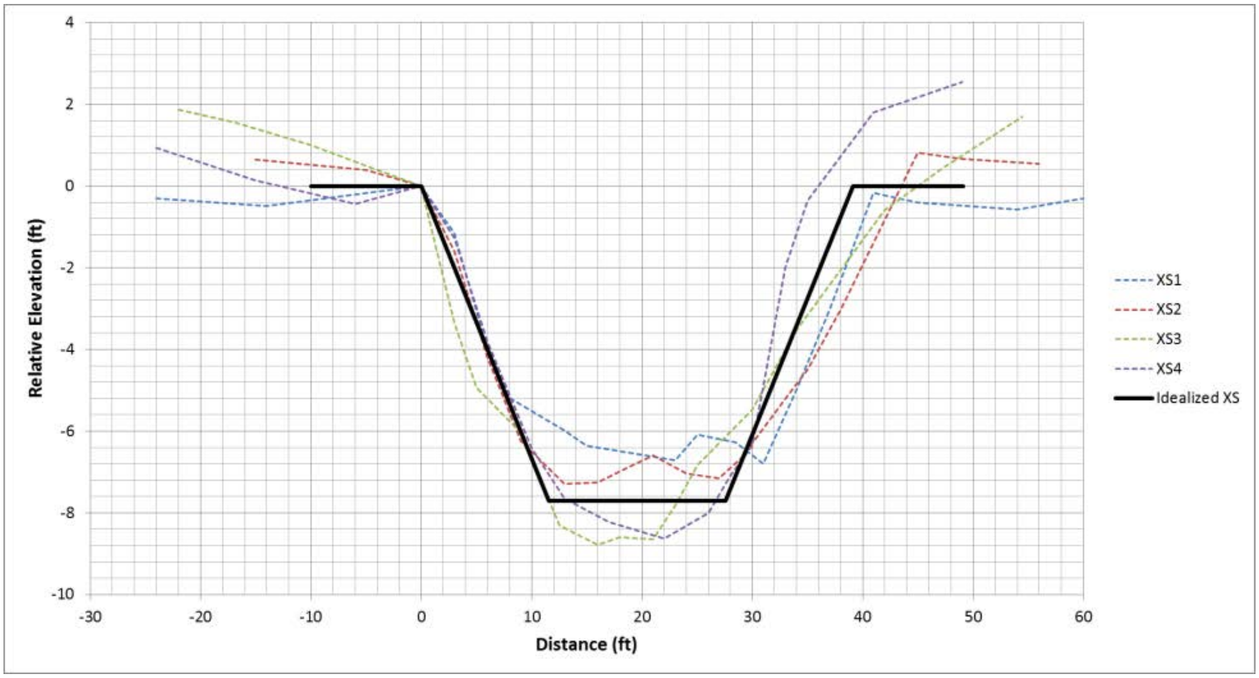


Figure 6: Reach 1 idealized cross section, Salvador Creek.

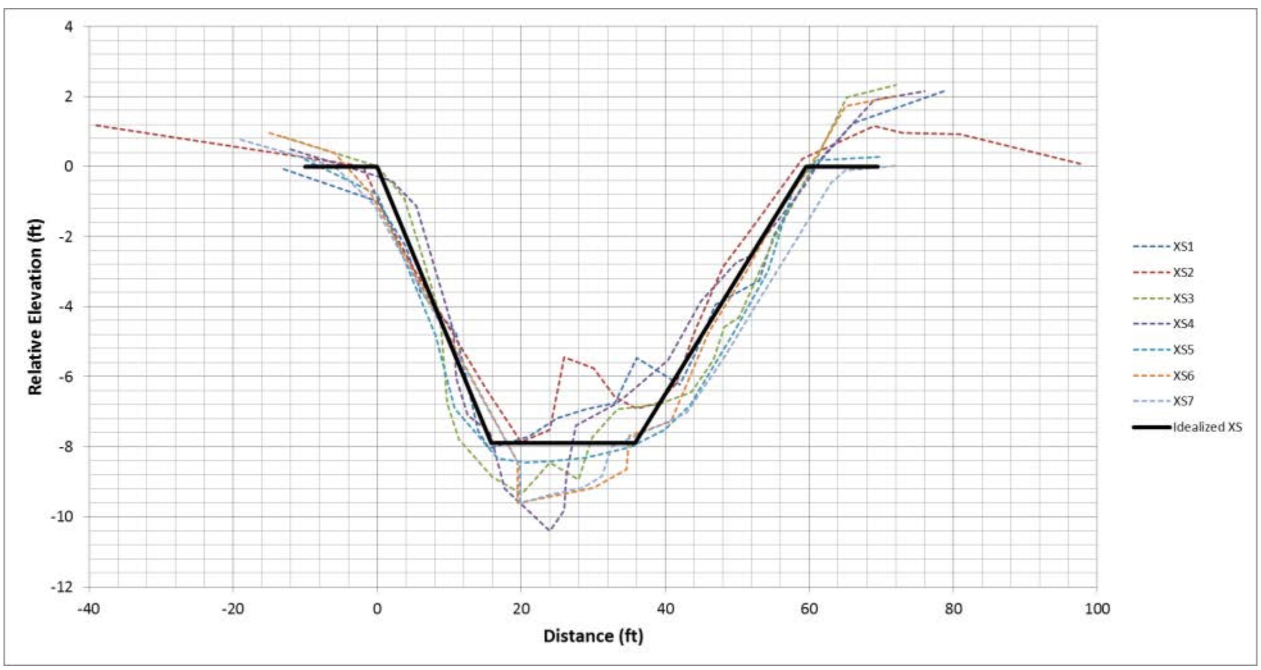


Figure 7: Reach 2 idealized cross section, Salvador Creek.

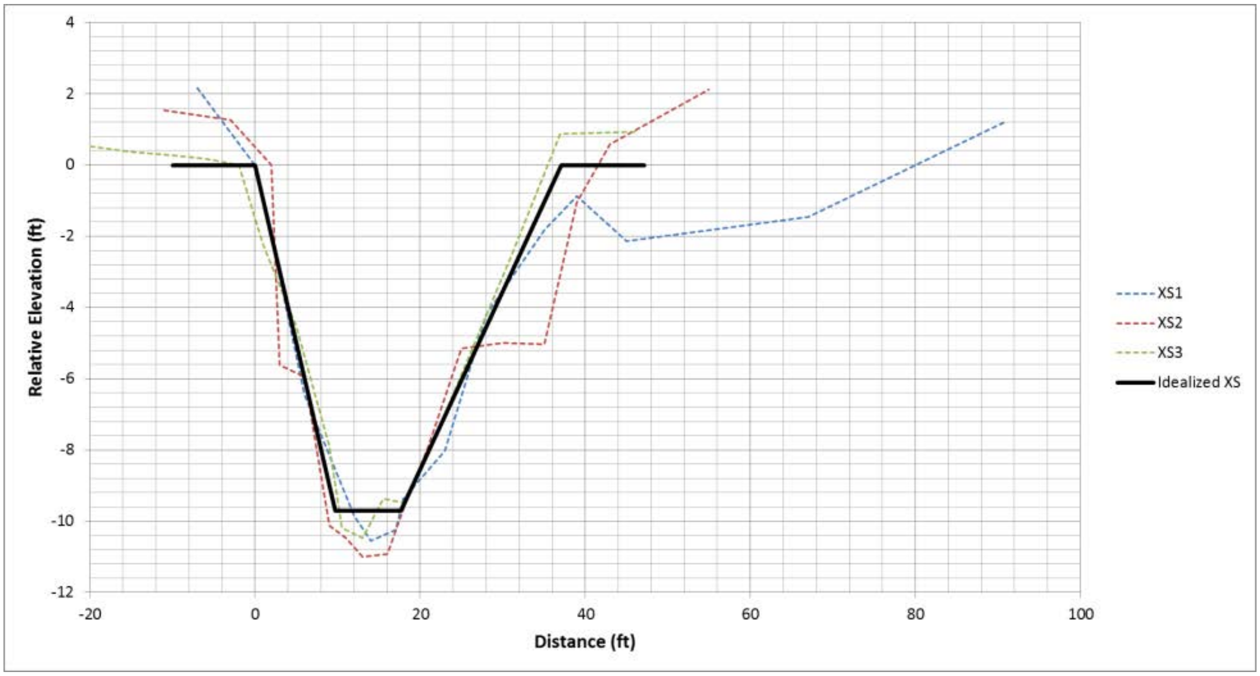


Figure 8: Reach 3 idealized cross section, Salvador Creek.

Channel Roughness Objectives

Since the banks of Salvador Creek are unarmored for most of its length, growth of riparian vegetation is desirable to protect against bank erosion. In addition, riparian vegetation often enhances wildlife habitat and aesthetics. However, overgrowth of riparian vegetation will increase channel roughness and therefore decrease water velocity and channel capacity according to Manning's Equation. To develop objectives for roughness to help identify excessive overgrowth and trigger maintenance to maintain channel capacity, ideal channel roughness was back calculated using Manning's Equation, the idealized cross section for the reach, the average slope of the reach, and maximum channel capacity.

Manning's Equation:

$$Q = \frac{1.49\ A\ R^{\frac{2}{3}} S^{\frac{1}{2}}}{n}$$

Q is the discharge in cfs, ***A*** is the cross sectional area in square feet, ***R*** is the hydraulic radius in feet, ***S*** is the slope in ft/ft, and ***n*** is the unitless Manning's roughness coefficient. The input values and calculated Manning's roughness results are shown in Table 4.

Table 4: Manning's equation input values and roughness results.

Reach	Q (ft3/s)	A (ft^2)	R (ft)	S (ft/ft)	n
1	1,360	212	4.85	0.0026	**0.034**
2	1,410	314	5.01	0.0027	**0.050**
3	1,610	223	5.07	0.0063	**0.047**

For these calculations, RCD uses the slope of the streambed instead of the water surface slope, which is called for by Manning's Equation, but unknown for this channel. However, these calculations are being performed for very high channel capacity flows where water surface slope approaches the bed slope. It is common to use bed slope as an estimate of water surface slope. Slope values and roughness objectives could be refined in the future with high-water mark surveys performed following a large event.

These n values are estimates of the maximum channel roughness in each reach that will convey the channel capacity flow through the idealized cross section, and represent the roughness objectives for the reaches. RCD collected photographs of the three reaches to depict current roughness conditions for comparison to the roughness objectives. Figures 6, 7, and 8 show roughness conditions that are representative of Reaches 1, 2, and 3, respectively. Roughness estimates for each reach are provided in the figure captions.

Photo 3: Reach 1 looking upstream showing channel roughness. n=0.030-0.040

Photo 4: Reach 2 looking downstream showing channel roughness. n=0.030-0.040

Photo 5: Reach 3 looking downstream showing channel roughness. n=0.040-0.050

3.2 Proposed Channel Assessment Work Plan

The District is proposing to carryout 2-3 channel assessments each year. The assessments will help the district identify roughness objectives, quasi equilibrium conditions, identify maintenance triggers and assist with the prioritization of maintenance prevention projects. The District is not proposing to carry out this level of assessment in drainage ditches because maintenance is typically limited to minor vegetation management.

Table 5: Channel Assessment Work Plan & Schedule

Creek	Channel Type	Assessment Schedule
Salvador Creek	Modified	2014-2015
Salvador Collector	Modified	2014-2015
Tulocay Creek	Semi-Modified	2015-2016
Camille Creek	Semi-Modified	2015-2016
Fagan Creek	Modified	2016-2017
Sheehy Creek	Modified	2016-2017
Conn Creek	Semi-Modified	2017-2018
Yountville Collector	Modified	2017-2018
Yountville Outfall	Modified	2017-2018

4.0 Channel Inventories

The District is responsible for maintaining flood control channels that are surrounded by private property and in most cases were not designed to convey a defined stormflow. The District recognizes that the vast majority of flood control easements and channels within the County are undersized. In an effort to better understand channel conditions and inform maintenance activities the District is carrying out multiple inventories in accordance with provision 43 of the WDR/WQC for flood control channels to assess and determine specific causes of maintenance related problems and to develop priority maintenance prevention projects.

Provision 43

The District shall submit the inventories note below. The purpose of the inventories is to guide assessments and determine specific causes of maintenance problems and to develop priority maintenance prevention projects. Each inventory and its associated support documentation shall be submitted to and approved by the Executive Officer.

a) An inventory of engineered channels shall be submitted with the 2014 Annual Workplans. The inventory shall include a list of all areas and channels identified as engineered channels and all channels that are subject to routine maintenance activities including the specific locations of the areas and channels identified.

b) Inventories of for the following type of projects shall be submitted with the Annual Workplans when these types of projects are included in the Annual Workplans.

i. An inventory of targeted sediment and vegetation removal areas.

ii. An inventory of localized sediment and vegetation removal areas where activities occur on an on-going basis. Localized projects that are newly-discovered and not listed in the inventory shall be included in the Annual Workplans for that year.

c) The following inventories shall be submitted with the 2014 Workplans:

i. An inventory of the stream reaches with hydraulic constrictions (e.g., under-sized culverts, bridge abutments, railroad trestles, utility crossings, and other natural or human caused obstructions) potentially causing backwater conditions, increased water surface elevations, bank instabilities, or fish passage barriers.

ii. An inventory of stream reaches that are a priority based on chronic problems, such as sediment accumulation, flooding, or excessive erosion. The inventory should include an assessment of the causes of the chronic problems and a corrective action plan.

iii. An inventory of those reaches that potentially function as migration, spawning, or high flow refugia habitat for salmonids.

iv. An inventory of stream reaches that flow through alluvial fan landscapes.

Stream Maintenance Channel Inventories

The District developed channel inventories based on the framework outlined in provision 43 of the WDR/WQC. The District surveyed all flood control channels during the 2014 stream survey season and developed the following inventories, flood control channels, target and localized vegetation maintenance activities, hydraulic constrictions and chronic maintenance issues including localized and target sediment removal projects. The District included sediment maintenance activities in the chronic maintenance inventory because the majority of sediment removal projects are seen as chronic maintenance issues. The District then developed separate inventories for flood control channel that intersect with anadromous streams and alluvial fans. The District anticipates integrating these channel inventories and quantitative assessment into the SMP channel reach sheets to help inform annual maintenance activities.

Table 6: Inventory of Flood Control Channels

Channel Type	Maintenance Priority
Drainage Ditches	
Beard Ditch	Low
Solano Ditch	Low
Webber Ditch	Low
Mee Lane Ditch	Low
Collector Channels	
Yountville Collector	Moderate
Salvador Collector	Moderate
Modified Channels	
Salvador Creek	High
Sheehy Creek	Low
Fagan Creek	Moderate
Yountville Outfall	High
Conn Creek	High
Camille Creek	High
Tulocay Creek	High

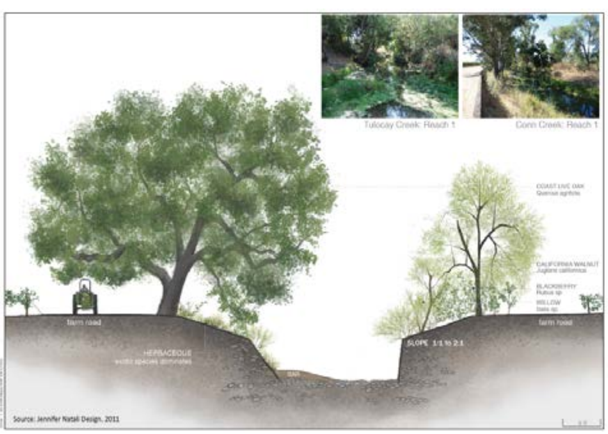


Figure 9: Example of semi-modified channel

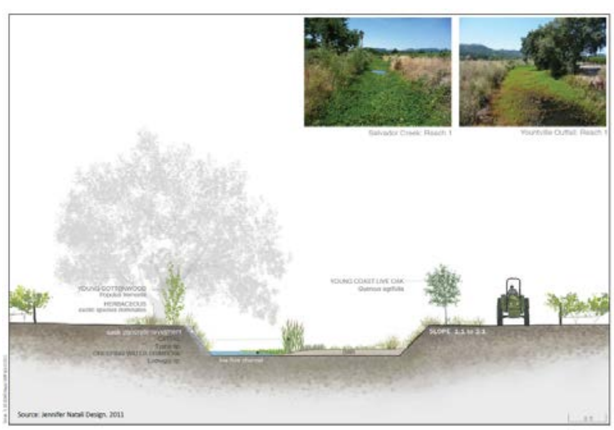


Figure 10: Example of modified channel

Salvador Collector

Vegetation Assessment

Vegetation Issue	Type (Target or Localized)	Corrective Action
Cattails	Localized	Annual vegetation management. Maintain planted trees along top of bank to create shade canopy.
Non-native Invasive Weeds	Localized	Annual mowing
Cattails	Localized	Annual vegetation management. Maintain planted trees along top of bank to create shade canopy.

Hydraulic Assessment

Issue	Cause	Corrective Action
Hydraulic Constriction/Erosion	Stream bed erosion downstream of the box culvert	Monitor
Hydraulic Constriction	Rail road abutment & road culvert	Additional assessment

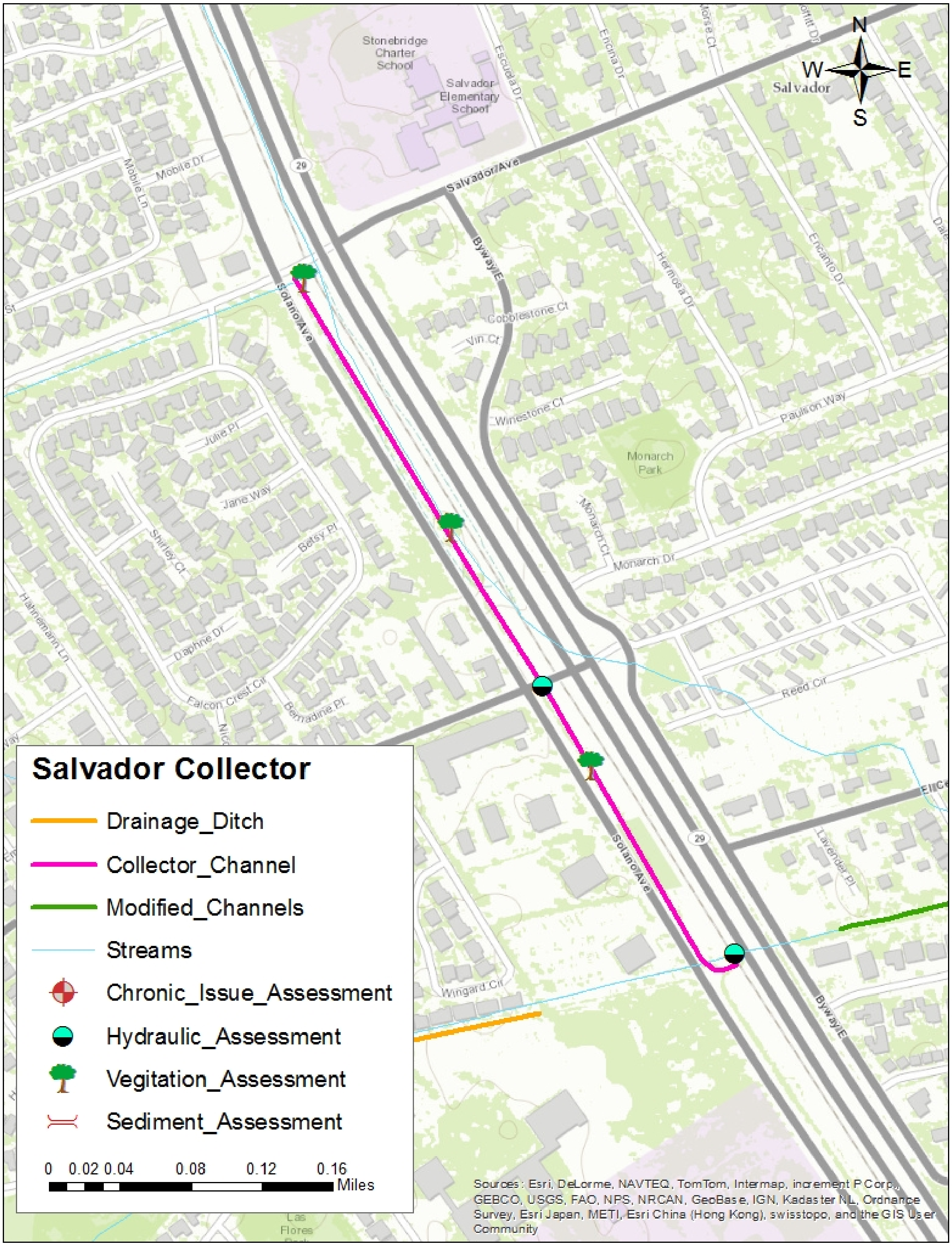
Chronic Issues & Sediment

Issue	Cause	Corrective Action
NA	NA	NA

Photo 6: Salvador Collector cattails

Photo 7: Wine Country Rd. box culvert

Photo 8: Wine Country Rd. box culvert


Salvador Collector
Drainage_Ditch
Collector_Channel
Modified_Channels
Streams
Chronic_Issue_Assessment
Hydraulic_Assessment
Vegitation_Assessment
Sediment_Assessment
0 0.02 0.04 0.08 0.12 0.16
Miles
N
W
E
S
Salvador
Stonebridge Charter School
Salvador Elementary School
Salvador Ave
Byway E
Solano Ave
Cobblestone Ct
Winestone Ct
Monarch Park
Monarch Dr
Monarch Ct
Hermosa Dr
Encanto Dr
Paulson Way
Reed Cir
Lavender Pl
Wingard Cir
Mobile Dr
Mobile Ln
Julie Pl
Jane Way
Betsy Pl
Shirley Ct
Daphne Dr
Falcon Crest Cir
Bernadine Pl
Hahnemann Ln
Escuela Dr
Encina Dr
Sources: Esri, DeLorme, NAVTEQ, TomTom, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, and the GIS User Community

Yountville Collector

Vegetation Assessment

Vegetation Issue	Type (Target or Localized)	Corrective Action
Cattails	Localized	Annual vegetation management. Maintain planted trees along top of bank to create shade canopy.
Cattails	Localized	Annual vegetation management. Maintain planted trees along top of bank to create shade canopy.

Hydraulic Assessment

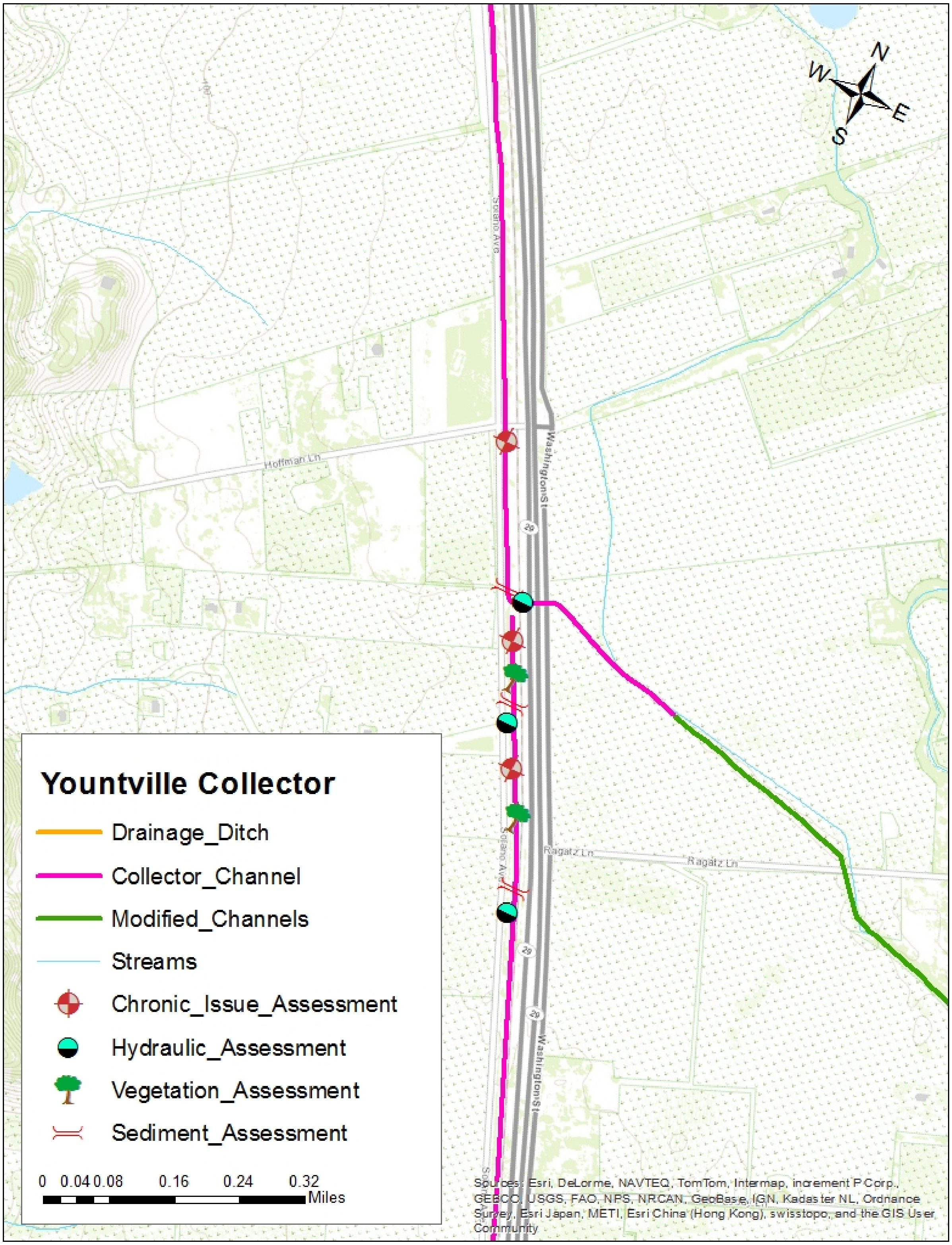
Issue	Cause	Corrective Action
Hydraulic Constriction	Railroad abutment & box culvert	Monitor
Hydraulic Constriction	Road crossing/box culvert (Salano ave.)	Monitor
Hydraulic Constriction	Road crossing/box culvert (Salano ave.)	Monitor

Chronic Issues & Sediment Assessment

Issue	Cause	Corrective Action
Invasive vegetation (Ludwigia)	Slow water	Sediment management, physical removal, and maintenance of planted trees to establish canopy.
Sediment	Confluence of South and North Yountville Collector	Sediment was removed in 2013, monitor sediment deposition.
Erosion	Drainage culvert causing bank erosion	Working with roads department on repair in 2014 or 2015.
Sediment	Box culvert & confluence	Sediment was removed in 2013, monitor sediment deposition.
Sediment	Box culvert & confluence	Sediment was removed in 2013, monitor sediment deposition.

Photo 9: Confluence of south and north Yountville collectors upstream of railroad bridge and HWY 29, first winter after sediment removal project.

Photo 10: Confluence of upstream drainage and south Yountville collector, first winter after sediment removal project.


N
W
E
S
Hoffman Ln
Washington St
Ragatz Ln
Ragatz Ln
Solano Ave
Yountville Collector
Drainage_Ditch
Collector_Channel
Modified_Channels
Streams
Chronic_Issue_Assessment
Hydraulic_Assessment
Vegetation_Assessment
Sediment_Assessment
0 0.04 0.08 0.16 0.24 0.32
Miles
Sources: Esri, DeLorme, NAVTEQ, TomTom, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, and the GIS User Community

Yountville Outfall

Vegetation Assessment

Vegetation Issue	Type (Target or Localized)	Corrective Action
Willow Pruning	Target	Vegetation pruning every two years

Hydraulic Assessment

Issue	Cause	Corrective Action
Hydraulic Constriction	Box Culvert and Rail Road Abutment at Highway 29	Monitor and additional assessment
Hydraulic Constriction	Agricultural Bridge Abutment	Monitor and additional assessment

Chronic Issues & Sediment Assessment

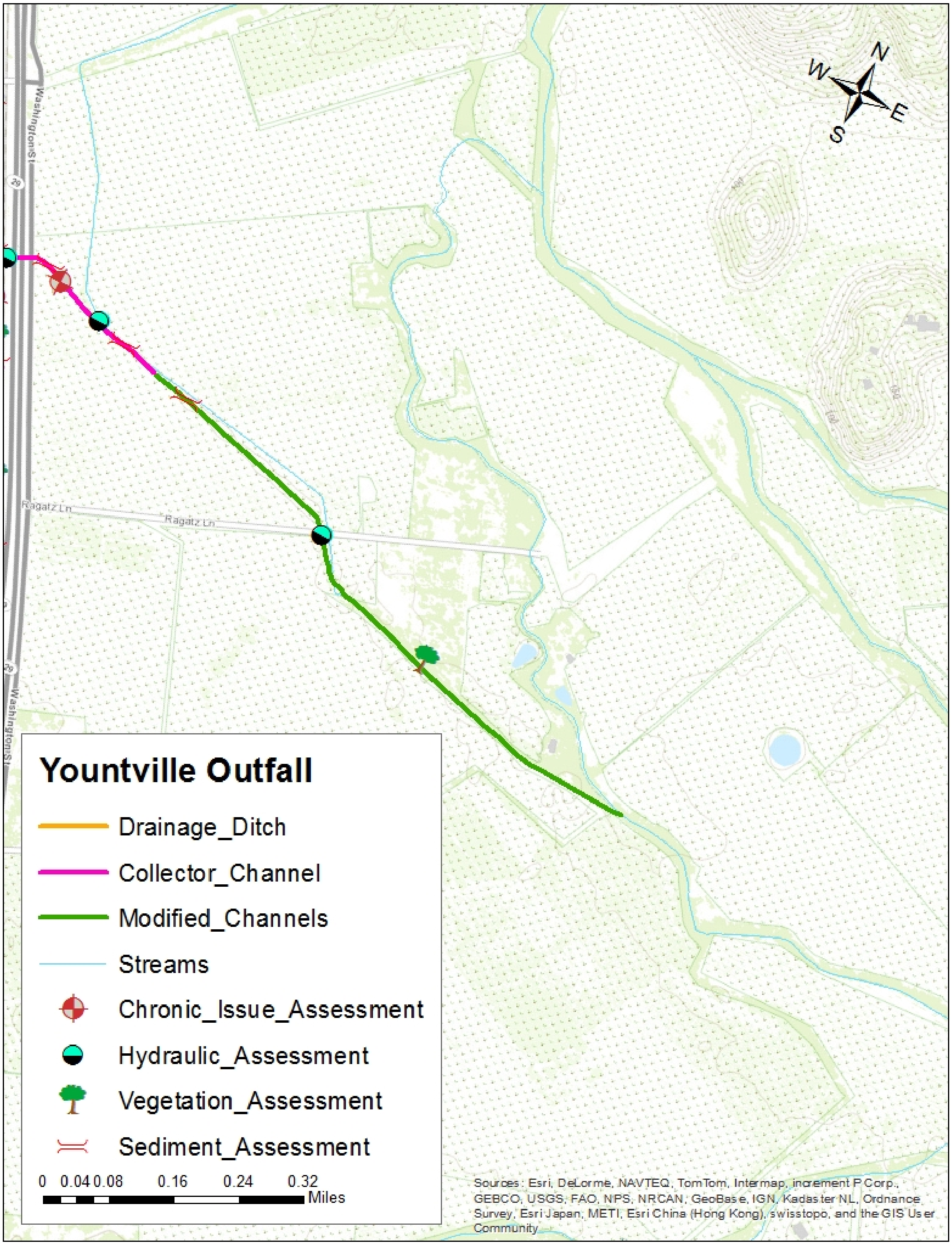
Issue	Cause	Corrective Action
Sediment	Box culvert Outfall	Monitor/Sediment Management every 5-8 years
Invasive Vegetation	Ludwigia	Establish tree canopy through maintaining top of bank plantings, physical removal and treatment.
Sediment	Agricultural Bridge Abutment	Monitor/Sediment Management every 5-8 years
Sediment	Straightened Channel	Monitor/Sediment Management every 5-8 years

Photo 11: Agricultural bridge

Photo 12: Ragatz lane bridge

Photo 13: Sediment deposition downs stream of agricultural bridge

Photo 14: Ragatz lane box culvert with invasive ludwigia colonizing channel upstream


Yountville Outfall
Drainage_Ditch
Collector_Channel
Modified_Channels
Streams
Chronic_Issue_Assessment
Hydraulic_Assessment
Vegetation_Assessment
Sediment_Assessment
0 0.04 0.08 0.16 0.24 0.32
Miles
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W
Washington St
Ragatz Ln
Sources: Esri, DeLorme, NAVTEQ, TomTom, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, and the GIS User Community

Salvador Creek

Vegetation Assessment

Vegetation Issue	Type (Target or Localized)	Corrective Action
Willow Pruning	Localized	Prune annually to establish mature canopy over channel.
Invasive vegetation (ivy)	Target	Remove, treat, and revegetate
Invasive vegetation (blackberry)	Target	Remove, treat and revegetate

Hydraulic Assessment

Issues	Cause	Corrective Action
Railroad abutment & box culvert	Rail and road crossing	Additional assessment
Bridge deck and piers	Agricultural bridge	Monitor
Bridge deck and piers	Agricultural bridge	Remove bridge deck and piers in 2014 maintenance season.
Box culverts	Road crossing	Monitor
Box culverts	Road crossing	Monitor
Box culverts	High school foot bridge	Monitor
Box culverts	High school foot bridge	Monitor
Box culverts	High school foot bridge	Monitor
Bridge deck and piers	Footbridge	Monitor
Bridge deck and piers	Footbridge	City of Napa to remove deck and instream piers as part of low income development project.

Chronic Issues & Sediment

Issue	Cause	Corrective Action
Sediment	Box culvert	Sediment was removed in 2012, monitor sediment deposition.
Sediment	Box culvert	Sediment was removed in 2012, monitor sediment deposition.
Sediment	Box culvert	Sediment was removed in 2012, monitor sediment deposition.
Sediment	Box culvert	Sediment was removed in 2012, monitor sediment deposition.
Erosion	Top of bank drainage & foot traffic	Biotechnical bank repair
Invasive Vegetation	Accacia tree infestation	Annually remove trees starting at the upstream extent, monitor regrowth and revegetate with natives.

Photo 15: Agricultural bridge crossing Salvador creek

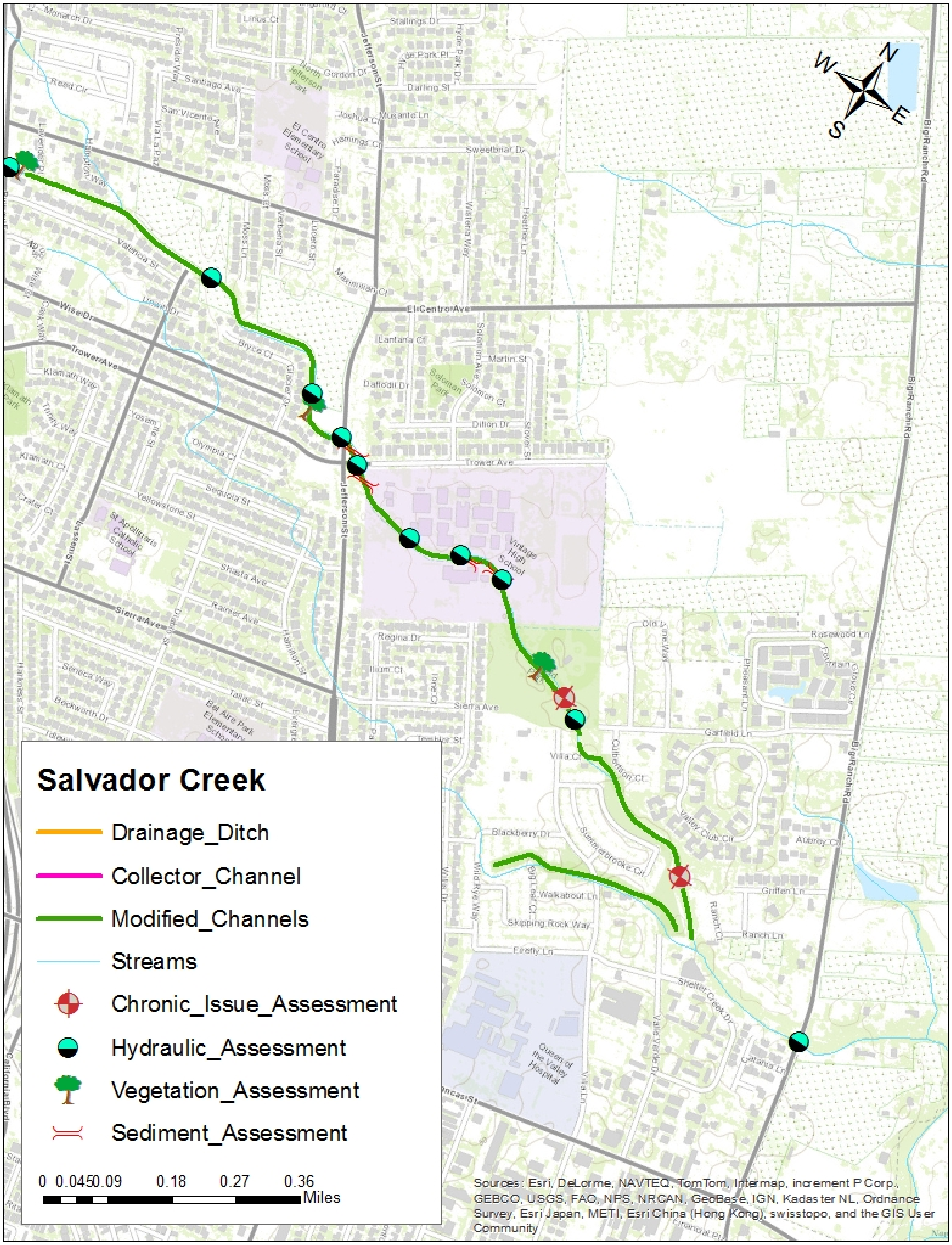
Photo 16: First Vintage High School footbridge and downstream beaver dam

Photo 17: Second Vintage High School footbridge with beaver dam upstream

Photo 18: Third Vintage High School footbridge with beaver dam upstream

Photo 19: Non-native Accacia tree infestation degrading channel capacity and native plant diversity

Photo 20: Non-native blackberry scheduled to be removed during 2014 maintenance season


Salvador Creek
Drainage_Ditch
Collector_Channel
Modified_Channels
Streams
Chronic_Issue_Assessment
Hydraulic_Assessment
Vegetation_Assessment
Sediment_Assessment
0 0.045 0.09 0.18 0.27 0.36
Miles
N
E
S
W
Sources: Esri, DeLorme, NAVTEQ, TomTom, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, and the GIS User Community

Tulocay and Camille Creek

Vegetation Assessment

Vegetation Issue	Type (Target or Localized)	Corrective Action
Tulocay Creek		
Willow Pruning	Target	Vegetation pruning every two years and annual monitoring.
Camille Creek		
Willow Pruning	Target	Vegetation pruning every two years and annual monitoring.

Hydraulic Assessment

Issue	Cause	Corrective Action
Hydraulic Constriction	Box Culvert and Rail Road Abutment at Highway 29	Monitor and additional assessment
Hydraulic Constriction	Agricultural Bridge Abutment	Monitor and additional assessment

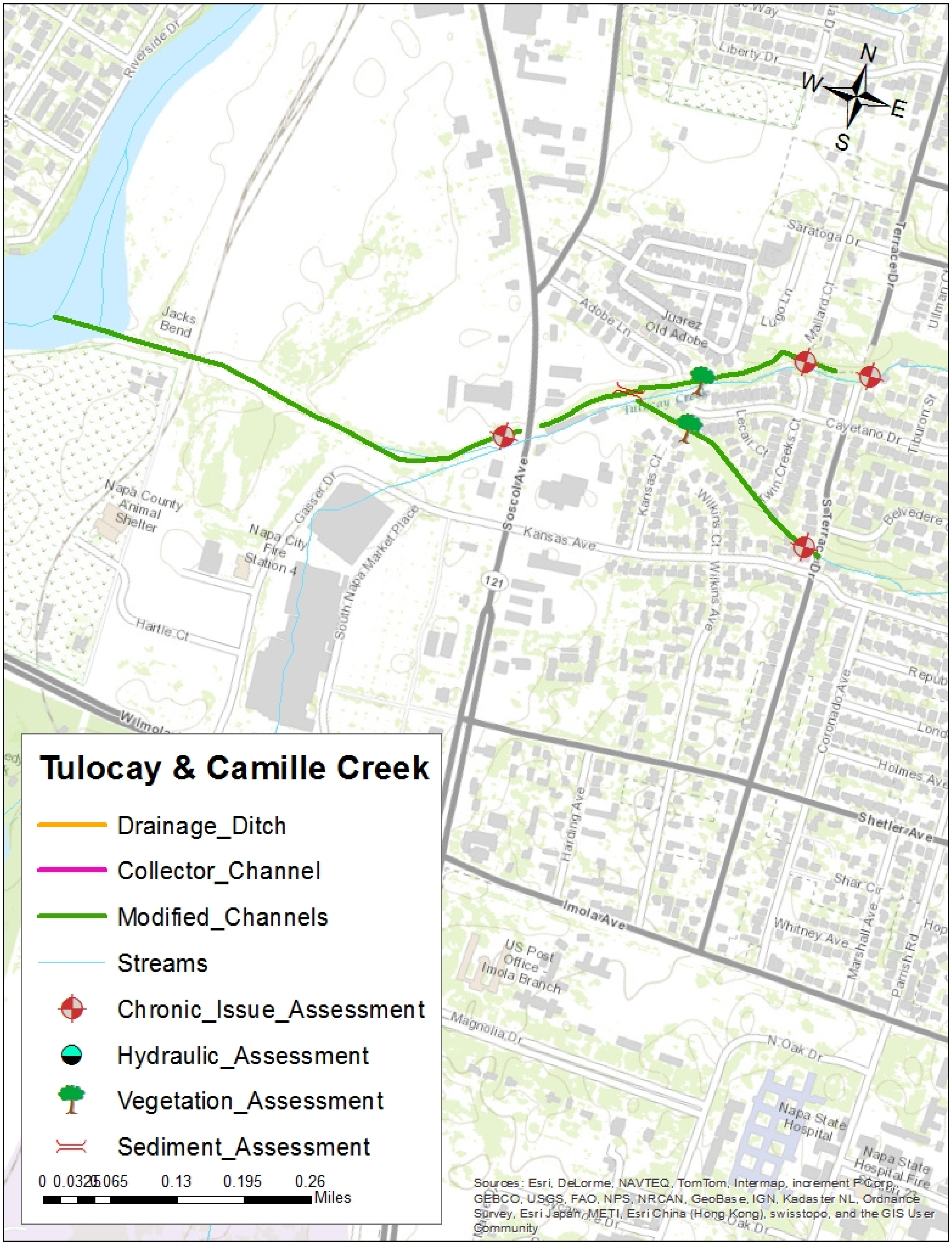
Chronic Issues & Sediment

Issue	Cause	Corrective Action
Tulocay Creek		
Erosion	Further assessment	Outreach to property owner to provide Bank Stabilization Cost Share program and further assessment.
Erosion	Undercut tree slipped into channel	Implement Biotechnical bank repair project
Sediment	Confluence of Tulocay and Camille Creek	Monitor and manage cattails
Camille Creek		
Vegetation	Ivy	Banks infested with ivy and damaging trees should be removed, treated and revegetated with natives.

Photo 21: Invasive vegetation

Photo 22: Significant erosion outreaching to property owner

Photo 23: Erosion along bank due to fallen tree, repair


Tulocay & Camille Creek
Drainage_Ditch
Collector_Channel
Modified_Channels
Streams
Chronic_Issue_Assessment
Hydraulic_Assessment
Vegetation_Assessment
Sediment_Assessment
0 0.0325 0.065 0.13 0.195 0.26
Miles
N
W
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S
Sources: Esri, DeLorme, NAVTEQ, TomTom, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, and the GIS User Community

Fagan and Sheehy Creek

Vegetation Assessment

Vegetation Issue	Type (Target or Localized)	Corrective Action
Fagan Creek		
Non-native Blackberry	Target	Remove blackberry, treat and revegetate banks with native plants.
Willow Pruning	Target	Vegetation pruning every two years and annual monitoring.

Hydraulic Assessment

Issues	Cause	Corrective Action
Fagan Creek		
Hydraulic Constriction	Culvert under airport runway	Monitor
Hydraulic Constriction	Box culvert under road crossing	Monitor and additional assessment
Hydraulic Constriction	Railroad abutment	Monitor
Sheehy Creek		
Hydraulic Constriction	Box culvert under road crossing	Monitor and additional assessment

Chronic Issues & Sediment

Issue	Cause	Corrective Action
Fagan Creek		
Erosion	Additional assessment	Monitor
Sediment	Straightened channel and drainage outfall	Monitor and manage sediment every 5 years
Sheehy Creek		
Flooding	Beaver dam upstream of box culvert	Annual monitoring prior to winter
Flooding	Beaver dam downstream of box culvert	Annual monitoring prior to winter
Flooding	Channel bend	Monitor vegetation and drainage outfalls
Vegetation	Cattails and bulrush	Establish tree canopy through maintaining top of bank plantings, physical removal and treatment.

Photo 24: Box culvert with beaver dam upstream and downstream on Sheehy Creek

Photo 25: Vegetation blocking downstream box culvert on Sheehy Creek

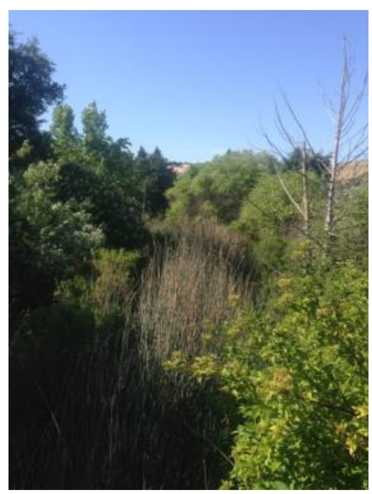
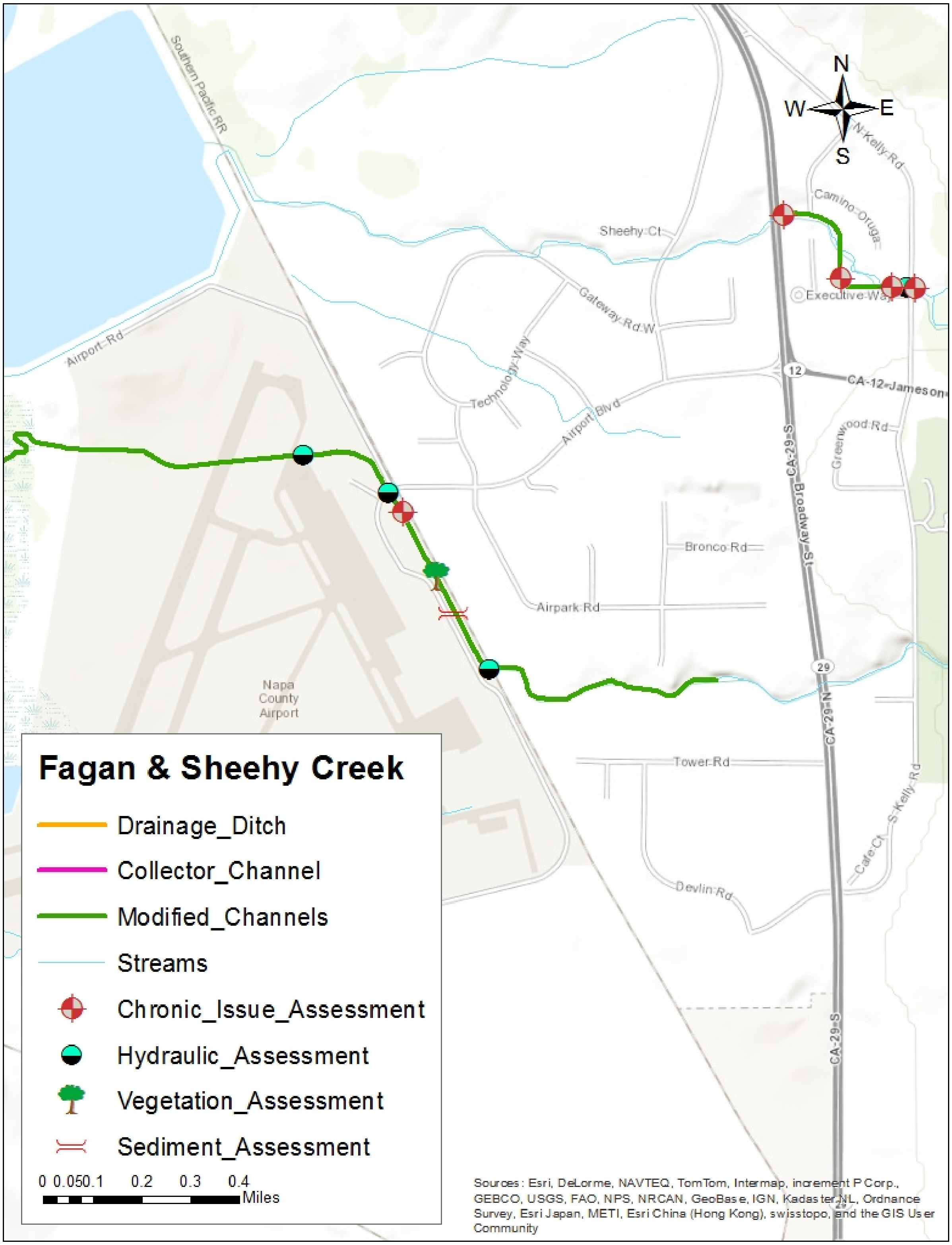


Photo 26: Bulrush in Sheehy Creek


Fagan & Sheehy Creek
Drainage_Ditch
Collector_Channel
Modified_Channels
Streams
Chronic_Issue_Assessment
Hydraulic_Assessment
Vegetation_Assessment
Sediment_Assessment
0 0.050.1 0.2 0.3 0.4
Miles
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S
E
W
Southern Pacific RR
Airport Rd
Sheehy Ct
Camino Oruga
N Kelly Rd
Executive Way
Gateway Rd W
Technology Way
Airport Blvd
CA-12-Jameson
Greenwood Rd
CA-29-S
Broadway St
Bronco Rd
Airpark Rd
Napa County Airport
Tower Rd
CA-29-N
Devlin Rd
Cafe Ct
S Kelly Rd
Sources: Esri, DeLorme, NAVTEQ, TomTom, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, and the GIS User Community

Conn Creek

Vegetation Assessment

Vegetation Issue	Type (Target or Localized)	Corrective Action
Non-Native Invasive Plants	Localized	Work with property owners to remove eucalyptus over multiple years and revegetate with native plants.
Non-Native Invasive Plants	Target	Remove and treat blackberry, vinca and Arundo dispersed throughout reach.
Non-Native Invasive Plants	Target	Remove and treat invasive non-natives.
Willow In Channel	Localized	Monitor and conduct annual pruning to minimize debris obstructions around bridge abutments.

Hydraulic Assessment

Issues	Cause	Corrective Action
Hydraulic Constriction	Agricultural bridge	Additional assessment and annual monitoring
Hydraulic Constriction	Agricultural bridge	Monitor

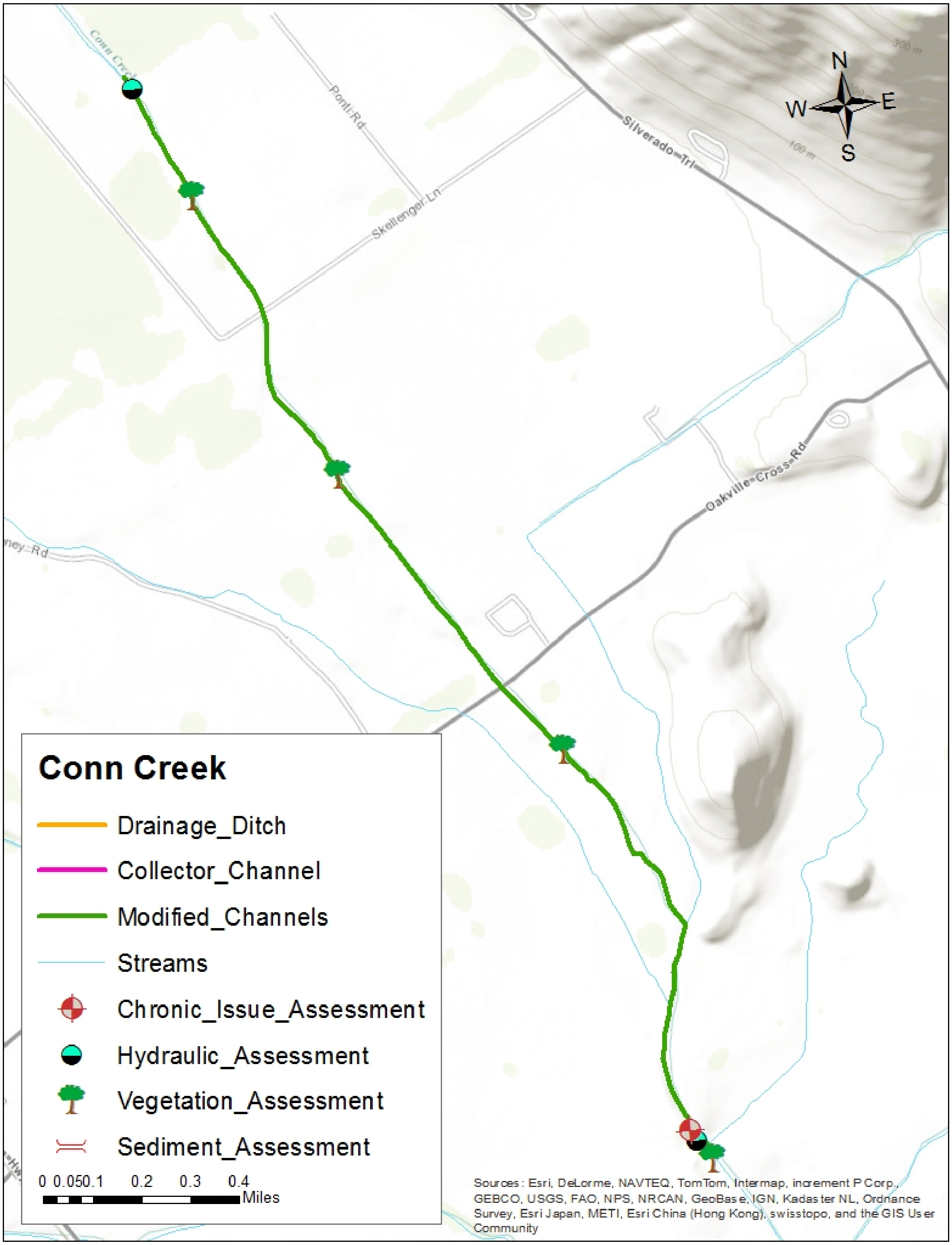
Chronic Issues & Sediment

Issue	Cause	Corrective Action
Debris	Debris racking on bridge abutments	Monitor and manage vegetation annually

Photo 27: Downstream of Oakville Cross Rd. bridge sediment build

Photo 28: Upstream of Skellenger Rd. Eucalyptus along top of bank

Photo 29: Upstream of agricultural bridge



Conn Creek
Drainage_Ditch
Collector_Channel
Modified_Channels
Streams
Chronic_Issue_Assessment
Hydraulic_Assessment
Vegetation_Assessment
Sediment_Assessment
0 0.050.1 0.2 0.3 0.4
Miles
N
W
E
S
Silverado Trl
Skellenger Ln
Oakville Cross Rd
Sources: Esri, DeLorme, NAVTEQ, TomTom, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, and the GIS User Community

4.1 Anadromous Channels

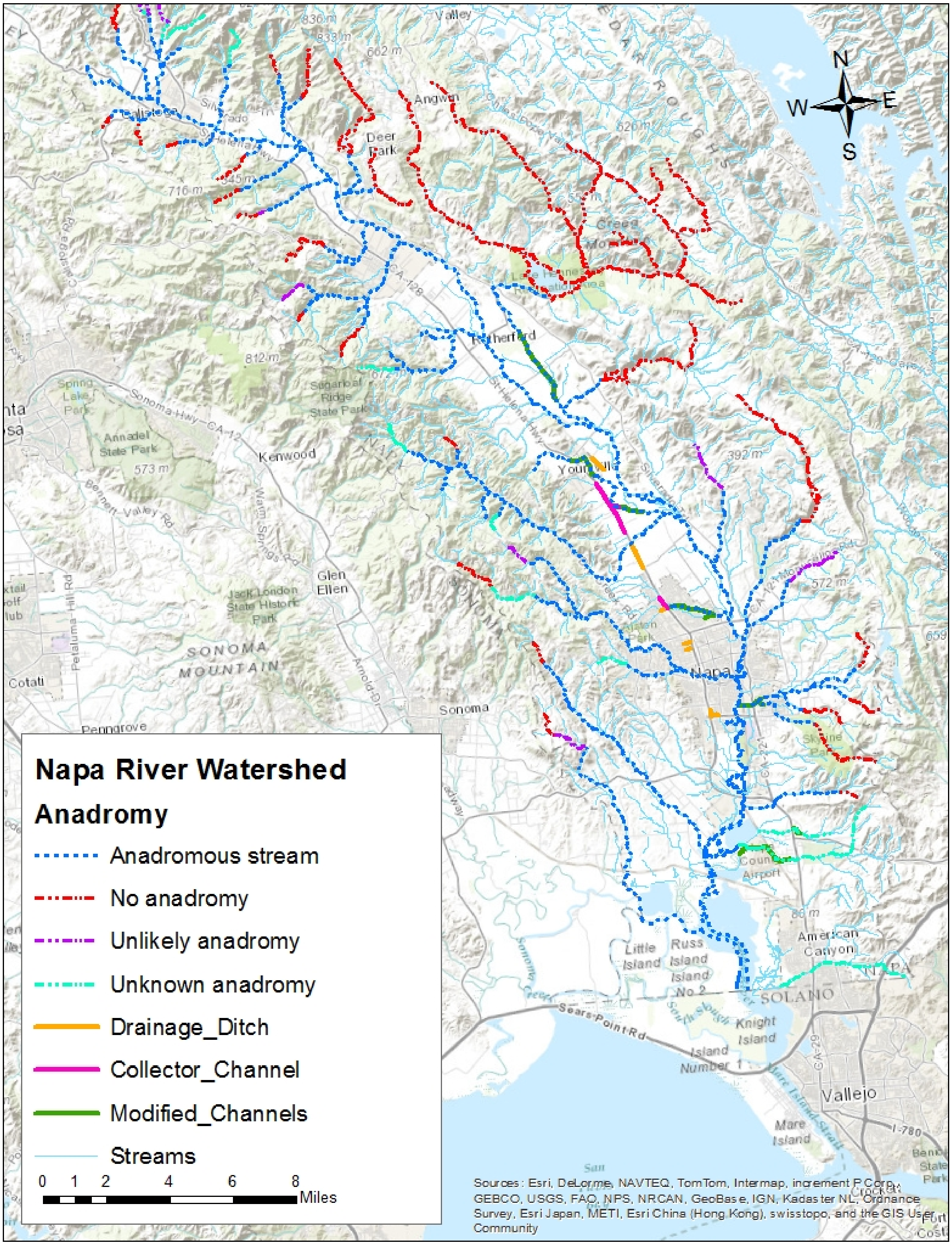
Streams and drainages in the program area include tributaries to the Napa River and San Pablo Bay, and other smaller water conveyance features such as ditches and swales. The characteristics of the aquatic habitat associated with these features vary considerably. Several of the Napa River tributaries provide perennial aquatic habitat for fish and wildlife. Many smaller streams and drainages experience periods of low flow or no surface flow during summer and fall and provide poor quality habitat for salmonids.

Steelhead are relatively widespread in Napa Valley streams (Ecotrust and Friends of Napa River 2001 and 2002, Stillwater Sciences and Dietrich 2002, Leidy et al. 2005, Koehler and Blank 2010), but current abundance is thought to be only a small fraction of historical levels. Fall-/late fall-run Chinook salmon also spawn and rear in the Napa River (Koehler and Edwards 2008, Koehler and Blank 2010). Annual observations in the Napa River of spawning adults and juvenile Chinook salmon by the Napa County Resource Conservation District from 2004–2010 indicate that successful spawning occurs in most years (Koehler and Blank 2010). Despite considerable habitat degradation and loss of anadromous fish habitat relative to historical conditions, the Napa River watershed still contains extensive areas of relatively high-quality spawning and rearing habitat for steelhead and salmon (Koehler and Blank 2010).

The Napa River Watershed Anadromy map below identifies where known anadromous stream reaches intersect with flood control channels. A summary table is also included, which provides additional details regarding the quality of migration, spawning and high flow refugia habitat for salmonids.

Table 7: Channel Anadromy

Stream	Habitat Quality
Tulocay Creek	Poor spawning habitat Moderate migration Poor high flow refugia
Camille Creek	Poor spawning habitat Moderate migration Poor high flow refugia
Salvador Creek	Poor spawning habitat Poor migration Moderate to poor high flow refugia
Yountville Outfall	Poor spawning habitat Moderate to poor migration Poor high flow refugia
Conn Creek	Poor spawning habitat Poor migration Poor high flow refugia
Sheehy Creek	Poor spawning habitat Poor migration Poor high flow refugia


Napa River Watershed
Anadromy
Anadromous stream
No anadromy
Unlikely anadromy
Unknown anadromy
Drainage_Ditch
Collector_Channel
Modified_Channels
Streams
0 1 2 4 6 8
Miles
N
W
E
S
Sources: Esri, DeLorme, NAVTEQ, TomTom, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, and the GIS User Community

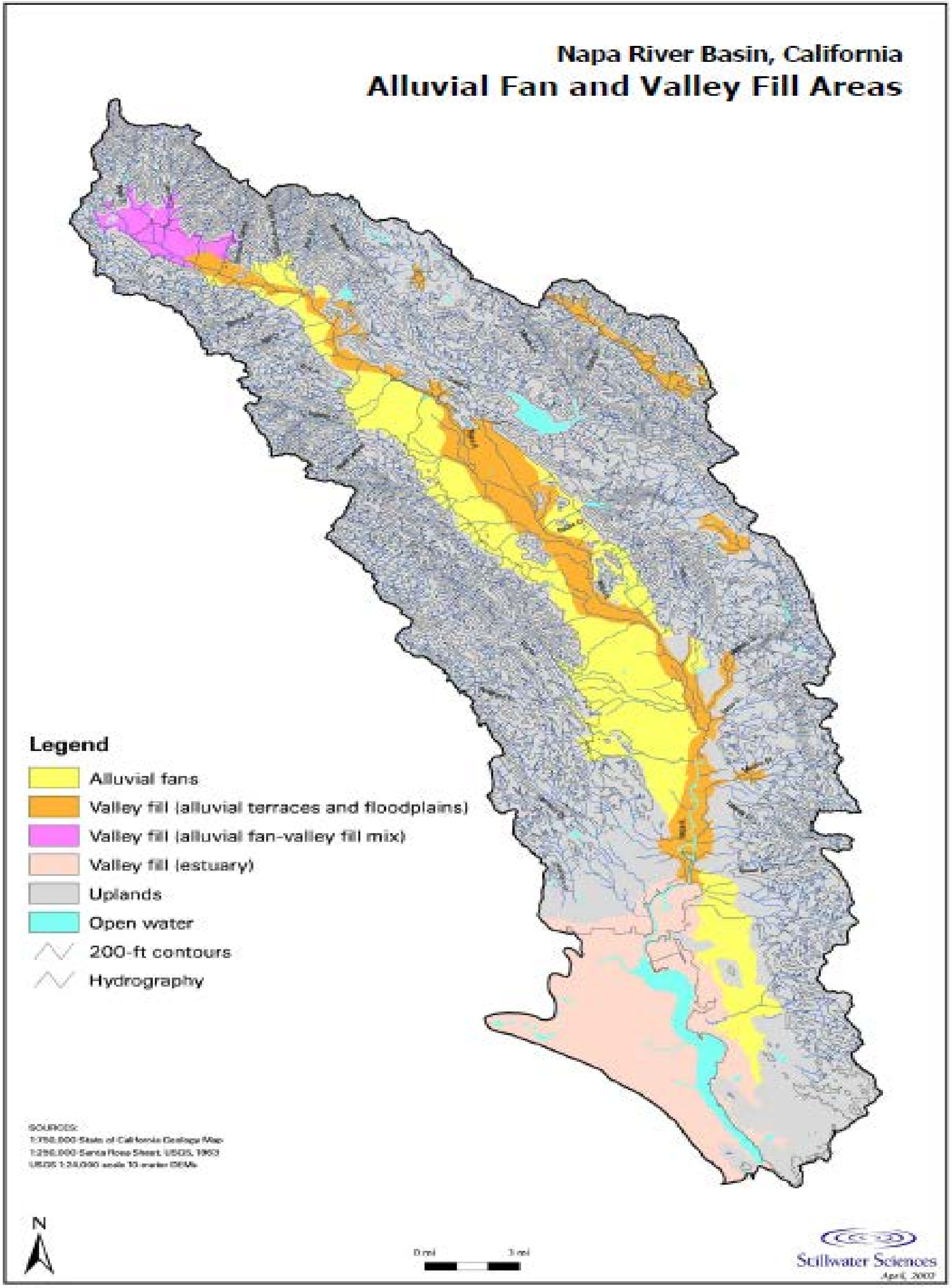
4.2 Channels & Alluvial Fans

The Napa River watershed structure and its stream network are relevant in considering sediment delivery and stream maintenance needs. The higher mountains that ring the Napa River watershed provide the headwater source areas for runoff and sediment that accumulate in the tributary and valley floor streams below. The steep canyons and headwater mountain streams deliver flows and sediment to the valley floors and often build characteristic alluvial fans at the base of the mountains. Historically, these alluvial fans functioned as depositional areas that stored sediments in the topographic transition between the higher and steeper headwater areas and the more gently sloping floodplain of the Napa Valley floor. Historically, during large flood events, streams migrated across these alluvial fan and valley floor floodplain and distributed sediments evenly across the surface. Over time, fans prograded downstream onto the valley floor at variable rates depending upon sediment sources, climatic conditions, and tectonic activity (earthquakes and motion along fault lines).

The topographic transition between mountain, fan, and plain is important in considering maintenance needs for the channels that the District maintains. As shown in the Alluvial Fan Map below, many of the maintenance channels begin in the historic alluvial fan zone, most often in the lower fan areas. Historically these were reaches that received abundant sediment from upstream sources. Over time these reaches may have stored this sediment in the channel, distributed and deposited it along the fan or floodplain surface, or carried it in the channel toward the next larger river confluence downstream. The table below provides a summary of the channels that intersect with alluvial fans.

Table 8: Inventory of Channels Flowing Through Alluvial Fans

Valley Fill (Alluvial terraces and floodplains)	
Collector Channels	**Modified & Semi Modified Channels**
Yountville Collector Salvador Collector	Salvador Creek Sheehy Creek Fagan Creek Yountville Outfall Conn Creek Camille Creek Tulocay Creek
Alluvial Fans	
NA	**NA**


Napa River Basin, California
Alluvial Fan and Valley Fill Areas
Legend
Alluvial fans
Valley fill (alluvial terraces and floodplains)
Valley fill (alluvial fan-valley fill mix)
Valley fill (estuary)
Uplands
Open water
200-ft contours
Hydrography
N
Stillwater Sciences

5.0 Proposed Preventative Maintenance Projects

The District has identified a number of potential preventative maintenance projects that may reduce the frequency of routine maintenance activities and help to restore physical and biological processes within flood control channels. As the District continues to carry out subsequent quantitative assessments of flood control channels, inventories will be updated and refined and additional preventative maintenance project may be identified. Proposed preventative maintenance projects are outlined below.

Table 28: Preventative Maintenance Projects

Issue	Corrective Action	Implementation Schedule
Yountville Collector		
Erosion	Culvert replacement and installation of energy dissipation rock.	Working with roads department on repair in 2014 or 2015
Yountville Outfall		
Sediment	Sediment removal and revegetation of willow trees to help create channel canopy to minimize cattail growth	2015 maintenance season
Salvador Creek		
Hydraulic constriction caused by agricultural bridge	Remove bridge deck, piers, abutments, and install biotechnical bank stabilization elements.	2014 maintenance season
Erosion	Working with City of Napa to implement biotechnical bank repair and revegetate upper bank area	2014 maintenance season
Hydraulic constriction abandoned vehicle bridge	City of Napa Scheduled to remove bridge as part of low income development project	2015 or 2016
Tulocay Creek		
Erosion	Biotechnical bank repair	2014 Maintenance season
Erosion	Bank set back or biotechnical repair	Outreaching to property owner regarding Bank Stabilization Cost Share Program
Fagan Creek		
Sediment	Remove sediment and manage cattails to minimize deposition	2016 maintenance season
Conn Creek		
Sediment	Additional assessment including cross sections downstream of Oakville Cross rd. bridge	Conduct as part of quantitative assessment in 2017

5.0 References

Ecotrust and FONR. 2002. Results of Hankin-Reeves standard uncalibrated *O. mykiss* survey of Napa River tributaries, Portland, Oregon.

Ecotrust and Friends of the Napa River (FONR). 2001. Results of Hankin-Reeves standard uncalibrated *O. mykiss* survey of Napa River tributaries, Portland, Oregon.

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Stillwater Sciences. 2007. Napa River tributary steelhead growth analysis. Final report. Prepared by Stillwater Sciences, Berkeley, California for U.S. Army Corps of Engineers, San Francisco, California.

NAPA COUNTY RCD Resource Conservation District

Napa County Resource Conservation District
1303 Jefferson St., Ste. 500B
Napa, California 94559
Phone: (707) 252-4188
Fax: (707) 252-4219
www.naparcd.org

MEMORANDUM

Date: August 14, 2015
To: Shaun Horne, Napa County Flood Control and Water Conservation District
From: Paul Blank, Napa County Resource Conservation District
RE: **Tulucay and Camille Creek Channel Assessments, Stream Maintenance Program**

At the request of the Napa County Flood Control and Water Conservation District (FCWCD), Napa County Resource Conservation District (RCD) conducted assessments of Tulucay and Camille Creeks, modified stream channels in Napa County's Stream Maintenance Program (SMP). The purpose of the assessments was to assist in development of science-based channel maintenance objectives to guide maintenance activities. Specifically, FCWCD requested that RCD:

- Develop channel capacity objectives and estimates of stage-discharge relationships for the two reaches of Tulucay Creek and single reach of Camille Creek;
- Develop estimates of channel dimensions for best establishing quasi-equilibrium conditions to avoid future excessive erosion or deposition within the channels; and,
- Develop roughness objectives to determine the tolerance for loss of freeboard in the creeks.

TULUCAY CREEK

Tulucay Creek is tributary of the Napa River that drains a 12.75 square mile watershed. It has several named tributaries including Camille Creek, Kreuse Creek, Spencer Creek, and Murphy Creek. The maintained reaches of Tulucay Creek are located in the urbanized areas at the outlet of the watershed. Reach 1 begins at Twin Creeks Court and ends 1,620 feet downstream at the Soscol Avenue bridge. Camille Creek enters Tulucay Creek from the southeast in the approximate middle of Reach 1. The tops of both stream banks in Reach 1 are closely lined with residential and commercial structures. Reach 2 begins at the Soscol Avenue bridge and ends 1,980 feet downstream at the railroad bridge. Reach 2 has been leveed to constrain high flows to the channel and reclaim adjacent land, which is currently mostly vacant, but zoned for commercial use.

Significant previous work, including a HEC-RAS hydraulic model, is available for Tulucay Creek. The model was originally developed for a FEMA map revision, and subsequently updated by WEST Consultants, Inc. in 2013 to inform the design of a proposed pedestrian bridge. The model was constructed using 23 cross sections that span the entirety of Reaches 1 and 2.

Channel Capacity and Stage-Discharge Relationships

Ideally, in an urban or residential setting, stream channels and crossing structures should be sized and maintained to safely convey the 1% chance exceedance discharge, also called the 100-year peak flood event (Q100). Although some stream discharge monitoring has been conducted in the Tulucay Creek watershed, the resulting data are insufficient for statistical analysis that would produce a high-confidence Q100 value. However, indirect methods have produced estimates over the years, and the current estimate of 4,530 cfs has been accepted by FCWCD and the Army Corp of Engineers.

Since the Q100 estimate has been revised upward in recent years, the channel was designed and constructed to convey a lesser discharge; therefore, the Q100 is not an appropriate channel capacity objective. At the request of FCWCD, WEST computed channel capacities of both reaches of Tulucay Creek using the HEC-RAS model. The capacity of the upper portion of Reach 1, and all of Reach 2, was determined to be approximately 3,500 cfs; however, at this flow, the model indicates overtopping of the left bank of the channel in the lower portion of Reach 1, just upstream of the Soscol Avenue bridge. The estimated capacity of this subreach of Reach 1, according to the model, is approximately 1,000 cfs, but there appears to be potential accuracy issues at this location in the model due to incomplete representation of a flood wall along the south bank. Since the true capacity of this subreach is unknown, RCD recommends setting the channel capacity objective for stream maintenance purposes for the entirety of Reaches 1 and 2 at 3,500 cfs.

The HEC-RAS analysis was also used to generate stage-discharge ratings for both reaches (Figures 1 and 2). Ratings are associated with a particular cross section location on a stream, so RCD selected cross sections from the model that represented the reach. For Reach 1, RCD selected the downstream-most cross section that was above the poorly-represented "flood wall" subreach described above. For Reach 2, RCD selected a cross section near the top of the reach which represents the minimum capacity of the channel.

Figure 1. Stage-discharge rating for Tulucay Creek Reach 1, obtained from HEC-RAS analysis.

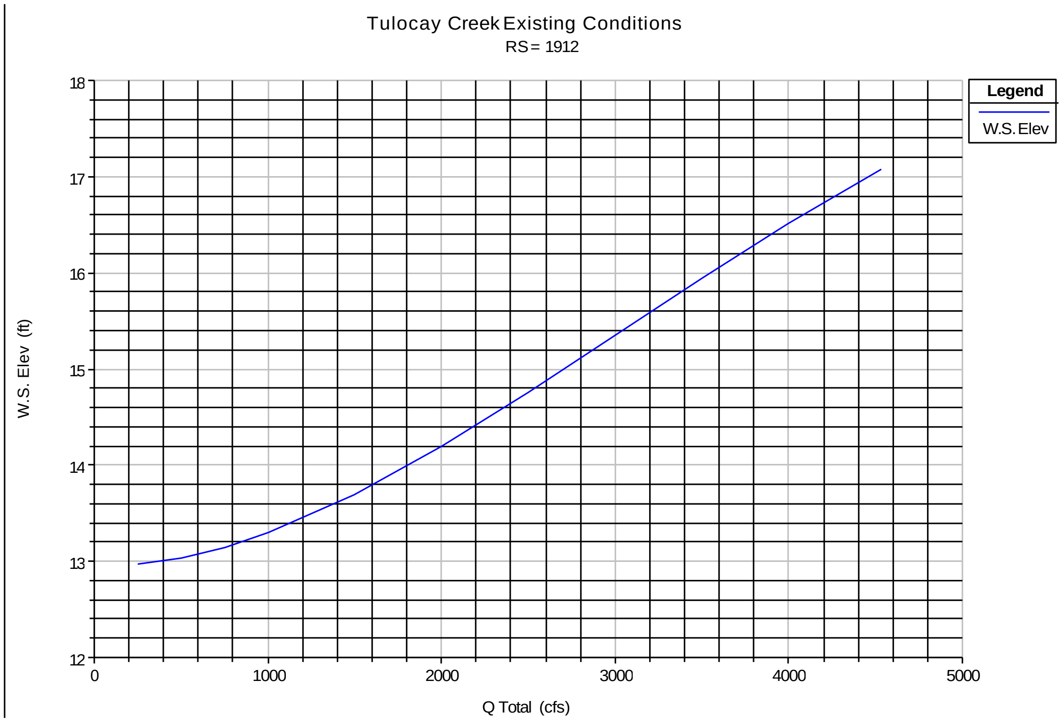


Figure 2. Stage-discharge rating for Tulucay Creek Reach 2, obtained from HEC-RAS analysis.

Estimates of Quasi-Equilibrium Channel Dimensions

The HEC-RAS model was built with many cross sections of Tulucay Creek, including 8 in Reach 1 and 9 in Reach 2. RCD overlayed the cross sections for each reach and fit idealized trapezoidal cross sections to the plot (Figures 3 and 4). The 5 downstream-most cross sections in Reach 1 were omitted due to incomplete representation of a flood wall in this area. These idealized cross sections depict the average channel dimensions, and since the channels appear to be stable based on visual assessment, they also represent the channel in a quasi-equilibrium state. The idealized channel dimensions are summarized in Table 1.

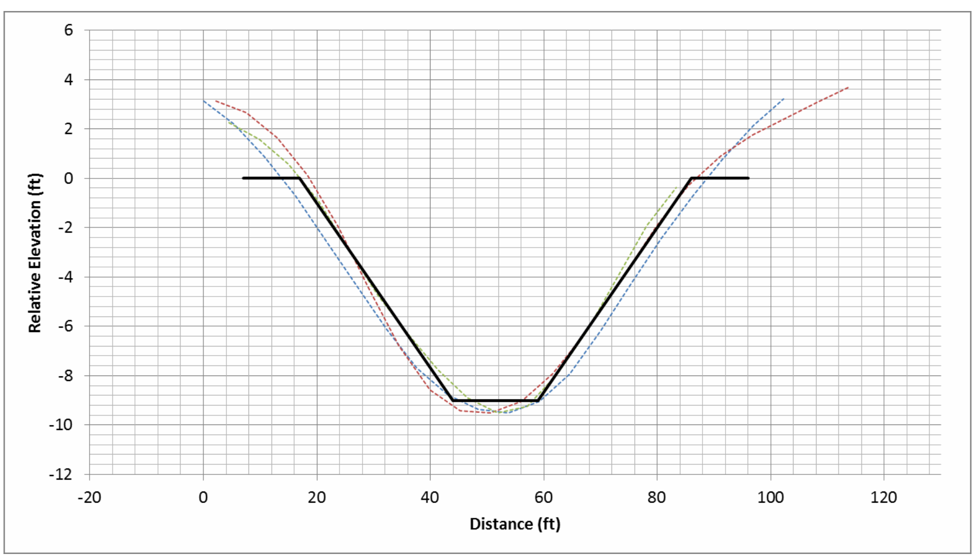


Figure 3. Idealized cross section, Tulucay Creek Reach 1, based on measured cross sections.

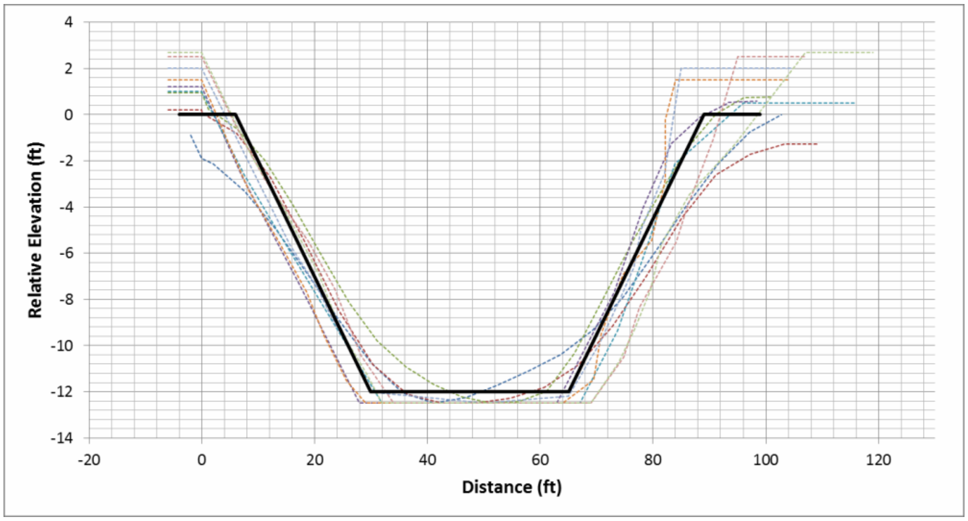


Figure 4. Idealized cross section, Tulucay Creek Reach 2, based on measured cross sections.

Idealized Channel Dimensions		
Reach	Reach 1	Reach 2
Shape	Trapezoidal	Trapezoidal
Bottom Width (ft)	15	35
Left Bank Slope (H:1V)	3	2
Right Bank Slope (H:1V)	3	2
Depth (ft)	9.0	12.0
Area (ft^2)	378	708

Table 1. Idealized channel dimensions, Tulucay Creek.

Channel Roughness

Since the banks of Tulucay Creek are unarmored for most of its length, and the surrounding land is developed or zoned for future development, right up to the top-of-bank, growth of riparian vegetation is necessary to protect against bank and levee erosion. In addition, riparian vegetation enhances wildlife habitat and aesthetics. However, overgrowth of riparian vegetation will increase channel roughness and therefore decrease water velocity and channel capacity according to Manning's Equation.

RCD conducted a visual assessment of roughness in Tulucay Creek Reaches 1 and 2, collected photographs, and estimated Manning's roughness coefficients. Figures 5 through 8 depict roughness conditions representative of each reach. Estimated Manning's roughness coefficients are provided in the figure captions.

Figure 5. The upstream portion of Tulucay Creek Reach 1, looking downstream, showing channel roughness and inundation from beaver activity. n=0.04-0.05

Figure 6. The downstream portion of Tulucay Creek Reach 1 looking downstream showing channel roughness and inundation from beaver activity. n=0.04-0.05

As evident from Figures 1 and 2, Reach 1 has been completely inundated with backwater from a beaver dam located just upstream of the Soscol Avenue bridge. Beavers are common in the Napa River system and seem to be increasing in population. In general, local beaver activity is not known to lead to significant channel capacity decreases and potential stream flooding issues due to the large size and intensity of local winter storm flows, which tend to wash out the dams on an annual basis; however, this particular dam appears to be quite resilient. It seems to have withstood a medium-size flow on December 11, 2014, estimated (roughly) at approximately 800 cfs, with little damage, or at least in a condition in which it could be quickly repaired. It is still assumed that larger flows would wash out beaver dams and restore full channel capacity.

Figure 7. Tulucay Creek Reach 2 looking downstream from Soscol Avenue bridge showing channel roughness. n=0.1-0.15

Figure 8. Tulucay Creek Reach 2 looking upstream from the railroad bridge at the downstream boundary of the reach, showing channel roughness. n=0.04-0.045

RCD's selection of Manning's Roughness Coefficients for Reach 1 (n=0.04 to 0.05) closely agree with those used by WEST in the HEC-RAS analysis (n=0.045). Since the analysis indicated that the reach will convey the channel capacity objective flow under these roughness conditions, the channel roughness objective for Reach 1 should be set at 0.045.

RCD's selection of roughness coefficients for Reach 2 (n=0.04 to 0.15) agree with those used by WEST in the HEC-RAS analysis (n=0.04) except in the upper portion of the reach. Overgrowth in this area (Figure 3) is likely recent and due to extended drought conditions, and RCD recommends active clearing be considered to reduce roughness and maintain channel capacity. Regardless, the HEC-RAS analysis indicates that a Manning's Roughness Coefficient of 0.04 is required to achieve the channel capacity objective, and therefore, the channel roughness objective for Reach 2 should be set at 0.04.

CAMILLE CREEK

Camille Creek, also called Cayetano Creek or Marie Creek, is a tributary of Tulucay Creek that drains a 3.13 square mile area, 25% of the Tulucay Creek watershed. The maintained reach of Camille Creek begins at the South Terrace Drive culvert and ends 1,250 feet downstream where it empties into Tulucay Creek in the approximate middle of Reach 1. The tops of both stream banks in the reach are closely lined with residential structures. RCD is not aware of previous hydraulic analyses or discharge monitoring efforts for Camille Creek.

Channel Capacity and Stage-Discharge Relationships

To develop a channel capacity objective for the reach, RCD first determined the maximum capacity of the South Terrace Drive culvert. Stream crossing structures, especially culverts, are often the most constricted points in a reach; and therefore the maximum discharge conveyed by these structures often represents a suitable capacity objective for the reach.

During June 2015, RCD measured the dimensions of the South Terrace Drive culvert, recorded the inlet configuration, surveyed the inlet and outlet elevations, and measured a channel cross section at the tailwater control with a theodolite and stadia rod relative to NGVD29 (City of Napa Benchmark 87-A). These data were input into HY-8, a culvert analysis program developed by the Federal Highway Administration (FHWA). HY-8 analysis input data and results are provided as an attachment to this memorandum. The results of the analysis indicate that the capacity of the culvert is 695 cfs at the top of the inlet, and 815 cfs at the point at which it overtops and spills onto the roadway. The analysis also generated a stage-discharge rating for the culvert that will predict discharge based on headwater elevation. The rating is provided and discussed below.

The Camille Creek watershed is an ungaged basin and therefore the Q100 is not known. RCD estimated the Q100 by adjusting the current Q100 estimate for Tulucay Creek (4,530 cfs) based on drainage area according the following equation:

$$Q_u = Q_g \left(\frac{A_u}{A_g}\right)^{0.87}$$

where Q_u is the discharge for the ungaged site, Q_g is the discharge for the gaged site, A_u is the drainage area of the ungaged site, and A_g is the drainage area of the gaged site. This adjustment method is described in the June 1977 USGS report *Magnitude and Frequency of Floods in California* by A.O. Waananen and J.R. Crippen. This method results in a Q100 estimate for Camille Creek of 1,350 cfs.

It should be noted that this estimate is based on previous work done for Tulucay Creek, which is also an estimate based on indirect methods, and there may be significant error associated with the Q100 estimates for both creeks. For comparison purposes, RCD computed a second estimate of the Camille Creek Q100 using USGS's National Streamflow Statistics (NSS) program, which uses regional flood-frequency regression equations. Based on drainage area and mean annual precipitation, NSS predicts a Q100 of 800 cfs for Camille Creek. For this assessment, RCD selected the greater value of 1,350 cfs as the estimated Q100 because it has a local basis and is more conservative.

Comparison of the culvert capacity to the Q100 reveals that the culvert would be overtopped should this flow occur. In this case, the culvert capacity is not a suitable objective for the reach and the capacity of the channel itself must be estimated and compared to the Q100. To do this, RCD began with a visual assessment of the reach to evaluate channel shape and condition. The channel is incised but appears to have stabilized. Significant areas of erosion and/or deposition were not observed. The streambanks are not armored but are generally well vegetated. The reach does not maintain a consistent shape along its length. In the downstream direction, the stream banks become lower and shallower. A stable location in the most-contracted subreach of the creek was selected for measurement of a cross section. A stable location was selected because this indicates that it represents the channel in a quasi-equilibrium state. The most-contracted subreach, with the smallest cross-sectional area, was selected because it will control the capacity.

RCD measured the cross section by stretching a tape between the tops of the banks perpendicular to the channel centerline. Elevations were measured with a theodolite and stadia rod relative to NGVD29. The measured cross section was plotted and an idealized cross section was fit to the plot (Figure 9). This idealized cross section represents the most-contracted, yet stable, configuration of the channel. The capacity of the actual channel, which widens downstream, will be greater.

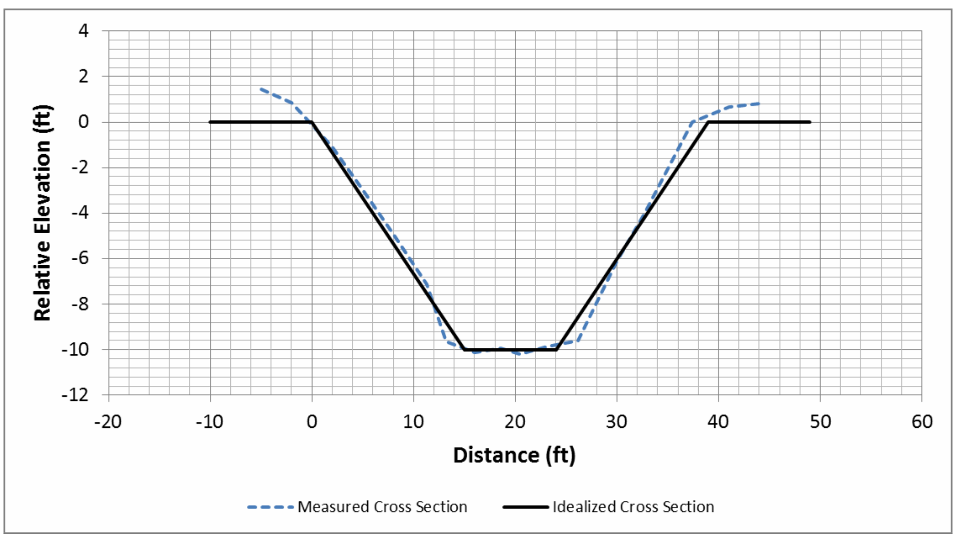


Figure 9. Idealized cross section, Camille Creek, based on a measured cross section at a carefully selected location.

RCD performed a channel analysis using the idealized cross section, the bed slope of the reach, roughness estimates, and Manning's Equation. The analysis resulted in a general stage-discharge relationship, or rating, for the reach. The stage-discharge rating is shown in Figure 10.

The rating indicates that the capacity of the channel is 1,780 cfs at the top of bank. Although there is a wide-margin of error associated with this result, it is well above the Q100, indicating that the channel, even at its narrowest location, will safely convey the Q100. It should be noted that HY-8 analysis of the South Terrace Drive culvert indicates roadway flooding and culvert inundation at this flow. In addition, although the channel should contain and convey the Camille Creek Q100, in an extreme high-water scenario, backwater from Tulucay Creek may cause flooding in the lower part of the reach.

This rating, though useful for estimating channel capacity and specifically for comparison of channel capacity to the Q100, is based on generalizations and applies to the reach as a whole, not to stage at a specific location. To estimate the discharge associated with an observed stage in the reach, the headwater elevation to discharge rating from the HY-8 analysis of the South Terrace Drive culvert is provided as Figure 11. This rating predicts discharge based on the headwater depth of the South Terrace Drive culvert. Due to the short length of the reach, the absence of tributaries, and the small amount of additional contributing drainage area, this estimate is also applicable to any location in the maintained reach for many purposes, including guiding channel maintenance decisions.

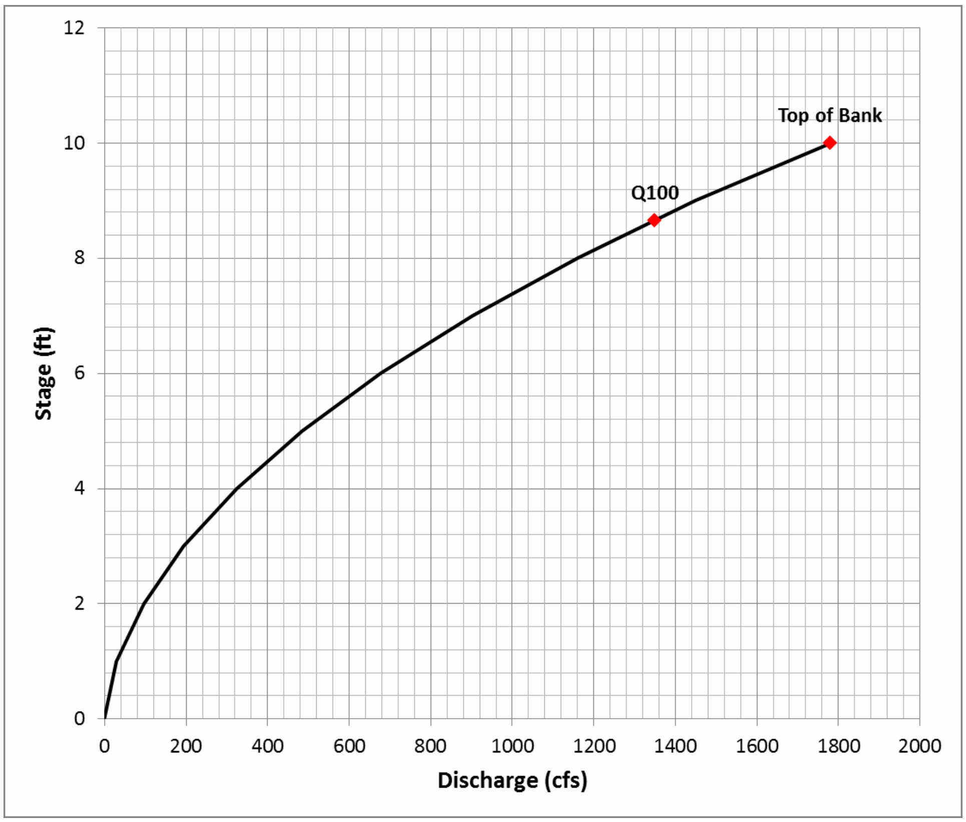


Figure 10. Stage-discharge rating for Camille Creek, obtained from channel analysis using idealized cross section.

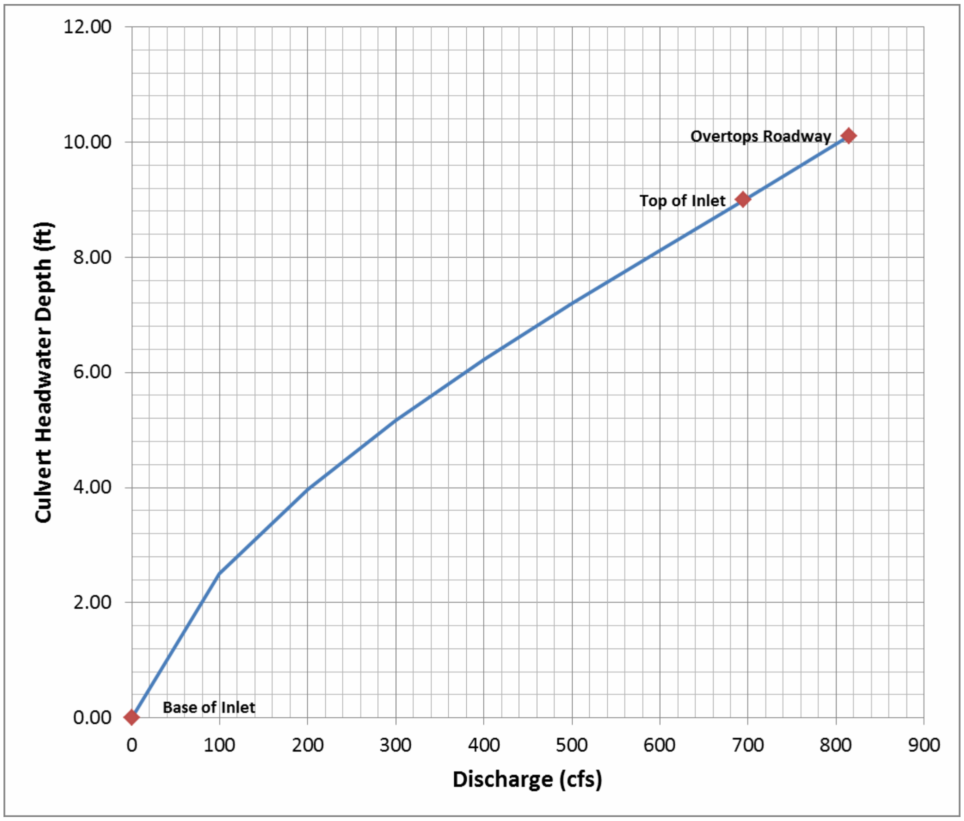


Figure 11. Headwater depth – discharge rating for South Terrace Drive culvert, obtained from HY-8 analysis.

Estimates of Quasi-Equilibrium Channel Dimensions

The idealized cross section constructed to estimate channel capacity represents the channel at a quasi-equilibrium condition, yet at its most susceptible to potential change because it has the steepest bank slopes and experiences the highest velocities due to its having the minimum cross-sectional area in the reach. Therefore, the dimensions of this cross section represent the extremes that should not be exceeded in any subreach, and therefore comparison of future channel conditions to these dimensions can indicate a problem and guide channel maintenance activities. Cross-sectional area, bank slope, bottom width, and depth were calculated to develop idealized channel dimensions for the reach (Table 2).

Idealized Channel Dimensions	
Shape	Trapezoidal
Bottom width (ft)	9
Left Bank Slope (H:1V)	1.5
Right Bank Slope (H:1V)	1.5
Depth (ft) **Area (ft^2):**	10.0 240

Table 2. Idealized channel dimensions, Camille Creek.

Channel Roughness

Since the banks of Camille Creek are unarmored for most of its length, and the surrounding land is developed right up to the top-of-bank, growth of riparian vegetation is necessary to protect against bank erosion. In addition, riparian vegetation enhances wildlife habitat and aesthetics. However, overgrowth of riparian vegetation will increase channel roughness and therefore decrease water velocity and channel capacity according to Manning's Equation.

Based on visual assessment of the maintenance reach of Camille Creek, RCD estimates the Manning's Roughness Coefficient of the active scour channel and the stream bank slopes to be 0.04 and 0.1, respectively. When composited using the Lotter Method, this equates to an overall channel roughness of approximately 0.05 at all high stages. Roughness coefficients were selected based on reference documents provided by USGS and others, and on local experience and professional judgement. A photograph depicting the typical roughness conditions of the maintained reach of Camille Creek is provided as Figure 12.

RCD considers the current condition of the channel to be stable and in a quasi-equilibrium state, and analysis reveals that the most-confined portion of the reach will convey the Q100 under the current roughness conditions. Therefore, the current roughness conditions should be maintained to ensure continued conveyance of the Q100, and the Channel Roughness Objective should be set at 0.05.

Figure 12. Camille Creek looking downstream showing channel roughness. RCD selected an overall Manning's Roughness Coefficient of 0.05 for the reach.

Summary and Channel Maintenance Objectives

Visual assessment of Tulucay Creek Maintenance Reaches 1 and 2 indicates that the channel is in a quasi-equilibrium condition. RCD compiled several channel cross sections measured throughout the reach as part of a previous HEC-RAS analysis, and defined idealized channel dimensions for each reach that should be maintained in order to preserve channel capacity. HEC-RAS analysis used weighted Manning's roughness coefficients of 0.045 and 0.040 for Reaches 1 and 2, respectively, and indicated a maximum channel capacity of 3,500 cfs under these conditions. RCD considers these values to be reasonable and should be used as the roughness and capacity objectives for the reaches; however, visual assessment of the upper portion of Reach 2 revealed increased roughness due to vegetation overgrowth and active clearing should be considered in this area to maintain channel maintenance objectives. The HEC-RAS analysis also provided stage-discharge relationships for both reaches.

Visual assessment of the maintained reach of Camille Creek indicates that the channel is currently in a quasi-equilibrium condition, and capacity analyses indicate that the channel will currently convey the 100-year peak flood event, although overtopping and roadway flooding at the South Terrace Drive culvert is expected to occur at this flow. Therefore, current channel dimensions and roughness conditions should be maintained in the future to maintain adequate channel capacity. Stage-discharge relationships were estimated for Camille Creek, and discharges up to approximately 800 cfs can be estimated in the field by measuring headwater depth at the South Terrace Drive culvert.

Channel maintenance objectives for Camille Creek and both reaches of Tulucay Creek are summarized in Table 3.

Channel Characteristic	**Tulucay Creek Reach 1**	**Tulucay Creek Reach 2**	**Camille Creek**
Capacity	Maintain channel to convey a flow of 3,500 cfs.	Maintain channel to convey a flow of 3,500 cfs.	Maintain channel to convey the 1% chance exceedance flow (100-year peak flood event) of 1,350 cfs.
Quasi-Equilibrium Dimensions	Maintain bank slopes of approximately 3H:1V. Maintain an approximate minimum cross sectional area of 380 ft^2 at the top-of-bank.	Maintain bank slopes of approximately 2H:1V. Maintain an approximate minimum cross sectional area of 700 ft^2 at the top-of-bank.	Maintain bank slopes of 1.5H:1V or shallower. Maintain a minimum cross sectional area of 240 ft^2 at the top-of-bank.
Roughness	Maintain overall channel roughness of 0.045 as shown in Figures 5 and 6.	Maintain overall channel roughness of 0.04 as shown in Figure 8.	Maintain overall channel roughness of 0.05 as shown in Figure 12.

Table 3. Tulucay and Camille Creek channel maintenance objectives.

Attachment: HY-8 Culvert Analysis Report, South Terrace Drive Culvert, Camille Creek.

ATTACHMENT

HY-8 CULVERT ANALYSIS REPORT
SOUTH TERRACE DRIVE CULVERT
CAMILLE CREEK

Table 1 - Summary of Culvert Flows at Crossing: S Terrace Dr

Headwater Elevation (ft)	Total Discharge (cfs)	Culvert 1 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
22.81	0.00	0.00	0.00	1
25.86	135.40	135.40	0.00	1
27.64	270.80	270.80	0.00	1
29.09	406.20	406.20	0.00	1
30.40	541.60	541.60	0.00	1
31.64	677.00	677.00	0.00	1
31.81	695.00	695.00	0.00	1
33.57	947.80	883.95	63.82	5
34.07	1083.20	934.33	148.84	4
34.50	1218.60	977.39	241.18	4
34.90	1354.00	1015.84	337.84	3
32.92	815.54	815.54	0.00	Overtopping

Rating Curve Plot for Crossing: S Terrace Dr

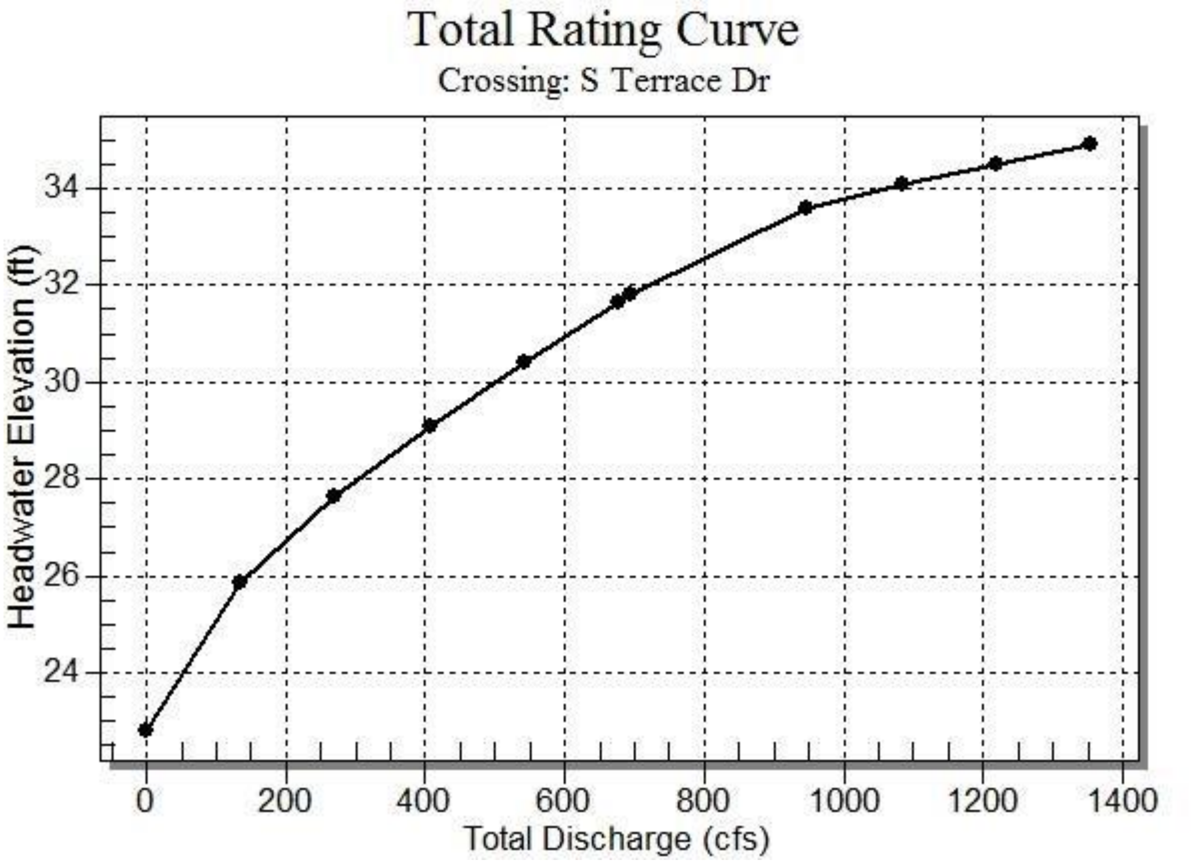


Table 2 - Culvert Summary Table: Culvert 1

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
0.00	0.00	22.81	0.000	0.0*	0-NF	0.000	0.000	0.000	0.000	0.000	0.000
135.40	135.40	25.86	3.053	0.0*	1-S2n	1.377	1.789	1.507	2.316	8.983	4.602
270.80	270.80	27.64	4.831	0.0*	1-S2n	2.228	2.841	2.459	3.348	11.014	5.742
406.20	406.20	29.09	6.284	0.0*	1-S2n	2.967	3.722	3.280	4.169	12.383	6.441
541.60	541.60	30.40	7.589	0.0*	1-S2n	3.652	4.509	4.028	4.873	13.445	6.932
677.00	677.00	31.64	8.831	0.0*	1-S2n	4.294	5.232	4.722	5.499	14.336	7.304
695.00	695.00	31.81	8.995	0.0*	1-S2n	4.379	5.325	4.813	5.577	14.441	7.347
947.80	883.95	33.57	10.762	0.0*	5-S2n	5.241	6.251	5.718	6.593	15.460	7.846
1083.20	934.33	34.07	11.256	0.0*	5-S2n	5.467	6.486	5.949	7.083	15.706	8.056
1218.60	977.39	34.50	11.691	11.551	5-S1t	5.656	6.684	7.584	7.544	12.888	8.239
1354.00	1015.84	34.90	12.089	11.767	5-S1t	5.824	6.858	8.020	7.980	12.666	8.401

* theoretical depth is impractical. Depth reported is corrected.

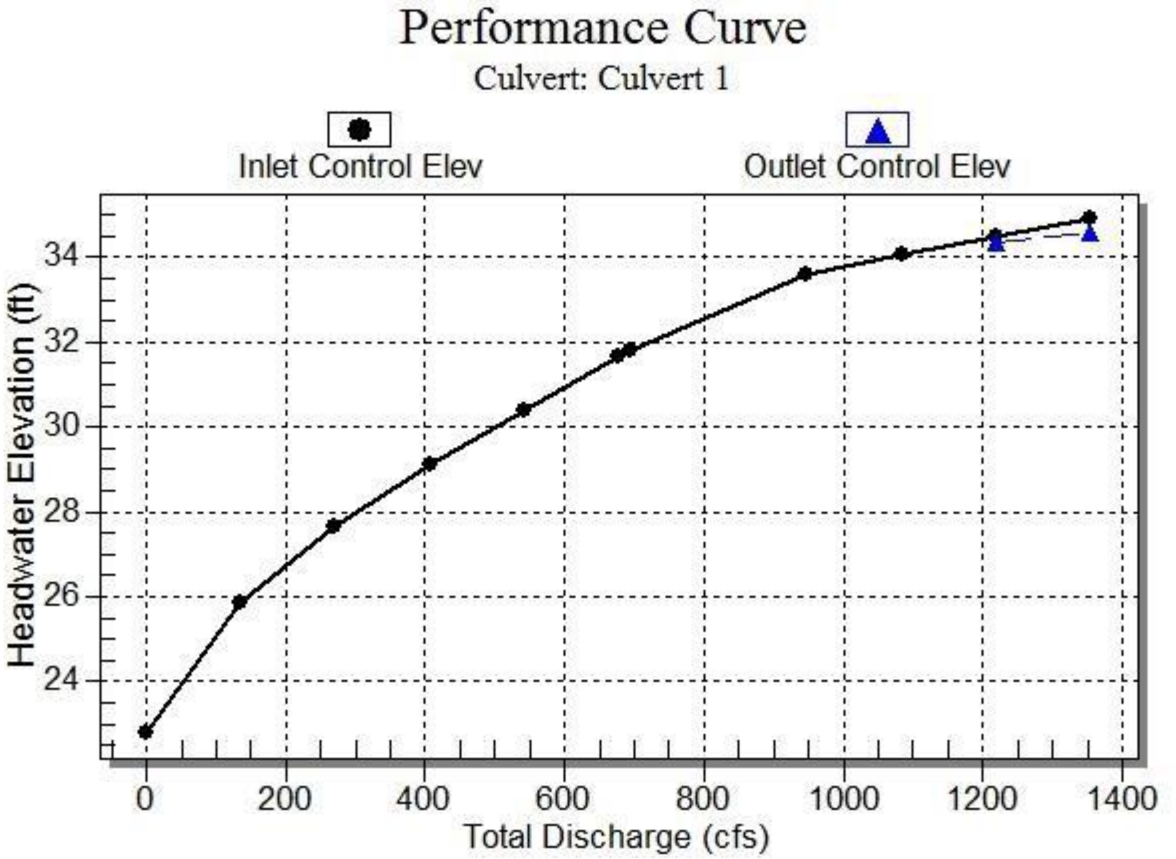
****

Inlet Elevation (invert): 22.81 ft, Outlet Elevation (invert): 22.52 ft

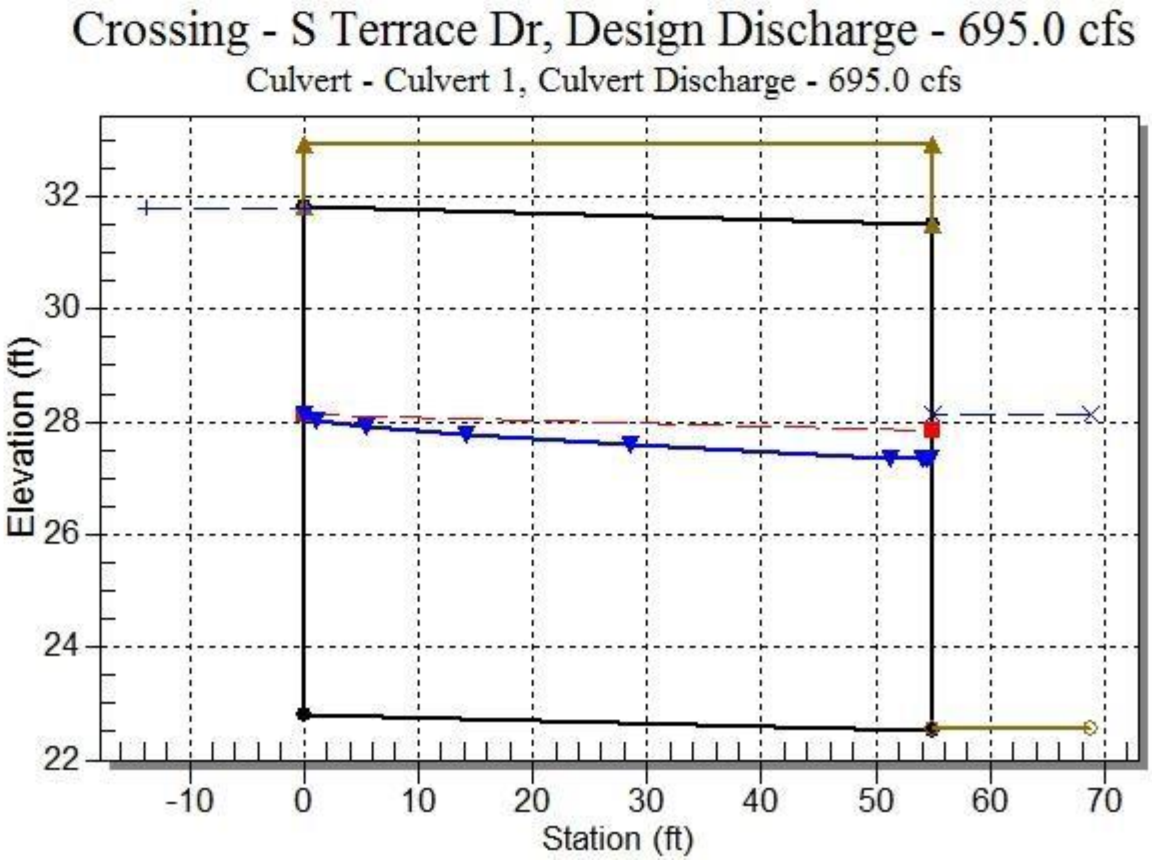
Culvert Length: 55.00 ft, Culvert Slope: 0.0053

****

Culvert Performance Curve Plot: Culvert 1



Water Surface Profile Plot for Culvert: Culvert 1



Site Data - Culvert 1

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 22.81 ft

Outlet Station: 55.00 ft

Outlet Elevation: 22.52 ft

Number of Barrels: 1

Culvert Data Summary - Culvert 1

Barrel Shape: Concrete Box

Barrel Span: 10.00 ft

Barrel Rise: 9.00 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Inlet Type: Conventional

Inlet Edge Condition: Square Edge (90º) Headwall

Inlet Depression: NONE

Table 3 - Downstream Channel Rating Curve (Crossing: S Terrace Dr)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)	Velocity (ft/s)	Shear (psf)	Froude Number
0.00	22.56	0.00	0.00	0.00	0.00
135.40	24.88	2.32	4.60	1.01	0.60
270.80	25.91	3.35	5.74	1.46	0.63
406.20	26.73	4.17	6.44	1.82	0.65
541.60	27.43	4.87	6.93	2.13	0.65
677.00	28.06	5.50	7.30	2.40	0.66
695.00	28.14	5.58	7.35	2.44	0.66
947.80	29.15	6.59	7.85	2.88	0.66
1083.20	29.64	7.08	8.06	3.09	0.65
1218.60	30.10	7.54	8.24	3.30	0.65
1354.00	30.54	7.98	8.40	3.49	0.65

Tailwater Channel Data - S Terrace Dr

Tailwater Channel Option: Irregular Channel

Channel Slope: 0.0070

User Defined Channel Cross-Section:

Coord No.	Station (ft)	Elevation (ft)	Manning's n
1	0.00	33.62	0.1000
2	4.00	31.70	0.1000
3	7.00	29.78	0.1000
4	10.20	27.74	0.1000
5	13.30	25.64	0.1000
6	15.20	23.11	0.0400
7	18.00	22.63	0.0400
8	20.60	22.82	0.0400
9	22.50	22.56	0.0400
10	25.10	22.90	0.0400
11	28.20	23.17	0.1000
12	32.00	26.62	0.1000
13	34.70	28.73	0.1000
14	39.40	32.76	0.0000

Roadway Data for Crossing: S Terrace Dr

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 40.00 ft

Crest Elevation: 32.92 ft

Roadway Surface: Paved

Roadway Top Width: 55.00 ft

Napa County Flood Control and
Water Conservation District

Stream Maintenance Program
Channel Quantitative Assessment Report

Prepared for:

Water Boards

Waste Discharge Requirements & Water Quality Certification
Order No. R2-2012-0063

Napa County Flood Control
& Water Conservation District
804 First Street
Napa, CA. 94559-2623

April 17, 2017

NAPA COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT
American Canyon • Calistoga • Napa
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Quantitative Assessment Report

1.0 Introduction

The Napa County Flood Control and Water Conservation District is responsible for maintaining the hydrological capacity of flood control channels and natural streams to minimize flooding. The District sees itself not merely as a flood management bureau, but more broadly as a resource management agency with a duty to integrate environmental benefits (such as habitat protection and enhancement) into stream maintenance activities.

The District has maintenance responsibilities for flood control channels that the District owns in fee title, as well as other channels for which the District has a maintenance agreement or easement. The location and channel ownership types for District maintenance are presented in the Stream Maintenance Manual (SMM). The District's staff surveys flood control channels and easements annually and prescribes maintenance activities based on existing conditions. The stream maintenance program has four primary activities: vegetation management, downed tree management, erosion protection and bank stabilization, and sediment and debris management.

The District also provides discretionary maintenance in other county channels, maintains instream facilities for their proper functioning, responds to public requests for maintenance activities at other stream and channel locations and is involved in the maintenance of ongoing restoration projects. In recent years, the District has been collaborating with private landowners and other local entities on the implementation of riparian and stream restoration projects as well as on the long term monitoring and maintenance of such projects.

In 2012 the District finalized the SMM to guide maintenance activities and to expand the programs permit coverage. The objective of the SMM is to provide clearly articulated guidance to avoid and minimize environmental impacts while conducting maintenance. As part of the District's Stream Maintenance Program (SMP) permit with the RWQCB WQC/WDR the District was required to develop an inventory of engineered channels and develop quantitative assessment of flood control channels. To complete the channel quantitative assessment work the District collaborated with the Napa County Resource Conservation District to complete the necessary field work and to develop this quantitative assessment report.

1.1 Quantitative Assessment

The District submitted the Quantitative Assessment Work Plan and Channel Inventories to the RWQCB on May 30, 2014. As part of this effort and in accordance with provision 26 of the WDR/WQC, the District has been carrying out quantitate assessment on flood control channels over the last five years. As outlined in the submitted work plan the District is schedule to complete channel assessment for Conn Creek and Yountville Collector during the 2018 maintenance season. The District will submit these final channel assessment reports by August of 2017.

Provision 26

The District shall develop a workplan and an implementation schedule for developing channel capacity objectives and estimates of flood stage-discharge relationships. The Development of this information will guide the selection of annual maintenance locations needed for flood protection as reported in the Annual Workplans. Channel dimensions objectives that facilitate stream equilibrium conditions, address excessive erosion and deposition problems, and promote sustainable habitat conditions, shall be developed and used to guide channel grading and enhancements activities.

A. *The District shall develop roughness objectives for all major channels contained in the SMP Manual and determine the tolerance for loss of freeboard in engineered flood controls channels.*
B. *The District shall provide preliminary estimates of stage-discharge relationships for channel reaches most likely subject to maintenance (including those areas and channels identified in the inventories for targeted and localized sediment and vegetation removal projects). These estimates should be based on field measurements. For those channels lacking sufficient high flow data, the District shall implement a program for developing stage-discharge relationships for larger magnitude flows.*
C. *The District shall develop estimates of channel dimensions for best establishing quasi equilibrium conditions to avoid future excessive erosion of or deposition within an active channel. These dimensions can be established using a combination of information from regional stream restoration curves, reference reach data, computation of effective discharges, shear stresses and other assessments. These estimations of active channel dimension should guide the management approaches contained in the maintenance plans and be used in implementing the maintenance activities in order to achieve more sustainable channel shapes and floodplains.*

1.2 Channel Assessment Work Plan

The District work plan proposed a schedule which included 2-3 channel assessments per year. The assessments were carried out to help the District identify roughness objectives, quasi equilibrium conditions, identify maintenance triggers and assist with the prioritization of maintenance prevention projects. The District limited these assessments to flood control channels that the District owns in fee title or has a maintenance agreement or easement on. The channel assessment work plan schedule is outlined below in Table 1-1.

Table 1-1: Channel Assessment Work Plan & Schedule

Creek	Channel Type	Assessment Schedule
Salvador Creek	Modified	2014-2015
Salvador Collector	Modified	2014-2015
Tulocay Creek	Semi-Modified	2015-2016
Camille Creek	Semi-Modified	2015-2016
Fagan Creek	Modified	2016-2017
Sheehy Creek	Modified	2016-2017
Conn Creek	Semi-Modified	2017-2018
Yountville Collector	Modified	2017-2018
Yountville Outfall	Modified	2017-2018

2.0 Salvador Creek Channel Assessment

The Napa County Stream Maintenance Manual divides Salvador Channel into three reaches (Reaches 1 through 3). General reach characteristics were computed for each reach using geographic information systems (GIS) methods, as summarized in Table 2-1. Reaches 1 through 3 are located between Highway 29 and Big Ranch Road. Stream crossings include two major street crossings (Jefferson Street and Trower Avenue culverts), three small private vehicular bridges, and five pedestrian bridges.

Table 2-1: Reach characteristics, Reaches 1 through 3, Salvador Creek.

Reach	Length (ft)	Drainage Area (mi^2)	Slope (ft/ft)
1	3,750	4.71	0.0026
2	2,850	4.88	0.0027
3	3,170	5.59	0.0063

Reach slope was calculated from topographic profiles extracted from the LIDAR digital elevation model (DEM) for Napa County. There were short sections near the middle of Reaches 1 and 2 that had greater slopes, 0.0056 and 0.0080, respectively, but the lesser slope was selected for the reaches to be most conservative.

2.1 Channel Capacity

The Jefferson Street and Trower Avenue culverts are located approximately 200-feet apart at the downstream end of Reach 1. Of these two culverts, the one with the smallest capacity will control the discharge and establish the capacity objective for the upstream reach. The District visited the culvert sites and collected culvert dimensions, inverts, and roadway elevations, and performed analyses of the culverts using the HY-8 software developed by the Federal Highway Administration (FHWA). The analyses revealed that the Trower Avenue culvert has the smaller capacity, conveying 1,360 cubic feet per second (cfs) at the top of the inlet. Therefore, the upstream channel, Reach 1, should convey a maximum of 1,360 cfs at the top-of-bank without spilling onto its floodplain.

The channel capacity objectives for Reaches 2 and 3 were computed by increasing the capacity flow for Reach 1 proportionally by the increase in drainage area. The channel capacity objectives for Salvador Creek are listed in Table 2-2.

Table 2-2: Channel capacity objectives Salvador Creek.

Reach	Channel Capacity Objective (cfs)
1	1,360
2	1,410
3	1,610

Channel capacity objectives are often reported in terms of peak-flow estimates; however, peak flows for Salvador Creek are not well understood and it is currently unknown what return period event corresponds to these capacity flows. The watershed is highly urbanized and common stormflow events such as the 1- and 2-years floods are known to nearly fill the channel. For example, the USGS regression equations, a common tool for estimating peak flows, predicts a 2-year flow of 324 cfs for Salvador Creek, but 9 of 10 years of stream gaging data collected at Station 28 have recorded flows well above that level, and indicate a 2-year flow of 635 cfs. Continued operation of Station 28 will eventually result in a more robust dataset which will help with frequency analysis of higher flows.

2.2 Stage-Discharge Relationships

Salvador Creek at the Big Ranch Road crossing is the location of ALERT flood warning Station 28, and a stage-discharge rating for this station has been developed over the past several years. The discharge at Station 28 is a reasonable estimate of discharge for all locations in Reach 3. The Station 28 rating is included as Figure 2, and discharge data is publically available in real-time on napa.onerain.com. Water enters Reach 3 via storm drain outfalls which may give the Station 28 discharge a high bias for upstream locations.

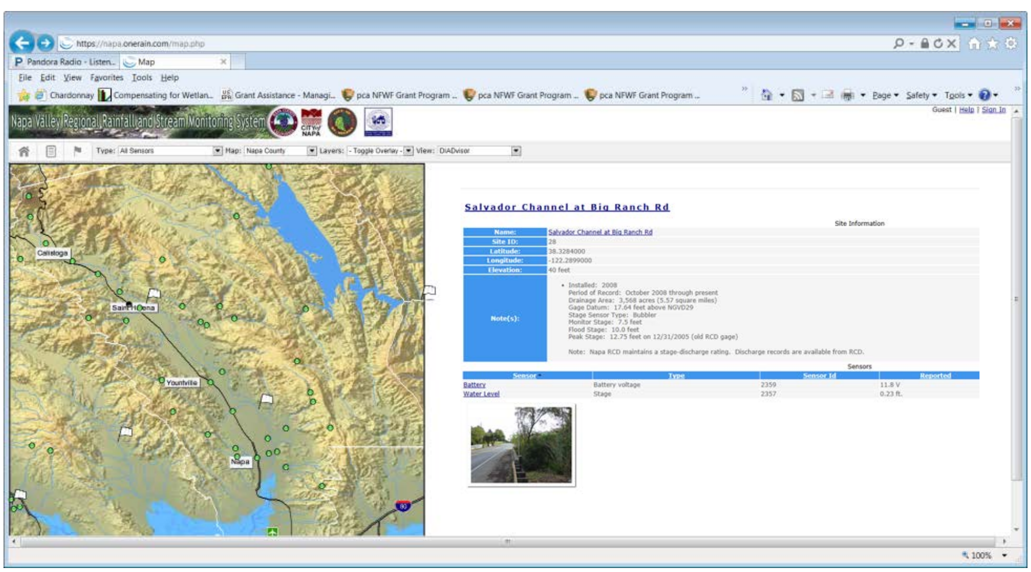

Figure 2-1: Napa One Rain Stream and Rain Gauge Website

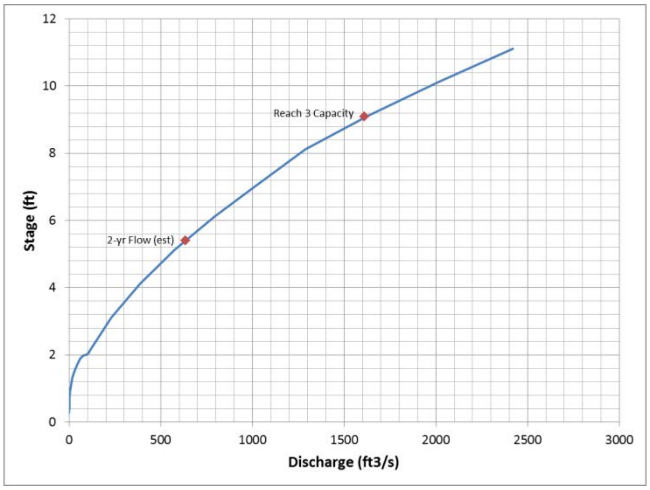

Figure 2-2: Stage-discharge rating for Station 28, Salvador Creek at Big Ranch Road.

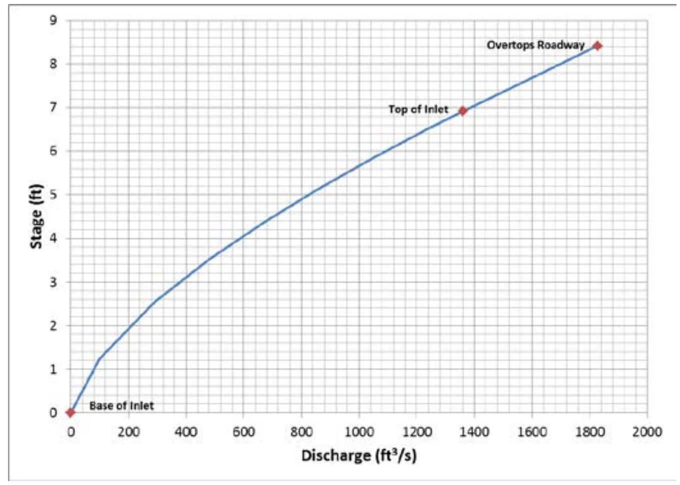

Figure 2-3: Stage-discharge rating for Reaches 1 and 2, Salvador Creek, HY-8 analysis of the Trower Avenue culvert.

A preliminary discharge estimate for Reaches 1 and 2 can be obtained by decreasing the flow at Station 28 proportionally by the decrease in drainage area, which is 84% for Reach 1 and 87% for Reach 2. However, although this method gives a discharge estimate, it is not tied to stage within Reaches 1 or 2 which may be helpful for guidance of channel maintenance activities. In addition, constructing and long-term operation and maintenance of a streamgaging station will not be an option for assessment of other ungaged channels in the SMP. To demonstrate how a preliminary stage-discharge relationship for a channel can be developed in a simple manner using an existing culverted crossing, a rating curve from the output of the HY-8 analysis of the Trower Avenue culvert described above (Figure 2-3).

This rating predicts discharge based on the headwater depth of the Trower Avenue culvert, and is a good estimate of discharge for other locations in the channel near the culvert. Due to the short length of the reaches, the absence of tributaries, and the small amount of additional contributing drainage area for Reach 2, this estimate is also reasonable for any location in Reaches 1 and 2 for many purposes, including guiding channel maintenance decisions. Water does enter Salvador Creek via storm drain outfalls in both reaches, which will give the Trower culvert discharge a high bias for Reach 1 locations upstream, and a low bias for Reach 2 locations.

The District will carry out high flow monitoring during winter months for all flood control channels being assessed. The high flow monitoring photos will help the District develop a more accurate understanding of channel capacity and stage discharge relationships.

Figure 2-4: Salvador Channel at Big Ranch Rd. (28) water level December 2, 2012

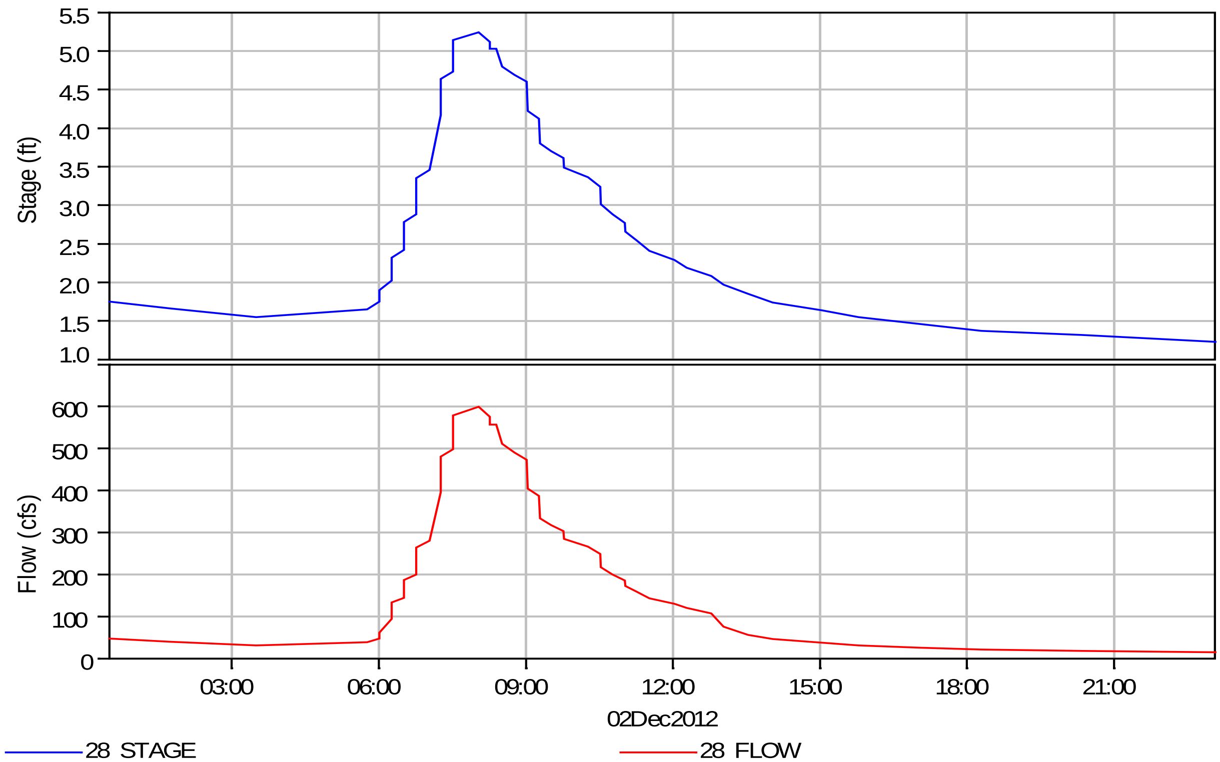

Photo 2-1: Trower St. bridge on 12-2-2012 at 9:34 am

Photo 2-2: Byway east bridge on 12-2-2012 at 9:44 am

2.3 Estimates of Quasi-Equilibrium Channel Dimensions

To develop estimates of quasi-equilibrium channel dimensions to avoid excessive erosion or deposition within each reach of Salvador Channel, channel cross section surveys were compiled as part of previous modeling efforts, and selected only those cross sections located in stable subreaches of the channel. These cross sections represent the channel in a quasi-equilibrium state. Cross-sectional area, bank slope, bottom width, and depth were calculated and averaged for each cross section to develop an idealized cross section for the reach. The number of cross sections used in each reach and the idealized channel dimensions are presented in Table 3. Figures 2-5 through 2-7 depict the idealized cross sections in relation to the surveyed cross sections. These ideal dimensions can be compared to cross sections measured at problem sites in the future to guide maintenance activities.

Table 2-3: Idealized channel dimensions, Salvador Creek.

Reach	No. of Cross Sections	Range of Cross Sectional Area (ft^2)	Average Cross Sectional Area (ft^2)	Idealized Channel Dimensions	
1	4	192 – 231	211	**Shape:** Trapezoidal **Bottom width (ft):** **Left Bank Slope (H:1V):** **Right Bank Slope (H:1V):** **Depth (ft):** **Area (ft^2):**	 16.0 1.5 1.5 7.7 212
2	7	245 – 372	314	**Shape:** Trapezoidal **Bottom width (ft):** **Left Bank Slope (H:1V):** **Right Bank Slope (H:1V):** **Depth (ft):** **Area (ft^2):**	 20.0 2.0 3.0 7.9 314
3	3	196 – 256	222	**Shape:** Trapezoidal **Bottom width (ft):** **Left Bank Slope (H:1V):** **Right Bank Slope (H:1V):** **Depth (ft):** **Area (ft^2):**	 8.0 1.0 2.0 9.7 223

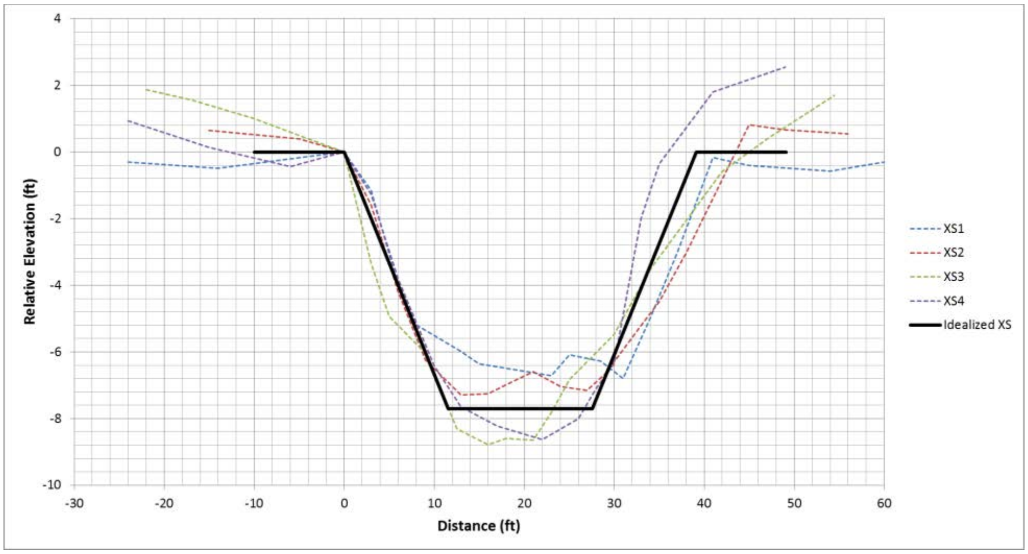

Figure 2-5: Reach 1 idealized cross section, Salvador Creek.

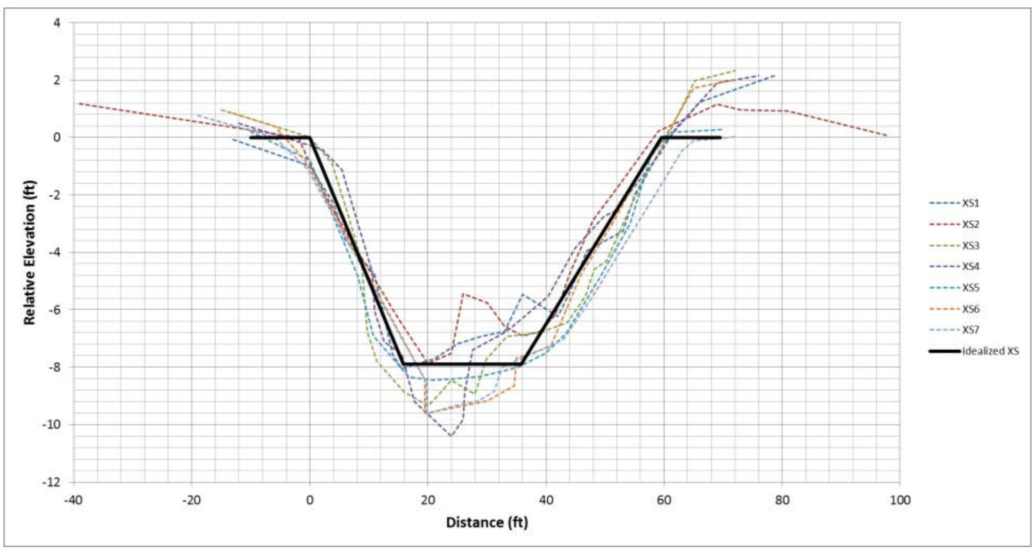

Figure 2-6: Reach 2 idealized cross section, Salvador Creek.

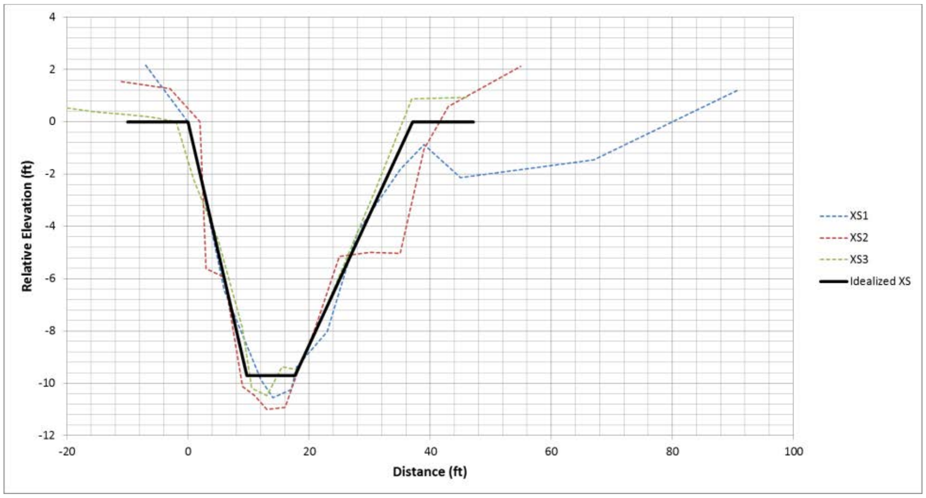

Figure 2-7: Reach 3 idealized cross section, Salvador Creek.

2.4 Channel Roughness Objectives

Since the banks of Salvador Creek are unarmored for most of its length, growth of riparian vegetation is desirable to protect against bank erosion. In addition, riparian vegetation often enhances wildlife habitat and aesthetics. However, overgrowth of riparian vegetation will increase channel roughness and therefore decrease water velocity and channel capacity according to Manning's Equation. To develop objectives for roughness to help identify excessive overgrowth and trigger maintenance to maintain channel capacity, ideal channel roughness was back calculated using Manning's Equation, the idealized cross section for the reach, the average slope of the reach, and maximum channel capacity.

Manning's Equation:

$$Q = \frac{1.49\ A\ R^{\frac{2}{3}} S^{\frac{1}{2}}}{n}$$

Q is the discharge in cfs, ***A*** is the cross sectional area in square feet, ***R*** is the hydraulic radius in feet, ***S*** is the slope in ft/ft, and ***n*** is the unitless Manning's roughness coefficient. The input values and calculated Manning's roughness results are shown in Table 4

Table 2-4: Manning's equation input values and roughness results.

Reach	Q (ft3/s)	A (ft^2)	R (ft)	S (ft/ft)	n
1	1,360	212	4.85	0.0026	**0.034**
2	1,410	314	5.01	0.0027	**0.050**
3	1,610	223	5.07	0.0063	**0.047**

For these calculations, RCD uses the slope of the streambed instead of the water surface slope, which is called for by Manning's Equation, but unknown for this channel. However, these calculations are being performed for very high channel capacity flows where water surface slope approaches the bed slope. It is common to use bed slope as an estimate of water surface slope. Slope values and roughness objectives could be refined in the future with high-water mark surveys performed following a large event.

These n values are estimates of the maximum channel roughness in each reach that will convey the channel capacity flow through the idealized cross section, and represent the roughness objectives for the reaches. RCD collected photographs of the three reaches to depict current roughness conditions for comparison to the roughness objectives. Photos 2-3, 2-4, and 2-5 show roughness conditions that are representative of Reaches 1, 2, and 3, respectively. Roughness estimates for each reach are provided in the figure captions.

Photo 2-3: Reach 1 looking upstream showing channel roughness. n=0.030-0.040

Photo 2-4: Reach 2 looking downstream showing channel roughness. n=0.030-0.040

Photo 2-5: Reach 3 looking downstream showing channel roughness. n=0.040-0.050

3.0 Tulucay Creek Channel Assessment

Tulucay Creek is tributary of the Napa River that drains a 12.75 square mile watershed. It has several named tributaries including Camille Creek, Kreuse Creek, Spencer Creek, and Murphy Creek. The maintained reaches of Tulucay Creek are located in the urbanized areas at the outlet of the watershed. Reach 1 begins at Twin Creeks Court and ends 1,620 feet downstream at the Soscol Avenue bridge. Camille Creek enters Tulucay Creek from the southeast in the approximate middle of Reach 1. The tops of both stream banks in Reach 1 are closely lined with residential and commercial structures. Reach 2 begins at the Soscol Avenue bridge and ends 1,980 feet downstream at the railroad bridge. Reach 2 has been leveed to constrain high flows to the channel and reclaim adjacent land, which is currently mostly vacant, but zoned for commercial use.

Significant previous work, including a HEC-RAS hydraulic model, is available for Tulucay Creek. The model was originally developed for a FEMA map revision, and subsequently updated by WEST Consultants, Inc. in 2013 to inform the design of a proposed pedestrian bridge. The model was constructed using 23 cross sections that span the entirety of Reaches 1 and 2.

3.1 Channel Capacity and Stage-Discharge Relationships

Ideally, in an urban or residential setting, stream channels and crossing structures should be sized and maintained to safely convey the 1% chance exceedance discharge, also called the 100-year peak flood event (Q100). Although some stream discharge monitoring has been conducted in the Tulucay Creek watershed, the resulting data are insufficient for statistical analysis that would produce a high-confidence Q100 value.

However, indirect methods have produced estimates over the years, and the current estimate of 4,530 cfs has been accepted by FCWCD and the Army Corp of Engineers.

Since the Q100 estimate has been revised upward in recent years, the channel was designed and constructed to convey a lesser discharge; therefore, the Q100 is not an appropriate channel capacity objective. At the request of FCWCD, WEST computed channel capacities of both reaches of Tulucay Creek using the HEC-RAS model. The capacity of the upper portion of Reach 1, and all of Reach 2, was determined to be approximately 3,500 cfs; however, at this flow, the model indicates overtopping of the left bank of the channel in the lower portion of Reach 1, just upstream of the Soscol Avenue bridge. The estimated capacity of this subreach of Reach 1, according to the model, is approximately 1,000 cfs, but there appears to be potential accuracy issues at this location in the model due to incomplete representation of a flood wall along the south bank. Since the true capacity of this subreach is unknown, RCD recommends setting the channel capacity objective for stream maintenance purposes for the entirety of Reaches 1 and 2 at 3,500 cfs.

The HEC-RAS analysis was also used to generate stage-discharge ratings for both reaches (Figures 1 and 2). Ratings are associated with a particular cross section location on a stream, so RCD selected cross sections from the model that represented the reach. For Reach 1, RCD selected the downstream-most cross section that was above the poorly-represented "flood wall" subreach described above. For Reach 2, RCD selected a cross section near the top of the reach which represents the minimum capacity of the channel.

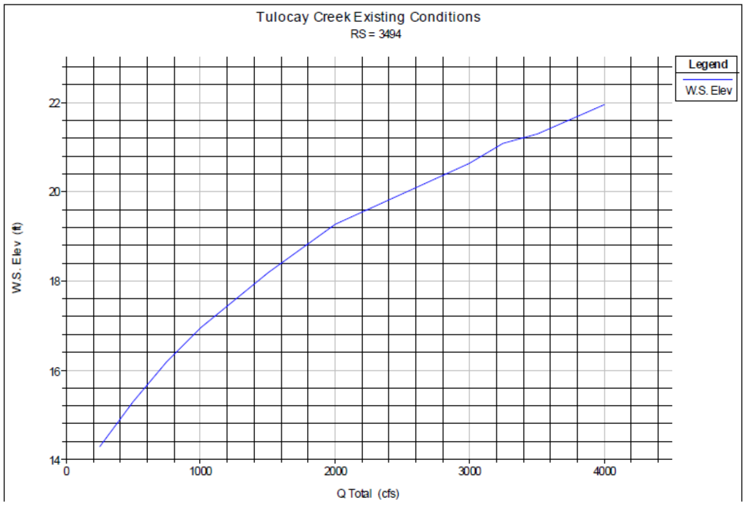

Figure 3-1: Stage-discharge rating for Tulucay Creek Reach 1, obtained from HEC-RAS analysis.

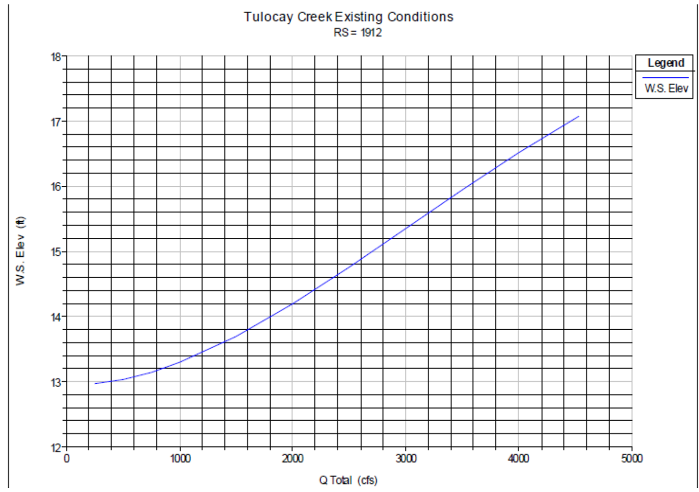

Figure 3-2: Stage-discharge rating for Tulucay Creek Reach 1, obtained from HEC-RAS analysis.

3.2 Estimates of Quasi-Equilibrium Channel Dimensions

The HEC-RAS model was built with many cross sections of Tulucay Creek, including 8 in Reach 1 and 9 in Reach

2. RCD overlayed the cross sections for each reach and fit idealized trapezoidal cross sections to the plot (Figures 3-3 and 3-4). The 5 downstream-most cross sections in Reach 1 were omitted due to incomplete representation of a flood wall in this area. These idealized cross sections depict the average channel dimensions, and since the channels appear to be stable based on visual assessment, they also represent the channel in a quasi-equilibrium state. The idealized channel dimensions are summarized in Table 3-1.

Table 3-1: Idealized channel dimensions, Tulucay Creek.

Idealized Channel Dimensions		
Reach	Reach 1	Reach 2
Shape	Trapezoidal	Trapezoidal
Bottom Width (ft)	15	35
Left Bank Slope (H:1V)	3	2
Right Bank Slope (H:1V)	3	2
Depth (ft)	9.0	12.0
Area (ft^2)	378	708

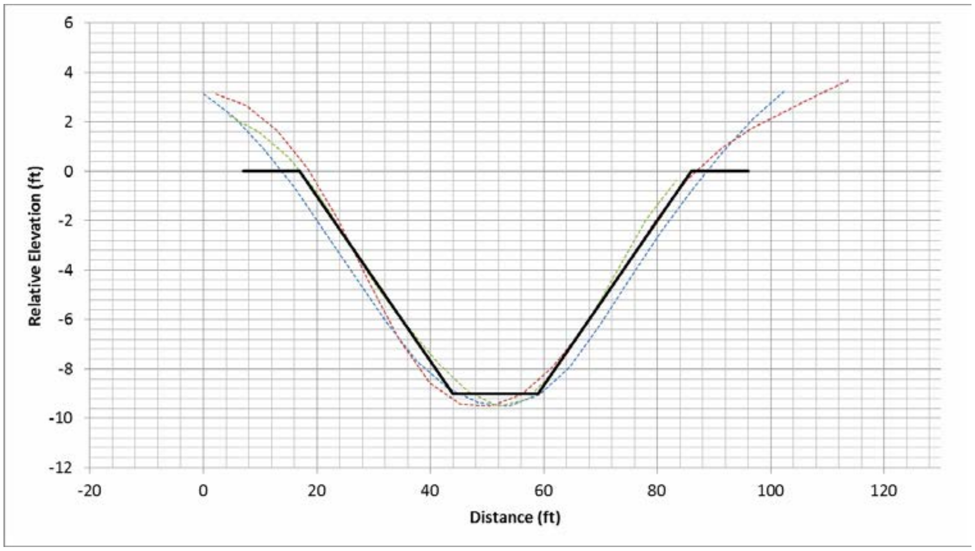

Figure 3-3 : Idealized cross section, Tulucay Creek Reach 1, based on measured cross sections.

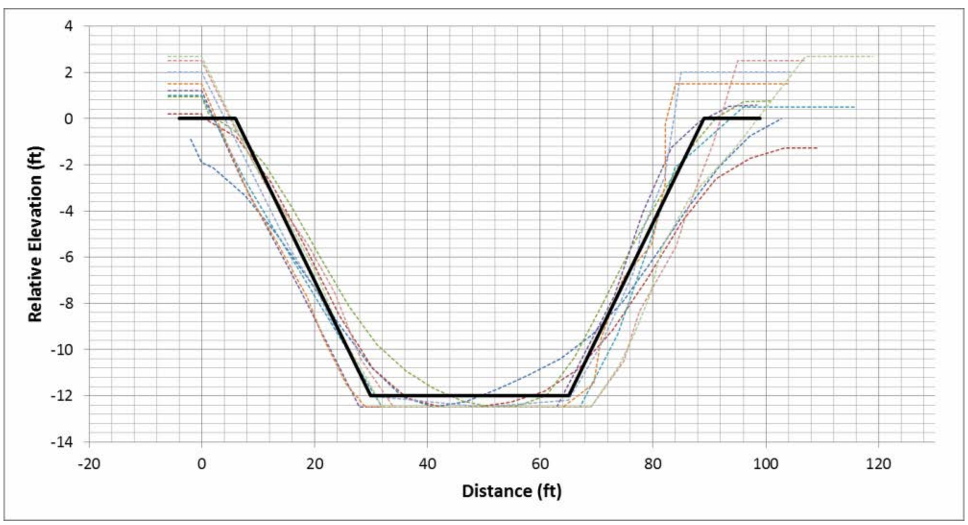

Figure 3-4: Idealized cross section, Tulucay Creek Reach 2, based on measured cross sections.

3.3 Channel Roughness

Since the banks of Tulucay Creek are unarmored for most of its length, and the surrounding land is developed or zoned for future development, right up to the top-of-bank, growth of riparian vegetation is necessary to protect against bank and levee erosion. In addition, riparian vegetation enhances wildlife habitat and aesthetics. However, overgrowth of riparian vegetation will increase channel roughness and therefore decrease water velocity and channel capacity according to Manning's Equation.

RCD conducted a visual assessment of roughness in Tulucay Creek Reaches 1 and 2, collected photographs, and estimated Manning's roughness coefficients. Photos 3-1 through 3-4 depict roughness conditions representative of each reach. Estimated Manning's roughness coefficients are provided in the figure captions.

Photo 3-1: The upstream portion of Tulucay Creek Reach 1, looking downstream, showing channel roughness and inundation from beaver activitv. n=0.04-0.05

Photo 3-2: The downstream portion of Tulucay Creek Reach 1 looking downstream showing channel roughness and inundation from beaver activity. n=0.04-0.05

As evident from Figures 1 and 2, Reach 1 has been completely inundated with backwater from a beaver dam located just upstream of the Soscol Avenue bridge. Beavers are common in the Napa River system and seem to be increasing in population. In general, local beaver activity is not known to lead to significant channel capacity decreases and potential stream flooding issues due to the large size and intensity of local winter storm flows, which tend to wash out the dams on an annual basis; however, this particular dam appears to be quite resilient. It seems to have withstood a medium-size flow on December 11, 2014, estimated (roughly) at approximately 800 cfs, with little damage, or at least in a condition in which it could be quickly repaired. It is still assumed that larger flows would wash out beaver dams and restore full channel capacity.

Photo 3-3: Tulucay Creek Reach 2 looking downstream from Soscol Avenue bridge showing channel roughness. n=0.1-0.15

Photo 3-4: Tulucay Creek Reach 2 looking upstream from the railroad bridge at the downstream boundary of the reach, showing channel roughness. n=0.04-0.045

RCD's selection of Manning's Roughness Coefficients for Reach 1 (n=0.04 to 0.05) closely agree with those used by WEST in the HEC-RAS analysis (n=0.045). Since the analysis indicated that the reach will convey the channel capacity objective flow under these roughness conditions, the channel roughness objective for Reach 1 should be set at 0.045.

RCD's selection of roughness coefficients for Reach 2 (n=0.04 to 0.15) agree with those used by WEST in the HEC-RAS analysis (n=0.04) except in the upper portion of the reach. Overgrowth in this area (Figure 3) is likely recent and due to extended drought conditions, and RCD recommends active clearing be considered to reduce roughness and maintain channel capacity. Regardless, the HEC-RAS analysis indicates that a Manning's Roughness Coefficient of 0.04 is required to achieve the channel capacity objective, and therefore, the channel roughness objective for Reach 2 should be set at 0.04.

3.4 Tulucay Creek Channel Assessment Summary

Visual assessment of Tulucay Creek Maintenance Reaches 1 and 2 indicates that the channel is in a quasi- equilibrium condition. RCD compiled several channel cross sections measured throughout the reach as part of a previous HEC-RAS analysis, and defined idealized channel dimensions for each reach that should be maintained in order to preserve channel capacity. HEC-RAS analysis used weighted Manning's roughness coefficients of 0.045 and 0.040 for Reaches 1 and 2, respectively, and indicated a maximum channel capacity of 3,500 cfs under these conditions. RCD considers these values to be reasonable and should be used as the roughness and capacity objectives for the reaches; however, visual assessment of the upper portion of Reach 2 revealed increased roughness due to vegetation overgrowth and active clearing should be considered in this area to maintain channel maintenance objectives. The HEC-RAS analysis also provided stage-discharge relationships for both reaches.

Table 3-2: Tulucay Creek Channel Maintenance Objectives

Channel Characteristic	Tulucay Creek Reach 1	Tulucay Creek Reach 2
Capacity	Maintain channel to convey a flow of 3,500 cfs.	Maintain channel to convey a flow of 3,500 cfs.
Quasi-Equilibrium Dimensions	Maintain bank slopes of approximately 3H:1V. Maintain an approximate minimum cross sectional area of 380 ft^2 at the top-of-bank.	Maintain bank slopes of approximately 2H:1V. Maintain an approximate minimum cross sectional area of 700 ft^2 at the top-of-bank.
Roughness	Maintain overall channel roughness of 0.045 as shown in Figures 5 and 6.	Maintain overall channel roughness of 0.04 as shown in Figure 8.

4.0 Camille Creek Channel Assessment

Camille Creek, also called Cayetano Creek or Marie Creek, is a tributary of Tulucay Creek that drains a 3.13 square mile area, 25% of the Tulucay Creek watershed. The maintained reach of Camille Creek begins at the South Terrace Drive culvert and ends 1,250 feet downstream where it empties into Tulucay Creek in the approximate middle of Reach 1. The tops of both stream banks in the reach are closely lined with residential structures. RCD is not aware of previous hydraulic analyses or discharge monitoring efforts for Camille Creek.

4.1 Channel Capacity and Stage-Discharge Relationships

To develop a channel capacity objective for the reach, RCD first determined the maximum capacity of the South Terrace Drive culvert. Stream crossing structures, especially culverts, are often the most constricted points in a reach; and therefore the maximum discharge conveyed by these structures often represents a suitable capacity objective for the reach.

During June 2015, RCD measured the dimensions of the South Terrace Drive culvert, recorded the inlet configuration, surveyed the inlet and outlet elevations, and measured a channel cross section at the tailwater control with a theodolite and stadia rod relative to NGVD29 (City of Napa Benchmark 87-A). These data were input into HY-8, a culvert analysis program developed by the Federal Highway Administration (FHWA). HY-8 analysis input data and results are provided as an attachment to this memorandum. The results of the analysis indicate that the capacity of the culvert is 695 cfs at the top of the inlet, and 815 cfs at the point at which it overtops and spills onto the roadway. The analysis also generated a stage-discharge rating for the culvert that will predict discharge based on headwater elevation. The rating is provided and discussed below.

The Camille Creek watershed is an ungaged basin and therefore the Q100 is not known. RCD estimated the Q100 by adjusting the current Q100 estimate for Tulucay Creek (4,530 cfs) based on drainage area according the following equation:

$$Q_u = Q_g \left(\frac{A_u}{A_g}\right)^{0.87}$$

where Q_u is the discharge for the ungaged site, Q_g is the discharge for the gaged site, A_u is the drainage area of the ungaged site, and A_g is the drainage area of the gaged site. This adjustment method is described in the June 1977 USGS report *Magnitude and Frequency of Floods in California* by A.O. Waananen and J.R. Crippen. This method results in a Q100 estimate for Camille Creek of 1,350 cfs.

It should be noted that this estimate is based on previous work done for Tulucay Creek, which is also an estimate based on indirect methods, and there may be significant error associated with the Q100 estimates for both creeks. For comparison purposes, RCD computed a second estimate of the Camille Creek Q100 using USGS's National Streamflow Statistics (NSS) program, which uses regional flood-frequency regression equations. Based on drainage area and mean annual precipitation, NSS predicts a Q100 of 800 cfs for Camille Creek. For this assessment, RCD selected the greater value of 1,350 cfs as the estimated Q100 because it has a local basis and is more conservative.

Comparison of the culvert capacity to the Q100 reveals that the culvert would be overtopped should this flow occur. In this case, the culvert capacity is not a suitable objective for the reach and the capacity of the channel itself must be estimated and compared to the Q100. To do this, RCD began with a visual assessment of the reach to evaluate channel shape and condition. The channel is incised but appears to have stabilized.

Significant areas of erosion and/or deposition were not observed. The streambanks are not armored but are generally well vegetated. The reach does not maintain a consistent shape along its length. In the downstream direction, the stream banks become lower and shallower. A stable location in the most-contracted subreach of the creek was selected for measurement of a cross section. A stable location was selected because this indicates that it represents the channel in a quasi-equilibrium state. The most-contracted subreach, with the smallest cross-sectional area, was selected because it will control the capacity.

RCD measured the cross section by stretching a tape between the tops of the banks perpendicular to the channel centerline. Elevations were measured with a theodolite and stadia rod relative to NGVD29. The measured cross section was plotted and an idealized cross section was fit to the plot (Figure 4-1). This idealized cross section represents the most-contracted, yet stable, configuration of the channel. The capacity of the actual channel, which widens downstream, will be greater.

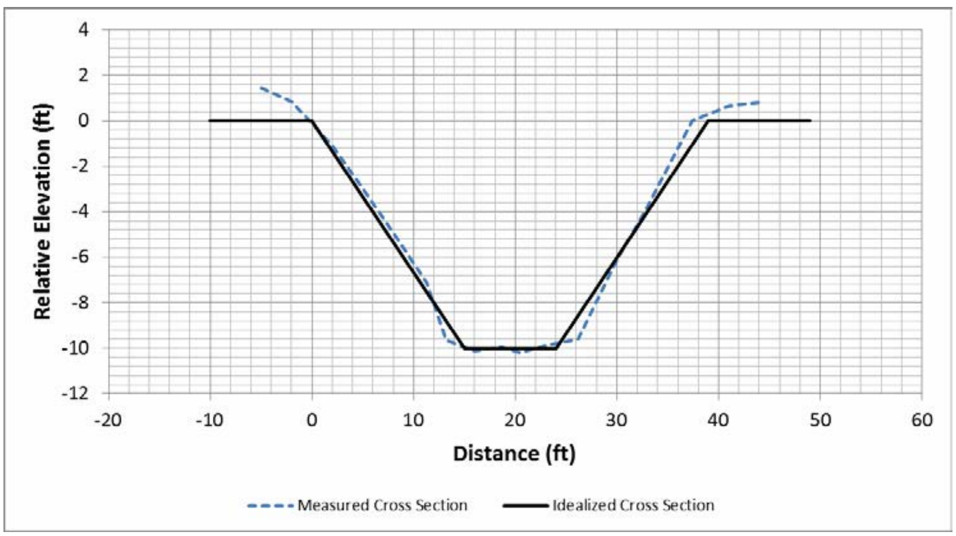

Figure 4-1: Idealized cross section, Camille Creek, based on a measured cross section at a carefully selected location.

RCD performed a channel analysis using the idealized cross section, the bed slope of the reach, roughness estimates, and Manning's Equation. The analysis resulted in a general stage-discharge relationship, or rating, for the reach. The stage-discharge rating is shown in Figure 4-2.

The rating indicates that the capacity of the channel is 1,780 cfs at the top of bank. Although there is a wide- margin of error associated with this result, it is well above the Q100, indicating that the channel, even at its narrowest location, will safely convey the Q100. It should be noted that HY-8 analysis of the South Terrace Drive culvert indicates roadway flooding and culvert inundation at this flow. In addition, although the channel should contain and convey the Camille Creek Q100, in an extreme high-water scenario, backwater from Tulucay Creek may cause flooding in the lower part of the reach.

This rating, though useful for estimating channel capacity and specifically for comparison of channel capacity to the Q100, is based on generalizations and applies to the reach as a whole, not to stage at a specific location. To estimate the discharge associated with an observed stage in the reach, the headwater elevation to discharge rating from the HY-8 analysis of the South Terrace Drive culvert is provided as Figure 4-3. This rating predicts discharge based on the headwater depth of the South Terrace Drive culvert. Due to the short length of the reach, the absence of tributaries, and the small amount of additional contributing drainage area, this estimate is also applicable to any location in the maintained reach for many purposes, including guiding channel maintenance decisions.

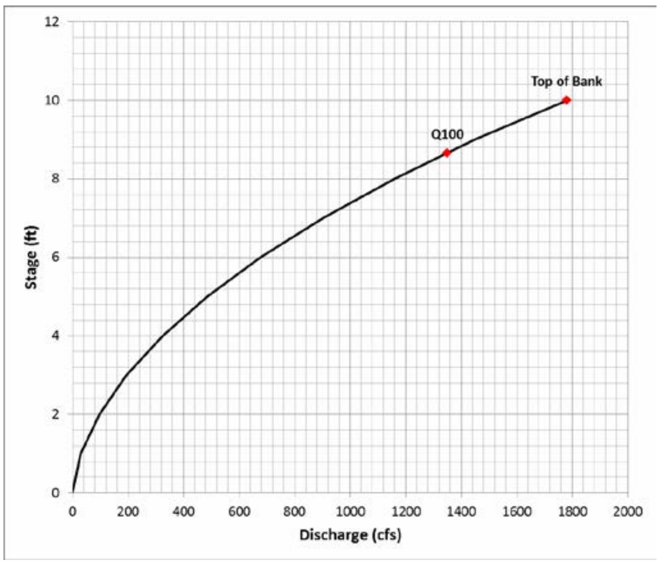

Figure 4-2: Stage-discharge rating for Camille Creek, obtained from channel analysis using idealized cross section.

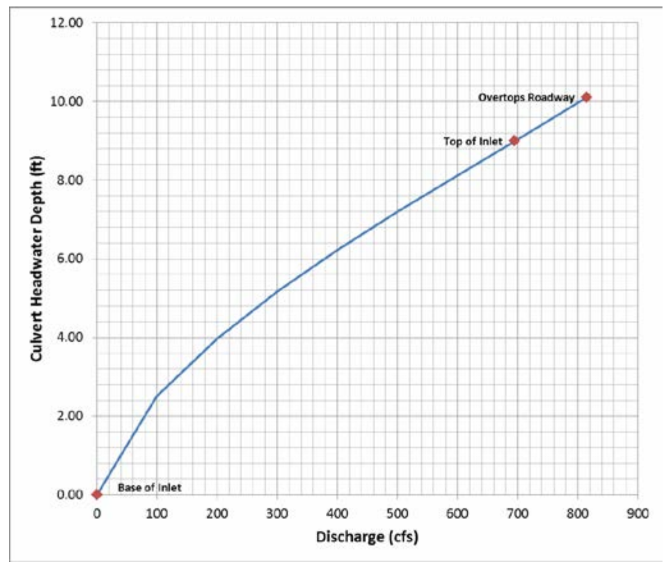

Figure 4-3: Headwater depth – discharge rating for South Terrace Drive culvert, obtained from HY-8 analysis.

4.2 Estimates of Quasi-Equilibrium Channel Dimensions

The idealized cross section constructed to estimate channel capacity represents the channel at a quasi- equilibrium condition, yet at its most susceptible to potential change because it has the steepest bank slopes and experiences the highest velocities due to its having the minimum cross-sectional area in the reach.

Therefore, the dimensions of this cross section represent the extremes that should not be exceeded in any subreach, and therefore comparison of future channel conditions to these dimensions can indicate a problem and guide channel maintenance activities. Cross-sectional area, bank slope, bottom width, and depth were calculated to develop idealized channel dimensions for the reach (Table 4-1).

Table 4-1: Idealized channel dimensions, Camille Creek

Idealized Channel Dimensions	
Shape	Trapezoidal
Bottom width (ft)	9
Left Bank Slope (H:1V)	1.5
Right Bank Slope (H:1V)	1.5
Depth (ft) **Area (ft^2):**	10.0 240

4.3 Channel Roughness

Since the banks of Camille Creek are unarmored for most of its length, and the surrounding land is developed right up to the top-of-bank, growth of riparian vegetation is necessary to protect against bank erosion. In addition, riparian vegetation enhances wildlife habitat and aesthetics. However, overgrowth of riparian vegetation will increase channel roughness and therefore decrease water velocity and channel capacity according to Manning's Equation.

Based on visual assessment of the maintenance reach of Camille Creek, RCD estimates the Manning's Roughness Coefficient of the active scour channel and the stream bank slopes to be 0.04 and 0.1, respectively. When composited using the Lotter Method, this equates to an overall channel roughness of approximately

0.05 at all high stages. Roughness coefficients were selected based on reference documents provided by USGS and others, and on local experience and professional judgement. A photograph depicting the typical roughness conditions of the maintained reach of Camille Creek is provided as Photo 4-1.

RCD considers the current condition of the channel to be stable and in a quasi-equilibrium state, and analysis reveals that the most-confined portion of the reach will convey the Q100 under the current roughness conditions. Therefore, the current roughness conditions should be maintained to ensure continued conveyance of the Q100, and the Channel Roughness Objective should be set at 0.05

Photo 4-1: Camille Creek looking downstream showing channel roughness.
RCD selected an overall Manning's Roughness Coefficient of 0.05 for the reach.

4.4 Camille Creek Channel Assessment Summary

Visual assessment of the maintained reach of Camille Creek indicates that the channel is currently in a quasi- equilibrium condition, and capacity analyses indicate that the channel will currently convey the 100-year peak flood event, although overtopping and roadway flooding at the South Terrace Drive culvert is expected to occur at this flow. Therefore, current channel dimensions and roughness conditions should be maintained in the future to maintain adequate channel capacity. Stage-discharge relationships were estimated for Camille Creek, and discharges up to approximately 800 cfs can be estimated in the field by measuring headwater depth at the South Terrace Drive culvert. Channel maintenance objectives for Camille Creek and both reaches of Tulucay Creek are summarized in Table 4-2.

Table 4-2: Tulucay Creek Channel Maintenance Objectives

Channel Characteristic	Camille Creek
Capacity	Maintain channel to convey the 1% chance exceedance flow (100-year peak flood event) of 1,350 cfs.
Quasi-Equilibrium Dimensions	Maintain bank slopes of 1.5H:1V or shallower. Maintain a minimum cross sectional area of 240 ft^2 at the top-of-bank.
Roughness	Maintain overall channel roughness of 0.05 as shown in Figure 12.

5.0 Fagan Creek Channel Assessment

Fagan Creek is a tributary of the Napa River that drains a 6.56 square mile watershed and empties into Fagan Slough, a tidal slough in the Napa River marshes. Land use in the upper watershed is mostly grassland with small areas of riparian forest. The lower watershed is developed with vineyards, a golf course, an industrial park, and an airport. The maintained reach of Fagan Creek is located at the outlet of the watershed. The reach begins at the railroad tracks and continues as an open channel for 3,400 feet where it enters a 1,300-foot culverted section that carries flow beneath an airport runway, and followed again by a short reach of open channel before discharging to Fagan Slough (Figure 5-1). The tops of both stream banks in the reach are closely lined with industrial and airport developments. The channel, except for the culverted portion, is mostly grass-lined and devoid of overstory. RCD is not aware of previous hydraulic analyses or discharge monitoring efforts for Fagan Creek.

Figure 5- 1: Map of maintained reach of Fagan Creek

5.1 Peak Flow Estimates

Ideally, in a developed setting, stream channels and crossing structures should be sized and maintained to safely convey the 1% chance exceedance discharge, also called the 100-year peak flood event (Q100). The Fagan Creek watershed is an ungaged basin and therefore the Q100 is not known. To estimate the Q100, RCD analyzed the Fagan Creek watershed using USGS's National Streamflow Statistics (NSS) program, which uses regional flood-frequency regression equations based on drainage area and mean annual precipitation. The drainage area of 6.56 square miles at the outlet of the creek was measured using the Napa County GIS watershed layer. The mean annual precipitation of 24.6 inches was obtained for the approximate centroid of the watershed from the Prism Climate Group's 30-Year Normals (1981-2010) dataset. The NSS peak flow estimates for Fagan Creek are listed in Table 5-1. The Q100 estimate for the outlet of Fagan Creek is 1,470 cubic feet per second (cfs).

Table 5-1: Peak streamflow estimates for Fagan Creek

Annual Exceedance Probability	Recurrence Interval (yrs)	Discharge Estimate (cfs)
0.5	2	232
0.2	5	510
0.1	10	720
0.04	25	1,010
0.02	50	1,230
0.01	100	1,470

5.2 Channel Assessment

Prior to a field visit, RCD completed a GIS analysis to measure drainage area, reach lengths, culvert and structure lengths, and channel slope. RCD also examined historical aerial photos to identify potential significant changes to the channel.

RCD visited the maintained reach of Fagan Creek in July 2016 and surveyed two channel cross sections (XS1 and XS2) at locations carefully selected to represent each respective subreach. The cross sections are shown in Figure 5-2. Surveying was performed with a theodolite and stadia rod relative to NGVD29 (Napa County benchmark A-C). Lateral distance was measured with a tape. RCD surveyed the configurations of stream crossings and other structures in the reach. Structures included the Airport Road bridge, a concrete grade-control weir, and the 1,300-foot runway culvert. RCD also performed a visual assessment of the bed and banks and collected data for an assessment of roughness conditions in the channel.

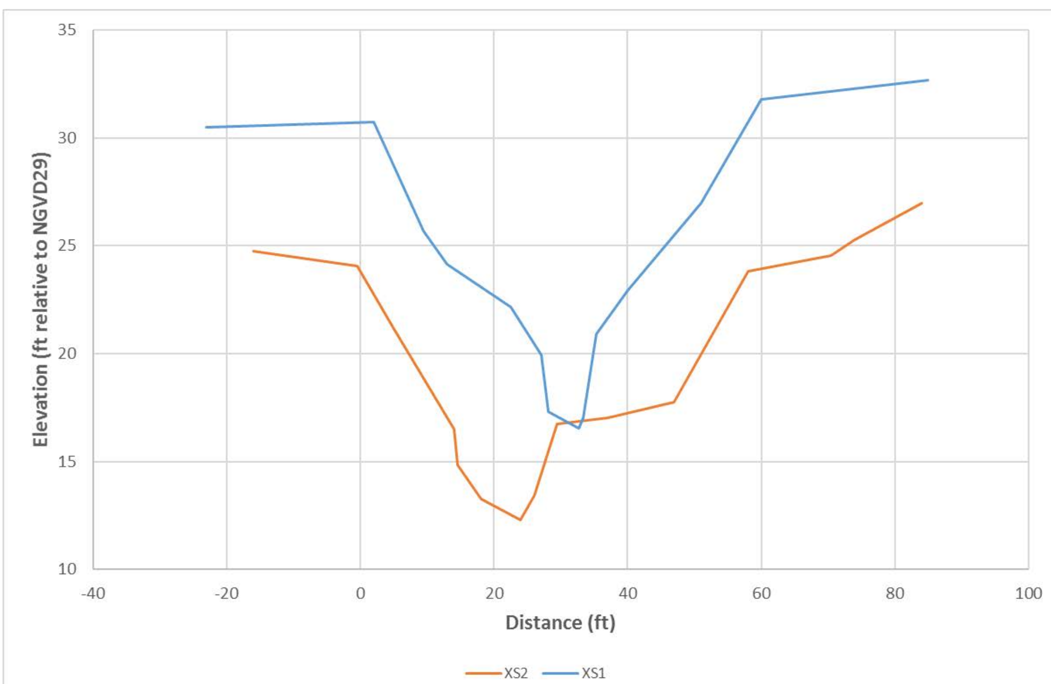

Figure 5-2 Fagan Creek channel cross sections XS1 and XS2, shown looking downstream.

Immediately apparent was a trench-like low-flow channel running along the bottom of the main channel from the upstream end of the reach to the inlet of the runway culvert. The depth of the trench ranges from approximately 5 feet at the upstream end to near zero, and is present on both sides of the grade-control weir. Assuming the channel was originally constructed with a trapezoidal cross-sectional shape, this trench feature may be evidence of an erosional adjustment of the channel. Air photo review reveals that this feature existed in similar condition at least as far back as 2002, which would indicate that it has stabilized. Deposition of sediment on the streambed was only apparent in the immediate upstream vicinity of the grade-control weir, and appeared to be minor. The stream banks appear to be stable and in good condition.

The Airport Road bridge has vertical concrete abutments and a straight horizontal deck with no center pier, and resembles a large box culvert in shape although it has a natural channel bottom. The grade-control weir is located 250 feet downstream of the bridge, and is assumed to have been installed to help stabilize the channel and protect the bridge abutments. The weir controls the stage of the pool beneath the bridge. The runway culvert inlet is 870 feet downstream of the weir. Beaver activity downstream of the outlet of the culvert has backwatered the channel through the entire length of the culvert and for several hundred feet upstream. This can be expected to affect culvert capacity to an unknown degree if these conditions persist during the storm flow season.

RCD estimates roughness by visually assessing and photographing channel conditions, and then employing the procedure outlined in *Guide for Selecting Manning's Roughness Coefficients for Natural Channels and Flood Plains* (USGS 1989). For the maintained reach of Fagan Creek, RCD noted firm soil substrate, low irregularity, gradual variation in cross section, negligible obstructions, low degree of meandering, and medium to large amounts of vegetation. Figures 5-1 through 5-3 depict roughness conditions in the reach.

Photo 5-1: The upstream portion of the Fagan Creek maintenance reach, looking obliquely upstream from the right bank, showing channel roughness.

Photo 5-2: The upstream portion of the Fagan Creek maintenance reach, looking obliquely upstream from the right bank, showing channel roughness.

Photo 5-3: Fagan Creek maintenance reach, looking upstream from the inlet of the runway culvert, showing channel roughness.

Data collected in the field were used to compute channel dimensions and channel and structure capacities. RCD analyzed the channel and crossing structures with software developed by the Federal Highways Administration (FHWA), Hydraulic Toolbox and HY-8. The Airport Road bridge has many similarities to a box culvert in hydraulic function and was modeled as a box culvert in order to use the simple analysis tools included in the scope of this assessment. The actual capacity of the bridge should be greater than the computed result. Due to inundation at the outlet of the runway culvert from beaver activity, RCD was unable to collect tailwater survey data. The capacity analysis for the runway culvert assumes inlet control and no backwatering from the beaver dam, which may or may not be the condition during the storm season. The results of channel and structure analyses are summarized in Table 5-2.

Table 5-2. Results of Fagan Creek stream channel assessment. Culvert capacities shown are for headwater elevation at the top of the inlet. The overtopping capacity of the runway culvert is included in parentheses.

Parameter	Result
Channel Slope (ft/ft)	0.003
Left Bank Slope (H:1V)	2
Right Bank Slope (H:1V)	2
Channel Depth (ft)	9 – 15
Cross Sectional Area (ft2)	360 – 382
Manning's Roughness Estimate	0.05
Channel Capacities (cfs)	
XS1	2,020
XS2	1,820
Airport Rd Bridge	1,965
Grade-Control Weir	1,875
Runway Culvert	926 (Overtopping 1,100)

5.3 Channel Dimension Objectives

The channel assessment identified a low-flow trench in the bottom of the channel of the maintained reach of Fagan Creek that appeared to have been created by erosion. The banks of the channel appeared to be well-vegetated and stable. A review of historical air photos indicated that the trench existed in similar condition in 2002, indicating that erosion of the streambed has stabilized since channel construction. Therefore, the current dimensions of the channel, and not the original dimensions, should be maintained. To determine objectives for channel dimensions, RCD used the approximate bank slopes from cross sections XS1 and XS2 and computed the required width and depth of an idealized trapezoidal channel that would convey the Q100 under current roughness conditions and channel slope (Figure 5-2). The dimensions of this idealized channel cross section were used to set the channel dimension objectives (Table 5-3).

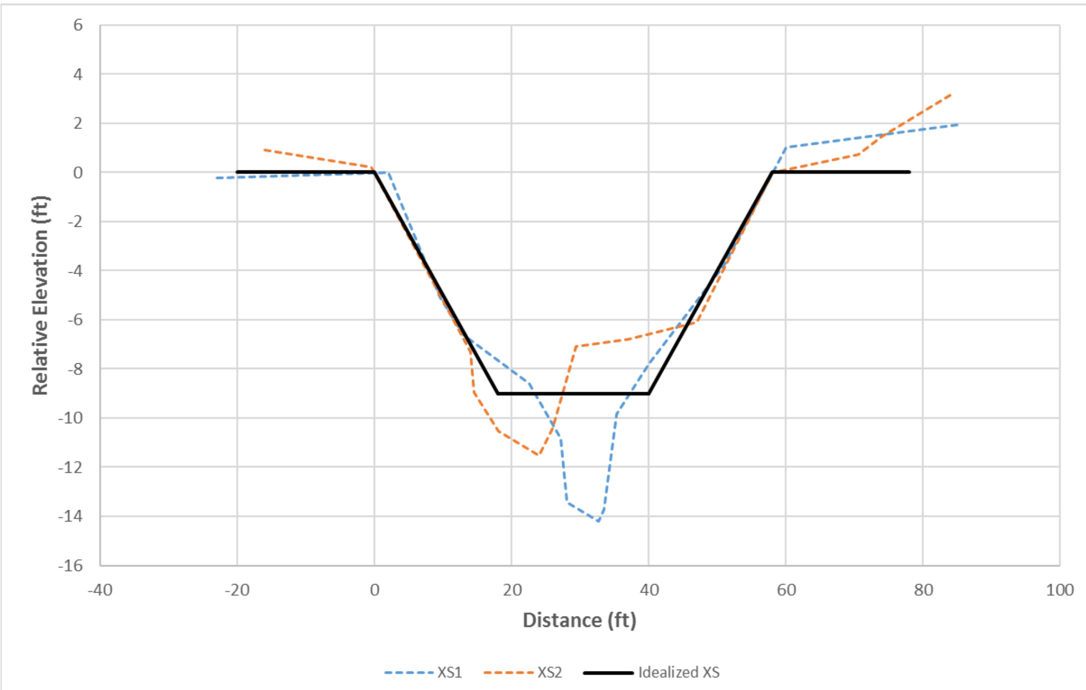

Figure 5-3: Idealized trapezoidal channel cross section for the maintained reach of Fagan Creek, overlaid on cross sections XS1 and XS2, shown looking downstream.

Table 5-3: Channel Dimension Objectives for the maintained reach of Fagan Creek.

Dimension	Objective
Left Bank Slope (H:1V)	2
Right Bank Slope (H:1V)	2
Minimum Average Depth (ft)	9
Minimum Cross Sectional Area (ft^2)	360

5.4 Channel Capacity Objective and Stage-Discharge Relationships

Based on the results of this channel assessment, all elements of the maintenance reach of Fagan Creek, with the exception of the runway culvert, will convey the Q100 under RCD's best estimate of normal roughness conditions. Therefore, the channel capacity objective for the reach should be set at the Q100 of 1,470 cfs.

Analysis reveals that the runway culvert will convey 926 cfs at the top of the culvert inlet, and will be overtopped at 1,100 cfs, and flooding can be expected to occur during storms that cause larger flows. RCD's analysis of the runway culvert assumes inlet control and does not include effects of the backwatering from downstream beaver activity. More rigorous analysis of this culvert should be completed to calculate precise capacities.

The analysis also generated stage-discharge ratings for the concrete weir that is providing grade control and also controlling the tailwater elevation for the Airport Road bridge (Figure 5-4). This rating assumes that all sediment and vegetation are cleared from the weir.

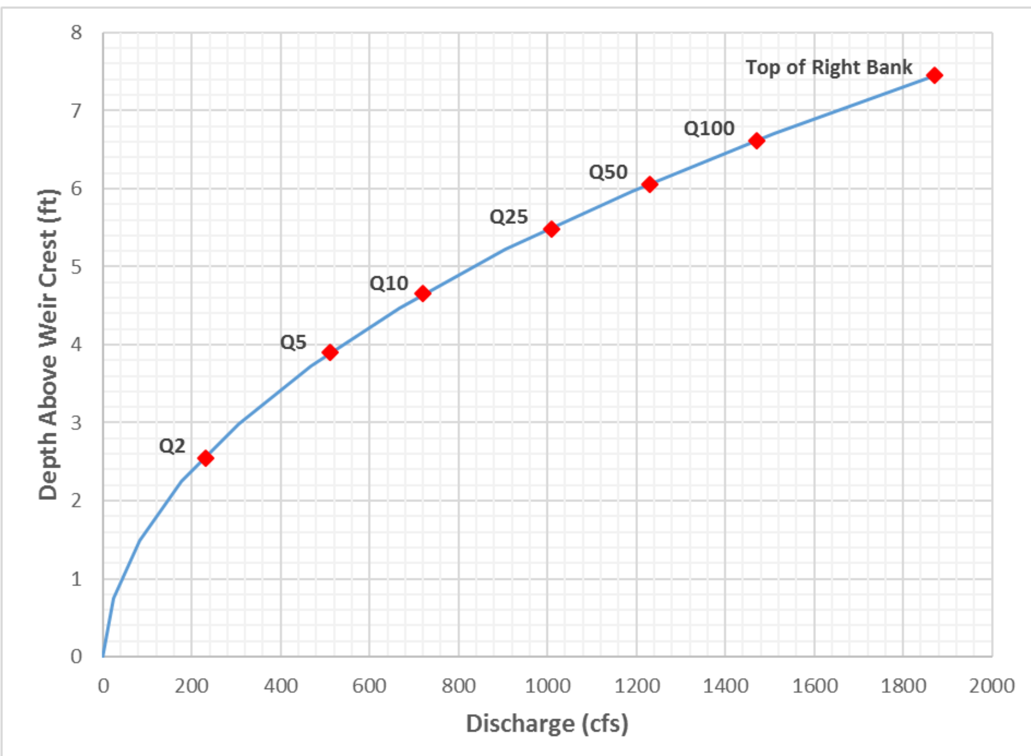

Figure 5-4: Stage-discharge rating for Fagan Creek concrete weir, obtained from Hydraulic Toolbox analysis. The red points show the water depth at the estimated recurrence interval peak flows.

5.5 Fagan Creek Channel Assessment Summary

The maintained reach of Fagan Creek has sufficient capacity to convey the Q100 (100-year peak flood event), with the exception of the runway culvert, and should therefore be maintained to convey this flow. In order to do this, the current channel slope of 0.003 and the current bank slopes of 2H:1V should be preserved. An average minimum depth of 9 feet and minimum cross sectional area of 360 ft^2 should be maintained. The current Manning's roughness of 0.05 should be maintained as well. Analyses indicate that flooding of the channel may occur during the Q100 if roughness exceeds 0.063.

This preliminary assessment indicates that the runway culvert may overtop and flood during the largest storm events. More rigorous analysis of this culvert should be performed to answer further questions about the runway culvert. Currently, the culvert is backwatered by downstream beaver activity, which may further decrease culvert capacity if it persists in the storm season.

6.0 Sheehy Creek Channel Assessment

Sheehy Creek is a tributary of the Napa River that drains a 4.24 square mile watershed and empties into the Napa River Marshes. Land use in the upper watershed is mostly grassland, wastewater spray fields, vineyards, and a wastewater treatment plant. The lower watershed is largely developed with industrial park, wastewater spray fields, and vacant industrial parcels. The maintained reach of Sheehy Creek is located in the approximate center of the watershed. The reach begins at a culvert beneath North Kelly Road and continues for approximately 2,000 feet where it enters a culvert and runs beneath Highway 29 (Figure 6-1). The tops of both streambanks are closely lined with industrial developments. The channel is vegetated with a single row of widely-spaced mature trees along the tops-of-bank providing some overstory. RCD is not aware of previous hydraulic analyses or discharge monitoring efforts for Sheehy Creek.

Figure 6-1: Map of maintained reach of Sheehy Creek.

6.1 Peak Flow Estimates

The Sheehy Creek watershed is an ungaged basin and therefore the Q100 is not known. To estimate the Q100, RCD analyzed the Sheehy Creek watershed using NSS. The drainage area of 2.39 square miles at the downstream end of the maintained reach of the creek was measured using the Napa County GIS watershed layer. The mean annual precipitation of 24.3 inches was obtained for the approximate centroid of the watershed from the Prism Climate Group's 30-Year Normals (1981-2010) dataset. The NSS peak flow estimates for Sheehy Creek are listed in Table 6-1. The Q100 estimate for Sheehy Creek at the Hwy 29 culvert is 608 cfs.

Table 6-1. Peak streamflow estimates for the maintained reach of Sheehy Creek.

Annual Exceedance Probability	Recurrence Interval (yrs)	Discharge Estimate (cfs)
0.5	2	92.2
0.2	5	206
0.1	10	294
0.04	25	413
0.02	50	508
0.01	100	608

6.2 Channel Assessment

Prior to a field visit, RCD completed a GIS analysis to measure drainage area, reach lengths, culvert and structure lengths, and channel slope. RCD also examined historical aerial photos to identify potential significant changes to the channel.

RCD visited the maintained reach of Sheehy Creek in May 2016 and surveyed two channel cross sections (XS3 and XS4) at locations carefully selected to represent each respective subreach. The cross sections are shown in Figure 9. Surveying was performed with a theodolite and stadia rod relative to NGVD29 (Napa County benchmark 923-C). Lateral distance was measured with a tape. RCD surveyed the configurations of stream crossings and other structures in the reach,including the Kelly Road and Hwy 29 culverts. RCD also performed a visual assessment of the bed and banks and collected data for an assessment of roughness conditions in the channel.

Neither erosion or deposition of sediment was apparent in the channel. The stream banks appeared to be stable and in good condition.

The Kelly Road culvert is an old arch bridge that has been extended in both directions with box culverts. The Hwy 29 culvert is an 8-foot by 8-foot box culvert that is currently backwatered by presumed downstream beaver activity. This can be expected to affect culvert capacity to an unknown degree if these conditions persist during the storm flow season.

As part of the roughness assessment, RCD noted firm soil substrate, low irregularity, gradual variation in cross section, negligible obstructions, low degree of meandering, and large amounts of vegetation. Figures 6-1 and 6-2 depict roughness conditions in the reach.

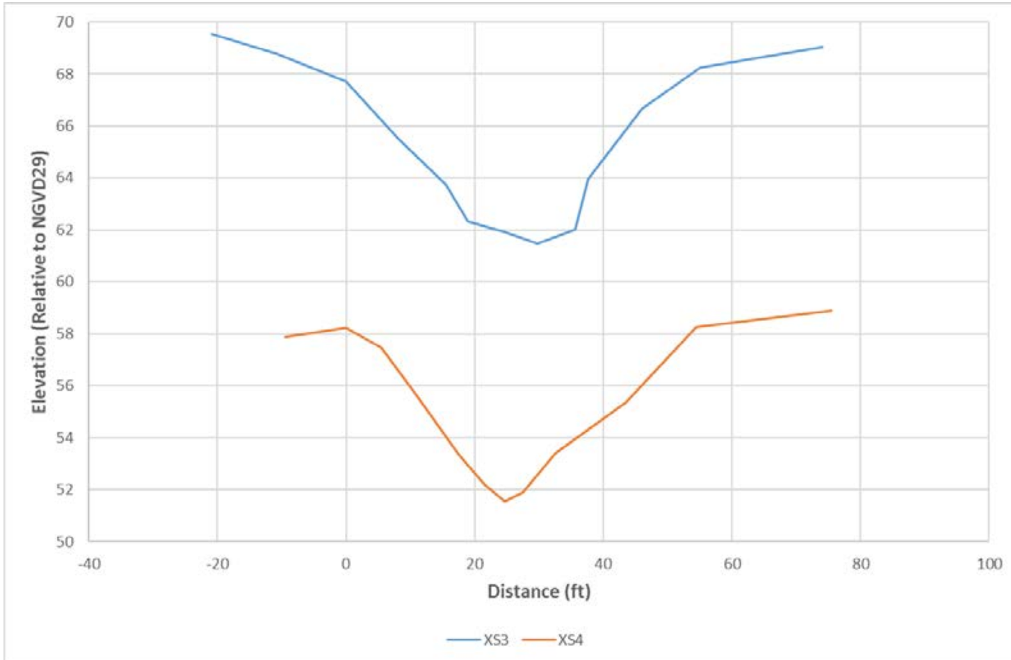

Figure 6-2: Sheehy Creek channel cross sections XS3 and XS4, shown looking downstream.

Photo 6-1: The maintained reach of Sheehy Creek looking downstream from the Kelly Road culvert, showing channel roughness.

Photo 6-2: The maintained reach of Sheehy Creek looking upstream from the Hwy 29 culvert, showing channel roughness.

Data collected in the field were used to compute channel dimensions and channel and structure capacities. The Kelly Road culvert was modeled both as an arch and a box culvert to determine which section limits the capacity. Analysis of the Hwy 29 culvert assumes inlet control and no backwatering from beaver activity, which may or may not be the condition during the storm season. The results of channel and structure analyses are summarized in Table 6-2.

Table 6-2. Results of Sheehy Creek stream channel assessment. Culvert capacities are shown for headwater elevation at the top of the inlet. The overtopping capacities are included in parentheses.

Parameter	Result
Channel Slope (ft/ft)	0.01
Left Bank Slope (H:1V)	3
Right Bank Slope (H:1V)	3
Channel Depth (ft)	6.5
Cross Sectional Area (ft2)	180
Manning's Roughness Estimate	0.07
Channel Capacities (cfs)	
XS3	835
XS4	840
Kelly Rd Culvert	273 (Overtopping 533)
Hwy 29 Culvert	471 (Overtopping 831)

6.3 Channel Dimension Objectives

The channel assessment did not identify significant areas of erosion or deposition of the bed or banks of the maintained reach of Sheehy Creek, and the channel appeared to be well-vegetated and stable. This indicates that the channel was well-designed and is in a quasi-equilibrium condition. Therefore, the current dimensions of the channel should be maintained. To determine objectives for channel dimensions, RCD used the approximate bank slopes from cross sections XS3 and XS4 and computed the required width and depth of an idealized trapezoidal channel that would convey the Q100 under current roughness conditions and channel slope (Figure 6-3). The dimensions of this idealized channel cross section were used to set the quasi-equilibrium channel dimension objectives (Table 6-3).

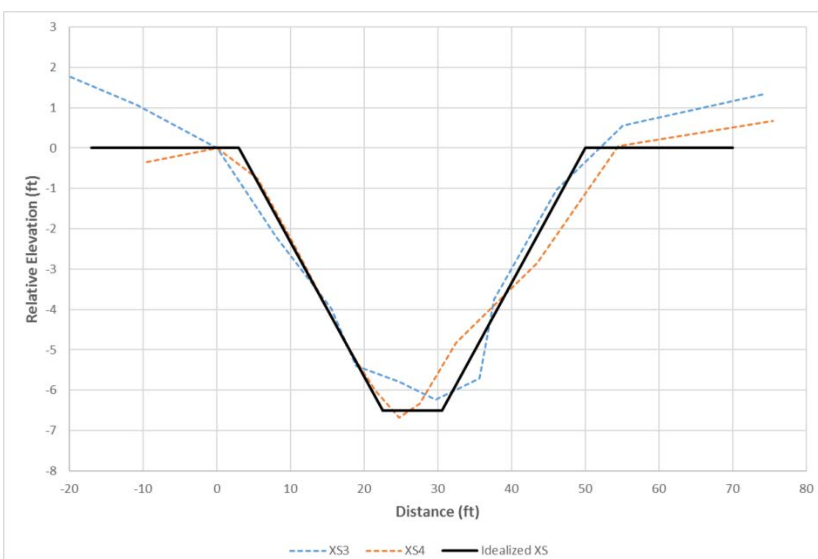

Figure 6-3: Idealized trapezoidal channel cross section for the maintained reach of Sheehy Creek, overlaid on cross sections XS3 and XS4, shown looking downstream.

Table 6-3. Channel Dimension Objectives for the maintained reach of Sheehy Creek.

Dimension	Objective
Left Bank Slope (H:1V)	3
Right Bank Slope (H:1V)	3
Approximate Depth (ft)	6.5
Minimum Cross Sectional Area (ft^2)	178

6.4 Channel Capacity Objective and Stage-Discharge Relationships

Based on the results of this channel assessment, all elements of the maintained reach of Sheehy Creek, with the exception of the Kelly Road culvert, will convey the Q100 under RCD's best estimate of normal roughness conditions. Therefore, the channel capacity objective for the reach should be set at the Q100 of 608 cfs.

Analysis reveals that the Kelly Road culvert will convey 273 cfs at the top of the culvert inlet, and will be overtopped at 533 cfs, and flooding can be expected to occur during storms that cause larger flows. Headwater elevation at the Hwy 29 culvert can be expected to exceed the top of the inlet during the Q100, but remain below the roadway. Backwater from such a flow may cause upstream flooding in the vicinity of the culvert. RCD's analysis of the Hwy 29 culvert assumes inlet control and does not include effects of the backwatering from downstream beaver activity. More rigorous analysis of this culvert should be completed to calculate precise capacities.

The analysis also generated a stage-discharge rating for the inlet of the Hwy 29 culvert (Figure 6-4). This rating assumes inlet control at all stages and no backwatering.

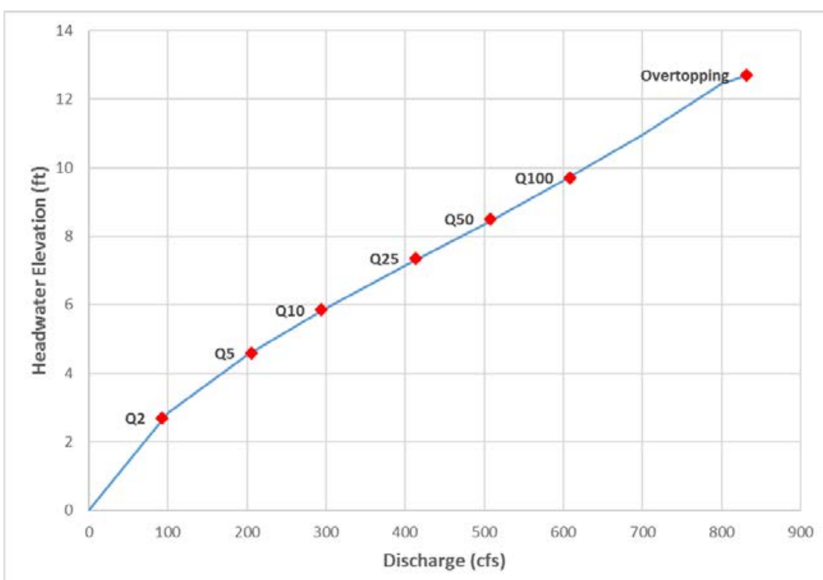

Figure 6-4: Stage-discharge rating for inlet of Sheehy Creek Hwy 29 culvert, obtained from HY-8 analysis. The red points show the water depth at the estimated recurrence interval peak flows.

6.5 Sheehy Creek Channel Assessment Summary

The maintained reach of Sheehy Creek has sufficient capacity to convey the Q100 (100-year peak flood event), with the exception of the Kelly Road culvert, and should therefore be maintained to convey this flow. In order to do this, the current channel slope of 0.01 and the current bank slopes of 3H:1V should be preserved. An approximate depth of 6.5 feet and minimum cross sectional area of 178 ft^2 should be maintained. The current Manning's roughness of 0.07 should be maintained as well. Analyses indicate that flooding of the channel may occur during the Q100 if roughness exceeds 0.09.

This preliminary assessment indicates that the Kelly Road culvert may overtop and flood during the largest storm events. In addition, the Hwy 29 culvert is currently backwatered due to presumed downstream beaver activity. This condition may decrease capacity should it persist into the storm season.

Appendix G

Aquatic Pesticide Application Plan

April 4, 2014

NPDES Wastewater Unit
State Water Resources Control Board
1001 I Street, 15th Floor
Sacramento, CA 95814

Subject: Notice of Intent for coverage under Order 2013-0002-DWQ for the Napa County Flood Control and Water Conservation District

To whom it may concern,

The Napa County Flood Control and Water Conservation District (District) is applying for coverage under the Statewide General National Pollutant Discharge Elimination System (NPDES) Permit for Residual Aquatic Pesticide Discharges to Waters of the United States from Algae and Aquatic Weed Control Applications, Water Quality Order 2013-0002-DWQ. The District is a new discharger under this Order.

Enclosed are the following items, as required for coverage:

- A Notice of Intent (NOI) completed according Attachment E of Order 2013-0002-DWQ;
- An application fee of $2062.00; and
- An Aquatic Pesticide Application Plan (APAP).

As described in the APAP, the District's weed control activities are conducted throughout Napa County, including the Napa River and Suisun Creek watersheds within jurisdiction of the San Francisco Bay Regional Water Quality Control Board (RWQCB) (Region 2) and the Putah Creek/Lake Berryessa watershed within the jurisdiction of the Central Valley RWQCB (Region 5).

Please contact me if the state requires additional information to approve coverage under the NPDES General Permit.

Sincerely,

Richard Thomasser, P.G.
Operations Manager

Attachment E – Notice of Intent

WATER QUALITY ORDER NO. 2013-0002-DWQ
GENERAL PERMIT NO. CAG990005

STATEWIDE GENERAL NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM (NPDES) PERMIT FOR RESIDUAL AQUATIC PESTICIDE DISCHARGES TO WATERS OF THE UNITED STATES FROM ALGAE AND AQUATIC WEED CONTROL APPLICATIONS

I. NOTICE OF INTENT STATUS (see Instructions)

Mark only one item A. X New Applicator B. Change of Information: WDID# ____________

C. ☐ Change of ownership or responsibility: WDID# ____________

II. DISCHARGER INFORMATION

A. Name Napa County Flood Control and Water Conservation District			
B. Mailing Address 804 First Street			
C. City Napa	D. County Napa	E. State CA	F. Zip 94559
G. Contact Person Rick Thomasser	H. E-mail address richard.thomasser@countyofnapa.org	I. Title Watershed and Flood Control Operations Manager	J. Phone 707-259-8657

III. BILLING ADDRESS (Enter Information *only* if different from Section II above)

A. Name			
B. Mailing Address			
C. City	D. County	E. State	F. Zip
G. E-mail address	H. Title	I. Phone	

IV. RECEIVING WATER INFORMATION

A. Algaecide and aquatic herbicides are used to treat (check all that apply):

1. ☒ Canals, ditches, or other constructed conveyance facilities owned and controlled by Discharger.
   Name of the conveyance system: various in the Napa River watershed, Putah Creek and Lake Berryessa watershed and Suisun Creek watershed
2. ☐ Canals, ditches, or other constructed conveyance facilities owned and controlled by an entity other than the Discharger.
   Owner's name: ______
   Name of the conveyance system: ______
3. Directly to river, lake, creek, stream, bay, ocean, etc.
   Name of water body: Napa River watershed, Putah Creek and Lake Berryessa watershed, Suisun Creek watershed

B. Regional Water Quality Control Board(s) where treatment areas are located (REGION 1, 2, 3, 4, 5, 6, 7, 8, or 9): Region 2 and 5
(List all regions where algaecide and aquatic herbicide application is proposed.)

V. ALGAECIDE AND AQUATIC HERBICIDE APPLICATION INFORMATION

A. Target Organisms: ____

Arundo donax, tamarisk (tamarix spp.), Scarlet Sesbania (Sesbania punicea), Perennial Pepperweed (Lepidium latifolium), Himalayan blackberry (Rubus armeniacus [syn. Rubus discolor]) and water primrose (Ludwigia)

B. Algaecide and Aquatic Herbicide Used: List Name and Active ingredients

glyphosate (trade name: Rodeo Aquamaster®) and imazapyr (trade names: Habitat®, Polaris®)

C. Period of Application: Start Date June 15, for the life of the permit End Date Nov 15, with exceptions noted in GEN-1, for the life of the perimt

D. Types of Adjuvants Used:
. Glyphosate requires use of a non-ionic surfactant, such as R-11™, LI-700™, Cygnet Plus™and Liberate™. Imazapyr requires use of an oil-based surfactant, such as Hasten™, Agri-Dex™, and Competitor™.

VI. AQUATIC PESTICIDE APPLICATION PLAN

Has an Aquatic Pesticide Application Plan been prepared and is the applicator familiar with its contents?
☒ Yes ☐ No

If not, when will it be prepared? ______

VII. NOTIFICATION

Have potentially affected public and governmental agencies been notified? ☐ Yes ☒ No

VIII. FEE

Have you included payment of the filing fee (for first-time enrollees only) with this submittal?
☒ YES ☐ NO ☐ NA

IX. CERTIFICATION

"I certify under penalty of law that this document and all attachments were prepared under my direction and supervision in accordance with a system designed to ensure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine or imprisonment. Additionally, I certify that the provisions of the General Permit, including developing and implementing a monitoring program, will be complied with."

A. Printed Name: Richard Thomasser

B. Signature: [signature] **Date:** 4/2/14

C. Title: Operations Manager.

XI. FOR STATE WATER BOARD STAFF USE ONLY

WDID:	**Date NOI Received:**	**Date NOI Processed:**
Case Handler's Initial:	**Fee Amount Received:** **$**	**Check #:**
☐ **Lyris List Notification of Posting of APAP**	**Date** ______________	**Confirmation Sent** _______

Napa County
Flood Control and Water Conservation District

Aquatic Pesticide Application Plan (APAP)
for the
Statewide General National Pollutant Discharge Elimination System (NPDES) Permit for Residual Aquatic Pesticide Discharges to Waters of the United States from Algae and Aquatic Weed Control Applications
Water Quality Order No. 2013-0002-DWQ
General Permit No. CAG990005

Prepared for:

Napa County Flood Control and Water Conservation District
804 First Street
Napa, CA 94559

Prepared by:

Horizon Water and Environment
180 Grand Avenue, Suite 1405
Oakland, CA 94612

Horizon Water and Environment. Napa County Flood Control and Water Conservation District Aquatic Pesticide Application Plan. March 2014. (HWE 10.004) Oakland, CA.

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List of Acronyms

asl	above sea level
BDR	Napa County Baseline Data Report
BMP	Best Management Practice
CDPR	California Department of Pesticide Regulation
COC	chain-of-custody
District	Napa Valley Flood Control and Water Conservation District
DNQ	detected, but not quantified
FDCF	field data collection form
FIFR	Federal Insecticide, Fungicide and Rodenticide Act
Flood Control Project	Napa River Flood Control Project
GIS	geographic information systems
GPS	global positioning system
MDL	minimum detection limit
ML	minimum level
ND	not detected
OHWM	ordinary high water mark
QAC	qualified application certificate
QAL	qualified application license
QAP	quality assurance plan
SWOA	South Wetland Opportunities Area
USEPA	United States Environmental Protection Agency
WIMS	weed information mapping system

1. Introduction

The Napa County Flood Control and Water Conservation District (District) is a special district of the County of Napa. Within its authority, the District provides maintenance for the flood control channels that it owns, as well as other channels for which the District has a maintenance agreement or easement. The District also provides discretionary maintenance in channels throughout the county, and responds to public requests for maintenance activities at other stream and channel locations (on an as-needed basis).

Vegetation management activities are conducted to maintain flow conveyance capacity, establish a canopy of riparian trees, and control invasive vegetation. Use of herbicides to control terrestrial and aquatic vegetation is relatively consistent from year to year, though locations change depending on recent growth and blockages. Herbicides may be applied on the banks of channels (above the Ordinary High Water Mark [OHWM]) and may include targeted spraying (such as to treat *Arundo donax*) and direct application (using a brush on stumps of trees that have been recently cut). Herbicides are also directly applied to submerged aquatic vegetation (below the OHWM) to maintain channel flow conveyance capacity. The District uses glyphosate and imazapyr for both terrestrial and aquatic herbicide applications.

This Aquatic Pesticide Application Plan (APAP) was developed in compliance with the *General NPDES Permit for Discharge of Aquatic Pesticides for Aquatic Weed Control (*Order No. 2013-0002-DWQ; NPDES No. CAG990005) (General Permit) that went into effect on December 1, 2013. This APAP covers application of aquatic herbicides throughout the entire Napa County. This includes the Napa River and Suisun Creek watersheds within Napa County which are under the jurisdiction of the San Francisco Bay Regional Water Quality Control Board. Additionally, this APAP covers aquatic pesticide application in the Putah Creek/Lake Berryessa watershed within Napa County that is under the jurisdiction of the Central Valley Regional Water Quality Control Board.

The following sections of this plan describe aquatic pesticide application activities conducted by the District:

Section 2	Goals and Objectives
Section 3	Application Area
Section 4	Site Treatment Area
Section 5	Vegetation Management
Section 6	Aquatic Herbicides Applied
Section 7	Herbicide Use Alternatives
Section 8	Best Management Practices
Section 9	Monitoring Program
Section 10	Annual Reporting

2. Goals and Objectives

Habitat Management Goals

The District's long-term habitat restoration goals include enhancement of the Napa River and its major tributaries, and the creation and restoration of brackish emergent marsh (tidal), seasonal and emergent freshwater wetlands, tidal mudflats, riparian and native woodlands. The broader goal is to establish an ecologically self-sustaining mosaic of habitats. The District's stream management goals include ensuring that adequate flood conveyance capacity is provided, maintaining stable stream bank conditions, and enhancing instream ecological conditions.

The District's vegetation management and invasive species plant management efforts support countywide restoration goals by:

1. Preserving and restoring upland, wetland, tidal, and woodland habitats throughout the County by identifying, mapping, and eradicating invasive plant species;
2. Avoid disturbing native habitat and plants areas and enhancing those areas through planting of appropriate native species.

Management Philosophy and Prioritization: An Adaptive Management Strategy

Certain non-native invasive plant species may be tenacious and harmful, while others may restrict themselves to recently disturbed locations and be less invasive or harmful. Attempting to control all non-native invasive species present can be overwhelming and ultimately unsuccessful. Therefore, the District developed a strategy to ensure the efficient use of resources. The strategy is built upon the following principles:

1. Manage for the eradication and control of target non-native invasive species and maintain native habitat communities.
2. Assess species occurrences and assign treatment priorities based on the severity of the non-native species impacts to native habitat and rate of infestation. To accomplish this, non-native species are mapped using a global positioning system (GPS) and the Weed Information Mapping System (WIMS). The WIMS is a series of forms that allow the District to capture pertinent information about weed occurrences. District staff utilizes the WIMS system to identify and map non-native species in the field. WIMS data is then entered into a geographic information system (GIS) and queried to examine patterns and distributions on non-native species and develop treatment prioritization criteria.
3. Develop and consider appropriate methods for controlling non-native invasive species. Then, document these considerations in species specific control plans.
4. After the species specific control plan is implemented, results will be monitored to evaluate control method effectiveness. This information can be used to modify and improve priorities, control methods and plans, and prepare annual monitoring and treatment reports.
5. Repeat the planning, monitoring, and treatment cycle by re-establishing those methods that proved effective and modify control and management goals as necessary.

   In summary, the District has adopted an adaptive management strategy. An adaptive strategy is one that uses the lessons from previous seasons of work to mold future efforts.

3. Application Area

The Application Area is located in Napa County, California as shown in Figure 1 and described below by drainage area. The descriptions below are from the Napa County Baseline Data Report prepared in 2005 (Napa County 2005[1]).

Figure 1: Napa River Watershed and Napa County
(Source: Napa County 2007)

Napa River Watershed

The Napa River drains an area of approximately 426 square miles and drains into San Pablo Bay, descending from an elevation of 4,344 feet (1,323 meters) in the Maycamas Mountains to sea level (Figure 1). Historically, the lower reaches of the Napa River supported a diverse number of habitats including tidal marshes, freshwater marsh wetlands, oak woodland, riparian forests, and grasslands that provided habitat for a myriad of plant and animal species. Today most of these habitats still exist but have decreased in area and quality and continue to be threatened and degraded by habitat loss, urban development, agricultural practices, and invasive species colonization.

Putah Creek/Lake Berryessa Watershed

East of the Napa River watershed is the Putah Creek watershed, which contains Lake Berryessa. This region consists of several small valleys, including the Pope and Capell Valleys, surrounded by topography that is generally mountainous and steep. Elevations in the Lake Berryessa watershed are generally higher than in the Napa Valley. To the east of the Napa Valley, hills rise to an elevation of approximately 1,500 to 2,000 feet asl, forming a divide between the Napa Valley and the adjacent Putah Creek watersheds.

Putah Creek is the largest river in the Lake Berryessa basin. It originates in Lake County to the north, flows into Napa County and into Lake Berryessa, and flows out of the County at Lake Berryessa's outlet (Monticello Dam) along the eastern border where it eventually flows into the Sacramento River. Other notable tributaries in the drainage include Pope Creek, Chiles Creek, Capell Creek, and Eticuera Creek.

Lake Berryessa is the largest body of surface water in Napa County, with a storage capacity of 1.6 million acre-feet. The primary uses of the lake are as a water supply for the irrigation of agricultural lands and municipal and industrial users, power generation, and recreation. The District does not conduct vegetation management activities in Lake Berryessa.

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[1] Napa County. 2005. Napa County Baseline Data Report, Version 1. Prepared by Jones & Stokes/EDAW. November. Oakland, CA.
Napa County. 2007. Draft Environmental Impact Report for the Napa County General Plan. SCH # 200510288. Prepared by PMC. February. Sacramento, CA.

Suisun Creek Watershed

The Suisun Creek watershed lies to the south of Lake Berryessa and the Putah Creek watershed. Only the upper portions of the Suisun Creek watershed are located within Napa County; the flows to the south and into Solano County before discharging to Suisun Bay.

Lake Curry is a human-made reservoir created by the damming of Suisun Creek. It supplies water for municipal and industrial use in the City of Vallejo. The District does not conduct vegetation management activities in Lake Curry.

4. Site Treatment Areas

4.1 Napa River Restoration Projects

The District surveys and maps target non-native invasive species within the Napa River and its tributaries from Calistoga downstream to American Canyon. The purpose of the surveying and mapping is to support the eradication and management of target species and other ongoing river restoration projects. The District is responsible for the long-term maintenance of 15 miles of River Restoration on the Napa River from Rutherford Cross Rd. to Oak Knoll Avenue. The District recognizes that in order to effectively control target invasive species throughout the restoration reach it is necessary to manage and monitor invasive species in their source areas in the upper watershed.

The riparian corridor along the Napa River is generally narrow and fragmented with some interspersed late seral stage riparian forest. Through the restoration reaches there are some newly restored flood plain benches, alcoves and expanded riparian areas. Target species are treated in this reach from the top of the stream bank down to and below the OHWM, depending on the species and level of infestation. A typical treatment scenario includes a target species growing along the toe of the stream and overhanging the water. Herbicide is applied directly to the target species with a spray wand during the summer when flows are at the lowest level. When feasible the District cuts and removes the invasive vegetation prior to applying herbicide.

Herbicide treatments may occur along natural streams from the edge of the stream channel to the top of bank within the riparian zone. In the lower reaches of the Napa River herbicide treatments may occur in the intertidal zone. In an engineered flood control channel herbicide potentially could be applied to the surface of the water to treat *Ludwigia*. Herbicide treatment potentially could occur in a pond adjacent to a stream in an effort ot minimize the spread of a particular species.

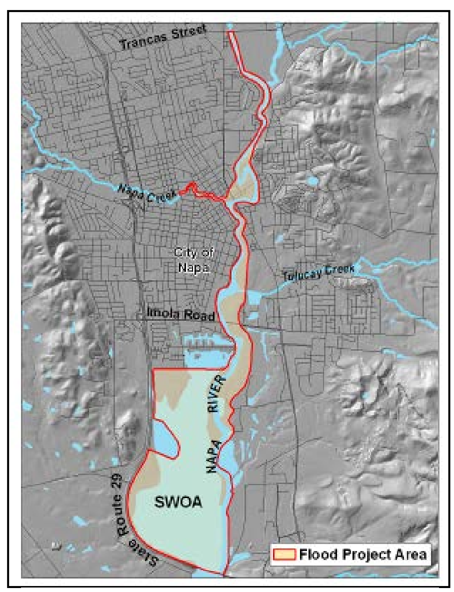

Figure 2: Napa River South Wetland Opportunity Area

4.2 Napa River Flood Project

The Napa River Flood Control Project (Flood Control Project), implemented by the U.S. Army Corps of Engineers and the District, was designed to provide protection from a 100-year flood event and enhance, restore, and create wildlife and wetland habitat within the flood plain of the Napa River. The Flood Control Project Area covers a 6.9-mile reach of the Napa River from Trancas Street in the City of Napa to State Route 29 (upstream to downstream, respectively), including an area solely for the purposes of habitat restoration known as the South Wetland Opportunity Area (SWOA), and encompasses over 1400 acres of land (Figure 2). The SWOA consists of intertidal marshes and sloughs, open mudflats, seasonal wetlands, and alluvial flood plains. A typical treatment area would be within the higher zones of the intertidal marsh. Target species are mapped within this zone and maintenance actions are prioritized based on the severity of the infestation.

4.3 Engineered/Modified Flood Control Channels

The District is responsible for providing routine maintenance along 13 miles of engineered and modified flood control channels. Examples of this channel type include the Yountville and Salvador Collector channels, which collect drainage from upstream smaller tributaries. Most of the channels the District maintains are constructed with a trapezoidal cross section with earthen banks and streambeds. However, some channels have sections with hardened banks and beds formed in rock or concrete. Invasive species management within these channels is implemented to maintain the hydraulic capacity of the flood control channel and to minimize flow obstructions. Target species and problematic reaches are mapped and prioritized based on the level of infestation. A typical treatment area in the flood control channels may be on or near the edge of the water depending on the target species and level of infestation. The purpose of invasive species management in these reaches is to maintain adequate flow conveyance while creating a diverse and complex native riparian canopy.

4.4 Natural Channels

The District targets non-native invasive species along water ways throughout Napa County. The District maps invasive plant species during annual stream surveys and develops management priorities based on the level of infestation. Channel conditions vary depending on the stream and reach but most are tributaries to the Napa River, which flow through agricultural and urban areas. Some of the natural channels are deeply incised with undercut and eroding stream banks. While other streams have mature riparian forests and well established bed forms. A typical treatment area in a natural channel would be from the toe of the stream to the top of bank.

4.5 Ponds

The District does not commonly conduct invasive management in ponds. However, there are many irrigation ponds near the mainstem of the Napa River and along tributaries where invasive plants species do grow. At times it is necessary for the District to work with private property owners to manage non-native invasive plants within irrigation ponds to minimize potential dispersal into natural waterways.

5. Vegetation Management

The primary invasive exotic weeds managed in the program area are *Arundo donax*, tamarisk (*tamarix spp.*), Scarlet Sesbania (*Sesbania punicea*), Perennial Pepperweed (*Lepidium latifolium*), and Himalayan blackberry (*Rubus armeniacus* [syn. *Rubus discolor*]). These species rapidly invade stream channels, often growing aggressively to the exclusion of other riparian species. The rapid and voluminous growth of these invasive plants can significantly reduce channel capacity. The management of other invasive aquatic plants including water primrose (*Ludwigia*) is also conducted by the District in a limited number of creeks such as Salvador Creek and the Yountville Collectors. Managing invasive vegetation is a continuous, routine, and on-going activity of the District's stream maintenance program.

5.1 Herbicide Application for Invasive Species Control

Herbicides can be toxic to people and wildlife if not handled properly. However, the safe use of herbicides is a critical method for vegetation management, especially to control invasive and exotic plants. All herbicide applications conducted by the District occur in accordance with federal, state, and local regulations. The District applies herbicides to control invasive and exotic plants in upland areas (vegetation growing along and on top of stream banks) and within water bodies.

Targeted spot spraying and hand painting of cut stumps are the primary methods of herbicide application. Foliar spraying may be conducted to control growth on larger plants such as exotic trees or large stands of pampas grass. Herbicide application is conducted when the climate is dry (between June 15 and November 15), wind is not above 5-10 mph, and no rain is forecast for the next 24 hours. The maximum average herbicide use is 5 to 8 gallons monthly. The average total area where herbicide is applied is approximately 3 to 5 acres annually. Typical herbicides used for control of invasive and exotic plants are glyphosate (trade name: Rodeo Aquamaster®) and imazapyr (trade names: Habitat®, Polaris®). Herbicides are used on a site by site basis and only when necessary, such as when hand and mechanical methods are unsuccessful. Further detail on the District's application methods are provided below.

5.2 Invasive Species Profiles

In the paragraphs below summary species profiles for the primarily invasive and exotic plants managed by the District are presented along with stream management considerations and approaches. Other invasive species, such as yellow star thistle, are also managed by the District. Management approaches for control of other species are the same as those described below.

Arundo donax removal by California Conservation Corps team

Giant reed *(Arundo donax)*
Priority: High (from top of bank to toe of stream channel). Arundo is a bamboo-like plant targeted by the District as a priority weed. This species reproduces vegetatively and does not produce viable seed. When established within stream channels, Arundo can quickly reduce channel capacity, increase hydraulic roughness, and increase the flood risk. The plant's shallow roots encourage mobility in high flow events. Dislodged Arundo pieces move downstream, often plugging culverts or creating debris blockages at bridge crossings. Upon settling, Arundo will

rapidly colonize at its new downstream location. In this manner, entire streams systems have been invaded in a relatively short time period. The dense lower stalks and root masses of Arundo are also effective at trapping fine sediment, whereby a positive feedback process occurs. Arundo settles, traps fine sediment, the channel bed elevates, more Arundo colonizes, more sediment is trapped, etc. Arundo favors stream beds and banks in full sun conditions. Developing a native riparian canopy that can shade the channel is an effective long-term strategy to reduce Arundo presence.

The District's approach to managing Arundo is to target removal activities by sub-watershed, beginning in upstream areas and eradicating Arundo colonies progressively downstream through each sub-watershed. Arundo is eradicated by either spraying the entire standing plant with herbicide or mechanically cutting the stalks and painting each stalk-stump by hand with herbicide. The District's standard Arundo herbicide mix includes glyphosate, a non-ionic surfactant, and ammonium sulfate. The herbicide mix is applied in the fall from September through early November. Dead canes are removed for fire safety in the fall (September or later) following herbicide application. Any bare soil remaining after cane removal is revegetated with native plants or seeds, such as the native species listed in Appendix A.

Perennial Pepperweed *(Lepidium latifolium)*
Priority: High (in wetland and brackish marsh areas). Perennial Pepperweed is scattered throughout seasonal wetland and wrack lines of brackish march areas within the Project Area and may interfere with primary habitat management and restoration goals. Plants are multiple stemmed and grow stiffly erect masses up to 5ft in height. The leaves are lanceolate, bright green to gray green, and entire or toothed. Basal leaves are stalked, up to 1 ft. long and 3 in. wide and have serrate margins. Flowing occurs from early summer to fall.

In general, it is assumed that populations are established and spreading, and complete eradicate is impossible. However, it is possible to control its spread with annual herbicide treatment, re-vegetation, and monitoring.

Water primrose (*Ludwigia peploides montevidensis*)
Priority: Moderate (on surface of water). *Ludwigia* is an invasive, exotic, aquatic weed found in apparently increasing occurrence on the west coast as well as nationally. The species occurs in tributaries to the Napa River, including Salvador Creek. Generally, winter streamflow rises above the *Ludwigia* patches or flushes the plants downstream. In most cases, *Ludwigia* patches are not problematic in conveying flood flows. However, accumulated *Ludwigia* is known to collect at downstream bridge piers where it can quickly grow, completely fill channels (as shown in the photo), and create flow blockages. *Ludwigia* also provides some beneficial functions similar to the native species (*Ludwigia peploides peploides*) including, bank toe stabilization, nutrient exchange and uptake, and cover for young fish and amphibians. While these functions may not be enough to support presence of *Ludwigia* in District flood control channels, it does provide sound reasoning for leaving it in a channel if there is no other emergent cover, or where the degree of *Ludwigia* present does not create a flow blockage.


Ludwigia in Yountville Outfall

Mechanical removal is the primary method to control *Ludwigia* and is generally conducted using a long-reach excavator from maintenance roads adjacent to the project site channel. Where the channel is too wide, the excavator may occasionally travel partially down the bank in areas that will not impact existing native and riparian vegetation. The excavator will work from the mid-bank position, thus reducing the need for multiple trips along the bank slope by smaller equipment. The District anticipates the need to periodically manage *Ludwigia* between June 15th and October 31st.

Debris generated from invasive plant management activities are either left on site to decay and redistribute nutrients into the soil or, if plant and root clippings remain viable for regrowth, the debris it taken to the local landfill for disposal.

6. Aquatic Herbicides Applied

6.1 Types of Herbicides Used

Types of herbicides expected to be used and degradation byproducts.

Glyphosate (Aquamaster®, AquaNeat®, Refuge®, and others)
Glyphosate is a foliar-applied, systemic herbicide used to control vegetation near water bodies and several immersed weeds. Glyphosate carries from the treated foliage to underground storage organs (e.g, rhizomes). Its mode of action inhibits the synthesis of certain amino acids and other secondary metabolites. To be most effective it should be applied during a perennial weed's flowering or fruiting stage. On annual species it will be most effective when applied during active plant growth. An aquatically approved non-ionic surfactant should be used with glyphosates that do not contain a surfactant. If a rain event occurs within 4 to 6 hours of application, the effectiveness of glyphosate is reduced. Therefore, as required by BMP GEN-1, herbicides will only be applied when a 40% chance or higher chance of rain is forecast 48 hours prior to or after planned applications.

Glyphosate degradation is by microbial activity in soil, and by sunlight and water to a lesser extent. Tests have shown the half-life of glyphosate in water is 35 days or more, while the half-life of glyphosate in anaerobic soil conditions is 22 days[2].

Imazapyr (Habitat®, Polaris®, and others)
Imazapyr is a foliar-applied, translocated systemic herbicide used to control many floating and emergent weed species. It may be particularly effective on plants such as cattails and giant reed. Imazapyr works in meristematic tissue (i.e., rapidly growing and dividing) by inhibiting the synthesis of certain amino acids in protein production. A spray adjuvant must be used with imazapyr. Recommended spray adjuvants include non-ionic or silicone-based surfactants or methylated seed or vegetable oils. Imazapyr is quickly absorbed by plants. The growing plant tips usually yellow and die within 1-4 weeks after treatment.

The primary form of degradation in water is photodegradation with a half-life of approximately 2-5 days. Due to its rapid photodegradation by sunlight, water contamination by imazapyr is generally not of concern to people or the environment. Imazapyr is the primary herbicide used to control invasive

[2] California Department of Pesticide Regulation. 1998. Environmental Fate of Glyphosate. Prepared by Jeff Schuette. Environmental Monitoring & Pest Management. Sacramento, CA. Available: http://www.cdpr.ca.gov/docs/emon/pubs/fatememo/glyphos.pdf. Accessed, June 12, 2013.

Spartina cordgrass throughout the San Francisco Bay Estuary.

6.2 Surfactants

Surfactants are used to reduce the surface tension of the water and increase the conveyance of the chemicals to the target plants. Glyphosate requires use of a non-ionic surfactant, such as R-11™, LI-700™, Cygnet Plus™and Liberate™. Imazapyr requires use of an oil-based surfactant, such as Hasten™, Agri-Dex™, and Competitor™. These surfactants are considered practically non-toxic (LI-700, Hasten and Agri-Dex) to moderately toxic (R-11). Acidifying agents like LI-700 and oil-based agents like Hasten and Agri-Dex exhibit lower toxicity compared to R-11, especially to aquatic species (ENTRIX 2003[3]). However, all these surfactants are approved for aquatic herbicide applications. The County strives to implement the least impactful means for aquatic plant control. Where feasible, the least toxic surfactant will be used with glyphosate and imazapyr.

6.3 Methods of Application

Cut-Stump Treatment - This technique is used when managing an infestation below the OHWM. The method involves applying a high concentration of herbicide directly to the cut face of the stump. Applications occur through the use of a small paint brush or hand sprayer with a cloth tied around the nozzle. Because there is direct access to the cambium the amount of herbicide used on each stump is low. This method ensures that there are very few adverse effects associated with herbicide contacting other plants surrounding the treatment area or coming in contact with the water surface.

Foliar Spray - This technique involves applying herbicide directly to the foliage of the plant. The application will be carried out with a backpack sprayer or a spray rig carrying several gallons of diluted herbicide. The sprayer tank is kept pressurized through the use of generator in the case of the spray rig or through hand pumping a lever on the backpack sprayer. When using this method wind conditions are always monitored and applications will cease if wind gusts exceed 5-10 mph. To ensure that sufficient uptake into the target plants occurs it is necessary to completely and thoroughly cover the leaf area. In many cases the biomass of the targeted plant will first be cut and removed and the re-growth will be treated sometime later. This method minimizes the amount of herbicide used. The foliar spray method tends to be ineffective on plants that have leaves with thick waxy cuticles.

Wicking - This technique requires a hand or backpack sprayer with a wicking wand that has a sponge attached to the end, which is used to wipe herbicide onto the leaves of a plant or on to a cut stump. The method ensures that herbicide is only applied to the target plant and minimizes overspray and dripping.

Application Made According to Label - All aquatic herbicide application are made according to the manufactures label and in accordance with regulations of the USEPA, California Environmental Protection Agency, California Department of Pesticide Regulation, California Division of Occupational Safety and Health and the local Agricultural Commissioner. Precautions on the product label to prevent fish kill or other impacts to wildlife will be followed.

[3] Entrix, Inc. 2003. Ecological Risk Assessment of the Proposed Use of the Herbicide Imazapyr to Control Invasive Cordgrass (*Spartina spp.*) in Estuarine Habitat of Washington State. Washington State Department of Agriculture. Olympia, Washington. Available: http://www.spartina.org/referencemtrl/Washington%20ERA-Imazapyr.pdf. Accessed: June 12, 2013.

6.4 Application Training

District staff are trained annually on proper herbicide handling and use. Staff are trained by a District or County staff with a current State Department of Pesticide Regulation-Qualified Applicator Certificate (QAC). Staff with the QAC are required to complete 20 hours of continuing education every 2 years to stay licensed, and therefore are up-to-date on the latest techniques for pest control.

Annual trainings will be held with District staff and District contractors to review best management practices, target species, biological resources of concern, monitoring procedures and spill prevention and response procedures. Training will include a review of relevant invasive plant management literature and field training to ensure that District staff and Contractors are operating in accordance with the APAP.

The District commonly contracts herbicide application work to other companies. Prior to application, a Pest Control Advisor (PCA) licensed by DPR, makes a positive identification of pest(s) present checks applicable product label(s) for control efficacy, and in collaboration with District staff, the PCA prepares a written recommendation, including rates of application, notes any conditions that may limit the application to ensure that non-target flora and fauna are not adversely impacted. The District ensures that contractors conducting the application are properly trained in handling and use of herbicides, have a current Qualified Applicator Certificate (QAC), or Qualified Applicator Licenses (QAL). A QAC/QAL must complete 20 hours of continuing education every 2 years to stay licensed, and therefore are up-to-date on the latest techniques for pest control.

7. Herbicide Use Alternatives

The prioritization of treatment for non-native invasive species occurrences by the District is presented here as a guide which can be applied adaptively and modified as needed. The District established these priorities in the hope of minimizing the total, long-term workload based on available resources and management goals, and maximizing the potential environmental benefit for habitat protection and enhancement. A range of factors were developed to assign management priorities. District overall priorities are to:

1. Assign highest priority to fastest growing and most disruptive infestations that affect the most highly valued native habitat type(s) within the Project Area.
2. Consider the difficulties of control, giving higher priority to infestations most likely to be able to be controlled with available technology and resources.
3. Consider species, which are not yet problematic, but could become problematic if they spread throughout the District's general maintenance area, for priority treatment. The invasive species management program includes regularly monitoring the District's maintenance area for these species in order to quickly detect and eliminate them if they ever do appear.

Once a management area is identified, actions taken include the following alternatives. Some methods are applied simultaneously. For example, at a creek reach (say from one road crossing to the next), vegetation may be left alone in one area, trees may be planted to provide future shading in another area, grass may be mowed, and herbicides may be used to control cattail growth until the trees get tall enough to provide shading.

No Action. If the vegetation is not currently a threat, it is left alone and reevaluated the next season.

Prevention - The District implements preventative methods to discourage vegetation from growing in the channels. For example, the District plants trees to shade creek channels and prevent invasive aquatic plants like cattails from growing. This preventative method requires many years (5 to 10, or more) for the trees to grow tall enough to provide the shade needed to discourage cattail growth.

Mechanical or Physical Methods - The District controls vegetation growth by mowing aquatic vegetation or breaking up floating piles to encourage them to pass downstream. These methods only temporarily alleviate the flood threat and must be conducted on a regular basis.

Cultural Methods - The District has a long-standing program to plant native vegetation along channels in an effort to prevent growth of exotic, invasive vegetation. This is a long term process and requires a substantial maintenance effort to ensure successful growth of native vegetation.

Biological Control Agents - Biological control have not been used and no such controls have been identified as a viable alternative for controlling the species of concern.

Grazing - This option is most suitable for emergent and terrestrial weeds. There are potential impacts such as water quality from animal feces, nutrients, increase turbidity, and bank erosion, and impacts to desirable native plant species. The lack of adequate fencing, site access, and presence of vehicle traffic make this option unfeasible in some cases. Grazing will be considered as an alternative control where feasible.

Aquatic Herbicides - Aquatic herbicides are a key component of the District's vegetation management program. In order to successfully enhance native aquatic and wildlife habitat, while protecting the public and property in Napa County, the District needs to use a small amount of aquatic herbicides. If herbicides are not utilized for vegetation management, people and property could be at risk due to flooding. Only the least impactful herbicides are used and application of the minimum amount necessary for effective control, consistent with product label requirements, is conducted.

Native Species Establishment - After the successful removal of non-native invasive species, the introduction and re-colonization of native species has been successful along streambanks or margins of streams and rivers. This methodology provides competition for non-native species, creates, habitat, increases native plant diversity, and may reduce the need for future aquatic weed abatement. Limitation to this approach include lack of infrastructure for irrigation, ongoing access to private property, availability of labor to plant native species, and the high cost of ongoing site maintenance to ensure successful reestablishment. This approach is expensive, takes many years and requires long term access to private property. The District attempts to integrate this technique into all invasive plant management sites.

Tilling or Disking - This option is not a suitable alternative for controlling aquatic or riparian vegetation because tilling or disking exposes erodible soils which impact water quality. The District generally avoids tilling and disking in and around its flood control system, natural water ways, and wetlands so as not to encourage erosion of banks and sedimentation.

8. Best Management Practices

The following BMPs will be implemented prior to and during herbicide application events. The purpose of these BMPs is to avoid and minimize impacts on people, the environment, and Beneficial Uses of waters of the U.S. and state.

BMP Number	BMP Title	BMP Description
GEN-1	Work Windows and Weather Considerations	▪ Herbicide applications will occur between June 15 and November 15, with an extension through December 31 or until the first occurrence of any of the following conditions; whichever happens first: o Local rainfall greater than 0.5 inches is forecasted within a 24-hour period from planned application events; or o When salmonids begin upmigrating and spawning, as determined by a qualified biologist (typically in November/December) ▪ Check weather service prior to application and DO NOT make application if rain (40% chance or higher) is forecast 48 hours prior to or after planned applications. ▪ DO NOT make spray applications if wind speeds are less that 3 mile per hour or over 10 miles per hour. ▪ Avoid spraying during stable (inversion) conditions (early morning and early evening) when there is little or no vertical mixing of the air. These conditions generate concentrated drift clouds and increase the chance of drift fallout. ▪ Monitor wind direction and do not spray when there are sensitive areas/crops immediately downwind. ▪ Keep records of air temperature, wind speed, and wind direction for aerial applications.
GEN-10	Spill Prevention and Response	The District will prevent the accidental release of chemicals, fuels, lubricants, and non-storm drainage water into channels following these measures: 1. To the extent practicable, algaecides and aquatic herbicides will be mixed and loaded in the District or District Contractors yard before leaving for the application site(s). 2. New District field personnel will be appropriately trained in spill prevention, hazardous material control, and cleanup of accidental spills. 3. Equipment and materials for cleanup of spills will be available on site and spills and leaks will be cleaned up immediately and disposed of according to manufacturer’s label. 4. Field personnel will ensure that hazardous materials are properly handled and natural resources are protected by all reasonable means. 5. Spill prevention kits will always be in close proximity when using hazardous materials (e.g., at crew trucks and other logical locations). All field personnel will be advised of these locations. 6. Application equipment will be regularly checked and maintained to identify and minimize

BMP Number	BMP Title	BMP Description
		the likelihood of leads developing or equipment malfunction that would lead to a spill. 7. District staff will routinely inspect the work site to verify that spill prevention and response measures are properly implemented and maintained. 8. Applicators will report spills as required by County policy and in a manner consistent with local, state, and federal requirements. *Spill Response Measures:* For small spills on impervious surfaces, absorbent materials will be used to remove the spill, rather than hosing it down with water. For small spills on pervious surfaces such as soil, the spill will be excavated and properly disposed rather than burying it. Absorbent materials will be collected and disposed of properly and promptly.
VEG-4	Standard Herbicide Use Requirements	▪ Only herbicides and surfactants that have been approved for aquatic use by the U.S. Environmental Protection Agency (USEPA) and are registered for use by the California Department of Pesticide Regulation (CDPR) will be used for aquatic vegetation control work. ▪ Herbicide application will be consistent with Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) label instructions and use conditions issued by the USEPA, CDPR, and the Napa County Agricultural Commissioner. ▪ Conduct an annual search for Material Safety Data Sheets (MSDS) and Label updates or revisions for herbicides to be used. ▪ The least persistent and lowest toxicity pesticide and the lowest recommended application rate to achieve the desired control. ▪ Herbicides will not be mixed adjacent to storm drain inlets, culverts, or water courses. Mix herbicides in areas where spillage, if it occurs, can be easily contained. ▪ Mix only as much herbicide as necessary for the application. ▪ Use low pressure application equipment. ▪ Conduct spot treatment when applicable. ▪ Use spotters to avoid accidents and aide in preventing spraying in non-target areas.
VEG-5	Properly Maintain Application Equipment	▪ Calibrate spray equipment per manufactures specifications. ▪ Conduct equipment screening tests and tank sampling. ▪ Dedicate specific equipment for specific products. ▪ Clean equipment regularly following the manufactures specifications and the pesticide label directions. ▪ Select the appropriate nozzle to ensure proper coverage.

BMP Number	BMP Title	BMP Description
		▪ Maintain and equipment log to track calibration, cleaning and repairs. ▪ Conduct visual inspection of equipment prior to use. Check all equipment for leaking hoses, connections and nozzles. ▪ Monitor the operation of the nozzles during the application. ▪ DO NOT use any equipment that appears to be damaged. ▪ Discontinue use immediately in the event of an equipment malfunction. ▪ Ensure all staff are trained to clean up spills
VEG-6	Proper Handling, Storage, and Disposal of Herbicides	▪ Clean equipment and dispose of rinse water per label directions: a. Rinse equipment according to manufacturer's label instructions. b. Discharge rinse water only in areas that are part of the application site or at a certified waste treatment facility. c. Dispose of container rinse water and spray tank rinse water as a product over a target treatment site. c. Dispose of surplus chemical and containers according to label instructions, and County Agricultural Commissioner guidelines. ▪ Herbicide Storage a. All pesticides are stored at District/County facilities in original containers. b. All pesticides removed from original container for use are sealed within a service container. c. All service containers are sealed within a tool box inside the bed of a modified truck. d. Tool boxes are supervised when not locked. ▪ Pesticides that have reached their expiration date shall be disposed of.
BIO-3	Protection of Sensitive Fauna Species from Herbicide Use	Approved herbicides and adjuvants may be applied in habitat areas for sensitive wildlife species (including salmonids, California red-legged frog, western pond turtle); all applications will occur in accordance with federal and state regulations. For sprayable or dust formulations: when the air is calm or moving away from sensitive wildlife habitat, applications will commence on the side nearest the sensitive habitat and proceed away from the sensitive habitat. When air currents are moving toward sensitive habitat, applications will not be made within 200 yards (600 feet) by air or 40 yards (120 feet) by ground upwind from sensitive habitat. However, these distances may be modified for the control of invasive species on salmonid streams if the following measures are implemented:

BMP Number	BMP Title	BMP Description
		▪ A qualified biologist will determine presence/absence of sensitive resources in designated herbicide use areas and develop site-specific control methods (including the use of approved herbicide and surfactants). ▪ A qualified fisheries biologist will review proposed herbicide application methods and locations. The fisheries biologist will conduct a pre-application survey (and any other appropriate data research) to determine whether the proposed herbicide application would adequately prevent against fish kills, and prescribe measures to ensure adequate protection of biological resources.
BIO-4	Avoid and Minimize Impacts to Special-Status Plant Species and Sensitive Natural Vegetation Communities	If there are known occurrences of special status plant species near the project site a qualified botanist, arborist, or resource specialist will identify special status plant species and sensitive natural vegetation communities and clearly map or delineate them as needed in order to avoid and/or minimize disturbance, using the following protocols: 1. A desktop audit of the CNDDB, vegetation maps, soils maps, and aerial photos to identify if suitable habitats for special status plants and sensitive natural vegetation communities are potentially located within or near work areas. 2. In the event that an area is identified as potentially having sensitive natural communities will be conducted by a qualified person prior to commencement of work. 3. Surveys will be conducted during the appropriate time of the year to adequately identify plants. 4. District staff will ensure avoidance and minimize impacts by implementing one or more of the following, as appropriate, per the botanist's recommendation: a) Flag or otherwise delineate in the field the special status plant populations and/or sensitive natural community to be protected; b) Allow adequate buffers around plants or habitat; the location of the buffer zone will be shown on the maintenance design drawings and marked in the field with stakes and/or flagging in such a way that exclusion zones are visible to maintenance personnel without excessive disturbance of the sensitive habitat or population itself (e.g., from installation of fencing). c) Time construction or other activities during dormant and/or non-critical life cycle period; d) Store removed sediment off site; and e) Limit the operation of maintenance equipment to established roads whenever possible.

BMP Number	BMP Title	BMP Description
		5. No herbicides, terrestrial or aquatic, will be used in areas identified as potential habitat for special status plants species or containing sensitive natural communities, until a qualified botanist has surveyed the area and determined the locations of special status plant species present. 6. If special status plant species are present and maintenance cannot avoid impacts to the species, then a qualified botanist will determine the ecologically appropriate minimization measures for the species. Minimization measures may include transplanting, seed collection, or both, depending on the physiology of the species. 7. The District will not conduct maintenance activities that would result in the reduction of a plant species range or compromise the viability of a local population.
APAP-1	Applicator Training	District staff that handle and apply herbicides will be trained annually on proper herbicide handling and use. Staff will be trained by a District or County staff with a pesticide applicator certificate obtained from the State Department of Pesticide Regulation. Training will include review of the BMPs included in this document, with particular focus on target and non-target plants, environmental impact avoidance measures, and herbicide label requirements. The District will ensure that applicators are properly trained in handling and use of herbicides, have a current QAC, or QAL. A QAC/QAL must complete 20 hours of continuing education every 2 years to stay licensed, and therefore are up-to-date on the latest techniques for pest control.
APAP-2	Planning and Coordination	When a site is selected for application of herbicides, adjacent and downstream water users (farmers and agencies with water rights diversions) will be notified to ensure their water supply is not impacted during the aquatic herbicide treatment period. The District will post an annual work plan on the District website. Property owners adjacent to a project site will be notified of the work that is being planned and given information regarding project objectives and management strategy.

9. Monitoring Program

This monitoring program was developed to answer the following two questions, as required in Attachment C, *Monitoring and Reporting Program*, of the General Permit.

1. Does the residual aquatic herbicide discharge cause an exceedance of receiving water limitations?
2. Does the discharge of residual aquatic herbicide, including active ingredients, inert ingredients, and degradation byproducts, in any combination cause or contribute to an exceedance of the “no toxics in toxic amount” narrative toxicity objective?

The District will comply with the monitoring provisions and reporting requirements stated in Attachment C of the General Permit. The questions above will be addressed and documented as described below.

9.1 Monitoring Locations

Samples collected and analyzed will be representative of the area affected by applied herbicides. The sampling sites will vary annually depending on the sites maintained that year. At a minimum, samples will be collected in similar hydrologic conditions (flowing and non-flowing conditions) within 5 to 15 feet from the treatment area. This is an appropriate distance away from the application site because in general, areas treated in Napa County are along the stream bank, within the riparian corridor of the channel. When herbicides are applied directly in a creek or river channel, samples will be collected 10 to 15 feet downstream of the treatment area. In a pond or body of standing water, samples will be collected 5 to 10 feet away from the treatment area.

Applications typically occur from the OHWM to the top of bank with a small portion of the application occurring over the edge of the channel and below the OHWM. In lower reaches that are tidally influenced the treatment may occur at the edge of the receding tide line and continue to the top of bank or outer edge of the infestation on the landward side.

Treatment types are summarized in Table 1.

Table 1: Treatment Types

Treatment Site Type	Water Conditions	General Application Area Description
Napa River	- Flowing - Standing pools within the channel bank	Non-tidal reaches of the Napa River mainstem may be treated. Herbicides may be applied to standing pools within the channel or onto vegetation on the banks. Vegetation will typically be treated from the toe of the stream up to the top of bank, however, applications may also occur below the OHWM and over the surface of the water.
Napa River Flood Project	- Flowing – tidal	Treatment will occur in the tidal zone along the edge of the channel.
Engineered/Modified Channels	- Flowing (seasonally) - Stagnant pools - Dry channel	Treatment within flood control channels may be applied to the surface of the water, along the edge of the channel below OHWM, and along the banks up to the top of bank.
Natural Channels	- Flowing (seasonally) - Stagnant pools - Dry channel	Treatment will occur from the toe of the stream to the top of bank. Applications may occur near or below the OHWM.
Ponds	- Non-flowing	Occasionally, water storage or stormwater detention ponds may be treated. Treatment may occur along the edge of the pond or over the surface depending on the species of concern.

9.2 Monitoring Types

Sample Type:

- Background or pre-treatment monitoring – Samples will be collected upstream at the time of the application event or in the application area just prior to (up to 24 hours in advance of) the application event.
- Treatment event monitoring – Event monitoring samples shall be collected immediately downstream of the treatment area in flowing waters or immediately outside of the treatment area in non-flowing waters, immediately after the application event, but after sufficient time has elapsed such that treated water would have exited the treatment area.
- Post-event monitoring – Post-event monitoring samples shall be collected within the treatment area within one week after application.

Table 2 describes the monitoring activities will occur annually at Background, Event, and Post-Event Monitoring locations identified in Table 1.

Table 2: Monitoring Requirements

Sample Type	Parameter	Method	Frequency
Visual	▪ Water Body Description ▪ Appearance of water ▪ Weather Conditions ▪ Flow Conditions	Visual	All Applications, All Sites
Physical	▪ Temperature (degF) ▪ pH ▪ Turbidity (NTU) ▪ Electrical Conductivity @ 25degC (µmhos/cm)	Grab	6 events for Imazapyr in each environmental setting[1] per year 1 event for Glyphosate from each environmental setting[1] per year
Chemical	▪ Active Ingredient (µg/L) ▪ Dissolved Oxygen (mg/L)	Grab	6 events for Imazapyr in each environmental setting[1] per year 1 event for Glyphosate from each environmental setting[1] per year

1. Flowing and non-flowing water

9.3 Visual Monitoring

Visual observations of the water body will be noted on a sampling field data sheet log for each water sampling site chosen. Observations will include:

- Water Body Description (pond, lake, channel, creek, stream, etc.)
- Appearance of water (sheen, color, clarity, etc.)
- Weather Conditions (rain, wind, fog, etc.)
- Flow Conditions (stagnant, flowing, tidal inflowing or outflowing)

Attention will be given and noted to the presence of:

- Floating or suspended matter
- Discoloration
- Bottom deposits
- Aquatic life
- Visible films, sheens, or coatings
- Fungi, algal slimes or objectionable growths
- Potential nuisance conditions

See the example Field Data Collection Form (FDCF) in Appendix B.

9.4 Physical Monitoring

Physical measurements will be made during surface water sampling events to provide additional data for characterizing water quality. Measurements will be recorded on a sampling field data sheet. A YSI-650 MDS meter or equivalent will be used to measure pH, conductivity, temperature, turbidity, and dissolved oxygen. The meter will be calibrated according to the manufacturer's instructions prior to use.

Physical readings will be made "in-stream" by inserting the probe directly into the water, just downstream from the point where a water sample will be extracted. Readings from the probe should be collected at three feet below the surface of the water body, or at mid-water column depth if the depth is less than three feet.

A field data sheet will be used to record visual observations, water quality measurements, and water sample collection information. See the example FDCF in Appendix B.

9.5 Chemical Monitoring and Analysis

Sampling Design

The sampling events are designed to characterize the potential risk involved with herbicide applications relative to adjacent surface waters. Consistent with permit requirements, the monitoring program includes background/pre-treatment sampling up to 24 hours prior to the application, application event monitoring immediately post-treatment, and one-week post-application event monitoring (a total of three samples per event). During background sample collection, the sampling point will be recorded using a GPS unit to aid staff in locating the point for future sampling events.

The application event samples will be collected after sufficient time has elapsed such that treated water will have entered the adjacent area. In tidal areas, herbicides will be applied on a low or receding tide. Thus, application event samples will be taken 0.5-5 hours post-treatment when the tide has again flooded the site. Finally, the one-week post-treatment monitoring will be conducted when sufficient water is present at the site on the seventh day after the application. See Section 9.1 above for further discussion of sampling locations.

Field Sampling Procedures

Water samples will be collected using a sampling rod and pre-cleaned amber glass 1-liter bottles provided by the laboratory. To collect the sample, the bottle is attached to the sampling rod with a clamp, extended out over the water at the application site, and lowered to approximately three feet below the surface of the water body, or at mid-water column depth if the depth is less than three feet. When the bottle is full it is pulled back out of the water and the cap is affixed to the mouth of the bottle. The sample is labeled in permanent ink with the sample ID number, date, time, and initials of the sampler.

The sample ID number is determined by the following protocol: a four-letter code unique to the site, followed by the site visit number (e.g., -01 for pre-treatment, -02 for treatment, or -03 for one-week post-treatment), followed by the time since the application (e.g., “pre” for the baseline sample, the number of hours since the application for the treatment sample, or “1w” for the one-week post-treatment). For example, “SAL3-01-pre-1h” would mean: Salvador Creek, site 3, pre-treatment sample, 1 hour prior to application.

To help assess contamination from field equipment, ambient conditions, sample containers, transit, and the laboratory, one field blank will be collected and submitted to the lab for analysis on a regular basis. It is standard for the lab to include blanks as part of their quality control, but additional trip blanks consisting of distilled water will be submitted as a quality assurance measure. These will be added to either the treatment event or post-treatment event sample batches since the herbicide levels in the pre-treatment samples are usually ND (not detected). Field blank samples will be prepared by pouring distilled water into a pre-cleaned sampling container at the sampling point.

Sample Shipment

Following collection, water samples will be stored in a cooler with ice packs and shipped for priority overnight delivery to the laboratory. If samples are not shipped until the following day, they will be stored in a cooler on ice until they can be transferred to a refrigerator, and subsequently transferred back into a cooler for shipping.

Field Data Sheets

At each sampling location, the sample ID number, the time of the sampling, the sample depth, and the water temperature, pH, dissolved oxygen, conductivity, and salinity measurements, will be entered on a FDCF. Also recorded on the FDCF will be site information, including the site ID number, the station location (application point, upstream, downstream), station type (reference, treated), wind conditions, tidal cycle, water color, and the type of herbicide and surfactant that might be present. Any other unusual conditions or concerns will be noted, and any fish, birds, or other wildlife present will be recorded. The FDCFs will be dated and numbered consecutively for each site on that date. Data from these field forms will be entered into an electronic spreadsheet for processing, and the FDCFs will be compiled into a data log and kept for at least 5 years in the District’s office. An example FDCF is included in Appendix B.

A Chain-of-Custody (COC) form will be completed and sent with the samples to the laboratory. COC procedures ensure the custody and integrity of the samples through transport, delivery to lab, data gathering, and reporting. The following will be documented on the COC form:

1. Quantity and identification by name of samples transported
2. Name and signature of person transporting samples, date, time and purpose
3. Name and signature any subsequent person transporting samples, date, time and purpose
4. Name and address of laboratory performing analysis
5. Name of persons at laboratory receiving samples and the receipt date
6. Condition of samples when received at lab

Laboratory Analysis

Samples will be analyzed for the active ingredients used and the most appropriate EPA-approved analytical method. Analyses will be conducted in accordance with the latest edition of "Guidelines Establishing Test Procedures for Analysis of Pollutants," promulgated by the USEPA in title 40 CFR Part 136. Note that the approved methods listed in 40 CFR Part 136 do not include test procedures for imazapyr. However, other methods approved by the USEPA will be used for imazapyr. The proposed analytical methods for glyphosate and imazapyr are shown in Table 3 below.

Table 3: Required Sample Analysis

Herbicide Active Ingredient	CAS Registration Number	EPA Test Method and Reporting Limit	Sample Collection Comments
Glyphosate	1071-83-6	547 0.5 µg/L	Two 40mL VOA No chemical preservative 14 days hold time
Imazapyr	81334-34-1	8321B (LC/MS/MS detection) 100 ug/L	1 liter amber glass No chemical preservative 7 days hold time

Analysis of residual active ingredients in samples will be conducted by a laboratory certified by the California Department of Public Health in accordance with California Water Code section 13176. The name and contact information for the laboratory will be included in all monitoring reports. Each season, the contracted analytical laboratory is required to provide a Quality Assurance Plan (QAP) that meets USEPA standards prior to initiating analysis. The lab plan must specify the method of analysis to be used, and describe any variations from a standard protocol.

Laboratory results will be reported as follows:

1. Each sample result will be reported with the applicable Minimum Level (ML) and the current Minimum Detection Limit (MDL), as determined by the procedure in 40 CFR Part 136.
2. Sample results greater than or equal to the reported ML shall be reported as measured by the laboratory (i.e., the measured chemical concentration in the sample.)
3. Sample results less than the Report Limit, but greater than or equal to the laboratory's MDL, shall be reported as "Detected, but Not Quantified," or DNQ. The estimated chemical concentration of the sample shall also be reported.
4. For the purposes of data collection, the laboratory shall write the estimated chemical concentration next to DNQ as well as the words "Estimated Concentration" (may be shortened

to "Est. Conc."). The laboratory may, if such information is available, include numerical estimates of the data quality for the reported result. Numerical estimates of data quality may be percent accuracy (plus a percentage of the reported value), numerical ranges (low to high), or any other means considered appropriate by the laboratory.

5. Sample results less than the laboratory's MDL shall be reported as "<" followed by the MDL.
6. The laboratories will establish calibration standards so that the ML value (or its equivalent if there is differential treatment of samples relative to calibration standards) is the lowest calibration standard. At no time is the laboratory to use analytical data derived from extrapolation beyond the lowest point of the calibration curve.
7. Multiple Sample Data: If two or more sample results are available, the District will compute the arithmetic mean unless the data set contains one or more reported determinations of DNQ or ND. In those cases, the District will compute the median in place of the arithmetic mean in accordance with the following procedure:
    a. The data set shall be ranked from low to high, ranking the reported ND determinations lowest, DNQ determinations next, followed by quantified values (if any). The order of the individual ND or DNQ determinations is unimportant.
    b. The median value of the data set shall be determined. If the data set has an odd number of data points, then the median is the middle value. If the data set has an even number of data points, then the median is the average of the two values around the middle unless one or both of the points are ND or DNQ, in which case the median value shall be the lower of the two data points where DNQ is lower than a value and ND is lower than DNQ.

10. Annual Reporting

The District will prepare and submit an annual report to the Regional Water Quality Control Board Executive Officer by March 1st. The report will clearly state whether discharge of aquatic herbicides, their residues, or their degradation by products occurred.

The annual report will contain the following information:

1. An executive summary discussing compliance or violation of the General Permit and the effectiveness of the APAP to reduce or prevent the discharge of pollutants associated with aquatic pesticide applications.
2. A summary of aquatic herbicide application events conducted in the past year, including map of application and treatment areas, types and amounts of aquatic herbicides used, and all information used to calculate dosage and quantity of each herbicide used.
3. A summary of monitoring data, including chemical analysis results. All reported data will be arranged in a summary table. The data shall be summarized to clearly illustrate whether the aquatic herbicide applications were conducted in compliance with effluent and receiving water limitations.
4. Identification of BMPs and their effectiveness in meeting permit requirements. Additionally, the report will include a discussion of proposed BMP modifications or improvements.
5. Proposed changes to the APAP, BMPs, and monitoring program, as necessary to further ensure compliance with the General Permit.

Appendix A. Sample District Planting Palettes

COMPREHENSIVE PLANT PALETTE BY SPECIES AND CONTAINER SIZE

Container / Pole / Plug Plantings Acreage Total x.xx ac

	Biological Name / Common Name	Container	Quantity Required
Trees	*Acer macrophyllum* / Big Leaf Maple	Treepot 4	XX
	Aesculus californica / California Buckeye	Seed	XX
	Alnus rhombifolia / White Alder	Treepot 4	XX
	Fraxinus latifolia / Oregon Ash	Treepot 4	XX
	Juglans californica var. hindsii / California Black Walnut	Treepot 4	XX
	Populus fremontii / Fremont's Cottonwood	Pole	XX
	Populus fremontii / Fremont's Cottonwood	Treepot 4	XX
	Quercus kelloggii / Black Oak	Treepot 4	XX
	Quercus agrifolia / Coast Live Oak	Treepot 4	XX
	Quercus lobata / Valley Oak	Treepot 4	XX
	Salix laevigata / Red Willow	Pole	XX
	Salix lasiolepis / Arroyo Willow	Pole	XX
	Salix lutea / Yellow Willow	Pole	XX
	Umbellularia californica / Bay Laurel	Treepot 4	XX
		Total Trees	0
Shrubs	*Achillea millefolium* / Yarrow	Deepot 40	XX
	Baccharis pilularis / Coyote Bush	Deepot 40	XX
	Baccharis salicifolia/ mule fat	Deepot 40	XX
	Calycanthus occidentalis / Western Spice Bush	1-Gallon	XX
	Heteromeles arbutifolia / Toyon	Treepot 4	XX
	Physocarpus capitatus/ Ninebark	1-Gallon	XX
	Ribes californicum/ California gooseberry	1-Gallon	XX
	Rosa californica / California Wild Rose	1-Gallon	XX
	Sambucus mexicana/ Elderberry	1-Gallon	XX
	Symphoricarpos albus / Snowberry	1-Gallon	XX
		Total Shrubs	0
Vines	*Lonicera hispidula* / Honeysuckle	1-Gallon	XX
	Aristolochia californica/ Pipe vine	1-Gallon	XX
		Total Vines	0
Herbaceous	*Bromus carinatus* / California Brome	Plug	XX
	Carex barbarae / Santa Barbara Sedge	Super Stubby (L6)	XX
	Carex praegracilis / California Field Sedge	Super Stubby (L6)	XX
	Elymus glaucus / Blue Wildrye	Plug	XX
	Elymus triticoides /Creeping Wildrye	Plug	XX
	Euthamia occidentalis / Western Goldenrod	Liner	XX
	Festuca idahoensis / Idaho Fescue	Plug	XX
	Juncus balticus /Baltic Rush	Plug	XX
	Juncus effusus var. brunneus / Common Rush	Super Stubby (L6)	XX
	Muhlenbergia rigens / Deergrass	1-Gallon	XX
	Symphyotrichum chilense / Common Aster	Plug	XX
		Total Grasses and Forbs	0

Sample District Seeding Palette

VEGETATION MANAGEMENT & DISTURBED AREA SEEDING			
		Seeding Acerage Total	x.xx ac
	Habitat Type: Disturbed Area		**0.5 ac**
	Biological Name / Common Name	**Seeding Method**	**Qty**
Herbaceous	*Bromus carinatus* / California Brome	Broadcast Seed	X
	Elymus glaucus / Blue Wildrye	Broadcast Seed	X
	Elymus triticoides /Creeping Wildrye	Broadcast Seed	X
	Festuca idahoensis / Idaho Fescue	Broadcast Seed	X
	Festuca microstachys / Small Fescue	Broadcast Seed	X
	Hordeum brachyantherum / Meadow Barley	Broadcast Seed	X

Appendix B. Field Data Collection Form

Page ___ of ___ on this date

Field Data Collection Form

Site ID (XXXX) (eg. SAL3): ____________________ Date: ___________________ Collected By: ___________________________

Station Location (circle): at application point upstream downstream Station Type (circle): Reference Treated

Wind (circle): low high Tidal Cycle (circle): high low slack Water Color (circle): green green-brown brown blue (dye)

Herbicide:_________ Surfactant (if applicable):__________________ Gallons tank mix applied _______ Application Time (Start/Finish): ______/_______

Field Measurements

Water Depth	pH	Dissolved Oxygen	Water Temp	Conductivity	Salinity	Meter Used
Meters		mg/L	^{o}C	mS	ppt	

Samples Collected

Sample ID (XXXX-YY-Ab)*	Time	Sample Depth (m)	Notes

* **XXXX-YY-Ab** (eg. SAL3 -01- pre - 0.5h) = **XXXX** Site No., **YY** site visit number (01- first , 02- second, 03 -third), **A:** time to application (either pre, increments thereafter in half hours – 0.5), **b:** time increment (h=hour, w=week (for 1 week post-treatment))

Additional Notes or Comments: ____

Wildlife presence: ____

Appendix H

Arundo Management Program

Napa River Watershed Invasive Plant Management: Arundo Management and Riparian Enhancement Plan

June 2015

Prepared by:
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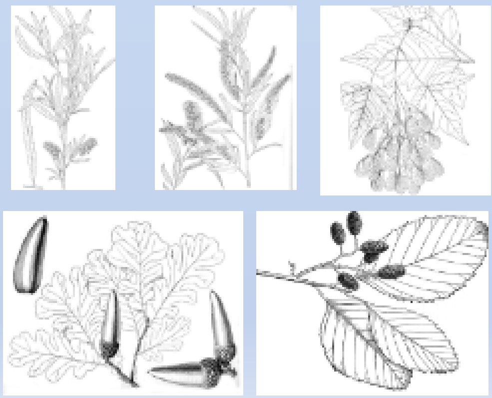

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Background

Invasive Plant Management Overview

The Napa County Flood Control and Water Conservation District (District) takes an integrated approach to stream management that involves protecting existing resources, managing non-native invasive plant species, and enhancing native riparian plant communities while maintaining flood conveyance and bank stability conditions. The District's invasive plant management program targets a number of priority non-native invasive plants, which are outlined in Chapter 4 of the District's Stream Maintenance Manual (SMM).

Arundo donax

One major focus of the District's invasive plant management program has been on controlling *Arundo* donax. The District has been responding to concerns regarding the infestation of Arundo in the Napa River and its tributaries for over 15 years. Arundo is a significant issue because it can rapidly invade stream channels, often growing aggressively to the exclusion of other riparian species. The rapid and voluminous growth of this invasive plant can significantly reduce channel capacity. Successful eradication is possible in the Napa River Watershed because it has not reached the level of infestation that is seen in other streams, for example throughout Southern California. The District's Arundo management program is based on an adaptive management strategy which allows for operational procedures, maintenance activities, and treatment approaches to be updated as new best management practices (BMPs) are developed to minimize potential impacts.

In 2001, the District began collaborating with the Arundo Del Norte working group, a cooperative partnership of several northern California agencies, to identify the most effective treatment options and began systematically mapping and monitoring the distribution of Arundo throughout the watershed and collaborating with landowners and other organizations on the management and treatment of Arundo. The District's approach to managing Arundo is to target removal activities by sub-watershed, beginning in upstream areas and eradicating Arundo colonies progressively downstream through each sub-watershed as much as possible. Because infestations are mostly located on private property, the District's program includes significant outreach to local landowner's to gain permission to conduct treatments and follow-on revegetation activities.

Managing invasive vegetation is a continuous, routine, and on-going activity of the District's stream maintenance program. The District's invasive plant management activities may have temporary impacts and there is the possibility of impacting non-target species during treatment. The District has a robust habitat enhancement and restoration program designed to offset the temporary impacts associated with invasive plant management activities. Typically Arundo removal requires two to four years of treatment with herbicide, followed up by a riparian enhancement strategy that may include native plant revegetation and/or erosion control BMPs. A critical component to Arundo and invasive management in general is the ongoing monitoring and maintenance of treatment areas.

Arundo Management Issues

Arundo is an extremely resilient and difficult plant to manage within the riparian corridor. The District takes every opportunity to review and update operational procedures to minimize potential impacts. In 2011, the District, following treatment recommendations from the Arundo Del Norte group, treated standing patches of Arundo with a mixture of Glyphosate and Imazapyr in the fall. The theory was that the herbicide combination was more effective, applications in the fall would translocate to roots more efficiently as the plant goes dormant, and that spraying a standing patch maximized herbicide contact with the leaf surface area. At that time (2011) the District was collaborating with the California Land Stewardship Institute (CLSI) on a project reach along the Napa River from Larkmead Lane to Lodi Lane and was also conducting a second round of herbicide treatment along a District project reach upstream of Larkmead Lane to the city of Calistoga's wastewater treatment plant on the Napa River. The licensed applicator for the 2011 applications was the Napa County Mosquito Abatement District (NCMAD) operating under the direction of a District contractor who was overseeing the Arundo management program. Subsequent monitoring of treatment areas found that there were impacts to non-target vegetation associated with this method. In 2013, the District was notified of some observed impacts to nearby grapevines and an investigation of NCMAD for this incident by the Napa County Agricultural Commissioner, focused on the impacted grapevines. This incident, and our own observations of non-target impacts, resulted in the District re-examining its invasive treatment program as discussed more specifically later in this report.

Photo 1: Example of non-target tree impacts.

The District continued monitoring and treating the project reaches to ensure that the Arundo was completely controlled. Follow up treatments were carried out with only Glyphosate in 2012, 2013 and 2014. The follow up treatments were limited to small isolated patches of regrowth. Monitoring of treatment sites found that within the project reach upstream of Larkmead Lane 43 trees ranging from 3-20 inch DBH were impacted from the 2011 treatment round. The District recognizes that the non-target tree impacts should be mitigated in accordance with regulatory permits. Tree impacts and the associated mitigation ratios (for tree removals) included within the District's current Department of Fish and Wildlife Routine Maintenance Agreement indicate that the District should install 202 native trees to mitigate for the observed impacts to non-target trees. To date, the District has carried out revegetation at six locations within this project reach and has already installed 303 trees. **Appendix A** summarizes the non-target tree impacts in this reach and the mitigation plantings installed to date. There were additional impacts to non-target vegetation downstream of Larkmead Lane, and the impacted non-target vegetation was removed in 2013 ahead of the revegetation effort that was carried out by CLSI. Although the planting that the District has already implemented already exceeds the indicated mitigation requirements at the subset of revegetated sites completed, the District intends to continue enhancement efforts throughout all affected project reaches. As part of the ongoing riparian enhancement effort the District will focus on installing similar tree species to the trees that were impacted at treatment sites to re-establish similar canopy cover as discussed below.

Native Riparian Enhancement and Mitigation Plan

The District maps all treatment locations and is conducting ongoing monitoring to ensure successful control of Arundo. In treatment sites that have had impacts to non-target vegetation the District will install similar native tree, shrub, and grass species consistent with upstream and downstream reference sites. The objective is to enhance the complexity of the riparian corridor by increasing canopy cover and diversity of the riparian plant communities. This means evaluating sites to determine if understory, mid-canopy, or upper canopy species are missing and planting according to site conditions. This adaptive and flexible planting strategy allows the District to enhance the complexity and diversity of treatment sites rather than applying a one size-fits all planting approach or focusing just on woody vegetation.

The District has recently started applying a multi-phased riparian enhancement strategy. The concept is based on successional native plant development. The initial rounds of herbicide treatment employed to control the Arundo can be viewed as the beginning of a disturbance-driven successional sequence. This approach allows the District to focus on planting a site with the goal of enhancing plant diversity and complexity of the riparian structure over multiple years on a planting continuum that mimics natural succession. The first phase includes applying native grass seed, rice hay or mulch to a site to help suppress other non-natives that may colonize the site and to help stabilize exposed soils. The second phase is to identify suitable revegetation sites and select and install an array of native plants that mimic upstream or downstream reference conditions with a focus on early seral stage species. The third phase includes installation of irrigation, dry-water or applying an alternative water plan. The fourth phase is the ongoing monitoring and maintenance to control non-natives and ensure plant survivorship. The overall objective of this strategy is to allow treatment areas to be adaptively managed in a manner that will enhance the riparian structure at all canopy levels through the installation of a variety of vegetation types, including herbaceous plants, shrubs and trees.

This adaptive and flexible planting strategy is important because, based on field observation the District recognizes that sites will evolve from year to year depending on the location of the treatment site on the streambank and stream flow conditions. Often once the Arundo has been successfully controlled, small secondary high flow channels will scour out around the Arundo root masses. These micro topographic changes associated with fluvial processes will influence the riparian planting strategy, and the District recognizes that these changes are beneficial to overall channel complexity but is focused on minimizing the input of fine sediments and significant bank erosion. Over the years the District has observed that some sites will naturally recruit native riparian plants, such as elderberry, willows, and sedges. In cases where natural recruitment is significant the District's focus will be mainly on the maintenance of non-natives.


Photo 2: Example of revegetation site.

In treatment areas that have had impacts to non-target species the District is actively working on implementing riparian enhancement efforts. These efforts include a variety of strategies as described above and are dependent on site conditions. At revegetation sites the District will typically over plant with the understanding that about 10 percent of the installed plants may not survive due to site constraints, such as soil conditions, water, or other disturbances. As noted above, there were 43 impacted trees indicating 202 native riparian trees as mitigation; and the District has thus far implemented six revegetation projects within the reach that include 303 native trees (**Appendix A**). This high density planting will be continued at other revegetation sites to ensure that temporary impacts are fully mitigated and the riparian corridor is enhanced as planned.

Typical Planting Plan

The average size of the District's completed Arundo treatment sites is approximately 950 sq ft or .02 acres. Typical plant species and densities are outlined in Table 2 below. At most sites the District will increase quantities to improve success and has outlined a typical planting plan in Table 1, which provides a general approach to the revegetation. A combination of mid-canopy and upper-canopy trees are included with a combination of mid-canopy and low-canopy shrubs, as well as herbaceous ground cover. Exact species and quantities will be selected based on site conditions and nearby reference sites.

Table 1: Planting Plan Example

Coverage Type	Scientific Name	Common Name	Quantity (950 ft²/.02 acres)
Trees	*Salix laevigata*	red willow	20
	Alnus rhombifolia	white alder	5
	Quercus agrifolia	live oak	5
	Quercus lobate	valley oak	5
	Juglans californica	Walnut	3
	Aesculus californica	California buckeye	2
Shrubs	*Baccharis pilularis*	Coyote Bush	5
	Rosa californica	California wild rose	5
	Symphoricarpos rivularis Elderberry	snowberry	10
	Sambucus nigra	blue elderberry	2
Herbaceous	*Carex barbarae*	Santa Barbara sedge	75
	Juncus spp.	Juncus	25
	Native grass seed mix variation as described in Table 3		
Total			157

Current Arundo Treatment Approach

As discussed above, the District's approach to Arundo treatment has been refined over the years and operational procedures are annually reviewed. Often, the District is notified by a concerned landowner, at which point the District will survey the reach in question to identify and map the extent of the Arundo infestation. The District then outreaches to the appropriate landowners to discuss the feasibility of carrying out an Arundo management project. Once a group of landowners has approved the work the District will request a limited permit of entry from each participating landowner before initiating the Arundo management work. The first step in the Arundo removal process is to cut the plant at the base in early summer using a chainsaw or flail mower and then the biomass is chipped along the top of the bank. The District then contracts with a licensed pesticide applicator to carry out the initial round of herbicide treatment in late September through early October using Glyphosate (2-5%), a non-ionic surfactant, and blue marker dye. Applicators are only applying herbicide to the new growth and using a targeted application procedure. Annual monitoring of each site is carried out for the following two-three maintenance season, to determine if the infestation requires follow up herbicide treatments.

Once the District determines that the infestation has been completely controlled a riparian enhancement strategy is developed. The riparian enhancement strategy includes identifying areas that require erosion control BMP's and/or are suitable revegetation sites. The first stage includes spreading native grass and wild flower seed and/or the placement of woodchips or rice hay along the bank. The second step is to identify suitable revegetation areas and determine if there is a point of connection for irrigation or if an alternative watering system is required. In suitable revegetation areas the District will choose appropriate native plants from the riparian plant palette (**Table 2**). Plant selection is based on site conditions. The objective is to create a multi-layered riparian canopy that enhances the complexity and diversity of the riparian structure to improve channel shading and create a functional understory that can compete with other non-natives. In treatment sites that have abundant natural recruitment the District may limit the installation of new species and focus on monitoring and managing other non-natives to ensure successful native plant establishment.

Once the Arundo has been successfully eradicated from a site and riparian enhancement efforts have been carried out the District will continue to monitor plant survivorship, irrigation systems, and re-growth for five years. Ongoing maintenance of treatment sites is critical and may include management of other non-natives, mulching to improve soil structure and water holding capacity, and installation of additional plants to mimic the natural successional development of the riparian structure. The District is committed to following through with the management and enhancement of treatment reaches and is dedicated to eradicating Arundo from the watershed.

Photo 3: Example of large patch of Arundo along Streambank.

Photo 4: CCC crew removing Arundo Biomass.

Photo 5: CCC crew completing Arundo biomass removal.

Photo 4: Example of typical regrowth prior to herbicide application.

Summary

The District recognizes that riparian vegetation influences numerous important ecological functions in relation to aquatic and terrestrial habitat and provides important physical benefits. River ecosystems are highly susceptible to infestation of non-native invasive plants because of their dynamic hydrology and because channels can act as conduits for the efficient dispersal of propagules. Arundo has been, and will continue to be, an ongoing management concern of residents within Napa County due to its ability to rapidly colonize streambanks, impact native vegetation, reduce habitat quality, consume high quantities of water, and constrict channels leading to flood-related hazards. The District has been adapting management methods over the years and is in the process of mitigating for impacts associated with early treatment approaches in an effort to enhance the riparian corridor. Arundo infested sites were a significant environmental issue prior to the District beginning treatment and the above-described temporary impacts associated with non-target species being impacted, are unfortunate but are being mitigated through riparian enhancement efforts which will create a higher quality riparian corridor over time. Furthermore, the practices that lead to these impacts have been abandoned and operational procedures have been updated.

In 2012 the District developed a Stream Maintenance Manual that outlines an integrated stream maintenance strategy, which includes resource protection and environmental sustainability in addition to flood control and channel maintenance principles. This manual and program provide clear guidance on how projects can be implemented to avoid and minimize environmental impacts while conducting maintenance projects. The District has modified Arundo and invasive management operational procedures since the 2011 treatment incident. These include removing the standing patch of Arundo and only treating the regrowth, which minimizes the amount of herbicide being applied. Upon successful treatment of an infestation area a phased approach to riparian enhancement is being employed to enhance the complexity, diversity, and structure of the riparian corridor within a treatment reach.

The District intends to continue to work with landowners on the treatment, restoration, monitoring and maintenance of Arundo sites throughout the watershed and is committed to controlling and eradicating Arundo in the most environmentally sensitive manner. The District feels that current Arundo project sites clearly demonstrate the effectiveness of our current treatment approach and that non-target species are being avoided.

Table 2: Riparian Planting Palette

Botanical Name	Common Name	Quantity/Acre
TREES		
Acer macrophyllum	Big leaf maple	20
Aesculus californica	California buckeye	20
Alnus rhombifolia	White alder	60
Fraxinus latifolia	Oregon ash	20
Juglans hindsii	Black walnut	25
Populus fremontii	Fremont’s cottonwood	30
Quercus agrifolia	Coast live oak	15
Quercus lobata	Valley oak	20
Salix laevigata	Red willow	90
Salix lasiandra	Arroyo willow	40

Salix lucida	Shining willow	30
Umbellularia californica	Bay laurel	20
SHRUBS		
Baccharis pilularis	Coyote bush	35
Calycanthus occidentalis	Western spice bush	15
Heteromoles arbutifolia	Toyon	15
Rhamnus californica	Coffeeberry	15
Rosa californica	California wild rose	40
Symphoricarpos albus	Snowberry	20
LOW HERBACEOUS PLANTS		
Carex barbarae	Santa Barbara sedge	500
Carex praegracilis	California field sedge	200
Elymus glaucus	Blue wildrye	750
Festuca idahoensis	Idaho fescue	500
Juncus balticus	Baltic rush	500
Juncus effusus var. brunneus	Pacific rush	500
Leymus triticoides	Creeping wildrye	750
Lonicera hispidula	Honeysuckle	250
Muhlenbergia rigens	Deergrass	500

Table 3: Basic Seed Mix for SMP Erosion Control

Scientific Name	Common Name	Application Rate (lbs/acre)	Growth Form
Achillea millefolium	yarrow	2	forb
Agrostis exarata	spike bentgrass	4	grass
Artemisia douglasiana	mugwort	4	forb
Baccharis salicifolia	mule fat	4	shrub
Bromus carinatus	California brome	4	grass
Collinsia heterophylla	Chinese houses	2	forb
Deschampsia cespitosa	tufted hairgrass	4	grass
Elymus glaucus	blue wildrye	4	grass
Eschscholzia californica	California poppy	2	forb
Festuca idahoensis	Idaho fescue	8	grass
Hordeum brachyantherum	California barley	8	grass
Leymus triticoides	creeping wild rye	4	grass
Nassella pulchra	Purple needle-grass	4	grass
Poa secunda	one sided blue grass	4	grass
Vulpia microstachys	vulpia	8	grass

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Appendix A. Arundo Treatment and Revegetation Sites

Table A: Non-target tree impacts

Tree	Size/DBH	CDFW Mitigation Count*
Red willow	14	6
Walnut	16	6
Cottonwood	4	3
Walnut	8	6
Red willow	8	6
Red willow	10	6
Pine	15	6
Red willow	8	6
Red willow	8	6
Cottonwood	5	3
Cottonwood	6	3
Cottonwood	8	6
Valley Oak	3	3
Valley Oak	3	3
Red willow	6	3
Red willow	5	3
Red willow	7	6
Red willow	5	3
Ash	6	3
Walnut	5	3
Red willow	16	6
Red willow	8	6
Walnut	10	6
Walnut	2	1
Red willow	15	6
Red willow	6	3
Red willow	6	3
Red willow	8	6
Red willow	18	6
Walnut	8	6
Ash	12	6
Red willow	7	6
Red willow	10	6
Red willow	8	6
Red willow	6	3
Red willow	16	6
Red willow	16	6
Red willow	14	6
Valley Oak	8	6
Alder	20	6
Red willow	4	3
Red willow	6	3
Total Trees Impacted		43
Total Tree Mitigation		202

* Mitigation Count is based upon required ratios for trees removed as part of the District's Stream Maintenance Program

Appendix I

Typical Preliminary Design Plans for Biotechnical Treatments

Appendix J

Stream Bank Stabilization Cost-Share Program

Stream Bank Stabilization

Cost-Share Program

The District is committed to making a concerted effort to reduce streambank erosion and enhance riparian corridors throughout Napa County. Riparian and stream bank enhancement measures include extensive planting of riparian vegetation along exposed streambanks and removing non-native and invasive species along watercourses. In an effort to reduce streambank erosion the District offers a cost share program to assist private property owners with stream bank stabilization. The District offers three cost-share options:

1. 50/50 native riparian planting solution,
2. 50/50 bank stabilization for engineered hardscape solution,
3. 75/25 biotechnical bank stabilization solution,

Cost-Share Program Check List

Interested parties shall follow the steps outlined below to ensure that the project is completed according to the Stream Bank Stabilization Cost Share Program procedures. To be eligible for project reimbursement each step must be completed. Further details are provided in Exhibit A of the sample agreement (page 5).

1. Meet With Flood Control District To Discuss Stream Bank Issues
2. Property Owner Contacts Design Engineer or Landscape Architect
3. Property Owner Takes Project Through Design Phase
4. Property Owner Completes & Submits Permit Application (DFG, San Francisco Bay Regional Water Quality Control Board, Army Corps of Engineers)
5. Property Owner Submits Design & Permits To Flood Control District For Review
6. Agreement Is Drafted By The District & Signed By The Property Owner
7. District Engineer Signs Off On The Project
8. Notice To Proceed Is Issued By The District
9. Property Owner Completes Project According To Design & Permits
10. Property Owner Is Reimbursed For Completed Project For The Agreed Amount Upon Proof Of Payment (Completed according to DFG Permits, Designs, and District Approval)

To schedule a site visit or request additional information on the Stream Bank Stabilization Cost-Share Program call the Flood Control District at (707)259-8624 or visit our website at www.countyofnapa.org/flooddistrict/

RIPARIAN PLANTING TEMPLATE

RIPARIAN VEGETATION ZONES

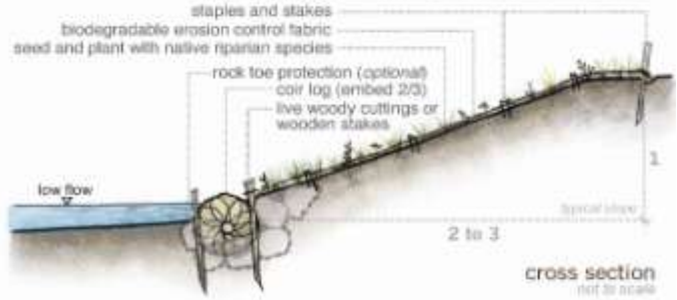
COIR LOG AND EROSION CONTROL FABRIC

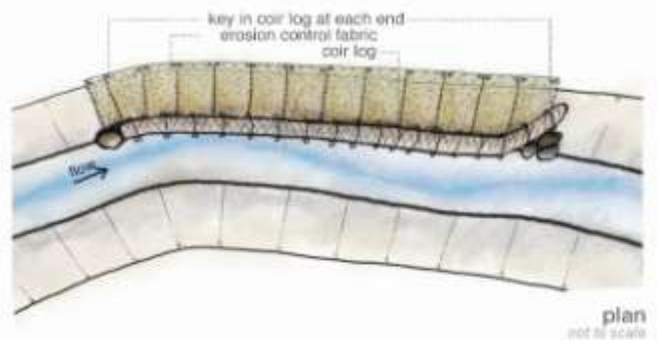
DESCRIPTION
This treatment provides simple biotechnical erosion protection and bank stabilization. A coir log placed at the toe of the slope protects from scour. Erosion control fabric protects the bank slope from erosion during the vegetation establishment period.

APPLICABILITY
Suitable for low to moderate velocity and shear stress conditions. Recommended for newly graded banks and existing banks with 2h:1v slopes or shallower.

CONSIDERATIONS
May require a wide right-of-way to accommodate broad bank slopes.

VARIATIONS
Replace coir log with willow wattle and/or replace erosion control fabric with live brush mattress to increase vegetation cover. Where feasible, consider including a floodplain bench to increase flood flow capacity, channel complexity and diversity of riparian vegetation. Provide rock toe protection in high energy settings.





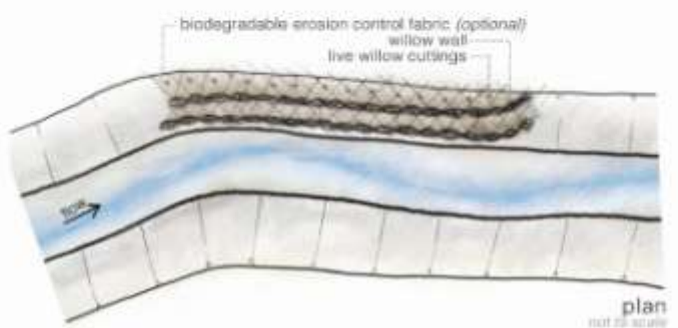
WILLOW WALL

DESCRIPTION
The willow pole cuttings are used as a biotechnical structural element to increase bank strength. Once established, willow pole cuttings will provide dense vegetated cover with high habitat value.

APPLICABILITY
Suitable for moderate velocity and shear stress flow conditions. Suitable for steep slopes. Can be constructed with hand tools and labor, especially useful where access is limited.

CONSIDERATIONS
Generally not suitable for protecting infrastructure. Mature willows will increase roughness and may require maintenance and thinning. Site should be appropriate for increased roughness.

VARIATIONS
Can be combined with brush mattress or soil lifts.



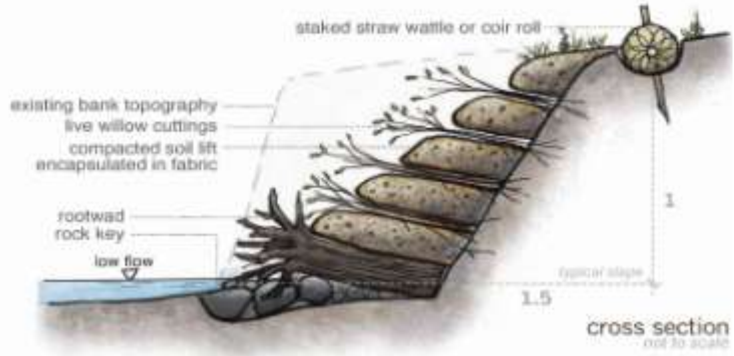
ENCAPSULATED SOIL LIFTS

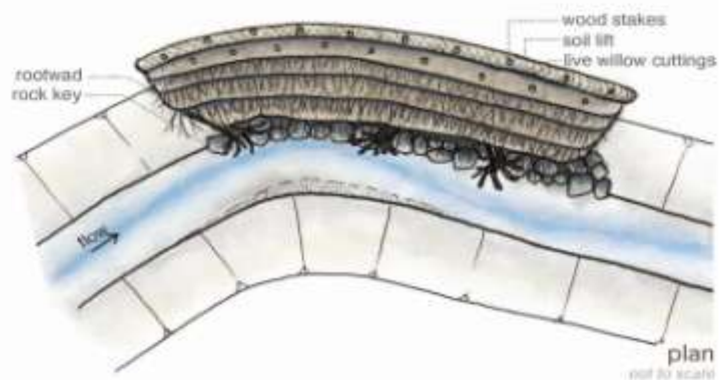
DESCRIPTION
This treatment uses soil and sediment wrapped in erosion control fabric to reconstruct stream banks. Live willow cuttings are planted in interstitial spaces. Provides high habitat and aesthetic value once vegetation is established.

APPLICABILITY
Suitable for steep slopes with moderate to high velocity and shear stress flow conditions. Appropriate for confined areas or constricted right-of-ways.

CONSIDERATIONS
Costly to construct and requires good access. Reuse native bank soil when feasible. Incorporate root wads or large woody debris when feasible to increase habitat complexity.

VARIATIONS
Provide rock toe protection in high energy settings.





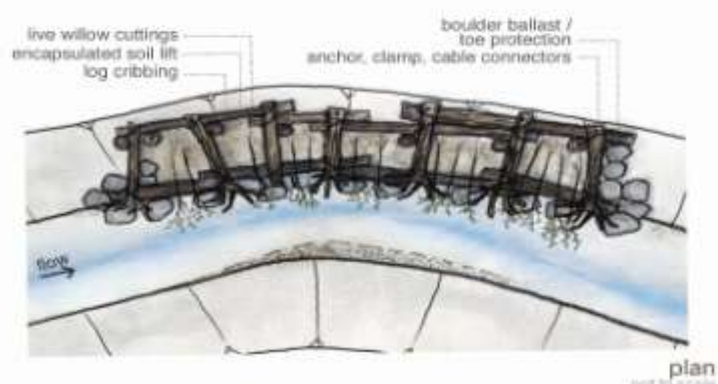
CRIB WALL

DESCRIPTION
This treatment involves construction of an engineered log crib structure filled with native soil and/or stream substrate. Suitable for restoring or establishing native riparian vegetation on extremely steep slopes. Provides high habitat value on confined, steep banks.

APPLICABILITY
Suitable for high velocity and high shear stress flow conditions for stream reaches with steep, overhanging banks. May be appropriate where right-of-way is highly constrained or where valuable infrastructure is threatened by erosion.

CONSIDERATIONS
Costly to construct and requires heavy equipment access. Requires boulder ballasts and anchoring. Risk of downstream impacts if crib wall is dislodged in high flows. Reuse native bank soil when feasible.

VARIATIONS
Transition to encapsulated soil lifts above ordinary high water.



Native Riparian Planting List

Trees			
Scientific Name	Common Name	Planting Area/Zone	Habitat and Suitability
Acer macrophyllum	Big leaf maple	Mid to Upper Bank	Preferred species, relatively upright growth, wide spreading well adapt to toe and mid bank.
Acer negundo	Box Elder	Mid to Upper Bank	Spreading well adapt to heavy soils
Alnus rhombifolia	White alder	Toe to Mid Bank	Preferred species, relatively upright growth, wide spreading well adapt to toe and mid bank.
Aesculus californica	California buckeye	Upper Bank	Preferred species, relatively upright growth, wide spreading well adapt to toe and mid bank.
Fraxinus latifolia	Oregon Ash	Toe to Mid Bank	Preferred species, relatively upright growth, wide spreading well adapt to toe and mid bank.
Juglans californica	N.California Black Walnut	Mid to Upper Bank	Adds diversity
Populus fremontii	Fremont cottonwood	Toe to Mid Bank	Upright growth, wide spreading, well adapted to mid and upper bank plantings
Quercus agrifolia	Coast live oak	Upper Bank	Relatively upright growth, wide spreading, well adapted to mid and upper bank plantings
Quercus lobata	Valley oak	Upper Bank	Relatively upright growth, wide spreading, well adapted to mid and upper bank plantings
Salix laevigata	Red willow	Toe to Mid Bank	Preferred species, relatively upright growth, wide spreading, well adapted to mid and upper bank plantings
Salix lasiolepis	Arroyo willow	Toe to Mid Bank	Fast growth, spreading,
Umbellularia californica	California bay laurel	Upper Bank	Relatively upright growth, wide spreading, well adapted to mid and upper bank plantings
Shrubs			
Baccharis douglasii	Marsh bacharis	Toe to Mid Bank	Suitable, may need to control stem density over time
Bacharis salicifolia	Mulefat	Toe to Mid Bank	Suitable, may need to control stem density over time
Calycanthus occidentalis	Western spicebush	Toe to Mid Bank	Suitable, may need to control stem density over time
Cornus sericea	Stream dogwood	Toe to Mid Bank	Suitable, may need to control stem density over time

Corylus cornuta californica	California Hazelnut	Mid to Upper Bank	Suitable, adds diversity and forage
Holodiscus dicolor	Toyon	Upper Bank	Suitable, adds diversity and forage
Rhamnus californica	Coffeeberry	Upper Bank	Suitable, adds diversity and forage
Rosa californica	California wild rose	Toe to Upper Bank	Suitable, may need to control stem density over time
Symphoricarpos albus laevigatus	Snowberry	Mid to Upper Bank	Suitable, adds diversity and forage
Sambucus mexicana	Blue elderberry	Upper Bank	Suitable, adds diversity and forage, may need to control stem density over time
Rubus Ursinus	California blackberry	Toe to Mid Bank	Possible Himalayan blackberry competitor
Grasses/Sedges			
Carex barbarae	Santa Barbara sedge	Toe to Upper Bank	Rhizomatous, excellent soil binder
Carex nudata	Torrent Sedge	Toe to In-Channel	Use in higher gradient gravel and cobble substrate
Eleocharis macrostachya	Pale spikerush	Toe to In-Channel	Rhizomatous
Elymus glaucus	Blue wild rye	Mid to Upper Bank	Clumping heavy seeder
Festuca californica	California fescue	Mid to Upper Bank	Rhizomatous, excellent soil binder
Juncus effusus	*Pacific Rush*	Toe to In-channel	Clumping heavy seeder
Juncus patens	Common Rush	Toe to In-Channel	Clumping heavy seeder
Hordeum brachyantherum	Meadow barley	Toe to Mid Bank	Tufted, heavy seeder
Leymus triticoides	Creeping wild rye	Toe to Upper Bank	Rhizomatous, excellent soil binder
Leersia oryzoides	Rice cut grass	In-Channel	Possible cattail competitor

NAPA COUNTY FLOOD CONTROL AND WATER

CONSERVATION DISTRICT AGREEMENT NO. NCFCWCD ______

(STREAMBANK COST SHARING AGREEMENT)

Project Name: OWNER NAME – CREEK NAME Bank Repair

Owner: OWNER FULL NAME

APN: ______________________________

Site Address: __________________________________

THIS AGREEMENT ("Cost-Sharing Agreement") is made and entered into as of this ___ day of ____, ____, by and between the NAPA COUNTY FLOOD CONTROL & WATER CONSERVATION DISTRICT ("DISTRICT") and the persons and/or entities ("OWNER") listed above as the owner(s) of Napa County Assessor's Parcel No. ______________________ ("the Property");

RECITALS

This Cost-Sharing Agreement is made in recognition by DISTRICT and OWNER of the following facts:

1. OWNER owns the Property and has the authority to enter into this Agreement and to be bound by the terms hereof.

2. DISTRICT, by action of its Board of Directors at a regular meeting on June 8, 2010, approved modifications to the District Engineer's policy guidelines ("Policies and Guidelines") that were originally adopted on April 1, 1997 for a program providing property owners reimbursement of a portion of the costs of designing, permitting, repairing and restoring damaged river and stream banks under the circumstances, terms and conditions set forth in Exhibit "A", attached hereto and incorporated by reference herein.

3. DISTRICT has budgeted funds for such eligible cost sharing assistance and the District Engineer is authorized to determine eligibility and enter into an agreement with OWNER, pursuant to the policies mentioned above.

4. River and stream bank damage suffered on the Property as a consequence of floods can be repaired or remedied through a project ("Project") of reconstruction and stabilization meeting the eligibility requirements of the Policies and Guidelines, the project description, plans and specifications ("Plans and Specifications") of which, prepared by a licensed engineer or qualified landscape profession retained by OWNER, are set forth in Exhibit "B", attached hereto and incorporated by reference herein.

5. Having obtained at least two bids from a duly licensed contractor for completion of the Project in accordance with the Plans and Specifications and an estimate of Project costs based thereon, OWNER has requested, as shown on Exhibit "C", attached hereto and incorporated by reference herein, and DISTRICT is willing to enter into this Cost-Sharing Agreement for the funding by DISTRICT, depending on the type of project, up to 75% of the costs of the Project, in accordance with the Policies and Guidelines on a reimbursement basis, with all initial outlays being made by OWNER.

TERMS

NOW, THEREFORE, DISTRICT and OWNER agree as follows

1. OWNER shall be solely responsible for all payments due or owing to any person or entity for services performed or materials provided in connection with completion of the Project. No reimbursement of OWNER by DISTRICT for any of the costs of the Project shall be made by DISTRICT until all work is complete and documentation of the actual costs and payment therefore has been provided to DISTRICT as set forth in (3), below.

2. OWNER hereby grants DISTRICT, its representatives, and the representatives of any agency issuing permits for or otherwise having jurisdiction over the Project a right of entry onto the Property as well as a right of entry onto and right of passage over any other land owned or within the legal possession of OWNER where deemed necessary by DISTRICT or such agency to obtain access to the sites of the Project on the Property. In addition to granting such right of entry, OWNER shall cooperate with all such agencies and representatives in the accomplishment of the Project.

3. Upon receipt by DISTRICT's Engineer of a notice of completion and a written claim completed on a form satisfactory to the DISTRICT Engineer and DISTRICT Auditor, and depending on the nature of the project, an amount equal to 50 or 75% of the actual, documented construction costs, but not to exceed $30,000 in total, shall be reimbursed by DISTRICT to OWNER.

4. OWNER shall retain and make available to DISTRICT for copying and inspection upon request all records pertaining to the design, construction, completion, maintenance and costs of the Project for at least five years following completion of the Project as signified in the notice of completion.

5. Except for the designation of an individual to act as a liaison pursuant to this Cost-Sharing Agreement, to the extent that DISTRICT makes any commitments, assumes any responsibility, or is required to perform any act under the terms of this Cost-Sharing Agreement or the underlying public law, such commitments, responsibilities and performances shall become the responsibility of OWNER.

6. OWNER agrees that the Project shall be conducted and completed in accordance with the Plans and Specifications. To the extent that any changes in such work or the Plans and Specifications become necessary in the opinion of either OWNER or DISTRICT, OWNER agrees to be bound by, and to pay OWNER's share of the cost of any such changes and to be solely responsible for retaining any licensed engineers, contractors or other professionals necessary to design and/or implement.

7. OWNER specifically acknowledges that any delays or stoppages effecting the commencement or completion of the Project shall not result in any further responsibility of DISTRICT and,

to the extent DISTRICT has or claims to have, an obligation to third parties under this Cost-Sharing Agreement, such obligation shall become the obligation of OWNER.

8. OWNER hereby agrees to indemnify, save and hold DISTRICT harmless from any claims, losses, judgment or expense, including reasonable attorneys' fees, arising from the work undertaken to complete the Project, the design of the Project, or the subsequent use or maintenance of the Project.

9. OWNER and DISTRICT mutually acknowledge that, while the partial public reimbursement of OWNER for costs incurred in completion of the Project serves in part a public purpose through facilitating and expediting remediation of a possible threat to public as well as private resources in the event of future flooding events, nevertheless it is the intention of the parties that OWNER shall have sole responsibility for ownership, design, contracting, oversight, control, and completion of the Project; that nothing in this Cost-Sharing Agreement shall convey to DISTRICT any easement or property rights to the Property or Project; that nothing in this Cost-Sharing Agreement shall imply or be interpreted so as to result in the Project being deemed a "public project", "public contract", or DISTRICT project for any purposes, including but not limited to laws pertaining to competitive bidding or payment of prevailing wages on public projects, permit exemptions, tax exemptions, or public liability; and that nothing in this Cost-Sharing Agreement shall impose on DISTRICT any responsibility for future use or maintenance of the Project.

IN WITNESS WHEREOF, this Agreement was executed by DISTRICT and OWNER as

of the date first above written.

FIRST NAME LAST NAME and FIRST NAME LAST NAME

By:____________________________________

"OWNER"

NAPA COUNTY FLOOD CONTROL AND

WATER CONSERVATION DISTRICT

APPROVED AS TO FORM

Office of District Counsel

By: ______________________

Date: ____________________

By:____________________________________

Phillip M. Miller , P.E., District Engineer

"DISTRICT"

EXHIBIT A

Napa County Flood Control and Water Conservation District Stream Bank Stabilization Program

Do you own property with or along a creek? Is the creek eroding or undermining your property? The Flood Control District has a program that can help you permanently stabilize stream banks affecting your property. Contact Shaun Horne at the Flood Control District at (707) 259-8624 for more information or to apply.

ELIGIBILITY POLICIES

1. Property must be ***privately owned***.
2. The Owner must ***not be eligible for financial assistance from any other known grant funds*** for bank repairs or the removal of invasive non-native plants and the restoration of native plants. District staff will assist the owner in making this determination, and if necessary, put the owner in contact with the appropriate agency.
3. A professional engineer must design structural repairs. Qualified landscape professionals in consultation with the local office of the United States Department of Agriculture / Natural Resources Conservation Service (USDA/NRCS) may design non-structural or bio-engineered repairs. Such designs must utilize stream assessment protocols established by the NRCS/NCRCD, and meet “Stream Corridor Improvement” practice standards. In either case ***the installation is to be performed by a licensed contractor.***
4. The ***Owner must agree to maintain the resulting improvements and*** keep them up to standards acceptable to the District and all agencies issuing permits for the repair and restoration project. The owner must also agree to allow the District access for inspection purposes on an annual basis for up to five (5) years.
5. The ***stream bank must show evidence of serious erosion, or*** in the opinion of District or NRCS staff, have the very ***real potential of serious erosion*** occurring during high flows if left unprotected, or have the presence of significant amounts of invasive non-native plants. Protective measures shall be those that are deemed to be permanent in nature.

IMPLEMENTATION POLICIES

1. ***Owner must apply to the District for assistance prior to making permanent repairs or improvements. District will not reimburse Owner for work done prior to the District’s granting of written authorization to proceed.***
2. Upon receipt of a written request to participate in the District’s program, District staff will perform a field check with Owner to check the severity of the stream bank erosion, potential for erosion or the significant presence of invasive non-native plants.
3. District staff will then make a determination of Owner eligibility.
4. Owner will be required to enter into an agreement with the District identifying the obligations of both parties. The District Engineer is authorized to execute said agreements on behalf of the District.

5. ***<u>Owner shall be responsible for contracting with a professional engineer or qualified landscape professional for the preparation of plans, specifications, cost estimates and construction inspection.</u>***
6. Plans will be reviewed and approved by District staff and shall conform to the Standards that the District uses for similar projects under District jurisdiction and ownership.
7. ***<u>Owner shall be responsible for hiring a licensed contractor</u>*** to construct the repairs and improvements in accordance with the approved plans and specifications.
8. ***<u>Owner shall obtain all legally required permits and /or licenses from federal, state and local regulatory agencies and agrees to complete all permit required monitoring and reporting. Non-compliance with permit conditions may result in District's refusal to reimburse Owner's costs, depending on the nature of the non-compliance and at the sole discretion of the District Engineer.</u>***
9. District shall reimburse Owner upon:
   a. Receipt of a statement from the Engineer or qualified landscape professional that the work was performed in substantial conformance to the regulatory agency permits, and approved plans and specifications, including all required mitigation planting etc.

   b. Receipt of evidence that the contractor has been fully paid, indicating the amount that was paid for the eligible work. This should be in the form of a signed letter or final zero balance invoice sent to the District by the contractor or copies of canceled checks and

   c. A final inspection of the completed project by Flood District staff.

10. ***<u>District funds shall be used to reimburse Owner for 50% of the cost of construction and other related expenses such as permit fees, design costs and construction inspection, up to a maximum amount of $30,000. Designs that utilize bioengineering techniques, as defined below, will be reimbursed 75% of the aforementioned costs.</u>***
11.

    <u>Bioengineering construction methods are those that incorporate structural repairs with native vegetation and are designed to protect and enhance the riparian environment. Bioengineered methods are designed to work with the natural geomorphic conditions in a stream versus to control erosion by simply armoring the stream bank. Generally, a setback of active land use at the top of the stream bank is also encouraged whenever possible. Approval of the Project for the higher reimbursement percentage (75% versus 50%) will be based on the sole discretion of the District Engineer.</u>

    <u>Projects involving only non-native invasive vegetation removal and replanting with native plants (no regarding of streambank or armoring) will be reimbursed at 50%.</u>

12. Completed projects shall be maintained by owner to standards acceptable to the District.
13. District shall be granted access rights to inspect the facility at any time during and after construction.
14. Project approvals shall be granted on a 'first come, first served' basis determined by the date that the Owner signs the Project Agreement. Project approval will be revoked if construction has not been completed within one (1) year of the date the Owner signs the Project Agreement. District Engineer has the authority to grant an extension of time if Owner can demonstrate that he/she has proceeded with due diligence and that factors beyond his/her control have delayed the project.

15. The District Engineer is authorized to execute agreements committing no more than the total amount of money budgeted in any given fiscal year. He can also establish a waiting list of Project Agreements that have been signed by Owners in order to continue the 'first come, first served' policy. Owners who wish to proceed in advance of the District's commitment of funds will be eligible for reimbursement only if funding eventually becomes available; said funding extends to their place on the waiting list; and if they have followed all program criteria. District staff is authorized to assist Owners on the waiting list as they would Owners with funded projects, to review and approve plans and do project inspection. The reason for this is to give incentive to Owners to make repairs before the next rainy season, rather than wait for the next year's budget appropriation. The waiting list will also assist the Board in measuring the demand for this program.

Appendix K

Sediment Sampling and Analysis Guidelines

Appendix K: Sediment Sampling and Analysis Guidelines

Introduction

These sediment sampling and analysis guidelines accompany the description of sediment disposal in Chapter 7 of the Stream Maintenance Manual (Manual), and identify disposal options based on characteristics of the sediment. Guidance is provided for identifying sediment sampling frequency, sampling methodology, sediment analysis, and other sediment characterization activities. Sediment sampling, disposal, monitoring, and reporting conditions issued by the San Francisco Bay Regional Water Quality Control Board (RWQCB) under the forthcoming Waste Discharge Order (No. R2-2019-XXXX) are included by reference and as guided by the "Beneficial Reuse of Dredged Materials: Sediment Screening and Testing Guidelines" developed by the RWQCB in May 2000, U.S. EPA Guidelines and sampling methodologies, and sampling parameters provided by the RWQCB in March 2018. The sediment sampling and disposal process will be coordinated annually between the RWQCB and the Napa County Flood Control and Water Conservation District (District) as part of the review and approval process for annual stream maintenance and disposal activities.

Sediment Disposal

Sediment disposal sites will be identified when the need for sediment removal activities arise; sediment removal and disposal activities may not be necessary every year. Sediment disposal sites will be reviewed and approved by the RWQCB based on analytical results from sediment sampling at the channels to be maintained and in consideration of the ultimate fate of the sediment. The conditions for approval will evolve as the RWQCB and District become familiarized with the characteristics of sediment removed as part of maintenance activities and with sediment disposal and reuse conditions.

In general, sediment disposal sites can be characterized into five categories based on potential reuse or disposal opportunities. These categories include (1) on-site reuse, (2) other wetland, channel, or floodplain restoration reuse, (3) upland agricultural or commercial reuse (dry), (4) landfill disposal, and (5) hazardous waste disposal options. These disposal options are listed below in preferential order according to how well they support program objectives for ecologic sustainability.

- **Option 1: On-site reuse.** This includes reusing the sediment on-site (i.e., at the project site) within the channel or easement area for various fill or restoration purposes. For example, sediment excavated from the channel bottom could be placed adjacent to the active channel (remaining within the easement area), to enhance soil, vegetation, and riparian habitat conditions. Sediment could also be used on-site for bank stabilization purposes.
- **Option 2: Wetland, channel, or floodplain restoration or enhancement.** Option 2 consists of beneficial reuse of the sediment outside or off-site of District channel or easement areas, but in a wetland, channel, or floodplain setting to support ecologic functioning and habitat. As examples, gravel removed from one creek that does not support steelhead or salmonids could be placed in another creek that does in order to enhance salmonid habitat. Additionally, excavated sediment could be reused as part of habitat enhancement activities along the Napa River mainstem.

  Under this option, sediment would be used as fill in an already approved and permitted restoration project. This is a specific case where an approved and permitted project requires the use of sediment to fill a wetland or enhance in-stream habitat. It is important to note that this sediment disposal plan in no way encourages or sanctions the filling of existing wetlands. However, for restoration projects that are already approved and permitted, it may be preferable to use sediment materials that share similar properties. In this way, using good quality excavated channel sediment for reuse in a wetland, channel, or floodplain setting may be preferable or advantageous to using other fill material or soils.

For the purposes of the sediment quality criteria discussed below, Option 2 sites are located in the vicinity of and potentially drain to wetlands or water bodies.

- **Option 3: Upland agricultural or commercial reuse (dry upland sites).** Under this option, sediment would be reused for upland agricultural or commercial uses that are dry, whereby the sediment would not be secondarily eroded to stream channels or water bodies. Demand for dry sediment is high, particularly for use as soil amendment for agricultural crops, construction of foundation pads for buildings or structures, or permanent fill of pits or to level the landscape. It is likely that upland disposal sites within Napa County will be frequently available and can accept large quantities of sediment.

- **Option 4: Landfill disposal.** In this option the sediment would be disposed at an approved and operating landfill for use as daily cover material for landfill operations. The nearest operating landfills are the Upper Valley Disposal and Recycling (UVDS) Clover Flat Landfill located in St. Helena and the Potrero Hills Sanitary Landfill in Suisun City. Another landfill disposal option is the Redwood Landfill located in Novato. Sediment would be taken to the nearest landfill in need of cover material.

  The District, in conjunction with the City of Napa and the U.S. Army Corps of Engineers, maintains two sediment disposal sites in the southern portion of the county. These are the Edgerly Island Disposal Site and the Napa Sanitation District Imola Site (described in Chapter 10 of the Manual). Both sites are approved by the USACE to receive sediment spoils from dredging of the Napa River and other sites within the county. The Edgerly Island Disposal Site has the capacity to receive up to 330,000 cu. yds. of sediment and has only been used once; the site is nearly empty. The Napa Sanitation District Imola Site has the capacity to receive up to 50,000 cu. yds. of sediment and has not been utilized since 2016. Both sites operate under Waste Discharge Requirements (WDRs) issued by the RWQCB.

- **Option 5: Hazardous waste disposal.** This option involves the disposal of sediments containing hazardous levels of contaminants. Hazardous waste will be disposed at appropriate hazardous waste facilities. The nearest hazardous waste landfill is located in Kettleman City, California.

These five disposal options will be evaluated in decreasing preference with potential site selection based on the quality of sediment. The preference is to select disposal options that most beneficially reuse the sediment with the least environmental effects.

It is anticipated that off-site disposal (Options 3 and 4) would be proposed for the majority of maintenance activities. Disposal Option 2 would be implemented on rare occasions due to the infrequency of sediment removal and the specific needs of other pre-approved restoration projects in the County. Option 5 would only be used if the sediment is deemed hazardous. The specific disposal sites for the options selected will be identified as part of the sediment planning process and approved by the RWQCB prior to maintenance.

Sample Analysis Approach

All sediment samples will be analyzed according to the forthcoming conditions of the RWQCB Waste Discharge Requirements - Monitoring and Reporting Program (Order No. R2-2019-XXXX). Sampling parameters/analytes may be modified after a history of sampling is obtained. This may result in not requiring monitoring for some of these contaminants under certain situations or at certain locations, or the addition of more parameters/analytes if deemed necessary by the RWQCB.

Analytes tested will vary depending on the proposed reuse of the sediment, as follows.

- If sediment is reused on-site (Option 1), no testing is required because it is assumed the sediment quality would be comparable to existing conditions at the location of on-site reuse.
- If sediment is reused for wetland, channel, or floodplain restoration, where the newly placed sediment would be in contact with water bodies (Option 2), analysis would be conducted according to the "wetland surface" testing requirements stated in the *Beneficial Reuse of Dredged Materials: Sediment Screening and Testing Guidelines* (RWQCB 2000). Required analysis includes sediment chemistry and acute toxicity testing.
- If sediment is reused for upland agricultural or commercial use where dry sediment would be permanently removed from the system (i.e., there would be no contact with water bodies), then analytes listed in Table 1 would be tested. This analyte list was provided to District by RWQCB staff in March 2018.
- If sediment is taken to a landfill for use as cover material or to the Edgerly Island Disposal Site or the Napa Sanitation District Imola Site, sediment quality testing would be conducted as required by RWQCB permits issued to those sites and in compliance with DTSC waste acceptance regulations.
- Sediment exhibiting levels in the hazardous range, as defined by the California Department of Toxic Substances Control (DTSC), would be taken to a permitted hazardous waste facility.

Sample Collection Frequency and Locations

- For sediment removal projects that involve the removal and disposal of less than 200 cubic yards of sediment, one sample will be collected and analyzed. Details on the methodology used to collect and composite samples are described below.

- For sediment removal projects that require the removal and disposal of more than 200 cubic yards of sediment, one sample will be collected for every increment of 500 cubic yards of sediment to be removed (beyond the original 200 cubic yards). Details on the methodology used to collect and composite samples are described below.

- Sampling locations will be selected to represent overall sediment conditions at the maintenance site. Sampling sites will be selected to target conditions at the upstream and downstream ends of the project zone. As is feasible, sampling sites will also specifically target conditions downstream of culvert crossings, culvert outfalls, and key stream confluences.

Sediment Sampling Methodology

This guidance applies to discrete (single) samples and composite samples. All samples shall be collected by means of a hand trowel, a hand auger, or another sampling method approved by the regulatory agencies. The individual collecting the sample will have the discretion of choosing the sampling method which is the most efficient to perform.

All sampling equipment will be decontaminated using Alconox© soap and rinsing with distilled or de-ionized water. Latex-free gloves will be worn when handling cleaned equipment. Sampling will be conducted in accordance with the methods described below:

Hand Trowel Procedure

1. Remove vegetation and woody debris from the ground surface.
2. If collecting a subsurface sample, use a shovel to dig down to the desired sampling interval.
3. Use a stainless steel hand trowel to collect soil.
4. Place soil in an appropriate sampling container.
5. Replace all excavated soils to their original location (i.e., backfill the sampling hole).

Hand Auger Procedure

1. Remove vegetation and woody debris from the ground surface.
2. Use the hand auger to advance down to the top of the sampling interval.
3. Use a hand auger to collect soil from the desired depth.
4. Use a clean (decontaminated) tool to scoop the soil out of the auger and place in an appropriate sampling container.
5. Replace all excavated soils to their original location (i.e., backfill the sampling hole).

Composite Sediment Sampling

Discrete sediment samples will be collected from multiple locations to represent the entire wedge of sediment designated for removal using a hand trowel or auger. Discrete samples will be composited into one sample by mixing the soil in a decontaminated contained, then filling the sampling jars. Laboratory analyses will be performed on the composite sample.

Sampling Depth

The sampling depth will be determined in the field. At each sampling location, the staff collecting the samples shall make an estimate of the depth of the sediment using visual clues and/or existing data. Sediment samples shall be collected at the surface and at 1 ft. intervals down to a maximum 3 ft level. In the event that the depth of the sediment is less than 1 foot, then the sample shall be collected at the surface. Samples will be collected up to a maximum depth of 3 feet because collection of samples below that depth is prohibitively difficult due to the finite strength of the individual collecting the sample, and the wet properties of the sediment, which may cause a borehole to collapse. In some locations it may even be infeasible to collect a sample at 3 feet bgs due to the unstable nature of the sediments or grain size (gravels or cobbles too large or compacted to sample). In the event that it is infeasible to collect a sample at the depth interval specified, the sample shall be collected at the deepest interval possible (using 1/2 foot increments). Also note that the maximum depth at the majority of sediment removal sites is not greater than 3 feet because sediment is removed at this threshold due to the significant reduction in channel conveyance capacity which occurs when sediment is accumulated higher than 3 feet.

Other Sediment Sampling Details

In general, samples will be taken from the finest sediment at a sampling site and every attempt will be made to collect sediments that are representative of the materials to be removed. Most contaminants are associated with fine-grained sediment, and it is therefore important that some of the samples contain the finest sediment that is present at a given project site. Fine sediments include mud, silts, and finer sandy materials. A suitable field test for grain size is to rub sediments between the fingers: finer sediments will feel smooth, whereas coarser sediments will be gritty (SWRCB 2008). Note that in many of Napa County channels, the grain size of accumulated sediments is larger, in the large sand and small gravel ranges. Contaminants are less apt to sorb onto larger sized materials.

Observed Contamination and Results That Exceed Water Quality Criteria

For all projects, any observed contamination as evidenced by chemical-like odors, oily sheens, or irregularly colored sediment would be immediately reported to the local fire department's hazardous materials team and the appropriate RWQCB staff person in the Cleanups and Investigations Unit. The RWQCB will direct the District on how to handle and remove potentially hazardous sediment.

In addition, if sediment test results are found to exceed water quality criteria, the District will coordinate with the RWQCB to develop an action plan to properly handle and dispose of the sediment. Under the guidance of the RWQCB, the sediment removal activity may proceed according to the action plan or the maintenance activity may not be conducted.

Sediment Disposal Best Management Practices

Sediment Disposal Best Management Practices are discussed in Chapter 4 of the Manual and in Table 4-1, Stream Maintenance Best Management Practices.

Reporting of Sediment Sampling Results

The District will maintain records of field sampling methods, locations, depths, analysis, and results.

The District will submit complete laboratory sediment sampling results to the RWQCB when sediment removal activities are proposed.

TABLE 1: Sediment Sampling Analyte List

EPA Test Method[1]	Analyte	Reporting Limit for Soil[2] (mg/kg)	Analyte (cont.)	Reporting Limit for Soil (mg/kg)
9045	pH	pH Units		
6010/ CAM 17	Metals			
	Antimony (total)	1.1	Lead (total)	1.1
	Antimony (soluble)	1.0 mg/l	Lead (soluble)	0.50 mg/l
	Arsenic (total)	0.086	Mercury (total)	0.10
	Arsenic (soluble)	0.10 mg/l	Mercury (soluble)	0.10 mg/l
	Barium (total)	0.13	Molybdenum (total)	0.36
	Barium (soluble)	1.0 mg/l	Molybdenum (soluble)	0.10 mg/l
	Beryllium (total)	0.11	Nickel (total)	1.1
	Beryllium (soluble)	0.050 mg/l	Nickel (soluble)	0.10 mg/l
	Cadmium (total)	0.12	Selenium (total)	0.074
	Cadmium (soluble)	0.10 mg/l	Selenium (soluble)	0.10 mg/l
	Chromium (total)	0.66	Silver (total)	0.33
	Chromium (soluble)	0.10 mg/l	Silver (soluble)	0.10 mg/l
	Cobalt (total)	0.30	Thallium (total)	1.1
	Cobalt (soluble)	1.0 mg/l	Thallium (soluble)	0.10 mg/l
	Copper (total)	0.26	Vanadium (total)	0.55
	Copper (soluble)	0.10 mg/l	Vanadium (soluble)	0.10 mg/l
	Fluoride (total)	1.0	Zinc (total)	2.4
			Zinc (soluble)	0.50 mg/l
8081	Organochlorine Pesticides			
	Aldrin	0.0050	Endosulfan I	0.0050
	α-HCH (hexachlorocyclohexane)	0.0050	Endosulfan II	0.0050
	β-HCH	0.0050	Endosulfan sulfate	0.0050
	γ-HCH (Lindane)	0.0050	Endrin	0.0050
	δ-HCH	0.0050	Endrin aldehyde	0.0050
	Chlordane (tech)	0.20	Heptachlor	0.0050
	4,4'-DDD	0.0050	Heptachlor epoxide	0.0050
	4,4'-DDE	0.0050	Kepone	1.0
	4,4'-DDT	0.0050	Methoxychlor	0.0050
	Dieldrin	0.0050	Mirex	0.10
			Toxaphene	0.20
8141	Organophosphorus Pesticides			
	Azinphos-ethyl	0.10	Famphur	0.10
	Azinphos-methyl	0.10	Fenthion	0.025
	Bolstar (Sulprofos)	0.050	Malathion	0.025
	Chlorpyrifos	0.025	Mevinphos	0.050
	Coumaphos	0.10	Parathion, ethyl	0.025

[1] The most recent version of EPA's Test Methods for Evaluating Solid Waste, Physical/Chemical Methods", also known as SW-846, will be used.

[2] All laboratory analytical reports will include the detection and reporting limits, any flags, and a QA/QC report. Electronic (PDF) submittals are preferred.

EPA Test Method[1]	Analyte	Reporting Limit for Soil[2] (mg/kg)	Analyte (cont.)	Reporting Limit for Soil (mg/kg)
	Demeton-O	0.050	Parathion, methyl	0.025
	Demeton-S	0.050	Phorate	0.025
	Diazinon	0.025	Ronnel	0.050
	Dichlorvos (DDVP)	0.050	Simazine	0.050
	Dimethoate	0.10	Stirophos	0.025
	Disulfoton	0.025	Thionazin	0.050
	EPN	0.050	Tokuthion	0.050
	Ethion	0.025	Trichloronate	0.0050
	Ethoprop	0.050		
8082	Polychlorinated biphenyls (PCBs)			
	Aroclor 1016	0.20	Aroclor 1242	0.20
	Aroclor 1221	0.20	Aroclor 1248	0.20
	Aroclor 1232	0.20	Aroclor 1254	0.20
			Aroclor 1260	0.20
8260	Volatile Organic Compounds (VOCs)			
	Acetone	0.020	1,1-Dichloropropene	0.0050
	Benzene	0.0050	cis-1,3-Dichloropropene	0.0050
	Bromobenzene	0.0050	trans-1,3-Dichloropropene	0.0050
	Bromochloromethane	0.0050	Ethylbenzene	0.0050
	Bromodichloromethane	0.0050	Hexachlorobutadiene	0.0050
	Bromoform	0.0050	Isopropylbenzene	0.0050
	Bromomethane	0.0050	p-Isopropyltoluene	0.0050
	n-Butylbenzene	0.0050	Methyl ethyl ketone	0.015
	sec-Butylbenzene	0.0050	Methyl isobutyl ketone	0.010
	tert-Bertylbenzene	0.0050	Methyl tert-butyl ether (MTBE)	0.0050
	Carbon tetrachloride	0.0050	Methylene chloride	0.0050
	Chlorobenzene	0.0050	Naphthalene	0.0050
	Chloroethane	0.0050	n-Propylbenzene	0.0050
	Chloroform	0.0050	Styrene	0.0050
	Chloromethane	0.0050	1,1,1,2-Tetrachloroethane	0.0050
	2-Chlorotoluene	0.0050	1,1,2,2-Tetrachloroethane	0.0050
	4-Chlorotoluene	0.0050	Tetrachloroethene	0.0050
	Dibromochloromethane	0.0050	Toluene	0.0050
	1,2-Dibromo-3-chloropropane	0.0050	1,2,3-Trichlorobenzene	0.0050
	1,2-Dibromoethane	0.0050	1,2,4-Trichlorobenzene	0.0050
	Dibromomethane	0.0050	1,1,1-Trichloroethane	0.0050
	1,2-Dichlorobenzene	0.0050	1,1,2-Trichloroethane	0.0050
	1,3-Dichlorobenzene	0.0050	Trichloroethene	0.0050
	1,4-Dichlorobenzene	0.0050	Trichlorofluoromethane	0.0050
	Dichlorodifluoromethane	0.0050	Trichlorotrifluoroethane	0.0050
	1,1-Dichloroethane	0.0050	1,2,3-Trichloropropane	0.0050
	1,2-Dichloroethane	0.0050	1,2,4-Trimethylbenzene	0.0050
	1,1-Dichloroethene	0.0050	1,3,5-Trimethylbenzene	0.0050
	cis-1,2-Dichloroethene	0.0050	Vinyl chloride	0.0050
	trans-1,2-Dichloroethene	0.0050	m,p-Xylene	0.0050
	1,2-Dichloropropane	0.0050	o-Xylene	0.0050
	1,3-Dichloropropane	0.0050	Xylenes (total)	0.0050

EPA Test Method[1]	Analyte	Reporting Limit for Soil[2] (mg/kg)	Analyte (cont.)	Reporting Limit for Soil (mg/kg)
8270	Poly Aromatic Hydrocarbons (PAHs)			
	Acenaphthene	0.062	Dimethyl phthalate	0.33
	Acenaphthylene	0.062	4,6-Dinitro-2-methylphenol	1.6
	Anthracene	0.062	2,4-Dinitrophenol	1.6
	Benzidine	1.6	2,4-Dinitrotoluene	0.33
	Benzoic acid	1.6	2,6-Dinitrotoluene	0.33
	Benz(a)anthracene	0.33	1,2-Diphenylhydrazine	0.33
	Benzo(b)fluoranthene	0.062	Fluoranthene	0.062
	Benzo(k)fluoranthene	0.062	Fluorene	0.062
	Benzo(g,h,i)perylene	0.062	Hexachlorobenzene	0.33
	Benzo(a)pyrene	0.062	Hexachlorobutadiene	0.33
	Benzyl alcohol	0.66	Hexachlorocyclopentadiene	1.6
	Bis(2-chloroethoxy) methane	0.33	Hexachloroethane	0.33
	Bis(2-chloroethyl) ether	0.33	Indeno(1,2,3-cd)pyrene	0.062
	Bis(2-chloroisopropyl) ether	0.33	Isophorone	0.33
	Bis(2-ethylhexyl) phthalate	0.33	2-Methylnaphthalene	0.062
	4-Bromophenyl phenyl ether	0.33	2-Methylphenol (o-cresol)	0.33
	Butyl benzyl phthalate	0.33	3 & 4 –Methylphenol (m,p-cresol)	0.33
	4-Chloroaniline	0.66	*N*-Nitrosodi-*n*-propylamine	0.33
	4-Chloro-3-methylphenol	0.33	*N*-Nitrosodimethylamine	0.66
	2-Chloronaphthalene	0.33	*N*-Nitrosodiphenylamine	0.33
	2-Chlorophenol	0.33	Naphthalene	0.062
	4-Chlorophenyl phenyl ether	0.33	2-Nitroaniline	1.6
	Chrysene	0.010	3-Nitroaniline	1.6
	Dibenz(a,h)anthracene	0.062	4-Nitroaniline	1.6
	Dibenzofuran	0.33	2-Nitrophenol	1.6
	Di-n-butyl phthalate	2.0	4-Nitrophenol	1.6
	Di-n-octyl phthalate	0.33	Nitrobenzene	0.33
	1,2-Dichlorobenzene	0.33	Pentachlorophenol	1.6
	1,3-Dichlorobenzene	0.33	Phenanthrene	0.062
	1,4-Dichlorobenzene	0.33	Phenol	0.33
	3,3'-Dichlorobenzidine	0.66	Pyrene	0.062
	2,4-Dichlorophenol	0.33	1,2,4-Trichlorobenzene	0.33
	Diethyl phthalate	0.33	2,4,5-Trichlorophenol	0.33
	2,4-Dimethylphenol	0.33	2,4,6-Trichlorophenol	0.33
8015[3]	Total Extractable Petroleum Hydrocarbons (TPHs)			
	TPH as Diesel	1.0		
	Motor Oil	2.0		
	Gasoline (1,4-Bromoflurobenzene)	1.0		
8290[4]	Dioxin	1.0 pg/g		
	Asbestos	1% (PLM EPA Qualitative Method) 0.005 to 0.001 (TEM by EPA Quantitative Method)		
GCMSSIM	Nonylphenol	0.2		

[3] The full list of TPHs will be reported with all peaks (rather than specific compounds).

[4] For dioxin/furans all congeners and their TEQs will be reported.

NOTE: this table is replicated from Table 4, "Discrete Sediment Sampling and Analysis" from the draft Monitoring and Reporting Program for City of American Canyon Stream Maintenance Program (RWQCB 2016)

Sediment Sampling Plan Development Guidelines

Sediment sampling plans will be developed to correspond with the forthcoming conditions of the RWQCB Waste Discharge Requirements - Monitoring and Reporting Program (Order No. R2-2019-XXXX). The plan will include a list of sediment removal projects planned for a given year, number of samples to be collected, locations of sampling (e.g., Google map), list of analytes proposed for testing at each site, and preliminary disposal/reuse locations. The plan may also incorporate previous testing results from prior years and adjustments to sampling and analysis methods to improve results. For each sediment removal project that involves disposing sediment in upland agricultural or commercial reuse areas, the District will sample all analytes listed in Table 1. The District proposes an exemption from further sediment testing for sites that have been tested two or more times with no exceedances of the U.S. EPA's reporting limits. Sediment removal projects that involve beneficial reuse of sediment must sample sediment in accordance with the RWQCB's *Beneficial Reuse of Dredged Materials: Sediment Screening and Testing Guidelines* (2000).

An example template for a sediment sampling plan is presented in Attachment 1.

Once completed, the sediment sampling plan will be submitted to the Regional Board for review. This may include an in-person meeting or conference call with the Regional Board. After receiving the Regional Board's approval of the sediment sampling plan, the District will then coordinate with their field crews or subconsultant to prepare for and conduct sampling and laboratory testing. A memorandum summarizing sampling results will be prepared after the lab results are complete.

References Cited

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San Francisco Bay Regional Water Quality Control Board (RWQCB). 2010. Water Quality Control Plan (Basin Plan) for the San Francisco Bay Basin (Region 2). Oakland, CA. Available: http://www.waterboards.ca.gov/sanfranciscobay/basin_planning.shtml

RWQCB. 2000. *Beneficial Reuse of dredged materials: sediment screening and testing guidelines. Draft Staff Report.* Available:

http://www.waterboards.ca.gov/sanfranciscobay/water_issues/available_documents/benreuse.pdf

U.S. Environmental Protection Agency (USEPA) 2008. *Regional Screening Levels (RSL) for Chemical Contaminants at Superfund Sites. RSL Table Update. Region 9.* September 12, 2008. Available: http://www.epa.gov/region09/waste/sfund/prg/pdf/master_sl_table_bwrun_12SEP2008.pdf

Attachment 1. Example Template for the SMP's Annual Sediment Sampling and Disposal Notifications

Memorandum

Subject: **Sediment Sampling and Disposal Notification for Napa County's Stream Maintenance Program**

[Date]

To: Agnes Farres, San Francisco Bay Regional Water Quality Control Board (SFBRWQCB)

From: Mike Gordon, Napa County Flood Control and Water Conservation District (District)
Rick Thomasser, District

This is the proposed sediment sampling and disposal plan for the District's 2018 Stream Maintenance Program (SMP) maintenance sites for review and approval by the SFBRWQCB (or Regional Board), as required under the Monitoring and Reporting Program, as part of Waste Discharge Requirements and Water Quality Certification Order No. R2-2019-XXXX.

1. Summary of SMP sampling efforts to date

Regulatory approval of the SMP by the SFBRWQCB was provided in August 2012 and most recently in 2019. SCWA has conducted sediment sampling at XX sites since [year]. The results of the sediment analysis have been submitted to the RWQCB each year. The attached Excel file (electronic) includes test results from all samples collected under the SMP since 2012 [District to attach].

2. Evaluation of Proposed [Year] Sediment Removal Sites

The sites listed below are proposed for sediment removal in 2019. Project designs for these projects will be submitted by the Water Agency as part of their 2019 Annual Notification.

1. [Site 1]
2. [Site 2]
3. [Site 3]
4. [Site 4]

The District requests an exemption from further testing for the following project sites that have been tested two or more times with negative exceedances or elevated anthropogenic background levels (see Table 1).

- Site 3
- Site 4

Table 1 summarizes past sampling efforts within 1,000 feet of proposed sediment removal locations, analyte exceedances, and the proposed testing plan.

Table 1. Evaluation of [Prior Year] Project Sites using Existing Sediment Results Compared to U.S. EPA Reporting Limit for Soil.

Project Site	**Previous Reach(s)**	**Previous Year Sampled**	**Analytes with Exceedance(s)**	**Previous Results** (mg/kg)	**EPA Reporting Limit for Soil** (mg/kg)	**High Background** (mg/kg)	**Exempt from Testing**	**Comment**
Site 1								Tested 1x, no exceedances
Site 2								Tested 1X, no exceedances
Site 3								Tested 2x, no exceedances
Site 4								Tested 2X, no exceedances

3. Proposed Sediment Sampling and Testing Plan for [YEAR]

Sampling plans for [year] project sites, including creek reach, removal volume, number of composite samples, and core sampling locations are presented in Table 2.

Table 2: Proposed Sediment Sampling Plan for [YEAR]

Maintenance Reach Number, Maintenance Scale (see SMP Manual for reach locations)	**Linear Feet of Sediment Removal**	**Estimated Amount of Sediment to be Removed** (cubic yards)	**Number of Samples to be Collected**	**Comments**
Site 1				[Description of where the core samples will be collected]
Site 2				[Description of where the core samples will be collected]

4. Sediment Disposal and Reuse Plan for 2019

[Description of sites proposed for sediment disposal and reuse (e.g., Edgerly Island, Imola Avenue, landfill, upland agricultural or commercial use, on-site, or beneficial reuse).]

Appendix L

Typical Plans for Napa County RCD's Road Maintenance Activities

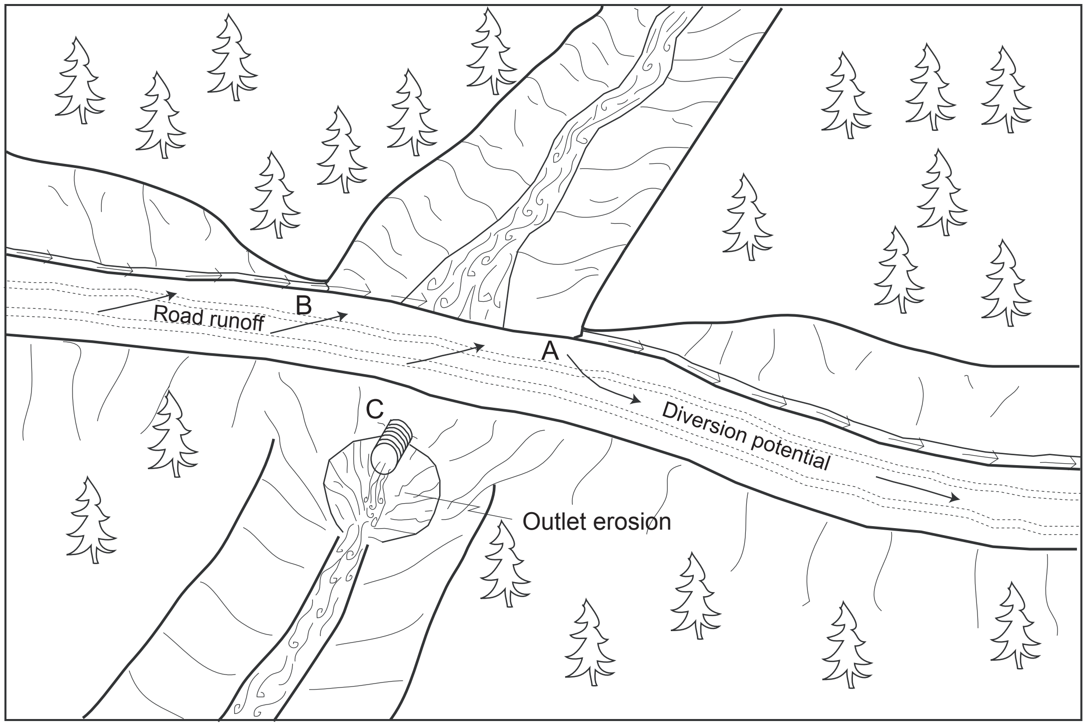
Typical Problems and Applied Treatments for a Non-fish Bearing Upgraded Stream Crossing

Problem condition (before)

A - Diversion potential

B - Road surface and ditch drain to stream

C - Undersized culvert high in fill with outlet erosion

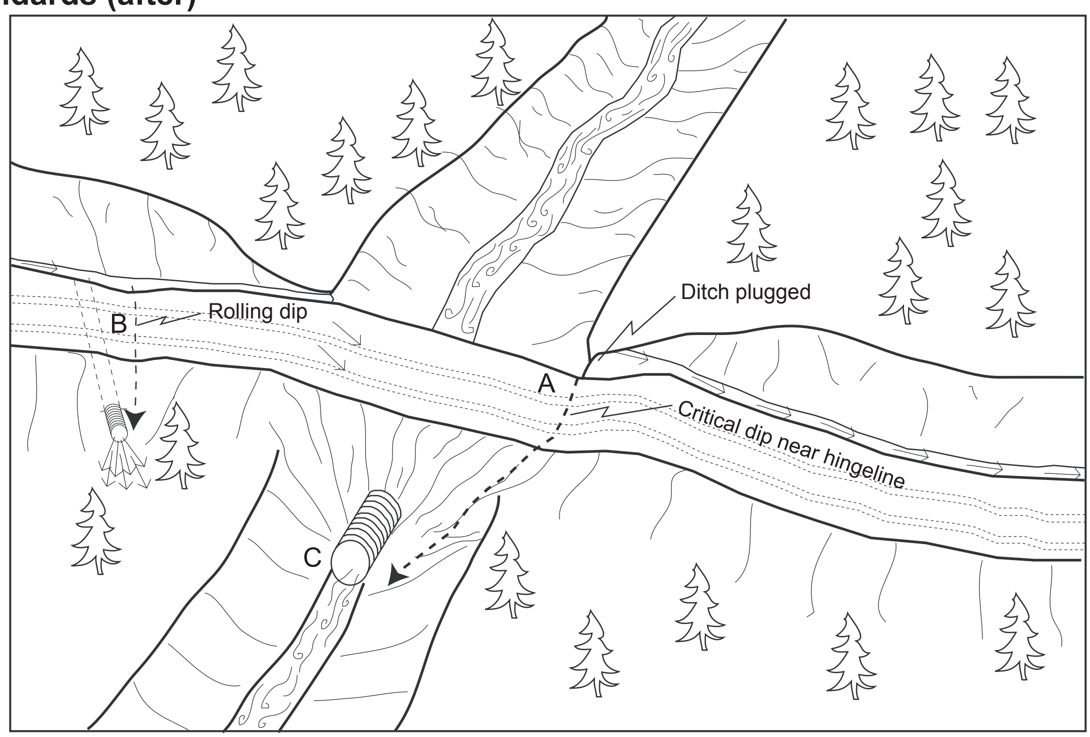


Treatment standards (after)

A - No diversion potential with critical dip installed near hingeline

B - Road surface and ditch disconnected from stream by rolling dip and ditch relief culvert

C - 100-year culvert set at base of fill



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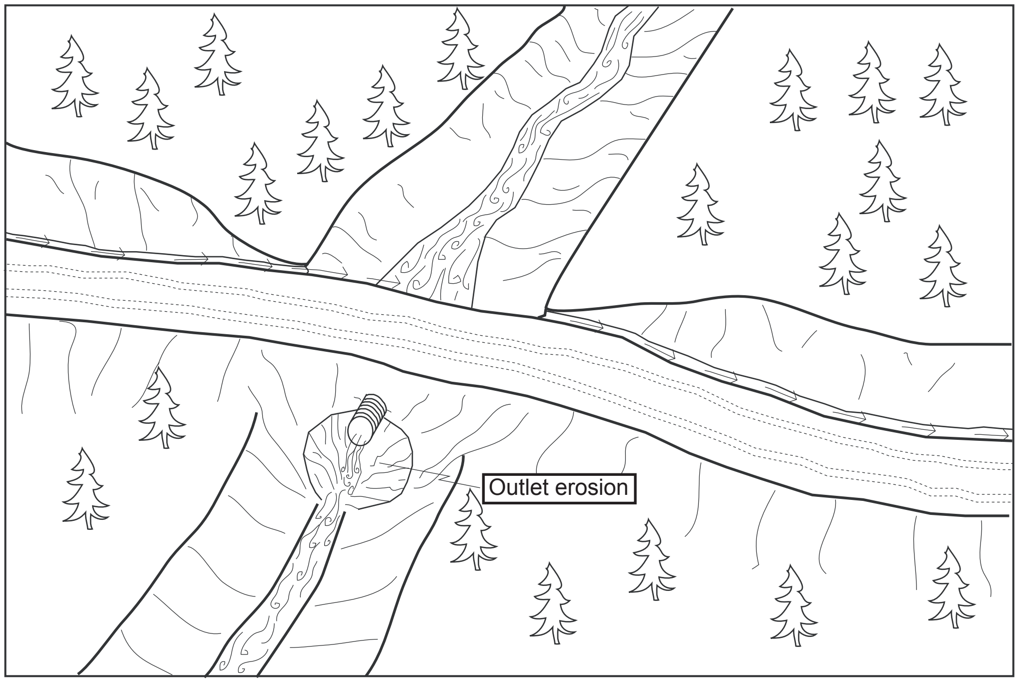
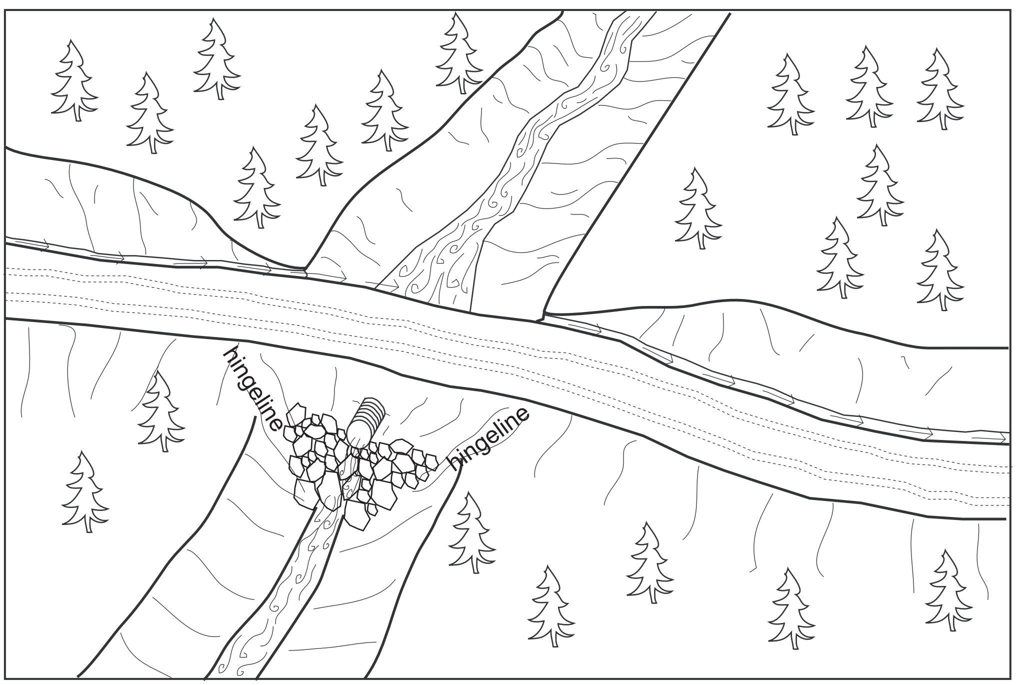
PWA Typical Drawing #1a

Armoring Fill Faces to Upgrade Stream Crossings



Problem: Culvert set high in outboard fill has resulted in scour of the outboard fill face and natural channel.
Conditions: The existing stream crossing has a culvert sufficient in diameter to manage design stream flows and has a functional life.



Action: The area of scour is backfilled with rip-rap to provide protection in the form of energy dissipation for the remaining fill face and channel.

Treatment Specifications:

1) Placement of rip-rap should be between the left and right hingelines and extend from a keyway excavated below the existing channel base level at the base of the fill slope up and under the existing culvert.
2) Rock size and volume is determined on a site by site basis based on estimated discharge and existing stream bed particle size range (See accompanying road log).

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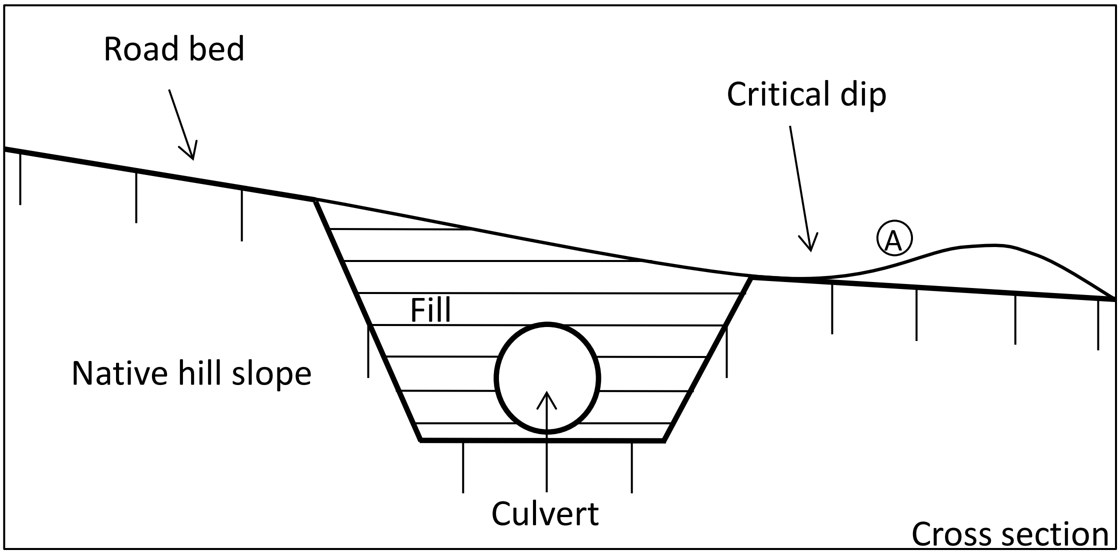
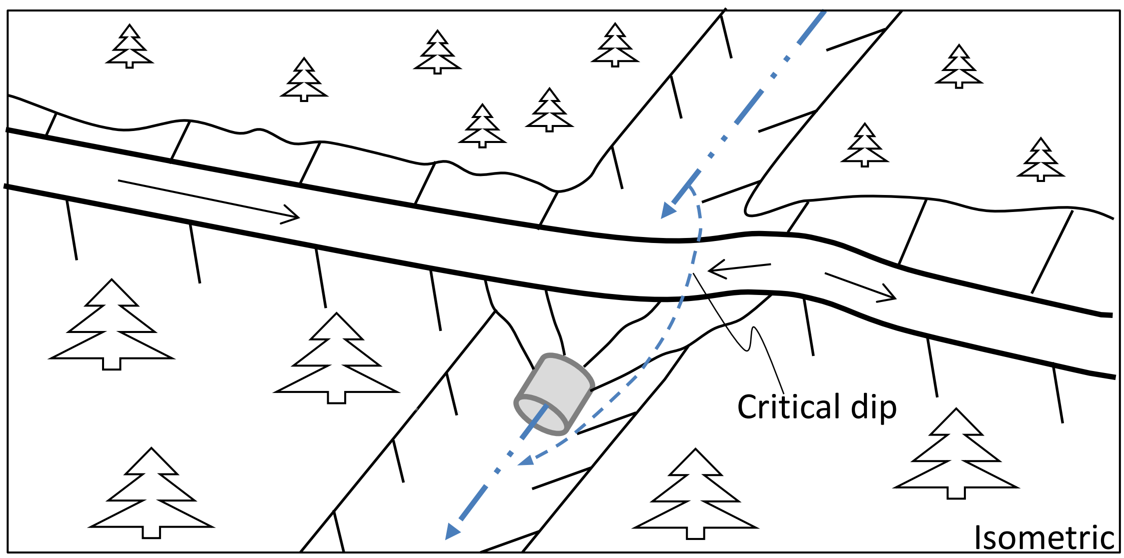
Typical Critical Dip Design for Stream Crossings with Diversion Potential





Critical Dip Construction:

1. Critical dip will be constructed on the lower side of crossing.
2. Critical dip will extend from the cutbank to the outside edge of the road surface. Be sure to fill inboard ditch, if present.
3. Critical dip will have a reverse grade (A) from cutbank to outside edge of road to ensure flow will not divert outside of crossing.
4. The rise in the reverse grade will be carried for about 10 to 20 feet and then return to original slope.
5. The transition from axis of bottom, through rising grade, to falling grade, will be in the road distance of at least 15 to 30 feet.
6. Critical dips are usually built perpendicular to the road surface to ensure that flow is directed back into the stream channel.

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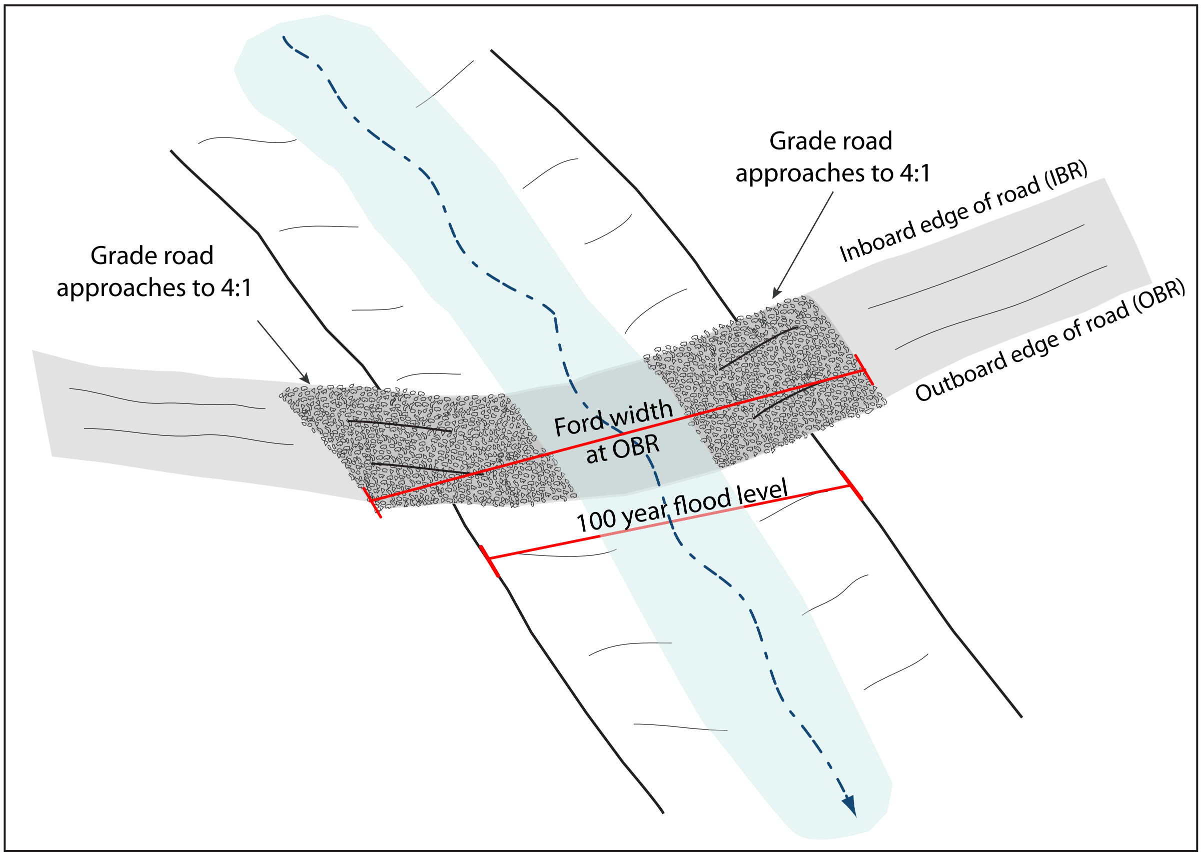
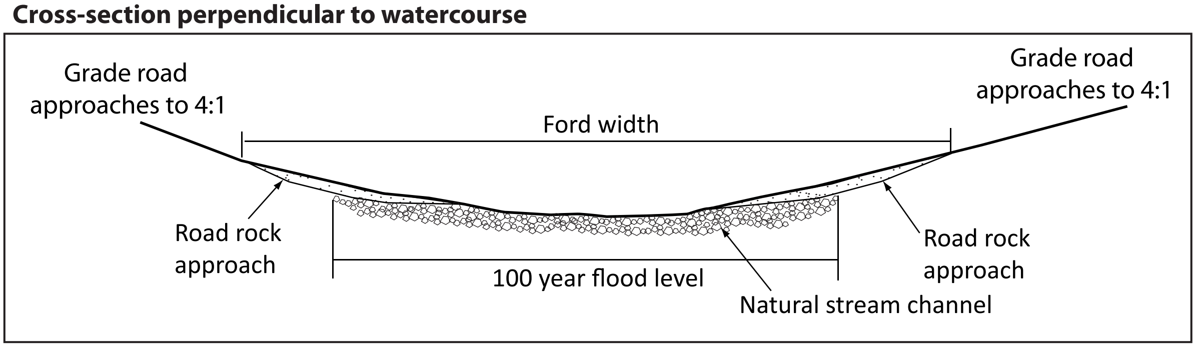
Typical Ford Crossing Installation

Oblique view



Cross-section perpendicular to watercourse



<u>Steps for ford crossing construction:</u>

1. Remove any existing structures (culverts, logs, large boulders, etc.)
2. Remove all road fill as you dip through the crossing to reach natural stream channel.
3. Establish a "U" shape across the channel at the width specified in the road logs.
4. Grade road approaches to specified slope angle (e.g., 4:1). Approaches may or may not be rocked; follow specifications in the road logs.

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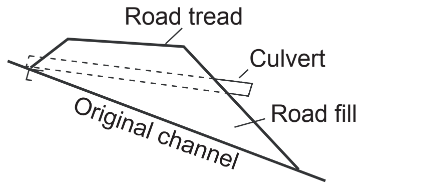
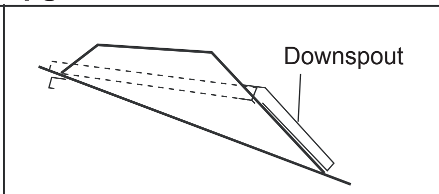
Typical Design of a Non-fish Bearing Culverted Stream Crossing

Existing



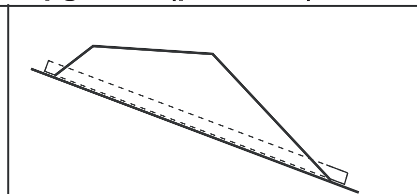
1. Culvert not placed at channel grade.
2. culvert does not extend past base of fill.

Upgraded



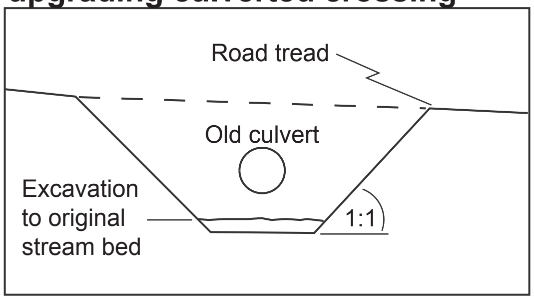
1. Culvert not placed at channel grade.
2. Downspout added to extend outlet past road fill.

Upgraded (preferred)

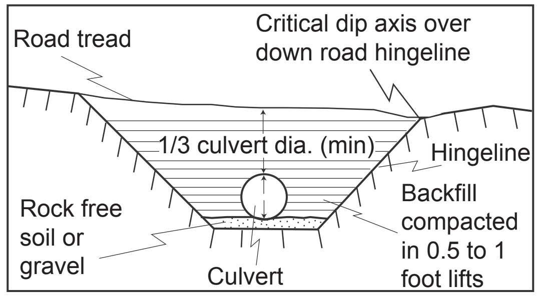


1. Culvert placed at channel grade.
2. Culvert inlet and outlet rest on, or partially in, the originial streambed.

Excavation in preparation for upgrading culverted crossing



Upgraded stream crossing culvert installation



Note:
Road upgrading tasks typically include upgrading stream crossings by installing larger culverts and inlet protection (trash barriers) to prevent plugging. Culvert sizing for the 100-year peak storm flow should be determined by both field observation and calulations using a procedure such as the Rational Formula.

Stream crossing culvert Installation

1. Culverts shall be aligned with natural stream channels to ensure proper function, and prevent bank erosion and plugging by debris.
2. Culverts shall be placed at the base of the fill and the grade of the original streambed, or downspouted past the base of the fill.
3. Culverts shall be set slightly below the original stream grade so that the water drops several inches as it enters the pipe.
5. To allow for sagging after burial, a camber shall be between 1.5 to 3 incher per 10 feet culvert pipe length.
6. Backfill material shall be free of rocks, limbs or other debris that could dent or puncture the pipe or allow water to seep around pipe.
7. First one end then the other end of the culvert shall be covered and secured. The center is covered last.
8. Backfill material shall be tamped and compacted throughout the entire process:
   - Base and side wall material will be compacted before the pipe is placed in its bed.
   - Backfill compacting will be done in 0.5 - 1 foot lifts until 1/3 of the diameter of the culvert has been covered. A gas powered tamper can be used for this work.
9. Inlets and outlets shall be armored with rock or mulched and seeded with grass as needed.
10. Trash protectors shall be installed just upstream from the culvert where there is a hazard of floating debris plugging the culvert.
11. Layers of fill will be pushed over the crossing until the final designed road grade is achieved, at a minimum of 1/3 to 1/2 the culvert diameter.

Erosion control measures for culvert replacement

Both mechanical and vegetative measures will be employed to minimize accelerated erosion from stream crossing and ditch relief culvert upgrading. Erosion control measures implemented will be evaluated on a site by site basis. Erosion control measures include but are not limited to:

1. Minimizing soil exposure by limiting excavation areas and heavy equipment distrubance.
2. Installing filter windrows of slash at the base of the road fill to minimize the movement of eroded soil to downslope areas and stream channels.
3. Retaining rooted trees and shrubs at the base of the fill as "anchor" for the fill and filter windrows.
4. Bare slopes created by construction operations will be protected until vegetation can stabilize the surface. Surface erosion on exposed cuts and fills will be minimized by mulching, seeding, planting, compacting, armoring, and/or benching prior to the first rains.
5. Excess or unusable soil will be stored in long term spoil disposal locations that are not limited by factors such as excessive moisture, steep slopes greater than 10%, archeology potential, or proximity to a watercourse.
6. On running streams, water will be pumped or diverted past the crossing and into the downstream channel during the construction process.
7. Straw bales and/or silt fencing will be employed where necessary to control runoff within the construction zone.

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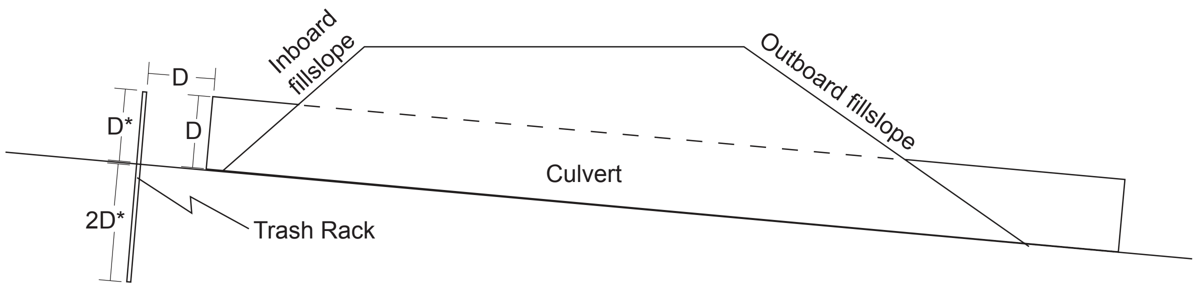
Typical Design of a Single-post Culvert Inlet Trash Rack

Cross section view



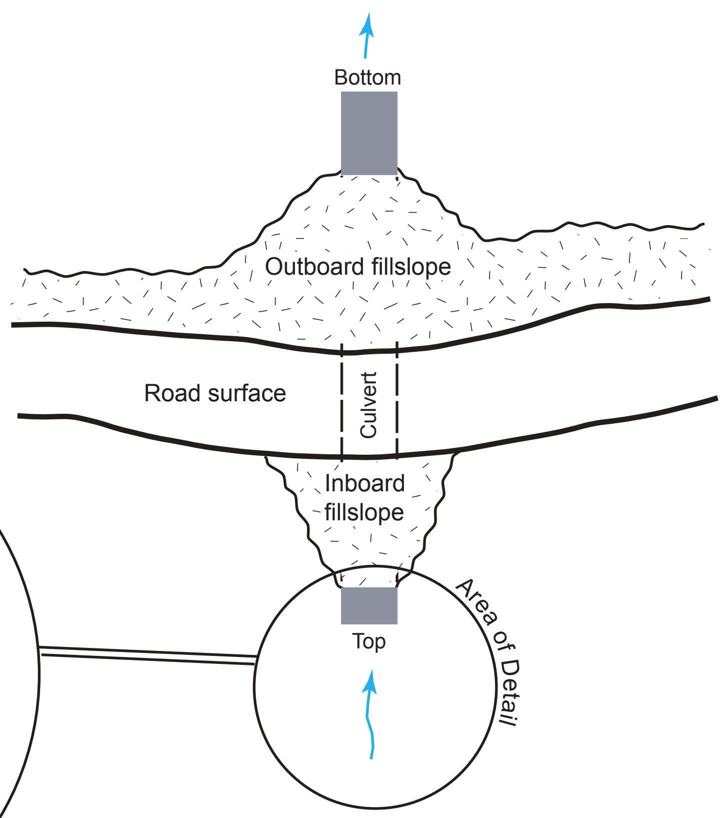
D - Culvert diameter
D* - If the culvert is designed for the 100-year peak storm flow, the trash rack height above the streambed should equal D.
If the culvert is undersized, then the trash rack needs to be extended vertically above the streambed to match or exceed the expected headwall height.

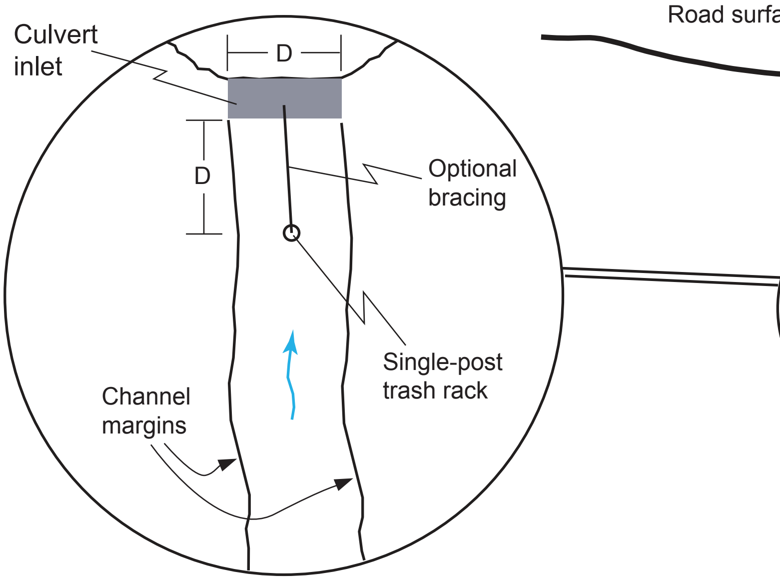
Plan view

Notes:

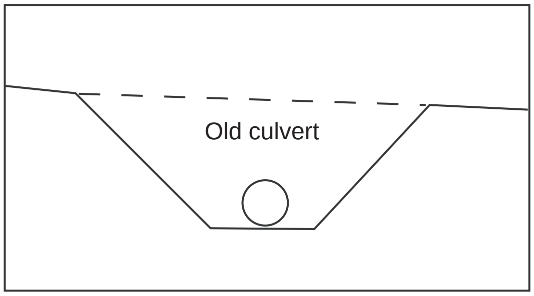
1. Many materials can be used for a single-post trash rack including old railroad track, galvanized pipe, and fence posts.

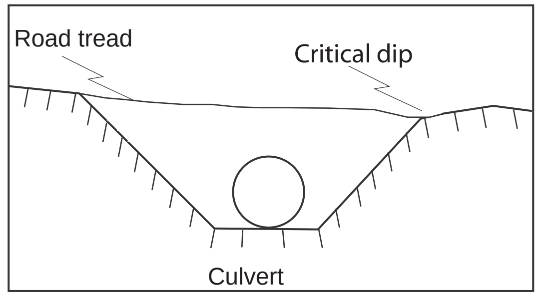
2. The diameter of single-post trash racks should be sized based on the size of expected woody debris. As a basic rule of thumb, the diameter of the trash rack should be equal to the diameter of the expected woody debris up to 4 inches.





Typical Design of Upgraded Stream Crossings





Stream crossing culvert Installation

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   - backfill compacting will be done in 0.5 - 1 foot lifts until 1/3 of the diameter of the culvert has been covered. A gas powered tamper can be used for this work.
9. Inlets and outlets shall be armored with rock or mulched and seeded with grass as needed.
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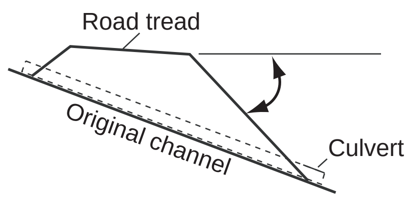
11. Layers of fill will be pushed over the crossing until the final designed road grade is achieved, at a minimum of 1/3 to 1/2 the culvert diameter.

Note:
Road upgrading tasks typically include upgrading stream crossings by installing larger culverts and inlet protection (trash barriers) to prevent plugging. Culvert sizing for the 100-year peak storm flow should be determined by both field observation and calculations using a procedure such as the Rational Formula.

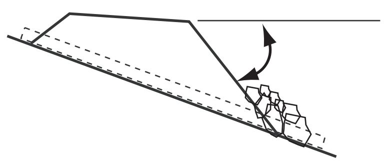
Armoring fill faces

Fill angles ≤ 2:1



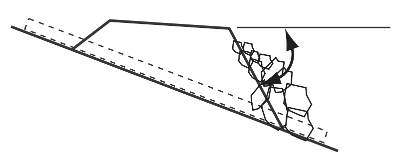
No rock armor needed

Fill angles (between 2:1 & 1.5:1)



Armor 1/4 up fill face

Fill angles steeper than 1.5:1



Armor 3/4 way up fill face

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Typical Design of Ford and Armored Fill Stream Crossings

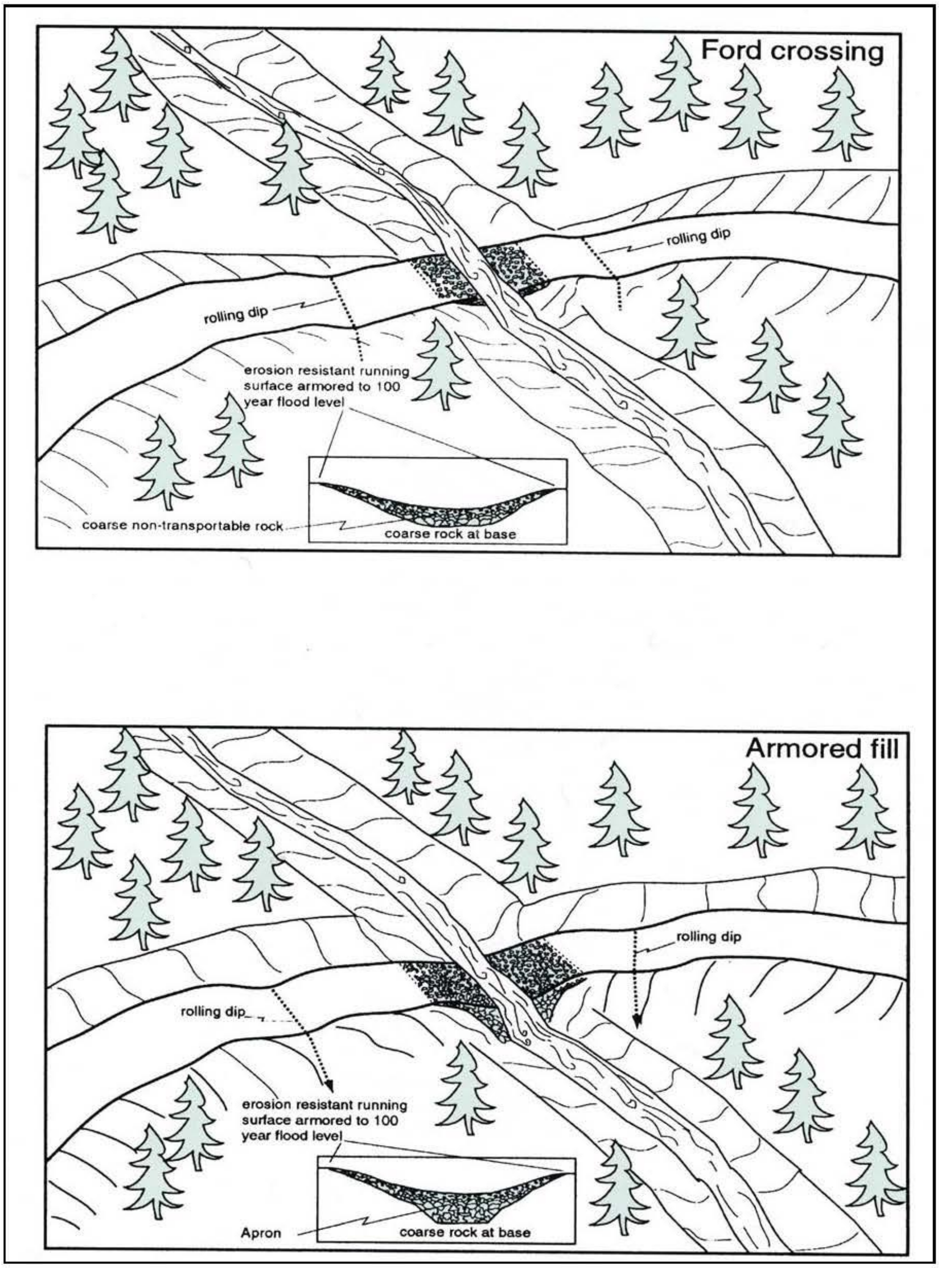
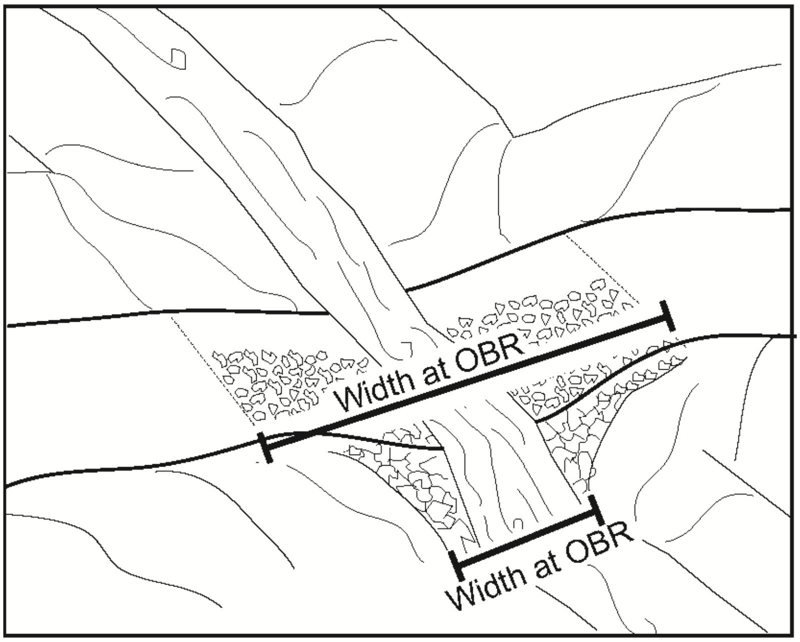


Figure X-15. CDFW California Salmonid Stream Habitat Restoration Manual.

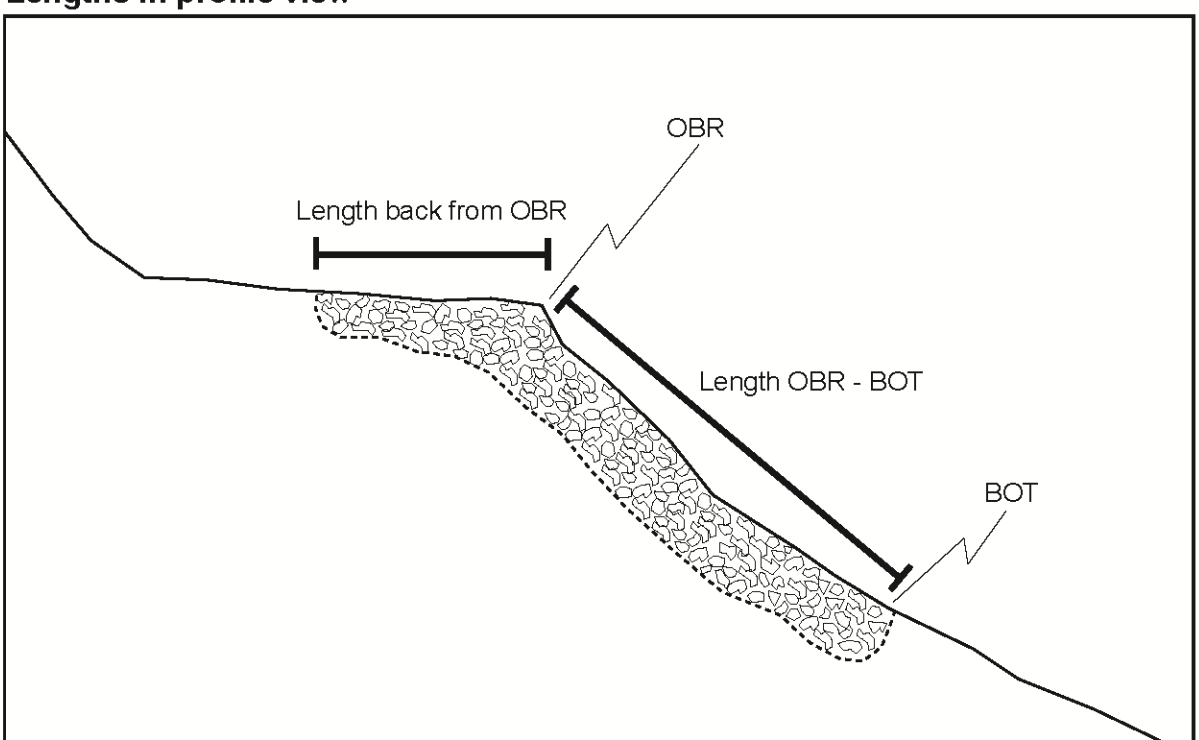
Typical Dimensions Refered to for Armored Fill Crossings

Widths in oblique view



OBR - Outboard edge of road

Lengths in profile view



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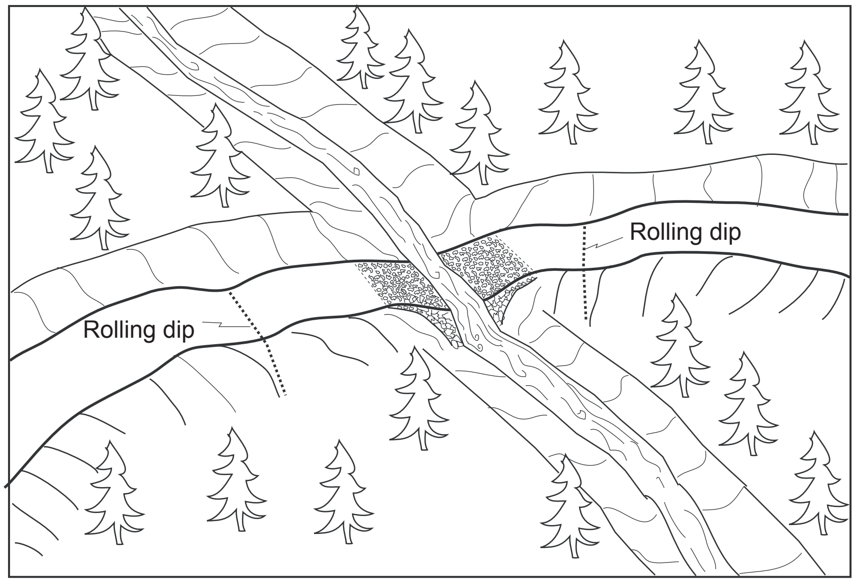
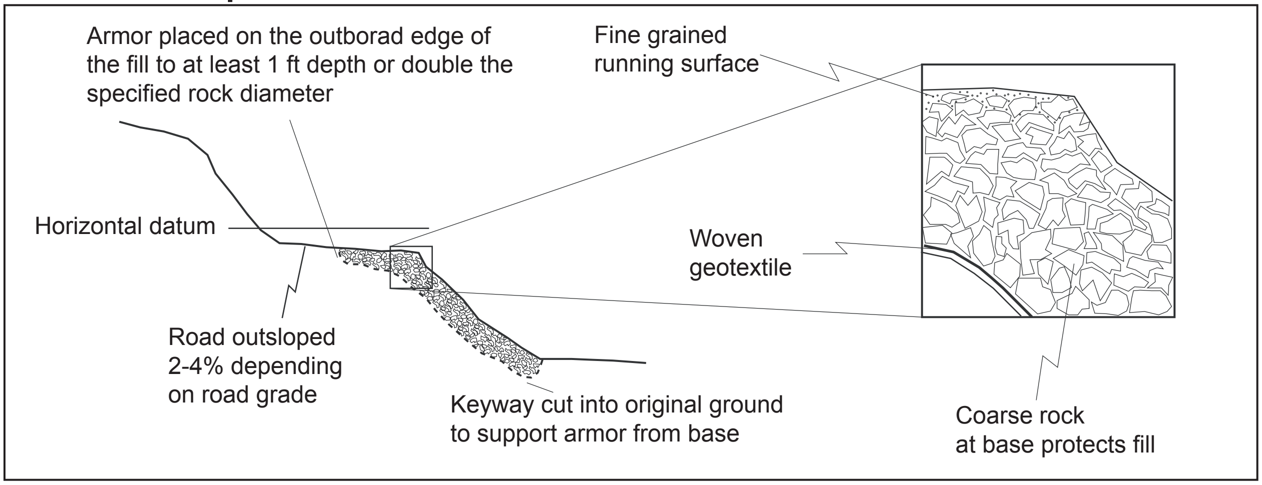
Typical Drawing # 5b

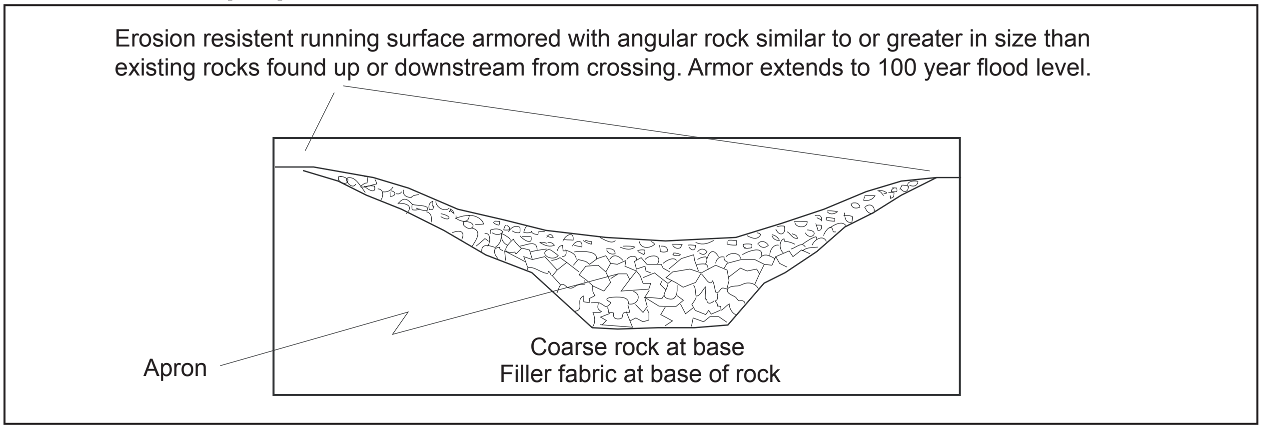
Typical Armored Fill Crossing Installation



Cross section parallel to watercourse



Cross section perpendicular to watercourse



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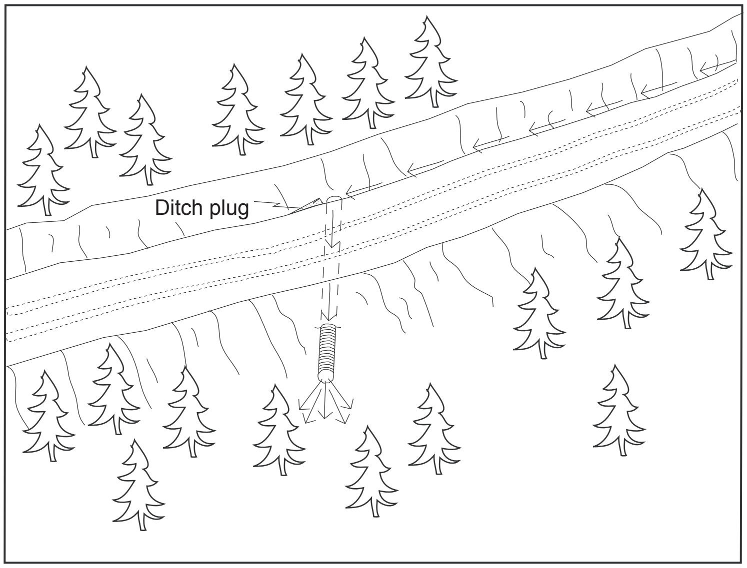
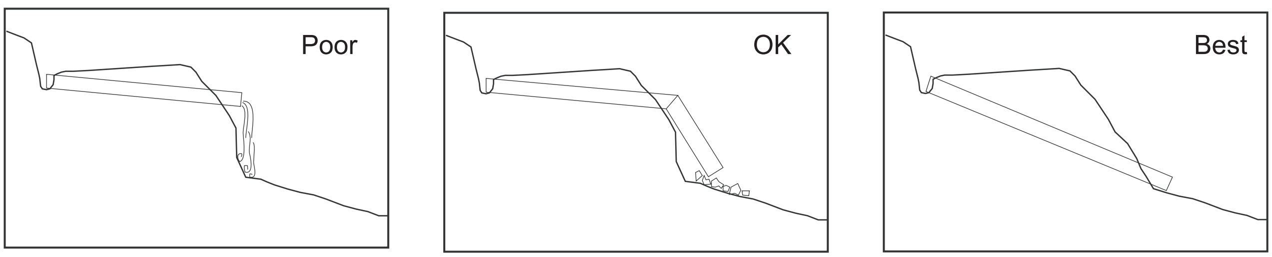
Typical Ditch Relief Culvert Installation





Ditch relief culvert installation

1) The same basic steps followed for stream crossing installation shall be employed.
2) Culverts shall be installed at a 30 degree angle to the ditch to lessen the chance of inlet erosion and plugging.
3) Culverts shall be seated on the natural slope or at a minimum depth of 5 feet at the outside edge of the road, whichever is less.
4) At a minimum, culverts shall be installed at a slope of 2 to 4 percent steeper than the approaching ditch grade, or at least 5 inches every 10 feet.
5) Backfill shall be compacted from the bed to a depth of 1 foot or 1/3 of the culvert diameter, which ever is greater, over the top of the culvert.
6) Culvert outlets shall extend beyond the base of the road fill (or a flume downspout will be used). 7Culverts will be seated on the natural slope or at a depth of 5 feet at the outside edge of the road, whichever is less.

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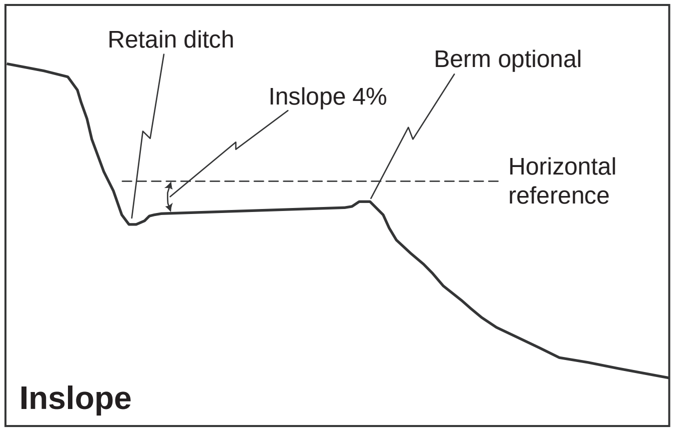
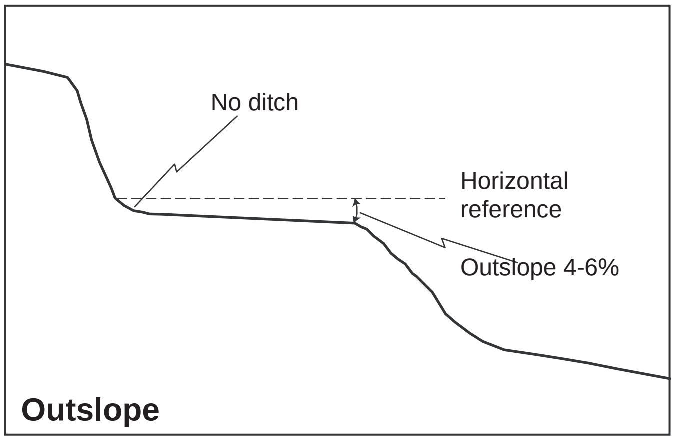
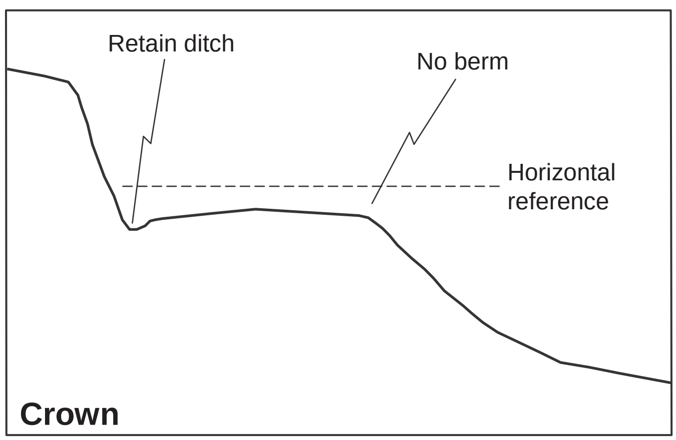
Typical Designs for Using Road Shape to Control Road Runoff

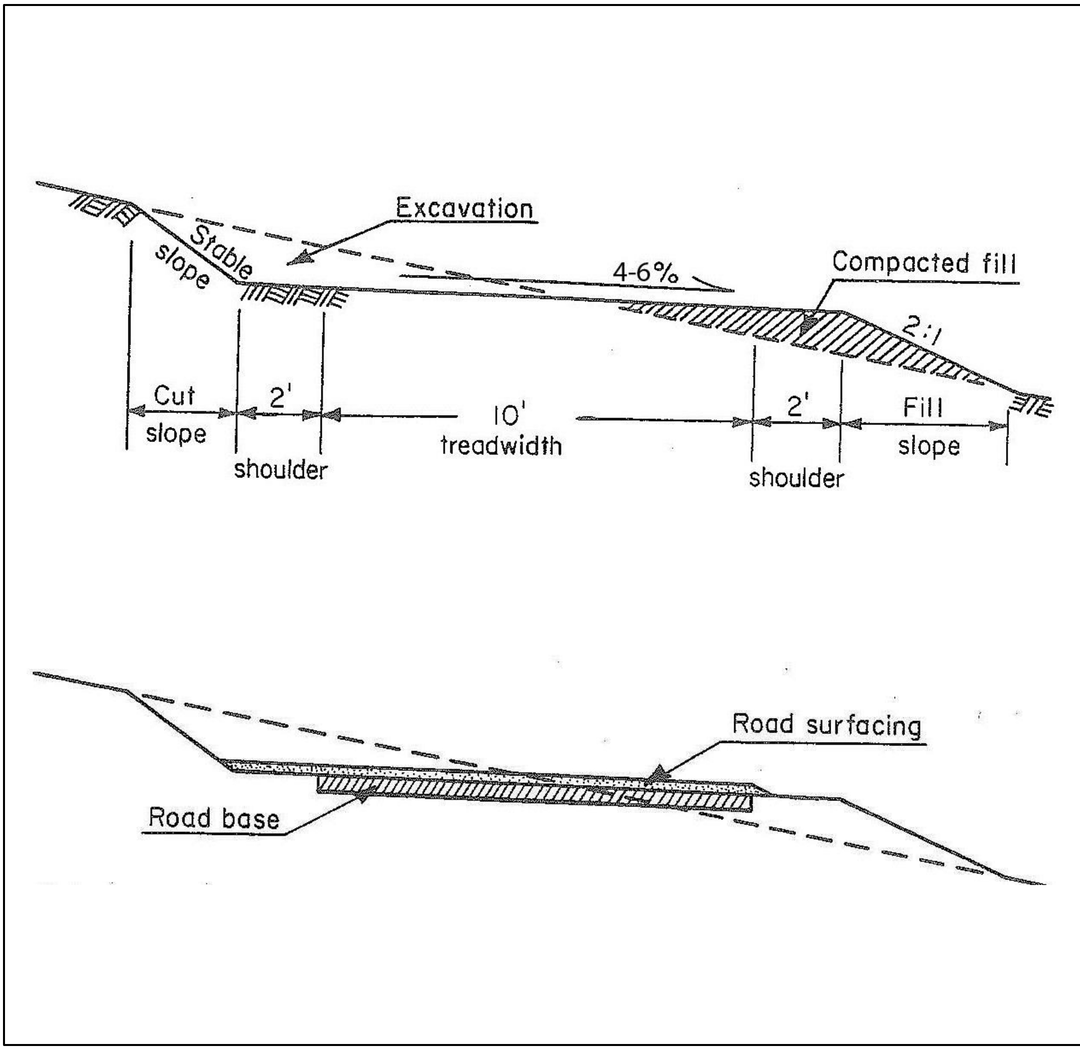






Outsloping Pitch for Roads Up to 8% Grade		
Road grade	**Unsurfaced roads**	**Surfaced roads**
4% or less	3/8" per foot	1/2" per foot
5%	1/2" per foot	5/8" per foot
6%	5/8" per foot	3/4" per foot
7%	3/4" per foot	7/8" per foot
8% or more	1" per foot	1 1/4" per foot

Typical Design for Outsloped Road



Outsloped Road Notes:

1. Road tread will have at least a 4% outslope, steepening to 6% outlsope along outside shoulder to promote drainage.
2. Edge berms from grading will be completely removed – OR – install compacted edge berm with drainage outlets every 150’.
3. All road surface and fills will be compacted to 95% of ASTM D-698 before final grading.
4. Road base and surface to be designed for road use and site conditions.
5. Cut and fill slopes will be vegetated.
6. For two-lane road, add 6’of treadwidth.
7. For turnout, add 10’ to treadwidth.

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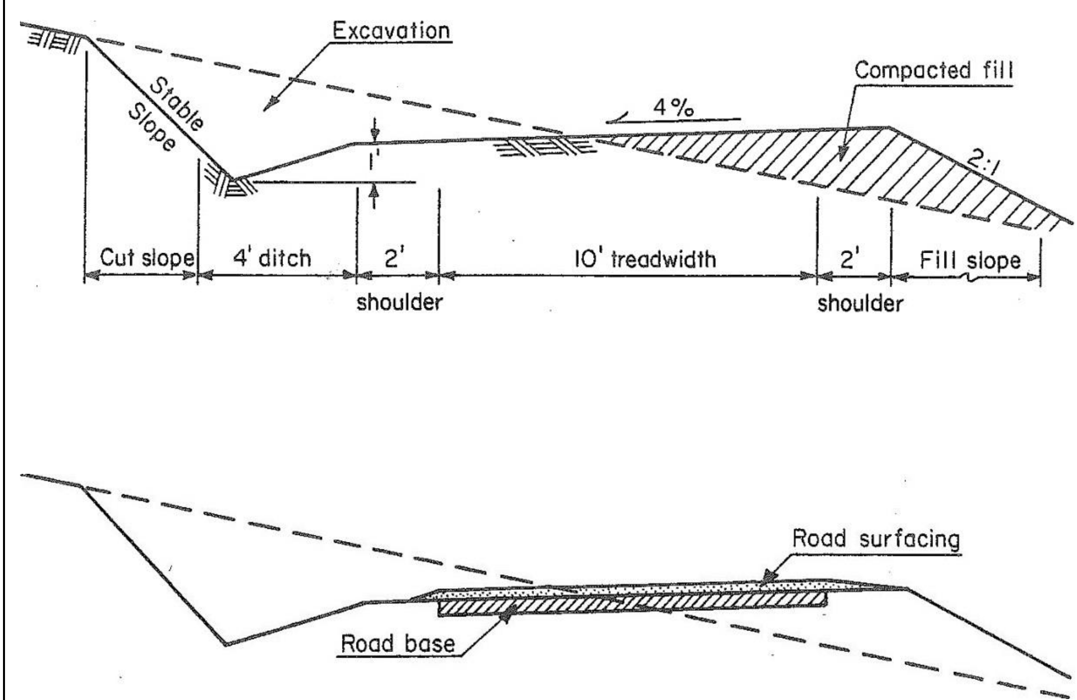
Typical Design for Insloped Road

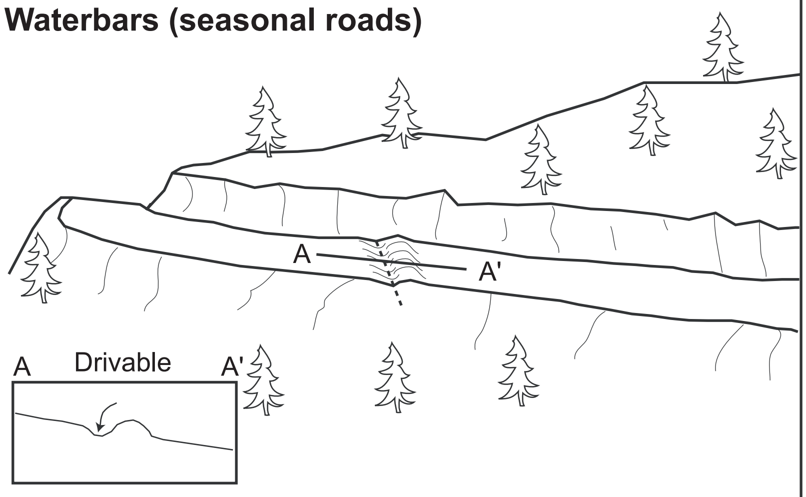


Insloped Road Notes:

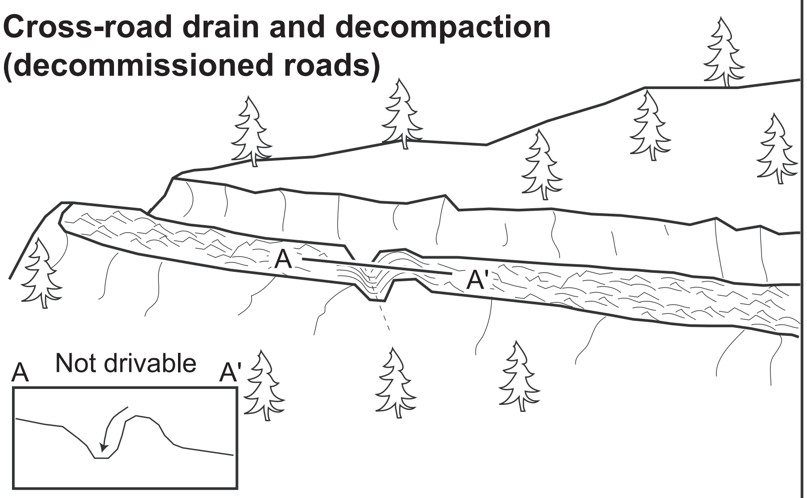
1. Road tread will have at least a 4% inslope.
2. Inboar ditch will be cut with an average 1' depth and 4' width.
3. Inboard ditch will be drained every 150' with ditch relief culverts.
4. All road surface and fills will be compacted to 95% of ASTM D-698 before final grading.
5. Road base and surface to be designed for road use and site conditions.
6. Cut and fill slopes will be vegetated.
7. For two-lane road, add 6'of treadwidth.
8. For turnout, add 10' to treadwidth.

Typical Methods for Dispersing Road Surface Runoff with Waterbars, Cross-road Drains, and Rolling Dips

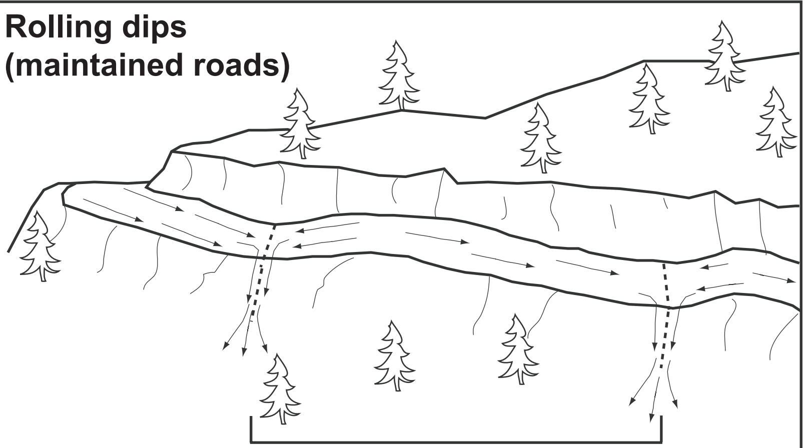
Waterbars (seasonal roads)



Cross-road drain and decompaction (decommissioned roads)



Rolling dips (maintained roads)



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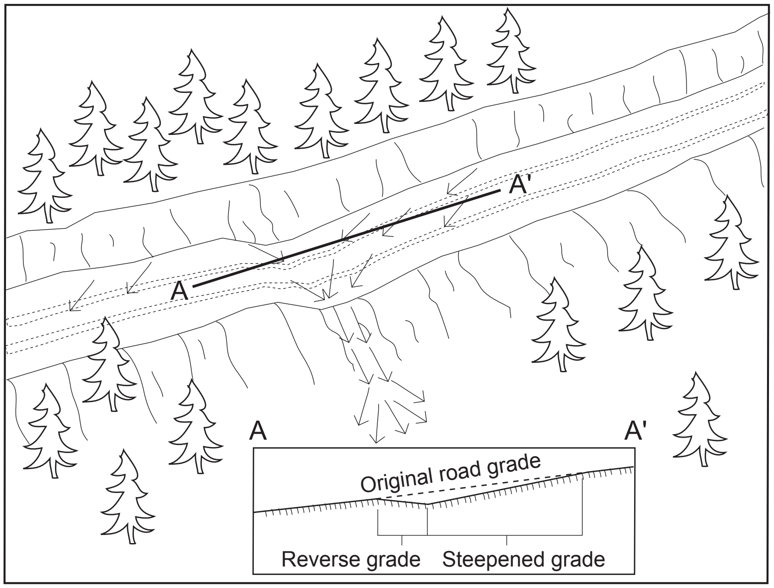
Typical Road Surface Drainage by Rolling Dips



Rolling dip installation:

1. Rolling dips will be installed in the roadbed as needed to drain the road surface.
2. Rolling dips will be sloped either into the ditch or to the outside of the road edge as required to properly drain the road.
3. Rolling dips are usually built at 30 to 45 degree angles to the road alignment with cross road grade of at least 1% greater than the grade of the road.
4. Excavation for the dips will be done with a medium-size bulldozer or similar equipment.
5. Excavation of the dips will begin 50 to 100 feet up road from where the axis of the dip is planned as per guidelines established in the rolling dip dimensions table.
6. Material will be progressively excavated from the roadbed, steepening the grade unitl the axis is reached.
7. The depth of the dip will be determined by the grade of the road (see table below).
8. On the down road side of the rolling dip axis, a grade change will be installed to prevent the runoff from continuing down the road (see figure above).
9. The rise in the reverse grade will be carried for about 10 to 20 feet and then return to the original slope.
10. The transition from axis to bottom, through rising grade to falling grade, will be in a road distance of at least 15 to 30 feet.

Table of rolling dip dimensions by road grade

Road grade %	**Upslope approach distance** (from up road start to trough) ft	**Reverse grade distance** (from trough to crest) ft	**Depth at trough outlet** (below average road grade) ft	**Depth at trough inlet** (below average road grade) ft
<6	55	15 - 20	0.9	0.3
8	65	15 - 20	1.0	0.2
10	75	15 - 20	1.1	0.01
12	85	20 - 25	1.2	0.01
>12	100	20 - 25	1.3	0.01

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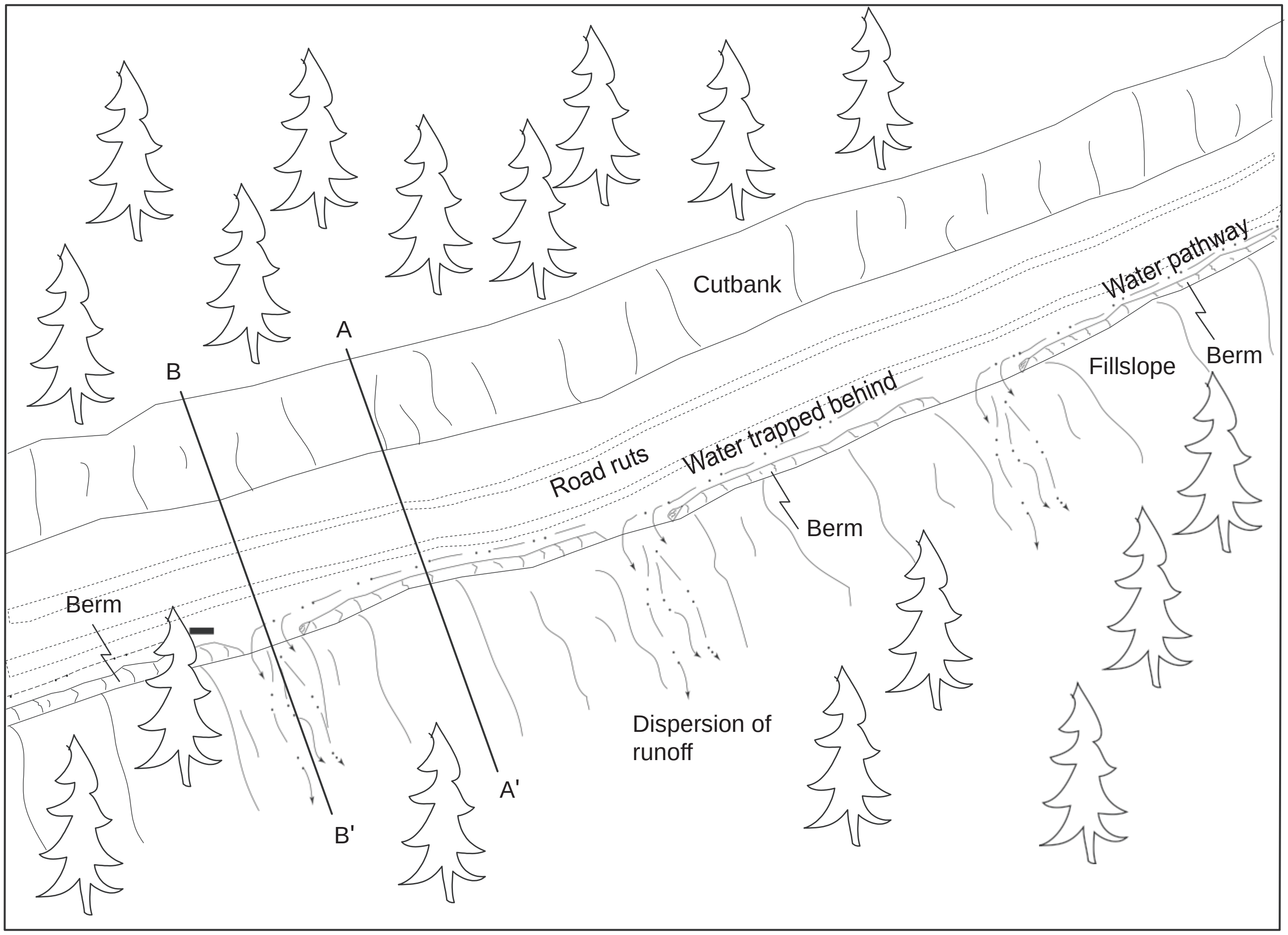
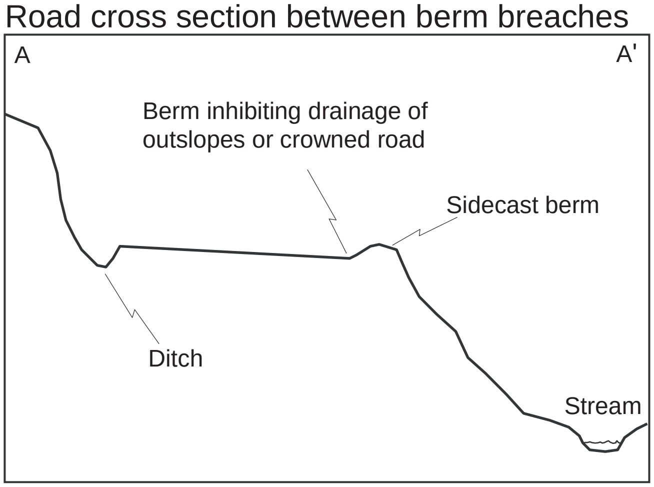
Typical Sidecast or Excavation Methods for Removing Outboard Berms on a Maintained Road

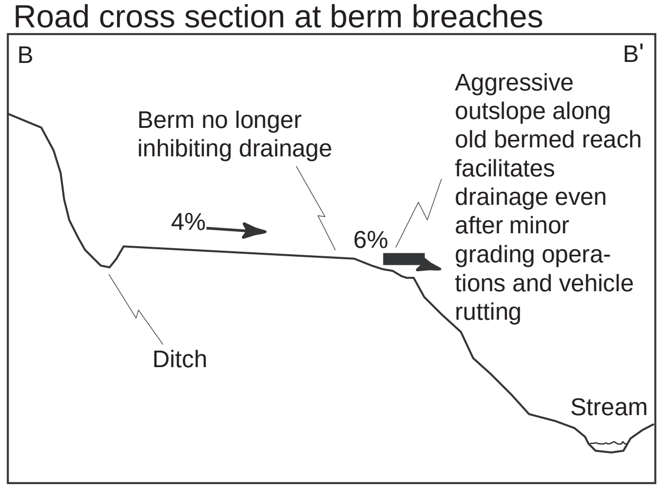
1. On gentle road segments berms can be removed continuously (see B-B').
2. On steep road segments, where safety is a concern, the berm can be frequently breached (see A-A' & B-B') Berm breaches should be spaced every 30 to 100 feet to provide adequate drainage of the road system while maintaining a semi-continuous berm for vehicle safety.



Road cross section between berm breaches



Road cross section at berm breaches



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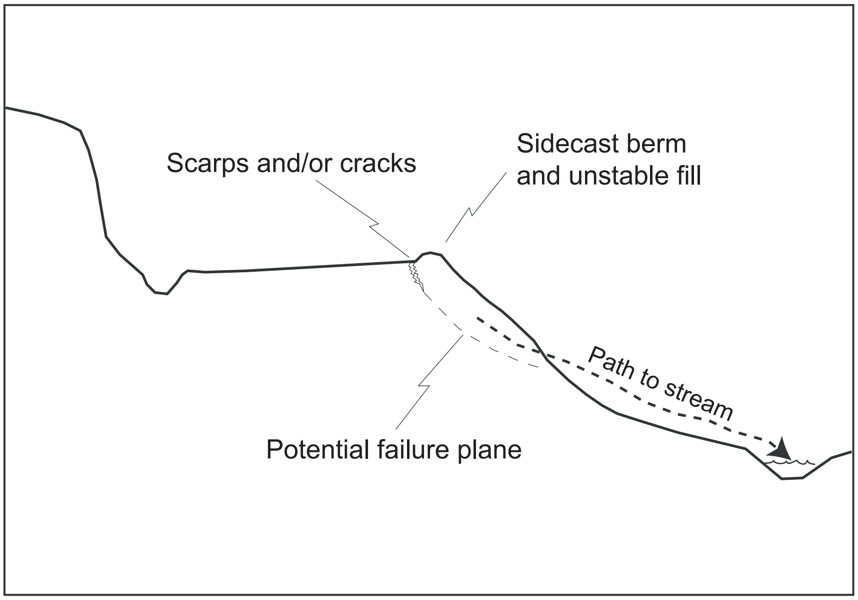
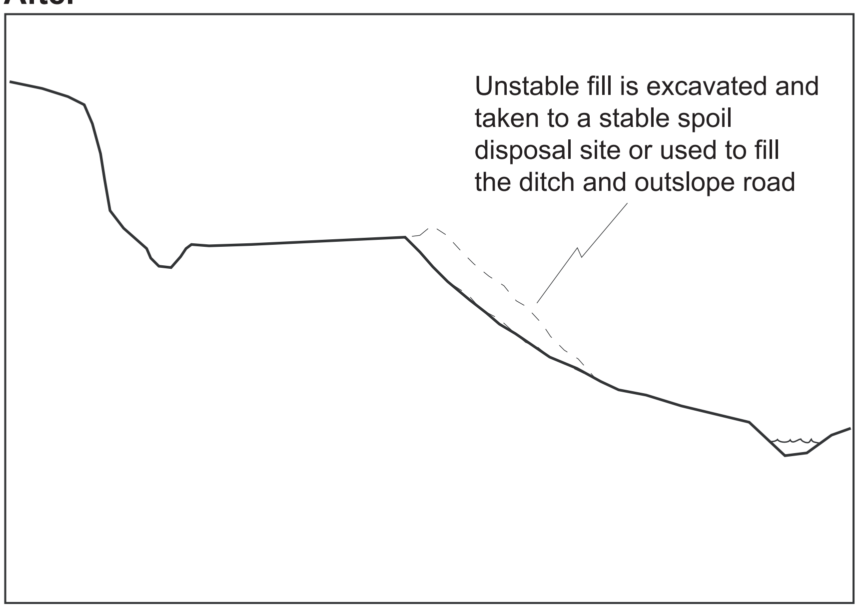
Typical Excavation of Unstable Fillslope on an Upgraded Road

Before



After



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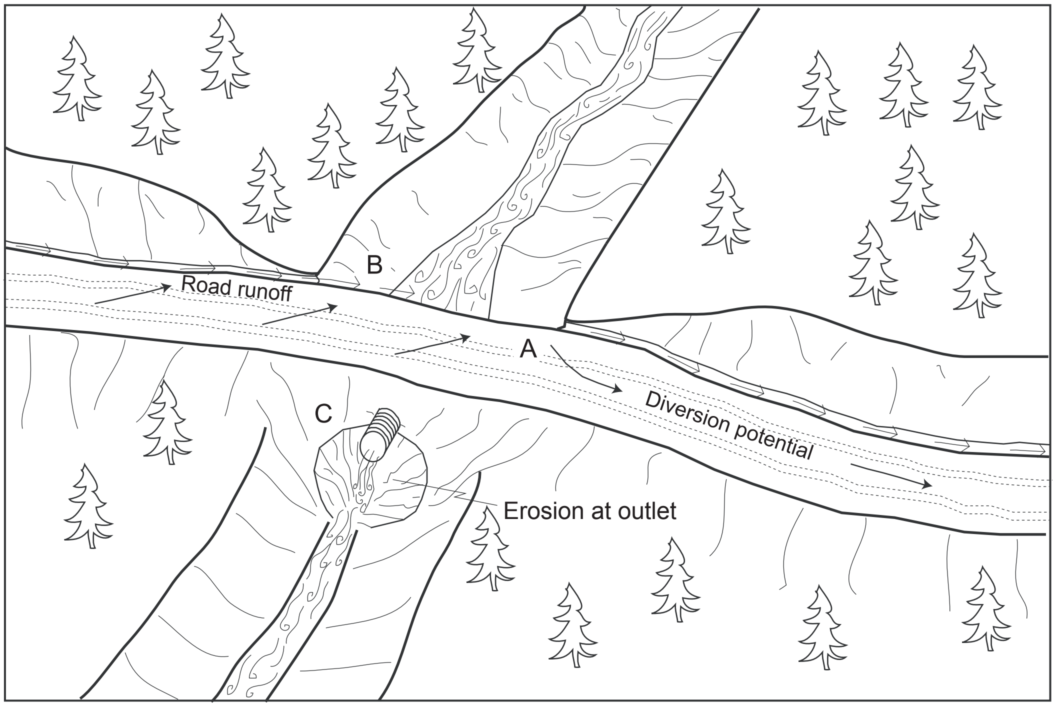
Typical Problems and Applied Treatments for a Decommissioned Stream Crossing

Problem condition (before)

A - Diversion potential

B - Road surface and ditch drain to stream

C - Undersized culvert high in fill with outlet erosion

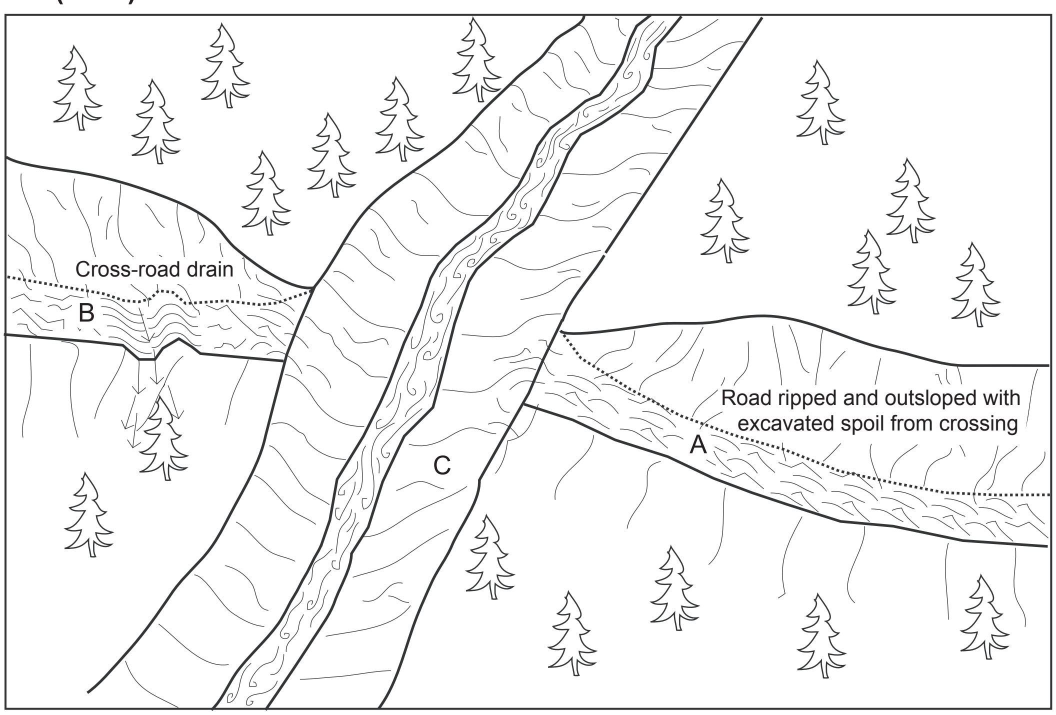


Treatment standards (after)

A - Diversion prevented by road surface ripping and outsloping using excavated spoils

B - Road surface and ditch disconnected from stream by road surface decompaction and cross-road drains

C - Stream crossing fill completely excavated



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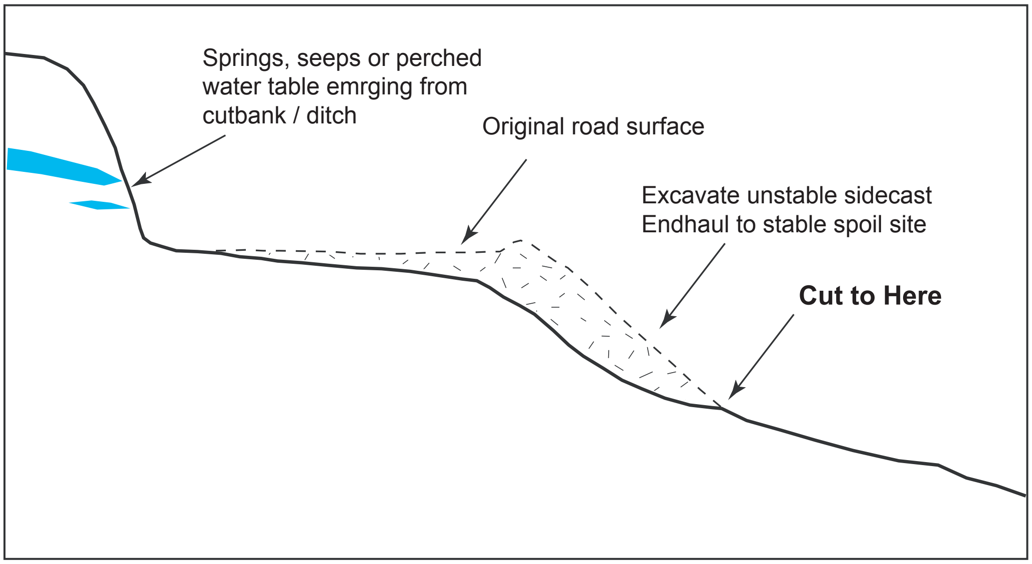
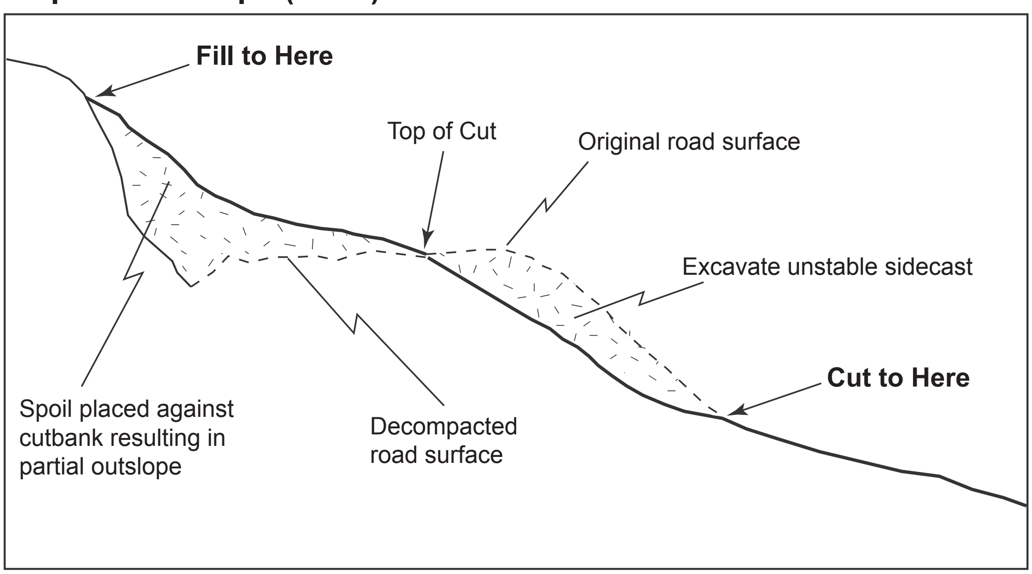
Typical Design for Road Decommisioning Treatments Employing Export and In-Place Outsloping Techniques

Export outslope (EPOS)



In-place outslope (IPOS)



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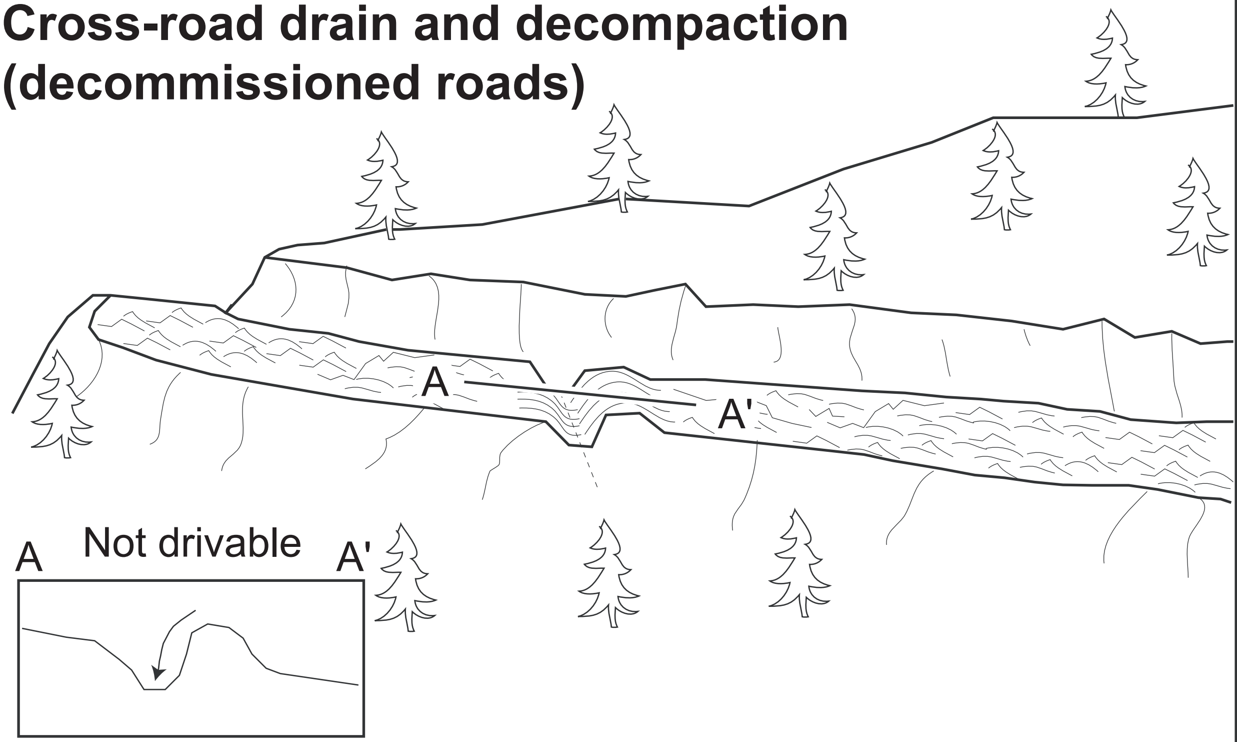
Cross-road drain and decompaction (decommissioned roads)



Cross road drain construction will ensure gullies, springs, road runoff and other concentrated flow will no longer collect over long lengths of road causing gully erosion and sediment delivery to streams. Cross road drains will be constructed at approximately 75 ft spacing intervals and these cross road drains will direct road surface runoff off the road onto stable hillslope locations.

Ripping the road surface 16 to 24 inches deep will increase road surface infiltration rates, decompact the road surface, and prevent concentrated runoff. Road ripping will also pulverize the compacted road surface or hardpan and allow for vegetation to establish and recover naturally.

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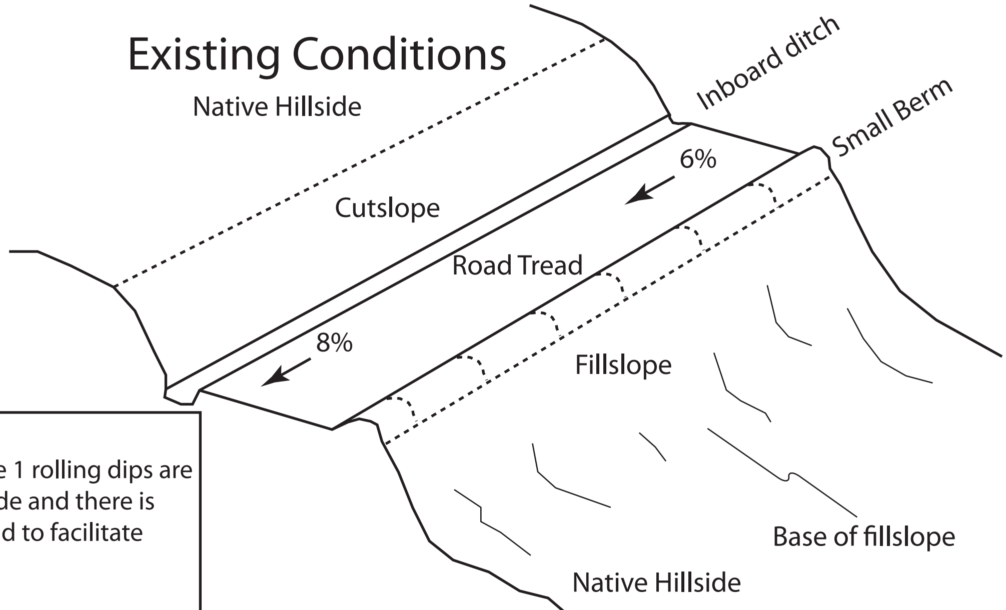
Standard (Type 1) Rolling Dip Construction

Existing Conditions



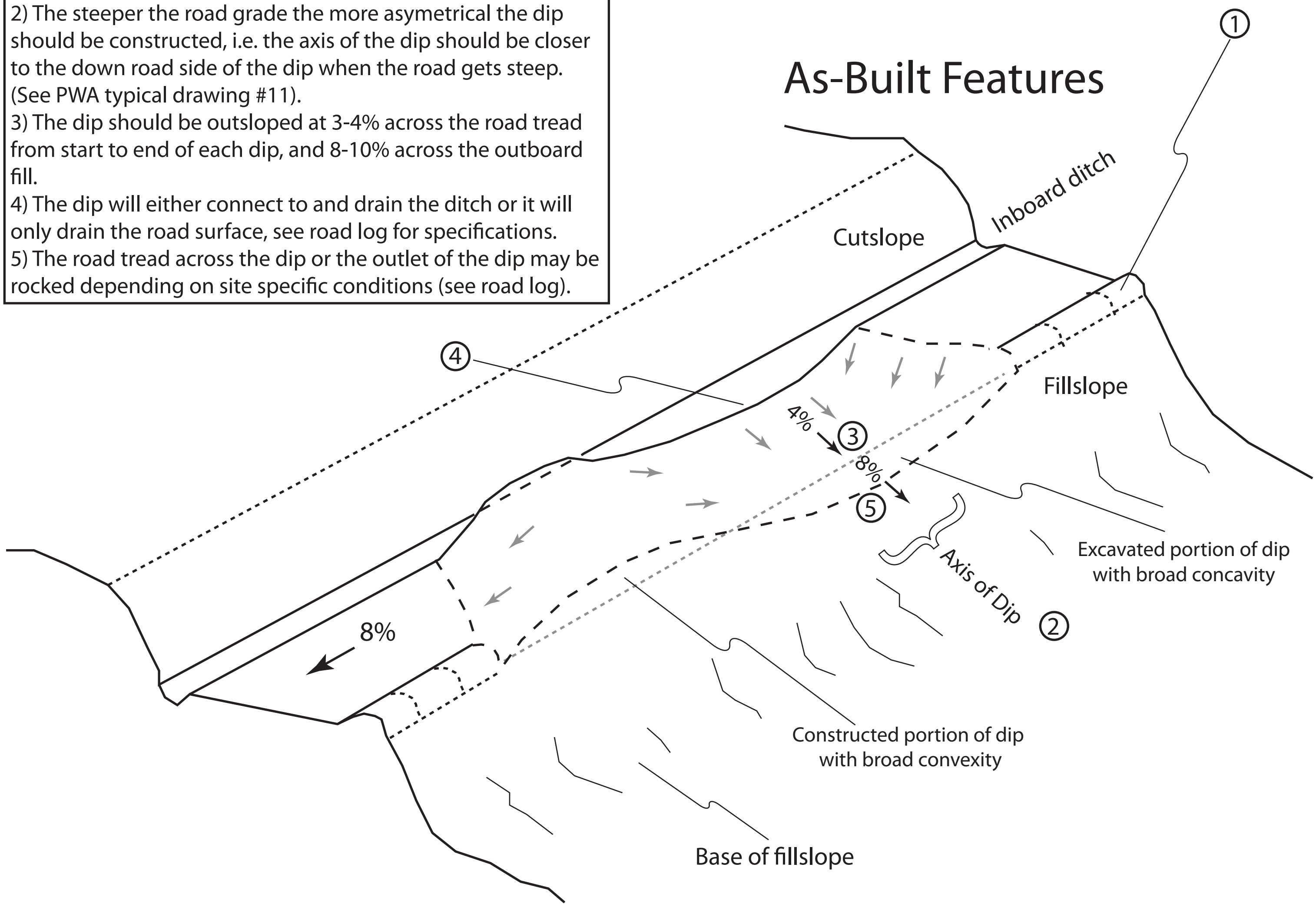
Notes

Rolling dip type 1 existing conditions: Type 1 rolling dips are utilized when roads are less than 12-14% grade and there is proximal outfall adjacent to the outboard road to facilitate road drainage.

Design Notes:

1) The berm should be removed for the entire length of the dip.
2) The steeper the road grade the more asymetrical the dip should be constructed, i.e. the axis of the dip should be closer to the down road side of the dip when the road gets steep. (See PWA typical drawing #11).
3) The dip should be outsloped at 3-4% across the road tread from start to end of each dip, and 8-10% across the outboard fill.
4) The dip will either connect to and drain the ditch or it will only drain the road surface, see road log for specifications.
5) The road tread across the dip or the outlet of the dip may be rocked depending on site specific conditions (see road log).

As-Built Features



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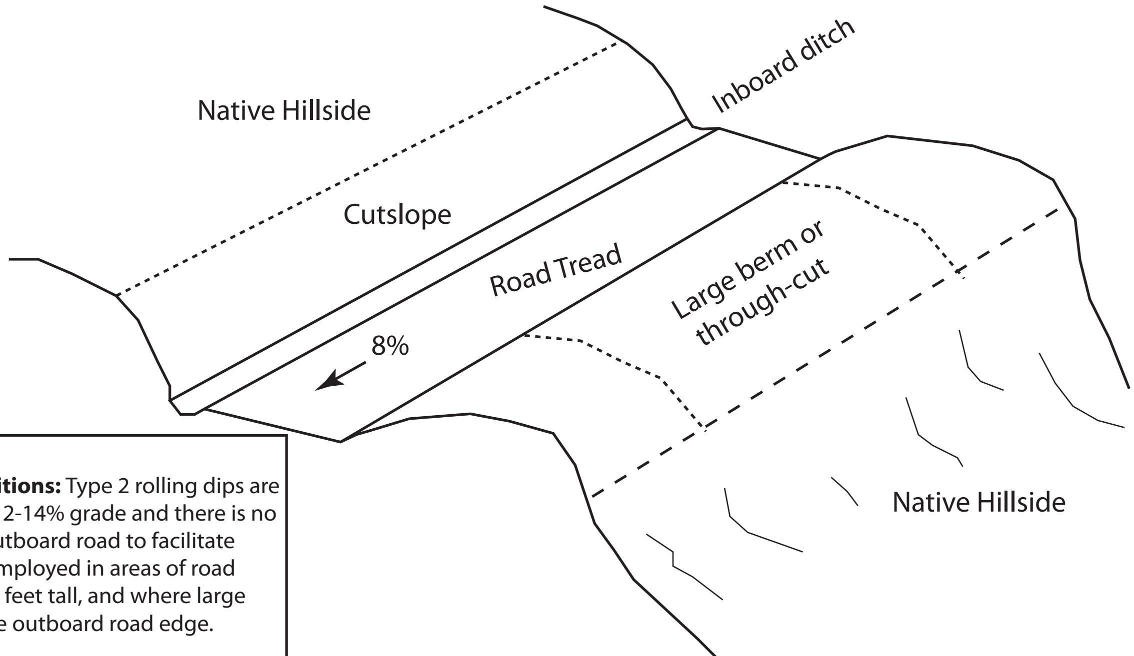
Type 2 Rolling Dip Construction

(Through-cut or thick berm road reaches)



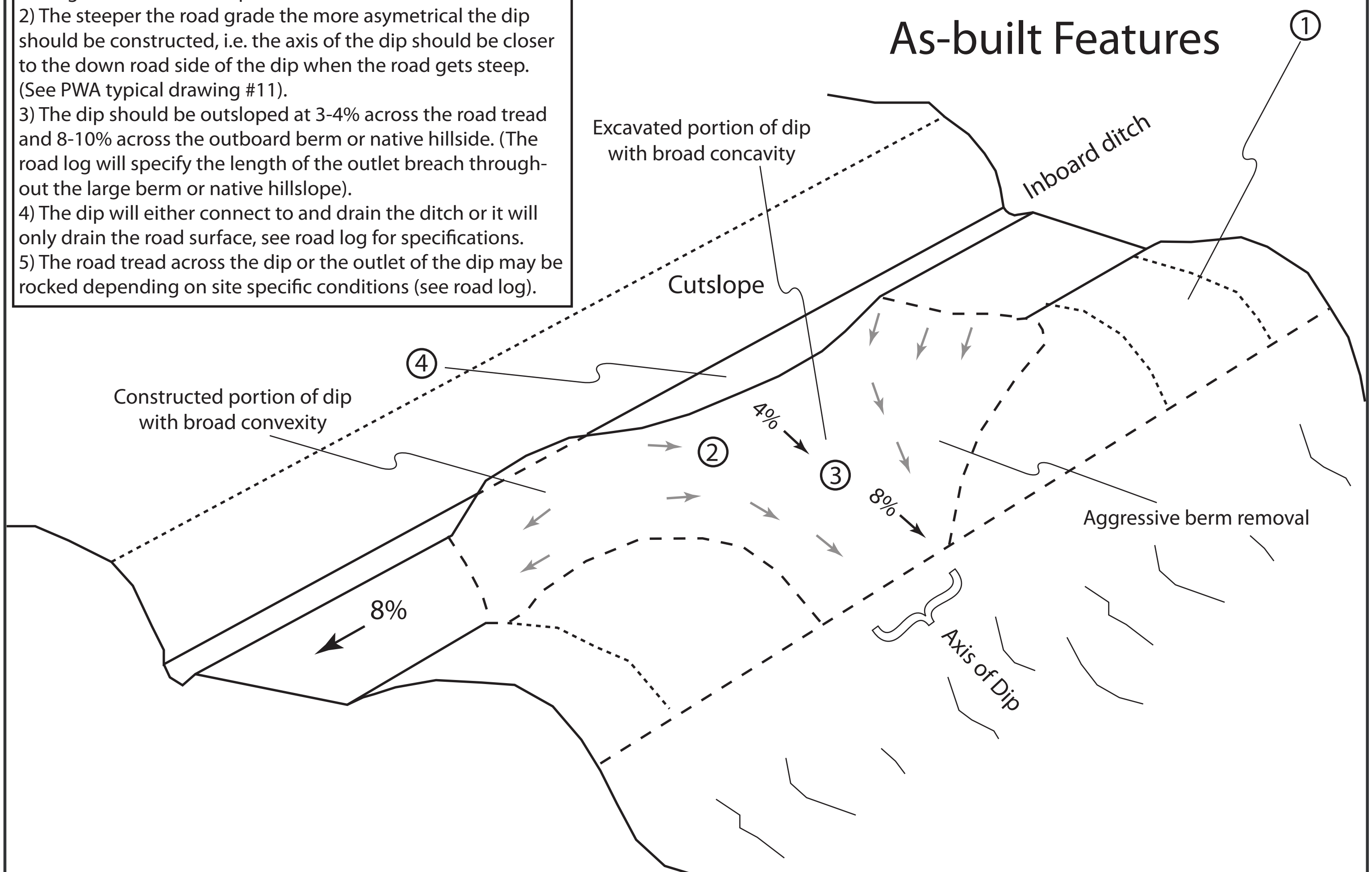
Notes

Rolling dip type 2 existing conditions: Type 2 rolling dips are utilized when roads are less than 12-14% grade and there is no proximal outfall adjacent to the outboard road to facilitate road drainage. These should be employed in areas of road through-cuts generally less than 3 feet tall, and where large wide and/or tall berms exist on the outboard road edge.

Design Notes:

1) The berm or native hillside should be removed for the entire length of the excavated portion of the dip, or, at a minimuim through the axis of the dip.
2) The steeper the road grade the more asymetrical the dip should be constructed, i.e. the axis of the dip should be closer to the down road side of the dip when the road gets steep. (See PWA typical drawing #11).
3) The dip should be outsloped at 3-4% across the road tread and 8-10% across the outboard berm or native hillside. (The road log will specify the length of the outlet breach throughout the large berm or native hillslope).
4) The dip will either connect to and drain the ditch or it will only drain the road surface, see road log for specifications.
5) The road tread across the dip or the outlet of the dip may be rocked depending on site specific conditions (see road log).

As-built Features



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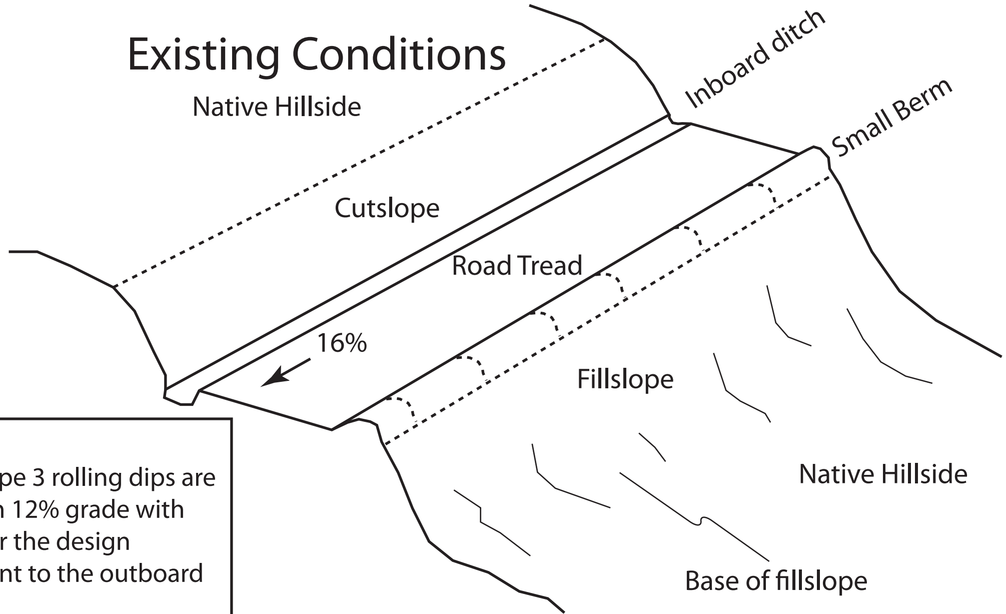
PWA Typical Drawing #19b

Type 3 Rolling Dip Construction
(steep slope outslope)

Existing Conditions

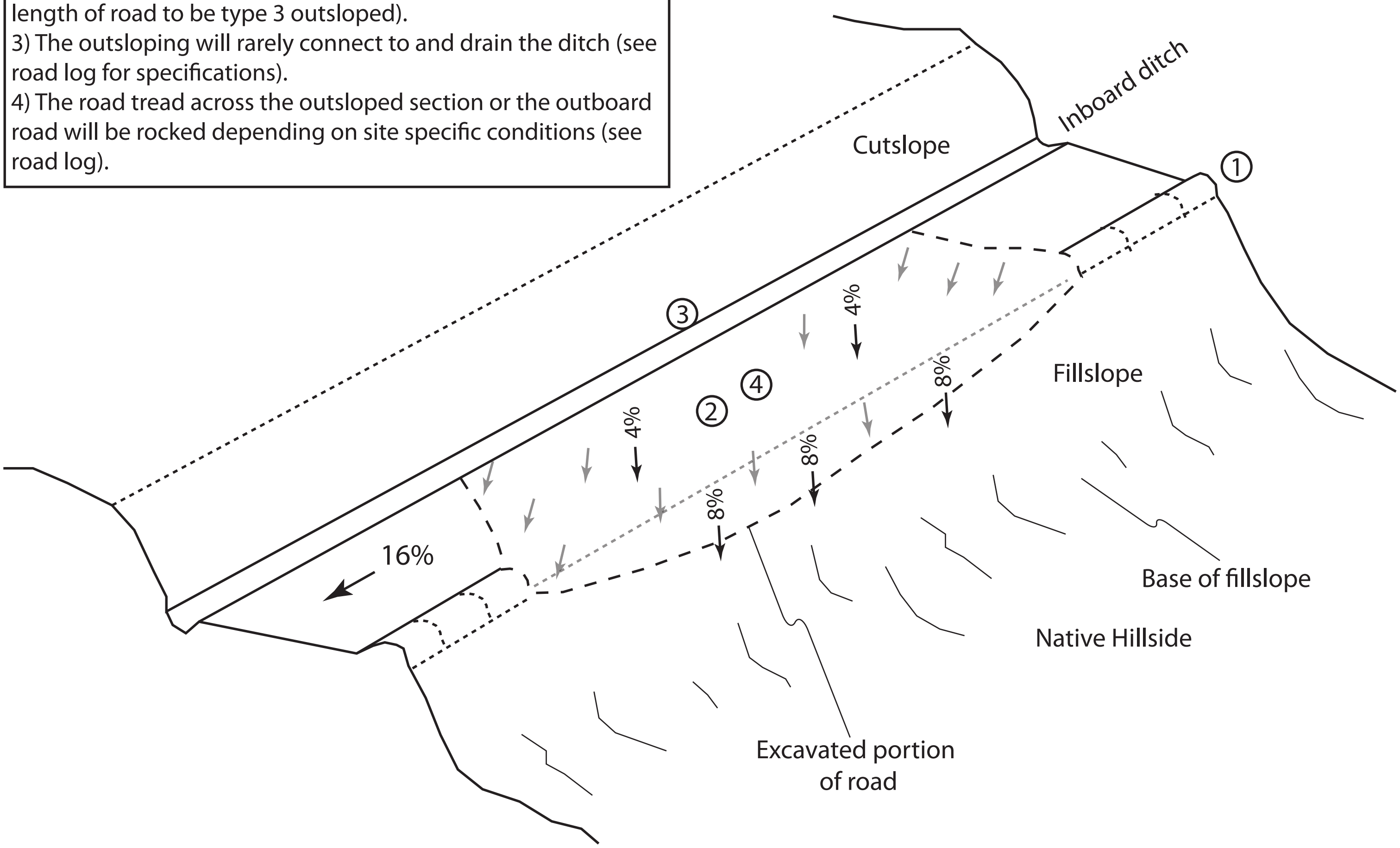


Notes

Rolling dip type 3 existing conditions: Type 3 rolling dips are utilized when roads grades are steeper than 12% grade with little opportunity to create reverse grade for the design vehicle, and there is proximal outfall adjacent to the outboard road to facilitate road drainage.

Design Notes:

1) The berm should be removed for the entire length of the outsloped section.
2) The dip should be outsloped at 2-4% across the road tread and 4-8% across the outboard fill. (The road log will specify the length of road to be type 3 outsloped).
3) The outsloping will rarely connect to and drain the ditch (see road log for specifications).
4) The road tread across the outsloped section or the outboard road will be rocked depending on site specific conditions (see road log).



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Appendix M

Final Operations, Maintenance, Repair, Replacement, and Rehabilitation Manual for the Napa River / Napa Creek Flood Protection Project

(*Note: Appendices of the OMRRR Manual are not included herein due to file size. Appendices are available upon request*.)

FINAL MANUAL

OPERATIONS, MAINTENANCE, REPAIR,
REPLACEMENT AND REHABILITATION MANUAL

FOR THE

NAPA RIVER / NAPA CREEK FLOOD PROTECTION PROJECT
NAPA, CALIFORNIA

APRIL 2018

US Army Corps
of Engineers®
Sacramento District

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Acronyms and Abbreviations

ACE	Annual Chance of Exceedance
BO	biological opinion
CDFW	California Department of Fish and Wildlife
CEQA	California Environmental Quality Act
CFR	Code of Federal Regulations
cfs	cubic feet per second
CIDH	cast-in-drilled-holes
CIP	cast-in-place
CIPI	California Invasive Plant Inventory
Corps	U.S. Army Corps of Engineers (see also USACE)
CRK	Creek
CWA	Clean Water Act
EIR	Environmental Impact Report
EIS	Environmental Impact Statement
ER	Engineering Regulation
ETL	Engineering Technical Letter
FEA	flowage easement area
FEMA	Federal Emergency Management Agency
FRM	Flood Risk Management
FSEIS/-EIR	Final Supplemental Environmental Impact Statement/Environmental Impact Report
GDM	General Design Memorandum
HEC-RAS	Hydraulic Engineering Center's River Analysis System
HPTRM	High Performance Turf Reinforcement Mat
HTRW	Hazardous, Toxic and Radioactive Waste
H&H	hydraulics and hydrology
IPCP	Invasive Plant Control Plan
LIS	Levee Inspection System
LRR	Limited Reevaluation Report
MMP	Mitigation and Monitoring Plan
MOU	Memorandum of Understanding
FCD	Napa County Flood Control and Water Conservation District (NCFCWCD)
NED	National Economic Development
NGVD of 1929	National Geodetic Vertical Datum
NMFS	National Marine Fisheries Service
NSD	Napa Sanitation District
NVWT	Napa Valley Wine Train
O&M	Operations and Maintenance
OMRR&R	operations, maintenance, repair, replacement and rehabilitation
PCA	Project Cooperation Agreement
PED	pre-construction engineering and design
RC	reinforced concrete
RR&R	repair, replacement and rehabilitation
RS	River Station
RWQCB	Regional Water Quality Control Board
SEIS/EIR	Supplemental Environmental Impact Statement/Environmental Impact Report
SGDM	Supplemental General Design Memorandum

SMHM	salt marsh harvest mouse
SPD	USACE South Pacific Division
SPK	USACE Sacramento District
SPN	USACE San Francisco District
SRA	shaded riverine aquatic habitat
SWOA	South Wetland Opportunity Area
USACE	U.S. Army Corps of Engineers (see also Corps)
USDA	U.S. Department of Agriculture
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
VRSS	vegetated reinforced soil slopes
WDR	Waste Discharge Requirements
WSE	water surface elevation

Glossary

acre-foot	The volume of water required to cover 1 acre to a depth of 1 foot (approximately 325,000 gallons).
adaptive management	Adjusting project strategy as needed to achieve mitigation objectives while the project is being implemented.
adverse impacts	Unfavorable, harmful, or detrimental changes in environmental conditions caused by project or municipal activities.
anadromous fish	Fish, such as salmon, steelhead, and shad that inhabit marine waters during juvenile and adult life stages, and migrate to fresh water to spawn.
Anchored High Performance Turf Reinforcement Mat (HPTRM)	A high-strength, woven, three-dimensional mat of polypropylene yarns anchored to the underlying soil with locked cable strand anchors. An anchored HPTRM, combined with a grass vegetative cover, anchors soil in place to prevent erosion under high water flow conditions.
armored; armoring	A facing layer or protective cover of concrete structural features placed to prevent erosion or the sloughing off of an embankment. Also, a layer or large stones, broken rocks or boulders, or precast blocks placed in specific random fashion on a river to protection against flowing water.
bank protection	Bank protection stabilizes a channel bank using rock, riprap, concrete, soft materials, vegetation, or a combination of materials or methods. Bank protection can also include preventative maintenance to ensure that banks do not erode in the future.
bank repair	Maintenance of existing bank protection structures with in-kind, in-place materials. This type of maintenance occurs when such structures fail.
bed	The bottom of a body of water such as a stream, channel, or river.
bench	An area cut into a terrace for riparian zone restoration or for strengthening the design of a water channel.
berm	A short earthen embankment structure, which may or may not be built against a dike or levee.
biotechnical bank stabilization areas	Sections of a water channel that are strengthened through the introduction of specific plants, trees, and shrubs.
box culvert	A water conduit in the shape of a rectangular concrete box.
bypass culvert	A flood protection conduit through which all or a portion of a channel’s flow is diverted from one point and reintroduced into the channel at the downstream end of the conduit to reduce the impact to the channel during flood.

bypass	A flood protection feature through which a portion, or all, of a channel's flow is diverted from one point and reintroduced into the channel at another point to reduce the flow in a section of the channel during floods.
channel	A natural or engineered bed of a stream, river, or harbor which acts as a conduit or route for the conveyance of water or other liquid medium.
channel erosion	Includes the processes of stream bank erosion, streambed scour, and degradation.
channel geometry	The natural or engineered shape of a waterway, which is used to convey water or other liquid medium.
Chinook salmon	The largest species of the salmon family. Inhabits the northwest Pacific Ocean and spawns in rivers and streams of North America. The species has a number of runs classified by the season in which they migrate into rivers to spawn. Winter run, spring run, fall run, and late-fall run are known to occur in California.
Clean Water Act	Formally known as the Federal Water Pollution Control Act, it constitutes the basic water pollution control statute for the United States.
confluence	A junction of two or more streams or rivers.
crib	A box constructed of timber that is filled with earth, stone, or heavy material.
cultural resources	Refers to the tangible remains left behind by past human activities. This includes prehistoric and historic archeological sites, and historic buildings, structures, and objects. Archeological sites consist of artifacts, plant and faunal remains, trash deposits, and a variety of features. An artifact is any object made or altered by humans in the past that may be picked up and moved. These may include prehistoric objects made of stone, bone, shell, pottery, or perishable materials; and historic objects such as cans, glass, ceramics, tools, and so forth. Features are human creations that are functionally or logistically tied to a certain location. A feature cannot be moved without destroying its integrity. Features may be such things as hearths or fire pits, house structures, storage pits, trash deposits, historic structures, walls, mines, or any other aspect of the built environment.
culvert	Any covered structure not classified as a bridge which conveys a waterway under a road or other paved area.
debris	Large objects such as recently fallen trees and branches, broken concrete, riprap, shopping carts, or objects greater in size than 1 cubic foot. It does not include established in-water Large Woody Debris (large ecologically valuable downed wood) and established in-water small woody debris (small ecologically valuable wood).
degradation	The lowering of the streambed by erosive processes such as scouring by flowing water, removal of channel bed materials, or down cutting of natural

	stream channels. Such action may initiate erosion of tributary channels, causing damage similar to that due to gully erosion and valley trenching.
design capacity	An engineering term used to describe the magnitude of stream flow that a modified channel was designed to convey.
design flood	The flood magnitude selected for use as a criterion in designing flood damage risk reduction measures. The largest flood that a given project is designed to pass safely.
design flow	The magnitude of stream flow that is used in design of channel improvements and structures across the channels.
design profile distance	Vertical distance between the top of an embankment adjoining a channel and the water level in the channel.
dike	A set-back earthen embankment structure whose purpose is to replicate the pre-project condition of embankments located along the riverbank that were removed or breached as part of project construction. Dikes are not flood protection features.
down cutting	The erosive effect of water against the river channel and their protective features; incision.
drainage area	Area that drains into a body of water such as a stream or a reservoir.
earthen channel	A waterway lined with soil and rock.
endangered or threatened species	A species or subspecies of plant or animal whose prospects of survival and reproduction are in immediate jeopardy or threatened with jeopardy throughout all or a significant portion of its range.
Environmental Impact Report	A detailed statement prepared under the California Environmental Quality Act describing and analyzing the significant environmental impacts of a project and discussing ways to mitigate or avoid the effects.
Environmental Impact Statement	A detailed written statement, required by Section 102(2)(C) of the National Environmental Policy Act, analyzing the environmental impacts of a proposed action, adverse effects that cannot be avoided, alternative courses of action, short-term uses of the environment versus the maintenance of long-term productivity, and any irreversible and irretrievable commitment of resources.
erosion	The wearing away of land surface by running water including rainfall, surface runoff, drainage, or wind.
flap gates	Typically installed on outlets that are 6 inches or larger in diameter to allow storm water to discharge and prevent flood water from flowing back into the drainage system.

fish passage	Structure intended to allow or enhance the movement of anadromous fish in their upstream and downstream migrations past dams and other barriers; includes fish ladders, bypass pipelines, and associated structures.
flood protection project	A project that affects the flood conveyance capacity or flood management behavior of the system, usually designed to reduce flooding hazards.
flood	The temporary inundation of lands normally dry; any waters escaping from a creek or river.
floodplain terrace	Low-lying areas adjacent to a stream or river channel that are flooded during high flows in a channel.
floodwall	A wall constructed along a channel to prevent flooding of the surroundings areas.
freeboard (levee)	The height of the physical top of levee above the design water surface elevation, and serves as a factor of safety for containing water in the stream without overtopping the levee.
freeboard(railways/ bridges)	The distance from top of design water level and bottom of railway/bridge to allow debris to flow without blockage conditions.
freeboard berm	A berm, not constructed against a dike or levee, whose purpose is to provide design profile freeboard during the project design flood event.
gabion	A wire cage, usually rectangular, filled with cobbles and used as a component for water control structures or for channel and bank protection.
gaging station	A structure on a stream, canal, lake, or reservoir where systematic observations of gage height or discharge are obtained.
grade control structure	Typically either a weir, chute, or pipe constructed within the confines of a gulley or waterway. These structures allow water to move from a higher to a lower elevation over a short distance while preventing erosion or gouging of the waterway.
groundwater	A term used to describe water which is found below ground in soil and rock pore spaces and in rock fractures.
habitat	The place where an animal or plant normally lives, among its associated species and support systems, often characterized by a dominant plant and co-dominant form, such as riparian habitat.
HEC-RAS	HEC-RAS (Hydrologic Engineering Center's River Analysis System) is a software program used to model the water surface profile for this project.
invert	A creek or channel bottom.
levee	An embankment constructed to prevent a river or stream from flooding adjacent lands.

low-flow channel	A section of stream that carries the more frequent, periodic stream flows.
marshplain terrace	A tidally-inundated graded terrace below the floodwalls and along the Napa River, which provides scour protection of the floodwalls and provides environmental habitat.
Mason's lilaeopsis	A species of flowering plant in the carrot family which is endemic to California which is threatened by environmental factors such as erosion and flood control activities.
mitigation	An action taken to moderate, reduce, or alleviate the impacts of a proposed activity by (a) avoiding the impact by not taking a certain action or parts of an action; (b) minimizing impacts by limiting the degree or magnitude of the action and its implementation; (c) rectifying the impact by repairing, rehabilitating, or restoring the affected environment; (d) reducing or eliminating the impact over time by preservation and maintenance operations during the life of the action; or (e) compensating for the impact by replacing or providing substitute resources or environments.
NCFCWCD	The NCFCWCD (Napa County Flood Control and Water Conservation District) is the local sponsor for the authorized project. In this document the acronym has been shorted to Flood Control District (FCD).
natural channel	A watercourse without any significant improvements or modifications and very little evidence of historical alterations.
overbank	The area of land between the waterside toe of a setback dike or levee and the top of the stream bank.
peak flows	The maximum discharge of a stream during a specified period of time or for a given storm event.
Planting Berm	A berm constructed against a dike or levee whose purpose is to supplement the structural dike or levee section to allow vegetation planting adjacent to the dike or levee.
plunge pool	A pool created by water passing over or through a complete or nearly complete channel obstruction, and dropping steeply into the streambed below, scouring out a basin in the stream substrate where the flow radiates from the point of water entry (Armantrout, 1998).
Project	A project is made up of one or more flood damage reduction systems that were constructed under the same authorization. In this case, the Project is all features that are both authorized and have been constructed to for the Napa River/Napa Creek Project.
riparian	Pertaining to the banks of a river, stream, waterway, or other, typically, flowing body of water, as well as to plant and animal communities along such bodies of water.

riparian habitat	Woody vegetation, especially trees and shrubs, that grow in riparian areas, such as along the edges of open water bodies (e.g., lakes, rivers, or ditches) or on levees. USACE typically considers riparian habitat as that vegetation growing below the upper top of the bank. Vegetation landward of this zone is upland vegetation/habitat.
riprap	Strategically interlocked rock or concrete of varying size, typically brought to a site and used to provide slope armoring to protect channel banks, drainage outlets, and other structures from erosion and scouring forces.
runoff (surface)	The flow of water across the land surface and in stream channels. Occurs only after the local storage capacity of the landscape has been exceeded and includes both overland flow and stream flow.
saltmarsh harvest mouse	A small rodent listed as endangered under the Federal and California Endangered Species Acts requiring special provisions for inspections (Section 10.6) and maintenance work including mowing (Section 10.6.1) in the Site 1 area where this mouse is expected to inhabit.
scour	The clearing and erosional action of flowing water, especially the downward erosion caused by stream water in removing material (e.g., soil, rocks) from a channel bed or bank or around in-channel structures.
sediment removal	The act of removing sediment deposited within a stream, channel, or bypass culvert. Typically, sediment is removed when it reduces the carrying capacity.
sediment	Solid material, both mineral and organic, that is carried by the water and settles to the bottom of channels, bypass culverts, drain pipes, or behind dams.
sedimentation	The process by which rock and organic materials settle out of water.
segment	A segment is defined as a discrete portion of a flood damage reduction system that is operated and maintained by a single entity. A segment can be made up of one or more features, including levee/dike embankments, floodwalls, channels, pump stations, closure structures etc.
shaded riverine aquatic cover	Provides habitat complexity and diversity in the form of in-stream cover and a source of food for young fish, and has been defined as the nearshore aquatic area occurring at the interface between a river and adjacent woody riparian habitat; principal attributes include (1) the adjacent bank composed of naturally erodible material, (2) riparian vegetation that either overhangs or protrudes into the water, and (3) the water containing variable amounts of woody material (i.e., logs, branches, and roots).
spawning gravel	Rocks and pebbles deposited in streambeds that are the proper size for anadromous fish to use as they lay their eggs.
station	A station is a standard channel location system used by the FCD that gives the distance from the downstream limit of jurisdiction (usually San Francisco

	Bay), or, for a tributary creek, from where it branches off of the main channel. Distance is measured in feet, with each "station" representing 100 feet for the Project. For example, station 43+56 would be a point 4,356 feet upstream of the 0 point.
stoplog	A mechanical device installed between the ends of floodwalls used to prevent flood water from reaching beyond the location of the device.
streambed	The part of a stream over which water moves.
superintendent	A FCD staff person responsible for the development and maintenance of, and directly in charge of, an organization responsible for the efficient operation and maintenance of all of the structures and facilities during flood periods and for continuous inspection and maintenance of the project works during periods of low water.
system	A system is made up of one or more segments that collectively provide flood damage reduction to a defined area. Failure of one segment within a system constitutes failure of the entire system. Failure of one system does not affect another system.
toe	The line of a natural or fill slope where it intersects with the natural ground.
vegetation management	Vegetation growing onsite is monitored, controlled, or enhanced by the following safety guidelines and regulations, and by the Napa Project's plan for short-term and long-term horticultural goals. Vegetation growing on and near flood protection features (levees, dikes) must be maintained in accordance with in Section 10.7.3 of this Manual. Vegetation management includes the monitoring and documenting of the health and vigor of the native plants, noting competing exotic species to be later controlled, and observing other factors, such as weather and the degree of public access allowed. Mowing, grazing, scheduling prescribed burns, and spot-spraying herbicide treatments are implemented to help native species establish the site.
velocity	Speed with which water flows in a channel. It depends on several factors, such as slope, smoothness and uniformity of channel, area of flow, and wetted perimeter.
vortex rock weirs	A weir constructed such that water flows from a small opening at its base, causing the water to form a whirlpool as it collects behind the weir.
watershed	The area of a landscape from which surface runoff flows to a given point; a drainage basin. A ridge or drainage divide separates a watershed from adjacent watersheds.
weir	A dam, wall, or other structure in a waterway for the purpose of storing, diverting, or measuring water.
weed	Vegetative growth including all non-native and invasive grasses, forbs and other herbaceous plants, and non-native woody vegetation that has not been

planted and competes for environmental and microclimate elements necessary for healthy plant growth of installed plants, such as soil moisture and sunlight.

SECTION 1 – GENERAL

1.1 INTRODUCTION

This section provides a general description of the Napa River, California Project (Project). The non-Federal sponsor is the Napa County Flood Control and Water Conservation District, NCFCWCD, hereby referred to as the Flood Control District (FCD) throughout this document. The FCD is responsible for operation, maintenance, repair, replacement, and rehabilitation (OMRR&R) of the completed project. United States Army Corps of Engineers (USACE) has managed the construction work which has directly affected the city of Napa. The manual is in final interim status meaning this is a final document for the existing flood control features with an interim status due to an incomplete flood control project. The interim status of this manual means that the hydraulic model is incomplete and it is not possible to fully develop without all of the project features (which affect the final geometry and conveyance of the river). The number of unknown features which affect the hydraulics of the river cannot be foreseen during model construct. Therefore, until the project is fully constructed the model cannot be fully developed without being able to capture all of the floodwalls, levees, geometric details, final elevations, and materials (manmade and natural) in the hydraulic model.

1.2 GENERAL DESCRIPTION

The Napa Project is authorized to provide flood damage risk reduction and recreation. The Napa Project provides flood risk management by reconnecting the Napa River to its floodplain, creating wetlands throughout the area, maintaining fish and wildlife habitats, and retaining the natural characteristics of the river. The Napa Project involves about 6.7 miles of the Napa River and two-thirds of a mile along Napa Creek. Key features of this Project include Sites 1A, 1B, 2 East (2E), 2 West (2W), the Dry Bypass and Napa Creek. The various features are provided for in Figure 5-1. This included creating marshplain and floodplain terraces, two bypass culverts along Napa Creek, and construction of levees, dikes, floodwalls, biotechnical bank stabilization, two new railroad bridges, utility relocations, building demolitions, maintenance roads, recreation trails, and flood closure gates. A summary of key flood control features is provided in SECTION 8. Once complete, the project is intended to provide flood damage risk reduction to the City of Napa. Mitigation is not necessary because the project does not cause long term adverse impacts to habitat that would require mitigation.

1.3 DOCUMENT ORGANIZATION

This manual provides information, guidance, and requirements for the OMRR&R of the Project. The manual is in accordance with the USACE Engineer Regulation (ER) 1110-2-401, "Operation, Maintenance, Repair, Replacement and Rehabilitation Manual for Projects and Separable Elements Managed by Project Sponsors," (1994).

1.4 REFERENCES TO APPPROVED REGULATIONS

This manual is submitted in accordance with the provisions of the *Code of Federal Regulations* Title 33, Chapter II - Corps of Engineers, Department of the Army, Part 208 - Flood Control Regulations (33 CFR 208) (Appendix H:1). The regulations describe obligations assumed by the non-Federal sponsor, project superintendent, and USACE District Engineer, San Francisco District (SPN). These regulations are incorporated by reference into this OMRR&R.

SECTION 2 – AUTHORIZATION

2.1 PROJECT AUTHORIZING & FUNDING LEGISLATION

The project was authorized by Section 204 of the Flood Control Act of 1965 (Pub.L. 89-298) for the purposes of flood control and recreation (Appendix H:4)

> "The project for the Napa River, California, is hereby authorized substantially in accordance with the recommendations of the Chief of Engineers in House Document Numbered 222, Eighty-ninth Congress, at an estimated cost of $14,950,000."

Section 136 of the Water Resources Development Act (WRDA) of 1976 (Pub. L. 94-587) authorized the addition of fish and wildlife mitigation and improvements to Napa Creek:

> "(a) The project for flood control on the Napa River, Napa County, California, authorized by section 204 of the Flood Control Act of 1965, is hereby modified to authorize and direct the Secretary of the Army, acting through the Chief of Engineers, to acquire approximately 577 acres of land for the purpose of mitigating adverse impacts on fish and wildlife occasioned by the project. The non-federal share of the cost of such lands shall be the percentage as that required for the overall project.
> (b) Such project is further modified to include construction by the Secretary of the Army acting through the Chief of Engineers, of the Napa Creek watershed project of the Soil Conservation Service approved June 25, 1962.
> (c) No part of the cost of the modified project authorized by this section shall include the cost of the Secretary of the Army, acting through the Chief of Engineers, performing maintenance dredging for the navigation project for the Napa River."

The WRDA 1976 modification was apparently intended to allow the implementation of the plan presented in a General Design Memorandum (GDM) completed in 1975, but that plan was not implemented. There was no further change in the Congressional authorization after 1976. The approved plan that was followed during final project design and construction was identified as the Selected Plan in the Final Supplemental GDM (SGDM) for the Napa River/Napa Creek Flood Protection Project dated October 1998. The SGDM was a stand-alone revision of the 1975 GDM. The 1998 SGDM included major changes in the overall project plan from that presented in the 1965 authorizing document (H. Doc. 89-222), including reductions in the project length and design level of performance. The Record of Decision for the SGDM was approved by the USACE Director of Civil Works on June 9, 1999 (Appendix H:2). As described in the SGDM, the approved plan includes dike removal, one-side overbank excavation, biotechnical bank stabilization, a dry bypass channel, levees and floodwalls, bridge relocations, pump stations, utility relocations, building demolition, maintenance roads, and recreation trails for the approximately 6.9 mile reach of the Napa River from Highway 29 to Trancas Street. The plan also includes approximately two-thirds of a mile of channel modifications with bypass culverts for Napa Creek. The approved plan does not include compensatory fish and wildlife mitigation as authorized by WRDA 1976 because the project design features, including plantings, were expected to offset adverse effects. The approved plan was identified as the National Economic Development (NED) Plan and was intended to provide a 100-year level of flood protection to the City of Napa (downstream to Imola Avenue) while maintaining or enhancing the river's natural processes and features.

The constructed project includes several significant design refinements relative to the SGDM approved plan, including: addition of the Vineyard Dike; deletion of 3560 feet of maintenance road/recreation trail south of Newport Marina; and relocation of railroad track near Tulocay Creek and Imola Avenue. The reasons for these design changes were documented in a Limited Reevaluation Report approved by South Pacific Division in 2012.

Federal construction funding was provided through multiple appropriation Acts beginning in FY2000. The Project Cooperation Agreement between the Department of the Army and the Flood Control District for the project was signed on February 1, 2000 (Appendix B:1). PED and Construction were cost-shared with the non-Federal sponsor in accordance with WRDA 1976, as amended.

2.2 PROJECT APPROVALS AND ENVIRONMENTAL DOCUMENTS

The following approvals and environmental documents are necessary to construct, operate, and maintain the Project:

- The National Marine Fisheries Service (NMFS) issued a Biological Opinion (BO) on December 14, 1998 as pursuant to Section 7 of the Endangered Species Act (16 U.S.C. 1536[c]) of 1973, as amended. (See Appendix E:2)

- The Final Supplemental Environmental Impact Statement/Environmental Impact Report (FSEIS-EIR), dated March 1999, evaluated the environmental effects of the Project under National Environmental Policy Act and California Environmental Quality Act (USACE, 1999). (See Appendix E:10)

  - The Record of Decision approving the FSEIS-EIR was signed by the USACE Director of Civil Works on June 9, 1999. (See Appendix H:2)

- Section 404 of the Clean Water Act (CWA) was complied with through a Section 404(b)(1) analysis, which was completed in December 1997. The 404(b)(1) analysis can be found in Appendix D: of the FSEIS-EIR. (See Appendix E:10)

- The U.S. Fish & Wildlife Service (USFWS) issued a BO pursuant to (see Appendix E:3) pursuant to Section 7 of the Endangered Species Act (16 U.S.C. 1536[c]) of 1973, as amended,. (See Appendix E:3)

- Both USFWS and NMFS issued BO's with pertinent conservation measures necessary for construction, and operations and maintenance procedures. Subsequent species that have since become listed (Western yellow billed cuckoo) do not have nesting habitat within the Napa project area. Therefore, reconsultation with the resource agencies is not necessary. The current O&M manual contains the conservation measures required by previous USFWS and NMFS BO's.

- The Water Quality Certification Waste Discharge Requirements (CWA Section 401) was obtained on September 15, 1999 from the California Regional Water Quality Control Board (RWQCB). (See Appendix E:4)

- The California Department of Fish & Wildlife (CDFW) issued a Streambed Alteration Agreement (Section 1602 of the Fish and Game Code) to the FCD on August 8, 2000. This agreement has been subsequently renewed several times. (See Appendix E:5)

SECTION 3 – LOCATION

3.1 PROJECT LOCATION

The Project is located in Napa County, California, with the majority of the project work occurring within the downtown portion of the city of Napa. The Napa River limits of the Project are from Trancas street, north of the Napa River oxbow, and extends approximately 6.7 miles downstream (south) to the State Highway 29 bridge which crosses Napa River. The Project also includes approximately two-thirds of a mile along Napa Creek upstream of the confluence with the Napa River..

3.2 PROJECT CONTROL DATA

The majority of the Project features were constructed using the horizontal and vertical controls based on North American Datum of 1927 (NAD 27) and National Geodetic Vertical Datum of 1929 (NGVD29), respectively. The Napa Dry Bypass project was designed and constructed using North American Vertical Datum of 1988, (NAVD88).

A datum conversion equation of Elevation (NAVD88) = Elevation (NGVD29) + 2.39’ feet has been used to convert from NGVD29 to NAVD88 for features constructed in NGVD29. See Appendix G:1 for the Sacramento District Datum Documentation Report. Flood stage elevations listed throughout the manual will be based on the NAVD 88 datum.

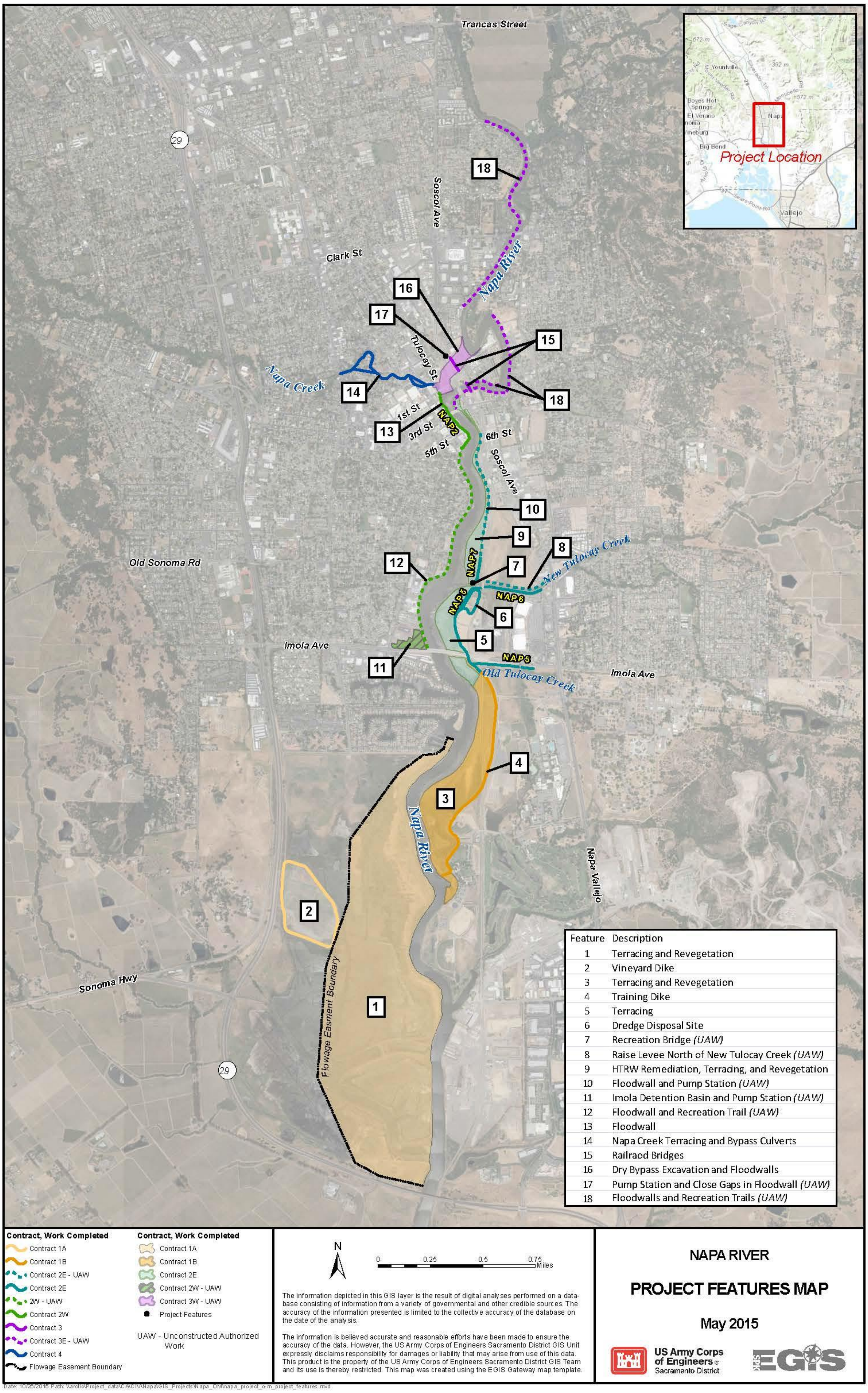

Figure 3-1: Project Features Map

SECTION 4 – PERTINENT INFORMATION

4.1 PROJECT HISTORY

The Federal Government first became involved with the Napa River in 1938 when “preliminary examinations and surveys” were authorized by the Secretary of War. Six years later, House Document 626 of the 78th Congress was released. The report recommended channel improvements for reaches of the Napa River and Conn Creek, and construction of a dam to create a 37,000 acre-foot flood damage reduction and water conservation reservoir on Conn Creek. Although these features were authorized by the Flood Control Act of 1944, Congress never appropriated construction funds. During 1948, the City of Napa built a dam on Conn Creek to establish a 31,000 acre-foot water conservation reservoir.

The flood of 1955 compelled the House of Representatives Committee on Public Works to request the Board of Rivers and Harbors “to review reports on Napa River and its tributaries” and "determine the need for modification of the recommendations in such reports and the advisability of adopting further improvements for flood control and allied purposes in view of the heavy damages caused by recent floods." The committee's request was fulfilled in 1963 by the Review Report for Flood Control and Allied Purposes, which recommends that previously authorized flood control improvements above Soscol, California, be rescinded and that the Federal Government “should adopt a project in the basin below Trancas Street for flood control and recreation purposes.”

Three years passed before funding for “Advanced Engineering and Design (FY67)” was provided and in September 1975 a General Design Memorandum (GDM) and EIS was completed. The 1975 plan included recreation features that were requested by the FCD. The 1975 plan was opposed by voters by referendum election in 1976 and again in 1977. After its second defeat, the Napa Project was placed on inactive status at the request of the FCD.

The 1986 flood, which forced the evacuation of some 5,000 residents, took three lives, and caused an estimated $100 million in county damages, revived public interest in flood damage reduction. Subsequently, in letters dated February 9, 1987 and April 9, 1987, the FCD requested that the Napa Project be reactivated. The Project was reactivated in October 1988 and PED activities were initiated. This effort led to preparation of an initial draft SGDM and SEIS/EIR. The plan in these documents included a levee and channel modification project which sought to provide flood risk reduction to the City. These documents underwent public review in April 1995 and received numerous comments. The major concerns expressed in these comments dealt with salinity intrusion due to channel deepening, degradation of water quality in the river oxbow due to construction of a “wet” bypass channel, and disposal of contaminated dredge material. Because of these concerns, resource agencies and several local groups requested modifications to the plan. The San Francisco Bay RWQCB, which must provide a Section 401 Water Quality Certification, stated: “Without major improvements in the project and Draft SEIS/EIR as currently submitted, approval of this project will be difficult.”

To foster community consensus regarding modification for flood damage reduction for the City of Napa, the FCD and other local groups created a community-wide coalition to consider various ways to refine the plan proposed in the initial draft SGDM so that it would be more acceptable to the community and resource agencies. The Community Coalition, with the assistance of outside consultants, resource agency personnel, and USACE as a resource, held numerous meetings from January 1996 to May 1997 to develop refinements to the SGDM’s National Economic Development (NED) plan. The result of these meetings is the current refined plan. This plan provides flood damage reduction, eliminates the primary environmental concerns of the previously developed plan, and provides significant associated environmental quality outputs. The revised plan, as described in the final SGDM and SEIS/EIR, was also more acceptable to the resource agencies with regard to maintaining water quality and avoiding further damage to the Napa River ecosystem. Because of the changes to the plan it was decided to revise the SGDM and SEIS/EIR and again issue them for public review. The 1998 SGDM was approved by the U.S. Army Director of Civil Works on June 8, 1998.

There have been no further changes in the project authorization since 1976. The 1998 SGDM included major changes in the overall project plan from the plan presented in the 1965 authorizing document (Pub. Law 89-298, see Appendix H:4) The Limited Revaluation Report (LRR) (USACE, 2012) describes the changes to the project since the 1998 SGDM.

4.2 WATERSHED PHYSIOGRAPHY

The Napa River drains a watershed of more than 400 square miles as it flows from Mt. St. Helena to San Pablo Bay and on to San Francisco Bay. The drainage basin runs 50 miles north to south, ranges from 5 to 10 miles in width. The Napa River originates near Mount St. Helena, follows the valley, and empties into the Mare Island Strait which flows into the tidal marshlands and sloughs of San Pablo Bay.

Napa Creek is a tributary to the Napa River in the city of Napa. Its headwaters rise in the Mayacamas Mountains on the west side of the valley and flow southeasterly to discharge through a narrow, meandering channel into the Napa River, downstream of the Oxbow area. The Napa Creek drainage area is approximately 15 square miles.

4.3 CLIMATE AND WEATHER

The climate of the Napa Valley is moderate and low levels of smog with temperatures ranging from an average high of 83^{o} Fahrenheit (F) during July-September to an average low of 39^{o} F in January.[1] The average rainfall is 27.71 inches per year, with the majority of the rainfall occurring from November to March with December being the wettest month.[2]

4.4 ENVIRONMENTAL

The project has environmental impacts on sensitive habitats including riparian woodland, estuarine and freshwater aquatic habitats, and wetland habitats. Implementation of the project has been fully coordinated with the concerned resource agencies. Some resources agencies, such as the Regional Water Quality Control Board and the U.S. Fish and Wildlife Service, have the authority to review final designs pursuant to Federal environmental laws. Upon review of the final designs for construction contracts, design changes have sometimes been required to resolve resource agency concerns, often resulting in increased monitoring and maintenance activities to further avoid impacts to listed species.

4.5 RUNOFF CHARACTERISTICS

Stream flow of flood-producing magnitude is the result of precipitation over the entire river basin for a period in excess of 12 hours. After the periods of most intense rainfall, maximum river stages and discharges in the city can be expected from 8 to 14 hours later. Streamflow in the southern part of the Napa River is also affected by tide conditions, which can affect the river as far upstream as Trancas Street. Napa River peak flood flows occur near Mount St. Helena about four hours after the most intense storm precipitation. Peak flood flows occur about two hours later at Oak Knoll Avenue, relative to the peak at

[1] Source: www.weather.com
[2] Source: Western Regional Climate Center (normal's 1981–2010, extremes 1893–present)

Mount St. Helena, and about three or four hours later at Imola Avenue, relative to the peak at Mount St. Helena.

4.6 TIDAL INFLUENCES

Within the city of Napa, Napa River can be characterized as a tidal influenced estuarine system. Upstream of Trancas Street, the Napa River is largely freshwater. As the river proceeds through the city, the water quality transitions to a brackish marsh. Tidal influences on the river affect both discharges to San Pablo Bay and water surface elevations (WSE) extending upstream approximately 0.5 miles north of the city.[3]

To account for sea level rise, water surface profiles in the year 2067 (end of period of analysis, project year 50) resulted in a 1.04 ft sea level rise at the 1% Annual Chance Exceedance (ACE) for the Napa River mouth. This would generate only a 0.12 ft water surface increase at Napa River Station 685+00 which is near the Imola Avenue bridge. The effect of this small increase in starting WSE on design elevations would be negligible.[4] (Reference LRR, 2012)

Table 11-1 shows the computed probability flows at river reaches downstream of Trancas Street. All flows except the 0.1% Annual Chance of Exceedance (ACE) event were used in the analysis to define the discharge-frequency relationship input to the Flood Damage Reduction Analysis (FDA)-based economic analysis to evaluate project performance.

4.7 CHANNEL STABILITY

4.7.1 Napa River

The Project uses engineered and bio-engineered bank and channel stabilization to resist erosion, prevent bank degradation and provide protection to man-made improvements at select locations along the project reach. These features include concrete and rock lined channels, rock riffles, slope protection riprap, slope protection vegetation, floodwalls, and marsh plain terrace vegetation and are designed to reduce the amount of sediment deposited downstream of 3rd Street.

4.7.2 Napa River Dry Bypass

The Napa Dry Bypass channel is comprised of a man-made channel which is planted with a varied plant community. Planting includes Brackish Emergent Marsh, Upland Native and Native grasses, and turf planted over high performance turf reinforcement matting (HPTRM) material. In addition, various shrubs and trees are planted to stabilize the channel. The channel bottom will be protected by HPTRM and concrete sidewalks. Rock is placed at the inlet and outlet of the channel which are also protected by permanent, capped, sheet piling at both toes. Due to high velocities anticipated within the bypass channel, concrete energy dissipaters are included below the Napa Valley Wine Train (NVWT) Dry Bypass bridge see Figure 5-10 and Figure 5-11.

4.7.3 Napa Creek

The Napa Creek channel is planted with native and non-native trees and brush. Channel stability will be provided by a number of methods including In-Water Wood Structures, vegetated reinforced soil slopes (VRSS), planted and non-planted rock protection structures, planted rock grade control structures (riffles), and reinforced concrete inlet, outlet and retaining walls.

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[3] City of Napa, 2009 Hazard and Mitigation Plan
[4]USACE SPK, 2012 Limited Reevaluatin Report Napap River/ Napa Creek Flood Protection Project

4.8 HYDRAULIC DESIGN

All Napa River project features are designed for the completed fully-built conditions. For the completed fully-built Project, flood risk reduction features are designed to adequately and safely pass the Risk & Uncertainty (R&U) flood events, the 1% flood event at 95% assurance with 2 feet of freeboard or at 90% assurance with 3 feet of freeboard. The Project's FRM on the Napa River extends from about one-half mile below Trancas Street to just north of Highway 29.

Hydraulic design for Napa Creek employs the approach for channel improvements for a natural stream without the installation of a levee or floodwalls. The channel conveyance capacity is increased through the construction of upper and lower bypasses. Napa Creek channel is designed to reduced flood damage risk for up to a 1/200-ACE event with localized minor overtopping. Acceptable shear stress and velocity ranges are also included in the hydraulic design considerations and procedures to verify that the proposed bank treatments are suitable and appropriate for Napa Creek.

The Napa River project is currently in interim condition. In its current state of completion, the Napa Project does not provide the design level of FRM. It is possible for the currently completed sections to provide increased FRM protection for portions of downtown, however this does not equate to the same level of FRM until the completion of the entire project. The only exception to this is Napa Creek where the design level of protection has been achieved since it is isolated from the greater Napa River Flood Risk Management System.

4.8.1 Projects within Downtown Napa

4.8.1.1 Site 2W: Hatt to 1st Street

During the design of Site 2W: Hatt to 1st Street, there were concerns of the boat dock in Napa River between 3rd and 4th streets causing flow obstruction during high water events. Noble Consultants, Napa city's consultant developed a HEC-RAS model with the boat dock improvements incorporated. USACE SPK reviewed the City's consultants work and agreed the boat dock design showed no adverse impacts on design WSE. See Appendix I:14 for the technical memorandum.

4.8.1.2 Site 3: NVWT Hydraulic Design

The NVWT Phase II Relocation project ("Project") constructed two new railroad bridges in downtown Napa. The previous railroad bridge over Napa River was a combination original timber trestle and newer steel span that dates back to the late nineteenth and early twentieth century. The old bridge created a significant flow constriction within the river, raising water levels upstream and through downtown Napa. The old bridge was replaced with a new concrete bridge (the Napa River Bridge), with the tracks approximately four to five feet higher and only two flow efficient piers within the river. The Dry Bypass Channel required the construction of a second railroad bridge (over the Dry Bypass Bridge) where before no bridge existed and the tracks were an obstruction to flow in the bypass prior to its construction.

4.8.1.3 Site 3: Dry Bypass Hydraulic Design

During the design phase of the Dry Bypass project, McMillen LLC was contracted to perform an updated hydraulic analysis using a two dimensional steady state finite-element surface-water modeling system (FESWMS) of the Napa Dry Bypass. See Appendix I:4 for additional analysis information and results.

4.8.1.4 Site 4: Napa Creek Hydraulic Design

Flood protection on Napa Creek extends from the confluence of the Napa River upstream approximately two-thirds of a mile along Napa Creek to the Jefferson Street Bridge. The flood reduction features for Napa Creek include upper and lower bypass culverts with elevated weir entrances, channel improvements in the form of an excavated flood conveyance terrace, and the removal of constrictive bridges and architectural features and implementation of bio-engineered structures.

Erosion protection treatments for Napa Creek include:

(1) Channel bank grading combined with vegetation planting for an effective stabilization treatment when sufficient room for laying back the bank is available
(2) Floodplain benches were implemented to provide continuous plantable surfaces that promote the establishment of overstory and understory vegetation to increase riparian habitat in the system.
(3) In-stream rock and boulder structures placed in the channel to provide aquatic habitat, promote hydraulic diversity, and help prevent channel incision due to downcutting.
(4) Incorporate in-stream woody material to protect banks against erosion, reduce flow impingement at outside of bends, and provide habitat structure for fish and aquatic invertebrates.

Northwest Hydraulic Consultants performed a study completed in May 13, 2010 which contained preliminary bank stabilization design and summaries of the H&H analysis performed for Napa Creek within and adjacent to the project limits (see Appendix I:1). The downstream bypass inlet was later modified by the Lower Bypass Inlet Study performed by Northwest Hydraulic Consultants (see Appendix I:2).

4.8.2 Projects outside Downtown Napa

Sites 1A, 1B and 2E all increase conveyance and excavating channel banks to form flood conveyance terraces. Dikes constructed in Sites 1A and 1B match pre-project dike elevations and do not provide additional flood protection.

4.9 UNCONSTRUCTED AUTHORIZED FEATURES

Below is a list of authorized features included in the SGDM which have not been constructed. The unconstructed features have not yet received Congressional appropriations to be added to the existing project. To date a sufficient portion of the project has been completed to qualify as needing an interim operation and maintenance manual.

- Site 2E: Gravity drain structure through Imola levee, floodwalls, pump station, shoreline stabilization and trail on east bank of Napa River, pedestrian bridge over New Tulocay Creek and north levee raise on New Tulocay Creek. (New Tulocay Creek to 3rd Street)
- Site 2W: Floodwalls, pump station, detention basin, shoreline stabilization, and trail on right bank of Napa River. (500 feet south of Imola Avenue to Hatt Building)
- Site 3W: Floodwalls/levees north of the Oxbow, bank stabilization, detention basin, and a combination maintenance road/recreation trail to Trancas Street. A pump station located just north of the bypass floodwalls between Soscol Ave and the Railroad tracks.
- Site 3W: completion of gaps in the Dry Bypass floodwall (see Appendix I:3)
- Throughout the Project: Planned 6-inch to 72-inch reinforced concrete drainage pipes (note Table 17-1 of the SGDM).

4.10 USACE LEVEE SAFETY PROGRAM & LEVEE INSPECTION SYSTEM (LIS)

4.10.1 Project, System, and Segment Delineations

For purposes of the USACE Levee Safety Program, flood damage reduction features, such as levees and floodwalls, are divided into projects, systems, and segments as defined below.

- Project: A project is made up of one or more flood damage reduction systems that were constructed under the same authorization.
- Segment: A segment is defined as a discrete portion of a flood damage reduction system that is operated and maintained by a single entity. A segment can be made up of one or more features, including levee embankments, floodwalls, channels, pump stations, closure structures etc.
- System: A system is made up of one or more segments that collectively provide flood damage reduction to a defined area. Failure of one segment within a system constitutes failure of the entire system. Failure of one system does not affect another system.

USACE Periodic and Routine Inspections are done by segment. Each segment has a four-character Levee Inspection System (LIS) code assigned to it. See **Figure 4-1**.

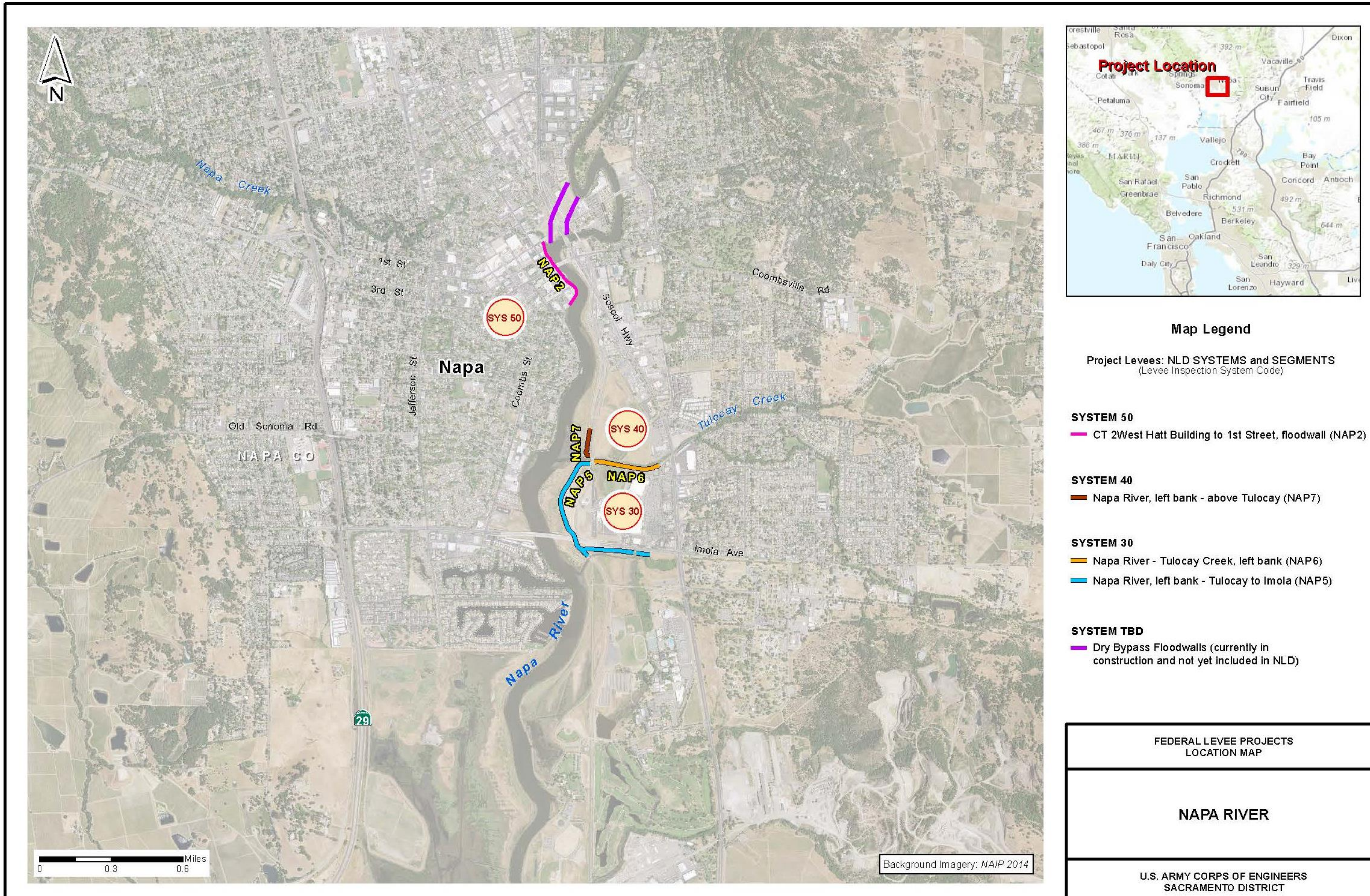


Figure 4-1: Napa Levee Safety System and Levee Inspection Program Map

4.11 FLOOD HISTORY

Almost all of the land adjacent to the Napa River through the city of Napa is subject to flooding. Numerous damaging floods have been recorded since 1862 on the Napa River. Seven major floods occurred between 1862 and 1900. The 15 most recent serious floods occurred in 1942, 1943, 1955, 1962, 1963, 1965, 1967, 1973, 1978, 1982, 1983, 1986, 1995, 1997, and 2005. The February 1986 flood was estimated to have been a 35-year event. The flood resulted in 3 people dead, 27 injured, 5,000 evacuations, 250 homes destroyed, and another 2,500 residences damaged county wide, totaling $100 million in damages. The most recent flooding occurred on December 31, 2005.

4.12 MONITORING STATIONS

Installation, locations and functioning of monitoring stations are included in SECTION 11– Surveillanc

SECTION 5 – CONSTRUCTION HISTORY

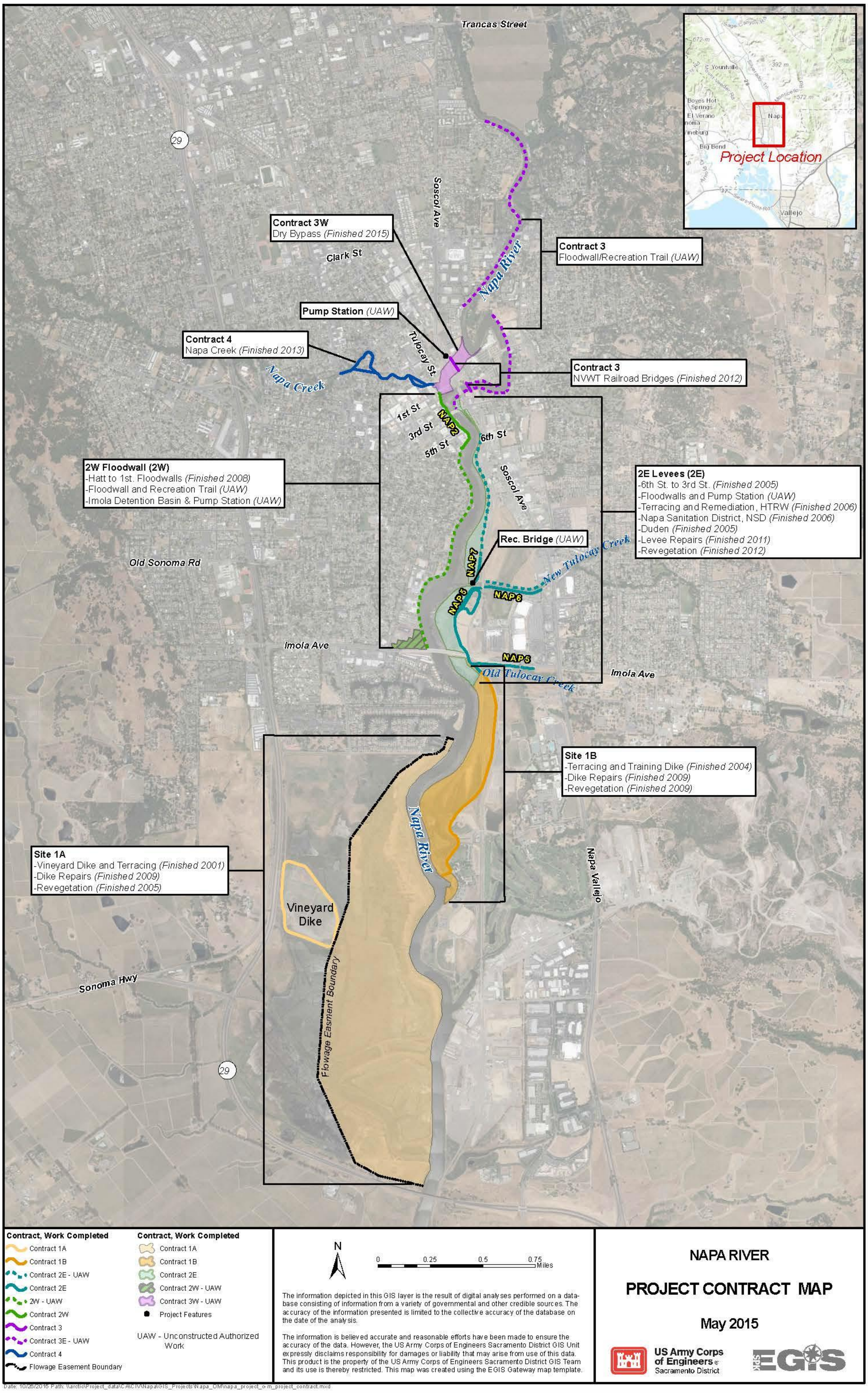


Figure 5-1: Project Site Map

5.1 CONSTRUCTION HISTORY

Table 5-1summarizes the construction history for the project. Table 5-2 identifies all of the revegetation contracts. The USACE, Sacramento District, was responsible for construction of the projects.

5.2 CONSTRUCTION CONTRACT SUMMARY

Table 5-1: Construction Contract Summary

Contract	Contract Number	Start	Finish	Contract Award Amount	Contract Mods	Total Contract Amount	Contractor	Project Engineer	Resident Engineer	Contracting Officer
1A (HWY 29 to Imola)	DACW05-00-C-0031	Jul 2000	Jan 2001	$2,717,189	$243,902	$2,961,091	S.D. Carmack Dirtmoving PO Box 278 Live Oak, CA 95953	Len Ramsey	Ralph Cameron	Linda Hales
1B	DACW05-03-C-0007	Jun 2003	May 2004	$2,546,591	$99,191	$2,447,400	Mass Ex Const Co. 700 River Street, Suite 1 Santa Cruz, CA 95060	Robert Myers	Greg Schulz	Ronald Schunk
2 East (6^{th} to 3^{rd})	W91238-04-C-0023	Jul 2004	Sep 2005	$2,199,553	$357,433	$2,556,986	S.D. Carmack Dirtmoving 10460 Live Oak Blvd. Live Oak, CA 95953	Robert Myers	Cathy Wise	Ronald Schunk
2 East (Duden)	W91238-05-C-0012	Mar 2005	Nov 2005	$2,909,670	$1,039,937	$3,949,608	J.A. Gallegos Construction 2412 Foothill Blvd, SPC 64 Calistoga, CA 94515-1233	Robert Myers	Cathy Wise	Ronald Schunk
2 East (NSD)	W91238-05-C-0019	Jun 2005	Oct 2006	$2,488,565	$366,584	$2,855,149	TPA-CKY Joint Venture 302 W. 5^{th} Street #310 San Pedro, CA 94507	Robert Myers	Cathy Wise	Ronald Schunk
2E HTRW Phase I	99-D-0012	Apr 2007	Nov 2007	$8,443,653.33 (Fed) $772,256.50 (NF)				Curtis Payton	Floyd Bolton	
2E HTRW Phase II	03-F-0067	Dec 2007	Nov 2007	$11,780,980.52 (Fed) $451,126.48 (NF)				Curtis Payton	Floyd Bolton	
2E Repairs	W91238-08-D-0043	Aug 2010	Oct 2010	$164,000	- $29,588	$134,412	North Star Construction and Engineering, Inc. 1282 Stabler Lane, Suite 630-109 Yuba City, CA 95993-2625	Aurelio Gavieres	Cathy Wise	Matthew Hancsarik
2West Floodwall	W91238-05-C-0020	2006	2008	$19,251,959	$16,620,177	$35,872,136	R&L Brosamer, Inc. 333 Camille Avenue Alamo, CA 94507	Robert Myers	Floyd Bolton	Matthew Hancsarik

Contract	Contract Number	Start	Finish	Contract Award Amount	Contract Mods	Total Contract Amount	Contractor	Project Engineer	Resident Engineer	Contracting Officer
Contract 3 - Wine Train Relocation	W91238-08-C-0022	Sep 2008	Jul 2012	$64,965,826	$14,046,764	$79,012,590	Suulutaaq Inc. 4300 B Street, Suite 205 Anchorage, AK 99503	Aurelio Gavieres	Floyd Bolton	Matthew Hancsarik
1A/1B Dike Repairs	W91238-08-D-0043	Sep 2009	Dec 2009	$539,012	None	$539,012	North Star Construction and Engineering, Inc. 1282 Stabler Lane #630-109 Yuba, CA 95993	Aurelio Gavieres	Floyd Bolton	Matthew Hancsarik
4 (Napa Creek)	W91238-10-C-0028	July 2010	May 2013	$14,826,020	$3,197,941	$18,241,849	Proven Management Inc. 712 Sansome Street San Francisco, CA 94111	Aurelio Gavieres	Floyd Bolton	Matthew Hancsarik
Contract 3 - Napa River Dry Bypass	W91238-14-C-0002	April 2014	XX	$16,886,857	$2,016,400	$18,903,257	Nordic Industries, Inc. 1437 Furneaux Rd; Olivehurst, CA 95961	Aurelio Gavieres	Floyd Bolton	Rachel Rosas

Table 5-2: Revegetation Construction Contract Summary

Contract	Contract Number	Start	Finish	Contract Award Amount	Contract Mods	Total Contract Amount	Contractor	Contracting Officer
1A	DACW05-01-C-0003	Jan 01	Jan 05	$456,725	$15,381	$472,106	Hanford Applied Restoration and Construction 23195 Maffei Road Sonoma, CA 95474	Ronald Schunk
1B	W91238-05-C-0013	Nov 04	Oct 09	$723,127	$267,435	$930,562	Baywood Environmental Services, Inc. 2901 Sir Francis Drake Blvd. Fairfax, CA 94930-1641	Shirley Martin
2	W91238-08-C-0009	Aug 08	Dec 2012	$887,774	$125,541	$1,013,315	SMP SERVICES, INC. SHAWN PETERSON 1911 DOUGLAS BLVD #85-393 ROSEVILLE CA 95661-3714	Gregory Tom

5.3 SUMMARY OF COMPLETED PROJECTS

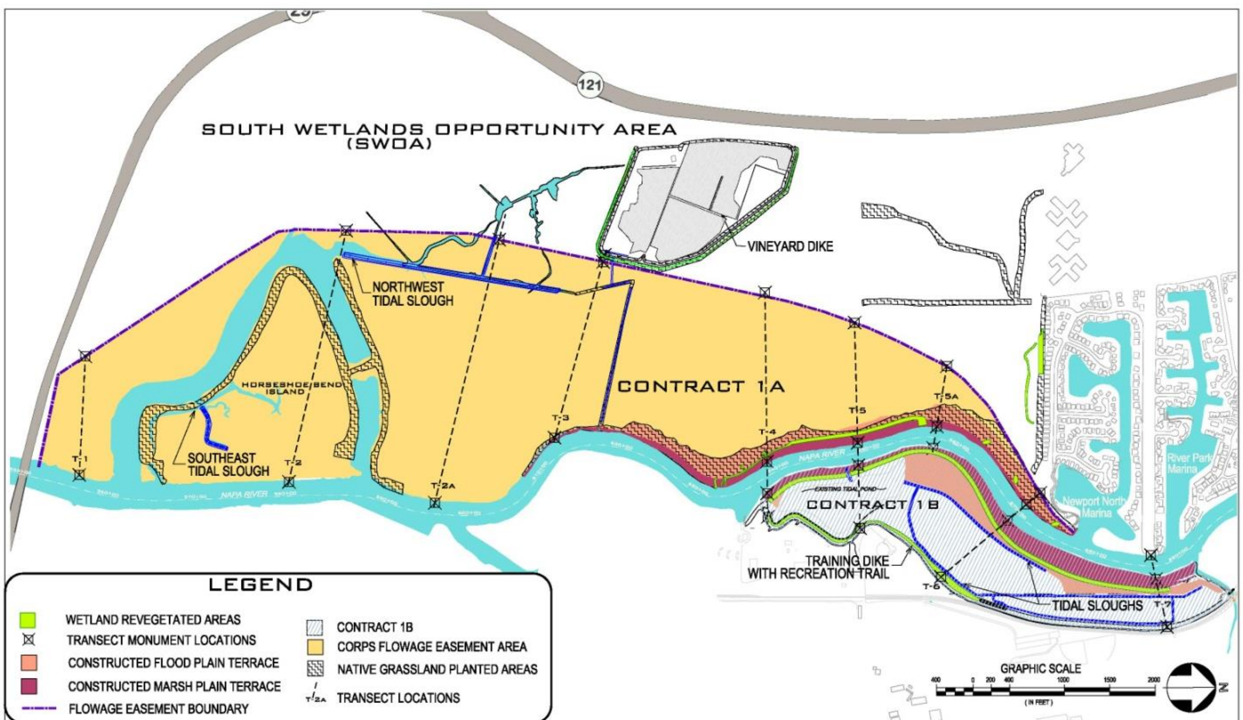
5.3.1 Contract 1A

Site 1A consisted of excavating marsh and floodplains, lowering of river banks, breaching of the river bank dikes in two locations and construction of a circular non FEMA certified Vineyard Dike to protect an existing vineyard from tidal flows caused by breaching the river banks. The Vinyard Dike includes an interior drainage system to collect local surface runoff collected and discharged through pipes through the dike.

The breached river banks along the existing Horseshoe Bend create the USACE flowage easement area (FEA) as shown in Figure 5-1. Construction of the FEA required removal of two existing flap gates and complete bank removal (breaching) at two locations along the Horseshoe Bend Island channel (an old river oxbow). The 1st breach in the dike was a length of about 100 feet on the northwest (outside) bend of the channel. The second breach was on the west side of Horseshoe Bend Island on the southeast bend of the channel, where the dike was breached about 50 feet. See Figure 5-2 for site map.

5.3.1.1 Site 1A - Revegetation Contract

Site 1A area was planted in the fall 2001 and had a 3-year establishment period. The project included 56 acres of native grass seeding and native plants divided into three different zones corresponding to lower (*Scirpus*, *Typha*, and *Juncus* spp.), middle (*Salicornia* and *Jaumea* spp), and upper (*Distichlis* sp) tidal vegetation zones. 15 gallon trees were installed adjacent to the marina on the northeast corner of the project adjacent to the marina (see Appendix A:3 for as-built drawings). The wetland revegetation and native grassland plantings will provide additional stability and erosion control on the berm and dike structures. Refer to Figure 5-2 for locations.



NAPA RIVER/NAPA CREEK FLOOD CONTROL PROJECT O&M MANUAL PLATE 1.1
CONTRACTS 1A &1B OVERALL SITE MAP, STATIONS 550+00 TO 690+00

Figure 5-2: Site 1A & 1B Site Map

5.3.2 Site 1B

The Training Dike in the Site 1B area includes a waterside Planting Berm between approximate Napa River Stations 636+00 and 674+00 (Dike Stations 0+00 and 33+00). Small trees and shrubs were planted on the Planting Berm. An old tidal pond on the south end of the site (Napa River Station 637+00), which was previously diked and isolated from tidal fluctuation, was restored by removing the flap gate and breaching the dike.

5.3.2.1 Site 1B - Revegetation Contract

Site 1B revegetation contract began plant installation in the spring of 2005 which was completed in June of 2005. The contract originally had a 3-year establishment period but was extended by 1.5 years ending in October 2009. The project included plantings in the marsh zone, riparian zone and upland zone. The wetland revegetation and native grassland plantings will provide additional stability and erosion control on the berm and dike structures. Refer to Figure 5-2 for locations.

5.3.3 Site 1A & 1B Repair Work

The Vineyard Dike in the Site 1A area and the Training Dike in the Site 1B area were repaired in 2009. The Vineyard Dike work consisted of filling rodent holes with cement/bentonite grout, adding aggregate base course to a vehicle rut on the crest, and repairing a crack in the waterside slope near the dike crest.

The Training Dike overtopped at several locations during the flood event of 2005/2006. The overtopping resulted in erosion of the landside dike slope between Dike Stations 26+50 and 32+50. The erosion was repaired in 2009 by rebuilding the landside portion of the embankment with compacted levee fill, installing an anchored HPTRM on the landside slope to prevent future erosion, seeding the rebuilt landside slope with native grasses, and replacing the aggregate base and pavement on the landside portion of the crest. Additional work on the Training Dike included filling rodent holes with cement/bentonite grout, sealing cracks in the crest road pavement and pavement overlay in two areas which had a high concentration of pavement cracks.

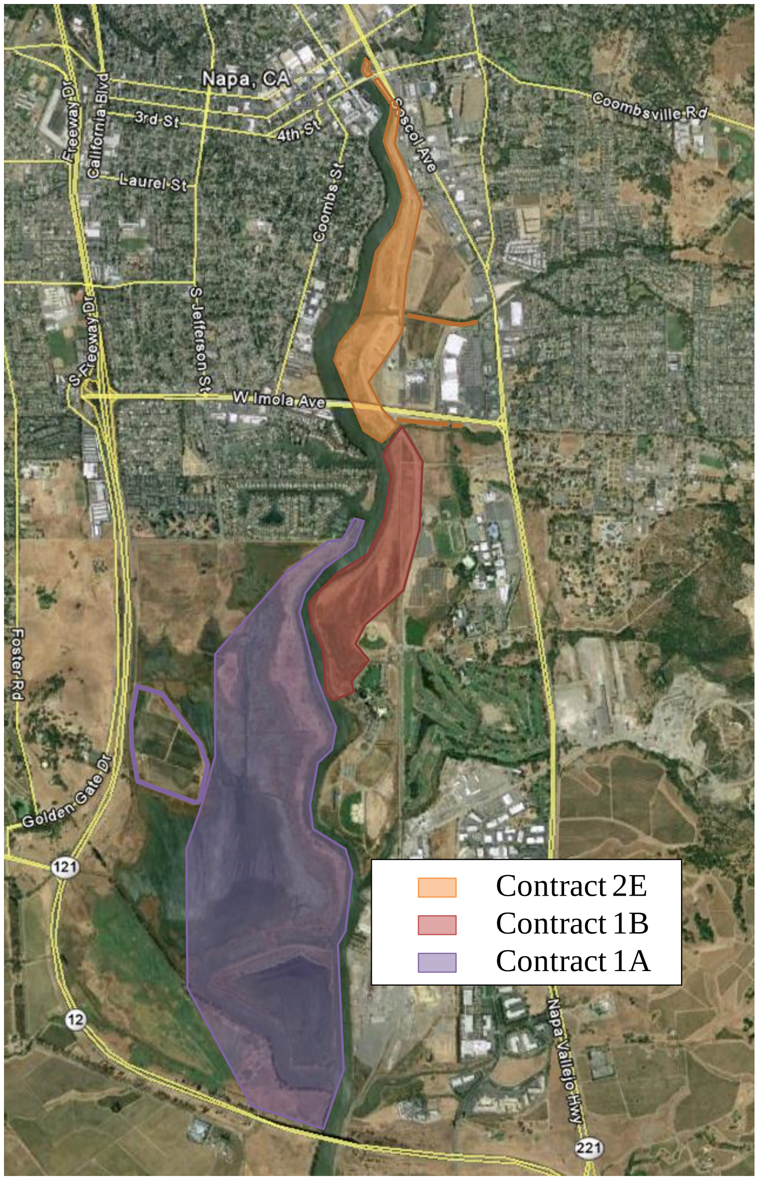


Figure 5-3: Projects outside Downtown Napa

5.3.4 Site 2E

The Site 2 East River work has been broken into four separate contracts beginning at Old Tulocay Creek and ending at the crossing of Soscol Ave and Napa River. The following contracts are listed from downstream to upstream along Napa River. In some cases the contracts overlap.

- Duden
- Napa Sanitation District (NSD)
- Terracing & Remediation
- 6^{th} to 3^{rd} Street

5.3.4.1 Site 2E: Duden – Old Tulocay Creek to Imola Ave

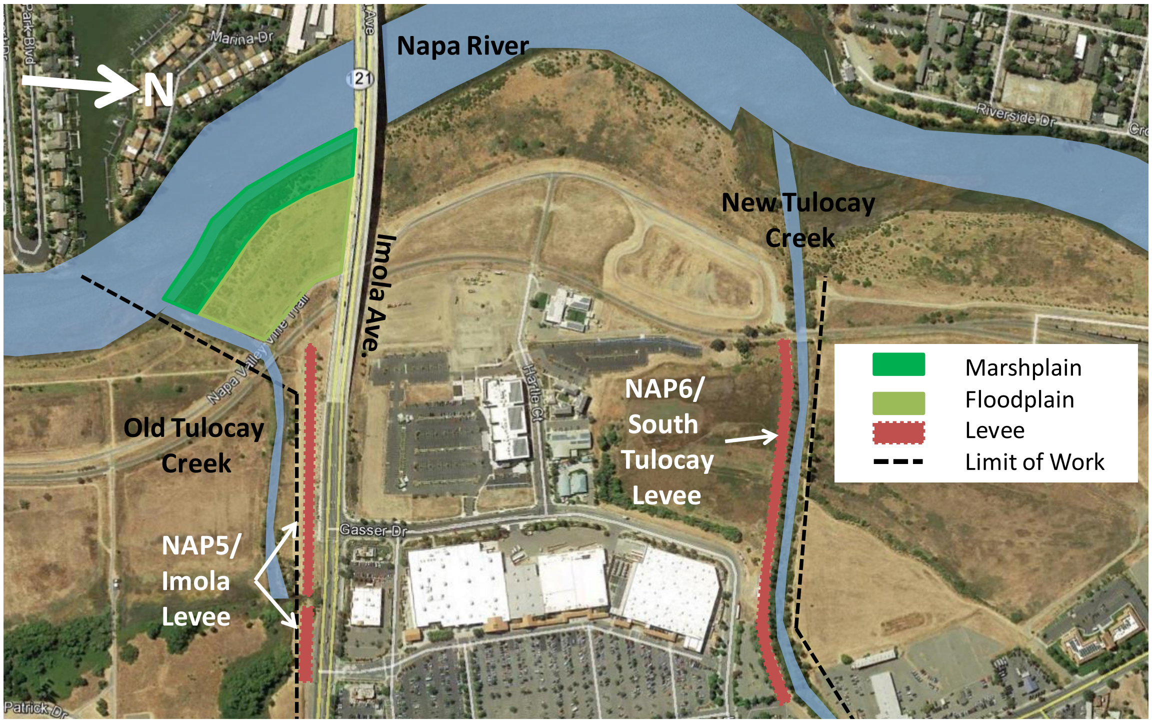


Figure 5-4: Site 2E - Duden Construction Features

The Duden section included marshplain and floodplain terracing between Old Tulocay Creek to Imola Avenue (Napa River Station 688+00 to 700+00). The SGDM had originally identified this reach to be in the Site 1B area, but the contract, storm water pollution prevention plan, and other USACE documents placed this reach in the Site 2E area. Additionally, construction of approximately 0.25 miles of levee south of Imola Ave and the raising of the levee south of New Tulocay Creek, shown as Imola Levee and South Tulocay Levee, respectively, see Figure 5-4, was performed as part of the Site 2E Duden Contract.

Site 2E repair contract was required to correct general maintenance items. The work included repair to an erosion gully on the NAP7 Levee, filling rodent holes in Imola Levee and installation of various survey markers. See Appendix A:9 and Appendix A:10 for plans and specifications and Appendix A:26 for as built drawings.

5.3.4.2 Site 2E: NSD – Imola Ave to New Tulocay Creek

Figure 5-5 shows the construction area of Site 2E-NSD which included marshplain and floodplain terracing between Imola Avenue to New Tulocay Creek (Napa River Station 700+00 to 725+00) and construction of a dredge disposal dike. A 0.35 mile long flood control levee and paved recreation/maintenance trail was constructed east of the floodplain terrace and west of the dredge disposal dike. This levee extends past (south) Imola Ave an additional 500 feet to Old Tulocay Creek and connects with the pedestrian bridge construction in Site 1B. See Appendix A:11 and Appendix A:12 for additional construction details.

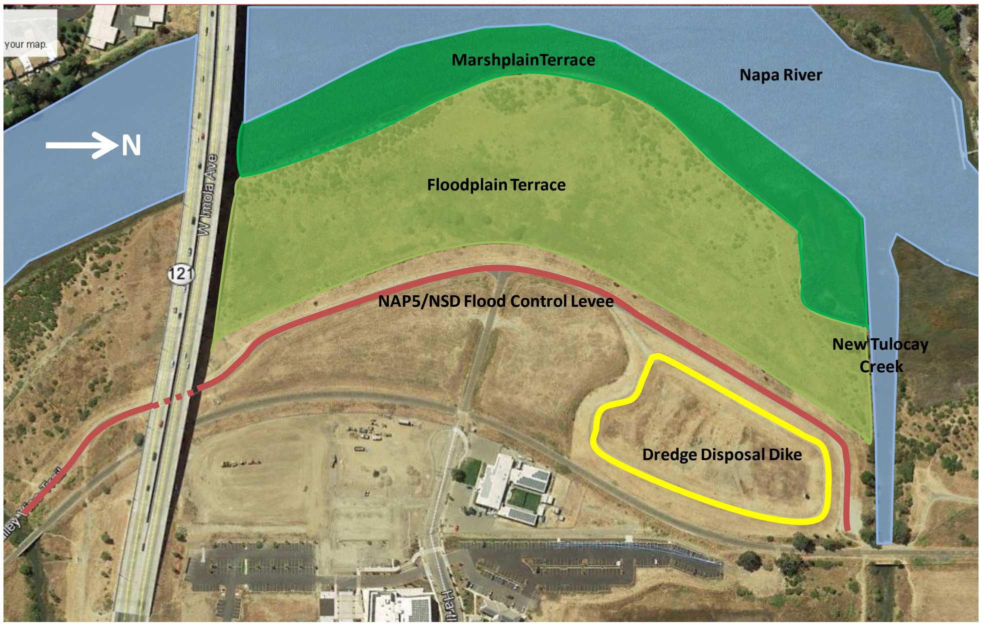


Figure 5-5: Site 2E - NSD Construction Features

5.3.4.3 Site 2E: Remediation & Terracing (Phase I & II)

This work included cleanup of contaminated soil (Hazardous, Toxic and Radioactive Waste (HTRW)) from New Tulocay Creek north to 7th Street including the Oil Company Road area. In June 2001, CA RWQCB approved the Site Cleanup Requirements and Remedial Action Plan, In summer of 2002, Phase I of the cleanup began on the half-mile long contaminated stretch of riverbank, and Phase II began in the fall of 2003 which continued cleanup efforts and included east bank terracing between New Tulocay Creek and 7th Street (see Figure 5-6). Although as-built plans, construction plans and specifications are not available for this reach, original construction plans are included.

The California RWQCB required installation of groundwater monitoring wells which were installed at the direction of USACE SPK staff. The wells were turned over to the sponsor on August 22, 2012 (see transfer letter in Appendix C:2).

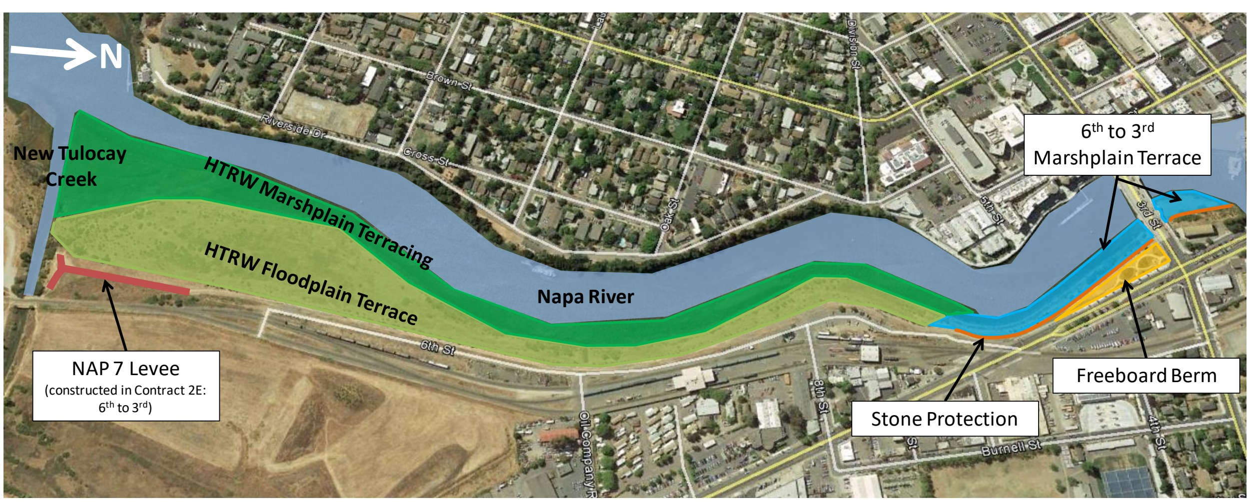


Figure 5-6: Site 2E - 6th to 3rd and Terracing & Remediation

5.3.4.4 Site 2E: 6th to 3rd Street

The 6th to 3rd Street Contract included marshplain terracing and construction of a freeboard berm near 3rd Street along the eastern river bank. Stone erosion protection and plantings within the stone protection were provided along the river along Napa River's eastern side slope which follows Soscol Avenue from 6th street to approximately 250 feet north of 3rd Street. Further south along Napa River, this contract included construction of a 700 foot flood control levee beginning on the north side of New Tulocay Creek. See Figure 5-6. Construction plans and specifications are available in Appendix A:13 and Appendix A:14, respectively. Although as-built plans, construction plans and specifications are not available for this reach, original construction plans are included.

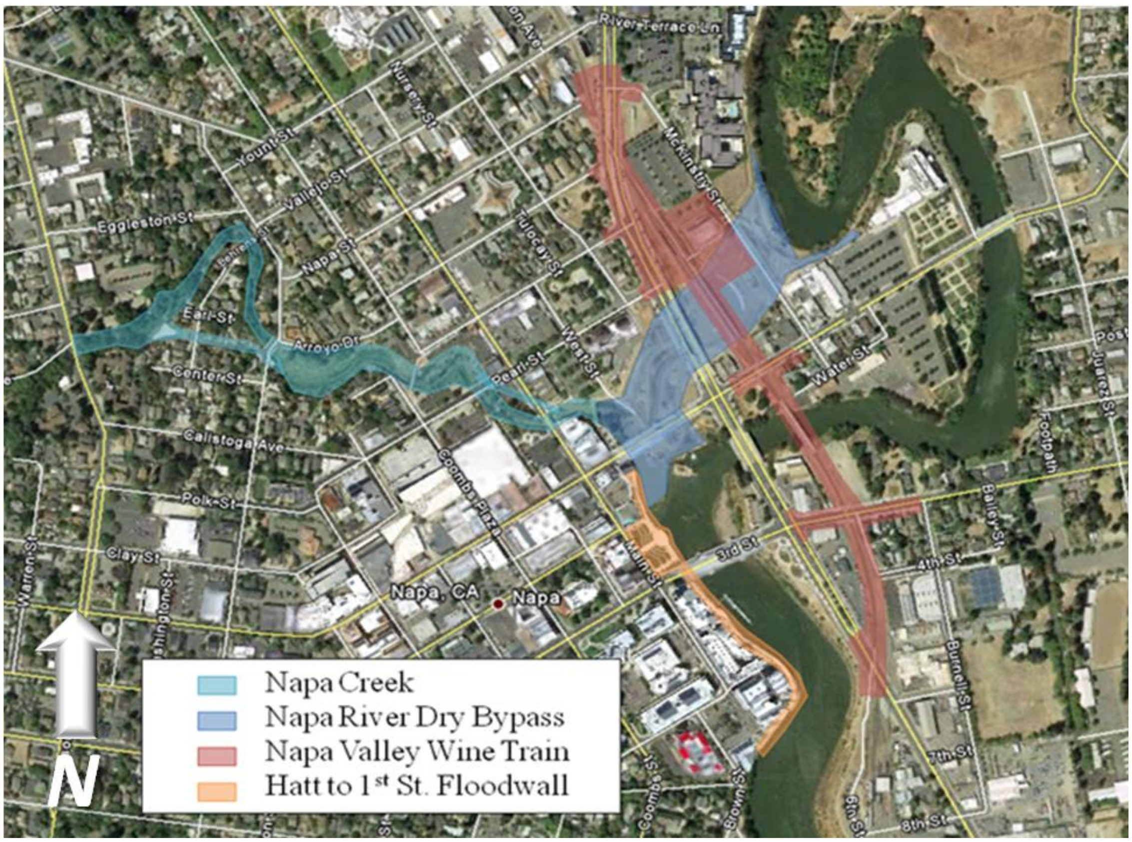


Figure 5-7: Projects within Downtown Napa

5.3.5 Site 2W – Hatt to 1st Street Floodwall

Site 2W included construction of 2,700 feet of floodwall and promenade, Veterans Park and marshplain terrace covered with stone protection from approximately the Hatt Building on Main Street and 5th to 1st Streets. Two lighting system were included in the Promenade Area between 5th and 3rd Streets and Veterans Park. The removable stoplogs are stored within a locked structure within Veterans Park. The trigger for when to install the stop logs are in Section 9.3.7, Step 2. As-builts are available in Appendix A:15 and Appendix A:16.

5.3.6 Site 2 – Revegetation Contract

Work began in August 2008 in the Site 2 Revegetation Area on both east and west sides of Napa River as shown in Figure 5-8. Work included shoreline planting of water emergent plants, with areas of riparian, and upland plantings and installation of irrigation. The floodplain terrace was seeded with California native grasses. The grassland area located in between the upland and riparian zones was mowed a couple of times per year and sprayed with herbicides to control weeds. See Appendix A:17 to Appendix A:19 for construction plan, irrigation as builts and specifications.

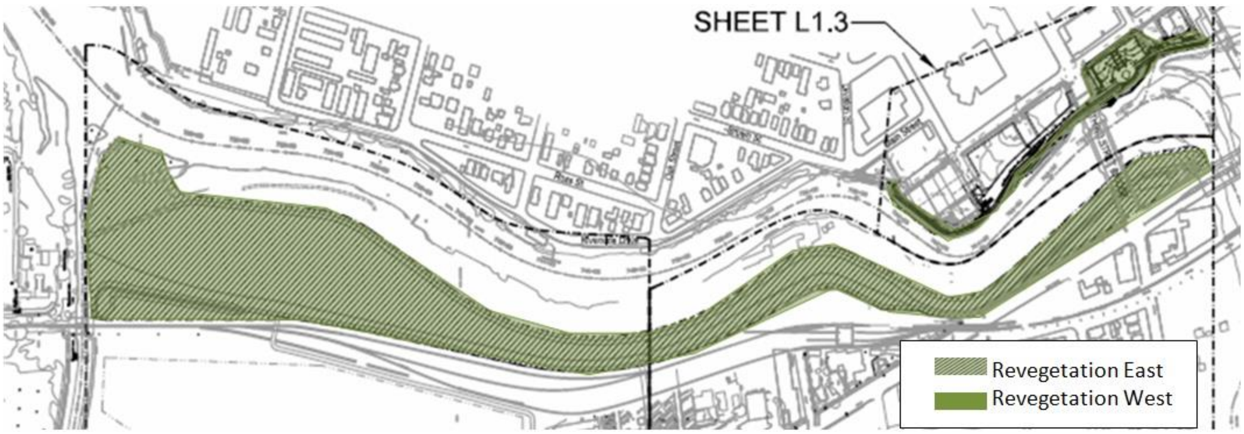


Figure 5-8: Site 2 Revegetation Area

5.3.7 Site 3 – Napa Valley Wine Train (NVWT) Relocation Project

This work included replacing the existing Napa River Railroad Bridge with a new two-track railroad bridge and the construction of a similar bridge over the future Dry Bypass Channel see Figure 5-9. Floodwalls were constructed around the NVWT Depot Building. Train tracks required realignment and the following city streets were affected (see Appendix A:22 and Appendix A:23):

- Soscol Avenue near 6th Street: Minor grade change and addition of railroad crossing panels.
- 3rd Street between Soscol Avenue and Burnell Street: 3 foot increase in grade at railroad tracks, addition of retaining walls, new utilities, new pavement.
- Lawrence Street between 3rd and 4th Streets: 2.5 foot increase in grade at 3rd Street, addition of retaining wall, new utilities, new pavement.
- Water Street adjacent to the railroad tracks: Street shortened to accommodate new track alignment.
- 1st Street between Soscol Avenue and McKinstry Street: 6 foot increase in grade at railroad tracks, addition of retaining walls, new utilities, new pavement.
- Soscol Avenue between Clinton and Napa Streets: 4 foot increase in grade change at railroad tracks, addition of retaining walls, new utilities, new pavement.
- Napa Street at Soscol Avenue: connection to Soscol Avenue closed and turned into a cul-de-sac.

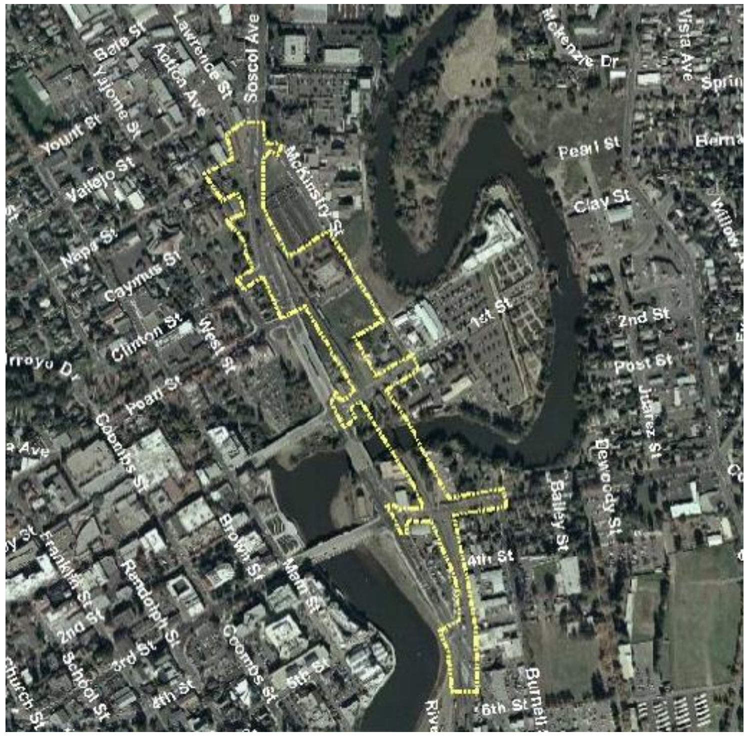


Figure 5-9: NVWT Construction Limits

5.3.8 Site 3 – Dry Bypass

The Dry Bypass project consists of a 1,300 foot long flood channel which is between 200 and 300 feet wide and crosses below 1st Street, Soscol Avenue and NVWT Dry Bypass Bridge. To provide the proper flood protection McKinstry Street was lowered and reconstructed with floodgates which tie into floodwalls which were constructed on either side of the channel. A low flow channel was included to convey street flooding from the northern bank and allows the conveyance of local rainfall without flooding the entire bypass. Anything within the channel excluding the bridge piers is subject to damage when the bypass conveys flood flows. The pre-cast concrete culvert has removable railings added as a safety feature.

The modeling studies conducted prior to the design of the bypass indicated that the lack of interior drainage for the community once the bypass was constructed could not be addressed until a pump station was constructed to pump the interior flooding. Interior flooding is the occurrence of local floodwaters attempting to flow to the bypass and drain into Napa River. With the floodwalls in place the local drainage backs up against the floodwalls and creates a flooding issue for the community. Because a pump station was not a part of the funding for the design and construction, in order to avoid interior drainage issues, the northern portion of the floodwall was constructed with two gaps in them in order to allow interior drainage to pass into the bypass. Future design and construction work is intended to design and construct a pump station for the northern portion of the floodwall area and then close the gaps which remain in the floodwall.

The bypass is not a concrete lined channel and thus relies on various types of vegetation and turf reinforced matting (HPTRM) to secure the channel lining and prevent scour. Therefore, the vegetation is more than an aesthetic appeal and acts as a structural component along with the HPTRM to hold the channel in place. These structural components along with the irrigation system must be kept in working order for full functionality.

The inlet and outlet of the bypass are rock shaped/lined for maximum erosion protection. The inlet and outlet areas will require yearly inspection and should be inspected for rock displacement following any storm events where the bypass conveyed runoff.

Within the bypass are various concrete pathways that aid visitors to either get across the bypass or traverse within it for recreation purposes. Besides its practical appear, the pathways also serve as a structural component to the channel invert. Any damage beyond minor cracks should be repaired in order to maintain the structural integrity of the channel. See Figure 5-10, Figure 5-11, Appendix A:20 and Appendix A:21 for the project area, as builts and specifications, respectively. See SECTION 10 – Maintenance and Inspection for more details on maintenance for the bypass. See Section 9.3.7 for when to begin to take action to close the bypass prior to a flood event.

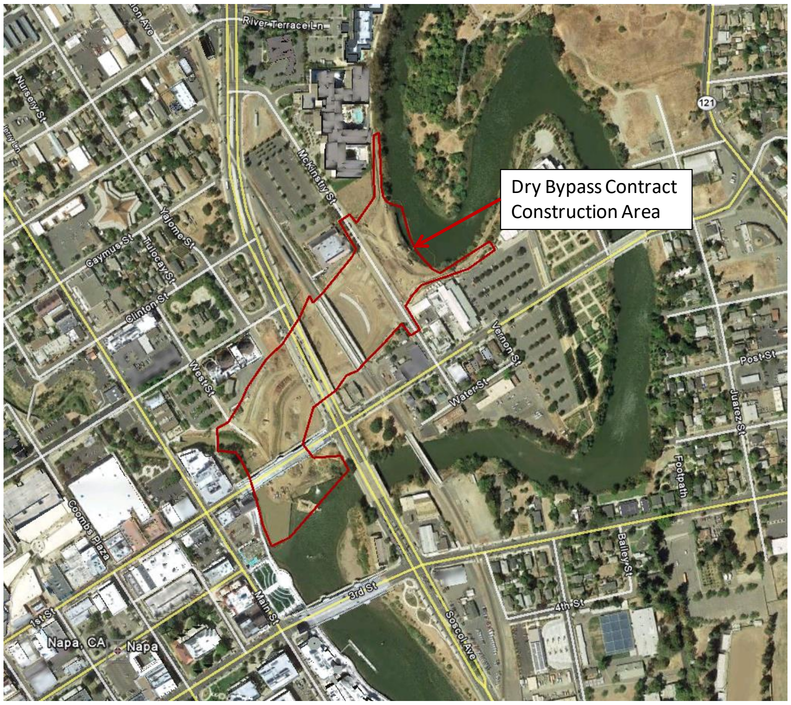


Figure 5-10: Site 3: Dry Bypass Project Limits

Figure 5-11: Site 3: Dry Bypass Project Features

5.3.9 Site 4 – Napa Creek

Figure 5-12 shows Napa Creek Project area included work along the Creek beginning at the Napa River confluence and continued upstream just before the Jefferson Street Bridge. The work included excavation for a vegetated floodplain terrace on the north bank, installation of two bypass culverts, bank stabilization features, bioengineered structures and installation of irrigation system. See Appendix A:24 and Appendix A:25 for contract as-builts.

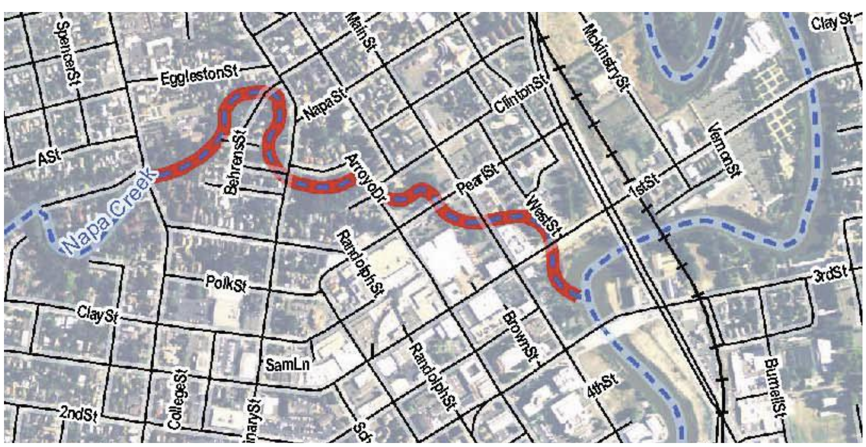


Figure 5-12: Site 4 - Napa Creek Project Area

5.3.10 Post Closure Contingency Monitoring of Former HTRW Residual Soil Left in Place

The Final Post Remedial Action Monitoring Plan (MWH, July 2003) specified monitoring activities required to be performed following the completion of the Marsh and Flood Plain terracing in Contract 2 East to evaluate the sufficiency of remedial actions completed according to the Consolidated Remedial Action Plan (MWH, 2001) and in accordance with California RWQCB Order No. 01-066 (RWQCB, June 2001). All groundwater monitoring required by the Final Post Remedial Action Monitoring Plan has been completed and the RWQCB approved the Request for Closure Report dated March 28, 2016 submitted by the Napa County Flood Control and Water Conservation District in a letter dated March 14, 2017, and required the Flood District to prepare a Post-Construction Contingency Plan to address the potential for exposure of residual soil contamination at depth located in certain defined areas of the Contract 2 East Marsh and Flood Plain.

The District's Post Closure Contingency Plan will be based upon Corps of Engineers surveyed Cross Sections 10A and 10B (See Appendix G Survey Documents) that were located based upon the presence of subsurface soils that did not meet the soil cleanup levels specified in RWQCB Order 01-066. The District is responsible to continue to monitor these locations for visual signs of erosion during Annual inspections. If evidence of erosion is noted, a survey will be conducted to measure the erosion and compare to the Corps surveyed Cross Sections established in 2007 and the results of the survey will be included in the monitoring report with an analyses of whether the subsurface residual soils exceeding the cleanup levels are at risk of exposure.

The District shall avoid soil excavation in the areas where these residual soils are present. If any such excavation is necessary, a work plan shall be prepared for RWQCB approval. The Work Plan shall outline appropriate measures for evaluation of the presence of residual contamination and soil handling and disposal.

5.4 SUMMARY OF ADDITIONAL FEATURES REQUIRING MAINTENANCE

The additional features listed below should be considered for maintenance purposes:

- Napa River Railroad Bridge: Napa Valley Railroad will own the superstructure (bridge deck and all rail appurtenances), while FCD will own the substructure (bridge piers and foundation). This work was constructed during the NVWT Construction and the manual has been turned over to the FCD.
- Napa Bypass Railroad Bridge: The Napa Valley Wine Train owns the tracks and attachments which FCD owns the bridge and substructure. This work was constructed during the NVWT Construction and the manual has been turned over to the FCD.
- The South Wetland Opportunity Area (SWOA) consisting of the "west overbank lands" referred to in the SGDM was purchased by the sponsor. The FCD is responsible for operation and maintenance of the area.

SECTION 6 – PROJECT PERFORMANCE

6.1 INTRODUCTION

This section describes the protection provided by the various features of the project. The prime objective of maintaining the project features is protection of the project benefits. This section describes the benefits provided by the flood damage risk reduction and recreation features of the project. It also discusses the consequences of flood conditions exceeding the project design and the mitigation and benefits related to cultural resources, environment, and recreation.

6.2 PROJECT MODELS

The following hydraulic models have been developed for the analysis and design of flood risk reduction features for Napa River and Napa Creek:

(1) Without-project condition HEC-RAS 1D model for Napa River
(2) Without-project condition HEC-RAS 1D model for Napa Creek
(3) Interim Condition HEC-RAS 1D model for Napa River
(4) With-project condition HEC-RAS 1D model for Napa River
(5) With-project condition HEC-RAS 1D model for Napa Creek
(6) With-project 2D FESWMS model for Napa River

The Napa River HEC-RAS 1D model domain extends along Napa River from RS 686+00 at River Park Marina to RS 916+60 at Trancas Street. The Napa Creek HEC-RAS 1D model domain extends along Napa Creek from RS 410 just upstream of the confluence with the Napa River to RS 5394 in Napa Creek. The 2D FESWMS model domain extends along Napa River from RS 754+00 near Riverside Drive to RS 849+00 below Lincoln Avenue Bridge.

The interim HEC-RAS model for Napa River has been developed to represent the interim project condition which include project components shown in Table 6-1.

Table 6-1: Project Components Included in Interim Condition HEC-RAS 1D Model

Project Component	Status	Included in Interim Condition
BRIDGE		
Napa River		
Maxwell (Imola Avenue) Bridge	Completed	Yes
Third Street Bridge	Completed	Yes
Napa Valley Wine Train Bridge	Completed	Yes
First Street Bridge	Completed	Yes
Oxbow Bypass		
First Street Bridge	Completed	Yes
Soscol Avenue Bridge	Completed	Yes
Napa Valley Wine Train Bridge	Completed	Yes
OTHER PROJECT COMPONENTS		
All works downstream of Imola Avenue	Completed	Yes
All terracing on Napa River	Completed	Yes

Project Component	Status	Included in Interim Condition
Dry Bypass on Napa River	Completed	Yes
Dry Bypass Right Bank Flood Walls with 2 Gaps(on either side of Soscol Avenue)	Completed	Yes
Dry Bypass Left Bank Flood Walls	Completed	Yes
All other works on Napa River upstream of Napa Creek confluence	To be studied	No
All three pump stations for interior drainage	To be studied	No

It should be noted that the hydraulic condition in the vicinity of the oxbow and dry bypass is predominantly 2-dimensional flow. A 2D FESWMS model was therefore developed for the with-project condition for the design of the oxbow and dry bypass potions of the project at a time when 2D hydraulic computation features were not available in HEC-RAS.

HEC-RAS 1D2D Version 5.1 has been officially released for use. It is recommended that a HEC-RAS 1D2D model for the with project condition be developed by FCD. The HEC-RAS 1D2D model should be calibrated with the results of the FEWSWMS before being adopted as the baseline hydraulic model for the completed fully-built Napa project. This model shall be utilized by the FCD as a tool to perform performance based maintenance and monitoring of the project, see SECTION 11– Surveillance.

6.3 PROJECT PERFORMANCE

6.3.1 Interim Project Performance (Napa River) and With-Project Performance (Napa Creek)

For both Napa River and Napa Creek, the performance of the project can best be illustrated by the comparison of the water surface profiles of the without-project condition and the current project condition. The current project condition for Napa River is the interim condition. The Napa Creek project is in the fully-built completed condition.

Figure 6-1 through Figure 6-4 depict the lowering of the water surface profiles in the Napa River and Napa Creek for the 1/10 and 1/100 ACE flood events as a result of the construction of flood reduction features.

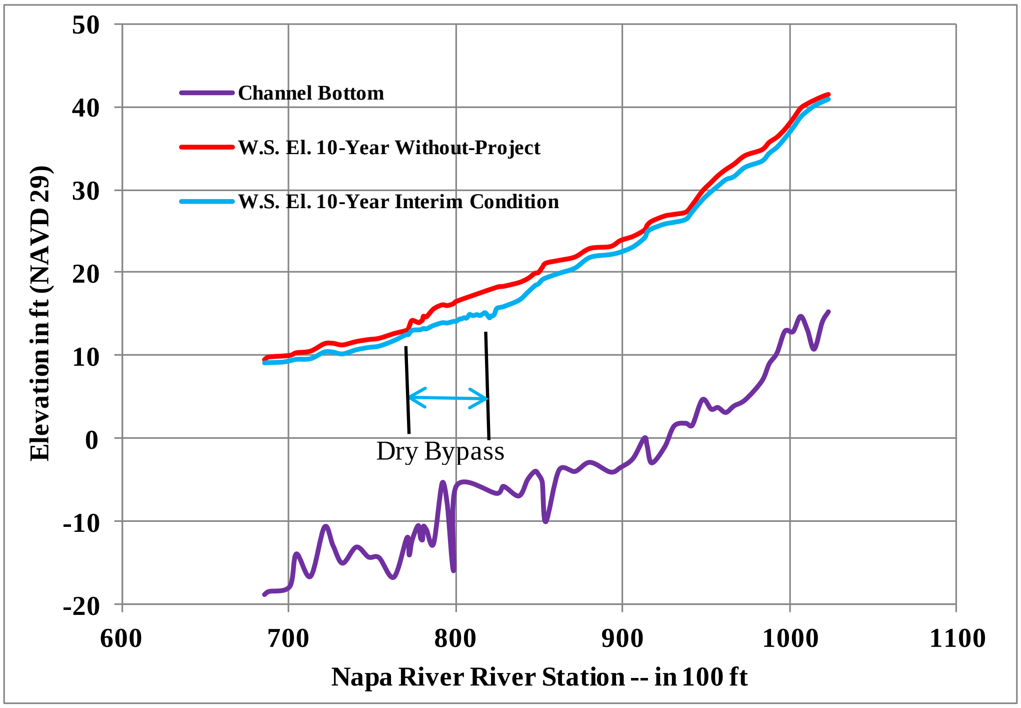


Figure 6-1: Napa River Water Surface Profile Comparison of Without-Project & Interim-Conditions for 1/10 ACE Flood Event

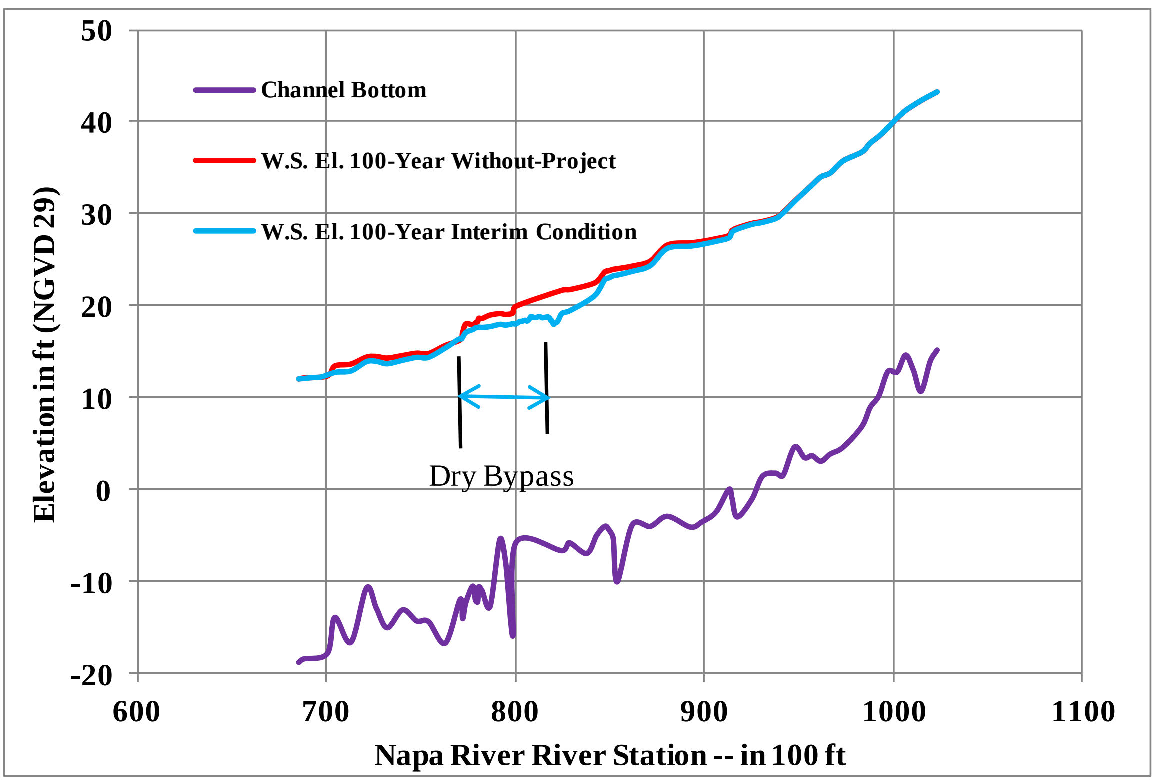


Figure 6-2: Napa River Water Surface Profile Comparison of Without-Project & Interim-Conditions for 1/100 ACE Flood Event

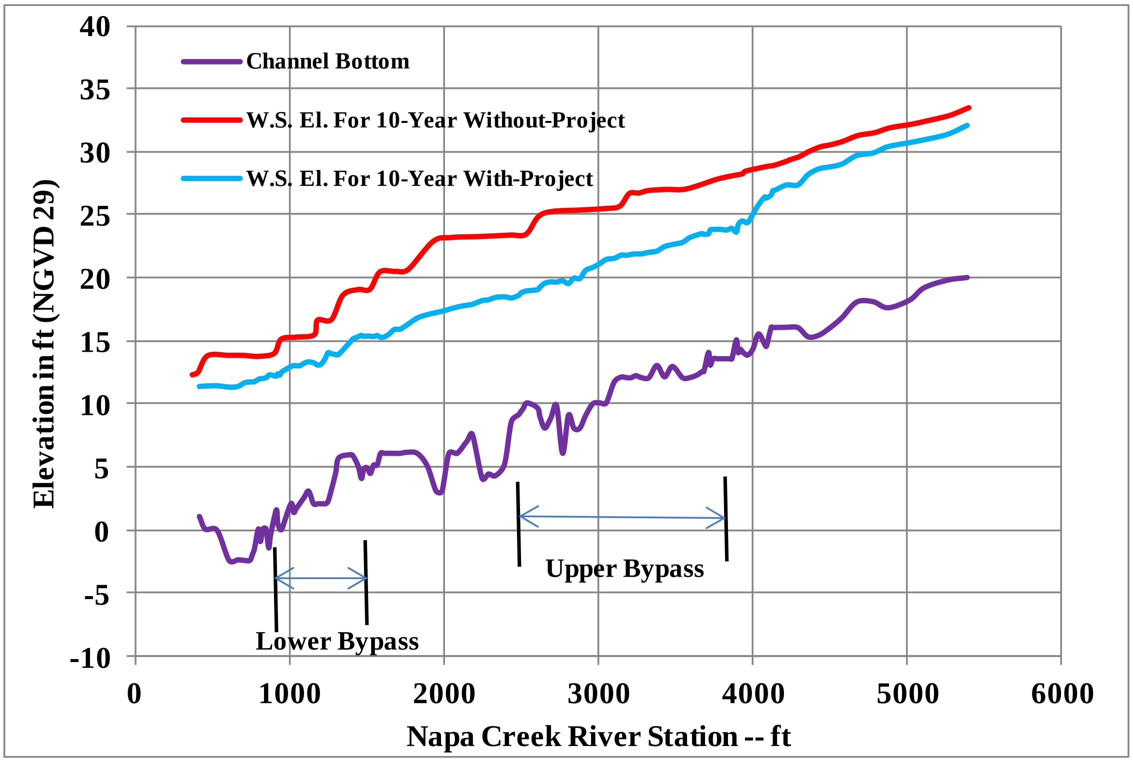


Figure 6-3: Napa Creek Water Surface Profile Comparison of Without-Project & With-Project Conditions for 1/10 ACE Flood Event

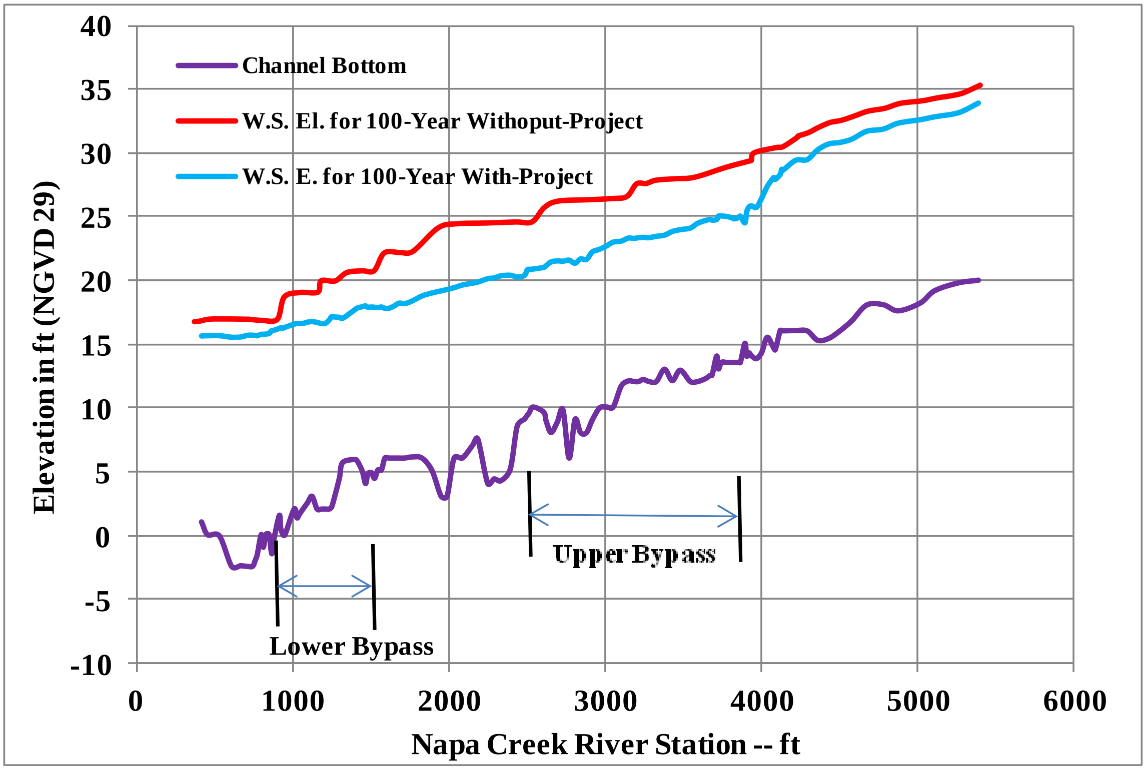


Figure 6-4: Napa Creek Water Surface Profile Comparison of Without-Project & With-Project Conditions for 1/100 ACE Flood Event

The increase in conveyance capacity through the installation of bypasses in both Napa River and Napa Creek results in the lowering of water surface profiles in the river channels shown in Figure 6-1 through Figure 6-4. As a consequence, flood risk damages are reduced.

6.3.2 Consequence of Flows Exceeding the Interim Condition for Napa River or Design Condition for Napa Creek

Interim actions taken to reduce inundation risks posed by the Napa River system are needed while longer term solutions are planned and implemented. Figure 6-5 depicts the anticipated breakout points when the flood events exceed the interim condition for Napa River.

(1) On the right bank upstream of Lincoln Avenue (in the River Pointe area between the Lake Park Levee and Lincoln Avenue): Under Post-Bypass conditions, flow begins to reach the overbank at about the 1/6 Annual Chance Exceedance (ACE) event, but is isolated in the River Pointe area until approximately at the 1/10 ACE event.

(2) On the left bank within the Oxbow, near Taylor Street: Under Post-Bypass conditions, flow begins to leave the channel at between the 1/10 and 1/15 ACE events, but stays pretty localized until flow reaches the 1/25 to 1/50 ACE events.

Figure 6-6 shows the breakout locations for Napa Creek when the flood events exceed the 1/100 ACE event.

(1) Flow overtops the north bank approximately 800 ft upstream of Jefferson Street and south of Cedar Avenue for the 3,700 cfs For Napa Creek. The 3,700 cfs flow is between 1/25 and 1/50 ACE events.
(2) Flow overtops the channel banks near Behrens Street Bridge for the 1/200 event of 4,600 cfs.
(3) Inundation is localized adjacent to the banks up to the 1/200 ACE event.

Flood conditions may cause additional unanticipated breakout points and the entire system should be monitored during floods (see SECTION 8, SECTION 9, and SECTION 10 for additional information on flood response activities including monitoring).

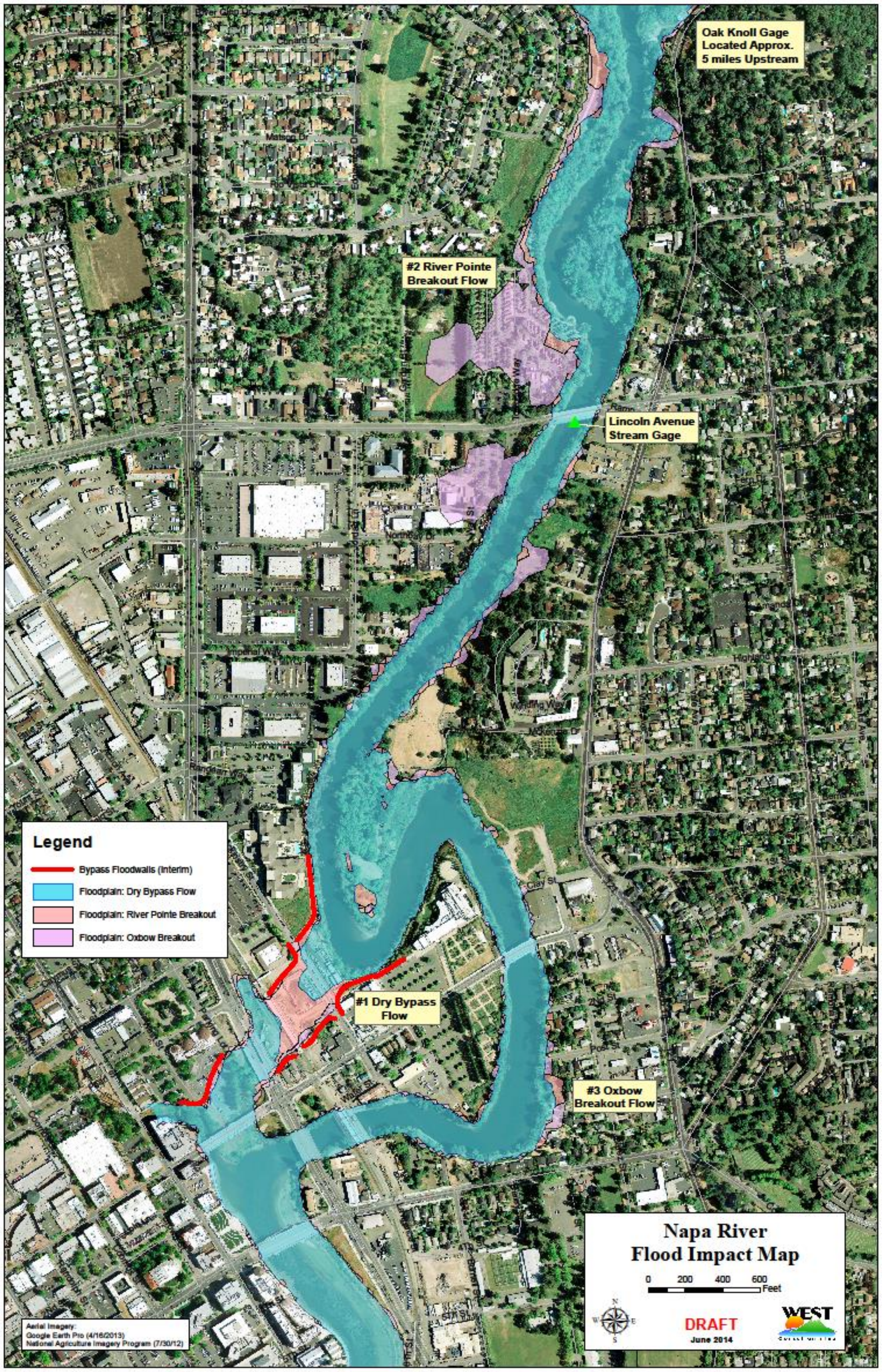


Figure 6-5: Anticipated Breakout Points when the Flood Events Exceed the Interim Condition for Napa River

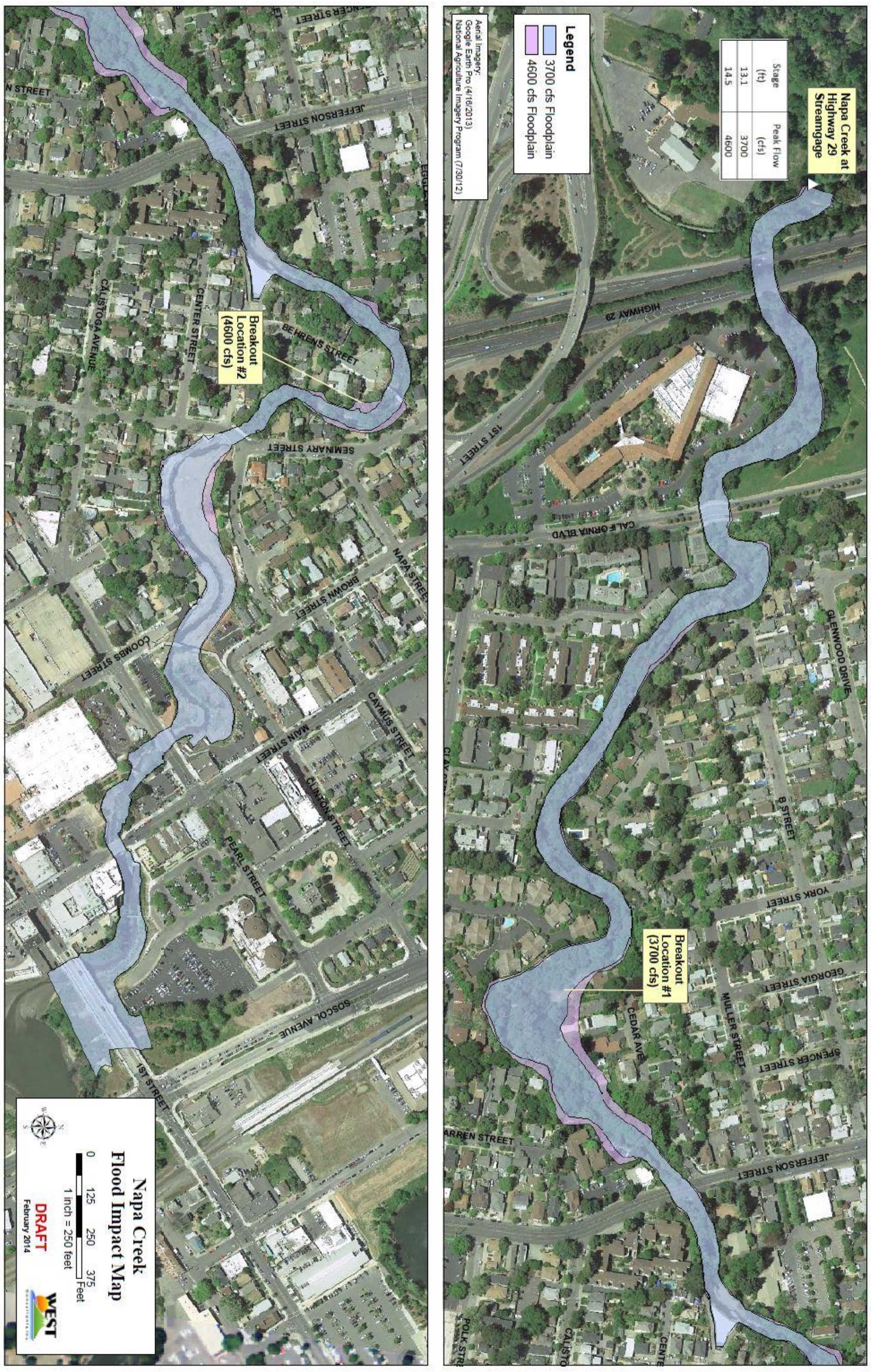


Figure 6-6: Anticipated Breakout Points when the Flood Events Exceed the 1/100 ACE Event for Napa Creek

6.4 FLOOD RISK REDUCTION BENEFITS

6.4.1 Features Downstream of Imola Ave

The features constructed in Contract 1A and Contract 1B, south/downstream of Imola Ave do not provide flood protection to adjacent lands because the reconstructed dikes were set at the same elevation as existing dikes. However, this work does provide increased flood management for the heavily developed portion of the project upstream of Imola Avenue by allowing additional flood conveyance through the constructed marshplain and floodplain terraces. This reduces flood risk damages by reducing the water surface through upstream portions of the Napa River

6.4.1.1 West Bank: Site 1A – Highway 29 to Newport Marina

Between Highway 29 and Newport Marina the marsh plain terrace excavation and lowering of dikes restored historically functioning floodplains adjacent to Napa River on approximately 910 acres of floodplain lands. The lowered dikes will still prevent most tides from encroaching into low areas which exist behind the dikes. The Vineyard Dike does not provide additional flood damage risk reduction benefits as it was constructed at the same elevation as existing dikes.

6.4.1.2 East Bank: Site 1B – Kennedy Park to Old Tulocay Creek

On the east bank of Napa River, a marshplain terrace approximately 100 to 150 feet wide was excavated for approximately 450 feet along Napa River. In addition, east of the marsh plain terrace, high ground was excavated and a floodplain terrace approximately 500 feet wide by 500 feet long was constructed to increase the size of the floodplain. The training dike, set at the same elevation as the pre-Project dike, is located along the eastern boundary of the floodplain terrace. The Training Dike is not a flood protection feature and will over top before the design event is reached. On the water side of the Training Dike there is a Planting Berm which does not adversely impact the project performance.

6.4.2 Features North of Imola Ave to Soscol Avenue

6.4.2.1 Old Tulocay Creek to New Tulocay Creek

The marshplain and floodplain excavation increases conveyance through the Imola Avenue bridge crossing and the NAP5 & NAP6 levees, shown in Figure 6-7, were constructed for the design flood event. Levee slope erosion control has been provided with the planting of native grasses. As indicated in Section 4.9, a portion of NAP5 which parallels Imola Avenue is missing a gravity drainage structure. Installation of this may improve future benefits from possible interior drainage issues.

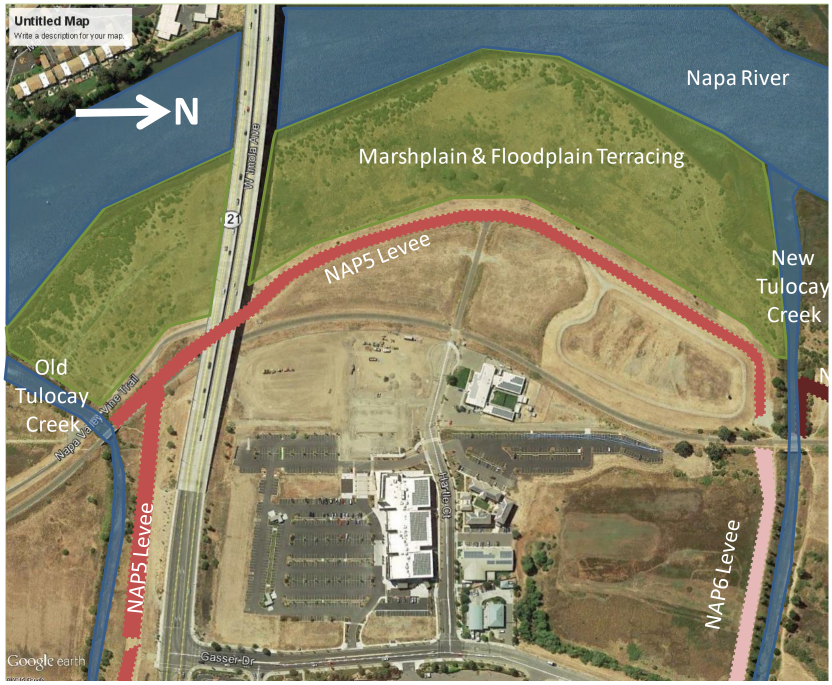


Figure 6-7: Old Tulocay Creek to New Tulocay Creek FRM Features

6.4.2.2 New Tulocay Creek to Soscol Avenue

This reach encompasses the remainder of Contract 2E and features marshplain and floodplain terraces, see Figure 6-8. The excavated marshplain terrace begins on the east bank of the northern bank line of the New Tulocay Creek with NAP7 levee and ends just downstream of the Soscol Bridge. The marshplain and floodplain terracing provide increased channel conveyance which reduces flood damage risk. The NAP 7 levee and the freeboard berm provide flood damage risk reduction. The stone protection reduces risk of erosion failure of the levee, decreasing flood damage risk.

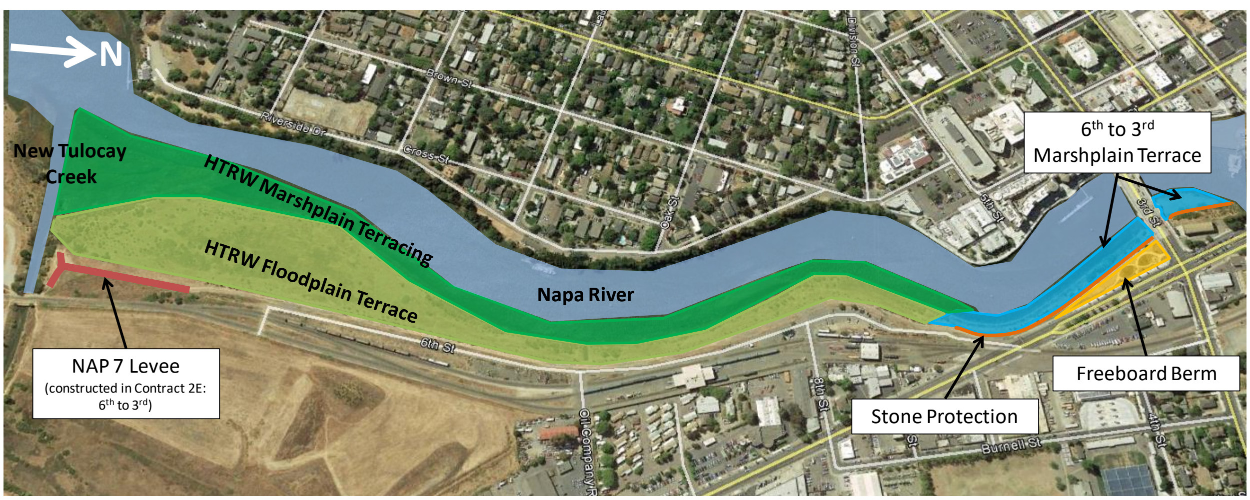


Figure 6-8: New Tulocay Creek to Soscol Avenue FRM Features

6.4.3 Downtown Napa FRM Features

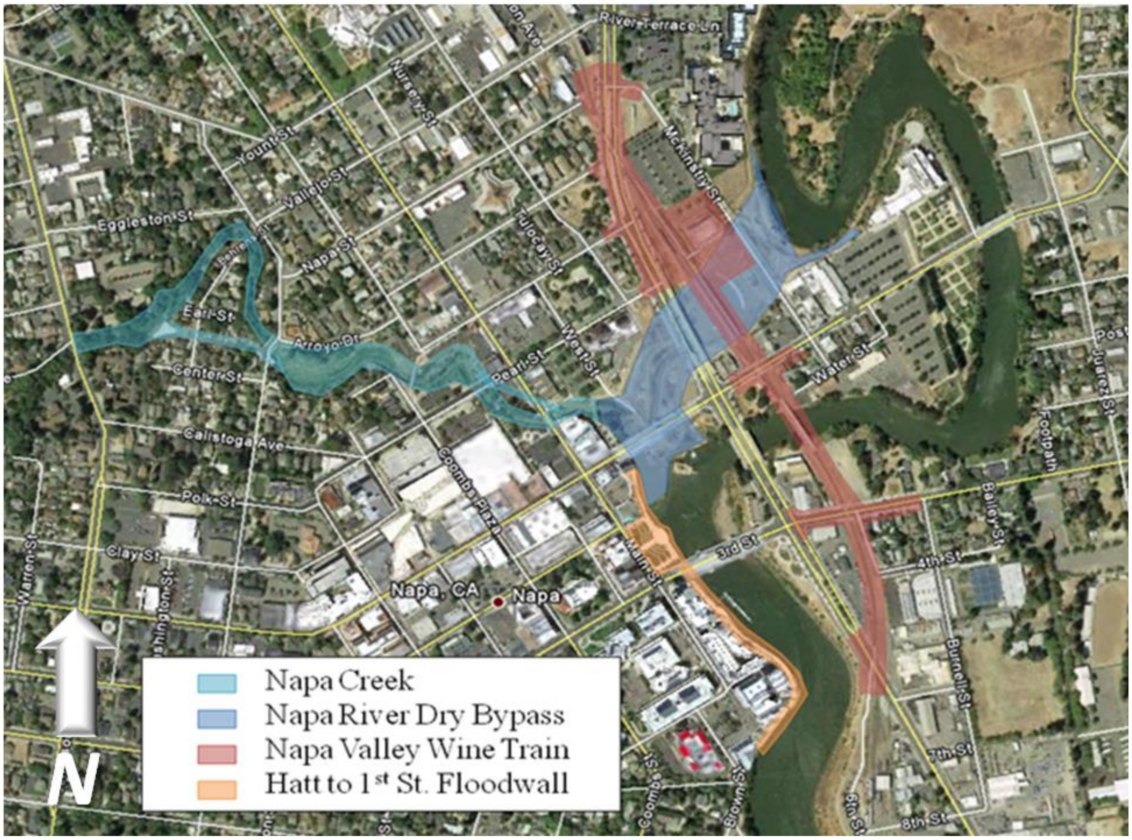


Figure 6-9: Downtown Napa FRM Features

6.4.3.1 Napa Creek

The Napa Creek's conveyance capacity has been increased to meet the demands of the design event by slope modifications, addition of two bypass culverts and pedestrian bridge removal or replacements, see Figure 6-9. Root wads and slope vegetation is present along the length of this reach to provide slope stability during high water events. The slope stability features reduces erosion of the banks. This reduces downstream sedimentation, In addition, it decreases flood damage risk to adjacent properties by reducing the likelihood that property will be eroded and lost during a flood event.

6.4.3.2 NVWT Railroad Bridges

The existing NVWT Bridge was replaced with the new Napa River Railroad Bridge which gives more than 3 feet of freeboard to the design flood event. The minimum soffit elevation is 21.74 feet NAVD 88. The Dry Bypass Bridge soffit elevation is 23.0 feet NAVD 88 and provides 2.6 feet of freeboard to the design flood event. The new bridges are more efficient hydraulically and help reduce flood damage risk by reducing the bridges impact to conveyance.

6.4.3.3 Napa Dry Bypass

The Dry Bypass is designed to remain dry under non-precipitation conditions. With a severe storm event, the Napa River will begin to flow through the channel when the River reaches elevation 13 feet NAVD 88 and above. The bypass flood conveyance minimizes the flows through the Napa River Oxbow and provides a direct path of travel for flood flows. The Bypass channel protects the surrounding businesses from flooding by floodwalls along the north and south side of the channel and floodwall closure structures where McKinstry Street crosses the bypass. The dry bypass allows flood flows to move downstream more efficiently, reducing the water surface elevation. This results in reduced flood damage risk along Napa River.

6.4.3.4 Hatt Building to 1st Street Floodwall

The Hatt Building to 1st Street segment for the project provides FRM with the construction of a floodwall NAP2 set at elevation 19.9' NAVD88 (17.5' NGVD29). This wall begins at Hatt Street and continues north past 3rd Street for approximately 260 ft. The floodwall protects nearby areas from flooding.

6.4.4 Upstream of Oxbow to Trancas Street

In the current interim condition, the project reach between the Oxbow and Trancas Street is the most prone to Napa River overtopping its banks causing flooding to occur within the city of Napa. Additional features will need to be constructed for this portion of the project to reach the project performance of the completed project.

6.5 MINIMIZATION MEASURES AND BENEFITS OF OTHER PROJECT FUNCTIONS

6.5.1 Cultural Resources

Several cultural resources were impacted by the Napa River project. Project impacts and minimization measures are summarized in Table 6-2.

Table 6-2: Cultural Resources Impact Summary for the Napa River Project

	Cultural Resources Impact	Minimization Measures
Contract 4: Napa Creek	*Seminary Street Bridge*. Impacted by construction activities.	-Bridge abutments will be protected during construction to prevent damage. No permanent alteration will be made.
	CA-NAP-261, the prehistoric River Glen Site. Destroyed by the preferred alternative.	-A Memorandum of Agreement was made between the Corps and the SHPO regarding treatment of the site. Treatment included data recovery excavation, the creation of an excavation report, and monitoring during construction.
	CA-NAP-744H, the Chinatown Site. Destroyed by the preferred alternative.	-Test excavations were performed. It was determined that the site lacked sufficient integrity for National Register eligibility.
-Site 2W: Hatt to 1st -Site 3: Dry Bypass & NVWT -Site 4: Napa Creek	*Downtown Napa*. The preferred alternative would alter the fabric of the area.	-$2,400 was allocated for a photographic and videographic recordation of affected buildings, bridges, and streetscapes.
	Other Historical Buildings. Not affected by the preferred alternative.	A number of other historic structures exist in the vicinity of the project. Many, but not all, are National Register eligible. The project has been designed so as to not pose any threat to these structures. They include, but are not limited to: The Hatt Building, The Napa Opera House, the Kyser-Williams Block, and others.

6.5.2 Habitat

The Napa River/Napa Creek Project was subject to environmental commitments and regulatory requests and mandates during the construction phase. (Refer to the 'Conservation Measures' sections in the NMFS and USFWS BO's, Appendix E:2 and Appendix E:3). Environmental features were included in the project design to increase and improve habitat for both terrestrial and aquatic species of special concern. The acreages of habitat types were delineated by the USFWS (1999) BA; a summary of environmental restoration and revegetation features is shown in Table 6-3. OMRR&R requirements for the environmental feature areas are included in the 2001 MMP (Appendix E:8) and referenced by habitat type and contract in Table 6-4. The title of the 2001 MMP should not have originally contained any references to mitigation. This was an oversight by the contractor who prepared the document. Plantings and other habitat modifications were included as environmentally sustainable design features to minimize any adverse effects.

Table 6-3: Environmental Onsite Summary for the Napa River Project

Project Impacts	Environmental Feature	Location
Loss of riparian forest habitat (5.44 acres)	Revegetate (17.68 acres)	Between Kennedy Park and Lake Park
Loss of riparian scrub shrub habitat (1.80 acres)	Revegetate (10.68 acres)	Between Kennedy Park and Lake Park
Loss of SRA habitat cover (0.19 acre)	Revegetate (2.57 acres)	Between Kennedy Park and Lake Park
Loss of low-value woodlands (11.24 acres)	No features proposed (not a native habitat)	N/A
Loss of high-value woodlands (0.99 acre)	Revegetate (121.97 acres)	South Wetland Opportunity Area and Kennedy Park to Lake Park
Loss of brackish emergent marsh (7.32 acres)	Restoration/revegetate (160.72 acres)	South Wetland Opportunity Area and Site 2E/2W terraces
Loss of seasonal wetlands (44.18 acres)	Restoration/revegetate (56.20 acres)	South Wetland Opportunity Area and Sites 1A/1B/2E
Loss of tidal mudflats (0.61 acre)	Restoration/excavation (2.50 acres)	South Wetland Opportunity Area and Sites 1A/1B/2E

Table 6-4: Monitoring Plan Habitat Type and Contract Reference Chart

Habitat	*M&M Plan Page references*	Site 1 A	Site 1B	Site 2E	Napa Creek	Napa Dry Bypass	Gasser E-7
Riparian Forest and Scrub Shrub	5-1 to 5-9	X	X	X	X	X	X
High Value Oak Woodland	5-9 to 5-12		X	X			
Shaded Riverine Aquatic	5-13 to 5-16		X	X	X	X	X
Brackish Emergent Marsh/Tidal	5-17 to 5-23	X	X	X		X	

Habitat	***M&M Plan Page references***	Site 1 A	Site 1B	Site 2E	Napa Creek	Napa Dry Bypass	Gasser E-7
Seasonal and Emergent Wetlands	5-25 to 5-28			**X**			
Tidal Mudflat	5-28 to 5-31	**X**	**X**	**X**		**X**	**X**
Grassland	5-31 to 5-34	**X**	**X**	**X**	**X**	**X**	

6.5.3 Recreation

The Project Cooperation Agreement (PCA) for Recreation Development outlines the approved recreation elements that are cost-shared between USACE and FCD. The approved recreation elements are summarized in Table 6-5. Recreational elements are categorized and authorized as project opportunities via the Flood Control Act of 1944, The Federal Water Project Recreation Act of 1965, and NEPA. Recreation provides National Economic Development benefits that were quantified for the Napa project in the Supplemental GDM and the 2012 LRR.

Table 6-5: Napa River/Napa Creek Project Recreation Elements

Recreation Element	Location
River walk trails	Kennedy Park to Oxbow and Dry Bypass
Trees	Site 1B Training Dike on berm, Napa Creek, Hatt to 1st Promenade, Dry Bypass
Shrubs	Site 1B Training Dike on berm, Napa Creek, Hatt to 1st Promenade, Dry Bypass
Irrigation	Hatt to 1st, Dry Bypass
Signage	Training Dike, Hatt to 1st
Veterans Park	Hatt to 1st
Benches	Training Dike, Hatt to 1st
Trash receptacles	Hatt to 1st
Stairway access	Hatt to 1st
Security lighting	Hatt to 1st, Dry Bypass
Pedestrian bridges	Old Tulocay Creek (Site 1B)

SECTION 7 – PROJECT COOPERATION AGREEMENT

The FCD and the Department of the Army have entered into a Project Cooperation Agreement (PCA) for this project on February 1, 2000 as required by Public Law 99-662. A copy of the duly executed PCA is included as Appendix B: of this manual.

Authorizing legislation by the State of California has designated the FCD as the agency to fulfill local interest responsibilities for the Project. The FCD has entered into agreements with USACE (SPK) to fulfill these responsibilities.

Responsibility for operating and maintaining completed Project works will be officially transferred to the FCD. Paragraph 208.10(a)(10) of the Flood Control Regulations (CFR Title 33) provides that the Department of the Army will furnish local interests with a manual for each completed Project, or separate useful part thereof, to assist them in carrying out their obligations. Copies of all Transfer Letters for these projects are included in Appendix C:.

After USACE (SPK), acting as the agent for the Federal Government's Department of the Army, transfers the completed project, or functional portion thereof, to the FCD and provides the FCD with a copy of the Operation and Maintenance Manual, the FCD must operate, maintain, repair, replace, and rehabilitate (OMRR&R) the completed project, or functional portion thereof, in accordance with regulations or directions prescribed by the Federal Government. The PCA includes the FCD's specific responsibilities for operating and maintaining the flood control facilities.

SECTION 8 – OPERATION

8.1 INTRODUCTION

In accordance with ER 1110-2-401, this section details the operations that are necessary for the safe and efficient functioning of the Project to produce the benefits set forth in the project authorization. The operational requirements for non-reservoir projects are presented as operation plans covering essentially the who, what, when and how of various project operations.

8.2 PROJECT OPERATIONS

The Project must be operated and maintained in a manner that will propagate as-built conditions defined in the record drawings, design studies and the requirements set in 33 CFR 208.10 (Appendix H:1). Project operations include management of flood control, recreational, and environmental facilities.

1. Inspect and evaluate the integrity of structural features (levees, drainage structures, etc.)
2. Visually monitor bank stability, deposition and/or erosion of marshes and floodplains and vegetative cover by using aerial photographs.
3. Monitor vegetation establishment through visual inspection.
4. Ensure project flood protection features remain in a sound condition so that they will function as designed.

8.3 RESPONSIBLE LOCAL AGENCY

In accordance with 33 CFR Ch. II Section 208.10, the NCFCWCD shall appoint a "superintendent" who shall be responsible for the development and maintenance of, and directly in charge of an organization responsible for efficient operations and maintenance of all structures and facilities during flood periods and for continuous inspection and maintenance of the project works during period of low water.

In addition to the duties listed in 33 CFR Ch. II Section 208.10, the "superintendent" shall remain knowledgeable and be kept up to date on:

- Reviewing all safety codes and hazards of prescribed operation activities. Watchmen or patrols employed during flood periods need to consist of teams of not less than two people.
- The FCD and superintendent needs to have available the names, addresses, and telephone numbers of all key workers and a reasonable number of substitutes, including an assistant to act for and in the absence of the superintendent.
- Ensuring access to a reserve supply of materials which may be necessary during a flood.

8.4 GENERAL OPERATIONS

8.4.1 Inspection Frequency

The superintendent/FCD staff and City of Napa must conduct inspections and prepare reports as described Section 10.4 and Section 10.5, respectively, to verify that the Federal Regulations are being adhered to and ensure the project will operate as intended.

8.5 PROJECT FEATURE OPERATION

8.5.1 Marshplain and Floodplain Terrace

Marshplain and floodplain vegetation goal is to achieve a natural protective cover for the ground surface, to stabilize slopes against erosion using environmentally friendly methods and to provide wildlife habitat in an aesthetically pleasing way. Vegetation growing on and near levees and dikes must be maintained in accordance with Section 10.7.3 of this Manual.

8.5.2 Veteran's Park Stoplog Operation

A stoplog closure gate on the north side of the park provides flood protection along the upper part of the Americans with Disabilities Act route access point to the park. A storage locker has been incorporated in the adjacent planter for stoplog storage when not in use. The stoplog needs to be installed and removed annually in the fall to ensure knowledgeable staff, check stoplog and storage condition and the proper operation of this stoplog structure.

8.5.3 McKinstry Street Floodwall Closure Gates

The Dry Bypass McKinstry Street floodwall closure gates are recessed into an alcove within the floodwall to minimize exposure to the public and present an aesthetically pleasing gate face. Yearly, the closure gates will be manually closed and locked to the adjustable support post to ensure knowledgeable staff and proper function of the floodgate. A storage locker has been incorporated at the east end of the southern gate in order to house the temporary steel bars that the gates seal against which are anchored to the road. The storage locker stores these bars when not in use. The steel bars needs to be installed and removed annually in the fall to ensure knowledgeable staff understand its installation and proper operation. Once the annual dry-run of installing the bars and testing the closure of the gate is complete, return the floodgate to its recessed position.

8.5.4 Low Flow Channel and Gabion Wall

The Dry Bypass low flow channel is design to convey the existing storm drain runoff water from the area west and north of the project site south to the Bypass Outlet to the Napa River. The low flow channel collects storm water at the gabion wall between Soscol Avenue and NVWT Dry Bridge. The channel terminates at the outfall of the Dry Bypass into Napa River. This storm drain run off will be maintained at its current location until the future storm drainage pump station is constructed.

8.5.5 Napa Creek Bypass Culverts

Box culverts are used in two locations to divert high water flows from Napa Creek. The most upstream bypass passes under the alley from approximately 125 feet north of Center Street and re-enters Napa Creek just east of Seminary Street. The second bypass consists of two side-by-side box culverts to divert high water flows from Napa Creek in a bypass that passes under the Napa City Parking Lot associated with the Fire Fighter's Museum and under Pearl Street and the parking lot on the south side of Pearl.

8.5.6 Retaining Wall Drains

Concrete retaining walls have been placed at strategic locations along the side slopes of Napa Creek and Napa River to provide channel stability and increased floodway capacity, and prevent bank erosion. The walls utilize a sub-drain system comprised of solid and perforated piping and granular backfill. This drain system discharges through retaining walls through Outlet Gate Boxes, details shown in Figure 8-1. These sub-drain systems are necessary for relief and drainage of subsurface water that flows towards the creek and river and may be blocked by debris. Blockage of the drains could compromise the performance of the retaining wall and contribute to wall failure and reduced project benefits.

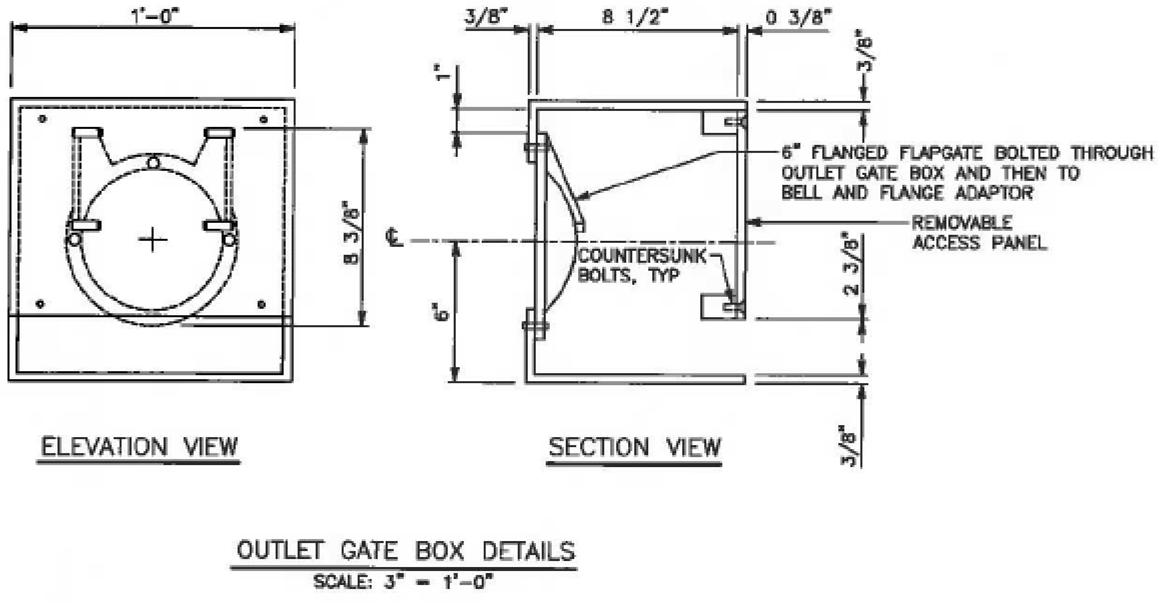


Figure 8-1: Outlet Gate Box Detail

8.5.7 Levees, Dikes & Berms

Dikes and levees will have water above the landside toe elevation during floods. Freeboard berms will only have water higher than the landside toe elevation during events larger than the Project design flood as described in Section 4.8. During floods of Napa River, a breach would result in extensive flooding of the protected area, leading to significant loss of property and endangering residents. Continuous long term inspection and maintenance will ensure long-term structural integrity and the ability to contain design flood flows. Dikes, levees, and freeboard/Planting Berms must be inspected in accordance with inspection frequency defined in Section 10.4.

8.5.8 Drainage Systems

Proper operation of outlets and flap gates is critical because failure or clogging could flood areas. Failure of flap gates in the open position will allow floodwater to infiltrate into the opposite side of the floodwall, dike or levee potentially causing flooding. Inspection prior to the beginning of flood season on gates shall alert the FCD as to action that may need to be taken to replace or repair. If necessary, the FCD shall coordinate with the city of Napa to manage the operation activities necessary to insure that storm drainage systems operate properly prior to the beginning of flood season.

8.5.9 Erosion and Sediment Control

Napa River and Napa Creek carries a large amount of sediment and deposition in the project reach of concern. Sediment in Napa River, downstream of 3rd street is part of the Napa River Navigation Project and navigation depths are maintained through channel dredging by USACE, San Francisco District (SPN). The project is designed assuming that the navigation channel section will continue to be maintained.

Stream bank and terrace slopes below levees and floodwalls cannot be allowed to erode and threaten these important lines of protection. Erosion protection measures, such as vegetation and riprap, have been installed in those areas where potential erosion would threaten flood features. The sponsor shall be responsible to maintain and repair/replace of the following materials or engineered features if damaged to the degree that it doesn't function or is a safety hazard.

8.5.9.1 HPTRM

Anchored HPTRM consists of a high strength woven, three-dimensional mat of polypropylene yarns anchored to the underlying soil with locked cable strand anchors used at the Dry Bypass channel invert and along the levees for site 1B. An anchored HPTRM, combined with a grass vegetative cover, anchors the soil in place to prevent erosion under flood water conditions. The HPTRM allows the bypass channel to pass a portion of the normally high water in the oxbow area and reduce overall flooding potential to the community with lower risk of erosion to the features its protecting including floodwalls, levees, and recreational features. By protecting the levees (i.e. Site 1B) with HPTRM the flooding potential is reduced.

8.5.9.2 Rock Weirs

Two pairs of Rock weirs located at Napa Creek stations (measured in feet) 10+68 and 21+42 redirect stream flow to the center of the stream channel and disrupt the velocity gradient in the near-bank region reducing the amount of erosion. By reducing erosion, the Rock weirs provide flood damage risk reduction by reducing likelihood of erosion that could cause property damage and loss of life. Rock sizes will vary between 0.5 to 2-ton boulders placed across the channel and keyed into channel banks. The key is vegetated with pole cuttings placed around the edges of the rock and the voids filled with a stream bed material and soil mix. The rock weirs utilize a low weir section pointed upstream to force water flowing over the weir into a hydraulic jump and include a low flow notch for fish passage. Weir boulders are placed in the creek channel and smaller gravel and cobble material is added in the voids between rocks to help seal the structure.

8.5.9.3 Rock Riffle

Rock riffles are included in Napa Creek at locations where channel incision would threaten bypass structures or existing infrastructure. The riffles are designed in groups of 2 or 3 such that the crest of the lower riffle provides backwater to submerge the toe of the upper riffle. This helps to lower the hydraulic grade line in smaller steps, reduces the need for additional rock between structures, and ensures sufficient tailwater for the upstream structure to promote fish passage. As a consequence, upstream velocities will be lower and potential bank erosion will be reduced, which could lead to bank failure, or failure of conduits/bypasses which could contribute to more flooding.

8.5.9.4 Vegetated Reinforced Soil Slopes (VRSS)

5-layer and 2 layer VRSS are installed in Napa Creek banks to prevent erosion and promote vegetation. This treatment is typically used where velocities are expected to be moderately high (6 to 9 feet per second) and where room for bank grading alone is not feasible. The fabric used to wrap each soil lift is permeable but provides additional structural support to the bank to resist sloughing and shear stresses from the flow. The VRSS treatments include horizontal brush layers planted between lifts and vertical willow poles planted on top of lifts to provide cover and structure. The top VRSS layer provides a 3-foot floodplain bench and is densely covered with container plantings. The VRSS provides secure, cost-effective erosion control on the river banks and river channel to prevent channel erosion that could lead to bank failure.

8.5.9.5 In stream Woody Material and Rock/Rootwad Revetment

In-stream woody structures help to direct the flow away from channel banks and promote hydraulic diversity in the channel. Under moderate flood conditions, the barbs can encourage the local trapping and sorting of gravels to improve fish spawning habitat in the creek. The woody material also provides refugia (hiding and resting places) for juvenile fish from predators.

8.5.9.6 Anchored Rock

In-stream rock structures are a well graded mass with minimum percentage of voids so that during fast moving flood waters the rock won't displace (note in the Quick Reference Maintenance Guide that the joint planted rock has been planted with vegetation). Final rock placement involves rearranging individual pieces by mechanical equipment or by hand as necessary to obtain a minimum percentage of voids. Anchored rock is located at the Newport Marina (nearest Newport Dr., along the west bank of the river), along the southern edge of the 2W floodwall along the west bank of the river, along the eastern bank of the river from 3rd Street to approximately 250 to 300 yards south of the 3rd Street Bridge, at the inlet of the Napa Creek bypass downstream of Jefferson St, at the inlet of the downstream bypasses for the Napa Creek project, along the eastern bank at the outlet of the Napa Creek project, at the inlet and outlet to the Napa Dry Bypass, the Low Flow Channel of the Dry Bypass, and along the walking trail of the Dry Bypass leading up to the northwest corner of Soscol Avenue and 1st street.

8.5.9.7 Willow Brush Mattress/Vegetated Matting

Vegetated matts are similar to rolls of turf grass sod, as they are pre-grown, soilless, and delivered in rolls. Vegetated matts are grown from custom seed mixes or native grasses. Vegetated matts are initially staked into the soil for support until plant establishment occurs. Brush mattresses are a single row of cuttings, placed side-by-side to form a single layer of plants. The cuttings are either stocks or branches and are taken from live growing material and stripped of all lateral branches to form a single pole. Cuttings can be any tree or shrub species designated as such, but generally are species that sprout easily at nodes when placed in direct contact with the soil. Brush layer cuttings shall be 6 to 8-feet in length with a caliper ranging from ½ to 1 ½ inches. These features are found in the Napa Creek project. The vegetated matting is planted on the north bank of Napa Creek from approximate Sta. 20+25 to 21+25 and from 18+25 to 19+00. The vegetated matting is planted on the south bank of Napa Creek from approximate Sta. 18+60 to 20+85. The willow brush mattress is placed along the south bank of Napa Creek from approximately 21+25 to 22+00. For vegetated mattress locations notes above reference the map of project features provided with this manual.

8.5.10 Domestic/Fire/Irrigation Water Systems

Irrigation systems are the responsibility of the City of Napa for operation and maintenance. The temporary irrigation systems are intended to be disconnected and abandoned following completion of construction and salvageable equipment shall be removed and returned to the City of Napa Department of Utilities. The construction contractor awarded the post construction plant maintenance contract is responsible for plant maintenance for the 3-year warranty period.

The project has supplied the City of Napa with irrigation water systems for:

- Site 4, Napa Creek (see Appendix J: for water meter details)
- Site 2W, Hatt to 1st Street
- Site 2E Revegetation
- Dry Bypass (see Appendix J: for water meter details)

The 5th Street Plaza provides water for areas south of the 3rd Street Bridge and the Veteran's Park south planter provides water for areas north of the 3rd Street Bridge. The City of Napa provides water to areas above and below the 3rd Street Bridge. The above ground appurtenances need to be inspected for damage on an annual basis.

8.5.11 Lighting

Public Lighting and Electrical systems described herein are the responsibility of the City of Napa for operation and maintenance.

In the Hatt to 1st reach, there are two electrical systems installed for this project in order for foot traffic to be able to walk the promenade at night and for purposes of recreation. South of the 3rd Street Bridge is an electrical system supporting site lighting and irrigation controllers. The meter and panel for this system is located at the south side of the 5th Street plaza. The second electrical system is located in the planter south of Veteran's Park, and north of the 3rd Street Bridge. This system controls the lighting, irrigation and future power to the bandstand area.

The electrical system supporting the bypass lighting is located in the northeast corner of McKinstry Street and the flood gate. Lighting is provided along the flood wall of the bypass and at either end of McKinstry Street so that sufficient illumination is provided for vehicular traffic at the closure gates regardless of whether the gates are open or closed, and in order to monitor flooding for nighttime hours.

8.5.12 Additional Key Flood Protection Project Features

The Napa project incorporates many features to attenuate flooding in addition to the items listed above. The table below provides for some of the key features and their location with respect to key features to assist with flooding. For further information, reference as-built drawings with respect to their locations.

Table 8-1: Flooding Attenuation Features, Location of Features, and Benefits of the Features for the Napa Flood Control Project, Napa, California

Feature	Location	Benefits
Removal of Levees, Construction of Ring Levee (Vineyard Dike).	Site 1A	Provides increased conveyance on the river. Provided marshplain terracing. Protection of vineyard after removal of levees (Vineyard Dike project).
Removal of Levees and Reconstruction of Levees Further Inland	Site 1B	Provides Increased conveyance on the river. Provided marshplain terracing.
Turf Reinforced Mat (HPTRM)	Sites 1B, Dry Bypass	Allows normal vegetative growth, yet anchors the soil to prevent erosion and failure of levee
Vegetated Reinforced Soil Slope (VRSS)	Napa Creek, Dry Bypass	Multiple coir fabric wraps with vegetation planted between wraps prevent bank erosion and

Feature	Location	Benefits
		property damage from flooding @ upper portion of bank
Root Wad Revetment	Napa Creek	Bolt anchored tree trunk roots along lower portions of banks to prevent bank erosion/loss of property
Bank Log Pocket*	Napa Creek	Minimal erosion protection, maximizes habitat value at river/creek lower portion of bank
Low Flow Channel (LFC)	Dry Bypass	Reinforced channel within TRM channel for additional overland flow drainage and to prevent damage to landscape features outside of LFC
Vegetated Coir Matting	Napa Creek	Vegetation planted within coconut coir matting to provide additional soil strength prior to mature establishment
Concrete Bypass Channels	Napa Creek	Provides additional flow capacity to channel system at specific water surface elevation
Energy Dissipator	Dry Bypass	Reduces energy of flow entering the dry bypass to prevent erosion d/s of dissipator
Flood Gates	Dry Bypass	Allows traffic along McKinstry Street. When closed prevents flooding beyond floodwalls
Stop Logs	2W – Veteran's Park	Prevents high water from entering downtown through a low area in Park when installed
Levees, Floodwalls	1A, 1B, 2E, 2W, Dry Bypass	Containment of rising WSE
Rock Weirs	Napa Creek	Provides grade control, bed stabilization and undermining of root wad structures
Rock Riffles	Napa Creek	Provides bed stabilization

* **-** subject to the adaptive management plan for Napa due to its construction along the banks of Napa Creek which can be subjected to fast moving water and damage due to scour.

8.6 OPERATION RECORDS

Operation records will be maintained by the project superintendent and made available for inspection upon request.

- Annual report entitled "Status of Project Operation and Maintenance"
  - indicates the degree of proficiency attained by each obligated local agency in providing required maintenance.
  - This report shall include all records of inspection and maintenance as required by SECTION 10 and SECTION 11.
  - FCD will provide copies of the report to USACE (SPN) and the City of Napa.
  - Operation records (installation of stop logs, any opening or closing of gates, etc) shall be provided.

SECTION 9 – OPERATIONS

9.1 INTRODUCTION

This section addresses flood emergency operation plans and responsibilities, including preparations for and responses to project emergency conditions. This section provides an outline of emergency operation records and covers:

- Chain of responsibility.
- Emergency communications network including redundancies (internal and external).
- Local emergency response assistance such as fire, police, medical, and Red Cross.
- State and Federal emergency response agencies.
- Flood fight or other plans that may have been part of design documentation.

The emergency operations defined in this section represents an initial project guideline and will require adaptation and modification as determined and defined following evaluation of the success of emergency operations following a flood event. Post event evaluation and operations modification are considered to be an integral part of adaptive management necessary for successful continuing operation of this project and are the responsibility of the FCD.

9.2 EMERGENCY OPERATION RESPONSIBILITIES

9.2.1 Lead Agency

FCD is the lead agency in charge of operation of the flood project features. The City of Napa is responsible for emergency response and evacuations. During periods of flood danger, the FCD is responsible for the Project areas and maintaining contact with secondary agencies.

9.2.2 Secondary Agencies

The following secondary agencies are involved in emergency operations. See Section 9.5 for Emergency Contact List.

- Napa County Office of Emergency Services (Public Works, Police, and Fire Departments)
- City of Napa (Public Works, Police, and Fire Departments)
- California Department of Water Resources (DWR), State Flood Operations Center
- Pacific Gas and Electric (PG&E)
- California Office of Emergency Services
- Federal Emergency Management Agency
- California Department of Transportation
- California Highway Patrol
- USACE San Francisco District

9.2.3 U.S. Army Corps of Engineers (USACE)

USACE has authority under PL 84-99, Flood Control and Coastal Emergencies (FCCE) (33 U.S.C. 701n) (69 Stat. 186) for emergency management activities. Under PL 84-99, the Chief of Engineers, acting for the Secretary of the Army, is authorized to undertake activities including disaster preparedness, Advance Measures, emergency operations (Flood Response and Post Flood Response), rehabilitation of flood control works threatened or destroyed by flood, protection or repair of federally authorized shore protective works threatened or damaged by coastal storm, and provisions of emergency water due to drought or contaminated source.

- Preparedness: The Flood Control and Coastal Emergency Act establishes an emergency fund for preparedness for emergency response to natural disasters; for flood fighting and rescue operations; for rehabilitation of flood control and hurricane protection structures. Funding for USACE emergency response under this authority is provided by Congress through the annual Energy and Water Development Appropriation Act. Disaster preparedness activities include coordination, planning, training and conduct of response exercises with local, state and federal agencies.
- Response Activities: PL 84-99 allows the Corps of Engineers to supplement State and local entities in flood fighting urban and other non-agricultural areas under certain conditions (Engineering Regulation 500-1-1 provides specific details). All flood fight efforts require a Project Cooperation Agreement (PCA) signed by the Public Sponsor and a requirement for the Sponsor to remove all flood fight material after the flood has receded. PL 84-99 also authorizes emergency water support and drought assistance in certain situations and allows for “advance measures” assistance to prevent or reduce flood damage conditions of imminent threat of unusual flooding.
- Rehabilitation: Under the authority of PL 84-99, an eligible flood protection system can be rehabilitated if damaged by a flood event. The flood system would be restored to its pre-disaster status at no cost to the Federal system owner, and at 20% cost to the eligible non-Federal system owner. All systems considered eligible for PL 84-99 rehabilitation assistance have to be in the Rehabilitation and Inspection Program (RIP) prior to the flood event. Acceptable operation and maintenance by the public levee sponsor are verified by levee inspections conducted by the Corps on a regular basis. The Corps has the responsibility to coordinate levee repair issues with interested Federal, State, and local agencies following natural disaster events where flood control works are damaged.

9.3 EMERGENCY OPERATION PROCEDURES

9.3.1 General

In accordance with ER 1110-2-401, flood emergency is addressed with respect to operations, procedures and responsibilities. Napa County has an emergency action plan and flood fighting procedures in place. This manual doesn’t supersede the county’s existing plans.

As it pertains to the operation of the federally-constructed project, NCFCWCD is the lead agency in charge of the Emergency Operations. As the lead agency, NCFCWCD will coordinate operations of the federal flood control project during flood emergencies and will be on alert status from November 1 through May 1 of each year.

9.3.2 Preliminary Activities

Within the county of Napa, an incident command system will be used for flood emergencies and all other emergency incidents. Prior to each flood season, the project superintendent should review the following emergency plans:

- Establish an incident command in accordance with FEMA National Incident Management System standards
- Size up the incident, determine the objectives and resource requirements
- Determine the organizational elements required to mitigate the incident if necessary

- Request additional resources necessary to mitigate the incident if necessary
- Delegate authority within the organizational structure
- Develop an Incident Action Plan (IAP), incorporating objectives and strategies

9.3.3 Pre-Flood Activities Checklist

The superintendent will notify the appropriate agencies and labor crews of the impending flood emergency and should assign individuals to defined sections of the Project to perform the following tasks:

- Verify telephone numbers of all emergency team members and communication equipment.
- Know the location of equipment and material stockpiles (such as sacks, sandbags, brush, lumber, lights, emergency generators, fuel, etc.).
- Perform an assessment of levees, dikes, freeboard berms, riverbanks, floodwalls, drainage swales, and access roads.
- Verify that flood fighting personnel have keys to stoplogs, floodwall closure gates, electrical boxes, bollards and other access points necessary for flood fighting, project access and utility shutdown.
    - Napa Creek Bypass Culverts
- Closure of recreation areas and evacuation of pedestrians.
    - Veterans Park
    - Napa Dry Bypass
    - Recreation trail over Training Dike
    - Lower Promenade Trail
- Ensure that all flap gates on culverts are operable, seated properly and closed.
- Understand locations of access roads and ramps in the project vicinity.
- Reserve supplies of filled sacks and rolls of polyethylene sheeting or canvas should be available for immediate use.
- Follow operation procedures described in Section 8.5

9.3.4 General Inspections and Ongoing Activities

After the initial inspection has been made and the location and availability of labor crews, vehicles, heavy equipment, and materials has been ascertained, the following actions need to be taken, time permitting:

- ❑ Removal of accumulation of debris at bridge foundations and overflow weirs.
- ❑ Once Napa Creek flows splits into the bypass culverts, periodic inspections of the bypass inlet trash racks shall be initiated for obstructions. (Equipment capable of safely removing debris from the trashracks shall be stationed at the two bypass inlets in order to be activated should debris wash up and affect the flow split.)
- ❑ Monitor condition of marsh plain terrace, floodwalls, design profile distances (freeboard), and any recent repairs.
- ❑ Monitor condition of the culverts and flap gates of the levee/dike/floodwall drainage structures.
- ❑ Monitor condition of the levees/dikes/floodwall and any recent repairs.
- ❑ Levees and floodwalls more than 5 feet tall with floodwaters at least one-fourth of the way up the structure or higher (from landside toe), must be inspected once every hour. Levees and floodwalls more than 5 feet tall with floodwater above the landside levee/floodwall toe, but with floodwaters less than one-fourth of the way up the structure (landside toe), must be inspected once every 24 hours.

- Monitor condition of access roads to the levees/dikes/floodwalls, crest roads on the levees/dikes, and the roads on the landside of the floodwalls.

9.3.5 Site Specific Operational Flood Activities

The levees, floodwalls, floodways, improved channels, promenades, drainage structures and terraces must be patrolled during periods of high water. Appropriate measures must be taken to prevent obstructions due to debris, especially at channel constrictions (e.g., bridge crossings) and floodwall protrusions into the river channel once floodwaters have receded. Large objects (greater than 1 cubic yard) that become lodged against the banks, walls or bridge piers must be removed after floodwater have receded.

9.3.5.1 Kennedy Park to Imola Avenue

- Training and Vineyard Dike inspections should occur *before flood events only*. Since these structures will be overtopped relatively easily, they need to be closed to all people during a flood event. All the accesses to the Training Dike shall be closed to pedestrians before any anticipated flood events. The Vineyard Dike accesses shall either be closed, or the owner of the property should be notified to close the area to pedestrians or workers before any anticipated flood events.
- Includes monitoring and removal of debris build-up at the Imola Avenue Bridge and the pedestrian bridge over Old Tulocay Creek following a flood event.

9.3.5.2 Imola Avenue to 3rd Street

- Inspect the levees before and during a flood event.
- Removal of any debris build-up at the 3rd Street Bridge following a flood event.

9.3.5.3 3rd Street to Trancas Avenue

- Close McKinstry Street floodwall gates and remove the low flow culvert hand rails.
- Install Veterans Park stoplogs. See Plate 1.7 for manufacturer's stoplog fabrication and Plate 1.6 for stoplog as built drawing.
- Close the stoplog on the Dry Bypass floodwall left bank behind the Oxbow market.
- Monitor and remove any debris build-up at the three oxbow bypass channel bridges (1st Street, Soscol Avenue and NVWT) and at the three other bridge crossings of Napa River (1st Street, Lincoln Avenue and Trancas Street).
- Shut off the domestic, irrigation and fire water systems at Veteran's Park water meter near Main and 3rd Streets to prevent floodwall damage caused by piping due to a main break during high water and to avoid water contamination.
- Shut off the electrical service to the streetlights and walkway lights within the promenade and Veteran's Park during a high-water event to avoid short circuiting or damaging of the system. Electrical Service shut-offs located at the 5th Street Promenade and at the electric meter panel near the northeast corner of 3rd and Main Street. The 5th Street electrical system is expected to remain above flooding and shutdown will likely not be required for flood events. However, the area should be monitored for unexpected flooding and the electricity turned off.

9.3.5.4 Napa Creek

- Remove any debris build-up at Main, Pearl, Seminary Street and pedestrian bridges and at the entrance of both culvert bypass entrances following a flood event.

9.3.6 Site Specific Activities Following Flood Event

Debris removal shall be made within 1-week following a flood event. Assessments for damage shall be made within 2-weeks of a flood event triggering the below actions. Repairs shall be made within 2 months after the assessment is complete which noted that repairs are needed unless dictated otherwise by P.L. 84-99 actions. Clean-up and repairs shall be made prior to opening public areas.

9.3.6.1 Kennedy Park to Imola Avenue

- The condition of the training dikes, biotechnical bank stabilization features, plant cover and recreation trail/maintenance roads should be assessed and repaired.

9.3.6.2 Imola Avenue to 3rd Street

- Inspect the condition of the levees, floodwalls, tidal rock, biotechnical bank stabilization measures and recreation trail/maintenance roads should be assessed and repaired as needed. Any repairs needed shall be made prior to opening the recreation trail/maintenance roads.

9.3.6.3 3rd Street to Trancas Avenue

- The condition of the levees, floodwalls, tidal rock, biotechnical bank stabilization measures and recreation trail/maintenance roads should be assessed and repaired.
- Before re-pressurizing the domestic water system the valve boxes need to be cleared of water and debris.
- The electrical receptacles need to be inspected for debris and standing water prior to re-energizing.

9.3.6.4 Napa Creek

- The condition of the floodplain terrace and bank stabilization plant cover should be assessed and repaired as needed.
- Inspection of bypass culverts for accumulated debris.
- The creek slopes should be inspected for any damage.

9.3.7 Emergency Operating Procedure Checklist

During a flood emergency, the following 4 steps are to be taken by the NCFCWCD or designee:

STEP 1: Monitoring and Advisory (Flood Watch)

GENERAL: Data on predicted rainfall and river stages from the USGS maintained Napa River Near Napa gage (located at Oak Knoll Avenue Bridge) will be utilized to substantiate potential flood conditions in the flood control project area. The National Weather Service (NWS) California-Nevada River Forecast Center provides stage forecast regularly during periods of flooding. This data will govern the determination to operate flood control infrastructure and mobilize response forces. The Lincoln Ave

Napa River gage and the Napa Creek Hwy 29 gage will also be used as additional data, however NWS only provides predictions for Oak Knoll. Elevations listed in these Steps are based upon gage datum for the individual gage. The Oak Knoll gage datum is 24.74 feet NGVD 29 (27.13 feet NAVD 88) and the Lincoln Ave gage datum is 0.0 feet NGVD 29 (2.39 feet NAVD 88). Note that Napa Creek will generally rise to flood stage sooner than Napa River.

- ❑ NCFCWCD will monitor levees, stream and channel levels. Time, stage and rainfall amounts are recorded by the Napa Valley Regional Rainfall and Stream Monitoring System accessible at http://napa.onerain.com.

- ❑ NCFCWCD will coordinate with the City and County Emergency Operation Centers (EOCs) on water levels and flow activities.

- ❑ NCFCWCD will monitor the NWS predictions for rainfall and river stage at Oak Knoll.
  If the river stage at the Oak Knoll gage is not predicted to rise above 20.0 feet, then the only action necessary is to continue monitoring the appropriate gages on Napa River and Napa Creek.

STEP 2: Flood Warning (River Stage predicted to rise above 20.0 feet @ Oak Knoll River Gage)

If the river stage is forecast to be greater than 20.0 feet at the Oak Knoll gage, then the following actions shall be completed at least 3 hours before the stage at Oak Knoll is predicted to reach 20.0 feet.

- Evacuate all pedestrians from within the Napa River Dry Bypass
- Post ‘No Parking’ and flood evacuation signage on McKinstry Street.
- Coordinate with City Parks staff to barricade, or place Do Not Cross Emergency Tape, at all pedestrian walkways or entrances leading into the bypass, Veteran’s Park, and the Hatt to First lower walkway.
- Place emergency response contractors on standby.
- Notify the City of Napa Public Works and Police Department, the Department of Water Resources, and USACE, San Francisco District that the bypass has been closed to foot traffic and shall remain closed until the threat of flooding, or actual flood has passed. Notification to the above departments shall include the current water surface elevation, the predicted maximum water surface elevation, and the projected time necessary to complete remaining emergency preparation procedures.

At least 1 hour before the stage at Oak Knoll is predicted to rise above 20.0 feet the following actions shall be completed.

- o Request towing of any remaining parked cars on McKinstry Street.
- o Remove the low flow channel pedestrian crossing railings and store offsite.
- o Install McKinstry Street closure signage
- o Close North and South floodgates on McKinstry Street.
- o Install stop log structures at Veteran’s Park and the River Bypass floodwall near the Oxbow Market.
- o Notify the City of Napa Public Works and Napa County Roads divisions to be prepared for possible sandbagging and flood fighting response.
- o Stage flood fighting equipment at an accessible location outside known flooding areas.

Napa Creek

At 7.5 feet on the Napa Creek Hwy 29 gage, flow will begin to enter the Napa Creek bypass culverts.. Personnel shall visually assess the culverts and terrace areas to verify if evacuation of pedestrians is necessary. Once flow begins to enter the bypass culverts, NCFCWCD staff will deploy equipment to clear the trash racks at the inlets as needed.

STEP 3: Flood Fighting (River Stage 22.0 feet or greater @ Oak Knoll River Gage)

GENERAL: At this stage, the Napa River Bypass channel begins to flow over McKinstry Street. The Superintendant shall initiate the following activities.

- Notify the City of Napa Public Works and Napa County Roads divisions to be prepared for possible sandbagging and flood fighting response.
- Begin patrol of levees and floodwalls. Monitor for signs of erosion, boils, cracking, or other signs of distress.

STEP 4: Flood Evacuations (River Stage above 22.0 feet or greater and predicted to exceed 26.0 feet @ Oak Knoll River Gage)

GENERAL: Notification shall be made to the City of Napa Public Works and Police Departments, the Department of Water Resources and the USACOE, Sacramento District. Notification shall include the water surface elevation, the rate at which the water is rising and the projected time to initiate Notification of Evacuation of businesses and residences adjacent to Napa Creek

- At 26.0 feet on the Oak Knoll gage, flow is expected to leave the channel at River Pointe near Lincoln Avenue.
- At 27.0 feet on the Oak Knoll gage, flow is expected to leave the channel at the South Coombs area north of Imola Avenue.
- At 28.0 feet on the Oak Knoll gage, significant flooding is expected to break out at Lincoln Avenue. Flow is also expected to leave the Napa River Oxbow near Taylor Street.
- At 29.0 feet on the Oak Knoll gage, major flow is expected down the Soscol Avenue corridor between Lincoln Avenue and the River Bypass.

- ❑ The City of Napa Public Works Department will be notified and directed to execute emergency notification and evacuation procedures for each identified location.

- ❑ NCFCWCD will continue monitoring, record the time, stage and rainfall amount for Napa River at the 3rd Street Bridge staff gauge.

9.4 FLOOD FIGHTING METHODS

The following flood fighting tactics may be needed. The following methods pertain to earth channel and natural river portions of the Project. The project superintendent may consult the DWR, State Flood Operations Center, and the USACE SPN District Engineer, for further guidance. The methods listed below and in Appendix F:1, Appendix F:2 and Appendix F:3 have proven effective during many years of flood fighting by Federal, State, and local agencies.

9.4.1 Scour and Erosion

Scour and erosion may occur near places where trees, pipes, sewers, or other structures penetrate the riverbank or levee. All scour and erosion should be carefully observed to determine the necessity and adequacy of repairs to be accomplished. Observed scour and erosion should be repaired as quickly as possible. Areas of scour and erosion with the highest risk of compromising the function of the project shall be repaired first.

9.4.2 Bank Caving

In an emergency, rock riprap or rock-filled cribs, if properly placed, are very effective as protection against active bank caving. Riprap should consist of broken stone material and should be free of segregation, seams, cracks, or other defects that would impede its resistance to weathering. Neither the breadth nor the thickness of any piece of riprap should be less than one-third of its length. Riprap material should be in shapes that will form a stable protective structure. Rounded boulders or cobbles should not be used. As a general guideline, California Department of Transportation Class III riprap (10-24 inches in diameter) can be used for emergency operations. However, larger rock may be necessary at times if this gradation provides insufficient protection.

9.4.3 Debris Accumulation

During a major flood, the bridge foundations (piers/walls) and the three inlets to bypass culverts have the potential to become partially obstructed by large, floatable debris. Debris could accumulate on weirs, divider walls, bridge piers, and behind the numerous grade control structures in the river. In addition, vegetation planted along the riverbanks could trap floodwater debris that floats down the river. The weirs, inlet structures, bridge piers, and grade control structures should be checked for debris accumulation, and debris should be removed as quickly as possible to return the river to its pre-flood condition.

9.4.4 Emergency Topping Methods

The as-constructed line of protection, whether from the natural riverbanks or a structural flood control feature (i.e., gabions, downstream levees, floodwalls, or stone protection) must maintain the original design grades (elevations) for the life of the project. If any reaches or localized areas show signs of degradation below design grades, emergency grade raising should be conducted at once to restore the necessary grade and protect adjacent landowners. Emergency grade raising or control of overtopping includes sandbag topping, temporary levee, and lumber and sack topping as described in Appendix F:1.

9.4.5 Site Security and Access

It is critical that site security be maintained during and immediately following an emergency. Immediate surveillance of project features will ensure that public access to potentially hazardous conditions is restricted. Site security shall be maintained until the danger to the public has been removed.

9.4.6 Flood Fight Documentation

- Prepare a report documenting damages and proposed repairs.
- Prepare an After Action Report to include lessons learned and proposed changes to current procedures.

9.5 TELEPHONE CONTACT LIST

Department of Water Resources Floodplain Management
- (916) 574-1474

CA Department of Water Resources Flood Operations Center
- (916) 574-2619

U.S. Army Corps of Engineers Emergency Management
- San Francisco District Office: (415) 289-3079
- Sacramento District Office (916) 557-6884
- South Pacific Division office: (415) 503-6610

Napa County, City of Napa (Public Works, Police, and Fire Departments)
- Public Works Deportment: (707) 257-9520
- Police Department: (707) 257-9223 (24-hour non-emergency)
- Fire Department: (707) 257-9593

California Department of Water Resources (DWR), State Flood Operations Center
- (800) 952-5530
- (http://www.water.ca.gov/about/contacts.cfm)

California Emergency Management Agency
- (916) 845-8506

Federal Emergency Management Agency
- (202) 646-2500

California Department of Transportation
- (916) 654-2852

California Highway Patrol, Napa
- (707) 253-4906

Environmental Emergency Contact for Emergency in-water works
- (800) 424-8802

National Weather Service, Monterey Office
- (831) 656-1725

Pacific Gas & Electric
- (707) 257-5906

SECTION 10 – MAINTENANCE & INSPECTION

10.1 INTRODUCTION

This section details the inspection and maintenance required for proper care of the project elements. Completed projects must be adequately maintained if they are to function as intended. The FCD shall maintain and inspect project elements in accordance with local, state, and federal standards and requirements. The FCD is responsible for preserving maintenance and inspection records and making them available for Government inspection. Government inspections will be performed in consultation with the FCD. The SPN District Engineer may update this Manual for changed conditions and, if warranted, to correct conditions discovered during inspections. Such updates will be performed in consultation with the FCD and other regulatory agencies, as required. Alterations to original project features by the FCD shall be approved by the SPN District Engineer since alterations shall not be considered maintenance.

10.2 SAFETY REQUIREMENTS

FCD should be aware of, and adhere to, all federal, State, and local regulations that are applicable to this project. USACE Safety and Health Requirements Manual, EM 385-1-1, the Occupational Safety and Health Act (OSHA) Standards for Construction (29 CFG Part 1926), and Cal/OSHA are applicable to this project.

Scheduled maintenance work should not be performed within the Project limits during periods of high water flow and caution should be exercised during the potential high water season of October 1st through March 31st.

10.3 APPROVALS REQUIRED PRIOR TO MAINTENANCE

10.3.1 Routine Maintenance

- The sponsor shall maintain and obtain the necessary permits and authorizations to implement repairs below the high tide line or in- water work which involves rip-rap or placement of fill to correct scour and erosion.
- San Francisco District Dredge Management and Maintenance Office (DMMO) at telephone 415-503-6808 can guide the FCD if channel maintenance is required to re-align cross-sections by sediment removal. Sediment removed from discharge structures can be disposed of in an approved land fill, without authorization, if access can be gained from land owner.
- Any in-water work, except USACE-approved emergency work, will be conducted within the June 1 to October 15 work window (NMFS BO; USFWS BO; RWQCB Waste Discharge Requirement [WDR] General Finding #26).

In-water work is prohibited October 15 to June 1, unless specifically authorized by Federal and State regulatory agencies, i.e., USFWS, NMFS, RWQCB, and CDFW, to work outside of these dates. All relevant agency approvals can be found in Appendix E:.

10.3.2 Emergency Maintenance

Any emergency maintenance measures or repairs which the superintendent deems necessary must be promptly taken or made and documented in the flood fight documentation. Other maintenance activities will be described in the “Status of Project Maintenance” annual report and must be approved, in writing, by the RWQCB Executive Officer prior to the work starting, as described in Finding 45 of the attached

RWQCB Order #99-074. This must also be coordinated with other national resource agencies (i.e., USFWS, NMFS, and CDFW) as their permits/approvals require (see Appendix E:4).

10.3.3 Project Alterations

Project alteration current policy Section 14 of the Rivers and Harbors Act of 1899 and codified in 33 USC 408 (commonly referred to as “Section 408”) authorizes the Secretary of the Army, on the recommendation of the Chief of Engineers of the US Army Corps of Engineers (USACE), to grant permission for the alteration or occupation or use of a USACE civil works project if the Secretary determines that the activity will not be injurious to the public interest and will not impair the usefulness of the project. On July 31, 2014 USACE issued Engineer Circular (EC) 1165-2-216, *Policy and Procedural Guidance for Processing Requests to Alter U.S. Army Corps of Engineers Civil Works Projects Pursuant to 33 USC 408*. The purpose of this policy is to improve consistency in processing requests both geographically and across Civil Works project types, outline a process that is scalable to be commensurate with the anticipated impacts of an alteration, and provide those seeking alteration a clear understanding of information required by them in seeking alteration to a USACE project. The EC provides the policies and procedural guidance for an overall review process that can be tailored to the scope, scale, and complexity of individual proposed alternations, and provides infrastructure specific considerations for dams, levees, floodwalls, flood risk management channels, and navigation projects.

10.4 INSPECTION SCHEDULE

Table 10-1 gives the inspection schedule for specific items. All other items which are not included in this table shall be inspected on a schedule set by the superintendent, but a minimum of once per year.

Table 10-1: Inspection Schedule

	Section	Pre Flood Season (Fall, no later than October)	Immediately prior to every high water event	Following High Water Events	Every 90 Days During Flood Season	Following Flood Season (Spring/Summer)	Post Earthquake
NAPA RIVER / CREEK							
Improved Channels/Floodway	10.7.1	X		X	X		X**
Marshplain & Floodplain Terrace	10.9.1	X	X	X	X		
Levee & Freeboard Berm	10.7.3	X*	X	X	X	X*	X
Dikes & Planting Berm	10.7.3	X*	X	X	X		X
Floodwall and Retaining Walls	10.7.4	X		X			X
McKinstry Floodwall Gates	10.7.5	X		X	X	X	X
McKinstry St (integrity)				X			X
Bridges	10.10	X					X
Bypass Culverts/Trash Racks	10.7.7	X	X	X			X
Riprap and Planted Rock Protection	10.7.8	X		X		X	
Napa Creek Restoration	10.9.4	X				X	
Drain System/Utilities							
Drainage Channel & Gabion Wall	10.8.1	X		X			X
Flap Gates	10.8.2	X					
Drainage Through Dikes & Levees	10.8.3	Once every five years.	X				X
Positive Closure Structure	10.8.4	X					X
Other							
Flowage Easement Area	10.9.3	X		X		X	
Invasive Plant Control Survey	10.6.3					X	
Biotechnical Bank Stabilization	10.9.7	X		X		X	
Dredge Disposal Area							X

* Inspections to occur within 1 week after mowing.

**Napa Creek and Dry Bypass channels only

10.5 INSPECTION DOCUMENTS & REPORTS

A joint meeting will be undertaken by the superintendent, USACE, and other invited agencies such as local utilities and the City of Napa to review and discuss the inspection report.

10.5.1 Semi-Annual Report

10.5.1.1 Inspection, Maintenance & Operation Semi-Annual Report

Under 33 CFR Chapter II Paragraph 208.10(a)(6), a semi-annual report must be submitted within a 10-day period prior to June 1 and December 1 of each year to the USACE (SPN) District Engineer covering inspection, maintenance, and operation of the project features included in Table 10-1. The report shall include inspection performed during the month of October (before flood season) and the month of June (after flood season).

10.5.2 Annual Reports

10.5.2.1 RWQCB Report

The FCD will submit an annual report of planned maintenance activities for written approval by the Executive Officer of the California Regional Water Quality Control Board, San Francisco Bay Region as required by Order #99-074. (Refer to Appendix E:4a, finding 45e) Monitoring and reporting will be conducted until performance criteria is satisfied or ultimately until performance criteria have been satisfied with the completion of the project as outlined in Section 4.8 and Section 6.3.

10.5.2.2 NMFS Report

An annual report will also be submitted to NMFS by April 15 of each year which summarizes the previous year's flood reduction, bank stabilization, and revegetation activities conducted pursuant to the Napa Project and will include planned activities for the following year. The report will include an estimate of all incidental take of steelhead resulting from disturbance, relocation, or incidental mortality.

10.5.2.3 Inspection, Maintenance & Damage Reports

- FCD semi-annual content and inspection checklist, see Appendix D:0
- Bridge Inspection Checklist, see Appendix D:2
    - See Section 10.10
- Annual Dike Inspection Checklist, See Appendix D:3
    - Use to inspect the Training Dike and Vineyard Dike on a yearly basis.
    - Levee Inspection Checklist, See Appendix D:4
        - NAP5, NAP6, and NAP7
    - Floodwall Inspection Checklist, see Appendix D:5
        - NAP2 and Dry Bypass Floodwalls
    - Channel/Floodway Inspection Checklist, see Appendix D:6
        - Napa Creek, Dry Bypass, Site 2 and Site 1.
    - Drainage System Checklist, see Appendix D:7
    - Dredge Disposal Inspection Report, see Appendix D:8
    - Deficiencies and Repairs, see Appendix D:9

    - Flood Damage Reduction/Segment/System Inspection Report - Appendix D:1

    - Information Only for Sponsor. This Inspection Form will be used by USACE, SPN to perform the National Levee Database required yearly inspection for continued PL84-99 eligibility.
- The FCD must keep written records of all maintenance tasks performed and submit them with the annual report.

10.5.3 Vegetation & Environmental Reports

10.5.3.1 Annual Vegetation Report

A vegetation report done every year for each project site (to be included in the annual report) will document the following information:

- Health of existing brackish emergent plants.
- Natural recruited native species present.
- Damage to the plants from acts of nature or other reasons.
- Document the removal of exotic trees from the Napa Creek Riparian Corridor.
- Deposition or removal of soil from planting area (~5.8- 6.6 feet NAVD 88) since previous year.
- Number of plants to be installed.
- Invasive weeds present and method of removal.
- Additional plant species installed at the site.
- Photographs taken at the time of inspection.
- Document volunteer native herbaceous plants, trees, and woody shrubs growing in the Project area to include: increase or decrease in volunteers, environmental changes, competing plant species, impacts (natural or manmade), and recommendations.

10.5.3.2 Annual Revegetation Report

The local sponsor must prepare an annual report (per calendar year) for all the revegetation sites for submittal to the USACE (SPN) District Engineer and/or his/her designated representative(s) by e-mail or conventional mail. Copies of the report must be provided to the resource agencies, at their request.
The annual report shall include:

- Address all significant events that took place during the previous 12 months.
- The checklists for all inspections. (FCD shall create their own checklist form to be used)
- A photographic record of overall conditions and specific significant damage.
- A summary statement of the general vegetation conditions for the reporting period.

The FCD will submit an annual report of planned maintenance activities for written approval by the Executive Officer of the California Regional Water Quality Control Board, San Francisco Bay Region as required by Order #99-074. (Refer to Appendix E:4a, finding 45e) The annual report for year ten shall include a Report of Waste Discharge for long-term maintenance activities necessary in all reaches of the Project after the initial ten years.

10.5.3.3 Annual Conservation Measure report

See Section 10.6.2.

10.5.3.4 Comprehensive Vegetation Monitoring Report

See Section 10.9.3.1.

10.6 MAINTENANCE & INSPECTION - ENVIRONMENTAL

Most activities associated with maintenance of flood control projects are exempt from the statutory requirement for a USACE permit, or may be covered by a general permit. Some maintenance activities such as channel dredging or recontouring of project features would require specific Army Corps Regulatory Division authorization. Further information can be found on the USACE (SPN) Regulatory Division website (USACE, 2010b).

The project was also issued several environmental permits or approvals from various Federal and State resource agencies, as described in Section 2.2. The summary below provides an update and description of the most pertinent OMRR&R conditions from these permits or approvals.

Pursuant to USFWS BO File #1-1-99-F-0041 and subsequent BO re-initiations (see Appendix E:3); the FCD in conjunction with the Corps will reinitiate formal consultation with the USFWS for proposed work exceeding the BO limits in the 1999 BO or any of its subsequent re-initiations (see Appendix E:3). Special attention must be made to the May 21, 2012, BO amendment allowing limited work in the Salt Marsh Harvest Mouse (SMHM) habitat in Site 1A and 1B areas.

10.6.1 Pickleweed and Saltmarsh Harvest Mouse (SMHM)

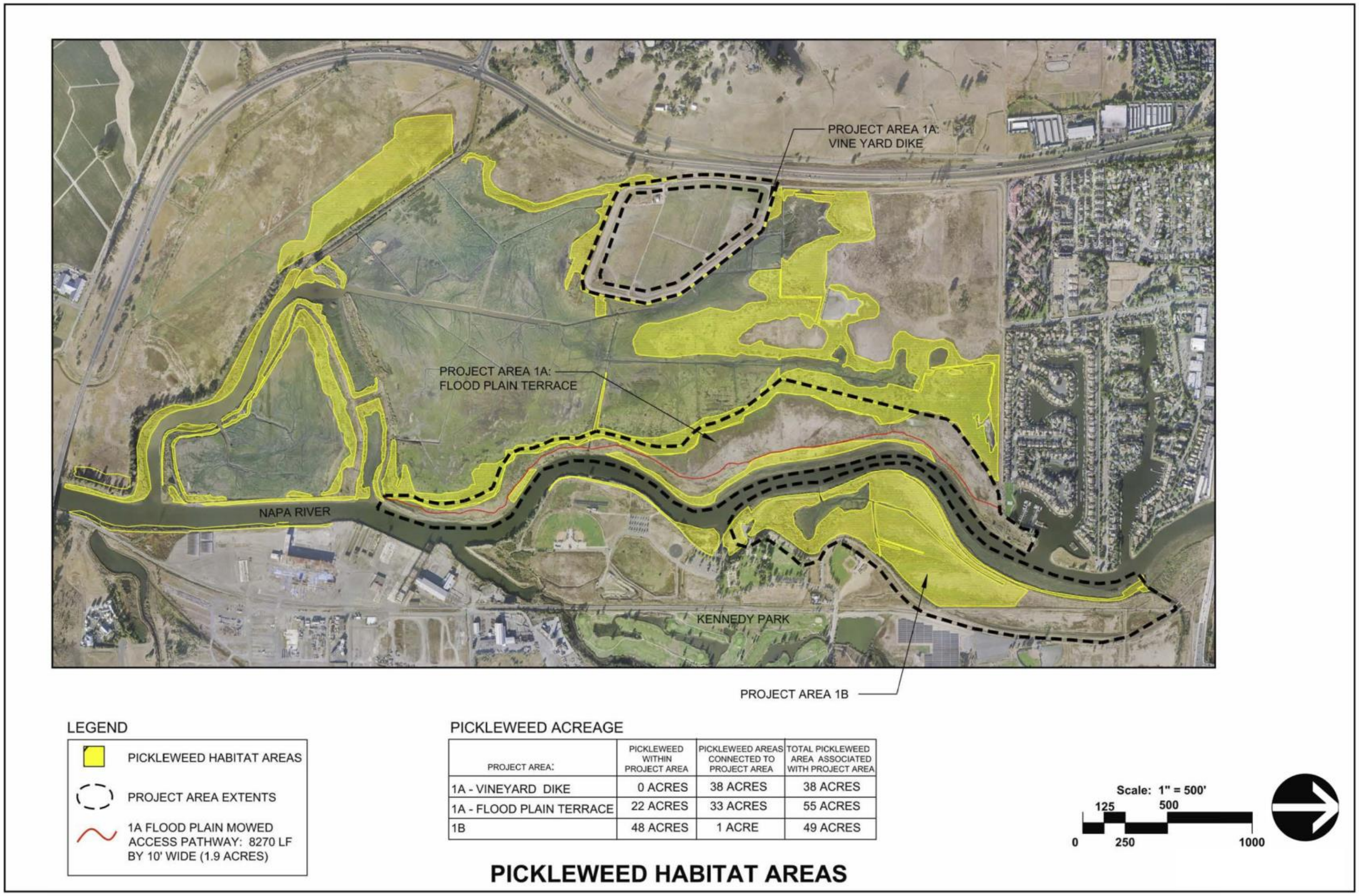
The SMHM is a federal endangered species found primarily in pickleweed saltmarsh habitat. Figure 10-1 delineates pickleweed SMHM habitat that must be maintained under the maintenance requirements for Contract 1 dike and riprap areas, summarized below for SMHM from the May 21, 2012 Biological Opinion (BO). Appendix E:3 lists all environmental compliances that must be met prior to inspection and maintenance activities.

- All maintenance and repair activities including mowing, must be monitored in areas near SMHM habitat, by a biologist approved by the USFWS. (See the May 21, 2012, BO no. 6 for additional direction)
- Required maintenance and repairs must not operate during periods of extreme high tides. (See May 21, 2012 BO no. 1 for additional information)
- A field assessment of pickleweed must be performed by a USFWS approved biologist prior to any repairs or maintenance activity. (See May 21, 2012 BO no. 2 for additional information)
- Ensure that all staff involved with maintenance and repair activities attend SMHM awareness training. (See May 21, 2012 BO no. 4 for additional information)
- Removal of pickleweed for any OMRRR activities must be conducted by hand, without machinery. (See May 21, 2012 BO no. 5 for additional information)
- For major structural repairs of dikes or culverts. (see May 21, 2012 BO no. 7 for requirements)
- Al earthmoving equipment will be cleaned of soil, seeds, and plant materials prior to arriving on site (and between sites). Implementation of the current Invasive Plant Control Plan to minimize the spread of non-native perennial pepperweed and other invasive weeds that threaten the upland refugia and tidal marsh habitat for the SMHM.

10.6.2 Annual Report

An Annual Report shall be prepared that documents repairs and maintenance activities. (Refer to the USFWS May 21, 2012 BO no. 3 for additional information). The annual maintenance report shall record the current calendar year activities, and will be submitted to USFWS by March 30 of the following year. This report shall include:

- Types and date of work of all maintenance activities in that calendar year
- Extent of work by all actions (including annual mowing), shown by both quantity (work area, lineal feet of dike or path) and by mapped location
- Pickleweed quantity (area) removed
- Saltmarsh Harvest Mouse (SMHM) sightings
- Photographs immediately before and after maintenance
- Copy of annual report for the herbicide eradication program



PICKLEWEED ACREAGE

PROJECT AREA:	PICKLEWEED WITHIN PROJECT AREA	PICKLEWEED AREAS CONNECTED TO PROJECT AREA	TOTAL PICKLEWEED AREA ASSOCIATED WITH PROJECT AREA
1A - VINEYARD DIKE	0 ACRES	38 ACRES	38 ACRES
1A - FLOOD PLAIN TERRACE	22 ACRES	33 ACRES	55 ACRES
1B	48 ACRES	1 ACRE	49 ACRES

Figure 10-1: Pickleweed Habitat Areas

10.6.3 Invasive Plant Control Plan (IPCP)

The FCD has developed an IPCP that includes a schedule for annual spring identification and mapping surveys. The plan includes prioritization of treatment areas by species, specific species recommended control options (both mechanical and herbicidal), and post treatment re-vegetation guidance with adaptive management strategies and annual reporting requirements. The IPCP is consistent with the invasive plant inventory and control methods, as outlined by the California Invasive Plant Council (CIPC, 2010). Table 10-2 shows a priority ranking of the most invasive plant species that have been observed at Site 1A and Site 1B areas, and are currently the target species to be managed and eradicated. Additional species may be added to the list as needed.

The RWQCB Section 401 Certification discusses the importance of invasive plant control and the responsibilities of the Corps and FCD for this project. A list of invasive plant species relevant to the project is listed in Appendix E:9.

Table 10-2: Priority Ranking for Invasive Plant Species Control and Monitoring

Scientific Name	Common Name	Habitat Type				
		Woodland	Grassland	Wetland/ Riparian	Brackish Marsh	Mudflat
Lepidium latifolium	Pepperweed	Low	High	High	High	Low
Centaurea solstitialis	Yellow star-thistle	High	High	N/C	N/C	N/C
Foeniculum vulgare	Fennel	High	High	Medium	Medium	N/C
Arundo donax	Giant reed	N/C	N/C	Medium	N/C	N/C

N/C = No known occurrence

Napa Projects IPCP

The FCD has developed as list of "A-rated pest plant species" that requires immediate control and will be limited to monotypic concentrations of no more than 100 square feet consisting of no more than 1% cover throughout the authorized project area and the SWOA will be limited to the following species:

giant reed (*Arundo donax*)
pepperweed (*Lepidium latifolium*)
purple loosestrife (*Lythrum salicaria*)
tree of heaven (Ailanthus altissima)
smooth cordgrass (*Spartina alterniflora*)
fennel (Foeniculum vulgare)

Manage the remaining invasive species, considered as B-rated pest plant species and listed as "high, moderate, or limited" in the current California Invasive Plant Inventory (Appendix E:9) so that they do not exceed 5% cover of the authorized project area and South Wetlands Opportunity Area (SWOA). The FCD current participatory efforts with "Team Arundo del Norte" and management control methods are beneficial and should be continued.

Consistent with standard Integrated Pest Management techniques practiced by the local sponsor, use of herbicides must be minimized. Mechanical and cultural weed controls must be used when feasible in lieu of herbicide application. Any herbicide use or other invasive plant control method must target only plants selected for removal. The FCD will ensure that weed growth is controlled on the firebreaks, if any, at each site.

10.6.3.1 Herbicide Eradication Program

The herbicide eradication program report is required to be submitted with the Annual Report to the USFWS by March 30 of the following year (See Section 10.6.2).

- **Weed Survey**: Include a list of invasive species, include where each invasive species is growing, specify what habitat zone/area of the project the invasive is growing, and specify how much damage the invasive is doing prevent establishment of native plants.

- **Weed Eradication Program**: Include details of all mowing, general weeding (other than mowing), and herbicide applications including the chemical used, quantity, and total area sprayed per application.

10.7 FLOOD REDUCTION FEATURE MAINTENANCE & INSPECTION

The following inspections shall be performed to ensure adequate operability of each project feature.

10.7.1 Improved Channels and Floodways

Superintendant shall make the following inspection and prescribe required maintenance based on inspection findings.

Inspection

- Channel or floodway vegetation is acceptable as long as it meets the following requirements:
  - Does not reduce hydraulic capacity
  - Is located more than 15 feet from the waterside levee toe. Is located 15 feet from the face of the floodwall, or 8 feet from the floodwall foundation, whichever is less, with exceptions (exception: 10.7.3 – Vegetation Removal).
- The channel of floodway is not being restricted by the depositing of waste materials, building of unauthorized structures or other encroachments.
- Banks are not being damaged by rain or wave wash, and that no sloughing of banks has occurred.
- Approach and egress channels adjacent to the improved channel or floodway are sufficiently clear of obstructions and debris to permit proper functioning of the project works.

Maintenance
As prescribed by Superintendant.

Location
Any improved Napa River and Napa Creek shoreline.

10.7.2 Sedimentation Dredging

The reach downstream of 3rd Street is part of the Napa River Navigation Project and navigation depths are maintained by periodic channel dredging by USACE (SPN). The Napa Project's design assumes that the navigation channel section will continue to be maintained. Observations should be made to note if sediment deposition is occurring in the Napa River just downstream of the bypass inlet. If sufficient deposition occurs in the river it could equate to more flow being diverted into the bypass than the bypass was designed to accommodate.

Maintenance of the Napa River channel and floodway will be based on results of the Performance Based Maintenance Surveillance Results as described in SECTION 11.

10.7.3 Levee, Dike and Freeboard Berm Inspection

Prior to performing maintenance and inspection on levees and berms, Section 10.6 shall be reviewed for important environmental features, specifically the BO exception granted for maintenance to Site 1 dikes. Measures shall be taken to promote the growth of sod, exterminate burrowing animals, and to provide routine mowing of the grass and weeds, removal of wild growth and drift deposits, and repair of damage caused by erosion and other forces unless otherwise noted. Vineyard Dike, Training Dike, Planting Berm and Dredge Disposal Dike shall follow the requirements described below except if it conflicts with the Special Instruction given in Section 10.7.3.1, 10.7.3.2, and 10.7.3.3, respectively.

Location

Figure 10-2: (left) Freeboard Berm Location, (right) Levee Location

Maintenance

Maintenance activities shall follow the requirements of the CFR 208.10 (b) for Levees (Appendix H:1) which has been summarized below with additional site specific instructions:

- The water side levee slope and adjacent marsh and floodplain terraces shall not be tread upon by equipment (excluding mowing equipment).
- Fill up holes or washes in the levee crest and slopes. Where new construction has been completed during the year and vegetation has not had time to become established, rain washes and deep gullies may have developed.
- Repair gaps where the levee is below grade. Borrow material normally needs to come from off-site commercial sources. However, onsite borrow material can be used, provided the borrow material is excavated at least 50 feet from any project feature. All borrow material, whether off-site or onsite, must meet the following conditions:
    - Borrow material meets specifications for levee fill material given in the third bullet under Slope Stability below.
    - Borrow material is clean and free of any contaminants.
    - No other environmental impacts to cultural resources sites, threatened and endangered species, water quality, or other resources occur when obtaining the material.

Vegetation – mowing:

- Grass cover on the dike slopes will be kept below 12 inches at any time during the year.
- A minimum of once a year, prior to the October inspection before flood season, the crests and slopes must be mowed to no more than 2 inches in height to allow for a thorough inspection.
- All mowing shall occur between March 1 and November 30 and be timed to interrupt weed seed production.

Vegetation – removal:

- New growth of woody vegetation (trees and shrubs) must be removed from the dike and levee sideslopes, the landside toe easement area, and within 15 feet of the waterside toe. For a floodwall the waterside and landside toe vegetation clearance should be 15-feet from the face of the floodwall or 8-feet from the floodwall foundation, whichever is less, before vegetation has time to become well established. Removal of woody vegetation shall include removal of all roots greater than larger than half an inch in diameter. After removal of woody vegetation, including roots, the voids shall be filled by placement of levee fill material in 6 inch lifts and compacted. There is an exception to the 15-ft landside and waterside easement area as the Napa project in general uses biotechnical bank features. The planting berm within the contract 1B limits was specifically constructed as a berm with vegetation where the vegetation can be maintained. The planting berm isn't considered a flood control levee but rather a berm to support vegetation in order to keep it out of the floodplain terrace area. The area beside and east of the 2W floodwall which was planted with Tules, the planting berm for the 2E levee, the planting berm/training dike in 1B, and the incomplete Imola levee which runs parallel to Imola Avenue are exceptions to the landside easement requirement. Other smaller area that are exceptions are provided in the Quick Reference Maintenance Guide table. Levee fill material is defined in the Slope Stability section below.
- Native upland grasses on the levee slopes and the landside and waterside toe easement areas must, when dry, be mowed to a height of 3 to 6 inches at any time the grass reaches a height of 12 inches. A minimum of once a year, shortly prior to the October inspection before flood season and coordinated with the USACE (SPN) Inspection of Completed Works (ICW) Program Manager, the dike/levee/berm slopes and toe easement areas must be mowed to no less than two inches in height to allow for a thorough inspection. A good grass cover on the dike/levee/berm slopes will minimize erosion of the slopes during rain and flood events.

Erosion Protection:

- Service/patrol roads along or on the dikes and levees need to be maintained in a usable condition during all weather conditions, especially during periods of precipitation, to allow vehicular patrols and monitoring of embankment performance. All holes, soft areas, or cracks need to be filled and compacted with aggregate similar to the type used in the roadway base. Tire ruts on the crest must be repaired by blading of the aggregate course or by adding additional compacted aggregate course. If rutting routinely occurs at times when the dikes, levees, and berms are not saturated by rainfall, then the speed of vehicles driving along the crest road needs to be reduced.
- No action will be taken that will compromise erosion protection of the earth structure. An example of an inappropriate action would include burning grass or weeds along the embankment or toe areas just prior to the normal rainy season.
- Any barren embankment side slopes that have been disturbed by maintenance and repair activities or other reasons must be reseeded before the rainy season (November 15), if at all possible. Preventative measures such as employing straw rolls and straw mulch need to be considered as measures to prevent erosion, such as gullies and rills on levee slopes, especially if the barren areas are seeded later than October 15 of a given year. Some of the most important conditions that need to be considered when planting native grasses for erosion control are: the importance of the grass to grow quickly and the overall amount of moisture in the soil during the year. A quick cover native seed mix (Vulpia microstachys and Trifolium willdenovii species), a seed mix with species

tolerant to dry conditions, and a native seed mix with species adaptable to moist conditions would satisfy the requirements/conditions listed above. The end product must be a continuous stand of grass chosen for a given site.

- Embankment side slopes must be kept clear of debris and trash. It is common for woody debris and trash to be deposited on the waterside slope during flood events. These items must be removed from the slopes as soon as possible after they are observed. Woody debris and trash hinder grass mowing and inspection activities, and woody debris may encourage burrowing animals.
- Unauthorized vehicles are not allowed on the dikes, levees, and berms; however, pedestrians and bicyclists are allowed on the dike/levee/berm crests, but not the sideslopes. This is provided that such activities do not adversely impact the ability of the maintaining agency to inspect, maintain, and flood fight the embankments. No encroachments or modifications will be made to the dikes/levees/berms or the landside/waterside toe easement areas without prior approval from the USACE (SPN) District Engineer.

Slope Stability:

- The slope of the dike/levee/berm crest needs to be maintained to allow surface runoff to drain readily and prevent ponding on the crest.
- The dike/levee/freeboard berm cross section needs to be maintained at its original design elevation and geometry. See Section 11.2.2 for Levee/Dike Surveillance.
- Dike, levee, and berm slopes need to be kept free of surface erosion rills or gullies using preventative measures or repairs. Any missing portion of the original embankment cross section due to erosion or other causes needs to be replaced. Rills and gullies in need of repair must be filled with levee fill material. Levee fill material is soil that meets the following physical property requirements:
  - Maximum particle size of 2 inches,
  - Minimum of 20 percent by weight passing the number 200 Standard Sieve,
  - Liquid Limit below 45,
  - Plasticity Index between 7 and 25, and
  - Be free of organic material.
- Levee fill material also must be able to support grass growth in any areas where grass cover is required for erosion protection. In these areas levee fill material must have adequate nutrients for plant growth or must be amended with fertilizers to sustain adequate native grass growth and must not contain substances toxic to plants (such as salts). Where grass cover is required, levee fill material must fall into one of the following agricultural soil classifications: loam, clay loam, sandy clay loam, silty clay loam, or loamy clay. A minimum of 6 inches must be excavated around the eroded area prior to placing fill. The excavated material may be re-used during the repair. Fill needs to be placed in loose layers not exceeding 6 inches in thickness and compacted to a density equal to that of the original embankment.

Rodent Abatement:

- A rodent abatement program needs to be employed as soon as evidence of burrowing activity is found on the dike/levee/berm embankment or toe. Burrows and dens may be filled in with either a low-pressure grout or over-excavation and backfill with compacted levee fill material assuming the SMHM is not present. If it is determined that SMHM is present, grout and backfill to correct levee deficiencies will not be possible to undertake. For circumstances on abatement in areas that are SMHM habitat see Section 10.6.1.
-

- Construction/installation of raptor perches within the Project area is not acceptable. This encourages raptor populations in SMHM habitat which is contrary to encouraging the SMHM species.

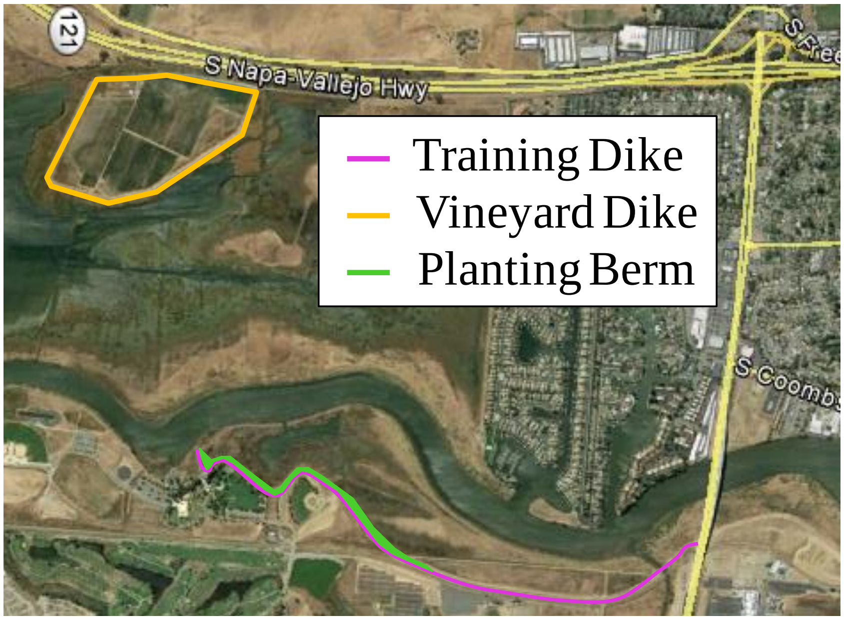


Figure 10-3: Location Map of Dikes and Planting Berm

10.7.3.1 Vineyard Dike Special Instruction

Do not mow the emergent marsh grasses planted at the waterside toe of the Vineyard Dike; only dike landside slopes, and crest should be mowed. The marsh grasses on the water side toe have shallow, fibrous root systems similar to upland native grasses and pose no additional hazard to the dike. All woody vegetation shall be removed from the dike's landside and waterside slopes as soon as detected so it does not become established. Refer to the Quick Reference Mantenancy Guide for special instructions for the maintenance of the Vineyard Dike.

10.7.3.2 Training Dike Special Instruction

Do not mow the wetlands at the waterside toe of the Training Dike contained in site 1B. Retain woody vegetation on the waterside Planting Berm. Refer to the Quick Reference Mantenancy Guide for special instructions for the maintenance of the Training Dike.

10.7.3.3 Planting Berm Special Instruction

Retain woody vegetation on the Planting Berm on the waterside of the Training Dike, but remove volunteer trees/shrubs that start to grow within 3 feet of the edge of the crest road pavement, and existing woody vegetation that is diseased or dead. Do not remove existing mature trees near the landside toe of the Training Dike at Kennedy Park unless they become diseased and die. Removal of woody vegetation includes the tree/shrub branches and trunk and all roots larger than half an inch in diameter. After removal of woody vegetation, including roots, the voids shall be filled by placement of levee fill material in 6 inch lifts and compacting. Conduct woody vegetation removal only by hand methods on or near the Site I dikes during the low tide cycle. Hand methods include use of hand-held mechanical weed whippers. Refer to the Quick Reference Mantenancy Guide for special instructions for the maintenance of the Planting Berm.

10.7.3.4 Dredge Disposal Dike Special Instruction

There are no specific vegetation management requirements for the dredge disposal dike as it is located on the landside of the project flood risk management levees. The FCD can use their own judgment for the management of vegetation on this dike. The FCD should consider their ability to inspect, maintain, and repair the interior and exterior dike slopes as well as the future ability for dredge tailings disposal when deciding whether or not to remove living woody vegetation; dead or dying woody vegetation must be removed from the dike slopes. Excessive woody vegetation on the interior and exterior dike slopes may make inspection and routine maintenance (such as mowing and repair of cracking) more difficult, and excessive woody vegetation on the interior dike slope may interfere with the future placement of dredge spoils within the disposal cell.

The discharge pipe through the dike is not required to be videoinspected every 5 years. The purpose of the discharge pipe is to drain water from future disposal of dredge tailings to the exterior of the cell. The FCD will perform a visual inspection of the discharge pipe yearly looking for visible damage and/or obstructions. This inspection includes shining a high-powered flashlight into both ends of the pipe. Erosion, "sinkholes", and cracking of the slope directly over the pipe may be an indication of pipe damage which must be investigated and repaired. The discharge pipe must be videoinspected prior to the disposal of dredge spoils within the disposal cell to assure that the pipe is undamaged and will function as intended. Any damage to the discharge pipe revealed in the videoinspection must be repaired prior to disposal of dredge spoils within the disposal cell.

10.7.4 Floodwalls and Retaining Walls

Maintenance & Inspection
Floodwalls and retaining walls should be inspected for unusual vertical or horizontal movement, cracking or spalling. Should cracking appear, a structural engineer with at least 10 years of structural experience shall observe the cracking and recommend a monitoring plan or determine the level of repair necessary for the floodwall or retaining wall. When the recommendation is made the plan shall be sent to USACE San Francisco District for approval prior to initiating the recommended fix.

Maintenance shall not include the removal of tules along the waterside of the 2W floodwall. The 2W floodwall was specifically designed with this vegetation. In addition, along the downstream bypass retaining wall for the Napa Creek project (closest to the Chop House), vegetation whose roots will not impact the retaining wall have been planted in this area and maintenance activities shall not remove this vegetation.

Proper drainage is important to ensure proper stability of retaining and floodwalls. The terraced walkway between the Hatt Building and 3rd Street on the west bank will require inspection after each flood event. Repair and/or replacement of the asphaltic concrete and recreational features shall be performed as needed throughout the life of the project. See Section 10.8 for inspection requirements for drainage features.

Location
See Table 10-5 for location of Floodwalls and Retaining Walls.

10.7.5 McKinstry Street Floodwall Closure Gates

Location

The floodwall closure gates are integral components of Floodwall 352 and Floodwall 362 located along the Dry Bypass boundaries of McKinstry Street.

Inspection and Maintenance

The following inspection and maintenance is to be performed as required by Table 10-1 and in accordance with evaluation, inspection, and repairs as provided in EM 110-2-6054.:

- Check for debris that has accumulated on the gates and removable gate post pockets
- Clean hinges (Oiling of hinges is not required) and internal structural components and refinishing wood surfaces as needed.
- Check to verify that no damage to the structural portions of the gates including hinges, anchoring post, structural members, gate seals or other related structural components has occurred.
- Check for vandalism
- Annually by October 1st:
    - Check gate locking mechanism
    - Unlock and exercise each closure gate
    - Check and operate the gate center post lift mechanism
    - Check and operate the hand wheel and bevel drive assembly. Maintain per manufacturer's recommendations.

10.7.6 Stoplog Structures

Stoplogs are stored at Veteran's park within 10-feet from the intended installation, and approximately 500-feet from the intended installation for the Dry Bypass. Each stoplog weighs approximately 20 pounds. They are 14-feet long and approximately 6-inches wide and made of aluminum. The following inspection and maintenance is to be performed for the stoplog structure and should be followed in accordance with EM 110-2-6054.

Location

- Veterans Park
- Stoplogs on the Dry Bypass floodwall left bank behind the Oxbow market.

Inspection & Maintenance

- Remove any debris that may have accumulated within stoplog guide embedments.
- Check neoprene seals for wear and damage. Repair or replace as necessary.
- Ensure nonslip coating on sill plate is performing as required.
- Install stoplog guides yearly and check for damage or leaks.
- Check for any signs of corrosion. Repair as necessary.
- Clean as necessary.

10.7.7 Napa Creek Bypass Culvert and Dry Bypass Box Culvert

Location

There are two underground dual box culvert bypasses along Napa Creek. The downstream box culvert bypass is located between Main Street and Pearl Street and the upstream box culvert bypass is located between Seminary Street and Behrens Street. The dry bypass box culvert forms a "bridge" over the low flow channel in the dry bypass along a recreation trail. The box culvert locations are shown on Figure 10-4.

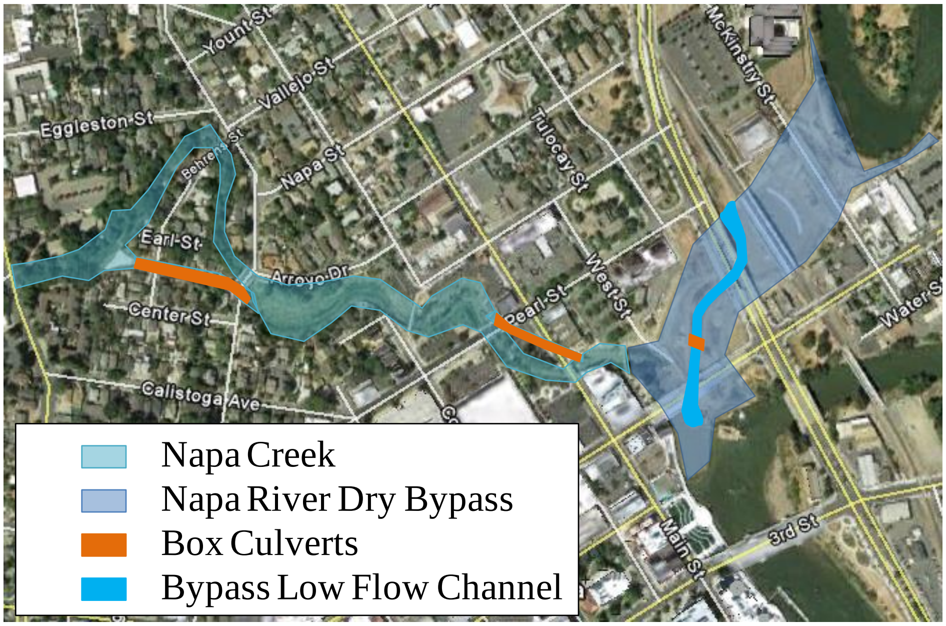


Figure 10-4: Box Culvert Location Map

Inspection and Maintenance

- The Napa Creek bypass culverts may be inspected by walking through the culverts. The Dry Bypass box culverts may be inspected by shining a high-powered flashlight into the interior of the culvert from both ends.
- It is recommended that photographs be taken of the box culverts during inspections.
- Spalling, cracking, tilting, leaking, settlement, and joint displacement of the concrete shall be evaluated by a structural engineer with at least 10 years of structural experience. The engineer will develop monitoring or repair recommendations based on the cause and severity of the anomaly.
- Debris must be removed from inlet of box culverts
- Culvert interiors shall be cleaned of debris and sediment or anything that may impede the hydraulic capacity.

Special Inspection for Napa Creek Box Culvert

Inspection and maintenance shall include the concrete apron at the inlet for any cracks, removal of debris from the trash racks at the inlets of the bypass box culverts, inspection of the interior box culvert for the presence of cracks, sediment and debris, inspection of barrier railing atop inlet and outlet walls, verify operation of access control gates and fences at the bypass culvert inlets and outlets. Sometimes large voids can form above the culverts that are not visible on the ground until a “sink hole” develops. Inspections should check for this. Tapping the sides of the culvert could help locate hidden voids that could point to piping issues. Check for piping around the culvert, check for settlement, cracking, and discoloration of the box culvert that can lead to loss of water in the box culvert and contribute to piping of the surrounding soil and structural failure of the box culvert.

10.7.8 Riprap and Planted Rock Protection

During floods the Napa Creek and Napa River experiences high velocity flow which can cause erosion of slopes. Riprap deterioration could result in instability and erosion of the protected slopes endangering nearby structures and adding sedimentation issues downstream causing premature maintenance activities. See Table 10-6 to reference locations of riprap on the project site.

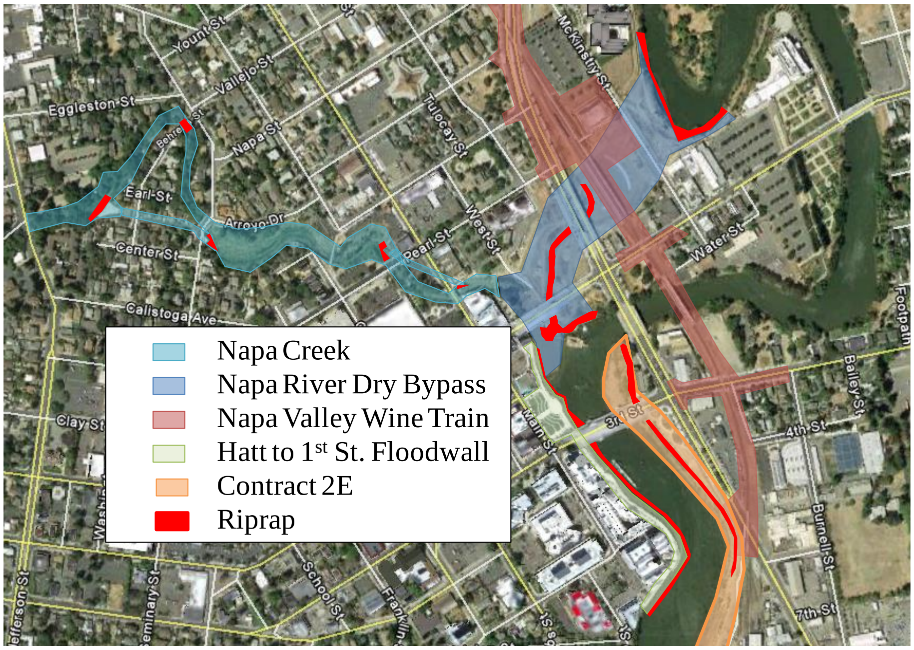


Figure 10-5: Location of Riprap around Downtown Napa

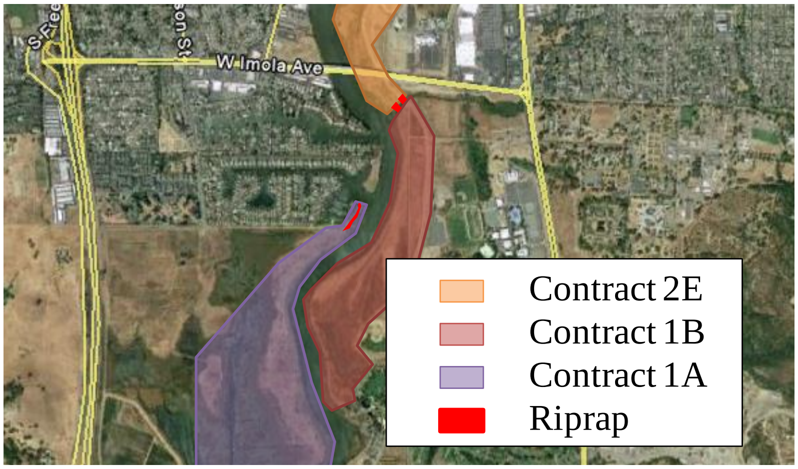


Figure 10-6: Location of Riprap in Southern Project Reach

Potential Challenges

- *Slumping or other rock displacement.* A riprap slope may become unstable similar to an earthen embankment, resulting in rock possibly sliding down the slope. Individual stones may also become displaced due to flood flows or human activity. Rock displacement results in a reduced riprap thickness at some locations, resulting in a reduction in the erosion protection provided.
- *Stone deterioration.* Over time individual stones may slake or break apart. Riprap is sized based in part on the expected flow velocity. Smaller sized rock may be washed away or displaced during floods, resulting in a significant reduction in erosion protection for the impacted slopes.

- *Vegetation growth.* Over time vegetation will grow up through the riprap, which can cause problems with visual inspections and it may increase the rate of riprap deterioration. The vegetation needs to be suppressed except where riprap has been covered with soil and planted as part of the project construction (i.e., 2W floodwall marshplain terrace, the 2E remediation site from 6th to 3rd Streets for bank protection, and the inlet and outlet of the Napa dry bypass channel (there are other exceptions not mentioned which can be refered to in the project map and the Quick Reference Maintenance Guide in order to locate these areas)). Vegetation is also allowed to grow at those locations where it was planted during construction.
- *Debris accumulation.* Debris, including trash and wood, will tend to be deposited on the riprap during flood events. Debris interferes with inspections. Impacts with heavy debris may cause rock displacement.
- *Displacement by people.* Fishing platforms, windbreaks, etc.

Maintenance
- Riprap must be maintained as a smooth slope to the original size, design elevation, thickness, and geometry. Rock displacement must be repaired by moving stones back into position on the slope or adding additional stones of the appropriate size to maintain the design thickness.
- If significant deterioration of individual stones occurs, additional riprap needs to be placed on the slope. The new riprap needs to be keyed at the toe of the slope in the same manner as the original riprap. In no case shall the underlying geotextile or aggregate bedding material be exposed. If the geotextile or bedding material becomes damaged, it must be removed and replaced as well in accordance with manufacturer criteria.
- Debris needs to be removed from the riprap slopes.
- Soil covering and native planting should be inspected and replaced as required.

10.8 DRAINAGE SYSTEM/OUTFALL MAINTENANCE & INSPECTION

Structures need to be inspected by an individual familiar with or having inspection experience with drainage facilities. Inspections performed in SMHM habitat need to follow requirements of Section 10.6.1.

Interior drainage systems collect local surface runoff collected behind project dikes, levees, floodwalls and retaining walls. The surface water is discharged into the channels through pipes. Surface drains and inlets provide collection points from promenades, walkways, ramps and platforms and discharge collected water via storm drain piping and wall penetrations. Routine inspection and maintenance of outlets and flap gates is critical because failure or clogging could cause flooding of areas behind the dikes, levees and floodwalls.

10.8.1 Drainage Channels & Gabion Wall

Location
- Drainage channels were constructed in Site 1B at Napa River Station 647+00 and the Site 2E area in the vicinity of Imola Bridge.
- Dry Bypass:
  - The open channel north of the Soscol Avenue Bridge will be retained and will discharge into the new low flow channel. This channel extends south to discharge into Napa River.
  - The gabion wall is located at the most upstream location of the Bypass Low Flow Channel shown in Figure 10-4.

Potential Challenges
- Vegetation growth (large trees, cushy vegetation) within the channel, thereby reducing its hydraulic capacity.

- Excessive accumulation of sediment and debris within the channel.
- Bank erosion and sediment deposition.
- Check for signs of erosion around gabion baskets.
- Remove debris that has accumulated behind gabion wall.
- Verify that no rocks have been displaced, washout or removed.
- Check wire casing of gabion basket for damage from debris, vandalism, or general deterioration. Repair to manufacturer specifications, including replacing any rock that may be missing.

Maintenance

- Perform maintenance as required to keep channel and gabion wall in normal working order or as required by the superintendent. Annual inspection of the gabion wall wire basket for cut, damaged or weakened basket wire. Repair per manufacturer's recommendations or recommended repair for gabion baskets.

10.8.2 Flap Gates

Location

See Table 10-9 for locations of flap gates.

Inspection

- Note any soil erosion and vegetation growth near the structures that may inhibit stability and performance. Also note any cracking spalling, tilting of the headwalls, and settlement of the headwalls or concrete pads and whether damage is cosmetic or structural.
- Prop flap gate open and shine a high-powered flashlight through the conduits from both the inlet and the outlet, when possible. Note any visible debris, sedimentation, misalignment, and damage to the conduit. Video tape on a periodic basis if visual inspection is inconclusive.
- Remove any debris, sediment, and vegetation from the inlets and outlets and within the conduit pipes.
- Repair any erosion adjacent to inlets and outlets that threatens the stability and performance of the structures. Place riprap protection in eroded areas to prevent further erosion.
- Check the gate for alignment and seating.
- Examine and trial-operate flap gate as part of the routine maintenance program.
- Assembly bolts and pivot lugs need to be free of corrosion and shearing.
- Growth of "slime" on the metal flap gates and concrete portions of drainage structures. The FCD will determine the need for cleaning individual structures based on the yearly inspection.
- Make sure flap gate is seating properly.

Note: Flap gates that are mounted to the face of Site 2W: Hatt to 1st Street lower floodwall (Wall no. 1) will require special equipment for maintenance and inspection, either through the use of an articulating boom from above or via access from the riverside below.

Maintenance

- All flap gates must be lubricated and tested for smooth operation annually in the fall.
- Adjustable pivot points need to be free of any stiff or binding action. Do not damage studs or jam gates in an open position.
- The structures must be cleaned with water only (no bleach, detergents, etc.) using a wire brush or a power washer. All rinseate must be contained in buckets or small basins. The material shall be disposed of off-site as non-hazardous waste.

- All problems found during the inspection need to be corrected immediately. If damage is significant or if the same damage occurs repeatedly, an engineer needs to evaluate the structures to determine the cause of the problem and develop a corrective action to eliminate the problem.

10.8.3 Drainage through Levees, Dikes and Floodwalls (Excludes Flapgates)

Follow inspection requirements included in Section 10.8.2 and special inspection requirements below.

Location
- Dry Bypass
  - Storm drain that passes through floodwall
  - Gravity sewer under the Dry Bypass
- Site 2W – Hatt to 1st Street
  - 3rd Street Bridge drainage through floodwall
- Site 2E
  - Two sanitary sewer lines that cross Site 2E levees. One crosses the Imola levee near the Caltrans drainage structure and the other crosses the NAP5 levee just north of the Imola Bridge.
- Site 1A – Vineyard Dike drainage
  - North and south Interior drainage structures comprised of a 24-inch inside diameter reinforced concrete pipe and their outlets are located at the dike encompassing the vineyard.

Maintenance & Inspection
Once every 5 years, conduits shall be inspected using video and/or sonar, depending on conditions. Video is preferred when the pipe is completely dry. Due to endangered species and Clean Water Act issues, dewatering of the conduits for inspection is not practical. The video/sonar inspection must be performed at low tide to minimize the amount of standing water in the conduit inverts. The portion of the conduits above water will be video inspected, and the portion of the conduit below water will be sonar inspected. The inspection must be done without cleaning the conduits if possible. If the conduits must be cleaned to be adequately inspected, effluent water must be vacuumed into a storage truck. The effluent water within the truck will be tested for turbidity and pH. If those values are within the Numeric Action Levels (NALs) (pH between 6.5 and 8.5, and maximum turbidity of 250 Nephelometric Turbidity Units (NTU), the water can be discharged on the waterside of the dike, levee or floodwall, at a location/rate that prevents erosion. If the water exceeds the limits, it can be sprayed onto the crest or access road for dust control. The video inspection must be conducted by personnel certified by National Association of Sewer Service Companies Pipeline Assessment Certification Program (NASSCO PACP). Provide a copy of the video and the video/sonar inspection report to USACE (SPN) with the next regularly submitted inspection report.

10.8.4 Positive Closure Structures

Positive closure gates are installed on the storm drain outlets that pass through floodwalls and levees to allow discharge of storm water and prevent water from flowing back into the drainage system during flood events.

Location
- Imola Levee – Cal Trans Slough Gate
- Dry Bypass
  - The West Street system drains under Floodwall 352 and will have a concrete box installed on the dry side of the floodwall next to the existing drop inlet (water collection system). Within

the concrete box a positive control valve gate is installed per the USACE requirements. This gate allows the flow into the piping system to be closed if there is a problem with the pipe crossing under the floodwall.

10.8.5 Storm Drain – Trench Drain & Wall Drain Outlets

Location
Trench drains and outlet gate boxes are located at various locations throughout the Site 2W area (see Figure 8-1). See Table 10-7, Table 10-8, and Table 10-9 for location of storm drains, trench drains and wall drain outlets throughout the project.

Potential Challenges

- Blockage of trench drains, drainage inlets and area drains due to vegetation, trash, siltation, and debris.
- Damage to outlet gate boxes and outlet pipes by impact of floating debris inhibiting internal flap operation.
- Accumulation of debris in safety grates.
- Erosion adjacent to drainage structures that endangers water tightness or stability of outlet pipes.

Inspection & Maintenance

- The outlet gate box covers need to be removed for these periodic inspections and to verify operation of the interior flaps.
- Trench drain covers need to be removed annually in the fall, and the trench drains flushed with water to remove debris and sediment.
- Washing of trench drains following removal of grates allows maintenance staff to verify discharge flow during maintenance activities.

10.8.6 Dry Bypass Gravity Sanitary Sewer System

Location
An existing 48-inch-diameter gravity sanitary sewer main crosses the bypass channel on a diagonal alignment just downstream from McKinstry Street. Final grading provides for approximately 1 foot of soil cover over a 12-inch-thick concrete pipe cap. The top of the 48-inch sewer line is approximately 2 feet below the top of the concrete cap.

The 48-inch sewer crosses the floodwall in two locations within the project limits. One crossing is under Floodwall 352 near the Wine Train Station. The second crossing is under the Floodwall 362 closure gate on McKinstry Street. Both crossings are located under the structural elements of the floodwalls and are encased in a Controlled Low Strength Material (CLSM) concrete. The crossing details are illustrated in Appendix A:20 on sheet S-118 for the crossing under the closure gate and sheet S-231 for the crossing under the wall.

Inspection
These crossings shall be inspected semi-annually and before/after flood events to monitor for any movement in the walls or settlement along the pipe crossings.

10.9 PLANT CARE MAINTENANCE & INSPECTION

10.9.1 Marshplain and Floodplain Terrace

A larger variety of vegetation will attempt to establish on the floodplain terrace and on the slope from the marsh plain terrace to the floodplain terrace. Vegetation must be closely controlled on this terrace or flow conveyance could be significantly reduced.

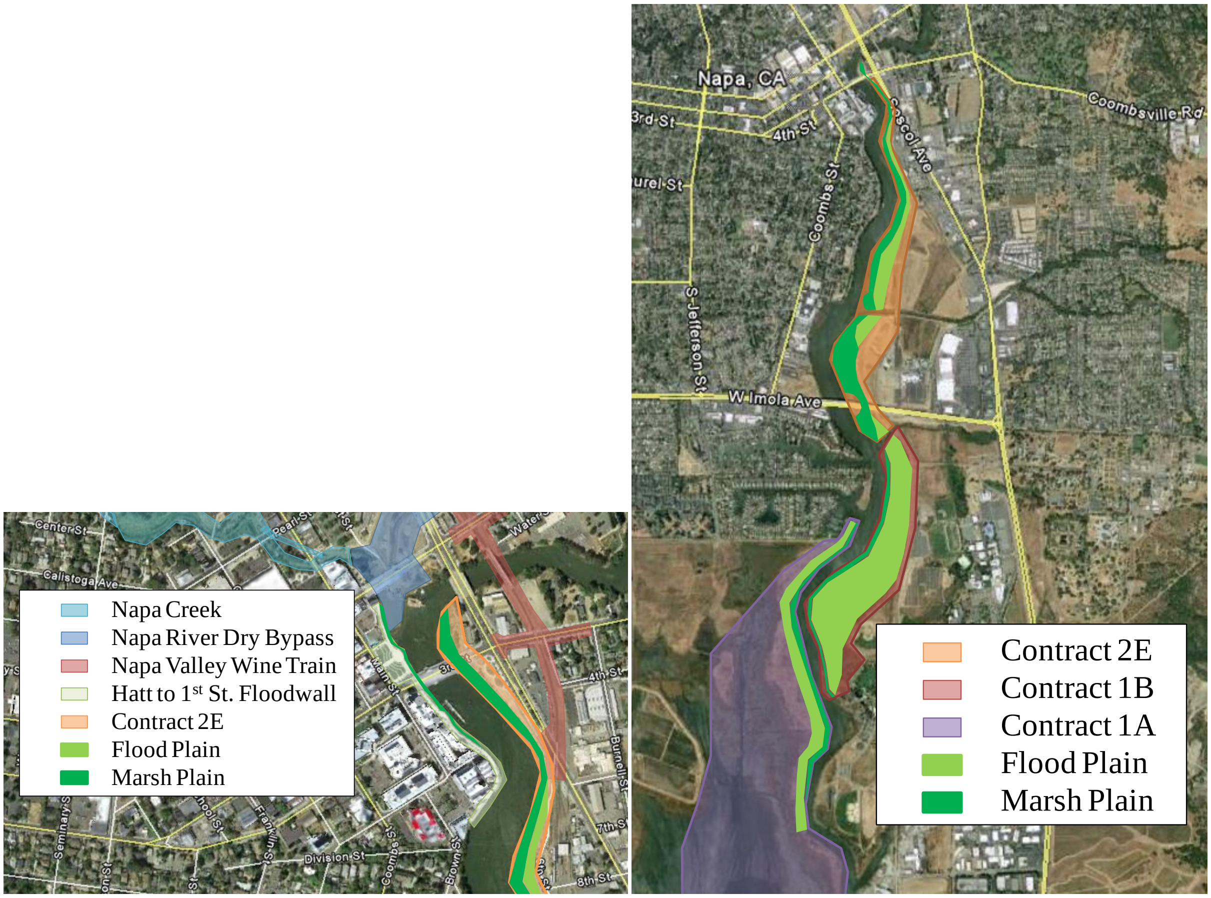


Figure 10-7: Location of Marshplain and Floodplain Terrace

10.9.1.1 Floodplain Terrace Vegetation

Inspection

Vegetation on the floodplain terrace itself outside the riparian strip is restricted to native grasses/shrubs (ie. coyote brush) with occasional trees with the exception of allowing native shrubs and trees to develop on the slope of the interface of the marsh plain terrace and the floodplain terrace (from the toe of the floodplain terrace) a distance of 30 perpendicular feet inland. Do not exceed more than ten trees per acre, spaced no closer than 50 feet apart. The vegetation density doesn't apply to the interface of the marshplain and floodplain terrace area. When a tree reaches a height of fifteen feet, any limbs below the design water elevation shall be removed. Another heavily vegetated strip will be allowed at the edge of the floodplain terrace where it transitions to natural ground. This strip will most likely take on the characteristics of an Oak Upland.

Maintenance

- FCD must include noxious weed control and thinning of non-native species, debris removal, repair of fences and gates, and maintenance of firebreaks.
- lA Floodplain Terrace: An access path is mowed along the entire length of the lA Floodplain Terrace to allow for maintenance access. This mowed path shall provide a buffer from areas supporting pickleweed by staying 75-100 feet from pickleweed areas.

10.9.1.2 Marshplain Terrace Vegetation

Inspection

Monitor and record the vegetation conditions along the Project reach and compare these conditions with assumed design vegetation conditions outlined in the SGDM Record losses of plant quantities and species installed in the various project sites. See Appendix A: for as-builts. Inspect water emergent plants after storm events that bring the river stage elevation to 12 feet NAVD 88 or greater, and inspect once during March.

Potential Challenges

Sporadic storm events are expected to be the main cause of mortality of marshplain terrace plants. High water events can kill plants in the following ways: high velocity currents scouring the finish grade, which washes out plants, silt deposition that buries plants, and by standing water in depressions that suffocate the roots of plants in poor drainage conditions. Browsing of domesticated geese can cause extensive damage to emergent plants. Excessive vegetation can reduce flood conveyance and increase flood damage risk.

Maintenance

- Plants shall be protected from predation or other damage caused by domesticated animals and wildlife.
- Monitoring will determine whether additional plantings are needed. If the goals are not being met, the FCD will determine the cause of plant mortality and propose measures to reestablish the required vegetation cover in affected areas. The findings and corrective action plan will be included in the semi-annual report.
- If replacement plants are required, they must be installed between April and July to develop a healthy root system that anchors within the soil.
- Site 2W Floodwall: The 2W floodwall was constructed with tules along the waterside. The FCD will make accommodations to be able to fully inspect the floodwall along the entire length of the floodwall along this deposition area. The intent is to be able to inspect without damaging/harming the Tules.
- Remove vegetation impeding the design flood conveyance.

10.9.1.3 Preservation of Woody Vegetation

Ropes, cables or guy wires must not be fastened or attached to any existing trees for anchorage. Where emergency use is necessary, wrap trunks and limbs with a sufficient thickness of burlap, temporary boards, or other appropriate material that will adequately protect the bark.

Native shrubs and trees can develop on the interface from the marsh plain terrace and the floodplain terrace (from the toe of the floodplain terrace) to a distance of 30 perpendicular feet inland. Because of flood conveyance concerns, vegetation on the floodplain terrace outside the riparian strip must be restricted to native grasses with shrubs and occasional trees. If the existing planting densities in specific locations are found to be out of compliance, the local sponsor must either remove the vegetation or ask USACE (SPN) to re-evaluate the risk of keeping the vegetation. The vegetation density doesn't apply to the interface of the marshplain and floodplain terrace area.

10.9.2 Woody Debris and Felled Trees

Downed trees and branches, dead limbs, and dead trees provide habitat for numerous wildlife species. Therefore, clearing and pruning must not occur unless such materials restrict site access, prove to be detrimental to the integrity of the bank protection structure, or present a risk to public safety, or impede conveyance of the design flood. Woody debris can be left on the marshplain and floodplain terraces, but must be removed from the dike/levee/berm slopes and the toe easement areas as this may encourage burrowing animals.

10.9.3 Flowage Easement Area (FEA)

The FEA is frequently flooded during large storm events and it is important to monitor the vegetation in this area. The monitoring will be completed by comparing results of on-site vegetation studies, which occur every 5 years, with previous studies through the 40th year following Project completion. See Section 10.9.3.1 for details.

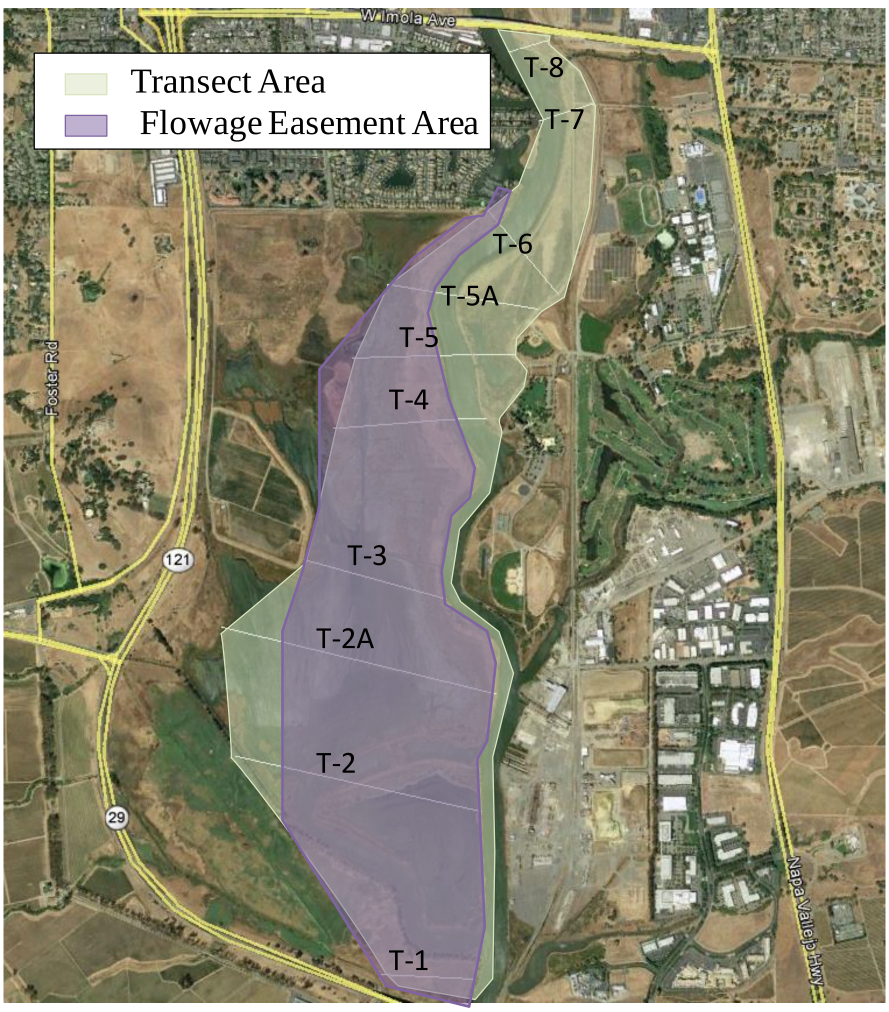


Figure 10-8: Location of Flowage Easement Area

Potential Challenges

- Excessive woody vegetation growth
- Unauthorized planting of row crops
- Excessive accumulation of sediment and debris
- Bank erosion, especially at the confluences with Horseshoe Bend.

Maintenance

- Erosion of the slough banks may occur during the rainy season and after high flood flow each year, particularly at the confluences with Horseshoe Bend where pre-project riverbank levees were breached. Repair banks and replace gravel and lost soil with proper compaction to allow regular access.
- Remove excessive accumulation of sediment along and at the upper end of the channel. The local sponsor will be responsible for complying with all laws and regulations, and for all necessary documentation and/or permits to comply with all Federal, State, and local laws and regulations, if dredging becomes necessary.
- Remove non-native vegetation and debris that impedes flow and/or obscures inspection and routine maintenance.

10.9.3.1 Comprehensive Vegetation Monitoring Report

Conduct the remaining comprehensive vegetation monitoring studies every 5 years beginning with the next comprehensive study in spring 2018. Studies should follow the format and procedures of the last USACE study and must include any interested agencies that wish to compare the condition of the sites with the goals stated in the March 1999 FRP FSEIS-EIR and other subsequent project documents. Inspections must be conducted in the spring between March and May when leaves emerge from buds, facilitating plant identification and evaluation of general plant health and mortality. Transect information is located in Appendix G of the report and transects can also be located on the project maps in Appendix K. The first 7 cross sections have been surveyed with monuments (Appendix G, Back Up Info, NAPASurveyMarkPlotsWith Connections.kmz) and the remaining transects will be surveyed upon project completion, or as the project progresses with construction. For locations of each transect point surveyed see Appendix G, the G-2 SPK Installed Transect Survey Data, Description Cards file.

- Presence/absence surveys and management of invasive plant species: relative frequency, as measured in quadrants along permanent transects, to document presence/absence of both native and non-native species and manage invasive plants.
- Vegetative cover: relative abundance, as measured in quadrants along permanent transects, to document percentage of ground surface covered by vertical projection of native vegetation canopy.
- Woody species: relative percent cover of woody plants, as measured by a qualitative estimate along permanent transects.
- Natural recruitment: visual count of seedlings or vegetative reproduction, as measured in quadrants along permanent transects, to determine if communities are self sustaining.
- Water salinity: measured in parts per million at or near permanent quadrants along transects.

10.9.4 Napa Creek Revegetation

The Maintenance efforts at Napa Creek shall be focused on the health of the plantings, the condition of the willows growing in the VRSS, the willows and alders adjacent to the channel, the upland trees and shrubs, and the Native grasses growing throughout the site. Willow pole cuttings eventually help stabilize the lower bank and provide SRA; and may be installed to fill in gaps along the creek. The sponsor should inspect the willows growing in the VRSS, to make sure they still are actively growing. Additionally, the VRSS at the lower reach of the creek may need to have the salt from the brackish water tide leeched, in order to keep plants growing. The sponsor should keep the irrigation system in working order. The native grasses and herbaceous cover should be kept at least 70% growth, and invading weeds should be eliminated. A Vegetation Report (see Section 10.5.3.1) shall be completed on a yearly basis for each Corp project that had a vegetation establishment requirement.

Inspection
Napa Creek must be inspected at least twice a year by a specialist of stream restoration, with an understanding of the biotechnical applications. When temporary irrigation is turned off, monitor these plants for health twice a week after the site is turned over, and after the irrigation is discontinued until it is certain that the plants no longer need irrigation.

The inspection of the vegetation health and vigor per plant species per zone as shown in the original site drawings is as follows:

- Health and Vigor: For each zone, document the health of the plant species per zone
- Have the plants used for biotechnical applications (esp. VRSS) grown enough to provide protection for the following storm events: 2 year, 10 year, or 30 year storm events?
- Significant insect browse or other damage done by wildlife
- Make note if there are particular plant species in poor health by zone
- Are there specific maintenance practices that could help the growth of some plants? For instance, thinning of trees could be warranted if such thinning does not affect the function of a biotechnical application
- Vandalism: Have plants been affected by trespass, trash, or other unauthorized man-made activities?
- Do some of the plants need additional irrigation?
- Has there been erosion damage to the plants?

10.9.5 Volunteer Growth

Volunteer native herbaceous plants, trees, and woody shrub saplings found growing in the riparian zone and on the Planting Berm must be protected whenever possible from maintenance practices, such as mowing and herbicide application events. The local sponsor must protect volunteers in other areas within the densities described in the SGDM.

An exception of the "do not disturb the native volunteers" would be if a large number of volunteers crowded each other and the vegetation nearby causing severely stunted growth and declining health of the vegetation. Thinning should be prescribed and supervised by a horticulturist with a restoration background or similar experience. Volunteer growth may need to be removed to restore flood conveyance so that the flood damage risk reduction benefits of the project can be realized.

10.9.6 Dry Bypass Inlet-Outlet Inspection and Volunteer Growth

The inlet of the dry bypass was constructed with a rock depression for the width of the inlet from the top of the inlet to elevation 5.0' (at the hinge point just before the rock transitions to a steeper grade). The bottom of the depression is layered with coir matting and planting soil is placed on top of the coir matting. The coir matting is anchored to the top of the soil in order to keep it in place. The local sponsor shall conduct a bi-yearly inspection of the plants planted into this despression and replace the plants bi-annually in order to insure the soil is held in place as practically as possible. Both the inlet and outlet may experience volunteer growth at the water's edge which is acceptable.

The outlet of the bypass was originally designed with rock over soil and at the request of the CRWQCB and CA Fish and Game the Corps allowed for soil to be placed over rock which would allow plant growth. The stipulation that the Corps mandated was that if the soil ever washed into the Napa River that neither the Corps nor NCFCWCD wouldn't be mandated to return and replace/replant the soil over the rock at the bypass outlet. The CRWCB and Fish and Game agreed.

The top of the inlet of the bypass has been planted with willow stakes which has produced immature willow plants that stand approximately 3 to 4-feet in height and that flex easily. The current growth of willow is acceptable so long as a thick stand of willow trees doesn't choke the ability of the inlet to accept flows scheduled at the 2 ½ year storm event from entering the bypass.

10.9.7 Biotechnical Bank Stabilization

10.9.7.1 Anchored HPTRM

Location

Figure 10-9: Locations of Anchored High Performance Turf Reinforced Matt

Potential Challenges

- **Loss of intimate contact with the underlying soil surface.** For the anchored HPTRM to maintain its level of performance, it needs to remain in intimate contact with the underlying soil surface. If intimate contact is lost, the underlying soil is susceptible to erosion during heavy rainfall and overtopping events. The HPTRM itself is also susceptible to tearing damage by routine mowing operations if the intimate contact is lost.
- **Woody vegetation.** The anchored HPTRM is designed to work in combination with a grass cover. The larger diameter and stiffer stems of woody vegetation, including brush, saplings, and trees growing through the mat will cause localized mat damage. During flood events, uprooting of woody vegetation will lift the anchored HPTRM from the slope surface and increase the rate of erosion.
- **Mat Penetrations.** Items penetrating the mat, including but not limited to pipelines, monitoring wells, posts, and survey markers, cause a stress concentration where the mat is attached to the penetration. Movement of the penetration over time due to settlement, equipment impact, or other reasons could result in tears in the mat at the location of the penetration.

- **Mowing Damage.** If mowing of the vegetative cover over the anchored HPTRM is not done carefully, the mowing operation could lift the mat off the slope surface and/or rip the mat.

Maintenance

All slopes, channels, banks and other transition structures shall be maintained to assure the expected design of life of the reinforced vegetated system. Here are a few tips that should prove helpful as per the Product Data Sheets for HPTRM in Appendix J:1 and J:5.

- **Monitoring.** Should be conducted semi-annually and after major storm events. This should include: observing the condition of the vegetation; testing the irrigation system; checking condition of all permanent erosion systems; observing sediment and debris deposits that need removal.
- **Vegetation.** Repair and maintenance of various types of vegetation shall be consistent with their original design intent, including:
    - **Grass/Turf Areas:** applications shall be maintained for adequate cover and height.
    - **Mowing:** grasses shall be mowed according to normal maintenance schedules as determined by local jurisdictions or maintenance agreements; operations shall not start until vegetation achieves a minimum height of 6 in (150mm); mower blades shall be greater than 6 in (150mm) above the mat.
    - **Unvegetated Area:** shall be re-seeded and soil-filled (if applicable).
- **Sediment and Debris Deposits.** Accumulation of sediment and debris can reduce the hydraulic capacity of channels, clog inlet and outlet structures and can damage existing vegetation. Sediment and debris removal is a vital part of system maintenance.
    - **Removal:** shall be done carefully to avoid damage. When excavation is within 12 in (300mm) minimum of matting, removal shall be done by hand or with a visual “spotter”. If equipment must operate on the mat, make sure it is of the rubber-tired type. No tracked equipment or sharp turns allowed on the mat.
        - **Alternatively,** “steak chasers” or some other form of permanent visual markers can be utilized to provide a visual marker for maintenance activities.
- **Damage Sections.** Missing or damaged sections of the matting should be replaced per the installation guidelines.
    - **Repairing Rips or Holes:** these should be patched with identical matting material. First, carefully cut out the damaged section with a knife. Then replace the compact soil to the elevation of the surrounding subgrade and plant seed. Cut a piece of replacement material a minimum of 12 in (300mm) larger than the rip or tear. Use ties to attach the replacement material to the existing material. At overlaps, the upstream and upslope material should be on the top. Secure the replacement material with a ground anchoring devices spaced every 6 in (150mm) around the circumference of the repair and at the frequency and spacing shown in the Anchor Pattern Guide on page 7 in the HPTRM Product Data Sheets in Appendix J:1. Seed and Soil fill replacement area.

10.9.7.2 VRSS

Location

VRSS is located throughout the Napa Creek and with the confluence of Napa Creek and Dry Bypass.

Potential Challenges

VRSS is susceptible to undermining from local scour and application of this bank treatment in the project includes a scour apron below the summer water line. Vandalism or debris could damage the face of the VRSS, leading to loss of functionality. Minimally, inspection should occur after each of the first few floods and/or at least twice a year for the first year and once a year thereafter. Repair any undercutting, flanking and scour. Examine the cut branches and rooted plants for survival and growth and absence of disease, insect, or other animal/human damage (e.g., grazing, trampling, digging, eating, and cutting). Repair damage to the geosynthetic in accordance with manufacturer's recommendations. Repair the vegetation to insure structural stability. VRSS should be repaired prior to flood season.

10.9.8 Irrigation

Maintenance of the irrigation system may include repair and replacement of components and ensuring proper function per design specifications and plans. Maintenance activities may include cleaning and adjusting sprinkler and bubbler nozzles, repairing damaged equipment, servicing valves, controller programming Irrigation systems shall be test-operated and adjusted annually in early June to verify correct operation in advance of the high-demand summer season.

10.9.9 Planter Box Vegetation

Vegetation which includes vines, flowers, small shrubs and trees, were planted at numerous locations along the floodwall. Vegetation at the floodwall location will be maintained to allow visibility of concrete features for inspection purposes. Maintenance may include Repair of small eroded areas, removal of trash and debris and rake surface soils, removal of accumulated fine sediments, dead leaves and trash, removal of weeds and prune back excess plant growth, removal of sediment and debris accumulation near inlet and outlet structures.

10.9.10 Prescribed Burning

Should the FCD decide to carry out prescribed burns, an approval from USACE (SPN) and the resource agencies (i.e., USFWS, NMFS, RWQCB, CDFW) shall be obtained prior to burning. The FCD is responsible for determining the safety and feasibility of the prescribed burn from the City of Napa Fire Department. The FCD must pinpoint the location of the proposed prescribed burn and consult with the City of Napa Fire Department to determine safety precautions and the feasibility of performing a prescribed burn on the particular site. The FCD must contact the California Department of Forestry and Fire Protection and the Bay Area Air Quality Management District for prescribed fire planning and permit applications.

The FCD must inform USACE no less than 14 calendar days before a prescribed burn as to the location of the intended burn site. The prescribed burn must be done following all State and local codes, and the local sponsor must obtain necessary permits to safely conduct the burn. The burn must be performed by an experienced crew, with a Fire Leader who has at least 5 years experience as part of a prescribed burn fire crew, having been a Fire Leader or Captain on a prescribed burn fire crew for no less than 10 burns. Trees and shrubs must be protected from damage caused from fire getting too close. The FCD will be responsible for damage caused by a prescribed burn. The local sponsor must have a qualified biologist or ornithologist survey the proposed prescribed burn area in accordance with Federal law (i.e., Migratory Bird Treaty Act) and State codes. Prescribed burns must not occur in the grasslands north of the vineyard on the west side of the SWOA, must not burn HPTRM and VRSS, and burns must not occur from February 1 to August 31 to avoid impacting existing and potential burrowing owl habitat, unless specifically approved by all resource agencies. A Fire and Logistics Plan must be completed, and copies of the document must be made available to the resource agencies and USACE 7 calendar days before the scheduled prescribed burn (see Appendix E:6).

10.9.11 Grazing

Impacts to Site 1A and Site 1B from grazing (i.e., livestock traffic soil compaction) may offset benefits by augmenting restoration. The FCD must consult with the University of California Livestock and Natural Resources Advisor assigned to the region and with the USDA, Natural Resources Conservation Service.

The FCD will comply with the following measures for grazing in any area of the Project.

- The FCD must coordinate and receive approval from the USACE (SPN) and all the resource agencies (i.e. USFWS, NMFS, RWQCB, CDFW) before grazing domesticated animals on the Napa River revegetation sites.
- The local sponsor must have a qualified biologist or ornithologist survey the proposed grazing area in accordance with Federal law and State codes prior to any future grazing activities.
- The FCD must have a grazing plan and keep records to document each graze. In the plan, the FCD must document the location within the project to be grazed, the duration of the graze, the number of cattle or sheep to graze, and the location of grazing within the project area. Within the grazing zone, the plan must catalog the number of trees and shrubs before each graze.
- Grazing must be monitored on a regular basis by the FCD for signs of overgrazing and trampling of grass. The FCD must not allow grazing animals to browse on native shrubs and trees. The FCD must 1st test the group of grazing animals by observation to see if the animals find native plants (*Grendelia*, *Salicornia* species, etc.), native shrubs, and trees palatable. The length of time to determine the behavior of the grazing must be determined by an expert in the field (Range Management specialist or similar, the owner of the herd of sheep or cattle). If the FCD chooses not to test the preference of plant material, they will be required to by protect native herbaceous shrubs (*Grendelia*, *Salicornia*, etc.) and trees with fencing.
- Grazing will be prohibited on levee/dike slopes. Damage from accidental grazing shall be repaired.
- Damage to native plant material, volunteers, trees, shrubs, and the native grass stand, as a direct result from grazing, will be the responsibility of the FCD.
- The FCD must plant additional trees and shrubs for trees or shrubs that have been damaged as a result of grazing. A shrub or tree must be replaced at a 2:1 ratio if 50 percent or more of each individual plant is damaged as a result of grazing. Replacement plants must be irrigated and protected from grazing for a period of 2 years.
- Once excessive rain has caused saturation of the soil, or before excessive trampling has occurred, the FCD must remove grazing animals from the site.
- Before grazing, the cattle must be given feed which is as free of weed as possible for such a time as it takes to go through the animals' digestive system.
- The FCD must take photographs of grazing areas before and after grazing.
- All above records must be made available to USACE, upon request.

The Project is not intended to be maintained to ornamental landscape conditions. Greater habitat value is afforded by those conditions that might be unsightly in an ornamental landscape; for example, downed trees, broken branches, un-mown grass, etc. Removal of vegetation must be consistent with the guidance provided below and must be documented in the FCD's annual maintenance and monitoring report to the USACE (SPN) District Engineer. Additional plantings, if needed, must be grown from plant material that originated from the Napa Watershed.

10.9.12 Damage Repair

The local sponsor will be responsible for the restoration of sites due to human impacts and environmental damage as indicated below. Discrepancies noted during the annual inspection and reported in the Annual Report will be reviewed by all concerned resource agencies, and required actions relative to repair or replanting will be decided.

- The public's access to the Napa River revegetation sites will be limited to designated walkways or trails. The public's impact on a site may continue to be potentially disruptive to the vegetation. The local sponsor must ensure that recreational activities do not impact the vegetation.

- If it is necessary to work within revegetation sites and natural vegetation stands, the location of adjacent woody vegetation to be retained should be field-marked and protected and preserved in advance to avoid destruction or damage of the vegetation.
- Vandalism is always a potential threat, but generally decreases over time. Most vandalism involves the theft of planting stock while young (usually the 1st year after planting). As the plant root systems develop, the plants become hard to remove, and are no longer a desirable target. Cuttings of trees for firewood can be another long-term threat. Vandalism damage to signs, fences, and gates are long-term problems and will be repaired or replaced by the local sponsor in a timely fashion.
- Damage caused by domestic animals will be the responsibility of the local sponsor (see Section 10.9.8, Grazing).
- Damage caused by wildlife (beaver, deer, rabbit, and gopher damage) is an ongoing threat to the vegetation. Beaver damage is the most common. Deer, rabbit and gopher damage are prevalent while the vegetation is young, but have less of an impact over time. Wildlife damage is considered an "act of nature" and will be revisited by all concerned agencies; decisions, relative to replanting, will be made on a case-by-case basis.
- Natural processes are inevitable, and natural environmental damage could occur at any time during the reestablishment of the vegetation. However, over time the damage will likely be less, due to the maturity of the vegetation. Wind throws of trees may increase over time as trees mature and provide beneficial habitat. They do not need to be removed as a measure of routine maintenance unless they are located in the dike/levee slopes or within the toe easement areas.
- Flood and erosion damage could be an annual occurrence and must be documented in each annual report. Damage due to flooding will impact both vegetation and soil erosion.
- Fire and wind damage must be documented in each annual report. Fire is a potential threat from both maintenance practices and public carelessness.

10.10 STRUCTURAL MAINTENANCE &INSPECTION

Structures need to be inspected by either a Licensed Civil Engineer with bridge or similar structures inspection experience or other qualified personnel from FCD. Post-flood inspections need to note any unusual accumulation of debris such as fallen trees, broken concrete, riprap, shopping carts, or other debris greater than 1 cubic foot in size. An inspection checklist is included in Appendix D:2.

10.10.1 NVWT River Bridge

Per Section 5.4, the NVWT River Bridge is not under the jurisdiction of USACE for maintenance and inspection.

10.10.2 NVWT Dry Bypass Bridge

The NVWT Dry Bypass railroad bridge shall be inspected annually by a competent inspector to determine whether the structure conforms to its design rating condition. Inspection should include measuring and recording the condition of substructure support at locations subject to erosion from moving water. The drainage system should be inspected for blockages and debris annually. Drain covers should be removed annually in the fall, and the drains flushed with water to remove debris and sediment. See Appendix D:2 for the Bridge Inspection Checklist.

A special bridge inspection should be performed after an occurrence that might have reduced the integrity of the bridge, including a flood, earthquake, derailment or an unusual impact. For more information on this topic, consult the Federal Track Safety Standards, Title 49 Code of Federal Regulations Part 213 in Appendix C:.

The FCD shall provide copies of bridge inspection reports to the track owner, Napa Valley Railroad, and should solicit their participation during the inspection.

10.10.3 Old Tulocay Creek Pedestrian Bridge

Structures need to be inspected by a Licensed Civil Engineer with bridge or similar structures inspection experience, or other FCD qualified personnel. Bridge plans can be found in Appendix A:5, sheet S-1 to sheet S-4. Post-flood inspection needs to note any unusual accumulation of debris (large objects such as fallen trees, broken concrete, riprap, shopping carts, or debris greater in size than 1 cubic foot).

Potential Challenges

- Hairline cracks in the north and south abutments and bridge deck can be typical. Cracks wider than a hairline need to be monitored.
- Cracks in the welds connecting the steel members.
- Debris collecting on the bridge deck and on the bridge seats.
- Signs of seated structural steel drifting laterally off the elastomeric bearing pads, or impeded movement (binding) in the longitudinal direction.
- Debris and sediment deposits can impede flow capacity of the facility, resulting in structural damage due to debris movement.
- Corrosion on the steel members, bearing anchorage, and on the stay-in-place metal forms.

10.11 SITE ACCESS AND SECURITY

10.11.1 Maintenance Roads and Access Ramps

Maintenance roads provide access for maintaining various project features and for public enjoyment. Inspection and maintenance team should have knowledge of these roads and keys to access gates for inspection and surveillance during flood season.

Potential Challenges

- Road surface damage such as cracks, potholes, ruts and undulations.
- Erosion of areas adjacent to the road surface.
- Inadequacy of surface drainage.

Maintenance

Maintenance will be based on actual problems identified during field inspections. Routine maintenance for maintenance roads and access ramps includes the following:

- Any debris on road surfaces needs to be removed to avoid obstruction to traffic and drainage.
- Dirt or sediment on road surfaces need to be removed to avoid a slick or wet surface that poses a hazard to pedestrians or vehicles.
- Vegetation on the dike/levee access roads needs to be removed or sprayed immediately to allow for unimpeded vehicular access at all times and to reduce potential fire danger during the dry summer months. USACE encourages uprooting of small bushes and trees instead of using herbicides or other chemicals to minimize the environmental impact. Also see Section 10.7.3
- All asphalt pavement will deteriorate over time. When pavement damage occurs, then the pavement needs to be repaired or replaced to current local, county, state or federal standards. If pavement is actively repaired quickly it can last longer than waiting until there is widespread damage.

- During flood season, any damage to the access roads or access ramps needs to be repaired immediately. At a minimum, provide temporary repair to re-establish access within 24 hours.

10.11.2 Unacceptable Site Uses

The local sponsor is responsible for stewarding the Project site according to the goals of the project. Any use not defined here with potential to cause significant damage to resources on site must be discussed with all concerned agencies. This includes:

- Camping
- Unauthorized activity or access
- Off-road vehicles
- Off-trail biking
- Mining for minerals, aggregate, oil, and sand
- Disposal and/or spoiling of dredged material.
- Thorough fare for livestock or other grazing animals.
- Other recreational uses.

The local sponsor must patrol the project area to make sure unlawful activities will be promptly reported to the appropriate law enforcement agency, documented, and included in the annual report. Reoccurring unlawful activities at the site are cause for concern and need to be addressed by the local sponsor by either stepping up patrols of the site or further limiting access. Signs listing acceptable and prohibited activities will be posted by the FCD at access points for the public.

10.12 RECREATION

10.12.1 Pedestrian Railing

Location
The pedestrian railing is installed in the following sites:
- Site 4, Napa Creek – provides a barrier between the public areas above the Coombs Street Retaining wall and the bypass culvert inlet and outlet walls.
- Site 2W, Hatt to 1st – provides a barrier between the public areas above the wall and the Napa River or lower promenade below. (This is also a convenient location to remove debris that may have collected on the lower promenade during a period of high water.)
  - A portion of the railing south of the 3rd Street Bridge can be removed to accommodate a portable dock access system in the river.
- Dry Bypass Site – on top of flood control walls and pedestrian culvert crossing over low flow channel
  - The culvert crossing railing is designed to be removed and stored during high flow events.

Maintenance
The anchoring system needs to be inspected yearly for signs of corrosion, loose anchoring points and bent or missing railing. Finish/paint of the metal railing/fences shall be inspected for flaking or corrosion. Inspections should begin 2 years after installation and be conducted yearly thereafter.

10.12.2 River Access

There are two concrete river access areas and pedestrian river access locations within the Dry Bypass.

The first is located Dry Bypass Outlet below China Point Park, north of the salt marsh tidal flat. The second site is located at the easterly side of the Dry Bypass Inlet. Access to the two locations is provided by pedestrian pathway within the project or by river access.

Maintenance & Inspection

- Check for debris that has accumulated on the ramps or access areas.
- Check to verify that no rock adjacent to the ramps has been displaced or removed.
- Check the 2 inch access handrail on the upstream river access to ensure it is still securely anchored to the concrete.
- Check that the glide rails on the upstream river launch for wear and damage.
- Ensure that the 4- by 4- inch pressure treated edge rails are securely anchored.

The program shall include removing any debris, replacement of missing or worn parts, cleaning and removal of accumulated sediment, and repair of the kayak launch rails and glide rails.

10.12.3 Lighting

Maintenance and inspection of lighting features are the responsibility of the project sponsor and City of Napa.

10.12.4 After Earthquake Inspection

Per Chapter 11 of ER 1110-2-1156, USACE recommends a special post-earthquake project inspection be conducted if earthquake ground motions are felt in downtown Napa or in accordance with the following earthquake magnitude and epicentral distance from downtown Napa provided in Table 10-3.

Table 10-3: Criteria for Post-Earthquake Inspections

Magnitude	Epicentral Distance from Downtown Napa
<4.5	10
5.0	50
6.0	75
7.0	125
8.0	200

10.12.5 After Flood Inspection

Special post-flood inspections should be conducted for specific project features in accordance with Table 10-4.

Table 10-4: Post-Flood Inspection Guidance

Project Feature	Inspect After
Dikes, levees, floodwalls, berms (including appurtenant features)	Water level above the landside toe elevation

Project Feature	Inspect After
Floodplain Terrace (including slopes up to natural ground and down to Marshplain Terrace)	Water more than 1 foot deep on floodplain terrace
Riprap	Water more than 1 foot deep on riprap
Napa Creek (includes box culverts and bank/channel stabilization features)	Water flows through box culvert
Dry Bypass (including NVWT bridge and other appurtenant features)	Water flows through bypass
Hatt Building to First Street floodwall	Water above lower promenade under Third Street bridge

10.13 MAINTENANCE/INSPECTION FOR NON-FLOOD CONTROL FEATURES

For non-flood control features it shall be the responsibility of the NCFCD to assess on a periodic basis and maintain the features for safe and efficient functioning of the project to produce the authorized benefits as detailed in the design documentation. The FCD shall maintain and inspect project elements in accordance with local, state, and federal standards and requirements.

10.14 LOCATION TABLES

Table 10-5: Retaining Wall/Floodwall Locations

Station Line	Beginning Station	End Station	Location	Description / Location	Size / Material	Contract / Sheet Number
Napa River	758+50	776+30	West Bank	Wall 1	Reinforced Concrete Retaining Wall	2 West / C-101 - C103
Napa River	765+50	768+18	West Bank	Wall 2	Reinforced Concrete Retaining Wall	2 West / C-101B / C-102
Napa River	768+50	770+50	West Bank	Wall 3	Reinforced Concrete Retaining Wall	2 West / C-102
Napa River	771+42	772+35	West Bank	Wall 4	Reinforced Concrete Retaining Wall	2 West / C-103
Napa River	773+19	774+00	West Bank	Wall 5	Reinforced Concrete Retaining Wall	2 West / C-103
Napa River	774+08	776+00	West Bank	Wall 6	Reinforced Concrete Retaining Wall	2 West / C-103
CRK Line	10+10.27	10+66.54	East Bank	CSRW1	Reinforced Concrete Retaining Wall	Contract 4 / C-111
CRK Line	11+34.85	11+59.11	West Bank	CSRW2	Reinforced Concrete Retaining Wall with CIDH pile	Contract 4 / C-111
CRK Line	17+06.05	20+37.38	Coombs Street	COOMBSRW	Reinforced Concrete Retaining Wall	Contract 4 / C-121 / C-122
CRK Line	8+80	9+25	North Side of Creek	DB1 Wall	Reinforced Concrete Retaining Wall	Contract 4 / C-101
CRK Line	7+39.70	9+25	North Side of Creek	DB2 Wall	Reinforced Concrete Retaining Wall	Contract 4 / C-101
CRK Line	14+63	15+00	East Bank	DB3 Wall	Reinforced Concrete Retaining Wall	Contract 4 / C-102
CRK Line	23+94.49	24+28.64	West Bank	Lopez Wall	Reinforced Concrete Retaining Wall	Contract 4 / C-151
CRK Line	24+00	25+00	West Bank	UB1 Wall	Reinforced Concrete Retaining Wall	Contract 4 / C-151
CRK Line	38+00	39+40	South Bank	UB2 Wall	Reinforced Concrete Retaining Wall	Contract 4 / C-152
CRK Line	38+01	37+35	South Bank	UB3 Wall	Reinforced Concrete Retaining Wall	Contract 4 / C-152
Dry Bypass- Napa River	782+50	790+00	East Bank	Wall 362	Reinforced Concrete Retaining Wall	NapaBypass / CS-102
Dry Bypass- Napa River	778+25	882+75	West Bank	Wall 352	Reinforced Concrete Retaining Wall	NapaBypass / CS-102

Table 10-6: Rip Rap Locations

Station Line	Beginning Station	End Station	Location in Channel	Description / Location / Drawing Designation	Size / Material	Contract / Sheet Number
Napa River	677+00	670+00	On Top of West Bank	Top of Bank	Stone Protection	1A / C-20
Pedestrian Bridge Old Tulocay Creek	1+00	1+50	East and West bank of	Bottom Of Pedestrian Bridge	Stone Protection	1B / C-22
Napa River	758+00	775+00	West Bank	Napa River Inn to Veteran Park	Stone Protection	2W / G-004
Napa River	762+00	777+00	East Bank	Above Marsh Plain	Stone Protection	2E / C-1-07 / C-1-08
Napa River	777+50	778+50	South Bank	Under Soscal Ave Bridge	Stone Protection	2E / C-5-23
Napa River	691+75		West Bank	Drainage Swale into Old Tulocay Creek	Stone Protection	2E / C-104
Napa Creek			Under Bridge Both Banks	Behrens Street Pedestrian Bridge	Stone Protection	Napa Creek / C-01
Napa Creek			South Bank	Main Street Road Bridge	Stone Protection	Napa Creek / C-113 / P-111
CRK Line	40+80	41+45	North Bank		Stone Protection	Napa Creek / C-184
CRK Line	39+45	37+15	South Bank	Single out Culvert	Stone Protection	Napa Creek / C-183
CRK Line	24+60	25+40	West Bank	Double in Culvert	Stone Protection	Napa Creek / C-124
CRK Line	13+80	14+85	East Bank	Double out Culvert	Stone Protection	Napa Creek / C-123
CRK Line	9+55	7+40	North Bank	Single in Culvert	Stone Protection	Napa Creek / C-103C / C-103D
Napa River	774+00	783+70		Low Flow Channel	Stone Protection	Napa Bypass / C-102
Napa River	816+75	819+00	South Bank	Beginning of Dry Bypass	Stone Protection	Napa Bypass / C-115
Napa River	776+00	783+30	Bypass	In Dry Bypass	Stone Protection	Napa Bypass / B-101 / B-102

Table 10-7: Storm Drain Location Table 1 of 2

Station Line	Beginning Station	Location	Description / Location / Drawing Designation	Size / Material	Contract / Sheet Number
Napa River	672+55	North West Bank	Exhisting Strom Drain	24 inch	1-A / C-20
Pedestrian Bridge Old Tulocay Creek Line B	0+82	South East Bank	Weephole Drain Pipe (X2) Tulocay Creek Pedestrian Bridge	4 inch PVC	1B / C-22 / S-3
Pedestrian Bridge Old Tulocay Creek Line B	1+65	North West Bank	Weephole Drain Pipe (X2) Tulocay Creek Pedestrian Bridge	4 inch PVC	1B / C-22 / S-3
New Tulocay Creek Line	9+00	North Side Levee	Exhisting Storm Drain inlet	High Density Polyethlene	2E / C-127
New Tulocay Creek Line	12+15	North Side Levee	Exhisting Storm Drain outlet	High Density Polyethlene	2E / C-127
Napa River	758+65	West Bank	Exhisting Storm Drain	4 inch PVC	2 West / C-104
Napa River	758+75	West Bank	Exhisting Storm Drain	4 inch PVC	2 West / C-104
CRK Line	10+07.66	Napa Creek West Bank	Into Napa Creek	42 inch Corrugated Metal Pipe	Contract 4 / C-146C
CRK Line	19+00	Brown Street	Into Napa Creek	15 inch Reinforced Concrete Pipe	Contract 4 / C-146D
CRK Line	25+45	UB Culvert	Through Wall UB Culvert	15 inch Reinforced Concrete Pipe	Contract 4 / C-163A
CRK Line	33+77.61	East Bank	Into Napa Creek	12 inch Reinforced Concrete Pipe	Contract 4 / C-172
CRK Line	32+32.03	West Bank	Into Napa Creek	12 inch Reinforced Concrete Pipe	Contract 4 / C-172
CRK Line	32+50	West Bank	Exhisting Storm Drain Into Napa Creek	12 inch Reinforced Concrete Pipe	Contract 4 / C-173
CRK Line	32+65	East Bank	Exhisting Storm Drain Into Napa Creek	36 inch Reinforced Concrete Pipe	Contract 4 / C-173
Pedestrian Bridge Old Tulocay Creek Line B	0+82	South East Bank	Old Tulocay Creek Pedestrian Bridge	Geosynthetic Wall Drain	1B / C-22 / S-3
Pedestrian Bridge Old Tulocay Creek Line B	1+65	North West Bank	Old Tulocay Creek Pedestrian Bridge	Geosynthetic Wall Drain	1B / C-22 / S-3
Napa River	763+25	West Bank	Storm Drain Through Wall with Oulet Gate Box from Trench Drain	6 inch SDR35	2 West / C-104B
Napa River	763+35	West Bank	Storm Drain Through Wall with Oulet Gate Box from Tree Well Drain	6 inch SDR35	2 West / C-104B
Napa River	763+81	West Bank	Storm Drain Through Wall with Oulet Gate Box from Tree Well Drain	6 inch SDR35	2 West / C-104B
Napa River	764+29	West Bank	Storm Drain Through Wall with Oulet Gate Box from Tree Well Drain	6 inch SDR35	2 West / C-104B
Napa River	765+25	West Bank	Storm Drain Tree Well Drain through Wall	6 inch PVC	2 West / C - 104B
Napa River	765+50	West Bank	Storm Drain Tree Well Drain through Wall	6 inch PVC	2 West / C - 104B
Napa River	765+75	West Bank	Storm Drain Tree Well Drain through Wall	6 inch PVC	2 West / C - 104B
Napa River	766+00	West Bank	Storm Drain Tree Well Drain through Wall	6 inch PVC	2 West / C - 105
Napa River	766+50	West Bank	Storm Drain Tree Well Drain through Wall	6 inch PVC	2 West / C - 105
Napa River	766+53	West Bank	Storm Drain Through Wall with Oulet Gate Box	6 inch PVC	2 West / C - 105
Napa River	769+25	West Bank	Storm Drain Through Wall with Oulet Gate Box	6 inch PVC	2 West / C - 105
Napa River	769+37	West Bank	Storm Drain Tree Well Drain through Wall	6 inch PVC	2 West / C - 105
Napa River	769+87	West Bank	Storm Drain Tree Well Drain through Wall	6 inch PVC	2 West / C - 105
Napa River	770+37	West Bank	Storm Drain Tree Well Drain through Wall	6 inch PVC	2 West / C - 105
Napa River	771+06	West Bank	Storm Drain Through Wall with Oulet Gate Box	12 inch Reinforce Concrete Pipe	2 West / C - 105
Napa River	773+43	West Bank	Storm Drain Through Wall with Oulet Gate Box from Trench Drain	6 inch PVC	2 West / C - 106
Napa River	774+10	West Bank	Storm Drain Through Wall with Oulet Gate Box from Trench Drain	6 inch PVC	2 West / C - 106
Napa River	774+95	West Bank	Storm Drain Through Wall with Oulet Gate Box from Trench Drain	6 inch PVC	2 West / C - 106
Napa River	759+25	West Bank	Through Wall with Oulet Gate Box	6 inch SDR35	2 West / C-104A
Napa River	775+81	West Bank	Storm Drain Through Wall with Oulet Gate Box from Trench Drain	6 inch PVC	2 West / C - 106

Storm Drain Table Continues on Next Page

Table 10-8: Storm Drain Location Table 2 of 2

Station Line	Beginning Station	Location	Description / Location / Drawing Designation	Size / Material	Contract / Sheet Number
Napa River	760+80	West Bank	Through Wall with Oulet Gate Box	6 inch SDR35	2 West / C-104A
CRK Line	12+60	Pearl street and Main street Bypass	Throught wall into Bypass Culvert	24 inch Reinforced Concrete Pipe	Contract 4 / C-104A
SD Arroyo Drive Line	12+33.36	Arroyo Dr into Napa Creek	Throught wall into Napa Creek	15 inch Reinforced Concrete Pipe	Contract 4 / C-135B
SD Coombs Street Line	10+30.92	Coombs Street Retaining Wall	Throught wall into Napa Creek	15 inch Reinforced Concrete Pipe	Contract 4 / C-135A
CRK Line	17+38.55	Coombs Street	Storm Drain Through Wall with Oulet Gate Box into Napa Creek	6 inch PVC	Contract 4 / S-131 / S-132
CRK Line	17+68.55	Coombs Street	Storm Drain Through Wall with Oulet Gate Box into Napa Creek	6 inch PVC	Contract 4 / S-131 / S-133
CRK Line	18+03.55	Coombs Street	Storm Drain Through Wall with Oulet Gate Box into Napa Creek	6 inch PVC	Contract 4 / S-131 / S-134
CRK Line	18+21.05	Coombs Street	Storm Drain Through Wall with Oulet Gate Box into Napa Creek	6 inch PVC	Contract 4 / S-131 / S-135
CRK Line	18+46.05	Coombs Street	Storm Drain Through Wall with Oulet Gate Box into Napa Creek	6 inch PVC	Contract 4 / S-131 / S-136
CRK Line	18+76.05	Coombs Street	Storm Drain Through Wall with Oulet Gate Box into Napa Creek	6 inch PVC	Contract 4 / S-131 / S-137
CRK Line	19+03.55	Coombs Street	Storm Drain Through Wall with Oulet Gate Box into Napa Creek	6 inch PVC	Contract 4 / S-131 / S-138
CRK Line	19+29.05	Coombs Street	Storm Drain Through Wall with Oulet Gate Box into Napa Creek	6 inch PVC	Contract 4 / S-131 / S-139
CRK Line	19+56.05	Coombs Street	Storm Drain Through Wall with Oulet Gate Box into Napa Creek	6 inch PVC	Contract 4 / S-131 / S-140
CRK Line	19+84.05	Coombs Street	Storm Drain Through Wall with Oulet Gate Box into Napa Creek	6 inch PVC	Contract 4 / S-131 / S-141
CRK Line	24+16.49	West Bank Napa Creek	Storm Drain Through Wall with Oulet Gate Box into Napa Creek	6 inch PVC	Contract 4 / S-162
CRK Line	7+54.70	North Bank DB2 Wall	Storm Drain Through Wall with Oulet Gate Box into Napa Creek	6 inch PVC	Contract 4 / S-102 / S-103
CRK Line	7+77.70	North Bank DB2 Wall	Storm Drain Through Wall with Oulet Gate Box into Napa Creek	6 inch PVC	Contract 4 / S-102 / S-103
CRK Line	7+99.70	North Bank DB2 Wall	Storm Drain Through Wall with Oulet Gate Box into Napa Creek	6 inch PVC	Contract 4 / S-102 / S-103
CRK Line	8+22.70	North Bank DB2 Wall	Storm Drain Through Wall with Oulet Gate Box into Napa Creek	6 inch PVC	Contract 4 / S-102 / S-103
CRK Line	8+44.70	North Bank DB2 Wall	Storm Drain Through Wall with Oulet Gate Box into Napa Creek	6 inch PVC	Contract 4 / S-102 / S-103
CRK Line	8+66.70	North Bank DB2 Wall	Storm Drain Through Wall with Oulet Gate Box into Napa Creek	6 inch PVC	Contract 4 / S-102 / S-103
CRK Line	8+99.70	North Bank DB2 Wall	Storm Drain Through Wall with Oulet Gate Box into Napa Creek	6 inch PVC	Contract 4 / S-102 / S-103
CRK Line	9+05	South Bank DB1 Wall	Storm Drain Through Wall with Oulet Gate Box into Napa Creek	6 inch PVC	Contract 4 / S-102 / S-103
CRK Line	14+80	North Bank DB3 Wall	Storm Drain Through Wall with Oulet Gate Box into Napa Creek	6 inch PVC	Contract 4 / S-153
Upper Bypass Culvert UB Line	0+55	West Bank UB1 Wall	Storm Drain Through Wall with Oulet Gate Box into Napa Creek	6 inch PVC	Contract 4 / S-153
Upper Bypass Culvert UB Line	0+78	West Bank UB1 Wall	Storm Drain Through Wall with Oulet Gate Box into Napa Creek	6 inch PVC	Contract 4 / S-153
Upper Bypass Culvert UB Line	1+02	West Bank UB1 Wall	Storm Drain Through Wall with Oulet Gate Box into Napa Creek	6 inch PVC	Contract 4 / S-153
Upper Bypass Culvert UB Line	5+81.50	South Bank UB2 Wall	Storm Drain Through Wall with Oulet Gate Box into Napa Creek	6 inch PVC	Contract 4 / S-153
Upper Bypass Culvert UB Line	6+07.50	South Bank UB2 Wall	Storm Drain Through Wall with Oulet Gate Box into Napa Creek	6 inch PVC	Contract 4 / S-153
Upper Bypass Culvert UB Line	6+27.50	South Bank UB2 Wall	Storm Drain Through Wall with Oulet Gate Box into Napa Creek	6 inch PVC	Contract 4 / S-153
Upper Bypass Culvert UB Line	6+93.50	South Bank UB2 Wall	Storm Drain Through Wall with Oulet Gate Box into Napa Creek	6 inch PVC	Contract 4 / S-153
Upper Bypass Culvert UB Line	5+81.50	South Bank UB3 Wall	Storm Drain Through Wall with Oulet Gate Box into Napa Creek	6 inch PVC	Contract 4 / S-153
Upper Bypass Culvert UB Line	6+07.50	South Bank UB3 Wall	Storm Drain Through Wall with Oulet Gate Box into Napa Creek	6 inch PVC	Contract 4 / S-153
Upper Bypass Culvert UB Line	6+27.50	South Bank UB3 Wall	Storm Drain Through Wall with Oulet Gate Box into Napa Creek	6 inch PVC	Contract 4 / S-153
Upper Bypass Culvert UB Line	6+50.50	South Bank UB3 Wall	Storm Drain Through Wall with Oulet Gate Box into Napa Creek	6 inch PVC	Contract 4 / S-153
Upper Bypass Culvert UB Line	6+72.50	South Bank UB3 Wall	Storm Drain Through Wall with Oulet Gate Box into Napa Creek	6 inch PVC	Contract 4 / S-153
Upper Bypass Culvert UB Line	6+97.50	South Bank UB3 Wall	Storm Drain Through Wall with Oulet Gate Box into Napa Creek	6 inch PVC	Contract 4 / S-153
Upper Bypass Culvert UB Line	7+23.50	South Bank UB3 Wall	Storm Drain Through Wall with Oulet Gate Box into Napa Creek	6 inch PVC	Contract 4 / S-153

Table 10-9: Flap Gate Location Table

Station Line	Station	Location	Description / Location / Drawing Designation	Size / Material	Contract / Sheet Number
Vineyard Dyke Line A	10+80	East Bank Vinyard Dike	Drain Pipe with Flap Gate	24 inch Reinforced Concrete Pipe	1-A / C-5 / C-30
Vineyard Dyke Line A	30+52	North Bank Vineyard Dike	Drain Pipe with Flap Gate	24 inch Reinforced Concrete Pipe	1-A / C-8 / C-30
Vineyard Dyke Line A	55+60	West Bank Vineyard Dike	Drain Pipe with Flap Gate	24 inch Reinforced Concrete Pipe	1-A / C-7 / C-30
Napa River	617+00	West Bank	Exhisting Drainage Structure with Flap Gate	Unknown	1-A / C-17
Napa River	767+15	North Bank	Exhisting Storm Drain with Flap Gate	18 inch or 8 inch Reinforced Concrete Pipe	2E / C-4-26 /C-5-23.1
Napa River	771+05	North Bank	Exhisting Storm Drain with Flap Gate	19 inch or 8 inch Reinforced Concrete Pipe	2E / C-4-26 /C-5-23.1
New Tulocay Creek Line	7+50	North Side Levee	Storm Drain Concrete Headwall with Flap Gate	24 inch High Density Polyethlene	2E /C- 121 / C-449 / C-555
Dredge Disposal Levee Line C	5+50	South Side Levee	Imola Dredge Disposal Drainage Structure with Flap Gate	25 inch High Density Polyethlene	2E / C-123 / C-554
CRK Line	14+87.95	Napa Creek East Bank	Into Napa Creek with Flap Gate	24 inch Reinforced Concrete Pipe	Contract 4 / C-145B
Napa River	773+10	West Bank	Storm Drain Through Wall with Flap Gate	18 inch Reinforce Concrete Pipe	2 West / C - 106
Napa River	775+50	West Bank	Storm Drain Through Wall with Flap Gate	15 inch Reinforce Concrete Pipe	2 West / C - 106

Table 10-10: Drainage through Levees, Dikes and Floodwalls (Table 1 of 2)

Station Line	Station	Location	Description / Location / Drawing Designation	Size / Material	Contract / Sheet Number
Vineyard Dyke Line A	10+80	East Bank Vinyard Dike	Drain Pipe with Flap Gate	24 inch Reinforced Concrete Pipe	1-A / C-5 / C-30
Vineyard Dyke Line A	30+52	North Bank Vineyard Dike	Drain Pipe with Flap Gate	24 inch Reinforced Concrete Pipe	1-A / C-8 / C-30
Vineyard Dyke Line A	55+60	West Bank Vineyard Dike	Drain Pipe with Flap Gate	24 inch Reinforced Concrete Pipe	1-A / C-7 / C-30
New Tulocay Creek Line	7+50	North Side Levee	Storm Drain Concrete Headwall with Flap Gate	24 inch High Density Polyethlene	2E /C- 121 / C-449 / C-555
Dredge Disposal Levee Line C	5+50	South Side Levee	Imola Dredge Disposal Drainage Structure with Flap Gate	25 inch High Density Polyethlene	2E / C-123 / C-554
Napa River	763+25	West Bank	Storm Drain Through Wall with Oulet Gate Box from Trench Drain	6 inch SDR35	2 West / C-104B
Napa River	763+35	West Bank	Storm Drain Through Wall with Oulet Gate Box from Tree Well Drain	6 inch SDR35	2 West / C-104B
Napa River	763+81	West Bank	Storm Drain Through Wall with Oulet Gate Box from Tree Well Drain	6 inch SDR35	2 West / C-104B
Napa River	764+29	West Bank	Storm Drain Through Wall with Oulet Gate Box from Tree Well Drain	6 inch SDR35	2 West / C-104B
Napa River	765+25	West Bank	Storm Drain Tree Well Drain through Wall	6 inch PVC	2 West / C - 104B
Napa River	765+50	West Bank	Storm Drain Tree Well Drain through Wall	6 inch PVC	2 West / C - 104B
Napa River	765+75	West Bank	Storm Drain Tree Well Drain through Wall	6 inch PVC	2 West / C - 104B
Napa River	766+00	West Bank	Storm Drain Tree Well Drain through Wall	6 inch PVC	2 West / C - 105
Napa River	766+50	West Bank	Storm Drain Tree Well Drain through Wall	6 inch PVC	2 West / C - 105
Napa River	766+53	West Bank	Storm Drain Through Wall with Oulet Gate Box	6 inch PVC	2 West / C - 105
Napa River	769+25	West Bank	Storm Drain Through Wall with Oulet Gate Box	6 inch PVC	2 West / C - 105
Napa River	769+37	West Bank	Storm Drain Tree Well Drain through Wall	6 inch PVC	2 West / C - 105
Napa River	769+87	West Bank	Storm Drain Tree Well Drain through Wall	6 inch PVC	2 West / C - 105
Napa River	770+37	West Bank	Storm Drain Tree Well Drain through Wall	6 inch PVC	2 West / C - 105
Napa River	771+06	West Bank	Storm Drain Through Wall with Oulet Gate Box	12 inch Reinforce Concrete Pipe	2 West / C - 105
Napa River	773+10	West Bank	Storm Drain Through Wall with Flap Gate	18 inch Reinforce Concrete Pipe	2 West / C - 106
Napa River	773+43	West Bank	Storm Drain Through Wall with Oulet Gate Box from Trench Drain	6 inch PVC	2 West / C - 106
Napa River	774+10	West Bank	Storm Drain Through Wall with Oulet Gate Box from Trench Drain	6 inch PVC	2 West / C - 106
Napa River	774+95	West Bank	Storm Drain Through Wall with Oulet Gate Box from Trench Drain	6 inch PVC	2 West / C - 106
Napa River	775+50	West Bank	Storm Drain Through Wall with Flap Gate	15 inch Reinforce Concrete Pipe	2 West / C - 106
Napa River	759+25	West Bank	Through Wall with Oulet Gate Box	6 inch SDR35	2 West / C-104A
Napa River	775+81	West Bank	Storm Drain Through Wall with Oulet Gate Box from Trench Drain	6 inch PVC	2 West / C - 106
Napa River	760+80	West Bank	Through Wall with Oulet Gate Box	6 inch SDR35	2 West / C-104A
SD Coombs Street Line	10+30.92	Coombs Street Retaining Wall	Throught wall into Napa Creek	15 inch Reinforced Concrete Pipe	Contract 4 / C-135A
CRK Line	17+38.55	Coombs Street	Storm Drain Through Wall with Oulet Gate Box into Napa Creek	6 inch PVC	Contract 4 / S-131 / S-132
CRK Line	17+68.55	Coombs Street	Storm Drain Through Wall with Oulet Gate Box into Napa Creek	6 inch PVC	Contract 4 / S-131 / S-133
CRK Line	18+03.55	Coombs Street	Storm Drain Through Wall with Oulet Gate Box into Napa Creek	6 inch PVC	Contract 4 / S-131 / S-134
CRK Line	18+21.05	Coombs Street	Storm Drain Through Wall with Oulet Gate Box into Napa Creek	6 inch PVC	Contract 4 / S-131 / S-135
CRK Line	18+46.05	Coombs Street	Storm Drain Through Wall with Oulet Gate Box into Napa Creek	6 inch PVC	Contract 4 / S-131 / S-136
CRK Line	18+76.05	Coombs Street	Storm Drain Through Wall with Oulet Gate Box into Napa Creek	6 inch PVC	Contract 4 / S-131 / S-137
CRK Line	19+03.55	Coombs Street	Storm Drain Through Wall with Oulet Gate Box into Napa Creek	6 inch PVC	Contract 4 / S-131 / S-138
CRK Line	19+29.05	Coombs Street	Storm Drain Through Wall with Oulet Gate Box into Napa Creek	6 inch PVC	Contract 4 / S-131 / S-139
CRK Line	19+56.05	Coombs Street	Storm Drain Through Wall with Oulet Gate Box into Napa Creek	6 inch PVC	Contract 4 / S-131 / S-140
CRK Line	19+84.05	Coombs Street	Storm Drain Through Wall with Oulet Gate Box into Napa Creek	6 inch PVC	Contract 4 / S-131 / S-141

Drainage through Levees, Dikes, Floodwalls

Table 10-11: Location of Drainage through Levees, Dikes and Floodwalls (Table 2 of 2)

Station Line	Station	Location	Description / Location / Drawing Designation	Size / Material	Contract / Sheet Number
CRK Line	24+16.49	West Bank Napa Creek	Storm Drain Through Wall with Oulet Gate Box into Napa Creek	6 inch PVC	Contract 4 / S-162
CRK Line	7+54.70	North Bank DB2 Wall	Storm Drain Through Wall with Oulet Gate Box into Napa Creek	6 inch PVC	Contract 4 / S-102 / S-103
CRK Line	7+77.70	North Bank DB2 Wall	Storm Drain Through Wall with Oulet Gate Box into Napa Creek	6 inch PVC	Contract 4 / S-102 / S-103
CRK Line	7+99.70	North Bank DB2 Wall	Storm Drain Through Wall with Oulet Gate Box into Napa Creek	6 inch PVC	Contract 4 / S-102 / S-103
CRK Line	8+22.70	North Bank DB2 Wall	Storm Drain Through Wall with Oulet Gate Box into Napa Creek	6 inch PVC	Contract 4 / S-102 / S-103
CRK Line	8+44.70	North Bank DB2 Wall	Storm Drain Through Wall with Oulet Gate Box into Napa Creek	6 inch PVC	Contract 4 / S-102 / S-103
CRK Line	8+66.70	North Bank DB2 Wall	Storm Drain Through Wall with Oulet Gate Box into Napa Creek	6 inch PVC	Contract 4 / S-102 / S-103
CRK Line	8+99.70	North Bank DB2 Wall	Storm Drain Through Wall with Oulet Gate Box into Napa Creek	6 inch PVC	Contract 4 / S-102 / S-103
CRK Line	9+05	South Bank DB1 Wall	Storm Drain Through Wall with Oulet Gate Box into Napa Creek	6 inch PVC	Contract 4 / S-102 / S-103
CRK Line	14+80	North Bank DB3 Wall	Storm Drain Through Wall with Oulet Gate Box into Napa Creek	6 inch PVC	Contract 4 / S-153
Upper Bypass Culvert UB Line	0+55	West Bank UB1 Wall	Storm Drain Through Wall with Oulet Gate Box into Napa Creek	6 inch PVC	Contract 4 / S-153
Upper Bypass Culvert UB Line	0+78	West Bank UB1 Wall	Storm Drain Through Wall with Oulet Gate Box into Napa Creek	6 inch PVC	Contract 4 / S-153
Upper Bypass Culvert UB Line	1+02	West Bank UB1 Wall	Storm Drain Through Wall with Oulet Gate Box into Napa Creek	6 inch PVC	Contract 4 / S-153
Upper Bypass Culvert UB Line	5+81.50	South Bank UB2 Wall	Storm Drain Through Wall with Oulet Gate Box into Napa Creek	6 inch PVC	Contract 4 / S-153
Upper Bypass Culvert UB Line	6+07.50	South Bank UB2 Wall	Storm Drain Through Wall with Oulet Gate Box into Napa Creek	6 inch PVC	Contract 4 / S-153
Upper Bypass Culvert UB Line	6+27.50	South Bank UB2 Wall	Storm Drain Through Wall with Oulet Gate Box into Napa Creek	6 inch PVC	Contract 4 / S-153
Upper Bypass Culvert UB Line	6+93.50	South Bank UB2 Wall	Storm Drain Through Wall with Oulet Gate Box into Napa Creek	6 inch PVC	Contract 4 / S-153
Upper Bypass Culvert UB Line	5+81.50	South Bank UB3 Wall	Storm Drain Through Wall with Oulet Gate Box into Napa Creek	6 inch PVC	Contract 4 / S-153
Upper Bypass Culvert UB Line	6+07.50	South Bank UB3 Wall	Storm Drain Through Wall with Oulet Gate Box into Napa Creek	6 inch PVC	Contract 4 / S-153
Upper Bypass Culvert UB Line	6+27.50	South Bank UB3 Wall	Storm Drain Through Wall with Oulet Gate Box into Napa Creek	6 inch PVC	Contract 4 / S-153
Upper Bypass Culvert UB Line	6+50.50	South Bank UB3 Wall	Storm Drain Through Wall with Oulet Gate Box into Napa Creek	6 inch PVC	Contract 4 / S-153
Upper Bypass Culvert UB Line	6+72.50	South Bank UB3 Wall	Storm Drain Through Wall with Oulet Gate Box into Napa Creek	6 inch PVC	Contract 4 / S-153
Upper Bypass Culvert UB Line	6+97.50	South Bank UB3 Wall	Storm Drain Through Wall with Oulet Gate Box into Napa Creek	6 inch PVC	Contract 4 / S-153
Upper Bypass Culvert UB Line	7+23.50	South Bank UB3 Wall	Storm Drain Through Wall with Oulet Gate Box into Napa Creek	6 inch PVC	Contract 4 / S-153

Table 10-12: Summary of Reporting Requirements for the Napa Flood Protection Project

Report	Reporting Frequency	Reference
Status of Project Maintenance	annual	10.5.2.1
Semi-Annual	June 1, December 1	10.5.1
NMFS	annual, by 4/15	10.5.2.2
Inspection, Maintenance & Damage	see reference	10.5.2.3
Vegetation	annual	10.5.3.1
Revegetation	annual	10.5.3.2
Conservation Measure; Maintenance	annual	10.6.2
Comprehensive Vegetation Monitoring	every 5-years	10.9.3.1

Report	Reporting Frequency	Reference
Invasive Plant Control Plan	annual	10.6.3
Herbicide Eradication Program	annual	10.6.3.1
Periodic Inspection	every 5 years	10.8.3
Bridge Inspection	annual or more often if needed	10.10.2, 10.10.13

SECTION 11 – SURVEILLANCE

11.1 INTRODUCTION

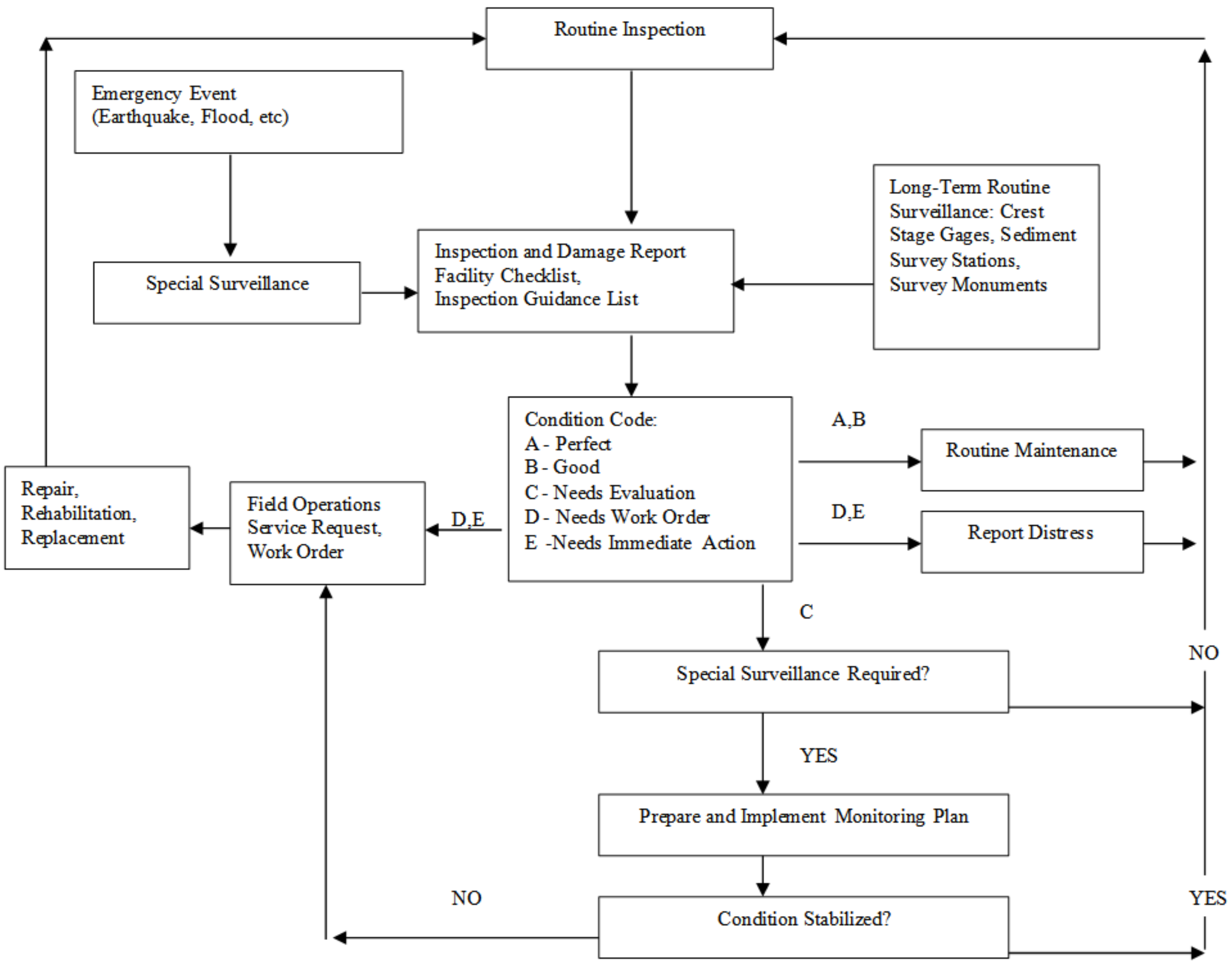
In accordance with ER 1110-2-401, this section discusses the surveillance program for the project. The unique nature of the Napa Project and its associated environmental features require adaptive management and maintenance to achieve project performance. Maintenance of constructed project features ensures that the project operates or performs as intended.

Surveillance includes the use of measurements, observations, and other activities to verify that project benefits are being realized. Results of surveillance activities are evaluated to identify the need for additional maintenance, continued surveillance, or repair, replacement, and rehabilitation activities. The sequences of and relations among the activities involved in surveillance are shown in Figure 11-1.

Surveillance can be classified into three categories:

- Long-term routine surveillance conducted annually.
- Special surveillance specified in Inspection and Damage Reports conducted as needed.
- Special surveillance after emergency events conducted post-flood and post-earthquake.

Figure 11-1: Work Flow Chart



11.2 LONG –TERM ROUTINE SURVEILLANCE

The long-term surveillance program consists of monitoring, measuring, observing, and gathering/documenting various features of the Project as required by subsequent sections.

11.2.1 USACE Levee Safety Program Surveillance

For purposes of the USACE Levee Safety Program, flood damage reduction features, such as levees and floodwalls, are divided into projects, systems, and segments as defined below.

- Project: A project is made up of one or more flood damage reduction systems that were constructed under the same authorization.

- Segment: A segment is defined as a discrete portion of a flood damage reduction system that is operated and maintained by a single entity. A segment can be made up of one or more features, including levee embankments, floodwalls, channels, pump stations, closure structures, etc.

- System: A system is made up of one or more segments that collectively provide flood damage reduction to a defined area. Failure of one segment within a system constitutes failure of the entire system. Failure of one system does not affect another system.

See Sections 10.7.3 and 10.7.4 for constructed project feature inspection requirements.

The Project is currently in the interim condition phase and additional segments will be added to the system as construction is completed and turned over to the Sponsor.

11.2.2 Channel Conveyance Monitoring and Maintenance

The objectives of the monitoring and maintenance program are to: 1) assess channel conveyance performance, 2) monitor bank stability performance, and 3) monitor vegetation establishment and roughness. Hydraulic performance will be assessed through monitoring of physical conditions and the use of a hydraulic model. Bank stability will be assessed using repeated cross section surveys, erosion pins, aerial photographs and vegetative cover. Vegetation establishment and roughness will be assessed through visual inspection.

To carry out the monitoring and maintenance program, various physical features that affect performance in the project reach will be monitored to identify changes. These conditions include hydrology, channel geometry, vegetation, and bank stability. Not all changes are considered detrimental. Considerable reconfiguration of physical features may be allowed as long as they do not adversely affect conveyance, bank stability, structural integrity, or habitat quality. Significant evolution of the physical features is expected following construction.

Hydrology

Table 11-1 shows the computed probability peak flows at river reaches downstream of Trancas Street. Computed probability flows were used in the risk-based analysis of the NED plan's project feature design. Those flows and the associated flood frequency will be used in the hydraulic modeling for channel conveyance monitoring and maintenance. Hydrologic and hydraulic changes will be monitored using gage stations.

Table 11-1: Computed Probability Flows in Napa River & Tributaries

Location	Computed Probability Flows (cfs)							
	50%	20%	10%	2%	1%	0.5%	0.2%	0.1%
Upstream of Milliken Creek (RS 876+00)	10,420	17,640	22,760	33,430	37,470	40,730	44,540	47,160
Downstream of Milliken Creek (RS 876+00)	11,320	18,520	23,810	35,010	39,350	42,850	47,300	50,430
Upstream of Napa Creek (RS 773+00)	11,630	18,810	24,040	35,600	40,100	43,620	48,300	51,810
Downstream of Napa Creek (RS 773+00)	12,940	20,480	25,810	38,010	42,720	46,310	51,260	55,140
Upstream of New Tulocay Creek (RS 724+00)	12,900	20,270	25,850	37,610	42,410	46,110	51,060	54,770
Downstream of New Tulocay Creek to Study Limit (RS 685+00)	13,580	21,170	26,830	39,170	44,370	48,310	53,590	57,550

Stream flow gage stations shall be installed in the Napa River/Napa Creek project area to provide stream-discharge data base for water resources planning and design, hydrologic analysis, and for operation and maintenance of the project features.

Currently there are 3 gage stations located in the vicinity of the project area. The gage station at Oak Knoll Avenge is owned and operated by USGS. Gage stations located at HW 29 and at Lincoln Avenue are operated by the Napa County Resources and Conservation District (RCD). The vertical datum of both stations is based on NGVD 29. The discharge rating curve at HW 29 gage station has been developed by RCD. RCD does not maintain a discharge rating curve for Lincoln Avenue gage station.

A new gage station shall be installed at Imola Avenue, as shown in Figure 11-2. The stage-discharge data collected at those 4 gage stations can be used to verify current conditions and reconcile differences between the model-predicted baseline and actual conditions. This reconciliation should be performed in the first performance assessment report.

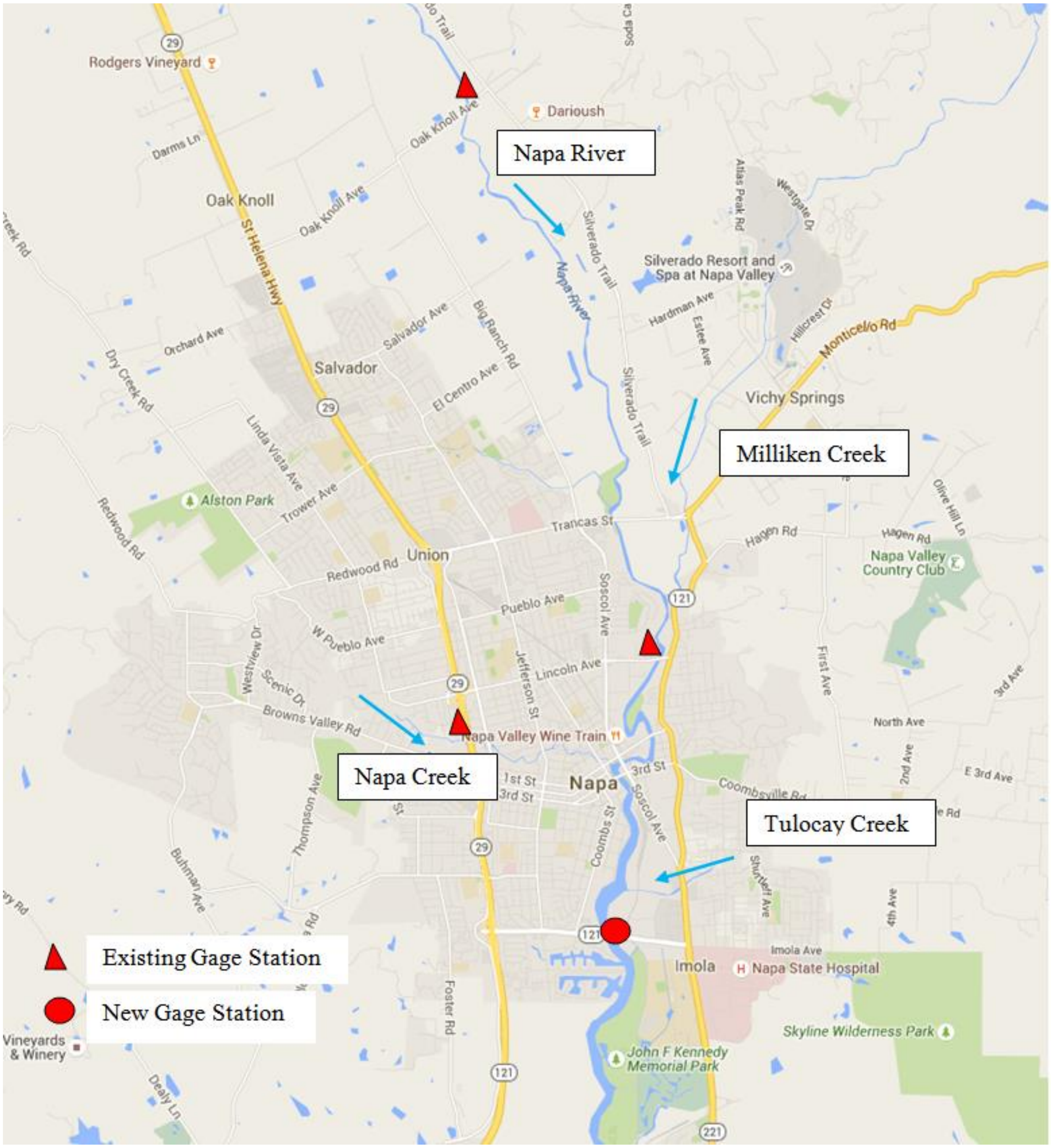


Figure 11-2: Existing and Proposed Gage Stations

Channel Geometry

The Napa River carries large amounts of sediment. Possible erosion and deposition in the project reach are matters of concern. A channel stability study was carried out by Phillip Williams & Associated, Ltd., San Francisco, California, 1997. The results of the study were presented in a report entitled “Sediment Transport Assessment for Napa River Flood Damage Reduction Plan.” The study assesses the sediment transport characteristics of a geomorphically-based channel proposed for flood management of a six-mile tidally influenced reach of Napa River.

Sections of the river that show tendencies for substantial local bed erosion of 3 feet or more for a 100-year flood based on modeling include stations 820+00 (upstream of the Bypass entrance), 800+00 (First Street bridge), 781+00 (Wine Train bridge), 767+00 (between Third Street and the Hatt Building), 699+00 (between Imola Avenue and River Park Marina), and 688+00 (between River Park Marina and Newport North Marina). These locations are shown on Figure 11-3. Note that a small amount of erosion very close to a structure is frequently more critical than a larger amount of erosion that occurs further away from structures. Sections of river bed expected to receive 3 feet or more of deposition for a 100-year flood are downstream of the Bypass entrance and between Soscol Avenue and Third Street at stations 817+00 and 774+00, respectively.

Figure 11-3: Potential Erosion Locations.

Deposition rates on the marshplain and floodplain terraces are conservatively expected to range from 0.02 – 0.09 feet/year (5 to 28 mm/year). In limited areas (i.e., on the marshplain terrace upstream of Third Street at station 774+00 and on the west floodplain terrace across from the Kennedy Park constructed wetland at stations 638+00 and 650+00), deposition rates are expected to reach 50 mm/year.

Sediment survey stations are fixed cross-section locations in the channel used to evaluate the changes in the cross-sectional areas due to sediment deposition and erosion in the river channel. These survey stations listed in Table 11-2 are selected based on the 1997 sediment study report by Phillip Williams & Associated.

Table 11-2: Cross Section Monitoring Locations

Cross Section	River Station	Location Description
1	638+00	Approximately 300 feet downstream of Newport North Marina north of the boat ramp@ Kennedy Park
2	650+00	At Kennedy Park ponded tidal wetland
3	685+00	Downstream-most HEC-RAS Model Cross Section
4	688+00	Between River Park Marina and Newport North Marina
5	699+00	Just downstream of Imola Avenue
6	767+00	Between Hatt Building and 3rd Street Bridge
7	774+00	Peninsula between Dry Bypass and Napa Creek across to the intersection of Soscol Avenue and 3rd Street
8	781+00	Upstream of Napa Valley Wine Train Bridge
9	800+00	Upstream of 1st Street Bridge
10	817+00	Southwest tip of Peninsula Building at Napa River
11	822+00	Swimming pool at Westin Hotel Napa 1314 McKinstry Street)

The reach downstream of Third Street is part of the Napa River Navigation Project and a hydro-survey has been performed by USACE San Francisco District since 2003. Survey data is available at the following website or by contacting USACE San Francisco District:

http://www.spn.usace.army.mil/Missions/Surveys,StudiesStrategy/HydroSurvey/NapaRiver.aspx

Figure 11-4 shows 1 of 25 hydro-survey data sheets performed in 2014. Permanent survey monuments are therefore not required for River Stations downstream of 3rd Street Bridge at 638+00, 650+00, 688+00, 699+00 and 767+00. Figure 11-5 depicts permanent cross section monitoring locations upstream of 3rd Street Bridge.

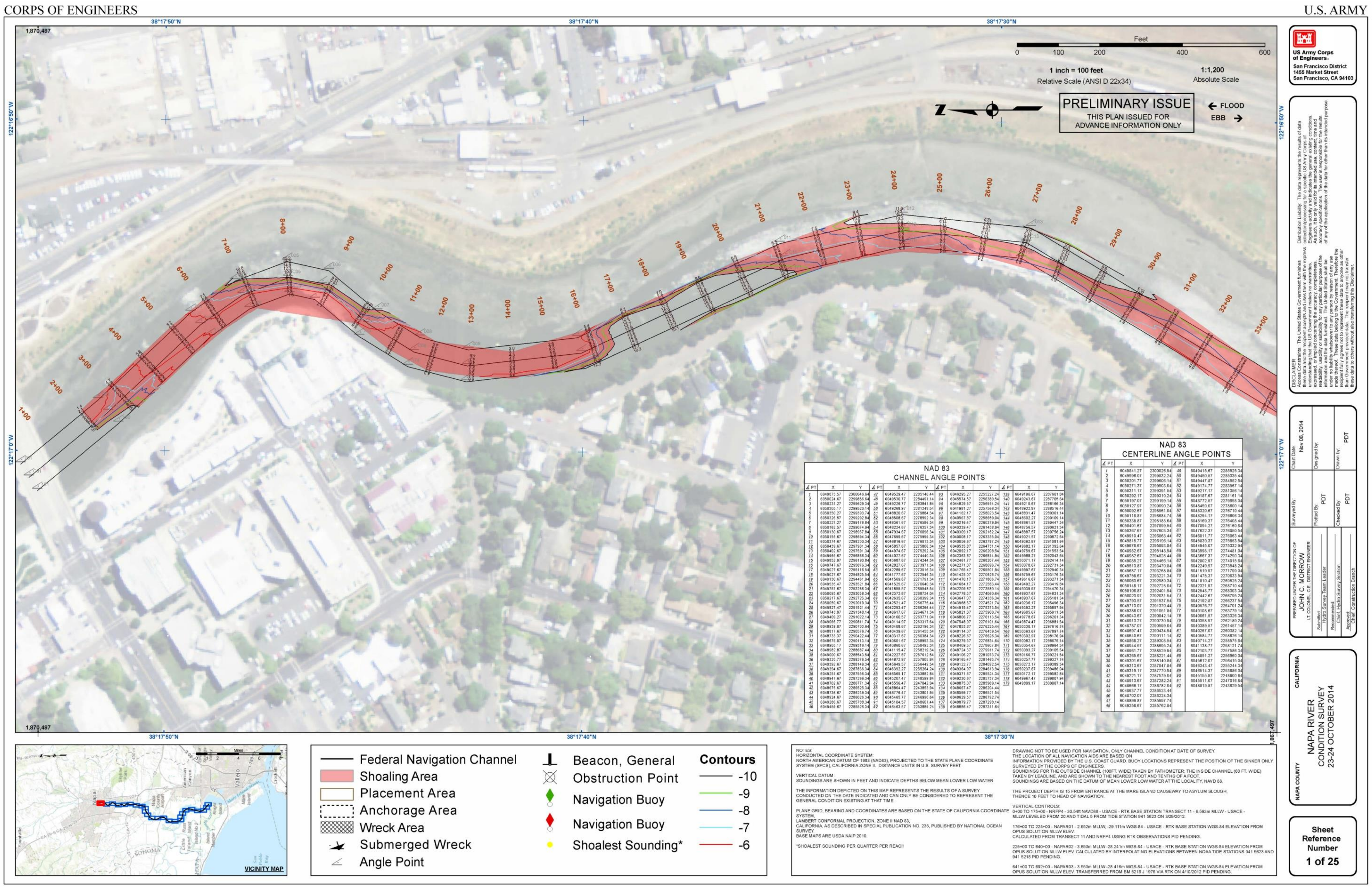


Figure 11-4: Sample location of USACE Hydro Survey. 1 of 25 Hydro-survey of Napa River, 2014

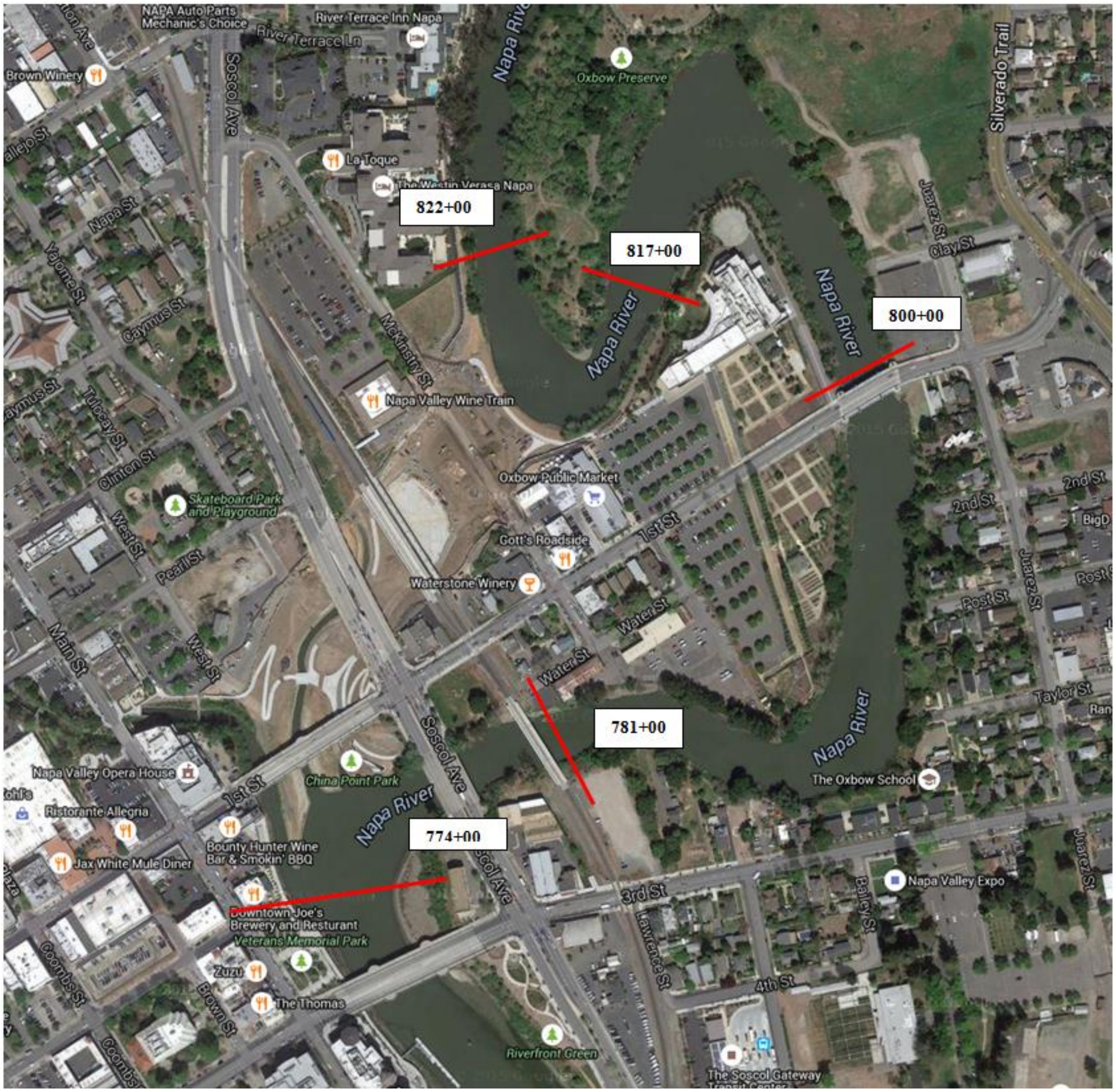


Figure 11-5: Permanent Survey Monitoring Cross Sections

Vegetation and Debris

While the establishment of vegetation is important to the Project for both mitigation and erosion control, there are some restrictions to vegetation establishment to protect flow conveyance. After establishment, vegetation must be maintained to achieve project objectives. However, vegetation cannot become excessive enough to interfere substantially with water or sediment movement. Vegetation growth could hinder conveyance of flood flows if not controlled. Maintenance requirements such as mowing of terraces or clearing of excess woody debris are needed to maintain the flood conveyance and realize the FRM benefits of the project.

Within the HEC-RAS 1D2D model domain, photographic monitoring of vegetation, such as setting up and maintaining fixed photo points, is needed. The primary purpose of this photographic monitoring is to visually track changes to vegetation growth to help inform establishing Manning's n values for performance based maintenance and monitoring (see Section 11.2.4). A photographic monitoring plan will be developed by FCD to track changes to vegetation to inform estimating Manning's n values for the HEC-RAS 1D2D model. For estimating purposes the photography can be used to inform staff to check the hydrology to calculate the Manning's "n" value. These locations are expected to include the Dry Bypass, Napa Creek, and the Marsh and Floodplain Terraces and other key areas for estimating Manning's roughness in the HEC-RAS 1D2D model.

Bank Stability and Erosion

Certain areas of the existing bank and the transition slopes between the terraces wil1 be subject to erosive forces from either waves or high flow velocities. Where this erosion does not threaten floodwalls, levees, or bridge structures, it can be allowed to occur naturally. The project will be monitored for erosion and bank stability issues. Sites experiencing erosion and bank stability will be tracked and monitored to determine if and when they need to be repaired. These sites and monitoring results will be reported in the annual report to USACE. Immediate remedial actions will need to be implemented if erosion and bank stability threaten to reduce the flood risk damage protection of the project, such as undermining project features. Some areas of concern for erosion and bank stability include, but are not limited to, the Dry Bypass, just upstream of the Dry Bypass, Napa Creek, and training levees that are designed to overtop.

The reach upstream of the Bypass is of particular concern for erosion, because hydraulic analysis suggests that this will be a reach of high velocities after construction of dry bypass. The analysis also shows that this reach is subject to high, apparently erosive velocities under existing conditions. This reach has well-established riparian vegetation along the banks that helps to stabilize them. The approach adopted for erosion control in this reach is to rely on the established riparian vegetation to stabilize the banks, and to augment this with plantings where existing vegetation is sparse. FCD shall monitor this reach to ensure that plantings are providing needed bank stabilization. Emergency actions (e.g., rock protection) will need to be implemented immediately if significant erosion (defined below) is detected.

Other Monitoring Activities

(1) FCD is responsible for monitoring and maintaining the flow split between the dry bypass and the oxbow and taking corrective action as necessary.

(2) FCD is responsible for maintaining operation of the features for future relative sea level rise as needed.

11.2.3 Hydraulic Maintenance and Monitoring Considerations

Section 11.2.3 is inactive during the interim status until the project is complete. As the project reaches completion, Section 11.2.3 should below should be activated.

Factors which affect the river channel water surface profiles include vegetative growth which increases channel roughness and sediment deposit which decreases the flow conveyance area. In order to determine the impact of vegetation and channel geometry on the water surface profiles, FCD shall periodically re-survey representative cross sections and update bathymetric maps, re-evaluate Manning's n values and develop a modified HEC-RAS 1D2D model. Future maintenance activities shall be based on results from the updated 1D2D model.

(1) *The representative cross sections listed in Table 11-2 shall be surveyed at least once every 5 years and after major flood events. High-water mark elevations at the sediment survey locations, gage stations and other critical locations, such as at the inlets of Napa Creek lower bypass and upper bypass will be documented in the annual reported provided to USACE. The model shall be calibrated using actual observed river and creek stages with discharges from gage data.*

(2) *If the change in average channel bed elevation at a monitoring station is greater than +/-2 ft, the cross sectional channel survey will need to extend to cross sections upstream and downstream of the permanent cross sections. The cross-section that will need to be added will vary and depends on the extent of the change. At a minimum, cross-section will need to be added to this monitoring effort to fully measure the upstream and downstream extent of the change. These cross-sections will be used to update the bathymetric maps in the HEC-RAS 1D2D model as part of Performance Based Maintenance and Monitoring Report in Section 11.2.4.*

(3) *The baseline with-project HEC-RAS 1D2D model shall be revised and rerun to determine if there is a change in water surface for the 1/100 (1%) ACE event. In the event that significant maintenance is required, the program will fall under the permit activities between the Flood Control agency and the resource agencies. If encroachment is noted and maintenance is found to be necessary on a significant scale, a team involving county and resource agencies would determine how best to lower the WSE through sediment removal, vegetation management, or a combination of both. If the 50% threshold is exceeded, maintenance of the channel shall be initiated as soon as possible for the specific reach in question as noted in 11.2.3 (2) which may encompass upstream and downstream cross sections. If maintenance is found to be necessary on a significant scale, a team involving county and resource agencies would determine how best to lower the WSE through sediment removal, vegetation management, or a combination of both. The revised HEC-RAS 1D2D model shall include current bathymetric maps and newly estimated Manning's n values. The HEC-RAS 1D2D models will be provided to USACE when providing the annual report to USACE.*

11.2.4 Performance Based Maintenance and Monitoring Report

Section 11.2.4 is inactive during the interim status until the project is complete. As the project reaches completion, Section 11.2.4 should below should be activated.

It is possible that hydraulic analysis would show that maintenance would only be required in certain reaches of the floodway and not necessarily throughout the floodway. This maintenance plan could be a mixture of vegetation removal or deposition removal that would result in computed water surface elevation less than or equal to design water surface elevations once the maintenance measures were completed. The plan needs to address the conditions that are creating the greatest increase in water surface elevation. Upon the completion of the performance based maintenance plan, the FCD shall submit the plan to USACE SPN and required agencies for final acceptance before implementation. The HEC-RAS 1D2D models showing the results of implementing the maintenance actions shall be provided to USACE along with the HEC-RAS 1D2D model without the maintenance actions when the maintenance plan is submitted to USACE.

SECTION 12 – REPAIR, REPLACEMENT AND REHABILITATION (RR&R)

Repair is considered to entail those activities of a routine nature that maintain the project in a well kept condition. Replacement covers those activities taken when a worn-out element or portion thereof is replaced. Rehabilitation refers to a set of activities, as necessary, to bring a deteriorated project back to original condition. RR&R actions are to conform to the project as-built plans and specifications and all applicable conditions in this manual, unless other arrangements are made with the USACE (SPN) District Engineer. These activities are the responsibility of the project sponsor. Any evidence of distress, as listed in Paragraph 6 of ER 1110-2-401, needs to be reported to USACE.

When performing RR&R actions, the FCD must follow all local, State, and Federal laws. Specifically they must comply with project environmental documentation as discussed in Section 10.3.

SECTION 13 – NOTIFICATION OF DISTRESS

13.1 INTRODUCTION

This section prescribes the responsibilities and procedures for the immediate notification to USACE of evidence of distress or potential failure of any project element in accordance with ER 1110-2-101, Reporting of Evidence of Distress of Civil Works Structures.

13.2 RESPONSIBILITIES

If evidence of distress is found, the FCD must report it immediately to USACE San Francisco District in accordance with ER 1110-2-101.

13.3 PROCEDURES

Procedures for reporting evidence of distress are outlined in ER 1110-2-101. Typical distress signals include the following:

- Sloughs, settlement, or slides in structures such as dikes, levees, and channels.
- Evidence of piping, muddy water, or sand boils in the landside of any dike or levee. Any increase in seepage quantities through or under any dike or levee.
- Unusual vertical or horizontal movement or cracking of dikes and levees.
- Significant cracking, spalling, or other damage to the concrete drainage structures through the levees and dikes.
- Sinkholes or localized subsidence in the foundation of or adjacent to dikes or levees.
- Significant damage to any structure.
- Significant damage to or changes in structures, foundations, groundwater conditions, and adjacent terrain as a result of seismic events. Special inspections for damage need to be made immediately following the events as described in ER 1110-2-1802.
- Any other indications of distress or potential failure that could inhibit the operation of the projects or endanger life and property.
- Abnormal increase or decrease of flow from foundation drains, or from structural joints in concrete floodwalls.
- Any increase in seepage quantities through or under levee embankments or abutments.
- Any significant change in pore-water pressure in either levees embankments or their foundations.
- Any significant change in uplift pressures under concrete structures.
- Significant cracking of mass concrete structures, either during construction or after completion.
- Excessive deflection, displacement, or vibration of concrete structures (e.g. tilting or sliding of floodwalls).
- Significant damage to any structure, closure, pump station, gate well, etc.
- Frequent power interruptions to major pump stations.
- Erratic movement, binding, excessive deflection, or vibration of gates and control valves observed during operations.
- Any other indications of distress or potential failure that could inhibit the operation of a project or endanger life and property.

The extent and significance of distress signals should be reviewed by a licensed engineer before reporting requirements are finalized.

SECTION 14 – REFERENCES

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PLATES SECTION

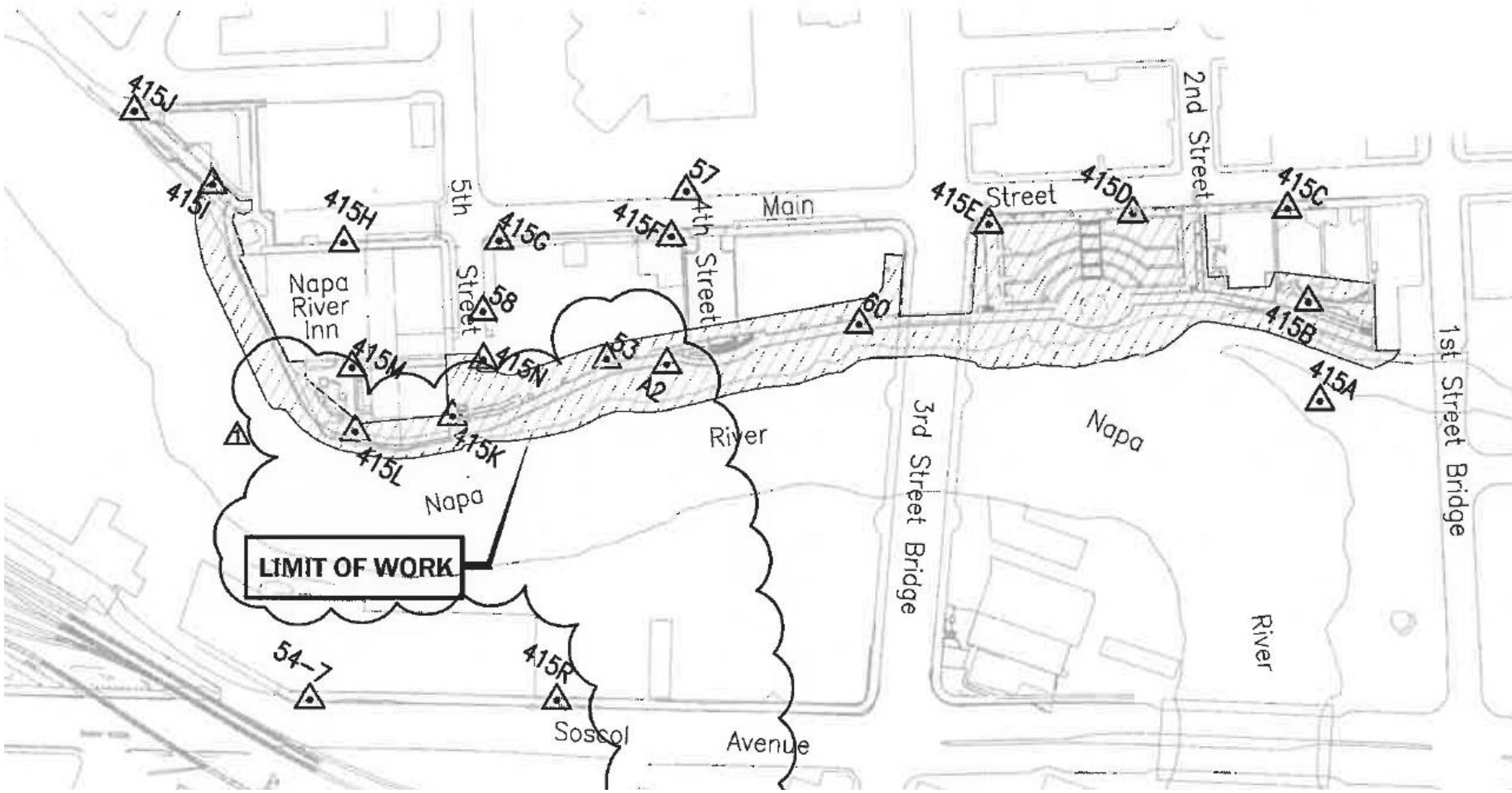

Plate 1.1 Site 2W – Hatt to 1st Project Limits

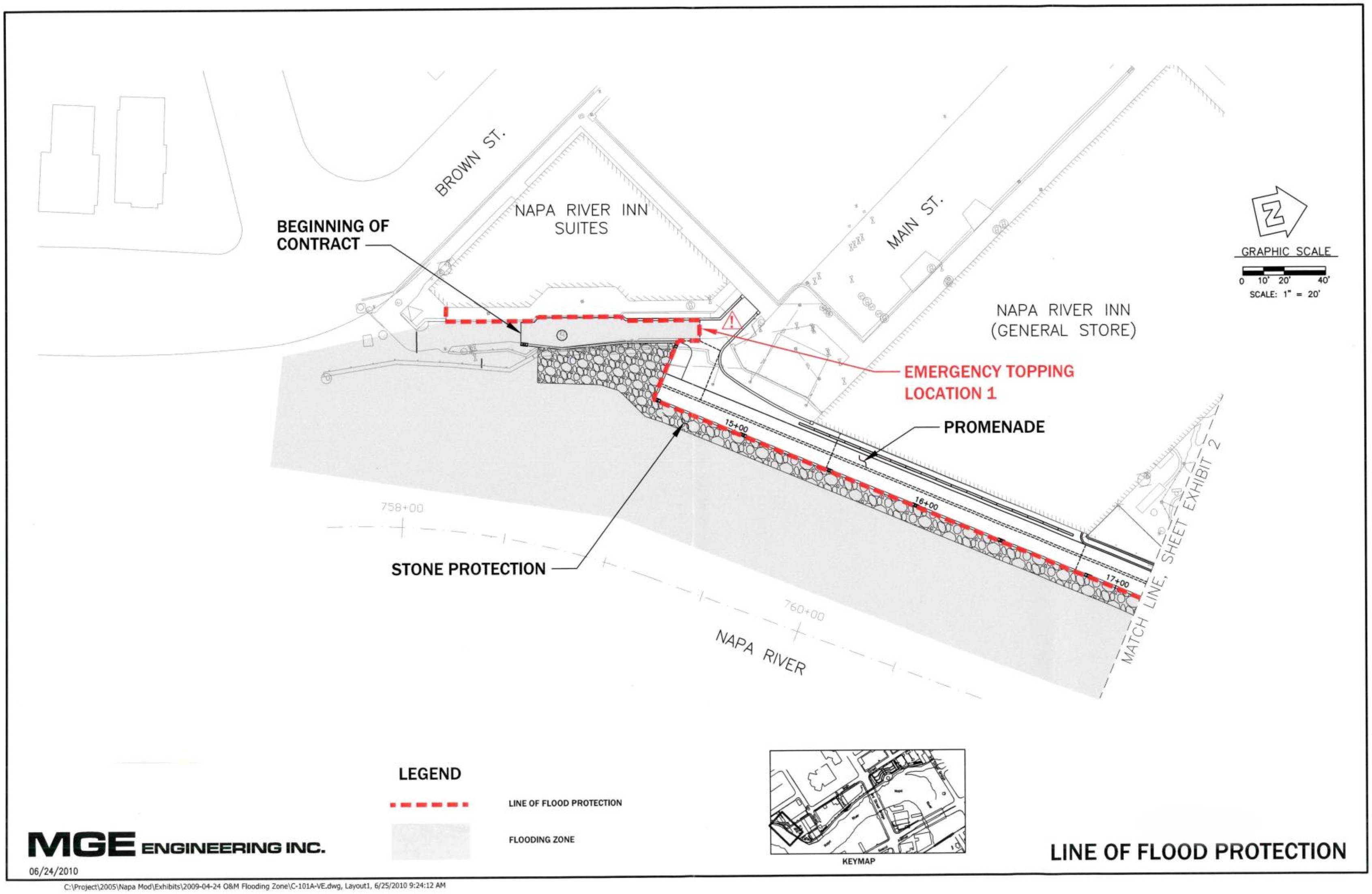

Plate 1.2 - Line of Flood Protection, Napa River Stations 758+00 to 760

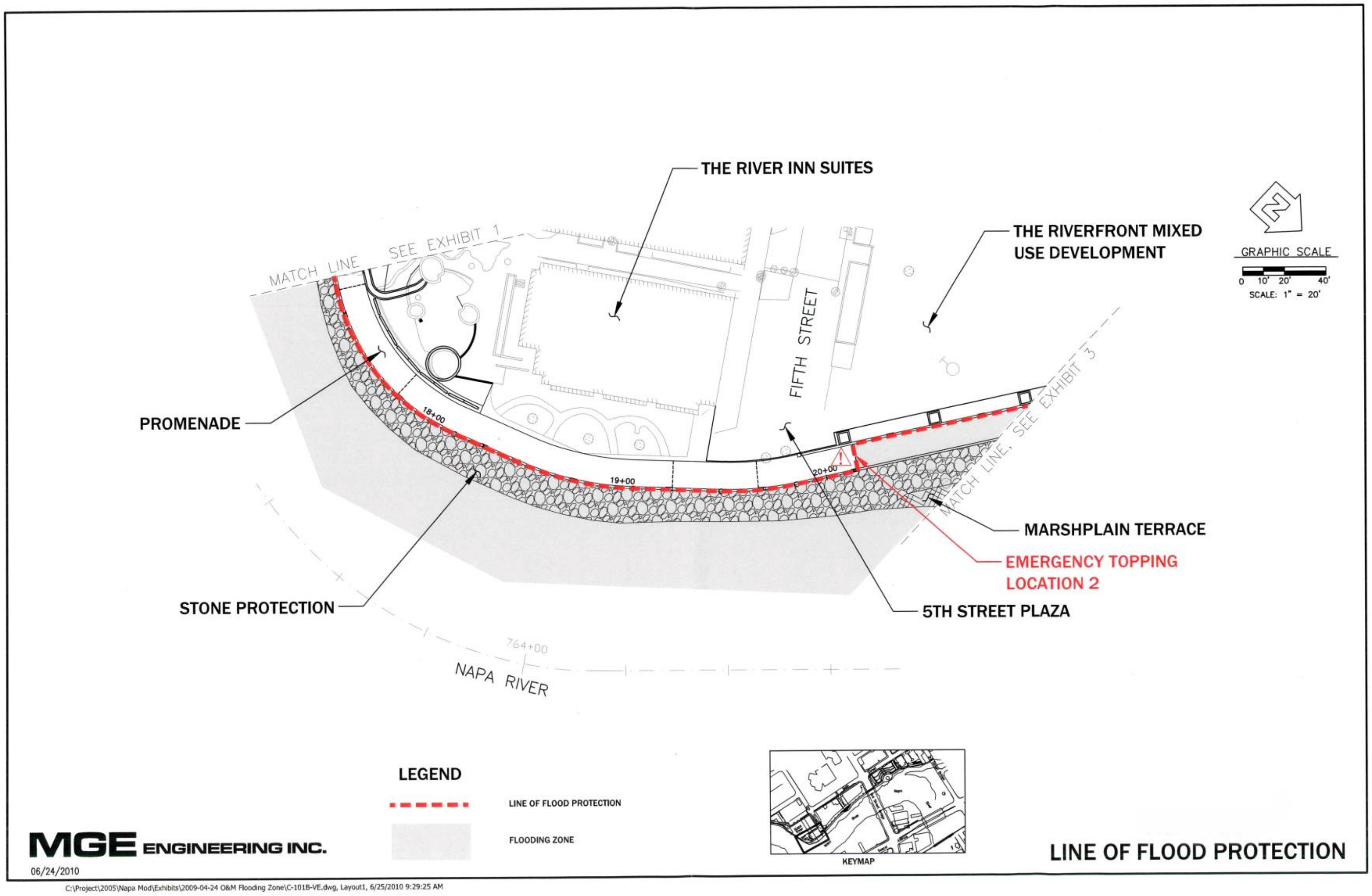

Plate 1.3 - Line of Flood Protection, Napa River Stations 760+50 to 765+00

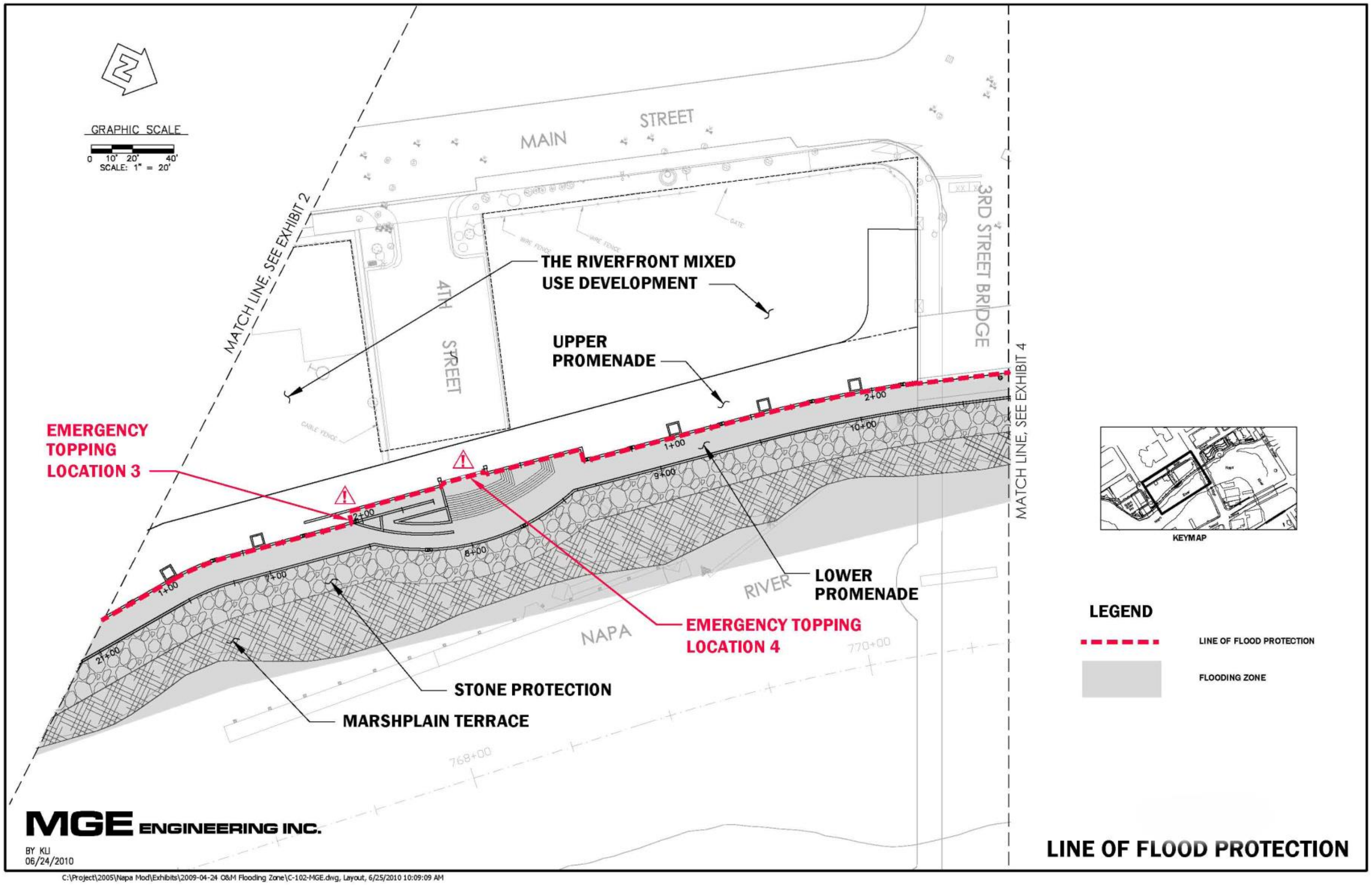

Plate 1.4 - Line of Flood Protection, Napa River Stations 765+00 to 770+50

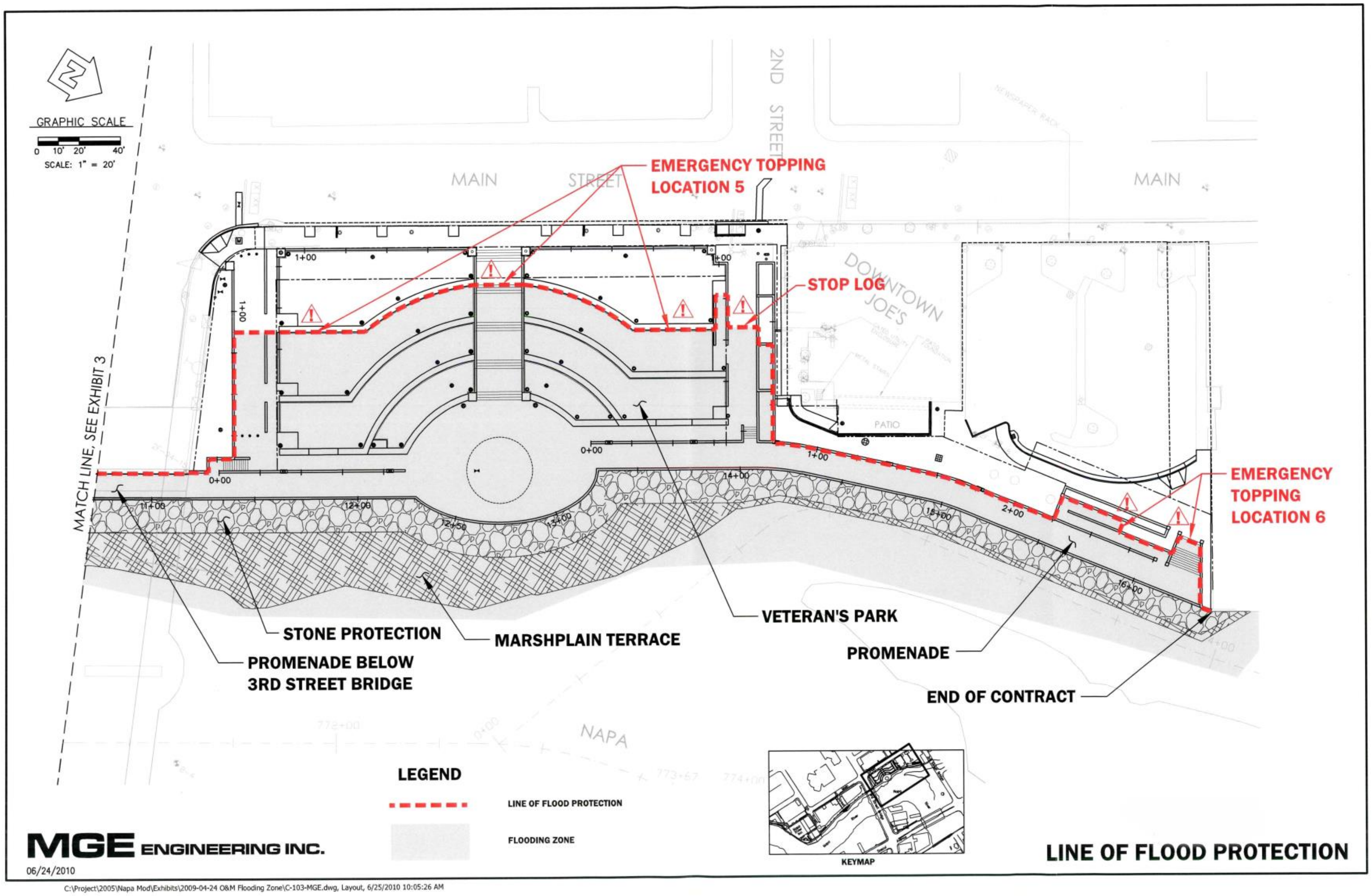

Plate 1.5 - Line of Flood Protection, Napa River Stations 770+50 to 775+00

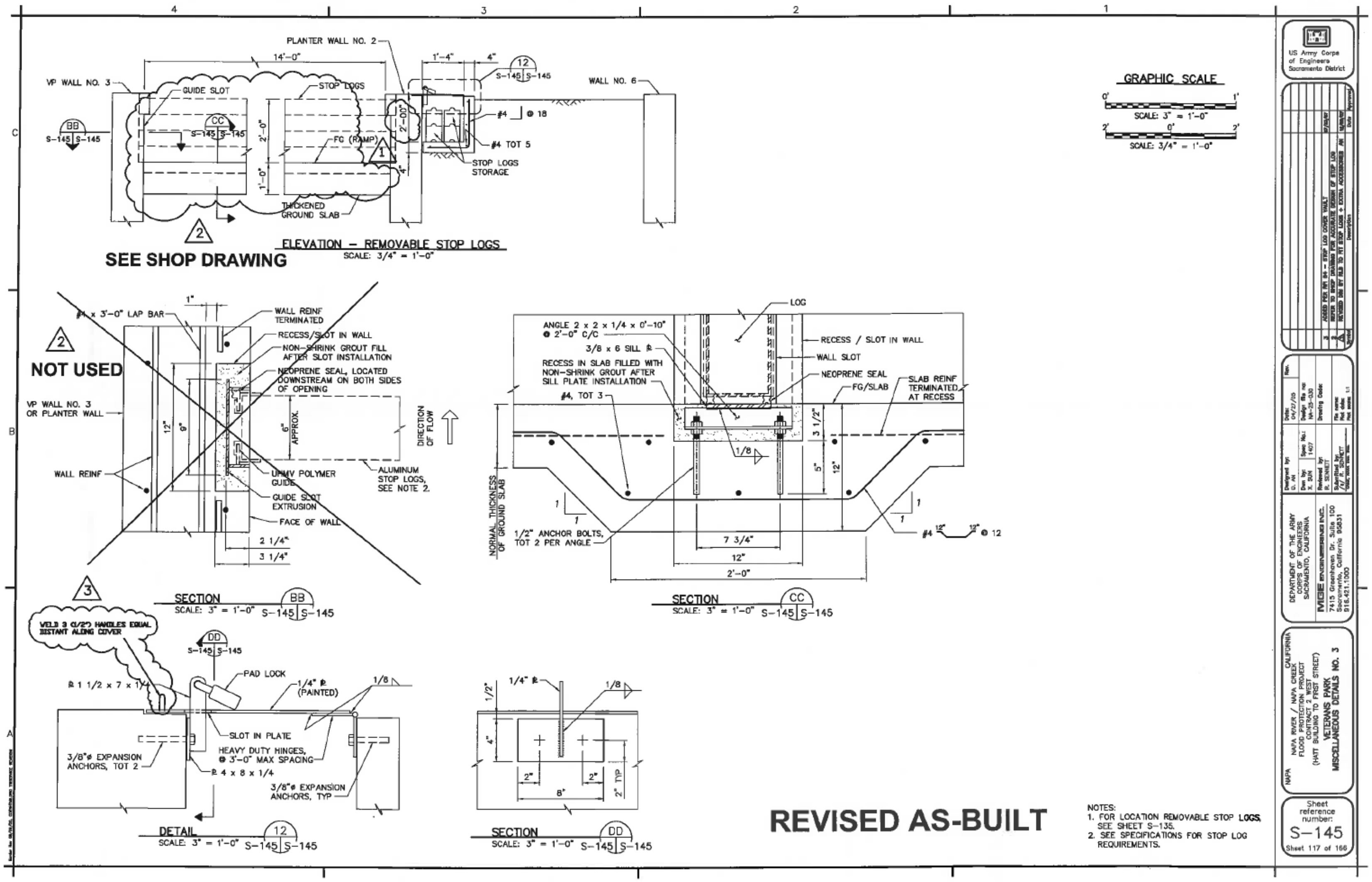

Plate 1.6 – Stop Log As-built drawing

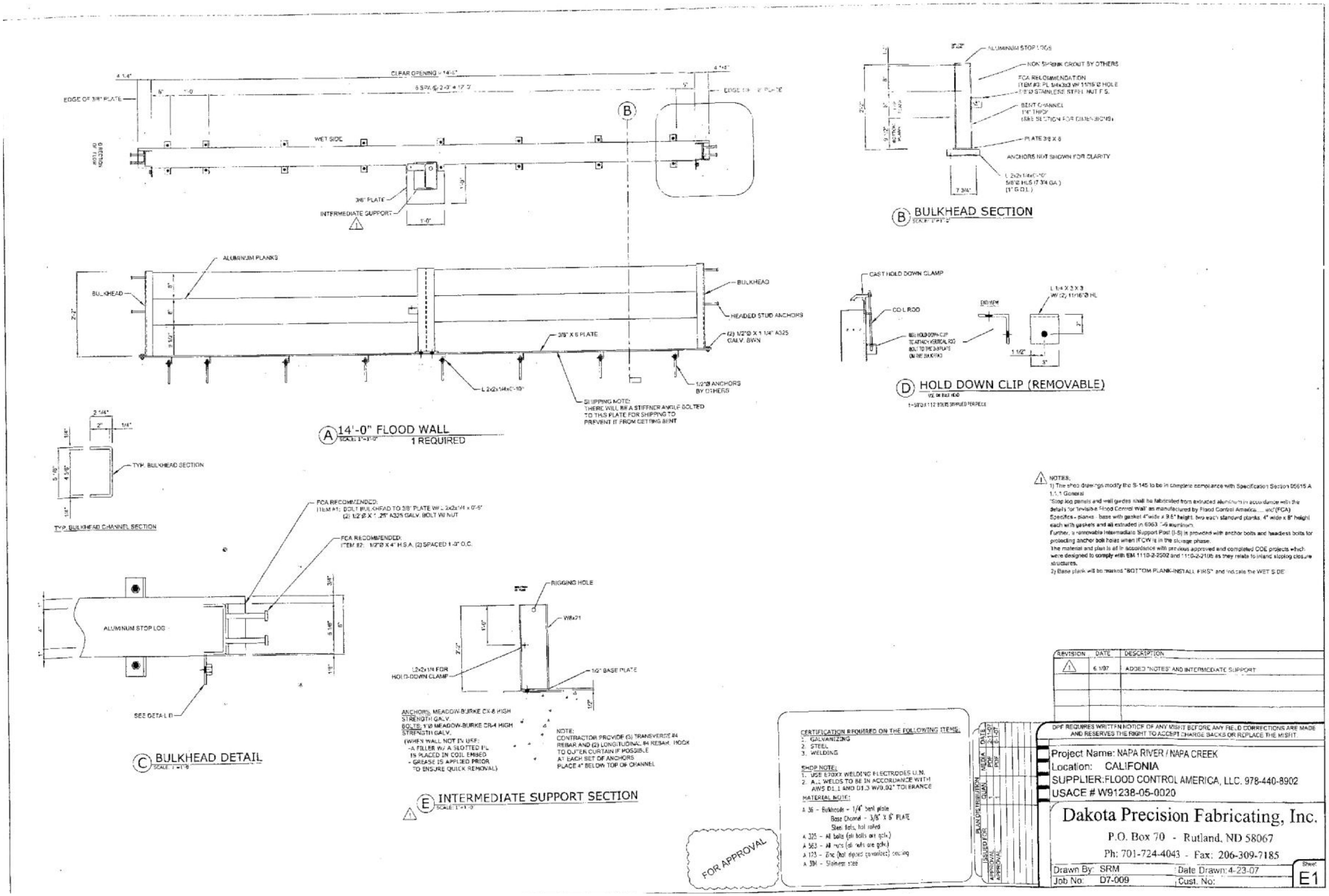

Plate 1.7 - Stop Log Fabrication Drawing

Appendix A: As-Built Information

(see DVD – inside back cover)

A-1 Contract 1A – As Built Plans
A-2 Contract 1A – Specifications
A-3 Contract 1A Revegetation – As Built Plans
A-4 Contract 1A Revegetation – Specifications
A-5 Contract 1B – Construction Contract Final Plans
A-6 Contract 1B – Specifications
A-7 Contract 1B Revegetation – Final Plans
A-8 Contract 1B Revegetation – Specifications
A-9 Contract 2E – Duden Construction Plans
A-10 Contract 2E – Duden Specifications
A-11 Contract 2E – NSD Construction Plans
A-12 Contract 2E – NSD Specifications
A-13 Contract 2E – 6^{th} to 3^{rd} Construction Plans
A-14 Contract 2E – 6^{th} to 3^{rd} Specifications
A-15 Contract 2W – Floodwall As Built Plans
A-16 Contract 2W – Floodwall Specifications
A-17 Contract 2 – Revegetation Construction Plans
A-18 Contract 2 – Revegetation Irrigation As Built Plans
A-19 Contract 2 – Revegetation Specifications
A-20 Contract 3 – Dry Bypass Construction Drawings (Placeholder for As builts)
A-21 Contract 3 – Dry Bypass Specifications (Placeholder for completed project Specs)
A-22 Contract 3 – NVWT As Built Plans
A-23 Contract 3 – NVWT Specifications
A-24 Contract 4 – Napa Creek As Built Plans
A-25 Contract 4 – Napa Creek Specifications
A-26 Contract 2E – Levee Repair As Built Plans
A-27 Contract 2E – Levee Repair Specifications

Appendix B: Project Cooperation Agreement

B-1 Project Cooperation Agreement (PCA)

Appendix C: USACE Transfer Letter

C-1 1A, 1B, 2W, 2E, and NVWT Transfer letter
C-2 2E Wells Transfer letter

Appendix D: Inspection Forms & Checklists

D-0 FCD Inspection Checklist
D-1 Flood Damage Reduction Segment/System Inspection Report
D-2 Appendix D-2 Structure Inventory & Appraisal (SI&A) Bridge Inspection Form
D-3 Dike Inspection Report
D-4 Levee Inspection Report
D-5 Floodwall Inspection Checklist
D-6 Channel/Floodway Inspection Checklist
D-7 Drainage Structure Inspection Checklist (for Pipes)
D-8 Dredge Disposal Inspection Report
D-9 Deficiency Table

Appendix E: Environmental

(see DVD – inside back cover)

E-1 Napa River Flood Protection Project Mitigation and Monitoring Plan (2001)
E-2 National Marine Fisheries Service Biological Opinion (12/14/98)
E-3 U.S. Fish & Wildlife Service (USFWS) Endangered Species Act (ESA) approvals

a) 1999 April 9 Biological Opinion (BO)
b) 2000 June 9 BO reinitiation modifying project for south Wine Track work
c) 2000 June 22 BO reinitiation modifying in-water work window
d) 2007 May 17 BO reinitiation modifying project for 2W floodwall work
e) 2009 November 24 BO reinitiation to account for delta smelt impacts
f) 2012 May 21 BO reinitiation to account for saltmarsh harvest mouse impacts of operation and maintenance of project segments 1A and 1B.

E-4 California Regional Water Quality Control Board (RWQCB) Orders

a) No. 99-074 (for entire project; 9/15/99)
b) No. R2 01-066 (for 2E monitoring wells; 6/01)

E-5 California (CA) Department of Fish & Wild Life(CDFW)

a) 1602 Streambed Alteration Agreement (10/20/09)
b) CA ESA Incidental Take Permit (10/06/14)

E-6 Napa Sites 1A and 1B Revegetation Fire and Logistics Plan Guide California Department of Fish and Wildlife MOU June 2002
E-8 Napa River Mitigation and Monitoring Plan
E-9 Invasive Plant Inventory
E-10 Napa River-Napa Creek FRP FSEIS-EIR March 1999

Appendix F: Flood Fighting Information

(see DVD – inside back cover)

F-1 State of California (2012) Flood Fighting Methods
F-2 Living With Levees: Know Your Flood Risk!
F-3 Emergency Material Supply List

Appendix G: Survey Documents

G-1 Datum Documentation Report - NGVD 29 conversion to NAVD 88
G-2 SPK installed Transect Survey Data
G-3 Contractor Installed Transect Survey Data & Cross Sections

Appendix H: Project Authorization References

H-1 33 CFR 208
H-2 Record of Decision
H-3 Programmatic Agreement
H-4 Pub. Law 89-298
H-5 Water Resources Reform and Development Act of 2014

Appendix I: Design References (Included on attached DVD)

I-1 Napa Creek Basis of Design
I-2 Napa Creek Lower Bypass Physical Model Report
I-3 Dry Bypass White Paper
I-4 Napa Dry Bypass Technical Memorandum 013
I-5 ATR Memorandum on Computed Probability of Flows
I-6 Contract 2E Geotechnical Design Report
I-7 Contract 2W Geotechnical Design Report
I-8 Contract 2W Civil/Structural Design Report
I-9 Contract 2W Structural Calculations
I-10 Napa Creek Geotechnical Design Report
I-11 Napa Creek Civil/Structural Design Report
I-12 Draft Dry Bypass Geotechnical Design Report
I-13 Dry Bypass Civil/Structural Design Report
I-14 Contract 2W Hydraulic Design

Appendix J: Irrigation System Info

J-1 HPTRM Manufacturers Literature
J-2 NVWT Sump Pumps and Flood Gates Attachments
J-3 PP5 HPTRM Product Performance
J-4 PP5 HPTRM Product Specs

Napa Creek

NAPA CREEK BOX CULVERT AND TERRACE PROJECT **Summary of Landscape Water Meters**				
Meter No.	T=Temporary P=Permanent S=Sub-meter	Location	Service Area	Comment
1	1” – T	Main St., east side, north of bridge, from (N) 12” Main St. main.	Left bank between 1st St. Bridge and Main St. Bridge	City may wish to consider this as a permanent meter for area between decorative fence and sidewalk following Oxbow bypass construction.
2	2” – S	South side of Pearl St., east of Bridge.	Upper and Lower Channel Smoothing areas	Existing 2” Landscape meter to be provided with 2” Sub-meter for Revegetation.
3	1” – T	North Side of Pearl St, in Heritage Park from Pearl St. Main	Right bank across from inlet between Pearl St. Bridge and (E) Saccrete bank protection.	
4	¾” – S	West side of Main Street Parking Lot, north of Ped Bridge, served from (E) Main Street Parking meter	Left bank between DS face of Pearl St Bridge and US face of Pedestrian Bridge.	Service point near back of sidewalk between driveways. POC at base of (E) concrete wall near top of bank.
5	2” – T	East side of Coombs Street, north of Pedestrian Bridge, top of right bank	Right bank (E) saccrete to approx Creek Station 21+50	Route behind Coombs Street Retaining Wall within Flood Protection Levee Easement (FPLE)
6	2” – P	Clinton-Brown Parking Lot, north side service from Brown St. Main.	Permanent: Brown Street Parking Lot Temporary: Left Bank from DB Inlet to approx. Sta.19+75	Future Uses: Clinton/Main Street Parking Lot, 9/11 Monument

NAPA CREEK BOX CULVERT AND TERRACE PROJECT Summary of Landscape Water Meters				
7	2” – T	Arroyo St, south side, behind back of walk, from Arroyo St. Main	Left bank from approx Sta 19+75 to DF face of Seminary St Bridge.	
8	2” - T	Seminary St. at UB outlet, from Seminary St. main near Center	Right bank, UB outlet to approx. 21+50	Routed behind “UB1 wall. Meter and In-ground double check at back of new sidewalk near UB outlet at Seminary St.
9	1” – T	Sub-meter from (E) irrigation supply at north side of Senior Center, routed behind building, along top of bank to Ped Bridge	Left bank between 37+50 and Pedestrian Bridge, and right bank, low bank Revegetation between UB Inlet and 39+40	Left bank POC at top of bank, downstream of Ped Bridge. Right bank POC fed from 1” line temporarily hung on Ped bridge

Dry Bypass

DRY BYPASS - Landscape Water Meter Location				
Meter No.	T=Temporary P=Permanent S=Sub-meter	Location	Service Area	Comment
1	4 inches – P	North side of McKinstry Street at approximate station 7+20 across from the Wine Train Depot	Complete Project area.	The 4-inch irrigation water service crosses McKinstry Street in an 8 inch Schedule 80 PVC sleeve.

Appendix B

Air Quality and Greenhouse Gas Estimates

Napa SMP

Napa County, Winter

1.0 Project Characteristics

1.1 Land Usage

Land Uses	Size	Metric	Lot Acreage	Floor Surface Area	Population
User Defined Recreational	0.00	User Defined Unit	0.00	0.00	0

1.2 Other Project Characteristics

Urbanization	Urban	**Wind Speed (m/s)**	3.6	**Precipitation Freq (Days)**	64
Climate Zone	4			**Operational Year**	2030
Utility Company	Pacific Gas & Electric Company				
CO2 Intensity (lb/MWhr)	641.35	**CH4 Intensity (lb/MWhr)**	0.029	**N2O Intensity (lb/MWhr)**	0.006

1.3 User Entered Comments & Non-Default Data

Project Characteristics -

Land Use -

Construction Phase - Based on pers comms

Off-road Equipment - Assumed 1,000 hp chipper

Off-road Equipment - Reflects info from pers comms

Off-road Equipment - Emissions from this phase are accounted for under Trips and VMT

Off-road Equipment - Reflects info from pers comms

Trips and VMT - Reflects info in pers comms

Grading - Reflects pers comms

Vehicle Emission Factors -

Vehicle Emission Factors -

Vehicle Emission Factors -

Fleet Mix -

Table Name	Column Name	Default Value	New Value
tblConstructionPhase	NumDays	0.00	93.00
tblConstructionPhase	NumDays	0.00	20.00
tblConstructionPhase	NumDays	0.00	50.00
tblConstructionPhase	NumDays	0.00	10.00
tblConstructionPhase	PhaseEndDate	3/30/2029	10/23/2029
tblConstructionPhase	PhaseEndDate	3/30/2029	7/12/2029
tblConstructionPhase	PhaseEndDate	3/30/2029	9/20/2029
tblConstructionPhase	PhaseEndDate	3/30/2029	10/4/2029
tblConstructionPhase	PhaseStartDate	4/1/2029	6/15/2029
tblConstructionPhase	PhaseStartDate	3/31/2029	6/15/2029
tblConstructionPhase	PhaseStartDate	3/31/2029	7/13/2029
tblConstructionPhase	PhaseStartDate	3/31/2029	9/21/2029

Napa SMP - Napa County, Winter

tblOffRoadEquipment	HorsePower	172.00	1,000.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	0.00	1.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	0.00	1.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	0.00	1.00
tblOffRoadEquipment	PhaseName		Excavator Backhoe Dumptruck
tblOffRoadEquipment	PhaseName		Excavator Backhoe Dumptruck
tblOffRoadEquipment	PhaseName		Chipper
tblOffRoadEquipment	UsageHours	8.00	6.00
tblOffRoadEquipment	UsageHours	8.00	2.60
tblTripsAndVMT	HaulingTripLength	20.00	24.00
tblTripsAndVMT	HaulingTripLength	20.00	24.00
tblTripsAndVMT	HaulingTripLength	20.00	24.00
tblTripsAndVMT	HaulingTripLength	20.00	24.00
tblTripsAndVMT	HaulingTripNumber	0.00	20.00
tblTripsAndVMT	VendorTripLength	7.30	34.00
tblTripsAndVMT	VendorTripLength	7.30	34.00
tblTripsAndVMT	VendorTripLength	7.30	34.00
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tblTripsAndVMT	VendorTripNumber	0.00	3.00
tblTripsAndVMT	WorkerTripLength	10.80	12.00

tblTripsAndVMT	WorkerTripLength	10.80	12.00
tblTripsAndVMT	WorkerTripLength	10.80	12.00
tblTripsAndVMT	WorkerTripLength	10.80	12.00
tblTripsAndVMT	WorkerTripNumber	0.00	3.00

2.0 Emissions Summary

2.1 Overall Construction (Maximum Daily Emission)

Unmitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	lb/day										lb/day					
2029	0.8596	8.4994	6.5885	0.0180	6.2103	0.3517	6.5620	3.3624	0.3237	3.6861	0.0000	1,779.1903	1,779.1903	0.4441	0.0000	1,790.2925
Maximum	**0.8596**	**8.4994**	**6.5885**	**0.0180**	**6.2103**	**0.3517**	**6.5620**	**3.3624**	**0.3237**	**3.6861**	**0.0000**	**1,779.1903**	**1,779.1903**	**0.4441**	**0.0000**	**1,790.2925**

Mitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	lb/day										lb/day					
2029	0.8596	8.4994	6.5885	0.0180	6.2103	0.3517	6.5620	3.3624	0.3237	3.6861	0.0000	1,779.1903	1,779.1903	0.4441	0.0000	1,790.2925
Maximum	**0.8596**	**8.4994**	**6.5885**	**0.0180**	**6.2103**	**0.3517**	**6.5620**	**3.3624**	**0.3237**	**3.6861**	**0.0000**	**1,779.1903**	**1,779.1903**	**0.4441**	**0.0000**	**1,790.2925**

	ROG	**NOx**	**CO**	**SO2**	**Fugitive PM10**	**Exhaust PM10**	**PM10 Total**	**Fugitive PM2.5**	**Exhaust PM2.5**	**PM2.5 Total**	**Bio- CO2**	**NBio-CO2**	**Total CO2**	**CH4**	**N20**	**CO2e**
Percent Reduction	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

2.2 Overall Operational

Unmitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Area	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Energy	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Mobile	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

Mitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Area	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Energy	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Mobile	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N20	CO2e
Percent Reduction	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

3.0 Construction Detail

Construction Phase

Phase Number	Phase Name	Phase Type	Start Date	End Date	Num Days Week	Num Days	Phase Description
1	Sediment Debris Removal	Site Preparation	6/15/2029	7/12/2029	5	20	
2	On Road	Site Preparation	6/15/2029	10/23/2029	5	93	
3	Chipper	Site Preparation	7/13/2029	9/20/2029	5	50	
4	Excavator Backhoe Dumptruck	Site Preparation	9/21/2029	10/4/2029	5	10	

Acres of Grading (Site Preparation Phase): 0

Acres of Grading (Grading Phase): 0

Acres of Paving: 0

Residential Indoor: 0; Residential Outdoor: 0; Non-Residential Indoor: 0; Non-Residential Outdoor: 0; Striped Parking Area: 0 (Architectural Coating – sqft)

OffRoad Equipment

Phase Name	Offroad Equipment Type	Amount	Usage Hours	Horse Power	Load Factor
On Road	Graders	0	8.00	187	0.41
On Road	Tractors/Loaders/Backhoes	0	6.00	97	0.37
Sediment Debris Removal	Cranes	0	4.00	231	0.29
Sediment Debris Removal	Excavators	1	8.00	158	0.38
Sediment Debris Removal	Forklifts	0	6.00	89	0.20
Sediment Debris Removal	Graders	0	8.00	187	0.41
Sediment Debris Removal	Rubber Tired Dozers	1	8.00	247	0.40
Sediment Debris Removal	Tractors/Loaders/Backhoes	0	8.00	97	0.37
Chipper	Graders	0	8.00	187	0.41
Chipper	Other Construction Equipment	1	8.00	1000	0.42
Chipper	Tractors/Loaders/Backhoes	0	8.00	97	0.37
Excavator Backhoe Dumptruck	Excavators	1	2.60	158	0.38
Excavator Backhoe Dumptruck	Graders	0	8.00	187	0.41
Excavator Backhoe Dumptruck	Off-Highway Trucks	1	2.60	402	0.38
Excavator Backhoe Dumptruck	Tractors/Loaders/Backhoes	1	2.60	97	0.37

Trips and VMT

Phase Name	Offroad Equipment Count	Worker Trip Number	Vendor Trip Number	Hauling Trip Number	Worker Trip Length	Vendor Trip Length	Hauling Trip Length	Worker Vehicle Class	Vendor Vehicle Class	Hauling Vehicle Class
On Road	0	3.00	3.00	0.00	12.00	34.00	24.00	LD_Mix	HDT_Mix	HHDT
Sediment Debris Removal	2	5.00	0.00	20.00	12.00	34.00	24.00	LD_Mix	HDT_Mix	HHDT
Chipper	1	3.00	0.00	0.00	12.00	34.00	24.00	LD_Mix	HDT_Mix	HHDT
Excavator Backhoe Dumptruck	3	8.00	0.00	0.00	12.00	34.00	24.00	LD_Mix	HDT_Mix	HHDT

3.1 Mitigation Measures Construction

3.2 Sediment Debris Removal - 2029

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Fugitive Dust					6.0221	0.0000	6.0221	3.3102	0.0000	3.3102			0.0000			0.0000
Off-Road	0.8152	7.8528	6.2571	0.0137		0.3500	0.3500		0.3220	0.3220		1,327.2980	1,327.2980	0.4293		1,338.0299
Total	**0.8152**	**7.8528**	**6.2571**	**0.0137**	**6.0221**	**0.3500**	**6.3721**	**3.3102**	**0.3220**	**3.6323**		**1,327.2980**	**1,327.2980**	**0.4293**		**1,338.0299**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	5.4300e-003	0.1612	0.0533	8.2000e-004	0.0209	3.3000e-004	0.0213	5.7400e-003	3.1000e-004	6.0500e-003		88.5417	88.5417	4.6300e-003		88.6575
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Worker	0.0126	6.8900e-003	0.0773	3.0000e-004	0.0456	2.1000e-004	0.0458	0.0121	1.9000e-004	0.0123		29.6160	29.6160	4.5000e-004		29.6273
Total	**0.0180**	**0.1681**	**0.1306**	**1.1200e-003**	**0.0666**	**5.4000e-004**	**0.0671**	**0.0178**	**5.0000e-004**	**0.0183**		**118.1577**	**118.1577**	**5.0800e-003**		**118.2847**

3.2 Sediment Debris Removal - 2029

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Fugitive Dust					6.0221	0.0000	6.0221	3.3102	0.0000	3.3102			0.0000			0.0000
Off-Road	0.8152	7.8528	6.2571	0.0137		0.3500	0.3500		0.3220	0.3220	0.0000	1,327.2980	1,327.2980	0.4293		1,338.0299
Total	**0.8152**	**7.8528**	**6.2571**	**0.0137**	**6.0221**	**0.3500**	**6.3721**	**3.3102**	**0.3220**	**3.6323**	**0.0000**	**1,327.2980**	**1,327.2980**	**0.4293**		**1,338.0299**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	5.4300e-003	0.1612	0.0533	8.2000e-004	0.0209	3.3000e-004	0.0213	5.7400e-003	3.1000e-004	6.0500e-003		88.5417	88.5417	4.6300e-003		88.6575
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Worker	0.0126	6.8900e-003	0.0773	3.0000e-004	0.0456	2.1000e-004	0.0458	0.0121	1.9000e-004	0.0123		29.6160	29.6160	4.5000e-004		29.6273
Total	**0.0180**	**0.1681**	**0.1306**	**1.1200e-003**	**0.0666**	**5.4000e-004**	**0.0671**	**0.0178**	**5.0000e-004**	**0.0183**		**118.1577**	**118.1577**	**5.0800e-003**		**118.2847**

3.3 On Road - 2029

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Fugitive Dust					0.0000	0.0000	0.0000	0.0000	0.0000	0.0000			0.0000			0.0000
Off-Road	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**		**0.0000**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.0189	0.4744	0.1544	2.9800e-003	0.0943	1.0500e-003	0.0953	0.0271	1.0100e-003	0.0281		315.9649	315.9649	9.4600e-003		316.2016
Worker	7.5400e-003	4.1400e-003	0.0464	1.8000e-004	0.0274	1.2000e-004	0.0275	7.2600e-003	1.1000e-004	7.3800e-003		17.7696	17.7696	2.7000e-004		17.7764
Total	**0.0265**	**0.4785**	**0.2008**	**3.1600e-003**	**0.1216**	**1.1700e-003**	**0.1228**	**0.0344**	**1.1200e-003**	**0.0355**		**333.7346**	**333.7346**	**9.7300e-003**		**333.9779**

3.3 On Road - 2029

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Fugitive Dust					0.0000	0.0000	0.0000	0.0000	0.0000	0.0000			0.0000			0.0000
Off-Road	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**		**0.0000**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.0189	0.4744	0.1544	2.9800e-003	0.0943	1.0500e-003	0.0953	0.0271	1.0100e-003	0.0281		315.9649	315.9649	9.4600e-003		316.2016
Worker	7.5400e-003	4.1400e-003	0.0464	1.8000e-004	0.0274	1.2000e-004	0.0275	7.2600e-003	1.1000e-004	7.3800e-003		17.7696	17.7696	2.7000e-004		17.7764
Total	**0.0265**	**0.4785**	**0.2008**	**3.1600e-003**	**0.1216**	**1.1700e-003**	**0.1228**	**0.0344**	**1.1200e-003**	**0.0355**		**333.7346**	**333.7346**	**9.7300e-003**		**333.9779**

3.4 Chipper - 2029

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Fugitive Dust					0.0000	0.0000	0.0000	0.0000	0.0000	0.0000			0.0000			0.0000
Off-Road	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**		**0.0000**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Worker	7.5400e-003	4.1400e-003	0.0464	1.8000e-004	0.0274	1.2000e-004	0.0275	7.2600e-003	1.1000e-004	7.3800e-003		17.7696	17.7696	2.7000e-004		17.7764
Total	**7.5400e-003**	**4.1400e-003**	**0.0464**	**1.8000e-004**	**0.0274**	**1.2000e-004**	**0.0275**	**7.2600e-003**	**1.1000e-004**	**7.3800e-003**		**17.7696**	**17.7696**	**2.7000e-004**		**17.7764**

3.4 Chipper - 2029

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Fugitive Dust					0.0000	0.0000	0.0000	0.0000	0.0000	0.0000			0.0000			0.0000
Off-Road	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**		**0.0000**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Worker	7.5400e-003	4.1400e-003	0.0464	1.8000e-004	0.0274	1.2000e-004	0.0275	7.2600e-003	1.1000e-004	7.3800e-003		17.7696	17.7696	2.7000e-004		17.7764
Total	**7.5400e-003**	**4.1400e-003**	**0.0464**	**1.8000e-004**	**0.0274**	**1.2000e-004**	**0.0275**	**7.2600e-003**	**1.1000e-004**	**7.3800e-003**		**17.7696**	**17.7696**	**2.7000e-004**		**17.7764**

3.5 Excavator Backhoe Dumptruck - 2029

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Fugitive Dust					0.0000	0.0000	0.0000	0.0000	0.0000	0.0000			0.0000			0.0000
Off-Road	0.2525	1.7624	2.8192	6.9900e-003		0.0703	0.0703		0.0647	0.0647		676.6725	676.6725	0.2189		682.1437
Total	**0.2525**	**1.7624**	**2.8192**	**6.9900e-003**	**0.0000**	**0.0703**	**0.0703**	**0.0000**	**0.0647**	**0.0647**		**676.6725**	**676.6725**	**0.2189**		**682.1437**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Worker	0.0201	0.0110	0.1237	4.7000e-004	0.0730	3.3000e-004	0.0733	0.0194	3.1000e-004	0.0197		47.3857	47.3857	7.2000e-004		47.4036
Total	**0.0201**	**0.0110**	**0.1237**	**4.7000e-004**	**0.0730**	**3.3000e-004**	**0.0733**	**0.0194**	**3.1000e-004**	**0.0197**		**47.3857**	**47.3857**	**7.2000e-004**		**47.4036**

3.5 Excavator Backhoe Dumptruck - 2029

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Fugitive Dust					0.0000	0.0000	0.0000	0.0000	0.0000	0.0000			0.0000			0.0000
Off-Road	0.2525	1.7624	2.8192	6.9900e-003		0.0703	0.0703		0.0647	0.0647	0.0000	676.6725	676.6725	0.2189		682.1437
Total	**0.2525**	**1.7624**	**2.8192**	**6.9900e-003**	**0.0000**	**0.0703**	**0.0703**	**0.0000**	**0.0647**	**0.0647**	**0.0000**	**676.6725**	**676.6725**	**0.2189**		**682.1437**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Worker	0.0201	0.0110	0.1237	4.7000e-004	0.0730	3.3000e-004	0.0733	0.0194	3.1000e-004	0.0197		47.3857	47.3857	7.2000e-004		47.4036
Total	**0.0201**	**0.0110**	**0.1237**	**4.7000e-004**	**0.0730**	**3.3000e-004**	**0.0733**	**0.0194**	**3.1000e-004**	**0.0197**		**47.3857**	**47.3857**	**7.2000e-004**		**47.4036**

4.0 Operational Detail - Mobile

4.1 Mitigation Measures Mobile

Category	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
	lb/day										lb/day					
Mitigated	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Unmitigated	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000

4.2 Trip Summary Information

	Average Daily Trip Rate			Unmitigated	Mitigated
Land Use	Weekday	Saturday	Sunday	Annual VMT	Annual VMT
User Defined Recreational	0.00	0.00	0.00		
Total	0.00	0.00	0.00		

4.3 Trip Type Information

	Miles			Trip %			Trip Purpose %		
Land Use	H-W or C-W	H-S or C-C	H-O or C-NW	H-W or C-W	H-S or C-C	H-O or C-NW	Primary	Diverted	Pass-by
User Defined Recreational	9.50	7.30	7.30	0.00	0.00	0.00	0	0	0

4.4 Fleet Mix

Land Use	LDA	LDT1	LDT2	MDV	LHD1	LHD2	MHD	HHD	OBUS	UBUS	MCY	SBUS	MH
User Defined Recreational	0.623911	0.031449	0.164057	0.095380	0.013597	0.004624	0.015860	0.039066	0.003868	0.001518	0.004990	0.001015	0.000663

5.0 Energy Detail

Historical Energy Use: N

5.1 Mitigation Measures Energy

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
NaturalGas Mitigated	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
NaturalGas Unmitigated	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000

5.2 Energy by Land Use - NaturalGas

Unmitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU/yr	lb/day										lb/day					
User Defined Recreational	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

Mitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU/yr	lb/day										lb/day					
User Defined Recreational	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

6.0 Area Detail

6.1 Mitigation Measures Area

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Mitigated	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Unmitigated	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000		0.0000

6.2 Area by SubCategory

Unmitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	lb/day										lb/day					
Architectural Coating	0.0000					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Consumer Products	0.0000					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Landscaping	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**		**0.0000**

6.2 Area by SubCategory

Mitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	lb/day										lb/day					
Architectural Coating	0.0000					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Consumer Products	0.0000					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Landscaping	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**		**0.0000**

7.0 Water Detail

7.1 Mitigation Measures Water

8.0 Waste Detail

8.1 Mitigation Measures Waste

9.0 Operational Offroad

Equipment Type	Number	Hours/Day	Days/Year	Horse Power	Load Factor	Fuel Type

10.0 Stationary Equipment

Fire Pumps and Emergency Generators

Equipment Type	Number	Hours/Day	Hours/Year	Horse Power	Load Factor	Fuel Type

Boilers

Equipment Type	Number	Heat Input/Day	Heat Input/Year	Boiler Rating	Fuel Type

User Defined Equipment

Equipment Type	Number

11.0 Vegetation

Napa SMP

Napa County, Winter

1.0 Project Characteristics

1.1 Land Usage

Land Uses	Size	Metric	Lot Acreage	Floor Surface Area	Population
User Defined Recreational	0.00	User Defined Unit	0.00	0.00	0

1.2 Other Project Characteristics

Urbanization	Urban	**Wind Speed (m/s)**	3.6	**Precipitation Freq (Days)**	64
Climate Zone	4			**Operational Year**	2020
Utility Company	Pacific Gas & Electric Company				
CO2 Intensity (lb/MWhr)	641.35	**CH4 Intensity (lb/MWhr)**	0.029	**N2O Intensity (lb/MWhr)**	0.006

1.3 User Entered Comments & Non-Default Data

Project Characteristics -

Land Use -

Off-road Equipment - Assumed 1,000 hp chipper

Off-road Equipment - Reflects info from pers comms

Off-road Equipment - Emissions from this phase are accounted for under Trips and VMT

Off-road Equipment - Reflects info from pers comms

Trips and VMT - Reflects info in pers comms

Grading - Reflects pers comms

Construction Phase - Based on PD and feedback

Table Name	Column Name	Default Value	New Value
tblConstructionPhase	NumDays	0.00	93.00
tblConstructionPhase	NumDays	0.00	20.00
tblConstructionPhase	NumDays	0.00	50.00
tblConstructionPhase	NumDays	0.00	10.00
tblOffRoadEquipment	HorsePower	172.00	1,000.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	0.00	1.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	0.00	1.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	0.00	1.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	0.00	1.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	0.00	1.00
tblOffRoadEquipment	PhaseName		Sediment Debris Removal
tblOffRoadEquipment	PhaseName		Sediment Debris Removal
tblOffRoadEquipment	PhaseName		Excavator Backhoe Dumptruck
tblOffRoadEquipment	PhaseName		Sediment Debris Removal
tblOffRoadEquipment	PhaseName		Excavator Backhoe Dumptruck
tblOffRoadEquipment	PhaseName		Chipper
tblOffRoadEquipment	PhaseName		Sediment Debris Removal
tblOffRoadEquipment	UsageHours	8.00	6.00
tblOffRoadEquipment	UsageHours	8.00	2.60

tblTripsAndVMT	HaulingTripLength	20.00	24.00
tblTripsAndVMT	HaulingTripLength	20.00	24.00
tblTripsAndVMT	HaulingTripLength	20.00	24.00
tblTripsAndVMT	HaulingTripLength	20.00	24.00
tblTripsAndVMT	HaulingTripNumber	0.00	20.00
tblTripsAndVMT	VendorTripLength	7.30	34.00
tblTripsAndVMT	VendorTripLength	7.30	34.00
tblTripsAndVMT	VendorTripLength	7.30	34.00
tblTripsAndVMT	VendorTripLength	7.30	34.00
tblTripsAndVMT	VendorTripNumber	0.00	3.00
tblTripsAndVMT	WorkerTripLength	10.80	12.00
tblTripsAndVMT	WorkerTripLength	10.80	12.00
tblTripsAndVMT	WorkerTripLength	10.80	12.00
tblTripsAndVMT	WorkerTripLength	10.80	12.00
tblTripsAndVMT	WorkerTripNumber	0.00	3.00

2.0 Emissions Summary

2.1 Overall Construction (Maximum Daily Emission)

Unmitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	lb/day										lb/day					
2019	1.5018	16.3372	8.2332	0.0186	6.2102	0.7340	6.9442	3.3624	0.6758	4.0382	0.0000	1,866.8147	1,866.8147	0.4479	0.0000	1,878.0120
Maximum	**1.5018**	**16.3372**	**8.2332**	**0.0186**	**6.2102**	**0.7340**	**6.9442**	**3.3624**	**0.6758**	**4.0382**	**0.0000**	**1,866.8147**	**1,866.8147**	**0.4479**	**0.0000**	**1,878.0120**

Mitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	lb/day										lb/day					
2019	1.5018	16.3372	8.2332	0.0186	6.2102	0.7340	6.9442	3.3624	0.6758	4.0382	0.0000	1,866.8147	1,866.8147	0.4479	0.0000	1,878.0120
Maximum	**1.5018**	**16.3372**	**8.2332**	**0.0186**	**6.2102**	**0.7340**	**6.9442**	**3.3624**	**0.6758**	**4.0382**	**0.0000**	**1,866.8147**	**1,866.8147**	**0.4479**	**0.0000**	**1,878.0120**

	ROG	**NOx**	**CO**	**SO2**	**Fugitive PM10**	**Exhaust PM10**	**PM10 Total**	**Fugitive PM2.5**	**Exhaust PM2.5**	**PM2.5 Total**	**Bio- CO2**	**NBio-CO2**	**Total CO2**	**CH4**	**N20**	**CO2e**
Percent Reduction	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

2.2 Overall Operational

Unmitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Area	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Energy	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Mobile	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

Mitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Area	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Energy	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Mobile	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N20	CO2e
Percent Reduction	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

3.0 Construction Detail

Construction Phase

Phase Number	Phase Name	Phase Type	Start Date	End Date	Num Days Week	Num Days	Phase Description
1	On Road	Site Preparation	6/15/2019	10/23/2019	5	93	
2	Sediment Debris Removal	Site Preparation	6/15/2019	7/12/2019	5	20	
3	Chipper	Site Preparation	7/13/2019	9/20/2019	5	50	
4	Excavator Backhoe Dumptruck	Site Preparation	9/21/2019	10/4/2019	5	10	

Acres of Grading (Site Preparation Phase): 0

Acres of Grading (Grading Phase): 0

Acres of Paving: 0

Residential Indoor: 0; Residential Outdoor: 0; Non-Residential Indoor: 0; Non-Residential Outdoor: 0; Striped Parking Area: 0 (Architectural Coating – sqft)

OffRoad Equipment

Napa SMP - Napa County, Winter

Phase Name	Offroad Equipment Type	Amount	Usage Hours	Horse Power	Load Factor
On Road	Graders	0	8.00	187	0.41
On Road	Tractors/Loaders/Backhoes	0	6.00	97	0.37
Sediment Debris Removal	Cranes	0	4.00	231	0.29
Sediment Debris Removal	Excavators	1	8.00	158	0.38
Sediment Debris Removal	Forklifts	0	6.00	89	0.20
Sediment Debris Removal	Graders	0	8.00	187	0.41
Sediment Debris Removal	Rubber Tired Dozers	1	8.00	247	0.40
Sediment Debris Removal	Tractors/Loaders/Backhoes	0	8.00	97	0.37
Chipper	Graders	0	8.00	187	0.41
Chipper	Other Construction Equipment	1	8.00	1000	0.42
Chipper	Tractors/Loaders/Backhoes	0	8.00	97	0.37
Excavator Backhoe Dumptruck	Excavators	1	2.60	158	0.38
Excavator Backhoe Dumptruck	Graders	0	8.00	187	0.41
Excavator Backhoe Dumptruck	Off-Highway Trucks	1	2.60	402	0.38
Excavator Backhoe Dumptruck	Tractors/Loaders/Backhoes	1	2.60	97	0.37

Trips and VMT

Phase Name	Offroad Equipment Count	Worker Trip Number	Vendor Trip Number	Hauling Trip Number	Worker Trip Length	Vendor Trip Length	Hauling Trip Length	Worker Vehicle Class	Vendor Vehicle Class	Hauling Vehicle Class
On Road	0	3.00	3.00	0.00	12.00	34.00	24.00	LD_Mix	HDT_Mix	HHDT
Sediment Debris Removal	2	5.00	0.00	20.00	12.00	34.00	24.00	LD_Mix	HDT_Mix	HHDT
Chipper	1	3.00	0.00	0.00	12.00	34.00	24.00	LD_Mix	HDT_Mix	HHDT
Excavator Backhoe Dumptruck	3	8.00	0.00	0.00	12.00	34.00	24.00	LD_Mix	HDT_Mix	HHDT

3.1 Mitigation Measures Construction

3.2 On Road - 2019

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Fugitive Dust					0.0000	0.0000	0.0000	0.0000	0.0000	0.0000			0.0000			0.0000
Off-Road	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**		**0.0000**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.0549	1.1824	0.3162	3.2500e-003	0.0942	0.0139	0.1080	0.0271	0.0133	0.0403		343.1020	343.1020	0.0117		343.3936
Worker	0.0153	0.0117	0.1100	2.6000e-004	0.0274	1.9000e-004	0.0276	7.2600e-003	1.7000e-004	7.4300e-003		25.5322	25.5322	8.2000e-004		25.5526
Total	**0.0702**	**1.1941**	**0.4262**	**3.5100e-003**	**0.1216**	**0.0141**	**0.1356**	**0.0343**	**0.0134**	**0.0478**		**368.6342**	**368.6342**	**0.0125**		**368.9462**

3.2 On Road - 2019

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Fugitive Dust					0.0000	0.0000	0.0000	0.0000	0.0000	0.0000			0.0000			0.0000
Off-Road	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**		**0.0000**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.0549	1.1824	0.3162	3.2500e-003	0.0942	0.0139	0.1080	0.0271	0.0133	0.0403		343.1020	343.1020	0.0117		343.3936
Worker	0.0153	0.0117	0.1100	2.6000e-004	0.0274	1.9000e-004	0.0276	7.2600e-003	1.7000e-004	7.4300e-003		25.5322	25.5322	8.2000e-004		25.5526
Total	**0.0702**	**1.1941**	**0.4262**	**3.5100e-003**	**0.1216**	**0.0141**	**0.1356**	**0.0343**	**0.0134**	**0.0478**		**368.6342**	**368.6342**	**0.0125**		**368.9462**

3.3 Sediment Debris Removal - 2019

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Fugitive Dust					6.0221	0.0000	6.0221	3.3102	0.0000	3.3102			0.0000			0.0000
Off-Road	1.3953	14.7563	7.5473	0.0137		0.7181	0.7181		0.6606	0.6606		1,356.554 1	1,356.554 1	0.4292		1,367.284 0
Total	**1.3953**	**14.7563**	**7.5473**	**0.0137**	**6.0221**	**0.7181**	**6.7402**	**3.3102**	**0.6606**	**3.9709**		**1,356.554 1**	**1,356.554 1**	**0.4292**		**1,367.284 0**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0109	0.3674	0.0764	9.3000e-004	0.0209	1.5500e-003	0.0225	5.7200e-003	1.4800e-003	7.2000e-003		99.0728	99.0728	4.8500e-003		99.1942
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Worker	0.0254	0.0194	0.1833	4.3000e-004	0.0456	3.1000e-004	0.0459	0.0121	2.9000e-004	0.0124		42.5536	42.5536	1.3600e-003		42.5876
Total	**0.0363**	**0.3869**	**0.2597**	**1.3600e-003**	**0.0665**	**1.8600e-003**	**0.0684**	**0.0178**	**1.7700e-003**	**0.0196**		**141.6264**	**141.6264**	**6.2100e-003**		**141.7818**

3.3 Sediment Debris Removal - 2019

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Fugitive Dust					6.0221	0.0000	6.0221	3.3102	0.0000	3.3102			0.0000			0.0000
Off-Road	1.3953	14.7563	7.5473	0.0137		0.7181	0.7181		0.6606	0.6606	0.0000	1,356.554 1	1,356.554 1	0.4292		1,367.284 0
Total	**1.3953**	**14.7563**	**7.5473**	**0.0137**	**6.0221**	**0.7181**	**6.7402**	**3.3102**	**0.6606**	**3.9709**	**0.0000**	**1,356.554 1**	**1,356.554 1**	**0.4292**		**1,367.284 0**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0109	0.3674	0.0764	9.3000e-004	0.0209	1.5500e-003	0.0225	5.7200e-003	1.4800e-003	7.2000e-003		99.0728	99.0728	4.8500e-003		99.1942
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Worker	0.0254	0.0194	0.1833	4.3000e-004	0.0456	3.1000e-004	0.0459	0.0121	2.9000e-004	0.0124		42.5536	42.5536	1.3600e-003		42.5876
Total	**0.0363**	**0.3869**	**0.2597**	**1.3600e-003**	**0.0665**	**1.8600e-003**	**0.0684**	**0.0178**	**1.7700e-003**	**0.0196**		**141.6264**	**141.6264**	**6.2100e-003**		**141.7818**

3.4 Chipper - 2019

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Fugitive Dust					0.0000	0.0000	0.0000	0.0000	0.0000	0.0000			0.0000			0.0000
Off-Road	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**		**0.0000**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Worker	0.0153	0.0117	0.1100	2.6000e-004	0.0274	1.9000e-004	0.0276	7.2600e-003	1.7000e-004	7.4300e-003		25.5322	25.5322	8.2000e-004		25.5526
Total	**0.0153**	**0.0117**	**0.1100**	**2.6000e-004**	**0.0274**	**1.9000e-004**	**0.0276**	**7.2600e-003**	**1.7000e-004**	**7.4300e-003**		**25.5322**	**25.5322**	**8.2000e-004**		**25.5526**

3.4 Chipper - 2019

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Fugitive Dust					0.0000	0.0000	0.0000	0.0000	0.0000	0.0000			0.0000			0.0000
Off-Road	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**		**0.0000**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Worker	0.0153	0.0117	0.1100	2.6000e-004	0.0274	1.9000e-004	0.0276	7.2600e-003	1.7000e-004	7.4300e-003		25.5322	25.5322	8.2000e-004		25.5526
Total	**0.0153**	**0.0117**	**0.1100**	**2.6000e-004**	**0.0274**	**1.9000e-004**	**0.0276**	**7.2600e-003**	**1.7000e-004**	**7.4300e-003**		**25.5322**	**25.5322**	**8.2000e-004**		**25.5526**

3.5 Excavator Backhoe Dumptruck - 2019

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Fugitive Dust					0.0000	0.0000	0.0000	0.0000	0.0000	0.0000			0.0000			0.0000
Off-Road	0.3911	3.9679	3.1079	6.9800e-003		0.1777	0.1777		0.1635	0.1635		691.0797	691.0797	0.2187		696.5459
Total	**0.3911**	**3.9679**	**3.1079**	**6.9800e-003**	**0.0000**	**0.1777**	**0.1777**	**0.0000**	**0.1635**	**0.1635**		**691.0797**	**691.0797**	**0.2187**		**696.5459**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Worker	0.0407	0.0311	0.2933	6.8000e-004	0.0730	5.0000e-004	0.0735	0.0194	4.6000e-004	0.0198		68.0858	68.0858	2.1800e-003		68.1401
Total	**0.0407**	**0.0311**	**0.2933**	**6.8000e-004**	**0.0730**	**5.0000e-004**	**0.0735**	**0.0194**	**4.6000e-004**	**0.0198**		**68.0858**	**68.0858**	**2.1800e-003**		**68.1401**

3.5 Excavator Backhoe Dumptruck - 2019

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Fugitive Dust					0.0000	0.0000	0.0000	0.0000	0.0000	0.0000			0.0000			0.0000
Off-Road	0.3911	3.9679	3.1079	6.9800e-003		0.1777	0.1777		0.1635	0.1635	0.0000	691.0797	691.0797	0.2187		696.5459
Total	**0.3911**	**3.9679**	**3.1079**	**6.9800e-003**	**0.0000**	**0.1777**	**0.1777**	**0.0000**	**0.1635**	**0.1635**	**0.0000**	**691.0797**	**691.0797**	**0.2187**		**696.5459**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Worker	0.0407	0.0311	0.2933	6.8000e-004	0.0730	5.0000e-004	0.0735	0.0194	4.6000e-004	0.0198		68.0858	68.0858	2.1800e-003		68.1401
Total	**0.0407**	**0.0311**	**0.2933**	**6.8000e-004**	**0.0730**	**5.0000e-004**	**0.0735**	**0.0194**	**4.6000e-004**	**0.0198**		**68.0858**	**68.0858**	**2.1800e-003**		**68.1401**

4.0 Operational Detail - Mobile

4.1 Mitigation Measures Mobile

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Mitigated	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Unmitigated	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000

4.2 Trip Summary Information

	Average Daily Trip Rate			Unmitigated	Mitigated
Land Use	Weekday	Saturday	Sunday	Annual VMT	Annual VMT
User Defined Recreational	0.00	0.00	0.00		
Total	0.00	0.00	0.00		

4.3 Trip Type Information

	Miles			Trip %			Trip Purpose %		
Land Use	H-W or C-W	H-S or C-C	H-O or C-NW	H-W or C-W	H-S or C-C	H-O or C-NW	Primary	Diverted	Pass-by
User Defined Recreational	9.50	7.30	7.30	0.00	0.00	0.00	0	0	0

4.4 Fleet Mix

Land Use	LDA	LDT1	LDT2	MDV	LHD1	LHD2	MHD	HHD	OBUS	UBUS	MCY	SBUS	MH
User Defined Recreational	0.569185	0.038999	0.171806	0.120317	0.026328	0.006551	0.017860	0.035422	0.003826	0.001868	0.005693	0.001021	0.001123

5.0 Energy Detail

Historical Energy Use: N

5.1 Mitigation Measures Energy

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
NaturalGas Mitigated	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
NaturalGas Unmitigated	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000

5.2 Energy by Land Use - NaturalGas

Unmitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU/yr	lb/day										lb/day					
User Defined Recreational	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

Mitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU/yr	lb/day										lb/day					
User Defined Recreational	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

6.0 Area Detail

6.1 Mitigation Measures Area

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Mitigated	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Unmitigated	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000		0.0000

6.2 Area by SubCategory

Unmitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	lb/day										lb/day					
Architectural Coating	0.0000					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Consumer Products	0.0000					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Landscaping	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**		**0.0000**

6.2 Area by SubCategory

Mitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	lb/day										lb/day					
Architectural Coating	0.0000					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Consumer Products	0.0000					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Landscaping	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**		**0.0000**

7.0 Water Detail

7.1 Mitigation Measures Water

8.0 Waste Detail

8.1 Mitigation Measures Waste

9.0 Operational Offroad

Equipment Type	Number	Hours/Day	Days/Year	Horse Power	Load Factor	Fuel Type

10.0 Stationary Equipment

Fire Pumps and Emergency Generators

Equipment Type	Number	Hours/Day	Hours/Year	Horse Power	Load Factor	Fuel Type

Boilers

Equipment Type	Number	Heat Input/Day	Heat Input/Year	Boiler Rating	Fuel Type

User Defined Equipment

Equipment Type	Number

11.0 Vegetation

Napa SMP

Napa County, Summer

1.0 Project Characteristics

1.1 Land Usage

Land Uses	Size	Metric	Lot Acreage	Floor Surface Area	Population
User Defined Recreational	0.00	User Defined Unit	0.00	0.00	0

1.2 Other Project Characteristics

Urbanization	Urban	**Wind Speed (m/s)**	3.6	**Precipitation Freq (Days)**	64
Climate Zone	4			**Operational Year**	2030
Utility Company	Pacific Gas & Electric Company				
CO2 Intensity (lb/MWhr)	641.35	**CH4 Intensity (lb/MWhr)**	0.029	**N2O Intensity (lb/MWhr)**	0.006

1.3 User Entered Comments & Non-Default Data

Project Characteristics -

Land Use -

Construction Phase - Based on pers comms

Off-road Equipment - Assumed 1,000 hp chipper

Off-road Equipment - Reflects info from pers comms

Off-road Equipment - Emissions from this phase are accounted for under Trips and VMT

Off-road Equipment - Reflects info from pers comms

Trips and VMT - Reflects info in pers comms

Grading - Reflects pers comms

Vehicle Emission Factors -

Vehicle Emission Factors -

Vehicle Emission Factors -

Fleet Mix -

Table Name	Column Name	Default Value	New Value
tblConstructionPhase	NumDays	0.00	93.00
tblConstructionPhase	NumDays	0.00	20.00
tblConstructionPhase	NumDays	0.00	50.00
tblConstructionPhase	NumDays	0.00	10.00
tblConstructionPhase	PhaseEndDate	3/30/2029	10/23/2029
tblConstructionPhase	PhaseEndDate	3/30/2029	7/12/2029
tblConstructionPhase	PhaseEndDate	3/30/2029	9/20/2029
tblConstructionPhase	PhaseEndDate	3/30/2029	10/4/2029
tblConstructionPhase	PhaseStartDate	4/1/2029	6/15/2029
tblConstructionPhase	PhaseStartDate	3/31/2029	6/15/2029
tblConstructionPhase	PhaseStartDate	3/31/2029	7/13/2029
tblConstructionPhase	PhaseStartDate	3/31/2029	9/21/2029

tblOffRoadEquipment	HorsePower	172.00	1,000.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	0.00	1.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	0.00	1.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	0.00	1.00
tblOffRoadEquipment	PhaseName		Excavator Backhoe Dumptruck
tblOffRoadEquipment	PhaseName		Excavator Backhoe Dumptruck
tblOffRoadEquipment	PhaseName		Chipper
tblOffRoadEquipment	UsageHours	8.00	6.00
tblOffRoadEquipment	UsageHours	8.00	2.60
tblTripsAndVMT	HaulingTripLength	20.00	24.00
tblTripsAndVMT	HaulingTripLength	20.00	24.00
tblTripsAndVMT	HaulingTripLength	20.00	24.00
tblTripsAndVMT	HaulingTripLength	20.00	24.00
tblTripsAndVMT	HaulingTripNumber	0.00	20.00
tblTripsAndVMT	VendorTripLength	7.30	34.00
tblTripsAndVMT	VendorTripLength	7.30	34.00
tblTripsAndVMT	VendorTripLength	7.30	34.00
tblTripsAndVMT	VendorTripLength	7.30	34.00
tblTripsAndVMT	VendorTripNumber	0.00	3.00
tblTripsAndVMT	WorkerTripLength	10.80	12.00

tblTripsAndVMT	WorkerTripLength	10.80	12.00
tblTripsAndVMT	WorkerTripLength	10.80	12.00
tblTripsAndVMT	WorkerTripLength	10.80	12.00
tblTripsAndVMT	WorkerTripNumber	0.00	3.00

2.0 Emissions Summary

2.1 Overall Construction (Maximum Daily Emission)

Unmitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	lb/day										lb/day					
2029	0.8575	8.4787	6.5898	0.0180	6.2103	0.3517	6.5620	3.3624	0.3236	3.6861	0.0000	1,786.2119	1,786.2119	0.4437	0.0000	1,797.3035
Maximum	**0.8575**	**8.4787**	**6.5898**	**0.0180**	**6.2103**	**0.3517**	**6.5620**	**3.3624**	**0.3236**	**3.6861**	**0.0000**	**1,786.2119**	**1,786.2119**	**0.4437**	**0.0000**	**1,797.3035**

Mitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	lb/day										lb/day					
2029	0.8575	8.4787	6.5898	0.0180	6.2103	0.3517	6.5620	3.3624	0.3236	3.6861	0.0000	1,786.2119	1,786.2119	0.4437	0.0000	1,797.3035
Maximum	**0.8575**	**8.4787**	**6.5898**	**0.0180**	**6.2103**	**0.3517**	**6.5620**	**3.3624**	**0.3236**	**3.6861**	**0.0000**	**1,786.2119**	**1,786.2119**	**0.4437**	**0.0000**	**1,797.3035**

	ROG	**NOx**	**CO**	**SO2**	**Fugitive PM10**	**Exhaust PM10**	**PM10 Total**	**Fugitive PM2.5**	**Exhaust PM2.5**	**PM2.5 Total**	**Bio- CO2**	**NBio-CO2**	**Total CO2**	**CH4**	**N20**	**CO2e**
Percent Reduction	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

2.2 Overall Operational

Unmitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Area	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Energy	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Mobile	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

Mitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Area	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Energy	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Mobile	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N20	CO2e
Percent Reduction	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

3.0 Construction Detail

Construction Phase

Phase Number	Phase Name	Phase Type	Start Date	End Date	Num Days Week	Num Days	Phase Description
1	Sediment Debris Removal	Site Preparation	6/15/2029	7/12/2029	5	20	
2	On Road	Site Preparation	6/15/2029	10/23/2029	5	93	
3	Chipper	Site Preparation	7/13/2029	9/20/2029	5	50	
4	Excavator Backhoe Dumptruck	Site Preparation	9/21/2029	10/4/2029	5	10	

Acres of Grading (Site Preparation Phase): 0

Acres of Grading (Grading Phase): 0

Acres of Paving: 0

Residential Indoor: 0; Residential Outdoor: 0; Non-Residential Indoor: 0; Non-Residential Outdoor: 0; Striped Parking Area: 0 (Architectural Coating – sqft)

OffRoad Equipment

Phase Name	Offroad Equipment Type	Amount	Usage Hours	Horse Power	Load Factor
On Road	Graders	0	8.00	187	0.41
On Road	Tractors/Loaders/Backhoes	0	6.00	97	0.37
Sediment Debris Removal	Cranes	0	4.00	231	0.29
Sediment Debris Removal	Excavators	1	8.00	158	0.38
Sediment Debris Removal	Forklifts	0	6.00	89	0.20
Sediment Debris Removal	Graders	0	8.00	187	0.41
Sediment Debris Removal	Rubber Tired Dozers	1	8.00	247	0.40
Sediment Debris Removal	Tractors/Loaders/Backhoes	0	8.00	97	0.37
Chipper	Graders	0	8.00	187	0.41
Chipper	Other Construction Equipment	1	8.00	1000	0.42
Chipper	Tractors/Loaders/Backhoes	0	8.00	97	0.37
Excavator Backhoe Dumptruck	Excavators	1	2.60	158	0.38
Excavator Backhoe Dumptruck	Graders	0	8.00	187	0.41
Excavator Backhoe Dumptruck	Off-Highway Trucks	1	2.60	402	0.38
Excavator Backhoe Dumptruck	Tractors/Loaders/Backhoes	1	2.60	97	0.37

Trips and VMT

Phase Name	Offroad Equipment Count	Worker Trip Number	Vendor Trip Number	Hauling Trip Number	Worker Trip Length	Vendor Trip Length	Hauling Trip Length	Worker Vehicle Class	Vendor Vehicle Class	Hauling Vehicle Class
On Road	0	3.00	3.00	0.00	12.00	34.00	24.00	LD_Mix	HDT_Mix	HHDT
Sediment Debris Removal	2	5.00	0.00	20.00	12.00	34.00	24.00	LD_Mix	HDT_Mix	HHDT
Chipper	1	3.00	0.00	0.00	12.00	34.00	24.00	LD_Mix	HDT_Mix	HHDT
Excavator Backhoe Dumptruck	3	8.00	0.00	0.00	12.00	34.00	24.00	LD_Mix	HDT_Mix	HHDT

3.1 Mitigation Measures Construction

3.2 Sediment Debris Removal - 2029

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Fugitive Dust					6.0221	0.0000	6.0221	3.3102	0.0000	3.3102			0.0000			0.0000
Off-Road	0.8152	7.8528	6.2571	0.0137		0.3500	0.3500		0.3220	0.3220		1,327.298 0	1,327.298 0	0.4293		1,338.029 9
Total	**0.8152**	**7.8528**	**6.2571**	**0.0137**	**6.0221**	**0.3500**	**6.3721**	**3.3102**	**0.3220**	**3.6323**		**1,327.298 0**	**1,327.298 0**	**0.4293**		**1,338.029 9**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	5.3100e-003	0.1582	0.0510	8.3000e-004	0.0209	3.2000e-004	0.0213	5.7400e-003	3.1000e-004	6.0500e-003		89.7742	89.7742	4.4400e-003		89.8853
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Worker	0.0117	5.4400e-003	0.0829	3.2000e-004	0.0456	2.1000e-004	0.0458	0.0121	1.9000e-004	0.0123		32.0294	32.0294	4.9000e-004		32.0416
Total	**0.0170**	**0.1637**	**0.1339**	**1.1500e-003**	**0.0666**	**5.3000e-004**	**0.0671**	**0.0178**	**5.0000e-004**	**0.0183**		**121.8036**	**121.8036**	**4.9300e-003**		**121.9269**

3.2 Sediment Debris Removal - 2029

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Fugitive Dust					6.0221	0.0000	6.0221	3.3102	0.0000	3.3102			0.0000			0.0000
Off-Road	0.8152	7.8528	6.2571	0.0137		0.3500	0.3500		0.3220	0.3220	0.0000	1,327.2980	1,327.2980	0.4293		1,338.0299
Total	**0.8152**	**7.8528**	**6.2571**	**0.0137**	**6.0221**	**0.3500**	**6.3721**	**3.3102**	**0.3220**	**3.6323**	**0.0000**	**1,327.2980**	**1,327.2980**	**0.4293**		**1,338.0299**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	5.3100e-003	0.1582	0.0510	8.3000e-004	0.0209	3.2000e-004	0.0213	5.7400e-003	3.1000e-004	6.0500e-003		89.7742	89.7742	4.4400e-003		89.8853
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Worker	0.0117	5.4400e-003	0.0829	3.2000e-004	0.0456	2.1000e-004	0.0458	0.0121	1.9000e-004	0.0123		32.0294	32.0294	4.9000e-004		32.0416
Total	**0.0170**	**0.1637**	**0.1339**	**1.1500e-003**	**0.0666**	**5.3000e-004**	**0.0671**	**0.0178**	**5.0000e-004**	**0.0183**		**121.8036**	**121.8036**	**4.9300e-003**		**121.9269**

3.3 On Road - 2029

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Fugitive Dust					0.0000	0.0000	0.0000	0.0000	0.0000	0.0000			0.0000			0.0000
Off-Road	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**		**0.0000**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.0184	0.4589	0.1491	2.9900e-003	0.0943	1.0500e-003	0.0953	0.0271	1.0000e-003	0.0281		317.8926	317.8926	9.1700e-003		318.1218
Worker	6.9900e-003	3.2700e-003	0.0497	1.9000e-004	0.0274	1.2000e-004	0.0275	7.2600e-003	1.1000e-004	7.3800e-003		19.2177	19.2177	2.9000e-004		19.2250
Total	**0.0253**	**0.4622**	**0.1988**	**3.1800e-003**	**0.1216**	**1.1700e-003**	**0.1228**	**0.0344**	**1.1100e-003**	**0.0355**		**337.1103**	**337.1103**	**9.4600e-003**		**337.3468**

3.3 On Road - 2029

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Fugitive Dust					0.0000	0.0000	0.0000	0.0000	0.0000	0.0000			0.0000			0.0000
Off-Road	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**		**0.0000**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.0184	0.4589	0.1491	2.9900e-003	0.0943	1.0500e-003	0.0953	0.0271	1.0000e-003	0.0281		317.8926	317.8926	9.1700e-003		318.1218
Worker	6.9900e-003	3.2700e-003	0.0497	1.9000e-004	0.0274	1.2000e-004	0.0275	7.2600e-003	1.1000e-004	7.3800e-003		19.2177	19.2177	2.9000e-004		19.2250
Total	**0.0253**	**0.4622**	**0.1988**	**3.1800e-003**	**0.1216**	**1.1700e-003**	**0.1228**	**0.0344**	**1.1100e-003**	**0.0355**		**337.1103**	**337.1103**	**9.4600e-003**		**337.3468**

3.4 Chipper - 2029

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Fugitive Dust					0.0000	0.0000	0.0000	0.0000	0.0000	0.0000			0.0000			0.0000
Off-Road	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**		**0.0000**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Worker	6.9900e-003	3.2700e-003	0.0497	1.9000e-004	0.0274	1.2000e-004	0.0275	7.2600e-003	1.1000e-004	7.3800e-003		19.2177	19.2177	2.9000e-004		19.2250
Total	**6.9900e-003**	**3.2700e-003**	**0.0497**	**1.9000e-004**	**0.0274**	**1.2000e-004**	**0.0275**	**7.2600e-003**	**1.1000e-004**	**7.3800e-003**		**19.2177**	**19.2177**	**2.9000e-004**		**19.2250**

3.4 Chipper - 2029

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Fugitive Dust					0.0000	0.0000	0.0000	0.0000	0.0000	0.0000			0.0000			0.0000
Off-Road	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**		**0.0000**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Worker	6.9900e-003	3.2700e-003	0.0497	1.9000e-004	0.0274	1.2000e-004	0.0275	7.2600e-003	1.1000e-004	7.3800e-003		19.2177	19.2177	2.9000e-004		19.2250
Total	**6.9900e-003**	**3.2700e-003**	**0.0497**	**1.9000e-004**	**0.0274**	**1.2000e-004**	**0.0275**	**7.2600e-003**	**1.1000e-004**	**7.3800e-003**		**19.2177**	**19.2177**	**2.9000e-004**		**19.2250**

3.5 Excavator Backhoe Dumptruck - 2029

Unmitigated Construction On-Site

Category	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
	lb/day										lb/day					
Fugitive Dust					0.0000	0.0000	0.0000	0.0000	0.0000	0.0000			0.0000			0.0000
Off-Road	0.2525	1.7624	2.8192	6.9900e-003		0.0703	0.0703		0.0647	0.0647		676.6725	676.6725	0.2189		682.1437
Total	**0.2525**	**1.7624**	**2.8192**	**6.9900e-003**	**0.0000**	**0.0703**	**0.0703**	**0.0000**	**0.0647**	**0.0647**		**676.6725**	**676.6725**	**0.2189**		**682.1437**

Unmitigated Construction Off-Site

Category	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Worker	0.0187	8.7100e-003	0.1326	5.1000e-004	0.0730	3.3000e-004	0.0733	0.0194	3.1000e-004	0.0197		51.2471	51.2471	7.8000e-004		51.2666
Total	**0.0187**	**8.7100e-003**	**0.1326**	**5.1000e-004**	**0.0730**	**3.3000e-004**	**0.0733**	**0.0194**	**3.1000e-004**	**0.0197**		**51.2471**	**51.2471**	**7.8000e-004**		**51.2666**

3.5 Excavator Backhoe Dumptruck - 2029

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Fugitive Dust					0.0000	0.0000	0.0000	0.0000	0.0000	0.0000			0.0000			0.0000
Off-Road	0.2525	1.7624	2.8192	6.9900e-003		0.0703	0.0703		0.0647	0.0647	0.0000	676.6725	676.6725	0.2189		682.1437
Total	**0.2525**	**1.7624**	**2.8192**	**6.9900e-003**	**0.0000**	**0.0703**	**0.0703**	**0.0000**	**0.0647**	**0.0647**	**0.0000**	**676.6725**	**676.6725**	**0.2189**		**682.1437**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Worker	0.0187	8.7100e-003	0.1326	5.1000e-004	0.0730	3.3000e-004	0.0733	0.0194	3.1000e-004	0.0197		51.2471	51.2471	7.8000e-004		51.2666
Total	**0.0187**	**8.7100e-003**	**0.1326**	**5.1000e-004**	**0.0730**	**3.3000e-004**	**0.0733**	**0.0194**	**3.1000e-004**	**0.0197**		**51.2471**	**51.2471**	**7.8000e-004**		**51.2666**

4.0 Operational Detail - Mobile

4.1 Mitigation Measures Mobile

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Mitigated	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Unmitigated	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000

4.2 Trip Summary Information

	Average Daily Trip Rate			Unmitigated	Mitigated
Land Use	Weekday	Saturday	Sunday	Annual VMT	Annual VMT
User Defined Recreational	0.00	0.00	0.00		
Total	0.00	0.00	0.00		

4.3 Trip Type Information

	Miles			Trip %			Trip Purpose %		
Land Use	H-W or C-W	H-S or C-C	H-O or C-NW	H-W or C-W	H-S or C-C	H-O or C-NW	Primary	Diverted	Pass-by
User Defined Recreational	9.50	7.30	7.30	0.00	0.00	0.00	0	0	0

4.4 Fleet Mix

Land Use	LDA	LDT1	LDT2	MDV	LHD1	LHD2	MHD	HHD	OBUS	UBUS	MCY	SBUS	MH
User Defined Recreational	0.623911	0.031449	0.164057	0.095380	0.013597	0.004624	0.015860	0.039066	0.003868	0.001518	0.004990	0.001015	0.000663

5.0 Energy Detail

Historical Energy Use: N

5.1 Mitigation Measures Energy

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
NaturalGas Mitigated	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
NaturalGas Unmitigated	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000

5.2 Energy by Land Use - NaturalGas

Unmitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU/yr	lb/day										lb/day					
User Defined Recreational	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

Mitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU/yr	lb/day										lb/day					
User Defined Recreational	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

6.0 Area Detail

6.1 Mitigation Measures Area

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Mitigated	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Unmitigated	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000		0.0000

6.2 Area by SubCategory

Unmitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	lb/day										lb/day					
Architectural Coating	0.0000					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Consumer Products	0.0000					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Landscaping	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**		**0.0000**

6.2 Area by SubCategory

Mitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	lb/day										lb/day					
Architectural Coating	0.0000					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Consumer Products	0.0000					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Landscaping	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**		**0.0000**

7.0 Water Detail

7.1 Mitigation Measures Water

8.0 Waste Detail

8.1 Mitigation Measures Waste

9.0 Operational Offroad

Equipment Type	Number	Hours/Day	Days/Year	Horse Power	Load Factor	Fuel Type

10.0 Stationary Equipment

Fire Pumps and Emergency Generators

Equipment Type	Number	Hours/Day	Hours/Year	Horse Power	Load Factor	Fuel Type

Boilers

Equipment Type	Number	Heat Input/Day	Heat Input/Year	Boiler Rating	Fuel Type

User Defined Equipment

Equipment Type	Number

11.0 Vegetation

Napa SMP

Napa County, Summer

1.0 Project Characteristics

1.1 Land Usage

Land Uses	Size	Metric	Lot Acreage	Floor Surface Area	Population
User Defined Recreational	0.00	User Defined Unit	0.00	0.00	0

1.2 Other Project Characteristics

Urbanization	Urban	**Wind Speed (m/s)**	3.6	**Precipitation Freq (Days)**	64
Climate Zone	4			**Operational Year**	2020
Utility Company	Pacific Gas & Electric Company				
CO2 Intensity (lb/MWhr)	641.35	**CH4 Intensity (lb/MWhr)**	0.029	**N2O Intensity (lb/MWhr)**	0.006

1.3 User Entered Comments & Non-Default Data

Project Characteristics -

Land Use -

Off-road Equipment - Assumed 1,000 hp chipper

Off-road Equipment - Reflects info from pers comms

Off-road Equipment - Emissions from this phase are accounted for under Trips and VMT

Off-road Equipment - Reflects info from pers comms

Trips and VMT - Reflects info in pers comms

Grading - Reflects pers comms

Construction Phase - Based on PD and feedback

Table Name	Column Name	Default Value	New Value
tblConstructionPhase	NumDays	0.00	93.00
tblConstructionPhase	NumDays	0.00	20.00
tblConstructionPhase	NumDays	0.00	50.00
tblConstructionPhase	NumDays	0.00	10.00
tblOffRoadEquipment	HorsePower	172.00	1,000.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	0.00	1.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	0.00	1.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	0.00	1.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	0.00	1.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	0.00	1.00
tblOffRoadEquipment	PhaseName		Sediment Debris Removal
tblOffRoadEquipment	PhaseName		Sediment Debris Removal
tblOffRoadEquipment	PhaseName		Excavator Backhoe Dumptruck
tblOffRoadEquipment	PhaseName		Sediment Debris Removal
tblOffRoadEquipment	PhaseName		Excavator Backhoe Dumptruck
tblOffRoadEquipment	PhaseName		Chipper
tblOffRoadEquipment	PhaseName		Sediment Debris Removal
tblOffRoadEquipment	UsageHours	8.00	6.00
tblOffRoadEquipment	UsageHours	8.00	2.60

tblTripsAndVMT	HaulingTripLength	20.00	24.00
tblTripsAndVMT	HaulingTripLength	20.00	24.00
tblTripsAndVMT	HaulingTripLength	20.00	24.00
tblTripsAndVMT	HaulingTripLength	20.00	24.00
tblTripsAndVMT	HaulingTripNumber	0.00	20.00
tblTripsAndVMT	VendorTripLength	7.30	34.00
tblTripsAndVMT	VendorTripLength	7.30	34.00
tblTripsAndVMT	VendorTripLength	7.30	34.00
tblTripsAndVMT	VendorTripLength	7.30	34.00
tblTripsAndVMT	VendorTripNumber	0.00	3.00
tblTripsAndVMT	WorkerTripLength	10.80	12.00
tblTripsAndVMT	WorkerTripLength	10.80	12.00
tblTripsAndVMT	WorkerTripLength	10.80	12.00
tblTripsAndVMT	WorkerTripLength	10.80	12.00
tblTripsAndVMT	WorkerTripNumber	0.00	3.00

2.0 Emissions Summary

2.1 Overall Construction (Maximum Daily Emission)

Unmitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	lb/day										lb/day					
2019	1.4980	16.2680	8.2279	0.0186	6.2102	0.7339	6.9441	3.3624	0.6758	4.0381	0.0000	1,875.661 7	1,875.661 7	0.4475	0.0000	1,886.848 1
Maximum	**1.4980**	**16.2680**	**8.2279**	**0.0186**	**6.2102**	**0.7339**	**6.9441**	**3.3624**	**0.6758**	**4.0381**	**0.0000**	**1,875.661 7**	**1,875.661 7**	**0.4475**	**0.0000**	**1,886.848 1**

Mitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	lb/day										lb/day					
2019	1.4980	16.2680	8.2279	0.0186	6.2102	0.7339	6.9441	3.3624	0.6758	4.0381	0.0000	1,875.661 7	1,875.661 7	0.4475	0.0000	1,886.848 1
Maximum	**1.4980**	**16.2680**	**8.2279**	**0.0186**	**6.2102**	**0.7339**	**6.9441**	**3.3624**	**0.6758**	**4.0381**	**0.0000**	**1,875.661 7**	**1,875.661 7**	**0.4475**	**0.0000**	**1,886.848 1**

	ROG	**NOx**	**CO**	**SO2**	**Fugitive PM10**	**Exhaust PM10**	**PM10 Total**	**Fugitive PM2.5**	**Exhaust PM2.5**	**PM2.5 Total**	**Bio- CO2**	**NBio-CO2**	**Total CO2**	**CH4**	**N20**	**CO2e**
Percent Reduction	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

2.2 Overall Operational

Unmitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Area	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Energy	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Mobile	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

Mitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Area	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Energy	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Mobile	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N20	CO2e
Percent Reduction	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

3.0 Construction Detail

Construction Phase

Phase Number	Phase Name	Phase Type	Start Date	End Date	Num Days Week	Num Days	Phase Description
1	On Road	Site Preparation	6/15/2019	10/23/2019	5	93	
2	Sediment Debris Removal	Site Preparation	6/15/2019	7/12/2019	5	20	
3	Chipper	Site Preparation	7/13/2019	9/20/2019	5	50	
4	Excavator Backhoe Dumptruck	Site Preparation	9/21/2019	10/4/2019	5	10	

Acres of Grading (Site Preparation Phase): 0

Acres of Grading (Grading Phase): 0

Acres of Paving: 0

Residential Indoor: 0; Residential Outdoor: 0; Non-Residential Indoor: 0; Non-Residential Outdoor: 0; Striped Parking Area: 0 (Architectural Coating – sqft)

OffRoad Equipment

Phase Name	Offroad Equipment Type	Amount	Usage Hours	Horse Power	Load Factor
On Road	Graders	0	8.00	187	0.41
On Road	Tractors/Loaders/Backhoes	0	6.00	97	0.37
Sediment Debris Removal	Cranes	0	4.00	231	0.29
Sediment Debris Removal	Excavators	1	8.00	158	0.38
Sediment Debris Removal	Forklifts	0	6.00	89	0.20
Sediment Debris Removal	Graders	0	8.00	187	0.41
Sediment Debris Removal	Rubber Tired Dozers	1	8.00	247	0.40
Sediment Debris Removal	Tractors/Loaders/Backhoes	0	8.00	97	0.37
Chipper	Graders	0	8.00	187	0.41
Chipper	Other Construction Equipment	1	8.00	1000	0.42
Chipper	Tractors/Loaders/Backhoes	0	8.00	97	0.37
Excavator Backhoe Dumptruck	Excavators	1	2.60	158	0.38
Excavator Backhoe Dumptruck	Graders	0	8.00	187	0.41
Excavator Backhoe Dumptruck	Off-Highway Trucks	1	2.60	402	0.38
Excavator Backhoe Dumptruck	Tractors/Loaders/Backhoes	1	2.60	97	0.37

Trips and VMT

Phase Name	Offroad Equipment Count	Worker Trip Number	Vendor Trip Number	Hauling Trip Number	Worker Trip Length	Vendor Trip Length	Hauling Trip Length	Worker Vehicle Class	Vendor Vehicle Class	Hauling Vehicle Class
On Road	0	3.00	3.00	0.00	12.00	34.00	24.00	LD_Mix	HDT_Mix	HHDT
Sediment Debris Removal	2	5.00	0.00	20.00	12.00	34.00	24.00	LD_Mix	HDT_Mix	HHDT
Chipper	1	3.00	0.00	0.00	12.00	34.00	24.00	LD_Mix	HDT_Mix	HHDT
Excavator Backhoe Dumptruck	3	8.00	0.00	0.00	12.00	34.00	24.00	LD_Mix	HDT_Mix	HHDT

3.1 Mitigation Measures Construction

3.2 On Road - 2019

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Fugitive Dust					0.0000	0.0000	0.0000	0.0000	0.0000	0.0000			0.0000			0.0000
Off-Road	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**		**0.0000**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.0538	1.1311	0.3056	3.2700e-003	0.0942	0.0138	0.1080	0.0271	0.0132	0.0403		345.1243	345.1243	0.0114		345.4082
Worker	0.0143	9.1800e-003	0.1138	2.8000e-004	0.0274	1.9000e-004	0.0276	7.2600e-003	1.7000e-004	7.4300e-003		27.6057	27.6057	8.5000e-004		27.6270
Total	**0.0682**	**1.1403**	**0.4194**	**3.5500e-003**	**0.1216**	**0.0140**	**0.1356**	**0.0343**	**0.0134**	**0.0477**		**372.7299**	**372.7299**	**0.0122**		**373.0352**

3.2 On Road - 2019

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Fugitive Dust					0.0000	0.0000	0.0000	0.0000	0.0000	0.0000			0.0000			0.0000
Off-Road	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**		**0.0000**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.0538	1.1311	0.3056	3.2700e-003	0.0942	0.0138	0.1080	0.0271	0.0132	0.0403		345.1243	345.1243	0.0114		345.4082
Worker	0.0143	9.1800e-003	0.1138	2.8000e-004	0.0274	1.9000e-004	0.0276	7.2600e-003	1.7000e-004	7.4300e-003		27.6057	27.6057	8.5000e-004		27.6270
Total	**0.0682**	**1.1403**	**0.4194**	**3.5500e-003**	**0.1216**	**0.0140**	**0.1356**	**0.0343**	**0.0134**	**0.0477**		**372.7299**	**372.7299**	**0.0122**		**373.0352**

3.3 Sediment Debris Removal - 2019

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Fugitive Dust					6.0221	0.0000	6.0221	3.3102	0.0000	3.3102			0.0000			0.0000
Off-Road	1.3953	14.7563	7.5473	0.0137		0.7181	0.7181		0.6606	0.6606		1,356.554 1	1,356.554 1	0.4292		1,367.284 0
Total	**1.3953**	**14.7563**	**7.5473**	**0.0137**	**6.0221**	**0.7181**	**6.7402**	**3.3102**	**0.6606**	**3.9709**		**1,356.554 1**	**1,356.554 1**	**0.4292**		**1,367.284 0**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0106	0.3561	0.0715	9.4000e-004	0.0209	1.5200e-003	0.0224	5.7200e-003	1.4600e-003	7.1800e-003		100.3683	100.3683	4.6300e-003		100.4840
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Worker	0.0239	0.0153	0.1897	4.6000e-004	0.0456	3.1000e-004	0.0459	0.0121	2.9000e-004	0.0124		46.0094	46.0094	1.4200e-003		46.0450
Total	**0.0345**	**0.3714**	**0.2612**	**1.4000e-003**	**0.0665**	**1.8300e-003**	**0.0684**	**0.0178**	**1.7500e-003**	**0.0196**		**146.3777**	**146.3777**	**6.0500e-003**		**146.5289**

3.3 Sediment Debris Removal - 2019

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Fugitive Dust					6.0221	0.0000	6.0221	3.3102	0.0000	3.3102			0.0000			0.0000
Off-Road	1.3953	14.7563	7.5473	0.0137		0.7181	0.7181		0.6606	0.6606	0.0000	1,356.5541	1,356.5541	0.4292		1,367.2840
Total	**1.3953**	**14.7563**	**7.5473**	**0.0137**	**6.0221**	**0.7181**	**6.7402**	**3.3102**	**0.6606**	**3.9709**	**0.0000**	**1,356.5541**	**1,356.5541**	**0.4292**		**1,367.2840**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0106	0.3561	0.0715	9.4000e-004	0.0209	1.5200e-003	0.0224	5.7200e-003	1.4600e-003	7.1800e-003		100.3683	100.3683	4.6300e-003		100.4840
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Worker	0.0239	0.0153	0.1897	4.6000e-004	0.0456	3.1000e-004	0.0459	0.0121	2.9000e-004	0.0124		46.0094	46.0094	1.4200e-003		46.0450
Total	**0.0345**	**0.3714**	**0.2612**	**1.4000e-003**	**0.0665**	**1.8300e-003**	**0.0684**	**0.0178**	**1.7500e-003**	**0.0196**		**146.3777**	**146.3777**	**6.0500e-003**		**146.5289**

3.4 Chipper - 2019

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Fugitive Dust					0.0000	0.0000	0.0000	0.0000	0.0000	0.0000			0.0000			0.0000
Off-Road	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**		**0.0000**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Worker	0.0143	9.1800e-003	0.1138	2.8000e-004	0.0274	1.9000e-004	0.0276	7.2600e-003	1.7000e-004	7.4300e-003		27.6057	27.6057	8.5000e-004		27.6270
Total	**0.0143**	**9.1800e-003**	**0.1138**	**2.8000e-004**	**0.0274**	**1.9000e-004**	**0.0276**	**7.2600e-003**	**1.7000e-004**	**7.4300e-003**		**27.6057**	**27.6057**	**8.5000e-004**		**27.6270**

3.4 Chipper - 2019

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Fugitive Dust					0.0000	0.0000	0.0000	0.0000	0.0000	0.0000			0.0000			0.0000
Off-Road	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**		**0.0000**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Worker	0.0143	9.1800e-003	0.1138	2.8000e-004	0.0274	1.9000e-004	0.0276	7.2600e-003	1.7000e-004	7.4300e-003		27.6057	27.6057	8.5000e-004		27.6270
Total	**0.0143**	**9.1800e-003**	**0.1138**	**2.8000e-004**	**0.0274**	**1.9000e-004**	**0.0276**	**7.2600e-003**	**1.7000e-004**	**7.4300e-003**		**27.6057**	**27.6057**	**8.5000e-004**		**27.6270**

3.5 Excavator Backhoe Dumptruck - 2019

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Fugitive Dust					0.0000	0.0000	0.0000	0.0000	0.0000	0.0000			0.0000			0.0000
Off-Road	0.3911	3.9679	3.1079	6.9800e-003		0.1777	0.1777		0.1635	0.1635		691.0797	691.0797	0.2187		696.5459
Total	**0.3911**	**3.9679**	**3.1079**	**6.9800e-003**	**0.0000**	**0.1777**	**0.1777**	**0.0000**	**0.1635**	**0.1635**		**691.0797**	**691.0797**	**0.2187**		**696.5459**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Worker	0.0382	0.0245	0.3035	7.4000e-004	0.0730	5.0000e-004	0.0735	0.0194	4.6000e-004	0.0198		73.6151	73.6151	2.2800e-003		73.6720
Total	**0.0382**	**0.0245**	**0.3035**	**7.4000e-004**	**0.0730**	**5.0000e-004**	**0.0735**	**0.0194**	**4.6000e-004**	**0.0198**		**73.6151**	**73.6151**	**2.2800e-003**		**73.6720**

3.5 Excavator Backhoe Dumptruck - 2019

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Fugitive Dust					0.0000	0.0000	0.0000	0.0000	0.0000	0.0000			0.0000			0.0000
Off-Road	0.3911	3.9679	3.1079	6.9800e-003		0.1777	0.1777		0.1635	0.1635	0.0000	691.0797	691.0797	0.2187		696.5459
Total	**0.3911**	**3.9679**	**3.1079**	**6.9800e-003**	**0.0000**	**0.1777**	**0.1777**	**0.0000**	**0.1635**	**0.1635**	**0.0000**	**691.0797**	**691.0797**	**0.2187**		**696.5459**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Worker	0.0382	0.0245	0.3035	7.4000e-004	0.0730	5.0000e-004	0.0735	0.0194	4.6000e-004	0.0198		73.6151	73.6151	2.2800e-003		73.6720
Total	**0.0382**	**0.0245**	**0.3035**	**7.4000e-004**	**0.0730**	**5.0000e-004**	**0.0735**	**0.0194**	**4.6000e-004**	**0.0198**		**73.6151**	**73.6151**	**2.2800e-003**		**73.6720**

4.0 Operational Detail - Mobile

4.1 Mitigation Measures Mobile

Category	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
	lb/day										lb/day					
Mitigated	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Unmitigated	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000

4.2 Trip Summary Information

	Average Daily Trip Rate			Unmitigated	Mitigated
Land Use	Weekday	Saturday	Sunday	Annual VMT	Annual VMT
User Defined Recreational	0.00	0.00	0.00		
Total	0.00	0.00	0.00		

4.3 Trip Type Information

	Miles			Trip %			Trip Purpose %		
Land Use	H-W or C-W	H-S or C-C	H-O or C-NW	H-W or C-W	H-S or C-C	H-O or C-NW	Primary	Diverted	Pass-by
User Defined Recreational	9.50	7.30	7.30	0.00	0.00	0.00	0	0	0

4.4 Fleet Mix

Land Use	LDA	LDT1	LDT2	MDV	LHD1	LHD2	MHD	HHD	OBUS	UBUS	MCY	SBUS	MH
User Defined Recreational	0.569185	0.038999	0.171806	0.120317	0.026328	0.006551	0.017860	0.035422	0.003826	0.001868	0.005693	0.001021	0.001123

5.0 Energy Detail

Historical Energy Use: N

5.1 Mitigation Measures Energy

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
NaturalGas Mitigated	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
NaturalGas Unmitigated	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000

5.2 Energy by Land Use - NaturalGas

Unmitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU/yr	lb/day										lb/day					
User Defined Recreational	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

Mitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU/yr	lb/day										lb/day					
User Defined Recreational	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

6.0 Area Detail

6.1 Mitigation Measures Area

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Mitigated	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Unmitigated	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000		0.0000

6.2 Area by SubCategory

Unmitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	lb/day										lb/day					
Architectural Coating	0.0000					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Consumer Products	0.0000					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Landscaping	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**		**0.0000**

6.2 Area by SubCategory

Mitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	lb/day										lb/day					
Architectural Coating	0.0000					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Consumer Products	0.0000					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Landscaping	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**		**0.0000**

7.0 Water Detail

7.1 Mitigation Measures Water

8.0 Waste Detail

8.1 Mitigation Measures Waste

9.0 Operational Offroad

Equipment Type	Number	Hours/Day	Days/Year	Horse Power	Load Factor	Fuel Type

10.0 Stationary Equipment

Fire Pumps and Emergency Generators

Equipment Type	Number	Hours/Day	Hours/Year	Horse Power	Load Factor	Fuel Type

Boilers

Equipment Type	Number	Heat Input/Day	Heat Input/Year	Boiler Rating	Fuel Type

User Defined Equipment

Equipment Type	Number

11.0 Vegetation

Napa SMP

Napa County, Annual

1.0 Project Characteristics

1.1 Land Usage

Land Uses	Size	Metric	Lot Acreage	Floor Surface Area	Population
User Defined Recreational	0.00	User Defined Unit	0.00	0.00	0

1.2 Other Project Characteristics

Urbanization	Urban	**Wind Speed (m/s)**	3.6	**Precipitation Freq (Days)**	64
Climate Zone	4			**Operational Year**	2030
Utility Company	Pacific Gas & Electric Company				
CO2 Intensity (lb/MWhr)	641.35	**CH4 Intensity (lb/MWhr)**	0.029	**N2O Intensity (lb/MWhr)**	0.006

1.3 User Entered Comments & Non-Default Data

Project Characteristics -

Land Use -

Construction Phase - Based on pers comms

Off-road Equipment - Assumed 1,000 hp chipper

Off-road Equipment - Reflects info from pers comms

Off-road Equipment - Emissions from this phase are accounted for under Trips and VMT

Off-road Equipment - Reflects info from pers comms

Trips and VMT - Reflects info in pers comms

Grading - Reflects pers comms

Vehicle Emission Factors -

Vehicle Emission Factors -

Vehicle Emission Factors -

Fleet Mix -

Table Name	Column Name	Default Value	New Value
tblConstructionPhase	NumDays	0.00	93.00
tblConstructionPhase	NumDays	0.00	20.00
tblConstructionPhase	NumDays	0.00	50.00
tblConstructionPhase	NumDays	0.00	10.00
tblConstructionPhase	PhaseEndDate	3/30/2029	10/23/2029
tblConstructionPhase	PhaseEndDate	3/30/2029	7/12/2029
tblConstructionPhase	PhaseEndDate	3/30/2029	9/20/2029
tblConstructionPhase	PhaseEndDate	3/30/2029	10/4/2029
tblConstructionPhase	PhaseStartDate	4/1/2029	6/15/2029
tblConstructionPhase	PhaseStartDate	3/31/2029	6/15/2029
tblConstructionPhase	PhaseStartDate	3/31/2029	7/13/2029
tblConstructionPhase	PhaseStartDate	3/31/2029	9/21/2029

tblOffRoadEquipment	HorsePower	172.00	1,000.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	0.00	1.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	0.00	1.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	0.00	1.00
tblOffRoadEquipment	PhaseName		Excavator Backhoe Dumptruck
tblOffRoadEquipment	PhaseName		Excavator Backhoe Dumptruck
tblOffRoadEquipment	PhaseName		Chipper
tblOffRoadEquipment	UsageHours	8.00	6.00
tblOffRoadEquipment	UsageHours	8.00	2.60
tblTripsAndVMT	HaulingTripLength	20.00	24.00
tblTripsAndVMT	HaulingTripLength	20.00	24.00
tblTripsAndVMT	HaulingTripLength	20.00	24.00
tblTripsAndVMT	HaulingTripLength	20.00	24.00
tblTripsAndVMT	HaulingTripNumber	0.00	20.00
tblTripsAndVMT	VendorTripLength	7.30	34.00
tblTripsAndVMT	VendorTripLength	7.30	34.00
tblTripsAndVMT	VendorTripLength	7.30	34.00
tblTripsAndVMT	VendorTripLength	7.30	34.00
tblTripsAndVMT	VendorTripNumber	0.00	3.00
tblTripsAndVMT	WorkerTripLength	10.80	12.00

tblTripsAndVMT	WorkerTripLength	10.80	12.00
tblTripsAndVMT	WorkerTripLength	10.80	12.00
tblTripsAndVMT	WorkerTripLength	10.80	12.00
tblTripsAndVMT	WorkerTripNumber	0.00	3.00

2.0 Emissions Summary

2.1 Overall Construction

Unmitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	tons/yr										MT/yr					
2029	0.0110	0.1112	0.0888	3.4000e-004	0.0673	3.9200e-003	0.0713	0.0351	3.6100e-003	0.0387	0.0000	30.9502	30.9502	5.3500e-003	0.0000	31.0838
Maximum	**0.0110**	**0.1112**	**0.0888**	**3.4000e-004**	**0.0673**	**3.9200e-003**	**0.0713**	**0.0351**	**3.6100e-003**	**0.0387**	**0.0000**	**30.9502**	**30.9502**	**5.3500e-003**	**0.0000**	**31.0838**

Mitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	tons/yr										MT/yr					
2029	0.0110	0.1112	0.0888	3.4000e-004	0.0673	3.9200e-003	0.0713	0.0351	3.6100e-003	0.0387	0.0000	30.9502	30.9502	5.3500e-003	0.0000	31.0838
Maximum	**0.0110**	**0.1112**	**0.0888**	**3.4000e-004**	**0.0673**	**3.9200e-003**	**0.0713**	**0.0351**	**3.6100e-003**	**0.0387**	**0.0000**	**30.9502**	**30.9502**	**5.3500e-003**	**0.0000**	**31.0838**

	ROG	**NOx**	**CO**	**SO2**	**Fugitive PM10**	**Exhaust PM10**	**PM10 Total**	**Fugitive PM2.5**	**Exhaust PM2.5**	**PM2.5 Total**	**Bio- CO2**	**NBio-CO2**	**Total CO2**	**CH4**	**N20**	**CO2e**
Percent Reduction	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

Quarter	Start Date	End Date	Maximum Unmitigated ROG + NOX (tons/quarter)	Maximum Mitigated ROG + NOX (tons/quarter)
1	**4-1-2029**	**6-30-2029**	0.0533	0.0533
2	**7-1-2029**	**9-30-2029**	0.0615	0.0615
		Highest	0.0615	0.0615

2.2 Overall Operational

Unmitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Area	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Energy	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Mobile	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Waste						0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Water						0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

2.2 Overall Operational

Mitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Area	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Energy	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Mobile	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Waste						0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Water						0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N20	CO2e
Percent Reduction	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

3.0 Construction Detail

Construction Phase

Phase Number	Phase Name	Phase Type	Start Date	End Date	Num Days Week	Num Days	Phase Description
1	Sediment Debris Removal	Site Preparation	6/15/2029	7/12/2029	5	20	
2	On Road	Site Preparation	6/15/2029	10/23/2029	5	93	
3	Chipper	Site Preparation	7/13/2029	9/20/2029	5	50	
4	Excavator Backhoe Dumptruck	Site Preparation	9/21/2029	10/4/2029	5	10	

Acres of Grading (Site Preparation Phase): 0

Acres of Grading (Grading Phase): 0

Acres of Paving: 0

Residential Indoor: 0; Residential Outdoor: 0; Non-Residential Indoor: 0; Non-Residential Outdoor: 0; Striped Parking Area: 0 (Architectural Coating – sqft)

OffRoad Equipment

Phase Name	Offroad Equipment Type	Amount	Usage Hours	Horse Power	Load Factor
On Road	Graders	0	8.00	187	0.41
On Road	Tractors/Loaders/Backhoes	0	6.00	97	0.37
Sediment Debris Removal	Cranes	0	4.00	231	0.29
Sediment Debris Removal	Excavators	1	8.00	158	0.38
Sediment Debris Removal	Forklifts	0	6.00	89	0.20
Sediment Debris Removal	Graders	0	8.00	187	0.41
Sediment Debris Removal	Rubber Tired Dozers	1	8.00	247	0.40
Sediment Debris Removal	Tractors/Loaders/Backhoes	0	8.00	97	0.37
Chipper	Graders	0	8.00	187	0.41
Chipper	Other Construction Equipment	1	8.00	1000	0.42
Chipper	Tractors/Loaders/Backhoes	0	8.00	97	0.37
Excavator Backhoe Dumptruck	Excavators	1	2.60	158	0.38
Excavator Backhoe Dumptruck	Graders	0	8.00	187	0.41
Excavator Backhoe Dumptruck	Off-Highway Trucks	1	2.60	402	0.38
Excavator Backhoe Dumptruck	Tractors/Loaders/Backhoes	1	2.60	97	0.37

Trips and VMT

Phase Name	Offroad Equipment Count	Worker Trip Number	Vendor Trip Number	Hauling Trip Number	Worker Trip Length	Vendor Trip Length	Hauling Trip Length	Worker Vehicle Class	Vendor Vehicle Class	Hauling Vehicle Class
On Road	0	3.00	3.00	0.00	12.00	34.00	24.00	LD_Mix	HDT_Mix	HHDT
Sediment Debris Removal	2	5.00	0.00	20.00	12.00	34.00	24.00	LD_Mix	HDT_Mix	HHDT
Chipper	1	3.00	0.00	0.00	12.00	34.00	24.00	LD_Mix	HDT_Mix	HHDT
Excavator Backhoe Dumptruck	3	8.00	0.00	0.00	12.00	34.00	24.00	LD_Mix	HDT_Mix	HHDT

3.1 Mitigation Measures Construction

3.2 Sediment Debris Removal - 2029

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					0.0602	0.0000	0.0602	0.0331	0.0000	0.0331	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	8.1500e-003	0.0785	0.0626	1.4000e-004		3.5000e-003	3.5000e-003		3.2200e-003	3.2200e-003	0.0000	12.0410	12.0410	3.8900e-003	0.0000	12.1384
Total	**8.1500e-003**	**0.0785**	**0.0626**	**1.4000e-004**	**0.0602**	**3.5000e-003**	**0.0637**	**0.0331**	**3.2200e-003**	**0.0363**	**0.0000**	**12.0410**	**12.0410**	**3.8900e-003**	**0.0000**	**12.1384**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	5.0000e-005	1.6100e-003	5.2000e-004	1.0000e-005	2.0000e-004	0.0000	2.1000e-004	6.0000e-005	0.0000	6.0000e-005	0.0000	0.8097	0.8097	4.0000e-005	0.0000	0.8108
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	1.1000e-004	6.0000e-005	7.5000e-004	0.0000	4.4000e-004	0.0000	4.4000e-004	1.2000e-004	0.0000	1.2000e-004	0.0000	0.2716	0.2716	0.0000	0.0000	0.2717
Total	**1.6000e-004**	**1.6700e-003**	**1.2700e-003**	**1.0000e-005**	**6.4000e-004**	**0.0000**	**6.5000e-004**	**1.8000e-004**	**0.0000**	**1.8000e-004**	**0.0000**	**1.0814**	**1.0814**	**4.0000e-005**	**0.0000**	**1.0825**

3.2 Sediment Debris Removal - 2029

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					0.0602	0.0000	0.0602	0.0331	0.0000	0.0331	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	8.1500e-003	0.0785	0.0626	1.4000e-004		3.5000e-003	3.5000e-003		3.2200e-003	3.2200e-003	0.0000	12.0410	12.0410	3.8900e-003	0.0000	12.1384
Total	**8.1500e-003**	**0.0785**	**0.0626**	**1.4000e-004**	**0.0602**	**3.5000e-003**	**0.0637**	**0.0331**	**3.2200e-003**	**0.0363**	**0.0000**	**12.0410**	**12.0410**	**3.8900e-003**	**0.0000**	**12.1384**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	5.0000e-005	1.6100e-003	5.2000e-004	1.0000e-005	2.0000e-004	0.0000	2.1000e-004	6.0000e-005	0.0000	6.0000e-005	0.0000	0.8097	0.8097	4.0000e-005	0.0000	0.8108
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	1.1000e-004	6.0000e-005	7.5000e-004	0.0000	4.4000e-004	0.0000	4.4000e-004	1.2000e-004	0.0000	1.2000e-004	0.0000	0.2716	0.2716	0.0000	0.0000	0.2717
Total	**1.6000e-004**	**1.6700e-003**	**1.2700e-003**	**1.0000e-005**	**6.4000e-004**	**0.0000**	**6.5000e-004**	**1.8000e-004**	**0.0000**	**1.8000e-004**	**0.0000**	**1.0814**	**1.0814**	**4.0000e-005**	**0.0000**	**1.0825**

3.3 On Road - 2029

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	8.6000e-004	0.0219	7.0400e-003	1.4000e-004	4.2500e-003	5.0000e-005	4.2900e-003	1.2300e-003	5.0000e-005	1.2700e-003	0.0000	13.3758	13.3758	3.9000e-004	0.0000	13.3856
Worker	3.1000e-004	1.7000e-004	2.1100e-003	1.0000e-005	1.2200e-003	1.0000e-005	1.2300e-003	3.3000e-004	1.0000e-005	3.3000e-004	0.0000	0.7579	0.7579	1.0000e-005	0.0000	0.7581
Total	**1.1700e-003**	**0.0221**	**9.1500e-003**	**1.5000e-004**	**5.4700e-003**	**6.0000e-005**	**5.5200e-003**	**1.5600e-003**	**6.0000e-005**	**1.6000e-003**	**0.0000**	**14.1337**	**14.1337**	**4.0000e-004**	**0.0000**	**14.1438**

3.3 On Road - 2029

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	8.6000e-004	0.0219	7.0400e-003	1.4000e-004	4.2500e-003	5.0000e-005	4.2900e-003	1.2300e-003	5.0000e-005	1.2700e-003	0.0000	13.3758	13.3758	3.9000e-004	0.0000	13.3856
Worker	3.1000e-004	1.7000e-004	2.1100e-003	1.0000e-005	1.2200e-003	1.0000e-005	1.2300e-003	3.3000e-004	1.0000e-005	3.3000e-004	0.0000	0.7579	0.7579	1.0000e-005	0.0000	0.7581
Total	**1.1700e-003**	**0.0221**	**9.1500e-003**	**1.5000e-004**	**5.4700e-003**	**6.0000e-005**	**5.5200e-003**	**1.5600e-003**	**6.0000e-005**	**1.6000e-003**	**0.0000**	**14.1337**	**14.1337**	**4.0000e-004**	**0.0000**	**14.1438**

3.4 Chipper - 2029

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	1.7000e-004	9.0000e-005	1.1300e-003	0.0000	6.6000e-004	0.0000	6.6000e-004	1.8000e-004	0.0000	1.8000e-004	0.0000	0.4074	0.4074	1.0000e-005	0.0000	0.4076
Total	**1.7000e-004**	**9.0000e-005**	**1.1300e-003**	**0.0000**	**6.6000e-004**	**0.0000**	**6.6000e-004**	**1.8000e-004**	**0.0000**	**1.8000e-004**	**0.0000**	**0.4074**	**0.4074**	**1.0000e-005**	**0.0000**	**0.4076**

3.4 Chipper - 2029

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	1.7000e-004	9.0000e-005	1.1300e-003	0.0000	6.6000e-004	0.0000	6.6000e-004	1.8000e-004	0.0000	1.8000e-004	0.0000	0.4074	0.4074	1.0000e-005	0.0000	0.4076
Total	**1.7000e-004**	**9.0000e-005**	**1.1300e-003**	**0.0000**	**6.6000e-004**	**0.0000**	**6.6000e-004**	**1.8000e-004**	**0.0000**	**1.8000e-004**	**0.0000**	**0.4074**	**0.4074**	**1.0000e-005**	**0.0000**	**0.4076**

3.5 Excavator Backhoe Dumptruck - 2029

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	1.2600e-003	8.8100e-003	0.0141	3.0000e-005		3.5000e-004	3.5000e-004		3.2000e-004	3.2000e-004	0.0000	3.0693	3.0693	9.9000e-004	0.0000	3.0942
Total	**1.2600e-003**	**8.8100e-003**	**0.0141**	**3.0000e-005**	**0.0000**	**3.5000e-004**	**3.5000e-004**	**0.0000**	**3.2000e-004**	**3.2000e-004**	**0.0000**	**3.0693**	**3.0693**	**9.9000e-004**	**0.0000**	**3.0942**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	9.0000e-005	5.0000e-005	6.0000e-004	0.0000	3.5000e-004	0.0000	3.5000e-004	9.0000e-005	0.0000	9.0000e-005	0.0000	0.2173	0.2173	0.0000	0.0000	0.2174
Total	**9.0000e-005**	**5.0000e-005**	**6.0000e-004**	**0.0000**	**3.5000e-004**	**0.0000**	**3.5000e-004**	**9.0000e-005**	**0.0000**	**9.0000e-005**	**0.0000**	**0.2173**	**0.2173**	**0.0000**	**0.0000**	**0.2174**

3.5 Excavator Backhoe Dumptruck - 2029

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	1.2600e-003	8.8100e-003	0.0141	3.0000e-005		3.5000e-004	3.5000e-004		3.2000e-004	3.2000e-004	0.0000	3.0693	3.0693	9.9000e-004	0.0000	3.0942
Total	**1.2600e-003**	**8.8100e-003**	**0.0141**	**3.0000e-005**	**0.0000**	**3.5000e-004**	**3.5000e-004**	**0.0000**	**3.2000e-004**	**3.2000e-004**	**0.0000**	**3.0693**	**3.0693**	**9.9000e-004**	**0.0000**	**3.0942**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	9.0000e-005	5.0000e-005	6.0000e-004	0.0000	3.5000e-004	0.0000	3.5000e-004	9.0000e-005	0.0000	9.0000e-005	0.0000	0.2173	0.2173	0.0000	0.0000	0.2174
Total	**9.0000e-005**	**5.0000e-005**	**6.0000e-004**	**0.0000**	**3.5000e-004**	**0.0000**	**3.5000e-004**	**9.0000e-005**	**0.0000**	**9.0000e-005**	**0.0000**	**0.2173**	**0.2173**	**0.0000**	**0.0000**	**0.2174**

4.0 Operational Detail - Mobile

4.1 Mitigation Measures Mobile

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Mitigated	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Unmitigated	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

4.2 Trip Summary Information

	Average Daily Trip Rate			Unmitigated	Mitigated
Land Use	Weekday	Saturday	Sunday	Annual VMT	Annual VMT
User Defined Recreational	0.00	0.00	0.00		
Total	0.00	0.00	0.00		

4.3 Trip Type Information

	Miles			Trip %			Trip Purpose %		
Land Use	H-W or C-W	H-S or C-C	H-O or C-NW	H-W or C-W	H-S or C-C	H-O or C-NW	Primary	Diverted	Pass-by
User Defined Recreational	9.50	7.30	7.30	0.00	0.00	0.00	0	0	0

4.4 Fleet Mix

Land Use	LDA	LDT1	LDT2	MDV	LHD1	LHD2	MHD	HHD	OBUS	UBUS	MCY	SBUS	MH
User Defined Recreational	0.623911	0.031449	0.164057	0.095380	0.013597	0.004624	0.015860	0.039066	0.003868	0.001518	0.004990	0.001015	0.000663

5.0 Energy Detail

Historical Energy Use: N

5.1 Mitigation Measures Energy

Category	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
	tons/yr										MT/yr					
Electricity Mitigated						0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Electricity Unmitigated						0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
NaturalGas Mitigated	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
NaturalGas Unmitigated	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

5.2 Energy by Land Use - NaturalGas

Unmitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU/yr	tons/yr										MT/yr					
User Defined Recreational	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

Mitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU/yr	tons/yr										MT/yr					
User Defined Recreational	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

5.3 Energy by Land Use - Electricity

Unmitigated

	Electricity Use	Total CO2	CH4	N2O	CO2e
Land Use	kWh/yr	MT/yr			
User Defined Recreational	0	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**

Mitigated

	Electricity Use	Total CO2	CH4	N2O	CO2e
Land Use	kWh/yr	MT/yr			
User Defined Recreational	0	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**

6.0 Area Detail

6.1 Mitigation Measures Area

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Mitigated	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Unmitigated	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

6.2 Area by SubCategory

Unmitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	tons/yr										MT/yr					
Architectural Coating	0.0000					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Consumer Products	0.0000					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Landscaping	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

6.2 Area by SubCategory

Mitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	tons/yr										MT/yr					
Architectural Coating	0.0000					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Consumer Products	0.0000					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Landscaping	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

7.0 Water Detail

7.1 Mitigation Measures Water

	Total CO2	CH4	N2O	CO2e
Category	MT/yr			
Mitigated	0.0000	0.0000	0.0000	0.0000
Unmitigated	0.0000	0.0000	0.0000	0.0000

7.2 Water by Land Use

<u>Unmitigated</u>

	Indoor/Outdoor Use	Total CO2	CH4	N2O	CO2e
Land Use	Mgal	MT/yr			
User Defined Recreational	0 / 0	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**

7.2 Water by Land Use

Mitigated

	Indoor/Outdoor Use	Total CO2	CH4	N2O	CO2e
Land Use	Mgal	MT/yr			
User Defined Recreational	0 / 0	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**

8.0 Waste Detail

8.1 Mitigation Measures Waste

Category/Year

	Total CO2	CH4	N2O	CO2e
	MT/yr			
Mitigated	0.0000	0.0000	0.0000	0.0000
Unmitigated	0.0000	0.0000	0.0000	0.0000

8.2 Waste by Land Use

Unmitigated

	Waste Disposed	Total CO2	CH4	N2O	CO2e
Land Use	tons	MT/yr			
User Defined Recreational	0	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**

Mitigated

	Waste Disposed	Total CO2	CH4	N2O	CO2e
Land Use	tons	MT/yr			
User Defined Recreational	0	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**

9.0 Operational Offroad

Equipment Type	Number	Hours/Day	Days/Year	Horse Power	Load Factor	Fuel Type

10.0 Stationary Equipment

Fire Pumps and Emergency Generators

Equipment Type	Number	Hours/Day	Hours/Year	Horse Power	Load Factor	Fuel Type

Boilers

Equipment Type	Number	Heat Input/Day	Heat Input/Year	Boiler Rating	Fuel Type

User Defined Equipment

Equipment Type	Number

11.0 Vegetation

Napa SMP
Napa County, Annual

1.0 Project Characteristics

1.1 Land Usage

Land Uses	Size	Metric	Lot Acreage	Floor Surface Area	Population
User Defined Recreational	0.00	User Defined Unit	0.00	0.00	0

1.2 Other Project Characteristics

Urbanization	Urban	**Wind Speed (m/s)**	3.6	**Precipitation Freq (Days)**	64
Climate Zone	4			**Operational Year**	2020
Utility Company	Pacific Gas & Electric Company				
CO2 Intensity (lb/MWhr)	641.35	**CH4 Intensity (lb/MWhr)**	0.029	**N2O Intensity (lb/MWhr)**	0.006

1.3 User Entered Comments & Non-Default Data

Project Characteristics -

Land Use -

Off-road Equipment - Assumed 1,000 hp chipper

Off-road Equipment - Reflects info from pers comms

Off-road Equipment - Emissions from this phase are accounted for under Trips and VMT

Off-road Equipment - Reflects info from pers comms

Trips and VMT - Reflects info in pers comms

Grading - Reflects pers comms

Construction Phase - Based on PD and feedback

Table Name	Column Name	Default Value	New Value
tblConstructionPhase	NumDays	0.00	93.00
tblConstructionPhase	NumDays	0.00	20.00
tblConstructionPhase	NumDays	0.00	50.00
tblConstructionPhase	NumDays	0.00	10.00
tblOffRoadEquipment	HorsePower	172.00	1,000.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	0.00	1.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	0.00	1.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	0.00	1.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	0.00	1.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	0.00	1.00
tblOffRoadEquipment	PhaseName		Sediment Debris Removal
tblOffRoadEquipment	PhaseName		Sediment Debris Removal
tblOffRoadEquipment	PhaseName		Excavator Backhoe Dumptruck
tblOffRoadEquipment	PhaseName		Sediment Debris Removal
tblOffRoadEquipment	PhaseName		Excavator Backhoe Dumptruck
tblOffRoadEquipment	PhaseName		Chipper
tblOffRoadEquipment	PhaseName		Sediment Debris Removal
tblOffRoadEquipment	UsageHours	8.00	6.00
tblOffRoadEquipment	UsageHours	8.00	2.60

tblTripsAndVMT	HaulingTripLength	20.00	24.00
tblTripsAndVMT	HaulingTripLength	20.00	24.00
tblTripsAndVMT	HaulingTripLength	20.00	24.00
tblTripsAndVMT	HaulingTripLength	20.00	24.00
tblTripsAndVMT	HaulingTripNumber	0.00	20.00
tblTripsAndVMT	VendorTripLength	7.30	34.00
tblTripsAndVMT	VendorTripLength	7.30	34.00
tblTripsAndVMT	VendorTripLength	7.30	34.00
tblTripsAndVMT	VendorTripLength	7.30	34.00
tblTripsAndVMT	VendorTripNumber	0.00	3.00
tblTripsAndVMT	WorkerTripLength	10.80	12.00
tblTripsAndVMT	WorkerTripLength	10.80	12.00
tblTripsAndVMT	WorkerTripLength	10.80	12.00
tblTripsAndVMT	WorkerTripLength	10.80	12.00
tblTripsAndVMT	WorkerTripNumber	0.00	3.00

2.0 Emissions Summary

2.1 Overall Construction

Unmitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	tons/yr										MT/yr					
2019	0.0199	0.2265	0.1169	3.6000e-004	0.0673	8.7500e-003	0.0761	0.0351	8.0700e-003	0.0432	0.0000	33.2464	33.2464	5.4900e-003	0.0000	33.3836
Maximum	**0.0199**	**0.2265**	**0.1169**	**3.6000e-004**	**0.0673**	**8.7500e-003**	**0.0761**	**0.0351**	**8.0700e-003**	**0.0432**	**0.0000**	**33.2464**	**33.2464**	**5.4900e-003**	**0.0000**	**33.3836**

Mitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	tons/yr										MT/yr					
2019	0.0199	0.2265	0.1169	3.6000e-004	0.0673	8.7500e-003	0.0761	0.0351	8.0700e-003	0.0432	0.0000	33.2464	33.2464	5.4900e-003	0.0000	33.3836
Maximum	**0.0199**	**0.2265**	**0.1169**	**3.6000e-004**	**0.0673**	**8.7500e-003**	**0.0761**	**0.0351**	**8.0700e-003**	**0.0432**	**0.0000**	**33.2464**	**33.2464**	**5.4900e-003**	**0.0000**	**33.3836**

	ROG	**NOx**	**CO**	**SO2**	**Fugitive PM10**	**Exhaust PM10**	**PM10 Total**	**Fugitive PM2.5**	**Exhaust PM2.5**	**PM2.5 Total**	**Bio- CO2**	**NBio-CO2**	**Total CO2**	**CH4**	**N20**	**CO2e**
Percent Reduction	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

Quarter	Start Date	End Date	Maximum Unmitigated ROG + NOX (tons/quarter)	Maximum Mitigated ROG + NOX (tons/quarter)
1	**4-1-2019**	**6-30-2019**	0.1015	0.1015
2	**7-1-2019**	**9-30-2019**	0.1270	0.1270
		Highest	0.1270	0.1270

2.2 Overall Operational

Unmitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Area	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Energy	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Mobile	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Waste						0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Water						0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

2.2 Overall Operational

Mitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Area	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Energy	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Mobile	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Waste						0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Water						0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

	ROG	**NOx**	**CO**	**SO2**	**Fugitive PM10**	**Exhaust PM10**	**PM10 Total**	**Fugitive PM2.5**	**Exhaust PM2.5**	**PM2.5 Total**	**Bio- CO2**	**NBio-CO2**	**Total CO2**	**CH4**	**N20**	**CO2e**
Percent Reduction	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

3.0 Construction Detail

Construction Phase

Phase Number	Phase Name	Phase Type	Start Date	End Date	Num Days Week	Num Days	Phase Description
1	On Road	Site Preparation	6/15/2019	10/23/2019	5	93	
2	Sediment Debris Removal	Site Preparation	6/15/2019	7/12/2019	5	20	
3	Chipper	Site Preparation	7/13/2019	9/20/2019	5	50	
4	Excavator Backhoe Dumptruck	Site Preparation	9/21/2019	10/4/2019	5	10	

Acres of Grading (Site Preparation Phase): 0

Acres of Grading (Grading Phase): 0

Acres of Paving: 0

Residential Indoor: 0; Residential Outdoor: 0; Non-Residential Indoor: 0; Non-Residential Outdoor: 0; Striped Parking Area: 0 (Architectural Coating – sqft)

OffRoad Equipment

Phase Name	Offroad Equipment Type	Amount	Usage Hours	Horse Power	Load Factor
On Road	Graders	0	8.00	187	0.41
On Road	Tractors/Loaders/Backhoes	0	6.00	97	0.37
Sediment Debris Removal	Cranes	0	4.00	231	0.29
Sediment Debris Removal	Excavators	1	8.00	158	0.38
Sediment Debris Removal	Forklifts	0	6.00	89	0.20
Sediment Debris Removal	Graders	0	8.00	187	0.41
Sediment Debris Removal	Rubber Tired Dozers	1	8.00	247	0.40
Sediment Debris Removal	Tractors/Loaders/Backhoes	0	8.00	97	0.37
Chipper	Graders	0	8.00	187	0.41
Chipper	Other Construction Equipment	1	8.00	1000	0.42
Chipper	Tractors/Loaders/Backhoes	0	8.00	97	0.37
Excavator Backhoe Dumptruck	Excavators	1	2.60	158	0.38
Excavator Backhoe Dumptruck	Graders	0	8.00	187	0.41
Excavator Backhoe Dumptruck	Off-Highway Trucks	1	2.60	402	0.38
Excavator Backhoe Dumptruck	Tractors/Loaders/Backhoes	1	2.60	97	0.37

Trips and VMT

Phase Name	Offroad Equipment Count	Worker Trip Number	Vendor Trip Number	Hauling Trip Number	Worker Trip Length	Vendor Trip Length	Hauling Trip Length	Worker Vehicle Class	Vendor Vehicle Class	Hauling Vehicle Class
On Road	0	3.00	3.00	0.00	12.00	34.00	24.00	LD_Mix	HDT_Mix	HHDT
Sediment Debris Removal	2	5.00	0.00	20.00	12.00	34.00	24.00	LD_Mix	HDT_Mix	HHDT
Chipper	1	3.00	0.00	0.00	12.00	34.00	24.00	LD_Mix	HDT_Mix	HHDT
Excavator Backhoe Dumptruck	3	8.00	0.00	0.00	12.00	34.00	24.00	LD_Mix	HDT_Mix	HHDT

3.1 Mitigation Measures Construction

3.2 On Road - 2019

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	2.5200e-003	0.0544	0.0144	1.5000e-004	4.2400e-003	6.4000e-004	4.8800e-003	1.2300e-003	6.2000e-004	1.8400e-003	0.0000	14.5229	14.5229	4.8000e-004	0.0000	14.5350
Worker	6.4000e-004	4.9000e-004	4.9200e-003	1.0000e-005	1.2200e-003	1.0000e-005	1.2300e-003	3.3000e-004	1.0000e-005	3.3000e-004	0.0000	1.0889	1.0889	3.0000e-005	0.0000	1.0897
Total	**3.1600e-003**	**0.0549**	**0.0193**	**1.6000e-004**	**5.4600e-003**	**6.5000e-004**	**6.1100e-003**	**1.5600e-003**	**6.3000e-004**	**2.1700e-003**	**0.0000**	**15.6118**	**15.6118**	**5.1000e-004**	**0.0000**	**15.6247**

3.2 On Road - 2019

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	2.5200e-003	0.0544	0.0144	1.5000e-004	4.2400e-003	6.4000e-004	4.8800e-003	1.2300e-003	6.2000e-004	1.8400e-003	0.0000	14.5229	14.5229	4.8000e-004	0.0000	14.5350
Worker	6.4000e-004	4.9000e-004	4.9200e-003	1.0000e-005	1.2200e-003	1.0000e-005	1.2300e-003	3.3000e-004	1.0000e-005	3.3000e-004	0.0000	1.0889	1.0889	3.0000e-005	0.0000	1.0897
Total	**3.1600e-003**	**0.0549**	**0.0193**	**1.6000e-004**	**5.4600e-003**	**6.5000e-004**	**6.1100e-003**	**1.5600e-003**	**6.3000e-004**	**2.1700e-003**	**0.0000**	**15.6118**	**15.6118**	**5.1000e-004**	**0.0000**	**15.6247**

3.3 Sediment Debris Removal - 2019

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					0.0602	0.0000	0.0602	0.0331	0.0000	0.0331	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	0.0140	0.1476	0.0755	1.4000e-004		7.1800e-003	7.1800e-003		6.6100e-003	6.6100e-003	0.0000	12.3065	12.3065	3.8900e-003	0.0000	12.4038
Total	**0.0140**	**0.1476**	**0.0755**	**1.4000e-004**	**0.0602**	**7.1800e-003**	**0.0674**	**0.0331**	**6.6100e-003**	**0.0397**	**0.0000**	**12.3065**	**12.3065**	**3.8900e-003**	**0.0000**	**12.4038**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	1.1000e-004	3.6500e-003	7.3000e-004	1.0000e-005	2.0000e-004	2.0000e-005	2.2000e-004	6.0000e-005	1.0000e-005	7.0000e-005	0.0000	0.9056	0.9056	4.0000e-005	0.0000	0.9067
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	2.3000e-004	1.7000e-004	1.7600e-003	0.0000	4.4000e-004	0.0000	4.4000e-004	1.2000e-004	0.0000	1.2000e-004	0.0000	0.3903	0.3903	1.0000e-005	0.0000	0.3906
Total	**3.4000e-004**	**3.8200e-003**	**2.4900e-003**	**1.0000e-005**	**6.4000e-004**	**2.0000e-005**	**6.6000e-004**	**1.8000e-004**	**1.0000e-005**	**1.9000e-004**	**0.0000**	**1.2959**	**1.2959**	**5.0000e-005**	**0.0000**	**1.2972**

3.3 Sediment Debris Removal - 2019

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					0.0602	0.0000	0.0602	0.0331	0.0000	0.0331	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	0.0140	0.1476	0.0755	1.4000e-004		7.1800e-003	7.1800e-003		6.6100e-003	6.6100e-003	0.0000	12.3064	12.3064	3.8900e-003	0.0000	12.4038
Total	**0.0140**	**0.1476**	**0.0755**	**1.4000e-004**	**0.0602**	**7.1800e-003**	**0.0674**	**0.0331**	**6.6100e-003**	**0.0397**	**0.0000**	**12.3064**	**12.3064**	**3.8900e-003**	**0.0000**	**12.4038**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	1.1000e-004	3.6500e-003	7.3000e-004	1.0000e-005	2.0000e-004	2.0000e-005	2.2000e-004	6.0000e-005	1.0000e-005	7.0000e-005	0.0000	0.9056	0.9056	4.0000e-005	0.0000	0.9067
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	2.3000e-004	1.7000e-004	1.7600e-003	0.0000	4.4000e-004	0.0000	4.4000e-004	1.2000e-004	0.0000	1.2000e-004	0.0000	0.3903	0.3903	1.0000e-005	0.0000	0.3906
Total	**3.4000e-004**	**3.8200e-003**	**2.4900e-003**	**1.0000e-005**	**6.4000e-004**	**2.0000e-005**	**6.6000e-004**	**1.8000e-004**	**1.0000e-005**	**1.9000e-004**	**0.0000**	**1.2959**	**1.2959**	**5.0000e-005**	**0.0000**	**1.2972**

3.4 Chipper - 2019

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	3.4000e-004	2.6000e-004	2.6500e-003	1.0000e-005	6.6000e-004	0.0000	6.6000e-004	1.8000e-004	0.0000	1.8000e-004	0.0000	0.5854	0.5854	2.0000e-005	0.0000	0.5859
Total	**3.4000e-004**	**2.6000e-004**	**2.6500e-003**	**1.0000e-005**	**6.6000e-004**	**0.0000**	**6.6000e-004**	**1.8000e-004**	**0.0000**	**1.8000e-004**	**0.0000**	**0.5854**	**0.5854**	**2.0000e-005**	**0.0000**	**0.5859**

3.4 Chipper - 2019

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	3.4000e-004	2.6000e-004	2.6500e-003	1.0000e-005	6.6000e-004	0.0000	6.6000e-004	1.8000e-004	0.0000	1.8000e-004	0.0000	0.5854	0.5854	2.0000e-005	0.0000	0.5859
Total	**3.4000e-004**	**2.6000e-004**	**2.6500e-003**	**1.0000e-005**	**6.6000e-004**	**0.0000**	**6.6000e-004**	**1.8000e-004**	**0.0000**	**1.8000e-004**	**0.0000**	**0.5854**	**0.5854**	**2.0000e-005**	**0.0000**	**0.5859**

3.5 Excavator Backhoe Dumptruck - 2019

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	1.9600e-003	0.0198	0.0155	3.0000e-005		8.9000e-004	8.9000e-004		8.2000e-004	8.2000e-004	0.0000	3.1347	3.1347	9.9000e-004	0.0000	3.1595
Total	**1.9600e-003**	**0.0198**	**0.0155**	**3.0000e-005**	**0.0000**	**8.9000e-004**	**8.9000e-004**	**0.0000**	**8.2000e-004**	**8.2000e-004**	**0.0000**	**3.1347**	**3.1347**	**9.9000e-004**	**0.0000**	**3.1595**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	1.8000e-004	1.4000e-004	1.4100e-003	0.0000	3.5000e-004	0.0000	3.5000e-004	9.0000e-005	0.0000	1.0000e-004	0.0000	0.3122	0.3122	1.0000e-005	0.0000	0.3125
Total	**1.8000e-004**	**1.4000e-004**	**1.4100e-003**	**0.0000**	**3.5000e-004**	**0.0000**	**3.5000e-004**	**9.0000e-005**	**0.0000**	**1.0000e-004**	**0.0000**	**0.3122**	**0.3122**	**1.0000e-005**	**0.0000**	**0.3125**

3.5 Excavator Backhoe Dumptruck - 2019

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	1.9600e-003	0.0198	0.0155	3.0000e-005		8.9000e-004	8.9000e-004		8.2000e-004	8.2000e-004	0.0000	3.1347	3.1347	9.9000e-004	0.0000	3.1595
Total	**1.9600e-003**	**0.0198**	**0.0155**	**3.0000e-005**	**0.0000**	**8.9000e-004**	**8.9000e-004**	**0.0000**	**8.2000e-004**	**8.2000e-004**	**0.0000**	**3.1347**	**3.1347**	**9.9000e-004**	**0.0000**	**3.1595**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	1.8000e-004	1.4000e-004	1.4100e-003	0.0000	3.5000e-004	0.0000	3.5000e-004	9.0000e-005	0.0000	1.0000e-004	0.0000	0.3122	0.3122	1.0000e-005	0.0000	0.3125
Total	**1.8000e-004**	**1.4000e-004**	**1.4100e-003**	**0.0000**	**3.5000e-004**	**0.0000**	**3.5000e-004**	**9.0000e-005**	**0.0000**	**1.0000e-004**	**0.0000**	**0.3122**	**0.3122**	**1.0000e-005**	**0.0000**	**0.3125**

4.0 Operational Detail - Mobile

4.1 Mitigation Measures Mobile

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Mitigated	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Unmitigated	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

4.2 Trip Summary Information

	Average Daily Trip Rate			Unmitigated	Mitigated
Land Use	Weekday	Saturday	Sunday	Annual VMT	Annual VMT
User Defined Recreational	0.00	0.00	0.00		
Total	0.00	0.00	0.00		

4.3 Trip Type Information

	Miles			Trip %			Trip Purpose %		
Land Use	H-W or C-W	H-S or C-C	H-O or C-NW	H-W or C-W	H-S or C-C	H-O or C-NW	Primary	Diverted	Pass-by
User Defined Recreational	9.50	7.30	7.30	0.00	0.00	0.00	0	0	0

4.4 Fleet Mix

Land Use	LDA	LDT1	LDT2	MDV	LHD1	LHD2	MHD	HHD	OBUS	UBUS	MCY	SBUS	MH
User Defined Recreational	0.569185	0.038999	0.171806	0.120317	0.026328	0.006551	0.017860	0.035422	0.003826	0.001868	0.005693	0.001021	0.001123

5.0 Energy Detail

Historical Energy Use: N

5.1 Mitigation Measures Energy

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Electricity Mitigated						0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Electricity Unmitigated						0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
NaturalGas Mitigated	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
NaturalGas Unmitigated	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

5.2 Energy by Land Use - NaturalGas

Unmitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU/yr	tons/yr										MT/yr					
User Defined Recreational	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

Mitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU/yr	tons/yr										MT/yr					
User Defined Recreational	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

5.3 Energy by Land Use - Electricity

Unmitigated

	Electricity Use	Total CO2	CH4	N2O	CO2e
Land Use	kWh/yr	MT/yr			
User Defined Recreational	0	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**

Mitigated

	Electricity Use	Total CO2	CH4	N2O	CO2e
Land Use	kWh/yr	MT/yr			
User Defined Recreational	0	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**

6.0 Area Detail

6.1 Mitigation Measures Area

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Mitigated	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Unmitigated	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

6.2 Area by SubCategory

Unmitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	tons/yr										MT/yr					
Architectural Coating	0.0000					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Consumer Products	0.0000					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Landscaping	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

6.2 Area by SubCategory

Mitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	tons/yr										MT/yr					
Architectural Coating	0.0000					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Consumer Products	0.0000					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Landscaping	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

7.0 Water Detail

7.1 Mitigation Measures Water

	Total CO2	CH4	N2O	CO2e
Category	MT/yr			
Mitigated	0.0000	0.0000	0.0000	0.0000
Unmitigated	0.0000	0.0000	0.0000	0.0000

7.2 Water by Land Use

Unmitigated

	Indoor/Outdoor Use	Total CO2	CH4	N2O	CO2e
Land Use	Mgal	MT/yr			
User Defined Recreational	0 / 0	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**

7.2 Water by Land Use

Mitigated

	Indoor/Outdoor Use	Total CO2	CH4	N2O	CO2e
Land Use	Mgal	MT/yr			
User Defined Recreational	0 / 0	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**

8.0 Waste Detail

8.1 Mitigation Measures Waste

Category/Year

	Total CO2	CH4	N2O	CO2e
	MT/yr			
Mitigated	0.0000	0.0000	0.0000	0.0000
Unmitigated	0.0000	0.0000	0.0000	0.0000

8.2 Waste by Land Use

Unmitigated

	Waste Disposed	Total CO2	CH4	N2O	CO2e
Land Use	tons	MT/yr			
User Defined Recreational	0	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**

Mitigated

	Waste Disposed	Total CO2	CH4	N2O	CO2e
Land Use	tons	MT/yr			
User Defined Recreational	0	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**

9.0 Operational Offroad

Equipment Type	Number	Hours/Day	Days/Year	Horse Power	Load Factor	Fuel Type

10.0 Stationary Equipment

Fire Pumps and Emergency Generators

Equipment Type	Number	Hours/Day	Hours/Year	Horse Power	Load Factor	Fuel Type

Boilers

Equipment Type	Number	Heat Input/Day	Heat Input/Year	Boiler Rating	Fuel Type

User Defined Equipment

Equipment Type	Number

11.0 Vegetation

Appendix C

U.S. Fish and Wildlife Service List of Federal Endangered and Threatened Species

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Sacramento Fish And Wildlife Office
Federal Building
2800 Cottage Way, Room W-2605
Sacramento, CA 95825-1846
Phone: (916) 414-6600 Fax: (916) 414-6713

In Reply Refer To: August 13, 2018
Consultation Code: 08ESMF00-2018-SLI-2974
Event Code: 08ESMF00-2018-E-08805
Project Name: Napa County Stream Maintenance Program Update

Subject: List of threatened and endangered species that may occur in your proposed project location, and/or may be affected by your proposed project

To Whom It May Concern:

The enclosed species list identifies threatened, endangered, proposed and candidate species, as well as proposed and final designated critical habitat, under the jurisdiction of the U.S. Fish and Wildlife Service (Service) that may occur within the boundary of your proposed project and/or may be affected by your proposed project. The species list fulfills the requirements of the Service under section 7(c) of the Endangered Species Act (Act) of 1973, as amended (16 U.S.C. 1531 *et seq.*).

Please follow the link below to see if your proposed project has the potential to affect other species or their habitats under the jurisdiction of the National Marine Fisheries Service:

http://www.nwr.noaa.gov/protected_species/species_list/species_lists.html

New information based on updated surveys, changes in the abundance and distribution of species, changed habitat conditions, or other factors could change this list. Please feel free to contact us if you need more current information or assistance regarding the potential impacts to federally proposed, listed, and candidate species and federally designated and proposed critical habitat. Please note that under 50 CFR 402.12(e) of the regulations implementing section 7 of the Act, the accuracy of this species list should be verified after 90 days. This verification can be completed formally or informally as desired. The Service recommends that verification be completed by visiting the ECOS-IPaC website at regular intervals during project planning and implementation for updates to species lists and information. An updated list may be requested through the ECOS-IPaC system by completing the same process used to receive the enclosed list.

The purpose of the Act is to provide a means whereby threatened and endangered species and the ecosystems upon which they depend may be conserved. Under sections 7(a)(1) and 7(a)(2) of the Act and its implementing regulations (50 CFR 402 *et seq.*), Federal agencies are required to utilize their authorities to carry out programs for the conservation of threatened and endangered species and to determine whether projects may affect threatened and endangered species and/or designated critical habitat.

A Biological Assessment is required for construction projects (or other undertakings having similar physical impacts) that are major Federal actions significantly affecting the quality of the human environment as defined in the National Environmental Policy Act (42 U.S.C. 4332(2)(c)). For projects other than major construction activities, the Service suggests that a biological evaluation similar to a Biological Assessment be prepared to determine whether the project may affect listed or proposed species and/or designated or proposed critical habitat. Recommended contents of a Biological Assessment are described at 50 CFR 402.12.

If a Federal agency determines, based on the Biological Assessment or biological evaluation, that listed species and/or designated critical habitat may be affected by the proposed project, the agency is required to consult with the Service pursuant to 50 CFR 402. In addition, the Service recommends that candidate species, proposed species and proposed critical habitat be addressed within the consultation. More information on the regulations and procedures for section 7 consultation, including the role of permit or license applicants, can be found in the "Endangered Species Consultation Handbook" at:

http://www.fws.gov/endangered/esa-library/pdf/TOC-GLOS.PDF

Please be aware that bald and golden eagles are protected under the Bald and Golden Eagle Protection Act (16 U.S.C. 668 *et seq.*), and projects affecting these species may require development of an eagle conservation plan (http://www.fws.gov/windenergy/eagle_guidance.html). Additionally, wind energy projects should follow the wind energy guidelines (http://www.fws.gov/windenergy/) for minimizing impacts to migratory birds and bats.

Guidance for minimizing impacts to migratory birds for projects including communications towers (e.g., cellular, digital television, radio, and emergency broadcast) can be found at: http://www.fws.gov/migratorybirds/CurrentBirdIssues/Hazards/towers/towers.htm; http://www.towerkill.com; and http://www.fws.gov/migratorybirds/CurrentBirdIssues/Hazards/towers/comtow.html.

We appreciate your concern for threatened and endangered species. The Service encourages Federal agencies to include conservation of threatened and endangered species into their project planning to further the purposes of the Act. Please include the Consultation Tracking Number in the header of this letter with any request for consultation or correspondence about your project that you submit to our office.

Attachment(s):

- Official Species List

Official Species List

This list is provided pursuant to Section 7 of the Endangered Species Act, and fulfills the requirement for Federal agencies to "request of the Secretary of the Interior information whether any species which is listed or proposed to be listed may be present in the area of a proposed action".

This species list is provided by:

Sacramento Fish And Wildlife Office
Federal Building
2800 Cottage Way, Room W-2605
Sacramento, CA 95825-1846
(916) 414-6600

This project's location is within the jurisdiction of multiple offices. Expect additional species list documents from the following office, and expect that the species and critical habitats in each document reflect only those that fall in the office's jurisdiction:

San Francisco Bay-Delta Fish And Wildlife
650 Capitol Mall
Suite 8-300
Sacramento, CA 95814
(916) 930-5603

Project Summary

Consultation Code: 08ESMF00-2018-SLI-2974

Event Code: 08ESMF00-2018-E-08805

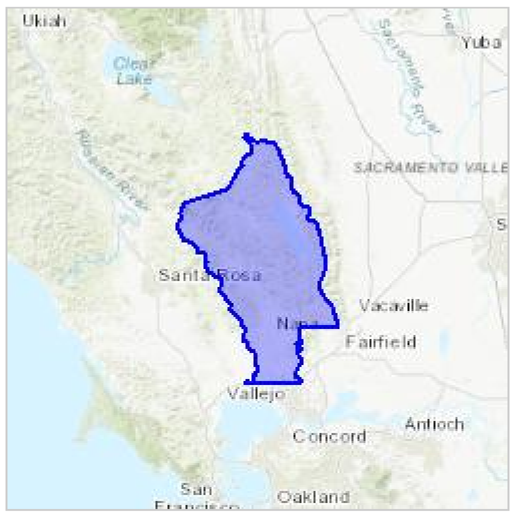
Project Name: Napa County Stream Maintenance Program Update

Project Type: STREAM / WATERBODY / CANALS / LEVEES / DIKES

Project Description: Habitat restoration, flood control, watershed management

Project Location:

Approximate location of the project can be viewed in Google Maps: https://www.google.com/maps/place/38.509486511367115N122.32604207025409W



Counties: Napa, CA

Endangered Species Act Species

There is a total of 36 threatened, endangered, or candidate species on this species list.

Species on this list should be considered in an effects analysis for your project and could include species that exist in another geographic area. For example, certain fish may appear on the species list because a project could affect downstream species.

IPaC does not display listed species or critical habitats under the sole jurisdiction of NOAA Fisheries[1], as USFWS does not have the authority to speak on behalf of NOAA and the Department of Commerce.

See the "Critical habitats" section below for those critical habitats that lie wholly or partially within your project area under this office's jurisdiction. Please contact the designated FWS office if you have questions.

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1. NOAA Fisheries, also known as the National Marine Fisheries Service (NMFS), is an office of the National Oceanic and Atmospheric Administration within the Department of Commerce.

Mammals

NAME	STATUS
Salt Marsh Harvest Mouse *Reithrodontomys raviventris* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/613	Endangered

Birds

NAME	STATUS
California Clapper Rail *Rallus longirostris obsoletus* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/4240	Endangered
California Least Tern *Sterna antillarum browni* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/8104	Endangered
Northern Spotted Owl *Strix occidentalis caurina* There is **final** critical habitat for this species. Your location overlaps the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/1123	Threatened
Western Snowy Plover *Charadrius nivosus nivosus* Population: Pacific Coast population DPS-U.S.A. (CA, OR, WA), Mexico (within 50 miles of Pacific coast) There is **final** critical habitat for this species. Your location overlaps the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/8035	Threatened

Reptiles

NAME	STATUS
Giant Garter Snake *Thamnophis gigas* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/4482	Threatened
Green Sea Turtle *Chelonia mydas* Population: East Pacific DPS No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/6199	Threatened

Amphibians

NAME	STATUS
California Red-legged Frog *Rana draytonii* There is **final** critical habitat for this species. Your location overlaps the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/2891	Threatened
California Tiger Salamander *Ambystoma californiense* Population: U.S.A. (Central CA DPS) There is **final** critical habitat for this species. Your location is outside the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/2076	Threatened

Fishes

NAME	STATUS
Delta Smelt *Hypomesus transpacificus* There is **final** critical habitat for this species. Your location is outside the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/321	Threatened
Tidewater Goby *Eucyclogobius newberryi* There is **final** critical habitat for this species. Your location is outside the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/57	Endangered

Insects

NAME	STATUS
Callippe Silverspot Butterfly *Speyeria callippe callippe* There is **proposed** critical habitat for this species. The location of the critical habitat is not available. Species profile: https://ecos.fws.gov/ecp/species/3779	Endangered
Delta Green Ground Beetle *Elaphrus viridis* There is **final** critical habitat for this species. Your location is outside the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/2319	Threatened
Myrtle's Silverspot Butterfly *Speyeria zerene myrtleae* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/6929	Endangered
San Bruno Elfin Butterfly *Callophrys mossii bayensis* There is **proposed** critical habitat for this species. The location of the critical habitat is not available. Species profile: https://ecos.fws.gov/ecp/species/3394	Endangered
Valley Elderberry Longhorn Beetle *Desmocerus californicus dimorphus* There is **final** critical habitat for this species. Your location is outside the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/7850 Habitat assessment guidelines: https://ecos.fws.gov/ipac/guideline/assessment/population/436/office/11420.pdf	Threatened

Crustaceans

NAME	STATUS
California Freshwater Shrimp *Syncaris pacifica* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/7903	Endangered
Conservancy Fairy Shrimp *Branchinecta conservatio* There is **final** critical habitat for this species. Your location is outside the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/8246	Endangered
Vernal Pool Fairy Shrimp *Branchinecta lynchi* There is **final** critical habitat for this species. Your location overlaps the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/498	Threatened
Vernal Pool Tadpole Shrimp *Lepidurus packardi* There is **final** critical habitat for this species. Your location is outside the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/2246	Endangered

Flowering Plants

NAME	STATUS
Burke's Goldfields *Lasthenia burkei* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/4338	Endangered
Calistoga Allocarya *Plagiobothrys strictus* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/6161	Endangered
Clara Hunt's Milk-vetch *Astragalus clarianus* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/3300	Endangered
Contra Costa Goldfields *Lasthenia conjugens* There is **final** critical habitat for this species. Your location overlaps the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/7058	Endangered
Few-flowered Navarretia *Navarretia leucocephala ssp. pauciflora (=N. pauciflora)* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/8242	Endangered
Keck's Checker-mallow *Sidalcea keckii* There is **final** critical habitat for this species. Your location is outside the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/5704	Endangered
Kenwood Marsh Checker-mallow *Sidalcea oregana ssp. valida* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/1622	Endangered
Loch Lomond Coyote Thistle *Eryngium constancei* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/5106	Endangered
Many-flowered Navarretia *Navarretia leucocephala ssp. plieantha* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/2491	Endangered
Napa Bluegrass *Poa napensis* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/2266	Endangered
Sebastopol Meadowfoam *Limnanthes vinculans* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/404	Endangered
Showy Indian Clover *Trifolium amoenum*	Endangered

NAME	STATUS
No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/6459	
Soft Bird's-beak *Cordylanthus mollis ssp. mollis* There is **final** critical habitat for this species. Your location overlaps the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/8541	Endangered
Sonoma Alopecurus *Alopecurus aequalis var. sonomensis* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/557	Endangered
Sonoma Sunshine *Blennosperma bakeri* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/1260	Endangered
Tiburon Paintbrush *Castilleja affinis ssp. neglecta* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/2687	Endangered

Critical habitats

There are 6 critical habitats wholly or partially within your project area under this office's jurisdiction.

NAME	STATUS
California Red-legged Frog *Rana draytonii* https://ecos.fws.gov/ecp/species/2891#crithab	Final
Contra Costa Goldfields *Lasthenia conjugens* https://ecos.fws.gov/ecp/species/7058#crithab	Final
Northern Spotted Owl *Strix occidentalis caurina* https://ecos.fws.gov/ecp/species/1123#crithab	Final
Soft Bird's-beak *Cordylanthus mollis ssp. mollis* https://ecos.fws.gov/ecp/species/8541#crithab	Final
Vernal Pool Fairy Shrimp *Branchinecta lynchi* https://ecos.fws.gov/ecp/species/498#crithab	Final
Western Snowy Plover *Charadrius nivosus nivosus* https://ecos.fws.gov/ecp/species/8035#crithab	Final

United States Department of the Interior

FISH AND WILDLIFE SERVICE
San Francisco Bay-Delta Fish And Wildlife
650 Capitol Mall
Suite 8-300
Sacramento, CA 95814
Phone: (916) 930-5603 Fax: (916) 930-5654
http://kim_squires@fws.gov

In Reply Refer To: August 13, 2018
Consultation Code: 08FBDT00-2018-SLI-0337
Event Code: 08FBDT00-2018-E-00623
Project Name: Napa County Stream Maintenance Program Update

Subject: List of threatened and endangered species that may occur in your proposed project location, and/or may be affected by your proposed project

To Whom It May Concern:

The enclosed species list identifies threatened, endangered, proposed and candidate species, as well as proposed and final designated critical habitat, that may occur within the boundary of your proposed project and/or may be affected by your proposed project. The species list fulfills the requirements of the U.S. Fish and Wildlife Service (Service) under section 7(c) of the Endangered Species Act (Act) of 1973, as amended (16 U.S.C. 1531 *et seq.*).

New information based on updated surveys, changes in the abundance and distribution of species, changed habitat conditions, or other factors could change this list. Please feel free to contact us if you need more current information or assistance regarding the potential impacts to federally proposed, listed, and candidate species and federally designated and proposed critical habitat. Please note that under 50 CFR 402.12(e) of the regulations implementing section 7 of the Act, the accuracy of this species list should be verified after 90 days. This verification can be completed formally or informally as desired. The Service recommends that verification be completed by visiting the ECOS-IPaC website at regular intervals during project planning and implementation for updates to species lists and information. An updated list may be requested through the ECOS-IPaC system by completing the same process used to receive the enclosed list.

The purpose of the Act is to provide a means whereby threatened and endangered species and the ecosystems upon which they depend may be conserved. Under sections 7(a)(1) and 7(a)(2) of the Act and its implementing regulations (50 CFR 402 *et seq.*), Federal agencies are required to utilize their authorities to carry out programs for the conservation of threatened and endangered species and to determine whether projects may affect threatened and endangered species and/or designated critical habitat.

A Biological Assessment is required for construction projects (or other undertakings having similar physical impacts) that are major Federal actions significantly affecting the quality of the human environment as defined in the National Environmental Policy Act (42 U.S.C. 4332(2)(c)). For projects other than major construction activities, the Service suggests that a biological evaluation similar to a Biological Assessment be prepared to determine whether the project may affect listed or proposed species and/or designated or proposed critical habitat. Recommended contents of a Biological Assessment are described at 50 CFR 402.12.

If a Federal agency determines, based on the Biological Assessment or biological evaluation, that listed species and/or designated critical habitat may be affected by the proposed project, the agency is required to consult with the Service pursuant to 50 CFR 402. In addition, the Service recommends that candidate species, proposed species and proposed critical habitat be addressed within the consultation. More information on the regulations and procedures for section 7 consultation, including the role of permit or license applicants, can be found in the "Endangered Species Consultation Handbook" at:

http://www.fws.gov/endangered/esa-library/pdf/TOC-GLOS.PDF

Please be aware that bald and golden eagles are protected under the Bald and Golden Eagle Protection Act (16 U.S.C. 668 *et seq.*), and projects affecting these species may require development of an eagle conservation plan (http://www.fws.gov/windenergy/eagle_guidance.html). Additionally, wind energy projects should follow the wind energy guidelines (http://www.fws.gov/windenergy/) for minimizing impacts to migratory birds and bats.

Guidance for minimizing impacts to migratory birds for projects including communications towers (e.g., cellular, digital television, radio, and emergency broadcast) can be found at: http://www.fws.gov/migratorybirds/CurrentBirdIssues/Hazards/towers/towers.htm; http://www.towerkill.com; and http://www.fws.gov/migratorybirds/CurrentBirdIssues/Hazards/towers/comtow.html.

We appreciate your concern for threatened and endangered species. The Service encourages Federal agencies to include conservation of threatened and endangered species into their project planning to further the purposes of the Act. Please include the Consultation Tracking Number in the header of this letter with any request for consultation or correspondence about your project that you submit to our office.

Attachment(s):

- Official Species List

Official Species List

This list is provided pursuant to Section 7 of the Endangered Species Act, and fulfills the requirement for Federal agencies to "request of the Secretary of the Interior information whether any species which is listed or proposed to be listed may be present in the area of a proposed action".

This species list is provided by:

San Francisco Bay-Delta Fish And Wildlife
650 Capitol Mall
Suite 8-300
Sacramento, CA 95814
(916) 930-5603

This project's location is within the jurisdiction of multiple offices. Expect additional species list documents from the following office, and expect that the species and critical habitats in each document reflect only those that fall in the office's jurisdiction:

Sacramento Fish And Wildlife Office
Federal Building
2800 Cottage Way, Room W-2605
Sacramento, CA 95825-1846
(916) 414-6600

Project Summary

Consultation Code: 08FBDT00-2018-SLI-0337

Event Code: 08FBDT00-2018-E-00623

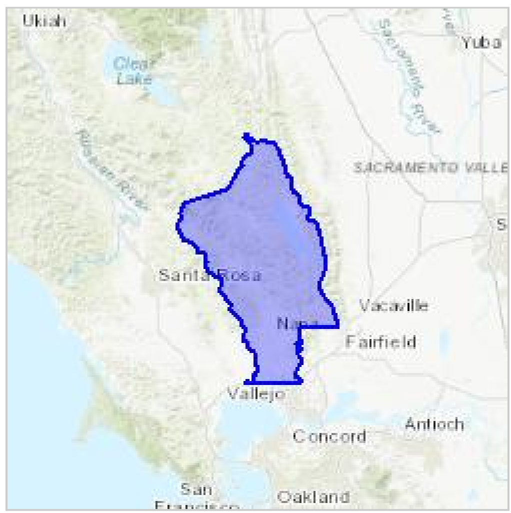
Project Name: Napa County Stream Maintenance Program Update

Project Type: STREAM / WATERBODY / CANALS / LEVEES / DIKES

Project Description: Habitat restoration, flood control, watershed management

Project Location:

Approximate location of the project can be viewed in Google Maps: https://www.google.com/maps/place/38.509486511367115N122.32604207025409W



Counties: Napa, CA

Endangered Species Act Species

There is a total of 16 threatened, endangered, or candidate species on this species list.

Species on this list should be considered in an effects analysis for your project and could include species that exist in another geographic area. For example, certain fish may appear on the species list because a project could affect downstream species.

IPaC does not display listed species or critical habitats under the sole jurisdiction of NOAA Fisheries[1], as USFWS does not have the authority to speak on behalf of NOAA and the Department of Commerce.

See the "Critical habitats" section below for those critical habitats that lie wholly or partially within your project area under this office's jurisdiction. Please contact the designated FWS office if you have questions.

---

1. NOAA Fisheries, also known as the National Marine Fisheries Service (NMFS), is an office of the National Oceanic and Atmospheric Administration within the Department of Commerce.

Mammals

NAME	STATUS
Salt Marsh Harvest Mouse *Reithrodontomys raviventris* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/613	Endangered

Birds

NAME	STATUS
California Clapper Rail *Rallus longirostris obsoletus* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/4240	Endangered
California Least Tern *Sterna antillarum browni* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/8104	Endangered
Northern Spotted Owl *Strix occidentalis caurina* There is **final** critical habitat for this species. Your location overlaps the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/1123	Threatened
Western Snowy Plover *Charadrius nivosus nivosus* Population: Pacific Coast population DPS-U.S.A. (CA, OR, WA), Mexico (within 50 miles of Pacific coast) There is **final** critical habitat for this species. Your location overlaps the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/8035	Threatened

Amphibians

NAME	STATUS
California Red-legged Frog *Rana draytonii* There is **final** critical habitat for this species. Your location overlaps the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/2891	Threatened

Fishes

NAME	STATUS
Delta Smelt *Hypomesus transpacificus* There is **final** critical habitat for this species. Your location is outside the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/321	Threatened

Insects

NAME	STATUS
Callippe Silverspot Butterfly *Speyeria callippe callippe* There is **proposed** critical habitat for this species. The location of the critical habitat is not available. Species profile: https://ecos.fws.gov/ecp/species/3779	Endangered
Myrtle's Silverspot Butterfly *Speyeria zerene myrtleae* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/6929	Endangered
San Bruno Elfin Butterfly *Callophrys mossii bayensis* There is **proposed** critical habitat for this species. The location of the critical habitat is not available. Species profile: https://ecos.fws.gov/ecp/species/3394	Endangered

Crustaceans

NAME	STATUS
California Freshwater Shrimp *Syncaris pacifica* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/7903	Endangered
Conservancy Fairy Shrimp *Branchinecta conservatio* There is **final** critical habitat for this species. Your location is outside the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/8246	Endangered
Vernal Pool Fairy Shrimp *Branchinecta lynchi* There is **final** critical habitat for this species. Your location overlaps the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/498	Threatened

Flowering Plants

NAME	STATUS
Contra Costa Goldfields *Lasthenia conjugens* There is **final** critical habitat for this species. Your location overlaps the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/7058	Endangered
Sebastopol Meadowfoam *Limnanthes vinculans* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/404	Endangered
Soft Bird's-beak *Cordylanthus mollis ssp. mollis* There is **final** critical habitat for this species. Your location overlaps the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/8541	Endangered

Critical habitats

There are 3 critical habitats wholly or partially within your project area under this office's jurisdiction.

NAME	STATUS
Soft Bird's-beak *Cordylanthus mollis ssp. mollis* https://ecos.fws.gov/ecp/species/8541#crithab	Final
Vernal Pool Fairy Shrimp *Branchinecta lynchi* https://ecos.fws.gov/ecp/species/498#crithab	Final
Western Snowy Plover *Charadrius nivosus nivosus* https://ecos.fws.gov/ecp/species/8035#crithab	Final

Appendix D

National Marine Fisheries Service West Coast Region California Species List

MMPA Species

Click on blue text "MMPA Species" above

Consult the NMFS Long Beach office
562-980-4000

Species	MMPA Status	ESA Status
Baird's Beaked Whale	***MMPA Depleted***	
Blue Whale	***MMPA Depleted***	***E***
Cuvier's Beaked Whale	MMPA Protection	
Dwarf Sperm Whale	MMPA Protection	
False Killer Whale	MMPA Protection	
Fin Whale	***MMPA Depleted***	***E***
Gray Whale (Western North Pacific)	***MMPA Depleted***	***E***
Gray Whale (Eastern North Pacific)	MMPA Protection	
Hubb's Beaked Whale	MMPA Protection	
Humpback Whale	***MMPA Depleted***	***E***
Killer Whale (Southern Resident)	***MMPA Depleted***	***E***
Killer Whale	***MMPA Depleted***	
Minke Whale	MMPA Protection	
North Pacific Right Whale	***MMPA Depleted***	***E***
Pygmy Sperm Whale	MMPA Protection	
Sei Whale	***MMPA Depleted***	***E***
Short Finned Pilot Whale	MMPA Protection	
Sperm Whale	***MMPA Depleted***	***E***
Stejneger's Beaked Whale	MMPA Protection	
Dall's Porpoise	MMPA Protection	
Harbor Porpoise	MMPA Protection	
Northern Right Whale Dolphin	MMPA Protection	
Pacific White Sided Dolphin	MMPA Protection	
Risso's Dolphin	MMPA Protection	
Short Beaked Common Dolphin	MMPA Protection	
Striped Dolphin	MMPA Protection	
California Sea Lion	MMPA Protection	
Guadalupe Fur Seal	***MMPA Depleted***	***T***
Northern Elephant Seal	MMPA Protection	
Northern Fur Seal	***MMPA Depleted***	
Pacific Harbor Seal	MMPA Protection	
Steller Sea Lion	MMPA Protection	

Quad Name	Knoxville
Quad Number	**38122-G3**
ESA Anadromous Fish	
SONCC Coho ESU (T) -	
CCC Coho ESU (E) -	
CC Chinook Salmon ESU (T) -	
CVSR Chinook Salmon ESU (T) -	
SRWR Chinook Salmon ESU (E) -	
NC Steelhead DPS (T) -	
CCC Steelhead DPS (T) -	
SCCC Steelhead DPS (T) -	
SC Steelhead DPS (E) -	
CCV Steelhead DPS (T) -	
Eulachon (T) -	
sDPS Green Sturgeon (T) -	
ESA Anadromous Fish Critical Habitat	
SONCC Coho Critical Habitat -	
CCC Coho Critical Habitat -	
CC Chinook Salmon Critical Habitat -	
CVSR Chinook Salmon Critical Habitat -	
SRWR Chinook Salmon Critical Habitat -	
NC Steelhead Critical Habitat -	
CCC Steelhead Critical Habitat -	
SCCC Steelhead Critical Habitat -	
SC Steelhead Critical Habitat -	
CCV Steelhead Critical Habitat -	
Eulachon Critical Habitat -	
sDPS Green Sturgeon Critical Habitat -	
ESA Marine Invertebrates	
Range Black Abalone (E) -	
Range White Abalone (E) -	
ESA Marine Invertebrates Critical Habitat	
Black Abalone Critical Habitat -	
ESA Sea Turtles	
East Pacific Green Sea Turtle (T) -	
Olive Ridley Sea Turtle (T/E) -	
Leatherback Sea Turtle (E) -	
North Pacific Loggerhead Sea Turtle (E) -	
ESA Whales	
Blue Whale (E) -	
Fin Whale (E) -	
Humpback Whale (E) -	
Southern Resident Killer Whale (E) -	
North Pacific Right Whale (E) -	
Sei Whale (E) -	
Sperm Whale (E) -	
ESA Pinnipeds	
Guadalupe Fur Seal (T) -	
Steller Sea Lion Critical Habitat -	
Essential Fish Habitat	
Coho EFH -	
Chinook Salmon EFH -	
Groundfish EFH -	
Coastal Pelagics EFH -	
Highly Migratory Species EFH -	
MMPA Species (See list at left)	
ESA and MMPA Cetaceans/Pinnipeds	
See list at left and consult the NMFS Long Beach office	
562-980-4000	
MMPA Cetaceans -	
MMPA Pinnipeds -	

Quad Name	**Guinda**
Quad Number	**38122-G2**
ESA Anadromous Fish	
SONCC Coho ESU (T) -	
CCC Coho ESU (E) -	
CC Chinook Salmon ESU (T) -	
CVSR Chinook Salmon ESU (T) -	
SRWR Chinook Salmon ESU (E) -	
NC Steelhead DPS (T) -	
CCC Steelhead DPS (T) -	
SCCC Steelhead DPS (T) -	
SC Steelhead DPS (E) -	
CCV Steelhead DPS (T) -	
Eulachon (T) -	
sDPS Green Sturgeon (T) -	
ESA Anadromous Fish Critical Habitat	
SONCC Coho Critical Habitat -	
CCC Coho Critical Habitat -	
CC Chinook Salmon Critical Habitat -	
CVSR Chinook Salmon Critical Habitat -	
SRWR Chinook Salmon Critical Habitat -	
NC Steelhead Critical Habitat -	
CCC Steelhead Critical Habitat -	
SCCC Steelhead Critical Habitat -	
SC Steelhead Critical Habitat -	
CCV Steelhead Critical Habitat -	
Eulachon Critical Habitat -	
sDPS Green Sturgeon Critical Habitat -	
ESA Marine Invertebrates	
Range Black Abalone (E) -	
Range White Abalone (E) -	
ESA Marine Invertebrates Critical Habitat	
Black Abalone Critical Habitat -	
ESA Sea Turtles	
East Pacific Green Sea Turtle (T) -	
Olive Ridley Sea Turtle (T/E) -	
Leatherback Sea Turtle (E) -	
North Pacific Loggerhead Sea Turtle (E) -	
ESA Whales	
Blue Whale (E) -	
Fin Whale (E) -	
Humpback Whale (E) -	
Southern Resident Killer Whale (E) -	
North Pacific Right Whale (E) -	
Sei Whale (E) -	
Sperm Whale (E) -	
ESA Pinnipeds	
Guadalupe Fur Seal (T) -	
Steller Sea Lion Critical Habitat -	
Essential Fish Habitat	
Coho EFH -	
Chinook Salmon EFH -	**X**
Groundfish EFH -	
Coastal Pelagics EFH -	
Highly Migratory Species EFH -	
MMPA Species (See list at left)	
ESA and MMPA Cetaceans/Pinnipeds	
See list at left and consult the NMFS Long Beach office	
562-980-4000	
MMPA Cetaceans -	
MMPA Pinnipeds -	

Quad Name	**Jericho Valley**
Quad Number	**38122-G4**
ESA Anadromous Fish	
SONCC Coho ESU (T) -	
CCC Coho ESU (E) -	
CC Chinook Salmon ESU (T) -	
CVSR Chinook Salmon ESU (T) -	
SRWR Chinook Salmon ESU (E) -	
NC Steelhead DPS (T) -	
CCC Steelhead DPS (T) -	
SCCC Steelhead DPS (T) -	
SC Steelhead DPS (E) -	
CCV Steelhead DPS (T) -	
Eulachon (T) -	
sDPS Green Sturgeon (T) -	
ESA Anadromous Fish Critical Habitat	
SONCC Coho Critical Habitat -	
CCC Coho Critical Habitat -	
CC Chinook Salmon Critical Habitat -	
CVSR Chinook Salmon Critical Habitat -	
SRWR Chinook Salmon Critical Habitat -	
NC Steelhead Critical Habitat -	
CCC Steelhead Critical Habitat -	
SCCC Steelhead Critical Habitat -	
SC Steelhead Critical Habitat -	
CCV Steelhead Critical Habitat -	
Eulachon Critical Habitat -	
sDPS Green Sturgeon Critical Habitat -	
ESA Marine Invertebrates	
Range Black Abalone (E) -	
Range White Abalone (E) -	
ESA Marine Invertebrates Critical Habitat	
Black Abalone Critical Habitat -	
ESA Sea Turtles	
East Pacific Green Sea Turtle (T) -	
Olive Ridley Sea Turtle (T/E) -	
Leatherback Sea Turtle (E) -	
North Pacific Loggerhead Sea Turtle (E) -	
ESA Whales	
Blue Whale (E) -	
Fin Whale (E) -	
Humpback Whale (E) -	
Southern Resident Killer Whale (E) -	
North Pacific Right Whale (E) -	
Sei Whale (E) -	
Sperm Whale (E) -	
ESA Pinnipeds	
Guadalupe Fur Seal (T) -	
Steller Sea Lion Critical Habitat -	
Essential Fish Habitat	
Coho EFH -	
Chinook Salmon EFH -	
Groundfish EFH -	
Coastal Pelagics EFH -	
Highly Migratory Species EFH -	
MMPA Species (See list at left)	
ESA and MMPA Cetaceans/Pinnipeds	
See list at left and consult the NMFS Long Beach office	
562-980-4000	
MMPA Cetaceans -	
MMPA Pinnipeds -	

Quad Name	**Mount Saint Helena**
Quad Number	**38122-F6**
ESA Anadromous Fish	
SONCC Coho ESU (T) -	
CCC Coho ESU (E) -	**X**
CC Chinook Salmon ESU (T) -	**X**
CVSR Chinook Salmon ESU (T) -	
SRWR Chinook Salmon ESU (E) -	
NC Steelhead DPS (T) -	
CCC Steelhead DPS (T) -	**X**
SCCC Steelhead DPS (T) -	
SC Steelhead DPS (E) -	
CCV Steelhead DPS (T) -	
Eulachon (T) -	
sDPS Green Sturgeon (T) -	
ESA Anadromous Fish Critical Habitat	
SONCC Coho Critical Habitat -	
CCC Coho Critical Habitat -	**X**
CC Chinook Salmon Critical Habitat -	
CVSR Chinook Salmon Critical Habitat -	
SRWR Chinook Salmon Critical Habitat -	
NC Steelhead Critical Habitat -	
CCC Steelhead Critical Habitat -	**X**
SCCC Steelhead Critical Habitat -	
SC Steelhead Critical Habitat -	
CCV Steelhead Critical Habitat -	
Eulachon Critical Habitat -	
sDPS Green Sturgeon Critical Habitat -	
ESA Marine Invertebrates	
Range Black Abalone (E) -	
Range White Abalone (E) -	
ESA Marine Invertebrates Critical Habitat	
Black Abalone Critical Habitat -	
ESA Sea Turtles	
East Pacific Green Sea Turtle (T) -	
Olive Ridley Sea Turtle (T/E) -	
Leatherback Sea Turtle (E) -	
North Pacific Loggerhead Sea Turtle (E) -	
ESA Whales	
Blue Whale (E) -	
Fin Whale (E) -	
Humpback Whale (E) -	
Southern Resident Killer Whale (E) -	
North Pacific Right Whale (E) -	
Sei Whale (E) -	
Sperm Whale (E) -	
ESA Pinnipeds	
Guadalupe Fur Seal (T) -	
Steller Sea Lion Critical Habitat -	
Essential Fish Habitat	
Coho EFH -	**X**
Chinook Salmon EFH -	**X**
Groundfish EFH -	
Coastal Pelagics EFH -	
Highly Migratory Species EFH -	
MMPA Species (See list at left)	
ESA and MMPA Cetaceans/Pinnipeds	
See list at left and consult the NMFS Long Beach office	
562-980-4000	
MMPA Cetaceans -	
MMPA Pinnipeds -	

Quad Name	**Detert Reservoir**
Quad Number	**38122-F5**
ESA Anadromous Fish	
SONCC Coho ESU (T) -	
CCC Coho ESU (E) -	**X**
CC Chinook Salmon ESU (T) -	**X**
CVSR Chinook Salmon ESU (T) -	
SRWR Chinook Salmon ESU (E) -	
NC Steelhead DPS (T) -	
CCC Steelhead DPS (T) -	**X**
SCCC Steelhead DPS (T) -	
SC Steelhead DPS (E) -	
CCV Steelhead DPS (T) -	
Eulachon (T) -	
sDPS Green Sturgeon (T) -	
ESA Anadromous Fish Critical Habitat	
SONCC Coho Critical Habitat -	
CCC Coho Critical Habitat -	**X**
CC Chinook Salmon Critical Habitat -	
CVSR Chinook Salmon Critical Habitat -	
SRWR Chinook Salmon Critical Habitat -	
NC Steelhead Critical Habitat -	
CCC Steelhead Critical Habitat -	**X**
SCCC Steelhead Critical Habitat -	
SC Steelhead Critical Habitat -	
CCV Steelhead Critical Habitat -	
Eulachon Critical Habitat -	
sDPS Green Sturgeon Critical Habitat -	
ESA Marine Invertebrates	
Range Black Abalone (E) -	
Range White Abalone (E) -	
ESA Marine Invertebrates Critical Habitat	
Black Abalone Critical Habitat -	
ESA Sea Turtles	
East Pacific Green Sea Turtle (T) -	
Olive Ridley Sea Turtle (T/E) -	
Leatherback Sea Turtle (E) -	
North Pacific Loggerhead Sea Turtle (E) -	
ESA Whales	
Blue Whale (E) -	
Fin Whale (E) -	
Humpback Whale (E) -	
Southern Resident Killer Whale (E) -	
North Pacific Right Whale (E) -	
Sei Whale (E) -	
Sperm Whale (E) -	
ESA Pinnipeds	
Guadalupe Fur Seal (T) -	
Steller Sea Lion Critical Habitat -	
Essential Fish Habitat	
Coho EFH -	**X**
Chinook Salmon EFH -	**X**
Groundfish EFH -	
Coastal Pelagics EFH -	
Highly Migratory Species EFH -	
MMPA Species (See list at left)	
ESA and MMPA Cetaceans/Pinnipeds	
See list at left and consult the NMFS Long Beach office	
562-980-4000	
MMPA Cetaceans -	
MMPA Pinnipeds -	

Quad Name	**Aetna Springs**
Quad Number	**38122-F4**
ESA Anadromous Fish	
SONCC Coho ESU (T) -	
CCC Coho ESU (E) -	
CC Chinook Salmon ESU (T) -	
CVSR Chinook Salmon ESU (T) -	
SRWR Chinook Salmon ESU (E) -	
NC Steelhead DPS (T) -	
CCC Steelhead DPS (T) -	
SCCC Steelhead DPS (T) -	
SC Steelhead DPS (E) -	
CCV Steelhead DPS (T) -	
Eulachon (T) -	
sDPS Green Sturgeon (T) -	
ESA Anadromous Fish Critical Habitat	
SONCC Coho Critical Habitat -	
CCC Coho Critical Habitat -	
CC Chinook Salmon Critical Habitat -	
CVSR Chinook Salmon Critical Habitat -	
SRWR Chinook Salmon Critical Habitat -	
NC Steelhead Critical Habitat -	
CCC Steelhead Critical Habitat -	
SCCC Steelhead Critical Habitat -	
SC Steelhead Critical Habitat -	
CCV Steelhead Critical Habitat -	
Eulachon Critical Habitat -	
sDPS Green Sturgeon Critical Habitat -	
ESA Marine Invertebrates	
Range Black Abalone (E) -	
Range White Abalone (E) -	
ESA Marine Invertebrates Critical Habitat	
Black Abalone Critical Habitat -	
ESA Sea Turtles	
East Pacific Green Sea Turtle (T) -	
Olive Ridley Sea Turtle (T/E) -	
Leatherback Sea Turtle (E) -	
North Pacific Loggerhead Sea Turtle (E) -	
ESA Whales	
Blue Whale (E) -	
Fin Whale (E) -	
Humpback Whale (E) -	
Southern Resident Killer Whale (E) -	
North Pacific Right Whale (E) -	
Sei Whale (E) -	
Sperm Whale (E) -	
ESA Pinnipeds	
Guadalupe Fur Seal (T) -	
Steller Sea Lion Critical Habitat -	
Essential Fish Habitat	
Coho EFH -	
Chinook Salmon EFH -	
Groundfish EFH -	
Coastal Pelagics EFH -	
Highly Migratory Species EFH -	
MMPA Species (See list at left)	
ESA and MMPA Cetaceans/Pinnipeds	
See list at left and consult the NMFS Long Beach office	
562-980-4000	
MMPA Cetaceans -	
MMPA Pinnipeds -	

Quad Name	Walter Springs
Quad Number	**38122-F3**
ESA Anadromous Fish	
SONCC Coho ESU (T) -	
CCC Coho ESU (E) -	
CC Chinook Salmon ESU (T) -	
CVSR Chinook Salmon ESU (T) -	
SRWR Chinook Salmon ESU (E) -	
NC Steelhead DPS (T) -	
CCC Steelhead DPS (T) -	
SCCC Steelhead DPS (T) -	
SC Steelhead DPS (E) -	
CCV Steelhead DPS (T) -	
Eulachon (T) -	
sDPS Green Sturgeon (T) -	
ESA Anadromous Fish Critical Habitat	
SONCC Coho Critical Habitat -	
CCC Coho Critical Habitat -	
CC Chinook Salmon Critical Habitat -	
CVSR Chinook Salmon Critical Habitat -	
SRWR Chinook Salmon Critical Habitat -	
NC Steelhead Critical Habitat -	
CCC Steelhead Critical Habitat -	
SCCC Steelhead Critical Habitat -	
SC Steelhead Critical Habitat -	
CCV Steelhead Critical Habitat -	
Eulachon Critical Habitat -	
sDPS Green Sturgeon Critical Habitat -	
ESA Marine Invertebrates	
Range Black Abalone (E) -	
Range White Abalone (E) -	
ESA Marine Invertebrates Critical Habitat	
Black Abalone Critical Habitat -	
ESA Sea Turtles	
East Pacific Green Sea Turtle (T) -	
Olive Ridley Sea Turtle (T/E) -	
Leatherback Sea Turtle (E) -	
North Pacific Loggerhead Sea Turtle (E) -	
ESA Whales	
Blue Whale (E) -	
Fin Whale (E) -	
Humpback Whale (E) -	
Southern Resident Killer Whale (E) -	
North Pacific Right Whale (E) -	
Sei Whale (E) -	
Sperm Whale (E) -	
ESA Pinnipeds	
Guadalupe Fur Seal (T) -	
Steller Sea Lion Critical Habitat -	
Essential Fish Habitat	
Coho EFH -	
Chinook Salmon EFH -	
Groundfish EFH -	
Coastal Pelagics EFH -	
Highly Migratory Species EFH -	
MMPA Species (See list at left)	
ESA and MMPA Cetaceans/Pinnipeds	
See list at left and consult the NMFS Long Beach office	
562-980-4000	
MMPA Cetaceans -	
MMPA Pinnipeds -	

Quad Name	**Brooks**
Quad Number	**38122-F2**
ESA Anadromous Fish	
SONCC Coho ESU (T) -	
CCC Coho ESU (E) -	
CC Chinook Salmon ESU (T) -	
CVSR Chinook Salmon ESU (T) -	
SRWR Chinook Salmon ESU (E) -	
NC Steelhead DPS (T) -	
CCC Steelhead DPS (T) -	
SCCC Steelhead DPS (T) -	
SC Steelhead DPS (E) -	
CCV Steelhead DPS (T) -	**X**
Eulachon (T) -	
sDPS Green Sturgeon (T) -	
ESA Anadromous Fish Critical Habitat	
SONCC Coho Critical Habitat -	
CCC Coho Critical Habitat -	
CC Chinook Salmon Critical Habitat -	
CVSR Chinook Salmon Critical Habitat -	
SRWR Chinook Salmon Critical Habitat -	
NC Steelhead Critical Habitat -	
CCC Steelhead Critical Habitat -	
SCCC Steelhead Critical Habitat -	
SC Steelhead Critical Habitat -	
CCV Steelhead Critical Habitat -	
Eulachon Critical Habitat -	
sDPS Green Sturgeon Critical Habitat -	
ESA Marine Invertebrates	
Range Black Abalone (E) -	
Range White Abalone (E) -	
ESA Marine Invertebrates Critical Habitat	
Black Abalone Critical Habitat -	
ESA Sea Turtles	
East Pacific Green Sea Turtle (T) -	
Olive Ridley Sea Turtle (T/E) -	
Leatherback Sea Turtle (E) -	
North Pacific Loggerhead Sea Turtle (E) -	
ESA Whales	
Blue Whale (E) -	
Fin Whale (E) -	
Humpback Whale (E) -	
Southern Resident Killer Whale (E) -	
North Pacific Right Whale (E) -	
Sei Whale (E) -	
Sperm Whale (E) -	
ESA Pinnipeds	
Guadalupe Fur Seal (T) -	
Steller Sea Lion Critical Habitat -	
Essential Fish Habitat	
Coho EFH -	
Chinook Salmon EFH -	**X**
Groundfish EFH -	
Coastal Pelagics EFH -	
Highly Migratory Species EFH -	
MMPA Species (See list at left)	
ESA and MMPA Cetaceans/Pinnipeds	
See list at left and consult the NMFS Long Beach office	
562-980-4000	
MMPA Cetaceans -	
MMPA Pinnipeds -	

Quad Name	**Mark West Springs**
Quad Number	**38122-E6**
ESA Anadromous Fish	
SONCC Coho ESU (T) -	
CCC Coho ESU (E) -	X
CC Chinook Salmon ESU (T) -	X
CVSR Chinook Salmon ESU (T) -	
SRWR Chinook Salmon ESU (E) -	
NC Steelhead DPS (T) -	
CCC Steelhead DPS (T) -	X
SCCC Steelhead DPS (T) -	
SC Steelhead DPS (E) -	
CCV Steelhead DPS (T) -	
Eulachon (T) -	
sDPS Green Sturgeon (T) -	
ESA Anadromous Fish Critical Habitat	
SONCC Coho Critical Habitat -	
CCC Coho Critical Habitat -	X
CC Chinook Salmon Critical Habitat -	
CVSR Chinook Salmon Critical Habitat -	
SRWR Chinook Salmon Critical Habitat -	
NC Steelhead Critical Habitat -	
CCC Steelhead Critical Habitat -	X
SCCC Steelhead Critical Habitat -	
SC Steelhead Critical Habitat -	
CCV Steelhead Critical Habitat -	
Eulachon Critical Habitat -	
sDPS Green Sturgeon Critical Habitat -	
ESA Marine Invertebrates	
Range Black Abalone (E) -	
Range White Abalone (E) -	
ESA Marine Invertebrates Critical Habitat	
Black Abalone Critical Habitat -	
ESA Sea Turtles	
East Pacific Green Sea Turtle (T) -	
Olive Ridley Sea Turtle (T/E) -	
Leatherback Sea Turtle (E) -	
North Pacific Loggerhead Sea Turtle (E) -	
ESA Whales	
Blue Whale (E) -	
Fin Whale (E) -	
Humpback Whale (E) -	
Southern Resident Killer Whale (E) -	
North Pacific Right Whale (E) -	
Sei Whale (E) -	
Sperm Whale (E) -	
ESA Pinnipeds	
Guadalupe Fur Seal (T) -	
Steller Sea Lion Critical Habitat -	
Essential Fish Habitat	
Coho EFH -	X
Chinook Salmon EFH -	X
Groundfish EFH -	
Coastal Pelagics EFH -	
Highly Migratory Species EFH -	
MMPA Species (See list at left)	
ESA and MMPA Cetaceans/Pinnipeds	
See list at left and consult the NMFS Long Beach office	
562-980-4000	
MMPA Cetaceans -	
MMPA Pinnipeds -	

Quad Name	**Calistoga**
Quad Number	**38122-E5**
ESA Anadromous Fish	
SONCC Coho ESU (T) -	
CCC Coho ESU (E) -	**X**
CC Chinook Salmon ESU (T) -	**X**
CVSR Chinook Salmon ESU (T) -	
SRWR Chinook Salmon ESU (E) -	
NC Steelhead DPS (T) -	
CCC Steelhead DPS (T) -	**X**
SCCC Steelhead DPS (T) -	
SC Steelhead DPS (E) -	
CCV Steelhead DPS (T) -	
Eulachon (T) -	
sDPS Green Sturgeon (T) -	
ESA Anadromous Fish Critical Habitat	
SONCC Coho Critical Habitat -	
CCC Coho Critical Habitat -	**X**
CC Chinook Salmon Critical Habitat -	
CVSR Chinook Salmon Critical Habitat -	
SRWR Chinook Salmon Critical Habitat -	
NC Steelhead Critical Habitat -	
CCC Steelhead Critical Habitat -	**X**
SCCC Steelhead Critical Habitat -	
SC Steelhead Critical Habitat -	
CCV Steelhead Critical Habitat -	
Eulachon Critical Habitat -	
sDPS Green Sturgeon Critical Habitat -	
ESA Marine Invertebrates	
Range Black Abalone (E) -	
Range White Abalone (E) -	
ESA Marine Invertebrates Critical Habitat	
Black Abalone Critical Habitat -	
ESA Sea Turtles	
East Pacific Green Sea Turtle (T) -	
Olive Ridley Sea Turtle (T/E) -	
Leatherback Sea Turtle (E) -	
North Pacific Loggerhead Sea Turtle (E) -	
ESA Whales	
Blue Whale (E) -	
Fin Whale (E) -	
Humpback Whale (E) -	
Southern Resident Killer Whale (E) -	
North Pacific Right Whale (E) -	
Sei Whale (E) -	
Sperm Whale (E) -	
ESA Pinnipeds	
Guadalupe Fur Seal (T) -	
Steller Sea Lion Critical Habitat -	
Essential Fish Habitat	
Coho EFH -	**X**
Chinook Salmon EFH -	**X**
Groundfish EFH -	
Coastal Pelagics EFH -	
Highly Migratory Species EFH -	
MMPA Species (See list at left)	
ESA and MMPA Cetaceans/Pinnipeds	
See list at left and consult the NMFS Long Beach office	
562-980-4000	
MMPA Cetaceans -	
MMPA Pinnipeds -	

Quad Name	**Saint Helena**
Quad Number	**38122-E4**
ESA Anadromous Fish	
SONCC Coho ESU (T) -	
CCC Coho ESU (E) -	
CC Chinook Salmon ESU (T) -	
CVSR Chinook Salmon ESU (T) -	
SRWR Chinook Salmon ESU (E) -	
NC Steelhead DPS (T) -	
CCC Steelhead DPS (T) -	**X**
SCCC Steelhead DPS (T) -	
SC Steelhead DPS (E) -	
CCV Steelhead DPS (T) -	
Eulachon (T) -	
sDPS Green Sturgeon (T) -	
ESA Anadromous Fish Critical Habitat	
SONCC Coho Critical Habitat -	
CCC Coho Critical Habitat -	
CC Chinook Salmon Critical Habitat -	
CVSR Chinook Salmon Critical Habitat -	
SRWR Chinook Salmon Critical Habitat -	
NC Steelhead Critical Habitat -	
CCC Steelhead Critical Habitat -	**X**
SCCC Steelhead Critical Habitat -	
SC Steelhead Critical Habitat -	
CCV Steelhead Critical Habitat -	
Eulachon Critical Habitat -	
sDPS Green Sturgeon Critical Habitat -	
ESA Marine Invertebrates	
Range Black Abalone (E) -	
Range White Abalone (E) -	
ESA Marine Invertebrates Critical Habitat	
Black Abalone Critical Habitat -	
ESA Sea Turtles	
East Pacific Green Sea Turtle (T) -	
Olive Ridley Sea Turtle (T/E) -	
Leatherback Sea Turtle (E) -	
North Pacific Loggerhead Sea Turtle (E) -	
ESA Whales	
Blue Whale (E) -	
Fin Whale (E) -	
Humpback Whale (E) -	
Southern Resident Killer Whale (E) -	
North Pacific Right Whale (E) -	
Sei Whale (E) -	
Sperm Whale (E) -	
ESA Pinnipeds	
Guadalupe Fur Seal (T) -	
Steller Sea Lion Critical Habitat -	
Essential Fish Habitat	
Coho EFH -	**X**
Chinook Salmon EFH -	**X**
Groundfish EFH -	
Coastal Pelagics EFH -	
Highly Migratory Species EFH -	
MMPA Species (See list at left)	
ESA and MMPA Cetaceans/Pinnipeds	
See list at left and consult the NMFS Long Beach office	
562-980-4000	
MMPA Cetaceans -	
MMPA Pinnipeds -	

Quad Name	**Chiles Valley**
Quad Number	**38122-E3**
ESA Anadromous Fish	
SONCC Coho ESU (T) -	
CCC Coho ESU (E) -	
CC Chinook Salmon ESU (T) -	
CVSR Chinook Salmon ESU (T) -	
SRWR Chinook Salmon ESU (E) -	
NC Steelhead DPS (T) -	
CCC Steelhead DPS (T) -	
SCCC Steelhead DPS (T) -	
SC Steelhead DPS (E) -	
CCV Steelhead DPS (T) -	
Eulachon (T) -	
sDPS Green Sturgeon (T) -	
ESA Anadromous Fish Critical Habitat	
SONCC Coho Critical Habitat -	
CCC Coho Critical Habitat -	
CC Chinook Salmon Critical Habitat -	
CVSR Chinook Salmon Critical Habitat -	
SRWR Chinook Salmon Critical Habitat -	
NC Steelhead Critical Habitat -	
CCC Steelhead Critical Habitat -	
SCCC Steelhead Critical Habitat -	
SC Steelhead Critical Habitat -	
CCV Steelhead Critical Habitat -	
Eulachon Critical Habitat -	
sDPS Green Sturgeon Critical Habitat -	
ESA Marine Invertebrates	
Range Black Abalone (E) -	
Range White Abalone (E) -	
ESA Marine Invertebrates Critical Habitat	
Black Abalone Critical Habitat -	
ESA Sea Turtles	
East Pacific Green Sea Turtle (T) -	
Olive Ridley Sea Turtle (T/E) -	
Leatherback Sea Turtle (E) -	
North Pacific Loggerhead Sea Turtle (E) -	
ESA Whales	
Blue Whale (E) -	
Fin Whale (E) -	
Humpback Whale (E) -	
Southern Resident Killer Whale (E) -	
North Pacific Right Whale (E) -	
Sei Whale (E) -	
Sperm Whale (E) -	
ESA Pinnipeds	
Guadalupe Fur Seal (T) -	
Steller Sea Lion Critical Habitat -	
Essential Fish Habitat	
Coho EFH -	**X**
Chinook Salmon EFH -	**X**
Groundfish EFH -	
Coastal Pelagics EFH -	
Highly Migratory Species EFH -	
MMPA Species (See list at left)	
ESA and MMPA Cetaceans/Pinnipeds	
See list at left and consult the NMFS Long Beach office	
562-980-4000	
MMPA Cetaceans -	
MMPA Pinnipeds -	

Quad Name	Lake Berryessa
Quad Number	**38122-E2**
ESA Anadromous Fish	
SONCC Coho ESU (T) -	
CCC Coho ESU (E) -	
CC Chinook Salmon ESU (T) -	
CVSR Chinook Salmon ESU (T) -	
SRWR Chinook Salmon ESU (E) -	
NC Steelhead DPS (T) -	
CCC Steelhead DPS (T) -	
SCCC Steelhead DPS (T) -	
SC Steelhead DPS (E) -	
CCV Steelhead DPS (T) -	X
Eulachon (T) -	
sDPS Green Sturgeon (T) -	
ESA Anadromous Fish Critical Habitat	
SONCC Coho Critical Habitat -	
CCC Coho Critical Habitat -	
CC Chinook Salmon Critical Habitat -	
CVSR Chinook Salmon Critical Habitat -	
SRWR Chinook Salmon Critical Habitat -	
NC Steelhead Critical Habitat -	
CCC Steelhead Critical Habitat -	
SCCC Steelhead Critical Habitat -	
SC Steelhead Critical Habitat -	
CCV Steelhead Critical Habitat -	
Eulachon Critical Habitat -	
sDPS Green Sturgeon Critical Habitat -	
ESA Marine Invertebrates	
Range Black Abalone (E) -	
Range White Abalone (E) -	
ESA Marine Invertebrates Critical Habitat	
Black Abalone Critical Habitat -	
ESA Sea Turtles	
East Pacific Green Sea Turtle (T) -	
Olive Ridley Sea Turtle (T/E) -	
Leatherback Sea Turtle (E) -	
North Pacific Loggerhead Sea Turtle (E) -	
ESA Whales	
Blue Whale (E) -	
Fin Whale (E) -	
Humpback Whale (E) -	
Southern Resident Killer Whale (E) -	
North Pacific Right Whale (E) -	
Sei Whale (E) -	
Sperm Whale (E) -	
ESA Pinnipeds	
Guadalupe Fur Seal (T) -	
Steller Sea Lion Critical Habitat -	
Essential Fish Habitat	
Coho EFH -	
Chinook Salmon EFH -	X
Groundfish EFH -	
Coastal Pelagics EFH -	
Highly Migratory Species EFH -	
MMPA Species (See list at left)	
ESA and MMPA Cetaceans/Pinnipeds	
See list at left and consult the NMFS Long Beach office	
562-980-4000	
MMPA Cetaceans -	
MMPA Pinnipeds -	

Quad Name	**Monticello Dam**
Quad Number	**38122-E1**
ESA Anadromous Fish	
SONCC Coho ESU (T) -	
CCC Coho ESU (E) -	
CC Chinook Salmon ESU (T) -	
CVSR Chinook Salmon ESU (T) -	
SRWR Chinook Salmon ESU (E) -	
NC Steelhead DPS (T) -	
CCC Steelhead DPS (T) -	
SCCC Steelhead DPS (T) -	
SC Steelhead DPS (E) -	
CCV Steelhead DPS (T) -	**X**
Eulachon (T) -	
sDPS Green Sturgeon (T) -	
ESA Anadromous Fish Critical Habitat	
SONCC Coho Critical Habitat -	
CCC Coho Critical Habitat -	
CC Chinook Salmon Critical Habitat -	
CVSR Chinook Salmon Critical Habitat -	
SRWR Chinook Salmon Critical Habitat -	
NC Steelhead Critical Habitat -	
CCC Steelhead Critical Habitat -	
SCCC Steelhead Critical Habitat -	
SC Steelhead Critical Habitat -	
CCV Steelhead Critical Habitat -	
Eulachon Critical Habitat -	
sDPS Green Sturgeon Critical Habitat -	
ESA Marine Invertebrates	
Range Black Abalone (E) -	
Range White Abalone (E) -	
ESA Marine Invertebrates Critical Habitat	
Black Abalone Critical Habitat -	
ESA Sea Turtles	
East Pacific Green Sea Turtle (T) -	
Olive Ridley Sea Turtle (T/E) -	
Leatherback Sea Turtle (E) -	
North Pacific Loggerhead Sea Turtle (E) -	
ESA Whales	
Blue Whale (E) -	
Fin Whale (E) -	
Humpback Whale (E) -	
Southern Resident Killer Whale (E) -	
North Pacific Right Whale (E) -	
Sei Whale (E) -	
Sperm Whale (E) -	
ESA Pinnipeds	
Guadalupe Fur Seal (T) -	
Steller Sea Lion Critical Habitat -	
Essential Fish Habitat	
Coho EFH -	
Chinook Salmon EFH -	**X**
Groundfish EFH -	
Coastal Pelagics EFH -	
Highly Migratory Species EFH -	
MMPA Species (See list at left)	
ESA and MMPA Cetaceans/Pinnipeds	
See list at left and consult the NMFS Long Beach office	
562-980-4000	
MMPA Cetaceans -	
MMPA Pinnipeds -	

Quad Name	**Kenwood**
Quad Number	**38122-D5**
ESA Anadromous Fish	
SONCC Coho ESU (T) -	
CCC Coho ESU (E) -	**X**
CC Chinook Salmon ESU (T) -	**X**
CVSR Chinook Salmon ESU (T) -	
SRWR Chinook Salmon ESU (E) -	
NC Steelhead DPS (T) -	
CCC Steelhead DPS (T) -	**X**
SCCC Steelhead DPS (T) -	
SC Steelhead DPS (E) -	
CCV Steelhead DPS (T) -	
Eulachon (T) -	
sDPS Green Sturgeon (T) -	
ESA Anadromous Fish Critical Habitat	
SONCC Coho Critical Habitat -	
CCC Coho Critical Habitat -	**X**
CC Chinook Salmon Critical Habitat -	
CVSR Chinook Salmon Critical Habitat -	
SRWR Chinook Salmon Critical Habitat -	
NC Steelhead Critical Habitat -	
CCC Steelhead Critical Habitat -	**X**
SCCC Steelhead Critical Habitat -	
SC Steelhead Critical Habitat -	
CCV Steelhead Critical Habitat -	
Eulachon Critical Habitat -	
sDPS Green Sturgeon Critical Habitat -	
ESA Marine Invertebrates	
Range Black Abalone (E) -	
Range White Abalone (E) -	
ESA Marine Invertebrates Critical Habitat	
Black Abalone Critical Habitat -	
ESA Sea Turtles	
East Pacific Green Sea Turtle (T) -	
Olive Ridley Sea Turtle (T/E) -	
Leatherback Sea Turtle (E) -	
North Pacific Loggerhead Sea Turtle (E) -	
ESA Whales	
Blue Whale (E) -	
Fin Whale (E) -	
Humpback Whale (E) -	
Southern Resident Killer Whale (E) -	
North Pacific Right Whale (E) -	
Sei Whale (E) -	
Sperm Whale (E) -	
ESA Pinnipeds	
Guadalupe Fur Seal (T) -	
Steller Sea Lion Critical Habitat -	
Essential Fish Habitat	
Coho EFH -	**X**
Chinook Salmon EFH -	**X**
Groundfish EFH -	
Coastal Pelagics EFH -	
Highly Migratory Species EFH -	
MMPA Species (See list at left)	
ESA and MMPA Cetaceans/Pinnipeds	
See list at left and consult the NMFS Long Beach office	
562-980-4000	
MMPA Cetaceans -	
MMPA Pinnipeds -	

Quad Name	**Rutherford**
Quad Number	**38122-D4**
ESA Anadromous Fish	
SONCC Coho ESU (T) -	
CCC Coho ESU (E) -	
CC Chinook Salmon ESU (T) -	
CVSR Chinook Salmon ESU (T) -	
SRWR Chinook Salmon ESU (E) -	
NC Steelhead DPS (T) -	
CCC Steelhead DPS (T) -	**X**
SCCC Steelhead DPS (T) -	
SC Steelhead DPS (E) -	
CCV Steelhead DPS (T) -	
Eulachon (T) -	
sDPS Green Sturgeon (T) -	
ESA Anadromous Fish Critical Habitat	
SONCC Coho Critical Habitat -	
CCC Coho Critical Habitat -	
CC Chinook Salmon Critical Habitat -	
CVSR Chinook Salmon Critical Habitat -	
SRWR Chinook Salmon Critical Habitat -	
NC Steelhead Critical Habitat -	
CCC Steelhead Critical Habitat -	**X**
SCCC Steelhead Critical Habitat -	
SC Steelhead Critical Habitat -	
CCV Steelhead Critical Habitat -	
Eulachon Critical Habitat -	
sDPS Green Sturgeon Critical Habitat -	
ESA Marine Invertebrates	
Range Black Abalone (E) -	
Range White Abalone (E) -	
ESA Marine Invertebrates Critical Habitat	
Black Abalone Critical Habitat -	
ESA Sea Turtles	
East Pacific Green Sea Turtle (T) -	
Olive Ridley Sea Turtle (T/E) -	
Leatherback Sea Turtle (E) -	
North Pacific Loggerhead Sea Turtle (E) -	
ESA Whales	
Blue Whale (E) -	
Fin Whale (E) -	
Humpback Whale (E) -	
Southern Resident Killer Whale (E) -	
North Pacific Right Whale (E) -	
Sei Whale (E) -	
Sperm Whale (E) -	
ESA Pinnipeds	
Guadalupe Fur Seal (T) -	
Steller Sea Lion Critical Habitat -	
Essential Fish Habitat	
Coho EFH -	**X**
Chinook Salmon EFH -	**X**
Groundfish EFH -	
Coastal Pelagics EFH -	
Highly Migratory Species EFH -	
MMPA Species (See list at left)	
ESA and MMPA Cetaceans/Pinnipeds	
See list at left and consult the NMFS Long Beach office	
562-980-4000	
MMPA Cetaceans -	
MMPA Pinnipeds -	

Quad Name	Yountville
Quad Number	**38122-D3**
ESA Anadromous Fish	
SONCC Coho ESU (T) -	
CCC Coho ESU (E) -	
CC Chinook Salmon ESU (T) -	
CVSR Chinook Salmon ESU (T) -	
SRWR Chinook Salmon ESU (E) -	
NC Steelhead DPS (T) -	
CCC Steelhead DPS (T) -	X
SCCC Steelhead DPS (T) -	
SC Steelhead DPS (E) -	
CCV Steelhead DPS (T) -	
Eulachon (T) -	
sDPS Green Sturgeon (T) -	
ESA Anadromous Fish Critical Habitat	
SONCC Coho Critical Habitat -	
CCC Coho Critical Habitat -	
CC Chinook Salmon Critical Habitat -	
CVSR Chinook Salmon Critical Habitat -	
SRWR Chinook Salmon Critical Habitat -	
NC Steelhead Critical Habitat -	
CCC Steelhead Critical Habitat -	X
SCCC Steelhead Critical Habitat -	
SC Steelhead Critical Habitat -	
CCV Steelhead Critical Habitat -	
Eulachon Critical Habitat -	
sDPS Green Sturgeon Critical Habitat -	
ESA Marine Invertebrates	
Range Black Abalone (E) -	
Range White Abalone (E) -	
ESA Marine Invertebrates Critical Habitat	
Black Abalone Critical Habitat -	
ESA Sea Turtles	
East Pacific Green Sea Turtle (T) -	
Olive Ridley Sea Turtle (T/E) -	
Leatherback Sea Turtle (E) -	
North Pacific Loggerhead Sea Turtle (E) -	
ESA Whales	
Blue Whale (E) -	
Fin Whale (E) -	
Humpback Whale (E) -	
Southern Resident Killer Whale (E) -	
North Pacific Right Whale (E) -	
Sei Whale (E) -	
Sperm Whale (E) -	
ESA Pinnipeds	
Guadalupe Fur Seal (T) -	
Steller Sea Lion Critical Habitat -	
Essential Fish Habitat	
Coho EFH -	X
Chinook Salmon EFH -	X
Groundfish EFH -	
Coastal Pelagics EFH -	
Highly Migratory Species EFH -	
MMPA Species (See list at left)	
ESA and MMPA Cetaceans/Pinnipeds	
See list at left and consult the NMFS Long Beach office	
562-980-4000	
MMPA Cetaceans -	
MMPA Pinnipeds -	

Quad Name	Capell Valley
Quad Number	**38122-D2**
ESA Anadromous Fish	
SONCC Coho ESU (T) -	
CCC Coho ESU (E) -	
CC Chinook Salmon ESU (T) -	
CVSR Chinook Salmon ESU (T) -	
SRWR Chinook Salmon ESU (E) -	
NC Steelhead DPS (T) -	
CCC Steelhead DPS (T) -	X
SCCC Steelhead DPS (T) -	
SC Steelhead DPS (E) -	
CCV Steelhead DPS (T) -	X
Eulachon (T) -	
sDPS Green Sturgeon (T) -	
ESA Anadromous Fish Critical Habitat	
SONCC Coho Critical Habitat -	
CCC Coho Critical Habitat -	
CC Chinook Salmon Critical Habitat -	
CVSR Chinook Salmon Critical Habitat -	
SRWR Chinook Salmon Critical Habitat -	
NC Steelhead Critical Habitat -	
CCC Steelhead Critical Habitat -	X
SCCC Steelhead Critical Habitat -	
SC Steelhead Critical Habitat -	
CCV Steelhead Critical Habitat -	
Eulachon Critical Habitat -	
sDPS Green Sturgeon Critical Habitat -	
ESA Marine Invertebrates	
Range Black Abalone (E) -	
Range White Abalone (E) -	
ESA Marine Invertebrates Critical Habitat	
Black Abalone Critical Habitat -	
ESA Sea Turtles	
East Pacific Green Sea Turtle (T) -	
Olive Ridley Sea Turtle (T/E) -	
Leatherback Sea Turtle (E) -	
North Pacific Loggerhead Sea Turtle (E) -	
ESA Whales	
Blue Whale (E) -	
Fin Whale (E) -	
Humpback Whale (E) -	
Southern Resident Killer Whale (E) -	
North Pacific Right Whale (E) -	
Sei Whale (E) -	
Sperm Whale (E) -	
ESA Pinnipeds	
Guadalupe Fur Seal (T) -	
Steller Sea Lion Critical Habitat -	
Essential Fish Habitat	
Coho EFH -	X
Chinook Salmon EFH -	X
Groundfish EFH -	
Coastal Pelagics EFH -	
Highly Migratory Species EFH -	
MMPA Species (See list at left)	
ESA and MMPA Cetaceans/Pinnipeds	
See list at left and consult the NMFS Long Beach office	
562-980-4000	
MMPA Cetaceans -	
MMPA Pinnipeds -	

Quad Name	**Mount Vaca**
Quad Number	**38122-D1**
ESA Anadromous Fish	
SONCC Coho ESU (T) -	
CCC Coho ESU (E) -	
CC Chinook Salmon ESU (T) -	
CVSR Chinook Salmon ESU (T) -	**X**
SRWR Chinook Salmon ESU (E) -	**X**
NC Steelhead DPS (T) -	
CCC Steelhead DPS (T) -	**X**
SCCC Steelhead DPS (T) -	
SC Steelhead DPS (E) -	
CCV Steelhead DPS (T) -	**X**
Eulachon (T) -	
sDPS Green Sturgeon (T) -	
ESA Anadromous Fish Critical Habitat	
SONCC Coho Critical Habitat -	
CCC Coho Critical Habitat -	
CC Chinook Salmon Critical Habitat -	
CVSR Chinook Salmon Critical Habitat -	
SRWR Chinook Salmon Critical Habitat -	
NC Steelhead Critical Habitat -	
CCC Steelhead Critical Habitat -	
SCCC Steelhead Critical Habitat -	
SC Steelhead Critical Habitat -	
CCV Steelhead Critical Habitat -	
Eulachon Critical Habitat -	
sDPS Green Sturgeon Critical Habitat -	
ESA Marine Invertebrates	
Range Black Abalone (E) -	
Range White Abalone (E) -	
ESA Marine Invertebrates Critical Habitat	
Black Abalone Critical Habitat -	
ESA Sea Turtles	
East Pacific Green Sea Turtle (T) -	
Olive Ridley Sea Turtle (T/E) -	
Leatherback Sea Turtle (E) -	
North Pacific Loggerhead Sea Turtle (E) -	
ESA Whales	
Blue Whale (E) -	
Fin Whale (E) -	
Humpback Whale (E) -	
Southern Resident Killer Whale (E) -	
North Pacific Right Whale (E) -	
Sei Whale (E) -	
Sperm Whale (E) -	
ESA Pinnipeds	
Guadalupe Fur Seal (T) -	
Steller Sea Lion Critical Habitat -	
Essential Fish Habitat	
Coho EFH -	
Chinook Salmon EFH -	**X**
Groundfish EFH -	
Coastal Pelagics EFH -	
Highly Migratory Species EFH -	
MMPA Species (See list at left)	
ESA and MMPA Cetaceans/Pinnipeds	
See list at left and consult the NMFS Long Beach office	
562-980-4000	
MMPA Cetaceans -	
MMPA Pinnipeds -	

Quad Name	**Sonoma**
Quad Number	**38122-C4**
ESA Anadromous Fish	
SONCC Coho ESU (T) -	
CCC Coho ESU (E) -	
CC Chinook Salmon ESU (T) -	
CVSR Chinook Salmon ESU (T) -	
SRWR Chinook Salmon ESU (E) -	
NC Steelhead DPS (T) -	
CCC Steelhead DPS (T) -	**X**
SCCC Steelhead DPS (T) -	
SC Steelhead DPS (E) -	
CCV Steelhead DPS (T) -	
Eulachon (T) -	
sDPS Green Sturgeon (T) -	
ESA Anadromous Fish Critical Habitat	
SONCC Coho Critical Habitat -	
CCC Coho Critical Habitat -	
CC Chinook Salmon Critical Habitat -	
CVSR Chinook Salmon Critical Habitat -	
SRWR Chinook Salmon Critical Habitat -	
NC Steelhead Critical Habitat -	
CCC Steelhead Critical Habitat -	**X**
SCCC Steelhead Critical Habitat -	
SC Steelhead Critical Habitat -	
CCV Steelhead Critical Habitat -	
Eulachon Critical Habitat -	
sDPS Green Sturgeon Critical Habitat -	
ESA Marine Invertebrates	
Range Black Abalone (E) -	
Range White Abalone (E) -	
ESA Marine Invertebrates Critical Habitat	
Black Abalone Critical Habitat -	
ESA Sea Turtles	
East Pacific Green Sea Turtle (T) -	
Olive Ridley Sea Turtle (T/E) -	
Leatherback Sea Turtle (E) -	
North Pacific Loggerhead Sea Turtle (E) -	
ESA Whales	
Blue Whale (E) -	
Fin Whale (E) -	
Humpback Whale (E) -	
Southern Resident Killer Whale (E) -	
North Pacific Right Whale (E) -	
Sei Whale (E) -	
Sperm Whale (E) -	
ESA Pinnipeds	
Guadalupe Fur Seal (T) -	
Steller Sea Lion Critical Habitat -	
Essential Fish Habitat	
Coho EFH -	**X**
Chinook Salmon EFH -	**X**
Groundfish EFH -	
Coastal Pelagics EFH -	
Highly Migratory Species EFH -	
MMPA Species (See list at left)	
ESA and MMPA Cetaceans/Pinnipeds	
See list at left and consult the NMFS Long Beach office	
562-980-4000	
MMPA Cetaceans -	
MMPA Pinnipeds -	

Quad Name	**Napa**
Quad Number	**38122-C3**
ESA Anadromous Fish	
SONCC Coho ESU (T) -	
CCC Coho ESU (E) -	
CC Chinook Salmon ESU (T) -	
CVSR Chinook Salmon ESU (T) -	
SRWR Chinook Salmon ESU (E) -	
NC Steelhead DPS (T) -	
CCC Steelhead DPS (T) -	**X**
SCCC Steelhead DPS (T) -	
SC Steelhead DPS (E) -	
CCV Steelhead DPS (T) -	
Eulachon (T) -	
sDPS Green Sturgeon (T) -	**X**
ESA Anadromous Fish Critical Habitat	
SONCC Coho Critical Habitat -	
CCC Coho Critical Habitat -	
CC Chinook Salmon Critical Habitat -	
CVSR Chinook Salmon Critical Habitat -	
SRWR Chinook Salmon Critical Habitat -	
NC Steelhead Critical Habitat -	
CCC Steelhead Critical Habitat -	**X**
SCCC Steelhead Critical Habitat -	
SC Steelhead Critical Habitat -	
CCV Steelhead Critical Habitat -	
Eulachon Critical Habitat -	
sDPS Green Sturgeon Critical Habitat -	**X**
ESA Marine Invertebrates	
Range Black Abalone (E) -	
Range White Abalone (E) -	
ESA Marine Invertebrates Critical Habitat	
Black Abalone Critical Habitat -	
ESA Sea Turtles	
East Pacific Green Sea Turtle (T) -	
Olive Ridley Sea Turtle (T/E) -	
Leatherback Sea Turtle (E) -	
North Pacific Loggerhead Sea Turtle (E) -	
ESA Whales	
Blue Whale (E) -	
Fin Whale (E) -	
Humpback Whale (E) -	
Southern Resident Killer Whale (E) -	
North Pacific Right Whale (E) -	
Sei Whale (E) -	
Sperm Whale (E) -	
ESA Pinnipeds	
Guadalupe Fur Seal (T) -	
Steller Sea Lion Critical Habitat -	
Essential Fish Habitat	
Coho EFH -	**X**
Chinook Salmon EFH -	**X**
Groundfish EFH -	**X**
Coastal Pelagics EFH -	
Highly Migratory Species EFH -	
MMPA Species (See list at left)	
ESA and MMPA Cetaceans/Pinnipeds	
See list at left and consult the NMFS Long Beach office	
562-980-4000	
MMPA Cetaceans -	
MMPA Pinnipeds -	

Quad Name	**Mount George**
Quad Number	**38122-C2**
ESA Anadromous Fish	
SONCC Coho ESU (T) -	
CCC Coho ESU (E) -	
CC Chinook Salmon ESU (T) -	
CVSR Chinook Salmon ESU (T) -	
SRWR Chinook Salmon ESU (E) -	
NC Steelhead DPS (T) -	
CCC Steelhead DPS (T) -	X
SCCC Steelhead DPS (T) -	
SC Steelhead DPS (E) -	
CCV Steelhead DPS (T) -	
Eulachon (T) -	
sDPS Green Sturgeon (T) -	
ESA Anadromous Fish Critical Habitat	
SONCC Coho Critical Habitat -	
CCC Coho Critical Habitat -	
CC Chinook Salmon Critical Habitat -	
CVSR Chinook Salmon Critical Habitat -	
SRWR Chinook Salmon Critical Habitat -	
NC Steelhead Critical Habitat -	
CCC Steelhead Critical Habitat -	X
SCCC Steelhead Critical Habitat -	
SC Steelhead Critical Habitat -	
CCV Steelhead Critical Habitat -	
Eulachon Critical Habitat -	
sDPS Green Sturgeon Critical Habitat -	
ESA Marine Invertebrates	
Range Black Abalone (E) -	
Range White Abalone (E) -	
ESA Marine Invertebrates Critical Habitat	
Black Abalone Critical Habitat -	
ESA Sea Turtles	
East Pacific Green Sea Turtle (T) -	
Olive Ridley Sea Turtle (T/E) -	
Leatherback Sea Turtle (E) -	
North Pacific Loggerhead Sea Turtle (E) -	
ESA Whales	
Blue Whale (E) -	
Fin Whale (E) -	
Humpback Whale (E) -	
Southern Resident Killer Whale (E) -	
North Pacific Right Whale (E) -	
Sei Whale (E) -	
Sperm Whale (E) -	
ESA Pinnipeds	
Guadalupe Fur Seal (T) -	
Steller Sea Lion Critical Habitat -	
Essential Fish Habitat	
Coho EFH -	X
Chinook Salmon EFH -	X
Groundfish EFH -	
Coastal Pelagics EFH -	
Highly Migratory Species EFH -	
MMPA Species (See list at left)	
ESA and MMPA Cetaceans/Pinnipeds	
See list at left and consult the NMFS Long Beach office	
562-980-4000	
MMPA Cetaceans -	
MMPA Pinnipeds -	

Quad Name	**Fairfield North**
Quad Number	**38122-C1**
ESA Anadromous Fish	
SONCC Coho ESU (T) -	
CCC Coho ESU (E) -	
CC Chinook Salmon ESU (T) -	
CVSR Chinook Salmon ESU (T) -	X
SRWR Chinook Salmon ESU (E) -	X
NC Steelhead DPS (T) -	
CCC Steelhead DPS (T) -	X
SCCC Steelhead DPS (T) -	
SC Steelhead DPS (E) -	
CCV Steelhead DPS (T) -	X
Eulachon (T) -	
sDPS Green Sturgeon (T) -	
ESA Anadromous Fish Critical Habitat	
SONCC Coho Critical Habitat -	
CCC Coho Critical Habitat -	
CC Chinook Salmon Critical Habitat -	
CVSR Chinook Salmon Critical Habitat -	
SRWR Chinook Salmon Critical Habitat -	
NC Steelhead Critical Habitat -	
CCC Steelhead Critical Habitat -	
SCCC Steelhead Critical Habitat -	
SC Steelhead Critical Habitat -	
CCV Steelhead Critical Habitat -	
Eulachon Critical Habitat -	
sDPS Green Sturgeon Critical Habitat -	
ESA Marine Invertebrates	
Range Black Abalone (E) -	
Range White Abalone (E) -	
ESA Marine Invertebrates Critical Habitat	
Black Abalone Critical Habitat -	
ESA Sea Turtles	
East Pacific Green Sea Turtle (T) -	
Olive Ridley Sea Turtle (T/E) -	
Leatherback Sea Turtle (E) -	
North Pacific Loggerhead Sea Turtle (E) -	
ESA Whales	
Blue Whale (E) -	
Fin Whale (E) -	
Humpback Whale (E) -	
Southern Resident Killer Whale (E) -	
North Pacific Right Whale (E) -	
Sei Whale (E) -	
Sperm Whale (E) -	
ESA Pinnipeds	
Guadalupe Fur Seal (T) -	
Steller Sea Lion Critical Habitat -	
Essential Fish Habitat	
Coho EFH -	
Chinook Salmon EFH -	X
Groundfish EFH -	
Coastal Pelagics EFH -	
Highly Migratory Species EFH -	
MMPA Species (See list at left)	
ESA and MMPA Cetaceans/Pinnipeds	
See list at left and consult the NMFS Long Beach office	
562-980-4000	
MMPA Cetaceans -	
MMPA Pinnipeds -	

Quad Name	**Sears Point**
Quad Number	**38122-B4**
ESA Anadromous Fish	
SONCC Coho ESU (T) -	
CCC Coho ESU (E) -	
CC Chinook Salmon ESU (T) -	
CVSR Chinook Salmon ESU (T) -	X
SRWR Chinook Salmon ESU (E) -	X
NC Steelhead DPS (T) -	
CCC Steelhead DPS (T) -	X
SCCC Steelhead DPS (T) -	
SC Steelhead DPS (E) -	
CCV Steelhead DPS (T) -	X
Eulachon (T) -	
sDPS Green Sturgeon (T) -	X
ESA Anadromous Fish Critical Habitat	
SONCC Coho Critical Habitat -	
CCC Coho Critical Habitat -	
CC Chinook Salmon Critical Habitat -	
CVSR Chinook Salmon Critical Habitat -	
SRWR Chinook Salmon Critical Habitat -	X
NC Steelhead Critical Habitat -	
CCC Steelhead Critical Habitat -	X
SCCC Steelhead Critical Habitat -	
SC Steelhead Critical Habitat -	
CCV Steelhead Critical Habitat -	
Eulachon Critical Habitat -	
sDPS Green Sturgeon Critical Habitat -	X
ESA Marine Invertebrates	
Range Black Abalone (E) -	
Range White Abalone (E) -	
ESA Marine Invertebrates Critical Habitat	
Black Abalone Critical Habitat -	
ESA Sea Turtles	
East Pacific Green Sea Turtle (T) -	
Olive Ridley Sea Turtle (T/E) -	
Leatherback Sea Turtle (E) -	
North Pacific Loggerhead Sea Turtle (E) -	
ESA Whales	
Blue Whale (E) -	
Fin Whale (E) -	
Humpback Whale (E) -	
Southern Resident Killer Whale (E) -	
North Pacific Right Whale (E) -	
Sei Whale (E) -	
Sperm Whale (E) -	
ESA Pinnipeds	
Guadalupe Fur Seal (T) -	
Steller Sea Lion Critical Habitat -	
Essential Fish Habitat	
Coho EFH -	X
Chinook Salmon EFH -	X
Groundfish EFH -	X
Coastal Pelagics EFH -	X
Highly Migratory Species EFH -	
MMPA Species (See list at left)	
ESA and MMPA Cetaceans/Pinnipeds	
See list at left and consult the NMFS Long Beach office	
562-980-4000	
MMPA Cetaceans -	
MMPA Pinnipeds -	X

Quad Name	**Cuttings Wharf**
Quad Number	**38122-B3**
ESA Anadromous Fish	
SONCC Coho ESU (T) -	
CCC Coho ESU (E) -	
CC Chinook Salmon ESU (T) -	
CVSR Chinook Salmon ESU (T) -	X
SRWR Chinook Salmon ESU (E) -	X
NC Steelhead DPS (T) -	
CCC Steelhead DPS (T) -	X
SCCC Steelhead DPS (T) -	
SC Steelhead DPS (E) -	
CCV Steelhead DPS (T) -	X
Eulachon (T) -	
sDPS Green Sturgeon (T) -	X
ESA Anadromous Fish Critical Habitat	
SONCC Coho Critical Habitat -	
CCC Coho Critical Habitat -	
CC Chinook Salmon Critical Habitat -	
CVSR Chinook Salmon Critical Habitat -	
SRWR Chinook Salmon Critical Habitat -	X
NC Steelhead Critical Habitat -	
CCC Steelhead Critical Habitat -	X
SCCC Steelhead Critical Habitat -	
SC Steelhead Critical Habitat -	
CCV Steelhead Critical Habitat -	
Eulachon Critical Habitat -	
sDPS Green Sturgeon Critical Habitat -	X
ESA Marine Invertebrates	
Range Black Abalone (E) -	
Range White Abalone (E) -	
ESA Marine Invertebrates Critical Habitat	
Black Abalone Critical Habitat -	
ESA Sea Turtles	
East Pacific Green Sea Turtle (T) -	
Olive Ridley Sea Turtle (T/E) -	
Leatherback Sea Turtle (E) -	
North Pacific Loggerhead Sea Turtle (E) -	
ESA Whales	
Blue Whale (E) -	
Fin Whale (E) -	
Humpback Whale (E) -	
Southern Resident Killer Whale (E) -	
North Pacific Right Whale (E) -	
Sei Whale (E) -	
Sperm Whale (E) -	
ESA Pinnipeds	
Guadalupe Fur Seal (T) -	
Steller Sea Lion Critical Habitat -	
Essential Fish Habitat	
Coho EFH -	X
Chinook Salmon EFH -	X
Groundfish EFH -	X
Coastal Pelagics EFH -	X
Highly Migratory Species EFH -	
MMPA Species (See list at left)	
ESA and MMPA Cetaceans/Pinnipeds	
See list at left and consult the NMFS Long Beach office	
562-980-4000	
MMPA Cetaceans -	
MMPA Pinnipeds -	X

Quad Name	Cordelia
Quad Number	**38122-B2**
ESA Anadromous Fish	
SONCC Coho ESU (T) -	
CCC Coho ESU (E) -	
CC Chinook Salmon ESU (T) -	
CVSR Chinook Salmon ESU (T) -	
SRWR Chinook Salmon ESU (E) -	
NC Steelhead DPS (T) -	
CCC Steelhead DPS (T) -	X
SCCC Steelhead DPS (T) -	
SC Steelhead DPS (E) -	
CCV Steelhead DPS (T) -	
Eulachon (T) -	
sDPS Green Sturgeon (T) -	X
ESA Anadromous Fish Critical Habitat	
SONCC Coho Critical Habitat -	
CCC Coho Critical Habitat -	
CC Chinook Salmon Critical Habitat -	
CVSR Chinook Salmon Critical Habitat -	
SRWR Chinook Salmon Critical Habitat -	
NC Steelhead Critical Habitat -	
CCC Steelhead Critical Habitat -	X
SCCC Steelhead Critical Habitat -	
SC Steelhead Critical Habitat -	
CCV Steelhead Critical Habitat -	
Eulachon Critical Habitat -	
sDPS Green Sturgeon Critical Habitat -	X
ESA Marine Invertebrates	
Range Black Abalone (E) -	
Range White Abalone (E) -	
ESA Marine Invertebrates Critical Habitat	
Black Abalone Critical Habitat -	
ESA Sea Turtles	
East Pacific Green Sea Turtle (T) -	
Olive Ridley Sea Turtle (T/E) -	
Leatherback Sea Turtle (E) -	
North Pacific Loggerhead Sea Turtle (E) -	
ESA Whales	
Blue Whale (E) -	
Fin Whale (E) -	
Humpback Whale (E) -	
Southern Resident Killer Whale (E) -	
North Pacific Right Whale (E) -	
Sei Whale (E) -	
Sperm Whale (E) -	
ESA Pinnipeds	
Guadalupe Fur Seal (T) -	
Steller Sea Lion Critical Habitat -	
Essential Fish Habitat	
Coho EFH -	X
Chinook Salmon EFH -	X
Groundfish EFH -	X
Coastal Pelagics EFH -	X
Highly Migratory Species EFH -	
MMPA Species (See list at left)	
ESA and MMPA Cetaceans/Pinnipeds	
See list at left and consult the NMFS Long Beach office	
562-980-4000	
MMPA Cetaceans -	
MMPA Pinnipeds -	

Appendix E

California Natural Diversity Database (CNDDB) List of Plant and Animal Species Known to Occur in the Project Area

CALIFORNIA DEPARTMENT OF FISH and WILDLIFE RareFind

Query Summary:
County IS (Napa)

Print Close

CNDDB Element Query Results

Scientific Name	Common Name	Taxonomic Group	Element Code	Total Occs	Returned Occs	Federal Status	State Status	Global Rank	State Rank	CA Rare Plant Rank	Other Status	Habitats
Accipiter striatus	sharp-shinned hawk	Birds	ABNKC12020	22	1	None	None	G5	S4	null	CDFW_WL-Watch List, IUCN_LC-Least Concern	Cismontane woodland, Lower montane coniferous forest, Riparian forest, Riparian woodland
Agelaius tricolor	tricolored blackbird	Birds	ABPBXB0020	951	7	None	Candidate Endangered	G2G3	S1S2	null	BLM_S-Sensitive, CDFW_SSC-Species of Special Concern, IUCN_EN-Endangered, NABCI_RWL-Red Watch List, USFWS_BCC-Birds of Conservation Concern	Freshwater marsh, Marsh & swamp, Swamp, Wetland
Agrostis hendersonii	Henderson's bent grass	Monocots	PMPOA040K0	26	1	None	None	G2Q	S2	3.2	null	Valley & foothill grassland, Vernal pool, Wetland
Allium peninsulare var. franciscanum	Franciscan onion	Monocots	PMLIL021R1	25	1	None	None	G5T2	S2	1B.2	null	Cismontane woodland, Ultramafic, Valley & foothill grassland
Amorpha californica var. napensis	Napa false indigo	Dicots	PDFAB08012	69	23	None	None	G4T2	S2	1B.2	SB_RSABG-Rancho Santa Ana Botanic Garden	Broadleaved upland forest, Chaparral, Cismontane woodland
Amsinckia lunaris	bent-flowered fiddleneck	Dicots	PDBOR01070	86	3	None	None	G3	S3	1B.2	BLM_S-Sensitive	Cismontane woodland, Coastal bluff scrub, Valley & foothill grassland
Antrozous pallidus	pallid bat	Mammals	AMACC10010	415	20	None	None	G5	S3	null	BLM_S-Sensitive, CDFW_SSC-Species of Special Concern, IUCN_LC-Least Concern, USFS_S-Sensitive, WBWG_H-High Priority	Chaparral, Coastal scrub, Desert wash, Great Basin grassland, Great Basin scrub, Mojavean desert scrub, Riparian woodland, Sonoran desert scrub, Upper montane coniferous forest, Valley & foothill grassland

Aquila chrysaetos	golden eagle	Birds	ABNKC22010	320	4	None	None	G5	S3	null	BLM_S-Sensitive, CDF_S-Sensitive, CDFW_FP-Fully Protected, CDFW_WL-Watch List, IUCN_LC-Least Concern, USFWS_BCC-Birds of Conservation Concern	Broadleaved upland forest, Cismontane woodland, Coastal prairie, Great Basin grassland, Great Basin scrub, Lower montane coniferous forest, Pinon & juniper woodlands, Upper montane coniferous forest, Valley & foothill grassland
Arctostaphylos manzanita ssp. elegans	Konocti manzanita	Dicots	PDERI04271	69	2	None	None	G5T3	S3	1B.3	null	Chaparral, Cismontane woodland, Lower montane coniferous forest
Arctostaphylos stanfordiana ssp. decumbens	Rincon Ridge manzanita	Dicots	PDERI041G4	12	2	None	None	G3T1	S1	1B.1	null	Chaparral, Cismontane woodland
Ardea alba	great egret	Birds	ABNGA04040	43	1	None	None	G5	S4	null	CDF_S-Sensitive, IUCN_LC-Least Concern	Brackish marsh, Estuary, Freshwater marsh, Marsh & swamp, Riparian forest, Wetland
Ardea herodias	great blue heron	Birds	ABNGA04010	154	1	None	None	G5	S4	null	CDF_S-Sensitive, IUCN_LC-Least Concern	Brackish marsh, Estuary, Freshwater marsh, Marsh & swamp, Riparian forest, Wetland
Astragalus claranus	Clara Hunt's milk-vetch	Dicots	PDFAB0F240	6	5	Endangered	Threatened	G1	S1	1B.1	SB_RSABG-Rancho Santa Ana Botanic Garden	Chaparral, Cismontane woodland, Valley & foothill grassland
Astragalus rattanii var. jepsonianus	Jepson's milk-vetch	Dicots	PDFAB0F7E1	51	6	None	None	G4T3	S3	1B.2	BLM_S-Sensitive	Cismontane woodland, Ultramafic, Valley & foothill grassland
Astragalus tener var. tener	alkali milk-vetch	Dicots	PDFAB0F8R1	65	2	None	None	G2T2	S2	1B.2	null	Alkali playa, Valley & foothill grassland, Vernal pool, Wetland
Athene cunicularia	burrowing owl	Birds	ABNSB10010	1971	6	None	None	G4	S3	null	BLM_S-Sensitive, CDFW_SSC-Species of Special Concern, IUCN_LC-Least Concern, USFWS_BCC-Birds of Conservation Concern	Coastal prairie, Coastal scrub, Great Basin grassland, Great Basin scrub, Mojavean desert scrub, Sonoran desert scrub, Valley & foothill grassland
Balsamorhiza macrolepis	big-scale balsamroot	Dicots	PDAST11061	50	3	None	None	G2	S2	1B.2	BLM_S-Sensitive, USFS_S-Sensitive	Chaparral, Cismontane woodland, Ultramafic, Valley & foothill grassland
Bombus caliginosus	obscure bumble bee	Insects	IIHYM24380	181	7	None	None	G4?	S1S2	null	IUCN_VU-Vulnerable	null

Bombus occidentalis	western bumble bee	Insects	IIHYM24250	282	3	None	None	G2G3	S1	null	USFS_S-Sensitive, XERCES_IM-Imperiled	null
Branchinecta lynchi	vernal pool fairy shrimp	Crustaceans	ICBRA03030	766	1	Threatened	None	G3	S3	null	IUCN_VU-Vulnerable	Valley & foothill grassland, Vernal pool, Wetland
Brodiaea leptandra	narrow-anthered brodiaea	Monocots	PMLIL0C022	39	21	None	None	G3?	S3?	1B.2	null	Broadleaved upland forest, Chaparral, Cismontane woodland, Lower montane coniferous forest, Valley & foothill grassland
Buteo regalis	ferruginous hawk	Birds	ABNKC19120	107	1	None	None	G4	S3S4	null	CDFW_WL-Watch List, IUCN_LC-Least Concern, USFWS_BCC-Birds of Conservation Concern	Great Basin grassland, Great Basin scrub, Pinon & juniper woodlands, Valley & foothill grassland
Buteo swainsoni	Swainson's hawk	Birds	ABNKC19070	2460	8	None	Threatened	G5	S3	null	BLM_S-Sensitive, IUCN_LC-Least Concern, USFWS_BCC-Birds of Conservation Concern	Great Basin grassland, Riparian forest, Riparian woodland, Valley & foothill grassland
Calasellus californicus	An isopod	Crustaceans	ICMAL34010	3	1	None	None	G2	S2	null	null	Aquatic
Calystegia collina ssp. oxyphylla	Mt. Saint Helena morning-glory	Dicots	PDCON04032	9	4	None	None	G4T3	S3	4.2	null	Chaparral, Lower montane coniferous forest, Ultramafic, Valley & foothill grassland
Carex lyngbyei	Lyngbye's sedge	Monocots	PMCYP037Y0	29	1	None	None	G5	S3	2B.2	null	Marsh & swamp, Wetland
Castilleja affinis var. neglecta	Tiburon paintbrush	Dicots	PDSCR0D013	7	1	Endangered	Threatened	G4G5T1T2	S1S2	1B.2	SB_UCBBG-UC Berkeley Botanical Garden	Ultramafic, Valley & foothill grassland
Castilleja ambigua var. meadii	Mead's owls-clover	Dicots	PDSCR0D404	3	3	None	None	G4T1	S1	1B.1	null	Meadow & seep, Vernal pool, Wetland
Castilleja rubicundula var. rubicundula	pink creamsacs	Dicots	PDSCR0D482	30	2	None	None	G5T2	S2	1B.2	BLM_S-Sensitive	Chaparral, Cismontane woodland, Meadow & seep, Ultramafic, Valley & foothill grassland
Ceanothus confusus	Rincon Ridge ceanothus	Dicots	PDRHA04220	33	14	None	None	G1	S1	1B.1	BLM_S-Sensitive	Chaparral, Cismontane woodland, Closed-cone coniferous forest, Ultramafic
Ceanothus divergens	Calistoga ceanothus	Dicots	PDRHA04240	23	12	None	None	G2	S2	1B.2	BLM_S-Sensitive	Chaparral, Cismontane woodland, Ultramafic

Ceanothus purpureus	holly-leaved ceanothus	Dicots	PDRHA04160	43	37	None	None	G2	S2	1B.2	null	Chaparral, Cismontane woodland
Ceanothus sonomensis	Sonoma ceanothus	Dicots	PDRHA04420	30	10	None	None	G2	S2	1B.2	null	Chaparral, Ultramafic
Centromadia parryi ssp. parryi	pappose tarplant	Dicots	PDAST4R0P2	39	3	None	None	G3T2	S2	1B.2	BLM_S-Sensitive	Chaparral, Coastal prairie, Marsh & swamp, Meadow & seep, Valley & foothill grassland
Charadrius alexandrinus nivosus	western snowy plover	Birds	ABNNB03031	134	2	Threatened	None	G3T3	S2S3	null	CDFW_SSC-Species of Special Concern, NABCI_RWL-Red Watch List, USFWS_BCC-Birds of Conservation Concern	Great Basin standing waters, Sand shore, Wetland
Chloropyron molle ssp. molle	soft salty bird's-beak	Dicots	PDSCR0J0D2	27	3	Endangered	Rare	G2T1	S1	1B.2	null	Marsh & swamp, Salt marsh, Wetland
Circus cyaneus	northern harrier	Birds	ABNKC11010	53	2	None	None	G5	S3	null	CDFW_SSC-Species of Special Concern, IUCN_LC-Least Concern	Coastal scrub, Great Basin grassland, Marsh & swamp, Riparian scrub, Valley & foothill grassland, Wetland
Coastal Brackish Marsh	Coastal Brackish Marsh	Marsh	CTT52200CA	30	2	None	None	G2	S2.1	null	null	Marsh & swamp, Wetland
Coastal and Valley Freshwater Marsh	Coastal and Valley Freshwater Marsh	Marsh	CTT52410CA	60	1	None	None	G3	S2.1	null	null	Marsh & swamp, Wetland
Corynorhinus townsendii	Townsend's big-eared bat	Mammals	AMACC08010	626	13	None	None	G3G4	S2	null	BLM_S-Sensitive, CDFW_SSC-Species of Special Concern, IUCN_LC-Least Concern, USFS_S-Sensitive, WBWG_H-High Priority	Broadleaved upland forest, Chaparral, Chenopod scrub, Great Basin grassland, Great Basin scrub, Joshua tree woodland, Lower montane coniferous forest, Meadow & seep, Mojavean desert scrub, Riparian forest, Riparian woodland, Sonoran desert scrub, Sonoran thorn woodland, Upper montane coniferous forest, Valley & foothill grassland
Cryptantha dissita	serpentine cryptantha	Dicots	PDBOR0A0H2	10	1	None	None	G2	S2	1B.2	BLM_S-Sensitive	Chaparral, Ultramafic
Cypseloides niger	black swift	Birds	ABNUA01010	46	1	None	None	G4	S2	null	CDFW_SSC-Species of Special Concern, IUCN_LC-Least Concern, NABCI_YWL-	null

											Yellow Watch List, USFWS_BCC-Birds of Conservation Concern	
Desmocerus californicus dimorphus	valley elderberry longhorn beetle	Insects	IICOL48011	271	3	Threatened	None	G3T2	S2	null	null	Riparian scrub
Dicamptodon ensatus	California giant salamander	Amphibians	AAAAH01020	232	8	None	None	G3	S2S3	null	CDFW_SSC-Species of Special Concern, IUCN_NT-Near Threatened	Aquatic, Meadow & seep, North coast coniferous forest, Riparian forest
Downingia pusilla	dwarf downingia	Dicots	PDCAM060C0	132	9	None	None	GU	S2	2B.2	null	Valley & foothill grassland, Vernal pool, Wetland
Elanus leucurus	white-tailed kite	Birds	ABNKC06010	175	2	None	None	G5	S3S4	null	BLM_S-Sensitive, CDFW_FP-Fully Protected, IUCN_LC-Least Concern	Cismontane woodland, Marsh & swamp, Riparian woodland, Valley & foothill grassland, Wetland
Emys marmorata	western pond turtle	Reptiles	ARAAD02030	1343	29	None	None	G3G4	S3	null	BLM_S-Sensitive, CDFW_SSC-Species of Special Concern, IUCN_VU-Vulnerable, USFS_S-Sensitive	Aquatic, Artificial flowing waters, Klamath/North coast flowing waters, Klamath/North coast standing waters, Marsh & swamp, Sacramento/San Joaquin flowing waters, Sacramento/San Joaquin standing waters, South coast flowing waters, South coast standing waters, Wetland
Erethizon dorsatum	North American porcupine	Mammals	AMAFJ01010	508	1	None	None	G5	S3	null	IUCN_LC-Least Concern	Broadleaved upland forest, Cismontane woodland, Closed-cone coniferous forest, Lower montane coniferous forest, North coast coniferous forest, Upper montane coniferous forest
Erigeron greenei	Greene's narrow-leaved daisy	Dicots	PDAST3M5G0	20	12	None	None	G3	S3	1B.2	null	Chaparral, Ultramafic
Eriogonum nervulosum	Snow Mountain buckwheat	Dicots	PDPGN08440	9	1	None	None	G2	S2	1B.2	BLM_S-Sensitive, SB_RSABG-Rancho Santa Ana Botanic Garden, USFS_S-Sensitive	Chaparral, Ultramafic
Eryngium jepsonii	Jepson's coyote-thistle	Dicots	PDAPI0Z130	19	5	None	None	G2	S2	1B.2	null	Valley & foothill grassland, Vernal pool

Extriplex joaquinana	San Joaquin spearscale	Dicots	PDCHE041F3	124	3	None	None	G2	S2	1B.2	BLM_S-Sensitive, SB_RSABG-Rancho Santa Ana Botanic Garden	Alkali playa, Chenopod scrub, Meadow & seep, Valley & foothill grassland
Falco mexicanus	prairie falcon	Birds	ABNKD06090	459	4	None	None	G5	S4	null	CDFW_WL-Watch List, IUCN_LC-Least Concern, USFWS_BCC-Birds of Conservation Concern	Great Basin grassland, Great Basin scrub, Mojavean desert scrub, Sonoran desert scrub, Valley & foothill grassland
Falco peregrinus anatum	American peregrine falcon	Birds	ABNKD06071	57	4	Delisted	Delisted	G4T4	S3S4	null	CDF_S-Sensitive, CDFW_FP-Fully Protected, USFWS_BCC-Birds of Conservation Concern	null
Fritillaria pluriflora	adobe-lily	Monocots	PMLIL0V0F0	113	14	None	None	G2G3	S2S3	1B.2	BLM_S-Sensitive, SB_RSABG-Rancho Santa Ana Botanic Garden	Chaparral, Cismontane woodland, Ultramafic, Valley & foothill grassland
Geothlypis trichas sinuosa	saltmarsh common yellowthroat	Birds	ABPBX1201A	112	15	None	None	G5T3	S3	null	CDFW_SSC-Species of Special Concern, USFWS_BCC-Birds of Conservation Concern	Marsh & swamp
Haliaeetus leucocephalus	bald eagle	Birds	ABNKC10010	327	4	Delisted	Endangered	G5	S3	null	BLM_S-Sensitive, CDF_S-Sensitive, CDFW_FP-Fully Protected, IUCN_LC-Least Concern, USFS_S-Sensitive, USFWS_BCC-Birds of Conservation Concern	Lower montane coniferous forest, Oldgrowth
Harmonia hallii	Hall's harmonia	Dicots	PDAST650A0	19	7	None	None	G2	S2	1B.2	BLM_S-Sensitive, SB_RSABG-Rancho Santa Ana Botanic Garden	Chaparral, Ultramafic
Hesperolinon bicarpellatum	two-carpellate western flax	Dicots	PDLIN01020	25	5	None	None	G2	S2	1B.2	null	Chaparral, Ultramafic
Hesperolinon breweri	Brewer's western flax	Dicots	PDLIN01030	29	5	None	None	G2	S2	1B.2	BLM_S-Sensitive	Chaparral, Cismontane woodland, Ultramafic, Valley & foothill grassland
Hesperolinon drymarioides	drymaria-like western flax	Dicots	PDLIN01090	20	3	None	None	G2	S2	1B.2	BLM_S-Sensitive, USFS_S-Sensitive	Chaparral, Cismontane woodland, Closed-cone coniferous forest, Ultramafic,

												Valley & foothill grassland
Hesperolinon sharsmithiae	Sharsmith's western flax	Dicots	PDLIN010E0	32	29	None	None	G2Q	S2	1B.2	BLM_S-Sensitive	Chaparral, Ultramafic
Juglans hindsii	Northern California black walnut	Dicots	PDJUG02040	5	2	None	None	G1	S1	1B.1	SB_USDA-US Dept of Agriculture	Riparian forest, Riparian woodland
Juncus luciensis	Santa Lucia dwarf rush	Monocots	PMJUN013J0	37	1	None	None	G3	S3	1B.2	USFS_S-Sensitive	Chaparral, Great Basin scrub, Lower montane coniferous forest, Meadow & seep, Vernal pool, Wetland
Lasiurus blossevillii	western red bat	Mammals	AMACC05060	126	1	None	None	G5	S3	null	CDFW_SSC-Species of Special Concern, IUCN_LC-Least Concern, WBWG_H-High Priority	Cismontane woodland, Lower montane coniferous forest, Riparian forest, Riparian woodland
Lasthenia burkei	Burke's goldfields	Dicots	PDAST5L010	34	1	Endangered	Endangered	G1	S1	1B.1	SB_RSABG-Rancho Santa Ana Botanic Garden	Meadow & seep, Vernal pool, Wetland
Lasthenia conjugens	Contra Costa goldfields	Dicots	PDAST5L040	33	4	Endangered	None	G1	S1	1B.1	SB_UCBBG-UC Berkeley Botanical Garden	Alkali playa, Cismontane woodland, Valley & foothill grassland, Vernal pool, Wetland
Laterallus jamaicensis coturniculus	California black rail	Birds	ABNME03041	303	3	None	Threatened	G3G4T1	S1	null	BLM_S-Sensitive, CDFW_FP-Fully Protected, IUCN_NT-Near Threatened, NABCI_RWL-Red Watch List, USFWS_BCC-Birds of Conservation Concern	Brackish marsh, Freshwater marsh, Marsh & swamp, Salt marsh, Wetland
Lathyrus jepsonii var. jepsonii	Delta tule pea	Dicots	PDFAB250D2	131	12	None	None	G5T2	S2	1B.2	SB_BerrySB-Berry Seed Bank, SB_RSABG-Rancho Santa Ana Botanic Garden	Freshwater marsh, Marsh & swamp, Wetland
Layia septentrionalis	Colusa layia	Dicots	PDAST5N0F0	57	14	None	None	G2	S2	1B.2	BLM_S-Sensitive	Chaparral, Cismontane woodland, Ultramafic, Valley & foothill grassland
Legenere limosa	legenere	Dicots	PDCAM0C010	83	1	None	None	G2	S2	1B.1	BLM_S-Sensitive	Vernal pool, Wetland
Leptosiphon jepsonii	Jepson's leptosiphon	Dicots	PDPLM09140	39	20	None	None	G3	S3	1B.2	SB_RSABG-Rancho Santa Ana Botanic Garden, SB_USDA-US Dept of Agriculture	Chaparral, Cismontane woodland, Ultramafic
Lilaeopsis masonii	Mason's lilaeopsis	Dicots	PDAPI19030	197	1	None	Rare	G2	S2	1B.1	null	Freshwater marsh, Marsh & swamp, Riparian

												scrub, Wetland
Limnanthes floccosa ssp. floccosa	woolly meadowfoam	Dicots	PDLIM02043	54	1	None	None	G4T4	S3	4.2	null	Chaparral, Cismontane woodland, Valley & foothill grassland, Vernal pool, Wetland
Limnanthes vinculans	Sebastopol meadowfoam	Dicots	PDLIM02090	45	2	Endangered	Endangered	G1	S1	1B.1	SB_RSABG-Rancho Santa Ana Botanic Garden	Meadow & seep, Valley & foothill grassland, Vernal pool, Wetland
Lupinus sericatus	Cobb Mountain lupine	Dicots	PDFAB2B3J0	46	25	None	None	G2?	S2?	1B.2	BLM_S-Sensitive	Broadleaved upland forest, Chaparral, Cismontane woodland, Lower montane coniferous forest, Ultramafic
Melospiza melodia samuelis	San Pablo song sparrow	Birds	ABPBXA301W	41	5	None	None	G5T2	S2	null	CDFW_SSC-Species of Special Concern, USFWS_BCC-Birds of Conservation Concern	Salt marsh
Myotis evotis	long-eared myotis	Mammals	AMACC01070	139	1	None	None	G5	S3	null	BLM_S-Sensitive, IUCN_LC-Least Concern, WBWG_M-Medium Priority	null
Myotis thysanodes	fringed myotis	Mammals	AMACC01090	86	1	None	None	G4	S3	null	BLM_S-Sensitive, IUCN_LC-Least Concern, USFS_S-Sensitive, WBWG_H-High Priority	null
Myotis yumanensis	Yuma myotis	Mammals	AMACC01020	263	1	None	None	G5	S4	null	BLM_S-Sensitive, IUCN_LC-Least Concern, WBWG_LM-Low-Medium Priority	Lower montane coniferous forest, Riparian forest, Riparian woodland, Upper montane coniferous forest
Navarretia leucocephala ssp. bakeri	Baker's navarretia	Dicots	PDPLM0C0E1	58	2	None	None	G4T2	S2	1B.1	BLM_S-Sensitive	Cismontane woodland, Lower montane coniferous forest, Meadow & seep, Valley & foothill grassland, Vernal pool, Wetland
Navarretia leucocephala ssp. pauciflora	few-flowered navarretia	Dicots	PDPLM0C0E4	10	2	Endangered	Threatened	G4T1	S1	1B.1	SB_RSABG-Rancho Santa Ana Botanic Garden	Vernal pool, Wetland
Navarretia paradoxinota	Porter's navarretia	Dicots	PDPLM0C160	9	3	None	None	G2	S2	1B.3	null	Meadow & seep, Ultramafic

Navarretia rosulata	Marin County navarretia	Dicots	PDPLM0C0Z0	15	3	None	None	G2	S2	1B.2	null	Chaparral, Closed-cone coniferous forest, Ultramafic
Northern Coastal Salt Marsh	Northern Coastal Salt Marsh	Marsh	CTT52110CA	53	2	None	None	G3	S3.2	null	null	Marsh & swamp, Wetland
Northern Interior Cypress Forest	Northern Interior Cypress Forest	Forest	CTT83220CA	22	3	None	None	G2	S2.2	null	null	Closed-cone coniferous forest
Northern Vernal Pool	Northern Vernal Pool	Herbaceous	CTT44100CA	20	6	None	None	G2	S2.1	null	null	Vernal pool, Wetland
Nycticorax nycticorax	black-crowned night heron	Birds	ABNGA11010	37	1	None	None	G5	S4	null	IUCN_LC-Least Concern	Marsh & swamp, Riparian forest, Riparian woodland, Wetland
Oncorhynchus mykiss irideus pop. 8	steelhead - central California coast DPS	Fish	AFCHA0209G	44	4	Threatened	None	G5T2T3Q	S2S3	null	AFS_TH-Threatened	Aquatic, Sacramento/San Joaquin flowing waters
Pandion haliaetus	osprey	Birds	ABNKC01010	500	3	None	None	G5	S4	null	CDF_S-Sensitive, CDFW_WL-Watch List, IUCN_LC-Least Concern	Riparian forest
Penstemon newberryi var. sonomensis	Sonoma beardtongue	Dicots	PDSCR1L483	11	8	None	None	G4T2	S2	1B.3	null	Chaparral
Phalacrocorax auritus	double-crested cormorant	Birds	ABNFD01020	39	1	None	None	G5	S4	null	CDFW_WL-Watch List, IUCN_LC-Least Concern	Riparian forest, Riparian scrub, Riparian woodland
Plagiobothrys hystriculus	bearded popcornflower	Dicots	PDBOR0V0H0	14	1	None	None	G2	S2	1B.1	null	Valley & foothill grassland, Vernal pool, Wetland
Plagiobothrys strictus	Calistoga popcornflower	Dicots	PDBOR0V120	3	3	Endangered	Threatened	G1	S1	1B.1	SB_UCBBG-UC Berkeley Botanical Garden	Meadow & seep, Valley & foothill grassland, Vernal pool, Wetland
Poa napensis	Napa blue grass	Monocots	PMPOA4Z1R0	2	2	Endangered	Endangered	G1	S1	1B.1	SB_RSABG-Rancho Santa Ana Botanic Garden	Meadow & seep, Valley & foothill grassland, Wetland
Polygonum marinense	Marin knotweed	Dicots	PDPGN0L1C0	32	2	None	None	G2Q	S2	3.1	null	Brackish marsh, Marsh & swamp, Salt marsh, Wetland
Progne subis	purple martin	Birds	ABPAU01010	71	4	None	None	G5	S3	null	CDFW_SSC-Species of Special Concern, IUCN_LC-Least Concern	Broadleaved upland forest, Lower montane coniferous forest
Puccinellia simplex	California alkali grass	Monocots	PMPOA53110	71	1	None	None	G3	S2	1B.2	null	Chenopod scrub, Meadow & seep, Valley & foothill grassland, Vernal pool
Rallus obsoletus obsoletus	California Ridgway's rail	Birds	ABNME05016	98	7	Endangered	Endangered	G5T1	S1	null	CDFW_FP-Fully Protected, NABCI_RWL-Red Watch List	Brackish marsh, Marsh & swamp, Salt marsh, Wetland

Rana boylii	foothill yellow-legged frog	Amphibians	AAABH01050	2054	48	None	Candidate Threatened	G3	S3	null	BLM_S-Sensitive, CDFW_SSC-Species of Special Concern, IUCN_NT-Near Threatened, USFS_S-Sensitive	Aquatic, Chaparral, Cismontane woodland, Coastal scrub, Klamath/North coast flowing waters, Lower montane coniferous forest, Meadow & seep, Riparian forest, Riparian woodland, Sacramento/San Joaquin flowing waters
Rana draytonii	California red-legged frog	Amphibians	AAABH01022	1497	6	Threatened	None	G2G3	S2S3	null	CDFW_SSC-Species of Special Concern, IUCN_VU-Vulnerable	Aquatic, Artificial flowing waters, Artificial standing waters, Freshwater marsh, Marsh & swamp, Riparian forest, Riparian scrub, Riparian woodland, Sacramento/San Joaquin flowing waters, Sacramento/San Joaquin standing waters, South coast flowing waters, South coast standing waters, Wetland
Reithrodontomys raviventris	salt-marsh harvest mouse	Mammals	AMAFF02040	144	6	Endangered	Endangered	G1G2	S1S2	null	CDFW_FP-Fully Protected, IUCN_EN-Endangered	Marsh & swamp, Wetland
Rhynchospora californica	California beaked-rush	Monocots	PMCYP0N060	9	1	None	None	G1	S1	1B.1	BLM_S-Sensitive	Freshwater marsh, Lower montane coniferous forest, Marsh & swamp, Meadow & seep, Wetland
Riparia riparia	bank swallow	Birds	ABPAU08010	297	1	None	Threatened	G5	S2	null	BLM_S-Sensitive, IUCN_LC-Least Concern	Riparian scrub, Riparian woodland
Sagittaria sanfordii	Sanford's arrowhead	Monocots	PMALI040Q0	126	1	None	None	G3	S3	1B.2	BLM_S-Sensitive	Marsh & swamp, Wetland
Serpentine Bunchgrass	Serpentine Bunchgrass	Herbaceous	CTT42130CA	22	3	None	None	G2	S2.2	null	null	Valley & foothill grassland
Sidalcea hickmanii ssp. napensis	Napa checkerbloom	Dicots	PDMAL110A6	2	2	None	None	G3T1	S1	1B.1	null	Chaparral
Sidalcea keckii	Keck's checkerbloom	Dicots	PDMAL110D0	16	5	Endangered	None	G2	S2	1B.1	SB_RSABG-Rancho Santa Ana Botanic Garden	Cismontane woodland, Ultramafic, Valley & foothill grassland
Sidalcea oregana ssp. hydrophila	marsh checkerbloom	Dicots	PDMAL110K2	35	1	None	None	G5T2	S2	1B.2	null	Meadow & seep, Riparian forest, Wetland
Sorex ornatus sinuosus	Suisun shrew	Mammals	AMABA01103	15	2	None	None	G5T1T2Q	S1S2	null	CDFW_SSC-Species of Special Concern	Marsh & swamp, Wetland

Spergularia macrotheca var. longistyla	long-styled sand-spurrey	Dicots	PDCAR0W062	22	2	None	None	G5T2	S2	1B.2	null	Marsh & swamp, Meadow & seep
Spirinchus thaleichthys	longfin smelt	Fish	AFCHB03010	46	1	Candidate	Threatened	G5	S1	null	CDFW_SSC-Species of Special Concern	Aquatic, Estuary
Streptanthus brachiatus ssp. brachiatus	Socrates Mine jewelflower	Dicots	PDBRA2G072	10	1	None	None	G2T1	S1	1B.2	BLM_S-Sensitive	Chaparral, Closed-cone coniferous forest, Ultramafic
Streptanthus hesperidis	green jewelflower	Dicots	PDBRA2G510	19	13	None	None	G2	S2	1B.2	null	Chaparral, Cismontane woodland, Ultramafic
Streptanthus morrisonii ssp. elatus	Three Peaks jewelflower	Dicots	PDBRA2G0S1	7	7	None	None	G2T1	S1	1B.2	BLM_S-Sensitive	Chaparral, Ultramafic
Streptanthus morrisonii ssp. kruckebergii	Kruckeberg's jewelflower	Dicots	PDBRA2G0S4	5	3	None	None	G2T1	S1	1B.2	BLM_S-Sensitive	Cismontane woodland, Ultramafic
Symphyotrichum lentum	Suisun Marsh aster	Dicots	PDASTE8470	173	3	None	None	G2	S2	1B.2	SB_RSABG-Rancho Santa Ana Botanic Garden, SB_USDA-US Dept of Agriculture	Brackish marsh, Freshwater marsh, Marsh & swamp, Wetland
Syncaris pacifica	California freshwater shrimp	Crustaceans	ICMAL27010	20	2	Endangered	Endangered	G2	S2	null	IUCN_EN-Endangered	Aquatic, Sacramento/San Joaquin flowing waters
Taxidea taxus	American badger	Mammals	AMAJF04010	559	2	None	None	G5	S3	null	CDFW_SSC-Species of Special Concern, IUCN_LC-Least Concern	Alkali marsh, Alkali playa, Alpine, Alpine dwarf scrub, Bog & fen, Brackish marsh, Broadleaved upland forest, Chaparral, Chenopod scrub, Cismontane woodland, Closed-cone coniferous forest, Coastal bluff scrub, Coastal dunes, Coastal prairie, Coastal scrub, Desert dunes, Desert wash, Freshwater marsh, Great Basin grassland, Great Basin scrub, Interior dunes, Ione formation, Joshua tree woodland, Limestone, Lower montane coniferous forest, Marsh & swamp, Meadow & seep, Mojavean desert scrub, Montane dwarf scrub, North coast coniferous

												forest, Oldgrowth, Pavement plain, Redwood, Riparian forest, Riparian scrub, Riparian woodland, Salt marsh, Sonoran desert scrub, Sonoran thorn woodland, Ultramafic, Upper montane coniferous forest, Upper Sonoran scrub, Valley & foothill grassland
Trachykele hartmani	serpentine cypress wood-boring beetle	Insects	IICOLX6010	3	1	None	None	G1	S1	null	null	null
Trichostema ruygtii	Napa bluecurls	Dicots	PDLAM220H0	19	18	None	None	G1G2	S1S2	1B.2	null	Chaparral, Cismontane woodland, Lower montane coniferous forest, Valley & foothill grassland, Vernal pool, Wetland
Trifolium amoenum	two-fork clover	Dicots	PDFAB40040	26	3	Endangered	None	G1	S1	1B.1	SB_RSABG-Rancho Santa Ana Botanic Garden, SB_USDA-US Dept of Agriculture	Coastal bluff scrub, Ultramafic, Valley & foothill grassland
Trifolium hydrophilum	saline clover	Dicots	PDFAB400R5	49	6	None	None	G2	S2	1B.2	null	Marsh & swamp, Valley & foothill grassland, Vernal pool, Wetland
Vandykea tuberculata	serpentine cypress long-horned beetle	Insects	IICOLX7010	2	2	None	None	G1	S1	null	null	null
Viburnum ellipticum	oval-leaved viburnum	Dicots	PDCPR07080	38	3	None	None	G4G5	S3?	2B.3	null	Chaparral, Cismontane woodland, Lower montane coniferous forest
Wildflower Field	Wildflower Field	Herbaceous	CTT42300CA	5	1	None	None	G2	S2.2	null	null	Valley & foothill grassland

Appendix F

California Native Plant Society's Inventory of Rare and Listed Plant Query for Napa County

CNPS California Native Plant Society

Plant List

Inventory of Rare and Endangered Plants

128 matches found. *Click on scientific name for details*

Search Criteria

Found in Napa County

Modify Search Criteria Export to Excel Modify Columns Modify Sort Display Photos

Scientific Name	Common Name	Family	Lifeform	Blooming Period	CA Rare Plant Rank	State Rank	Global Rank
Agrostis hendersonii	Henderson's bent grass	Poaceae	annual herb	Apr-Jun	3.2	S2	G2Q
Allium fimbriatum var. purdyi	Purdy's onion	Alliaceae	perennial bulbiferous herb	Apr-Jun	4.3	S3	G4G5T3
Amorpha californica var. napensis	Napa false indigo	Fabaceae	perennial deciduous shrub	Apr-Jul	1B.2	S2	G4T2
Amsinckia lunaris	bent-flowered fiddleneck	Boraginaceae	annual herb	Mar-Jun	1B.2	S2S3	G2G3
Antirrhinum virga	twig-like snapdragon	Plantaginaceae	perennial herb	Jun-Jul	4.3	S3?	G3?
Arabis modesta	modest rockcress	Brassicaceae	perennial herb	Mar-Jul	4.3	S3	G3
Arabis oregana	Oregon rockcress	Brassicaceae	perennial herb	May	4.3	S3	G3G4Q
Arctostaphylos manzanita ssp. elegans	Konocti manzanita	Ericaceae	perennial evergreen shrub	(Jan)Mar-May(Jul)	1B.3	S3	G5T3
Arctostaphylos stanfordiana ssp. decumbens	Rincon Ridge manzanita	Ericaceae	perennial evergreen shrub	Feb-Apr(May)	1B.1	S1	G3T1
Asclepias solanoana	serpentine milkweed	Apocynaceae	perennial herb	May-Jul(Aug)	4.2	S3	G3
Astragalus breweri	Brewer's milk-vetch	Fabaceae	annual herb	Apr-Jun	4.2	S3	G3
Astragalus claranus	Clara Hunt's milk-vetch	Fabaceae	annual herb	Mar-May	1B.1	S1	G1
Astragalus clevelandii	Cleveland's milk-vetch	Fabaceae	perennial herb	Jun-Sep	4.3	S4	G4
Astragalus rattanii var. jepsonianus	Jepson's milk-vetch	Fabaceae	annual herb	Mar-Jun	1B.2	S3	G4T3
Astragalus tener var. tener	alkali milk-vetch	Fabaceae	annual herb	Mar-Jun	1B.2	S2	G2T2
Balsamorhiza macrolepis	big-scale balsamroot	Asteraceae	perennial herb	Mar-Jun	1B.2	S2	G2

Brodiaea leptandra	narrow-anthered brodiaea	Themidaceae	perennial bulbiferous herb	May-Jul	1B.2	S3?	G3?
Calamagrostis ophitidis	serpentine reed grass	Poaceae	perennial herb	Apr-Jul	4.3	S3	G3
Calandrinia breweri	Brewer's calandrinia	Montiaceae	annual herb	(Jan)Mar-Jun	4.2	S4	G4
Calochortus uniflorus	pink star-tulip	Liliaceae	perennial bulbiferous herb	Apr-Jun	4.2	S4	G4
Calycadenia micrantha	small-flowered calycadenia	Asteraceae	annual herb	Jun-Sep	1B.2	S2	G2
Calyptridium quadripetalum	four-petaled pussypaws	Montiaceae	annual herb	Apr-Jun	4.3	S4	G4
Calystegia collina ssp. oxyphylla	Mt. Saint Helena morning-glory	Convolvulaceae	perennial rhizomatous herb	Apr-Jun	4.2	S3	G4T3
Carex lyngbyei	Lyngbye's sedge	Cyperaceae	perennial rhizomatous herb	Apr-Aug	2B.2	S3	G5
Castilleja affinis var. neglecta	Tiburon paintbrush	Orobanchaceae	perennial herb (hemiparasitic)	Apr-Jun	1B.2	S1S2	G4G5T1T2
Castilleja ambigua var. ambigua	johnny-nip	Orobanchaceae	annual herb (hemiparasitic)	Mar-Aug	4.2	S4	G4T5
Castilleja ambigua var. meadii	Mead's owl's-clover	Orobanchaceae	annual herb (hemiparasitic)	Apr-May	1B.1	S1	G4T1
Castilleja rubicundula var. rubicundula	pink creamsacs	Orobanchaceae	annual herb (hemiparasitic)	Apr-Jun	1B.2	S2	G5T2
Ceanothus confusus	Rincon Ridge ceanothus	Rhamnaceae	perennial evergreen shrub	Feb-Jun	1B.1	S1	G1
Ceanothus divergens	Calistoga ceanothus	Rhamnaceae	perennial evergreen shrub	Feb-Apr	1B.2	S2	G2
Ceanothus purpureus	holly-leaved ceanothus	Rhamnaceae	perennial evergreen shrub	Feb-Jun	1B.2	S2	G2
Ceanothus sonomensis	Sonoma ceanothus	Rhamnaceae	perennial evergreen shrub	Feb-Apr	1B.2	S2	G2
Centromadia parryi ssp. parryi	pappose tarplant	Asteraceae	annual herb	May-Nov	1B.2	S2	G3T2
Chloropyron molle ssp. molle	soft bird's-beak	Orobanchaceae	annual herb (hemiparasitic)	Jun-Nov	1B.2	S1	G2T1
Clarkia gracilis ssp. tracyi	Tracy's clarkia	Onagraceae	annual herb	Apr-Jul	4.2	S3	G5T3
Collomia diversifolia	serpentine collomia	Polemoniaceae	annual herb	May-Jun	4.3	S4	G4
Cordylanthus tenuis ssp. brunneus	serpentine bird's-beak	Orobanchaceae	annual herb (hemiparasitic)	Jul-Aug	4.3	S3	G4G5T3
Cryptantha dissita	serpentine cryptantha	Boraginaceae	annual herb	Apr-Jun	1B.2	S2	G2
Delphinium uliginosum	swamp larkspur	Ranunculaceae	perennial herb	May-Jun	4.2	S3	G3
Downingia pusilla	dwarf downingia	Campanulaceae	annual herb	Mar-May	2B.2	S2	GU

Eleocharis parvula	small spikerush	Cyperaceae	perennial herb	(Apr)Jun-Aug(Sep)	4.3	S3	G5
Equisetum palustre	marsh horsetail	Equisetaceae	perennial rhizomatous herb	unk	3	S1S3	G5
Erigeron biolettii	streamside daisy	Asteraceae	perennial herb	Jun-Oct	3	S3?	G3?
Erigeron greenei	Greene's narrow-leaved daisy	Asteraceae	perennial herb	May-Sep	1B.2	S3	G3
Eriogonum nervulosum	Snow Mountain buckwheat	Polygonaceae	perennial rhizomatous herb	Jun-Sep	1B.2	S2	G2
Eriogonum tripodum	tripod buckwheat	Polygonaceae	perennial deciduous shrub	May-Jul	4.2	S4	G4
Eriogonum umbellatum var. bahiiforme	bay buckwheat	Polygonaceae	perennial herb	Jul-Sep	4.2	S3	G5T3
Eryngium constancei	Loch Lomond button-celery	Apiaceae	annual / perennial herb	Apr-Jun	1B.1	S1	G1
Eryngium jepsonii	Jepson's coyote thistle	Apiaceae	perennial herb	Apr-Aug	1B.2	S2?	G2?
Erythranthe nudata	bare monkeyflower	Phrymaceae	annual herb	May-Jun	4.3	S4	G4
Erythronium helenae	St. Helena fawn lily	Liliaceae	perennial bulbiferous herb	Mar-May	4.2	S3	G3
Extriplex joaquinana	San Joaquin spearscale	Chenopodiaceae	annual herb	Apr-Oct	1B.2	S2	G2
Fritillaria pluriflora	adobe-lily	Liliaceae	perennial bulbiferous herb	Feb-Apr	1B.2	S2S3	G2G3
Fritillaria purdyi	Purdy's fritillary	Liliaceae	perennial bulbiferous herb	Mar-Jun	4.3	S4	G4
Harmonia hallii	Hall's harmonia	Asteraceae	annual herb	Apr-Jun	1B.2	S2	G2
Harmonia nutans	nodding harmonia	Asteraceae	annual herb	Mar-May	4.3	S3	G3
Helianthus exilis	serpentine sunflower	Asteraceae	annual herb	Jun-Nov	4.2	S3	G3
Hesperevax caulescens	hogwallow starfish	Asteraceae	annual herb	Mar-Jun	4.2	S3	G3
Hesperolinon bicarpellatum	two-carpellate western flax	Linaceae	annual herb	May-Jul	1B.2	S2	G2
Hesperolinon breweri	Brewer's western flax	Linaceae	annual herb	May-Jul	1B.2	S2?	G2?
Hesperolinon drymarioides	drymaria-like western flax	Linaceae	annual herb	May-Aug	1B.2	S2	G2
Hesperolinon sharsmithiae	Sharsmith's western flax	Linaceae	annual herb	May-Jul	1B.2	S2	G2Q
Hesperolinon tehamense	Tehama County western flax	Linaceae	annual herb	May-Jul	1B.3	S2	G2
Iris longipetala	coast iris	Iridaceae	perennial rhizomatous herb	Mar-May	4.2	S3	G3
Juglans hindsii	Northern California black walnut	Juglandaceae	perennial deciduous tree	Apr-May	1B.1	S1	G1

Juncus luciensis	Santa Lucia dwarf rush	Juncaceae	annual herb	Apr-Jul	1B.2	S3	G3
Lasthenia burkei	Burke's goldfields	Asteraceae	annual herb	Apr-Jun	1B.1	S1	G1
Lasthenia conjugens	Contra Costa goldfields	Asteraceae	annual herb	Mar-Jun	1B.1	S1	G1
Lathyrus jepsonii var. jepsonii	Delta tule pea	Fabaceae	perennial herb	May-Jul(Aug-Sep)	1B.2	S2	G5T2
Layia septentrionalis	Colusa layia	Asteraceae	annual herb	Apr-May	1B.2	S2	G2
Legenere limosa	legenere	Campanulaceae	annual herb	Apr-Jun	1B.1	S2	G2
Leptosiphon acicularis	bristly leptosiphon	Polemoniaceae	annual herb	Apr-Jul	4.2	S4?	G4?
Leptosiphon jepsonii	Jepson's leptosiphon	Polemoniaceae	annual herb	Mar-May	1B.2	S3	G3
Leptosiphon latisectus	broad-lobed leptosiphon	Polemoniaceae	annual herb	Apr-Jun	4.3	S4	G4
Lessingia hololeuca	woolly-headed lessingia	Asteraceae	annual herb	Jun-Oct	3	S3?	G3?
Lilaeopsis masonii	Mason's lilaeopsis	Apiaceae	perennial rhizomatous herb	Apr-Nov	1B.1	S2	G2
Lilium rubescens	redwood lily	Liliaceae	perennial bulbiferous herb	Apr-Aug(Sep)	4.2	S3	G3
Limnanthes floccosa ssp. floccosa	woolly meadowfoam	Limnanthaceae	annual herb	Mar-May(Jun)	4.2	S3	G4T4
Limnanthes vinculans	Sebastopol meadowfoam	Limnanthaceae	annual herb	Apr-May	1B.1	S1	G1
Lomatium hooveri	Hoover's lomatium	Apiaceae	perennial herb	Apr-Jul	4.3	S3	G3
Lomatium repostum	Napa lomatium	Apiaceae	perennial herb	Mar-Jun	4.3	S3	G3
Lupinus sericatus	Cobb Mountain lupine	Fabaceae	perennial herb	Mar-Jun	1B.2	S2?	G2?
Malacothamnus helleri	Heller's bush-mallow	Malvaceae	perennial deciduous shrub	May-Jul	3.3	S3	G3Q
Melica spectabilis	purple onion grass	Poaceae	perennial rhizomatous herb	May-Jul	4.3	S4	G5
Micropus amphibolus	Mt. Diablo cottonweed	Asteraceae	annual herb	Mar-May	3.2	S3S4	G3G4
Microseris sylvatica	sylvan microseris	Asteraceae	perennial herb	Mar-Jun	4.2	S4	G4
Monardella viridis	green monardella	Lamiaceae	perennial rhizomatous herb	Jun-Sep	4.3	S3	G3
Navarretia cotulifolia	cotula navarretia	Polemoniaceae	annual herb	May-Jun	4.2	S4	G4
Navarretia heterandra	Tehama navarretia	Polemoniaceae	annual herb	Apr-Jun	4.3	S4	G4
Navarretia jepsonii	Jepson's navarretia	Polemoniaceae	annual herb	Apr-Jun	4.3	S4	G4
Navarretia leucocephala ssp. bakeri	Baker's navarretia	Polemoniaceae	annual herb	Apr-Jul	1B.1	S2	G4T2

Navarretia leucocephala ssp. pauciflora	few-flowered navarretia	Polemoniaceae	annual herb	May-Jun	1B.1	S1	G4T1
Navarretia linearifolia ssp. pinnatisecta	pinnate-leaved navarretia	Polemoniaceae	annual herb	Jun-Aug	4.3	S4	G4G5T4
Navarretia paradoxinota	Porter's navarretia	Polemoniaceae	annual herb	May-Jun(Jul)	1B.3	S2	G2
Navarretia rosulata	Marin County navarretia	Polemoniaceae	annual herb	May-Jul	1B.2	S2	G2
Navarretia subuligera	awl-leaved navarretia	Polemoniaceae	annual herb	Apr-Aug	4.3	S4	G4
Orobanche valida ssp. howellii	Howell's broomrape	Orobanchaceae	perennial herb (parasitic)	Jun-Sep	4.3	S3	G4T3
Penstemon newberryi var. sonomensis	Sonoma beardtongue	Plantaginaceae	perennial herb	Apr-Aug	1B.3	S2	G4T2
Perideridia gairdneri ssp. gairdneri	Gairdner's yampah	Apiaceae	perennial herb	Jun-Oct	4.2	S3S4	G5T3T4
Pityopus californicus	California pinefoot	Ericaceae	perennial herb (achlorophyllous)	(Mar-Apr)May-Aug	4.2	S4	G4G5
Plagiobothrys hystriculus	bearded popcornflower	Boraginaceae	annual herb	Apr-May	1B.1	S2	G2
Plagiobothrys strictus	Calistoga popcornflower	Boraginaceae	annual herb	Mar-Jun	1B.1	S1	G1
Poa napensis	Napa blue grass	Poaceae	perennial herb	May-Aug	1B.1	S1	G1
Polygonum marinense	Marin knotweed	Polygonaceae	annual herb	(Apr)May-Aug(Oct)	3.1	S2	G2Q
Psilocarphus brevissimus var. multiflorus	Delta woolly-marbles	Asteraceae	annual herb	May-Jun	4.2	S3	G4T3
Puccinellia simplex	California alkali grass	Poaceae	annual herb	Mar-May	1B.2	S2	G3
Ranunculus lobbii	Lobb's aquatic buttercup	Ranunculaceae	annual herb (aquatic)	Feb-May	4.2	S3	G4
Rhynchospora californica	California beaked-rush	Cyperaceae	perennial rhizomatous herb	May-Jul	1B.1	S1	G1
Ribes victoris	Victor's gooseberry	Grossulariaceae	perennial deciduous shrub	Mar-Apr	4.3	S4	G4
Sagittaria sanfordii	Sanford's arrowhead	Alismataceae	perennial rhizomatous herb (emergent)	May-Oct(Nov)	1B.2	S3	G3
Senecio clevelandii var. clevelandii	Cleveland's ragwort	Asteraceae	perennial herb	Jun-Jul	4.3	S3	G4?T3Q
Sidalcea hickmanii ssp. napensis	Napa checkerbloom	Malvaceae	perennial herb	Apr-Jun	1B.1	S1	G3T1
Sidalcea hickmanii ssp. viridis	Marin checkerbloom	Malvaceae	perennial herb	May-Jun	1B.1	SH	G3TH
Sidalcea keckii	Keck's checkerbloom	Malvaceae	annual herb	Apr-May(Jun)	1B.1	S2	G2

Sidalcea oregana ssp. hydrophila	marsh checkerbloom	Malvaceae	perennial herb	(Jun)Jul-Aug	1B.2	S2	G5T2
Streptanthus barbiger	bearded jewelflower	Brassicaceae	annual herb	May-Jul	4.2	S3	G3
Streptanthus brachiatus ssp. brachiatus	Socrates Mine jewelflower	Brassicaceae	perennial herb	May-Jun	1B.2	S1	G2T1
Streptanthus hesperidis	green jewelflower	Brassicaceae	annual herb	May-Jul	1B.2	S2	G2
Streptanthus morrisonii ssp. elatus	Three Peaks jewelflower	Brassicaceae	perennial herb	Jun-Sep	1B.2	S1	G2T1
Streptanthus morrisonii ssp. kruckebergii	Kruckeberg's jewelflower	Brassicaceae	perennial herb	Apr-Jul	1B.2	S1	G2T1
Symphyotrichum lentum	Suisun Marsh aster	Asteraceae	perennial rhizomatous herb	(Apr)May-Nov	1B.2	S2	G2
Thelypodium brachycarpum	short-podded thelypodium	Brassicaceae	perennial herb	May-Aug	4.2	S3	G3
Toxicoscordion fontanum	marsh zigadenus	Melanthiaceae	perennial bulbiferous herb	Apr-Jul	4.2	S3	G3
Trichostema ruygtii	Napa bluecurls	Lamiaceae	annual herb	Jun-Oct	1B.2	S1S2	G1G2
Trifolium amoenum	two-fork clover	Fabaceae	annual herb	Apr-Jun	1B.1	S1	G1
Trifolium hydrophilum	saline clover	Fabaceae	annual herb	Apr-Jun	1B.2	S2	G2
Triteleia lugens	dark-mouthed triteleia	Themidaceae	perennial bulbiferous herb	Apr-Jun	4.3	S4?	G4?
Viburnum ellipticum	oval-leaved viburnum	Adoxaceae	perennial deciduous shrub	May-Jun	2B.3	S3?	G4G5

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Appendix G

Special-Status Plant, Animal and Fish Species with Potential to Occur in the Project Vicinity

Table G-1 Special-Status Plant Species

Sci. Name Common Name	Status (Fed/State/CRPR)	Range	Habitat	Potential To Occur in Stream Maintenance Program (SMP) area and Rationale
Allium peninsulare var. franciscanum Franciscan onion	-/-/1B.2	Known from records in Fresno, Mendocino, Monterey, Marin, Napa, Santa Clara, San Joaquin, San Mateo, Solano, and Sonoma counties.	Clay, volcanic, and often serpentine soils in cismontane woodland and valley and foothill grassland. 52-305 meters. Blooms April-June.	**Not expected.** One occurrence record within the SMP area from Di Rosa Preserve. SMP activities are not anticipated to impact suitable habitat within the Preserve.
Alopecurus aequalis var. *sonomensis* Sonoma alopecurus	FE/-/1B.1	Known from records in Marin and Sonoma counties.	Freshwater marshes and swamps, riparian scrub. Wet areas, marshes, and riparian banks, with other wetland species. 5-360 meters. Blooms May-July.	**None**. This species is only known from Sonoma and Marin Counties (USFWS 2011).
Amorpha californica var. *napensis* Napa false indigo	-/-/1B.2	Known from records in Lake, Monterey, Marin, Napa, Sonoma, and Yolo counties.	Openings in broad-leafed upland forest, chaparral, and cismontane woodland. 120-2,000 meters. Blooms April-July.	**Not expected.** Occurrence records of this species are known from the western portion of the SMP area, but SMP activities are not anticipated to impact suitable habitat.
Amsinckia lunaris Bent-flowered fiddleneck	-/-/1B.2	Known from records in Alameda, Contra Costa, Colusa, Fresno, Glenn, Humboldt, Lake, Madera, Merced, Monterey, Marin, Napa, San Benito, Santa Clara, Santa Cruz, San Mateo, Sonoma, Sutter, and Yolo counties.	Cismontane woodland, valley and foothill grassland, coastal bluff scrub. 3-795 m. Blooms May-June.	**Possible.** Suitable to marginal habitat (grassland) is located within the SMP area.
Arctostaphylos manzanita ssp. *elegans* Konocti manzanita	-/-/1B.3	Known from records in Colusa, Fresno, Glenn, Humboldt, Lake, Mendocino, Napa, San Francisco, Shasta, Sonoma, Tehama, and Trinity counties.	Volcanic soils in chaparral, cismontane woodland, and lower montane coniferous forest. 395-1,615 meters. Blooms March-May.	**None.** SMP activities are not anticipated to impact suitable habitat (volcanic soils in chaparral, cismontane woodland, coniferous forest).

Sci. Name Common Name	Status (Fed/State/CRPR)	Range	Habitat	Potential To Occur in Stream Maintenance Program (SMP) area and Rationale
Arctostaphylos stanfordiana ssp. *decumbens* Rincon Ridge manzanita	-/-/1B.1	Known from records in Napa and Sonoma counties.	Rhyolitic soils in chaparral and cismontane woodland. 75-370 meters. Blooms February-April.	**Not expected.** SMP activities are not anticipated to impact suitable habitat (rhyolitic soils in chaparral or cismontane woodland).
Astragalus claranus Clara Hunt's milk-vetch	FE/ST/1B.1	Known from records in Napa and Sonoma counties.	Cismontane woodland, valley and foothill grassland, chaparral. Open grassy hillsides, especially on exposed shoulders in thin, volcanic clay soil moist in spring. 95-235 meters. Blooms March-May.	**Possible**. Suitable to marginal habitat (grassland) is present in the SMP area.
Astragalus rattanii var. *jepsonianus* Jepson's milk-vetch	-/-/1B.2	Known from records in Colusa, Glenn, Lake, Napa, San Benito, Sonoma, and Tehama counties.	Often serpentine soils in chaparral, cismontane woodland, and valley and foothill grassland. 295-700 meters. Blooms March-June.	**Possible**. Suitable to marginal habitat (grassland) is present in the SMP area.
Astragalus tener var. tener alkali milk-vetch	-/-/1B	Known from records in Alameda, Contra Costa, Kern, Merced, Monterey, Marin, Napa, San Benito, Santa Clara, San Diego, San Francisco, San Joaquin, San Mateo, Solano, Sonoma, Stanislaus, and Yolo counties.	Alkali playa, valley and foothill grassland, vernal pools. Low ground, alkali flats, and flooded lands; in annual grassland or in playas or vernal pools. 1-170 meters. Blooms March-June.	**Possible**. Suitable to marginal habitat (alkali grassland) is present in the SMP area, but vernal pools are not anticipated to be affected.
Balsamorhiza macrolepis big-scale balsamroot	-/-/1B.2	Known from records in Alameda, Amador, Butte, Colusa, El Dorado, Lake, Modoc, Mariposa, Napa, Nevada, Placer, Plumas, Santa Clara, Shasta, Sierra, Solano, Sonoma, Sutter, Tehama, and Tuolumne counties.	Chaparral, valley and foothill grassland, cismontane woodland. Sometimes on serpentine. 35-1465 m. Blooms March-June.	**Possible**. Suitable to marginal habitat (grassland) is present in the SMP area.
Blennosperma bakeri Sonoma sunshine	FE/SE/1B.1	Known from records in Sonoma county.	Vernal pools and swales within valley and foothill grassland. 10-290 meters. Blooms March-May.	**None**. This species is only known from Sonoma County (USFWS 2008).

Sci. Name Common Name	Status (Fed/State/CRPR)	Range	Habitat	Potential To Occur in Stream Maintenance Program (SMP) area and Rationale
Brodiaea leptandra narrow-anthered brodiaea	-/-/1B.2	Known from records in Lake, Napa, Solano, and Sonoma counties.	Volcanic soils in chaparral, cismontane woodland, and valley and foothill grassland.	**Possible**. Suitable to marginal habitat (volcanic soils in grassland) is present in the SMP area.
Calycadenia micrantha small-flowered calycadenia	-/-/1B.2	Known from records in Colusa Humboldt, Lake Monterey, Napa and Trinity counties.	Roadsides, talus, scree, rocky, sometimes serpentine substrate in sparsely vegetated areas within chaparral, meadows and seeps (volcanic), and valley and foothill grassland. 5-1,500 meters. Blooms June-September.	**Not expected**. No occurrence records are known from the SMP area.
Carex lyngbyei Lyngbye's sedge	-/-/2B.2	Known from records in Del Norte, Humboldt, Mendocino, Monterey, Marin, Napa, and Santa Clara counties.	Brackish and freshwater marshes and swamps. 0-10 meters. Blooms April-August.	**Possible**. Suitable to marginal habitat (brackish and freshwater marshes and swamps) is present in the SMP area.
Castilleja affinis var. *neglecta* Tiburon paintbrush	FE/ST/1B.2	Known from records in Marin, Santa Clara, and Solano counties.	Valley and foothill grassland. Rocky serpentine sites. 120-400 meters. Blooms April-June.	**Not expected.** SMP activities are not anticipated to occur in suitable habitat (rocky serpentine sites).
Castilleja ambigua var. *meadii* Mead's owls-clover	-/-/1B.1	Known from records in Napa County.	Gravel, volcanic, and clay soils in meadows and seeps, and vernal pools. 450-475 meters. Blooms April-May.	**Possible**. Suitable to marginal habitat (meadows and seeps) is present in the SMP area.
Castilleja rubicundula var. *rubicundula* pink creamsacs	-/-/1B.2	Known from records in Butte, Colusa, Glenn, Lake, Napa, Santa Clara, and Shasta counties.	Serpentine soils in chaparral, cismontane woodland, meadows and seeps, and valley and foothill grassland.	**Not expected.** SMP activities are not anticipated to occur in suitable habitat (serpentine sites).
Ceanothus confuses Rincon Ridge ceanothus	-/-/1B.1	Known from records in Lake, Mendocino, Napa, and Sonoma counties.	Volcanic or serpentine soils in closed-cone coniferous forest, chaparral, and cismontane woodland.	**Possible**. Suitable to marginal habitat (volcanic soils) is present in the SMP area.
Ceanothus divergens Calistoga ceanothus	-/-/1B.2	Known from records in Lake, Monterey, Marin, and Napa counties.	Serpentine or volcanic rocky soils in chaparral.	**Possible**. Suitable to marginal habitat (rocky volcanic soils) is present in the SMP area.

Sci. Name Common Name	Status (Fed/State/CRPR)	Range	Habitat	Potential To Occur in Stream Maintenance Program (SMP) area and Rationale
Ceanothus purpureus holly-leaved ceanothus	-/-/1B.2	Known from records in Lake, Mendocino, Napa, Solano, and Sonoma counties.	Volcanic rocky soils in chaparral and cismontane woodland. 120-640 meters. Blooms February-June.	**Possible**. Suitable to marginal habitat (rocky volcanic soils) is present in the SMP area.
Ceanothus sonomensis Sonoma ceanothus	-/-/1B.2	Known from records in Lake, Napa, and Sonoma counties.	Chaparral with sandy serpentine or volcanic soils. 215-800 m. Blooms February-April.	**Not expected.** SMP activities are not anticipated to occur in suitable habitat (serpentine sites).
Centromadia parryi ssp. *congdonii* Congdon's tarplant	-/-/1B.1	Known from records in Alameda, Contra Costa, Monterey, Santa Clara, Santa Cruz, San Luis Obispo, San Mateo, and Solano counties.	Valley and foothill grassland. Alkaline soils, sometimes described as heavy white clay. 0-230 m. Blooms May-October.	**Possible**. Suitable to marginal habitat (alkaline soils) is present in the SMP area.
Chloropyron molle ssp. *molle* [=*Cordylanthus mollis* ssp. *mollis*] Soft bird's-beak	FE/SR/1B.2	Known from records in Contra Costa, Marin, Napa, Sacramento, San Francisco, Solano, and Sonoma counties.	In coastal salt marsh with saltgrass (*Distichlis*), pickleweed (*Salicornia*), and Alkali heath (*Frankenia*). 0-3 meters. Blooms July-November.	**Possible.** Suitable habitat located within the SMP area in the brackish marsh habitat in the 45-acre mitigation site adjacent to the Edgerly Island Dredged Material Rehandling Site. Critical Habitat is located northeast of Edgerly Island and east of the Napa River, but SMP activities are not anticipated at this location.
Cryptantha dissita serpentine cryptantha	-/-/1B.2	Known from records in Colusa, Lake, Mendocino, Napa, Siskiyou, and Sonoma counties.	Serpentine soils in chaparral. 395-580 m. Blooms April-June.	**Not expected.** SMP activities are not anticipated to occur in suitable habitat (serpentine sites).
Downingia pusilla dwarf downingia	-/-/2B.2	Known from records in Calaveras, Fresno, Merced, Mariposa, Napa, Placer, Sacramento, San Joaquin, Solano, Sonoma, Stanislaus, Sutter, Tehama, Tuolumne, and Yuba counties.	Vernal pools, vernal lakes, seasonal wetlands, and swales within grasslands and oak woodlands. 1-445 meters. Blooms March-May.	**Not expected.** SMP activities are not anticipated to occur in suitable habitat (vernal pools, seasonal wetlands, lakes, or swales).

Sci. Name Common Name	Status (Fed/State/CRPR)	Range	Habitat	Potential To Occur in Stream Maintenance Program (SMP) area and Rationale
Erigeron greenei Greene's narrow-leaved daisy	-/-/1B.2	Known from records in Colusa, Lake, Napa, Shasta, Siskiyou, Solano, Sonoma, Tehama, and Trinity counties.	Serpentine or volcanic soils in chaparral. 80-1,005 m. Blooms Mar-September.	**Possible.** Suitable to marginal habitat (volcanic soils) is present in the SMP area.
Eriogonum nervulosum Snow Mountain buckwheat	-/-/1B.2	Known from records in Colusa, Glenn, Lake, Napa, and Sonoma counties.	Serpentine soils in chaparral. 300-2,105 m. Blooms June-September.	**Not expected**. SMP activities are not anticipated to impact suitable habitat (serpentine soils).
Eryngium constancei Loch Lomond coyote thistle	FE/SE/1B.1	Known from records in Contra Costa, Lake Napa, Sacramento, and Sonoma counties.	Vernal pools. Volcanic ash flow vernal pools. 460-855 meters. Blooms April-June.	**Not expected**. SMP activities are not anticipated to impact vernal pool habitats.
Eryngium jepsonii Jepson's coyote-thistle	-/-/1B.2	Known from records in Alameda, Amador, Calaveras, Contra Costa, Fresno, Napa, Placer, San Joaquin, San Mateo, Solano, Stanislaus, Tuolumne, and Yolo counties.	Vernal pools, valley and foothill grassland. Clay. 3-305 m. Blooms April-August.	**Possible.** Suitable to marginal habitat (grassland) occurs in the SMP area.
Extriplex joaquinana San Joaquin spearscale	-/-/1B	Known from records in Alameda, Contra Costa, Colusa, Fresno, Glenn, Merced, Monterey, Napa, San Benito, Santa Clara, San Joaquin, San Luis Obispo, Solano, and Yolo counties.	Chenopod scrub, alkali meadow, playas, valley and foothill grassland. In seasonal alkali wetlands or alkali sink scrub with saltgrass (*Distichlis spicata*), alkali heath (*Frankenia*), and others. 1-835 meters. Blooms April-October.	**Possible.** Suitable to marginal habitat (grassland) occurs in the SMP area.
Fritillaria pluriflora adobe-lily	-/-/1B.2	Known from records in Butte, Colusa, Glenn, Lake, Mendocino, Napa, Sacramento, Solano, Tehama, and Yolo counties.	Adobe soils in chaparral, cismontane woodland, and valley and foothill grassland. 60-705 m. Blooms February-April.	**Possible.** Suitable to marginal habitat (grassland in adobe soils) occurs in the SMP area.
Harmonia hallii Hall's harmonia	-/-/1B.2	Known from records in Colusa, Glenn, Lake, Napa, and Tehama counties.	Serpentine soils in chaparral. 305-975 m. Blooms April-June.	**Not expected**. SMP activities are not anticipated to impact suitable habitat (serpentine soil).

Sci. Name Common Name	Status (Fed/State/CRPR)	Range	Habitat	Potential To Occur in Stream Maintenance Program (SMP) area and Rationale
Hesperolinon bicarpellatum two-carpellate western flax	-/-/1B.2	Known from records in Alameda, Contra Costa, Colusa, Lake, Napa, Sonoma, and Stanislaus counties.	Serpentine soils in chaparral. 60-1,005 m. Blooms May-July.	**Not expected**. SMP activities are not anticipated to impact suitable habitat (serpentine soil).
Hesperolinon breweri Brewer's western flax	-/-/1B.2	Known from records in Alameda, Contra Costa, Napa, Solano, and Yolo counties.	Chaparral, cismontane woodland, valley and foothill grassland in rocky serpentine soil in serpentine chaparral and serpentine grassland. 195-910 m. Blooms May-July.	**Not expected**. SMP activities are not anticipated to impact suitable habitat (serpentine soil).
Hesperolinon drymarioides drymaria-like western flax	-/-/1B.2	Known from records in Colusa, Glenn, Lake, and Napa counties.	Serpentine soils in closed-cone coniferous forest, chaparral, cismontane woodland, and valley and foothill grassland. 100-1,130 m. Blooms May-August.	**Not expected**. SMP activities are not anticipated to impact suitable habitat (serpentine soil).
Hesperolinon sharsmithiae Sharsmith's western flax	-/-/1B.2	Known from records in Alameda, Lake, Napa, and Stanislaus counties.	Serpentine soils in chaparral. 270-300 m. Blooms May-July.	**Not expected**. SMP activities are not anticipated to impact suitable habitat (serpentine soil).
Hesperolinon tehamense Tehama County western flax	-/-/1B.3	Known from records in Alameda, Glenn, Lake, Napa, Stanislaus, and Tehama counties.	Serpentine soils in chaparral and cismontane woodland. 100-1,250 meters. Blooms May-July.	**Not expected**. SMP activities are not anticipated to impact suitable habitat (serpentine soil).
Juglans hindsii Northern California black walnut	-/-/1B	Known from throughout all of California, except from Alpine, Del Norte, Imperial, Lassen, Modoc, Mono, Plumas, Sierra, and Tulare counties. Considered to currently be present around San Francisco Bay counties, as species has been cultivated with agricultural cultivars elsewhere.	Riparian forest and riparian woodland in deep alluvial soils. Few extant native stands remain; widely naturalized. Hybridizes with non-native English walnut (*Juglans regia*). 0-440 meters. Blooms April-May	**Possible**. Suitable habitat (riparian forest and woodland) occurs in the SMP area.

Sci. Name Common Name	Status (Fed/State/CRPR)	Range	Habitat	Potential To Occur in Stream Maintenance Program (SMP) area and Rationale
Juncus luciensis Santa Lucia dwarf rush	-/-/1B.2	Known from records in Lake, Lassen, Monterey, Modoc, Napa, Nevada, Placer, Plumas, Riverside, Santa Barbara, San Benito, San Diego	Chaparral, Great Basin scrub, lower montane coniferous forest, meadows and seeps, and vernal pools. 300-2,040 m. Blooms April-July.	**Possible.** Suitable habitat (meadows and seeps) occurs in the SMP area.
Lasthenia burkei Burke's goldenfields	FE/SE/1B.1	Known from records in Lake, Mendocino, Napa, and Sonoma counties.	Vernal pools, meadows and seeps. Most often in vernal pools and swales. 15-600 meters. Blooms April-June	**Not expected.** SMP activities are not anticipated to impact vernal pool habitats. The only documented Napa County occurrence of this species is from 1929.
Lasthenia conjugens Contra Costa goldfields	FE/-/1B	Known from records in Alameda, Contra Costa, Mendocino, Monterey, Marin, Napa, Santa Barbara, Santa Clara, Solano, and Sonoma counties.	Vernal pools, swales, or low depressions, in open grassy areas. 1-450 meters. Blooms March-June.	**Not expected.** SMP activities are not anticipated to impact vernal pool habitats. Critical Habitat is located south of the Imola Avenue Dredged Material Rehandling Site, but SMP activities are not anticipated within Critical Habitat possessing primary constituent elements.
Lathyrus jepsonii var. jepsonii Delta tule pea	-/-/1B.2	Known from records in Alameda, Contra Costa, Fresno, Marin, Napa, Sacramento, Santa Clara, Shasta, San Joaquin, San Mateo, and Solano counties.	Freshwater and brackish marshes, usually on marsh and slough edges. Often found with cattails (*Typha* spp.), Suisun marsh aster (*Symphyotrichum lentum*), California rose (*Rosa californica*), rushes (*Juncus* spp.), and bulrushes (*Schoenoplectus* spp.). 0-5 meters. Blooms May-September	**Possible.** Suitable habitat (freshwater and brackish water marsh) occurs in the SMP area.
Layia septentrionalis Colusa layia	-/-/1B.2	Known from records in Butte, Colusa, Glenn, Lake, Mendocino, Napa, Sonoma, Sutter, Tehama, and Yolo counties.	Sandy and serpentine soils in chaparral, cismontane woodland, and valley and foothill grassland. 100-1,0955 meters. Blooms April-May.	**Possible.** Suitable to marginal habitat (woodland and grassland with sandy soils) occurs in the SMP area.

Sci. Name Common Name	Status (Fed/State/CRPR)	Range	Habitat	Potential To Occur in Stream Maintenance Program (SMP) area and Rationale
Legenere limosa legenere	-/-/1B.1	Known from records in Alameda, Calaveras, Lake, Monterey, Napa, Placer, Sacramento, Santa Clara, Shasta, San Joaquin, San Mateo, Solano, Sonoma, Stanislaus, Tehama, and Yuba counties.	Vernal pools below 880 meters. Blooms April-June.	**Not expected.** SMP activities are not anticipated to impact vernal pools habitat.
Leptsiphon jepsonii Jepson's leptosiphon	-/-/1B.2	Known from records in Lake, Napa, Sonoma, and Yolo counties.	Usually volcanic soils in chaparral, cismontane woodland, and valley and foothill grassland. 100-500 meters. Blooms March-May.	**Possible.** Suitable to marginal habitat (woodland and grassland with volcanic soils) occurs in the SMP area.
Lilaeopsis masonii Mason's lilaeopsis	-/SR/1B	Known from records in Alameda, Contra Costa, Marin, Napa, Sacramento, San Joaquin, Solano, and Yolo counties.	Freshwater and brackish marshes and riparian scrub. Tidal zones, in muddy or silty soil formed through river deposition or river bank erosion. 0-10 meters. Blooms April-November	**Possible.** Suitable to marginal habitat (freshwater and brackish water marshes and riparian scrub) occurs in the SMP area.
Limnanthes vinculans Sebastopol meadowfoam	FE/SE/1B.1	Known from records in Napa and Sonoma counties.	Meadows and seeps, vernal pools, valley and foothill grassland. Swales, wet meadows and marshy areas in valley oak savanna; on poorly drained soils of clays and sandy loam. 15-115 meters. Blooms April-May.	**Possible**. An occurrence of this species is present near the confluence of the Napa River and Conn Creek, in the Napa River Ecological reserve (CDFW 2018).
Lupinus sericatus Cobb Mountain lupine	-/-/1B.2	Known from records in Colusa, Lake, Napa, and Sonoma counties.	Broad-leafed upland forest, chaparral, cismontane woodland, and lower montane coniferous forest. 275-1,525 meters. Blooms March-June.	**Not expected.** SMP activities are not anticipated to impact suitable habitat (upland forest, chaparral, cismontane woodland, coniferous forest).
Navarretia leucocephala ssp. *bakeri* Baker's navarretia	-/-/1B.1	Known from records in Butte, Colusa, Glenn, Humboldt, Lake, Lassen, Madera, Mendocino, Marin, Napa, Shasta, Solano, Sonoma, Sutter, Tehama, Trinity, and Yolo counties.	Throughout mesic environments: lower montane coniferous forest, cismontane woodland, meadows and seeps, valley and foothill grassland, and vernal pools. 5-1,740 meters. Blooms April-July.	**Possible**. Suitable to marginal habitat (meadows and seeps, grassland) occurs in the SMP area.

Sci. Name Common Name	Status (Fed/State/CRPR)	Range	Habitat	Potential To Occur in Stream Maintenance Program (SMP) area and Rationale
Navarretia leucocephala ssp. *paucifolia* few-flowered navarretia	FE/ST/1B.1	Known from records in Lake and Napa counties.	Vernal pools. Volcanic ash flow, and volcanic substrate vernal pools. 425-855 meters. Blooms May-June.	**Not expected.** SMP activities are not anticipated to impact vernal pool habitats.
Navarretia leucocephala ssp. *plieantha* many-flowered navarretia	FE/SE/1B.2	Known from records in Lake and Sonoma counties.	Vernal pools. Volcanic ash flow vernal pools. 30-915 meters. Blooms May-June.	**Not expected.** SMP activities are not anticipated to impact vernal pool habitats.
Navarretia paradoxinota Porter's navarretia	-/-/1B.3	Known from records in Colusa, Lake, and Napa counties.	Openings in serpentine soils that are vernally mesic, often drainages, in meadows and seeps. 165-840 meters. Blooms May-June.	**Possible.** Suitable habitat (drainages, meadows and seeps) occurs in the SMP area.
Navarretia rosulata Marin County navarretia	-/-/1B.2	Known from records in Marin and Napa counties.	Serpentine and rocky soils in closed-cone coniferous forest and chaparral. 200-635 meters. Blooms May-July.	**Not expected.** SMP activities are not anticipated to impact suitable habitat (serpentine and rocky soils in coniferous forest or chaparral).
Pentstemon newberryi var. *sonomensis* Sonoma beardtongue	-/-/1B.3	Known from records in Lake, Napa, and Sonoma counties.	Rocky soils in chaparral. 700-1,370 meters. Blooms April-August.	**Not expected.** SMP activities are not anticipated to impact suitable habitat (rocky soils in chaparral).
Plagiobothrys hystriculus bearded popcornflower	-/-/1B.1	Known from records in Merced, Napa, Solano, and Yolo counties.	Vernal pools and seasonal wetlands within grasslands. 0-275 meters. Blooms April-May.	**Not expected.** SMP activities are not anticipated to impact suitable habitat (vernal pools, seasonal wetlands).
Plagiobothrys strictus Calistoga popcornflower	FE/ST/1B.1	Known from records in Napa County.	Meadows and seeps, valley and foothill grassland, vernal pools. Alkaline sites near thermal springs and on margins of vernal pools in heavy, dark, adobe-like clay. 90-125 meters. Blooms March through June	**Not expected.** SMP activities are not anticipated to impact vernal pool habitats. The SMP does not include activities in or adjacent to hot springs.

Sci. Name Common Name	Status (Fed/State/CRPR)	Range	Habitat	Potential To Occur in Stream Maintenance Program (SMP) area and Rationale
Poa napensis Napa blue grass	FE/SE/1B.1	Known from records in Napa County.	Meadows and seeps, valley and foothill grassland. Moist alkaline meadows fed by runoff from nearby hot springs. 100-120 meters. Blooms May-August.	**Not expected.** The SMP does not include activities in or adjacent to hot springs.
Puccinellia simplex California alkali grass	-/-/1B.2	Known from records in Alameda, Butte, Contra Costa, Colusa, Fresno, Glenn, Kings, Kern, Lake, Los Angeles, Madera, Merced, Napa, San Bernardino, Santa Clara, Santa Cruz, San Luis Obispo, Solano, Stanislaus, Tulare, and Yolo counties.	Alkaline soils that are vernally mesic in sinks, flats, and lake margins within chenopod scrub, meadows and seeps, valley and foothill grassland, and vernal pools. 2-930 metes. Blooms March-May.	**Possible.** Suitable habitat (alkaline soils in sinks, flats, lake margins, meadows and seeps, grasslands) occurs in the SMP area.
Rhynchospora californica California beaked-rush	-/-/1B.1	Known from records in Butte, Marin, Napa, and Sonoma counties.	Bogs and fens, lower montane coniferous forest, meadows and seeps, and marshes and swamps (freshwater). 45-1,010 meters. Blooms. May-July.	**Possible.** Suitable habitat (meadows and seeps, marshes and swamps) occurs in the SMP area.
Sagittaria sanfordii Sanford's arrowhead	-/-/1B	Known from records in Butte, Colusa, Del Norte, El Dorado, Fresno, Madera, Merced, Mariposa, Marin, Napa, Orange, Sacramento, San Bernardino, Shasta, San Joaquin, Solano, Stanislaus, Sutter, Tehama, Tulare, Ventura, Yolo, and Yuba counties.	In standing or slow-moving freshwater ponds, marshes, and ditches. 0-650 meters. Blooms May-October.	**Possible.** Suitable habitat (freshwater ponds, marshes and ditches) occurs in the SMP area.
Sidalcea hickmanii ssp. *napensis* Napa checkerbloom	-/-/1B.1	Known from records in Napa and Sonoma counties.	Rhyolitic soils in chaparral. l415-610 meters. Blooms April-June.	**Not expected.** SMP activities are not anticipated to impact suitable habitat (rhyolitic soils in chaparral).
Sidalcea hickmanii ssp. *viridis* Marin checkerbloom	-/-/1B.1	Known from records in Lake, Marin, Napa and Sonoma counties.	Serpentine soils in chaparral. 50-430 meters. Blooms May-June.	**Not expected.** SMP activities are not anticipated to impact suitable habitat (serpentine soils in chaparral).

Sci. Name Common Name	Status (Fed/State/CRPR)	Range	Habitat	Potential To Occur in Stream Maintenance Program (SMP) area and Rationale
Sidalcea keckii Keck's checker-mallow	FE/-/1B	Known from records in Colusa, Fresno, Merced, Napa, Solano, Tulare, and Yolo counties.	Cismontane woodland, valley and foothill grassland. Grassy slopes in blue oak woodland. Often on serpentine-derived, clay soils. 85-505 meters. Blooms April-May.	**Possible.** This plant has been reported in the Putah Creek watershed in Napa County. Potentially suitable habitat is present in the SMP area.
Sidalcea oregana ssp. *hydrophila* marsh checkerbloom	-/-/1B.2	Known from records in Colusa, Glenn, Lake, Mendocino, and Napa counties.	Mesic areas in meadow and seeps, and riparian forest. 1,100-2,300 meters. Blooms July-August.	**Possible.** Suitable habitat (meadow and seeps, riparian forest) occurs in the SMP area.
Sidalcea oregana ssp. *valida* Kenwood Marsh checkerbloom	FE/SE/1B.1	Known from records in Sonoma County.	Marshes and swamps. Edges of freshwater marshes. 115-125 meters. Bloom June-September.	**None**. This species is only known from Sonoma County (USFWS 2009a).
Spergularia macrotheca var. longistyla long-styled sand-spurrey	-/-/1B.2	Known from records in Alameda, Contra Costa, Napa, and Solano counties.	Alkaline marshes and swamps, and meadows and seeps. 0-220 m. Blooms February-May.	**Possible.** Suitable habitat (alkaline marshes and swamps, meadows and seeps) occurs in the SMP area.
Streptanthus brachiatus ssp. *brachiatus* Socrates Mine jewelflower	-/-/1B.2	Known from records in Napa and Sonoma counties.	Usually serpentine soils in closed-cone coniferous forest and chaparral. 545-1,000 meters. Blooms May-June.	**Not expected.** SMP activities are not anticipated to affect serpentine soils.
Streptanthus hesperidis green jewelflower	-/-/1B.2	Known from records in Colusa, Glenn, Lake, Napa, Sonoma, and Yolo counties.	Serpentine and rocky soils in chaparral and cismontane woodland. 130-760 meters. Blooms May-July.	**Not expected.** SMP activities are not anticipated to affect suitable habitat (rocky soils in cismontane woodland and chaparral).
Streptanthus morrisonii ssp. *elatus* Three Peaks jewelflower	-/-/1B.2	Known from records in Lake, Napa, and Sonoma counties.	Serpentine soils in chaparral. 90-815 meters. Blooms June-September.	**Not expected.** SMP activities are not anticipated to affect serpentine soils.

Sci. Name Common Name	Status (Fed/State/CRPR)	Range	Habitat	Potential To Occur in Stream Maintenance Program (SMP) area and Rationale
Streptanthus morrisonii ssp. *kruckebergii* Kruckeberg's jewelflower	-/-/1B.2	Known from records in Lake, Napa, and Sonoma counties.	Serpentine soils in cismontane woodland. 21-1,035 meters. Blooms April-July.	**Not expected.** SMP activities are not anticipated to affect serpentine soils.
Symphyotrichum lentum Suisun Marsh aster	-/-/1B	Known from records in Contra Costa, Napa, Sacramento, San Joaquin, Solano, and Yolo counties.	Brackish and freshwater marshes. Most often seen along sloughs, ponds, and ditches with common reed (*Phragmites australis*), *Schoenoplectus* spp., Himalayan blackberry (*Rubus armeniacus*), and *Typha* spp. 0-3 meters. Blooms May-November.	**Possible.** Suitable habitat (brackish and freshwater marshes, slough, ponds, and ditches) occurs in the SMP area.
Trichostema ruygtii Napa bluecurls	-/-/1B.2	Known from records in Lake, Napa, and Solano counties.	Chaparral, cismontane woodland, lower montane coniferous forest, valley and foothill grassland, and vernal pools. 30-680 meters. Blooms June-October.	**Possible.** Suitable to marginal habitat (grassland) occurs in the SMP area.
Trifolium amoenum two-fork (=showy Indian) clover	FE/-/1B.2	Known from records in Alameda, Marin, Napa, Santa Clara, San Mateo, Solano, and Sonoma Counties.	Valley and foothill grassland, coastal bluff scrub. Sometimes on serpentine soil, open sunny sites, swales. Most recently cited on roadside and eroding cliff face. 5-310 meters. Blooms April-June.	**Not expected.** The Napa County population of this species is considered extirpated (USFWS 2012a).

Sci. Name Common Name	Status (Fed/State/CRPR)	Range	Habitat	Potential To Occur in Stream Maintenance Program (SMP) area and Rationale
Trifolium hydrophilum Saline cover	-/-/1B.2	Known from records in Alameda, Butte, Calaveras, Contra Costa, Colusa, El Dorado, Fresno, Glenn, Kern, Lake, Los Angeles, Madera, Mendocino, Merced, Monterey, Mariposa, Marin, Napa, Orange, Riverside, Sacramento, Santa Barbara, San Bernardino, San Benito, Santa Clara, Santa Cruz, San Diego, San Francisco, Shasta, San Joaquin, San Luis Obispo, San Mateo, Solano, Sonoma, Stanislaus, Tehama, Tulare, Tuolumne, Ventura, and Yolo Counties.	Found in freshwater marshes, depressions, and vernal pools. Also, in mesic, alkaline valley and foothill grassland below 300 meters. Blooms April-June.	**Possible**. Suitable habitat (freshwater marshes and alkaline grassland) occurs in the SMP area.
Viburnum ellipticum oval-leaved viburnum	-/-/2B.3	Known from records in Alameda, Contra Costa, Colusa, El Dorado, Fresno, Glenn, Humboldt, Lake, Los Angeles, Mendocino, Mariposa, Napa, Nevada, Placer, Shasta, Solano, Sonoma, and Tehama Counties.	Chaparral, cismontane woodland, lower montane coniferous forest. 215-1400 m. Blooms March-June.	**Not expected.** SMP activities are not anticipated to impact suitable habitat (chaparral, cismontane woodland, coniferous forest).

"Potential to Occur" Categories Definitions

Present = species was either observed directly or its presence was confirmed by field investigations or previous studies in the SMP area.

Possible = suitable habitat is present that could support the species as it is within the species range and/or near an occurrence record.

Not expected = marginal to poor quality habitat is present or isolated from the nearest extant occurrence record(s), and/or the species is not known to occur in the area.

None = SMP area is outside of species' range, record is possibly or presumed extirpated, or lacks suitable habitat capable of supporting the species.

Status Legend

Federal

FE = Federally endangered
FT = Federally threatened
FPE = Federally proposed endangered
FPT = Federally proposed threatened

State

SR = State rare
SE = State endangered
ST = State threatened

CRPR (California Rare Plant Rank)

1A = Plants Presumed Extirpated in California and Either Rare or Extinct Elsewhere
1B = Plants Rare, Threatened, or Endangered in California and Elsewhere

FC = Federal candidate for listing as threatened or endangered

Other
CNDDB= California Natural Diversity Database

2A = Plants Presumed Extirpated in California, But More Common Elsewhere
2B = Plants Rare, Threatened, or Endangered in California, But More Common Elsewhere

Table G-2 Special Status Wildlife Species

Sci. Name Common Name	Status (Fed/State)	Range	Habitat	Potential to Occur in Maintenance Program area
Invertebrates				
Branchinecta conservatio Conservancy fairy shrimp	FE/-	California Central Valley from Butte and Tehama counties south to Merced and Stanislaus counties.	Large, deep vernal pools within grasslands.	**None.** The SMP area is outside of the species' range[1].
Branchinecta lynchi vernal pool fairy shrimp	FT/-	California Central Valley and southern Coast Range in Santa Barbara County. Isolated populations in Riverside County.	Vernal pools, but also found in sandstone rock outcrop pools.	**None.** SMP activities would not occur in suitable habitat. Critical Habitat is located east of Edgerly Island and the Napa River, but SMP activities are not anticipated to occur at this location.
Callophrys mossii bayensis San Bruno elfin butterfly	FE/-	San Mateo Peninsula (San Bruno Mountain, Milagra Ridge, and Montara Mountain), Mount Diablo, and Marin County (near Alpine Lake and Dillon Beach) within the San Francisco Bay area.	Rocky outcrops, cliffs, and coastal scrub typically on north-facing slopes within conglomerations of its host plant, broadleaf stonecrop (*Sedum spathulifolium*), in coastal mountains near the San Francisco Bay.	**None.** The SMP area is outside of the species' range, which is limited to San Mateo County[2].

[1] U.S. Fish and Wildlife Service (USFWS). 2012. Conservancy Fairy Shrimp (*Branchinecta conservatio*). 5-Year Review: Summary and Evaluation. June.

[2] U.S. Fish and Wildlife Service (USFWS). 2010. San Bruno Elfin Butterfly (*Callophrys mossii bayensis*) and Mission Blue Butterfly (*Icaricia icarioides missionensis*). 5-Year Review: Summary and Evaluation. February.

Sci. Name Common Name	Status (Fed/State)	Range	Habitat	Potential to Occur in Maintenance Program area
Desmocerus californicus dimorphus Valley elderberry longhorn beetle	FT/-	California Central Valley and adjacent low foothills.	Occurs only in the California Central Valley in association with blue elderberry (*Sambucus nigra* ssp. *caerulea*) shrubs with stems 1 inch or greater basal diameter.	**Possible.** Program activities could occur within suitable habitat in the species' range in the Suisun Creek watershed. The species was collected downstream of Montecello Dam on Putah Creek, but the species has not been observed upstream of the Dam. Therefore, it is not expected to occur within the Putah Creek watershed in Napa County.
Elaphrus viridis Delta green ground beetle	FT/-	California Central Valley in Jepson Prairie to Travis AFB within south-central Solano County.	Restricted to the margins of vernal pools in the grassland area between Jepson Prairie and Travis AFB.	**None.** The SMP area is outside of the species' range.
Lepidurus packardi Vernal pool tadpole shrimp	FE/-	California Central Valley from Shasta County to Merced County, with isolated populations in Fresno, Alameda, and Tulare counties.	Inhabits vernal pools and swales containing clear to highly turbid water.	**None.** The SMP area is outside of the species' range.
Speyeria callippe callippe Callippe silverspot butterfly	FE/-	Inner coast range of northwest Contra Costa County south to Castro Valley in Alameda County, and San Francisco south to La Honda in San Mateo County.	Restricted to the northern coastal scrub and grasslands of the San Francisco Peninsula and inner coast range of East Bay where its hostplant, *Viola pedunculata*, is present.	**None.** Extant populations of this species are limited to San Mateo and Solano counties[3].

[3] U.S. Fish and Wildlife Service (USFWS). 2009. Callippe Silverspot Butterfly (*Speyeria callippe callippe*). 5-Year Review: Summary and Evaluation. August.

Sci. Name Common Name	Status (Fed/State)	Range	Habitat	Potential to Occur in Maintenance Program area
Speyeria zerene myrtleae Myrtle's silverspot butterfly	FE/-	San Mateo County north to the Russian River in Sonoma County. Four populations known from western Marin and southwest Sonoma (including Point Reyes National Seashore) counties.	Coastal dune, bluff, scrub, and prairie typically in areas sheltered from wind below 810 feet above mean sea level and within 3 miles of the Coast. Larval hostplants are violets, typically *Viola adunca*, and adult foodplants are *Grindelia hirsutula*, *Abronia latifolia*, mints, *Monardella* spp., *Cirsium vulgare*, and *Erigeron glaucus*.	**None.** The SMP area is outside of the species' range (approximately 27 miles from the Coast).
Syncaris pacifica California freshwater shrimp	FE/SE	Endemic to Marin, Napa, and Sonoma counties. Currently known from lower Russian River drainage and tributaries, coastal streams that flow directly into the Pacific Ocean, streams that drain into Tomales Bay, and streams that flow into northern San Pablo Bay.	Found in low elevation (<380 feet above mean sea level), low gradient (<1%) streams where riparian cover is moderate to heavy.	**Present.** The species is known to occur in the SMP area.
Amphibians				
Ambystoma californiense California tiger salamander	FT/ST	Yolo County to Tulare County in the Central Valley and San Luis Obispo County in the Coast Range. Unique distinct population segments (DPS) in Sonoma and Santa Barbara counties.	Grassland with underground refuges, especially ground squirrel burrows within 1.3 miles of vernal pools or other seasonal water sources suitable breeding habitat.	**None.** The SMP area is outside of the species' range[4],[5].

[4] U.S. Fish and Wildlife Service. 2017. Recovery Plan for the Central California Distinct Population Segment of the California Tiger Salamander (*Ambystoma californiense*). U.S. Fish and Wildlife Service, Pacific Southwest Region, Sacramento, California.

[5] U.S. Fish and Wildlife Service. 2016. Recovery Plan for the Santa Rosa Plain: *Blennosperma bakeri* (Sonoma sunshine); *Lasthenia burkei* (Burke's goldfields); *Limnanthes vinculans* (Sebastopol meadowfoam); California Tiger Salamander Sonoma County Distinct Population Segment (*Ambystoma californiense*). U.S. Fish and Wildlife Service, Pacific Southwest Region, Sacramento, California. vi + 128 pp.

Sci. Name Common Name	Status (Fed/State)	Range	Habitat	Potential to Occur in Maintenance Program area
Dicamptodon ensatus California giant salamander	-/SSC	Southern Mendocino County south to Marin County, from the Pacific Coast east to southwestern Lake County and the western half of Napa County. San Mateo and Santa Cruz counties, and western edge of Santa Clara County.	Partly-shaded, shallow streams & riffles with a rocky substrate in a variety of habitats. Need at least some cobble-sized substrate for egg-laying. Need at least 15 weeks to metamorphose.	**Possible.** Suitable habitat (partially shaded shallow streams with rocky substrate) occurs within the SMP area.
Rana boylii Foothill yellow-legged frog	-/CT, SSC	California Coast from Del Norte County south to Monterey County, northern Sacramento Valley south to Tehama County, and northern Sierra Nevada Mountain Range south to the Tehachapi Mountains.	Permanent drainages with deep water with dense, shrubby or emergent riparian vegetation within lowlands and foothills up to 6,000 feet above mean sea level.	**Possible.** Suitable habitat (permanent drainages) within some streams occurs in the SMP area.
Rana draytonii California red-legged frog	FT/SSC	Pacific Coast and coastal mountain ranges of California from Mendocino County to San Diego County and in the Sierra Nevada Mountains from Butte County to Stanislaus County.	Permanent and semipermanent aquatic habitat, such as creeks and cold-water ponds, with emergent and/or submergent vegetation. May aestivate in cracks or rodent burrows during dry periods.	**Possible.** Suitable habitat (permanent, intermittent, and ephemeral streams and ponds) occurs in the SMP area, but the species is not expected to be widespread in streams within relatively more developed areas. Further, the presence of large bullfrog populations in several streams within the SMP area reduces the ability of these drainages to support breeding populations of the species. Critical Habitat is located south of Lake Berryessa and north of Lake Curry, but SMP activities are not planned within this location.
Spea hammondii *western spadefoot*	-/SSC	Sierra Nevada foothills, Central Valley, Coast ranges, coastal counties in southern California.	Occurs primarily in grassland habitats, but can be found in valley-foothill hardwood woodlands. Vernal pools are essential for breeding and egg-laying.	**None.** SMP activities would not occur in suitable habitat and no occurrence records are known from the SMP area.

Sci. Name Common Name	Status (Fed/State)	Range	Habitat	Potential to Occur in Maintenance Program area
Reptiles				
Actinemys (=*Emys*) *marmorata* *Western pond turtle*	-/SSC	From the Oregon border of Del Norte and Siskiyou counties south along the Coast to San Francisco Bay, inland through the Sacramento Valley and the western slope of the Sierra Nevada Mountain Range.	Ponds, marshes, rivers, streams & irrigation ditches, usually with submerged and/or emergent vegetation. Needs exposed basking sites near water.	**Present.** Western pond turtles are present in several stream s and other suitable habita in the SMP area.
Chelonia mydas green sea turtle	FT/-	Worldwide in tropical oceans and moves into temperate oceanic zones in the summer. Along the Pacific Coast, nesting occurs from Baja California south to Panama.	Shallow lagoons, bays, estuaries and typically prefers areas with abundant vegetation (mangroves, eelgrass, algae, and seaweed beds) in shallow, protected areas.	**None.** The SMP area lacks suitable habitat, as it is too far upstream/inland.
Thamnophis gigas *Giant garter snake*	FT/ST	Central Valley, roughly from Chico in Butte County south to Burrel in Fresno County. Species is extirpated from the region south of Fresno.	Marshes, streams, wetlands, and riparian scrub, and agricultural wetlands, and rice fields. Prefers freshwater marsh and low gradient streams. Has adapted to drainage canals and irrigation ditches. Habitat consists of (1) adequate water during the snake's active season, (2) emergent herbaceous wetland vegetation for escape and foraging habitat, (3) grassy banks and openings in waterside vegetation for basking, and (4) higher elevation upland habitat for cover and refuge from flooding[6].	**None.** The SMP area is outside of the species' range.

[6] U.S. Fish and Wildlife Service. 2012. Giant Garter Snake (*Thamnophis gigas*) 5-Year Summary and Evaluation. U.S. Fish and Wildlife Service Sacramento Fish and Wildlife Office. Sacramento, California.

Sci. Name Common Name	Status (Fed/State)	Range	Habitat	Potential to Occur in Maintenance Program area
Birds				
Accipiter cooperii Cooper's hawk	-/- (MBTA)	Year-round resident of California. Breeds throughout the state.	Woodland, primarily open, interrupted or marginal quality. Primarily nests in live oak and riparian deciduous woodland, often in canyon bottoms on river floodplains.	**Possible.** Species routinely occurs in the SMP area, but is an uncommon nester.
Accipiter striatus sharp-shinned hawk	-/- (MBTA)	Nonbreeding resident over much of California. Year-round resident in San Mateo Peninsula north to Oregon border, Cascades and plains east, and central to northern Sierra Nevada Mountains and east to Nevada.	Ponderosa pine, black oak, riparian deciduous, mixed conifer, and Jefferey pine dominated land covers. North-facing slopes with plucking perches are critical. Typically nests within 275 feet of water.	**Present.** Species routinely occurs in the SMP area and breeding activity is known to occur.
Agelaius tricolor tricolored blackbird	-/ST, SSC	Year-round in California primarily along the Coast from Marin County south to Baja California, and throughout Central Valley and adjacent Coast Range.	Highly colonial species, most numerous in Central Valley and vicinity. Largely endemic to California. Requires open water, protected nesting substrate, and foraging area with insect prey within a few kilometers of the colony. Nests in dense thickets of cattails (*Typha* spp.), bulrush (*Schoenoplectus* spp.), willow (*Salix* spp.), blackberry (*Rubus* spp.), wild rose (*Rosa californica*), and other tall vegetation near fresh water.	**Possible.** Suitable habitat exists in the SMP area.
Ammodramus savannarum grasshopper sparrow	-/SSC	Breeds throughout California Coast and Coast Range, western portion of Sacramento Valley, and western edge of Sierra Nevada foothills.	Dense grasslands on rolling hills, low plains, in valleys, and on hillsides on low mountain slopes. Typically associated with native grasslands. Loosely colonial nester.	**Possible.** Suitable habitat is present within the SMP area, but it is not likely to be impacted by SMP activities.

Sci. Name Common Name	Status (Fed/State)	Range	Habitat	Potential to Occur in Maintenance Program area
Amphispiza belli belli Bell's sage sparrow	-/- (MBTA)	Coastal region from San Diego to Santa Clara and Contra Costa counties, as well as in Marin and Sonoma counties, western rim of Sacramento Valley, and western Sierra Nevada foothills.	Nests in chaparral dominated by dense chamise, and coastal sage scrub in southern portion of range. Nests typically located on the ground under or in shrub 6-18 inches above ground. Territories about 50 yards apart.	**Possible.** Suitable habitat is present within the SMP area, but it is not likely to be impacted by SMP activities.
Aquila chrysaetos Golden eagle	-/FP	Mountains and foothills throughout California. Does not breed in lowlands (e.g., Central Valley).	Rolling foothills, mountain areas, sage-juniper flats, & desert. Cliff-walled canyons provide nesting habitat in most parts of range; also, large trees in open areas.	**Possible.** Suitable foraging habitat exists in the SMP area, but SMP activities are not expected to affect or occur near suitable nesting substrate (cliffs, large trees in open areas).
Ardea alba great egret	-/- (MBTA)	Year-round resident throughout Central Valley, San Francisco Bay, from Marin County to Yolo County, the Salton Sea, and Colorado River. Nonbreeding resident elsewhere in California.	Freshwater, brackish, and marine wetlands, as well forage in flooded agricultural fields. Nests in colonies in trees located adjacent to waterbodies, rivers, estuaries, and marshes.	**Possible.** Species is known to occur throughout the SMP area and could nest within the SMP area.
Ardea herodias great blue heron	-/- (MBTA)	Nests throughout suitable habitat in California except at high elevations in Sierra Nevada and Cascade mountain ranges.	Widely distributed in freshwater and calm intertidal habitat.	**Possible.** Species is known to occur throughout the SMP area and could nest within the SMP area.
Asio flammeus Short-eared owl	-/SSC	Permanent resident along the Coast from Del Norte County to Monterey County (rare in summer north of SF Bay), north of Nevada County in Sierra Nevada, plains east of the Cascades, and Mono County.	Grasslands, marshes, and some agricultural land (e.g., row crops). Needs dense bulrush or tall grass for daytime roosts and nesting.	**Possible.** Suitable nesting and foraging habitat (grasslands and marshes) exists in the SMP area.

Sci. Name Common Name	Status (Fed/State)	Range	Habitat	Potential to Occur in Maintenance Program area
Athene cunicularia Burrowing owl	-/SSC	Lowlands throughout California, including the Central Valley, northeastern plateau, southeastern deserts, and coastal areas; rare along south coast.	Yearlong resident of open, dry grassland and desert habitats, as well as in grass, forb and open shrub stages of pinyon-juniper and ponderosa pine habitats. Open, dry annual or perennial grasslands, deserts & scrublands characterized by low-growing vegetation. Subterranean nester, dependent upon burrowing mammals, most notably, the California ground squirrel (*Spermophilus beecheyi*).	**Possible.** Suitable habitat exists in the SMP area. There are several CNDDB occurrences north of Lake Berryessa and from the flatter portions of the southern and eastern portions of the SMP area.
Buteo regalis Ferruginous hawk	-/- (MBTA)	Winter visitor of California, except for North Coast and Sierra Nevada. Breeds in northeastern California east of Cascades, along Nevada border.	Nest on cliffs, rock outcrops, and tree groves. Forage in grasslands, sagebrush, saltbush-greasewood shrublands, edges of pinyon-juniper forests.	**None.** While the species could forage in the SMP area, it is not known to nest in the SMP area.
Buteo swainsoni Swainson's hawk	-/ST	Lower Sacramento and San Joaquin valleys, Klamath Basin, and Butte Valley. Recent breeding in Santa Clara County and expected elsewhere in greater San Francisco Bay Area.	Breeds in grasslands with scattered trees, juniper-sage flats, riparian areas, savannahs, and agricultural or ranch lands with groves or lines of trees. Requires adjacent suitable foraging areas such as grasslands, or alfalfa or grain fields supporting rodent populations.	**Possible.** Suitable foraging and nesting habitat exist in the SMP area. CNDDB occurrences are recorded from the western and southern portions of the SMP area.
Charadrius nivosus nivosus Western snowy plover	FT/SSC	Pacific Coast (including islands, bays, estuaries, coastal rivers, and peninsulas) adjacent to tidal waters of the Pacific Ocean from Damon Point, Washington south to Bahia Magdelena, Baja California.	Sandy beaches, salt pond levees & shores of large alkali lakes. Needs sandy, gravelly or friable soils for nesting.	**Possible.** Species is known to occur in the salt ponds (Pond 7/7a) and marshes (Green Island Unit) within the Napa-Sonoma Marsh Wildlife Area[7] in southern Napa County.

[7] Pearl, B., K. Tokatlian, and J. Scullen. 2016. Western Snowy Plover Monitoring in the San Francisco Bay Annual Report 2015. San Francisco Bay Bird Observatory. February.

Sci. Name Common Name	Status (Fed/State)	Range	Habitat	Potential to Occur in Maintenance Program area
Circus hudsonius (formerly *cyaneus*) Northern harrier	-/SSC	California coast from Del Norte County south to San Luis Obispo, east of California Cascades, northern 2/3 of Central Valley, and portion of Great Basin within California.	Nests in marshes, moist fields, and grasslands, and forages over open areas.	**Present.** Species is known to occur year-round in the SMP area, and suitable foraging and nesting habitat (marshes and grasslands) occurs in lowland portions of the SMP area.
Cypseloides niger black swift	-/SSC	Migrates along Coast and Coast Range from Santa Barbara County north. Scattered breeding locations in western Monterey County, in the southern Transverse Range, Sierra Nevada Moutains adjacent to the northern San Joaquin and along the Sacramento Valley.	Nest on cliff ledges near waterfalls and sea caves, and forage in open areas.	**Possible.** Suitable nesting habitat (cliff ledges) is present in the western and northeastern portions of the SMP area, but SMP activities are not anticipated to affect suitable nesting habitat.
Elanus leucurus white-tailed kite	-/FP	Lowlands west of the Sierra Nevada Mountains from Sacramento Valley south to western San Diego County (including coastal foothills and valleys).	Nests in rolling foothills/valley margins with scattered oaks and river bottomlands or marshes next to deciduous woodland. Open grasslands, meadows, or marshes for foraging close to isolated, dense-topped trees for nesting and perching.	**Present.** Species observed at numerous locations within the SMP area, and suitable habitat (grasslands, oak woodlands, marshes) and nesting substrate (trees near open areas) are present in lowland areas of the SMP area.
Eremophila alpestris actia California horned lark	-/- (MBTA)	Year-round resident throughout California except from Humboldt County to western Siskiyou County, where they are migratory.	Nests on bare ground in depressions within dry, open areas, such as grasslands, tundra, deserts, beaches, dunes, and heavily grazed pastures.	**Possible.** Species is known to occur year-round in the SMP area, and suitable nesting and foraging habitat (open areas with low to no vegetation) occurs in the lowland portions of the SMP area.

Sci. Name Common Name	Status (Fed/State)	Range	Habitat	Potential to Occur in Maintenance Program area
Falco mexicanus prairie falcon	-/- (MBTA)	Permanent resident in the south Coast, Transverse, Peninsular, and northern Cascade ranges; southern deserts; Inyo-White Mountains; foothills surrounding the Central Valley; and in the Sierra Nevada Mountains in Modoc, Lassen, and Plumas Counties. Winters in the Central Valley, in Marin County, and along the Coast from Santa Barbara County to San Diego County.	Nests on cliffs or escarpments, typically overlooking dry, open terrain or uplands.	**Possible.** Primarily occurs in the SMP area during winter but the species may occur year-round and nest in the western portion of the SMP area. SMP activities are not anticipated to affect suitable nesting substrate (cliffs or escarpments).
Falco peregrinus anatum American peregrine falcon	FD/FP, SD	Year-round throughout most of California, except for northern Sierra Nevada, Central Valley, and interior Southern California.	Forages near wetlands, lakes, rivers, or other water; on cliffs, banks, dunes, mounds; also, human-made structures. Nest consists of a scrape or a depression or ledge in an open, elevated site (cliffs, tall isolated trees, high bridges, and power transmission towers).	**Possible.** Suitable foraging habitat throughout the SMP area, but nesting substrate (cliffs, tall isolated trees, high bridges, transmission towers) is limited to the western, southern, and eastern extents of the SMP area.
Geothlypis trichas sinuosa saltmarsh common yellowthroat	-/SSC	San Francisco Bay.	Resident of fresh and salt water marsh and swamps. Requires thick, continuous cover down to water surface for foraging, and tall grasses, bulrush patches, and/or willows for nesting.	**Possible.** Suitable nesting and foraging habitat exist in the SMP area and multiple CNDDB occurrence records are documented in the Napa River, Sonoma-Marin marshes, and other marshes in the southern portion of the SMP area.

Sci. Name Common Name	Status (Fed/State)	Range	Habitat	Potential to Occur in Maintenance Program area
Haliaeetus leucocephalus bald eagle	FD/SE, FP	Non-breeding resident throughout most of California. Within California, breeds in northern portion of state near Cascades and adjacent plains.	Occurs mainly along coasts, rivers, and lakes; nests in tall trees or in cliffs, usually within 1 mile of water. Nests in large, old-growth, or trees with open branches, especially ponderosa pine. Roosts communally in winter. Feeds mostly on fish.	**Possible.** This species is known to occur near Lake Berryessa and Lake Hennessey, and suitable nesting and foraging habitat also occurs at Lake Curry. However, urban development and the lack of large perennial waterbodies limits the species potential in most portions of the SMP area.
Icteria virens yellow-breasted chat	-/SSC	Breeds throughout California, except for northern Sierra Nevada and Cascades.	Summer resident; inhabits riparian thickets of willow and other brushy tangles near watercourses. Nests in low, dense riparian, consisting of willow, blackberry, wild grape; forages and nests within 10 feet of ground.	**Possible.** Suitable habitat exists in the SMP area. No occurrence records of the species are known from the SMP area, but this species' habitat preference make it likely to be unnoticed.
Lanius ludovicianus Loggerhead shrike	-/SSC	Year-round resident throughout California, except for North Coast, northern Sierra Nevada and Cascades.	Broken woodlands, savannah, pinyon-juniper, Joshua tree, riparian woodlands, desert oases, scrub and washes. Prefers open country for hunting, with perches for scanning, and fairly dense shrubs and brush for nesting.	**Possible.** Suitable habitat exists in open undeveloped portions of lowlands in the SMP area.
Laterallus jamaicensis coturniculus California black rail	-/ST, FP	Year-round resident in the Lower Colorado River and greater San Francisco Bay Area.	Inhabits freshwater marshes, wetland meadows, and the shallow margins of saltwater marshes bordering larger bays. Needs water depths of about 1 inch that do not fluctuate during the year & dense vegetation for nesting habitat.	**Possible.** Suitable habitat (fresh and saltwater marshes) exists in the southern portion of the SMP area. Occurrence records are known from the marshes along the lower Napa River, tributaries in the southern SMP area, and the Napa-Sonoma Marshes.
Pelecanus occidentalis californicus California brown pelican	FD/SD, FP	Pacific Coast from Canada to Mexico.	Open water and adjacent coastal habitat. Nests on islands and occasionally along Arizona's lakes and rivers.	**None.** The SMP area lacks suitable habitat (coastal islands) and no occurrences records are known from the SMP area.

Sci. Name Common Name	Status (Fed/State)	Range	Habitat	Potential to Occur in Maintenance Program area
Melospiza melodia samuelis San Pablo song Sparrow	-/SSC	Year-round resident fringe of San Pablo Bay, Napa-Sonoma Marsh, Petaluma River, Napa River, and northern edges of San Francisco Bay,	Resides in tidal sloughs of salt marshes. Nests in dense marsh vegetation, including *Grindelia* sp. and *Baccharis pilularis*.	**Possible.** Suitable habitat (tidal salt marshes) exists in the southwest portion of the SMP area in the Napa-Sonoma Marshes (including Edgerly Island) and lower Napa River.
Nycticorax nycticorax black-crowned night heron	-/- (MBTA)	Year-round resident in California Coast and Coast Range, Cascades, and along the Colorado River. Migrates throughout the remainder of the state.	Nests colonially within a tree or cattails over or near water. Forage in freshwater, brackish, and salt marshes; rivers; mud flats; other water bodies; and wet agricultural fields.	**Possible.** Suitable nest colony habitat (trees and cattails near water) exists throughout the SMP area.
Pandelion haliaetus osprey	-/- (MBTA)	Nests in northern Sierra Nevada, southern Cascades, and plains east of Cascades. Year-round in northern half of California to San Mateo Peninsula. Winters in San Joaquin Valley and central to southern California coast and along Colorado River. Migrates through deserts to southern Mono Basin.	Nests in tall trees, cliffs, or human-derived platforms near water. Forages for fish over a variety of water bodies (rivers, lakes, sea, and marshes).	**Possible.** Suitable nesting habitat occurs near Lake Berryessa, Lake Hennessey, and Lake Curry; and foraging habitat occurs at these lakes, the lower Napa River, and aquatic areas along the Napa-Sonoma Marshes. However, urban development and the lack of large perennial waterbodies limits the species potential in most portions of the SMP area.
Phalacrocorax auratus double-crested cormorant	-/- (MBTA)	Nests along the Colorado River, California coast north of Humboldt County and south of Los Angeles County, and San Francisco Bay.	Nests colonially in trees, on human-derived structures, and on the ground near water bodies. Forages in open water for fish.	**Possible.** Suitable foraging habitat in the lower Napa River and Napa-Sonoma Marshes, marginal nesting substrate in the Napa-Sonoma Marshes.
Progne subis purple martin	-/SSC	Breeds in the Salinas River Valley north to Del Norte County, northern Sierra Nevada (north of Lake Tahoe), and a few scattered locations in the central Sierra Nevada foothills.	Nests along forest edges and rivers with dead snags offering tree cavities, as well as in nest boxes in more developed areas. Forages over numerous land cover types, including over parks, open fields, developed areas, dunes, streams, wet meadows, and other open areas.	**Possible.** Species occurrence records are known from the SMP area, and suitable nesting habitat occurs in wooded areas with snags throughout the SMP area.

Sci. Name Common Name	Status (Fed/State)	Range	Habitat	Potential to Occur in Maintenance Program area
Rallus obsoletus Ridgway's rail	FE/SE, FP	In California, year-round in San Francisco Bay, Southern California coast (from Ventura County south), the Salton Sea, and the lower Colorado River and tributaries.	Saltwater and brackish marshes traversed by tidal sloughs in the vicinity of San Francisco Bay. Associated with abundant growths of pickleweed, but feeds away from cover on invertebrates from mud-bottomed sloughs.	**Possible.** Species known to occur at Edgerly Island Dredged Material Rehandling Site in southern Napa County and expected to occur in tidal sloughs within the greater Napa-Sonoma Marshes.
Riparia riparia bank swallow	-/ST	Migrates throughout all of California. Year-round resident on the San Mateo Peninsula, Sacramento River, and northern Sierra Nevada to plains east of the Cascades.	Colonial nester; nests primarily in riparian and other lowland habitats west of the desert. Requires vertical banks/cliffs with fine-textured/sandy soils near streams, rivers, lakes, or ocean to dig nesting hole.	**None**. The SMP area is outside of the species' breeding range.
Setophaga petechia yellow warbler	-/SSC	Breeds along California coast, except Santa Cruz to San Mateo Peninsula, Cascades, plains east of the Cascades, and Coast Range and Sierra Nevada foothills surrounding the Sacramento Valley. Migrant throughout the rest of California.	Nest in thickets and disturbed/regrowing habitat, typically willows and dogwood, up to 9,000 feet above mean sea level. Forage in scrub, marshes, and forests.	**Possible.** Suitable nesting habitat occurs in early successional riparian habitat throughout the SMP area.
Sternula antillarum browni California least tern	FE/SE, FP	Nests along the coast from San Francisco Bay south to northern Baja California.	Colonial breeder on bare or sparsely vegetated, flat substrates: sand beaches, alkali flats, landfills, or paved areas. Forages in open water, marine habitat.	**Possible.** Species is known to occur and breed in the salt ponds (Pond 7/7a) and marshes (Green Island Unit) within the Napa-Sonoma Marsh Wildlife Area[8] in southern Napa County.

[8] Frost, N. 2017. California least tern breeding survey, 2016 season. California Department of Fish and Wildlife, Wildlife Branch, Nongame Wildlife Program Report, 2017-03. Sacramento.

Sci. Name Common Name	Status (Fed/State)	Range	Habitat	Potential to Occur in Maintenance Program area
Strix occidentalis caurina Northern spotted owl	FT/ST, SSC	Year-round resident north of San Francisco Bay along the Coast north throughout the Coast Range and into the Cascades into Oregon.	Old-growth forests or mixed stands of old-growth & mature trees. Occasionally in younger forests w/patches of big trees.	**Possible.** Suitable habitat present in western portions of the SMP area. Critical Habitat for the species occurs in the northwest corner of the SMP area and north of Lake Hennessey, but no SMP activities are anticipated at these locations.
Vireo bellii pusillus least Bell's vireo	FE/SE	Southern Inyo, southern San Bernardino, Riverside, San Diego, Orange, Los Angeles, Ventura, and Santa Barbara counties.	Summer resident of Southern California in low riparian in vicinity of water or in dry river bottoms; below 2000 feet. Nests placed along margins of bushes or on twigs projecting into pathways, usually willow, *Baccharis*, mesquite.	**None.** The SMP area is outside of the species' breeding range**.**
Xanthocephalus xanthocephalus yellow-headed blackbird	-/SSC	Central Valley and southeastern California year-round. Winters in southern Arizona, Texas, New Mexico, and Mexico. Occurs in the Great Basin to Canada during summer.	Nests in freshwater emergent wetlands with dense vegetation & deep water. Often along borders of lakes or ponds. Nests only where large insects such as *Odonata* are abundant, nesting timed with maximum emergence of aquatic insects.	**Possible.** Suitable nesting habitat (freshwater emergent marsh) exists along the lower Napa River and marshes in the southern-half of the SMP area.
Mammals				
Antrozous pallidus *Pallid bat*	-/SSC, WBWG: High Priority	Widespread throughout California.	Deserts, grasslands, shrublands, woodlands & forests. Most common in open, dry habitats with rocky areas for roosting. Roosts must protect bats from high temperatures. Very sensitive to disturbance of roosting sites.	**Possible.** Trees located outside of developed areas in the SMP area provide suitable roosting habitat. Lacustrine, riparian, and marsh habitats, and to some extent the adjacent ruderal habitats, provide foraging habitat.
Arctocephalus townsendi Guadalupe fur-seal	FT, MMPA: Depleted/ST, FP	Point Conception, California south to Guadalupe Island, Mexico.	Pelagic except for breeding, which occurs in sea caves of Guadalupe Island off the Mexico coast.	**None.** The SMP area lacks suitable habitat.
Callorhinus ursinus northern fur-seal	MMPA: Depleted/-	Japan to California Channel Islands, north to the Bering Sea.	Pelagic except for breeding and pupping, which occurs on certain offshore islands (e.g., Farallon Islands).	**None.** The SMP area lacks suitable habitat.

Sci. Name Common Name	Status (Fed/State)	Range	Habitat	Potential to Occur in Maintenance Program area
Corynorhinus townsendii *Townsend's big-eared bat*	-/SSC, WBWG: High Priority	Coastal regions from Del Norte County south to Santa Barbara County.	Found throughout California in a wide variety of habitats, including woodlands, forests, chaparral, scrubs, and grasslands. Most common in mesic sites. Roosts on open surfaces in caves, abandoned mines, and buildings. Also uses bridges, rock crevices and hollow trees as roost sites. Roosting sites are limiting. This species is extremely sensitive to human disturbance.	**Possible.** Trees, rock crevices, and unused structures outside of developed areas in the SMP area provide suitable roosting habitat. Lacustrine, riparian, and marsh habitats, and to some extent the adjacent ruderal habitats, provide foraging habitat.
Erethizon dorsatum North American porcupine	-/-	Sierra Nevada and Cascade mountain ranges from Kern County north to the Oregon border, in the Coast Ranges to Sonoma County, and from San Mateo County south to Los Angeles and San Bernardino Counties	Most prevalent in montane coniferous forest, Douglas-fir forest, alpine dwarf-shrub, and wet meadow land cover types. Less commonly occurs in hardwood forest, hardwood-coniferous forest, montane and valley-foothill riparian forest, aspen forest, pinyon-juniper forest, and sage. Dens in caves, rock crevices, cliffs, hollow logs, snags, existing burrows, and dense foliage in trees.	**Possible.** Forested portions of the SMP area represent suitable habitat, but no occurrences records are known from the SMP area. SMP activities are not anticipated to impact this species. This species has no regulatory protection, so impacts to it would not be significant and it is not discussed further.
Eumetopias jubatus Steller (=northern) sea lion	FD, MMPA: Depleted/-	North Pacific Ocean from Japan, north to the Gulf of Alaska, and east to central California.	In California, the species breeds and raises pups on islands along the from Año Nuevo Island to the Oregon border.	**None.** The SMP area lacks suitable habitat.
Eumops perotis californicus western mastiff bat	-/SSC, WBWG: High Priority	Southwestern United States to central Mexico.	Many open, semi-arid to arid habitats, including conifer and deciduous woodlands, coastal scrub, grasslands, chaparral, etc. Roosts in crevices in cliff faces, high buildings, trees and tunnels.	**Not expected.** SMP activities are not anticipated to affect suitable roost habitat (cliff crevices, tunnels, trees in semi-arid to arid areas).

Sci. Name Common Name	Status (Fed/State)	Range	Habitat	Potential to Occur in Maintenance Program area
Lasiurus blossevillii *western red bat*	-/SSC, WBWG: High Priority	Year-round range spans the Central Valley, Sierra Nevada foothills, Coast Range, and coast except for Humboldt and Del Norte counties.	Cismontane woodland, lower montane coniferous forest, riparian forest, woodlands, and orchards. Roosts primarily in trees, 2-40 feet above ground, from sea level up through mixed conifer forests. Prefers habitat edges and mosaics with trees that are protected from above and open below with open areas for foraging.	**Possible.** Riparian areas in the SMP area provide suitable roosting and foraging habitat for this species, and adjacent agricultural areas with trees also provides limited roosting and foraging habitat.
Mirounga angustirostris northern elephant seal	MMPA/-	North Pacific Ocean from the Gulf of Alaska and Aleutian Islands south to Baja California.	During the breeding season live on beaches, offshore islands, and other accessible shoreline habitat.	**None.** The SMP area lacks suitable habitat.
Myotis evotis long-eared myotis	-/-, WBWG: Medium Priority	Southwestern Canada to Baja California, east to the western Great Plains.	Typically associated with coniferous forests, but also occurs in shrub, sage, chaparral, and agricultural areas. Roost in tree cavities, under exfoliating bark, in caves, mines, cliff crevices, outcrops, and less frequently in buildings and bridges.	**Possible.** Coniferous forest, chaparral, and shrub in the SMP area provide suitable roosting and foraging habitat for this species, and adjacent agricultural areas with trees also provide limited roosting and foraging habitat. SMP activities are not anticipated to affect cliffs or rock outcrops, where the species could roost.
Myotis thysanodes fringed myotis	-/-, WBWG: High Priority	British Columbia to Chiapas, Mexico and east to the Black Hills of South Dakota.	Dry woodlands (oak, pinyon-juniper, ponderosa pine), desert scrub, mesic coniferous forest, grassland, and sage-grass steppe up to 9,350 feet above mean sea level. Roosts in crevices in trees, buildings, mines, rocks, cliffs, and bridges.	**Possible.** Suitable roost and foraging habitat is present in dry oak and coniferous woodlands, mesic coniferous forest, and grasslands throughout the northern and eastern portions of the SMP area. However, SMP activities are not anticipated to impact suitable roost habitat in upland areas.

Sci. Name Common Name	Status (Fed/State)	Range	Habitat	Potential to Occur in Maintenance Program area
Myotis yumanensis Yuma myotis	-/-, WBWG: Low Priority	British Columbia to Baja California, western third of North America.	Numerous land cover types (most often riparian woodland, forest, scrub, and desert) near permanent water sources (typically rivers and streams). Roosts in bridges, buildings, cliff crevices, caves, mines, and trees.	**Possible.** Suitable roost habitat (riparian woodland and scrub) occurs throughout the SMP area. SMP activities are not expected to impact suitable roost habitat (cliff crevices) in upland areas.
Phoca vitulina Pacific harbor seal	MMPA/-	Northern hemisphere of the Atlantic and Pacific Oceans.	Prefer near-shore coastal waters, rock islands, sandy beaches, mud flats, bays, and estuaries.	**Possible.** Species is known to occur in the lower Napa River and sloughs in the Napa-Sonoma Marshes.
Reithrodontomys raviventris *Salt-marsh harvest mouse*	FE/SE, FP	San Francisco Bay Estuary and Suisun Marsh.	Saline emergent wetlands of San Francisco Bay and its tributaries.	**Possible.** Species is known to occur in the SMP area vicinity in pickleweed (*Salicornia pacfiica*)-dominated salt marshes of southern Napa County.
Sorex ornatus sinuosus Suisun shrew	-/SSC	Tidal marshes of the northern shores of San Pablo and Suisun bays.	Require dense low-lying cover, driftwood, or other litter above mean hightide for nesting and foraging.	**Possible.** Suitable habitat (tidal marsh with low vegetation and cover) is present within the Napa-Sonoma Marshes in the SMP area.
Taxidea taxus *American badger*	-/SSC	Majority of northern, western, and central United States south to Baja California.	Most abundant in drier open stages of most shrub, forest, and herbaceous habitats, with friable soils. Needs sufficient food, friable soils and open, uncultivated ground. Preys on burrowing rodents. Digs burrows.	**Possible.** Suitable habitat is present in undeveloped areas throughout the SMP area.
Zalophus califorianus California sea lion	MMPA/-	Vancouver Island, British Columbia to Baja California, Mexico.	Breeding and pupping occur on offshore islands, including California Channel Islands, Año Nuevo Island, and the Farallon Islands. Frequent many coastal beaches and jetties.	**Possible.** Suitable habitat in the lower Napa River and adjacent tidal sloughs in the Napa-Sonoma Marshes within the SMP area. Breeding and pupping activities occur on offshore islands, so SMP activities are not anticipated to affect sea lions.

"Potential to Occur" Categories Definitions

Present = species was either observed directly or its presence was confirmed by field investigations or previous studies in the SMP area.

Possible = suitable habitat is present that could support the species as it is within the species range and/or near an occurrence record.

Not expected = marginal to poor quality habitat is present or isolated from the nearest extant occurrence record(s), and/or the species is not known to occur in the area.

None = SMP area is outside of species' range, record is possibly or presumed extirpated, or lacks suitable habitat capable of supporting the species.

Status Legend

Federal

FE = federally endangered
FT = federally threatened
FPE = federally proposed endangered
FPT = federally proposed threatened
FC = federal candidate for listing as threatened or endangered
FD = federally delisted
MMPA = Marine Mammal Protection Act
MBTA = Migratory Bird Treaty Act

State

SR = state rare
SE = state endangered
ST = state threatened
FP = fully protected
SSC = species of special concern
SC = state candidate
SD = state delisted

WBWG (Western Bat Working Group) Priority

(available: http://wbwg.org/matrices/species-matrix/)

High = species "considered the highest priority for funding, planning, and conservation actions. Information about status and threats to most species could result in effective conservation actions being implemented should a commitment to management exist. Species is imperiled or are at high risk of imperilment."

Moderate = species warrants "evaluation, more research, and conservation actions of both the specie and possible threats. The lack of meaningful information is a major obstacle in adequately assessing species' status and should be considered a threat."

Table G-3 Special Status Fish Species

Sci. Name Common Name	Status (Fed/State)	Range	Habitat	Potential to Occur in Stream Maintenance Program (SMP) area and Rationale
Fish				
Acipenser medirostris Green Sturgeon, Southern DPS	FT/SSC	Year-round off Pacific Coast from Graves Harbor, Alaska south to Monterey Bay, including San Francisco Bay and Delta. Spawn within tributaries of Sacramento and Feather Rivers.	Spawns at temperatures between 8–14 ° C. Preferred spawning substrate is large cobble, but can range from clean sand to bedrock. Occasionally reported in the San Joaquin River upstream from Stockton[1].	**Possible.** Although there are no documented occurrences of this species in Napa County, it is possible that it occasionally occurs in the downstream, tidal portions of the Napa River[2]. Additionally, tidal portions of the Napa River are designated Critical Habitat for this species. SMP activities are not anticipated within Critical Habitat possessing the primary constituent elements.
Eucyclogobius newberryi Tidewater Goby	FE/SSC	Del Norte County to Del Mar in San Diego County.	Coastal lagoons and brackish bays at freshwater stream mouths.	**Not expected.** The SMP area is outside of the species' extant range.
Hypomesus transpacificus Delta smelt	FT/SE	San Francisco Bay to Sacramento-San Joaquin Delta.	Freshwater streams to tidally influenced sloughs and channels.	**Possible.** Delta smelt are known to occur in downstream, tidal portions of the Napa River[2, 3].

[1] Jackson, Z. J., and J.P. Van Eenennaam.2013. 2012 San Joaquin River sturgeon spawning survey. Stockton Fish and Wildlife Office, Anadromous Fish Restoration Program, U.S. Fish and Wildlife Service, Lodi, California.

[2] Leidy, R.A. 2007. Ecology, Assemblage Structure, Distribution, and Status of Fishes in Streams Tributary to the San Francisco Estuary, California. San Francisco Estuary Institute. Contribution No. 530. April.

[3] Santos, N.R., J.V. Katz, P.B. Moyle, and J.H. Viers. 2014. A programmable information system for management and analysis of aquatic species range data in California. Environmental Modelling & Software, 53, 13-26.

Sci. Name Common Name	Status (Fed/State)	Range	Habitat	Potential to Occur in Stream Maintenance Program (SMP) area and Rationale
Oncorhynchus kisutch Coho salmon, Central Valley DPS (population 4)	FE/SE	Coastal rivers south of Punta Gorda to and including Aptos Creek, as well as San Francisco Bay tributaries.	Require clean, cold water over large gravel substrate beds near deep pools with water temperatures between 5 and 19° C for spawning.	**None.** The Monticello Dam is a total barrier to the Central Valley DPS.
Oncorhynchus mykiss Steelhead - Central Valley DPS (population 11); Central California Coast DPS (population 8)	FT/-; FT/-	Sacramento and San Joaquin river systems and tributaries (excludes San Francisco and San Pablo bays).; Coastal rivers and stream from the Russian River to and including Aptos Creek, as well as all drainages of San Francisco and San Pablo bays east to Chipps Island at the confluence of the Sacramento and San Joaquin Rivers.	(all DPS) Require clean, cold water with near DO saturation levels over loose silt-free gravel beds with water temperatures between 15 and 24° C for spawning.	**None.** The Monticello Dam is a total barrier to the Central Valley DPS. **Possible.** Suitable habitat (perennial freshwater rivers and tributaries) for the California Central Coast DPS is present in the Napa River and steelhead are known to occur downstream of Lake Curry in Suisun Creek[4].Critical habitat is located within the Napa River and several of its perennial tributaries throughout the Napa Valley.
Oncorhynchus tshawytscha Chinook Salmon, California coast ESU (population 17); Central Valley spring-run ESU (population 6); Sacramento River winter-run ESU (population 7)	FT/-; FT/ST; FE/SE	Coastal rivers and streams south of the Klamath River to and including the Russian River; Populations spawning in the Sacramento and San Joaquin Rivers and their tributaries.; Sacramento River below Keswick Dam, but does not spawn in tributary streams.	(all ESUs) Require clean, cold water over loose silt-free gravel beds with water temperatures between 5 and 19° C for spawning.	**None.** The SMP area is outside of the California Coast ESU species' range. **None.** The Monticello Dam is a total barrier to the Central Valley DPS. **None.** The SMP area is outside of the California Coast ESU species' range.

[4] Leidy, R. A., G. S. Becker, B. N. Harvey. 2005. Historical Distribution and Current Status of Steelhead/Rainbow Trout (Oncorhynchus mykiss) in Streams of the San Francisco Estuary, California. Center for Ecosystem Management and Restoration, Oakland, CA.

Sci. Name Common Name	Status (Fed/State)	Range	Habitat	Potential to Occur in Stream Maintenance Program (SMP) area and Rationale
Spirinchus thaleichthys Longfin Smelt	FC/ST, SSC	Bays, estuaries, and nearshore environments from Lake Earl to the San Francisco Bay. Includes Suisun Bay and Marsh, San Pablo Bay, San Francisco Bay, Gulf of the Farallones, and Humboldt Bay. Eastward range limited to upstream of Rio Vista on Sacramento River, Cache Slough and Medford Island on San Joaquin River.	Mid-water to near-bottom of water column in freshwater to saltwater bays, estuaries, and nearshore environments below 22°C	**Possible.** Longfin smelt are known to occur in downstream, tidal portions of the Napa River[2, 5].

"Potential to Occur" Categories Definitions

Present = species was either observed directly or its presence was confirmed by field investigations or previous studies in the SMP area.

Possible = suitable habitat is present that could support the species as it is within the species range and/or near an occurrence record.

Not expected = marginal to poor quality habitat is present or isolated from the nearest extant occurrence record(s), and/or the species is not known to occur in the area.

None = SMP area is outside of species' range, record is possibly or presumed extirpated, or lacks suitable habitat capable of supporting the species.

Status Legend

Federal

FE = federally endangered
FT = federally threatened
FPE = federally proposed endangered
FPT = federally proposed threatened
FC = federal candidate for listing as threatened or endangered
FD = federally delisted

State

SR = state rare
SE = state endangered
ST = state threatened
FP = fully protected
SSC = species of special concern
SC = state candidate

[5] Merz, J.E., P.S. Bergman, J.F. Melgo, and S. Hamilton. 2013. Longfin smelt: spatial dynamics and ontogeny in the San Francisco Estuary, California. California Fish and Game 99(3):122-148.

Notes: *DO = dissolved oxygen; DPS = Distinct Population Segment; ESU = Evolutionarily Significant Unit; FGC = California Fish and Game Code; MMPA = Marine Mammal Protection Act; ppt = parts per thousand; Delta = Sacrament-San Joaquin River Delta.*

Appendix H

Correspondence with Native American Tribes Pursuant to AB 52

Local Government Tribal Consultation List Request

Native American Heritage Commission
1550 Harbor Blvd, Suite 100
West Sacramento, CA 95691
916-373-3710
916-373-5471 – Fax
nahc@nahc.ca.gov

Type of List Requested

☒ **CEQA Tribal Consultation List (AB 52)** – *Per Public Resources Code § 21080.3.1, subs. (b), (d), (e) and 21080.3.2*

☐ **General Plan (SB 18)** - *Per Government Code § 65352.3.*

Local Action Type:

___ **General Plan** ___ **General Plan Element** ___ **General Plan Amendment**

___ **Specific Plan** ___ **Specific Plan Amendment** ___ **Pre-planning Outreach Activity**

Required Information

Project Title: Napa County Flood Control and Water Conservation District Stream Maintenance Manual Update

Local Government/Lead Agency: Napa County Flood Control and Water Conservation District

Contact Person: Richard Thomasser

Street Address: 1195 Third Street

City: Napa, CA **Zip:** 94559

Phone: (707) 259-8657 **Fax:** ______

Email: Richard.thomasser@countyofnapa.org

Specific Area Subject to Proposed Action

County: NAPA **City/Community:** ______

Project Description:

The Napa County Flood Control and Water Conservation District is preparing to update its Stream Maintenance Manual, which describes the maintenance activities, including best management practices, that are implemented through their maintenance program. The District is also partnering with the County Roads Department for maintenance on County roads, the Napa County Resource Conservation District, and the City of American Canyon for its stream maintenance activities. The program area covers all of Napa County. Preparation of the Maintenance Manual is considered a project under CEQA.

Additional Request

☒ **Sacred Lands File Search** - ***Required Information:***

USGS Quadrangle Name(s): see attached list

Township: ______ **Range:** ______ **Section(s):** ______

Napa County Flood Control and Water Conservation District Stream Maintenance Manual Update – USGS 7.5' Quadrangle List

Napa County
JERICHO VALLEY
KNOXVILLE
GUINDA
MOUNT SAINT HELENA
DETERT RESERVOIR
AETNA SPRINGS
WALTER SPRINGS
BROOKS
MARK WEST SPRINGS
CALISTOGA
SAINT HELENA
CHILES VALLEY
MONTICELLO DAM
KENWOOD
RUTHERFORD
YOUNTVILLE
CAPELL VALLEY
MT VACA
SONOMA
NAPA
MT GEORGE
FAIRFIELD NORTH
SEARS POINT
CUTTINGS WHARF
CORDELIA

Napa County Flood Control and Water Conservation District Stream Maintenance Manual Update – USGS 7.5' Quadrangle List

Napa County
JERICHO VALLEY
KNOXVILLE
GUINDA
MOUNT SAINT HELENA
DETERT RESERVOIR
AETNA SPRINGS
WALTER SPRINGS
BROOKS
MARK WEST SPRINGS
CALISTOGA
SAINT HELENA
CHILES VALLEY
MONTICELLO DAM
KENWOOD
RUTHERFORD
YOUNTVILLE
CAPELL VALLEY
MT VACA
SONOMA
NAPA
MT GEORGE
FAIRFIELD NORTH
SEARS POINT
CUTTINGS WHARF
CORDELIA

NATIVE AMERICAN HERITAGE COMMISSION
Environmental and Cultural Department
1550 Harbor Blvd., Room 100
West Sacramento, CA 95691
(916) 373-3710

March 28, 2018

Richard Thomasser
Napa County Flood Control and water Conservation District

Sent by Email: richard.thomasser@countyofnapa.org
Number of Pages: 2

RE: Flood Control and Water Conservation District Stream Maintenance Manual Update, Napa County

Dear Mr. Thomasser:

A record search of the Native American Heritage Commission (NAHC) *Sacred Lands File* (SLF) was completed for the area of potential project effect (APE) for the above referenced project. **Sacred sites were identified in the project areas provided**. For the Aetna Springs, Kenwood, Rutherford, Yountville, and Napa USGS Quads please contact the Mishewal-Wappo Tribe of Alexander Valley. For the Sonoma and Detert Reservoir USGS Quads please contact the Tribes on the attached Tribal Consultation List directly for more information about potential sites and tribal cultural resources within the APE.

The absence of site information in the *Sacred Lands File* does not indicate the absence of Native American cultural resources in any APE. Other sources of cultural resources information should be contacted regarding known and recorded sites. Please contact all of the people on the attached list. The list should provide a starting place to locate areas of potential adverse impact within the APE. I suggest you contact all of those listed, if they cannot supply information, they might recommend others with specific knowledge. **By contacting all those on the list, your organization will be better able to respond to claims of failure to consult under applicable laws.** If a response has not been received within two weeks of notification, the NAHC requests that you follow-up with a telephone call to ensure that the project information has been received.

If you receive notification of change of addresses and phone numbers from any of these individuals or groups, please notify me. With your assistance we are able to assure that our lists contain current information. If you have any questions or need additional information, please contact me at my email address: sharaya.souza@nahc.ca.gov.

Sincerely,

Sharaya Souza
Staff Services Analyst
(916) 573-0168

Native American Heritage Commission
Native American Contacts
3/28/2018

Cortina Indian Rancheria of Wintun Indians
Charlie Wright, Chairperson
P.O. Box 1630 — Wintun / Patwin
Williams, CA 95987
(530) 473-3274 Office
(530) 473-3301 Fax

Middletown Rancheria
Jose Simon III, Chairperson
P.O. Box 1035 — Pomo
Middletown, CA 95461 — Lake Miwok
(707) 987-3670 Office
(707) 987-9091 Fax

Mishewal-Wappo Tribe of Alexander Valley
Scott Gabaldon, Chairperson
2275 Silk Road — Wappo
Windsor, CA 95492
scottg@mishewalwappotribe.com
(707) 494-9159

Yocha Dehe Wintun Nation
Anthony Roberts, Chairperson
P.O. Box 18 — Wintun (Patwin)
Brooks, CA 95606
aroberts@yochadehe-nsn.gov
(530) 796-3400
(530) 796-2143 Fax

This list is current only as of the date of this document and is based on the information available to the Commission on the date it was produced.

Distribution of this list does not relieve any person of statutory responsibility as defined in Section 7050.5 of the Health and Safety Code, Section 5097.94 of the Public Resource Code, or Section 5097.98 of the Public Resources Code.

This list is only applicable for contacting local Native American Tribes for the proposed:
Flood Control and Water Conservation District Stream Maintenance Manual Update, Napa County.

Napa County Flood Control and Water Conservation District

PHILLIP M. MILLER, P.E.
DISTRICT ENGINEER

March 29, 2018

Charlie Wright, Chairperson
Cortina Indian Rancheria of Wintun Indians
P.O. Box 1630
Williams, CA 95987

RE: Napa County Flood Control and Water Conservation District Stream Maintenance Manual Update – Tribal Coordination

Dear Honorable Chairperson Wright:

The Napa County Flood Control and Water Conservation District (District) is writing to notify you of a proposed project in order to coordinate with you about the existence of any information on known tribal resources that may be present or affected. It is important to note that the District has not received a request from you for notification of projects under Assembly Bill 52 (AB52).

The District was established in 1951 to conduct watershed maintenance and management activities in Napa County. Its primary purpose is to reduce the potential for flood damage along the riparian corridors on private and public lands throughout Napa County. Through a variety of programs enacted since the late 1990s, the District has worked with public and private partners to enhance the natural environment of the Napa River and its tributaries, while maintaining flood protection. Maintenance activities generally include vegetation management such as invasive plant removal and revegetation, sediment removal, erosion control, and maintenance of storm drainage facilities and outfalls. The District frequently partners with the Napa County Resource Conservation District (RCD) to implement creek stewardship projects for property owners and managers, and stakeholders to conserve, protect, and restore natural resources throughout Napa County and a small portion of Solano County. The District developed a Stream Maintenance Manual (Manual) in 2012 to describe the maintenance activities, including best management practices, that are implemented through their maintenance program.

The California Department of Fish and Wildlife issued a 10-year approval and San Francisco Bay Regional Water Quality Control Board issued a 5-year approval to conduct the maintenance activities as described in the 2012 Manual. The updated Manual would expand District maintenance responsibilities and revise maintenance approaches, and maintenance activities conducted by both the Napa County RCD and County in partnership with the District. The Manual would also include the addition of stream maintenance activities within the City of American Canyon consistent with maintenance practices described in the Manual.

Manual updates would include:

- Revisions to ongoing maintenance practices, such as the addition of bank repair activities, increasing the annual routine sediment removal limit from 500 feet to 1,500 feet, and species-specific avoidance and minimization measures for work in perennial streams;

- Expanded routine maintenance activities in the Napa River and Green Valley Creek watersheds based on easement agreements;
- Expanded maintenance coverage for the Rutherford Reach ad Oakville Knoll Restoration Projects;
- Inclusion of maintenance activities for the Napa River/Napa Creek Flood Protection Project;
- Inclusion of RCD and County Public Works road maintenance activities (e.g., clearing of debris from existing culverts, minor vegetation removal, debris removal, biotechnical bank stabilization, and culvert repair or replacement);
- Inclusion of City of American Canyon stream maintenance activities (e.g., sediment and debris removal from culvert aprons, culverts and bridge structures, vegetation maintenance within the stream channels and sediment basins, and some sediment removal along segments of drainages) along approximately 7.5 miles of streams that flow into the Napa River; and
- Addition of a mitigation chapter with a suite of mitigation options.

The District considers itself as "creek stewards" for Napa County and sees this Manual as not only an internal reference manual for District staff, but also an important educational and guidance document for the County at large. The Manual update would also provide the basis to secure regulatory approvals under federal and state regulations, including the federal Clean Water Act (CWA) and Endangered Species Act (ESA).

The area encompassed by the updated Manual includes all of Napa County, as depicted in Figure 1-1.

Preparation of the Manual update is considered a project under the California Environmental Act and, as a result, the District is preparing an Initial Study/Mitigated Negative Declaration to provide the public, responsible agencies, trustee agencies, and Native American Tribes with information about the potential environmental effects of the proposed updated Stream Maintenance Program.

A Sacred Lands and Files Search request at the Native American Heritage Commission (NAHC) identified a number of tribal resources in the Sacred Lands File within the project area. The NAHC suggested that we contact you for information about such resources located on the Aetna Springs, Kenwood, Rutherford, Yountville, and Napa USGS 7.5' quadrangles. We are requesting any information that you may have regarding tribal cultural resources (as defined by Public Resources Code 21074) within the project area so that this information can be incorporated into project planning and the resources can be protected. The District is respectfully requesting input from you within 30 days of receipt of this letter.

Your comments and concerns are important to us and we look forward to hearing from you. If you have any questions or comments regarding the project, I can be contacted via email at Richard.thomasser@countyofnapa.org or by phone at (707) 259-8657.

Sincerely,

Richard Thomasser, P.G.
Watershed and Flood Control Operations Manager

Enclosures: Figure 1-1 – Program Area

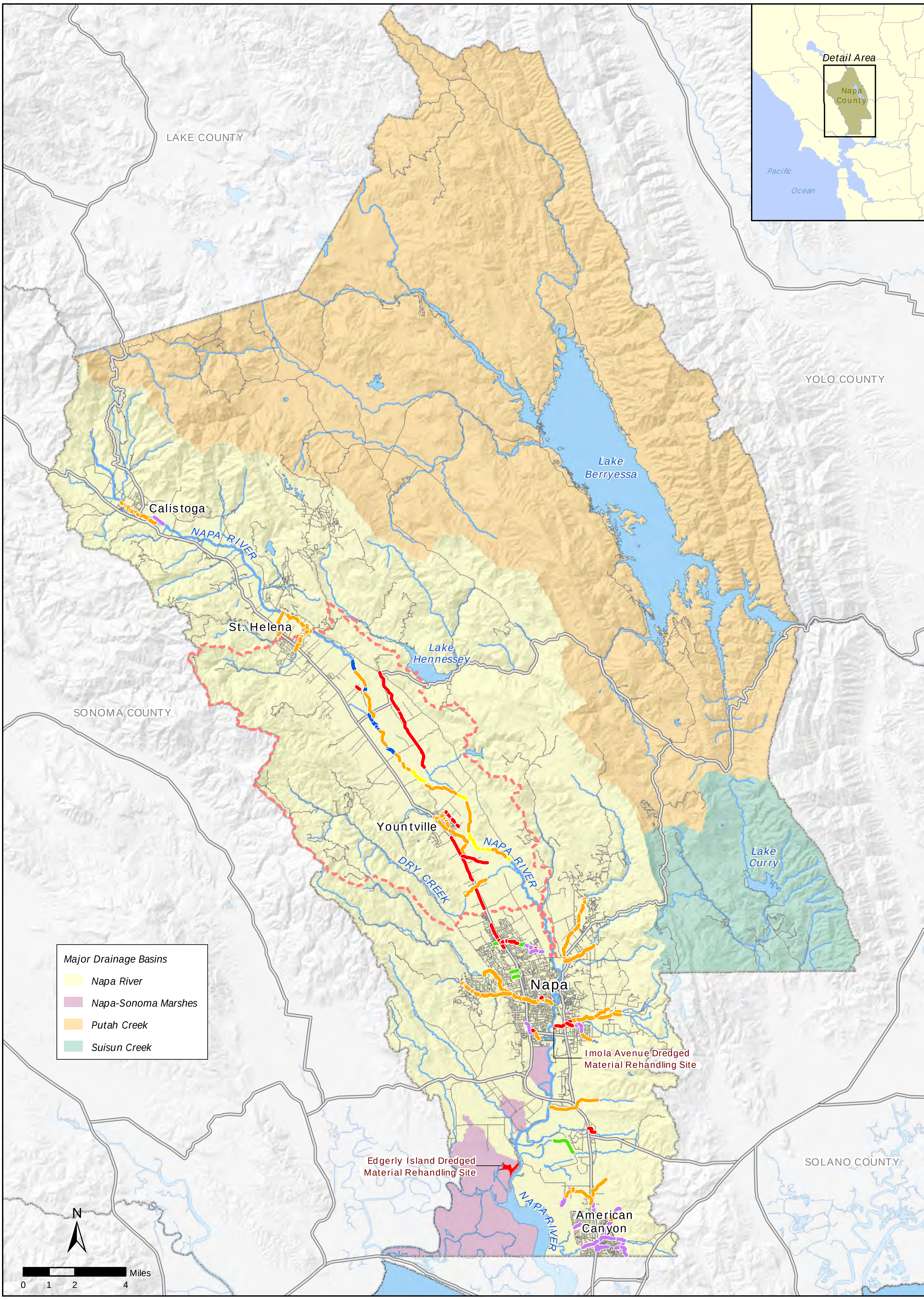

Figure 1-1

Flood Control District Owned or Easement (surveyed annually and maintained)

County Owned or Easement (surveyed annually and maintained by agreement)

Other Public Owned Easement (surveyed annually and maintained by agreement)

Private Owned: FCD surveyed annually and maintained as needed

Rutherford Reach Restoration Project

Oakville to Oak Knoll Restoration Project

Napa River

Streams where maintenance may occur

Water Body

Community Facilities District Boundary

Highway

Roads and Streets

County Lines

Napa County
Stream Maintenance Program Area
and Maintenance Reaches

Source: Napa County Flood Control & Water Conservation District, 2010; Napa County GIS, 2010. USGS

Napa County Flood Control and Water Conservation District

PHILLIP M. MILLER, P.E.
DISTRICT ENGINEER

March 29, 2018

Jose Simon III, Chairperson
Middletown Rancheria
P.O. Box 1035
Middletown, CA 95461

RE: Napa County Flood Control and Water Conservation District Stream Maintenance Manual Update – Tribal Coordination

Dear Honorable Chairperson Simon:

The Napa County Flood Control and Water Conservation District (District) is writing to notify you of a proposed project in order to coordinate with you about the existence of any information on known tribal resources that may be present or affected. It is important to note that the District has not received a request from you for notification of projects under Assembly Bill 52 (AB52).

The District was established in 1951 to conduct watershed maintenance and management activities in Napa County. Its primary purpose is to reduce the potential for flood damage along the riparian corridors on private and public lands throughout Napa County. Through a variety of programs enacted since the late 1990s, the District has worked with public and private partners to enhance the natural environment of the Napa River and its tributaries, while maintaining flood protection. Maintenance activities generally include vegetation management such as invasive plant removal and revegetation, sediment removal, erosion control, and maintenance of storm drainage facilities and outfalls. The District frequently partners with the Napa County Resource Conservation District (RCD) to implement creek stewardship projects for property owners and managers, and stakeholders to conserve, protect, and restore natural resources throughout Napa County and a small portion of Solano County. The District developed a Stream Maintenance Manual (Manual) in 2012 to describe the maintenance activities, including best management practices, that are implemented through their maintenance program.

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Manual updates would include:

- Revisions to ongoing maintenance practices, such as the addition of bank repair activities, increasing the annual routine sediment removal limit from 500 feet to 1,500 feet, and species-specific avoidance and minimization measures for work in perennial streams;

- Expanded routine maintenance activities in the Napa River and Green Valley Creek watersheds based on easement agreements;
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- Addition of a mitigation chapter with a suite of mitigation options.

The District considers itself as "creek stewards" for Napa County and sees this Manual as not only an internal reference manual for District staff, but also an important educational and guidance document for the County at large. The Manual update would also provide the basis to secure regulatory approvals under federal and state regulations, including the federal Clean Water Act (CWA) and Endangered Species Act (ESA).

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Preparation of the Manual update is considered a project under the California Environmental Act and, as a result, the District is preparing an Initial Study/Mitigated Negative Declaration to provide the public, responsible agencies, trustee agencies, and Native American Tribes with information about the potential environmental effects of the proposed updated Stream Maintenance Program.

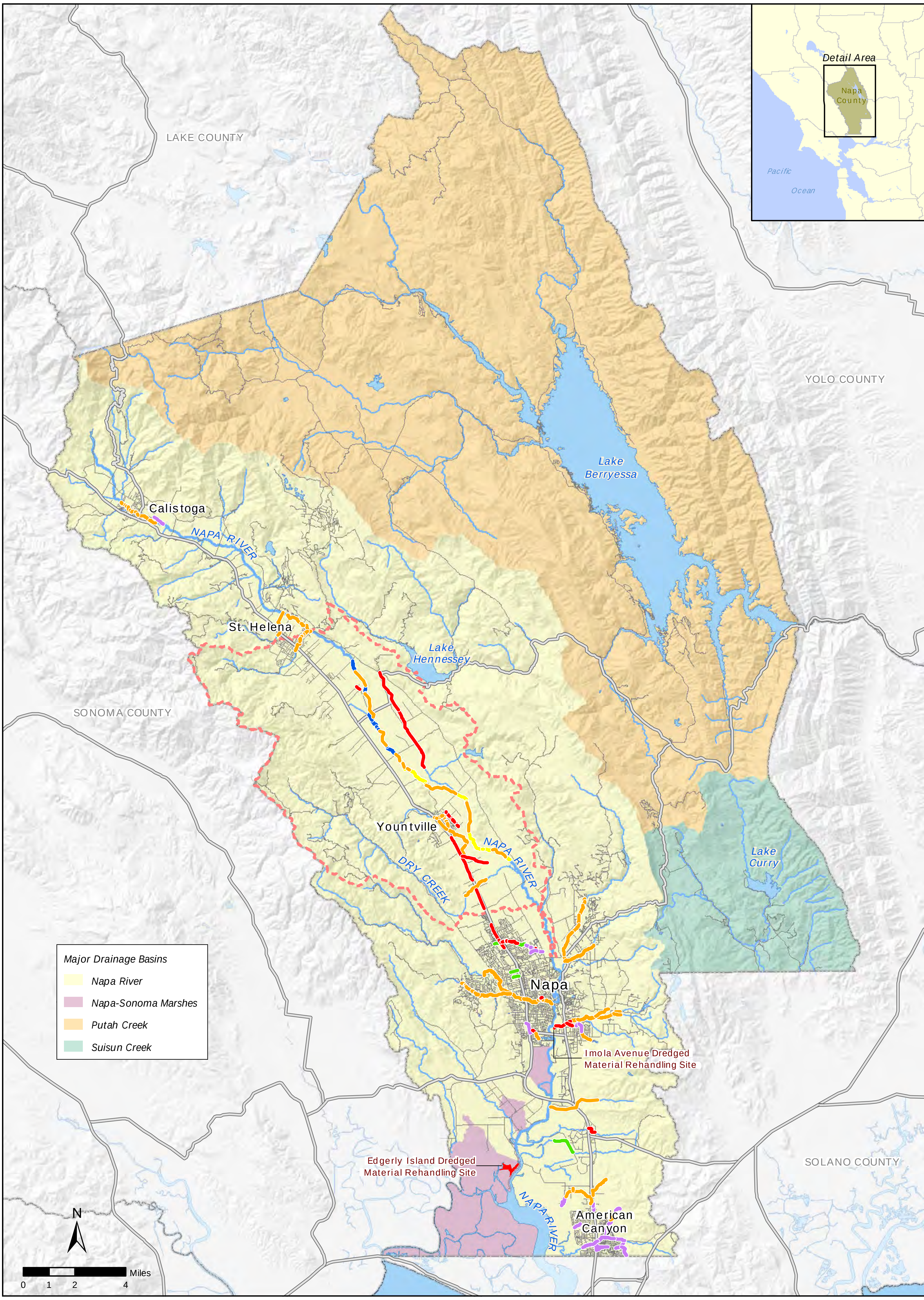
A Sacred Lands and Files Search request at the Native American Heritage Commission (NAHC) identified a number of tribal resources in the Sacred Lands File within the project area. The NAHC suggested that we contact you for information about such resources located on the Sonoma (Sonoma and Napa counties) and Detert Reservoir (Lake and Napa counties) USGS 7.5' quadrangles. We are requesting any information that you may have regarding tribal cultural resources (as defined by Public Resources Code 21074) within the project area so that this information can be incorporated into project planning and the resources can be protected. The District is respectfully requesting input from you within 30 days of receipt of this letter.

Your comments and concerns are important to us and we look forward to hearing from you. If you have any questions or comments regarding the project, I can be contacted via email at Richard.thomasser@countyofnapa.org or by phone at (707) 259-8657.

Sincerely,

Richard Thomasser, P.G.
Watershed and Flood Control Operations Manager

Enclosures: Figure 1-1 – Program Area



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Napa County
Stream Maintenance Program Area
and Maintenance Reaches

Source: Napa County Flood Control & Water Conservation District, 2010; Napa County GIS, 2010. USGS

Napa County Flood Control and Water Conservation District

PHILLIP M. MILLER, P.E.
DISTRICT ENGINEER

March 29, 2018

Scott Gabaldon, Chairperson
Mishewal-Wappo Tribe of Alexander Valley
2275 Silk Road
Windsor, CA 95492

RE: Napa County Flood Control and Water Conservation District Stream Maintenance Manual Update – Tribal Coordination

Dear Honorable Chairperson Gabaldon:

The Napa County Flood Control and Water Conservation District (District) is writing to notify you of a proposed project in order to coordinate with you about the existence of any information on known tribal resources that may be present or affected. It is important to note that the District has not received a request from you for notification of projects under Assembly Bill 52 (AB52).

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Sincerely,

Richard Thomasser, P.G.
Watershed and Flood Control Operations Manager

Enclosures: Figure 1-1 – Program Area

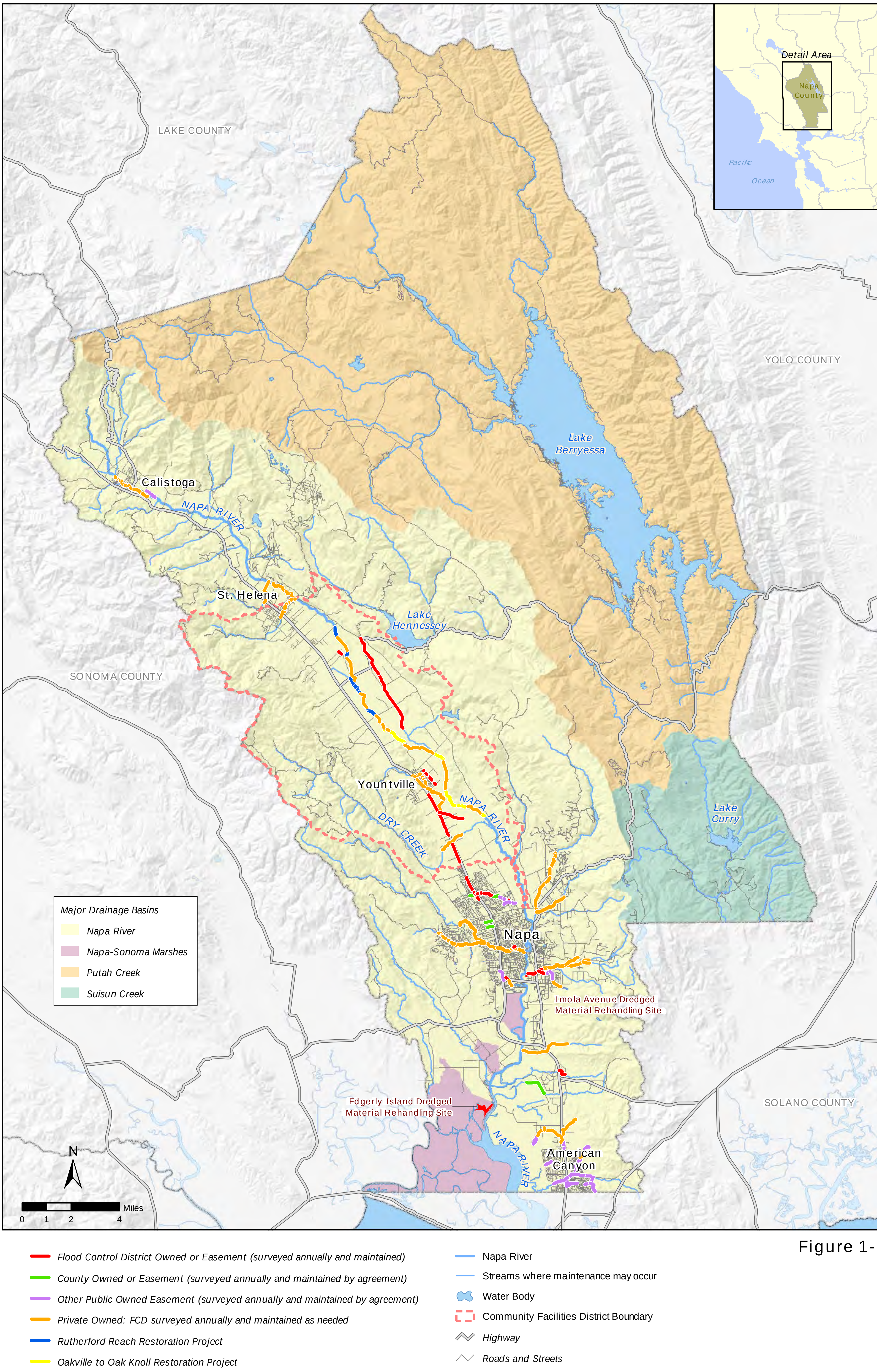

Figure 1-1

Napa County
Stream Maintenance Program Area
and Maintenance Reaches

Source: Napa County Flood Control & Water Conservation District, 2010; Napa County GIS, 2010. USGS

Napa County Flood Control and Water Conservation District

PHILLIP M. MILLER, P.E.
DISTRICT ENGINEER

March 29, 2018

Anthony Roberts, Chairperson
Yocha Dehe Wintun Nation
P.O. Box 18
Brooks, CA 95606

RE: Napa County Flood Control and Water Conservation District Stream Maintenance Manual Update – Tribal Coordination

Dear Honorable Chairperson Roberts:

The Napa County Flood Control and Water Conservation District (District) is writing to notify you of a proposed project in order to coordinate with you about the existence of any information on known tribal resources that may be present or affected. It is important to note that the District has not received a request from you for notification of projects under Assembly Bill 52 (AB52).

The District was established in 1951 to conduct watershed maintenance and management activities in Napa County. Its primary purpose is to reduce the potential for flood damage along the riparian corridors on private and public lands throughout Napa County. Through a variety of programs enacted since the late 1990s, the District has worked with public and private partners to enhance the natural environment of the Napa River and its tributaries, while maintaining flood protection. Maintenance activities generally include vegetation management such as invasive plant removal and revegetation, sediment removal, erosion control, and maintenance of storm drainage facilities and outfalls. The District frequently partners with the Napa County Resource Conservation District (RCD) to implement creek stewardship projects for property owners and managers, and stakeholders to conserve, protect, and restore natural resources throughout Napa County and a small portion of Solano County. The District developed a Stream Maintenance Manual (Manual) in 2012 to describe the maintenance activities, including best management practices, that are implemented through their maintenance program.

The California Department of Fish and Wildlife issued a 10-year approval and San Francisco Bay Regional Water Quality Control Board issued a 5-year approval to conduct the maintenance activities as described in the 2012 Manual. The updated Manual would expand District maintenance responsibilities and revise maintenance approaches, and maintenance activities conducted by both the Napa County RCD and County in partnership with the District. The Manual would also include the addition of stream maintenance activities within the City of American Canyon consistent with maintenance practices described in the Manual.

Manual updates would include:

- Revisions to ongoing maintenance practices, such as the addition of bank repair activities, increasing the annual routine sediment removal limit from 500 feet to 1,500 feet, and species-specific avoidance and minimization measures for work in perennial streams;

- Expanded routine maintenance activities in the Napa River and Green Valley Creek watersheds based on easement agreements;
- Expanded maintenance coverage for the Rutherford Reach ad Oakville Knoll Restoration Projects;
- Inclusion of maintenance activities for the Napa River/Napa Creek Flood Protection Project;
- Inclusion of RCD and County Public Works road maintenance activities (e.g., clearing of debris from existing culverts, minor vegetation removal, debris removal, biotechnical bank stabilization, and culvert repair or replacement);
- Inclusion of City of American Canyon stream maintenance activities (e.g., sediment and debris removal from culvert aprons, culverts and bridge structures, vegetation maintenance within the stream channels and sediment basins, and some sediment removal along segments of drainages) along approximately 7.5 miles of streams that flow into the Napa River; and
- Addition of a mitigation chapter with a suite of mitigation options.

The District considers itself as "creek stewards" for Napa County and sees this Manual as not only an internal reference manual for District staff, but also an important educational and guidance document for the County at large. The Manual update would also provide the basis to secure regulatory approvals under federal and state regulations, including the federal Clean Water Act (CWA) and Endangered Species Act (ESA).

The area encompassed by the updated Manual includes all of Napa County, as depicted in Figure 1-1.

Preparation of the Manual update is considered a project under the California Environmental Act and, as a result, the District is preparing an Initial Study/Mitigated Negative Declaration to provide the public, responsible agencies, trustee agencies, and Native American Tribes with information about the potential environmental effects of the proposed updated Stream Maintenance Program.

A Sacred Lands and Files Search request at the Native American Heritage Commission (NAHC) identified a number of tribal resources in the Sacred Lands File within the project area. The NAHC suggested that we contact you for information about such resources located on the Sonoma (Sonoma and Napa counties) and Detert Reservoir (Lake and Napa counties) USGS 7.5' quadrangles. We are requesting any information that you may have regarding tribal cultural resources (as defined by Public Resources Code 21074) within the project area so that this information can be incorporated into project planning and the resources can be protected. The District is respectfully requesting input from you within 30 days of receipt of this letter.

Your comments and concerns are important to us and we look forward to hearing from you. If you have any questions or comments regarding the project, I can be contacted via email at Richard.thomasser@countyofnapa.org or by phone at (707) 259-8657.

Sincerely,

Richard Thomasser, P.G.
Watershed and Flood Control Operations Manager

Enclosures: Figure 1-1 – Program Area

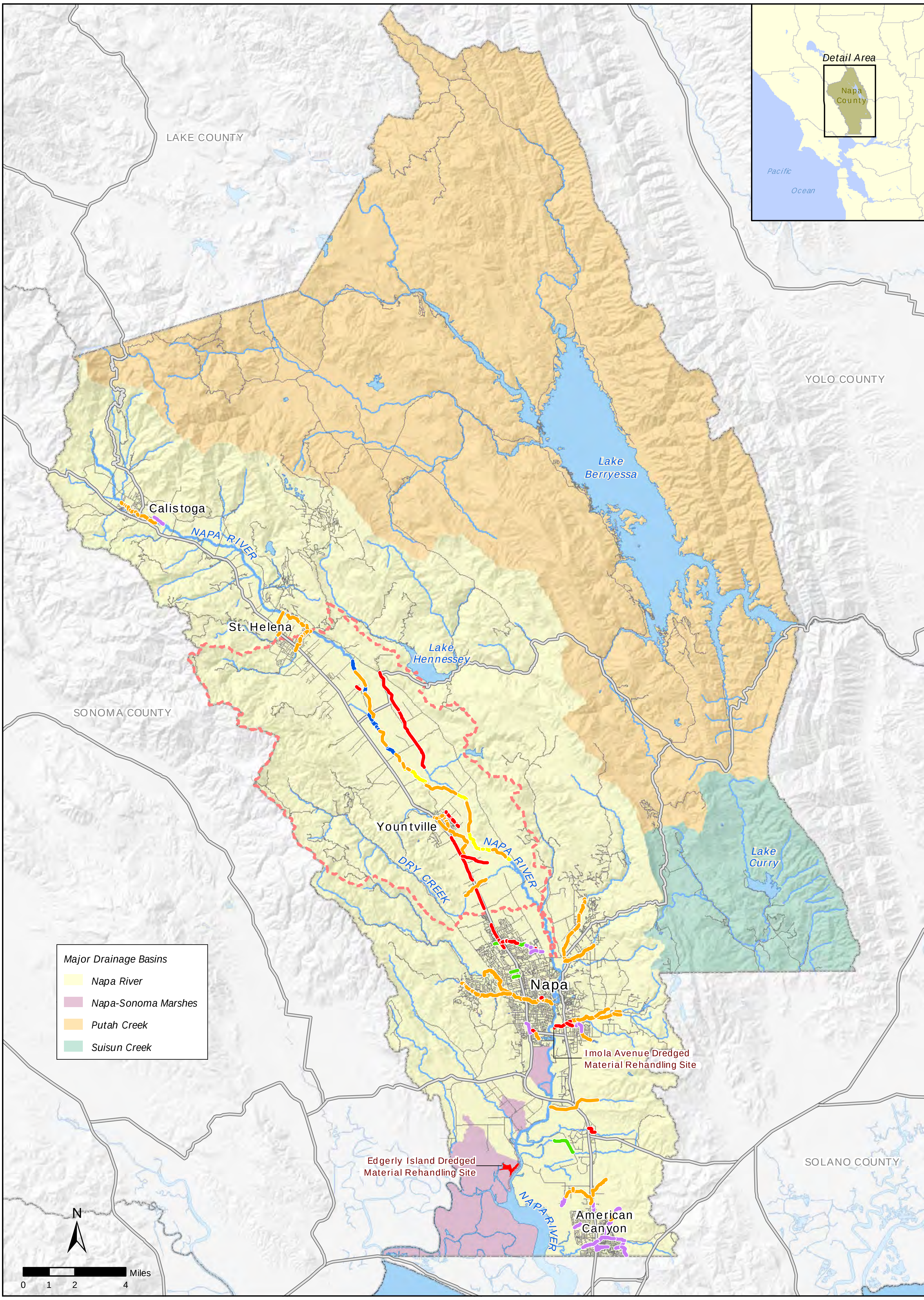

Figure 1-1

Flood Control District Owned or Easement (surveyed annually and maintained)
County Owned or Easement (surveyed annually and maintained by agreement)
Other Public Owned Easement (surveyed annually and maintained by agreement)
Private Owned: FCD surveyed annually and maintained as needed
Rutherford Reach Restoration Project
Oakville to Oak Knoll Restoration Project

Napa River
Streams where maintenance may occur
Water Body
Community Facilities District Boundary
Highway
Roads and Streets
County Lines

Napa County
Stream Maintenance Program Area
and Maintenance Reaches

Source: Napa County Flood Control & Water Conservation District, 2010; Napa County GIS, 2010. USGS